CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
CALIFORNIA

State Plan of Flood Control Descriptive Document

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Cover Photo:

Sacramento Weir is part of the State Plan of Flood Control.

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Guide to Report

This report provides an inventory and description of the flood control projects and works (facilities), lands, programs, plans, conditions, and mode of operations and maintenance (O&M) for the State-federal flood protection system in the Sacramento River and San Joaquin River watersheds of California. This flood protection system comprises federally and State-of-California (State) authorized projects for which the Central Valley Flood Protection Board (Board), formerly The Reclamation Board, or the California Department of Water Resources (DWR) of the State, has provided assurances of cooperation to the United States federal government. These Board- or DWR-provided assurances, coupled with State authorization, are an important distinction for what constitutes the State-federal flood protection system[1]. Other flood protection facilities in the Sacramento River and San Joaquin River watersheds that are not covered by assurances to the federal government from the Board or DWR are not part of the State-federal system.

Section 9110(f) of the California Water Code (CWC) defines the SPFC as follows:

> *"State Plan of Flood Control" means the state and federal flood control works, lands, programs, plans, policies, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in Section 8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds authorized pursuant to Article 2 (commencing with Section 12648) of Chapter 2 of Part 6 of Division 6 for which the board or the department has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in Section 8361.*

This State Plan of Flood Control (SPFC) Descriptive Document is the first inventory of the SPFC that has been compiled or referenced in a single report. Until now, much of the information on the SPFC has been individually maintained for each of the many flood protection projects that constitute State-federal flood protection along the Sacramento and San Joaquin rivers, tributaries, and distributaries. For example, much of the information contained in sections of this report originates in 118 individual project (unit-specific) O&M manuals. The O&M manuals provide key information about each project and how it should be operated and maintained (see reference digital versatile disc (DVD) at the back of this report).

The Sacramento Weir provided flood protection for the City of Sacramento in 1995

In addition, since the individual projects for the system were implemented over almost a century, some information may have been lost or never obtained. In those cases, gaps exist in the information presented in this report and further research is required.

It is important to note that the SPFC is only a portion of the larger system that provides flood protection for the Central Valley. The SPFC relies on many other features that do not meet the definition of the SPFC. For example, non-SPFC reservoirs provide substantial regulation of flows that in turn reduces loading on public and private nonfederal levees, SPFC facilities, locally operated drainage systems, and other facilities work in conjunction with SPFC facilities. Management practices such as emergency response, floodplain management, and other practices are critical to successful operation of the flood protection system. All parts of the system, including the SPFC, depend on other parts of the system to operate as a unit.

[1]SPFC facilities also include other features identified in Section 8361 of the CWC.

OVERVIEW OF SPFC

Project Works (facilities)

- Approximately 1,600 miles of levees
- Five major weirs spilling floodwaters from the Sacramento River to bypass channels
- Four dams
- Two flood relief structures and one natural overflow area from the Sacramento River into the Butte Basin
- Five control structures directing flow in bypass channels along the San Joaquin River
- Seven major pumping plants
- Channels
- Bypasses and sediment basins
- Environmental mitigation areas
- Associated facilities, such as bank protection, stream gages, and drainage facilities

Lands

- Fee title, easements, and land use agreements
- Approximately 18,000 parcels

Operations and Maintenance

- Two standard operations and maintenance (O&M) manuals
- 118 unit-specific O&M manuals
- Maintenance by State and Local Maintaining Agencies (LMA)

Conditions (terms)

- Assurances of Cooperation (as specified in Memorandums of Agreement (MOU), the CWC, and agreements)
- Flood Control Regulations, Section 208.10, 33 Code of Federal Regulations
- Requirements of standard and unit-specific O&M manuals
- Design profiles (1955 and 1957)

Programs and Plans

- Historical documents and processes
- As-constructed drawings
- Oversight and management
- Ongoing programs and plans

This report is structured as a reference document for the SPFC. It includes narrative descriptions, tables, and figures, especially maps, to help the reader find information for this complex flood protection system. Some sections include summary portions for readers who only need an overview of the subject. Figure G-1 shows a geographic overview of the SPFC facilities. This document is organized in the following sections:

1. Introduction. Provides overview information about why this reference document has been prepared.
2. Existing Projects. Presents the federal and State authorizations and the assurances of cooperation for each of the projects included in the SPFC.
3. SPFC Facilities. Describes SPFC project works, or facilities, located along the various reaches of the Sacramento and San Joaquin rivers and their tributaries and distributaries. This description of the functional layout of the system follows the flow path of floodwaters. It is intended to complement the information contained in the many unit-specific O&M manuals.
4. SPFC Lands. Describes property rights held for the SPFC.
5. SPFC Operations and Maintenance. Describes the O&M responsibilities and activities that maintaining agencies have and implement. Maintaining agencies primarily include DWR and LMAs (levee districts, reclamation districts, cities, counties, and other public agencies and municipalities).

6. **SPFC Conditions.** Describes conditions (terms) to which the State has agreed for long-term O&M of the SPFC facilities.
7. **Programs and Plans Related to the SPFC.** Describes existing programs and plans that support the SPFC, and ongoing evaluations and processes that will affect the SPFC in the future.
8. **SPFC Updates.** Describes how this document will be updated. While much of the information contained in this report is not expected to change, report updates or supplements will be necessary to keep the description of the SPFC current as new projects are planned and added to the SPFC, and as other changes occur.
9. **Observations.** Contains observations about the material encountered during work on this document. While material pertaining to the SPFC was being compiled, the DWR planning team observed that additional work or research may be warranted to fill noted data gaps, that information may need to be managed differently than under current conditions, or may provide the basis for future SPFC updates.
10. **Acronyms and Abbreviations.** Provides list of acronyms and abbreviations used in this SPFC Descriptive Document.
11. **References.** Contains a list of references used to compile this SPFC Descriptive Document.

Because of the voluminous material available to describe the SPFC, a DVD located in the pocket at the back of the report includes important base information and reference material. The DVD includes O&M manuals, an O&M Map Book, data tables, design water surface profiles, and other supporting documents.

Please visit the Central Valley Flood Management Planning Program Web site (http://www.water.ca.gov/cvfmp/documents.cfm) to view comments on earlier drafts of this report and responses.

Central Valley Flood Management Planning Program Web site (http://www.water.ca.gov/cvfmp/documents.cfm) October 30, 2010

Figure G-1. Geographic Overview of the State Plan of Flood Control

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Attachments

Attachment A – State Plan of Flood Control Index and Location Maps

Attachment B – State Plan of Flood Control Reference DVD

1. *State Plan of Flood Control Descriptive Document.*
2. Federal authorizations and supporting Chief of Engineers reports.
3. *1953 Memorandum of Understanding* (USACE and The Reclamation Board, 1953) and Supplements.
4. O&M manuals (standard and unit-specific).
5. O&M manual map book.
6. O&M tables (summary of facilities and ancillary features).
7. Project agreements
8. *Draft Technical Memorandum, Historical Reference Document for the State Plan of Flood Control* (DWR, 2009a).
9. *Cache Creek Basin California, Middle Creek Project, Stream Profiles* (USACE, 1957b).
10. *Sacramento River Flood Control Project, California, Levee and Channel Profiles* (USACE, 1957a) also known as 1957 Revised Profile Drawings.
11. *San Joaquin River and Tributaries Project, California, Levee Profiles* (USACE, 1955) also known as 1955 Profile.
12. *Mormon Slough Project, San Joaquin County, Plan of Improvement, Profile and Flood Plane* (USACE, 1965).
13. *Sacramento River Flood Control System, Project Design Flows* (form letter from A. Gomez to The Reclamation Board) (USACE, 1969).
14. 2006 letter from USACE to The Reclamation Board regarding allowable vegetation within floodways (USACE, 2006).

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1.0 Introduction

With few exceptions, the largest and most damaging floods in California have occurred in the Central Valley. A complex system of dams and reservoirs, levees, weirs, bypasses, and other features constructed piecemeal over the last 150 years protects urban and rural areas against most flooding, and has prevented billions of dollars in damages. Still, only small portions of the system provide protection from rare and substantially large flows that cause severe damage when they occur. Portions of the system can be damaged and fail during floods that happen as frequently as every 5 to 10 years.

A portion of this complex flood protection system includes State- and federally authorized projects for which the Central Valley Flood Protection Board (Board), formerly The Reclamation Board, or the California Department of Water Resources (DWR) has provided assurances of cooperation to the federal government. This portion of the flood protection system is known as the State-federal flood protection system.

This section presents introductory information, including the definition of State Plan of Flood Control (SPFC), legislative requirement, purpose and scope for the document, description of Board or DWR assurances of cooperation to the federal government, local assurances to the State, the geographic focus area covered by the SPFC, and a brief acknowledgement of the importance of the remainder of the flood protection system.

1.1 Definition of State Plan of Flood Control

Section 9110 (f) of the California Water Code (CWC) defines the SPFC as follows:

> *"State Plan of Flood Control" means the state and federal flood control works, lands, programs, plans, policies, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in Section 8350, and of flood control projects in the Sacramento River and San Joaquin River watersheds authorized pursuant to Article 2 (commencing with Section 12648) of Chapter 2 of Part 6 of Division 6 for which the board or the department has provided the assurances of nonfederal cooperation to the United States, and those facilities identified in Section 8361.*

In summary, flood control features may be part of the SPFC if they are as follows:

1. Part of the Sacramento River Flood Control Project described in CWC Section 8350; ***or***
2. Part of projects authorized pursuant to CWC Division 6, Part 6, Chapter 2, Article 2, ***and*** located in the Sacramento River or San Joaquin River watersheds, ***and*** the Board or DWR has provided assurances of cooperation to the federal government; ***or***
3. Identified in Section 8361 of the CWC.

Sections of the CWC cited in the definition may be found at the following Web site:

http://www.leginfo.ca.gov/.html/wat_table_of_contents.html

The Sacramento River and San Joaquin River watershed boundaries for the SPFC are shown in Figure 1-1.

Figure 1-1. Sacramento and San Joaquin River Basins Planning Area for the State Plan of Flood Control

1.2 Legislative Requirement

Proposition 1E (Disaster Preparedness and Flood Prevention Act of 2006), approved by California voters on November 7, 2006, requires that information on the SPFC "*…be updated by the department and compiled into a single document entitled 'The State Plan of Flood Control.'*"

1.3 Report Purpose and Scope

The purpose of this report is to serve as the reference document required by Proposition 1E, Disaster Preparedness and Flood Prevention Act of 2006, for the project facilities, lands, programs, plans, conditions, and mode of operations and maintenance (O&M) that comprise the SPFC. This report is not a plan for the future, but a description of what is known about the current SPFC, with future updates to be prepared as changes are made to the SPFC. The nature of the SPFC makes the following information especially important:

- The State-federal flood protection system includes numerous separate projects along the Sacramento and San Joaquin rivers and tributaries.
- The system has been developed incrementally since before the first federal authorization for projects in 1917. Because of the incremental nature of building the system over many decades, and the system's evolution, comprehensive information was not available in a single location.
- Many of the SPFC levees and the Sacramento Weir predate the first federally authorized projects and were either accepted as meeting federal standards or modified to meet federal standards.
- Two standard O&M manuals describe O&M requirements for the Sacramento River, San Joaquin River, tributaries, and distributaries.
- Numerous separate unit-specific O&M manuals and O&M requirements are applicable to each unit of the system.
- Thousands of individual land records define the property rights held by the Sacramento-San Joaquin Drainage District (SSJDD) as part of the SPFC. The SSJDD is under the jurisdiction of the Board and was created by State legislation in 1913.
- DWR and local maintaining agencies (LMA) perform O&M in 110 jurisdictional areas (see Table 5-1). LMAs include levee districts, reclamation districts, cities, counties, and other public agencies and municipalities.
- Numerous plans and programs have evolved during the life of the State-federal flood protection system in the Central Valley.
- In some cases, the Board, jointly with an LMA, provided assurances of cooperation to the federal government.

This report describes the major elements of the SPFC, but only in a level of detail necessary to orient the reader to the SPFC and reference where more information can be found. For example, a given reach of levee may have many encroachments such as pipes that cross under, through, or over the levee. In addition, a given river reach may have associated bridges, stream gages, drainage facilities, etc. No attempt was made to itemize of all these encroachments and associated facilities in this SPFC Descriptive Document. Because of the volume of this available information, a reference digital versatile disc (DVD) is located in a pocket at the end of this report. The DVD provides more details than can be contained in the following sections.

1.4 State Assurances of Cooperation to the Federal Government

An important distinction of the projects included in the SPFC is that the Board or DWR, as the non-federal sponsor, has given assurances of cooperation to the federal government[2]. At a minimum, the assurances include that the Board or DWR provide without cost to the United States, all lands, easements, and rights-of-way necessary for completion of a project; bear the expense of necessary highway, railroad, and bridge alterations; hold and save the United States free from claims for damages resulting from construction of the works (facilities); and maintain and operate all works (facilities) after they are completed. Depending on when a facility was authorized and constructed, there could be additional assurances of cooperation, including providing replacement, rehabilitation, and repair (see project-specific agreements).

[2]SPFC facilities also include other features identified in Section 8361 of the CWC.

The unit-specific O&M manual files contained on the reference DVD generally include a letter indicating that the project has been transferred from the federal government to the nonfederal sponsor for O&M responsibilities.

The Board or DWR has not provided assurances of cooperation for all parts of the flood protection system in the Central Valley. This SPFC Descriptive Document does not include details on projects without Board or DWR assurances because those projects are not part of the SPFC (except the overflow areas into the Butte Basin identified in Section 8361 of the CWC). The SPFC Descriptive Document does, however, provide a brief overview of those existing facilities in Sections 2.3 and 2.4 as context that the flood protection system includes more than the SPFC facilities. In cases when local entities have given assurances of cooperation directly to the federal government, the projects are not considered part of the SPFC.

1.5 Local Assurances of Cooperation to the Board

For most units of the flood protection system, the responsibility for O&M has been transferred from the Board to LMAs. Generally, the LMAs gave assurances of cooperation to the Board under which the LMAs are responsible for operating and maintaining, replacing, rehabilitating, and repairing the completed facilities in accordance with the federal requirements described in the O&M manuals and federal regulations.

1.6 Flood Protection System

The SPFC is only a portion of the larger system that provides flood protection for the Central Valley. In addition, the State and federal governments have invested in California flood protection projects outside the Central Valley.

The SPFC relies on many other features that do not technically meet the definition of the SPFC (Section 1.1). For example, non-SPFC reservoirs provide substantial regulation of flows to levels that SPFC facilities can generally accommodate – without these reservoirs, flows could overwhelm SPFC facilities frequently. In addition, other public and private levees, locally operated drainage systems, and other State, federal, and local facilities work in conjunction with SPFC facilities. Management practices such as emergency response, floodplain management, and other practices are part of the overall flood protection system. All parts of the system, including the SPFC and other facilities and management practices, depend on other parts of the system to operate as a cohesive unit.

Non-SPFC dams such as Shasta Dam provide substantial regulation of flows that affects SPFC facilities

Since this report is structured as a reference document for the SPFC, it does not provide detailed information on non-SPFC features of the system. However, it does provide short descriptions of other non-SPFC flood protection projects in Sections 2.3, 2.4, and 2.5. Additional system descriptions, including the interrelationship among SPFC facilities and non-SPFC facilities, can be found in the Flood Control System Status Report (FCSSR) and the Central Valley Flood Protection Plan (CVFPP).

2.0 Existing Projects

Within the Central Valley watershed, numerous reservoirs, channels, levees, bypasses, and related facilities reduce the threat of major flooding along the Sacramento and San Joaquin rivers and tributaries and distributaries. As early as the 1850s, the first levees were constructed by local landowners in the Central Valley. Some of these early levees eventually became part of a State-federal flood protection system that began when Congress authorized the Sacramento River Flood Control Project (SRFCP) in the Flood Control Act of 1917.

This section presents the State and federal authorizations for the State-federal flood protection projects included in the SPFC. Also mentioned are ongoing State-federal projects that are likely to become part of the SPFC upon completion and other portions of the flood management system (Sections 2.3, 2.4, and 2.5) that are important for overall flood management, but not part of the SPFC. In general, successful operation of these non-SPFC facilities is essential for successful operation of the SPFC.

This section is not a description of the history of the SPFC, but instead it describes the legal basis for the flood protection projects. Information pertaining to history of the SPFC is included in the Technical Memorandum, Draft Historical Reference Document for the State Plan of Flood Control (DWR, 2009a). At the time of this report, development of a more detailed SPFC History Report is underway.

2.1 Summary

The SPFC includes many different projects authorized in federal and State legislation. Table 2-1 summarizes these projects, organized under the Sacramento River and San Joaquin River basins. The table includes the federal acts, public law numbers, and Chief of Engineers Reports (generally printed as U.S. House documents (HD) or U.S. Senate documents (SD)) and CWC sections pertaining to each SPFC project. Figure 2-1 shows general project locations. The projects listed in Table 2-1 are completed projects that include facilities of the SPFC (Sections 2.2 and 3.0).

Table 2-1. Summary of Existing State Plan of Flood Control Projects

Project	Federal Act	Public Law	Chief of Engineers Report	State Authorization
SACRAMENTO RIVER BASIN				
Sacramento River Flood Control Project				
	FCA 1917	64-367	HD 62-81 RHCD 63-5	CWC Section 8350 and CWC Section 12648
	FCA 1928	70-391	SD 69-23	
	RHA 1937	75-392	SCCD 75th Congress	
	FCA 1941	77-205	HD 77-205	
Sacramento River and Major and Minor Tributaries Project				
	FCA 1944	78-534	HD 78-649	CWC Section 12648
	FCA 1950	81-516		
American River Flood Control Project				
	FCA 1954	83-780	HD 81-367	CWC Section 12648.1
Sacramento River – Chico Landing to Red Bluff				
	FCA 1950	81-516	HD 84-272	CWC Section 12648.2
	FCA 1958	85-500		
Adin Project				
	FCA 1937	75-352	CAP	CWC Section 12656.7 (channel clearing)
	FCA 1954	83-780		
Middle Creek Project				
	FCA 1954	83-780	HD 81-367	CWC Section 12656.5
McClure Creek Project				
	FCA 1937	75-352	CAP	CWC Section 12656.7 (channel clearing)
	FCA 1954	83-780		
Salt Creek Project				
	FCA 1937	75-352	CAP	CWC Section 12656.7 (channel clearing)
	FCA 1954	83-780		
Lake Oroville Project				
	FCA 1958	85-500	Not applicable	CWC Section 12648 and CWC Section 12649 (not specific to Lake Oroville)
Sacramento River Bank Protection Project				
	FCA 1960	86-645	SD 86-103	CWC Section 12649.1
North Fork Feather River Project				
	FCA 1968	90-483	HD 90-314	CWC Section 12648.7

Table 2-1. Summary of Existing State Plan of Flood Control Projects (contd.)

Project	Federal Act	Public Law	Chief of Engineers Report	State Authorization
SAN JOAQUIN RIVER BASIN				
Lower San Joaquin River and Tributaries Project				
	FCA 1944	78-534	FCCD 78-2	CWC Section 12651
	FCA 1950	84-327		
Buchanan Reservoir and Channel Improvement on Chowchilla River				
	FCA 1962	87-874	SD 87-98	CWC Section 12648.4
Hidden Dam and Hensley Lake Project				
	FCA 1962	87-874	SD 87-37	CWC Section 12648.3
Merced County Streams Project				
	FCA 1944	78-534	HD 78-473	CWC Section 12650
	FCA 1970	91-611		
Bear Creek Project				
	FCA 1944	78-534	HD 78-545	CWC Section 12652
Littlejohns Creek and Calaveras River Stream Group Project				
	FCA 1944	78-534	HD 78-545	CWC Sections 12652 and 12653
Farmington Reservoir Project				
	FCA 1944	78-534	HD 78-545	CWC Section 12653 (channel work only)
Mormon Slough Project				
	FCA 1962	87-874	HD 87-576	CWC Section 12648.6

Note:
Other federal authorizations for flood management projects may be included in future updates to this SPFC Descriptive Document if the projects are added to the SPFC. Similarly, some of these projects may be removed from the SPFC if they are deauthorized.
Key:
CAP = Continuing Authorities Projects
CWC = California Water Code
FCA = Flood Control Act
FCCD = Flood Control Committee Document
HD = U.S. House Document
RHA = Rivers and Harbors Act
RHCD = Rivers and Harbors Committee Document
SCCD = Senate Commerce Committee Document
SD = U.S. Senate Document

Figure 2-1. Approximate Locations of Federal/State Flood Damage Reduction Projects Within the Sacramento and San Joaquin River Basins that are included in the State Plan of Flood Control

2.2 Federal and State Authorizations for Completed State-Federal Flood Protection Projects

This section shows the federal and State authorizations for each completed State-federal flood protection project currently included in the SPFC. The projects are organized as Sacramento River Basin projects and San Joaquin River Basin projects. While each authorization covers one major project, such as the SRFCP, projects were generally implemented over time through construction of various segments of the projects. Some levees are physically disconnected from the larger system and were constructed to provide local benefits while others were constructed to provide system benefits.

While the purpose of this section is to show the federal and State authorizations, statements on each project's features are included. The statements were extracted from the Congressional authorizations and their supporting U.S. Army Corps of Engineers (USACE) Chief of Engineers Reports (included on the reference DVD).

Major SPFC project works (facilities) associated with the following State-federal authorized projects are detailed in Section 3.0.

2.2.1 Sacramento River Basin Projects

The majority of the State-federal flood protection projects that are included in the SPFC are located in the Sacramento River Basin. Federal authorizations for projects described below began in 1917 while State authorization began in 1953.

Sacramento River Flood Control Project

The SRFCP is the core of the flood protection system along the Sacramento River and tributaries. The SRFCP includes most of the levees, weirs, control structures, bypass channels, and river channels that comprise the SPFC. About 980 miles of levees were involved in the project. Portions of these levees were originally constructed by local interests, and were either included directly in the project without modification or modified to meet USACE project standards. The project was originally authorized by the Flood Control Act of 1917 and subsequently modified and extended by the Flood Control Acts of 1928, 1937, and 1941. The State of California (State) adopted and authorized the SRFCP in 1953 by adding Section 12648 to the CWC. Assurances of cooperation were provided in the 1953 Memorandum of Understanding (MOU) (USACE and The Reclamation Board, 1953).

- Flood Control Act of 1917 – Public Law 64-367 (64th Congress) is the Flood Control Act of 1917. The authorized project was in accordance with plans contained in the California Debris Commission (predecessor of the Board) report submitted on August 10, 1910, and printed as HD 81 (62nd Congress), as modified by the California Debris Commission report submitted on February 8, 1913, and printed in Rivers and Harbors Committee Document No. 5 (63rd Congress). The 1913 document provides for the rectification and enlargement of river channels and the construction of weirs.
- Flood Control Act of 1928 – Public Law 70-391 (70th Congress) is the Flood Control Act of 1928. The 1928 act modified the Flood Control Act of 1917 in accordance with the California Debris Commission report submitted on May 1, 1924, and printed in SD 23 (69th Congress). Significant changes made by the act include the following:
  - Elimination of reclamation works in Butte Basin
  - Construction of a weir above Colusa
  - Elimination of two of the four proposed cutoffs in the stretch of river between Colusa and the mouth of the Feather River
  - Use of the existing Tisdale Weir instead of construction of a new weir
  - Relocation of certain levee lines on the Feather River and Yolo Bypass
  - Settling basin at the mouth of Cache Creek
  - Three sloughs in the Sacramento-San Joaquin Delta (Delta) to be left open instead of closed
  - Increase in levee cross-section dimensions
  - Conclusion that San Joaquin Valley flood problems are different from those of the Sacramento Valley, and that flood control in the San Joaquin Valley should be considered in a separate report, if deemed advisable
  - Federal government to carry some maintenance responsibility (enlarged channels, of weirs, and of certain gages)
  - Increase in the project cost

- Change of the cost share between the federal government and nonfederal interests
- Set design capacities

- Rivers and Harbors Act of 1937 – Public Law 75-392 (75th Congress) is the Rivers and Harbors Act of 1937. The prior 1917 and 1928 Flood Control Acts were modified in accordance with a Senate Commerce Committee Document (75th Congress). The document concluded that maintenance by the federal government was not consistent with policies of the Flood Control Act of 1936 (Public Law 74-738, 74th Congress). Additional work was required on revetment for eroding levees, and the project cost was adjusted. Requirements were added for local interests to provide rights-of-way and hold the federal government harmless from damage claims.
- Flood Control Act of 1941 – Public Law 77-228 (77th Congress) is the Flood Control Act of 1941. The 1941 act modified previous acts in accordance with HD 205 (77th Congress). The act authorized federal expenditures for completion of the project, and required the following local cooperation:

  - Furnish all rights-of-way, including railway, highway, and all other utility modifications
  - Hold and save the United States free from damage claims
  - Maintain and operate all works after completion in accordance with regulations prescribed by the Secretary of the Army

Construction of the SRFCP began in 1918 and continued for decades. By 1944, the project was regarded as being about 90 percent complete. The plan for completing the project was presented in the November 30, 1953, *MOU Respecting the Sacramento River Flood Control Project* between USACE and The Reclamation Board (see reference DVD) (USACE and The Reclamation Board, 1953). This MOU included levee construction standards for river project levees and bypass levees, and outlined maintenance responsibilities. The plan specified no difference in levee standards for urban versus agricultural levees. By 1961, the project was essentially completed (Kelley, 1989).

Some documents refer to the project from these authorizations as the "Old" SRFCP.

Sacramento River and Major and Minor Tributaries Project

The Sacramento River and Major and Minor Tributaries Project was initially authorized by the federal government in the Flood Control Act of 1944 (Public Law 78-534, 78th Congress), and was further amended by the Flood Control Act of 1950 (Public Law 81-516, 81st Congress). The project was a modification and extension of the SRFCP, and was to supplement reservoir storage by reducing flooding potential to certain areas along the Sacramento River. Authorizing legislation by the State of California is contained in Section 12648 of the CWC. Assurances of cooperation were provided in the 1953 MOU.

The project provided for levee construction and/or channel enlargement of the following minor tributaries of the Sacramento River: Chico, Mud and Sandy Gulch, Butte and Little Chico creeks; Cherokee Canal; and Elder and Deer creeks (Tehama County). In addition, the project also included revetment of levees for the Sutter, Tisdale, Sacramento, and Yolo bypasses. Minor tributary improvements were to reduce flood risk to about 80,000 acres of agricultural land important to the economy of the region and to the City of Chico and other smaller communities. Bypass levee revetment features of the project were to reduce flood risk to floodplain lands adjacent to the bypasses, and ideally would decrease requirements for levee repairs under emergency conditions (USACE, 1999).

American River Flood Control Project

The American River Flood Control Project was authorized by the federal government in the Flood Control Act of 1954 to reduce flood risk along the lower American River. Authorizing legislation by the State of California is contained in Section 12648.1 of the CWC. The project was constructed in 1958 by USACE, and includes approximately 8 miles of levee along the north bank of the American River between Carmichael Bluffs and the terminus of the SRFCP levee near the State Fairgrounds. It also includes about 10 miles of levee along the south bank of the American River from the confluence with the Sacramento River to Mayhew drain.

Sacramento River – Chico Landing to Red Bluff

The Sacramento River project for bank protection and channel improvements from Chico Landing to Red Bluff was authorized by the Flood Control Act of 1958 (Public Law 85-500, 85th Congress). Authorizing legislation by the State of California is contained in Section 12648.2 of the CWC. The project was authorized in accordance with recommendations by the USACE Chief of Engineers in HD 272 (84th Congress). The project was a modification and extension of the SRFCP, and was to increase bank protection along the Sacramento River from Chico Landing to Red Bluff and lower portions of its principal tributaries to reduce flood risk with discharges modified by Shasta Dam and Black Butte Dam. Black Butte Dam was planned to be constructed soon after this project was completed. The area encompassed by this project included the Sacramento River from Chico Landing to Red Bluff, and lower portions of Antelope, Mill, Deer, Pine, Elder, Thomes, and Stony creeks (USACE, 1999).

Lake Oroville Project

Federal participation in the construction of Oroville Dam was authorized by the Flood Control Act of 1958 (Section 204 of Public Law 85-500, 85th Congress). The federal interest was flood control provided by the flood control storage reservation of 750,000 acre-feet. This authorization also included the non-SPFC New Bullards Bar and the Marysville Dam (not constructed at the time of this report). Authorizing legislation by the State of California is contained in Sections 12648 and 12649 of the CWC, though these sections refer only to a project that would accomplish the same flood control purposes as proposed by the Table Mountain Dam.

Sacramento River Bank Protection Project

Erosion presents a serious ongoing threat to the SRFCP levee system. The Sacramento River Bank Protection Project (SRBPP) was authorized by Section 203 of the Flood Control Act of 1960 (Public Law 86-645, 74 Statute 498), supplemented by Section 202 of the River Basin Monetary Authorization Act of 1974 (Public Law 93-252, 88 Statute 49), as amended by Section 3031 of the Water Resources Development Act (WRDA) of 2007, and further supplemented by Section 140 of Public Law 97-377 (96 Statute 1916), to preserve the integrity of the SRFCP levee system. Section 12649.1 of the CWC provides the State authorization for the project.

The First and Second Phases authorized construction of 915,000 linear feet of bank protection work. Construction of the First Phase began in June 1965. The Second Phase of construction was authorized in 1974 and USACE began investigation of the Third Phase in the mid-1990s.

Sacramento River Bank Protection Project, First Phase Mitigation

Environmental mitigation for the impacts of the First Phase of the SRBPP was authorized by Congress in 1986, and approved a post-project mitigation program involving the purchase, protection, and revegetation of 260 acres.

North Fork Feather River Project

The North Fork Feather River Project at Chester was authorized by Section 203 of the Flood Control Act of 1968 (Public Law 90-483, 90th Congress). Section 12648.7 of the CWC provides the State authorization for the project. The authorized local project was in accordance with recommendations by the USACE Chief of Engineers in HD 314 (90th Congress). This project, consisting of a diversion dam, channel, and levees, was intended to reduce local flood risk.

Middle Creek Project

The Middle Creek Project, upstream from Clear Lake, was authorized by the Flood Control Act of 1954, Section 203. The authorized project was in accordance with recommendations by the USACE Chief of Engineers in HD 367 (81st Congress). Authorizing legislation by the State of California is contained in Section 12656.5 of the CWC and was enacted under the California Statutes of 1955.

Snagging and Clearing Projects

The Continuing Authorities Program allows USACE to respond to a variety of flood problems without obtaining specific congressional authorization for each project. Section 208 of the 1954 Flood Control Act, as amended, allows work to remove accumulated snags and other debris, and to clear and straighten stream channels. Section 12656.7 of the CWC provides the State authorization for these types of projects. Three snag removal and stream clearing

projects in the Sacramento River Basin include the following:

- Adin Project – A flood control project was authorized by the federal government for Ash and Dry creeks at Adin in Modoc County in the Flood Control Act of 1937, and modified by the Flood Control Act of 1954. Ash and Dry creeks are tributary streams to the Pit River above Shasta Dam. This project was intended to reduce local flood risk.
- Salt Creek Project – The Salt Creek Project was authorized by Section 2 of the Flood Control Act of 1937, as amended by Section 208 of the Flood Control Act of 1954. This project was intended to reduce local flood risk.
- McClure Creek Project – The McClure Creek Project was authorized by Section 2 of the Flood Control Act of 1937, as amended by Section 208 of the Flood Control Act of 1954. This project was intended to reduce local flood risk.

2.2.2 San Joaquin River Basin Projects

Components of the SPFC located in the San Joaquin River Basin are the Lower San Joaquin River and Tributaries Project, Littlejohns Creek and Calaveras River Stream Group Project, including the New Hogan and Farmington projects, and the Merced County Streams Project. Federal authorizations began in 1944 while State authorization began in 1955.

The Lower San Joaquin River and Tributaries Project was authorized by the Flood Control Act of 1944, including levee and channel improvements along the San Joaquin River

Lower San Joaquin River and Tributaries Project

Improvement of lower reaches of the San Joaquin River and tributaries was authorized by the federal government in the Flood Control Act of 1944 (Public Law 78-534). Section 12651 of the CWC provides the State authorization for the project. The project provided for improvement by the federal government of the existing channel and levee system on the San Joaquin River from the Delta upstream to the mouth of the Merced River, and the on lower reaches of the Stanislaus and Tuolumne rivers, by raising and strengthening existing levees, constructing new levees, constructing revetments on riverbanks where required, and removing accumulated snags in the main river channel. The project was also intended to reduce flood risk for areas above the mouth of the Merced River through State construction of levee and channel improvements, authorized by the federal government in the Emergency Flood Control Funds Act of 1955. The project includes a State-designed and -constructed bypass system in the upper reaches of the project area. Project construction was completed by November 1968, except the left bank San Joaquin River levee between the confluence with the Merced River and the confluence with the Tuolumne River (completed in 1972).

Buchanan Dam and Eastman Lake Project

The Buchanan Dam and Eastman Lake Project, was authorized by the Flood Control Act of 1962 (Public Law 87-874, 87th Congress) in accordance with recommendations by the USACE Chief of Engineers in SD 98. Section 12648.4 of the CWC provides the State authorization for the project. The dam and reservoir are not part of the SPFC, but the channel improvements downstream from Buchanan Dam on the Chowchilla River and tributaries are included in the SPFC.

Hidden Dam and Hensley Lake Project

The Hidden Dam and Hensley Lake Project was authorized by the Flood Control Act of 1962 (Public Law 87-874, 87th Congress), substantially in accordance with recommendations by the USACE Chief of Engineers in SD 37 (87th Congress). Section 12648.3 of the CWC provides the State authorization for the project. The dam and reservoir are not part of the SPFC, but the channel improvements downstream from Hidden Dam on the Fresno River are included in the SPFC.

Merced County Streams Project

Improvement of the Merced County Streams was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). The authorization was based on HD 473 (78th Congress). Section 12650 of the CWC provides the State authorization for the project. The project includes a diversion from Black Rascal Creek to Bear Creek, a diversion between Owens Creek and Mariposa Creek, channel improvements and levees, and one retarding-type reservoir east of the City of Merced. The project reduces flood risk to agricultural areas, the City of Merced, and the towns of Planada and Le Grand and other smaller communities. Of the five authorized and constructed reservoirs, the State provided assurances to the federal government for only one reservoir, Castle Dam, authorized by the Flood Control Act of 1970 (Public Law 91-611, Section 201, Statute 1824).

Bear Creek Project

The Bear Creek Project was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). Section 12652 of the CWC provides the State authorization for the project. Bear Creek is a tributary to the San Joaquin River in the Delta near Stockton. The Bear Creek channel and levee improvements are included in USACE Chief of Engineers recommendations to the Secretary of the Army in HD 545 (78th Congress).

Littlejohns Creek and Calaveras River Stream Group Project

The Littlejohns Creek and Calaveras River Stream Group Project was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). Sections 12652 and 12653 of the CWC provide the State authorization for the project. This act authorized improvement of Littlejohns Creek and Calaveras River and tributaries in accordance with recommendations by the USACE Chief of Engineers in HD 545 (78th Congress). The project included a diversion from Duck Creek to Littlejohns Creek and other channel improvements and levees.

Farmington Dam Project

The Farmington Dam Project was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). Section 12653 of the CWC provides the State authorization for the project. This act authorized improvement of Littlejohns Creek and tributaries in accordance with recommendations by the USACE Chief of Engineers in HD 545 (78th Congress). Farmington Dam is not part of the SPFC, but channel improvements along South Littlejohns Creek and its north and south branches are included in the SPFC.

Mormon Slough Project

The Mormon Slough Project was authorized by the Flood Control Act of 1962 (Public Law 87-874, 87th Congress). Section 12648.6 of the CWC provides the State authorization for the project. The authorization was in accordance with recommendations in HD 576 (87th Congress). The USACE Chief of Engineers concurred with these recommendations in his 1962 report. The project includes channel improvements, levees, and pumping plants.

2.3 Federal and State Authorizations for Ongoing State-Federal Flood Protection Projects

At the time of this report, there are multiple ongoing authorized State-federal flood protection projects. Upon completion, these projects are likely to become facilities (or modifications to facilities) of the SPFC (Section 7.6). Table 2-2 includes the federal acts, public law numbers, and Chief of Engineers Reports and CWC sections pertaining to each ongoing project. Brief descriptions of each project are provided below, with the status of each project as of the time of this report. Future updates to ongoing project status will be included in updates to the FCSSR.

2.3.1 Ongoing Sacramento River Basin Projects

Ongoing State-federal flood protection projects in the Sacramento River Basin include modifications to the SRFCP; American River Watershed, Common Features Project; American River Watershed, Folsom Dam Raise Project; Yuba River Basin, Marysville Ring Levee Project; Middle Creek Flood Damage Reduction and Ecosystem Restoration Project; South Sacramento County Streams Group Project; West Sacramento Project (Slip Repair); Cache Creek Settling Basin Enlargement; and Murphy Slough Habitat Restoration Project.

Modifications to the Sacramento River Flood Control Project

Ongoing modifications to the SRFCP include the Upper Sacramento Area Levee Reconstruction, Mid-Valley Area Levee Reconstruction, and Lower Sacramento Area Levee Reconstruction projects to restore sections of levee to design standards. Construction of these modifications is partially complete as of the time of this report, and some elements are being re-evaluated.

American River Watershed, Common Features Project

The American River Watershed, Common Features Project includes multiple proposed improvements along the lower American River downstream from Folsom Dam, Sacramento River downstream from the Natomas Cross Canal, and the Natomas Cross Canal to provide a minimum 200-year level of flood protection in combination with the Folsom Dam Raise Project. Construction of these improvements is partially complete as of the time of this report, and some elements are being re-evaluated.

American River Watershed, Folsom Dam Raise Project

The American River Watershed, Folsom Dam Raise Project includes raising Folsom Dam, other modifications to the dam facilities, environmental restoration, and a new bridge downstream from the dam to provide a minimum 200-year level of flood protection in combination with the Common Features Project. Construction of the bridge element is complete and construction of other elements is underway at the time of this report.

Construction of the American River Watershed, Folsom Dam Raise Project is underway

Yuba River Basin, Marysville Ring Levee Project

The Yuba River Basin, Marysville Ring Levee Project includes improvements to the ring levee that surrounds Marysville. The project is being constructed at the time of this report.

Middle Creek Flood Damage Reduction and Ecosystem Restoration Project

The Middle Creek flood Damage Reduction and Ecosystem Restoration Project includes removal of levees to restore vegetation and wetlands on approximately 1,650 acres in the Robinson Lakebed area. The project is about to begin the design phase at the time of this report.

South Sacramento County Streams Group Project

The South Sacramento County Streams Group Project includes levee and channel improvements on Morrison Creek and its major tributaries and, in the lower basin, the Beach Stone Lakes levees to provide a 200-year level of flood protection to the area, and enhance recreation and restore wildlife habitat. The project is under construction at the time of this report.

West Sacramento Project (Slip Repair)

The West Sacramento Project includes raising and strengthening about 5 miles of existing levees on the east side of the Yolo Bypass and south side of the Sacramento Bypass to provide a 200-year level of flood protection to West Sacramento. Construction was completed in 2005, but slips developed during high water in 2006. Design and construction are currently underway to repair the damaged levee sections at the time of this report.

Cache Creek Settling Basin Enlargement

The Cache Creek Settling Basin Enlargement includes enlargement of the settling basin facilities. Construction is mostly complete at the time of this report.

Murphy Slough Habitat Restoration Project

The Murphy Slough Habitat Restoration Project includes restoration of riparian vegetation on approximately 300 acres of fallow land and 2,000 linear feet of riverbank and to protect the area from head cuts. Construction is complete at the time of this report.

Table 2-2. Summary of Ongoing State-Federal Flood Protection Projects

Project	Federal Act	Public Law	Chief of Engineers Report	State Authorization
American River Watershed (Common Features) Project				
	WRDA 1986	99-662	American River Watershed Project, California	CWC Section 12670.10, .11, .12, .14, .16
	WRDA 1996	104-303		
	WRDA 1999	106-53		
American River Watershed (Folsom Dam Raise) Project				
	DAA 1993	102-396	American River Watershed Project, California	CWC Section 12670.11
	WRDA 1999	106-53		
American River Watershed (Folsom Dam Raise, Bridge Element) Project				
	WRDA 1999	106-53	American River Watershed Project, California	CWC Section 12670.11
	EWDAA 2005	108-447		
	EWDAA 2006	109-103		
Yuba River Basin, Marysville Ring Levee Project				
	WRDA 1999	106-53	Yuba River Basin Investigation, California Feasibility Report	CWC Sections 8615, 12616, and 12670.7
	WRDA 2007	110-114		
Middle Creek Flood Damage Reduction and Ecosystem Restoration Project				
	FCA 1962	87-874	HD 104-149	CWC Sections 12585.12 and 12656.5
	WRDA 2007	110-114		
South Sacramento County Streams Group Project				
	WRDA 1999	106-53	South Sacramento County Streams, California, October 6, 1998	CWC Section 12670.14
West Sacramento Project (Slip Repair)				
	WRDA 1992	102-580	Sacramento Metro Area, California, June 29, 1992	CWC Sections 12670.2 and 12670.3
Cache Creek Settling Basin Enlargement				
	WRDA 1986	99-662	Report dated April 27, 1981	CWC Section 12670
Murphy Slough Habitat Restoration Project				
	WRDA 1986	99-662	CAP	CWC Sections 8590, 8590.2, 8615, 8623, and 12841

Key:
CAP = Continuing Authorities Project
CWC = California Water Code
DAA = Defense Appropriation Act
EWDAA = Energy and Water Development Appropriation Act
FCA = Flood Control Act
FCCD = Flood Control Committee Document
HD = U.S. House Document
WRDA = Water Resources Development Act

2.3.1 Ongoing San Joaquin River Basin Projects

At the time of this report, there are no ongoing State-federal flood protection projects in the San Joaquin River Basin.

2.4 Existing Federal Participation in Other Non-SPFC Flood Protection Projects

In addition to SPFC facilities, USACE has an interest and role in other flood management projects in the Central Valley. While these are not part of the SPFC, operation of these projects may influence operation of the SPFC, especially in reducing peak flood flows through the SPFC levee system. The following information is provided in an overview to help describe other projects that function along with the SPFC as a flood protection system.

2.4.1 Multipurpose Reservoir Projects

Many of the storage facilities that contribute to flood management in the Sacramento and San Joaquin river basins are also operated for other purposes, such as water supply and power generation, but are not part of the SPFC because they include no State assurances to the federal government. Debris dams in the upper Yuba River Basin contribute in a minor way to flood management in the Sacramento River Basin, and hydroelectric reservoirs in the upper American River Basin sometimes provide flood storage space that can be credited to Folsom Lake. Major multipurpose storage projects that contribute significantly to flood management are shown in Figure 2-2 and listed in Table 2-3 in chronological order of construction. USACE has been involved with each of these reservoirs by establishing (funding in most cases) seasonal flood reservation storage and developing rules for operation of flood storage. Note that Oroville Dam is the only major multipurpose project listed that is part of the SPFC.

During high-water periods, reservoir operators coordinate with DWR and USACE during daily operations conferences at the State-federal Flood Operations Center in Sacramento. These conferences sometimes lead to voluntary modifications of individual reservoir operating rules to improve overall system operation. In total, these reservoir operations significantly reduce peak flood flows to the downstream levee system.

Friant Dam is operated for multiple purposes, including flood management (photo courtesy of Anne Canright)

Figure 2-2. Locations of Multipurpose (Including Flood Control) Dams and Reservoirs in the Sacramento and San Joaquin River Basins

Table 2-3. Major Multipurpose Reservoir Project Summary

Reservoir	Dam	Date Completed	Total Reservoir Capacity (acre-feet)	Flood Storage Capacity (acre-feet)	Owner/Operator
SACRAMENTO RIVER BASIN					
Shasta Lake	Shasta Dam	1949	4,550,000	1,300,000	Reclamation
Black Butte Lake	Black Butte Dam	1963	160,000	137,000	USACE
Folsom Lake	Folsom Dam	1956	973,000	400,000[2]	Reclamation
Lake Oroville	Oroville Dam[1]	1967	3,540,000	750,000	DWR
New Bullards Bar Reservoir	New Bullards Bar Dam	1967	960,000	170,000	Yuba County Water Agency
Indian Valley Reservoir	Indian Valley Dam	1976	301,000	40,000	Yolo County Flood Control and Water Conservation District
SAN JOAQUIN RIVER BASIN					
Millerton Lake	Friant Dam	1949	521,000	390,000[3]	Reclamation
Lake McClure	New Exchequer Dam	1967	1,025,000	400,000	Merced Irrigation District
New Don Pedro Reservoir	New Don Pedro Dam	1970	2,030,000	340,000	Turlock and Modesto Irrigation Districts
Hensley Lake	Hidden Dam	1975	90,000	65,000	USACE
Eastman Lake	Buchanan Dam	1975	150,000	45,000	USACE
New Melones Lake	New Melones Dam	1978	2,420,000	450,000	Reclamation
Los Banos Reservoir	Los Banos Detention Dam	1965	34,600	14,000	Reclamation/DWR
Pardee Reservoir	Pardee Dam	1963	198,000	200,000[4]	East Bay Municipal Utilities District
Camanche Reservoir	Camanche Dam	1963	431,000		
New Hogan Reservoir	New Hogan Dam	1964	325,000	165,000	USACE

Source: USACE, 1997

Notes:

[1] Oroville Dam is part of the SPFC as is the smaller single-purpose Castle Dam in the San Joaquin River Basin. All other dams in this table are non-SPFC.

[2] Folsom Dam is operated with variable flood storage between 400,000 acre-feet and 670,000 acre-feet to take credit for seasonally available storage in upstream reservoirs.

[3] Friant Dam operated in conjunction with Mammoth Pool and upstream reservoirs.

[4] Camanche Dam operated in conjunction with Pardee Dam and upstream reservoirs.

Key:

DWR = California Department of Water Resources

Reclamation = U.S. Department of the Interior, Bureau of Reclamation

SPFC = State Plan of Flood Control

USACE = U.S. Army Corps of Engineers

2.4.2 Local and Regional Projects

The federal government has interest in local projects for which local or regional entities, rather than the State, provided assurances. These projects include, but are not limited to the following:

- Folsom Lake Crossing
- Yuba River Goldfields
- Chico Landing to Keswick Dam
- Indian Valley Dam and Reservoir Project
- Big Dry Creek Dam and Diversion Project
- Duck Creek Project
- Stanislaus River Local Interest Project Levees
- Kings River and Tulare Lake Basin Project
- Mariposa Dam
- Owens Dam
- Burns Dam
- Bear Dam
- North Area Local Project (Sacramento Area Flood Control Agency)

2.5 Other Non-SPFC Flood Protection Facilities

In addition to the projects described in Sections 2.4, the flood protection system in the Central Valley includes other facilities that are not part of the SPFC. They are briefly discussed here.

Nonproject levees along Bear Creek in Merced affect performance of the SPFC

2.5.1 Nonproject Levees

Nonproject levees and related facilities have been constructed by USACE and local agencies along many of the rivers, creeks, and streams in the Central Valley. Many of these facilities are operated and maintained similar to project facilities and connect to project facilities for flood management purposes. By definition, they are not part of the SPFC, and are not addressed in this report. However, it is important to recognize that these nonproject levees may affect the performance of the SPFC as part of the flood management system.

Nonproject levees include the levee system in the Delta downstream from Collinsville on the Sacramento River and downstream from the Stockton area on the San Joaquin River that consist entirely of nonproject levees maintained by USACE (e.g., levees of the Sacramento and Stockton ship channels) or local interests. These levees were not constructed for flood management purposes.

2.5.2 Other Nonproject Facilities

Numerous other flood protection facilities are owned and operated by local entities but are not part of the SPFC, including the following:

- Local levees and floodwalls within SPFC-levee-protected areas.
- Local pumping plants that discharge drainage water into SPFC-leveed channels. Examples include a number of pumping plants owned and operated by local reclamation and levee districts and communities to pump interior storm runoff into the larger waterways.

2.5.3 Designated Floodways

Designated floodways are not part of the SPFC facilities, as defined in CWC Section 9110 (f) because they are State-designated without assurances to, or participation of, the federal government. However, these floodways provide an important management tool to help the State meet its requirement for passing project design flows (see Section 6.8 for designated floodways as a condition of project operation).

Designated floodways are the primary nonstructural flood management program employed by the State of California. The program was started in 1968 to control encroachments and preserve the flow regimes of floodways to protect public improvements, lives, and land-use values (CWC Section 8609). Designated floodways are defined as follows: (1) the channel of the stream and that portion of the adjoining floodplain reasonably required to provide for the passage of a design flood, as indicated by floodway encroachment lines on an adopted map, or (2) the floodway between existing levees, as adopted by the Board or the California State Legislature.

Designated floodways serve a critical function in protecting life and property from flood risks. The designated floodway system includes more than 60 designated floodways covering more than 1,300 miles of stream length. Figure 2-3 shows designated floodways along the Sacramento and San Joaquin rivers as well as major tributaries. There are additional designated floodways in the Tulare Lake Basin.

To designate a floodway, the Board usually completes a detailed hydraulic study to determine the design discharge associated with the design flood (usually 100-year recurrence interval) and the area needed to convey the design flood. The findings of the study are then used to delineate floodway maps, and in some cases, determine areas of shallow flooding. In other cases, floodway boundaries have been developed using analytical methods based on engineering judgment and review of historical floods. In proposing or revising designated floodways, the Board must also consider (1) flood control improvements and regulations affecting the floodplain, (2) the degree of danger from flooding to life, property, and public health and welfare, and (3) rate and type of development taking place on the floodplain (23 California Code of Regulations (CCR) Section 102).

Land uses within an adopted designated floodway are restricted to not impede the free flow of water in the floodway or jeopardize public safety (23 CCR Section 107). In general, activities such as agriculture, grazing, and recreation are allowed, as are structures and activities that can be quickly and easily removed or pose little impedance to river flow. The Board has the authority to determine additional permitted uses within the floodway on a case-by-case basis.

Figure 2-3. Location of Designated Floodways Within the Sacramento and San Joaquin River Basins

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3.0 State Plan of Flood Control Facilities

This section describes SPFC facilities according to the function they perform, which is to manage snowmelt and stormwater runoff. Therefore, the facility descriptions are presented geographically by river reach, generally bounded by points where significant inflows or outflows occur.

The facility descriptions are scaled to the major facilities – levees, drainage pumping plants, weirs or other water control structures, drop structures, dams/reservoirs, other major channel improvements, and mitigation areas. Smaller components of these facilities and associated features, such as transportation relocations, stream gages, pipes passing through levees, or bridges, are not included in this section, but can be found in unit-specific O&M manuals or the O&M summary data table included on the reference DVD that accompanies this report.

The facilities are generally described in an upstream-to-downstream direction. However, since the flood management system is not linear, but instead a network of tributary and distributary channels, some deviation from the upstream-to-downstream convention is necessary. Levees referred to as being on the left bank or right bank of a river reach are based on their position when looking downstream.

Levee data for the SPFC are mostly consistent with the California Levee Database (CLD). Because CLD information is continually being revised to reflect the best available information, future updates to this SPFC Descriptive Document will reflect changes since the prior draft or update.

3.1 Summary

This subsection presents a general summary of the SPFC facilities that are described in more detail in Sections 3.2 and 3.3. With the exception of the backwater effect of flows mingling in the Delta, SPFC facilities on the Sacramento River and tributaries operate independently from SPFC facilities on the San Joaquin River and tributaries. The Sacramento River system carries flood flows that are about 10 times greater in volume than those in the San Joaquin River system.

Both the Sacramento and San Joaquin rivers use bypass systems to carry a large portion of floodwater. Together, the rivers and their tributaries have approximately 1,600 miles of SPFC levees. Mostly non-SPFC reservoirs in each system have flood reservation storage that significantly helps attenuate flows and aids in operation of downstream SPFC facilities.

3.1.1 Sacramento River Basin

The flood management system along the Sacramento River and tributaries manages flood flows originating from an area of approximately 27,000 square miles. Major tributaries to the Sacramento River include the Feather, Yuba, Bear, and American rivers, which discharge to the Sacramento River from the east. Three smaller upstream SPFC projects on streams tributary to the Sacramento River are shown in Figure 3-1 (North Fork Feather River near Chester, Middle Creek, and Adin projects). Figure 3-2 shows an overview of SPFC facilities in the Sacramento River Basin. The design flood flow capacities of the various stream reaches are also shown in Figure 3-2 and listed in Table 3-1.

The design flood flow capacity of the Sacramento River upstream from Sacramento Weir is 107,000 cfs

The design flood flow capacities shown in Table 3-1 are from unit-specific O&M manuals and from SRFCP levee and channel profiles dated March 1957, revised August 1969 (1957 Revised Profile Drawings) (USACE, 1957a) (see Section 6.6.1); in some cases, these capacities are inconsistent within a given river reach. Where design flood flow capacities

are inconsistent between the O&M manuals and 1957 Revised Profile Drawings, DWR operates SPFC facilities in the Sacramento River Basin based on the 1957 Revised Profile Drawings rather than on design flood flows from the O&M manuals. These design flood flow capacities are based on hydraulic analyses conducted before 1960, generally to establish the minimum standard for top-of-levee elevations during the design phase. These capacities do not account for geotechnical or geomorphic conditions that may result in current flood flow capacities being less than design flood flow capacities. In some cases, State, federal, or local agencies may have conducted more recent hydraulic studies that estimate higher or lower flow capacities than those shown in the table – see the FCSSR (under development) for updated estimates of current actual flood flow capacities and the CVFPP for resolution of these inconsistencies.

Where the 1957 Revised Profile Drawings did not include design flood flow capacities and the capacities from O&M manuals are different for the left-bank levee and right-bank levee along a particular reach, the lowest capacity is shown in Figure 3-2. Detailed maps of the area covered in Figure 3-2 are included in Attachment A.

Along tributary streams to the Sacramento River upstream from Ord Ferry, most SPFC facilities were constructed primarily to help reduce local flooding, and have no association with the continuous flood management system that stretches from Ord Ferry to Collinsville in the Delta.

Flow in the Sacramento River is reduced by spilling floodwater into bypass areas through historic overflow areas and SPFC weirs. The first spill from the Sacramento River occurs just upstream from the start of the levee system at Ord Ferry. Floodwater leaves the river through three designated overflow areas and flows into the Butte Basin, which drains into the Sutter Bypass. Additionally, floodwater spills into bypasses over five SPFC weirs. Because of these spills to the bypass areas, the design flow capacity of the Sacramento River generally decreases in a downstream direction except where tributary inflow increases river flow. For example, the design capacity of the Sacramento River upstream from the leveed system is about 260,000 cubic feet per second (cfs). Downstream from the Tisdale Weir, the design capacity of the river is only 30,000 cfs.

The comprehensive system of SPFC levees, river channels, overflow weirs, drainage pumping plants, and flood bypass channels is the largest flood management system in California. This system includes the following major SPFC facilities:

- About 440 miles of river, canal, and stream channels (including an enlarged channel of the Sacramento River from Cache Slough to Collinsville)
- About 1,000 miles of levees (along the Sacramento River channel, Sutter and Yolo basins, and Feather, Yuba, Bear, and American rivers)
- Four relief bypasses (Sutter, Tisdale, Sacramento, and Yolo bypasses)
- Knights Landing Ridge Cut, connecting the Colusa Basin to the Yolo Bypass
- Five major weirs (Sacramento Weir, built in 1916; Fremont Weir, built in 1924; and Moulton, Tisdale, and Colusa weirs, built in 1932 and 1933)
- Two flood relief structures and one natural overflow area (M&T Flood Relief Structure, Three B's Natural Overflow Area, and Goose Lake Flood Relief Structure)

Fremont Weir (photo courtesy of NOAA)

- Two sets of outfall gates
- Five major drainage pumping plants
- Cache Creek Settling Basin, maintaining the flood conveyance integrity of the Yolo Bypass
- Numerous appurtenant structures such as minor weirs and control structures, bridges, and gaging stations

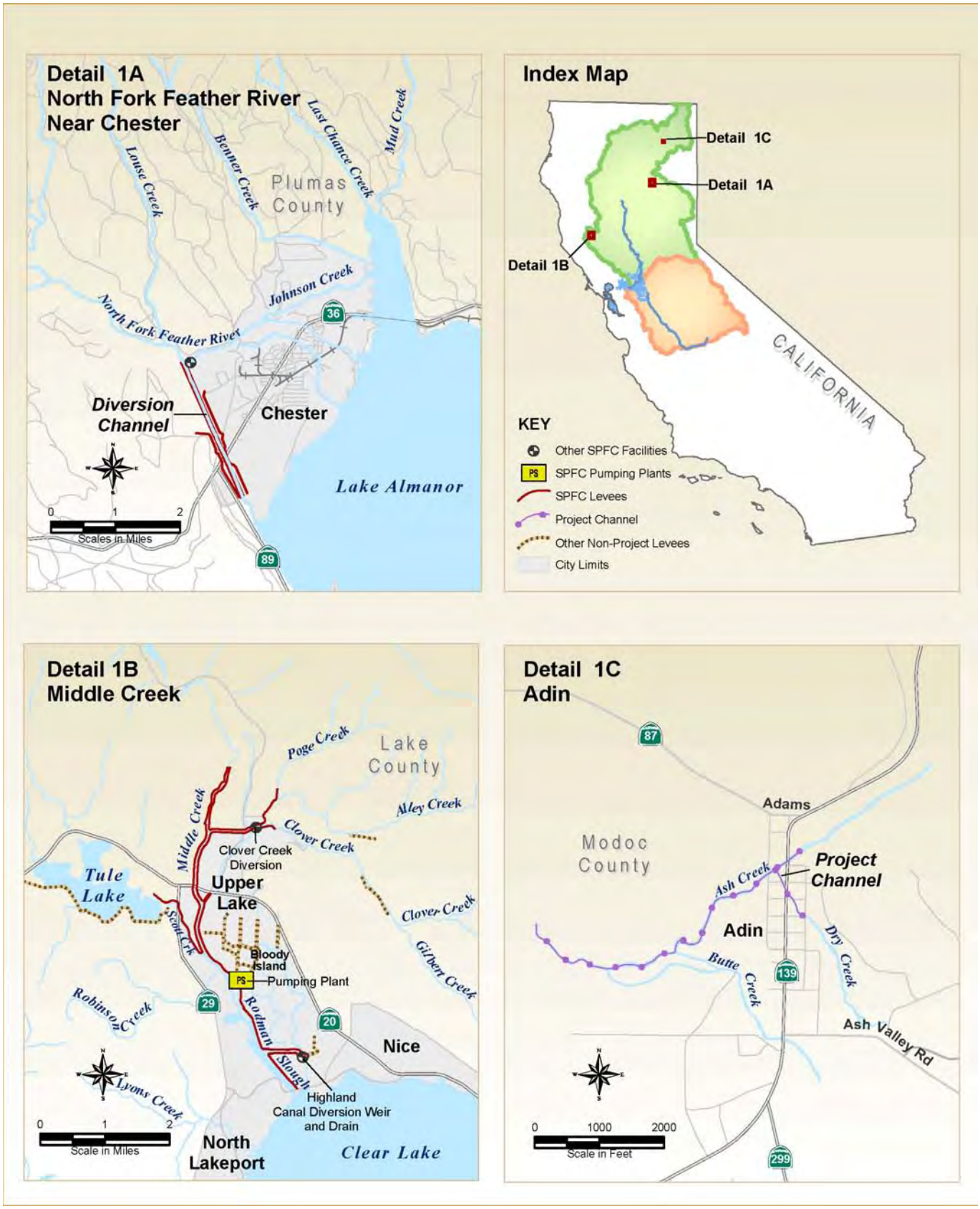


Figure 3-1. State Plan of Flood Control Facilities Within the Sacramento River Basin near Chester, Middle Creek, and Adin

Figure 3-2. Design Flood Flow Capacities Within the Sacramento River, Bypasses, and Major Tributaries and Distributaries in the Sacramento River Basin

Table 3-1. Design Capacities by Reach in Sacramento River Basin

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manuals		Design Capacity (cfs) from 1957 Revised Profile Drawings (basis of State operations)
	From	To	Left Bank	Right Bank	
RED BLUFF TO CHICO LANDING					
Sacramento River					
Deer Creek to Chico Landing			260,000 cfs from Senate Document No. 23		
Tributaries to Sacramento River					
Elder Creek	6.00	0.00	17,000	17,000	17,000
Deer Creek	7.40	0.00	21,000	21,000	21,000
CHICO LANDING TO COLUSA WEIR					
Sacramento River					
Chico Landing to Head of East Levee	175.00	166.00	160,000	160,000	160,000
East Levee Head to Moulton Weir	166.00	148.25	160,000	160,000	160,000
Moulton Weir to Colusa Weir	148.25	138.00	110,000	135,000	135,000
Tributaries to Sacramento River					
Mud Creek and Big Chico Creek					
Mud Creek – End of Levees to Sycamore Creek	8.2[2]	6.8[2]	5,500	5,500	No Data
Mud Creek – Sycamore Creek to SPRR	6.8[2]	4.3[2]	15,000	15,000	15,000
Mud Creek – SPRR to Big Chico Creek	4.3[2]	0	13,000	13,000	13,000 to 15,000
Big Chico Creek – Mud Creek to Sacramento River	0.2[2]	0	15,000	15,000	15,000
Distributaries from Sacramento River					
Overflow to Butte Basin	191	175	100,000 cfs from Senate Document No. 23		
Moulton Weir	158.5	158.5	25,000	25,000	25,000
Colusa Weir	146[2]	146[2]	70,000	70,000	70,000
COLUSA WEIR TO FREMONT WEIR					
Sacramento River					
Colusa Weir to Butte Slough	138.00	130.00	48,000	48,000	65,000
Butte Slough to Tisdale Weir	130.00	119.50	66,000	48,000	66,000
Tisdale Weir to Knights Landing	119.50	90.00	30,000	30,000	30,000
Knights Landing to Fremont Weir	90.00	85.00	30,000	30,000	30,000
Tributaries to Sacramento River					
Butte Slough Outfall	138[2]	138[2]	3,500	3,500	1,000

Table 3-1. Design Capacities by Reach in Sacramento River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manuals		Design Capacity (cfs) from 1957 Revised Profile Drawings (basis of State operations)
	From	To	Left Bank	Right Bank	
Knights Landing Outfall	90[2]	90[2]	No Data	No Data	No Data
Distributaries from Sacramento River					
Tisdale Weir and Bypass	119[2]	119[2]	38,000	38,000	38,000
Fremont Weir	85[2]	82[2]	343,000	343,000	343,000
Sutter Bypass					
Butte Slough to Wadsworth Canal	93[2]	83.00	178,000	178,000	150,000
Wadsworth Canal to Tisdale Bypass	83.00	77.80	178,000	178,000	155,000
Tisdale Bypass to Feather River	77.80	67.00	216,500	216,500	180,000
Feather River to Verona	67.00	59.00	416,500	416,500	380,000
Tributaries to Sutter Bypass					
Butte Creek					
Little Chico Creek Diversion Channel to Midway	15.3[2]	8[2]	27,000	27,000	27,000
Midway to 1.6 Miles Downstream from Aguas Frias Road	8[2]	0	22,000	22,000	22,000
Cherokee Canal					
Dry Creek to Gold Run Creek at Nelson Road	21.7[2]	20.2[2]	N/A	8,100	No Data
Gold Run Creek at Nelson Road to Cottonwood Creek at Western Canal	20.2[2]	15.8[2]	8,500	8,500	No Data
Cottonwood Creek at Western Canal to RD 833 Canal Entrance at Afton Road	15.8[2]	7.9[2]	11,500	11,500	12,500
RD 833 Canal Entrance at Afton Road to Lower Butte Basin About 1 Mile Downstream from Colusa-Gridley Road	7.9[2]	0	12,500	12,500	12,500
Wadsworth Canal	5.00	0.50	1,500	1,500	1,500
Feather River					
Oroville to Mouth of Yuba River	50.85	27.40	210,000	210,000	210,000
Mouth of Yuba River to Bear River	27.40	12.00	300,000	300,000	300,000
Bear River to Yolo bypass	12.00	7.60	320,000	320,000	320,000
Tributaries to Feather River					
Honcut Creek	4.50[2]	0.00[2]	5,000	5,000	25,000
Yuba River	5.00	0.50	120,000	120,000	120,000
Bear River					
River Mile 13 to Dry Creek	13.00[2]	6.00[2]	30,000	30,000	30,000
Dry Creek to WPRR	6.00[2]	4.70[2]	37,000	37,000	37,000
WPRR to Feather River	4.70[2]	0.00[2]	40,000	40,000	40,000

Table 3-1. Design Capacities by Reach in Sacramento River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manuals		Design Capacity (cfs) from 1957 Revised Profile Drawings (basis of State operations)
	From	To	Left Bank	Right Bank	
Tributaries to Bear River					
WPRR Interceptor Channel	6.30[2]	0.00[2]	10,000	10,000	10,000
South Dry Creek	1.50[2]	0.00[2]	7,000	7,000	9,000
Yankee Slough	4.00[2]	0.00[2]	2,500	2,500	2,500
FREMONT WEIR TO AMERICAN RIVER					
Sacramento River					
Fremont Weir to Sacramento Weir	85.00	63.90	107,000	107,000	107,000
Sacramento Weir to American River	63.40	51.70	110,000	110,000	18,000
Tributaries to Sacramento River					
Natomas Cross Canal	4.7	0.1	22,000	22,000	22,000
Tributaries to Natomas Cross Canal					
East Side Canal					
WPRR to Markham Ravine	No Data	No Data	N/A	5,000	5,000
Markham Ravine to Auburn Ravine	No Data	No Data	N/A	12,000	12,000
Auburn Ravine to Natomas Cross Canal	No Data	No Data	N/A	16,000	16,000
Pleasant Grove Creek Canal					
Sankey Road to Keys Road	No Data	No Data	900	900	800
Keys Road to Pleasant Grove Creek	No Data	No Data	2,700	2,700	2,300
Pleasant Grove Creek to Natomas Cross Canal	No Data	No Data	7,000	7,000	6,000
American River					
Carmichael to State Fairgrounds (left bank)	10.00[2]	3.00[2]	115,000 to 152,000[3]	N/A	115,000 to 152,000[3]
Mayhew to State Fairgrounds (right bank)	13.00[2]	3.00[2]	N/A	115,000 to 152,000[3]	115,000 to 152,000[3]
State Fairgrounds to Sacramento River	3.00[2]	0.00	180,000	180,000	180,000
Tributaries to American River					
Natomas East Main Drainage Canal					
Sankey Road to Dry (Linda) Creek	13.00[2]	4.00[2]	N/A	1,100	1,500
Dry (Linda) Creek to Arcade Creek	4.00[2]	2.00[2]	12,600 to 12,900	12,600 to 12,900	16,300
Arcade Creek to American River	2.00[2]	0.00	16,000 to 16,300	16,000 to 16,300	16,000 to 16,300

Table 3-1. Design Capacities by Reach in Sacramento River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manuals		Design Capacity (cfs) from 1957 Revised Profile Drawings (basis of State operations)
	From	To	Left Bank	Right Bank	
Tributaries to Natomas East Main Drainage Canal					
Dry Creek (previously, Linda Creek)	1.30[2]	0.00	15,000	N/A	15,000
Arcade Creek	2.00[2]	0.00	3,300	3,300	3,300
Distributaries from Sacramento River					
Sacramento Weir and Bypass	45.30	45.30	112,000	112,000	112,000
Yolo Bypass					
Fremont Weir to Knight's Landing Ridge Cut	57[2]	54[2]	343,000	343,000	343,000
Knight's Landing Ridge Cut to Cache Creek	54[2]	51.8	362,000	362,000	362,000
Cache Creek to Sacramento Weir	51.8	45.3	377,000	377,000	377,000
Sacramento Weir to Putah Creek	45.30	39.5	480,000	480,000	480,000
Putah Creek to Miner Slough	39.5	19[2]	490,000	490,000	490,000
Miner Slough to Cache Slough	No Data	No Data	490,000	490,000	500,000
Cache Slough to Sacramento River	No Data	0.00	490,000	490,000	500,000
Tributaries to Yolo Bypass					
Knight's Landing Ridge Cut	2.6	0	20,000	20,000	20,000
Cache Creek	12.7	0	30,000	30,000	30,000
Willow Slough Bypass	No Data	0	6,000	6,000	6,000
Putah Creek	9.7	0	40,000	40,000	62,000
Miner Slough	1.68	0	10,000	10,000	10,000
Cache Slough and Lindsey Slough	No Data	0	43,500	43,500	30,000
AMERICAN RIVER TO COLLINSVILLE					
Sacramento River					
American River to Elk Slough	51.6	42.3	110,000	110,000	110,000
Elk Slough to Sutter Slough	42.1	34.3	110,000	110,000	110,000
Sutter Slough to Steamboat Slough	34.1	32.7	84,500	84,500	85,000
Steamboat Slough to Head of Georgiana Slough	32.5	26.75	56,500	56,500	56,500
Georgiana Slough to Yolo Bypass Junction	26.5	14.75	35,900	35,900	35,900
Yolo Bypass to 3-Mile Slough	14.62	9.75	579,000	579,000	579,000
3-Mile Slough to Collinsville	9.5	0	514,000	514,000	514,000
Distributaries from Sacramento River					
Sutter Slough – Sacramento River to Miner	No Data	0	25,500	25,500	26,500
Sutter Slough – Miner to Steamboat	6.55[2]	No Data	15,500	15,500	15,500
Steamboat Slough – Sac River to Sutter Slough	10	7	28,000	28,000	28,000
Steamboat Slough – Sutter Slough to Sac River	7	0	43,500	43,500	43,500

Table 3-1. Design Capacities by Reach in Sacramento River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manuals		Design Capacity (cfs) from 1957 Revised Profile Drawings (basis of State operations)
	From	To	Left Bank	Right Bank	
Georgiana Slough	10	0	20,600	20,600	20,600
3-Mile Slough	No Data	0	65,000	65,000	65,000

Source: 1957 Revised Profile Drawings (USACE, 1957a)

Notes:

[1] Sequential river reaches were not necessarily designed as a system. Therefore, the capacities in the table do not add up. In some cases, left- and right-bank levees along the same reach may have different design capacities. Elk Slough design capacity is 0 cfs, based on O&M manuals, and is not listed in the table.

[2] The river mile was estimated at this location.

[3] The capacity is 115,000 cfs at 5 feet of freeboard and 152,000 cfs at 3 feet of freeboard.

Key:

cfs = cubic feet per second

N/A = not applicable

No. = number

No Data = No Data currently presented

O&M = operations and maintenance

RD = Reclamation District

SPRR = Southern Pacific Railroad

State = State of California

WPRR = Western Pacific Railroad

3.1.2 San Joaquin River Basin

The flood management system along the San Joaquin River is intended to manage flood flows originating from an area of approximately 16,700 square miles in the Sierra Nevada, Central Valley, and Coastal Range in Central California. Major tributaries to the San Joaquin River include the Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, and Fresno rivers, which discharge to the San Joaquin River from the east. In addition, during flood release events from Pine Flat Reservoir, about half of Kings River flows are diverted north through the James Bypass into the San Joaquin River.

Unlike on the Sacramento River, where SPFC levees are continuous from Ord Ferry to the Delta, San Joaquin River SPFC levees are intermittent from near River Mile 225 to the Delta. The Chowchilla, Eastside, and Mariposa bypasses are the main SPFC facilities for the upstream portion of the San Joaquin River system. For portions of the system, these bypasses are the only SPFC facilities, and the San Joaquin River itself is not part of the SPFC. The bypass system ends upstream from the Merced River.

Figure 3-3 shows an overview of SPFC facilities in the San Joaquin River Basin. The design flood flow capacities of the various stream reaches are shown in Figure 3-3 and listed in Table 3-2. Where available, DWR operates SPFC facilities in the San Joaquin River Basin based on design flood flows reported in *Design Memorandum No. 1, San Joaquin River Levees, Lower San Joaquin River and Tributaries Project, California General Design* (USACE, 1955b) associated with levee profiles dated December 1955 (1955 Profile) (USACE, 1955a) (see Section 6.2.2) rather than on design flood flows from the O&M manuals.

Where the design flood flow capacities from O&M manuals were different for the left-bank levee and right-bank levee along a particular reach, the lowest design flood flow capacity is shown in Figure 3-3. Detailed maps of the area covered in Figure 3-3 are included in Attachment A. Similar to the discussion for Table 3-1 in Section 3.1.1, Table 3-2 shows design flood flow capacities used to set minimum levee height, without consideration of geotechnical or geomorphic conditions that may result in lower current flood flow capacities. See the FCSSR (under development) for updated estimates of current actual flood flow capacities, and the CVFPP for resolution of these inconsistencies.

Downstream view of the San Joaquin River at Sand Slough Control Structure

Major SPFC facilities along the San Joaquin River and tributaries include the following:

- Chowchilla Bypass (and levees), which begins at the San Joaquin River downstream from Gravelly Ford, diverts San Joaquin River flows, and discharges the flows into the Eastside Bypass
- Eastside Bypass (and levees), which begins at the Fresno River, collects drainage from the east, and discharges to the San Joaquin River between Fremont Ford and Bear Creek
- Mariposa Bypass, which begins at the Eastside Bypass and discharges to the San Joaquin River (and levees)
- Approximately 99 miles of levees along the San Joaquin River
- Approximately 135 miles of levees along San Joaquin River tributaries and distributaries
- Six instream control structures (Chowchilla Bypass Control Structure, San Joaquin River Control Structure, Mariposa Bypass Control Structure, Eastside Bypass Control Structure, Sand Slough Control Structure, and San Joaquin River Structure)
- Two major pumping plants

Figure 3-3. Design Flood Flow Capacities Within the San Joaquin River, Bypasses, and Major Tributaries and Distributaries in the San Joaquin River Basin

Table 3-2. Design Capacities by Reach in San Joaquin River Basin

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manual[2]		Design Capacity (cfs) from Design Memo No. 1, 1955 (basis of State Operations)
	From	To	Left Bank	Right Bank	
FRIANT DAM TO CHOWCHILLA BYPASS[3]					
San Joaquin River	224.66	214.03	8,000	8,000	No Data
CHOWCHILLA BYPASS TO SAND SLOUGH CONTROL STRUCTURE					
San Joaquin River	170[4]	166.44	4,500	4,500	No Data
Distributaries from San Joaquin River					
Chowchilla Bypass	32.04	15.85	5,500	5,500	No Data
Eastside Bypass					
Fresno River to Berenda Slough	15.85	13.59	10,000	10,000	No Data
Berenda Slough to Ash Slough	13.59	10.48	12,000	12,000	No Data
Ash Slough to Sand Slough	10.48	0.00	17,500	17,500	No Data
Tributaries to Eastside Bypass					
Fresno River	8.36	0.00	5,000	5,000	No Data
Berenda Slough	4.28	0.00	2,000	2,000	No Data
Ash Slough	4.52	0.00	5,000	5,000	No Data
SAND SLOUGH CONTROL STRUCTURE TO MERCED RIVER					
San Joaquin River					
Control Structure to Mariposa Bypass	149.89	145.15	1,500	1,500	No Data
Mariposa Bypass to Eastside Bypass	145.15	133.80	10,000	10,000	No Data
Eastside Bypass to Merced River	133.80	116.66	22,000	22,000	20,000
Tributaries to San Joaquin River					
Mariposa Bypass	4.23	0.00	8,500	8,500	No Data
Eastside Bypass					
Control Structure to Mariposa Bypass	8.96	16[3]	16,500	16,500	No Data
Mariposa Bypass to Owens Creek	8.96	5[3]	8,000	8,000	No Data
Owens Creek to Bear Creek	5[3]	1[3]	9,000	9,000	No Data
Bear Creek to San Joaquin River	1[3]	0.00	14,400	14,400	No Data
Tributaries to Eastside Bypass					
Owens Creek	0.98	0.00	No Data	No Data	No Data
Deep Slough	6.66	0.00	9,000	9,000	No Data
Upper Bear Creek	7.98	4.25	7,000	7,000	No Data
Bear Creek	4.25	0.00	14,400	14,400	No Data

Table 3-2. Design Capacities by Reach in San Joaquin River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manual[2]		Design Capacity (cfs) from Design Memo No. 1, 1955 (basis of State Operations)
	From	To	Left Bank	Right Bank	
MERCED RIVER TO STANISLAUS RIVER					
San Joaquin River					
Merced River to Tuolumne River	110.90	81.50	45,000	45,000	45,000
Tuolumne River to Stanislaus River	81.50	72.60	46,000	46,000	46,000
Tributaries to San Joaquin River					
Tuolumne River	0.60	0.00	15,000	15,000	15,000
Stanislaus River	11.90	0.00	12,000	12,000	12,000
STANISLAUS RIVER TO BURNS CUTOFF					
San Joaquin River					
Stanislaus River to Paradise Cut	72.60	58.30	52,000	52,000	52,000
Paradise Cut to Old River	58.30	53.30	37,000	37,000	37,000
Old River to Burns Cutoff	53.30	40.60	18,000	18,000	No Data
Tributaries to San Joaquin River					
French Camp Slough	6.40	0.00	3,000	2,000	No Data
Tributaries to French Camp Slough					
Littlejohns Creek	1.00	0.00	1,750	1,750	No Data
Duck Creek	0.90	0.00	900	900	No Data
Distributaries from San Joaquin River					
Paradise Cut – San Joaquin River to Old River	0.00	7.4 or 5.9[3]	15,000	15,000	15,000
Old River – Downstream from Paradise Cut	5.9	8.2	30,000	30,000	No Data
Old River – San Joaquin to Middle River	No Data	No Data	19,000	19,000	No Data
Old River – Middle River to Paradise Cut	No Data	No Data	19,000	15,000	No Data
Old River/Salmon Slough – Paradise Cut to Grant Line Canal	No Data	No Data	N/A	30,000	No Data
BURNS CUTOFF TO DISAPPOINTMENT SLOUGH					
Tributaries to San Joaquin River					
Calaveras River	5.80	0.00	13,500	13,500	No Data
Tributaries to Calaveras River					
Mormon Slough	8.40	6.20	12,500	12,500	No Data
Bear Creek – Disappointment Slough to Mosher Creek	No Data	No Data	5,500	5,500	No Data
Bear Creek – Mosher Creek to Paddy Creek	No Data	No Data	5,000	5,000	No Data
Bear Creek – upstream from Paddy Creek	No Data	No Data	3,500	3,500	No Data

Table 3-2. Design Capacities by Reach in San Joaquin River Basin (contd.)

River Reach[1]	River Miles		Design Capacity (cfs) from O&M Manual[2]		Design Capacity (cfs) from Design Memo No. 1, 1955 (basis of State Operations)
	From	To	Left Bank	Right Bank	
Tributaries to Bear Creek					
Paddy Creek – Bear Creek to North Paddy Creek	No Data	No Data	2,000	2,000	No Data
Paddy Creek – Upstream from North Paddy Creek	No Data	No Data	400	400	No Data
Middle Paddy Creek	No Data	No Data	750	750	No Data
North Paddy Creek – Paddy Creek to Middle Paddy Creek	No Data	No Data	1,800	1,800	No Data
North Paddy Creek – Upstream from Middle Paddy Creek	No Data	No Data	1,200	1,200	No Data

Notes:
[1] Sequential river reaches were not necessarily designed as a system. Therefore, the capacities in the table do not add up. In some cases, left- and right-bank levees along the same reach may have different design capacities.
[2] Where available, the State operates SPFC facilities in the San Joaquin River Basin based on the 1955 profile rather than on design flows from the O&M manuals.
[3] This capacity only applies to the leveed reach upstream from the Chowchilla Bypass.
[4] The river mile was estimated at this location.
Key:
cfs = cubic feet per second
N/A = not applicable
No Data = No Data currently presented
O&M = operations and maintenance
SPFC = State Plan of Flood Control

3.2 SPFC Facilities in the Sacramento River Basin

This section describes SPFC facilities in the Sacramento River Basin by reach. Because of the numerous locations of tributary and distributary flow, the Feather River watershed, American River watershed, Sutter Bypass watershed, Yolo Bypass watershed, and Sacramento River watershed are described separately. The description for the Sacramento River watershed identifies where the Feather River, American River, Sutter Bypass, and Yolo Bypass are either tributary or distributary to the Sacramento River.

The Standard O&M Manual for the SRFCP specifies general levee dimensions that were used for the original project design. These dimensions include a general crown width of 20 feet, with side slopes of 2:1 on the waterside, and 3:1 on the landside. Exceptions to these dimensions are noted in the unit-specific O&M manuals and as-constructed dimensions provide an even better indication of how the levees were actually built.

Figure 3-4 is an index map of the Sacramento River Basin showing the five major watersheds, including SPFC facilities.

3.2.1 Feather River Watershed

The Feather River, a tributary to the Sacramento River, drains a major watershed in the Sierra Nevada and Cascade mountain ranges. Figure 3-5 shows SPFC facilities in the Feather River watershed.

Figure 3-4. Index Map of the Sacramento River Basin Including the Five Major Watersheds with Facilities of the State Plan of Flood Control

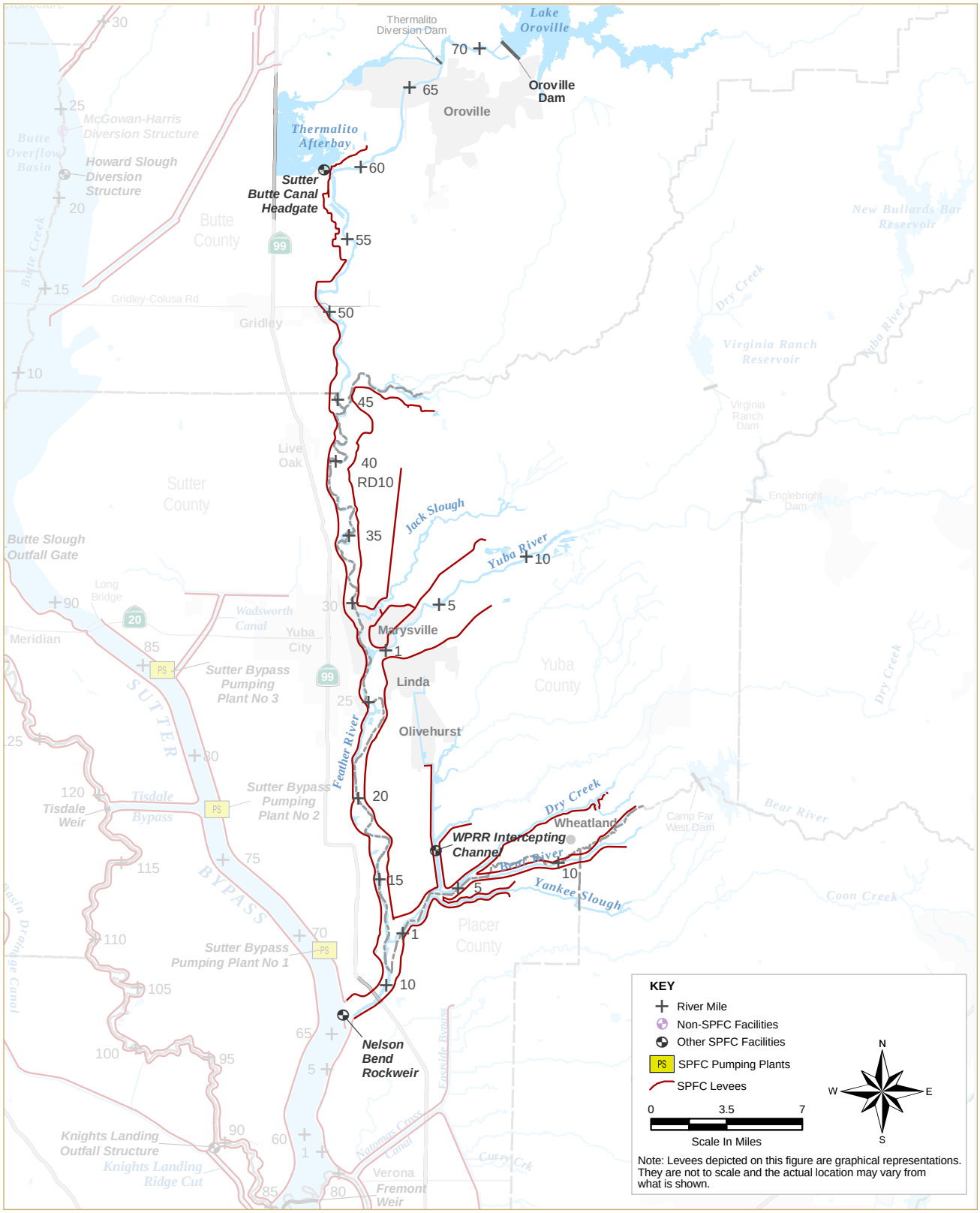


Figure 3-5. Feather River Watershed – State Plan of Flood Control Facilities Along the Feather, Yuba, and Bear Rivers and Tributaries

North Fork Feather River near Chester

SPFC channel improvements and levees (see O&M Manual SAC508) are intended to reduce flood risk to the town of Chester, bridges for Highway 36, two county roads, and a railroad. The project (see Figure 3-1) consists of a diversion structure, an excavated rock-lined diversion channel, about 3 miles of levees along the channel (about 1.8 miles on the left bank and 1.2 miles on the right bank), and seven drop structures. At design flood flow (based on the O&M manual), an estimated 3,000 cfs would pass through the diversion structure to the North Fork Feather River and to Lake Almanor, and approximately 10,000 cfs would be conveyed by the diversion channel to Lake Almanor. The project is located upstream from Lake Oroville. Project O&M is performed by the Plumas County Department of Public Works.

Oroville Dam and Facilities

Lake Oroville and related facilities are operated by DWR to provide multiple benefits, including flood management. With a total storage of 3.5 million acre-feet, the lake is operated with 750,000 acre-feet available for flood storage during the flood season. Since the State has provided assurances of nonfederal cooperation for flood management operation, Oroville Dam and facilities are included in the SPFC.

Oroville Dam is part of the SPFC

Feather River from Thermalito to Yuba River

This reach of river has a design channel capacity of 210,000 cfs at 3 feet of freeboard based on O&M manuals identified below. SPFC facilities include right- and left-bank levees along the Feather River, the Sutter-Butte Canal Headgate, a levee on the left bank of Honcut Creek, a back levee for Reclamation District (RD) 10, and a ring levee around Marysville. The levees were originally built by local interests and enlarged or improved by USACE as project levees.

- The Feather River right-bank levee (see O&M Manuals SAC144, SAC152, and SAC154), about 28 miles long, is intended to reduce flood risk to adjacent agricultural lands and the towns of Biggs, Gridley, Live Oak, and Yuba City. Maintenance is provided by DWR through Maintenance Areas 7 and 16, and Levee Districts 1 and 9.
- The Feather River left-bank levee (see O&M Manual SAC151), extending about 11.2 miles from Honcut Creek to Jack Slough just north of Marysville, is intended to reduce flood risk for RD 10. Maintenance is provided by RD 10.
- The Sutter-Butte Canal Headgate (O&M Manual SAC160) controls release of river water to the irrigation canal. The Sutter-Butte Canal now receives water from the Thermalito Afterbay – no supplement to O&M Manual SAC160 has been found to document this change. The structure is operated and maintained by DWR through Sutter Maintenance Yard.
- A left-bank levee (see O&M Manual SAC151) along Honcut Creek extends about 4.5 miles from high ground to the confluence with the Feather River. The Honcut Creek design channel capacity is 5,000 cfs, based on the O&M manual. This differs from the design capacity of 25,000 cfs in the 1957 Revised Profile Drawings (USACE, 1957a). The levee is maintained by RD 10.
- The back levee (see O&M Manual SAC151) for RD 10 extends about 8 miles along Jack Slough and Simmerly Slough. The levee is intended to reduce flood risk from waters from the east. The levee is maintained by RD 10. Together, the Honcut Creek levee, the left-bank levee along the Feather River, and the back levee nearly surround RD 10.
- The ring levee (see O&M Manual SAC147) around Marysville is about 7.2 miles long. The levee is intended to reduce flood risk to Marysville from

The ring levee protects Marysville during the flood of 1955 (photo courtesy of California Disaster Office, 1956)

the Feather River, the Yuba River, and Jack and Simmerly sloughs. The levee is maintained by the Marysville Levee Commission.

Yuba River

The channel capacity of the Yuba River upstream from its confluence with the Feather River is 120,000 cfs based on O&M manuals. SPFC facilities include right- and left-bank levees. The right-bank levee (see O&M Manual SAC147) extends about 4 miles upstream from the Marysville ring levee (see description above). The levee is maintained by the Marysville Levee Commission. Note that the water control manual for the upstream New Bullards Bar Dam specifies a maximum release of 180,000 cfs for the Yuba River.

The left-bank levee (see O&M Manuals SAC145 and SAC149) extends about 6.1 miles from high ground to the confluence connection with the Feather River levees. The levee is maintained by RD 784, and is intended to reduce flood risk to Linda and Olivehurst and adjoining agricultural land. The left-bank levee was originally built by local interests and enlarged or improved to project standards by USACE as a project levee.

Feather River from Yuba River to Bear River

The design channel capacity of the Feather River in this reach is 300,000 cfs with 3 feet of freeboard, based on O&M manuals. SPFC facilities include right- and left-bank levees. The right-bank levee (see O&M Manual SAC144), about 14 miles long, reduces flood risk to Yuba City and adjoining agricultural land. The right-bank levee is maintained by Levee District 1. The left-bank levee (see O&M Manual SAC145) is about 13 miles long. The levee is maintained by RD 784 and reduces flood risk to Linda and Olivehurst and adjoining agricultural land.

Bear River

SPFC facilities in the Bear River watershed include levees along Dry Creek, the Bear River, Yankee Slough, and the Western Pacific Railroad (WPRR) Intercepting Channel. Originally built by local interests, these levees were later repaired or enlarged to project standards by USACE.

- Dry Creek has a design channel capacity of 7,000 cfs based on O&M manuals. This differs from

SPFC facilities include right-and-left bank levees on the Yuba River

the design capacity of 9,000 cfs estimated in the 1957 Revised Profile Drawings (USACE, 1957a). The 1.5-mile-long right-bank levee (see O&M Manual SAC145) extends from high ground to the confluence with the Bear River. The levee is maintained by RD 784 and RD 817. The left-bank levee (see O&M Manual SAC146) extends about 8.5 miles from high ground to the confluence with the Bear River. The levee reduces flood risk to Wheatland and adjoining agricultural land. The left-bank levee is maintained by RD 817 and RD 2103.

- Upstream from its confluence with Dry Creek, the Bear River design channel capacity is 30,000 cfs, based on the O&M manual. The right-bank levee extends about 8.9 miles from high ground to the confluence. The levee is maintained by RD 817 and RD 1001 and is intended to reduce flood risk to Wheatland and adjoining agricultural land. The left-bank levee (see O&M manual SAC141.1) extends about 7.5 miles from high ground to the confluence with Dry Creek.
- Yankee Slough has a design channel capacity of 2,500 cfs based on the O&M manual. Left- and right-bank levees (see O&M Manual SAC141.1) each extend about 4 miles from high ground to the confluence with the Bear River. Both levees along Yankee Slough are maintained by RD 1001.
- The design capacity of the WPRR Intercepting Channel is 10,000 cfs, based on the O&M manual. The right-bank levee, about 6.3 miles in length, extends from high ground and serves as a back levee for RD 784. Levee improvements by the Three Rivers Levee Improvement Authority (TRLIA) are included in an addendum to the O&M manual. The left-bank levee, about 4.2 miles in length, is intended to reduce flood risk to RD 784. The levees are maintained by RD 784.
- Downstream from the Dry Creek confluence, the right-bank levee (see O&M Manual SAC145) of the Bear River extends about 4.7 miles to its connection with the Feather River levee. The right-bank levee is maintained by RD 784. The WPRR Intercepting Channel enters the Bear River from the north along this reach. Downstream from the WPRR Intercepting Channel, the Bear River has a design capacity of 40,000 cfs with 3 feet of freeboard, based on O&M manuals. Downstream from the Dry Creek confluence, the left-bank levee (see O&M Manuals SAC141.1 and SAC141.2) of the Bear River extends about 5 miles to its connection with the Feather River levee. Yankee Slough enters along the left side of this reach. The left-bank levee is maintained by RD 1001.

Feather River from Bear River to Sutter Bypass

The design channel capacity of the Feather River in this reach is 320,000 cfs with 3 feet of freeboard based on O&M manuals. SPFC facilities include right- and left-bank levees and a rock weir at Nelson Bend.

The right-bank levee (see O&M Manual SAC143) is 5.2 miles in length. Maintenance is provided by Levee District 1 and DWR through Maintenance Area 3. The left-bank levee (see O&M Manuals SAC141.1 and SAC141.2) is about 5 miles long and is maintained by RD 1001. Originally built by local interests, these levees were later enlarged or improved to project standards by USACE.

The rock weir (see O&M Manual SAC501) was constructed in 1970 and 1971 to control flow where the Feather River meets the Sutter Bypass. The improvements of the Nelson Bend Modification Project provide protection against the formation of Feather River overflow channels into the Sutter Bypass, and act to retard deposition of sediments in the Sutter Bypass during flood flows.

Joint Feather River/Sutter Bypass Channel to the Sacramento River

From their junction, the Feather River and Sutter Bypass flow in a joint channel to the Sacramento River (see Figure 3-7). The design channel capacity of this reach is 416,500 cfs with 6 feet of freeboard, based on O&M manuals. SPFC facilities include right- and left-bank levees about 1.3 miles apart. The right-bank levee (see O&M Manual SAC129), about 10 miles long, is intended to reduce flood risk to agricultural land in RD 1500. The levee is maintained by RD 1500. The left-bank levee (see O&M Manual SAC141.1), about 7 miles long, is intended to reduce flood risk to agricultural land in RD 1001. The levee is maintained by RD 1001. The left-bank levee was originally built by local interests and later enlarged or improved to project standards by USACE.

3.2.2 American River Watershed

The American River enters the Sacramento River at the City of Sacramento. Figure 3-6 includes SPFC facilities in the American River watershed.

American River from Carmichael Bluffs to Natomas East Main Drainage Canal

The design capacity of this reach is 115,000 cfs with 5 feet of freeboard and 152,000 cfs with 3 feet of freeboard, based on O&M manuals. SPFC facilities along this reach include right- and left-bank levees, two pumping plants, and vegetation on mitigation sites. The levees and pumping plants is intended to reduce flood risk to urban areas in Sacramento County. Portions of the levees were originally built by local interests, and portions of these levees were enlarged to project standards by USACE.

The right-bank levee (see O&M Manuals SAC118.2 and SAC517) extends about 12 miles from high ground to the Natomas East Main Drainage Canal. The levee is maintained by American River Flood Control District and DWR through Maintenance Areas 10 and 11. Two SPFC pumping plants (see O&M Manual SAC518) are located along the American River and are operated by Sacramento County. Pumping Plant No. 1 is located about 1 mile downstream from the H Street Bridge; Pumping Plant No. 2 is located about 0.25 miles east of the Watt Avenue Bridge. The pumping plants dispose of local drainage water from about 15.5 square miles of the area located behind the levee. Five vegetation mitigation sites (see O&M Manual SAC517.3) are located between the Watt Avenue and Howe Avenue bridges.

Based on the O&M manual, the left-bank levee (see O&M Manual SAC118.1) begins at Mayhew Road, about 3.5 miles downstream from the right-bank levee and extends about 10 miles from high ground to the Natomas East Main Drainage Canal. The levee has been extended by USACE upstream from Mayhew. Four vegetation mitigation sites (see O&M Manual SAC118.1A) are located along this reach of levee. The levee is maintained by the American River Flood Control District, and DWR maintains the channel.

The American River right-bank levee extends from high ground near Carmichael Bluffs

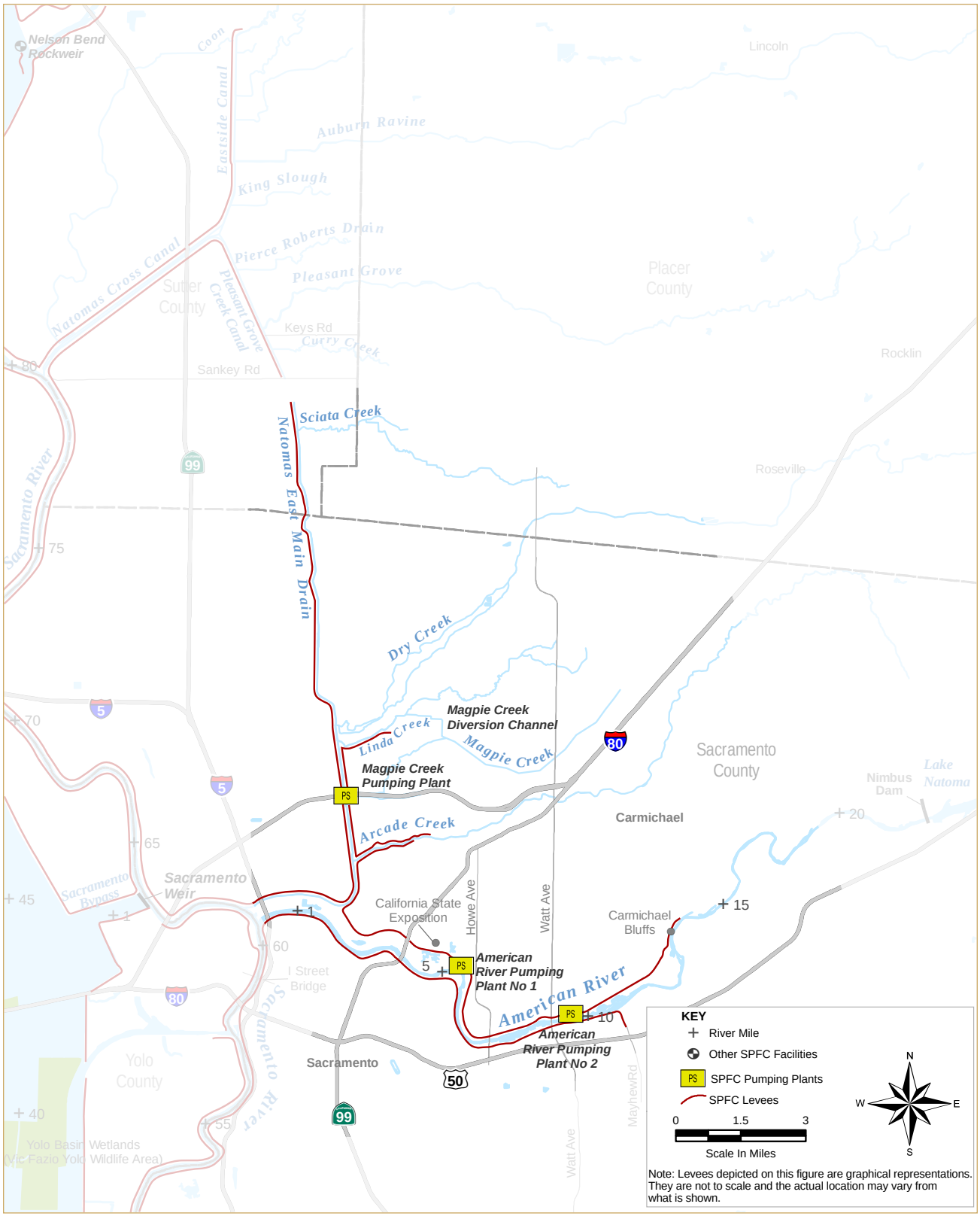


Figure 3-6. American River Watershed – State Plan of Flood Control Facilities Along the American River, Natomas East Main Drainage Canal, and Tributaries

Natomas East Main Drainage Canal

The Natomas East Main Drainage Canal was designed to intercept streams approaching RD 1000 from the east and discharge them into the American River. SPFC facilities are levees and improved channels for the Natomas East Main Drainage Canal and tributaries. With the exception of the left-bank levee along Dry Creek (formerly Linda Creek), right-bank levee along Arcade Creek, and left-bank levee of the Natomas East Main Drainage Canal between Arcade and Dry Creek constructed by USACE, the levees were originally constructed by local interests and rebuilt by USACE to project standards. The levees are maintained by the American River Flood Control District.

- RD 1000 is entirely surrounded by levees. In the vicinity of Sankey Road on the east side of RD 1000, flow along the levee is southerly into the Natomas East Main Drainage Canal and northerly into the Pleasant Grove Creek Canal (see description under Section 3.2.5). For the reach of the Natomas East Main Drainage Canal from Sankey Road to the Dry Creek north levee, there is a right-bank levee (see O&M Manual SAC125) but no left-bank levee. The design flood capacity of this 9-mile reach of the Natomas East Main Drainage Canal is about 1,500 cfs, based on the O&M manual.
- Dry Creek enters the Natomas East Main Drainage Canal about 4 miles upstream from the American River. A left-bank levee (see O&M Manual SAC118.2) extends about 1.3 miles along Dry Creek. The right-bank levee and floodwall of Dry Creek has been constructed as part of the Sacramento Area Flood Control Agency (SAFCA) and USACE authorized project, but is not yet turned over to the Board and documented in the O&M manual. The design capacity of Dry Creek upstream from the Natomas East Main Drainage Canal is 15,000 cfs, based on the O&M manual. A 1.4 mile-long diversion channel from Magpie Creek to Dry Creek is intended to limit flood flows in the lower reaches of Magpie Creek. The Magpie Creek diversion channel has a design capacity of 250 cfs.
- From Arcade Creek to the American River, the Natomas East Main Drainage Canal has a capacity of 16,000 cfs, based on the O&M manuals. This reach of the Natomas East Main Drainage Canal has a right-bank levee (see O&M Manual SAC125) and a left-bank levee (see O&M Manual SAC118.2), each about 4 miles long. Along this reach, Arcade Creek enters from the east. The design capacity of Arcade Creek upstream from the Natomas East Main Drainage Canal is 3,300 cfs. Right- and left-bank levees (see O&M Manual SAC118.2) each extend along Arcade Creek about 2 miles from high ground to the Natomas East Main Drainage Canal.

American River from Natomas East Main Drainage Canal to Sacramento River

This reach of river has a design capacity of 180,000 cfs with 3 feet of freeboard, based on the O&M manuals. SPFC facilities include levees along both banks of the river. The right-bank levee (see O&M Manual SAC124) is about 2.2 miles long. The right-bank levee was originally built by local interests and accepted into the project without modification because it equaled or exceeded USACE standards. The right-bank levee is maintained by RD 1000. A vegetation mitigation site (see O&M Manual SAC124.2) is located about 0.9 miles upstream from the Sacramento River. The left-bank levee (see O&M Manual SAC118.1) is about 2.5 miles in length. The left-bank levee was originally constructed by local interests and rebuilt by USACE to project standards. The levee is intended to reduce flood risk for areas in Sacramento County.

3.2.3 Sutter Bypass Watershed

The Sutter Bypass receives water from natural runoff areas south of Chico, overflow and weir flow from the Sacramento River, and drainage from the east side of the bypass through the Wadsworth Canal and pumping plants. The bypass joins the Feather River upstream from its confluence with the Sacramento River near the Fremont Weir. Figure 3-7 shows SPFC facilities in the Sutter Bypass watershed.

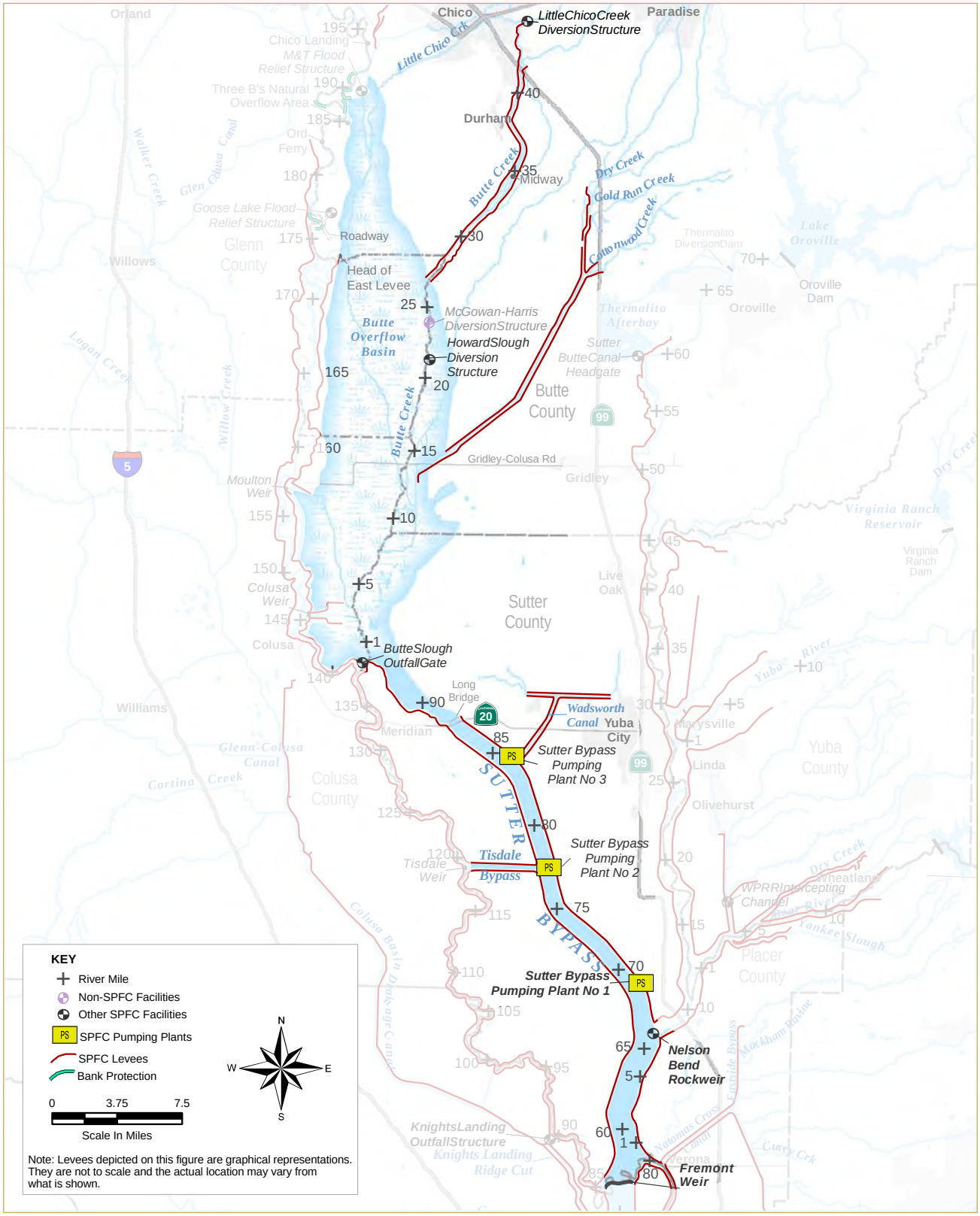


Figure 3-7. Sutter Bypass Watershed – State Plan of Flood Control Facilities Along Butte Creek, Cherokee Canal, Sutter Bypass, and Tributaries

Butte Creek Upstream from Butte Basin

SPFC facilities for Butte Creek include a diversion structure on Little Chico Creek, a diversion channel from Little Chico Creek to Butte Creek, and levees along the diversion channel and along Butte Creek. The facilities are intended to reduce flood risk to Chico, Durham, adjoining agricultural land, Highway 99, and several railroads and county roads. With the exception of levees along the downstream 8 miles of Butte Creek, levees were originally built by local interests and set back or enlarged to project standards by USACE. The facilities are maintained by DWR through Maintenance Area 5.

- The ungated Little Chico Diversion Structure (see O&M Manual SAC516) was designed to limit flood flows through Chico and route excess flood flows to Butte Creek. Upstream from the diversion, Little Chico Creek has a design capacity of 6,700 cfs, based on the O&M manual. The design capacity of Little Chico Creek downstream from the diversion is about 2,200 cfs. The design capacity of the 3-mile-long diversion channel to Butte Creek is about 3,000 cfs with 3 feet of freeboard. According to the O&M manual, the diversion channel can carry 4,500 cfs with no freeboard. The diversion channel has intermittent levees along the right bank (see O&M Manual SAC516).
- The design capacity of Butte Creek downstream from the confluence with the Little Chico Creek Diversion Structure is 27,000 cfs with 3 feet of freeboard, based on the O&M manual. According to the O&M manual, the channel can carry 40,000 cfs with no freeboard. Right- and left-bank levees (see O&M Manuals SAC515 and SAC516) extend about 15 miles downstream to the Butte Basin.

Cherokee Canal

SPFC facilities (see O&M Manual SAC519) consist of levees along Cherokee Canal, the lower reaches of Cottonwood Creek and Gold Run Creek, and irrigation and drainage structures from Butte Basin to high ground. The facilities are intended to provide reduced flood risk to adjacent agricultural lands, area transportation facilities, and irrigation canals. The facilities are maintained by DWR through Maintenance Area 13.

- The right-bank levee along Dry Creek and Gold Run Creek extends about 5.2 miles from high ground to the confluence with Cottonwood Creek. The left-bank levee extends about 3.5 miles from high ground to the confluence with Cottonwood Creek. The design capacity of this reach is about 8,500 cfs with 3 feet of freeboard, based on the O&M manual.
- The lower reach of Cottonwood Creek has a design capacity of about 3,500 cfs. Right- and left-bank levees, each about 1.3 miles long, extend from high ground to the connection with the Cherokee Canal levees.
- Downstream from Cottonwood Creek, the Cherokee Canal has a design capacity varying from 11,500 cfs to 12,500 cfs, based on the O&M manual. The right-bank levee extends about 14 miles. The left-bank levee is about 17 miles long. About midway along this reach, to allow flow to enter from the east, the left-bank levee is broken into two parallel segments for approximately 1.5 miles.

Butte Basin (including Butte Creek and Butte Slough)

SPFC facilities within the Butte Basin include channel improvements along lower Butte Creek and the Butte Slough Outfall Gates to the Sacramento River.

Water from Butte Creek (see O&M Manuals SAC153, SAC515, and SAC516), the Cherokee Canal (see O&M Manual SAC519), and other small tributaries from the north and east enter the Butte Basin. Flood flow from the Sacramento River enters the upper end of the Butte Basin (see discussion in Section 3.2.5, Sacramento River Watershed) at three overflow areas below Chico Landing on the Sacramento River.

Flood flow to the Butte Basin from the Sacramento River also occurs from the Moulton Weir (see O&M Manual SAC154) and from the Colusa Weir (see O&M Manuals SAC155 and SAC502) (see Figure 3-10). The weirs are described in Section 3.2.5. The Butte Basin provides about 1 million acre-feet of transitory storage at flood stage.

SPFC facilities in the Butte Basin are described below:

- Downstream from the Butte Creek levees, channel improvements (see O&M Manual SAC153) extend about 13 miles along lower Butte Creek to the Gridley-Colusa Road. The channel improve-

ments and clearing allow a flow of about 2,500 cfs without extensive overbank flooding. The improvements along this reach also included replacing the old Howard Slough Diversion Structure with a new structure. The diversion structure is located across Butte Creek about 0.5 miles downstream from the bifurcation with Howard Slough. The O&M manual states that the nearby McGowan-Harris Diversion Structure, which was constructed by local interests, is not part of the project, but must be operated in conjunction with the Howard Slough Diversion Structure. Both of these diversion structures are for irrigation and have no flood management role. However, DWR does inspect these structures to be sure that flashboards are removed during the nonirrigation season to minimize their impact on flood stage.

- The Butte Slough Outfall Gates (see O&M Manual SAC161) to the Sacramento River control passage of floodwaters from the Butte Basin to the Sacramento River at a maximum flow of about 3,500 cfs, based on the O&M manual. The gates also allow passage of Butte Slough drainage water to the Sacramento River during the irrigation season.

Flood flows in the Butte Basin flow through Butte Slough and into the Sutter Bypass about 8 miles downstream from the Butte Slough Outfall Gates.

Butte Slough

SPFC facilities include the right-bank levee (see O&M Manual SAC134) from the Butte Slough Outfall Gates to the head of the Sutter Bypass. The levee, about 7.3 miles long, is intended to reduce flood risk to RD 70 and is maintained by RD 70. The levee was constructed by local interests and reconstructed to adopted grade and section by USACE. Based on the O&M manual, the design capacity of this reach is 185,000 cfs at the upstream end and 178,000 cfs with 6 feet of freeboard at the beginning of the Sutter Bypass.

Sutter Bypass

SPFC facilities along the Sutter Bypass and tributaries include levees and pumping plants. The levees along the Sutter Bypass are about 4,000 feet apart.

- From Long Bridge, just upstream from Highway 20 to the Wadsworth Canal, SPFC facilities include levees and a pumping plant. This reach has a design capacity of 178,000 cfs with 6 feet of freeboard, based on O&M manuals. The right-bank levee (see O&M Manuals SAC133 and SAC134) is about 4.5 miles long and is intended to reduce flood risk to the town of Meridian and agricultural land in RD 70 and RD 1660. The left-bank levee (see O&M Manual SAC135) is about 4 miles long and is intended to reduce flood risk to adjacent agricultural land south of the town of Sutter and to Yuba City. Pumping Plant No. 3 (see O&M Manual SAC159) discharges water to the Sutter Bypass from the area located behind the levee. The plant has a capacity of about 180 cfs. In addition, reverse gravity flow water from the bypass provides irrigation water to adjacent agricultural areas.
- SPFC facilities along the Wadsworth Canal and intercepting canals are levees (see O&M Manual SAC135). Based on the O&M manual, the design capacity of the Wadsworth Canal is 1,500 cfs with 6 feet of freeboard at the confluence with the Sutter Bypass, and reduces to 3 feet at River Mile 4. Both the right- and left-bank levees of the Wadsworth Canal are about 4.7 miles long. The Wadsworth Canal levees were built by local interests and reconstructed to adopted grade and section by USACE. At the upstream end of the Wadsworth Canal, the West Intercepting Canal and levees are about 1.4 miles long and the East Intercepting Canal and levees are about 3.8 miles long. The intercepting canals and levees were built by local interests, and a portion of the West Intercepting Canal was reconstructed by USACE. The levees are intended to reduce flood risk to adjacent agricultural land and to Yuba City. Maintenance is by DWR through Maintenance Area 3.
- From the Wadsworth Canal to the Tisdale Bypass, the Sutter Bypass has a design capacity of 178,000 cfs with 6 feet of freeboard, based on O&M manuals. The right-bank levee (see O&M Manual SAC133) is about 5.8 miles long. The levee is intended to reduce flood risk to adjacent agricultural lands and the town of Meridian, and is maintained by RD 1660. The left-bank levee (see O&M Manual SAC135) is about 6.5 miles long. The levee is intended to reduce flood risk to adjacent agricultural land and Yuba City, and is maintained by DWR through Maintenance Area 3. Pumping Plant No. 2 (see O&M Manual SAC159)

has a capacity of about 775 cfs. In addition, reverse gravity flow water from the bypass provides irrigation water to adjacent agricultural areas. Flow from the Tisdale Weir and Bypass (see O&M Manuals SAC129 and SAC135) enters the bypass from the west.

- SPFC facilities along the Sutter Bypass downstream from the Tisdale Bypass to the Feather River include levees and a pumping plant. The Sutter Bypass has a design capacity of 216,500 cfs with 6 feet of freeboard, based on O&M manuals. The right-bank levee (see O&M Manual SAC129) is about 12.2 miles long. The levee is intended to reduce flood risk to adjacent agricultural lands and is maintained by RD 1500. The left-bank levee (see O&M Manual SAC135) is about 12.9 miles long. The levee is intended to reduce flood risk to adjacent agricultural land and is maintained by DWR through Maintenance Area 3. Pumping Plant No. 1 (see O&M Manual SAC159) has a capacity of about 280 cfs from the area located behind the levee into the bypass. In addition, reverse gravity flow water from the bypass provides irrigation water to adjacent agricultural areas.

Joint Feather River/Sutter Bypass Channel to Sacramento River

As described under the Feather River watershed, from their junction, the Feather River and the Sutter Bypass flow in a joint channel to the Sacramento River. The design channel capacity of this reach is 416,500 cfs with 6 feet of freeboard, based on O&M manuals. This differs from the design capacity of 380,000 cfs estimated in the 1957 Revised Profile Drawings (USACE, 1957a). SPFC facilities include right- and left-bank levees about 1.3 miles apart. The right-bank levee (see O&M Manual SAC129), about 10 miles long, is intended to reduce flood risk to agricultural land and is maintained by RD 1500. The left-bank levee (see O&M Manual SAC141.1), about 7 miles long, is intended to reduce flood risk to agricultural land and is maintained by RD 1001. The left-bank levee was originally built by local interests and later enlarged or improved to project standards by USACE.

3.2.4 Yolo Bypass Watershed

Fremont Weir is located at the junction of the Sacramento River and the joint Feather River/Sutter Bypass channel. The Yolo Bypass receives the majority of its flow by spill over the Fremont Weir from the Sacramento/Feather/Sutter Bypass. The Yolo Bypass receives additional flow from smaller tributaries along its length and from the Sacramento River through the Sacramento Bypass. For this description, the Yolo Bypass watershed begins in the Colusa Basin. Figure 3-8 shows SPFC facilities in the Yolo Bypass watershed.

Colusa Basin

SPFC facilities in the Colusa Basin include a left-bank levee, outfall gates to the Sacramento River, an excavated channel and levees to the Yolo Bypass, and stone biotechnical levee protection.

- The left-bank levee (see O&M Manual SAC132) to the Colusa Basin Drain (Colusa Trough Drainage Canal) is about 36.2 miles long and serves as a back levee for RD 108 and RD 787. The design capacity of the levee is 20,000 cfs with 3 feet of freeboard, based on the O&M manual. There is no SPFC right-bank levee. Maintenance is performed by RD 108 and DWR through Maintenance Area 12. About 36 acres of stone biotechnical levee protection (see O&M Manual SAC132.1) were added in three sites along this reach.
- The Knights Landing Outfall Gates (see O&M Manual SAC162), also known as the Sycamore Slough Outfall Gates, is intended to reduce flood risk to the lower Colusa Basin from Sacramento River backwater, but provide drainage to the Sacramento River during low flow. The structure was originally built by local interests. Flap gates were added by USACE and DWR. Maintenance is conducted by DWR through Sacramento Maintenance Yard.
- Knights Landing Ridge Cut (see O&M Manual SAC127) provides drainage of the Colusa Basin Drain to the Yolo Bypass. Based on the O&M manual, the design capacity of the cut is 20,000 cfs with 3 feet of freeboard at the upstream end, and 6 feet of freeboard at the Yolo Bypass. The channel and its right- and left-bank levees are each about 6.4 miles in length. Maintenance is conducted by the Knights Landing Ridge Drainage District.

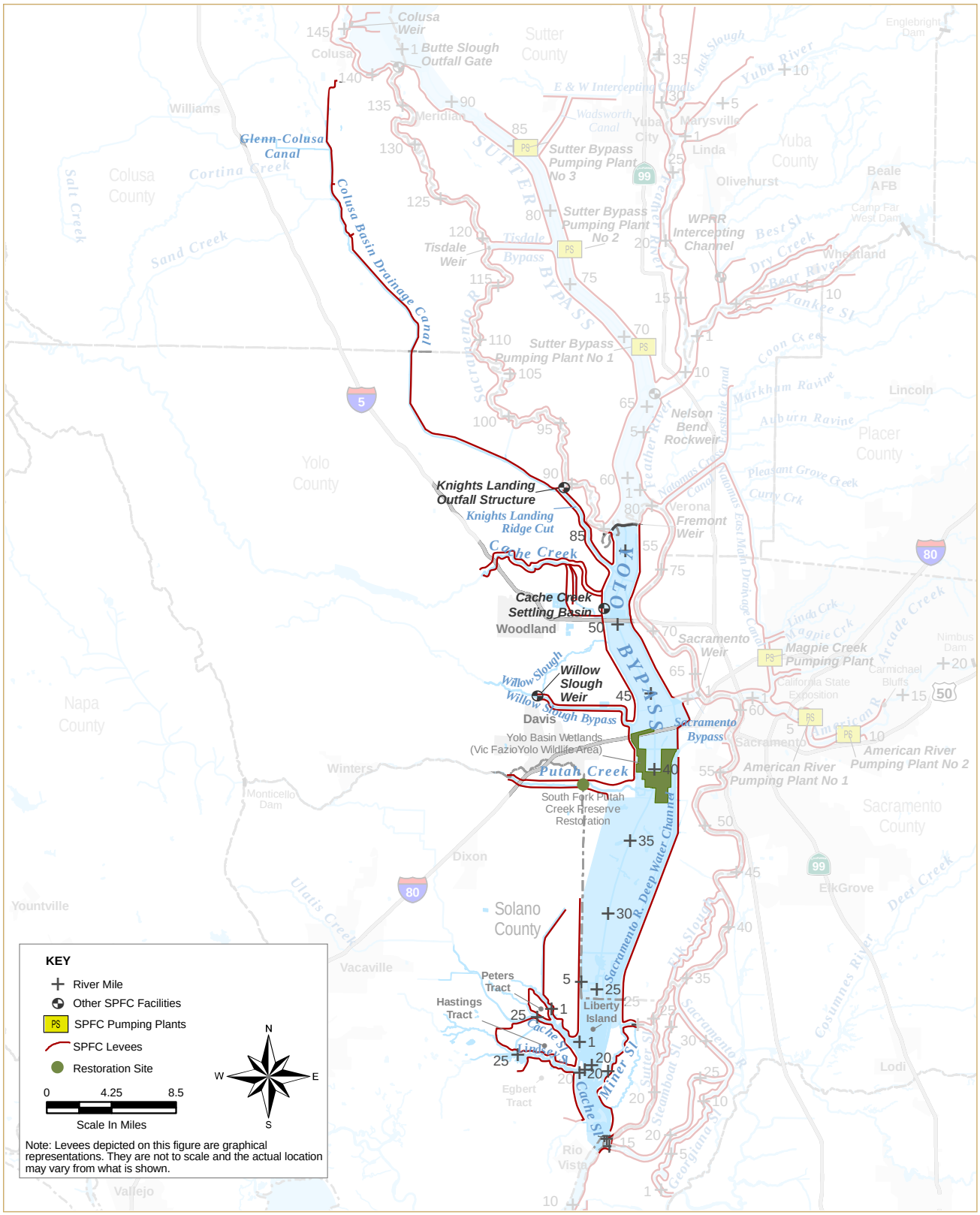


Figure 3-8. Yolo Bypass Watershed – State Plan of Flood Control Facilities Along the Yolo Bypass, Cache Creek, and Other Tributaries

Cache Creek

SPFC facilities on Cache Creek and tributaries are clustered in two separate areas, those of the Middle Creek Project upstream from Clear Lake, and those along Cache Creek near the Yolo Bypass. The Cache Creek Settling Basin and adjoining levees are important SPFC facilities that reduce sediment transport into the Yolo Bypass.

- The Middle Creek and Tributaries Project (see Figure 3-1) upstream from Clear Lake reduces flood risk for the town of Upper Lake, adjoining agricultural land, Highway 20, and several county roads. The project includes about 14.4 miles of levees (see O&M Manual SAC506.2), diversion structures, and a pumping plant. A design freeboard of 3 feet was provided for all levees. Levees exist along Poge Creek/Alley Creek (2,800 cfs design capacity based on the O&M manual), and Clover Creek (500 cfs design capacity). A diversion structure on Clover Creek diverts flood flows to a leveed diversion channel (8,000 cfs design capacity) to Middle Creek. Levees exist along Middle Creek (19,000 and 21,500 cfs design capacities) and Scott Creek (11,000 cfs design capacity). Downstream from Scott Creek, Middle Creek (27,000 cfs design capacity) has only a left-bank levee (see O&M Manuals SAC506. 2 and SAC506.3). A pumping plant (see O&M Manual SAC506.1) is located at Bloody Island to discharge (130 cfs capacity) drainage water from a 3.1-square-mile area from behind project levees into Middle Creek. During low flow, flow direction can be reversed to provide irrigation water from Middle Creek. The left-bank levee continues to Clear Lake. Through its history, the project has been maintained at times by the Lake County Flood Control and Water Conservation District, Lake County Watershed Protection District, and DWR. Since 2000, the project has been operated and maintained by Lake County and DWR. Lake County is responsible for operating and maintaining the Upper District (facilities north of the confluence of Scott Creek) and DWR is responsible for operating and maintaining the Lower District (Maintenance Area 17—from Clear Lake north to the confluence of Scott Creek).
- Lower Cache Creek has SPFC levees (see O&M Manual SAC126) beginning at high ground about 1.5 miles west of Interstate 5 near Woodland. The design capacity is 30,000 cfs, based on the O&M manual. The right-bank levee leading to the Cache Creek Settling Basin is about 6 miles long and the left-bank levee is about 8 miles long. The levees are intended to reduce the flood risk to Woodland and adjoining agricultural lands. The facilities are maintained by DWR through Sacramento Maintenance Yard.
- East and west training levees (see O&M Manual SAC120), each about 2.5 miles long, direct flows toward the southern end of the Cache Creek Settling Basin. In addition, the embankments and spillway forming the Cache Creek Settling Basin (see O&M Manual SAC120) are about 7.5 miles long. The purpose of the settling basin is to control debris and sediment that would otherwise flow into the Yolo Bypass and compromise its capacity. The O&M manual recognized that the deposition of sediment could not be predicted in advance. The east training levee is designed to be periodically breached to regulate deposition of sediment within the basin. Discharge from the basin directly enters the Yolo Bypass. The settling basin has been modified several times since its original construction in 1937. In 1991, the basin was enlarged to provide 50-year storage capacity. The basin was authorized and designed with a spillway to the Yolo Bypass to be raised 6 feet when the sediment trapping efficiency of the basin was reduced to a predetermined level. This was estimated to occur around 2017. The facilities are maintained by DWR through Sacramento Maintenance Yard.

Relocated Willow Slough

SPFC facilities include relocation of Willow Slough to the Willow Slough Bypass with levees along the excavated channel (see O&M Manual SAC120). The bypass is intended to reduce the risk of flooding to the City of Davis. A diversion weir is located at the point of bifurcation of the original and relocated channels. Based on the O&M manual, the design capacity of the relocated channel is 6,000 cfs with 3 feet of freeboard at the upstream end, gradually increasing to 6 feet at the Yolo Bypass. The right-bank levee extends about 7.4 miles from high ground to the Yolo Bypass. The left-bank levee extends about 7.6 miles from high ground to the Yolo Bypass. The mouth of Willow Slough is now about 5.5 miles south of the

original channel. The project is maintained by DWR through Sacramento Maintenance Yard.

Putah Creek

SPFC facilities (see O&M Manual SAC119) include channel improvements and levees. Based on the O&M manual, the design channel capacity is 62,000 cfs with 3 feet of freeboard from high ground to the Yolo Bypass. Freeboard gradually increases from 3 feet at the upstream end to 6 feet at the Yolo Bypass. The project includes clearing the Putah Creek channel from the highway bridge at Winters to a point about 1 mile upstream from the Interstate 80 crossing of Putah Creek. From that, point 1 mile upstream from Interstate 80, the project includes channel excavation and clearing to the Yolo Bypass and right- and left-bank levees. The facilities are intended to reduce flood risk to southern portions of Davis and adjoining agricultural lands. Maintenance is conducted by DWR through Sacramento Maintenance Yard.

Cache Slough and Lindsey Slough

SPFC facilities include levees along sloughs and land tracts near the terminus of the Yolo Bypass. The design capacity of the Lindsey Slough discharge to the Yolo Bypass is 43,500 cfs with 3 feet of freeboard, based on O&M manuals. Levees, maintained by RD 2060, RD 2068, RD 2093 and RD 536, include the following:

- Back levee (see O&M Manual SAC109) from RD 2068 and RD 2098
- Levees around Peters Tract (see O&M Manual SAC108)
- Levees around Hastings Tract (see O&M Manual SAC107)
- North and south levees of Egbert Tract (see O&M Manual SAC106)

Yolo Bypass

The Yolo Bypass begins at Fremont Weir (see O&M Manual SAC157 and description under Section 3.2.5). SPFC facilities include levees on the right and left sides of the bypass.

- From Fremont Weir to the Knights Landing Ridge Cut, the design capacity of the Yolo Bypass is 343,000 cfs with 6 feet of freeboard, based on O&M manuals. The right-bank levee (see O&M Manual SAC127) is about 2 miles long and is intended to reduce flood risk to adjacent agricultural land. Maintenance is performed by DWR through Sacramento Maintenance Yard. The Knights Landing Ridge Cut, with a design capacity of 20,000 cfs, enters the right side of the Yolo Bypass along this reach. The left-bank levee (see O&M Manual SAC123) is about 4 miles long and is intended to reduce flood risk to adjacent agricultural land in RD 1600. Maintenance is conducted by RD 1600.
- Based on O&M manuals, the design capacity increases to 362,000 cfs from the Knights Landing Ridge Cut to Cache Creek. There is a right-bank levee for the Yolo Bypass between the Knights Landing Ridge Cut and the Cache Creek Settling Basin, but it does not show in the O&M manuals as an SPFC facility. The left-bank levee (see O&M Manual SAC123) is about 2 miles long and is intended to reduce flood risk to adjacent agricultural land in RD 1600. Maintenance is conducted by RD 1600.
- From Cache Creek to the Sacramento Bypass, the design capacity of the Yolo Bypass is 377,000 cfs with 6 feet of freeboard, based on O&M manuals. SPFC facilities in this reach include levees along both sides of the bypass. The right-bank levee (see O&M Manual SAC121) is about 6.4 miles long and is intended to reduce flood risk to agricultural land in RD 2035 and Woodland. Maintenance of the levee is conducted by RD 2035. The left-bank levee (see O&M Manual SAC122)

The Yolo Bypass conveys flood flows east of Sacramento

is about 6.1 miles long and reduces flood risk to adjacent agricultural land. Maintenance of the left-bank levee is conducted by RD 1600. Design inflow to the Yolo Bypass from the Sacramento Bypass is 112,000 cfs, based on the O&M manual.

- From the Sacramento Bypass to Putah Creek, the design capacity of the Yolo Bypass is 480,000 cfs with 6 feet of freeboard, based on O&M manuals. SPFC facilities in this reach include levees along the sides of the bypass. The right-bank levee (see O&M Manuals SAC119, SAC120, and SAC121) is about 5.2 miles long. Willow Slough, with a design flow of 6,000 cfs, enters the Yolo Bypass within this reach. The left-bank levee (see O&M Manual SAC116) is about 7 miles long and is intended to reduce flood risk to West Sacramento. The right-bank levee of the bypass is maintained by RD 900 and DWR through Sacramento Maintenance Yard, and the left-bank levee is maintained by RD 900. The Yolo Basin Wetlands (see O&M Manual SAC521, Vic Fazio Yolo Wildlife Area) is located within this reach and lies over the bypass channel. It provides about 3,700 acres of wildlife habitat, including permanent wetlands, seasonal wetlands, grassland/uplands, and riparian woodland. The California Department of Fish and Game operates and maintains the wildlife area in accordance with USACE requirements. The Sacramento Deep Water Ship Channel, completed in 1963, narrowed the channel of the Yolo Bypass and impacted the design profile. The west levee of the ship channel replaced the function of the left levee of the Yolo Bypass. The Deep Water Ship Channel levees are maintained by USACE, and are not part of the SPFC because DWR or the Board did not provide assurances of nonfederal cooperation for them and they are not listed in Section 8316 of the CWC.
- From Putah Creek to the Sacramento River, the Yolo Bypass has a design capacity of 490,000 cfs with 6 feet of freeboard, based on O&M manuals. SPFC facilities include right- and left-bank levees. The SPFC right-bank levee (see O&M Manuals SAC106, SAC107, and SAC109) begins about 7 miles downstream from Putah Creek and extends about 13 miles to the Sacramento River in the Delta, near Rio Vista. Along this reach, Cache Slough and Lindsey Slough enter the Yolo Bypass. The levee is intended to reduce flood risk to adjacent agricultural land. Maintenance is conducted by RD 536, RD 2060, RD 2098, and RD 2068. The left-bank levee (see O&M Manuals SAC105 and SAC113) extends about 23 miles to the Sacramento River. Along this reach, Miners Slough has a design inflow of 10,000 cfs from a series of Delta sloughs that are distributary from the Sacramento River. Maintenance is conducted by RD 501 and RD 999. The Sacramento Deep Water Ship Channel narrowed the channel of the Yolo Bypass and impacted the design profile. The west levee of the ship channel replaced a portion of the left levee of the Yolo Bypass. As stated previously, the Deep Water Ship Channel levees are maintained by USACE, and are not part of the SPFC.
- Liberty Island, Little Holland Tract, Prospect Island, Little Egbert Tract, and other lands surrounded by non-SPFC private levees lie within the bypass near its southern end. The levees, generally limited in height, restrict low flows in the Yolo Bypass, but overtop during high discharges. Levees on Liberty Island and a portion of Little Holland Tract failed from Yolo Bypass flows in 1995 and 1998, and the lands have remained flooded since that time.

3.2.5 Sacramento River Watershed

The previous sections describe the main tributaries that provide flow directly to the Sacramento River or divert flow away from the river. This section completes the description of SPFC facilities within the Sacramento River Basin in an upstream-to-downstream direction. Figures 3-9, 3-10, and 3-11 show SPFC facilities in the main stem of the Sacramento River watershed.

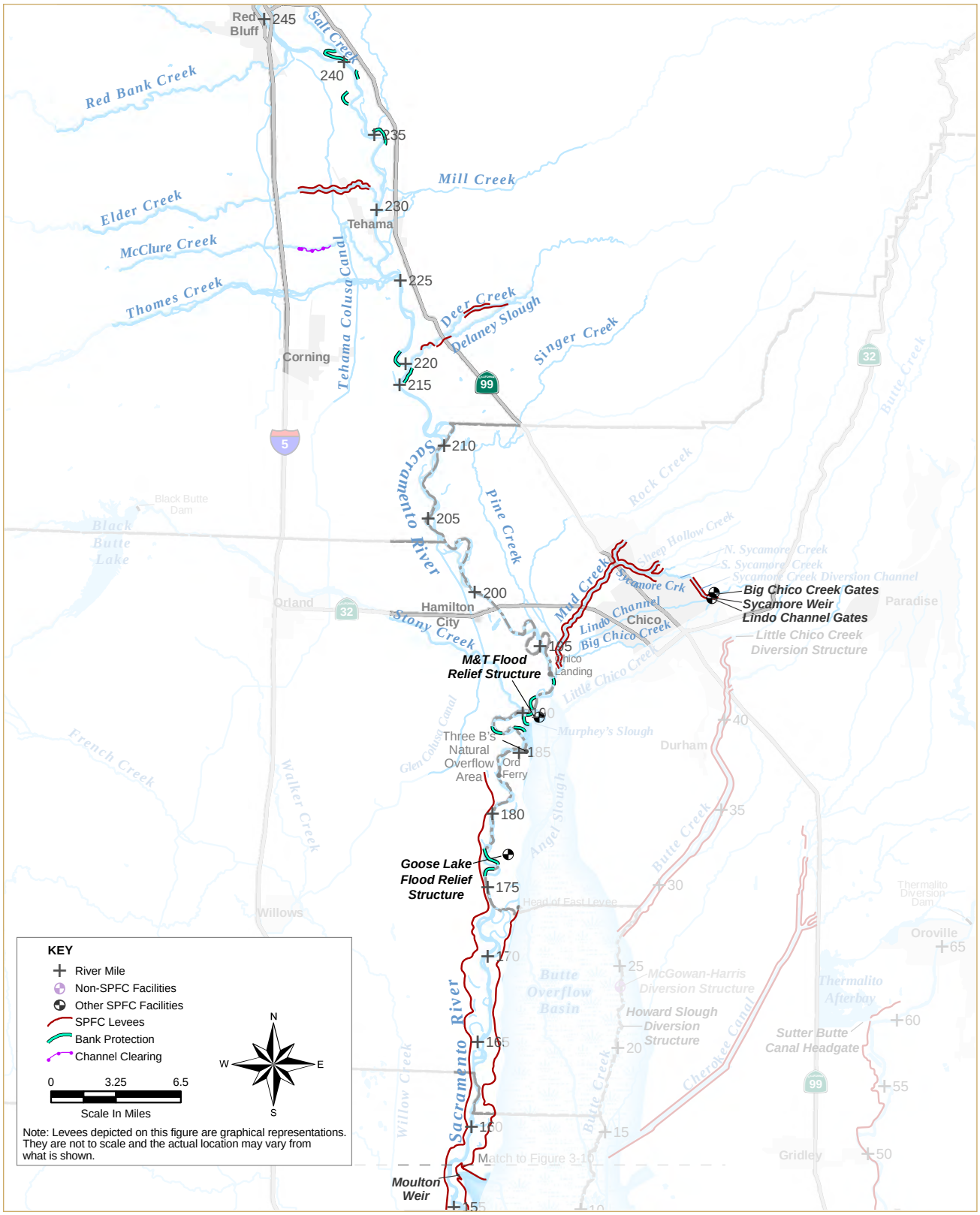


Figure 3-9. Main Stem Sacramento River Watershed – State Plan of Flood Control Facilities Along the Sacramento River and Certain Tributaries from Red Bluff to Moulton Weir

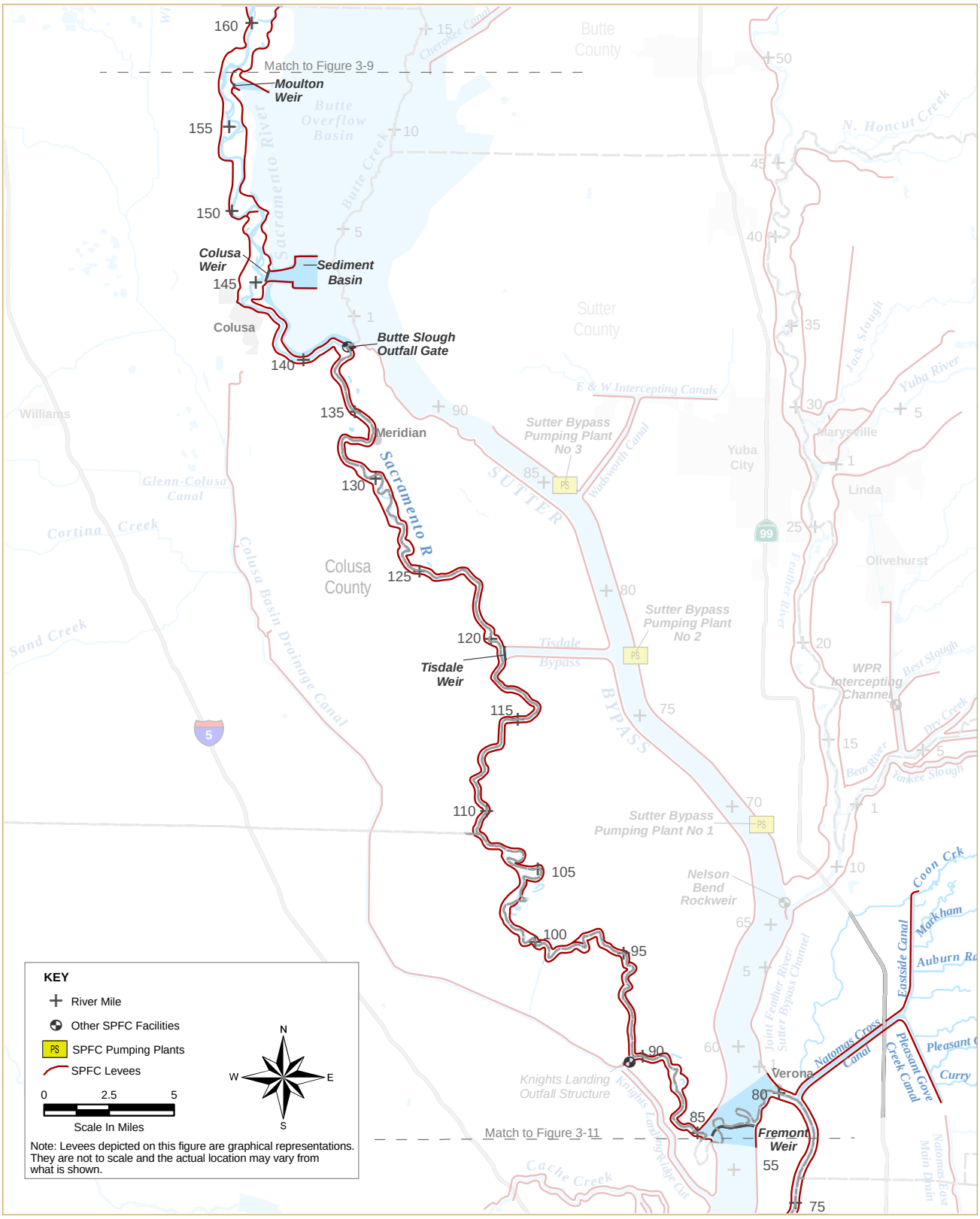


Figure 3-10. Main Stem Sacramento River Watershed – State Plan of Flood Control Facilities Along the Sacramento River from Moulton Weir to Fremont Weir

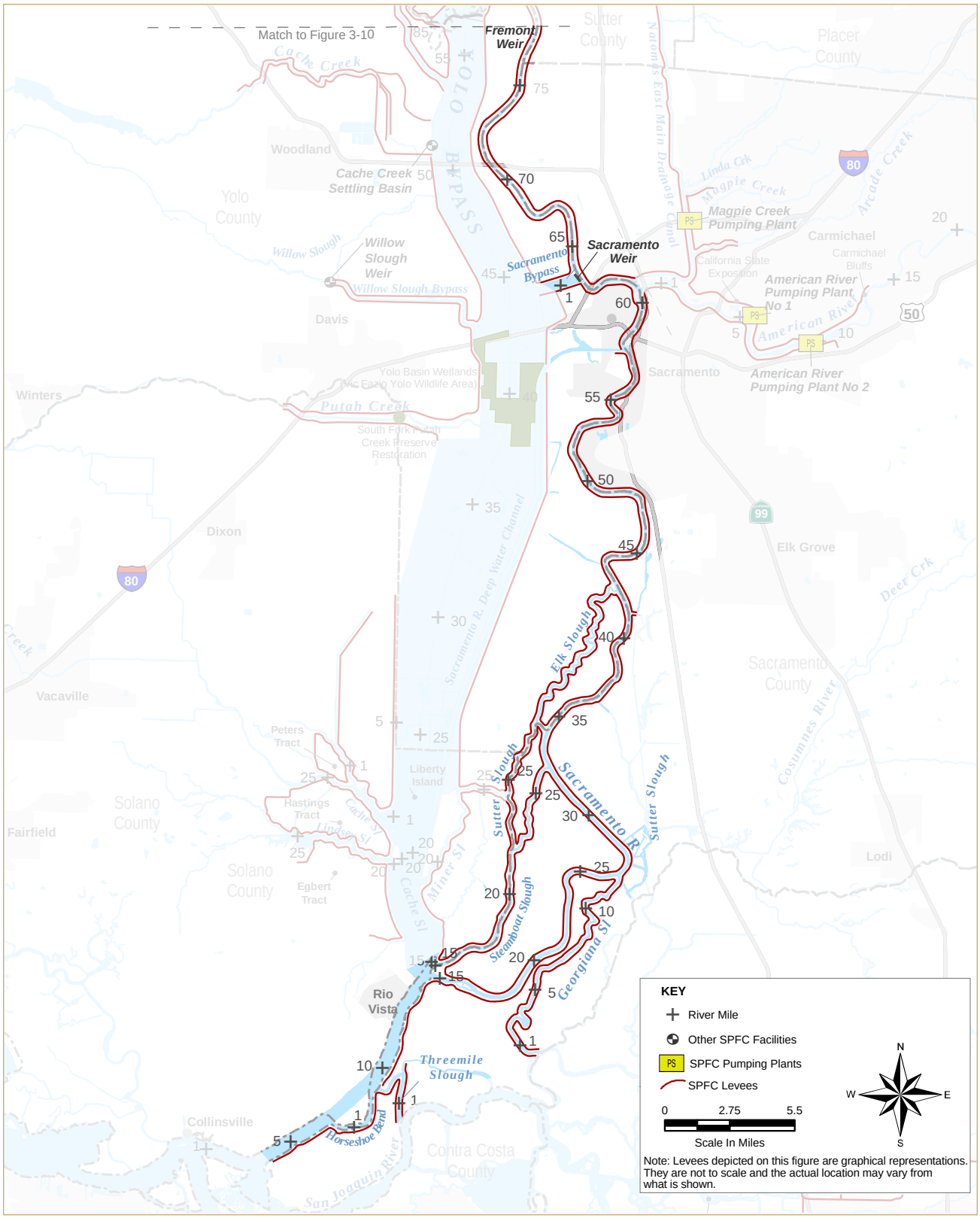


Figure 3-11. Main Stem Sacramento River Watershed – State Plan of Flood Control Facilities Along the Sacramento River and Certain Tributaries and Distributaries from Fremont Weir to Collinsville

Ash and Dry Creeks at Adin

SPFC channel clearing and snagging (see O&M Manual SAC503) was conducted over about 1 mile of Ash Creek downstream from Highway 299 and Dry Creek from its confluence with Ash Creek to a point about 900 feet upstream. The project (see Figure 3-1) is intended to reduce flood risk to the town of Adin in Modoc County about 80 miles northeast of Redding. Ash Creek drains into the Pit River, which drains into Shasta Lake. The project is maintained by the Adin Community Services District.

Sacramento River Tributaries Between Red Bluff and Chico Landing

There are several SPFC improvements along tributaries to the Sacramento River between Red Bluff and Chico Landing; none of these improvements is connected to the SPFC levee system that begins downstream at Ord Ferry.

- Salt Creek enters the Sacramento River about 4 miles downstream from Red Bluff. Channel clearing and shaping (see O&M Manual SAC513) of Salt Creek from its confluence with the Sacramento River to about 1.7 miles upstream is intended to reduce flood risk to residences on the east side of Salt Creek as well as agricultural land. The Tehama County Flood Control and Water Conservation District maintains the project.
- Elder Creek enters the Sacramento River about 12 miles downstream from Red Bluff. SPFC improvements (see O&M Manual SAC510) include channel clearing for about 1.25 miles upstream from the Sacramento River and an adjacent leveed channel reach. The left-bank levee is about 4.1 miles long and the right-bank levee is about 4 miles long. The design capacity of the leveed channel is 17,000 cfs with 3 feet of freeboard, based on the O&M manual. The improvements are intended to reduce flood risk to the town of Garber, adjacent agricultural land, several highways, and a railroad. The Tehama County Flood Control and Water Conservation District maintains the project.
- McClure Creek is located in Tehama County. The creek drains from west to east toward the town of Tehama, about 13 miles south of Red Bluff. SPFC improvements (see O&M Manual SAC511) include channel clearing along an 8,700-foot-long reach from about 1 mile upstream from U.S. Highway 99 to 0.7 miles downstream from the highway. The improvements are intended to reduce flood risk to the town of Tehama to the north, bridges for Highway 99, several county roads, and adjacent agricultural land to the south. The Tehama County Flood Control and Water Conservation District maintains the project.
- Deer Creek enters the Sacramento River about 21 miles downstream from Red Bluff. SPFC improvements (see O&M Manual SAC509) include channel clearing and levees along Deer Creek. The design capacity of the channel is 21,000 cfs with 3 feet of freeboard, based on the O&M manual. Channel clearing extends from upstream of Delany Slough to the Sacramento River. The right-bank levee is about 1.5 miles long. The left-bank levee extends about 4.3 miles, in two segments, from high ground to the Sacramento River floodplain. The facilities were designed to reduce flood risk to the town of Vina and adjacent agricultural land. The Tehama County Flood Control and Water Conservation District maintains the project.

Sacramento River from Red Bluff to Chico Landing

SPFC facilities, including bank protection sites (see O&M Manual SAC512), extend intermittently along a 50-mile reach of the Sacramento River between Red Bluff (River Mile 244) and Chico Landing (River Mile 194). Because of the meandering nature of the river in the reach, USACE identified locations that needed improvement to prevent movement of the river onto adjoining lands.

Specific works completed along this stretch were documented in letters from USACE that are included in Exhibit C of O&M Manual SAC512. Some of the river miles listed in the letters used an older system with numerical values that were approximately 50 to 52 miles less than the current system. For example, River Mile 141.2 in the old system is classified as River Mile 193.12 in the new system. The specific works are listed below and the old river mileage system is identified, where necessary.

- River banks were shaped and stone protection was placed on the left bank of the Sacramento River at Site No. 8, River Mile 183.4 (old river mileage system); Site No. 9, River Mile 183.9

Aerial view of the Sacramento River where the river meanders, near River Mile 239

(old river mileage system); on the right bank at Site No. 10, River Mile 187.0 (old river mileage system); Site No. 11, River Mile 188.6 (old river mileage system); and Site No. 12, River Mile 189.7 (old river mileage system). This work was completed December 3, 1963.

- River banks were shaped and stone protection was placed on the right bank of the Sacramento River at Site No. 6, River Mile 169.0 (old river mileage system), and Site No. 7, River Mile 169.8 (old river mileage system). This work was completed December 20, 1963.
- River banks were shaped and 500 feet of stone bank protection placed on the right bank of the Sacramento River at Site Mile 177.3 (old river mileage system). This work was completed October 23, 1968.
- River banks were shaped and 525 feet of stone bank protection placed on the left bank of the Sacramento River at Site Mile 218.3. This work was completed June 12, 1970.
- River banks were shaped and stone protection was placed on the left bank of the Sacramento River at Site Mile 185.3 (old river mileage system). This work was completed November 18, 1971.
- River banks were shaped and stone protection was placed on the left bank of the Sacramento River at Site Miles 194.0 (1,900 feet) and 196.3 (875 feet). This work was completed January 4, 1974.
- River banks were shaped and stone protection was placed on the left bank of the Sacramento River at Site Miles 208.4 (4,470 feet) and 213.1 (2,080 feet). This work was completed November 6, 1974.
- River banks were shaped and stone protection was placed on the Sacramento River left bank at Site Miles 194.0 (440 feet) and 230.5 (3,425 feet), and right bank at Site Miles 202.0 (600 feet) and 229.0 (3,280 feet). This work was completed November 5, 1975.
- River banks were shaped and 6,500 feet of stone bank protection placed on the right bank of the Sacramento River at Site Mile 197.0. This work was completed on January 9, 1976.
- River banks were shaped and stone protection was placed on the left bank of the Sacramento River at Site Miles 202.4 (1,300 feet), 207.0 (1,900 feet), and 211.1 (4,000 feet). This work was completed July 29, 1976.

- Repair of 650 feet of stone bank protection took place along the left bank of the Sacramento River at Site Mile 196.3. This work was completed November 15, 1976
- River banks were shaped and stone protection was placed on the Sacramento River right bank at Site Miles 215.3 (1,320 feet), 226.3 (7,130 feet), and 231.2 (1,550 feet) and on the left bank at Site Miles 233.9 (1,640 feet), 238.1 (710 feet), 239.8 (690 feet), and 242.0 (2,525 feet). This work was completed November 9, 1978.
- River banks were shaped and stone protection was placed on the Sacramento River right bank at Site Mile 204.9 (710 feet), and on the left bank at the Site Mile 242.0 (500 feet) extension. This work was completed June 14, 1979.
- River banks were shaped and stone protection was placed on the Sacramento River right bank at Site Mile 215.0. This work was completed December 17, 1982.
- River bank protection was restored on the Sacramento River left bank at Site Mile 208.4 and on the right bank at Site Mile 226.3. This work was completed February 23, 1984.
- River bank protection was restored on the Sacramento River left bank at Site Miles 219.4 and 240.0 and on the right bank at Site Mile 197.0. This work was completed May 3, 1984.
- River banks were shaped and stone protection was placed on the Sacramento River left bank at Site Mile 227.5 and on the right bank at Site Mile 209.5. This work was completed August 30, 1984.
- River bank protection was restored on the Sacramento River left bank at Site Miles 234.0 and on the right bank at Site Mile 197.0. This work was completed November 2, 1984.

Big Chico Creek/Mud Creek

Big Chico Creek/Mud Creek enters the Sacramento River about 600 feet upstream from Chico Landing. SPFC facilities (see O&M Manual SAC504) on this stream system include channel clearing, levees, diversion structures, and a diversion channel to reduce flood risk in Chico and local transportation facilities. The project also includes improvements to Big Chico Creek, Sandy Gulch, Sheep Hollow, Sycamore Creek, Dry Creek, and Mud Creek. Butte County is the maintaining agency. Design capacities referenced in the following discussion are from the O&M manual.

- Diversion structures on the eastern side of Chico on Big Chico Creek and Sandy Gulch (Lindo Channel) divert excess flows through a diversion channel to Sycamore Creek. These structures include the Big Chico Creek Gates, Lindo Channel Gates, and the Sycamore Weir. The diversion channel, about 2 miles long, has a design capacity of 8,500 cfs and has a levee along the left bank. Sandy Gulch, Big Chico Creek Gates, Lindo Channel Gates, and the Sycamore Weir are shown in the O&M manual map book included on the reference DVD, on the map for O&M Manual SAC504.
- The project includes the unimproved channels of Big Chico Creek and Lindo Channel that lie between the diversion structures and the Sacramento River.
- Channel improvements and levees extend along both banks of Sycamore Creek, Sheep Hollow, and Mud Creek. About 20 miles of levee are located along these channels, downstream from the diversion channel. Levees line portions of the diversion channel. The design capacity of these levees at their upstream end on Sycamore Creek is 10,000 cfs with 3 feet of freeboard. Sheep Hollow (with a design capacity of 1,400 cfs) and Dry Creek (with a design capacity of 500 cfs) enter Sycamore Creek about 1.8 miles upstream from the Sycamore Creek and Mud Creek confluence. At the confluence, Sycamore Creek has a design capacity of 11,000 cfs and Mud Creek has a capacity of 5,500 cfs. While the design capacity of Mud Creek is 15,000 cfs for most of its length, portions of the channel have a capacity of 13,000 cfs.

Butte Basin Overflow Area

The Butte Basin Overflow Area is an historic overflow area where floodwaters from the Sacramento River spill into the Butte Basin periodically. The importance of this river reach to the functioning of the SRFCP was recognized through the Board's 1986 certification of the EIR for the "Plan of Flood Control for the Butte Basin Overflow Area" (1986 Butte Basin Plan), and its concurrent approval of a State construction project to implement the "Overbank Flow Element" of the 1986 Plan. DWR's 1988 construction defined and established the M&T and Goose Lake Flood Relief Structures (FRS) to provide overflow into the Butte Basin (along with flow from the Three B's Natural Overflow Area) when the Ord

Ferry gage exceeds 114 feet National Geodetic Vertical Datum (NGVD). DWR also raised the Murphy Slough Plug (a segment of the private Phelan Levee immediately downstream from the M&T FRS) by two feet. This fortification reduced the risk of a neck cutoff of the Sacramento River at Monroeville Bend during high water, which would compromise the hydraulic efficiency of the M&T FRS.

The USACE implemented the "Bank Stabilization Element" of the 1986 Butte Basin Plan by constructing several bank protection sites during the late 1980s.

The SPFC relies on the Three B's Natural Overflow Area to protect downstream levees on the Sacramento River

DWR design capacity of the Sacramento River at Chico Landing is about 260,000 cfs; inflow from Stony Creek and Big Chico Creek increase the total design capacity at the latitude of Ord Ferry (where the right-bank, or west levee begins) to about 300,000 cfs. The design capacity of the river where the left-bank, or east levee begins (7.5 river miles downstream from Ord Ferry, near the Butte-Glenn county line) is about 160,000 cfs, based on the O&M manual. This reduction in river capacity requires that flow leave the river upstream of the dual SPFC levees. Historically, overflow over the east bank of the river has spilled into the Butte Basin during periods of high water. While the magnitude and duration of these flows have been reduced by upstream flow regulation, overflow into the Butte Basin still occurs and is essential to the success of the downstream flood management system along the Sacramento River.

Flows above 90,000 cfs at Ord Ferry overtop the east bank of the Sacramento River at several locations upstream from the SPFC left-bank levees. The three prominent overflow areas are the M&T FRS located about 3 river miles downstream from Chico Landing, the Three B's Natural Overflow Area located about 7.5 river miles downstream from Chico Landing, and the Goose Lake FRS located about 15.5 river miles downstream from Chico Landing. As SPFC facilities for which the State has maintenance responsibility under the CWC, DWR maintains both the State-constructed overbank flow features (M&T and Goose Lake FRS) and the USACE-constructed bank stabilization features of the 1986 Butte Basin Plan. CWC Section 8361(p) refers to "the flood relief structures or weirs and other structures or facilities essential for their proper functioning in the vicinity of the Sacramento River between Big Chico Creek and the north boundary of Glenn County Levee District No. 3." CWC Section 9110(f) states that facilities identified in Section 8361 (such as those described above) are part of the SPFC.

The State also included regulation of overflow to the Butte Basin in Title 23 CCR (see http://cvfpb.ca.gov/regulations/CCRTitle23WatersDiv1.pdf). The standards for the Butte Basin are contained in Section 135, Division 1, 23 CCR. In general, these standards require approval from the Board for any encroachment that could reduce or impede flood flows, or would reclaim any of the floodplain within the Butte Basin. The Board also requires the elevation of the roadway downstream from the Goose Lake FRS to remain at or below the elevation required for flood flows to overtop them when flow in the Sacramento River exceeds 150,000 cfs; and the elevation of Three B's Natural Overflow to remain at or below the elevation required for flood flows to overtop when the gage at Ord Ferry Bridge reaches 114 feet NGVD, which is the equivalent to a flood flow of approximately 100,000 cfs.

The current configuration and function of the Butte Basin features are a result of collaboration in planning, design, construction, and maintenance among federal, State, and local entities for the common purpose of providing proper function of the SRFCP. See the SPFC History Report (under development) for a detailed description and chronology of the Butte Basin Overflow Area.

Moulton Weir spills water into the Butte Basin

Sacramento River from Ord Ferry to Moulton Weir

Ord Ferry marks the beginning of SPFC levees that extend more than 183 river miles to the Delta. SPFC facilities along the Sacramento River between Ord Ferry and Moulton Weir include levees on both sides of the river. The design capacity of this reach is 160,000 cfs, based on O&M manuals. The right-bank (west) levee (see O&M Manuals SAC137, SAC139, and SAC140) begins at Ord Ferry and extends downstream to the Colusa Bridge. The levee is intended to reduce flood risk to adjacent agricultural lands and small communities, and is maintained by Glenn County Levee Districts 1 and 2, and by DWR through Maintenance Area 1.

The left-bank (east) levee (see O&M Manuals SAC136 and SAC138) begins about 7.5 river miles downstream from Ord Ferry and extends past Moulton Weir to the Butte Slough Outfall Gates. The levee is intended to provide a consistent division of flows between the Butte Basin and Sacramento River. Because water flows on both sides of the levee, the levee does not preclude flood flows to the area east of the levee. Maintenance is performed by Butte County Levee District 3 and by DWR under CWC Section 8361(i). The levees in the reach are generally set back from the river and are about 0.5 to 1.5 miles apart.

Moulton Weir

Moulton Weir and its training levee are SPFC facilities. The weir (see O&M Manual SAC154) is a fixed-crest concrete structure, about 500 feet long, with a design capacity of 25,000 cfs to the Butte Basin (see Section 3.2.3). The outlet channel is flanked by training levees on the downstream side of the weir. Discharge over the weir occurs when Sacramento River flows exceed about 60,000 cfs at the site. Maintenance is conducted by DWR through Sutter Maintenance Yard.

Sacramento River from Moulton Weir to Colusa Weir

SPFC facilities along this reach of river include levees. The design capacity of this reach is 135,000 cfs, based on O&M manuals. The right-bank levee (see O&M Manual SAC137) is about 10 miles long. The levee is intended to reduce flood risk to adjacent agricultural lands and small communities, and is maintained by DWR under CWC Section 8361(i) from the Butte Slough Outfall Gates upstream to a point four miles northerly from the Moulton Weir. The levees in the reach are generally set back from the river and are about 0.5 to 1.5 miles apart.

The Colusa Weir, its training levees, and sediment basin are SPFC facilities

The left-bank levee (see O&M Manual SAC136) is about 9 miles long. The levee is intended to reduce flood risk to adjacent agricultural land and small communities. Maintenance is conducted by Levee District 3 and DWR through Maintenance Area 1.

Colusa Weir and Sediment Basin

Colusa Weir, its training levees, and sediment basin are SPFC facilities. The weir (see O&M Manual SAC155) is a fixed-crest concrete structure, about 1,650 feet long, with a design capacity of 70,000 cfs to Butte Basin (see Section 3.2.3). Spill over the uncontrolled Colusa Weir begins when Sacramento River flows at the weir exceed about 30,000 cfs.

The bypass channel leading from the weir lies between two training levees that extend about 2 miles into Butte Basin. A sediment basin (see O&M Manual SAC502) was added to limit the discharge of sand into downstream agricultural areas. The basin is operated so that at least 1 million cubic yards of reserve sediment storage are available at the beginning of each flood season. The weir, training levees, and sediment basin are maintained by DWR through Sutter Maintenance Yard.

Sacramento River from Colusa Weir to Tisdale Weir

SPFC facilities between the Colusa Weir and Tisdale Weir include levees and the Butte Slough Outfall Gates. The design capacity upstream from the outfall gates is 65,000 cfs and downstream is 66,000 cfs, based on O&M manuals. The right-bank levee (see O&M Manuals SAC137 and SAC131) is about 26 miles long. The levee is intended to reduce flood risk to adjacent agricultural lands and the town of Colusa, and is maintained by DWR through Maintenance Areas 1 and 12 and the Sacramento River West Side Levee District.

The left-bank levee (see O&M Manuals SAC133, SAC134, and SAC136) is about 25.6 miles long. The levee is intended to reduce flood risk to adjacent agricultural land. Maintenance is performed by RD 70, RD 1660, and by DWR through Maintenance Areas 1 and 12.

The Butte Slough Outfall Gates (see O&M Manual SAC161) to the Sacramento River control passage of floodwaters from Butte Basin to the Sacramento River at a maximum flow of 3,500 cfs. The gates also allow passage of Butte Slough drainage water to the Sacramento River during the irrigation season.

Tisdale Weir

Tisdale Weir and bypass levees to the Sutter Bypass are SPFC facilities. The weir (see O&M Manual SAC156) is a fixed-crest concrete structure with a design capacity of 38,000 cfs. The bypass channel is 1,150 feet wide and extends 4 miles to the Sutter Bypass. Levees (see O&M Manuals SAC129 and SAC133) are continuous along both sides of the bypass. Both levees are intended to reduce flood risk to adjacent agricultural land in RD 1500 and RD 1660. The weir was originally built by local interests and improved by USACE to project standards. The facilities are maintained by DWR through Sutter Maintenance Yard. Discharge over Tisdale Weir begins when the Sacramento River exceeds 23,000 cfs. During a slow rise on the river, the weir begins to pass flows before the Moulton and Colusa weirs, 8 to 10 hours after the upstream Colusa gage exceeds 55.0 feet NGVD 29.

Tisdale Weir spills into the Sutter Bypass (photo courtesy of Sutter County)

Sacramento River from Tisdale Weir to Fremont Weir

SPFC facilities between Tisdale Weir and Fremont Weir include levees and the Knights Landing Outfall Gates. The design capacity of the river downstream from Tisdale Weir is 30,000 cfs, based on O&M manuals. The right-bank levee (see O&M Manuals SAC127 and SAC130) is about 32 miles long. The levee is intended to reduce flood risk to

Sacramento River near Knights Landing (photo courtesy of Julia Fredenberg)

adjacent agricultural lands and is maintained by the Sacramento River West Side Levee District. The levees along this reach are generally at the riverbank, about 300 to 400 feet apart.

The Knights Landing Outfall Gates are located along the right-bank levee about 26 miles downstream from Tisdale Weir. The Knights Landing Outfall Gates (see O&M Manual SAC162), also known as the Sycamore Slough Outfall Gates, are intended to reduce flood risk to the lower Colusa Basin from Sacramento River backwater, but provide drainage to the Sacramento River during low flow. The structure was originally built by local interests. Flap gates were added by USACE and DWR.

The left-bank levee (see O&M Manual SAC128) is about 33.6 miles long. The levee reduces flood risk to adjacent agricultural land. Maintenance is performed by RD 1500.

Fremont Weir

The Sacramento River and the joint channel for the Sutter Bypass and Feather River join at the Fremont Weir. The weir, an SPFC facility, is a fixed-crest concrete structure. At this location, the Sacramento River has a design capacity of 30,000 cfs, and the joint channel for the Sutter Bypass and Feather River has a design capacity of 416,500 cfs, roughly half of which spilled from the Sacramento River to the Butte Basin at the overflow areas south of Chico Landing, and over the Moulton, Colusa, and Tisdale weirs.

The Fremont Weir (see O&M Manual SAC157) is a concrete overflow section about 9,120 feet long with a design capacity of 343,000 cfs. The Fremont Weir begins to spill water to the Yolo Bypass (see Section 3.2.4) when the combined flow from the Sacramento River, Sutter Bypass, and Feather River reaches about 60,000 cfs. This value depends on the amount of flow that each river contributes. The Sacramento River continues on the east side of the weir. The weir is maintained by DWR through Sutter Maintenance Yard.

Sacramento River from Fremont Weir to Sacramento Weir

SPFC facilities along this reach include levees. The design capacity of the Sacramento River in this reach is 107,000 cfs, based on O&M manuals. The right-bank levee (see O&M Manuals SAC122 and SAC123) is about 18 miles long. The levee is intended to reduce flood risk to adjacent agricultural land and is maintained by RD 1600 and RD 827.

The left-bank levee (see O&M Manuals SAC124 and SAC141.1) is about 17 miles long. The levee is intended to reduce flood risk to the urbanizing area in Natomas and adjoining agricultural land. The levee is maintained by RD 1000. Near the upstream end of the levee, the Natomas Cross Canal enters the river from the east with a design capacity of 22,000 cfs, based on the O&M manual.

The 4.8-mile-long East Side Canal and right-bank levee (see O&M Manual SAC142) and the 4.3-mile-long Pleasant Grove Creek Canal and left-bank levee (see O&M Manual SAC125) collect water from streams approaching RD 1000 (Natomas Basin) and RD 1001, and discharge it into the head of the Natomas Cross Canal. Levees along both sides of the Natomas Cross Canal (see O&M Manuals SAC125 and SAC142) are each about 5 miles long. The East Side Canal levee (design capacity of 16,000 cfs, based on the O&M manuals) and the right-bank levee of the Natomas Cross Canal are maintained by RD 1001. The Pleasant Grove Creek Canal levee (design capacity of 6,000 cfs, based on the O&M manual) and left-bank levee of the Natomas Cross Canal are maintained by RD 1000. The Pleasant Grove Creek Canal left levee was raised in the early 1950s by USACE. The levees described above are intended to reduce flood risk to the Natomas area and nearby agricultural land.

The Sacramento Weir is the only weir that requires manual operation for flow release

SPFC levees protect the Pocket Area of Sacramento

Sacramento Weir and Bypass

The Sacramento Weir and its bypass levees are SPFC facilities. The weir (see O&M Manual SAC158) is a reinforced concrete structure with wooden needles that provide a movable crest. The Sacramento Weir is the only weir and overflow area in the SPFC that requires manual operation for flow release. The weir consists of 48 weir sections, each 38 feet wide, with a total design capacity of 112,000 cfs. Sections of the weir are opened when the Sacramento River reaches or exceeds a stage of 27.5 feet NGVD at the I Street Bridge. The weir was constructed by the City of Sacramento and later adopted into the SRFCP by USACE.

The leveed bypass downstream from the Sacramento Weir extends to the Yolo Bypass. The right-bank levee (see O&M Manual SAC116) is about 1.8 miles long and the left-bank levee (see O&M Manual SAC122) is about 1.8 miles long. The Sacramento Weir and bypass are maintained by DWR through Sacramento Maintenance Yard.

Sacramento River from Sacramento Weir to American River

SPFC facilities along this reach of river include levees on both banks. This reach serves a unique function among all major SPFC channels in that it carries water in both directions, depending on flow conditions. Since the American River enters the downstream end of this reach with a design capacity of 180,000 cfs, and the Sacramento River downstream from the American River has a design capacity of only 110,000 cfs, a portion of the American River must flow upstream to the Sacramento Weir during large flood events.

The right-bank levee (see O&M Manual SAC116) of the Sacramento River and the left-bank levee (see O&M Manual SAC124) are both about 2.5 miles long. The right-bank levee is intended to reduce flood risk to West Sacramento and is maintained by DWR through Maintenance Area 4 and RD 537. The left-bank levee is intended to reduce flood risk to the Natomas area and is maintained by RD 1000.

Sacramento River from American River to Elk Slough

SPFC facilities along this reach of river include levees. Based on the O&M manuals, the design capacity is 110,000 cfs with 3 feet "or more" of freeboard (transitions to 6 feet near the downstream end of the reach). The right-bank levee (see O&M Manuals SAC113, SAC114, and SAC116) is about 22 miles long. The levee was originally built by local interests and modified to project standards by USACE. The levee is intended to reduce flood risk to West Sacramento near its upstream end, and to adjacent agricultural land. The levee is maintained by RD 307, RD 537, RD 900, RD 765, RD 999, and DWR through Maintenance Area 4.

The left-bank levee (see O&M Manuals SAC111, SAC115, SAC117, and SAC118.1) is about 18 miles long. The levee is intended to reduce flood risk to Sacramento and suburbs to the south. The upstream 4-mile-long (approximately) portion of the

left-bank levee was built by local interests and brought into the project without modification since it equaled or exceeded USACE project standards. The City of Sacramento maintains about 3.6 miles of the left-bank levee. The remaining levee was built by local interests and rebuilt to project standards by USACE, and is maintained by the American River Flood Control District and DWR through Maintenance Area 9.

Sacramento River from Elk Slough to Collinsville

SPFC facilities along this reach include levees. For most of the reach length, the design capacity decreases because of distributary channels as the river enters the Delta. Based on O&M manuals, the design capacity of the river is as follows:

- Downstream from the Elk Slough distributary – 110,000 cfs with 6 feet of freeboard
- Downstream from the Sutter Slough distributary – 84,500 cfs with 6 feet of freeboard
- Downstream from the Steamboat Slough distributary – 56,500 cfs with 6 feet of freeboard
- Downstream from the Georgiana Slough distributary – 35,900 cfs with 6 feet of freeboard
- Downstream from the confluence with the Yolo Bypass – 579,000 cfs with 6 feet of freeboard
- Downstream from the Three Mile Slough distributary – 514,000 cfs with 6 feet of freeboard

The right-bank levee along the Sacramento River (see O&M Manuals SAC104, SAC110, and SAC112) is about 20 miles long. The levee was constructed by local interests and enlarged, set back, or repaired to project standards by USACE. There is no right-bank levee downstream from the confluence with the Yolo Bypass. The levee is intended to reduce flood risk to adjacent agricultural land in the Delta and is maintained by RD 3, RD 150, and RD 349.

The left-bank levee along the Sacramento River (see O&M Manuals SAC101, SAC102, SAC103, and SAC111) is about 38 miles long. The levee was constructed by local interests and enlarged, set back, or repaired to project standards by USACE. The levee is intended to reduce flood risk to adjacent agricultural areas in the Delta and is maintained by RD 369, RD 551, RD 554, RD 556, RD 755, the Brannan-Andrus Levee Maintenance District, and DWR through Maintenance Area 9.

The Sacramento River near Walnut Grove (photo courtesy of Aquafornia)

SPFC levees on distributary channels include the following:

- Levees on both banks of Elk Slough (see O&M Manuals SAC112 and SAC113); design capacity of 0 cfs. RD 999 maintains 9.7 miles of right-bank levee and RD 150 maintains 9.6 miles of left-bank levee.
- Levees on both banks of Sutter Slough (see O&M Manuals SAC105, SAC110, SAC112, and SAC113); design capacity of 25,500 cfs (between Miner Slough and the Sacramento River) and 15,500 cfs (between Steamboat Slough and Miner Slough). RD 999 maintains 3.8 miles of right-bank levee and RD 349 maintains 6.6 miles of left-bank levee. RD 501 maintains 2.3 miles of right-bank levee and RD 150 maintains 0.5 mile of left-bank levee along Sutter Slough.
- Levees on both banks of Miner Slough (see O&M Manuals SAC105 and SAC113), a distributary of Sutter Slough; design capacity of 10,000 cfs to Yolo Bypass. RD 999 maintains 2.3 miles of right-bank levee and RD 501 maintains 7.8 miles of left-bank levee.
- Levees on both banks of Steamboat Slough (see O&M Manuals SAC104, SAC105, SAC110); design capacity of 28,000 cfs upstream from Miner Slough and 43,500 cfs downstream from Miner Slough. RD 349 maintains 4.4 miles of right-bank levee, RD 501 maintains 6.8 miles of left-bank levee, and RD 3 maintains 11 miles of left-bank levee along Steamboat Slough.

- Levees on both banks of Georgiana Slough (see O&M Manual SAC103); design capacity of 20,600 cfs. RD 556 maintains 5.5 miles of right-bank levee, the Brannan-Andrus Maintenance District maintains 6 miles of right-bank levee, and RD 563 maintains 12.4 miles of left-bank levee.
- Levees on both banks of Three Mile Slough (see O&M Manuals SAC101 and SAC102); design capacity of 65,000 cfs. RD 341 maintains 3.3 miles of right-bank levee and RD 1601 maintains 2.5 miles of left-bank levee.

Sacramento River Bank Protection Project

The SRBPP is a continuing construction project of the Board and USACE. The purpose of the project is to protect/preserve the integrity of the SRFCP's levee system.

Phase 1 of the SRBPP was authorized in1960. It was constructed from 1963 to 1975, and consisted of 430,000 linear feet of completed bank protection work. Phase 2 was authorized in 1974 to construct 405,000 linear feet of bank protection. In 2007, the authorized length was increased by 80,000 linear feet, bringing the authorized bank protection length of Phase 2 to a total of 485,000 linear feet. Construction began in 1976 and, over time, the Board provided assurances of cooperation to USACE separately for each element of the work, as each was developed for construction. For Phase 2, nearly 400,000 linear feet of work has been completed at various locations of the SRFCP to date. The types of bank protection measures applied varied throughout the system.

Construction included 11 rivers and waterways: (1) American River, (2) Bear River, (3) Colusa Basin, (4) Elder Creek, (5) Feather River, (6) Georgiana Slough, (7) Miner Slough, (8) Murphy's Slough, (9) Sacramento River, (10) Steamboat Slough, and (11) Sutter Slough.

The completed works are maintained by the agencies responsible for the maintenance of adjacent levees.

3.3 SPFC Facilities in the San Joaquin River Basin

This section provides a reach-by-reach description of SPFC facilities in the San Joaquin River Basin. Descriptions are provided for the Chowchilla and Eastside bypass system and for the San Joaquin River. Tributary and distributary flow points are identified along each flow path.

SPFC facilities in the San Joaquin River Basin include the Eastside Bypass Control Structure

The Standard O&M Manual for the Lower San Joaquin River and Tributaries Project specifies general levee dimensions that were used for the original project design. These dimensions include a general crown width of 20 feet, with side slopes of 2:1 on the waterside, and 3:1 on the landside. Exceptions to these dimensions are noted in the unit-specific O&M manuals and as-constructed dimensions provide an even better indication of how the levees were actually built.

An index map of the San Joaquin River Basin showing the two major watersheds, which include SPFC facilities, is included as Figure 3-12.

Figure 3-12. Index Map of the San Joaquin River Basin Including the Two Major Watersheds With Facilities of the State Plan of Flood Control

3.3.1 Chowchilla and Eastside Bypasses Watershed

The bypass system for the San Joaquin River begins at the river about 5 miles east of the town of Mendota. The bypass is designed to carry all flood flows from the San Joaquin River at that location if Kings River floodwater (up to 4,750 cfs) is entering downstream through the North Fork and James Bypass. The bypass system discharges water back to the San Joaquin River at two locations, about 42 miles and 50 miles downstream from the upstream end of the bypass.

This section describes SPFC facilities along the bypass system and on tributary streams to the bypass system. Portions of levees already in place along canal banks were rehabilitated, and new reaches of levees were built as part of the project. The bypass system includes about 193 miles of levees. Levees along tributary streams were designed with 3 feet of freeboard. The Lower San Joaquin Levee District is the maintaining agency.

Figure 3-13 shows SPFC facilities in the Chowchilla and Eastside bypasses watershed.

Chowchilla Canal Bypass Control Structure

The Chowchilla Canal Bypass Control Structure is an SPFC facility. Water enters the bypass system from the San Joaquin River through the Chowchilla Canal Bypass Structure (see O&M Manual SJR601B). The structure has four gated bays, each 20 feet wide, with a total design capacity of 5,500 cfs. At times, higher discharges can be diverted into the bypass, depending on sediment movement. While not described in the O&M manual, flows up to 12,000 cfs have been diverted to the bypass. Although the gates were designed for automatic operation, the gates are currently operated manually. Approach embankments connect the structure with the levee system. The Chowchilla Canal Bypass Control Structure operates in conjunction with a nearby identical structure across the San Joaquin River, described in Section 3.3.2.

The Chowchilla Canal Bypass Control Structure is an SPFC facility

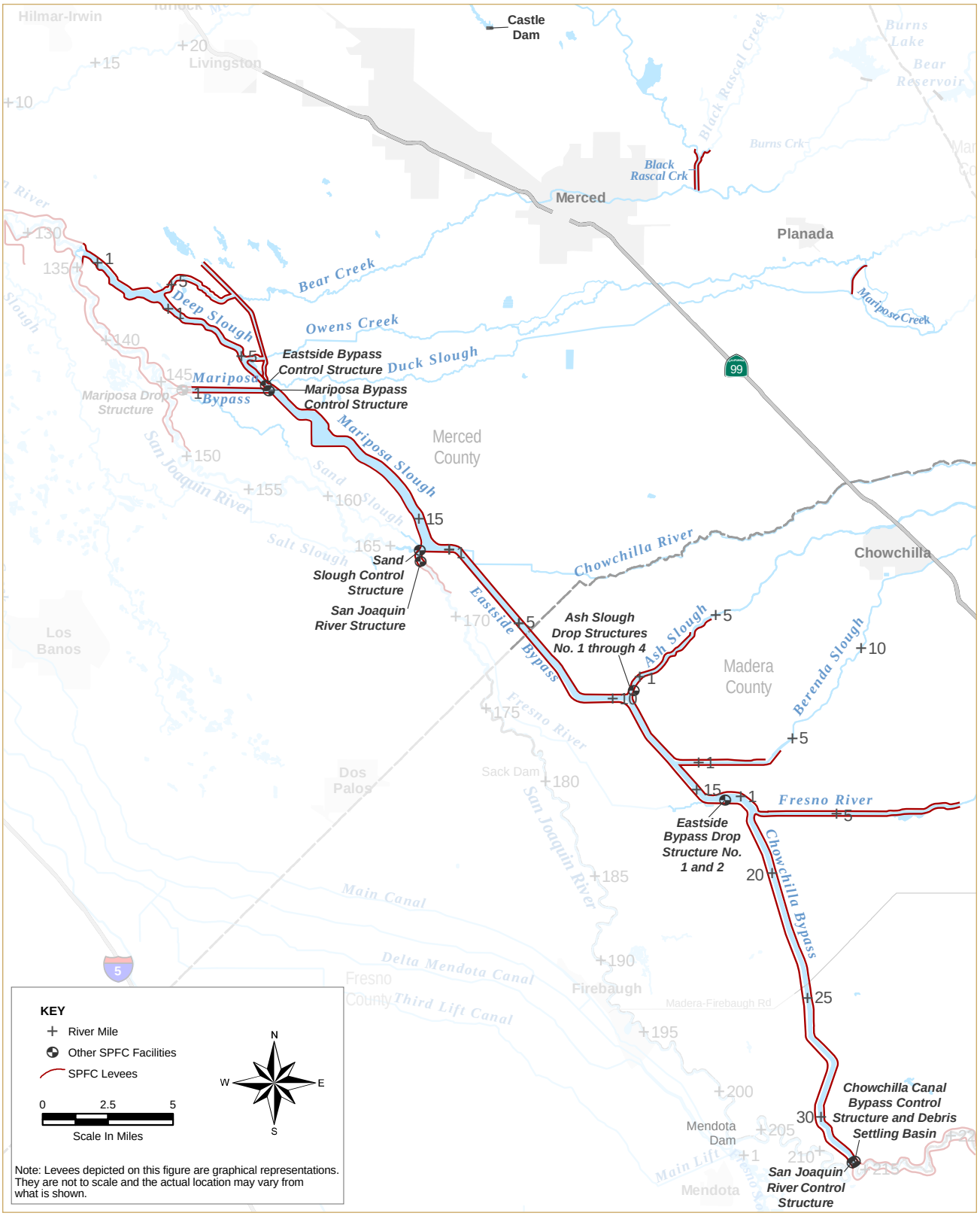


Figure 3-13. Chowchilla and Eastside Bypasses – State Plan of Flood Control Facilities Along the Chowchilla and Eastside Bypasses and Tributaries

Chowchilla Bypass from Control Structure to Fresno River

SPFC facilities along this reach of the bypass include levees on both banks and a debris settling basin. The design capacity of the reach is 5,500 cfs. The levees (see O&M Manual SJR601) in this reach are each about 14.6 miles long. The debris settling basin, with 200,000 cubic yards of storage capacity, is located just downstream from the control structure. This reach of the bypass includes a pilot reach of habitat planting between Avenue 14 and the Madera-Firebaugh Road. The facilities are maintained by the Lower San Joaquin Levee District.

Levees line the channel downstream from the Chowchilla Canal Bypass Control Structure

Fresno River

The Fresno River enters the bypass system at the downstream end of the Chowchilla Bypass. SPFC facilities (see O&M Manual SJR606) include an excavated trapezoidal channel with levees on both banks for a realigned Fresno River and a diversion weir. Based on the O&M manual, the channel has a design capacity of 5,000 cfs and the levees are each about 18.3 miles long. The average levee height is about 7 feet and the maximum height is about 9 feet. The diversion weir provides for release of flows for riparian water users along the right and left banks. The facilities are intended to reduce flood risk to adjacent agricultural land and the City of Madera, and are maintained by the Madera County Flood Control and Water Conservation District.

Eastside Bypass from Fresno River to Berenda Slough

The Eastside Bypass begins at the confluence of the Chowchilla Bypass and Fresno River. SPFC facilities (see O&M Manual SJR601) include levees on both banks of the channel and drop structures. Based on the O&M manual, the design capacity of the channel is 10,000 cfs, and the length of the channel and levees is about 4 miles. Two drop structures help control the channel grade. The facilities are maintained by the Lower San Joaquin Levee District.

Berenda Slough

Berenda Slough is a distributary channel of the Chowchilla River that enters the bypass system. SPFC facilities (see O&M Manuals SJR601 and SJR605) include channel enlargements, levees on both channel banks, and diversion structures. The design capacity of Berenda Slough at its confluence with the Eastside Bypass is 2,000 cfs, based on the O&M manuals. The right-bank levee is about 1.9 miles long and the left-bank levee is about 2.7 miles long. A diversion dam on Berenda Slough sends excess flows through a diversion channel to Ash Slough. Several other flow diversions move water between streams. The facilities are intended to reduce flood risk to adjacent agricultural land and the City of Chowchilla, and are maintained by Madera County.

Eastside Bypass from Berenda Slough to Ash Slough

SPFC facilities (see O&M Manual SJR601) along this reach of bypass include levees on both banks of the channel and drop structures. Based on the O&M manual, the channel has a design capacity of 12,000 cfs and the levees are about 3.1 miles long. Two drop structures help control the channel grade. Ash Slough enters the bypass at the downstream end of the reach. The levees are maintained by the Lower San Joaquin Levee District.

Ash Slough

Ash Slough is a distributary channel of the Chowchilla River that enters the bypass system. SPFC facilities (see O&M Manuals SJR601 and SJR605) include channel enlargements, levees on both banks of the channel, diversion structures, and drop structures. The design capacity of Ash Slough at its

confluence with the Eastside Bypass is 5,000 cfs, based on the O&M manuals. The right-bank levee is about 2.7 miles long and the left-bank levee is about 2.3 miles long. Four drop structures help control the channel grade. The facilities are intended to reduce flood risk to the City of Chowchilla and adjacent agricultural land, and are maintained by the Lower San Joaquin Levee District.

Eastside Bypass from Ash Slough to Sand Slough

SPFC facilities (see O&M Manual SJR601) along this reach of bypass include levees on both banks of the channel. Based on the O&M manual, the channel has a design capacity of 17,000 cfs, and the levees are about 10.5 miles long. Water from the San Joaquin River enters the bypass through the Sand Slough Control Structure (see description under Section 3.3.2, San Joaquin River Watershed) at the downstream end of the reach. Design inflow from the San Joaquin River is about 4,500 cfs. The levees are maintained by the Lower San Joaquin Levee District.

Eastside Bypass from Sand Slough to Mariposa Bypass

SPFC facilities (see O&M Manual SJR601) along this reach of bypass include levees on both banks of the channel. Based on the O&M manual, the channel has a design capacity of 16,500 cfs and the levees are about 8.7 miles long. At the downstream end of this reach, the flow branches – up to 13,500 cfs continue down the Eastside Bypass and up to 8,500 cfs flow into the Mariposa Bypass. Flow in both bypasses is regulated by control structures just downstream from the flow branch. The levees are maintained by the Lower San Joaquin Levee District.

Mariposa Bypass

SPFC facilities for the Mariposa Bypass (see O&M Manual SJR601) include levees along both banks, a control structure at its upstream end, and a drop structure near its downstream end. Based on the O&M manual, the channel has a design capacity of 8,500 cfs, and the levees are about 3.4 miles long. The Mariposa Bypass Control Structure (see O&M Manual SJR601A) consists of fourteen 20-foot-wide bays – eight gated and six ungated. Although the gates were designed for automatic operation, the gates are currently operated manually. The facilities are maintained by the Lower San Joaquin Levee District.

The drop structure on the Mariposa Bypass helps control the channel grade near its downstream end

Eastside Bypass from Mariposa Bypass to Bear Creek

SPFC facilities (see O&M Manual SJR601) along this reach of bypass include levees on both banks of the channel and the Eastside Bypass Control Structure. Based on the O&M manual, the channel has a design capacity of 13,500 cfs, and the levees are about 6 miles long. The Eastside Bypass Control Structure (see O&M Manual SJR601A), located about 1,100 feet downstream from the junction with the Mariposa Bypass, consists of six 20-foot-wide bays. Although the gates were designed for automatic operation, the gates are currently operated manually. Owens Creek, with a design capacity of 2,000 cfs, enters the bypass on the left bank. Levees on Owens Creek extend about 0.8 miles upstream from the bypass. Bear Creek, with a design capacity of 7,000 cfs, enters the bypass at the downstream end of the reach. Right- and left-bank levees on Bear Creek (see O&M Manual SJR601) extend about 3.5 miles upstream from the bypass. The East Side Canal and its left-bank levee extend from the Eastside Bypass to a point approximately 1.7 miles north of Bear Creek. The facilities are maintained by the Lower San Joaquin Levee District.

Merced County Stream Group Project

The Merced County Stream Group project (see O&M Manual SJR607) includes two diversion channels with levees and channel clearing, a dam, and channel enlargements intended to reduce flood risk for the City of Merced and adjacent agricultural land. SPFC facilities include a diversion channel from Black Rascal Creek to Bear Creek. The design capacity of the channel is 3,000 cfs based on the O&M manual. The right-bank levee along the channel is about 1.6 miles long and the left-bank levee is about 1.9 miles long. SPFC facilities also include a diversion channel from Owens Creek to Mariposa Creek. The design capacity of the channel is 400 cfs. The right- and left-bank levees along the diversion channel are each about 1.5 miles long. Channel improvements are included along Black Rascal Creek, Bear Creek, Burns Creek, Miles Creek, Owens Creek, and Mariposa Creek. The facilities are maintained by Merced County.

Castle Dam (see O&M Manual SJR607A) is located on Canal Creek, a tributary of Black Rascal Creek. Castle Dam (completed in 1992) is located on Canal Creek about 6 miles northeast of Merced. Castle Reservoir has 6,400 acre-feet of flood storage. Castle Dam is owned by DWR and Merced County, and is operated and maintained by the Merced Irrigation District (USACE, 1999).

Eastside Bypass from Bear Creek to San Joaquin River

SPFC facilities (see O&M Manual SJR601) along this reach of bypass include levees on both banks of the channel. Based on the O&M manual the channel has a design capacity of 18,500 cfs, and the levees are about 3.6 miles long. The Eastside Bypass ends at its confluence with the San Joaquin River. The facilities are maintained by the Lower San Joaquin Levee District.

Eastside Bypass levees are maintained by Lower San Joaquin Levee District

3.3.2 San Joaquin River Watershed

Unlike the Sacramento River, where SPFC levees are continuous over about 180 miles from beginning to end, SPFC levees on the San Joaquin River are intermittent. About 45 miles of San Joaquin River from the beginning of the bypass system downstream to near the Sand Slough Control Structure have no SPFC levees or other facilities.

Flow in the San Joaquin River upstream from the control structures for diverting water to the bypass system normally varies from 0 to 8,000 cfs, with infrequent snowmelt flows of up to 12,000 cfs and rain flood flows of up to 50,000 cfs when the capacity of the upstream Millerton Lake behind Friant Dam is exceeded. With a total flow of 8,000 cfs in the river, normal operations would divert 5,500 cfs into the bypass and a maximum of 2,500 cfs down the San Joaquin River. If flows exceed 8,000 cfs at the control structures, or 10,000 cfs at the latitude of Mendota, the Lower San Joaquin Levee District operates the facilities at its own discretion with the objective of minimizing damage to the flood system and to the adjacent area. At times, flows exceeding 5,500 cfs are diverted to the bypass.

Figures 3-14, 3-15, and 3-16 show SPFC facilities along the San Joaquin River.

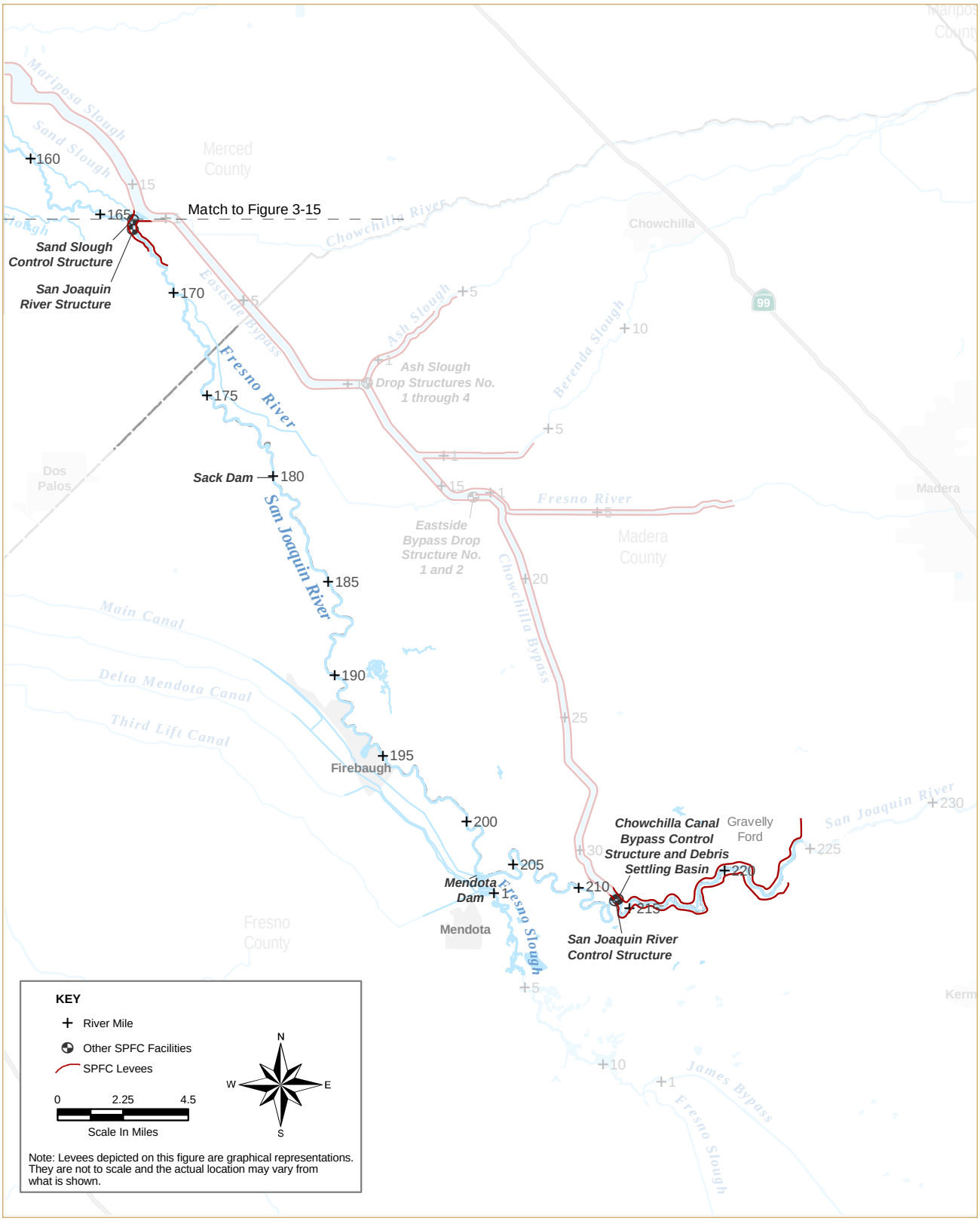


Figure 3-14. San Joaquin River Watershed – State Plan of Flood Control Facilities Along the San Joaquin River from Gravelly Ford to the Sand Slough Control Structure

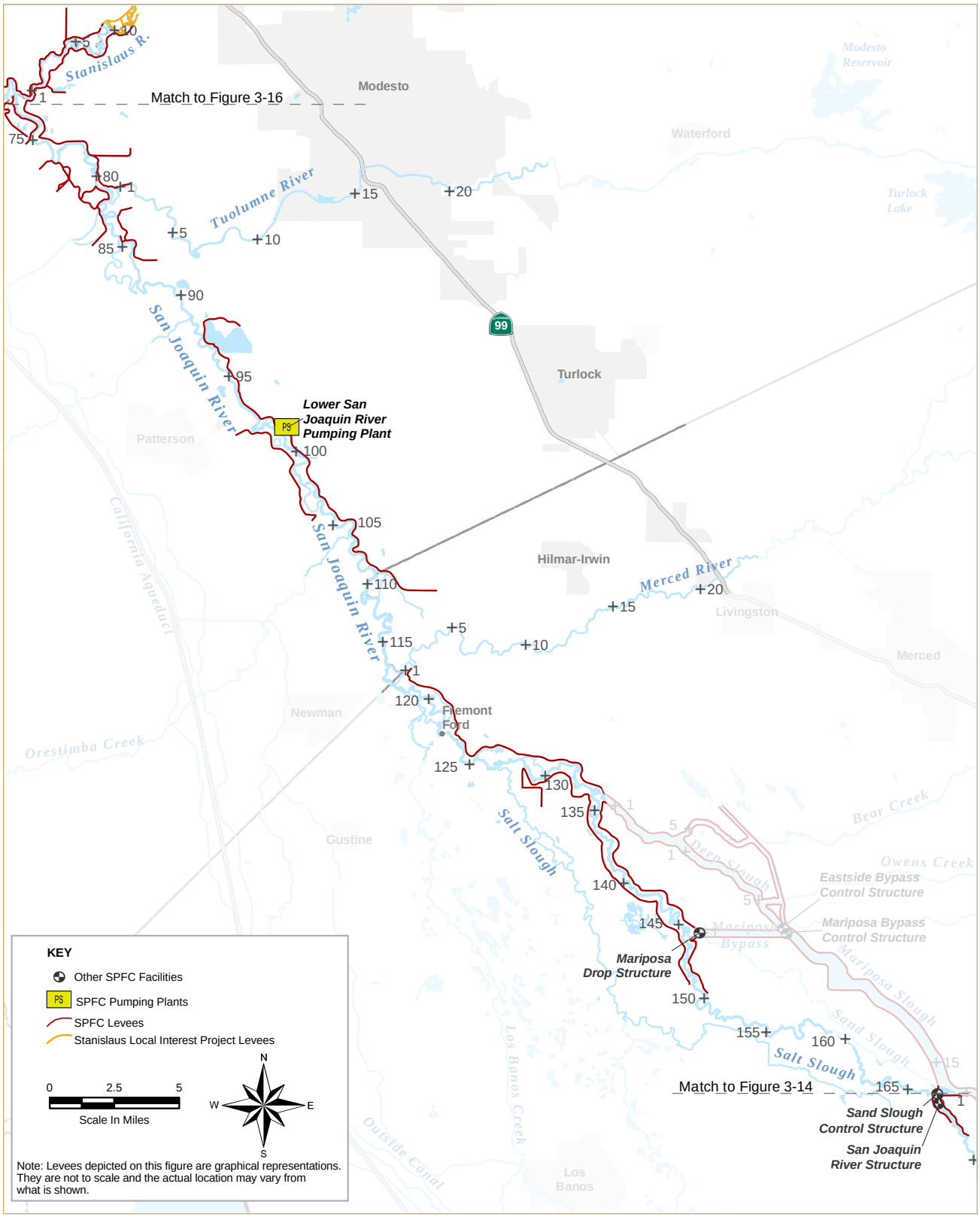


Figure 3-15. San Joaquin River Watershed – State Plan of Flood Control Facilities Along the San Joaquin River from the Sand Slough Control Structure to Stanislaus River

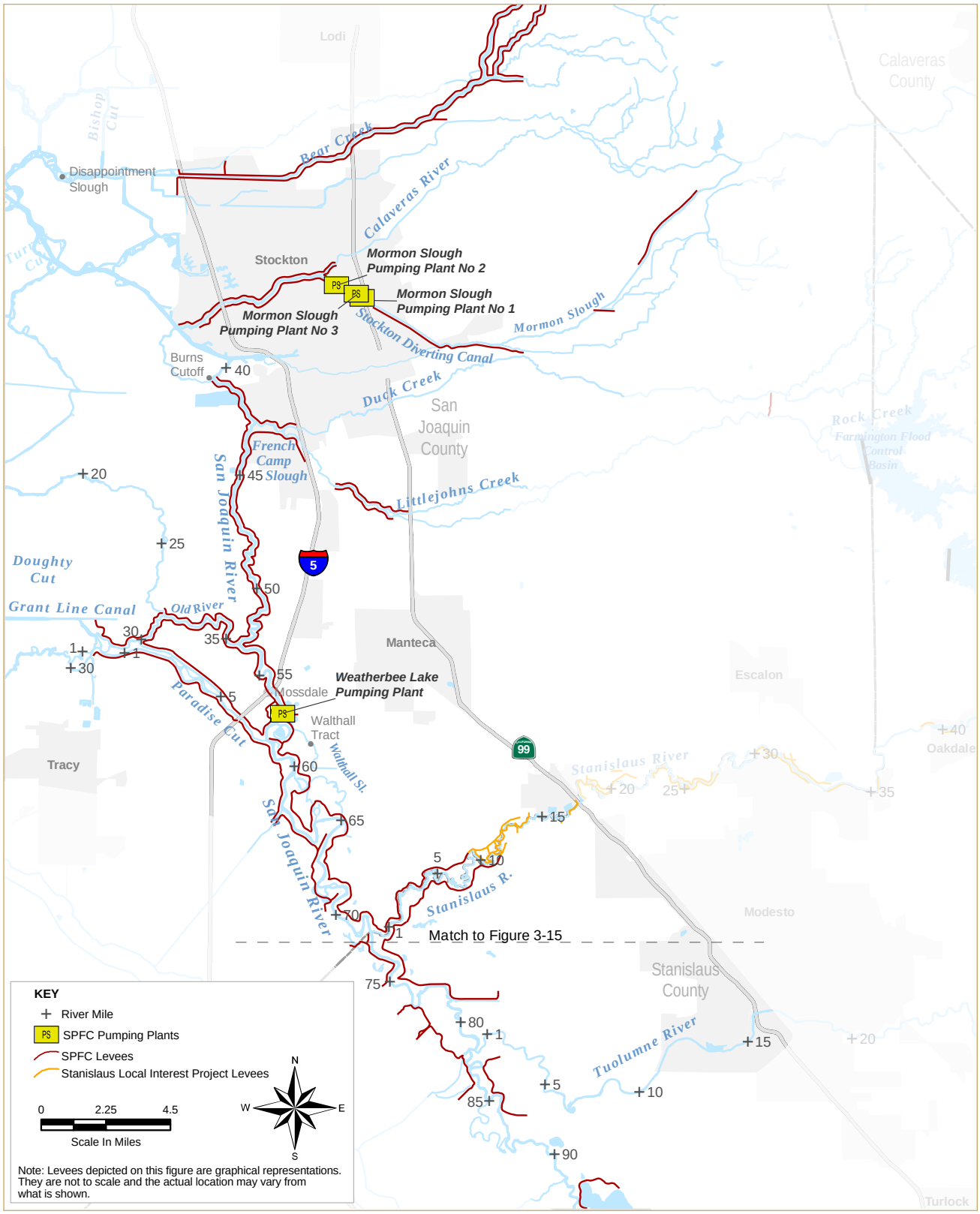


Figure 3-16. San Joaquin River Watershed – State Plan of Flood Control Facilities Along the San Joaquin River and Major Tributaries and Distributaries from Stanislaus River to Disappointment Slough

San Joaquin River from High Ground to San Joaquin River Control Structure

Levees are the only SPFC facilities along this reach (see O&M Manual SJR601). The design capacity of this reach is 8,000 cfs based on the O&M manual. The right-bank levee begins at high ground on Road 21, about 9 miles upstream from the control structure. The left-bank levee begins at high ground about 7.5 miles upstream from the control structure. At the downstream end of the reach, flows are divided between the Chowchilla Bypass (see Section 3.3.1) and the San Joaquin River. The San Joaquin River Control Structure releases water into the San Joaquin River. The levees are maintained by the Lower San Joaquin Levee District.

San Joaquin River Control Structure

The San Joaquin River Control Structure (see O&M Manual SJR601B) is an SPFC facility, identical to the Chowchilla Bypass Control Structure. The structure has four gated bays, each 20 feet wide. Although the gates were designed for automatic operation, the gates are currently operated manually. Approach embankments connect the structure with the levee system. The San Joaquin River Control Structure operates in conjunction with the Chowchilla Canal Bypass Control Structure at the head of the Chowchilla Bypass. The San Joaquin River downstream from the control structure for about 33 miles to near the Sand Slough Control Structure has no SPFC facilities.

San Joaquin River from Control Structure to Fresno Slough

There are no SPFC facilities along the San Joaquin River between the San Joaquin River Control Structure and Fresno Slough. The channel capacity downstream from the control structure is about 2,500 cfs. The Kings River Channel Improvement Project (see O&M Manuals SJR604 and SJR604A) is a non-SPFC project in the Tulare Lake Basin, but federally regulated flows enter the San Joaquin River. During flood release events from Pine Flat Reservoir, the majority of Kings River flows, up to 4,750 cfs, are diverted north into the San Joaquin River through the North Fork and James Bypass. The next 4,750 cfs flow through south through the Kings River. Any flood flows beyond that are evenly split between the James Bypass and the Kings River.

The Sand Slough Control Structure spills San Joaquin River water into the Eastside Bypass

San Joaquin River from Fresno Slough to San Joaquin River Structure at Sand Slough

While local levees extend on both banks of the San Joaquin River downstream from Mendota Dam to near Sand Slough, the only SPFC facilities are near the downstream end of the reach (see O&M Manual SJR601). A 2.2-mile-long right-bank levee and a 1.6-mile-long left-bank levee connect with the Eastside Bypass. The Sand Slough Control Structure spills San Joaquin River water into the bypass. Just upstream from the Sand Slough Control Structure, the San Joaquin River Structure controls flow into the San Joaquin River through operable gates. While the O&M manual describes the flow split between the bypass and the river, the San Joaquin River Structure has remained closed for many years because of limited channel capacity in the San Joaquin River. The design capacity of the San Joaquin River Structure is 1,500 cfs based on the O&M manual. SPFC facilities are maintained by the Lower San Joaquin Levee District.

San Joaquin River from San Joaquin River Structure to Mariposa Bypass

SPFC facilities (see O&M Manual SJR601) along this reach are levees just upstream from the junction with the Mariposa Bypass. The levee design capacity is 1,500 cfs based on the O&M manual. The right-bank levee extends 3 miles upstream from the junction and the left-bank levee extends 2 miles upstream from the junction. Levees are maintained by Lower San Joaquin Levee District.

The design capacity of the San Joaquin River increases downstream from the Mariposa Bypass

San Joaquin River from Mariposa Bypass to Eastside Bypass

SPFC facilities (see O&M Manual SJR601) are levees along both sides of the river. The design capacity of this reach is 10,000 cfs based on the O&M manual. The levees are each about 7 miles long, and maintained by Lower San Joaquin Levee District.

San Joaquin River from Eastside Bypass to Merced River

The San Joaquin River and the Eastside Bypass join about 11.5 miles upstream from the Merced River. SPFC facilities (see O&M Manual SJR601) along this reach include levees. The design capacity of this reach is 26,000 cfs based on the O&M manual. The right-bank levee is continuous from the junction with the Eastside Bypass to the overflow area of the Merced River. The left-bank levee extends from the Eastside Bypass to Salt Slough, about 6 miles downstream. This levee extends upstream on the right bank of Salt Slough for about 2.5 miles. Levees are maintained by Lower San Joaquin Levee District.

San Joaquin River from Merced River to Stanislaus River

The river has discontinuous SPFC levees along both banks of this 44-mile-long reach and one pumping plant. Based on O&M manuals, the design channel capacity is 45,000 cfs between the Merced River and Tuolumne River and 46,000 cfs between the Tuolumne River and Stanislaus River. The design flow of the Tuolumne River at the confluence with the San Joaquin River is 15,000 cfs.

The right-bank levee (see O&M Manuals SJR4, SJR5, and SJR6) consists of three discontinuous segments totaling 20.4 miles. The levees are intended to reduce flood risk agricultural land in RD 2031, RD 2063, RD 2091, and Dos Rios Ranch. About midway between the Merced and Tuolumne rivers, the Lower San Joaquin River Pumping Plant is an SPFC pumping plant (also known as Gomes Lake Pumping Plant) (see O&M Manual SJR6A) that allows discharge of drainage water from the levee-protected area to the San Joaquin River. The pumping plant (capacity of 30,000 gallons per minute) also has provision for gravity flow of drainage water when the flow in the San Joaquin River is low, and is maintained by RD 2063. The left-bank levee (see O&M Manuals SJR12 and SJR13) consists of four discontinuous segments totaling 16.4 miles. The levees are intended to reduce flood risk to agricultural land in RD 1602, RD 2099, RD 2100, RD 2101, and RD 2102, and are maintained by those agencies.

Stanislaus River

SPFC facilities on the Stanislaus River include levees on both banks upstream from the San Joaquin River. Under flood control conditions, upstream reservoir release operations are designed not to exceed a flow of 8,000 cfs (channel capacity) in the lower Stanislaus River from Goodwin Dam downstream to the San Joaquin River. The local interest project levees (see Section 2) have been identified by USACE as adequate to contain this design capacity. The right-bank levee (see O&M Manual SJR3) is 6.1 miles long from high ground to its connection with the San Joaquin River levee. The left-bank levee (see O&M Manual SJR4) is 7.2 miles long from high ground to its connection with the San Joaquin River levee. Channel maintenance (see O&M Manual SJR614) is included downstream from Goodwin Dam.

San Joaquin River from Stanislaus River to Paradise Cut

SPFC facilities on this reach of San Joaquin River include levees on both banks of the river. The design capacity of this reach is 52,000 cfs based on O&M manuals. The right-bank levee (see O&M Manual SJR3) is 11.3 miles long. This levee is intended to

reduce flood risk to agricultural land in RD 2064, RD 2075, and RD 2094, and is maintained by those agencies. The left-bank levee (see O&M Manual SJR11) begins about 2 miles downstream from the Stanislaus River. This levee is intended to reduce flood risk a State prison, the Deuel Vocational Institution, and agricultural land in RD 2085 and RD 2095. It is maintained by RD 2085 and RD 2095. Paradise Cut is a distributary to the San Joaquin River.

Paradise Cut

SPFC facilities along Paradise Cut include levees on both sides of the channel from the San Joaquin River to the confluence with the Old River. The design channel capacity is 15,000 cfs based on O&M manuals. The right-bank levee (see O&M Manual SJR9) is 5.9 miles long, and is maintained by RD 2062 and RD 2107. This levee is intended to reduce flood risk to Stewart Tract and the developing area of Lathrop. The left-bank levee (see O&M Manual SJR10) is 6.2 miles long, and is maintained by RD 2058 and RD 2095.

SPFC levees along Paradise Cut reduce flood risk to Stewart Tract and the developing area of Lathrop

San Joaquin River from Paradise Cut to Old River

SPFC facilities include levees on both banks of the river and a pumping plant. The design capacity of this reach is 37,000 cfs based on O&M manuals. The right-bank levee (see O&M Manuals SJR2 and SJR3) is about 5.5 miles long and is maintained by RD 17 and RD 2096. The Weatherbee Lake Pumping Plant and Navigation Gate (see O&M Manual SJR3A) is located where the right-bank levee crosses Walthall Slough, about 0.8 miles upstream from Mossdale, and is maintained by RD 2096. The pumping plant has a rated capacity of 22,500 gallons per minute. The left-bank levee (see O&M Manual SJR9) is 5 miles long and is intended to reduce flood risk Lathrop. It is maintained by RD 2062 and RD 2107.

Old River

SPFC facilities along Old River include levees on both sides of the channel. The right-bank levee (see O&M Manuals SJR7 and SJR8) extends about 7.1 miles from the San Joaquin River to the Grant Line Canal. Based on the O&M manuals, the project design capacity for this reach is 19,000 cfs from the San Joaquin River to the Middle River, 15,000 cfs from the Middle River to Paradise Cut, and 30,000 cfs from Paradise Cut to the Grant Line Canal. The left-bank levee (see O&M Manual SJR9) extends about 5.6 miles from the San Joaquin River to the confluence with Paradise Cut. The project design capacity for this reach is 19,000 cfs. The levee is intended to reduce flood risk Stewart Tract and the urbanizing area of Lathrop. Levees along Old River are maintained by RD 2062, RD 2089, RD 544, and RD 1.

San Joaquin River from Old River to Burns Cutoff

SPFC facilities along this reach of river include levees on both banks. The design capacity of this reach is 18,000 cfs based on O&M manuals. The right-bank levee (see O&M Manuals SJR1 and SJR2) is 12.6 miles long and is maintained by RD 17 and RD 404. French Camp Slough enters the river about 2.3 miles upstream from Burns Cutoff. The left-bank levee (see O&M Manual SJR7) is about 12.4 miles long and is maintained by RD 544.

French Camp Slough

SPFC facilities within the French Camp Slough drainage include a diversion, channel clearing and excavation, and levees. A dike across Duck Creek and a 5,000-foot-long diversion channel (see O&M Manual SJR613B) divert Duck Creek flow to Littlejohns Creek. The channel has a design capacity of 500 cfs based on the O&M manual. The project included cleared and excavated channels along South Littlejohns Creek and both the north and south branches. South Littlejohns Creek has a 2.3-mile-long right-bank levee in two segments and a 2.6-mile-long left-bank levee. The project is intended to reduce flood risk to Stockton and its surrounding urban area. Levees along the Duck Creek Diversion

and South Littlejohns Creek are maintained by San Joaquin County Flood Control and Water Conservation District.

Both the right-bank (see O&M Manual SJR1) and left-bank (see O&M Manual SJR2) levees on French Camp Slough extend about 1.8 miles upstream from the San Joaquin River. The project design capacity for the left-bank levee is 3,000 cfs and the project design capacity for the right-bank levee is 2,000 cfs based on the O&M manuals. The left-bank levee along French Camp Slough is maintained by RD 17, and the right-bank levee is maintained by RD 404.

Calaveras River and Mormon Slough

The Calaveras River is a tributary to the San Joaquin River. SPFC facilities within the Calaveras River drainage include facilities of the Mormon Slough Project, composed of a diversion from Mormon Slough, pumping plants, and levees and improved channels along Mormon Slough, Potter Creek, and the Calaveras River (see O&M Manual SJR611.1 for channels and levees and O&M Manual SJR611.2 for the pumping plants). There is also a diversion from the Calaveras River to Mormon Slough at Bellota that is not shown in the O&M manual as an SPFC facility. The Mormon Slough Project is maintained by the San Joaquin County Flood Control and Water Conservation District.

Intermittent spoil dikes and levees are located along about 11 miles of Mormon Slough. Both banks of Mormon Slough have levees for a distance of about 2.3 miles upstream from the Stockton Diverting Canal. Potter Creek has a 0.9-mile-long left-bank levee upstream from its confluence with Mormon Slough. The Stockton Diverting Canal, about 5 miles long, diverts Mormon Slough water to the Calaveras River. Both banks of the diversion canal have levees. Design capacity is 12,500 cfs based on the O&M manuals. Three pumping plants along the right bank of the Stockton Diverting Canal discharge local drainage water into the canal.

The Calaveras River has levees along both banks for a distance of about 6.5 miles upstream from the San Joaquin River. The design capacity of the river is 13,500 cfs. Levees along the Calaveras River are maintained by the San Joaquin County Flood Control and Water Conservation District.

Bear Creek

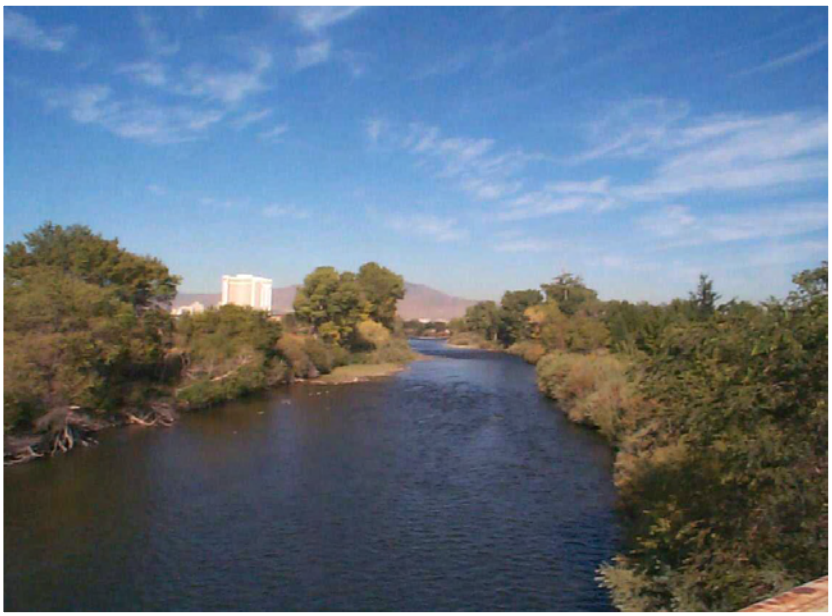
Bear Creek is a tributary to the San Joaquin River – the creek is not the same Bear Creek that is tributary to the Eastside Bypass. SPFC facilities include 15.7 miles of channels and 30.1 miles of levees on Bear Creek, Paddy Creek, Middle Paddy Creek, and North Paddy Creek. O&M Manual SJR612.2 covers the project from high ground to U.S. Highway 99. O&M Manual SJR612.1 covers the project from U.S. Highway 99 to Disappointment Slough. Facilities are maintained by the San Joaquin County Flood Control and Water Conservation District.

3.4 Other Flood Projects with Board or DWR Assurances of Cooperation

The Board or DWR has provided the federal government assurances of cooperation for other flood management projects in California, but these projects do not meet the definition (see Section 1.1) of the SPFC because they are not in the Sacramento River or San Joaquin River watersheds; the SPFC is limited to projects within the watersheds of the Sacramento and San Joaquin rivers. Examples of other flood projects with Board or DWR assurances of cooperation that are not in the Sacramento or San Joaquin River watersheds include the following:

- The Truckee River and Tributaries Project was authorized by the Flood Control Act of 1954 (Public Law 780, 83rd Congress). The Truckee River drains into Pyramid Lake in the Great Basin. While the Board provided assurances of cooperation to the federal government, because it is not within the watershed of the Sacramento or San Joaquin rivers, the project is not part of the SPFC.
- The Fairfield Vicinity Streams Project was authorized by House and Senate Public Works Committees' resolutions adopted December 15, 1970, and December 17, 1970, respectively, under provisions of Section 201 of the Flood Control Act of 1965. The authorization was substantially in accordance with a report of the Secretary of the Army and the USACE Chief of Engineers in HD 159 (91st Congress). Section 117 of Public Law 99-190 modified the project authorization. Project authorization was also modified under the Supplemental Appropriations Act of 1987 (Public Law 100-71). The project (see O&M Manual SAC514) is

intended to reduce flood risk to the City of Fairfield and Suisun City. The Fairfield Vicinity Streams Project includes improvements along Union Avenue Creek, a small unnamed tributary near Highway 80, 1 mile of Ledgewood Creek from Highway 12 to Peytonia Slough, Laurel Creek from just south of Gulf Drive to McCoy Creek, and McCoy Creek south to the Buffer Channel.
The peak flow for McCoy Creek upstream to its confluence with Laurel Creek is 3,700 cfs. At this confluence, the peak inflow from McCoy is 2,000 cfs, and 3,700 cfs from the Laurel Diversion. At the Laurel Diversion confluence with the Diversion Stub, the peak inflow is 700 cfs from the Diversion Stub and 2,600 cfs from the channel.
While the Board provided assurances of cooperation to the federal government, the project is not part of the SPFC because it does not meet the SPFC definition – the project drains downstream from River Mile 0.0 for the Sacramento River and is therefore not part of the Sacramento River watershed.



While the Board provided assurances of cooperation to the federal government for The Truckee River and Tributaries Project, it is not part of the SPFC

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4.0 State Plan of Flood Control Lands

In most cases, federal project authorizations require the nonfederal sponsor to provide all lands, easements, and rights-of-way for project construction, maintenance, and operation. Property rights for SPFC lands are held by the SSJDD, which is under the jurisdiction of the Board. The SSJDD was created by State legislation in 1913 and has associated property rights going back to 1900. Boundaries of the SSJDD are shown in Figure 4-1.

SPFC property rights extend to about 18,000 parcels of land. All comprehensive property records, indexes, and mapping associated with SPFC lands are maintained by DWR's Division of Engineering, Geodetic Branch, Cadastral Survey Section. Each parcel of land has a file folder containing hard copies of the parcel description and other pertinent information. About 400 plat maps show the locations of the land parcels. Since the recording system has been in place for more than 100 years, it is set up to identify rights on individual properties at specific locations and is not readily suitable to general queries or other summaries.

This section presents information about SSJDD land holdings, types of property rights, agreements for use of easements and properties, lands of designated floodways, and ongoing evaluations.

Figure 4-1. Boundaries of the Sacramento-San Joaquin Drainage District

4.1 Summary

In general, SSJDD or LMAs acquired and hold property rights necessary for the construction of facilities and ongoing O&M. Property rights are held for approximately 210,500 acres of land throughout 19 Central Valley counties. Table 4-1 summarizes, by county, the approximate acreage of land for which SSJDD holds property rights.

Table 4-1. Acres of Land for Which Sacramento-San Joaquin Drainage District Holds Property Rights, by County

County	Acres
Butte	26,510
Colusa	5,272
Fresno	5,018
Glenn	38,000
Lake	174
Madera	5,460
Mariposa	3,246
Merced	10,900
Modoc	2
Placer	95
Plumas	177
Sacramento	8,650
San Joaquin	4,350
Solano	16,100
Stanislaus	500
Sutter	29,200
Tehama	580
Yolo	74,800
Yuba	950

Note:
This table represents approximate acres of land in each county. For more information on property rights, contact DWR Division of Engineering-Geodetic Branch, Cadastral Survey Section.

4.2 Data Gaps

The record of SPFC property right holdings is not clear in all areas. Because of the incremental construction of SPFC facilities over almost a century, records are not of uniform quality and records for rights in some areas are missing.

SPFC property rights have been acquired and disposed of for various reasons throughout the history of the SPFC in the Sacramento and San Joaquin river basins. For example, property rights may have been acquired for spoiling or borrowing soil material necessary for construction and, in some cases, these rights were disposed of through sale or transfer after construction.

Standards for easements beyond the land-side toe of levees for O&M have varied with time. Since the 1980s, a 10-foot-wide easement has been standard. However, a majority of SPFC levee easements were acquired before the 1980s according to standards existing at the time of acquisition. Therefore, 10-foot-wide easements do not exist throughout the system. Similarly, easements to gain access to and from various points along the levee system are not consistent. In some areas, the inventory of unauthorized encroachments on these easements is incomplete.

In some cases, levee were set back by USACE, and the new levee toe infringed on preexisting structures and features. Also in some cases, these features were not previously encroachments, but became encroachments when levees were moved. Many of these features were not removed or relocated as part of a project, and were accepted at the time.

4.3 Fee Title Lands

Fee title lands, or fee simple lands, are those with full ownership. Some of the property rights for the SPFC are held in fee title, but the current method of record-keeping does not allow easy summarization of these holdings. Some levees are on lands owned by the State. Also, the State owns the land within the Chowchilla Bypass, and the Eastside Bypass upstream from Sand Slough.

In some areas, land was purchased by the State in fee and then disposed of while the State retained some easement rights.

4.4 Easements

Easements are limited-use rights to property owned by others. SSJDD often acquired property rights in areas where it was determined that purchasing easements was more appropriate than purchasing the land in fee title. The majority of SSJDD's property rights are easements. In these locations, most

notably the Butte Basin (Colusa and Glenn counties only), the Sutter, Sacramento, Yolo, Butte, Tisdale, and Mariposa bypasses, and the Eastside Bypass downstream from Sand Slough, flowage easements were acquired that compensate landowners for giving SSJDD the right to flow or flood water over land.

Common easement types used by SSJDD are listed below:

- Levee – Standard levee easement language has been revised numerous times in the past 100 years. With each revision, the standard version has become more specific and defined. Also, standard language has been modified or sections deleted in some easement deeds, as requested by the grantor. Because of the revisions and customization, language in each deed must be evaluated to determine SSJDD's exact rights for the parcel. For example, two levee easements (acquired at different times, one 60 years ago to build the levee, the other 5 years ago to enlarge and improve the levee) could be adjacent but have different levee rights. The latter would have the right to preserve and retain all vegetative growth desirable for project purposes; the older document would only state that SSJDD had the right to build, construct, reconstruct, repair, and maintain, with no mention of replanting or preserving vegetation. Current levee language, Rights 1 through 8 (revised in 1994) are as follows:

  1. *Construct, reconstruct, enlarge, fence, plant with trees, shrubs and other vegetation, preserve and retain all vegetative growth desirable for project purposes, repair and use flood control works, which shall include, but not be limited to, access, haul and patrol roads, levees, ditches, embankments, channels, berms, fences and appurtenant structures, and operate and maintain said flood control works in conformity with the Code of Federal Regulations, Corps of Engineers' Standard O&M Manual, and State of California Standards.*
  2. *Clear and remove from said flood control works any or all natural or artificial obstructions, improvements, trees and vegetation necessary for construction, operation, maintenance, repair, reconstruction and emergence flood fight.*
  3. *Flow waters and materials and by said flow erode.*
  4. *Place or deposit earth, debris, sediment or other material.*
  5. *Excavate and remove earth, debris, sediment, or other material, including that placed or deposited as above.*
  6. *Locate or relocate roads and public utility facilities by grantee or others.*
  7. *Restrict the rights of the grantor, his successors and assigns, without limitations, to explore, extract, remove, drill, mine or operate through the surface or upper 100 feet of the subsurface in exercise of the grantor's interest in any minerals, including oil and gas.*
  8. *Restrict any use by others which may interfere with any of the uses listed herein or any use necessary or incidental thereto.*

- Access – A perpetual easement and right-of-way to construct, reconstruct, operate, maintain, and use an access and service road over a property.
- Canal/Channel – A perpetual easement and right-of-way to construct, reconstruct, enlarge, operate, and maintain, a canal or ditch, and all works necessary and appurtenant to a flood control facility.
- Drainage and Flowage – A perpetual easement and right-of-way to construct, reconstruct, enlarge, operate, and maintain drainage facilities, and to flood, seep, pond, and overflow water over a property.
- Flowage – A perpetual easement and right-of-way to flood, seep, pond, and overflow water over, through, and across a property.
- Slope – A perpetual easement, with the right to construct, reconstruct, extend, and maintain cut and fill slopes and drainage facilities over a property.
- Temporary – Other temporary easements and rights-of-way for access, borrow, spoil, and construction may have been acquired. Since these rights terminated after construction, they are no longer part of the SPFC property rights.

4.5 Implied Dedication

In cases where the State or LMA lack recorded real property rights, the State has relied on the doctrine of implied dedication codified in the California Civil Code (CCC) Section 1009(d) for access to SPFC features for inspections, O&M, floodfighting or other activities critical to the function of the system. This code creates, as defined, a vested right for a governmental entity to continue the use of lands where public funds have been used to make improvements on private property.

4.6 Agreements

SSJDD has agreements with public entities (cities, counties, utilities, other State departments, and federal entities) and individual landowners for specified use of easements and properties. Each agreement is unique and allows specific uses and restrictions.

4.7 Designated Floodways

See Sections 2.5.3 and 6.8 for descriptions of designated floodways. Designated floodways are not considered lands of the SPFC, but they are a condition for successful operation of the SPFC. They do not carry specific property rights, but are a regulatory designation.

4.8 Encroachment Permits

The Board issues permits for encroachments that are compatible with the flood system and do not weaken its facilities and hamper its O&M. The permits are not SPFC property rights, but are permissions by the Board to enter and use features of the SPFC under specific conditions. Encroachment permit applications must also be approved by USACE before the Board's issuance of permits.

There are many unpermitted encroachments on SPFC facilities. Some of these encroachments are clearly incompatible with O&M of SPFC facilities and should be removed. Others may be compatible and need permitting. Limiting and controlling encroachments are important to public safety. Unpermitted encroachments can limit visibility for inspections, can impede access necessary for floodfights and O&M, and can weaken the structural integrity of the facilities. Also, unpermitted encroachments could delay planned construction activities.

4.9 Ongoing Evaluation

Each individual property for which the SSJDD holds property rights represents an agreement between the previous owner of the rights and SSJDD or a Final Order of Condemnation forcibly transferring property rights to the government. While standard ownership and easement right agreements have been used by SSJDD, these agreements have changed throughout the years. In addition, individual property owners may have negotiated modified agreement terms. While the types of property rights may be aggregated into groups of similar rights, each individual deed must be reviewed to understand the specific rights held for the parcel.

Documentation and analysis of SPFC lands is extremely complex. More than 100 years of records exist that document thousands of land acquisitions and disposal actions. Over this period, record-keeping protocols, technology, surveying accuracy and methods, and legal language have all changed and developed significantly. Many early records use descriptive language that leaves significant interpretation to the boundary delineation of a parcel or the rights conferred by the deed. Compiling, rectifying, and standardizing these records into a state-of-the-art electronic database is an ongoing activity underway by DWR. This effort has been initiated, but substantial work remains to be completed so that records can be analyzed in detail. In the absence of this completed geographic information system (GIS) database, only approximate conclusions can be drawn from the existing data. Specific inquires into the rights of individual parcels or groups of parcels are handled by DWR's Division of Engineering, Geodetic Branch, Cadastral Survey Section.

Based on rights that can be quantified, additional property rights may need to be obtained, especially for gaining access to SPFC facilities and for adequate easements along the landside toes of levees. Therefore, the State and LMAs may not have the land rights necessary for SPFC facility O&M as intended.

5.0 State Plan of Flood Control Operations and Maintenance

The modes of O&M are part of the SPFC. Modes of O&M for the completed facilities of the SPFC that USACE has turned over to the Board include O&M manuals, inspections and maintenance of SPFC facilities by DWR and LMAs, and flood operations.

This section presents information about O&M manuals, inspections, maintenance, and operations for the SPFC.

5.1 Summary

DWR depends on 81 LMAs to keep the SPFC levees in good condition. In addition, DWR maintains structures, channels, and levees in specific sections of the SRFCP. USACE does not perform O&M on SPFC facilities.

O&M manuals specify needed inspections and O&M for each unit of the SPFC. A unit may be a reach of levee along a waterway, a pumping plant, a weir, a control structure, a dam and reservoir, or another facility.

5.2 Operation and Maintenance Manuals

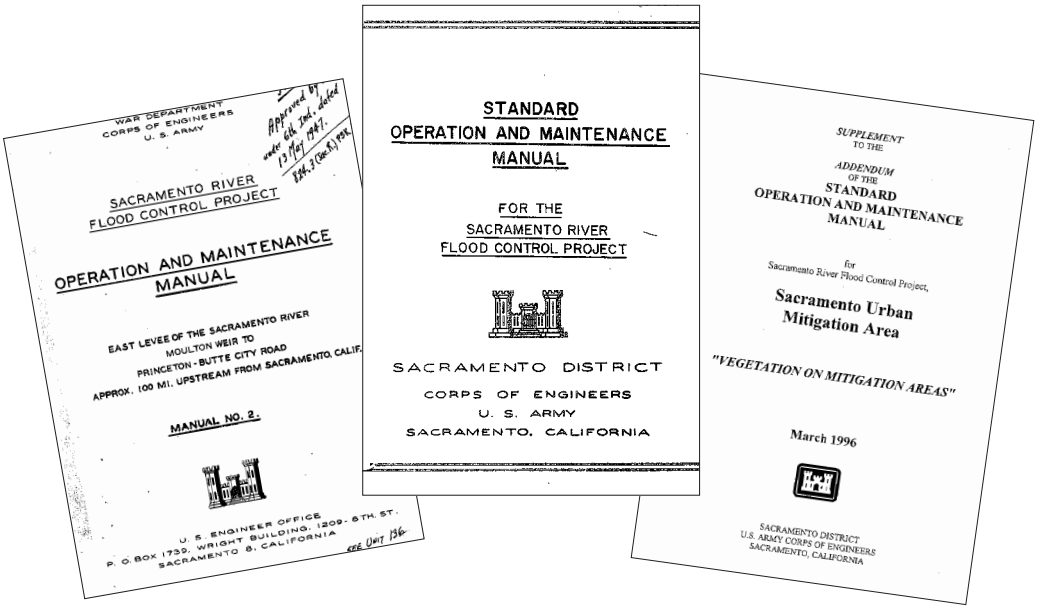
The O&M manuals contained on the reference DVD included with this report are part of the SPFC. O&M manuals describe actions that maintaining agencies are to follow during high-water events and for keeping project facilities in good working condition. USACE has prepared two standard O&M manuals for Sacramento and San Joaquin river facilities, respectively. These standard O&M manuals are supported by more detailed O&M manuals for each unit of the State-federal flood management system in the Sacramento and San Joaquin river basins.

5.2.1 Standard Operations and Maintenance Manuals

The two standard USACE O&M manuals present requirements that apply to all maintaining agencies that operate and maintain the various geographical SPFC units. The two standard USACE O&M manuals are listed below:

- *Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project (USACE, revised May 1955)*
- *Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees, Lower San Joaquin River and Tributaries Project, California (USACE, April 1959)*

The standard O&M manual for the Sacramento River portion of the system (see O&M Manual SAC000) and the standard O&M manual for the San Joaquin River portion of the system (see O&M Manual SJR000) can be found on the reference DVD in the back pocket of this report. The standard O&M manuals apply to all units of each project and conform to Section 208.10, Title 33 of the Code of Federal Regulations (CFR), as approved by the Acting Secretary of the Army on August 9, 1944, and published in the Federal Register on August 17, 1944. Each of the two manuals includes a copy of the regulation.


WAR DEPARTMENT
CORPS OF ENGINEERS
U. S. ARMY

SACRAMENTO RIVER
FLOOD CONTROL PROJECT

OPERATION AND MAINTENANCE MANUAL

EAST LEVEE OF THE SACRAMENTO RIVER
MOULTON WEIR TO
PRINCETON - BUTTE CITY ROAD
APPROX. 100 MI. UPSTREAM FROM SACRAMENTO, CALIF.

MANUAL NO. 2.

U. S. ENGINEER OFFICE
WRIGHT BUILDING, 1209 - 6TH. ST.
P. O. BOX 1739,
SACRAMENTO 8, CALIFORNIA

STANDARD
OPERATION AND MAINTENANCE
MANUAL

FOR THE
SACRAMENTO RIVER
FLOOD CONTROL PROJECT

SACRAMENTO DISTRICT
CORPS OF ENGINEERS
U. S. ARMY
SACRAMENTO, CALIFORNIA

SUPPLEMENT
TO THE
ADDENDUM
OF THE
STANDARD
OPERATION AND MAINTENANCE
MANUAL

for
Sacramento River Flood Control Project,

Sacramento Urban
Mitigation Area

"VEGETATION ON MITIGATION AREAS"

March 1996

SACRAMENTO DISTRICT
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

Examples of general rules for O&M of local flood control works (facilities) specified in the two standard manuals are as follows:

- O&M for maximum benefits
- O&M in accordance with USACE-prescribed regulations
- Reserve supply of materials for flood emergencies
- No encroachments that adversely affect O&M
- No improvements without USACE approval
- Semiannual report
- USACE access at all times
- Maintenance and repairs performed by maintaining agencies, as deemed necessary by USACE
- Coordination during flood periods

Examples of more detailed O&M information contained in the two USACE standard manuals include the following:

- Conditions requiring facility maintenance such as erosion, vegetation, burrowing animals, degradation of levee crown
- Need for patrols during floods
- Need for inspections
- Procedures to combat flood conditions

5.2.2 Unit-Specific Operation and Maintenance Manuals

USACE prepared detailed O&M manuals for each separate unit of the State-federal flood management system when the unit was completed. Unit-specific O&M manuals (see reference DVD) were incrementally prepared for specific O&M requirements that apply to the unit. These O&M manuals supplement information included in the two USACE standard O&M manuals. Each unit-specific manual includes information on authorization, location, project description, protection provided, assurances of cooperation provided by the nonfederal sponsor (usually the Board), maintenance methods, operation methods, and inspection and reporting.

The O&M manuals generally include the as-constructed drawings as an appendix, but the drawings are filed separately because of their large size. Some manuals include information on reconstruction or improvements completed following construction of the original facilities, but it is apparent that not all O&M manuals are up to date. Levee repairs such as construction of seepage berms and relief wells in 1997 and 1998, many repairs under Public Law 84-99, and other levee modifications are yet to be included in the unit-specific O&M manuals. Considering the age of the levees, it is likely that there are other levee modifications that have not been documented in the manuals or records may no longer exist.

Most of the unit-specific O&M manuals were prepared for individual segments of levees, often aligned to the LMA responsible for their maintenance. Other unit-specific O&M manuals were prepared for pumping plants along a given reach of stream channel, weirs, diversions, storage reservoirs, or other features of the SPFC.

Each unit-specific O&M manual also includes information on ancillary features that are part of each unit such as bridges, culverts, and other minor drainage facilities, and hydrographic features such as gages necessary for operation. The O&M manuals and the reference DVD contained at the end of this report contain specific information on these features. This information should be viewed as a general inventory of these facilities, not a definitive list of existing features.

O&M Manuals SAC1 through SAC17 are early manuals that have been superseded by more recent information in O&M manuals numbered SAC100 and higher. SAC1 through SAC17 are included on the reference DVD for historical completeness, but do not reflect current information.

As mentioned, many levees have been modified subsequent to original construction throughout the system. The common practice is for USACE to prepare a supplemental O&M manual to cover work by USACE under a separate project at the same location. DWR and USACE are currently assembling a set of these supplemental O&M manuals.

5.3 Inspections

Each individual unit-specific O&M manual includes requirements for inspection of SPFC facilities. DWR is responsible for inspections of all SPFC facilities. DWR inspects levees that are maintained by DWR and LMAs, and then reports the findings to USACE and the Board. DWR has implemented a self-inspection program that requires LMAs to inspect

their levees in the summer and winter, while DWR conducts inspections in the spring and fall. From the inspection information submitted, USACE may choose to conduct follow-up inspections in certain areas. USACE uses the State's inspection findings and its own follow-up inspections to make Public Law 84-99[1] eligibility determinations.

While each O&M manual contains specific inspection criteria, the following are examples of items included in inspections:

- Debris
- Channel vegetation
- Levee vegetation
- Encroachments
- Sedimentation
- Settlement
- Erosion
- Rodent damage
- Condition of structures
- Other conditions specified in each O&M manual

Annual inspection reports and a variety of other inspection reports prepared by DWR's Flood Project Integrity and Inspection Branch can be found on the California Data Exchange Center (CDEC) Web site: http://cdec.water.ca.gov/fsir.html

The maintenance status of project channels and structures is reported in an annual Inspection Report. Each annual report includes criteria for inspections of levee maintenance, channels, and structures.

5.3.1 Interim Vegetation Inspection Criteria

In April 2007, USACE released a draft white paper, *Treatment of Vegetation Within Local Flood Damage Reduction Systems* (USACE, 2007), which called for the removal of wild growth, trees, and other encroachments that might impair levee integrity or floodfighting access to reduce the risk of flood damage. Guidance on vegetation standards for flood control structures can be found in USACE *Engineering Technical Letter* (ETL) *1110-2-571* (USACE, 2009) and *Engineering Manual* (EM) *1110-2-301* (USACE, 2000). These standards limit uncontrolled vegetation growth (brush, weeds, or trees) to smaller than 2 inches in diameter. USACE notified sponsors that levees that fail to meet these existing standards be rated as unacceptable, with the consequence that the sponsors could lose eligibility for federal assistance (Public Law 84-99) in post-flood levee rehabilitation.

In response to USACE vegetation criteria, DWR revised its levee inspection criteria for vegetation in fall 2007. The interim vegetation inspection criteria will be considered in the short term until they can be revised using best available science, and USACE completes its review and revision of its levee vegetation standards. The inspection criteria are aimed at improving public safety by providing visibility for inspections, eliminating vegetation conflicts and encroachments that could hamper floodfight activities, and improving access for overall maintenance.

DWR's Interim Vegetation Inspection Criteria apply on the entire land-side slope plus a 10-foot-wide easement beyond the land-side toe. On the water-side, these criteria apply to vegetation on only the top 20 feet (slope length) of the levee slope. Trees within these areas must be trimmed up to 5 feet above the ground (12 feet above the crown road) and thinned enough for visibility and access. Brush, weeds, or other vegetation more than 12 inches high blocking visibility and access within these levee areas should be trimmed, thinned, mowed, burned, dragged, or otherwise removed in an allowed manner.

5.3.2 Enforcement

During the spring and fall inspection cycles, DWR identifies and documents inspection items as acceptable (A), minimally acceptable (M), or unacceptable (U) considering USACE inspection rating criteria.

The Board, in conjunction with DWR and LMAs, addresses deficient items, including the following:

- Critical items impacting the structural integrity of a levee
- Vegetation not in compliance with interim vegetation inspection criteria, or determined to critically weaken a levee and lower public safety
- Critical erosion issues
- Aggressive rodent control and repair of levee damage by rodents

[1]Public Law 84-99 defines federal rehabilitation assistance for flood control works.

- Encroachments affecting floodfighting activities or levee integrity

To address deficiencies identified in inspections, the Board, in conjunction with DWR, does the following:

- Notifies USACE of inspection findings
- Requires submittal of an LMA Corrective Action Plan consistent with the agency's O&M responsibility
- Identifies a time period required to correct deficiencies
- Sends notification letters to appropriate LMAs indicating inspection status, maintenance history, and impacts on Public Law 84-99 eligibility through DWR's Flood Risk Notification Program

To enforce compliance regarding deficiencies, DWR will rate items that are minimally acceptable as unacceptable (U) if they are not corrected within the time period in the notification, unless work is scheduled or in progress. This may lead to an overall rating of unacceptable (U), resulting in loss of Public Law 84-99 eligibility.

Levees in maintenance areas (MA) (see Section 5.4.1) and LMAs and channels ranked unacceptable (U) because of vegetation will be expected to remedy deficiencies. To remain eligible for the Public Law 84-99 program, the Board expects these issues to be addressed expeditiously, and in compliance with all appropriate environmental laws.

5.4 Maintenance

As mentioned, maintenance of SPFC facilities is performed by DWR and 81 different LMAs. USACE Regulation 33, CFR 208.10, separates responsibilities into two categories – levees and channels. In addition, DWR and LMAs are responsible for satisfying all environmental and resource agency requirements or laws that apply during performance of maintenance activities.

5.4.1 Maintenance by DWR

In the Sacramento River Basin, DWR maintains levees and roads in accordance with USACE O&M manuals for about 293 miles of levees under DWR jurisdiction. DWR also maintains 14 SPFC structures and all SPFC channels for compliance with the O&M manuals. Channel maintenance can include vegetation, debris, and sediment removal for maintaining flood-carrying capacity, and erosion repairs. DWR performs maintenance through its Sacramento and Sutter maintenance yards on a continuing basis.

In the San Joaquin River Basin, the Board generally has passed all maintenance responsibility to the LMAs. However, DWR has performed some critical erosion repairs identified under the Governor's Executive Order S-01-06; these repairs were funded through a legislative appropriation by Assembly Bill (AB) 142.

State Responsibility in California Water Code 8361

CWC Section 8361 specifies the portions of the SRFCP for which DWR has O&M responsibility:

> *8361. The department shall maintain and operate on behalf of the state the following units or portions of the works of the Sacramento River Flood Control Project, and the cost of maintenance and operation shall be defrayed by the state:*
>
> *(a) The east levee of the Sutter Bypass north of Nelson Slough.*
>
> *(b) The levees and channels of the Wadsworth Canal, Willow Slough Channel downstream from the Southern Pacific Railroad from Davis to Woodland except that portion of the north levee thereof lying within Reclamation District No. 2035, Putah Creek downstream from Winters, the intercepting canals draining into them, and all structures incidental thereto.*
>
> *(c) The collecting canals, sumps, pumps, and structures of the drainage system of Project No. 6 east of the Sutter Bypass.*
>
> *(d) The bypass channels of the Butte Slough Bypass, the Sutter Bypass, the Tisdale Bypass, the Yolo Bypass, and the Sacramento Bypass with all cuts, canals, bridges, dams, and other structures and improvements contained therein and in the borrow pits thereof.*
>
> *(e) The levees of the Sacramento Bypass.*
>
> *(f) The channels and overflow channels of the Sacramento River and its tributaries and the major and minor tributaries' flood control*

projects as authorized and defined in Sections 12648, 12648.1, and 12656.5.

(g) The Knights Landing ridge cut flowage area.

(h) The flood relief channels controlled by the Moulton and Colusa Weirs and the training levees thereof.

(i) The levee on the left bank of the Sacramento River adjoining Butte Basin, from the Butte Slough outfall gates upstream to a point four miles northerly from the Moulton Weir, after completion.

(j) All weirs and flood relief structures.

(k) The west levee of the Yolo Bypass, extending from the west end of the Fremont Weir southerly to the Cache Creek Settling Basin and from Willow Slough Channel to Putah Creek and the east levee of the Yolo Bypass from Fremont Weir southerly two miles.

(l) The levee on the west bank of Feather River extending a distance of about two miles southerly from the Sutter-Butte Canal headgate.

(m) The levees of Cache Creek and the easterly and westerly levees of Cache Creek Settling Basin; excepting the portion of the southerly levee of Cache Creek lying upstream from State Highway Route 7 (U.S. 99W).

(n) The flowage area of Western Pacific Intercepting Canal extending northerly for a distance of five miles from Bear River.

(o) The levees of Tisdale Bypass from Tisdale Weir 4.5 miles easterly to Sutter Bypass.

(p) The flood relief structures or weirs and other structures or facilities essential for their proper functioning in the vicinity of the Sacramento River between Big Chico Creek and the north boundary of Glenn County Levee District No. 3.

Channel Maintenance

DWR is responsible for maintaining all SPFC channels to control vegetation, sedimentation, fallen trees, and other debris affecting channel capacity. CWC Sections 8361 (b), (d) and (f) and (h) require DWR to carry out those functions that are necessary to maintain carrying capacity of the channels and overflow channels. Channels maintained by DWR are listed in Table 5-1.

Maintenance Areas

When an LMA is not able to operate or maintain project facilities to acceptable standards, DWR or the Board is authorized to form a maintenance area and take responsibility for those facilities in the best interest of the State. CWC Section 12878 defines a maintenance area as follows:

> *"Maintenance area" means described or delineated lands that are found by the board or department to be benefited by the maintenance and operation of a particular unit of a project.*

The procedure for forming a maintenance area is covered in CWC Sections 12878 through 12878.21. The flood management benefit of this program is that it addresses sections of levee that are not being maintained through either (1) identifying another maintaining agency willing to accept the maintenance responsibility, or (2) turning over maintenance responsibilities to the State to be paid for by local beneficiaries. Ten maintenance areas (1, 3, 4, 5, 7, 9, 12, 13, 16, and 17) are currently active within the jurisdictional boundaries of the Board (see Figures 5-1 and 5-2). Based on their location, levees within these maintenance areas are maintained by either the DWR Sacramento or Sutter maintenance yards.

5.4.2 Maintenance by Local Maintaining Agencies

Most levees in the SPFC are maintained by LMAs that fund maintenance activities through assessing landowners within their boundaries. These LMAs primarily comprise levee districts and RDs. A variety of cities, counties, and other public agencies and municipalities also maintain SPFC levees and other facilities. In addition, DWR maintains specific facilities defined in CWC Section 8361 and for specific maintenance areas (see Section 5.4.1). LMAs and DWR maintenance areas are shown in Figures 5-1 and 5-2, and listed in Table 5-1 along with the SPFC facilities they maintain.

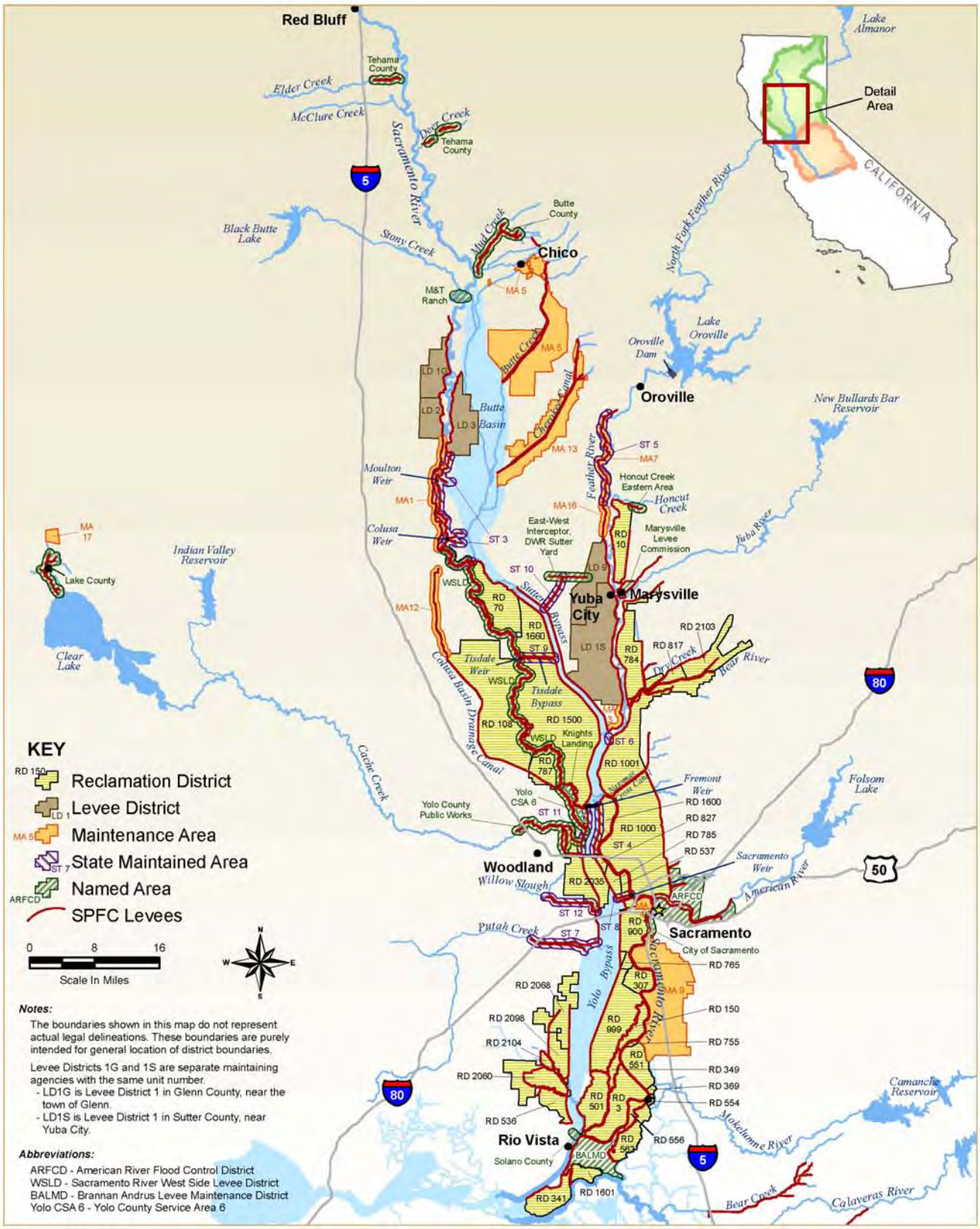


Figure 5-1. Locations of Maintaining Agencies Within the Sacramento River Basin

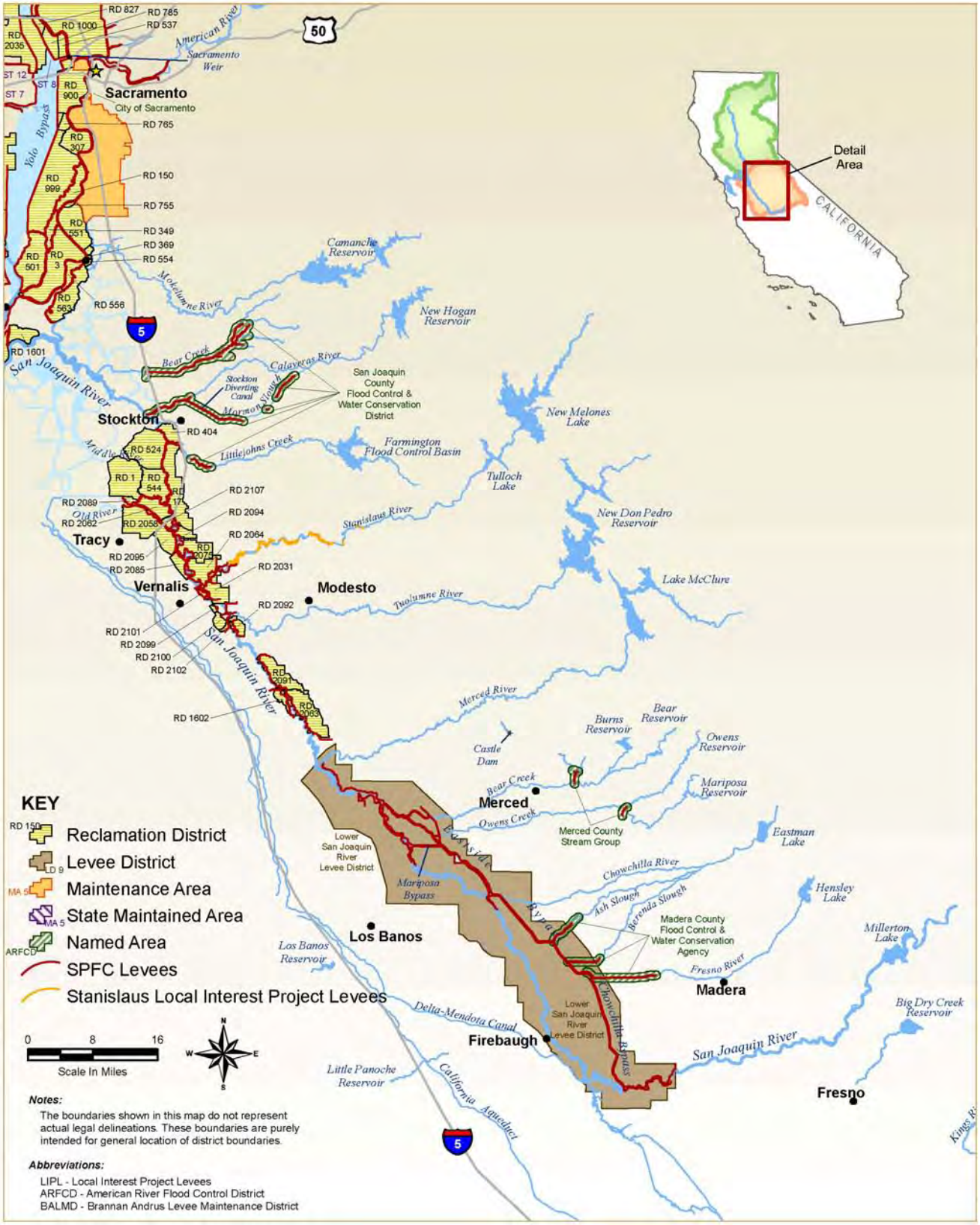


Figure 5-2. Locations of Maintaining Agencies Within the San Joaquin River Basin

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities

State Plan of Flood Control Facility	Maintaining Agency
Sacramento River bank protection, Red Bluff to Chico Landing	DWR – Sutter Maintenance Yard
North Fork Feather River channel improvements, including a diversion structure, an excavated rock-lined diversion channel, seven drop structures, and levees	Plumas County Department of Public Works
Feather River right-bank levee, high ground to Yuba City	DWR – Sutter Maintenance Yard, LD 9
Feather River right-bank levee, Yuba City to Sutter Bypass	LD 1 (Sutter County)
Feather River left-bank levee, Honcut Creek to Jack Slough	RD 10
Feather River left-bank levee, Yuba River to Bear River	RD 784
Sutter-Butte Canal Headgate	DWR – Sutter Maintenance Yard
Honcut Creek left bank levee, upstream from Feather River confluence	RD 10
Back levee for RD 10, along Jack and Simmerly sloughs	RD 10
Ring levee around City of Marysville	Marysville Levee Commission
Yuba River right-bank levee, upstream from Marysville ring levee	Marysville Levee Commission
Yuba River left-bank levee, upstream from Feather River confluence	RD 784
Feather River left-bank levee	RD 784
Feather River right-bank levee	LD 1 (Sutter County)
Dry Creek left-bank levee, upstream from Bear River confluence	RD 817, RD 2103
Dry Creek right-bank levee, upstream from Bear River confluence	RD 784, RD 817
Bear River right- and left-bank levees, upstream from Dry Creek confluence	RD 784, RD 817, RD 1001
Yankee Slough right- and left-bank levee, upstream from Bear River confluence	RD 1001
WPRR Intercepting Channel right-bank levee	RD 784
WPRR Intercepting Canal Bridge (WI-1)	DWR – Sutter Maintenance Yard
WPRR Intercepting Canal Bridge (WI-2)	DWR – Sutter Maintenance Yard
WPRR Intercepting Canal Bridge (WL-1)	DWR – Sutter Maintenance Yard
Bear River right-bank levee, downstream from Dry Creek confluence	RD 784
Bear River left-bank levee, downstream from Dry Creek confluence	RD 1001
Feather River right-bank levee from Bear River to Sutter Bypass	LD 1 (Sutter County), DWR – Sutter Maintenance Yard
Feather River left-bank levee from Bear River to Sutter Bypass	RD 1001
Nelson Bend Rock weir on Feather River at Sutter Bypass	DWR – Sutter Maintenance Yard
Sutter Bypass channel	DWR – Sutter Maintenance Yard
Sutter Bypass Toe Drain Bridge (EL-1A)	DWR – Sutter Maintenance Yard
Sutter Bypass East Borrow Canal Bridge (EL-2)	DWR – Sutter Maintenance Yard
Sutter Bypass East Borrow Canal Bridge (EL-3)	DWR – Sutter Maintenance Yard
Sutter Bypass East Borrow Canal Bridge (EL-6)	DWR – Sutter Maintenance Yard
East Interceptor Canal/Sand Creek Bridge (EI-2)	DWR – Sutter Maintenance Yard
East Interceptor Canal Bridge (EI-5)	DWR – Sutter Maintenance Yard
State Drain Bridge (CC-4)	DWR – Sutter Maintenance Yard

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities (contd.)

State Plan of Flood Control Facility	Maintaining Agency
Feather River/Sutter Bypass right-bank levee, upstream from Sacramento River confluence	RD 1500
Feather River/Sutter Bypass left-bank levee, upstream from Sacramento River confluence	RD 1001
American River right-bank levee, upstream from Natomas East Main Drainage Canal	American River Flood Control District
Vegetation mitigation, five sites between H Street and Watt Avenue	American River Flood Control District
Pumps along American River at H Street and Watt Avenue	Sacramento County
American River left-bank levee, upstream from Natomas East Main Drainage Canal	American River Flood Control District
American River channel	DWR – Sacramento Maintenance Yard
Natomas East Main Drainage Canal right-bank levee at Sankey Road	RD 1000
Dry (Linda) Creek left-bank levee, upstream from Natomas East Main Drainage Canal	American River Flood Control District
Magpie Creek diversion channel	American River Flood Control District
Natomas East Main Drainage Canal right- and left-bank levees, from Arcade Creek to American River	RD 1000
Arcade Creek right- and left-bank levees, upstream from Natomas East Main Drainage Canal	American River Flood Control District
American River right-bank levee, from Natomas East Drainage Canal to Sacramento River	RD 1000
Lower Butte Creek channel improvements and Howard Slough diversion structure	DWR – Sutter Maintenance Yard
Butte Slough Outfall Gates	DWR – Sutter Maintenance Yard
Butte Slough Bypass channel	DWR – Sutter Maintenance Yard
Right-bank levee from Butte Slough Outfall Gates to Sutter Bypass	RD 70
Sutter Bypass channel	DWR – Sutter Maintenance Yard
Sutter Bypass pumps and right- and left-bank levees from State Route 20 to Wadsworth Canal	DWR – Sutter Maintenance Yard, RD 70, RD 1660
Wadsworth Canal right- and left-bank levees and channel, West Intercepting Canal, and East Intercepting Canal right- and left-bank levees	DWR – Sutter Maintenance Yard
Sutter Bypass right-bank levee from Wadsworth Canal to Tisdale Bypass	RD 1660
Sutter Bypass left-bank levee from Wadsworth Canal to Tisdale Bypass and Pumping Plant No. 2	DWR – Sutter Maintenance Yard
Sutter Bypass right-bank levee downstream from Tisdale Bypass to Feather River confluence	RD 1500
Sutter Bypass left-bank levee downstream from Tisdale Bypass to Feather River confluence and Pumping Plant No. 1	DWR – Sutter Maintenance Yard
Feather River/Sutter Bypass right-bank levee, upstream from Sacramento River confluence	RD 1500
Feather River/Sutter Bypass left-bank levee, upstream from Sacramento River confluence	RD 1001
Colusa Basin Drain left-bank levee	RD 108 and DWR - Sutter Maintenance Yard
Knights Landing Outfall Gates	DWR – Sacramento Maintenance Yard

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities (contd.)

State Plan of Flood Control Facility	Maintaining Agency
Knights Landing Ridge Cut channel and right- and left-bank levees	Knights Landing Ridge Drainage District
Knights Landing Ridge Cut channel	DWR – Sacramento Maintenance Yard
Middle Creek and Tributaries Project (levees, channels, diversion structures, and pumping plant)	Lake County Watershed Protection District and DWR – Sutter Maintenance Yard
Willow Slough Diversion Weir, right- and left-bank levees to confluence with Yolo Bypass, and channel downstream from Southern Pacific Railroad from Davis to Woodland	DWR – Sacramento Maintenance Yard
Putah Creek channel and levees from Interstate 505 highway bridge in Winters to Yolo Bypass	DWR – Sacramento Maintenance Yard
Cache Slough and Lindsey Slough levees	RD 2068, RD 2098, RD 2093, RD 536
Yolo Bypass right-bank levee from Fremont Weir to Cache Creek Settling Basin	DWR – Sacramento Maintenance Yard
Yolo Bypass left-bank levee from Knights Landing Ridge Cut to Cache Creek Settling Basin	RD 1600
Cache Creek Settling Basin, east and west training levees	DWR – Sacramento Maintenance Yard
Yolo Bypass right-bank levee from Cache Creek to Sacramento Bypass	RD 2035
Yolo Bypass left-bank levee from Cache Creek to Sacramento Bypass	RD 785, RD 827, RD 2035
Yolo Bypass right-bank levee from Sacramento Bypass to Putah Creek	RD 900 and DWR - Sacramento Maintenance Yard
Yolo Bypass left-bank levee from Sacramento Bypass to Putah Creek	RD 900
Yolo Bypass right-bank levee from Putah Creek to Sacramento River	RD 536, RD 2060, RD 2068, RD 2098
Yolo Bypass left-bank levee from Putah Creek to Sacramento River	RD 501, RD 999
Yolo Bypass channel	DWR – Sacramento Maintenance Yard
Ash Creek and Dry Creek channel clearing	Adin Community Services District
Salt Creek channel clearing, upstream from Sacramento River confluence	Tehama County Flood Control and Water Conservation District
Elder Creek channel clearing and left-bank levee upstream from Sacramento River confluence	Tehama County Flood Control and Water Conservation District
Elder Creek channel	DWR – Sutter Maintenance Yard
McClure Creek channel clearing near U.S. Highway 99	Tehama County Flood Control and Water Conservation District
Deer Creek channel clearing and right and left-bank levees upstream from Delany Slough to Sacramento River	Tehama County Flood Control and Water Conservation District
Deer Creek channel	DWR – Sutter Maintenance Yard
Cherokee Canal channel	DWR – Sutter Maintenance Yard
Big Chico/Sandy Gulch (Lindo Channel) left-bank levee and Big Chico Creek Gates, Lindo Channel Gates, and Sycamore Weir diversion structures	Butte County Public Works
Big Chico Creek, Sandy Gulch (Lindo Channel), Little Chico Creek channels	DWR – Sutter Maintenance Yard
Sycamore, Sheep Hollow and Mud creeks right- and left-bank levees	Butte County Public Works
Sacramento River channel, as included in the Sacramento River Flood Control Project	DWR – Sutter and Sacramento Maintenance Yards
Sacramento River bank protection, Chico Landing to Goose Lake Flood Relief Structure	DWR – Sutter Maintenance Yard

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities (contd.)

State Plan of Flood Control Facility	Maintaining Agency
M&T and Goose Lake Flood Relief Structures	DWR – Sutter Maintenance Yard
Sacramento River right-bank levee from Ord Ferry to Moulton Weir	LD 1 (Glenn County), LD 2
Sacramento River left-bank levee from Ord Ferry to Moulton Weir	LD 3
Moulton Weir	DWR – Sutter Maintenance Yard
Sacramento River right-bank levee from Moulton Weir to Colusa Weir	DWR – Sutter Maintenance Yard
Sacramento River left-bank levee from Moulton Weir to Colusa Weir	LD 3, DWR – Sutter Maintenance Yard
Colusa Weir, sediment basin, and training levees	DWR – Sutter Maintenance Yard
Sacramento River left-bank levee from Colusa Weir to Tisdale Weir	RD 70, RD 1660
Sacramento River right-bank levee from Colusa Weir to Tisdale Weir	Sacramento River West Side LD
Tisdale Weir and Tisdale Bypass, including right-bank, and left-bank levees	DWR – Sutter Maintenance Yard
Sacramento River right-bank levee from Fremont Weir to Sacramento Weir	RD 1600, RD 827
Sacramento River left-bank levee from Fremont Weir to Sacramento Weir	RD 1000
Sacramento Weir and Sacramento Bypass channel	DWR – Sacramento Maintenance Yard
East Side Canal and Natomas Cross Canal right-bank levee	RD 1001
Pleasant Grove Canal and Natomas Cross Canal left-bank levee	RD 1000
Sacramento River left-bank levee from Sacramento Weir to American River confluence	RD 1000
Sacramento River right-bank levee from Sacramento Weir to American River confluence	RD 537, DWR – Sacramento Maintenance Yard
Sacramento River right-bank levee from American River to Elk Slough	DWR – Sacramento Maintenance Yard, RD 307, RD 537, RD 900, RD 765, RD 999
Sacramento River left-bank levee from American River to Elk Slough	City of Sacramento, American River Flood Control District, DWR –Sacramento Maintenance Yard
Sacramento River right-bank levee from Elk Slough to Collinsville	RD 3, RD 150, RD 349
Sacramento River left-bank levee from Elk Slough to Collinsville	RD 369, RD 407, RD 551, RD 554, RD 556, RD 755, Brannan-Andrus Levee Maintenance District
Elk Slough right- and left-bank levees	RD 150, RD 999
Sutter Slough right- and left-bank levees	RD 349, RD 999, RD 150, RD 501
Miner Slough right- and left-bank levees	RD 501, RD 999
Steamboat Slough right- and left-bank levees	RD 3, RD 349, RD 501
Georgiana Slough right- and left-bank levees	RD 556, RD 563, Brannan-Andrus Levee Maintenance District
Three Mile Slough right- and left-bank levees	RD 341, RD 1601
Chowchilla Bypass right- and left-bank levees, Chowchilla Canal Bypass Control Structure and Debris Settling Basin, San Joaquin River Control Structure	Lower San Joaquin LD
Fresno River right- and left-bank levees	Madera County Flood Control and Water Conservation Agency
Berenda Slough right- and left-bank levees from levee mile 0 to levee mile 2.03	Lower San Joaquin LD

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities (contd.)

State Plan of Flood Control Facility	Maintaining Agency
Berenda Slough right- and left-bank levees in Madera County Flood Control and Water Conservation Agency	Madera County Flood Control and Water Conservation Agency
Ash Slough right- and left-bank levees from levee mile 0 to levee mile 1.28, Ash Slough Drop Structures No. 1 through 4	Lower San Joaquin LD
Ash Slough right- and left-bank levees in Madera County Flood Control and Water Conservation Agency	Madera County Flood Control and Water Conservation Agency
Eastside Bypass right- and left-bank levees, Eastside Bypass Control Structure, Eastside Bypass Drop Structures No. 1 and 2	Lower San Joaquin LD
Mariposa Bypass right- and left-bank levees, Mariposa Bypass Control Structure	Lower San Joaquin LD
San Joaquin River right- and left-bank levees in Lower San Joaquin LD, Sand Slough Control Structure, San Joaquin River Structure	Lower San Joaquin LD
Owens Creek Diversion Channel right- and left-bank levees	Merced Irrigation District
Merced County Stream Group Project (Black Rascal Creek, Bear Creek Burns Creek, Mariposa Creek and Duck Slough, Miles Creek, Owens Creek) channels	Merced County
Black Rascal Diversion Channel	Merced Irrigation District
Castle Dam	Merced Irrigation District
San Joaquin River left-bank levee in RD 1602	RD 1602
San Joaquin River right-bank levee in RD 2063 and Lower San Joaquin River (RD 2063) pumping plant	RD 2063
Mormon Slough Project (diversion, Pumping Plants No. 1, 2, and 3, right and left-bank levees, and channels)	San Joaquin County Flood Control and Water Conservation District
San Joaquin River right-bank levee in RD 2091	RD 2091
San Joaquin River right-bank levee in RD 2092	RD 2092
San Joaquin River left-bank levee in RD 2102	RD 2102
San Joaquin River left-bank levee in RD 2100	RD 2100
San Joaquin River left-bank levee in RD 2099	RD 2099
San Joaquin River left-bank levee in RD 2101	RD 2101
San Joaquin River right-bank levee in RD 2031	RD 2031
Stanislaus River left-bank levee from levee mile 0 to levee mile 7.15	RD 2031
Stanislaus River right-bank levee from levee mile 6.06 to San Joaquin River	RD 2064
San Joaquin River right-bank levee in RD 2064	RD 2064
San Joaquin River right-bank levee in RD 2075	RD 2075
San Joaquin River left-bank levee in RD 2085	RD 2085
San Joaquin River right-bank levee in RD 2094	RD 2094
Weatherbee Lake Pumping Plant and Navigation Gate and San Joaquin River right-bank levee in RD 2096	RD 2096
San Joaquin River left-bank levee in RD 2095	RD 2095
Paradise Cut left-bank levee in RD 2095	RD 2095
Paradise Cut left-bank levee in RD 2058	RD 2058

Table 5-1. Maintaining Agencies for State Plan of Flood Control Facilities (contd.)

State Plan of Flood Control Facility	Maintaining Agency
Paradise Cut right-bank levee in RD 2107	RD 2107
Paradise Cut right-bank levee in RD 2062	RD 2062
San Joaquin River left-bank levee in RD 2107	RD 2107
San Joaquin River left-bank levee in RD 2062	RD 2062
Old River left-bank levee from San Joaquin River to Paradise Cut	RD 2062
Old River right-bank levee from San Joaquin River to Middle River	RD 544
Old River right-bank levee in RD 1	RD 1
Old River and Salmon Slough right-bank levees in RD 2089	RD 2089
San Joaquin River left-bank levee from Old River to Howard Road	RD 544
San Joaquin River right-bank levee from Walthall Slough to French Camp Slough	RD 17
San Joaquin River left-bank levee from Howard Road to Burns Cutoff	RD 524
French Camp Slough right-bank levee	RD 404
French Camp Slough left-bank levee	RD 17
San Joaquin River right-bank levee from French Camp Slough to Burns Cutoff	RD 404
South Littlejohns Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District
Duck Creek Diversion Channel	San Joaquin County Flood Control and Water Conservation District
Potter Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District
North Paddy Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District
Middle Paddy Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District
Paddy Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District
Bear Creek right- and left-bank levees	San Joaquin County Flood Control and Water Conservation District

Key:
DWR = California Department of Water Resources
LD = levee district
RD = reclamation district
WPRR = Western Pacific Railroad

Sixty LMAs perform maintenance for the SRFCP. Twenty-nine LMAs perform maintenance for the SPFC in the San Joaquin River Basin. AB 156, Local Agency Annual Report 2009 (DWR, 2009), provides maps and available reports for each entity (see reference DVD).

Local Maintaining Agency Responsibility in California Water Code Section 8370

The LMAs are responsible for maintaining SRFCP facilities not included in the section on DWR responsibility in CWC Section 8361. CWC Section 8370 specifies responsibilities of the LMAs:

> *8370. It is the responsibility, liability and duty of the reclamation districts, levee districts, protection districts, drainage districts, municipalities, and other public agencies within the Sacramento River Flood Control Project limits, to maintain and operate the works of the project within the boundaries or jurisdiction of such agencies, excepting only those works enumerated in Section 8361 and those for which provision for maintenance and operation is made by Federal law.*

Local Reporting Requirements

An example of the evolving nature of the SPFC is the additions to the CWC resulting from the adoption of AB 156 in the 2007 – 2008 legislative session. Additions to the CWC include requirements for LMAs to submit to DWR, by September 30 of each year, specific information relative to the SPFC levees they operate and maintain. In turn, DWR is required to summarize this information in an annual report to the Board by December 30 of each year.

Required information includes the following:

- Information known to the LMA that is relevant to the condition or performance of an SPFC levee.
- Information identifying known conditions that might impair or compromise the level of flood protection provided by an SPFC levee.
- Summary of maintenance performed by the LMA during the previous fiscal year.
- Statement of work and estimated cost for O&M of an SPFC levee for the current fiscal year.
- Any other readily available information contained in records of the LMA relevant to the condition or performance of an SPFC levee.

5.5 Operations

The standard O&M manuals and unit-specific O&M manuals specify necessary operations during high water. In most cases for levees, the operation is limited to patrolling at specified river stages and floodfighting, as necessary. Other facilities, such as pumping plants, control structures, and the Sacramento Weir, require additional facility-specific operations.

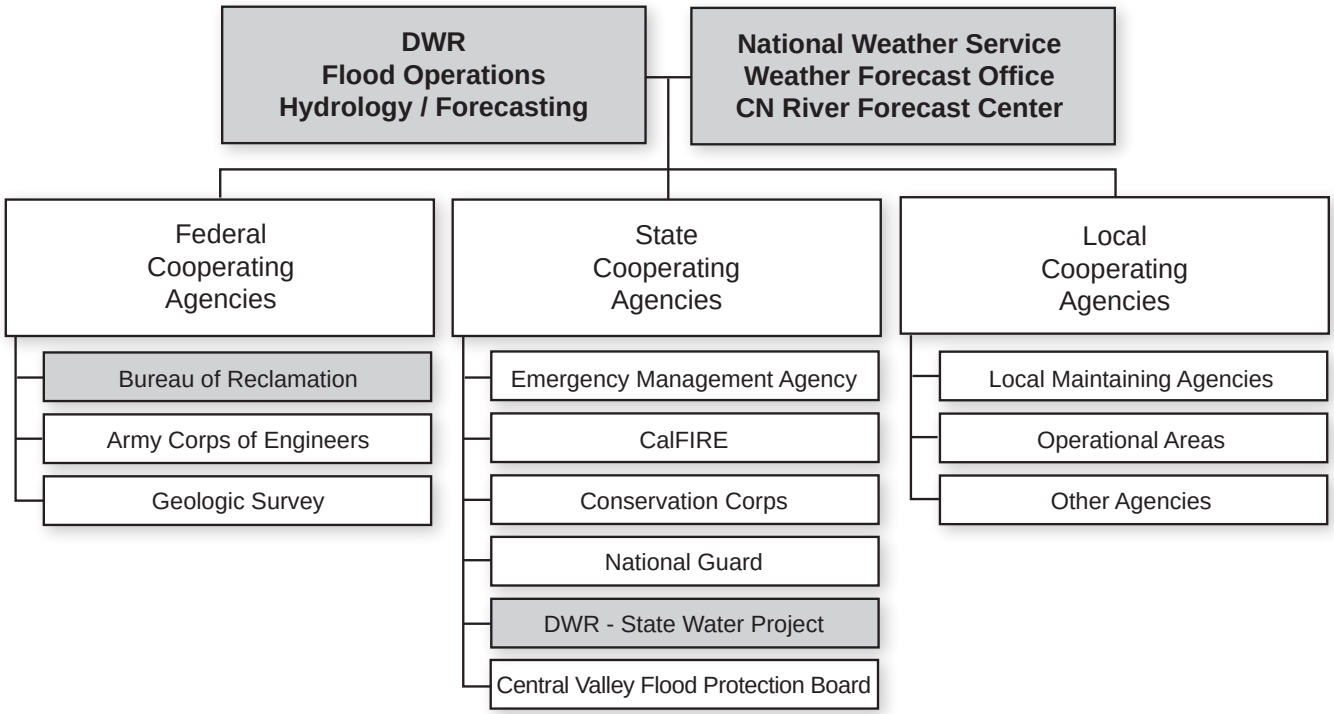
5.5.1 Real-Time Gages

Real-time gages for stream stage and flow are essential to successful operation of SPFC facilities. Most unit-specific O&M manuals include specific stream gages (called hydrographic facilities in most manuals). The condition or existence of these gages may have changed over time, evolving to the set of stream gages, precipitation stations, snow accumulation stations, and other tools used by the State-federal Flood Operations Center (FOC) (see Section 5.5.2) during flood operations. These tools and historical records can be found on the CDEC Web site (http://cdec.water.ca.gov/). These represent base data that may be revised after analysis. Data for DWR-maintained gages can be found on DWR's Water Data Library Web site (http://www.water.ca.gov/waterdatalibrary/) and data for U.S. Geological Survey (USGS)-maintained gages can be found on the USGS Web site (http://waterdata.usgs.gov/ca/nwis/rt).

5.5.2 State-Federal Flood Operations Center

The FOC, located in Sacramento, California, is a component of DWR's Division of Flood Management. While actions of the FOC are not specifically performed for the SPFC, these actions are essential for SPFC operations.

As major storms approach California, forecasters from the National Weather Service (NWS) and DWR forecast the location, amount, and timing of expected precipitation, river flows, and stages and, when needed, prepare emergency notifications to local agencies so they can respond and inform the public. In addition to the NWS, many agencies cooperate with DWR during flood emergencies and some send representatives to work at the FOC. Figure 5-3 provides an overview of local, State, and federal cooperating agencies with colocated agencies depicted by shaded boxes.



Note: Agencies in shaded boxes are colocated at the State-federal Flood Operations Center.
Key:
CN = California-Nevada
DWR = California Department of Water Resources

Figure 5-3. Cooperating Agencies in State-Federal Flood Operations Center

5.5.3 High-Water Levee Patrols

Each unit-specific O&M manual provides information on required high-water patrols, generally keyed to water stages at stream gages. These patrols are performed by LMAs beginning at river stages specified in the unit-specific O&M manuals.

5.5.4 Floodfights

DWR is the lead State agency for flood emergency response, including floodfight assistance in California. The FOC serves as DWR's Emergency Operations Center and leads the statewide flood emergency operations responsibility. Each of the two USACE standard O&M manuals contains methods for combating floods.

DWR is the lead State agency for floodfight assistance in California

5.5.5 Facilities Requiring Active Operations

The following SPFC facilities require active operation by DWR or local agencies. The procedures for operation are included in the unit-specific O&M manuals. Maps showing more detailed locations of the facilities below are included in Section 3, and in Attachment A.

Pumping Plants

The following SPFC pumping plants require active operation:

- Two pumping plants along the American River (see O&M Manual SAC518)
- Three pumping plants along the Sutter Bypass (see O&M Manual SAC159)
- Pumping plant along the lower San Joaquin River between the Merced and Tuoloume rivers (see O&M Manual SJR6A)
- Pumping plant along the lower San Joaquin River between Paradise Cut and Old River (see O&M Manual SJR3A)
- Three pumping plants along the Mormon Slough Diversion Channel (see O&M Manual SJR611.2)

Weirs

Two SPFC weirs require operation to release flow:

- Howard Slough Diversion Structure (see O&M Manual SAC153)
- Sacramento Weir (see O&M Manual SAC158)
- Willow Slough Weir (see O&M Manual SAC120)

Dams

There are four SPFC dams in the system:

- Oroville Dam
- North Fork Feather River Diversion (see O&M Manual SAC508)
- Cache Creek Settling Basin (see O&M Manual SAC120)
- Castle Creek Dam (see O&M Manual SJR607A)

Control Structures

Several SPFC water control structures require active manual operation:

- Sutter-Butte Canal Headgate (see O&M Manual SAC160)
- Butte Slough Outfall Gates (see O&M Manual SAC161)
- Knights Landing Outfall Gates (see O&M Manual SAC162)
- Lindo Channel and Big Chico Creek diversion gates (see O&M Manual SAC504)
- Chowchilla Canal Bypass Control Structure (see O&M Manual SJR601B)
- San Joaquin River Control Structure (see O&M Manual SJR601B)
- Mariposa Bypass Control Structure (see O&M Manual SJR601A)
- Eastside Bypass Control Structure (see O&M Manual SJR601A)
- Sand Slough Control Structure (see O&M Manual SJR601)
- San Joaquin River Structure (see O&M Manual SJR601)

6.0 State Plan of Flood Control Conditions

This section presents the conditions, or terms, of the SPFC set forth by the federal government and the State.

6.1 Summary

Federal requirements for construction of federal flood damage reduction projects are set by USACE in accordance with federal laws, regulations, and policies. Federal projects are constructed by USACE in partnership with nonfederal sponsors. The nonfederal partners are required to enter into agreements with USACE and agree to adhere to the federal requirements. Federal requirements have evolved over the years, as reflected in the form and contents of the agreements. Among these requirements are the acceptance of the completed works and their O&M throughout the life of the projects. For the State, the Board has given assurances of cooperation to USACE in the form of signed MOUs and agreements.

6.2 Assurances of Cooperation

State assurances of cooperation to the federal government are described in Section 1.4.

6.3 Federal Flood Control Regulations

Nonfederal sponsors abiding by the federal flood control regulations are a condition for federal participation in the development of flood damage reduction, formerly flood control, projects. Federal flood control regulations are contained in 33 CFR Section 208. Federal requirements for O&M are contained in 33 CFR Section 208.10. The regulations apply to all entities responsible for maintaining the completed and "turned-over" federal facilities.

6.4 Standard O&M Manuals

As mentioned in Section 5.2.1, the two USACE standard O&M manuals present requirements that apply to all maintaining agencies that operate and maintain the various geographical SPFC units. Fulfilling the requirements outlined in the two USACE standard O&M manuals is a condition for federal projects.

6.5 Unit-Specific O&M Manuals

As mentioned in Section 5.2.2, unit-specific O&M manuals supplement information included in the two USACE standard O&M manuals with O&M requirements applicable to each unit. Fulfilling the requirements outlined in the unit-specific O&M manuals is a condition for federal projects.

6.6 Design Profiles

USACE has prepared design water surface elevation profiles for much of the Sacramento River, San Joaquin River, and major tributaries of the flood management system. The primary published profiles are the 1957 Revised Profile Drawings (described in Section 6.6.1), the 1955 Profile (described in Section 6.6.2), Cache Creek Basin, Middle Creek Project profiles (described in Section 6.6.3), and Mormon Slough Project profiles (described in Section 6.6.4). Flood system improvements that have occurred after the 1950s are not reflected in the design profiles discussed below. For channels not delineated in the profiles listed above, the as-constructed plans are assumed to take precedence.

DWR operates SPFC facilities based on the design profiles rather than on design flows from the O&M manuals (USACE, 1969). The profiles are on the reference DVD included in this document or can be viewed on the Board Web site at http://recbd.ca.gov/profiles/index.cfm.

The Board uses designated floodways (see Section 2.5.3) as a management tool for passage of design flood flows shown by the design profiles described below.

It should be noted that USACE now employs uncertainty analyses that no longer use a single flow value for a river reach. This may require revisions to how the following flow profiles are used in the future.

6.6.1 1957 Revised Profile Drawings

For the SRFCP, USACE requires that channels pass design flood flows for stages at or below the 1957 Revised Profile Drawings. The reference DVD contains 1969 and 2006 letters from USACE to the Board with this directive (USACE, 1969 and 2006). The 1957 profile is shown in the *Sacramento River Flood Control Project, California, Levee and Channel Profiles* (USACE, 1957a) (re-created in 2006). The profiles are contained on four sheets identified as File No. 50-10-3334. The profiles include the design flows at various locations throughout the system, and are listed in Table 3-1.

6.6.2 1955 Profile

For the San Joaquin River and tributaries, USACE requires that channels pass design flood flows for stages at or below the 1955 Profile. The 1955 Profile for the Merced River and downstream is shown in the *San Joaquin River and Tributaries Project, California, Levee Profiles* (USACE, 1955). The profiles are contained on one sheet identified as Sheet SJ-20-60. The profiles do not include the design flood flows.

6.6.3 Profiles for Middle Creek Project

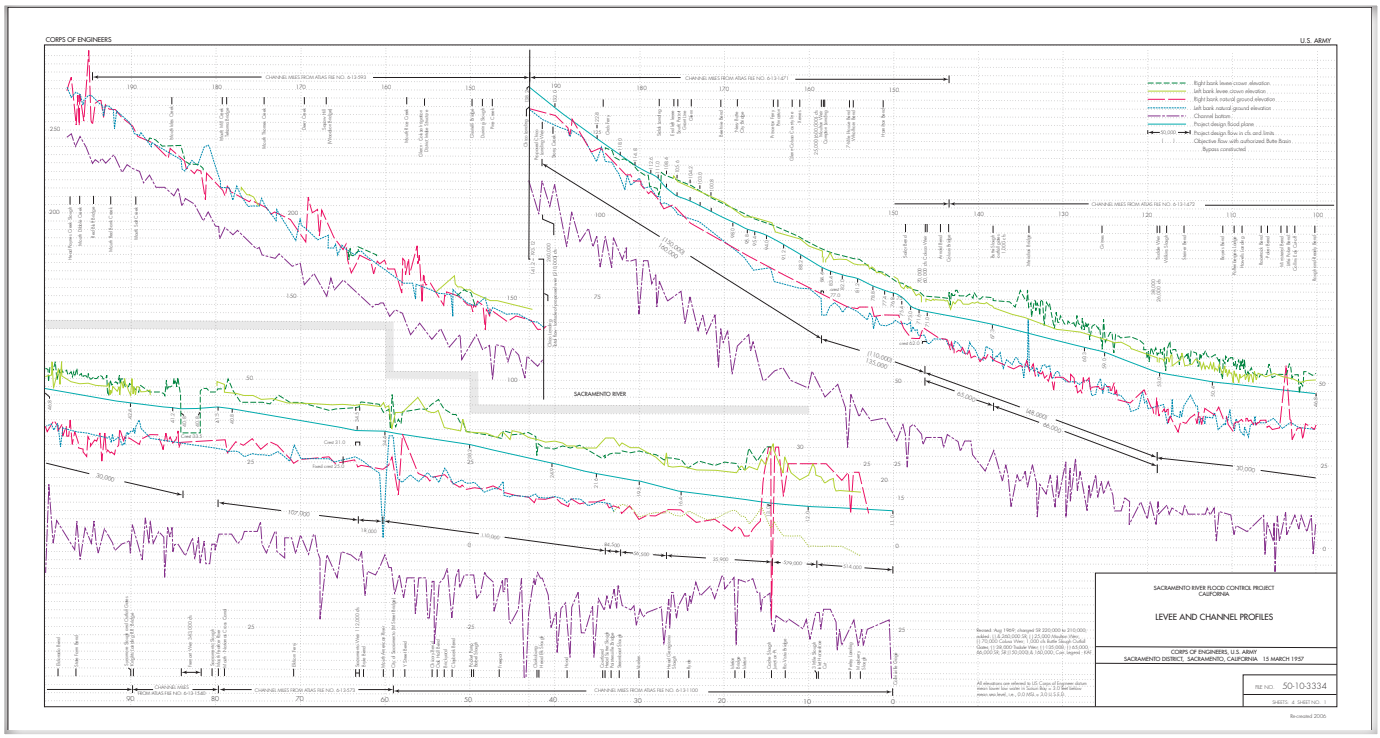
Profiles for the Middle Creek Project are shown in *Cache Creek Basin California, Middle Creek Project, Stream Profiles* (USACE, 1957b) on one sheet, File No. CC-4-20-16 (re-created in 2006).

6.6.4 Profiles for Mormon Slough Project

Profiles for the Mormon Slough Project are shown on *Mormon Slough Project, San Joaquin County, Plan of Improvement, Profile and Flood Plane* on six sheets (USACE, 1965), File No. 3-20-142 (re-created in 2006).

6.7 Project Cooperation Agreements

Project cooperation agreements (PCA) specify other conditions that must be met by parties to the agreements. These PCAs have evolved over time, and are especially important before new project construction is started.



USACE has prepared design profiles for much of the SPFC Planning Area

6.7.1 Federal/State Project Cooperation Agreement

The Project Partnership Agreement (PPA), formerly Local Cooperation Agreement (LCA) and PCA, between the Department of the Army and the State of California (The Reclamation Board or Central Valley Flood Protection Board, depending on the date of the agreement), is a contract for project construction. While the agreements vary by time and project, they contain specific provisions. Examples include the following:

- Obligations of both parties, including cost-sharing of project cost
- Compliance requirements for land right acquisition and relocation
- Compliance requirements with federal flood insurance programs and floodplain management
- Project coordination
- Method of payment
- Dispute resolution
- Requirement for nonfederal operation, maintenance, repair, replacement, and rehabilitation (OMRR&R)
- Indemnification of the federal government
- Other contract terms

Upon completion of a functional portion of projects, USACE turns over that portion of the project by a letter to the Board for OMRR&R. The Board in turn sends USACE a letter saying that the Board may accept the project as constructed or accept the completed portion of the project while other portions are completed. Concurrent with the Board's acceptance of a completed portion of a project, the Board transfers that portion to the LMA for OMRR&R.

6.7.2 Local Project Cooperation Agreement

The Local Project Partnership Agreement (LPPA), formerly Agreement and Local Project Cooperation Agreement (LPCA), between the Board and an LMA is a legally binding document for federal project sponsorship. Among many provisions, the agreement outlines specific conditions for the local sponsor to fulfill, such as cost-share, OMRR&R, holding the State harmless and other conditions. Recent agreements have included requirements to participate in federal floodplain management and flood insurance programs, to publicize floodplain information, and for the local sponsor to pay the total cost of betterments requested by the local sponsor.

Concurrent with the Board's acceptance of a completed portion of a project, the Board transfers that portion to the LMA for OMRR&R.

6.8 State-Adopted Conditions

Successful operation of the SPFC requires many other conditions that do not meet the strict definition of the SPFC provided by the Legislature (see Section 1.1). One of the most important conditions for operation of the SPFC is that the upstream reservoirs operate in compliance with the flood storage rules established by USACE. Except for Oroville Dam (see Section 3.2.1) and Castle Dam (see Section 3.3.1), the State has no direct responsibility for O&M of flood control reservoirs that regulate flow to the SPFC – federal agencies and local agencies are responsible for their operation. Similarly, the State has no direct operational responsibility for many other non-SPFC facilities.

The Board considers its Designated Floodway Program (see Section 2.5.3) as a condition for successful operation of the SPFC. Where implemented, the program is important and necessary in helping to limit further development into active floodways. The program is also considered necessary to help provide for the passage of project design flood flows (see Section 6.6) along many reaches of the SPFC system. As mentioned, Figure 2-3 shows the location of designated floodways within the Sacramento and San Joaquin river basins. Maps of designated floodways by county can also be found at the Board's Web site: http://recbd.ca.gov/maps/index.cfm.

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7.0 Programs and Plans Related to State Plan of Flood Control

This section provides information on programs and plans related to the SPFC, which include State and federal oversight and management of the flood system. Ongoing State-federal projects, the Early Implementation Program (EIP), and Section 221 of the Flood Control Act of 1970 (Section 221) are described as plans and programs related to the SPFC. Ongoing State-federal projects in the Sacramento and San Joaquin River watersheds are expected to become part of the SPFC after completion and turn over to the State. While projects being completed through the EIP and Section 221 are also not part of the SPFC, they may become part of the SPFC in the future after undergoing the process to become incorporated into the SPFC. As additional programs and plans related to the SPFC are developed in the future, information will be incorporated into updates to the FCSSR as necessary.

The Bear River Setback Levee was constructed under the Early Implementation Program

7.1 Summary

DWR, the Board, and USACE are the main partners in SPFC oversight and management. Programs and plans related to the SPFC are both historical and ongoing. Historical documents include the following:

- Federal legislation for authorizing specific projects and setting partnership requirements for project development
- State legislation establishing the roles and responsibilities of the Board and DWR regarding flood control
- State legislation for authorizing specific projects and establishing requirements for partnering with the federal government and local entities for project development
- Partnership agreements with USACE and LMAs
- As-constructed project documents
- O&M manuals
- Master Plan for Flood Control in the Butte Basin (1964)
- Interim Plan of Flood Control for the Sacramento River from the Butte County Line to Chico Landing (1984) and Butte Basin Plan of Flood Control (1986)

Ongoing programs and plans include the following:

- The FloodSAFE California (FloodSAFE) initiative, California Levees Roundtable (Roundtable), FCSSR, CVFPP, and California Water Plan
- Ongoing projects that have been federally and State-authorized, as plans related to the SPFC
- The EIP and Section 221, as programs related to the SPFC

7.2 State Oversight and Management of State Plan of Flood Control

The Board is the State agency responsible for the OMRR&R of existing facilities, and for working with USACE to develop flood damage reduction projects. DWR assists the Board with project development, inspections, and operation of the flood center. Other State agencies assist the Board and DWR. Following is a summary of State agencies whose responsibilities at least in part include flood management in the Central Valley.

7.2.1 Central Valley Flood Protection Board

Following is the mission of the Board[2]:

- To control flooding along the Sacramento and San Joaquin rivers and their tributaries in cooperation with USACE.
- To cooperate with various agencies of local, State, and federal governments in establishing, planning, constructing, operating, and maintaining flood control works.
- To maintain the integrity of the existing flood control system and designated floodways through the Board's regulatory authority by issuing permits for encroachments.

The Board requires permits for any project that may affect how the existing flood system functions. A permit is required for any project or plan of work that meets the following criteria:

- Is within federal flood control project levees and within a Board easement.
- May have an effect on the flood control functions of project levees.
- Is within a Board-designated floodway.
- Is within regulated Central Valley streams listed in Table 8.1, Title 23, CCR.

These projects include any project proposed for a regulated stream, in a designated floodway on federal flood management project levee slopes, within 10 feet of a levee toe, or in a location that may have an effect on flood control facilities. Examples of activities might include, but are not limited to, boat docks, ramps, bridges, sand and gravel mining, placement of fill, fences, and landscaping and irrigation facilities. Streams regulated by the Board are listed in Table 8.1, Title 23, CCR.

With this responsibility, the Board reviews encroachment permit applications and approves permits when encroachment will not affect O&M of the flood management system. The Board also approves or adopts the flood-related technical work prepared by DWR or other agencies.

7.2.2 California Department of Water Resources

DWR's Division of Flood Management provides staff support to the Board and is responsible for managing a variety of programs related to flood management. Other DWR divisions, such as the Division of Engineering and Division of Safety of Dams, may provide technical support. Examples of work performed by the Division of Flood Management include the following:

- Development and maintenance of the CLD
- Emergency preparedness, and emergency response and participation in post-emergency recovery
- O&M of some of the facilities
- Inspections
- Floodplain management, planning, and delineation
- Flood project funding and grant administration

The intention of DWR's FloodSAFE initiative is to guide improvements of the flood management system in the Sacramento and San Joaquin watersheds and the remaining State over the next 20-plus years.

7.2.3 California Department of Fish and Game

The California Department of Fish and Game (DFG) assists DWR in its environmental stewardship responsibilities, including the following:

- Provides input on mitigation strategies, including banking opportunities and possible partnerships
- Identifies specific habitat and species restoration and enhancement opportunities
- Provides input on modeling for impact assessment
- Provides input on and reviewing environmental documentation under the California Environmental Quality Act (CEQA)
- Permits under California Endangered Species Act and DFG Code 1600 for implementation of FloodSAFE projects

[2]The Central Valley Flood Protection Board was formerly known as The Reclamation Board. Correspondence, O&M manuals, and other documents prepared before mid-2007 are cited as from The Reclamation Board.

7.2.4 Other Assisting State Agencies

Several other State agencies assist the Board and DWR in their management and oversight of the SPFC:

- California Emergency Management Agency (CALEMA)
- California Building Standards Commission
- State Lands Commission
- State Historic Preservation Office
- Office of the Attorney General
- Department of Finance

7.3 Federal Oversight and Management of State Plan of Flood Control

Federal agencies are partners with State agencies in oversight and management of the SPFC.

7.3.1 U.S. Army Corps of Engineers

USACE is the nation's flood control agency. The USACE Sacramento District is the district directly involved with the SPFC, and partners with the Board in developing new flood management projects in the Sacramento and San Joaquin River watersheds. USACE has prepared O&M manuals that guide O&M of the various SPFC units.

Part of the assurances of nonfederal cooperation that the Board provided to the federal government for the SPFC is that the State will maintain and operate all works after completion in accordance with regulations prescribed by the Secretary of the Army. Title 33 CFR, Chapter II Corps of Engineers, Part 208, prescribes flood control regulations that the SPFC must follow. USACE headquarters in Washington, D.C., prepares, and periodically updates, policies, standards, and guidance documents on special flood-related subjects.

DWR inspects levees maintained by many separate local agencies, and then reports findings of the inspections to USACE, which performs quality assurance work. From the inspection information submitted, USACE may choose to conduct follow-up inspections in certain areas. USACE uses its own follow-up inspections and the State's inspection findings to make Public Law 84-99 eligibility determinations for each local agency.

USACE provides the following other assistance to the State in support of project planning and implementation:

- Assists in statewide and regional planning efforts
- Partners with the Board in project development, and plans, designs, and constructs flood damage reduction facilities
- Funds the federal share of costs of project development (up-front funds, credits, and reimbursements)
- Permits project modifications
- Manages Public Law 84-99 programs, including floodfight and rehabilitation assistance
- Funds the federal share of Public Law 84-99 program
- Inspects and coordinates inspection of completed works and rehabilitation for compliance with regulations and O&M manual requirements to maintain Active status for Public Law 84-99
- Regulates projects with regard to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act

PUBLIC LAW 84-99 REHABILITATION ASSISTANCE OF FLOOD CONTROL WORKS

Federal and nonfederal flood control works in the Rehabilitation and Inspection Program (RIP) damaged by floods may be repaired at up to 100 percent of federal cost for federal projects. For nonfederal projects, the repairs are cost-shared at 80 percent federal and 20 percent nonfederal sponsor. To be eligible for these repairs, the projects must be in "Active" status, and the assistance is limited to restoration of predisaster condition and level of protection. Any deferred maintenance is the responsibility of the sponsor. The intent of the program is to make the damaged flood control works operationally effective before the next flood season. See ER 500-1-1 and EP 500-1-1 for details.

Eligible projects must have an overall system rating of Acceptable or Minimally Acceptable. A Minimally Acceptable project must have deficiencies corrected within 2 years. An Unacceptable system has an Inactive status in the RIP, and the eligibility status will remain Inactive until the sponsor submits proof that all items rated Unacceptable have been corrected. Inactive systems are ineligible for rehabilitation assistance.

- Reviews and, as necessary, modifies reservoir water control manuals for improved flood management, including consideration of climate change
- Maintains current O&M manuals for completed works
- Assists in interpreting federal laws, regulations, policies

7.3.2 Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) assists DWR with floodplain issues in the following ways:

- Produces digital flood hazard data, provides access to flood hazard data and maps via the Internet, and leads the Map Modernization Program. DWR is a FEMA Cooperating Technical Partner for floodplain mapping.
- Continues partnership with DWR to provide accurate flood hazard maps, develops and maintains a GIS database of California levees and flood management structures, provides technical outreach to communities and citizens on floodplain management issues, and supports the National Flood Insurance Program (NFIP).
- Provides other services, including levee accreditation.

7.3.3 National Weather Service

NWS and the River Forecast Center work with DWR on technical studies, flood forecasting and warning, and related activities. NWS is a colead agency with DWR in the FOC.

7.3.4 Other Assisting Federal Agencies

Several other federal agencies assist the Board and DWR in their management and oversight of the SPFC:

- U.S. Department of the Interior, Bureau of Reclamation (Reclamation)
- U.S. Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS)

7.4 As-Constructed Drawings

As-constructed drawings are on file with the USACE Sacramento District for each unit of the SPFC, but some O&M manuals include as-constructed drawings. In general, these are large-sized drawings that are physically detached from the O&M manuals. These include original drawings prepared when a unit was accepted into a project and modifications, repairs, and other changes made since originally constructed. The drawings often include profiles along the project reach. The State has collected copies of the as-constructed drawings for preparation of electronic copies for its records.

In many cases within the SRFCP, levees and other facilities were originally constructed by local interests before a federally authorized project. In some cases, facilities met or exceeded project standards and were made part of the project by USACE without modification. In other cases, USACE repaired, enlarged, or otherwise modified these existing facilities to bring them to project standards at the time of construction, or USACE constructed new facilities.

7.5 Authorizing Legislation

The State and federal authorizing legislation and supporting USACE Chief of Engineers reports for each of the projects in the SPFC are summarized in Section 2.2. Authorized projects that are completed are considered "facilities" of the SPFC, and authorized projects that are not completed are considered plans related to the SPFC.

7.6 Ongoing State-Federal Projects

State and federally authorized flood projects in the Sacramento and San Joaquin River watersheds that have not been completed are not yet considered part of the SPFC. After execution of project participation agreement by the State, and upon completion of a flood project by the USACE, the projects are turned over to the State and become facilities (or accepted modifications to facilities) of the SPFC. The current status of ongoing State-federal projects is included in the FCSSR, and will be included in updates to that document. At the time of this report, ongoing State-federal projects (or elements of State-federal projects that have not been completed) are described in Section 2.3.

7.7 Early Implementation Program

The EIP is a State program related to the SPFC, created to fund high priority projects to restore or improve flood protection in advance of the 2012 CVFPP. Projects designed and constructed under the EIP in urban areas generally provide, or are consistent with providing, flood protection to at least the 200-year level of protection required for urban areas. While projects being completed under the EIP are not part of the SPFC because the projects are not federally and State authorized at the onset, many of these projects are likely to become part of the SPFC after completion.

The EIP was created as a result of the passage of the Disaster Preparedness and Flood Prevention Bond Act of 2006 (Proposition 1E) and the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84). These propositions authorized DWR to make funds available to local agencies for, among other purposes, flood protection work. These funds may be used for (1) repair, rehabilitation, reconstruction or replacement of levees, weirs, bypasses and facilities of the SPFC and (2) improving or adding facilities to the SPFC to increase levels of flood protection for urban areas. This program applies only to certain portions of the Central Valley and adjacent areas. Ongoing EIP projects at the time of this report include the following:

- LD 1 Setback Levee at Star Bend (Feather River)
- RD 17 100-Year Levee Seepage Project
- RD 2103 Bear River North Levee Rehabilitation Project
- SAFCA Natomas Levee Improvement Project (NLIP) (RD 1000)
- TRLIA (RD 784) Feather River Levee Improvement Project
- TRLIA (RD 784) Upper Yuba Levee Improvement Project
- West Sacramento Area Flood Control Agency (WSAFCA) West Sacramento Levee Improvement Project

To become part of the SPFC, projects under the EIP must complete the following process:

- After construction is complete, the project finishes the close-out phase.
- USACE prepares a Chief of Engineers Report to recommend to Congress that the completed works be incorporated into the federal project.
- Once the project has been authorized by both the State and federal governments, a State agency executes a project participation or similar agreement, and the project becomes part of the SPFC.

The process to closeout a completed project and incorporate into the SPFC may take 3 or more years.

7.8 Section 221 of the Flood Control Act of 1970

Local flood management agencies may implement flood management projects without State and federal authorization, and apply for cost-share credit under Section 221 of the Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b). These criteria for projects to be completed and eligible for cost-share credit are detailed in Section 221 cited above, including a written partnership agreement with the Secretary of the Army (unless the administrative costs associated with negotiating, executing, or administering the agreement would exceed the amount of the contribution required from the non-federal interest and are less than $25,000).

Although projects completed under Section 221 are not part of the SPFC because the projects are not federally and State-authorized at the onset, many of these projects may become part of the SPFC after completion by following the process outlined in Section 7.7.

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8.0 State Plan of Flood Control Updates

This SPFC Descriptive Document includes a description of what the SPFC is at a given time. It is not a plan for future modifications. However, as the ongoing FloodSAFE initiative makes changes in the SPFC, updates to this SPFC Descriptive Document will be necessary. DWR will prepare future updates when requested by the Board.

This section describes the ongoing FloodSAFE initiatives.

8.1 Summary

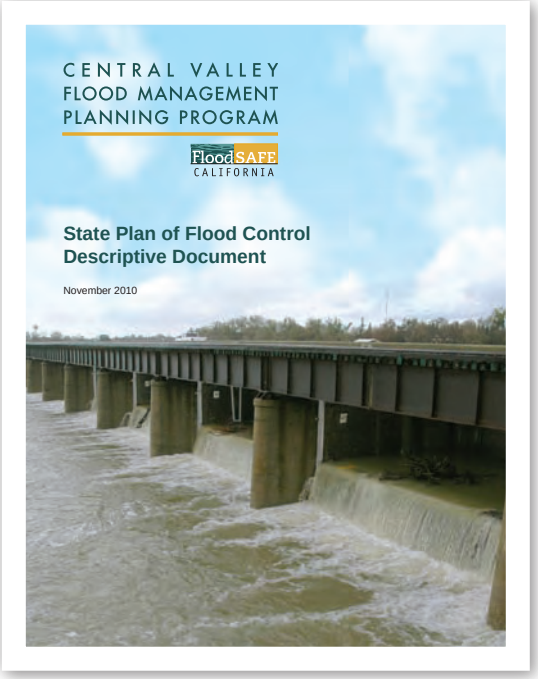
Several ongoing activities will likely lead to making improvements to existing SPFC facilities, and either add new facilities or modify existing facilities of the SPFC.

FloodSAFE is DWR's overall initiative for integrated flood management throughout California. The FloodSAFE Implementation Plan describes the work that needs to be accomplished to make flood system improvements (DWR, 2010). The SPFC is a major focus of this work.

DWR's management works closely with managers from other local, State, and federal agencies. The Roundtable provides a venue for agencies to cooperatively address the multiagency issues facing the flood management system.

The FCSSR provides information on physical deficiencies, and recommendations for improving performance of the flood management system, including the SPFC, in the Sacramento and San Joaquin river watersheds.

The CVFPP, which will cover the entire flood system, including the SPFC, will be a sustainable, integrated flood management plan describing existing flood risk in the Central Valley, and will recommend actions to reduce the probability and consequences of flooding. The CVFPP will rely on information from the FCSSR and from ongoing evaluations. The first issue of the CVFPP is scheduled for 2012, with updates every 5 years.



The SPFC Descriptive Document will be updated when requested by the Board

8.2 FloodSAFE Implementation Plan

FloodSAFE, a statewide multifaceted initiative to improve public safety through integrated flood management, builds on the State's ongoing flood management work.

8.2.1 FloodSAFE Definition

FloodSAFE is an initiative to improve integrated flood management in California through a systemwide approach, while reducing flood risk at the local and regional level. Flood management improvements will, therefore, be achieved through three processes:

1. Improve basic flood management functions, including flood emergency response, O&M of flood management facilities, management of floodplains, and assistance with local projects.
2. Implement regional projects to reduce flood risks, including "early implementation projects" and implementation of USACE projects.

3. Implement a systemwide approach in which broad system evaluation is conducted (i.e., map floodplains and evaluate levee conditions throughout the system) to determine flood system deficiencies and define feasible projects/programs to remedy system deficiencies by developing a comprehensive systemwide flood protection plan for the Central Valley (i.e., CVFPP).

8.2.2 Implementation Plan

The FloodSAFE *Implementation Plan* (DWR, 2010) defines authorities, responsibilities, timelines, budgets, priorities, and expected outcomes of flood management programs as they are currently known. The implementation plan was prepared at a strategic level of detail to describe the overall objectives of the FloodSAFE initiative and how the work will be accomplished in seven functional areas to achieve these objectives. The seven functional areas describe the type of work being done, rather than organizational structure within DWR's Division of Flood Management.

The implementation plan focuses on flood management work required over approximately the next 5 years, but also provides long-term direction to 2025 and beyond. Much of this work is directly related to improving the SPFC. The seven functional areas are as follows:

- Flood emergency response
- O&M and environmental stewardship
- Floodplain risk management
- Flood protection projects and project grants
- Evaluation and engineering
- Flood management planning and conservation strategy
- Legislation, budget, and communication

8.3 California Levees Roundtable

The Roundtable was created through an effort by officials at the Board following the successful Levee Vegetation Science Conference organized by SAFCA, DWR, and USACE in August 2007. The Roundtable comprises senior-level officials representing USACE from Headquarters, the South Pacific Division, and the Sacramento District, and the Board, DWR, NMFS, USFWS, DFG, RD 2068, and SAFCA. The Roundtable agencies worked together to prepare a short-term framework, the *California Central Valley Flood System Improvement Framework* (California Levees Roundtable, 2009), for flood system improvements that are already underway or will be initiated before a comprehensive plan is ready in 2012. The report was adopted by the Board.

The Roundtable continues to meet at the management level to cooperatively address the multiagency issues facing the flood management system.

8.4 Flood Control System Status Report

In 2007, the State Legislature authorized DWR, in Section 9120 of the CWC, to prepare an FCSSR for the SPFC, which is to provide a complete description and analysis of the SPFC, identification of evident deficiencies, and recommendations for improving the performance of the system.

In part, Section 9120 of the CWC states the following:

> *§9120. (a) The department shall prepare and the board shall adopt a flood control system status report for the State Plan of Flood Control. This status report shall be updated periodically, as determined by the board. For the purpose of preparing the report, the department shall inspect the project levees and review available information to ascertain whether there are evident deficiencies.*
>
> *(b) The status report shall include identification and description of each facility, an estimate of the risk of levee failure, a discussion of the inspection and review undertaken pursuant to subdivision (a), and appropriate recommendations regarding the levees and future work activities.*

The FCSSR contains information on the current status of the SPFC.

8.5 Central Valley Flood Protection Plan

The CVFPP will be a sustainable, integrated flood management plan describing existing flood risk in the Sacramento and San Joaquin River watersheds, and recommending actions to reduce the probability and consequences of flooding. The CVFPP

will include the entire flood management system, of which the SPFC is a part. The CVFPP will also identify mutual goals, objectives, and constraints important in the planning process; distinguish plan elements that address mutual flood risks; and recommend improvements to the State-federal flood management system.

Primary authorization for the CVFPP originates in SB 5, also known as the Central Valley Flood Protection Act of 2008, resulting in specific requirements described in Division 5, Part 6 in the CWC Sections 9600 through 9625. According to the legislation, DWR is to prepare the CVFPP by January 1, 2012, for adoption by the Board. The Board is to hold public hearings and adopt the CVFPP by July 2012 (CWC Section 9612(b)). The CVFPP is to be updated every 5 years thereafter. At the time of this report, the 2012 CVFPP is being prepared as a long-term planning document, to accomplish the following:

- Create a broadly supported plan for improving integrated flood management in Central Valley
- Promote understanding related to integrated flood management from State, federal, local, regional, tribal and other perspectives
- Develop new data and information that can be shared for many purposes

The CVFPP will support and guide many implementation activities by local, State, and federal agencies for subsequent feasibility studies, environmental compliance, design, and construction. Development of the CVFPP will be coordinated closely with USACE's *Central Valley Integrated Flood Management Study*.

The 2012 CVFPP is to be a descriptive document and reflect a systemwide approach to protecting areas of the Sacramento and San Joaquin River watersheds currently receiving protection from flooding by existing facilities of the SPFC. In addition, the CVFPP will include a prioritized list, schedule of implementation, and recommendations on both structural and nonstructural means for improving performance and eliminating deficiencies of flood management facilities, and addressing ecosystem and other water-related objectives.

8.6 Ongoing Evaluations, Projects, and Repairs

As part of DWR's FloodSAFE initiative, work is underway by DWR's Division of Flood Management on evaluation and engineering assessments of existing flood management facilities to identify deficiencies and needed improvements. Ongoing evaluations, projects, and repairs are detailed in the FCSSR, and updates to the SPFC related to that work will be included in updates to the FCSSR.

8.6.1 Urban Levee Evaluations

One of the highest priorities of the FloodSAFE initiative is the evaluation of levees protecting urban areas with populations greater than 10,000 residents. The Urban Levee Evaluations (ULE) Project is performing a geotechnical evaluation on approximately 350 miles of the State-federal levee system of the Sacramento and San Joaquin Flood Control Projects (project levees), focusing on levees protecting the approximate urban areas of Sutter Basin, Marysville, RD 784, Woodland, Natomas, West Sacramento, Davis, San Joaquin Area Flood Control Agency, RD 404, and RD 17. As part of a systemwide approach, ULE is also performing the same evaluation of about 120 miles of nonproject levees that protect the same urban areas. This project consists of geotechnical exploration, testing, and analysis required to evaluate the performance and safety of existing urban project and nonproject levees, and prefeasibility-level designs and cost estimates for potential levee repairs where deficiencies are noted.

8.6.2 Non-Urban Levee Evaluations

DWR's Non-Urban Levee Evaluations (NULE) Project is evaluating more than 1,200 miles of nonurban State-federal project levees and approximately 400 miles of appurtenant nonurban, nonproject levees to determine if they meet defined geotechnical criteria and, where needed, to identify remedial measures and develop corresponding cost estimates to meet those criteria.

8.6.3 Systemwide Modeling

DWR and USACE are evaluating hydrologic and hydraulic information throughout the system to determine flood flows and elevations during different frequency flood events. A variety of other system evaluations will assist work to prepare the CVFPP.

8.6.4 Levee Repairs

Existing levees can have critical problems that could lead to failure during high-water events. Repair of these sites is needed regardless of other planned system improvements. Repairs can be made if the benefit/cost ratio is greater than 1. The Critical Levee Repair Program was established by DWR to carry out critical levee repair work authorized by the 2006 Disaster Preparedness and Flood Prevention Bond Act. Certain levees have already been identified as needing repair as a result of existing inspection programs and problems encountered during recent high-water events. Completed repairs are expected to correct deficiencies, including, but not limited to, underseepage, insufficient freeboard, unchecked erosion, and instability. This work will complete levee and erosion repairs begun under AB 142 funding, and correct deficient levees identified by other programs. The current status of levee repairs to address identified deficiencies is included in the FCSSR.

- Levee Repairs – Levee repairs can be made when urgent underseepage and slope instability problems exist in an existing levee. The work includes repairs of levee structural problems, exclusive of erosion repairs under the following component. Designs will be developed to repair basic levee deficiencies but not necessarily to increase levels of protection beyond the original levee design. This includes levee stability repairs and work funded by Public Law 84-99, Rehabilitation Assistance.
- Erosion Control – Actions to arrest erosion have been taken under the SRBPP and San Joaquin River Erosion Protection Program. Since 2006, DWR has spent $300 million and USACE has spent $140 million for a total of 116 critical and 149 proactive noncritical levee erosion sites. Currently, approximately 161 erosion sites have been identified by USACE as needing bank protection.

9.0 Observations

Because this SPFC Descriptive Document is intended as a reference document for the existing SPFC, no recommendations for improvements are provided. However, during compilation of material for the document, some observations could be made to facilitate presentation of SPFC materials.

1. While SPFC property right records are based on physically accessing information about a specific parcel of land, electronic access to that information and electronic representation would make the information more useful.
2. Easements along levee toes appear insufficient. A plan for securing needed easements, including access to various levee reaches, as part of the CVFPP, could improve long-term O&M of the SPFC. The State and LMAs may not have the necessary land rights to operate and maintain SPFC facilities as intended.
3. Some of the bank protection sites along the Red Bluff to Chico Landing reach of the Sacramento River (O&M Manual SAC512) no longer appear to be effective but are still part of the SPFC. These may be candidate features for removal from the SPFC.
4. While some O&M manuals include information on improvements since original construction, other O&M manuals may not be up to date and could benefit from this supplemental information.
5. There may be supplemental O&M manuals that have either not been located or have not been produced.
6. Unpermitted encroachments on SPFC facilities are incompatible with O&M of SPFC facilities and should be removed.
7. Some projects like Salt Creek, McClure Creek, and Dry Creek at Adin currently meet the definition of the SPFC, but clearly perform no significant function regarding the flood control system as a whole along the Sacramento River, and perhaps are candidates for removal from the SPFC.
8. River mile numbers for the 1957 Revised Profile Drawings for the SRFCP and other sources are not consistent (USACE, 1957a).
9. Design flood flows contained in O&M manuals are often different than design flows obtained from the 1957 Revised Profile Drawings. In addition, results from local, State, federal, and agency studies indicate that actual flow capacities at time of project completion do not agree with either the O&M design capacities or 1957 design flood capacities, in many cases.
10. DWR operates SPFC facilities based on the 1957 and 1955 profiles rather than on design flows from the O&M manuals, but it is unknown if the Board officially adopted the profiles for operation.
11. USACE use of uncertainty analysis to characterize the system is inconsistent with the system's characterization in the O&M manuals. Future reconciliation may be required.
12. Channel maintenance responsibilities for much of the San Joaquin River Flood Control System should be more clearly identified.
13. The 1991 Aerial Atlas should be updated as a reference document, and coverage extended to include tributary streams.

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10.0 Acronyms and Abbreviations

1955 Profile	San Joaquin River and Tributaries Project, California, Levee Profiles
1957 Revised Profile Drawings	Sacramento River Flood Control Project, California, Levee and Channel Profiles
AB	Assembly Bill
Board	The Reclamation Board or Central Valley Flood Protection Board
CALEMA	California Emergency Management Agency
CCC	California Civil Code
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLD	California Levee Database
CVFPP	Central Valley Flood Protection Plan
CWC	California Water Code
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game
DVD	digital versatile disc
DWR	California Department of Water Resources
EIP	Early Implementation Program
EM	Engineering Manual
ETL	Engineering Technical Letter
facilities	flood control projects and works
FCSSR	Flood Control System Status Report
FEMA	Federal Emergency Management Agency
FloodSAFE	FloodSAFE California initiative
FOC	Flood Operations Center
FRS	Flood Relief Structure
GIS	geographic information system
HD	U.S. House document
LCA	Local Cooperation Agreement
LMA	local maintaining agency
LPCA	Local Project Cooperation Agreement
LPPA	Local Project Partnership Agreement
MA	maintenance area
MOU	Memorandum of Understanding
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NLIP	Natomas Levee Improvement Project

NMFS	National Marine Fisheries Services
NULE	Non-Urban Levee Evaluations
NWS	National Weather Service
O&M	operations and maintenance
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
PCA	Project Cooperation Agreement
PPA	Project Partnership Agreement
Proposition 1E	Disaster Preparedness and Flood Prevention Act of 2006
RD	Reclamation District
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RIP	Rehabilitation and Inspection Program
Roundtable	California Levees Roundtable
SAFCA	Sacramento Area Flood Control Agency
SD	U.S. Senate document
SPFC	State Plan of Flood Control
SRBPP	Sacramento River Bank Protection Project
SRFCP	Sacramento River Flood Control Project
SSJDD	Sacramento-San Joaquin Drainage District
State	State of California
TRLIA	Three Rivers Levee Improvement Authority
ULE	Urban Levee Evaluations
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WPRR	Western Pacific Railroad
WRDA	Water Resources Development Act
WSAFCA	West Sacramento Area Flood Control Agency

11.0 References

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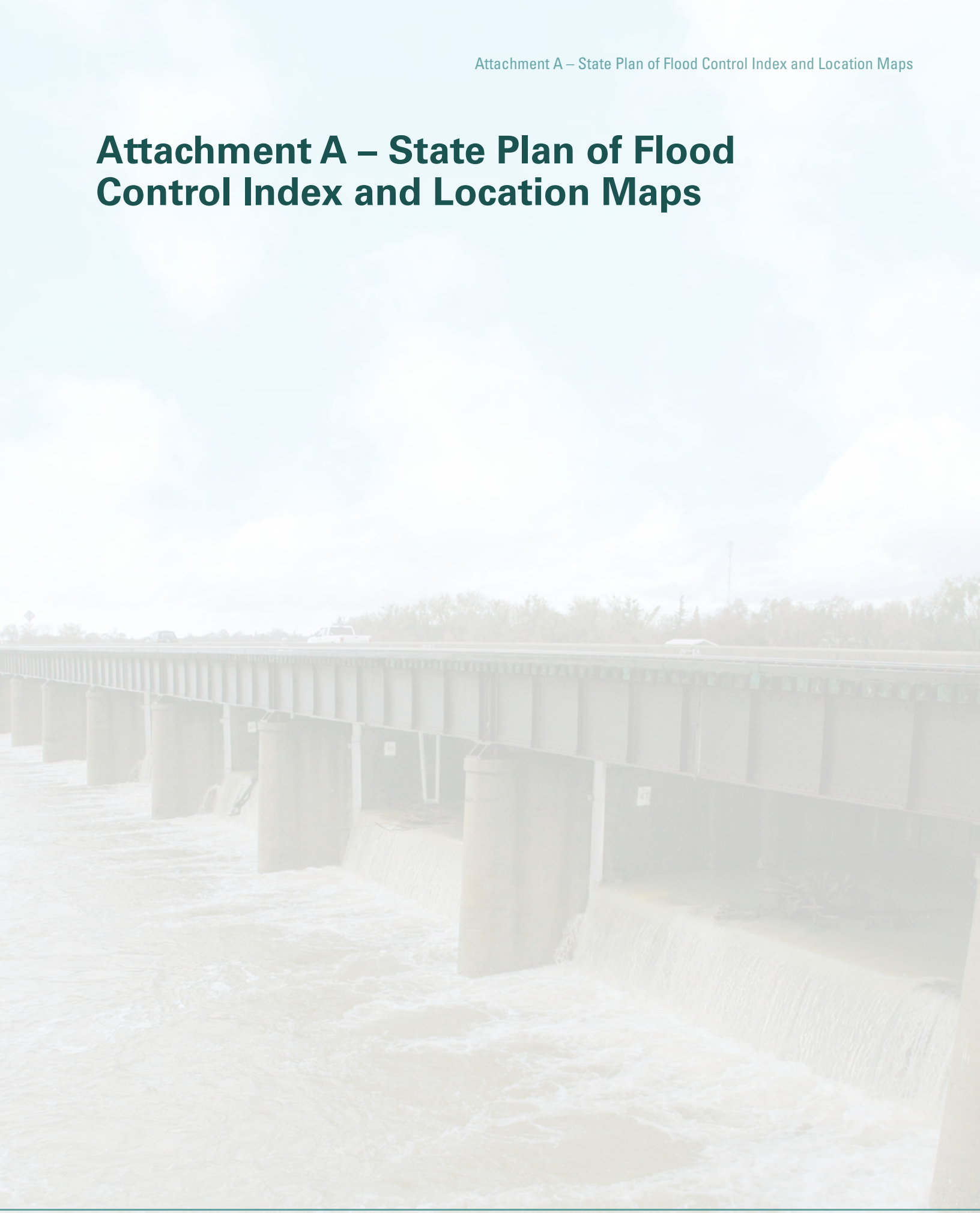
Attachment A – State Plan of Flood Control Index and Location Maps



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Attachment A – State Plan of Flood Control Index and Location Maps

On the following pages are an index map and eight location maps that illustrate features of the State Plan of Flood Control (SPFC) and important related features in the Central Valley. Following the map showing Details 1A, IB and 1C are seven maps of SPFC facilities, all at the same scale, starting from the northern end of the Central Valley near Red Bluff and continuing south to the San Joaquin River near Gravelly Ford. In addition to showing levees and related SPFC features, these maps also show important non-SPFC levees as they are on the ground in a geographic coordinate system using geographic information system (GIS) data.

- Details 1A – 1C. Map of three outlying projects: North Fork Feather River Near Chester, Middle Creek, and Adin Channel Clearing.
- Detail 2. Sacramento River from Red Bluff to the Parrott Plug Relief Structure.
- Detail 3. Sacramento River from the Parrott Plug Relief Structure to the Tisdale Bypass, Sutter Bypass, Butte Overflow Basin, and the Feather River.
- Detail 4. Sacramento River from Tisdale Bypass to Elk Slough, the American River, and Yolo Bypass.
- Detail 5. Sacramento River from Elk Slough to Collinsville.
- Detail 6. San Joaquin River from Disappointment Slough to Old River.
- Detail 7. San Joaquin River from Old River to the Mariposa Bypass.
- Detail 8. San Joaquin River from the Mariposa Bypass to high ground near Gravelly Ford, and Eastside and Chowchilla bypasses.

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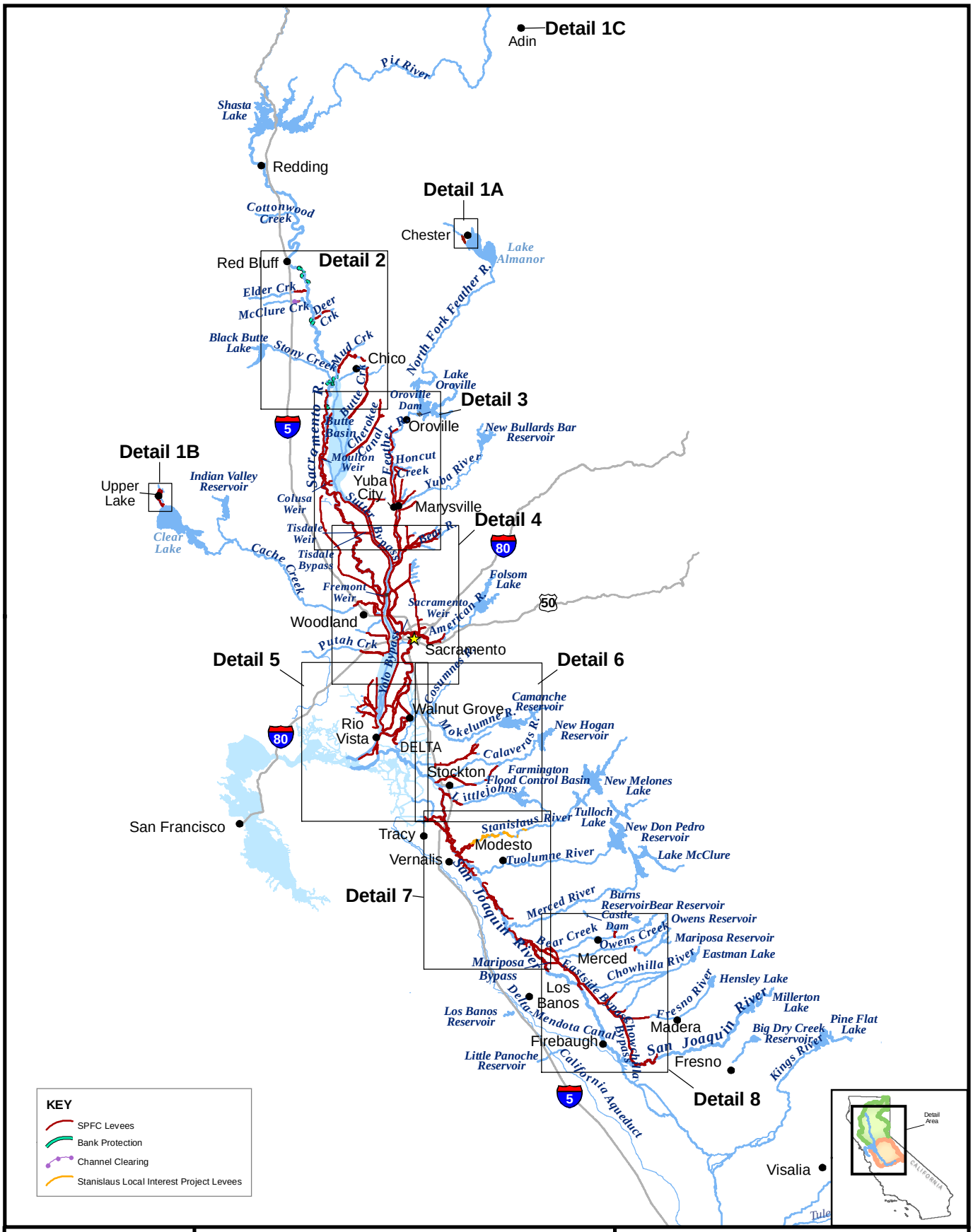

1 " = 40 miles

Miles

0 10 20 40

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Zone:
Sources:

Projection: Teal Albers
Units: Meters

State Plan of Flood Control Descriptive Document

Sacramento and San Joaquin River Basins Showing the Areal Extents of Details 1A through 8

FloodSAFE CALIFORNIA

DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Index Map
Job No.:	Date: October 14, 2010
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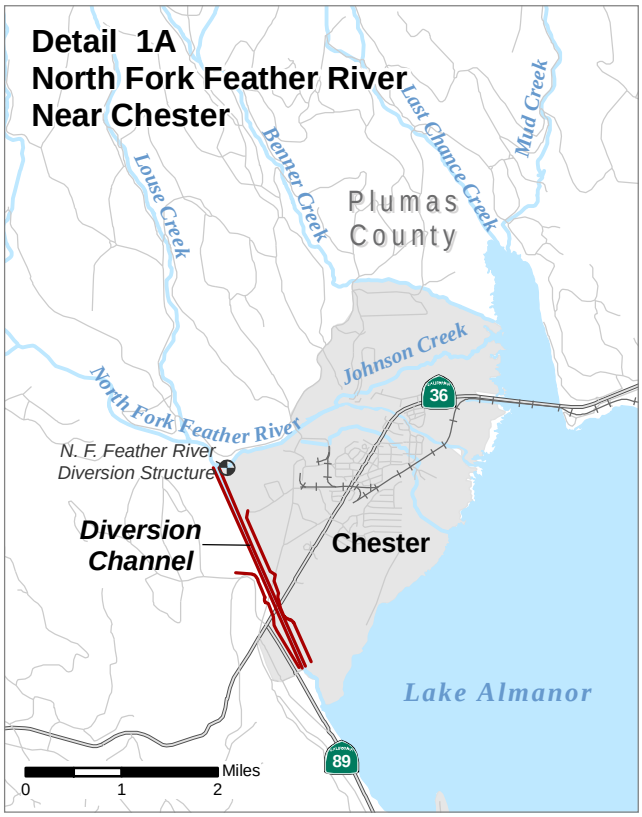

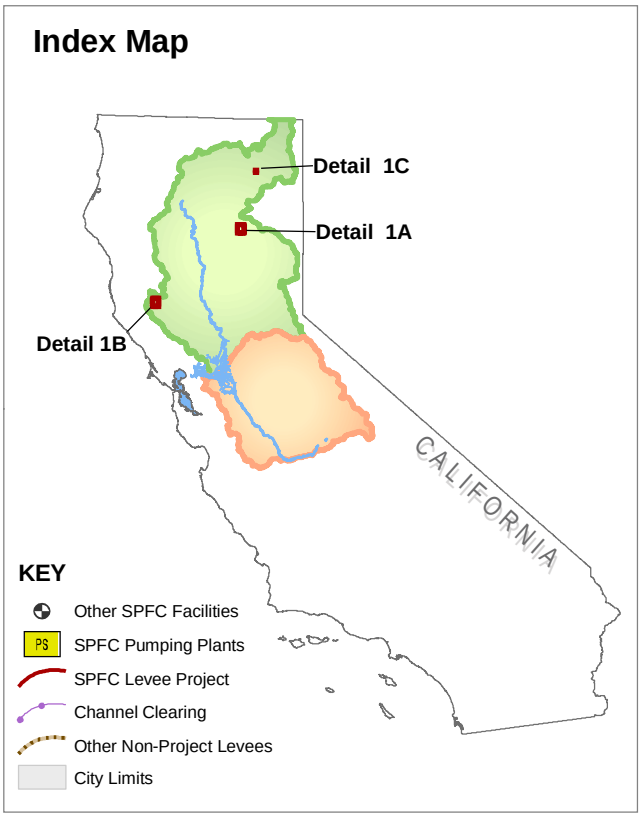

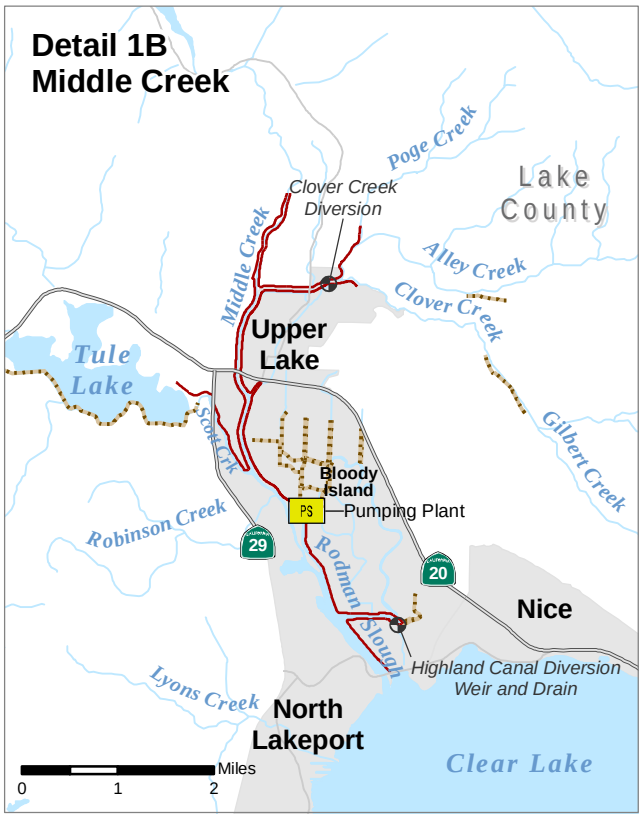

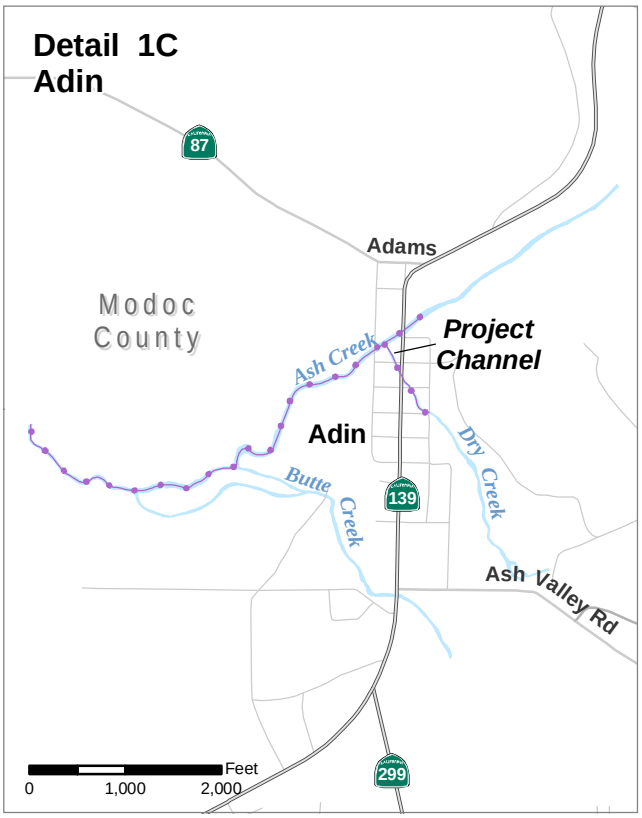

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Sources:

Projection: Teale Albers
Units: Meters

State Plan of Flood Control Descriptive Document

Map of three outlying projects, North Fork Feather River Near Chester, Middle Creek and Adin Channel Clearing.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 1A-1C
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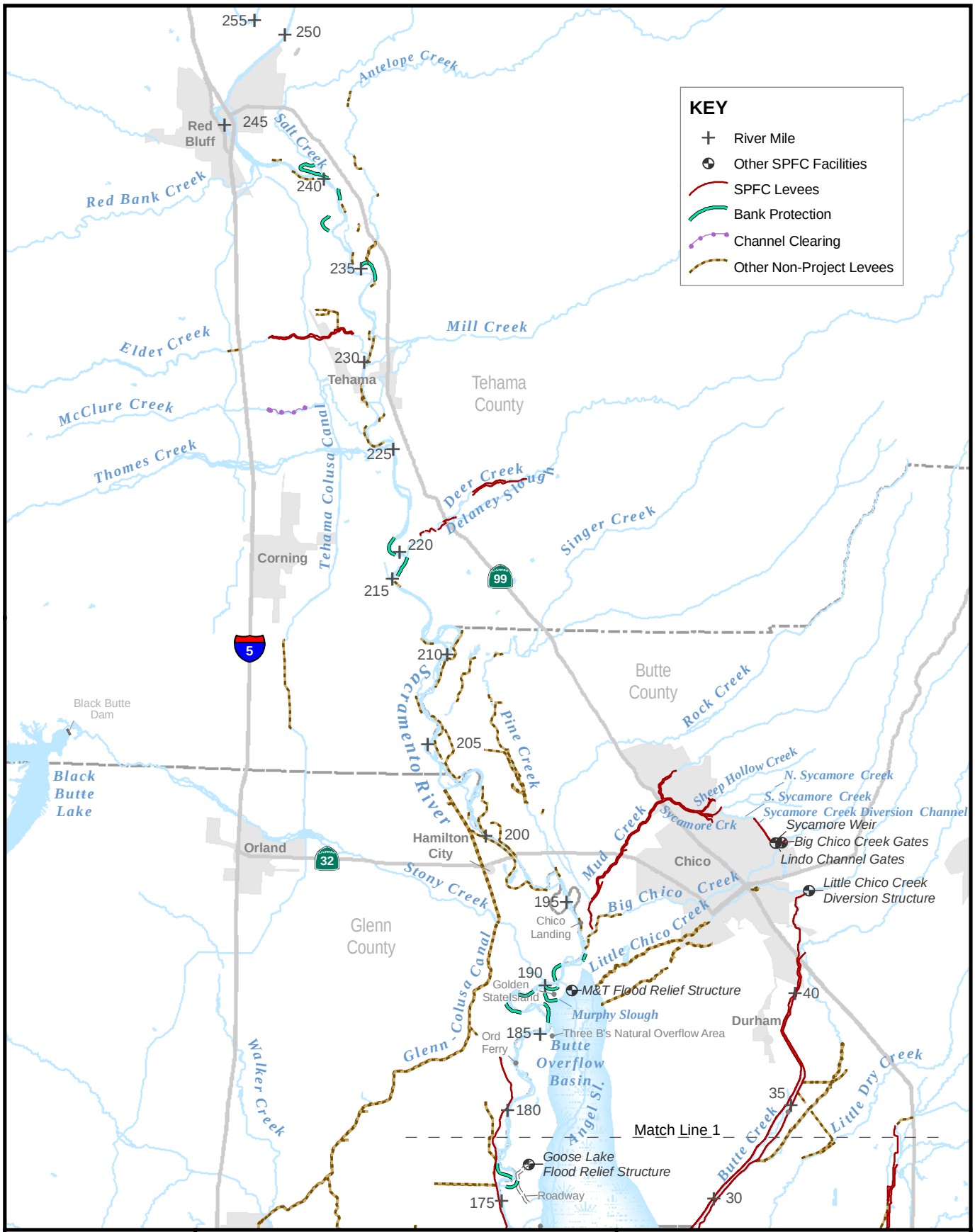

1 " = 5.5 miles

Miles

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Datum: NAD83
Zone:
Sources:

Projection: Teal Albers
Units: Meters

State Plan of Flood Control Descriptive Document

Sacramento River from Red Bluff to the Goose Lake Flood Relief Structure.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 2
Job No.:	Date: October 13, 2010
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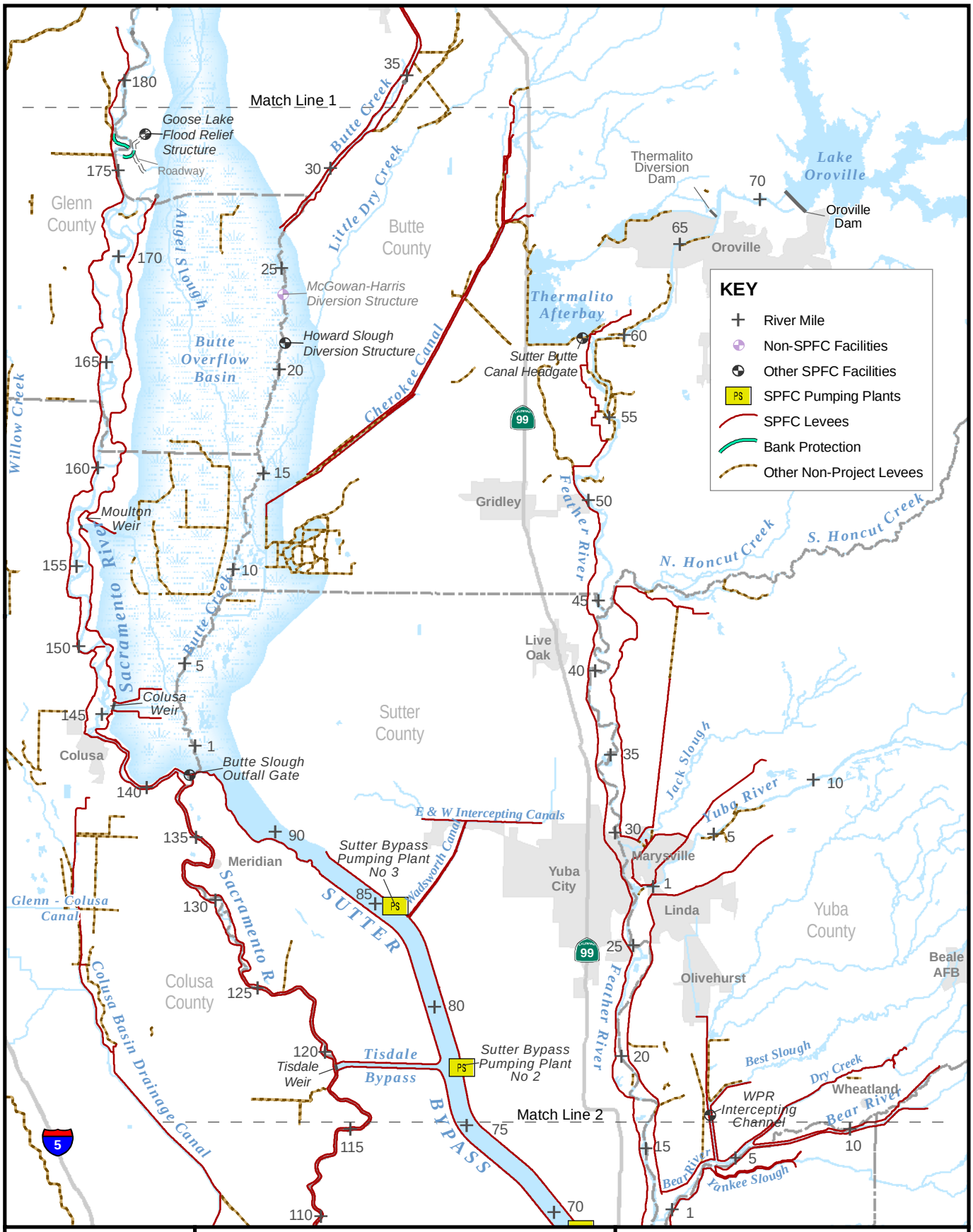

1 " = 5.5 miles

Miles

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Datum: NAD83
Zone:
Sources:

Projection: Teale Albers
Units: Meters

State Plan of Flood Control Descriptive Document

Sacramento River from the Goose Lake Flood Relief Structure to the Tisdale Bypass, Sutter Bypass,Butte Overflow Basin and the Feather River.

FloodSAFE CALIFORNIA

DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 3
Job No.:	Date: October 13, 2010
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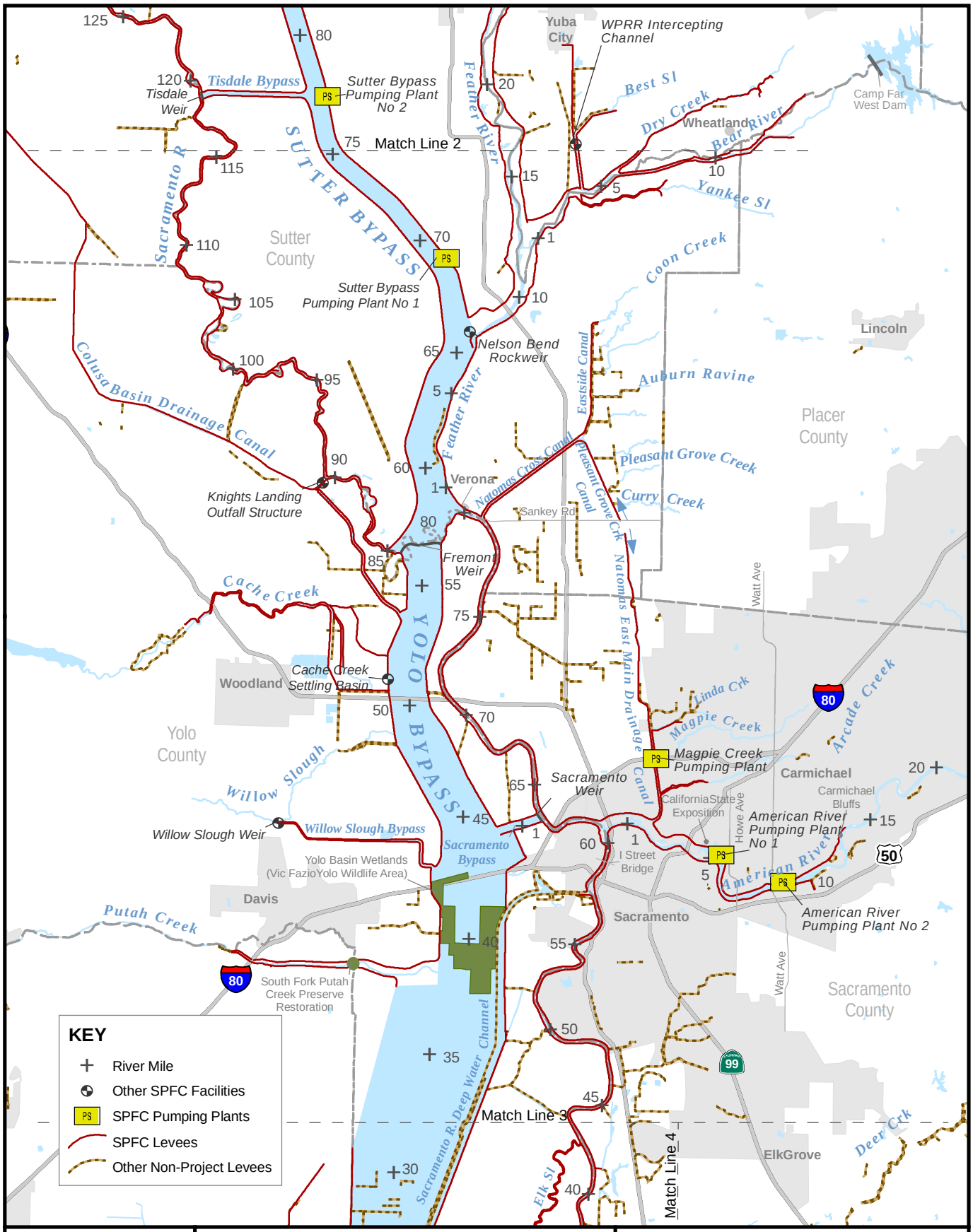

1 " = 5.5 miles

Miles

0 1.375 2.75 5.5

Datum: NAD83 Projection: Teale Albers
Zone: Units: Meters
Sources: State of California Levee Database

State Plan of Flood Control Descriptive Document

Sacramento River from Tisdale Bypass to Elk Slough, the American River and Yolo Bypass.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 4
Job No.:	Date: November 4, 2010
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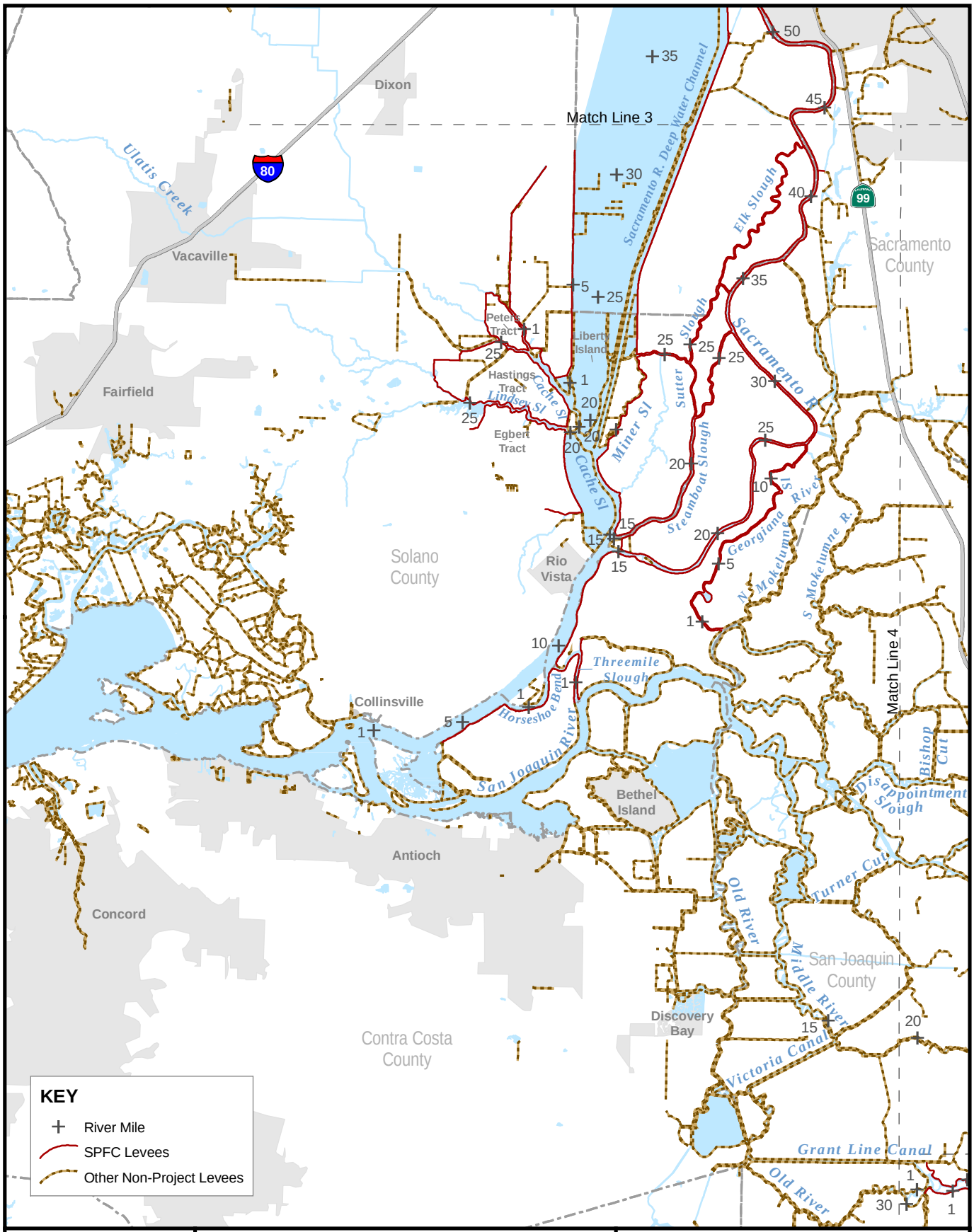

1 " = 5.5 miles

Miles
0 2.75 5.5

Datum: NAD83 Projection: Teale Albers
Zone: Units: Meters
Sources: State of California Levee Database.

State Plan of Flood Control Descriptive Document

Sacramento River from Elk Slough to Collinsville.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 5
Job No.:	Date: July 27, 2010
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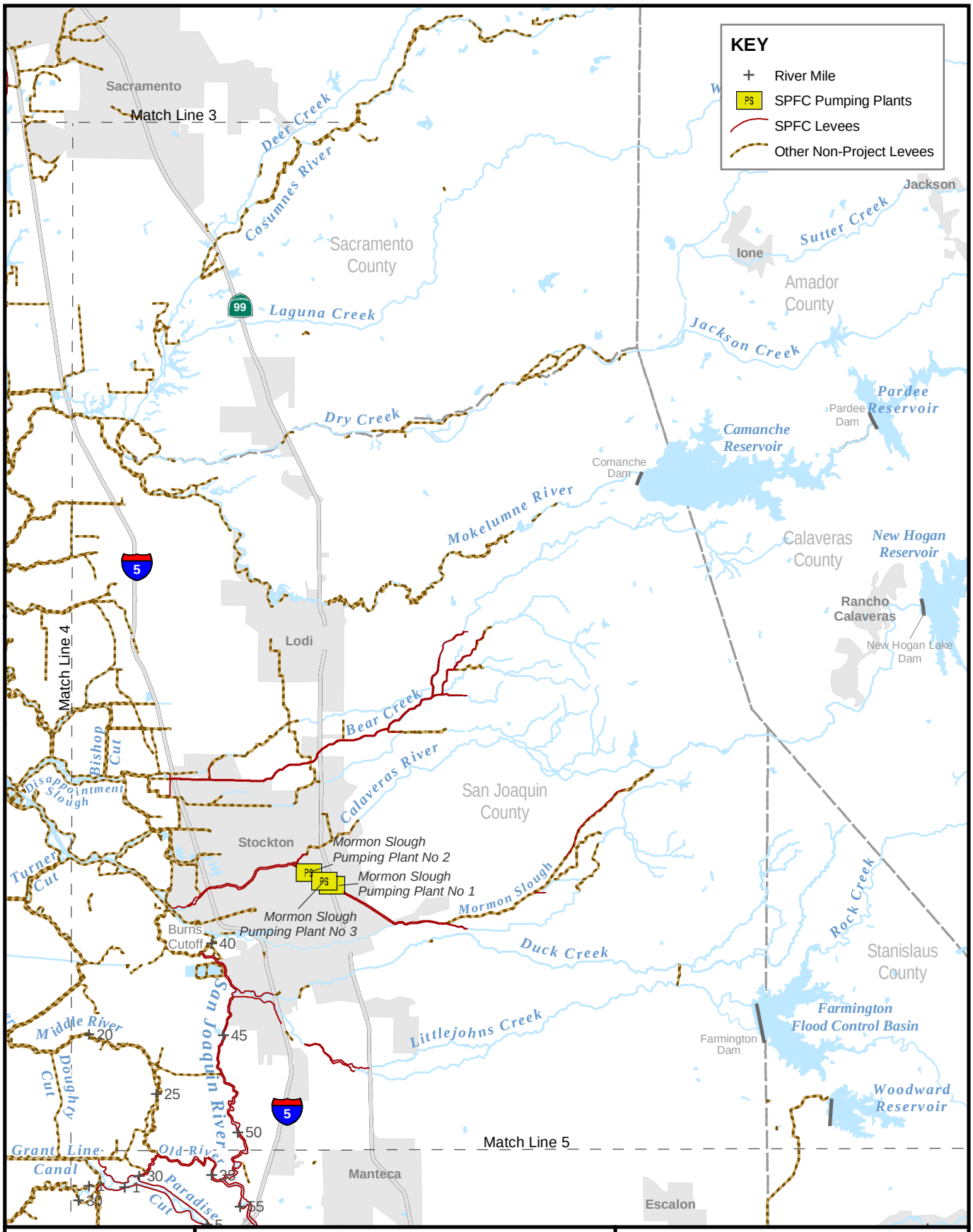

1 " = 5.5 miles

Miles

0 2.75 5.5

Datum: NAD83 Projection: Teale Albers
Zone: Units: Meters
Sources: State of California Levee Database

State Plan of Flood Control Descriptive Document

San Joaquin River from Disappointment Slough to Old River.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 6
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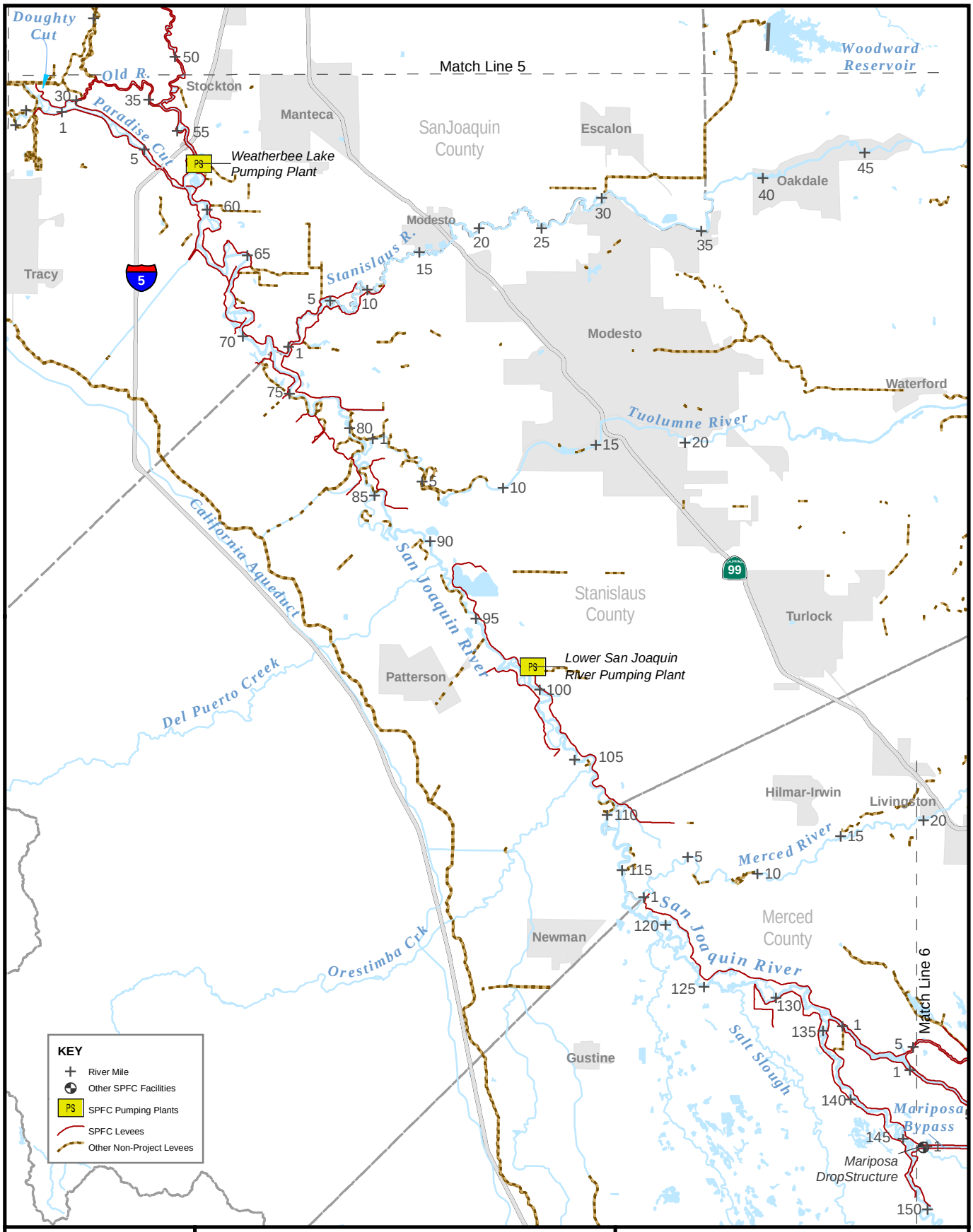

1 " = 5.5 miles

Miles
0 2.75 5.5

Datum: NAD83 Projection: Teale Albers
Zone: Units: Meters
Sources: State of California Levee Database

State Plan of Flood Control Descriptive Document

San Joaquin River from Old River to the Mariposa Bypass.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 7
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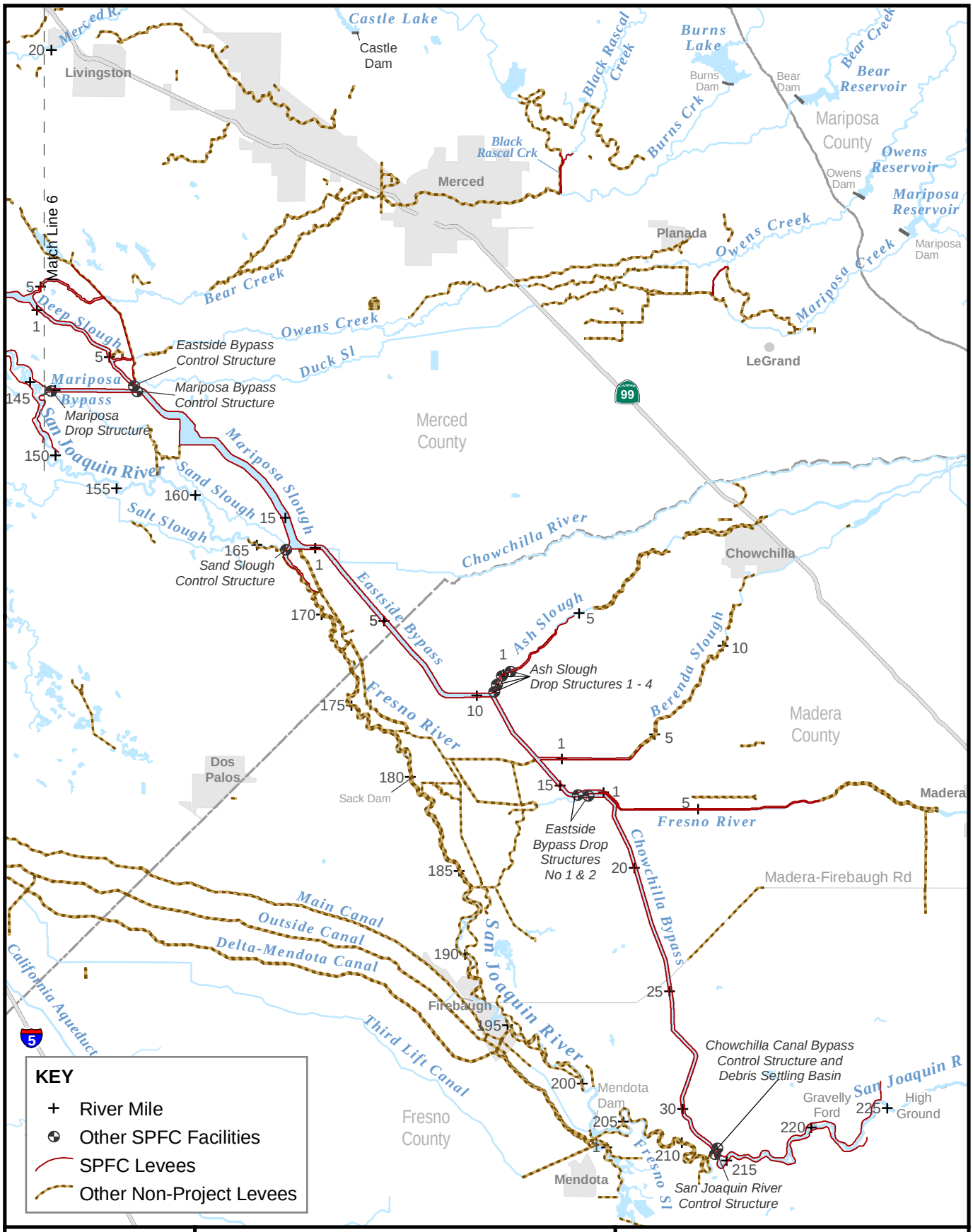

1 " = 5.3 miles

Miles
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Datum: NAD83 Projection: Teale Albers
Zone: Units: Meters
Sources: State of California Levee Database

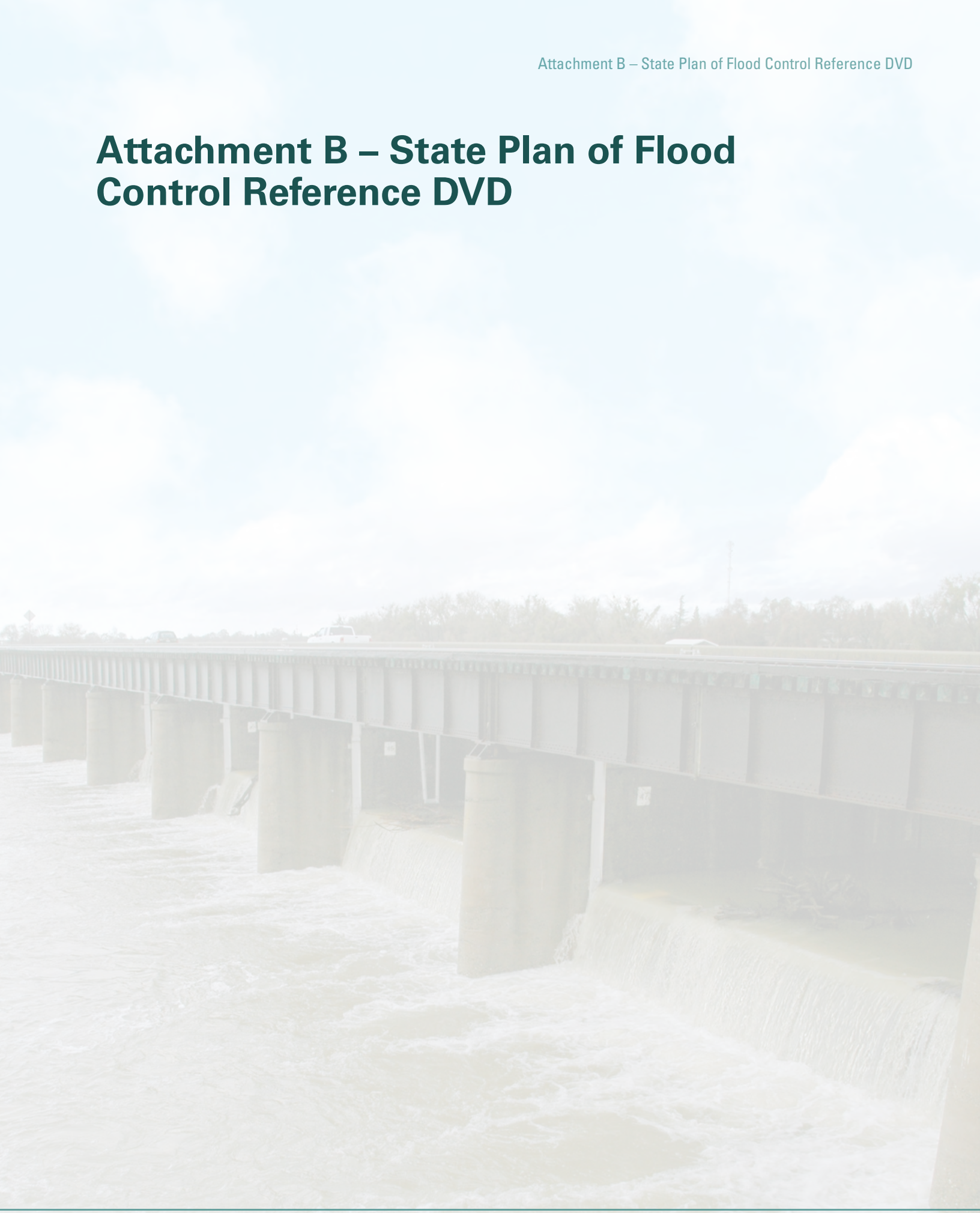
State Plan of Flood Control Descriptive Document

San Joaquin River from the Mariposa Bypass to high ground near Gravelly Ford, Eastside and Chowchilla Bypasses.

FloodSAFE CALIFORNIA DEPARTMENT OF WATER RESOURCES

Prepared By: M Jacobson, M Rabo	Appendix: Detail 8
Job No.:	Date: October 25, 2010
File: Appendix_Detail_8_20101025t.mxd	

Attachment B – State Plan of Flood Control Reference DVD



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Contents of Reference DVD

The 14 documents listed below are included on the reference DVD, which may be found on the following page. Items 1 and 8 are reports that have been prepared as part of the Central Valley Flood Management Planning Program. Item 4 is a collection of operations and maintenance (O&M) manuals for State Plan of Flood Control (SPFC) facilities in the Sacramento and San Joaquin river basins. Item 5 is a collection of interactive maps that show the location of facilities and associated O&M manuals within the geographic areas displayed. The electronic file for an O&M manual can be opened by clicking on the O&M manual labels shown on the maps. Item 6 contains tables for each O&M manual that summarize, in tabular form, the contents of the O&M manuals. Items 9 through 14 contain information that served as the basis for design of the SPFC facilities.

1. *State Plan of Flood Control Descriptive Document.*
2. Federal authorizations and supporting Chief of Engineers reports.
3. *1953 Memorandum of Understanding* (USACE and The Reclamation Board, 1953) and Supplements.
4. O&M manuals (standard and unit-specific).
5. O&M manual map book.
6. O&M tables (summary of facilities and ancillary features).
7. Project agreements
8. *Draft Technical Memorandum, Historical Reference Document for the State Plan of Flood Control* (DWR, 2009a).
9. *Cache Creek Basin California, Middle Creek Project, Stream Profiles* (USACE, 1957b).
10. *Sacramento River Flood Control Project, California, Levee and Channel Profiles* (USACE, 1957a) also known as 1957 Revised Profile Drawings.
11. *San Joaquin River and Tributaries Project, California, Levee Profiles* (USACE, 1955) also known as 1955 Profile.
12. *Mormon Slough Project, San Joaquin County, Plan of Improvement, Profile and Flood Plane* (USACE, 1965).
13. *Sacramento River Flood Control System, Project Design Flows* (form letter from A. Gomez to The Reclamation Board) (USACE, 1969).
14. 2006 letter from USACE to The Reclamation Board regarding allowable vegetation within floodways (USACE, 2006).

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SPFC Reference DVD
November 2010

If missing,
email DWR (CVFMP@water.ca.gov)
to obtain a copy.

DWR
Division of Flood Management
Central Valley Flood Planning Office

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State of California
The Natural Resources Agency
Department of Water Resources