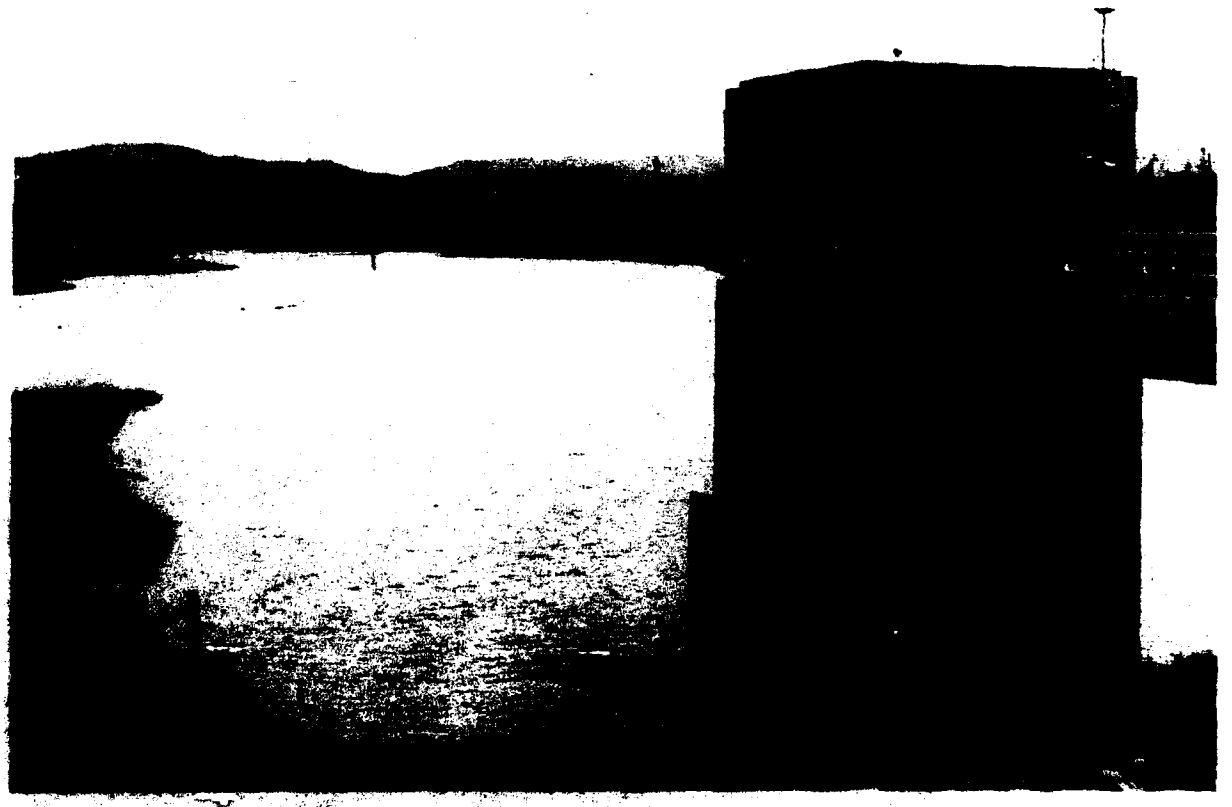
US Army Corps of Engineers
Los Angeles District

WATER CONTROL MANUAL

FULLERTON DAM
FULLERTON CREEK
California



Flood of March 1941. Two Months Prior to Completion of the Project.

May 1989

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DAMS-FULLERTON
RESERVOIR REGULATIONS
FLOOD CONTROL

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This manual provides information on Fulerton Dam and the drainage area in which it is located. The dam regulates flood stages flow through east Fullerton Creek. It minimizes flood damage downstream of the structure. Thus, the original purpose of the dam is to protect the town of Fullerton, Placenta, Anaheim and the adjacent highly developed agricultural areas from floods.

FULLERTON DAM AND RESERVOIR
ORANGE COUNTY, CALIFORNIA

PERTINENT DATA
MARCH 1989

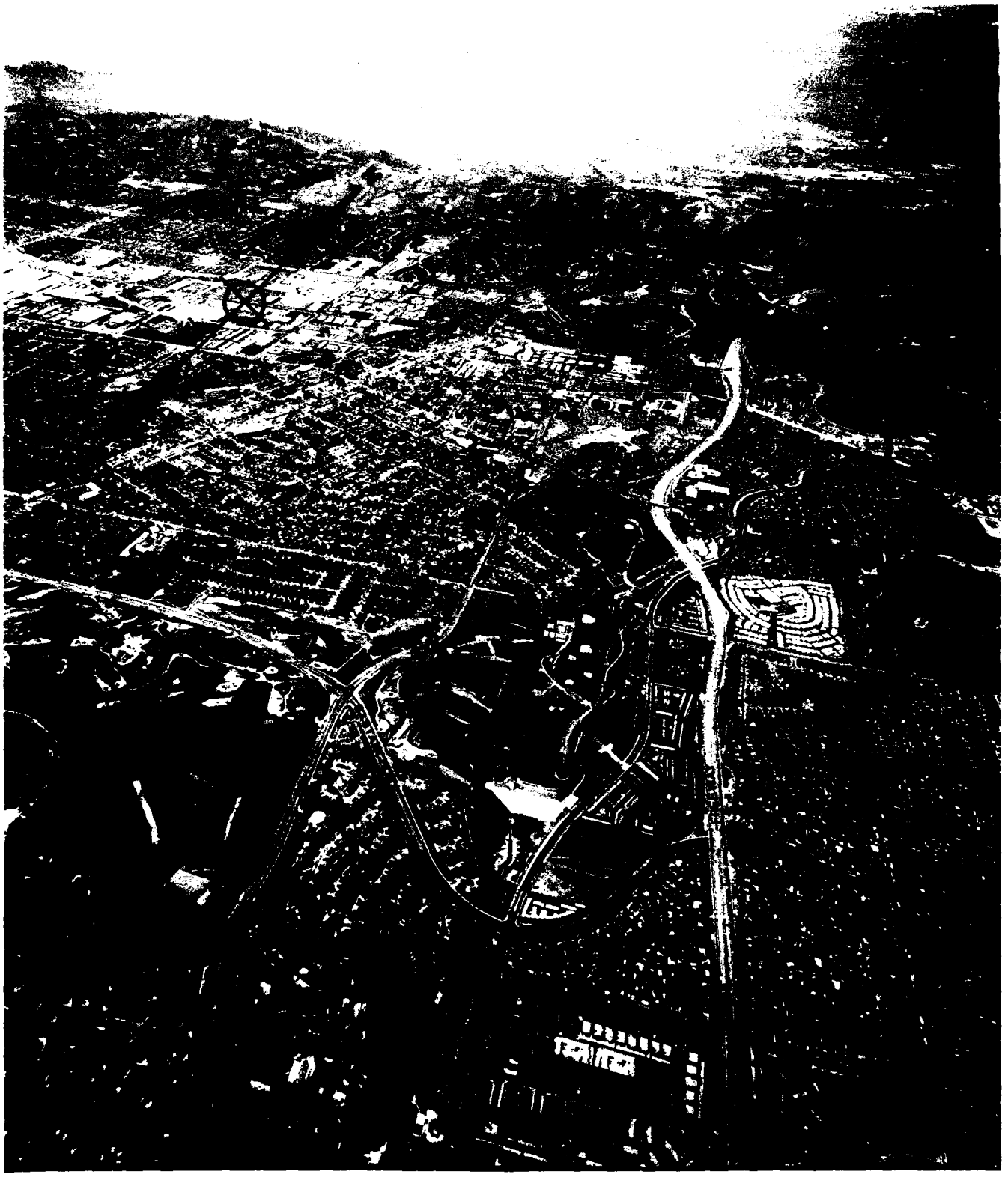
Construction Completed	May 1941
Stream System	Fullerton Creek
Drainage Area, sq. miles	5.0
Reservoir:	
Elevation	
Streambed at dam, ft., NGVD	260
Spillway crest, ft., NGVD	290
Spillway design surcharge level, ft., NGVD	298.4
Top of dam, ft., NGVD	307
Area	
Spillway crest, acres	62
Spillway design surcharge level, acres	92
Top of dam, acres	130
Capacity, gross	
Spillway crest, acre-feet	764 (2.84*)
Spillway design surcharge level, acre-feet	1394 (5.18*)
Top of dam, acre-feet	2306 (8.56*)
Original allowance for sediment, acre-feet	230
Dam: - Type	Earthfill
Height above original streambed, ft.	46
Top length, ft.	575
Top width, ft.	15
Freeboard (PMF), ft.	8.6
Spillway: - Type	Ungated ogee
Crest length, ft.	40
Crest elevation, ft.	290
Design surcharge (modified Rational Method), ft.	8.4
Design discharge (modified Rational Method), ft.	3380
Outlets:	
Uncontrolled	
Number and size	1 - 3'W x 2'H
Entrance invert elevation, ft., NGVD	275
Controlled	
Gate type	Vertical lift
Size, ft.	2 - 3'W x 5'H
Entrance invert elevation, ft., NGVD	261
Conduits	
Number and size	1 - 4'W x 6'H
Length, ft.	346
Maximum capacity at spillway crest, cfs	590
Regulated capacity at spillway crest, cfs	500
Standard project flood:	
Duration (inflow), days	1.75
Total volume, acre-feet	1750 (6.50*)
Inflow peak, cfs	2100
Outflow peak, cfs	1250
Maximum water surface elevation	
1969 reservoir regulation schedule, ft.	293.75
Current reservoir regulation schedule, ft.	292.50
Probable maximum flood	
Duration (inflow), days	0.25
Total volume, acre-feet	1820 (6.76*)
Inflow peak, cfs	16000
Outflow peak, cfs	5650
Spillway outflow peak, cfs	5650
Maximum water surface elevation, ft.	301.44
Historic maximums:	
Maximum inflow, cfs	3800
Date	3-14-41
Maximum outflow, cfs	444
Date	3-1-83
Maximum water surface elevation, ft., NGVD	285.6
Maximum storage, acre-feet	522.5 (68% full)
Date	1-31-79

*Inches of runoff

WATER CONTROL MANUAL
FULLERTON DAM AND RESERVOIR
FULLERTON CREEK, CALIFORNIA

MAY 1989

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES



FULLERTON DAM AND WATERSHED AREA

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in looseleaf form; and only those sections, or parts thereof, requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made in order to keep the manual current.

EMERGENCY REGULATION ASSISTANCE PROCEDURES

In the event that unusual conditions arise, contact can be made by the telephone to the U.S. Army Corps of Engineers, Los Angeles District Office during official business hours (0730-1600, Monday through Friday), plus during non-duty periods of flood operations:

Reservoir Regulation Unit (213) 894-4756

WATER CONTROL MANUAL

FULLERTON DAM AND RESERVOIR
FULLERTON CREEK, CALIFORNIA

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LIST OF ABBREVIATIONS

AF	acre-feet
ALERT	Automated Local Evaluation in Real Time
CALTRANS	California Department of Transportation
cfs	cubic feet per second
DWR	California Department of Water Resources
EM	Engineering Manual
ER	Engineering Regulation
ETL	Engineering Technical Letter
LACDA	Los Angeles County Drainage Area
LACDPW	Los Angeles County Department of Public Works
LAD	Los Angeles District
LATS	Los Angeles Telemetry System
mph	miles per hour
NGVD	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service.
OCEMA	Orange County Environmental Management Agency
OCFCD	Orange County Flood Control District
PMF	Probable Maximum Flood
QPF	Quantitative Precipitation Forecast
RCB	reinforced concrete box
RESCAL	Reservoir Calculation computer program
ROC	Reservoir Operation Center
SPF	Standard Project Flood
SPD	South Pacific Division
tc	time of concentration
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WSE	water surface elevation

I - INTRODUCTION

1-01 Authorization. This Water Control Manual for Fullerton Dam was prepared in accordance with regulations and guidelines set forth in the following directives: Engineering Regulation (ER) 1110-2-240, "Engineering and Design, Water Control Management", dated 8 October 1982; Engineering Technical Letter (ETL) 1110-2-251, "Engineering and Design, Preparation of Water Control Manuals", dated 14 March 1980; and Engineering Manual (EM) 1110-2-3600, "Engineering and Design, Management of Water Control Systems", dated 30 September 1987. The chain of correspondence leading to approval of this manual is included as Exhibit D.

1-02 Purpose and Scope. This manual provides current information on Fullerton Dam and the drainage area in which it is located. A revised reservoir regulation schedule is presented as well as information concerning the organizational structure of the regulating agency, the U.S. Army Corps of Engineers.

Because they do not apply to Fullerton Dam, this manual does not address the issues of water supply, hydroelectric power generation or navigation. Water supply was originally indicated as one of the purposes for building Fullerton Dam, but no facilities exist to utilize the short-term impoundment of storm flows. Dam characteristics preclude any application of hydroelectric power generation or navigation.

1-03 Related Manuals and Reports. Manuals and reports relevant to Fullerton Dam and its contributing watershed are listed on plate 1-01.

1-04 Responsibility for Project. Fullerton Dam is owned and operated by the U.S. Army Corps of Engineers, Los Angeles District (LAD). This agency is solely responsible for development and initiation of water control scheduling and required maintenance at the dam. The flood control basin behind Fullerton Dam contains Craig Regional Park. The land is owned by the Federal Government but the park is leased and operated by Orange County Parks and Recreation Department.

During storm events, the operation of Fullerton Dam is coordinated with the Orange County Environmental Management Agency (OCEMA) which maintains the improved sections of the downstream channel on Fullerton Creek.

1-05 Project Operation. Fullerton Dam is staffed by one dam tender on a year-round basis. During normal working hours he works in and around the dam. He lives in a mobile home just downstream of the dam, and has easy access to the dam during storm events. In case the dam tender is unavailable, there is an alternate dam tender assigned to the dam. All dam tenders are under the supervision of the Operations Branch, LAD, but receive their reservoir regulation instructions from the Reservoir Regulation Section, LAD. Fullerton Dam's telephone number is 714-529-2532.

II - PROJECT DESCRIPTION

2-01 Location. Fullerton Dam is located on East Fullerton Creek, in the San Gabriel River drainage, as seen on plate 2-04. The dam is situated in the eastern Coyote Hills, which provide the last topographic relief before East Fullerton Creek enters the coastal plain. The dam is located in Orange County, one mile south of the intersection of Imperial Highway and Orange Freeway, and approximately 2 miles northeast of the City of Fullerton. The local project area is shown on plate 2-05.

2-02 Purpose. The purpose of Fullerton Dam is regulating flood stage flows through East Fullerton Creek, and minimizing flood damage downstream of the structure. The protected area includes the City of Fullerton and development on the adjacent coastal plain. The original (1938) stated purpose (ref. c, pl. 1-01) was protection of "the towns of Fullerton, Placentia, and Anaheim, and the adjacent highly developed agricultural area from floods originating in the watershed above."

2-03 Physical Components. Fullerton Dam consists of an earthfilled embankment with outlet works and a detached concrete spillway. The components of Fullerton Dam are shown in the site plan on plate 2-06. They include:

a. Dam. The dam is an impervious, unzoned, earthfill gravity structure. Crest length at the top of the dam is 575 feet, with a crest width of 15 feet and a top elevation of 307 ft. NGVD. The maximum height above the original East Fullerton Creek streambed is 46 feet. The structure of the dam features 3H:1V side slopes on both the upstream and downstream faces, with the upstream slope changing to 4H:1V near the toe. The upstream face is covered with a 2 foot blanket of graded rip-rap placed on a 12-inch gravel blanket. The downstream slope is protected by a 12-inch thick gravel blanket. The base of the dam is 330 feet long in the direction of streamflow, with a rock toe at the bottom of the upstream face, and a cut-off trench beneath the center of the dam. Details of the embankment sections are shown on plates 2-07 and 2-08.

b. Outlet Works. The outlet works are located near the western abutment of the dam. The outlet works are shown on plate 2-09.

(1) Approach Channel. The unlined approach channel is trapezoidal in cross-section, has a bottom width of 20 feet and side slopes of 2H:1V. The approach channel is 873 feet long.

(2) Inlet Channel. The rock-faced inlet channel is 52 feet long with a bottom width of 20 feet and side slopes of 2H:1V.

(3) Intake Structure. The reinforced concrete intake structure includes a 37-foot long inlet channel transition section, and a 47-foot high intake tower. Trash racks are positioned in the base of the intake tower. The intake tower provides access to the gate-stem guides and the outlet gates. Details of the intake structure are shown on plate 2-10.

(4) Outlet Structure. Two vertical lift gates, 3 feet wide by 5 feet high, are set in the base of the intake tower at invert elevation 261 ft. NGVD. The Southern California Edison Company supplies 440 volt power to the motors

on the two gate hoist assemblies. In case of commercial power failure, a diesel standby power unit is available to supply 30 KW at 480 volts and 60 Hz. The gates open and close at a rate of one foot per minute.

A 3-foot wide by 2-foot high ungated outlet with entrance crest at elevation 275 ft. NGVD prevents permanent storage above that elevation. A transition section with level invert at elevation 261 ft. NGVD extends 28.5 feet downstream of this ungated outlet, merging flows from the gated and ungated outlets, and directing them into the outlet conduit, as seen on plate 2-10.

The rectangular outlet conduit is 4 feet wide by 6 feet high, and 317.5 feet long with a slope of .00189. Maximum outlet discharge is controlled by the outlet conduit capacity. At a water surface elevation of 290 ft. NGVD (spillway crest), conduit capacity is 590 cfs. Outlet discharge rating curves were computed based upon the following design information: Manning's "n" = 0.010; entrance loss = 0.050; upper conduit bend losses = 0.144 and 0.167; lower conduit loss = 0.0968; transition loss = 0.20; and the gates losses were adopted from the Hansen Dam gates. Outlet discharge rating curves for the ungated and two gated outlets are shown on plates 2-11 and 2-11A. These curves are valid only if both gate openings are set at the same height. Should the gate openings be set at different heights, establishing discharge values from an outlet discharge rating curve is very difficult, due to the complex hydraulics of the outlet structure.

(5) Downstream Structure. The outlet conduit discharges into a concrete stilling basin about 171 feet long, with width varying from 4 to 11 feet, and walls ranging in height from 9 to 17 feet. The stilling basin merges into an outlet channel 214 feet long with a bottom width of 8 feet and side slopes of 2H:1V as seen on plate 2-12. Downstream of this rock-faced channel, discharge moves into a grass channel, and eventually enters an improved section of Fullerton Creek maintained by the Orange County Environmental Management Agency (OCEMA).

c. Control House. The concrete gate control house, located on top of the intake tower, has inside dimensions of 16 feet wide by 19 feet long by 13.5 feet high. The control house contains: (1) the gate hoists and electrical controls; (2) a standby diesel generator; (3) gate position indicators and recorders; (4) a radio transceiver; (5) three digital recorders monitoring reservoir water surface elevation, downstream gauge height and precipitation; and (6) a remote terminal unit (RTU) that transmits digital recorder information to the Water Control Data System computer located in the downtown Los Angeles District Office.

d. Spillway. The spillway is northeast of Fullerton Dam in the hill forming the dam's eastern abutment. Plan and profile of the spillway are shown on plate 2-13.

(1) Spillway Approach Channel. The trapezoidal approach channel is approximately 300 feet long with side slopes of 2H:1V and a rounded inlet transition.

(2) Spillway Control Section. The control section is formed by a concrete ogee weir 8 feet high and 40 feet long, with a crest elevation of 290 ft. NGVD. The spillway channel terminates in a flip bucket with a lip elevation of 270 ft. NGVD. Plate 2-14 shows the spillway discharge rating curve.

(3) Outlet Channel. Flow from the spillway outlet channel will tend to follow the Bastanchury Drain watercourse (shown on pl. 2-06) into Fullerton Creek below the dam. When the capacity of this tributary is exceeded, water will flow onto Bastanchury Road and Associated Road. Exceeding the capacity of Fullerton Creek or Bastanchury Drain will likely cause flooding of the campus of California State University at Fullerton and part of the northwest portion of the City of Fullerton.

e. Reservoir. Reservoir boundaries are defined by the extent of the land acquired by the Federal Government for flood control behind Fullerton Dam (shown on pl. 2-15). Although there is perennial flow in Fullerton Creek near the dam site, periods of impounded water are infrequent and short-lived.

A June 1970 survey is the latest available source of reservoir elevation-storage information. This survey is shown on plate 2-16. Area and capacity curves for the reservoir are shown on plate 2-17 and provided in tabular form on plate 2-01. When the reservoir is filled to spillway crest (elevation 290 ft. NGVD), the impounded storage is 764 acre-feet, covering 60.7 acres.

2-04 Related Water Control Facilities. Fullerton Dam is the primary regulating facility on Fullerton Creek. Upstream of the dam, Loftus Diversion Channel increases the dam's drainage area by approximately 2 square miles, bringing runoff into the flood control basin from the east. This diverted flow passes through a debris basin and small recreation pool before reaching the dam, as seen on plate 2-06.

Downstream of the dam, Fullerton Creek is predominantly an improved channel maintained by the OCEMA. There are no spreading grounds or other water conservation facilities along the course of the creek. Two U.S. Army Corps of Engineer dams, Brea Dam and Carbon Canyon Dam, are located near Fullerton Dam, but each dam primarily protects its separate downstream channel, and the three facilities are not operated in conjunction.

2-05 Real Estate Acquisition. The acquired real estate conforms with criteria in ER 405-2-150. The initial acquisition, finalized 14 February 1941, encompassed 140.31 acres and cost $26,955. Subsequent to land acquisition, a variety of land use deeds were granted to public groups. A list of current land users is provided on plate 2-02.

2-06 Public Facilities. Orange County holds a Parks and Recreation outlease for 11.26 acres of land within the reservoir property. The improved area is named Ted Craig Regional Park, and is shown on plate 2-18. Facilities include: an administration building, a small pond, tennis courts, baseball fields with backstops, picnic areas, and rest areas. Elevations of all facilities in Ted Craig Regional Park are listed on plate 2-03.

Trees have been planted throughout the park and an extensive lawn is maintained. Roads and sidewalks are paved. A nominal fee is charged to enter the park by car. The only unimporved area of the park lies immediately north of the dam. This area had included groomed baseball fields, but repeated inundation by impounded water caused the fields to be abandoned, and the area is now overgrown.

III - PROJECT HISTORY

3-01 History and Authorization. The flood of 1916 and the agricultural growth of Orange County in the 1920's gave rise to the need for improved flood protection on the county's coastal plain, and development of a system to replenish the ground water that was used at constantly increasing rate. The Orange County Flood Control District envisioned a plan that would address both of these issues, and outlined it in their 1929 report, "The Control of Floods and Conservation of Water", (ref. a, pl. 1-01). Fullerton Dam was one unit of this comprehensive plan.

The dam was originally intended to collect water from the upstream watershed, the Loftus Diversion Channel, and the discharge from projects on nearby Brea Creek. Releases from Fullerton Dam would then be routed to Carbon Canyon Creek via conduit, and subsequently released into the Santa Ana River with the intent of recharging the ground water aquifer.

Orange County originally submitted a report on the overall Santa Ana River Basin and Orange County project for a grant under the Federal Emergency Relief Appropriation Act of 1935. The project was later authorized under the Flood Control Act of 22 June 1936 (as amended). Construction of Fullerton Dam and Loftus Diversion Channel became the responsibility of the United States Government; and Orange County would handle improvement of downstream channels and any water conservation facilities.

3-02 Planning and Design. Orange County's preliminary design of Fullerton Dam included siting the spillway on the east abutment of the dam, and constructing an outlet works of three separate conduits capable of discharging a total of 2,240 cfs. Because the reservoir site is over a proven oil field, Orange County wanted the flooded area kept as small as possible. The planning and design of Fullerton Dam was then transferred to the U.S. Engineer Office, Los Angeles, California, now known as the U.S. Army Corps of Engineers. Economics, and the Government's interest solely in flood control, led to the current spillway site and outlet works. Design work for Fullerton Dam by the U.S. Engineer Office was completed in early 1940. Plans for construction of Loftus Diversion Channel were not adopted by the Federal Government due to concerns over sediment buildup. Design of Fullerton Dam anticipated the diversion construction at a later date.

3-03 Construction. Construction of Fullerton Dam was started in June 1940 and completed in May of 1941. The cost of the project, financed by Federal funds, was $577,965. Orange County Flood Control District (now part of OCEMA), completed Loftus Diversion Channel in December 1954. Orange County has not built any water conservation facilities for use with Fullerton Dam.

3-04 Related Projects. Fullerton Dam was one of several facilities authorized by the Flood Control Act of 1936 (as amended) and built by the U.S. Army Corps of Engineers. Because Fullerton Dam is located in Orange County, it was authorized as part of a Santa Ana River Basin flood protection program. Functionally, the facility is part of the Los Angeles County Drainage Area (LACDA) system. Flood flows released from Fullerton Dam eventually join with Coyote Creek in Los Angeles County and subsequently enter

the San Gabriel River. Because Fullerton Dam influences only the upper portion of Fullerton Creek, no other Federal structures directly relate to its operation.

The Loftus Diversion Channel, upstream of Fullerton Dam, was completed in December 1954 by the Orange County Flood Control District, (now part of OCEMA). The debris basin at the outlet of Loftus Diversion Channel was built in 1984 by OCEMA.

3-05 Modifications to Regulation. The original water control plan for Fullerton Flood Control Basin is presented in the report, "Fullerton Dam, Analysis of Design," dated January 1940. This initial plan called for establishment of a water conservation pool, to be formed by keeping the gates closed until the water surface reached an elevation of 277 ft. NGVD, providing a pool depth of 16 feet. Plans for water conservation regulation were later dropped, as the Orange County Flood Control District had no facilities for utilizing conservation releases.

The water control plan presented in the 1970 Reservoir Regulation Manual for Fullerton Flood Control Reservoir called for a standby gate opening of 0.3 feet for both gates. Because this gate setting impounded water during minor rainfall events and inundated recreational facilities, the standby setting was increased to 0.5 feet in 1977. In 1983 a new standby gate setting was implemented at 1.1 feet, along with a modified gate schedule at low water surface elevations. During storm events, gate openings are adjusted according to changing reservoir water surface elevations. Maximum discharge under the 1983 water control plan was 261 cfs. The current water control plan, presented in this manual, is calculated using the improved downstream channel capacity and the availability of telemetry gauge data. With these improvements, greater releases can be made that improve the overall protection provided by Fullerton Dam.

3-06 Principle Regulation Problems. There are problems associated with water control at Fullerton Dam and Reservoir. First, the dam and reservoir cannot handle the Standard Project Flood (SPF) without spillway flow. The SPF design method was not in use at the time Fullerton Dam was designed. The capacity of the present structure, designed by the Modified Rational method, cannot contain the critically greater volume event determined by the current SPF design method. The spillway discharges into a small drainage channel running parallel to Bastanchury Road. Spillway flow could easily exceed that channel capacity and cause flooding of local streets, the California State University at Fullerton campus, and private homes, in an event not necessarily as great in magnitude as the SPF. The new regulation schedule presented in Chapter VII should help to minimize these problems by increasing the release made from the outlet works and decreasing the uncontrolled peak release.

Secondly, during most high flow events, runoff passing through the dam outlet works causes debris to accumulate on the trash racks and inhibits water discharge. During low flow events, debris from the Loftus Diversion Channel is captured by the OCEMA debris basin upstream from the dam. When larger flows occur, the floating debris is flushed out of this basin, and received by the dam in a single slug. The debris must be prevented from causing a

blockage of outlet discharge during a high runoff situation. Such blockage can result in greater impoundment heights, putting recreational facilities in Craig Regional Park underwater and, under conditions well below an SPF, could cause undesirable spillway flow. Water control managers and the dam tender should pay attention to the status of debris accumulation, and notify the maintenance section if a cleanout is warranted.

Third, the channel downstream of Fullerton Dam is susceptible to flooding caused by local inflow. Thus the downstream channel should be monitored, so that releases from the dam do not worsen an existing flood situation. This can be done by using the telemetry stations in Fullerton Creek channel and by dispatching channel observers with radio equipped cars to patrol the channel when necessary.

Fourth, the project is subject to a very rapid runoff response time. The contributing drainage area characteristics cause streamflow to increase rapidly in response to effective rainfall. Plots of historical events inflow, outflow, and reservoir elevations (pls. 4-03 through 4-09) show a consistent pattern of rapid peak inflow (6 hours or less to peak from a base flow condition) and peak or near peak outflow and reservoir storage lagged only approximately 4 hours behind the time of peak inflow. This results in a requirement for a corresponding rapid response on the part of the dam tender and reservoir regulation personnel so that releases may be most effectively regulated.

IV - WATERSHED CHARACTERISTICS

4-01 General Characteristics. East Fullerton Creek originates on the southern slopes of the Puente Hills in the northwestern corner of Orange County, California. The stream flows in a southwesterly direction, through Fullerton Dam, to the edge of the City of Fullerton, where it turns westward and joins Coyote Creek. The longest watercourse in Fullerton Dam's drainage area is 5.4 miles, and the overall gradient is 187 feet per mile.

The total drainage area controlled by Fullerton Dam is 5.0 square miles. Natural drainage area above the dam is approximately 3.25 square miles, with an additional area of 1.75 square miles drained through the Loftus Diversion Channel. The entire drainage area is shown on plate 2-05. The upper portion of the drainage area has a light-to-medium cover of chaparral. Native grasses and a variety of small trees exist in the watershed along with residential development in the lower areas. At the time of Fullerton Dam's construction, the watershed contained extensive orange groves and oil fields. The orange groves have been replaced by residential development, but active oil fields remain.

4-02 Topography. Elevations in the watershed vary from 261 ft. NGVD at Fullerton Dam to 1,298 ft. NGVD at the highest point in the Loftus drainage area. The Puente Hills define the northern portion of the watershed and are characterized by rolling hills punctuated with steep narrow canyons. The watershed south of Puente Hills is a mildly sloping plain until it reaches the Coyote Hills where Fullerton Dam is located. Peak elevation of the East Coyote Hills near Fullerton Dam is 534 ft. NGVD. Downstream of the dam, Fullerton Creek moves through a gently sloping coastal plain until it reaches Coyote Creek. The channel profile is depicted on plate 4-01.

4-03 Geology and Soils. The Whittier fault zone is located just north of the East Fullerton Creek drainage area, traversing the Puente Hills in a north 65° west direction. This fault exhibits upward movement of the fault block containing most of the Puente Hills. During this uplift, sediments of this region were subjected to considerable folding, especially in the immediate vicinity of the major fault zone. Older Tertiary sediments are present east of the Whittier fault, while to the west the Pliocene aged Fernando beds are continuous for many miles, dipping deeply beneath the alluvium toward the coastal plain.

The local soils are composed of marine sediments of late Tertiary to Quaternary age. Igneous rocks are absent from the region, and the sediments in the area consist of a variety of sand and clay loams of the Altamont, Diablo, Ramona, and Yola series. These are moderately weathered, medium-textured soils of high agricultural value.

4-04 Sediment. The slope and soils of the Fullerton Dam drainage area are such that appreciable erosion occurs in undeveloped areas. A November 1944 survey of the Fullerton Dam Flood Control Basin indicated that the storage capacity loss rate due to sedimentation was 3.4 AF per year during the first 3 years of operation. A March 1962 survey indicated that the storage capacity loss rate decreased to 2.1 AF per year for the period between November 1944

and March 1962. Although the drainage area and sediment contributing area were increased when the Loftus Diversion Channel was completed in December 1954, an increase in urbanization has probably reduced potential sediment inflow and deposition. The completion of a debris basin in 1984 at the outlet of Loftus Diversion Channel is expected to further reduce sedimentation rates in the flood control basin. In 1970 the reservoir capacity was increased by excavation upstream of the dam to provide material for freeway construction. The June 1970 survey of the reservoir was done by CALTRANS after this excavation.

4-05 Climate. The climate of the drainage area above Fullerton Dam is generally temperate-subtropical and semi-arid, with warm, dry summers and mild, moist winters.

a. Temperature. Average daily minimum/maximum temperatures (degrees Fahrenheit) range from 42/66 in winter to 59/90 in summer. All-time low/high extremes of temperature are about 22/113. The area does not experience significant periods of freezing temperatures.

b. Precipitation. Normal annual precipitation in the drainage area above Fullerton Dam ranges from greater than 13 inches at the dam to about 16 inches at the top of the watershed. Monthly precipitation data are shown on plate 4-02. Plate 4-03 is a listing of historic monthly precipitation and a summary of mean and maximum observed monthly and annual precipitation for Fullerton Dam (Sta. No. 3285). There is a great deal of year-to-year variability in annual, monthly, and daily precipitation.

Plate 4-04 is a precipitation depth-duration-frequency tabulation for Fullerton Dam. In it are listed the computed point-value precipitation depths for durations from 15 minutes to 24 hours, and for return periods from 2 to 200 years. Data for this table were obtained from the State of California Department of Water Resources publication, Rainfall Depth-Duration Frequency for California, revised November 1982. These California Water Resources data are almost the same magnitude as those obtained from the National Oceanic and Atmospheric Administration publication, NOAA Atlas 2, for durations from 15 minutes to 6 hours. At durations of 12 and 24 hours, the NOAA Atlas 2 data are higher than the California data, up to 23 percent higher at 24 hours for the 100-year return period.

(1) General Winter Storms. Most precipitation in southern California coastal basin occurs during the cool season, primarily from November through early April, as mid-latitude cyclones from the north Pacific Ocean move across the west coast of the United States to bring precipitation to southern California. Most of these storms are of the general winter type, with hours of light to moderate steady precipitation, but with occasional heavy showers or thunderstorms. Although these storms frequently produce significant snow above an elevation of 6,000 ft. NGVD snowfall and snowmelt very rarely occur in the Fullerton watershed, with a peak elevation less than 1,300 feet.

(2) Local Thunderstorms. Local thunderstorms can occur in southern California at any time of the year, but are least common and least intense during the late spring. These types of storms occur fairly frequently in the

coastal areas during or just after general winter storms. They can also occur between early July and early October, when desert thunderstorms occasionally drift westward across the mountains into coastal areas, sometimes enhanced by moisture drifting northward from tropical storms off the west coast of Mexico. Local thunderstorms can also occur throughout the fall, as upper-level low-pressure centers trigger residual summer moisture. These local thunderstorms can result in very heavy rain for short periods of time, causing very rapid runoff from small drainage areas. The Fullerton Dam watershed is especially vulnerable to this type of storm.

(3) General Summer Storms. General summer storms in southern California are quite rare. However, a tropical storm from off the west coast of Mexico can occasionally drift far enough northward to bring heavy rain and very heavy thunderstorms to southern California. The season in which these storms are the most likely to significantly affect southern California is mid-August through early October, although there have been some effects in southern California from tropical storms as early as June, and as late as November.

On rare occasions, southern California has received light rain from non-tropical general summer storms, some of which exhibited characteristics of general winter storms.

c. Wind. The prevailing wind in northern Orange County is the sea breeze. This gentle onshore wind is normally strongest during late spring and summer afternoons, with speeds of about 10 to 15 miles per hour (mph) in the Fullerton-Yorba Linda area.

The Santa Ana is a dry desert wind blowing from the northeast, most frequently during late fall and winter. It can be especially strong below the Santa Ana River Canyon (from whence it receives its name), with peak gusts of more than 70 mph. This type of wind, which does not normally occur when water is impounded behind Fullerton Dam, can create very high fire hazards, but can also be instrumental in drying a saturated watershed and reducing the flood potential.

Rainstorm-related winds are the next most common wind type in southern California. Winds from the southeast ahead of an approaching storm average 20-30 mph, with occasional gusts of more than 40 mph. West to northwest winds behind storms can sometimes exceed 35 mph, with higher velocity gusts.

d. Evaporation. Few formal studies of evaporation have been made in Orange County, and evaporation is not a significant consideration at Fullerton Dam. Studies from nearby locations indicate that mean daily evaporation ranges from about one-quarter inch in winter to about one-half inch in summer. On days of very strong, dry Santa Ana winds, evaporation can be considerably greater than one inch.

4-06 Storms and Floods. Most of the major inflow and impoundment events in the history of Fullerton Dam have been the result of general winter storms, but several local thunderstorms have produced significant peak inflows. Plate 4-05 is a summary of peak annual flows affecting Fullerton Reservoir.

Prior to the construction of the dam, there were a number of major storms and floods on southern California streams, including those of January 1862, February and March 1884, January and February 1914, January 1916, December 1921, February 1927, December 1933-January 1934, October 1934, and February-March 1938. There was also a significant summer tropical storm in September 1939; and shortly before Fullerton Dam began operation, a heavy local thunderstorm struck the watershed in March 1941.

a. Storms of January 1916. Two major series of general winter storms hit southern California during January 16, as intense cold fronts dropped down the coast from the north, then turned inland. The first series occurred 14-20 January and dropped about 6-7 inches over Fullerton and vicinity. Yorba Linda measured 6.38 inches for the storm period, including 3.52 inches on 17 January. The second storm series occurred 24-30 January and was generally somewhat less heavy; but ground conditions, saturated from the first storm, were more favorable for runoff. About 4 inches fell in the vicinity of Fullerton. Yorba Linda measured 3.98 inches, including 3.01 inches on 27 January. No discharge values are available for Fullerton Creek.

b. Storm and Flood of 30 December 1933-1 January 1934. A slow-moving low-latitude North Pacific storm moved directly into southern California at the end of 1933 and dropped very heavy precipitation in Orange County and especially Los Angeles County. Total rainfall in the vicinity of Fullerton ranged between 5 and 6 inches. Yorba Linda measured 5.44 inches. More than half of this rain fell within a 24 hour period of about noon of 31 December to noon of 1 January. The very heaviest rain fell near midnight at the turn of the year. The peak runoff of the 1933-34 season on Fullerton Creek occurred on 1 January, but no time of day or discharge values are available.

c. Storm and Flood of 27 February-3 March 1938. The general winter storm of 27 February-3 March 1938 resulted when high pressure over California and Nevada pushed northward, and allowed a series of low-latitude Pacific storms to move into southern California from the west-southwest. These storms produced an average of about 10 inches of rainfall over the watershed above Fullerton Dam, with roughly 4.5 inches falling on 2 March, the day of the most intense cold front of the storm series. This 2 March rainfall generated a peak flow of 950 cfs at the Fullerton Reservoir site.

d. Storm and Flood of 14 March 1941. On the afternoon of 14 March 1941, during a moderately heavy general winter storm, an intense local thunderstorm occurred in the vicinity of the City of Fullerton, producing more than two inches of rainfall in less than one hour. The peak discharge per square mile from Fullerton Creek exceeded all previous records for drainage areas with similar characteristics. The peak inflow of 3,800 cfs to Fullerton flood control basin, when adjusted to current conditions, would have been 4,000 cfs. Overflow actually occurred at several places along Fullerton Creek and several streets immediately to the north. Although Fullerton Dam was not yet officially complete, gates were operated for flood control, with a maximum water surface elevation of 282.8 ft. NGVD, and a peak outflow of about 140 cfs during the time of greatest inflow. There is no data available on the amount of damage prevented, though it was undoubtedly considerable.

e. Storms and Floods of 19-27 January 1969. In January 1969, a storm track developed from the equatorial zone southeast of Hawaii, all the way to southern California. As a result, four intense storms and several minor rain bands passed through southern California during a nine-day period. About 4.5 inches of rain fell on the Fullerton watershed, producing a peak inflow to the reservoir of greater than 430 cfs (pl. 4-06).

f. Storms and Floods of 21-27 February 1969. In late February 1969 several contiguous storms moved into southern California from the west, with one stalling over Orange County on 25 February. The total of about 6.5 inches of rain over the Fullerton watershed during the 6-day period produced a peak reservoir inflow of about 600 cfs (pl. 4-07).

g. Storms and Floods of 28 February-5 March 1978. In a pattern very similar to that of exactly 40 years earlier, a series of low-latitude Pacific storms moved into southern California at the end of February and beginning of March 1978. There were four major rainfall and inflow peaks during the storm period: 28 February, 1 March, 4 March (greatest volume of rain of the four storms), and 5 March (greatest rainfall intensity). More than 9 inches of rain fell at Fullerton Dam during the storm period, with an estimated 11 inches averaged over the watershed. Close to 3 inches of this fell on 4 March. Plate 4-08 depicts the hydrographs of hourly rainfall at Fullerton Dam (the distribution of which has been partially estimated from that of nearby Brea Dam) and the inflow, outflow, and water surface elevation hydrographs for Fullerton Reservoir during the February-March 1978 storm series. The maximum inflow to the reservoir of approximately 1,500 cfs occurred on 1 March, while the maximum water surface elevation of 280.9 ft. NGVD occurred on 4 March.

h. Storm and Flood of 5 January 1979. On 5 January 1979 a cold storm dropped rapidly southward from the Gulf of Alaska, spreading general moderate rain over most of southern California. Most of the rain had ended by mid-evening, but an intense post-frontal thunderstorm hit the Fullerton area just before midnight. Fullerton Dam recorded 1.35 inches between 2100 and 2300 hours, and Brea Dam recorded 1.30 inches between 2200 and 2400 hours. The storm totals ending early 6 January were 3.02 and 3.28 inches at the respective dams. This thunderstorm caused a very rapid rise in the inflow rate to Fullerton Reservoir (pl. 4-09), with a peak of 1,490 cfs just before midnight 5 January.

i. Storm and Flood of 30 January-2 February 1979. Near the end of January 1979, a cold low pressure center dropped southward off the coast of California, and picked up moisture over the ocean west of southern California. Locally heavy rain developed during the afternoon of 30 January and became heavy during the early evening. Fullerton Dam recorded 1.61 inches between 1800 and 2100 hours, while Brea Dam recorded 1.70 inches between 1900 and 2200 hours. Brief heavy showers continued on 31 January, with light showers through 2 February. The peak inflow to Fullerton Reservoir of approximately 1,300 cfs occurred on 30 January between 2000 and 2100 hours (pl. 4-10). The peak water surface elevation of 285.6 ft. NGVD, which occurred about 0700 hours on 31 January, is the highest ever recorded at Fullerton Reservoir.

j. Storms and Floods of 13-18 February 1980. From 13 through 21 February 1980 a series of intense, warm Pacific storms moved into southern California from out of the west-southwest, dropping a total of 10-13 inches of rain in the greater Fullerton area over nine days, including about 8 inches during the 5 days 13-17 February. The Yorba Linda station measured 11.69 inches for the period. Of this, 7.83 inches fell 13-17 February, including 2.50 inches from 1800 hours 13 February to 1800 hours 14 February. The heaviest of the series of storms in the greater Fullerton area occurred during the late evening of 13 February, when an sharp occluded cold front moved through and triggered several intense thunderstorms. Although data from several northern Orange County recording rain gauges were not reported for February 1980, the rainfall intensities from stations a few miles away indicate up to 0.6 inch in 1 hour and up to 1.4 inches in 3 hours at or just before midnight of 13 February. The peak inflow to Fullerton Reservoir occurred between 2300 and 2400 hours 13 February, and was 1,700 cfs (pl. 4-11). Additional bursts of heavy rain (up to 1 inch in 3 hours) and significant peak inflows to Fullerton Reservoir occurred late 14 February, 16 February both near mid-day and again late afternoon, and late 17 February into 18 February.

k. Storm and Flood of 28 February-3 March 1983. A low-latitude Pacific storm reminiscent of those of 5 and 45 years earlier moved into southern California at the end of February and first of March 1983, dropping 5-8 inches of rain over portions of Orange County. The heaviest rainfall occurred during the passage of a strong occluded cold front on the morning of 1 March, with peak intensities well in excess of 1 inch per hour. Inflow to Fullerton Reservoir on 1 March consisted of three peaks between 0900 and 1400 hours (pl. 4-12). The first, which occurred between 0900 and 1000 hours, was the heaviest, with an estimated maximum discharge of 1,890 cfs. The maximum water surface elevation of 285.0 ft. NGVD was reached at 1350 hours.

4-07 Runoff Characteristics. Little streamflow occurs in Fullerton Creek except during and shortly after heavy rainfalls. The drainage area characteristics are not conducive to continuous flow, but runoff from the steep slopes in the upper part of the watershed causes streamflow to increase rapidly in response to effective rainfall. These sharp streamflow peaks are followed by rapid recessions in the absence of further rain.

The drainage area has steadily increased in urbanization since World War II, and the effective impervious cover is currently estimated at about 25 percent, as seen on plate 4-13. As the remaining undeveloped land is primarily in the less easily developed Puente Hills area, the rate of watershed urbanization should gradually decrease.

The Los Angeles region has historically experienced long-term wet and dry periods as seen on plate 4-14. Because of the current generally wet period, it is difficult to establish what percentage of the recent increased flows into Fullerton Reservoir are the result of urbanization, and what percentage increase is attributable to heavier rainfalls. Rainfall records for recent years at Fullerton Dam are not adequate to specifically define the amount of rain that produced the largest peaks because of gaps in the data base.

The inflow frequency curves shown on plate 4-15 are adjusted to 1985 conditions, and represent the instantaneous peak and 24-hour maximum annual inflow frequencies at Fullerton Dam. The curves were derived from the historic record of reservoir regulation and stream gauge records in the vicinity of Fullerton Dam prior to construction. Inflow curves are not affected by the regulation schedule of Fullerton Dam or any upstream facility. Values have been adjusted to establish a homogeneous data set representing current conditions as presented on plates 4-16 and 4-17.

Because of the small size and fast response time of Fullerton watershed (t_c = 30 minutes), antecedent rain need not be present for significant runoff to occur. The pervious area loss rates are generally considered to be a constant 0.20 inches/hour, though in reality the initial loss rate would be greater, and the long-term loss rate may be as low as 0.10 inches/hour.

4-08 Water Quality. Water quality is not affected by the normal operation of Fullerton Dam. The watershed drains unimproved hills, residential areas, oil wells, an oil refinery, and a landfill. Under normal conditions none of these land areas should adversely affect the quality of runoff waters. Impoundment durations at Fullerton Dam are generally less than a day, and should have minimal affect on water quality. There are no ground water recharge facilities available to utilize Fullerton Creek flows, and all inflows ultimately reach the Pacific Ocean.

4-09 Channel and Floodway Characteristics. Downstream of Fullerton Dam the Fullerton Creek channel is unimproved for a distance of approximately 1.2 miles. The remainder of the channel, out to Coyote Creek, is an improved concrete channel built and maintained by OCEMA. The channel's course traverses Orange County's gently sloping coastal plain and goes through the urbanized business districts of Fullerton and Buena Park. Throughout the developed area, storm drains convey urban runoff into Fullerton Creek. The channel is maintained in generally good condition. Plate 4-18 is a schematic diagram of the downstream channel capacities.

a. Unimproved Channel. Immediately downstream of the dam, the channel is a grassy-sloped, irregular trapezoid that is fairly free of obstructive vegetation. Along the approximately 900 foot reach, a wooden pedestrian bridge crosses the channel and allows homeowner access to tennis courts on the east side of the channel. The channel then enters a 12 feet x 8 feet reinforced concrete box (RCB) culvert under Bastanchury Road. Flow from Bastanchury Drain also enters Fullerton Creek on the upstream side of the Bastanchury Road culvert as seen on plate 4-19. This is a critical location for the operation of Fullerton Dam. If Bastanchury Drain flow is great enough, the addition of a large dam release may exceed the Bastanchury Road culvert capacity of approximately 900 cfs. This could result in a backwater effect that might inundate the dam tender's residence, or cause the channel to overflow into Associated Road. Channel observers should be dispatched to this location whenever dam releases of 400 cfs or greater are anticipated. It should be noted that runoff from the Bastanchury Drain watershed of 0.8 square miles could exceed the Associated Road culvert capacity of approximately 600 cfs, and flood Associated Road independently of Fullerton Dam operations.

Downstream from Bastanchury Road, the grassy channel carries flow through the Northcreek Lane RCB culvert and the Almira Road RCB culvert. From Almira Road to State College Boulevard the channel contains scattered trees and a medium density of underbrush. From the dam down to State College Boulevard, the local homeowners associations have responsibility for channel maintenance.

Between State College Boulevard and Dorothy Lane, Fullerton Creek is a deep, U-shaped channel with dense vegetation in the flow path. The channel is on the east side of Acacia Park, a flat, turf recreational area that includes Acacia School on the southwestern corner of the park. Crossing the channel in the park is a wooden pedestrian bridge approximately 17 feet above the channel bottom. A drop structure just upstream of Dorothy Lane marks the beginning of the improved concrete channel. The park channel reach is primarily maintained by the City of Fullerton, but the OCEMA also observes and corrects debris problems that may affect their structures.

b. Improved Channel. Fullerton Creek is a concrete channel from Dorothy Avenue all the way to Coyote Creek, as seen on plate 4-18. The channel has been undergoing sectional improvements since the mid-1970's. Some locations of concern are as follows:

(1) Dorothy Lane to Hart Place (extended). The channel capacity here ranges from 1,000-1,700 cfs and is not able to carry the OCEMA Q_{100} (i.e., 100-year discharge) of 3,600 cfs.

(2) Chapman Avenue to Wilshire Avenue. The current box culvert under Wilshire, Raymond, and Chapman Avenues has a capacity of 1,800 cfs and is low compared to the OCEMA Q_{100} of 4,100 cfs. OCEMA finished increasing the channel capacity to 4,100 cfs during August 1988.

(3) Wilshire Avenue to A.T. & S.F. Railway. During the storm of 28 February-1 March 1978 and again in late January 1979, flooding occurred here due to overtopping of the channel reach. In late 1979 the channel was upgraded to its current condition.

(4) Harbor Boulevard to Richmond Avenue. This section was built in 1959, and its capacity of 2,930 cfs is not considered adequate. This reach contains the telemetered stream gauge at Fullerton Creek at Richmond Avenue (FCKR). The ability of Fullerton Dam to control flood events on Fullerton Creek channel downstream of this location is minimal.

(5) Southern Pacific Railroad Bridge d/s of Santa Ana Freeway. Planned improvements on this bridge are currently scheduled by OCEMA to be completed by the Summer of 1989.

4-10 Structures Affecting Fullerton Creek. Upstream of Fullerton Dam, the Loftus Diversion Channel and its debris basin increase the contributing area of runoff into Fullerton Dam. Storm channels draining the developed areas of the watershed feed into Loftus Diversion Channel. No operational facilities exist upstream of the dam.

Downstream from Fullerton Dam, storm channels bring urban runoff into Fullerton Creek. The largest of these drains are the Bastanchury Storm Drain, the Kimberly Storm Drain, and the Melrose Storm Drain, as seen on plate 4-18. No operational or conservation facilities exist on Fullerton Creek. The dam is located within LACDA, but it is not operated as a LACDA water control system element because its influence is strictly local.

4-11 Economic Data.

a. Population. Orange County has been one of the fastest growing areas in the country since the end of World War II. The watershed of Fullerton Dam lies mostly within the City of Brea and an unincorporated area east of the city. Most of the downstream area is located in the heart of the City of Fullerton and further west in the City of Buena Park. The population estimates below are from the State of California, Department of Finance, Population Research Unit, as of January, 1984:

Fullerton	106,900
Brea	31,850
Buena Park	65,100

b. Agriculture. The watershed above and below the dam was once primarily citrus groves. The postwar era has brought increasing urbanization to the area, virtually replacing all agriculture. There is still a large nursery in the watershed.

c. Industry. The explosive growth in population has been accompanied by corresponding growth in industry and commerce. In the watershed there are oil fields and a large refinery. The largest manufacturing facility is a rubber plant. Both the upstream watershed and downstream area have numerous business/industrial parks. Most of the manufacturing is light industry that specializes in highly technical fields, especially aerospace and electronics. The downstream area is heavily residential and supports general office and commercial development. The California State University at Fullerton lies just below the dam.

d. Flood Damages. Since completion of the project, flood damages prevented through fiscal year 1984 are estimated to be $2,200,000. Stage-damage curves for Fullerton Creek are not available.

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01 Hydrometeorological Stations.

a. Facilities. Hydrologic instrumentation installed at Fullerton Dam provides data on reservoir water surface elevation, downstream gauge height, precipitation, and the outlet gate heights. A list of the instrumentation and available data is provided on plate 5-01. Data collection facilities of interest in the vicinity of Fullerton Dam include Fullerton Creek gauging stations and nearby precipitation gauges. These facilities are detailed on plate 5-02 and all pertinent hydrometeorological instrumentation in the area is located on plate 5-03.

(1) Reservoir Water Surface Recording System. A tape-float-pulley assembly is used within a float well to measure water surface elevation. A Stevens A-71 strip-chart recorder and a digital recorder automatically record the float well water surface elevation. The digital recorder takes a reading every 15 minutes during the flood season and every hour the rest of the year.

(2) Reservoir Staff Gauges. A series of staff gauge boards are installed along the upstream face of the dam. The boards are graduated in 0.10 foot increments and are readable from the top of the dam.

(3) Outlet Gate Recorders. Each outlet service gate has a Leitz recorder that documents all gate movements. These recorders monitor gate settings and make a permanent paper record of them. These are strip chart recorders that provided continuous readings year round.

(4) Precipitation Measurement. A tipping bucket rain gauge is installed at the control house. The gauge is connected to a digital recorder by a magnetic sensor. Rainfall is also measured by a glass rain tube and a Belfort recording gauge. The paper charts from the Belfort gauge are sent to the National Weather Service for publication. The digital recorder takes a reading every 15 minutes during the flood season and every hour the rest of the year.

(5) Stream Gauging Stations. Hydrologic facilities for obtaining stream flow data include USGS gauge #11090000 below the dam and Orange County Environmental Agency (OCEMA) gauge #2 located downstream at Fullerton Creek at Richman Avenue. The USGS gauge uses a float-well system with a Stevens Digital Recorder. The OCEMA gauge uses a float-well system with a Stevens A-71 strip-chart recorder. Rating tables for both gauges are provided on plates 5-04 and 5-05, and rating curves are shown on plates 5-06 and 5-07. These gauges take readings every 15 minutes year round.

b. Reporting. Hydrologic data from Fullerton Dam are reported in three separate ways. Readings are made manually by the dam operator, recorded automatically by gauges, and reported in real-time by the telemetry system.

(1) Manual. The dam tender at Fullerton Dam reports via radio or telephone each morning between 15 November and 15 April to the Reservoir Regulation Unit. The report includes water surface elevation, downstream

stage, rainfall and gate settings. This report is made more frequently during periods of rain, as specified by the Reservoir Regulation Section. Between 15 April and 15 November, reports are made every Monday morning only.

(2) Recording Instrument. Records provided by automatic recording gauges are stored on paper punch tape or strip charts. These paper records are retrieved on a monthly basis in the rainy season, and on a quarterly basis the remainder of the year.

(3) Telemetry System. Hydrologic data measured at the dam and at other gauges are transmitted to the Los Angeles District Office by the Los Angeles Telemetry System. These gauges automatically transmit reports at predetermined 24-hour intervals. The event mode is the primary data source for the telemetry system. As a gauge registers an event, current data is radio-transmitted to a repeater from which it is sent via microwave to the LAD Office. Each gauge is programmed to trigger whenever .04 inches of precipitation, or a 0.25-foot change in water surface elevation, is recorded. Recording time intervals for each instrument are discussed in paragraph 5-01. All gauges can also be interrogated at any time for current data via polled mode.

(4) ALERT System. There is also an event reporting gauge system throughout southern California sponsored by the National Weather Service. This system is referred to as the ALERT system (Automatic Local Evaluation in Real Time). OCEMA maintains a network of these gauges in Orange County. Included in this network are two precipitation gauges that may be useful in determining rainfall at Fullerton Dam. These gauges are #265 in the City of Brea, and #241 located at Miller Basin on Carbon Canyon Creek. Access to this information can be obtained through the REPORT program on the Water Control Data System computer.

c. Maintenance. The Water Control Data Unit of the Reservoir Regulation Section, Engineering Division, LAD, is responsible for maintaining the instrumentation at Fullerton Dam, except for the U.S. Geological Survey (USGS) downstream gauge.

5-02 Sediment Stations. A sediment range exists in Fullerton Reservoir, but is no longer used for surveying reservoir capacities. Aerial photographic methods are currently used to determine elevation-capacity relationships.

5-03 Recording Hydrologic Data. Hydrologic data from Fullerton Dam is recorded and stored in several forms within the communication network. A report of daily observations is made at the dam and this record, form SPL-19, Flood Control Basin Operation Report, is stored by the Water Control Data Unit of the Reservoir Regulation Section in the District's Base Yard Office. Using this report and strip charts from the reservoir water surface recorder, reservoir computations are made by the Water Control Data Unit on form SPL-30, Reservoir Computations. The information transmitted by radio or telephone to the Reservoir Regulation Unit is recorded on form SPL-424, Reservoir Operation Report. This information is entered into the RESCAL computer program which stores the record in a computer database and produces a "Daily Reservoir

Report" that is issued by the Reservoir Regulation Unit. However, the SPL-30 form is the official record of the District. Examples of these report forms are shown in figures 5-01 through 5-07.

The telemetry system also stores its data in a computer database file. Paper punch tapes retrieved from recording instruments at Fullerton Dam are stored in the District's Base Yard Office.

The USGS publishes daily mean streamflow recorded on Fullerton Creek in the yearly publication Water Resources Data for California, Volume 1. The paper punch tapes for this gauge are archived by the USGS. The strip chart of precipitation at Fullerton Dam is sent to the National Climatic Center in Asheville, NC for publication in the NOAA monthly report Hourly Precipitation Data.

The State of California, Department of Water Resources, publishes data from the ALERT telemetry gauge network on a monthly basis. The Orange County Department of Public Works and the adjacent Ventura County Flood Control District and Los Angeles County Department of Public Works archive their recording and non-recording data and furnish these data to other agencies upon request.

5-04 Communications Network. The LAD maintains a voice radio communication network connecting all of its operations. This FM radio system uses repeaters on Mount Disappointment or, alternately, Pleasants Peak to communicate between the District Office and Fullerton Dam. This radio network is backed up by a second, parallel radio system.

Power at the District Office, as well as at each dam, is backed up by an emergency generator system. If all systems fail at the District Office there is a complete radio system at the District's Base Yard in El Monte, eleven miles east of the downtown District Office.

5-05 Communication with Project.

a. Regulating Office with Control House. During the flood season (15 November through 15 April), a routine radio call is made at least once each weekday from the Reservoir Regulation Unit to each dam tender, including Fullerton Dam. This Reservoir Operation Report (or "morning report") is usually made at 0800 hours, Monday through Friday. During flood events the reporting interval is usually reduced to one hour, with the Reservoir Regulation Unit originating the radio call. Other routine or non-routine radio or telephone calls are made as needed.

In the event that all communications with the District Office, including the Base Yard, should be interrupted, a set of "Standing Instructions to the Project Operator for Water Control" have been compiled for each dam. A copy of these instructions for Fullerton Dam is included in Exhibit A of this manual.

b. Between Control House and Others. No routine communication exists between Fullerton Dam and other agencies.

c. Between Regulating Office and Others. Before and during the earliest stage of any reservoir releases, the LAD notifies officials of Orange County and the City of Fullerton. A list of agencies to be notified, with applicable office and home telephone numbers, is published annually in the LAD's Instructions for Reservoir Operations Center Personnel (the "Orange Book"). The current notifications list is provided in table 5-08.

The District's Reservoir Operations Center (ROC) communicates wi h Orange County and City of Fullerton officials by telephone during major runoff events. The ROC is also in direct radio contact with channel observers dispatched to patrol the downstream channel during significant floods.

5-06 Project Reporting Instructions. During periods of dam operation, communications between the ROC and each affected dam tender are made on a frequent basis, normally once each hour. A more frequent interval of communications may be required. If a gate change is required, the ROC broadcasts the gate change instructions to the dam tender. When the gate change is completed, the dam tender calls back to the ROC with information on the change. Other special instructions to dam tenders are conducted in a similar manner. This network of radio communications is also used by the dam tender to report any mechanical failures or other problems at the dam.

5-07 Warnings. The responsibility for issuing all weather watches and warnings and all flood and flash flood watches and warnings rests with the National Weather Service. Local emergency officials of cities and counties are responsible for issuing any public warnings regarding unusual overflows, evacuations, unsafe roads or bridges, toxic spills, etc. The U.S. Army Corps of Engineers is responsible for providing these officials with current information, and when possible, forecasts of water elevations within Fullerton Reservoir, and flow rates in Fullerton Creek downstream of Fullerton Dam. If an uncontrolled spillway flow or dam break were imminent, the ROC should notify the OCEMA Communications Center so they could initiate evacuations.

VI - HYDROLOGIC FORECASTS

6-01 General. There are no official hydrologic forecasts made by the U.S. Army Corps of Engineers or the National Weather Service (NWS) for Fullerton Dam. Fullerton Creek water quality is not predicted by any agency.

a. Role of Corps of Engineers. Although no formal hydrologic forecasts are made for Fullerton Dam, the Corps of Engineers does carefully monitor conditions at the dam and makes a general forecast of inflow to the dam for floodflow regulation as needed. Any significant change in hydrologic conditions at the dam will prompt the LAD to notify pertinent agencies (see pl. 5-08), and coordinate with them when necessary.

The LAD Meteorologist prepares quantitative precipitation forecasts (QPF), when significant rain is forecast in any region of the district. The Fullerton-Brea area is one of the subareas for which an individual forecast is prepared. The QPF assists in estimating the severity of the upcoming event, and in scheduling personnel to man affected LAD facilities.

b. Role of Other Agencies. No other agency currently prepares forecasts of inflow to Fullerton Dam. The LAD does receive real-time weather reports and forecasts from the NWS. This is accomplished primarily by means of weather facsimile pictures and text forecasts received at the District Office.

Historical precipitation and streamflow data are available from the OCEMA, NWS, USGS, and others. These data, while not of use in real-time, are important to studies of historical storms and floods that aid in the development and refinement of computerized rainfall-runoff forecast models.

6-02 Flood Condition Forecasts. Forecasts of flood hydrographs are not currently made. The LAD does collect inflow, precipitation and downstream flow conditions to provide a general prediction of flood situations.

The time of concentration (T_c) on the 5 square mile watershed above Fullerton Dam is approximately 30 minutes. In order to define rapidly changing conditions, reports from the dam tender may be requested as often as every 5 minutes.

Four miles downstream of Fullerton Dam is the Fullerton Creek at Richmond Avenue (FCKR) stream gauge. This gauge is of value because of the potential for flooding caused solely by local runoff. Under conditions of local flooding, it would be imprudent to continue making releases from Fullerton Dam. Travel time from the dam to this gauge is approximately 20-30 minutes. These generally short lead times warrant careful monitoring of the dam's surrounding conditions to recognize a potential downstream flood condition. It is not possible to make long-range hydrologic forecasts, except for forecasts based on forecasted rainfall.

VII - WATER CONTROL PLAN

7-01 General Objectives. Fullerton Dam and Reservoir is a single purpose flood control facility. It provides local flood protection for the City of Fullerton, and it is operated independently of any other flood control facility or system. Flood waters are stored on a short term basis, and released as soon as available downstream channel capacity permits. The maximum channel capacity immediately downstream of the dam is 500 cfs. Channel capacities are schematically illustrated on plate 4-18. Allocation of storage is depicted on plate 7-01.

7-02 Major Constraints. Constraints that impact the regulation of Fullerton Dam and Reservoir are:

a. Channel Capacity. The channel capacity may be constricted immediately downstream of the dam by a wooden footbridge crossing Fullerton Creek, heavy vegetation buildup in the channel, and an 8 feet x 12 feet RCB culvert under Bastanchury Road. Individually, these two structures are capable of safely passing the full range of Fullerton Dam releases, but with the combination of additional local inflow from Bastanchury Drain and the backwater effect of the culvert or the footbridge, channel capacity could be sufficiently lessened to require a reduction in release from Fullerton Dam. This backwater effect might inundate the dam tender's residence, or cause the channel to overflow into Associated Road. Channel observers should be dispatched to this location whenever dam releases of 400 cfs or greater are anticipated.

b. Reservoir Deficiency. The SPF cannot be contained by Fullerton Dam and Reservoir, and would result in damaging spillway flow. The outlet works can only discharge a maximum of 590 cfs, and cannot evacuate the available flood control storage space quickly, relative to the rapidly responding Fullerton Reservoir watershed. As a result, the operational emphasis of the project is to release stored water as quickly as downstream channel capacity and outlet capability permit, in order to maintain the maximum flood control space possible.

c. Downstream Flooding. Local runoff alone is capable of exceeding the downstream channel capacity. Outflow from Fullerton Dam primarily influences the downstream channel for approximately 4 miles. Beyond this, the Fullerton Creek channel capacity is more than ten times greater than the maximum Fullerton Dam release. Within this reach there are some channel sections that cannot carry the Q_{100} (as determined by OCEMA). These include reaches along Victoria Drive. If flooding is observed in the 4 mile reach downstream of the dam, and flood control storage still exists in Fullerton Reservoir, releases should be reduced to a minimum.

d. Spillway Flow. Spillway flow should be avoided because of its damage potential. Immediately downstream of the Fullerton Dam spillway is a tennis court complex that would sustain damage. Flow would then combine with Bastanchury Drain flow and attempt to rejoin Fullerton Creek upstream of the Bastanchury Road culvert. Flow breakouts are possible all along this route (see pl. 4-19), and flow could reach the campus of California State University at Fullerton.

e. Debris. Debris collection on the trash racks can be an operational concern. During small inflow events vegetative debris is primarily caught by the Loftus Diversion Channel debris basin and the natural stand of vegetation upstream of the outlet works. Larger inflows release much of this as a single plug of debris that catches on the trash racks. This debris interferes with visual reading of water surface elevation and can alter the outlet elevation-discharge relationship.

f. Recreational Facilities. Moderate to high water surface elevations will inundate recreational facilities in Craig Regional Park (see pl. 2-03). This is not a reservoir regulation constraint because easements are available for all reservoir lands.

7-03 Overall Plan for Water Control. Fullerton Dam and Reservoir is operated for local flood control of Fullerton Creek. Because the facility does not provide SPF protection, the operational emphasis is to release stored water as soon as possible, thereby maintaining the greatest available flood control space. Opposing this objective, is concern for the potential of flooding downstream of Fullerton Dam due entirely to local runoff. Outflow from Fullerton Dam should be reduced as much as possible if the downstream channel capacity is being exceeded.

The reservoir regulation schedule (Exhibit B) attempts to address these concerns by monitoring rainfall and downstream flow along with reservoir water surface elevation. These three parameters are used on a real-time basis as input to the reservoir regulation schedule, which takes the form of a decision alogorithm. The schedule generally recommends a release of as much as 450 cfs, the maximum non-damaging release from the dam. However, if spillway flow appears imminent (water surface elevation of 289.5 ft. NGVD or greater), releases may be increased to 500 cfs in an effort to avoid this event. When releases greater than or equal to 400 cfs are indicated, channel observers should be dispatched to critical channel locations. If downstream flow and/or significant rainfall indicate that the channel capacity may be nearly full, the schedule advises a reduction in dam discharges.

Generally, the schedule assumes that every event is a SPF-type event and regulates it accordingly. The schedule does not follow this objective blindly, however, as the additional hydrologic information allows for flexibility in adjusting to local constraints.

During the early stages of an inflow event, a small debris pool is formed behind the dam by leaving the gates at the standby setting of 1.1 feet. When a water surface elevation of 267 ft. NGVD is attained, the gates are completely opened and vegetative debris that has collected on the trash rack is, hopefully, churned into smaller pieces that can pass through the outlet works. The gates are returned to the standby setting at the end of an impoundment period, when doing so will not significantly reduce outflow.

7-04 Standing Instructions to the Project Operator. The standing instructions to the project operator for regulation of Fullerton Dam and Reservoir are given in Exhibit A. During periods of normal communications, the dam tender will receive operating instructions from the Reservoir

Regulation Section, located at the District Office in Los Angeles. In the event communication with the District Office is interrupted, the dam tender should follow the standing instructions in Exhibit A.

7-05 Flood Control. Regulation of Fullerton Dam and application of the reservoir regulation schedule are described in this section. The schedule should be used as the best available guidance, and results of implementing the schedule should be examined after the reservoir is drained to ensure that proper regulation of the reservoir has been achieved.

At the onset of a rainfall-runoff event, the gates at Fullerton Dam are at a standby setting of 1.1 feet, and the reservoir is normally dry. Due to the short lag time between rainfall and basin runoff, it is probable that the reservoir will have impounded some water prior to the dam tender arriving at the dam. The schedule accounts for an initial impoundment of 21 AF, and, prior to this level of storage, no gate changes are required. Upon the dam tender's arrival at the dam the reservoir elevation and precipitation readings should be transmitted to the ROC, and a reporting interval established.

At this point, ROC personnel will determine the latest measurements from the FCKR stream gauge and the precipitation gauge at Fullerton Dam (FLTN) and, along with the current reservoir elevation and use this information with the reservoir regulation schedule to determine the appropriate release. By knowing the desired release and the elevation, the correct gate setting can be established, either through the use of plates contained in this manual or by using the RESCAL computer program. This procedure should be repeated each time the dam tender makes a report. Reports should be taken at least every half hour, or more frequently when conditions are rapidly changing.

The reservoir regulation schedule can be implemented (i.e., a recommended release can be determined) with reservoir elevation information alone or in combination with precipitation and/or downstream flow information. Should contact be lost between the ROC and the dam, the dam tender should refer to Exhibit A, "Standing Instructions to the Project Operator for Water Control."

When the reservoir regulation schedule calls for releases of 400 cfs or more, channel observers should be sent out to monitor flow in Fullerton Creek. The primary location to be manned is Bastanchury Road directly below Fullerton Dam. Other primary locations to be monitored include the Chapman Avenue culvert and the vicinity of Victoria Drive. OCEMA channel patrols may be able to assist with this task, along with LAD channel observers. Channel observation is important, because the effect of local inflow on available channel capacity may be different from the situation assumed by the schedule. Development of any potential problems involving downstream flow should be communicated to the ROC as quickly as possible, so that the release from the dam can be adjusted accordingly.

Releases from Fullerton Dam should not be altered by more than 100 cfs in one gate change. When the reservoir regulation schedule indicates a change in reservoir outflow, either an increasing or decreasing of more than 100 cfs, the gate change should be undertaken in two steps, allowing discharge from the

first step of the gate change to stabilize downstream before completing the gate change on the second step. Exception to this guidance may be appropriate in the case of an emergency.

In the event of imminent spillway flow, the dam tender should be requested to make reports to the ROC on an interval of 5 minutes or less. The operational emphasis at this point is to make releases of 500 cfs in an attempt to avoid spillway flow. When spillway flow begins, total outflow from the dam should still be maintained at 500 cfs. If the combined spillway flow and ungated outflow are less than 500 cfs, the difference should be made up with gated outflow releases. If the total uncontrolled outflow from the dam (spillway plus ungated outlet) exceeds 500 cfs, the gates should be closed.

The reservoir regulation schedule can be applied to the rising and falling limb of a flood event. The gates can be returned to a standby setting of 1.1 feet when this action will no longer significantly reduce outflow from the dam.

7-06 Recreation and Cultural Resources. There is no aspect of Fullerton's reservoir regulation that can provide recreational use or benefit. Impoundments can impact the recreational facilities in Craig Regional Park, but this is not normally a water control consideration. The entire Fullerton Dam flood control basin has been surveyed by LAD staff archaeologists for the presence of cultural resources. No cultural resources have been identified within the basin.

7-07 Water Quality. The surface water flow is normally composed of urban and agricultural runoff, and some perennial flow from the mountains. Under low flow conditions, the concentrations of nutrients (nitrogen and phosphorus) and trace metals are elevated, as is common in urban and agricultural runoff. Following storms, the quality of initial runoff is usually poor (high concentrations of trace metals, oil and grease, nutrients, turbidity and coliform bacteria), because storm drains are flushed and accumulated pollutants are washed from roads and lawns. As the storm progresses, quality (except for turbidity) of the runoff improves because of dilution. Retention time of water at the dam is short (i.e., one day), and has no effect on water quality. The dam may be used to contain chemical spills or an oil spill in the event an oil well malfunctioned in the Fullerton watershed.

7-08 Fish and Wildlife. The primary land use within Fullerton reservoir is a maintained urban park. A small (less than 100 feet long and 20 feet wide) and highly disturbed riparian plant community occurs at low elevations in the reservoir in response to the greater availability of water. The riparian plant community at Fullerton Dam is composed of an overstory of medium sized (less than 25 feet tall) black willow trees, and understory of primarily mulefat and willow shrubs. The riparian habitat supports wildlife typical of urban environments. Included in the wildlife are snakes, ground squirrels, gophers, rabbits, skunks, and a variety of birds, including mockingbird, common crow, starling, and wrens, among other species. The area below the dam is a severely disturbed riparian/exotic grassland community intermixed with urbanization. No threatened or endangered species were observed or are

expected to occur at Fullerton Dam. The Environmental Assessment that accompanies this water control manual contains more detailed information on species types found within tne Fullerton Dam project area.

7-09 Deviation from Normal Regulation. There may be instances when it is necessary for the operation of Fullerton Dam to deviate from the established flood control plan. Prior approval of deviations is required from the Reservoir Regulation Section, LAD, except for emergencies and minor deviations as discussed in subparagraphs a and b, below:

a. Emergencies. Emergencies may take the form of drownings or other accidents, chemical spills, and failure of operation facilities. Necessary action should be taken immediately, so long as this does not create a worsened overall condition. In any action taken, assessment of the situation by the dam tender should rely on his knowledge of the dangers involved. The Reservoir Regulation Section, LAD, should be informed of any deviations due to emergencies as soon as practical.

b. Unplanned Minor Deviations. Instances arise where there is a need for minor deviations from the normal regulation of the reservoir, although they are not considered emergencies. Construction activities are the primary source of these deviations. Downstream maintenance of culverts and channel sections are another reason for minor regulation changes. Each request is analyzed on its own merits. Consideration is given to the potential of flooding and possible alternative measures. Approval for these minor deviations should be obtained from the Reservoir Regulation Section, LAD.

c. Planned Deviations. There are planned instances which require deviations from normal regulation. Each condition is to be judged on its own merits. One possible deviation may involve impounding water for the purpose of making test releases to correlate the gate rating curves with measured outflow. Requests for planned deviations would most likely originate from either the Reservoir Regulation Section (LAD) or OCEMA. Any planned deviations would require the approval of the Reservoir Regulation Section (LAD).

7-10 Drought Contingency Plan. Fullerton Dam and Reservoir does not contain any storage allocation for water supply or water conservation. Fullerton Creek downstream from the dam is mostly concrete lined and does not contain any ground water recharge facilities. However, in the event of a drought, the possibility of impounding water for water conservation would be considered. Any such plan would be evaluated to ensure that the flood control purpose of the project would not be compromised.

VIII - EFFECT OF WATER CONTROL PLAN

8-01 General. The water control plan presented in this manual provides for greater releases from Fullerton Dam, under non-damaging circumstances, than the previous water control plan. The increased releases will take advantage of the downstream channel improvements made by OCEMA in the 1970's. The plan also incorporates the real-time analysis of three hydrologic parameters; water surface elevation, rainfall, and downstream flow, to more readily react to increasing local runoff entering the downstream channel. The intent of the plan is to make the optimum use of the downstream channel to increase available flood control space, thereby increasing the level of protection provided by the dam.

8-02 Flood Control.

a. Spillway Design Flood. The spillway of a dam is designed to pass the maximum inflow resulting from the most severe combination of rainfall and runoff conditions that might reasonably be expected to occur. This hypothetical flood is called the Probable Maximum Flood (PMF), and the spillway must withstand the PMF without threatening to overtop the dam or causing damage to any dam structure.

(1) Original Criteria. The 1939 spillway design flood for Fullerton Dam was computed using the modified rational method and a hypothetical 4 day storm. The fourth day of this storm produced 9 inches of rain, as averaged over the Fullerton Dam drainage area, and resulted in a peak inflow of 9,300 cfs. This sharp inflow peak created a maximum spillway surcharge of 8.4 feet and a spillway flow of 3,380 cfs. The top of the dam was set at 307 ft. NGVD, providing 8.6 feet of freeboard.

(2) Revised Criteria. A 1969 interim report addressing the hydrology of Fullerton Dam (ref. c in pl. 1-01) led to a new PMF for judging the performance of the Fullerton Dam spillway. The new storm is 6 hours in duration and has an average areal precipitation depth of 8 inches. The watershed characteristics used to produce the PMF include a loss rate of 0.10 inches/hour, 40 percent impervious cover in the valley portion of the watershed, and a base flow of 15 cfs/sq. mi. from the Puente Hills area.

The revised PMF routing, as shown on plate 8-01, assumes an initial water surface elevation of 290 ft. NGVD (spillway crest). The peak inflow of 16,000 cfs produces a spillway outflow of 5,650 cfs, and the resulting freeboard of 5.5 feet is considered adequate. The water control plan does not affect the PMF routing as presented in the 1969 Review of Design Features of Existing Dams (ref. i, pl. 1-01).

b. Standard Project Flood. The Standard Project Flood (SPF) represents the runoff event that would result from the most severe combination of rainfall and watershed conditions that are considered reasonably characteristic of an area. The Corps of Engineers began using the SPF as the criteria for protecting urban areas in 1952, and, until recently, it served as the Reservoir Design Flood for the construction of flood control dams.

(1) Original Reservoir Design Flood. The reservoir design flood was computed from a 4 day storm with an increasing inflow peak on each successive day. The total 4 day rainfall was 14.28 inches, and the 24 hour rainfall on the 4th day was 7 inches, resulting in a peak inflow of 4,600 cfs. The total storm runoff volume was 1,730 acre feet. The rainfall distribution and modified rational method used to compute the runoff produced a sharply peaked inflow hydrograph. Based on this inflow pattern and a controlled outflow of 240 cfs, the spillway crest was set at an elevation of 290 ft. NGVD.

(2) Current Standard Project Flood. The standard project flood presented here was originally developed for the previous Reservoir Regulation manual. The storm of 30 December 1933-1 January 1934, which was centered over the La Crescenta area north of Los Angeles, was transposed over the Fullerton Dam drainage area to produce the current SPF. The storm was centered to produce the greatest project storm rainfall amounts that would be consistent with reasonable assumptions concerning the causative meteorological situation. The maximum 1-, 6-, 24-, and 42-hour (total storm) average precipitation over the area was 0.80, 3.38, 9.25, and 10.20 inches, respectively.

A synthetic unit hydrograph was used to compute runoff from rainfall. An average variable loss rate of 0.20 inches/hour with a minimum of 0.10 inches/hour was used for the Puente Hills, and a constant 0.20 inches/hour was assumed in the valley areas. Forty percent of the valley area was considered impervious, and a baseflow of 10 cfs/square mile was used for the Puente Hills. Using an 'n' value of 0.025 and the Fullerton S-graph, a peak discharge of 2100 cfs was computed with a total flood volume of 1,750 AF. Although these values appear similar to the original reservoir design flood, the SPF shown on plate 8-02 represents a significantly greater critical volume event, because the inflow is continuous for a period of approximately 24 hours, as opposed to four short-term inflow events spread over 4 days.

c. Flood of 16-18 February 1980. The period of 13-18 February 1980 contained multiple large runoff events into Fullerton Reservoir, as described in Section 4-06j. Within this five day period, a large portion of the runoff volume occurred between 0600 hours 16 February and 0600 hours 18 February. Because it represented a significant challenge to the flood control facility, this shorter time period was selected to test the water control plan described in this manual.

The three elements needed to fully implement the plan are Fullerton Dam water surface elevations, detailed precipitation records, and the flow record of the Fullerton Creek at Richmond Avenue gauge (FCKR). All three records were available in sufficient detail to test the plan. The results of comparison between the previous and the current water control plans are shown on plate 8-03.

Release rates are higher with the current plan than were actually achieved during the inflow event. The resulting shorter impoundment period will improve the dam's level of protection in a multiple storm event. Note the cutback in dam releases at 1800 hours on 16 February. This was due to increasing flows at the downstream gauge, indicating potential stress on the

channel capacity's ability to handle both dam releases and local uncontrolled inflow. Downstream flow volumes decreased after a short period, and larger dam outflows were resumed.

Using the current water control plan, the peak water surface elevation at Fullerton Dam reservoir would have been reduced from the actual elevation of 279.6 ft. NGVD at 1900 hours 16 February, to an elevation of 277.4 ft. NGVD.

d. 100-Year Flood Routing. The 10-year flood inflow hydrograph was developed using the inflow frequency curve and the SPF runoff pattern. The 100-year flood was routed following the Reservoir Regulation schedule shown in Exhibit B. As shown on plate 8-06, the peak inflow of 3,030 cfs was reduced to a peak outflow of 710 cfs. The peak pool elevation was 292.4 ft. NGVD, 2.4 feet above spillway crest, resulting in spillway flow.

8-03 Recreational and Cultural Resources.

The water control plan will not affect any known cultural resources within the basin. The State Historic Preservation Officer concurred that there are no National Register or National Register eligible properties (letter dated 26 July 1985).

Under the current plan greater releases will be made, reducing the peak water surface elevation for specific events. This will reduce any impact that dam operations may have on existing recreational facilities water at higher elevations.

8-04 Water Quality.

Residence time for impounded water using the current plan will be decreased only a small amount compared to the previous plan. This will not affect surface or ground water quality.

8-05 Fish and Wildlife.

The reduced inundation time due to the current water control plan will not affect vegetation in any significant manner. Reduced inundation time will decrease any adverse impacts to wildlife. No threatened, endangered or candidate species have been observed during site visits to the reservoir area, and none are expected to be affected by the revised schedule. A finding of no significant environmental impact resulting from the water control plan was issued in the Environmental Assessment for Fullerton Dam Water Control Plan, dated August 1988 (pl. 1-01, u, Exhibit C).

8-06 Frequencies.

a. Peak Inflow and Outflow Probabilities. Discharge-frequency values in this manual were developed by routing inflow hydrographs representing specific frequency events through Fullerton Dam, using the Reservoir Regulation schedule shown in Exhibit B. Plate 4-15 shows two inflow peak durations, instantaneous and 24 hour. Based upon these curves, the greatest

instantaneous inflow event recorded at Fullerton Reservoir (3,800 cfs, WY 1941) has approximately a 90 year return period, and the 24 hour maximum inflow event of 356 cfs (WY 1979) has only a 25 year return period.

The outflow curve, plate 8-04, reflects the Fullerton Dam Water Control Plan following the Reservoir Regulation schedule shown in Exhibit B. The curve shows a plateau at 450 cfs, which relates to the plan's recommended maximum release. The most frequent end of the curve (2 year to 10 year return period), is based primarily on historic operations adjusted to account for the new plan.

b. Pool Elevation Duration and Frequency. Plate 8-05 is the computed elevation frequency (filling frequency) curve for Fullerton Dam based upon 1985 conditions. These conditions include 25 percent of impervious cover in the drainage area above Fullerton Reservoir, runoff routing conditions, and the Reservoir Regulation schedule specified in Exhibit B. The curve shows that the return period for pool elevation at spillway crest is approximately 80 years. However, even if both outlet gates are maintained fully open throughout an entire inflow event, the dam cannot contain a 100 year flood without spillway flow.

8-07 Other Studies.

a. Hydrology. The "Interim Report, Review of Design Features of Existing Dams, Hydrology and Hydraulic Review of Prado, Brea, Fullerton, and Salinas Dams" dated November 1969 (see pl. 1-01, i), presents the derivation of the Probable Maximum and Standard Project Floods used in this manual.

b. Channel and Floodway Improvements. No studies addressing the downstream channel have been conducted by the U.S. Army Corps of Engineers since construction at Fullerton Dam. 100-year design discharges were presented by the Hydrology Section of the Orange County Flood Control District in the "Hydrology Report, Fullerton Creek Channel from Coyote Creek Channel to Fullerton Dam, 100-Year Local Flood Design Discharges" revision dated June 1974 (pl. 1-01, m). The LAD's Santa Ana River Basin Orange County Interim 3 study of Coyote Creek and tributaries is scheduled to begin in fiscal year 1988.

A Flood Insurance Study was completed by the Federal Insurance Administration in July, 1977 (pl. 1-01, q). This study mentions the inadequacy of protection levels in Fullerton Creek at Chapman Avenue; and in Bastanchury Channel. A "Project Report for Fullerton Creek Channel from Wilshire Avenue to Chapman Avenue" was prepared by the Orange County Environmental Management Agency (OCEMA) in April, 1986. This report addresses the capabilities of the Fullerton Creek Channel at Chapman Avenue (see pl. 1-01, t), and suggested possible improvement plans. OCEMA is currently implementing these improvements, and periodically issues reports concerning further planned channel improvements.

Fullerton Dam was evaluated during the on-going "Los Angeles County Drainage Area (LACDA) Review Study", but because of its strictly local influence, Fullerton Dam was not included in the alternative analysis phase of that study.

IX - WATER CONTROL MANAGEMENT

9-01 Responsibilities and Organization.

a. Corps of Engineers. Fullerton Dam is owned, operated, and maintained by the U.S. Army Corps of Engineers, LAD, which has complete regulatory responsibility.

Reservoir regulation criteria at Fullerton Dam and other LAD reservoirs are specified by the Reservoir Regulation Section of LAD. Table 9-01 is an organizational chart depicting the chain of command for Reservoir Regulation decisions.

Gate regulation instructions to the dam tender are issued by the Reservoir Regulation Unit (see Secs. 5-04 and 5-05). In the event that communications between the Reservoir Regulation Section and Fullerton Dam are interrupted, a set of Standing Instructions to Project Operator are included in this manual as Exhibit A. Dam tenders are part of the Operations Branch, under the Construction-Operations Division.

b. Other Federal Agencies. The U.S. Army Corps of Engineers has complete responsibility for the operation of Fullerton Dam. Although the Corps of Engineers receives data and information from other Federal and local agencies and informs these agencies of major decisions affecting Fullerton Dam, no other agency has operational responsibility.

c. State and County Agencies. At the time of construction, Orange County agreed to assume responsibility for maintaining the channel capacity of Fullerton Creek downstream of Fullerton Dam. A large portion of Fullerton Reservoir, owned by the Corps of Engineers, is leased to Orange County for recreational purposes. The Corps of Engineers retains all rights to inundate this land.

d. Private Organizations. There is no involvement of private organizations in the regulation of Fullerton Dam.

9-02 Interagency Coordination. The U.S. Army Corps of Engineers coordinates with other Federal, State, County, and local organizations, and informs the press concerning water control of Fullerton Dam and Reservoir.

a. Local Press and Corps of Engineers Bulletins. The Public Affairs Office of the Corps of Engineers, LAD, is responsible for notifying the press regarding operations at all District dams. This is accomplished through both interviews and the occasional issuance of press releases. The Corps of Engineers does not publicly issue flood watches or warnings, or other status reports or forecasts to the general public. These notifications are the responsibility of the National Weather Service (NWS).

b. National Weather Service. The Corps of Engineers utilizes NWS data and forecasts to assist in the operation of Fullerton Dam. The Corps shares data with the NWS and other agencies both on a real-time basis and on a post-event basis.

c. U.S. Geological Survey. The Corps of Engineers receives streamflow data from the U.S. Geological Survey, primarily on a historical basis in southern California. The Corps coordinates data collection of the Fullerton Creek below Fullerton Dam stream gauge with the USGS through the Cooperative Stream Gauging Program.

d. Other Federal, State, or Local Agencies. The Corps of Engineers and Orange County Environmental Management Agency maintain communications concerning the operation of Fullerton Dam, and the maintenance and patrol of the downstream channel. The Corps keeps the City of Fullerton informed of any anticipated and actual reservoir impoundments. Other interested agencies, such as the California Department of Transportation (CALTRANS) are informed by the Corps of Engineers whenever a major inundation of, or release from Fullerton Dam is anticipated. In the Instructions for Reservoir Operations Center Personnel notebook (the "Orange Book") appendix J, is a list of agencies and individuals that would be notified regarding the status of any reservoir regulation.

9-03 Reports. As required by ER 1110-2-240 "Water Control Management", the LAD prepares three types of report for transmittal to the South Pacific Division Office concerning the operation of Fullerton Dam:

a. Annual Division Water Control Management Report (RCS DAEN-CWE-16 (R1)).
This report covers significant activities of the previous water year and a description of project accomplishments planned for the current year.

b. Summary of Runoff Potentials in Current Season (RCS DAEN-CWO-2).
This report is generally submitted monthly during the storm season (October 15-April 15), and covers snow accumulation and runoff potential in the District. Supplemental reports are submitted in the event of severe situations.

c. Monthly Water Control Charts (RCS DAEN-CWE-6(R1)). A monthly record of reservoir operations prepared in either a graphical or tabular format.

Two reports that are produced for District use are:

d. Flood Control Basin Operation Report. A report of daily observations is made at the dam and this record, figure 5-01, is stored at the Water Control Data Unit of the Reservoir Regulation Section in the District's Baseyard Office.

e. Daily Reservoir Report. The daily observations from the data are entered into the RESCAL computer program which stores the record in a computer database and produces a "Daily Reservoir Report" that is issued by the Reservoir Regulation Unit.

Table 9-01. Chain of Command for Reservoir Regulation Decisions.

Corps of Engineers
Los Angeles District

Title	Office Phone Number:
District Engineer	(213) 894-5300

Water Control Decisions

Title	Phone
Chief, Engineering Division	(213) 894-5470
Chief, Hydrology & Hydraulics Branch	(213) 894-5520
Chief, Reservoir Regulation Section	(213) 894-6915
Chief, Reservoir Regulation Unit	(213) 894-6916

Gate Operations

Title	Phone
Chief, Construction Operations Division	(213) 894-5600
Chief, Operations Branch	(213) 894-5620
Chief, Operations & Maintenance Section	(818) 401-4008
Dam Tender Foreman	(818) 401-4006
Fullerton Dam Tender at Fullerton Dam	(714) 529-2532

FLOOD CONTROL BASIN OPERATION REPORT

Reports Control Symbol
SPLCO – 7

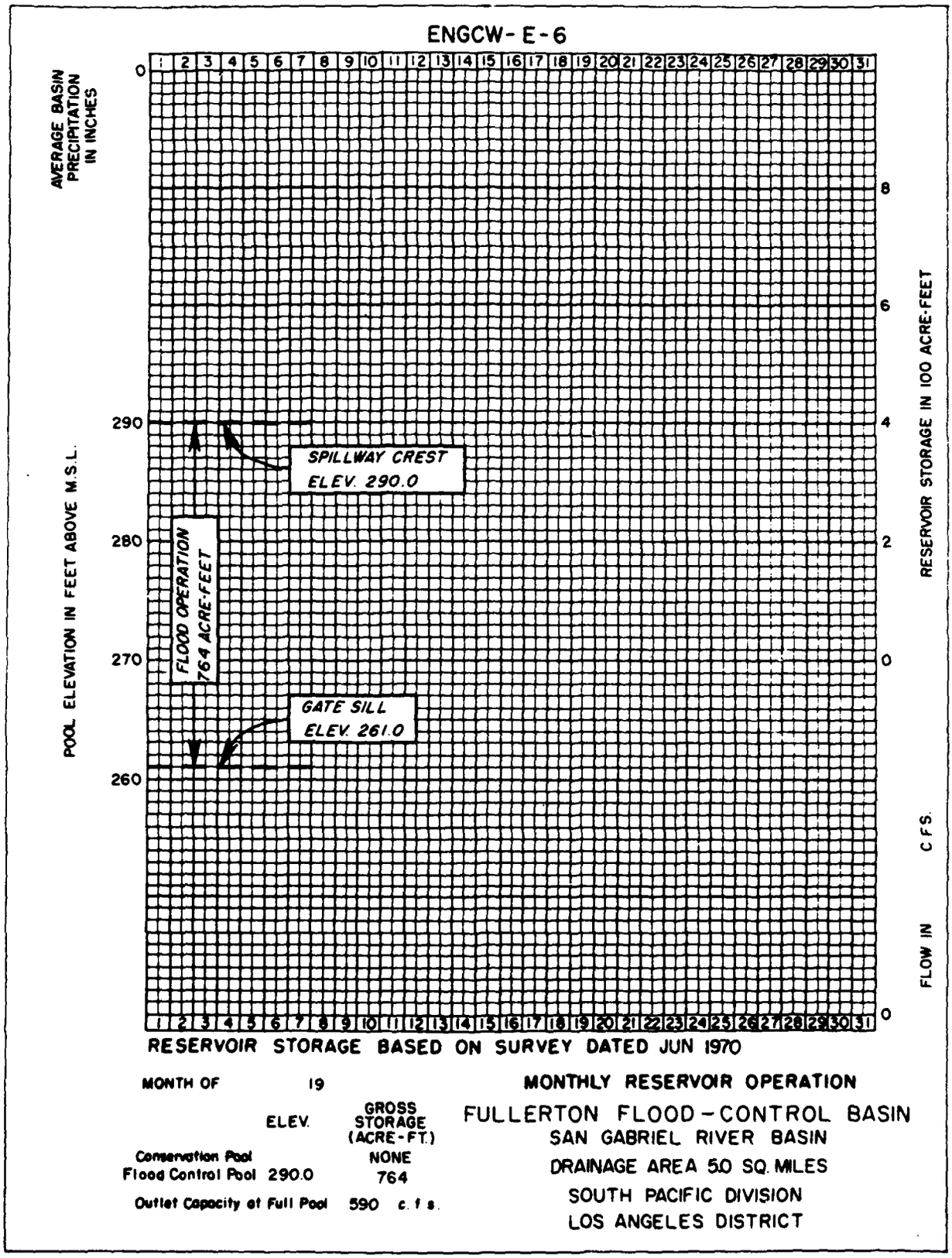
Name | **Month** | **Year**

Day	Reservoir W.S. Elev			Outlet channel		Time	Gate operation																OPERATOR
	Time	Type of Gage	Gage reading in feet	Time	Gage height in feet		Gate opening in feet																
							No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.10	No.11	No.12	No.13	No.14	No.15	No.16	

REMARKS:

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS

ENGCW-E-6



RESERVOIR STORAGE BASED ON SURVEY DATED JUN 1970

MONTH OF 19

	ELEV.	GROSS STORAGE (ACRE-FT.)
Conservation Pool		NONE
Flood Control Pool	290.0	764
Outlet Capacity at Full Pool		590 c.f.s.

MONTHLY RESERVOIR OPERATION

FULLERTON FLOOD-CONTROL BASIN
SAN GABRIEL RIVER BASIN
DRAINAGE AREA 5.0 SQ. MILES
SOUTH PACIFIC DIVISION
LOS ANGELES DISTRICT

FILE NO. RO 15/

FIGURE 5-02

RAINFALL RECORD

STATION					☐ HOURLY ☐ DAILY		DATE
HR	DA	TIME OF READING	GAGE READING	STORM TOTAL	SEASON TOTAL	OBSERVER	REMARKS (SNOW, TEMP., ETC.)
0000	1						
0100	2						
0200	3						
0300	4						
0400	5						
0500	6						
0600	7						
0700	8						
0800	9						
0900	10						
1000	11						
1100	12						
1200	13						
1300	14						
1400	15						
1500	16						
1600	17						
1700	18						
1800	19						
1900	20						
2000	21						
2100	22						
2200	23						
2300	24						
2400	25						
	26						
	27						
	28						
	29						
	30						
	31						
TOTAL							

SPL FORM 31 OCT 65

PREV. ED. OF THIS FORM MAY BE USED
REPLACES SPL FORM 32 WHICH MAY BE USED

FIGURE 5-03

RECORD OF CALLS ☐ Radio ☐ Telephone

DATE

LOCAL TIME	FROM		TO		CHECK REPTBLE CALLS*	MESSAGE OR REMARKS
	PERSON AND/OR CALL SIGN	TELEPHONE AND CITY	PERSON AND/OR CALL SIGN	TELEPHONE AND CITY		

*Reportable telephone calls include collect calls, charge calls and long distance calls that can not be dialed without a code number. Calls are chargeable to MA 3-1311 unless otherwise indicated.

RECORD OF DATA FROM DIGITAL RECORDERS

NAME OF DAM

DATE	TIME	WATER SURFACE	GAGE HEIGHT	PRECIPITATION	OPERATOR

SPL FORM 648, 1 FEB 77

FIGURE 5-05

RESERVOIR COMPUTATIONS

☐ HOURLY ☐ DAILY

DAM	TIME OF READING (IF DAILY)	DATE

COMPUTED BY	CHECKED BY	DATA SOURCE

HR.	DA.	WATER SURFACE ELEV. FT.	STORAGE AC. FT.	GATE STEP NO.	INST. OUTFLOW			HRS.	STORAGE CHANGE		AV. OUT-FLOW CFS	AV. INFLOW CFS	GATE SETTINGS FT.
					OUT-LETS CFS	DOWNSTREAM G. HT. FT.	DOWNSTREAM FLOW CFS		ACRE-FEET	CFS			
PREVIOUS REPORT													
	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												
	9												
	10												
	11												
	12												
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	22												
	23												
	24												
	25												
	26												
	27												
	28												
	29												
	30												
	31												

REMARKS					
	TOTAL				
	MEAN				

SPL FORM 30 MAY 67 PREVIOUS EDITIONS MAY BE USED; REPLACES SPL FORM 29 WHICH MAY BE USED

ARMY - C. OF E. - LOS ANGELES

FIGURE 5-06

RESERVOIR OPERATION REPORT

DATE | TIME

RADIO CALL SIGN WUK	DAM	WATER SURFACE ELEVATION (FT. MSL)	DIGITAL RECORDER READINGS	RAINFALL				GATE SETTINGS (Printed values show initial settings of gates prior to flood runoff)
				DIGITAL RECORDER	GLASS TUBE			
					SINCE LAST REPORT (INCHES)	STORM TOTAL (INCHES)	SEASON TOTAL (INCHES)	
411	SEPULVEDA		WS GH					GATES OPEN 9.0 FT ☐
412	HANSEN		WS GH					GATES OPEN 8.0 FT. ☐
419	SANTA FE		WS GH					#14 OPEN 0.5 FT. ☐
416	BREA		WS GH					GATES OPEN 2.0 FT. ☐
417	FULLERTON		WS GH					GATES OPEN 1.1 FT. ☐
418	CARBON CANYON		WS GH					#1 OPEN 0.5 FT. ☐
421	PRADO		WS GH					GATES 1 & 6 OPEN 1.0 FT. REM. GATES CLOSED ☐
420	SAN ANTONIO		WS GH					GATES CLOSED ☐
415	WHITTIER NARROWS – RIO HONDO POOL	W. PIT	GH					LACFCD DIVERSION GATE OPEN FT. GATE 1 OPEN FT. GATES 2, 3, & 4 OPEN FT. FT. ☐
		E. PIT						
		COMB.						
	WHITTIER NARROWS – SAN GABRIEL POOL	TELEMARK	GH		XXXX	XXXX	XXXX	GATE #8 OPEN 0.30 FT. ☐
		W. STAFF						
		E. STAFF						
		COMB.						
429	PAINTED ROCK	RES: S T	XXXX	XXXX				GATES OPEN 0.5 FT ☐ HOOK: ANEMOMETER: TEMPERATURE:
		B. PIT						
437	ALAMO	RES: S T	XXXX	XXXX				GATES CLOSED ☐ GATE NO. 3 BYPASS CFS ☐ HOOK: ANEMOMETER: TEMPERATURE:

SPL FORM 1 APR 82 424 REPLACES EDITION JUL 75, WHICH IS OBSOLETE.

FIGURE 5-07

References Relevant to Fullerton Dam.
(Chronological Listing)

a. Orange County Flood Control District, "The Control of Floods and Conservation of Water in Orange County California," dated April 1929.

b. Orange County Flood Control District, "Engineering and Geological Reports for Flood Control and Conservation Project of Orange County Flood Control District," dated April 1931.

c. U.S. Engineer Office, Los Angeles, California, "Basis for Design, Santa Ana River Improvement," dated April 1938.

d. U.S. Engineer Office, Los Angeles, California, "Hydrology in the East Fullerton Creek Drainage Area", dated October 1939.

e. U.S. Engineer Office, Los Angeles, California, "Fullerton Dam, Analysis of Design", Revised, dated July, 1940.

f. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Operation and Maintenance Manual for Fullerton Dam", dated July, 1963.

g. U.S. Army Engineer District, Los Angeles Corps of Engineers, Preliminary Report, "Review of Safety and Functional Adequacy of Fullerton Dam", dated October 1968.

h. U.S. Army Engineer District, Los Angeles Corps of Engineer, "Fullerton Dam and Reservoir, Periodic Inspection and Continuing Evaluation Report No. 1", dated May 1969.

i. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Interim Report, Review of Design Features of Existing Dams, Hydrology and Hydraulic Review of Prado, Brea, Fullerton, and Salinas Dams", dated November 1969.

j. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Reservoir Regulation Manual for Fullerton Flood-Control Reservoir", dated May 1970.

k. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Operation and Maintenance Manual for Fullerton Dam", dated August 1970.

l. Orange County Planning Department, "The Physical Environment of Orange County", dated November 1971.

m. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Fullerton Dam; Dam, Outlet Works and Spillway, Periodic Inspection Report No. 2", dated February 1974.

n. Orange County Flood Control District, "Hydrology Report, Fullerton Creek Channel, Facility No. A03", Revised June 1974.

o. Orange County Flood Control District, "Hydrology Report, Loftus Diversion Channel, Facility No. A06", Revised, June 1974.

p. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Fullerton Dam Master Plan", dated August 1974.

q. U.S. Department of Housing and Urban development, Federal Insurance Administration, "Flood Insurance Study, City of Fullerton, Orange County, California", dated July 1977.

r. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Fullerton Dam; Dam, Outlet Works and Spillway, Periodic Inspection Report No. 3", dated April 1979.

s. U.S. Army Engineer District, Los Angeles Corps of Engineers, "Fullerton Dam; Dam, Outlet Works and Spillway, Periodic Inspection Report No. 4", dated February 1984.

t. Orange County Environmental Management Agency, "Project Report for that Portion of Fullerton Creek Channel Facility No A03 from Wilshire Ave. to Chapman Avenue", dated April 1986.

u. U.S Army Engineer District, Los Angeles Corps of Engineers, "Draft Environmental Assessment for Fullerton Dam Water Control Plan," dated September 1986.

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

REFERENCES RELEVANT

TO FULLERTON DAM

US ARMY CORPS OF ENGINEERS

LOS ANGELES DISTRICT

PLATE 1-01

Fullerton Dam Elevation-Area - Capacity Table (based on June 1970 Survey).

Area (Acres)	Elevation (ft.)	Storage (Acre-Feet) 0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	261	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2	262	0.1	0.1	0.1	0.2	0.2	0.3	0.5	0.6	0.7	0.9
	263	1.1	1.3	1.5	1.7	2.0	2.3	2.6	2.9	3.2	3.6
3.7	264	3.9	4.3	4.7	5.1	5.5	6.0	6.4	6.9	7.3	7.8
	265	8.3	8.8	9.4	9.9	10.4	11.0	11.6	12.1	12.7	13.3
6.7	266	14.0	14.6	15.2	15.9	16.6	17.3	18.1	18.8	19.6	20.4
	267	21.2	22.0	22.9	23.7	24.6	25.5	26.5	27.4	28.4	29.4
10.0	268	30.4	31.4	32.4	33.5	34.6	35.7	36.8	37.9	39.0	40.2
	269	41.4	42.6	43.8	45.0	46.2	47.5	48.8	50.1	51.4	52.7
13.5	270	54.0	55.4	56.8	58.1	59.5	61.0	62.4	63.8	65.3	66.8
	271	68.3	68.3	71.3	72.9	74.4	76.0	77.6	79.2	80.8	82.4
16.9	272	84.1	85.7	87.4	89.1	90.9	92.6	94.4	96.2	98.0	99.9
	273	101.7	103.6	105.5	107.5	109.4	111.4	113.4	115.4	117.4	119.4
20.7	174	121.6	123.7	125.8	127.9	130.1	132.2	134.5	136.7	138.9	141.1
	275	143.4	145.6	147.9	150.2	152.5	154.9	157.2	159.6	162.0	164.4
24.9	276	166.8	169.2	171.7	174.2	176.7	179.3	181.9	184.5	187.2	189.9
	277	192.6	195.3	198.1	200.9	203.8	206.6	209.6	212.5	215.5	218.5
30.1	278	221.5	224.6	227.6	230.7	233.9	237.0	240.2	243.4	246.7	249.9
	279	253.2	256.5	259.9	263.2	266.6	270.0	273.5	276.9	280.4	283.9
35.4	280	287.5	291.0	294.6	298.2	301.9	305.5	309.2	312.9	316.6	320.4
	281	324.2	327.9	331.8	335.6	339.5	343.4	347.3	351.2	355.1	359.1
40.1	282	363.1	367.1	371.2	375.3	379.4	383.5	388.6	391.8	395.8	400.1
	283	400.4	408.6	412.9	417.2	421.5	425.8	430.2	434.5	438.9	443.4
44.8	284	447.8	452.3	456.8	a461.3	465.8	470.4	475.0	479.6	484.3	489.0
	285	493.7	498.4	503.2	508.0	512.8	517.6	522.5	527.4	532.3	537.3
49.9	286	542.3	547.3	552.3	557.4	562.4	567.6	572.7	577.9	583.1	588.3
	287	593.5	598.8	604.1	609.5	614.8	620.2	625.7	631.1	636.6	642.1
55.3	288	647.6	653.3	658.7	664.4	670.0	675.7	681.3	687.1	692.8	698.6
	289	704.3	710.2	716.0	721.9	727.8	733.7	739.6	745.6	751.6	757.7
60.7	290	763.7	769.8	775.9	782.0	788.2	794.4	800.6	806.9	813.1	819.4
	291	825.8	832.1	838.5	844.9	851.4	857.8	864.3	870.9	877.4	884.0
	292	890.6	897.3	903.9	910.7	917.4	924.2	931.1	938.0	944.9	951.9
	293	958.9	965.9	973.0	980.1	987.3	994.5	1001.8	1009.0	1016.4	1023.7
	294	1031.2	1038.6	1046.1	1053.6	1061.2	1068.8	1076.4	1084.1	1091.8	1099.5
	295	1107.3	1115.1	1122.9	1130.8	1138.7	1146.7	1154.7	1162.7	1170.8	1178.9
				1203.4	1211.7	1220.0	1228.3	1236.7	1245.1	1253.6	1262.1

	297	1270.4	1279.2								
	298	1358.1	1367.1	1376.1	1385.1	1394.2	1403.3	1412.5	1421.6	1430.8	1440.1
44.8	284	447.8	452.3	456.8	461.3	465.8	470.4	475.0	479.6	484.3	489.0
	285	493.7	498.4	503.2	508.0	512.8	517.6	522.5	527.4	532.3	537.3
49.9	286	542.3	547.3	552.3	557.4	562.4	567.6	572.7	577.9	583.1	588.3
	287	593.5	598.8	604.1	609.5	614.8	620.2	625.7	631.1	636.6	642.1
55.3	288	647.6	653.3	658.7	664.4	670.0	675.7	681.3	687.1	692.8	698.6
	289	704.3	710.2	716.0	721.9	727.8	733.7	739.6	745.6	751.6	757.7
60.7	290	763.7	769.8	775.9	782.0	788.2	794.4	800.6	806.9	813.1	819.4
	291	825.8	832.1	838.5	844.9	851.4	857.8	864.3	870.9	877.4	884.0
	292	890.6	897.3	903.9	910.7	917.4	924.2	931.1	938.0	944.9	951.9
	293	958.9	965.9	973.0	980.1	987.3	994.5	1001.8	1009.0	1016.4	1023.7
	294	1031.2	1038.6	1046.1	1053.6	1061.2	1068.8	1076.4	1084.1	1091.8	1099.5
	295	1107.3	1115.1	1122.9	1130.8	1138.7	1146.7	1154.7	1162.7	1170.8	1178.9
	296	1187.0	1195.2	1203.4	1211.7	1220.0	1228.3	1236.7	1245.1	1253.6	1262.1
	297	1270.6	1279.2	1287.8	1296.4	1305.1	1313.9	1322.6	1331.4	1340.3	1349.2
	298	1358.1	1367.1	1376.1	1385.1	1394.2	1403.3	1412.5	1421.6	1430.8	1440.1
	299	1449.4	1458.7	1468.1	1477.5	1486.9	1496.3	1505.8	1515.4	1524.9	1534.5
99.9	300	1544.2	1553.8	1563.6	1573.3	1583.1	1592.9	1602.7	1612.6	1622.5	1632.5
	301	1642.5	1652.5	1662.6	1672.7	1682.8	1693.0	1703.2	1713.4	1723.7	1734.0
	302	1744.3	1754.7	1765.1	1775.6	1786.0	1796.5	1807.1	1817.7	1828.3	1839.0
	303	1849.7	1860.4	1871.2	1882.0	1892.8	1903.7	1914.6	1925.5	1936.5	1947.5
	304	1958.5	1969.6	1980.7	1991.9	2003.1	2014.3	2025.5	2036.8	2048.2	2059.5
	305	2070.9	2082.4	2093.8	2105.3	2116.9	2128.4	2140.0	2151.7	2163.4	2175.1
	306	2186.8	2198.6	2210.4	2222.3	2234.2	2246.1	2258.1	2270.1	2282.1	2294.2
	307	2306.3									

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

RESERVOIR AREA

AND CAPACITY TABLE

US ARMY CORPS OF ENGINEERS

LOS ANGELES DISTRICT

PLATE 2-0

Flood Control Basin Land Use Allocations
1985

Grantee	Type* Instrument	Purpose	Acreage**	----Term---- From Y M D	To Y M D
County of Orange	Lease	Park & Recreation	111.26	72 11 1	97 19 31
Union Oil Co.	Easement	Water Pipeline		43 1 2	93 1 6
Pacific Tel & Tele	License	Communication Facilities	0	81 17 26	86 7 25
Group W Cable Inc	License	Cable Line		81 7 1	86 6 30
S. Calif Edison	License	Power Line	0.05	81 2 15	86 2 14
Glass, Mr. Bud	Lease	Mobile Home, Dam Tender		84 2 6	86 2 5
Fullerton, City of	Easement	Sewer Line	0.14	74 12 23	24 12 22
Fullerton, City of	Easement	Sewer Line	0.19	73 3 12	23 3 11
Fullerton, City of	Easement	Water Pipeline	0.42	73 1 19	23 1 18
Fullerton, City of	Easement	Sewer Line	0.07	70 9 10	20 9 9
Orange County FCD	Easement	Storm Drain	4.66	54 10 13	04 10 12
S. Calif Edison	Easement	Power Line	1.50	54 4 1	04 3 31
Fullerton, City of	Easement	Road	3.09	61 4 5	
Cty Sanitation Dist	Easement	Sewer Line	2.09	66 12 13	
Brea, City of	Easement	Road	3.03	64 4 13	
Brea, City of	Easement	Sewer Line	1.84	67 4 26	
California, State of	Easement	Access Road	5.99	68 8 28	
Orange County FCD	Easement	Access Road	0.38	69 3 13	
Orange County	Easement	Road	0.63	45 2 17	
City of Fullerton	Easement	Road	5.79	45 2 20	

*Instruments:
Easement - A privilege or right of use or enjoyment which one person may have in the lands of another, i.e., a right-of-way.
Lease - A contract between the owner and the tenant, setting forth conditions upon which tenant may occupy and use the property, and the term of occupancy.
License - Authority to enter or use another person's land or property, without possessing estate in it - revocable.

**The total of the individual parcels does not exactly equal the total land originally bought due to minor variances in estimating the area of small land tracts.

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

FLOOD CONTROL BASIN

LAND USE ALLOCATIONS

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-02

Craig Regional Park Facility Elevations.

ELEV (FT. N.G.V.D.)	FEATURES IN BASIN
268	Turn Around Road
Silted Over	Multi-Purpose Turfball Field
275	Baseball Field No. 2
276	Baseball Field No. 1
277	Baseball Field No. 3
277	Baseball Field No. 4
279	Baseball Field No. 5
281	Handball Courts
282	Ramada No. 2
284	Volleyball Courts (Sand)
284	Basketball Courts
285	Ramada Storage
286	Volleyball Courts (Sand)
287	Restroom No. 3
287	Maintenance Building
288	Ramada Storage/Restroom
288	Equestrian Trail
288	Basketball Courts
289	Gazebo Tot Lot #1
291	Ramada No. 1
291	Ramada No. 4
293	Gazebo No. 2
295	Ramada No. 3
295	Restroom No. 4
296	Restroom No. 2
298	Restroom No. 6
304	Equestrian Trail
309	Gazebo No. 1
314.5	Restroom No. 1
321	Amphitheater
328	Administration Building
328	Gazebo No. 3
332	Restroom No. 5
338	Gazebo Tot Lot #2
341	Viewing Pavilion

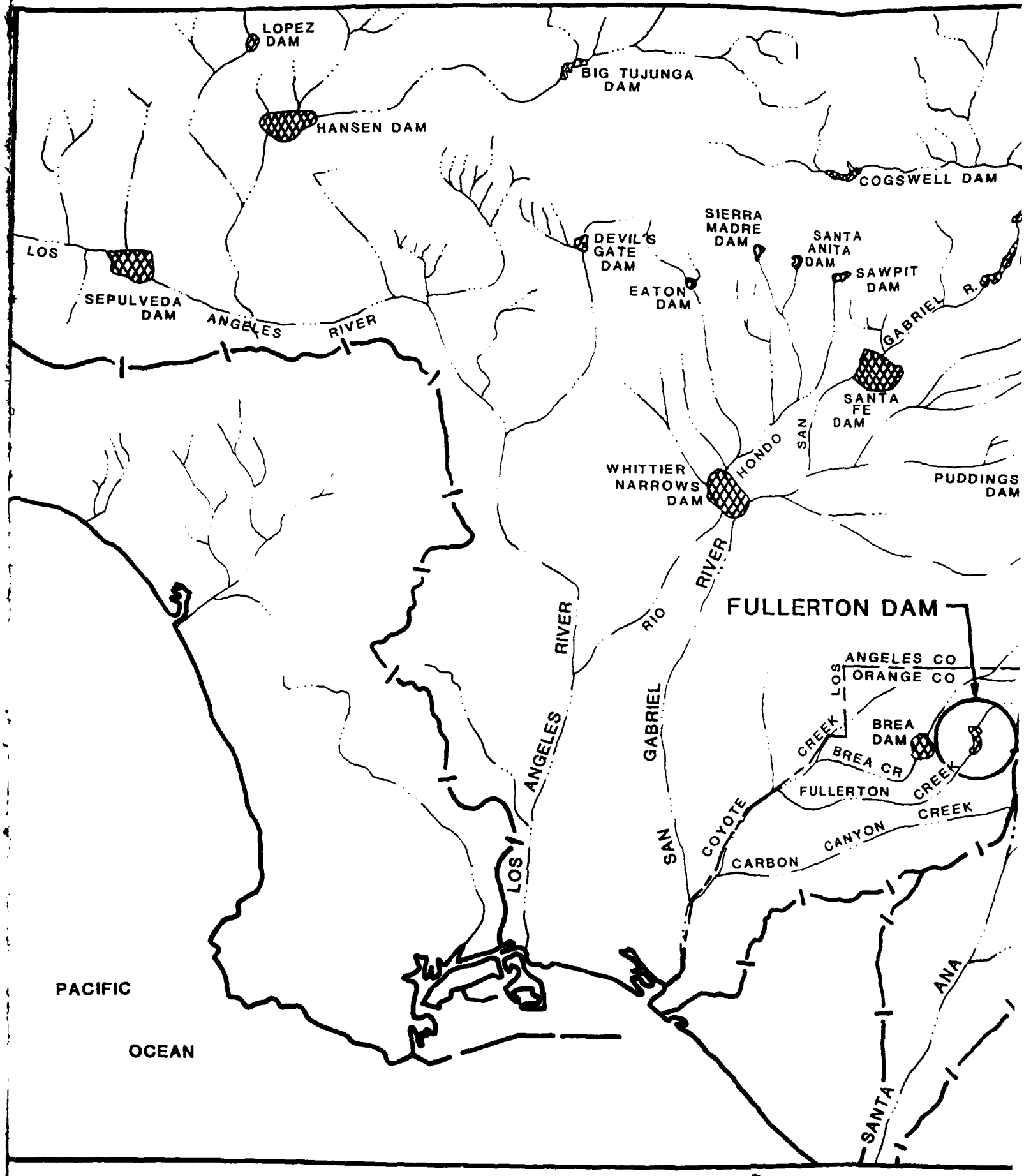
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

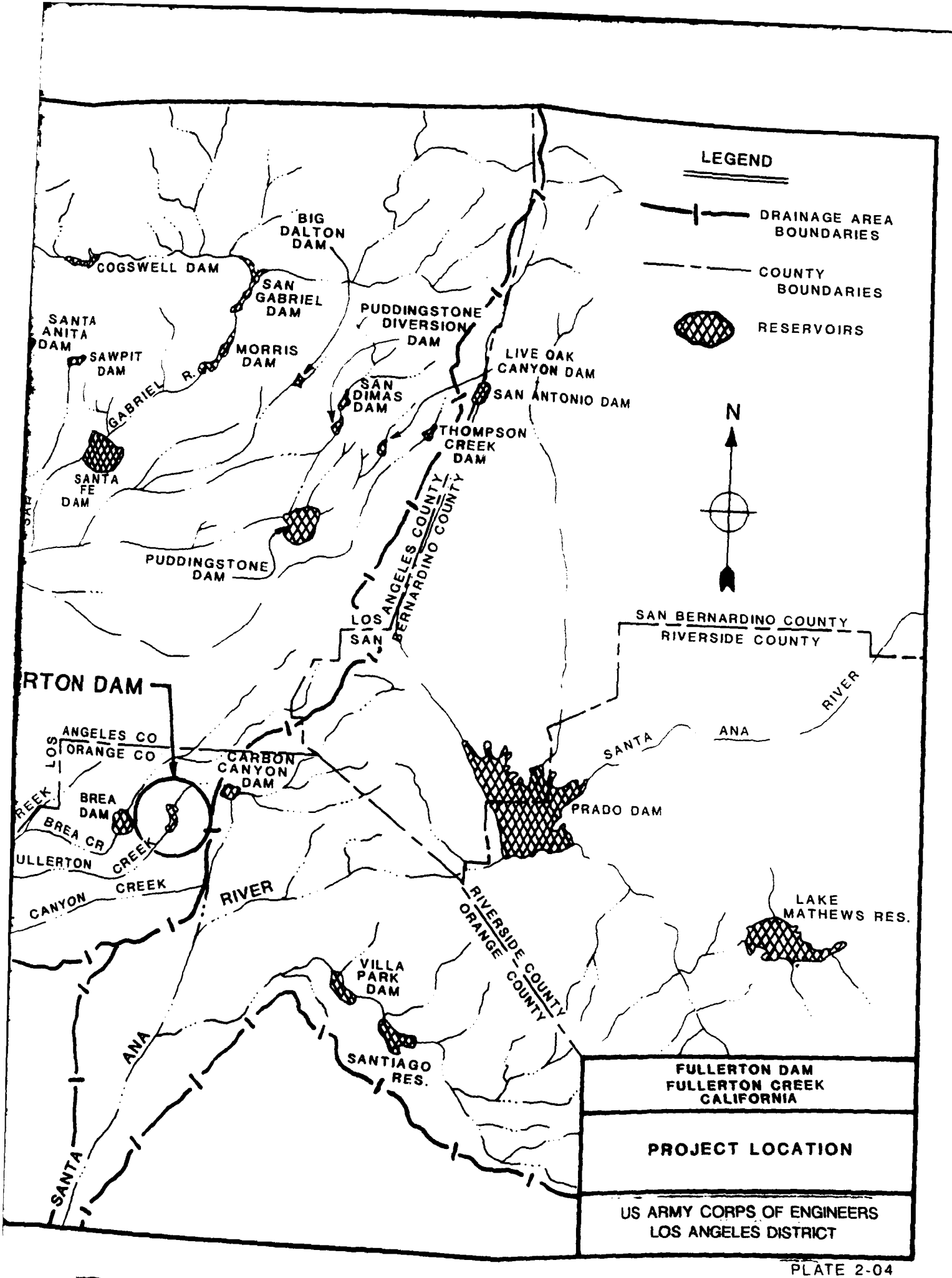
CRAIG REGIONAL PARK

FACILITY ELEVATIONS

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-03


LOPEZ DAM
BIG TUJUNGA DAM
HANSEN DAM
COGSWELL DAM
SIERRA MADRE DAM
SANTA ANITA DAM
DEVIL'S GATE DAM
SAWPIT DAM
EATON DAM
LOS
SEPULVEDA DAM
ANGELES RIVER
GABRIEL R.
SANTA FE DAM
SAN
HONDO
WHITTIER NARROWS DAM
PUDDINGS DAM
RIO
RIVER
FULLERTON DAM
ANGELES CO
ORANGE CO
LOS
CREEK
BREA DAM
BREA CR
FULLERTON CREEK
COYOTE CANYON CREEK
CARBON
SAN GABRIEL RIVER
LOS ANGELES RIVER
PACIFIC
OCEAN
SANTA ANA

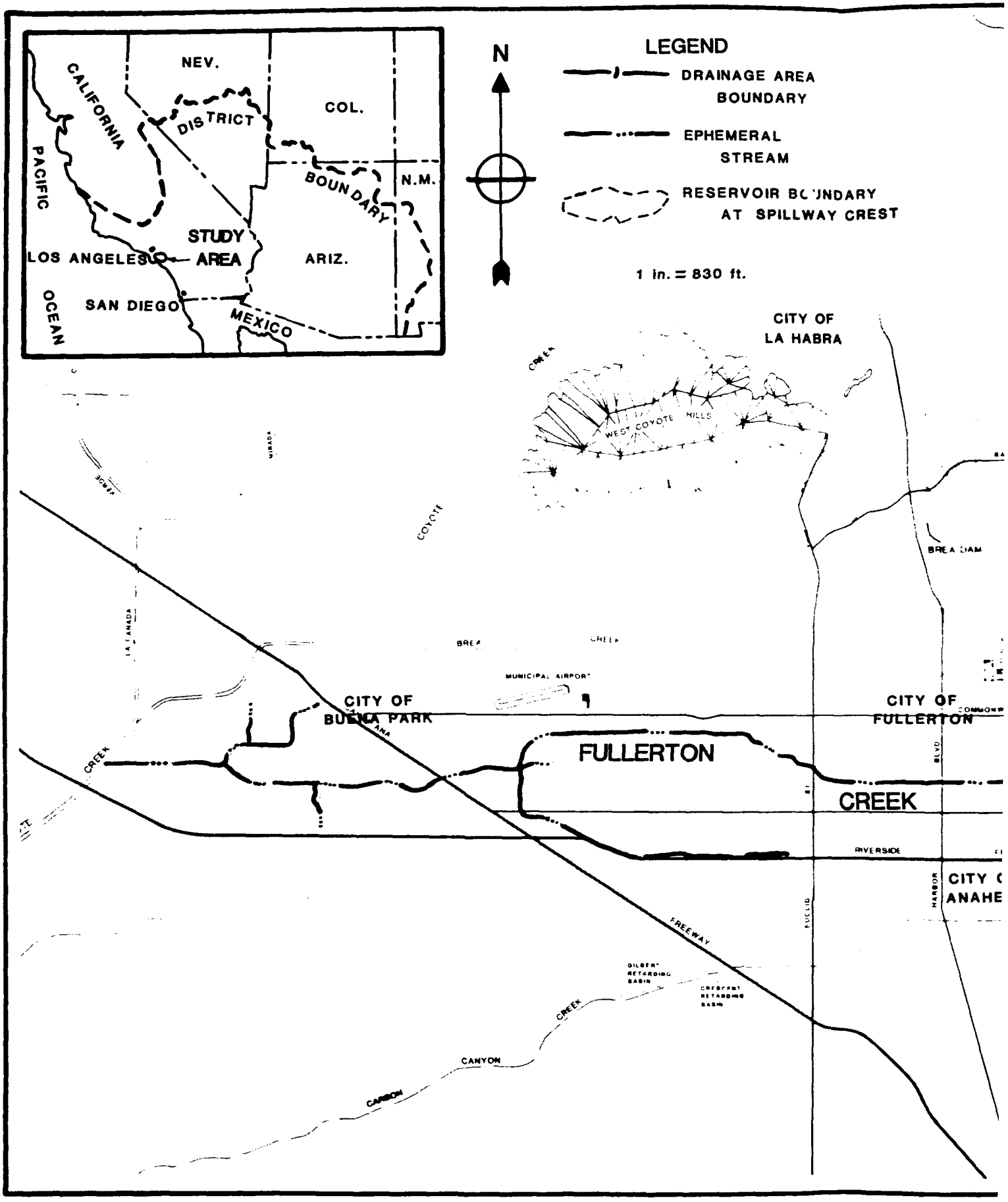


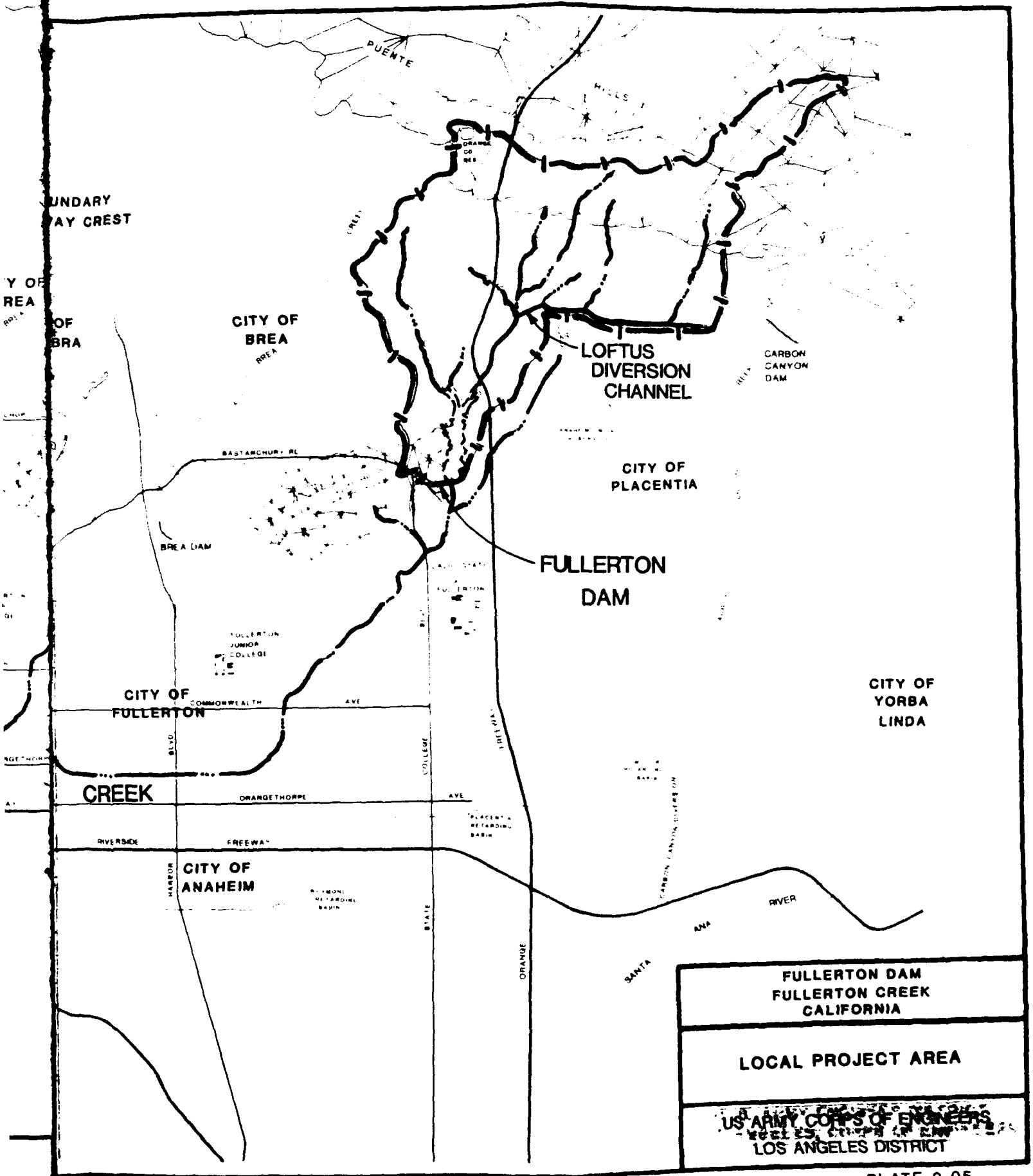
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

PROJECT LOCATION

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-04


NEV.
CALIFORNIA
DISTRICT
COL.
PACIFIC
BOUNDARY
N.M.
STUDY
AREA
LOS ANGELES
ARIZ.
SAN DIEGO
MEXICO
OCEAN
N
LEGEND
DRAINAGE AREA BOUNDARY
EPHEMERAL STREAM
RESERVOIR BOUNDARY AT SPILLWAY CREST
1 in. = 830 ft.
CITY OF LA HABRA
WEST COYOTE HILLS
COYOTE
BREA DAM
BREA
CREEK
MUNICIPAL AIRPORT
CITY OF BUENA PARK
CITY OF FULLERTON
FULLERTON
CREEK
RIVERSIDE
FREEWAY
GILBERT RETARDING BASIN
CREEK
CANYON
CANYON

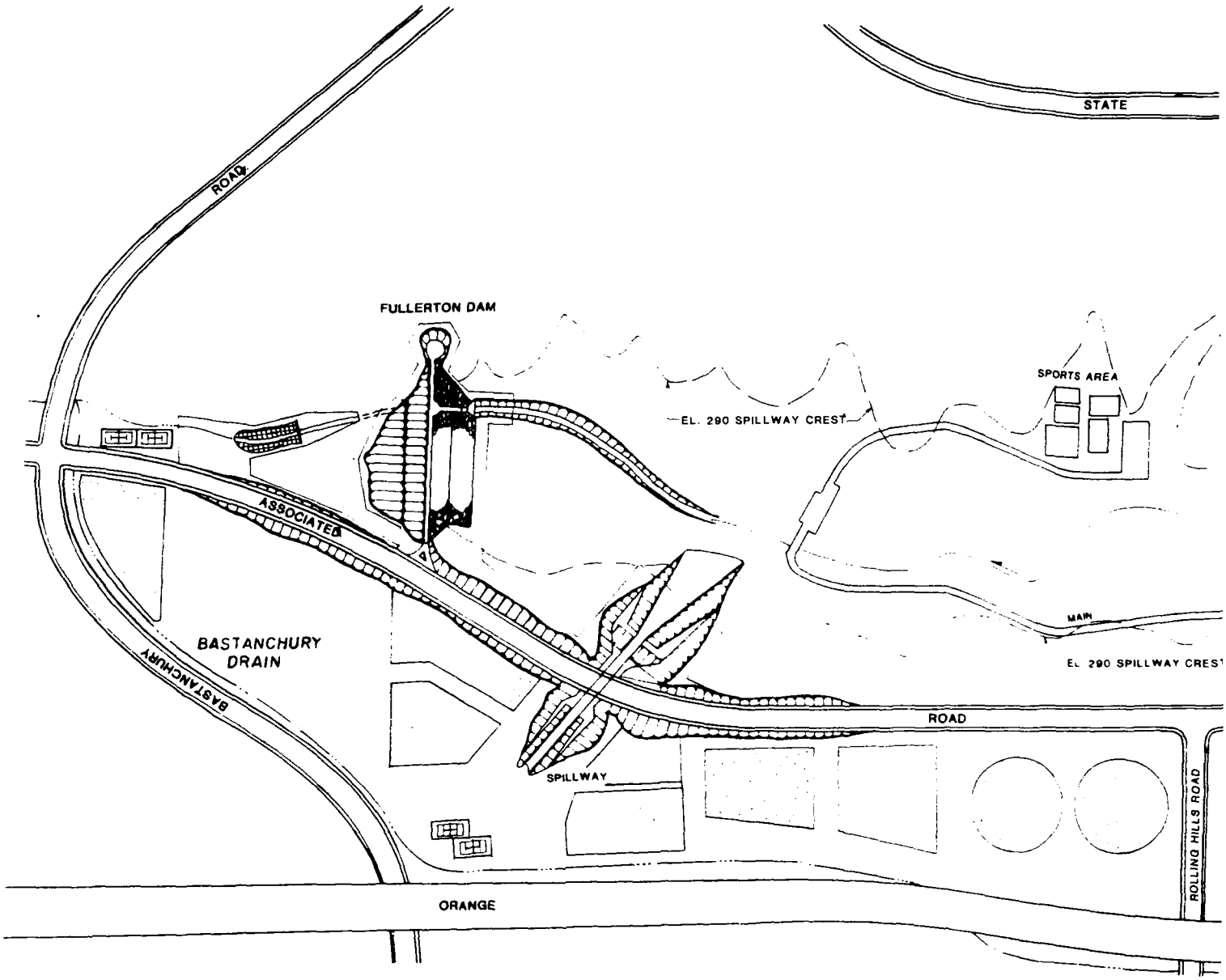


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

LOCAL PROJECT AREA

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

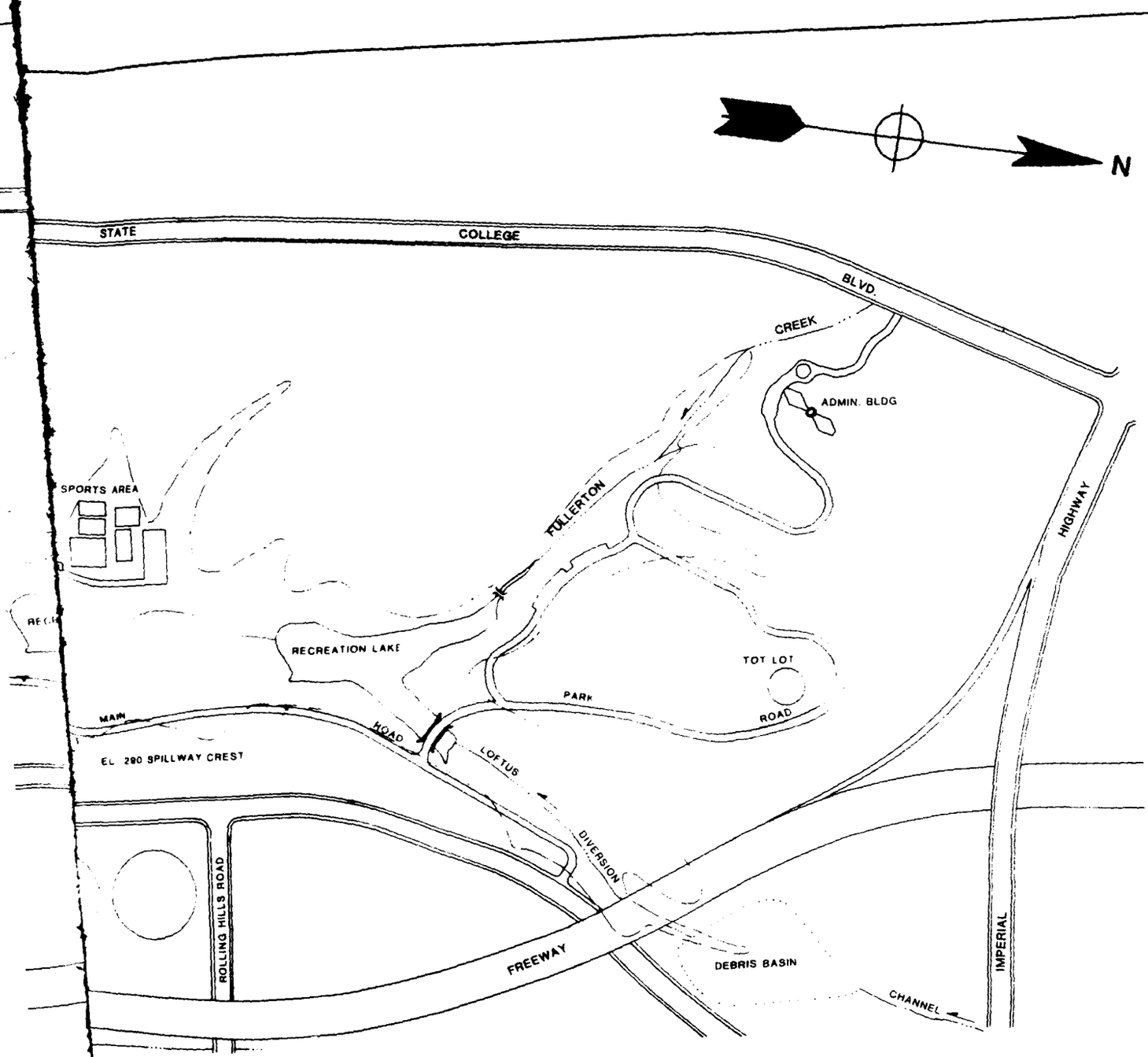
PLATE 2-05



LEGEND

STREAM CHANNEL

APARTMENT COMPLEX



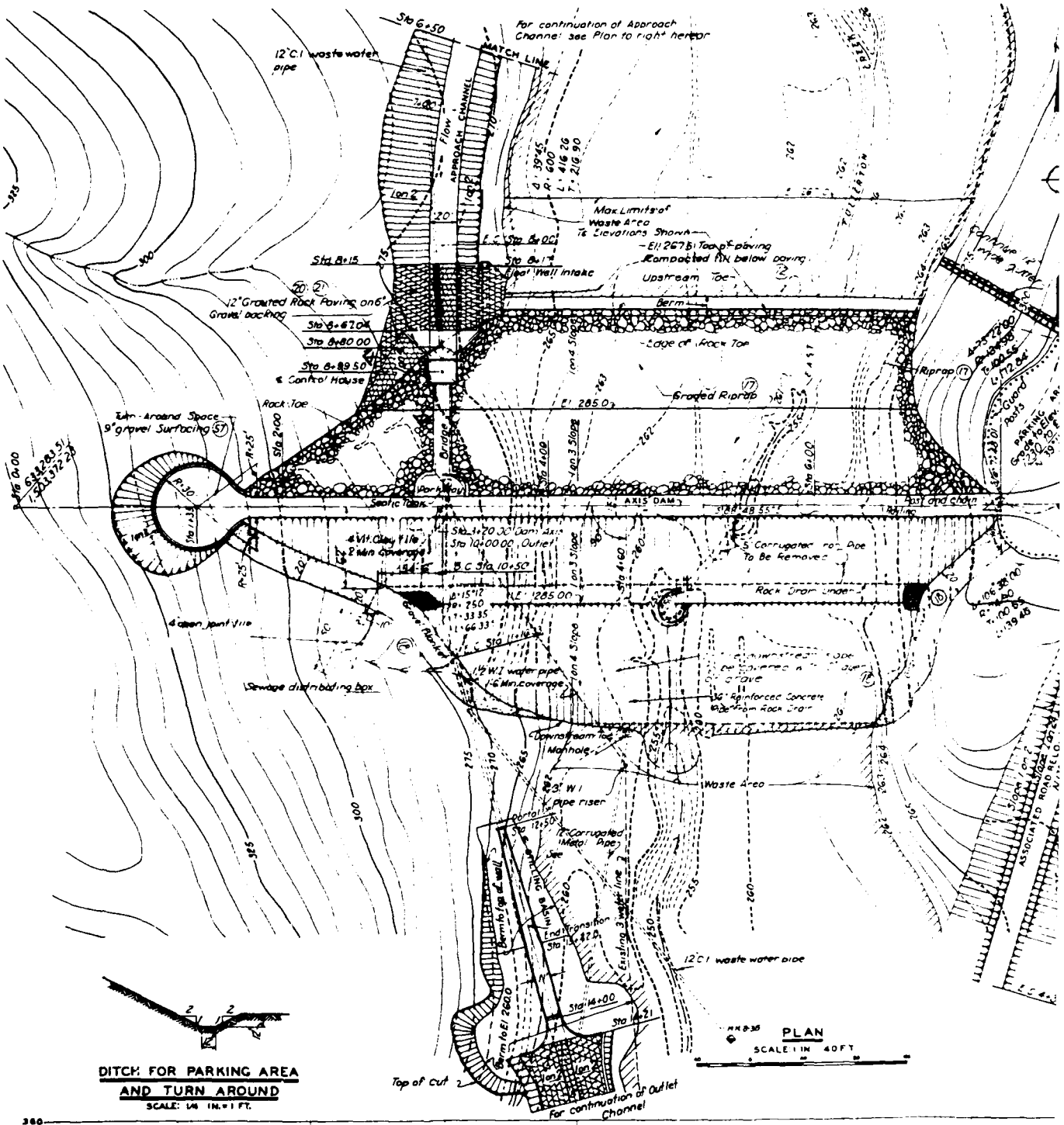
1 in.=450ft.

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

SITE PLAN

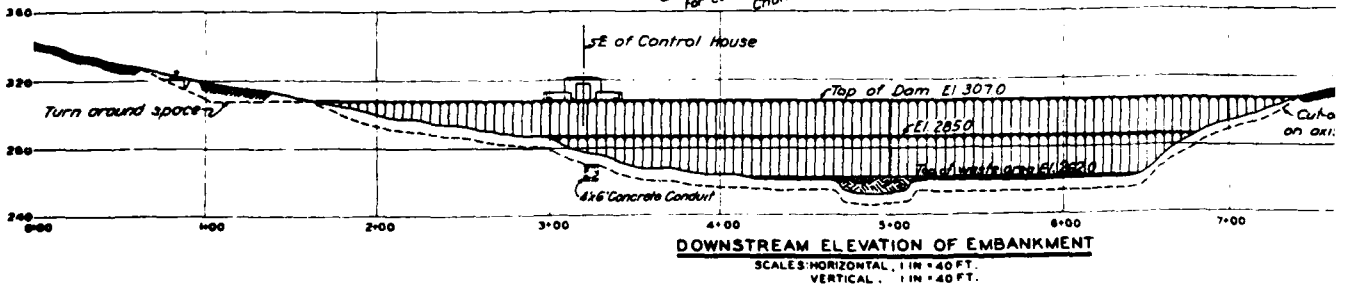
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-06



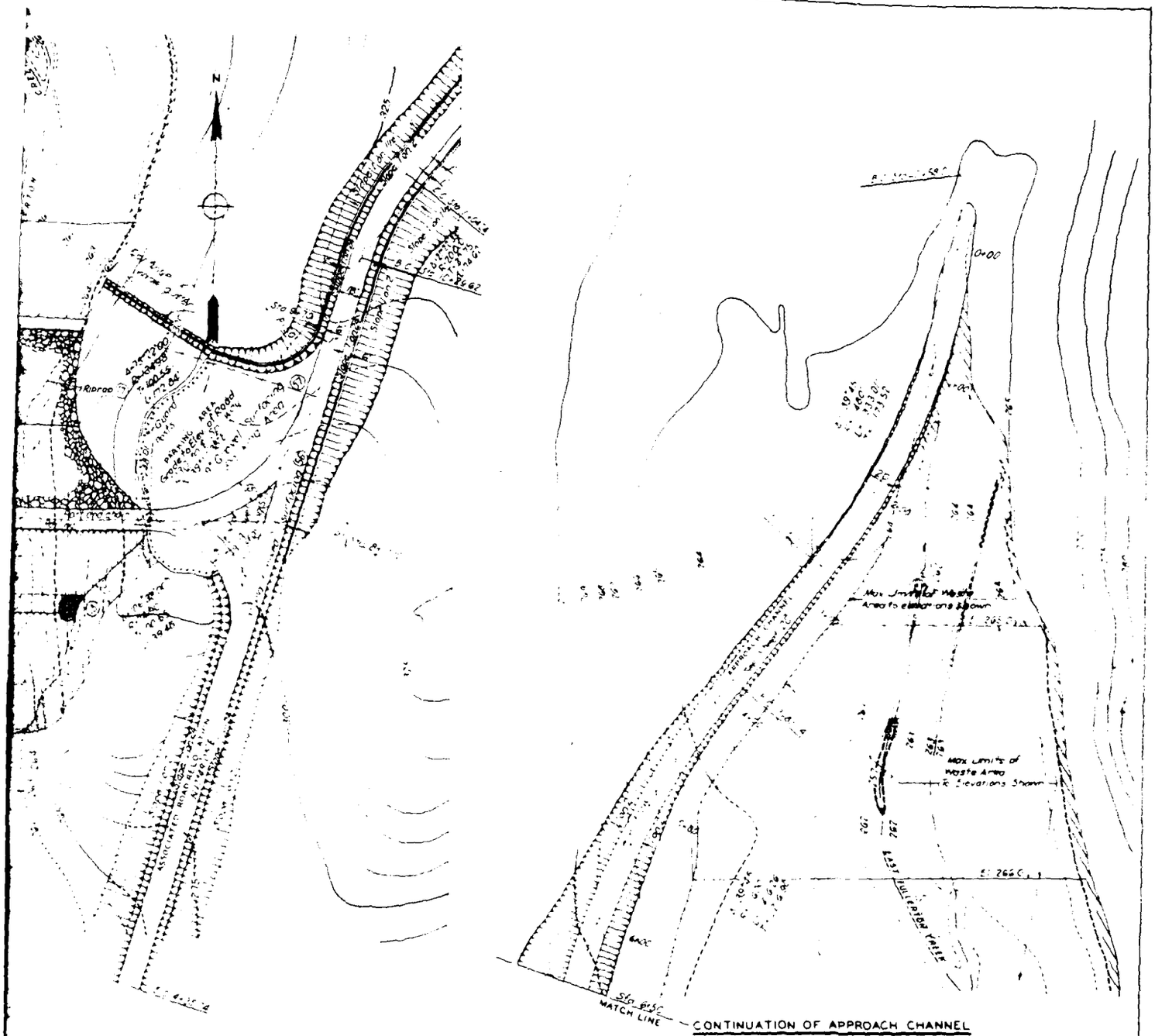
DITCH FOR PARKING AREA AND TURN AROUND

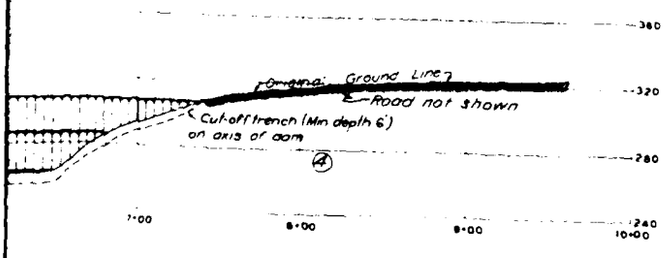
SCALE: 1/8 IN. = 1 FT.



DOWNSTREAM ELEVATION OF EMBANKMENT

SCALES: HORIZONTAL, 1 IN = 40 FT.
VERTICAL, 1 IN = 40 FT.



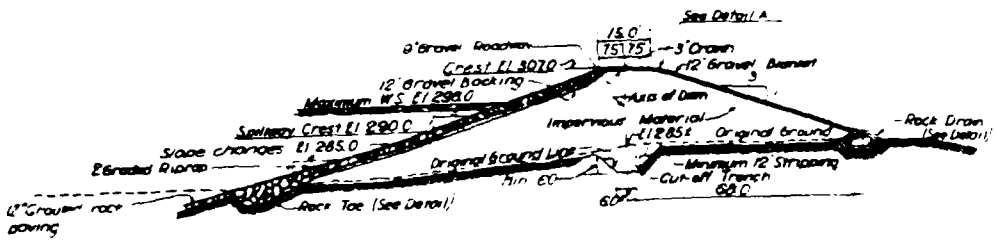


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

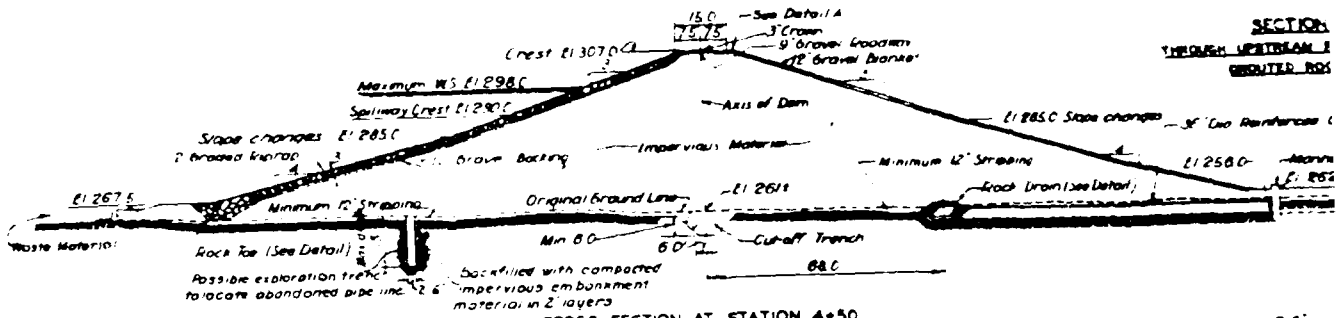
EMBANKMENT SECTION PLAN VIEW

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

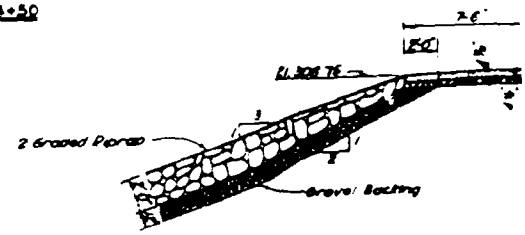
PLATE 2-07

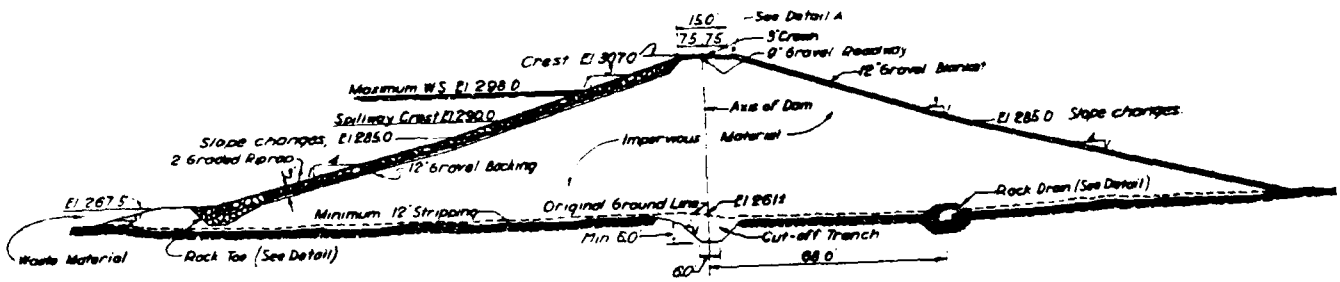


CROSS SECTION AT STATION 3+00

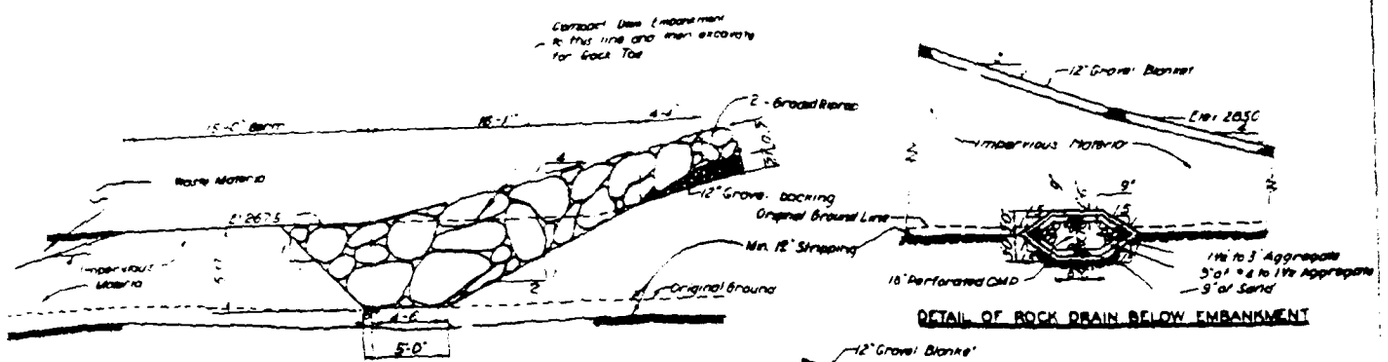


CROSS SECTION AT STATION 4+50



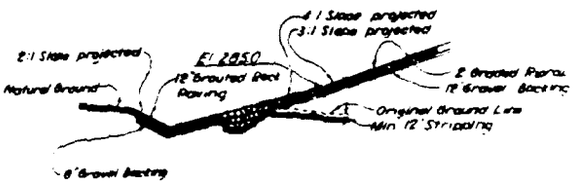


CROSS SECTION AT STATION 6+00

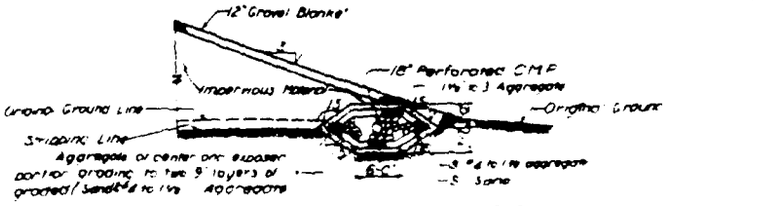


DETAIL OF UPSTREAM ROCK TOE

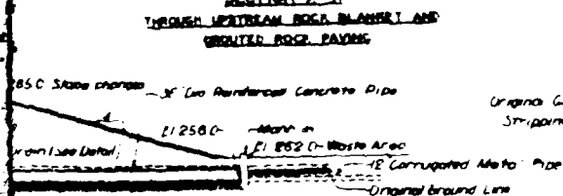
DETAIL OF ROCK DRAIN BELOW EMBANKMENT

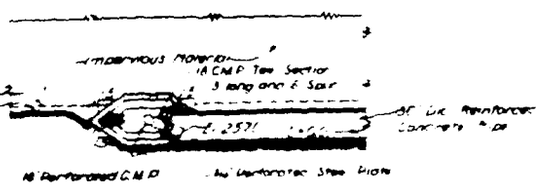


SECTION X - X
THROUGH UPSTREAM ROCK BLANKET AND GROUTED ROCK PAVING

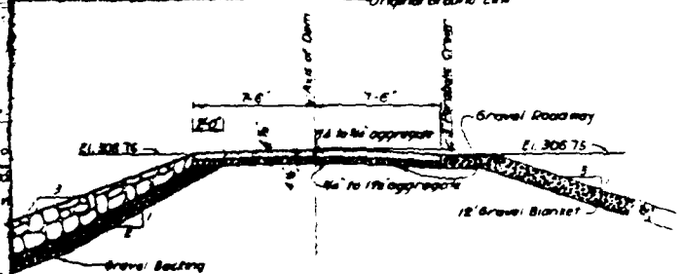


DETAIL OF ROCK DRAIN AT ABUTMENT

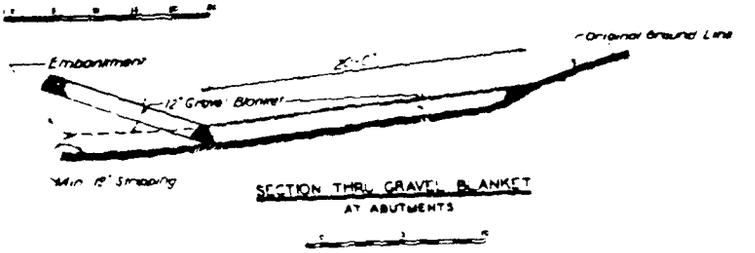




SECTION THRU CONCRETE PIPE



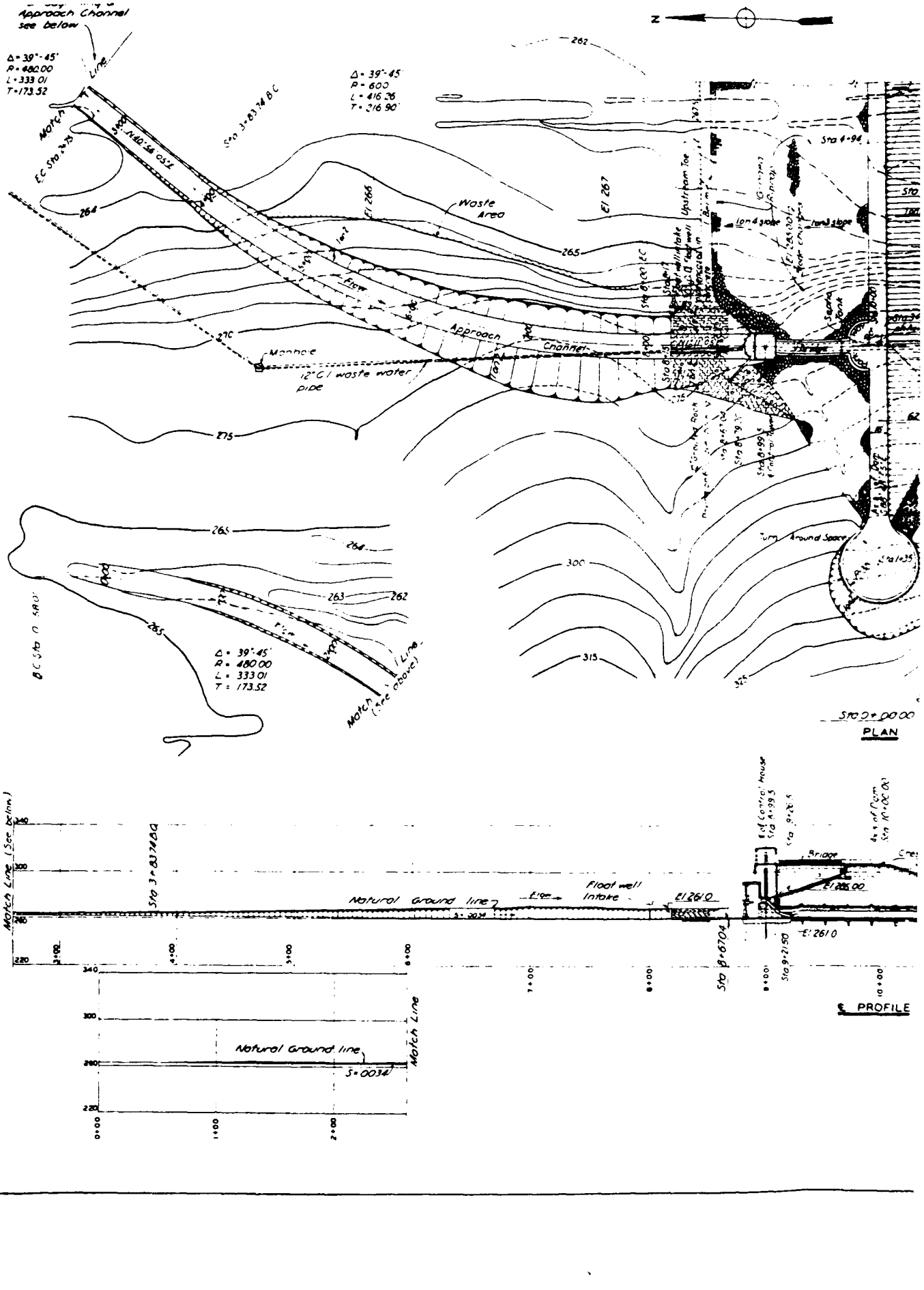
DETAIL A

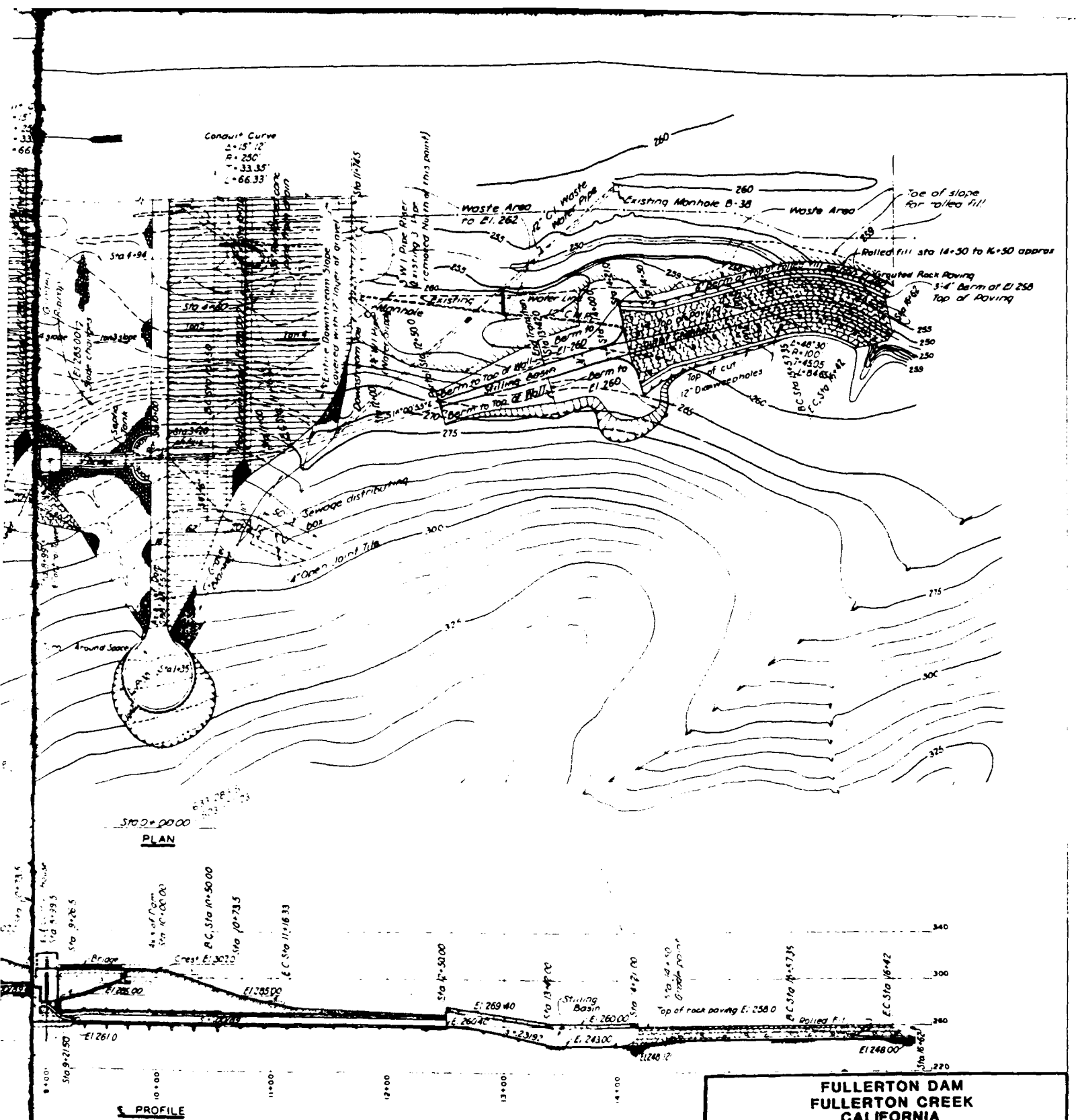


SECTION THRU GRAVEL BLANKET AT ABUTMENTS

FULLERTON DAM FULLERTON CREEK CALIFORNIA
EMBANKMENT SECTION SIDE VIEW
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

PLATE 2-08


Approach Channel see below
Δ = 39°-45'
R = 480.00
L = 333.01
T = 173.52
Notch
Sta 3+83.74 B.C.
N 40°-36 E.
E.C. Sta 3+75
Waste Area
El 267
Upstream Toe
Sta 4+94
Sta 4+35
Jam
Approach Channel
Manhole
12" C.I. waste water pipe
Sta 0+00.00
PLAN
Notch Line (See below)
Sta 3+83.74 B.C.
Natural Ground line
Float well Intake
El 261.0
Sta 8+67.04
Sta 9+21.50
Bridge
El 286.00
El 261.0
PROFILE
Notch Line
Natural Ground line
S = 0.034

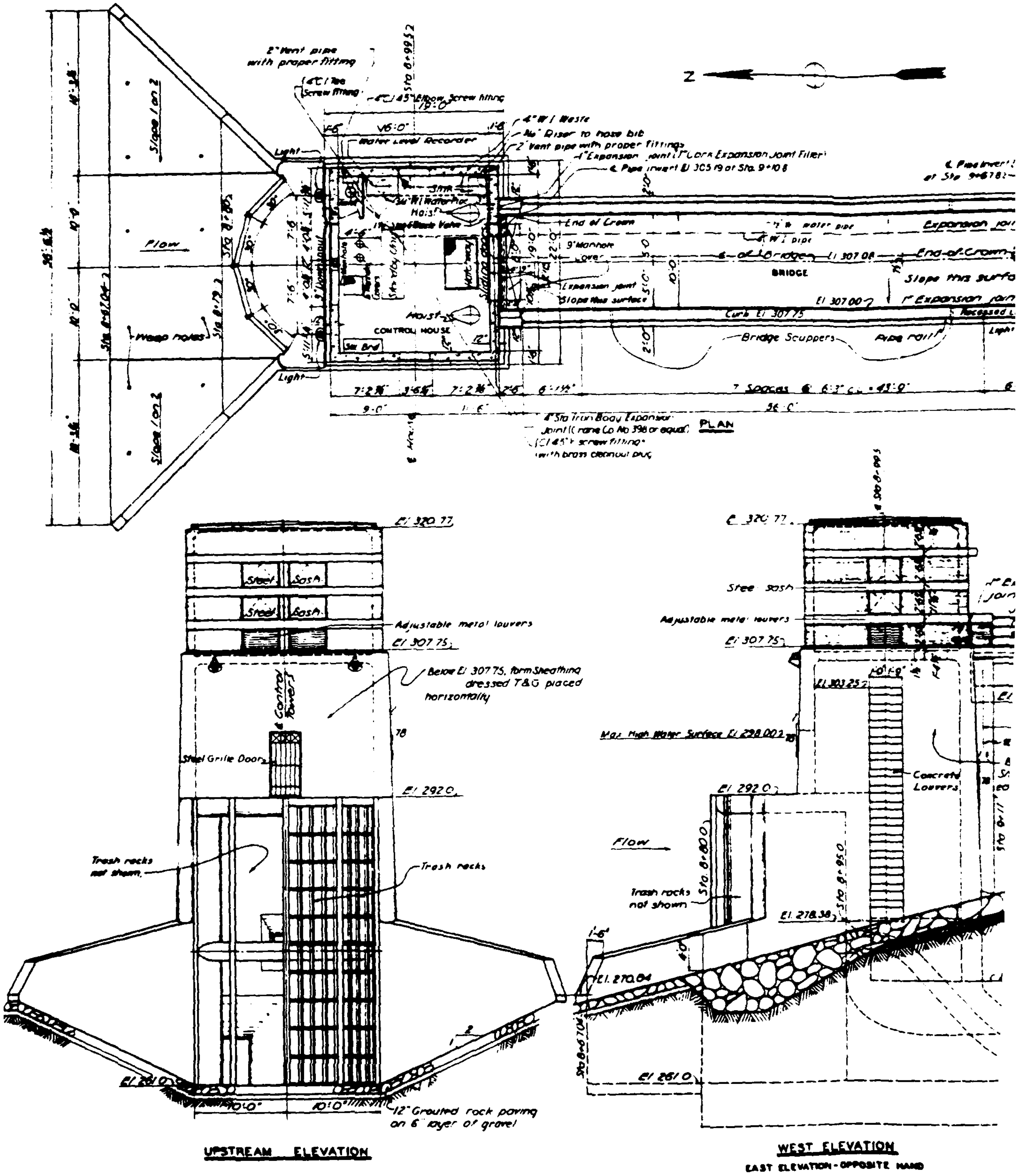


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

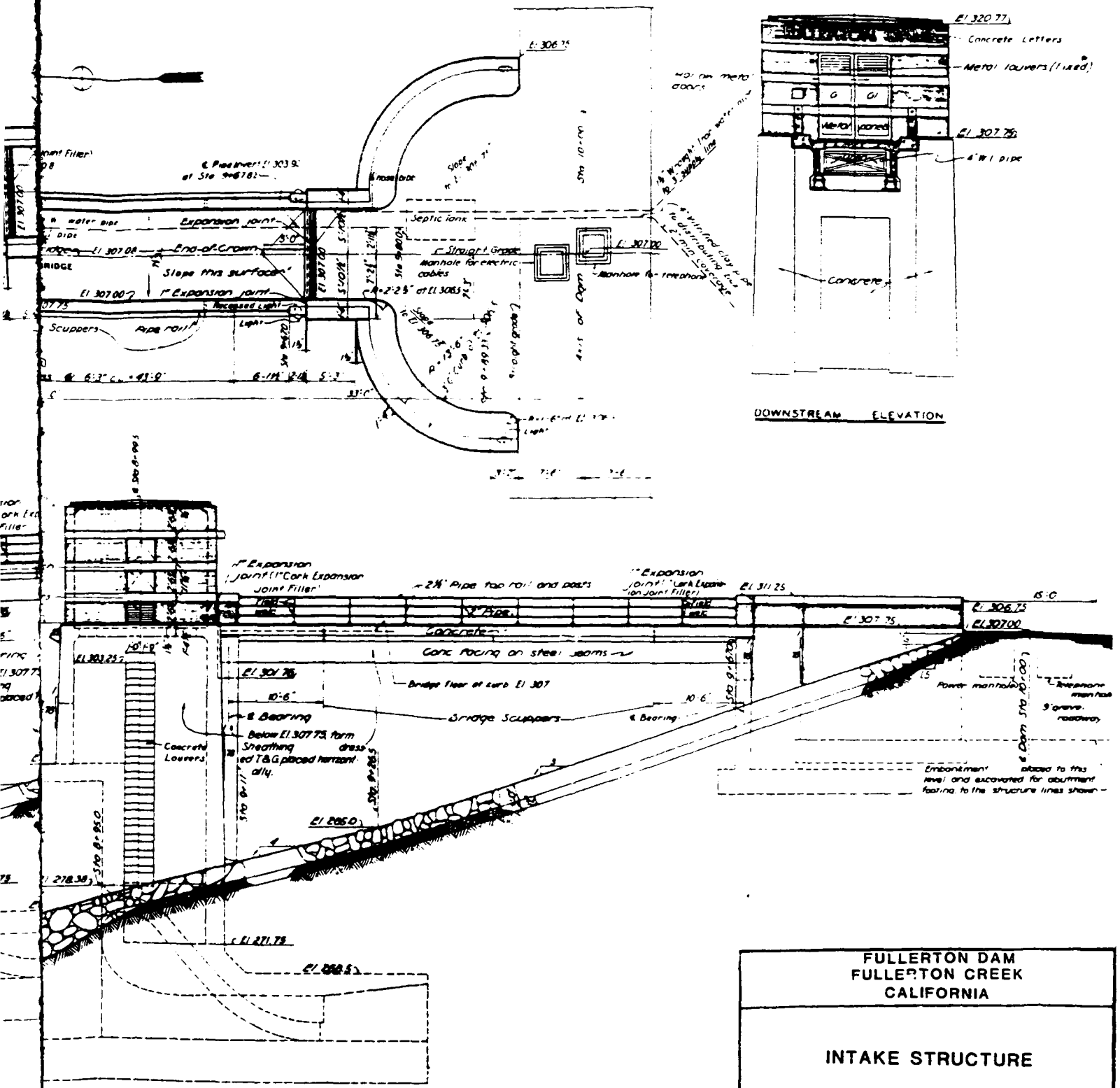
OUTLET WORKS

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-09

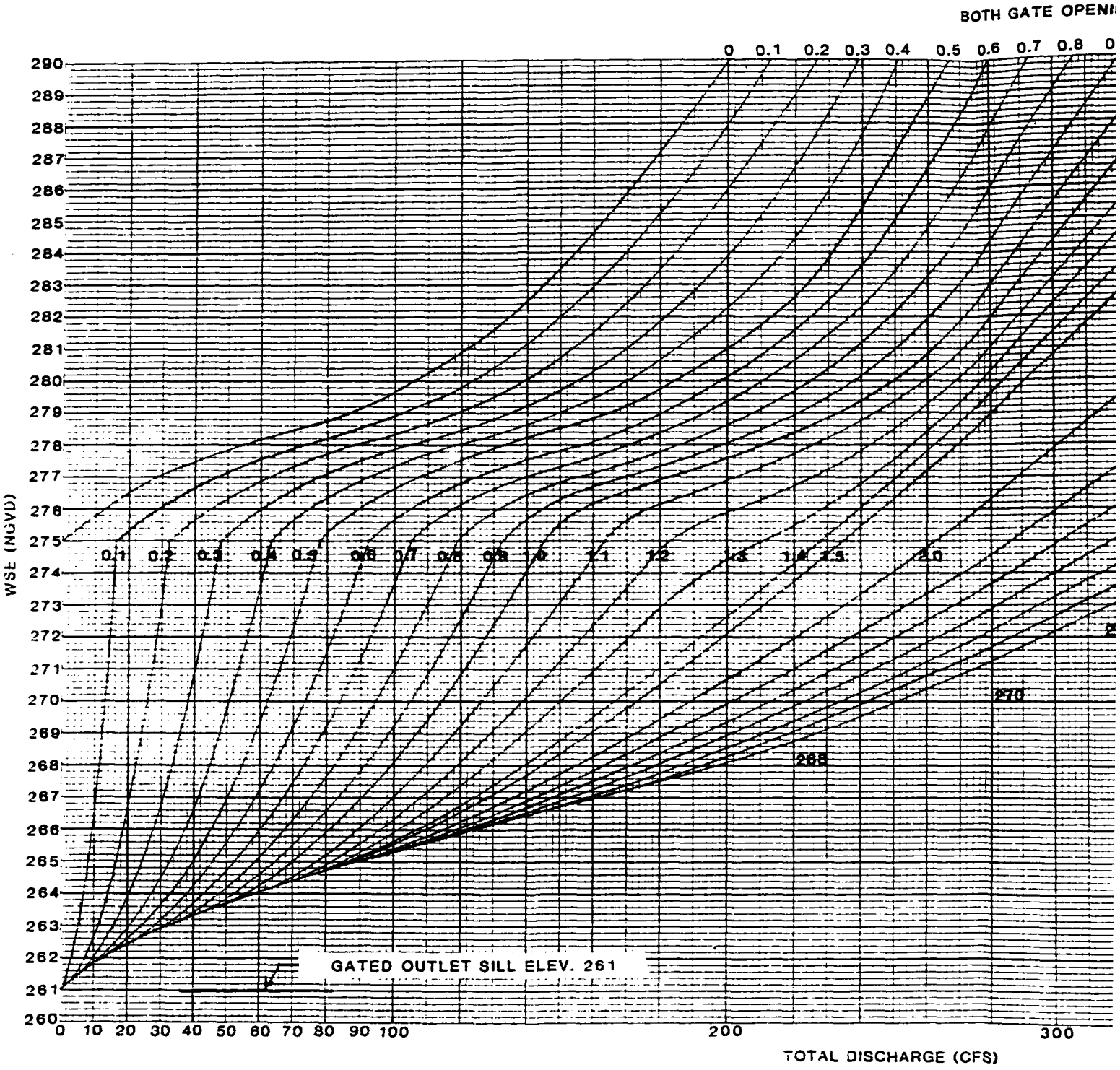


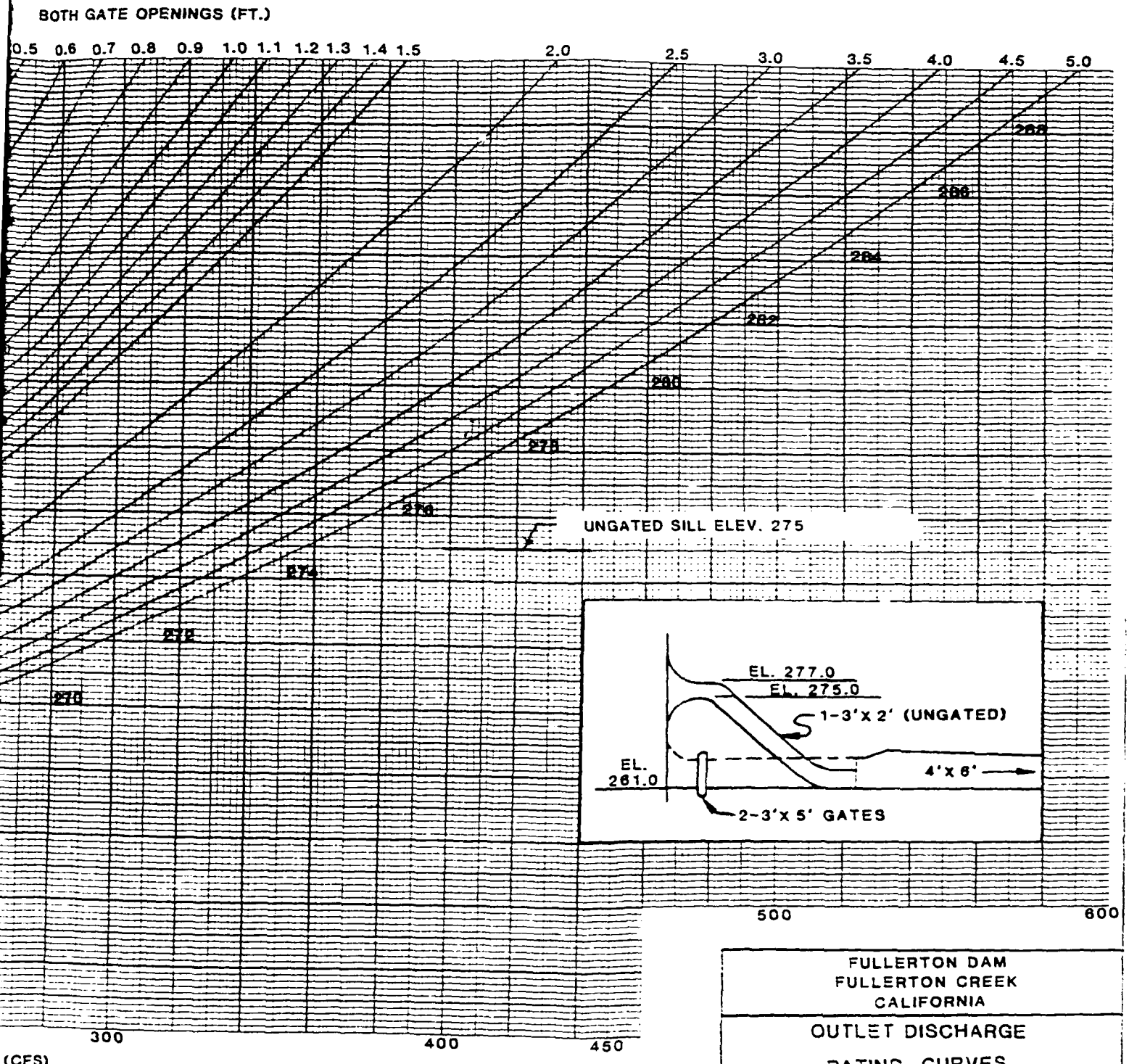
PLAN
Z
Flow
Slope 1 on 2
Weep holes
Light
Water Level Recorder
CONTROL HOUSE
BRIDGE
End of Crown
Bridge Scuppers
Pipe rail
Curb El 307.75
Hoist
9" Manhole cover
Expansion joint
Slope this surface
2" Vent pipe with proper fitting
4" W.I. Waste
2" Vent pipe with proper fittings
1" Expansion joint (1" Cork Expansion Joint Filler)
7 Spaces @ 6'-3" c.c. = 43'-9"
56'-0"
9'-0"
UPSTREAM ELEVATION
El 320.77
Steel Sash
Adjustable metal louvers
El 307.75
Below El 307.75, form sheathing dressed T&G placed horizontally
Control Towers
Steel Grille Door
El 292.0
Trash racks not shown
Trash racks
El 261.0
10'-0"
12" Grouted rock paving on 6" layer of gravel
WEST ELEVATION
EAST ELEVATION - OPPOSITE HAND
Steel sash
Adjustable metal louvers
El 307.75
El 303.25
Max High Water Surface El 298.00
Concrete Louvers
El 292.0
Flow
Trash racks not shown
El 278.38
El 270.64
El 261.0



FULLERTON DAM FULLERTON CREEK CALIFORNIA
INTAKE STRUCTURE
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

PLATE 2-10


BOTH GATE OPENI
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0
290
289
288
287
286
285
284
283
282
281
280
279
278
277
276
275
274
273
272
271
270
269
268
267
266
265
264
263
262
261
260
WSE (NGVD)
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 2.0
270
268
GATED OUTLET SILL ELEV. 261
0 10 20 30 40 50 60 70 80 90 100
200
300
TOTAL DISCHARGE (CFS)

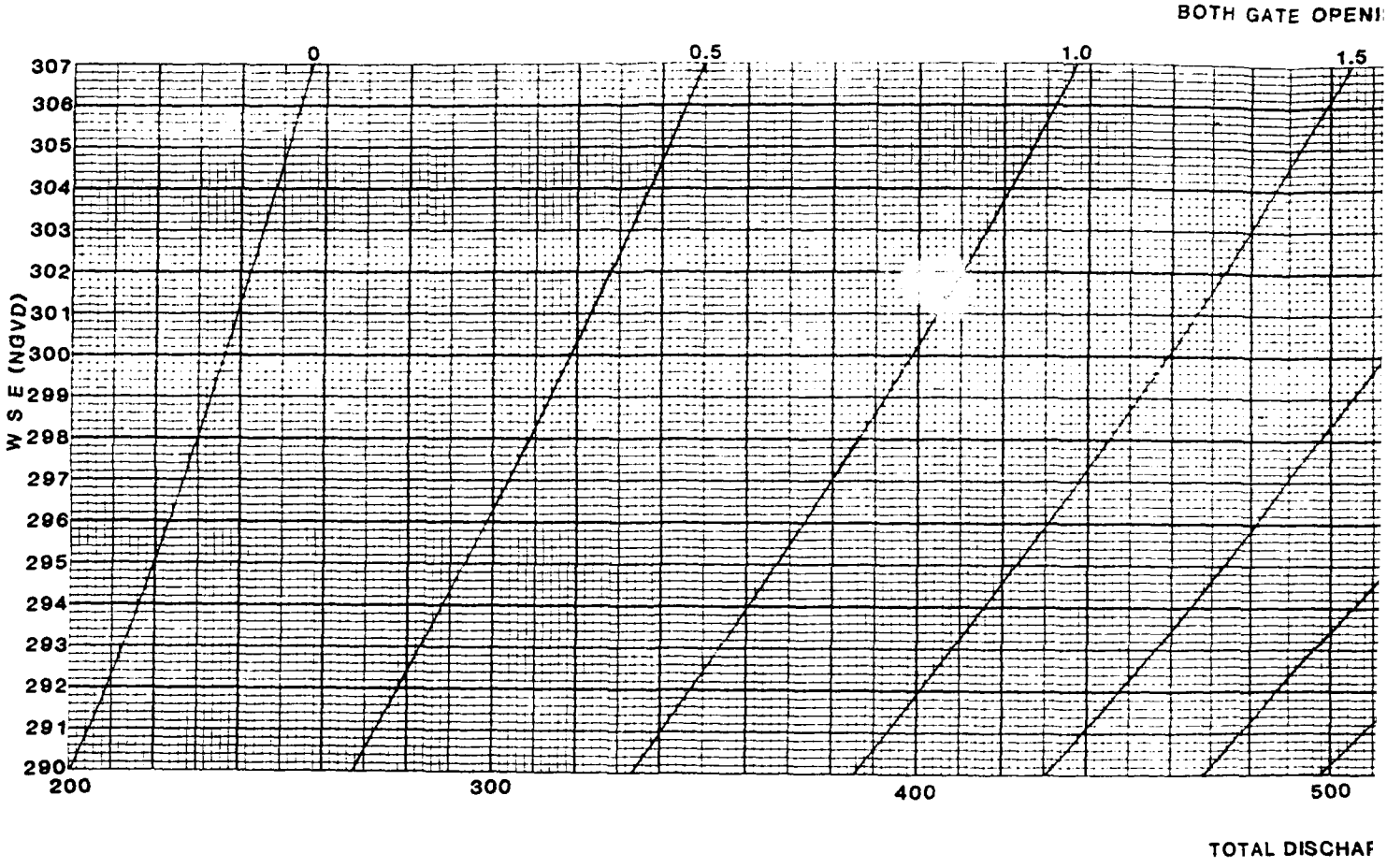


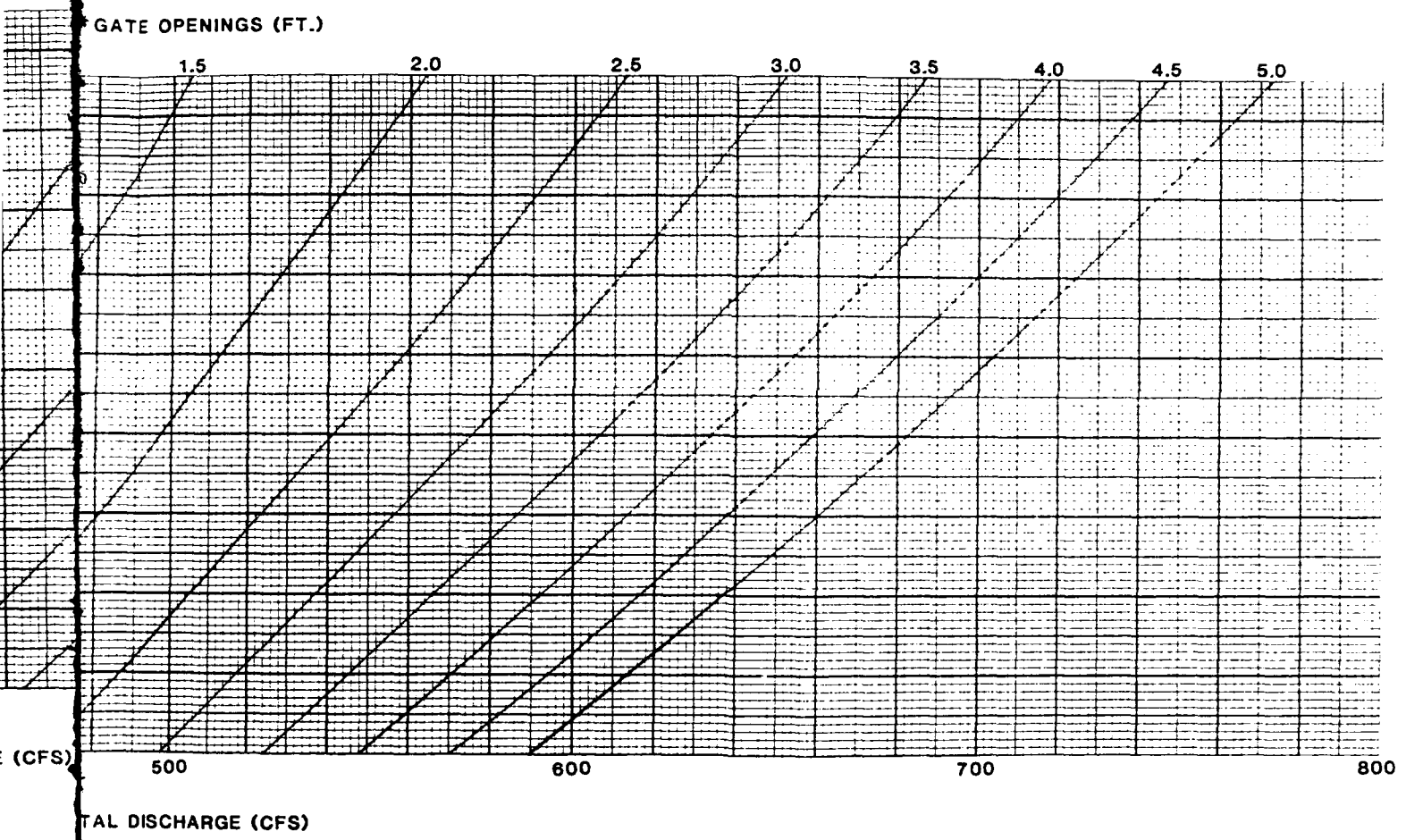
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

OUTLET DISCHARGE
RATING CURVES
2 GATED AND 1 UNGATED

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

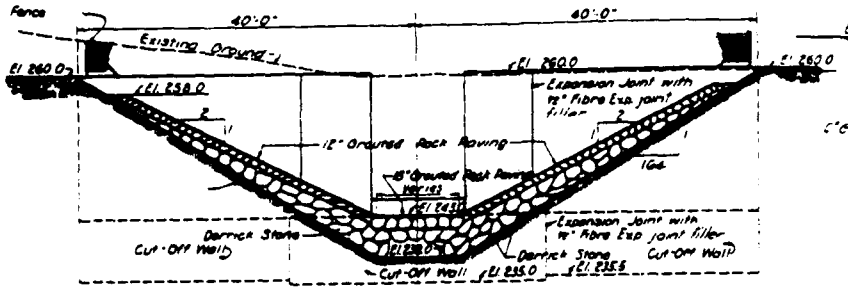
PLATE 2-11


BOTH GATE OPENI
0
0.5
1.0
1.5
307
306
305
304
303
302
301
300
299
298
297
296
295
294
293
292
291
290
W S E (NGVD)
200
300
400
500
TOTAL DISCHAF

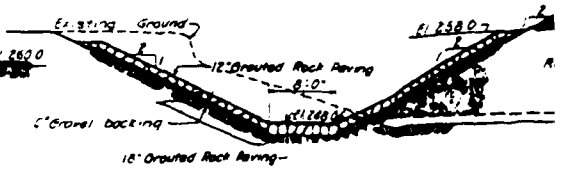


FULLERTON DAM FULLERTON CREEK CALIFORNIA
OUTLET DISCHARGE RATING CURVES 2 GATED AND 1 UNGATED
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

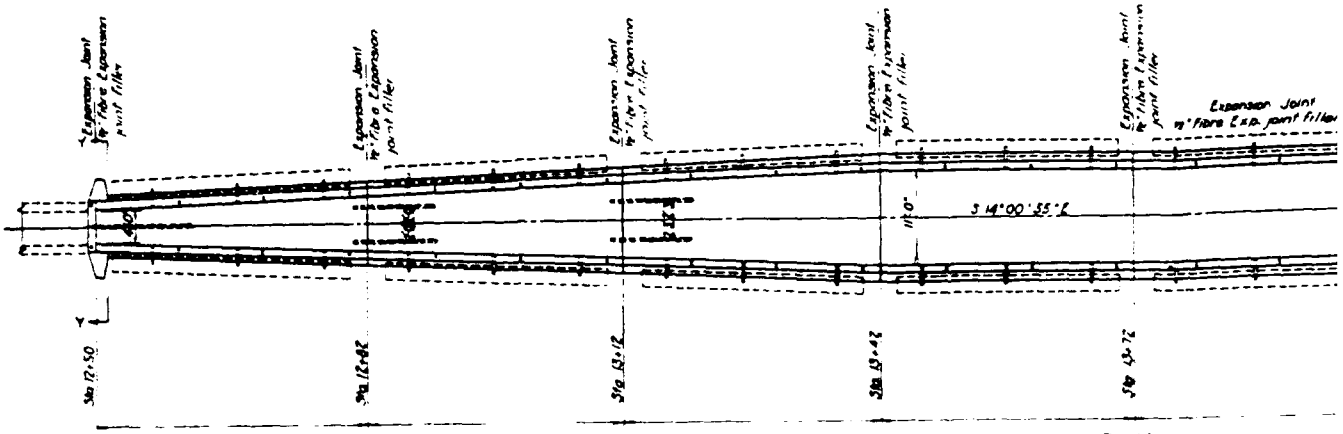
PLATE 2-11A



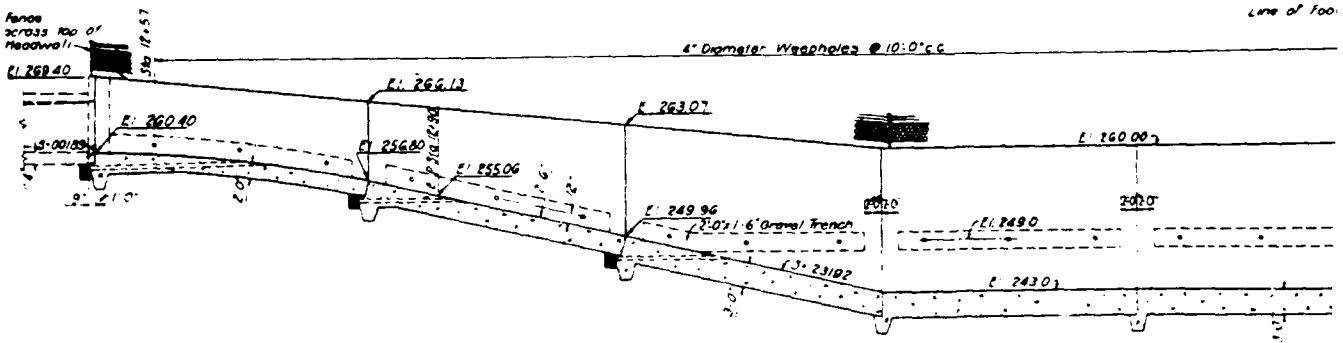
SECTION H-H



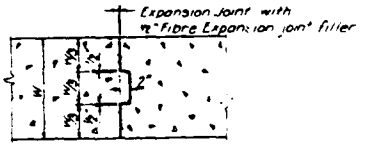
SECTION I-I



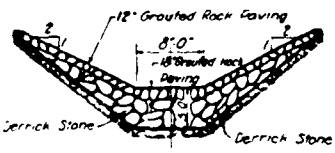
PLAN



SECTION ON CENTER LINE



DETAIL OF
EXPANSION JOINT IN WALL



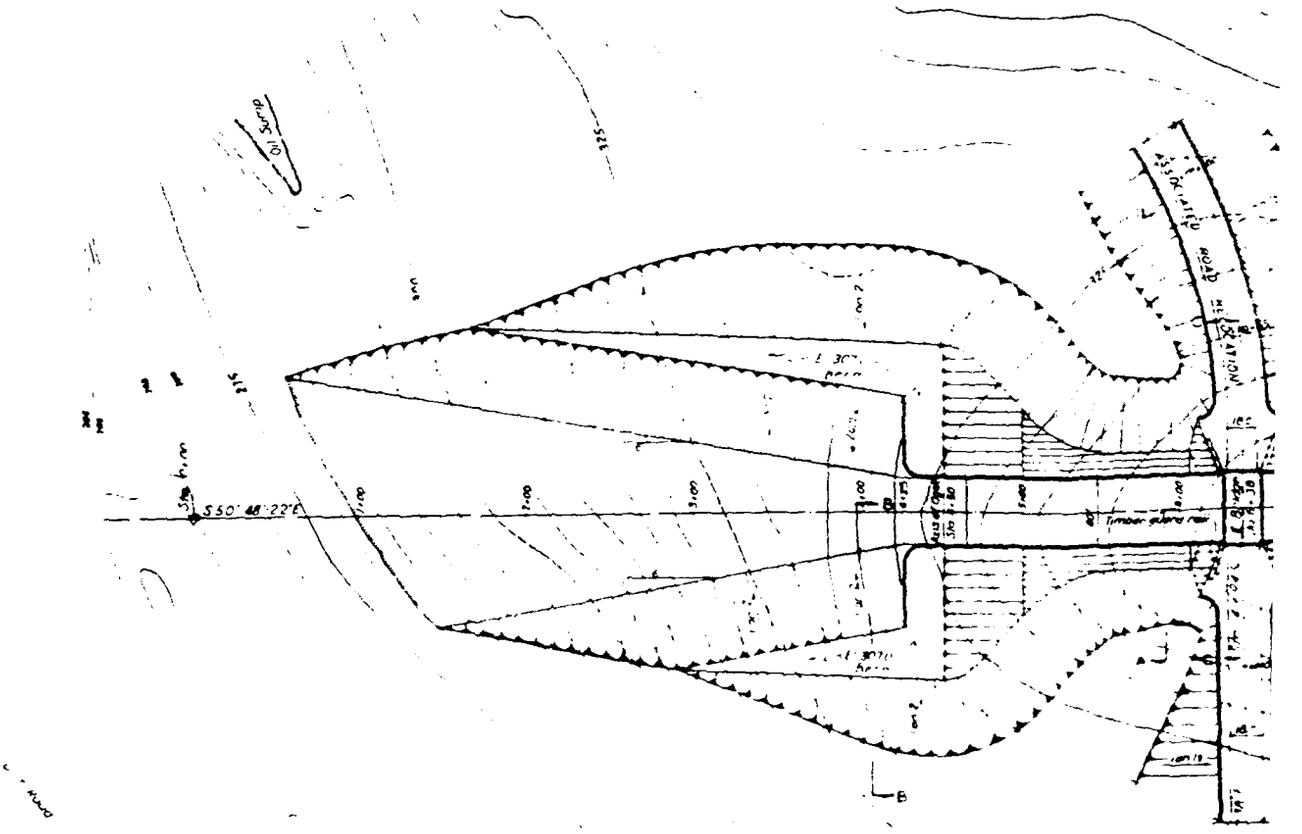
SECTION J-J

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

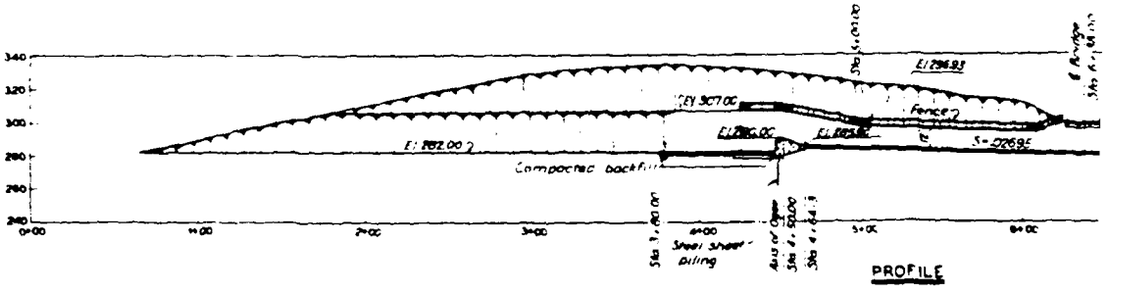
STILLING BASIN

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

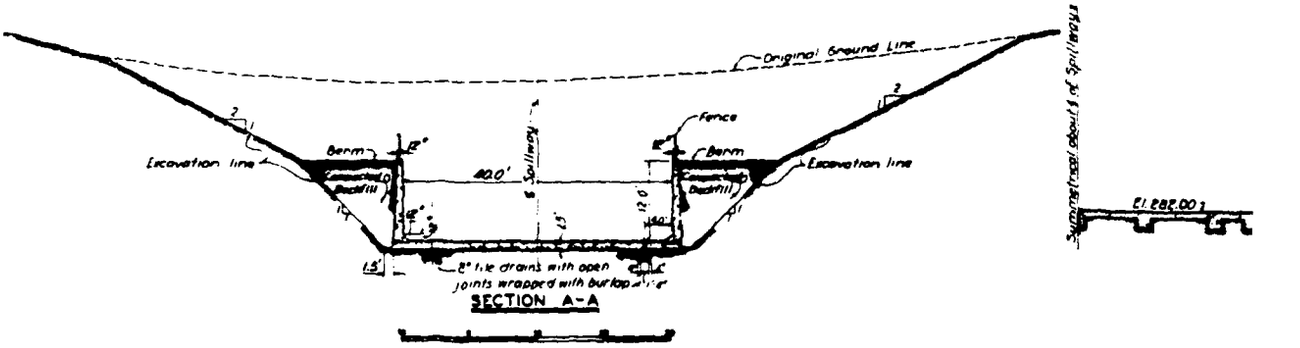
PLATE 2-12



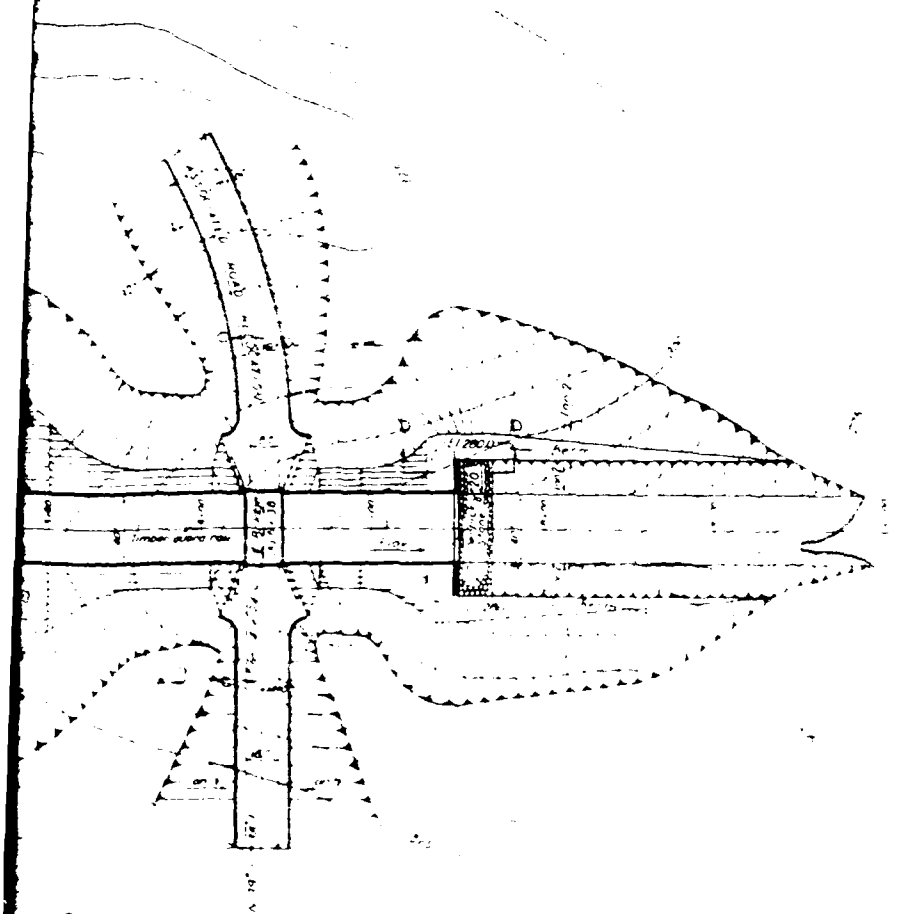
PLAN



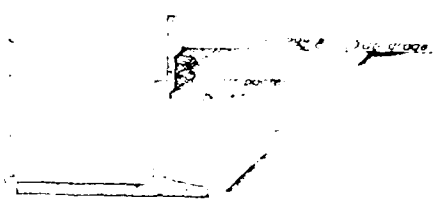
PROFILE



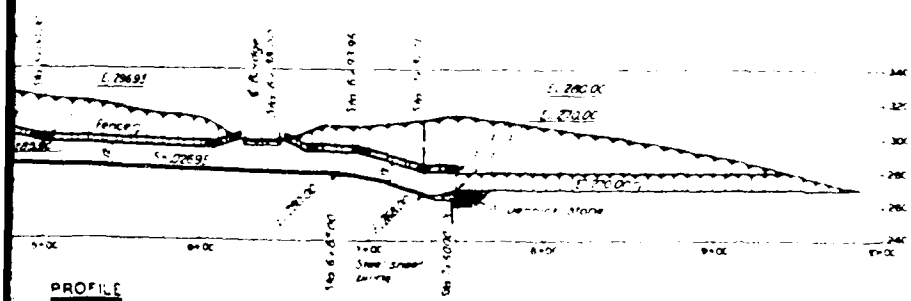
SECTION A-A



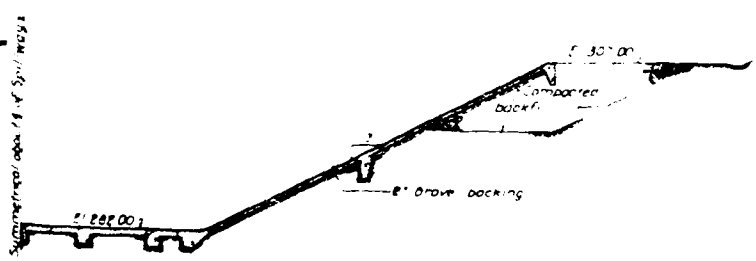
PLAN



HALF-SECTION



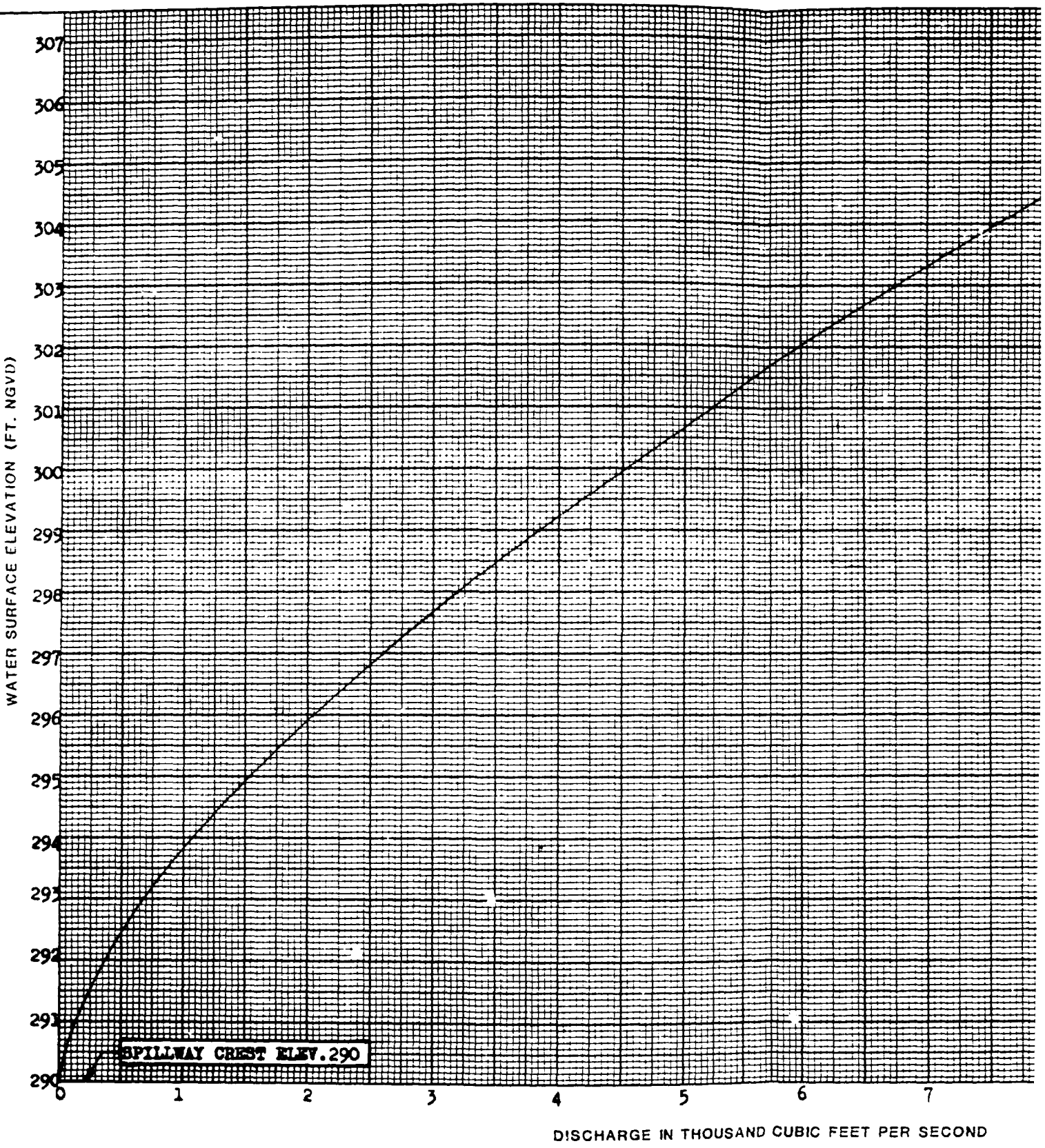
PROFILE

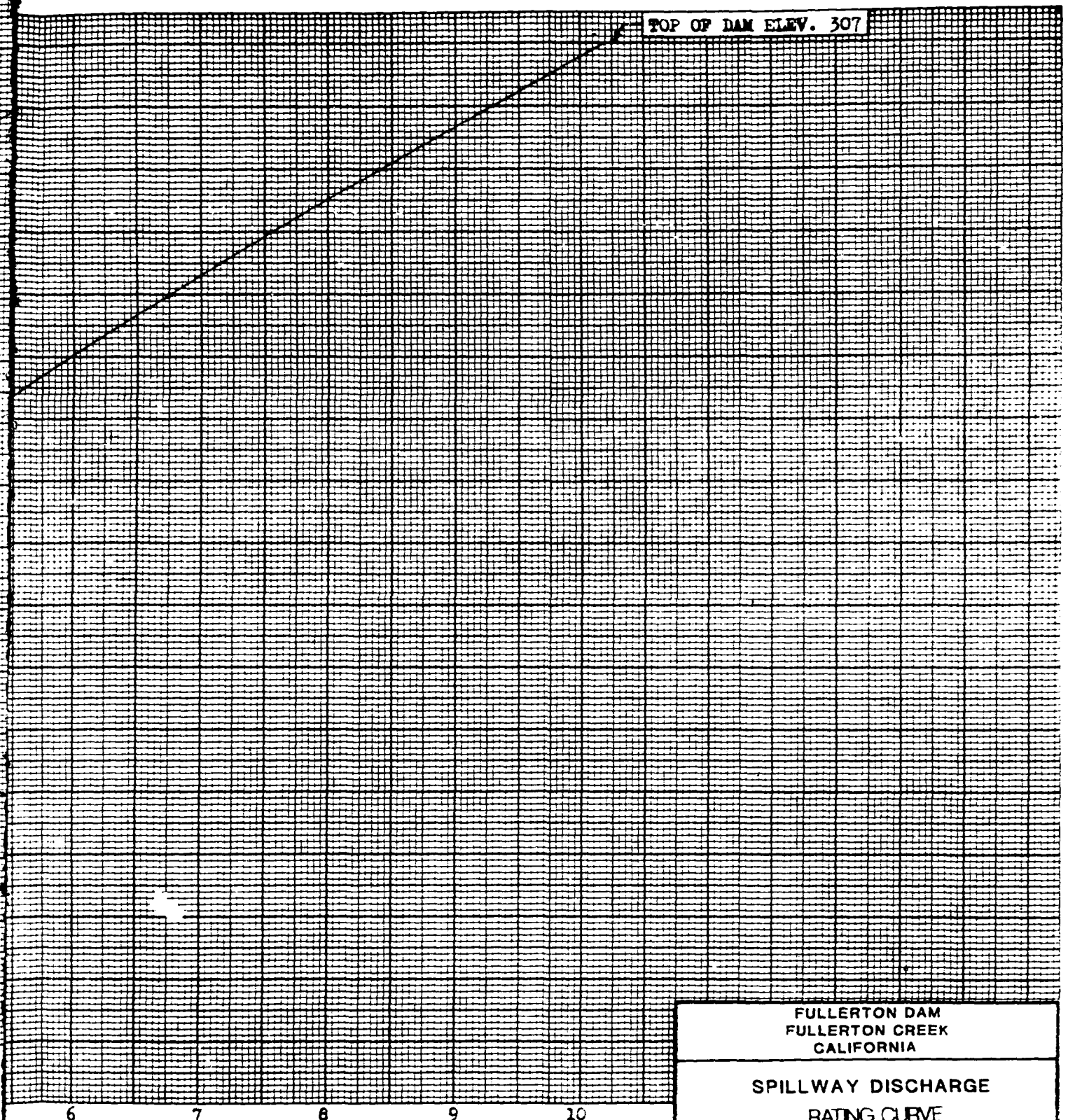


SECTION B-B

FULLERTON DAM FULLERTON CREEK CALIFORNIA
SPILLWAY PLAN AND PROFILE
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

PLATE 2-13


WATER SURFACE ELEVATION (FT. NGVD)
307
306
305
304
303
302
301
300
299
298
297
296
295
294
293
292
291
290
SPILLWAY CREST ELEV. 290
0
1
2
3
4
5
6
7
DISCHARGE IN THOUSAND CUBIC FEET PER SECOND



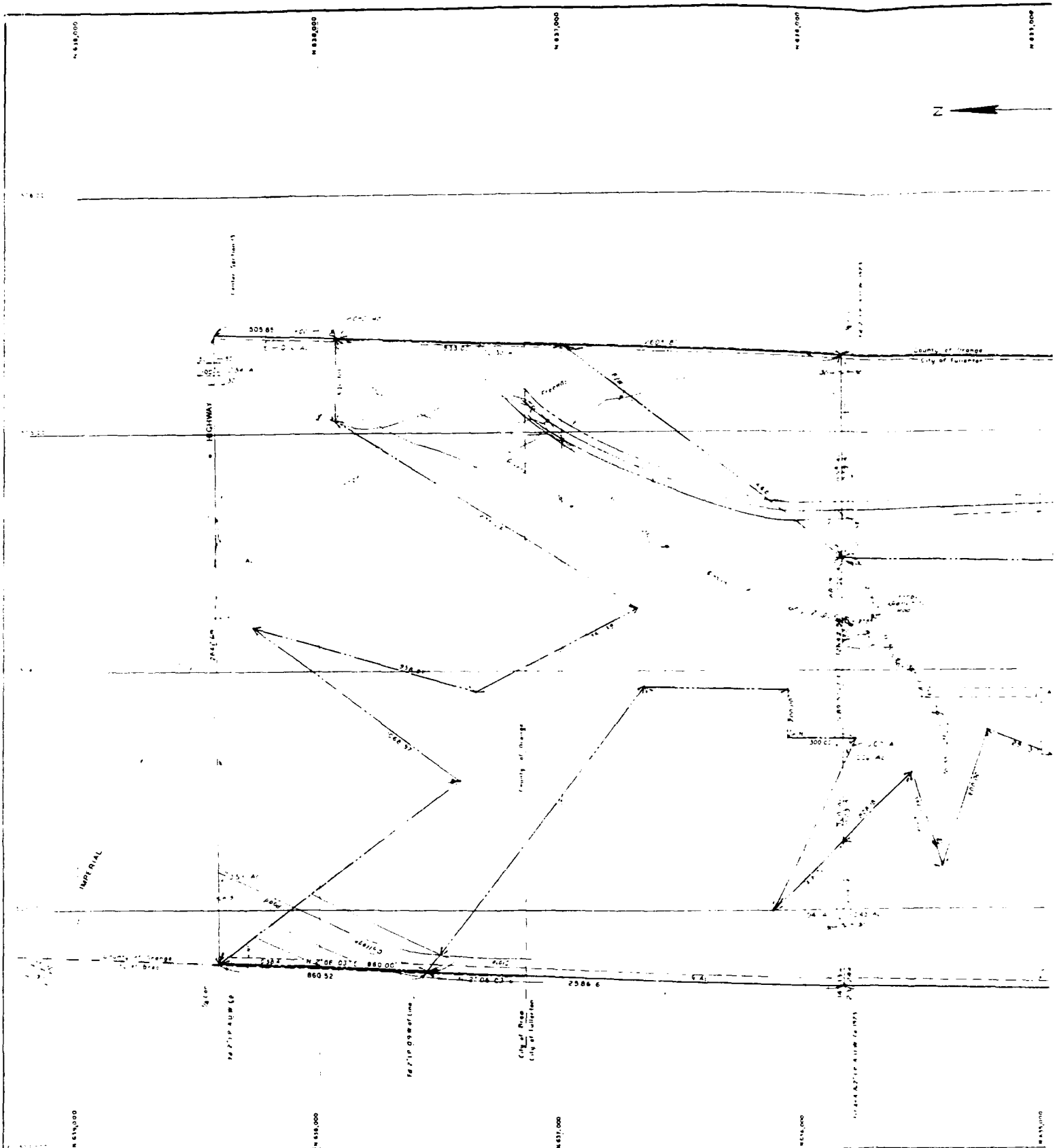
AND CUBIC FEET PER SECOND

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

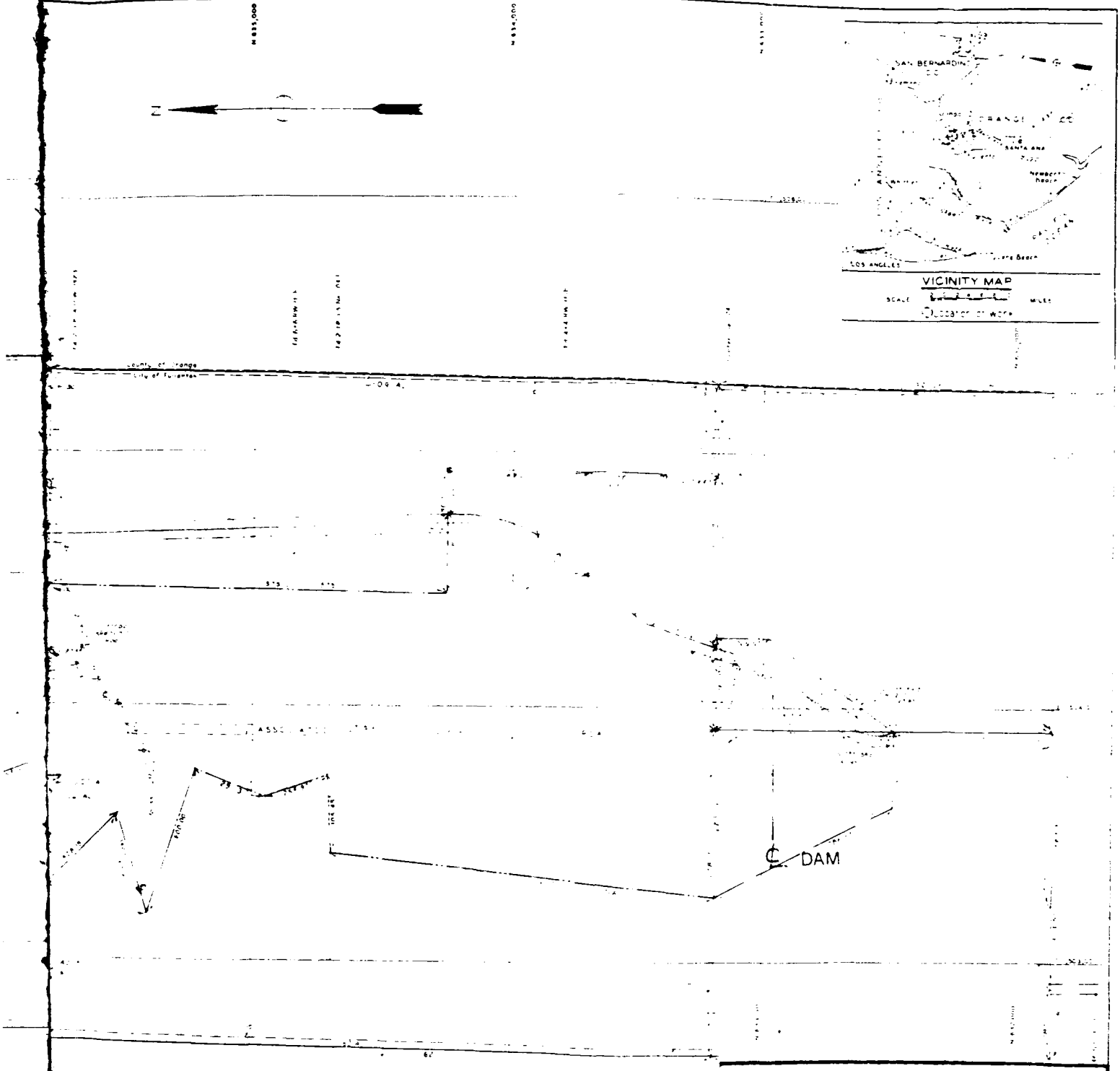
SPILLWAY DISCHARGE
RATING CURVE

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-14



1.59 ACRES TO GENERAL SERVICES ADMINISTRATION BY REPORT OF EXCESS (STANDARD FORM 118, NO. LA-24) ON 7 NOVEMBER 1956
GENERAL SERVICES ADMINISTRATION CONVEYED TO (THOMAS STRAIN, JR.) BY QUITCLAIM DEED DATED 30 AUGUST 1957.

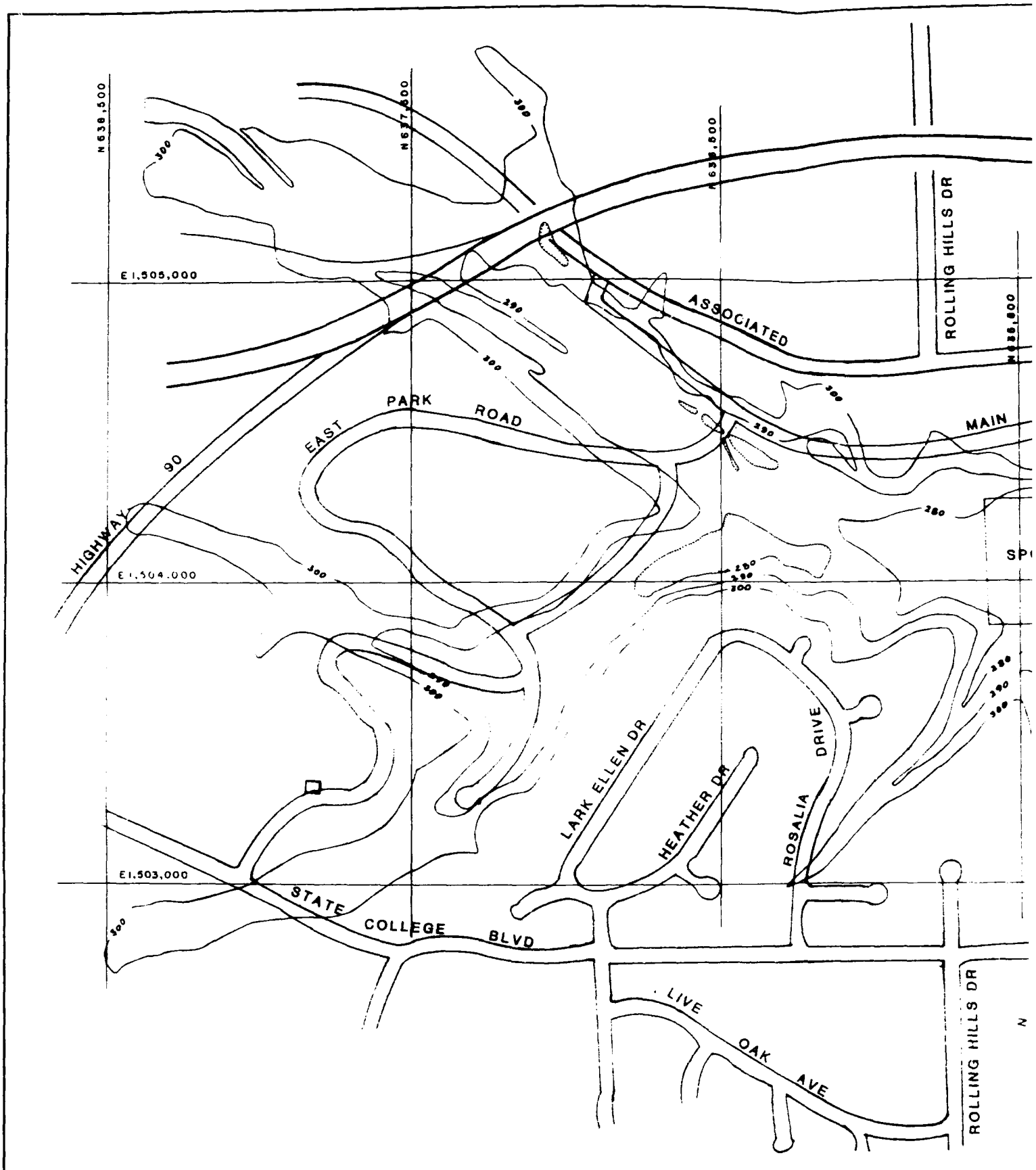


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

REAL ESTATE BOUNDARIES

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-15


N638,500
N637,500
N636,500
N635,800
E1,505,000
E1,504,000
E1,503,000
ASSOCIATED
ROLLING HILLS DR
EAST PARK ROAD
MAIN
HIGHWAY 90
LARK ELLEN DR
HEATHER DR
ROSALIA DRIVE
STATE COLLEGE BLVD
LIVE OAK AVE
ROLLING HILLS DR
300
290
280

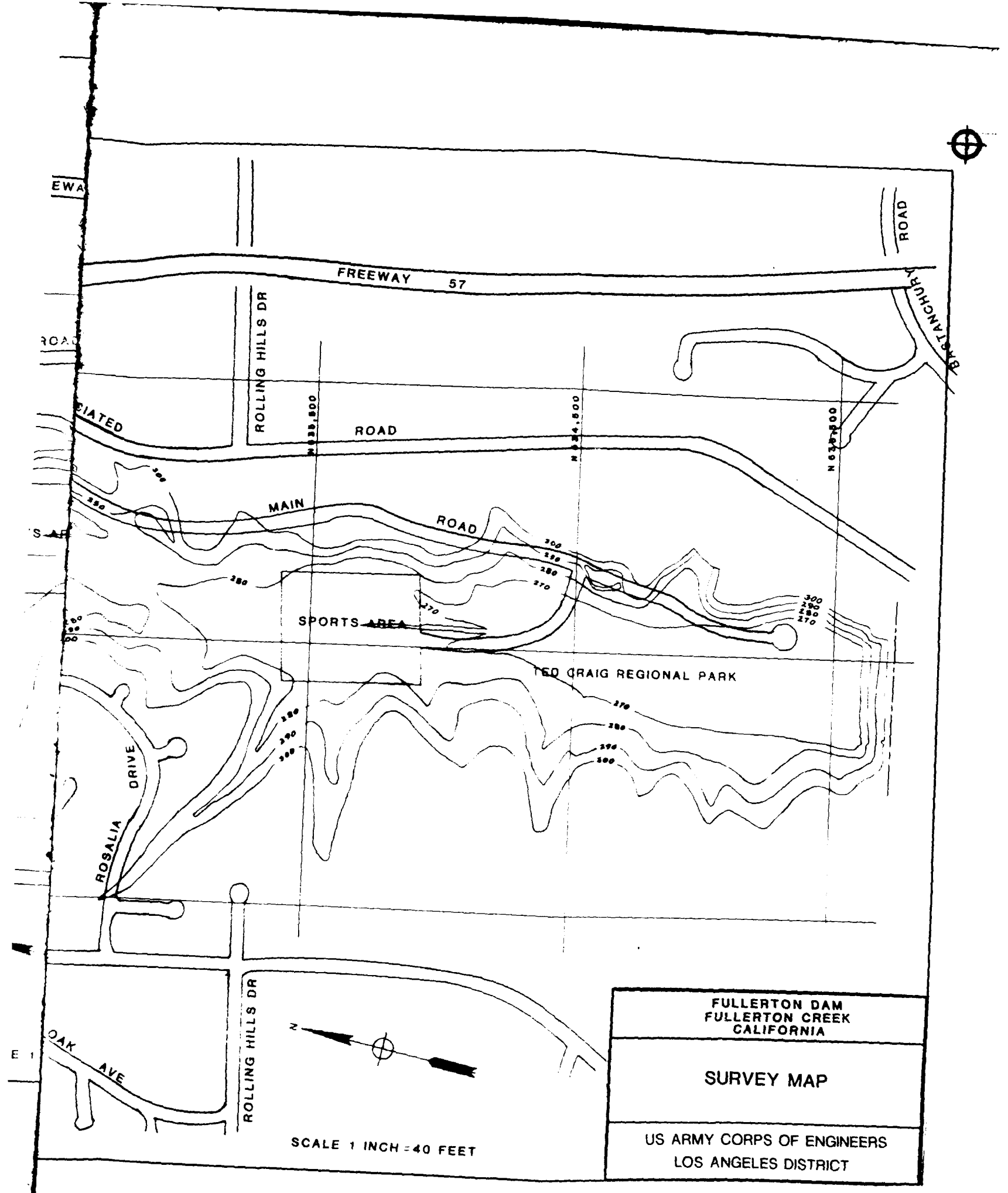
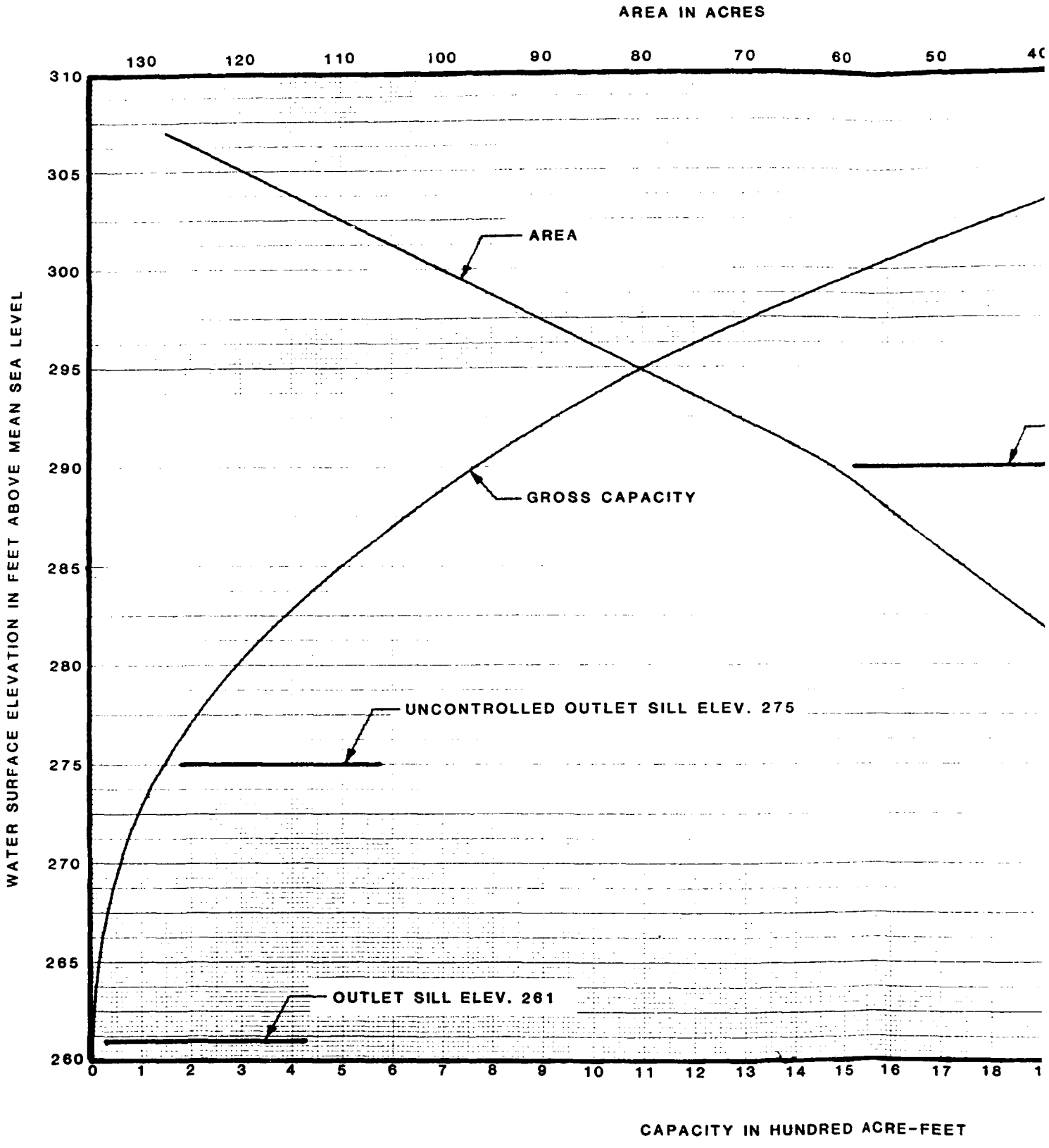
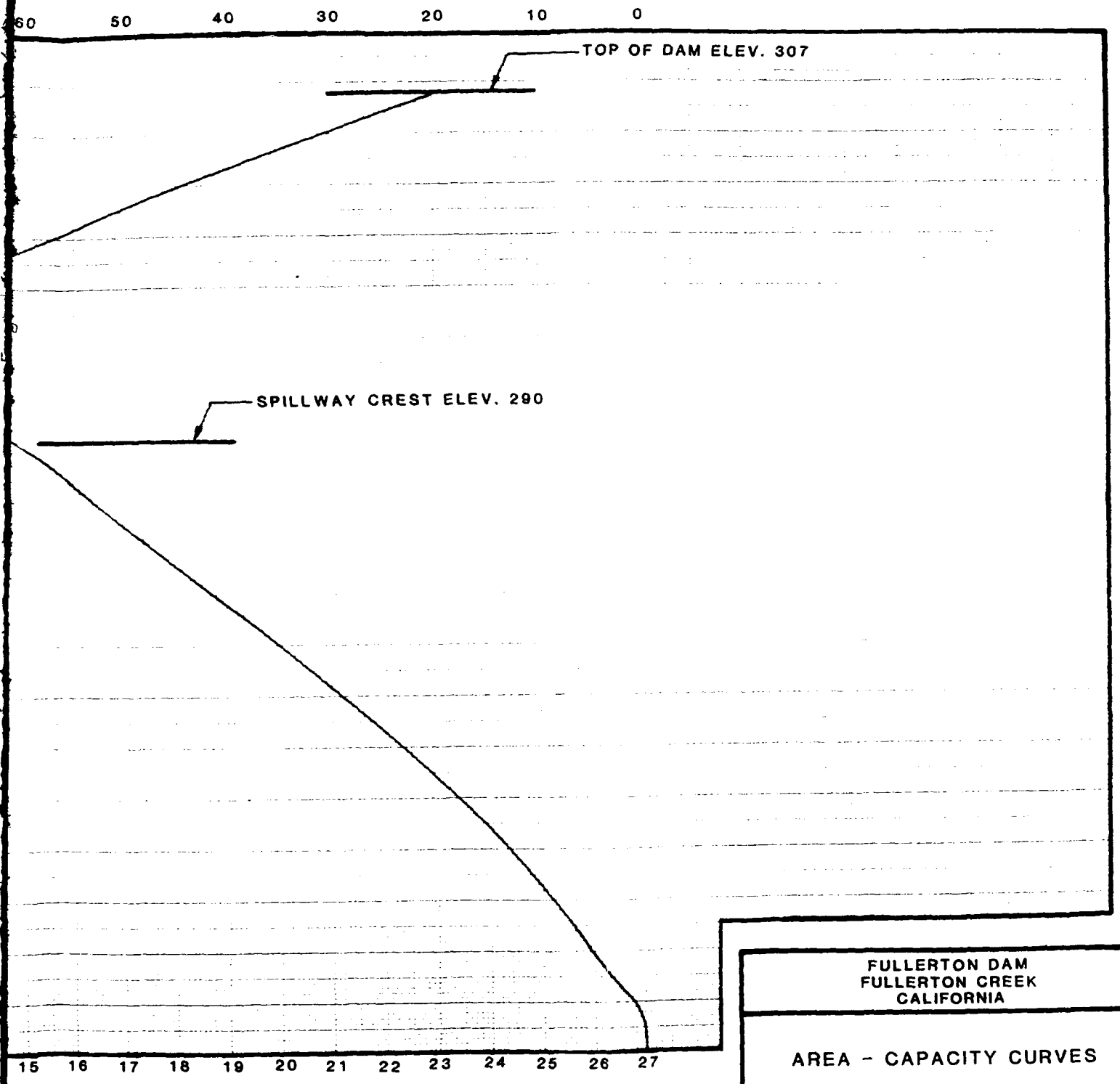

FREEWAY 57
ROAD
ROLLING HILLS DR
ROAD
MAIN ROAD
SPORTS AREA
TED CRAIG REGIONAL PARK
ROSALIA DRIVE
ROLLING HILLS DR
OAK AVE
SCALE 1 INCH = 40 FEET
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA
SURVEY MAP
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-16


AREA IN ACRES
130
120
110
100
90
80
70
60
50
310
305
300
295
290
285
280
275
270
265
260
AREA
GROSS CAPACITY
UNCONTROLLED OUTLET SILL ELEV. 275
OUTLET SILL ELEV. 261
WATER SURFACE ELEVATION IN FEET ABOVE MEAN SEA LEVEL
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
CAPACITY IN HUNDRED ACRE-FEET

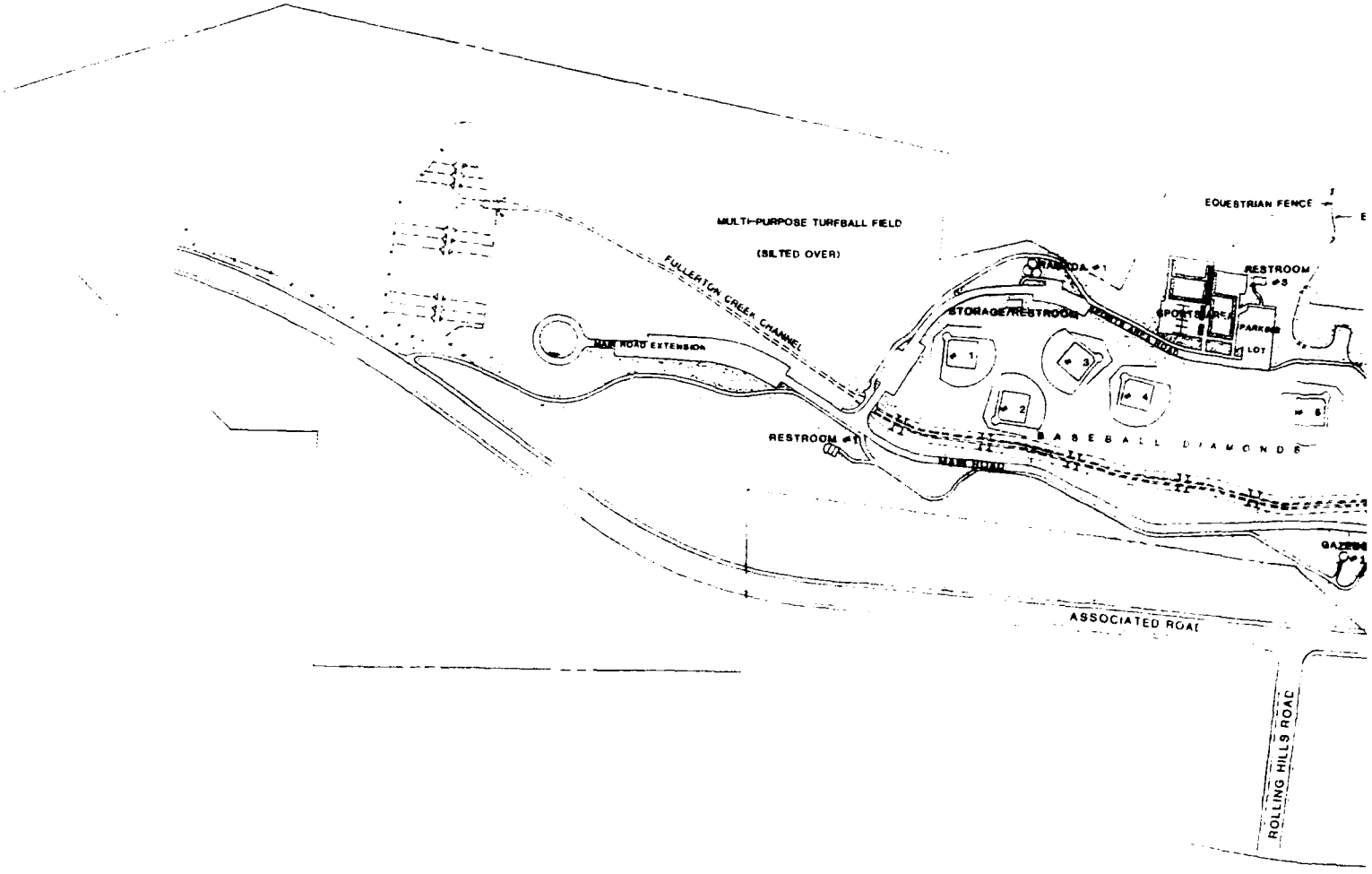


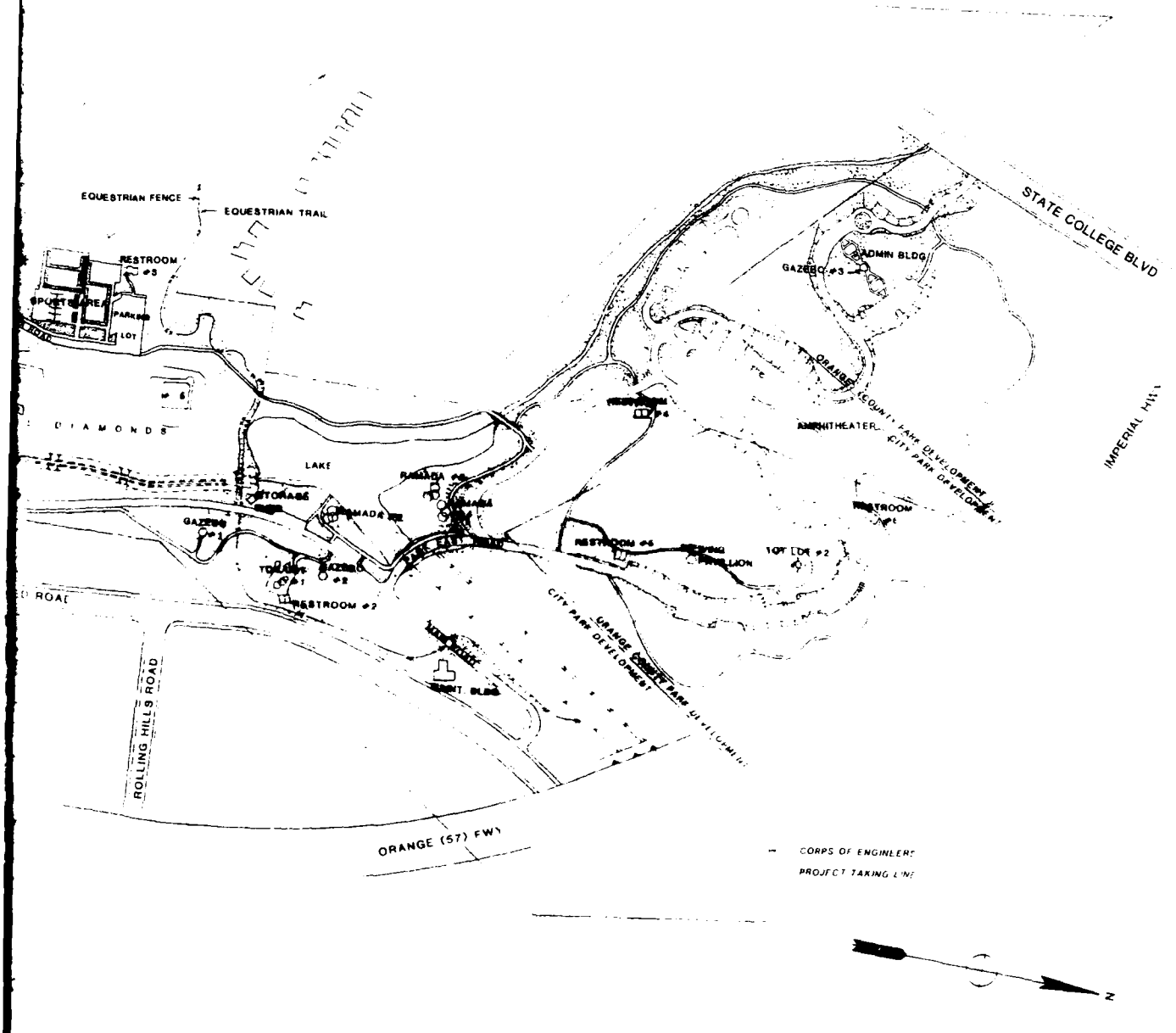
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

AREA - CAPACITY CURVES

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-17


MULTI-PURPOSE TURFBALL FIELD
(SILTED OVER)
FULLERTON CREEK CHANNEL
MAIN ROAD EXTENSION
EQUESTRIAN FENCE
RESTROOM #3
STORAGE/RESTROOM
SPECTATORS
PARKING LOT
#1
#2
#3
#4
#5
RESTROOM #1
BASEBALL DIAMONDS
ASSOCIATED ROAD
ROLLING HILLS ROAD

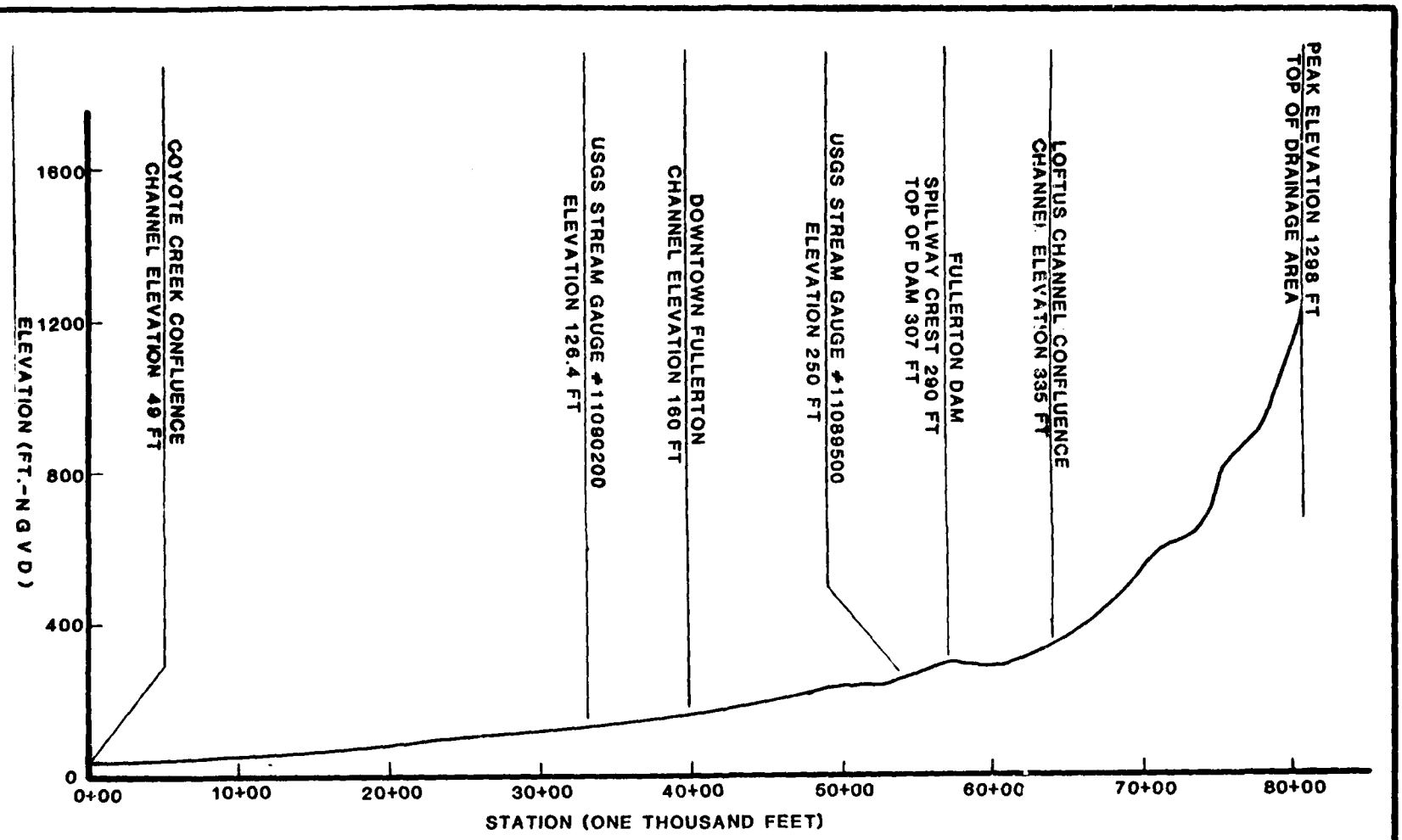


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

TED CRAIG REGIONAL PARK

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-11



NOTE: The horizontal distance axis is greatly compressed.

FULLERTON DAM FULLERTON CREEK CALIFORNIA
FULLERTON CREEK CHANNEL PROFILE
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

PLATE 4-01

FULLERTON DAM GAUGE AT FULLERTON DAM

PERIOD OF RECORD 1948- PRESENT

MEAN ANNUAL PRECIPITATION 13.6 IN

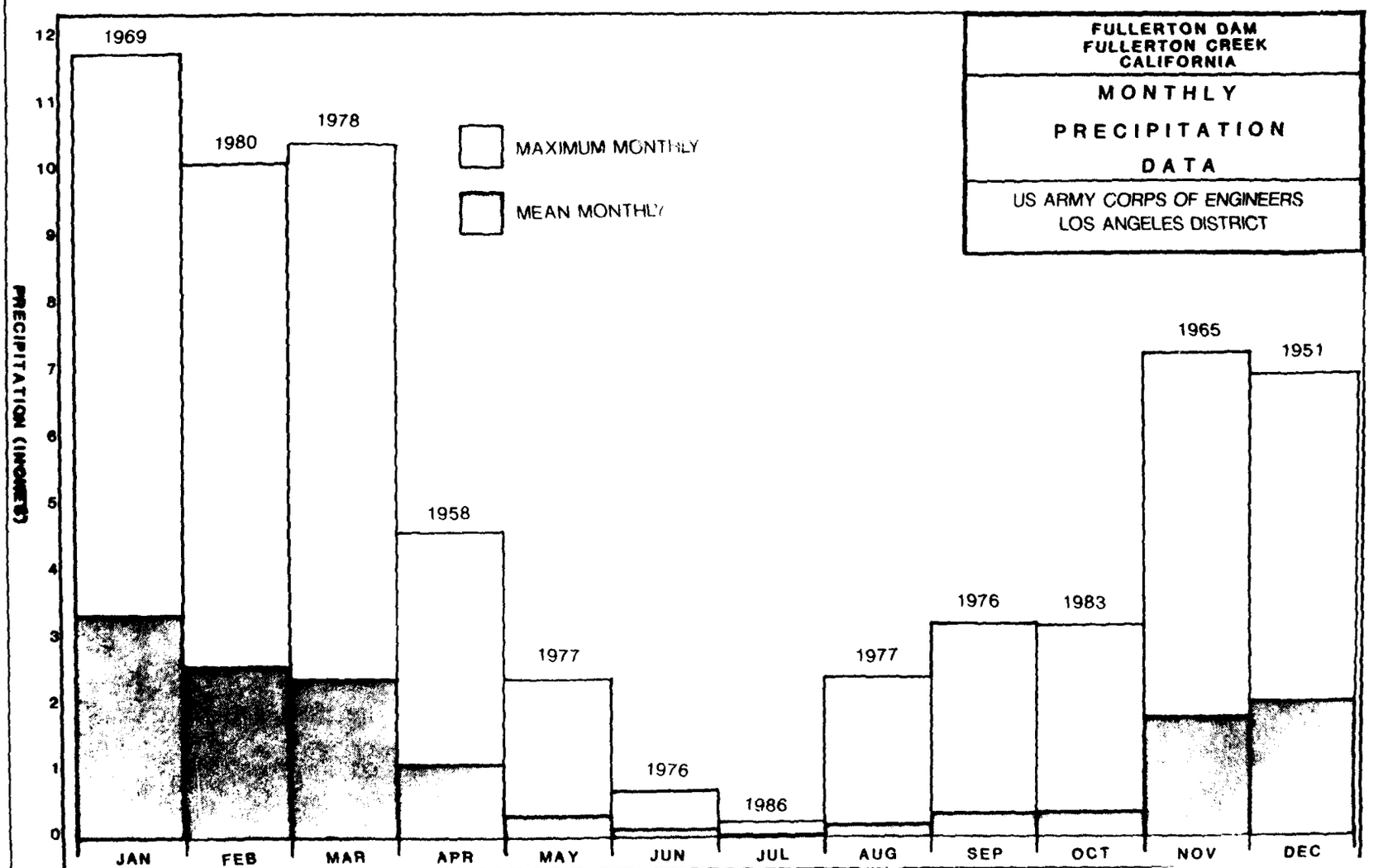


PLATE 2-12

Fullerton Dam Historic Precipitation Data (in

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1948							0.00	0.00	0.00	0.04
1949	1.91	1.64	1.19	0.00	0.30	0.00	0.00	0.00	0.00	0.00
1950	2.54	2.44	0.95	0.72	0.03	0.00	0.00	0.00	0.00	0.00
1951	2.27	0.68	0.40	1.56	0.38	0.00	0.00	0.11	0.15	0.00
1952	8.36	0.00	6.06	1.75	0.00	0.00	0.00	0.00	0.11	0.00
1953	1.35	0.56	0.88	1.13	0.00	0.00	0.00	0.00	0.00	0.00
1954	6.12	2.40	3.97	0.10	0.00	0.07	0.00	0.00	0.00	0.00
1955	4.29	1.12	0.17	0.84	1.30	0.00	0.00	0.00	0.00	0.00
1956	8.21	0.43	0.00	2.20	1.17	0.00	0.00	0.00	0.00	0.33
1957	3.81	1.02	0.72	1.11	1.14	0.24	0.00	0.00	0.00	1.56
1958	2.38	6.25	4.26	4.51	0.00	0.02	0.00	0.25	0.40	0.09
1959	1.77	3.44	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00
1960	2.73	2.82	0.52	1.17	0.12	0.00	0.00	0.00	0.00	0.69
1961	0.85	0.00	0.39	0.12	0.00	0.00	0.00	0.00	0.00	0.00
1962	2.87	8.23	0.91	0.00	0.19	0.01	0.00	0.00	0.00	0.10
1963	0.52	4.83	1.84	1.54	0.00	0.05	0.00	0.08	2.00	0.61
1964	1.15	0.15	1.75	0.47	0.21	0.18	0.00	0.00	0.00	0.18
1965	0.53	0.13	1.70	4.08	0.00	0.00	0.05	0.10	0.77	0.00
1966	0.93	1.44	0.38	0.00	0.02	0.00	0.00	0.00	0.02	0.02
1967	4.15	0.00	1.78	3.05	0.01	0.00	0.00	0.00	0.42	0.00
1968	1.06	0.66	3.13	0.61	0.00	0.00	0.14	0.00	0.00	0.20
1969	11.68	9.67	1.11	0.76	0.06	0.00	0.06	0.00	0.00	0.00
1970	1.98	2.45	1.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1971	0.59	0.86	0.35	0.47	0.22	0.00	0.00	0.00	0.00	0.33
1972	0.00	0.00	0.00	0.31	0.00	0.20	0.00	0.40	0.10	0.32
1973	3.02	4.79	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.10
1974	6.53	0.10	3.44	0.31	0.19	0.00	0.00	0.00	0.00	0.49
1975	0.10	2.65	4.26	1.40	0.00	0.00	0.00	0.00	0.00	0.22
1976	0.00	3.75	1.96	1.37	0.03	0.60	0.00	0.00	3.12	0.00
1977	2.44	0.67	0.92	0.00	2.30	0.00	0.00	2.35	0.00	0.00
1978	7.40	7.62	10.24	1.94	0.00	0.00	0.00	0.00	1.16	0.07
1979	10.40	0.00	4.47	0.00	0.00	0.00	0.00	0.00	0.00	0.86
1980	7.81	10.05	3.12	0.43	0.25	0.01	0.00	0.00	0.00	0.00
1981	2.94	1.64	3.62	0.29	0.05	0.00	0.00	0.00	0.00	0.21
1982	3.15	0.64	5.50	1.57	0.03	0.00	0.00	0.02	0.38	0.16
1983	4.62	5.24	8.33	3.63	0.14	0.00	0.00	0.17	0.95	3.09
1984	0.28	0.00	0.26	0.68	0.00	0.00	0.00	0.05	0.23	0.13
1985	1.21	1.90	1.34	0.00	0.08	0.00	0.00	0.00	0.24	0.15
1986	2.26	4.83	3.50	0.59	0.00	0.00	0.16	0.00	2.00	0.49
1987	3.40	0.96	0.94	0.13	0.02	0.00	0.05	0.07	0.20	2.07
1988	2.25	1.20	0.07	1.88	0.00	0.00	0.00			
Ave.	3.25	2.43	2.23	1.03	0.21	0.04	0.01	0.10	0.30	0.31
Max.	11.68	10.05	10.24	4.51	2.30	0.60	0.16	2.35	3.12	3.09

ic Precipitation Data (in inches).

AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL	ANNUAL PEAK 24 HR
0.00	0.00	0.04	0.00	2.05		1.10
0.00	0.00	0.00	0.82	2.87	8.73	1.10
0.00	0.00	0.00	2.83	0.00	9.51	2.11
0.11	0.15	0.00	1.15	6.84	13.54	1.58
0.00	0.11	0.00	3.55	3.06	22.89	4.18
0.00	0.00	0.00	1.16	0.29	5.37	1.78
0.00	0.00	0.00	1.46	0.86	14.98	2.58
0.00	0.00	0.00	1.35	0.67	9.74	1.37
0.00	0.00	0.33	0.00	0.38	12.72	5.43
0.00	0.00	1.56	0.81	3.10	13.51	1.39
0.25	0.40	0.09	0.20	0.00	18.36	2.85
0.00	0.00	0.00	0.09	1.41	7.11	1.59
0.00	0.00	0.69	1.94	0.10	10.09	1.29
0.00	0.00	0.00	1.08	1.75	4.19	0.80
0.00	0.00	0.10	0.03	0.00	12.34	2.22
0.08	2.00	0.61	2.79	0.00	14.26	4.09
0.00	0.00	0.18	1.23	1.26	6.58	2.10
0.10	0.77	0.00	7.18	3.35	17.89	1.80
.00	0.02	0.02	2.30	6.15	11.26	2.68
.00	0.42	0.00	3.18	1.81	14.40	2.31
.00	0.00	0.20	0.24	1.43	7.47	2.41
.00	0.00	0.00	2.06	0.19	25.59	3.63
.00	0.00	0.00	4.00	3.78	14.06	1.99
.00	0.00	0.33	0.25	5.60	8.67	2.93
.40	0.10	0.32	3.65	1.88	6.86	1.98
.00	0.00	0.10	1.73	0.52	12.96	NA
.00	0.00	0.49	0.00	3.51	14.57	2.56
.00	0.00	0.22	0.61	0.22	9.46	NA
.00	3.12	0.00	0.62	0.86	12.31	2.05
.35	0.00	0.00	0.08	5.56	14.32	2.78
.00	1.16	0.07	1.80	2.63	32.86	3.03
.00	0.00	0.86	0.21	0.29	16.23	4.78
.00	0.00	0.00	0.00	0.79	22.46	NA
.00	0.00	0.21	3.46	0.58	12.79	NA
.02	0.38	0.16	3.96	1.95	17.36	NA
.17	0.95	3.09	3.45	2.03	31.65	NA
.05	0.23	0.13	2.05	5.14	8.82	NA
.00	0.24	0.15	3.95	0.29	9.16	NA
.00	2.00	0.49	1.12	0.21	15.16	NA
.07	0.20	2.07	0.84	2.14	10.82	NA
.10	0.30	0.31	1.68	1.89	13.62	2.44
.35	3.12	3.09	7.18	6.84	32.86	5.43

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

FULLERTON DAM
HISTORIC PRECIPITATION
DATA

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-03

Precipitation Depth-Duration-Frequency

STATION: FULLERTON DAM ELEVATION: 340 ft. LAT: 33.897 LONG: 117.885

MAXIMUM PRECIPITATION FOR INDICATED DURATION

RETURN PERIOD IN YEARS	15 Min	30 Min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr	Water year
2	0.25	0.35	0.50	0.71	0.86	1.24	1.73	2.22	12.22
5	0.37	0.51	0.73	1.04	1.27	1.82	2.55	3.27	17.20
10	0.45	0.62	0.89	1.26	1.54	2.21	3.09	3.96	20.36
20	0.52	0.72	1.03	1.47	1.79	2.57	3.59	4.61	23.26
25	0.54	0.75	1.08	1.53	1.87	2.68	3.75	4.81	24.16
40	0.59	0.82	1.17	1.67	2.04	2.92	4.07	5.23	26.00
50	0.61	0.85	1.21	1.73	2.11	3.02	4.22	5.42	26.86
100	0.68	0.94	1.35	1.92	2.34	3.36	4.69	6.02	29.46
200	0.75	1.03	1.48	2.10	2.57	3.68	5.14	6.60	31.98
MEAN	0.276	0.382	0.546	0.778	0.949	1.360	1.899	2.438	13.103
N	29	29	34	34	34	34	34	34	33
Record maximum	1953	1961	1978	1979	1974	1979	1979	1956	1978
Record year	0.54	0.65	0.98	1.35	1.63	2.45	3.68	5.43	32.86

SOURCE: Rainfall Depth-Duration-Frequency for California, State of CA, DWR. Revised November 1982.

Pearson Type III distribution used in analysis.
Database duration from 1942-1982.

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

PRECIPITATION DEPTH-DURATION-FREQUENCY

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-04

Peak Annual Flow at Fullerton Reservoir

WATERYEAR	PEAK INFLOW DATE	ESTIMATED* PEAK INFLOW (CFS)	24 HR DATE (IF DIFFERENT)	MAX. 24 HR** INFLOW (CFS)	PEAK OUTFLOW DATE	USGS INST. PEAK OUTFLOW (CFS)	MAX WSE DATE	MAX WSE
1930-31	4 FEB	12		2	NO DAM CONSTRUCTED			
31-32	8 FEB	230		52	NO DAM CONSTRUCTED			
32-33	29 JAN	40		5	NO DAM CONSTRUCTED			
33-34	1 JAN	--		63	NO DAM CONSTRUCTED			
1934-35	17 OCT	1050		96	NO DAM CONSTRUCTED			
35-36	12 FEB	292		39	NO DAM CONSTRUCTED			
36-37	16 FEB	636		184	NO DAM CONSTRUCTED			
37-38	2 MAR	900		346	NO DAM CONSTRUCTED			
38-39	19 DEC	333		50	NO DAM CONSTRUCTED			
1939-40	8 JAN	358		--	NO DAM CONSTRUCTED			
40-41	14 MAR	3800+		--	DAM NOT COMPLETED		14 MAR	282.80
41-42	10 DEC	12		0	--	--	JUN	265.89
42-43	22 JAN	435		216	16 MAR	298	23 JUN	279.71
43-44	22 FEB	380		139	25 FEB	102	22 FEB	277.21
1944-45	15 MAR	43	14 NOV	12	14 NOV	85	14 NOV	267.80
45-46	23 DEC	135		25	23 APR	63	23 DEC	240.39
46-47	25 DEC	31		14	3 JAN	22	26 DEC	270.39
47-48	--	0		0	--	0	--	261.00
48-49	--	0		0	--	0	--	261.00
1949-50	6 FEB	25		4	8 FEB	66	6 FEB	266.00
50-51	--	0		0	--	0	--	261.00
51-52	16 JAN	600	18 JAN	178	19 JAN	115	18 JAN	281.75
52-53	2 DEC	60		4	2 DEC	38	2 DEC	266.20
53-54	13 FEB	120		25	25 JAN	56	13 FEB	269.79
1954-55	16 JAN	76		12	19 JAN	83	19 JAN	268.10
55-56	26 JAN	435		157	27 JAN	198	26 JAN	279.92
56-57	23 APR	12		--	23 APR	12	23 APR	266.40
57-58	3 FEB	420		88	18 MAR	110	4 FEB	275.53
58-59	9 FEB	21		4	6 JAN	18	9 FEB	265.04
1959-60	2 FEB	56		7	12 JAN	17	2 FEB	265.95
60-61	3 OCT	7		--	3 OCT	7	3 OCT	261.40
61-62	15 FEB	233	11 FEB	56	13 FEB	57	11 FEB	271.46
62-63	10 FEB	96		28	10 FEB	23	10 FEB	268.80
63-64	20 NOV	27		7	20 NOV	15	20 NOV	265.15
1964-65	9 APR	74		12	9 APR	20	9 APR	267.21
65-66	23 NOV	120		42	29 DEC	22	23 NOV	270.67
66-67	24 JAN	495		97	24 JAN	128	24 JAN	275.68
67-68	8 MAR	385		81	8 MAR	26	8 MAR	273.20
68-69	24 FEB	600	25 JAN	241	25 JAN	313	25 JAN	278.55
1969-70	4 MAR	73		18	5 MAR	36	5 MAR	267.45
70-71	21 DEC	425		43	21 DEC	30	21 DEC	271 51
71-72	24 DEC	237	27 DEC	55	24 DEC	23	27 DEC	271.30
72-73	16 JAN	283	11 FEB	78	2 MAR	26	13 FEB	273.76
73-74	6 JAN	515	7 JAN	106	7 JAN	259	7 JAN	276.89
1974-75	4 DEC	475		52	8 MAR	60	4 DEC	272.08
75-76	10 SEP	225		69	12 SEP	48	11 SEP	272.74
76-77	3 JAN	260		38	13 AUG	162	3 JAN	270.76

1979-80	13 FEB	1700			18 FEB	299	16 FEB	279.60
62-63	10 FEB	96		[illegible]	17 FEB	21	10 FEB	268.80
63-64	20 NOV	27		-	20 NOV	15	20 NOV	265.15
1964-65	9 APR	74		12	9 APR	20	9 APR	267.21
65-66	23 NOV	120		47	29 DEC	22	23 NOV	270.67
66-67	24 JAN	495		97	24 JAN	128	24 JAN	275.68
67-68	8 MAR	385		81	8 MAR	26	8 MAR	273.20
68-69	24 FEB	600	25 JAN	241	25 JAN	313	25 JAN	278.55
1969-70	4 MAR	73		18	5 MAR	36	5 MAR	267.45
70-71	21 DEC	425		43	21 DEC	30	21 DEC	271.51
71-72	24 DEC	237	27 DEC	55	24 DEC	23	27 DEC	271.30
72-73	16 JAN	283	11 FEB	78	2 MAR	26	13 FEB	273.76
73-74	6 JAN	515	7 JAN	106	7 JAN	259	7 JAN	276.89
1974-75	4 DEC	475		52	8 MAR	60	4 DEC	272.08
75-76	10 SEP	225		69	12 SEP	48	11 SEP	272.74
76-77	3 JAN	260		38	17 AUG	162	3 JAN	270.76
77-78	1 MAR	1500		257	9 FEB	263	4 MAR	280.90
78-79	5 JAN	1490	30 JAN	356+	31 JAN	296	31 JAN	285.57+
1979-80	13 FEB	1700		275	18 FEB	299	16 FEB	279.60
80-81	1 MAR	980		164	1 MAR	275	1 MAR	276.19
81-82	17 MAR	560		167	1 APR	219	17 MAR	270.60
82-83	1 MAR	1890		327	1 MAR	392+	1 MAR	285.00
83-84	1 OCT	960	24 NOV	176	1 OCT	243	1 OCT	276.70
1984-85	27 DEC	810	18 DEC	111	18 DEC	221	18 DEC	271.90

*Data set is not homogeneous. Values are derived from:
- USGS gauges near damsite
- dam inflow records before and after completion of Loftus Diversion Channel.
- estimated peaks primarily based on hourly interval reservoir data.

**Data is homogeneous; adjusted for current conditions. Values derived from any 24-hour period of greatest inflow during event.

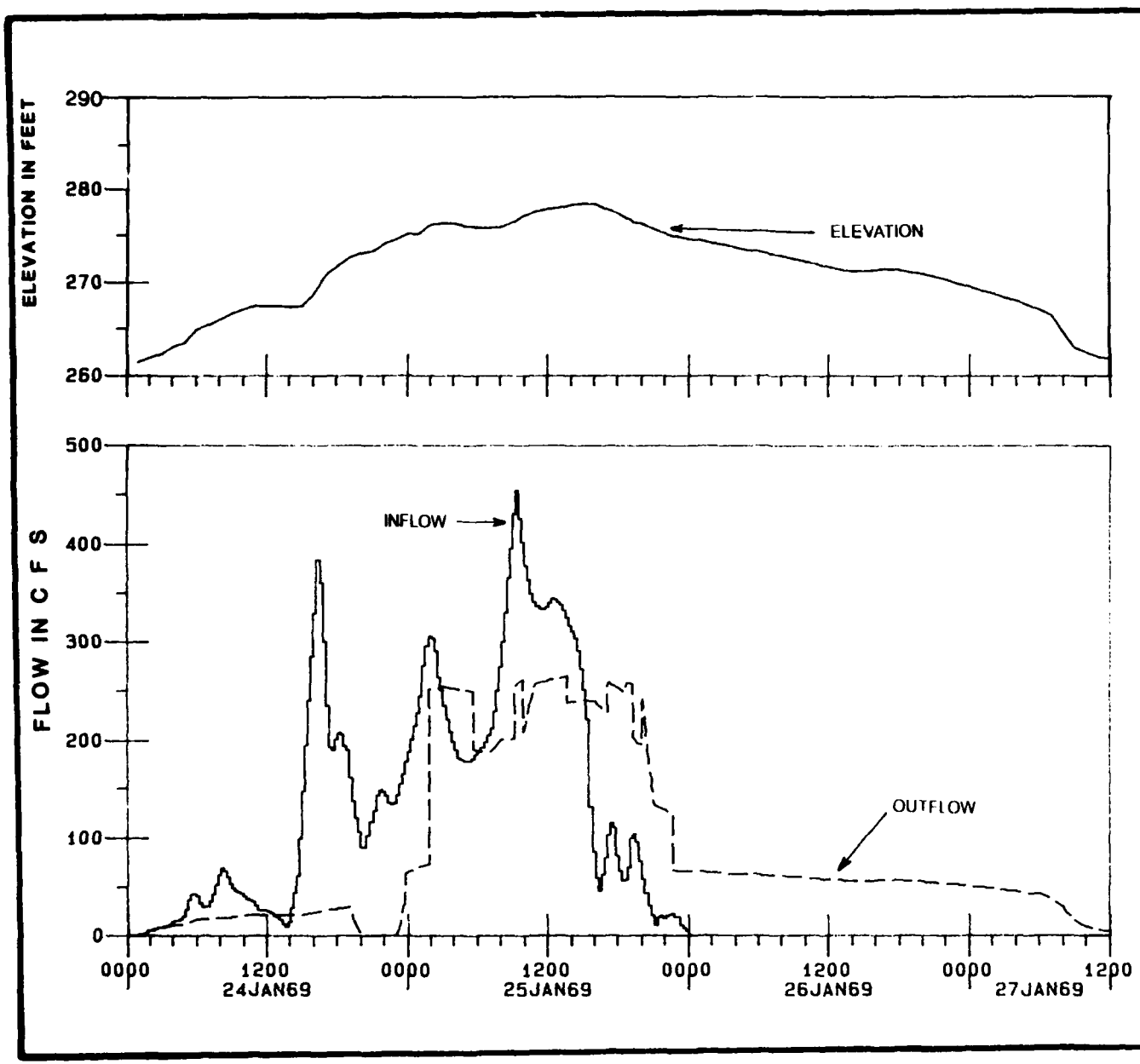
+Historic maximum.

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

PEAK ANNUAL FLOW AT FULLERTON RESERVOIR

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-05



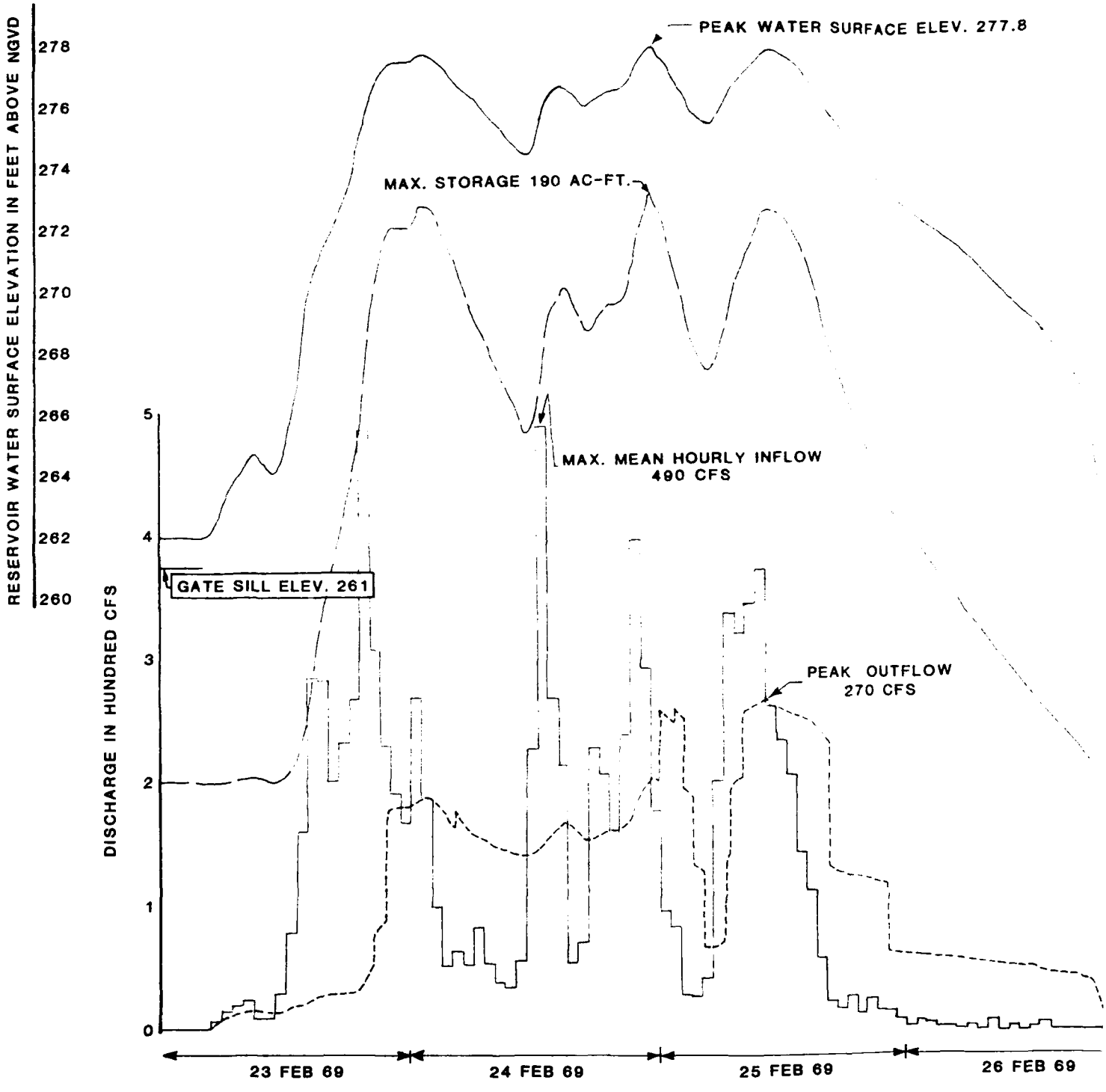
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

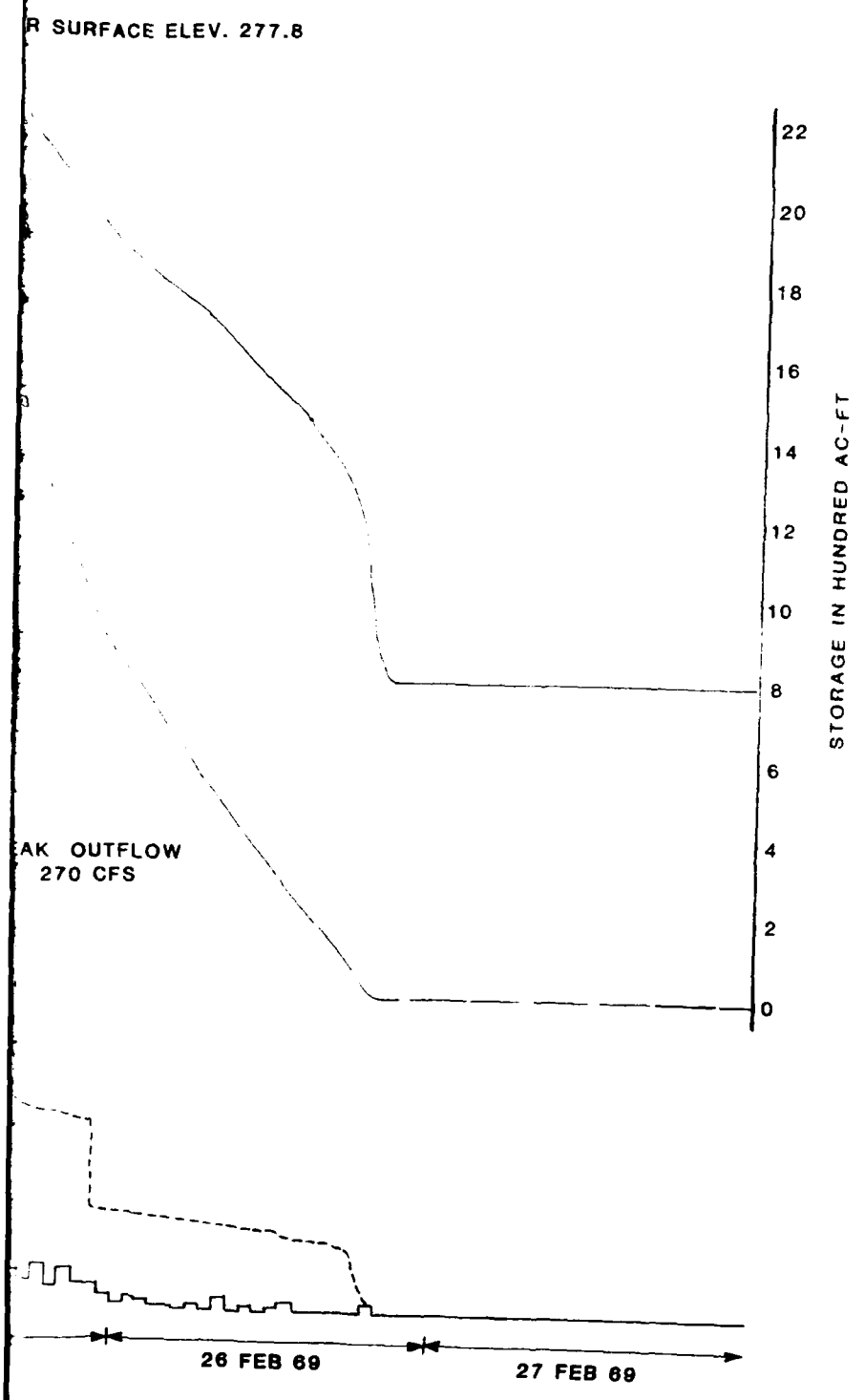
24-27 JAN 1969

FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

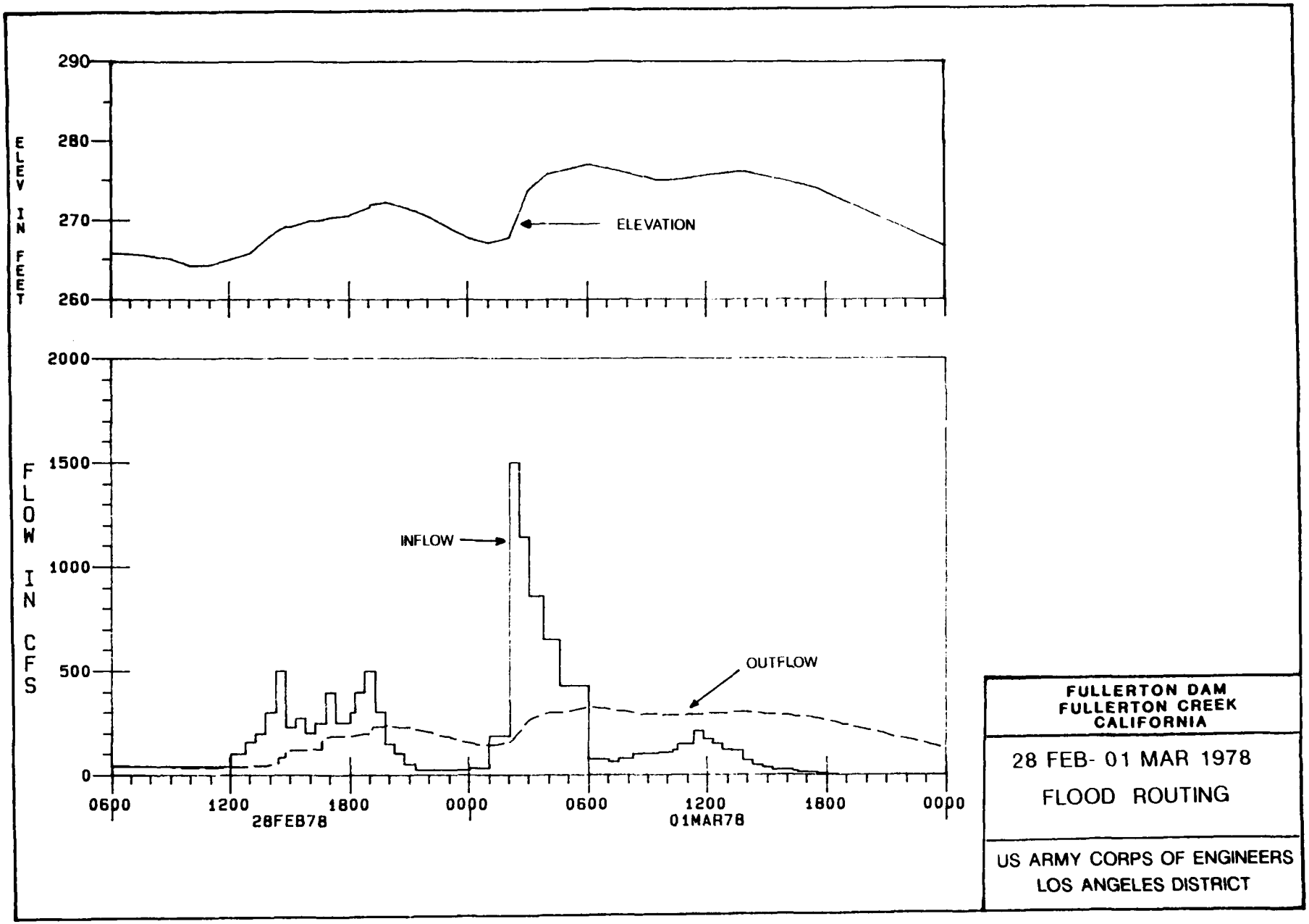
PLATE 4-06


RESERVOIR WATER SURFACE ELEVATION IN FEET ABOVE NGVD
278
276
274
272
270
268
266
264
262
260
PEAK WATER SURFACE ELEV. 277.8
MAX. STORAGE 190 AC-FT.
MAX. MEAN HOURLY INFLOW
490 CFS
GATE SILL ELEV. 261
PEAK OUTFLOW
270 CFS
DISCHARGE IN HUNDRED CFS
5
4
3
2
1
0
23 FEB 69
24 FEB 69
25 FEB 69
26 FEB 69



FULLERTON DAM FULLERTON CREEK CALIFORNIA
23-27 FEB 1969 FLOOD ROUTING
US ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

PLATE 4-07



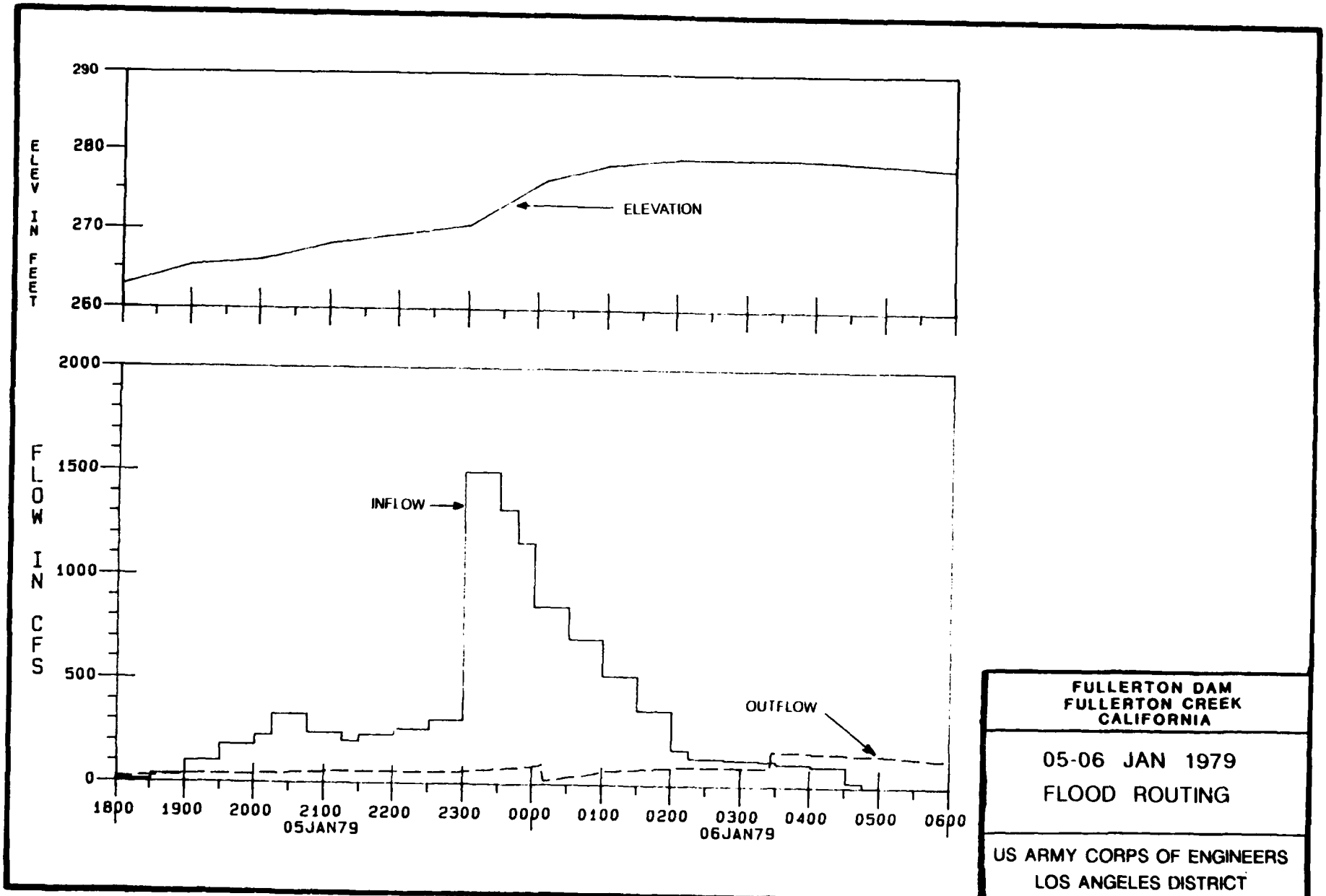
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

28 FEB- 01 MAR 1978

FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-08

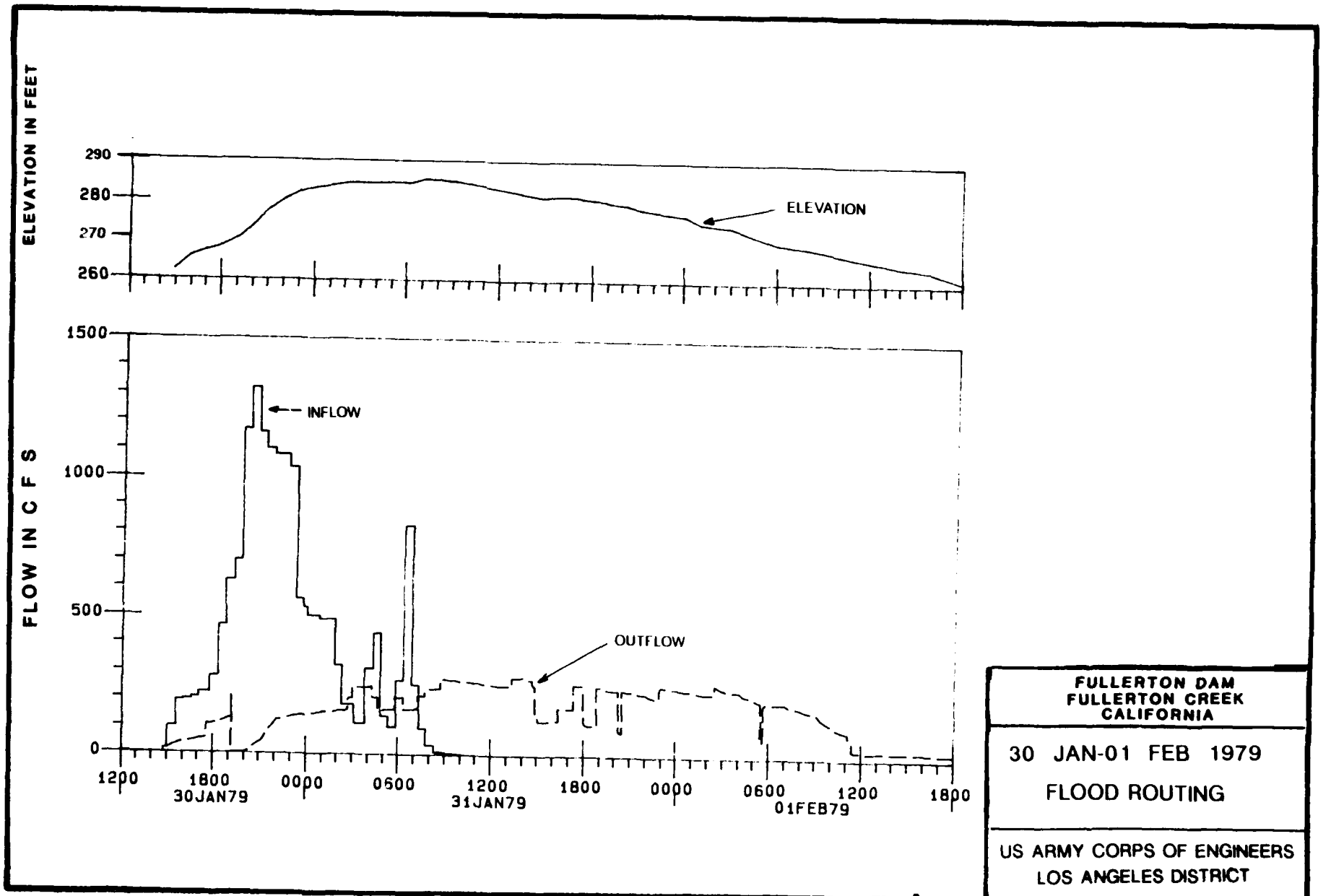


FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

05-06 JAN 1979
FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-09



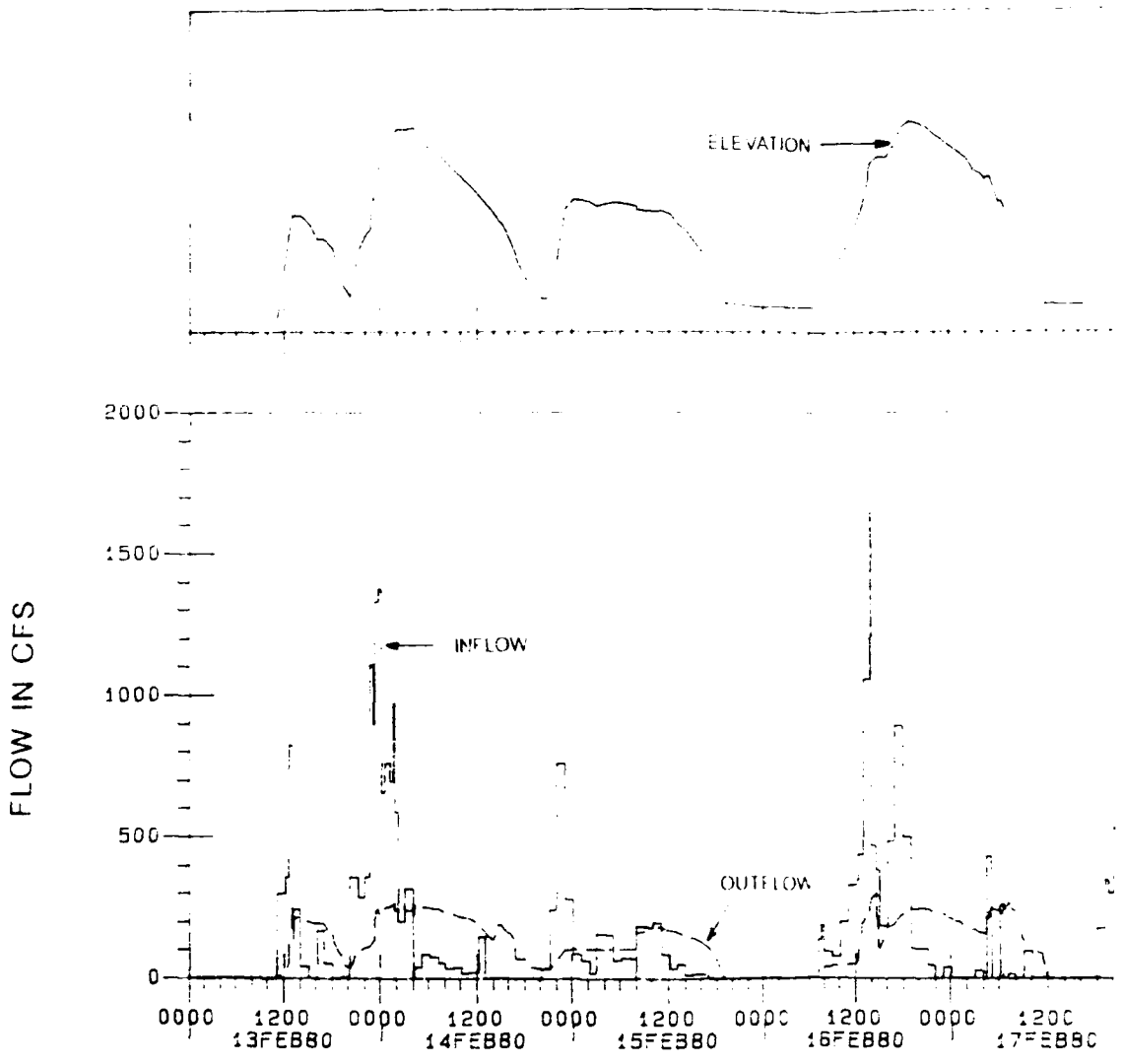
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

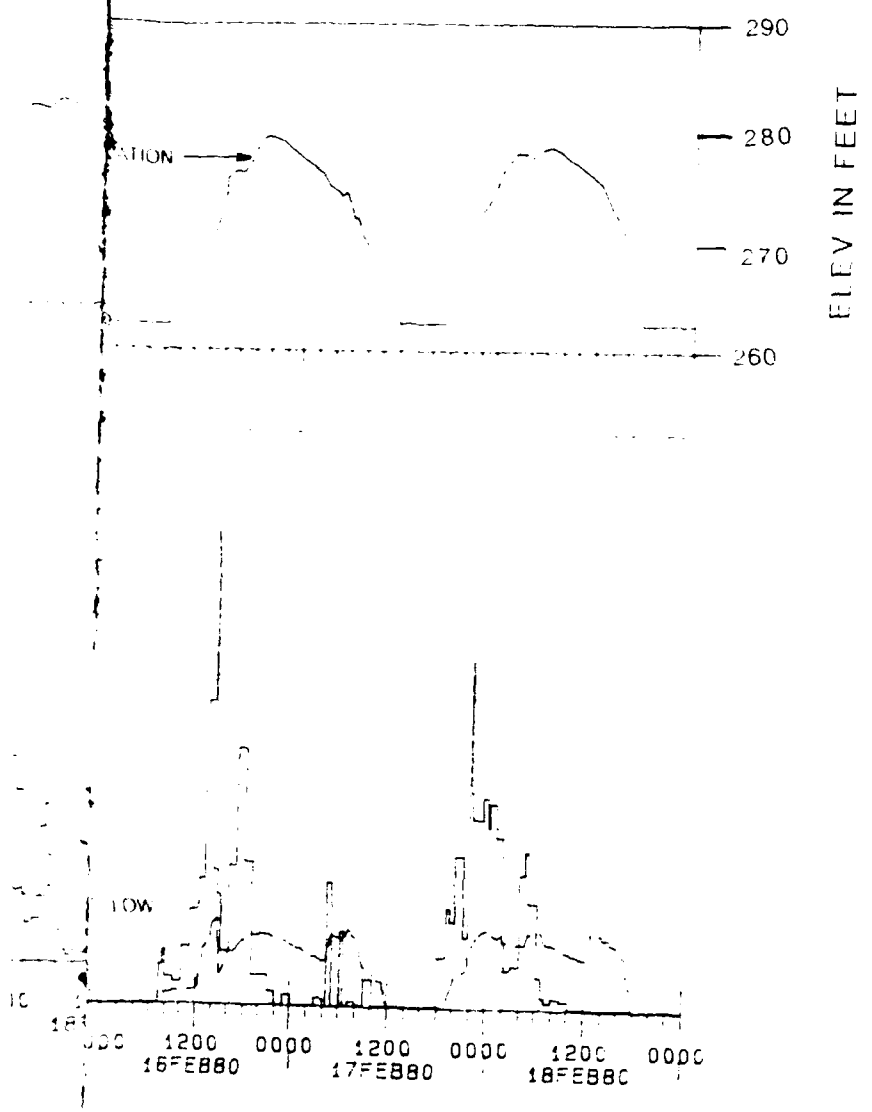
30 JAN-01 FEB 1979

FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-10


ELEVATION
2000
1500
1000
500
0
FLOW IN CFS
INFLOW
OUTFLOW
0000
1200
13FEB80
14FEB80
15FEB80
16FEB80
17FEB80



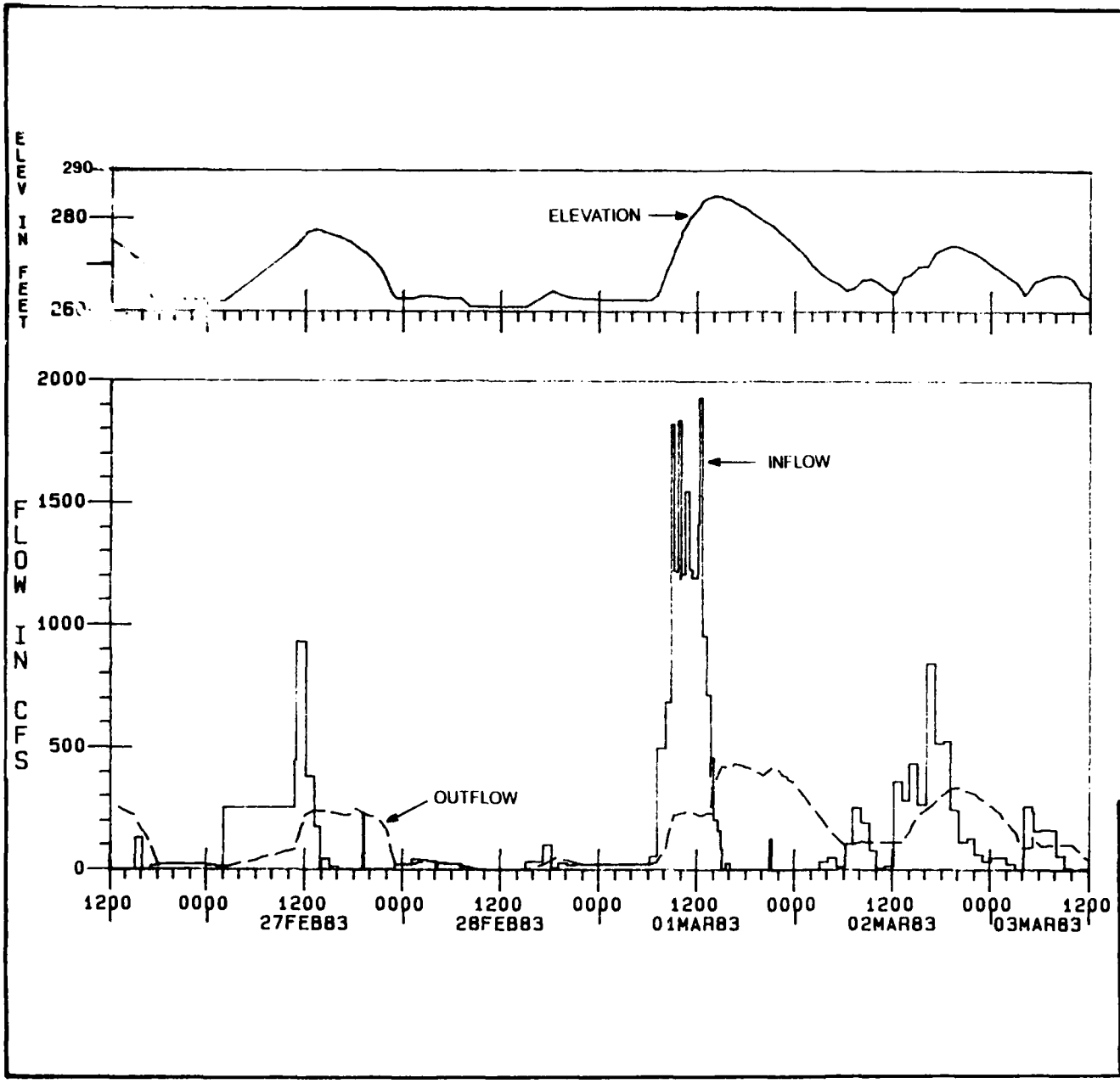
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

13-18 FEB 1980

FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-11



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

26 FEB - 03 MAR 1983

FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-12

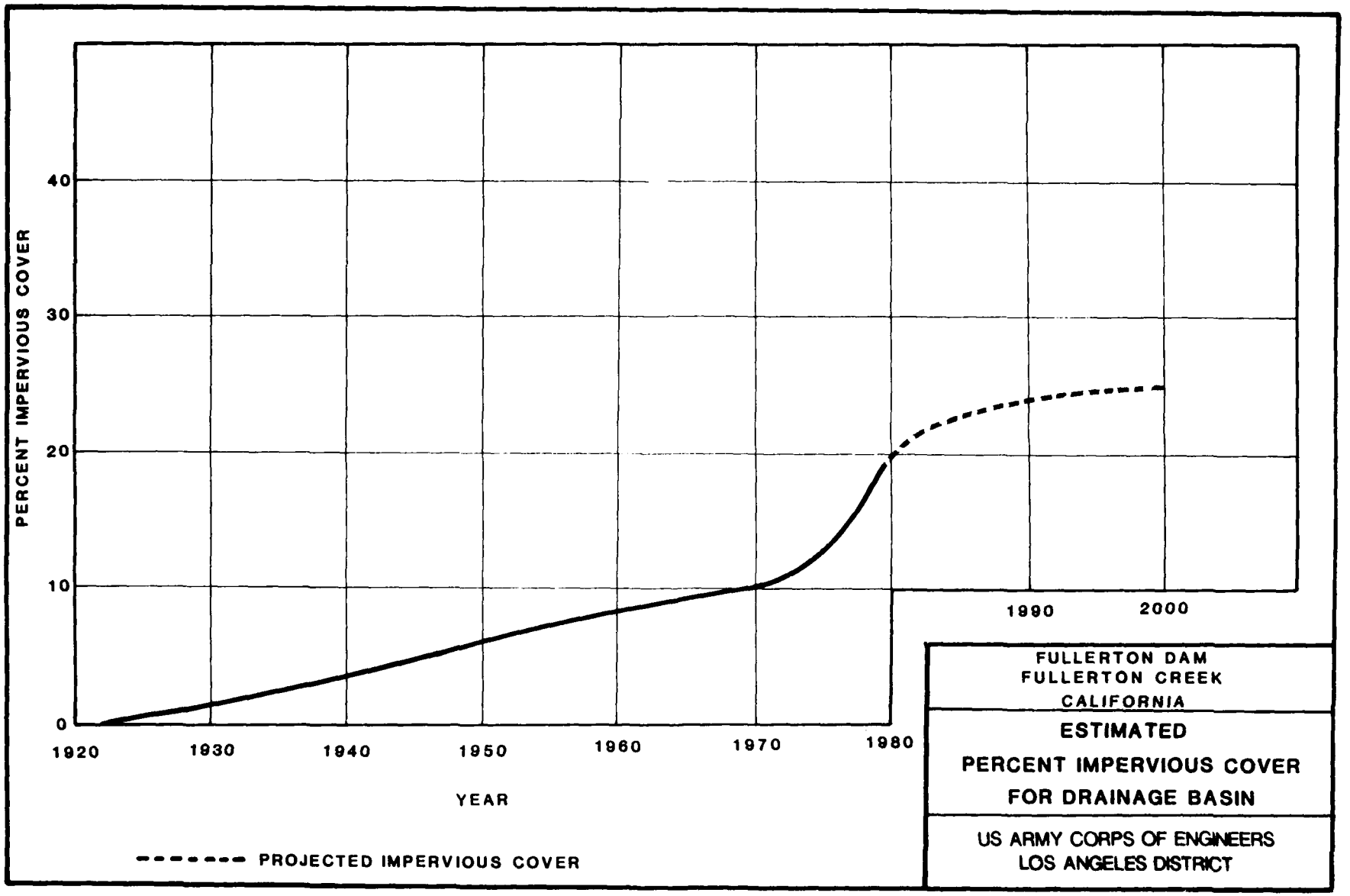
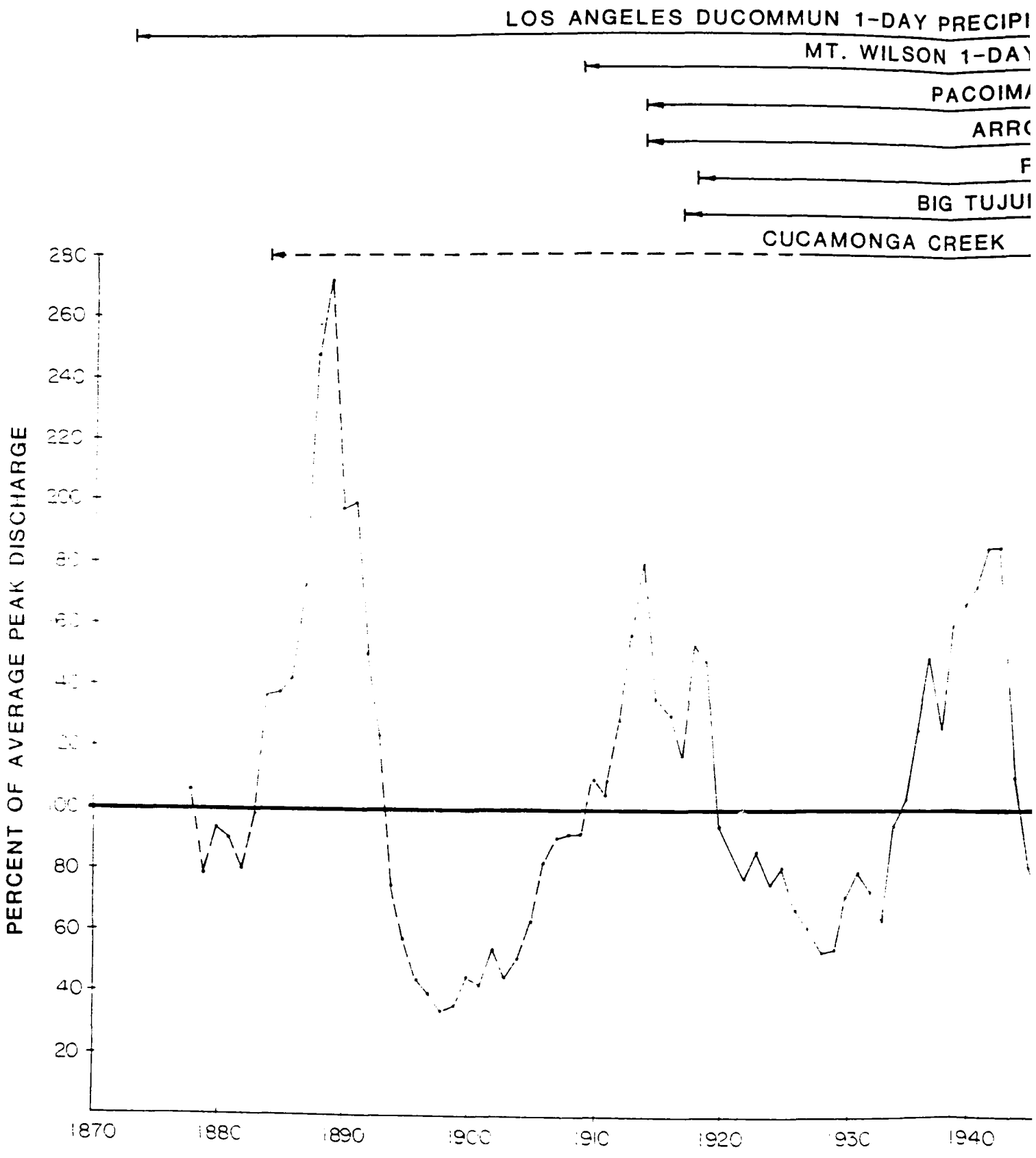

PERCENT IMPERVIOUS COVER
0
10
20
30
40
1920
1930
1940
1950
1960
1970
1980
1990
2000
YEAR
PROJECTED IMPERVIOUS COVER
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA
ESTIMATED
PERCENT IMPERVIOUS COVER
FOR DRAINAGE BASIN
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-13


LOS ANGELES DUCOMMUN 1-DAY PRECIPI
MT. WILSON 1-DAY
PACOIMA
ARRO
F
BIG TUJUI
CUCAMONGA CREEK
PERCENT OF AVERAGE PEAK DISCHARGE
280
260
240
220
200
80
60
40
20
1870
1880
1890
1900
1910
1920
1930
1940

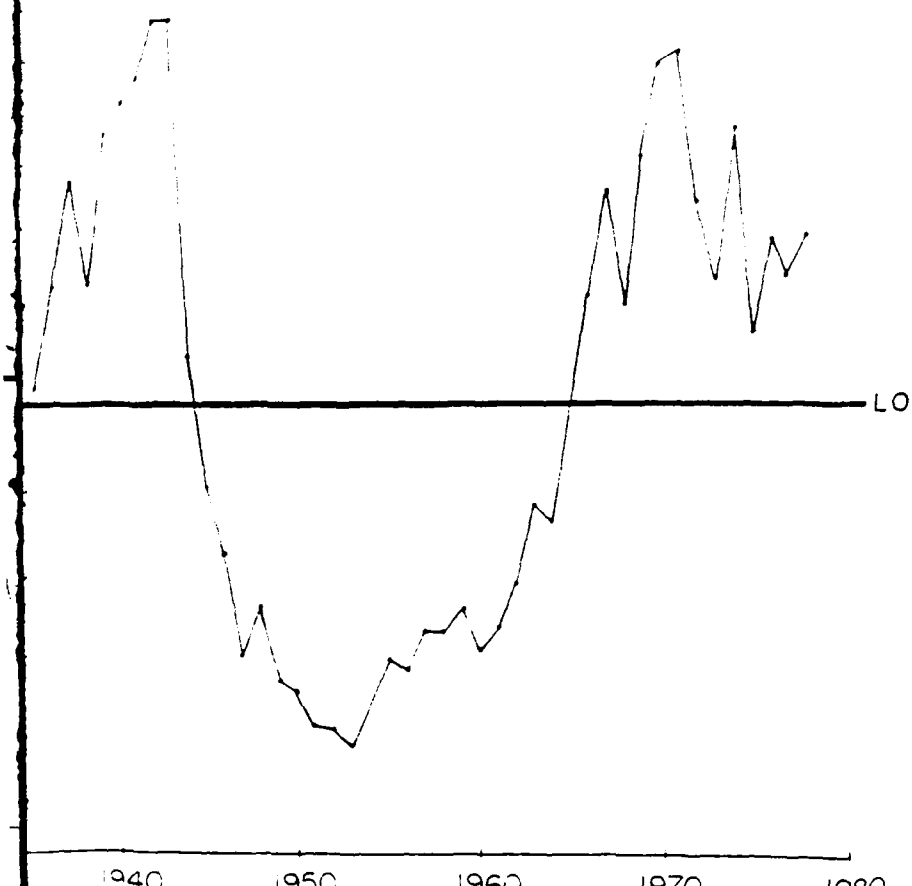
AY PRECIPITATION
SON 1-DAY PRECIPITATION
} RAINFALL STATIONS

PACOIMA DAM INFLOW
ARROYO SECO
FISH CREEK
BIG TUJUNGA DAM INFLOW
A CREEK
} DISCHARGE STATIONS

——— RECORDED

– – – – – ESTIMATED FROM CORRELATION WITH RAINFALL DATA

NOTE: GRAPH REPRESENTS 10-YEAR RUNNING MEAN, PLOTTED AT THE MIDDLE OF EACH 10-YEAR PERIOD.



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

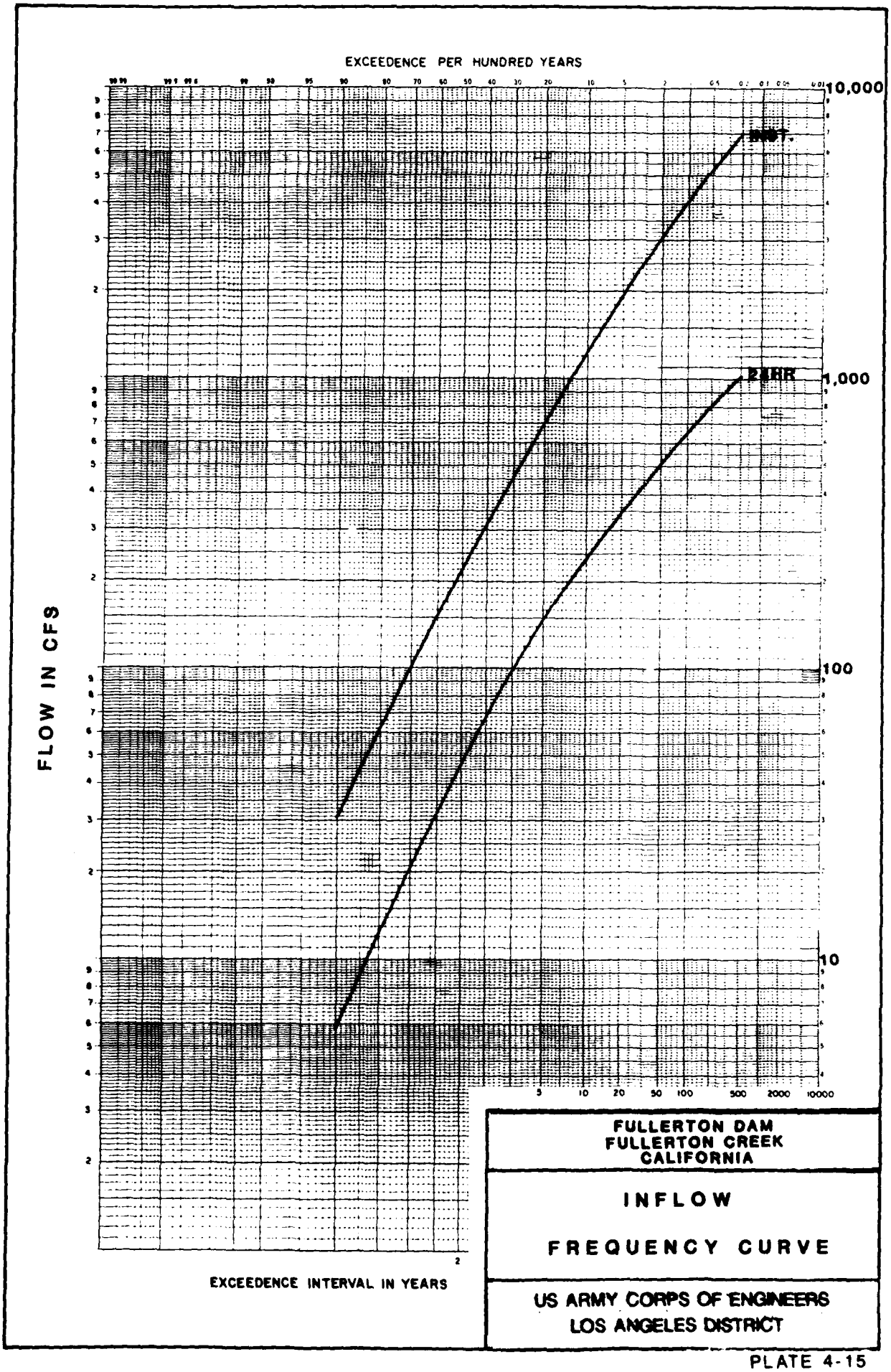
VARIATION IN 10-YEAR MEAN

PEAK DISCHARGE

LOS ANGELES COUNTY REGION

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-14



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

INFLOW

FREQUENCY CURVE

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-15

Ranking of Inflow Events - Peak Inflow at Fullerton Dam

WY	Rank	Plotting Position	Estim. Instant. Peak Inflow (cfs)	WY	Rank	Plotting Position	Estim. Instant. Peak Inflow (cfs)
41	1	1.01	4000	36	28	51.66	248
83	2	2.67	1890	72	29	53.55	237
80	3	4.56	1700	62	30	55.43	233
78	4	6.44	1500	32	31	57.32	230
79	5	8.32	1490	76	32	59.20	225
35	6	10.21	1050	54	33	61.08	168
81	7	12.09	980	66	34	62.97	120
84	8	13.98	960	63	35	64.85	96
38	9	15.86	950	53	36	66.74	84
52	10	17.75	840	55	37	68.62	76
85	11	19.63	810	65	38	70.51	74
43	12	21.51	609	70	39	72.39	73
69	13	23.40	600	45	40	74.27	60
82	14	25.28	560	60	41	76.16	56
37	15	27.17	541	46	42	78.04	53
44	16	29.05	532	47	43	79.93	43
74	17	30.94	515	33	44	81.81	40
67	18	32.82	495	50	45	83.70	35
75	19	34.70	475	64	46	85.58	27
56	20	36.59	435	59	47	87.46	21
71	21	38.47	425	31	48	89.35	12
58	22	40.36	420	57	49	91.23	12
68	23	42.24	385	61	50	93.12	7
40	24	44.13	304	49	51	95.00	0
39	25	46.01	283	48	52	96.89	0
73	26	47.89	283	51	53	98.77	0
77	27	49.78	260				

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

PEAK INFLOW AT

FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-16

Ranking of Inflow Events - 24-Hour Mean Inflow at Fullerton Dam

WY	Rank	Plotting Position	24-Hour Mean (cfs)	WY	Rank	Plotting Position	24-Hour Mean (cfs)
79	1	1.36	356	39	27	51.95	50
38	2	3.31	346	66	28	53.89	47
83	3	5.25	327	71	29	55.84	43
80	4	7.20	275	36	30	57.78	39
78	5	9.14	257	77	31	59.73	38
69	6	11.09	241	63	32	61.67	28
43	7	13.04	216	54	33	63.62	25
37	8	14.98	184	70	34	65.56	18
52	9	16.93	178	47	35	67.51	14
84	10	18.87	176	45	36	69.46	12
82	11	20.82	167	55	37	71.40	12
81	12	22.79	164	65	38	73.35	12
56	13	24.71	157	46	39	75.29	10
44	14	26.65	139	64	40	77.24	7
85	15	28.60	111	60	41	79.18	7
74	16	30.54	106	33	42	81.13	5
67	17	32.49	97	59	43	83.07	4
35	18	34.44	96	53	44	85.02	4
58	19	36.38	88	50	45	86.96	4
68	20	38.33	81	31	46	88.91	2
73	21	40.27	78	48	47	90.86	0
76	22	42.22	69	61	48	92.80	0
62	23	44.16	56	57	49	94.75	0
72	24	46.11	55	51	50	96.69	0
75	25	48.05	52	49	51	98.64	0
32	26	50.00	52				

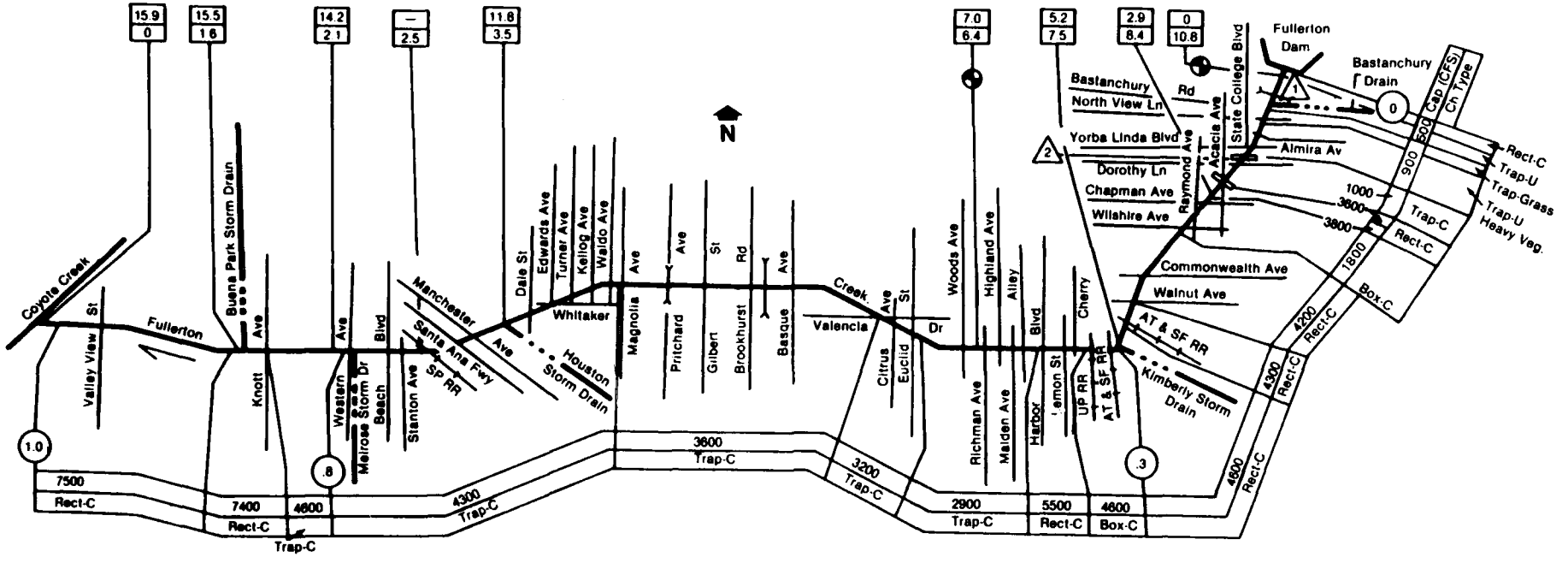
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

24-HOUR MEAN INFLOW

AT FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-17



Legend

- Dam
- Culvert
- Stream Gage
- Drainage Area Mi. From Stream Mouth
- Travel Time (Hours)
- Foot Bridge
- U — Channel Unlined
- R — Rip Rap Side Slopes
- S — Soft Bottom
- C — Concrete
- G — Grouted Stone
- G/C — Side Slope / Bottom

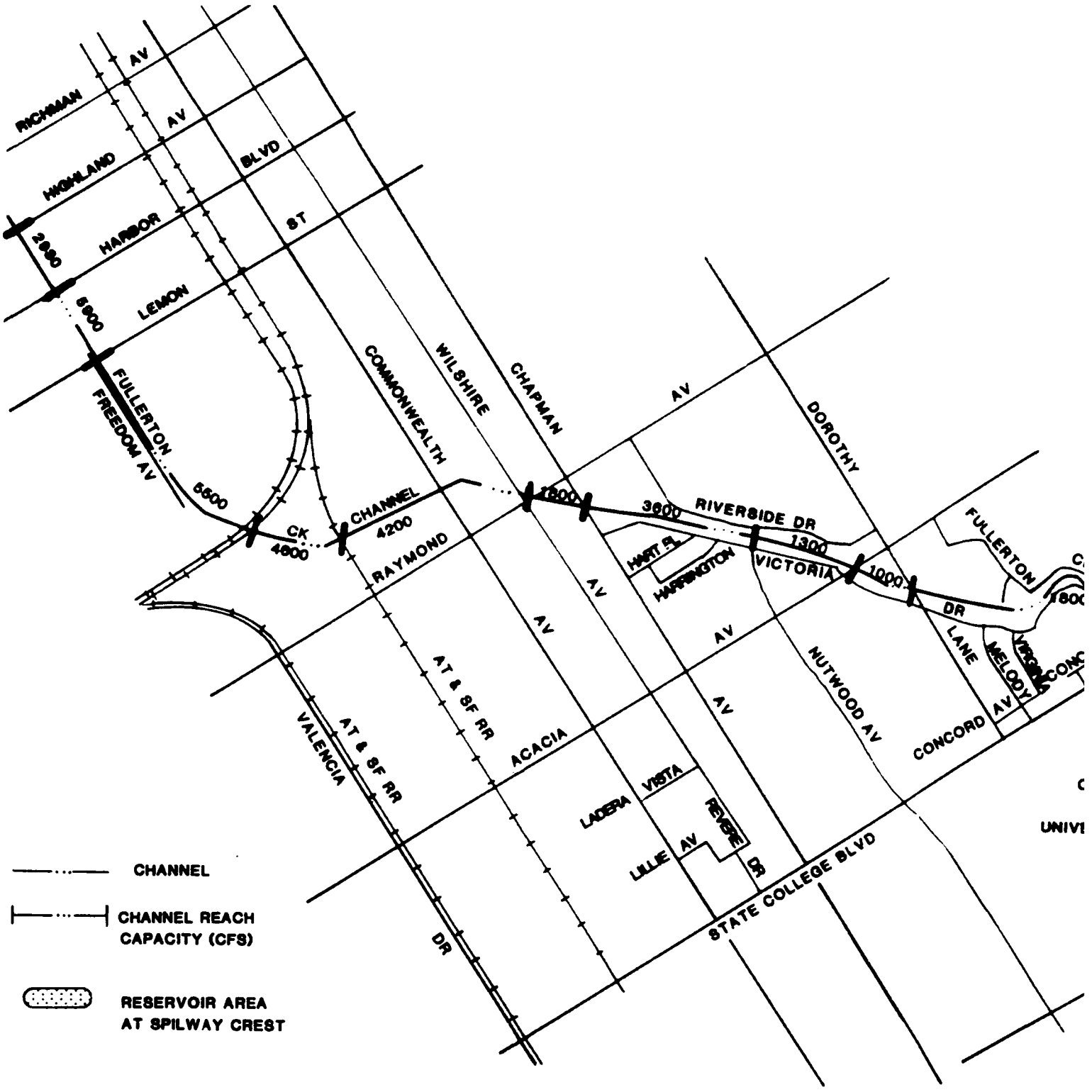
	Significant Features	Miles	Remarks
◓	Fullerton Creek Below Fullerton Dam	10.8	Telemetry 046 FLTN
1	Dam Tender House	10.7	
	Crossings Below Dam	10.7-8.4	
	1. Foot Bridge		1. Trap-U (30' TW, 5' B, 2 on 1
	2. Bastanchury Rd.		2. RCB 12'x8' 45° WW
	3. North View Ln		3. Double RCB 10'x9.5'
	4. Almira		4. RCB 14'x8' 45° WW
2	Acacia Park (Downstream of State College & Yorba Linda Blvd)	9.0	Park Alongside Fullerton Creek (Foot Bridge 60' TW 12' Deep, Trap-U)
◓	Fullerton Creek at Richman	6.4	Telemetry FCKR
	Note: SP RR Crossing Downstream of Santa Ana Freeway	2.5	OCEMA Considers Serious Hydraulic Condition Exists Cap Unk

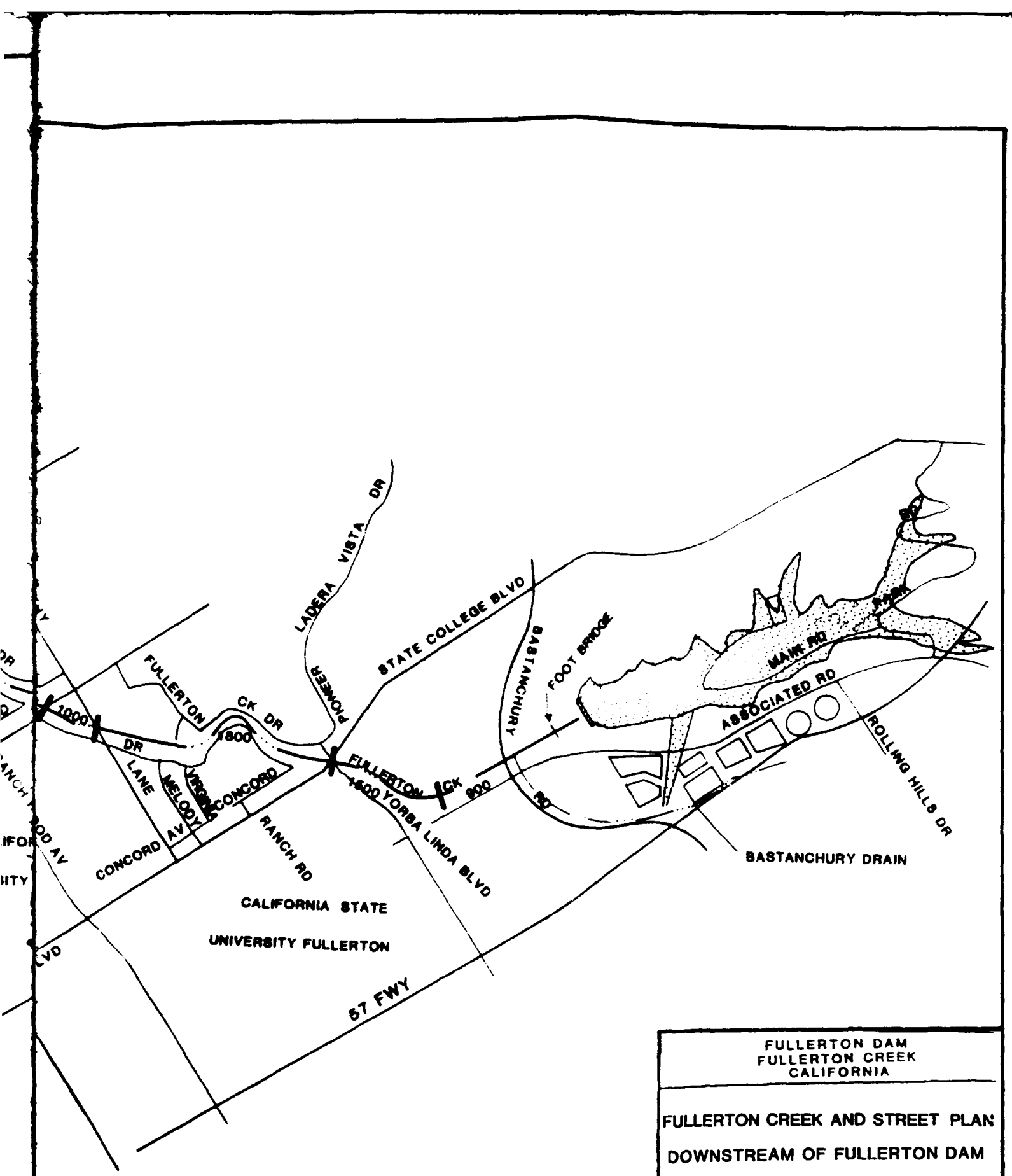
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

FULLERTON DAM
TO
COYOTE CREEK

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-18


RICHMAN
AV
HIGHLAND
AV
BLVD
HARBOR
ST
2800
LEMON
5900
FULLERTON
FREEDOM AV
5600
COMMONWEALTH
WILSHIRE
CHAPMAN
AV
DOROTHY
CHANNEL
4200
CK
4600
RAYMOND
1800
3600
RIVERSIDE DR
1300
HART PL
HARRINGTON
VICTORIA
1000
FULLERTON
DR
LANE
MELODY
AV
NUTWOOD AV
CONCORD
AV
AT & SF RR
VALENCIA
AT & SF RR
ACACIA
LADERA
VISTA
LILLIE
AV
REVERE
DR
STATE COLLEGE BLVD
DR
CHANNEL
CHANNEL REACH
CAPACITY (CFS)
RESERVOIR AREA
AT SPILWAY CREST



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

FULLERTON CREEK AND STREET PLAN
DOWNSTREAM OF FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-19

Parameter	Gauge Type	Report Mode	Stored Record (period available)
Water Surface Elevation	staff boards	Visual	Flood Control Basin Operation Report
	Stevens A-71 recorder w/quartz clock	Visual	Reservoir Operation Report SPL 424 (paper strip chart (1941-present)
	D.R.*	Telemetry	punch tape (1974-present) telemetry data file
Downstream gauge height	Digital Recorder*	Visual	Flood Control Basin Operators Report
		Telemetry	punch tape (1974-present) telemetry data file
Outlet Gate opening	gate opening indicator	Visual	Flood Control Basin Operators Report
	Leitz recorders		
Precipitation	tipping bucket gauge connected by magnetic sensor to D.R.*	Telemetry	Reservoir Operation Report SPL 424 (punch tape (1974-present) telemetry data file
	Belfort recording gauge	None	paper chart (1941-present)
	glass raintube	Visual	Rainfall Record SPL 31 (1941-present

*Digital Recorder - A device that converts gauge motion into coded digital information a in paper tape.

m.

strumentation of Fullerton Dam.

	rd (period available)	Comments
l-pr	ol Basin Operation Report SPL 19 (1941-present)	
	peration Report SPL 424 (1941-present) chart (1941-present) 1974-present) ata file	-new recorder installed in 1985 -float well occasionally silts in -the paper strip chart is operated at 9.6"/day during the rainy season for better data definition; 2.4"/day in other periods
	ol Basin Operators Report SPL 19 (1941-pres.) (1974-present) ta file	USGS operates the gauge, publishes the daily record and stores the paper punch tape for USGS Station ID #11109500
	l Basin Operators Report SPL 19 (1941-present)	
l-P		Units are operational but will eventually be replaced with Leopold & Stevens Type F recorders (chart drum recorders).
	peration Report SPL 424 (1941-Present) (1974-present) data file	tipping bucket type gauge installed in 1985
rec	(1941-present)	data on paper charts is evaluated for daily rainfall amounts and charts are then sent to NWS in Asheville, N.C. for publication
	ecord SPL 31 (1941-present)	

oded digital information and records this periodically as a pattern of punched holes

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

HYDROLOGIC INSTRUMENTATION

FULLERTON DAM

US ARMY CORPS OF ENGINEERS

LOS ANGELES DISTRICT

PLATE 5-01

Hydrometeorologic Gauges in the Vicinity of Fullerton

Station Identification	Station Name	Latitude N	Longitude W
BREA	Brea Dam	33° 54' 24"	117° 55'
CCYN	Carbon Canyon Dam	33° 52' 40"	117° 50'
OCEMA #[illegible]	Orange County Reservoir	33° 56' 07"	117° 52'
OCEMA #[illegible]	Fullerton Airport	33° 52' 23"	117° 58'
OCEMA $2650	City of Brea	33° 54' 52"	117° 54'
OCEMA $2410	Miller Basin	33° [illegible]' [illegible]"	[illegible]
FLTN	Fullerton Dam	33° 53' 50"	[illegible]
USGS #11089500	Fullerton Creek below Fullerton Dam	[illegible]	[illegible]
USGS #11090000	Fullerton Creek at Fullerton	[illegible]	[illegible]
OCEMA #[illegible]	Fullerton Creek at Bronmar Avenue	[illegible]	[illegible]

*Legend:

	Rain Precipitation
Non-Standard, Non-Recording (Staff	NF
Standard, Non-Recording	SI
Recording (at site)	RF
Corps Event Reporting Telemetry	CR
Alert Event-Reporting Automatic Telemetry	AF

For locations of these gauges, see plate E-03.

the Vicinity of Fullerton Dam.

Latitude N	Longitude W	Elev. (ft.)	Type of Gauge(s)
55' 11"	117° 55' 56"	340	CR, RR
54' 40"	117° 50' 29"	403	CR, RR
56' 07"	117° 52' 58"	660	RR
52' 33"	117° 58' 24"	31	RF
54' 52"	117° 54' 04"	110	RF, AF
51' 54"	117° 51' 10"	210	RF, AF
53' 50"	117° 53' 08"	170	RF, MF
51' 45"	117° 53' 07"	150	RF, MF
[illegible]	[illegible]	[illegible]	RF
[illegible]	[illegible]	[illegible]	RF, AF

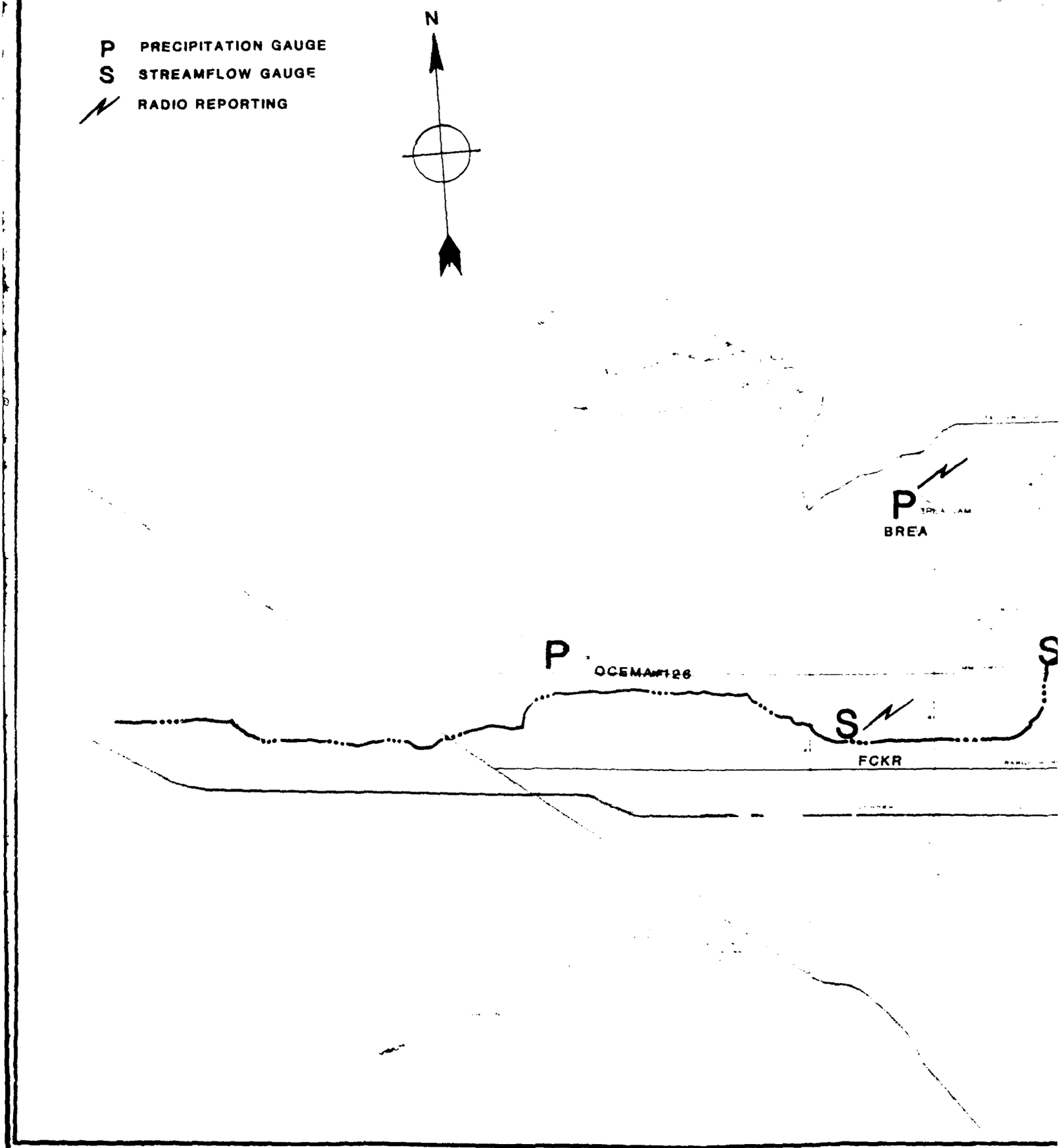
M.P. Precipitation	Streamflow Water Surface Elevation
MF	MS
CF	
RF	RS
CF	CS
AF	AS

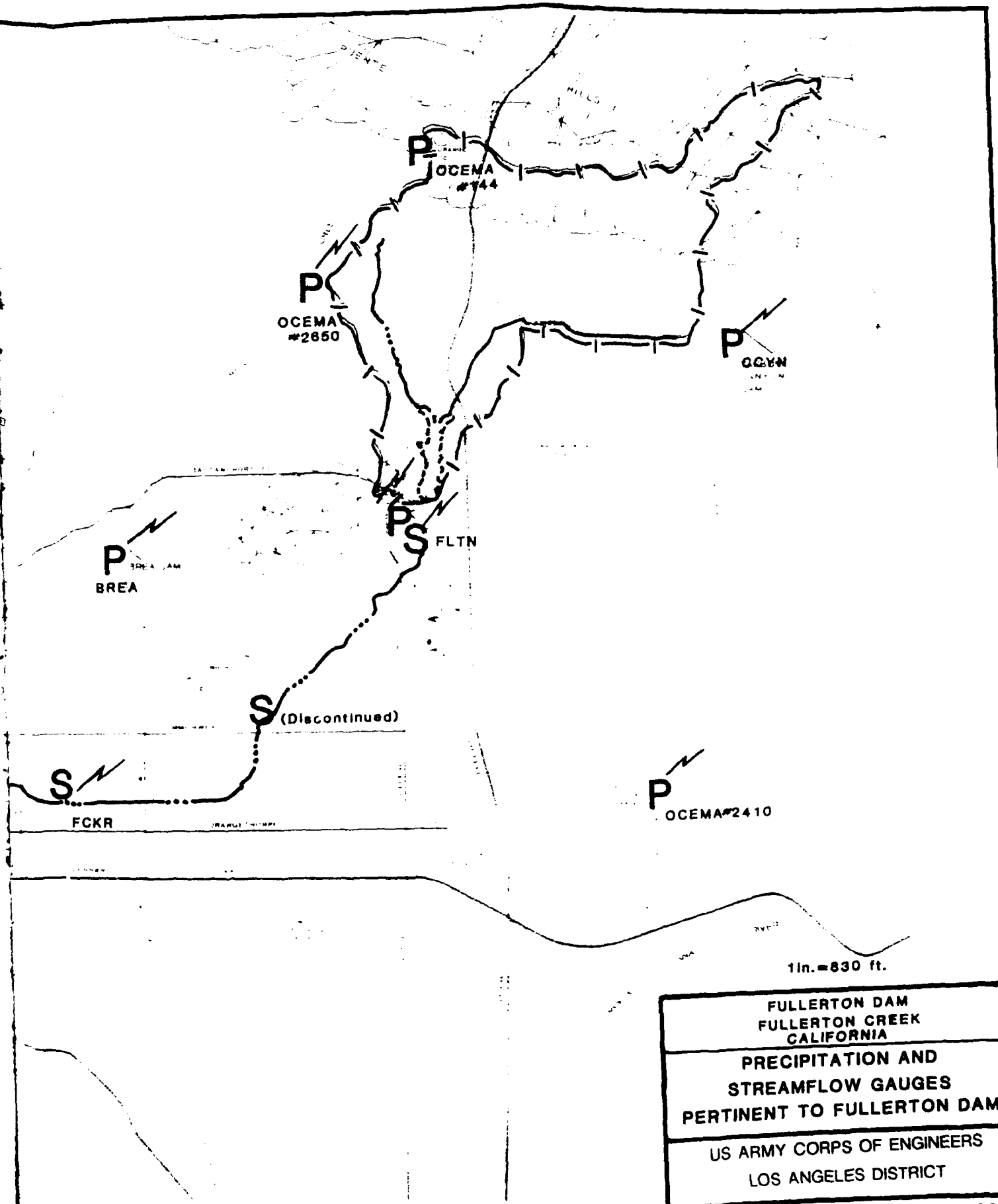
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

HYDROMETEOROLOGIC GAUGES IN THE VICINITY OF FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-02


P PRECIPITATION GAUGE
S STREAMFLOW GAUGE
RADIO REPORTING
N
P
BREA
P
OCEMA#126
S
S
FCKR



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

PRECIPITATION AND STREAMFLOW GAUGES PERTINENT TO FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-03

Rating Table for Fullerton Creek below Fullerton Dam (FLTN)

Gauge Height (ft)	Channel Flow (cfs)	Gauge Height (ft)	Channel Flow (cfs)
3.00	0	6.10	159.0
3.10	0.01	6.20	168.0
3.20	0.11	6.30	177.0
3.30	0.70	6.40	186.0
3.40	2.65	6.50	195.0
3.50	7.30	6.60	205.0
3.60	15.0	6.70	215.0
3.70	18.3	6.80	225.0
3.80	21.0	6.90	235.0
3.90	23.5	7.00	246.0
4.00	27.0	7.10	257.0
4.10	31.1	7.20	267.0
4.20	35.3	7.30	278.0
4.30	38.9	7.40	288.0
4.40	44.6	7.50	300.0
4.50	49.5	7.60	312.0
4.60	54.4	7.70	323.0
4.70	59.4	7.80	335.0
4.80	64.9	7.90	348.0
4.90	70.9	8.00	360.0
5.00	77.0	8.10	372.0
5.10	83.6	8.20	385.0
5.20	90.4	8.30	398.0
5.30	97.4	8.40	411.0
5.40	105.0	8.50	424.0
5.50	112.0	8.60	437.0
5.60	119.0	8.70	450.0
5.70	127.0	8.80	463.0
5.80	135.0	8.90	477.0
5.90	143.0	9.00	490.0
6.00	151.0		

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

RATING TABLE FOR FULLERTON CREEK BELOW FULLERTON DAM (FLTN)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-04

Rating Table for Fullerton Creek at Richmond Avenue (FCKR)

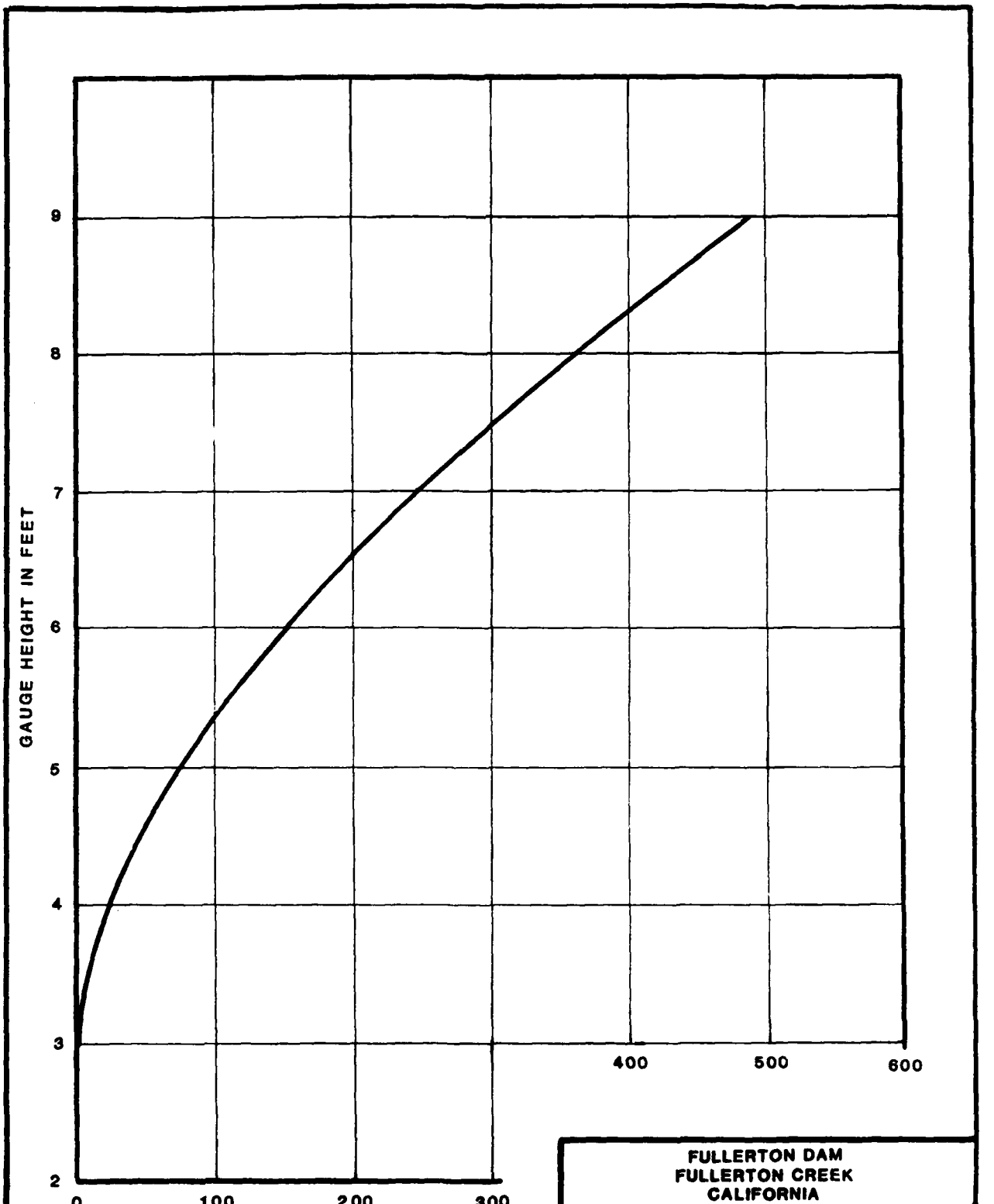
Gauge Height (ft)	Channel Flow (cfs)	Gauge Height (ft)	Channel Flow (cfs)
0.00	0	6.20	1800
0.20	0.4	6.40	1900
0.40	2.7	6.60	2000
0.60	9.5	6.80	2100
0.80	24.0	7.00	2200
1.00	43.0	7.20	2320
1.20	63.0	7.40	2440
1.40	86.0	7.60	2560
1.60	114	7.80	2680
1.80	145	8.00	2800
2.00	182	8.20	2940
2.20	222	8.40	3080
2.40	266	8.60	3220
2.60	316	8.80	3360
2.80	367	9.00	3500
3.00	419	9.20	3640
3.20	480	9.40	3780
3.40	545	9.60	3920
3.60	616	9.80	4060
3.80	689	10.00	4220
4.00	766	10.20	4380
4.20	847	10.40	4540
4.40	932	10.60	4700
4.60	1020	10.80	4860
4.80	1110	11.00	5020
5.00	1200	11.20	5180
5.20	1300	11.40	5340
5.40	1400	11.60	5500
5.60	1500	11.80	5660
5.80	1600	12.00	5820
6.00	1700		

FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

RATING TABLE FOR FULLERTON CREEK AT RICHMOND AVENUE (FCKR)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-05



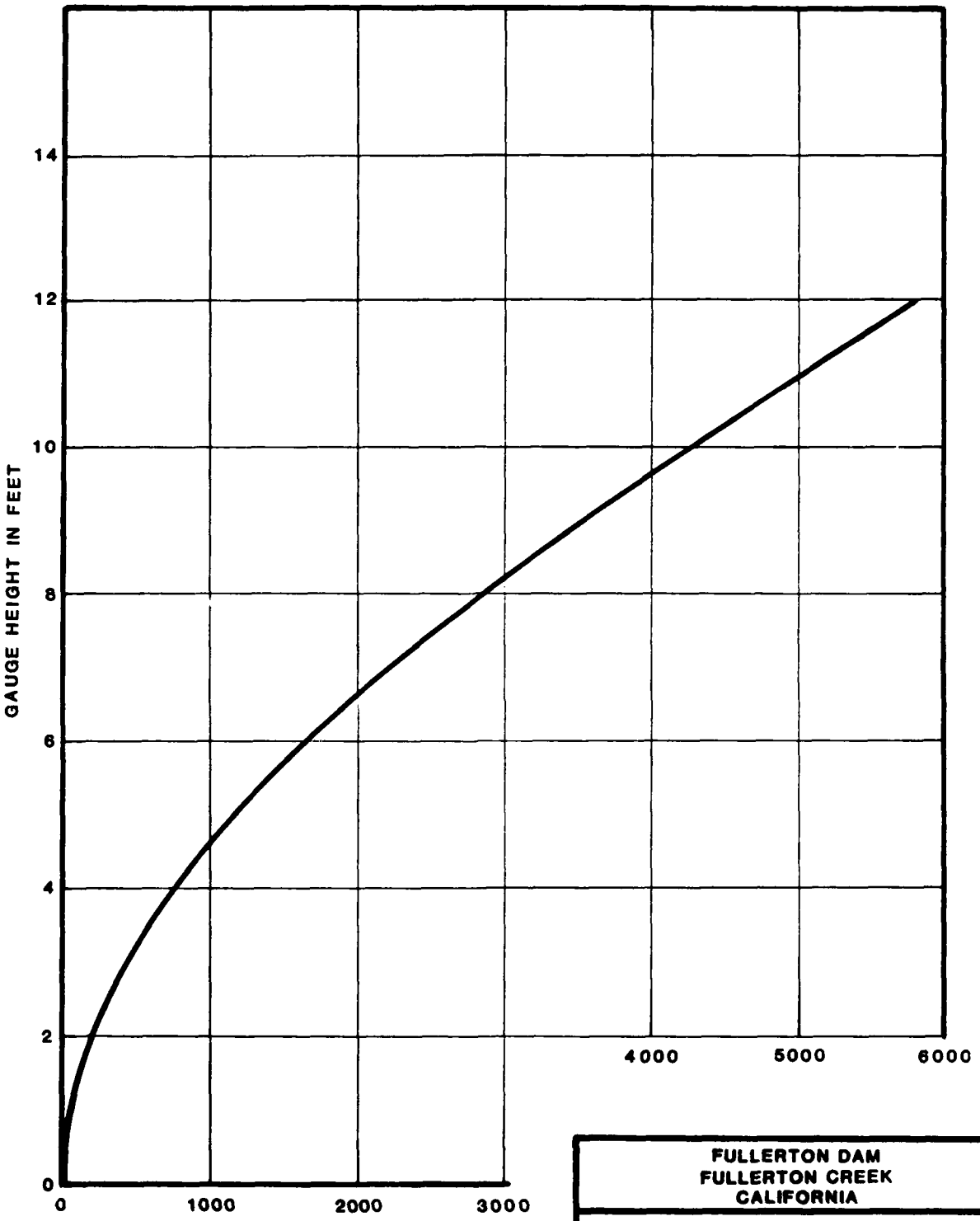
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

RATING CURVE

STREAM GAUGE
FULLERTON CREEK BELOW
FULLERTON DAM (FLTN)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-06



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

RATING CURVE

STREAM GAUGE
FULLERTON CREEK AT
RICHMOND AVE. (FCKR)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-07

Notification List for Fullerton Dam
(See Orange Book for Home Phone Numbers)

a. Prior to the starting of releases notify--

Orange County Storm Center	714-834-7083
--Environmental Management Agency	714-634-7003
(Manager Operations Division)	714-834-3820
Orange County Sheriff (24-hour)	714-834-3000
City of Fullerton	714-738-6306
Fullerton Police Department	714-738-6817 714-738-6800

b. If the water will reach elevation 275 notify:

USACE, Operation and Maintenance Section	818-401-4008
Craig Regional Park, Ranger Station	714-990-0271

c. If water will reach elevation 285 notify:

SPECIAL DAM INSPECTION TEAM

John Karakawa (Team Leader)	213-894-2245
Steve Vaughan	213-894-5546
Andy Korkos	213-894-5949

d. If uncontrolled spillway flow (above elevation 290) or a dam break is imminent make the following emergency evacuation notifications:

USACE, Emergency Management Branch	213-894-3440
Orange County Communications Center (24-hour)	714-834-2127
Fullerton Police Department	714-738-6800

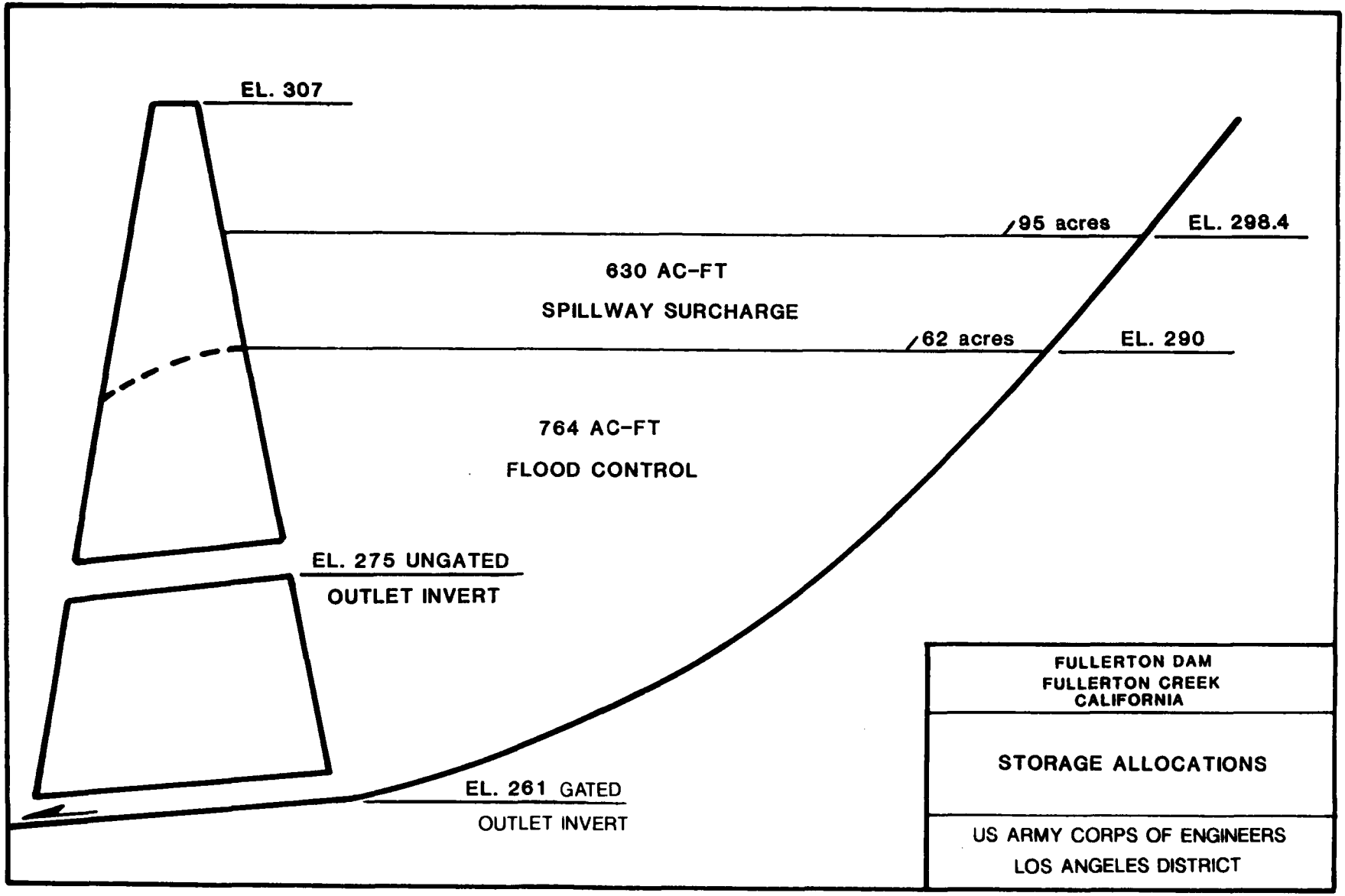
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

NOTIFICATION LIST

FOR FULLERTON DAM

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-08



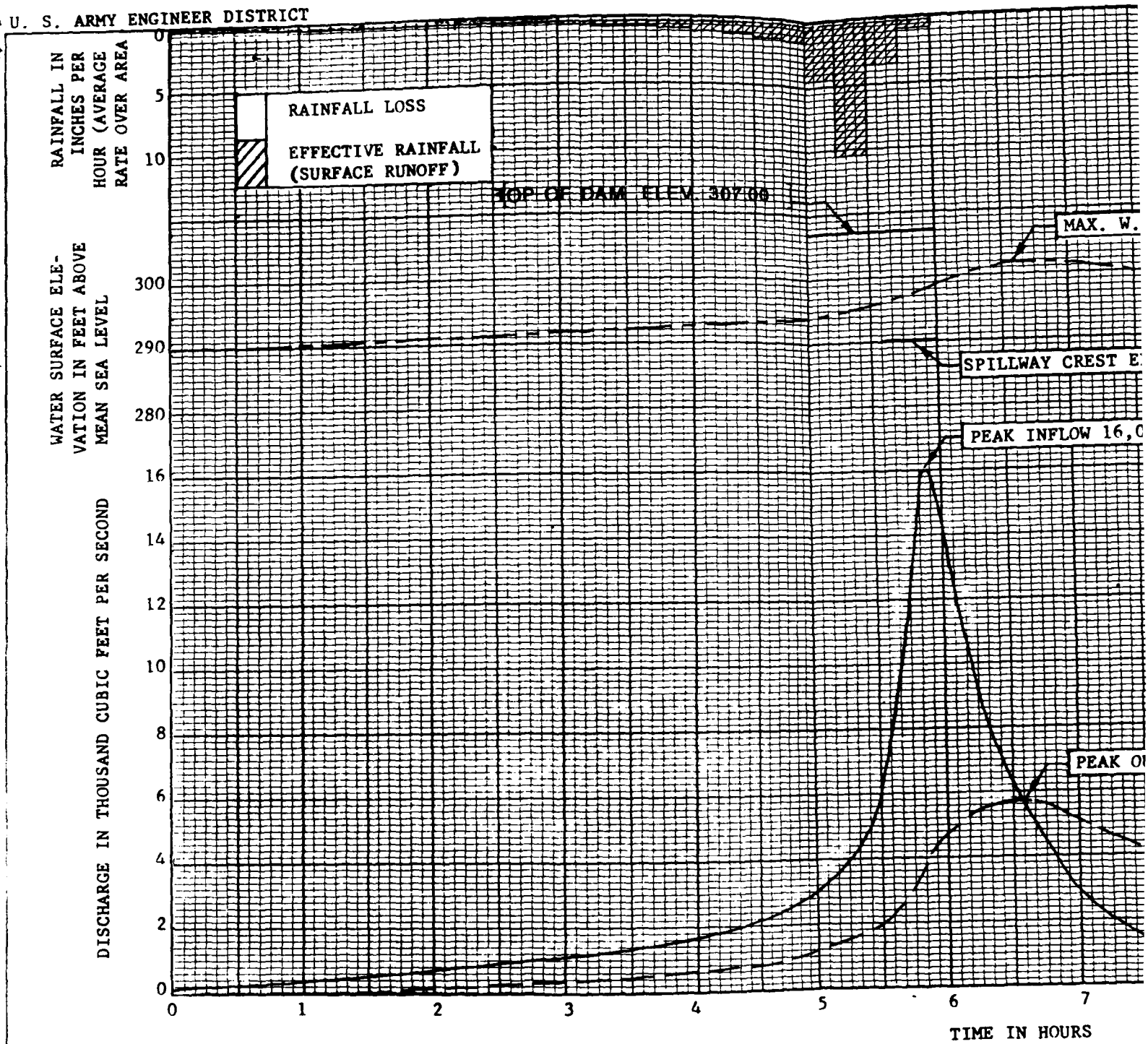
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

STORAGE ALLOCATIONS

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

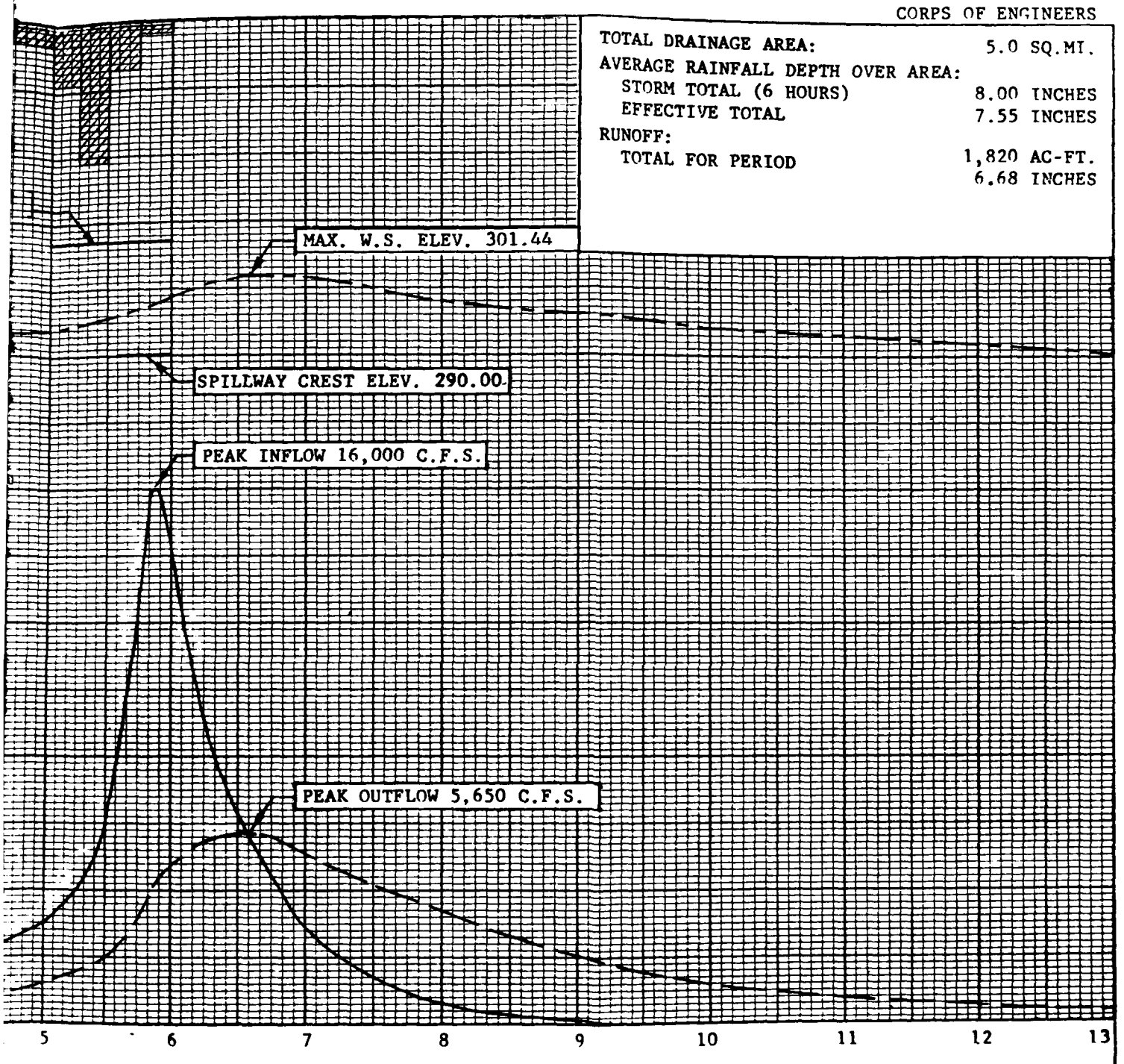
PLATE 7-01

U. S. ARMY ENGINEER DISTRICT



CORPS OF ENGINEERS

TOTAL DRAINAGE AREA:	5.0 SQ.MI.
AVERAGE RAINFALL DEPTH OVER AREA:	
STORM TOTAL (6 HOURS)	8.00 INCHES
EFFECTIVE TOTAL	7.55 INCHES
RUNOFF:	
TOTAL FOR PERIOD	1,820 AC-FT.
	6.68 INCHES



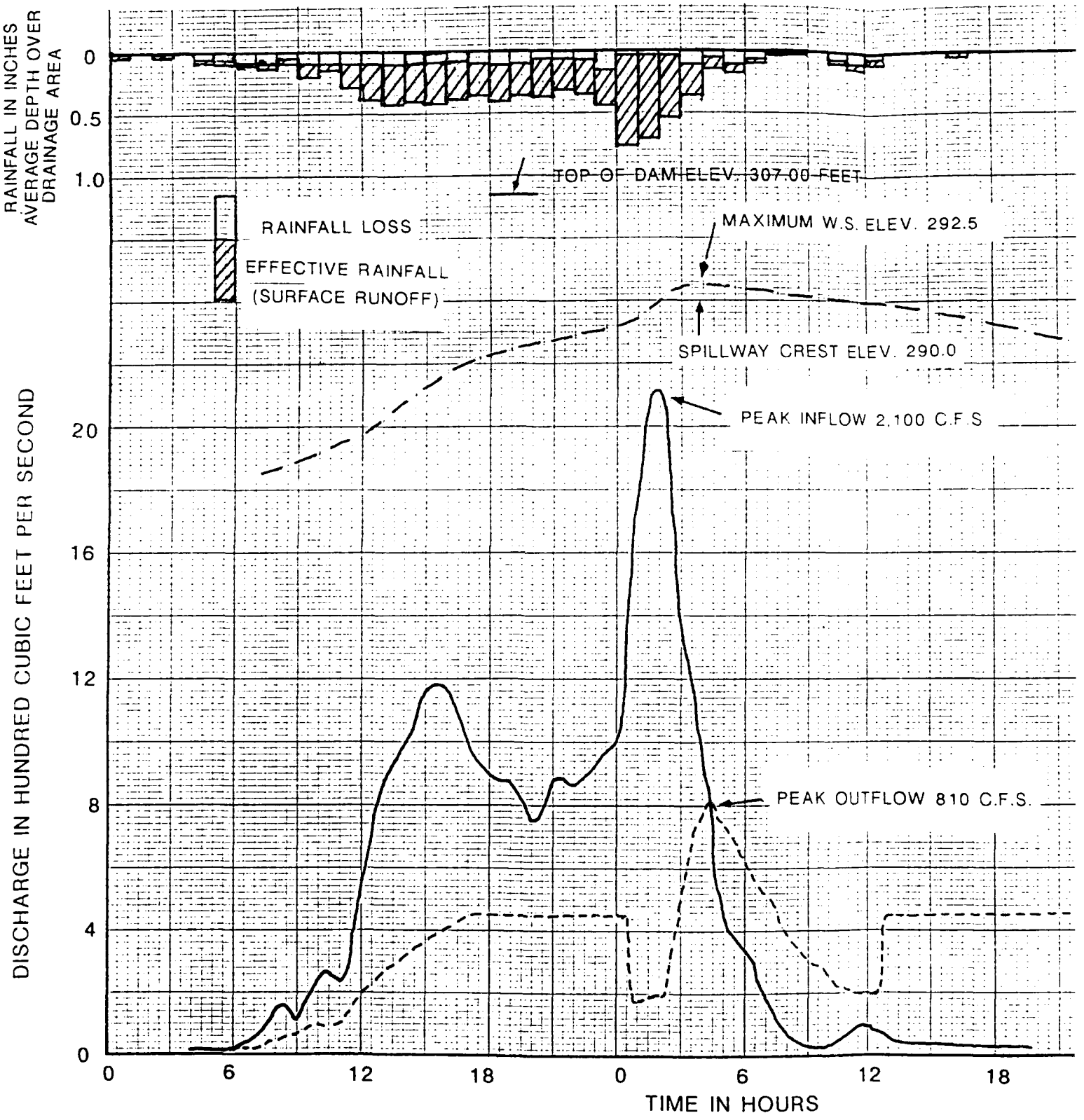
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

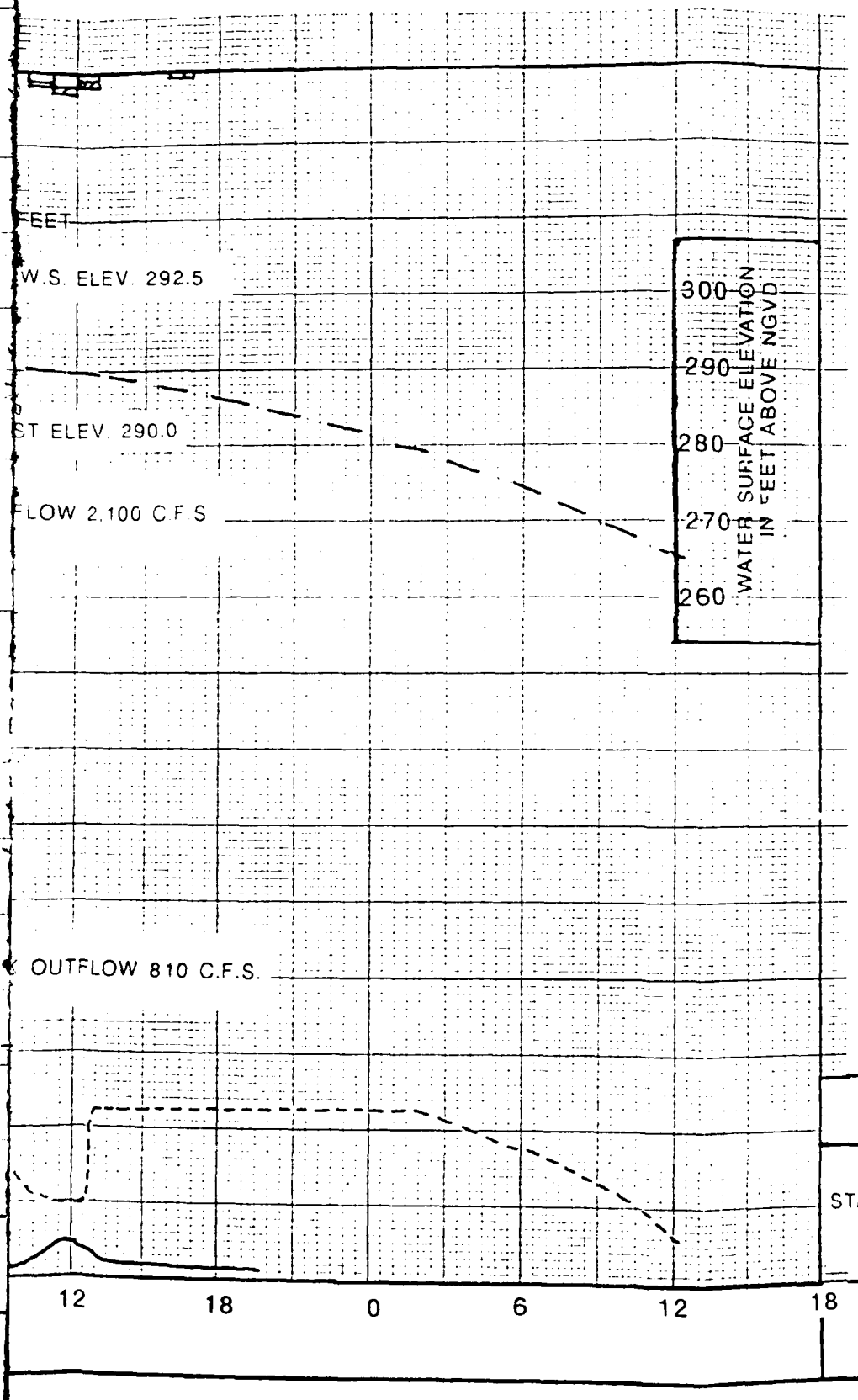
PROBABLE MAXIMUM

FLOOD ROUTING

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-01


RAINFALL IN INCHES
AVERAGE DEPTH OVER
DRAINAGE AREA
0
0.5
1.0
TOP OF DAM ELEV. 307.00 FEET
RAINFALL LOSS
EFFECTIVE RAINFALL
(SURFACE RUNOFF)
MAXIMUM W.S. ELEV. 292.5
SPILLWAY CREST ELEV. 290.0
PEAK INFLOW 2,100 C.F.S
PEAK OUTFLOW 810 C.F.S.
DISCHARGE IN HUNDRED CUBIC FEET PER SECOND
20
16
12
8
4
0
0
6
12
18
0
6
12
18
TIME IN HOURS



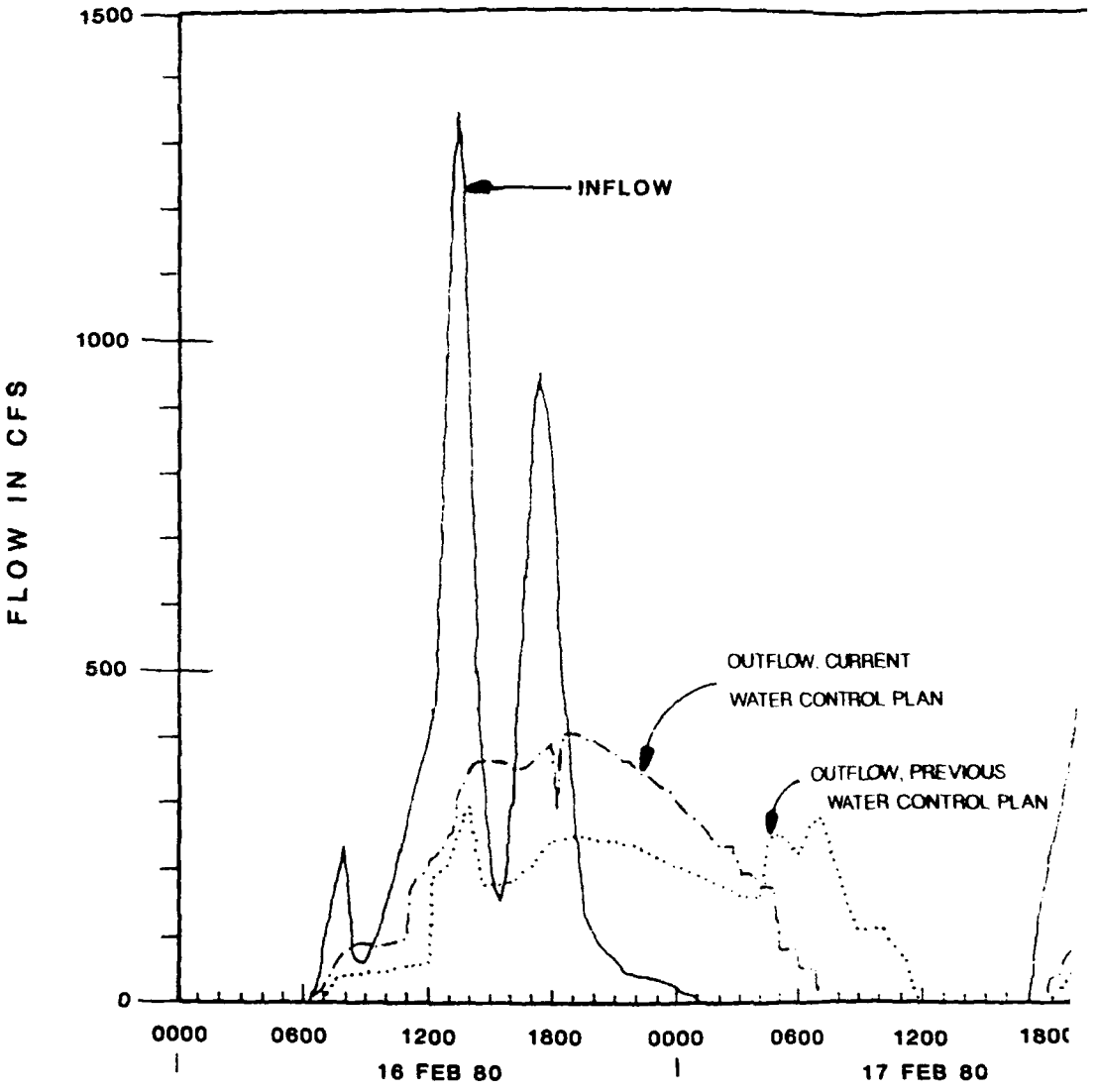
TOTAL DRAINAGE AREA:	5.0 SQ. MI.
AVERAGE RAINFALL DEPTH OVER AREA:	
MAXIMUM 24-HOUR	9.25 INCHES
TOTAL STORM	10.20 INCHES
RUNOFF:	
MAXIMUM 24-HOUR	1,630 AC-FT 6.11 INCHES
TOTAL STORM	1,750 AC-FT 6.56 INCHES

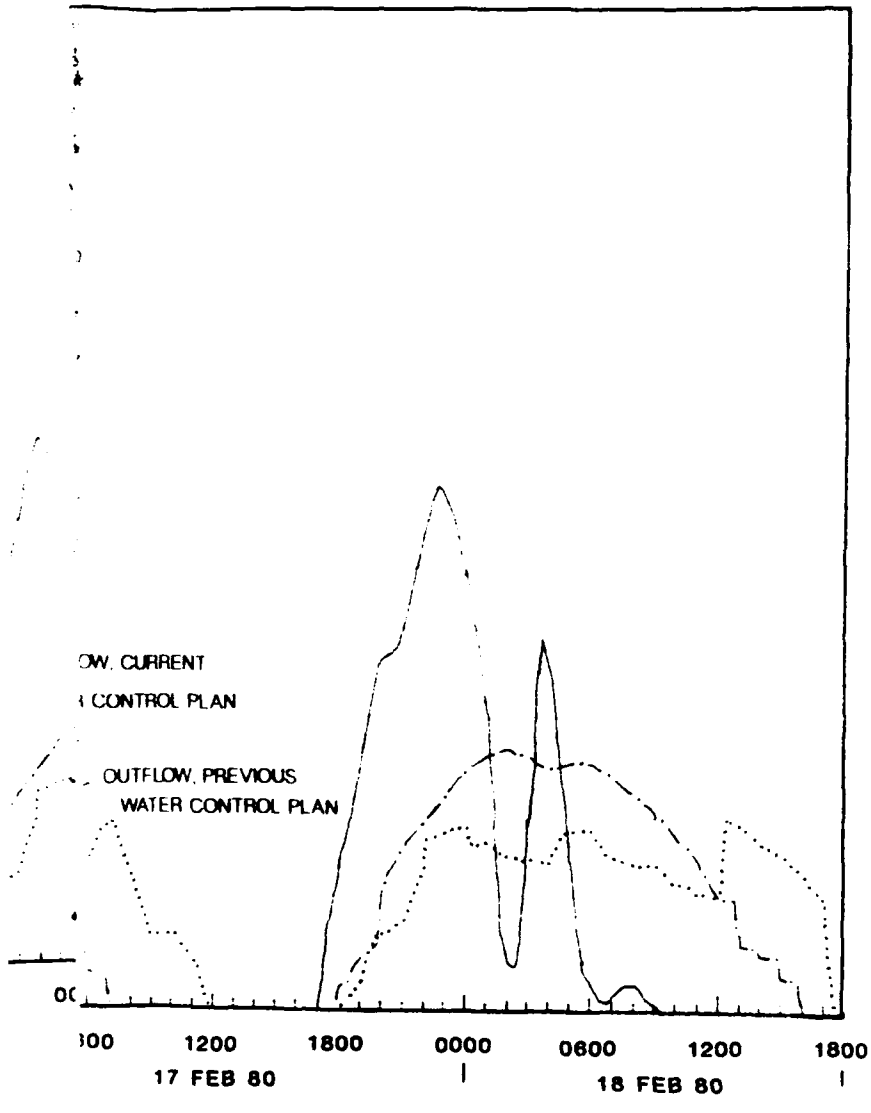
FULLERTON DAM
FULLERTON CREEK, CALIFORNIA

STANDARD PROJECT FLOOD ROUTING
1989 RESERVOIR REGULATION SCHEDULE

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-02


1500
1000
500
0
FLOW IN CFS
INFLOW
OUTFLOW, CURRENT
WATER CONTROL PLAN
OUTFLOW, PREVIOUS
WATER CONTROL PLAN
0000
0600
1200
1800
0000
0600
1200
16 FEB 80
17 FEB 80



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

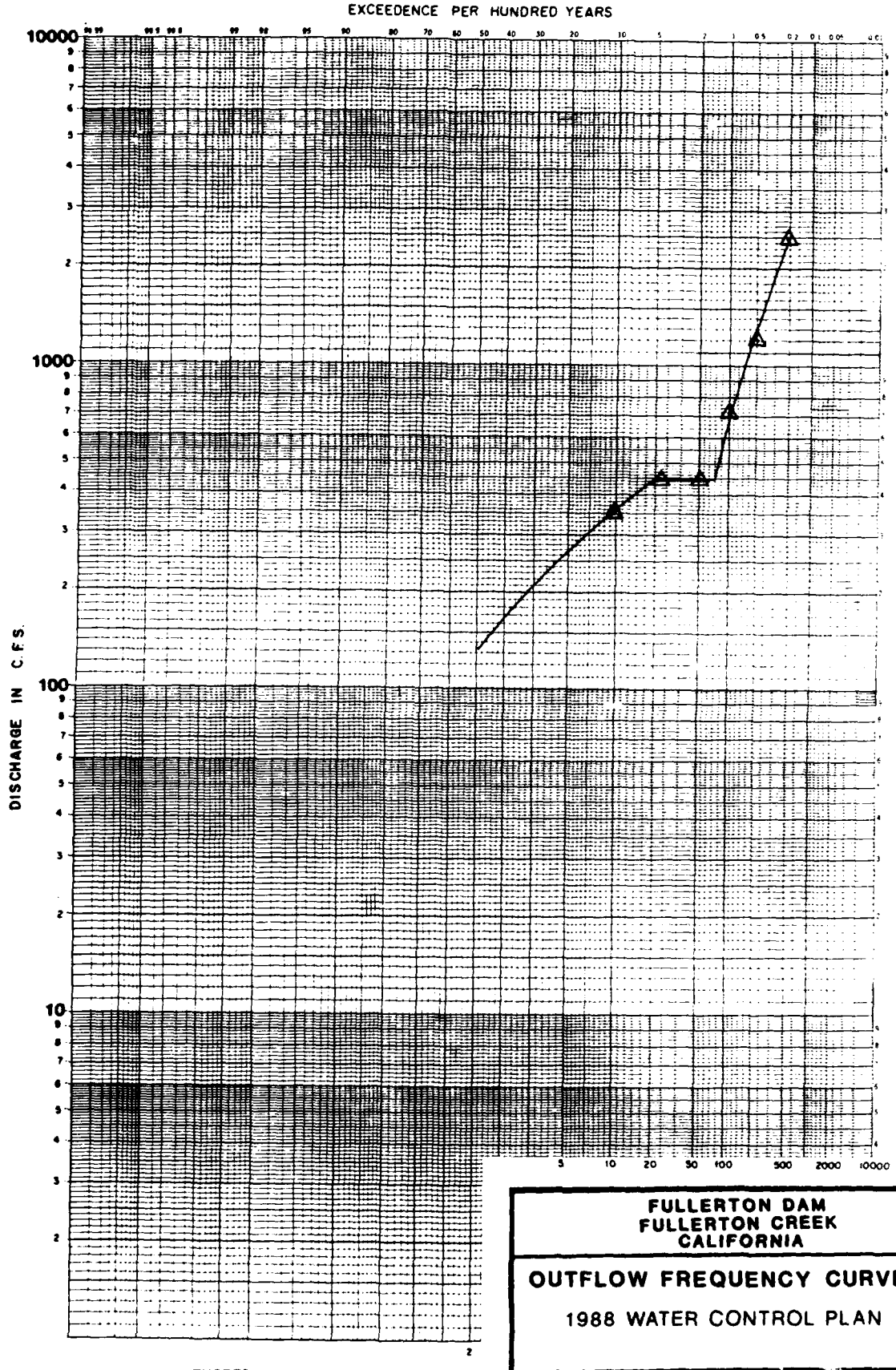
16-18 FEBRURARY 1980 FLOOD ROUTING

COMPARING CURRENT AND PREVIOUS

WATER CONTROL PLAN

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-03



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

OUTFLOW FREQUENCY CURVE

1988 WATER CONTROL PLAN

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-04

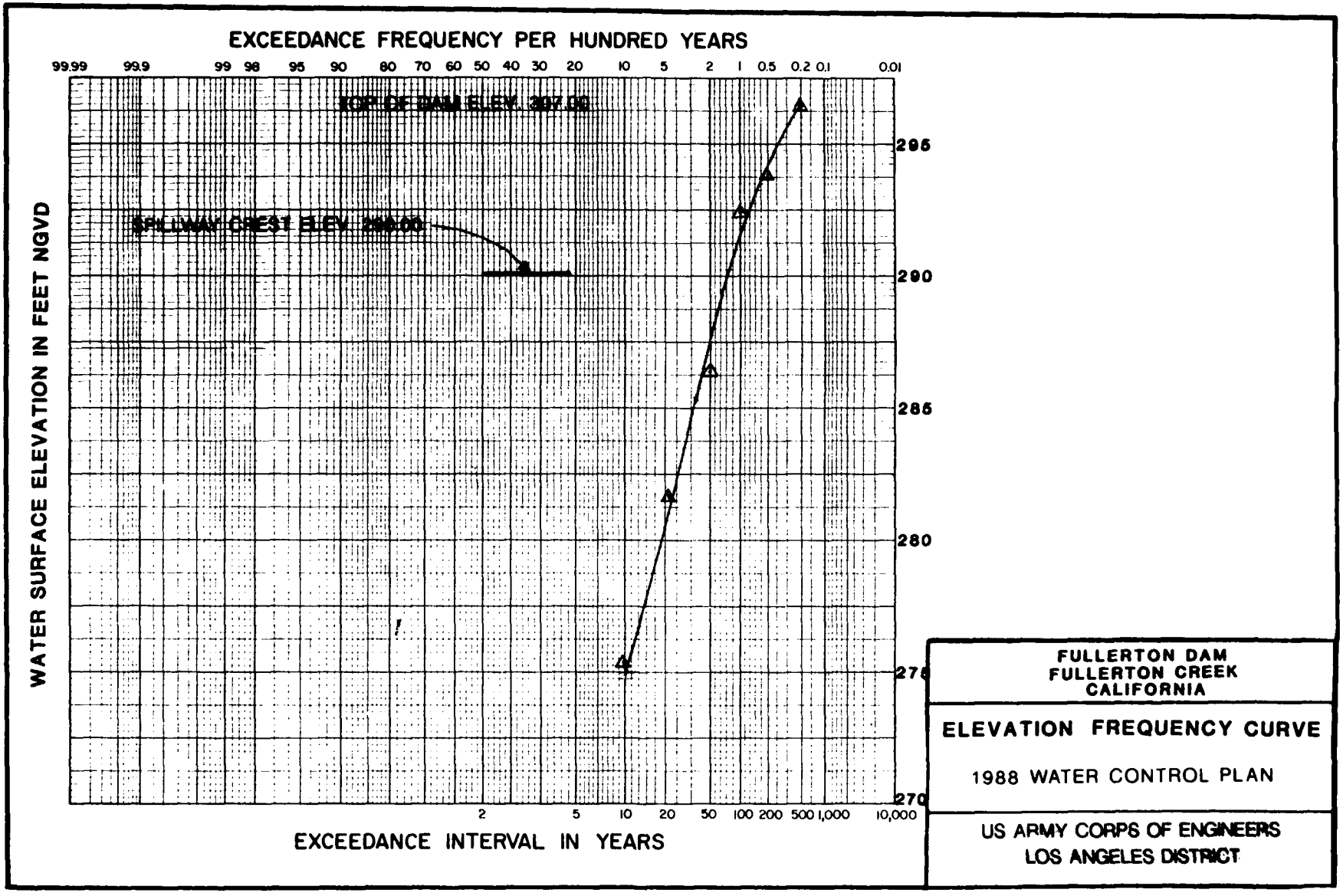
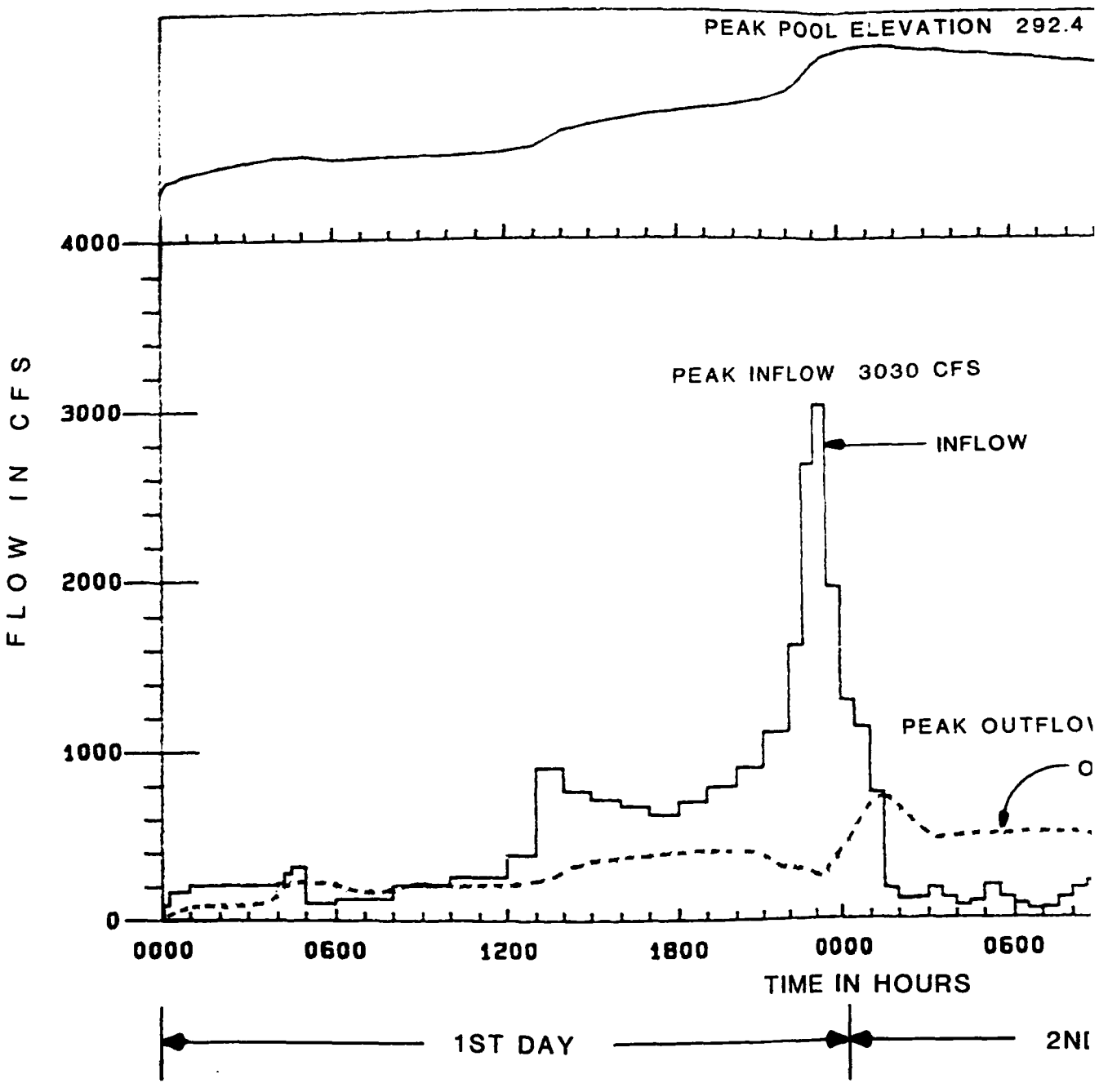
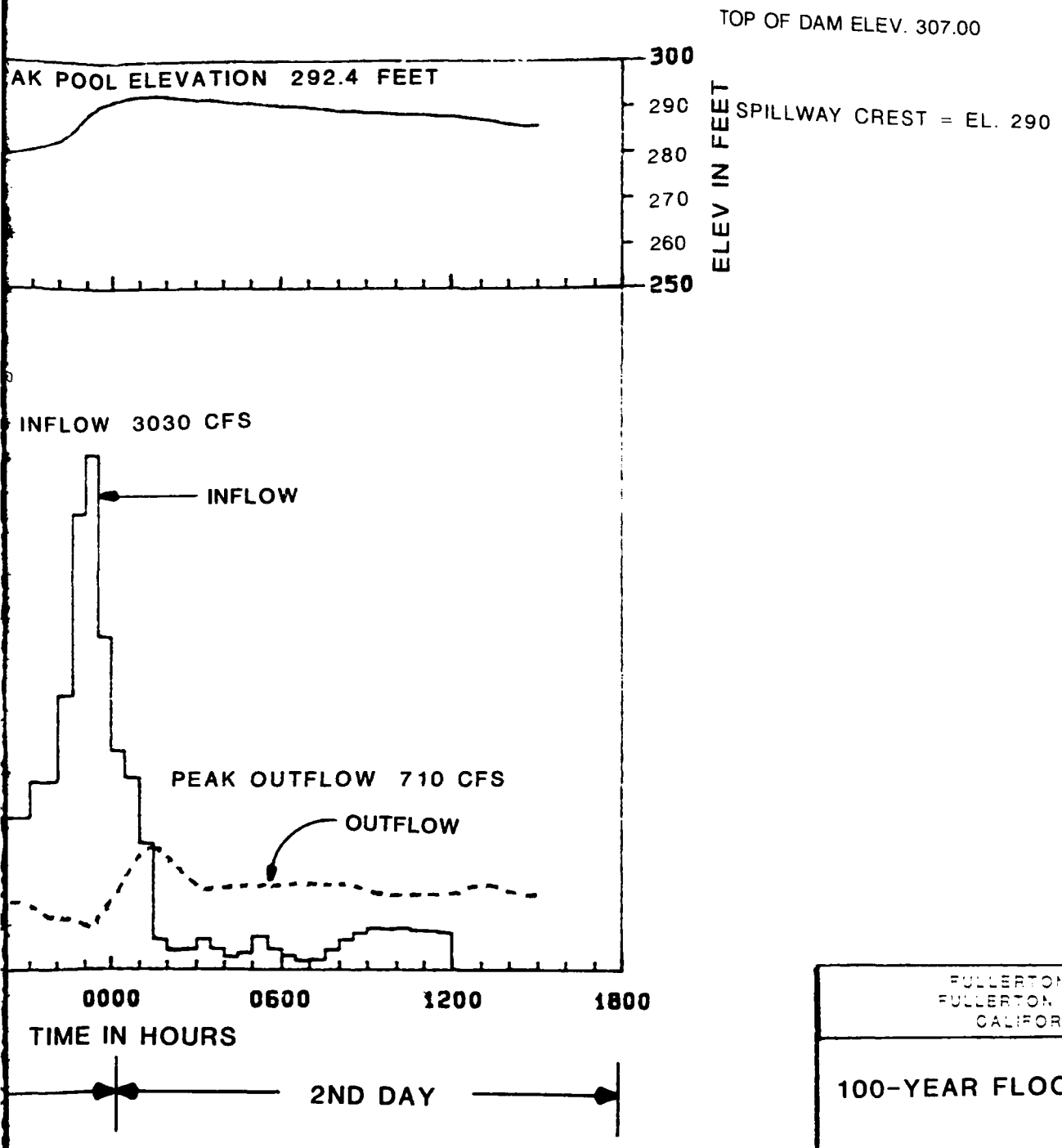

EXCEEDANCE FREQUENCY PER HUNDRED YEARS
99.99 99.9 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.01
TOP OF DAM ELEV. 297.00
SPILLWAY CREST ELEV. 268.00
WATER SURFACE ELEVATION IN FEET NGVD
295
290
285
280
275
270
2 5 10 20 50 100 200 500 1,000 10,000
EXCEEDANCE INTERVAL IN YEARS
FULLERTON DAM
FULLERTON CREEK
CALIFORNIA
ELEVATION FREQUENCY CURVE
1988 WATER CONTROL PLAN
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-05


PEAK POOL ELEVATION 292.4
4000
3000
2000
1000
0
FLOW IN CFS
PEAK INFLOW 3030 CFS
INFLOW
PEAK OUTFLOW
O
0000
0600
1200
1800
0000
0600
TIME IN HOURS
1ST DAY
2ND



FULLERTON DAM
FULLERTON CREEK
CALIFORNIA

100-YEAR FLOOD ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-06

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL

FULLERTON DAM

EAST FULLERTON CREEK

San Gabriel River Basin

Exhibit A
to the
Water Control Manual
for
Fullerton Dam

Los Angeles District Office

U.S. Army Corps of Engineers

May 1989

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR
FOR WATER CONTROL
FULLERTON DAM

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STANDING INSTRUCTIONS TO THE PROJECT OPERATOR
FOR WATER CONTROL
FULLERTON DAM

I. BACKGROUND AND RESPONSIBILITIES.

1-01 General Information.

(1) This exhibit is prepared in accordance with instructions contained in EM 1110-2-3600, paragraph 9-2, (Standing Instructions to Project Operators for Water Control), and ER 1110-2-240, and pertains to duties and responsibilities of dam tenders associated with the operation of Fullerton Dam.

Operational instructions to dam tenders are outlined with specific emphasis on flood emergencies when communication between the dam tender and the LAD Reservoir Operation Center (ROC) have been disrupted. This exhibit is designed to be used as an operational guide for the dam tender to use in implementing the Fullerton Dam and Reservoir Water Control Plan Reservoir Regulation schedule (Exhibit B). Associated plates are contained in the main body of the water control manual.

The dam tender is required to have available at the damsite this water control manual and exhibit, and the current version of other manuals that complement these standing instructions. These manuals are: (a) "Instructions for Reservoir Operations Center Personnel"; (b) "Operation and Maintenance Manual for Fullerton Dam"; and (c) Fullerton Dam Flood Emergency Plan. Any deviation from Standing Instructions will require approval of the District Commander.

(2) The purpose of Fullerton Dam is regulating flood stage flows through East Fullerton Creek, and minimizing flood damage downstream of the structure. The protected area includes the City of Fullerton and development on the adjacent coastal plain. The original (1938) stated purpose (ref. c, pl. 1-01) was protection of "the towns of Fullerton, Placentia, and Anaheim, and the adjacent highly developed agricultural area from floods originating in the watershed above."

(3) Table 9-01 is an organizational chart depicting the chain of command for reservoir regulation decisions.

Gate operation instructions to the dam tender are issued by the Reservoir Regulation Unit. Dam tenders are part of the Operations Branch, under the Construction-Operations Division.

(4) Fullerton Dam is located on East Fullerton Creek, in the San Gabriel River drainage, as seen on plate 2-04. The dam is situated in the eastern Coyote Hills, which provide the last topographic relief before East Fullerton Creek enters the coastal plain. The dam is located in Orange County, one mile south of the intersection of Imperial Highway and Orange Freeway, and approximately 2 miles northeast of the City of Fullerton. The local project area is shown on plate 2-05. Fullerton Dam consists of an earthfilled embankment with outlet works and a detached concrete spillway. The components of Fullerton Dam are shown in the site plan on plate 2-06.

(5) Debris accumulation on the trash racks can be an operational concern. During small inflow events, vegetative debris is primarily caught by the Loftus Diversion Channel debris basin and the natural stand of vegetation upstream of the outlet works. Larger inflows release much of this as a single plug of debris that catches on the trash racks. This debris interferes with visual reading of water surface elevation and can alter the outlet elevation-discharge relationship.

(6) Fullerton Dam is owned, operated, and maintained by the U.S. Army Corps of Engineers, LAD, which has complete regulatory responsibility. Fullerton Dam and Reservoir is operated for local flood control of Fullerton Creek.

1-02 Role of the Project Operator.

(1) Normal Conditions. The Project Operator (Dam tender) will be instructed by the Reservoir Regulation Unit as necessary for water control actions under normal conditions. The dam tender will verify that all equipment at the project is in good operating condition; test-operate gates and electrical facilities in the control house, and inspect all structures and equipment according to a pre-established schedule; and refer to the Operation and Maintenance Manual for instructions on actual operation procedures for all equipment.

(2) Emergency Conditions. The dam tender will be present at the dam during periods of significant runoff, as instructed by the Operations Branch; operate the dam in accordance with instructions from the Reservoir Regulation Section; and follow the Reservoir Regulation Schedule provided in Exhibit B during periods of communication disruption.

II. DATA COLLECTION AND REPORTING.

2-01 Normal Conditions.

(1) During normal conditions, measurements are made daily at 0800 hours local time by the dam tender to determine reservoir staff reading (water surface elevation), float well or manometer gauge "tape" reading, incremental precipitation since last report, total accumulated precipitation for the season, the settings of each outlet gate, and the times of these measurements. This information will be logged on the appropriate forms and reported by radio to the Reservoir Regulation Unit, WUK4ROC as requested.

(2) The dam tender will also maintain records, including water surface elevations, outflow gauge heights, precipitation amounts, outlet gate settings, and log all radio and telephone communications on forms prescribed below.

(a) The Record of Calls Form (SPL-188). This form is used each time a message is transmitted or received by radio or telephone. The purpose of every call will be noted, whether for a radio check, reservoir report, etc.

(b) Flood Control Basin Operation Report Form (SPL-19). The dam tender should log all of the information on this form each time a water surface elevation measurement is taken or a gate change has been completed.

(c) Rainfall Record Form (SPL-31). This form should be filled in each time a rainfall measurement is taken from a glass tube rainfall gauge.

(d) All of these forms should be submitted monthly to the Water Control Data Unit CESPL-ED-HR (BASEYARD) of the Reservoir Regulation Section for archival storage. A copy of each of these forms is included in the Fullerton Dam Water Control Manual in figures 5-01 through 5-04.

2-02 Emergency Conditions.

During flood events, the dam tender should follow instructions as issued by the Reservoir Regulation Section on measurement type and frequency. Due to the speed with which events occur at Fullerton Dam, measurements at fifteen minute intervals are often necessary. When reporting to the Reservoir Regulation Section, the dam tender should clearly describe the silt and debris situation at the trash racks, gates, and downstream gauges. When instruments are not working or are stuck in the silt, the operator should not report the erroneous reading, but should rather state the instrument or staff problem. Care should be taken to avoid issuing misleading reports due to siltation at the reservoir staff boards. When debris or silt causes flows to be deceptively perched above the invert, or causes a loss of contact with the staff board, the dam tender should report a descriptive message identifying the limitations, and quantifying the estimated reservoir depth. If the radio system, including the dam tender's mobile unit, malfunctions, the Reservoir Regulation Section will contact the operator via telephone. It is especially important to maintain all records discussed above during emergency conditions.

2-03 Regional Hydrometerological Conditions.

Dam tenders will be informed by the Reservoir Regulation Section of regional hydrometerological conditions that may/will impact the Fullerton Dam. If regional conditions change, the dam tender should notify Reservoir Regulation Section of those conditions.

III. WATER CONTROL ACTION AND REPORTING.

3-01 Normal Conditions.

Except during times of emergency when fast action is critical, the the Reservoir Regulation Section must approve all gate changes. The Reservoir Regulation Section will originate the request for a gate change, and will provide settings for both gates whenever a gate change is necessary. Generally, both gates should be set at the same elevation. The dam tender should implement gate changes immediately following acknowledgment of instructions. Delaying a gate change may have serious impacts on affected activities. If other concurrent activities cause a delay in implementation of a gate change, the dam tender should advise the Reservoir Regulation Section by calling radio call sign WUK4ROC and request guidance.

Once a gate change is completed, the dam tender should radio back to the Reservoir Regulation Section (WUK4ROC) to report the time the change was completed, the staff and tape readings, the downstream discharge reading, and the current settings of both gates. All individuals involved should strive to achieve accuracy and complete clarity regarding gate settings.

The two vertical lift gates are electrically controlled from the control house. The dam tender should refer to the O&M Manual for instructions on actual operating procedures.

3-02 Emergency Conditions.

During flood events and other emergency conditions water control actions and reporting are vital to the successful operation of the dam reservoir.

If flooding conditions or some other emergency occurs at the dam, the dam tender should notify the Reservoir Regulation Section as soon as possible with a description of the conditions.

During an emergency condition such as a hazardous chemical spill or a potential drowning where immediate action is necessary, the dam tender should make the appropriate gate changes and report in to the Reservoir Regulation Section as soon as possible.

During a flood event, it is important to maintain the procedures for data collection and water control actions (gate changes) used during normal conditions.

The Reservoir Regulation Section should keep the dam tender apprised of operational objectives and critical operational constraints whenever possible. This will afford the dam tender a greater opportunity to recognize and identify potential problems in the field. The Reservoir Regulation Section may also provide additional water surface elevation criteria, instructing the dam tender to alert them via radio channel WUK4ROC when the reservoir pool reaches the indicated level. Such an action would normally be conducted during periods of intense storm runoff, and would require the operator to remain at the control house.

3-03 Inquiries.

All significant inquiries received by the dam tender from citizens, constituents or interest groups regarding water control procedures or actions must be referred directly to the Reservoir Regulation Section.

3-04 Water Control Problems.

The Reservoir Regulation Section must be contacted immediately by the most rapid means available in the event that an operational malfunction, erosion, or other incident occurred that could impact project integrity in general or water control capability in particular.

Emergency departures from the regulation instructions issued by the Reservoir Regulation Section may be required, because of equipment failures, accidents, or other emergencies requiring immediate action. Under these situations, the dam tender should contact the Reservoir Regulation Section via radio for instructions. When communications are broken, or the situation demands immediate action, the dam tender may proceed independently. The Reservoir Regulation Section should be notified of such actions as soon as possible. All other emergency deviations from normal procedure should be approved in advance by the Reservoir Regulation Section. The District Engineer, Los Angeles District, U.S. Army Corps of Engineers, may make temporary modifications to the water control regulations. Permanent changes are subject to approval by the Division Engineer, South Pacific Division, U.S. Army Corps of Engineers.

The dam tender should immediately alert the Reservoir Regulation Section via radio channel WUK4ROC whenever the requested gate change cannot be fully implemented due to mechanical or other physical problems. For example, debris occasionally prevents total gate closure. The Reservoir Regulation Section will evaluate the problem and provide further instructions to the dam tender.

3-05 Communication Outage.

Coordination of flood control operation is under the direction of the Reservoir Regulation Section, Corps of Engineers, Los Angeles District. During flood periods, close contact will be maintained between operating personnel at Fullerton Dam and the Reservoir Regulation Section in Los Angeles. If communication is broken between the dam tender and the Reservoir Regulation Section, initially continue releases in accordance with the last instructions from the Reservoir Regulation Section, and make every attempt to re-establish communications. If this effort is unsuccessful for one half hour, the dam tender should use water surface elevations and precipitation data to make releases following the Reservoir Regulation Schedule (Exhibit B).

Emergency notifications are normally made by the Reservoir Regulation Section. However, if the dam tender loses communication with the Reservoir Regulation Section, and an emergency notification situation arises, such as an imminent dam failure or uncontrolled spillway flow (water surface

elevation above 290 feet NGVD), the dam tender should make the necessary notifications. The parties listed below are to be immediately notified upon declaration of an uncontrollable emergency.

Orange County Communications Center	714-834-2127
Fullerton Police Department	714-738-6719
Corps Emergency Management Branch	213-894-3440

Notifications should include: (a) description of the type and extent of existing or impending emergency; (b) advisement for evacuation from the flood plain; (c) information on the time of initial release of hazardous amounts of water; (d) the depth of water behind the dam; and (e) the dam tender's name and telephone number.

Upon completing the above notifications, attempt to re-establish communications with the Reservoir Regulation Section. Document all notifications made, and refer to the Orange Book (Instructions for Reservoir Operations Center Personnel) for more information on additional emergency notifications. The dam tender should not leave the dam unless his safety is in jeopardy.

EXHIBIT B

FULLERTON DAM
RESERVOIR REGULATION SCHEDULE

EXHIBIT B
FULLERTON DAM
RESERVOIR REGULATION SCHEDULE

May 1989

FLTN WSE RANGE 1														267'-274'
Fltn Precip	0 - 0.1"					0.11" - 0.3"					0.31" - 0.6"			
FCKR Flow	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800
Desired release	340	300	100	0	340	340	300	100	0	340	340	200	100	0
Gate Setting @ 261'	5.0	5.0	5.0	0	5.0	5.0	5.0	5.0	0	5.0	5.0	5.0	5.0	0
Gate Setting @ 274'	5.0	3.5	0.7	0	5.0	5.0	3.5	0.7	0	5.0	5.0	1.3	0.7	0

FLTN WSE RANGE 2														274'-280'
Fltn Precip	0 - 0.1"					0.11" - 0.3"					0.31" - 0.6"			
FCKR Flow	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800
Desired Release	450*	300	100	NA	350	450*	300	100	0	350	400*	300	100	0
Gate Setting @ 274'	5.0	3.5	0.7	0	5.0	5.0	3.5	0.7	0	5.0	5.0	3.5	0.7	0
Gate Setting @ 280'	5.0	1.6	0	0	2.4	5.0	1.6	0	0	2.4	3.5	1.6	0	0

FLTN WSE RANGE 3														280'-286'
Fltn Precip	0 - 0.1"					0.11" - 0.3"					0.31" - 0.6"			
FCKR Flow	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800
Desired Release	450*	300	NA	NA	350	450*	300	0	0	350	400*	300	0	0
Gate Setting @ 280'	5.0	1.6	0	0	2.4	5.0	1.6	0	0	2.4	3.5	1.6	0	0
Gate Setting @ 286'	3.0	1.0	0	0	1.5	3.0	1.0	0	0	1.5	2.1	1.0	0	0

FLTN WSE RANGE 4														286'-289.5'
FLTN Precip	0 - 0.1"					0.11" - 0.3"					0.31" - 0.6"			
FCKR Flow	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800
Desired Release	450*	400*			400	450*	350			350	400*	300		
Gate Setting @ 286'	3.0	2.1			2.1	3.0	1.5			1.5	2.1	1.0		
Gate Setting @ 289.5'	2.3	1.7			1.7	2.3	1.2			1.2	1.7	0.8		

FLTN WSE RANGE 5														289.5 and above
FLTN Precip	0 - 0.1"					0.11" - 0.3"					0.31" - 0.6"			
FCKR Flow	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800	Unk	≤ 2000	≤ 2500	≤ 2800	>2800
Desired Release	500*	500*			0	500*	500*			0	500	500		
Gate Setting @ 290'	3.0	3.0			0	3.0	3.0			0	3.0	3.0		

HOW TO USE THIS SCHEDULE

1) Locate the Fullerton Dam water surface elevation range that corresponds to the current reading.

2) Determine the measured precipitation at Fullerton Dam for the past one half hour. Locate the corresponding range of pr

3) Determine current streamflow for Fullerton Creek at Richmond Avenue gauge (FCKR). Locate the corresponding range of th

4) Directly below FCKR flow range is the desired Fullerton Dam release to be made, if possible. Gate settings for desired fall within the range of gate settings shown for both gates.

Example: The current Fullerton WSE = 281.5, precip in last 1/2 hr = 0.25", and FCKR flow = 2400 cfs.
The desired release = 300 cfs and the gate settings should be between 1.9' - 1.6' (1.4' from outlet discharge cur

Footnotes: (NA) Not Attainable - Because of the ungated outlet or spillway flow the desired release cannot be attained.

* Channel observers should be dispatched to monitor releases in excess of 400 cfs.

EXHIBIT B
FULLERTON DAM
RESERVOIR REGULATION SCHEDULE

May 1989

267'-274'

	0.31" - 0.6"					0.61" +					Unknown				
Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk
340	340	200	100	0	300	250	200	100	0	200	340	300	100	0	300
5.0	5.0	5.0	5.0	0	5.0	5.0	5.0	5.0	0	5.0	5.0	5.0	5.0	0	5.0
5.0	5.0	1.3	0.7	0	3.5	2.0	1.3	0.7	0	1.3	5.0	3.5	0.7	0	3.5

274'-280'

	0.31" - 0.6"					0.61" +					Unknown				
Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk	2000	2500	2800	2800	Unk
350	400*	300	100	0	350	350	300	100	0	300	400*	300	100	0	300
5.0	5.0	3.5	0.7	0	5.0	5.0	3.5	0.7	0	3.5	5.0	3.5	0.7	0	3.5
2.4	3.5	1.6	0	0	2.4	2.4	1.6	0	0	1.6	3.5	1.6	0	0	1.6

280'-286'

	0.31" - 0.6"					0.61" +					Unknown				
nk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk
50	400*	300	0	0	300	300	300	0	0	200	400*	300	0	0	300
.4	3.5	1.6	0	0	1.6	1.6	1.6	0	0	0.6	3.5	1.6	0	0	1.6
.5	2.1	1.0	0	0	1.0	1.0	1.0	0	0	0.2	2.1	1.0	0	0	1.0

286'-289.5'

	0.31" - 0.6"					0.61" +					Unknown				
nk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk
00	400*	300	0	0	300	400	300	0	0	300	400*	300	0	0	400
.1	2.1	1.0	0	0	1.0	2.1	1.0	0	0	1.0	2.1	1.0	0	0	2.1
.7	1.7	0.8	0	0	0.8	1.7	0.8	0	0	0.8	1.7	0.8	0	0	1.7

289.5 and above

	0.31" - 0.6"					0.61" +					Unknown				
nk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk	≤2000	≤2500	≤2800	>2800	Unk
	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0

nt reading.

ate the corresponding range of precipitation below the Fullerton WSE.

ate the corresponding range of flow below the precipitation.

ssible. Gate settings for desired release should be determined based on actual water surface elevations and should

= 2400 cfs.
' '1.4' from outlet discharge curves).

esired release cannot be attained.

EXHIBIT C

Finding of No Significant Impact (FONSI)

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT CORPS OF ENGINEERS
FINDING OF NO SIGNIFICANT IMPACT
FULLERTON DAM WATER CONTROL PLAN
ORANGE COUNTY, CALIFORNIA

I have reviewed the enclosed environmental assessment (EA) for the Fullerton Dam Water Control plan. The proposed modification to the operational schedule would accommodate expected incoming flows into the reservoir while not exceeding the capacity of the downstream channel. No significant biological resources, cultural resources, water quality, or land use would be potentially affected by the proposed plan. The environmental assessment covers the proposed operational schedule which would go into effect upon approval of the South Pacific Division office of the U.S. Army Corps of Engineers, expected in December 1988.

I have considered possible impacts on environmentally significant resources as discussed in the EA and find that there are no significant impacts resulting from the project. Therefore, an environmental impact statement need not be prepared for the modification to the operational schedule.

25 Oct 1988
DATE

TADAHIKO ONO
Colonel, Corps of Engineers
District Engineer

EXHIBIT D

Chain of Correspondence For Approval

of Water Control Manual

CESPD-ED-W (CESPL-ED-HR/8 Nov 89) 3d End (1110-2-240b) Krhoun/dh/556-6210
SUBJECT: Fullerton Dam Water Control Manual

DA, South Pacific Division, Corps of Engineers, 630 Sansome St., Room 720, San Francisco, CA 94111-2206 18 JUN 1990

FOR Commander, Los Angeles District, ATTN: CESPL-ED-HR

1. Subject manual is approved.

2. Please furnish this office four copies of the final printing of the manual.

FOR THE COMMANDER:

JAY K. SOPER
Chief, Engineering Division

Encl
wd

1 - JUN 1989

CESPL-ED-HR (CESPD-ED-W/18 Jan 89) (1110-2-240b) 2nd End
Reid/ep/894-3003
SUBJECT: Fullerton Dam Water Control Manual

DA, Los Angeles District, Corps of Engineers, 300 N. Los Angeles Street, Room 6042, Los Angeles, CA 90053-2325 30 May 1989

FOR Commander, South Pacific Division, Attn: CESPD-ED-W

1. Enclosed are four copies of the final Fullerton Dam Water Control Manual prepared in accordance with ETL 1110-2-251. Responses to CESPD comments provided by 1st endorsement have been incorporated into the enclosed manuals. Report quality reproduction of this final version of the manual will begin upon receipt of your final approval.

2. If there are any questions, please contact Boni Bigornia of the Reservoir Regulation Unit at (213)894-6916.

FOR THE COMMANDER:

Robert C. Jagger

Enclosure
1. as

Carl F. Enson, PE
Chief, Engineering Division

CESPD-ED-W (CESPL-ED-HR/8 Nov 1988) (1110-2-240) 1st End Krhoun/6-2033

SUBJECT: Fullerton Dam Water Control Manual

DA, South Pacific Division, Corps of Engineers, 630 Sansome Street, Room 720, San Francisco CA. 94111-2206

JAN 1989

FOR: Commander, Los Angeles District, ATTN: CESPL-ED-HR

1. Subject final draft manual has been reviewed and comments are attached. These comments are submitted to assist the District in finalizing the manual. Approval will be given after review by this office of the final manual.

2. District is requested to submit its responses to the comments along with the submission of the final manual.

FOR THE COMMANDER:

WALTER C. DAY
Acting Chief, Engineering Division

2 Encls
wd encl 1
Added 1 encl
2. SPD Comments

CESPD-ED-W 17 January 1989

SOUTH PACIFIC DIVISION
COMMENTS ON
DRAFT
FULLERTON WATER CONTROL MANUAL

1. Page 2-2, Paragraph b(4)- Provide actual opening and closing rates of gates.

2. Page 6-1, Paragraph 6-01a- Remove references to future operating procedures as noted in the last two paragraphs. The water control manual should describe the current operating plan and not future studies that may be undertaken. Should the rainfall-runoff model become operable the manual would be updated to reflect that operation.

3. Page 7-1, Paragraph 7-02a- Provide channel capacity immediately downstream of the dam in this paragraph.

4. Page 7-3, Paragraph 7-02f- Remove the last part of this paragraph beginning with "however, unnecessary inundation....in its entirety.

5. Page 7-5, Paragraph 7-05- The qualifications a and b should be removed from the manual. The plan as described should meet authorizing legislation, be based on state of the art technical analysis and provide the degree of protection the project was designed for. The District also has almost 50 years of experience in operating Fullerton Dam so it can assumed the plan described will meet all objectives of the project. In addition, the operating plan will work for a full range of events not just major events.

6. Page 7-5, Paragraph 7-05- The first full paragraph on this page notes a dam tender may not be necessary for small events. This infers that the dam tender will be activated only based on forecast. Since forecasting is not an exact science and the response time of the area above the dam is so short the dam tender should be activated at the onset the rainfall-runoff event.

7. Page 7-6- In the first paragraph on this page Section 9 is the wrong reference. Please change to correct reference.

8. Page 7-6- In the third paragraph fully describe the two stages used in changing the outflow from the dam.

9. Page 8-01, Paragraph 8-01- Remove greater from the first sentence in the paragraph.

10. Need ~~a~~ P on contigency during droughts

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS

REPLY TO
ATTENTION OF

CESPL-ED-HR (1110-2-240) 08 NOV 1989

MEMORANDUM FOR: Commander, South Pacific Division, Attn: CESPD-ED-W

SUBJECT: Fullerton Dam Water Control Manual

1. Enclosed are three draft copies of the Water Control Manual and Accompanying Environmental Assessment (EA) for Fullerton Dam for your review and approval.

2. Copies of the draft Water Control Manual and EA have also been sent to the city of Fullerton and the Orange County Environmental Management Agency for concurrent review.

FOR THE COMMANDER:

Robert C. Kyle
for CARL F. ENSON, P.E.
Chief, Engineering Division

Encl (3 copies)

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2711
LOS ANGELES, CALIFORNIA 90053-2325

November 8, 1988

REPLY TO
ATTENTION OF

Office of the Chief
Hydrology and Hydraulics Branch

Mr. W. M. Reiter
Orange County Environmental
Management Agency
Public Works Operations
10852 Douglas Road
Anaheim, California 92806

Dear Mr. Reiter:

Enclosed are three copies of the draft Water Control Manual and Environmental Assessment for Fullerton Data for your review and comments. Please provide your written comments by 15 December 1988.

These documents are currently undergoing concurrent review by our Division Office and are subject to revision. We will send you a final version of the Water Control Manual when it is completed.

If you have any questions, please contact Mr. Edward Andrews at (213)894-2994. Thank you for your cooperation.

Sincerely,

Carl F. Enson, PE
Chief, Engineering Division

Enclosure (3 copies)

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS

November 8, 1988

REPLY TO
ATTENTION OF

Office of the Chief
Hydrology and Hydraulics Branch

Mr. Hugh Berry
City of Fullerton
Director of City Engineering
308 West Commonwealth Avenue
Fullerton, California 92632

Dear Mr. Berry:

Enclosed is a copy of the draft Water Control Manual and Environmental Assessment for Fullerton Dam for your review and comments. Please provide us with your written comments by 15 December 1988.

These documents are currently undergoing review by our Division office and are subject to revision. We will send you a final version of the water control manual when it is completed.

If you have any questions, please contact Mr. Edward Andrews at (213)894-2994. Thank you for your cooperation.

Sincerely,

Carl F. Enson, PE
Chief, Engineering Division

Enclosure