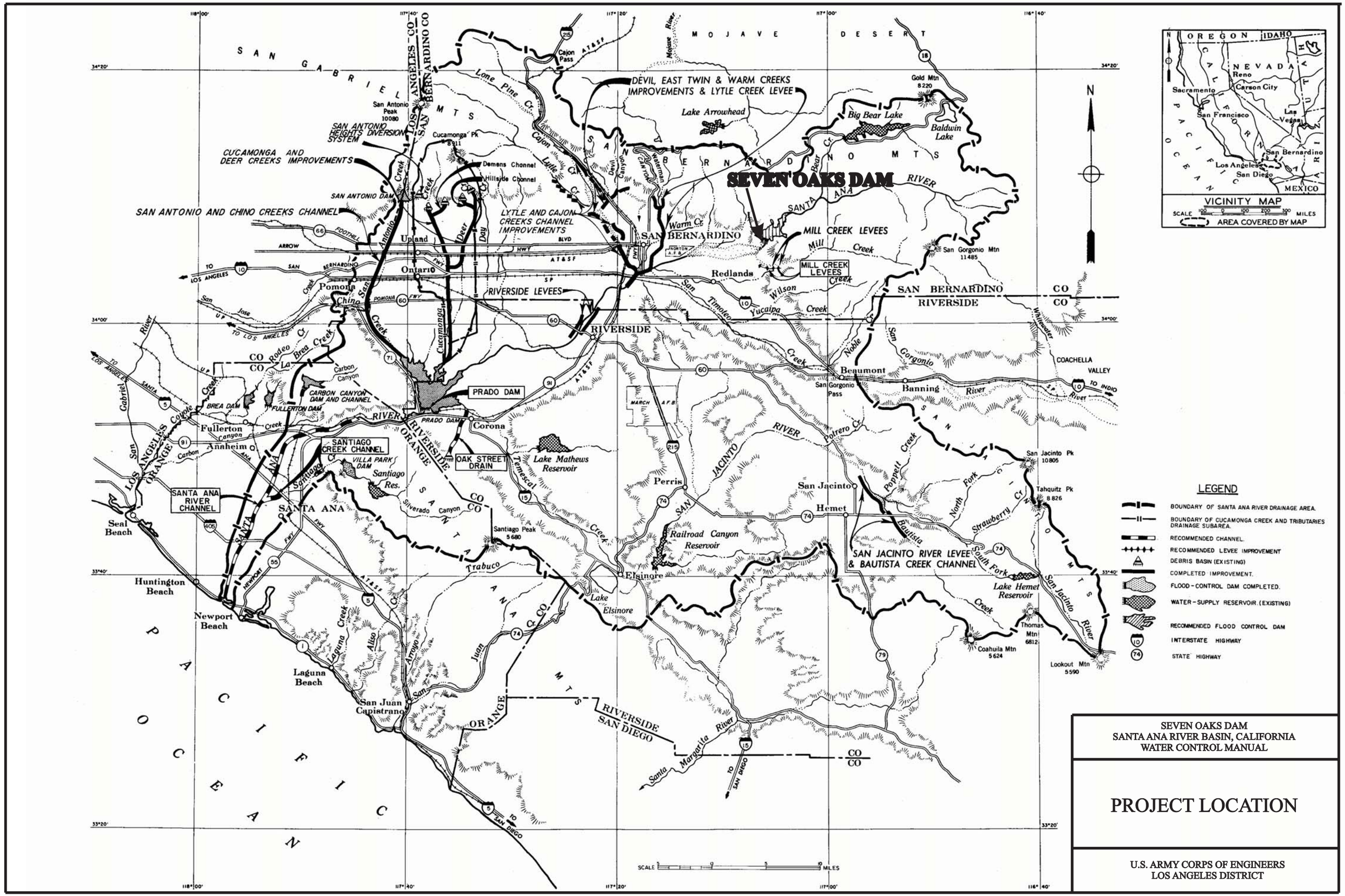


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

PROJECT LOCATION

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-01

The Plate you are attempting to access (Plate 2-02) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-03) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-04) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-05) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-05A) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-06) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-07) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-08) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-09) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-09A) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-10) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-11) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-12) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-13) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-14) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-15) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-16) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-17) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-18) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-19) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-20) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-21) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-22) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-23) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-24) is not currently available.

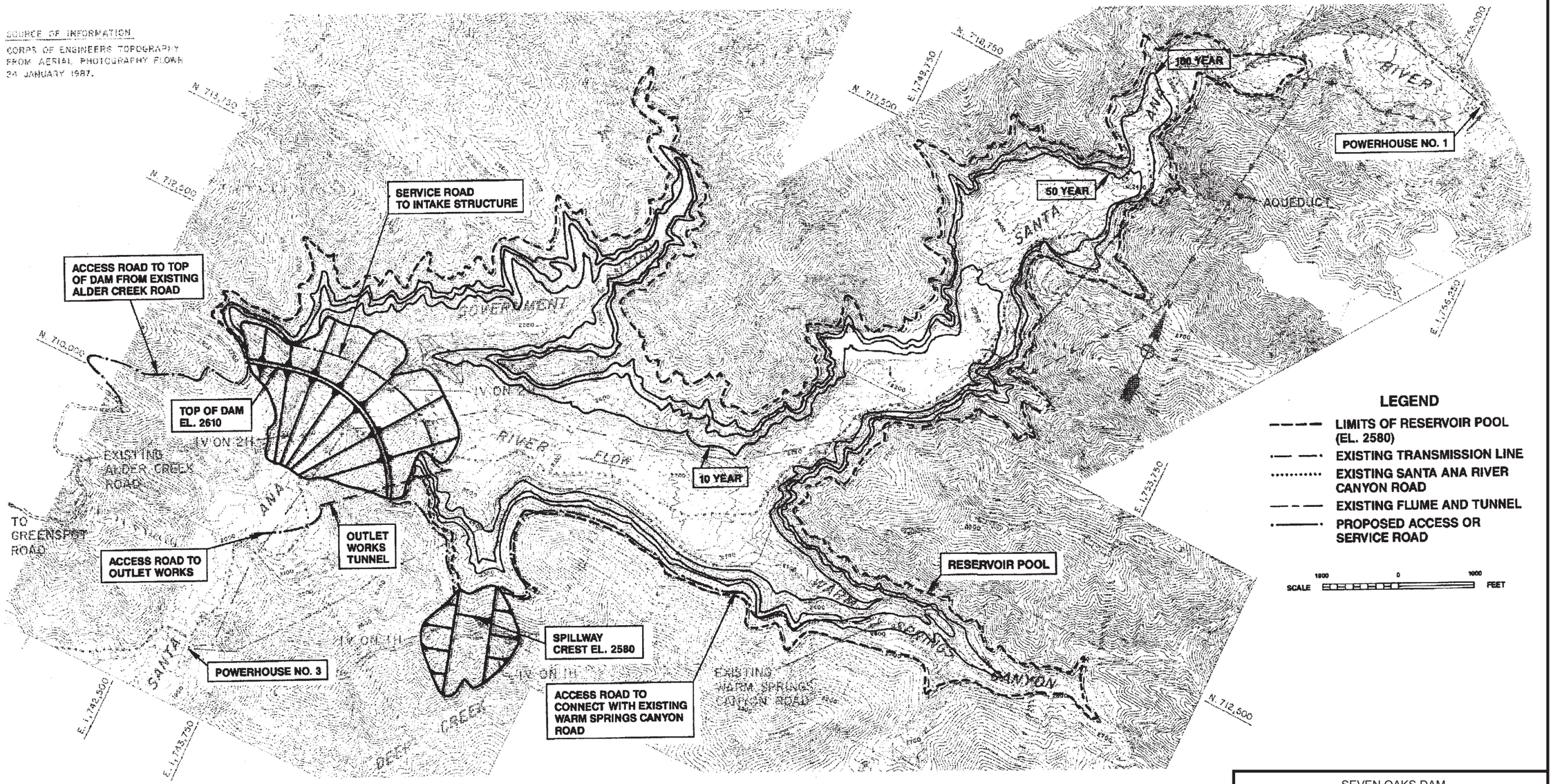
For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

The Plate you are attempting to access (Plate 2-25) is not currently available.

For additional information, please contact the Los Angeles District Public Affairs Office at (213) 452-3908.

SOURCE OF INFORMATION

CORPS OF ENGINEERS TOPOGRAPHY FROM AERIAL PHOTOGRAPHY FLOWN 24 JANUARY 1987.

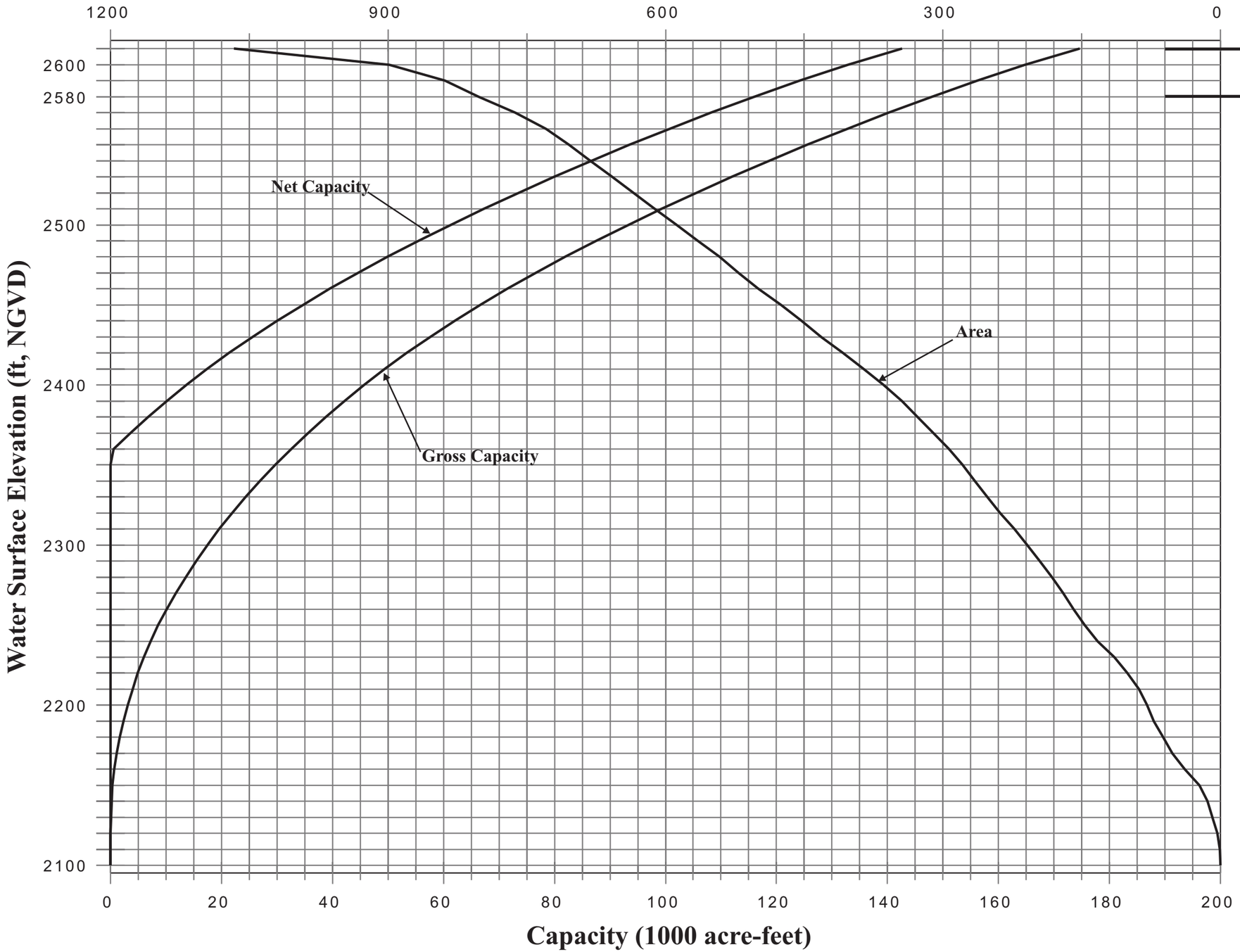


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

RESERVOIR FILLING FREQUENCY INUNDATION MAP

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2-26



NOTE:

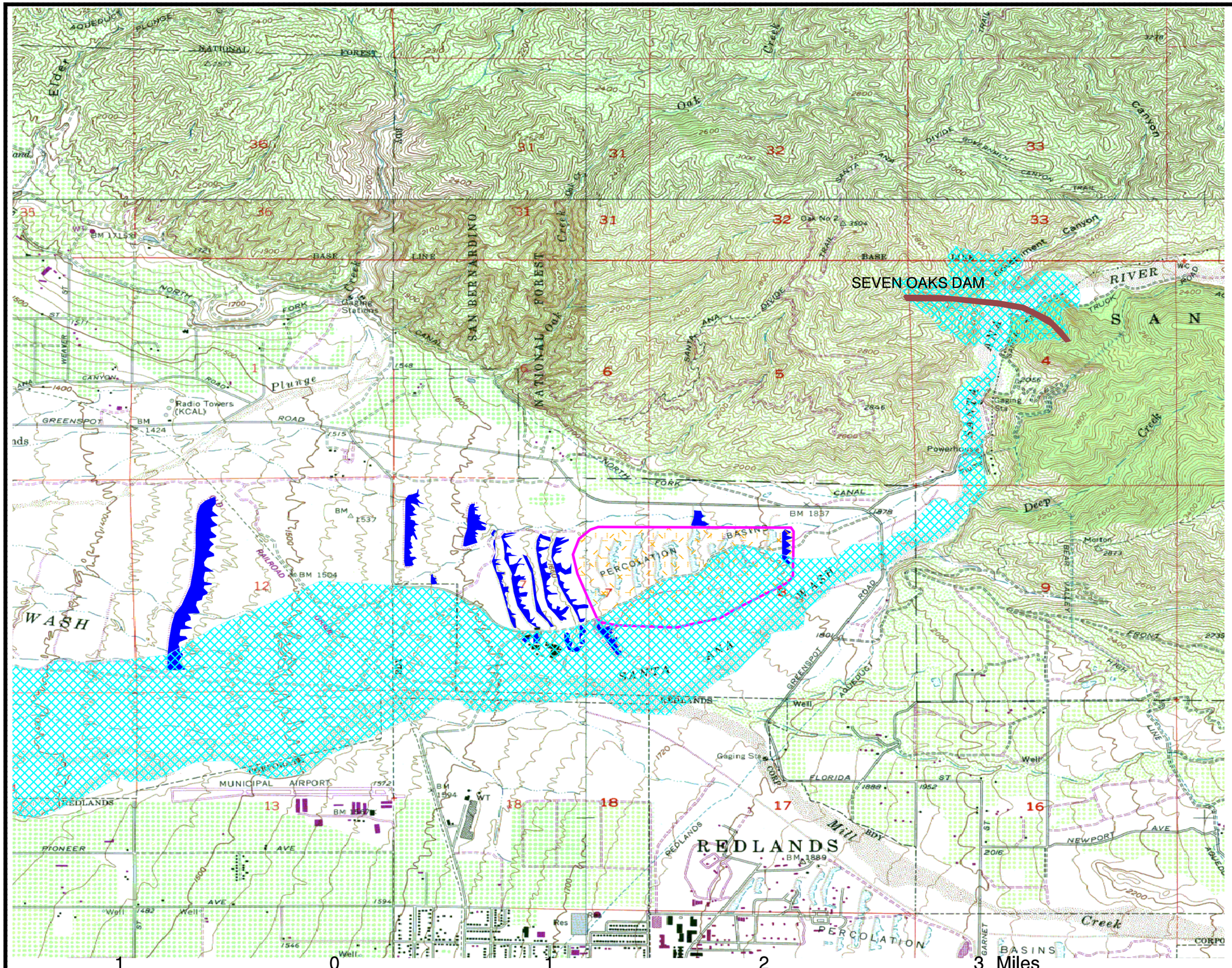
The Net Capacity is the Gross Capacity minus the sediment allotment if 32,000 ac-ft.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

AREA AND CAPACITY CURVES

BASED ON 1999 SURVEY

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



N

W E

S

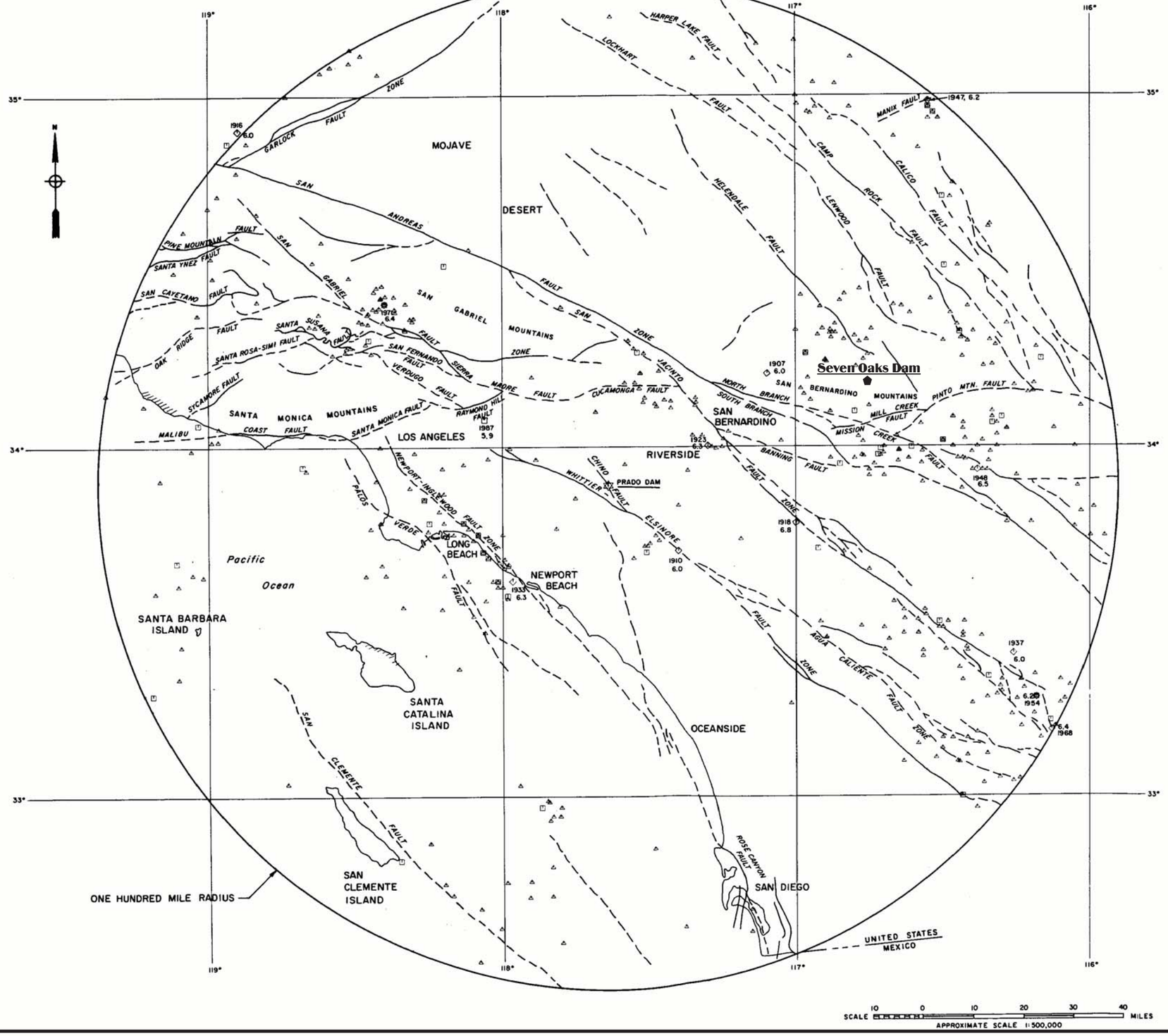
- Seven Oaks Dam
- 100-yr Overflow with Seven Oaks Dam
- Basins Under Construction
- Existing Basins

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

SBVWCD SPREADING BASINS DOWNSTREAM OF SEVEN OAKS DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 3-01



LEGEND

- EARTHQUAKE WITH MAGNITUDE 4.0 THRU 4.99
- EARTHQUAKE WITH MAGNITUDE 5.0 THRU 5.99
- EARTHQUAKE WITH MAGNITUDE 6.0 THRU 6.99
- LOCATION OF PROJECT AREA
- TRACE OF FAULT DASHED WHERE INFERRED OR CONCEALED

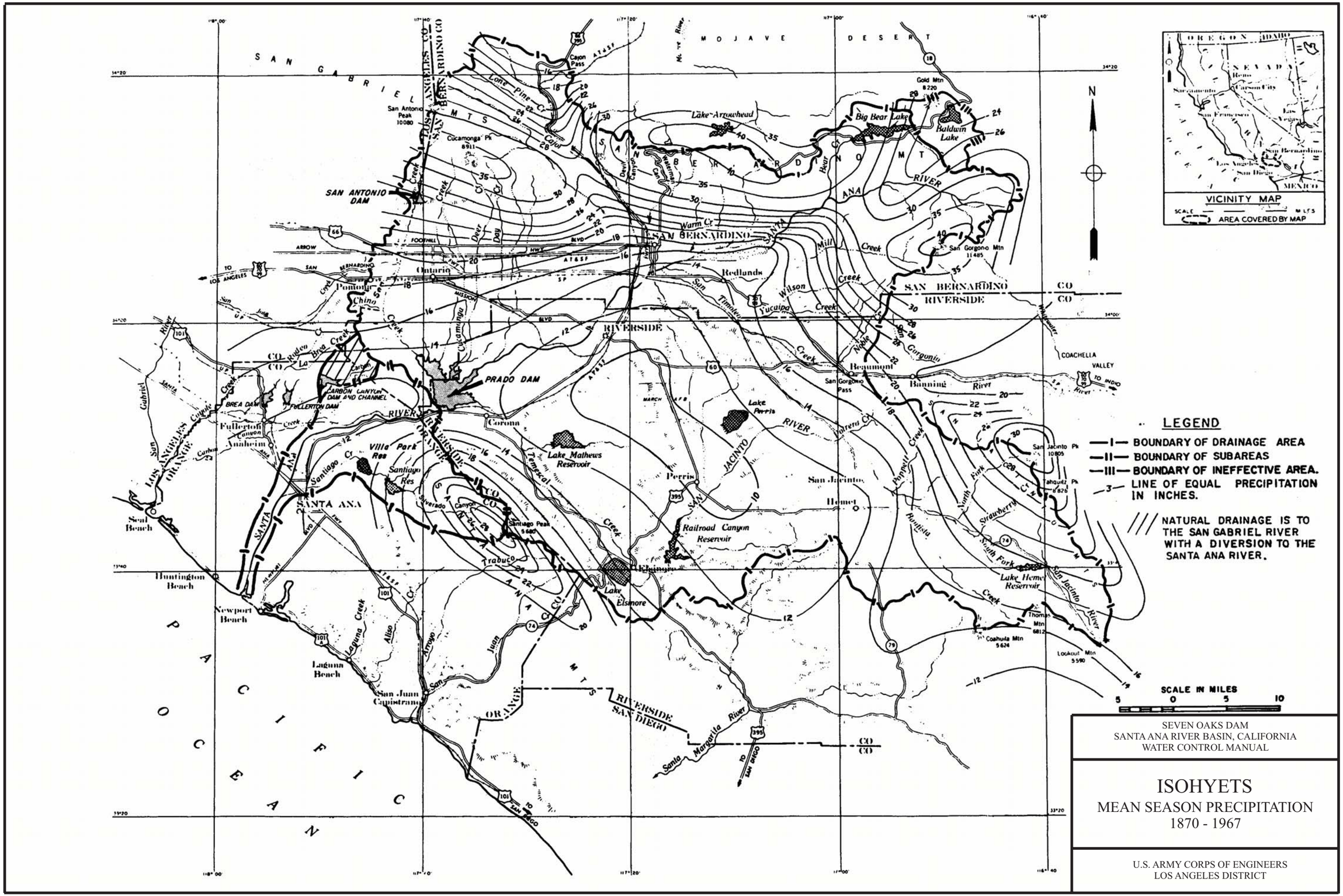
NOTES:

1. Richter scale magnitudes are a measure of the energy released at the focus (center of the earthquake) as determined by the amplitudes produced on a seismogram.
2. The epicenter is the point on the earth's surface directly above the focus.
3. Earthquake epicenters plotted are from 1932 to 1987, unless earlier dates are shown.
4. Base map modified from state of California (South Half) 1:500,000 topographic map; United States Geological Survey, 1981.
5. Locations of faults are approximate. Data derived from various California Division of Mines and Geology and United States Geological Survey publications.
6. Earthquake epicenter locations are from California Institute of Technology's seismologic data base for Southern California, Nevada, and Arizona; from Toppozada and others (1981), and from Toppozada and Parke (1982).

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

EARTHQUAKE EPICENTER AND FAULT LOCATION

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELELS DISTRICT

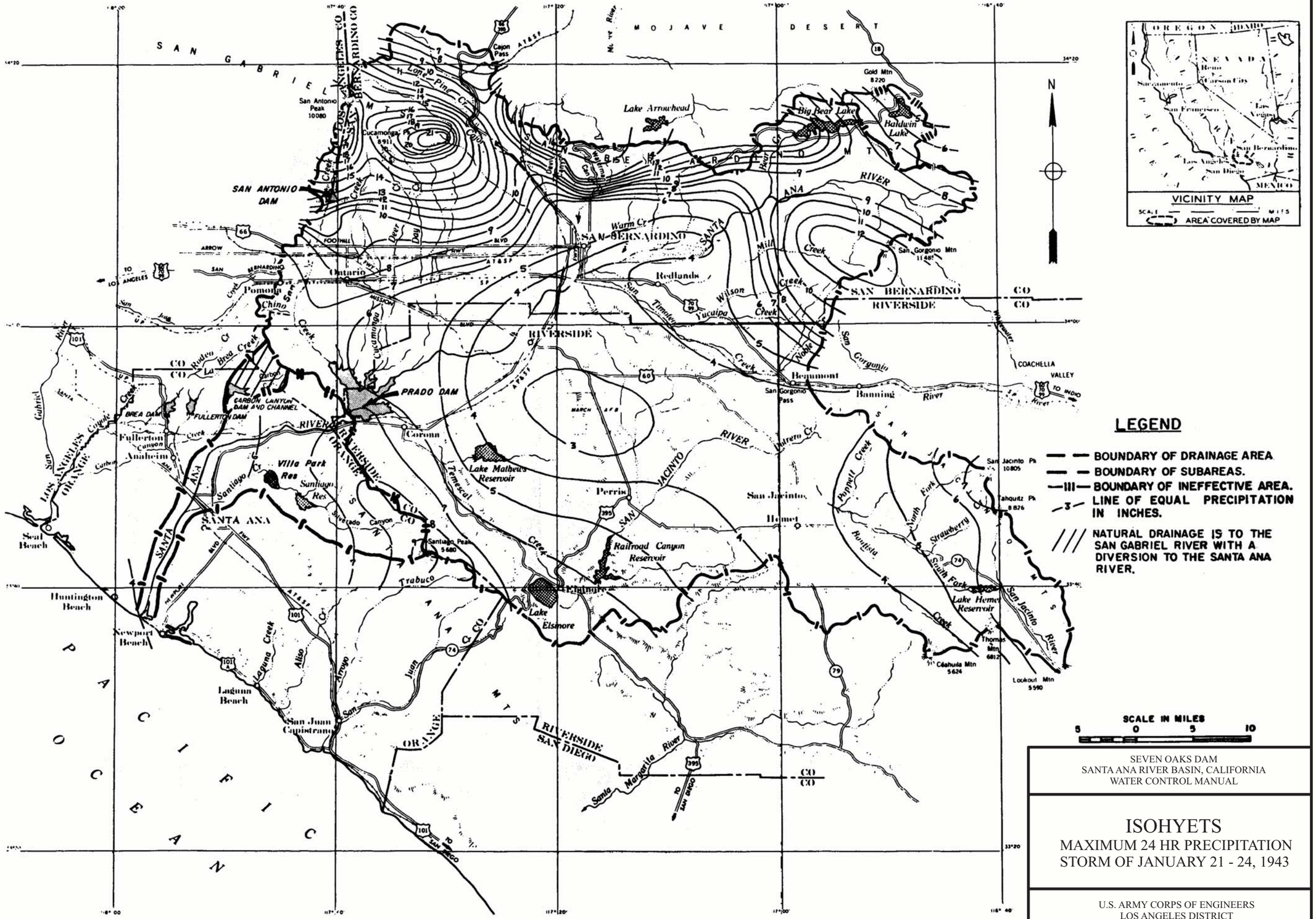


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

ISOHYETS
MEAN SEASON PRECIPITATION
1870 - 1967

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-02



LEGEND

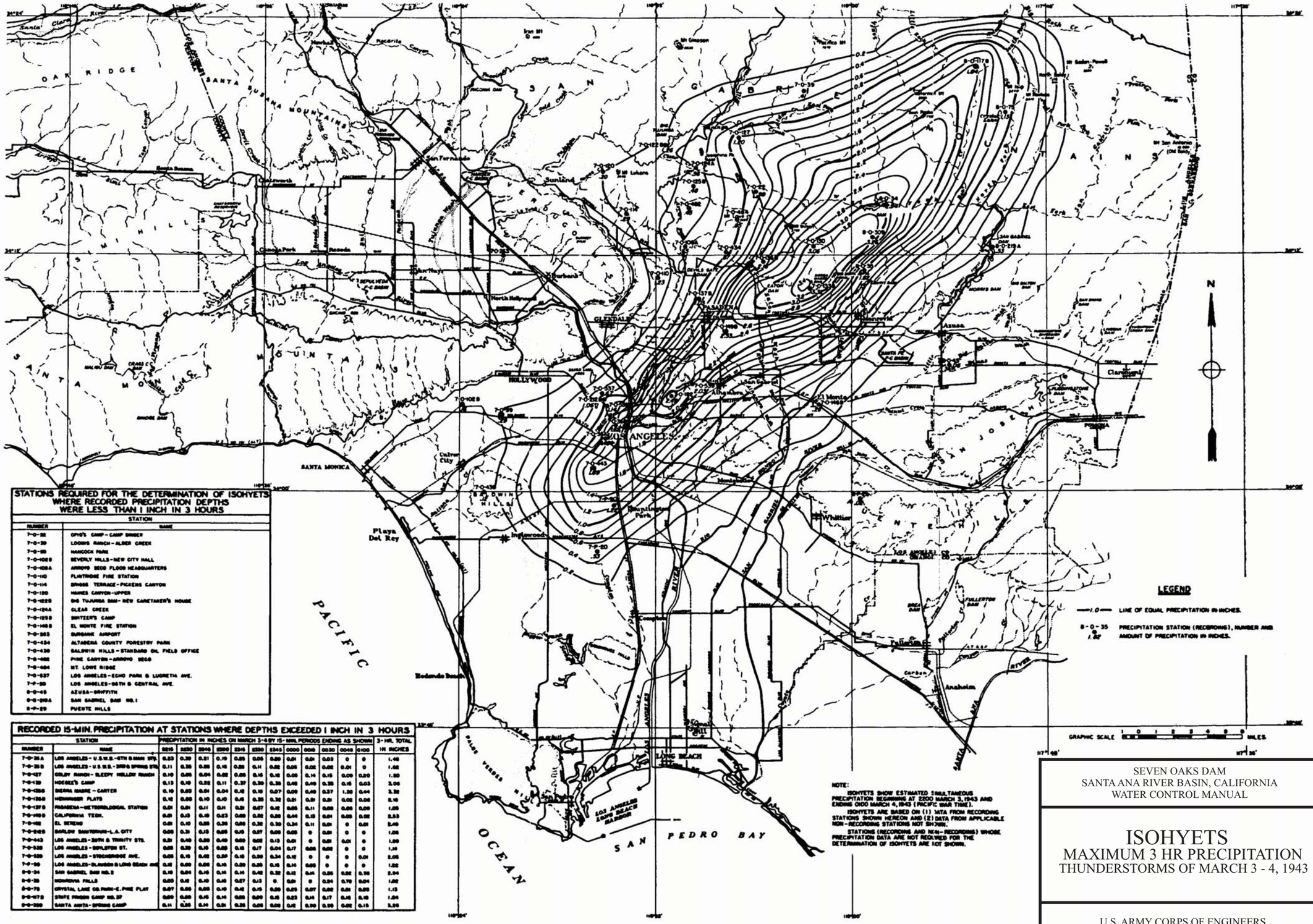
- BOUNDARY OF DRAINAGE AREA
- BOUNDARY OF SUBAREAS.
- BOUNDARY OF INEFFECTIVE AREA.
- 3 LINE OF EQUAL PRECIPITATION IN INCHES.
- /// NATURAL DRAINAGE IS TO THE SAN GABRIEL RIVER WITH A DIVERSION TO THE SANTA ANA RIVER.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

ISOHYETS
MAXIMUM 24 HR PRECIPITATION
STORM OF JANUARY 21 - 24, 1943

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-03



LEGEND

—1.0— LINE OF EQUAL PRECIPITATION IN INCHES.

8-O-35 / 1.32 PRECIPITATION STATION (RECORDING), NUMBER AND AMOUNT OF PRECIPITATION IN INCHES.

GRAPHIC SCALE 0 1 2 3 4 5 6 MILES

NOTE:
ISOHYETS SHOW ESTIMATED SIMULTANEOUS PRECIPITATION BEGINNING AT 2200 MARCH 3, 1943 AND ENDING 0100 MARCH 4, 1943 (PACIFIC WAR TIME).
ISOHYETS ARE BASED ON (1) DATA FROM RECORDING STATIONS SHOWN HEREON AND (2) DATA FROM APPLICABLE NON-RECORDING STATIONS NOT SHOWN.
STATIONS (RECORDING AND NON-RECORDING) WHOSE PRECIPITATION DATA ARE NOT RECEIVED FOR THE DETERMINATION OF ISOHYETS ARE NOT SHOWN.

STATIONS REQUIRED FOR THE DETERMINATION OF ISOHYETS WHERE RECORDED PRECIPITATION DEPTHS WERE LESS THAN 1 INCH IN 3 HOURS

STATION NUMBER	STATION NAME
7-O-32	OPID'S CAMP – CAMP SINNER
7-O-39	LOOMIS RANCH – ALDER CREEK
7-O-59	HANCOCK PARK
7-O-102B	BEVERLY HILLS – NEW CITY HALL
7-O-108A	ARROYO SECO FLOOD HEADQUARTERS
7-O-110	FLINTRIDGE FIRE STATION
7-O-114	SPRUCE TERRACE – PICKENS CANYON
7-O-120	HAINES CANYON – UPPER
7-O-122B	DWP TUJUNGA DAM – NEW CARETAKER'S HOUSE
7-O-124A	CLEAR CREEK
7-O-125B	SWITZER'S CAMP
7-O-146B	EL MONTE FIRE STATION
7-O-263	BURBANK AIRPORT
7-O-434	ALTADENA COUNTY FORESTRY PARK
7-O-438	BALDWIN HILLS – STANDARD OIL FIELD OFFICE
7-O-482	PINE CANYON – ARROYO SECO
7-O-484	MT. LOWE RIDGE
7-O-537	LOS ANGELES – ECHO PARK & LUCRETIA AVE.
7-P-20	LOS ANGELES – 98TH & CENTRAL AVE.
8-O-48	AZUSA – GRIFFITH
8-O-240A	SAN GABRIEL DAM NO. 1
8-P-29	PUENTE HILLS

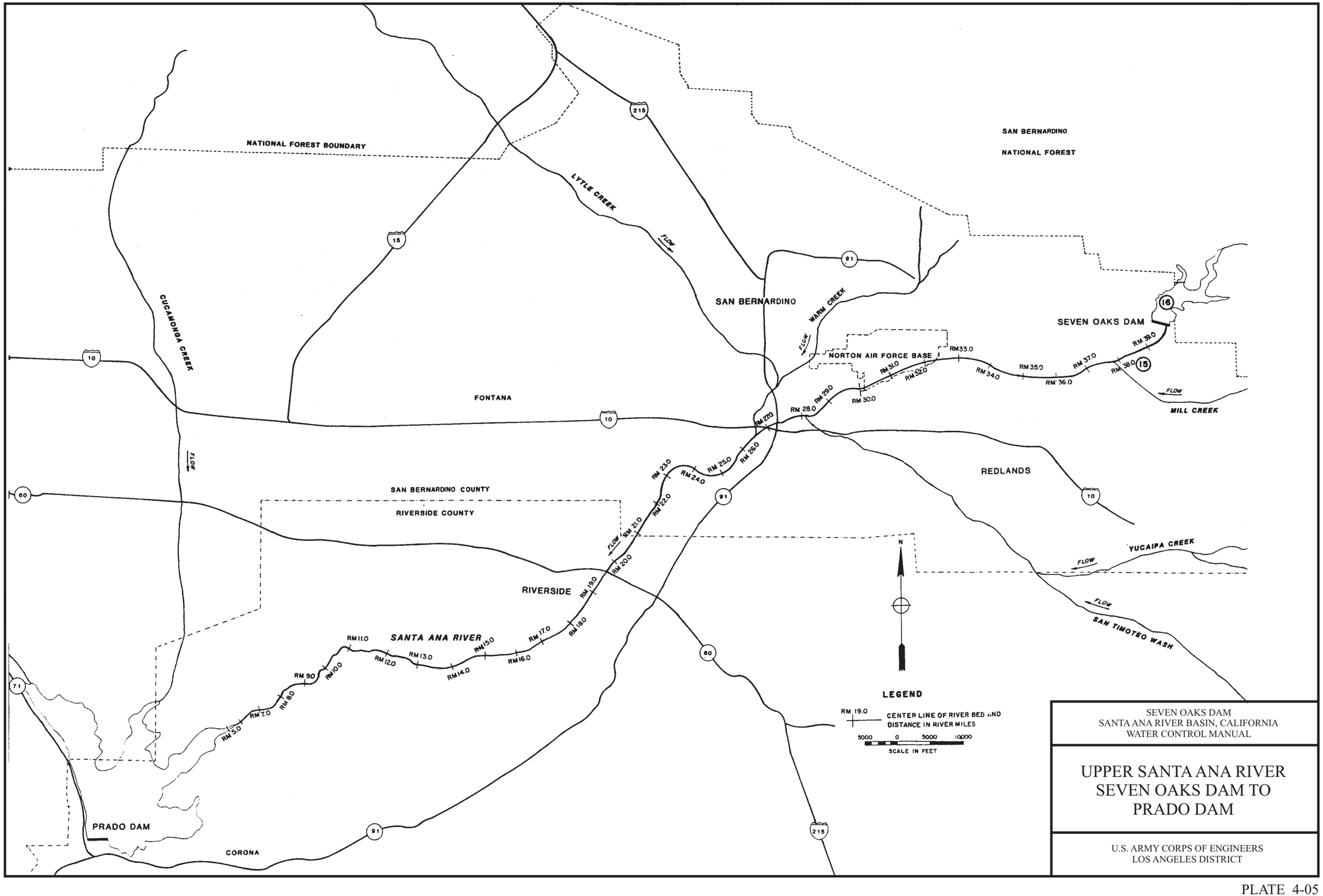
RECORDED 15-MIN. PRECIPITATION AT STATIONS WHERE DEPTHS EXCEEDED 1 INCH IN 3 HOURS

STATION NUMBER	STATION NAME	PRECIPITATION IN INCHES ON MARCH 3-4 BY 15-MIN. PERIODS ENDING AS SHOWN												3-HR. TOTAL IN INCHES
		2215	2230	2245	2300	2315	2330	2345	0000	0015	0030	0045	0100	
7-O-35A	LOS ANGELES – U.S.W.B. – 6TH & MAIN STS.	0.53	0.39	0.21	0.19	0.25	0.05	0.09	0.01	0.01	0.03	0	0	1.48
7-O-35B	LOS ANGELES – U.S.W.B. – 3RD & SPRING STS.	0.11	0.35	0.25	0.16	0.28	0.11	0.02	0.05	0.02	0.01	0	0	1.06
7-O-127	GOLDY RANCH – SLEEPY HOLLOW RANCH	0.10	0.05	0.04	0.02	0.05	0.15	0.10	0.05	0.14	0.15	0.09	0.20	1.30
7-O-139	HOEGEE'S CAMP	0.13	0.10	0.22	0.11	0.37	0.39	0.35	0.40	0.40	0.35	0.15	0.03	3.05
7-O-139A	SIERRA MADRE – CARTER	0.10	0.03	0.01	0.04	0.12	0.10	0.07	0.09	0.40	0.37	1.30	0.44	3.28
7-O-139B	HUMMINGBIRD FLATS	0.12	0.05	0.10	0.10	0.15	0.35	0.32	0.21	0.21	0.21	0.05	0.06	2.19
7-O-137B	PASADENA – METEOROLOGICAL STATION	0.01	0.01	0.11	0.11	0.25	0.07	0.12	0.05	0.11	0.05	0.05	0.00	1.05
7-O-140B	CALIFORNIA TECH.	0.01	0.13	0.10	0.23	0.05	0.02	0.25	0.04	0.15	0.01	0.05	0.02	2.53
7-O-142	EL SERENO	0.01	0.10	0.05	0.25	0.05	0.32	0.30	0.24	0.11	0.01	0	0.01	2.49
7-O-143B	BARLOW SANATORIUM – L.A. CITY	0.01	0.31	0.13	0.05	0.10	0.07	0.05	0.05	0	0.01	0	0	1.06
7-O-143	LOS ANGELES – 36TH & TRINITY STS.	0.01	0.05	0.05	0.05	0.05	0.05	0.13	0.07	0	0.01	0.01	0	1.59
7-O-538	LOS ANGELES – DOYLETOWN ST.	0.05	0.39	0.15	0.05	0.15	0.17	0.04	0.17	0.05	0.05	0	0	1.31
7-O-539	LOS ANGELES – STOCKBRIDGE AVE.	0.05	0.15	0.45	0.25	0.15	0.25	0.34	0.12	0	0	0	0.01	2.05
7-P-90	LOS ANGELES – ISLANDIA & LONG BEACH AVE.	0.12	0.25	0.25	0.15	0.25	0.25	0.15	0.14	0.05	0	0	0	1.32
8-O-24	SAN GABRIEL DAM NO. 2	0.10	0.01	0.15	0.15	0.14	0.42	0.32	0.12	0.14	0.25	0.02	0.19	2.34
8-O-25	MONROVIA FALLS	0.03	0.12	0.10	0.10	0.27	0.13	0	0.05	0	0.24	0.70	0.04	1.82
8-O-75	CRYSTAL LAKE CG PARK – E. PINE FLAT	0.07	0.05	0.05	0.10	0.12	0.15	0.05	0.25	0.07	0.02	0.01	0.03	1.15
8-O-97B	STATE PRISON CAMP NO. 37	0.05	0.05	0.15	0.14	0.05	0.09	0.15	0.23	0.14	0.17	0.15	0.15	1.04
8-O-200	SANTA ANITA – SPRING CAMP	0.11	0.25	0.14	0.21	0.35	0.05	0.05	0.12	0.20	0.20	0.02	0.15	2.26

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

ISOHYETS
MAXIMUM 3 HR PRECIPITATION
THUNDERSTORMS OF MARCH 3 - 4, 1943

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

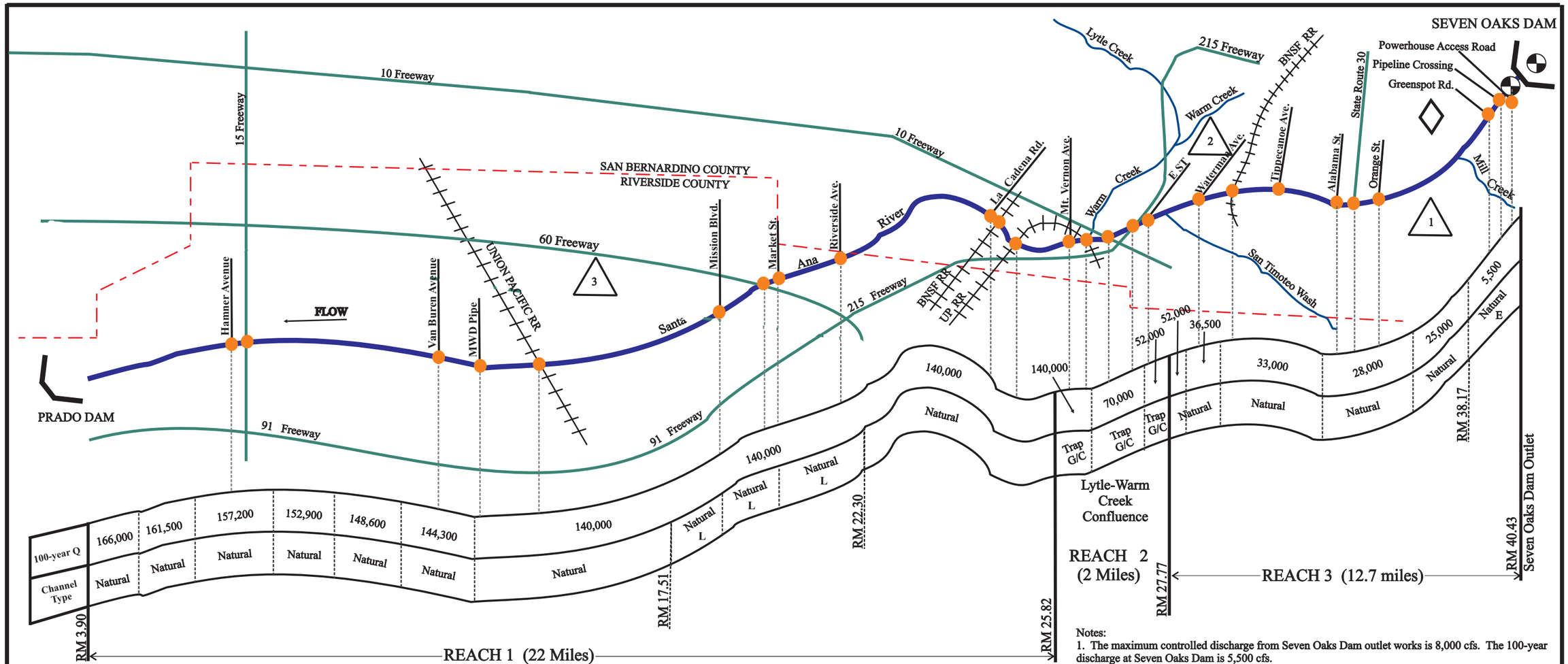


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

UPPER SANTA ANA RIVER SEVEN OAKS DAM TO PRADO DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-05



Notes:

1. The maximum controlled discharge from Seven Oaks Dam outlet works is 8,000 cfs. The 100-year discharge at Seven Oaks Dam is 5,500 cfs.

2. Discharge values shown in the channel configuration are based on the post project 100-year flood plain and floodway delineation for the upper Santa Ana River. This information is contained in a report entitled, Feature Design memorandum No.2, Seven Oaks Dam, Floodway Delineation, dated August 1991. The discharges shown can be contained within the channel limits.

3. The delineated floodway (for the specified discharges above) is exceeded at 3 major parts of Reach 3: 1) AT&SF Railroad Bridge, 2) State Route 30 and Orange Street, and 3) Church Street extension. The 100-year discharge is fully contained within the delineated floodway channel for Reaches 1 and 2.

Legend

	Dam
	Recharge Basin
	Stream Gage
	Bridge Locations
U	Unlined Channel
C	Concrete
G	Grouted Stone
G/C	Side Slope/Bottom
L	Levee
E	Earth Berm

	Significant Features	River Miles (RM)	Remarks
	Santa Ana River above Seven Oaks Dam		Located on right bridge abutment of the Southern California Edison bridge crissing, just u/s of Alder Creek confluence
	Santa Ana River near Mentone		In San Bernardino County, on right bank near mouth of canyon, 1.6 miles u/s from Mill Creek, 3.2 miles, NE of Mentone, 16 miles d/s from Big Bear Lake.
1	Redlands Municipal Airport	0.5	This distance is relative to Seven Oaks Dam.
2	Norton Airforce Base	4.4	This distance is relative to Seven Oaks Dam.
3	Flabob Airport	18.4	This distance is relative to Seven Oaks Dam.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

CHANNEL CONFIGURATIONS
SEVEN OAKS DAM TO PRADO DAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-05A

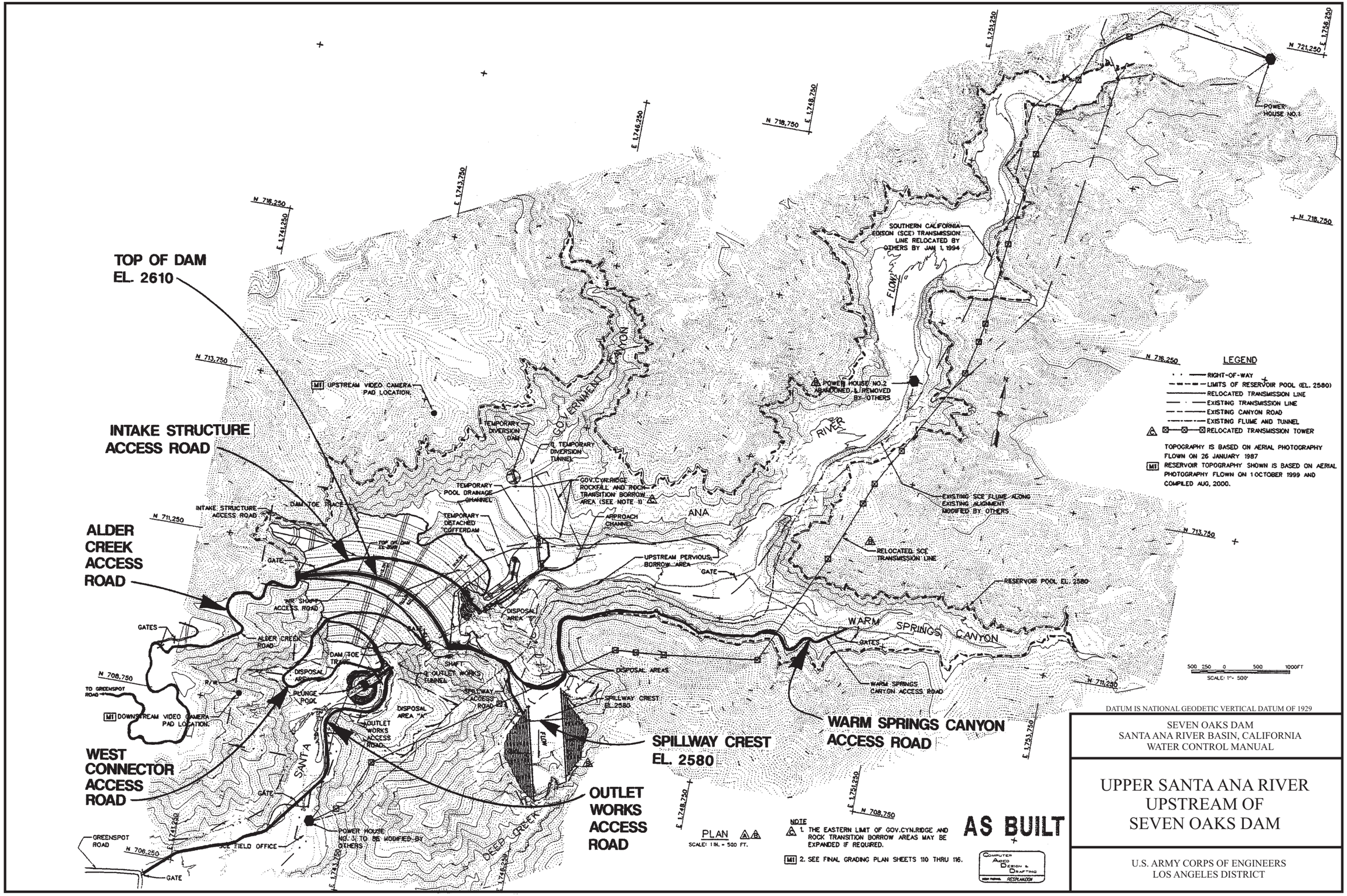
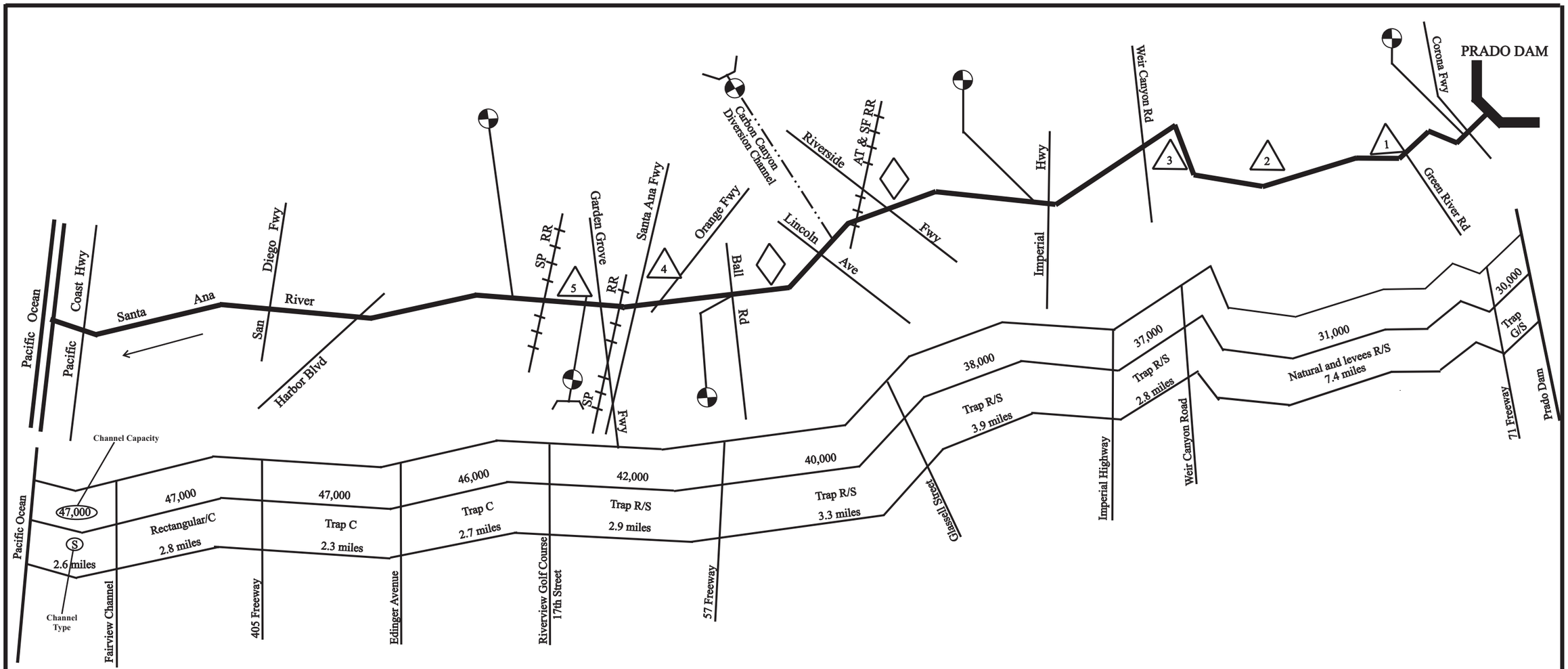

TOP OF DAM
EL. 2610
INTAKE STRUCTURE
ACCESS ROAD
ALDER
CREEK
ACCESS
ROAD
WEST
CONNECTOR
ACCESS
ROAD
SPILLWAY CREST
EL. 2580
OUTLET
WORKS
ACCESS
ROAD
WARM SPRINGS CANYON
ACCESS ROAD
POWER HOUSE NO.1
POWER HOUSE NO.2
ABANDONED, TO BE REMOVED BY OTHERS
SOUTHERN CALIFORNIA EDISON (SCE) TRANSMISSION LINE RELOCATED BY OTHERS BY JAN 1, 1994
EXISTING SCE FLUME ALONG EXISTING ALIGNMENT MODIFIED BY OTHERS
RELOCATED SCE TRANSMISSION LINE
RESERVOIR POOL EL. 2580
GOVERNMENT CANYON
WARM SPRINGS CANYON
SANTA ANA RIVER
DEEP CREEK
UPSTREAM VIDEO CAMERA PAD LOCATION
DOWNSTREAM VIDEO CAMERA PAD LOCATION
TEMPORARY DIVERSION DAM
TEMPORARY DIVERSION TUNNEL
TEMPORARY POOL DRAINAGE CHANNEL
TEMPORARY DETACHED COFFERDAM
GOV.CYN.RIDGE ROCKFALL AND ROCK TRANSITION BORROW AREA (SEE NOTE 1)
APPROACH CHANNEL
UPSTREAM PERVIOUS BORROW AREA
DISPOSAL AREA "E"
DISPOSAL AREAS
DISPOSAL AREA "A"
DAM TOE TRACE
ADIT SHAFT
OUTLET WORKS TUNNEL
SPILLWAY ACCESS ROAD
PLUNGE POOL
SPILLWAY CREST EL. 2580
ADIT SHAFT ACCESS ROAD
ALDER CREEK ROAD
WARM SPRINGS CANYON ACCESS ROAD
SCE FIELD OFFICE
POWER HOUSE NO. 3 TO BE MODIFIED BY OTHERS
GREENSPOT ROAD
TO GREENSPOT ROAD
GATES
GATE
R/W
N 721,250
E 1,756,250
N 718,750
E 1,751,250
E 1,748,250
E 1,746,250
E 1,743,750
E 1,741,250
N 718,250
N 716,250
N 713,750
N 711,250
N 708,750
N 706,250
E 1,753,750
E 1,751,250
E 1,748,250
E 1,746,250
E 1,743,750
E 1,741,250
LEGEND
RIGHT-OF-WAY
LIMITS OF RESERVOIR POOL (EL. 2580)
RELOCATED TRANSMISSION LINE
EXISTING TRANSMISSION LINE
EXISTING CANYON ROAD
EXISTING FLUME AND TUNNEL
RELOCATED TRANSMISSION TOWER
TOPOGRAPHY IS BASED ON AERIAL PHOTOGRAPHY FLOWN ON 26 JANUARY 1987
M1 RESERVOIR TOPOGRAPHY SHOWN IS BASED ON AERIAL PHOTOGRAPHY FLOWN ON 1 OCTOBER 1999 AND COMPILED AUG, 2000.
500 250 0 500 1000FT
SCALE: 1"= 500'
PLAN
SCALE: 1 IN. = 500 FT.
NOTE
1. THE EASTERN LIMIT OF GOV.CYN.RIDGE AND ROCK TRANSITION BORROW AREAS MAY BE EXPANDED IF REQUIRED.
M1 2. SEE FINAL GRADING PLAN SHEETS 110 THRU 116.
AS BUILT
COMPUTER AIDED DESIGN & DRAFTING
DATUM IS NATIONAL GEODETIC VERTICAL DATUM OF 1929
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL
UPPER SANTA ANA RIVER
UPSTREAM OF
SEVEN OAKS DAM
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4-05B



Legend

- Dam
- Recharge Basin
- Stream Gage
- U Channel Unlined
- R Rip Rap Side Slopes
- C Concrete
- G Grouted Stone
- G/G Side Slope/Bottom
- L Levee
- S Soft Bottom

	Significant Features	Miles	Remarks
	Santa Ana River at Prado	31.2	Telemetry 052 PRAO
1	Green River Golf Course, Mobile Homes	20.4 - 27.2	
2	Featherly Park	25.7 - 24.2	
3	Horseshoe Bend	23.6	Orchards, Savi and Bryant Levees
	Santa Ana River at Imperial	19.9	
	Santa Ana River Spreading Grounds	19.8 -13.8	All Flood discharges less than 2200 cfs flows into the Santa Ana River
	Carbon Canyon Diversion Channel	16.1	Flows exceeding 2200 cfs will split at Miller Retarding Basin
	Santa Ana River at Ball Road	14.2	
4	Anaheim Stadium	12.8	Flows Regulated by Santiago Dam and Villa
5	Riverview Golf Course	11.9 - 9.9	
	Santiago Creek at Santa Ana	10.4	
	Santa Ana River at Fifth Street	8.7	Telemetry 011 SAR5

N

Notes:

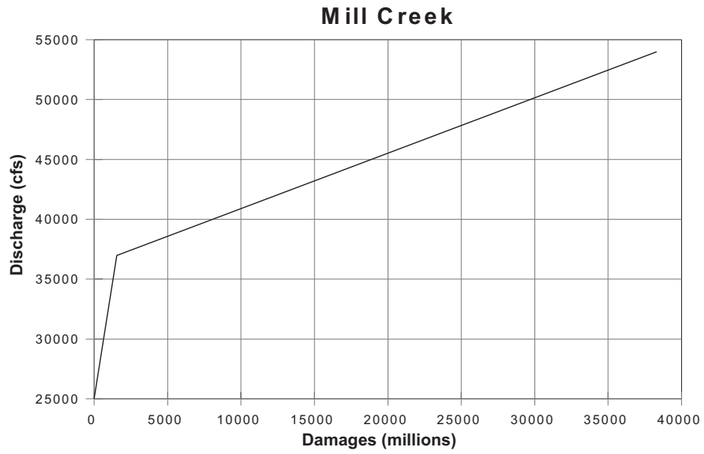
1. Schematic of the channel is not to scale.
2. Channel Capacities shown above are based on the design Q specified within the Phase II GDM, Vol 3, dated August 1988.
3. Design disharge values are in cubic feet per second.

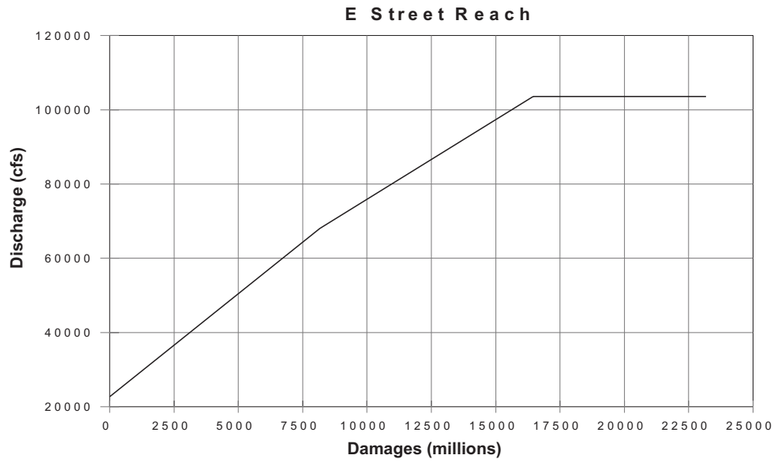
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

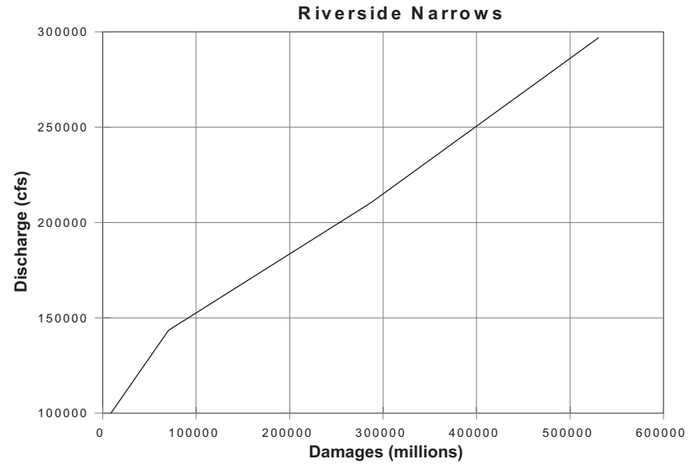
DOWNSTREAM CHANNEL
PRADO DAM TO PACIFIC OCEAN

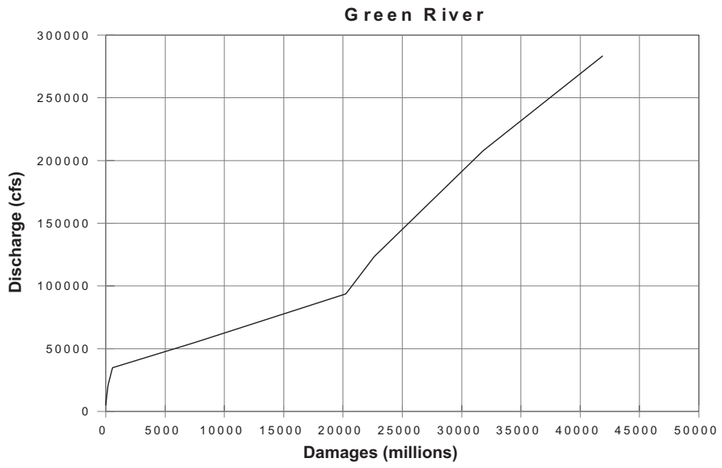
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

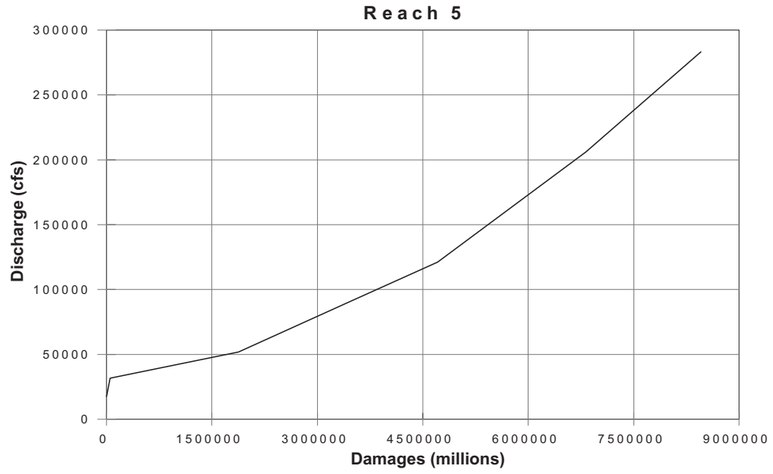
PLATE 4-06

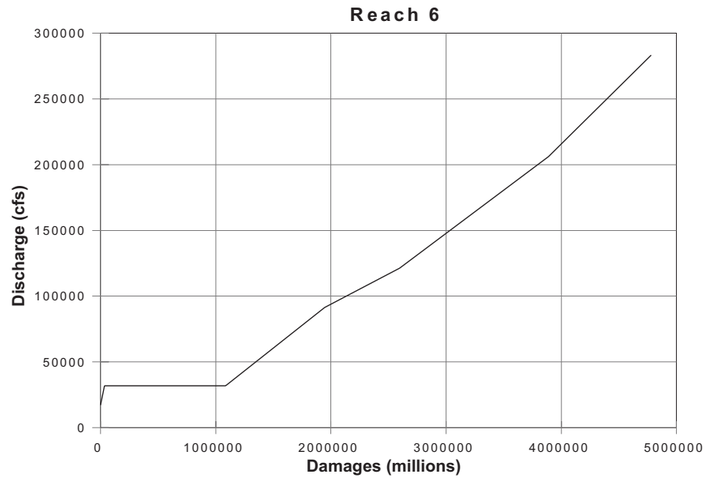


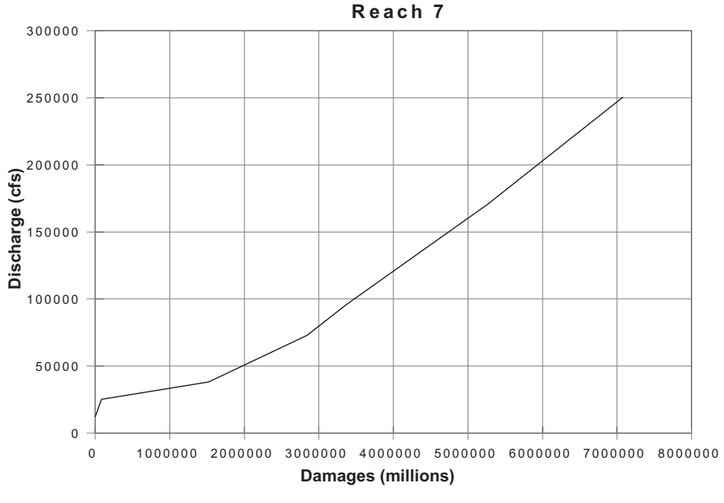


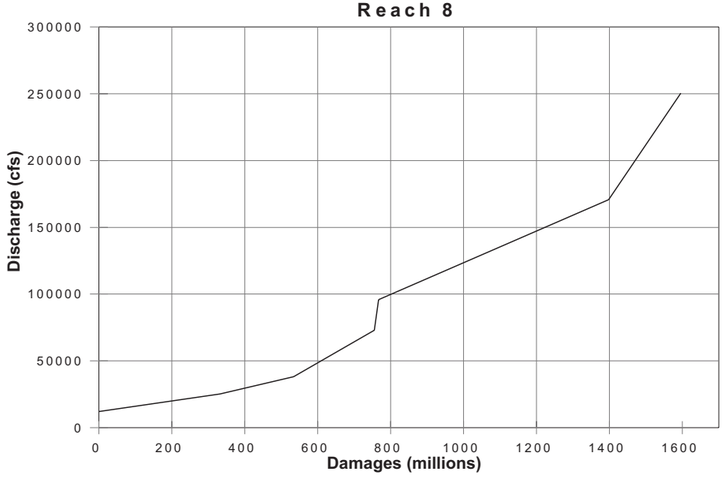












Note:

These curves were generated by the Los Angeles District Corps of Engineers, Economics Section through their annual flood damages program HEC-EAD. Models were generated for the Seven Oaks Dam economic study based on 2001 and 2099 dollars. This study was recently updated to reflect 2002 dollars.

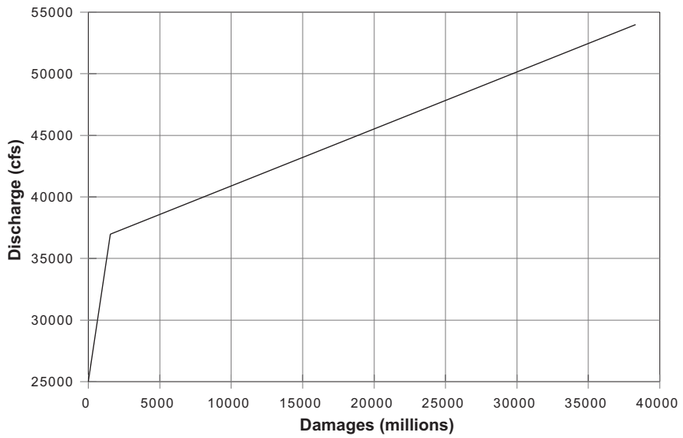
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

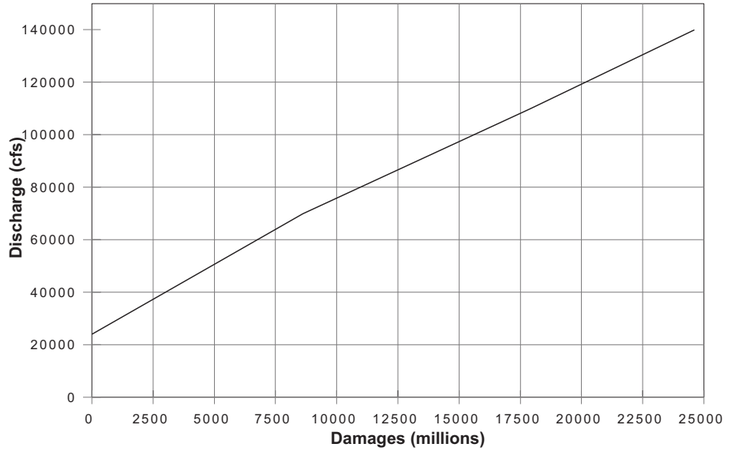
DAMAGE vs. DISCHARGE 2002 DOLLARS

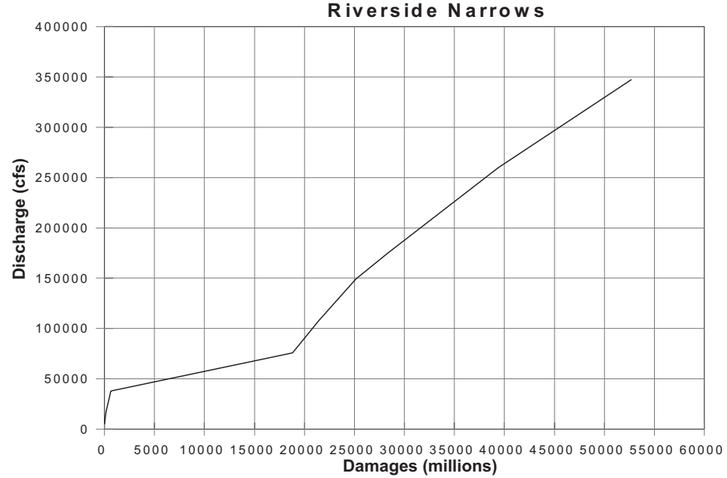
(SEVEN OAKS DAM IN CONJUNCTION WITH PRADO DAM)

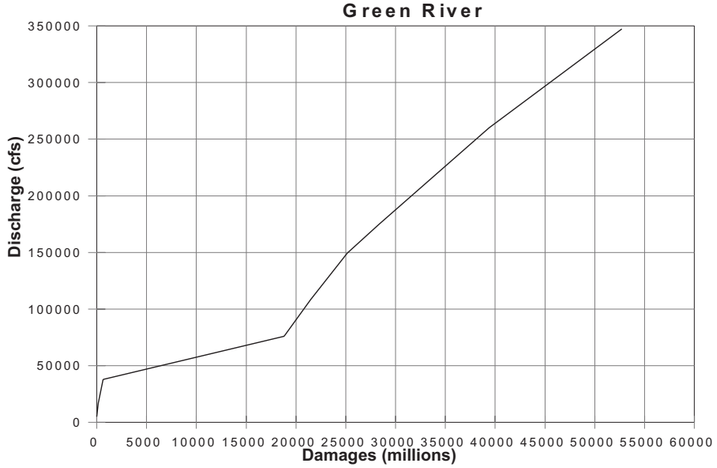
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

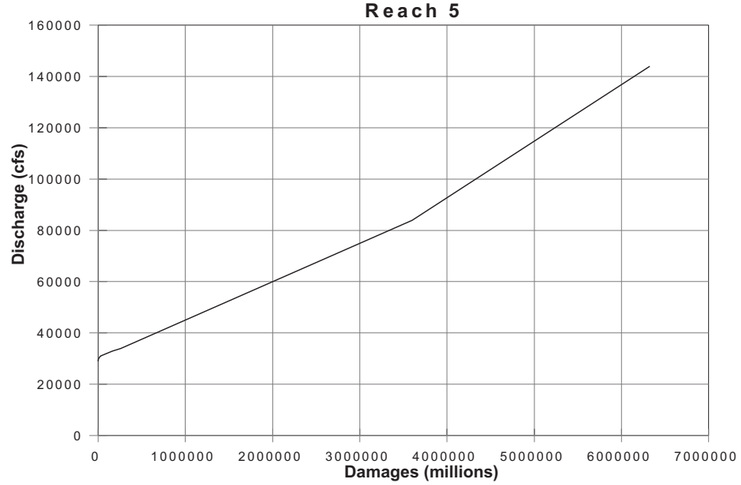
PLATE 4-07A

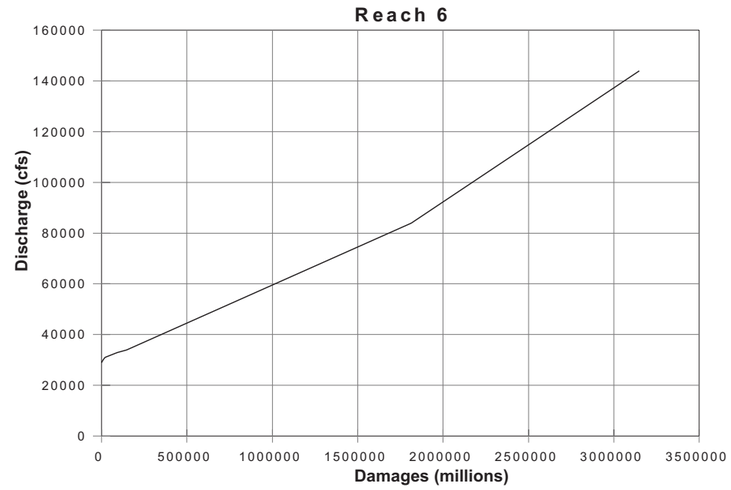


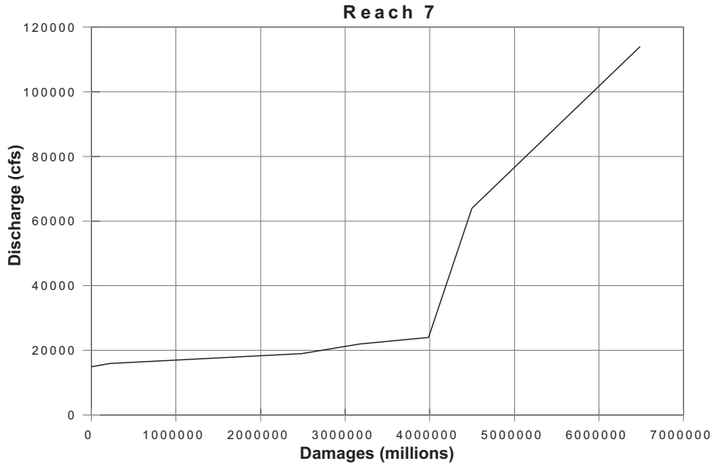


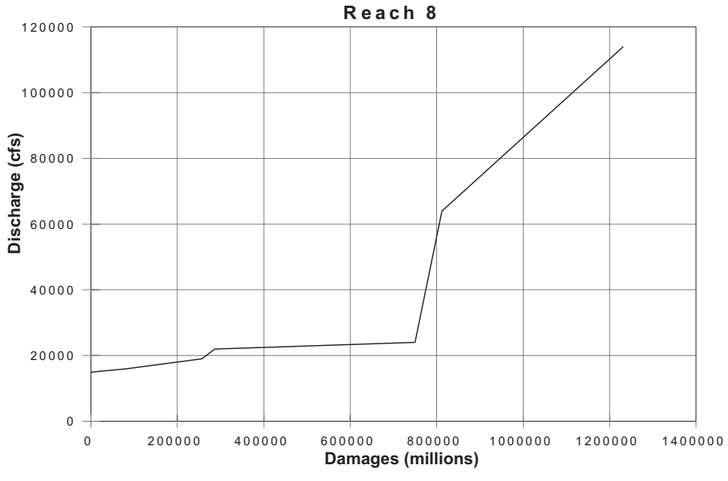












Note:

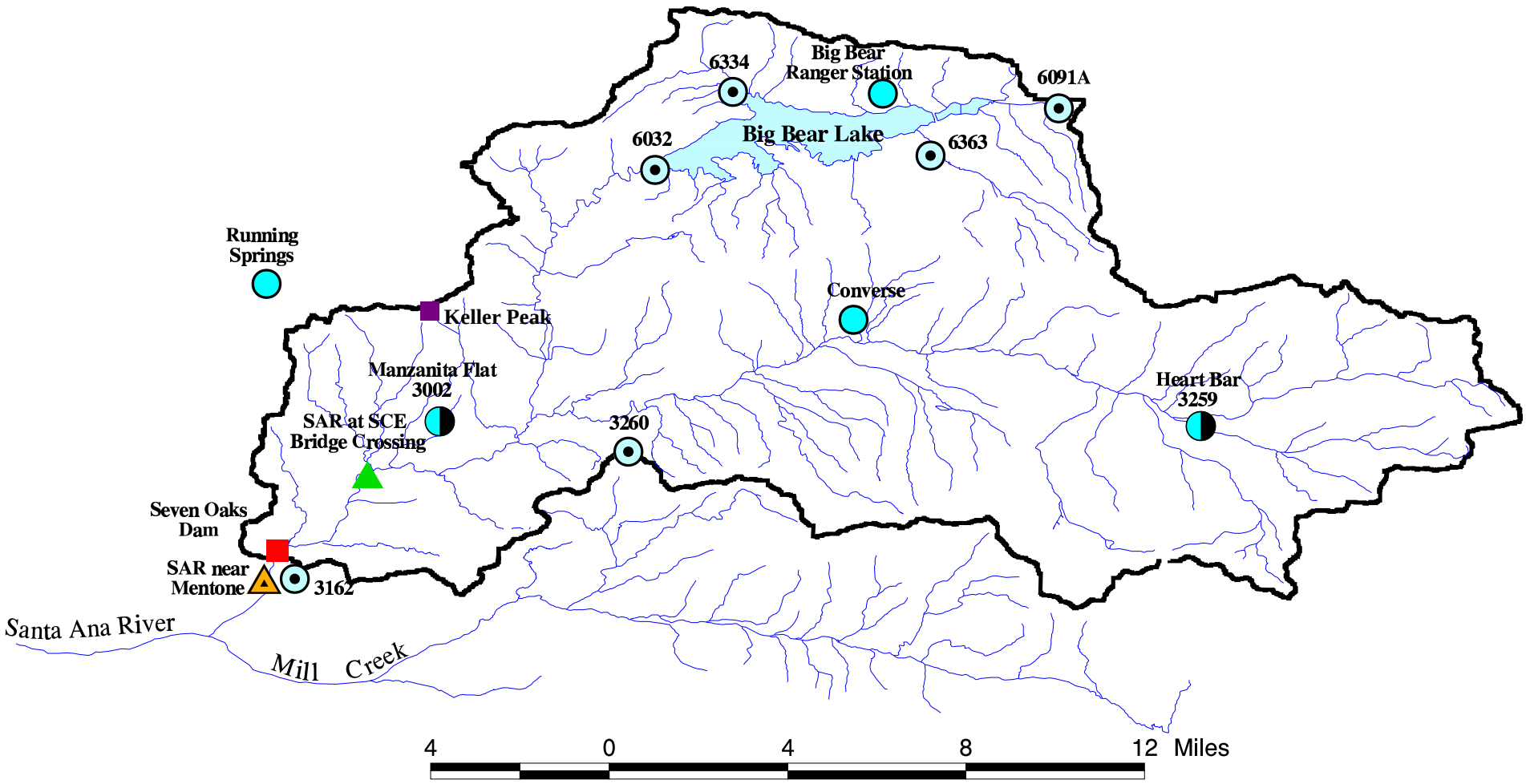
These curves were generated by the Los Angeles District Corps of Engineers, Economics Section through their annual flood damages program HEC-EAD. Models were generated for the Seven Oaks Dam economic study based on 2001 and 2099 dollars. This study was recently updated to reflect 2002 dollars.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

DAMAGE vs. DISCHARGE
2099 DOLLARS

(SEVEN OAKS DAM IN CONJUNCTION WITH PRADO DAM)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



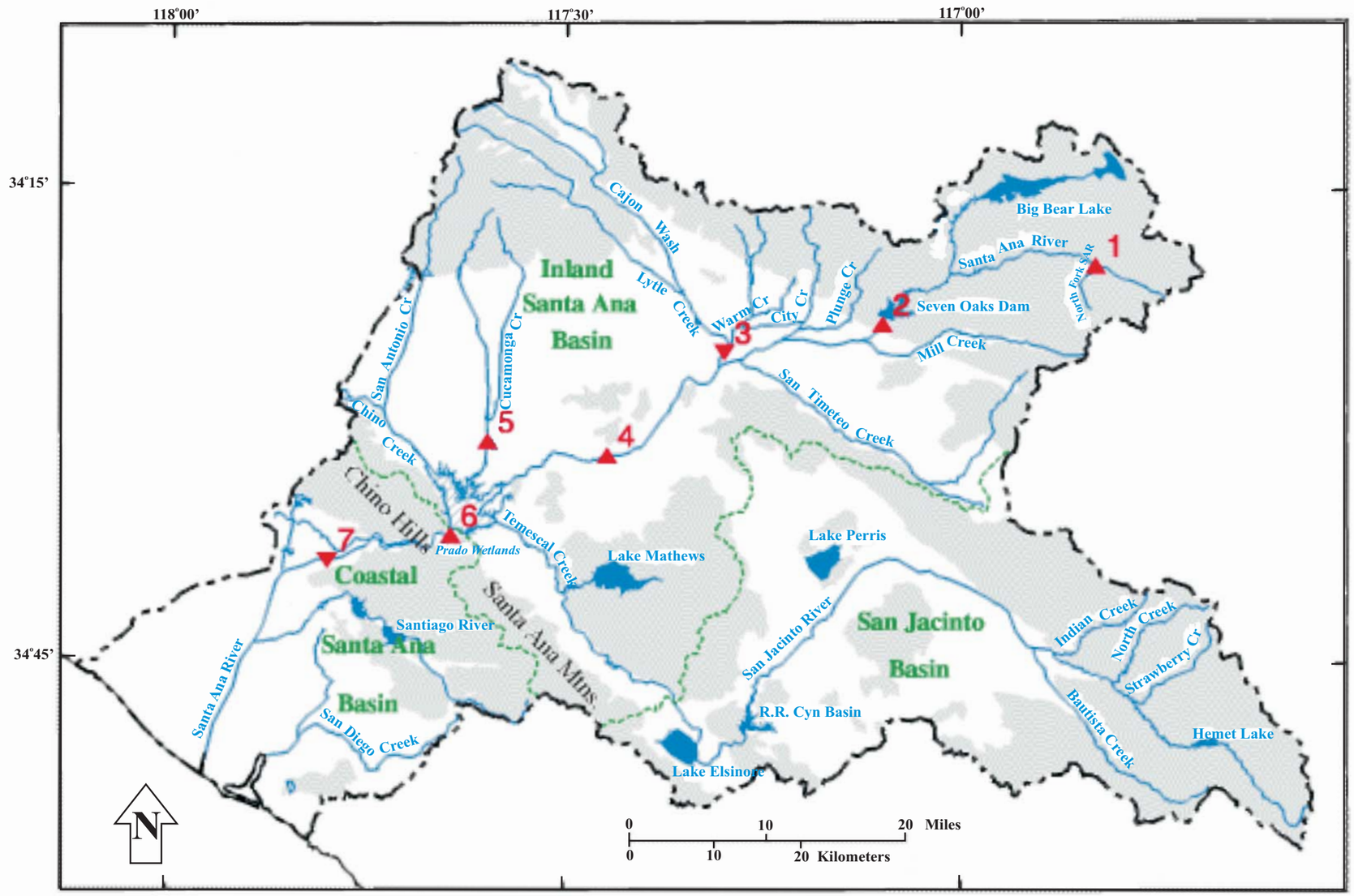
- San Bernardino County Precipitation Gage (No Telemetry)
- COE Precipitation Gage co-located or adjacent to San Bernardino County Gage (Note: Manzanita Flat gage is equipped with ALERT telemetry. Heart Bar gage is not equipped with telemetry.)
- COE Precipitation Gage with ALERT Telemetry
- USGS Stream and Precipitation Gage
- COE Stream Gage
- Water Level Gage at Seven Oaks Dam
- COE Repeater

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
INTERIM WATER CONTROL MANUAL

GAGING STATIONS IN SEVEN OAKS BASIN

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-01



Consolidated Rock - Areas conducive to higher surface runoff.

Subunit Boundaries - Inland Santa Ana Basin consists of 5 Basic Fixed Sites for Water Quality Sampling. Coastal Santa Ana Basin consists of 2 Intensive Fixed Sites.

Basic Fixed Site - Sampled by the USGS for the analysis of major irons, nutrients, dissolved organic carbon, suspended organic carbon, and suspended sediment.

Intensive Fixed Site - Sampled for Water Quality like the Basic Fixed Sites, and also analyzed for volatile orgainc compounds and pesticides.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

USGS WATER QUALITY MONITORING STATIONS BASIC-FIXED SITES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 5-02

Table 1. MINIMUM AND MAXIMUM GATE OPENING REQUIREMENTS

GATE TYPE	MINIMUM GATE OPENING (FEET)	MAXIMUM GATE OPENING (FEET)
REGULATION OUTLET (R.O.)	.75	6.8
LOW FLOW (L.F.)	.5	2.8

Table 2. RECOMMENDED MAXIMUM RATE OF RELEASE CHANGE

DISCHARGE	TO INCREASE FLOW	TO DECREASE FLOW
0 - 200	NO RESTRICTION	NO RESTRICTION
UP TO 500	250 CFS/HOUR	250 CFS/HOUR
500 - 4,000	500 CFS/HOUR	500 CFS/HOUR
4,000 -8,000	1000 CFS/HOUR	1000 CFS/HOUR

MDL - Minimum Discharge Line
LF - Low Flow Gate
RO - Regulation Outlet Gates (Main Gates)
MDLE - Minimum Discharge Line Extension *

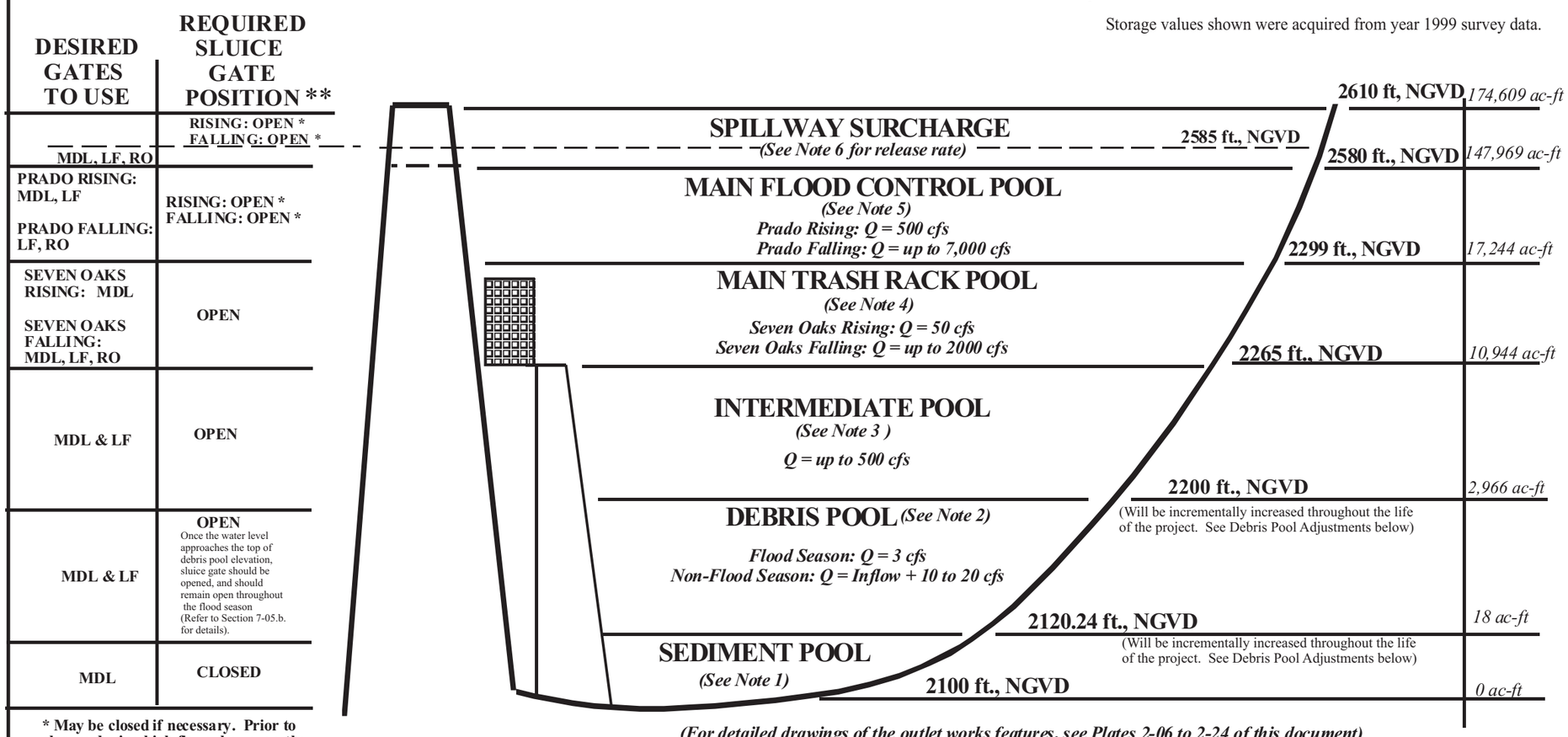
* During the dry months, the MDLE will usually be used to bypass the plunge pool. The MDLE is controlled by a 30-inch ball valve. This ball valve cannot be used to regulate flows and must be either in a fully open or fully closed position.

Storage values shown were acquired from year 1999 survey data.

DESIRED GATES TO USE	REQUIRED SLUICE GATE POSITION **
MDL, LF, RO	RISING: OPEN * FALLING: OPEN *
PRADO RISING: MDL, LF PRADO FALLING: LF, RO	RISING: OPEN * FALLING: OPEN *
SEVEN OAKS RISING: MDL SEVEN OAKS FALLING: MDL, LF, RO	OPEN
MDL & LF	OPEN
MDL & LF	OPEN Once the water level approaches the top of debris pool elevation, sluice gate should be opened, and should remain open throughout the flood season (Refer to Section 7-05.b. for details).
MDL	CLOSED

*** May be closed if necessary. Prior to closure during high flows, however, the LF and RO gates must be temporarily closed to avoid the possibility of damaging the sluice gate.**

**** Refer to Section 7-06.b. for procedures in operating the sluice gate.**



(For detailed drawings of the outlet works features, see Plates 2-06 to 2-24 of this document)

DEBRIS POOL ADJUSTMENTS:

- The maximum allowance for Debris Pool storage is about 3,000 ac-ft. The minimum required Debris Pool storage by the end of project life is about 800 ac-ft.

- As sediments accumulate and additional stop logs are placed within the multilevel withdrawal structure, the top of sediment pool will rise and the debris pool storage will diminish.

- When it is suspected that the debris pool storage is approaching the minimum of 800 ac-ft, the reservoir should be re-surveyed and the top of debris pool elevation raised to re-establish the 3,000 ac-ft of debris pool storage.

- Continue raising the top of debris pool elevation over project life until the top of debris pool reaches the final elevation of 2300 ft, NGVD.

NOTES:

1. SEDIMENT POOL:
- Additional stop logs are installed as necessary prior to each flood season. Sediment pool elevation may vary in any given year. Additional stop logs may be installed during the flood season, if necessary. When reservoir water surface elevation is within this pool, releases are generally made through the MDLE.

2. DEBRIS POOL:
- Prior to using LF and or RO gates sluice gate needs to be opened. See Section 7-06.b. of this document for procedures.

3. INTERMEDIATE POOL:
- Maximum combined capacity of LF and MDL in this elevation range is 500 cfs.

- May delay releases and modify release rates if hydrologic conditions warrant to support mitigation and enhancement plans.

4. MAIN TRASH RACK POOL:
- During Rising Stages: Release 50 cfs through the MDL only.

- During Falling Stages: Release theoretical maximum safe rates. The theoretical maximum Q's at different elevation ranges are:

- @2265 ft, NGVD ---- Q = 500 cfs
- @2269 ft, NGVD ---- Q = 1,000 cfs
- @2273 ft, NGVD ---- Q = 1,500 cfs
- @2299 ft, NGVD ---- Q = 2,000 cfs

- Note that the rates shown can be adjusted depending upon the amount of trash observed, the proximity of the next storm, the time required to clean the trash racks, and operation of the dam.

- May delay releases and modify release rates if hydrologic conditions warrant to support mitigation and enhancement plans.

- See Table 1 for max & min allowable gate openings.

5. MAIN POOL:
- During Falling Stages: The Q's at different elevation ranges are:

- @2299 ft, NGVD ---- Q = 2,000 cfs
- @2300 ft, NGVD ---- Q = 2,030 cfs
- @2400 ft, NGVD ---- Q = 4,340 cfs
- @2500 ft, NGVD ---- Q = 6,560 cfs
- @2580 ft, NGVD ---- Q = 7,000 cfs

- May delay releases and modify release rates if hydrologic conditions warrant to support mitigation and enhancement plans.

- See Table 1 for max & min allowable gate openings.

6. SPILLWAY SURCHARGE:
- During Rising Stages below el 2585 ft, NGVD, maintain a combined release total of 7,000 cfs. Above el. 2585 ft, NGVD, all gates shall be closed.

- During Falling Stages: Gates may be adjusted to maintain the resulting maximum spillway flow for quicker evacuation of the remaining surcharge pool.

7. OPERATIONAL CONSIDERATIONS:
- For all release adjustments, see Tables 1 and 2.

- Scheduled releases will be curtailed, if necessary, in order to assure the safe operation of the dam (i.e., exceedance of downstream channel capacity, or any other emergencies.

- All release ranges shown can be cut or increased, as necessary, in order to allow safety inspection for inspection or for maintenance purposes.

- Instrumentation Testing Program: Collection of data to verify the dam's performance may be done if the opportunity exists.

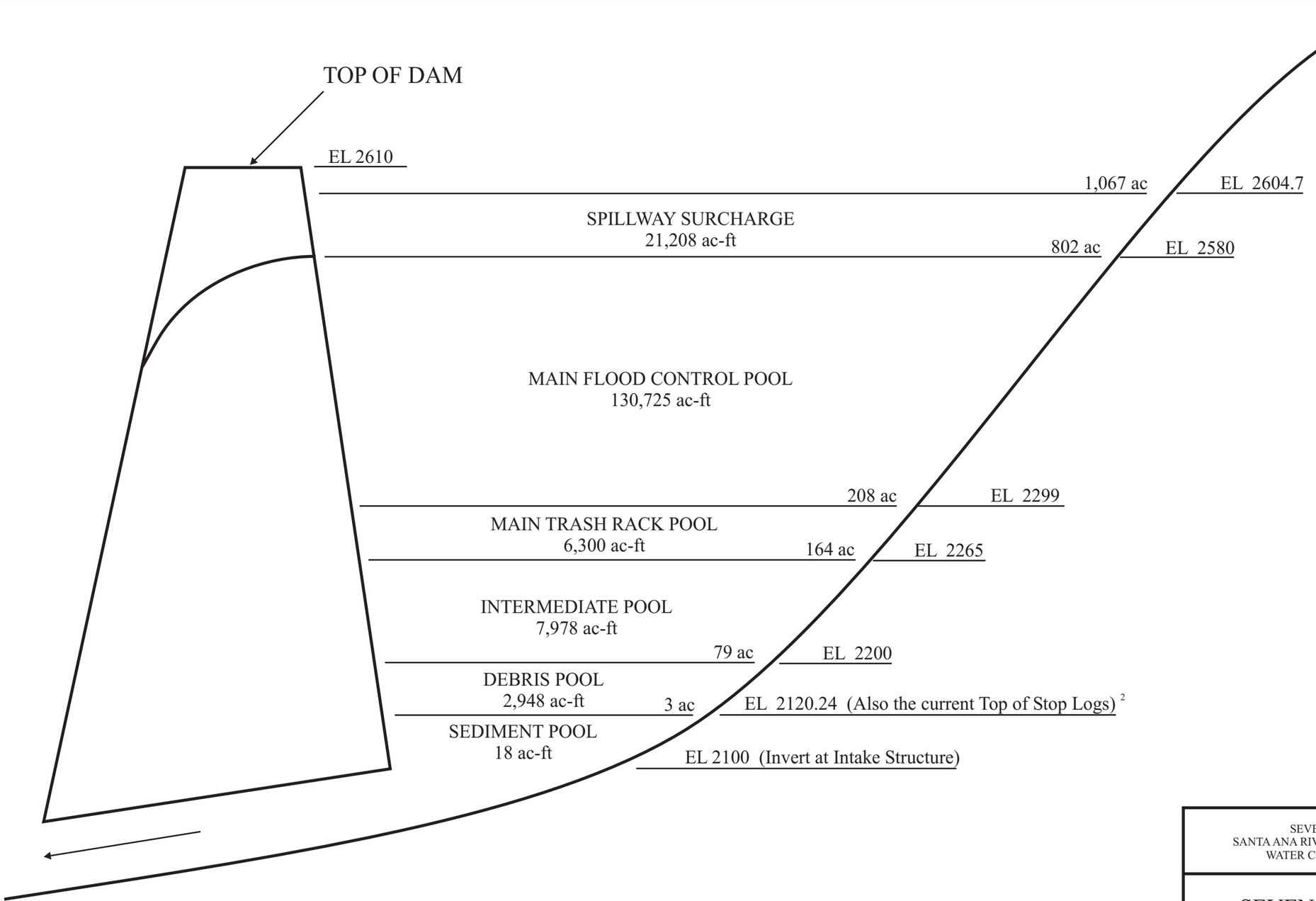
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

WATER CONTROL PLAN

Revised: October 2002

(Note: Revise Plate every time debris pool elevation is increased)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



Notes:

1. Storage and Area values based on year 1999 survey
2. The top of sediment pool is determined by the current top of stop logs elevation. Additional stop logs will be placed as additional sediment accumulates over the life of the project.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

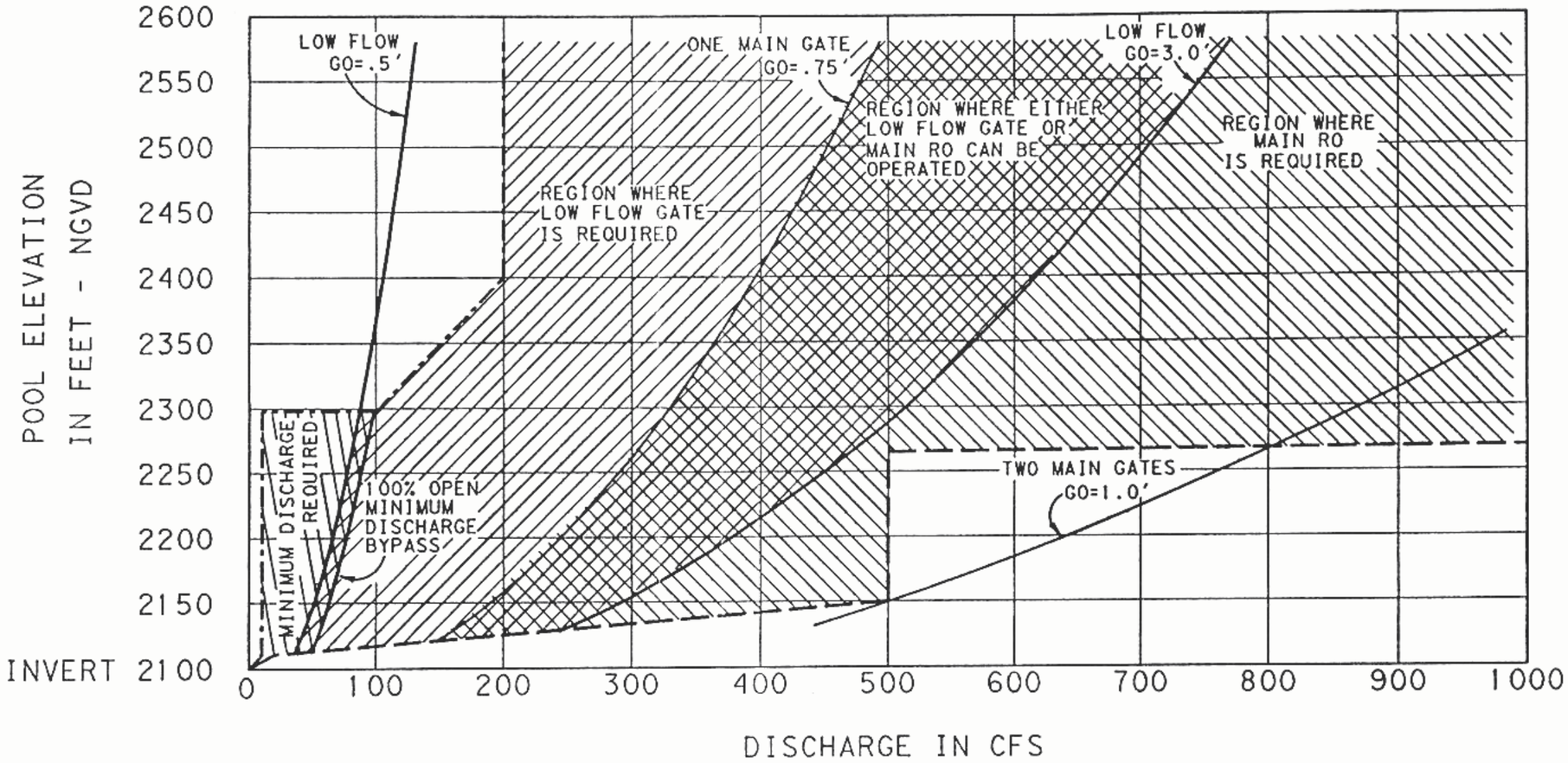
SEVEN OAKS DAM STORAGE ALLOCATION DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7-01A

SEVEN OAKS

GATE RATING



HIGH-LEVEL INTAKE OPERATION ONLY ABOVE ELEV. 2300'
MULTI-LEVEL OR HIGH-LEVEL INTAKE OPERATION BETWEEN ELEV. 2300' AND 2265'
MULTI-LEVEL INTAKE OPERATION ONLY BELOW ELEV. 2265'

GO=GATE OPENING (FT.)

-·-·-·- MINIMUM OPERATION SCHEDULE

— — — MAXIMUM OPERATION SCHEDULE

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

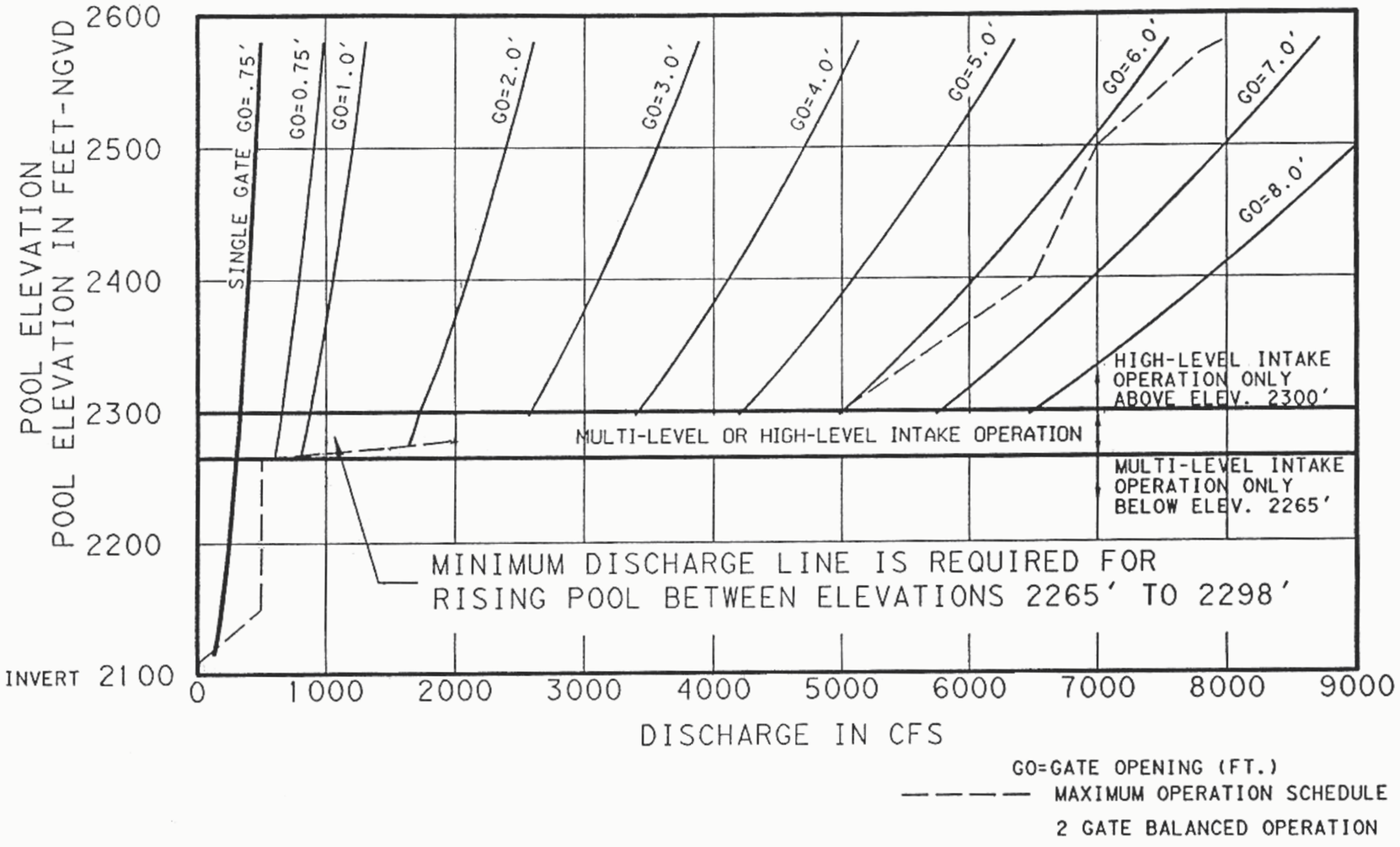
GATE OPERATING REQUIREMENTS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7-02

SEVEN OAKS

GATE RATING

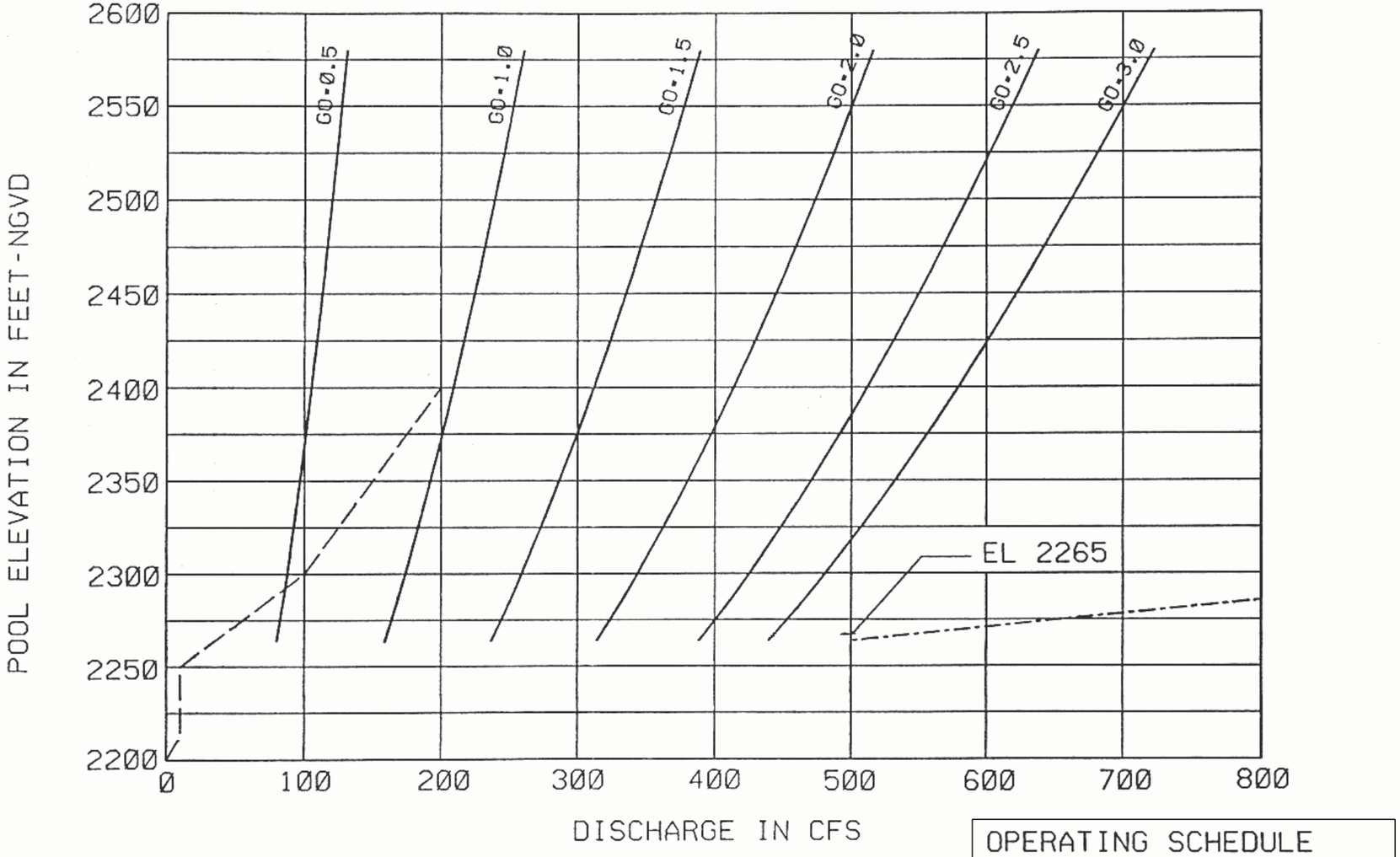


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

HIGH LEVEL INTAKE RO GATE RATING CURVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

SEVEN OAKS
GATE RATING



OPERATING SCHEDULE

-·-·-· MAXIMUM RELEASE

— — — MINIMUM RELEASE

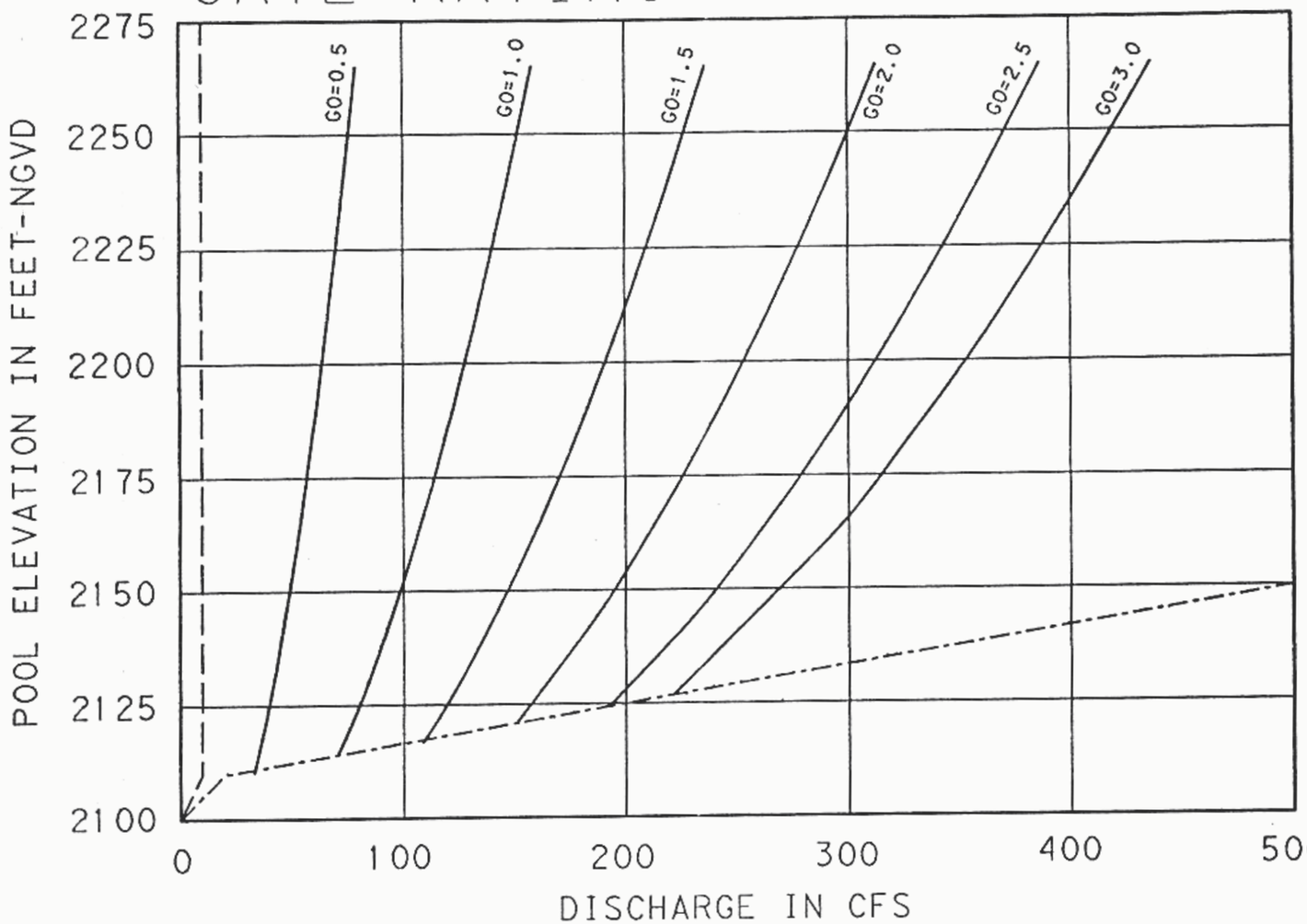
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

HIGH LEVEL INTAKE LOW FLOW GATE RATING CURVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7-04

SEVEN OAKS
GATE RATING



OPERATION SCHEDULE

-·-·-·- MAXIMUM RELEASE

———— MINIMUM RELEASE

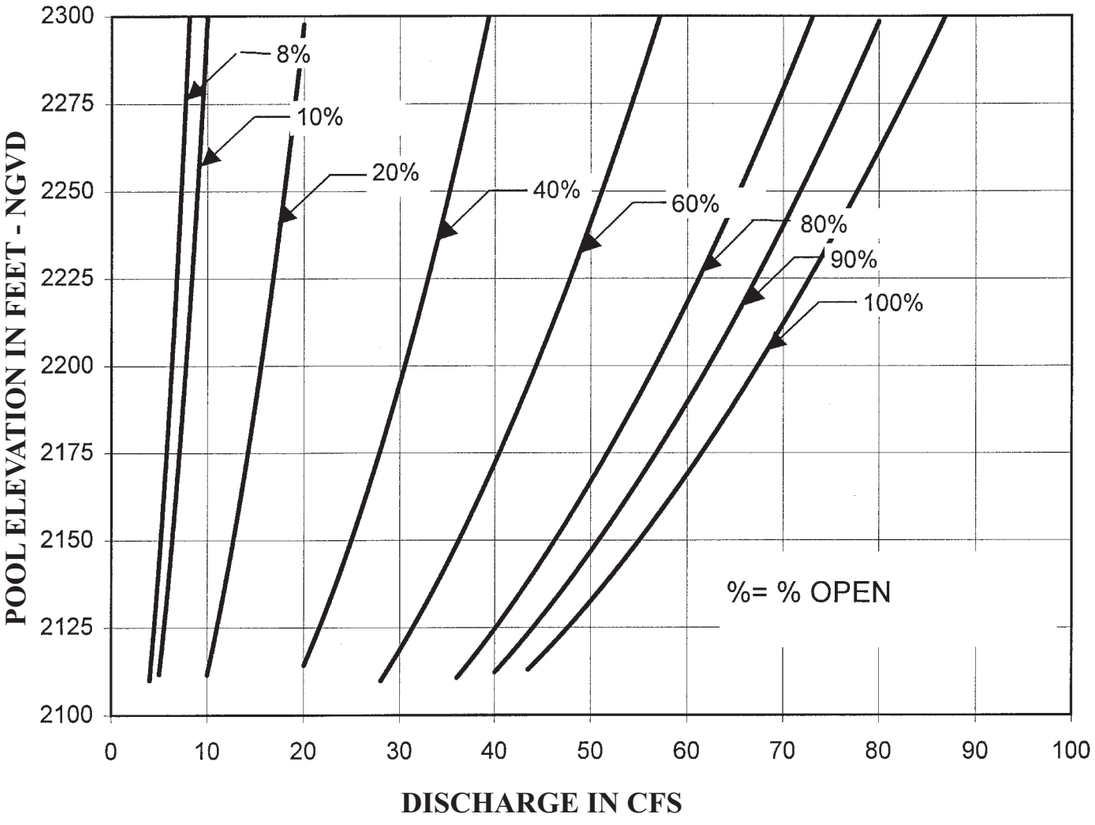
SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

MULTI-LEVEL WITHDRAWAL SYSTEM LOW FLOW GATE RATING CURVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELEL DISTRICT

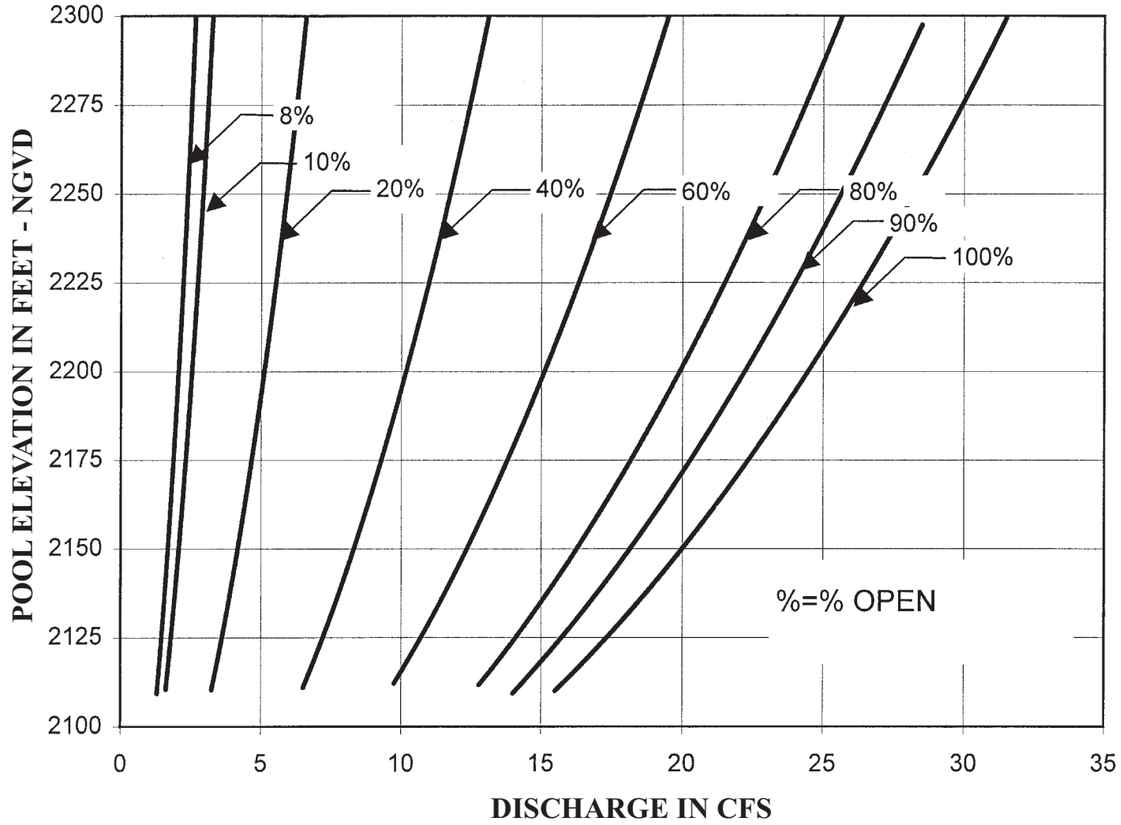
SEVEN OAKS

14-INCH VALVE RATING



SEVEN OAKS

8-INCH VALVE RATING



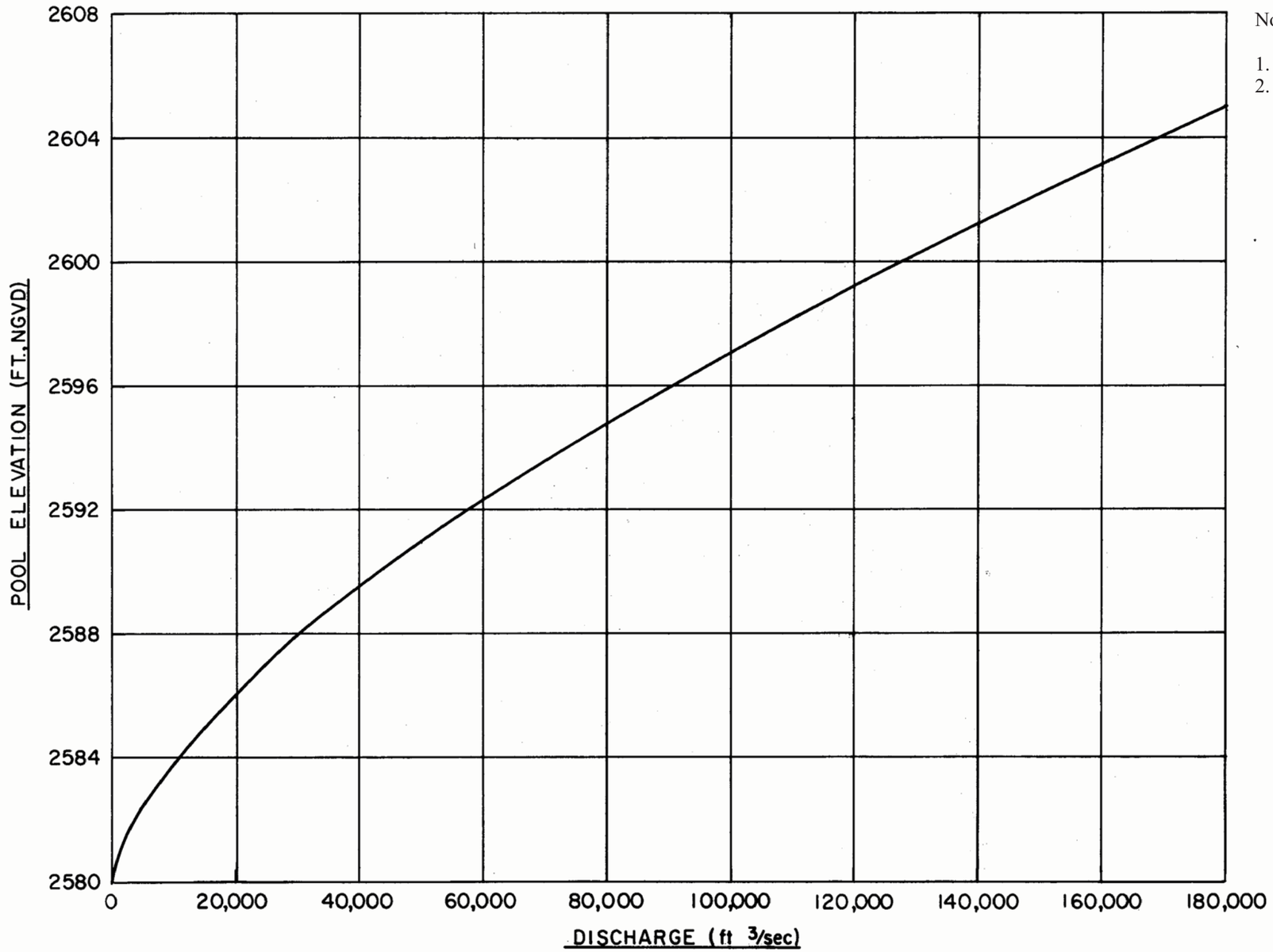
Note: Rating curves provided by the U.S. Army Engineering Research and Development Center (ERDC-WES), Portland District

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

MINIMUM DISCHARGE LINE
RATING CURVES
14 - INCH AND 8 - INCH CONE
VALVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7-06



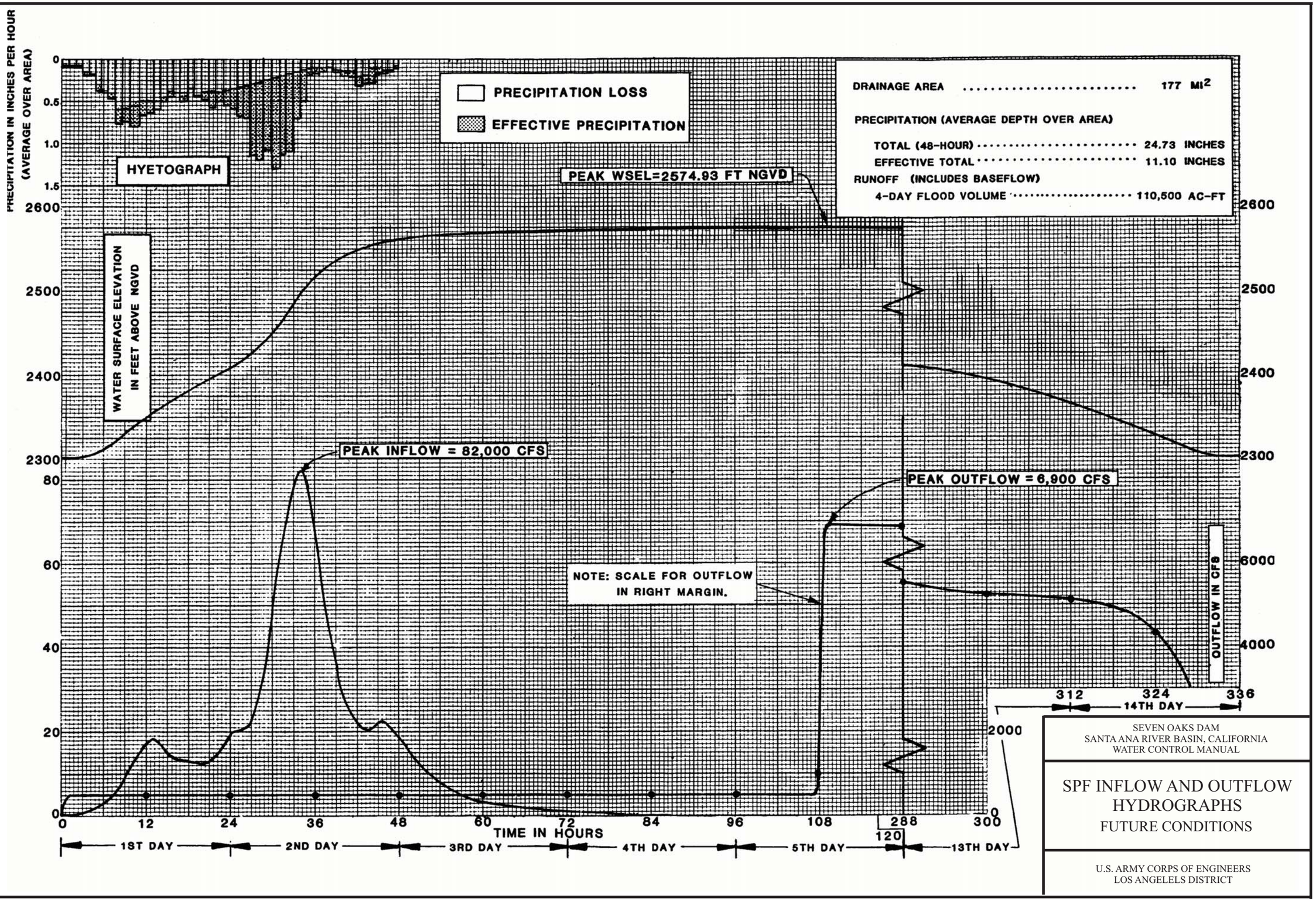
Notes:

1. The top of dam elevation is at 2610 ft, NGVD
2. Refer to Plate 2-25 for details of the spillway.

SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

SPILLWAY RATING CURVE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELELS DISTRICT

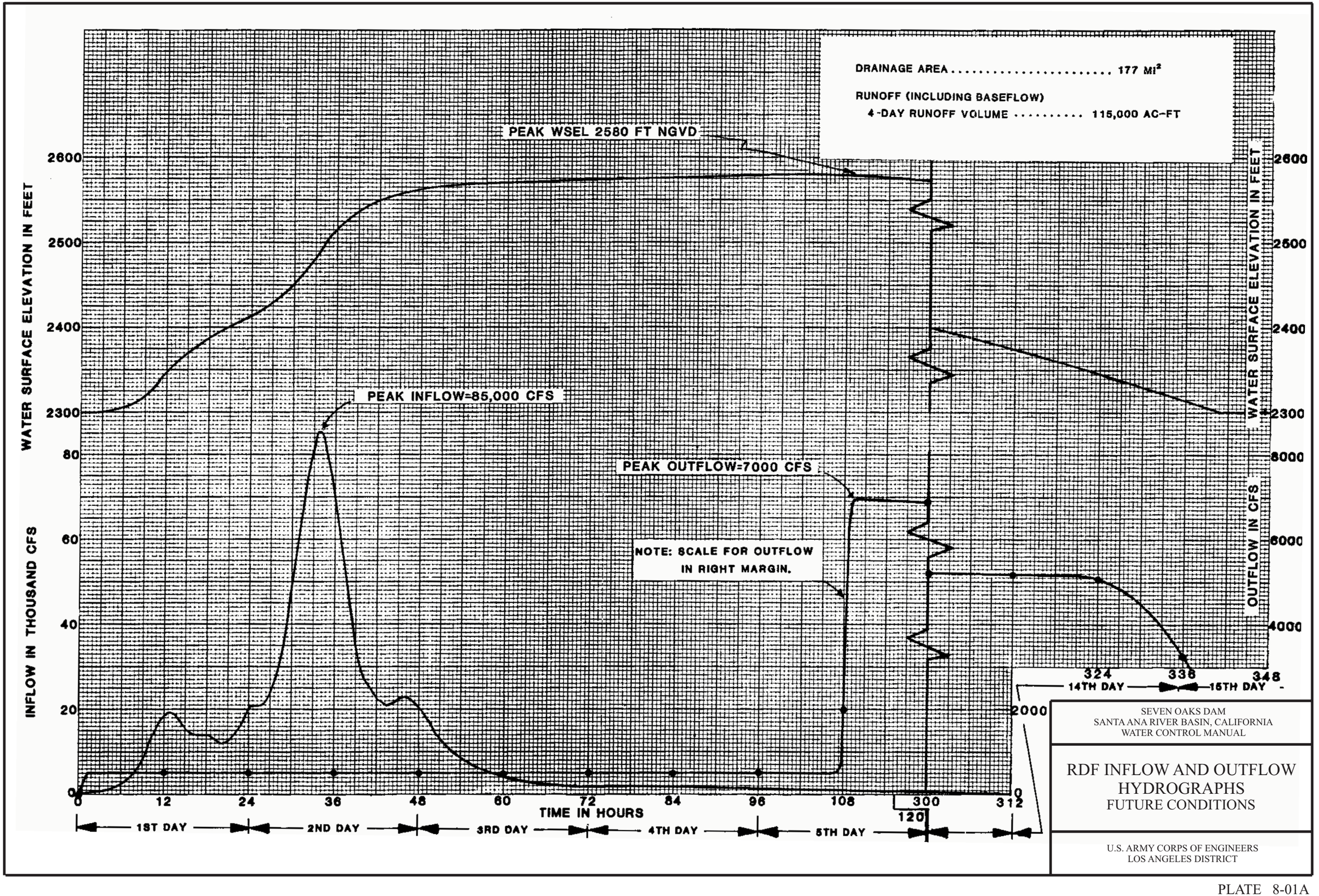


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

SPF INFLOW AND OUTFLOW HYDROGRAPHS
FUTURE CONDITIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELELS DISTRICT

PLATE 8-01

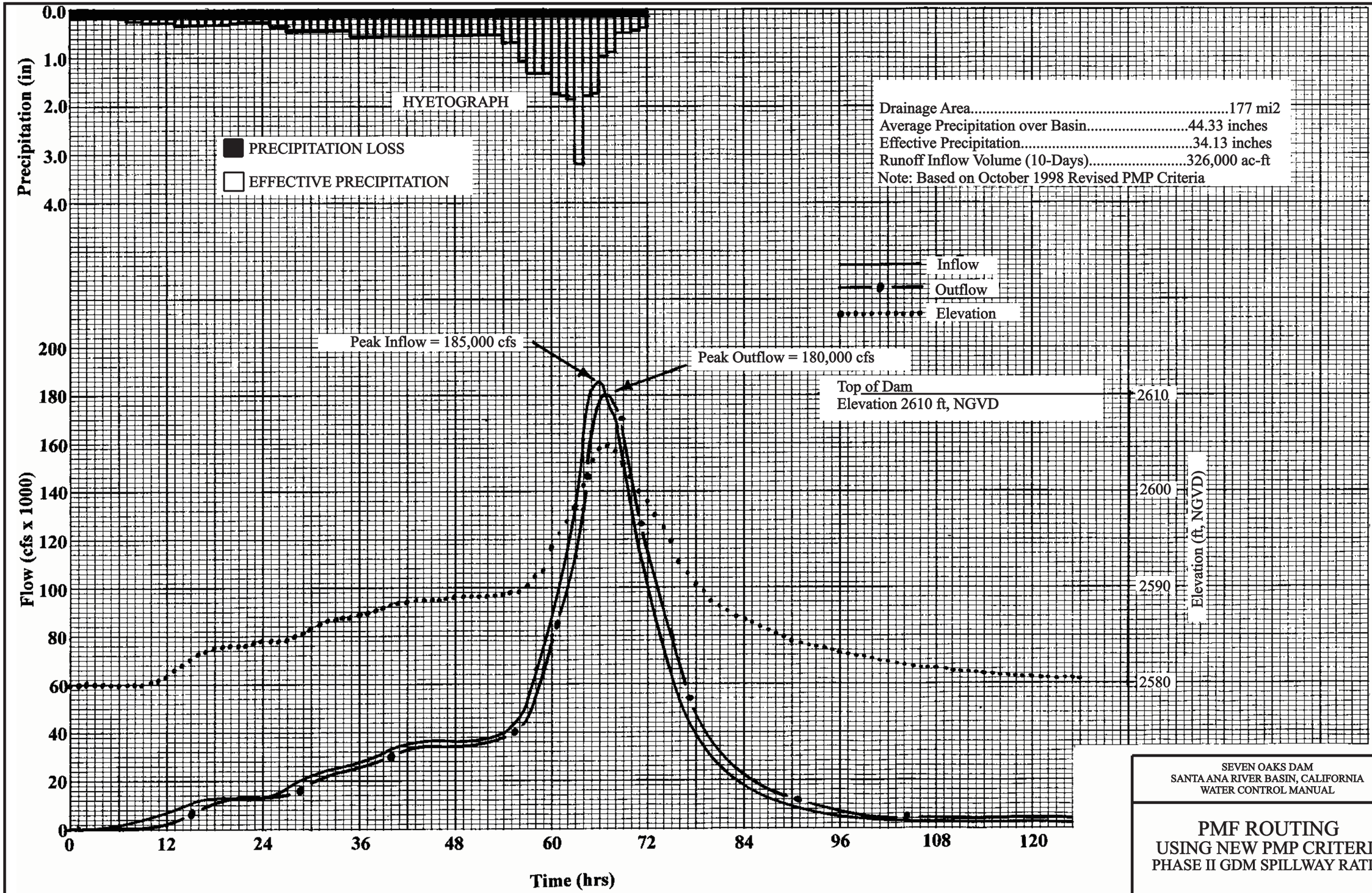


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

RDF INFLOW AND OUTFLOW HYDROGRAPHS
FUTURE CONDITIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-01A

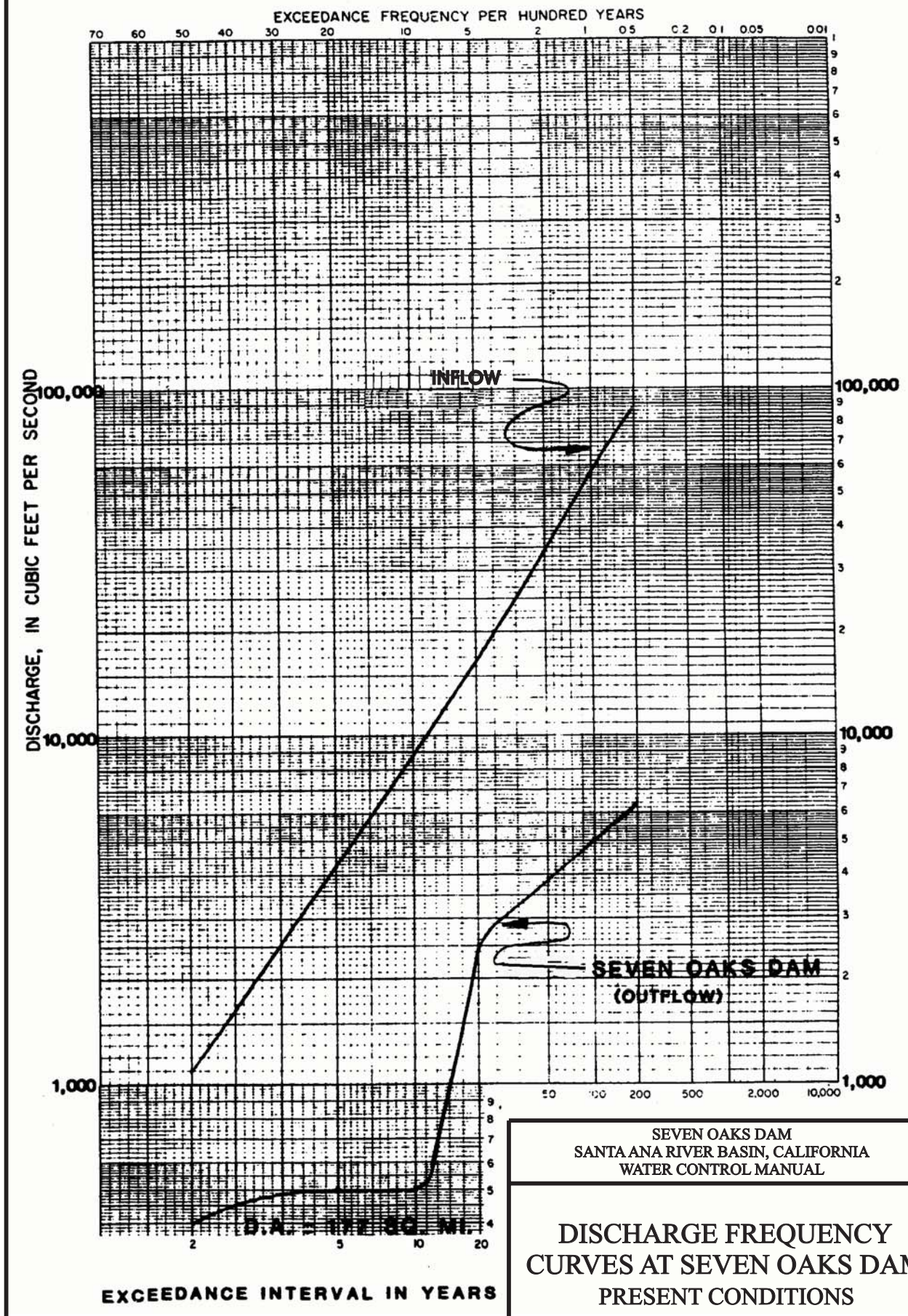


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

PMF ROUTING
USING NEW PMP CRITERIA
PHASE II GDM SPILLWAY RATING

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-02

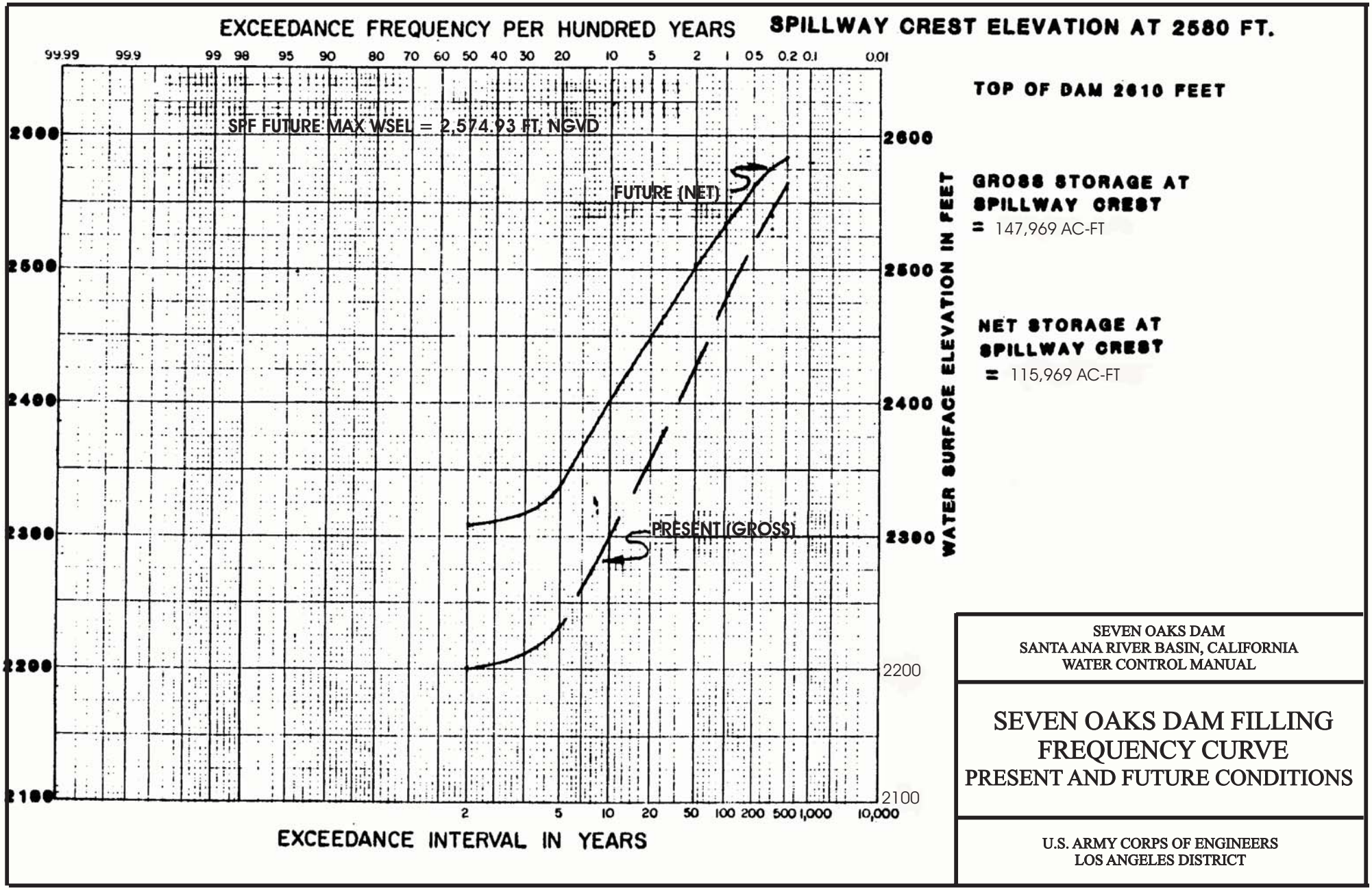


SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

DISCHARGE FREQUENCY CURVES AT SEVEN OAKS DAM
PRESENT CONDITIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-03



SEVEN OAKS DAM
SANTA ANA RIVER BASIN, CALIFORNIA
WATER CONTROL MANUAL

SEVEN OAKS DAM FILLING FREQUENCY CURVE
PRESENT AND FUTURE CONDITIONS

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 8-04