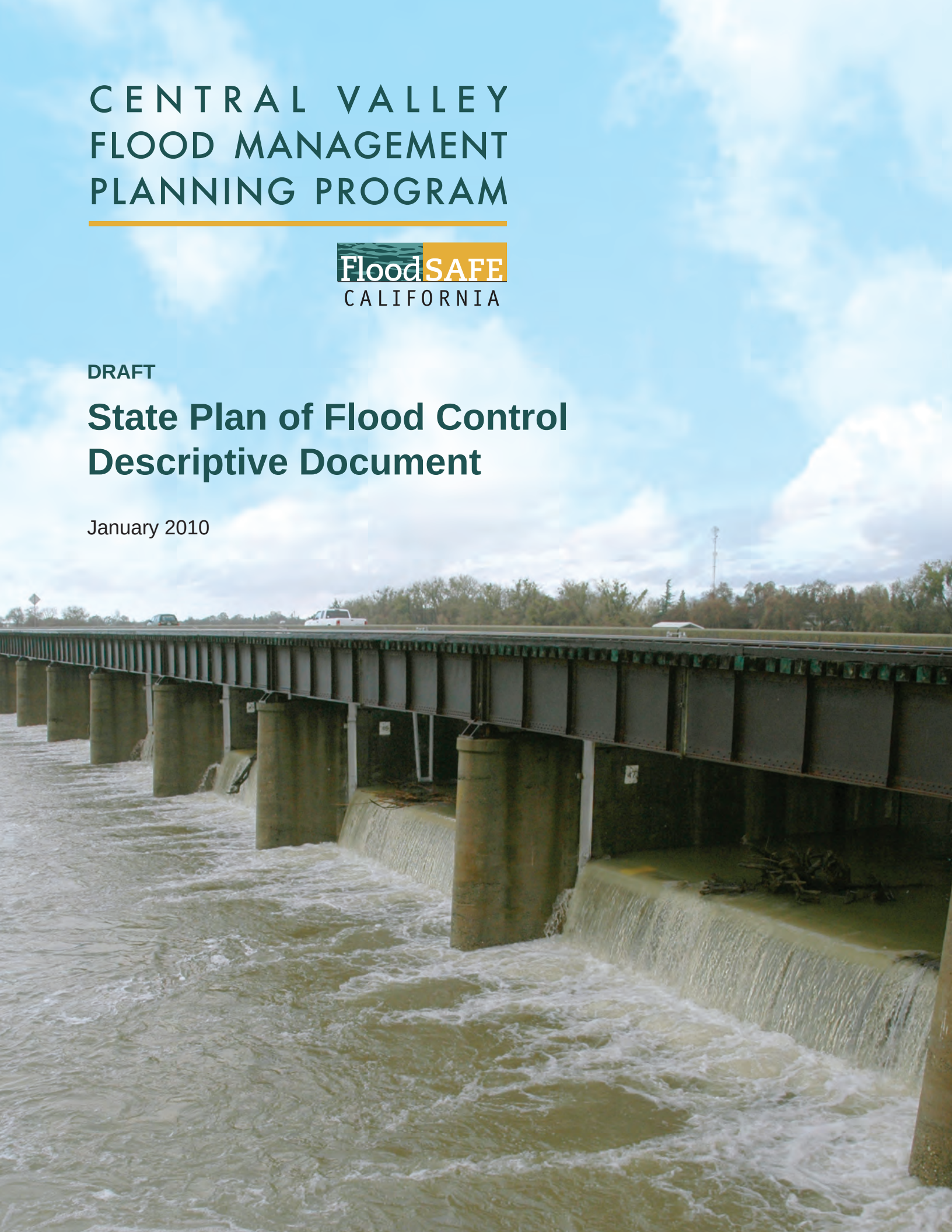
CENTRAL VALLEY
FLOOD MANAGEMENT
PLANNING PROGRAM

FloodSAFE
CALIFORNIA

DRAFT

State Plan of Flood Control Descriptive Document

January 2010



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 existing flood control works (facilities), lands, programs, plans, conditions, and mode of operations and maintenance (O&M) for the State-federal flood protection system in the Central Valley of California. This flood protection system is composed of federally authorized project levees and related facilities for which the State has provided assurances[1] of cooperation to the federal government. These State-provided assurances are an important distinction for what constitutes the State-federal flood protection system since other flood protection facilities in the Central Valley are not covered by State assurances and are not part of the State-federal system.

The Sacramento Weir provided flood protection for the City of Sacramento in1995

Collectively, the facilities, lands, programs, conditions, and mode of O&M for the State-federal flood protection system in the Central Valley are referred to as the State Plan of Flood Control (SPFC). This SPFC Descriptive Document is the first time that an inventory of the SPFC has been compiled or referenced in a single document. 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 and tributaries. 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). 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.

[1] The assurances include that the State provide without cost to the United States, all lands, easements, and rights-of-way necessary for the completion of the 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; and maintain and operate all works after they are completed.

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 to levels that SPFC facilities can mostly handle. Private levees, 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 part of the overall flood protection system. All parts of the system, including the SPFC, depend on other parts of the system to operate as a unit.

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 management system. Some sections include summary sections for readers who only need an overview of the subject. Figure G-1 shows a geographic overview of the SPFC facilities. The 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 authorization for each of the projects that together constitute the SPFC.

3. **SPFC Facilities**. Describes SPFC project works, or facilities, located along the various reaches of the Sacramento and San Joaquin rivers and tributaries. 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.

Overview of SPFC

Project Works (Facilities)

- Approximately 1,600 miles of levees
- Five major weirs spilling floodwaters from the Sacramento River to bypass channels
- Five control structures directing flow in bypass channels along the San Joaquin River
- Six major pumping plants
- Channel improvements
- Bank protection
- Associated facilities, such as stream gages, drainage facilities.

Lands

- Fee title, easements, and agreements for project works and mitigation areas
- Approximately 18,000 parcels

Operations and Maintenance

- Two standard O&M manuals
- 118 unit-specific manuals
- Maintenance by State and local maintaining agencies

Conditions (terms)

- Assurances
- Flood Control Regulations, Part 208.10 of 33, Code of Federal Regulations
- Requirements of standard and unit-specific O&M manuals
- Design profiles (1955 and 1957)
- Project Cooperation Agreements

Programs and Plans

- Historical documents and processes
- As-constructed drawings
- Oversight and management

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

5. **SPFC Operations and Maintenance**. Describes the O&M responsibilities and activities that the State and local maintaining agencies have and implement.

6. **SPFC Conditions**. Describes conditions (terms) under which the State has agreed to abide by 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 the 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 implemented, as changes in O&M are made, or 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 California Department of Water Resources drafting team made several observations that may warrant additional work or research to fill data gaps, may require that information 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 in 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, O&M Map Book, data tables, design water surface profiles, and other supporting documents.

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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 once every 5 to 10 years.

A portion of this complex flood protection system includes federally authorized project levees and related facilities for which the State of California has provided assurances[2] (see Section 1.3) of continued cooperation to the federal government. This portion of the flood management system is known as the State-federal flood protection system.

This report describes the existing flood control works of the State-federal flood protection system in the Central Valley, together with lands, modes of operations and maintenance (O&M) necessary for the system to function, conditions, and programs and plans for the system. Collectively, these are the State Plan of Flood Control (SPFC). While recognizing that the SPFC is only a part of the larger flood protection system for the Central Valley, this report focuses on the SPFC and does not attempt to provide detailed information on non-SPFC facilities.

This section presents introductory information, including the legislative requirement, purpose and scope for the document, a description of State assurances 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 entire flood system.

[2] The assurances include that the State provide without cost to the United States, all lands, easements, and rights-of-way necessary for the completion of the 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; and maintain and operate all works after they are completed.

1.1 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 compiled into a single document. Proposition 1E and Public Resources Code (PRC) Section 5096.805 (j) define the SPFC as follows:

"State Plan of Flood Control" means the state and federal flood control works, lands, programs, plans, conditions, and mode of maintenance and operations of the Sacramento River Flood Control Project described in Section 8350 of the Water Code, 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 of the Water Code for which the board or the department has provided the assurances of nonfederal cooperation to the United States, which shall be updated by the department and compiled into a single document entitled "The State Plan of Flood Control."

California Water Code Section 8350

The approval and adoption, by and on behalf of the State of California, of the conditions, plans, construction, and mode of maintenance and operation of works within the Sacramento River Flood Control Project, set forth in Senate Committee Print, Seventy-fifth Congress, First Session, as authorized and approved by Act of Congress, Public No. 392, Seventy-fifth Congress, approved August 26, 1937, including the holding and saving the United States from damages because of construction works, are continued in effect.

Chapter 2, Part 6, Division 6 of California Water Code Commencing with Section 12648

See http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=12001-13000&file=12648-12670.20

Note: The State did not provide assurances to the Federal government for all projects, commencing with Section 12648.

1.2 Purpose and Scope

The purpose of this report is to serve as the reference document required by Proposition 1E for the project works, lands, programs, plans, conditions, and mode of O&M that encompass the SPFC. This report is not a plan for the future, but a description of what is known about the existing SPFC, with future updates to be prepared as changes are made to the SPFC. The nature of the SPFC makes this compilation of information especially important:

- The State-federal flood protection system in the Central Valley is composed of numerous separate projects along the Sacramento and San Joaquin rivers and tributaries.

- The system has been assembled incrementally since before the first federal authorization for projects in 1917.

- Many of the project 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, one for the Sacramento River and tributaries and one for the San Joaquin River and tributaries, describe O&M requirements for the entire flood system.

- There are 118 separate unit-specific O&M manuals describe projects that make up the State-federal system and specific O&M requirements applicable to each unit of the system.

- Thousands of individual land records define the State's property rights in the SPFC.

- State and local agencies perform O&M in 110 jurisdictional areas.

- Numerous plans and programs have evolved during the life of the State-federal flood protection system in the Central Valley.

- In some cases, responsibility for individual projects has changed and the State no longer provides assurances of cooperation to the federal government – local agencies may have provided assurances directly to the federal government.

Because of the incremental nature of building the system over many decades and the system's evolution, all available information was not available in a single location, prompting preparation of this report. The following sections describe 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 details can be found. For example, a given mile reach of levee may have many other associated features 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 all these 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 directly in the following sections.

1.3 State Assurances to the Federal Government

An important distinction of the SPFC is that the State, as the lead nonfederal sponsor, has given assurances of cooperation to the federal

government. At a minimum, the assurances include that the State provide without cost to the United States, all lands, easements, and rights-of-way necessary for the completion of the 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; and maintain and operate all works after they are completed. Depending on when a facility was authorized (Congressional authorization) and constructed, there could be additional assurances (see unit-specific O&M manuals in the reference DVD).

The acceptance of projects and assurances of cooperation are included in the unit-specific O&M manuals (see reference DVD), and are provided by State legislation, as contained in various portions of the California Water Code (CWC). Each O&M manual for a project shows when the project was transferred from the federal government to the State. Most manuals include a letter, or letters, of acceptance of the project by The Reclamation Board (now the Central Valley Flood Protection Board, or Board).

The State has not provided assurances for all parts of the flood protection system in the Central Valley. This SPFC Descriptive Document does not include details on local projects, multipurpose projects, or other projects without State assurances because those projects are not part of the SPFC. It 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 directly to the federal government, the projects are not considered part of the SPFC.

The State's authorities and responsibilities for providing O&M are codified in the CWC, Sections 8350 through 9577 and Sections 12878 through 12878.45, inclusive.

1.4 Local Assurances to the State

For most units of the flood protection system, the responsibility for O&M has been transferred from the State to local maintaining agencies by way of a letter from the State (The Reclamation Board or Board, depending on when the transfer occurred). The transfer letter generally refers to a local project cooperation agreement that outlines what the local agency agrees to for the project, including its nonfederal cost share, O&M responsibilities, hold harmless provisions, and other cooperation.

1.5 SPFC Planning Area and Systemwide Planning Area

The SPFC Planning Area, defined as the geographic area that includes the lands currently receiving protection from the SPFC, encompasses the watershed areas of the two major river systems of the Central Valley – the Sacramento and the San Joaquin rivers with a combined drainage area of more than 45,000 square miles (see Figure 1-1). Areas outside the watersheds of the Sacramento and San Joaquin rivers are excluded from the SPFC. The planning area does not include lands or features within the Tulare Lake Basin, such as the Kings River watershed, but intermittent flood flows from this area enter the San Joaquin River when Pine Flat Dam makes flood releases.

The existing State-federal flood management system in the SPFC Planning Area influences flooding and flood management on more than 2.2 million acres (3,400 square miles) of land within the Central Valley. Local and regional flood management facilities and projects reduce flooding to additional valley land in both urban and rural areas. The geographic area that includes land subject to flooding under the current facilities and operation of the Sacramento-San Joaquin River Flood Management System[3] is referred to as the Systemwide Planning Area.

[3] California Water Code Section 9611 defines the Sacramento-San Joaquin River Flood Management System as the system that includes the facilities of the State Plan of Flood Control, as amended, and any existing dam, levee, or other flood management facility that is not part of the State Plan of Flood Control if the board determines, upon recommendation of the department, that the facility does one or more of the following: (1) Provides significant systemwide benefits for managing flood risks within the Sacramento-San Joaquin Valley; and (2) Protects urban areas within the Sacramento-San Joaquin Valley (where urban area herein is defined as "*any contiguous area in which more than 10,000 residents are protected by project levees*").

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

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 of 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 mostly handle – without these reservoirs, flows could overwhelm SPFC facilities frequently. In addition, 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 all parts of the system to operate as a unit.

Since this report is structured as a reference document for the SPFC, it does not provide detailed information on non-SPFC facilities of the system. However, it does provide short descriptions of other non-SPFC flood protection projects in Sections 2.3 and 2.4. More detailed system descriptions, including the interrelation 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).

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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. 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 project that began when Congress authorized the Sacramento River Flood Control Project (SRFCP) in the Flood Control Act of 1917.

This section presents federal authorizations for the existing State-federal flood protection projects included in the SPFC. Also mentioned are other portions of the flood management system (see Sections 2.3 and 2.4) that are important for overall flood management, but are not part of the SPFC because they do not carry State assurances of cooperation to the federal government. However, 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. A more extensive history of the flood system is included in the Technical Memorandum, Draft Historical Reference Document for the State Plan of Flood Control (DWR, 2009a).

2.1 Summary

The SPFC is composed of many different projects authorized in federal legislation. Table 2-1 summarizes these projects, organized under the Sacramento River and San Joaquin River watersheds. The table includes the federal acts, public law numbers, and Chief of Engineers Report (generally printed as U.S. House documents (HD) or U.S. Senate documents (SD)) numbers pertaining to each SPFC project. The table also indicates whether the project (or portions thereof) is included in the SPFC. Figure 2-1 shows general project locations.

In addition, there have been authorizations for other flood management projects that are not listed in this chapter because the projects have not been officially incorporated in the SPFC at the time of this writing. Some of these projects may be include as SPFC facilities in the future.

Table 2-1. Summary of Federal Authorized and Constructed State Plan of Flood Control Projects

Project	Federal Act	Public Law	Chief of Engineers Report	Included in the State Plan of Flood Control
Sacramento River Flood Control Project				**yes**
	FCA 1917	64-367	HD 62-81 RHCD 63-5	
	FCA 1928	70-391	SD 69-23	
	RHA 1937	75-352	SCCD 75th Congress	
	FCA 1941	77-205	HD 77-205	
Sacramento River and Major and Minor Tributaries Project				**yes**
	FCA 1944	78-534	HD 78-649	
	FCA 1950	81-516		
American River Flood Control Project				**yes**
	FCA 1954			
Sacramento River – Chico Landing to Red Bluff				**yes**
	FCA 1950	81-516		
	FCA 1958	85-500	HD 84-272	
Adin Project				**yes**
	FCA 1937	75-352		
	FCA 1954			
Middle Creek Project				**yes**
	FCA 1954		HD 81-367	
McClure Creek Project				**yes**
	FCA 1937	75-352		
	FCA 1950	81-516		
Salt Creek Project				**yes**
	FCA 1937	75-352		
	FCA 1954			
Lake Oroville Project				**yes**
	FCA 1958	85-500		
Sacramento River Bank Protection Project				**yes**
	FCA 1960	86-645		
North Fork Feather River Project				**yes**
	FCA 1968	90-483	HD 90-314	

Table 2-1. Summary of Federal Authorized and Constructed State Plan of Flood Control Projects (Contd.)

Project	Federal Act	Public Law	Chief of Engineers Report	Included in the State Plan of Flood Control
Lower San Joaquin River and Tributaries Project				**yes**
	FCA 1944	78-534		
	FCA 1950	84-327		
Buchanan Dam and Eastman Lake Project				**channel work only**
	FCA 1962	87-874	SD 98	
Hidden Dam and Hensely Lake Project				**channel work only**
	FCA 1962	87-874	SD 37	
Merced County Stream Group Project				**Castle Dam and levees along diversion canals only**
	FCA 1944	78-534		
	FCA 1970	91-611		
Bear Creek Project				**yes**
	FCA 1944	78-534	HD 545	
Littlejohns Creek and Calaveras River Stream Group Project				**yes**
	FCA 1944	78-534	HD 545	
Farmington Reservoir Project				**channel work only**
	FCA 1944	78-534	HD 545	
Mormon Slough Project				**yes**
	FCA 1962	87-874	HD 576	

Note:
Other federal authorizations for flood management projects may be included in future updates to this State Plan of Flood Control 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:
FCA = Flood Control Act
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 Comprise the State Plan of Flood Control

2.2 Federal Authorizations for Existing State-Federal Flood Protection Projects

This section shows the federal authorizations for each of the existing State-federal flood protection projects included in the SPFC. The projects are organized as Sacramento River Basin projects, San Joaquin River Basin projects, and other facilities with State assurances. While each authorization covers one major project, such as the SRFCP, implementation of the projects generally occurred over time with the construction of various units 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 federal authorizations, some statements on each project's features are included. This information was 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 associated with the following 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 constitute the SPFC are located in the Sacramento River Basin. Federal authorizations for projects described below began in 1917 and extended into the 1980s. Some projects authorized by later federal authorizations may eventually become part of the SPFC.

Sacramento River Flood Control Project

The SRFCP is the core of the flood system along the Sacramento River and tributaries. It includes most of the levees, weirs, control structures, bypass channels, and river channels that make up the SPFC. About 980 miles of levees were involved in the project. Portions of these levees were originally constructed by local interests and 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 Acts of 1928, 1937, and 1941. Cost changes over time are reflected in these acts along with rectification, additions, and deletions.

- **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 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). Some 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 75-332 (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 Memorandum of Understanding (MOU) included levee construction standards for river project levees and bypass levees, and outlined maintenance responsibilities. The plan included 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" Sacramento River Flood Control Project.

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.

The project provided for levee construction and/or channel enlargement of the following minor tributaries of the Sacramento River: Chico and Mud creeks and Sandy Gulch, Butte and Little Chico creeks, Cherokee Canal, Elder Creek, and Deer Creek (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. 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.

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 federal government in the Flood Control Act of 1950, as amended by the Flood Control Act of 1958 (Public Law 85-500, 85th Congress). 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 Reservoir. This reservoir was planned to be constructed soon after the project. The area encompassed by the 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).

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. This project reduces local flood risk.

Lake Oroville Project

Federal participation in the construction of Oroville Dam was authorized by the Flood Control Act of 1958 (Public Law 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 writing).

Sacramento River Bank Protection Project

The Sacramento River Bank Protection Project (SRBPP) was authorized by the Flood Control Act of 1960 (Public Law 86-645, 86th Congress) to repair eroding levees along levee reaches of the Sacramento River. The project modifies the existing SRFCP through a program for bank erosion control works and setback levees within the limits of the existing levee system. Phases I and II have modified the SRFCP through construction of more than 835,000 linear feet of bank protection and setback levees. USACE and the Board will begin investigation of a Phase III in 2010.

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). 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, reduces local flood risk.

Snagging and Clearing Projects

The Continuing Authorities Program allows USACE to respond to a variety of flood problems without the need to obtain 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. Three projects in the Sacramento River Basin are snagging and clearing projects:

- **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 reduces 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 reduces 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 1950. This project reduces local flood risk.

2.2.2 San Joaquin River Basin Projects

Components of the SPFC located in the San Joaquin River Basin include 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 Stream Group Project.

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). 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 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 also reduces 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 for 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, 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. 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). 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 Stream Group Project

Improvement of the Merced County Stream Group was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). The authorization was based on HD 473 (78th Congress). 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 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). 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.

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). 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. 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). This act authorized improvement of Littlejohns Creek and tributaries in accordance with recommendations by the USACE Chief of Engineers in HD 545. 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). The authorization was in accordance with recommendations in HD 574. The USACE Chief of Engineers concurred with these recommendations in his 1962 report. The project includes channel improvements, levees, and pumping plants.

2.3 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 influences operation of the SPFC, especially in reducing flood peak flows through the SPFC levee system. The following information is provided in an overview level of detail to show other projects that function along with the SPFC as a flood protection system.

2.3.1 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 Sacramento River Basin provide credit space for larger downstream multipurpose reservoirs. Major multipurpose storage projects that contribute significantly to flood management are shown in Figure 2-2 and listed in Table 2-2 in chronological order of construction. USACE has participated in 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 California Department of Water Resources (DWR) and USACE during daily operations conferences at the State-federal Flood Operations Center in Sacramento. These conferences lead to voluntary modifications of individual reservoir operating rules to improve overall system operation. In total, these reservoir operations significantly reduce flood flows to the downstream levee system.

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

Table 2-2. Major Multipurpose Reservoir Project Summary

Reservoir	Dam	Date Constructed	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	1,000,000	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	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[3]	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 State Plan of Flood Control 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.
Key:
DWR = California Department of Water Resources
Reclamation = U.S. Department of the Interior, Bureau of Reclamation
USACE = U.S. Army Corps of Engineers

2.3.2 Local and Regional Projects

The federal government has interest in local projects for which local or regional entities, rather than the State, provided assurances.

Yuba River Goldfields

The Yuba River gravel training walls constructed by the California Debris Commission provide substantial flood benefits to the Yuba Basin inhabitants. These facilities are maintained by the federal government.

Chico Landing to Keswick Dam

As discussed above, the bank protection projects from Chico Landing to Red Bluff are part of the SPFC. However, the authorizing legislation provided in the Flood Control Act of 1958 recognized the encroachment of development into the floodplain of the Sacramento River below Keswick Dam – development would ultimately prevent Shasta Dam from being operated to provide the benefits for which it was authorized. Accordingly, HD 272 (84th Congress) required local interests to enact and enforce adequate zoning regulations to prevent construction of permanent improvements within the floodplain.

Glenn, Butte, Tehama, and Shasta counties are involved in the zoning requirement from Chico Landing to Keswick Dam. Glenn, Butte, and Tehama counties adopted ordinances in 1972, 1971, and 1974, respectively, to control development within the 100-year floodplain. O&M Manual SAC512 mentions that these ordinances together with the State's Designated Floodway Program (see Section 2.4.3) satisfy the floodplain zoning requirement. Shasta County has a Designated Floodway (FI) District that includes the Sacramento River from Keswick Dam to the Shasta-Tehama county line, but the O&M manual makes no mention of when this was first instituted.

Big Dry Creek Dam and Diversion Project

Big Dry Creek Dam was authorized by the federal government in the Flood Control Act of 1941 (Public Law 77-288, 77th Congress). The project includes an earthfill dam across the channel of Big Dry Creek, creating a reservoir with a maximum capacity of 16,250 acre-feet and all storage space reserved for flood management. The project also includes accompanying diversion facilities both upstream and downstream from the dam. Flows from the dam in excess of downstream capacities are diverted to the San Joaquin River downstream from Friant Dam.

This project, located about 10 miles northwest of Fresno, reduces flood risk for the cities of Fresno and Clovis and the surrounding areas. Modification of the Big Dry Creek Dam and Diversion Project was included as one of the component features of the Redbank and Fancher Creeks Flood Control

Project authorized by the Water Resources Development Act (WRDA) of 1986. Although the State originally provided assurances to the federal government for the project in 1947, the 1987 Local Cooperation Agreement signed between USACE and the Fresno Metropolitan Flood Control District superseded the 1947 agreement – assurances are now provided by the district. The capacity of the Big Dry Creek Dam and Diversion Project was increased from 16,250 acre-feet to 30,200 acre-feet as part of the 1986 project (USACE, 1997).

Duck Creek Project

The Duck Creek Project was authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). This act authorized improvement of Littlejohns Creek and tributaries in accordance with recommendations by the USACE Chief of Engineers in HD 545. The San Joaquin County Board of Supervisors, on behalf of the San Joaquin County Flood Control and Water Conservation District, provided assurances to the federal government for lands, holding the federal government free from damages, and for O&M.

Stanislaus River Local Interest Project Levees

Improvements for the Stanislaus River channel (New Melones Project) and local interest project levees (LIPL) below Goodwin Dam were authorized by the federal government in the Flood Control Act of 1962 (Public Law 87-874). USACE was given responsibility for maintenance if local interests agreed to prevent encroachment of the existing channel and floodway and maintain private levees. In 1963, The Reclamation Board accepted responsibility as the nonfederal sponsor.

On June 19, 1981, The Reclamation Board adopted the Stanislaus River Designated Floodway, including the existing channel and LIPL along the Stanislaus River between Goodwin Dam and the San Joaquin River confluence. In Resolution 81-33, the Board accepted USACE's offer for the Board to exercise USACE property rights in the designated floodway and project floodway. The Board also delegated control of encroachments in those areas to the USACE Sacramento District.

The Board provided assurances to USACE that if the LIPLs are not satisfactorily maintained, the Board will extend the encroachment lines of the designated floodway to include the area that would be flooded during a design flood if those levees did not exist.

Kings River and Tulare Basin Project

The Kings River and Tulare Lake Basin Project was adopted and authorized by the Flood Control Act of 1944 (Public Law 78-534, 78th Congress). The authorization was substantially in accordance with the

recommendations by the USACE Chief of Engineers in HD Number 630 (76th Congress, Third Session) and as modified by data in Design Memorandum No. 3, Kings River and Tulare Lake, California, Kings River Channel Improvement, General Design, dated April 20, 1959, and by Letter Supplement No. 1 to Design Memorandum No. 3, by the District Engineer, USACE Sacramento District. The Kings River Conservation District gave assurances for cooperation with the federal government instead of the State providing assurances. During flood times, the project discharges water (up to 4,750 cubic feet per second (cfs)) through the James Bypass to the Fresno Slough, a tributary of the San Joaquin River. This discharge directly affects operation of the Chowchilla Canal Bypass and San Joaquin River Control Structures (see O&M Manual SJR601B, Sections 3.2.6 and 3.2.7).

Merced County Stream Group Project

The State provided assurances to the federal government for portions of the Merced County Stream Group Project (see Section 2.2.2). In addition, USACE built and operates four retention-type reservoirs:

- Mariposa Dam (completed in 1948) is located on Mariposa Creek, about 18 miles east of Merced. Mariposa Reservoir has 15,000 acre-feet of flood management space, which is equal to the gross storage. The dam is owned, operated, and maintained by USACE.

- Owens Dam (completed in 1949) is located on Owens Creek about 16 miles east of Merced. Owens Reservoir has 3,600 acre-feet of flood management space, which is equal to the gross storage. The dam is owned, operated, and maintained by USACE.

- Burns Dam (completed in 1950) is located on Burns Creek, about 13 miles northeast of Merced. Burns Reservoir has 6,800 acre-feet of flood management space, which is equal to the gross storage. The dam is owned, operated, and maintained by USACE.

- Bear Dam (completed in 1954) is located on Bear Creek about 16 miles northeast of Merced. Bear Reservoir has 7,700 acre-feet of flood management space, which is equal to the gross storage. The dam is owned, operated, and maintained by USACE.

In Progress Projects

Several projects are in planning, design, or construction phases, and other projects have been completed. The Bear River setback levee, and improvements to Dry Creek and Stockton levees are examples of completed projects. Examples of projects that are in progress are the Hamilton City Flood Damage Reduction and Ecosystem Restoration Project, Folsom Dam Modifications Project, and early implementation

projects including those that have been underway with State bond funding since 2006. Some of these in progress and completed projects are expected to eventually become part of the SPFC, but some may not. These projects can only become part of the SPFC after construction is completed and they are accepted by USACE, USACE prepares the O&M manuals, the projects are transferred to the State, and the State accepts the projects. All or portions of some projects like the Middle Creek Project may be deauthorized and removed from the SPFC.

2.4 Other Non-SPFC Flood Protection Facilities

In addition to the projects described in Section 2.3, the flood protection system in the Central Valley includes other facilities that are not part of the SPFC. They are briefly discussed here.

2.4.1 Nonproject Levees

Nonproject, or local, levees and related facilities have been constructed by 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. 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 affect the performance of the SPFC as part of the flood protection system. In addition, the levee system in the Delta downstream from Collinsville on the Sacramento River and downstream from the Stockton area on the San Joaquin River is composed entirely of nonproject levees maintained by USACE (e.g., levees of the Sacramento and Stockton ship channels) or local interests. Some of these levees have O&M manuals, but not SPFC manuals.

2.4.2 Other Nonproject Facilities

Numerous other flood protection facilities are owned and operated by local entities that are not part of the SPFC. These include 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.

2.4.3 Designated Floodways

Designated floodways are not part of the SPFC facilities, as defined in PRC Section 5096.805e 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 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 of flooding that would result from 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 are 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 floodplain on a case-by-case basis.

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