

LITTLEJOHN CREEK AND CALAVERAS RIVER
STREAM GROUPS

OPERATION AND MAINTENANCE MANUAL
FOR
DUCK CREEK DIVERSION
A UNIT OF
FARMINGTON RESERVOIR PROJECT



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

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PREPARED BY THE SACRAMENTO DISTRICT
CORPS OF ENGINEERS, U. S. ARMY
SACRAMENTO, CALIFORNIA, DATED DECEMBER 1952

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OPERATION AND MAINTENANCE MANUAL

FOR

DUCK CREEK DIVERSION

DECEMBER 1952

SECTION I

INTRODUCTION

1-01. Authorization. The project works covered by this manual were authorized by Act of Congress (Public Law No. 534, Seventy-eighth Congress, second session, H. R. 4485), approved 22 December 1944. This act authorized improvement of Littlejohn Creek and its tributaries in accordance with recommendations contained in the report of the Chief of Engineers dated 14 January 1944 (House Document No. 545, Seventy-eighth Congress, second session).

1-02. Location. The Duck Creek Diversion unit of the Farmington Project is located approximately 0.5 miles east of Farmington, California and approximately 3.5 miles downstream from Farmington Dam, as shown on the locality map of exhibit A - 1 herewith. Also included in the Duck Creek Diversion unit is dike "B", built across the North Branch of Duck Creek approximately 4 miles downstream from the diversion works; and dike "C", built across the North Branch of Duck Creek approximately 9 miles downstream from the diversion works and just upstream from the Jack Tone Road. All portions of this unit are shown on drawing No. CA-2-13-101, sheets 1, 2 and 3 of exhibit B.

1-03. Description of Project Works. The project works covered by this manual include the following:

- a. Diversion works consisting of a low compacted earth dike across Duck Creek with one 72" gated and one 60" ungated outlet discharging into Duck Creek, and an ungated concrete spillway 73' long discharging into the diversion channel.
- b. An unlined diversion channel extending southward about 5,000 feet from the Duck Creek diversion works to Littlejohn Creek.
- c. A 10-inch soil-proofed steel pipe line and supports constructed across the diversion channel.
- d. Wooded panel gates and supports constructed across the diversion channel at three locations.
- e. Dike "A" constructed across the abandoned Littlejohn Creek Channel adjacent to the diversion channel just upstream from State Highway No. 4.

f. Levees and spoil banks constructed on both banks of the diversion channel upstream from State Highway No. 4.

All the above work was performed at a location approximately 0.5 miles east of Farmington, California. Also included in this project works are the following:

a. Clearing of the channel of Littlejohn Creek between the end of the diversion channel and the Southern Pacific Railroad Bridge.

b. Dike "B" constructed across the north branch of Duck Creek approximately 4 miles downstream from the diversion works.

c. Dike "C" constructed across the north branch of Duck Creek approximately 9 miles downstream from the diversion works and just upstream from the Jack Tone Road.

1-04. Protection Provided. The project works are designed to protect lands adjacent to Duck Creek downstream from the diversion works from flows in excess of 500 cubic feet per second. However, until such time as local interests desire to improve the channel of Duck Creek downstream from the diversion works, the flow will be restricted to the presently estimated non-damaging capacity of 250 cubic feet per second. Operation of the Duck Creek diversion works is outlined in paragraph 4-02(d) of this manual.

1-05. Construction Data. The major portion of the Duck Creek diversion works and other channel improvements were constructed under Contract No. DA-04-167-eng-483, copies of which are on file in the office of the District Engineer, Sacramento District, Sacramento, California. The contractor was A. Teichert and Son. Work was started in May 1951 and completed in May 1952.

Duck Creek project improved D.S. channel & now both pipes remain open all the time. Gate is not supposed to be closed. Design flow of div. channel apparently is 2000 cfs-sec. Exh F, sheet 1 of 3. This agrees with channel design on Littlejohn Creek & is what the objective flow for Farmington Dam. No backup to verify 2000 cfs could be found in design documents & there apparently is no design W.S. profile.

SECTION II

LOCAL COOPERATION REQUIREMENTS

2-01. Applicable Portions of Flood Control Act. Section 10 of the Act approved 22 December 1944, which authorized construction of the project works, reads in part as follows:

"SACRAMENTO - SAN JOAQUIN RIVER BASIN

. The plan of improvement for flood control and other purposes on the Calaveras River and Littlejohn Creek and tributaries, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 545, Seventy-eighth Congress, second session."

2-02. Project Document. The work included herein is described in the following project document: H.R. Document No. 545, Seventy-eighth Congress, second session, in which the following conditions of local cooperation are set forth:

- "(1) Provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the works.
- (2) Make all necessary bridge and utility alterations.
- (3) Hold and save the United States free from damages due to the construction works.
- (4) Maintain and operate all works after completion in accordance with regulations prescribed by the Secretary of War."

2-03. Assurances Provided by Local Interests. Construction of the improvement was undertaken by the United States subject to the condition specified in the law that local interests would comply with the conditions as set forth in paragraph 2-02 above. Assurance of cooperation by local interests is provided by State legislation, as contained in Chapter 3, Part 2, Division 5 of the State Water Code.

2-04. Acceptance by State Reclamation Board. Responsibility for operating and maintaining the completed works herein described was officially accepted by the Reclamation Board of the State of California on 3 July 1952, as shown on the attached letter of acceptance, Exhibit G.

SECTION III

MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01. Reference to Approved Regulations. This manual is furnished in accordance with provisions of Title 33 - Navigation and Navigable Waters, chapter II, Corps of Engineers, Department of the Army, part 208 - Flood Control Regulations, Maintenance and Operation of Flood Control Works, approved by the Secretary of the Army, 9 August 1944, and published in Federal Register, 17 August 1944, 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) 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."

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 local flood-protection projects for which such regulations are required by law. Section 208.10 (a) (10) of the regulations read as follows: "The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations." This manual has, therefore, been prepared to furnish local interests with information on the project works and advice 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 flood-fighting operations and emergency repairs. The project works are to be maintained and operated in accordance with the Flood Control Regulations referred to above and further details contained herein.

3-04. Definitions. As used hereinafter, the term "Superintendent" shall be defined to mean the person appointed by local interests to be directly in charge of an organization which will be fully responsible for the continuous inspection, operation, and maintenance of the project works; the term "District Engineer" shall be defined to mean the District Engineer of the Sacramento District, Corps of Engineers, U.S. Army, or his authorized representative. The term "flood" shall mean any river stage which exceeds a reading of 5.5 on the recording gage at the

diversion works. 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 facing downstream. The term "operating personnel" shall be defined to mean the Superintendent and his key assistants individually or collectively when operating the diversion works.

3-05. General Provisions of the Regulations. In addition to that part of the Flood Control Regulations 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 the efficient operation and maintenance of all 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 of the protective facilities.
- (5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavations or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any features of the works without prior determination by the District Engineer of the War Department 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 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 to the Superintendent "As Constructed" drawings of the project works at the time they are transferred.
- b. Make periodic inspections of the project works and notify the Superintendent of any repairs or maintenance measures which the District Engineer deems necessary in addition to the measures taken by the Superintendent.
- c. 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, and to furnish the Superintendent with an approval thereof in writing.
- d. Assist the Superintendent as may be practicable, in his duties of ascertaining storm developments having flood-producing potentialities, assembling flood-fighting forces and materials, and initiating and carrying out flood-fighting operations.

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 men and a reasonable number of substitutes. These key men should, in turn, have similar data on all of the men who will assist them in the discharge of their duties. The organization of key men should include the following:

- (1) An assistant to act in the place of the Superintendent in case of his absence or indisposition.
- (2) Sector foremen 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 arrange for the prosecution of offenders under local ordinances and report actions taken to the District Engineer.

d. Permits for Right-of-Entry or Use of Portion of Right-of-Way. Permits for temporary right-of-entry or use of portions of the right-of-way shall not be issued without prior determination by the District Engineer that such use will not adversely affect the safety and functioning of the project structures or maintenance and flood fighting operations. Applications for such permits must be submitted by the Superintendent to the District Engineer sufficiently in advance of issuance to permit adequate study and consideration and determination of conditions to be embodied in the permit document. Executed copies, in triplicate, of the permit document as issued shall be furnished the District Engineer. See Exhibit E, Sheet 1, for regulations governing issuance of permits for right-of-entry.

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 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 and in accordance with plans and specifications approved by the District Engineer or his authorized representative; 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 or inspectors appointed by him.

(2) After completion of the work, "As Constructed" drawings or prints, in duplicate, showing such improvements as finally constructed shall be furnished the District Engineer.

A sample permit form is attached in Exhibit E, Sheet 2.

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

- (2) For sake of uniformity, and to the extent practicable, the dates of inspection shall be as follows: 1 December, 1 March, 1 June, 1 September, and immediately following each flood in excess of a reading of 5.5 on the recording gage at the diversion works.
- (3) Check Lists. The check lists and instructions shown in exhibit C, sheets 1 to 11 inclusive, are to be explicitly followed in each inspection to insure that no features of the protective system are overlooked. Check lists locally printed in conformity with sheets 1, 4, 7, and 10 shall have printed on the reverse side the applicable instructions shown on sheets 2, 3, 5, 6, 8, 9 and 11, exhibit C. Carbon copy of the inspector's original field notes as recorded on the check list shall be transmitted 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 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 routine mowing of the grass and weeds, 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 Corps of Engineers 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 construction 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 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 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 Superintendent shall submit, within a 10-day period following 1 December and 1 June 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 condition of the protective works as summarized from the logs of inspection.
 - (b) Flood behavior of the protective works, and flood-fighting activities during the period.
 - (c) Prosecutions for encroachment or trespass.
 - (d) Permits issued for right-of-entry or use of right-of-way.
 - (e) Permits issued for improvements of construction within 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.

SECTION IV

FEATURES OF THE PROJECT SUBJECT TO FLOOD CONTROL REGULATIONS

4-01. Project Works. The flood control works covered by this manual are known as the Duck Creek Diversion unit of the Farmington Project and consist of an excavated diversion channel from Duck Creek to Littlejohn Creek, levees and spoil banks on both banks of the diversion channel between the diversion weir and State Highway No. 4, a diversion weir, a control structure that regulates the flow into Duck Creek, an irrigation pipe line crossing over the channel, three sets of panel gates across the diversion channel, and dike "A" built across the abandoned Littlejohn Creek channel just upstream from State Highway No. 4. This portion of the unit is located approximately 0.5 miles east of Farmington, California, and approximately 3.5 miles downstream from Farmington Dam. Also included in the Duck Creek diversion unit is dike "B", built across the North Branch of Duck Creek approximately 4 miles downstream from the diversion works, and dike "C" built across the North Branch of Duck Creek approximately 9 miles downstream from the diversion works and just upstream from the Jack Tone road. The clearing of the channel of Littlejohn Creek in the reach from the diversion channel to the Southern Pacific Railroad was also included as a part of this unit.

4-02. Diversion Works.

a. General. - The diversion works in this unit consist of a control structure in the Duck Creek channel and a diversion weir set in the left bank of Duck Creek just upstream from the control structure. The purpose of this diversion works is to limit the flow down Duck Creek below the structure to a maximum of 250 c.f.s. and to limit the flows down Duck to non-damaging rates and to divert excess flows to Littlejohn Creek.

b. Description.

- (1) The diversion weir is one of the broad crested type having a length of 73 feet and a crest elevation of 106.0 M.S.L. It discharges directly into the diversion canal. This structure is shown on drawing No. CA-2-13-101, sheets 4 and 5 of exhibit B. The flow of water over the weir for a given water surface elevation in Duck Creek can be determined from the attached rating curve (exhibit F).
- (2) The Duck Creek control structure consists of two corrugated metal pipe openings in an earth fill dike. The 60 inch diameter opening is uncontrolled and water may pass through it at all times, while the 72-inch diameter opening is equipped with a 72-inch slide

Duck Creek channel below diversion was improved to pass 700 cfs. With gate on 72" conduit fully open max flow through control structure is 500 cfs per F. 1. 1. 1.

headgate to regulate the flow of water down Duck Creek below the structure. With proper control, no flows in excess of 500 c.f.s. will be released into Duck Creek. This structure is shown on drawing No. CA-2-13-101, sheets 4 and 5 of exhibit B. The outlet rating curve is found in exhibit F.

c. Inspection.

(1) Pertinent Requirements of the Code of Federal Regulations. 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. Flap gates 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 head-walls 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 structures 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 as required by paragraph 3-07 g (1) of this manual, the following items shall be particularly noted:

(a) Damage or settlement of corrugated metal pipes through the control structure.

(b) Condition of slide gate guides, stem, and hoists.

- (c) Condition of concrete cracks, spalls or erosion on the diversion weir.
 - (d) Debris or other obstructions to flow.
 - (e) Condition of embankments adjacent to outlet structures.
 - (f) Condition of riprap or stone blanket adjacent to outlet structures.
- (3) All concrete shall be repaired as soon as any reinforcement steel is exposed. The repair shall be made by thoroughly cleaning the surface, by chipping or sand blasting, and building up the concrete to its original section. For this purpose, the use of pneumatically-placed Portland cement mortar is considered satisfactory. All evidence of settlement, uplift or failure of concrete structures should be referred to the District Engineer for analysis and recommendation of remedial action.
- (4) If the inspection shows the control gate has been jammed by debris or other obstructions, it shall be thoroughly cleaned so that it operates completely to full opening or full closure.
- (5) The operating mechanism of the control gate on the control structure shall be kept well lubricated. A coating of lime soap base grease blended into heavy oil or other grease which is non-fluid, adhesive, and resistant to water, dust and sun shall be applied to the stem threads. This coating shall be similar and equal to Standard Oil Company Calol multi-service grease No. 4. It should be applied as needed. The unthreaded portion of the stem shall be coated with an adhesive, water resistant, high melting point grease. This grease should be similar and equal to Standard Oil Company Calol W. P. Grease No. 2. Apply a coating of this grease to the full length of the stem below the threads. This portion of the stem should be inspected during low water periods and grease applied when necessary.
- (6) If any parts of the control gates have been damaged or broken, they shall be replaced by new parts. New parts for the 72-inch Calco slide headgate can be obtained from the California Corrugated Metal Company in Berkeley, California.

- (7) Gate leaves, exposed surfaces of frames and guides of the slide gate shall be repainted completely with one coat of coal tar paint every two years. Prior to repainting, all surfaces shall be thoroughly cleaned. Rust spots and other areas where the film is broken are to be cleaned by sanding down to base metal. Two coats of coal tar paint are to be applied.

d. Operation. Under present conditions the diversion works, consisting of the control structure and the diversion weir, shall be operated as follows:

- (1) The ungated 60-inch conduit of the control structure shall be maintained in a fully open and unobstructed condition at all times. The gate of the 72-inch conduit shall be kept fully closed whenever the water surface at the diversion works is less than 5.5 feet on the pool gage and shall be opened as necessary to prevent or minimize exceedance of that stage.

The Duck Cr. channel was improved in 1966. Design flow below div. is 700 cfs. No new rules have been issued but it would seem that 22" gate could be left open because max. flow thru both conduits is 530 cfs. 4-03. Channels.

(2) When and if local interests improve the channel of Duck Creek below the diversion works to accommodate a flow of 500 cubic feet per second, the District Engineer shall be notified and operating rules will be issued for the new condition.

see next page out of Farmington Res Reg Manual

a. General. - The channel improvements on the Duck Creek Diversion unit of the Farmington Project consists of the excavated diversion channel from Duck Creek to Littlejohn Creek and channel clearing between sta. 50+14 and sta. 10+10. For supplemental stream flow information, the main outflow station rating curve for Littlejohn Creek has been included in exhibit F.

b. Description. - The location of this channel is shown on drawing No. CA-2-13-101, sheet 1 of exhibit C-5. The centerline of the Duck Creek diversion channel extends from Station 0+00 at its junction with Duck Creek in a southerly direction to its junction with Littlejohn Creek at Station 50+14. The trapezoidal channel has a bottom width of 62 feet and side slopes of 1 on 2. The elevation of the bottom of the channel varies uniformly from 103.0 (M.S.L.) at Station 0+00 to 99.76 at Station 50+14.

The area between banks of Littlejohn Creek from Station 10+10 at the town of Farmington upstream to Station 50+14 was cleared of all vegetation.

CHAPTER 7 - DUCK CREEK DIVERSION WORKS

38. Regulation objective. - The objective of regulation by the Duck Creek Diversion Works is to restrict flows in Duck Creek below the diversion works to channel capacity rates and spill all excess water through the diversion channel into Littlejohn Creek, where it combines with the regulated outflow from Farmington Reservoir.

39. Plan of operation presented in previous reports. - The plan of improvement presented in the project document provided for a dam across Duck Creek with ungated outlets that would discharge a flow of 500 c.f.s. under maximum head. Consequently the operation would have been fully automatic. At the time of construction it was found that the capacity of Duck Creek below the diversion was only 250 c.f.s. Therefore, the diversion structure was designed with one gated and one ungated outlet having capability of passing flows varying from 250 c.f.s. to 500 c.f.s. at design head by regulation of the gated outlet, which would normally remain closed to regulate flows in Duck Creek to the restricted channel capacity. Improvement of Duck Creek channel completed in 1967 provides capacity to accommodate project document plan flows and permits operation with both outlet gates fully open under normal circumstances.

40. Limitation on flows. - Flows in the Duck Creek channels downstream from the diversion works will be automatically limited to 500 c.f.s. at design head (gage height 5.5 feet) which is less than the present non-damage capacity of those channels.

41. Criteria for operation. - The criteria for operation of Duck Creek Diversion Works are as follows:

a. Both gated and ungated outlets to Duck Creek shall be kept fully open except when closure of the gated outlet is authorized by the District Engineer during emergency conditions.

b. The outlets to Duck Creek shall be kept free of obstruction at all times.

From Farmington Res
Reg Manual

c. Inspection

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

- "(g) Channels and Floodways..... (1) Maintenance. Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:
- (i) The Channel or Floodway is clear of debris, weeds and wild growth;
 - (ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;
 - (iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;
 - (iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;
 - (v) Riprap sections and deflection dikes and walls are in good condition;
 - (vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made 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 flood-flow 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 Par. 208.10 (9) (1) of the Flood Control Regulations, particular attention will, therefore, be given the following:

- (a) Location, extent and size of vegetal growth.

(b) Unauthorized operations within the flood-flow 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 free-flow 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 injuries.

2. Fencing:

- a. Injuries to posts, fencing or barbed wire.
- b. Damage to galvanizing.

3. Earth fills:

- a. Settlement.
- b. Erosion of back slopes.
- 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.

d. Maintenance

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Par. 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.

(6) Weeds and other growth in the channel shall be cut in advance of the flood season and, together with all debris, removed from the channel.

(7) All eroded concrete shall be repaired as soon as erosion approaches a depth of 4 inches. For this purpose, it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the section with pneumatically placed Portland cement mortar. All evidence of settlement, uplift, or failure of concrete structures shall be referred to the State Engineer for analysis and remedial measures.

(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) All subdrainage structures which have become cemented due to the evaporation of ground water or other causes, shall be thoroughly cleaned out and repacked with fresh gravel.

e. Operation

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

"(g) Channels and floodways.....(2) Operation.

Both banks of the channel shall be patrolled during periods of high water ... 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 towalls, drainage outlets or other flood control structures repaired."

4-04. Embankment.

a. Levees

(1) General. - The levees within this unit consist of both levees along a portion of the diversion channel from Duck Creek to Littlejohn Creek, a wing levee extending southeasterly from the left abutment of the diversion weir to high ground, a wing levee extending northerly from the Duck Creek control works to high ground, and the embankment that joins the right abutment of the diversion weir with the Duck Creek control structure.

(2) Description. - Plans, profiles and sections of the levees are shown on drawing No. CA-2-13-101, sheet 1 of exhibit B. The levees on both banks of the diversion channel extend from the diversion weir at centerline station 2+11 downstream to station 13+65. However, because of the excess excavation necessary to construct the channel, spoil banks were erected on both banks of the diversion channel from the diversion weir to State Highway No. 4. Between State Highway No. 4 and Littlejohn Creek, the excavated material from the diversion channel was used to fill the abandoned portion of the Littlejohn Creek Channel and consequently no spoil banks were necessary. The wing levees extending to high ground from the diversion weir and from the control structure, as well as the embankment between the two structures are shown on drawing No. CA-2-13-101, sheet 4 of exhibit B.

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) MaintenancePeriodic Inspection shall be made by the Superintendent...to be certain that

(i) No unusual settlement, sloughing, or material loss of grade of 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; (see Note (a) at end of subparagraph (1).)
- (viii) Access roads to and on the levee are being 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 ..."

Note (a)

Since the growth of sod on the slopes of the levees of this project is not practicable and as the nature of the levee growth warrants burning thereof to facilitate inspection, the provisions of subparagraph b(1) of the regulations inconsistent therewith shall not apply. In place of item (vii), therefore, the following shall be observed:

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

(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:

- (a) Aggradation or degradation of the stream bed along the toe.
- (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 matter. If of larger extent, the fill should be made in the same manner as the original construction, of selected material from borrow pits approved for the project, placed in uniform layers of loose material and not more than 6 inches in depth and compacted in accordance with the specifications under which the work was completed or compacted according to approved construction practices.

(2) Depredations of Burrowing Animals. Dens and runways formed within the levee by burrowing animals are frequently the causes of levee failures during flood stages. Burrowing animals such as muskrats, ground hogs, ground squirrels, moles and gophers, found in the levee should be exterminated. The dens and runways should be opened up and thoroughly compacted as they are backfilled. Levees kept properly cleared are not seriously menaced by burrowing animals as they prefer areas where a protective cover, such as high grass, weeds, and brush, is found. Several methods of extermination are found effective, such as trapping, baiting, and poison gases, depending on the type of animal present and the time of year the work is done. Advice concerning the best methods in each locality can be obtained from the County Agricultural Agent.

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

d. Operation

(1) Pertinent Requirements of the Code of Federal Regulations. Flood Control Regulations, Par. 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 indication of slides or sloughs developing.
 - (ii) Wave wash or scouring action is not occurring.
 - (iii) No low reaches of levee exist which may be over-topped.
 - (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."

(3) Flood emergency protection. During major high water periods, as defined in paragraph 3-04 of this manual, action should be taken as outlined in Section V of this manual.

e. Dikes.

(1) General. - Included in this unit are dikes "A", "B", and "C". All embankment sections are constructed from homogeneous material borrowed from areas adjacent to the dikes.

(2) Description.

- (a) Dike "A". - Dike "A" is located just upstream of State Highway No. 4 on the right bank of the Duck Creek Diversion Channel. It is shown on drawing No. CA-2-13-101, sheet 1, of exhibit B. It has a crown width of 30 feet with 1 on 3 slopes.
- (b) Dike "B". - Dike "B" is located in the North Branch of Duck Creek approximately 4 miles downstream from the Duck Creek Diversion works. Plan, profile and section of the dike is shown on drawing No. CA-2-13-101, sheet 2, or exhibit B. The dike has a 20-foot crown with slopes of 1 on 3 on the upstream side and 1 on 2 on the downstream side. Elevation of the crown is 90.2 (M.S.L.). A 24 inch corrugated metal pipe has been placed through the dike to allow winter flows to pass into the North Branch of Duck Creek to replenish pools used for stock watering.
- (c) Dike "C". - Dike "C" is located in the North Branch of Duck Creek approximately 9 miles downstream from the diversion works and immediately upstream from Jack Tone road. The plan, profile, and section of this dike is shown on drawing No. CA-2-13-101, sheet 3 of exhibit B. The dike has a 20 foot crown width with slopes of 1 on 3 on the upstream side and 1 on 2 on the downstream side. Elevation of the crown is 61.7 (M.S.L.).

(3) Inspection and maintenance.

- (a) Requirements for inspection and maintenance of dikes will be the same as quoted for levees under paragraph 4-04 above.

4-05. Miscellaneous Facilities.

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

(1) Irrigation Pipe Line Crossing. - The steel pipe line crossing the diversion channel at station 11+50 CL conveys irrigation water from one field to another located on the opposite side of the channel. The pipe line consists of 174 feet of 10-inch No. 12 gauge soil-proofed steel pipe which extends through the spoil banks. At each end of the pipe a 10-inch Model 300 Calco gate is attached. Collapsible steel supports are provided for use during the irrigation season and a cable suspension is provided to support the pipe during the flood season, at which time the collapsible supports are disengaged from the pipe and folded to lie down in the channel. This structure is shown on drawing No. CA-2-2-103, sheet 1 of Exhibit B.

(2) Wooden Panel Gates. - The panel gates consist of 15½ foot sections of wooden panel suspended from a cable. They are designed to hang transversely across the diversion channel and to function as continuations of fences which terminate on the banks of the channel. These structures are shown on drawing No. CA-2-27-113.

(3) A corrugated metal gage house and stilling well for a water stage recorder is located on Duck Creek just upstream from the Duck Creek Diversion Structure. For details of this gage see Drawing No. CA-2-25-102 of Exhibit B. The Corps of Engineers will be responsible for operation and maintenance of this structure.

(4) A bridge crossing Duck Creek Diversion Channel due east from the town of Farmington. (State Highway No.4)

(5) Utility Relocations. - No utility relocations were necessary during the construction of the Duck Creek Diversion channel.

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 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 the inspection of the other features of the project are made, and shall be reported on check list No. 4, sheet No. 10, of exhibit C.

(3) The interest of the Corps of Engineers and the responsibility of the local interests in the existing highway bridge is confined to its effect on the safety and functioning of the flood control channel, but any conditions noted in the inspections that may affect it in any way should, as a matter of courtesy, be brought to the attention of the agency maintaining and operating it. 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 District Engineer for his information. A report on the action taken by the owner shall be submitted to the District Engineer to accompany the next semi-annual report. The suggested report form is included as exhibit D.

(4) The purpose of the periodic inspections of miscellaneous structures is to insure that these structures are functioning properly and that they are performing their functions as planned in the design assumptions. The Superintendent shall be certain that:

(a) The channel in the vicinity of the irrigation pipe crossing and the panel gates is clear of debris, weeds, and wild growth.

(b) The proper functioning of these structures is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments.

(c) Erosion of the channel banks is not occurring at the pipeline crossing or at the panel gates.

(d) The gates on either end of the pipe line crossing are in good working order and well lubricated.

(5) At each inspection, particular attention will be given to the following:

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

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

(c) Rubbish disposal.

(d) Erosion at or near the panel gates or at the pipe line crossing.

(6) All damage to pipe, panel gates, or supporting structures whether resulting from accidental or willful injuries or corrosion shall be promptly repaired with new material.

(7) All vegetal matter or debris shall be removed from the vicinity of the panel gates when inspection discloses it to be a hazard.

(8) When inspection discloses that the pipe is beginning to show spots of rust, these spots shall be cleaned with a wire brush and a coating of asphalt paint applied.

(9) No fires shall be built in the vicinity of the wooden panel gates and the area adjacent to the gates shall be kept free of weeds, dry grass, and other inflammable materials.

(10) The gates at either end of the pipe crossing shall be trial-operated and lubricated at frequent intervals to insure proper maintenance and operation.

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 District Engineer, U.S. Corps of Engineers, Sacramento, California, 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 to find at the last moment that preparations were incomplete or unsatisfactory. Confidence of the protected persons and firms 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 the 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 throughout any major flood. However, a serious accident may result in 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. Security. Personnel of the Corps of Engineers, whether military or civilian, are not vested with any 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.

5-04. Inspection of Flood Control Works. Immediately upon receipt of information that a high water is imminent, the Supervisory Committee through their Superintendents, should form a skeleton organization, capable of quick expansion, and assign individuals (Sector Foremen) to have charge of definite sections of levees. As his initial activity, each Sector Foreman 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, flap gates, and sluice gates.
- d. Transportation facilities.
- e. Material supply; quantity, location, and condition.
- f. Communications; locate and check all necessary tele-phones in the sector.

5-05. Preliminary Repair Work. After the initial inspection has been made, each Sector Foreman 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 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 flap gates 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 a good state of 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, (sacks, 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.

5-06. Disaster Relief. It is the responsibility of local, state, municipal 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 War Department through its Army Area Commander under existing Army Regulations, but such measures will be undertaken only as a last resort, in extreme cases and under compelling circumstances where local resources are clearly inadequate to cope with the situation.

5-07. Flood Fight. After the above preliminary organization and precautions have been completed, the "flood fight" itself commences. The methods of combatting 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.

b. Sandboils. 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 a height necessary to reduce the velocity of flow to a point at which material is no longer discharged from the boil. See Exhibit H, Plate 1. 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 and Sector Foreman should study the levee beforehand to determine the possibility of wave wash. All such reaches will be located well in advance and for use in emergency, a reserve supply of filled sacks and rolls of cotton bagging will 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 cotton bagging should be placed over the washed areas, as shown on Exhibit H, Plate 3. 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. Plate 2, Exhibit H shows a movable type of wave wash protection, also used with good results. Its advantage is that it can rapidly be 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 the profiles show a high water slope of two feet per mile or greater. Trouble may be looked for at the ends of old levee dikes, road-crossings 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, tree tops, or lumber, 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 by 14 feet in plan by 10 to 14 inches in inside depth. 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 floor boards are five equally spaced pairs of 1" x 4" boards about 3 feet center-to-center. On top of the cover, 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 20d 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. See Exhibit "H", Plate 4.

5-08. Topping. Immediate consideration should be given the grade line of each levee section by comparison of existing grades with those

shown on the drawings of Exhibit "B". If any reaches show a grade below the previous highest water, emergency topping should be undertaken at once to such a grade as may be established by the District Engineer, U. S. Corps of Engineers, Sacramento, California, 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 stretcherwise or along the levee from the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least $\frac{1}{3}$ either way and well mauled 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 the front facing so as to avoid washing out.

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 topping, 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 the 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 the 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 shown in the drawing, Exhibit "H", Plate 5.

5-09. 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 communication should be provided along dangerous stretches of the levee when travel or other satisfactory means of communication cannot be maintained.

**TITLE 33—NAVIGATION AND
NAVIGABLE WATERS**

**Chapter II—Corps of Engineers, War
Department**

**PART 208—FLOOD CONTROL REGULATIONS
MAINTENANCE AND OPERATION OF FLOOD
CONTROL WORKS**

PURSUANT to the provisions of section 3 of the Act of Congress approved June 22, 1936, as amended and supplemented (49 Stat. 1571; 50 Stat. 877; and 55 Stat. 638; 33 U. S. C. 701c; 701c-1), the following regulations are hereby prescribed to govern the maintenance and operation of flood control works:

§ 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 War, 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 right-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 War Department 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 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.

(10) The War Department will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under these regulations.

(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) The 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 accomplished 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) The 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 and/or 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 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.

(3) *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.

(c) *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 90 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. (49 Stat. 1871, 50 Stat. 877; and 55 Stat. 632; 33 U.S.C. 701c; 701c-1) (Regs. 9 Aug. 1944, CE SFEWF)

[SEAL]

J. A. ULJO,

Major General,

The Adjutant General.

[P. R. Doc. 44-12285; Filed, August 16, 1944; 9:44 a. m.]

EXHIBIT "A" Sheet 2 of 2

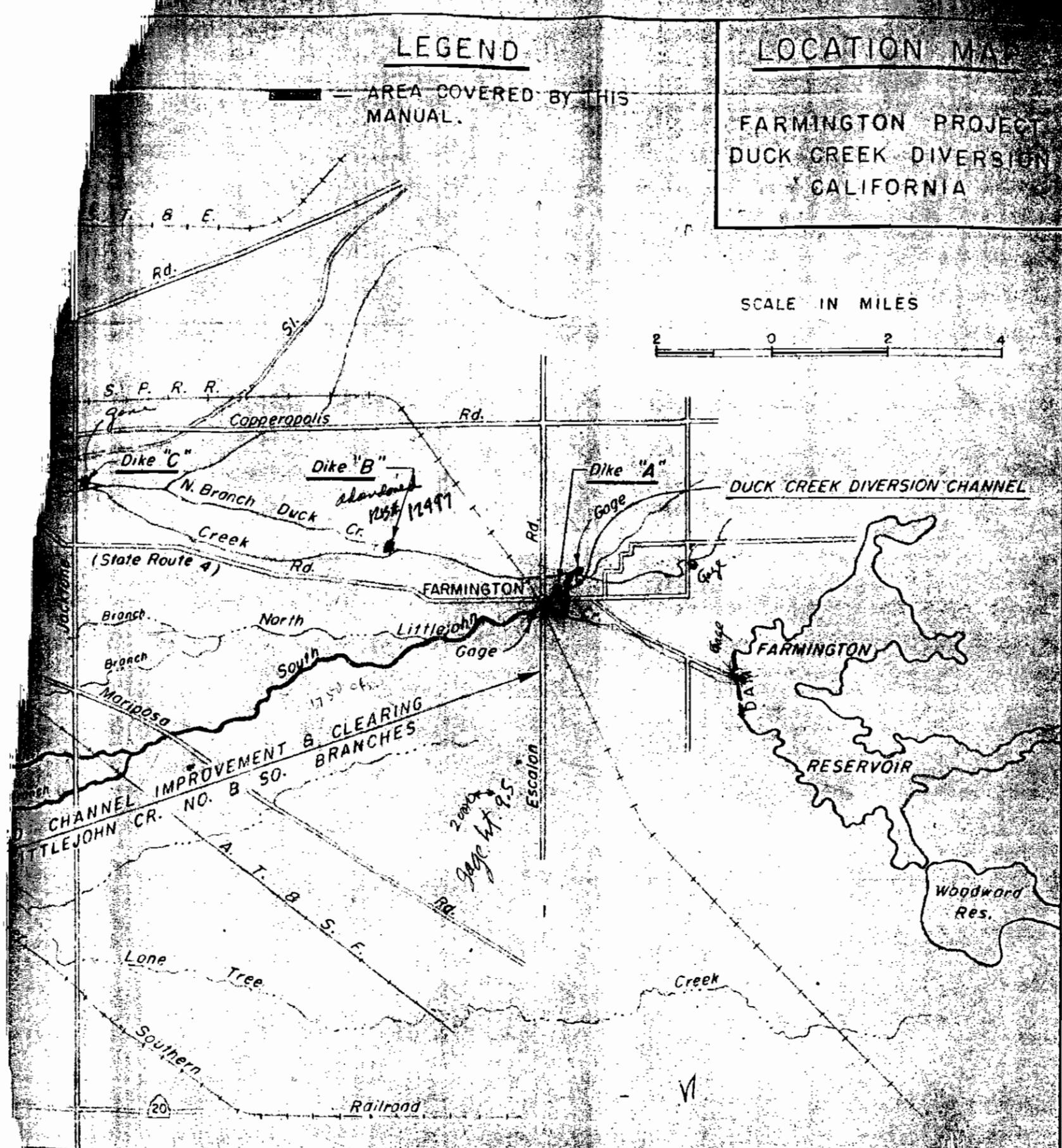
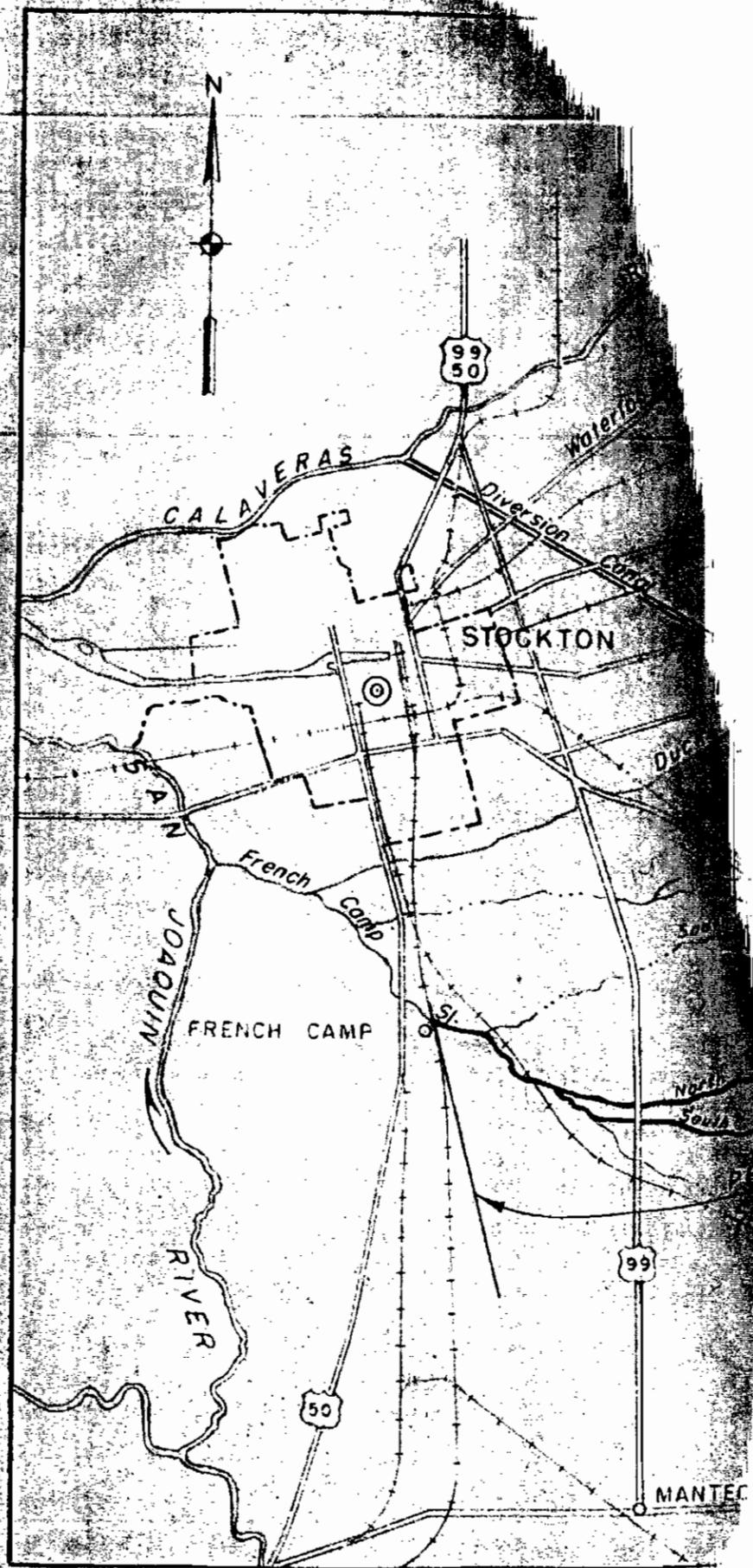


EXHIBIT B

"AS CONSTRUCTED"
DRAWINGS

See separate folder for the following drawings:

<u>File No.</u>	<u>Title</u>
CA-2-2-103	Pipe Crossing Diversion Channel Station 11+50, 1 sheet
CA-2-25-102	Stilling Well & Gage House for Water Stage Recorder, 1 sheet.
CA-2-13-101	Diversion Channel, Diversion Structure & Dike Construction near Farmington, California sheets 1 to 5, inclusive.

Additional drawings of cross-sections, structures and miscellaneous facilities are available in the Office of the District Engineer.

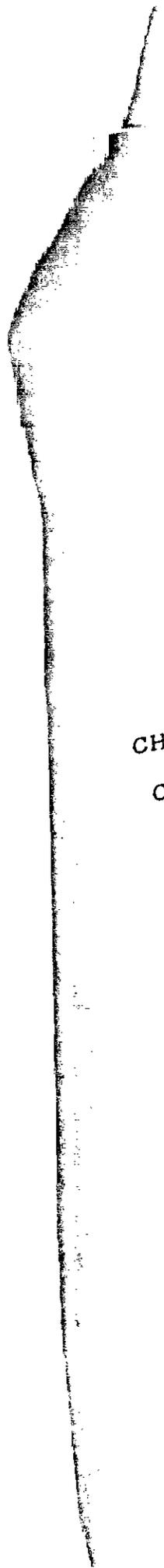


EXHIBIT C
CHECK LISTS OF LEVEE AND DIKE EMBANKMENTS,
CHANNELS, DIVERSION WORKS AND STRUCTURES

EXHIBIT C

EXHIBIT C

CHECK LIST NO. 1

Levee and Dike Embankments

Inspector's Report Sheet No, _____ Date _____

<u>Item</u>	<u>Remarks</u>
(a) Name and location of levee or dike by station	:
(b) Settlement, sloughing, or loss of grade	:
(c) Condition of riprap protection	:
(d) Condition of roadway, including ramps	:
(e) Evidence of seepage	:
(f) Condition of drains	:
(g) Condition of farm gates and fencing	:
(h) Maintenance measures taken since last inspection	:
(i) Comments	:

Inspector

Superintendent

Check List No. 1 (Cont'd)

Instructions for completing Check List No. 1, Exhibit C-2
(To be printed on back of sheet 1)

Item

- (a) Indicate levees of the diversion canal or name of dike and show station of observation obtained by pacing from nearest reference point.
- (b) If sufficient settlement of earth work 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.
- (c) State any change that has taken place in the riprap such as disintegration of rock, erosion, or sliding of rock down face. Indicate size and character of vegetation that may have grown up through the riprap. Note the presence of any drift or debris.
- (d) Note any material change in grade and section of roadway or ramps. Indicate any inadequacy in surface drainage system.
- (e) Indicate any evidence of seepage through the embankment sections.
- (f) Indicate condition of drain through dike "B".
- (g) Indicate the serviceability of all farm gates across the embankment roadway and indicate if repainting is required. Note particularly the condition of the suspended panel gates across the diversion channel at Station 3+51 also any damage to posts, fencing, and barbed wire.
- (h) Indicate maintenance measures that have been performed since last inspection and their condition at the time of this inspection.
- (i) 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.

EXHIBIT C

CHECK LIST NO. 2

Channel

Inspector's Report Sheet No. _____ Date _____

<u>Item</u>	<u>Remarks</u>
(a) Name of channel and location by stations	:
(b) Vegetal growth in channel	:
(c) Debris and refuse in channel	:
(d) New constructions within rights-of-way	:
(e) Extent of aggradation or de- gradation	:
(f) Condition of riprapped section	:
(g) Condition of bridge	:
(h) Measures taken since last inspection	:
(i) Comments	:

Inspector

Superintendent

Check List NO. 2 (Cont'd)

Instructions for completing Check List No. 2, Exhibit C.
(To be printed on back of sheet 3)

Item

- (a) Indicate "Diversion Channel" and "Duck Creek above the Diversion Works" and show station of observation obtained by pacing from nearest reference point.
- (b) Note nature, extent, and size of vegetal growth within the limits of the flood flow channel.
- (c) Note nature and extent of debris and refuse that might cause clogging of the conduits of the outlet works, the suspended panel gates, the weir, or the bridge at State Highway No. 4.
- (d) Report any construction along 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.
- (e) Indicate any change in grade or alignment of the channels, either deposition of sediments or scour, that is noticeable by visual inspection. Estimate amount and extent.
- (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.
- (g) Note any damage or settlement of the concrete footings of the bridge at State Highway No. 4. Indicate condition of wooden structures and if repainting is required. Indicate condition of bridge approaches, headwalls, and other appurtenances.
- (h) Indicate maintenance measures that have been performed since the last inspection and their condition at time of this inspection.
- (i) 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.

EXHIBIT C

CHECK LIST NO. 3

Diversion Works

Inspector's Report Sheet No. _____ Date _____

<u>Item</u>	<u>Remarks</u>
(a) Name of structure and location	:
(b) Debris or obstructions to flow	:
(c) Damage or settlement of conduit or structure	:
(d) Condition of concrete	:
(e) Condition of riprapped intake and outlet sections	:
(f) Condition of control gates and accessories	:
(g) Corrective action taken since last inspection	:
(h) Comments	:

Inspector

Superintendent

Check List No. 3 (Cont'd)

Instructions for completing Check List No. 3, Exhibit C.
(To be printed on back of sheet 5)

Item

- (a) Indicate name of structure and enter centerline station or traverse station, depending on location. This sheet is intended for use during inspection of the Duck Creek control structure and the diversion weir.
- (b) Inspect the conduits of the control structure for accumulation of sediment, rubbish or vegetal matter.
- (c) Record any settlement of the conduits, headwalls, or diversion weir structure.
- (d) Indicate condition of concrete in headwalls of control structure or in the diversion weir structure and record evidence of cracks, "popouts", spalls and abrasive wear. Note condition of expansion joints.
- (e) Note condition of riprap and indicate such changes as disintegration of rock, erosion or movement, and the presence of vegetal growth through the riprap.
- (f) Note condition of control gates in respect to: Freedom of movement in guides, condition of seals, condition of supports, lubrication, and operating condition of hoist. Indicate evidence of rust and condition of paint for gate and accessories.
- (g) Indicate maintenance measures that have been performed since the last inspection and their condition at the time of this inspection.
- (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.

Instructions for Completing Check List No. 4, Exhibit C
(To be printed on back of sheet 7)

Item

- (a) Indicate conditions of irrigation pipe and show whether damage of any kind has occurred. Also show condition of pipe surface due to erosion or weathering.
- (b) Indicate condition of steel pipe supports in channel, condition of cables and condition of "A" frames. Any corrosion or deterioration should be noted.
- (c) Indicate condition of panel gates and whether damage of any kind has occurred. Indicate whether any deterioration is occurring.
- (d) Indicate condition of suspension cables and "A" Frames. Deterioration or damage should also be noted.
- (e) Indicate maintenance measures that have been performed since the last inspection and their condition at the time of this inspection.
- (f) Record opinion, if any, of contributing causes for conditions observed, and also any observations not covered under other columns.

EXHIBIT D
SUGGESTED SEMI-ANNUAL REPORT FORM

EXHIBIT D

(1 June 19__)
(1 Dec 19__)

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

Dear Sir:

The semi-annual report for the period (1 June 19__ to 30 November 19__) (1 December 19__ to 31 May 19__) on the Duck Creek Diversion of the Farmington Project, San Joaquin County, California is as follows:

a. The physical condition of the protective works is indicated by the inspector's reports, 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 stages (water level at 4.0 on the Duck Creek gage or higher) occurred on the following dates:

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

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

(Superintendent's log of flood observations)

During the high water stages when the water level reached a height of _____ on the gage or in 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.

Action or prosecution for abatement of these encroachments or trespasses is summarized as follows: (or state none has been necessary).

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:

Labor Material Equipment Overhead Total

1. Inspection
2. Maintenance
3. Flood fighting operations

TOTAL

Respectfully submitted,

Superintendent of Works

EXHIBIT E
REGULATIONS GOVERNING ISSUANCE OF PERMITS
AND SUGGESTED PERMIT FORM

EXHIBIT E

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, the issuance of any permits to use any part of the rights-of-way will be handled by the Local Interests, with the restriction that no such permit 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 City or Levee Commission having jurisdiction over the local flood protection project. The City or Levee Commission will then forward the application to the District Engineer, Corps of Engineers, 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 arguments. 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 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.

2 Inclosures:

1. Regulations of Secretary of the Army
2. Sample permit form

EXHIBIT E
PERMIT

(NAME of Levee Commission or City)

(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 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 or 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 any time 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.

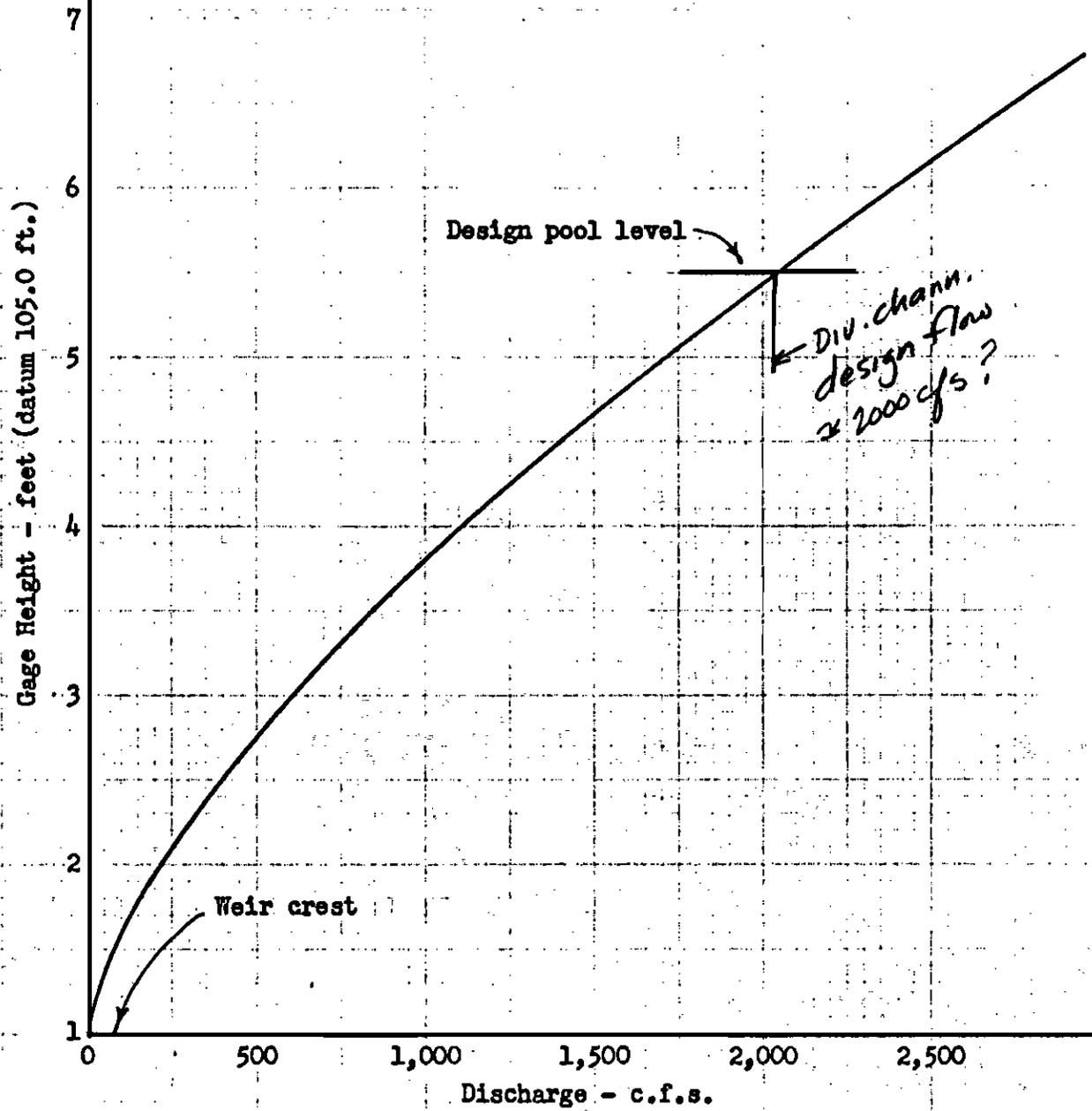
The construction, installation and maintenance of the structure or structures covered by this permit shall be subject to inspection by representatives of the grantor and the United States at all reasonable times.

In the event the work covered by this permit consists of or includes major construction, the cost of inspection thereof by the grantor

District Engineer

EXHIBIT F
RATING CURVES

EXHIBIT F



NOTES: Spillway discharges into Littlejohn Creek through diversion canal.

To accompany Reservoir Regulation Manual for Farmington Project dated 1 December 1952

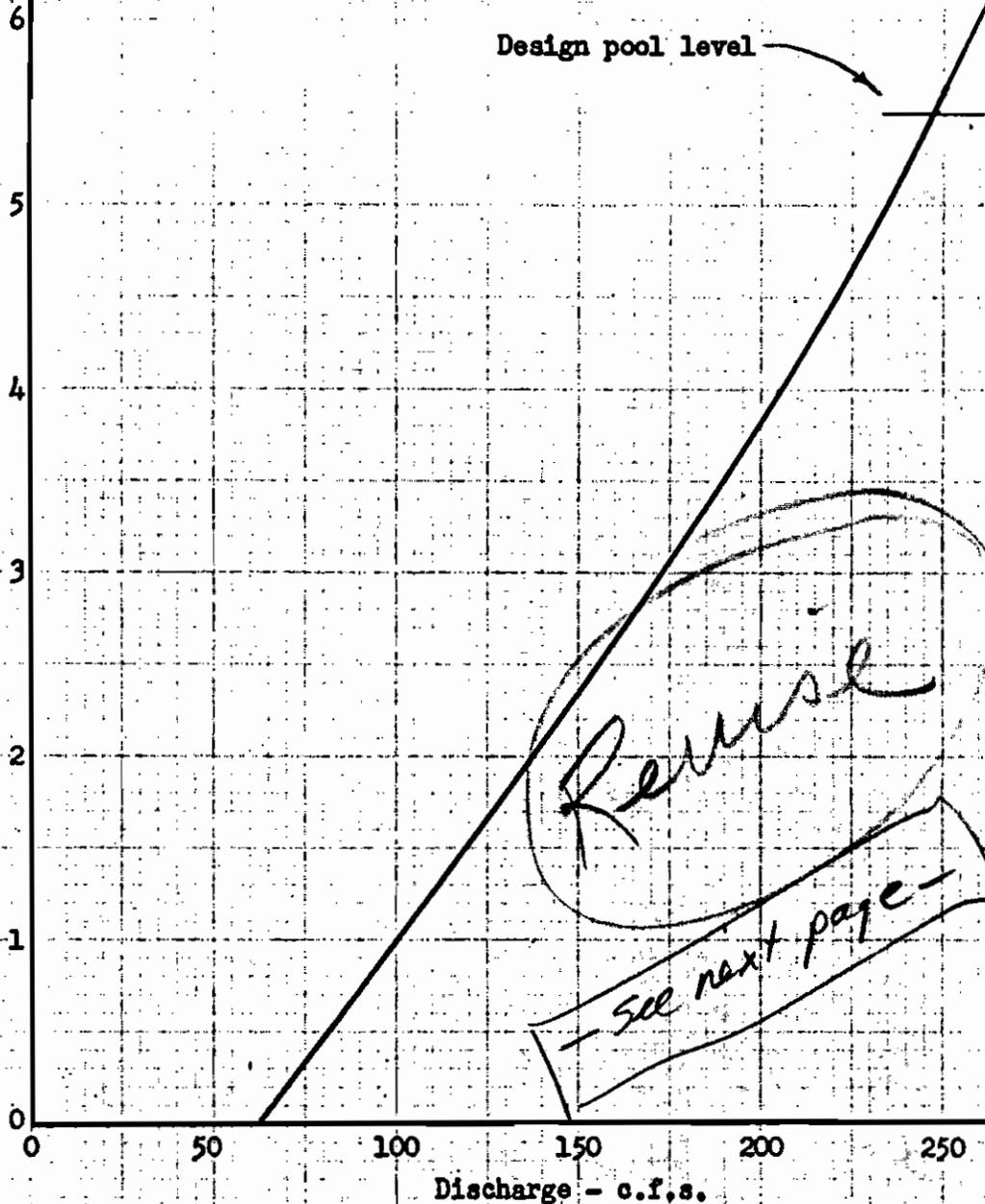
FARMINGTON PROJECT
 Littlejohn and Duck Creeks, Calif.
 DUCK CREEK DIVERSION
 SPILLWAY RATING CURVE

Corps of Engineers, Sacramento, Cal.

File No. CA-2-26-133

Prepared: H.A.K. Date: 26 Sept. 1951

Gage Height - feet (datum 105.0 ft.)



NOTES: (1) Rating is for one 60" dia. ungated outlet at invert elevation 101.5 ft. (2) When gate on the 72" dia. outlet is open the combined capacity at design pool elevation is 530 c.f.s.

To accompany Reservoir Regulation Manual for Farmington Project dated 1 December 1952

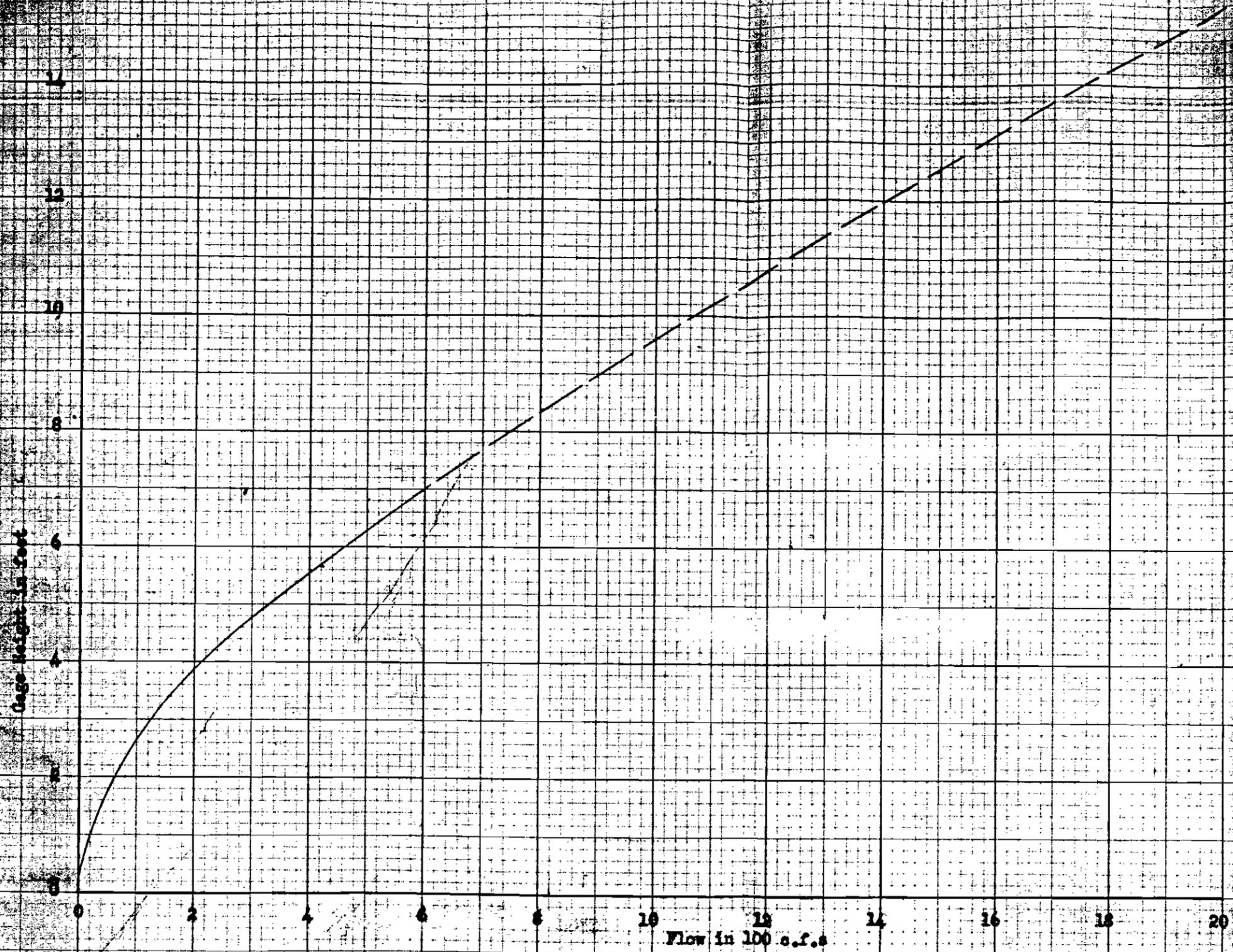
FARMINGTON RESERVOIR
Littlejohn and Duck Creeks, Calif.
DUCK CREEK DIVERSION
DUCK CREEK OUTLET RATING

Corps of Engineers, Sacramento, Cal.

Prepared: H.A.K. Date: 26 Sept. 1951

File No. CA-2-26-134

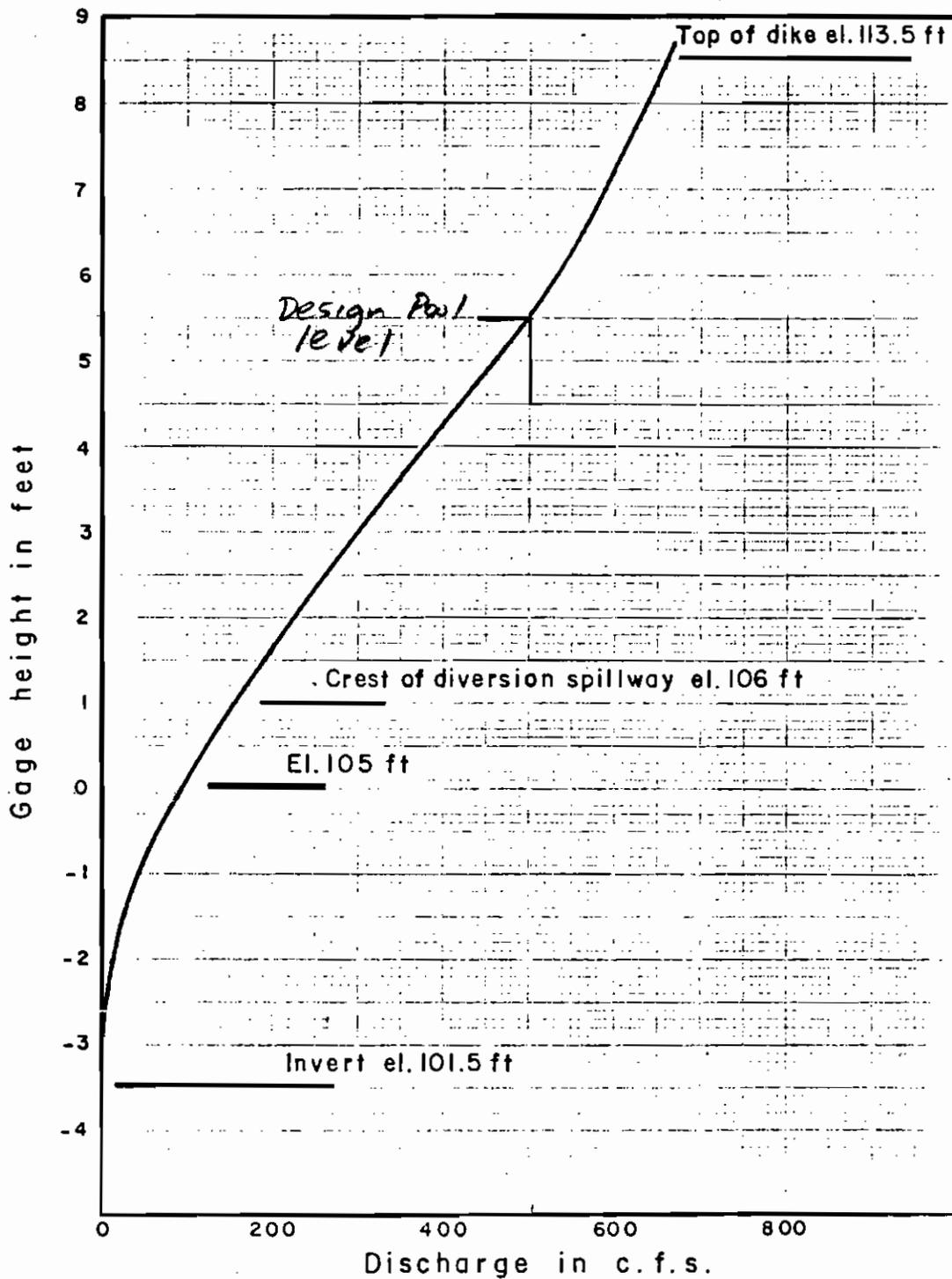
EXHIBIT F, Sheet 2 of 3 CHART A-8



NOTE: Based on Main Outflow Gage, located on Littlejohn Creek at Farmington, California.
 Gage zero = 90.00 feet, sea level datum of 1929.

LEGEND
 ——— Based on measurements
 - - - Based on computation

FARMINGTON PROJECT
 Littlejohn and Duck Creeks, Calif.
 MAIN OUTFLOW STATION RATING CURVE
 Corps of Engineers, Sacramento, Calif.
 Prepared: G.E.G., Date: 17 Feb 1954
 Exhibit F, Sheet 3 of 3



NOTE:

Combined capacity of 60 inch ungated conduit and 72 inch conduit with gate fully open.

FARMINGTON RESERVOIR
California

DUCK CREEK DIVERSION
OUTLET RATING

CORPS OF ENGINEERS, SACRAMENTO, CALIFORNIA

Prepared: C.E.F.-L.R.B. Date: 17 January 1967

Source: Farmington Res Control

CHART 11

EXHIBIT G
LETTER OF ACCEPTANCE
BY STATE RECLAMATION BOARD

C
O
P
Y

STATE RECLAMATION BOARD LETTERHEAD

July 3, 1952

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

Dear Sir:

Reference your letter SPIKO-P 824.3 (Littlejohn Cr.) dated 19 June 1952, in which letter you transferred to the State of California for maintenance and operation the completed units of work pertaining to the Farmington Flood Control Project on Littlejohn Creek near Farmington consisting of a diversion channel from Duck Creek to Littlejohn Creek, including a diversion structure, dikes and related works, and channel clearing along Littlejohn Creek from the lower end of the diversion channel, Station 50+14, downstream to the Southern Pacific Railroad Bridge at Station 10+10.

The Reclamation Board accepted said transfer, for maintenance and operation of the project as outlined, and it is requested that you furnish this office with sufficient copies of the maintenance manual covering the work in order that we may provide the maintenance agency with two copies and have one available in this office.

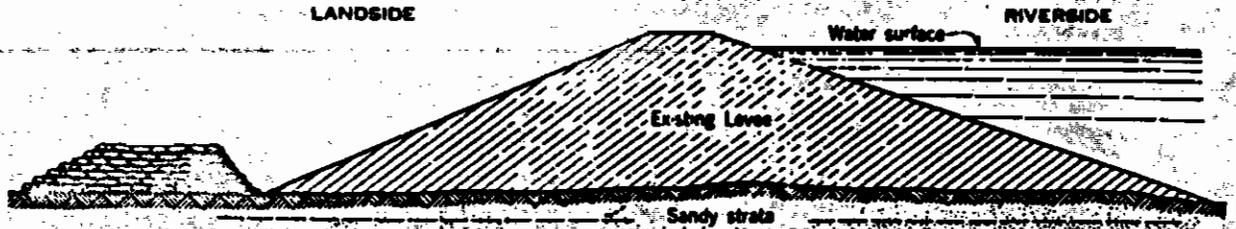
Yours very truly

THE RECLAMATION BOARD
A. M. BARTON
Chief Engineer and General Manager

By /s/
S. A. HONANER
Assistant Secretary

SAH: emw
cc: State Engineer

EXHIBIT H
PLATES SHOWING SUGGESTED METHODS
OF COMBATING FLOOD CONDITIONS

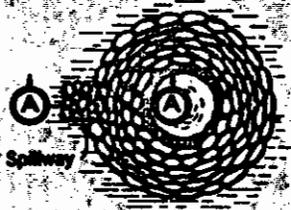


Note:
 Bottom width to be no less than 1 1/2 times height.
 Be sure to clear sand discharge.
 Tie into levee if boil is near toe.

ELEVATION



SECTION A-A

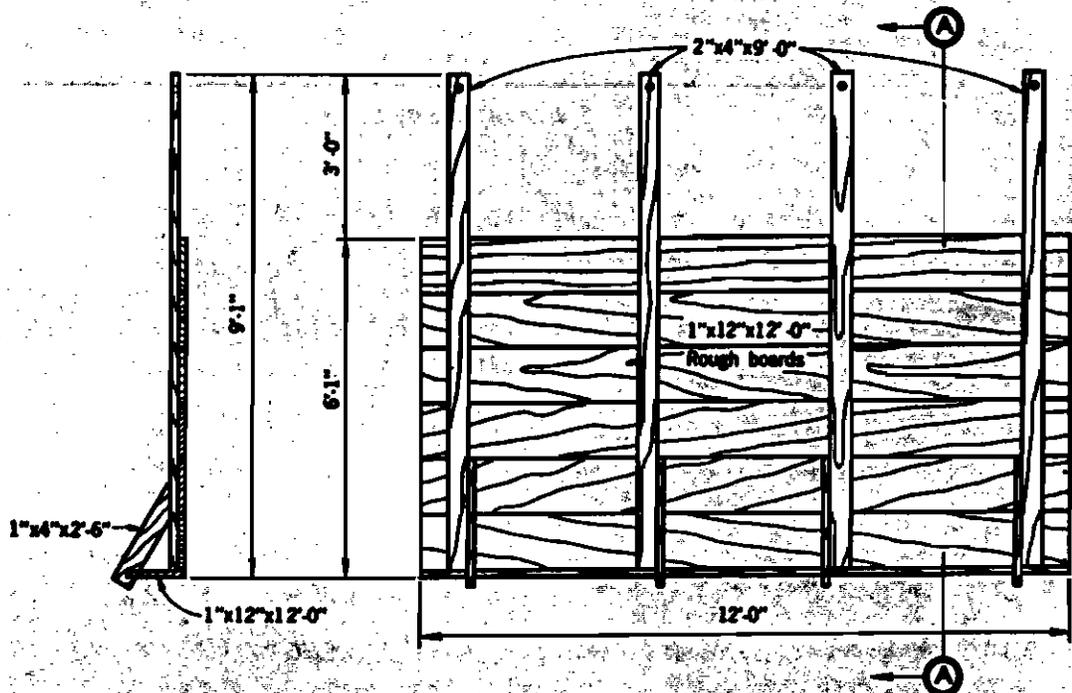


PLAN

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.

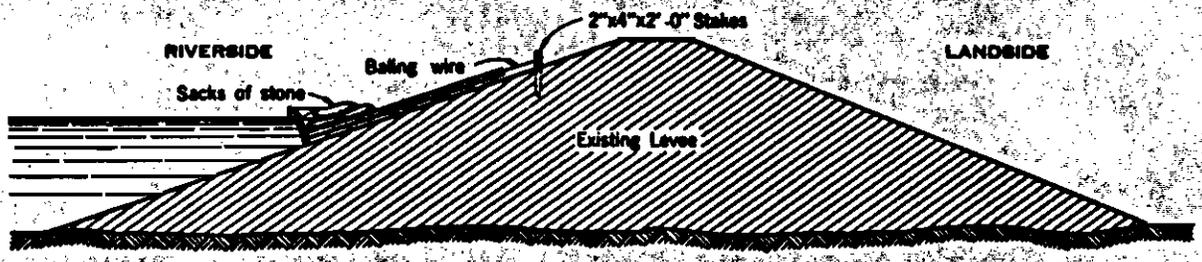
CONTROL OF SAND BOILS

U.S. ENGINEER OFFICE, SACRAMENTO, CALIF.
 MAY, 1946



SECTION A-A

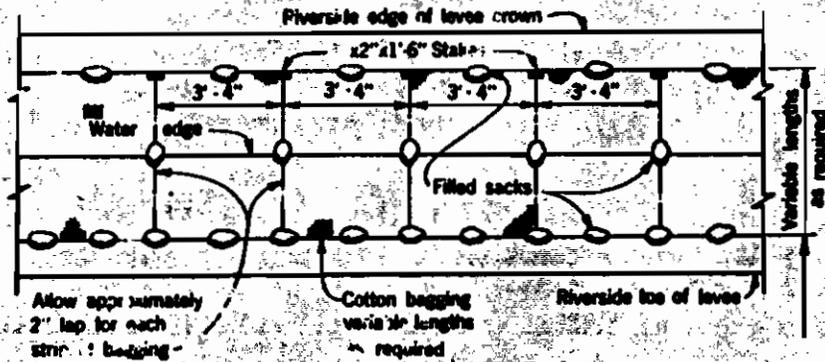
PLAN



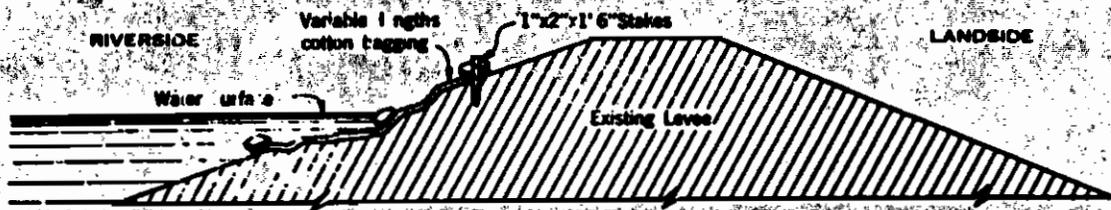
SECTION

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

**MOVABLE
WAVE WASH PROTECTION**
U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.
MAY, 1946



PLAN



SECTION

Note:

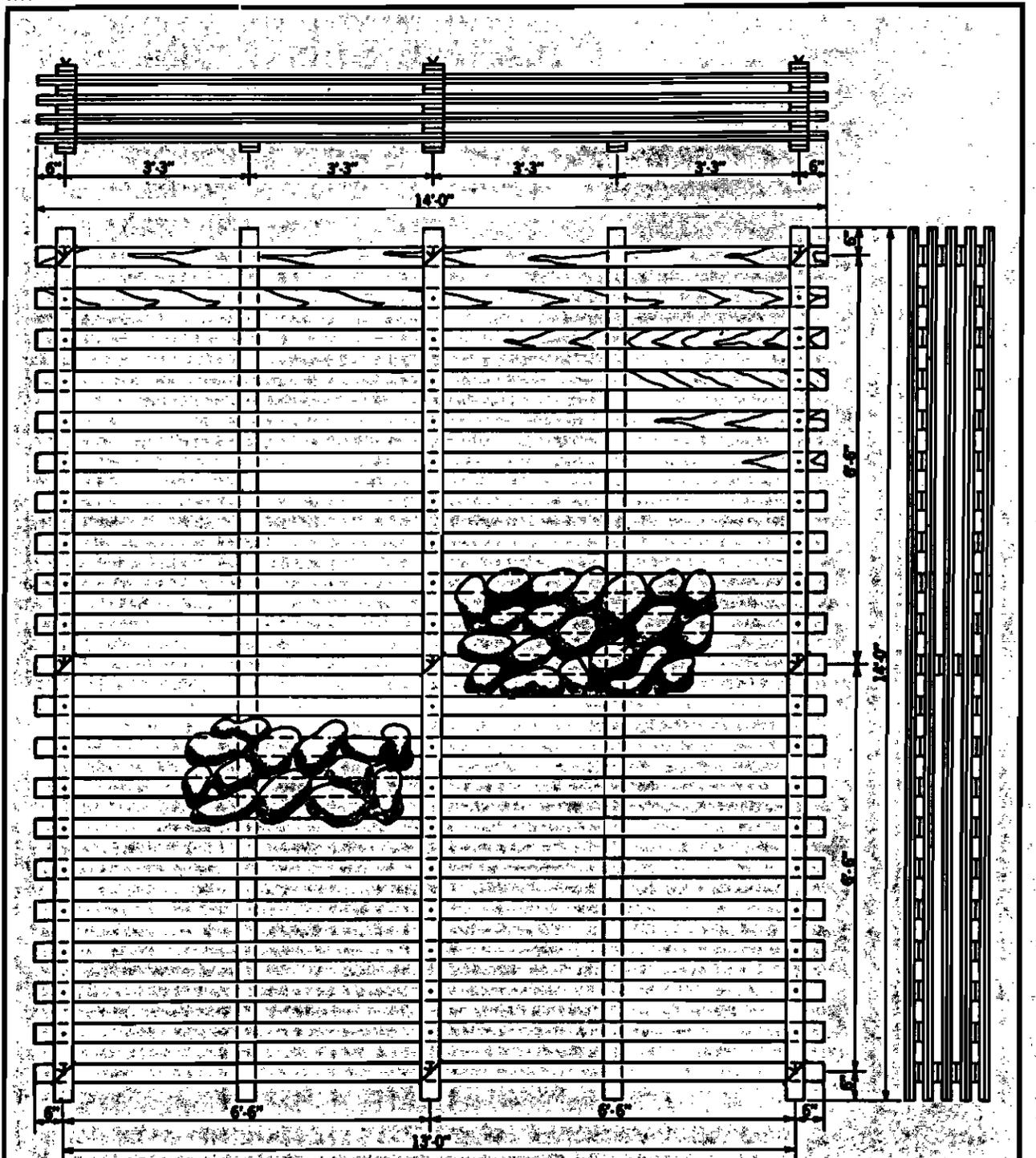
Lay lengths as required of cotton bagging approximately parallel with levee slope and across damaged section. Weight top and edges of bagging with filled sacks as shown above. The filled sacks should be wired or tied to each strip before laying in place. Stake the corners of each strip above water surface. Where cotton bagging is not available burlap sacking may be substituted.

MATERIAL REQUIRED FOR 100 LINEAR FEET OF LEVEE
LUMBER
<ul style="list-style-type: none"> • 30 Stakes 1"x2"x1'-6" • (Sharpened)
SANDBAGS
<ul style="list-style-type: none"> 120 sand bags Cotton bagging as required

WAVE WASH PROTECTION

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.

MAY, 1946

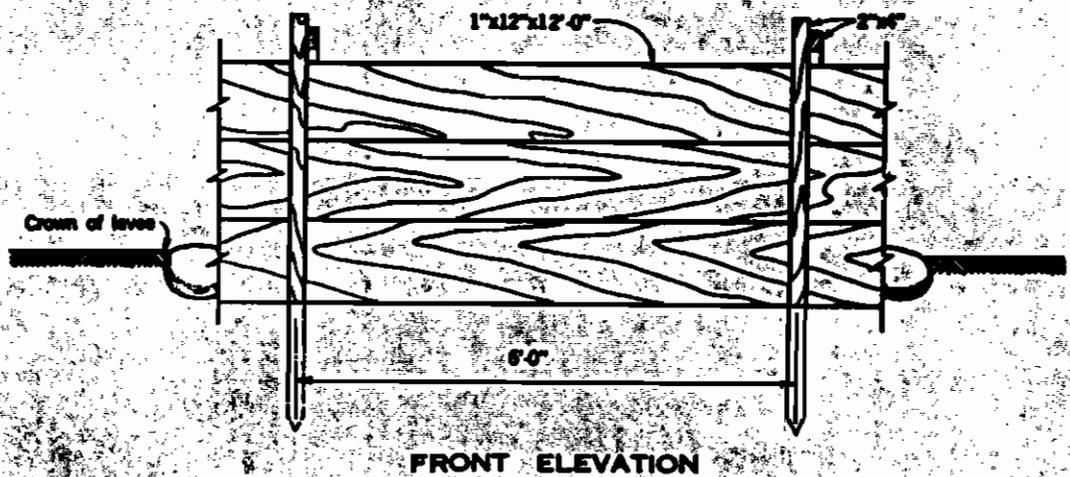
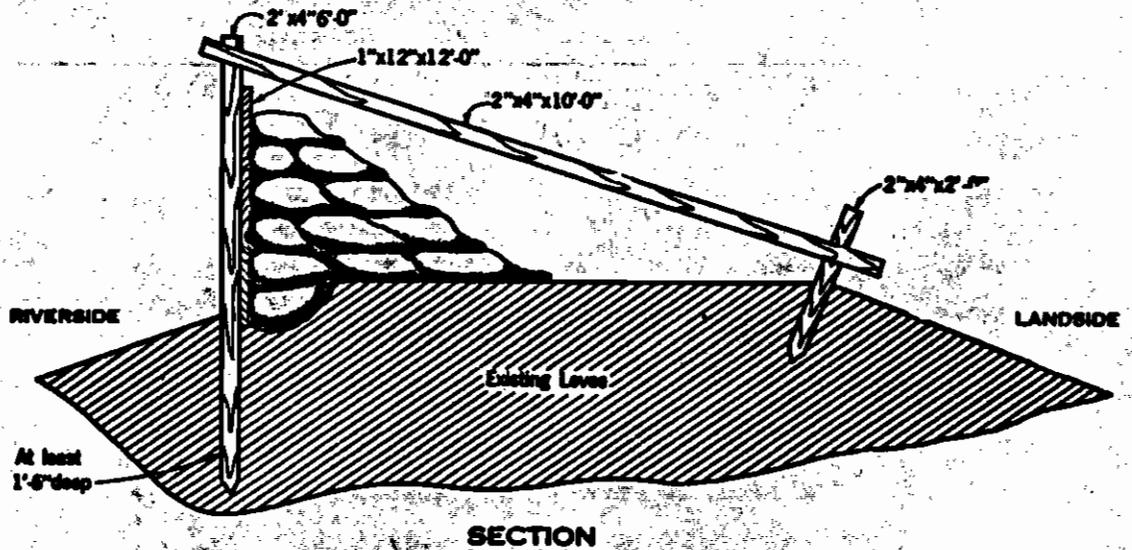


Note:
 Crib constructed of double thickness of 1"x4"x14'-0" lumber. Nail all intersections with 1-20d nail. Each intersection of walls securely fastened by a loop of No. 9 wire, lightly twisted.

BILL OF MATERIAL FOR ONE CRIB 13'-0"	
LUMBER	
130 pieces	1"x4"x14'-0"
	WIRE
30'	No. 9 wire
	NAILS
12 1/2	lb.-20d nails

CAVING BANK PROTECTION

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.
 MAY, 1946



BILL OF MATERIAL FOR 100 LINEAR FEET OF LEVEE	
LUMBER	
25 pieces	1'x12'x12'0"
17 pieces	2'x4'x10'0"
• 17 pieces	2'x4'x6'0"
• 17 pieces	2'x4'x2'0"
•	(Sharpened)
NAILS	
1 lb.	8d nails
2 lbs.	16d nails
SANDBAGS	
1100	bags

LUMBER AND SACK TOPPING

U. S. ENGINEER OFFICE, SACRAMENTO, CALIF.
MAY, 1946