

APPENDIX A
Operation and Maintenance Report

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LOWER SAN JOAQUIN RIVER AND TRIBUTARIES PROJECT, CALIFORNIA

PROJECT DESCRIPTION

Location and Description

General. - The 1944 Flood Control Act authorized the Lower San Joaquin River and Tributaries Project. The authorized Project was for improvements by the Federal Government to the then existing channel and levee system along the San Joaquin River from Sacramento-San Joaquin Delta upstream to the mouth of Merced River and on several tributaries and distributaries. The Project also provided for flood protection along the San Joaquin River above the mouth of Merced River by the State of California. These Project elements are an integral part of the overall plan for flood control and other purposes in the San Joaquin River Basin. The Project is designed to supplement upstream reservoirs by providing channel capacity along San Joaquin River sufficient to safely pass regulated flows.

Federally Constructed Portion. - Federal construction of the Lower San Joaquin River and Tributaries Project was initiated in 1956 and completed in 1968 except for the left (west) bank levee along San Joaquin River from Tuolumne River to Merced River (completed in 1972). Additional modifications were made in the mid-1980's. The Federally constructed portion of the Project consists of about 100 miles of intermittent levees along San Joaquin River, Paradise Cut, Old River, and the lower reaches of the Stanislaus and Tuolumne Rivers. The levees vary in height from about 15 feet at the downstream end to an average of 6 to 8 feet over much of the Project. The Project levees, along with upstream river regulation, were designed to contain floods varying from about once in 60 years at the lower end of the Project to about once in 100 years at the upper limits. The Reclamation Board of the State of California provide assurances to the Federal Government to operate and maintain the project. The Board has made agreements with local reclamation districts which actually perform the maintenance work with funds derived from taxes in the area of benefit.

The Lower San Joaquin River Levees Project lies in the San Joaquin Valley, California, and extends about 80 miles upstream from the junction of the San Joaquin River with the Stockton Deep Water Channel near Stockton, to the mouth of the Merced River in Merced County. It includes the distributaries of the San Joaquin River in the Upper Delta, i.e., Paradise Cut, the upper part of Middle River, Old River, and the lower reaches of the Stanislaus and Tuolumne River within backwater limits of the San Joaquin River. In general, the Project includes construction or reconstruction of levees, channel improvement and the provision for bank protection along the Lower San Joaquin River from the mouth of the Merced River to the Delta. The combined total length is about 100 miles. A map showing the location of the features of the project is attached.

Levees. - The Lower San Joaquin River Levees Project has been divided into geographical units for ease of reference. These units usually conform to political subdivisions which are responsible for operation and maintenance of the project units within their boundaries. Levees of the various units are described in detail in the applicable Supplement Manuals which are prepared after completion of the construction work within the units. The extent of the levee system of the Lower San Joaquin River and Tributaries Project is shown on the attached map. The levees of the Project are constructed generally with a crown width of 20 feet, with land side slopes of 1 on 2 and riverside slopes of 1 on 3. Some bypass levees and some river levees do not have the standard slopes or crown widths. On the Lower San Joaquin River and tributaries the levee grade provides for a

freeboard of 3 feet above adopted flood plane profile. Patrol roads, earthen ramps, road crossings and turn-outs have been constructed at intervals or wherever necessary throughout the length of the levees.

Channels. - The channels of the Project constitute that part of the waterway which lies between the levees of the San Joaquin River from its junction with the Stockton Deep Water Channel to the mouth of the Merced River. Also between the levees of the distributaries of the San Joaquin River in the Upper Delta, i.e. Paradise Cut, the upper part of Middle River, Old River and the lower reaches of the Stanislaus and Tuolumne Rivers within backwater limits of the San Joaquin River. The area in general is shown on the attached map. More complete detailed descriptions and limits of channels are contained in the Supplement O&M Manuals.

UNIT NO. 1 RIGHT BANK LEVEE OF SAN JOAQUIN RIVER AND FRENCH CAMP SLOUGH WITHIN RECLAMATION DISTRICT NO. 404

This unit consists of the right bank levee and channel of the San Joaquin River from the Stockton Deep Water Ship Channel to French Camp Slough and the right bank levee and channel of French Camp Slough from the San Joaquin River to the French Camp Road, a total distance of about 4.06 miles. Location by levee mileage for R.D. 404; Unit No. 1 starts at the junction of the San Joaquin River with the Stockton Deep Water Ship Channel (Mile 0.0); thence upstream along the right bank of the San Joaquin River 2.30 miles to the junction of French Camp Slough; Unit No. 2 starts at said junction (Mile 0.0); thence upstream along the right bank of French Camp Slough 1.76 miles to the French Camp Road. The area is located within Reclamation District No. 404 in the County of San Joaquin, California, and in the general vicinity as shown on figure 2.

Along the right bank of the San Joaquin River the grade of the adopted flood plain profile varies from elevation 7.5 at the Stockton Deep Water Ship Channel to elevation 11.0 at the junction of French Camp Slough. Along the right bank of French Camp Slough the grade of the adopted flood plain profile is level at elevation 11.0 from the San Joaquin River to the French Camp Road. All elevations are referred to mean sea level datum (1929 adjustment). The levee has been surfaced for patrol road purposes with a crown width of 12 feet. The necessary turnouts, turnarounds and road approaches were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 18,000 cubic feet per second and 2,000 cubic feet per second for French Camp Slough.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letter dated 3 January 1963.

UNIT NO. 2 RIGHT BANK LEVEE OF SAN JOAQUIN RIVER AND LEFT BANK OF FRENCH CAMP SLOUGH WITHIN RECLAMATION DISTRICT NO. 17

This unit consists of the left bank and channel of French Camp Slough from the French Camp Turnpike to the San Joaquin River and the right bank and channel of the San Joaquin River from French Camp Slough to Walthall Slough, a total distance of about 16.18 miles. Location by levee mileage for R.D. 17; Unit No. 1 starts near the French Camp Turnpike (Mile 0.0), thence downstream 1.81 miles to the junction with the San Joaquin River; Unit No. 2 starts at said junction

(Mile 0.0), thence upstream 14.37 miles along the San Joaquin River to Walthall Slough. The area is located within Reclamation District No. 17 in the county of San Joaquin, California, and in the general vicinity as shown on the Location Map 2.

Along French Camp Slough the grade of the adopted flood plain profile is level at elevation 11.0 from the San Joaquin River to the French Camp Turnpike. Along the right bank of the San Joaquin River, the grade of the adopted flood plain profile varies from elevation 11.0 at French Camp Slough to elevation 23.5 at Walthall Slough. The levee has been reconstructed with slopes of 1 on 3 waterside (1 on 2 downstream from Old River) and 1 on 2 landside with a crown width of 20 feet and 12 feet downstream from Old River. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit, the project design flood for French Camp Slough is 3,000 cubic feet per second and for the San Joaquin River about 18,000 cubic feet per second from French Camp Slough to Old River and 37,000 cubic feet per second from Old River to Walthall Slough. The flow in French Camp Slough coincidental with the San Joaquin River design flood would be about 2,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letter dated 3 January 1963.

UNIT NO. 3 NORTH LEVEE OF STANISLAUS RIVER AND EAST LEVEE OF SAN JOAQUIN RIVER WITHIN R.D. 2064, 2075, 2094 and 2096

This unit consists of the right bank and levee of the San Joaquin River from Weatherbee Lake to the mouth of the Stanislaus River; and the right bank and channel of the Stanislaus River from its mouth upstream to high ground; a total distance of about 22.08 miles. The area lies about 4 miles south from the town of Lathrop and 7 miles west from the town of Ripon. Location by levee mileage along the right bank of the San Joaquin River is from mile 0.00 at Weatherbee Lake to 0.17 within R.D. 2096; from mile 0.00 to mile 2.82 within R.D. 2094; from mile 0.00 to mile 7.58 within R.D. 2075; and from mile 0.00 to mile 5.45 (mouth of Stanislaus River) (Unit 1) within R.D. 2064 and mile 0.00 to mile 6.06 within R.D. 2064 (Unit 2) along the right bank of the Stanislaus River to high ground. All mileages listed above progress going upstream. The area lies within the above mentioned Reclamation Districts in the county of San Joaquin, California and in the general vicinity as shown on the Location Map 3.

Along the San Joaquin River right bank levee the grade of the adopted flood plain varies from elevation 23.2 at the lower end (Weatherbee Lake) to elevation 36.2 at the mouth of the Stanislaus River. Along the Stanislaus River the grade of the adopted flood plain varies from elevation 36.2 at the mouth to elevation 49.4 at high ground. The levee has been reconstructed to project standards with a minimum crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grade within this unit provides for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 52,000 cubic feet per second and for the Stanislaus River 12,000 cubic feet per second.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letter dated 7 December 1959. Other portions were officially accepted by letters dated 21 December 1962, 18 January 1963, and 2 December 1968.

UNIT NO. 4 EAST LEVEE OF SAN JOAQUIN RIVER WITHIN R.D. 2031

This unit consists of the right bank levee and channel of the Tuolumne River from high ground to the San Joaquin River; the right bank and channel of the San Joaquin River between the Tuolumne and Stanislaus Rivers; and the left bank and channel of the Stanislaus River from the San Joaquin River to high ground at Kiernan Avenue; a distance of about 13.19 miles. The area lies about 7 miles west of the town of Ripon and 4 miles east from the town of Vernalis. Location by levee mileage along the left bank of the Stanislaus River is from mile 0.00 (Unit No. 1) at Kiernan Avenue to mile 7.15 at the mouth of the Stanislaus River and for the right bank of the San Joaquin River (Unit No. 2) mile 0.00 at the junction of the left bank levee of the Stanislaus River and the right bank levee of the San Joaquin River to mile 6.04 at high ground along the right bank of the Tuolumne River. The area lies within Reclamation District No. 2031 in the county of Stanislaus, California, and in the general vicinity as shown on the Location Map 4.

Along the upper end of the Tuolumne River right bank levee the grade of the adopted flood plain varies from elevation 49.2 at the upper end to elevation 40.0 to elevation 36.0. Along the Stanislaus River the grade of the adopted flood plain varies from elevation 49.4 at the upper end to elevation 36.0 at the San Joaquin River. Levee grade within this unit provides for a freeboard of at least 3 feet above the adopted flood plain profile. The levee has been reconstructed to project standards with a minimum crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Within this unit the project design flood for the Tuolumne River is 15,000 cubic feet per second, for the San Joaquin River 46,000 cubic feet per second, and for the Stanislaus River 12,000 cubic feet per second.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letter dated 28 December 1966 and 21 November 1966.

UNIT NO. 5 EAST LEVEE OF THE SAN JOAQUIN RIVER WITHIN RECLAMATION DISTRICT NO. 2092

This unit consists of the east levee and channel (right bank) of the San Joaquin River from approximate river mile 89.0 to high ground on the left bank of the Tuolumne River, a distance of about 3.8 miles. The improvements are located on the right bank of the San Joaquin River between levee miles 0.00 on the left bank of the Tuolumne River and levee mile 3.76 on the San Joaquin River. It lies generally about 8 miles westerly from the City of Modesto, California. The area is located in Reclamation District No. 2092 in the County of Stanislaus, California, and in the general vicinity as shown on Location Map 5.

Along the east levee of the San Joaquin River within this unit the grade of the adopted flood plain varies from elevation 45.0 at the upper end to elevation 40.0 at the mouth of the Tuolumne River and on the Tuolumne River 40.0 to 40.5. All elevations are referred to mean sea level datum (1929 adjustment). Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. The levee has been reconstructed with slopes of 1 of 3 waterside and 1 on 2 landside with a crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Within this unit the project design flood for the San Joaquin River is 45,000 cubic feet per second and for the Tuolumne River 15,000 cubic feet per second. Particularly along the Tuolumne River, project protection will not be completely realized until the New Don Pedro Dam is constructed.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letter dated 30 March 1961.

**UNIT NO. 6 EAST LEVEE OF THE SAN JOAQUIN RIVER IN RECLAMATION DISTRICTS
NO. 2063 & 2091**

This unit consists of the north levee and channel of the Merced River at high ground to approximate river mile 93.0 on the east bank of the San Joaquin River, a total distance of about 18.2 miles. The area lies about 9 miles southwesterly from Modesto and 4 miles easterly from Patterson, California. Location by levee mileage is from mile 0.00 at the north boundary of R.D. 2091 to mile 7.59 on the south boundary of R.D. 2091 and from mile 0.00 at the north boundary of R.D. 2063 to mile 10.63 at the south boundary of R.D. 2063 and to the Mitchell Road. The area is located in Reclamation Districts No. 2063 and 2091 in the Counties of Stanislaus and Merced, California and in the general vicinity as shown on the Location Map 6.

Along the east levee of the San Joaquin River within this unit, the grade of the adopted flood plain varies from elevation 66.2 at the upper end to elevation 49.6 at the lower end. All elevations are referred to mean sea level datum (1929 adjustment). The levee has been reconstructed with slopes of 1 on 3 waterside and 1 on 2 landside with a crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 45,000 cubic feet per second.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letter dated 30 March 1961.

**UNIT NO. 7 WEST LEVEE OF SAN JOAQUIN RIVER AND NORTH LEVEE OF OLD RIVER
RECLAMATION DISTRICTS NO. 524 AND 544**

This unit consists of the left bank levee and channel of the San Joaquin River from Burns Cutoff to Old River and the right bank levee and channel of Old River from the San Joaquin River to Middle River, a total distance of 16.59 miles. Also, a permanent access road extending along the right bank levee of Middle River for a distance of 1.42 miles. The area lies southwesterly from the city of Stockton and about 2 miles northwesterly from Lathrop. Location by levee mileage within Reclamation District No. 524 is from mile 0.00 on the left bank of the San Joaquin River at Burns Cutoff thence upstream (southerly) 6.26 miles to the south boundary of Reclamation No. 524. In Reclamation District No. 544, mile 0.00 for Unit No. 1 starts at the south boundary of Reclamation District No. 524 (about one-half mile north of the Brandt Bridge) thence extends southerly along the left bank of the San Joaquin River 6.11 miles to the junction of the San Joaquin River and Old River. For Unit No. 2 of R.D. No. 544, mile 0.00 starts at the junction of the San Joaquin River and Old River thence extends westerly 4.22 miles along the right bank of Old River to Middle River. There is also a permanent access road along the right bank levee of Middle River that extends for a distance of 1.42 miles. The area is in the County Or San Joaquin and in the general vicinity as shown on the Location Map 7.

Along the westerly side of the San Joaquin River, the grade of the adopted flood plain varies from elevation 20.2 at the junction of Old River and the San Joaquin River to elevation 7.4 at the lower end at Burns Cutoff. For Old River the grade of the adopted flood plain varies from elevation 20.2 at the junction of Old River and the San Joaquin River to elevation 15.4 at the junction of Old River and Middle River. The levee has been reconstructed to protect standards with a minimum crown width of 12 feet along the San Joaquin River and Old River. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit, the project design flood for the San Joaquin River is 18,000 cubic feet per second and 19,000 cubic feet per second for Old River.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letters dated 29 December 1958 and 3 January 1963. Other portions were transferred to the State Reclamation Board by letters dated 4 April 1957 and 10 April 1957.

UNIT NO. 8 RIGHT BANKS OF OLD RIVER AND SALMON SLOUGH WITHIN R.D. NO. 1 AND R.D. NO. 2089

This unit consists of the right bank of Old River and right bank of Salmon Slough between Middle River and Grant Line Canal; a total distance of about 4.05 miles. The area lies about 5 miles southwest of Stockton and 3-1/2 miles northeast of Tracy, California. Location by levee mileage along the right bank of Old River is from mile 0.00 at Middle River to mile 1.15 at the south boundary of R.D. No. 1 and from 0.00 for Unit No. 1 to mile 1.53 and mile 0.00 to Grant Line Canal mile 1.37 for Unit No. 2. These units are within R.D. No. 2089. The total distance is 4.05 miles. The area lies within the above-mentioned Reclamation Districts in the County of San Joaquin, California, and in the general vicinity as shown on the Location Map 8.

Along Old River and Salmon Slough the adopted flood plain is at elevation 15.4 at head of Middle River, at elevation 13.0 at Paradise Cut and elevation 10.8 at Grant Line Canal. All elevations are referred to mean sea level (1929 adjustment). The levee has been reconstructed to project standards with a minimum crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grade within this unit provides for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for Old River below Middle River is 15,000 cubic feet per second and for Salmon Slough and Old River below Paradise Cut the flow is 30,000 cubic feet per second.

Responsibility for operating and maintaining portions of this unit was officially accepted by the State Reclamation Board by letters dated 29 December 1958 and 25 October 1963.

UNIT NO. 9 LEVEES AROUND RECLAMATION DISTRICT NO. 2062 AND SAN JOAQUIN COUNTY FLOOD CONTROL DISTRICT-AREA NO. 2

This unit consists of the left bank and channel of the San Joaquin River from the head of Paradise Cut to head of Old River; the left bank of Old River to the confluence of Old River and Paradise Cut; and the right bank of Paradise Cut, a total distance of about 16.52 miles. The San Joaquin River lies south and east of this area; Old River lies along the east and north and Paradise Cut lies along the westerly side. Roughly, the area lies about five miles southwesterly from the City of Stockton. Location by levee mileage for Reclamation District No. 2062; Unit No. 1 starts at the

head of Old River (Mile 0.0); thence upstream along the left bank of the San Joaquin River 2.63 miles to the Southern Pacific Railroad; Unit No. 2 starts at the Southern Pacific Railroad crossing Paradise Cut (Mile 0.0) thence downstream along the river bank of Paradise Cut 4.03 miles to the confluence of Paradise Cut and Old River; Unit 3 starts at the confluence of Paradise Cut and Old River (Mile 0.0) thence 5.63 miles upstream along the left bank of Old River to the head of Old River. For the San Joaquin County Flood Control District-area No. 2, Unit No. 1 starts at the Southern Pacific Railroad crossing the San Joaquin River thence upstream along the left bank of the San Joaquin River 2.37 miles to the head of Paradise Cut; and Unit No. 2 starts at the head of Paradise Cut thence downstream along the right bank of Paradise Cut 1.84 miles to the Southern Pacific Railroad. The area is located within Reclamation District No. 2062 and the San Joaquin County Flood Control District-Area No. 2 in the County of San Joaquin, California and in the general vicinity as shown on the Location Map 9.

Along the left bank of the San Joaquin River, the grade of the adopted flood plain varies from elevation 25.0 at the head of Paradise Cut to elevation 20.2 at the head of Old River; along the left bank of Old River the grade of the adopted flood plain varies from elevation 20.2 at the head of Old River to elevation 13.0 at its junction with Paradise Cut; and along Paradise Cut the adopted flood plain varies from elevation 22.2 at the upper end to elevation 13.0 at the lower end. The levee has been reconstructed with a crown width of 20 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 37,000 cubic feet per second; Old River 19,000 cubic feet per second and Paradise Cut 15,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letters dated 4 December 1958, 29 December 1958, 7 January 1963, and 25 October 1963.

UNIT NO. 10 WEST LEVEE OF PARADISE CUT RECLAMATION DISTRICT NO. 2058 AND SAN JOAQUIN COUNTY FLOOD CONTROL DISTRICT

This unit consists of the left bank; levee and channel of Paradise Cut from the San Joaquin River to Old River and Tom Paine Slough, a distance of about 8.2 miles. The area is about 5 miles southwesterly from the City of Stockton and 2-1/2 miles west from Lathrop. Location by levee mileage within Reclamation District No. 2058 is from mile 0.00 at the junction of Old River and Paradise Cut to mile 6.72 at U. S. Highway 50, and within the San Joaquin County Flood Control District, Area No. 2 from mile 0.00 at U. S. Highway 50 to mile 1.48 at the junction of Paradise Cut and the San Joaquin River. The area is located within Reclamation District No. 2058 and the San Joaquin County Flood Control District in the County of San Joaquin, California and in the general vicinity as shown on the Location Map 10.

Along the westerly levee of Paradise Cut, the grade of the adopted flood plain varies from elevation 22.2 at the upper end at the San Joaquin River to elevation 13.0 at the lower end at the junction of Paradise Cut with Old River and Tom Paine Slough. The levee has been surfaced for patrol road purposes with a minimum crown width of 12 feet. The necessary turnouts, turnarounds and road approaches were also included in the work. Levee grade within this unit provides for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the Paradise Cut is 15,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letters dated 15 January 1962, and 25 October 1963.

UNIT NO. 11 WEST LEVEE OF SAN JOAQUIN RIVER FROM DURHAM BRIDGE TO PARADISE DAM WITHIN R.D. NO. 2085 AND R.D. NO. 2095

This unit consists of the left bank levee and channel of the San Joaquin River from the Durham Bridge to Paradise Dam, a total distance of about 8.58 miles. The area lies about 20 miles south of Stockton and 7 miles east from the town of Tracy, California. Location by levee mileage along the left bank of the San Joaquin River is from mile 0.00 at Paradise Dam to mile 3.38 at Banta-Carbona Intake within Unit No. 2 of R.D. No. 2095 and from mile 0.00 at Banta-Carbona Intake to mile 5.20 at the Durham Ferry Road within Unit No. 1 of R.D. No. 2085. The area lies within the above Reclamation Districts in the County of San Joaquin, California and in the general vicinity as shown on the Location Map 11.

Along the San Joaquin River left bank levee the grade of the adopted flood plain varies from elevation 34.2 at the Durham Bridge to elevation 25.0 at the Paradise Dam. All elevations are referred to mean sea level datum (1929 adjustment). The levee has been reconstructed to project standards with a minimum crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grade within this unit provides for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 52,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letters dated 29 December 1958, 10 November 1959, 15 January 1962, and 9 January 1968.

UNIT NO. 12 WEST LEVEE OF SAN JOAQUIN RIVER FROM OPPOSITE MOUTH OF TUOLUMNE RIVER DOWNSTREAM TO STANISLAUS COUNTY LINE WITHIN R.D. NOS. 2099, 2100, 2101 AND 2102

This unit consists of the left bank levee and adjacent channel of the San Joaquin River from the vicinity of the mouth of the Tuolumne River to the north line of Stanislaus River, a total levee distance of about 10.17 miles. The area lies about 14 miles southeast of the town of Tracy, California. Location by levee mileage along the left bank of the San Joaquin River is from mile 0.00 at the end of Stanislaus Road to mile 1.84 at the south end of R.D. No. 2102; mile 0.00 at Hospital Creek to mile 2.69 at the end of Stanislaus Road within R.D. No. 2100, mile 0.00 at the end of Center Road to mile 2.44 at Hospital Creek within R.D. No. 2099; and mile 0.00 near the Stanislaus County line to mile 3.20 at the southerly end of the levee within R.D. No. 2101. The area lies within the above-mentioned Reclamation Districts in Stanislaus County, California, and in the general vicinity as shown on the Location Map 12.

Along the San Joaquin River left bank levee, the grade of the adopted flood plain varies from elevation 42.7 at the upper end of R. D. No. 2102 to elevation 36.2 at the lower end of R.D. No. 2101. The levee has been reconstructed to project standards with a minimum crown width of 12 feet. The necessary drainage structures, road approaches, bank protection, and appurtenances were also

included in the work. Levee grade within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 46,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letters dated 28 December 1966.

**UNIT NO. 13 WEST LEVEE OF THE SAN JOAQUIN RIVER IN RECLAMATION DISTRICT
NO. 1602**

This unit consists of the west levee channel of the San Joaquin River between river miles 100.0 and 106.5, a total distance of about 5.9 levee miles. The area lies about 13 miles southwesterly from Modesto and 5 miles southeasterly from Patterson, California. Location by levee mileage is from mile 0.00 at Fig Avenue to mile 6.29 at Moran Road Or R.D. 1602. The area is located in Reclamation District No. 1602 in the County of Stanislaus, California, and in the general vicinity as shown on the Location Map 13.

Along the west levee the San Joaquin River within this unit, the grade of the adopted flood plain varies from elevation 56.8 at the lower end to elevation 60.7 at the upper end. The levee has been reconstructed to project standards with a minimum crown width of 12 feet along the San Joaquin River. The necessary drainage structures, road approaches, bank protection, and appurtenances were also included in the work. Levee grades within this unit provide for a freeboard of at least 3 feet above the adopted flood plain profile. Within this unit the project design flood for the San Joaquin River is 45,000 cubic feet per second.

Responsibility for operating and maintaining this unit was officially accepted by the State Reclamation Board by letters dated 13 October 1972.

State Constructed Portion. - Under the authorized plan of improvement for the portion of the Project upstream from Merced River, the State of California was to provide flowage easements in areas subject to flooding. However, in lieu of flowage easements the State chose to construct a bypass system consisting of levees and channel improvements. These improvements were coordinated with the Federal Government to insure the effectiveness of the Federal portion of the Project. The Eastside and Chowchilla Canal Bypass System consists primarily of manmade channels (bypasses) which divert and carry floodflows from the San Joaquin River at Gravelly Ford, along with inflows from other eastside tributaries, downstream to the mainstem just above Merced River. The system consists of about 193 miles of new levees, several control structures and other appurtenant facilities, and about 80 miles of surfacing on then existing levees. Construction of the original State system was initiated in 1959 and completed in 1966. Maintenance and operation of the completed State upstream bypass features of the Project are accomplished by the Lower San Joaquin Levee District (LSJLD). The Reclamation Board provided assurances to the Federal Government to operate and maintain the Project in accordance with regulations prescribed by the Secretary of the Army.

Location. - The project works are located within the Lower San Joaquin Levee District boundaries in the Counties of Merced, Madera, and Fresno. The improvements extend along and adjacent to the San Joaquin River from Merced River to Gravelly Ford (excluding that portion situated between Mendota Dam and the San Joaquin River Control Structure), along and adjacent to the alignment of the Eastside Bypass from the San Joaquin River to Chowchilla Canal Bypass, along and adjacent to the alignment of the Chowchilla Canal Bypass from the Fresno River to San Joaquin River, along and adjacent to the alignment of Bear and Owens Creeks between Eastside Bypass and East Side Canal, along the East Side Canal from Eastside Bypass to a point approximately 1.8 miles northwest of Bear Creek, along the alignment of Mariposa Bypass between the San Joaquin River and Eastside Bypass, along the alignment of Ash Slough between Eastside Bypass and Chowchilla Canal, and along and adjacent to the alignment of Berenda Slough from Eastside Bypass to a point approximately 1 mile upstream.

Project Works. - The project works consist basically of levees constructed along natural drainage channels to increase floodwater carrying capacity and levees constructed for floodwater bypass channels (for project design flows see Plate XXX). The necessary drainage structures have been incorporated into the levee system to intercept cutoff of natural and interior drainage, along with irrigation structures. The levees have gravel patrol roads on the levee crown, access roads to the levees and patrol bridges across flood and river channels from levee crown to levee crown so that all portions of the flood control system are reachable at all times to vehicular travel necessary for flood fighting and project maintenance operations. The necessary fencing and gates have been provided for the integrity of the project works. Channels of the project have been cleared and grubbed of debris, brush, trees, and other wild growth to increase the floodwater carrying capacity of the channels during periods of high water.

The project consists of other miscellaneous facilities such as control structures to divert floodflows and hydrologic facilities to index floodflows in the project. A more complete description of levees, irrigation and drainage structures, channels, and miscellaneous facilities of the project works can be found in Sections 3000, 4000, 5000, and 6000, respectively of the O&M manual. All elevations or vertical control for the project works when referred to are on U.S.C. & G.S. Sea Level Datum, 1929 adjustment.

LEVEES - The levees described in this manual extend along and adjacent to the San Joaquin River from Merced River to a point approximately 3 miles upstream from Mariposa Bypass, from junction with Eastside Bypass at Slough interchange pool to a point approximately 2.2 miles

upstream, and from junction with Chowchilla Canal Bypass to Gravelly Ford; along and adjacent to right bank of Salt Slough from junction with San Joaquin River to a point approximately 2.5 miles upstream; along and adjacent to the alignment of the Eastside Bypass from the San Joaquin River to Chowchilla Canal Bypass; along and adjacent to Bear and Owens Creeks from Eastside Bypass to East Side Canal; along the alignment of the left bank of East Side Canal from Eastside Bypass to a point approximately 1.8 miles northwest of Bear Creek; along and adjacent to the alignment of Mariposa Bypass from San Joaquin River to East-side Bypass; along and adjacent to Ash and Berenda Sloughs from Eastside Bypass to Chowchilla Canal; and along and adjacent to the alignment of Chowchilla Canal Bypass from its junction with Eastside Bypass to the San Joaquin River.

This system comprises a total distance of approximately 193.1 linear miles of levee as shown on the map showing levee units, Appendix C. These levees are with slopes of one on three waterside and one on two landside with crown widths varying from 12, 20, 24 to 28 feet. Levees constructed along streams have been provided with a freeboard of 3 feet above maximum design water surface elevation and on bypass levees the freeboard is 4 feet.

Patrol roads have been provided on the levee crown. These roads are 4-inch-thick crushed mineral aggregate surfacing with 3 percent cross slope from the levee centerline to the shoulder. The 12-foot-wide levee crown has a 10-foot-wide roadway with 1-foot taper at the shoulder and the 20-foot-wide levee crown has a 12-foot-wide roadway with 4-foot taper. The necessary drainage structures, road approaches and access roads, bank protection, and appurtenances were also included in this work.

CHANNELS. - The channel as defined for this project is that area lying along the waterway between the waterward toe of one levee and the waterward toe of the opposite levee. In cross section this includes the drainage channel and banks, and the area from top of bank to toe of levee which is called the berm or floodway.

The channels consist of natural drainage channels and bypass channels constructed as a part of the project. These channels extend along and adjacent the San Joaquin River from Merced River to Mendota Dam, and from junction with Chowchilla Canal Bypass to Gravelly Ford; along and adjacent to Salt Slough from junction with San Joaquin River to a point approximately 2.5 miles upstream; along and adjacent to the alignment of the Eastside Bypass from San Joaquin River to Chowchilla Canal Bypass; along and adjacent to Bear and Owens Creeks from Eastside Bypass to East Side Canal; along and adjacent to the alignment of Mariposa Bypass from San Joaquin River to Eastside Bypass; along and adjacent to Ash and Berenda Sloughs from Eastside Bypass to Chowchilla Canal; and along and adjacent to alignment of Chowchilla Canal Bypass from its junction with Eastside Bypass to the San Joaquin River. These areas are as shown on the Location Map of Appendix B.

An important feature included under this chapter is the Sediment Settling Basin situated in the Chowchilla Canal Bypass just below the control structure. The settling basin has been designed for a 1.5 project storm bed load. This volume of sedimentation storage is approximately 200,000 cubic yards. The main geometric shape of the settling basin measures 1,600 feet along the centerline of the bypass channel, 350 feet in width, and 7.5 feet in depth below an extended line between the entrance and exit inverts of the drainage channel. The side slopes are 3 to 1 with 500-foot wedge-shaped transition at each end conforming to the drainage channel section.

Sedimentation disposal areas have been provided on the landside of the Chowchilla Canal Bypass levees. On the right bank, the spoil area extends from Levee Mile 14.70 to Levee Mile 16.09 and on the left bank, from Levee Mile 13.99 to Levee Mile 15.27. Ramps have been constructed for

hauling the sedimentation material across the levees from the channel area to the spoil areas on the landward side of the levee system. Three of these ramps are on the right levee and five are on the left. Following is a plan and profile for assistance when it will be necessary to reestablish the settling basin: Also shown is the location of ramps and spoil areas.

Recent Channel Work

Eastside Bypass. - In the process of investigations for the 1985 Project modifications, a serious flood problem was discovered in the Eastside Bypass at the confluence with San Joaquin River. The design capacity of the bypass at this location is 16,500 cfs. This capacity was found to have deteriorated to between 6,000 and 7,000 cfs. Should the west bypass levee at this location fail due to flow capacity exceedence, nearly 100 square miles of primarily agricultural lands would be inundated. Two primary causes for the capacity reduction were identified. One was a buildup of sand beginning at the confluence and extending downstream in the bypass about 2 miles and amounting to about 1 million cubic yards (cy). The other cause consisted of subsidence of the bypass west levee in about the same location as the deposited sand. An emergency plan was formulated to reduce the chances of levee failure through removal of the sand. The plan, which is described in DM No. 5, also called for restoration of the west State Project levee. Removal of the sand by the Corps restored approximately 30 percent of the design capacity and reduced backwater effects which will lower the water surface upstream along San Joaquin River. The work was accomplished between November 1984 and February 1985 at a cost of about \$2.3 million. The LSJLD initiated construction to raise the west levee in February 1985.

The Reclamation Board was the local sponsor for this emergency work. In addition to operating and maintaining the completed work, the Board has agreed to insure restoration to grade and maintenance of the west Project levee and removal of other flow obstructions in the bypass at near the confluence location, thereby restoring much of the Project flow capacity at this location.

Except for the emergency work described, channel improvements in the bypass system to improve flow conditions were not considered as part of the recently authorized Project modifications for channel clearing, unless the channel work would directly impact flow conditions in the historical San Joaquin River.

Gravelly Ford. - In 1968, 1969, and 1970 the Corps conducted channel clearing under authority of Section 208 of the 1954 Flood Control Act. The work was in response to requests from the Upper San Joaquin River Association and included clearing vegetated growth and snags from about 8-1/2 miles of channel at critical locations from near Highway 41 to Gravelly Ford (see Plate 1). Required assurances, including maintenance responsibility for the cleared areas, were provided by the Upper San Joaquin River Flood Control Association.

Other levee and channel improvements. - As mentioned, the primary levee and channel improvement flood damage reduction facilities along San Joaquin River are the Federal and State portions of the Lower San Joaquin River and Tributaries Project. However, in addition, there is an intricate series of minor levees and other channel improvements constructed, owned, operated, and maintained by local interests throughout the natural river system. These improvements significantly reduce the threat of flood-related damages to primarily agricultural improvements close to the river.

Reservoirs. - Major development of water resources in the basin began over 130 years ago and varies from local diversions from rivers and streams to large multiple-purpose reservoirs and extensive levee and channel improvements. All of the six primary tributaries as well as the San

Joaquin River have extensive multiple-purpose reservoirs that include storage for flood control. These include New Melones Lake on Stanislaus River, New Don Pedro Reservoir on Tuolumne River, New Exchequer Dam and Reservoir on Merced River, the Merced County Stream Group Reservoirs, Buchanan Dam on Chowchilla River, Hidden Dam on Fresno River, Pine Flat Lake on Kings River, and Friant Dam (Millerton Lake) on San Joaquin River. With respect to flood control purposes, each of the reservoirs is operated to control floodflows on its respective downstream river, with the secondary objective to reduce floodflows along lower San Joaquin River to the extent possible. Mendota Dam, located on the San Joaquin River at the confluence with Kings River North, is used for irrigation water supply diversion. It provides few, if any, direct downstream benefits resulting from flood damage reduction.

Upstream dams are an integral part of the flood control system and each dam is operated in accordance with Federal operations and maintenance manuals. The operation considers the project purpose of the dam such as water supply, flood control, and power. The O&M manuals were developed independently for each dam and in general do not consider coordinated flood control operation for the complete system. Coordinated flood control operation is done by the Corps during periods of high water.

LOCAL COOPERATION

Federal Requirements

The recommendation of the Chief of Engineers contained in House Flood Control Committee Document No. 2, 78th Congress, 2nd Session, provides in part that:

(c) Construction of channel improvement works and levee construction and reconstruction on San Joaquin River and tributary channels,; subject to the condition that the State of California or other responsible local agencies give assurances satisfactory to the Secretary of War that they will (1) furnish flowage rights to overflow certain lands along the main San Joaquin River and all lands, easements, and rights-of-way necessary for construction of levees; (2) hold and save the United States free from damages due to the construction works and their subsequent maintenance and operation; and (3) maintain all levees and channel improvements after completion in accordance with regulations prescribed by the Secretary of War.

State Legislation

Adoption of Federal Policy. - Part 6 of the State Water Code is quoted in part:

Section 12651. The plan of improvement for flood control and other purposes on the Lower San Joaquin River and tributaries, including Tuolumne and Stanislaus Rivers, is adopted and authorized in accordance with the recommendations of the Chief of Engineers in Flood Control Committee Document Numbered 2, Seventy-eighth Congress, Second Session . . ."

Section 12657. Except as otherwise provided in Chapters 1 and 2 of this part, the Reclamation Board shall give assurances satisfactory to the Secretary of War that the local cooperation, required by Section 3 of the act of Congress approved December 22, 1944 (Public, Numbered 534, Seventy-eighth Congress, Second Session), will be furnished by the State in connection with the flood control projects authorized and adopted in Sections 12648, 12648.1, 12650,

12651, 12652, 12654 and 21656.5 and on any flood control projects on any stream flowing into or in the Sacramento Valley or in the San Joaquin Valley heretofore or hereafter approved and authorized by Congress.

Section 12658. Except as otherwise provided in Chapters 1 and 2 of this part, the Reclamation Board, in conjunction with the War Department, shall execute the plans and projects referred to in Section 12657 and exercise all powers granted to it in Part 4, Division 5 of this code. The Reclamation Board may make such modifications and amendments to the plans as may be necessary to execute them for the purposes stated in Chapters 1 and 2 of this part.

Establishment of Maintenance Areas. - Sections 12878 to 12878.21, inclusive of the 1957 California State Water Code sets forth a procedure, available when necessary, whereby adequate and uniform maintenance of flood control projects may be secured. In substance, when the State Engineer finds that there is a failure on the part of local agencies to properly maintain project works or that a local agency no longer desires to carry out project maintenance, a report to that effect is made to the State Reclamation Board, which is empowered, after hearing, to form a "maintenance area" and thereafter the Department of Public Works maintains that particular unit of project works, and the Reclamation Board apportions the cost thereof upon the property benefitted within the "maintenance area" on an ad valorem basis and the assessment is extended for collection together with county taxes on the county assessment roll.

MAINTENANCE REQUIREMENTS

General Rules and Procedures

The general rules for maintenance and operation of flood-control works are as follows:

- a. The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.
- b. The State of California, the responsible local agency, which furnished assurance that it will maintain and operate flood control works of the Lower San Joaquin River Levees Project in accordance with regulations prescribed by the Secretary of Army as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.
- c. A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.
- d. No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

e. No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer, Corps of Engineers, or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer, or if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

f. It shall be the duty of the superintendent to submit a semi-annual report to the District Engineer covering inspection, maintenance and operation of the protective works.

g. The District Engineer or his authorized representative shall have access at all times to all portions of the protective works.

h. Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

i. Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

j. The District Engineer will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations. When special conditions do not permit full compliance with the general provisions of the Federal Control Regulations, or when conditions peculiar to a unit require additional care or attention, such supplement instructions will be contained in the Supplement Manual concerned.

Levees

Maintenance. - Applicable portions of the Flood Control Regulations, found in the Title 33 of the Code of Federal Regulations, paragraph 208.10(b)(1) are quoted as follows:

(b) *Levees* - (1) *Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures are being carried out and further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has

taken place;

- (ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;
- (iii) No seepage, saturated areas, or sand boils are occurring;
- (iv) Toe drainage systems and pressure relief walls are in good working condition, and that such facilities are not becoming clogged;
- (v) Drains through the levees and gates on said drains are in good working condition;
- (vi) No revetment work or riprap has been displaced, washed out, or removed; (see special instructions)
- (vii) No action is being taken; such as burning grass and weeds during inappropriate seasons which will retard or destroy the growth of sod; (see special instructions)
- (viii) Access roads to and on the levee are being properly maintained;
- (ix) Cattle guards and gates are in good condition;
- (x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;
- (xi) There is no unauthorized grazing or vehicular traffic on the levees;
- (xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, *and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.* (Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.)

Special Instructions. -

Revetment Work. - Due to the fact that many reaches of levees with their contiguous banks have been constructed with stone protection work consisting of quarry stone or cobbles, the provisions additional requirements are as follows:

Where scour, wash, settlement or failure of a portion of the originally provided stone protection has been noted, or where inspection indicates that such damage may result during the next flood or high water period, the scour or wash shall be filled with earth free from brush, roots, sod or

other unsuitable material and additional stone shall be placed upon the earth fill to bring the stone protection to its original section. In case of emergency and when stone is not available, sand bags or bags filled with gravel may be used for temporary repair measures.

When permanent repair of the stone protection is made, the stone used shall, as far as possible, be similar to the kind and gradation as originally used, and shall be placed to the thickness as shown in appropriate O&M Manual. Along reaches of the San Joaquin River and tributaries where the levees are subject to excessive wave wash and at other locations where filter was originally placed or where it may be required, repair of stone protection will include the placement of a properly graded six inch filter layer under the stone protection.

In the event an inspection reveals that due to scour, settlement or other causes, stone protection on the levee or bank is required beyond the limits of the original construction or in reaches of the levee or bank not originally provided with such protection, local interests will provide additional sloping of the bank and placement of stone protection as needed to protect completed work. The work shall be done in a manner acceptable under a standard engineering practice. Drawings or prints showing such improvements or alterations shall be furnished the District Engineer after completion of the work.

Care of Vegetation on Levee. - Due to conditions peculiar to this area, the growth of sod on the levee slope is not practicable. Accordingly, the following special instructions are furnished in lieu of the prescribed general regulations:

The Superintendent shall provide for clearing of brush, trees, and other wild growth from the levee crown and slopes. Brush and small trees may be retained on the waterward slope where desirable for the prevention of erosion and wave wash.

Weeds, grasses, and debris on the levee may be burned during appropriate seasons, where not dangerous or impracticable, in order to permit the detection of cracks, holes, burrows, slips, and other damage and to permit the detection and extermination of burrowing animals. Grass and weeds on levee slopes should be mowed where removal by burning is dangerous or impracticable, such as on peat levees or where burning would constitute a hazard.

Repairs to Levee Embankment. - Methods used for repair or reconstruction of the levee fill will depend on the extent of the damaged section. If of small extent, the most suitable method will be to bring the levee back to line and grade by a fill made in 6-inch layers of earth free from brush, roots, sod or other unsuitable matter. If of larger extent, the fill should be made in the same manner as the original construction, of selected material from borrow pits approved for the project, placed in uniform layers of loose material and not more than 6 inches in depth and compacted in accordance with the specifications under which the work was completed or compacted according to approved construction practices.

Depredations of Burrowing Animals. - Dens and runways formed within the levee by burrowing animals are frequently the causes of levee failures during flood stages. Burrowing animals such as muskrats, ground hogs, ground squirrels, moles and gophers, found in the levee should be exterminated. The dens and runways should be opened up and thoroughly compacted as they are backfilled. Levees kept properly cleared are not seriously menaced by burrowing animals as they prefer areas where a protective cover, such as high grass, weeds, and brush is found. Several methods of extermination are found effective, such as trapping, baiting, and poison gases, depending

on the type of animal present and the time of year the work is done. Advice concerning the best methods in each locality can be obtained from the County Agricultural Agent.

Access Roads. - Access roads to the levees shall be maintained in such condition that they will be accessible at all times to trucks used to transport equipment and supplies for maintenance of flood fighting.

Operation. - During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

- (i) There are no indications of slides or sloughs developing;
- (ii) Wave wash or scouring action is not occurring;
- (iii) No low reaches of levee exist which may be overtopped;
- (iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section

Channels and Floodways

Maintenance. - Applicable portions of the Flood Control Regulations, found in the Title 33 of the Code of Federal Regulations, paragraph 208.10(g)(1) are quoted as follows:

(g) Channels and Floodways – (1) Maintenance.

Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

- (i) The channel or floodway is clear of debris, weeds, and wild growth;
- (ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;
- (iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;
- (iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;
- (v) Riprap sections and deflection dikes and walls are in good condition;
- (vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. *Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for the periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.*

Other Maintenance Requirements. - The purpose of the floodflow channels inspection and maintenance is to insure that conditions which affect the channel capacity will remain substantially the same as those considered in the design assumptions and that no new conditions develop that may affect the stability of the project structures. Channel maintenance along navigable waterways relates to such maintenance as is required for flood control and is not to be confused with the snagging, clearing and dredging operations carried on by the United States in conjunction with maintenance of Federal navigation projects. Maintenance along channels which are not navigable waterways are the sole responsibility of local interests when such channels must be maintained to a certain capacity for flood control. Particular attention will, therefore, be given the following:

- (1) Weeds and other vegetal growth in the channel shall be cut in advance of the flood season and, together with all debris, removed from the channel.
- (2) Operations of any nature upstream from the project that would affect flow conditions.
- (3) Shoaling or aggradation at the inlets or outlets of side drainage structures may render them inoperative. It is, therefore, imperative that all drains be kept cleaned out and unobstructed at all times.
- (4) Dumped rock or other suitable types of protection should be placed at locations found by experience to be critical trouble points, with a view to stabilizing the channel alignment and preserving the general uniformity of the bank lines.
- (5) Sediment, rubbish, industrial waste or any debris plugs or other obstructions should be removed from the channel to prevent any tendency for the flows to be deflected within the channel. The heavy material likely to accumulate in the new channel at the mouths of tributaries should be removed to keep the channel clear.
- (6) All eroded concrete shall be repaired as soon as reinforcing steel is exposed or erosion reaches a depth of 4 inches. For this purpose, it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the section with pneumatically placed Portland cement mortar. All evidence of settlement, deviation from grade, uplift, or failure of concrete structures shall be referred to the State Engineer for analysis and remedial measures.
- (7) All damage to fencing, posts, barbed wire or galvanizing whether resulting from accidental or willful injuries or from corrosion, shall be promptly repaired with new material in order to maintain satisfactory protection to the public.
- (8) Earth fills should be checked for settlement, erosion of levee slopes, excessive seepage or saturation area back of fills and condition of bank protection - concrete or stone blanket.

(9) Right-of-way should be checked for presence of dumped refuse and encroachment of trespass.

Operation. - Pertinent requirements of the Code of Federal Regulations, Paragraph 208.10(g)(2), are as follows:

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes, and walls, drainage outlets, or other flood control structures repaired.

Repair of Flood damages

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 local agency responsible for maintenance will contact a representative of the Department of Water Resources, State of California, who coordinates maintenance of project works of the Lower San Joaquin River and Tributaries Flood Control Project. The State representative will give assistance or advise, or will determine appropriate action to be taken.

Inspection Procedure. Since the enactment by State legislation of Chapter 1528 Statutes of 1947, the Department of Water Resources, State of California, has made semi-annual inspections of all levees of authorized flood control projects in the Sacramento-San Joaquin drainage basin pursuant to the Federal Regulations of 16 August 1944 (Title 33), and reports its findings to the local agency, the State Reclamation Board and the Sacramento District, Corps of Engineers, U. S. Army. This activity, initiated pursuant to section 208.10(a) of the Federal Regulations, has in effect provided for transfer from the local agencies to the State Department of Water Resources the obligation of compliance with Sections 8371, 8372, and 8373 of the Water Code of State of California. These sections of the Code regulate the local responsible agencies to submit a report to the State Department of Water Resources on or before 1 June of each year on the condition of the levees within their jurisdiction. Supervisory powers and duties of the Department are applicable to all works of the Lower San Joaquin River and Tributaries Flood Control Project maintained and operated by the local agencies without regard to status of completion, or expenditure of Federal funds on the construction of such work.

The following procedure is used in inspecting the levees of the responsible maintaining agency:

Personnel of the State Department of Water Resources make a detailed inspection in the spring and fall of each year and make a report of any required maintenance. The inspection objectives are to determine if the following items, which are a condensation of Federal Regulations, are being adhered to:

a. That all brush, trees and wild growth other than sod are removed from the levee crown and slopes.

b. That all weeds, grass and debris on the levee have been burned during the appropriate season, where not dangerous or impractical.

c. That all grass and weeds on the levee have been mowed where removal by burning is dangerous or impracticable. This applies only on peat levees or where burning would constitute a hazard to improvements.

d. That all burrowing animals have been exterminated.

e. That all caves, sloughs, burrows, holes, slips or other damaged portions of the levee have been repaired.

f. That all irrigation and drainage structures through the levee are in good working condition.

g. That no revetment work or riprap have been displaced, washed out or removed.

h. That the crown of the levee is well shaped and maintained and that unauthorized vehicular travel is restricted.

i. That stock grazing on the levee is restricted to conditions and seasons when the levee would not be seriously scarred or otherwise damaged thereby.

j. That encroachments are not being erected on the levee would hinder travel by authorized patrol vehicles.

k. Prevent the erection of structures on, additions to, or alterations of, the levee unless authorized by permit from the State Reclamation Board.

Following this detailed inspection a joint field inspection is made with representatives of the responsible maintaining agency and the State Department of Water Resources to review and discuss the inspection report.

Upon completion of the fall inspection the State Department of Water Resources publishes an annual report entitled, "Status of Project Levee Maintenance" which indicates the degree of proficiency attained by each obligated local agency in providing required maintenance.

State portion of Project.

Local Cooperation. - Assurance of cooperation by local interests to maintain and operate the project is provided by an agreement made and entered into by and between the Reclamation Board of the State of California and the Lower San Joaquin Levee District, dated March 31, 1956, an agreement terminating the aforesaid agreement, dated October 7, 1958, and an agreement dated October 2, 1962, supplemental and amendatory to the agreement dated October 7, 1958.

Sections 12878 - 12878.45 of the 1965 State Water Code sets forth a procedure, available when necessary, whereby adequate and uniform maintenance of flood control projects may be secured. In substance, when the Department of Water Resources finds that there is a failure on the part of local agencies to properly maintain project works or that a local agency no longer desires to

carry out project maintenance, a report to that effect is made to the State Reclamation Board, which is empowered, after hearing, to form a "maintenance area" and thereafter the Department of Water Resources maintains that particular unit of project works, and the Reclamation Board apportions the cost thereof upon the property benefitted within the "maintenance area" on an ad valorem basis and the assessment is extended for collection together with county taxes on the county assessment roll.

Upon completion of the construction of any portion of the authorized Lower San Joaquin River Flood Control Project and receipt of written notice from the Reclamation Board, the district shall be responsible for the operation and maintenance of those completed portions of the project. Letters of written acceptance of completed portions of the project are on file with the Reclamation Board at Sacramento.

State Project O&M. - Operation and Maintenance Manuals have been prepared by the Department of Water Resources, Statewide Operations Office for the Reclamation Board to be employed by the Lower San Joaquin Levee District. The district has the responsibility for the operation and maintenance of the authorized Lower San Joaquin River Flood Control Project. The manuals set forth operating criteria and maintenance standards to be used by the district for the integrity of the project. These requirements follow closely the requirements discussed above. For changes or modifications see the referenced O&M manual.

CHECK LISTS

Suggested check list forms for reporting inspections are attached.

EXISTING CONDITIONS

An annual inspection report in prepared by the California Department of Water Resources, Division of Flood Management of the quality of maintenance of flood control levees, structures, and channels operated under cooperative State and Federal agreement. Review of these reports indicates that overall maintenance of the Lower San Joaquin River Flood Control Project is good. However, studies and site visits conducted during the conduct of this reconnaissance investigation has revealed several specific deficiencies in the upkeep of levees and channel capacities. These are detailed in tables 1 and 2.

TABLE 1

Levee And Channel Maintenance Deficiencies

(see Mike for Table)

TABLE 2

Selected Channel Capacity Status

REACH	DESIGN CAPACITY (cfs)	EXISTING CAPACITY (cfs)
San Joaquin River		
Upstream of Chowchilla Canal Bypass Diversion	8,000	
Chowchilla Canal Bypass to Mendota Dam	2,500	
Mendota Dam to Sand Slough Control Structure	4,500	
Sand Slough Control Structure to Mariposa Bypass	1,500	
Mariposa Bypass to Eastside Bypass	10,000	
Eastside Bypass to Merced River	26,000	
Merced River to Toulumne River	45,000	
Toulumne River to Stanislaus River	46,000	
Stanislaus River to Walthall Slough	52,000	
Walthall Slough to Old River	37,000	
Old River to Stockton DWSC	18,000	
Chowchilla Canal Bypass	5,500	8,800/8,500
Eastside Bypass		
Fresno River to Berenda Slough	10,000	14,600/16,600
Berenda Slough to Ash Slough	12,000	15,500
Ash Slough to Sand Slough	17,500	12,800
Sand Slough to Mariposa Bypass	16,500	7,800
Mariposa Bypass to Owens Creek	12,000	
Owens Creek to Bear Creek	13,500	7,000
Bear Creek to San Joaquin River	18,500	
Old River		
San Joaquin River to Middle River	19,000	
Middle River to Paradise Cut	15,000	
Below Paradise Cut (with Salmon Slough)	30,000	
Paradise Cut	15,000	

FUTURE WITHOUT PROJECT CONDITIONS

O&M ALTERNATIVE

SUGGESTED CHECK LIST NO. 1

LEVEE INSPECTION REPORT

Date _____

Inspected by _____

Report number of places requiring maintenance work opposite each item listed below. A separate report should be submitted describing the necessary maintenance work for each location.

Reference Manual No. _____

Item : No. :	Description	: Number of : Places
1	: Settlement, sloughing, or loss of grade	: _____
2	: Caving, (either side of levee)	: _____
3	: Seepage, saturated	: _____
4	: Rip-rap	: _____
5	: Sod	: _____
6	: Access roads and road ramps	: _____
7	: Cattle guards and gates	: _____
8	: Crown of levee	: _____
9	: Unauthorized grazing or traffic	: _____
10	: Unauthorized encroachment on rights-of-way	: _____
11	: Unauthorized excavation and loose backfill	: _____
12	: Accumulations of drift, trash or debris	: _____
13	: Weed or undesirable vegetation	: _____
14	: Miscellaneous pipe crossings	: _____
15	: Inappropriate burning of grass	: _____
16	: Other items not included above	: _____

Inspected by _____

SUGGESTED CHECK LIST NO. 2
UNIT NO. _____
SAN JOAQUIN RIVER

Inspector's Report Sheet No. _____ Inspector _____
Date _____ Superintendent _____

Item	Remarks
a) Location by Station	
b) Settlement, sloughing, or loss of grade	
c) Erosion of both levee slopes	
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	

Instructions for Completing Suggested List No. 2

- 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 or a foot. If sloughing has caused a change in slope or the 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 or 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.

SUGGESTED CHECK LIST NO. 3
 CHANNEL AND RIGHT-OF-WAY
 UNIT NO. ____
 SAN JOAQUIN RIVER

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 a aggradation or degradation	
f) Condition of bridges	
g) Condition of bridges	
h) Measures taken since last inspection	
i) Comments	

Instructions for Completing Suggested Check List No. 3

- 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.

SUGGESTED CHECK LIST NO. 4
DRAINAGE AND IRRIGATION STRUCTURES
UNIT NO. _____
SAN JOAQUIN RIVER

Inspector's Report Sheet No. _____ Inspector _____

Date _____ Superintendent _____

(a)	Levee Mile	
(b)	Bank	
(c)	Debris or other obstruction to flow	
(d)	Damage of 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	

Instructions for completing Suggested Check List No. 4

- (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 evidence of settlement, cracks, "pop-outs", spaces, abrasive wear, or other deterioration. Record conditions under Column (c).
- (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.

SUGGESTED SEMI-ANNUAL REPORT FORM

TO: The District Engineer
Sacramento District
Corps of Engineers
650 Capitol Avenue
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__) Unit No. 1 of the San Joaquin River and Tributaries Project 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 9.0 on the gage at McLeod Lake) 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