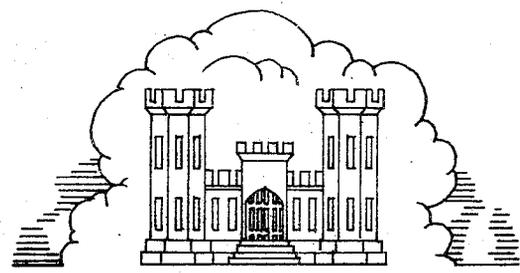

**OPERATION AND MAINTENANCE MANUAL
FOR
CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
CHANNEL IMPROVEMENT
AND LEVEE CONSTRUCTION
BUCHANAN DAM AND
H. V. EASTMAN LAKE PROJECT
MADERA, MERCED AND MARIPOSA COUNTIES
CALIFORNIA**



**DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA**

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BUCHANAN DAM-EASTMAN LAKE
CHOWCHILLA RIVER, CALIFORNIA

CHANNEL IMPROVEMENTS AND
LEVEE CONSTRUCTION

SECTION I - INTRODUCTION

1-01 Authorization - The Buchanan Dam, Eastman Lake Project of which improvement of the downstream channels is a part, was authorized by The Flood Control Act of 1962, Public Law 87-874, Eight-seventh Congress, 2nd Session, in accordance with the recommendations of the Chief of Engineers in Senate Document 98, which provides for channel improvement work on Chowchilla River and its tributaries downstream from Buchanan Dam.

1-02 Location - The Chowchilla River is a tributary of the San Joaquin River and its drainage basin extends from the San Joaquin River on the valley floor to an intermediate ridge on the westerly slope of the Sierra Nevada. The basin, including the valley portion, has a length of about 60 miles and an average width of about 10 miles. The Buchanan dam is located about 16 miles northeast of the city of Chowchilla, and has a watershed area above the Buchanan Dam Site of about 235 square miles of foothill and mountain area. Ash and Berenda Sloughs are distributary channels of the Chowchilla River located in Madera County within San Joaquin Valley.

1-03 Description of Project Works - The flood control project covered by this manual extends along Chowchilla River from Buchanan Dam downstream to the Chowchilla Canal, Ash Slough from its bifurcation with the Chowchilla River downstream to the Chowchilla Canal and on Berenda Slough from its bifurcation with Ash Slough downstream to the Chowchilla Canal. Work on Ash and Berenda Slough consisted of levee construction, enlargement, and setback along both banks. Channel enlargement was also accomplished upstream from the end of the project levees where existing channel capacities were inadequate to carry project design flows. The control structure constructed at the bifurcation of Ash and Berenda Sloughs is described in Para 4-04.

1-04 Protection Provided - Buchanan Reservoir and the channel improvements provide a high degree of flood protection to about 110,000 acres of agricultural and suburban lands along Chowchilla River and its distributaries, and to the city of Chowchilla. The land along both sides of Chowchilla River, Ash Slough and Berenda Slough, is used primarily for orchards, vineyards and row crops. The flood plain varies in width and extends from the foothill line downstream to the San Joaquin River,

a distance of about 25 miles. Main lines of the Southern Pacific and Santa Fe Railroads, and US Highway No. 99 and various state and county roads cross the flood plain. Since Chowchilla River floodwaters contribute to flooding along the lower San Joaquin River and in the Sacramento-San Joaquin Delta, the flood storage available in H.V. Eastman Lake provides additional protection to these areas.

1-05 Construction Data and Contractor - The construction contracts required by the Corps of Engineers on the channel improvement work for this project was accomplished under the following contracts:

a. Channel improvement and levee construction on Ash and Berenda Sloughs as a part of the Buchanan Dam Project was accomplished under contract No. DACW05-75-C-0067 by L. D. Folsom during the period from May 1975 to March 1976, Specification No. 4478 and Drawing No. SJ 4-4-106 (35 sheets).

b. Control structure construction at the Ash and Berenda Slough bifurcation, was accomplished under contract no. DACW05-76-C-0029 by NHL Company during the period from September 1975 to February 1976 Specification No. 4944 and Drawing No. SJ 4-4-127 in 14 sheets.

1-06 Floodflows - For the purpose of this manual the term "floodflow" or "high water period" refers to flows when the water surface in the streams reaches or exceeds the limits given as follows:

Ash Slough - Highway 152, staff gage reading of 6.0 feet
with approximate flow of 3750 c.f.s.

Berenda Slough - Highway 152, staff gage reading of 2.3 ft.
with approximate flow of 1500 c.f.s.

SECTION II
LOCAL COOPERATION REQUIREMENTS

2-01 Requirements for local cooperation - Construction of the channel improvement downstream of the Dam was undertaken by the United States subject to the conditions specified in Flood Control Act, October of 1962 Senate Document No. 98, 87th Congress, 2nd Session, requiring local interests to give assurances satisfactory to the Secretary of the Army that they would:

- a. Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project;
- b. Make all necessary relocations and alterations to existing improvements, including highway facilities, which may be required for construction of the project;
- c. Hold and save the United States free from damages due to the construction works;
- d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army; and
- e. Preserve, or restore and thereafter maintain, the unimproved portions of the channels along Chowchilla River and Ash and Berenda Sloughs from Buchanan Dam downstream to the Chowchilla Canal at the capacities existing in 1960. These channels are to be maintained to capacities as listed below:

CHOWCHILLA RIVER

Buchanan Dam site to head of Ash Slough	20,000 c.f.s.
Head of Ash Slough to 1 mile downstream from State Route 99 (previously US Highway 99)	1,000 c.f.s.
One mile downstream from State Route 99 to 4 miles downstream from State Route 99	500 c.f.s.
Four miles downstream from State Route 99 to 10 miles downstream from State Route 99	75 c.f.s.

ASH SLOUGH

Head of Ash Slough to head of Berenda Slough	15,000 c.f.s.
Head of Berenda Slough to 2 miles east of State Route 99	10,000 c.f.s.
Two miles east of State Route 99 to 1/4 mile west of State Route 99	6,000 c.f.s.

BERENDA SLOUGH

Head of Berenda Slough to Avenue 21-1/2	4,000 c.f.s.
Avenue 21-1/2 to 1/2 mile downstream from Road 13:	2,000 c.f.s.

2-02 Assurances Provided by Local Interests - The Reclamation Board of California is the local sponsor of this project. By letters dated 18 May 1971, and 20 September 1971, the Reclamation Board forwarded copies of resolutions providing their assurances which met the requirements of local cooperation. The assurances were formally accepted by the District Engineer on 8 December 1971.

2-03 Acceptance by The Reclamation Board - Responsibility for operating and maintaining the Chowchilla River Project was officially transferred to The Reclamation Board by Sacramento District letters dated 1, 9 and 29 March 1976. The Reclamation Board by letters dated 5 March and 21 May 1976, accepted work completed on the Chowchilla River Channel Improvement Project, see Exhibit F.

SECTION III

MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01 Reference to Approved Regulations. This manual is submitted in accordance with provisions of the code of Federal Regulations, Title 33 Navigation and Navigable Waters, as of 1 January 1962, Chapter II, Corps of Engineers, Department of the Army, Part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works, a copy of which is included as EXHIBIT A, sheets 1 and 2.

3-02 Intent of Regulations. The general intent of the regulations approved by the Secretary of the Army is stated in paragraph 208.10(a)(1) of the above regulations as follows: "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."

The principle mission of the Corps of Engineers, during flood emergencies, is to insure that flood control works are properly operated and maintained and offer technical advice to enable local interests to obtain maximum flood protection. All other matters become secondary and will yield precedence to the accomplishment of the above-stated mission. During flood periods local interests maintain close liaison with the office of the District Engineer, Corps of Engineers. However, in the event it is evident that all available county and local resources are insufficient to cope with the situation and the necessity for an emergency proclamation is anticipated, requests for State assistance in flood fighting should properly be made direct to the Department of Water Resources, which is the agency designated by the State Legislature, to receive requests from local agencies for assistance in flood fighting. This agency is authorized to request Federal assistance from the Corps of Engineers when State and local resources are insufficient to cope with the situation. Therefore, it is desired to emphasize that requests for Federal assistance in flood fighting should be made only when it is evident that County, State and/or other local equipment and manpower will be exhausted and local resources are insufficient to cope with the flood emergency situation.

3-03 Purpose of this Manual. In view of the large number of local flood protection projects authorized by Congress and the repetitious nature of regulations to govern maintenance and operation of each individual project, and in order that local interests may be fully aware of the extent of the obligations assumed by them in furnishing assurances of local cooperation for projects to be constructed in the future, the general regulations described above were established by the Secretary of the Army. The general regulations approved by the Secretary of the Army, August 1944, were intended to be sufficiently broad in scope and general in nature as to be applicable to all flood protection projects for which such regulations are required by law.

Section 208.10(a)(10) of the regulations read as follows: "The Department of the Army 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 this part." This manual has, therefore, been prepared to furnish local interests with information on the project works and advise as to the details of the operation and maintenance requirements applicable to this particular project, to state procedure required by the Department of the Army, and to indicate satisfactory methods of floodfighting operations and emergency repairs. The project works are to be maintained and operated in accordance with the Flood Control Regulations referred to above and interpretations thereof contained herein.

3-04 Definitions. The Reclamation Board of California is the local interest agency which provided the assurances for the project. The Board shall designate a local agent to act for the assurer and implement the instructions contained herein. This agent shall hereinafter be designated as the "Superintendent." The term "District Engineer" shall be defined to mean the District Engineer of the US Army Engineer District, Sacramento, or his authorized representative. The term "flood" shall mean any flow in the project streams for which the water surface reaches or exceeds the readings given in the Floodflow Table Section I, Paragraph 1-06. The term "right bank" or "left bank" shall be defined to mean the right or left bank or side, respectively, of a stream or channel when facing downstream.

3-05 General Provisions of Regulation. In addition to that quoted in paragraph 3-02 above, the general provisions of the Flood Control Regulations, contained in paragraphs 208.10(a)(2), to 208.10(a)(9), both inclusive, are quoted as follows:

"(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the 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 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.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) 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.

(5) 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 of the Department of the Army or his authorized representative that such improvements, 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 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 works.

(6) 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.

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

(8) Maintenance measures or repairs which the District Engineer deems necessary, shall be promptly taken or made.

(9) 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."

3-06 Assistance to be Furnished by the District Engineer The District Engineer will:

a. Furnish The Reclamation Board "As Constructed" drawings of the project works upon issuance of this manual.

b. Make periodic inspections of the project works and notify The Reclamation Board of any repairs or maintenance measures which the District Engineer deems necessary in addition to measures taken by the Superintendent.

c. Submit to the Office, Chief of Engineers, all cases of noncompliance with full details thereof for determination of corrective measures to be taken.

d. Make prior determination that any proposed encroachment, improvement, excavation, or construction within the right-of-way, or alteration of the project works, will not adversely affect the functioning of the protective facilities.

e. Assist local interests as may be practicable, in their duties of ascertaining storm developments having flood-producing potentialities, assembling flood-fighting forces and materials, and initiating and carrying out flood-fighting operations to the extent permitted by existing laws and regulations.

3-07 Responsibilities of the Superintendent. In line with the provisions of the Flood Control Regulations, the general duties of the Superintendent include the following:

a. Training of Key Personnel. Key personnel shall be trained in order that regular maintenance work may be performed efficiently and to insure that unexpected problems related to flood control may be handled in an expeditious and orderly manner. The Superintendent should have available the names, addresses, and telephone numbers of all his key personnel and a reasonable number of substitutes. These persons should, in turn, have similar data on all of those who will assist them in the discharge of their duties. The organization of key personnel should include the following:

(1) An assistant to act in the place of the Superintendent in case of his absence or indisposition.

(2) Work supervisors in sufficient number to lead maintenance patrol work of the levee, inspect the channel, and operate the gate structures properly during flood periods. High qualities of leadership and responsibility are necessary for these positions.

b. Files and Records. The Superintendent shall maintain a file of reports, records, and drawings concerning the project works readily available at all times to the District Engineer.

c. Encroachment or Trespass on Right-of-Way. In accordance with the provisions of Flood Control Regulations 208.10(a)(4), no encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted on the rights-of-way for the protective facilities. The Superintendent will, therefore, cause notices to be posted at conspicuous places along the project right-of-way directing public attention to this regulation. The Superintendent shall take whatever action is necessary under his own authority to remove any unauthorized encroachment or to prosecute the trespassers.

d. Permits for Right-of-Entry or Use of Portion of Right-of-Way.

Permits for temporary right-of-entry or use of portion of the right-of-way shall not be issued without prior determination by The Reclamation Board sufficiently in advance of issuance to permit adequate study and consideration and determination of conditions to be embodied in the permit document.

e. Permits for Improvements or Construction Within the Project Right-of-Way. All requests for permits for construction of any improvements of any nature within the limits of the project right-of-way shall be referred to the District Engineer through The Reclamation Board for determination that such construction will not adversely affect the stability, safety, and functioning of the protective facilities, and for definition of conditions under which permit should be granted. These conditions will include, among others, the following items:

(1) That all work shall be performed:

(a) In accordance with standard engineering practice; drawings or prints of proposed improvements or alterations to the existing flood-control works must be submitted for approval to the District Engineer sufficiently in advance of the proposed construction to permit adequate study and consideration of the work.

(b) To the satisfaction of the District Engineer.

(2) After approval of the permit by the Board or the General Manager, duplicate copies of the final Board Order concerning proposed improvements shall be furnished the District Engineer.

f. Coordination of Local Activities. In accordance with the provisions of Flood Control Regulations, paragraph 208.10(a)(9), the Superintendent will, during periods of floodflow, coordinate the functions of all agencies, both public and private, that are connected with the protective works. Arrangements shall be made with the local law enforce-

ment agencies, street departments, and railroad and utility companies for developing a coordinated flood-fighting program; and an outline of this program shall be filed with the District Engineer.

g. Inspection.

(1) Flood Control Regulations, paragraph 208.10(b)(1) are quoted in part as follows:

"(b) Levees (1) Maintenance . . . Periodic inspections shall be made by the Superintendent to insure that . . . maintenance measures are being effectively carried out . . . 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."

(2) For sake of uniformity, and to the extent practicable, the dates of inspection shall be as follows: 1 November through 15 April, and/or immediately following each floodflow in excess of readings listed in the Section I, Para. 1-06, Floodflows.

(3) The suggested check lists and instructions shown in EXHIBIT E, Sheets 1 to 6 inclusive, should be followed in each inspection to insure that no features of the protective system are overlooked. Check lists locally typed or printed in conformity with sheets 1, 3 and 5 shall have printed on the reverse side of the applicable instructions shown on sheets 2, 4 and 6 EXHIBIT E. Carbon copies of the inspector's original field notes as recorded on the check list shall be transmitted to The Reclamation Board for forwarding to the District Engineer immediately following each inspection, and one copy included as an inclosure to the semi-annual report as provided in paragraph 3-07(i)(1) of this manual.

h. Maintenance.

(1) Flood Control Regulations, paragraph 208.10(b)(1) are quoted in part as follows:

"(b)(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 . . . removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces . . . 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."

(2) Full responsibility for making the repairs and the methods used is placed on the Superintendent but the experience and facilities of the District Engineer will be available to him for advice and consultation.

(3) All repairs shall be made in accordance with standard engineering practice, to line and grade and in accordance with details shown on the "As Constructed" drawings for the project works, copies of which are included in EXHIBIT B. No change or alteration shall be made in any feature of the project works without prior determination by The Reclamation Board and the District Engineer that such alteration will not adversely affect the stability and functioning of the protective facilities. Plans and specifications of all changes or alterations that may be proposed by the Superintendent shall be submitted to The Reclamation Board for forwarding to the District Engineer for investigation and approval before prosecution of the work.

1. Reports.

(1) Semi-Annual Report. In accordance with the provisions of the Flood Control Regulations, paragraph 208.10(a)(6), the local agency providing the assurances shall submit within a 10-day period following 1 November and 15 April of each year, a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works. This report will present a statement of:

- (a) The physical conditions of the protective works as summarized from the logs of inspection.
- (b) Flood occurrences and behavior of the protective works, and flood-fighting activities during the period.
- (c) Prosecutions for encroachment or trespass.
- (d) Permits issued for right-of-way or use of right-of-way.
- (e) Permits issued for improvements or construction with the project right-of-way.
- (f) Maintenance measures taken; nature, date of construction, and date of removal of temporary repairs; date of permanent repairs.
- (g) Fiscal statement of cost of maintenance and operation for the period.

A suggested form for submission of the semi-annual report is included as EXHIBIT D, sheets 1 and 2.

3-08 Environment Protection.

a. In order to insure that channel maintenance is accomplished in a manner which minimizes any adverse environmental impact, any proposed plans for clearing of more than 1,500 feet of a continuous reach of channel and/or removal of live trees which are assessed to be an encroachment into the design flow capacity will be reviewed by The Reclamation Board who will coordinate the proposed work, if considered appropriate, with concerned environmental agencies. The proposed work shall not be initiated until concurrence is received from The Reclamation Board and the District Engineer. It is also the responsibility of the maintaining agency to comply with all State and Federal laws concerning environmental protection as related to any proposed maintenance work.

b. Vegetation preserved as a part of selective clearing on the waterside berm, channel bank or levee slope during prosecution of the contract shall not be removed as a part of normal maintenance. Dead trees with wildlife value will be retained except where they constitute a hazard to existing flood control works.

c. Consistent with the standards established in this manual and those established by the State of California, all wild growth, including but not limited to, trees, shrubs and other vegetation within those project areas where environmental easements have been obtained by local interests shall be preserved and retained.

3-09 Flood Immunity Statute.

The Flood Immunity Statute, 33 U.S.C. 702c, 15 May 1928, provides that the United States is completely immune from liability for any kind of damage caused by flood waters related to a flood control project.

SECTION IV

FEATURES OF THE PROJECT SUBJECT
TO FLOOD CONTROL REGULATIONS

4-01 Project Works not limited to construction reaches. Construction of Chowchilla River Channel Improvement Project generally consists of channel enlargement and levee construction. The project area lies in the delta reaches of the Chowchilla River which extends from near Buchanan Dam westerly along Chowchilla River, and Ash and Berenda Sloughs to Chowchilla Canal. The work provided channel capacities in reaches as follows:

ASH SLOUGH

1/4 Mile west of State Route 99 to Chowchilla Canal . . . 5,000 c.f.s.

BERENDA SLOUGH

Avenue 21-1/2 to Chowchilla Canal 2,000 c.f.s.

For further details of project work see the drawings of EXHIBIT B.

4-02 Levees.

a. Description. Levee construction was accomplished on Ash Slough from the Chowchilla Canal upstream to about Avenue 22 on both banks for a total distance of about 4.8 miles, and on Berenda Slough from Chowchilla Canal upstream to Road 11, right bank and to 4,000 ft.† upstream of Road 11, left bank for a total distance of about 4.2 miles. Portions of the above mentioned reaches had existing levees that were enlarged to meet established minimum design standards and for placement of patrol road surfacing, consisting of 4 inches of crushed mineral aggregate 10 feet in width with surfaced turnouts. For more complete details of items included in construction of the above mentioned levees, refer to the "As Constructed" drawings of EXHIBIT B. Regulations regarding inspection, maintenance and operation will be found in paragraphs 4-02b, 4-02c and 4-02d of this manual.

b. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(b)(1), are quoted in part as follows:

- "(b) Levees (1) Maintenance . . . Periodic inspection shall be made by the Superintendent . . . 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 landside or the

riverside 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 wells 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;
- (vii) No action is being taken, such as burning grass and weeds, during inappropriate seasons, which will retard or destroy the growth of sod;
- (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 beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times may be necessary to insure the best possible care of the levee . . ."

(2) To insure the taking of such maintenance measures as will be required for proper functioning of the levee, the following items shall be specifically covered in each inspection:

- the toe.
- (a) Aggradation or degradation of the streambed along
 - (b) Settlement of levee fill.
 - (c) Erosion of levee slopes; both sides of levees.
 - (d) Presence of seepage; saturated areas, or sand boils back of levee.
 - (e) Condition of access roads and roadway on levee.

c. Maintenance.

(1) 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 material. 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. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the levees in time of flood.

(2) Depredations of Burrowing Animals. Dens and runways formed within the levee by burrowing animals are frequently the causes of levee failure 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.

(3) Access Roads. Access roads to the project 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 or flood fighting.

d. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(b)(2) are quoted in part as follows:

"(2) Operation. During flood periods, the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope 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 structures.

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."

(2) It shall be the duty of the Superintendent to keep in contact with the State Department of Water Resources' Flood Operation Center during all periods of flood danger as necessary to take advantage of its forecasts and maintain a patrol of the project works in their area during periods of flows in excess of readings listed in the Floodflow Table, Section I, paragraph 1-06.

The Flood Operations Center is responsible for data collection and issuance of a joint stream forecast with the U. S. Weather Service and coordinates with the Sacramento District Engineer and other agencies to keep appraised of the current situation in accordance with terms of the Memorandum of Understanding dated 1 November 1956, between the Division Engineer, U. S. Army Engineer Division, South Pacific, and the Director, Department of Water Resources, State of California, for cooperative action during flood emergencies.

4-03 Channels.

a. Description. Project channel work consisted of enlarging the capacity of Ash Slough from the Chowchilla Canal upstream to about Avenue 24. Minor channel enlargement were also accomplished on this stream for a distance of about 5.5 miles from about Avenue 24 upstream to a point about 1/4 mile downstream from the Southern Pacific Railroad at the north edge of the city of Chowchilla. Berenda Slough channel enlargement was accomplished from the Chowchilla Canal upstream to about Road 10 1/2 and intermittent channel enlargement from Road 10 1/2 upstream to about 21 1/2. Bank protection was placed at sharp bends on both Ash and Berenda Sloughs.

b. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(g)(1) are quoted in part as follows:

"(g) Channels and floodways . . . (1) Maintenance. Periodic inspections . . . shall be made by the Superintendent to be certain that:

- (i) The channel or floodway is clear of debris 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 by the Superintendent 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 . . ."

(2) The purpose of the floodflow channels inspection is to insure that conditions which affect the channel capacity will remain the same, as far as possible, as those considered in the design assumptions and that no new conditions develop that may affect the stability of the project structures. At each inspection required by paragraph 208.10(g)(1) of the Flood Control Regulations, particular attention will, therefore, be given the following:

(a) Location, extent and size of vegetative growth.

(b) Unauthorized operations within the floodflow channel right-of-way, such as excavations, buildings and other structures, levees, bank protection, or training dikes.

(c) Rubbish and industrial waste disposal.

(d) Changes in the channel bed such as aggradation or degradation, which would interfere with freeflow from side drainage structures or induce local meanders that would scour the banks.

(e) Operations of any nature upstream from the project that would affect flow conditions within the limits of the flood control project.

(f) Condition of project structure.

1. Channel walls:

a. Deviation from alignment and grade.

b. Development of cracks and spalls.

c. Mechanical damages

2. Fencing:

a. Damages to post, fencing or barbed wire.

b. Damage to galvanizing.

3. Earth fills:

a. Settlement.

b. Erosion of either slope.

c. Excessive seepage or saturation area back of fills.

d. Condition of bank protection - concrete or stone blanket.

4. Right-of-way:

a. Presence of dumped refuse.

b. Encroachment or trespass.

(3) The intent of these inspections is to disclose all conditions which in any way affect the stability of the structures and their functioning for the control of floods. Each inspection report should note and comment on any repair measures that have been taken since the last inspection. In making these inspections, the check sheets included as EXHIBIT E shall be explicitly followed.

c. Maintenance.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(g)(1) are quoted in part as follows:

" . . . Immediate steps will be taken to remedy any adverse conditions disclosed by such inspection . . ."

(2) 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 open and unobstructed at all times.

(3) 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.

(4) Sediment and 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.

(5) The channel and right-of-way shall be kept reasonably clear of debris, refuse matter, or industrial wastes in accordance with criteria of the California State Water Resources Control Board.

(6) Dense growth in the channel shall be cut in advance of flood season and together with all debris, removed from the channel. Removal of vegetation should be performed by mechanical means however, controlled burning or discriminate use of herbicides is permissible.

(7) All eroded concrete shall be repaired as soon as any reinforcing steel is exposed or erosion approaches a depth of 2 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, uplift, or failure of concrete structures shall be given special attention.

(8) All damage to fencing, 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.

(9) No excavation within the limits of the Chowchilla River Project will be permitted unless an excavation permit has been approved by The Reclamation Board and the District Engineer.

(10) If any work is done to improve flow conditions in the Chowchilla River Project streams, an excavation permit must be obtained from the Superintendent and approved by The Reclamation Board and the District Engineer.

(11) Trees and other vegetation and ground cover that does not seriously interfere with the passage of floodflows shall not be removed as a part of normal maintenance. Removal of vegetation in an area where selective clearing was accomplished, shall be coordinated with the Reclamation Board and the District Engineer.

d. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations, paragraph 208.10(g)(2) are quoted in part as follows:

"(g) . . . Appropriate measures shall be taken to prevent the formation of jams . . . of 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 . . . walls, drainage outlets or other flood control structures repaired."

4-04 Diversion Dams.

a. Description

There are five flashboard dams within the limits of the Channel Improvement Project, four on Ash Slough and three on Berenda Slough. General location of these structures are as follows:

STREAM	LOCATION
Ash Slough	Bifurcation with Chowchilla River
Ash Slough	Bifurcation with Berenda Slough
Ash Slough	300' + downstream from Road 15
Ash Slough	1/4 mile downstream from Avenue 25
Berenda Slough	Bifurcation with Ash Slough
Berenda Slough	1/2 mile upstream from Road 19
Berenda Slough	1/4 mile upstream from Avenue 22

b. Maintenance - Ash and Berenda Bifurcation (Project) Structure.

(1) All structural steel work (stoplog supports, footbridge girders, handrails, etc.) shall be inspected once a year. Rust spots shall be cleaned and the metal shall be repainted where required. Galvaloy or equal shall be used for galvanized steel items. Loose connections and bolts shall be tightened.

(2) All stone protection at the approach and stilling basin of the bifurcation structure of Ash and Berenda Sloughs shall be inspected at least once a year and after each flood control release from H. V. Eastman Lake of greater than 3,000 c.f.s. All stones that have displaced shall be placed back to the line and grade shown on the "as constructed" drawings. Special care should be taken in replacing stones at the downstream end where drain materials are inclosed in plastic filter cloth.

(3) The approach channel of the bifurcation structure of Ash and Berenda Sloughs shall be inspected at least once a year. Whenever sediments are deposited over 12 inches in depth it shall be removed and the channel graded to the elevation as shown on the "as-constructed" drawing (elevation 295.0).

c. Operation

(1) Operation of this dam for flood control will be the responsibility of the agency (State Reclamation Board) providing the assurances for the project. However, the assuring agency may enter into separate agreements with the irrigation districts who own the dam for the purpose of operating this structure, as necessary for flood control.

(2) The control structures at the bifurcation of Ash and Berenda Sloughs were designed with the condition that, overstressing of the stop logs or structural failure of other parts of the structure be avoided. It will therefore be necessary to limit the height, of the pool water surface, to elevation 300.2 U.S.G.S. datum, which is 3.2 feet above the invert of the concrete slab.

(3) All flashboards shall be removed as necessary to prevent impairment of channel flows during flood season (1 November to 15 April). Any proposed operation of the dams during flood season or periods of high water must be coordinated with the releases from H. V. Eastman Lake and subject to the approval of the District Engineer.

4-05 Drainage Structures

a. Description. There are several drainage structures which extend through the levee on the various streams, their location is as follows:

Ash Slough	Lt. Bk. 52 + 50	36" C.M. Pipe
Ash Slough	Rt. Bk. 2 + 94	30" C.M. Pipe
Berenda Slough	Rt. Bk. 5 + 50	36" C.M. Pipe

b. Inspection

(1) Pertinent Requirements of the Code of Federal Regulation.

Flood Control Regulations, paragraph 208.10(d)(1), are quoted in part as follows:

"(d) Drainage Structures (1) Maintenance - Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures.

Flapgates and manually operated gates and valves on drainage structures shall be examined, oiled and trial operated at least once every 90 days . . . Periodic inspections shall be made by the Superintendent to be certain that:

- (i) Pipes, gates, operating mechanism, riprap and headwalls are in good condition;
- (ii) Inlet and outlet channels are open;
- (iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;
- (iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability. Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections."

(2) At each inspection the following items, if applicable, shall be particularly noted:

- (a) Debris or other obstructions to flow.
- (b) Condition of pipes and gates.
- (c) Damage or settlement of pipe.
- (d) Condition of concrete—cracks, spalls, erosion.

c. Maintenance.

(1) All eroded concrete shall be repaired as soon as erosion reaches a depth of 2 inches or any reinforcing steel is exposed. For this purpose it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the concrete to its original section with pneumatically-placed Portland cement mortar.

(2) If the inspection shows that the automatic drainage structures have been jammed in an open position by debris or other obstructions, they shall be thoroughly cleaned so that they swing freely to a true closure. If any parts of the gates have been damaged or broken, they shall be replaced by new parts.

(3) Compliance with the provisions prescribed above pertaining to drainage structures is essential for proper maintenance of the levee system covered by this manual. Levee failures caused by neglected drainage structures are of common occurrence; it is, therefore, of utmost importance that these structures always be kept in perfect working condition in accordance with the regulations.

(4) Care should be taken not to bury any of the side drainage inlets in the event that it becomes necessary to fill any of the lowlying pockets in back of the levee. Plans for the modification of drainage facilities at any such points should be submitted to the State Reclamation Board for approval before such work is started.

d. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(d)(2) are quoted in part as follows:

"(2) Operation. Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and objects which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed . . . All drainage structures in the levee shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse conditions."

(2) The outlets of the side drainage structures inundate at relatively low stream stages. They should, therefore, be inspected at the first sign of a rise in the stream to make certain that the gates are not jammed in an open position and thus allow flood waters to enter behind the levee.

4-06. Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were constructed as a part of, or existed in conjunction with, the channel works, and which might affect their functioning, include the following:

(1) Bridges.

Stream	:	Name of Road
Ash Slough		Avenue 21
" "		Road 8
" "		Road 9
" "		Highway 152
" "		Avenue 23½
" "		Avenue 25
" "		Road 13
Berenda Slough		Road 11 (Low water crossing)
" "		Avenue 18
" "		Avenue 18½
" "		Road 13
" "		Avenue 19½
" "		Avenue 20
" "		Avenue 20½
" "		Road 14
" "		Avenue 21
" "		Avenue 21½

(2) Utility Relocations. Because of the nature of the construction of the utilities by local interests, records of utility relocations are not available.

(3) Hydrologic Facilities There are at present 6 stream gaging stations located on the various channels of the Chowchilla River system. These stations are maintained by various agencies. Continuous operation of gages No. 1, 2, 4 and 6 will be required for the purpose of recording and regulating floodflow releases. The gages in the vicinity of the project are as follows:

<u>No.</u>	<u>Stream</u>	<u>Location</u>	<u>Operating Agency</u>
1.	Ash Slough	Hwy 152 (staff gage)	Madera County
2.	Ash Slough	1500' D.S. from Berenda Slough bifurcation	Chowchilla Water District
3.	Ash Slough	1000' D.S. from Chowchilla Canal	Chowchilla Water District

4.	Berenda Slough	1500' D.S. from Ash Slough bifurcation	Chowchilla Water District
5.	Berenda Slough	Road 9	Chowchilla Water District
6.	Berenda Slough	Hwy 152 (staff gage)	Madera County

b. Inspection and Maintenance.

(1) Pertinent Requirements of the Code of Federal Regulations.
Flood Control Regulations, paragraph 208.10(h)(1) are quoted in part as follows:

"(h) Miscellaneous Facilities. (1) Maintenance. Miscellaneous structures and facilities which constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be replaced without delay. . . "

(2) Inspection of the miscellaneous facilities shall be made at the same time that the inspection of the other features of the project are made, and shall be reported on check list No. 3, sheet No. 5 of 6 EXHIBIT E.

(3) The interest of the Corps of Engineers and the responsibility of the local interests in the existing highway and railroad bridges is confined to their effect on the safety and functioning of the flood control channel, but any conditions noted in the inspections that may affect them in any way should, as a matter of courtesy, be brought to the attention of the agencies maintaining and operating them. If the inspection of any miscellaneous structure, either existent or constructed in the future under permit, discloses any condition that indicates the probability of failure during periods of high water, the Superintendent shall address a letter to the owner of the structure, quoting this manual as authority and inviting attention to the conditions observed and requesting that immediate steps be taken to correct them. A copy of such letter shall be forwarded to the Reclamation Board and the District Engineer for their information. A report on the action taken by the owner shall be submitted to The Reclamation Board and the District Engineer to accompany the next semi-annual report. A suggested report form is included as EXHIBIT D of this manual.

(4) The purpose of maintenance work is to insure continuous satisfactory operation of equipment. It is, therefore, important in such work that all possible causes of future trouble be found and corrected. Particular attention should be given to minor weaknesses which may be an indication of future trouble.

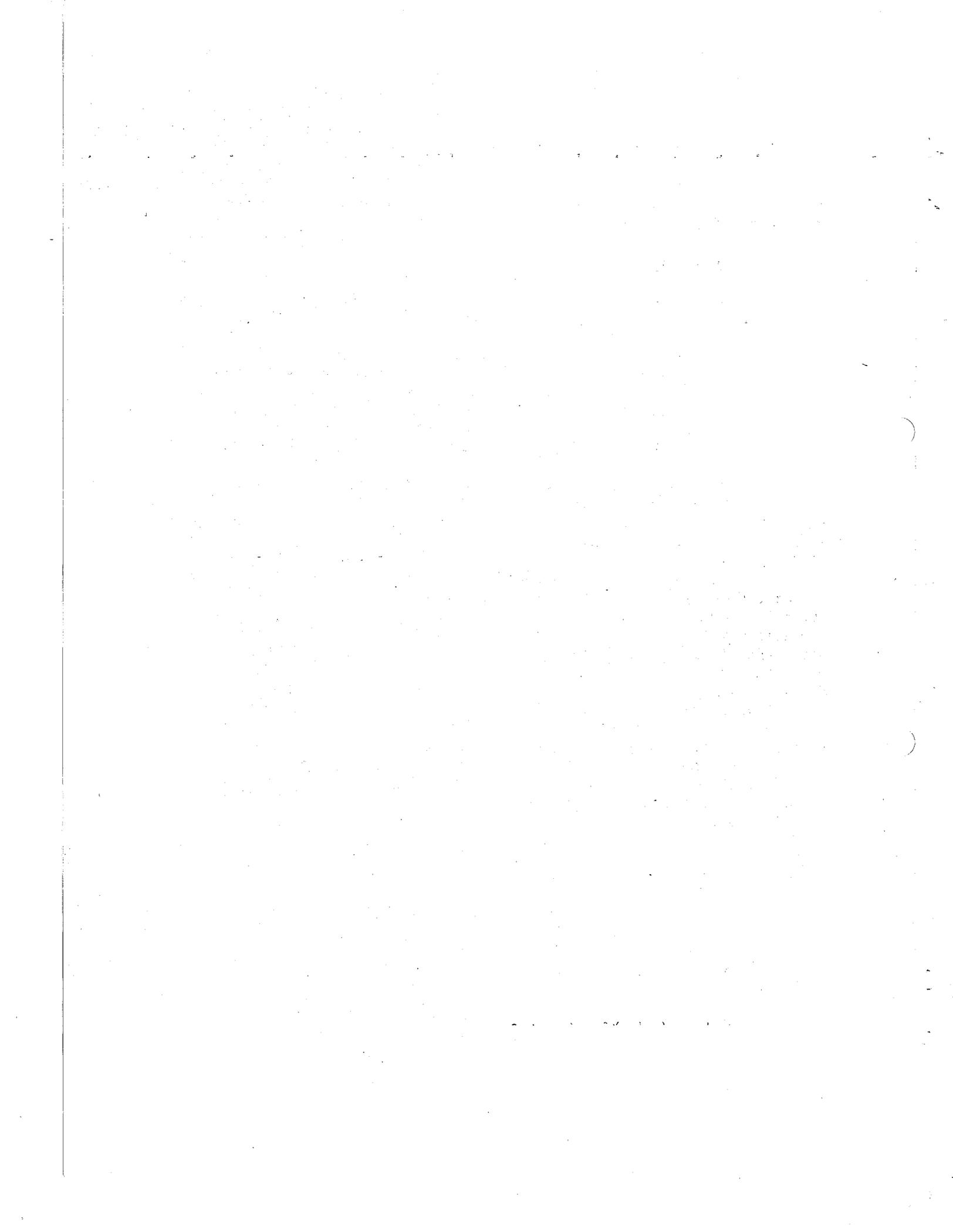
c. Operation.

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, paragraph 208.10(h)(2) is quoted as follows:

"(2) Operation. Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without the approval of the District Engineer unless designed therefore."

(2) Temporary sand dams in the reaches of the Project levees constructed annually for the purpose of recharging or diverting irrigation water shall be operated in such a manner as to prevent bank erosion and scouring of the channel invert.

The crests of the dams should not exceed a height of 3 feet below the top of levee with a low point coincident with the center of the channel, about 4.5 feet below the levee crown. The dams shall be removed as necessary to prevent impairment of channel flows, prior to the beginning of flood season (1 November) and the channel invert and banks completely restored to the as constructed condition, in the vicinity of the dam. The sand dams shall not be reconstructed before 15 April. Special approval from the superintendent will be required for any temporary sand dams which do not meet the above conditions. Sediment deposits may be used for construction of these sand dams provided no material is removed from below the as constructed channel invert or sideslopes. Other sources of materials to be used for the construction of the sand dams shall be reviewed by The Reclamation Board and the District Engineer.



SECTION V

SUGGESTED METHODS OF COMBATING FLOOD CONDITIONS

5-01 Methods Suggested. Most of the methods described herein have been developed during years of experience with the various problems that often come up during periods of high water, and they are not intended to restrict the Superintendent, or others concerned, to a rigid set of rules for every condition that may arise. The remarks are primarily concerned with the earthen portions of the levee system. If problems not covered by these suggestions arise where the Superintendent is in doubt as to the procedure to be taken, he will be expected to consult the State Department of Water Resources and follow standard engineering practices in meeting the situation. It should be noted that it is much better to be over-prepared for a "flood-fight" than it is to find at the last moment that preparations were incomplete or unsatisfactory. Confidence of the persons and firms protected is a valuable asset that should not be carelessly lost through inefficient operation of the protection system in time of emergency.

5-02 Earthen Levees. An earthen levee is in danger whenever there is water against it. This danger is directly proportional to the height of the water, the duration of the flood stage, and the intensity of either the current or wave action. The danger is inversely proportional to cross-sectional area of the levee, the levee's height, and the degree of maintenance. A well constructed levee of proper section should, if maintained and not overtopped, hold through any major flood. However, serious damages and loss of life may result from a break. Foundation troubles result in sand boils or a sinking levee, and the local use of unsatisfactory materials causes slides and sloughs. However, such threatened failures can be met if prompt action is taken and proper methods of treatment are used. Wave wash is to be expected whenever the levee is exposed to a wide stretch of open water and is serious if permitted to continue over a considerable length of time.

5-03 Premeditated Damage. In the event of an extraordinary flood requiring a flood fight over long stretches of levee on both sides of the channel there is a possibility that threatened landowners may be tempted to relieve the strain by premeditated breaking of the opposite levee. Local interests should continually guard against such premeditated damage to the levees.

5-04 Security. Personnel of the Corps of Engineers, whether military or civilian, are not vested with civil police authority in the performance of their engineering duties, and they will not attempt to exercise any such authority. The responsibility for protecting flood control works against sabotage, acts of depredation or other unlawful acts rests with the local interests through local and State governmental agencies.

5-05 Inspection of Flood Control Works. Immediately upon receipt of information that high water is imminent, local interests responsible for maintenance should form a skeleton organization, capable of quick expansion, and assign individuals (Work Supervisors) to have charge of definite sections of levees. As his initial activity, each Supervisor should go over his entire sector and parts of adjacent sectors, making a detailed inspection, particularly with reference to the following matters:

- a. Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.
- b. Condition of new levees and recent repairs.
- c. Condition of culverts, flapgates, and sluice gates.
- d. Transportation facilities; roads, rail and water communications.
- e. Material supply; quantity, location, and condition.
- f. Communications; locate and check all necessary telephones in the sector.

5-06 Preliminary Repair Work. After the initial inspection has been made, each work supervisor should recruit a labor crew and provide it with tools such as shovels, axes, wheelbarrows, etc. In addition, bulldozers, scrapers, trucks, etc. should be located and made ready for use in case of emergency. Then immediate action should be taken to perform the following work:

- a. Fill up holes or washes in the levee crown, slopes, and landside berms. Where new construction has been completed during the year, rain washes and deep gullies may have developed. While the levee is new, preparations should be made in advance to combat wave wash along the exposed reaches.
- b. Repair gaps where road crossings have been worn down and the levee is below grade. In filling the road crossings, it may be necessary to obtain material from landside borrow pits, in which case excavation for the material should be kept at least 50 feet from the toe of the levee. Any filling done in this connection should be tamped in place and, if in an exposed reach, subject to wave wash, the new section should be faced with bags of sand.
- c. Repair and close all flapgates on culverts and see that they are seated properly before they are covered with flood waters.

d. Ascertain that all roads to and along the levee are in good repair. The Superintendent should obtain assistance from the county road forces to have all roads put in first-class condition.

e. Locate necessary tools and materials (sand, sandbags, brush, lumber, lights, etc.), and distribute and store the same at points where active maintenance is anticipated.

f. Check and obtain repair of all telephone lines necessary for operation, obtain lists of all team forces, motorboats, motor cars, and truck transportation that can be made available.

g. Make thorough arrangements with reliable citizens of the community for the supply transportation, subsistence, and shelter for the necessary labor.

h. Communicate directly with owners of all stock pastured on the levee and direct that all stock be removed from the levee right-of-way. Cut all fences crossing the levee that do not have gates provided.

i. Investigate all drainage ditches on the landside of the levee and open these drains when obstructions exist. Prepare to cut the necessary seep drainage ditches; however, no attempt should be made to drain the levee slope until actual seepage takes place.

j. Remove all dynamite and explosives of any kind from the vicinity of the levee.

5-07 Disaster Relief. It is the responsibility of local and state, authorities, supported by and/or working in connection with the American Red Cross to adopt measures for the relief of flood disaster victims. Relief measures can be undertaken by the Department of the Army through its Army Area Commander under existing Army Regulations, but such measures will be undertaken only as a last resort, in extreme case and under compelling circumstances where local resources are clearly inadequate to cope with the situation.

5-08 Flood Fight. After the above preliminary organization and precautions have been completed, the "flood fight" itself commences. The methods of combating various defects in the earthen levee described in the following paragraphs have been proved effective during many years of use by the Corps of Engineers.

a. Drainage of slopes. This work can be done economically while awaiting developments and will serve to make the levees more efficient. Crews should be organized to cut seep drains at all places on the levee and berm when seepage appears. The drains should be V-shaped, no deeper than necessary, and never more than 6" deep. Care must be taken not to cut the sod unnecessarily. In all instances drains should be cut straight down the levee slope or nearly so. Near the toe of the slope the small drains

should be Y'd together and led into larger drains, which, in general, should lead straight across the landside berm into the landside pits or nearest natural or artificial drain, as shown on EXHIBIT C, Plate 1. Landside slope which are weakened by saturation, should be reinforced by the board or brush methods. EXHIBIT C, Plate 2.

b. Sand Boils. These danger spots are serious if discharging material. The common method of controlling sand boils consists of walling up a watertight sack ring around the boil up to height necessary to reduce the velocity of flow to a point at which material is no longer discharged from the boil. See EXHIBIT C, Plate 3. The sack ring around the boil should be large enough to protect the defective area immediately surrounding the boil. If several boils of sufficient force to displace sand are observed a sack sublevee may be built around the entire nest of boils, rising to such a height that none of the boils will discharge with enough force to displace sand.

c. Wave Wash. The Superintendent for local interests and Work Supervisor should study the levee beforehand to determine the possibility of wave wash. All such reaches should be located well in advance and for use in emergency, a reserve supply of filled sacks and rolls of polyethylene sheeting or canvas should be kept on board flats. If the slope is well sodded, a storm of an hour's duration should cause very little damage. During periods of high wind and high water, ample labor should stand by and experienced personnel should observe where the washouts are beginning by sounding or by actually wading along the submerged slope. Sections of canvas or polyethylene sheeting should be placed over the washed areas, as shown on EXHIBIT C, Plate 4. As an alternative, filled sacks should be placed in the cut in an effective manner and as soon as possible. The filled sacks should be laid in sections of sufficient length to give protection well above the anticipated rise. Bagging so laid must be thoroughly weighted down to be effective. EXHIBIT C, Plate 5 shows a movable type of wave wash protection, also used with good results. Its advantage is that it can be rapidly built at any convenient place and easily set in place on the job.

d. Scours. A careful observation should be made of the riverside of the levee at all localities where a current of more than two feet per second is observed, or where profiles show a highwater gradient of two feet per mile or greater. Trouble may be looked for at the ends of old levee dikes, roadcrossing ramps, old traverses, and places where pipes, sewers and other structures penetrate the levee. If any sign of scour is observed in the pits or at the ends of the dikes, soundings should be taken to observe the amount and progress of the scour. The approved method of construction to check scour in the pits, on the slopes, or at the ends of dikes will be to construct deflection dikes using brush, lumber, or driving stakes and wiring together, and filling in between with brush and filled sacks or stone.

e. Caving Bank Protection. As protection against active caving of riverbanks, rock-filled cribs are very effective if properly placed. Cribs are usually 14 feet by 14 feet in plan by 10 to 14 inches on the side. See EXHIBIT C, Plate 6. The cribs are constructed on a double thickness of 1" x 4" x 14' lumber, equivalent to 2" x 4" pieces, lapped rail fence fashion at all corners and intersections. They are divided into four compartments of about equal area by two perpendicular cross walls constructed in the same manner as the side walls. The floors and covers are built up of double 1" x 4" boards spaced about 9" center to center. Under the floor and perpendicular to the direction of the cover boards, are three pairs of top boards, one over each of the side walls and one over the central division wall. All intersections are nailed with one 20 penny nail. The compartments are filled with rock before covering. Each wall intersection of the fabricated cribs is securely fastened by a loop of No. 9 wire.

5-09 Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those shown on the drawings, EXHIBIT B. If any reaches show a grade below the previous highest water, emergency topping should be undertaken at once to provide a grade which may be established by the District Engineer, as follows:

a. Sack Topping. Sack topping may be used to raise the crown of the levee about three feet. The sacks should be laid stretcher-wise or along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/3 either way and well fitted into place. When properly sacked and tamped, one sack will give about three to four inches of topping. If gravel is available, it should be used for front facing so as to avoid washing out. See EXHIBIT C, Plate 7 for instructions.

b. Lumber and Sack Topping. This is the most commonly used method of raising low reaches in emergencies. In putting on this topping, as well as other toppings, a careful line of levels should be run and grade stakes set in advance. 2" x 4" x 6' stakes should then be driven on the riverside of the crown six feet apart, and 1" x 12" boards nailed to landside of the stakes. This wall, backed with a single tier of sacks, will hold out at least one foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. The stakes should be driven three feet in the ground, and should project out three feet, thus providing, in extreme cases, a three-foot topping if properly braced behind with sacks and earth. In some instances, it may be practicable to back up the planking with tamped earth obtained in the vicinity in lieu of the sacks as shown on the drawing, EXHIBIT C, Plate 8.

c. Mud Box Levee. Mud boxes consist of two parallel wooden walls placed near the waterward side of the levee crown or on a berm and filled with available material. When constructed on a wide levee crown, it may permit a portion of that crown to remain as a limited roadway. Use mud boxes when fill material has a soupy consistency, however the inner face of the wall should first be lined with canvas or polyethylene sheeting. See

EXHIBIT C, Plate 9 and 10 for details. Boxes with smaller dimensions than illustrated may be constructed when necessitated by limited right-of-way or materials, however the box measurements should be determined by the same ratio as that of a box 24" high by 30" wide.

5-10 Transportation. In instances where it is necessary to send equipment over roads that are impassable due to mud or sand, their passage may be provided by the use of a plank road or by means of steel or wire mats. Telephone or radio communication should be provided along dangerous stretches of the levee when travel or other satisfactory means of communication cannot be maintained.

5-11 Use of Government Plant. The District Engineer is authorized to use or loan Government property and plant in cases of emergency where life is in danger and there is no opportunity to secure prior authority for such use. The authority also extends to saving of property where no suitable private equipment is available, provided such use is without detriment to the Government.

EXHIBIT A

FEDERAL FLOOD CONTROL REGULATIONS

(SEE STANDARD MANUAL)

EXHIBIT A

**TITLE 33—NAVIGATION AND
NAVIGABLE WATERS**

**Chapter II — Corps of Engineers,
Department of the Army**

PART 208 — FLOOD CONTROL REGULATIONS

AUTHORITY: § 208.10 issued under Sec. 7, 58 Stat. 890; 33 U.S.C. 709.

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities*—(a) *General.* (1) 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.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the 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.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) 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.

(5) 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 of the Department of the Army 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.

(6) It shall be the duty of the Superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have ac-

cess at all times to all portions of the protective works.

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

(9) 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.

(10) The Department of the Army 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 this part.

(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 of 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 effectively 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 wells 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;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(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 accom-

plished during the appropriate season as scheduled by the Superintendent.

(2) *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.

(c) *Flood walls.*—(1) *Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

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. 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.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures*—(1) *Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once

CODE OF FEDERAL REGULATIONS (EXTRACT)

every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions impend, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(e) *Closure structures—(1) Maintenance.* Closure structures for traffic openings shall be inspected by the Superintendent every 90 days to be certain that:

(i) No parts are missing;

(ii) Metal parts are adequately covered with paint;

(iii) All movable parts are in satisfactory working order;

(iv) Proper closure can be made promptly when necessary;

(v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

Tools and parts shall not be removed for other use. Trial erections of one or more closure structures shall be made once each year, alternating the structures chosen so that each gate will be erected at least once in each 3-year period. Trial erection of all closure structures shall be made whenever a change is made in key operating personnel. Where railroad operation makes trial erection of a closure structure infeasible, rigorous inspection and drill of operating personnel may be substituted therefor. Trial erection of sand bag closures is not required. Closure materials will be carefully checked prior to and following flood periods, and damaged or missing parts shall be repaired or replaced immediately.

(2) *Operation.* Erection of each movable closure shall be started in sufficient time to permit completion before flood waters reach the top of the structure sill. Information regarding the proper method of erecting each individual closure structure, together with an estimate

of the time required by an experienced crew to complete its erection will be given in the Operation and Maintenance Manual which will be furnished local interests upon completion of the project. Closure structures will be inspected frequently during flood periods to ascertain that no undue leakage is occurring and that drains provided to care for ordinary leakage are functioning properly. Boats or floating plant shall not be allowed to tie up to closure structures or to discharge passengers or cargo over them.

(f) *Pumping plants—(1) Maintenance.* Pumping plants shall be inspected by the Superintendent at intervals not to exceed 30 days during flood seasons and 90 days during off-flood seasons to insure that all equipment is in order for instant use. At regular intervals, proper measures shall be taken to provide for cleaning plant, buildings, and equipment, repainting as necessary, and lubricating all machinery. Adequate supplies of lubricants for all types of machines, fuel for gasoline or diesel powered equipment, and flash lights or lanterns for emergency lighting shall be kept on hand at all times. Telephone service shall be maintained at pumping plants. All equipment, including switch gear, transformers, motors, pumps, valves, and gates shall be trial operated and checked at least once every 90 days. Megger tests of all insulation shall be made whenever wiring has been subjected to undue dampness and otherwise at intervals not to exceed one year. A record shall be kept showing the results of such tests. Wiring disclosed to be in an unsatisfactory condition by such tests shall be brought to a satisfactory condition or shall be promptly replaced. Diesel and gasoline engines shall be started at such intervals and allowed to run for such length of time as may be necessary to insure their serviceability in times of emergency. Only skilled electricians and mechanics shall be employed on tests and repairs. Operating personnel for the plant shall be present during tests. Any equipment removed from the station for repair or replacement shall be returned or replaced as soon as practicable and shall be trial operated after reinstallation. Repairs requiring removal of equipment from the plant shall be made during off-flood seasons insofar as practicable.

(2) *Operation.* Competent operators shall be on duty at pumping plants whenever it appears that necessity for pump operation is imminent. The operator shall thoroughly inspect, trial operate, and place in readiness all plant equipment. The operator shall be familiar with the equipment manufacturers' instructions and drawings and with the "Operating Instructions" for each station. The equipment shall be operated in accordance with the above-mentioned "Operating Instructions" and care shall be exercised that proper lubrication is being supplied all equipment, and that no overheating, undue vibration or noise is occurring. Immediately upon final recession of flood waters, the pumping station shall be thoroughly cleaned, pump house sumps flushed, and equipment thoroughly inspected, oiled and greased. A record or log of pumping plant operation shall be kept for each station, a copy of which shall be furnished the District Engineer following each flood.

(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;

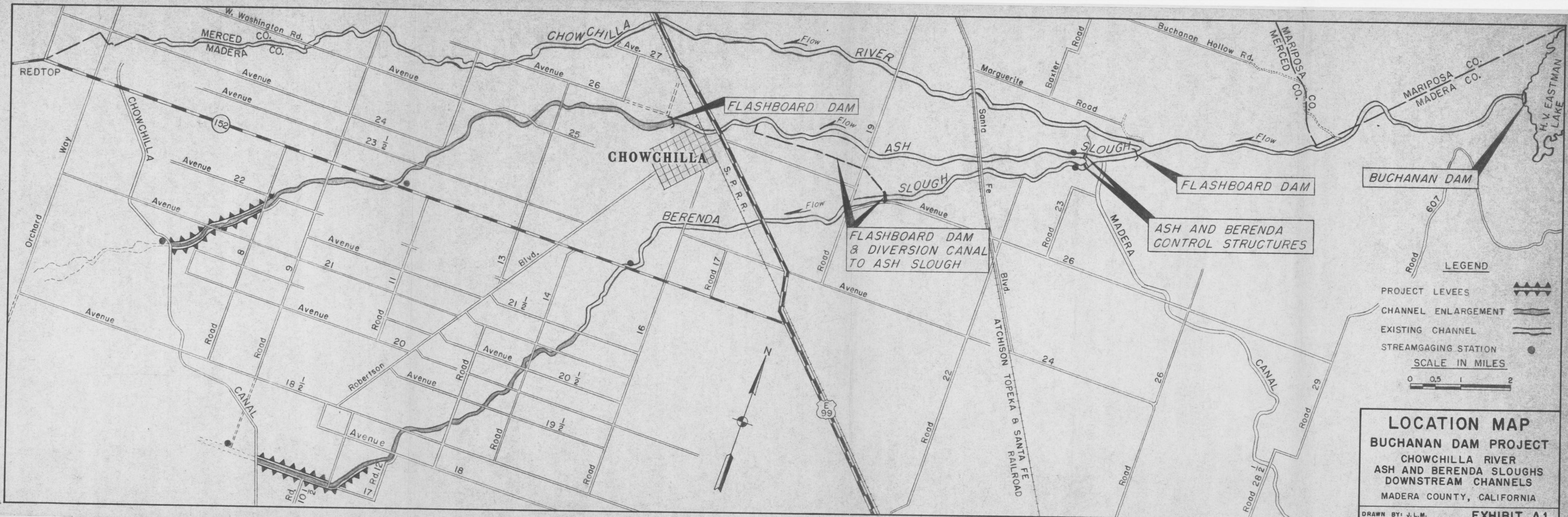
(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

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 periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(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.

(h) *Miscellaneous facilities—(1) Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor. (Sec. 3, 49 Stat. 1571, as amended; 33 U.S.C. 701C) [9 F.R. 9999, Aug. 17, 1944; 9 F.R. 10203, Aug. 22, 1944]



LEGEND

- PROJECT LEVEES
- CHANNEL ENLARGEMENT
- EXISTING CHANNEL
- STREAMGAGING STATION

SCALE IN MILES

LOCATION MAP
BUCHANAN DAM PROJECT
 CHOWCHILLA RIVER
 ASH AND BERENDA SLOUGHS
 DOWNSTREAM CHANNELS
 MADERA COUNTY, CALIFORNIA

DRAWN BY: J.L.M. **EXHIBIT A1**

EXHIBIT B

"AS CONSTRUCTED" DRAWINGS

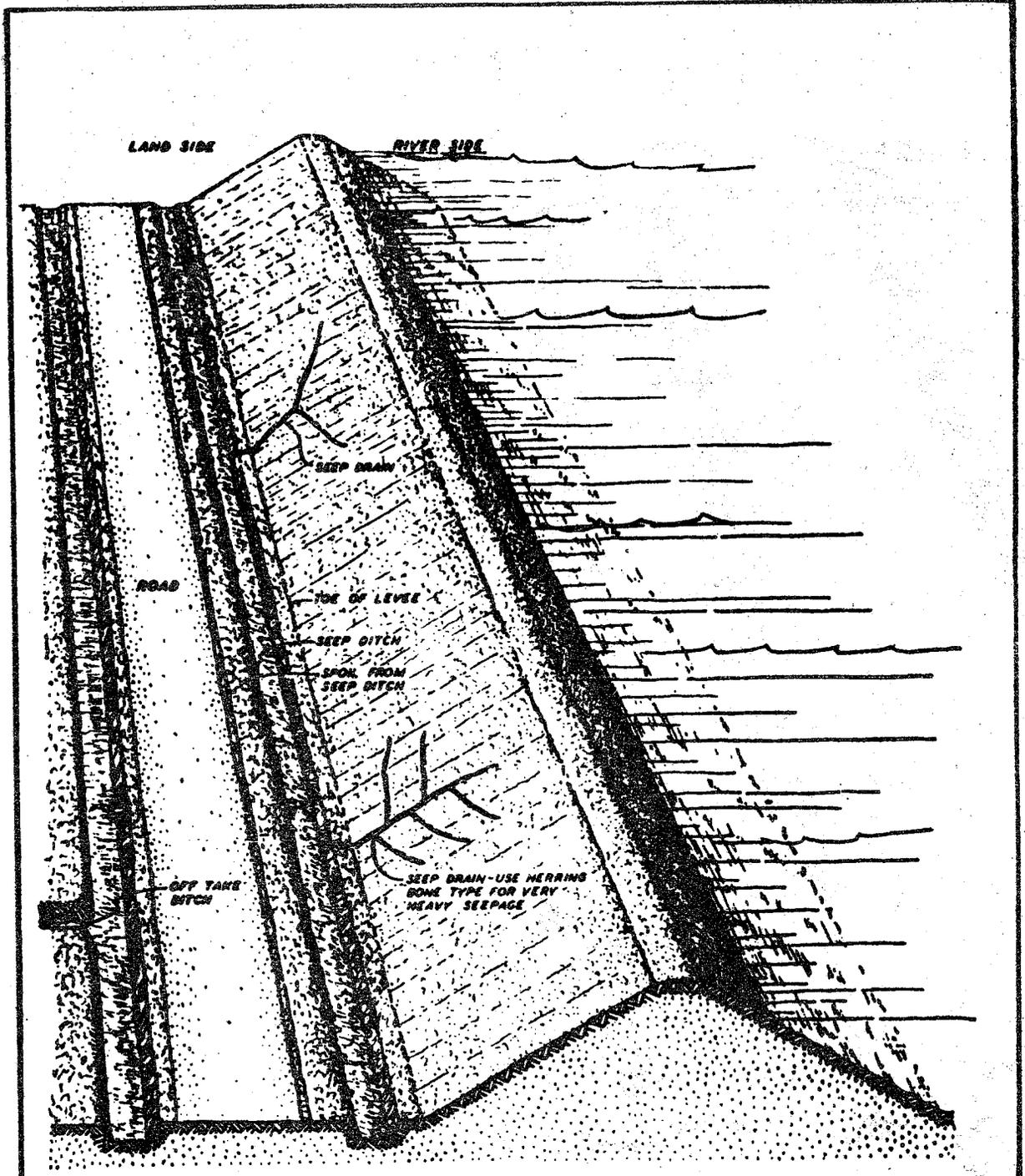
EXHIBIT B
Unattached

EXHIBIT C

PLATES OF SUGGESTED FLOOD FIGHTING METHODS

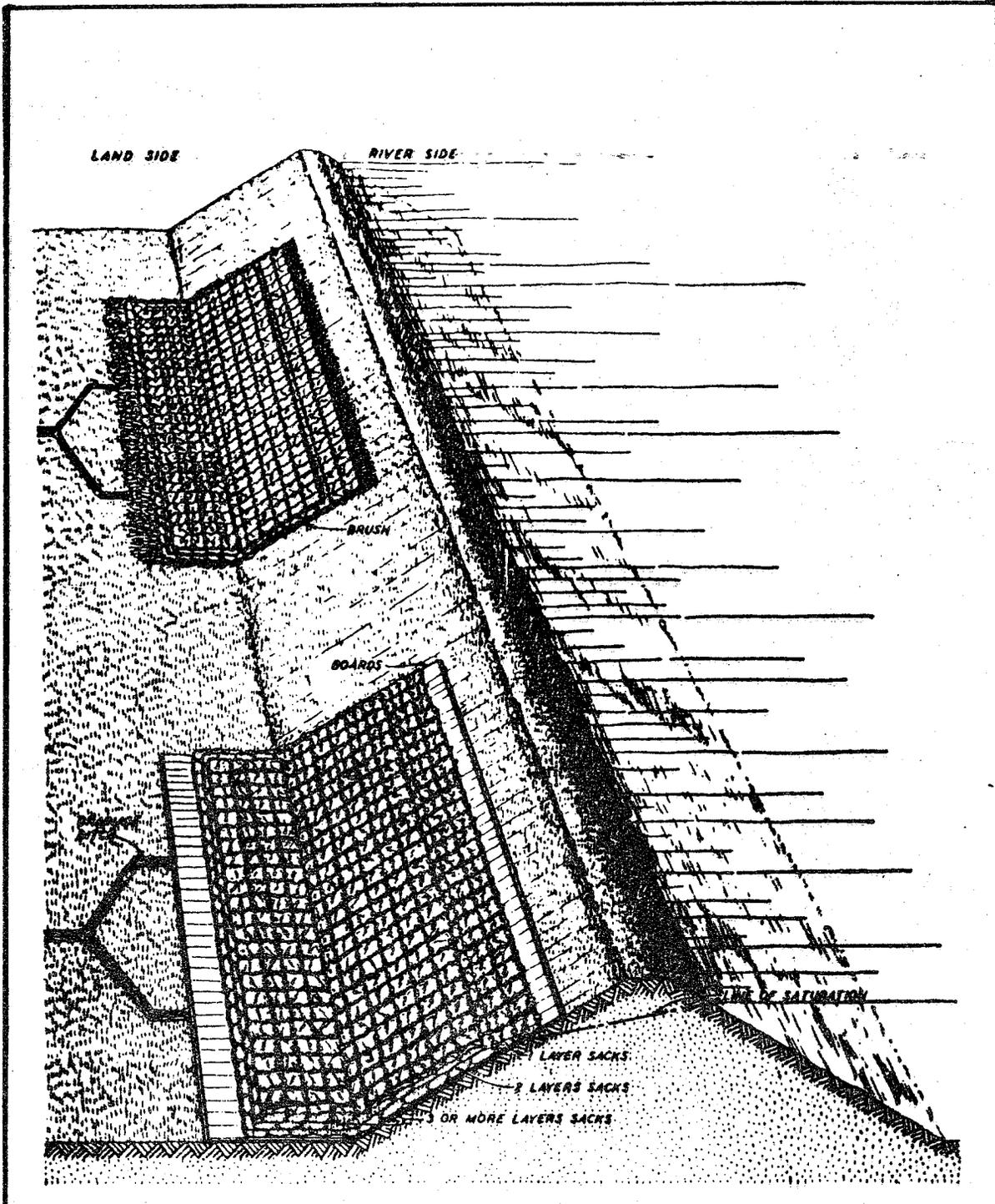
(SEE STANDARD MANUAL)

EXHIBIT C
Unattached



CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
**METHOD OF
DRAINING LEVEE SLOPE**

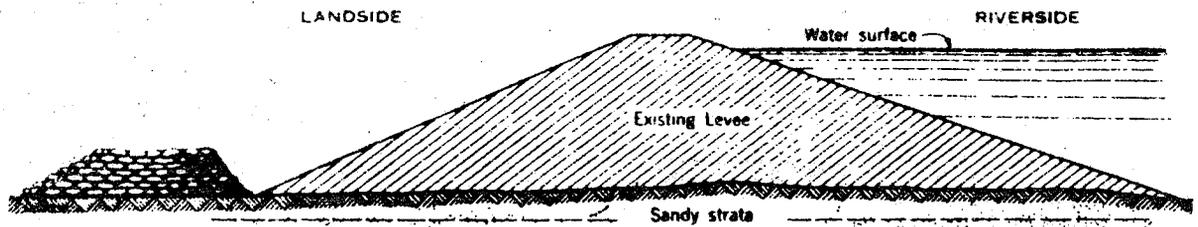
U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.



**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT**

**BRUSHING AND SACKING
THE LANDSIDE SLOPE**

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.

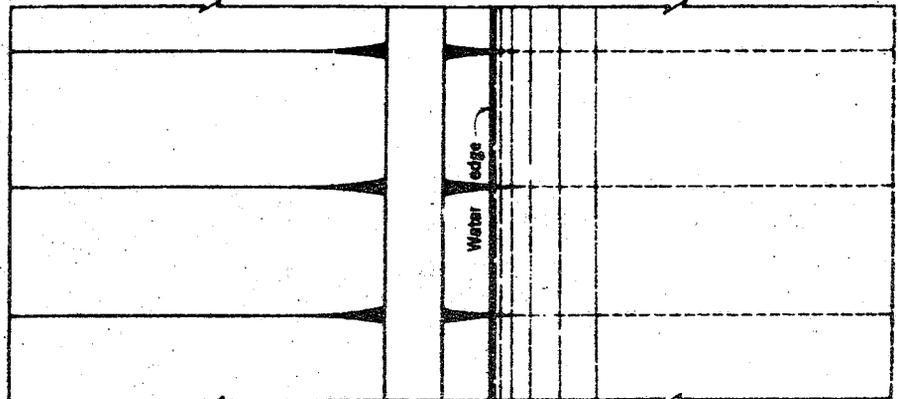
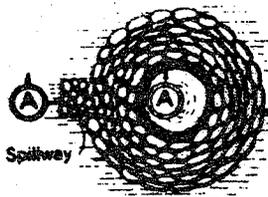


Note:
 Bottom width to be no less than 1 1/2 times height.
 Be sure to clear sand discharge.
 Tie into levee if boil is near toe.

ELEVATION



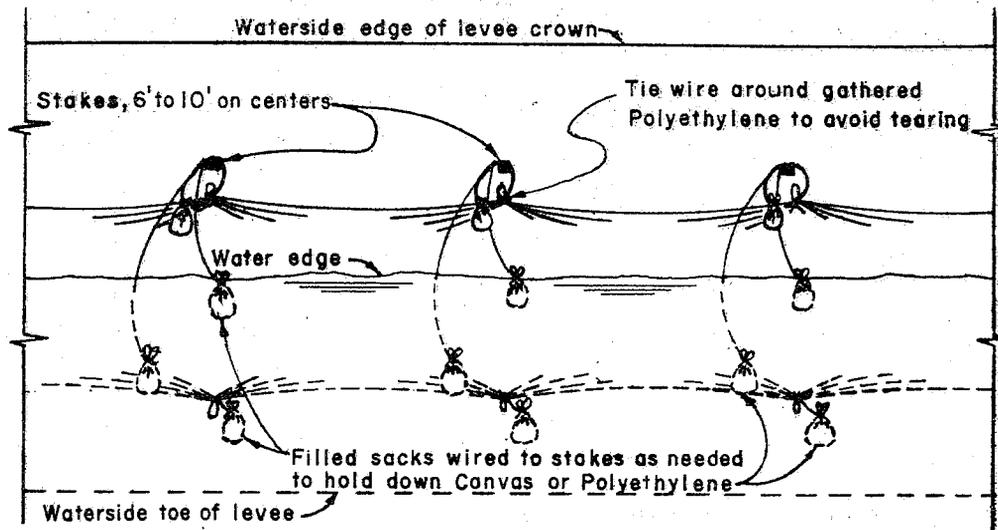
SECTION A-A



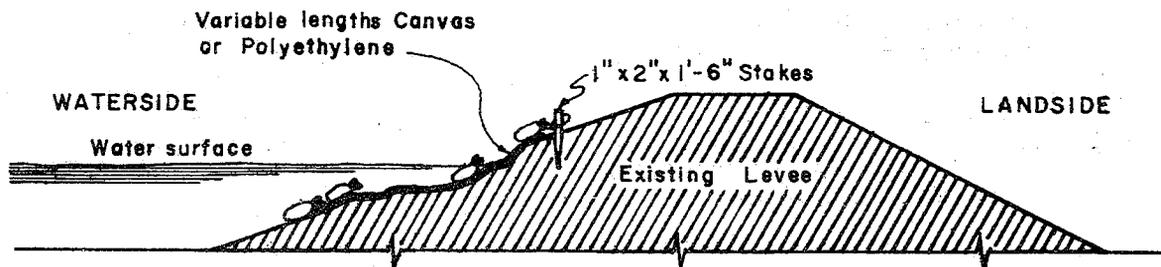
PLAN

Note:
 Do not sack boil which does not put out material.
 Height of sack loop or ring should be only sufficient to create enough head to slow down flow through boil so that no more material is displaced and boil runs clear.
 Never attempt to completely stop flow through boil.

**CHOWCHILLA RIVER
 ASH AND BERENDA SLOUGHS
 FLOOD PROTECTION PROJECT
 CONTROL OF SAND BOILS
 U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.**



PLAN



SECTION

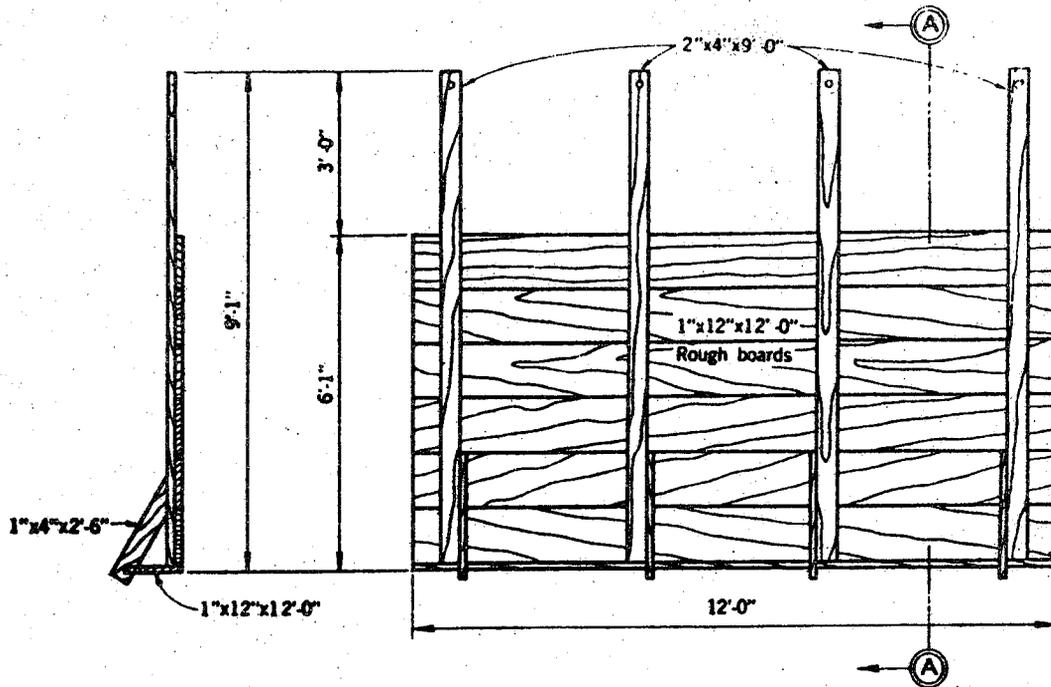
NOTE:

Use Polyethylene sheets, preferably 16' to 20' wide available in std. 100' long rolls, approx. 6 mil thickness, or canvas as available. Lay chosen length of Polyethylene sheeting or canvas parallel with levee slope, tie upper edge to stakes, tie sacks to bottom edge. Crew will then toss all bottom sacks over damaged slope at the same time to avoid tearing. Intermediate filled sacks will be immediately placed to hold down canvas or plastic. HAVE ALL ITEMS PREPARED BEFOREHAND.

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE
LUMBER
• 30 Stakes 1"x2"x1'-6" (Sharpened)
SANDBAGS
120 sandbags Canvas or Polyethylene sheeting as required

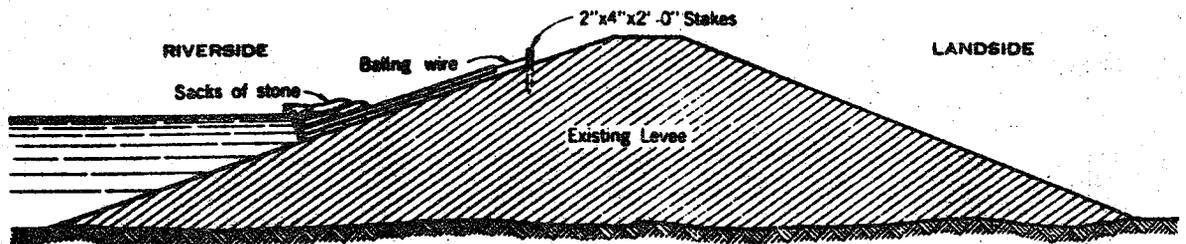
**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
WAVE WASH PROTECTION**

US Army Engineer District
Sacramento, California



SECTION A-A

PLAN

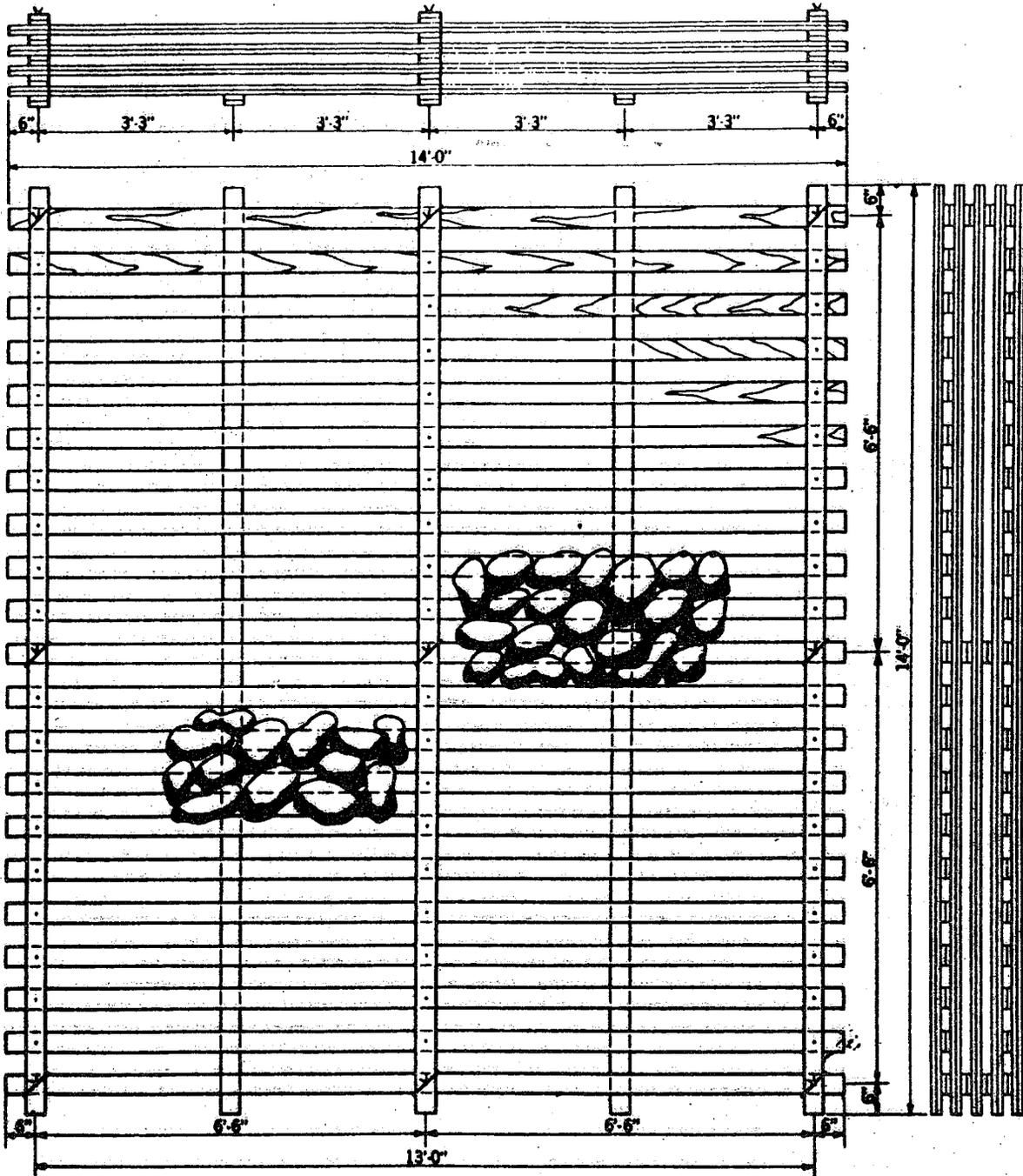


SECTION

BILL OF MATERIAL FOR 100 FEET	
LUMBER	
56 pieces	1"x12"x12'-0"
32 pieces	1"x4"x2'-6"
32 pieces	2"x4"x9'-0"
• 32 pieces	2"x4"x2'-0"
•	(Sharpened)
WIRE	
200'	baling wire
NAILS	
4	lbs.-8d nails

CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT

MOVABLE
WAVE WASH PROTECTION
 U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.



Note:

Cribs constructed of double thickness of 1"x4"x14'-0" lumber. Nail all intersections with 1-20d nail. Each intersection of walls securely fastened by a loop of No. 9 wire, tightly twisted.

BILL OF MATERIAL FOR ONE CRIB 13'-0"	
LUMBER	
130 pieces	1"x4"x14'-0"
WIRE	
30'	No. 9 wire
NAILS	
12½ lbs.	20d nails

**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
CAVING BANK PROTECTION**

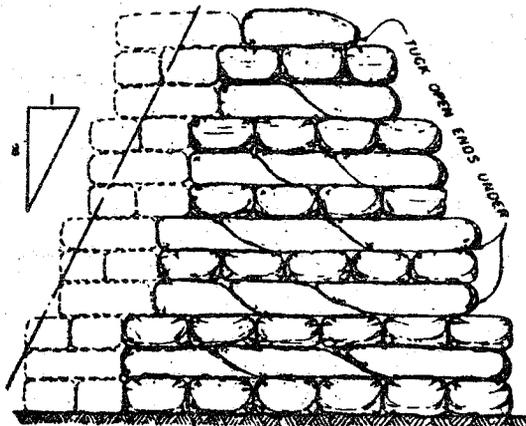
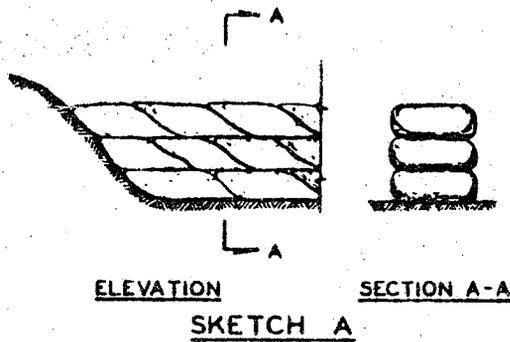
U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.

LEVEE CONSTRUCTION

SANDBAGGING USED TO PREVENT OVERTOPPING OF EXISTING LEVEES AND FOR RETAINING FLOOD WATERS WHERE NO BACK UP MATERIAL IS AVAILABLE.

INSTRUCTIONS:

1. FILL SANDBAGS 1/2 TO 2/3 FULL BUT LEAVE ENOUGH FLAP TO TURN UNDER DO NOT TIE. LEAVE ENDS OPEN.
2. FOR HEIGHTS OF 1 FOOT AND LESS, LAY 3 SINGLE COURSES WITH BAGS LENGTHWISE AS SHOWN IN SKETCH "A" BELOW.
3. FOR HEIGHTS GREATER THAN 1 FOOT, PLACE AS INDICATED IN SKETCH "B" BELOW.
4. WHEN BAGS ARE PLACED FLATTEN OUT AND FILL VOIDS BY MASHING BAGS WITH FEET AND VIGOROUSLY TRAMP EACH COURSE OF THE LEVEE SECTION THIS IS AN EXTREMELY IMPORTANT OPERATION FOR PROVIDING A LEVEE WHICH WILL BE AS IMPERVIOUS TO WATER AS POSSIBLE AND TO INSURE STABILITY OF SECTION LOOSELY PLACED SANDBAGS IMPROPERLY KEYS TOGETHER MAY RESULT IN FAILURE AND CAUSE SERIOUS DAMAGE.



LEVEE SECTION

FOR HEIGHTS IN EXCESS OF THE ABOVE (APPROX 3'-6") HOLD SAME BATTER AND BUILD ON THE SIDE AS INDICATED BY DASHED LINES ABOVE ALTERNATE HEADER COURSES (BAGS PLACED CROSSWISE) AND STRETCHER COURSES (BAGS PLACED LENGTHWISE).

SKETCH B

ESTIMATING DATA:

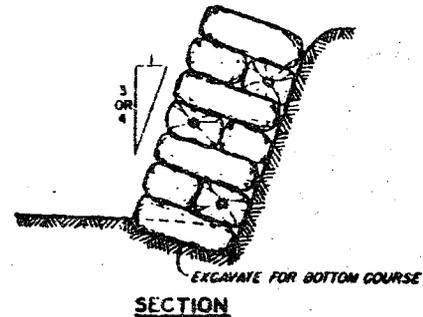
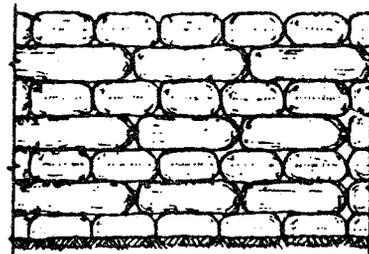
1. AVERAGE WEIGHT OF EACH FILLED SANDBAG, APPROX 50 LBS.
2. APPROXIMATELY 1000 SANDBAGS ARE REQUIRED FOR EACH 50 FT. OF SURFACE (HEIGHT MULTIPLIED BY DISTANCE)

REVETMENTS

USED FOR EMERGENCY BANK PROTECTION TO PREVENT UNDER CUTTING AND CONTROL OF COURSE OF FLOOD CHANNELS

INSTRUCTIONS:

1. FILL SANDBAGS 2/3 FULL AND TIE OPEN END.
2. TUCK IN BOTTOM CORNERS OF BAG AFTER FILLING.
3. PLACE BAGS PERPENDICULAR TO SLOPE.
4. LAY STRETCHER AND HEADER COURSES WITH CHOKE AND SIDE BEAMS IN: THUS -



ESTIMATING DATA:

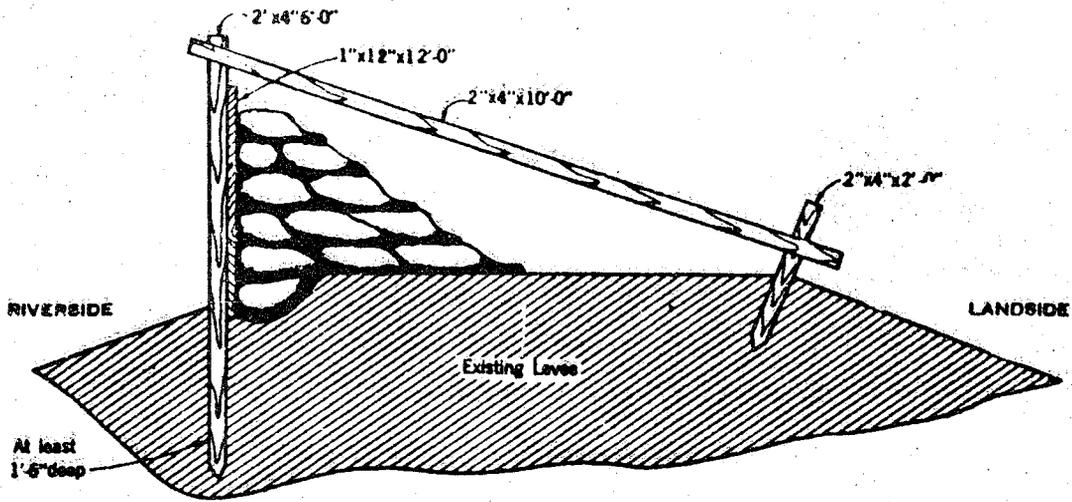
1. AVERAGE WEIGHT OF EACH FILLED SANDBAG APPROXIMATELY 55 LBS.
2. APPROXIMATELY 320 SANDBAGS ARE REQUIRED FOR EACH 100 SQ. FT. OF SURFACE TO BE REVETED.

FILL MATERIAL.

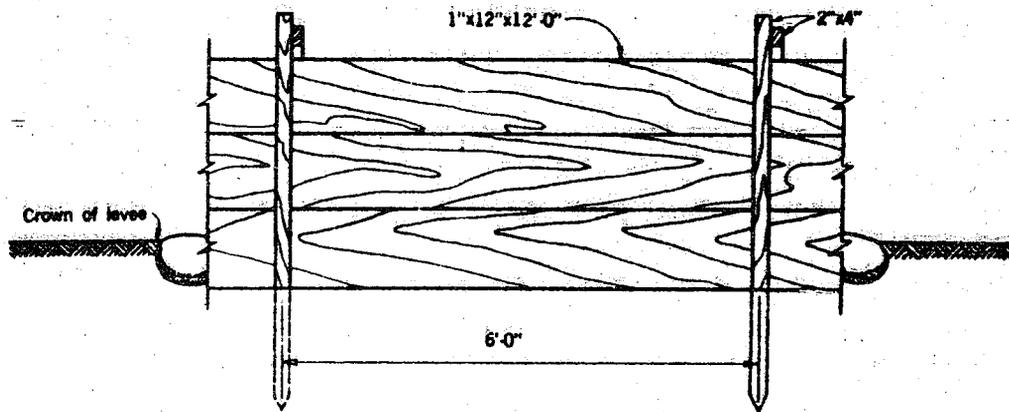
THE IDEAL MATERIAL FOR FILLING SAND BAGS IS A FINE SAND OR COARSE SILT AVOID, AS MUCH AS POSSIBLE, THE USE OF COARSE GRAVEL AND HEAVY CLAYS

**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
INSTRUCTIONS FOR
PLACING SANDBAGS**

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.



SECTION

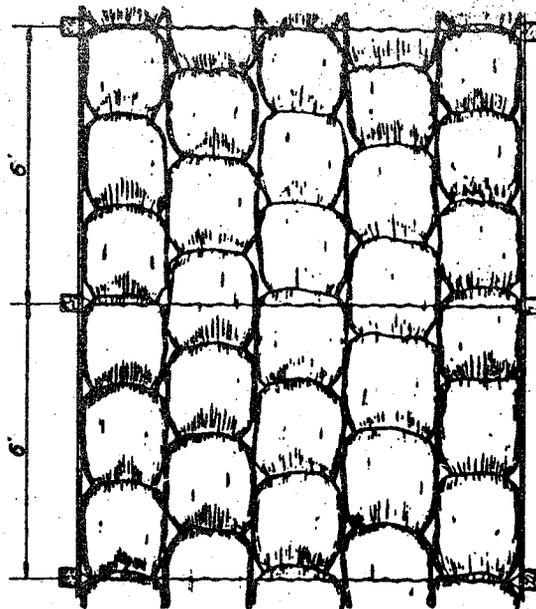


FRONT ELEVATION

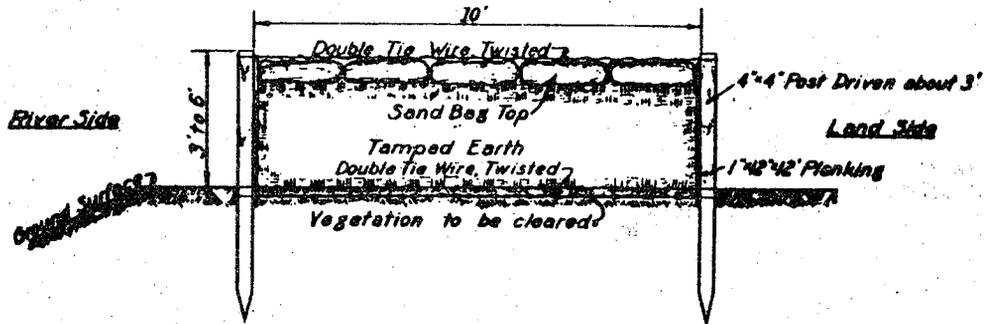
BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE	
LUMBER	
25 pieces	1" x 12" x 12'-0"
17 pieces	2" x 4" x 10'-0"
• 17 pieces	2" x 4" x 8'-0"
• 17 pieces	2" x 4" x 2'-0"
	(Sharpened)
NAILS	
1 lb.	8d nails
2 lbs.	16d nails
SANDBAGS	
1100	bags

**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
LUMBER AND SACK TOPPING**

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.



PLAN

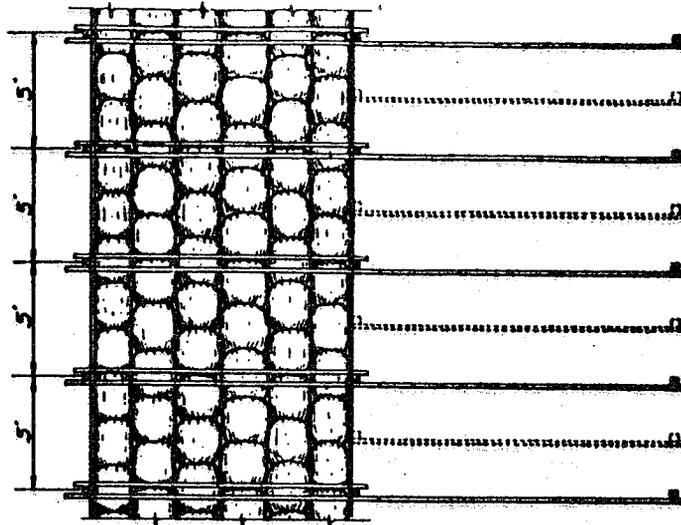


END ELEVATION

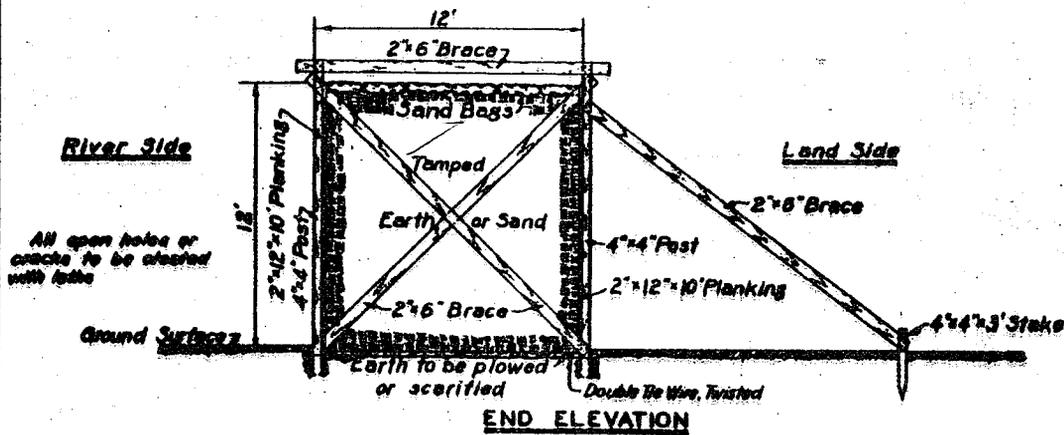
MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE		
4 FT HIGH	5 FT HIGH	6 FT HIGH
34 pieces 4"x4"x7' (sharpened) 1122	34 pieces 4"x4"x8' (sharpened) 1371	34 pieces 4"x4"x9' (sharpened) 1608
67 pieces 1"x12"x12' board feet	84 pieces 1"x12"x12' board feet	100 pieces 1"x12"x12' board feet
25 lbs wire #12 gage	25 lbs wire #12 gage	25 lbs wire #12 gage
13 lbs 10d nails	15 lbs 10d nails	17 lbs 10d nails
600 sand bags	600 sand bags	600 sand bags
148 cu. yds. earth	185 cu. yds. earth	222 cu. yds. earth

**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
3-6FT. MUD BOX LEVEE
CONSTRUCTION DETAILS**

U.S. CORPS OF ENGINEERS, SACRAMENTO, CALIF.



PLAN



END ELEVATION

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE			
LUMBER	SAND BAGS	NAILS	EARTH or SAND
40 Posts 4"x4"x14'	700	120 lbs. 20d	534 cu. yds.
200 Planks 2"x12"x10'		4 lbs. 3d fine	
20 Braces 2"x6"x14'		WIRE	
60 Braces 2"x6"x10'			
20 Stakes 4"x4"x3'		20 lbs. 12 gauge	
3 bundles bats			

Total Lumber 6587 board feet

ADDITIONAL MATERIAL FOR BRACING BACK SIDE IN BETWEEN BENTS			
LUMBER	SAND BAGS	NAILS	EARTH or SAND
20 Posts 4"x4"x14'		8 lbs. 20d	
20 Braces 2"x6"x14'			
20 Stakes 4"x4"x3'			
Total Lumber 813 board feet			

Sharpened

**CHOWCHILLA RIVER
ASH AND BERENDA SLOUGHS
FLOOD PROTECTION PROJECT
MUD BOX BULKHEAD LEVEE
CONSTRUCTION DETAILS**

U. S. CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

EXHIBIT D

SUGGESTED CHECK LIST NO. 1

LEVEE INSPECTION REPORT

(SEE STANDARD MANUAL)

TO: District Engineer
U. S. Army Engineer District, Sacramento
650 Capitol Mall
Sacramento, California 95814

(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__) _____ Project
_____ County 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 surface reached or exceeded the reading indicated in paragraph 1-06, page 2) occurred on the following dates:

<u>STREAM</u>	<u>DATE</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

EXHIBIT D
Sheet 2 of 2

CHECK LIST NO. 1

LEVEES AND CHANNELS

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

Item	Remarks
(a) Location by Station	
(b) Settlement, sloughing, or loss of grade	
(c) Erosion of 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 SHEET 1, EXHIBIT E
(To be printed on back of sheet 1)

- Item (a) Indicate levee station of observance, 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 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 on the back face of back toe of the levee has taken place to be noticeable by visual inspection, indicate affected area 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 if 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. 2

CHANNEL AND RIGHT-OF-WAY

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	

INSTRUCTIONS FOR COMPLETING SHEET 3, EXHIBIT E
(To be printed on back of Sheet 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 of 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. 3

DRAINAGE AND IRRIGATION STRUCTURES
(Reference Paragraph 4-04a and 4-05a)

Inspector's Report Sheet No. _____

Inspector _____

Date _____

Superintendent _____

(a) Located by Levee Mile	
(b) Bank	
(c) Debris or other obstruction to flow	
(d) Damage or settle- ment 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 SHEET 5, EXHIBIT E
(To be printed on back of Sheet 5)

- (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 (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.

EXHIBIT F

LETTER OF ACCEPTANCE BY
THE STATE RECLAMATION BOARD

EXHIBIT F

C
O
P
Y

STATE OF CALIFORNIA
THE RECLAMATION BOARD

C
O
P
Y

March 5, 1976

District Engineer
Sacramento District
U. S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Subject: Control Structures for Ash and Berenda Sloughs, Chowchilla
River, California, Spec. No. 4944, Contract No. DACW 05-76-C-0029

Dear Sir:

Reference is made to your letter of March 1, 1976, concerning transfer
of the subject project to the State of California.

The Reclamation Board, at its meeting of February 27, 1976, authorized
the General Manager to accept the turnover of the subject structures
from the Corps of Engineers and to subsequently turn over the structures
to the Madera County Flood Control and Water Conservation Agency for
operation and maintenance.

This letter formally accepts the above subject work for operation and
maintenance.

Sincerely,

/s/ Paul L. Clifton
PAUL L. CLIFTON
General Manager

EXHIBIT F
Sheet 1 of 2

C
O
P
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THE RECLAMATION BOARD
STATE OF CALIFORNIA

C
O
P
Y

May 21, 1976

District Engineer
Sacramento District
U. S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Sir:

Ash and Berenda Sloughs, Chowchilla River, California, Specification No. 4476, Contract No. DACW 05-75-C-0067

Reference is made to your letters of March 22, 1976, Ash Slough and March 29, 1976, Berenda Slough concerning the transfer of these projects to the State of California.

This will supersede our previous letter dated April 7, 1976, Ash Slough and our letter dated April 9, 1976, Berenda Slough.

The Reclamation Board, at its meeting of February 27, 1976, authorized the General Manager to accept the turnover of Ash and Berenda Sloughs from the Corps of Engineers and to subsequently turn over the channel to Madera County Flood Control and Water Conservation Agency for operation and maintenance.

This letter formally accepts Ash and Berenda Sloughs for operation and maintenance provided that spraying of bamboo will be included in the forthcoming mitigation contract.

Sincerely,

/s/ Paul L. Clifton
PAUL L. CLIFTON
General Manager

EXHIBIT F
Page 2 of 2

REGULATIONS GOVERNING ISSUANCE OF PERMITS FOR USE OF
RIGHTS-OF-WAY FOR FLOOD PROTECTION PROJECTS

As the flood protection works and rights-of-way are owned by the Local Interests and will be operated and maintained by them in accordance with the Regulations of the Secretary of the Army, and issuance of any permits to use the restriction that no such permits may be issued without the approval of the District Engineer, as stated in Paragraph No. 208.10 (a) General, (5) of the Regulations, a copy of which is attached hereto.

Applications for use of the rights-of-way should be addressed to the county or Levee Commission having jurisdiction over the local flood protection project. The county or Levee Commission will then forward the application to the District Engineer, of the U. S. Army Engineer District, Sacramento, California, with its recommendation, with reasons for such recommendation. It is suggested that the application and recommendations be forwarded with a draft copy of the permit, in order that all objectionable features may be eliminated prior to its proffer to the applicant as this may prevent misunderstandings and disagreements. If for any reason it is desired to forward the permit itself without this intervening step, five copies of the proposed permit should be included on which is stated the exact use of the rights-of-way, for which permission is being requested, together with any condition or restriction of the permit. The permit should be signed by the applicant and an official of the Local Interests. A drawing, sketch or detail plans as may be required to show the exact location, nature of work and proposed method of construction should be attached to each copy of the permit. If the permit is approved by the District Engineer, three copies will be returned. This will enable each party concerned to have a copy of the approved permit.

In any case where a permit is requested for any purpose which might cause disfigurement or damage to the flood protection rights-of-way or structure in its erection, use, or removal, it is suggested that the applicant be required to post a bond of sufficient amount to protect the Local Interests from any cost of repair or removal, and to guarantee faithful performance of the permit conditions. In such cases the permit should state the amount and conditions of the bond.

In cases involving major construction or other work which may directly affect the flood protection structure, it will be necessary that the United States inspect the work and the Local Interests may also desire to inspect it. As stated in the permit form, such inspection will be at the expense of the grantee, and this should be called to his attention. Except in cases of known financial security, arrangements should be made with the grantee for an advance deposit or bond to cover such costs.

There is attached hereto a copy of a permit form which has been successfully used by a number of cities and levee committees.

PERMIT
FOR
RIGHT OF ENTRY

(Name of Levee Commission or County)

(Location)

Permission is hereby granted to:

(Name of Firm or Individual)

(Address)

TO: (Describe in these spaces the proposal, including kind and type of construction, purpose intended, location by stationing. Indicate passageway provided by means of gates, etc. Use separate sheets if necessary, identifying each by reference herein.)

PROVIDED THAT:

Upon termination or expiration of this permit (whether by voluntary relinquishment by the grantee, by revocation by the grantor or otherwise) the grantee shall remove all structures, improvements, or appurtenances which may have been erected or constructed under this permit, and shall repair or replace any portion of the flood protection structure or right-of-way which may have been damaged by his operations (including grading and seeding, or sodding, if necessary), to the satisfaction of the grantor.

The structure or operation for which this permit is issued shall be maintained by the grantee in such manner as shall not injure or damage the flood protection structure, or interfere with its operation and maintenance in accordance with regulations of the Secretary of the Army.

The structure or operation covered by this permit may be damaged, removed or destroyed by the grantor in time of flood emergency if such action is determined by the grantor to be necessary in order to preserve life or

property or prevent damage or impairment to the use of safety of the flood protection structure, and the grantor shall not be liable to the grantee for such damage or destruction.

Unless otherwise specifically provided herein, this permit may be cancelled at anytime by the grantor upon 10 days written notice mailed to the address shown above. During such 10 day period, (or such other period as may be provided herein), the grantee will be permitted to remove any property or improvements installed under this permit, and to repair or replace any damage to the flood protection right-of-way or structures resulting from his use or operations. At the end of such period, the grantor shall have the right to possess and dispose of any such property or improvements remaining upon its right-of-way, and may proceed to repair or replace any such damage, and the grantee herein shall be liable to the grantor for the full cost of such repairs or replacements.

The construction, installation and maintenance of the structure or structures covered by this permit shall be subject to inspection by representatives of the grantor and the United States at all reasonable times.

In the event the work covered by this permit consists of or includes major construction, the cost of inspection thereof by the grantor and/or the United States shall be paid by the applicant.

Grantee agrees that it will not use the area or facilities covered by this permit, or permit such area to be used, for any purpose other than is specifically covered by this permit.

(Use these spaces for special conditions applicable to this permit.)

THIS PERMIT SHALL NOT BE VALID UNTIL APPROVED BY THE DISTRICT ENGINEER OF THE U. S. ARMY ENGINEER DISTRICT, SACRAMENTO, OR HIS AUTHORIZED REPRESENTATIVE.

Terms of this permit
are hereby accepted

Signature (Grantor) (Title) (Date)

Approved:

Signature (Grantee)

(Date)

(Date)

District Engineer