DEPARTMENT OF THE ARMY
SOUTH PACIFIC DIVISION, CORPS OF ENGINEERS
630 Sansome Street, Room 720
San Francisco, California 94111-2206

REPLY TO
ATTENTION OF:

DEC 28 1990

CESPD-ED-W (1110-2-240)

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, ATTN: CECW-EH-W, 20 Massachusetts Avenue, NW, Washington DC 20314-1000

SUBJECT: Updating Hansen Dam Water Control Manual

1. Enclosed is the updated Hansen Dam Water Control Manual for file purposes.

2. If you have any questions on the above, please contact Mr. Jack Hsu at FTS 465-1550 or commercial (415) 705-1550.

FOR THE COMMANDER:

Encl

JAY K. SOPER
Director, Engineering

WATER CONTROL MANUAL

HANSEN DAM

TUJUNGA WASH, LOS ANGELES COUNTY, CALIFORNIA

NOVEMBER 1990

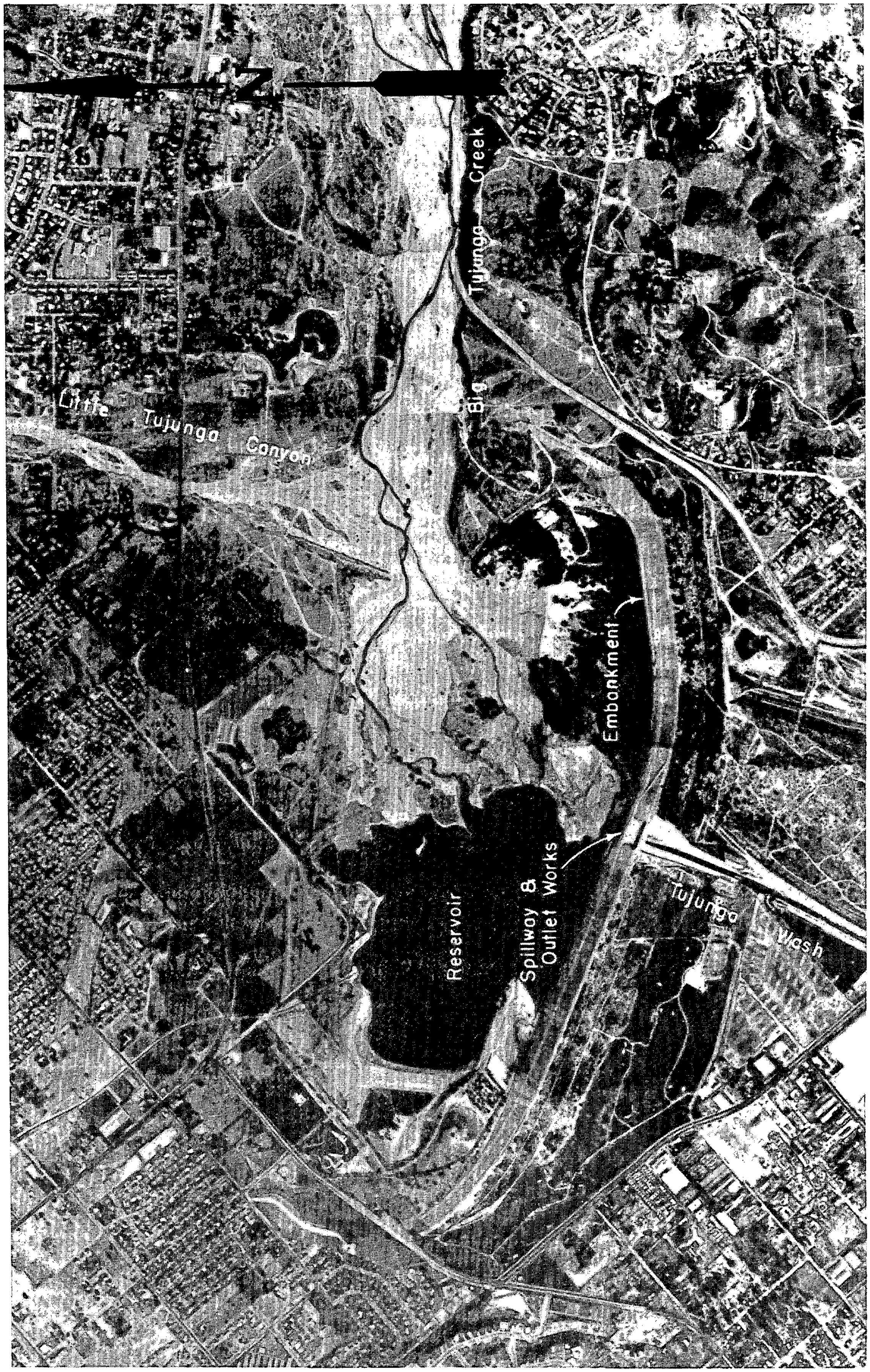
Prepared

by

U.S. Army Corps of Engineers

Los Angeles District

Reservoir Regulation Section



HANSEN FLOOD CONTROL DAM AND RESERVOIR (JAN 1969)

NOTICE TO USERS OF MANUAL

Regulations specify that this Water Control Manual be published in loose leaf 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 to keep the manual current.

EMERGENCY REGULATION ASSISTANCE PROCEDURES

In the event that unusual conditions arise, the Reservoir Regulation Section, Los Angeles District Office can be contacted by telephone at 213-894-4756. See plate 9-1 for other important telephone numbers for reservoir regulation assistance.

ORGANIZATION OF MANUAL

Indicated by Roman Numerals, this manual is divided into chapters. Within each chapter are numbered paragraphs, which are major topics discussed in the chapter. Figures cited in the text of each chapter are presented at the end of that chapter. Plates cited are located in the back of the manual. Exhibits are included in the back as appendices.

WATER CONTROL MANUAL

HANSEN DAM
TUJUNGA WASH, LOS ANGELES COUNTY, CALIFORNIA

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ABBREVIATIONS USED

ac-ft	acre-feet
ALERT	Automatic Local Evaluation in Real-Time
COE	U.S. Army Corps of Engineers
DWP	Department of Water and Power, City of Los Angeles
EM	Engineering Manual
ER	Engineering Regulation
ETL	Engineering Technical Letter
ft^3/s	cubic feet per second
ft.	feet
LACDA	Los Angeles County Drainage Area
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LAD	Los Angeles District, U.S. Army Corps of Engineers
LATS	Los Angeles Telemetry System
NGVD	National Geodetic Vertical Datum of 1929
NOAA	National Oceanographic and Atmospheric Administration
NWS	National Weather Service
PMF	Probable Maximum Flood
ppm	parts per million
QPF	Quantitative Precipitation Forecast
RDF	Reservoir Design Flood
ROC	Reservoir Operations Center
SPF	Standard Project Flood
SPS	Standard Project Storm
USGS	U.S. Geological Survey
VHF	Very High Frequency
WSE	Water Surface Elevation

I - INTRODUCTION

1-01 AUTHORIZATION

This Hansen Dam Water Control Manual was prepared in compliance with the following directives: Engineering Regulation (ER) 1110-2-240, "Engineering & Design, Water Control Management", dated 08 October 1982, Engineering Manual (EM) 1110-2-3600, "Engineering and Design, Management of Water Control Systems," dated 30 November 1987, Engineering Technical Letter (ETL) 1110-2-251, and "Engineering and Design, Guide For Preparing Water Control Manuals", dated 14 March 1980.

1-02 PURPOSE AND SCOPE

This water control manual provides a detailed plan for regulation of Hansen Dam and Reservoir on Tujunga Wash for the purpose of flood control. Hansen Dam is located approximately 4 miles southeast of the town of San Fernando, California, just below the confluence of Big and Little Tujunga Creeks. Major topics in this manual include: authorization, history, and description of the project; watershed characteristics; hydrometeorology; data collection and communication networks; hydrologic forecasting; the water control plan; and responsibilities and coordination for water control management.

1-03 RELATED MANUALS AND REPORTS

Manuals and reports with data and information relevant to the information in this manual are listed chronologically on plate 1-1.

1-04 PROJECT OWNER

Hansen Dam and Reservoir was constructed and is owned and operated by the U.S. Army Corps of Engineers, Los Angeles District (LAD).

1-05 OPERATING AGENCIES

a. The LAD is responsible for the operation and maintenance of the dam, reservoir, and outlet works. The outlet gates are operated manually, as needed.

b. The Los Angeles County Department of Public Works (LACDPW) is responsible for the operation and maintenance of the diversion works for the Hansen Spreading Grounds (1,500 ft. downstream of the dam). The Department of Water and Power, City of Los Angeles (DWP) is responsible for the operation and maintenance of the Tujunga Spreading Grounds, 3 miles downstream of the dam.

1-06 REGULATING AGENCIES

a. The LAD is responsible for developing the flood control regulation plan for Hansen Dam and Reservoir. The LAD is responsible for the flood control regulations and operation of the dam.

b. The LACDPW is responsible for the regulation of the diversion works for the downstream Hansen Spreading Grounds, which are used for groundwater replenishment.

II - DESCRIPTION OF PROJECT

2-01 LOCATION

Hansen Dam is located near the northern edge of the San Fernando Valley on Tujunga Wash, about one mile below the confluence of the Big Tujunga and Little Tujunga Washes, and about four miles southeast of the town of San Fernando. The boundary of the drainage area is formed by the San Gabriel Mountains on the north and west, and by the Verdugo Mountains and a secondary range of the San Gabriel Mountains on the south and east. The location of the project is shown on plate 2-1A. The drainage area is shown on plate 2-1B.

2-02 PURPOSE

Hansen Dam is an essential element for flood control in the Los Angeles River drainage basin. In conjunction with Sepulveda and Lopez Dams, Hansen Dam is vital for the flood protection of lower portions of the San Fernando Valley and the City of Los Angeles. Storage regulation given by the flood control basins permits efficient use of the Los Angeles River Channel. The storage allocation for Hansen Dam is shown on plate 2-2.

Currently, no facilities for the generation of hydroelectric power at Hansen Dam exist, nor are any contemplated. Furthermore, no navigation of any sort is possible or allowed in Hansen Reservoir or in Tujunga Wash, either upstream or downstream of Hansen Dam.

2-03 PHYSICAL COMPONENTS

a. Embankment. The dam is a compacted impervious earth-fill structure. It is 10,475 ft. long at the crest (elev. 1,087.0 ft. NGVD, i.e., National Geodetic Vertical Datum of 1929). The maximum height above streambed is 97 ft. It extends in a general east and west direction at right angles to Tujunga Wash. The axis of the dam follows a gentle curve in order to connect the abutments of the dam with a prominent rock outcrop located near the center of the dam. At the east end, the dam abuts against a range of small hills and on the west end, the dam terminates on a gentle sloping hill. Rock is exposed on the hillside at the east abutment and is found at shallow depths on the west abutment. Between the ends of the dam and the central rock outcrop, the axis of the dam crosses the lower end of a typical debris cone. The upstream face of the dam has a slope of 1V on 3H and is covered with a 2-ft. 6-inch layer of riprap over a 6-inch spall blanket. The downstream face has a slope of 1V on 6H from the rock toe to elevation 1,020, a slope of 1V on 5H from elevation 1,020 to 1,050, and a slope of 1V on 3H to the dam crest. Three berms, each 20 ft. wide, run parallel to thc axis of the dam, one on the upstream face at elevation 1,040 and two on the downstream face at elevations 1,020 and 1,050 ft.

The general plan, typical sections, and real estate limits are shown on plates 2-3, 2-4, and 2-5, respectively. Photographs of the embankment are shown in figure 2-1A and B.

b. Spillway. The spillway structure, with a crest elevation of 1,060 ft., is located near the center of the dam on a prominent rock outcrop just west of the Tujunga Wash channel. The approach channel, leading to the crest, is a 302-foot wide rectangular section with invert sloping from the earth berm at elevation 1,040 ft. to the point of intersection with the concrete crest section at elevation 1,060 ft. The crest is a Creager and Justin ogee section with an overall length of 302 ft. and six 3-foot wide crest piers, making a net length of 284 ft. A concrete lined rectangular spillway channel, which includes the outlet channel at its center, is designed to carry the spillway discharge beyond the earth embankment. The spillway channel consists of a 302-foot constant width section to the toe of the ogee section, and an 897-foot transition to a width of 180 ft. at the end of the channel. The spillway channel invert extends 233 ft. from the toe of the ogee section on a slope of 0.08584 and then 664 ft. on a slope of 0.02681, being parallel to the outlet channel invert, and terminating at elevation 964.0 and connects with the improved channel.

Details, dimensions, and other information related to the spillway are shown on plates 2-6, 2-7, and 2-8. Figures 2-2 and 2-3 show photographs of the spillway.

c. Outlet Works. The outlet structures and spillway are located west of the Tujunga Wash Channel in Hansen Knob, which is on the axis of the dam and approximately bisects it. The outlet structures include an approach channel, an intake structure with operating house and vent house, eight gated and two ungated outlet conduits, and an outlet channel. The outlet conduits are installed through the overflow spillway section (see fig. 2-3), located symmetrically with respect to the spillway center line and aligned to discharge into Tujunga Wash. The gated conduits are located in the center of the outlet section in two groups of four. All conduit entrances are elliptical in shape and have been provided with a semicircular trash rack structure. The throat entrances to the ungated conduits are 8 ft. by 8 ft. in order to allow larger discharges through these conduits. A 60-foot long section, dropping to the approximate elevation of the gated conduits, is used as the transition from the 8 ft. by 8 ft. entrance throat to the 8 ft. wide by 6 ft. high outlet section. The combined maximum capacity of the outlets is 22,000 ft^3/s at a reservoir water surface elevation of 1,060 ft. (i.e., at the spillway crest), of which 4,900 ft^3/s passes through the ungated openings and 17,100 ft^3/s passes through the gated openings. Plates 2-9, 2-10, and 2-11 show pertinent information pertaining to the reservoir outlet works. Figure 2-3 is a photograph of the Hansen Dam outlet works.

d. Water Supply Facilities. Hansen Dam's regulation objectives are to maximize flood protection and enhance recreational usage. These objectives are to be accomplished by operating Hansen Dam to release all flood waters as rapidly and safely possible. In the past, Hansen Dam has also been operated in the interest of water conservation by utilizing the storage allocated for sediment. Runoff would be temporarily stored for groundwater recharge downstream. However, due to the large accumulation of sediment in Hansen Dam, it is no longer possible to impound water for conservation without infringing on flood control capability and recreation facilities. The large sediment accumulation has created a situation in which even relatively small impoundments for conservation adversely impact on usage and maintenance of recreation facilities located within the basin. Operation for water conservation also tends to increase the rate of sediment deposition, thereby shortening the usable life of the project. Maintenance costs, including reservoir cleanout, are being borne by the agencies responsible for flood control and recreation, without participation from the beneficiaries of water conservation operation. The Corps has a strong interest in water conservation, but until a solution is found to the sedimentation problems, LAD will not be able to operate for water conservation.

2-04 RELATED CONTROL FACILITIES

There are three related control facilities: (a) Big Tujunga Dam, which is upstream from Hansen Dam, is operated by LACDPW as a flood control reservoir, in addition to its water conservation purpose; (b) the Hansen Spreading Grounds, which are owned and operated by the LACDPW; and (c) Lopez Canyon Diversion Channel which diverts runoff from a 2.4 square mile areas into Hansen flood control basin.

2-05 REAL ESTATE ACQUISITION

Hansen Dam and Reservoir project lands comprise 1468 acres as shown on plate 2-5.

2-06 PUBLIC FACILITIES

The recreation conditions at Hansen Dam have changed considerably during the past 48 years. The once expansive (Holiday) lake has all but disappeared, equestrian trails have expanded, and new facilities have been constructed within the basin.

Adjacent to the downstream face of the dam embankment is an 18-hole golf course with clubhouse, parking area, and driving range. An overlook area is located just north of the intersection of Osborne Street with Glenoaks Boulevard. The overlook has a paved parking area and provides nonvehicular, public access to the crest service road. Within the basin, the existing facilities include: six ballfields, an outdoor theatre, restrooms, two parking areas, an equestrian center, and several picnic areas. Prior to 1983 there was a lake used for swimming and boating, but due to sedimentation, the lake no longer exists. There were two large parking lots near the lake, one for the swimming area, and the other for the boat launching area. The boat trailer lot has been virtually eradicated by the deposition of large amounts of sediment in the area and a large portion of the swimming area lot has also been impacted by sediment inundation. See plates 2-12A, B, and plate 2-13 for current and proposed facilities in the reservoir with their respective elevations.

Figure 2-1a. Upstream View of Hansen Dam Embankment, Looking Northeast

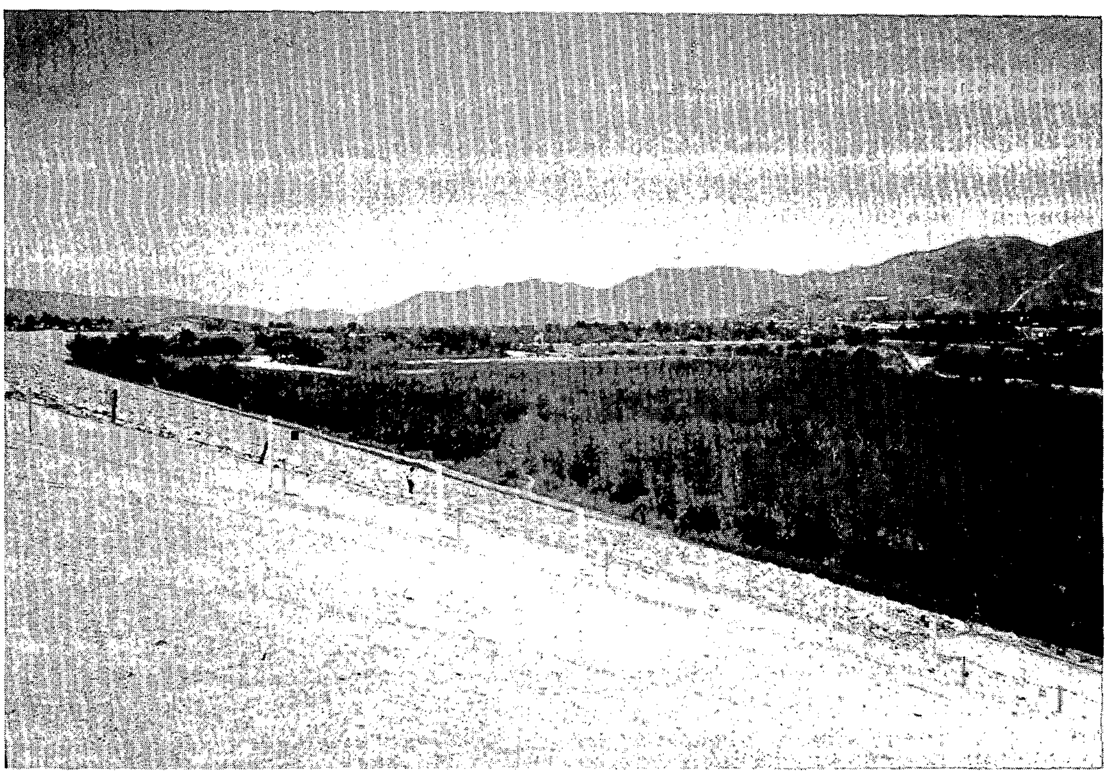


Figure 2-1b. Upstream View of Hansen Dam Embankment, Looking Northwest

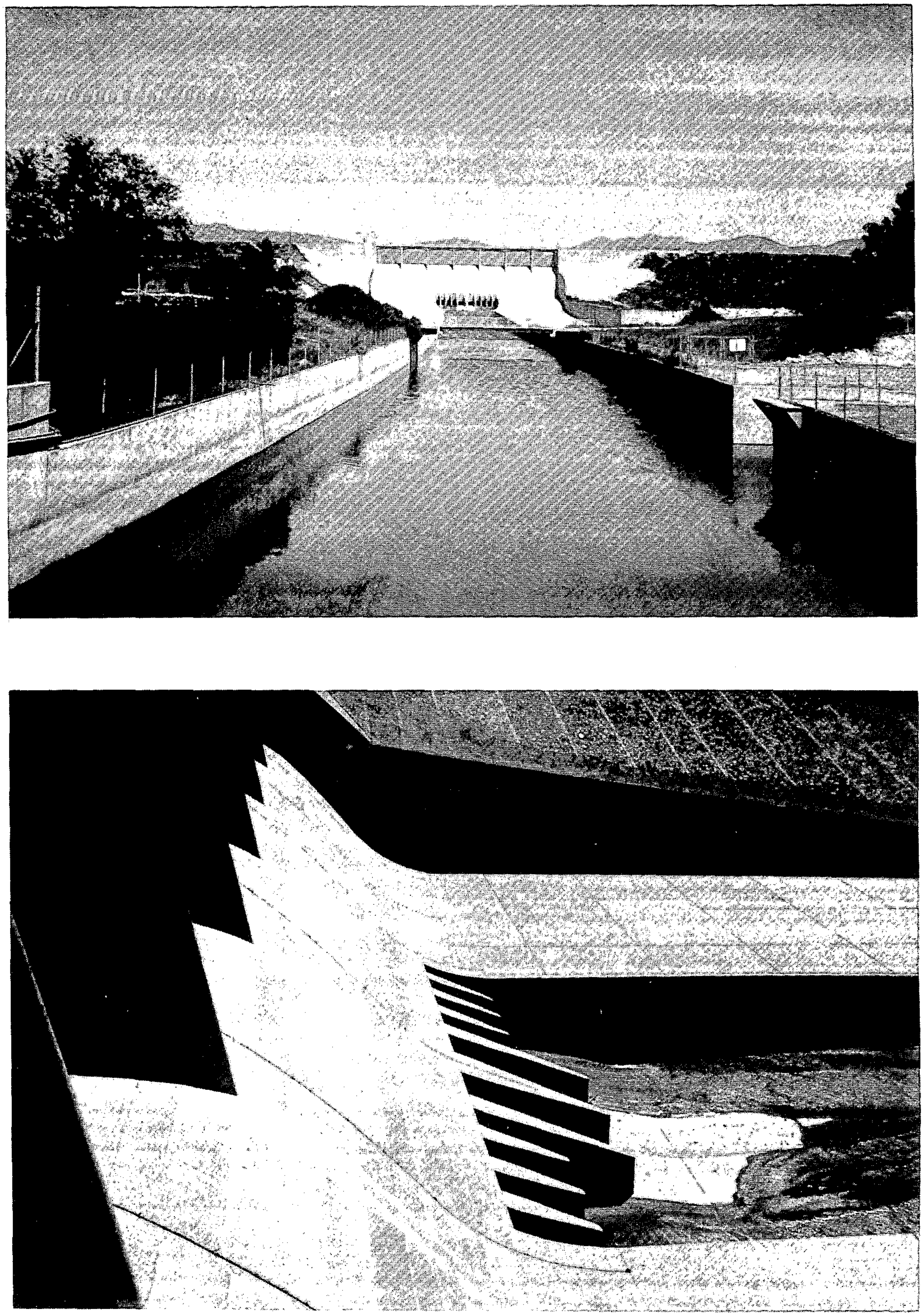


Figure 2-3. Hansen Dam Spillway and Outlet Channel.

III - HISTORY OF PROJECT

3-01 AUTHORIZATION

Hansen Dam was authorized by the Flood Control Act, approved 22 June 1936 (Public Law 738, 74th Congress) and extended and amended by subsequent Flood Control Acts of 1937, 1938, 1941, 1944, and 1946. The plan for construction, in accordance with the recommendations contained in the report dated 11 April 1940 by the Chief of Engineers, and submitted in House Document 838, 76th Congress, 3rd session, was authorized by the Flood Control Act, approved 18 August 1941.

3-02 PLANNING AND DESIGN

In 1935 and 1936, LAD and the Los Angeles County Flood Control District (LACFCD) became partners in a large Works Progress Administration contract to design a comprehensive flood control plan for Los Angeles County. During the next three years, a comprehensive flood control system was designed for the Santa Ana, San Gabriel, and Los Angeles Rivers (of which Hansen Dam is a part). This included a Definite Project Report for the control of the Los Angeles River, submitted in December 1936, which was revised in 1939 to include the influence and data of the March 1938 flood. Other design reports include: "Analysis of Design of Tujunga Wash Improvement - Hansen Dam" - Volume I and II, dated 2 May 1939, superseded by Volume III, dated 1 June 1940; "Analysis of Design of 5 ft. by 8 ft. Service Gates for Hansen Dam," issued January 1939; "Analysis of Hydraulic Design for Hansen Flood Control Basin", issued 18 March 1940.

3-03 CONSTRUCTION

Construction for Hansen Dam started on 20 September 1939, with work completed and accepted by the U.S. Army Corps of Engineers on 5 September 1940. The project was constructed by Guy F. Atkinson Company, and copies of the construction contract (Contract No. W-509-Eng-689) and construction drawings (File Nos. 424/66 through 424/104 and 425/1) are on file in the LAD Office, in the Design Section.

3-04 RELATED PROJECTS

Plate 2-1 shows related projects for the entire Los Angeles County drainage are (LACDA).

a. <u>Big Tujunga Dam</u>. Big Tujunga Dam is located on Big Tujunga Creek, approximately 15 miles upstream of Hansen Dam. The concrete arch structure, completed in 1931, is operated and maintained by the LACDPW for flood control and water conservation. Big Tujunga Dam has a storage capacity at spillway crest of 6,240 ac-ft with a maximum outflow of 24,250 ft^3/s. Information pertaining to Big Tujunga Dam and Reservoir is given in Exhibit A.

b. <u>Hansen Spreading Grounds</u>. Hansen Spreading Grounds is owned and operated by the LACDPW. The facility is located approximately 1,500 ft. downstream of Hansen Dam. A radial gate across Tujunga Wash can divert flow into the spreading grounds. Photographs of the diversion structure and the spreading facility are shown in figures 3-1 and 3-2. pertinent information concerning Hansen Spreading Grounds is listed below:

Maximum basin intake capacity	400 ft^3/s
Maximum basin outlet discharge	150 ft^3/s
Allowable water quality sediment limit	400 ppm
Storage capacity	330 ac-ft
Maximum percolation rate	250 ft^3/s
Basin gauge height limits*	4-5 ft

*Basin gauge height limit refers to the depth of water in the basin during spreading operations.

c. <u>Tujunga Wash Channel</u>. The Tujunga Wash channel, for Hansen Dam to the Los Angeles River, was constructed in 1952. The channel capacities and configuration are shown on plate 3-1. The channel capacities and configurations for the Los Angeles River from Sepulveda Dam to the Pacific Ocean are shown on plate 3-2, A, B, and C. The original capacity of the unimproved channel immediately downstream of the dam was 12,000 ft^3/s. Flowing improvement of the channel in 1952, the capacity rose to 22,000 ft^3/s. The channel capacity was revised in 1988 during LACDA review studies to 20,800 ft^3/s to reflect current freeboard criteria. The rectangular channel is lined with reinforced concrete.

d. <u>Tujunga Spreading Grounds</u>. Tujunga Spreading Grounds is owned and operated by the Department of Water and Power, City of Los Angeles (DWP). It is located approximately 3 miles downstream of Hansen Dam. Although DWP is capable of spreading water from Tujunga Wash, it does not, and has not since 1983, due to the high sediment concentration of flood control release. If DWP were to spread water, the water's origin would be surplus water from DWP's reservoirs via the California Aqueduct.

e. <u>Pacoima Diversion Channel</u>. Pacoima Wash is an improved channel from Lopez Dam to Paxton Street where it is diverted to Tujunga Wash by the Pacoima Diversion Channel. The channel capacities and configuration are shown on plate 3-3. This channel was constructed in 1954 as a part of the LAD Lopez Dam Project. The channel capacity is 17,000 ft^3/s at the confluence of Tujunga Wash.

f. <u>Branford Spreading Grounds</u>. Branford spreading Grounds are owned and operated by the LACDPW. THe facility is located near the Pacoima Diversion Channel/Tujunga Wash confluence. Branford Spreading Grounds obtains its water from a local storm drain system. The facility discharges water into the Pacoima Diversion Channel and has no capability of diverting water from the channel. The facility's maximum inflow and outflow is 1,540 ft^3/s and the outlet invert elevation is 835 ft. NGVD. Its location is shown on plate 3-3.

g. <u>Lopez Canyon Diversion Channel.</u> The Lopez Canyon Diversion Channel drainage area, located between Lopez Dam and Hansen dam, is bout 2.4 square miles. About 80 percent of the area is on the southern slope of the

San Gabriel Mountains. The gradient of the steam ranges from approximately 1,700 ft/mi (0.32) in the headwaters to 250 ft/mi (0.05) near the outlet into Hansen flood control basin. Its location is shown on plate 2-1.

3-05. MODIFICATIONS TO REGULATIONS

For the 1940-1951 period, Hansen Reservoir was operated to completely regulate minor floods by utilizing the nearly 4,00 ac-ft available for debris pool storage. The stored water of minor floods was released to the spreading grounds downstream, operated by the LACDPW and the DWP. For large floods that raised the reservoir water surface above the ungated outlets (elev. 1,011 ft. NGVD), the gates were to be operated to maintain a maximum outflow of 12,000 ft^3/s, required to prevent the spillway from going into operation for the reservoir design flood prior to 1952. As indicated in the preceding section, after the improvement of Tujunga Wash downstream of the dam in 1952, the regulation schedule was modified to provide for a maximum release of 22,000 ft^3/s. The current reservoir operation schedule was revised in 1988 to limit the maximum release to 20,800 ft^3/s. This schedule, in the form of water surface elevation versus outlet discharge, is based exclusively on operation for flood control and is shown in plate 3-4.

3-06. PRINCIPAL REGULATION PROBLEMS

Hansen Dam has performed adequately since its construction. The dam has never spilled, and there have never been any structural deficiencies or major hydraulic malfunctions.

However, based on the results of the April 1983 reservoir sedimentation survey, current storage capacity below the spillway crest elevation of 1,060 ft. is approximately 25,500 ac-ft, which is about 23 percent less than the initially allocated net flood control storage capacity of 33,100 ac-ft. Figures presented on plates 4-1A, 4-1B are indicative of the fact that sediment has accumulated behind the dam at an average rate of 255 ac-ft per year during the 1940-1978 period. Beginning in 1981 and continuing through 1983, the date of the most recent survey, excavation to remove sediment started. Total sediment removed during this period is estimated to be 333 ac-ft. Excavation has continued since 1983; the estimated annual sediment removals are given on plate 3-5. Excavation is continuing and since excavation began in 1981 it is projected to remove 7,320 ac-ft through 1990 thereby returning hansen reservoir close to original flood control capacity. Because of the uncertainties of sediment removed and the inconsistency of the 1982 survey with these figures, no sedimentation rate was determined since 178. For this manual, the sedimentation rate of 255 ac-ft/yr, for the period 1940-1978, is indicative of the long term sedimentation rate. The results of the 1983 reservoir sedimentation survey are graphically presented on plate 3-6. This plate showns the relationships between water surface elevation, surface area, and storage capacity based on this survey,. It is evident that sediment has accumulated behind the dam at a rate much faster than the 100-ac-ft per year initially anticipated during the dam's design, and that current flood control storage capacity of the reservoir is barely adequate to control the Standard Project Flood (SPF) event without exceeding downstream channel capacity. Consequently, in recent years the reservoir regulation plan has been altered. No storage will be used for water conservation until local interests formally agree to participate in the removal of sediment deposits accumulated in the reservoir that are attributable to water conservation operation.

Another regulation problem is the repetitive blocking of the trash rack by floatable debris. The debris problem at Hansen Dam has threatened the water control regulation of the project on at least two occasions in the past. During the flood of 1980, while all gates were fully open, inflow (up to 11,350ft^3/s) transported floatable debris into the trash rack, nearly sealing off the outlet works. The debris problem at the project can be described as follows: Hansen Dam has the heaviest sediment load (255 ac-ft/yr) of COE dams in LAD. Figure 3-3 shows debris being removed with a crane on February 18,1980 after the storm of February 17, 1980. A significant amount of debris is evident. Phone poles and large trees were observed to be included in the debris. During large flood events, debris has to be cleared from in front of the trash racks in order to prevent a "dam" being formed in front of the outlets. Very little flow was coming through the intakes works in spite of the fact that water level in the reservoir was up to the top of the trash racks (elev. 1,031). A crane was positioned at elevation 1,040 to remove debris which again had blocked the intakes. Eventually, a huge plug was released downstream causing bankfull flow when it finally flushed loose as the result of openings and closings of the gates in an effort to release the debris piled against the trash racks.

The tops of the trash racks are adjacent to a berm at elevation 1,040 ft. Just beyond the berm is the concrete approach to the spillway ogee (elev. 1,060 ft.) The field crew was working between the rising water and the spillway, with the crane positioned on the berm in the last accessible space from which to clear the outlets of debris. If the water had been allowed to rise further, with the outlets still plugged, the water could have flowed over the berm, and the crew would have had to evacuate. The crane cable was attached to the top 10-foot sections of the trash racks, which were pulled out as a last resort. The water and debris plunged downward into the ungated outlets and soon the system was able to discharge water again. During this same flood, the clamshell bucket got caught in debris and was tipping the crane. It had to be cut loose and was swept into the outlet works down through the ungated outlet.

The March 1, 1983 flood again required use of a crane to remove debris from in front of the trash racks. Figure 3-4 shows debris being removed with cranes on March 4, 1983 after that storm.

Suggested solutions to the debris problem have included: remove the trash racks all together; remove the upper and lower 10-foot sections of each trash rack tier similar to what was done at Sepulveda and Santa Fe Dams; remove the upper 10-foot sections of trash racks while making the lower 10-foot sections hinged, to allow cleaning of outlet works with heavy equipment in summer season; allow reservoir vegetation to grow to build a "natural" trash rack in the reservoir.

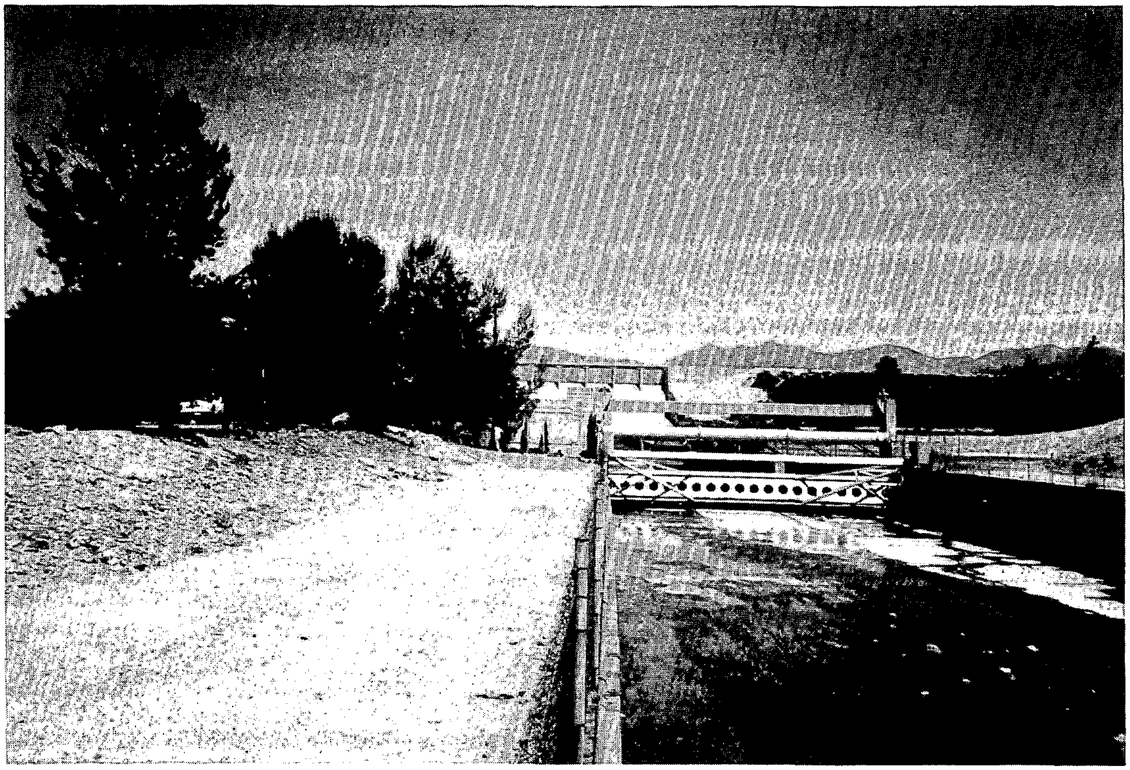


Figure 3-1. Hansen Spreading Grounds Diversion Structure.

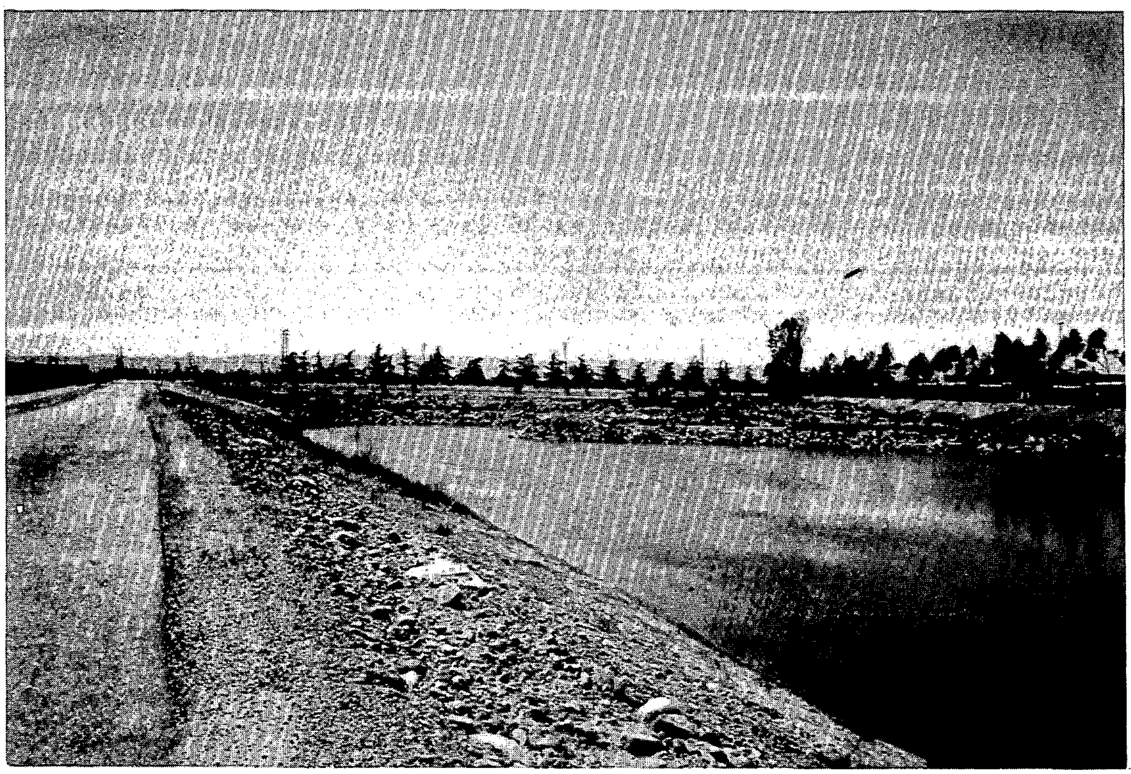


Figure 3-2. Hansen Spreading Grounds' Infiltration Pond.

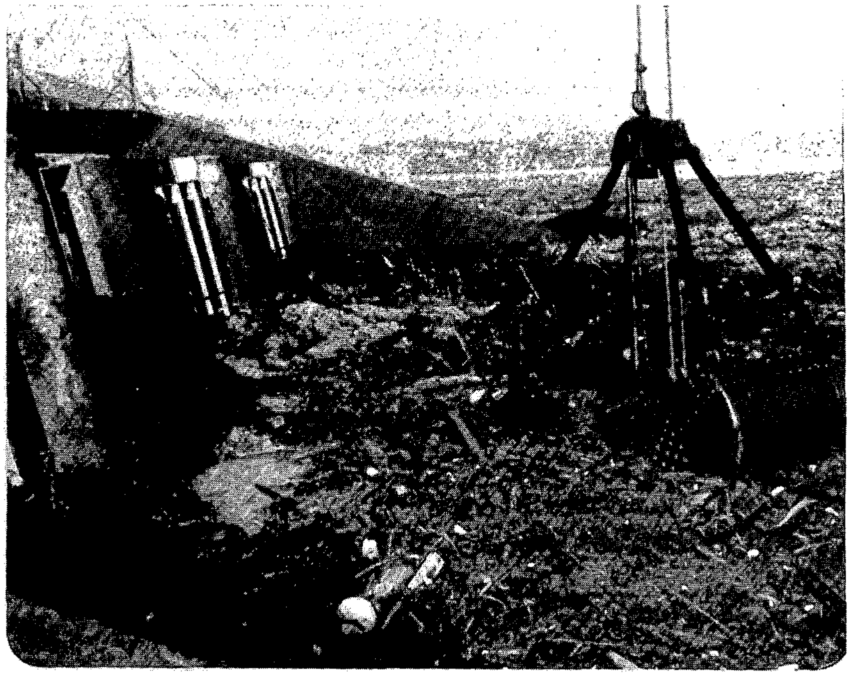


Figure 3-3. Debris at Hansen Dam after February 17, 1980 storm.

Figure 3-4. Debris at Hansen Dam after March 1, 1983 storm.

IV - WATERSHED CHARACTERISTICS

4-01 GENERAL CHARACTERISTICS

Hansen Dam is located on the edge of San Fernando Valley on Tujunga Wash, a principal tributary of the Los Angeles River system. The San Gabriel Mountain Range forms the northern drainage divide of the watershed and reaches an elevation of over 7,124 ft. NGVD upstream of Big Tujunga Dam, the largest structure in the Hansen Dam watershed. The drainage divide on the west is formed by the ridge between the Lopez Dam and Hansen Dam watersheds. On the east, the drainage divide is the high ridge between the Hansen Dam watershed and that of the upper San Gabriel River watershed. To the south Tujunga Wash flows across a broad alluvial fan and urbanized valley area before emptying into the Los Angeles River downstream of the dam. Little Tujunga Creek, the other major tributary in the watershed, joins Big Tujunga Creek within Hansen Reservoir. The longest watercourse in the watershed is the Big Tujunga Creek mainstem. It has a length of 31.5 miles, and an average slope of 148 ft. per mile (0.028).

4-02 TOPOGRAPHY

Approximately 140 square miles of the 152 square mile drainage area above Hansen Dam consists of steep, mountainous terrain, dissected by deep, narrow ravines containing the numerous watercourses tributary to this watershed. The remainder of the watershed consists of a relatively flat alluvial fan surface and valley fill area, much of which is occupied by urban development. Elevations in the mountains vary from 7,124 ft. at Pacifica Mountain (the highest point in the watershed) to 990 ft. at the dam site.

4-03 GEOLOGY

Hansen Dam is located in a basin formed by a series of tiered bluffs descending from the San Gabriel Mountains in the north to the dam site in the south. The Hansen Dam Basin foundation is comprised of alluvium consisting of sand, gravel, and boulders. Overbank areas tend to consist of the same material with somewhat larger amounts of silt and clay in the matrix. The dam itself is tied into two outcrops of Modelo sandstone. Soils at the dam tend to be well-graded alluvial materials receptive to the growth of vegetative cover. Soils in the mountains tend to be shallow, stony, and poorly developed.

4-04 SEDIMENT

Sediment production within the Hansen Dam watershed varies considerably, depending primarily on the terrain. In the urbanized valley areas, sediment production is at a minimum, and may be expected to decline even further with a continued increase in areas devoted to urban uses. In the steep mountainous segment of the watershed, sediment production can be quite high, particularly following periods in which wildfire impacts the watershed, and also following periods of high-intensity rainfall. The fire history of Hansen Dam watershed was computed to have burned 95 percent of the watershed over a period from 1878 through 1975. On September 9-12, 1968, the Limerock Fire burned 2,846 acres which included the entire western side of Little Tujunga Creek. This burn contributed sediment and debris to the January 24-28, 1969 storm runoff. Subsequent small fires in the watershed also occurred along the Little Tujunga Creek and Lopez Canyon drainages making the northwest edge of the Hansen Dam watershed the most likely source of much of the debris problems within Hansen Reservoir. On November 23-27, 1975 the Mill Fire burned 6,370 acres along a stretch from Hansen Dam watershed to Pasadena. This fire burned 95 percent of the area between Hansen Dam and Big Tujunga Dam as well as acreage behind Big Tujunga Dam. Subsequent runoff events in 1978, 1980, and 1983 have carried excess debris and sediment due to fire damage. Big Tujunga Dam and Reservoir initially intercepts much of the sediment produced by the 82.3 square miles drainage area upstream of Hansen Dam. Slucing of this sediment has not been permitted by the Corps because no agreement for sediment removal from Hansen Reservoir has been made with Los Angeles County Flood Control District.

Reservoir surveys for Hansen Dam were performed in September 1940, July 1941, October 1943, November 1945, January 1962, August 1969, October 1978, July 1982 and April 1983. Pertinent parts of Eng Form 1787, Reservoir Sediment Data Summary for Hansem Dam, are given on plates 4-1A, B. The plates show an average sedimentation rate of 255 ac-ft per year for the period 1940-1978. An average sedimentation rate has not been determined after 1978 because of the approximations of sediment removal and the inconsistancies with the 1982 survey. See section 3-06.

The loss in storage capacity due to sediment deposition within Hansen Reservoir amounts to 28.9 percent of total gross (1940) storage capacity as of April 1983. This figure would exceed 31 percent had it not been for excavation performed since 1982 to restore capacity.

4-05 CLIMATE

The climate of the drainage area above Hansen Dam is generally temperate and semi-arid, with warm, dry summers and cool, moist winters.

a. Temperature. Average daily minimum/maximum winter temperatures (in degrees Fahrenheit) range from about 40/65 near the dam to about 20/45 in the higher mountains. The corresponding summer temperatures are about 65/95 and 55/80, respectively. All-time low/high extremes in temperature are about 15/120 near the dam, and about -15/105 in the highest mountain valleys.

Plate 4-2 shows average and extreme temperature data for Burbank, California (located about 8 miles south of Hansen Dam), the nearest station with complete climatological data. The regular U.S. Weather Bureau station at Burbank was closed in 1965, so the climatological data on plate 4-2 extends only through 1964.

b. Precipitation. Plate 4-3 (from LACDPW) shows the mean annual precipitation over the Hansen Dam drainage area. Within the drainage area, mean annual precipitation ranges from slightly more than 15 inches near the dam to more than 36 inches in the San Gabriel Mountains southeast of Big Tujunga Dam.

Plate 4-2 lists the mean and maximum observed monthly precipitation for Burbank, California. Plate 4-4 lists the same for Hansen Dam and for 3 stations within the Hansen drainage basin. These plates indicate that there can be great year-to-year variability in monthly, as well as annual precipitation. Not listed on these plates are the minimum observed monthly precipitation values, which for most stations are at most 0.01 or 0.02 inches for every month of the year.

Plate 4-5 is a precipitation depth-duration-frequency tabulation for the centroid of the watershed above Hansen Dam. In it are listed the computed point-value precipitation depths for durations of from 5 minutes to 24 hours, and for return periods of from 2 to 100 years. Data for this table were obtained from National Oceangraphic and Atmospheric Administration (NOAA) Atlas 2.

1. Winter Storms. Most precipitation in southern California coastal drainages occurs during the winter season, primarily from November through early April, as mid-latitude cyclones from the northern Pacific Ocean move inland over the area. Most of these storms are the general winter type, characterized by hours of light-to-moderate precipitation, but with many heavy showers and thunderstorms within the storm system.

2. Summer Storms. Two types of summer storms can affect southern California, although they are relatively rare.

(a) Local Thunderstorms. During humid periods between July and September, the deserts and eastern mountains of southern California experience occasional thunderstorms. On a few occasions, these may drift westward into the coastal drainages, including the Hansen Dam watershed. These thunderstorms can at times result in very heavy rain for short periods of time over small areas.

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

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

3. Snow. Snow in southern California is relatively uncommon at elevations below 4,000 ft. and is extremely rare below 2,000 ft. Although even the valley floor has experienced light snow on isolated occasions, snowfall and snowmelt are not considered to be a significant hydrologic factor in the Hansen Dam drainage.

c. Evaporation. Few formal studies of evaporation have been made in the San Fernando Valley. Because Hansen Reservoir is normally dry, with any impoundments generally lasting less than 24 hours, evaporation is not a major consideration at this site. Studies for nearby locations indicate that mean daily evaporation ranges from about one-tenth inch in winter to about one-third inch in summer. On days of very strong, dry Santa Ana winds, evaporation can be considerably greater than one inch.

d. Wind. The prevailing wind in the San Fernando Valley is the sea breeze. This gentle onshore wind is normally strongest during late spring and summer afternoons, with speeds in the western San Fernando Valley typically 10 to 15 miles per hour.

The Santa Ana is a dry desert wind that blows from out of the northeast, most frequently during late fall and winter. This type of wind does not normally occur when water is impounded behind Hansen Dam. The characteristic low humidities and strong gusts of Santa Ana winds (which can exceed 70 miles per hour at times) usually create very high fire hazards, but can also be instrumental in drying a saturated watershed, thus reducing the flood hazard from later events.

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

4-06 STORMS AND FLOODS

All of the major inflow and impoundment events in the history of Hansen Dam have been the result of general winter storms.

Prior to the construction of the dam, there were a number of major storms and floods on Tujunga Wash and the Los Angeles River, including those of January 1862 (commonly refered to as the greatest storm in southern California history since records began in the late 1700's), February and March 1884, January and February 1914, January 1916, December 1921, February 1927, December 1933-January 1934, and February and March 1938. There was also one significant summer tropical storm that occurred in September 1939, but no widespread flooding in this area was caused by this event.

a. Storm and Flood of February-March 1938. The flood of 27 February-3 March 1938 was the most destructive of record on the Los Angeles River, Tujunga Wash, and many other streams in southern California. Its occurrence played a major role in the justification for the construction of Hansen Dam.

The storm developed as a series of low-latitude north Pacific disturbances, bringing several bands of intense rainfall to southern California during a 5-day period. The intense band of 1-2 March produced an estimated peak flow of 54,000 ft^3/s on Tujunga Wash, approximately 2,000 ft. below Hansen Dam (U.S.G.S. Gauge No. 11097000). This flow, combined with heavy runoff from the upper Los Angeles River and other tributaries, produced a very destructive flood on the Los Angeles River throughout the southeastern San Fernando Valley, downtown Los Angeles, and downstream locations.

b. Storms and Floods since 1941. Several of the major storms and floods that have occurred on Tujunga Wash since the completion of Hansen Dam in 1940 are discussed in section 8-02 of this manual.

4-07 RUNOFF CHARACTERISTICS

Runoff from the watershed is characterized by high flood peaks of short duration that result from high-intensity rainfall on the watershed. Flood hydrographs are typically of less than 12 hours duration and are usually less than 48 hours duration. Inflow rates drop rapidly between storms, and inflow during the dry summer season is usually less than 10 ft^3/s. Long-term average inflow to Hansen Dam for the period 1946 through 1988 is 27,450 acre-feet per year. Plate 4-6 lists the annual maximum of inflows, outflows, and contents at Hansen Dam from 1941 through 1986. Plates 4-7A and 4-7B display maximum peak inflow while plates 4-7C and 4-7D display the annual outflow for Big Tujunga Dam.

The greater Los Angeles area has historically experienced long-term wet and dry periods. Plate 4-8 illustrates the historic regional response of flood peaks from the 1870's to the 1970's.

In general, antecedent precipitation is required as a prerequisite for the occurrence of large floods from this watershed. With substantial antecedent precipitation resulting from a series of winter storms, precipitation loss rates may decrease to as low as 0.15 inch per hour by the end of a major storm. The basin unit hydrograph for the watershed between Hansen Dam and Big Tujunga Dam is shown on plate 4-9A; the unit hydrograph for the watershed above Big Tujunga Dam is shown on plate 4-9B.

4-08 WATER QUALITY

Because Hansen Reservoir is strictly a flood control project that rarely impounds water for more than 24 hours, it has no appreciable effect on water quality. The water quality of the runoff entering the reservoir is generally of poor quality. The water is characterized as hard with iron and manganese concentrations high. Routine base flow (usually less than 10 ft^3/s) is typically high in salinity content, whereas storm runoff is generally low in salinity content.

Two diversions exist for ground water recharge facilities. Hansen spreading grounds are used to recharge local base flow and captured storm runoff. Tujunga spreading grounds are used to recharge imported water.

4-09 CHANNEL AND FLOODWAY CHARACTERISTICS

The Tujunga Wash channel downstream from Hansen Dam is a rectangular concrete lined open channel. Channel capacities increase from 20,800 ft^3/s just below Hansen Dam to 28,200 ft^3/s at the confluence of the Los Angeles River (pl. 3-1). Travel times for significant flows are also shown on plate 3-1, and include a total time of 0.4 hours from Hansen Dam to the Los Angeles River. Plates 4-10 and 4-11 show the Big Tujunga Channel profile from Hansen Dam to the Los Angeles River.

4-10 UPSTREAM STRUCTURES

Big Tujunga Dam. The project is a water conservation and flood control facility of the LACDPW and is on Big Tujunga Creek, 15 miles above Hansen Dam. Exhibit C contains pertinent data on Big Tujunga Dam.

4-11 DOWNSTREAM STRUCTURES

a. Whittier Narrows Dam. This unique flood control facility was built by the COE in 1957 at the narrows of the San Gabriel River and Rio Hondo in Los Angeles County, just north of Pico Rivera (see pl. 2-1). The facility is Federally owned and is operated and maintained by the COE. Pertinent data for Whittier Narrows Dam are included in Exhibit D.

This dam has the capability of diverting San Gabriel River inflow westward for discharge into Rio Hondo. During moderate and high reservoir impoundment behind the dam, the waters from the two rivers combine within the reservoir, and can be let out into either of the two downstream channels. Thus a major portion of, and at times the total inflow from the entire upper Rio Hondo and San Gabriel River drainages can, when necessary or desired, be passed into the lower Rio Hondo, and ultimately into the lower Los Angeles River. During significant flows, however, the outflow from Whittier Narrows Dam is normally discharged into both the Rio Hondo and the San Gabriel River. Thus, along with Hansen Dam, Whittier Narrows, and Sepulveda Dam are regulated to control floods on the lower reaches of the Los Angeles River.

b. Santa Fe Dam. This Federally owned, COE operated flood control facility is on the San Gabriel River upstream of Whittier Narrows Dam. It is regulated in conjunction with Whittier Narrows Dam, and thus, at times, indirectly in conjunction with Hansen and Sepulveda Dams.

c. Other Projects. There are numerous other water supply reservoirs upstream of Whittier Narrows and Santa Fe Dams on Rio Hondo, San Gabriel River, and their tributaries. These can be seen on plate 2-1, and pertinent data for these reservoirs are included in Exhibit D, page D-5.

4-12 RELATED STRUCTURES

a. Sepulveda Dam. Sepulveda Dam is a major flood control dam owned, operated, and maintained by the LAD. It was constructed in 1941. It is located on the Los Angeles River, 43 miles above the mouth of the river, and 6 miles above the confluence of Tujunga Wash and Los Angeles River. The dam is in the south central portion of the San Fernando Valley, just northwest of the junction of the Ventura Freeway (U.S. Hwy. 101) and the San Diego Freeway (I-405) (see pl. 2-1). Pertinent data for Sepulveda Dam is included in Exhibit D. There are other water supply reservoirs upstream of Sepulveda Dam. These can be seen on plate 2-1, and pertinent data for these reservoirs are included in Exhibit D.

b. Pacoima Dam. This project is a water supply and flood control facility of DPW and is located on Pacomia Wash upstream of Lopez Dam. Pertinent data for Pacomia Dam is included in Exhibit D. It was constructed in 1929.

c. Lopez Dam. This dam was constructed on Pacoima Wash in 1954 in the far northeastern San Fernando Valley, 6.4 miles above the confluence of Pacoima Wash with Tujunga Wash. This gated facility is owned by the Federal Government and maintained by the LAD as part of the overall Los Angeles County Drainage Area (LACDA) flood control project. Pertinent data for Lopez Dam is included in Exhibit D.

4-13 ECONOMIC DATA

a. Population. No population figures are tabulated specifically for the watersheds above or below Hansen Dam. The San Fernando Valley is estimated to have a population of approximately 1,081,000, according to the 1980 Census, with the 1987 population of the 500-year flood overflow area of 11 square miles along Tujunga Wash between Hansen Dam and the Los Angeles River estimated at 54,000. Portions of the following towns and cities are within this 500-year flood overflow area; Arleta, Pacoima, Panorama City, Sun Valley, Tujunga, and Los Angeles. The population of the greater San Fernando Valley, including Sunland, Tujunga, and Lakeview Terrace, is approximately 1,133,000.

b. Agriculture. Agriculture was at one time a major activity in the San Fernando Valley, but declined sharply between 1946 and the early 1970's, as urban growth in the valley displaced the existing farmland. There remains a very small amount of commercial agriculture in the far western valley, along with many small private orchards, vineyards, and vegetable gardens. There are a few remaining small private horse ranches in the northwestern San Fernando Valley.

c. Industry. Industry has increased dramatically in the San Fernando Valley since World War II and is scattered throughout all portions of the valley. There is little heavy industry concentrated in any portion of the San Fernando Valley. There are a number of moderate-sized factories in the central and northeastern portions of the valley, and a large amount of light industry (especially electronics and related fields) is scattered throughout all portions of the valley.

d. Flood Damages. Since completion of the dam in 1941, there has been relatively little in the way of damaging flows on Tujunga Wash. As of FY 86, approximately $176,384,000 in damages has been prevented, primarily to single family and multi family residential structures. Within the 500-year flood plain below Hansen Dam are; 355 light industrial structures, 886 commercial structures, and 122 public buildings. The value (1987) of these light industrial, commercial, and public buildings is $421,000,000.

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01 HYDROMETEOROLOGICAL STATIONS

a. Facilities. Plates 5-1A, B show the precipitation, reservoir (water surface elevation), and stream gages in and near the watershed above Hansen Dam. These gages, along with their latitudes, longitudes, and elevations, are listed on plate 5-1B. Many of the stations consist of more than one type of gage, such as a recording and a non-recording precipitation gage.

b. Reporting. Hydrologic data from Hansen Dam and the upstream and downstream watersheds are observed and reported in 4 different ways as illustrated on plates 5-2 and 5-3.

(1) Manual. The Hansen Dam Tender observes precipitation, water surface elevation, and gate settings, and reports these to the District Office, as described in section 5-06.a.

(2) Recording Instruments. The recording instruments store data on paper tape, which is removed at predetermined intervals (once each month, October-April, plus once during the summer) and maintained on file by the District.

(3) Telemetry System. Hydrologic data measured at the dam and other gages are transmitted to the Los Angeles District Office (LAD) by the Los Angeles Telemetry System (LATS). These gages automatically transmit reports at predetermined 24-hour intervals. The event mode is the primary data sources for the telemetry system. As a gage registers an event, current data are radio-transmitted to a repeater from which it is sent via microwave to the LAD Office. Each gage is programmed to trigger whenever 0.04 inches of precipitation, or a 0.25-foot change in water surface elevation is recorded. All gages can also be interrogated at any time for current data via polled mode.

(4) ALERT System. There is also an event-reporting gage system throughout southern California sponsored by the National Weather Service. This system is referred to as the ALERT (Automatic Local Evaluation in Real Time) System. Access to this information can be obtained through the REPORT program on the Water Control Data System computer.

c. Maintenance. Each operating agency is responsible for the maintenance of its own gages and/or telemetry radio equipment. In many cases, the gage is owned by the U.S. Geological Survey, and the telemetry attachments are owned by the LAD or LACDPW. Plates 5-4 and 5-5 show stage/discharge relationships for Big Tujunga Creek below Hansen Dam.

5-02 WATER QUALITY

There are no water quality stations in the watershed above Hansen Dam.

5-03 SEDIMENT STATIONS

There are no sediment stations in the watershed above Hansen Dam. There are sediment ranges in Hansen Reservoir. Variations in minimum water level elevation (pls. 4-1A, B) have occurred because of rapid sedimentation and because the lake which existed inside the reservoir (until it completely filled in with sediment in the 1970's) was read with a staff gage extending lower than the invert elevation 990 ft. The high sedimentation rate and lake readings cause difficulty in relating area capacity curves from year to year within the reservoir.

5-04 RECORDING HYDROLOGIC DATA

Each agency maintains records of its own data (sec. 5-01 above). The NWS data are placed in archives at the National Climatic Center in Asheville, North Carolina. Precipitation and other data are published monthly by the National Climatic Center in Climatological Data and Hourly Precipitation Data.

The State of California, Department of Water Resources, publishes the data from the ALERT telemetry gage network on a monthly basis. The LACDPW maintains their recording and non-recording data bases, and furnishes data to other agencies upon request. The LAD maintains a data base from its recording and telemetry gages and provides selected data to the NWS for publication. Real Time Reports received from the ALERT gages and the LATS gages are stored in a database on the LAD Water Control Data System Computer. The LAD also enters data from its manual observations on various forms, which are maintained on file in the Reservoir Regulation Section of the LAD Office. These forms are discussed further in section 9-05 and illustrated in figures 9-1 through 9-7.

5-05 COMMUNICATION NETWORK

The LAD maintains a voice radio communication network for its entire operation activities. This routinely includes communications between the District Office and the various dam tenders, as well as vehicles in the field.

During periods of significant runoff, communication with the dam tenders becomes vital. The existing radio network, which has proven itself reliable, is backed up by a second radio network; both of these are backed up by the local telephone system.

Power at the District Office is backed up by an emergency generator system; and if all fails at the District Office, there is a complete radio system at the LAD Base Yard. The Base Yard is located a few miles east of the District Office.

5-06 COMMUNICATION WITH PROJECT

a. Regulating Office With Project Office. During the flood season (15 November through 15 April), a routine radio call is made at least once each weekday from the LAD District Office to the dam tender at Hansen Dam.

The Hansen Dam operator is also the operator for Lopez Dam. This "Morning Report" is usually made at 0810 hours, Monday through Friday. Other routine or non-routine radio or telephone calls are made as needed. Since Lopez Dam is an ungated facility, there are no telephone or electrical services at the site. Direct communication with the operator while he or she is at Lopez Dam is possible by calling the Mobile Radio (WUK 4121) assigned to this operator.

In the event that all communications with the LAD office, including the LAD Base Yard, should be interrupted, a set of "Standing Instructions to Project Operator for Water Control" has been compiled for Hansen Dam and a copy of these instructions is included in this manual as Exhibit A. The LAD organization chart and important phone numbers for reservoir operations decisions at Hansen and Lopez Dams are given on plate 9-1.

b. <u>Between Project Office and Others</u>. The Hansen Dam Tender is required to notify personnel at the Los Angeles County DWP spreading grounds downstream of Hansen Dam prior to making each gate change. The dam tender is instructed not to increase releases until confirmation is received that their diversion gate has been adjusted. In case of flood releases it is imperative that the diversion gate be raised prior to initiation of flood control releases.

c. <u>Between Regulating Office and Others</u>. Before and during the early stages of any reservoir impoundment, the LAD notifies other agencies and selected private interests of the impending rises in the reservoir water surface elevation and corresponding outflow. A list of the agencies to notify, with applicable office and home telephone numbers, is published annually in the LAD's <u>Instructions for Reservoir Operations Center Personnel</u> (the so-called "Orange Book") and is shown on plate 5-6. During major runoff events, the LAD Reservoir Operations Center (ROC) is in constant contact with the LACDPW Hydraulics Branch to fully coordinate the operations of both agencies. The LACDPW is directly tied into the LAD radio and telephone system. The LAD ROC is also in direct radio contact with channel observers dispatched to patrol the Los Angeles River during large floods. Channel observers are the eyes and ears of the ROC. It is their responsibility to observe the effects of floodwater and debris action and to keep the District Office informed so that proper decisions can be made relative to the operation of the reservoirs. Based on their report, decisions can also be made relative to sending crews out to repair vulnerable points in a channel or levee system, or to initiate evacuation of a surrounding neighborhood.

5-07 PROJECT REPORTING INSTRUCTIONS

During periods of water operations, communications between the LAD office and each affected dam tender are made on a frequent basis. Normal communications occur once each hour, and more frequent communications are sometimes required. If a gate change is required, the ROC staff broadcast 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. The dam tender records pertinent information associated with the gate change on the form shown in figure 9-1. This report form is subsequently submitted to the LAD Baseyard Office, Water Control Data Unit, Reservoir Regulation Section.

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 failure of machinery or other equipment, or any other unusual conditions at the dam.

5-08 WARNINGS

The responsibility for issuing all weather watches and warnings, and all flood and flash flood watches and warnings, rests with the NWS. Local emergency officials of cities and counties are responsible for issuing any other public safety warnings, including unusual overflows, evacuations, unsafe roads or bridges, and toxic spills. The LAD is responsible for providing these officials with up-to-date information, and forecasts where possible, of water rises within Hansen/Lopez Reservoirs and release rates into the channel downstream of Hansen Dam. The LAD ROC would notify the Emergency Management Branch, Los Angeles Police Department to initiate evacuation if a dam break is imminent.

VI - HYDROLOGIC FORECASTS

6-01 GENERAL

a. Role of LAD. The LAD does not make any formal hydrologic forecasts, published or unpublished, for Hansen Dam. Despite the lack of formal hydrologic forecasts, the LAD does carefully monitor the reservoir water surface elevation in Hansen Reservoir, and does notify other agencies of any significant changes or anticipated changes as described in section 5-06.

The LAD continues to improve its monitoring capabilities of conditions not only at Hansen Dam, but in adjacent watersheds. Improved and increased numbers of automatic telemetry rain and stream gauges help in this manner not only directly, but also in the development of computerized rainfall-runoff forecast models. The long-term goal of the LAD is to be able to provide relatively accurate predictions of inflows and reservoir water surface elevations as far in advance as possible. It is intended that these predictions will become accurate and reliable enough that they can be shared with the NWS, the LACDPW, city and county emergency officials, and others, to be used as basis for reservoir systems operations during the upcoming years.

The LAD Meteorologist prepares special quantitative precipitation forecasts (QPF's) for Los Angeles River drainages and other watersheds, including the hansen Dam watershed. These are used in determining the potential for significant runoff into Hansen and other reservoirs.

b. Role of Other Agencies. No agency has any specific forecast responsibility for water surface elevations in hansen Reservoir or for discharges in Tujunga Wash, either upstream or downstream of Hansen Dam. The NWS issues Flash Flood Warnings for rivers and other watercourses in the San Fernando Valley.

The LAD does receive real-time weather reports and forecasts, as well as historical weather data, from the NWS. This is accomplished by means of weather facsimile pictures and teletype data and forecasts transmitted by the NWS and received by a LAD facsimile recorder and teletype printer. Close coordination is maintained with the NWS forecast office located in Los Angeles.

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

6-02 FLOOD CONDITIONS FORECASTS

Forecasts of flood hydrographs are currently not made. However, routine evaluation of precipitation, resulting inflow, and forecast precipitation provide valuable subjective predictions of flood situations. Using such information, the LAD Reservoir Operations Center (ROC) can predict if an on-going flood will increase of decrease over the next 24 hours.

6-03 CONSERVATION PURPOSE FORECASTS

Because Hansen Dam is strictly a flood control facility, forecasts for other purposes including water conservation are not made.

6-04 LONG-RANGE FORECASTS

Because the watershed above Hansen Dam is relatively small, and because water is impounded behind Hansen Dam for short time periods, there is little direct need for long-range forecasts in the operation of Hansen Dam. Only in the event of major impoundment at hansen Reservoir, as well as simultaneously at other reservoirs affecting the downstream channel and Los Angeles River, would a forecast of more than one day be of immediate significance to the regulation of Hansen Dam. In such a case, the forecast of another impending major storm or lack of such a storm might influence the release rate of water from Hansen Dam. The primary consideration of the release rates from all of the dams in the Los Angeles River system is to prevent or minimize downstream damages.

VII - WATER CONTROL PLAN

7-01 GENERAL OBJECTIVES

The primary objective of Hansen Dam is flood control, specifically, the minimization of flood damages for portions of the San Fernando Valley along Tujunga Wash and the Los Angeles River. In this regard, water is temporarily stored behind Hansen Dam during periods of high inflows and is released more slowly through the downstream Tujunga Wash Channel.

There is no objective to operate the dam to reduce inundation damages to its improved reservoir lands. All usage of reservoir land is intended to have a purpose secondary to its role as the bottom of the flood control reservoir. All costs associated with reservoir inundation are intended to be routine maintenance costs associated with a clear understanding of risk and subsequent willingness to locate within the flood control reservoir.

7-02 MAJOR CONSTRAINTS

Significant problems have arisen at the project over recent years, including:

a. Loss of storage space due to sedimentation. Based on the results of the April 1983 reservoir sediment survey, current flood storage capacity below the spillway crest elevation of 1,060 ft. is approximately 25,500 ac-ft which is 23 percent less than the initially allocated flood control storage capacity (33,100 ac-ft). See plate 3-6 for the area-capacity curve reflecting 1983 conditions. Under 1983, conditions the SPF would reach a maximum water surface elevation of 1.057.25 ft., a maximum storage of 23,600 ac-ft, and a peak outflow of 20,640 ft^3/s.

b. Repetitive clogging of the outlet conduits with dense silt. Due to a 10-month impoundment period following the major flood of 1978, an 18-ft. deep cohesive silt deposit completely clogged the gated outlet conduits. In 1982, following a 1-1/2 month impoundment, some conduits were observed to be 80 percent clogged with material.

c. Repetitive blocking of the trash rack by floatable debris. During the flood of 1980, while all gates were fully open, inflow (up to 11,350 ft^3/s) transported floatable debris into the trash rack, nearly sealing off the outlet works. This occurrence is described in detail in section 3-06. During 1982, inflow as low as 500 ft^3/s carried floatable debris, clogging the lower 10 ft. of the trash rack.

d. A variety of downstream difficulties associated with the dam's sediment outflow. In 1980, a policy of leaving all gates in the fully open position was adopted to minimize reservoir siltation, including silt packing in the outlet conduits. Subsequently, the problem of debris clogging the trash rack due to the direct impingement of fast-moving inflow was experienced. Local agencies also complained that the free-flowing stream picked up sediment from the reservoir bottom and transported the sediment into the downstream channel. Several downstream problems were noted. Groundwater recharge basins silted in. Water that would have previously been diverted for recharge was bypassed to the ocean because of its high suspended sediment content and because it was released at rates exceeding diversion capability (up to 400 cfs). Low flow in the downstream concrete channels silted in. Abrasion to the downstream concrete channel inverts was accelerated.

7-03 OVERALL PLAN FOR WATER CONTROL

Hansen Dam is regulated for flood control on Tujunga Wash and in the Los Angeles River. Plate 2-2, which depicts the storage allocations for Hansen Reservoir, shows that the entire space of the reservoir below the elevation 1,060 ft. (the spillway crest) is devoted to flood control. It is also the maximum water surface elevation for a Standard Project Flood (SPF). Between elevation 1,060 and 1,081.2 ft. (the maximum surface elevation for a Probable Maximum Flood (PMF)) is the spillway design surcharge pool. Here flood control is no longer the prime objective in deference to passing as much water out of the reservoir as is required to assure the safety of the dam. The 5.8 ft. between elevation 1,081.2 and 1,087 ft. is reserved for freeboard.

Hansen Dam is regulated in coordination with other projects protecting Tujunga Wash and the middle Los Angeles River. These projects include Pacoima, Big Tujunga, Lopez, and Devil's Gate Dams. Their locations are shown on plate 2-1A.

There may be instances where some reduction in releases may be considered necessary from a systems perspective. These conditions are discussed in section 7-13.

7-04 STANDING INSTRUCTIONS TO THE PROJECT OPERATOR

In the event that all communication 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 Hansen Dam is included in Exhibit A of this manual.

7-05 FLOOD CONTROL

The plan for controlling floods on Tujunga Wash below Hansen Dam is presented in this section. The objective of the operating water control plan is to minimize flow damages. Project releases will be regulated to protect downstream communities. An attempt should be made to inform LACDPW and the Los Angeles City DWP of the release and of possible impacts to these agencies' spreading grounds downstream.

The project should be operated according to he Reservoir Regulation Schedule in Exhibit B. This is achieved by allowing the reservoir to build a pool by keeping the eight gates open at 1.0 ft. until the water surface elevation reaches 1.010.5 ft. After the water surface elevation reaches 1.010.5 ft., all gates are opened fully to 8.0 ft. until the downstream channel capacity of 20,800 ft^3/s is reached at a pool elevation of 1053.0. ft. The gates are progressively closed as the water surface elevation rises until, at elevation 1,066, the gates are fully closed. At this point, spillway flow plus ungated outflow approximately equal to downstream channel capacity occurs. On the falling limb of the inflow hydrograph, the same gate schedule is followed as the rising limb down to a pool elevation of 1,053.0 ft. All gates are left fully open at 8.0 ft below a water surface elevation of 1,053.0 until the reservoir is empty. Exhibit B provides a schedule that achieves this regulation. The schedule was revised in 1988 to reflect the following: to conform to a revised downstream channel capacity of 20,800 ft^3/s; to have no more than four gates operated at a time; and to prevent debris and sediment from building up and clogging the outlet works. Keeping the gates open at 1.0 ft. until the water surface elevation reaches 1.010.5 is intended to minimize the floating debris problem, and keeping the gates fully open as the reservoir empties is intended to minimize the conduit sedimentation problem.

Hansen Reservoir should be drained as rapidly as possible, consistent with the achievement of downstream flood control. If runoff conditions are expected to cause flow to exceed the downstream channel capacity based on downstream channel observers and anticipated side inflow, releases should be reduced, so as not to contribute to the flooding. The objective is to safely empty the reservoir in preparation for the next flood and to prevent the outlet works from becoming clogged from sediment deposition.

A forecast to make regulation decisions may be either a series of computer generated inflow hydrographs (expected in the future) or a reasonable judgmental assessment of on-going rainfall and runoff, based upon available information. In either case, the ROC of the LAD would be responsible for developing the forecast and for determining confidence in it toward its application to reservoir water control decisions. The intent is to consider all appropriate information in implementing the water control plan described above.

7-06 RECREATION

Approximately 1,450 acres are under lease to the City of Los Angeles for recreation development. Existing recreation development consists of an 18-hole golf course, two parks, a recreation center with ballfields, an amphitheater, and a miniature trail concession. There is significant equestrian use adjacent to the basin, and many trails meander through the reservoir. Some of the trails run through existing quarry operations and are often relocated by the City of Los Angeles to prevent conflicts.

As mentioned previously, the sole purpose of Hansen Dam is flood control. No water is impounded behind the dam for the purpose of recreation. A 130-acre recreational lake was maintained behind the dam up until the 1970's when it succumbed to sedimentation. The Water Resources Development Act of 1986, Report 99-1013, Section 847, provides for the sale of dredged material at Hansen Dam to be appropriated by Congress to the Secretary of the Army to construct, operate, and maintain recreational facilities at the Hansen Dam project. A proposal to excavate another lake in the basin is in process at this time. Other facilities proposed at this time are individual and group picnic areas and primitive camping areas. Plans are currently in preparation for a bike path and an equestrian trail which will run from one end of the dam to the other.

The channel of Tujunga Wash downstream of Hansen Dam is strictly a flood control channel, and provides no water oriented recreation use. Thus no releases are made for recreational purposes.

7-07 WATER QUALITY

Because Hansen Dam has two ungated outlets, it cannot be operated to contain contaminant spills, unless the water surface elevation remains below 1,011 ft. (invert of the two ungated outlets). Hansen Dam is not operated for water quality objectives.

7-08 FISH AND WILDLIFE

No Hansen Dam water control objectives exist for fish and wildlife, either within the reservoir, or within the channel of Tujunga Wash downstream. The Environmental Assessment that accompanies this water control manual contains detailed information on species types found within the Hansen Dam project area.

7-09 DROUGHT CONTINGENCY PLAN

Hansen Dam does not contain any storage allocation for water supply, however, the Water Resources Development Act of 1986, Report 99-1013, Section 847 authorizes the Secretary of the Army to facilitate water conservation and groundwater recharge measures at Hansen Dam project in coordination with the City of Los Angeles, California and the Los Angeles County Flood Control District, to the extent consistent with other project purposes. Tujunga Wash downstream of the dam is concrete-lined but diversion possibilities exist at the Hansen and the Tujunga Spreading Grounds (see secs. 3-04 b. and d.). Currently, no storage is used for water conservation until local interests formally agree to participate in the removal of sediment deposits accumulated in the reservoir that are directly attributable to water conservation operation. 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.

7-10 HYDROELECTRIC POWER

No facilities for the generation of hydroelectric power at Hansen Dam exist, nor are any contemplated.

7-11 NAVIGATION

No navigation of any sort is possible or allowed in Hansen Reservoir or in Tujunga Wash, either upstream or downstream of Hansen Dam.

7-12 OTHER

Maintenance and construction on the downstream channel of Tujunga Wash normally occur during the dry season of late spring and summer. During such periods, the eight Hansen Dam gates may be closed in order to reduce releases in support of such downstream activities.

7-13 DEVIATION FROM NORMAL OPERATION

The regulation schedule for Hansen Dam is outlined in Exhibit B and discussed in section 7-05.b. However, it is possible, and would be desirable, under certain limited circumstances, for the release rate from Hansen Dam to be decreased below what is called for in Exhibit B.

In addition to the prevention of downstream damages, there are other possible reasons for deviation form the normal release plan at Hansen Dam:

a. Emergencies. In the event of a potential drowning, toxic spill, or other accident in which high flows on Tujunga Wash downstream of Hansen Dam could prevent rescue or could cause further injury, the eight gates at Hansen Dam could temporarily be partially or totally closed. This would reduce, but not eliminate, the flow to the downstream channel if the reservoir water surface were above an elevation of 1,011, the elevation of the ungated outlets. Such emergency action should be taken immediately, unless such action would likely result in worse conditions. Notifications to all concerned agencies of emergency actions must be made as soon as possible.

b. Unplanned Minor Deviations. Unplanned events that could create a temporary need for minor deviations from the schedule published in Exhibit B include emergency bridge repairs, the restoration of utility lines across Tujunga Wash, and certain unplanned necessary maintenance and inspection. Hansen Dam may be operated to support these activities, provided that flood protection is not jeopardized, and provided that no significant threat is made to endangered wildlife species in the reservoir (see sec. 8-05).

c. Planned Deviations. The same arguments apply to planned construction, maintenance, inspections, etc., as described in section 7-13.b. Such planned activities should be scheduled for the dry season, whenever possible. The dry season is normally May through October, although on a rare occasion, a tropical storm with heavy rain and high runoff potential can occur during the late summer or early fall.

7-14 RATE OF RELEASE CHANGE

The eight hydraulic gates at Hansen Dam move at a rate of 0.8 ft/min. The dam tender can safely operate one gate at a time in succession, operating controls on one until the desired setting is reached, then operating the adjacent gate. When the water elevation in the reservoir has reached 1010.5 ft, this physical limitation on speed of operation prevents a sudden jump in downstream releases from 1,260 cfs to 7,920 cfs. In a major flood, with all gates open to 8.0 feet, the two ungated outlets will begin to discharge at elevation 1011.0 feet as inflow increases. The concrete lining of the downstream channel precludes concern over bank erosion or sloughing due to sudden gate changes, however the downstream channel capacity of 20,800 cfs maximum must not be exceeded and may be influenced by side inflow. Therefore gradual decreases in gate openings at Hansen Dam, based upon downstream reports by channel observers, may be desired even prior to gate closings scheduled when elevation 1053.0 feet is reached.

7-15 WATER CONTROL PLANNING TOOLS

Specific planning tools have been utilized in the development of the flood control plan. These tools are also used to evaluate and regulate rules planned deviations and also facilitate operation of the dam during emergencies and unplanned deviations. Water control planning tools used for Hansen Dam include:

a. Outlet Rating Curves (pl. 7-1 and 7-2).

b. Spillway Discharge Curve (pl. 7-3).

c. Area-Capacity Curves (pl. 3-6).

d. Downstream Channel Capacity Plate (pl. 3-1).

VIII - EFFECT OF WATER CONTROL PLAN

8-01 GENERAL

The sole purpose of Hansen Dam is flood control, and by far the greatest effect and benefit of the dam is the protection of life and property downstream of the facility. The major aspects of flood control at Hansen Dam for both the reservoir and spillway design floods, as well as several major historical floods, are discussed in section 8-02. Any other effects or benefits of Hansen Dam are decidedly secondary to those of flood control, but they are briefly described in sections 8-03 through 8-08.

8-02 FLOOD CONTROL

a. Original Reservoir Design Flood. The design of Hansen Flood Control Basin was based upon what was called, in those days, a "maximum probable flood". The hydrologic bases used in the development of the original reservoir design flood is briefly summarized as follows:

1. The design flood was computed from a four-day design storm, with the volume and intensity at their maximum on the fourth day.

2. The design storm had an average maximum 24-hour rainfall of 10.57 inches over the drainage area.

3. The rainfall for the 3 days preceding the maximum (fourth) rainfall day was based on a statistical analysis of rainfall data which indicated percentages of 20, 30, and 50 percent of the maximum day. To represent the most adverse conditions, these percentages were appraised in the order of increasing magnitudes, culminating in the fourth (100 percent) day.

4. Runoff coefficients for the modified rational procedure used were based on the rainfall to runoff relations computed for the adjacent drainage area above San Gabriel Dam No. 2, which indicated the highest runoff coefficients for the March 1938 flood.

5. Base flows on the fourth day of 40 ft^3/s/square mile for the drainage area above Big Tujunga Dam and 20 ft^3/s/square mile for the drainage area below Big Tujunga Dam were assumed.

6. The Big Tujunga Dam was assumed full (to spillway crest) at the start of the storm, and the flood was routed over the spillway.

The original reservoir design flood was routed through Hansen Flood Control Basin using the adopted method of operation as follows:

(a) At the beginning of the flood, all gates were open;

(b) When the water surface elevation (WSE) reached 1,024.5, the gates would be operated to maintain a constant outflow of 12,000 ft^3/s, including the ungated outlets;

(c) After the reservoir receded below WSE 1,024.5, all gates would be fully opened. Using this method of operation, the maximum WSE reached was 1,059.7.

b. Standard Project Flood. When Hansen Dam was originally designed, the SPF concept had not yet been developed. Sometime later, probably in about 1946, before the improvements to Tujunga Wash downstream from Hansen Dam were designed, a SPF was determined for Hansen Dam.

The standard project storm (SPS) selected was the 21-25 January 1943 storm which was centered in the mountains and foothills a few miles east - northeast of Hansen Dam. The storm was transposed to the drainage area above Hansen Dam using mean annual precipitation as a transposition factor.

Unit hydrographs, shown on plates 4-9A and 4-9B, were determined using the average Mountain S-graph and basin n-values of 0.055 above Big Tujunga Dam and 0.050 above Hansen Dam below Big Tujunga Dam. The Big Tujunga Dam subarea hydrograph was routed through Big Tujunga Reservoir assuming the reservoir was full to spillway crest at the beginning of the flood. The outflow hydrograph was then channel routed using the Modified Puls Method to Hansen Dam Reservoir and combined with the hydrograph for the intervening subarea. The resulting Hansen Reservoir inflow hydrograph has a peak inflow of 53,000 ft^3/s and a direct runoff (excludes baseflow) 4-day volume of 57,200 ac-ft. With baseflow, the total 4-day volume is 92,500 ac-ft. This inflow hydrograph is still considered appropriate.

With the improvement of Tujunga Wash below Hansen Dam, the maximum release could be increased from 12,000 ft^3/s to 22,000 ft^3/s. A reservoir routing performed with a maximum release of 22,000 ft^3/s, assuming the original 50-year sediment allocation of 5,000 ac-ft, would yield a maximum WSE of less than 1,057. However, the 1969 survey revealed that sediment accumulation had already exceeded 5,000 ac-ft. Therefore, a new sediment yield estimate based on the survey data was used to revise the 50-year sediment allowance to 10,500 ac-ft and calculate a 100-year sediment allowance of 21,000 ac-ft. Routing the SPF through Hansen Reservoir with the revised sediment allocations yield maximum WSEs of 1,057.7 and 1,064.76 for the 50-year sediment and 100-year sediment allowances, respectively.

The regulation schedule for Hansen Dam was revised in 1988 to conform to a revised downstream channel capacity of 20,800 ft^3/s.

Plate 8-1 depicts the results of routing the SPF at Hansen Dam for the 50- and 100-year sediment distributions, using the 1988 revised regulation schedule and the revised sediment allowances. The maximum inflow to the dam is still 53,000 ft^3/s on the second day of the flood, with a maximum discharge through the outlet works now controlled to 20,800 ft^3/s. For a 50-year sediment allowance, the maximum WSE is 1,057.38, or 2.6 ft. below the spillway crest. For a 100-year sediment allowance, the maximum WSE is 1,065.50 ft., having a spillway discharge of 12,000 ft^3/s, but a combined discharge of 20,800 ft^3/s, equal to the downstream channel capacity. Using the 1983 survey results to determine the elevation-storage relationship and the 1988 revised Regulation Schedule, the maximum WSE is 1057.38. Note on plate 8-1 that for a

50-year sediment allowance, the water surface reaches an elevation of 1,010.5 and then begins to recede prior to the peak. This occurs in accordance with the Regulation Schedule shown on plate 3-4, which requires all gates to be at 8.0 ft. at a water surface elevation of 1,010.5. Following the Regulation Schedule, the gates would remain open until the water surface rises to the point requiring a gate change or the reservoir is drained. In this case, the Schedule causes outflow to exceed inflow for a short period and a dip in the curve results.

c. Spillway Design Flood. The spillway at Hansen Dam was designed in 1939 for a peak outflow of 101,000 ft^3/s, having a surcharge of 21.8 ft. on the ogee crest. An additional 5.2 ft. of freeboard to account for wave runup and wind setup set the top of the dam at elevation 1,087 ft.

1. Original Criteria. The original spillway design flood was based on a "computed spillway flood," determined from rainfall 25 percent greater than the Reservoir Design Storm. The "computed spillway flood," resulted from a hypothetical four-day storm that had a basin average of 13.2 inches of rain during the maximum 24 hours. The adopted spillway design flood was determined by increasing the "computed spillway flood" by 50 percent, resulting in a peak inflow of 129,600 ft^3/s and a maximum one-day volume of 76,800 ac-ft.

In recent times, spillways have been designed using the PMF concept, with the National Weather Service (NWS) providing the Probable Maximum Precipitation. In a 1978 study, the adequacy of the Hansen Dam spillway was reviewed under modern criteria. This led to the development of a PMF for Hansen Dam.

2. PMF Criteria. Plate 8-2 depicts the hydrograph of the computed inflow for the Probable Maximum Flood over the drainage area above Hansen Dam, reservoir water surface elevation, and outflow that results when the PMF is routed through Hansen Reservoir.

The probable maximum precipitation was based upon a hypothetical 72-hour rain storm developed from the criteria published by the NWS in Hydrometeorological Report No. 36, entitled "Interim Report - Probable Maximum Precipitation in California" (1961, revised 1969). This storm was critically centered over the drainage above Hansen Dam.

The unit hydrograph was the same as for SPF except that lag times were reduced by 15 percent.

For the PMF routing, the reservoir was assumed initially full to elevation 1,060.0 ft. (spillway crest) and the flood control outlet works were considered completely blocked by debris.

The PMF generates a maximum inflow to Hansen Reservoir of 105,000 ft^3/s late on the third day of the storm (see pl. 8-2) and a total volume of 246,000 ac-ft. The maximum water surface elevation in the reservoir rises to 1,081.2 ft., storing 44,990 ac-ft behind the dam. The maximum outflow over the spillway is 99,700 ft^3/s.

d. Other Floods.

1. 22-26 January 1943. The storm of 22-26 January 1943 was in many respects the most severe of record in the coastal drainages of southern California. It occurred when a series of warm Pacific cyclones from Hawaii collided with a cold storm moving south from British Columbia, Canada producing strong winds and heavy rain over most of California.

Plate 8-3 depicts the runoff of this storm. The total 21-23 January precipitation ranged from less than 11 inches in the northern and central San Fernando Valley to more than 25 inches in the Santa Monica Mountains of Sepulveda Dam. Rainfall was heaviest during the first few hours of 23 January, with a less intense but longer-lasting period of generally heavy rain during the last 6 hours of that day.

Because of unseasonably dry antecedent conditions, infiltration rates were high at the beginning of the storm. This is reflected in a relatively moderate peak inflow rate to Hansen Dam following the intense burst of rain early on 22 January. Progressive saturation of the ground, brought on by prolonged and increasingly heavy rain on 22 January, resulted in an increasing rate of inflow late in the day. The maximum of the computed mean hourly inflow values was 18,900 ft^3/s during the third hour of 23 January.

The maximum water surface elevation of 1,036.5 ft. was reached at noon on the 24th, when 18,743 ac-ft of water was stored behind the dam. The outflow released to the channel downstream was regulated to 1,600 ft^3/s until the pool was drained.

2. 23-26 January 1969. The period of 18-27 January 1969 was exceptionally wet throughout southern California, as a series of warm storms from south of Hawaii were funneled into this area. After moderate to heavy rain 18-22 January, (followed by a one-day break), rain resumed 23 January, with several moderate rain bands and one long-lasting, heavy band that climaxed early 25 January. The flood hydrographs are shown on plate 8-4. The total precipitation for the period of 23-26 January in southern California ranged from just over 6 inches at Hansen Dam to more than 23 inches in the San Gabriel Mountains southeast of Big Tujunga Dam, according to an isohyetal map prepared by Los Angeles County Flood Control District.

By the time of the 24-25 January rain, the ground throughout the Hansen Basin and elsewhere was heavily saturated, with a high runoff potential. Hansen basin runoff potential was high due to the heavily saturated ground when the 24-25 January storm began. Big Tujunga Dam measured a peak inflow rate of 19,500 ft^3/s from 1000 to 1100 hours on the 25th, and inflow at Hansen peaked three hours later, averaging 17,970 ft^3/s from 1300 to 1400 hours (pl. 8-4). At 1700 hours the Hansen Reservoir water surface peaked at 1,018.3 ft. NGVD, with 9,015 ac-ft of water stored; the maximum outflow of 11,040 ft^3/s occurred at 1800 hours 25 January.

3. 23-25 February 1969. In late February 1969 several back-to-back storms moved into southern California from the west, with the rainfall of early 25 February by far the heaviest. The total precipitation for 23-25

February ranged from less than 5 inches at Hansen Dam to 20 inches along Angeles Crest Highway southeast of Big Tujunga Dam.

The combination of a thoroughly saturated watershed from the heavy January 1969 rains and continued moderate rain and snow during February 1969 resulted in a very high runoff potential when the very heavy rain burst occurred on the morning of 25 February. The flood down Big Tujunga Canyon pushed the water surface level behind Big Tujunga Dam to a height of 2,301.4 ft., 11.4 ft. above its spillway. Outflow there reached an average of 17,200 ft^3/s from 0500 to 0600 hours Mean hourly inflow at Hansen peaked at 26,012 ft^3/s from 0700 to 0800 (pl. 8-5), and its highest water surface elevation was 1,030.8 ft. NGVD at 1100 hours. Maximum storage was 14,872 ac-ft at 1100 hours, and maximum outflow from Hansen was 16,000 ft^3/s at noon on 25 February.

4. <u>9-11 February 1978</u>. After several moderately heavy storms during January and early February 1978, one low-latitude Pacific storm developed west of southern California and moved into the area during the night of 9-10 February. After a day of heavy rain in the San Gabriel Mountains on 9 February, in which Opid's Camp (near the San Gabriel-Big Tujunga watershed divide) received 10.8 inches, a major cloudburst struck the Hansen and adjacent watersheds during the first two hours of 10 February, with generally 1.0 to 1.5 inches of rain. Some stations measured up to 1.4 inches in 30 minutes. Total precipitation in and around the Hansen watershed ranges from 5-6 inches at the dam to 14 inches in the higher mountains southeast of Big Tujunga Dam.

As the result of the 10 February cloudburst, which occurred on saturated ground just beginning to recover from a major burn in November 1975, several streams in the Hansen watershed experienced severe flash floods and mud flows. Some campgrounds were totally washed away, with several fatalities. Inflow to Hansen Dam averaged 40,220 ft^3/s from 0300 to 0345 hours on 10 February (pl. 8-6), and the mean of 35,050 ft^3/s for the hour ending at 0400 is the greatest on record. The maximum water surface elevation for this flood event reached 1,023.9 ft. NGVD at 0630 hours on 10 February. At this time, 8,211 ac-ft of water was stored behind the dam, according to the storage/elevation survey of August 1969. The maximum outflow from the dam increased to 13,540 ft^3/s at 0600 hours on 10 February.

5. <u>March 1978 - February 1980</u>. Four more significant storm and flood periods occurred in southern California during the following two years. These occurred 28 February - 5 March 1978, 5 January 1979, 30 January - 2 February 1979, and 13-21 February 1980. The Hansen watershed experienced heavy rain, and the inflow to Hansen Dam was significant in each of these events.

6. <u>Storm and Flood of 28 February - 3 March 1983</u>. A low-latitude Pacific storm, reminiscent of those of 1938 and 1978, moved into southern California at the end of February and first of March 1983, with generally 10-20 inches of rain over the Hansen watershed. Big Tujunga Dam recorded 18.40 inches for the period. The heaviest rainfall occurred with the passage of a strong occluded cold front during the morning of 1 March, with peak intensities well in excess of 1 inch per hour.

The inflow to Hansen Reservoir consisted of three peaks between 2000 hours 1 March and 0500 hours 2 March (pl. 8-7). The middle peak, which occurred at midnight 1-2 March, was the greatest, with an estimated maximum inflow of 27,900 ft^3/s. The maximum water surface elevation of 1,039.7 ft. NGVD at 0700 hours, 2 March is the highest yet observed for Hansen Reservoir. The storage of 13,261 ac-ft is the third greatest amount of water ever impounded Hansen Dam. The maximum outflow from the reservoir was 18,100 ft^3/s at the time of the maximum water surface elevation.

8-03 RECREATION AND AGRICULTURE

a. Recreation. None of the recreational facilities in Hansen Reservoir depend upon runoff water impounded behind the dam, though there is a proposal to excavate a small lake in the basin at this time. Thus there are no direct recreational benefits that result from the dam or its operation at present. The recreational facilities were constructed because the land within the reservoir could not be used for other purposes. Thus there is an indirect recreation benefit accruing to the project.

The effects of the dam and its operation upon the recreational facilities within the reservoir are by necessity all negative; that is, some of these facilities are occasionally flooded by the impoundment of water behind the dam for flood control. These recreational facilities, however, were constructed and are operated with this understanding.

b. Agriculture. The same arguments cited above regarding recreation also apply to the agricultural products that are cultivated on Hansen Reservoir lands. Because the overall acreage of agriculture within the reservoir basin is small compared to the needs of the local populations, the impact of Hansen Dam and its operation upon the overall food production and consumption in the region is negligible.

8-04 WATER QUALITY

There are no benefits of Hansen Dam to water quality of Tujunga Wash. On the other hand, Hansen Dam and its operation should not in any way contribute to the degradation of the water quality of the river.

8-05 FISH AND WILDLIFE

The reservoir lands that constitute the Hansen Flood Control Basin are characterized by natural vegetation which survive in the environment of a flood control basin where there is no objective to operate the dam to reduce inundation damages to improved reservoir or recreational lands. The flood control basin contains several vegetational associations including willow riparian woodland, riparian scrub, alluvial wash, coastal sage scrub, oak woodland and oil field grassland. Additionally, established areas of vegetation occur at landscaped areas and in places on the dam face itself.

Associated wildlife include the side-blotched lizard, cottontail rabbit, jackrabbit, California ground squirrel, gopher, coyote and mule deer. About 24 resident bird species have been identified along with numerous migrant species. There are no fish within the flood control basin, though Big Tujunga wash is a perennial stream and supports the small native fish species; arroyo chub, Santa Ana sucker and speckled dace.

Inundation will have the potential to kill or displace ground dwelling animals or may result in the temporary loss of willow canopy, the prime habitat of several bird species. The only listed or threatened species that can be potentially affected within Hansen reservoir is the least Bell's vireo. However, the habitat in question is not proposed critical or designated critical habitat by the U.S. Fish and Wildlife Service. Also, there is no permanent loss of habitat since some of the wildlife is migrating, many species in the basin are adapted to flooding and habitat regeneration is relatively quick.

8-06 WATER SUPPLY

Because Hansen Dam is not operated for water supply, there are no direct effects or benefits of the dam or its operation upon the water supply of the San Fernando Valley or other parts of the greater Los Angeles Basin. The District will attempt to inform LACDPW and other downstream entities when flood control releases are to be made. However, there will be no restrictions in scheduled releases to mitigate for possible adverse impacts downstream. When conditions are favorable, low releases from below the debris pool can be coordinated with Los Angeles LACDPW and Los Angeles County DWP to facilitate use of their spreading grounds.

8-07 HYDROELECTRIC POWER

There is no existing or contemplated hydroelectric power generation at Hansen Dam.

8-08 NAVIGATION

There is no navigation on Tujunga Wash or in Hansen Reservoir at any time.

8-09 FREQUENCIES

a. Peak Inflow and Outflow Probabilities. Plate 8-8 is a graph of the peak inflow and outflow frequencies at Hansen Dam, computed from 1985 Los Angeles County Drainage Area (LACDA) review study. Plate 8-9 is a graph of the peak inflow and outflow frequencies at Big Tujunga Dam, computed from a 1985 LACDA Review Study. The values of these curves at specific return periods are listed on plates 8-10 and 8-11, respectively. Comparison of historical and design floods at Hansen Reservoir are presented on plates 8-14 and 8-15. Exhibit E contains stream flow data for stations on Tujunga Creek.

Due to the newly determined downstream channel capacity of 20,800 cfs, decreased from 22,000 cfs, the elevation frequency curve using the new regulation plan would be slightly higher for events with a frequency of occurrence (exceedence interval) of less than once in 400 years.

b. Pool Elevation Duration and Frequency. Plate 8-12 is the computed elevation frequency curve for Hansen Dam. Plate 8-13 is the computed elevation frequency curve for the Big Tujunga Dam. The values of the curves at specific return periods are listed on plates 8-10 an 8-11, respectively.

c. Key Control Points. Exhibit E shows a stage/discharge rating table for the USGS stream gauge on Tujunga Wash below Hansen Dam.

8-10 OTHER STUDIES

a. Examples of Regulation. Discharge-frequency values presented in this manual were derived from on-going (1985) investigations in the U.S. Army Corps of Engineers Los Angeles County Drainage Area Study. The "Interim Report on hydrology and Hydraulic Review of Design Features of Existing Dams for Los Angeles County Drainage Area Dams," dated June 1978, presents the derivation of the PMF and SPF used in this manual. The "Los Angeles County Drainage Area (LACDA) Review" dated February 1988, revised 1989, assesses current adequacy of channel capacities in the entire LACDA system. The Corps' "LACDA Review Feasibility Study", which was commissioned by Los Angeles County to study ways to improve the flood control capabilities of the LACDA system in view of increased urbanization, is anticipated to be available in FY 1991. Alternative solutions studied included reregulation of corps reservoirs as a system, deepening channels, widening channels and increasing levee heights. There is also a mini-report being prepared which studies in greater detail reregulation of the Corps reservoir projects to improve the flood control capability of the LACDA system.

b. Channel and Floodway Improvement. No floodplain management studies addressing the downstream channel have been conducted by the U.S. Army Corps of Engineers since the downstream channel was constructed. Several Flood Insurance Studies have been completed to date by the Corps of Engineers and Los Angeles County Flood Control District (now part of the Department of Public Works) for the Federal Emergency Management Agency (FEMA). FEMA is also preparing Flood Insurance Rate Maps (FIRM Maps) to consider specific flood depths for flooded areas. The maps will have a scale of 1" = 500' and will be used as part of the National Flood Insurance Program (NFIP).

IX - WATER CONTROL MANAGEMENT

9-01 RESPONSIBILITIES AND ORGANIZATION

a. Corps of Engineers. Hansen Dam is owned, operated, and maintained by the LAD, which has complete regulatory responsibility for the dam and the reservoir.

Reservoir regulation and water control decisions at Hansen Dam and other COE facilities in the LAD are conducted by the Reservoir Regulation Section. Plate 9-1 shows an organizational chart depicting the chain of command for Reservoir Regulation.

Gate operation instructions to the dam tender are issued by the Reservoir Operations Center (see secs. 5-06 and 5-07). In the event that communications between the Reservoir Operations Center and Hansen Dam are interrupted, a set of Standing Instructions to the Project Operator for Water Control are included in Exhibit A. The Hansen Dam Reservoir Regulation Schedule is presented in Exhibit B. Dam tenders are part of the Operation Branch, Construction-Operations Division.

b. Other Federal Agencies. The COE has complete responsibility for the operation of Hansen Dam. Although the COE receives data and information from other Federal and local agencies and informs these agencies of major decisions affecting Hansen Dam, no other agency has any responsibility in the operation of Hansen Dam. The U.S. Geological Survey (U.S.G.S.) operates stream gauges in the LACDA.

c. State and County Agencies. LACDPW has maintenance responsibility for the Tujunga Channel downstream of Hansen Dam and maintains and operates a number of projects in the drainage area, including Hansen Spreading Grounds. Exhibits C and D show pertinent data related to LACDPW projects.

d. City of Los Angeles. A large portion of the Hansen Reservoir lands, owned by the Federal Government and operated by the COE, is leased to the City of Los Angeles for recreational purposes. The Corps reserves the right to inundate this land. Also, the DWP maintains and operates Tujunga Spreading Grounds.

e. Private Organizations. There is no involvement of private organizations in the regulation of Hansen Dam.

9-02 INTERAGENCY COORDINATION

The LAD coordinates with other Federal, State, County, and local organizations, as well as with the press (media), concerning the water control for Hansen Reservoir.

a. Local Press and Corps of Engineers Bulletins. The Public Affairs Office of the LAD is responsible for interfacing with the press regarding operations at Hansen Dam and flows in the channel downstream of the dam. This is accomplished through interviews and the occasional issuance of press releases. The LAD does not issue flood watches, warnings or other status reports or forecasts to the general public. These are the responsibility of the NWS.

b. National Weather Service. The LAD utilizes NWS data and forecasts in the operation of Hansen Dam, including the real-time telemetry data from gauges installed in the watershed by the LACDPW in cooperation with the NWS. The LAD shares data with the NWS and other agencies both on a real-time basis and after the fact.

c. U.S. Geological Survey. The LAD receives streamflow data from the U.S.G.S., primarily on a historical basis in southern California. The LAD coordinates with the U.S.G.S. in many different ways, and shares its data with the U.S.G.S.

d. Los Angeles County Department of Public Works. The LAD and LACDPW closely coordinate the operation of their reservoir projects and the maintenance and patrolling of their channels in the LACDA. The LAD informs the City of Los Angeles of any anticipated and actual impoundments.

9-03 INTERAGENCY AGREEMENTS

No interagency agreements exist with the exception of the land leased to the City of Los Angeles for recreational purposes.

9-04 COMMISSIONS, RIVER AUTHORITIES, COMPACTS, AND COMMITTEES

Hansen Dam is not involved in any commissions, compacts, or other formal multi-agency agreements.

9-05 REPORTS

The LAD prepares and files several types of reports. Each month during the runoff season, November through April, a flood situation and runoff potential report is prepared and sent to the South Pacific Division (SPD) of the COE.

Seven specific forms are also prepared in conjunction with the LAD's reservoir operation at Hansen Dam. A copy of each of these forms is included in figures 9-01 through 9-07. These include: Flood Control Basin Operation Report (prepared by each dam tender), Monthly Reservoir Operation (operational hydrographs), Rainfall Records (from manual readings of glass tube rain gauges), Record of Data from Digital Recorders, Reservoir Computations, Reservoir Operation Reports, and Record of Calls (both radio and telephone).

The LAD also collects and files charts from recording instruments at Hansen Dam (and other dams), including precipitation, reservoir surface elevation, and gauge height. Daily precipitation totals and, as needed, other data (such as unusually high intensities) are manually extracted from the precipitation charts, and the charts are sent to the National Climatic Data Center of NOAA. The other charts are maintained on file at the LAD District Office in the Reservoir Regulation Section.

FLOOD CONTROL BASIN OPERATION REPORT

Reports Control Symbol
SPLCO – 7

Name **Month** **Year**

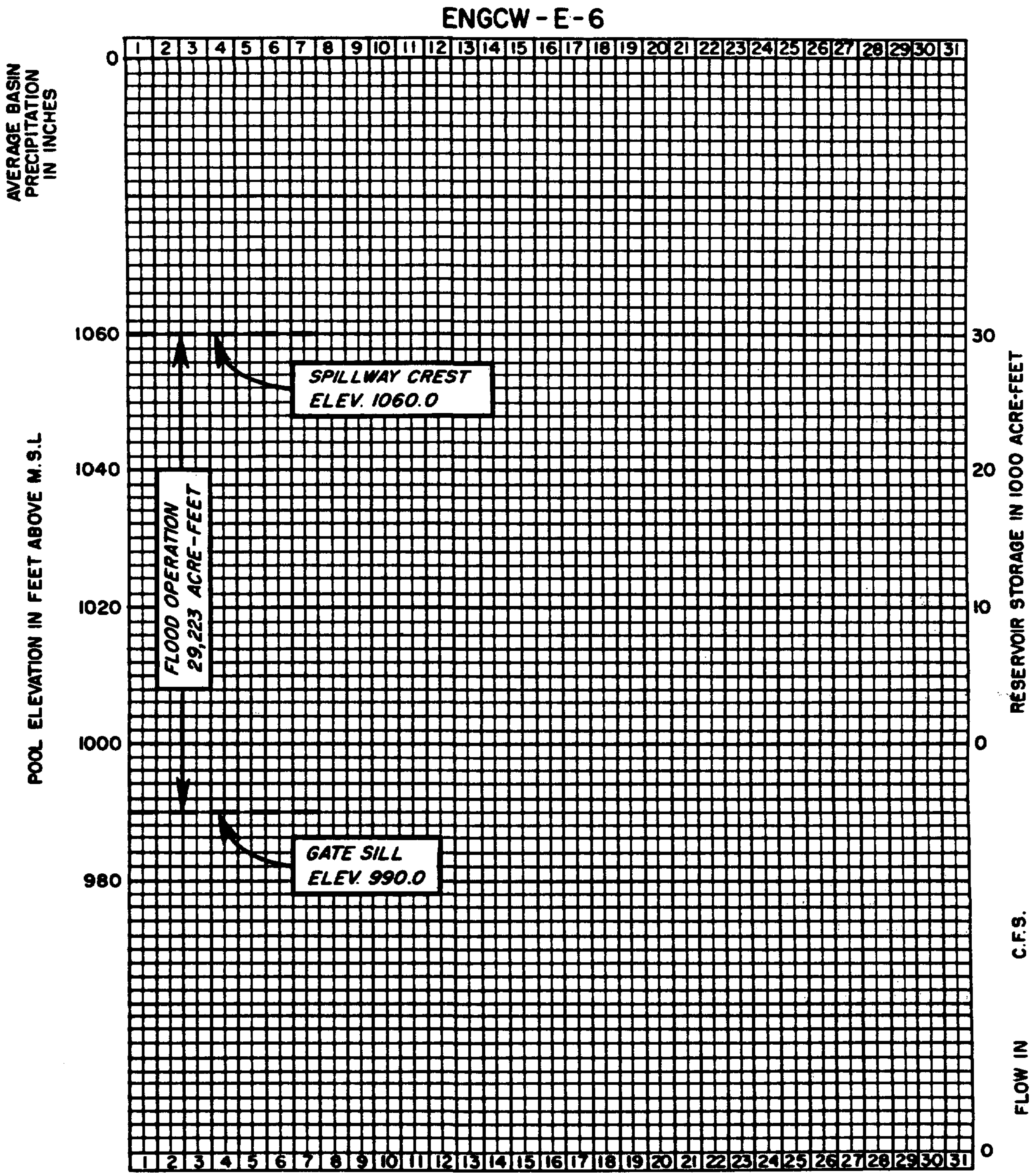
Day	Reservoir W.S. Elev			Outlet channel		Gate operation																	OPERATOR
	Time	Type of Gage	Gage reading in feet	Time	Gage height in feet	Time	Gate opening in feet																
							No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.10	No.11	No.12	No.13	No.14	No.15	No.16	

REMARKS:

SPL FORM 1 DEC 72 19 EDITION OF 1 MAR 55 MAY BE USED

FIGURE 9-1

ENGCW-E-6



RESERVOIR STORAGE BASED ON SURVEY DATED OCT 1978

MONTH OF 19

	ELEV.	GROSS STORAGE (ACRE-FT.)
Conservation Pool		NONE
Flood Control Pool	1,060.0	26,090

Outlet Capacity at Full Pool 22,000 c.f.s.

MONTHLY RESERVOIR OPERATION

HANSEN FLOOD-CONTROL BASIN
LOS ANGELES RIVER BASIN
DRAINAGE AREA 151.9 SQ. MILES
SOUTH PACIFIC DIVISION
LOS ANGELES DISTRICT

FILE NO. RO 02/

FIGURE 9-2

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 OCT 65 31

FIGURE 9-3

RECORD OF DATA FROM DIGITAL RECORDERS				NAME OF DAM	
DATE	TIME	WATER SURFACE	GAGE HEIGHT	PRECIPITATION	OPERATOR

SPL FORM 1 FEB 77 648

FIGURE 9-4

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												
	13												
	14												
	15												
	16												
	17												
	18												
	19												
	20												
	21												
	22												
	23												
	24												
	25												
	26												
	27												
	28												
	29												
	30												
	31												

REMARKS				
	TOTAL			
	MEAN			

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

ARMY - C. OF E. - LOS ANGELES

FIGURE 9-5

RESERVOIR OPERATION REPO[RT]

DATE | TI[ME]

RADIO CALL SIGN WUK	DAM		WATER SURFACE ELEVATION (FT. MSL)	DIGITAL RECORDER READINGS	RAINFALL: DIGITAL RECORDER	GLASS TUBE: SINCE LAST REPORT (INCHES)	GLASS TUBE: STORM TOTAL (INCHES)	GLASS TUBE: SEASON TOTAL (INCHES)	GATE SETTINGS (Printed values show initial settings of gates prior to flood runoff)	
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 E. PIT COMB.	GH					LACFCD DIVERSION GATE OPEN FT. GATE 1 OPEN FT. GATES 2, 3, & 4 OPEN FT. FT.	☐
		SAN GABRIEL POOL	TELEMARK W. STAFF E. STAFF COMB.	GH		XXXX	XXXX	XXXX	GATE #8 OPEN 0.30 FT.	☐
429	PAINTED ROCK		RES: S T B. PIT	XXXX	XXXX				GATES OPEN 0.5 FT HOOK: ANEMOMETER: TEMPERATURE:	☐
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 9-6

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.

SPL FORM 29 APR 59 188 PREVIOUS EDITIONS ARE OBSOLETE

FIGURE 9-7

Related Manuals and Reports.

1. U.S. Army Corps of Engineers, Los Angeles District, "Analysis of Design of Tujunga Wash Improvement - Hansen Dam " - Volumes I and II, 2 May 1938.

2. U.S. Army Corps of Engineers, Los Angeles District, "Analysis of Design of 5 feet by 8 feet Service Gates for Hansen Dam," January 1939.

3. U.S. Army Corps of Engineers, Los Angeles District, "Hydrology in the Los Angeles County Drainage Area," March 1939.

4. U.S. Army Corps of Engineers, Los Angeles District, "LACDA, Tujunga Wash Improvement; Specifications to Accompany Change Order No. 7 (Revised 10-23-39), Hansen Dam Contract No. W-509-Eng-689," October 1939.

5. U.S. Army Corps of Engineers, Los Angeles District, "Analysis of Hydraulic Design for Hansen Flood Control Basin," 18 March 1940.

6. U.S. Army Corps of Engineers, Los Angeles District, "Tujunga Wash Improvement, Hansen Dam, Analysis of Design," June 1940.

7. U.S. Army Corps of Engineers, Los Angeles District, "Hydrology, Upper Los Angeles River and Tributaries, Burbank-Western Channel to Sepulveda Dam," December 1946.

8. U.S. Army Corps of Engineers, Los Angeles District, "Specifications for Tujunga Wash Improvement, Los Angeles River to Hansen Dam; Gates, Footbridge, and Appurtenances at Hansen Spreading Ground Headworks," February 1952.

9. U.S. Army Corps of Engineers, Los Angeles District, "Los Angeles County Drainage Area, California, Flood Control, Design Memorandum No. 1, Hydrology for Lopez Canyon Diversion Channel," March 1959.

10. U.S. Army Corps of Engineers, Los Angeles District, "Operation and Maintenance Manual for Hansen Dam Flood Control Basin, Tujunga Wash Improvement," April 1963.

11. U.S. Army Corps of Engineers, Los Angeles District, "LACDA, CA, Hansen Dam Master Plan," February 1975.

12. U.S. Army Corps of Engineers, Los Angeles District, "Interim Report on Hydrology and Hydraulic Review of Design Features of Existing Dams for LACDA Dams," June 1978.

13. U.S. Army Corps of Engineers, Los Angeles District, "Los Angeles River Improvement, Los Angeles County, CA, Hansen Dam, Seismic Evaluation, Phase I Report," January 1982.

14. U.S. Army Corps of Engineers, Los Angeles District, "Hansen Dam Modeling Study; Impact of Water Supply vs Flood Control Operational Modes on Sediment Deposition in the Reservoir Area," June 1983.

15. U.S. Army Corps of Engineers, Los Angeles District, "LACDA, CA, Hansen Dam, Preliminary Formulation Report," September 1984.

16. U.S. Army Corps of Engineers, Los Angeles District, "Hansen Dam, LACDA, CA, Dam, Outlet, and Spillway, Periodic Inspection Report No. 4," May 1985.

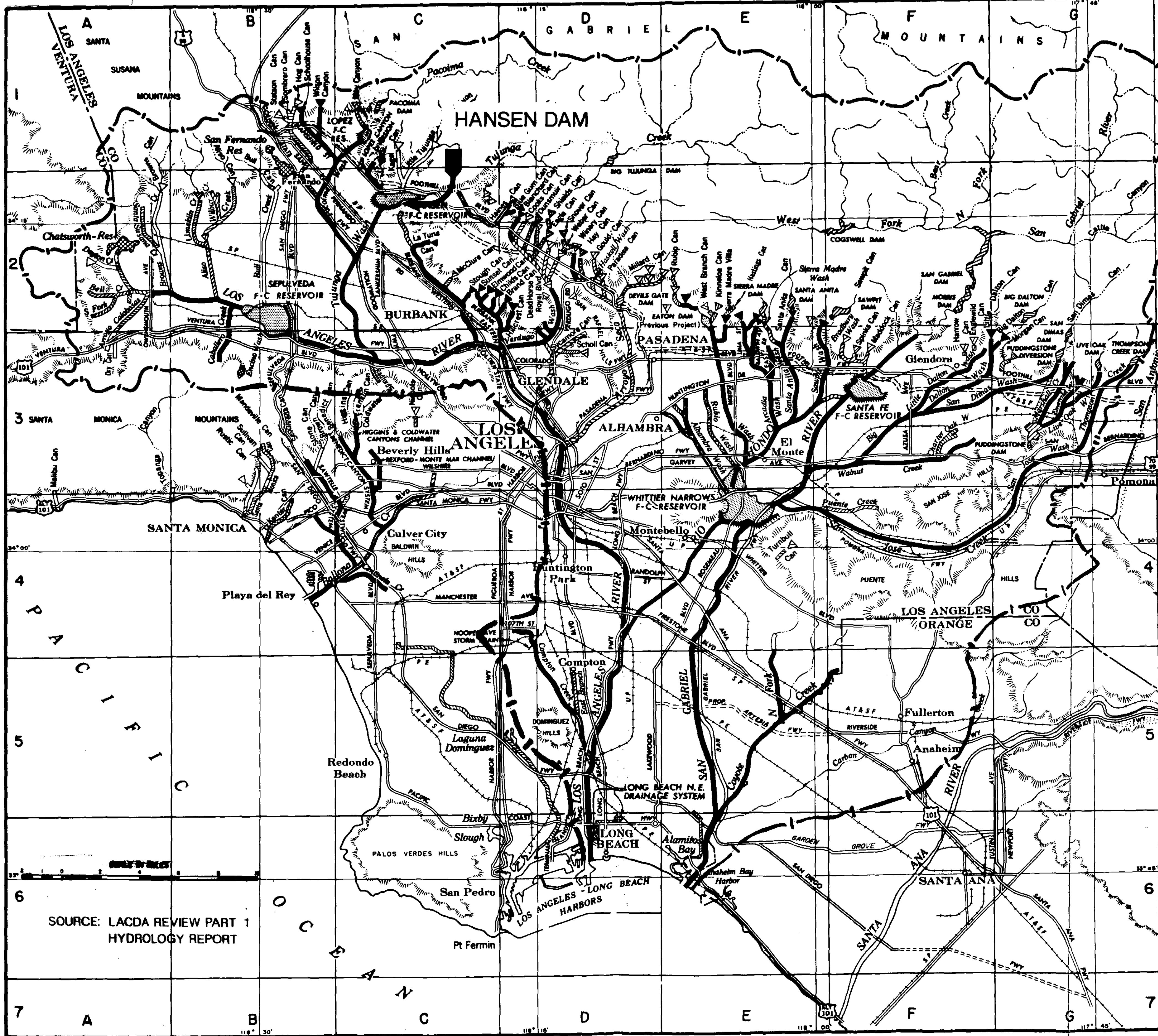
17. U.S. Army Corps of Engineers, "Los Angeles County Drainage Area, California, Review - Part 1 Hydrology Report," February, 1988.

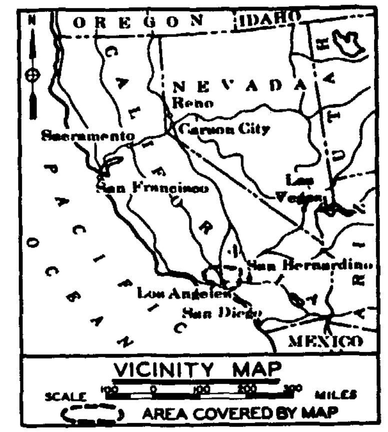
HANSEN DAM
TUJUNGA WASH, CALIFORNIA

RELATED MANUALS AND REPORTS

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SERIAL NO. 2





NOTE:
FOR DESIGN AND CONSTRUCTION INFORMATION ON UNITS IN THE EXISTING PROJECT, SEE MAPS, SERIAL NOS. 2-1 TO 2-63 INCLUSIVE.

LEGEND

- BOUNDARY OF DRAINAGE AREA.
- FLOOD-CONTROL CHANNEL.
- FLOOD-CONTROL DAM AND RESERVOIR.
- DEBRIS BASIN.
- WATER SUPPLY RESERVOIR.

STATUS OF EXISTING PROJECT

- IMPROVEMENT COMPLETED BY C. OF E. PARTLY WITH E.R.A. FUNDS AND PARTLY WITH REGULAR FUNDS. PART OF THE IMPROVEMENT WAS EFFECTED UNDER THE PREVIOUS PROJECT. (SEE UNDER "STATUS OF PREVIOUS PROJECT.")
- IMPROVEMENT COMPLETED BY C. OF E. - WITH REGULAR FUNDS.
- IMPROVEMENT TO BE CONSTRUCTED BY C. OF E. - WITH REGULAR FUNDS.

STATUS OF PREVIOUS PROJECT

- IMPROVEMENT COMPLETED BY C. OF E. - WITH E.R.A. FUNDS. IN ADDITION, ALL EXISTING-PROJECT IMPROVEMENT MARKED WAS STARTED UNDER THE PREVIOUS PROJECT AND THEN WAS TRANSFERRED TO THE EXISTING PROJECT FOR COMPLETION.

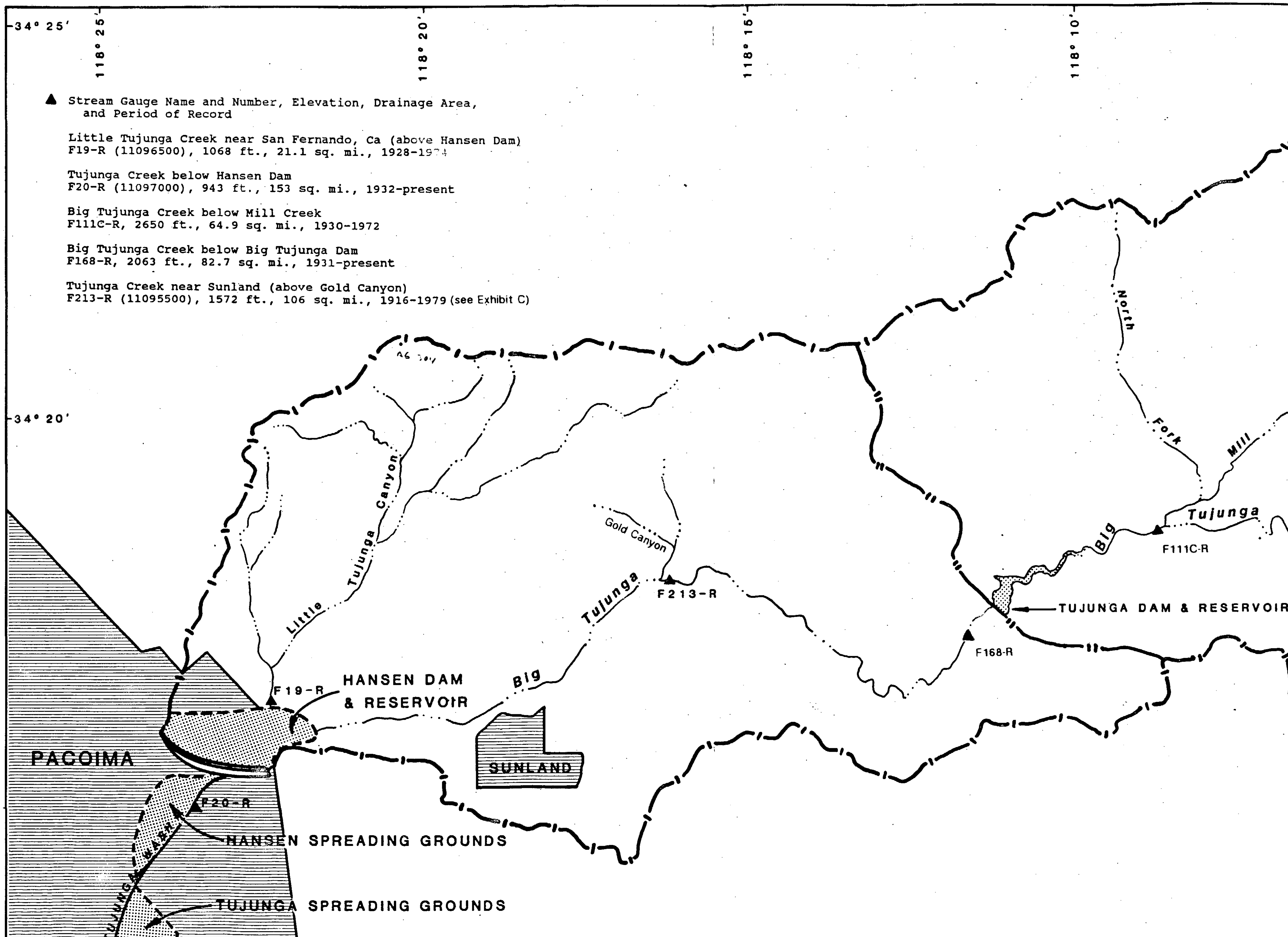
STATUS OF NON-FEDERAL CONSTRUCTION

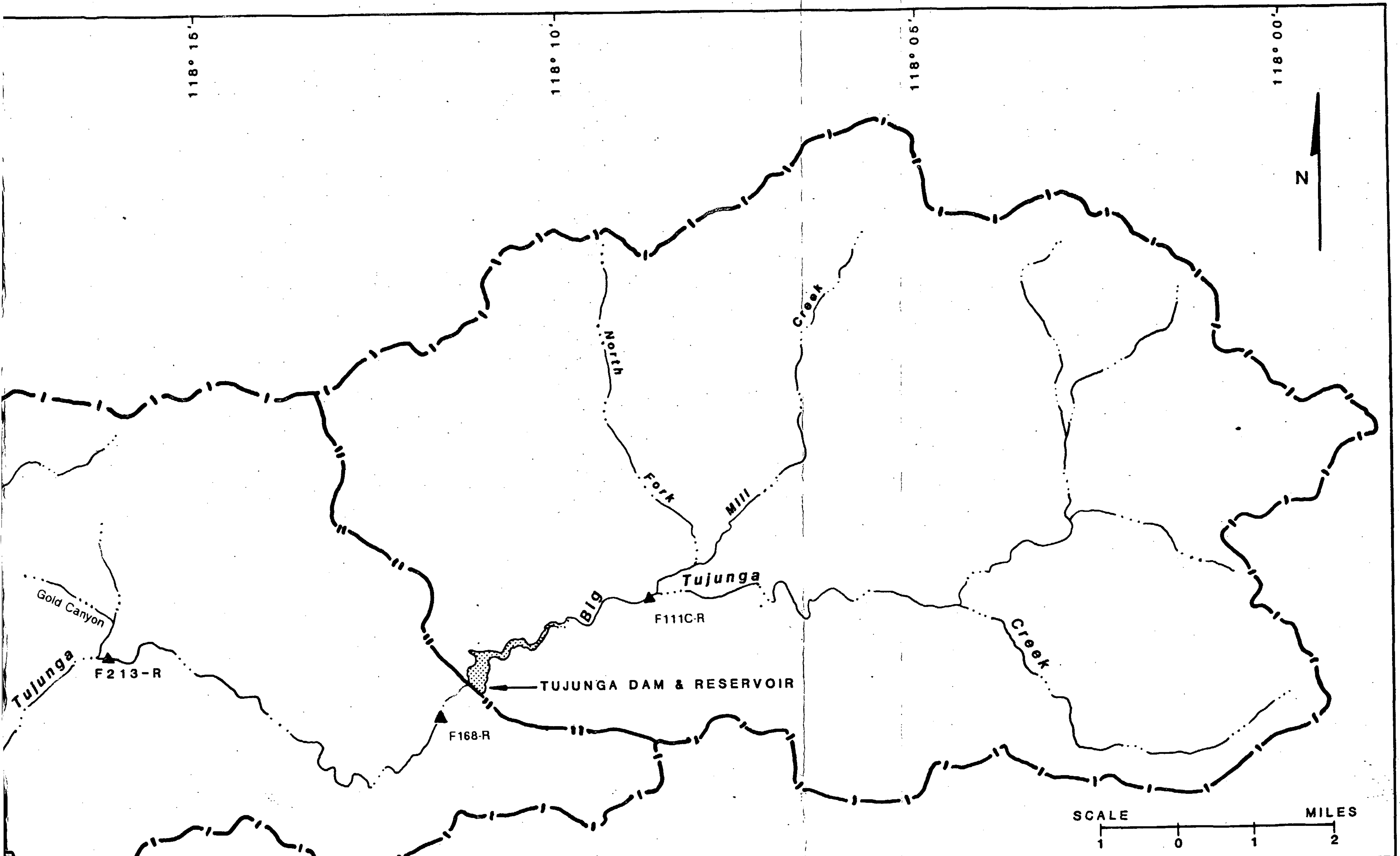
- IMPROVEMENT COMPLETED BY LOCAL INTERESTS.
- IMPROVEMENT TO BE CONSTRUCTED BY LOCAL INTERESTS.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

LOCATION MAP
(LOS ANGELES COUNTY DRAINAGE AREA)

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT


34° 25'
118° 25'
118° 20'
118° 15'
118° 10'
▲ Stream Gauge Name and Number, Elevation, Drainage Area, and Period of Record
Little Tujunga Creek near San Fernando, Ca (above Hansen Dam)
F19-R (11096500), 1068 ft., 21.1 sq. mi., 1928-1974
Tujunga Creek below Hansen Dam
F20-R (11097000), 943 ft., 153 sq. mi., 1932-present
Big Tujunga Creek below Mill Creek
F111C-R, 2650 ft., 64.9 sq. mi., 1930-1972
Big Tujunga Creek below Big Tujunga Dam
F168-R, 2063 ft., 82.7 sq. mi., 1931-present
Tujunga Creek near Sunland (above Gold Canyon)
F213-R (11095500), 1572 ft., 106 sq. mi., 1916-1979 (see Exhibit C)
34° 20'
North Fork
Mill
Tujunga
Big
F111C-R
Little Tujunga Canyon
Gold Canyon
Big Tujunga
F213-R
TUJUNGA DAM & RESERVOIR
F168-R
F19-R
HANSEN DAM & RESERVOIR
PACOIMA
SUNLAND
F20-R
HANSEN SPREADING GROUNDS
TUJUNGA WASH
TUJUNGA SPREADING GROUNDS



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HANSEN DAM
DRAINAGE AREA

U S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-1B

HANSEN RESERVOIR, CALIFORNIA

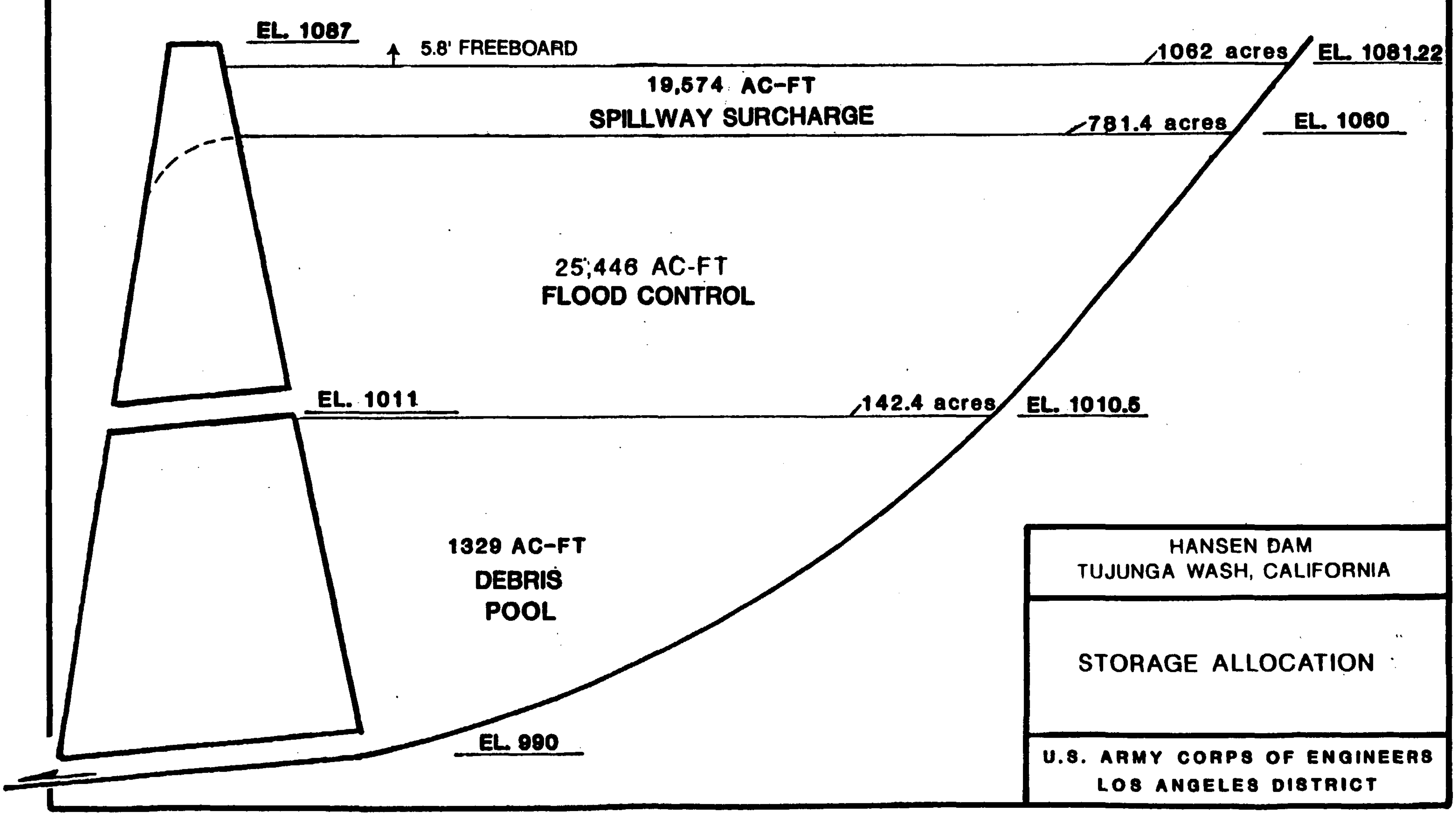


PLATE 2-2

The Plate you are attempting to access is not currently available.

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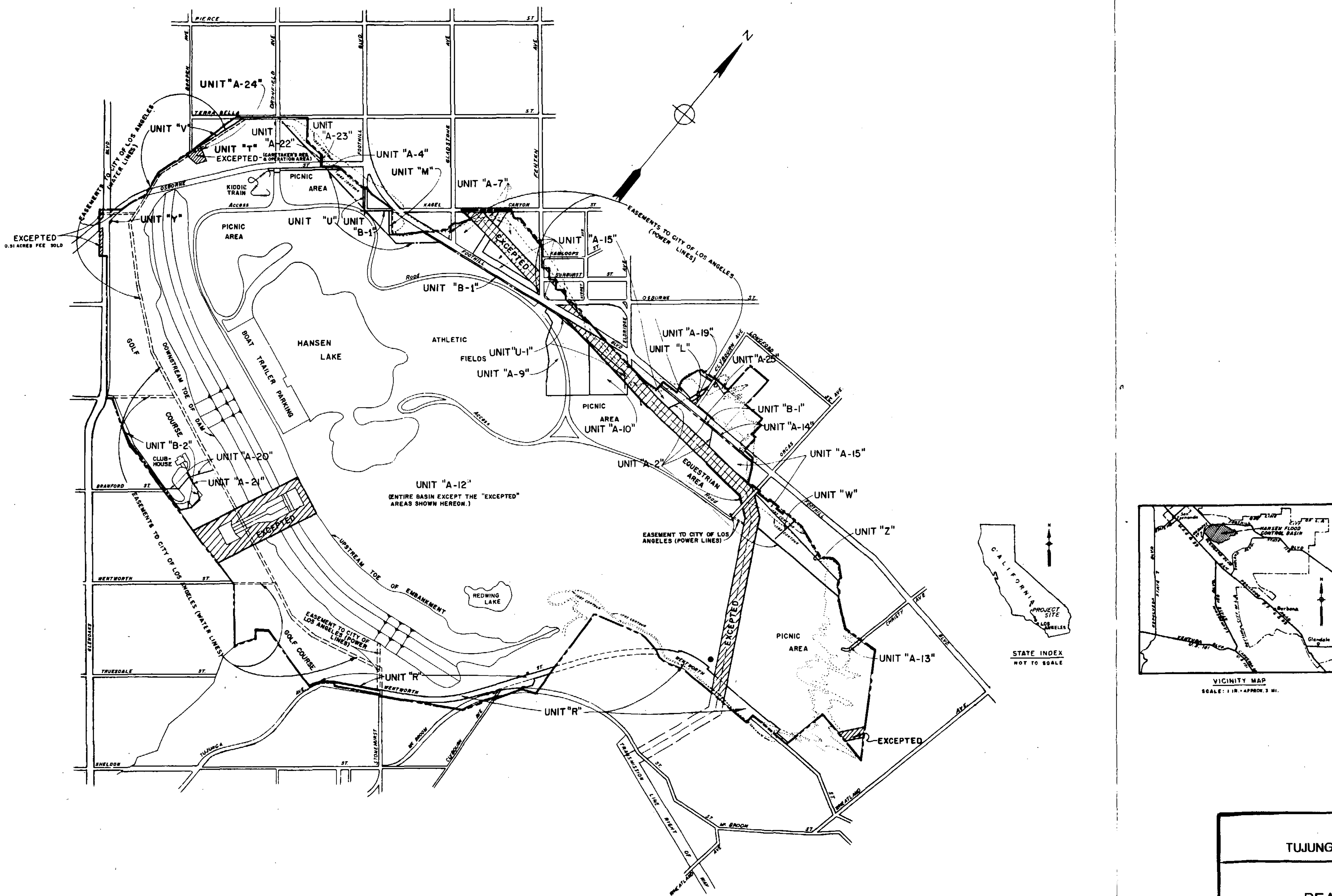
CORPS OF ENGINEERS

U. S. ARMY



OUTGRANT

PROJECT MAP

DEPT. OF THE

USING SERVICE

LOCATION OF PROJECT

STATE CALIFORNIA

COUNTY LOS ANGELES

DIVISION SOUTH PACIFIC

DISTRICT LOS ANGELES

ARMY AREA 6th

7 MILES NW OF BURBANK

16 MILES NW OF LOS ANGELES

TRANSPORTATION FACILITIES

RAILROADS S.P.

STATE ROADS 7 & 118

FEDERAL ROADS 6 & 99

AIR LINES

ACQUISITION

TOTAL ACRES ACQUIRED

FEE

PUBLIC DOMAIN (PERM. WITHDRAWAL / TEMP. WITHDRAWAL)

USE PERMIT

TRANSFER

LEASE

LESSER INTERESTS

DISPOSAL

TOTAL ACRES DISPOSED OF

SOLD

PUBLIC DOMAIN (PERM. WITHDRAWAL / TEMP. WITHDRAWAL)

USE PERMIT

TRANSFERRED

LEASES TERMINATED

LESSER INTERESTS TERM.

REASSIGNED

OTHER

LEGEND

EXCEPT FOR THE SPECIAL SYMBOLS SHOWN BELOW MAP SYMBOLS ARE STANDARD IN ARMY MAP SERVICE TECHNICAL MANUAL NO. 23.

RESERVATION LINE

RESERVATION LINE (Actual Survey)

TRACT BOUNDARY LINE

TRACT NUMBER

CONTOUR LINE

DISPOSAL

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

REAL ESTATE LIMITS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

DATE	REVISIONS	BY
2 MAY 1984	UPDATED	
7 MAR 1977	UPDATED ALL UNITS	

SOURCE: REAL ESTATE SECTION - INDEX TO OUT GRANTS (1977)
"EASEMENTS, PERMITS, AND LICENSES" INDEX LIST UPDATED IN 1989 (see PLATE 2-5B)

EASEMENTS, PERMITS & LICENSES					
UNIT	GRANTEE	GRANT	TERM	ACRES	MAP REF.
B-1	SOUTHERN CALIFORNIA EDISON CO.	EASEMENT FOR TELEPHONE LINES UNNUMBERED	6/11/46 - 06-10-96	1.01	UNK
B-2	CITY OF LOS ANGELES DEPT. OF WATER & POWER	LETTER PERMIT FOR POWER LINE FOR GOLF COURSE FACILITIES DA-04-353-CIVENG-64-109	2/26/64 - Indefinite	Undeter-mined	UNK
L	CITY OF LOS ANGELES	EASEMENT-PUBLIC ROAD OR STREET UNNUMBERED	7/15/48 - Indefinite	0.27	219-K-13
M	WALTER E. LINN, ALMA L.	EASEMENT FOR ACCESS ROAD & WATER PIPELINE UNNUMBERED.	12/7/48 - 12-06-98	0.34	219-K-14
R	CITY OF LOS ANGELES	EASEMENT FOR EXTENSION OF WENTWORTH ST. DA-04-353-CIVENG-60-56	09-08-58 - Indefinite	14.84	219-K-20
T	CITY OF LOS ANGELES	EASEMENT FOR STORM DRAIN OUTLET STRUCTURE DA-04-353-CIVENG-62-56	7/6/61 - Permanent	0.01	219-K-22
U	CITY OF LOS ANGELES	EASEMENT FOR 24" SANITARY SEWER LINE DA-04-353-CIVENGR62-131	7/3/60 - Permanent	0.73	219-K-23
V	SOUTHERN CALIFORNIA GAS CO.	EASEMENT FOR 4" GAS PIPELINE DA-04-353-CIVENG-61-184	3/28/61 - 03-27-01	0.35	219-K-24
[illegible]	CITY OF LOS ANGELES	EASEMENT FOR STORM DRAIN DA-04-353-CIVENG-65-128	2/5/65 - Permanent	0.08	219-K-25
Y	CITY OF LOS ANGELES	EASEMENT FOR PUBLIC STREET DA-04-353-CIVENG-62-141	8/28/62 - Permanent	0.01	219-K-27
Z	CITY OF LOS ANGELES	EASEMENT FOR STORM DRAIN DA-04-353-CIVENG-65-129	2/10/65 - Permanent	0.01	219-K-28
A-2	CITY OF LOS ANGELES	EASEMENT FOR SEWER LINE /SANITARY INTERCEPTOR DA04-353-CIVENG-65-110	12/21/64- Permanent	1.30	219-K-29
A-4	CITY OF LOS ANGELES	EASEMENT FOR STREET PURPOSES DA-04 353-CIVENG-66-95	12/1/65 - Permanent	0.27	219-K-31
A-7	VALLEY CREST TREE CO.	LEASE FOR AGRICULTURE /HORTICULTURE DACW09-1-86-19	12-01-86/10-31-90	9.59	219-K-34.4
A-9	HOMER ENDO	LEASE FOR AGRICULTURE HORTICULTURE DACW09-1-85-28	05-01-85/04-30-90	13.93	219-K-36.4
A-10	VALLEY CREST TREE CO.	LEASE FOR AGRICULTURE /NURSERY DACW09=1-88-16	11-20-87/11-19-92	6.51	219-K-37.3
A-12	CITY OF LOS ANGELES DEPT OF PARKS & RECREATION	LEASE FOR RECREATIONAL FACILITIES DACW09-1-69-45	01-05-67/01-04-17	1355.43	219-K-40.1
A-13	LOS ANGELES COUNTY FLOOD CONTROL DISTRICT	EASEMENT FOR STORM DRAIN DACW09-2-70-40	2/24/70 - Indefinite	0.57	219-K-41
A-14	GENERAL TELEPHONE COMPANY	EASEMENT FOR COMMUNICATION FACILITIES DACW09-2-89-32	10-08-88/10-07-93	0.26	219-K-42
A-15	STATE OF CALIFORNIA DEPT. OF TRANSPORTATION	EASEMENT FOR CONTROLLED DACW09-2-75-8 ACCESS HIGHWAY (ST. RTE. 210)	9/10/74 - Indefinite	22.11	219-K-43.1
P	CITY OF LOS ANGELES DEPT. OF WATER AND POWER	EASEMENT FOR WATER PUMPING STATION UNNUMBERED	07-09-51/0700[illegible]	0.09	UNK
A-19	CITY OF LOS ANGELES	EASEMENT FOR STORM DRAIN DACW09-2-72-51	4/13/72 - Permanent	0.164	219-K-47
A-20	CITY OF LOS ANGELES DEPARTMENT OF WATER & POWER	EASEMENT FOR WATER MAIN DACW09-2-76-64	7/27/76 - /07-26-26	0.301	219-K-48
A-21	CITY OF LOS ANGELES DEPARTMENT OF WATER & POWER	EASEMENT FOR POWER LINE DACW09-3-82-31	11-01-86/10-31-91	0.076	219-K-49
A-22	CITY OF LOS ANGELES	EASEMENT FOR SUBSURFACE SEWER STRUCTURE DACW09-2-84-7	10-12-83/10-11-2033	0.024	219-K-52
A-23	JH DEVELOPMENT INC. & ORANGE GROVE ENTERPRISES INC. HECTOR J. AQUILINO	DACW092-84-45 EASEMENT FOR DRAINAGE STRUCTURE	4-6-84/ 4-5-2034	0.024	219-K-53
A-24	GEORGE R. BROWN	DACW09-1-88-26 EASEMENT FOR TRAILER SPACE DAM TENDER	02-05-89/02-06-90	UNK	NO DRWG.
A-25	SHEILA U. MEARS	UNK	UNK	0.42	219-K-55
U-1	CITY OF LOS ANGELES	POWERLINE DACW09-2-88-33	11-03-88/11-02-13	UNK	219-K-56

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

EASEMENTS, PERMITS, AND LICENSES (1989)
(for PLATE 2-5A)

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

PLATE 2-5B

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INVENTORY MAP KEY

	Notes concerning trail systems in basins
	Notes concerning right of way
	Notes concerning adjacent use
	Notes concerning proposed right-of-way use
	Notes concerning proposed adjacent use
	Existing Bike Path
	Proposed Bike Path
	Existing Equestrian Trail
	Proposed Equestrian Trail
	Existing Foot Trail
	Beginning of Reach
	Access into Right-of-way
	Undercrossing
	Direction of Undercrossing (inside/outside levee)
	Tunnel
	Bridge
	Park or Golf Course
	Equestrian Facility
	Boundary of Recreation Area
	Boundary of Study Area within Flood Control Basin
NP	Neighborhood Park
CP	Community Park
RP	Regional Park
GC	Golf Course
BF	Ballfield (Baseball, football, etc.)
HC	Hardcourt (Handball, basketball, etc.)
TC	Tennis Court
CS	Comfort Station
PL	Parking Lot
PA	Picnic Area
CA	Camping Area
OM	Operations and Maintenance (within recreation area)
AR	Archery Range
MF	Model Field
HS	High School
COL	College

SOURCE: LACDA RECREATION REVIEW 1988

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

RECREATIONAL MAP SYMBOLS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

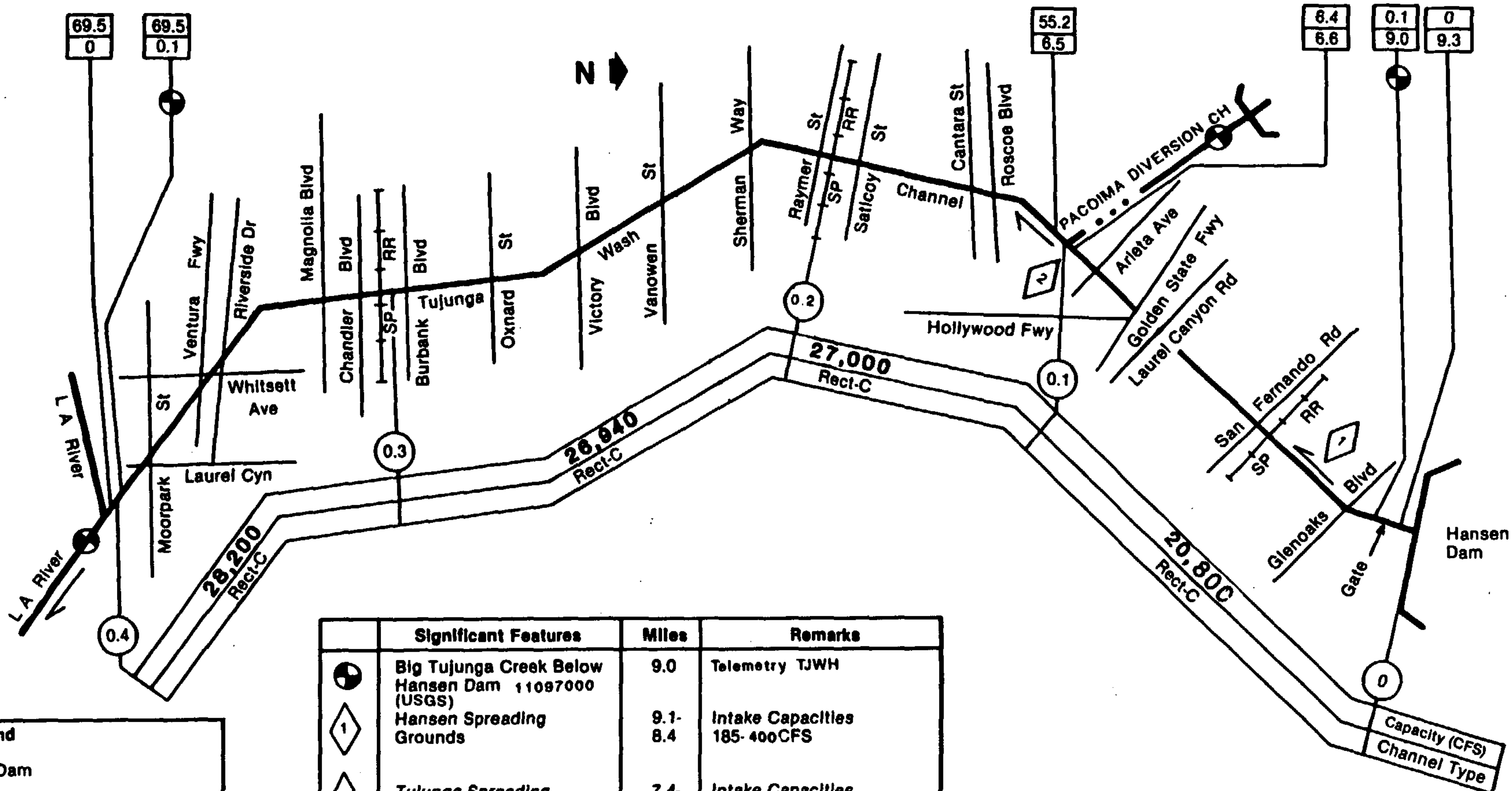
Elevations Of Recreational And Other Facilities In Hansen Reservoir

Elev. (Ft. M.S.L.)	Structure In Basin
990.0	Invert Outlet Works
997-1030	Trails Within Lake Area
1000	Beach From Former Lake
1011	Ungated Outlets
1012-1017	Trails East Of Spillway
1012-1072	Hiking & Equestrian Access To Basin
1040-1080	Natural Area Orcas Ave. Park
1044-1088	Picnic & Day Camp Area
1055-1070	Paved Parking - Day Use Only
1060	Spillway Crest
1060-1070	Hansen Dam Sports Center Outdoor Theater Athletic Field Football Field
1061-1108	Equestrian Area
1062-1067	West Lake Development Maintenance Yard - Admin. Bldg.
1065-1070	Picnic Areas
1075-1080	2 Little League Fields
1087	Top Of Dam

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

ELEVATIONS OF FACILITIES
IN HANSEN RESERVOIR

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



	Significant Features	Miles	Remarks
(Stream Gage)	Big Tujunga Creek Below Hansen Dam 11097000 (USGS)	9.0	Telemetry TJWH
(Recharge Basin 1)	Hansen Spreading Grounds	9.1-8.4	Intake Capacities 185-400CFS
(Recharge Basin 2)	Tujunga Spreading Grounds	7.4-6.5	Intake Capacities 390-400 CFS
(Dam)	Upstream Dams on Pacoima Wash 1. Lopez 2. Pacoima		Flows on Pacoima Wash Regulated by These Dams
(Stream Gage)	Pacoima Diversion at Branford St. F305-R (LACDPW)		
(Stream Gage)	Los Angeles River at Tujunga Ave F300-R (LACDPW)	0	Telemetry LART
(Stream Gage)	Tujunga Wash below Moorpark St. F105B-R (LACDPW)	0.1	

Legend

- Dam
- Recharge Basin
- RD Rubber Dam
- Drop Structure
- Stream Gage
- Drainage Area
- Miles 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
- L Levee

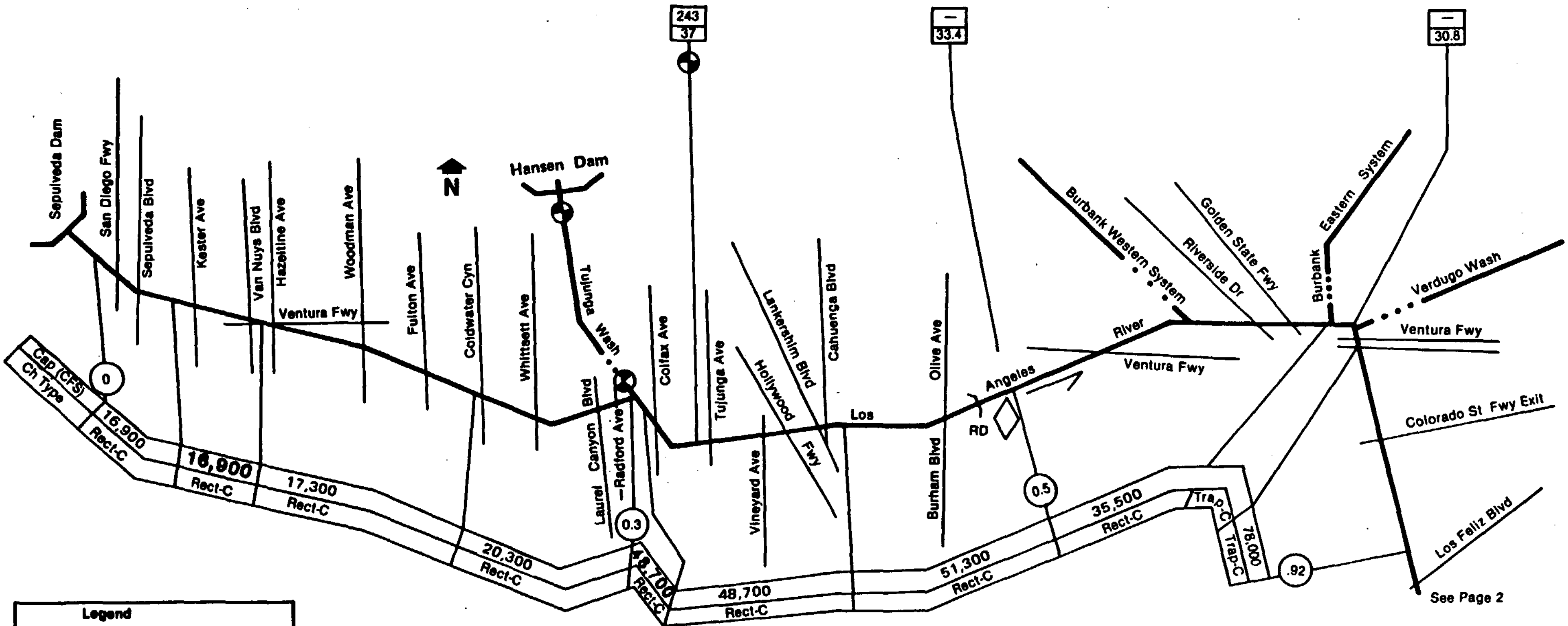
SOURCE: LACDA REVIEW PART 1 HYDROLOGY REPORT

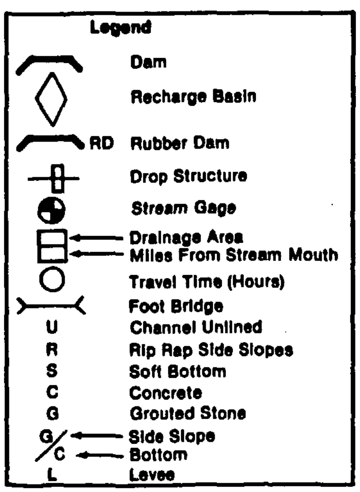
HANSEN DAM
TUJUNGA WASH, CALIFORNIA

CHANNEL CAPACITIES & CONFIGURATION TUJUNGA WASH

HANSEN DAM TO LOS ANGELES RIVER

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT





	Significant Features	Miles	Remarks
RD	Headworks Spreading Grounds	33.4	Intake Capacity 40 CFS at Rubber Dam
	Los Angeles River at Tujunga AVE F300-R (LACDPW)	37	Telemetry LART
	Tujunga Wash below Moorpark St F105B-R (LACDPW)	37.8	Flows Regulated by Hansen, Big Tujunga, Pacoima and Lopez Dams
	Big Tujunga Creek below Hansen Dam 11097000 (USGS)		

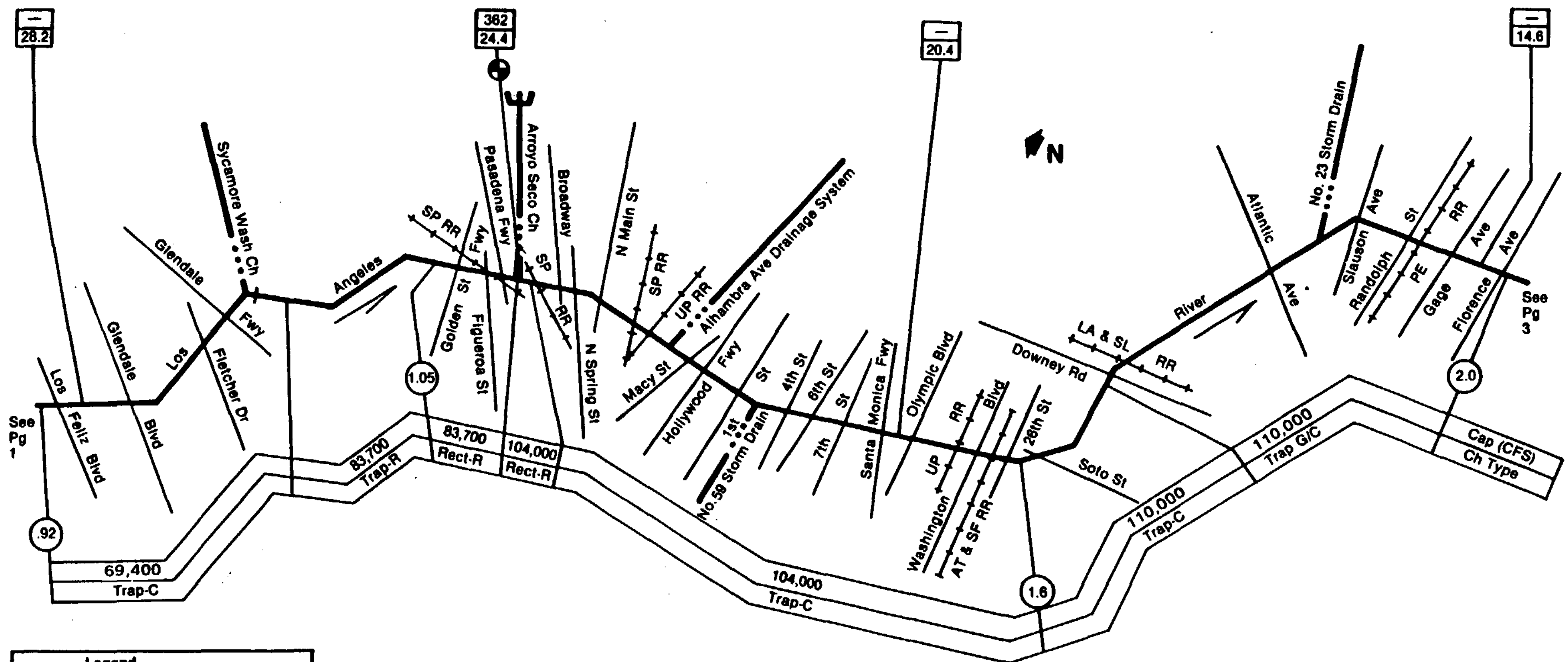
SOURCE: LACDA REVIEW PART 1 HYDROLOGY REPORT

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

CHANNEL CAPACITIES & CONFIGURATION
LOS ANGELES RIVER

SEPULVEDA DAM
TO
LOS FELIZ BLVD

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Legend

- Dam
- Recharge Basin
- RD Rubber Dam
- Drop Structure
- Stream Gage
- Drainage Area / Miles 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
- L Levee

	Significant Features	Miles	Remarks
(Stream Gage)	Los Angeles River Above Arroyo Seco F57C-R (LACDPW)	24.4	Telemetry LARA
	Arroyo Seco Channel	24.3	Flow Regulated by Devils Gate Dam (Max Q = 43,000 CFS)

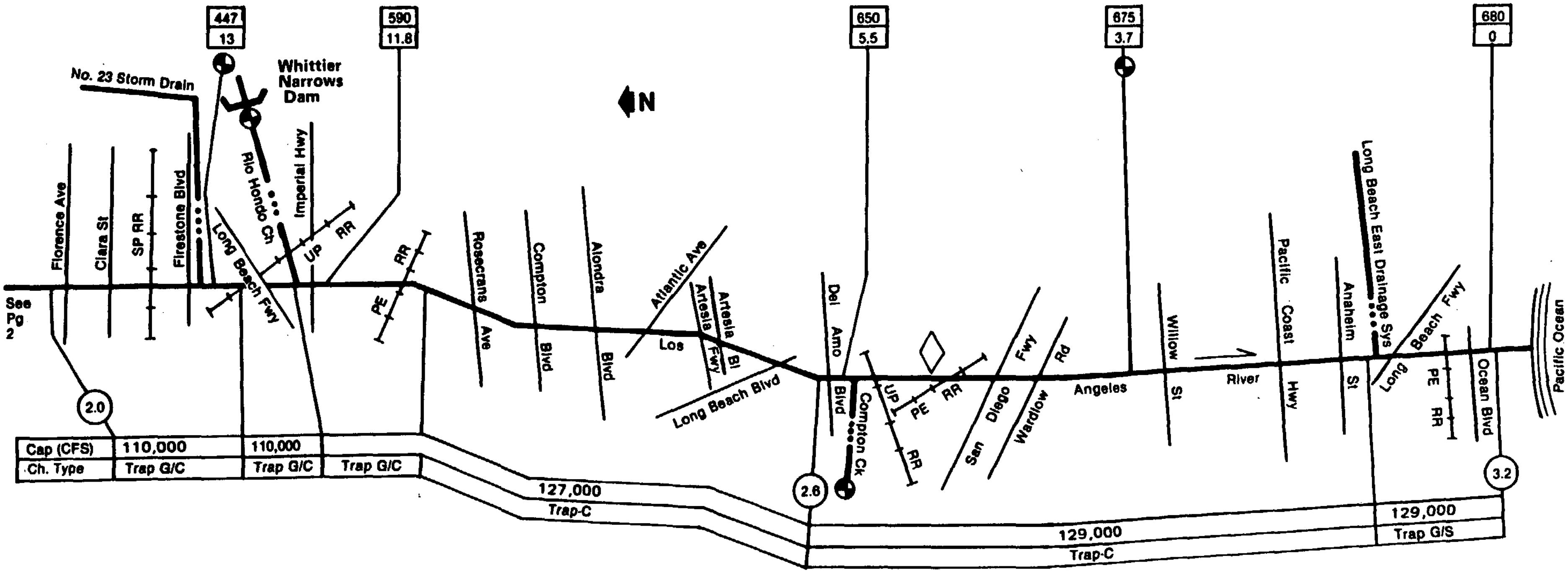
SOURCE: LACDA REVIEW PART 1 HYDROLOGY REPORT

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

CHANNEL CAPACITIES & CONFIGURATION
LOS ANGELES RIVER

LOS FELIZ BLVD
TO
FLORENCE AVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Legend

- Dam
- Recharge Basin
- RD Rubber Dam
- Drop Structure
- Stream Gage
- Drainage Area
- Miles 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
- L Levee

	Significant Features	Miles	Remarks
Stream Gage	Los Angeles River below Firestone F34D-R (LACDPW)	13	Telemetry LARF
Stream Gage	Rio Hondo below Whittier Narrows Dam 11102300 (USGS)	12.1	Telemetry RHDB Flows Regulated by Whittier Narrows Flood Control Reservoir
Recharge Basin	Dominguez Gap Spreading Grounds	4.7-5.1	Intake Capacities 3-20 CFS
Stream Gage	Los Angeles River below Wardlow F319-R (LACDPW)	3.7	Telemetry LARW
Stream Gage	Compton Creek Near Greenleaf F37B-R (LACDPW)		Telemetry CCKG

SOURCE: LACDA REVIEW PART 1 HYDROLOGY REPORT

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

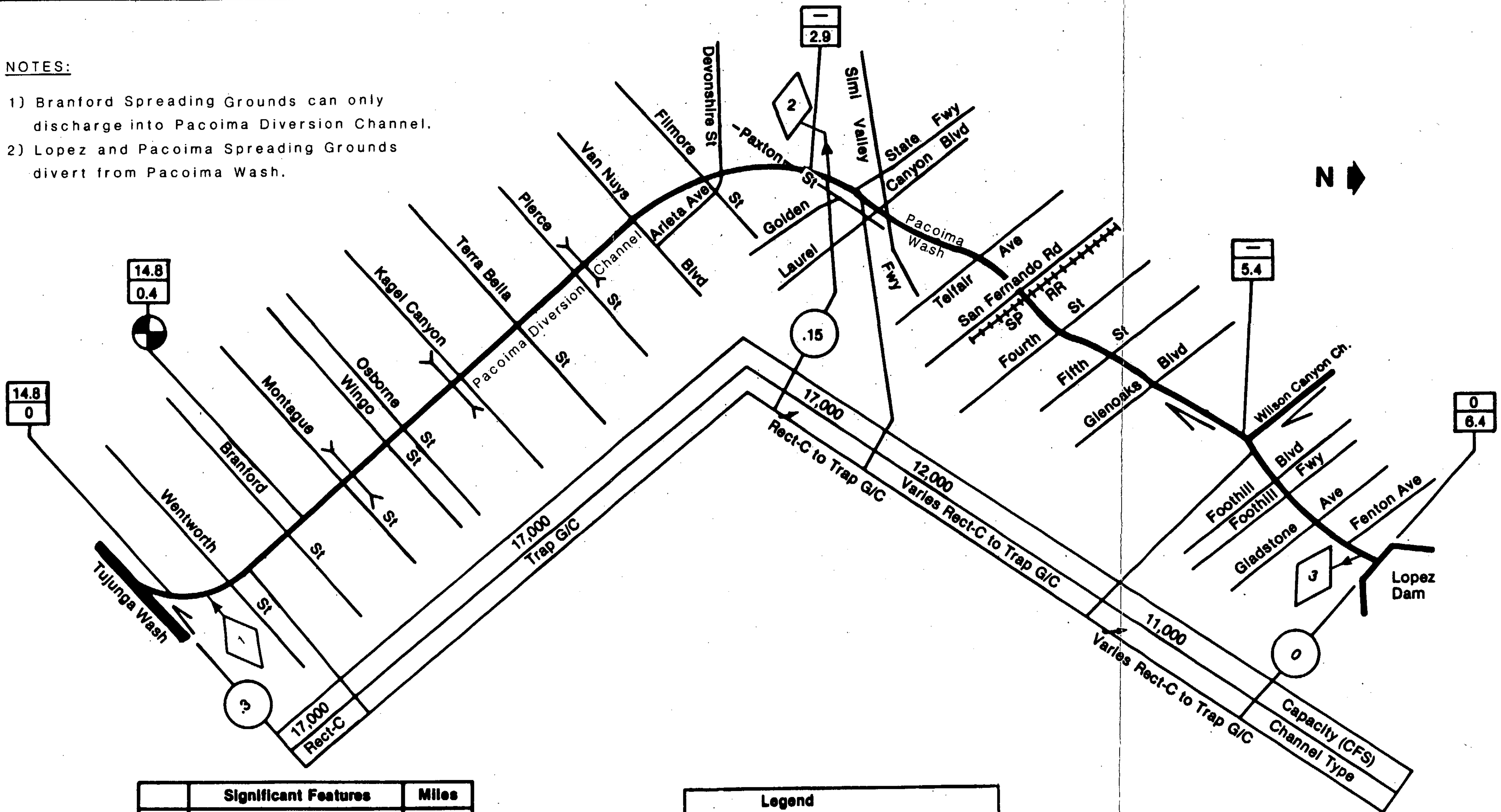
CHANNEL CAPACITIES & CONFIGURATION
LOS ANGELES RIVER

FLORENCE AVE
TO
PACIFIC OCEAN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

NOTES:

1) Branford Spreading Grounds can only discharge into Pacoima Diversion Channel.
2) Lopez and Pacoima Spreading Grounds divert from Pacoima Wash.



	Significant Features	Miles
Stream gage	Pacoima Diversion Channel Near Branford (LACDPW)	0.4
1	Branford Spreading Grounds	0.4
2	Pacoima Spreading Grounds	2.9
3	Lopez Spreading Grounds	6.3

Legend

(dam symbol)	Dam
(diamond)	Recharge Basin
(quartered circle)	Stream Gage
(upper box)	Drainage Area
(lower box)	Miles From Stream Mouth
(circle)	Travel Time (Hours)
(bridge symbol)	Foot Bridge
C	Concrete
G	Grouted Stone
G/	Side Slope
/C	Bottom
L	Levee

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

CHANNEL CAPACITIES & CONFIGURATION
PACOIMA WASH

LOPEZ DAM
TO
TUJUNGA WASH

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SOURCE: LOPEZ WATER CONTROL MANUAL

Hansen Dam Reservoir Regulation Schedule
(For rising and falling stages)

Step No.	When reservoir water surface is between elevation (Feet - NGVD)	No. 1 Feet of opening	No. 2 Feet of opening	No. 3 Feet of opening	No. 4 Feet of opening	No. 5 Feet of opening	No. 6 Feet of opening	No. 7 Feet of opening	No. 8 Feet of opening	Total Computed discharges ft3/s	Downstream gauge height** Feet
	Gate setting for gates as indicated										
	Follow Step 1 during rising stages										
1..	990.0 - 1,010.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0 to 1,260	0.97 - 2.52
	Follow Steps 2 to 9 during rising or falling stages										
2..	1,010.5 - 1,053.0*	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7,920 to 20,730	5.61 - 9.30
3..	1,053.0 - 1,060.0	8.0	7.0	7.0	8.0	8.0	7.0	7.0	8.0	19,370 to 20,520	8.88 - 9.22
										Spillway, Gated & Ungated	
4..	1,060.0 - 1,061.0	8.0	6.0	6.0	8.0	8.0	6.0	6.0	8.0	19,400 to 20,430	8.89 - 9.20
5..	1,061.0 - 1,062.0	7.0	6.0	6.0	7.0	7.0	6.0	6.0	7.0	18,960 to 20,740	8.78 - 9.29
6..	1,062.0 - 1,063.0	5.0	6.0	6.0	4.0	4.0	6.0	6.0	5.0	18,160 to 20,430	8.56 - 9.20
7..	1,063.0 - 1,064.0	5.0	3.0	3.0	4.0	4.0	3.0	3.0	5.0	17,580 to 20,280	8.41 - 9.15
8..	1,064.0 - 1,065.0	5.0	0	3.0	4.0	0	3	0	5.0	17,590 to 20,680	8.42 - 9.26
9..	1,065.0 - 1,066.0	0	0	3.0	1.0	0	3	0	0	17,300 to 20,660	8.35 - 9.26
										Spillway and ungated flow	
10..	1,066.0 -1,067.0	0	0	0	0	0	0	0	0	18,690 to 22,420	8.70 - 9.71
	Above 1,067.0	0	0	0	0	0	0	0	0	22,420+	9.71+

*During falling stages the gates shall be left fully open to drain the reservoir completely. Then the gates shall be set at 1.0 feet.
**Source for elevations up to 8.30 feet from USGS Rating Table No. 5; for elevations greater than 8.30 feet values were extrapolated from USGS data.
*** It may be necessary to regulate discharge according to downstream emergency conditions as authorized by the District Office.

April 1990

DAM OPERATOR INSTRUCTIONS

1. Communication with the District Office is available. ***

a. Notify the Reservoir Operations Center when a gate change will be required according to the schedule.

b. Notify the Reservoir Operations Center if unable to set the gates as instructed.

2. Communication with the District Office is not available.

a. Try to reestablish communications through the Los Angeles County Flood Control DPW (WUK470).

b. (i) Rising stages. Allow a period of one hour to pass to reestablish communications with the District Office. If, after one hour, communication is not reestablished, follow the gate operation schedule.

(ii) Falling stages. Maintain current downstream gauge height until communication is reestablished.

c. If one or more of the gates cannot be operated, adjust the remaining gates gradually and uniformly until the downstream gauge height agrees with scheduled values. Keep a close check on gauge height and change the gate opening as often as required. If the downstream gauge height is unobtainable, adjust the gates that are functioning so that the sum of the gate openings will equal the sum of the openings shown in the schedule.

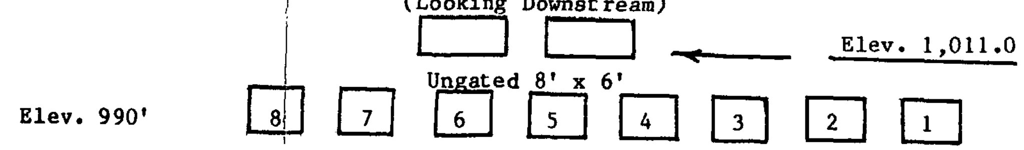
3. Trash Blockage.

If outlets become blocked with trash, increase gate openings to maintain scheduled downstream gauge height.

4. Notification to Los Angeles County DPW and to Los Angeles City DWP.

Notify personnel at Los Angeles County DPW and Los Angeles City DWP of the impending flood releases so that these agencies can take whatever action is necessary to mitigate damage to their spreading grounds downstream.

OUTLETS
(Looking Downstream)



Each Gated Outlet 5' x 8'

Estimated and Projected Annual Sediment Removal from Hansen Dam (1981 - 1990)

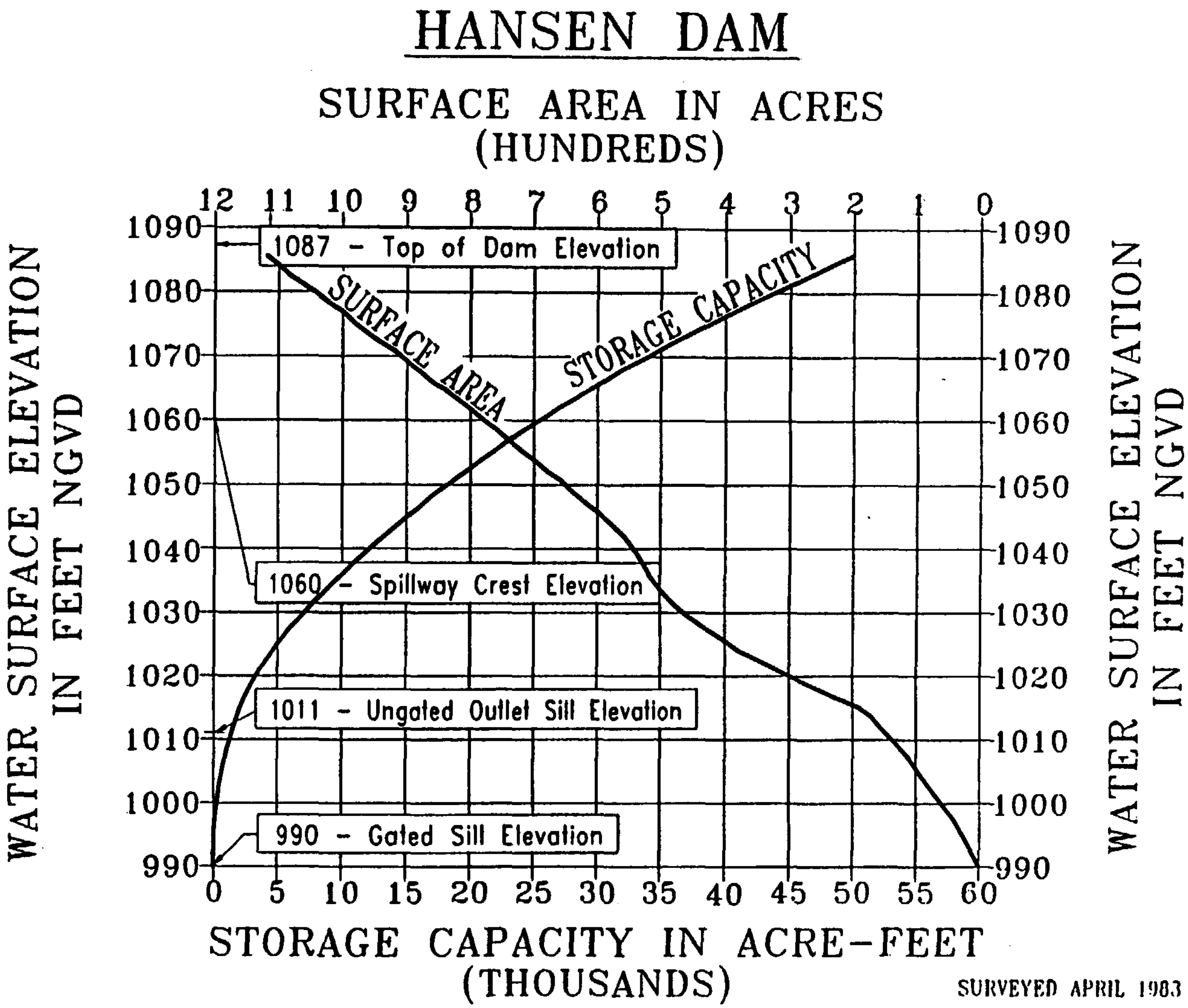
Year	Sediment Removed Yd^3	Sediment Removed Ac-Ft
1981	131,600	82
1982	197,000	122
1983	208,400	129
1984	337,267	209
1985	406,933	253
1986	1,382,071	857
1987	1,792,504	1111
1988	2,381,695	1477
* 1989	2,838,202	1760
* 1990	2,128,652	1320

* Projected, based on Operations Branch records

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

ANNUAL SEDIMENT REMOVAL FROM HANSEN DAM (1981-1990)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



SOURCE: 1983 RESERVOIR SEDIMENT SURVEY

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

AREA-CAPACITY CURVE

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES, CORPS OF ENGINEERS

RESERVOIR SEDIMENT DATA SUMMARY

Reservoir Sediment Data Summary, Hansen Dam

NAME OF RESERVOIR

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

DATA SHEET NO.

DAM	1. OWNER	2. STREAM	3. STATE
	4. SEC. TWP. RANGE	5. NEAREST P. O.	6. COUNTY
	7. LAT. ° ′ ″ LONG. ° ′ ″	8. TOP OF DAM ELEVATION	9. SPILLWAY CREST ELEV.

10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, ACRES	13. ORIGINAL CAPACITY, ACRE-FEET	14. GROSS STORAGE, ACRE-FEET	15. DATE STORAGE BEGAN
a. FLOOD CONTROL	1,060	794	33,100	33,100	
b. MULTIPLE USE				35,800	Sep 40
c. POWER					
d. WATER SUPPLY					16. DATE NORMAL OPER. BEGAN
e. IRRIGATION					
f. CONSERVATION					
g. INACTIVE	990	198	2,700	2,700	Sep 40

17. LENGTH OF RESERVOIR 1.3 MILES | AV. WIDTH OF RESERVOIR 1.0 MILES

WATERSHED		
18. TOTAL DRAINAGE AREA 151.9 SQ. MI.	22. MEAN ANNUAL PRECIPITATION INCHES	
19. NET SEDIMENT CONTRIBUTING AREA 1/ 150.9 SQ. MI.	23. MEAN ANNUAL RUNOFF INCHES	
20. LENGTH MILES	AV. WIDTH MILES	24. MEAN ANNUAL RUNOFF AC.-FT.
21. MAX. ELEV.	MIN. ELEV.	25. ANNUAL TEMP. MEAN RANGE

SURVEY DATA

26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA, ACRES	32. CAPACITY, ACRE-FEET	33. C/I. RATIO, AC.-FT. PER AC.-FT.
Sep 40	Orig	survey	Contour	5'	794	35,800	
Jul 41	0.8	0.8	Contour	5'	786	35,200	
Oct 43	2.3	3.1	Contour	5'	789	34,100	
Nov 45	2.1	5.2	Contour	5'	786	33,500	
Jan 62	16.2	21.4	Contour	2'	780	33,265	
Aug 69	7.58	28.91	Contour	2'	782	29,700	
Oct 78	9.17	38.08	Contour	2'	770	26,087	

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	36. WATER INFL. TO DATE, AC.-FT. a. MEAN ANNUAL	b. TOTAL TO DATE
Sep 40	Original survey					
Jul 41	48.03			91,040	93,300	91,040
Oct 43	27.03	38,880	75,930	89,430	59,870	180,470
Nov 45	26.22	35,400	59,720	74,340	50,720	254,310
Jan 62	18.54	6,855	34,258	111,051	17,096	365,361

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
Sep 40	Original survey					
Jul 41	600			600	600	4.1
Oct 43	1,100	550	3.78	1,700	570	3.9
Nov 45	600	300	2.06	2,300	460	3.2
Jan 62	235	14.5	0.01	2,535	118	0.8
69	3,565	470	3.22	6,100	211	1.45

26. DATE OF SURVEY	39. AV. DRY WGT., LBS. PER CU. FT.	40. SED. DEP., TONS PER SQ. MI.-YR. a. PERIOD	b. TOTAL TO DATE	41. STORAGE LOSS, PCT. a. AV. ANN.	b. TOT. TO DATE	42. SED. INFLOW, PPM a. PERIOD	b. TOT. TO DATE

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION -70	70-50	50-30	30-Crest
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION			
Sep 40	Original survey			
Jul 41	65	35	0	0
Oct 43	51	49	0	0
Nov 45	37	48	10	5
Jan 62	56	44	0	0
Aug 69	25	45	25	5

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1945-46	1010.63	989.76	12,206	1957-58	1012.55	975.60	34,133
1946-47	998.41	989.17	17,160	1958-59	997.50	982.75	2,165
1947-48	993.29	986.77	1,722	1959-60	983.52	981.69	330
1948-49	991.86	977.76	93	1960-61	985.30	982.16	486
1949-50	992.97	973.24	250	1961-62	1011.19	981.82	25,153
1950-51	998.71	963.15	34	1962-63	988.70	982.44	765
1951-52	1023.78	Dry	32,175	1963-64	985.35	982.32	645
1952-53	999.27	979.32	1,430	1964-65	992.83	981.71	1,484
1953-54	996.37	982.22	5,090	1965-66	1017.57	982.29	57,363
1954-55	985.79	977.68	712	1966-67	1013.58	990.42	41,175
1955-56	999.00	975.61	2,100	1967-68	1007.33	988.92	16,581
1956-57	992.98	976.55	495	1968-69	1003.78	986.81	180,372

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
990	0	0	1035	529	10,702	1080	1013	44,614
995	47	158	1040	565	13,430	1085	1071	49,831
1000	81	467	1045	607	16,357			
1005	115	962	1050	660	19,516			
1010	154	1630	1055	718	22,965			
1015	221	2538	1060	776	26,695			
1020	331	3914	1065	834	30,720			
1025	427	5819	1070	900	35,044			
1030	492	8136	1075	958	39,691			

47. REMARKS AND REFERENCES

1/ Item 19 - Includes 82 Sq. Mi. above Big Tujunga Dam; however, practically all sediment inflow is passed downstream by sluicing operations.

48. AGENCY MAKING SURVEY

49. AGENCY SUPPLYING DATA

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

RESERVOIR SEDIMENT DATA SURVEY

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

ENG FORM 1787 NOV 66 PREVIOUS EDITIONS ARE OBSOLETE.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

RESERVOIR SEDIMENT DATA SUMMARY

(Continued)
NAME OF RESERVOIR

DATA SHEET NO.

DAM	1. OWNER	2. STREAM	3. STATE
	4. SEC. TWP. RANGE	5. NEAREST P. O.	6. COUNTY
	7. LAT. ° ' " LONG. ° ' "	8. TOP OF DAM ELEVATION	9. SPILLWAY CREST ELEV.

RESERVOIR	10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, ACRES	13. ORIGINAL CAPACITY, ACRE-FEET	14. GROSS STORAGE, ACRE-FEET	15. DATE STORAGE BEGAN
	a. FLOOD CONTROL					
	b. MULTIPLE USE					
	c. POWER					16. DATE NORMAL OPER. BEGAN
	d. WATER SUPPLY					
	e. IRRIGATION					
	f. CONSERVATION					
	g. INACTIVE					
	17. LENGTH OF RESERVOIR MILES		AV. WIDTH OF RESERVOIR MILES			

WATERSHED	18. TOTAL DRAINAGE AREA SQ. MI.	22. MEAN ANNUAL PRECIPITATION INCHES
	19. NET SEDIMENT CONTRIBUTING AREA SQ. MI.	23. MEAN ANNUAL RUNOFF INCHES
	20. LENGTH MILES AV. WIDTH MILES	24. MEAN ANNUAL RUNOFF AC.-FT.
	21. MAX. ELEV. MIN. ELEV.	25. ANNUAL TEMP. MEAN RANGE

SURVEY DATA

26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA, ACRES	32. CAPACITY, ACRE-FEET	33. C/I. RATIO, AC.-FT. PER AC.-FT.
Jul 82	3.75	41.83	Contour	2'	776	26,695	
Apr 83	0.75	42.58				25,446	

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	36. WATER INFL. TO DATE, AC.-FT. a. MEAN ANNUAL	b. TOTAL TO DATE
Aug 69	27.58	41,997	180,372	318,336	23,666	834,197
Oct 78	28.47	25,978	163,185	238,217	24,223	922,414
Jul 82	30.51	58,396	115,809	218,985	27,287	1,141,399

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
Oct 78	3,613	394.00	2.70	9,713	255.07	1.75
Jul 82	-608	Excavation increased storage capacity.				
Apr 83	1,249					

26. DATE OF SURVEY	39. AV. DRY WGT., LBS. PER CU. FT.	40. SED. DEP., TONS PER SQ. MI.-YR. a. PERIOD	b. TOTAL TO DATE	41. STORAGE LOSS, PCT. a. AV. ANN.	b. TOT. TO DATE	42. SED. INFLOW, PPM a. PERIOD	b. TOT. TO DATE

ENG FORM 1787 NOV 68 PREVIOUS EDITIONS ARE OBSOLETE.

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION -70	70-50	50-30	30-Crest							
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION										
Oct 78	12	34	45	9							
Jul 82	Excavation increased storage capacity.										

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1969-70	1007.32	993.97	16,886	1981-82	1010.60	996.86	39,755
1970-71	1009.36	995.23	14,996				
1971-72	1004.62	993.50	2,273				
1972-73	1015.34	992.91	15,626				
1973-74	1010.48	996.35	7,829				
1974-75	1007.06	994.77	6,565				
1975-76	1006.72	994.57	5,222				
1976-77	1007.20	996.45	5,635				
1977-78	1023.90	994.92	163,185				
1978-79	1016.72	991.10	55,429				
1979-80	1025.30	996.31	115,809				
1980-81	999.05	997.00	10,054				

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY

47. REMARKS AND REFERENCES

48. AGENCY MAKING SURVEY

49. AGENCY SUPPLYING DATA

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

RESERVOIR SEDIMENT DATA SURVEY

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Summary of Climatological Data at Burbank, California, Hansen Flood Control Basin, Los Angeles County Drainage Area, California.*

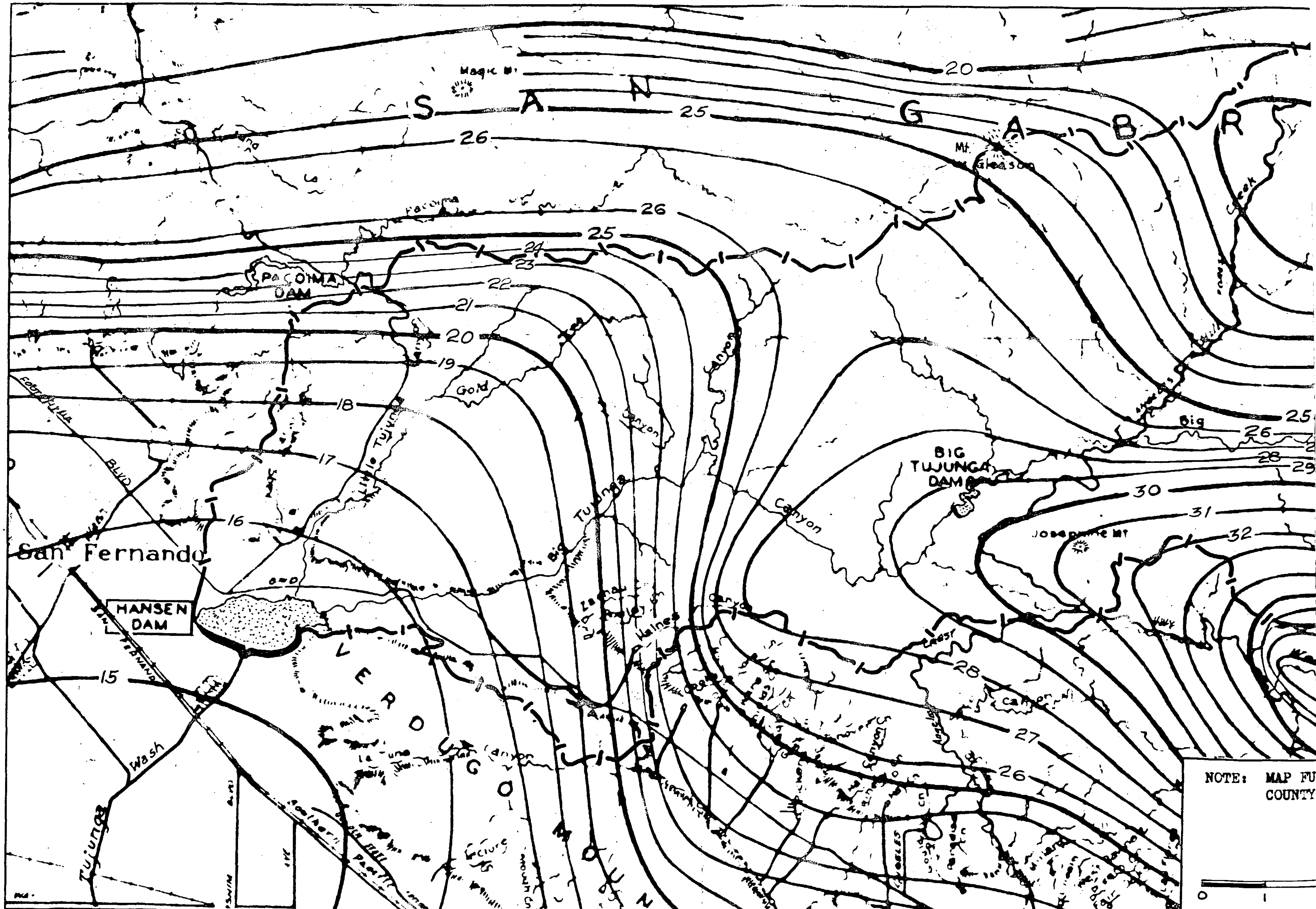
Month	Temperature			Precipitation	
	Mean Monthly Degrees Fahrenheit	Record Highest Degrees Fahrenheit	Record Lowest Degrees Fahrenheit	Mean Monthly Inches	Maximum Monthly Inches
Jan	53.8	92	22	3.77	14.16
Feb	56.3	92	27	3.33	15.19
Mar	57.5	96	22	2.52	12.87
Apr	60.6	100	32	1.24	5.66
May	64.5	106	39	0.28	3.79
Jun	69.3	111	43	0.04	0.31
Jul	75.1	108	45	0.01	0.05
Aug	75.2	110	46	0.14	2.97
Sep	73.1	113	45	0.24	3.89
Oct	67.1	108	33	0.31	2.42
Nov	59.6	98	29	1.94	10.63
Dec	54.7	92	22	1.96	6.84

*34°12'N latitude 118°22'W longitude; elevation 699 feet above mean sea level.
NOTE: Period of record is 30 years (1951-1980)

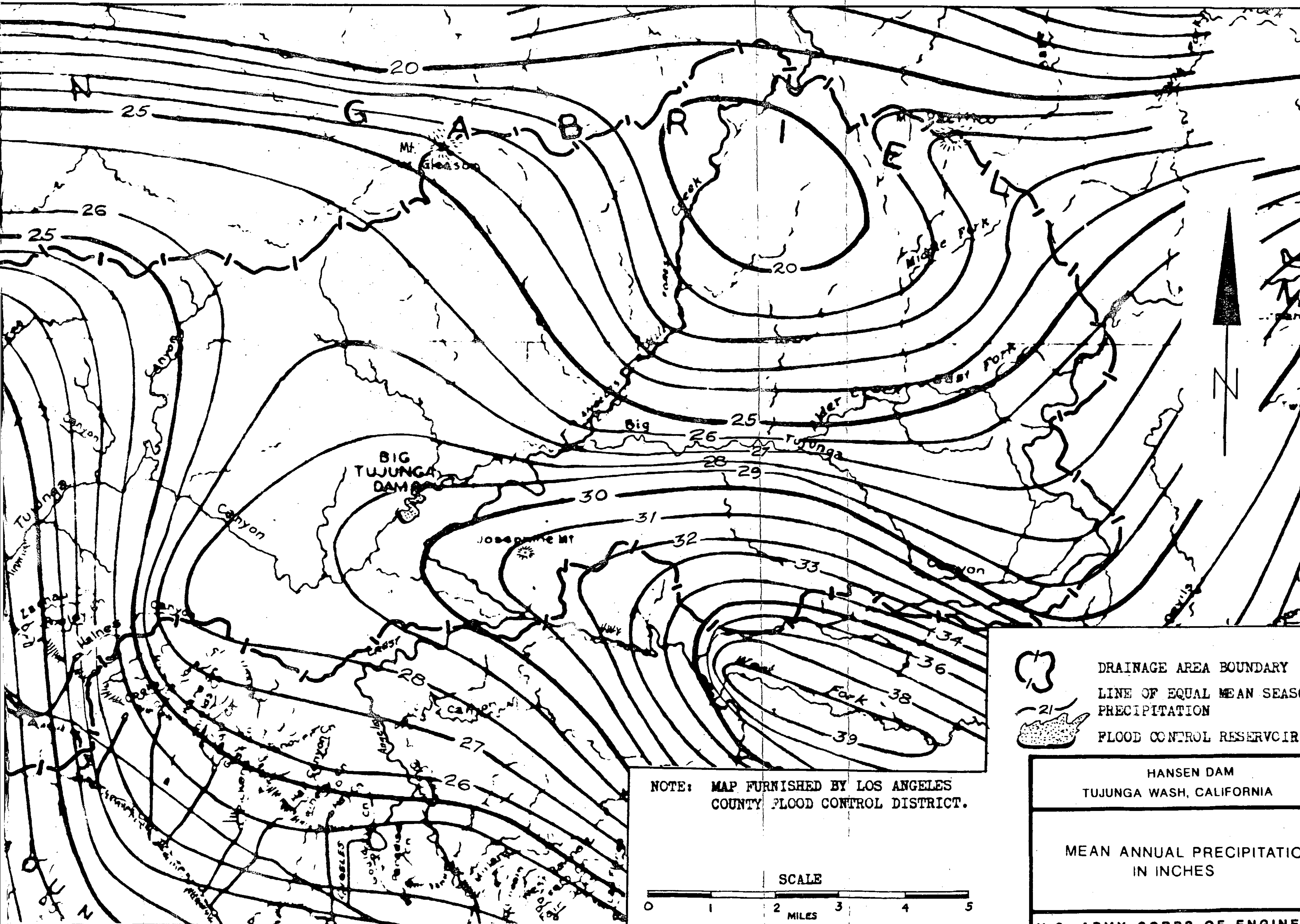
HANSEN DAM
TUJUNGA WASH, CALIFORNIA

SUMMARY OF CLIMATOLOGICAL DATA AT BURBANK, CA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



SOURCE: LACDPW



NOTE: MAP FURNISHED BY LOS ANGELES COUNTY FLOOD CONTROL DISTRICT.

SCALE

0 1 2 3 4 5 MILES

DRAINAGE AREA BOUNDARY

LINE OF EQUAL MEAN SEASONAL PRECIPITATION

FLOOD CONTROL RESERVOIR

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

MEAN ANNUAL PRECIPITATION IN INCHES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Summary of Precipitation Data at Hansen Dam and Three Stations in Watershed above Dam.

LACDPW Number	Station Name	Lat (N)	Long (W)	Elev (feet)	Period of Record
46D-E	Big Tujunga Dam	34-17-40	118-11-14	2315	1924 - 1988
436C	Hansen Dam	34-16-08	118-23-59	1110	1938 - 1988
488B	Kagel Canyon Ptl Stn	34-17-45	118-22-30	1450	1943 - 1987
54C	Lomis Ranch Alder Cr	34-20-55	118-02-54	4325	1916 - 1987

MEAN AND MAXIMUM OBSERVED MONTHLY AND ANNUAL PRECIPITATION VALUES (INCHES) PLUS MAXIMUM OBSERVED DAILY VALUES (INCHES), BY MONTH:

LACDPW NO:	46D-E			436C		
	MEAN	MAXIMUM		MEAN	MAXIMUM	
		Monthly	Daily		Monthly	Daily
JAN	5.58	33.39	14.39	2.81	14.39	3.84
FEB	5.86	21.12	11.24	2.96	13.16	4.83
MAR	4.60	20.38	10.83	2.33	11.92	5.61
APR	2.31	9.86	3.60	1.17	6.25	2.30
MAY	0 66	6.59	4.38	0.33	2.88	1.84
JUN	0.14	1.80	1.08	0.07	0.55	0.25
JUL	0.06	0.15	0.15	0.03	0.24	0.24
AUG	0.14	1.60	1.28	0.07	2.90	2.77
SEP	0.43	5 61	3.19	0.22	3.44	3.03
OCT	0.97	6.07	5.28	0.49	2.29	1.39
NOV	2.83	24.86	5.59	1.43	12.63	4.91
DEC	5.01	15.58	8.19	2.53	7.94	3.45
ANNUAL	28.59	60.68		14.44	46.45	

LACDPW NO:	488B			54C		
	MEAN	MAXIMUM		MEAN	MAXIMUM	
		Monthly	Daily		Monthly	Daily
JAN	3.24	12.50	4.22	3.63	17.87	9.69
FEB	3.40	13.81	4.02	3.82	14.82	8.13
MAR	2 68	12.03	4.83	3.00	15.50	5.90
APR	1.35	6.54	2.75	1.51	13.04	5.48
MAY	0.38	4.38	2.15	0.43	4.80	2.60
JUN	0.08	0.62	0.45	0.09	0.68	0.45
JUL	0.03	0.19	0.17	0.04	2.15	2.15
AUG	0.08	3.15	2.64	0.09	2.00	1.60
SEP	0.25	3.30	1.97	0.28	6.38	5.25
OCT	0.57	2.18	1.18	0.63	4.50	2.25
NOV	1.64	10.75	2.05	1.84	13.66	6.93
DEC	2.91	7.54	3.86	3.26	17.30	7.43
ANNUAL	16.61	42.47		18.62	40.56	

NOTES: 1. Minimum observed monthly values are approximately zero at each stn.
2. Data were obtained from Los Angeles County Dept. of Public Works (LACDPW).

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

SUMMARY OF PRECIPITATION DATA
HANSEN WATERSHED

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Precipitation Frequency Values (Inches) for Hansen Watershed.

DURATION	RETURN PERIOD 2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5-MIN	0.19	0.29	0.36	0.45	0.51	0.58
10-MIN	0.30	0.46	0.46	0.70	0.80	0.90
15-MIN	0.37	0.58	0.71	0.88	1.01	1.14
30-MIN	0.52	0.80	0.98	1.23	1.40	1.58
1-HR	0.66	1.02	1.25	1.55	1.77	1.99
2-HR	0.99	1.53	1.88	2.34	2.67	3.00
3-HR	1.30	2.01	2.47	3.08	3.53	3.96
6-HR	2.03	3.15	3.89	4.82	5.52	6.20
12-HR	3.04	5.01	6.28	7.96	9.19	10.40
24-HR	4.04	6.87	8.74	11.10	12.86	14.60

NOTES:
1. Values from NOAA Atlas 2 data, are for a site at the centroid of the watershed above Hansen Dam at latitude 34°19'N, longitude 118°11'W, elevation 3900 feet.
2. All values are for annual series.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

PRECIPITATION FREQUENCY VALUES FOR HANSEN WATERSHED

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

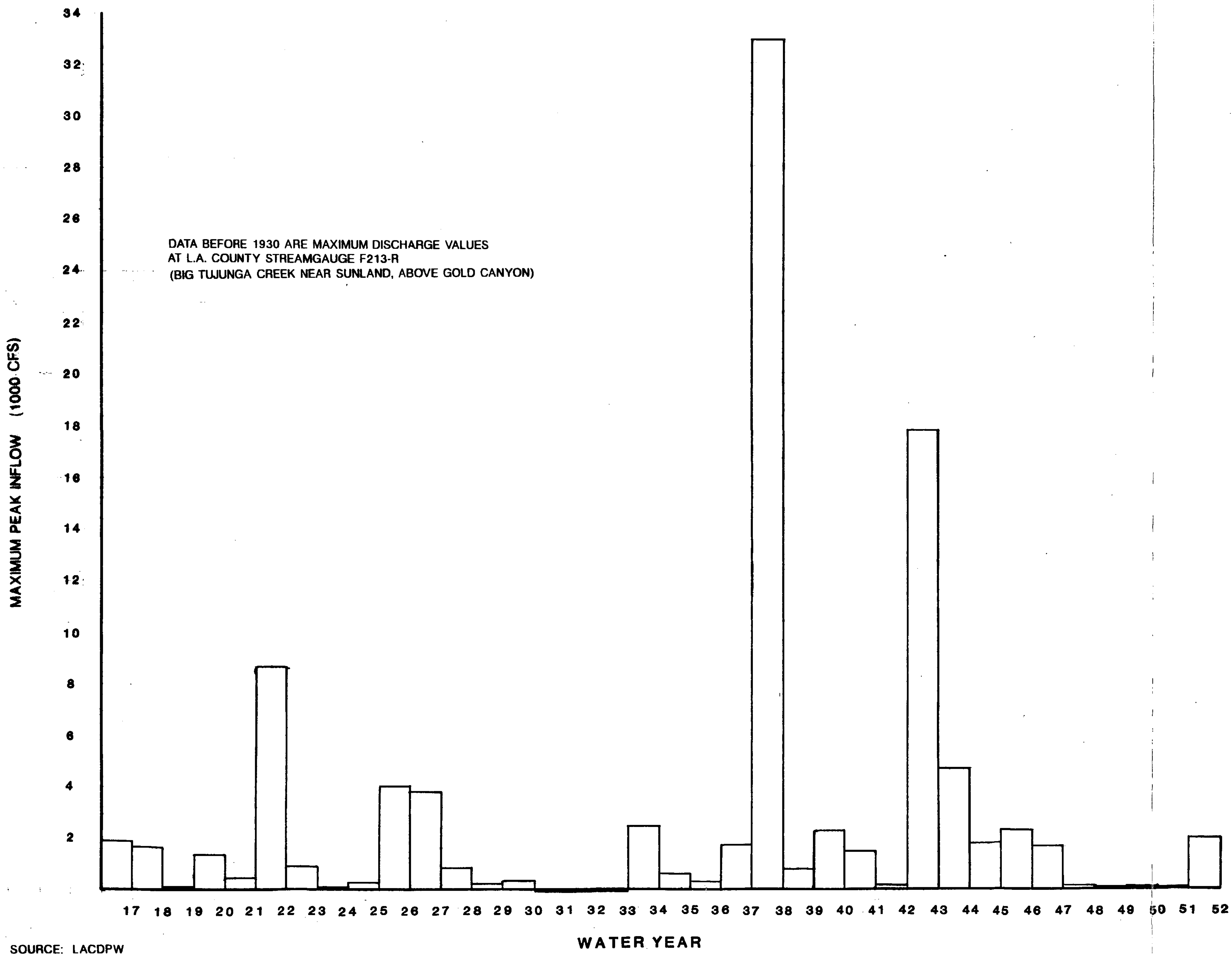
ANNUAL MAXIMUM INFLOW, OUTFLOW, AND STORAGE OF WATER AT HANSEN DAM

Water Year	Peak Inflow (cfs)	Date	Peak Outflow (cfs)	Date	Maximum Water Surface Elevation (ft., NGVD)	Max. Storage (ac-ft)	Date	Annual Inflow (ac-ft)
1941-42	678	28 Dec	58	31 Dec	992.40	2126	30 Dec	9870
1942-43	18860	23 Jan	1640	25 Jan	1036.47	18743	24 Jan	75930
1943-44	6600	22 Feb	1020	24 Feb	1022.32	11622	23 Feb	59720
1944-45	1320	2 Feb	707	5 Feb	1004.02	4807	1 Oct	14310
1945-46	1200	30 Mar	610	23 Dec	1010.62	6876	7 Apr	12206
1946-47	608	27 Dec	455	28 Dec	996.67	2934	27 Dec	17160
1947-48	33	5 Feb	2	5 Feb	990.40	1812	6 Jun	1722
1948-49	4	26 Feb	0		986.72	1275	1 Oct	93
1949-50	18	6 Feb	0		977.86	415	4 Mar	250
1950-51	4	29 Jan	0		973.24	132	1 Oct	34
1951-52	2835	18 Jan	2550	25 Jan	1023.90	12354	22 Jan	32175
1952-53	110	15 Nov	3	27 Apr	999.27	3541	9 Jan	1430
1953-54	286	4 Mar	471	3 Mar	995.82	2751	10 Mar	5090
1954-55	960	18 Jan	2	3 days	985.79	1139	23 Jan	712
1955-56	411	26 Jan	4	2 days	993.83	2364	1 Feb	2100
1956-57	32	1 Mar	2	12 Jan	981.80	557	18 Mar	495
1957-58	1327	4 Apr	1450	4 Apr	1012.54	7556	16 Apr	34113
1958-59	339	16 Feb	333	25 Feb	997.51	3123	25 Feb	2165
1959-60	13	11 Jan	0		983.52	808	28 Aug	330
1960-61	39	5 Nov	0		985.98	1167	27 Nov	486
1961-62	4603	10 Feb	3159	12 Feb	1011.19	6275	12 Feb	25153
1962-63	173	9 Feb	0		988.69	1219	14 Feb	765
1963-64	64	20 Jan	0		985.35	862	3 Apr	645
1964-65	146	9 Apr	0		992.83	1755	13 Apr	1484
1965-66	5200	22 Nov	3147	24 Nov	1017.54	8705	30 Dec	57363
1966-67	3133	6 Dec	405	22 Dec	1013.58	7140	9 Dec	41175
1967-68	1050	21 Nov	305	22 Apr	1007.33	5014	23 Nov	16581
1968-69	26012	25 Feb	15993	25 Feb	1030.78	14872	25 Feb	180372
1969-70	1640	6 Nov	144	3 Mar	1007.32	2761	5 Mar	16886
1970-71	2771	29 Nov	212	1 Mar	1009.36	3209	1 Dec	14996
1971-72	482	27 Dec	275	29 Dec	1004.62	2239	29 Dec	2273
1972-73	3205	11 Feb	269	21 Feb	1015.34	4882	12 Feb	15626
1973-74	1220	7 Jan	404	1 Apr	1010.48	3480	8 Jan	7829
1974-75	863	6 Mar	205	17 Mar	1007.06	2707	16 Mar	6565
1975-76	1549	1 Mar	213	19 Feb	1006.72	2638	19 Feb	5222
1976-77	607	3 Jan	205	20 Sep	1008.35	2980	11 May	5635
1977-78	35048	10 Feb	13541	10 Feb	1023.90	8211	10 Feb	163185
1978-79	1784	27 Mar	1481	21 Feb	1016.64	2931	29 Mar	55429
1979-80	11346	16 Feb	5025	17 Feb	1025.30	5950	17 Feb	115809
1980-81	378	29 Jan	372	29 Jan	998.99	390	4 Mar	10054
1981-82	5026	17 Mar	3981	17 Mar	1010.60	1724	18 Mar	39755
1982-83	27901	1 Mar	18104	2 Mar	1039.70	13261	2 Mar	182946
1983-84	1187	28 Dec	397	5 Oct	1012.80	1680	27 Dec	21923
1984-85	1882	19 Dec	1084	20 Dec	1006.20	802	20 Dec	22583
1985-86	1473	30 Jan	1212	25 Feb	1008.40	1050	17 Feb	22432

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

ANNUAL MAXIMUM INFLOW, OUTFLOW, AND STORAGE OF WATER AT HANSEN DAM

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

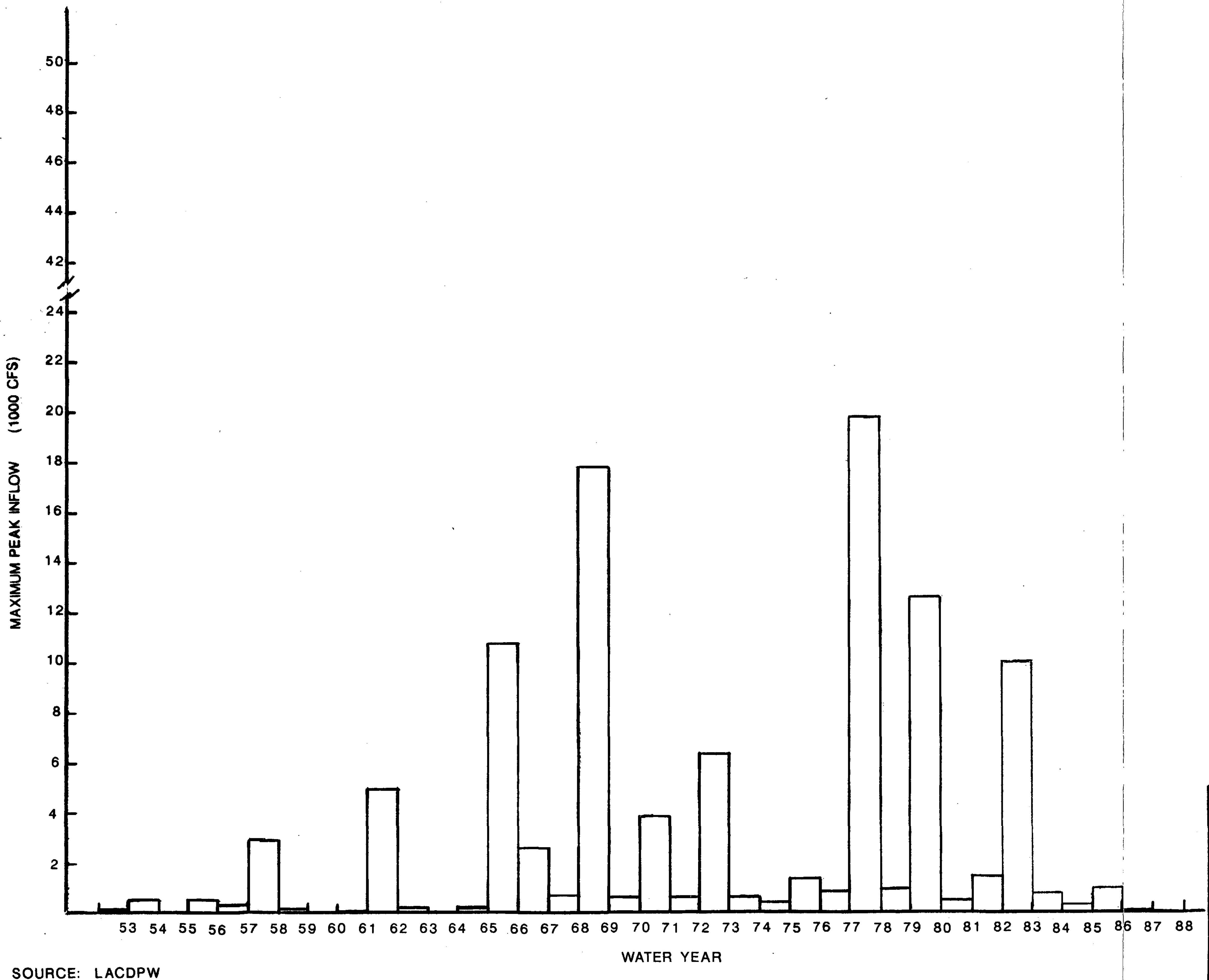


SOURCE: LACDPW

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

MAXIMUM PEAK INFLOW
BIG TUJUNGA DAM (1917-1952)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



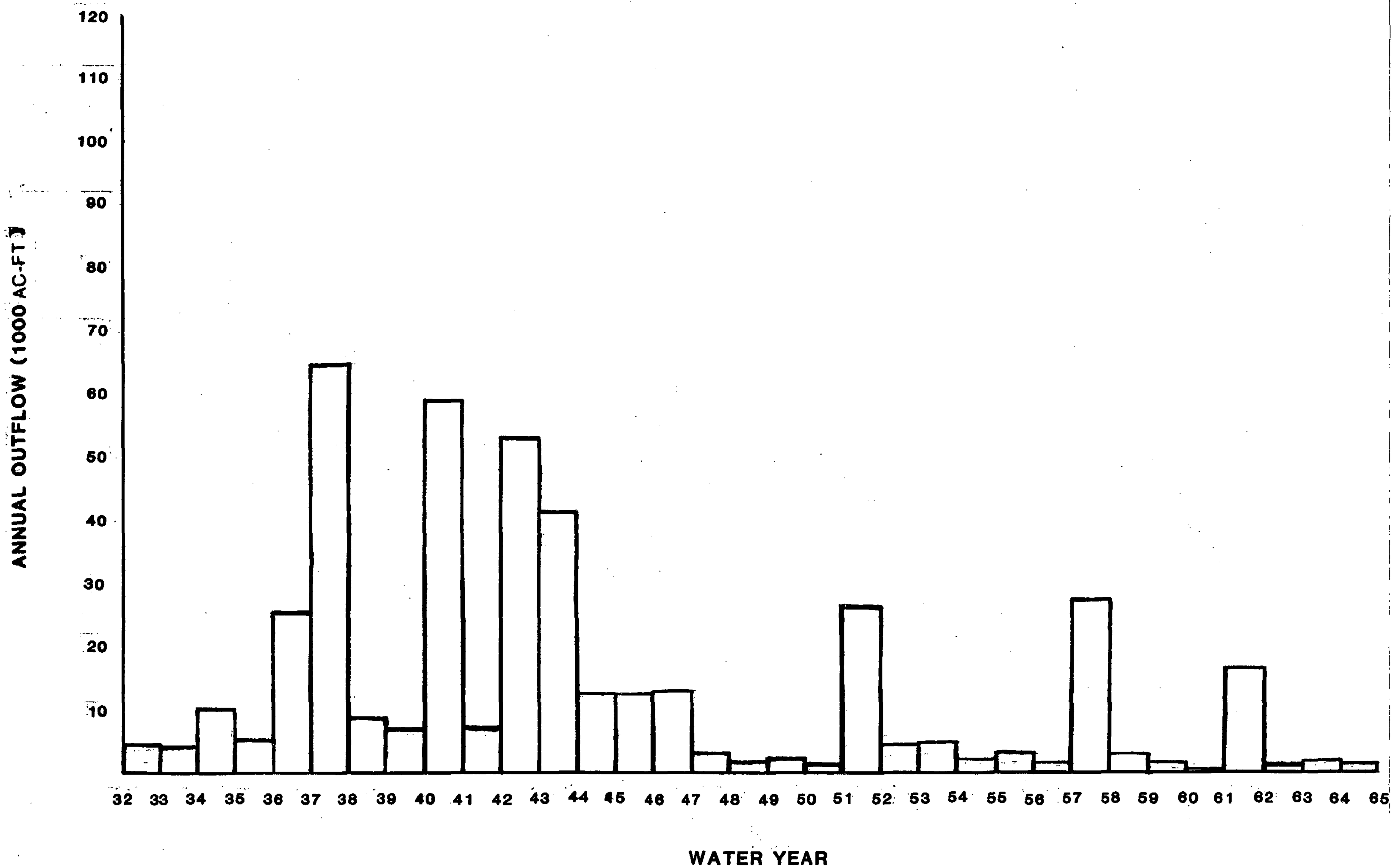
HANSEN DAM

TUJUNGA WASH, CALIFORNIA

MAXIMUM PEAK INFLOW

BIG TUJUNGA DAM (1953-1987)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



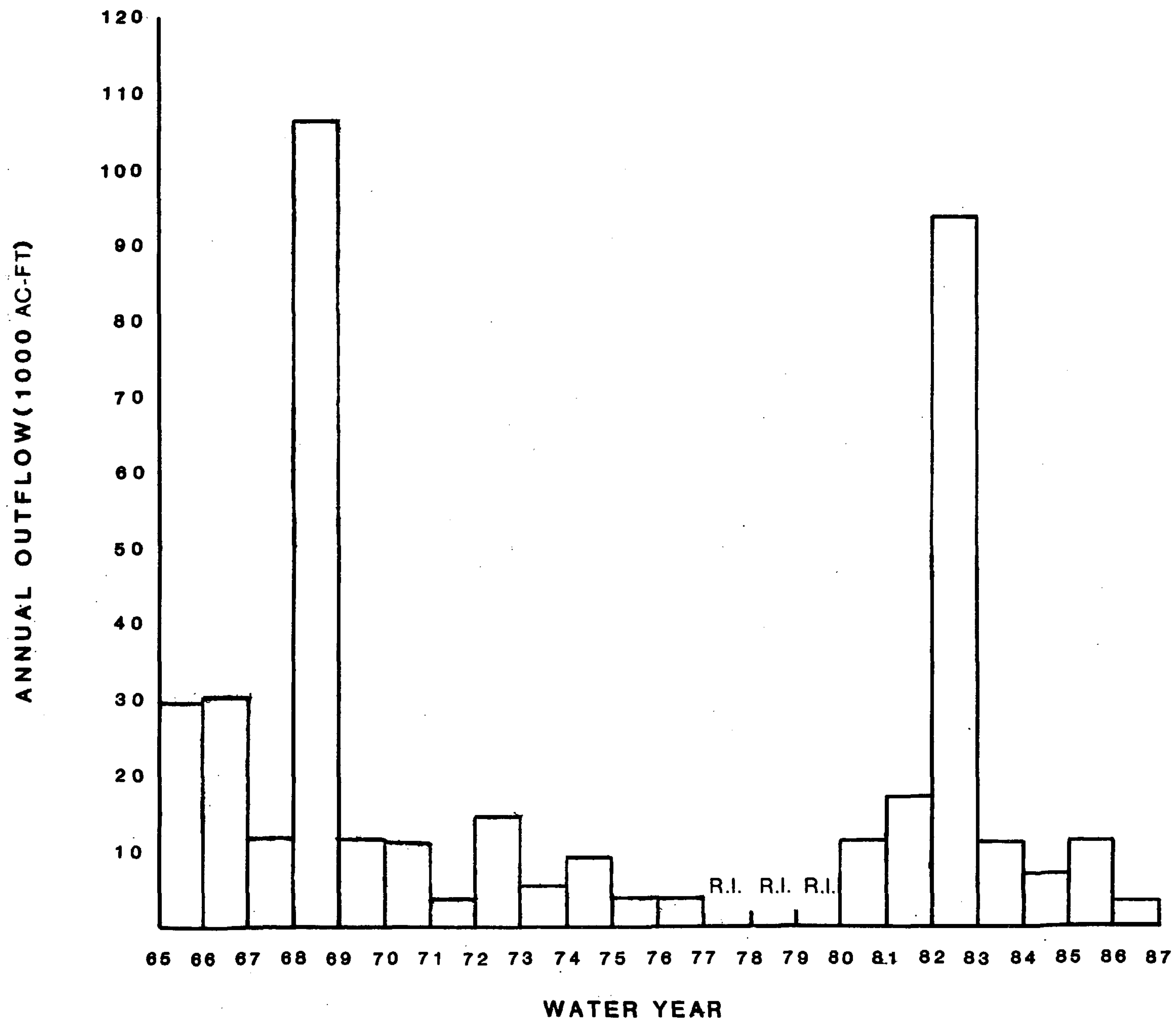
SOURCE: LACDPW

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BIG TUJUNGA DAM ANNUAL OUTFLOW

(1932-1965)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



SOURCE: LACDPW

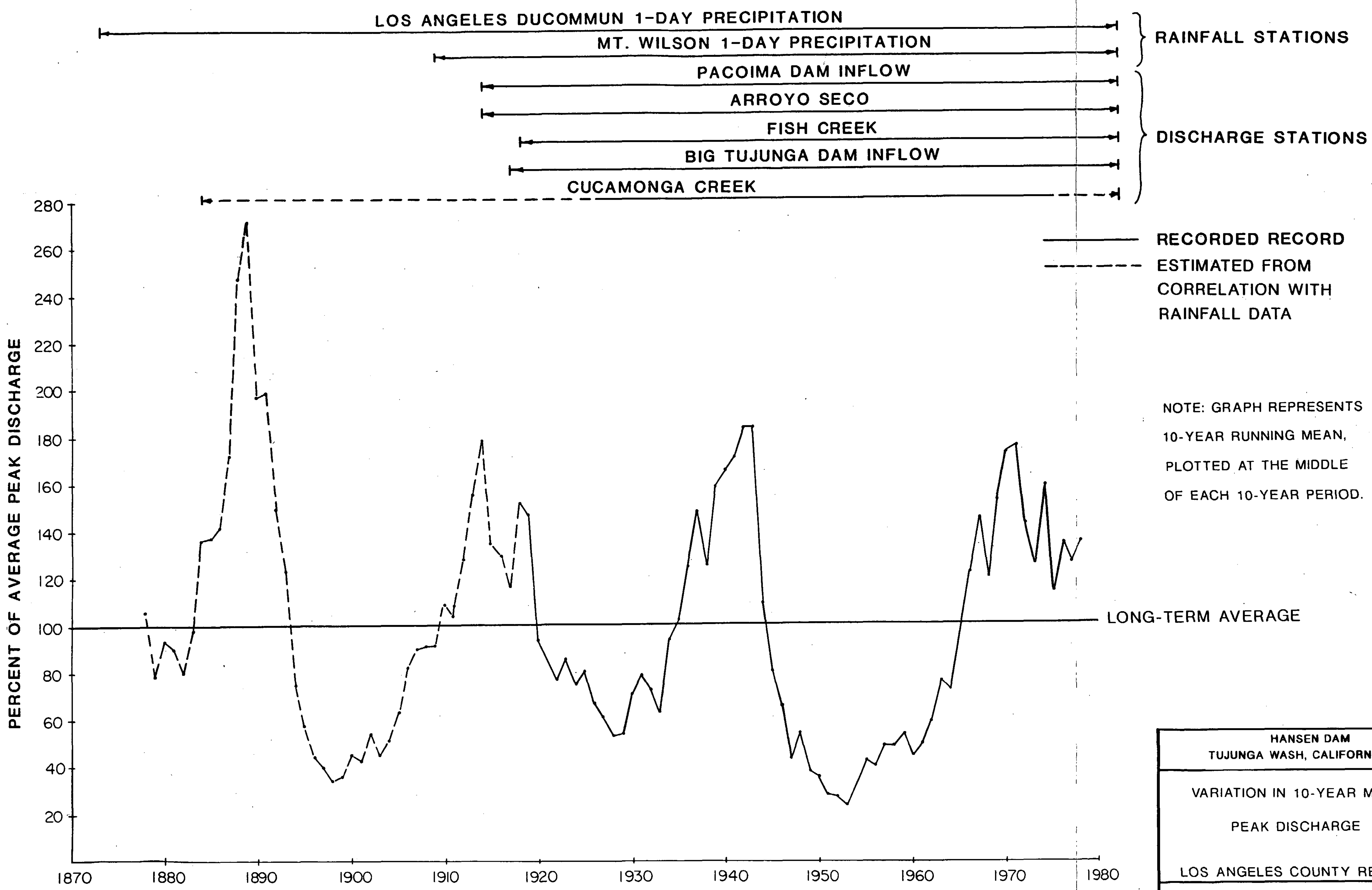
NOTE: 77-80 RECORD INCOMPLETE

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BIG TUJUNGA DAM ANNUAL OUTFLOW

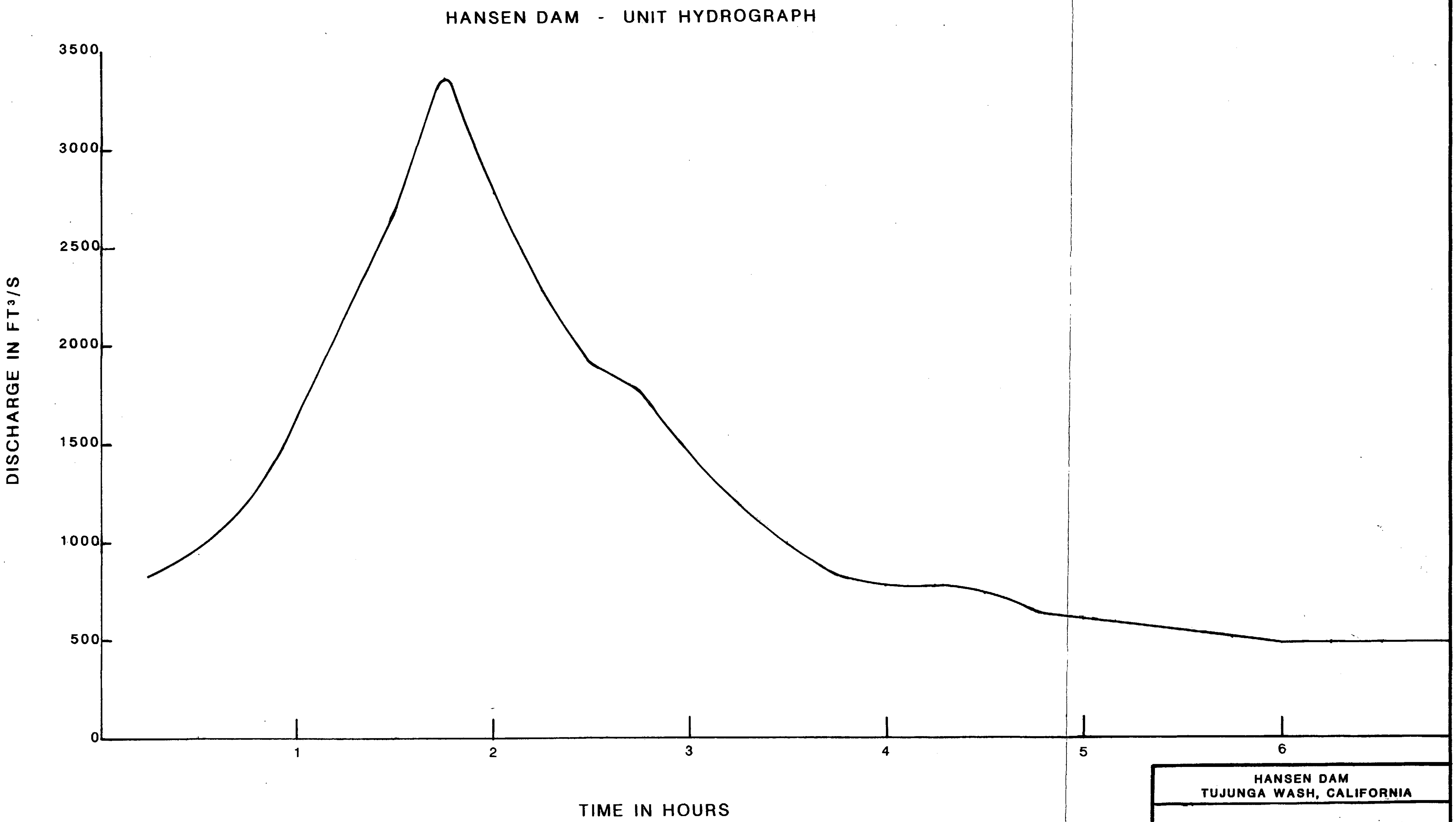
(1965-1987)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM TUJUNGA WASH, CALIFORNIA
VARIATION IN 10-YEAR MEAN PEAK DISCHARGE LOS ANGELES COUNTY REGION
U.S. ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

SOURCE: SEPULVEDA DAM WATER CONTROL MANUAL



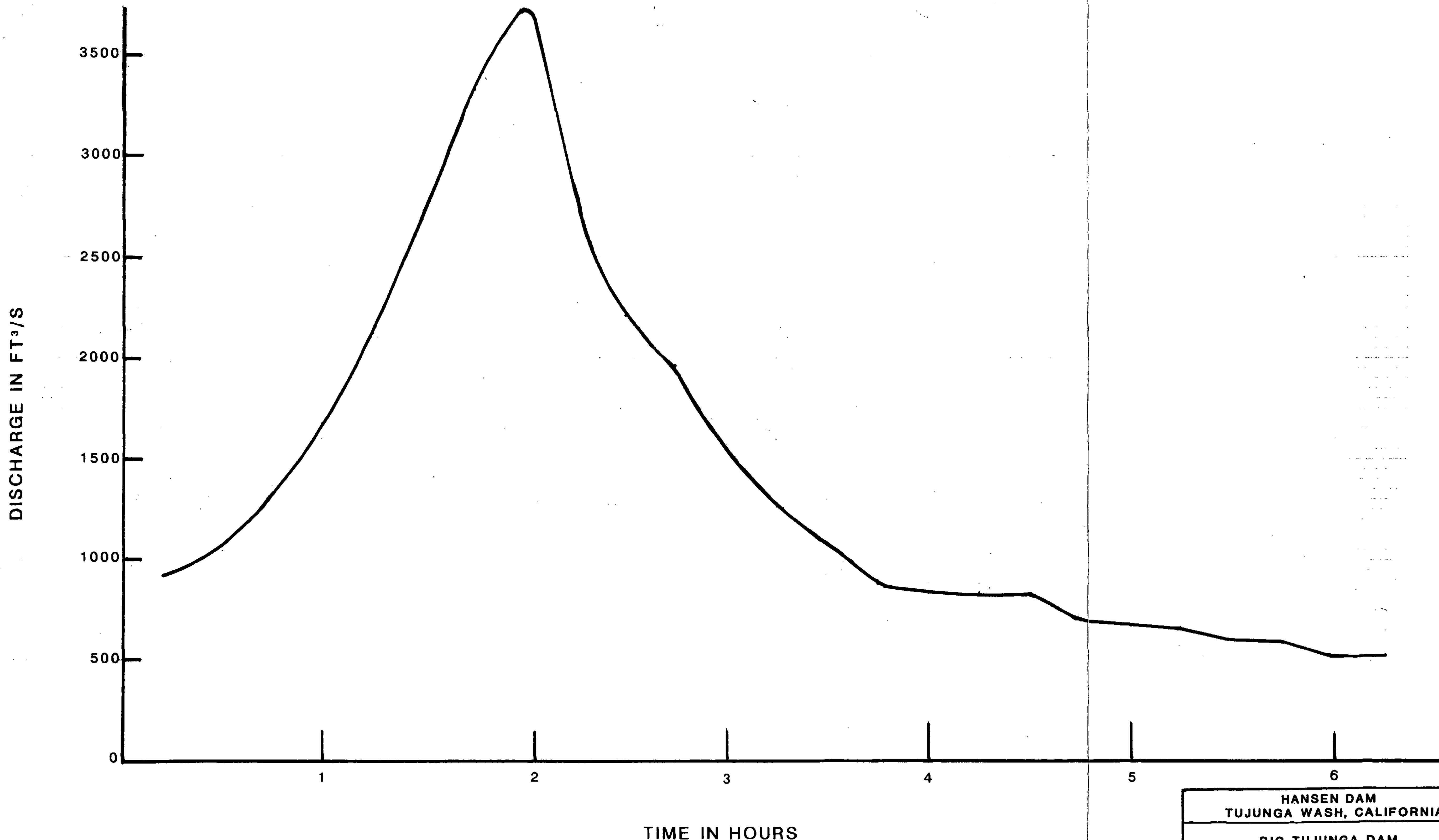
SOURCE: LACDA REVIEW PART 1 HYDROLOGY

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BASIN UNIT HYDROGRAPH
DRAINAGE AREA BETWEEN
HANSEN DAM AND BIG TUJUNGA DAM

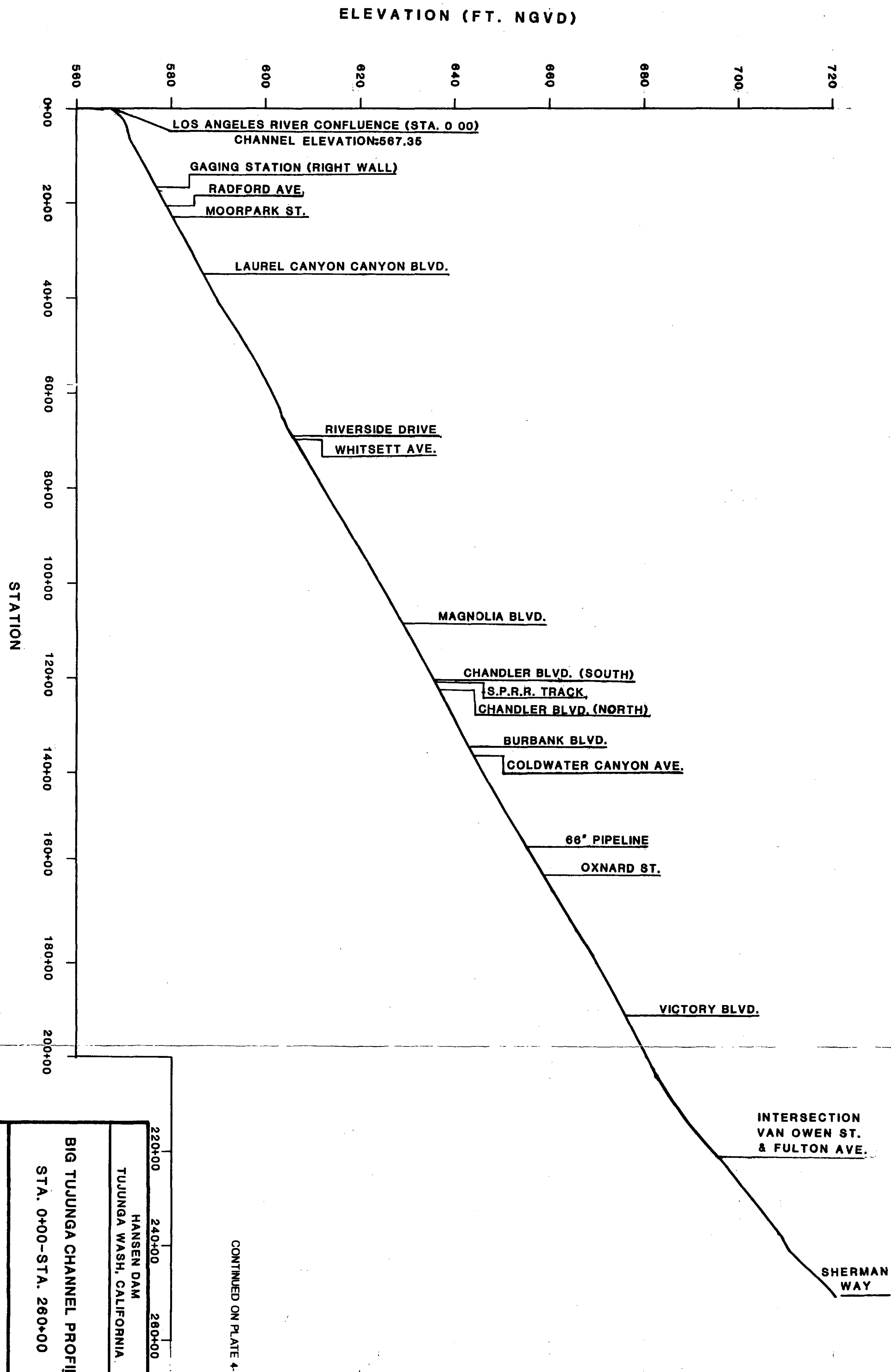
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

BIG TUJUNGA DAM - UNIT HYDROGRAPH



SOURCE: LACDA REVIEW PART 1 HYDROLOGY

HANSEN DAM TUJUNGA WASH, CALIFORNIA
BIG TUJUNGA DAM BASIN UNIT HYDROGRAGH DRAINAGE AREA ABOVE BIG TUJUNGA DAM
U.S. ARMY CORPS OF ENGINEERS LOS ANGELES DISTRICT

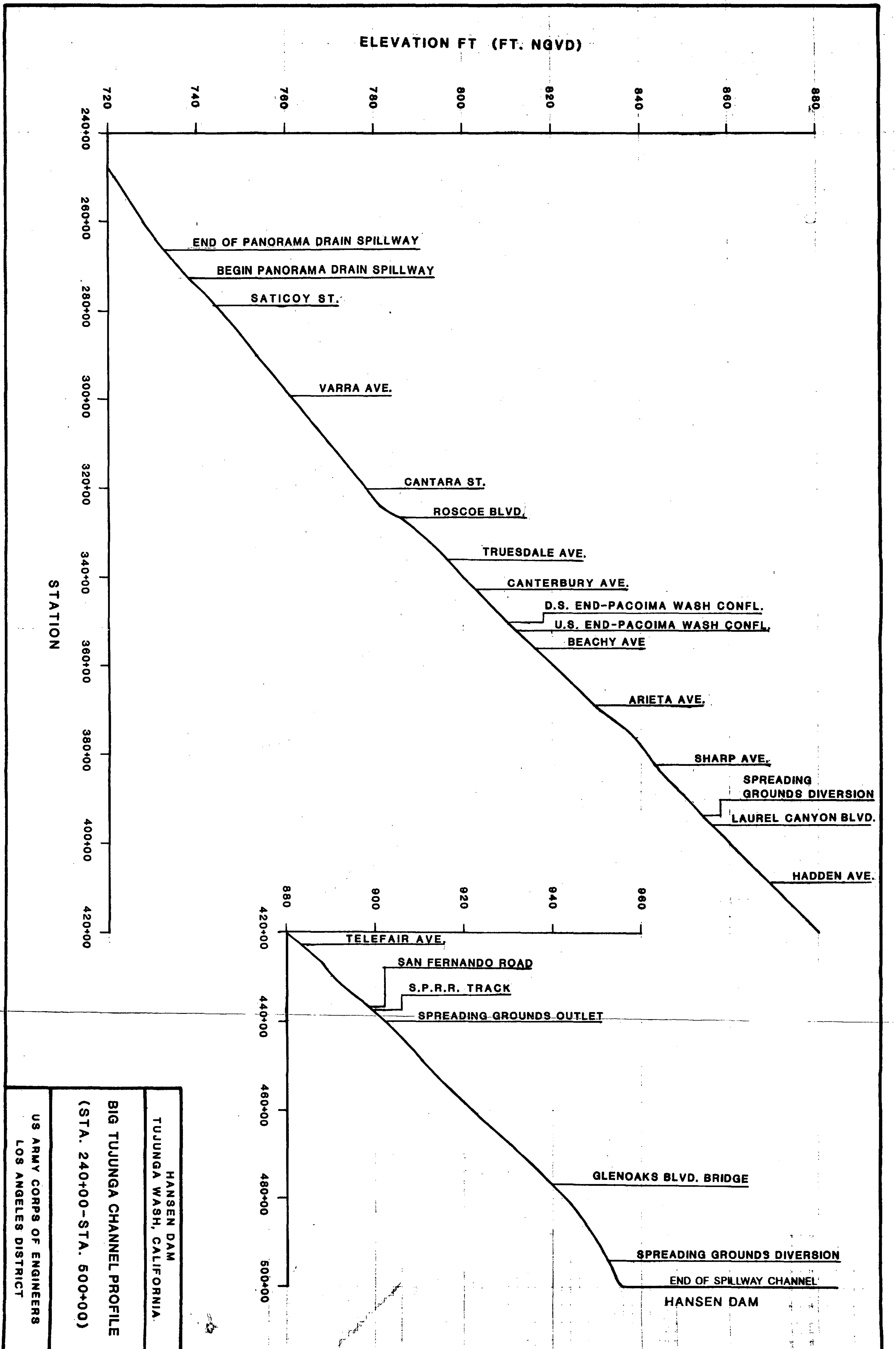


CONTINUED ON PLATE 4-11

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BIG TUJUNGA CHANNEL PROFILE
STA. 0+00-STA. 260+00

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

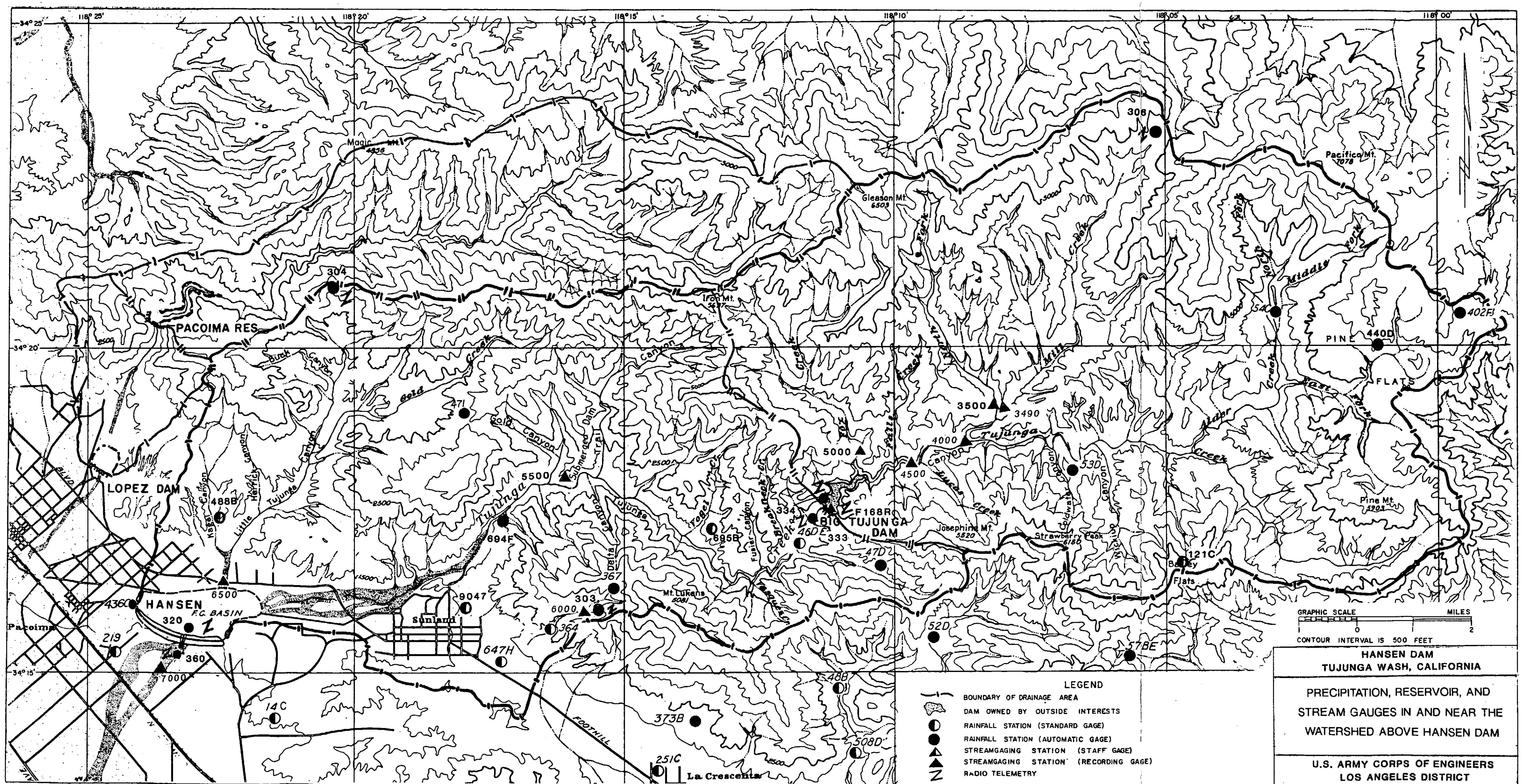


HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BIG TUJUNGA CHANNEL PROFILE
(STA. 240+00-STA. 500+00)

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SOURCE:LACDA REVIEW PART 1 HYDROLOGY REPORT



SOURCE: TABLE 5-1

Precipitation, Reservoir, and Stream Gauges In and Near the Watershed Above Hansen Dam.

Designation	Name	Latitude	Longitude	Elevation	Description
# 1 (303)*	Haines Canyon	34-16-03	118-15-20	3480	Precip.
# 2 (304)*	Mendenhall Ridge	34-20-57	118-18-23	4320	Precip.
# 3 (306)*	Mill Creek Summit	34-23-19	118-05-12	5400	Precip.
# 4 (319)*	Hansen Dam Out	34-15-23	118-23-13	960	Stage
# 5 (320)*	Hansen Dam	34-15-37	118-23-06	960	Precip.
# 6 (332)*	Big Tujunga Dam Lvl	34-17-40	118-11-14	2315	Level
# 7 (333)*	Big Tujunga Dam Out	34-17-19	118-11-38	2315	Stage
# 8 (334)*	Big Tujunga Dam	34-17-40	118-11-14	2315	Precip.
# 9 (357)*	Hansen Yard	34-15-22	118-23-13	950	Wind
#10 (360)*	Hansen Yard	34-15-22	118-23-13	950	Precip.
#11 (361)*	Hansen Yard	34-15-22	118-23-13	950	Rhum
#12 (362)*	Hansen Yard	34-15-22	118-23-13	950	Temp.
#13 (363)*	Hansen Yard	34-15-22	118-23-13	950	Solar
#14 (364)*	Hansen Yard	34-15-22	118-23-13	950	Pressure
#15 (F168R)	Tujunga Cr. below Big Tujunga				Punch Tape
#16 (34)**	Hansen Dam COE	34-15-22	118-23-04	1090	Wind, Gauge Height Precip.
#17 (72)**	Tujunga Wash D/S Hansen Dam (COE)	X	X	X	Gauge Height
#18 (46DE)**	Big Tujunga Dam	34-17-40	118-11-16	2315	Precip. Stream

Designation	Name	Latitude	Longitude	Elevation	Description
#19 (47D)**	Clear Creek City School	34-16-38	118-10-12	3150	Precip. Stream
#20 (54C)**	Loomis Ranch Alder Creek	34-20-55	118-11-16	4325	Precip. Stream
#21 (219)**	Pacomia Wash	34-15-21	118-24-24	955	Stream
#22 (365C)**	Mt. Lukens	34-16-05	118-14-06	5040	Stream
#23 (367)**	Upper Haines Cyn	34-16-18	118-15-07	3440	Precip. Stream
#24 (402F)**	Ceder Springs	34-21-21	117-52-34	6780	Precip.
#25 (436C)**	Hansen Dam	34-16-08	118-23-59	1110	Precip.
#26 (440D)**	Chilao-USFS Camp	34-20-00	118-01-23	5220	Stream
#27 (471)**	Little Tujunga Goln Creek	34-18-57	118-18-02	2750	Precip.
#28 (488B)**	Kagel Canyon Patrol Stn.	34-17-45	118-22-30	1450	Stream
#29 (647J)**	Tujunga	34-15-45	118-17-34	1685	Stream
#30 (694F)**	Big Tujunga Cyn	34-17-22	118-17-17	1525	Precip.
#31 (695B)**	Tujunga Cyn Vogel Flat	34-17-12	118-13-22	1850	Stream
#32 (1121C)**	Barley Flat	34-16-40	118-04-40	5525	Stream
#33 (W9047)**	Tujunga	34-16-99	118-17-99	1820	Stream
#34 (7000)***	Big TJC Bl. Hansen Dam	34-15-13	118-23-17	943	Stream

NOTE: *LACFCD ALERT Station and Designation.
**LAD, COE Gauge and Designation.
***USGS Gauge and Designation.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

PRECIPITATION, RESERVOIR, AND STREAM GAUGES IN AND NEAR THE HANSEN WATERSHED

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Hydrologic Instrumentation of Hansen Dam

Parameter	Gauge Type	Report Mode	Stored Record (period available)	Comments
Water Surface Elevation	Staff Boards	Visual	**Flood Control Basin Operation Report SPL 19 (1941-present)**	
	Stevens A-71 recorder	Visual	Reservoir Operation Report SPL 424 (1941-present) paper strip chart (1941-present) punch tape (1974-present)	
	D.R.*	Telemetry	telemetry data file	
Downstream gauge height	Digital Recorder*	Visual Telemetry	Flood Control Basin Operators Report SPL 19 (1941-pres.) punch tape (1974-present) telemetry data file	USGS operates the gauge, publishes the daily record and stores the paper punch tape for USGS station 11097000
Outlet Gate opening	Gate Opening Indicator	Visual	Flood Control Basin Operators Report SPL 19 (1941-present)	
	Leitz Recorders			Leitz are operational but will eventually be replaced with Leopold & Stevens Type F recorders (chart drum recorders)
Precipitation	tipping bucket gauge connected by magnetic sensor to D.R.*.	Telemetry	Reservoir Operation Report SPL 424 (1941-present) punch tape (1974-present) telemetry data file	Tipping bucket type installed in 1985, float type gauge used previously
	Belfort recording	None	paper chart (1941-present)	Data on paper charts evaluated for daily rainfall amounts and charts are then sent to NWS in Asheville, N.C. for publication
	glass raintube	Visual	Rainfall Record SPL 31 (1941-present)	

*Digital Recorder - A device that converts gauge motion into coded digital information and records this periodically as a pattern of punched holes in paper tape.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HYDROLOGIC INSTRUMENTATION

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Methods of Reporting Hydrologic Data

	Precipitation	Reservoir Water Surface Elevation	Streamflow Water Surface Elevation	Gate Heights
Manual	Glass Tube Precipitation Gauge	Staff Gauge	Staff Gauge	Gate Height Indicators
Recording	Precipitation Digital Recorder	Water Surface Recorder	Gauge Height Digital Recorder	Gate Height Recorder
	Universal Recording Precipitation Gauge			
Telemetry	Precipitation Telemetry HNSN	Water Surface HNSN	Stream Gauge Telemetry TJWH	
Interrogated	Precipitation Digital Recorder	Water Surface Digital Recorder	Water Surface Gauge Height Recorders	
Fixed-Time Self-Reporting	Telemetry At Dam	Self-Timed Interrogated	Telemetry Down Stream Gauge	
Event-Reporting	Alert System	Alert System		

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

METHODS OF REPORTING HYDROLOGIC DATA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

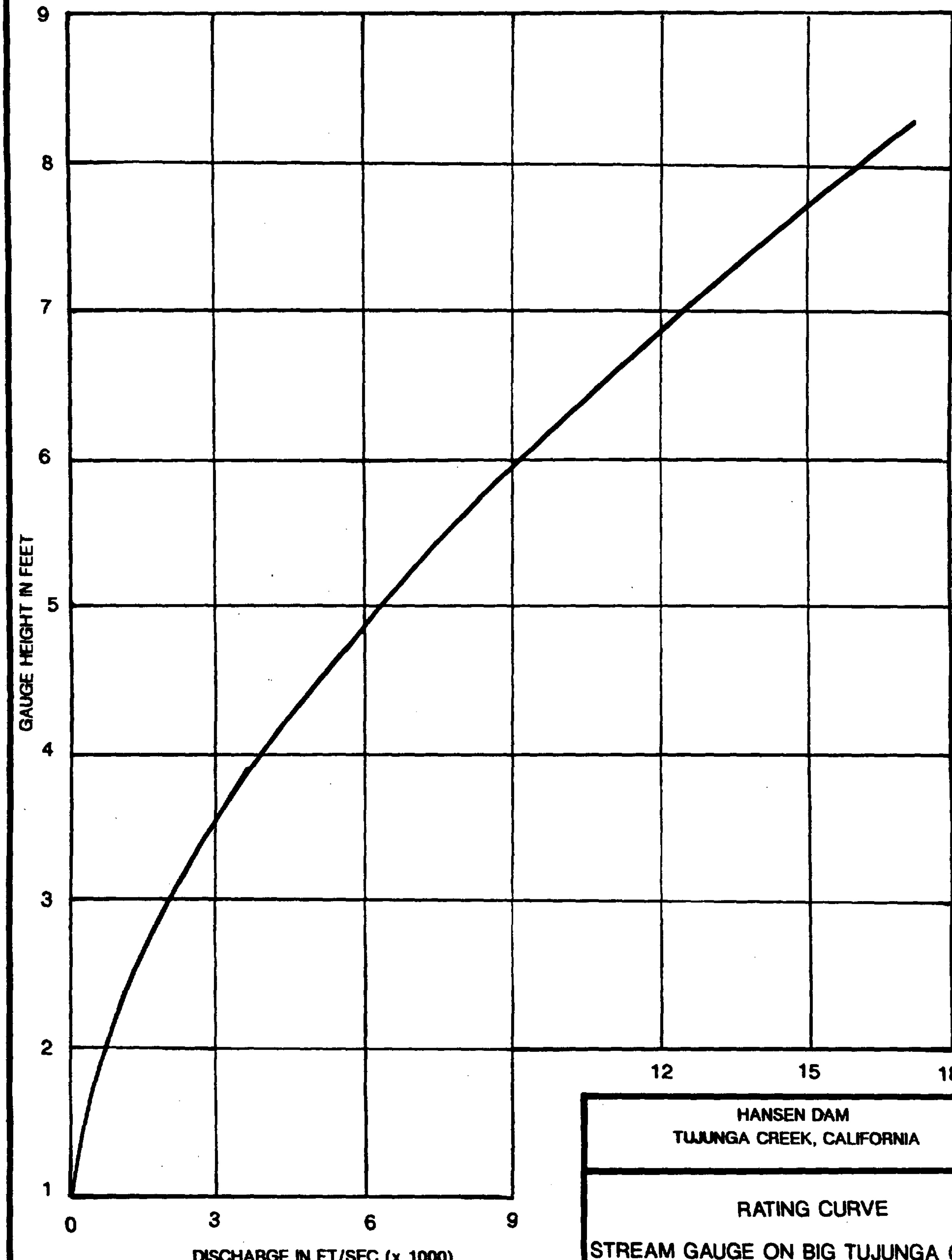
Rating Table for Big Tujunga Creek below Hansen Dam

Gauge Height (ft)	Channel Flow (cfs)	Gauge Height (ft)	Channel Flow (cfs)
1.00	0.0	4.70	5477.0
1.10	19.0	4.80	5728.0
1.20	47.0	4.90	5983.0
1.30	86.0	5.00	6243.0
1.40	138.0	5.10	6507.0
1.50	200.0	5.20	6776.0
1.60	273.2	5.30	7050.0
1.70	358.0	5.40	7328.0
1.80	446.9	5.50	7610.0
1.90	545.0	5.60	7897.0
2.00	646.4	5.70	8189.0
2.10	753.2	5.80	8484.0
2.20	864.5	5.90	8785.0
2.30	982.1	6.00	9089.0
2.40	1106.0	6.10	9398.0
2.50	1236.0	6.20	9711.0
2.60	1372.0	6.30	10030.0
2.70	1514.0	6.40	10350.0
2.80	1661.0	6.50	10680.0
2.90	1815.0	6.60	11010.0
3.00	1974.0	6.70	11340.0
3.10	2138.0	6.80	11680.0
3.20	2308.0	6.90	12020.0
3.30	2483.0	7.00	12370.0
3.40	2664.0	7.10	12720.0
3.50	2850.0	7.20	13080.0
3.60	3042.0	7.30	13440.0
3.70	3238.0	7.40	13800.0
3.80	3440.0	7.50	14170.0
3.90	3646.0	7.60	14540.0
4.00	3858.0	7.70	14910.0
4.10	4075.0	7.80	15290.0
4.20	4297.0	7.90	15680.0
4.30	4523.0	8.00	16060.0
4.40	4754.0	8.10	16460.0
4.50	4991.0	8.20	16850.0
4.60	5232.0	8.30	17250.0

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

RATING TABLE FOR BIG TUJUNGA CREEK BELOW HANSEN DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA CREEK, CALIFORNIA

RATING CURVE

STREAM GAUGE ON BIG TUJUNGA CREEK BELOW HANSEN DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Notification List for Hansen Dam
(see Orange Book for home phone numbers)

a. At start of releases notify:

Department of Water and Power	(N. Hlywd)	818-503-1824
	(24 Hour)	213-481-4900
L.A. County Department of Public Works		818-458-6177
	Emergency Operations Center	818-458-5503
L.A. County Emergency Operation Bureau		213-946-7935
L.A. County Sheriff		213-974-4211
L.A. Police Department (Foothill)		818-989-8861
Sewer Maintenance	Robert Parrish	213-485-5881
	or Robert Watts	213-485-5892
	or Ray Jellison	213-485-5888

b. At water surface elevation 1005 feet notify:

California Department of Fish and Game		213-590-5151
Department of Parks and Recreation (L.A.)		213-665-5188
Department of P&R (Van Nuys)	Tom Craig	818-989-8189
	or Martin Castille	818-989-8190

c. If water will reach elevation 1010 feet notify:

Sediment Removal Contractor,	Bill Blomgren	818-353-1921
	A.E. Schmidt	818-983-0297
U.S. Army Corps of Engineers CON-OPS Division	Lowell Flannery	213-894-4926

d. If water will reach elevation 1039 feet notify:

L.A. District Special Dam Inspection Team		
	Team Leader Vance Carson	213-894-5533
	Jim Berkland	213-894-4068
	Algis Bliudzuis	213-894-6979

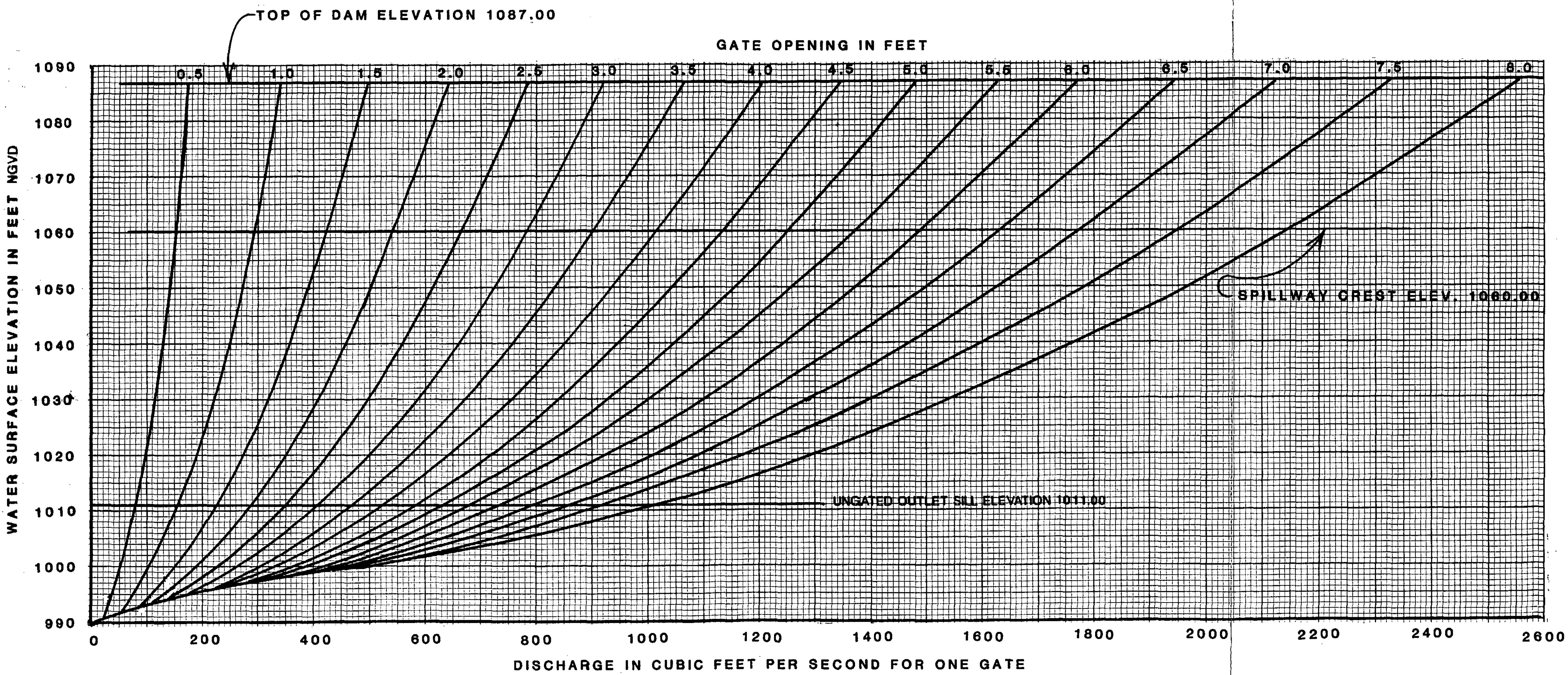
e. If spillway flow (elev. 1067) or dam break is imminent notify:

L.A. Police Dept. (Ask for Foothill Div.)		818-989-8861
U.S. Army Corps of Engineers, Chief Emergency Management Branch	Warren Hagstrom	213-894-3440

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

NOTIFICATION LIST

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



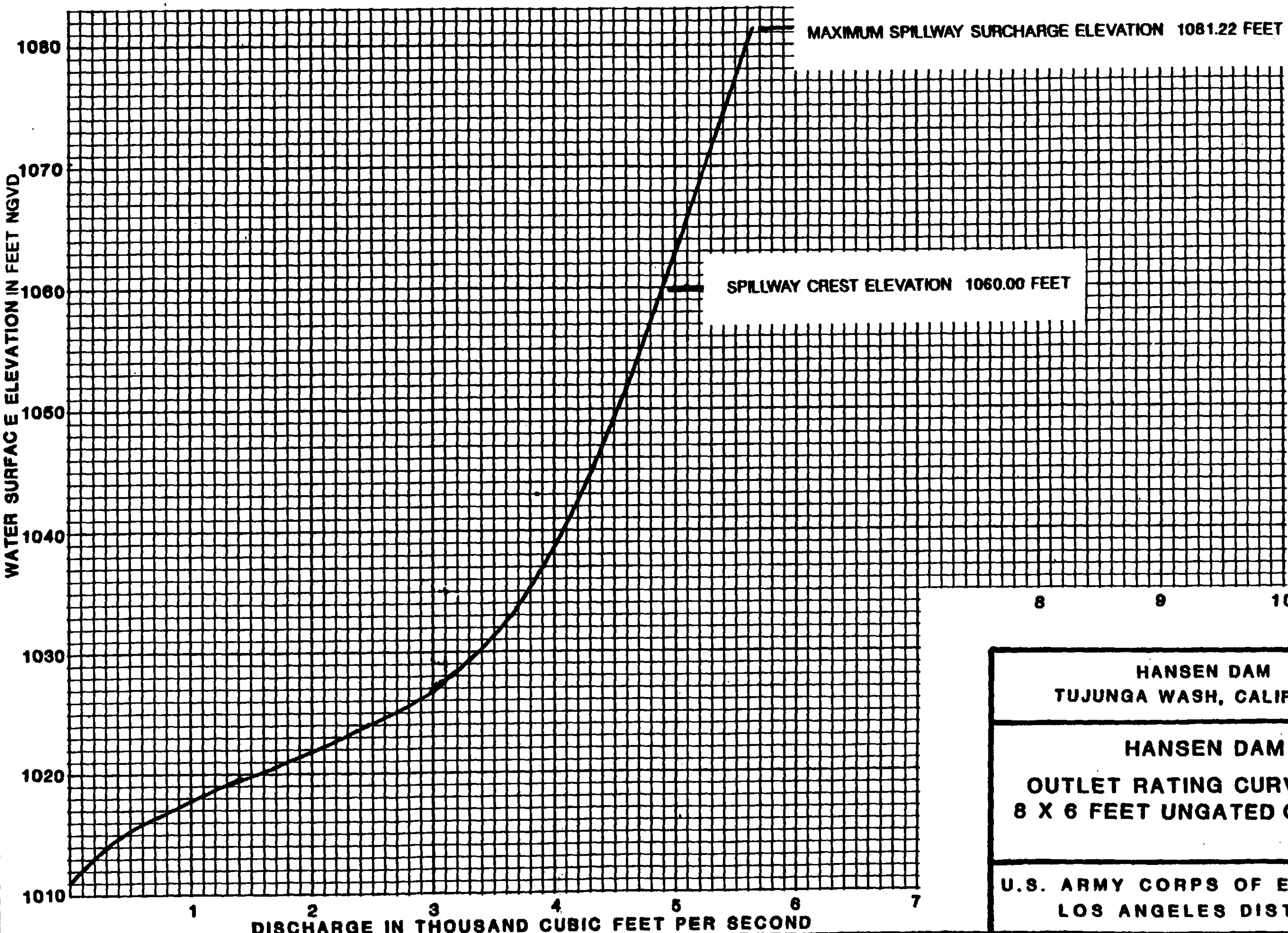
NOTE: TOTAL OUTFLOW IS THE SUM OF DISCHARGES FOR THE EIGHT GATED CONDUITS PLUS THE TWO UNGATED CONDUITS AND SPILLWAY FLOW

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HANSEN DAM OUTLET RATING CURVE

1-5X8 FEET GATED OUTLET

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

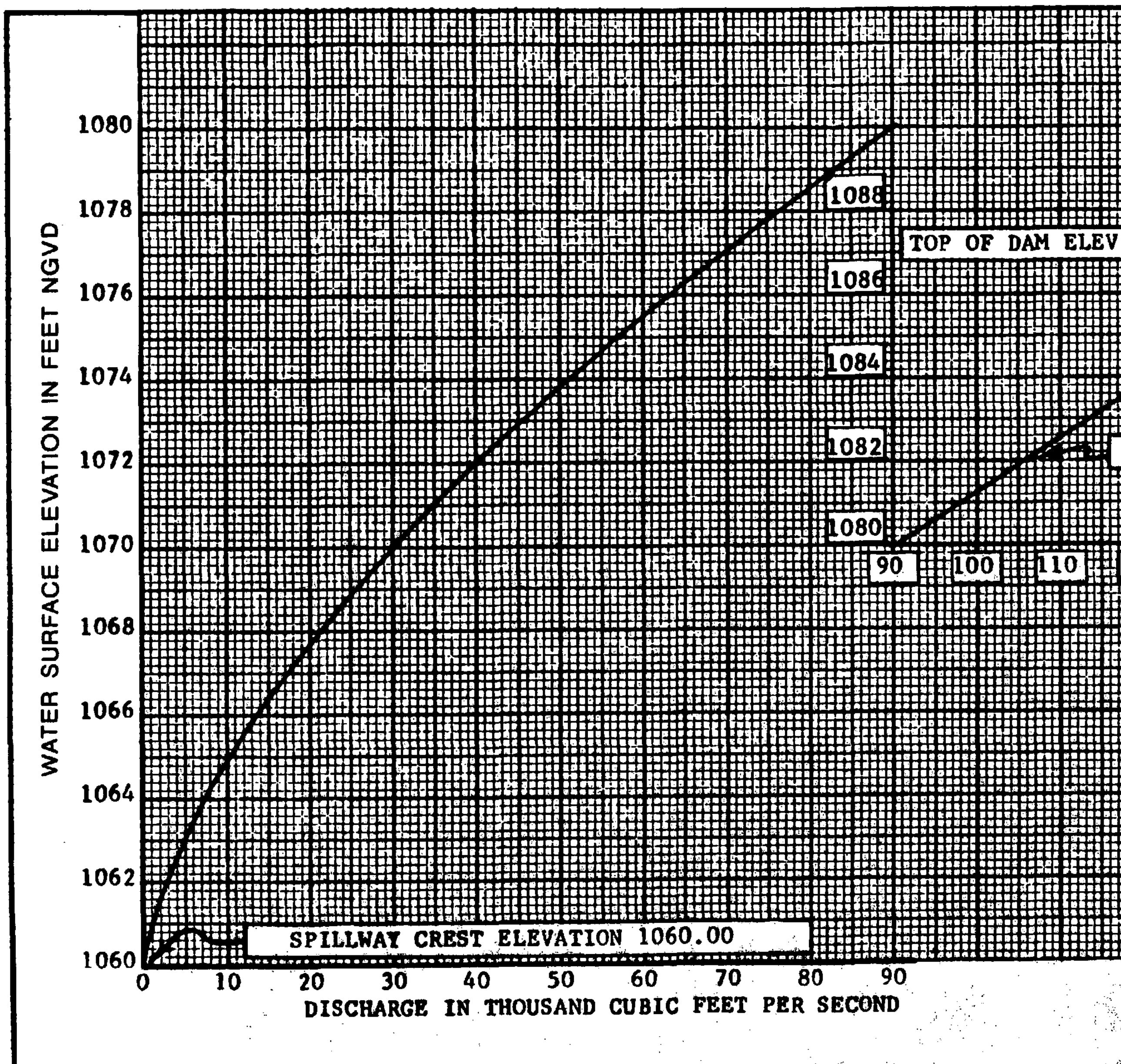


HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HANSEN DAM

OUTLET RATING CURVE TWO
8 X 6 FEET UNGATED OUTLETS

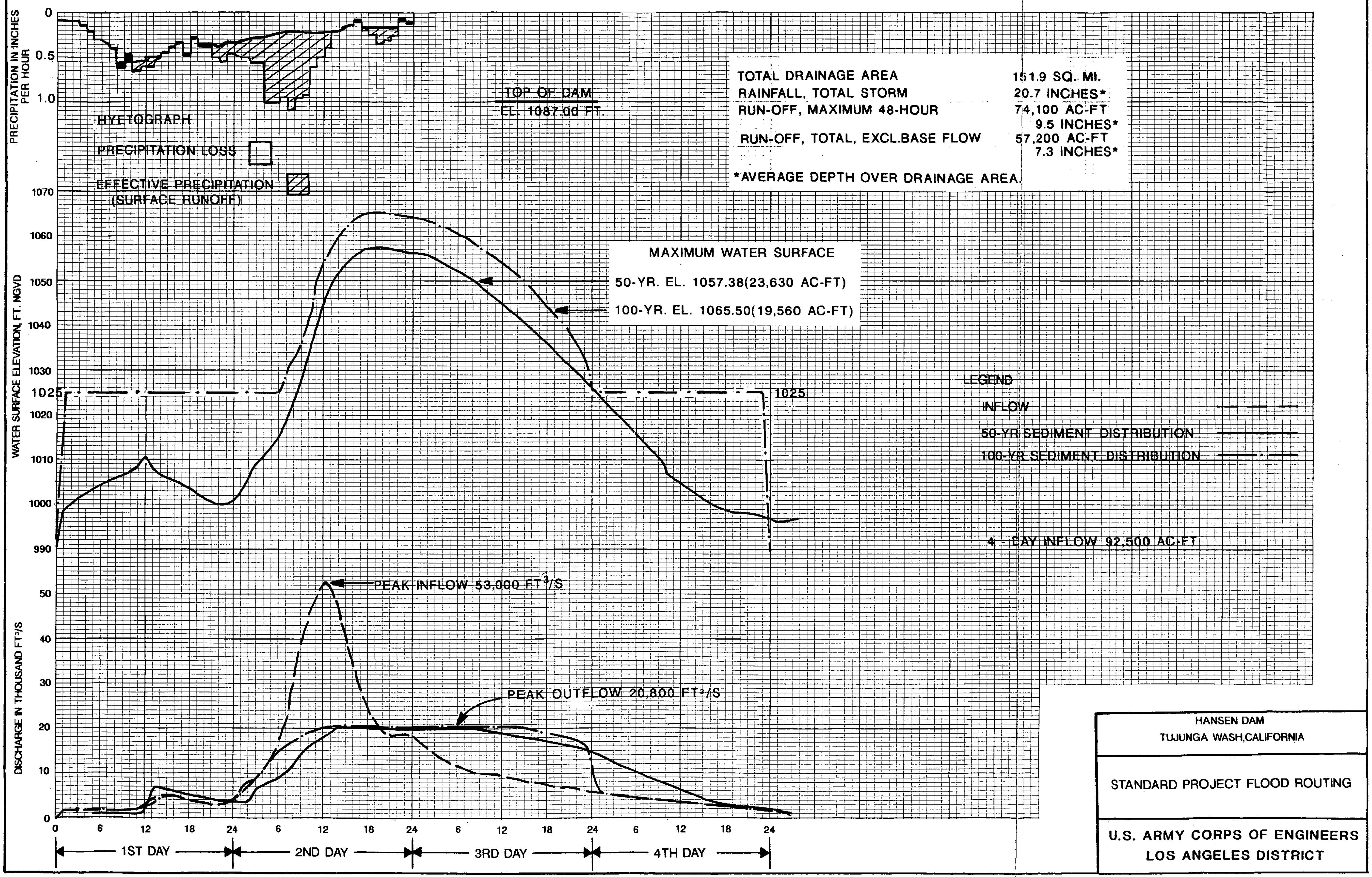
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HANSEN DAM SPILLWAY
DISCHARGE CURVE

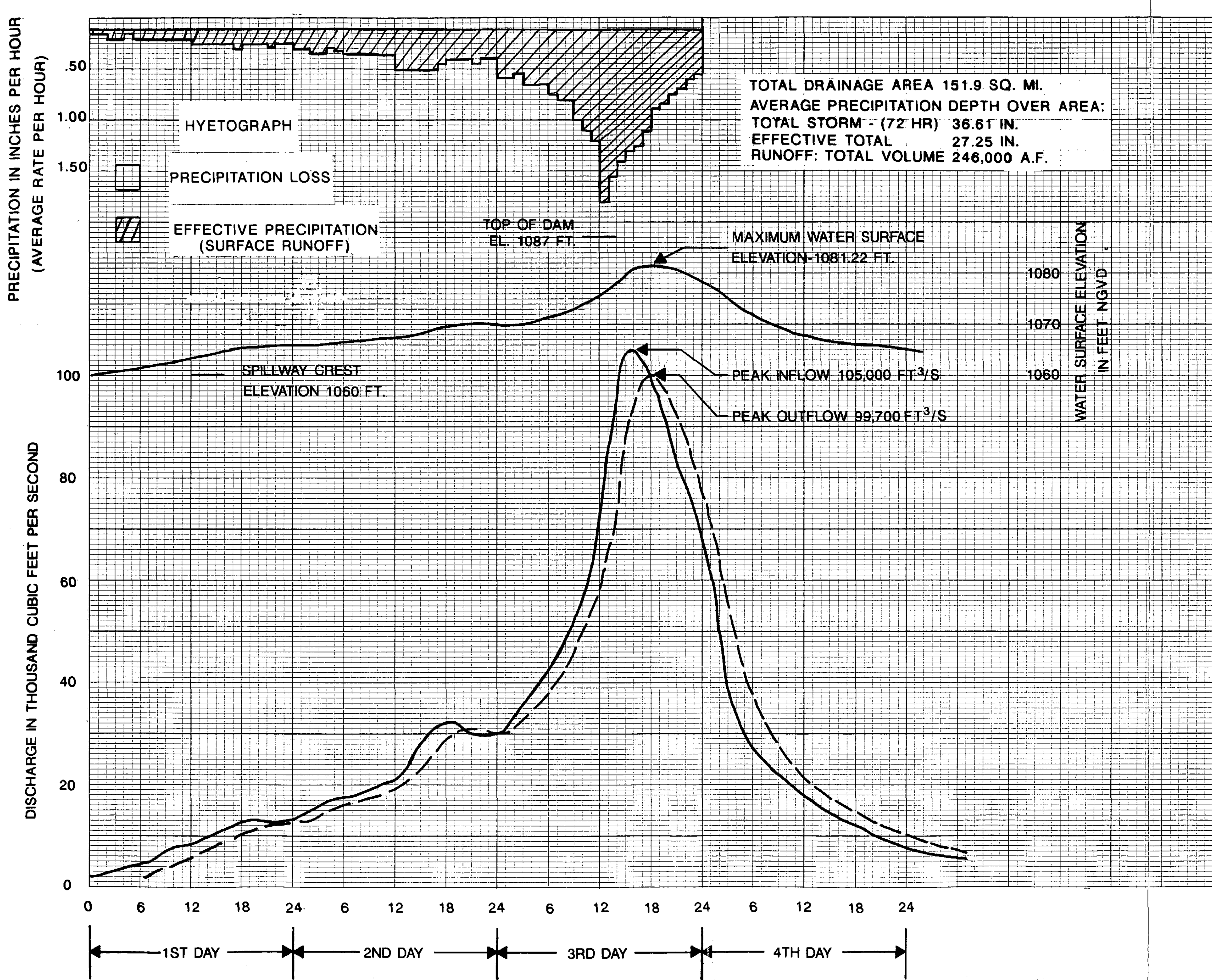
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA WASH,CALIFORNIA

STANDARD PROJECT FLOOD ROUTING

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

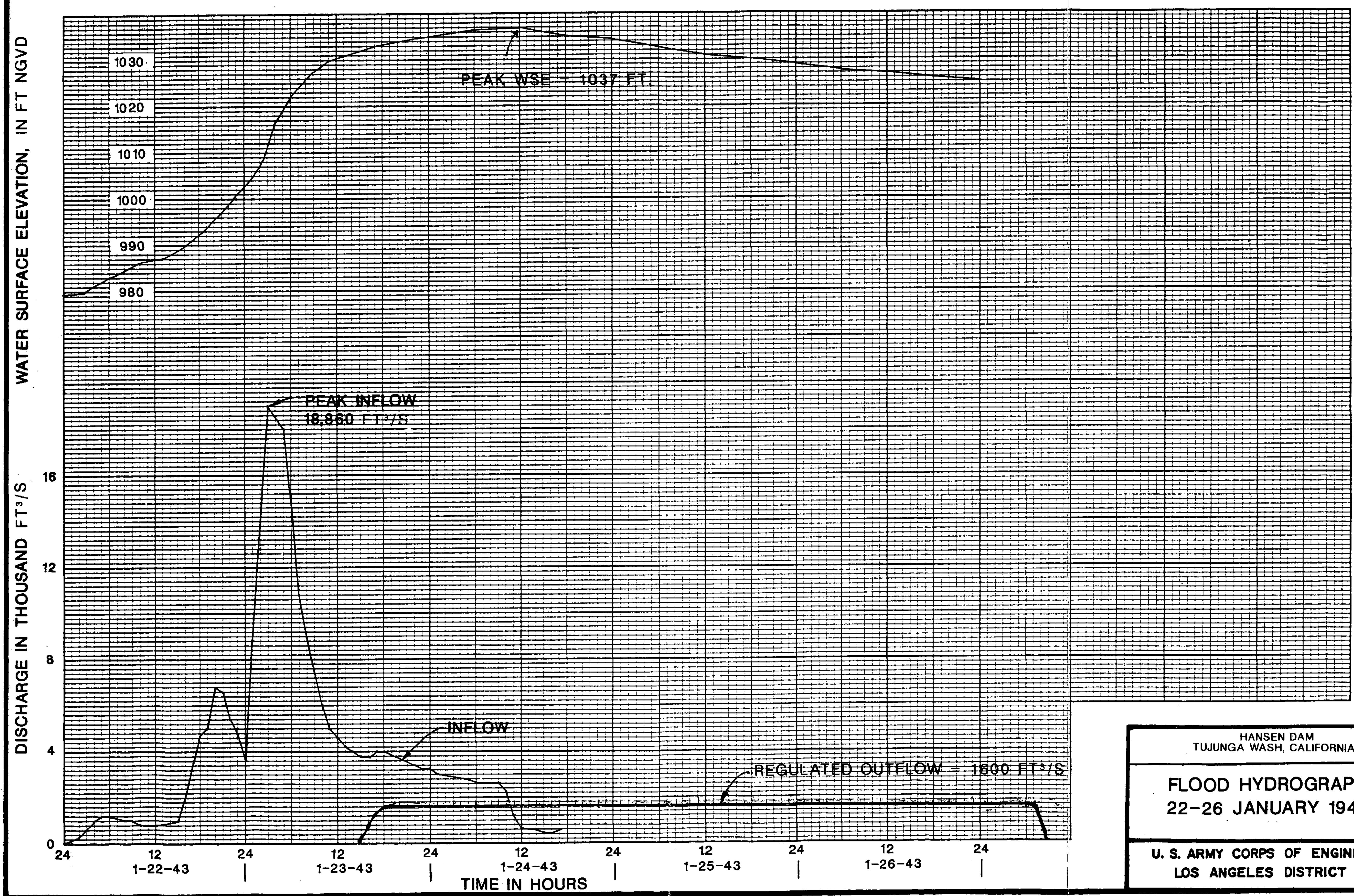


HANSEN DAM
TUJUNGA WASH,CALIFORNIA

PROBABLE MAXIMUM FLOOD (PMF) ROUTING

US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

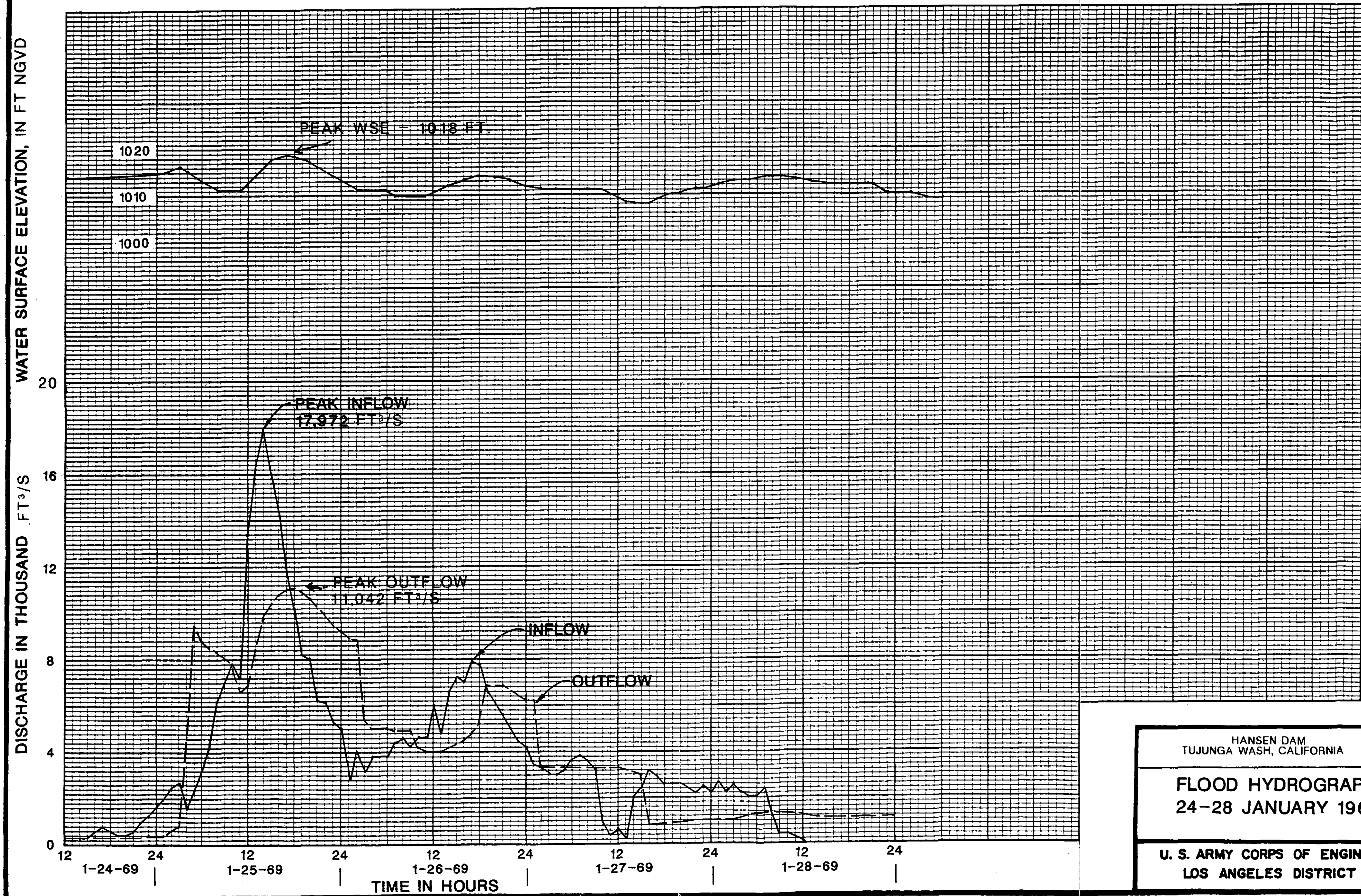
SOURCE:INTERIM REPORT OF H & H REVIEW OF DESIGN FEATURES OF EXISTING LACDA DAMS JUNE 1978



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

FLOOD HYDROGRAPH
22–26 JANUARY 1943

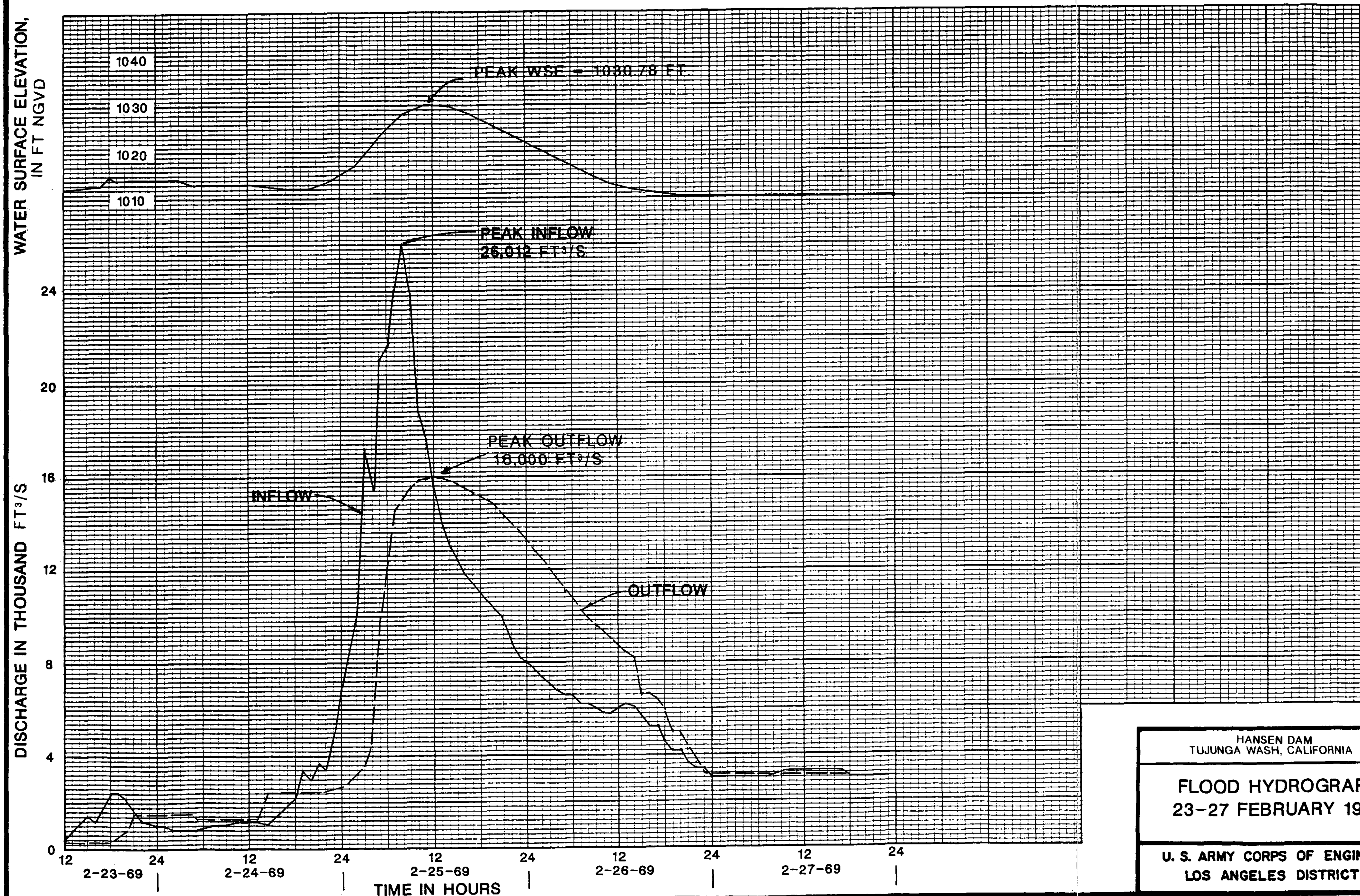
U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

FLOOD HYDROGRAPH
24-28 JANUARY 1969

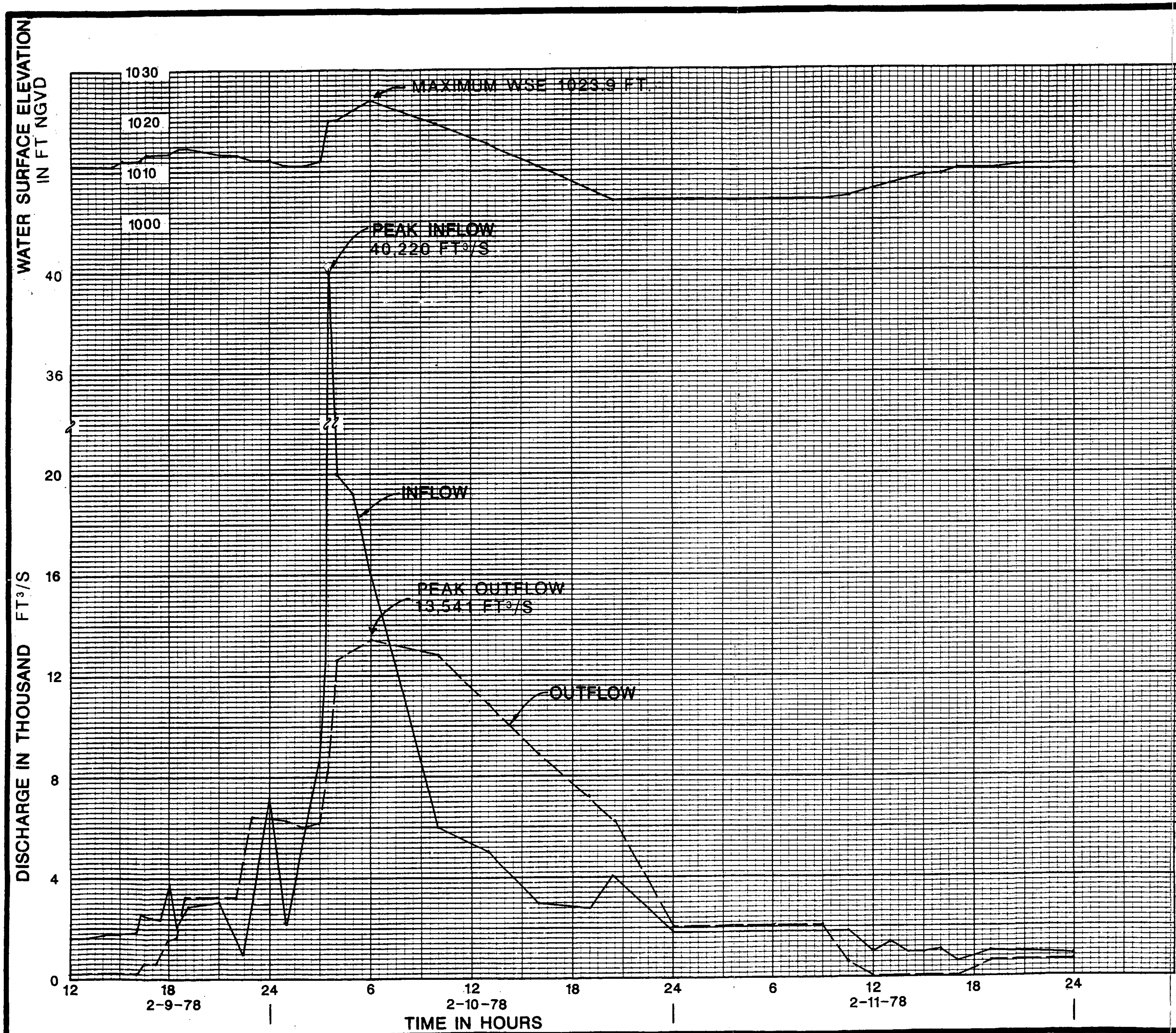
U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

FLOOD HYDROGRAPH
23–27 FEBRUARY 1969

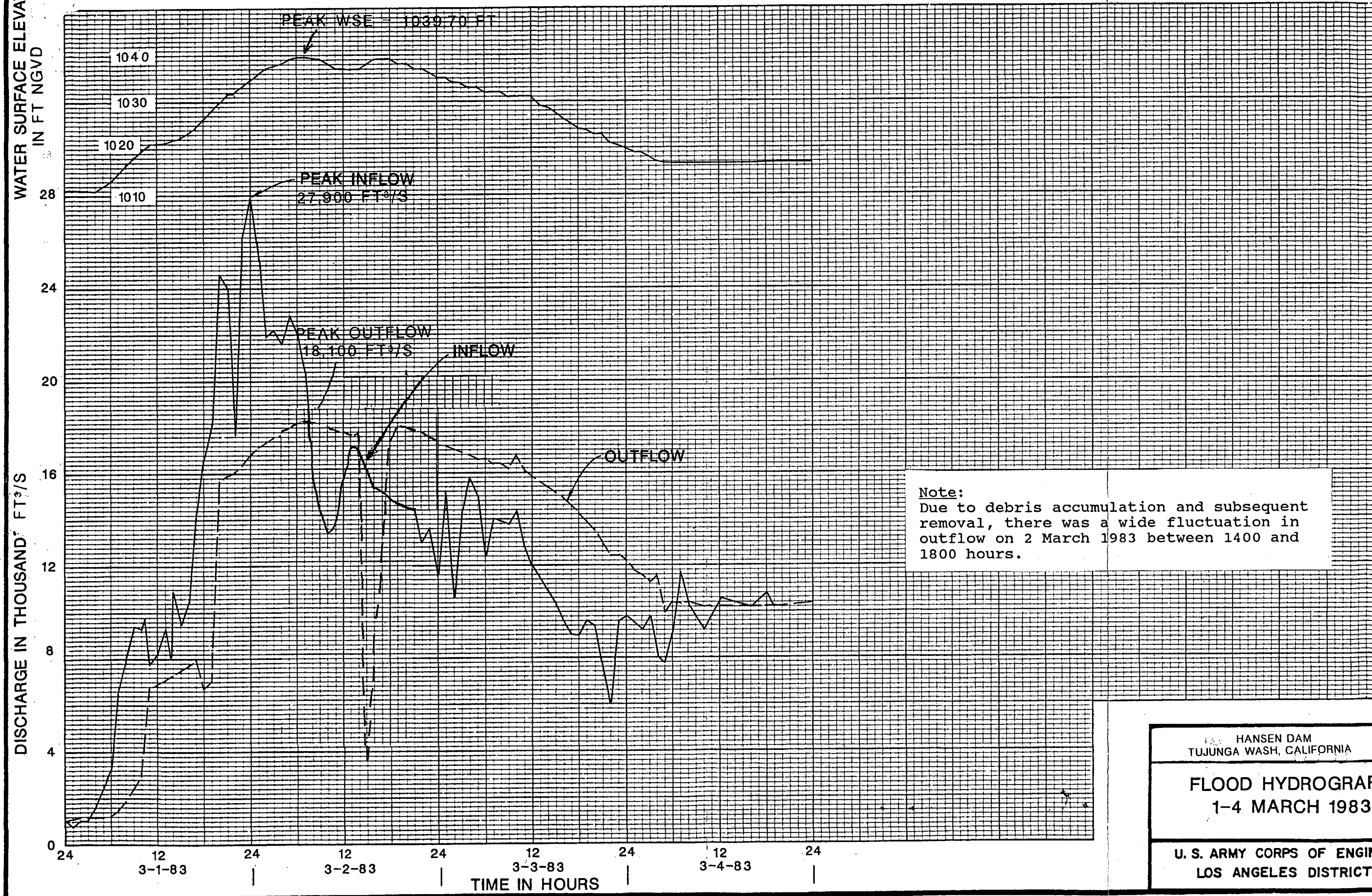
U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



HANSEN DAM
TUJUNGA WASH, CALIFORNIA

FLOOD HYDROGRAPH
9–11 FEBRUARY 1978

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

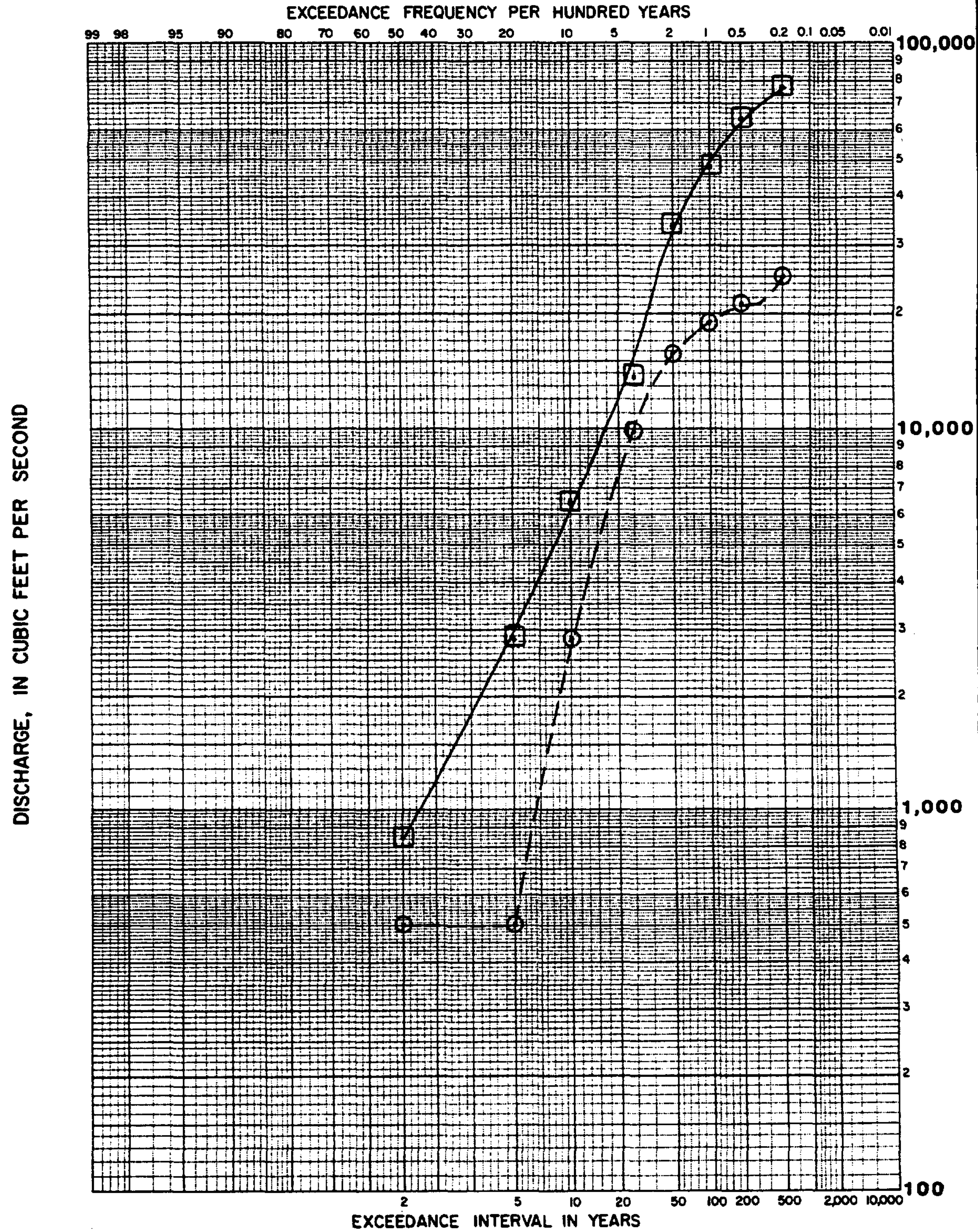


Note:
Due to debris accumulation and subsequent removal, there was a wide fluctuation in outflow on 2 March 1983 between 1400 and 1800 hours.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

FLOOD HYDROGRAPH
1-4 MARCH 1983

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



OUTFLOW (circles, dashed line)

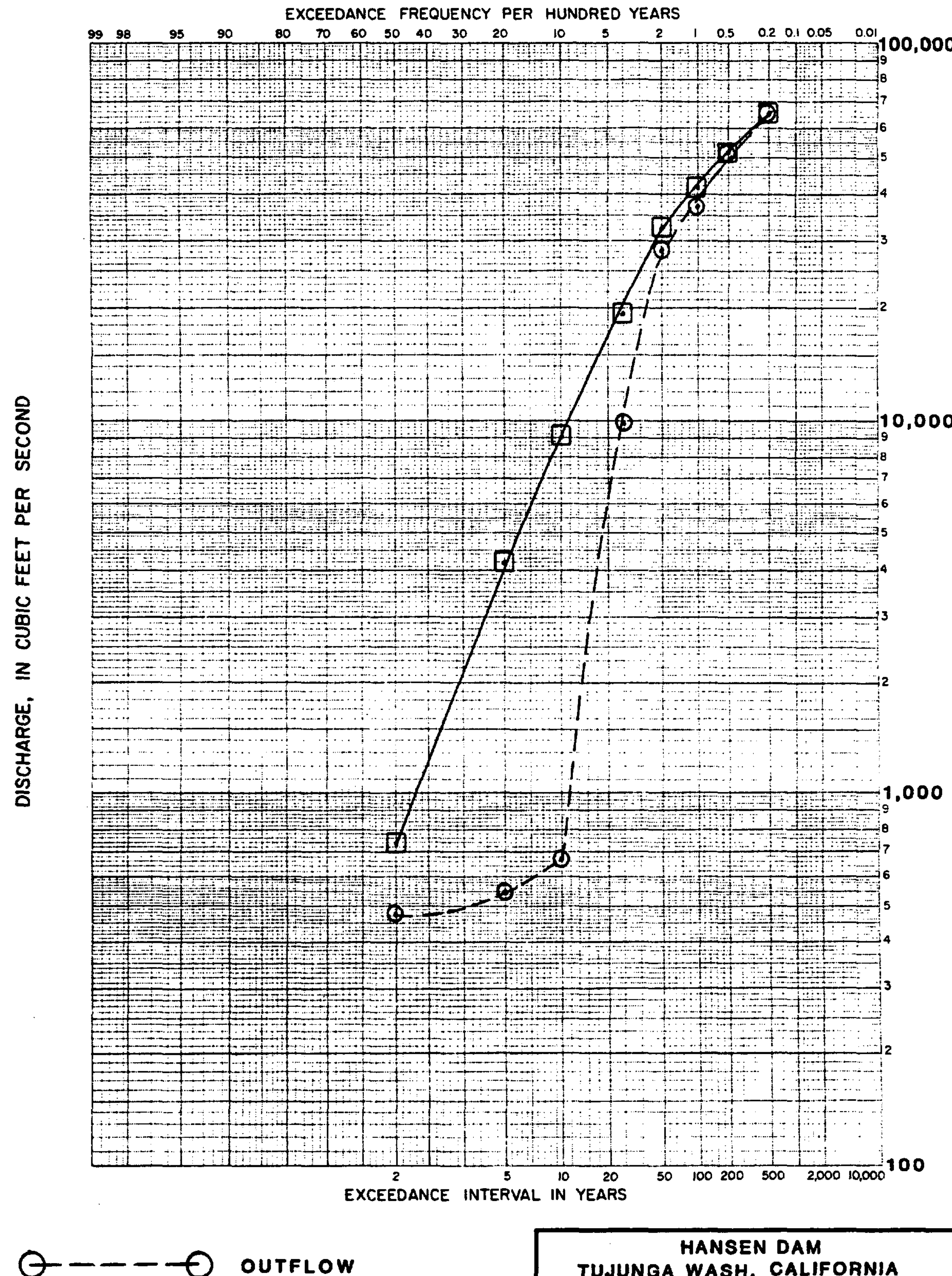
INFLOW (squares, solid line)

Data points derived from a rainfall runoff analysis as part of a 1989 Corps of Engineers review study. Frequency values of the data points are listed in Plate 8-10.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

DISCHARGE FREQUENCY CURVES FOR HANSEN DAM

U S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Data points derived from a rainfall runoff analysis as part of a 1989 Corps of Engineers review study. Frequency values of the data points are listed in Plate 8-11.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

DICHARGE FREQUENCY CURVES

FOR BIG TUJUNGA DAM

U S ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Inflow, Outflow, and Filling Frequency Values for Hansen Reservoir

Return Period (Years)	2	5	10	20	50	100	200	500
Peak Inflow (ft^3/s)	865	2,840	6,350	13,800	33,500	47,900	64,000	76,500
Peak Outflow (ft^3/s)	500	500	2,860	9,840	15,800	18,900	21,100	25,000
Peak Elevation (feet, NGVD)	999.4	1009.7	1010.5	1015.6	1030.3	1043.7	1054.2	1066.0

Note: These values, representing 1980 watershed conditions, were obtained from the peak inflow and outflow analysis of Plate 8-8 and from the frequency filling curve of Plate 8-12. The curves were drawn as best-fit lines through data points derived from a rainfall-runoff analysis as part of a 1989 Corps of Engineers LACDA review study.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

HANSEN RESERVOIR
INFLOW, OUTFLOW, AND
FILLING FREQUENCY VALUES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Inflow, Outflow, and Filling Frequency Values
for Big Tujunga Reservoir

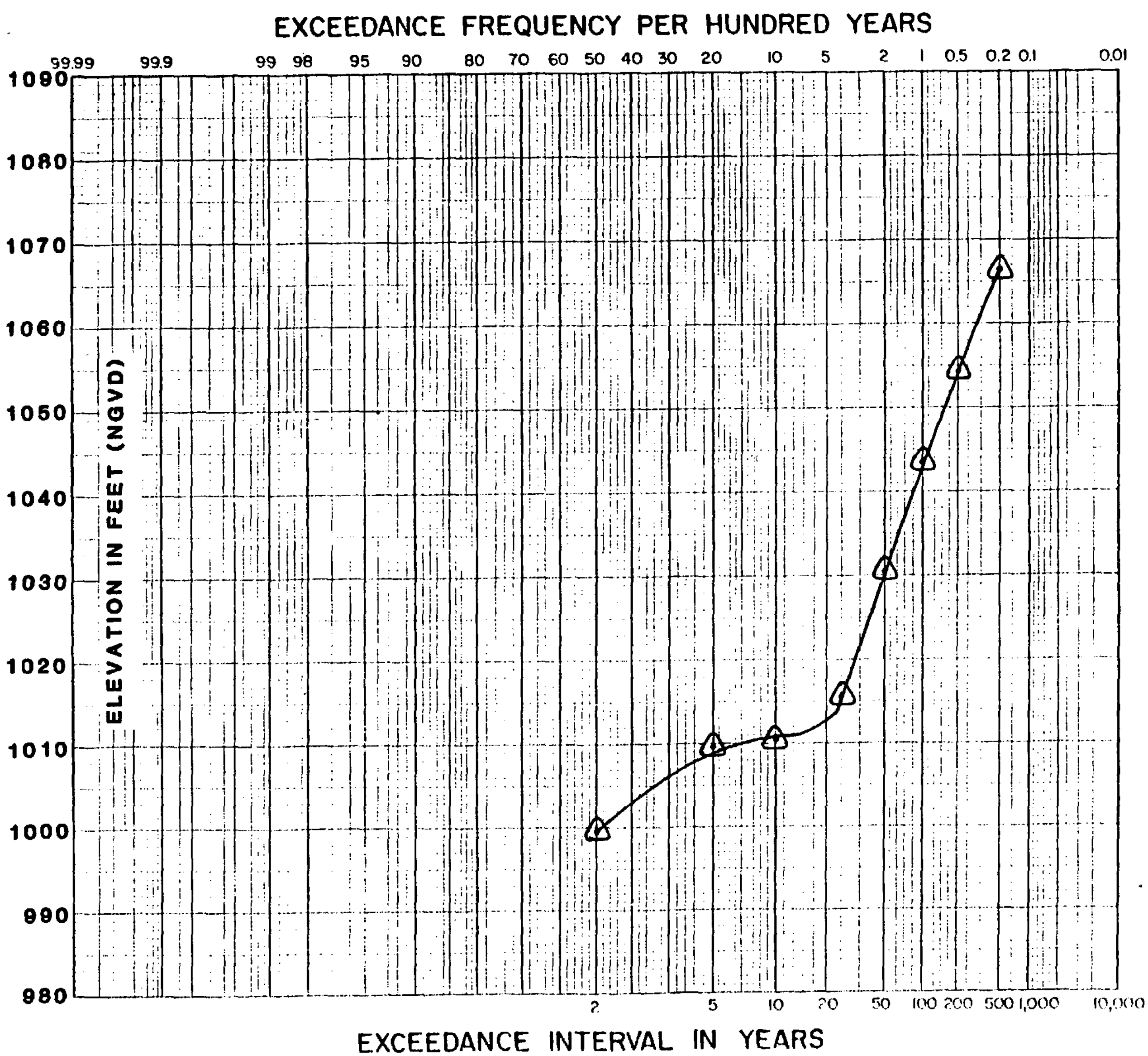
Return Period (Years)	2	5	10	20	50	100	200	500
Peak Inflow (ft^3/s)	730	4,160	9,050	19,300	32,200	41,400	51,700	65,200
Peak Outflow (ft^3/s)	470	540	665	9,820	28,400	36,300	51,700	65,200
Peak Elevation (feet, NGVD)	2219.7	2242.3	2281.9	2297.7	2305.5	2308.1	2308.5	2309.8

Note: These values, representing 1980 watershed conditions, were obtained from the peak inflow and outflow analysis of Plate 8-9 and from the frequency filling curve of Plate 8-13. The curves were drawn as best-fit lines through data points derived from a rainfall-runoff analysis as part of a 1989 Corps of Engineers LACDA review study.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

BIG TUJUNGA RESERVOIR
INFLOW, OUTFLOW, AND FILLING
FREQUENCY VALUES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

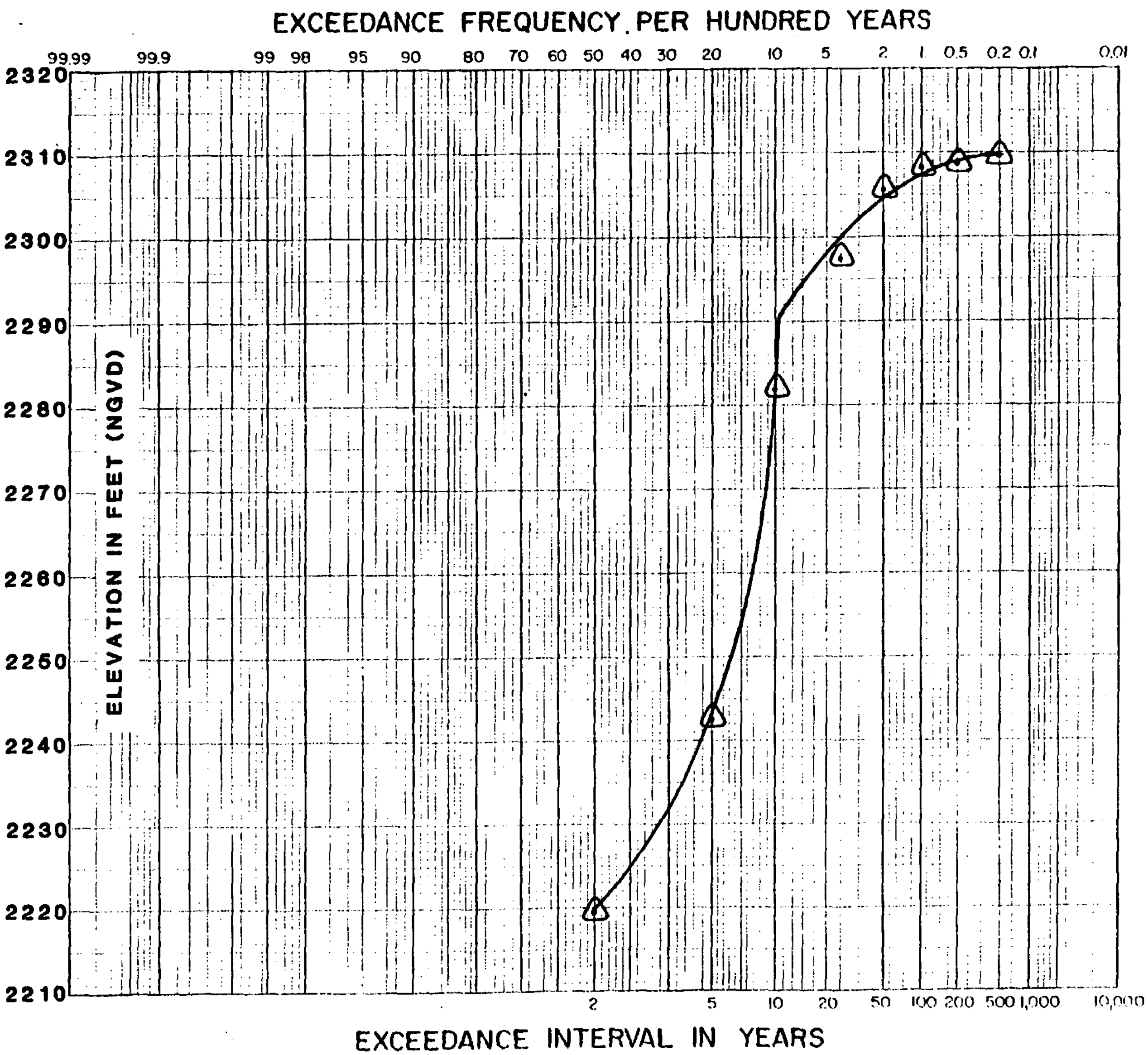


Data points derived from a rainfall runoff analysis as part of a 1989 Corps of Engineers review study. Frequency values of the data points are listed in Plate 8-10.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

ELEVATION FREQUENCY
HANSEN DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
TO ACCOMPANY REPORT DATED:



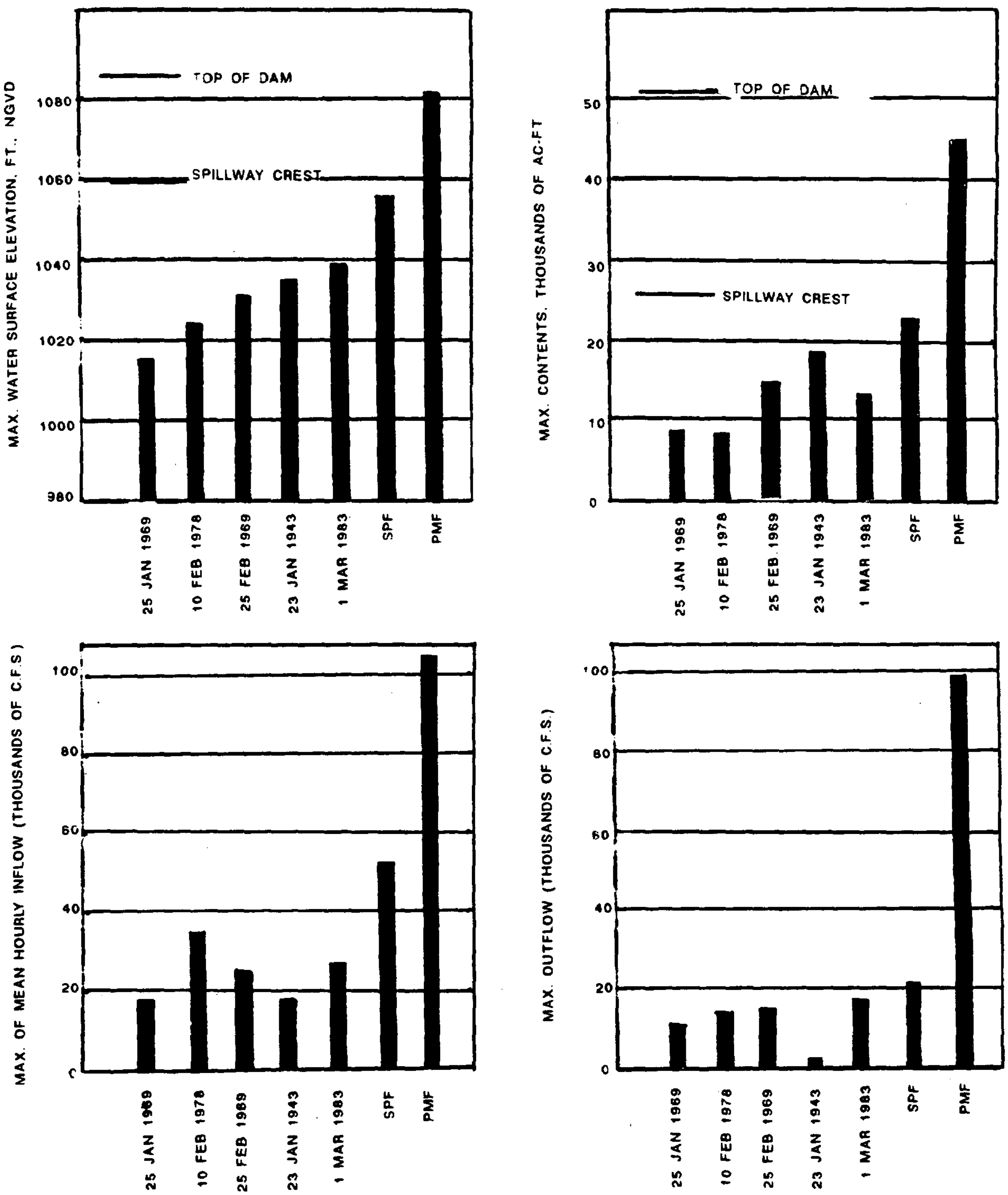
Data points derived from a rainfall runoff analysis as part of a 1989 Corps of Engineers review study. Frequency values of the data points are listed in Plate 8-11.

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

ELEVATION FREQUENCY

BIG TUJUNGA DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
TO ACCOMPANY REPORT DATED:



PMF--PROBABLE MAXIMUM FLOOD

SPF--STANDARD PROJECT FLOOD

HANSEN DAM

TUJUNGA WASH, CALIFORNIA

COMPARISON OF HISTORICAL FLOODS AND DESIGN FLOODS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Comparison of Historical Floods and Design Floods
Hansen Reservoir

	Plate No.	Water Surface Elevation (feet)	Contents (acre-feet)	Inflow* (cfs)	Outflow (cfs)
Probable Maximum Flood	8-02	1081.22	44,990	105,000	99,700
Standard Project Flood	8-01	1057.25	23,350	53,000	20,640
23 January 1943	8-03	1036.47	18,743	18,860	1,640
25 January 1969	8-04	1018.28	9,015	17,972	11,042
25 February 1969	8-05	1030.78	14,872	26,012	15,993
10 February 1978	8-06	1023.90	8,211	35,050**	13,541
1 March 1983	8-07	1039.70	13,261	27,900	18,104

* Maximum of mean hourly values
** Maximum inflow for 40 minutes: 40,220 cfs

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

COMPARISON OF
HISTORICAL AND DESIGN FLOODS
AT HANSEN RESERVOIR

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Chain of Command for Reservoir Operations Decisions

Corps of Engineers
Los Angeles District

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

Water Control Decisions		Gate Operations	
Title	**Phone**	**Title**	**Phone**
Chief, Engineering Division	(213) 894-5470	Chief, Construction-Operations Division	(213) 894-5600
Chief, Hydrology and Hydraulic Branch	(213) 894-5520	Chief, Operations Branch	(213) 894-5620
Chief, Reservoir Regulation Section	(213) 894-6915	Chief, Operations & Maintenance Section	(818) 401-4008
Chief, Reservoir Regulation Unit	(213) 894-6916	Dam Tender Foreman	(818) 401-4006
		Hansen Dam Tender	(818) 767-3810

HANSEN DAM
TUJUNGA WASH, CALIFORNIA

CHAIN OF COMMAND FOR
RESERVOIR OPERATIONS DECISIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR FOR WATER CONTROL

HANSEN DAM

TUJUNGA CREEK

Los Angeles River Basin

Exhibit A
to the
Water Control Manual
for
Hansen Dam

Los Angeles District Office

U.S. Army Corps of Engineers

July 1990

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR
FOR WATER CONTROL
HANSEN DAM

TABLE OF CONTENTS

STANDING INSTRUCTIONS TO THE PROJECT OPERATOR
FOR WATER CONTROL
HANSEN 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 Hansen 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 Hansen Dam Reservoir Regulations 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 Hansen Dam"; and (c) Hansen Dam Flood Emergency Plan. Any deviation from Standing Instructions will require approval of the District Commander.

(2) The purpose of Hansen Dam is regulating flood stage flows through Tujunga Creek, and minimizing flood damage downstream of the structure. Hansen Dam is an essential element for flood control in the Los Angeles River drainage basin. In conjunction with Sepulveda and Lopez Dams, Hansen Dam is vital for the flood protection of lower portions of the San Fernando Valley and the City of Los Angeles. Storage regulation given by the flood control basins permits efficient use of the Los Angeles River Channel. The storage allocation for Hansen Dam is shown on plate 2-2.

(3) Plate 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) Hansen Dam is located near the northern edge of the San Fernando Valley on Tujunga Wash, about one mile below the confluence of Tujunga and Little Tujunga Washes, and about four miles southeast of the town of San Fernando, in Los Angeles County. The boundary of the drainage area is formed by the San Gabriel Mountains on the north and west, and by the Verdugo Mountains and a secondary range of the San Gabriel Mountains on the south and

east. The location of the project is shown on plate 2-1A. The drainage area is shown on plate 2-1B.

(5) Debris accumulation on the trash racks can be an operational concern. Repetitive blocking of the trash racks by floatable debris has threatened the water control regulation of Hansen Dam in the past when it was necessary to bring heavy cranes to pull debris from in front of the trash racks in order to discharge flood waters. Due to past forest fires, Hansen Dam has the heaviest sediment load of COE dams in LAD. These fires have also contributed to floatable debris, which must be monitored and physically removed until trash rack modifications can be implemented.

(6) Hansen Dam was constructed and is owned and operated by the U.S. Army Corps of Engineers, Los Angeles District (LAD), which has complete regulatory responsibility. Hansen Dam is operated for local flood control on Tujunga Wash and is part of the Los Angeles County Drainage Area (LACDA) system for flood control in the Los Angeles River Drainage Area.

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 on week days 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) Record of Data From Digital Recorders Form (SPL 648). This form is filled in once daily at 08:00 when the dam tender reads the recorder drum on the digital punch tape record and logs the number read onto Form SPL 648.

(e) 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 Hansen Dam Water Control Manual in within figure set 9-1 through 9-7.

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. 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 Hansen 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 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 the gates whenever a gate change is necessary. 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 all 8 gates. All individuals involved should strive to achieve accuracy and complete clarity regarding gate settings.

The eight vertical lift gates are hydraulically 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. Hansen Dam is operated in flood events with all eight gates at standby (1.0 feet open) position until the debris pool elevation of 1010.5 feet NGVD is reached, at which point all gates are opened to 8.0 feet. See Exhibit B.

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 Hansen 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 hour, the dam tender should use water surface elevations 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 1060 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.

Los Angeles Police Department (ask for Foothill Division)	818-989-8861
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

Reservoir Regulation Schedule and

Instructions to Dam Operator

EXHIBIT B

Hansen Dam Reservoir Regulation Schedule
(For rising and falling stages)

Step No.	When reservoir water surface is between elevation Feet - NGVD	Gate setting for gates as indicated No. 1 Feet of opening	No. 2 Feet of opening	No. 3 Feet of opening	No. 4 Feet of opening	No. 5 Feet of opening	No. 6 Feet of opening	No. 7 Feet of opening	No. 8 Feet of opening	Total Computed discharges ft3/s	Downstream gauge height** Feet
	Follow Step 1 during rising stages										
1..	990.0 - 1,010.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0 to 1,260	0.97 - 2.52
	Follow Steps 2 to 9 during rising or falling stages										
2..	1,010.5 - 1,053.0*	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7,920 to 20,730	5.61 - 9.30
3..	1,053.0 - 1,060.0	8.0	7.0	7.0	8.0	8.0	7.0	7.0	8.0	19,370 to 20,520	8.88 - 9.22
										Spillway, Gated & Ungated	
4..	1,060.0 - 1,061.0	8.0	6.0	6.0	8.0	8.0	6.0	6.0	8.0	19,400 to 20,430	8.89 - 9.20
5..	1,061.0 - 1,062.0	7.0	6.0	6.0	7.0	7.0	6.0	6.0	7.0	18,960 to 20,740	8.78 - 9.29
6..	1,062.0 - 1,063.0	5.0	6.0	6.0	4.0	4.0	6.0	6.0	5.0	18,160 to 20,430	8.56 - 9.20
7..	1,063.0 - 1,064.0	5.0	3.0	3.0	4.0	4.0	3.0	3.0	5.0	17,580 to 20,280	8.41 - 9.15
8..	1,064.0 - 1,065.0	5.0	0	3.0	4.0	0	3	0	5.0	17,590 to 20,680	8.42 - 9.26
9..	1,065.0 - 1,066.0	0	0	3.0	1.0	0	3	0	0	17,300 to 20,660	8.35 - 9.26
										Spillway and ungated flow	
10..	1,066.0 -1,067.0	0	0	0	0	0	0	0	0	18,690 to 22,420	8.70 - 9.71
	Above 1,067.0	0	0	0	0	0	0	0	0	22,420+	9.71+

*During falling stages the gates shall be left fully open to drain the reservoir completely. Then the gates shall be set at 1.0 feet.

**Source for elevations up to 8.30 feet from USGS Rating Table No. 5; for elevations greater than 8.30 feet values were extrapolated from USGS data.

*** It may be necessary to regulate discharge according to downstream emergency conditions as authorized by the District Office.

DAM OPERATOR INSTRUCTIONS

1. Communication with the District Office is available.***

a. Notify the Reservoir Operations Center when a gate change will be required according to the schedule.

b. Notify the Reservoir Operations Center if unable to set the gates as instructed.

2. Communication with the District Office is not available.

a. Try to reestablish communications through the Los Angeles County Flood Control DPW (WUK470).

b. (i) Rising stages. Allow a period of one hour to pass to reestablish communications with the District Office. If after one hour communication is not reestablished follow the gate operation schedule.

(ii) Falling stages. Maintain current downstream gauge height until communication is reestablished.

c. If one or more of the gates cannot be operated adjust the remaining gates gradually and uniformly until the downstream gauge height agrees with scheduled values. Keep a close check on gauge height and change the gate opening as often as required. If the downstream gauge height is unobtainable adjust the gates that are functioning so that the sum of the gate openings will equal the sum of the openings shown in the schedule.

3. Trash Blockage.

If outlets become blocked with trash, increase gate openings to maintain scheduled downstream guage height.

4. Notification to Los Angeless County DPW.

Notify personnel at the Los Angeles County DWP spreading grounds prior to making each gate change. Do not increase release until confirmation is received that their diversion gate located in the downstream channel has been adjusted.

OUTLETS
(Looking Downstream)

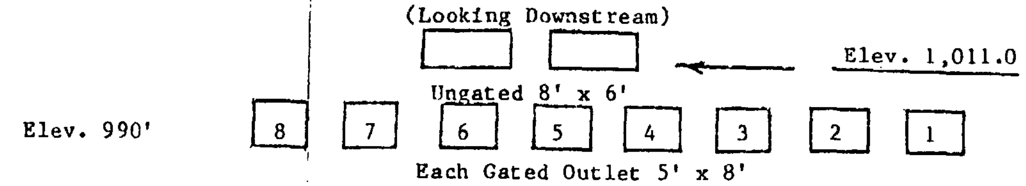


EXHIBIT C

Pertinent Data, Big Tujunga Dam and Reservoir

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

MEMORANDUM

TO: Mr. Mas Nagami

August 17, 1983

FROM: C. J. Wilt
Hydraulic Division

File No. 63.121
Big Tujunga Dam and Reservoir
Operations Plan

Approved
JLE
10/6

Concur
KWK
12/3

MN
12/3

Recommendation

It is recommended that the operation plan for Big Tujunga Dam and Reservoir described herein be approved.

Capital Flood Operations

No release plan would be effective for routing the capital flood through the dam with the peak inflow Q of 43,800 cfs passing virtually unchanged during the routing.

Deviation from the operation plan described below to accommodate large events will be implemented at the discretion of the operations engineer.

Operations Plan

The proposed plan is similar to current practice (memorandum dated October 18, 1976, File No. same as above, from H. C. Martin to Mr. C. F. Eshelby) with emphasis placed on water conservation compatibility. The No. 1 valve is used to control the outflows from the smaller more frequent storms while the No. 2 and No. 3 outlets are reserved for the larger storms to prevent spillway flows, or in an emergency to reduce drawdown times. Frequent use of the No. 3 valve during the smaller storms increases its chance of failure. Therefore, if it is needed it is used at 100 per cent open.

At the beginning of the season, the water surface in the dam will be held at the minimum cushion pool elevation of 2205 feet. As the storm season progresses, the water surface will be held below the State restricted elevation of 2213 feet whenever possible, and as water conservation activities allow, the level will be returned to elevation 2205 feet.

A. Rising Reservoir 1053 AF

2213 Ft 1273 AF
2290 Ft 5688 AF

There is no change over the existing plan for this phase of the operation. The activities are designed to minimize spillway flow and to minimize excessive downstream discharge.

1. During periods of low inflow, the reservoir will be held below elevation 2213 feet by using the No. A2 valve (25 cfs capacity at elevation 2213 feet).

2. When the reservoir reaches elevation 2213 feet, water will be released in accordance with the following schedule:

76M282G 11/78

Elevation (Feet)	Storage ** (Acre-Feet)	Valve No. 1 (% Open)	Q (cfs)
2213	1450	12	60
2215	1521	25	125
2217	1594	50	250
2219	1670	100	470
2290	5750	100	690
2291	5832	0	400*

* Spillway flow.

3. As the storm progresses, and inflow rates, weather forecasts, or other conditions suggest that spillway flow may be prevented by an increase in the above release rates, Valves Nos. 2 and 3 will be opened at the discretion of the operations engineer.

4. Drawdown of the reservoir will follow the release schedule described below unless the safety and protection of downstream facilities warrant a temporary reduction or suspension of outflow. Conversely, a forecast of rain may necessitate drawdown releases greater than outlined below.

B. Falling Reservoir

Drawdown of the reservoir will be accomplished as follows:

1. Valve No. 1 will be operated to limit the outflow to between 300 cfs in larger storms or initial inflow in smaller storms (whichever is less) to accommodate water conservation activities at Hansen Spreading Grounds. The duration for this release is to be for a maximum of 2 days.

2. After 2 days in the 300 cfs discharge mode, the outflow is to be limited to 200 cfs or initial inflow (whichever is less) for the next 30 days in order to draw the reservoir down at a reasonable rate. Any further releases for the following 30 days are to be limited to 150 cfs or inflow following the same rationale.

The proposed operating plan is based on the following considerations:

For normal storms (most probable storm events), the reservoir water surface will be above elevation 2213 feet for 2 to 5 days at an average elevation of 2234 feet, assuming no follow-up storm. Further, we could expect on the average of once in 10 years to experience an event that, using the proposed operating criteria, would cause the water surface to exceed elevation 2213 feet for a total of about a month with an average water surface elevation of 2222 feet. These types of events would produce spillway flow.

** Storage figures from table dated 4/5/83

Channel Restrictions

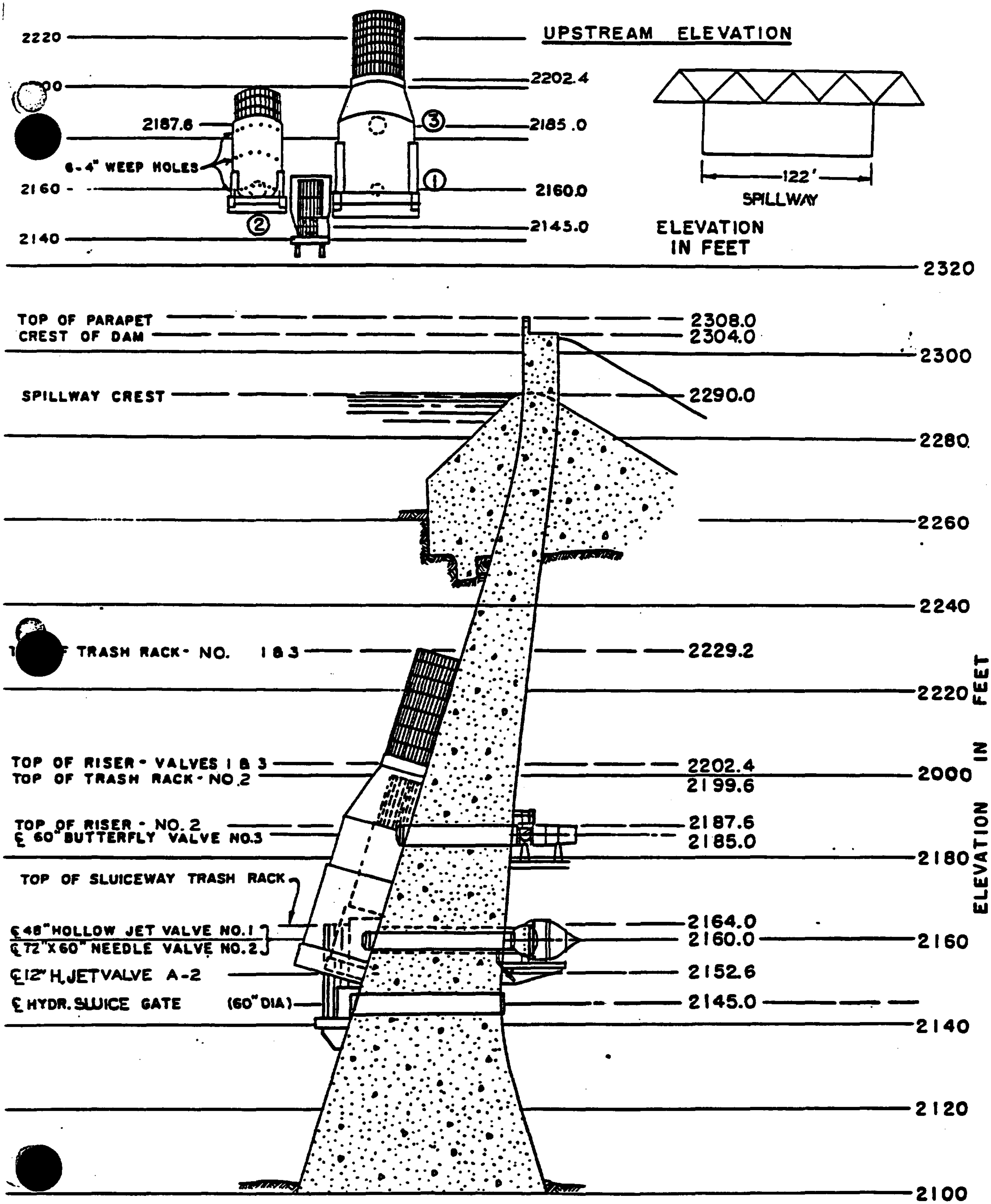
Flows in excess of 600 cfs begin to flood the Oro Vista Street crossing of Big Tujunga Wash impeding access to residents of Ebey and Doane Canyons. Since the discharge of the No. 1 valve is 470 cfs when first fully opened, the road should remain passable during most smaller storms. However, as the reservoir water surface elevation builds and flows from local drainage areas increase, the access could temporarily be lost.

James T. Sparks
Operations Section
Extension 4190

AMB:eg

Attach.

cc: Operation and Maintenance
Program Management
Hydraulic (2) (Operations, Files)
Water Conservation (2) (Erhard, Division)
General Files



BIG TUJUNGA DAM

RVSD MAR, 1985

Department of Public Works

FLOOD CONTROL DAM

DATA SHEET

GENERAL

NAME - BIG TUJUNGA DAM
LOCATION - BIG TUJUNGA CANYON 10 MI. N.E. OF SUNLAND
STREAM - BIG TUJUNGA CREEK
PURPOSE - FLOOD CONTROL AND CONSERVATION
TYPE - CONCRETE VARIABLE RADIUS ARCH

BOND ISSUE - 1924
DRAINAGE AREA - 82.3 SQ. MI. FROM ELEV. 2290 FT. TO ELEV. 7078 FT. ABOVE MEAN SEA LEVEL

CONSTRUCTION

BEGAN - JANUARY 1930
COMPLETED - JULY 1931
COST - $1,166,915.95
COST PER A.F. F.C. 156.42
COST PER A.F. F.C. CONSERV. 187.01
COSTS BASED ON ORIGINAL SURVEY DATA

CONSTRUCTED BY L.E. DIXON CO.
RESIDENT ENGINEER - K.J. HARRISON
DESIGN AND COMPUTATIONS - LACFCD DESIGN DIVISION

DIMENSIONS

CREST HT. ABOVE ORIG. STREAMBED	200.0 FT.
CREST HT. ABOVE FOUNDATION	251.0 FT.
CREST LENGTH (LESS SPILLWAY)	505.0 FT.
CREST WIDTH	8.0 FT.
HEIGHT OF PARAPET WALL	4.0 FT.
BASE THICKNESS AT ELEV. 2060 FT.	73.0 FT.

EXCAVATION AND FILL AS CONSTRUCTED

TOTAL VOL. OF EXCAVATION	81,318 C.Y.
TOTAL VOL. OF CONCRETE	79,293 C.Y.
TOTAL VOL. OF EARTHFILL	5,574 C.Y.
CHARACTER OF FOUNDATION -	GRANITE

OUTLETS

NO.	TYPE	SIZE	RISER OR INLET ELEVATION	℄ ELEV. VALVE	MAX. DISCH. AT SPILLWAY ELEV. CFS.
FLOOD OPERATION VALVES					
(4) 1	HOLLOW JET	48"	(1) 2202.4	2160.0	690.
1A	SLIDE GATE (H)	48"	2202.4	2160.0	—
2	NEEDLE VALVE	72"	(1) 2187.6	2160.0	1175.
(3) 2A	BUTTERFLY VALVE	72"	2187.6	2160.0	—
(5) 3	BUTTERFLY VALVE	60"	(1) 2202.4	2185.0	1035
3A	HYD. GATE	62"	2202.4	2185.0	—
SERVICE VALVES					
(6) A2	HOLLOW JET	12"	2187.6	2152.6	38.4
(2) A2A	GATE VALVE	12"	2187.6	2153.1	—
S.G.	SLUICE GATE	6'x 6'	2142.5	2145.0	—

SPILLWAY NO.	TYPE	SILL ELEV.	LENGTH	SPILLWAY ORIGINAL CAP. A.F.	MAX. DISCH. AT ASSUMED H.W.L. CFS
1	OPEN OGEE WEIR	2290.0	122.0	6240.	24,250 CFS

ELEVATIONS

	ELEV. (FT.)
ORIGINAL STREAMBED	2104.0
LOWEST EXCAVATION	2053.0
CREST	2304.0
TOP OF PARAPET	2308.0
ASSUMED H.W.L.	2304.0

REMARKS

(1) SILL OF RISERS CONSTRUCTED JANUARY 1939.
(2) 12" GATE VALVE INSTALLED OCTOBER 1956. RENUMBERED FROM A2 to A2A DUE TO INSTALLATION OF THE 12" H.J. ON 5/23/73.
(3) 72" HYD. BUTTERFLY INSTALLED OCTOBER 1956.
(4) 48" HOLLOW JET VALVE INSTALLED JUNE 1957.
(5) 60" HYD. BUTTERFLY INSTALLED NOVEMBER 1960.
(6) 12" HOLLOW JET VALVE INSTALLED 5/23/73 TO REPLACE ORIFICE PLATES.
2289.97 USGS = 2290.0 SPILLWAY DATUM. SPILLWAY DATUM SHOWN.
LATEST STATE APPROVAL MAY 13, 1976. RESTRICTED ELEV. 2213 FT.

REVISED OCTOBER 1984

EXHIBIT D

Pertinent Data for Other Reservoirs Affecting the Los Angeles River

Table 1
SEPULVEDA DAM AND RESERVOIR
LOS ANGELES COUNTY, CALIFORNIA

PERTINENT DATA
SEPTEMBER 1988

Construction Completed	30 December 1941
Stream System	Los Angeles River
Drainage area ... sq. miles	152
Reservoir:	
Elevation	
Top of crest gates (raised position) ... ft., NGVD	710.0
Flood control pool ... ft., NGVD	710.0
Spillway design surcharge level ... ft., NGVD	716.7
Top of dam ... ft., NGVD	725**
Crest gates begin to automatically lower ... ft., NGVD	712.0
Crest gates complete automatic lowering ... ft., NGVD	715.0
Area	
Top of crest gates (raised position) ... acres	1,335
Flood control pool ... acres	1,335
Fixed spillway crest ... acres	765
Fixed spillway design surcharge level ... acres	1,710
Top of dam ... acres	2,447
Purchased real estate*** ... acres	2,097
Capacity, gross	
Top of crest gates (raised position) ... acre-feet	17,425 (2.15*)
Flood control pool ... acre-feet	17,425 (2.15*)
Fixed spillway crest ... acre-feet	6,857 (0.85*)
Spillway design surcharge level ... acre-feet	27,563 (3.40*)
Top of dam ... acre-feet	44,727 (5.52*)
Allowance for sediment ... acre-feet	0
Dam: - Type	Earthfill
Height above original streambed ... ft.	57
Top length ... ft.	15,440
Top width ... ft.	30
Freeboard ... ft.	7.3
Spillway: - type	Concrete ogee
Crest length ... ft.	399
Crest elevation ... ft., NGVD	700
Design surcharge ... ft.	6.7
Design discharge ... c.f.s.	99,540
Outlets:	
Uncontrolled ... number	4
Size	6'W x 6.5'H
Entrance invert elevation ... ft., NGVD	668
Controlled ... number	4
Size ... ft.	6'W x 9'H
Gate type	Vertical lift
Entrance invert elevation ... ft., NGVD	668
Conduits - (Rectangular)	
Number and Size	
Ungated	4 - 6'W x 6.5'H
Gated	4 - 6'W x 9'H
Length ... ft.	40
Maximum capacity at spillway crest ... c.f.s.	16,500
Regulated capacity at spillway crest ... c.f.s.	16,500
Standard project flood:	
Duration (inflow) ... days	3
Total volume (including base flow) ... acre-feet	68,200 (8.41*)
Inflow peak ... c.f.s.	50,000
Probable maximum flood:	
Duration (inflow) ... days	4
Total volume ... acre-feet	163,200 (20.13*)
Inflow peak ... c.f.s.	114,000
Historic maximums:	
Maximum inflow ... c.f.s.	58,970
Date	2-16-80
Maximum release ... c.f.s.	15,320
Date	2-16-80
Maximum water surface elevation ... ft., NGVD	705.1
Date	2-16-80
Maximum storage ... acre-feet	11,470
Date	2-16-80

*inches of runoff

**December 1980 survey shows variation in elevation of top of dam from 723.7 feet northeast of Control House to 725.5 feet southwest of Control House.

***There are no easements acquired in the reservoir area. All real estate is acquired in fee title.

WHITTIER NARROW DAM AND RESERVOIR
LOS ANGELES COUNTY, CALIFORNIA

PERTINENT DATA
JUNE 1987

Stream System		Rio Hondo and San Gabriel Rivers
Drainage area	sq. miles	554
Reservoir:		
Elevation		
Water supply pool (Rio Hondo)	ft., m.s.l.	201.6
Water supply pool (San Gabriel)	ft., m.s.l.	213.5
Flood control pool	ft., m.s.l.	228.5
Top of gates (gates closed)	ft., m.s.l.	229
Spillway design surcharge level	ft., m.s.l.	238.9
Top of Dam	ft., m.s.l.	239
Area		
Water supply (Rio Hondo)	acres	252.0
Water supply (San Gabriel)	acres	89
Flood Control	acres	2,411
Top of gates (gates closed)	acres	2,470
Spillway design surcharge level	acres	3,622.8
Top of dam	acres	3,630
Capacity, gross		
Water supply (Rio Hondo)	acre-feet	2,498 (0.09*)
Water supply (San Gabriel)	acre-feet	532 (0.02*)
Flood control pool	acre-feet	34,947 (1.18*)
Top of gates (gates closed)	acre-feet	36,160 (1.22*)
Spillway design surcharge level	acre-feet	66,702 (2.26*)
Top of dam	acre-feet	67,060 (2.27*)
Allowance for sediment	acre-feet	0
Dam: - Type		Earthfill
Height above original streambed	ft.	56.0
Top length	ft.	16,960
Top width	ft.	16
Freeboard	ft.	0.1
Outlets: (Rio Hondo)		
Type of gates		Tainter
Number and size of gates		4 - 30'W x 20'H
Size of outlets		30'W x 19'H
Gate sill elevation	ft., m.s.l.	184.0
Regulated outflow	c.f.s.	40,000
Maximum capacity (el. 229.0)	c.f.s.	74,700
Spillway: (San Gabriel)		
Type of gates		Tainter
Number and size of gates		9 - 50' x 29'
Gate sill elevation	ft., m.s.l.	200.0
Top of gates (gates closed) elevation	ft., m.s.l.	229
Discharge at design surchange (el. 234.0)	c.f.s.	251,000
Maximum discharge capacity (el. 239.0)	c.f.s.	307,900
Standard project flood:		
Duration (inflow)	days	4
Total volume	acre-feet	198,000 (6.70*)
Inflow peak	c.f.s.	40,000
Probable maximum flood:		
Duration (inflow)	days	4
Total volume	acre-feet	910,000 (3.80*)
Inflow peak	c.f.s.	365,000
Historic maximums:		
San Gabriel:		
Maximum release	c.f.s.	11,500
Date		1-25-69
Maximum water surface elevation	ft. m.s.l.	216.5
Date		1-25-69
Rio Hondo:		
Maximum release	c.f.s.	38,800
Date		2-17-82
Maximum water surface elevation	ft. m.s.l.	213.5
Date		1-25-69

*inches of runoff

LOPEZ DAM AND RESERVOIR
LOS ANGELES COUNTY, CALIFORNIA

PERTINENT DATA
JULY 1985

Stream system	Pacoima Wash
Drainage area..sq. miles	34
Reservoir:	
Elevation	
Streambed at Dam..ft., m.s.l.	1,253.72
Flood control pool (spillway crest)..ft., m.s.l.	1,272.92
Spillway design surcharge level..ft., m.s.l.	1,293.48
Top of dam..ft., m.s.l.	1,298.92
Area	
Spillway crest..acres	41.3
Spillway design surcharge level..acres	70.7
Top of dam..acres	80.1
Capacity, gross	
Spillway crest..acre-feet	441 (0.24*)
Spillway design surcharge level..acre-feet	1,613.3 (0.89*)
Top of dam..acre-feet	2,021.4 (1.12*)
Allowance for sediment (50-year)..acre-feet	794 (0.44*)
Dam: - type	Earthfill
Height above original streambed..ft.	50
Top length..ft.	1,330
Top width..ft.	20
Freeboard..ft.	6.1
Spillway: - type	Broad-crested
Crest length..ft.	110
Design surcharge..ft.	19.9
Design discharge..c.f.s.	31,000
Outlets:	
Number and size-diameter..ft.	1-5' diameter
Length..ft.	428
Entrance invert elevation..ft., m.s.l.	1,253.92
Standard project flood:	
Duration (inflow)..days	3
Total volume..acre-feet	14,000 (7.78*)
Inflow peak..c.f.s.	11,200
Probable maximum flood	
Duration (inflow)..days	1
Total volume..acre-feet	19,900 (10.97*)
Inflow peak..c.f.s.	30,400
Historic maximums:	
Maximum release..c.f.s.	3,900
Date	3-1-83
Maximum water surface elevation..ft., m.s.l.	1,277.7
Date	3-1-83

*inches of runoff

SANTA FE DAM AND RESERVOIR
LOS ANGELES COUNTY, CALIFORNIA

PERTINENT DATA
MAY 1983

Stream System	San Gabriel River
Drainage area ... sq. miles	236
Reservoir:	
Elevation	
Debris pool ... ft., m.s.l.	456
Water supply pool ... ft., m.s.l.	466
Flood control pool (spillway crest) ... ft., m.s.l.	496
Spillway design surcharge level ... ft., m.s.l.	508.4
Top of dam ... ft., m.s.l.	513
Area	
Debris pool ... acres	331.2
Water supply pool ... acres	473.9
Spillway crest ... acres	1,084
Spillway design surcharge level ... acres	1,258
Top of dam ... acres	1,298
Capacity, gross	
Debris pool ... acre-feet	4,351.1 (0.35*)
Water supply pool ... acre-feet	8,291.4 (0.66*)
Spillway crest ... acre-feet	32,109 (2.55*)
Spillway design surcharge level ... acre-feet	46,712 (3.71*)
Top of dam ... acre-feet	53,088 (4.22*)
June 1978	
Allowance for sediment (50-year) ... acre-feet	8,000 (0.64*)
June 1978	
Allowance for sediment (100-year) ... acre-feet	16,000 (1.27*)
1969 Reduction in storage due to sediment ... acre-feet	4222
Dam: - Type	Earthfill
Height above original streambed ... ft.	92
Top length ... ft.	23,800
Top width ... ft.	30
Freeboard ... ft.	4.6
Spillway: - type	Ungated overflow concrete ogee
Crest length ... ft.	1,200
Design surcharge ... ft.	221,800
Design Discharge ... c.f.s.	13.21
Outlets:	
Gates - Type	Vertical lift
Number and size ... ft.	16 - 6'W x 9'H
Gate sill elevation ... ft., m.s.l.	421
Conduits	
Number and size	76 - 7.33'W x 7.33'H
Length ... ft.	515
Maximum capacity at spillway crest ... c.f.s.	41,000
Regulated discharge at spillway crest ... c.f.s.	41,000
Standard project flood:	
Duration (inflow) ... days	3.5
Total volume ... acre-feet	171,400 (13.62*)
Inflow peak ... c.f.s.	96,000
Probable maximum flood:	
Duration (inflow) ... days	4
Total volume ... acre-feet	556,000 (44.17*)
Inflow peak ... c.f.s.	222,000
Historic maximums:	
Maximum discharge on record ... c.f.s.	30,900
Date	1-26-69
Maximum water surface elevation ... ft., m.s.l.	473.97
Date	12-19-66

*inches of runoff

CHARACTERISTICS OF MAJOR STORAGE PROJECTS
LOS ANGELES COUNTY

PROJECT		DAM					SPILLWAY					RESERVOIR						
												ELEVATION		STORAGE				
NAME OF DAM	STREAM	DRAINAGE AREA (sq. mi.)	TYPE	HEIGHT (ft.)	CREST ELEVATION (ft. msl)	OUTLET SILL (ft. msl)	LENGTH (ft.)	TYPE	CREST ELEVATION (ft. msl)	DESIGN CAPACITY (cfs)	PRIMARY PURPOSE(S)	MAX. NORMAL POOL (ft. msl)	MAX. DESIGN POOL (ft. msl)*	MAX. NORMAL POOL (ac-ft)	DESIGN SURCHARGE (ac-ft)*	DAM CREST ELEVATION (ac-ft)	MAX. SCHEDULE RELEASES (cfs)	MAX. RELEASES INCLUDING SPILLWAY (cfs)*
Big Dalton	Big Dalton Creek	4.49	C,A,G	146.0	1711.0	1613.0**	480.0	U	1706.0	5310.0	FC, WS	1706.0	1711.0	915.0	119.2	1037.0	888.0	6198.0
Big Tujunga	Big Tujunga Creek	82.30	C,A	200.0	2304.0	2160.0**	505.0	U	2290.0	24,250.0	FC, WS	2290.0	2304.0	5750.0	1186.0	6906.0	2900.0	27,150.0
Cogswell	San Gabriel River-West Fork	39.20	R	265.0	2405.0	2148.0	585.0	U	2385.0	29,500.0	FC, WS	2385.0	2398.0	8853.0	2031.0	N/A	8725.0	38,225.0
Devil's Gate	Arroyo Seco	31.90	C,A,G	100.0	1070.0	[1]958.8** [2]985.5	310.0	U	1054.0 1065.5	14,800.0 1000.0	FC, WS	1054.0 1065.5	1072.0	2869.0 4787.0	OT OT	2820 5683.0	5637.0	20,937.0
Eaton Wash	Eaton Creek	12.42	E	62.0	902.0	841.0	1525.0	U	887.5	33,500.0	FC, WS	887.5	897.5	721.0	457.0	N/A	5040.0	38,540.0
Live Oak	Live Oak Creek	2.28	C,A,G	70.0	1500.1	1429.8**	303.0	U	1496.4 1497.0	2400.0 (COMB.)	FC, WS	1496.4 1497.0	1500.0	239.0 245.0	6.5 N/A	282.3	368.0	2768.0
Morris	San Gabriel River	217.0	C,G	245.0	1175.0	960.0	800.0	G	1152.0 1170.0	34,200.0 100,000	FC, WS	1175.0 (GR)	1175.0	22,758.0 N/A	N/A N/A	N/A	5280.0	100,000
Pacoima	Pacoima Creek	28.20	C,A,G	365.0	2015.0	1700.0**	640.0	U	1950.0 1989.95	10,780.0	FC, WS	1950.0 1989.0	2025.0	3115.0 6589.0	5204.0 N/A	8981.0	1048.0	11,828.0
Puddingstone	Puddingstone Creek	33.10	E,C	147.0	982.0	882.1	2698.0 (Combined)	U	970.0	6900.0	FC, WS	970.0	975.0	16,468.0	2504.0	N/A	850.0	7,750.0
Puddingstone Div.	San Dimas Creek	20.0	E,C	33.5	1163.8	1145.5	825.0	U	1152.5	10,600.0	FC, DIVERSION WS	1152.5	1158.5	191.0	116.0	N/A	2180.0	14,100.0
San Dimas	San Dimas Creek	16.20	C,A,G	117.0	1470.26	[1]1358.0 [2]1369	340.0 (LS)	U	1462.0	27,455.0	FC, WS	1462.0	1470.0	1306.0	315.0	1630.0	2060.0	28,600.0
San Gabriel	San Gabriel River	202.70	E,R,C	310.0	1481.0	1205.8**	1500.0	U	1453.0	92,000.0	FC, WS	1453.0	1466.0	44,226.0	7412.0	N/A	13,470.0	110,870.0
Santa Anita	Big Santa Anita Creek	10.82	C,A,G	224.8	1324.8	1161.2**	612.0	U	1316.0 1324.8	2900.0	FC, WS	1316.0 1324.8	1324.8	776.5 905.7	129.2 N/A	905.7	647.0	3533.0
Sawpit	Sawpit Creek	3.24	C,A	147.0	1375.18	1235.7**	527.0	U	1360.0 1375.18	1450.0 610	FC, WS	1360.0 1375.18	1375.18	354.0 506.6	152.6 N/A	506.6	457.0	2584.0
Thompson Cr.	Thompson Creek	3.51	C,GL	66.0	1648.0	1579.4	1500.0	U	1634.1	4520.0	FC, WS	1634.1	1645.0	543.0	369.7	N/A	320.0	4985.0

Dam Types

Material	Structure
E - Earthfill	A - Arch
R - Rockfill	G - Gravity
C - Concrete	GL - Gravel
M - Masonry	

Outlet Types
1. Slide Gates
2. Valves

Spillway Types
U - Ungated
G - Gated

Project Purposes
FC - Flood Control
P - Power
WS - Water Supply

OT - Overtop the Dam
GR - Gated in Raised Position
LS - Less Spillway

* Assumed at H.W.L.
** Center Line of Outlet Sill

EXHIBIT E

Streamflow Data For Big Tujunga

Creek Stations

LITTLE TUJUNGA CREEK NEAR SAN FERNANDO, CALIFORNIA
Station Number F19-R (11096500)
Drainage Area 21.1 square miles
Elevation 1068 feet
Period of Record 1928 to 1974
No regulation or diversions above station
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT
1929	0	0		0	0	0		0
1930	0	0		0	0	0		0
1931	0.078	30	FEB04	7	FEB14	0		56
1932	2.57	660	FEB09	274	FEB09	0		1870
1933	0.71	450	JAN19	118	JAN19	0		514
1934	1.13	1360	JAN01	258	JAN01	0		819
1935	0.63	89	DEC13	63	DEC13	0		455
1936	1.28	653	FEB02	83	FEB12	0		929
1937	6.58	964	FEB14	175	FEB14	0		4760
1938	12.4	8500	MAR02	1300	MAR02	0		8960
1939	0.71	175	MAR09	40	DEC18	0		510
1940	1.24	2090	JAN08	148	JAN08	0		899
1941	14.6	1310	MAR04	534	MAR04	0		10600
1942	0.27	198	DEC28	30	DEC28	0		199
1943	10.2	3700	JAN23	592	JAN22	0		7380
1944	8.04	4220	FEB22	826	FEB22	0		5840
1945	0.76	244	NOV11	48	FEB02	0		551
1946	0.8	156	MAR30	96	MAR30	0		577
1947	0.98	200	NOV20	54	DEC26	0		706
1948	0.01	16	MAR24	2.6	MAR24	0		9.1
1949	0.0003	0.9	MAY19	0.1	MAY19	0		0.2
1950	0.04	9.8	DEC18	3.1	FEB06	0		29
1951	0.01	13	JAN11	1.4	JAN29	0		9
1952	7.67	2110	JAN16	422	JAN16	0		5570
1953	0.25	138	DEC01	18	DEC20	0		184
1954	0.56	198	FEB13	43	JAN25	0		407
1955	0.06	35	JAN18	7.3	JAN18	0		47
1956	0.52	445	JAN26	123	JAN26	0		381
1957	0.05	112	FEB28	5	JAN13	0		35
1958	4.75	559	APR03	223	APR01	0		3440
1959	0.1	84	JAN06	10	FEB11	0		71
1960	0.002	6.7	FEB01	0.6	FEB01	0		1.4

LITTLE TUJUNGA CREEK NEAR SAN FERNANDO, CALIFORNIA

Station Number F19-R (11096500)
Drainage Area 21.1 square miles
Elevation 1068 feet
Period of Record 1928 to 1974
No regulation or diversions above station
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT
1961	0.07	266	NOV05	11	NOV06	0		52
1962	3.31	1630	FEB11	365	FEB11	0		2390
1963	0.06	52	FEB10	9.8	FEB10	0		45
1964	0.11	251	JAN22	20	JAN21	0		81
1965	0.28	223	APR09	50	APR19	0		201
1966	5.19	1300	NOV22	355	NOV24	0		3760
1967	5.71	901	DEC06	358	DEC06	0		4130
1968	0.58	112	NOV19	43	NOV21	0		420
1969	16.9	1420	FEB25	1180	FEB25	0		12250
1970	0.39	353	FEB28	37	MAR01	0		286
1971	0.98	est 569	NOV29	93	NOV30	0		711
1972	0.33	762	DEC25	58	DEC25	0		240
1973	2.14	1570	FEB11	477	FEB11	0		1550

Average Discharge, 45 years: 2.51 cfs (1820 acre-feet per year)
Maximum Discharge on record: estimated 8500 cfs on 02 MAR 1938
Peak flows are instantaneous maximum discharge values corresponding to the highest stage that occurred.

BIG TUJUNGA CREEK BELOW HANSEN DAM, CALIFORNIA

Station Number F20-R (11097000)
Drainage Area 153 square miles
Elevation 943 feet
Period of Record 1932 to present--fragmentary records before 1940 available in LACFCD Annual Reports
Flow regulated since 1931 by Big Tujunga Dam, and since 1940 by Hansen Dam--LACDPW began diverting water 0.3 miles upstream of gage beginning in 1952
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT	RUNOFF PLUS DIVER-SION	PER-CENT DIVRTD *
1941	115	1200	MAR06	1050	MAR07	0		83220		
1942	5.8	59	DEC30	59	JAN01	0		4190		
1943	9.25	1780	JAN23	1610	JAN24	0		66970		
1944	60.3	1100	FEB22	985	FEB24	0		43750		
1945	13.8	70	FEB05	441	FEB05	0		9960		
1946	7.01	610	DEC23	543	DEC24	0		5070		
1947	21.6	900	DEC27	480	DEC27	0		15650		
1948	0.013	34	FEB05	2.3	FEB05	0		9.1		
1949	0.004	0.5	APR01	0.08	MAR10	0		2.6		
1950	0.002	1.6	MAR01	0.01	MAR01	0		1.8		
1951	0	0		0		0		0		
1952	12.1	est3000	JAN24	2550	JAN25	0		8810	29040	70
1953	0.09	178	FEB04	3.8	DEC28	0		68	1330	95
1954	0.34	50	MAR02	9.4	JAN19	0		245	1290	81
1955	0.03	8.9	MAY07	1.9	APR30	0		20	20	0
1956	0.03	20	MAR01	4.1	APR12	0		25	25	0
1957	0.03	18	FEB28	1.7	FEB12	0		22	22	0
1958	18	1700	APR03	1510	APR04	0		13040	33560	61
1959	0.006	16	JAN06	1	JAN06	0		4.6	1020	99
1960	0.001	1.8	APR26	0.2	APR26	0		0.6	0.6	0
1961	0.003	4.2	FEB05	0.3	MAR15	0		2	2	0
1962	6.54	3130	FEB12	1600	FEB12	0		4740	17310	73
1963	0	0		0		0		0	0	0
1964	0	0		0		0		0	0	0
1965	0	0		0		0		0	0	0
1966	26.1	3240	NOV23	2320	NOV23	0		18900	38710	51
1967	8.54	5130	DEC22	404	DEC22	0		6180	39090	84
1968	0.055	372	NOV21	16	APR25	0		40	9870	99
1969	158	11700	FEB25	9450	FEB25	0		114200	147700	77
1970	3.3	200	MAR17	58	MAR18+	0		2400	14340	83

BIG TUJUNGA CREEK BELOW HANSEN DAM, CALIFORNIA

Station Number F20-R (11097000)
Drainage Area 153 square miles
Elevation 943 feet
Period of Record 1932 to present--fragmentary records before 1940 available in LACFCD Annual Reports
Flow regulated since 1931 by Big Tujunga Dam, and since 1940 by Hansen Dam--LACDPW began diverting water 0.3 miles upstream of gage beginning in 1952
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT	RUNOFF PLUS DIVER-SION	PER-CENT DIVRTD *
1971	0.05	228	DEC01	9.5	DEC01	0		43	11700	99
1972	0	0		0		0		0	1932	100
1973	4.54	329	FEB15	272	FEB12	0		3290	15050	78
1974	0.03	71	FEB08	2.1	NOV18	0		28	6310	99
1975	20.77	38	OCT31	2.5	MAR06	0		41	5470	99
1976	0.032	31	MAR11	1.9	FEB09	0		23	5530	99
1977	0.098	108	MAY11	5.9	MAY08	0		71	3170	98
1978	154	12500	FEB10	7760	FEB10	0		111200	139344	20
1979	24.8	1040	MAY24	597	MAR29	0		17980	42670	58
1980	119	5020	FEB17	3680	FEB17	0.14	SEP10+	86100	117176	27
1981	8.25	1070	JAN29	372	JAN29	0		5980	20440	71
1982	13.5	2100	MAR19	655	MAR19	0		9750	24000	59
1983	188	15200	MAR02	11400	MAR02	0		136300	213223	36
1984	22.4	761	DEC29	384	DEC06	0		16270	M	M
1985	2.38	1350	DEC20	337	DEC20	0		1720	13274	87
1986	2.95	887	FEB25	126	MAR16	0		2130	M	M
1987	0.36	38	OCT02	8.3	OCT03	0		258	7570	97

Maximum Discharge on Record: 15200 cfs on 02 MAR 1983
Maximum Outside of Record: 54000 cfs on 02 MAR 1938
Peak flows are instantaneous maximum discharge values corresponding to the highest stage that occurred.
* percentage of flow through Hansen Dam that is diverted by LACDPW for spreading

RATING TABLE NO. 5

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY - WATER RESOURCES DIVISION

VERSION PC 1.0 - 5/20/85 EXPANDED RATING TABLE DATE PRINTED 07/11/88

11097000 BIG TUJUNGA CREEK BELOW HANSEN DAM TYPE LOG(SCALE OFFSET = .9) RATING NO 5

BASED ON..........DISCHARGE MEASUREMENTS, NO.........., AND......., AND IS...... WELL DEFINED BETWEEN...... AND......
.... *COMP BY.......DATE.....
FROM..........TO........., FROM...........TO............. *CKD. BY.......DATE.....

GAGE HEIGHT IN FEET	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	DIFF IN Q PER TENTH GH
	DISCHARGE IN CUBIC FEET PER SECOND (EXPANDED PRECISION)										
1.00		0.500	3.400	4.620	6.140	8.000	9.710	11.700	13.800	16.300	
1.10	19.000	21.300	23.700	26.300	29.100	32.000	34.800	37.600	40.600	43.800	28.000
1.20	47.000	50.400	53.800	57.400	61.100	65.000	68.900	73.000	77.200	81.500	39.000
1.30	86.000	90.600	95.400	100.200	105.200	110.400	115.600	121.000	126.600	132.200	52.000
1.40	138.000	143.700	149.500	155.400	161.400	167.500	173.800	180.200	186.700	193.300	62.000
1.50	200.000	206.800	213.700	220.800	227.900	235.200	242.500	250.000	257.700	265.400	73.200
1.60	273.200	281.200	289.300	297.400	305.700	314.200	322.700	331.400	340.100	349.000	84.800
1.70	358.000	366.500	375.000	383.700	392.500	401.300	410.200	419.300	428.400	437.600	88.900
1.80	446.900	456.300	465.800	475.400	485.100	494.800	504.700	514.600	524.700	534.800	98.100
1.90	545.000	554.800	564.700	574.600	584.700	594.800	604.900	615.200	625.500	635.900	101.400
2.00	646.400	657.000	667.600	678.300	689.100	700.000	710.500	721.100	731.700	742.400	106.800
2.10	753.200	764.000	774.900	785.900	796.900	808.000	819.200	830.400	841.700	853.100	111.300
2.20	864.500	875.900	887.500	899.100	910.800	922.500	934.300	946.100	958.100	970.000	117.600
2.30	982.100	994.200	1006.000	1019.000	1031.000	1043.000	1056.000	1068.000	1081.000	1093.000	123.900
2.40	1106.000	1119.000	1131.000	1144.000	1157.000	1170.000	1183.000	1196.000	1209.000	1223.000	130.000
2.50	1236.000	1249.000	1263.000	1276.000	1290.000	1303.000	1317.000	1330.000	1344.000	1358.000	136.000
2.60	1372.000	1386.000	1400.000	1414.000	1428.000	1442.000	1456.000	1470.000	1485.000	1499.000	142.000
2.70	1514.000	1528.000	1543.000	1557.000	1572.000	1587.000	1601.000	1616.000	1631.000	1646.000	147.000
2.80	1661.000	1676.000	1691.000	1707.000	1722.000	1737.000	1753.000	1768.000	1783.000	1799.000	154.000
2.90	1815.000	1830.000	1846.000	1862.000	1877.000	1893.000	1909.000	1925.000	1941.000	1957.000	159.000
3.00	1974.000	1990.000	2006.000	2022.000	2039.000	2055.000	2072.000	2088.000	2105.000	2121.000	164.000
3.10	2138.000	2155.000	2172.000	2188.000	2205.000	2222.000	2239.000	2256.000	2274.000	2291.000	170.000
3.20	2308.000	2325.000	2343.000	2360.000	2378.000	2395.000	2413.000	2430.000	2448.000	2466.000	175.000
3.30	2483.000	2501.000	2519.000	2537.000	2555.000	2573.000	2591.000	2609.000	2628.000	2646.000	181.000
3.40	2664.000	2683.000	2701.000	2720.000	2738.000	2757.000	2775.000	2794.000	2813.000	2831.000	186.000
3.50	2850.000	2869.000	2888.000	2907.000	2926.000	2945.000	2964.000	2984.000	3003.000	3022.000	192.000
3.60	3042.000	3061.000	3081.000	3100.000	3120.000	3139.000	3159.000	3179.000	3198.000	3218.000	196.000
3.70	3238.000	3258.000	3278.000	3298.000	3318.000	3338.000	3358.000	3379.000	3399.000	3419.000	202.000
3.80	3440.000	3460.000	3481.000	3501.000	3522.000	3542.000	3563.000	3584.000	3605.000	3626.000	206.000
3.90	3646.000	3667.000	3688.000	3709.000	3731.000	3752.000	3773.000	3794.000	3815.000	3837.000	212.000
4.00	3858.000	3880.000	3901.000	3923.000	3944.000	3966.000	3988.000	4009.000	4031.000	4053.000	217.000
4.10	4075.000	4097.000	4119.000	4141.000	4163.000	4185.000	4207.000	4229.000	4252.000	4274.000	222.000

11097000 BIG TUJUNGA CREEK BELOW HANSEN DAM — TYPE LOG(SCALE OFFSET = .9) RATING NO 5

DISCHARGE IN CUBIC FEET PER SECOND (EXPANDED PRECISION)

GAGE HEIGHT IN FEET	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	DIFF IN Q PER TENTH GH
4.20	4297.000	4319.000	4341.000	4364.000	4387.000	4409.000	4432.000	4453.000	4477.000	4500.000	226.000
4.30	4523.000	4546.000	4569.000	4592.000	4615.000	4638.000	4661.000	4685.000	4708.000	4731.000	231.000
4.40	4754.000	4778.000	4801.000	4825.000	4848.000	4872.000	4896.000	4919.000	4943.000	4967.000	237.000
4.50	4991.000	5015.000	5038.000	5062.000	5086.000	5111.000	5135.000	5159.000	5183.000	5207.000	241.000
4.60	5232.000	5256.000	5280.000	5305.000	5329.000	5354.000	5379.000	5403.000	5428.000	5453.000	245.000
4.70	5477.000	5502.000	5527.000	5552.000	5577.000	5602.000	5627.000	5652.000	5677.000	5703.000	251.000
4.80	5728.000	5753.000	5779.000	5804.000	5829.000	5855.000	5880.000	5906.000	5932.000	5957.000	255.000
4.90	5983.000	6009.000	6035.000	6060.000	6086.000	6112.000	6138.000	6164.000	6190.000	6217.000	260.000
5.00	6243.000	6269.000	6295.000	6322.000	6348.000	6374.000	6401.000	6427.000	6454.000	6481.000	264.000
5.10	6507.000	6534.000	6561.000	6587.000	6614.000	6641.000	6668.000	6695.000	6722.000	6749.000	269.000
5.20	6776.000	6803.000	6830.000	6858.000	6885.000	6912.000	6940.000	6967.000	6995.000	7022.000	274.000
5.30	7050.000	7077.000	7105.000	7133.000	7160.000	7188.000	7216.000	7244.000	7272.000	7300.000	278.000
5.40	7328.000	7356.000	7384.000	7412.000	7440.000	7468.000	7497.000	7525.000	7553.000	7582.000	282.000
5.50	7610.000	7639.000	7667.000	7696.000	7724.000	7753.000	7782.000	7811.000	7839.000	7868.000	287.000
5.60	7897.000	7926.000	7955.000	7984.000	8013.000	8042.000	8072.000	8101.000	8130.000	8159.000	292.000
5.70	8189.000	8218.000	8247.000	8277.000	8306.000	8336.000	8366.000	8395.000	8425.000	8455.000	295.000
5.80	8484.000	8514.000	8544.000	8574.000	8604.000	8634.000	8664.000	8694.000	8724.000	8754.000	301.000
5.90	8785.000	8815.000	8845.000	8876.000	8906.000	8936.000	8967.000	8997.000	9028.000	9059.000	304.000
6.00	9089.000	9120.000	9151.000	9181.000	9212.000	9243.000	9274.000	9305.000	9336.000	9367.000	309.000
6.10	9398.000	9429.000	9460.000	9492.000	9523.000	9554.000	9586.000	9617.000	9648.000	9680.000	313.000
6.20	9711.000	9743.000	9775.000	9806.000	9838.000	9870.000	9901.000	9933.000	9965.000	9997.000	319.000
6.30	10030.000	10060.000	10090.000	10130.000	10160.000	10190.000	10220.000	10250.000	10290.000	10320.000	320.000
6.40	10350.000	10380.000	10420.000	10450.000	10480.000	10510.000	10550.000	10580.000	10610.000	10640.000	330.000
6.50	10680.000	10710.000	10740.000	10780.000	10810.000	10840.000	10870.000	10910.000	10940.000	10970.000	330.000
6.60	11010.000	11040.000	11070.000	11110.000	11140.000	11170.000	11210.000	11240.000	11270.000	11310.000	330.000
6.70	11340.000	11380.000	11410.000	11440.000	11480.000	11510.000	11540.000	11580.000	11610.000	11650.000	340.000
6.80	11680.000	11710.000	11750.000	11780.000	11820.000	11850.000	11890.000	11920.000	11950.000	11990.000	340.000
6.90	12020.000	12060.000	12090.000	12130.000	12160.000	12200.000	12230.000	12270.000	12300.000	12340.000	350.000
7.00	12370.000	12410.000	12440.000	12470.000	12510.000	12550.000	12580.000	12620.000	12650.000	12690.000	350.000
7.10	12720.000	12760.000	12790.000	12830.000	12860.000	12900.000	12930.000	12970.000	13010.000	13040.000	360.000
7.20	13080.000	13110.000	13150.000	13180.000	13220.000	13260.000	13290.000	13330.000	13360.000	13400.000	360.000
7.30	13440.000	13470.000	13510.000	13540.000	13580.000	13620.000	13650.000	13690.000	13730.000	13760.000	360.000
7.40	13800.000	13840.000	13870.000	13910.000	13950.000	13980.000	14020.000	14060.000	14090.000	14130.000	370.000
7.50	14170.000	14200.000	14240.000	14280.000	14310.000	14350.000	14390.000	14430.000	14460.000	14500.000	370.000
7.60	14540.000	14580.000	14610.000	14650.000	14690.000	14730.000	14760.000	14800.000	14840.000	14880.000	370.000
7.70	14910.000	14950.000	14990.000	15030.000	15060.000	15100.000	15140.000	15180.000	15220.000	15250.000	380.000
7.80	15290.000	15330.000	15370.000	15410.000	15450.000	15480.000	15520.000	15560.000	15600.000	15640.000	390.000
7.90	15680.000	15720.000	15750.000	15790.000	15830.000	15870.000	15910.000	15950.000	15990.000	16030.000	380.000
8.00	16060.000	16100.000	16140.000	16180.000	16220.000	16260.000	16300.000	16340.000	16380.000	16420.000	400.000
8.10	16460.000	16490.000	16530.000	16570.000	16610.000	16650.000	16690.000	16730.000	16770.000	16810.000	390.000
8.20	16850.000	16890.000	16930.000	16970.000	17010.000	17050.000	17090.000	17130.000	17170.000	17210.000	400.000
8.30	17250.000										

BIG TUJUNGA CREEK BELOW MILL CREEK, NEAR COLBY RANCH, CALIFORNIA

Station Number F111-R (1930-1932)
Station Number F111B-R (1932-1950) Drng Area 66.9 sq mi, Elev 2410 feet
Station Number F111C-R (1948-1972) Drng Area 64.9 sq mi, Elev 2650 feet
11094000
No regulation or diversions above station
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT	
Stations F111-R and F111B-R									
1931	2	216	FEB05	65	FEB04	0	JUN30	1450	
1932	14.8	3910	FEB08	964	FEB09	0	OCT01+	10800	
1933	3.6	324	JAN19	108	JAN19	0	OCT01+	2600	
1934	4.27	1520	JAN01	707	JAN01	0	OCT01+	3090	
1935	13.3	640	APR08	296	APR08	0	OCT01+	9600	
1936	3.21	159	FEB12	60	FEB12	0	JUL02+	2330	
1937	26.9	1030	FEB06	707	FEB14	0	OCT01+	19440	
1938	63	M	MAR02	8200	MAR02	0.8	OCT01+	45600	
1939	10.9	543	DEC19	345	DEC19	0.9	AUG13+	7920	
1940	7.62	M	M	276	JAN08	0.2	AUG20+	5530	
1941	67.3	1380	FEB20	1120	FEB20	0.8	OCT01+	48710	
1942	8.2	112	DEC10	57	DEC29	0.6	AUG05+	5930	
1943	61.7	14800	JAN23	4510	FEB23	0.8	OCT02+	44670	
1944	50.2	3300	FEB22	2240	FEB22	2.5	OCT02+	36470	
1945	14.2	1870	NOV11	500	FEB02	1.1	AUG09+	10300	
1946	13.9	2700	MAR30	1330	MAR30	0.7	JUL29+	10080	
1947	15.2	1500	DEC26	634	DEC26	0.1	AUG05+	11020	
1948	2.64	140	APR29	49	APR29	0.1	JUL13+	1910	
1949	2.09	16	JAN20	11	MAR11	0	JUL17+	1510	
1950	M	40	FEB06	23	FEB06	0.1	OCT01+	1330	THRU MAY17

BIG TUJUNGA CREEK BELOW MILL CREEK, NEAR COLBY RANCH, CALIFORNIA

Station Number F111-R (1930-1932)
Station Number F111B-R (1932-1950) Drng Area 66.9 sq mi, Elev 2410 feet
Station Number F111C-R (1948-1972) Drng Area 64.9 sq mi, Elev 2650 feet
11094000
No regulation or diversions above station
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT
Station F111C-R								
1949	1.78	13	MAR04	11	MAR11	0	JUL09	1290
1950	1.48	36	FEB06	21	FEB06	0	OCT01+	1070
1951	0.55	6.7	JAN29	4.3	APR29	0	OCT03+	398
1952	26.7	1380	JAN18	674	JAN18	0.06	OCT01+	19390
1953	3.28	65	DEC02	22	DEC02	0	JUL22+	2370
1954	5.28	260	JAN25	138	JAN25	0	JUL19+	3820
1955	2.63	41	MAY01	26	FEB17	0	JUL13+	1910
1956	2.49	324	JAN26	146	JAN26	0	OCT01+	1810
1957	2.03	313	JAN13	112	JAN13	0	OCT01+	1470
1958	27.6	1770	APR03	844	APR03	0	OCT01+	19970
1959	3.29	421	FEB16	154	FEB16	0	JUL23+	2380
1960	0.94	13	JAN10	7.4	APR27	0	JUN11+	683
1961	0.64	82	NOV06	23	NOV06	0	OCT01+	461
1962	15.6	2860	FEB11	1720	FEB11	0	OCT01+	11260
1963	1.61	292	FEB09	95	FEB10	0	JUL13+	1170
1964	1.17	93	APR01	55	APR01	0	OCT01+	852
1965	2.32	99	APR19	64	APR19	0	OCT01+	1680
1966	26.8	6550	DEC29	1640	DEC29	0	OCT01+	19370
1967	26	1630	DEC06	814	DEC06	0.8	OCT01+	18810
1968	21	410	NOV21	275	NOV22	1.3	SEP11+	15260
1969	98.9	20700	FEB25	5320	FEB25	0.9	OCT01+	71600
1970	10.8	707	FEB28	320	MAR01	1	SEP26	7800
1971	12.2	3300	NOV29	1050	NOV29	0.5	SEP19+	8850

Average Discharge, 19 years, 1930-1949: 20.3 cfs
Maximum Discharge 1930-1950, not determined, probably on
March 2, 1938

Average Discharge, 23 years, 1949-1971: 12.3 cfs (8910 acre-feet per year)
Maximum Discharge, 1949-1971: 20700 cfs on 25 FEB 1969

Peak flows are instantaneous maximum discharge values corresponding
to the highest stage that occurred.

BIG TUJUNGA CREEK ABOVE GOLD CANYON (near SUNLAND)
Station Number F213-R (11095500)
Drainage Area 106 square miles
Elevation 1572 feet
Period of Record 1916 to 1979
Flow regulated since 1931 by Big Tujunga Dam
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT
1917		800	DEC24	288	DEC24	0.3	AUG29	15000
1918	30.6	1760	MAR11	1150	MAR12	0.3	OCT05+	22200
1919	7.92	136	FEB11	73	FEB11	0.1	SEP20	5730
1920	22.9	1400	MAR22	750	MAR22	0.5	OCT09	16600
1921	14.4	411	MAR13	232	MAY22	0.5	SEP26	10500
1922	143	8600	DEC19	2500	DEC29	1.5	OCT20	103000
1923	20.4	900	DEC13	628	DEC13	0.4	AUG03+	14700
1924	5.06	87	MAR26	55	MAR27	0.1	AUG06+	3670
1925	5.1	325	APR05	122	APR05	0.1	OCT01+	3700
1926	26.9	4000	APR07	1040	APR08	0.2	OCT01+	19500
1927	29.6	3830	FEB16	1820	FEB16	0.5	OCT17+	21400
1928	6.67	850	FEB04	350	APR04	0.1	AUG04+	4840
1929	5.72	216	APR04	99	APR05	0.1	OCT08+	4130
1930	6.01	260	MAY03	128	MAR15	0.1	OCT01+	4350
1931	4.24	228	FEB04	152	FEB05	0.1	NOV11+	3070
1932	24.6	1330	FEB08	854	FEB09	0.1	OCT01+	17900
1933	10.5	1390	JAN19	488	JAN19	1.1	NOV24+	7590
1934	10.6	1450	JAN01	634	JAN01	0.9	NOV25	7700
1935	20.5	671	APR08	354	APR08	2.6	JUN27	14840
1936	10.5	494	FEB02	150	FEB12	2.4	DEC04+	7640
1937	50.1	495	DEC12	423	FEB17+	1	NOV08+	36260
1938	116	50000	MAR02	13000	MAR02	2.5	DEC17	83960
1939	18.8	380	DEC20	316	DEC21	3.5	JUL23+	13640
1940	15.1			350	FEB06	1.6	OCT29+	10990
1941	109	1650	FEB21	1260	FEB21	1.2	NOV26+	78840
1942	14.8	165	DEC28	62	DEC31	4.4	JUL07+	10690
1943	105	23000	JAN23	8000	JAN23	1.2	NOV10+	76020
1944	79.9	4760	FEB22	3320	FEB22	2.3	NOV15+	57990
1945	24	897	FEB02	320	FEB02	4.8	MAY16+	17370
1946	23.7	1300	MAR30	698	MAR31	4.9	MAR25	17160
1947	26.2	745	DEC25	644	DEC26	4	AUG06	18960
1948	6.4	53	FEB05	25	JUL16+	0.7	SEP13+	4640
1949	3.4	20	JAN20	13	JAN20	0.6	OCT08+	2460
1950	4.1	73	NOV10	30	NOV10	1.7	MAY11+	2960

BIG TUJUNGA CREEK ABOVE GOLD CANYON (near SUNLAND)
Station Number F213-R (11095500)
Drainage Area 106 square miles
Elevation 1572 feet
Period of Record 1916 to 1979
Flow regulated since 1931 by Big Tujunga Dam
See Plate 2-1B for location

WATER YEAR ENDING SEP 30	MEAN DAILY FLOW CFS	PEAK FLOW CFS	DATE	MAX DAILY CFS	DATE	MIN DAILY CFS	DATE	RUNOFF AC-FT
1951	2.1	10	NOV13	7.1	NOV13	0.2	AUG15+	1510
1952	56.9	2960	JAN18	1740	JAN18	1.3	OCT01+	41320
1953	9	108	NOV15	59	FEB07	1.8	MAY02	6510
1954	11.4	387	JAN25	227	JAN25	0.6	OCT18+	8240
1955	5	73	JAN18	33	JAN18	1.1	OCT26+	3580
1956	6.5	301	JAN27	214	JAN27	0.3	SEP23+	4700
1957	3.2	60	JAN13	25	JAN13	0.2	OCT03+	2290
1958	53.7	1670	APR03	1190	APR04	0.8	NOV20+	38910
1959	6.3	245	FEB11	133	FEB18	1.8	OCT17	4570
1960	2.7	22	JAN12	12	JAN12	0.1	SEP11	1950
1961	1.3	86	NOV05	16	NOV06	0.2	OCT06+	926
1962	29.8	4770	FEB11	1850	FEB12	0.6	OCT14+	21540
1963	3.3	412	FEB09	94	FEB10	0.6	OCT27	2370
1964	3.7	166	JAN22	44	JAN22	0.2	SEP09+	2690
1965	3.9	220	APR09	77	APR09	0.1	OCT04+	2790
1966	63.9	5220	DEC30	2850	NOV23	1	NOV07+	46250
1967	62.9	1900	DEC06	906	DEC06	10	OCT30	45540
1968	21	410	NOV21	275	NOV22	1.9	SEP11+	15260
1969	213	21300	FEB25	9250	FEB25	0.8	OCT23+	148100
1970	21.9	560	FEB28	208	MAR01	2.6	AUG27	15830
1971	22.8	1320	NOV29	290	NOV29	2.9	OCT01	16520
1972	6.4	121	JAN04	121	JAN04	0.9	OCT23+	4670
1973	28.3	1840	FEB11	970	FEB11	0.3	AUG03	20480
1974	13.6	336	JAN07	235	JAN07	1	SEP17+	9820
1975	15.1	232	MAR06	94	APR05	1	NOV07+	10900
1976	8.5	378	FEB09	151	SEP11	0.9	DEC30+	6080
1977	8.7	444	JAN03	202	MAY10	0.05	AUG03	6264
1978	208	26000	FEB10	13600	FEB10	0		150645
1979	55.1			579				39785

Average Discharge, 60 years, 1918-77: 28.0 cfs (20290 acre-feet/year)
Maximum Discharge on Record: estimated 50000 cfs on 02 MAR 1938
Peak flows are instantaneous maximum discharge values corresponding to the highest stage that occurred.

EXHIBIT F

Environmental Evaluation

DEPARTMENT OF THE ARMY

LOS ANGELES DISTRICT CORPS OF ENGINEERS

FINDING OF NO SIGNIFICANT IMPACT

HANSEN DAM WATER CONTROL MANUAL

LOS ANGELES COUNTY, CALIFORNIA

I have reviewed the attached Environmental Assessment (EA) prepared for the Hansen Dam Water Control Manual Project, Los Angeles County, California. The reservoir operation schedule was revised in 1988 to limit the maximum release to 20,800 cfs in order to maximize the discharge of water flow from the basin while not exceeding the capacity of the downstream channel. Under the recommended plan, the gates on the eight gated outlets will be kept open at 1.0 ft. until the water surface elevation reaches 1,010.5 feet. After the water surface elevation reaches 1,010.5 feet, all gates will be opened fully to 8.0 feet, until the downstream capacity of 20,800 cfs is reached at a pool elevation of 1053.0 feet. The gates will be progressively closed as the water surface elevation rises until, at elevation of 1066.0 feet, the gates are fully closed. At this point, spillway flow, plus flow through the two ungated outlets, will approximately equal downstream channel capacity.

I have considered possible impacts of implementation of the revised schedule on the environment, including those associated with significant resources as discussed in the Environmental Assessment. No significant adverse impact to vegetation or wildlife at Hansen Dam will occur. Communities such as willow riparian and riparian scrub were already subjected to inundation under the previous operations schedule. These communities will also be subject to inundation under revised operations. Under the proposed revisions, surface water elevation levels will generally be less than one foot greater than under existing conditions. Inundation will last less than two hours longer than under current operations. For any given flood event this increased inundation will affect less than five additional acres of habitat; therefore, no significant adverse impacts will be associated with the revised schedule.

Implementation of the revised operations schedule will not affect the continued existence of the least Bell's vireo, which has historically nested at Hansen Dam, or any other endangered or threatened wildlife or plant species.

Three prehistoric sites fall within the Hansen Dam flood control basin, LAn-167, LAn-300 and "Hansen 3". These sites within the basin are presently subject to inundation and flooding of the Tujunga Wash in extreme conditions. Sites will not be affected by temporary inundation. No impacts are expected to occur as a result of the change in operational schedule in the basin.

I have considered the available information contained in the EA, and it is my determination that the proposed project will not result in a significant effect on the existing environment. Therefore, preparation of an Environmental Impact Statement (EIS) is not required.

15 Jun 90
DATE

CHARLES S. THOMAS
Colonel, Corps of Engineers
District Engineer

EXHIBIT G

Chain of Correspondence For Approval of Water Control Manual

CESPD-ED-W (CESPL-ED-HR/14 Nov 89) (1110-2-240) 3rd End Hsu/bg/5-1521
SUBJECT: Hansen Dam Water Control Manual

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

28 SEP 1990

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

1. Subject manual is approved subject to the correction of the anomaly on the outflow hydrograph curve at 15 hours on 3-2-83 in Plate 8-7.

2. District is requested to submit four copies of report quality reproduction of this final version of the manual to this office after completion.

FOR THE COMMANDER:

Encl
wd

JAY K. SOPER
Director, Engineering

CF:
CESPD-ED-W
CESPD-ED-W/HSU
CESPD RF

JH/bg
CESPD-E
5-1521
28 SEP
CESPD-E
WCD
JKS 28 S
CESPD-E

28 SEP 1990

10 SEP 1990

CESPL-ED-HR (CESPL-ED-HR/14 Nov 89) (1110-2-240b) 2nd End. Stuart FTS 798-3001
SUBJECT: Hansen Dam Water Control Manual

DA, Los Angeles District, Corps of Engineers, 300 N. Los Angeles Street,
Los Angeles, CA 90053-2325

FOR Commander, South Pacific Division, ATTN: CESPD-ED

1. Enclosed are four copies of the final Hansen Dam Water Control Manual prepared in accordance with ETL 110-2-251. Responses to CESPD comments (enclosure 1) 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 you have any questions, please contact Robert Stuart of our Reservoir Regulation Section.

FOR THE COMMANDER:

Encls

ROBERT E. KOPLIN, PE
Chief, Engineering Division

CF: (wo/encls)

CESPL-ED-H
CESPL-ED-HR (2)
CESPL-ED-S

KOPLIN
CESPL-ED

LEIFIELD
CESPL-ED

EVELYN
CESPL-ED-H

BIGORNIA
CESPL-ED-HR

STUART
CESPL-ED-HR
ep/X3001

CESPD-ED-W (CESPL-ED-HR/14 Nov 89) (1110-2-240b) 1st End Krhoun/8-465-1433
SUBJECT: Hansen Dam Water Control Manual

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

23 MAR 1990

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

1. Subject final draft manual has been reviewed and comments are enclosed. 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. The EA associated with the manual was received and reviewed in January 1990. There are no comments on this document.

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

FOR THE COMMANDER:

2 Encls
Wd all cys of encl 1
Added 1 Encl
2. Comments

JAY K. SOPER
Director
Directorate of Engineering

CF: CESPD-ED-W/Krhoun (w/encl)
CESPD-ED-W (w/encl)
CESPD EF

FK/dh
CESPD-ED
5-1433
23 Mar 90

JM
CESPD-ED

WCD

JKS
CESPD-ED

FACSIMILE HEADER SHEET
(ER 105-1-5)

FROM (Name)	OFFICE SYMBOL	TELEPHONE NO.	RELEASER'S SIGNATURE		
F. Krhoun	CESPD-ED-W	705-1433	F. K[illegible]		
TO (Name)	OFFICE SYMBOL	TELEPHONE NO.	# PAGES	PRECEDENCE	DTG
B. Bigornia	CESPL-ED-HR	798-6915	2	ASAP	

SUBJECT

*U.S. Government Printing Office: 1988-[illegible]

CESPD-ED-W 8 March 1990

SOUTH PACIFIC DIVISION
COMMENTS ON
WATER CONTROL MANUAL
HANSEN DAM

1. Page III-2, 2nd line- Hansen Dam was authorized as a single purpose flood control reservoir. As such, its operation of the dam was for flood control and it should not have to be operated "more strictly" due to sediment increase. Suggest this sentence be revised.

2. Page III-3, Paragraph 3-05- Delete "and conservation storage" in the third line of this paragraph. Since the project was authorised for only flood control storing water for conservation purposes is not appropriate. It is noted that releasing water from the debris pool to enhance groundwater activities of LACDPW is desirable as this storage would not effect the protection afforded downstream.

3. Page V-3, Paragraph 5-06a- Indicate that Lopez Dam is ungated and that is the reason that there are no electrical or telephone at the dam. This would eliminate any possibility someone questioning the lack of facilities at dam.

4. Page VI-1, Paragraph 6-01a- Delete the last sentence in this sub-paragraph as it relates to future operations.

5. Page VII-2, Paragraph 7-05-

a. In the first paragraph change coordinated to attempt to inform. It appears the manual as written infers approval of LACDPW prior to the Corps making flood control releases. In the event of a communication outage the Corps should make flood control releases even if it can't contact LACDPW.

b. Revise the third sentence of the second paragraph. It is unlikely that outflow could equal inflow unless the reservoir is in a static condition, that is there is no change in storage. In most cases there will be a change of storage which is caused by a difference between inflow and outflow unless the gates settings are constantly changed. The plan in the manual calls for all gates to be fully opened once the reservoir reaches elevation 1010.5 feet.

6. Page VII-3, Paragraph 7-05- In the first full sub-paragraph on this page the manual states Hansen Dam is a component of a reservoir system and will be operated accordingly. Briefly describe in this section how that is to be accomplished.

7. Page VII-5, Paragraph 7-13- Eliminate the second sub-paragraph. The water control plan is based on the rated capacity of the downstream channel which should be able to pass the maximum release with minor damages. It is noted that the

District Commander has the approval authority for emergencies. Any planned deviations from approved operating criteria must be submitted to the Division office for approval.

8. Page VIII-7, Paragraph 8-06- This paragraph indicates that flood control releases will not be made until until LACDPW has adjusted its diversion gate in the channel downstream of the dam. The District should not be restricted to making releases by the downstream interests. Revise this paragraph to indicate the District will attempt to provide adequate warning time to downstream interests if flood control releases are to be made. District should make releases as shown in the operating plan even if LACDPW has not been able to adjust its diversion gate.

9. Plate 3-4- See comment 8 for notification of LACDPW.

10. Plate 4-2- The row marked annual is misleading. The data in this row is either average like mean monthly temperature and precipitation or maximums and minimums. Please revise the table accordingly. Although this table is based on 34 years of record the period of record ends in 1964. It would be more appropriate if this data could be shown for a gage with approximately the same length of record in the vicinity of the one shown in the chart which is still active and would be representative of Burbank.

11. Plate 4-8- Extend this chart through water year 1989.

12. Plates 5-4 and 5-6- Extend these tables through the channel capacity of 20,800 cfs.

13. Plate 8-7- There appears to be an error in the inflow and outflow curves at 1500 hours on 3-2-83.

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

REPLY TO ATTENTION OF:

CESPL-ED-HR (1110-2-240) 14 November 1989

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

SUBJECT: Hansen Dam Water Control Manual

1. Enclosed are three draft copies of the Hansen Dam Water Control Manual for your review and approval. The draft Environmental Assessment (EA) has been completed and requires additional coordination to address biological issues with the U.S. Fish and Wildlife Service. Submittal of the draft EA is expected to be made before the end of the calendar year. We are sending the draft Water Control Manual ahead of the EA in order to expedite the review process and minimize delays in the 3-year program for water control manual updates.

2. A copy of the draft Water Control Manual has also been sent to the Los Angeles County Department of Public Works for concurrent review.

FOR THE COMMANDER:

for [signature]
ROBERT E. KOPLIN, PE
Chief, Engineering Division

Encl (3 copies)