

**SUPPLEMENT TO STANDARD  
OPERATION AND MAINTENANCE MANUAL**

**SACRAMENTO RIVER  
FLOOD CONTROL PROJECT**

**UNIT No. 144**

**WEST LEVEE OF FEATHER RIVER  
FROM  
NORTH BOUNDARY OF LEVEE DISTRICT No. 1  
TO  
NORTH BOUNDARY OF MAINTENANCE AREA 3  
(PREVIOUSLY RECLAMATION DISTRICT No. 823)**



**US Army Corps  
of Engineers®**

**U.S. ARMY CORPS OF ENGINEERS  
SACRAMENTO DISTRICT**



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<b>LOCATION</b>	<b>ADDITION OR REVISION</b>	<b>DATE</b>
Supplemental Manual	This entire supplemental manual was revised to reflect the new format and incorporate the new Star Bend setback levee. For historical reference, the previous supplemental manual text and previous revisions can be found in Appendix M.	June 2013
Appendix G	Add Letter of Transfer Dated July 18, 2013	Aug 2015
Appendix G	Add CVFPB Letter of Permit Acceptance Dated October 23, 2012	Aug 2015
Appendix G	Add copy of transfer letter dated 29 Nov 2016	29 Dec 2016

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- K. USFWS B.O. # 81420-2009-F-0372-1 (and included for reference, *Habitat Enhancement Plan (HEP) for Feather River Setback Levee and Habitat Enhancement Project at Star Bend*, dated March 6, 2009)
- L. Section 408 Permissions
- M. Old Supplement Manual (list of previous revisions and main text)



## **SECTION 1      GENERAL**

- 1-01. This O&M Manual has been prepared in accordance with the guidelines contained in the U.S. Army Corps of Engineers' (USACE) Engineering Regulation ER 1110-2-401, *“Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual for Projects and Separable Elements Managed by Project Sponsors.”*
- 1-02. The levee of Unit No. 144 provides protection to Yuba City and adjacent agricultural land against flood waters of the Feather River and is an essential feature of the Sacramento River Flood Control Project.
- 1-03. The project works covered by this manual include the west levee and banks of the Feather River from the north boundary of Levee District No. 1 (LD 1) down 16.65 levee miles to the common boundary between LD 1 and Maintenance Area 3 (MA 3) (formerly Reclamation District No. 823).
- 1-04. This reach of levee was originally built by local interests and later re-constructed to the adopted grade and section by the USACE. The grade of the adopted floodplain profile in the Feather River varies from elevation 82.38 at the north boundary of LD 1 to elevation 57.0 at the north boundary of MA 3 (Elevations are referred to Corps of Engineers datum). Freeboard above the project floodplain of 3 feet has been equaled or exceeded within this unit, and the project design capacity is 300,000 cfs upstream of Bear River and 320,000 cfs downstream of Bear River. The low water channel of the Feather River meanders through an overflow area which has a variable width of 1,200 feet to over 6,000 feet with the incorporation of setback levees in the Lower Feather River Corridor (LFRC).
- 1-05. Environmental compliance and mitigation requirements are briefly described in Section 10-05 of this Supplement and in Appendices J and K.

## **SECTION 2      AUTHORIZATION**

- 2-01. See Standard Manual for the authorization for The Sacramento River Flood Control Project (SRFCP).
- 2-02. Unit No. 144 of the SRFCP was initially built by local interests and later re-constructed to project grade and section by the USACE. Responsibility for operating and maintaining the completed works of Unit No. 144 was officially accepted by the Reclamation Board of the State of California (now known as the Central Valley Flood Protection Board) on December 18, 1951 and December 2, 1952.
- 2-03. Flood and Coastal Storm Emergencies Act, Public Law 84-99.
- 2-04. Fiscal Year 1997 Emergency Supplemental Appropriations Act, Public Law 105-18.
- 2-05. Bank protection work was authorized by the Flood Control Act of 1960.
- 2-06. Setback levee work at star bend was administratively authorized by 33 U.S.C. Section 408 permission date June 16, 2009 and CVFPB permit # 18191BD.

## **SECTION 3      LOCATION**

- 3-01. The levee of Unit No. 144 provides protection to Yuba City and adjacent agricultural lands to south in Sutter County, California. The project works covered by this manual include the west levee and banks of the Feather River from the north boundary of LD 1 (about 1.9 miles upstream from State Highway 20 bridge crossing at Yuba City), southerly (downstream) to the common boundary between LD 1 and MA 3. Levee Unit No. 144 is approximately 16.65 miles in length and is located along the right bank of the Feather River approximately between RM 13 and RM 30.
- 3-02. Appendix B contains maps and aerial photos of the LD 1 boundaries and the alignment of the West Levee of the Feather River, Unit No. 144. There are 16.65 levee miles (LM) within this unit. With the incorporation of the Star Bend Setback Levee, the levee mileage jumps at LM 4.2 to 4.38; see Figure B-2. This allows for the project to maintain the same levee miles for consistency purposes. The Star Bend Setback Levee is located between LM 4.20 (LM 4.38) and LM 3.55.

## **SECTION 4      PERTINENT INFORMATION**

4-01. The authorized water surface elevation is defined by the USACE 1957 design profile.

## SECTION 5      CONSTRUCTION HISTORY

- 5-01. Unit No. 144 of the Sacramento River Flood Control Project was originally built by local interests and later re-constructed in various stages between 1939 and present to the grades and sections adopted by the USACE. In general, all construction features are based on standard plans and specifications, details being fully covered in the drawings (see Appendix C). The construction work required to bring the local levee unit to project grade and section was accomplished under the following contracts:
- a. Levee enlargement of the west levee of the Feather River in the vicinity of Yuba City from station 1380+00 to station 49+40, as shown on Drawing No. 44-172-1, was constructed under Contract No. W-1105-Eng-2350 by Hemstreet and Bell, Contractors, and completed on 26 January 1939.
  - b. Levee enlargement of west levee of the Feather River from Yuba City to Shanghai Bend and from Star Bend 2 miles southerly as shown on Drawing No. 4-4-188-1; sheets 2, 3, and 4 was constructed under Contract No. W-1105-eng-2405 by Morrison & Knudsen Company, Contractors, and completed 3 September 1939.
  - c. Levee enlargement of west levee of the Feather River from Shanghai Bend to Star Bend and from 2 miles south of Star Bend to opposite Bear River as shown on Drawing No. 4-4-205-1; sheets 2 to 8, inclusive, was constructed under Contract No. W-1105-eng-2694 by Morrison & Knudsen Company, Contractors, and completed 16 November 1940.
  - d. A short section of levee crown of the west levee of the Feather River was surfaced for patrol road purposes in the vicinity of Yuba City under Contract No. DA-04-167-eng-828 by Browne and Krull, Contractors, and completed on 2 December 1952. Specification No. 1636, Drawing No. 50-4-2897.
  - e. Emergency levee repairs along the west levee of the Feather River upstream and downstream from the 10<sup>th</sup> Street Bridge was accomplished under Contract No. DA-04-167-CIVENG-57-60 by W.H. Darrough and Sons, during the period from 1 October 1956 to 18 October 1956, Specification No. 2238, Drawing No. 4-4-431.
  - f. Emergency repair and reconstruction of approximately 8,000 feet of destroyed levee on the right bank of the Feather River downstream from Yuba City was accomplished under Contract Nos. DA-04-167-CIVENG-56-41, 56-45, 56-46, 56-102, 56-162, 56-169, and 56-173 by H. Earl Parker, Inc., San Francisco Bridge Company, Associated Dredging Company, and Pacific Gas and Electric Company, during the period from 26 December 1955 to 30 April 1956, Drawing No. 4-13-405.
  - g. Emergency levee repairs and bank paving, right bank of the Feather River at Star Bend was accomplished under Contract No. DA-04-167-CIVENG-56-154 by Lester L. Rice and Sons during the period from 5 March 1956 to 13 March 1956. No drawings made.

- h. Repairing levee of right bank of Feather River from Yuba City from 5<sup>th</sup> Street Bridge ½ mile downstream was accomplished under Contract No. DA-04-167-CIVENG-56-161 and 56-75 by Baldwin Contracting Company during the period from 29 December 1955 to 15 January 1956. No drawings made.
- i. Emergency relief wells and drains along the Feather River near Yuba City were installed under Contract No. DA-04-167-CIVENG-57-76 by C. S. Phillips Construction Company during the period from 13 November 1956 to 12 April 1957, Specification No. 2256, Drawing No. 4-4-435.
- j. Emergency levee repairs, west levee Feather River, relief trench drain at Yuba City was accomplished under Contract no. DA-04-167-CIVENG-57-109 by Baldwin Contracting Company during the period from 17 February 1957 to 14 May 1957, Specification No. 2302, Drawing No. 4-4-437.
- k. Emergency levee repairs, right bank Feather River at Shanghai Bend was accomplished under Contract No. DA-04-167-CIVENG-57-65 by H. Earl Parker, Inc. during the period from 8 October 1956 to 12 November 1956, Specification No. 2252, Drawing No. 4-4-433.
- l. Drainage pump and sump, right bank Feather River at Shanghai Bend was accomplished under Contract No. DA-04-167-CIVENG-57-112 by Munz Pump, Inc. during the period from 11 March 1957 to 21 June 1957, Specification No. 2295, Drawing No. 4-4-438.
- m. Levee stabilization, right bank Feather River, Levee Districts 1 and 9 was accomplished under Contract No. DA-04-167-CIVENG-60-73 by H. Earl Parker, Inc. during the period from 11 May 1960 to 28 July 1960, Specification No. 2655, Drawing No. 4-4-508.
- n. Bank protection on the right bank of the Feather River at Mile 24.5 (Unit No. 8) was accomplished under Contract No. DA-04-167-EIVENG-66-50 by H. Earl Parker, Inc. during the period from 18 October 1965 to 14 June 1966. Specification No. 3154. Drawing No. 50-4-4004.
- o. Levee repair on the right bank of the Feather River between Levee Mile 2.35 and Levee Mile 3.52 and at Levee Mile 1.5 (LD 1 site) located south of Yuba City along right bank of the Feather river between Levee Mile 1.43 and Levee Mile 1.60. Repair consists of seepage berms and a toe drain. Construction was completed 7 September 2001 under Contract No. DACW05-00-C-0041, Specification No. 1102E, Drawing No. 4-4-627.
- p. Emergency levee repairs, at various locations along the right bank of the Feather River in Levee District 1 were completed on 31 October 1997 by Syblon Reed Corp.

- under Contract No. DACW05-97-C-0122. Specification No. 9885E, Drawing No. 04-04-617.
- q. Emergency levee repairs, west levee Feather River, Levee Miles 14.60 to 16.02 in Levee District 1 were completed in July 2001 by BCN Company under Contract No. DACW05-00-C-0032. Specification No. 1101E, Drawing No. 4-25-626.
  - r. Emergency levee repairs, west levee Feather River Levee Miles 11.00 to 11.50 were completed on December 1999 by Clearwater Group Inc. under Contract No. DACW05-98-D-0035. Specification No. 9998E, Drawing No. 4-4-620.
  - s. Erosion repair sites, west levee of the Feather River at RM 28.5 (right levee). About 1260 feet of erosion repair work was completed by Newland Entities in December 2009 under Contract No. W91238-09-C-0021, Specification No. 1691, Drawing No. 50-04-6301.
  - t. At Star Bend, a 3,400 foot setback levee and soil-bentonite (SB) cutoff wall were built from approximately LM 4.20 (LM 4.38) to LM 3.55 with soil-cement-bentonite (SCB) cutoff wall, where the new levee ties into the old levee. The setback levee begins at the intersection of the east end of Star Bend Road and the existing right bank of the Feather River and continues southeasterly to the approximate intersection of the easterly extension of Tudor Road with the right bank of the Feather River. Work was completed by Nordic Industries between 17 July 2009 and 2 November 2009 under LD 1 Contract No. 09-02, USACE Specification No. 1941, and USACE File No. 4-04-0638. As a part of this design and construction, a pump station was reconstructed at least 10 feet beyond the landward toe of the completed setback levee. The original pump station was installed as part of PL 84-99 emergency repairs constructed by the USACE at Star Bend in 1997 (see item p. above).

## **SECTION 6      PROJECT PERFORMANCE**

- 6-01. As constructed, the levee height provides for a freeboard of at least 3 feet above the adopted floodplain profile.
- 6-02. The project design flow is 300,000 cfs upstream of Bear River and 320,000 cfs downstream of Bear River.
- 6-03. If the levee capacity is exceeded or fails, flooding occurs in the Sutter Basin, which includes portion of Sutter County; Yuba City; as well as adjacent agricultural areas.
- 6-04. Flood Flows. For the purposes of this manual, the term “flood” or “high water period” shall refer to flows when the water surface reaches or exceeds:
  - a. A reading of 65.0 on the California Data Exchange Center (CDEC) Yuba City (YUB) continuous water stage recorder and staff gage located near the right bank of the Feather River at the 5<sup>th</sup> Street Bridge in Yuba City;
  - b. A reading of 57.0 on the CDEC continuous water state recorder and staff gage located on the right bank of the Feather River at Boyd’s Landing (FBL) near River Mile 21.0, approximately three miles south of Yuba City;
  - c. Staff gages are set on Corps of Engineers datum (USED).

## **SECTION 7      PROJECT COOPERATION AGREEMENT**

- 7-01. Assurance of cooperation by local interests is provided by California State Legislation, as contained in Chapter 3, Part 2, Division 5, of the California State Water Code (see paragraph 2-02a of the Standard Manual).
- 7-02. Responsibility for operating and maintaining the completed works for Unit No. 144 was officially accepted by the Reclamation Board of the State of California (now known as the Central Valley Flood Protection Board or the CVFPB) on 18 December 1951 and 2 December 1952. See Appendix G.
- 7-03. Superintendent. The name and address of the Superintendent appointed by local interests to be responsible for the continuous inspection, operation and maintenance of the project works shall be furnished to the District Engineer, and in case of any change of Superintendent, the District Engineer shall be so notified.
- 7-04. Letters of acceptance and transfers can be found in Appendix G.
- 7-05. Section 408 permissions and acceptance by the CVFPB can be found in Appendix L.
- 7-06. Cooperation Agreements can be found in Appendix I.

## **SECTION 8      OPERATION**

8-01. See Section 10 for maintenance and inspection requirements for Unit 144.

## SECTION 9      EMERGENCY OPERATIONS

- 9-01. Emergency surveillance, communication, and chain of responsibility for the Unit No. 144 levees and associated infrastructure are to be under existing protocols of the Superintendent, under the supervision of the California Department of Water Resources.
- 9-02. The emergency operations are as recommended in Section 8 of the USACE's "*Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project.*"
- 9-03. Repair of Damage. In the event of serious damage to the project works, whether due to flood conditions or other causes, and which may be beyond the capability of local interests to repair, the Superintendent will contact a representative of the California Department of Water Resources, who coordinates maintenance of project works of the Sacramento River Flood Control Project. The State representative will give assistance or advice, or will determine appropriate action to be taken.
- 9-04. Applicable Methods. For applicable methods of combating flood conditions, reference is made to Section VIII of the Revised Standard Manual, where the subject is fully covered.
- 9-05. Other references include:
  - a. "*Design and Construction of Levees,*" U.S. Army Corps of Engineers, EM 1110-2-1913, 30 April 2000.
  - b. A good summary of flood-fighting methods is contained in the DWR publication entitled, "*Flood Fighting Methods,*" dated August 2010. This publication is included as Appendix D for reference.

## SECTION 10 MAINTENANCE AND INSPECTION

### 10-01. Levees

- a. Description. The levee described in this manual is located along the westerly side of the Feather River from the north boundary of LD 1 to the north boundary of MA 3. The levee within this unit was originally built by local interests and later re-constructed to project grade and section by the USACE. Surfacing was applied to the crown, turnouts, and road approaches were also provided.
- b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:
  - 1) Maintenance – paragraph 4-02 of the Standard Manual.
  - 2) Check Lists – Appendix E and F of this Supplement to the Standard Manual.
  - 3) Operation – paragraph 4-04 of the Standard Manual.
  - 4) Special Instructions – paragraph 4-05 of the Standard Manual.

### 10-02. Drainage and Irrigation Structures

- a. Description. As part of the original supplemental manual, the drainage and irrigation structures which extend through the right bank of the levee are listed below. Any other encroachments not listed should be documented in the project's levee log.

Location Station	Size and Kind of Pipe	Other Structure Description
1414+10	3" Steel	Extra strong galv. Pipe
1468+79	36" CMP	
1469+70	24" CMP	Yuba City outfall sewer, No. 781 gate valve No. 781 L.S. 2 Concr.
1473+60	18" Steel	Gas Line
109+23	12" Steel	
333+43	24" Steel	
358+00	8" Steel	
477+00	8" Steel	
486+00	10" Steel	
497+00	6" Steel	
529+28	12" Steel	
537+00	10" Steel	
574+20	8" Steel	
616+72	24" Steel	
638+07	8" Steel	
657+00	8" Steel	
678+00	8" Steel	
735+57	36" Steel	

736+00	54" CMP	
585+32	8" Steel	

CMP = Corrugated Metal Pipe

LS = Landside

- b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:
- 1) Maintenance – paragraph 5-02 of the Standard Manual.
  - 2) Check Lists – Appendix E and F of this Supplement to the Standard Manual.
  - 3) Operation – paragraph 5-04 of the Standard Manual.
  - 4) Additional Requirements – paragraph 5-05 of the Standard Manual.
  - 5) Safety Requirements – paragraph 5-06 of the Standard Manual.

#### 10-03. Channel

- a. Description. The channel of the Feather River within this unit consists of an overflow area that varies in width from 1,200 feet to over 6,000 feet that is confined between levees along both banks. This reach of the Feather River from the north boundary of LD 1 to the north boundary of MA 3, has a project capacity of 300,000 to 320,000 cubic feet per second and the levee provides for a freeboard of at least three feet above the adopted floodplain profile. There is a considerable growth of trees and brush in the overflow portion of the channel. The maintenance and operation of the channel of the Feather River, within this unit, shall be limited to flood control and the requirements which follow shall be observed to that extent and also as indicated in the various Biological Opinions (see Section 10-05 of this Supplement).
- b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:
- 1) Maintenance – paragraph 6-02 of the Standard Manual.
  - 2) Check Lists – Appendix E and F of this Supplement to the Standard Manual.
  - 3) Operation – paragraph 6-04 of the Standard Manual.
  - 4) Safety Requirements – paragraph 5-06 of the Standard Manual.
- c. It shall be the duty of the Superintendent to maintain a patrol of the project works during all periods of flood in excess of the reading defined in section 6-04 of this Supplement. The Superintendent shall dispatch a message by the most suitable means to the District Engineer whenever the water surface at Yuba City or below Shanghai bend reaches the gage readings indicated above. The Superintendent shall cause readings to be taken at said gages at intervals of two to four hours during the period when the water surface is above the flood-flow stage indicated above and record the time of observations. One copy of the readings shall be forwarded to the District Engineer immediately following the flood, and a second copy transmitted as an inclosure to the semi-annual report in compliance with paragraph 3-06 of the Standard Manual.

#### 10-04. Miscellaneous Facilities

- a. Description. Miscellaneous structures or facilities which were constructed as part of or existed in conjunction with, the protective works, and which might affect their functioning, include the following:
  - 1) Bridges
    - a) Southern Pacific Railroad trestle at station 1384+00
    - b) Highway 99E bridge crossing at station 1482+70
    - c) Sacramento Northern Railroad Bridge and highway crossing at station 2+77.
  - 2) Utility Relocations.
    - a) Portion of Yuba City outfall sewer was re-constructed at station 1469+70
    - b) Portion of Pacific Gas & Electric gas line was re-constructed at station 1473+60.
  - 3) Hydrographic Facilities (to be maintained by other agencies)
    - a) See Section 6 for further information.
- b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:
  - 1) Maintenance – paragraph 7-02 of the Standard Manual.
  - 2) Check Lists – paragraph 7-03 of the Standard Manual.
  - 3) Operation – paragraph 7-04 of the Standard Manual.
- c. Maintenance of cutoff walls: Modification or repair work in the vicinity of the SB or SCB cutoff wall should include provisions to avoid damaging the SB or SCB cutoff. The SB or SCB cutoff wall acts as an impervious barrier and shall not be penetrated at any point along its length or depth. Proposed future utilities shall be placed over the existing SB or SCB cutoff wall.

#### 10-05. Environmental Protection

- a. The following and USFWS B.O. #81420-2008-F-0805-1 within Appendix J pertain to the repair site at Feather RM 28.5R;
  - 1) Trees, either preserved or planted, shall not be removed as long as they remain healthy. As unhealthy trees are removed or fall over, any subsequent cavities in the rock must be filled in a timely manner with rock material equal to the surrounding repair. Leave the fallen trees in place. Dead or fallen trees will be retained except where they are a hazard to existing flood control work.
  - 2) In-stream Woody Material (IWM) has been used in conjunction with levee improvements at these locations. IWM is expected to degrade and wash away over time, therefore, it is not a requirement of normal maintenance to replace this material. IWM should not be removed from the site through maintenance activities. Additionally, any woody debris that arrives at the site and is deposited shall be left in place/not removed by the Superintendent, provided it is not posing a hazard to the existing flood control work.

- 3) Vegetation within mitigation areas shall be left in a natural state. No additional maintenance such as irrigation or mowing shall be required as a part of normal maintenance.
  - 4) Soil placed on/in rock as a part of the original repair and all associated vegetation (grasses & woody shrubs/trees) within the footprint of the bank protection sites at these locations do not require replacement as a part of normal maintenance. In other words, if the soil is washed out it does not need to be replaced and re-vegetated. However in areas where soil remains or new sediment is deposited and the vegetation is dislodged/ destroyed or leaves areas greater than 3' x 3' of exposed soil for more than 30 days during the months of April through November, those areas shall be hydro-seeded using the seed mix indicated on the As-Built.
  - 5) Vegetation, soil, and IWM placed on the erosion repair site were done so as on-site mitigation for the construction of the site. Vegetation (trees and shrubs) helps protect against soil erosion and provides shade cover for endangered salmonid species migrating up and down the river during various times of the year. Living and dead IWM provides diverse habitat and refuge for several fish species during low flow conditions. These features shall not be removed or damaged in any way.
- b. The Superintendent shall preserve and maintain at least 20 acres of Valley Elderberry Longhorn Beetle (VELB) habitat, as long as the VELB is a threatened or endangered species by USFWS, consistent with the USFWS B.O. #81420-2009-F-0372-1, dated February 6, 2009 (Appendix K), and shall use as a reference the Habitat Enhancement Plan (HEP) for the Setback Levee at Star Bend, dated March 6, 2009, (Appendix K) to comply with the B.O.
- 1) The vegetation maintenance and monitoring plan for the enlarged floodplain at Star Bend should be developed to be responsive to maintaining the flow conveyance and flood safety attributes of the improved flood control system at Star Bend while collectively meeting the USFWS Biological Opinion mitigation, compensatory, and conservation conditions specifically developed for the Setback Levee at Star Bend.
  - 2) In no event shall the vegetation in the floodplain within the Star Bend Project Area be managed to infringe upon the water surface profile defined by the USACE 1957 design profile and associated freeboard.

## **SECTION 11      SURVEILLANCE**

- 11-01. See Section 10, Maintenance and Inspection for required project surveillance.
- 11-02. The project design of the Setback Levee (see Section 5-01, item t, of this Supplement to the Standard Manual) anticipated a total post-construction settlement of approximately four inches (0.33 feet). Should the settlement exceed this amount, an engineer should be consulted to evaluate the levee height with respect to the design water surface. The Superintendent shall monitor settlement gages per the design requirements to ensure settlement does not exceed the specified amount.
- 11-03. Post-construction differential settlement, cracking, and small slips could take place along the setback levee at Star Bend. Observations of any cracking, differential settlement, or slips shall be recorded and reported to a qualified engineer, DWR representatives and USACE personnel. Applicable remediation measures shall be developed to correct normal and abnormal distress issues that may be encountered.

## **SECTION 12      REPAIR, REPLACEMENT, AND REHABILITATION**

- 12-01. Repair is considered to entail those activities of a routine nature that maintain the project in a well kept condition. Replacement covers those activities taken when a worn-out element or portion thereof is replaced. Rehabilitation refers to a set of activities as necessary to bring a deteriorated project back to its original condition. RR&R actions are to conform to the project as-built plans and specifications unless other arrangements are made with the district commander. These activities are the responsibility of the Superintendent.
- 12-02. All repairs, replacements, and/or rehabilitations should be made as recommended in the USACE's "*Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project,*" and to the specifications for the original project construction.
- 12-03. The Superintendent should take into consideration the timing and urgency of the specific repairs. Depending upon the nature and severity of the repair it may be advisable to proceed with the repairs prior the next flood season, or proceed cautiously during a current flood season. Other methods or procedures may need to be deployed by the Superintendent and approved by the USACE if the repairs are required during an immediate flood season.

## **SECTION 13      NOTIFICATION OF DISTRESS**

13-01. Notification of distress should be reported in accordance with ER 1110-2-101,  
*“Reporting of Evidenced of Distress of Civil Works Structures.”*

## **APPENDIX A**

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Flood Control Regulations (See Standard Manual)

## **APPENDIX B**

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Location Drawings

Figure B-1

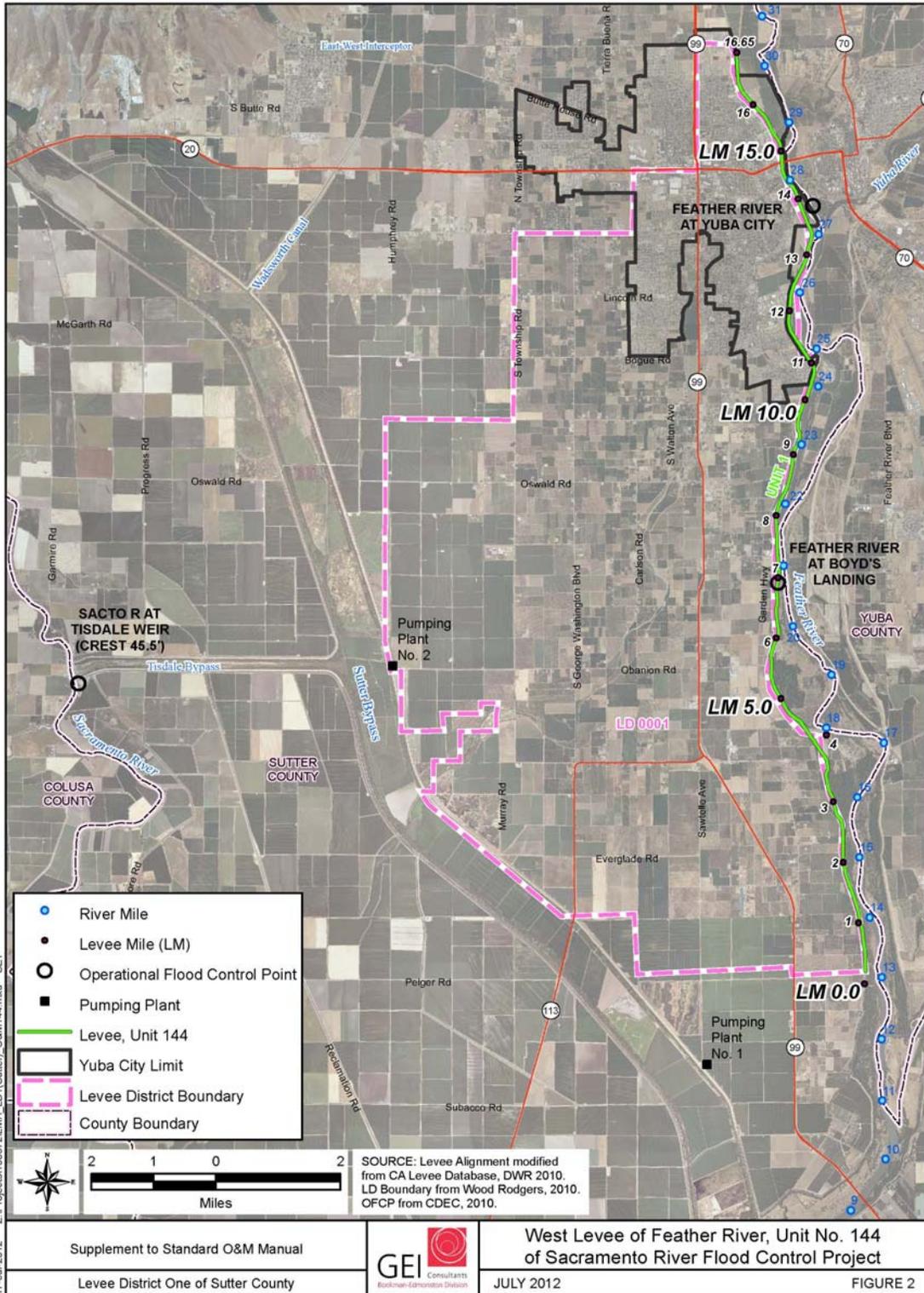
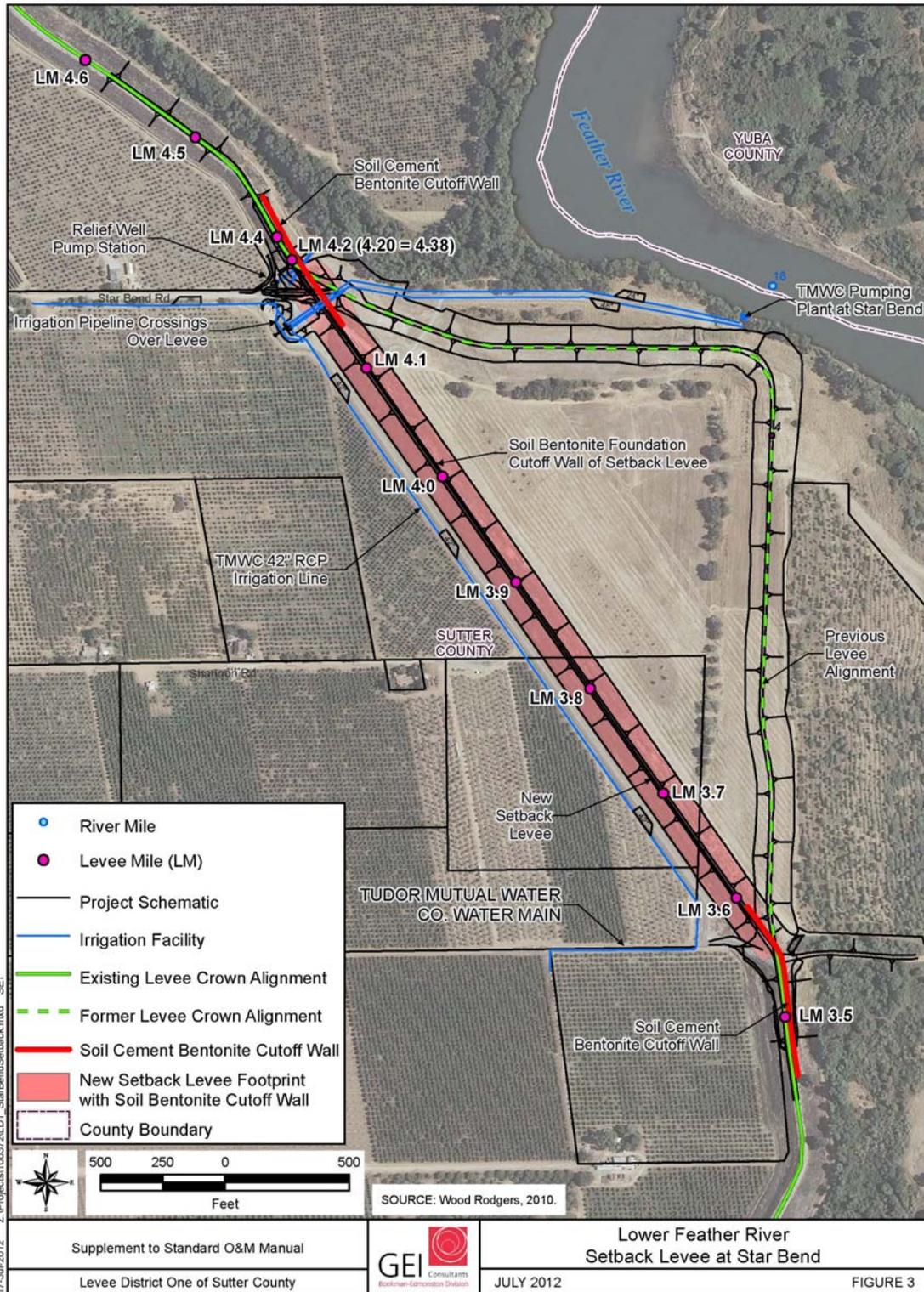
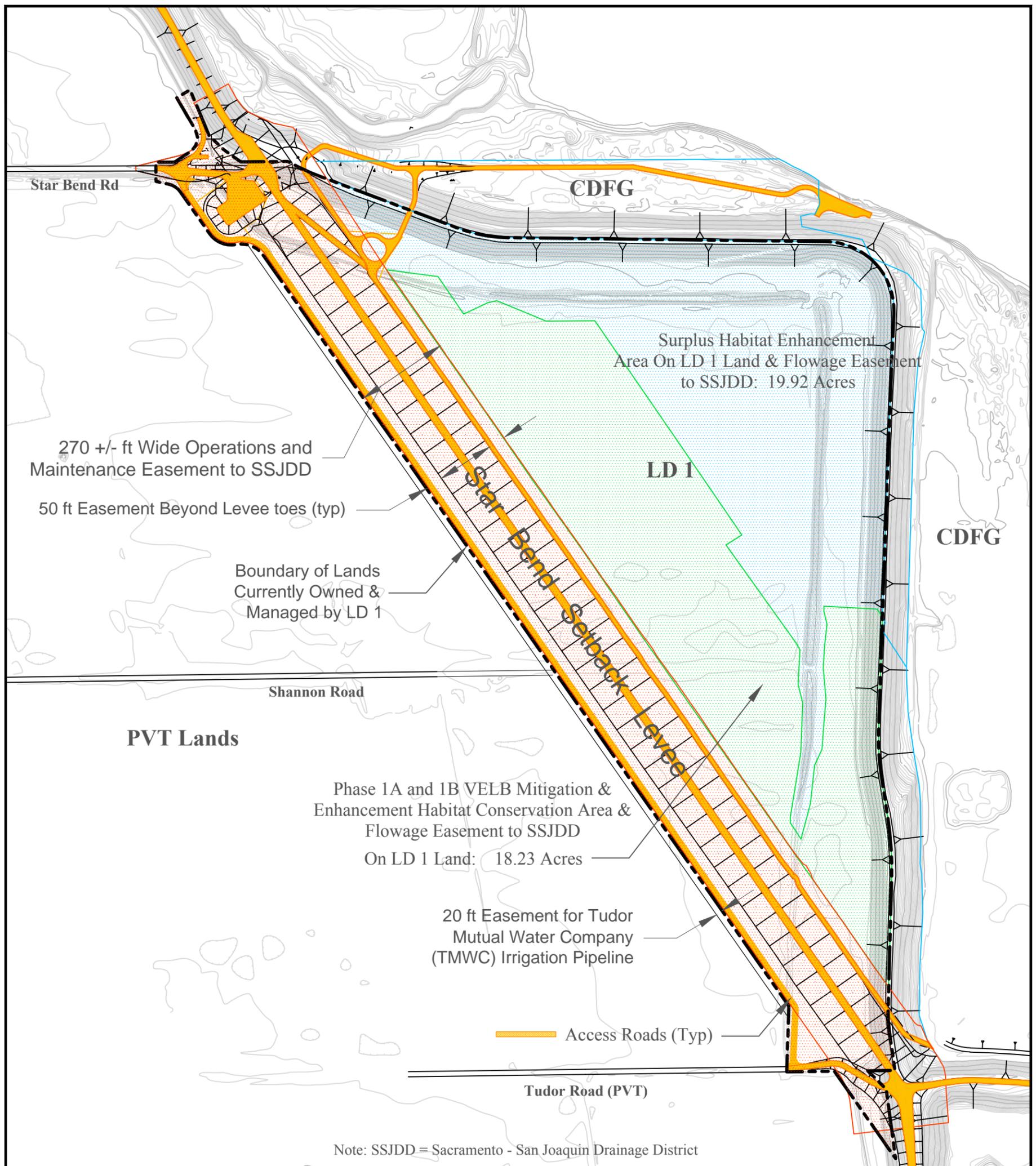


Figure B-2



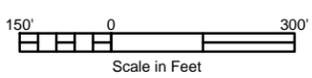
\*With the incorporation of the Star Bend Setback Levee, the levee mileage jumps at LM 4.2 to 4.38; see Figure B-2. This allows for the project to maintain the same levee miles for consistency purposes. The Star Bend Setback Levee is located between LM 4.20 (LM 4.38) and LM 3.55.

Figure B-3



Limits of Land Acquired for Starbend Setback Levee  
 Access Roads  
 Former Levee System Removed

Lands Acquired by LD1 for Star Bend Setback Levee		
(1)	Levee Footprint Area & 50 ft beyond landside and waterside toes of levee: Approximately 270 ft in width Fee Title by LD1 & Easement to SSJDD	21.29 Acres
(2)	Phase 1A & 1B VELB Mitigation and Enhancement Habitat Conservation Area in Floodway Fee Title by LD1 & Flowage Easement to SSJDD	18.23 Acres
(3)	Surplus Habitat Enhancement Area On LD 1 Land & Flowage Easement to SSJDD	19.92 Acres
Total Acres of Fee Title Acquired by LD1 and Easements Conveyed to SSJDD and Others		59.44 Acres



## **APPENDIX C**

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As-Built Information

**“As Constructed” Drawings**

See separate folder for the following drawings:

<b>File No.</b>	<b>Title</b>
4-4-172-1	Levee Enlargement – West Levee of Feather River – vicinity of Yuba City, Sheets 1 through 4.
4-4-188-1	Levee Enlargement – West Levee of Feather River – Yuba City to Shanghai Bend and from Star Bend 2 Miles Southerly, Sheets 1 through 4.
4-4-205-1	Levee Enlargement – West Levee of Feather River – Shanghai Bend to Star Bend and from 2 Miles South of Star Bend to Opposite Bear River, Sheets 1 through 8.
Additional drawings of cross-sections, structures, and miscellaneous facilities are available in the Office of the District Engineer.	
4-4-431	Emergency levee repairs, west levee Feather River, vicinity of 10 <sup>th</sup> Street Bridge, 1 sheet.
4-13-405	Emergency repairs and reconstruction of 8,000 feet of levee right bank Feather River downstream from Yuba City, in 4 sheets.
4-4-435	Emergency relief wells and drains along Feather River near Yuba City, in 4 sheets.
4-4-437	Emergency levee repairs, west levee Feather River, relief trench drain near Yuba City, in 1 sheet.
4-4-433	Emergency levee repairs, right bank Feather River at Shanghai Bend, in 4 sheets.
4-4-438	Drainage pump and sump, right bank Feather River at Shanghai Bend, in 2 sheets.
4-4-508	Levee Stabilization, Right Bank Feather River, Levee Districts 1 and 9, in 6 sheets.
4-6-361	Clearing and Debris removal in Feather River from Sutter Bypass upstream to the Yuba River (See Unit 165 for more information).
50-4-4004	Bank Protection, Various Locations, Rt. and Lt. Banks Sacramento River and Bear River and Rt. Bank Feather River, in 33 sheets (Unit No. 8).

4-4-627	PL-84-99 Cost Shared/Added sites Sacramento Basin No. 18 Laurel Ave. (MA3) and LM 1.5 (LD1), in 5 pages.
4-4-617	PL84-99 Phase III, Relief Wells – LD1 Feather River at Star Bend, Sutter County, California, in 20 sheets.
4-25-626	PL84-99 Cost Shared/Added Sites Sacramento Basin No. 18 LD1 Slurry Wall, in 3 sheets.
4-4-620	PL84-99 Cost Shared Sacramento Basin No. 18 Feather River, Shanghai Bend, in 12 sheets.
50-04-6301	Sacramento River Bank Protection Project Contract 2, Feather River mile (FRM) 28.5R, in 20 sheets.
4-4-0638	Lower Feather River Setback Levee at Star Bend, in 73 sheets.

## **APPENDIX D**

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State of California DWR Emergency Flood Fighting Methods, August 2010

STATE OF CALIFORNIA

EMERGENCY

# FLOOD FIGHTING Methods



Department of Water Resources  
Division of Flood Management  
Flood Operations Branch

*August 2010*



STATE OF CALIFORNIA  
CALIFORNIA NATURAL RESOURCES AGENCY  
DEPARTMENT OF WATER RESOURCES

# **FLOOD FIGHTING** Methods



Division of Flood Management  
Flood Operations Branch

August 2010

*Prepared by*  
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## **Foreword**

The California Department of Water Resources (DWR), Division of Flood Management has been tasked to prevent, reduce, and mitigate the risk of damages associated with flooding. For over fifty years DWR has been the lead State agency responsible for responding to this costly natural disaster. Our mission is to prevent loss of life and damage to property and infrastructure.

Working together State, federal, and local agencies manage California's Flood Control System which consists of reservoirs, levees, weirs, bypasses, and retention basins.

This statewide system is managed with support from technologies such as weather and water forecasting, coordination of reservoir releases and a network of rain and stream gauges and snow pack monitoring. The information gathered is extremely important to emergency responders and the public.

The 'Flood Fighting Methods' outlined in this booklet have proven effective during many years of use by DWR, United States Army Corps of Engineers, and local agencies on flood-related emergencies. This handbook is published by the DWR Flood Operations Branch and is designed to be used with the Flood Fighting Methods class.

## **Levee and Embankment Threats**

The main causes of levee failure or flood related problems due to high water are:

- Seepage through or under the levee heavy enough to cause a “boil”.
- Erosion of the levee or embankment due to swift moving water or wave action.
- Overtopping resulting from water-surface elevations higher than the levee or embankment.

## **Patrolling**

The best defense against flood related issues and/or levee failure is to identify problems early and repair them immediately. Biannual levee inspections and effective high water patrolling make this possible. The following suggestions will help in organizing patrol teams for this work.

- Operate under the SEMS / ICS system and report to the appropriate section chief.
- Provide a sufficient number of workers for two 12 hour shifts.
- Provide each worker with a copy of this ‘Flood Fighting Methods’ handbook.
- Assign two people to each mobile patrol.
- Assign each mobile patrol vehicle an area no larger than can be inspected at least every 2 hours, with more frequent patrols as conditions warrant. Foot patrols may offer a more thorough inspection.

- Furnish each mobile patrol vehicle with radio/cell phone or other communication equipment, lights for night patrol, and the following materials: Laths, survey ribbon, permanent marker, pad and pencil, flashlight with extra batteries, 2 shovels, 1 sledge hammer, approximately 50 sandbags (empty), 1 roll of plastic sheeting (visquine), 1 box twine, 100 buttons, 25 wooden stakes, lifeline, personal floatation devices, blanket, First Aid kit, Directory of Flood Officials, and Flood Emergency Phone Card. (see Reference Guide on page 36)
- Identify potential problems: boils, seepage, erosion, cracks, sloughing etc.
- Instruct each patrol team on the correct filling and placement of sandbags. They should know what danger signs to watch for, and how to signal for help.
- Vehicles should remain on high ground in threatened areas. Always have escape routes and make them known.
- Instruct each leader to check with their team members frequently. Investigate all reported problems.
- Be aware of the locations of stockpiled sandbags and other tools and equipment at strategic locations.
- Be prepared to obtain more workers, tools, and equipment on short notice.
- Advise the officials of the district or agency responsible for emergency assistance in the area and if necessary, request their help, i.e. local emergency services office.
- Contact the nearest representative of the Department of Water Resources for technical advice and assistance.

## **Filling Sandbags**

When filling sandbags you should work in pairs, with one person holding the bag while the other shovels in the fill material. The bag holder should find the most comfortable position while holding the bag open (see Figure 1 page 6). **The most common mistake made is overfilling bags.** The first shovel of fill should be placed on the lip of the bag to help hold the bag open. The shoveler should use rounded scoops of fill until the bag is approximately 1/3 full. While shoveling or holding, avoid extra movements (turning or twisting of the back) to prevent injury and reduce fatigue.



Filling Sandbags



Figure 1: Proper sandbag filling

## Passing Sandbags



Passing Sandbags

To avoid injuries and maximize productivity emergency responders can be organized into a sandbag passing line or ‘chain’.

The line is formed by standing facing the next person and slightly off set. The bags are passed down the center of the chain.



Passing Sandbags

## **Sandbag Construction**

The use of sandbags is a simple but effective method of preventing or reducing damage from floodwater and debris. (see Figure 2) Suggestions for constructing sandbag structures are:

1. Close-weave burlap bags 18” x 30” are recommended for all sandbag construction when available.
2. Fold the empty top of the bag at a 45-degree angle to keep sand from leaching out.
3. Place each bag over the folded top of the preceding bag and stomp into place.
4. Stagger the second layer of bags over the seams of the preceding layer.
5. Stomp all bags to form a tight seal.
6. The last sandbag in a line is referred to as a Key Sack. The empty top of this bag is folded under and stomped into place.



Sandbag Wall Construction

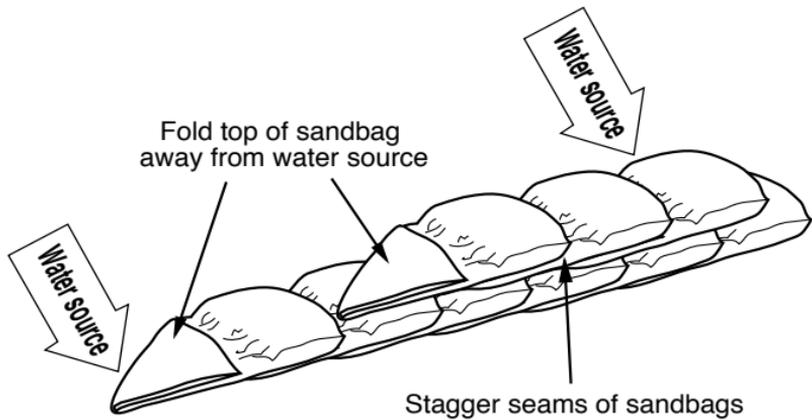


Figure 2: Fill sandbags 1/3 full, fold top of sandbag away from water source and stagger seams of sandbags.

## **Control of Overtopping**

If any levee reach or stream bank is lower than the anticipated high water elevation, an emergency topping should be constructed to raise the grade above the forecast flood height. A sack topping may be required at road or stock crossings, low levee sections, or railroad crossings. The following sections discuss various methods for increasing levee and bank elevations.

### ***Sack Topping***

The most common form of flood control work is the use of sandbags for construction of temporary walls. The use of sandbag walls to increase the height of a levee section is called “sack topping” (see Figure 3). The sacks are laid “as stretcher rows,” or along the levee.

Alternate layers can be crossed if additional strength is needed. The sacks should overlap at least one-third and stomped firmly into place. When properly placed and compacted, one sack layer will provide about 3 to 4 inches of topping.

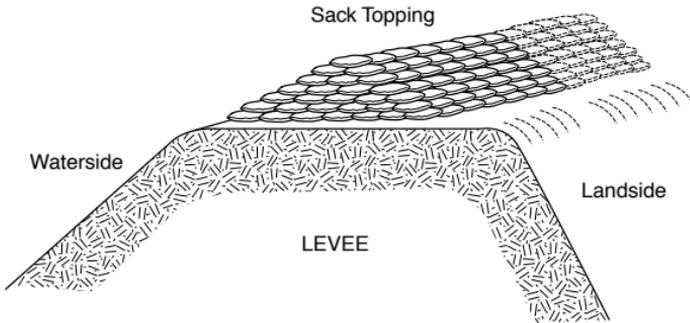


Figure 3: Sack topping on a levee



Sack Topping

### ***Temporary Levee***

This method is used to raise low areas during high water periods to prevent overtopping of levees, stream and riverbanks, small earthen dams, roadways, etc. To raise low areas, unfold a 20'x100'x10 mil roll of plastic sheeting and lay out flat on area to be raised (see Figure 4). Place fill material on plastic. Fold plastic over material, lay a single row of sandbags on the backside lip of plastic and on all seams. Fill material can be placed using bottom dump or dump bed trucks, front-end loader or manually.

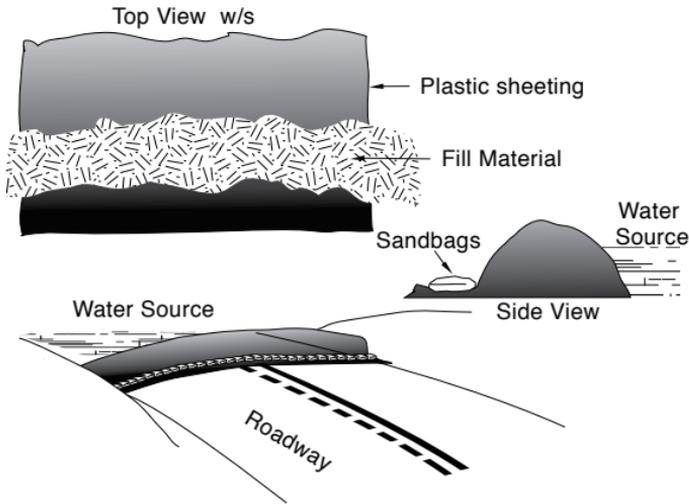


Figure 4: Temporary levee



Temporary Levee

### ***Lumber and Sack Topping***

Wooden panels are used on the waterside shoulder and reinforced on the opposite side with sandbags. The method is used to raise low reaches during high water and divert debris flows (see Figure 5). Stakes 2"x 4"x 6' should be driven on the waterside shoulder 6 feet apart. A shallow trench is and lined with empty sandbags to provide a seal. Pre-constructed wooden panels are placed in the trench

and nailed to the landside of the stakes. This wall should then be backed with enough sandbags to support the panels against the expected high water. In some cases, it may be practical to back the panels with compacted earth in lieu of sandbags. Attach 2"x 4"x 10' lumber kickers to the stakes that support the panels, and drive 2' stakes into the levee crown. Use at least two nails at each joint to provide rigid construction.

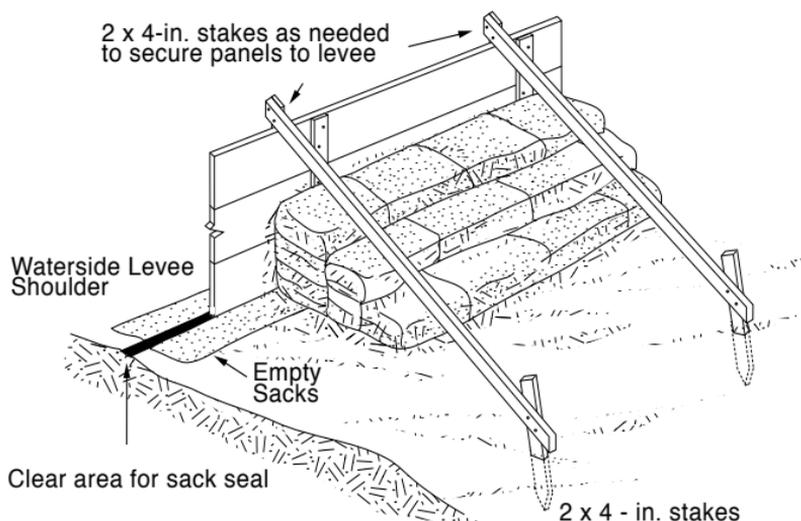


Figure 5: Lumber and sack topping

### **Control of Boils** (*Away from Levee*)

A boil is a condition that occurs when water is “piped” through or under a levee and resurfaces on the landside. These weak points are generally caused by burrowing rodents or decomposed tree roots. High water pressure can begin to erode the interior of the levee and weaken the structure. Levee material will deposit around the exit point as the water discharges on the landside. If the boil is determined to be “**carrying material**” then corrective action is required to control the situation.

If left unattended the material that makes up the levee can be eroded at an accelerated pace, causing subsidence and overtopping of the levee. This could result in a levee break.

The common method for controlling a boil is to create a watertight sack ring around it. The sandbag structure should be high enough to slow the velocity of the water and prevent further discharge of material from the boil (see Figures 6 & 7). The flow of water should never be stopped completely, since this may cause the boil to “break out” in an area near the existing sack ring. A spillway must be constructed to direct water away from all boil sites.

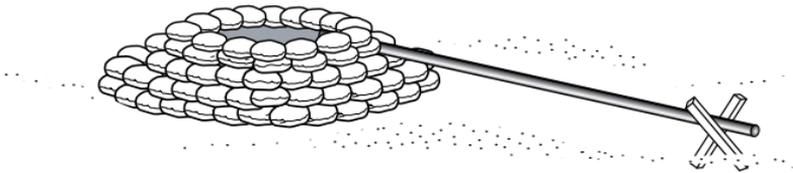


Figure 6: Boil sack ring

Bottom width should be at least  $1\frac{1}{2}$  times the height. Do not sack boils that are not carrying material, but continue to monitor. Boils can begin to carry material after first located.



Boil Sack Ring

The sack ring should be large enough to encompass the area immediately surrounding the discharge point (3 to 4 feet diameter). If several boils carrying material are found, a single large sack ring may be constructed around the entire “nest” of boils.

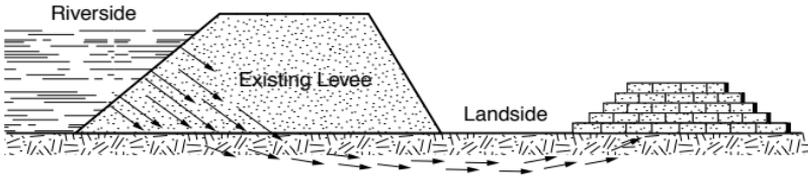


Figure 7: Flow of water through a levee

### **Control of Boils (On Levee Slope)**

If the boil is close to or on the levee slope, a U-shaped sack ring may be built around the boil and keyed into the slope. Construction of this method can be difficult and requires substantial shoring up of the U-shaped sack ring structure. A spillway must be constructed to direct water away from all boil sites (see Figure 8).

*NEVER completely stop the flow from a boil. This may cause the boil to “break out” in an adjacent area. ALWAYS control the boil to a point where it ceases to carry material and the water runs clear.*



“U” shape Sack Ring

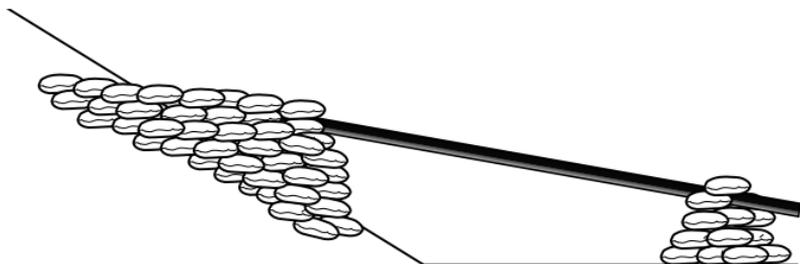


Figure 8: Spillways can be constructed by nailing two 2"x 6" boards together to form a V notch; PVC pipe; two parallel sandbag rows; visquine, etc.

### ***Waterside Boil Inlet Detection***

Water running through a levee and carrying material can sometimes be stopped on the waterside, thus eliminating the building of sack rings on the landside (see Figure 9). A six foot long section of 2" diameter metal pipe secured to a 5'x 6' foot piece of plastic or canvas can be rolled over the inlet hole on the waterside. Drive 1"x 3"x 2' stakes into the shoulder of the levee. Suspend half-filled sandbags on top of rolled-out material with twine and tie off to stakes. It can be difficult to locate the waterside inlet of boils. Sometimes a swirl is observed at the water's edge.

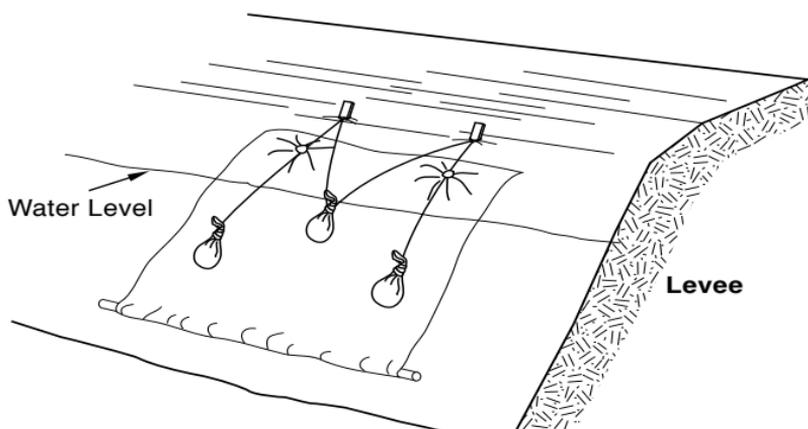


Figure 9: Waterside boil protection

## **Wavewash Protection**

All levees adjacent to wide stretches of water should be watched during periods of strong wind to detect the early stages of wavewash erosion. If the slope is well sodded, short periods of high wind should cause little damage. However during sustained periods of strong wind and high water, experienced personnel should observe and monitor the effected areas.

### ***Envelope Method***

When used correctly, plastic sheeting is useful for wavewash protection. Visquine should be purchased in 10 mil rolls, 20 feet wide by 100 feet long. 1"x3"x2' wooden stakes are driven into the ground just above the levee shoulder on the side you wish to protect. Place the stakes 4 feet apart and stagger vertically by 1 foot as shown in Figure 10.

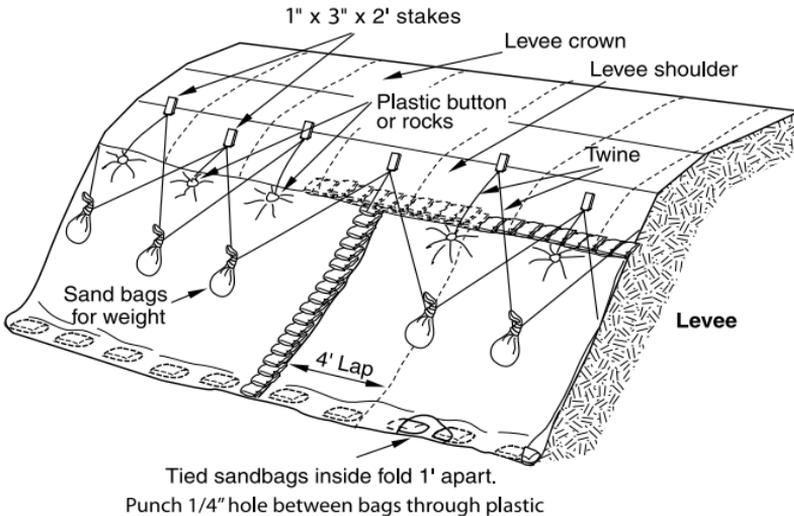


Figure 10: Wavewash Protection



Wavewash Protection

Avoid driving stakes in a straight line; this can cause cracking and sloughing of the slope. To provide added strength and leverage, drive stakes at a slight angle away from the water source with the wide (3") side facing the water. Be sure the stakes are well into the ground and are secure.

When rolling out the plastic sheeting it is helpful to use a shovel or similar long-handled tool. Eight to ten people should assist in shaking out the folds of the envelope. Be sure that both layers are held while the envelope is shaken out. Hold on tight! Use caution in strong winds. If the wind catches the plastic it could billow out and pull you along with it.

While flood workers hold the plastic securely, toss tied sandbags into the envelope. The tied sandbags (see Figure 12, page 20) are thrown into the bottom of the envelope with a one-foot gap between bags. The tied bags provide weight to hold the plastic against the levee slope.

A tie-down button or small stone (preferably round) is secured through both layers of visquine. If a stone is used, tie a slip knot and double half-hitch to secure it. Fasten buttons to the visquine and tie off to the stakes using a minimum 250 lb. tensile strength twine with these points in mind: (See Figure 11.)

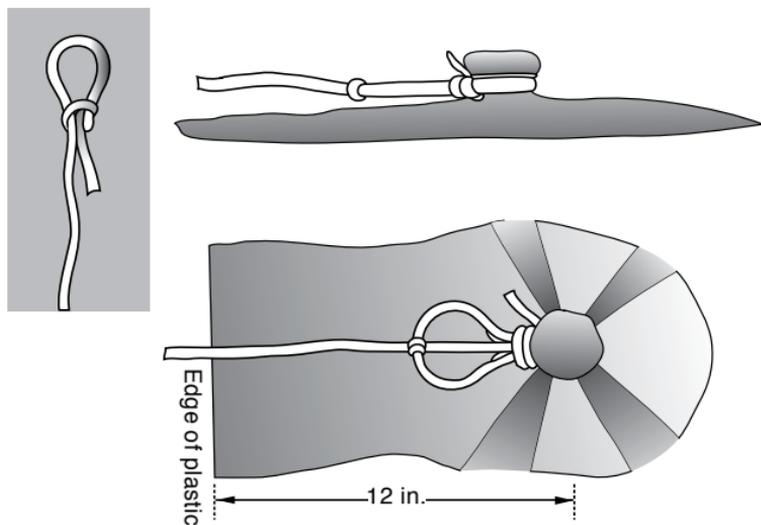


Figure 11: Plastic Tie-Down Buttons

1. Fasten button at least 1 foot from the edge of the plastic.
2. Fasten button to both layers of plastic.
3. Fasten button directly below stakes (one button per stake).
4. Tie twine low on stake for strength and to reduce tripping hazard.

Plastic sheeting is secured using tie down buttons. To attach plastic buttons to the plastic, tie a slipknot on the end of the twine; slip loop over button and plastic and draw tight. Tie two half-hitch knots around the throat of main body. Extend twine to large end of main body, tie a half-hitch knot around the end, and secure twine to stake (see Figure 11).

With the plastic secured to the stakes, punch a small hole between each tied bag in the envelope, (a pencil works well). These holes release water trapped in the envelope. **DO NOT** use a knife because a slice or slit will tear and



Button Tying

spread in the plastic. If further slope protection is necessary insert an additional envelope into the existing wavewash protection overlapping at least four feet. To secure the overlap to the stakes attach the two top layers with one button and the two bottom layers with another. The buttons line up with the stakes that are four feet apart. There should be four buttons securing the two envelopes.

Using a continuous piece of twine, hang tied bags from stakes in a zigzag fashion as shown in Figure 10. Tie a double half-hitch knot below the knot in each sandbag. ***Place each bag so that it hangs at the middle of the plastic directly below the stake between the two stakes from which it is suspended.*** Attach twine to every other stake with a double half-hitch. Add a second row of tied bags suspended from the stakes previously skipped. These bags will keep the plastic lying flat against the levee slope in windy conditions. If the upper portion of the slope needs protection, use an additional envelope. Be sure to place the upper layer over the lower layer by 2 to 3 feet. Finally place sandbags along all seams to prevent wind and water from entering the envelope. To prevent slippage, make sure the sandbags forming the top seam cap are half on the plastic and half on the levee as shown in Figure 10. If the levee slope is too steep,

some of the bags on the seam may be tied off with twine to the stake above the envelope for support.

Remember, wind is your worst enemy. When using plastic sheeting, be sure all seams are secured with sandbags, and make needed repairs to the envelope as soon as possible.

### ***Tying Sandbags***

Most sandbags are used with the open end folded. In some cases sandbags will have to be tied. Fill the bag 1/4 to 1/3 full of material. See Figures 12A–12D for instructions.

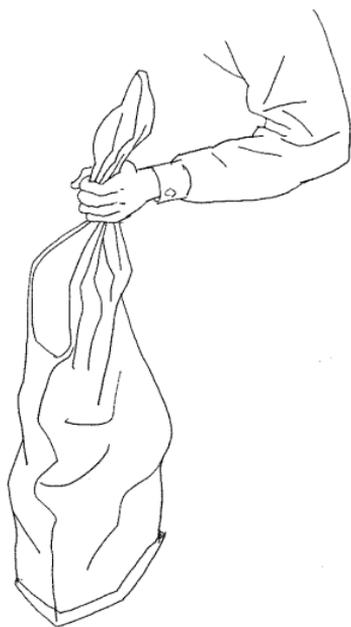


Figure 12A: Sandbag filled  
1/4 to 1/3 full

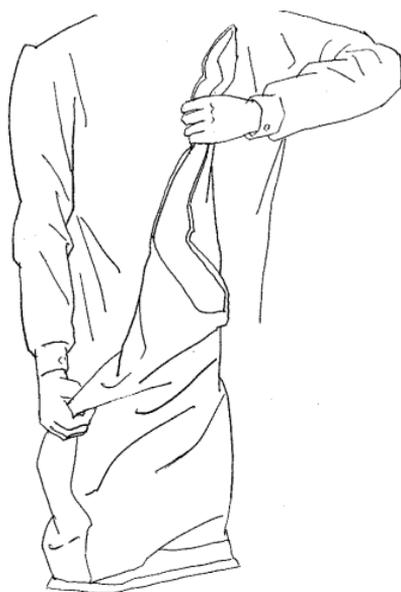


Figure 12B: Grasp bag at top  
corner and spin

Figure 12C: The long tail should be twisted tightly and look like a piece of rope.

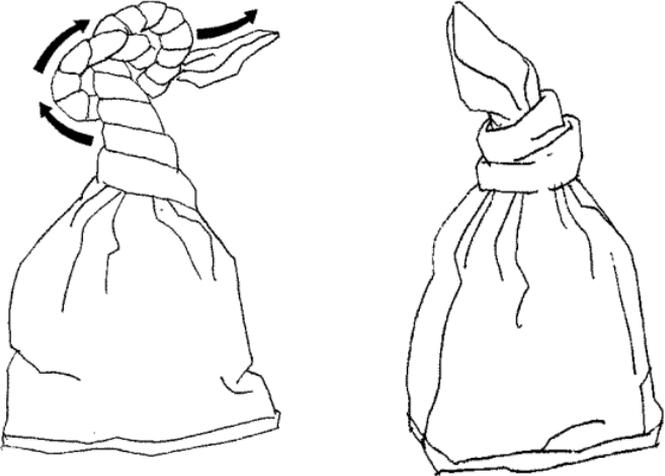


Figure 12D: Tie an overhand knot (pretzel knot) as low as possible on the bag.

## Raincoat Method

The raincoat method is used to prevent further saturation of levee or hillside slopes. Plastic sheeting is laid out flat on the slope, sandbags are placed around the perimeter with additional bags placed randomly for weight.



If the slope is steep, wooden stakes can be driven into the ground just above the area to be protected. The stakes are 4 feet apart with a 1-foot stagger. The plastic is secured to the stakes with tie-down buttons or small round rocks (see Figure 13).

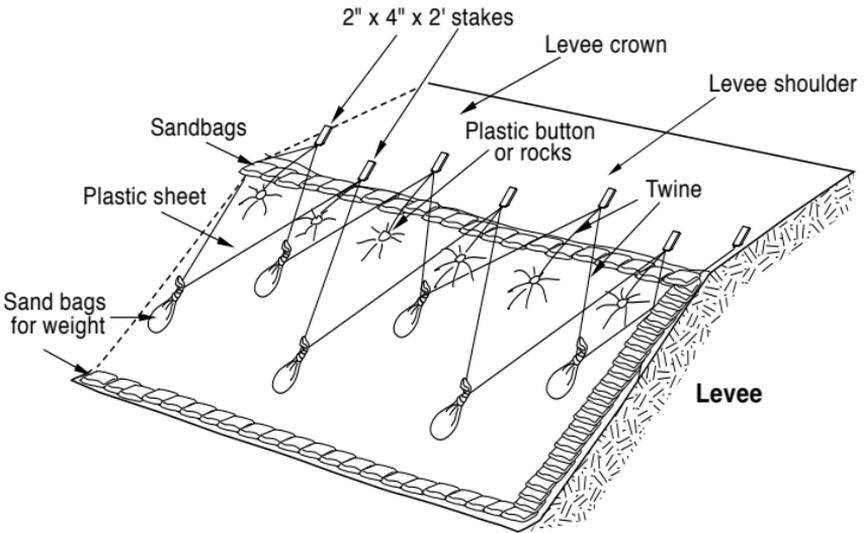


Figure 13: Raincoat method

Use a crisscross method of placing the sandbags (Figure 13) on the plastic. Place a solid row of sandbags on all edges of the plastic (half on the ground, half on the plastic).

### **Emergency Spillway**

To prevent damage to the levee slope due to overtopping, an emergency spillway can be constructed.

Place plastic sheeting over area to be used for spillway. Line all sides with at least a single row of sandbags. Use additional tied sandbags on plastic for weight if needed.

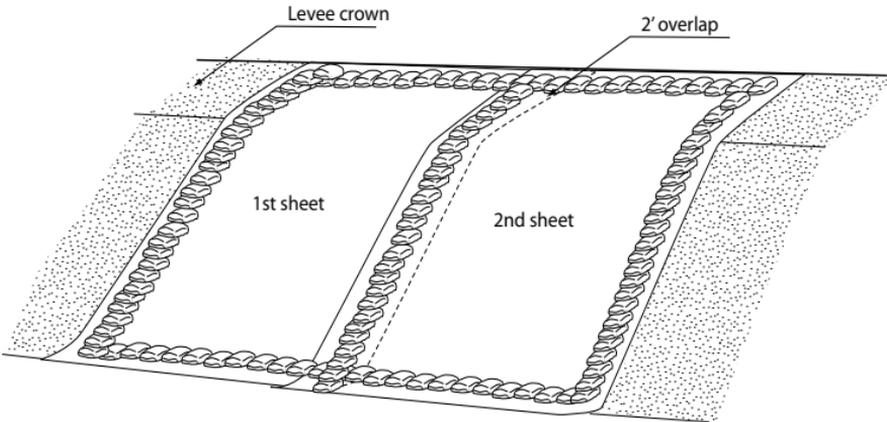


Figure 14: Emergency spillway using plastic sheeting and sandbags



Emergency Spillway

## **Structure Protection/Diversions**

The main causes of damage to structures, homes, and property during heavy rains or flood flows are:

1. Flood water from overwhelmed storm drains and urban diversions, particularly on sloping streets.
2. Flood flows onto property through driveway openings and low spots in curbs.
3. Debris flow from hillsides that have been cleared of vegetation by fire or real estate development.

The flood fighting methods described in the following sections have proved effective in combating floodwaters and debris flows.

### ***Diverting Water or Debris Flows Away from Structures***

Homes and structures can be protected from floodwater or debris flows by redirecting the flow as shown in Figure 15. Sandbag barriers must be long enough to divert the flows away from all structures. Barriers constructed of sandbags or lumber can also be used to channel mud and debris away from property improvements.



Structure Protection



Structure Protection

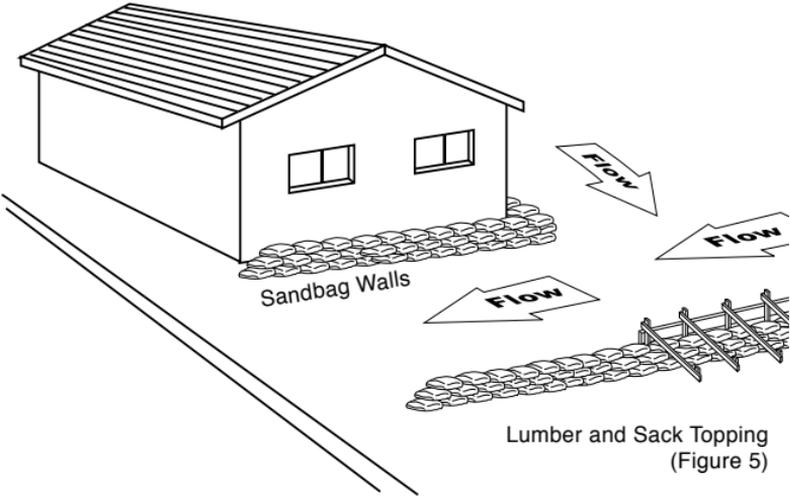


Figure 15: To divert mud, debris, and water, use sandbag walls or lumber and sack topping

### Structure Protection

The following method is used for protection of buildings and other structures along lake shores and in similar situations where water is rising with little or no current.

Lay plastic sheeting on the ground and up the building walls to a point at least 1 foot above the predicted water elevation, and far enough out on the ground to form a half pyramid of sandbags (see Figure 16). Secure plywood over doors and vents. Overlap plastic sheeting and sandbags at corners of buildings.



Home Protection

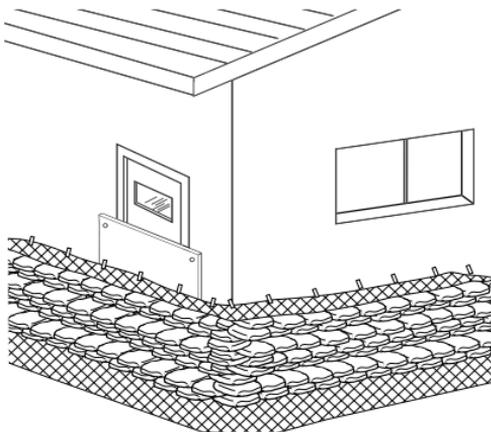
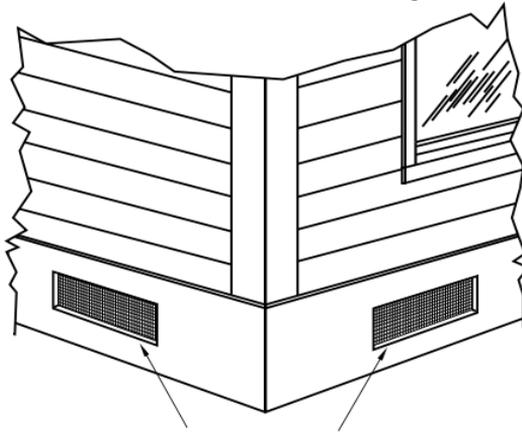


Figure 16: Structure protection

## ***Wet Flood Proofing Requirements for Structures Located Within Special Flood Hazard Areas***

National Flood Insurance Program regulations require that buildings on extended wall foundations or that have enclosures below the base flood elevation must have foundation or enclosure wall openings. These openings prevent the foundation or enclosure walls from weakening or collapsing under pressure from hydrostatic forces during a 100 year flood event. The openings allow flood waters to reach equal levels on both sides of the foundation or enclosure wall and minimize the potential for damage from hydrostatic pressure.

**THESE OPENINGS MUST NOT BE BLOCKED IF THE BUILDING IS LOCATED WITHIN A SPECIAL FLOOD HAZARD AREA.**



**Foundation or wall openings must be kept open within special flood hazard areas**

Figure 17: Foundation and wall openings in structures

For details refer to FEMA Technical Bulletins TB1-93 and TB-7.

These bulletins may be obtained from the FEMA web site at:

*<http://www.fema.gov>*

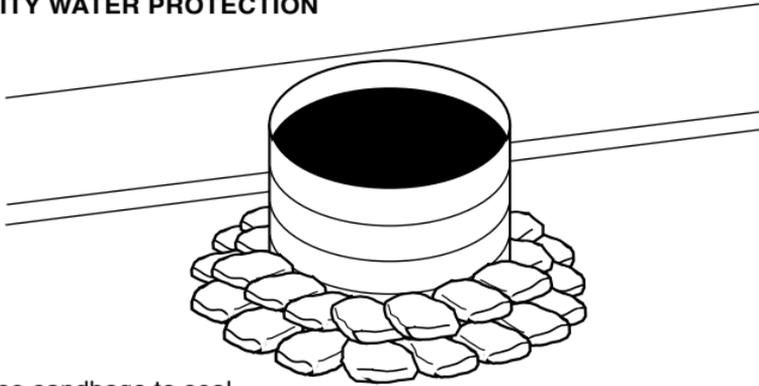
For additional information contact DWR Floodplain Management at

(916) 574-1475

## **Water / Storm Drain Protection**

Water or sewer systems can be protected by placing corrugated metal pipe (CMP) over the utility hole (see Figure 18). Lay plastic sheeting up the walls of the CMP and place sandbags in the form of a half pyramid around the CMP to seal it to the pavement. This method will prevent mud and debris from entering the system and also act as a surge chamber.

### **CITY WATER PROTECTION**



Use sandbags to seal pipe to pavement.

Using corrugated metal pipe (CMP) over utility hole to isolate sewer line or prevent contamination of water system.

Figure 18: Water / storm drain protection

## **Flood Fight Safety**

Numerous potential hazards exist during flood events. These hazards are manageable if identification and communication occur on an ongoing basis. Personal safety requires a conscious effort that every flood fighter must consider in their various duties and activities.

- ***Changing Weather Patterns:*** This occurrence can affect existing conditions and create more serious situations. Always know the forecast and how it affects vulnerable areas, workers and the public.
- ***Changing Water Patterns:*** The rise and fall of water can occur gradually or very quickly. Knowledge of high water and how it relates to levees, communities, and workers is essential. Continuous monitoring and communication of water level influences (i.e. reservoir releases, tides, and drainage inflow) are very important. Always know your area and the flood history around you.
- ***Swift Water:*** High velocities of water are common during flooding events. Extreme caution should be used when anyone is exposed to high water. Workers should have flotation devices, throw ropes, and lifelines in the immediate area. Swift water rescue teams may be available. Use common sense and sound judgement around swift water. Know your resources and how to activate them prior to the event.
- ***Temperature Related Illness:*** During a flood fight, weather patterns can change constantly. Changes in temperature present the potential for hypothermia and heat exhaustion/stroke. Flood fighters should know the signs of distress for these types of illnesses and how to treat them. During cold, wet weather it is recommended that workers layer clothing to stay warm and dry. A dry

blanket and warm clear fluids should be on the work site for emergency use. In warm, hot weather lightweight clothing is recommended. If skin is exposed, a sun block agent may need to be applied. Plenty of drinking water should be on site and consumed regularly. Headgear is recommended in both hot and cold situations.

- ***Insect/Animal Exposure:*** Flooded areas force a variety of animals to evacuate to high ground. Workers in these areas should be aware of these animals and not handle them. If animal removal is needed, contact a local professional. Stinging and biting insects are prominent in certain flood-prone areas. Chemical repellents can be useful as a deterrent. A complete first aid kit should be on site.
- ***Vegetation:*** Noxious plants such as star thistle, stinging nettle, and poison oak are commonly found along rivers, streams, and levees. Avoid direct contact with this type of vegetation to prevent itching and rash. Consult medical personnel if symptoms persist.
- ***Sandpile Safety:*** When shovels are used for filling bags a safe distance for workers is essential. Sandbags and sand may contain contaminants. Have disinfectant available. Safety glasses or goggles are recommended for protection from blowing sand particles.
- ***Contamination:*** Flooded areas can potentially carry high levels of contaminants. Common contaminants include fuel, sewage, and pesticides. Local Haz-Mat teams should be contacted if needed. Always wear protective clothing to help limit contact with water. Carry antibiotic hand soap and wash thoroughly after working around floodwater.
- ***Exhaustion:*** Stress combined with long, physically demanding hours can have an adverse effect on the flood

worker. It is very important to recognize exhaustion or sleep deprivation and treat them immediately. Operation of vehicles, machinery, or equipment should be avoided. A shift rotation of personnel will help eliminate fatigue factors.

- **Body Mechanics:** Proper body mechanics while working on floods is very important. The body is expected to work long, physical hours during the event. Each individual must make a conscious effort to use safe lifting and weight distribution techniques. Watch your footing; surfaces can be slippery and cluttered with tripping hazards.
- **Construction Equipment:** There are times when equipment and people will occupy the same work area. Workers should wear safety vests and hard hats and be aware of their surroundings. Safety warning devices (i.e. backup alarms and lights) should be in-tact and working on all equipment. Communication and alertness are vital! All operators must be certified for their equipment.
- **Boat Travel:** Materials and/or personnel will sometimes need to be transported to work sites by boat. Operators of the watercraft must be certified. Flotation devices must be available for every passenger. Extreme care should be taken while loading and off loading.
- **Patrolling:** Patrolling is the key to effective flood fighting. Patrols will identify, initiate control, and monitor trouble spots in affected areas. Vehicle patrols should travel in two person teams with dependable communication devices. Lifelines, flotation devices, and a blanket should be in the vehicle for possible water-related accidents. Foot patrols should also have the same considerations. Extreme caution should be exercised when travelling saturated, cracking, or sloughing areas.

- **Vehicle Placement:** Vehicles in work areas along the levee should remain parked on high ground. This is usually the crown roadway. Vehicles should also be parked facing their access point. An escape plan should be communicated to all flood workers.
- **Structure Considerations:** When working around structures, be aware of downed power lines, natural gas or propane leaks, and unstable structure supports. Communicate with the structure owner if possible.
- **Safety Gear:** Rain gear, warm clothing, handheld lights, gloves, goggles, hardhat, boots, first aid kit, ropes, personal flotation devices (PFD), hip waders.



## **Flood Fighting Terminology**

<b>Boil</b>	Also known as ‘Sand Boil’, is caused by water flowing through or under a levee, possibly carrying eroded levee material, and surfacing on the land side of the levee.
<b>Button</b>	A plastic tie down device used with plastic sheeting.
<b>Emergency Spillway</b>	Plastic sheeting and sandbags used to allow water to flow over a levee, protecting it from erosion. (Page 23)
<b>Flood Fighting</b>	An effort made to prevent or mitigate the effects of flood waters.
<b>Home Protection</b>	Plastic sheeting and sandbags placed around individual homes to protect from low current flood waters. (Page 26)
<b>Lath</b>	Long, narrow wooden stakes (4 feet long by 1 ½ inch wide) used to mark problem areas during high water patrolling. A brief description of the problem along with the date, time, and patroller’s initials are written on the lath with a permanent ink marker. Brightly colored survey ribbon is attached to the lath for easy identification.
<b>Levee</b>	An earthen structure that parallels a river or stream designed to prevent high water flows from inundating urban and/or agricultural land.

<b>Levee Break</b>	A point in the levee system that has failed to perform its designed function, has eroded away and is allowing water to inundate land.
<b>Levee Breach</b>	The same as Levee Break but can sometimes describe a section of levee that has been intentionally broken. If intentional, also known as a relief cut.
<b>Lumber and Sack Topping</b>	Wooden panels and sandbags used to prevent overtopping and to divert water, mud, and debris flows. (Page 11)
<b>Overtopping</b>	When water has risen higher than the banks of a waterway or the top of a levee.
<b>Plastic Sheeting</b>	Made of polyethylene, these 100'x20'x10 millimeter rolls are sometimes referred to as visquine and are used for erosion control.
<b>Rain Coat</b>	A single layer of plastic sheeting and sandbags used to protect slopes from further rain saturation. (Page 22)
<b>Relief Cut</b>	Intentionally-removed section of levee to relieve hydrologic pressure upstream and downstream of the levee section.
<b>Sack Ring</b>	Multiple sandbag rings used to encircle a boil, slow the flow of water, and stop the erosion of levee material. (Page 13)
<b>Sack Topping</b>	A sandbag wall designed to prevent overtopping. (Page 9)

<b>Sandbag</b>	An 18"x30" bag (burlap or plastic) filled with sand or other appropriate material intended for use as a temporary flood fighting measure.
<b>Sloughing</b>	Soil movement or slides often caused by over-saturated levee or hillside slopes. Can also be referred to as 'mud slides'.
<b>Structure Protection</b>	Sandbags, wooden panels, or other materials used to divert water, mud, and debris flows away from buildings, homes, and other structures. (Page 24)
<b>Temporary Levee</b>	Use of plastic sheeting, fill material and sandbags to raise a low area on a levee or embankment. (Page 10)
<b>Twine</b>	250lb tensile strength polypropylene tying twine.
<b>'U' Shaped Sack Ring</b>	A sandbag structure used on levee slopes to control boils. (Page 14)
<b>Wooden Panels</b>	Wooden planks or plywood sheets used in conjunction with other flood fighting materials to prevent overtopping of levees or embankments and divert water.
<b>Wavewash</b>	Wind-generated waves breaking against a levee or embankment and possibly causing erosion.
<b>Wavewash Protection</b>	Plastic sheeting, sandbags, twine, stakes, and buttons used to prevent erosion of levee slopes and embankments. (Page 16)

## Reference Guide:

DWR Division of Flood Management  
**[www.water.ca.gov/floodmgmt](http://www.water.ca.gov/floodmgmt)**

California Data Exchange Center  
CDEC  
**[www.cdec.water.ca.gov](http://www.cdec.water.ca.gov)**

California Emergency Management Agency  
CalEMA  
**[www.calema.ca.gov](http://www.calema.ca.gov)**

National Weather Service  
**[www.weather.gov](http://www.weather.gov)**

To request a copy of the Directory of Flood Officials or Flood Emergency Phone Card, contact the DWR Flood Operations Center at (916) 574-2619



## **Flood Fight Material/Equipment List**

Fill/Repair material (Sand, Rock, Road Base)  
 Sandbags (18" width x 30" length 10 oz.)  
 Plastic Sheeting (100'x20'x10 millimeter rolls)  
 Wooden Stakes (1"x3"x24")  
 Bailing Twine (250lb tensile strength)  
 Tie Down Buttons  
 Geotextile Fabric (20'x100' rolls)

### ***Patrolling***

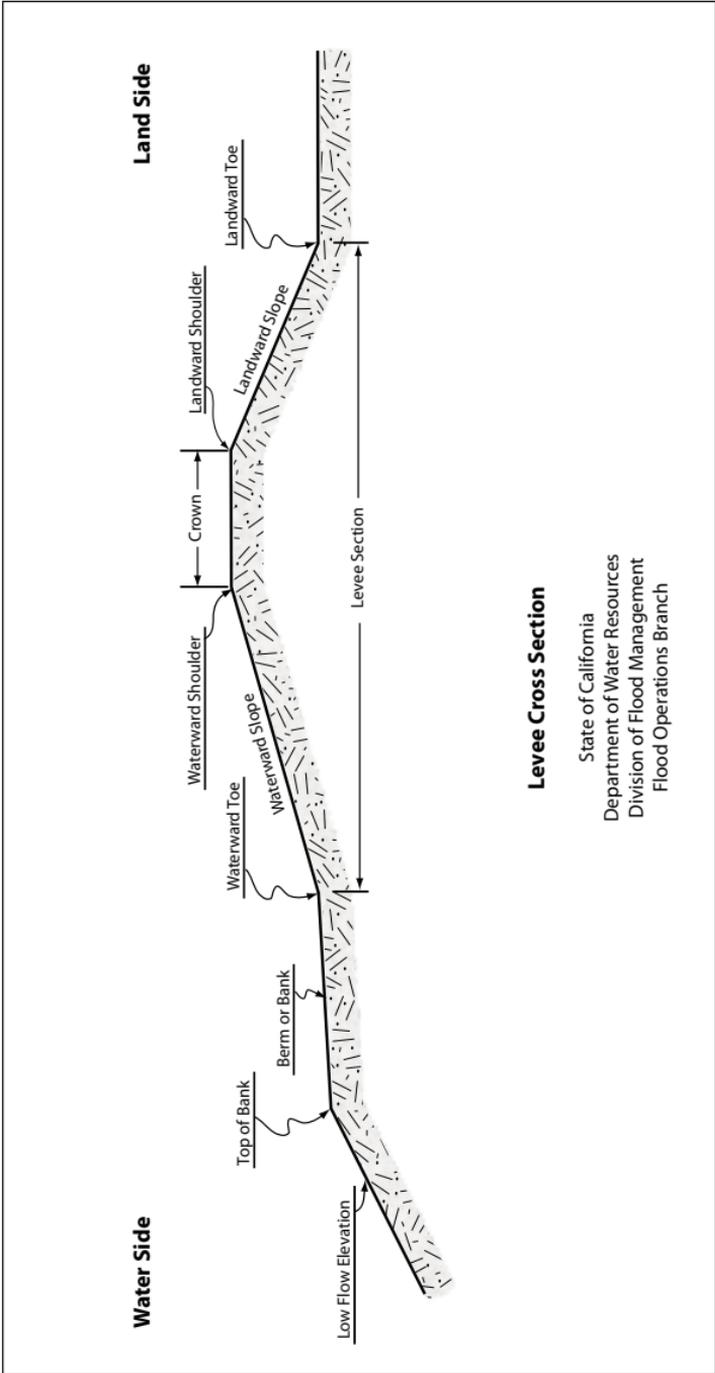
Patrol Vehicle (4Wheel Drive)  
 Communication Devices (Radio, Cell Phone, Laptop Computer (e-mail)  
 Global Positioning Satellite Handheld Device (GPS)  
 Digital Camera  
 Lighting (Flash Light, Flood Light)  
 Batteries  
 Lath (Bundle of 50)  
 Survey Ribbon (Bright Colors)  
 Permanent Ink Markers  
 Patrol Log (Writing Pad and Pencil)  
 Measuring Tape (100')

### ***Tools***

Shovels, Long Handle (#2 Mud Shovel)  
 Sledge Hammer (10lb)  
 Multi Purpose Lineman Pliers  
 Pulaski  
 McLeod  
 Loppers

### ***Safety***

Rain Gear  
 Rubber Boots  
 Hard Hat  
 Safety Glasses  
 Gloves  
 Boots  
 Personal Flotation Device (PFD)  
 Personal Safety Light  
 Warm Clothing  
 First Aid Kit





*For all flood emergencies, questions,  
or for additional information, please  
contact :*

**State-Federal Flood Operations Center**  
**(916) 574-2619**  
**[flood\\_center@water.ca.gov](mailto:flood_center@water.ca.gov)**

*For training information, contact:*

**Rick Burnett**  
*Flood Fight Specialist*  
**(916) 574-1203**  
**[rburnett@water.ca.gov](mailto:rburnett@water.ca.gov)**  
**[www.floodfightmethods.org](http://www.floodfightmethods.org)**



## **APPENDIX E**

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Check List No. 1 – Levee Inspection Report (See Standard Manual)

## **APPENDIX F**

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Check Lists, Channel and Structures

## CHECK LIST NO. 2

UNIT NO. 144

Inspector's Report Sheet No. \_\_\_\_\_

Inspector \_\_\_\_\_

Date \_\_\_\_\_

Superintendent \_\_\_\_\_

Item	Remarks
(a) Location by Station	
(b) Settlement, sloughing, or loss of grade	
(c) Erosion of back slope	
(d) Condition of roadways, including ramps	
(e) Evidence of seepage	
(f) Condition of farm gates and fencing	
(g) Maintenance measures taken since last inspection	
(h) Comments	

- Item (a) Indicate levee station of observation, obtained by pacing from nearest reference point; indicate right or left bank.
- Item (b) If sufficient settlement of earthwork has taken place to be noticeable by visual observation, indicate amount of settlement in tenths of a foot. If sloughing has caused a change in slope of embankment sections, determine the new slope. Note areas where erosion or gulying of the section has occurred.
- Item (c) If sufficient erosion or gulying of back face of back toe of levee has taken place to be noticeable by visual inspection, indicate area affected and depth.
- Item (d) Note any natural change in any section of roadway or ramps. Indicate any inadequacy in surface drainage system.
- Item (e) Indicate any evidence of seepage through the embankment section.
- Item (f) Indicate the serviceability of all farm gates across the embankments and roadway, and indicate if repainting is required.
- Item (g) Indicate maintenance measures that have been performed since last inspection and their condition at the time of this inspection.
- Item (h) Record opinion, if any, of contributory causes for conditions observed and also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 3

CHANNEL AND RIGHT-OF-WAY

UNIT NO. 144

Inspector's Report Sheet No. \_\_\_\_\_

Inspector \_\_\_\_\_

Date \_\_\_\_\_

Superintendent \_\_\_\_\_

Item	Remarks
(a) Name of channel and location by stations	
(b) Vegetal Growth in channel	
(c) Debris and refuse in channel	
(d) New construction within right-of-way	
(e) Extent of aggradation or degradation	
(f) Condition of riprapped section	
(g) Condition of bridges	
(h) Measures taken since last inspection	
(i) Comments	

- Item (a) Indicate station of observation obtained by pacing from nearest reference point.
- Item (b) Note nature, extent, and size of vegetal growth within the limits of flood flow channel.
- Item (c) Note nature and extent of debris and refuse that might cause clogging of the conduits of the irrigation intake works, fouling of the tainter gates, or the bridges over the channel.
- Item (d) Report any construction along the diversion channel or above the diversion channel or above the diversion works that has come to the attention of the inspector and that might affect the functioning of the project.
- Item (e) Indicate any change in grade or alignment of the channels, either by deposition or sediment or scour, that is noticeable by visual inspection. Estimate amount and extent.
- Item (f) Indicate any change that has taken place in the riprap such as disintegration of the rock, erosion, or movement of the rock. Note the presence of vegetal growth through the riprap.
- Item (g) Note any damage or settlement of the footings of the bridges. Indicate condition of wooden structures and if repainting is required. Indicate condition of bridge approaches, headwalls, and other appurtenances.
- Item (h) Indicate maintenance measures that have been performed since the last inspection and their condition at time of this inspection.
- Item (i) Record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.

NOTE: One copy of the Inspector's Report is to be mailed to the District Engineer immediately on completion, and one copy is to be attached to and submitted with the Superintendent's semi-annual report.

CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES

UNIT NO. 144

Inspector's Report Sheet No. \_\_\_\_\_ Inspector \_\_\_\_\_  
 Date \_\_\_\_\_ Superintendent \_\_\_\_\_

(a) Location by Station	(b) Bank	(c) Debris or other obstruction to flow	(d) Damage or settlement of pipe or conduit	(e) Condition of concrete headwall or invert paving	(f) Condition of right-of-way adjacent to structure	(g) Repair Measures Taken Since Last Inspection	(h) Comments
1414+10	Right						
1468+79	"						
1469+70	"						
1473+60	"						
109+23	"						
333+43	"						
358+00	"						
477+00	"						
486+80	"						
497+00	"						
529+28	"						
537+00	"						
574+20	"						
616+72	"						

CHECK LIST NO. 4

DRAINAGE AND IRRIGATION STRUCTURES

UNIT NO. 144

Inspector's Report Sheet No. \_\_\_\_\_ Inspector \_\_\_\_\_

Date \_\_\_\_\_ Superintendent \_\_\_\_\_

(a) Location by Station 638+07 657+00 678+00 735+57	(b) Bank Right " " " "	(c) Debris or other obstructions to flow	(d) Damage or settlement of pipe or conduit	(e) Condition of concrete headwall or invert paving	(f) Condition of right-of-way adjacent to structure	(g) Repair Measures Taken since last inspection	(h) Comments
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- (1) Enter station of all structures under Column (a) for check list.
- (2) Inspect inlet, barrel, and outlet for accumulation of sediment, rubbish, and vegetal matter. Note condition under Column (c).
- (3) If any settlement or damage to the pipe, barrel, or invert of the drain has occurred, estimate the location and amount. Note particularly if any backfill has come into the pipe or been disturbed. Record observations under Column (d).
- (4) Inspect the concrete portions of the structures for the evidence of settlement, cracks, "pop-outs", spaces, abrasive wear, or other deterioration. Record conditions under Column (e).
- (5) Inspect backfill area adjacent to structure for evidence of erosion caused by overflow of the drainage structure and note conditions in Column (f).
- (6) Under Column (g) indicate physical measures that have been taken to correct conditions reported in last inspection, and their condition at time of this inspection.
- (7) Under Column (h) record opinion, if any, of contributory causes for conditions observed, also any observations not covered under other columns.
- (8) A copy of the inspector's report is to be mailed to the District Engineer immediately on completion, and a record copy shall be attached to the Superintendent's semi-annual report.

## **APPENDIX G**

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Letter of Acceptance by Central Valley Flood Protection Board (previously State Reclamation Board) and Transfer Letters



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT  
1325 J STREET  
SACRAMENTO CA 95814-2922

NOV 29 2016

Ms. Leslie M. Gallagher  
Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room 151  
Sacramento, CA 95821

Dear Ms. Gallagher:

The purpose of this letter is to notify the Central Valley Flood Protection Board of the completion of an effort to update the Operation and Maintenance Manual Supplements for the Sacramento River Flood Control Project and the Lower San Joaquin River Levees and Lower San Joaquin River and Tributaries Project. These updates are a compilation of revisions made to the project over time and where we had record of a transfer letter to the Board. These updated supplements are the most current version and should be utilized as the baseline version for any future project modifications.

This process and the compiled updates have been coordinated with the Central Valley Flood Protection Board and Department of Water Resources staffs for review and comment. All comments have been addressed or incorporated into the manuals.

The Board staff has been provided a copy of the manuals in electronic format. Future updates will include entire unit supplements so updates can be seen in context with the entire unit supplement. The list of completed supplements, by the unit number and title, are attached. If you have any questions regarding this transmittal, please contact Gary Kamei at 916-557-6845.

Sincerely,

A handwritten signature in black ink, appearing to read "D. G. Ray", written over a horizontal line.

David G. Ray, P.E.  
Colonel, U.S. Army  
District Commander

Enclosures

<b>Standard O&amp;M Manual Sacramento River Flood Control Project</b>	
<b>Unit No.</b>	<b>Project Name</b>
101	RD 341 Sherman Island
102	E. Levee of Sac River, Isleton to Threemile Slough & N. Levee of Threemile Slough from Sac River to SJ River
103	Both Levees of Georgiana Slough & E. Levee of Sac River from Walnut Grove to Isleton
104	Levees around Grand Island
105	Levees Around Reyer Island
106	S. Levee Lindsey Slough & W. Levee of Yolo BP from Lindsey Slough to Watson Hollow and N. Levee of Watson Hollow Drain
107	Levees Around Hastings Tract
108	Levees Around Peters Tract
109	West Levee of Yolo Bypass & E. Levee of Cache Slough
110	Levees Around Sutter Island
111	E. Levee of Sac River from Freeport to Walnut Grove
112	Levees Around Merritt Island
113	E. Levee Yolo Bypass, N. Levee Miner Slough, W. Levees Sutter Slough, Elkhorn Slough & Sac River, All Bordering RD 999
114	W. Levee of Sac River from Northern Boundary of RD 765 to Southern Boundary of RD 307
115	E. Levee of Sac River from Sutterville Rd to Northern Boundary of RD 744
116	W. Levee of Sac River from Sac Weir to Mi 51.2 & S. Levee of Sac Bypass & E. Levee of Yolo Bypass from Sac Bypass to Southern Boundary of RD 900
117	E. Levee Sac River through City of Sac from Tower Bridge to Sutterville Rd
118.1	E. Levee of Sac River from American River to Tower Bridge & S. Levee of American River from Mayhews Downstream to Sac River
118.2	N. Levee American River, E. Levee Natomas Canal, Both Levees Arcade Creek, S. Levee Linda Creek, & Magpie Creek Diversion Channel
118.2 Sup	Vegetation on Mitigation Sites E. Levee of Sac River from American River to Tower Bridge & S. Levee of American River from Mayhews Downstream to Sac River
119	Putah Creek Channel & Levees & W. Levee of Yolo Bypass from Yolo Causeway Downstream 3 mi. Includes O&M manual for the Yolo Basin wetlands, and South Fork Putah Creek Preserve Restoration Section 1135 Authorization.
120	Relocated Willow Slough Channel & Levees & W. Levee Yolo Bypass from mouth of Relocated Willow Slough to Yolo Causeway
121	R. Levee of Yolo Bypass from Willow Slough Bypass to Woodland Rd RD2035
122.1	W. Levee of Sac River from Mi 70.8 to Sac Weir & N. Levee of Sac Bypass & E. Levee of Yolo Bypass from Woodland Hwy to Sac Bypass
123	W. Levee of Sac River from East End of Fremont Weir to Mi 70.8 & E. Levee of Yolo Bypass from East End Fremont Weir to Woodland Hwy RD 1600

124	N. Levee of American River from Natomas E. Canal to Sac River & E. Levee of Sac River from Natomas Cross Canal to American River. Includes supplement, Vegetation on Mitigation Sites.
125	Back Levee of RD 1000
126	Cache Creek Levees & Settling Basin Yolo Bypass to High Ground
127	Knights Landing Ridge Cut & Sac River & Yolo BP Levees of RD's 730 and 819 & S. Levee of Sycamore Slough
128	E. Levee of Sac River from Sutter Bypass to Tisdale Weir all within RD 1500
129	S. Levee of Tisdale By-Pass from E. Levee Sac River to W. Levee Sutter BP & W. Levee of Sutter BP Downstream to E. Levee of Sac River
130	W. Levee Sac River from Sycamore Slough to Wilkins Slough (Mi. 89.9 to Mi. 117.8)
131	W. Levee Sac River from Wilkins Slough to Colusa (Mi. 117.8 to Mi. 143.5)
132	Back Levees of RD 108
133	E. Levee of Sac River from Winship School to Tisdale BP & N. Levee of Tisdale BP & W. Levee of Sutter BP from Long Bridge to Tisdale BP
134	Levees of RD 70, E. Levee of Sac River from Butte Slough Outfall Gates to Winship School & W. Levee of Sutter BP from Butte Slough Outfall Gates to Long Bridge
135	E. Levee of Sutter BP from Sutter Buttes Southerly to Junction with Feather River & E. & W. Levees of Wadsworth Canal & Levee of Intercepting Canals
136	E. Levee of Sac River from Butte Slough Outfall Gates to the Princeton-Afton Rd (Mi. 138.3 to Mi. 164.4)
137	W. Levee of Sac River from North End of Princeton Warehouse to Colusa Bridge
138	E. Levee of Sac River from Parrott-Grant Line to Princeton-Afton Rd
139	W. Levee of Sac River from N. Boundary of LD 2 to North End of Princeton Warehouse
140	W. Levee of Sac River in LD 1 (Mi. 170.5 to Mi. 184.7). Includes mitigation site O&M manual, Yuba County
141.1	E. Levee of Feather River from Bear River to Natomas CC & S. Levee of Bear River & Both Levees of Yankee Slough. Parts 1 and 2
141.2	E. Levee of Feather River from Bear River to Natomas CC & S. Levee of Bear River & Both Levees of Yankee Slough. Parts 1 and 2
142	Back Levee of RD 1001
143	W. Levee of Feather River from North Boundary of RD 823 to E. Levee of Sutter Bypass
144	W. Levee of Feather River from North Boundary of LD 1 to North Boundary of RD 823
145	E. Levee of Feather River, S. Levee of Yuba River, Both Levees of WPRR Intercepting Channel, W. Levee of South Dry Creek & N. Levee of Bear River
146	N. Levee of Bear River & S. Levee of South Dry Creek RD 817 & Vicinity of Wheatland
147	Levee Around the City of Marysville & N. Levee of Yuba River to a Point 1.8 Mi. Upstream from Marysville

148	W. Levee of Feather River from North Boundary of RD 777 to North Boundary of LD 1
149	S. Levee of Yuba River Maintenance Area No. 8
151	E. Levee Feather River from Honcut Creek to Marysville & S. Levee of Honcut Creek & E. Levee of RD 10
152	W. Levee of Feather River from N. Boundary of RD 777 to Western Canal Intake (Levee of Drainage District No. 1)
153	Lower Butte Creek Channel Improvement, Colusa, Glenn & Butte Counties
154	Moulton Weir & Training Levee Sacramento River
155	Colusa Weir & Training Levee Sacramento River
156	Tisdale Weir & Bypass
157	Fremont Weir, Sacramento River
158	Sacramento Weir, Sacramento River
159	Pumping Plants No. 1, 2 & 3, Sutter Bypass
160	Sutter Butte Canal Headgate
161	Butte Slough Outfall Gates
162	Knights Landing Outfall Gates, Sacramento River

**Standard O&M Manual San Joaquin River**

<b>Unit No.</b>	<b>Project Name</b>
1	Right Bank Levee of the San Joaquin River & French Camp Slough within RD 404
2	Right Bank Levee of the San Joaquin River & French Camp Slough within RD 17
3	North Levee of Stanislaus River & East Levee of the San Joaquin River within RD 2064, 2075, 2094 and 2096
4	East Levee of San Joaquin River within RD 2031
5	East Levee of the San Joaquin River Within RD No. 2092
6	East Levee of the San Joaquin River in RD Nos. 2063 & 2091
7	West Levee of San Joaquin River & North Levee of Old River RD Nos. 524 & 544
8	Right Banks of Old River & Salmon Slough Within RD No. 1 & RD No. 2089
9	Levees Around RD No. 2062 & San Joaquin County Flood Control District Area No.2
10	West Levee of Paradise Cut RD No. 2058 & SJ County Flood Control District, Area No.2
11	West Levee of San Joaquin River from Durham Bridge to Paradise Dam Within RD No. 2085 & 2095
12	West Levee of San Joaquin River From Opposite Mouth of Tuolumne River Downstream to Stanislaus County Line Within RD Nos. 2099, 2100, 2101, & 2102
13	West Levee of the San Joaquin River in RD No. 1602



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
SACRAMENTO ENGINEER DISTRICT  
U.S. ARMY CORPS OF ENGINEERS  
1325 J STREET  
SACRAMENTO, CALIFORNIA, 95814-2922

Executive Office

JUL 18 2013

Mr. Jay Punia, Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room 151  
Sacramento, California 95821

Dear Mr. Punia,

Pursuant to 33 USC 408, the Director of Civil Works for the U.S. Army Corps of Engineers (USACE) approved your request to alter the Sacramento River Flood Control Project (SRFCP) on June 1, 2009, as part of the Feather River Levee Setback at Star Bend project. This project, implemented by Levee District 1 was the subject of encroachment permit number 18191. The Sacramento District granted permission for you to alter the aforementioned project on June 16, 2009 as it had been determined that such alteration would not be injurious to the public interest and would not impair the usefulness of the project work.

In accordance with the above granted approval and permission, while under the direction of the Central Valley Flood Protection Board, alterations to the Federal flood risk management system were substantially completed in fall 2009. Your office subsequently submitted a revised *Supplement to Standard Operation and Maintenance (O&M) Manual Sacramento River Flood Control Project, Unit No. 144, West Levee of Feather River from North Boundary of Levee District No. 1 to North Boundary of Reclamation District 823 (Maintenance Area 3); December 2010 As-Builts*, stamped January 2011; *Construction Completion Report, Volumes 1, 2a, 2b, and 3, dated December 2010*; and *Levee District 1 Flood Safety and Preparedness Plan*, dated July 2012. The Sacramento District has reviewed the above submittals and has determined that the local improvements were constructed in accordance with the final (100 percent) plans and specifications dated February 2009, as approved by the USACE under 33 USC 408.

This letter informs you that the approximately 3,400 feet of setback levee and the 3,400 feet of cutoff wall installed below the setback levee located on the Feather River right bank at Star Bend between Levee Mile 4.20 and 3.55 is accepted as part of the SRFCP. This letter transmits the *Supplement to Standard Operation and Maintenance (O&M) Manual Sacramento River Flood Control Project, Unit No. 144, West Levee of Feather River from North Boundary of Levee District No. 1 to North Boundary of Maintenance Area 3 (Previously Reclamation District 823)* (Encl 1) and the Star Bend Setback levee as-built drawings (Encl 2). This revised supplemental manual replaces, in its entirety, the previous version. Additionally, the *Levee District 1 Flood Safety and Preparedness Plan* has been reviewed and is acceptable as submitted.

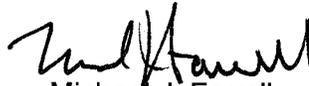
In accordance with the assurances you provided on November 14, 2008, you are responsible to operate and maintain this levee as part of the SRFCP. This letter of acceptance into the Federal flood control system should not be construed as an endorsement for inclusion of the alteration described above into the National Flood Insurance Program as outlined in Title 44 of the Code of Federal Regulations Section 65.10 of the National Flood Insurance Regulations (44 CFR Section 65.10). In addition this letter of acceptance shall neither be

interpreted as a Federal assurance regarding later approval of any project or credit nor shall it commit the United States to any type of reimbursement if a Federal project is not undertaken.

My point of contact for this action is Ms. Meegan Nagy, Chief, Flood Protection and Navigation Section. She may be reached by telephone at (916) 557-7257 or by email at Meegan.G.Nagy@usace.army.mil.

A copy of this letter is being furnished to Mr. Bill Hampton, General Manager, Levee District 1, 243 2nd Street, Yuba City, California 95991.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael J. Farrell".

Michael J. Farrell  
Colonel, U.S. Army  
District Commander

Enclosures

**CENTRAL VALLEY FLOOD PROTECTION BOARD**

3310 El Camino Ave., Rm. 151  
SACRAMENTO, CA 95821  
(916) 574-0609 FAX: (916) 574-0682  
PERMITS: (916) 574-2380 FAX: (916) 574-0682



October 23, 2012

Mr. Adam Riley  
U.S. Army Corps of Engineers  
Construction-Operation Division-Operation and Readiness Branch  
Sacramento District Office  
1325 J Street  
Sacramento, California 95814

**Subject:** PERMIT ACCEPTANCE  
Central Valley Flood Protection Board Permits No.'s 18191BD, 18437BD, 18438BD  
and a portion of 17936-Rev GM  
Unit No. 144 LD-1 Setback Levee at Star Bend West Levee of the Feather River

Dear Mr. Riley:

This letter is in reference to the subject Central Valley Flood Protection Board (Board) permits and is documentation that this portion of the Feather River Right Bank – Sutter Bypass East Bank Levee System in the Sacramento River Flood Control Project (SRFCP) meets the requirements of the Board permits.

In August 2012, Board staff received the *Addendum to the Operation and Maintenance Manual* prepared by GEI Consultants for Levee District No.1 of Sutter County (LD-1) to address operation and maintenance requirements for the improvements constructed on the west levee of the Feather River at Star Bend. These improvements and 20.65 acres of associated mitigation and habitat enhancement efforts for the Valley Elderberry Longhorn Beetle (VELB) and riparian habitat were completed as part of LD-1's Lower Feather River Setback Levee at the Star Bend Project. The project improvements by LD-1 at Star Bend, near Feather River Mile (RM) 18.0, are an addition to the existing West Levee System of the Feather River, Unit No. 144 of the U.S. Army Corps of Engineers' SRFCP.

In accordance with the Supplement to Standard Operation and Maintenance Manual (SSO&M) for the Sacramento River Flood Control Project Unit No. 144 by the U.S. Army Corps of Engineers (USACE), Sacramento District, assurances are provided by local interests and by the State Reclamation Board (now the Central Valley Flood Protection Board). Under paragraphs 1-06 and 1-07 it states:

1-06 "Assurance of cooperation by local interests is provided by State Legislation, as contained in Chapter 3, Part 2, Division 5, of the State Water Code under paragraph 2-02a of the Standard Manual."

1-07 "Responsibility for operating and maintaining the completed works was officially accepted by the Reclamation Board of the State of California on 18 December 1951 and 2 December 1952, as included in the SSO&M, letters of acceptance, Exhibit F."

On August 7, 2012, Board staff met with LD-1 General Manager, Bill Hampton, to review the final completed project. It is Board staff's opinion that permit conditions were met and performed in conformance with proper engineering criteria.

The levee segment of Unit No. 144 is approximately 16.65 miles in length and is located along the right bank of the Feather River between RM 13.0 and RM 30.0. The project was completed in 2009. The floodways of the Lower Feather River Corridor (LFRC) now include three setback levees varying from 1,200 feet to over 6,000 feet in low flow widths. With the completion of the LD-1 setback levee at Star Bend, there are two other completed projects of the LFRC which makeup the system. They are:

- 1) the east bank of the Feather River (Unit No. 145) upstream of Star Bend by the Three Rivers Levee Improvement Authority (TRLIA) completed in 2010; and
- 2) The north bank of the Bear River (Unit No. 145) near the confluence with the Feather River, also constructed by TRLIA, completed in 2008.

The three setback levees are shown on an enclosed map provided in this document as (Enclosure-1).

The total Star Bend Setback Levee Project was permitted through four Board Permits numbered 18191BD, 18437BD, 18438BD, and a portion of 17936-Rev GM. The permits described as follows:

**18191BD** (Enclosures 2 & 3)

Applicant: Levee District No.1, Sutter County

To remove approximately 4,500 linear-feet of existing project levee and construct a 3,400-linear-foot-long setback levee (LM 3.75 to 4.5) with a slurry cutoff wall; and modifying the existing pipelines at Star Bend on the right (west) bank of the Feather River. The project is located south of Yuba City, northeast of the intersection of Highway 99 and Garden Highway (Section 1&2, T13N, R3E, MDB&M, Levee District 1 Sutter, Feather River, Sutter County). Board Permit approved May 11, 2009 and USACE no objection letter dated April 3, 2009.

**18437BD** (Enclosure 4)

Applicant: Tudor mutual Water Company

To abandon and remove existing irrigation pipeline and install a 48-inch-diameter, 1,660-foot-long welded steel pipe from the existing pump station along the overflow area of the right (west) bank levee of the Feather River to the waterside toe of the new setback levee; install two 30-inch-diameter, 510-foot-long welded steel pipes up and over new setback levee; remove distribution box at landside toe of existing Feather River Levee and place fill material on landside slope at upstream end of setback levee. The project is located south of Yuba City, approximately one mile northeast of the intersection of Highway 99 and the Garden Highway (Section 2, T13N, R3E, MDB&M, Levee District 1 Sutter, Feather River, Sutter County). Board Permit approved April 13, 2009 and USACE no objection letter dated March 26, 2009.

**18438BD** (Enclosure 5)

Applicant: Volcano Vista Farms c/o Michael Churkin

To abandon and remove existing irrigation pipeline and install a 24-inch-diameter, 1,660-foot-long welded steel pipe from the existing pump station along the overflow area of the right (west) bank levee of the Feather River to the waterside toe of the new setback levee; install an 18-inch-diameter, 510-foot-long welded steel pipe up and over new setback levee; remove distribution box at landside toe of existing Feather River Levee and place fill material on landside slope at upstream end of setback levee. The project is located south of Yuba City, approximately one mile northeast of the intersection of Highway 99 and the Garden Highway (Section 2, T13N, R3E, MDB&M, Levee District 1 Sutter, Feather River, Sutter County). Board Permit approved April 13, 2009 and USACE no objection letter dated March 26, 2009.

**17936-Rev GM (the northern portion of the permit)** (Enclosure 6)

Applicant: California Department of Fish and Game

To restore 228 acres by planting several species of native trees and shrubs (Freemont Cottonwood, Western Sycamore, Valley Oak, Elderberry, California Blackberry, Wild Rose, Oregon Ash, Buttonbush, Coyote Bush, Arroyo, Black, and Sandbar Willow) on the overflow area of the right (west) bank of the Feather river within the Feather River Wildlife area in Sutter County. The project is located south of Yuba City, east of Garden Highway and south of Star Bend road (Section 1, T13N, R3E, MDB&M, Levee district 1, Feather River, Sutter County). Board Permit approved September 15, 2005 without USACE letter.

In accordance with the U.S. Army Corps of Engineers, Engineer Regulation (ER) 1110-2-401, "*Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual for projects and separable elements managed by project sponsors*" the permit applicant, LD-1, is required to submit specified documents that are outlined in the manual as part of the finalization of the project and ultimate final project close-out. The required documents are also a forerunner to an amendment to the federal Operation and Maintenance Manual which could ultimately lead to PL84-99 sponsorship and, finally, FEMA accreditation of the levee for the basin-wide levee certification.

Documents received from LD-1's engineer are:

- 1) Addendum to Supplement to Standard Operation and Maintenance Manual Sacramento River Flood Control Project, and Vegetation Monitoring Plan of Feather River Floodplain adjacent to Star Bend Setback Levee near RM 18.0; Unit No. 144, West Levee of Feather River from North Boundary of Levee District No. 1 to North Boundary of Reclamation District No. 823 (Maintenance Area 3) dated July 2012 by GEI Consultants.
- 2) Levee District No. 1 of Sutter County, Lower Feather River Setback Levee at Star Bend, Construction Completion Report – Volume 2A of 3 dated December 31, 2010 by MHM, Incorporated, including As-Built Record Drawings of Construction for:
  - Lower Feather River Setback Levee at Star Bend
  - Tudor Mutual Water Company – Irrigation System
  - Tudor Mutual Water Company – Vacuum and Sump Pump Project
  - Volcano Vista Farms – Irrigation System
  - And Final Levee Crown Surveys

- 3) Levee District No. 1 (LD-1) Flood Safety and Preparedness Plan for Unit No. 144 of Sacramento river Flood Control Project, adopted by LD-1, Sutter County, and Yuba City in March-April 2011
- 4) Lower Feather River Setback Levee at Star Bend; Contract Documents, Volume 1 of 2; Specifications for Contract No. 09-02 dated November 2008 (90% submittal).
- 5) Operation, Maintenance, Repair, Replacement, and Rehabilitation Agreement between The Central Valley Flood Protection Board and Levee District No.1 of Sutter County for The Lower Feather River Setback Levee Project at Star Bend. Agreement 4600008139 dated December 3, 2010. And a resolution by LD-1 signed by Francis K. Silva, Chairman of LD-1 (Resolution No. 2011-03 adopted November 8, 2010).

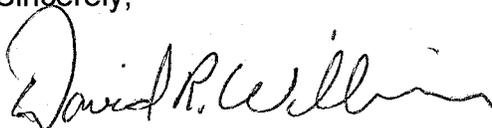
After review of the "As-Builts," supplements, inspection documents, and subsequent meetings, Board staff finds that the project was built according to permit requirements and in compliance with the California Code of Regulations Title-23, DWR's Urban Levee Design Criteria (May 2012) and USACE Engineering Regulations. Therefore, Board staff concludes that all matters have been met and that the project complies with permit conditions.

In accordance with SSO&M, for Unit No. 104, paragraph 1-08 states "*The name and address of the Superintendent appointed by local interests to be responsible for the continuous inspection, operation and maintenance of the project works shall be furnished the District Engineer, and in case of any change of Superintendent, the District Engineer shall be so notified.*"

This letter will be a trigger for the USACE Sacramento District Office to prepare a letter of permission to turn over Operation and Maintenance responsibilities to the Board, as the local sponsor, who, in turn, will relinquish that responsibility to the Long Term Maintenance Agency, LD-1. This is also a requirement for ultimately acquiring levee certification as outlined in the Code of Federal Regulations 44 CFR 65.10, a consistent requirement for both the USACE and FEMA, where the basin-wide project is recognized on FEMA's Flood Insurance Rate Map (FIRM) as providing protection from the 1% or greater annual chance flood event.

If you have any questions, please contact me at (916) 574-0698, or via e-mail at [Davidw@water.ca.gov](mailto:Davidw@water.ca.gov), or Deb Biswas at (916) 574-2383, or via email at [dbiswas@water.ca.gov](mailto:dbiswas@water.ca.gov).

Sincerely,



David R. Williams  
Projects Section Chief

Enclosures: (see attached list)

cc: (see attached list)

Enclosures:

- 1) Local Units of the Feather River Wildlife Area
- 2) Board signed Permit 18191BD
- 3) Draft Environmental Impact Report for the Feather River Setback Levee Project at Star Bend (includes the MMRP) per permit 18191
- 4) Board signed Permit 18437BD
- 5) Board signed Permit 18438BD
- 6) Board signed Permit 17936-Rev GM

cc: Ryan Larson  
Construction and Operations Branch  
U.S. Army Corps of Engineers  
Sacramento District  
1325 J Street  
Sacramento, California 95814

Meegan Nagy  
Construction and Operations Branch  
U.S. Army Corps of Engineers  
Sacramento District  
1325 J Street  
Sacramento, California 95814

Mr. Alfred Montna, Director  
Levee District 1  
12755 Garden Highway  
Yuba City, California 95991

Mr. Bill Hampton, General Manager  
Levee District 1  
243 Second Street  
Yuba City, California 95991

Mr. Francis K. Silva, Chairman  
Levee District 1  
54 Central Vanue  
Yuba City, California 95816

Mr. Jeffrey Twitchell  
GEI Consultants, Inc.  
2868 Prospect Park Drive, Suite 400  
Rancho Cordova, CA 95670

Mr. Sean Minard  
MHM  
P.O. Box B, 1204 E Street  
Marysville, California 95901

cc: (by electronic copy)

Kent Zenobia, DWR Project Delivery Branch  
Kelly Fucciolo, DWR EIP  
Jennifer Fasani, DWR EIP  
Noel Lerner, DWR Flood Maintenance Office

Andrew Pendery, DWR/ CVFPB Chief Inspector, EIP  
Don Rasmussen, DWR Flood Project Integrity & Inspection Branch  
David Pesavento, DWR Inspections Section

Jay Punia, Executive Officer, CVFPB  
Len Marino, Chief Engineer, CVFPB  
Eric Butler, Projects and Environmental Branch, CVFPB



DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Sacramento  
Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

REPLY TO  
ATTENTION OF

Operations and Readiness Branch

AUG 22 2012

Mr. Jay Punia, Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room 151  
Sacramento, California 95821

Dear Mr. Punia:

This letter is to transfer work performed by the Sacramento River Bank Protection Project to the Central Valley Flood Protection Board for Operation and Maintenance (O&M). The U.S. Army Corps of Engineers (USACE) completed work at the following locations:

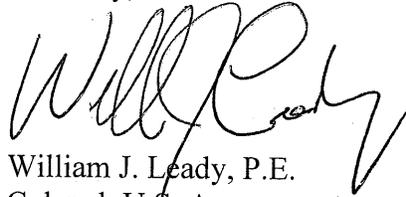
River	Site Name	O&M Manual Unit#	Drawing No.	Contract No.
Sacramento River	50.2 L	115	50-04-6118	W91238-06-C-0101
Sacramento River	51.5 L	115	50-04-6118	W91238-06-C-0101
Sacramento River	72.2 R	123	50-04-6245	W91238-06-C-0018
Sacramento River	99.3 R	130	50-25-6248	W91238-06-C-0019
Sacramento River	177.8 R	140	50-04-6280	W91238-08-C-0011
Lower American River	0.3 L	118 Part 1	50-04-6280	W91238-08-C-0011
Lower American River	2.8 L	118 Part 1	50-04-6280	W91238-08-C-0011
Feather River	28.5 R	144	50-04-6301	W91238-09-C-0021

The above work was completed under the "Agreement Between The United States of America and The State of California for Local Cooperation on the Sacramento River Bank Protection Project California," dated April 20, 1984. The work was completed in accordance with the drawings and contract numbers shown above.

The work shown above is considered complete as of the date of this letter. Attached are the revised O&M Manual Supplements. A copy of the As-Constructed drawings for the above work is included in Exhibit B of each supplement. The rehabilitation work meets the requirements of the O&M Manuals and enclosed revisions. The Central Valley Flood Protection Board shall continue to operate and maintain the completed sites as part of the project.

If you have any questions regarding the Sacramento River Bank Protection Project, please contact Mr. Dave Cook, Project Manager, at (916) 557-7890. If you have any questions regarding this transfer, please contact Mr. Ryan Larson at (916) 557-7568.

Sincerely,

A handwritten signature in black ink, appearing to read "William J. Leady". The signature is stylized and cursive.

William J. Leady, P.E.  
Colonel, U.S. Army  
District Commander

Enclosure

**THE RECLAMATION BOARD**

3310 El Camino Avenue, LL40  
SACRAMENTO, CA 95821  
(916) 574-0609 FAX: (916) 5790682  
Permits: (916) 574-0653 FAX: (916) 5740681



MAY 21 2004

Colonel Michael J. Conrad, Jr.  
District Engineer  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Dear Colonel Conrad:

In your February 04, 2004 letter to The Reclamation Board, the U.S. Army Corps of Engineers transferred the completed 1997 Cost-Shared Public Law 84-99 flood damage repairs along the right (west) levee of the Feather River between Levee Mile 14.60 and L.M. 16.02 in Levee District 1, Sutter County to the State of California for operation and maintenance. You advised the Board that the completed repairs meet the requirements of the existing Operation and Maintenance Manual, for Sacramento River Basin No. 18. We understand that the repairs were completed in accordance with the original plans and specifications. We acknowledge receipt of as-constructed plans and will forward a copy to LD 1, Sutter County.

The Board, on behalf of the State, accepted the completed repairs at its May 21, 2004 meeting and transferred the completed repairs to LD 1, Sutter County, for operation and maintenance.

If you have any questions, you may contact Peter D. Rabbon, General Manager of The Reclamation Board, at (916) 574-0609, or your staff may contact Michele Ng, Chief of the Department of Water Resources' System Integrity Section, at (916) 574-0364.

Sincerely,

ORIGINAL SIGNED BY

Betsy A. Marchand  
President

cc: (See attached list.)

*Handwritten signature*

Mr. Eric Nagy  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Mr. Kenneth Dickerson, Superintendent  
Sutter Maintenance Yard  
Post Office Box 40  
Sutter, California 95982

Mr. Bill Hampton, General Manager  
Levee District 1, Sutter County  
243 Second Street  
Yuba City, California 95991

*Unit 1944*

**THE RECLAMATION BOARD**

3310 El Camino Avenue, LL40  
SACRAMENTO, CA 95821  
(916) 574-0609 FAX: (916) 5790682  
Permits: (916) 574-0653 FAX: (916) 5740681



MAY 21 2004

Colonel Michael J. Conrad, Jr.  
District Engineer  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Dear Colonel Conrad:

In your March 12, 2004 letter to The Reclamation Board, the U.S. Army Corps of Engineers transferred the completed 1997 Cost-Shared Public Law 84-99 flood damage repairs along the right (west) levee of the Feather River between Levee Mile 11.00 and LM 11.50 of Levee District 1, Sutter County, to the State of California for operation and maintenance. You advised the Board that the completed repairs meet the requirements of the existing Operation and Maintenance Manual, for Sacramento River Basin No. 18. We understand that the repairs were completed in accordance with the original plans and specifications. We acknowledge receipt of as-constructed plans and will forward a copy to LD 1, Sutter County.

The Board, on behalf of the State, accepted the completed repairs at its May 21, 2004 meeting and transferred the completed repairs to LD 1, Sutter County, for operation and maintenance.

If you have any questions, you may contact Peter D. Rabbon, General Manager of The Reclamation Board, at (916) 574-0609, or your staff may contact Michele Ng, Chief of the Department of Water Resources' System Integrity Section, at (916) 574-0364.

Sincerely,

ORIGINAL SIGNED BY

Betsy A. Marchand  
President

cc: (See attached list.)

*Ann 1/1/04*

Mr. Eric Nagy ✓  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Mr. Kenneth Dickerson, Superintendent  
Sutter Maintenance Yard  
Post Office Box 40  
Sutter, California 95982

Mr. Bill Hampton, General Manager  
Levee District 1, Sutter County  
243 Second Street  
Yuba City, California 95991

*Christ 1/14/94*

MAR 12 2004

Navigation and Flood Control Unit

Mr. Peter D. Rabbon, General Manager  
The Reclamation Board  
State of California  
3310 El Camino Avenue, Room LL40  
Sacramento, California 95821

Dear Mr. Rabbon:

This letter is to transfer a portion of work along the Feather River to The Reclamation Board for Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). The completed work is located in Sutter County within Sacramento Basin No. 18. The completed work includes L.M. 11.00 intersecting at L.M. 11.50 of Levee District No. 1 located along the right bank of the Feather River. The site was repaired as a result of damage sustained during the Flood of 1997. A description of the repairs and the location of the site are included in the document titled, "Project Information Form, Levee District 1 (Sac-18) Shanghai Bend, 1997 Cost-Shared Levee Repairs, Sutter County, California" (encl 1).

The work was performed under the general authority of the Flood and Coastal Storm Emergencies Act, Public Law 84-99; and, special authority granted under the Fiscal Year 1997 Emergency Supplemental Appropriations Act, Public Law 105-18. This work now meets the requirements of the existing Operations and Maintenance Manual for the Feather River (Sac-18); therefore, said flood control work together with the waterway banks contiguous thereto are transferred as of the date of this letter to the State of California for operation and maintenance.

The repairs were completed in accordance with Specification Number 9998E, Drawing File Number 4-4-620, and Contract Number DACW05-98-D-0035, Task Order No. 2. A final inspection was conducted in December 1999 and all noted deficiencies have been resolved. The as-built drawings for the completed work are included in the document titled, "PL 84-99 Cost Shared, Sacramento Basin No. 18, Feather River, Shanghai Bend" (encl 2).

If you have any questions regarding this project, please contact Mr. Eric Nagy of the Programs and Project Management Division at (916) 557-5114. If you have any questions regarding this transfer, please contact Mr. Mohsen Tavana at (916) 557-5282 or Mr. Bob Murakami at (916) 557-6738.

Sincerely,

Michael J. Conrad, Jr.  
Colonel, Corps of Engineers  
District Engineer

Enclosures

Copy Furnished:

Mr. Keith Swanson, State of California, Department of Water Resources, 3310 El Camino Avenue,  
Room 110, Sacramento, CA 95821

*Unit No. 144*



DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO  
CORPS OF ENGINEERS  
1325 J STREET  
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO  
ATTENTION OF

Navigation and Flood Control Unit

FEB 04 2004

Mr. Peter D. Rabbon, General Manager  
The Reclamation Board  
State of California  
3310 El Camino Avenue, Room LL40  
Sacramento, California 95821

Dear Mr. Rabbon:

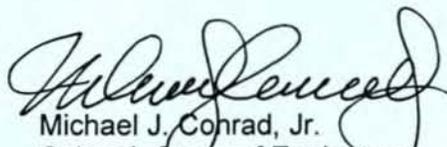
This letter is to transfer a portion of work along the Feather River to The Reclamation Board for Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). The completed work is located in Sutter County within Sacramento Basin No. 18. The completed work includes LM 14.60 through LM 16.02 of Levee District 1 located along the right (west) bank of the Feather River. The site was repaired as a result of damage sustained during the Flood of 1997. A description of the repairs and the location of the site are included in the document titled "Project Information Form, Levee District 1 Slurry Wall (Sac-18), 1997 Cost-Shared Levee Repairs, Sutter County, California" (encl 1).

The work was performed under the general authority of the Flood and Coastal Storm Emergencies Act, Public Law 84-99; and, special authority granted under the Fiscal Year 1997 Emergency Supplemental Appropriations Act, Public Law 105-18. This work now meets the requirements of the existing Operations and Maintenance Manual for Sacramento Basin No. 18; and, therefore, said flood control work, together with the waterway banks contiguous thereto, are transferred as of the date of this letter to the State of California for operation and maintenance.

The repairs were completed in accordance with Specification Number 1101E, Drawing File Number 4-25-626, and Contract Number DACW05-00-C-0032. A final inspection was conducted in July 2001 and all noted deficiencies have been corrected. The original construction drawings for the completed work are included in the document titled "PL 84-99, Cost Shared/Added Sites, Sacramento Basin No. 18, LD1 Slurry Wall" (encl 2).

If you have any questions regarding this project, please contact Mr. Eric Nagy of the Programs and Project Management Division at (916) 557-5114. If you have any questions regarding this transfer, please contact Mr. Mohsen Taviana at (916) 557-5282 or Mr. Bob Murakami at (916) 557-6738.

Sincerely,

  
Michael J. Conrad, Jr.  
Colonel, Corps of Engineers  
District Engineer

*Unit 1414*

Enclosures

Copy Furnished:

Mr. Keith Swanson, State of California, Dept of Water Resources, 3310 El Camino Avenue, Room 110,  
Sacramento, CA 95821

**THE RECLAMATION BOARD**

1416 NINTH STREET, ROOM 1601  
SACRAMENTO, CA 95814  
(916) 653-5434 FAX: (916) 653-5805  
Permits: (916) 653-5726 FAX: (916) 653-5805

JUL 18 2003



Colonel Michael J. Conrad, Jr.  
District Engineer  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Dear Colonel Conrad:

In your April 9, 2003 letter to The Reclamation Board, the U.S. Army Corps of Engineers transferred the repaired right-bank levee of the Feather River, Levee Mile 2.35 to LM 3.52 (in Maintenance Area 3) and LM 1.43 to LM 1.60 (in Levee District 1, Sutter County) to the State of California for operation and maintenance. You advised the Board that the completed repairs would be added by amendment to the Operation and Maintenance Manual, Sacramento River Flood Control Project. We also understand that the repairs were completed in accordance with the original plans and specifications. We acknowledge receipt of as-constructed drawings and will forward a copy to LD 1, Sutter County, as well as to the Department of Water Resources.

The Board, on behalf of the State, accepted the completed repairs at its July 18, 2003 meeting and transferred the Feather River LM 1.43 to LM 1.60 repairs to LD 1, Sutter County, and the LM 2.35 to LM 3.52 repairs to DWR for operation and maintenance. Until the Corps provides the O&M Manual amendment, LD 1, Sutter County, and DWR will perform operation and maintenance in accordance with the current manual.

If you have any questions, you may contact Peter D. Rabbon, General Manager of The Reclamation Board, at (916) 574-0609, or your staff may contact Michele Ng, Chief of the Department of Water Resources' System Integrity Section, Division of Flood Management, at (916) 574-0364.

Sincerely,

A handwritten signature in black ink that reads "Betsy A. Marchand".

Betsy A. Marchand  
President

(See attached list.)

cc: Mr. Eric Nagy  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Mr. Bill Hampton, General Manager  
Levee District 1, Sutter County  
243 Second Street  
Yuba City, California 95991

Mr. Kenneth Dickerson, Superintendent  
Sutter Maintenance Yard  
Post Office Box 40  
Sutter, California 95982



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO  
CORPS OF ENGINEERS  
1325 J STREET  
SACRAMENTO, CALIFORNIA 95814-2922  
April 9, 2003

APR 5/3 Rod  
**RECEIVED**  
APR 21 2003

Navigation and Flood Control Unit

**APR 14 2003**

Mr. Peter D. Rabbon, General Manager  
The Reclamation Board  
1416 Ninth Street, Room 1601  
Sacramento, California 95814-5509

Dear Mr. Rabbon:

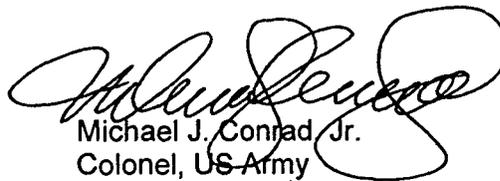
This letter is to transfer a portion of work along the Feather River to the Reclamation Board for Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R). The completed work is located on the right bank of the Feather River within Maintenance Area No. 3 and Levee District 1 of Sacramento Basin No. 18. The completed work includes two sites repaired as a result of damage sustained during the Flood of 1997. A description of the repairs and the location of each site is included in the document titled, "Project Information Form, Sacramento Basin No. 18, Laurel Avenue (M.A. 3) and L.M. 1.5 (Levee District 1), Sutter County, California" (encl 1).

The work was performed under the general authority of the Flood and Coastal Storm Emergencies Act, Public Law 84-99, and special authority granted under the Fiscal Year 1997 Emergency Supplemental Appropriations Act, Public Law 105-18. This work now meets the requirements of the existing Operations and Maintenance Manual for the Sacramento River Basin No. 18; and, therefore, said flood control work, together with the waterway banks contiguous thereto, are transferred as of the date of this letter to the State of California for operation and maintenance.

The repairs were completed in accordance with Specification Number 1102E, Drawing File Number 4-4-627, and Contract Number DACW05-00-C-0041. A final inspection was conducted on 7 September 2001 and all noted deficiencies have been resolved. The as-built drawings for these two sites are included in the document titled, "P.L. 84-99 Cost Shared/Added Sites, Sacramento Basin No. 18, Laurel Ave. (MA3) and LM 1.5 (LD1)" (encl 2).

If you have any questions regarding this project, please contact Mr. Eric Nagy of the Programs and Project Management Division at (916) 557-5114. If you have any question regarding this transfer, please contact Mr. Mohsen Tavana at (916) 557-5282 or Mr. Bob Murakami at (916) 557-6738 of the Navigation and Flood Control Unit.

Sincerely,

  
Michael J. Conrad Jr.  
Colonel, US Army  
District Engineer

Enclosures

## DEPARTMENT OF WATER RESOURCES

1416 NINTH STREET, P.O. BOX 942836  
SACRAMENTO, CA 94236-0001  
(916) 653-5791

JUN 19 2001

Colonel Michael J. Walsh  
District Engineer  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Dear Colonel Walsh:

In your April 11, 2001 letter to The Reclamation Board, the U.S. Army Corps of Engineers transferred the repaired Feather River levee at Star Bend Road at Levee Mile 3.79 to LM 4.67 (in Levee District No. 1, Sutter County) to the State of California for operation and maintenance. You advised the Board that the completed repairs would be added by amendment to the Operation and Maintenance Manual, Feather River River Flood Control Project. We understand that the repairs were completed in accordance with the original plans and specifications. We acknowledge receipt of as-designed drawings and will forward a copy to LD 1.

The Board, on behalf of the State of California, accepted the completed repairs at its June 15, 2001 meeting and transferred the Feather River levee repairs to LD 1. Until the Corps provides the O&M Manual amendment, LD 1 will perform operation and maintenance according to the current manual.

If you have any questions, you may contact Peter Rabbon, General Manager of The Reclamation Board, at (916) 653-5434, or your staff may contact Debbie Carlisle, Chief of the Department of Water Resources' System Integrity Section of the Division of Flood Management, at (916) 574-0364.

Sincerely,

Betsy A. Marchand  
President

cc: Mr. Kell Cloward  
Readiness Branch  
Sacramento District  
U.S. Army Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

Mr. Bill Hampton  
Levee District No. 1, Sutter County  
243 Second Street  
Yuba City, California 95991



DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO  
CORPS OF ENGINEERS  
1325 J STREET  
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO  
ATTENTION OF

APR 11 2001

Navigation and Flood Control Unit

Mr. Peter D. Rabbon, General Manager  
The Reclamation Board  
State of California  
1416 - 9<sup>th</sup> Street, Room 1601  
Sacramento, California 95814

Dear Mr. Rabbon:

This letter is to transfer a portion of work on the Sutter County Levee District No. 1, Feather River Levee at Star Bend Road, to the State of California for operation and maintenance.

The work consists of (1) On the landside of the levee, constructing a roadway with aggregate surface course and berm approximately 25-feet-wide from Star Bend Road (L.M. 3.79) to the end of the project at Abbott Lane (L.M. 4.67), with concrete "V" ditch being installed from L.M. 4.41 to L.M. 4.67, (2) Install 25 relief wells at 50-foot intervals from L.M. 4.08 to L.M. 4.14 and from L.M. 4.25 to L.M. 4.67. The work as listed in the enclosure was completed on October 31, 1997 in accordance with Specification No. 9885E, Drawing File 04-04-617, Contract No. DACW05-97-C-0122.

The work was performed under the general authority of 33 U.S.C. 701n (69 Stat. 186) PL 84-99 and now meets the requirements of the Operations and Maintenance Manual for the Feather River Flood Control System for the Sutter County Levee District No. 1, Feather River Levee at Star Bend Road. Therefore, said flood control work, together with the waterway banks contiguous thereto, are transferred as of the date of this letter to the State of California for operation and maintenance.

This portion of the project work will be added by amendment to the Operation and Maintenance Manual, Feather River Flood Control Project, which is being transferred under separate cover.

Sincerely,

  
Michael J. Walsh  
Colonel, Corps of Engineers  
District Engineer

Enclosure

*Walsh 4/11/01*

C  
O  
P  
Y

THE RECLAMATION BOARD  
STATE OF CALIFORNIA

C  
O  
P  
Y

28 Jun 1966  
Refer to: 4130.60.302  
Contract 66-50

District Engineer  
Corps of Engineers  
U. S. Army  
650 Capitol Mall  
Sacramento, California

Dear Sir:

Reference is made to your letter of June 20, 1966 concerning transfer to the State of California of the Sacramento River Bank Protection Project, Unit No. 8, Site Mile 77.6, left bank, Sacramento River; Site Mile 24.5, right bank, Feather River; Sites Mile 2.98 and 1.76, right bank, Bear River; and Sites Mile 11.6, 7.12 and 4.90, left bank, Bear River, in accordance with Specification No. 3154.

The Reclamation Board, at its meeting of June 23, 1966, formally accepted the above referred to work for operation and maintenance.

Sincerely yours,

/s/A. E. McCollam  
A. E. McCOLLAM  
General Manager

~~EXHIBIT F~~

20 June 1966

The Reclamation Board  
 State of California  
 1416 - 9th Street, Room 1335  
 Sacramento, California 95814

Gentlemen:

Reference is made to the joint inspection of 14 June 1966, made for the purpose of transferring a portion of the Sacramento River Bank Protection work, upon completion, to the State of California for operation and maintenance.

The flood control work, consisting of levee enlargement, levee set-back, bank sloping and placement of bank protection at: Sacramento River, Site Mile 77.6, left bank; Feather River, Site Mile 24.5, right bank; and Bear River, Site Miles 1.76 & 2.98, right bank and 4.90, 7.12 and 11.6, left bank; as listed on the attached inclosure. Work was completed on 14 June 1966, in accordance with Specification No. 3154, Contract No. DA-Or-167-CIVENG-66-50, Drawing No. 50-4-4004.

The work was performed under the general authority of the Flood Control Act of 1960, 86th Congress, 2nd Session; and Section 2304(a), Title 10.

The flood control work now meets the requirements of the Sacramento River Bank Protection Project. Therefore, said flood control work is transferred to the State of California for operation and maintenance.

This portion of the project work will be added by amendment to the Operation and Maintenance Manual by Supplement to the Sacramento River Flood Control Project, and furnished your office at a later date.

Sincerely yours,

T. S. MEADE  
 Lt. Col., CE  
 Acting District Engineer

REGISTERED

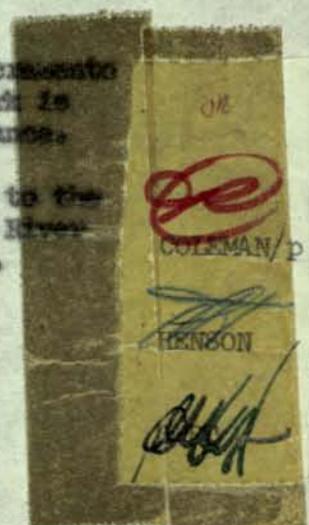
Copy furnished:

Dept Water Resources

O.C.E.  
 S.P.D.

RETURN RECEIPT REQUESTED

cc: Lev & Chan; Prog Dev;  
 Valley Res; F&A-Cordano



MEADE M

OK

en

Units 1211-1,  
 1214, 1216

Incl  
 Listing

SUMMARY OF SACRAMENTO RIVER BANK PROTECTION PROJECT

LEVEE UNIT SITE MILE	<u>SACRAMENTO RIVER</u>								RIGHT OR LEFT BANK	
	<u>LEVEE ENLARGEMENT</u>	<u>LINEAL FEET</u>	<u>ROCK TOEWALL</u>	<u>LINEAL FEET</u>	<u>BANK SLOPING</u>	<u>LINEAL FEET</u>	<u>STONE PROTECTION</u>	<u>LINEAL FEET</u>		
77.6	0+60to4+65	405	0+00to3+50	350	0+60to4+65	405	0+00to5+00	500	Left	<i>Unit 141.1</i>
					<u>FEATHER RIVER</u>					
24.5					2+00to24+00	2200	2+00to24+00	2200	Right	<i>Unit 144</i>
					<u>BEAR RIVER</u>					
1.76					0+23to3+50	327	0+23to3+50	327	Right	<i>146</i>
2.98					306+00to321+00	1500	306+00to321+00	1500	Right	
4.90					5+28to17+00	1172	2+50to17+00	1450	Left	
	<u>LEVEE SETBACK</u>		<u>LEVEE SURFACING</u>							
7.12	1+00to13+00	1200	1+00to13+00	1200	1+00to13+00	1200	1+00to13+00	1200	Left	<i>141.1</i>
	<u>LEVEE ENLARGEMENT</u>									
11.6	4+00to10+00	600	4+00to10+00	600	0+00to10+00	100	0+00to10+00	1000	Left	

THE RECLAMATION BOARD  
of the  
STATE OF CALIFORNIA

September 13, 1960

District Engineer  
Sacramento District  
U. S. Corps of Engineers  
P. O. Box 1739  
Sacramento, California

Dear Sir:

Reference is made to your letter of August 24, 1960, concerning transfer to the State of a levee rehabilitation on the Feather River at the following locations:

- Item 1c - Correct seepage endangering levee in Yuba City (Site "A" on Drawing No. 4-4-508)
- Item 4a - Complete repairs at two "near failure" locations in Levee District No. 9 (Sites "B-1" and "B-2" on Drawing No. 4-4-508)
- Item 4e - Correct seepage endangering levee in Levee District No. 9 (Site "C" on Drawing No. 4-4-508)

The Reclamation Board at its meeting of September 7, 1960, formally accepted these reconstructed levee sections for operation and maintenance.

Sincerely yours,

A. N. MURRAY /s/  
A. N. MURRAY  
General Manager and Chief Engineer

24 AUG 1960

The Reclamation Board  
 State of California  
 1215 "O" Street  
 Sacramento 14, California

Supplement #1

Gentlemen:

Reference is made to supplement dated 29 November 1957 to the Memorandum of Understanding entered into with the State of California under date of 30 November 1953, covering added items of work required to complete the Sacramento River Flood Control Project.

The flood control work consisting of levee stabilization at four locations on the right bank of the Feather River, listed below, in Sutter County, California, was completed 28 July 1960 in accordance with Specification No. 2655, Contract No. DA-04-167-CIVENG-60-73 and Drawing No. 4-4-508.

- Item 1c -- Correct seepage endangering levee in Yuba City (Site "A" on Drawing No. 4-4-508) RT Bank  
← .25 mi  
144
- Item 4a -- Complete repairs at two "near failure" locations in Levee District No. 9 (Sites "B-1" and "B-2" on Drawing No. 4-4-508) ← .10 mi  
148
- Item 4e -- Correct seepage endangering levee in Levee District No. 9 (Site "C" on Drawing No. 4-4-508) ← .30 mi  
148

The foregoing supplemental work having been completed to current standards for the Sacramento River Flood Control Project is hereby transferred to the State of California for operation and maintenance. A maintenance manual for this section of project levee has already been furnished which adequately covers maintenance and operation of requirements for the above items.

Total .91 mi

24 AUG 1960

SPKSO-C  
The Reclamation Board

A copy of this letter is being transmitted to the Department of Water Resources.

Sincerely yours,

Copy furnished:  
Dept Water Resources  
23rd & "R" Sts  
Sacto, Calif

H. N. TURNER  
Colonel, CE  
District Engineer

O.C.E.  
So. Pac. Div. Engr.

cc: Engr Div (Levees & Channels Sec)  
Program Develop Br  
Northern Area Ofc

*[Handwritten signature]*

Concurrences	
Originator:	<i>[Signature]</i>
Date:	8/23/60
Dist. Engr.	<i>[Signature]</i>
Asst. D.E. (A)	
Asst. D.E. (O)	
Exec. Asst.	<i>[Signature]</i>
Cmptlr.	
Budget Fin. & Acctg.	
Mgmt.	
Property	
Office Service	
Constn-Opns.	<i>[Signature]</i>
Engr'g	
R. E.	
Print.	
Legal	
Supply	

*[Handwritten signature]*

REGISTERED

See Unit 165 O&M Manual  
for more information

RETURN RECEIPT REQUESTED

SPRSO-P 824.3 (Sacto. Riv. F.C.P.)

18 DEC 1956

The Reclamation Board  
State of California  
1215 "D" Street  
Sacramento, California

Gentlemen:

Reference is made to the District Engineer's letter dated 9 November 1956, relative to the joint inspection, made on 20 November 1956, of the clearing and debris removal work in the Feather River Iron Sutter By-Pass upstream to the Yuba River.

The clearing and debris removal work referred to above was completed on 1 December 1956 under Contract No. DA-04-157-CIVSFC-56-205, Specification No. 1695 and Drawing No. 4-6-261. This work forms an integral part of the Sacramento River Flood Control Project and meets the requirements of the project; therefore said work is hereby transferred to the jurisdiction of the State of California for operation and maintenance.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations, inclosed herewith, which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress, approved 22 June 1936, as amended and supplemented by the current issue of the Standard Operation and Maintenance Manual for the Sacramento River Flood Control Project. As provided under paragraph 208.10 (10) of these regulations, a supplement to the Standard Operation and Maintenance Manual covering this unit of work is in process of preparation and will be furnished to you upon completion.

W. B. HARGRAVES

REGISTERED

RETURN RECEIPT REQUESTED

*Pay led*  
Cont. #56-205  
Unit 558

SMXO-P 82L3 (Sacto. Riv. F.C.P.)  
The Reclamation Board

A copy of this letter is being transmitted to the Department of  
Water Resources.

Sincerely yours,

1 Incl  
1. F.C. Reg.

Copy furnished:  
Department of Water Resources  
Sacramento, California w/o incl  
OES w/o incl  
So.Fac.Divn. Engr. w/o incl

cc: Engr. Div. w/o incl  
Northern Area Ofc w/o incl  
W. B. Hargraves w/o incl

A. E. McCOLLAM  
Colonel, CE  
District Engineer



REGISTERED MAIL  
Return Receipt  
Requested

SPKHO-P 824-3 (Sac. Riv. FCP)

2 OCT 1952

10/2/52

The Reclamation Board  
State of California  
1100 "O" Street  
Sacramento, California

Gentlemen:

Reference is made to District Engineer letter dated 3 September 1952, wherein it was suggested that a joint inspection be made for the purpose of transferring to the jurisdiction of the State of California, when completed, various levee units of the Sacramento River Flood Control Project. Reference is also made to joint inspections of these units of work which were made on 18 July and 11 September 1952.

In accordance with the above, you are hereby advised that the units listed below, which are covered under Specification No. 1636, Drawing No. 50-4-2897, have been completed as follows:

Part "F" - Levees protecting the City of Marysville:

1. Levee and patrol road along the left bank of Nigger Jack Slough, also known as "Simmerly Slough", from the Western Pacific Railroad to the Feather River at Marysville, California, completed 24 September 1952.

2. Levee and patrol road along the left bank of the Feather River and the right bank of the Yuba River, from Nigger Jack Slough "D" Street Bridge at Marysville, California, completed 24 September 1952.

Part "G" and "H" - Westerly Levee of the Feather River:

1. Levee and patrol road along the right bank of the Feather River, from 5th Street bridge, Yuba City, upstream 1400 feet, at Yuba City, Sutter County, California, completed 5 September 1952.

147

147

144

Concurrent	
Originator	
Date: 30	
Exec. O	2
Chief	
Ad. Asst.	2
Chf. Tech	
Asst.	
Engr.	
1952.	
Svcs.	
Oper.	
R. E.	
Pln.	
Per.	
Legal	
Supply	

Levee sections 352 to 362

Letter No. 37

36

824-3  
Sept 1952

SPKCO-P  
The Reclamation Board

143  
2. From Station 0+00 to 173+70, levee and patrol road along the right bank of the Feather River, from Nicalans Bridge upstream approximately 3.31 miles, near Nicalans, Sutter County, California, completed 24 September 1952.

Part "I" - Southerly Levee of Bear River:

From Station 46+80 to 343+70, levee and patrol road along the left bank of Bear River from a point 5,400 feet upstream from Carlin Bridge upstream to high ground, near Wheatland, Yuba County, California, completed 8 September 1952. 141.1

Part "J" and "K" - Southerly and Northerly Levees of Yankee Slough:

1. From Station 316+70 to 511+10, levee and patrol road along the left bank of Yankee Slough, from the W.P.R.R. upstream to high ground, near Rio Oso, Sutter County, California, completed 24 September 1952. 141.1

2. From Station 166+70 to 536+09, levee and patrol road along the right bank of Yankee Slough, from its junction with Bear River upstream to high ground, completed 16 September 1952. 141.1

Part "L" - Southerly Levee of South Dry Creek and Easterly and Westerly Levees of Grasshopper Diversion Channel:

1. From Station 98+45 to 671+28, levee and patrol road along the left bank of South Dry Creek Channel, from a point 1.86 miles upstream from Bear River to the westerly levee of Grasshopper Diversion Channel, near Wheatland, California, completed 8 September 1952. 146

2. From Station 377+60 to 418+16, levee and patrol road along the left bank of South Dry Creek, from the easterly levee of Grasshopper Diversion Channel upstream approximately 4056 feet, near Wheatland, California, completed 8 September 1952. 146

3. From Station 0+00 to 25+69, levee and patrol road along the westerly bank of Grasshopper Diversion Channel, from the southerly levee of South Dry Creek upstream approximately 2569 feet near Wheatland, California, completed 8 September 1952. Station 25+69 corresponds to Station 390+20 shown on drawing. 146

4. From Station 0+00 to 13+85, levee and patrol road along the easterly bank of Grasshopper Diversion Channel from the southerly levee of South Dry Creek upstream approximately 1385 feet, near Wheatland, California, completed 8 September 1952. 146

SPKCO-P  
The Reclamation Board

The levee units referred to above, together with the patrol roads thereon, form an integral part of the Sacramento River Flood Control Project and meet with the requirements of the project. Therefore, said levee units, together with the waterway banks contiguous thereto, are hereby transferred to the State of California for operation and maintenance.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of the Army pursuant to Section 3 of the Act of Congress, approved 22 June 1936, as amended and supplemented. As provided under Paragraph No. 208.10 (10) of these regulations, a maintenance manual covering these levee units is in process of preparation and will be furnished to you upon completion.

A copy of this letter is being transmitted to the State Engineer.

FOR THE DISTRICT ENGINEER:

Copy furnished:  
State Engineer,  
/ Dept. of Public Works  
1120 "N" St., Sacto, Calif.

cc: / Office of C. of E.  
/ So. Pac. Div. Eng.  
/ Eng. Div.  
/ Sacto Field Office  
/ C. deArrieta  
/ Service Section

Sincerely yours,

Earl G. Peacock  
Lt. Col., Corps of Engineers  
Executive Officer

REPLY MAIL  
Receipt  
Requested

Letter No. 12

12

SPKKA 824,3(Sac. Riv. F.C.P.)

8 DEC 1951

The Reclamation Board  
State of California  
1100 "O" Street  
Sacramento 14, California

Gentlemen:

Reference is made to your letter of 22 June 1951 acknowledging that certain reaches of the levees of the Sacramento River Flood Control Project and the waterway bank contiguous to said levee reaches meet the requirements of the project as authorized prior to the Flood Control Act of 1944.

The levee reaches in question are located as follows:

140. a. Northerly levee of the American River from Jibboom Street Bridge to Sacramento River. 118.2 (?)

b. Easterly levee of the Sacramento River.

Reach 15 141. (1) American River to Natoma Out. 60.25 to 79.0 124

Reach No. 11 142. (2) At Moulton Weir. (Man 2) 154

143. (3) Mile 158.5 (North End Moulton Weir) to Mile 164.4 (Princeton Ferry). (man 2) ? 136

144. (4) Mile 168.5 to Mile 168.9 (at Dutch City). (man 2) ? 138

c. Westerly levee of the Sacramento River.

145. (1) Mile 59.8 to Mile 60.75. 116

146. (2) Mile 61.8 to Mile 62.65 (at Drye Bend) 116

62.65

Accepted by  
letter  
dated  
9 March 1953

144

Letter 12 Items 140 to 198

12

Letter No. 12

12

c. Westerly levee of the Sacramento River. (cont'd)

- Reach No. 5
- ✓ 147. (3) Mile 62.65 to Mile 63.1 (South End Sacramento Weir). 116
  - ✓ 148. (4) At Sacramento Weir. 158
  - ✓ 149. (5) Mile 63.5 (North End Sacramento Weir) to Mile 67.11. 122
  - ✓ 150. (6) Mile 68.42 to Mile 70.9. 122
  - ✓ 151. (7) Mile 76.5 to Mile 81.7 (East End Fremont Weir). 123
  - ✓ 152. (8) Along Fremont Weir. 157
  - ✓ 153. (9) Mile 84.0 (West End Fremont Weir) to Mile 85.5. 128
  - ✓ 154. (10) Mile 85.5 to Mile 85.9. 128
  - ✓ 155. (11) Mile 87.6 to Mile 88.4. 128
  - ✓ 156. (12) Mile 89.2 to Mile 89.8 (Knights Landing Highway Bridge). 128
  - Reach No. 4
    - ✓ 157. (13) Mile <sup>89.2</sup> 89.8 (Knights Landing Highway Bridge) to Sycamore Slough. 89.9 128
    - ✓ 158. (14) Mile <sup>100.6</sup> 100.6 to Mile 101.4. 128
    - ✓ 159. (15) Mile 110.0 to Mile 111.2. 128

d. Westerly Levee of the Feather River.

- Reach 39
- ✓ 160. (1) Sutter Bypass to Nicolaus Bridge. 143
  - ✓ 161. (2) From a point 3.31 miles northerly from Nicolaus Bridge to the Fifth Street Bridge between Marysville and Yuba City. 143, 144
  - Reach 38
    - ✓ 162. (3) From a point 1,400 feet northerly from the Fifth Street Bridge between Marysville and Yuba City to Station 774+00 "Y.C.N.B." Traverse. 144
    - ✓ 163. (4) From a point east of Station 1188+00 "Y.C.N.B." Traverse to high ground just northerly from the Western Canal Headgate. 144
  - Reach 42
    - ✓ 164. a. Easterly levee of the Sacramento River from Matomas Cut to Feather River. 141.1

12

Letter No. 12

12

f. Easterly levee of the Feather River.

- Reach 42 ✓ 165. (1) Sacramento River to a point 2.37 miles southerly from Nicolaus Bridge. 141 Pt 1
- Reach 41 ✓ 166. (2) Bear River to Mile 14.4. } 145
- ✓ 167. (3) Mile 14.4 to Mile 14.7.
- ✓ 168. (4) Mile 14.7 to Mile 21.5.
- ✓ 169. (5) Mile 21.5 to Mile 22.75.
- ✓ 170. (6) Mile 22.75 to Mile 26.5 (Point where levee and S.F.R.R. meet). 145

g. Levees protecting the City of Marysville. All 147

- Reach 43 ✓ 171. (1) From the W.P.R.R. at Simerly Slough easterly to the Yuba River.
- ✓ 172. (2) Along the Yuba River from the "D" Street Bridge to the back levee near the Valley Meat Company.

h. Levees protecting Reclamation District No. 10.

- Reach No. 40 ✓ 173. (1) Northerly levee of Simerly Slough from the W.P.R.R. to the S.F.R.R. 151
- ✓ 174. (2) Easterly levee of the Feather River from Simerly Slough to a point 4.3 miles northerly from Simerly Slough. 151

Reach 46 ✓ 175. i. Northerly levee of the Yuba River from the back levee of the City of Marysville to a point 1.3 miles easterly from said back levee. 147

Reach 47 ✓ 176. j. Southerly levee of the Yuba River from Feather River (i.e. S.F.R.R.) easterly to the S.F.R.R. Main Line. 147

45 ✓ 177. k. Northerly levee of Bear River from Feather River easterly to the W. P.R.R. Interceptor. 145

45 ✓ 178. l. Westerly levee of the W.P.R.R. Interceptor and Clark Slough Interceptor (i.e. back levee of Reclamation District No. 784) from Bear River to the southerly end of the Clark Slough Interceptor. 145

12

SPEKA 824.3 (Sac. Riv. P.C.P.)  
The Reclamation Board

Letter No. 12

12

m. Southerly levee of the American River.

Ranch  
No. 251

- ✓ 179. (1) Sixteenth Street Bridge to the S.P.R.R. 118.1
- ✓ 180. (2) From a point 800 feet easterly from the W.P.R.R. to Mayhew Station. 118.1

n. Westerly levee of the Yolo Bypass.

- ✓ 181. (1) Sacramento River to Knights Landing Ridge Cut. 127
- ✓ 182. (2) Knights Landing Ridge Cut to the northeast corner of the Cache Creek Settling Basin. 126
- 28 ✓ 183. (3) S.P.R.R. Woodland Branch to a point 1.6 miles southerly from said railroad. 121
- 28 ✓ 184. (4) From a point 1.6 miles southerly from the S.P.R.R. Woodland Branch to the Willow Slough Pipes. 121
- 28 ✓ 185. (5) From a point 1.48 miles southerly from the Willow Slough Pipes to a point 1.9 miles southerly from said pipes. 121
- 28 ✓ 186. (6) From a point 1.9 miles southerly from the Willow Slough Pipes to the Willow Slough Interceptor. 121
- 28 ✓ 187. (7) From the Willow Slough Interceptor to Highway U.S. 40. 120
- ✓ 188. (8) From Highway U.S. 40 to Putah Creek. 119

27 ✓ 189. o. Easterly and Westerly training levees of Cache Creek Settling Basin from Cache Creek southerly. 126

28 ✓ 190. p. Northerly and Southerly levees of the Willow Slough Interceptor from the S.P.R.R. to the Yolo Bypass. 120

29 ✓ 191. q. Northerly levee of Putah Creek from Yolo Bypass westerly to high ground. 119

✓ 192. r. Southerly levee of Putah Creek from high ground on Dixon Ridge westerly to high ground. 119

s. Southerly levee of Knights Landing Ridge Cut. 127

26 ✓ 193. (1) From Yolo Bypass westerly 600 feet. Also covered under Unit 96-A

26 ✓ 194. (2) { From a point 2,500 feet westerly from Yolo Bypass to a point 2,900 feet westerly from Yolo Bypass. 127  
Also covered under 96-A

12

SPKKA 824.3(Sac. Riv. F.C.P.)  
The Reclamation Board

Letter No. 12

12

s. Southerly levee of Knights Landing Ridge Cut. (cont'd)

- 76 ✓ 195 (3) { From a point 3,300 feet westerly from Yolo Bypass to a point 7,100 feet westerly from Yolo Bypass. 127  
Also covered under Unit No. 46-A
- 35 ✓ 196 t. That portion of the back or westerly levee of Hastings Tract which runs east and west along the County Road for a distance of approximately one mile. 107
- ✓ 197 u. Northerly levee of Sycamore Slough from Sacramento River to Knights Landing Outfall Gates. 130
- ✓ 198 v. Southerly levee of Sycamore Slough from Sacramento River to Knights Landing Outfall Gates. 132

The records of this office show that your Board has accepted the levees and/or works covered by Items b<sub>1</sub>(1), b<sub>1</sub>(2), b<sub>1</sub>(3), c<sub>1</sub>(2), c<sub>1</sub>(4), c<sub>1</sub>(8), c<sub>1</sub>(11), c<sub>1</sub>(12), c<sub>1</sub>(14), d<sub>1</sub>(1), d<sub>1</sub>(3), d<sub>1</sub>(4), f<sub>1</sub>(3), f<sub>1</sub>(5), g<sub>1</sub>, h<sub>1</sub>, i<sub>1</sub>, l<sub>1</sub>, n<sub>1</sub>, n<sub>1</sub>(1), n<sub>1</sub>(2), n<sub>1</sub>(3), n<sub>1</sub>(6), n<sub>1</sub>(7), n<sub>1</sub>(8), o<sub>1</sub>, p<sub>1</sub>, q<sub>1</sub>, r<sub>1</sub> and s<sub>1</sub>(1) above, as complete. Accordingly the waterway bank contiguous to said Items is hereby transferred to the State of California for maintenance and operation.

The levee covered by Items a<sub>1</sub>, b<sub>1</sub>(4), c<sub>1</sub>(1), c<sub>1</sub>(3), c<sub>1</sub>(5), c<sub>1</sub>(6), c<sub>1</sub>(7), c<sub>1</sub>(9), c<sub>1</sub>(10), c<sub>1</sub>(13), c<sub>1</sub>(15), d<sub>1</sub>(2), e<sub>1</sub>, f<sub>1</sub>(1), f<sub>1</sub>(2), f<sub>1</sub>(4), f<sub>1</sub>(6), j<sub>1</sub>, k<sub>1</sub>, n<sub>1</sub>(4), n<sub>1</sub>(5), s<sub>1</sub>(2), s<sub>1</sub>(3), t<sub>1</sub>, u<sub>1</sub> and v<sub>1</sub>, above, although complete has not been formally transferred as contemplated by the Project documents. Accordingly the levee covered by said Items, together with the waterway bank contiguous thereto, is hereby transferred to the State of California for maintenance and operation.

The maintenance work required under the provisions of the Sacramento River Flood Control Project shall be performed in accordance with existing Flood Control Regulations which have been prescribed by the Secretary of the Army pursuant to Section 5 of the Act of Congress approved 22 June 1956, as amended and supplemented. As provided under paragraph 208.10(10) of these regulations, a maintenance manual covering these works is in process of preparation and will be furnished your Board upon completion.

A copy of this letter is being transmitted to the State Engineer.

FOR THE DISTRICT ENGINEER:

Sincerely yours,

Copy Furnished:  
Office, Chief of Engrs.  
So. Pac. Div. Engr.  
State Engineer  
Engr. Div. (2)  
C. de Arrieta

H. R. Reifsnnyder  
Lt. Colonel, Corps of Engineers  
Executive Officer

12

State Reclamation Board Letterhead

March 11, 1953

District Engineer  
Sacramento District  
Corps of Engineers, U.S. Army  
P.O. Box 1739  
Sacramento 8, California

Dear Sir:

Reference your letters file No. SPKKO-P 824.3 (Sac. R.F.C.P.) dated 1 December 1951, 3 December 1951, 4 December 1951, three letters dated 6 December 1951, 7 December 1951, and six letters dated 8 December 1951. Subject letters transferred to the Reclamation Board for operation and maintenance, various levee units of the Sacramento River Flood Control Project.

The Reclamation Board at its 18 December 1951 meeting, on behalf of the State of California, accepted certain of the transferred units together with their contiguous waterway banks for operation and maintenance, and rejected others. A tabulation of the units so accepted or rejected is attached hereto.

Yours very truly,

THE RECLAMATION BOARD

A. M. BARTON  
Chief Engineer and General Manager

By \_\_\_\_\_

D. M. CARR

~~EXHIBIT F~~

Sheet 1 of 3

December 18, 1951

The Board accepted the transfer from the Corps of Engineers in letters of dates listed below, the following reaches of levees and their contiguous waterway banks where applicable for flood control operation and maintenance, as complete and meeting the requirements of the Sacramento River Flood Control Project.

<u>No.</u>	<u>Date of Letter</u>	<u>Levee Location</u>	<u>Remarks</u>
I	-----	-----	-----
II	8 Dec 1951	W. Levee Feather River except: 3.31 miles North from Nicolaus Bridge; 1400 ft. in Yuba City; from Sta. 774+80 to Sta. 1188+00 of "Y.C.H.B." Traverse	Maintained by Maintenance Area No. 3, Levee Dist Nos. 1 & 9 of Sutter Co. Recl. Dist. No. 777 and State

Note: Only item pertaining to Operation and Maintenance Manual No. 144 is included in the above copy.

State Reclamation Board Letterhead

December 3, 1952

District Engineer  
Sacramento District  
U. S. Corps of Engineers  
P. O. Box 1739  
Sacramento, California

Dear Sir:

Reference is made to your SPIKKO-P 824.3 (Sac. Riv. FCP) dated 2 October 1952, transferring certain completed levee units, together with the patrol roads thereon and with the waterway banks contiguous thereto, to the State of California for operation and maintenance.

The Reclamation Board at its meeting December 2, 1952, accepted said levee units on behalf of the State of California.

Part "F" -----

Part "G" and "H" - Westerly Levee of the Feather River:

1. Levee and patrol road along the right bank of the Feather River, from 5th Street bridge, Yuba City, upstream 1400 feet, at Yuba City, Sutter County, California, completed 5 September 1952.

2. -----

Very truly yours,

THE RECLAMATION BOARD  
A. M. BARTON  
Chief, Engineer & General Manager

By \_\_\_\_\_  
S.A. HONAKER, Asst. Secretary

Note: Only item pertaining to Operation and Maintenance Manual No. 144 is included in above copy.

## **APPENDIX H**

---

Semi-Annual Report Form

TO: The District Engineer  
Sacramento District  
Corps of Engineers  
1209 - 8th Street  
Sacramento, California

(1 May 19\_\_\_\_)  
(1 Nov 19\_\_\_\_)

Dear Sir:

The semi-annual report for the period (1 May 19\_\_\_\_ to 31 October 19\_\_\_\_) (1 November 19\_\_\_\_ to 30 April 19\_\_\_\_) Sacramento River Flood Control Project, Unit No. 144, the west levee of the Feather River from the north boundary of Levee District No. 1 to the north boundary of Reclamation District No. 823 is as follows:

a. The physical condition of the protective works is indicated by the inspector's report, copies of which are inclosed, and may be summarized as follows:

(Superintendent's summary of conditions)

It is our intention to perform the following maintenance work in order to repair or correct the conditions indicated:

(Outline the anticipated maintenance operations for the following 6 months.)

b. During this report period, major high water periods (water level at 65.0 on gage at Sacramento Railroad Bridge or 59.0 on gage located below Shanghai Bend) occurred on the following dates:

<u>Dates</u>	<u>Maximum Elevation</u>
_____	_____
_____	_____
_____	_____

Comments on the behavior of the protective works during such high water periods are as follows:

(Superintendent's log of flood observations)

During the high water stages when the water level reached a height of \_\_\_\_\_, on the gage or excess thereof (dates) \_\_\_\_\_, it was necessary to organize and carry out flood operations as follows:

(See Maintenance Manual \_\_\_\_\_.)

c. The inspections have indicated (no) or (the following) encroachments or trespasses upon the project right-of-way.

d. (No) (\_\_\_\_\_) permits have been issued for (the following) improvements or construction within the project right-of-way.

Executed copies of the permit documents issued are transmitted for your files.

e. The status of maintenance measures, indicated in the previous semi-annual report as being required or as suggested by the representatives of the District Engineer, is as follows:

(Statement of maintenance operations, item by item with percent completion.)

f. The fiscal statement of the Superintendent's operations for the current report period is as follows:

	<u>Labor</u>	<u>Material</u>	<u>Equipment</u>	<u>Overhead</u>	<u>Total</u>
1. Inspection					
2. Maintenance					
3. Flood fighting operations					
TOTAL					

Respectfully submitted,

Superintendent of Works

## **APPENDIX I**

---

### Cooperation Agreements

AGREEMENT BETWEEN  
THE UNITED STATES OF AMERICA  
AND  
THE STATE OF CALIFORNIA  
FOR LOCAL COOPERATION ON THE  
SACRAMENTO RIVER BANK PROTECTION PROJECT CALIFORNIA

THIS AGREEMENT entered into this 20<sup>th</sup> day of April 1984 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), represented by the Contracting Officer executing this agreement, and the STATE OF CALIFORNIA, (hereinafter called the "State"), represented by the California State Reclamation Board, WITNESSETH THAT:

WHEREAS, construction of the Sacramento River Flood Control Project, California (hereinafter call the "Project"), was authorized by Congress in the Flood Control Act of 1960, approved 86th Congress, Second Session (Public Law 86-645), as supplemented by the River Basin Monetary Authorization Act of 1974, approved 93rd Congress, Second Session (Public Law 93-251), as supplemented further by Joint Resolution of Congress (Public Law 97-377); and

WHEREAS, the State hereby represents that it has the authority and capability to furnish the non-federal cooperation required by the federal legislation authorizing the Project and by other applicable law.

NOW, THEREFORE, the parties agree as follows:

1. The State agrees that, upon notification that the Government will commence construction of the Sacramento River Bank Protection Project substantially in accordance with federal legislation authorizing such Project, Public Law 86-645 and Public Law 93-251, the State shall, in consideration of the Government commencing construction of such Project, fulfill the requirements of non-federal cooperation specified in such legislation, to wit:

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

b. Hold and save the Government free from damages due to the construction, operation and maintenance of the Project except damages due to the fault or negligence of the Government or its contractors;

c. Operate and maintain the Project, or integral parts thereof, in accordance with regulations prescribed by the Secretary of the Army;

d. Undertake all relocations and alterations of roads, bridges (except railroad bridges), buildings, irrigation facilities, and other utilities which are necessary for the construction and operation of the Project;

f. Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) that no person shall be excluded from participation in, denied the benefit of, or be subjected to discrimination in connection with the Project on the grounds of race, creed, or national origin;

g. Assure that, in conjunction with acquiring rights-of-way, affected persons will be adequately informed of the benefits, policies, and procedures described in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), and in accordance with Sections 210 and 305 of said Act and implementing regulations, assure that;

(1) Fair and reasonable relocation payments and assistance shall be provided to or for displaced persons, as are required to be provided by a Federal agency under Sections 202, 203 and 204 of the Act;

(2) Relocation assistance programs offering the services described in Section 205 of said Act shall be provided to such displaced persons;

(3) Within a reasonable period of time prior to displacement, decent, safe, and sanitary replacement dwellings will be available to displaced persons in accordance with Section 205(c)(3) of said Act;

(4) In acquiring real property, it will be guided, to the greatest extent practicable under State law, by the land acquisition policies in Section 301 and the provisions of Section 302 of said Act;

h. Assume responsibility and pay damages, if necessary, in the event there is a failure to perform in accordance with the terms of this agreement and any other applicable provisions of Section 221 of Public Law 91-611;

1. Contribute an amount in cash which, when added to the cost of lands, easements, rights-of-way, and utility changes, equals one-third of the cost of each unit of the remedial work, this contribution to be based on the cost of the improvements shown by estimates approved by the Chief of Engineers to have economic superiority over possible alternative measures;

(1) The State shall maintain books, records, documents and other evidence pertaining to costs and expenses incurred in the acquisition of the required real estate interests to the extent and in such detail as will properly reflect all net costs of whatever nature involved therein. The State shall make available at their offices at reasonable times, the accounting records for inspection and audit by an authorized representative of the Division or District Commander.

(2) The Government shall credit the State for its participation upon receipt of properly certified invoices, in quadruplicate, supported by such evidence of payment as may be required by the contracting officer and upon approval of the sufficiency of the real estate interests acquired by the contracting officer.

j. For reaches where local interests prefer bank stabilization to the setbacks recommended by the Chief of Engineers, contribute the costs over and above the costs of setbacks, and provide also the local contribution as indicated above;

2. This Agreement shall apply only to the second phase of work on the Project as described in the supporting engineering documents and shall not revoke, rescind, modify or otherwise alter any prior agreements or assurances on this Project.

3. The State hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon land which it owns or controls, for access to the Project for the purpose of inspection, and for the purpose of repairing and maintaining the Project if such inspection shows that the State for any reason is failing to repair and maintain the Project in accordance with the assurances hereunder and has persisted in such failure after a reasonable notice in writing by the Government delivered to the California State Reclamation Board. No repair and maintenance by the Government in such event shall operate to relieve the State of responsibility to meet its obligations as set forth in paragraph 1 of the Agreement, or to preclude the Government from pursuing any other remedy at law or equity.

IN WITNESS WHEREOF, the parties hereto have executed this contract on the day and year first above written.

THE UNITED STATES OF AMERICA

APPROVED:

By

*Arthur E. Williams*  
Colonel, Corps of Engineers  
District Engineer  
Contracting Officer

FOR THE SECRETARY OF THE ARMY

DATE: 2 May 84

THE STATE OF CALIFORNIA

By:

*Robert E. Bush*  
The Reclamation Board

DATE: April 20, 1984

CERTIFICATE OF APPROVAL

I, the undersigned Attorney General for the State of California, hereby certify that I have reviewed the contract dated the 20<sup>th</sup> day of April, 1984, between the United States of America and the State of California through the Board of Reclamation and have approved said contract and the provisions contained therein, both as to form and substance, including, but not limited to, those provisions whereby the State of California has agreed to pay damages, if necessary, in the event of failure to perform in accordance with Section 221 of Public Law 91-611.

IN WITNESS WHEREOF, I have made and executed this Certificate  
this 17<sup>th</sup> day of April, 1984.

JOHN K. VAN DE KAMP, Attorney General

By: William D. Cravens  
Deputy Attorney General  
State of California

CERTIFICATE OF AUTHORITY

I, David B Anderson do hereby certify that I am one of the attorneys for the Reclamation Board, that the Board is a legally constituted public body with full authority and legal capability to perform the terms of the agreement between the United States of America and the Board in connection with the Sacramento River Bank Protection Project, to pay damages, if necessary, in the event of the failure to perform in accordance with Section 221 of Public Law 91-611, that the person who has executed the contract on behalf of the Board has acted within his or her statutory authority, and that the Board has satisfied the legal requirements of Article 13B of the California Constitution and Section 8517.1 of the California Water Code.

IN WITNESS WHEREOF, I have made and executed this Certificate this 17 day of April, 1984.

By: David B Anderson  
Attorney for the Reclamation Board

CERTIFICATE OF APPROVAL

I, the undersigned Attorney at Law, as legal counsel for The Reclamation Board which has undertaken to act as local sponsor of the Sacramento River Bank Protection Project, hereby certify that I have reviewed the contract dated the 20<sup>th</sup> day of April, 1984, between the United States of America and the Board and have approved said contract and the provisions contained therein, both as to form and substance, including, but not limited to, those provisions whereby the Board has agreed to pay damages, if necessary, in the event of failure to perform in accordance with Section 221 of Public Law 91-611.

IN WITNESS WHEREOF, I have made and executed this Certificate this 17 day of April, 1984.

By: David B. Adams  
Attorney for the Reclamation Board

DECLARATION OF FINANCIAL ABILITY

I, Raymond Bush, General Manager of the State Reclamation Board, do hereby declare that the Board, under the laws of the State of California, is financially capable of meeting the construction, operation and maintenance costs of the Project and is in compliance with Article 13B of the California Constitution and Section 8617.1 of the California Water Code.

I further declare that the Reclamation Board Activities Program fund will be used for the purpose of construction, operation and maintenance of the Project. There were \$ 1,851,000 allocated to the fund for this fiscal year. As of this day there is a balance of \$ 234,150 on hand in that fund. *There is \$2,150,000 allocated to the fund for fiscal year 1985.*

Dated this 20<sup>th</sup> day of April, 1984.

By:   
General Manager, State Reclamation Board

Sacramento River Bank Protection Project,  
California

DECLARATION OF FINANCIAL ABILITY

I, Raymond Barsch, General Manager of the State Reclamation Board, do hereby declare that the Board, under the laws of the State of California, is financially capable of meeting the construction, operation and maintenance costs of the Project and is in compliance with Article 138 of the California Constitution and Section 8617.1 of the California Water Code.

I further declare that the Reclamation Board Activities Program fund will be used for the purpose of construction, operation and maintenance of the Project. There were \$ 1,831,000 allocated to the fund for this fiscal year. As of this day there is a balance of \$ 234,000 on hand in that fund. There is \$ 2,150,000 allocated to the fund for fiscal year 1985.

Dated this 20th day of April, 1984.

By:   
General Manager, The Reclamation Board

Sacramento River Bank Protection Project,  
California



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO  
CORPS OF ENGINEERS  
1325 J STREET  
SACRAMENTO, CALIFORNIA 95814-2922

03/22/2006

Executive Office

Mr. Dan S. Fua, Acting General Manager  
The Reclamation Board  
State of California  
3310 El Camino Avenue, Room LL40  
Sacramento, California 95821

MAR 22 2006

Dear Mr. Fua:

A Local Cooperation Agreement (LCA) for the Sacramento River Bank Protection Project, California was executed between the Department of the Army and the State of California on April 20, 1984. The LCA was executed based on authority provided through the Flood Control Act of 1960 (Public Law 86-645); and, this authority was further supplemented through the River Basin Monetary Authorization Act of 1974 (Public Law 93-251) and a Joint Resolution of Congress (Public Law 97-377).

The enclosed amendment establishes the maximum length of bank erosion repair at 405,000-linear feet in accordance with the referenced project authority. Execution of the enclosed amendment was completed based upon review and approval by the President of the State of California Reclamation Board on March 18, 2006. One complete copy of this amendment has been enclosed for your records.

If you have any questions or concerns with regard to this issue, please feel free to contact the Project Manager, Mr. Stan Wallin, at (916) 557-5225.

Sincerely,

Ronald N. Light  
Colonel, U.S. Army  
District Engineer

Enclosure

Copy Furnished (w/encl):

Ms. Deborah Condon, State of California, Department of Water Resources, 3310 El Camino Avenue, Room 140, Sacramento, CA, 95821

**AMENDMENT NUMBER 1  
TO THE  
LOCAL COOPERATION AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE STATE OF CALIFORNIA  
ON THE SACRAMENTO RIVER BANK PROTECTION PROJECT**

**THIS AMENDMENT** is entered into this 12 day of MARCH 2006 by and between the **DEPARTMENT OF THE ARMY** (hereinafter represented by the Assistant Secretary of the Army (Civil Works)), and the **STATE OF CALIFORNIA** (hereinafter the "Non-Federal Sponsor"), represented by the Reclamation Board.

**WITNESSETH, THAT:**

**WHEREAS**, the Government and the Non-Federal Sponsor entered into a Local Cooperation Agreement on April 20, 1984 (hereinafter referred to as the "Agreement") for the Sacramento River Bank Protection Project (hereinafter referred to as the "Project");

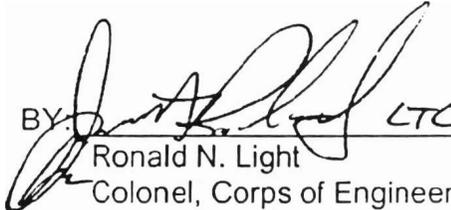
**WHEREAS**, the original agreement terms failed to reference a number for the lineal feet of river bank authorized by the statute for inclusion in the project,

**NOW, THEREFORE**, the Government and the Non-Federal Sponsor agree that the Agreement is hereby amended in the following particulars but in no others by adding the following:

4. As the original agreement terms failed to reference a number for the lineal feet of river bank authorized by the statute for inclusion in the project, the agreement is hereby amended to state the authorized project lineal footage is 405,000 linear feet, as established by the Flood Control Act of 1960, approved 86<sup>th</sup> Congress, Second Session (Public Law 86-645), as supplemented by the River Basin Monetary Authorization Act of 1974, approved 93<sup>rd</sup> Congress, Second Session (Public Law 93-251), as supplemented further by Joint Resolution of Congress (Public Law 97-377).

**IN WITNESS WHEREOF**, the parties hereto have executed this amendment to the Agreement, which shall become effective upon the date it is signed by the authorized representative of the Government.

**THE DEPARTMENT OF THE ARMY**

BY:  LTC  
Ronald N. Light  
Colonel, Corps of Engineers  
Sacramento District

DATE: 26 MARCH 2006

**THE STATE OF CALIFORNIA**

Represented by the Reclamation Board

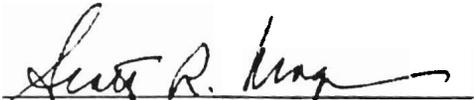
BY:   
Ben Carter  
Reclamation Board  
President

DATE: 18 MARCH 2006

CERTIFICATE OF AUTHORITY

I, Scott Morgan, do hereby certify that I am the principal legal officer of the State of California, acting by and through its Reclamation Board, a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the State of California, as amended by Amendment Number 1 to the Agreement, in connection with THE SACRAMENTO RIVER BANK PROTECTION PROJECT and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the City of Oakland, California, the State of California, acting by and through its Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this 16 day of March 2006.

  
Attorney for the Reclamation Board

## CERTIFICATION REGARDING LOBBYING

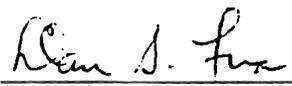
The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY:   
Dan Fua  
The Reclamation Board  
Acting Manager

DATE: MAR 17 2005

CERTIFICATION OF LEGAL REVIEW OF THE  
LOCAL COOPERATION AGREEMENT AMENDMENT 1  
BETWEEN THE DEPARTMENT OF THE ARMY  
AND  
THE STATE OF CALIFORNIA DEPARTMENT OF WATER  
RESOURCES/THE RECLAMATION BOARD

Amendment 1 for the Sacramento River Bank Protection Project, including associated documents required by both parties for the Local Cooperation Agreement, dated April 20, 1984 including explicating appendices dated September 7, 1988, has been reviewed by the Office of Counsel, Sacramento District and is approved as legally sufficient.

Date 11/16/2000



WILLIAM HENSON  
Sr. Assistant District Counsel

**AMENDMENT NUMBER 2  
TO THE  
AGREEMENT BETWEEN  
THE UNITED STATES OF AMERICA  
AND  
THE STATE OF CALIFORNIA  
FOR LOCAL COOPERATION ON THE  
SACRAMENTO RIVER BANK PROTECTION PROJECT CALIFORNIA**

**THIS AMENDMENT** is entered into this 5<sup>th</sup> day of MAY, 2006, by and between the **UNITED STATES OF AMERICA**, acting by and through the **DEPARTMENT OF THE ARMY** (hereinafter the "Government"), represented by the Assistant Secretary of the Army (Civil Works), and the **STATE OF CALIFORNIA**, acting by and through the California State Reclamation Board (hereinafter the "State"), represented by its President.

**WITNESSETH, THAT:**

**WHEREAS**, the Government and the State entered into a Local Cooperation Agreement on April 20, 1984 (hereinafter referred to as the "Agreement") for construction of the second phase of the Sacramento River Bank Protection Project (hereinafter referred to as the "Project");

**WHEREAS**, the Agreement was subsequently amended on March 26, 2006, to add paragraph 4 to the Agreement in order to state the authorized lineal footage for the second phase of the Project;

**WHEREAS**, the State proposes to accelerate its provision of funds to the Government in an amount not to exceed the current estimate of the State's required cash contribution for the Project, less any funds previously contributed, for the immediate use by the Government for construction of the Project; and

**WHEREAS**, the parties agree that such acceptance shall not represent or give rise to an obligation of the United States, including any obligation to provide reimbursement of the funds the State elects to provide or any obligation to request future funds to match the amount the State elects to provide, and that such funds will be credited against the State's future cost share only if additional Federal funds are appropriated.

**NOW, THEREFORE**, the Government and the State agree that the Agreement, as previously amended, is hereby further amended in the following particulars but in no others by adding the following paragraph:

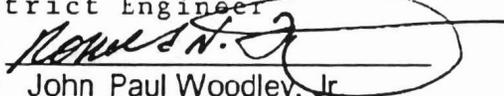
5. In fulfilling the obligations set forth in paragraph 1 of this Agreement, the following conditions and procedures shall apply to a State offer to accelerate its contribution of funds to the Government:

a. The State may offer in writing to accelerate a portion or all of its required cash contribution during the period of construction for immediate use by the Government. This offer shall be limited to an amount that does not exceed the most current estimate of the total of the State's required cash contribution as determined by the Government in coordination with the State, less any funds previously contributed by the State. Upon receipt of such offer or offers, the Government, subject to receiving such approvals and concurrences as customarily are required to accept such funds, may accept the funds, or such portion thereof as the Government determines to be necessary to meet the costs of construction of the Project. If the Government elects to accept such funds, it shall notify the State of such acceptance in a writing that sets forth any applicable terms and conditions. In the event of a conflict between this Agreement and any such writing, this Agreement shall control. Such funds shall be used by the Government for construction of the Project.

b. As Federal appropriations are made available to pay the Federal share of construction of the Project, the Government shall afford credit for funds provided during the period of construction in accordance with paragraph 5.a. of this Agreement. The Government shall credit this amount, provided during the period of construction, toward the State's cash contribution. If after the final accounting at the end of the period of construction, it is determined that the State has provided funds in excess of its required cash contribution, the Government shall proceed to determine whether a refund is applicable. However, if in the event of a final accounting due to termination prior to the end of the period of construction, it is determined that the State has provided funds in excess of its required cash contribution, the Government shall not reimburse the State for any such excess funds, except that any such excess funds which have not been obligated by the Government on the Project shall be refunded to the State, subject to the availability of funds.

**IN WITNESS WHEREOF**, the parties hereto have executed this amendment to the Agreement, which shall become effective upon the date it is signed by the authorized representative of the Government.

**THE UNITED STATES OF AMERICA**  
acting by and through the  
Department of the Army  
Ronald N Light, Colonel  
District Engineer

BY:   
FOR John Paul Woodley, Jr.  
Assistant Secretary of the Army  
(Civil Works)

DATE: 5/5/06

**THE STATE OF CALIFORNIA,**  
acting by and through the  
California State Reclamation Board

BY:   
Ben Carter  
President  
California State Reclamation Board

DATE: 5 MAY 2006

**CERTIFICATE OF AUTHORITY**

I, Scott R. Mowse, do hereby certify that I am the principal legal officer of the California State Reclamation Board, that the State Reclamation Board is a legally constituted public body with full authority and legal capability to perform, on behalf of the State of California, the terms of the Agreement between the United States of America and the State of California, as amended by Amendment Number 2 to the Agreement, in connection with the Sacramento River Bank Protection Project, and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the State of California, acting by and through its State Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this 5<sup>th</sup> day of May, 2006.

Scott R. Mowse  
Attorney for the California State Reclamation Board

## CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY: Stephen T. Brodley  
for Dan Fua  
Acting Manager  
California Reclamation Board

DATE: 5-5-06

**AMENDMENT NUMBER 3  
TO THE  
LOCAL COOPERATION AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE STATE OF CALIFORNIA  
ON THE SACRAMENTO RIVER BANK PROTECTION PROJECT  
CALIFORNIA**

THIS AMENDMENT is entered into this 20~~th~~ day of JUNE 2006, by and between the DEPARTMENT OF THE ARMY (hereinafter referred to as the "Government"), represented by the U.S. Army Engineer, Sacramento District, and the State of California (hereinafter referred to as the "State"), acting by and through the State Reclamation Board, represented by its President.

WITNESSETH, THAT:

WHEREAS, the Sacramento River Bank Protection project, California (hereinafter referred to as the "Project"), as described in Senate Document No. 103, 86<sup>th</sup> Congress, 2<sup>nd</sup> Session, and House Document No. 93-151, 93<sup>rd</sup> Congress, 1<sup>st</sup> Session, was authorized by Section 203 of the Flood Control Act of 1960, Public Law 86-645 (74 Stat. 498), as supplemented by Section 202 of the River Basin Monetary Authorization Act of 1974, Public Law 93-251 (88 Stat. 49) and by Public Law 97-377 (96 Stat. 1916);

WHEREAS, the Government and the State entered into a Local Cooperation Agreement (hereinafter referred to as the "Agreement") on April 20, 1984, for construction of the Project;

WHEREAS, the Government and the State entered into Amendment Number 1 to the Agreement on March 26, 2006 to identify the authorized lineal footage for the Project;

WHEREAS, the Government and the State entered into Amendment Number 2 to the Agreement on May 5, 2006 to document the State's proposal to accelerate its provision of funds to the Government;

WHEREAS, Section 215 of the Flood Control Act of 1958, Public Law 90-483, as amended (42 U.S.C. 1962d-5a; hereinafter "Section 215"), provides that the Secretary of the Army may, when he determines it to be in the public interest, enter into agreements providing for credit to States or political subdivisions thereof for the costs of certain work

performed by such non-Federal bodies at authorized water resources development projects;

WHEREAS, the State desires to perform certain work (hereinafter the "Section 215 work") which is a part of the Project and receive credit pursuant to Section 215 for the costs of such work;

WHEREAS, it has been determined that providing the State credit toward the amount of its required contributions for the Project for the costs of the Section 215 work to be accomplished by the State pursuant to this Amendment Number 3 is in the public interest; and

WHEREAS, Section 215 limits the amount of credit that may be provided for a single project to no more than \$5,000,000 or 1 percent of the total project costs, whichever is greater.

NOW, THEREFORE, the Government and the State agree that the Agreement, as previously amended, is hereby further amended in the following particulars but in no others:

1. Paragraph 1.i. of the Agreement is amended by deleting the phrase: " and utility changes," and substituting "utility changes, and the credit to be afforded for the Section 215 work pursuant to paragraph 6.h. of this Agreement,".
2. Paragraph 1.i(1) of the Agreement is amended by adding "and performance of the Section 215 work" after "interests".
3. The Agreement is amended by adding Paragraph 6 at the end thereof:

"6. The State shall perform the Section 215 work, described below, pursuant to Section 215 of the Flood Control Act of 1958, Public Law 90-483, as amended, subject to the conditions and limitations of this paragraph.

a. The State shall construct 3 setback levees, as described below, along the left bank of Cache Creek at three critical erosion sites located at Levee Miles (LM) 0.8, LM1.1 and LM 2.4 in Yolo County northwest of the City of Woodland and north and south of the town of Yolo. The project is described in two environmental documents – *Cache Creek North Levee Setback Project, Critical Erosion Sites 1, and 2* and *Cache Creek North Levee Setback Project, Critical Erosion Site 3*.

(1) Site 1 at LM 0.8 – A new levee will be constructed approximately 700 feet in length, and would be placed between 100 and 50 feet from the existing levee. Approximately 3,900 cubic yards of material would be needed for construction. Drawing no. S3-1, S3-2, S3-3, S3-4 and S3-5 provide design details.

(2) Site 2 at LM 1.1 – A new levee will be constructed approximately 825 feet in length, and would be placed between 100 and 50 feet from the existing levee. Approximately 4,500 cubic yards of material would be needed for construction. Drawing no. S4-1, S4-4, and S4-5 provide design details.

(3) Site 3 at LM 2.4 – A new levee will be constructed approximately 890 feet in length, and would be placed approximately between 100 and 50 feet from the existing levee. Approximately 7,200 cubic yards of material would be needed for construction. Drawing no. S5-1, S4-2, S5-3, and S5-4 provide design details.

The base of all three new levees will be between 40 and 50 feet wide. The new levees will tie into the existing levee that would be left in place; notches would be cut into the existing levee at each site to provide for drainage of areas between the existing and new setback levees. Construction of the setback levees will take approximately 3 months.

b. Manner of Performing the Section 215 Work. The Section 215 work includes the preparation of the design memorandum, engineering plans, geology reports, and the environmental review. The U.S. Army Corps of Engineer District, Sacramento, environmental planning staff will participate in the environmental review to insure compliance with Federal environmental law. In addition, the State will provide funding to the U.S. Army Corps of Engineer District, Sacramento, to review all designs, plans and specifications, and to perform construction quality assurance.

c. Review of Designs, Detailed Plans and Specifications. No construction of Section 215 work shall commence under this Agreement until the designs, detailed plans and specifications, and arrangements for prosecution of the work have been approved by the U.S. Army Engineer, Sacramento District (hereinafter the "District Engineer"). Proposed changes in approved designs, plans, and specifications also must be reviewed and approved by the District Engineer in advance of the related construction.

d. Prosecution of Work by Contract. In the event the State prosecutes the Section 215 work described herein by contract, all bids received and the proposed provisions of any contract shall be subject to review by the Government prior to contract award. Any such contract shall contain all of the applicable provisions required by Federal laws and regulations, including, but not necessarily limited to, applicable labor and equal opportunity provisions.

e. **Environmental Requirements.** No construction of Section 215 work shall commence under this Agreement until all applicable environmental laws and regulations have been complied with, including, but not limited to the National Environmental Policy Act of 1969 (42 U.S.C. 4321–4347) and Section 401 of the Federal Water Pollution Control Act (33 U.S.C. 1341).

f. **Expiration of Period to Commence Section 215 Work.** In order for the Section 215 work to be eligible for credit pursuant to this paragraph the Section 215 work must be commenced within one year of the effective date of Amendment Number 3 to this Agreement.

g. **Determination of Costs of Section 215 Work.** The Government shall determine the costs incurred by the State for Section 215 work, subject to the conditions and limitations of this paragraph. The State in a timely manner shall provide the Government with such documents as are sufficient to enable the Government to determine the amount of costs for Section 215 work.

(1) Section 215 work shall be subject to an on-site inspection and determination by the Government that the work was accomplished in a satisfactory manner and is suitable for inclusion in the Project.

(2) The amount of the State's costs for Section 215 work shall be subject to an audit to determine the reasonableness, allocability and allowability of such costs.

(3) The costs of any Section 215 work undertaken by the State prior to the effective date of Amendment Number 3 to this Agreement shall not be included in the costs considered for credit pursuant to this Agreement.

(4) The State's costs for Section 215 work are not subject to interest charges, nor are they subject to adjustment to reflect changes in price levels between the time the Section 215 work is completed and the time the credit for such costs is afforded.

(5) In the performance of the Section 215 work, the State must comply with applicable Federal labor laws covering non-Federal construction, including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti- Kickback Act (formerly 40 U.S.C. 276c)). Costs for the Section 215 work may not be included in the costs considered for credit by the Government, in whole or in part, as a result of the State's failure to comply with its obligations under these laws.

(6) For purposes of affording of credit for Section 215 work under paragraph 6.h. of this Agreement, the costs of the Section 215 work shall not include the costs of the lands, easements, rights-of-way, and utility changes that are associated with the Section 215 work.

**h. Affording of Credit for Section 215 Work.** The Government, in accordance with this paragraph, shall afford credit toward the State's contribution of funds required under paragraph 1.i. of this Agreement for the costs of the Section 215 work determined in accordance with paragraph 6.g. of this Agreement.

(1) The amount of credit to be afforded by the Government shall not exceed the Government's estimate of what the cost of the Section 215 work would be if were to be accomplished by the Government as a component of the Project, or the State's actual auditable costs for the section 215 work, whichever is less. As of the effective date of Amendment Number 3 to this Agreement, the Government's estimate of the Section 215 work is \$1,892,460.00.

(2) The credit for the Section 215 work shall be applied solely against the State's required cost-share contributions for future bank protection work under the Project.

(3) Notwithstanding any other provision of this Agreement, the amount of credit afforded by the Government for the Section 215 work, in combination with any credit provided pursuant to any other Section 215 agreements executed for the Project, shall not exceed the statutory limitation of \$5,000,000 or 1 percent of total project costs, whichever is greater. For the purposes of this Agreement, the term "total project costs" shall be understood to mean the sum of Federal and non-Federal first costs upon conclusion of the project construction actually and finally undertaken.

i. This Agreement shall not be construed as either committing the Government to assume any responsibility placed upon the State or any other non-Federal entity by the conditions of project authorization or any other applicable statute or regulation, or as committing the Government to reimburse the State if the remaining work on the Project is not undertaken or is modified so as to make the Section 215 work performed by the State no longer an integral part of the Project."

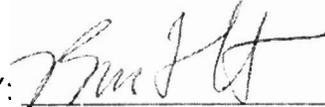
4. All other terms and conditions of the Agreement, as previously amended, remain unchanged.

IN WITNESS WHEREOF, the parties hereto have executed this Amendment Number 3 which shall become effective upon the date it is signed by the Assistant Secretary of the Army (Civil Works).

THE DEPARTMENT OF THE ARMY

THE STATE OF CALIFORNIA  
The Reclamation Board

BY:  LTC/EN  
for Ronald N. Light  
Colonel, Corps of Engineers  
District Engineer

BY:   
Benjamin F. Carter  
President  
The Reclamation Board

DATE: 20 JUN 06

DATE: 20 JUNE 2006

**CERTIFICATE OF AUTHORITY**

I, Scott R. Morgan do hereby certify that I am the principal legal officer of the California State Reclamation Board, that the State Reclamation Board is a legally constituted public body with full authority and legal capability to perform, on behalf of the State of California, the terms of the Agreement between the United States of America and the State of California, as amended by Amendment Number 3 to the Agreement, in connection with the Sacramento River Bank Protection Project, and to pay damages in accordance with the terms of the amended Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the State of California, acting by and through its State Reclamation Board, have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification on this  
16 day of June 2006

Scott R. Morgan  
Scott Morgan, Counsel  
The Reclamation Board

### CERTIFICATION REGARDING LOBBYING

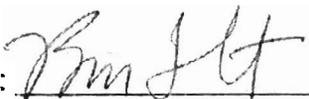
The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY:   
Benjamin F. Carter  
President  
The Reclamation Board

DATE: 20 JUNE 2006

**APPENDIX J**

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USFWS B.O. #81420-2008-F-0805-1

*This is an excerpt from USFWS BO June 23, 2008 Reference #81420-2008-F-0805-1, and NOAA Fisheries BO July 2, 2008 Reference #2007/07158 and applies to work performed at Feather River RM 28.5R,*

### **Operations and Maintenance:**

Once repairs are complete, a project site may require limited maintenance. During the initial establishment period, maintenance activities are anticipated to be required for 3 to 5 years, and include removing invasive vegetation detrimental to project success, pruning and watering planted vegetation to promote optimal growth, replacing plantings, monitoring navigational hazards, and placing fill and rock revetment if the site is damaged during high flow events or by vandalism. Once established, the riparian vegetation should be self-maintaining. Annual maintenance at each site will be limited to placement of no more than 600 cubic yards of material, which corresponds to a disturbance length of less than 300 feet; should more material be required in any year, the operating and maintaining agency (i.e., Central Valley Flood Protection Board) will obtain the necessary permits from the regulatory agencies. The Corps will be responsible for ensuring that conservation measures and environmental standards are stipulated in permits and all required documentation is maintained. Similarly, if outside alterations of a project site are proposed by other agencies or private entities, the Corps will work with the NMFS to ensure that environmental features at the project sites are maintained or that off-site compensation is implemented to make up for any deficits.

Any needed in-water maintenance work will be conducted during time periods that minimize adverse effects on listed fish species. Unless approved otherwise by the NMFS, in-water maintenance will be conducted between July 1 and November 30 of each year for sites above RM 60 and between August 1 and November 30 for sites below RM 60. Any maintenance not requiring in-water work may be conducted year-round.

### **Effects of Project Operation and Maintenance:**

O&M activities are expected to occur between July 1 and November 30 for the life of the project (i.e., 50 years) to maintain the flood control and environmental values of the site. Anticipated O&M actions include vegetation management and irrigation for up to three years, periodic rock placement to prevent or repair localized scouring, and periodic replacement or modification of IWM structures. Effects would be limited to the annual placement of up to 600 cubic yards of material at each site. Impacts from O&M actions generally will be similar to the impacts of initial construction, except that they will be smaller and localized. Effects may include injury or death to salmon and steelhead from predation cause by turbidity changes that temporarily disrupt normal behaviors, and affect sheltering abilities. However, since O&M actions are only expected to repair damaged elements of the project, they are expected to be infrequent (i.e., occurring only once every several years), small (i.e., only affecting small sections of the project area), and will not occur at all sites. Therefore, relatively few fish should be affected by O&M actions, and actual injury and mortality levels will be low relative to overall population abundance and not likely to cause any long-term, negative population responses. Any O&M actions that affect habitat conditions will incorporate BMPs, summer in-water construction windows, and other minimization and avoidance measures to reduce the potential for effects to anadromous salmonids, green sturgeon, and their habitat.

## **APPENDIX K**

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USFWS B.O. # 81420-2009-F-0372-1 (and included for reference, *Habitat Enhancement Plan (HEP) for Feather River Setback Levee and Habitat Enhancement Project at Star Bend*, dated March 6, 2009)



## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825-1846



In reply refer to:  
81420-2009-F-0372-1

FEB 6 2009

Frank Piccola  
Chief, Planning Division  
U.S. Army Corps of Engineers  
1325 J Street, Room 1480  
Sacramento, California 95814

Subject: Review of the Feather River Levee Setback and Habitat Enhancement Project at Star Bend, Sutter County, California, for Inclusion with the *Programmatic Formal Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle Within the Jurisdiction of the Sacramento Field Office* (Corps File No. 199600065, Service File No. 1-1-96-F-66)

Dear Mr. Piccola:

This letter is in response to your January 29, 2009, letter requesting to initiate formal consultation for the Feather River Levee Setback and Habitat Enhancement Project at Star Bend, Sutter County, California (project). The U.S. Fish and Wildlife Service (Service) received your request on January 29, 2009. At issue are the effects of the project on the federally-listed as threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle). The project is not located in proposed or designated critical habitat for any federally-listed species; therefore, no critical habitat would be affected. This response is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

The Service has determined that it is appropriate to append the proposed project to the September 19, 1996, *Programmatic Formal Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle Within the Jurisdiction of the Sacramento Field Office* (1-1-96-F-66) (Programmatic Consultation).

This consultation is based on the following: (1) Stillwater Sciences July 2008, draft Biological Assessment; (2) the Corps' January 29, 2009, letter requesting initiation of section 7 consultation; (3) email and phone conversations between Jennifer Hobbs of the Service and John Suazo of the Corps; and (4) other information available to the Service.

TAKE PRIDE  
IN AMERICA 

## BIOLOGICAL OPINION

### Project Description

The project would construct a setback levee on the west bank of the Feather River at Star Bend to replace portions of the existing levee that currently exhibit seepage and underseepage problems, constrict the channel, and present an unacceptably high risk for levee failure. Construction of the setback levee would reduce channel constriction at Star Bend, which would substantially reduce the risk of failure of the levee at Star Bend. The proposed setback levee would be consistent with local and state flood control objectives, including reducing the risk of flooding in Sutter and Yuba counties.

Native riparian and floodplain habitat would be restored within the O'Connor Lakes unit of the California Department of Fish and Game's (CDFG) Feather River Wildlife Area and the setback levee would connect O'Connor Lakes unit with the Abbott Lake unit. Borrow/spoil sites within O'Connor Lakes unit will be filled and revegetated. As part of the project about 50 acres of new floodplain will be created and Levee District (LD) 1 will revegetate 20 acres for habitat enhancement. The remaining acreage will be hydroseeded with native herbaceous plant species. Borrow/spoil sites at the O'Connor Lakes unit will be hydroseeded with native herbaceous plant species.

Nine elderberry shrubs (*Sambucus* sp.) would be transplanted due to construction of the setback levee. These shrubs would be transplanted to the area within the new setback that will be revegetated with riparian species including elderberry shrubs. Elderberries present within the O'Connor Lakes unit will be avoided by at least a 20 foot buffer. Work around all but 3 elderberry shrubs shall not occur within 100 feet during the beetles' flight season (March 15 to June 15). Additional elderberry and riparian plantings will be done within the restoration area to compensate for working up to 20 feet from elderberry shrubs located along the proposed haul route between March 15 and June 15. These shrubs will be fenced, a speed limit of 5 miles per hour will be enforced when vehicles are within 100 feet of the three shrubs during the flight season, and dust suppression measures as described in the environmental assessment.

On September 9, 2005, the Service signed a biological opinion (1-1-05-F-0016) on the Memorandum of Understanding between the Service, CDFG, and California Department of Parks and Recreation. The project description allows for the restoration of 228 acres of the O'Connor Lakes unit to include 1,366 elderberry seedlings. Because LD 1 and the California Department of Water Resources (DWR) need to maintain flood capacity within this section of the Feather River, an agreement was made which allows either entity to transplant any elderberries which are an impediment to flood control and/or maintenance activities. Elderberry shrubs numbers 8 and 9 are located within the O'Connor Lakes unit in an area that may be used as borrow for the flood control project. Therefore, if elderberry shrubs numbers 8 and 9 need to be transplanted as part of this project, any incidental take associated with the transplantation of these shrubs was covered in the September 9, 2005, biological opinion.

### Proposed Conservation Measures for the Valley Elderberry Longhorn Beetle

The Corps has proposed to compensate for effects to 9 elderberry shrubs by creating 20 acres of valley elderberry longhorn beetle habitat within the new setback area. Table 1 shows the stems that would be affected by transplantation. The project will include planting an additional 5 acres of valley elderberry longhorn beetle habitat to compensate for working during the flight season of three shrubs within the O'Connor Lakes unit. This project will increase the extent, connectivity, and quality of riparian habitat along the Feather River. Upon completion of construction DWR will annex the land to CDFG to become part of their Feather River Wildlife Area and ensure that maintenance and monitoring of the valley elderberry longhorn beetle compensation site is completed.

**Table 1: Description of elderberry shrub indirectly affected and proposed compensation.**

Stem size	Number of Stems	Exit hole	Seedling ratio	Number of replacement elderberries	Assoc. native ratios	Number of assoc. seedlings	Required acreage
1"-3"	201	Yes	4:1	804	2:1	1608	
3" -5"	50	Yes	6:1	300	2:1	600	
> 5"	1	No	4:1	4	1:1	4	
> 5"	12	Yes	8:1	96	2:1	192	
<b>Total</b>	<b>264</b>			<b>1204</b>		<b>2404</b>	<b>14.9</b>

This concludes the Service's review of the Feather River Levee Setback and Habitat Enhancement Project at Star Bend. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease pending reinitiation.

Mr. Frank Piccola

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If you have any questions regarding this biological opinion for Feather River Levee Setback and Habitat Enhancement Project at Star Bend, please contact Jennifer Hobbs, of my staff at (916) 414-6645.

Sincerely,

A handwritten signature in black ink that reads "Peter A. Gross". The signature is written in a cursive style with a large initial "P".

*for* Kenneth D. Sanchez  
Assistant Field Supervisor

cc:

John Suazo, Corps of Engineers, Sacramento, California

Zooley Diggory, Stillwater Sciences, Santa Cruz, California

# Habitat Enhancement Plan for the Feather River Setback Levee and Habitat Enhancement Project at Star Bend

Sutter County, California

March 6, 2009



*Prepared for:*  
Levee District 1 and Wood Rodgers

*Prepared by:*  
River Partners and Stillwater Sciences



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580 Vallombrosa Avenue  
Chico, CA 95926



2855 Telegraph Avenue, Suite 400  
Berkeley, CA 94705

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# HABITAT ENHANCEMENT PLAN FOR THE FEATHER RIVER SETBACK LEVEE AND HABITAT ENHANCEMENT PROJECT AT STAR BEND Sutter County, California

## I. INTRODUCTION

### A. Project overview

Levee District One (LD1) of Sutter County has proposed to construct the Feather River Setback Levee and Habitat Enhancement Project at Star Bend (Project) to replace a portion of existing levee that poses a high risk of failure in order to decrease the flood stage, velocity, and scour potential; increase and improve floodplain habitat; and improve habitat connectivity between the Abbot Lake and O'Connor Lakes Units of California Department of Fish and Game's (CDFG) Feather River Wildlife Area (Figure 1) (EIP Associates 2007). Setting back the levee will create approximately 55 acres of floodplain habitat, which includes habitat enhancement and on-site mitigation for impacted elderberry (*Sambucus mexicana*). Most of the material needed to build the new setback levee will come from the existing levee embankment and from CDFG's O'Connor Lakes Unit, just southeast of the project location. The project entails 1) filling in the levee toe ditch that is landward of the existing levee to prevent fish stranding; 2) realigning existing irrigation pipelines under the current levee to accommodate the new setback levee configuration; 3) create approximately 55 acres of riparian habitat with native vegetation that will be phased over time; and 4) filling and revegetating borrow areas disturbed by levee construction with native grasses and herbaceous understory species.

The project will occur in two phases. Phase one will consist of three components: (1) elderberry shrubs located on the banks of the existing levee toe ditch and within the path of a new pipeline will be transplanted to a nearby location within the project area prior to construction, (2) twenty acres (inclusive of the elderberry transplant area) of native associate plants will be planted to enhance habitat for the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) at the primary project area towards the end of or immediately following project construction, and (3) borrow areas at O'Connor Lakes will be seeded with native grasses and forbs after these areas have been refilled and graded. Phase two, which is optional and has not yet been scheduled, will consist of planting the remaining 35 acres of the primary project area. Consideration will be given to a cultural resources site located in the primary project area.

### B. Purpose of the Habitat Enhancement Plan

This plan is to serve as a technical guide for LD1, CDFG or the restoration contractor to implement the habitat enhancement and mitigation planting and post-implementation maintenance and monitoring associated with this project. It is intended to provide technical details to execute the project and assist in meeting the requirements established in the CDFG Streambed Alteration Agreement with LD1 of Sutter County (Notification No. 1600-2007-0217-R2) and partial mitigation requirements outlined in the Project Environmental Impact Report (EIR, EIP Associates 2007), Environmental

Assessment (EA, Stillwater Sciences and Wood Rodgers 2008), Biological Assessment (BA, Stillwater Sciences 2008a), and Elderberry Survey Report (Stillwater Sciences 2008b).

### **C. Location**

The Feather River Setback Levee and Habitat Enhancement Project at Star Bend is located on the west levee of the Feather River, approximately six miles south of Yuba City, Sutter County, California (Figure 1). The 55-acre site is just upstream of the Star Bend boat ramp (near River Mile 18) and is bound by a sharp bend in the river (Figure 2). Access by road is from the west via Star Bend Road off of Garden Highway.

### **D. Project Objectives**

Several objectives have been identified for the Feather River Setback Levee and Habitat Enhancement Project at Star Bend. These objectives also delineate the parameters and guides the actions devoted to habitat restoration. The primary goal of the habitat enhancement work is to identify a feasible restoration project to:

- Enhance and restore fish, wildlife, and riparian habitat in the project area with the restoration of 20 acres (Phase I), which includes on-site mitigation for impacted elderberry shrubs;
- Maximize a variety of riparian plant communities and other floodplain habitat types through the restoration of an additional 32.1 acres (Phase II).
- Improve connectivity between adjacent riparian habitats and river channels;
- Provide mitigation for impacts to elderberry shrubs, the host plant of the federally threatened Valley elderberry longhorn beetle;
- Meet hydraulic roughness value objectives in the expanded floodway, and
- Provide protection for a known archaeological site within the levee setback area.

### **E. Description of Work Activities**

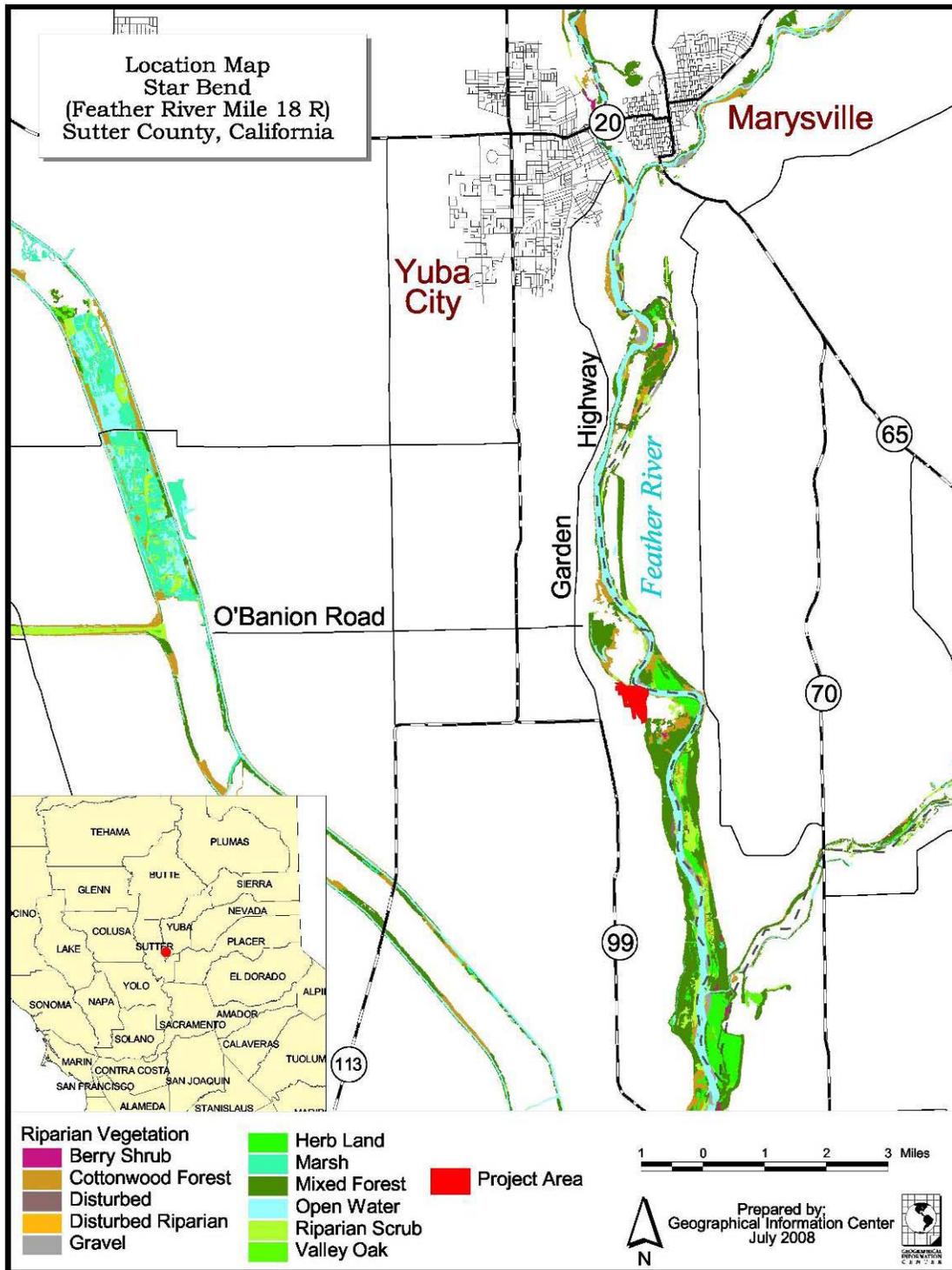
#### **1. Site Prep**

To accommodate construction of the setback levee, up to 55 acres of existing agricultural fields and orchards will be cleared and graded. Existing trees within and 50 feet beyond the landward proposed setback levee footprint, as well as within 15 feet of the pipeline realignment, will require removal, including stumps. Construction scrapers will remove the top 6 inches of vegetative matter from the levee footprint and adjacent area. Construction storage and lay-down areas (i.e., staging areas) will be located landward of the existing levee system adjacent to the two tie-ins at either end of the new levee alignment in the cleared and graded areas (Figure 2).

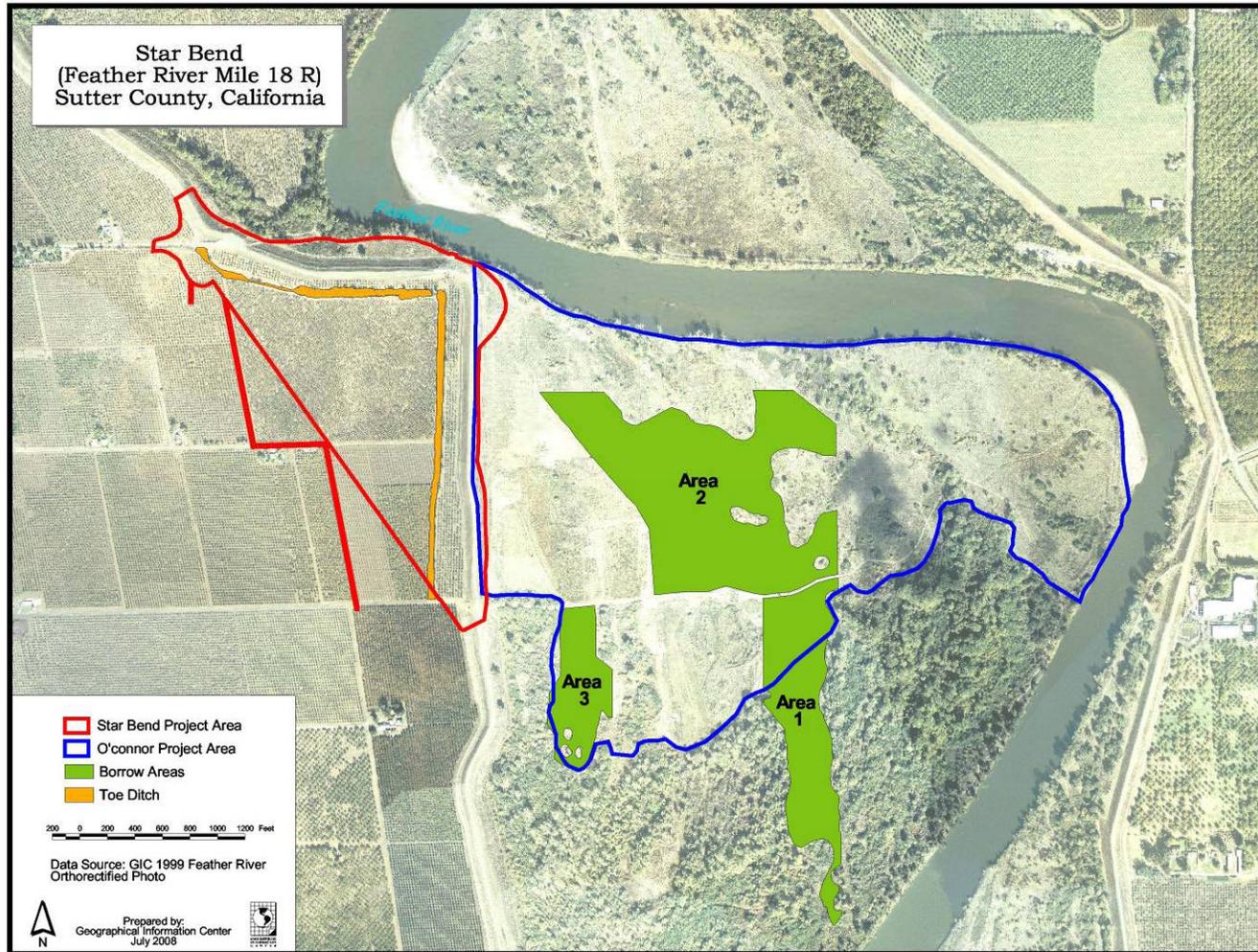
#### **2. Setback Levee Construction**

The proposed setback levee will consist of a 23-foot high earthen levee beginning near the intersection of Star Bend Road and the existing right bank of the Feather River at Levee Mile (LM) 4.50 near RM 18.0 and continue in a southeasterly direction to the approximate intersection of the extension of Tudor Road with the right bank of the Feather River at LM 3.75 and RM 16.75 (Figure 2). The total length of the setback will be approximately 3,400 feet with a minimum top width of 20 feet and side slopes that are 1-foot vertical to 3 feet horizontal.

**Figure 1. Project Vicinity Map for the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**



**Figure 2. Project Boundaries of the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**



Degradation and decommissioning of the existing levee will occur concurrently with the construction of the new setback levee. With the exception of the northeast corner, the existing levee will be fully degraded or removed to ground level. In the northeast corner, the existing levee will be partially degraded or removed to elevations 1 to 4 feet above natural ground level to protect an adjacent cultural resource site (not depicted in a figure, as the location is confidential). Areas disturbed by construction will be graded to provide positive drainage away from the setback levee and revegetated by seeding with native herbaceous plant species.

### **3. Setback Levee Borrow Areas proactive**

Most of the material needed to construct the new setback levee will come from three primary sources: (1) the existing levee that will be degraded; (2) a 12.6 acre triangular-shaped area located between the existing levee and proposed setback levee; and, (3) three areas in the O'Connor Lakes Unit, where material was borrowed previously for the Shanghai Bend Setback Levee Project (Figure 2). The O'Connor Lakes Unit is located immediately east and southeast of the existing levee (Figure 2). The unit is managed by CDFG and California Department of Water Resources (CDWR) to provide wildlife habitat, restore native plant communities, and convey Feather River flood events. CDWR regularly mows and clears a 400-foot swath of vegetation in Borrow Area 1, and portions of the property between borrow areas 2 and 3 were excavated by U.S. Army Corps of Engineers (USACE) to provide material for levee repair following the 1997 flood (Figure 2) (River Partners 2006). Following excavation and construction of the setback levee, all borrow areas adjacent to the new setback levee area and within the O'Connor Lakes Unit will be backfilled with material from the decommissioned levee and restored with native riparian vegetation. Any additional embankment material necessary to construct the setback levee will come from borrow sites within 30 miles of the Project area.

### **4. Pump and Pipeline Improvements**

With construction of the setback levee and decommissioning of the existing levee, various segments of pipelines now conveying water from a pumping facility on the waterside of the existing levee will need to be replaced and rerouted. New parallel pipe systems and a new distribution box will be installed between the existing pump station and the landside of the setback levee. The distribution box and control valves on the landside of the existing levee will be abandoned and/or removed.

### **5. Levee Ditch Filling**

Following the decommissioning of the existing levee, the existing levee ditch will become situated river-side of the new setback levee (Figure 2). There is concern that fish could become stranded in the existing levee ditch following flood events. The levee ditch will, therefore, be filled with material from the nearby orchard and the decommissioned levee so that there are no depressions where fish could become stranded. The levee ditch would be carefully filled to grade to preserve as much of the existing riparian trees and shrubs as possible.

### **6. Riparian Habitat Enhancement**

As part of the Project, LD1 will acquire and manage approximately 60 acres of land from the landowners prior to constructing the setback levee. Upon completing construction of the proposed setback levee and degradation of the existing levee, LD1 will make the

land on the waterside of the setback levee available to CDFG or other entities for native vegetation and wildlife habitat enhancements. LD1 will revegetate up to 52.1 acres for habitat enhancement in accordance with this Habitat Enhancement Plan, and will restrict future activities within this area to ensure that the habitat enhancement is sustained in perpetuity. Phase I will be planted in association with the setback levee construction. Phase II will be implemented for further restoration and expansion of riparian habitat that may be applied as mitigation for the future regional levee improvement projects and/or the Sutter County Habitat Conservation Plan.

## **F. Regulatory Context**

As described in the introduction, this Project is being initiated to replace a portion of the existing levee that poses a high risk of failure. Other related Project reports detail potential mitigation measures required as part of the Project, as well as the broad regulatory context (e.g., EIP Associates 2007 [EIR], Stillwater Sciences 2008a [BA] , Stillwater Sciences 2008b [Elderberry Survey Report], Stillwater Sciences 2008c [Wetland Delineation Report], and Stillwater Sciences and Wood Rodgers 2008 [EA]). Of pertinence to this Habitat Enhancement Plan are the unavoidable impacts that will occur to blue elderberry shrubs. The valley elderberry longhorn beetle is protected under the federal Endangered Species Act as a threatened species (45 FR 52803–52807); conservation is achieved through protection of its potential habitat and host plant, blue elderberry, with one or more stems measuring  $\geq 1$  inch in diameter at ground level. Because this Project involves unavoidable impacts to multiple elderberry shrubs, mitigation is required (Stillwater Sciences 2008b). LD1 is mitigating these impacts through on-site transplantation of unavoidable blue elderberry shrubs and on-site mitigation plantings.

## **II. ENVIRONMENTAL SETTING**

### **A. Land-use History**

Prior to the arrival of Europeans, Native Americans of the Valley Nisenan populations established villages along the Feather River and its tributaries in the vicinity of the site. The northwest corner of the site is a historic low rise along the river and contains a recorded indigenous village site (Bayham 2004).

John Sutter laid claim to the region when he secured the New Helvetia Land Grant in the 1840's. He promptly built Hock Farm, a rancho in the vicinity of the site, which provided cattle stock that ranged freely along Feather River. W.H. Ashford owned and farmed a section of the west bank as early as 1880, which includes most of the site. In 1880, the O'Connor family owned the parcel to the south of the site where the lakes are located (Sutter County 1880). The 1912 (U.S. Army Corps of Engineers 1912) geologic survey shows dredging activities to the north and south of the site, but not within the site. The 1912 survey also shows that the site had not been cleared for agriculture.

The Feather River and three other properties surround the Project site (i.e., Churkin, Singh, and CDFG properties). The majority of the primary Project area is a plum (*Prunus* sp.) orchard that is flood irrigated. The existing levee, operated by LD1, and the Star Bend pumping plant also are located in the main Project area. The pumping plant

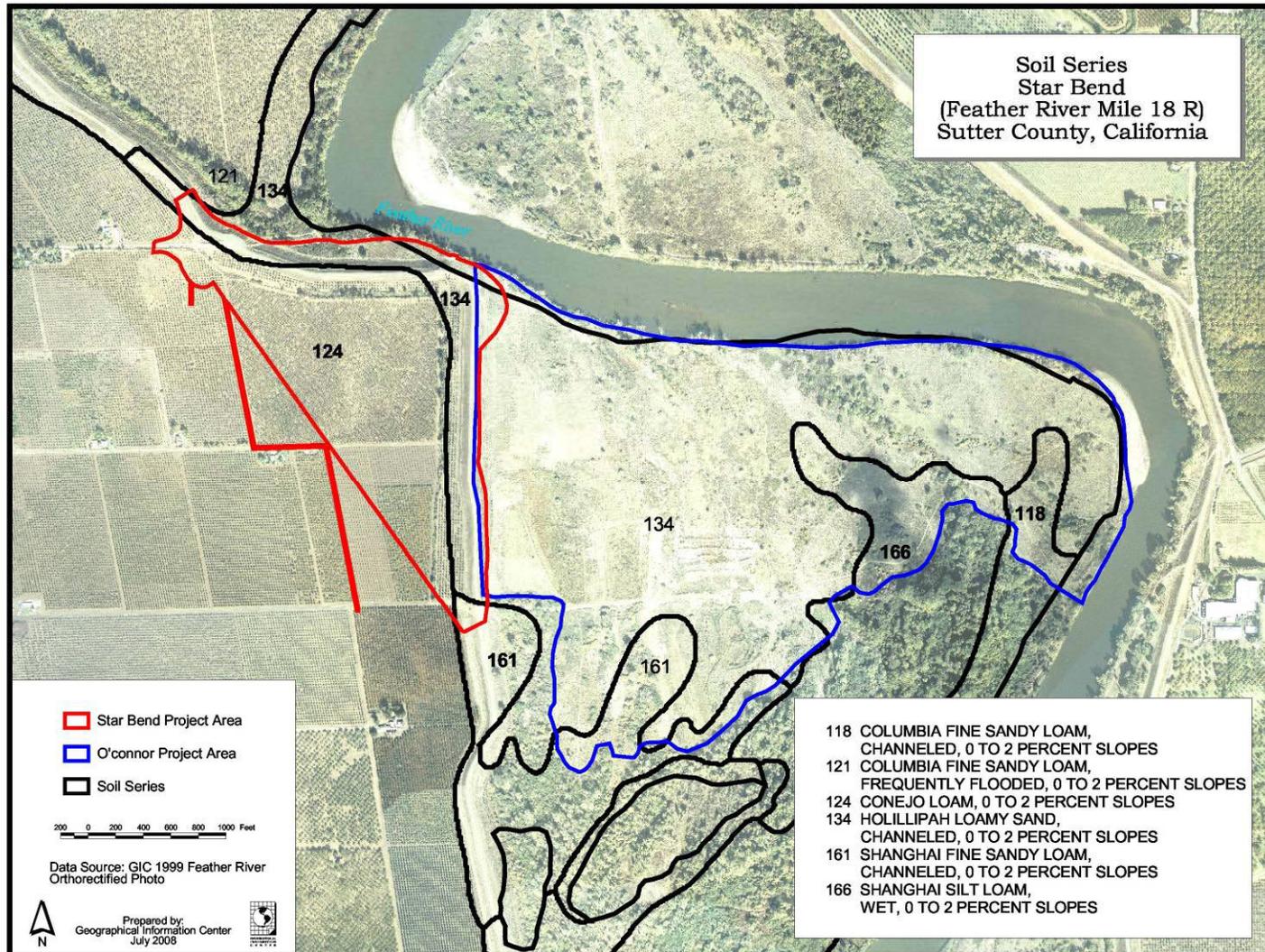
includes pump station discharge lines and irrigation pipelines that bisect the northern portion of the site and continue to adjacent properties. All the property to the east is part of the O'Connor Lakes unit of CDFG's Feather River Wildlife Area. The unit is managed by CDFG and CDWR to provide wildlife habitat, restore native plant communities, and convey Feather River flood events. CDWR regularly mows and clears vegetation in Borrow Area 1, and portions of the property between Borrow Areas 2 and 3 were excavated by USACE to provide material for levee repair following the 1997 flood (Figure 2) (River Partners 2006).

## **B. Topography and Soils**

Elevations of the Project area average 45 feet above sea level. Topography is generally flat, with steeper gradients at the river's edge. Several small hills and depressions occur in the O'Connor Lakes Unit as a result of overbank flood scour and deposition, and previous soil excavation and habitat enhancement projects.

The Sutter County Soil Survey (Lytle 1988, NRCS 2008) identifies four flood-plain soil series, Columbia, Conejo, Holillipah and Shanghai, within the project and borrow areas and shows that the Conejo mapping unit (124) accounts for the majority of the site (Figure 3). Conejo soils are very deep, well drained soils formed in alluvium and are observed on alluvial fans and stream terraces. Holillipah soil mapping unit (134) occupies the northern boundary of the project area, which runs along the Feather River, and the borrow areas at the O'Connor Lakes Unit. The Holillipah soils, which contain deep sand to loamy sand derived from mixed alluvium, are frequently flooded, and somewhat excessively well drained. Two other soil mapping units occur within the site and a summary of all the soil types is shown in Table 1 and Appendix I.

**Figure 3. Soils Map, Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**



**Table 1. Summary of typical soil conditions from the Soil Survey of Sutter County (Lytle 1988, NRCS 2008), California on soils found on the Feather River Setback Levee and Habitat Enhancement Project at Star Bend.**

Soil Property	Conejo loam, 0 to 2 percent slopes	Holillipah loamy sand, channeled, 0 to 2 percent slopes	Shanghai silt loam, wet, 0 to 2 percent	Shanghai fine sandy loam, channeled, 0 to 2 percent slopes	Columbia fine sandy loam, channeled, 0 to 2 percent slopes
<b>Mapping unit</b>	124	134	166	161	118
<b>% Slope</b>	0-2	0-2	0-2	0-2	0-2
<b>Texture</b>	Loam	Loamy sand	Silt loam	Fine sandy loam	Fine sandy loam
<b>Depth of soil</b>	Very deep	Very deep	Very deep	Very deep	Very deep
<b>Drainage</b>	Well drained	Somewhat excessively drained	Somewhat poorly drained soil	Somewhat poorly drained soil	Somewhat poorly drained soil
<b>Permeability</b>	Slow to medium	Rapid	Moderate	Moderate	Moderately rapid
<b>Available water capacity</b>		Low	High to very high	High	Moderate
<b>Limitations to plant growth</b>	Some areas subject to flooding.	Runoff is very slow, and the hazard of water erosion is severe. Subject to frequent, long periods of flooding in December through April.	Runoff is slow, and the hazard of water erosion is severe. Subject to frequent, long periods of flooding from December through April.	A seasonal high water table is at a depth of 36 to 60 inches in December through April. Runoff is slow, and the hazard of water erosion is severe. Subject to frequent, long periods of flooding from December through April.	A seasonal high water table is at a depth of 36 to 60 inches in December through April. Runoff is slow, and the hazard of water erosion is severe. Subject to frequent, long periods of flooding from December through April.

### **C. Hydrology**

The project area and the O'Connor Lakes Unit were once part of a dynamic system of meandering channels and oxbow lakes that covered an area much wider than the levees of the Feather River Flood Control Project. Levee construction, beginning in the 1860's, confined the channel to its present location, and dams on the Feather and Yuba rivers regulate flows.

To the north of the Project area, overbank flow from the Feather River periodically (i.e., modeled stage of the 2.5- to 3-year recurrence interval flow [approximately 60,000 cfs]) fills the drainage feature and depressions left by dredger mining (Wood Rodgers, Inc. 2007). In the O'Connor Lakes unit, scour channels, debris accumulations in trees and shrubs, and deposits of sand are evidence of periodic overbank flow. Periodic maintenance on the O'Connor Lakes Unit is conducted by the Department of Water Resources (DWR) to increase the conveyance of flood flows and transport sediment.

On the land-side of the existing levee system, rain, flood irrigation and seepage under the levee are the primary sources of surface water. Flooding is used to irrigate the orchard crops, occasionally leaving standing water behind for short periods of time following irrigation. The levee ditch was constructed to contain any water seeping under the toe of the levee, but was only inundated in 1986 and 1997, years in which extremely large flood events occurred (B. Hampton, Manager, LD1, pers. comm., 2007). During those events, water remained for a couple of weeks, generally percolating into soil after flood flows had receded (B. Hampton, Manager, LD1, pers. comm., 2007). In 2006, which had a relatively large flood event, there was no water in the levee ditch (B. Hampton, Manager, LD1, pers. comm., 2007).

### **D. Vegetation**

The majority of the primary Project area is a plum orchard that is flood irrigated. The orchard is bisected across the north and eastern edges by the levee ditch; the orchard continues immediately adjacent to the levee ditch on the north and east sides. Annual grass and weedy forb species occur between the rows of trees, but the sparse distribution and short stature of the forbs indicate they are sprayed with herbicides or otherwise controlled on a regular basis.

Vegetation types in the project and borrow areas were assessed during a September 13, 2006 field survey by EIP Associates (EIP Associates 2007a) and were mapped and described during wetland delineation surveys conducted in September 2007 and January 2008 by Stillwater Sciences (Stillwater Sciences 2008b).

Plant species observed during a September 13, 2006 field survey by EIP Associates included wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), soft brome (*Bromus hordeaceus*), turkey mullein (*Eremocarpus setigerus*), wild mustard (*Brassica* sp.), and prickly lettuce (*Lactuca serriola*) (EIP Associates 2007a).

Riparian forest habitat occurs north of the existing levee, throughout much of the levee ditch, and across much of the O'Connor Lakes unit. The area north of the existing levee in the primary Project Area has a dense canopy of native riparian tree species

(approximately one acre), including Fremont cottonwood (*Populus fremontii*), Goodding's black willow (*Salix gooddingii*), northern California black walnut (*Juglans californica* var. *hindsii*), Oregon ash (*Fraxinus latifolia*), and valley oak (*Quercus lobata*) (Figures 4a and 5g in Appendix F). There is a sparse to moderately dense shrub layer with arroyo willow (*Salix lasiolepis*), box elder (*Acer negundo*), California button willow (*Cephalanthus occidentalis*), California rose, and narrowleaf willow (*Salix exigua*). The vine layer is thin, containing predominantly California wild grape (*Vitis californica*) and poison oak (*Toxicodendron diversilobum*). The herb layer is generally absent, with small clearings containing black mustard (*Brassica nigra*), oat (*Avena* sp.), perennial pepperweed (*Lepidium latifolium*), seashore vervain (*Verbena littoralis*), and soft brome.

Portions of the levee ditch (approximately three acres) are predominantly comprised of a mature canopy of valley oak, occasionally shared with blue elderberry (*Sambucus mexicana*). The understory is fairly sparse, with blue wildrye (*Elymus glaucus*), California blackberry, California rose, California wild grape, Goodding's black willow, narrowleaf willow, and poison oak.

### **E. Wildlife**

The project area is part of 2,142-acre block of contiguous wildlife habitat on the Feather River. Game birds include pheasant, quail, dove, and wild turkey. Other game includes deer and rabbit. A Great blue heron rookery has been present at just south of the O'Connor Lakes for many years (Dale Whitmore, Wildlife Biologist, CDFG, personal communication). Special status species known to occur in the vicinity of the site include Yellow-billed cuckoo, Swainson's hawk, Chinook salmon, winter steelhead and river otter (California Department of Fish and Game 1988). The site and O'Connor Lakes Unit also contains habitat for the valley longhorn elderberry beetle.

The Feather River Setback Levee and Habitat Enhancement Project at Star Bend will increase the amount of floodplain potentially exposed to inundating flows by approximately 49 acres. Floodplain restoration will allow for higher quality floodplain habitat (better water quality, food inputs, and shelter) for juvenile salmonids and other native species such as Sacramento splittail and steelhead. Organic material produced by native deciduous species restored within the floodplain provides an increased nutrient load for the aquatic environment. This influx of nutrients provides for a greater invertebrate population, thereby creating an abundant food source for fish.

**Table 2. Federal and State-listed Endangered, Threatened, and Candidate Species occurring or potentially occurring at the Feather River Setback Levee and Habitat Enhancement Project.**

Name	Scientific Name	Status
Least Bell's Vireo (extirpated)	<i>Vireo bellii pusillus</i>	FE, CE
Chinook Salmon, Sacramento River winter-run ESU	<i>Oncorhynchus tshawytscha</i>	FE, CE
Chinook Salmon, Central Valley spring-run ESU	<i>Oncorhynchus tshawytscha</i>	FT, CT
Chinook Salmon, Central Valley Fall-run and late fall-run ESU	<i>Oncorhynchus tshawytscha</i>	FC, CSC
Steelhead, Central Valley ESU	<i>Oncorhynchus mykiss</i>	FT
Green sturgeon SDP	<i>Aspenser medirostris</i>	FC <sup>1</sup> , CSC
Valley Elderberry Longhorn Beetle	<i>Desmocerus californicus dimorphus</i>	FT
Western Yellow-billed Cuckoo	<i>Coccyzus americanus occidentalis</i>	FC, CE
Willow Flycatcher	<i>Empidonax trailii</i>	FSC, CE
Swainson's Hawk	<i>Buteo swainsoni</i>	FSC, CT

ESU – Evolutionary Significant Unit  
 FE – Federal-listed Endangered Species  
 FT – Federal-listed Threatened Species  
 FC – Federal Candidate Species  
 FSC – Federal Species of Concern  
<sup>1</sup>FT effective June 6, 2006

CE – California State-listed Endangered Species  
 CT – California State-listed Threatened Species  
 CSC – California Species of Concern

### III. ENHANCEMENT PLANTING AND IMPLEMENTATION

Riparian areas harbor the most diverse assemblage of wildlife species of all habitat types in California. Restoration and mitigation activities on the Feather River Setback Levee and Habitat Enhancement Project at Star Bend will have a number of ecological and biological benefits in both the short and long term. These activities will:

- Enlarge and connect habitat (diminish fragmentation) along the lower Feather River,
- Reduce the potential for invasion of non-native plant species, and
- Improve the habitat for a variety of wildlife species that are dependent on riparian habitat.

#### A. Planting Design

##### 1. Purpose of Planting Design

The plant design is an important component of the adaptive management framework and provides a testable hypothesis of site understanding. The plant design is intended to:

- Communicate project layout to the restoration contractor, regulatory agencies, and project stakeholders;
- Decrease cost while maintaining integrity of the plant design;
- Match plant placement to site conditions, management objectives, and wildlife habitat requirements;
- Estimate plant material so that appropriate numbers can be cultivated; and
- Provide a framework to document and analyze plant survivorship, and make adaptive management decisions regarding replanting, if necessary.

## **2. Procedure**

The plant design will be translated to the field through the use of a labeling system that identifies a woody plant for each planting location. This system allows for the rapid implementation of the site-specific design and monitors survival patterns across a field. The procedure consists of the following steps:

- Review site assessment information.
- List design considerations (based on the physical setting, wildlife objectives, or management issues).
- Match vegetation to site conditions and project goals:
  - identify appropriate vegetation associations,
  - express plant arrangement for particular vegetation associations (a “tile”),
  - provide a rationale for selection, and
  - assign vegetation associations to project areas.
- Estimate plant numbers and develop a plant design map.
- Enter data into a database, print labels, and modify database based on new information.

## **3. Notable Site Conditions and Design Characteristics**

Physical and biological features influence long-term survivorship and the selection of vegetation. When considering design, site condition is one important factor, but wildlife requirements and management practices are also critical elements. Based on the available information, the most influential factors on the design are:

- Wildlife objectives and the strategy to produce immediate habitat benefits,
- Hydraulic considerations,
- Mitigation needs,
- Site access, and
- Management practices

Specific design considerations are presented in Table 3.

### **B. Sensitive Species**

The design approach focuses on the habitat requirements of multiple sensitive species known to utilize riparian communities, including Valley elderberry longhorn beetle, Swainson’s hawk, Sacramento splittail, Central Valley spring-run Chinook salmon, Central Valley fall-run Chinook salmon, and Central Valley steelhead. These species and their specific habitat needs are listed in Table 4 and are discussed in greater detail below. Habitat requirements are compiled in the California Wildlife Habitat Relationship System, CWHR 8.0 (California Department of Fish and Game 2003) and Inland Fishes of California (Moyle, 2002).

## **1. Habitat Requirements for Sensitive Species**

### **a) Valley Elderberry Longhorn Beetle (VELB)**

VELB rely on blue elderberry shrubs for the completion of their lifecycle. The females lay eggs directly on the stem of the blue elderberry. Once hatched, the larvae bore into the pith of the tree and move down toward the base. Larvae reside in the stems of blue elderberry shrubs for one to two years before emerging as adults in early spring (mid-March to early June) to feed on the host plant's stem, leaves, and flowers. The presence of blue elderberry within and around the project area indicates the potential for VELB inhabitation. VELB habitat is provided in this plan.

### **b) Swainson's Hawk**

The current distribution and nesting habitat of the Swainson's hawk is not confined to riparian areas but is directly affiliated with such habitat. Over 90% of these birds are found to nest in cottonwoods and valley oaks that provide excellent cover near treetops, the prime look-out location for foraging (Josselyn et al., 1988). Preferred nesting trees are typically within 300 feet of a major valley stream, creek, or slough. Grasslands with abundant populations of small mammals are the preferred foraging habitat for Swainson's hawk. In the Central Valley, these hawks generally nest in riparian areas that are adjacent to grassland and pastures. The habitat requirements for Swainson's hawk, dense native riparian cover adjacent to grassland, are consistent with goals of this habitat enhancement plan.

**Table 3. Key Plant Design Considerations of the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Objective/Factor	Example of Project Design Considerations
Maintain general flood flow conveyance patterns	Orient rows parallel to general flow direction and do not direct flows toward the newly constructed setback levee. A combination of shrub and mixed riparian forest near the setback levee will aid in dissipating wave energy and protect the levee from surface erosion when overbank flows cross the site.
Provide immediate (< 3 years) habitat benefits and high probability of long-term survivorship	In the short term, relatively transient species (cottonwood and willows) will provide several generations of targeted bird species with nesting and foraging habitat. Planting a mixed riparian forest, maximizes quality habitat as the slow growing, but shade tolerant oaks mature.
Minimize sources of weeds, provide habitat along project edges	Use native plants to displace weeds in areas outside the main plantable area. We will use spreading plants (e.g., native blackberry) and native understory species will be used to outcompete black mustard, yellow starthistle, perennial pepperweed and other invasive species that currently grow on site.
Maintain high plant species and vegetative structural diversity	PRBO data suggests that bird diversity is highest in areas with 5-7 shrub species over a 50-m <sup>2</sup> area. Design considerations include varying density across the site to allow light gaps and create structural differences (grouping trees together will create pockets of shade and light gaps), creating vegetation patches (grouping small shrubs together will mimic larger plants and may attract desirable wildlife species faster than if they were grown apart), and considering herbaceous plantings between plant rows.
Provide valley elderberry longhorn beetle (VELB) habitat	Plant elderberry clusters across the site. A 100-foot buffer excludes elderberry from areas that are subject to future maintenance activities next to roads and levees.
Provide foraging and nesting sites for Swainson's hawk	Tall riparian trees will provide nesting and perching areas. Perennial grassland (RHJV 2000) provides consistent access to prey and good availability of prey.
Enhance floodplain habitat for anadromous fish species (spring-run Chinook, fall-run Chinook, steelhead).	Native trees, shrubs and understory will support the aquatic food web through increased food inputs by attracting invertebrate populations and providing shelter for juvenile fish species when the floodplain is inundated for a period of time.
Minimize disturbance to wildlife	Use vegetation as a screen by planting trees in curved rows and planting perimeter areas with grass and herbaceous plants such as mugwort and gumplant in the second year.
Minimize future impacts to maintenance areas.	No woody species will be planted within 50 feet of the setback levee. No elderberry or California blackberry will be planted within 100 feet of the setback levee.

**Table 4. Matrix of Targeted Species Habitat Needs, Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Species	Habitats	Habitat Elements								Notable Habitat Features
		Substrate	Tree layer	Riparian Inclusions	Herbaceous layer	Shrub layer	Hardwood	Invertebrates	Terrestrial insects	
Valley elderberry longhorn beetle ( <i>Desmocerus californicus dimorphus</i> )	Valley foothill riparian forest Valley oak woodland					E				Host plant is Mexican elderberry ( <i>Sambucus mexicana</i> )
Swainson's hawk ( <i>Buteo swainsoni</i> )	Valley foothill riparian forest Valley oak woodland Herbaceous		S	S		S				Nests in open riparian habitat, open grasslands with scattered large trees or groves.
Sacramento splittail ( <i>Pogonichthys macrolepidotus</i> )	Slough Floodplain				E	E		E		Found in slower moving sections of large rivers and in sloughs. Requires flooded vegetation such as terrestrial shrubs and herbs for spawning and rearing.
Central Valley fall-run Chinook salmon ( <i>Oncorhynchus tshawytscha</i> )	Main stem of large rivers Open ocean Estuary	E						E		Requires suitable conditions in the main stem of large rivers (gravel composition, water depth, and velocity) for spawning. Young fish survival is dependant on food source abundance (aquatic invertebrates and detritus) and available refugia. Emigrate to saltwater within 3 months to 2 years after emergence. Peak migration to freshwater occurs in September and October and spawning takes place in October and November.
Central Valley spring-run Chinook salmon ( <i>Oncorhynchus tshawytscha</i> )	Main stem of large rivers Open ocean Estuary	E						E		Same as Fall-run Chinook except this species enters the river as immature fish in May and June and spawn after reaching maturity, typically in mid-September.
Central Valley steelhead ( <i>Oncorhynchus mykiss</i> )	Main stem of large rivers Open ocean Estuary	E						E		Spend the first 1-3 years of life in freshwater streams then emigrates to salt or brackish waters for adult life stage. Spawns in main stem of large river systems in gravel substrate.

Notes: E = essential habitat element, S = secondary habitat element, Valley Oak Woodland = Valley Oak Series.  
Sources: California Wildlife Habitat Relations Database (CWHR 2002) and Inland Fishes of California (Moyle, 2002).

### **c) Central Valley Salmon**

#### **(1) Spring-run Chinook**

Spring-run Chinook salmon enter freshwater rivers as immature fish in spring and early summer. They hold in deep pools in upstream reaches for several months and spawn in areas with adequate gravel composition in early fall. Juvenile salmon require low water temperatures (13-18 degrees C) and refugia from predation (Moyle, 2002). Such conditions are typically made available by the presence of SRA habitat and LWD. Much of the former spring-run Chinook habitat has been eliminated by dams. The lower Feather River is among some of the few remaining spawning areas for spring-run Chinook salmon. Enhancing the floodplain habitat so that it can benefit spring-run Chinook salmon is consistent with the goals of this plan.

#### **(2) Fall-run Chinook**

Fall-run Chinook salmon begin migration to natal freshwater streams in late summer and early fall. These fish migrate as mature adult fish and spawn in gravel redds within a few days or weeks after arrival at spawning grounds. While the duration of juvenile freshwater inhabitation is significantly shorter (only 1-7 months) than that of spring-run Chinook (3 to 15 months), the habitat requirements are very similar (Moyle, 2002). The fall-run Chinook are the most abundant of the Central Valley Chinook salmon, yet their habitat range is also dwindling due to migration barriers. Enhancing the floodplain habitat so that it can benefit fall-run Chinook salmon is consistent with the goals of this plan.

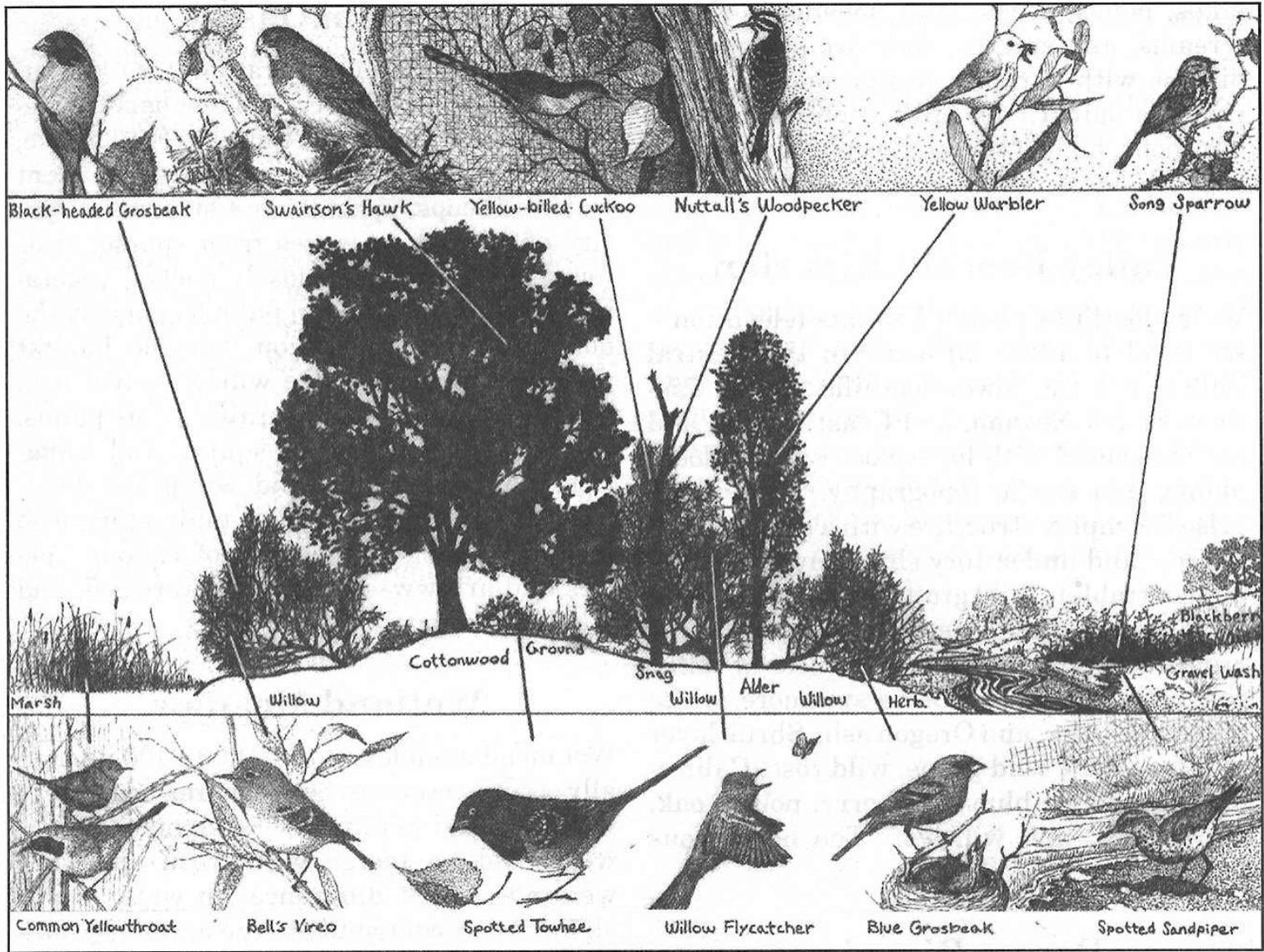
### **d) Steelhead**

Dams have also separated Central Valley steelhead from much of its former range. One of the documented remaining populations is found in the lower Yuba River, a major tributary to the Feather River. Central Valley steelhead is a cold water species that requires adequate gravel composition for spawning. Central Valley steelhead spend about half their lives in freshwater streams, which may account for the dramatic effect river regulation and habitat loss have had on this fish species. Enhancing the floodplain habitat so that it can benefit steelhead is consistent with the goals of this plan.

## **C. Targeted Avian Species**

Riparian ecosystems harbor the most diverse bird communities in the arid and semi-arid portions of the western United States (Knopf et al. 1988, Dobkin 1994, Saab et al. 1995), and may also provide the most important avian habitat in California (Manley and Davidson 1993). Therefore, a restored site will provide vital habitat and conditions for neo-tropical migratory birds, western yellow billed cuckoos, and other riparian dependent avian species (Figure 4). The benefits to terrestrial species are realized relatively quickly. Increases in species richness and numbers of neo-tropical migratory birds may be seen within three years of restoration (Geupel et al., 1997; RHJV, 2004).

**Figure 4. Habitat Value of Native Riparian Plants (RHJV 2004)**



## D. Mitigation

Although 14.9 acres are required, 20 acres are designed to mitigate impacts to elderberry shrubs during the construction of the setback levee. Table 5 summarizes the number of stems likely to be impacted by the project and describes the specific replacement ratios and conservation measures required by USFWS (1999a). Accidental damage or removal of blue elderberry plants at O'Connor Lakes will be covered under the pre-existing 2005 USFWS Biological Opinion and Incidental Take Statement Memorandum of Understanding (2005 MOU) (USFWS 2009). The 2005 MOU allows CDFG and CDWR to remove elderberry shrubs for the purposes of flood control projects as long as a baseline of 130 plants is maintained (CDFG and CDWR 2005).

**Table 5. Elderberry Mitigation Requirements<sup>1,2</sup> for Feather River Setback Levee and Habitat Enhancement Project at Star Bend (Stillwater Sciences 2008), Sutter County, California.**

Stem size	Number of Stems <sup>3</sup>	Exit hole?	Seedling ratio	Number of replacement elderberries	Associate native ratio	Number of associate seedlings
1"-3"	202	Yes	4:1	808	2:1	1608
3"-5"	50	Yes	6:1	300	2:1	600
>5"	1	No	4:1	4	1:1	4
>5"	12	Yes	8:1	96	2:1	192
TOTAL	265			1,208		2,404

Source: USFWS 2009

## E. Primary Project Area

Although the planting will be done in phases, the description of plant communities will be discussed here as a whole. Based on varying biological conditions of the site and hydraulic objectives, three plant communities are proposed. We suggest planting a combination of Great Valley Mixed Riparian Forest, Riparian Scrub Shrub and grassland communities (Figure 5, Table 6). Tree and shrub densities and compositions (Tables 7-12) will vary across the site to address mitigation and wildlife habitat goals and complement the vegetation communities designed and implemented within the O'Connor Lakes Unit. An integral component of the design is a native grass understory which is incorporated into the woody species plantings on 84% of the site.

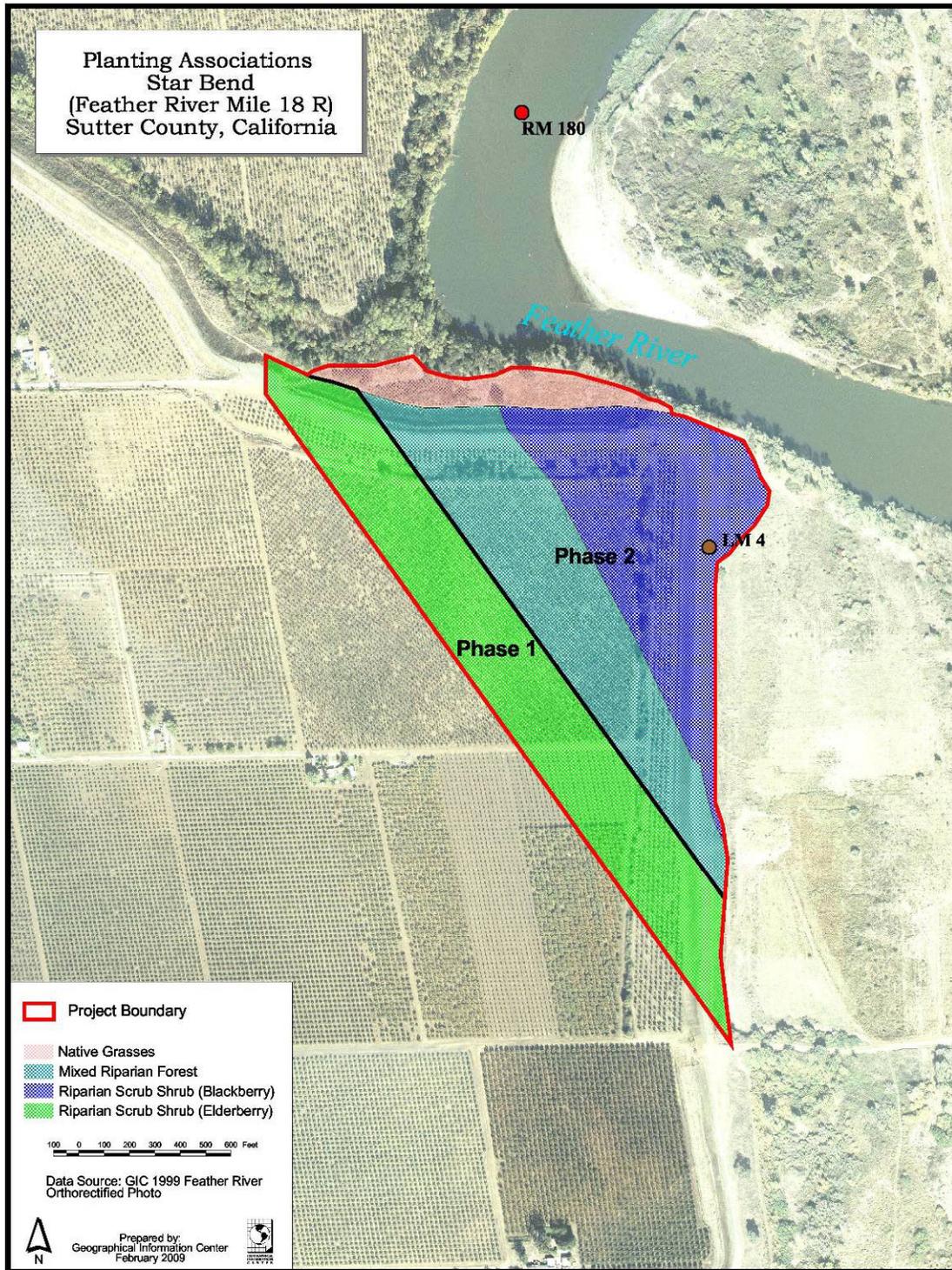
Figure 5 shows the locations of the proposed vegetation associations. To translate the vegetation associations to the field, the project area is to be made up of smaller planting units (a 5-row by 10-plant area), referred to as "tiles." The project area can be divided into a grid overlaying the site, with each square on the grid representing a tile (Appendix II). Vegetation is assigned for each area of the grid, based on site conditions, mitigation requirements, or wildlife needs. The Holland/CNDDDB classification system (Holland 1986) was used to communicate the vegetation composition for each area. The tiles describe plant composition (what plants are included in an area) and arrangement (how the plants are located relative to each other). Arrangements allow development of habitat features (for example, grouping trees to create dense groves for western yellow-billed cuckoos, or grouping small shrubs together to mimic a large shrub, for cover-

dependent wildlife). Conventional ecological theory holds that high plant species diversity and structural diversity translates to high wildlife diversity. Thus, alternative vegetation associations will be embedded into the design.

**Table 6. Summary of Overall Proposed Plant Species at the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Total Acres: 53.4				
Common name	Scientific name	Species composition (%)	Density (plant/acre)	Total Number
Arroyo willow	<i>Salix lasiolepis</i> Benth.	6.6	16.0	859
Box elder	<i>Acer negundo</i> L.	0.5	1.3	68
Buttonbush	<i>Cephalanthus occidentalis</i>	5.7	14.0	751
California blackberry	<i>Rubus ursinus</i> Chain. & Schldl.	25.9	63.0	3,391
Coyote brush	<i>Baccharis pilularis</i> DC.	5.4	13.2	712
Elderberry	<i>Sambucus mexicana</i>	15.9	38.7	2,082
Fremont cottonwood	<i>Populus fremontii</i> S.Watson ssp. <i>fremontii</i>	0.5	1.3	68
Gooding's black willow	<i>Salix goodingii</i> C.R. Ball	0.3	0.6	34
Mule fat	<i>Baccharis salicifolia</i>	4.4	10.8	580
Oregon ash	<i>Fraxinus latifolia</i> Benth	0.8	1.9	102
Sandbar (narrow-leaf) willow	<i>Salix exigua</i> Nutt.	2.5	6.0	325
Valley oak	<i>Quercus lobata</i> Nee	1.3	3.2	171
Western sycamore	<i>Platanus racemosa</i> Nutt.	1.3	3.2	171
Wild rose	<i>Rosa californica</i> Cham. & Schldl.	28.8	69.9	3,763
<b>TOTAL</b>		<b>100.0</b>	<b>243.1</b>	<b>13,077</b>

**Figure 5. Planting Associations for the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**



## 1. Riparian Scrub Shrub (Elderberry)

The habitat enhancement project will incorporate approximately 20 acres of mitigation habitat for VELB, which is designed with a Riparian Scrub Shrub (Elderberry) association (RSE) (Table 7) that is dominated by blue elderberry and will contain large shrubs of blue elderberry that have been excavated from construction impact areas and transplanted in accordance with guidelines previously established by the U.S. Fish and Wildlife Service (USFWS) (Appendix III). The purpose of transplanting is to transfer healthy, mature, blue elderberry individuals to the mitigation area to facilitate the recolonization of VELB to the project site. In addition, the area will be planted with elderberry seedlings and associates (other woody species) in accordance with USFWS guidance. All elderberry shrubs will be planted a sufficient distance from project levees to ensure that elderberries will not be disturbed by, or interfere with, levee maintenance activities.

This community is designed with a 100-foot wide buffer zone that will not include California blackberry or elderberry seedlings. This is intended to prevent the spread of these shrubs onto the levee thereby reducing future maintenance costs. A native grass understory will be planted between the planting rows over the entire 20 acres.

**Table 7. Proposed Composition of Riparian Scrub Shrub (Elderberry) at the Feather River Setback Levee and Habitat Enhancement Project, Sutter County, California.**

Estimated Acres:		20.0 <sup>1</sup>		
Common name	Scientific name	Species comp. (%)	Density (plant/acre)	Total Number
Arroyo willow	<i>Salix lasiolepis</i> Benth.	5.4	10.9	217
Buttonbush	<i>Cephalanthus occidentalis</i>	5.5	11.1	222
California blackberry	<i>Rubus ursinus</i> Chain. & Schldl.	7.8	15.8	316
Coyote brush	<i>Baccharis pilularis</i> DC.	13.0	26.2	524
Elderberry	<i>Sambucus mexicana</i>	36.5	73.8	1,475
Mule fat	<i>Baccharis salicifolia</i>	8.9	17.9	358
Sandbar (narrow-leaf) willow	<i>Salix exigua</i> Nutt.	3.4	6.9	137
Wild rose	<i>Rosa californica</i> Cham. & Schldl.	19.6	39.6	791
<b>TOTAL</b>		<b>100.0</b>	<b>202.2</b>	<b>4,040</b>

The total number of plantings is designed to meet the required 3,612 elderberry and associated species mitigation plantings, plus additional plantings to ensure adequate survival rates.

## 2. Great Valley Mixed Riparian Forest

The Great Valley Mixed Riparian Forest (MRF) (Table 8) will be planted primarily in the proposed borrow area within the setback project and will complement the existing mixed riparian forest dominated by cottonwoods in the levee toe ditch. This community will be comprised of a mixture of fast-growing species (cottonwood and willows) and slow-growing species (sycamore and oak), which provide short-term and long-term wildlife habitat. The MRF community will be planted with an open design to enhance the edge effect for wildlife. It will be planted in hedgerows, which consist of five planting rows twenty feet apart with breaks of one hundred feet between each hedgerow. The open spaces and all row centers will be planted with native grasses.

**Table 8. Proposed Composition of Great Valley Mixed Riparian Forest at the Feather River Setback Levee and Habitat Enhancement Project, Sutter County, California.**

Estimated Acres: 15.5

Common name	Scientific name	Species comp. (%)	Density (plant/acre)	Estimated Number
Arroyo willow	<i>Salix lasiolepis</i> Benth.	6.0	6.6	102
Box elder	<i>Acer negundo</i> L.	4.0	4.4	68
Buttonbush	<i>Cephalanthus occidentalis</i>	4.0	4.4	68
California blackberry	<i>Rubus ursinus</i> Chain. & Schldl.	24.0	26.4	409
Coyote bush	<i>Baccharis pilularis</i> DC.	2.0	2.2	34
Elderberry	<i>Sambucus mexicana</i>	4.0	4.4	68
Fremont cottonwood	<i>Populus fremontii</i> <i>S. Watson ssp. fremontii</i>	4.0	4.4	68
Gooding's black willow	<i>Salix goodingii</i> C.R. Ball	2.0	2.2	34
Mule fat	<i>Baccharis salicifolia</i>	4.0	4.4	68
Oregon ash	<i>Fraxinus latifolia</i> Benth	6.0	6.6	102
Sandbar (narrow-leaf) willow	<i>Salix exigua</i> Nutt.	2.0	2.2	34
Valley oak	<i>Quercus lobata</i> Nee	10.0	11.0	171
Western sycamore	<i>Platanus racemosa</i> Nutt.	10.0	11.0	171
Wild rose	<i>Rosa californica</i> Cham. & Schldl.	18.0	19.8	307
<b>TOTAL</b>		<b>100.0</b>	<b>110.0</b>	<b>1,705</b>

## 3. Riparian Scrub Shrub (Blackberry)

The Riparian Scrub Shrub (Blackberry) association, dominated by densely planted California blackberry and California rose (Table 9), will serve as a transition from native grasses to mixed riparian forest. The shrubs that comprise this plant association provide year round shrubby cover, produce high quantities of fruit and seeds, and attract insects. Moreover, this plant community will serve to protect the project area from erosive overbank flow; especially aiding in protecting cultural resources from disturbance. The open spaces and all row centers will be planted with native grasses.

A separate design within this community is planned for a cultural resources area located in the project area. California rose and California blackberry will be planted at a very high density (Table 10). Shrubs planted at this density should close in on themselves within a year and protect the area from disturbance.

**Table 9. Proposed Composition of Riparian Scrub Shrub (Blackberry) at the Feather River Setback Levee and Habitat Enhancement Project, Sutter County, California**

Estimated Acres: 15.9

Common name	Scientific name	Species Comp. (%)	Density (plant/acre)	Estimated Number
Arroyo willow	<i>Salix lasiolepis</i> Benth.	14.0	33.9	539
Buttonbush	<i>Cephalanthus occidentalis</i>	12.0	29.0	462
California blackberry	<i>Rubus ursinus</i> Chain. & Schldl.	24.0	58.1	923
Coyote bush	<i>Baccharis pilularis</i> DC.	4.0	9.7	154
Elderberry	<i>Sambucus mexicana</i>	14.0	33.9	539
Mule fat	<i>Baccharis salicifolia</i>	4.0	9.7	154
Sandbar (narrow-leaf) willow	<i>Salix exigua</i> Nutt.	4.0	9.7	154
Wild rose	<i>Rosa californica</i> Cham. & Schldl.	24.0	58.1	923
<b>TOTAL</b>		<b>100.0</b>	<b>242.0</b>	<b>3,847</b>

**Table 10. Proposed Composition of Riparian Scrub Shrub (Blackberry) (Closed) at the Feather River Setback Levee and Habitat Enhancement Project, Sutter County, California**

Estimated Acres: 2.0

Common name	Scientific name	Species Comp. (%)	Density (plant/acre)	Estimated Number
California blackberry	<i>Rubus ursinus</i> Chain. & Schldl.	50.0	871.2	1,742
Wild rose	<i>Rosa californica</i> Cham. & Schldl.	50.0	871.2	1,742
<b>TOTAL</b>		<b>100.0</b>	<b>1,742.4</b>	<b>3,484</b>

#### 4. Native Grasses

The planting of native grass minimizes the invasion of non-native species, enhances wildlife habitat, limits erosion, and provides less hazardous fire conditions. Soil conditions indicate that native grasses will do well on the project site. A native grassland will be planted in the area just north of the existing levee (Figure 5). Along with the benefits listed above, the grassland will also provide foraging habitat for Swainson's hawk. Grasses will also be planted as understory between the planting rows and hedgerows in all of the plant communities. The mosaic of grasses and woody species will provide nesting and cover areas as well as foraging areas for wildlife, maximizing the edge effect. Grasses will be planted over a total of approximately 42 acres which amounts to approximately 84% of the total project area.

Seed will be purchased from stock collected from the same ecoregion as the restoration project. The seeding rate will be approximately 13 pounds pure live seed (lbs pls) per acre, and seed will be planted with a no-till drill (Table 11). Native grass seeding will be applied in November or December after the first rains.

**Table 11. Proposed Composition of Native Grass Mix at the Feather River Setback Levee and Habitat Enhancement Project, Sutter County, California.**  
**Estimated Acres: 47.3**

Common Name	Scientific Name	Rate (lbs pls/acre)	Estimated Amount <sup>1</sup> (lbs)
Blue wildrye	<i>Elymus glaucus</i>	3	126
Creeping wildrye	<i>Leymus triticoides</i>	4	168
Meadow barley	<i>Hordeum branchyantherum</i>	2	84
Purple needlegrass	<i>Nasella pulchra</i>	4	168
<b>Total</b>		<b>13</b>	<b>546</b>

<sup>1</sup>Total pounds to purchase will be dependent upon purity of seed and percent germination. Consult with nursery for amount to order.

## F. O'Connor Lakes Unit Borrow Areas

After borrow areas are filled with material from the decommissioned levee and graded to pre-project elevations (approximately 41–45 ft), the three borrow areas at the O'Connor Lakes Unit will be revegetated with a similar design specified in the O'Connor Lakes Restoration Plan (River Partners 2006). The planting palette includes native grasses and an herbaceous understory.

### 1. Native Grasses

Disturbed areas in Borrow Area 2 will be revegetated with creeping wildrye (*Leymus triticoides*) plugs. This area carries the greatest quantity of overbank flows within the O'Connor Lakes Unit. Creeping wildrye is rhizomatous and well-suited to sandy soils. This area will be planted at a density of 2,720 plugs/acre (Table 12). To increase species and structural diversity, deer grass (*Muhlenbergia rigens*) plugs will be planted at a density of 2,500 plugs/acre. The total amount of creeping wildrye and deer grass plugs will depend on the amount of area disturbed.

**Table 12. Proposed Composition of Native Grasses for Borrow Areas, Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Common name	Scientific name	Location	Density plugs/acre
Creeping wildrye	<i>Leymus triticoides</i>	Borrow Area 2	2,720
Deer grass	<i>Muhlenbergia rigens</i>	Borrow Area 2	2,500

### 2. Herbaceous Understory

Borrow Area 1, where vegetation is annually cleared by DWR for flow conveyance, and Borrow Area 3, where material was previously removed, will be revegetated with mugwort at a rate of 2 lbs pls/acre. The total amount of mugwort seed needed will depend on the amount of area disturbed.

## G. Implementation of Phase I

The 20-acre Phase I planting consists entirely of elderberry mitigation plantings, including transplants, and the RSE community. This community includes a buffer zone planting that excludes California blackberry and elderberry. It will be planted in a strip 100 feet wide running the length of the setback levee. These communities provide the native associate plants required with the on-site mitigation for impacted elderberry

shrubs. The borrow areas on the O'Connor Lakes Unit will be revegetated with native grasses and other herbaceous species.

## **1. Pre-Construction Activities**

### **a) Orchard Removal**

The existing plum orchard will be removed prior to onset of levee degradation and construction activities. The ecological benefits provided by the current plum orchards are expected to be surpassed by the rapid wildlife responses observed after the first year of restoration.

### **b) Elderberry Transplanting**

Prior to the initiation of any levee setback construction activities, all blue elderberry plants with one or more stems measuring  $\geq 1.0$  inch in diameter at ground level that can not be avoided will be transplanted to a predetermined site that is acceptable to USFWS. LD1 proposes to transplant all unavoidable shrubs to an on-site location, as depicted in Figure 2. Blue elderberry transplants will be planted in rows oriented parallel to the setback levee; rows will be spaced 20 feet apart with 11 feet spacing within each planting row. These transplanted individuals, as well as all other blue elderberry plants within 100 feet of Project activities, will be protected as described in the Conservation Guidelines (USFWS 1999). At USFWS discretion, a plant that is unlikely to survive transplantation because of poor condition or location, or a plant that will be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible, mitigation ratios may be increased.

If possible, plants will be transplanted during their dormant season (approximately November through the first two weeks in February, after they have lost their leaves). This will reduce shock to the plant and increase transplantation success. If transplantation occurs during the growing season, increased mitigation ratios may apply. A qualified biologist (monitor) will be on site during transplantation to ensure that no unauthorized take of valley elderberry longhorn beetle occurs. If unauthorized take occurs, the monitor will have the authority to stop work until corrective measures have been completed. The monitor will immediately report any unauthorized take of the beetle or its habitat to USFWS and CDFG.

#### **Transplanting Procedure**

- The plant will be cut back 3 to 6 feet from the ground or to 50% of its height (whichever is taller) by removing branches and stems above this height. The trunk and all stems with diameters measuring 1 inch or greater at ground level will be replanted. Any leaves remaining on the plant should be removed. A hole will be excavated of adequate size to receive the transplant.
- The plant will be excavated using backhoe, excavator, front end loader, or other suitable equipment, taking as much of the root ball as possible, and replanting immediately at the designated area. If the plant is to be transplanted off site, the root ball will be secured with wire and wrapped with burlap. Care will be taken to ensure that the root ball remains moist. The root ball will be planted so that its top is level with the existing ground. The soil will be compacted sufficiently so that settlement does not occur.

- A basin will be constructed around the transplant and irrigated after planting.
- The planting area will be at least 1,800 ft<sup>2</sup> for each elderberry transplant. As many as five additional blue elderberry plantings (cuttings or seedlings) and up to five associated native species plantings will also be planted within the 1,800 ft<sup>2</sup> area with the transplant. Up to twenty stems greater than one inch are permitted per basin, forming a cluster design. These clusters will require large basins and will be oriented in the rows mentioned above. Water basins will have a continuous berm measuring approximately 8 inches wide at the base and 6 inches high.
- Soil should be saturated with water. Fertilizers and other potentially deleterious substances will not be used on or around the plants.
- Monitoring of the plants will occur to ascertain whether additional watering is necessary.

## **2. Post-Construction Site Preparation**

Elderberry transplanting will occur prior to the setback levee construction. The remaining associate plantings of Phase I will not be installed until setback levee construction is complete. The transplanted elderberries will be fenced with construction fencing. Once the setback levee construction is completed, the entire project area will be disked and floated to smooth the surface for irrigation and tractor operations (mowing and spraying). Existing native plants will be protected with fencing to minimize potential damage from machine operation. Prior to these activities, operations will be initiated to begin eradication of non-native species.

## **3. Row Orientation and Plant Spacing**

The Feather River channel flows north to south along the northern edge of the project, but then makes a 90-degree turn and flows east to west. All woody trees and shrubs will be planted in rows that will be oriented approximately parallel to flood flows and parallel to the newly constructed setback levee.

Details of plant orientation and spacing are as follows:

- Most of the planting areas will be 20 feet apart; with in-row plant spacing at 11 feet. Rows will be curved and generally follow a northwest-southeast orientation, paralleling the new setback levee.
- The density of the site will be 198 plants per acre. In addition, to allow flood conveyance, a high proportion of the plant communities will be comprised of flexible species such as California blackberry and California wild rose.

## **4. Plant Material Collection and Propagation**

To preserve any ecotype differences, plant material will be collected from vegetation as near as possible to the project site. Table 13 summarizes the types of plant propagation material to be used for woody species. Field cuttings of cottonwood and willows will be collected in January or February when the trees are dormant. A lead time of 12 to 18 months is required from time of seed collection to transplant maturity for plants grown in containers at a nursery. Seeds for the herbaceous understory will be bought at local nurseries or collected from sources near the project site.

**Table 13. Standard planting materials and times for woody species**

Species	Nursery Grown		Direct Planting		Standard Planting Time (primary method)
	Seeds	Cuttings	Seeds	Cuttings	
Arroyo willow	2	2		1	Feb-Mar
Black willow	2	2		1	Feb-Mar
Box elder	1				Oct-Apr
Buttonbush	1	2			Oct-Apr
California blackberry	1	2		2	Oct-Apr
Coyote bush	1	1		2	Oct-Apr
Dutchman's pipevine	1	2			Oct-Apr
Elderberry	1				Oct-Apr
Fremont cottonwood	2	2		1	Feb-Mar
Oregon ash	1				Oct-Apr
Red willow	2	2		1	Feb-Mar
Sandbar willow	2	2		1	Feb-Mar
Western sycamore	2	1			Oct-Apr
Wild rose	1	2		2	Oct-Apr
Valley oak	2		1		Nov-Dec
White alder	1	2			Oct-Apr

1 – primary method, 2 – secondary method.

## 5. Plant Installation

A computer database system provides the link between the design and field implementation. Each planting location receives a computer-generated vinyl label that lists its row and plant number, location, and species name and number code. This system connects the vegetation series to specific field conditions (e.g., flood-tolerant species in wet areas) or management objectives (e.g., dense vegetation to serve as a wildlife screen). The labels are installed on stakes in the field prior to planting, which communicates the plan to the planting crew. All plants are number coded and workers can match plants with the proper label.

Any deviations will be recorded and updated in the database. Plant deviations from the original design (e.g., planting an elderberry shrub at a valley oak location) can be recorded during the first census.

Planting efforts will focus on the woody plants in the first year with the native herbaceous understory planted in year 2. Table 14 provides a timeline for implementation of native woody and herbaceous species planting for Phase I.

**Table 14. Calendar of planting implementation for Phase I of the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Date	Trigger	Action
Spring Year 1	Weed germination, soil moisture for field activities.	Maintain complete weed control and prepare a seed bed through mowing, spraying, and disking when weeds are young.
Fall Year 1	Planting of woody species.	
Fall Year 2 (typically November)	After about an inch of rain, when the winter weeds “flush” (germinate).	Spray weeds (Roundup) to give the natives a good start. Broadcast native understory seeds. Due to size of the seeds, mix with an inert carrier (i.e. rice hulls) to distribute the seeds across the field.
Early Spring Year 3	Assessment of weed pressure in previous year, appearance of annual weeds.	Control annual weeds with Roundup if weather conditions allow.
Spring Year 3 to end of project	Weeds taller than 8”, or if weeds threaten to shade natives.	The objective is to increase germination and vegetative growth (and not necessarily seed production) of the native understory. Well-timed mowing will reduce the competition with non-native weeds.

### a) Woody species

Plant protectors (one-quart milk cartons) should be installed with about 2 inches of wood shavings applied as mulch to hold soil moisture and minimize weed growth. These help protect the plant from desiccation, herbivory, and drift from herbicide applications.

Once site preparation is complete and the irrigation systems are in place, plant installation can begin. The planting of woody species begins with the staking and labeling of each plant location. The location of woody species is expressed by the planting tiles (Appendix V).

Approximately 4,000 woody plants will be planted within the Phase II project area (Table 7). Additional details for the planting of woody species include the following:

- **Initial planting:** Initial planting will occur in the fall (oaks and nursery stock) and will continue through winter and spring (direct cuttings). By spring, the initial planting should be complete.
- **Replanting:** A replant of any missing or dead plants will occur after survivorship is calculated from the census completed in year 1. The plant design approach (over-planting) will minimize future replanting efforts in years 2 and 3.

Acorns will be planted directly into the field during the fall. Cottonwood and willow cuttings will be planted in February and March. Nursery material will be planted in the spring or fall when weather conditions are cool and moist.

## **H. Implementation of Phase II**

Phase II, an additional 32.1 acres, will be implemented for further restoration and expansion of riparian habitat that may be applied as mitigation for the future regional levee improvement projects and/or the Sutter County Habitat Conservation Plan.

### **1. Site Preparation**

The project area will be disked and floated to smooth the surface for irrigation and tractor operations (mowing and spraying). Existing native plants will be protected with fencing to minimize potential damage from machine operation. Prior to these activities, operations will be initiated to begin eradication of non-native species.

### **2. Row Orientation and Plant Spacing**

The Feather River channel flows north to south along the northern edge of the project, but then makes a 90-degree turn and flows east to west. All woody trees and shrubs will be planted in rows that will be oriented approximately parallel to flood flows and parallel to the newly constructed setback levee.

Details of plant orientation and spacing are as follows:

- The planting rows will be 20 feet apart; with in-row plant spacing at 11 feet, with the exception of the Riparian Scrub Shrub (Blackberry) association, where in-row plant spacing will be 5 feet. Rows will be curved and generally follow a northwest-southeast orientation, paralleling the new setback levee.
- A significant portion of the site will be planted in hedgerows which will consist of five rows spaced 20 feet apart. There will be a 100 foot break between each hedgerow.
- Plant densities will vary across the project area to accommodate physical and biological parameters. The density of the site will range from 110 plants per acre in the MRF Open community to 1,742 plants per acre in the high-density planting in the cultural resource area, with an overall density of 267 plants per acre. In addition, to allow flood conveyance, a high proportion of the plant communities will be comprised of flexible species such as California blackberry and California wild rose.

### **3. Plant Installation**

A computer database system provides the link between the design and field implementation. Each planting location receives a computer-generated vinyl label that lists its row and plant number, location, and species name and number code. This system connects the vegetation series to specific field conditions (e.g., flood-tolerant species in wet areas) or management objectives (e.g., dense vegetation to serve as a wildlife screen). The labels are installed on stakes in the field prior to planting, which communicates the plan to the planting crew. All plants are number coded and workers can match plants with the proper label.

Any deviations will be recorded and updated in the database. Plant deviations from the original design (e.g., planting an elderberry shrub at a valley oak location) can be recorded during the first census.

Planting efforts will focus on the woody plants in the first year with the native herbaceous understory and native grasses planted in year 2. Table 16 provides a timeline for implementation of native woody and herbaceous species planting for Phase II.

**Table 16. Calendar of planting implementation for Phase II of the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Date	Trigger	Action
Spring Year 1	Weed germination, soil moisture for field activities.	<ul style="list-style-type: none"> <li>• Maintain complete weed control and prepare a seed bed through mowing, spraying, and disking when weeds are young.</li> </ul>
Fall Year 1	Planting of woody species.	
Fall Year 2 (typically November)	After about an inch of rain, when the winter weeds “flush” (germinate).	<ul style="list-style-type: none"> <li>• Spray weeds (Roundup) to give the natives a good start. Directly seed native grass using a no till drill. Mix the seed prior to planting (no observed difference between mixed and separate seeding). Apply 30 pounds/acre of 16-20-0 fertilizer (no observed difference, but fertilizer may benefit new seedlings under extremely cold weather).</li> <li>• Broadcast native understory seeds. Due to size of the seeds, mix with an inert carrier (i.e. rice hulls) to distribute the seeds across the field.</li> </ul>
Early Spring Year 3	Assessment of weeds in previous year, appearance of broadleaf plants.	<ul style="list-style-type: none"> <li>• Control broadleaf plants (2,4-D) in native grass area if woody plants are dormant and weather conditions comply.</li> <li>• Control annual weeds with Roundup in areas broadcasted with native understory.</li> </ul>
Spring Year 3 to end of project	Weeds taller than 8”, or if weeds threaten to shade natives.	<ul style="list-style-type: none"> <li>• The objective is to increase germination and vegetative growth (and not necessarily seed production) of native grasses and native understory. Well-timed mowing will reduce the competition with non-native weeds, and may encourage vegetative growth (such as tillering) of the native grass.</li> </ul>

**a) Woody species**

Plant protectors (one-quart milk cartons) should be installed with about 2 inches of wood shavings applied as mulch to hold soil moisture and minimize weed growth. These help protect the plant from desiccation, herbivory, and drift from herbicide applications.

Once site preparation is complete and the irrigation systems are in place, plant installation can begin. The planting of woody species begins with the staking and labeling of each plant location. The location of woody species is expressed by the planting tiles (Appendix V).

Approximately 9,300 woody plants will be planted within the Phase II project area (Tables 8-10). Additional details for the planting of woody species include the following:

- **Initial planting:** Initial planting will occur in the fall (oaks and nursery stock) and will continue through winter and spring (direct cuttings). By spring, the initial planting should be complete.
- **Replanting:** A replant of any missing or dead plants will occur after survivorship is calculated from the census completed in year 1. The plant design approach (over-planting) will minimize future replanting efforts in years 2 and 3.

Acorns will be planted directly into the field during the fall. Cottonwood and willow cuttings will be planted in February and March. Nursery material will be planted in the spring or fall when weather conditions are cool and moist.

#### 4. Native Grasses

Seed will be purchased from stock collected from the same ecoregion as the restoration project. The seeding rate (Table 11) will be approximately 13 pounds pure live seed (lbs pls) per acre, applied with 30 pounds/acre of 16-20-0 fertilizer, and planted with a no-till drill. Native grass seeding will be applied in November or December before the first rains.

In addition to native grass seeding, plugs of native grasses will be planted. Plugs are an especially important method for cultivating plants that do not reproduce well by seed (e.g. deer grass). Deer grass is a more drought-tolerant species that will be planted in Borrow Area 2 to increase species richness. Table 17 shows the recommendations for plug planting within the project.

**Table 17. Summary of Native grass Plug-Planting for Borrow Areas of the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Common name	Scientific name	Location	Density plugs/acre	Spacing
Creeping wildrye	<i>Leymus triticoides</i>	Borrow Area 2	2,720	4 ft x 4 ft
Deer grass	<i>Muhlenbergia rigens</i>	Borrow Area 2	2,500	Scattered clumps

## IV. MAINTENANCE

This section provides field managers with technical details needed to implement the plant design. The subsections describe field layout and an approximate sequence of activities that will be carried out over the three-year term of the habitat enhancement project.

### A. Weed Control

Weed control is necessary for the successful establishment of native plants and improvement of habitat. The weeds of greatest concern at the site are black mustard, yellow starthistle and pepperweed.

During the growing season, weeds along the planting rows should primarily be controlled by the timely spraying of Roundup® or a generic herbicide brand with glyphosate as the active ingredient. Rows will also be mowed with side mower and weed eater as needed. The aisles between the planted rows (centers) should be mowed or disked to minimize weed growth and propagation. Spraying and/or mowing

should be implemented every 3-6 weeks during the growing season for at least the first two years.

In areas to be planted with herbaceous species, spraying and mowing for an entire season before planting is recommended. Once the herbaceous species are planted, weed control methods will be mowing, possibly applying 2,4-D to control broad leaf pressure.

The restoration contractor will abide by county and state herbicide permitting and reporting requirements. Roundup® (glyphosate) and 2,4-D (for broad-leaf control in native grass planting) are likely to be the most commonly used herbicides on the project. Rodeo® (for areas adjacent to water bodies), Telar® (for pepperweed control), Poast® (for post-emergence control of annual grasses in herbaceous understory planting) and Garlon™ (for woody species control) may also be used.

## **B. Irrigation**

Because of the dry summers typical of the climate in the area, irrigation will be required for plant establishment and survival. Irrigation should be applied with the goal that plants will become self-sufficient by the end of the third growing season.

In the first growing season, the rapidly growing seedlings have roots only in the surface (the top 1-2 feet) of the soil profile. The rooting zone must be kept moist through the season to ensure optimum growth and survival. Because of the sandy soils at the site and water table depths of over 20 feet, the soil moisture of the fields planted with woody species will need to be closely monitored. The intervals between irrigations are dependent upon soil texture, depth to water table, the weather conditions, and plant water stress. Because a mixture of species with different water demands is proposed, the plants must be carefully observed to maintain a balance of soil moisture that is acceptable for xeric species like valley oak and elderberry as well as more mesic species like cottonwood and willow.

Prior to project implementation, a more detailed irrigation design will be developed. All irrigation water will be provided by an existing well located in the O'Connor Lakes Unit, near the midpoint of the eastern edge of the project area. The mainline will run west from the well.

Based on knowledge of the site and plant design, the following are expected to be the requirements for the system:

- The plant spacing throughout most of the restoration and mitigation areas will be 20-foot-wide rows with a 11-foot distance down the planting rows, and rows planted in an approximate east-west direction. Shrub clusters will be planted with 20-foot-wide rows with a 5-foot distance down the rows. Levee remnants will be planted with 10-foot-wide rows with a 5-foot distance down the rows.
- Planting rows will curve and run parallel to flood flows. The irrigation system will utilize existing wells as water sources.

- The drip-line emitters will be spaced, with three emitters per plant 12 inches apart. The design flow will be 0.6 gallons per hour per emitter (1.8 gallons per plant per hour).

Within selected areas, soil-moisture sensors will be placed 1) near the Bear and Feather Rivers, 2) in the middle of the setback levee area, 3) in the middle of the grassland, 4) in the middle of the removed orchard, and 5) on top of the levee remnants. Sensors will be installed at depths of 12 and 36 inches.

In conjunction with these measurements, plant stress observations before and after irrigation periods will be necessary to critically judge the timeliness and effectiveness of irrigation. Measurements provide the most direct assessment of soil moisture. Table 18 provides the irrigation goals of the project.

**Table 18. Irrigation goals for the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Year	Goal	Frequency
1	Keep the shallow roots (1-2 feet) of young plants moist to ensure optimum growth and survival.	Utilize soil moisture probes to monitor and maintain moisture throughout the soil column.
2	Encourage deep rooting and enhance field access to facilitate weed control.	Deliver less frequent but longer irrigations.
3	Encourage deep rooting and enhance field access to facilitate weed control.	Continue with long irrigations and extend the period between irrigations.

The strategy for the second and third year is to train the roots to grow deep. Roots at depth (5-15 feet) will need less water and may be able to tap into the water table on the site and outcompete more shallow-rooted weeds. Less frequent, deep watering will encourage roots to grow deeper, well below the roots of the weeds, allowing the tree exclusive use of this deep moisture. As the tree's roots grow deeper, the times between irrigations become longer; this allows the soil surface layers to dry, thereby reducing weed vigor.

We anticipate that the well-drained, sandy soils, and relatively deep groundwater present on the site, will require frequent irrigations and careful observation of water stress. These areas may dictate the frequency of watering on the site. Field managers should use a combination of methods including evapotranspiration estimates, soil probes, gypsum blocks, and plant water stress signs to assess soil moisture and alter the irrigation regime.

### **C. Herbivore Control**

A number of measures can help control or minimize the effects of herbivores on young plants (Table 19). Cultural practices such as mowing or spraying can discourage most of these herbivores. One of the advantages of active restoration is that more plants are planted than the herbivores can eat. Some damage by herbivores is tolerable and should not impact the success of the planting.

## D. Flood and Fire Contingencies

All stockpiled material, cleared trees and brush, and equipment should be removed from the site during the flood season (November 1 to April 15). In the event of a flood, flood debris will be cleared from the site following the flood season.

Throughout the implementation of the project, the restoration contractor should periodically mow between rows and clusters, and along the perimeter of project areas, to reduce potential fire hazards.

**Table 19. Summary of Herbivore Control Methods at the Feather River Setback Levee and Habitat Enhancement Project at Star Bend, Sutter County, California.**

Herbivore	Type of Damage	Comment on measure(s) or plant response
Beaver	Cut down woody species to build dams	Dismantle dams or, if damage becomes severe, herbivore removal  Woody species can stump sprout
Deer	Browsing sapling Use trees to rub velvet off antlers	Install heavy-gauge metal hoops and garlic capsules or other deterrent. Saplings can resprout
Ground Squirrels ( <i>Otospermophilus beecheyi</i> )	Dig up and shred plants and protectors.	Flooding or disking can reduce populations.
Pocket Gophers ( <i>Thomomys bottae</i> )	Eat the bark of willow and cottonwood saplings and limbs. Eat root systems (probably killing more saplings than any other vertebrate pest).	Control of weed cover allows predators to hunt gophers. However, gophers can persist in an open, weed-free field.  Frequent disking, weed mulch control, or flooding reduces populations.  A variety of birds will prey on gophers if given the opportunity. Raptor perches and owl boxes may increase predation.
Rabbits and Hares	Browse early spring growth.	Most seedlings resprout.
Voles ( <i>Microtus</i> )	Eat bark and cambium at the base of sapling, usually girdling the entire stem.  Dig-up and eat recently planted acorns.	Saplings resprout, unless vole population is high.  Voles live only in dense herbaceous (weed) cover and never stop moving when in the open to avoid predators. Remove dense weed cover through herbicides or mowing.

## V. MONITORING AND REPORTING

Mitigation and riparian vegetation enhancement activities at the Project site will be monitored by LD1 and/or CDFG (or the restoration contractor) to determine if mitigation requirements and habitat enhancement goals and performance standards are being met. Annual monitoring of riparian vegetation establishment including natural native plant recruitment, nonnative plant recruitment, and plant development, will provide

guidance to LD1 and/or CDFG (or the restoration contractor) to determine if remedial actions are needed. Annual monitoring reports will be submitted in the fall of each year. If monitoring reveals that performance standards are not being met, remedial activities may be implemented.

Monitoring of the Phase I elderberry transplants and mitigation plantings (20 acres) will be conducted twice annually for ten consecutive years or for seven years over a fifteen year period following project completion, per USFWS (1999) mitigation monitoring requirements. Annual monitoring of the O'Connor Lakes component of Phase I as well as Phase II will be conducted for up to three years following planting. Details of both the elderberry and general riparian vegetation monitoring are detailed in the following sections.

### **A. Monitoring and Reporting of VELB Mitigation Area**

A biologist will monitor elderberry transplants and associated native plants within the VELB mitigation area. The population of VELB, the general condition of the mitigation area, and the condition of the elderberry and associated native plantings in the conservation area will be monitored over 10 consecutive years following the survey and monitoring procedures listed in the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS 1999). The monitoring and reporting requirements are summarized in Table 20 at the end of this section.

#### **1. Annual Surveys**

Each year during the 10-year monitoring period, a minimum of two site visits between February 14 and June 30 will be made by a qualified biologist. According to the guidelines, the surveys must include the following:

- A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their precise locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used.
- A census of beetle exit holes in elderberry stems, noting their precise locations and estimated ages.
- An evaluation of the elderberry plants and associated native plants on the site, and on the conservation area, if disjunct, including the number of plants, their size and condition.
- An evaluation of the adequacy of the signs and weed control efforts in the avoidance and conservation areas.
- A general assessment of the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive growth, etc.

A minimum survival rate of at least 60 percent of the elderberry plants and 60 percent of the associated native plants must be maintained throughout the monitoring period. Within 1 year of discovery that survival has dropped below 60 percent, failed plantings will be replaced to bring survivorship above the success criteria.

## 2. Reporting Requirements

Monitoring reports will be submitted annually by December 31 to USFWS and DFG. Copies of the report should be sent to:

- Chief of Endangered Species, Sacramento Fish and Wildlife Office, 2800 Cottage Way, W-2605, Sacramento, CA 95825
- Supervisor, Environmental Services, Department of Fish and Game, 1416 Ninth Street, Sacramento, CA 95814
- Staff Zoologist, California Natural Diversity Data Base, Department of Fish and Game, 1220 S Street, Sacramento, CA 95814.

**Table 20. VELB Mitigation Monitoring and Reporting, Feather River Setback Levee and Habitat Enhancement Project.**

Activity	Approximate Date or Frequency	Details
Qualitative Monitoring	Annually	<ul style="list-style-type: none"> <li>• Evaluate the adequacy of the signs and weed control in the avoidance and mitigation areas.</li> <li>• Assess the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive growth, etc.</li> </ul>
Quantitative Monitoring	Annually, minimum two surveys between February 14 and June 30.	<ul style="list-style-type: none"> <li>• A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used.</li> <li>• A census of beetle exit holes in elderberry stems, noting their locations and estimated ages.</li> <li>• An evaluation of the elderberry plants and associated native plants in the mitigation area, including the number of plants, their size and condition.</li> </ul>
Reporting	December 31	<ul style="list-style-type: none"> <li>• Submit monitoring reports annually to USFWS and DFG.</li> </ul>

## B. Monitoring and Reporting of Riparian Vegetation Areas

Given the presence of good soils and potential exposure to frequent flooding, the project area should sustain rapid growth of restored riparian species throughout the life of the project implementation (approximately 3 years). An “over-planting” approach is used to rapidly establish native riparian species. Over-planting the project site will eliminate the need for any additional replanting efforts. The ultimate ecological objective for over-planting is that in time the area will thin out and create a complex of open canopy, dense forest, and dead snags, all of which provide benefits to wildlife.

It is anticipated that at the end of the 3-year establishment period, 70% survivorship of woody species will be attained. Over time, mortality based on differences of soil textures and water table depths will create areas of complex, open canopy, dense forest, and dead snags, all of which create habitat for wildlife.

### 1. Annual Surveys

At the end of the first growing season, the restoration contractor will conduct a complete census of all woody species planted. The data are best analyzed using a database to calculate survivorship, and to determine any changes to or omissions from the original

planting design. During years two and three, woody species plantings will be sampled to determine survivorship, growth, and coverage. Sampling of native grass and herbaceous understory plantings will also be conducted.

### **a) Census**

At the end of the first growing season, a census noting survivorship for each location (alive, dead, or missing/not planted) will be conducted. The census allows for pattern analysis to examine the effects of soil, hydrology, or other factors affecting survivorship. During implementation, changes in the planting design are possible (or even desirable) and should be noted. Deviations in planting can also be recorded during the census. Results of the census will be used to determine progress towards performance criteria and replanting, if necessary.

### **b) Permanent Plot Sampling**

After the initial census, subsequent monitoring (years 2 and 3) utilizes permanent plots to collect data on overall survivorship, height, and cover. The sampling procedure is modified for a restoration setting from protocol developed by Dr. Dave Wood (CSU, Chico) to establish permanent plots in riparian forests (personal communication). Some of the methods have been adapted from Elzinga *et al.* 1998. Comparison of survivorship between the sampling procedure and census indicates that sampling estimates are within 2% and provide additional information on cover and recruitment (results based on data from field 4 of the Ord Bend Unit, Sacramento River National Wildlife Refuge (River Partners 2003)). The sampling procedure may also be used to compare pre- and post-restoration vegetation, if the permanent plots are installed beforehand.

#### **(1) Plot location and size**

All samples are based on 20 m x 50 m (1,000 m<sup>2</sup>) plots (quadrats) placed with the long axis oriented in a north-south direction. Permanent plot locations will be selected by stratifying the field and using the grid cell method (overlying each field with a 20 m x 50 m grid) to select sampled plots. Plots that extend past the plantable area are generally rejected. In addition, we exclude locations that are not characteristic of that particular area. In general, a plot should be established every 5-20 acres. The plots serve as areas to collect information on woody, shrub, and herbaceous species (if desired).

Once each specific plot location is randomly selected, its field location will be permanently recorded at the upstream, inland corner of the plot. The position will be recorded with a GPS unit, and, in subsequent monitoring years, will be reestablished in the same position.

#### **(2) Measurements**

At each plot, cover and height measurements of all shrubs and trees inside the 20 m x 50 m plot will be recorded. To assess the survivorship of planted species, we will note their status: alive, dead, or missing (not planted). Because restoration activities often create conditions that favor the survivorship and natural recruitment of native plants, newly recruited native riparian woody species will also be recorded. The estimate of aerial cover of both trees and shrubs will be based on the longest diameter through the

horizontal plane of the plant's drip line, a thin line at which a drop of water would fall from the outward most oriented leaf.

**c) Photo Points**

In addition to quantitative surveys, the restoration contractor will take pre- and post-planting photographs to provide qualitative information on vegetation changes at the restoration site. The photographs will be taken annually at established photo points late in the growing season.

**d) Herbaceous Species Monitoring**

(1) Visual Plots

Native grass (monitored in May) and native forb (monitored in August) cover will be measured from visual estimates of 0.5m square plots randomly selected along a permanent transect. Ocular estimates of cover by native herbaceous understory species, general weeds, weeds of concern, and bare ground/litter will be recorded.

**e) Annual Report**

Annual reports will document the monitoring data, review site activities and recommend future management actions. Reports will also document observations related to natural processes related to flooding (erosion, sedimentation, and debris deposition).

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## **Appendix I**

### **Excerpts from the Sutter County Soil Survey**

LOCATION CONEJO CA

Established Series

Rev. SBJ/DJL/DJE/SBS/DWB

03/2006

### **CONEJO SERIES**

The Conejo series consists of very deep, well drained soils that formed in alluvium from basic igneous or sedimentary rocks. Conejo soils are on alluvial fans and stream terraces. Slopes range from 0 to 9 percent. The mean annual precipitation is about 20 inches, (508 mm) and the mean annual air temperature is about 62 degrees F, (17 degrees C).

**TAXONOMIC CLASS:** Fine-loamy, mixed, superactive, thermic Pachic Haploxerolls

**TYPICAL PEDON:** Conejo clay loam under a cover of milo at an elevation of 135 feet, (41 m). Re-described on 7/20/1993. (Colors are for dry soil unless otherwise noted).

**Ap**--0 to 5 inches, (0 to 13 cm); dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; 31 percent clay, moderate medium and coarse subangular blocky and strong medium granular structure; very hard, friable, moderately sticky and moderately plastic; many fine and medium irregular pores; slightly alkaline, pH 7.5 by Hellige-Truog; abrupt wavy boundary. (3 to 8 inches, (8 to 20 cm) thick)

**A1**--5 to 19 inches, (13 to 48 cm); very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; 31 percent clay, moderate coarse subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; common very fine roots; many very fine and fine tubular and many fine irregular pores; slightly alkaline, pH 7.5 by Hellige-Truog; clear wavy boundary. (10 to 17 inches, (25 to 43 cm) thick)

**A2**--19 to 30 inches, (48 to 76 cm); very dark grayish brown (10YR 3/2) clay loam, very dark grayish brown (10YR 3/2) moist; 31 percent clay, moderate medium subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; common very fine roots; many very fine and few fine tubular pores; few pressure faces; common fine iron-manganese nodules about 1 mm diameter; 1 percent gravel; slightly alkaline, pH 7.5 by Hellige-Truog; gradual wavy boundary. (10 to 15 inches, (25 to 38 cm) thick)

**Bw1**--30 to 48 inches, (76 to 122 cm); dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; 29 percent clay; moderate coarse subangular blocky structure; very hard, friable, moderately sticky and moderately plastic; common very fine roots; many very fine and fine tubular and many fine irregular pores; many pressure faces; few fine iron-manganese nodules about 1 mm diameter; 2 percent gravel; slightly alkaline, pH 7.5 by Hellige-Truog; clear wavy boundary. (13 to 20 inches, (33 to 51 cm) thick)

**Bw2**--48 to 70 inches, (122 to 178 cm); brown (10YR 5/3) loam, dark yellowish brown (10YR 4/4) moist; 19 percent clay, weak fine and medium subangular blocky structure; slightly hard, weakly brittle but friable, nonsticky and slightly plastic; common very fine roots; many very fine and few fine and medium tubular pores; slightly effervescent in seams; common medium oxidized iron masses; 1 percent gravel; moderately alkaline, pH 8.0 by Hellige-Truog.

**TYPE LOCATION:** Butte County, California; about 6 miles south of Chico on west side of Aquas Frias Road; 800 feet south of northeast corner of Section 33, Township 21 N., Range 1 E., 39 degrees, 38 minutes, 10 seconds North latitude; 121 degrees, 51 minutes, 40 seconds West longitude, NAD27 - U.S.G.S. Quad: Chico, California.

**RANGE IN CHARACTERISTICS:** Depth is greater than 80 inches, (203 cm). The mean annual soil temperature is 59 to 66 degrees F, (15 to 19 degrees C). The soil moisture control section is dry in all parts from about May through October (about 140 to 160 days). The particle-size control section has about 20 to 35 percent clay and some gravel is present.

Some pedons have fine sandy loam or loam overwash less than 20 inches (51cm) thick. These pedons have clay loam or loam Ab and upper Bw horizons, have 0 to 5 percent gravel and average 18 to 35 percent clay in the particle-size control section. The extent of this overwash phase is 600 to 700 acres and is the result of hydraulic mine deposits splaying out of the early levees on Butte Creek, north of Durham.

The Ap and A horizons have dry colors of 10YR 3/2, 4/1, 4/2, 4/3, 4/4, 5/2 or 5/3. Moist color is 10YR 3/1, 3/2, 2/2, 3/3, 4/2 or 7.5YR 3/2. In some pedons, it has weak to strong granular structure; in others, all or part has moderate to strong subangular blocky structure. Texture is clay loam. Clay content ranges from 27 to 35 percent. Organic matter ranges from 1.5 to 6 percent. Rock fragments range from 0 to 2 percent gravel. Reaction ranges from slightly acid to slightly alkaline.

The upper Bw horizon has dry colors of 10YR 4/2, 4/3, 4/4, 5/2, 5/3, 5/4, 6/2, 6/3, 6/4, 7/3, 7.5YR 4/2, 4/4, 5/4 or 6/4. Moist color is 10YR 2/2, 3/2, 3/3, 3/4, 4/2, 4/3, 4/4, 5/2, 7.5YR 3/2, 3/4, 4/2 or 4/4. Texture is loam or clay loam. Clay content ranges from 27 to 35 percent. Rock fragments range from 0 to 2 percent gravel. Reaction ranges from slightly acid to slightly alkaline.

The lower Bw horizon has dry colors of 10YR 3/4, 4/2, 4/3, 4/4, 5/3, 5/4, 6/2, 6/3, 6/4, 7.5YR 4/2, 4/4, 5/2 or 5/4. Moist color is 10YR 4/2, 4/3, 4/4, 5/3 or 5/4. Texture is sandy loam, fine sandy loam, loam or clay loam. Clay content ranges from 15 to 35 percent. Rock fragments range from 0 to 2 percent gravel. Reaction ranges from neutral to moderately alkaline, but some pedons are slightly acid. Segregated or secondary lime is in some pedons at depths greater than 48 inches, (76 cm). Some pedons have redoximorphic features within 40 inches, (102 cm) of the surface, a few pedons have redoximorphic features within 30 inches, (76 cm) of the surface. Some pedons have siltstone at depths of 40 to 60 inches, (102 to 152 cm).

**COMPETING SERIES:** These are the [Agueda](#), [Almendra](#), [Anaheim](#), [Carranza](#), [Gazos](#), [Reward](#), [Salinas](#) and [Westfan](#) series. Agueda soils are calcareous throughout. Almendra soils

have 18 to 27 percent clay in the particle-size control section. Anaheim soils are moderately deep to a paralithic contact. Gazos soils have a lithic contact within 40 inches, (102 cm) of the surface. Carranza soils have extremely gravelly sandy clay loam C horizons within a depth of 40 inches, (102 cm). Reward soils are effervescent and have a lithic contact at 40 to 60 inches, (102 to 152 cm). Salinas soils have secondary carbonate accumulations in the C horizons. Westfan soils have Btk and Ck horizons that are strongly effervescent and have disseminated carbonates or concretions, have solum thickness of 25 to 60 inches, (64 to 152 cm), and have a water table between 36 to 60 inches, (91 to 152 cm) from November through April.

**GEOGRAPHIC SETTING:** Conejo soils are on alluvial fans and stream terraces at elevations of 30 to 2,000 feet, (9 to 610 m). Slopes range from 0 to 9 percent. The soil formed in alluvium from basic igneous and sedimentary rocks. The climate has hot dry summers and cool moist winters. Mean annual precipitation is 14 to 26 inches, (356 to 660 mm). Mean annual temperature is about 59 to 64 degrees F, (15 to 18 degrees C), average January temperature varies from 45 to 50 degrees F, (7 to 10 degrees C), and average July temperature varies from 70 to 80 degrees F, (21 to 26 degrees C). Frost free period is about 260 to 330 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the [Cibo](#), [Clear Lake](#) and [Trimmer](#) soils. Cibo and Trimmer soils occur on upland areas and have lithic and paralithic contacts respectively. Clear Lake soils are of clay texture and occupy basins.

**DRAINAGE AND PERMEABILITY:** Well drained; slow to medium runoff, moderately slow saturated hydraulic conductivity in the A and upper Bw horizons and moderately slow to moderately rapid in the lower Bw horizon. Some areas are subject to occasional flooding.

**USE AND VEGETATION:** Used for irrigated row crops, orchard, hay and pasture and grain. Vegetation is annual grasses and forbs with few scattered oaks.

**DISTRIBUTION AND EXTENT:** Valley areas in northern and central California and the Coast Range of California. The soils are of small extent

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Siskiyou County (Shasta Valley Area, California 1919).

**REMARKS:** The Conejo series was established in Siskiyou County in 1919. The type location was moved to Butte County some time prior to 1989. It is mapped in multiple MLRA's in Butte, Contra Costa, Los Angeles, San Benito, Santa Cruz, Solano, Sutter and Yuba Counties.

The official description from Butte County was written prior to modern soil survey mapping and does not adequately represent conditions in Butte County. The type location was revisited on 7/93 and the description revised. The range of characteristics has been left as is. The use of Conejo in other areas should be reviewed during MLRA updates. In Butte County, to reflect actual conditions, the range of characteristics in the taxonomic unit description is narrowed down. (Average clay in the particle-size control section is 27 to 35 percent).

Additional Data: Clay determined by particle-size analysis at local survey office.

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## National Cooperative Soil Survey U.S.A.

LOCATION HOLILLIPAH CA

Established Series

Rev:DJL/WBS/TDC/DJE

8/98

### HOLILLIPAH SERIES

The Holillipah series consists of stratified very deep, somewhat excessively drained soils that formed in alluvium from mixed sources. Holillipah soils are on flood plains and alluvial fans and have slopes of 0 to 2 percent. The mean annual precipitation is 18 inches and the mean annual temperature is 62 degrees F.

**TAXONOMIC CLASS:** Sandy, mixed, thermic Typic Xerofluvents

**TYPICAL PEDON:** Holillipah loamy sand - on a level flood plain of about 2 percent slope under annual grasses at 50 feet elevation. (Colors are for dry soil unless otherwise stated. When described on June 1, 1978, the soil was dry to 35 inches and slightly moist below.)

**A--**0 to 8 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak coarse granular structure; soft, loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine interstitial pores; slightly acid (pH 6.5); clear smooth boundary. (5 to 10 inches thick)

**C1--**8 to 32 inches; white (10YR 8/1) sand, light gray (10YR 7/1) moist; massive; loose, nonsticky and nonplastic; many very fine and fine and common medium roots; many very fine and fine interstitial pores; neutral (pH 7.0); abrupt wavy boundary. (20 to 40 inches thick)

**C2--**32 to 35 inches; light yellowish brown (10YR 6/4) loamy sand, dark yellowish brown (10YR 4/4) moist; common medium distinct strong brown (7.5YR 4/6) mottles; massive; soft, very friable, nonsticky and nonplastic; common very fine tubular pores; neutral (pH 7.0); abrupt wavy boundary. (3 to 20 inches thick)

**C3--**35 to 47 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; many medium distinct brown (7.5YR 5/4) mottles; massive; slightly hard, friable, nonsticky and nonplastic; common very fine tubular pores; neutral (pH 7.0); gradual irregular boundary. (0 to 15 inches thick)

**C4--**47 to 61 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine tubular pores; neutral (pH 7.0).

**TYPE LOCATION:** Sutter County, California; approximately 5.6 miles south of Yuba City on Garden Highway then east 0.56 miles to about 400 feet from Feather River; 2,100 feet north and 3,000 feet east of the intersection of O'Banion Road and Garden Highway in the New Helvetia land grant, T. 14 N., R. 3 E. Olivehurst Quadrangle.

**RANGE IN CHARACTERISTICS:** The mean annual soil temperature is 60 degrees to 65 degrees F. The soil temperature is above 47 degrees F the entire year. The soil between depths of 14 and 43 inches is dry in all parts from May through October, and is moist in some or all parts from November through April unless irrigated. The difference between average July and average January soil temperature is 30 degrees to 33 degrees F. The soil is stratified with thick layers of sand, loamy fine sand or loamy sand and thin layers of fine sandy loam, sandy loam and silt loam. The particle-size control section averages loamy sand or coarser. Strata of sandy loam, fine sandy loam or silt loam 1/2 1 cm thick occur above 40 inches in depth. Organic carbon content decreases irregularly with depth. It is slightly acid to neutral.

The A horizon has dry color of IOYR 6/4, 6/3, or 6/2 and moist color of IOYR 4/4, 4/3, 4/2, or 3/3. It is sandy loam or loamy sand.

The C horizon has dry color of IOYR 8/1, 7/1, 7/2, 7/3, 7/4, 6/3, 6/4 or 5/3 and moist color of IOYR 7/1, 7/2, 6/2, 5/2, 5/3, 5/4, 4/2, 4/3, 4/4 or 3/3. Mottles may be relic from initial deposition and are associated with the finer textured stratified layers and not indicative of an intermittent high water table. Gravel content ranges from 0 to 5 percent.

**COMPETING SERIES:** These are the [Metz](#) series. Metz soils are neutral to moderately alkaline, are calcareous below the A horizon, and have a difference between mean summer and mean winter soil temperature of about 20 degrees F.

**GEOGRAPHIC SETTING:** Holillipah soils are on alluvial fans and flood plains. Slopes are 0 to 2 percent. The soils formed in stratified alluvium from mixed sources. Elevations are 20 to 150 feet. The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation is 17 to 22 inches. January temperature is 45 degrees F., mean July temperature is 77 degrees F., and mean annual temperature varies from 60 degrees to 64 degrees F. Frost-free season is 260 to 280 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the [Columbia](#) and [Shanghai](#) soils. Columbia and Shanghai soils are on similar flood plain positions, but usually are slightly lower in the landscape.

**DRAINAGE AND PERMEABILITY:** Somewhat excessively drained; very slow runoff; moderately rapid permeability. The soils are flooded unless protected by levees.

**USE AND VEGETATION:** This soil is used for irrigated orchards and row crops. In some areas next to rivers, the natural vegetation is valley oak, cottonwood and shrubs.

**DISTRIBUTION AND EXTENT:** Southeastern part of the Sacramento Valley. Soils are not extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Sutter County, California 1984. Series name is from a tribe of native Americans in the area who have now vanished.

OSD scanned by SSQA. Last revised by state on 2/87.

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**National Cooperative Soil Survey  
U.S.A.**

LOCATION SHANGHAI CA  
Established Series  
Rev. ENV/DJL/TDC/CEJ/ET  
03/2003

**SHANGHAI SERIES**

The Shanghai series consists of very deep, somewhat poorly drained soils that formed in alluvium from mixed sources. Shanghai soils are on flood plains and have slopes of 0 to 2 percent. The annual temperature is about 62 degrees F. and the annual precipitation is about 18 inches.

**TAXONOMIC CLASS:** Fine-silty, mixed, superactive, nonacid, thermic Aquic Xerofluvents

**TYPICAL PEDON:** Shanghai silt loam - on a nearly level slope of less than 1 percent in an irrigated prune orchard at 30 feet elevation. (Colors are for dry soil unless otherwise stated. When described on April 9, 1979, the soil was moist throughout.)

**Ap--0** to 11 inches; very pale brown (10YR 7/4) silt loam, brown (10YR 4/3) moist; common medium distinct yellowish brown (10YR 5/6) mottles, yellowish brown (10YR 5/8) moist; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; common very fine tubular pores; neutral (pH 7.0); clear smooth boundary. (7 to 14 inches thick)

**A--11** to 21 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 4/3) moist; common large distinct strong brown (7.5YR 5/6) mottles, dark yellowish brown (10YR 4/6) moist; massive; slightly hard, friable, slightly sticky and plastic; common very fine roots; common very fine tubular pores; neutral (pH 7.0); gradual wavy boundary. (3 to 10 inches thick)

**C1--21** to 27 inches; pale brown (10YR 6/3) silt loam, yellowish brown (10YR 5/4) moist; many medium prominent yellowish brown (10YR 5/8) and many large prominent strong brown (7.5YR 4/6) mottles, dark yellowish brown (10YR 3/6) and dark reddish brown (2.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine tubular pores; neutral (pH 7.0); gradual wavy boundary. (6 to 18 inches thick)

**C2**--27 to 36 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; many medium prominent yellowish brown (10YR 5/8) and many large prominent strong brown (7.5YR 4/6) mottles, dark yellowish brown (10YR 3/6) and dark reddish brown (2.5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; very fine tubular pores; neutral (pH 7.0); gradual wavy boundary. (9 to 16 inches thick)

**C3**--36 to 54 inches; very pale brown (10YR 7/3) silt loam, dark yellowish brown (10YR 4/4) moist; common medium distinct strong brown (7.5YR 5/8) mottles, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; neutral (pH 7.0); gradual wavy boundary. (8 to 18 inches thick)

**C4**--54 to 62 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 3/3) moist; many medium distinct yellowish red (5YR 5/8) mottles; massive; soft, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; neutral (pH 7.0).

**TYPE LOCATION:** Sutter County, California; approximately 1.2 miles north of Yuba City on Live Oak Highway, then east on Rednall Road to levee; 2,000 feet north and 900 feet east of the intersection of Rednall Road and the western levee of the Feather River, approximately 800 feet from river, in the New Helvetia land grant T.15 N., R.3 E. Yuba City Quadrangle.

**RANGE IN CHARACTERISTICS:** The mean annual soil temperature is 60 degrees to 65 degrees F. The soil temperature is above 47 degrees F. the entire year. The soil between depths of 6 and 18 inches is dry in all parts from June through October and is moist in some or all parts from November through May unless irrigated. The difference between average July and average January soil temperature is 30 degrees to 33 degrees F.

The 10 to 40 inches control section is stratified layers of silt loam to fine sandy loam and silty clay loam, but is dominantly silt loam with less than 15 percent coarser than very fine sand. Clay content ranges from 20 to 35 percent. Content of organic matter decreases irregularly with depth. Reaction is slightly acid to moderately alkaline.

The A horizon has dry color of 10YR 7/4, 7/3, 6/4, 6/3, 5/4; 2.5Y 6/2 or 7/2 and moist color of 10YR 4/4, 4/3; 2.5Y 4/2, 3/2 or 3/3 with mottled colors dry and moist of 10YR 4/6, 5/6, 5/8; 7.5YR 5/6, 7/6 and 5YR 6/8. It is silty clay loam, silt loam or fine sandy loam.

The C horizon has dry colors of 10YR 8/4, 7/4, 6/4, 8/3, 7/3, 6/3; 2.5Y 6/2 or 7/2 and moist color of 10YR 6/6, 6/4, 6/3, 5/6, 5/3, 3/3, 5/4, 4/4; 2.5Y 5/2, 4/2, or 5Y 6/3 with prominent or distinct mottles. Some pedons have a clay layer at 40 to 60 inches.

**COMPETING SERIES:** There are no other series in this family.

**GEOGRAPHIC SETTING:** Shanghai soils are on flood plains with slopes of 0 to 2 percent. They formed in alluvium from mixed sources. Elevations are 20 to 150 feet. The climate has hot dry summers and cool moist winters. Mean annual precipitation is 14 to 22 inches. Average January temperature is about 45 degrees F., the average July temperature is about 77 degrees F.,

and the mean annual temperature is 60 degrees to 64 degrees F. The frost-free season is about 260 to 290 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the [Columbia](#) and [Holillipah](#) soils. Columbia soils are on similar flood plain positions. Holillipah soils are on similar but slightly higher flood plain positions in areas adjacent to rivers.

**DRAINAGE AND PERMEABILITY:** Somewhat poorly drained; runoff is very slow; permeability is moderate, but may be slow below 40 inches. Unless protected, these soils are subject to flooding. Unless drained, in low lying areas and areas adjacent to levees, a water table is present at a depth of 30 to 60 inches in December through April and below a depth of 48 inches in May to November. In other areas, the water table is at 36 to 60 inches in December through April.

**USE AND VEGETATION:** This soil is used for irrigated orchards, small grains and row crops.

**DISTRIBUTION AND EXTENT:** Southeastern part of Sacramento Valley. Soils are moderately extensive.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Sutter County, California 1984.

**REMARKS:** The activity class was added to the classification in February of 2003. Competing series were not checked at that time. - ET

Last revised by the state on 2/91.

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## National Cooperative Soil Survey U.S.A.

LOCATION COLUMBIA CA

Established Series

Rev. DJL/CAF/MAV/SBS/DWB

05/2006

### COLUMBIA SERIES

The Columbia series consists of very deep, moderately well drained soils formed in alluvium from mixed sources. These soils are on flood plains and natural levees and have slopes of 0 to 8 percent. The mean annual precipitation is 12 to 25 inches, (305 to 635 mm) and the mean annual temperature is about 61 degrees F, (16 degrees C).

**TAXONOMIC CLASS:** Coarse-loamy, mixed, superactive, nonacid, thermic Oxyaquic Xerofluvents

**TYPICAL PEDON:** Columbia fine sandy loam, on a nearly level plowed field. (Colors are for dry soil unless otherwise stated.)

**Ap**--0 to 11 inches, (0 to 28 cm); pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; few very fine tubular and many very fine interstitial pores; slightly acid (pH 6.4); clear smooth boundary. (7 to 12 inches, (18 to 31 cm) thick)

**A**--11 to 16 inches, (28 to 41 cm); pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; common very fine tubular pores, slightly acid (pH 6.4); clear wavy boundary. (4 to 8 inches, (10 to 20 cm) thick)

**C1**--16 to 23 inches, (41 to 58 cm): pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulations, strong brown (7.5YR 5/6) moist; slightly acid (pH 6.5); clear wavy boundary. (4 to 8 inches, (10 to 20 cm) thick)

**C2**--23 to 26 inches, (58 to 66 cm); pale brown (10YR 6/3) sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; many very fine roots; many very fine interstitial pores; slightly acid (pH 6.5); clear smooth boundary. (0 to 5 inches, (0 to 13 cm) thick)

**C3**--26 to 31 inches, (66 to 79 cm); very pale brown (10YR 7/3) and reddish yellow (7.5YR 6/6) fine sandy loam; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; common fine prominent yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) masses of iron accumulations moist; neutral (pH 7.0); clear smooth boundary. (2 to 8 inches, (5 to 20 cm) thick)

**C4**--31 to 34 inches, (79 to 86 cm); very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; very few very fine roots; many very fine and fine tubular pores; many medium distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/6) masses of iron accumulations moist; slightly alkaline (pH 7.5); clear smooth boundary. (0 to 5 inches, (0 to 13 cm) thick)

**C5**--34 to 38 inches, (86 to 97 cm); very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; very few very fine roots; many fine tubular and common very fine interstitial pores; many medium distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/6) masses of iron accumulation; slightly alkaline (pH 7.7); clear smooth boundary. (2 to 10 inches, (5 to 25 cm) thick)

**C6**--38 to 41 inches, (97 to 104 cm); pale brown (10YR 6/3) sand, dark brown (10YR 3/3) moist; single grained; loose, nonsticky and nonplastic; common very fine roots; common very fine tubular and many very fine interstitial pores; neutral (pH 7.0); abrupt smooth boundary. (1 to 5 inches, (2.5 to 13 cm) thick)

**C7**--41 to 55 inches, (104 to 140 cm); pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; many very fine, medium and coarse tubular pores; many medium distinct reddish yellow (7.5YR 6/6) and strong brown (7.5YR 5/6) masses of iron accumulation moist; moderately alkaline (pH 8.0); clear smooth boundary. (0 to 15 inches, (0 to 38 cm) thick)

**Ab**--55 to 59 inches, (140 to 150 cm); gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; massive; hard, friable, sticky and slightly plastic; very few very fine roots; many very fine, fine and medium tubular pores; common fine distinct strong brown (7.5YR 5/6), dark brown (7.5YR 3/2) masses of iron accumulation moist; moderately alkaline (pH 8.0).

**TYPE LOCATION:** Solano County, California; 400 feet south of the south end of the bridge at the north end of Ryer Island. Not sectionalized, T.5 N., R.3 E.

**RANGE IN CHARACTERISTICS:** The mean annual soil temperature is 60 to 65 degrees F, (16 to 18 degrees C). The soil between depths of 8 and 25 inches, (20 to 64 cm) is moist in some or all parts from late October to late May or June and is dry in all parts the remainder of the year, unless irrigated. The 10 to 40 inches, (25 to 102 cm) particle-size control section is stratified fine sandy loam, very fine sandy loam, silt loam, loam, loamy sand, loamy fine sand, fine sand or sand and averages 10 to 18 percent clay, when mixed, and has greater than 15 percent fine sand or coarser. Up to 35 percent gravel may occur below a depth of 40 inches, (102 cm). Redoximorphic features occur between 10 and 48 inches, (25 to 122 cm). Content of organic matter decreases irregularly with depth.

The A horizon is 10YR 7/2, 6/4, 6/3, 6/2, 5/4, 5/3 or 5/2 and moist color of 10YR 5/4, 4/4, 4/3 or 4/2. Texture is sandy loam, sand, loamy sand, loamy fine sand, fine sandy loam, loam or silt loam and commonly is stratified. Reaction is slightly acid to slightly alkaline.

The C horizon is 10YR 8/4, 8/1, 7/4, 7/3, 7/2, 7/1, 6/4, 6/3, 6/2 6/1, 5/4 or 5/3 and moist color of 10YR 7/4, 7/3, 7/2, 6/2, 6/4, 5/4, 5/3, 5/2, 4/4, 4/3, 4/2, 4/1, 3/3, or 3/4. Redoximorphic features have hues of 10YR, 7.5YR, 5YR or 2.5YR with chroma of 3, 4 or 6. Texture is stratified sand to silty clay loam. Finer textures occur below 40 inches, (102 cm). Reaction is slightly acid to slightly alkaline but may be moderately alkaline in horizons underlain by an Ab horizon.

The Ab horizon is 10YR 6/1, 5/1, 4/1, 4/2, 3/1 or 2/1; 2.5Y 6/2. Moist colors are 10YR 5/1, 4/1, 3/1, 2/1; N 2/0; 2.5Y 3/2. Texture is mucky clay loam, clay loam, silty clay loam, silty clay or clay. Depth to a buried horizon ranges from 40 to 60 inches, (102 to 152 cm). Some pedons lack a buried horizon and some pedons are calcareous at 40 inches, (102 cm) or more. Reaction is neutral to moderately alkaline.

**COMPETING SERIES:** There are no other series in this family.

**GEOGRAPHIC SETTING:** Columbia soils are on flood plains with bar and channel topography in some natural areas or are on natural levees. These soils formed in alluvium from mixed sources. Elevations are 10 feet below sea level to 155 feet above sea level (47 m). The climate is subhumid with hot dry summers and cool moist winters. Mean annual precipitation is

12 to 25 inches, (304 to 635 mm). Mean January temperature is 45 degrees F, (7 degrees C), mean July temperature is 80 degrees F, (27 degrees C). Mean annual temperature varies from 58 to 63 degrees F, (14 to 17 degrees C). Frost-free period is 230 to 340 days.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the [Arvin](#), [Clear Lake](#), [Sacramento](#), [Shanghai](#) and [Sycamore](#) soils. Arvin soils are not saturated with water within 60 inches, (152 cm) of the surface and are in similar or slightly higher flood plain positions. Clear Lake and Sacramento soils have clay textures and are in basins. Sycamore soils have less than 15 percent fine or coarser sand and are in similar flood plain positions.

**DRAINAGE AND PERMEABILITY:** Moderately well drained; negligible to medium runoff; moderately rapid permeability. Clay substratum phase has slow permeability below a depth of 40 inches, (102 cm). Sandy substratum phase has rapid permeability below a depth of 40 inches, (102 cm). Except where drained, these soils are saturated at 20 to 48 inches, (51 to 122 cm) for several months in the period from November to April. In areas not protected by levees or other flood control structures these soils are subject to occasional to frequent, brief to long periods of flooding in November to May. Rare flooding occurs in partly protected areas.

**USE AND VEGETATION:** These soils are used for irrigated hay, small grain, and orchard and row crops. Vegetation consists of a fairly dense cover of oaks, cottonwoods, willows, vines, shrubs and grasses near stream channels, but more open away from the channels.

**DISTRIBUTION AND EXTENT:** These soils occur in the central valley of California. The soils are moderately extensive in MLRA-16, 17.

**MLRA OFFICE RESPONSIBLE:** Davis, California

**SERIES ESTABLISHED:** Reconnaissance Survey of Southwest Washington 1911.

**REMARKS:** The series was redefined in the Chico area of Butte County, California in 1925. The type location was moved to Madera County, California 1959. The type location was then moved to Solano County, California 1970.

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface to a depth of 16 inches, (41 cm) (Ap, A)

Oxyaquic subgroup - the zone from 20 to 48 inches, (51 to 122 cm) is saturated for several months.

CEC/Clay ratio estimated from similar soils with laboratory data in the W. Stanislaus Soil Survey Area and University Laboratory data.

Edit log: Runoff terminology adjusted 4/96 to adjective criteria of the Soil Survey Manual (10/93). 5/2003 Proposed edits for use in Butte County; Range in Characteristics: expand allowed gravel from 5 to 35 percent below a depth of 40 inches. A horizon: add textures sand,

loamy sand, loamy fine sand, and add: commonly is stratified. C horizon: add colors moist 10YR 6/2 and 3/4. Geographic setting: expand elevation from 150 to 155 feet. In remarks added history of type location moves.

**ADDITIONAL DATA:** NO: 50-CAL-20-39-1-1 to 3 University of California, Madera County, Tehama County, and UC Berkley, 58-52-48.

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**National Cooperative Soil Survey  
U.S.A.**

**Appendix II  
Vegetation Association Tiles**

**Mixed Riparian Forest**

**Total area: 15.5**

Common name	Code	Scientific name	Species comp. (%)	Density (plant/acre)	Estimated Number
Arroyo willow	AW	<i>Salix lasiolepis Benth.</i>	6.0	6.6	102
Box elder	BE	<i>Acer negundo L.</i>	4.0	4.4	68
Buttonbush	BU	<i>Cephalanthus occidentalis</i>	4.0	4.4	68
California blackberry	BB	<i>Rubus ursinus Chain. &amp; Schldl.</i>	24.0	26.4	409
Coyote bush	CB	<i>Baccharis pilularis DC.</i>	2.0	2.2	34
Elderberry	EB	<i>Sambucus mexicana</i>	4.0	4.4	68
Fremont cottonwood	CO	<i>Populus fremontii S. Watson ssp. fremontii</i>	4.0	4.4	68
Gooding's black willow	BW	<i>Salix goodingii C.R. Ball</i>	2.0	2.2	34
Mule fat	MF	<i>Baccharis salicifolia</i>	4.0	4.4	68
Oregon ash	AS	<i>Fraxinus latifolia Benth</i>	6.0	6.6	102
Sandbar (narrow-leaf) willow	SW	<i>Salix exigua Nutt.</i>	2.0	2.2	34
Valley oak	OK	<i>Quercus lobata Nee</i>	10.0	11.0	171
Western sycamore	SY	<i>Platanus racemosa Nutt.</i>	10.0	11.0	171
Wild rose	RO	<i>Rosa californica Cham. &amp; Schldl.</i>	18.0	19.8	307
<b>TOTAL</b>			<b>100.0</b>	<b>110.0</b>	<b>1,705</b>

**MRF**

Plant#row	1	2	3	4	5
1	OK	CO	RO	AS	BW
2	CO	SY	BB	BB	AS
3	SW	RO	BU	MF	BB
4	BB	BB	RO	RO	BB
5	SY	EB	RO	AW	OK
6	EB	RO	OK	BE	RO
7	BB	BB	RO	BE	RO
8	CB	BB	BU	AW	OK
9	AW	SY	BB	MF	BB
10	SY	OK	BB	AS	SY

**Riparian Scrub Shrub (Elderberry)**

**Total area: 20.0**

Common name	Code	Scientific name	Species comp. (%)	Density (plant/acre)	Estimated Number
Arroyo willow	AW	<i>Salix lasiolepis</i> Benth.	5.4	10.9	217
Buttonbush	BU	<i>Cephalanthus occidentalis</i>	5.5	11.1	222
California blackberry	BB	<i>Rubus ursinus</i> Chain. & Schidl.	7.8	15.8	316
Coyote brush	CB	<i>Baccharis pilularis</i> DC.	13.0	26.2	524
Elderberry	EB	<i>Sambucus mexicana</i>	36.5	73.8	1,475
Mule fat	MF	<i>Baccharis salicifolia</i>	8.9	17.9	358
Sandbar (narrow-leaf) willow	SW	<i>Salix exigua</i> Nutt.	3.4	6.9	137
Wild rose	RO	<i>Rosa californica</i> Cham. & Schidl.	19.6	39.6	791
<b>TOTAL</b>			<b>100.0</b>	<b>202.2</b>	<b>4,040</b>

**RSE**

Plant#\row	1	2	3	4	5
1	EB	EB	RO	EB	EB
2	EB	EB	SW	EB	EB
3	CB	CB	MF	BB	BB
4	BB	EB	EB	EB	BB
5	EB	EB	BU	EB	EB
6	EB	AW	EB	BB	AW
7	RO	RO	EB	EB	MF
8	RO	CB	EB	RO	RO
9	EB	EB	BB	EB	EB
10	EB	EB	RO	EB	EB

**RSE Buffer**

Plant#\row	1	2	3	4	5
1	BU	CB	RO	CB	AW
2	BU	CB	SW	CB	MF
3	CB	CB	MF	RO	RO
4	CB	RO	MF	CB	RO
5	MF	MF	BU	MF	MF
6	CB	AW	RO	RO	AW
7	RO	RO	RO	AW	MF
8	RO	CB	CB	RO	RO
9	BU	SW	MF	BU	CB
10	RO	SW	RO	BU	CB

**Riparian Scrub Shrub (Blackberry)**

**Total area: 15.9**

Common name	Code	Scientific name	Species comp. (%)	Density (plant/acre)	Estimated Number
Arroyo willow	AW	<i>Salix lasiolepis</i> Benth.	14.0	33.9	539
Buttonbush	BU	<i>Cephalanthus occidentalis</i>	12.0	29.0	462
California blackberry	BB	<i>Rubus ursinus</i> Chain. & Schldl.	24.0	58.1	923
Coyote bush	CB	<i>Baccharis pilularis</i> DC.	4.0	9.7	154
Elderberry	EB	<i>Sambucus mexicana</i>	14.0	33.9	539
Mule fat	MF	<i>Baccharis salicifolia</i>	4.0	9.7	154
Sandbar (narrow-leaf) willow	SW	<i>Salix exigua</i> Nutt.	4.0	9.7	154
Wild rose	RO	<i>Rosa californica</i> Cham. & Schldl.	24.0	58.1	923
<b>TOTAL</b>			<b>100.0</b>	<b>242.0</b>	<b>3,847</b>

**RSB**

Plant# \ row	1	2	3	4	5
1	BB	BB	RO	RO	RO
2	BB	BB	RO	RO	RO
3	BB	BB	CB	RO	RO
4	RO	BU	CB	EB	EB
5	RO	BU	AW	AW	BU
6	BU	AW	AW	AW	BU
7	BB	MF	SW	BB	BB
8	BB	BU	MF	BB	BB
9	AW	RO	EB	EB	AW
10	EB	RO	EB	SW	EB

**Riparian Scrub Shrub (Blackberry) Closed**  
**Total area: 2.0**

Common name	Code	Scientific name	Species comp. (%)	Density (plant/acre)	Estimated Number
California blackberry	BB	<i>Rubus ursinus</i> Chain. & Schidl.	50.0	871.2	1,742
Wild rose	RO	<i>Rosa californica</i> Cham. & Schidl.	50.0	871.2	1,742
<b>TOTAL</b>			<b>100.0</b>	<b>1,742.4</b>	<b>3,484</b>

**RSB Closed**

Plant#\row	1	2	3	4	5
1	BB	RO	BB	RO	BB
2	RO	BB	RO	BB	RO
3	BB	RO	BB	RO	BB
4	RO	BB	RO	BB	RO
5	BB	RO	BB	RO	BB
6	RO	BB	RO	BB	RO
7	BB	RO	BB	RO	BB
8	RO	BB	RO	BB	RO
9	BB	RO	BB	RO	BB
10	RO	BB	RO	BB	RO

**Appendix III**  
**1999 U.S. Fish and Wildlife Service Elderberry Conservation Guidelines**

**United States Department of the Interior**  
**Fish and Wildlife Service**  
Sacramento Fish and Wildlife Office  
2800 Cottage Way, Room W-2605  
Sacramento, California 95825

**Conservation Guidelines for the Valley Elderberry Longhorn Beetle**

Revised July 9, 1999

The following guidelines have been issued by the U.S. Fish and Wildlife Service (Service) to assist Federal agencies and non-federal project applicants needing incidental take authorization through a section 7 consultation or a section 10(a)(1)(B) permit in developing measures to avoid and minimize adverse effects on the valley elderberry longhorn beetle. The Service will revise these guidelines as needed in the future. The most recently issued version of these guidelines should be used in developing all projects and habitat restoration plans. The survey and monitoring procedures described below are designed to avoid any adverse effects to the valley elderberry longhorn beetle. Thus a recovery permit is not needed to survey for the beetle or its habitat or to monitor conservation areas. If you are interested in a recovery permit for research purposes please call the Service's Regional Office at (503) 231-2063.

**Background Information**

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), was listed as a threatened species on August 8, 1980 (Federal Register 45: 52803-52807). This animal is fully protected under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The valley elderberry longhorn beetle (beetle) is completely dependent on its host plant, elderberry (*Sambucus* species), which is a common component of the remaining riparian forests and adjacent upland habitats of California's Central Valley. Use of the elderberry by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the elderberry's use by the beetle is an exit hole created by the larva just prior to the pupal stage. The life cycle takes one or two years to complete. The animal spends most of its life in the larval stage, living within the stems of an elderberry plant. Adult emergence is from late March through June, about the same time the elderberry produces flowers. The adult stage is short-lived. Further information on the life history, ecology, behavior, and distribution of the beetle can be found in a report by Barr (1991) and the recovery plan for the beetle (USFWS 1984).

**Surveys**

Proposed project sites within the range of the valley elderberry longhorn beetle should be surveyed for the presence of the beetle and its elderberry host plant by a qualified biologist. The beetle's range extends throughout California's Central Valley and associated foothills from about the 3,000-foot elevation contour on the east and the watershed of the Central Valley on the west (Figure 1). All or portions of 31 counties are included: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Madera, Mariposa, Merced, Napa, Nevada, Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba.

If elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level occur on or adjacent to the proposed project site, or are otherwise located where they may be directly or indirectly affected by the proposed action, minimization measures which include planting replacement habitat (conservation planting) are required (Table 1).

All elderberry shrubs with one or more stems measuring 1.0 inch or greater in diameter at ground level that occur on or adjacent to a proposed project site must be thoroughly searched

for beetle exit holes (external evidence of beetle presence). In addition, all elderberry stems one inch or greater in diameter at ground level must be tallied by diameter size class (Table 1). As outlined in Table 1, the numbers of elderberry seedlings/cuttings and associated riparian native trees/shrubs to be planted as replacement habitat are determined by stem size class of affected elderberry shrubs, presence or absence of exit holes, and whether a proposed project lies in a riparian or non-riparian area.

Elderberry plants with no stems measuring 1.0 inch or greater in diameter at ground level are unlikely to be habitat for the beetle because of their small size and/or immaturity. Therefore, no minimization measures are required for removal of elderberry plants with no stems measuring 1.0 inch or greater in diameter at ground level with no exit holes. Surveys are valid for a period of two years.

### Avoid and Protect Habitat Whenever Possible

Project sites that do not contain beetle habitat are preferred. If suitable habitat for the beetle occurs on the project site, or within close proximity where beetles will be affected by the project, these areas must be designated as avoidance areas and must be protected from disturbance during the construction and operation of the project. When possible, projects should be designed such that avoidance areas are connected with adjacent habitat to prevent fragmentation and isolation of beetle populations. Any beetle habitat that cannot be avoided as described below should be considered impacted and appropriate minimization measures should be proposed as described below.

### Avoidance: Establishment and Maintenance of a Buffer Zone

Complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level. Firebreaks may not be included in the buffer zone. In buffer areas construction-related disturbance should be minimized, and any damaged area should be promptly restored following construction. The Service must be consulted before any disturbances within the buffer area are considered. In addition, the Service must be provided with a map identifying the avoidance area and written details describing avoidance measures.

### Protective Measures

1. Fence and flag all areas to be avoided during construction activities. In areas where encroachment on the 100-foot buffer has been approved by the Service, provide a minimum setback of at least 20 feet from the dripline of each elderberry plant.
2. Brief contractors on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements.
3. Erect signs every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.
4. Instruct work crews about the status of the beetle and the need to protect its elderberry host plant.

### Restoration and Maintenance

Restore any damage done to the buffer area (area within 100 feet of elderberry

plants) during construction. Provide erosion control and re-vegetate with appropriate native plants.

Buffer areas must continue to be protected after construction from adverse effects of the project. Measures such as fencing, signs, weeding, and trash removal are usually appropriate.

No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant should be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level.

The applicant must provide a written description of how the buffer areas are to be restored, protected, and maintained after construction is completed.

Mowing of grasses/ground cover may occur from July through April to reduce fire hazard. No mowing should occur within five (5) feet of elderberry plant stems. Mowing must be done in a manner that avoids damaging plants (e.g., stripping away bark through careless use of mowing/trimming equipment).

### Transplant Elderberry Plants That Cannot Be Avoided

Elderberry plants must be transplanted if they can not be avoided by the proposed project. All elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level must be transplanted to a conservation area (see below). At the Service's discretion, a plant that is unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible the minimization ratios in Table 1 may be increased to offset the additional habitat loss.

Trimming of elderberry plants (e.g., pruning along roadways, bike paths, or trails) with one or more stems 1.0 inch or greater in diameter at ground level, may result in take of beetles. Therefore, trimming is subject to appropriate minimization measures as outlined in Table 1.

1. Monitor. A qualified biologist (monitor) must be on-site for the duration of the transplanting of the elderberry plants to insure that no unauthorized take of the valley elderberry longhorn beetle occurs. If unauthorized take occurs, the monitor must have the authority to stop work until corrective measures have been completed. The monitor must immediately report any unauthorized take of the beetle or its habitat to the Service and to the California Department of Fish and Game.
2. Timing. Transplant elderberry plants when the plants are dormant, approximately November through the first two weeks in February, after they have lost their leaves. Transplanting during the non-growing season will reduce shock to the plant and increase transplantation success.
3. Transplanting Procedure.
  - a. Cut the plant back 3 to 6 feet from the ground or to 50 percent of its height (whichever is taller) by removing branches and stems above this height. The trunk and all stems measuring 1.0 inch or greater in diameter at ground level should be replanted. Any leaves remaining on the plant should be removed.
  - b. Excavate a hole of adequate size to receive the transplant.
  - c. Excavate the plant using a Vemeer spade, backhoe, front end

loader, or other suitable equipment, taking as much of the root ball as possible, and replant immediately at the conservation area. Move the plant only by the root ball. If the plant is to be moved and transplanted off site, secure the root ball with wire and wrap it with burlap. Dampen the burlap with water, as necessary, to keep the root ball wet. Do not let the roots dry out. Care should be taken to ensure that the soil is not dislodged from around the roots of the transplant. If the site receiving the transplant does not have adequate soil moisture, pre-wet the soil a day or two before transplantation.

d. The planting area must be at least 1,800 square feet for each elderberry transplant. The root ball should be planted so that its top is level with the existing ground. Compact the soil sufficiently so that settlement does not occur. As many as five (5) additional elderberry plantings (cuttings or seedlings) and up to five (5) associated native species plantings (see below) may also be planted within the 1,800 square foot area with the transplant. The transplant and each new planting should have its own watering basin measuring at least three (3) feet in diameter. Watering basins should have a continuous berm measuring approximately eight (8) inches wide at the base and six (6) inches high.

e. Saturate the soil with water. Do not use fertilizers or other supplements or paint the tips of stems with pruning substances, as the effects of these compounds on the beetle are unknown.

f. Monitor to ascertain if additional watering is necessary. If the soil is sandy and well-drained, plants may need to be watered weekly or twice monthly. If the soil is clayey and poorly-drained, it may not be necessary to water after the initial saturation. However, most transplants require watering through the first summer. A drip watering system and timer is ideal. However, in situations where this is not possible, a water truck or other apparatus may be used.

### Plant Additional Seedlings or Cuttings

Each elderberry stem measuring 1.0 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted or destroyed) must be replaced, in the conservation area, with elderberry seedlings or cuttings at a ratio ranging from 1:1 to 8:1 (new plantings to affected stems). Minimization ratios are listed and explained in Table 1. Stock of either seedlings or cuttings should be obtained from local sources. Cuttings may be obtained from the plants to be transplanted if the project site is in the vicinity of the conservation area. If the Service determines that the elderberry plants on the proposed project site are unsuitable candidates for transplanting, the Service may allow the applicant to plant seedlings or cuttings at higher than the stated ratios in Table 1 for each elderberry plant that cannot be transplanted.

### Plant Associated Native Species

Studies have found that the beetle is more abundant in dense native plant communities with a mature overstory and a mixed understory. Therefore, a mix of native plants associated with the elderberry plants at the project site or similar sites will be planted at ratios ranging from 1:1 to 2:1 [native tree/plant species to each elderberry seedling or cutting (see Table 1)]. These native plantings must be monitored with the same survival criteria used for the elderberry seedlings (see below). Stock of saplings, cuttings, and seedlings should be obtained from local sources. If the parent stock is obtained from a distance greater than one mile from the conservation area, approval by the Service of the native plant donor sites must be obtained prior to initiation of the revegetation work. Planting or seeding the conservation area with native herbaceous species is encouraged. Establishing native grasses and forbs may discourage unwanted non-native species from becoming established or persisting at the conservation area. Only stock from local sources

should be used.

## Examples

### Example 1

The project will adversely affect beetle habitat on a vacant lot on the land side of a river levee. This levee now separates beetle habitat on the vacant lot from extant Great Valley Mixed Riparian Forest (Holland 1986) adjacent to the river. However, it is clear that the beetle habitat located on the vacant lot was part of a more extensive mixed riparian forest ecosystem extending farther from the river's edge prior to agricultural development and levee construction. Therefore, the beetle habitat on site is considered riparian. A total of two elderberry plants with at least one stem measuring 1.0 inch or greater in diameter at ground level will be affected by the proposed action. The two plants have a total of 15 stems measuring over 1.0 inch. No exit holes were found on either plant. Ten of the stems are between 1.0 and 3.0 inches in diameter and five of the stems are greater than 5.0 inches in diameter. The conservation area is suited for riparian forest habitat. Associated natives adjacent to the conservation area are box elder (*Acer negundo californica*), walnut (*Juglans californica* var. *hindsii*), sycamore (*Platanus racemosa*), cottonwood (*Populus fremontii*), willow (*Salix gooddingii* and *S. laevigata*), white alder (*Alnus rhombifolia*), ash (*Fraxinus latifolia*), button willow (*Cephalanthus occidentalis*), and wild grape (*Vitis californica*).

Minimization (based on ratios in Table 1):

- Transplant the two elderberry plants that will be affected to the conservation area.
- Plant 40 elderberry rooted cuttings (10 affected stems compensated at 2:1 ratio and 5 affected stems compensated at 4:1 ratio, cuttings planted:stems affected)
- Plant 40 associated native species (ratio of associated natives to elderberry plantings is 1:1 in areas with no exit holes):

5 saplings each of box elder, sycamore, and cottonwood

5 willow seedlings

5 white alder seedlings

5 saplings each of walnut and ash

3 California button willow

2 wild grape vines

Total: 40 associated native species

- Total area required is a minimum of 1,800 sq. ft. for one to five elderberry seedlings and up to 5 associated natives. Since, a total of 80 plants must be planted (40 elderberries and 40 associated natives), a total of 0.33 acre (14,400 square feet) will be required for conservation plantings. The conservation area will be seeded and planted with native grasses and forbs, and closely monitored and maintained throughout the monitoring period.

### Example 2

The project will adversely affect beetle habitat in Blue Oak Woodland (Holland 1986). One elderberry plant with at least one stem measuring 1.0 inch or greater in diameter at ground level will be affected by the proposed action. The plant has a total of 10 stems measuring over 1.0 inch. Exit holes were found on the plant. Five of the stems are between 1.0 and 3.0 inches in diameter and five of the stems are between 3.0 and 5.0 inches in diameter. The conservation area is suited for elderberry savanna (non-riparian habitat). Associated natives adjacent to the conservation area are willow (*Salix* species), blue oak (*Quercus douglasii*), interior live oak (*Q. wislizenii*), sycamore, poison oak (*Toxicodendron diversilobum*), and wild grape.

Minimization (based on ratios in Table 1):

- Transplant the one elderberry plant that will be affected to the conservation area.
- Plant 30 elderberry seedlings (5 affected stems compensated at 2:1 ratio and 5 affected stems compensated at 4:1 ratio, cuttings planted:stems affected)
- Plant 60 associated native species (ratio of associated natives to elderberry plantings is 2:1 in areas with exit holes):

20 saplings of blue oak, 20 saplings of sycamore, and 20 saplings of willow, and seed and plant with a mixture of native grasses and forbs

- Total area required is a minimum of 1,800 sq. ft. for one to five elderberry seedlings and up to 5 associated natives. Since, a total of 90 plants must be planted (30 elderberries and 60 associated natives), a total of 0.37 acre (16,200 square feet) will be required for conservation plantings. The conservation area will be seeded and planted with native grasses and forbs, and closely monitored and maintained throughout the monitoring period.

### Conservation Area—Provide Habitat for the Beetle in Perpetuity

The conservation area is distinct from the avoidance area (though the two may adjoin), and serves to receive and protect the transplanted elderberry plants and the elderberry and other native plantings. The Service may accept proposals for off-site conservation areas where appropriate.

1. Size. The conservation area must provide at least 1,800 square feet for each transplanted elderberry plant. As many as 10 conservation plantings (i.e., elderberry cuttings or seedlings and/or associated native plants) may be planted within the 1800 square foot area with each transplanted elderberry. An additional 1,800 square feet shall be provided for every additional 10 conservation plants. Each planting should have its own watering basin measuring approximately three feet in diameter. Watering basins should be constructed with a continuous berm measuring approximately eight inches wide at the base and six inches high.

The planting density specified above is primarily for riparian forest habitats or other habitats with naturally dense cover. If the conservation area is an open habitat (i.e., elderberry savanna, oak woodland) more area may be needed for the required plantings. Contact the Service for assistance if the above planting recommendations are not appropriate for the proposed conservation area.

No area to be maintained as a firebreak may be counted as conservation area. Like the avoidance area, the conservation area should connect with adjacent habitat wherever possible, to prevent isolation of beetle populations.

Depending on adjacent land use, a buffer area may also be needed between the

conservation area and the adjacent lands. For example, herbicides and pesticides are often used on orchards or vineyards. These chemicals may drift or runoff onto the conservation area if an adequate buffer area is not provided.

2. Long-Term Protection. The conservation area must be protected in perpetuity as habitat for the valley elderberry longhorn beetle. A conservation easement or deed restrictions to protect the conservation area must be arranged. Conservation areas may be transferred to a resource agency or appropriate private organization for long-term management. The Service must be provided with a map and written details identifying the conservation area; and the applicant must receive approval from the Service that the conservation area is acceptable prior to initiating the conservation program. A true, recorded copy of the deed transfer, conservation easement, or deed restrictions protecting the conservation area in perpetuity must be provided to the Service before project implementation.

Adequate funds must be provided to ensure that the conservation area is managed in perpetuity. The applicant must dedicate an endowment fund for this purpose, and designate the party or entity that will be responsible for long-term management of the conservation area. The Service must be provided with written documentation that funding and management of the conservation area (items 3-8 above) will be provided in perpetuity.

3. Weed Control. Weeds and other plants that are not native to the conservation area must be removed at least once a year, or at the discretion of the Service and the California Department of Fish and Game. Mechanical means should be used; herbicides are prohibited unless approved by the Service.

4. Pesticide and Toxicant Control. Measures must be taken to insure that no pesticides, herbicides, fertilizers, or other chemical agents enter the conservation area. No spraying of these agents must be done within one 100 feet of the area, or if they have the potential to drift, flow, or be washed into the area in the opinion of biologists or law enforcement personnel from the Service or the California Department of Fish and Game.

5. Litter Control. No dumping of trash or other material may occur within the conservation area. Any trash or other foreign material found deposited within the conservation area must be removed within 10 working days of discovery.

6. Fencing. Permanent fencing must be placed completely around the conservation area to prevent unauthorized entry by off-road vehicles, equestrians, and other parties that might damage or destroy the habitat of the beetle, unless approved by the Service. The applicant must receive written approval from the Service that the fencing is acceptable prior to initiation of the conservation program. The fence must be maintained in perpetuity, and must be repaired/replaced within 10 working days if it is found to be damaged. Some conservation areas may be made available to the public for appropriate recreational and educational opportunities with written approval from the Service. In these cases appropriate fencing and signs informing the public of the beetle's threatened status and its natural history and ecology should be used and maintained in perpetuity.

7. Signs. A minimum of two prominent signs must be placed and maintained in perpetuity at the conservation area, unless otherwise approved by the Service. The signs should note that the site is habitat of the federally threatened valley elderberry longhorn beetle and, if appropriate, include information on the beetle's natural history and ecology. The signs must be approved by the Service. The signs must be repaired or replaced within 10 working days if they are found to be damaged or destroyed.

## Monitoring

The population of valley elderberry longhorn beetles, the general condition of the conservation area, and the condition of the elderberry and associated native plantings in the conservation area must be monitored over a period of either ten (10) consecutive years or for seven (7) years over a 15-year period. The applicant may elect either 10 years of monitoring, with surveys and reports every year; or 15 years of monitoring, with surveys and reports on years 1, 2, 3, 5, 7, 10, and 15. The conservation plan provided by the applicant must state which monitoring schedule will be followed. No change in monitoring schedule will be accepted after the project is initiated. If conservation planting is done in stages (i.e., not all planting is implemented in the same time period), each stage of conservation planting will have a different start date for the required monitoring time.

Surveys. In any survey year, a minimum of two site visits between February 14 and June 30 of each year must be made by a qualified biologist. Surveys must include:

1. A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their precise locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used.
2. A census of beetle exit holes in elderberry stems, noting their precise locations and estimated ages.
3. An evaluation of the elderberry plants and associated native plants on the site, and on the conservation area, if disjunct, including the number of plants, their size and condition.
4. An evaluation of the adequacy of the fencing, signs, and weed control efforts in the avoidance and conservation areas.
5. A general assessment of the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive weed growth, etc.

The materials and methods to be used in the monitoring studies must be reviewed and approved by the Service. All appropriate Federal permits must be obtained prior to initiating the field studies.

Reports. A written report, presenting and analyzing the data from the project monitoring, must be prepared by a qualified biologist in each of the years in which a monitoring survey is required. Copies of the report must be submitted by December 31 of the same year to the Service (Chief of Endangered Species, Sacramento Fish and Wildlife Office), and the Department of Fish and Game (Supervisor, Environmental Services, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814; and Staff Zoologist, California Natural Diversity Data Base, Department of Fish and Game, 1220 S Street, Sacramento, California 95814). The report must explicitly address the status and progress of the transplanted and planted elderberry and associated native plants and trees, as well as any failings of the conservation plan and the steps taken to correct them. Any observations of beetles or fresh exit holes must be noted. Copies of original field notes, raw data, and photographs of the conservation area must be included with the report. A vicinity map of the site and maps showing where the individual adult beetles and exit holes were observed must be included. For the elderberry and associated native plants, the survival rate, condition, and size of the plants must be analyzed. Real and likely future threats must be addressed along with suggested remedies and preventative measures (e.g. limiting public access, more frequent removal of invasive non-native vegetation, etc.).

A copy of each monitoring report, along with the original field notes, photographs, correspondence, and all other pertinent material, should be deposited at the California Academy of Sciences (Librarian, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118) by December 31 of the year that monitoring is done and the report is prepared. The Service's Sacramento Fish and Wildlife Office should be provided with a copy of the receipt from

the Academy library acknowledging receipt of the material, or the library catalog number assigned to it.

Access. Biologists and law enforcement personnel from the California Department of Fish and Game and the Service must be given complete access to the project site to monitor transplanting activities. Personnel from both these agencies must be given complete access to the project and the conservation area to monitor the beetle and its habitat in perpetuity.

### Success Criteria

A minimum survival rate of at least 60 percent of the elderberry plants and 60 percent of the associated native plants must be maintained throughout the monitoring period. Within one year of discovery that survival has dropped below 60 percent, the applicant must replace failed plantings to bring survival above this level. The Service will make any determination as to the applicant's replacement responsibilities arising from circumstances beyond its control, such as plants damaged or killed as a result of severe flooding or vandalism.

### Service Contact

These guidelines were prepared by the Endangered Species Division of the Service's Sacramento Fish and Wildlife Office. If you have questions regarding these guidelines or to request a copy of the most recent guidelines, telephone (916) 414-6600, or write to:

U.S. Fish and Wildlife Service  
Ecological Services  
2800 Cottage Way, W-2605  
Sacramento, CA 95825

### Literature Cited

Barr, C. B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle *Desmocerus californicus dimorphus*. U.S. Fish and Wildlife Service; Sacramento, California.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Unpublished Report. State of California, The Resources Agency, Department of Fish and Game, Natural Heritage Division, Sacramento, California.

USFWS. 1980. Listing the valley elderberry longhorn beetle as a threatened species with critical habitat. Federal Register 45:52803-52807.

USFWS. 1984. Recovery plan for the valley elderberry longhorn beetle. U.S. Fish and Wildlife Service, Endangered Species Program; Portland, Oregon.

Table 1: Minimization ratios based on location (riparian vs. non-riparian), stem diameter of affected elderberry plants at ground level, and presence or absence of exit holes.

Location	Stems (maximum diameter at ground level)	Exit Holes on Shrub Y/N (quantify) 1	Elderberry Seedling Ratio <sup>2</sup>	Associated Native Plant Ratio <sup>3</sup>
non-riparian	stems $\geq 1"$ & $\leq 3"$	No:	1:1	1:1
		Yes:	2:1	2:1

non-riparian	stems >3" & <5"	No:	2:1	1:1
		Yes:	4:1	2:1
non-riparian	stems >=5"	No:	3:1	1:1
		Yes:	6:1	2:1
riparian	stems >=1" & <=3"	No:	2:1	1:1
		Yes:	4:1	2:1
riparian	stems > 3" & < 5"	No:	3:1	1:1
		Yes:	6:1	2:1
riparian	stems >=5"	No:	4:1	1:1
		Yes:	8:1	2:1

<sup>1</sup> All stems measuring one inch or greater in diameter at ground level on a single shrub are considered occupied when exit holes are present anywhere on the shrub.

<sup>2</sup> Ratios in the Elderberry Seedling Ratio column correspond to the number of cuttings or seedlings to be planted per elderberry stem (one inch or greater in diameter at ground level) affected by a project.

<sup>3</sup> Ratios in the Associated Native Plant Ratio column correspond to the number of associated native species to be planted per elderberry (seedling or cutting) planted.



Click for range map

[Endangered Species Div., Sacramento Fish & Wildlife Office, U.S. Fish & Wildlife Service](#)

## **APPENDIX L**

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### Section 408 Permissions



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Sacramento  
Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922

July 20, 2009

Flood Protection and Navigation Section

Mr. Jay Punia  
Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room LL40  
Sacramento, California 95821

Dear Mr. Punia:

This letter serves to supplement the letter of permission for the Feather River Levee Setback Project at Star Bend, Sutter County, California (permit #18191) dated June 16, 2009. The following special condition replaces Special Condition g on the original letter.

Special Conditions:

g. Degradation of the existing levee shall take place uniformly over its entire length in horizontal layers. No portion of the existing levee shall be degraded to less than one-third of its original height, except for the southern and northern tie-in reaches during slurry wall construction, until the entire length of the new setback levee is constructed to an elevation corresponding to one-third the original height of the existing levee. Degradation of the existing levee may continue in non-uniform layers once the entire length of the new levee reaches this height. The new setback levee shall be no less than 50 percent of design height by October 1<sup>st</sup>; no less than 80 percent of the design height by October 15<sup>th</sup>; and 100 percent complete by November 1<sup>st</sup>. Beginning September 1, 2009, weekly reports shall include the height of both the existing and new levee at least 4 points, including the northern and southern tie-ins. Reports shall be submitted to the POC listed below.

All other conditions listed in the June 16, 2009 letter of permission remain in effect. If you have any questions or concerns, my point of contact for this action is Ms. Meegan Nagy, Chief, Flood Protection and Navigation Section. She may be reached at 916-557-7257 or by emailing Meegan.G.Nagy@usace.army.mil. A copy of this letter is being sent to Levee District 1 of Sutter County.

Sincerely,

  
Kevin Knuuti, P.E.  
Chief, Engineering Division



**DEPARTMENT OF THE ARMY  
U.S. Army Engineer District, Sacramento  
Corps of Engineers  
1325 J Street  
Sacramento, California 95814-2922**

Executive Office

**JUN 16 2009**

Mr. Jay Punia  
Executive Officer  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Room LL40  
Sacramento, California 95821

Dear Mr. Punia:

The Director of Civil Works for the U.S. Army Corps of Engineers has approved your request to alter the Federal flood damage reduction project, Sacramento River Flood Control Project, pursuant to U.S.C. Title 33, Chapter 9, Subchapter 1, Section 408. These alterations, collectively referred to as the Feather River Levee Setback Project at Star Bend, Sutter County, California, are the subject of encroachment permit # 18191. Permission has been granted for you to alter the aforementioned project works as it has been determined that such alteration will not be injurious to the public interest and will not impair the usefulness of the project works (Encl 1).

This letter of permission approves your proposed work, including construction of a 3,300-foot long setback levee along the right bank of the Feather River between Levee Mile (LM) 3.75 and 4.5 and simultaneous degradation of the existing levee between LM 3.75 and 4.5 as described in the plans and specifications reviewed by this office.

The term "you" and its derivatives, as used in this approval letter, means the Central Valley Flood Protection Board or any future transferee. The term "this office" refers to the Sacramento District of the U.S. Army Corps of Engineers. Alteration of this project must be in accordance with the following conditions:

Special Conditions:

a. This letter of permission does not authorize you to take any threatened or endangered species or designated critical habitat. In order to legally take a listed species, you must have a separate authorization under an Endangered Species Act Section 10 permit, or a Biological Opinion under Endangered Species Act Section 7, with incidental take provisions with which you must comply. The U.S. Fish and Wildlife Service (USFWS) Biological Opinion Number 81420-2009-F-0372-1, dated February 6, 2009, contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with incidental take that is also specified in the Biological Opinion. Your authorization under this Corps permission is conditional upon your compliance with all of the mandatory terms and conditions associated with the Biological Opinion, which terms and conditions are incorporated herein by reference

(Encl 2). Failure to comply with the terms and conditions associated with the incidental take statement in the Biological Opinion where a take of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permission. The USFWS is the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the Endangered Species Act. The Central Valley Flood Protection Board must comply with all conditions of this Biological Opinion, including those ascribed to the Corps.

b. No work may result in a discharge, including a temporary discharge, of any material into any waters of the United States, including wetlands. You must employ best management practices, such as silt fences and mulching, to ensure that exposed soils do not erode and wash into any waters of the US.

c. To ensure your project complies with Section 106 of the National Historic Preservation Act and Public Resources Code 5097.98, you must comply with all terms of the Inadvertent Discovery Treatment Plan being developed in consultation with the Native American Most Likely Descendent (MLD) and State Historic Preservation Office (SHPO).

d. You are required to submit a revision to the LD 1 Operation and Maintenance (O&M) (33 CFR Section 208.10) Manual for this office's review within 180 days of project completion. You must also furnish a certification report that the work has been completed in accordance with the conditions of this permission, as-built drawings, and permanent maintenance easement boundaries in conjunction with the draft Operation and Maintenance manual. Upon receipt of the draft O&M manual, this office will schedule a transfer inspection with you to verify all construction has been completed in accordance with this permission. Any features found to be deficient during that inspection will require your correction prior to the Corps acknowledging that the work was completed in accordance with this permission.

e. Construction should be coordinated with this office. The proposed work shall be completed in one construction season beginning April 15 and ending November 1, unless otherwise approved in writing by your Board. Additionally, you must ensure adequate funding is available for complete construction of the setback levee and complete degradation of the existing levee in one construction season prior to initiation of construction.

f. Upon initiation of degradation, upstream dam operators shall be notified by the applicant and provided a notification roster for use upon decision of a release.

g. Degradation of the existing levee shall take place in layers and shall not be degraded more than 50 percent of design height, except for the southern and northern tie-in reaches during slurry-wall construction, until the new setback levee is at or above 50 percent of its design height. Degradation of the remaining levee may continue once the new levee is entirely at or above 50 percent of its design height.

h. If high water conditions occur, the southern and northern tie-in reaches shall be filled immediately to the height of the remainder of the levee and flood fighting procedures shall be followed.

i. You will follow and abide by your approved Safety Assurance Review plan dated April 20, 2009 prior to and during construction.

General Conditions:

a. You must accept the operation and maintenance responsibility of the completed work including all vegetation management requirements specified in your O&M manual.

b. You are responsible for continued operations and maintenance for this project during construction.

c. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of this approval.

d. Construction records, documenting field conditions, will be submitted to this office on a weekly basis.

e. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permission, you must immediately notify this office of your discovery. Inadvertent discoveries must be treated in accordance with the procedures specified by 36CFR800.13 requiring preparation of a treatment plan and consultation with the SHPO. If prehistoric human remains are discovered, the Corps is required to consult with the MLD to determine treatment of the remains.

f. To ensure there is mitigation for any increased residual flood risk, you are required to develop and submit a Floodplain Management Plan within one year of issuance of this permission that includes elements for flood information dissemination, public awareness training, flood warning and evacuation plans, emergency flood operations plan with annual exercise, dedicated evacuation resources, and post-flood recovery plans. You are required to participate in and comply with applicable Federal floodplain management and flood insurance programs.

Further Information:

a. Limits of this permission.

1. This permission does not obviate the need to obtain other Federal, state or local authorizations, approvals or permissions required by law.

2. This permission does not grant any property rights or exclusive privileges.

3. This permission does not authorize any injury to the property or rights of others.

b. The determination of this office to approve this action as not injurious to the public interest, nor will it impair the usefulness of the project works, was made in reliance on the information you provided.

c. The Corps may reevaluate its decision on this approval at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to the following:

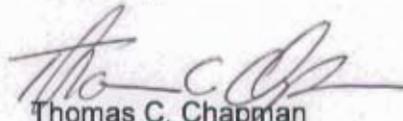
1. You fail to comply with the terms and conditions of this approval.
2. The information provided by you in support of your application proves to have been false, incomplete, or inaccurate. Should field conditions or future investigations require a deviation from the final Plans and Specifications referenced above, this deviation must be approved by this office through a request from the Board.
3. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

d. This approval should not be construed as an endorsement of certification for the FEMA base flood event.

e. The Corps acknowledges your commitment to accept the altered project for operation and maintenance and hold and save the United States free from damage due to the construction works.

My point of contact for this action is Ms. Meegan Nagy, Chief, Flood Protection and Navigation Section. She may be reached at 916-557-7257 or by emailing [Meegan.G.Nagy@usace.army.mil](mailto:Meegan.G.Nagy@usace.army.mil).

Sincerely,



Thomas C. Chapman  
Colonel, U.S. Army  
District Engineer

Enclosures  
Encl 1 408 Approval Letter  
Encl 2 Biological Opinion

CF: Bill Hampton, General Manager, Levee District 1 of Sutter County, 243 Second Street,  
Yuba City, California, 95991



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS  
441 G STREET NW  
WASHINGTON, D.C. 20314-1000

CEMP-SPD

JUN 1 2009

MEMORANDUM FOR Commander, South Pacific Division (ATTN: CESPDPDC)

SUBJECT: Sutter Basin, Sutter County, California - Feather River Levee Setback and Levee Degradation at Star Bend – Approval of a Flood Damage Reduction Project Alteration

1. Reference is made to CESPDP-DE Memorandum dated 23 April 2009, providing the initial submission package for the subject request, and CESPDP-PDC Memorandum dated 26 May 2009, providing the South Pacific Division endorsement of the request.
2. The request for approval of a Flood Damage Reduction Project Alteration under 33 U.S.C. 408 is approved. In addition, the Safety Assurance Review Plan, as mandated by Section 2035 of the Water Resources Development Act of 2007, is hereby approved for the subject project.

FOR THE COMMANDER:

A handwritten signature in black ink, appearing to read "S. L. Stockton".

STEVEN L. STOCKTON, P.E.  
Director of Civil Works

**CENTRAL VALLEY FLOOD PROTECTION BOARD**

3310 El Camino Ave., Rm. LL40  
SACRAMENTO, CA 95821  
(916) 574-0609 FAX: (916) 574-0682  
PERMITS: (916) 574-0653 FAX: (916) 574-0682



RECEIVED  
NOV 17 2008

November 14, 2008

Colonel Thomas C. Chapman, District Engineer  
U.S. Army Corps of Engineers  
Sacramento District  
1325 J Street  
Sacramento, California 95814

Dear Colonel Chapman:

Based on the Policy and Procedural Guidance for the Approval of Modification and Alteration of Corps of Engineers Projects dated October 23, 2006, and on behalf of Levee District No. 1 of Sutter County (LD1), the California Central Valley Flood Protection Board (Board) is requesting permission from the U.S. Army Corps of Engineers (Corps) to alter a portion of the Sacramento River Flood Control Project (SRFCP). The Board is making this request pursuant to 33 U.S.C. Section 408.

The Board has reviewed the project plans and drawings, the geotechnical report, hydraulic analysis, and other reports submitted by LD1 for the construction of a 3,400 foot backup levee that will eventually replace a portion of the existing Feather River west levee in Sutter County. The Board has determined that LD1 will accomplish this alteration in a manner that will not be injurious to the public interest and will not impair the usefulness of the SRFCP. Attached is the information you required to accompany this request as outlined in your October 23, 2006 policy and procedural guidance.

If the Corps approves this request, the Board will consider authorizing the proposed work by way of its permit process. If the proposed project is ultimately approved by the Board, and, upon completion, is formally incorporated within the federal SRFCP by the Corps, the State of California, acting through the Board, will accept the altered project for operation and maintenance and hold and save the United States free from damage due to the constructed works.

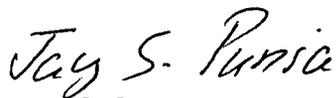
Within 180 days of completion of the project alteration the Board will provide both information to the Corps for the purposes of preparing a revised Operation and Maintenance Manual for this portion of the SRFCP, and as-built Plans and Specifications for the alteration.

In order to achieve the flood control benefits of this work for the 2009-2010 flood season, the Board is requesting that the Corps make any necessary determination so that LD1 may proceed with this alteration by April 2009.

Colonel Thomas C. Chapman  
November 14, 2008  
Page 2

If you have any questions, please feel free to contact me at (916) 574-0609, or your staff may contact Dan S. Fua, Staff Engineer of the Board, at (916) 574-0698.

Sincerely,



Jay S. Punia  
Executive Officer

Attachment

cc: Mr. Bill Hampton, General Manager (w/o attachment)  
Levee District No. 1 of Sutter County  
243 Second Street  
Yuba City, California 95991

Mr. Jeffrey E. Twitchell (w/o attachment)  
Wood Rodgers, Inc  
3301 C Street, Bldg. 100-B  
Sacramento, California 95816

## **APPENDIX M**

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Old Supplement Manual

(List of previous revisions and main text)

---

SUPPLEMENT TO STANDARD  
OPERATION AND MAINTENANCE  
MANUAL

SACRAMENTO RIVER  
FLOOD CONTROL PROJECT

UNIT NO. 144

WEST LEVEE OF FEATHER RIVER  
FROM  
NORTH BOUNDARY OF LEVEE DISTRICT NO. 1  
TO  
NORTH BOUNDARY OF RECLAMTION DISTRICT NO. 823



SACRAMENTO DISTRICT

CORPS OF ENGINEERS

U. S. ARMY

SACRAMENTO, CALIFORNIA

---

CORPS OF ENGINEERS

U. S. ARMY

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SUPPLEMENT TO STANDARD  
OPERATION AND MAINTENANCE MANUAL  
SACRAMENTO RIVER FLOOD CONTROL PROJECT

UNIT NO. 144

WEST LEVEE OF FEATHER RIVER  
FROM  
NORTH BOUNDARY OF LEVEE DISTRICT NO. 1  
TO  
NORTH BOUNDARY OF RECLAMATION DISTRICT NO. 823

Sacramento District  
Corps of Engineers  
U. S. Army  
August 1955

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**SUPPLEMENT TO STANDARD  
OPERATION AND MAINTENANCE MANUAL  
SACRAMENTO RIVER FLOOD CONTROL PROJECT**

UNIT NO. 144

WEST LEVEE OF FEATHER RIVER FROM  
NORTH BOUNDARY OF LEVEE DISTRICT NO. 1 TO  
NORTH BOUNDARY OF RECLAMATION DISTRICT NO. 823

<b>LOCATION</b>	<b>ADDITION OR REVISION</b>	<b>DATE</b>
1-04 e.	Add contract no. 57-60	Nov 1963
1-04 f.	Add contract no. 56-41, 56-45, 56-46, 56-102, 56-162, 56-169, and 56-173	Nov 1963
1-04 g.	Add contract no. 56-154	Nov 1963
1-04 h.	Add contract no. 56-75	Nov 1963
1-04 i.	Add contract no. 57-76	Nov 1963
1-04 j.	Add contract no. 57-109	Nov 1963
1-04 k.	Add contract no. 57-65	Nov 1963
1-04 l.	Add contract no. 57-112	Nov 1963
Exhibit B	Add drawing no. 4-4-431	Nov 1963
Exhibit B	Add drawing no. 4-13-405	Nov 1963
Exhibit B	Add drawing no. 4-4-435	Nov 1963
Exhibit B	Add drawing no. 4-4-437	Nov 1963
Exhibit B	Add drawing no. 4-4-433	Nov 1963
Exhibit B	Add drawing no. 4-4-438	Nov 1963
1-04 m.	Add contract no. 60-73	Oct 1964
Exhibit B	Add drawing no. 4-4-508	Oct 1964
Exhibit F	Add letter of acceptance dated 13 Sep 1960	Oct 1964
1-04 n.	Add contract no. 66-50	Dec 1966
Exhibit B	Add drawing no. 50-4-4004	Dec 1966
Exhibit F	Add letter of acceptance dated 28 Jun 1966	Dec 1966
1-04	Add paragraph o	29 Apr 2010
Exhibit B	Add Drawing No. 4-4-627	29 Apr 2010
Exhibit F	Add copy of letter of transfer dated 14 Apr 2003	29 Apr 2010
Exhibit F	Add copy of letter of transfer dated 18 Jul 2003	29 Apr 2010
Exhibit F	Add copy of letter of transfer dated 8 Dec 1951	27 Dec 2010
Exhibit F	Add copy of letter of transfer dated 2 Oct 1952	27 Dec 2010
Exhibit F	Add copy of letter of transfer dated 24 Aug 1960	27 Dec 2010
1-04	Add subparagraph p	27 Dec 2010
Exhibit B	Add drawing no. 04-04-617	27 Dec 2010
Exhibit F	Add copy of letter of transfer dated 11 Apr 2001	27 Dec 2010
1-04	Add subparagraph q	27 Dec 2010
Exhibit B	Add drawing no. 4-25-626	27 Dec 2010
Exhibit F	Add copy of letter of acceptance dated 19 Jun 2001	27 Dec 2010

<b>LOCATION</b>	<b>ADDITION OR REVISION</b>	<b>DATE</b>
Exhibit F	Add copy of letter of transfer dated 4 Feb 2004	27 Dec 2010
1-04	Add subparagraph r	27 Dec 2010
Exhibit B	Add drawing no. 4-4-620	27 Dec 2010
Exhibit F	Add copy of letter of transfer dated 12 Mar 2004	27 Dec 2010
Exhibit F	Add copy of letter of acceptance dated 21 May 2004 (LM 11 – 11.5)	27 Dec 2010
Exhibit F	Add copy of letter of acceptance dated 21 May 2004 (LM 14.60 – 16.02)	27 Dec 2010
Exhibit F	Add copy of letter of transfer dated 20 Jun 1966	2 Feb 2011
1-04	Add subparagraph s	Jan 2012
Exhibit B	Add drawing no. 50-04-6301	Jan 2012
Exhibit H	Create Exhibit H: Local Cooperation Agreement	Jan 2012
1-02	Authorization paragraph. Add Flood Control Act 1960	Jan 2012
2-05	Create Environment Protection section	Jan 2012
2-05	Add subparagraph a, b, c, d, & e	Jan 2012
Table of Contents	Update Table of Contents	Jan 2012
Exhibit I	Create Exhibit I: Biological Opinion	Jan 2012
Exhibit I	Add B.O. excerpt USFWS #81420-2008-F-0805-1	Jan 2012
Exhibit F	Add copy of letter of transfer dated 22 Aug 2012	Sept 2012

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<u>SECTION I - INTRODUCTION</u>		
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SUPPLEMENT TO STANDARD  
OPERATION AND MAINTENANCE MANUAL  
SACRAMENTO RIVER FLOOD CONTROL PROJECT  
UNIT NO. 144

WEST LEVEE OF FEATHER RIVER  
FROM  
NORTH BOUNDARY OF LEVEE DISTRICT NO. 1  
TO  
NORTH BOUNDARY OF RECLAMATION DISTRICT NO. 823

SECTION I – INTRODUCTION

1-01. Location. – The improvement covered by this manual is that part of the Sacramento River Flood Control Project which includes the west levee of the Feather River from the north boundary of Levee District No. 1, southerly (downstream) 17.55 miles to the north boundary of Reclamation District No. 823. The low water channel of the Feather River meanders through an overflow area which has a variable width from 1200 feet to 4800 feet and is confined between levees along both banks. The levee of this unit lies within Levee District No. 1 and Reclamation District No. 2066 (now inoperative), in Sutter County, California, and in general vicinity of Yuba City. The location of the completed unit covered by this manual is shown on Exhibit A-1.

1-02. Protection Provided. The levee of Unit No. 144 provides protection to Yuba City and adjacent agricultural land against flood waters of the Feather River and is an essential feature of the Sacramento River Flood Control Project. The grade of the adopted floodplain profile in the Feather River varies from elevation 82.38 at the north boundary of Levee District No. 1 to elevation 57.0 at the north boundary of Reclamation District No. 823 (Elevations are referred to Corps of Engineers datum). A freeboard above the project floodplain of 3 feet has been equaled or exceeded within this unit and the project design capacity is 300,000 to 320,000 cubic feet per second.

Bank protection work was authorized by the Flood Control Act of 1960.

1-03. Project Works. – The project works covered by this manual includes the west levee and banks of the Feather River from the north boundary of Levee District No. 1 (about 2.1 miles upstream from Highway No. 99E Bridge crossing at Yuba City), southerly (downstream) 17.55 miles to the common boundary between Levee District No. 1 (Sutter County) and Reclamation District No. 823. This reach of levee was originally built by local interests and later re-constructed to the adopted grade and section by the Corps of Engineers.

1-04. Construction Data and Contractor. Unit No. 144 of the flood control works described in this manual forms an integral part of the Sacramento River Flood Control Project. In general, all construction features are based on standard plans and specifications, details being fully covered in the drawings (see Exhibit B.)

Construction work required to bring locally built levees to project grade and section was accomplished under the following contracts:

a. Levee enlargement of the west levee of the Feather River in the vicinity of Yuba City from station 1380+00 to station 49+40 as shown on Drawing No. 44-172-1; sheets 2,3, and 4 of Exhibit

B, was constructed under Contract No. W-1105-Eng-2350 by Hemstreet and Bell, Contractors, and completed on 26 January 1939.

b. Levee Enlargement of the west levee of the Feather River from Yuba City to Shanghai Bend and from Starr Bend 2 miles southerly as shown on Drawing No. 4-4-188-1; sheets 2,3, and 4 was constructed under Contract No. W-1105-eng-2405 by Morrison & Knudsen Company, Contractors, and completed 3 September 1939.

c. Levee enlargement of the west levee of the Feather River from Shanghai Bend to Starr Bend and from 2 miles south of Starr Bend to opposite Bear River as shown on Drawing No. 4-4-205-1, sheets 2 to 8, inclusive, was constructed under Contract No. W-1105-eng-2694 by Morrison & Knudsen Company, Contractors, and completed on 16 November 1940.

d. A short section of levee crown of the west levee of the Feather River was surfaced for patrol road purposes in the vicinity of Yuba City under Contract No. DA-04-167-eng-828 by Browne and Krull, Contractors, and completed on 2 December 1952. Specification No. 1636, Drawing No. 50-4-2897.

e. Emergency levee repairs along the west levee of the Feather River upstream and downstream from the 10<sup>th</sup> Street Bridge was accomplished under Contract No. DA-04-167-CIVENG-57-60 by W. H. Darrough and Sons, during the period from 1 October 1956 to 18 October 1956, Specification No. 2238, Drawing No. 4-4-431.

f. Emergency repair and reconstruction of approximately 8,000 feet of destroyed levee on the right bank of the Feather River downstream from Yuba City was accomplished under Contract Nos. DA-04-167-CIVENG-56-41, 56-45, 56-46, 56-102, 56-162, 56-169, and 56-173 by H. Earl Parker, Inc., San Francisco Bridge company, Associated Dredging Company, and Pacific Gas and Electric Company, during the period from 26 December 1955 to 30 April 1956, Drawing No. 4-13-405.

g. Emergency levee repairs and bank paving, right bank of the Feather River at Starr Bend was accomplished under Contract No. DA-04-167-CIVENG-56-154 by Lester L Rice & Sons during the period from 5 March 1956 to 13 March 1956. No drawings made.

h. Repairing levee of right bank of Feather River at Yuba City from 5<sup>th</sup> Street Bridge ½ mile downstream was accomplished under Contract No. DA-04-167-CIVENG-56-161 and 56-75 by Baldwin Contracting Company during the period from 29 December 1955 to 15 January 1956. No drawings made.

i. Emergency relief wells and drains along the Feather River near Yuba City were installed under Contract No. DA-04-167-CIVENG-57-76 by C. S. Phillips Construction Company during the period from 13 November 1956 to 12 April 1957, Specification No. 2256, Drawing No. 4-4-435.

j. Emergency levee repairs, west levee Feather River, relief trench drain at Yuba City was accomplished under Contract no. DA-04-167-CIVENG-57-109 by Baldwin Contracting Company during the period from 17 February 1957 to 14 May 1957, Specification No. 2302, Drawing No. 4-4-437.

k. Emergency levee repairs, right bank Feather River at Shanghai Bend was accomplished under Contract No. DA-04-167-CIVENG-57-65 by H. Earl Parker, Inc. during the period from 8 October 1956 to 12 November 1956, Specification No. 2252, Drawing No. 4-4-433.

l. Drainage pump and sump, right bank Feather River at Shanghai Bend was accomplished under Contract No. DA-04-167-CIVENG-57-112 by Munz Pump, Inc. during the period from 11 March 1957 to 21 June 1957, Specification No. 2295, Drawing No. 4-4-438.

m. Levee stabilization, right bank Feather River, Levee Districts 1 and 9 was accomplished under Contract No. DA-04-167-CIVENG-60-73 by H. Earl Parker, Inc. during the period from 11 May 1960 to 28 July 1960, Specification No. 2655, Drawing No. 4-4-508.

n. Bank protection on the right bank of the Feather River at Mile 24.5 (Unit No. 8) was accomplished under Contract No. DA-04-167-EIVENG-66-50 by H. Earl Parker, Inc. during the period from 18 October 1965 to 14 June 1966. Specification No. 3154. Drawing No. 50-4-4004.

o. Levee repair on the right bank of the Feather River between Levee Mile 2.35 and Levee Mile 3.52 and at Levee Mile 1.5 (LD1 site) located south of Yuba City along right bank of the Feather river between Levee Mile 1.43 and Levee Mile 1.60. Repair consists of seepage berms and a toe drain. Construction was completed 7 September 2001 under Contract No. DACW05-00-C-0041, Specification No. 1102E, Drawing No. 4-4-627.

p. Emergency levee repairs, at various locations along the right bank of the Feather River in Levee District 1 was completed on 31 October 1997 by Syblon Reed Corp. under Contract No. DACW05-97-C-0122. Specification No. 9885E, Drawing No. 04-04-617.

q. Emergency levee repairs, west levee Feather River, Levee Miles 14.60 to 16.02 in Levee District 1 were completed in July 2001 by BCN Company under Contract No. DACW05-00-C-0032, Specification No. 1101E, Drawing No. 4-25-626.

r. Emergency levee repairs, west levee Feather River Levee Miles 11.00 to 11.50 were completed on December 1999 by Clearwater Group Inc. under Contract No. DACW05-98-D-0035, Specification No. 9998E, Drawing No. 4-4-620.

s. Erosion repair sites, West levee of the Feather River at RM 28.5 (Right levee). About 1260 feet of erosion repair work was completed by Newland Entities in December 2009 under Contract No. W91238-09-C-0021, Specification No. 1691, Drawing No. 50-04-6301.

1-05. Flood Flows. For purposes of this manual, the term “flood” or “high water period” shall refer to flows when the water surface reaches or exceeds a reading of 65.0 on the continuous water stage recorder and staff gage located near the right bank of the Feather River on the downstream side of the Sacramento Northern Railroad Bridge at Yuba City; also when the water surface reaches or exceeds a reading of 59.0 on the continuous water state recorder and staff gage located on the right bank of the Feather River about five miles south of Yuba City (below Shanghai Bend). Staff gages are set on U.S. Corps of Engineers datum.

1-06. Assurances Provided by Local Interests. Assurance of cooperation by local interests is provided by State Legislation, as contained in Chapter 3, Part 2, Division 5, of the State Water Code (see paragraph 2-02a of the Standard Manual).

1-07. Acceptance by State Reclamation Board. Responsibility for operating and maintaining the completed works was officially accepted by the Reclamation Board of the State of California on 18 December 1951 and 2 December 1952, as shown on the attached letters of acceptance, Exhibit E.

1-08. Superintendent. The name and address of the Superintendent appointed by local interests to be responsible for the continuous inspection, operation and maintenance of the project works shall be furnished the District Engineer, and in case of any change of Superintendent, the District Engineer shall be so notified.

SECTION II

FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS

2-01. Levees.

a. Description. The levee described in this manual is located along the westerly side of the Feather River from the north boundary of Levee District No. (Sutter County) to the north boundary of Reclamation District No. 823. The levee within this ~~unit~~ was originally built by local interests and later re-constructed to project grade and section by the Corps of Engineers. Surfacing was applied to the crown, turnouts and road approaches were also provided.

b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance - paragraph 4-02 of the Standard Manual.
- (2) Check Lists - Exhibit E of this Supplement Manual.
- (3) Operation - paragraph 4-04 of the Standard Manual.
- (4) Special Instructions - paragraph 4-05 of the Standard Manual.

2-02. Drainage and Irrigation Structures.

a. Description. Drainage and irrigation structures which extend through the levee are listed as follows:

Location Station	:	Bank	:	Size and Kind of pipe	:	Other Structure Description	:	Elev. of in- vert of pipe
1414+10	:	R	:	3" Steel	:	Extra strong galv. pipe	:	
1468+79	:	R	:	36" C.M.P.	:		:	
1469+70	:	R	:	24" C.M.P.	:	Yuba City outfall sewer, No. 781 gate valve No. 781 L.S. 2 Concr.	:	
1473+60	:	R	:	18" Steel	:	Gas Line	:	
109+23	:	R	:	12" Steel	:		:	
333+43	:	R	:	24" Steel	:		:	
358+00	:	R	:	8" Steel	:		:	
477+00	:	R	:	8" Steel	:		:	
486+00	:	R	:	10" Steel	:		:	
497+00	:	R	:	6" Steel	:		:	
529+28	:	R	:	12" Steel	:		:	
537+00	:	R	:	10" Steel	:		:	
574+20	:	R	:	8" Steel	:		:	
616+72	:	R	:	24" Steel	:		:	
638+07	:	R	:	8" Steel	:		:	

Location Station	: :	Size and Bank: Kind of Pipe	: :	Other Structure Description	: :	Elev. of invert of pipe
657+00	R	8" Steel				
678+00	R	8" Steel				
735+57	R	36" Steel				
736+00	R	54" C.M.P.				
585+32	R	8" Steel				

Note: Abbreviations are as follows:

C.M.P. = Corrugated Metal Pipe  
L.S. = Landside  
R. = Right Bank (looking downstream)

b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance - paragraph 5-02 of the Standard Manual.
- (2) Check Lists - Exhibit E of this Supplement Manual.
- (3) Operation - paragraph 5-04 of the Standard Manual.
- (4) Additional Requirements - paragraph 5-05 of the Standard Manual.
- (5) Safety Requirements - paragraph 5-06 of the Standard Manual.

### 2-03. Channel.

a. Description. The channel of the Feather River within this unit consists of an overflow area that varies in width from 1200 feet to 4800 feet that is confined between levees along both banks. This reach of the Feather River from the north boundary of Levee District No. 1 (Sutter County) to the north boundary of Reclamation District No. 823, has a project capacity of 300,000 to 320,000 cubic feet per second and the levee provides for a freeboard of at least three feet above the adopted flood plane profile. There is a considerable growth of trees and brush in the overflow portion of the channel. The maintenance and operation of the channel of the Feather River, within this unit, shall be limited to flood control and the requirements which follow shall be observed only to that extent.

b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance - paragraph 6-02 of the Standard Manual.
- (2) Check Lists - Exhibit E of this Supplement Manual.
- (3) Operation - paragraph 6-04 of the Standard Manual.
- (4) Safety Requirements - paragraph 6-05 of the Standard Manual.

It shall be the duty of the Superintendent to maintain a patrol of the project works during all periods of flood in excess of a reading of 65.0 on the gage at Yuba City or in excess of a reading of 59.0 on the gage located below Shanghai Bend as indicated in paragraph 1-05 of this manual. The Superintendent shall dispatch a message by the most suitable means to the District Engineer whenever the water surface at Yuba City or below Shanghai Bend reaches the gage readings indicated above. The Superintendent shall cause readings to be taken at said gages at intervals of two to four hours during the period when the water surface is above the flood-flow stage indicated above and record the time of observations. One copy of the readings shall be forwarded to the District Engineer immediately following the flood, and a second copy transmitted as an inclosure to the semi-annual report in compliance with paragraph 3-06 of the Standard Manual.

2-04. Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were constructed as a part of or existed in conjunction with, the protective works, and which might affect their functioning, include the following:

(1) Bridges.

- (a) Southern Pacific Railroad trestle at station 1384+00.
- (b) Highway 99E bridge crossing at station 1482+70
- (c) Sacramento Northern Railroad Bridge and highway crossing at station 2+77.

(2) Utility Relocations.

- (a) Portion of Yuba City outfall sewer was re-constructed at station 1469+70.
- (b) Portion of Pacific Gas & Electric gas line was re-constructed at station 1473+60.

(3) Hydrographic Facilities. (to be maintained by other agencies)

- (a) A continuous water stage recorder and staff gage located at Sacramento Northern Railroad Bridge at Yuba City.
- (b) A continuous water stage recorder and staff gage located about 5 miles south of Yuba City (below Shanghai Bend).

b. For pertinent Requirements of the Code of Federal Regulations and other requirements see the following:

- (1) Maintenance - paragraph 7-02 of the Standard Manual.
- (2) Check Lists - paragraph 7-03 of the Standard Manual.
- (3) Operation - paragraph 7-04 of the Standard Manual.

## 2-05. Environment Protection.

The following and USFWS B.O. #81420-2008-F-0805-1 within Exhibit I pertain to the repair sites at Feather RM 28.5R,

a. Trees, either preserved or planted, shall not be removed as long as they remain healthy. As unhealthy trees are removed or fall over, any subsequent cavities in the rock must be filled in a timely manner with rock material equal to the surrounding repair. Leave the fallen trees in place. Dead or fallen trees will be retained except where they are a hazard to existing flood control work.

b. In-stream Woody Material (IWM) has been used in conjunction with levee improvements at these locations. IWM is expected to degrade and wash away over time, therefore, it is not a requirement of normal maintenance to replace this material. IWM should not be removed from the site through maintenance activities. Additionally, any woody debris that arrives at the site and is deposited shall be left in place/not removed by the Local Sponsor, provided it is not posing a hazard to the existing flood control work.

c. Vegetation within mitigation areas shall be left in a natural state. No additional maintenance such as irrigation or mowing shall be required as a part of normal maintenance.

d. Soil placed on/in rock as a part of the original repair and all associated vegetation (grasses & woody shrubs/trees) within the footprint of the bank protection sites at these locations do not require replacement as a part of normal maintenance. In other words, if the soil is washed out it does not need to be replaced and re-vegetated. However in areas where soil remains or new sediment is deposited and the vegetation is dislodged/ destroyed or leaves areas greater than 3' x 3' of exposed soil for more than 30 days during the months of April through November, those areas shall be hydro-seeded using the seed mix indicated on the As-Built.

e. Vegetation, soil, and IWM placed on the erosion repair site were done so as on-site mitigation for the construction of the site. Vegetation (trees and shrubs) helps protect against soil erosion and provides shade cover for endangered salmonid species migrating up and down the river during various times of the year. Living and dead IWM provides diverse habitat and refuge for several fish species during low flow conditions. These features shall not be removed or damaged in any way.

### SECTION III

#### REPAIR OF DAMAGE TO PROJECT WORKS AND METHODS OF COMBATING FLOOD CONDITIONS

3-01. Repair of Damage. In the event of serious damage to the project works, whether due to flood conditions or other causes, and which may be beyond the capability of local interests to repair, the Superintendent will contact a representative of the Division of Water Resources, State of California, who coordinates maintenance of project works of the Sacramento River Flood Control Project. The State representative will give assistance or advice, or will determine appropriate action to be taken.

3-02. Applicable Methods. For applicable methods of combating flood conditions, reference is made to Section VIII of the Revised Standard Manual, where the subject is fully covered.