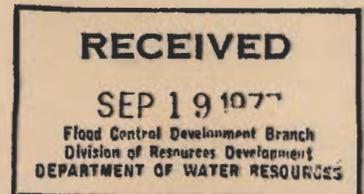


**OPERATION AND MAINTENANCE
MANUAL
FOR
NORTH FORK FEATHER RIVER
PROJECT
CHANNEL IMPROVEMENT
AND LEVEE CONSTRUCTION
NEAR CHESTER
PLUMAS COUNTY, CALIFORNIA**



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

OPERATION AND MAINTENANCE MANUAL
FOR
NORTH FORK FEATHER RIVER PROJECT
CHANNEL IMPROVEMENT AND LEVEE CONSTRUCTION
NEAR CHESTER, CALIFORNIA

REVISIONS OR ADDITIONS		DATE
Paragraph 1-03	Revise Paragraph	March 2001
Paragraph 1-05	Add Subparagraph c.	March 2001
Paragraph 2-04	Revise Paragraph	March 2001
Paragraph 4-04	Replace Page 20	March 2001
EXHIBIT B	Delete Drawing No. 4-13-605 (log boom)	March 2001
EXHIBIT H	Delete Letter of Transfer dated 14 July 1981 For the Log Boom	March 2001

SECTION I

1-05. Construction Data and Contractor.

e. For construction data and contractor for construction of the fish passage modification, see Supplement to Operation and Maintenance Manual for the North Fork Feather River Project near Chester, California - Fish Passage Modification, dated March 2001.

NORTH FORK FEATHER RIVER
NEAR CHESTER, CALIFORNIA

CHANNEL IMPROVEMENTS AND
LEVEE CONSTRUCTION

SECTION I - INTRODUCTION

1-01 Authorization. The Feather River Project at Chester, California, was authorized by the Flood Control Act approved 13 August 1968 in Public Law 90-483, 82 STAT 744, 90th Congress, 2d Session, which stated in part:

"The project for flood protection on the Feather River at Chester, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document numbered 314, Ninetieth Congress...."

1-02 Location. The North Fork of the Feather River drains a 115 square mile area above the point of bifurcation with the distributary Johnson Creek Channel at the town of Chester, Plumas County, California. The topography of the basin is mountainous with shallow canyons and interspersed mountain meadows. About 80 percent of the drainage basin lies within the Lassen National Forest or the Lassen Volcanic National Park.

Elevation in the drainage basin range from about 4,500 feet at Lake Almanor on North Fork of Feather River immediately below the town of Chester, to a maximum of 10,457 feet (Mount Lassen).

1-03 Description of Project Works. The project protects the Chester area by diverting flows in excess of the channel capacity of North Fork of Feather River into a bypass floodway for conveyance around the town and into Lake Almanor. The improvements include construction of patrol roads (levee crown shaping and surfacing) and maintenance roads; drop structures, a earth-fill diversion structure with outlet works and an excavated rock-lined flood channel with about 3 miles of flow confining levees. The levees were constructed on both sides of the excavated diversion channel from the sediment basin northerly and upstream on both banks for a total distance of about 3.2 miles with the crown surfaced for use as a patrol road. Seven drop structures were constructed to reduce velocities and prevent scouring. A shear boom structure was constructed upstream of the diversion structure to collect debris upstream of the trash racks. The operation and maintenance of the shear boom structure is described in the Supplement to Operation and Maintenance Manual for the North Fork Feather River Project near Chester, California - Fish Passage Modification, dated March 2001. *

1-04 Protection Provided. The project provides a high degree of flood protection (Standard Project Flood) to the town of Chester, bridges for Highway 36, two county roads and the Almanor Branch spurline of Western Pacific Railroad. The project provides protection to the above mentioned facilities for floodflows in excess of about 3,000 c.f.s., estimated to be the capacity of North Fork Feather River through Chester.

SECTION II - LOCAL COOPERATION REQUIREMENTS

2-01 Requirements for local cooperation. As a condition for the channel improvement project near the Town of Chester, construction was undertaken by the United States subject to the conditions specified by Flood Control Act, August of 1968, and other pertinent legislation which requires local interests to give assurances satisfactory to the Secretary of the Army that they will:

a. Provide without cost to the United States all lands, including borrow and disposal areas, easements, and rights-of-way necessary for construction of the project;

b. Hold and save the United States free from damages due to the constructed works; except for those damages due to the fault or negligence of the United States or its contractors;

c. Maintain and operate all the works after completion, in accordance with regulations prescribed by the Secretary of the Army;

d. Provide without cost to the United States all relocations of buildings, utilities, bridges and roads, sewers, pipelines, and other alterations of existing improvements which may be required for construction of the project;

e. Adjust all claims regarding water rights that may be affected by the project;

f. Prescribe and enforce regulations designed to prevent encroachment of any type that would impair the flood-control effectiveness of the works; and

g. Comply with the requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (Public Law 91-646, 84 STAT 1894).

2-02 Assurances Provided by Local Interests. The State Reclamation Board of California is the local sponsor of this project. By contract dated 6 May 1975, in accordance with PL 91-611, Section 221, the Board provided the assurances which met the requirements of local cooperation. The assurances were formally accepted by the Sacramento District on 27 May 1975.

2-03 Acceptance by The Reclamation Board. Responsibility for operating and maintaining the North Fork Feather River Project was officially transferred to the Reclamation Board by Sacramento District letter dated 18 October 1976. The Reclamation Board by letter dated 19 November 1976, accepted work completed on the North Fork Feather River Channel Improvement Project, see Exhibit F.

2-04 Transfer to State Reclamation Board. Responsibility for operating and maintaining the shear boom structure upstream of the diversion structure was transferred to The Reclamation Board. For transfer letter see the Supplement to Operation and Maintenance Manual for the North Fork Feather River Project near Chester, California - Fish Passage Modification, dated March 2001.

* Revised March 2001

a. Description. In 1976 a diversion dam was constructed as part of the Channel Improvement Project and is located at the junction of North Fork Feather River and the bypass channel. The dam structure is an earthfill embankment with three concrete box culvert outlet works and a stilling basin. The outlet conduits are designed to allow normal flows to continue downstream through the town of Chester with a maximum discharge of 3,500 cfs. In 1994 a shear boom structure and intake trash racks were constructed to replace the original ineffective log boom system and trash racks. The shear boom and new trash rack were designed to capture debris, for ease of debris removal and to maintain a clear passage for flows. A modification to the fish passage was also constructed in 1994. The existing fish baffles were removed and replaced with a more effective vertical slot fish ladder. The fish passage was extended upstream and downstream to help guide the fish through the dam. A more detailed description and operation and maintenance of these features constructed in 1994 are included in the Supplement to Operation and Maintenance Manual for the North Fork Feather River Project, dated March 2001.

b. Maintenance.

(1) All structural steel work (handrails, trash racks, and shear boom etc.) shall be inspected once a year. Rust stops shall be cleaned and the metal shall be repainted or recoated with originally used products. Galvaloy or equal shall be used for galvanized steel items. Loose connections and bolts shall be tightened.

(2) All eroded concrete shall be repaired when damages have reached a depth of 2 inches or exposure of any reinforcing steel, etc.

c. Special Instructions.

(1) Floatable Debris - Files of floatable debris and large trees shall be removed from the basin area upstream from the dam, from the trash racks and from the shear boom as required to prevent blockage of the outlet works by impending high flows in the river. Care is to be taken not to damage the trash racks or shear boom during debris removal.

(2) Sediment Deposits - Removal of sand and gravel deposits from the basin upstream from the dam shall be required to the extent necessary to prevent impairment of flows into the outlet and as required to prevent deposits in the reach of the river downstream from the dam that would reduce the capacity of the channel to less than the estimated capacity of about 3,000 cfs.

d. Operation.

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

*Page Replaced March 2001

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NORTH FORK FEATHER RIVER PROJECT
CHANNEL IMPROVEMENT AND LEVEE CONSTRUCTION
NEAR CHESTER, CALIFORNIA

REVISIONS OR ADDITIONS	DATE	
Paragraph 1-03	Revised Paragraph	September 1981
Paragraph 1-05	Add Subparagraph b	September 1981
Paragraph 2-04	Add Transfer Paragraph	September 1981
Paragraph 4-04	Revised Subparagraph a, b(1), & c(1)	September 1981
EXHIBIT A-1	Revised Map	September 1981
EXHIBIT B	Add Drawing No. 4-13-605	September 1981
EXHIBIT H	Add Letter of Transfer dated 14 July 1981	September 1981

SECTION I

1-05. Construction data and contractor.

b. R. J. Vergara Co. constructed and installed a 190 foot welded steel pipe log boom between the diversion structure and diversion channel. Under Contract No. DACW05-81-C-0080, Specification No. 6114, Drawing No. 4-13-605.

EXHIBIT B

File No.

Title

4-13-605

Welded Steel Pipe Log Boom, North Fork Feather River,
near Chester, California, in one sheet.

NORTH FORK FEATHER RIVER
NEAR CHESTER, CALIFORNIA

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A-1	Location Map	*
B	"As Constructed" Drawings (Unattached)	
C	Plates of Suggested Flood Fighting Methods	
D	Suggested Semi-Annual Report Form	
E	Suggested Check Lists of Levees, Channels and Structures	
F	Letter of Acceptance by State Reclamation Board	
G	Sample Permit for Use of Right-of-Entry	
H	Transfer Correspondence	*

NORTH FORK FEATHER RIVER
NEAR CHESTER, CALIFORNIA

CHANNEL IMPROVEMENTS AND
LEVEE CONSTRUCTION

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Elevation in the drainage basin range from about 4,500 feet at Lake Almanor on North Fork of Feather River immediately below the town of Chester, to a maximum of 10,457 feet (Mount Lassen).

1-03 Description of Project Works. The project protects the Chester area by diverting flows in excess of the channel capacity of North Fork of Feather River into a bypass floodway for conveyance around the town and into Lake Almanor. The improvements include construction of patrol roads (levee crown shaping and surfacing) and maintenance roads; drop structures, a earth-fill diversion structure with outlet works and an excavated rock-lined flood channel with about 3 miles of flow confining levees. The levees were constructed on both sides of the excavated diversion channel from the sediment basin northerly and upstream on both banks for a total distance of about 3.2 miles with the crown surfaced for use as a patrol road. Seven drop structures were constructed to reduce velocities and prevent scouring. A log boom was constructed upstream of the diversion structure to collect debris upstream of the trash racks. *

1-04 Protection Provided. The project provides a high degree of flood protection (Standard Project Flood) to the town of Chester, bridges for Highway 36, two county roads and the Almanor Branch spurline of Western Pacific Railroad. The project provides protection to the above mentioned facilities for floodflows in excess of about 3,000 c.f.s., estimated to be the capacity of North Fork Feather River through Chester.

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

a. Channel improvement and levee construction on the North Fork Feather River near Chester was accomplished under contract No. DACW05-75-C-0073 by R&D Watson, Inc. during the period from 18 June 1975 to 22 November 1976, Specification No. 4835 and Drawing No. 4-4-600 (20 sheets).

1-06 Floodflows. For the purpose of this manual the term "floodflow" or "high water period" (1 November to 15 April) refers to periods of flow for which the water surface in the streams reaches or exceeds the following limit:

North Fork Feather River - Diversion Structure, Staff gage No. 3 would have a reading of about 3.0 Ft. (Elev. 4593); for an approximate flow of 3000 c.f.s., through the diversion structure and about 10,000 c.f.s. in the Bypass channel.

SECTION II - LOCAL COOPERATION REQUIREMENTS

2-01 Requirements for local cooperation. As a condition for the channel improvement project near the Town of Chester, construction was undertaken by the United States subject to the conditions specified by Flood Control Act, August of 1968, and other pertinent legislation which requires local interests to give assurances satisfactory to the Secretary of the Army that they will:

a. Provide without cost to the United States all lands, including borrow and disposal areas, easements, and rights-of-way necessary for construction of the project;

b. Hold and save the United States free from damages due to the constructed works; except for those damages due to the fault or negligence of the United States or its contractors;

c. Maintain and operate all the works after completion, in accordance with regulations prescribed by the Secretary of the Army;

d. Provide without cost to the United States all relocations of buildings, utilities, bridges and roads, sewers, pipelines, and other alterations of existing improvements which may be required for construction of the project;

e. Adjust all claims regarding water rights that may be affected by the project;

f. Prescribe and enforce regulations designed to prevent encroachment of any type that would impair the flood-control effectiveness of the works; and

g. Comply with the requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (Public Law 91-646, 84 STAT 1894).

2-02 Assurances Provided by Local Interests. The State Reclamation Board of California is the local sponsor of this project. By contract dated 6 May 1975, in accordance with PL 91-611, Section 221, the Board provided the assurances which met the requirements of local cooperation. The assurances were formally accepted by the Sacramento District on 27 May 1975.

2-03 Acceptance by The Reclamation Board. Responsibility for operating and maintaining the North Fork Feather River Project was officially transferred to the Reclamation Board by Sacramento District letter dated 18 October 1976. The Reclamation Board by letter dated 19 November 1976, accepted work completed on the North Fork Feather River Channel Improvement Project, see Exhibit F.

2-04 Transfer to State Reclamation Board. Responsibility for operating and maintaining the log boom upstream of the diversion structure was transferred to The Reclamation Board by letter dated 14 July 1981 (See Exhibit H).

SECTION III - MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01 Reference to Approved Regulation. This manual is submitted in accordance with provisions of the Title 33 Code of Federal Regulations, Part 208, hereafter referred to as the Flood Control Regulations, regarding Maintenance and Operation of local flood control works, a copy of which is included as EXHIBIT A.

3-02 Intent of Regulations. The general intent of the regulations approved by the Secretary of the Army is stated in paragraph 208.10(a)(1) of the regulations as follows: "The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

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

3-03 Purpose of this Manual. In view of the large number of local flood protection projects authorized by Congress and the repetitious nature of regulations to govern maintenance and operation of each individual project, and in order that local interests may be fully aware of the extent of the obligations assumed by them in furnishing assurances of local cooperation for projects to be constructed in the future, the general regulations described above were established by the Secretary of the Army. The general regulations approved by the Secretary of the Army, August 1944, were intended to be sufficiently broad in scope and general in nature as to be applicable to all flood protection projects for which such regulations are required by law (33 CFR, 208).

(8) All damage to fencing, whether resulting from accidental or willful injuries or from corrosion, shall be promptly repaired with new material in order to maintain satisfactory protection to the public.

(9) No excavation within the limits of the North Fork Feather River project will be permitted unless an excavation permit has been approved by the Reclamation Board and the District Engineer.

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

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

(12) All stone protection at the approach and spillway of the 7 drop structures within the diversion channel reach shall be inspected at least once a year and after each flood period. All stones that have been displaced shall be placed back to the line and grade as constructed.

d. Operation.

(1) Pertinent Requirements of the Flood Control Regulations. Title 33, Code of Federal Regulations, Section 208.10(g)(2) is quoted in part as follows:

"(g) Channels and floodways . . . (2) Operation. . . . Appropriate measures shall be taken to prevent the formation of jams . . . of debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter all snags and other debris shall be removed and all damage to . . . walls, drainage outlets or other flood control structures repaired."

(2) Diversion Channel Sediment ponds - Removal of sediment deposits from the large existing gravel pits located between the downstream end of the diversion channel and Lake Almanor shall be required as necessary to curtail depositions into the Lake. Sediment deposits will be allowed to accumulate in these pits to about elevation 4498.0+. Once this elevation of deposition is reached, removal of subsequent sediment deposits in these pit areas to an elevation of about 4497.0+ will be required.

4-04 Diversion Dam.

a. Description. A diversion dam was constructed as part of the Channel Improvement Project and is located at the junction of North Fork Feather River and the bypass channel. The structure is an earthfill embankment with three concrete box culvert outlet works and a stilling basin. The outlet conduits are designed to allow normal flows to continue downstream through the town of Chester with a maximum discharge of 3,500 cfs. Removable metal trash racks for debris are provided for maintaining a clear passage of flows. Also removable baffles were constructed in one of the conduits for passage of migratory fish. A fine grid trash rack is provided in front of the debris trash rack for public safety and shall be removed only during flood season. A log boom was constructed about 200 feet upstream of the dam to collect large floating debris upstream of the trash racks which are located at the outlet works, thereby reducing debris accumulation at the trash racks. *

b. Maintenance.

(1) All structural steel work (handrails, trash racks, and log boom etc.) shall be inspected once a year. Rust spots shall be cleaned and the metal shall be repainted or recoated with originally used products. Galvaloy or equal shall be used for galvanized steel items. Loose connections and bolts shall be tightened. The chains under the log boom shall be repaired with new links as needed. *

(2) All eroded concrete shall be repaired when damages have reached a depth of 2 inches or exposure of any reinforcing steel, etc.

c. Special Instructions.

(1) Floatable Debris - Piles of floatable debris and large trees shall be removed from the basin area upstream from the dam, from the trash racks and from the log boom as required to prevent blockage of the outlet works by impending high flows in the river. Care is to be taken not to damage the trash racks or log boom during debris removal. *

(2) Sediment Deposits - Removal of sand and gravel deposits from the basin upstream from the dam shall be required to the extent necessary to prevent impairment of flows into the outlet and as required to prevent deposits in the reach of the river downstream from the dam that would reduce the capacity of the channel to less than the estimated capacity of about 3,000 cfs.

d. Operation.

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



DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF SPKCO-0

14 July 1981

C
O
P
Y

The Reclamation Board
State of California
1416 - 9th Street, Room 335
Sacramento, CA 95814

Members of the Board:

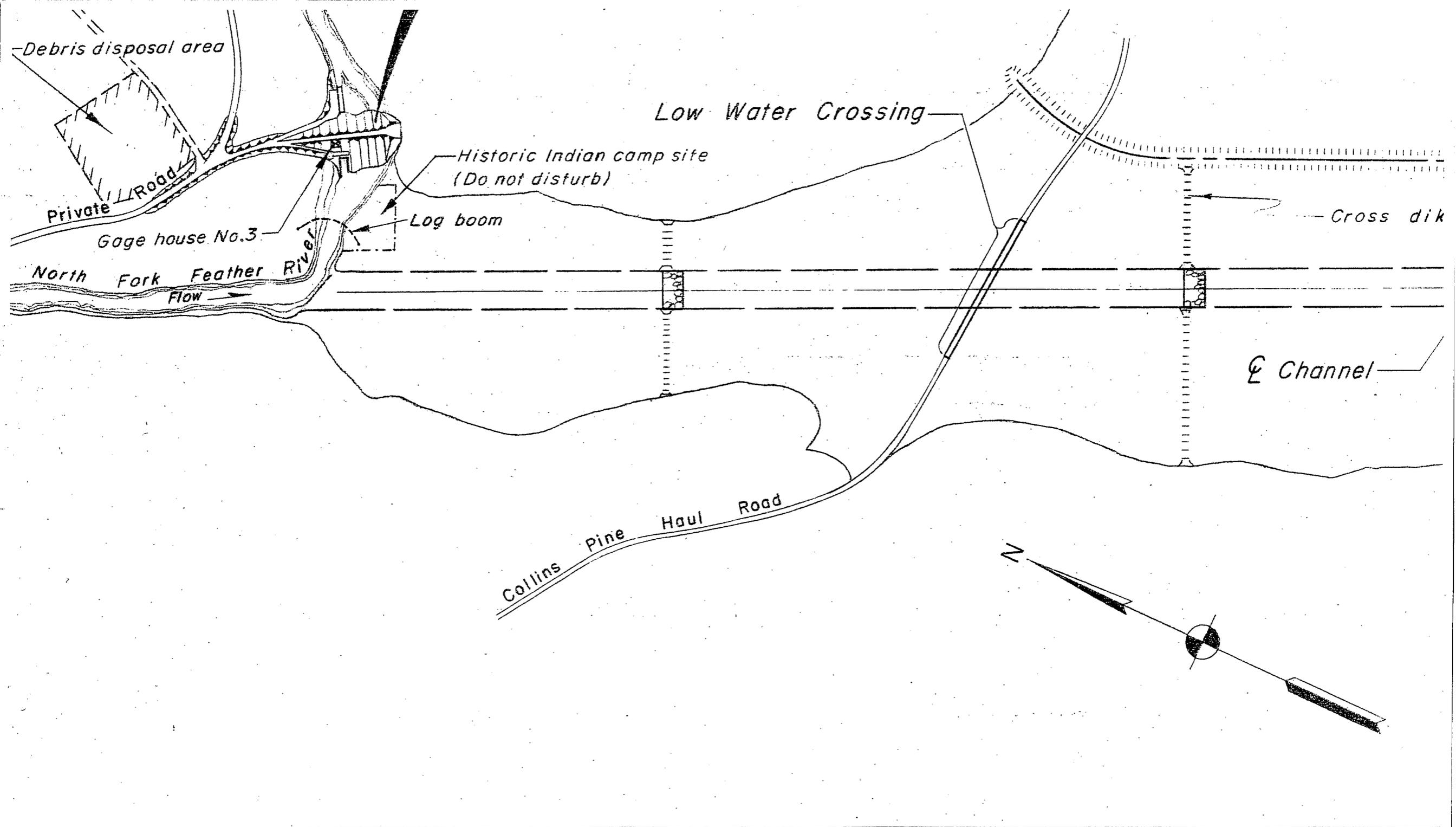
This letter will transfer additional work on the North Fork Feather River Project near Chester to the State of California for operation and maintenance. The work consisted of constructing and installing 190'± of welded steel pipe log boom between the diversion structure and diversion channel. An extra 20' length of steel pipe log boom was delivered to the Plumas County Road Department maintenance yard near Chester previously. The project was completed on 3 June 1981 in accordance with Contract No. DACW05-81-C-0080, Specifications No. 6114 and Drawing No. 4-13-605. The contract was authorized by the Flood Control Act of 1968, Public Law 90-483, 90th Congress, 2nd Session.

The completed work is hereby transferred to the State of California as of 14 July 1981 for operation and maintenance and will be added by amendment to the Operation and Maintenance Manual North Fork Feather River Project. Copies will be furnished your office at a later date.

Sincerely,

/s/
PAUL F. KAVANAUGH
Colonel, CE
Commander and District Engineer

EXHIBIT H



Debris disposal area

Low Water Crossing

Historic Indian camp site
(Do not disturb)

Private Road

Gage house No.3

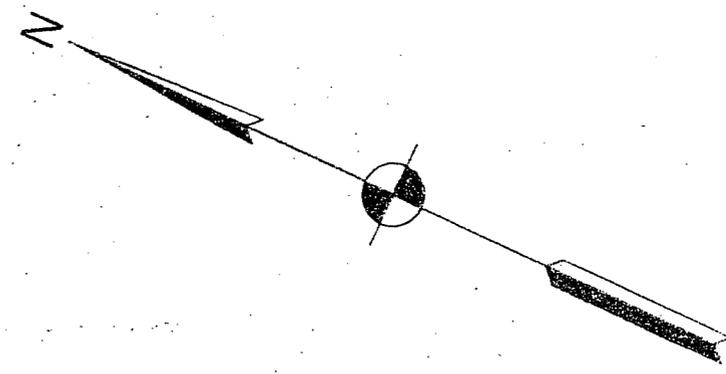
Log boom

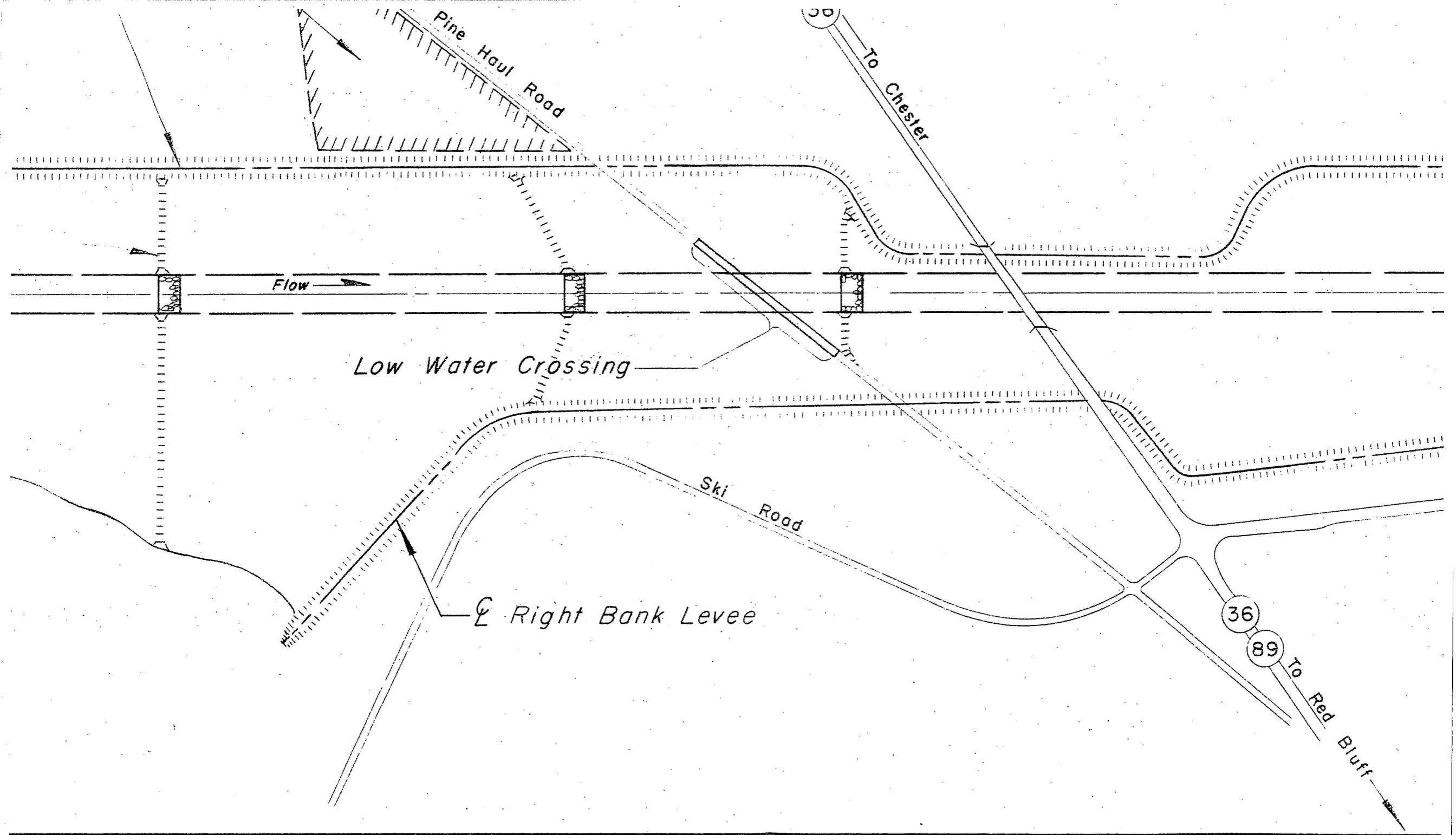
Cross dik

North Fork Feather River
Flow

E Channel

Collins Pine Haul Road





Pine Haul Road

To Chester

Flow

Low Water Crossing

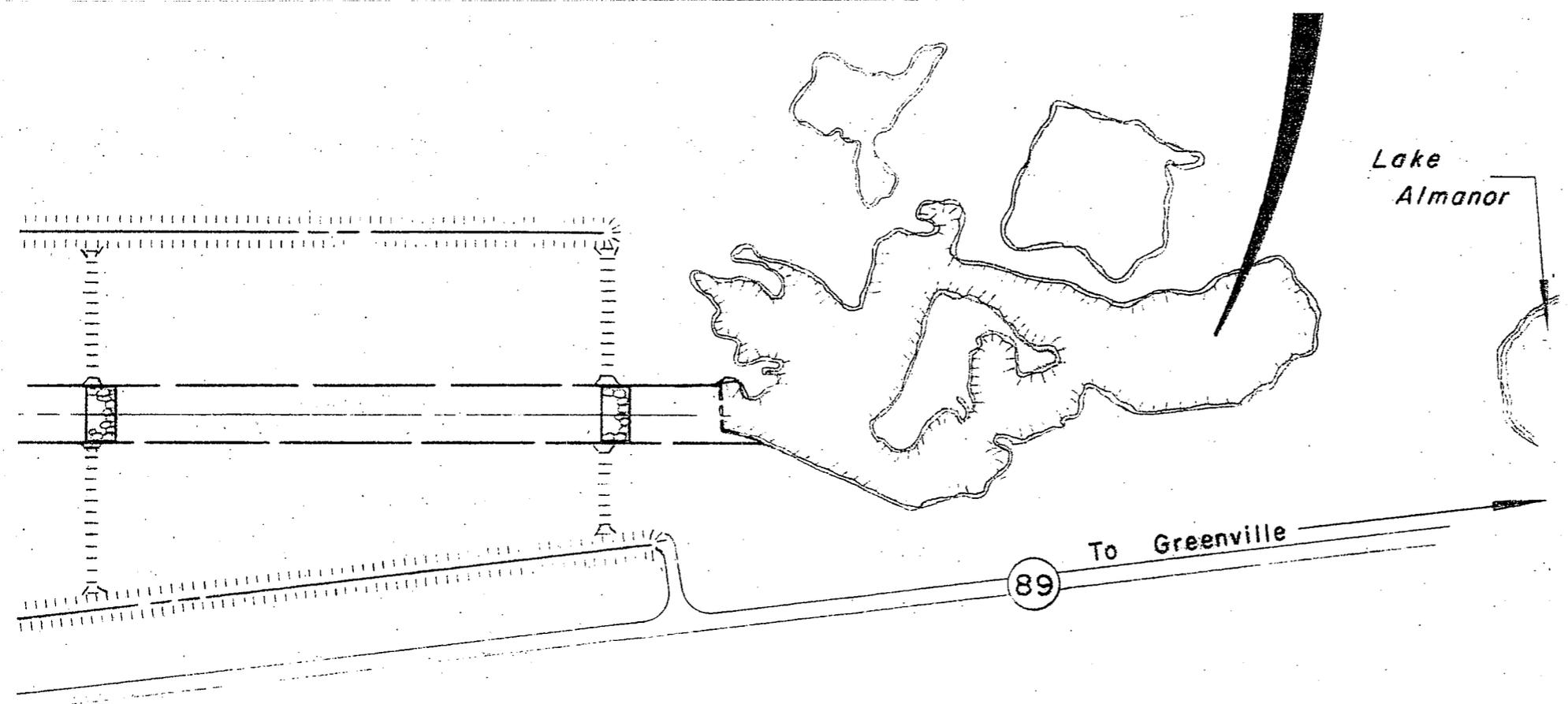
Ski Road

Right Bank Levee

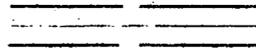
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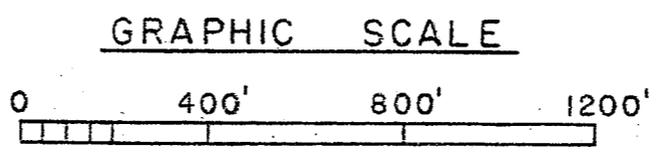
89

To Red Bluff



LEGEND

-  State Highway
-  Project Levee
-  Excavated Channel
-  Drop Structure



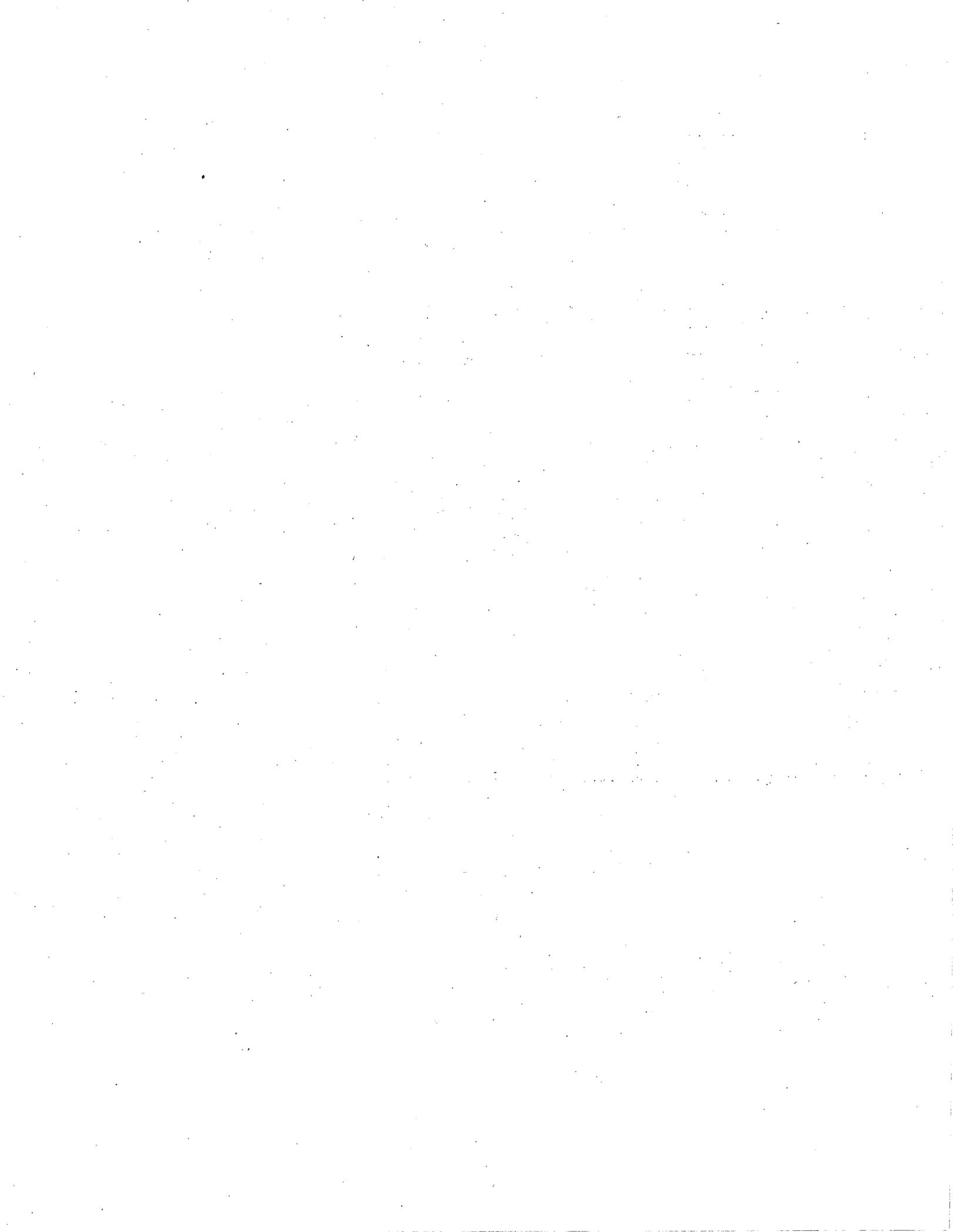
LOCATION MAP

NORTH FORK FEATHER RIVER PROJECT
NEAR CHESTER, CALIFORNIA

CHANNEL IMPROVEMENT

DR. BY: J. L. M. EXHIBIT A1

REVISED SEPT 1981



NORTH FORK FEATHER RIVER
NEAR CHESTER, CALIFORNIA

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NEAR CHESTER, CALIFORNIA

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"The project for flood protection on the Feather River at Chester, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document numbered 314, Ninetieth Congress....

1-02 Location. The North Fork of the Feather River drains a 115 square mile area above the point of bifurcation with the distributary Johnson Creek Channel at the town of Chester, Plumas County, California. The topography of the basin is mountainous with shallow canyons and interspersed mountain meadows. About 80 percent of the drainage basin lies within the Lassen National Forest or the Lassen Volcanic National Park.

Elevations in the drainage basin range from about 4,500 feet at Lake Almanor on North Fork of Feather River immediately below the town of Chester, to a maximum of 10,457 feet (Mount Lassen).

1-03 Description of Project Works. The project protects the Chester area by diverting flows in excess of the channel capacity of North Fork of Feather River into a bypass floodway for conveyance around the town and into Lake Almanor. The improvements include construction of patrol roads (levee crown shaping and surfacing) and maintenance roads; drop structures, a earth-fill diversion structure with outlet works and an excavated rock-lined flood channel with about 3 miles of flow confining levees. The levees were constructed on both sides of the excavated diversion channel from the sediment basin northerly and upstream on both banks for a total distance of about 3.2 miles with the crown surfaced for use as a patrol road. Seven drop structures were constructed to reduce velocities and prevent scouring.

1-04 Protection Provided. The project provides a high degree of flood protection (Standard Project Flood) to the town of Chester, bridges for Highway 36, two county roads and the Almanor Branch spurline of Western Pacific Railroad. The project provides protection to the above mentioned facilities for floodflows in excess of about 3,000 c.f.s., estimated to be the capacity of North Fork Feather River through Chester.

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

a. Channel improvement and levee construction on the North Fork Feather River near Chester was accomplished under contract No. DACW05-75-C-0073 by R&D Watson, Inc. during the period from 18 June 1975 to 22 November 1976, Specification No. 4835 and Drawing No. 4-4-600 (20 sheets).

1-06 Floodflows. For the purpose of this manual the term "floodflow" or "high water period" (1 November to 15 April) refers to periods of flow for which the water surface in the streams reaches or exceeds the following limit:

North Fork Feather River - Diversion Structure, Staff gage No. 3 would have a reading of about 3.0 Ft. (Elev. 4593); for an approximate flow of 3000 c.f.s., through the diversion structure and about 10,000 c.f.s. in the Bypass channel.

Title 33 Code of Federal Regulation, Section 208.10(a)(10) reads as follows: "The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part." This manual has, therefore, been prepared to furnish local interests with information on the project works and advise as to the details of the operation and maintenance requirements applicable to this particular project; to state procedures required by the Department of the Army; and to indicate satisfactory methods of floodfighting operations and emergency repairs. The project works are to be maintained and operated in accordance with the Flood Control Regulations referred to above and interpretations thereof contained in this manual.

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

3-05 General Provisions of Regulation. In addition to that quoted in paragraph 3-02 above, the general provisions of the Flood Control Regulations, contained in 33 CFR, 208.10(a)(2), to 208.10(a)(9), both inclusive, are quoted as follows:

"(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of, or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of an organization responsible for structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

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

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

(5) No improvement shall be passed over, under or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the Reclamation Board and the District Engineer of the Department of the Army or his authorized representative that such improvements, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer, or, if otherwise obtained, shall be submitted for his approval through the Reclamation Board. Drawings or prints showing such improvements or alterations as 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) Prompt action shall be taken on maintenance measures or repairs which the Reclamation Board and the District Engineer deem necessary.

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

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

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

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

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

SECTION II - LOCAL COOPERATION REQUIREMENTS

2-01 Requirements for local cooperation. As a condition for the channel improvement project near the Town of Chester, construction was undertaken by the United States subject to the conditions specified by Flood Control Act, August of 1968, and other pertinent legislation which requires local interests to give assurances satisfactory to the Secretary of the Army that they will:

a. Provide without cost to the United States all lands, including borrow and disposal areas, easements, and rights-of-way necessary for construction of the project;

b. Hold and save the United States free from damages due to the constructed works; except for those damages due to the fault or negligence of the United States or its contractors;

c. Maintain and operate all the works after completion, in accordance with regulations prescribed by the Secretary of the Army;

d. Provide without cost to the United States all relocations of buildings, utilities, bridges and roads, sewers, pipelines, and other alterations of existing improvements which may be required for construction of the project;

e. Adjust all claims regarding water rights that may be affected by the project;

f. Prescribe and enforce regulations designed to prevent encroachment of any type that would impair the flood-control effectiveness of the works; and

g. Comply with the requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (Public Law 91-646, 84 STAT 1894).

2-02 Assurances Provided by Local Interests. The State Reclamation Board of California is the local sponsor of this project. By contract dated 6 May 1975, in accordance with PL 91-611, Section 221, the Board provided the assurances which met the requirements of local cooperation. The assurances were formally accepted by the Sacramento District on 27 May 1975.

2-03 Acceptance by The Reclamation Board. Responsibility for operating and maintaining the North Fork Feather River Project was officially transferred to the Reclamation Board by Sacramento District letter dated 18 October 1976. The Reclamation Board by letter dated 19 November 1976, accepted work completed on the North Fork Feather River Channel Improvement Project, see Exhibit F.

SECTION III - MAINTENANCE AND OPERATION - GENERAL PROCEDURE

3-01 Reference to Approved Regulation. This manual is submitted in accordance with provisions of the Title 33 Code of Federal Regulations, Part 208, hereafter referred to as the Flood Control Regulations, regarding Maintenance and Operation of local flood control works, a copy of which is included as EXHIBIT A.

3-02 Intent of Regulations. The general intent of the regulations approved by the Secretary of the Army is stated in paragraph 208.10(a)(1) of the regulations as follows: "The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

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

3-03 Purpose of this Manual. In view of the large number of local flood protection projects authorized by Congress and the repetitious nature of regulations to govern maintenance and operation of each individual project, and in order that local interests may be fully aware of the extent of the obligations assumed by them in furnishing assurances of local cooperation for projects to be constructed in the future, the general regulations described above were established by the Secretary of the Army. The general regulations approved by the Secretary of the Army, August 1944, were intended to be sufficiently broad in scope and general in nature as to be applicable to all flood protection projects for which such regulations are required by law (33 CFR, 208).

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

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

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

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

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

(2) Work supervisors in sufficient number to lead maintenance patrol work of the levee, inspect the channel, and operate the 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 33 CFR, 208.10(a)(4), no encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted on the rights-of-way for the protective facilities. The Superintendent will, therefore, cause notices to be posted at conspicuous places along the project right-of-way directing public attention to this regulation. The Superintendent shall take whatever action is necessary under his own authority to remove any unauthorized encroachment or to prosecute the trespassers.

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

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

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

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

f. Coordination of Local Activities. In accordance with the provisions of Flood Control Regulations, 33 CFR 208.10(a)(9), the Superintendent will, during periods of floodflow, coordinate the functions of all agencies, both public and private, that are connected with the protective works. Arrangements shall be made with the local law 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, 33 CFR, 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 immediately following each major high water period, and otherwise at intervals not exceeding 90 days and such intermediate times as may be necessary to insure the best possible care of the levee."

(2) For the sake of uniformity, and to the extent practicable, the dates of inspection shall be as follows: 1 November through 15 April

and/or immediately following each floodflow in excess of reading listed in Section I, Para. 1-06, Floodflows.

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

h. Maintenance.

(1) Flood Control Regulations, 33 CFR 208.10(b)(1) are quoted in part as follows:

"(b)(1) Maintenance. The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood, measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for . . . Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent."

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

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

i. Reports.

(1) Semi-Annual Report. In accordance with the provisions of the Flood Control Regulations, 33 CFR, 208.10(a)(6), the local agency providing the assurances shall submit within a 10-day period following 1 November and 15 April of each year, a semi-annual report to the District Engineer covering inspection, maintenance, and operation of the protective works. This report will present a statement of:

(a) The physical conditions of protective works as summarized from the logs of inspection.

(b) Flood occurrences and behavior of the protective works, and flood-fighting activities during the period.

(c) Prosecutions for encroachment or trespass.

(d) Permits issued for right-of-way or use of right-of-way.

(e) Permits issued for improvements or construction 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 of all previous deficiencies.

(g) Fiscal statement of cost of maintenance and operation for the period.

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

3-08 Environment Protection.

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

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

Such inspections shall be made immediately prior to beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee . . ."

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

- (a) Aggradation or degradation of the streambed 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, roadway on levee and low-water crossing ramps on the levee slopes.

c. Maintenance.

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

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

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

d. Operation.

(1) Pertinent Requirements of the Flood Control Regulation. Title 33, Code of Federal Regulations, Section 208.10(b)(2) is quoted in part as follows:

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

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

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

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

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

4-03 Channels.

a. Description. The diversion channel of North Fork Feather River extends from the sediment basin located just east of Highway 89 approximately 3/4 mile south from the intersection with Highway 36, upstream to the junction with North Fork Feather River. The junction is located about 2 miles west from the City of Chester and 1/4 mile south of Drakesbad Road. The channel has a trapezoidal cross section with side slopes of 1V on 2H on which a minimum of 18 inch thickness of quarry rock bank protection has been provided. The bottom width of the excavated channel is approximately 150 feet with waterside berms of varying widths. The length of the diversion channel is approximately 2.5 miles and has a bankfull flow capacity of 10,000 c.f.s. The leveed floodway capacity is about 28,300 c.f.s. not including freeboard allowances.

b. Inspection.

(1) Pertinent Requirements of the Flood Control Regulations.
Title 33, Code of Federal Regulations, Section 208.10(g)(1) is quoted in part as follows:

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

Such inspections shall be made by the Superintendent prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections . . ."

(2) The purpose of the floodflow channel 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 33 CFR, 208.10(g)(1) of the Flood Control Regulations, particular attention will, therefore, be given the following:

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

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

(c) Rubbish and industrial waste disposal.

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

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

(f) Condition of project structures.

1. Channel walls:

a. Deviation from alignment and grade.

b. Development of cracks and spalls.

c. Mechanical damages.

2. Fencing:

a. Damages to post, fencing or barbed wire.

b. Damage to galvanizing.

3. Earth fills:

a. Settlement.

b. Erosion of either slope.

c. Excessive seepage or saturation area back of fills.

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

4. Right-of-way:

a. Presence of dumped refuse.

b. Encroachment or trespass.

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

c. Maintenance.

(1) Pertinent Requirements of the Flood Control Regulations. Title 33, Code of Federal Regulations, Section 208.10(g)(1) is 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 time.

(3) Dumped rock or other suitable types of protection should be placed at locations found by experience to be critical trouble points, with a view to stabilizing the channel alignment and preserving the general uniformity of the bank lines.

(4) Sediment and debris plugs or other obstructions should be removed from the channel to prevent any tendency for the flows to be deflected within the channel. The heavy material likely to accumulate in the new channel at the mouths of tributaries should be removed to keep the channel clear.

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

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

(7) All eroded concrete shall be repaired as soon as any reinforcing steel is exposed or erosion approaches a depth of 2 inches. For this purpose, it is recommended that the repair be made by thoroughly cleaning the surface by sandblasting and building up the section with pneumatically-placed Portland cement mortar. All evidence of settlement, uplift, or failure of concrete structures shall be given special attention.

(8) All damage to fencing, whether resulting from accidental or willful injuries or from corrosion, shall be promptly repaired with new material in order to maintain satisfactory protection to the public.

(9) No excavation within the limits of the North Fork Feather River project will be permitted unless an excavation permit has been approved by the Reclamation Board and the District Engineer.

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

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

(12) All stone protection at the approach and spillway of the 7 drop structures within the diversion channel reach shall be inspected at least once a year and after each flood period. All stones that have been displaced shall be placed back to the line and grade as constructed.

d. Operation.

(1) Pertinent Requirements of the Flood Control Regulations. Title 33, Code of Federal Regulations, Section 208.10(g)(2) is quoted in part as follows:

"(g) Channels and floodways . . . (2) Operation. . . . Appropriate measures shall be taken to prevent the formation of jams . . . of debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter all snags and other debris shall be removed and all damage to . . . walls, drainage outlets or other flood control structures repaired."

(2) Diversion Channel Sediment ponds - Removal of sediment deposits from the large existing gravel pits located between the downstream end of the diversion channel and Lake Almanor shall be required as necessary to curtail depositions into the Lake. Sediment deposits will be allowed to accumulate in these pits to about elevation 4498.0+. Once this elevation of deposition is reached, removal of subsequent sediment deposits in these pit areas to an elevation of about 4497.0+ will be required.

4-04 Diversion Dams.

a. Description. A diversion dam was constructed as part of the Channel Improvement Project and is located at the junction of North Fork Feather River and the Bypass channel. The structure is an earthfill embankment with three concrete box culvert outlet works and a stilling basin. The outlet conduits are designed to allow normal flows to continue downstream through the town of Chester with a maximum discharge of 3,500 cfs. Removable metal trash racks for debris are provided for maintaining a clear passage of flows. Also removable baffles were constructed in one of the conduits for passage of migratory fish. A fine grid trash rack is provided in front of the debris trash rack for public safety and shall be removed only during flood season.

b. Maintenance.

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

(2) All eroded concrete shall be repaired when damages have reached a depth of 2 inches or exposure of any reinforcing steel, etc.

c. Special Instructions.

(1) Floatable Debris - Piles of floatable debris and large trees shall be removed from the basin area upstream from the dam and from the trash racks as required to prevent blockage of the outlet works by impending high flows in the river. Care is to be taken not to damage the trash racks during debris removal.

(2) Sediment Deposits - Removal of sand and gravel deposits from the basin upstream from the dam shall be required to the extent necessary to prevent impairment of flows into the outlet and as required to prevent deposits in the reach of the river downstream from the dam that would reduce the capacity of the channel to less than the estimated capacity of about 3000 cfs.

d. Operation.

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

(2) Flashboards should not be installed during flood season (1 November to 15 April). Any proposed use of flashboards during the flood season or periods of high water is subject to the approval of the State Reclamation Board and the District Engineer. Also see section 4-06a(3).

4-05 Drainage Structures.

a. Description. Drainage structures were constructed in cross dikes as a part of contract No. DACW05-76-0073. The following paragraphs are for guidance, in conjunction with maintenance and operation of the project works.

b. Inspection.

(1) Pertinent Requirements of the Flood Control Regulation.
Title 33, Code of Federal Regulations, Section 208.10(d)(1).

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

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

c. Maintenance.

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

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

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

d. Operation.

(1) Pertinent Requirements of the Flood Control Regulations.
Title 33, Code of Federal Regulations, Section 208.10(d)(2).

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

4-06 Miscellaneous Facilities.

a. Description. Miscellaneous structures or facilities which were existing or constructed as a part of, the channel improvement work, and which might affect the functioning of the project, include the following:

(1) Bridges.

Stream	Description	Chan Station
North Fork Feather River Bypass	Hwy 36 Bridge	38+70
" " " " "	Low water crossing	48+50
" " " " "	" " "	97+50

Responsibility for maintaining of the above facilities will be in accordance with the separate agreement between State Reclamation Board and the maintaining agency i.e.; the project channel area under the bridge within the right-of-way of Highway 36 will be the responsibility of Plumas County. The maintenance responsibility of the low water crossings is delegated to its owners. The crossings shall not be raised or widened without approval from the Reclamation Board and District Engineer.

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

(3) Hydrologic Facilities. The stream gaging station consisting of a gage house and staff gage located on the crown of the diversion structure, will be maintained by Plumas County. Continuous operation of this station will be required for monitoring flood flows to insure that releases through the conduits be limited to a non-damaging magnitude, for the reach downstream from the diversion structure. Flashboards may be placed in the structure during flood season, after historical experiences have indicated the necessity of limiting flows in the river for the purpose of preventing flood damages in the reach downstream from the structure.

b. Inspection and Maintenance.

(1) Pertinent Requirements of the Flood Control Regulations. Title 33, Code of Federal Regulations, Section 208.10(h)(1) is quoted in part as follows:

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

(2) Inspection of the miscellaneous facilities shall be made at the same time that the inspection of the other features of the project are made, and shall be reported on check list No. 3, sheet No. 4 of EXHIBIT E.

(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 agencies maintaining and operating the bridge. If the inspection of any miscellaneous structure, either existing or constructed in the future under permit, discloses any condition that indicates the probability of failure during periods of high water, the Superintendent shall address a letter to the owner of the structure, quoting this manual as authority and inviting attention to the conditions observed and requesting that immediate steps be taken to correct them. A copy of such letter shall be forwarded to the Reclamation Board and the District Engineer for their information. A report on the action taken by the owner shall be submitted to the Reclamation Board and the District Engineer to accompany the next semi-annual report. A suggested report form is included as EXHIBIT D of this manual.

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

c. Operation.

(1) Pertinent Requirements of the Flood Control Regulations.
Title 33, Code of Federal Regulations, Section 208.10(h)(2) is quoted as follows:

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

SECTION V - SUGGESTED METHODS OF COMBATING FLOOD CONDITIONS

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

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

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

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

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

a. Sector limits; ascertain that the dividing line between sectors is plainly determined and, if necessary, marked.

b. Condition of new levees and recent repairs.

c. Condition of culverts, flapgates, and sluice gates.

d. Transportation facilities; roads, rail and water communications.

e. Material supply; quantity, location, and condition.

f. Communications; locate and check all necessary telephones in the sector.

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

a. Fill up holes or washes in the levee crown, slopes, and landside berms. Where new construction has been completed during the year, rain washes and deep gullies may have developed. While the levee is new, preparations should be made in advance to combat wave wash along the exposed reaches.

b. Repair gaps where road crossings have been worn down and the levee is below grade. In filling the road crossings, it may be necessary to obtain material from landside borrow pits, in which case excavation for the material should be kept at least 50 feet from the toe of the levee. Any filling done in this connection should be tamped in place and, if in an exposed reach, subject to wave wash, the new section should be faced with bags of sand.

c. Repair and close all flapgates on culverts and see that they are seated properly before they are covered with flood waters.

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

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

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

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

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

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

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

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

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

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

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

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

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

d. Scours. A careful observation should be made of the riverside of the levee at all localities where a current of more than two feet per second is observed, or where profiles show a highwater gradient of two feet per mile or greater. Scours may be found near the ends of old levee dikes, roadcrossing ramps and places where pipes, sewers or other structures penetrate the levee. All scours should be carefully observed to determine the necessity and adequate type of repairs to be accomplished. An approved method to control scour is to construct deflection dikes using brush, lumber, filled sacks, stones, or combinations of such and securing with wire and stakes. See EXHIBIT C, Plate 6.

e. Caving Bank Protection. As protection against active caving of riverbanks, rock-filled cribs are very effective if properly placed. Cribs are usually 14 feet by 14 feet in plan by 10 to 14 inches on the side. See EXHIBIT C, Plate 7. The cribs are constructed on a double thickness of 1" x 4" x 14' lumber, equivalent to 2" x 4" pieces, lapped rail fence fashion at all corners and intersections. They are divided into four compartments of about equal area by two perpendicular cross walls constructed in the same manner as the side walls. The floors and covers are built up of double 1" x 4" boards spaced about 9" center to center. Under the floor and perpendicular to the direction of the cover boards, are three pairs of top boards, one over each of the side walls and one over the central division wall. All intersections are nailed with one 20 penny nail. The compartments are filled with rock before covering. Each wall intersection of the fabricated cribs is securely fastened by a loop of No. 9 wire.

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

a. Sandbag Topping. Material filled sacks may be used to raise the crown of the levee about three feet. The sacks should be laid stretcher-wise or along the levee for the first layer, crosswise for the second layer, and so on. Sacks should be lapped at least 1/3 either way and well fitted into place. When properly sacked and tamped, one sack will give about three to four inches of topping. If gravel is available, it should be used for front facing so as to avoid washing out. See EXHIBIT C, Plate 8 for instructions.

b. Lumber and Sandbag Topping. This is the most commonly used method of raising low reaches in emergencies. In putting on this topping, as well as other toppings, a careful line of levels should be run and grade stakes set in advance. 2" x 4" x 6' stakes should then be driven on the riverside of the crown six feet apart, and 1" x 12" boards nailed to landside of the stakes. This wall, backed with a single tier of sacks, will hold out at least one foot of water. If a second foot is necessary, the layers of sacks will have to be increased in number and reinforced. The stakes should be driven three feet in the ground, and should project out three feet, thus providing, in extreme cases, a three-foot topping if properly braced behind with sacks and earth. In some instances, it may be practicable to back up the planking with tamped earth obtained in the vicinity in lieu of the sacks as shown on the drawing, EXHIBIT C, Plate 9.

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

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

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

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

EXHIBIT B
"AS CONSTRUCTED" DRAWINGS

EXHIBIT B
Unattached

**TITLE 33—NAVIGATION AND
NAVIGABLE WATERS**

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

PART 203 — FLOOD CONTROL REGULATIONS

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

§ 208.10 *Local flood protection works; maintenance and operation of structures and facilities—(a) General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

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

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

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

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

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

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

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

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

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

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

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

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

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

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

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

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

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days; and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accom-

plished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or weaknesses of the landward slope and certain that:

(i) There are no indications of or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee 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 contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair 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 accelerate seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to the 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 fires are being built near them;

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

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

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and defect 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 under the wall. Floating plant or boats will be allowed to lie against or tie up to wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall be taken to correct any condition which endangers the stability of the wall.

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

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

- (i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;
- (ii) Inlet and outlet channels are open;
- (iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

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

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

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

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

- (i) No parts are missing;
- (ii) Metal parts are adequately covered with paint;
- (iii) All movable parts are in satisfactory working order;
- (iv) Proper closure can be made promptly when necessary;
- (v) Sufficient materials are on hand for the erection of sand bag closures and that the location of such materials will be readily accessible in times of emergency.

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

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

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

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

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

(g) *Channels and floodways—(1) Maintenance.* Periodic inspections of improved channels and floodways shall be made by the Superintendent to be certain that:

(i) The channel or floodway is clear of debris, weeds, and wild growth;

(ii) The channel or floodway is not being restricted by the depositing of waste materials, building of unauthorized structures or other encroachments;

(iii) The capacity of the channel or floodway is not being reduced by the formation of shoals;

(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred;

(v) Riprap sections and deflection dikes and walls are in good condition;

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

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

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

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

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

Sediment Basin

Lake Almanor

To Greenville

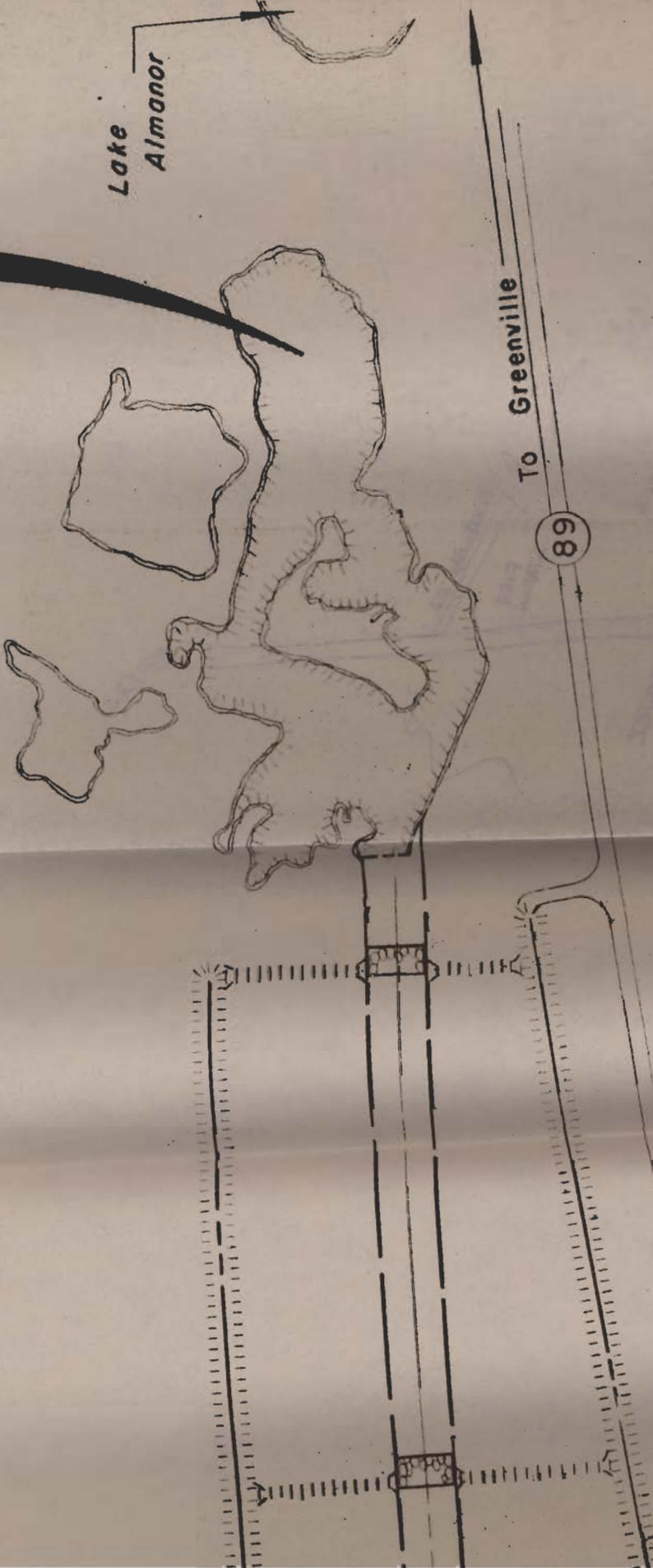
89

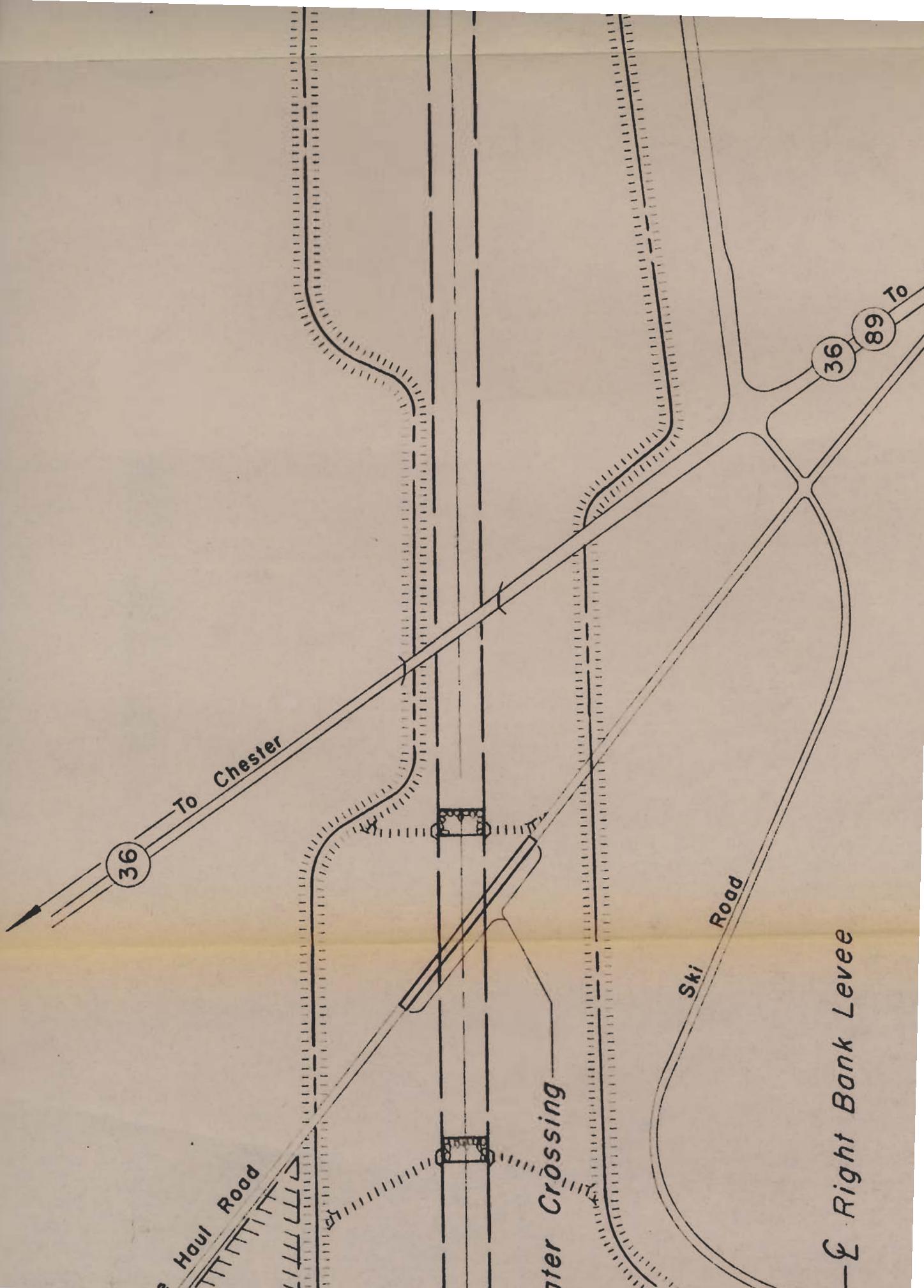
GRAPHIC SCALE



LEGEND

State Highway





36

To Chester

36

89

To

Haul Road

Center Crossing

Ski Road

Right Bank Levee

Diversion Structure

Debris d

Left Bank Level

Low Water Crossing

Historic Indian camp site
(Do not disturb)

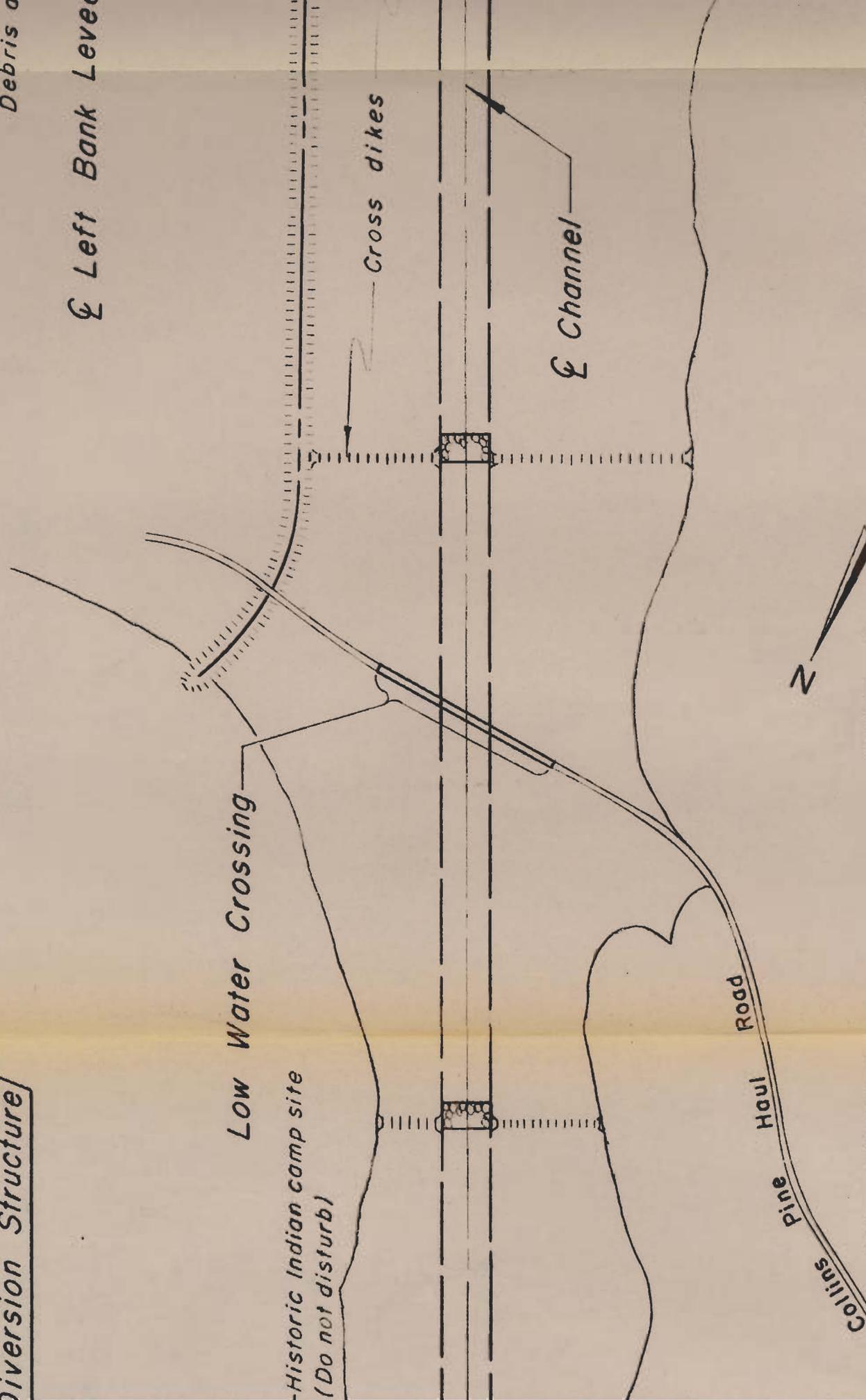
Cross dikes

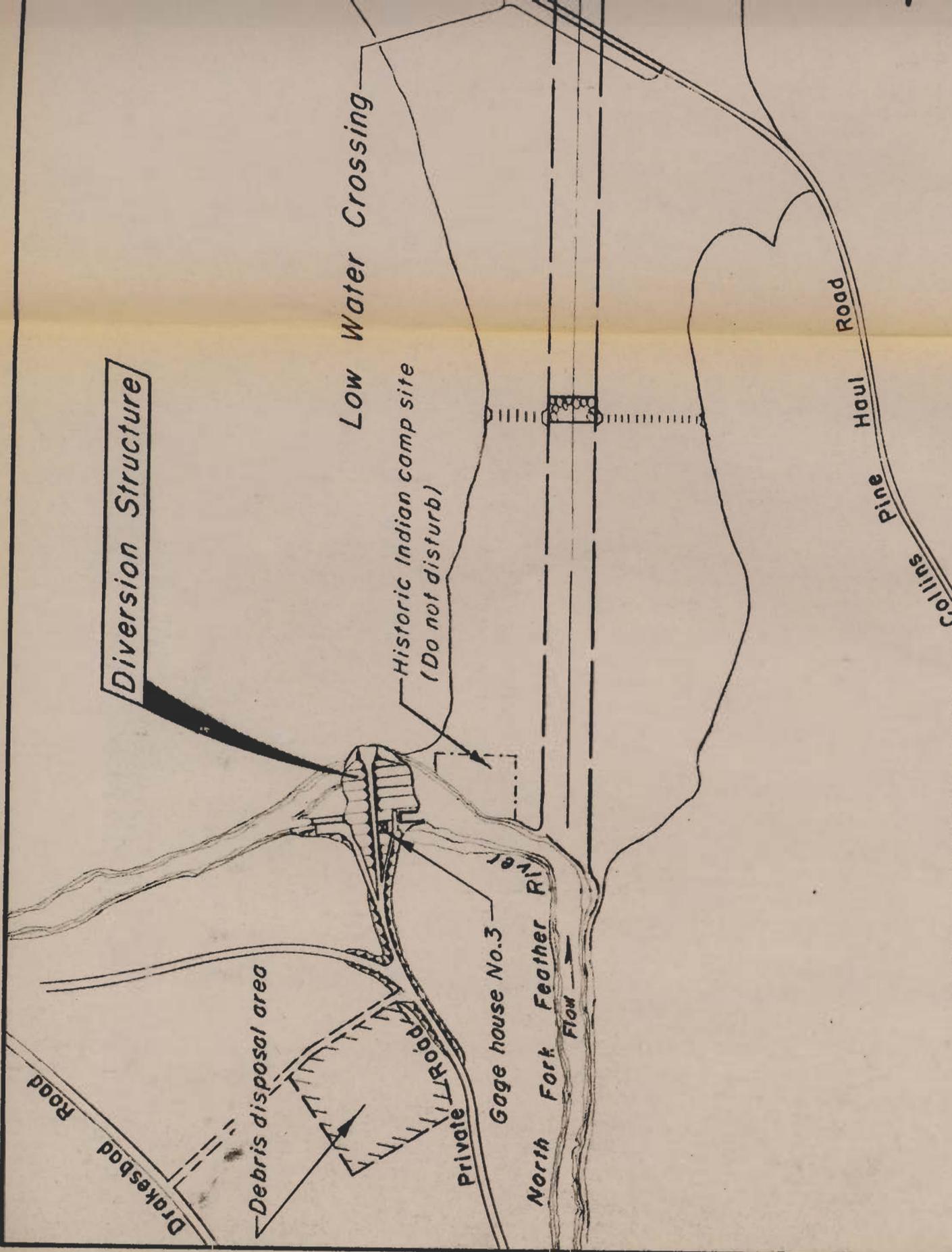
Channel

Pine Haul Road

Collins

N





Diversion Structure

Low Water Crossing

Historic Indian camp site
(Do not disturb)

Debris disposal area

Gage house No. 3

North Fork Feather River

Private Road

Drakesbad Road

Pine Haul Road

Collins