L. A. D. M. 1130 - 2 -2

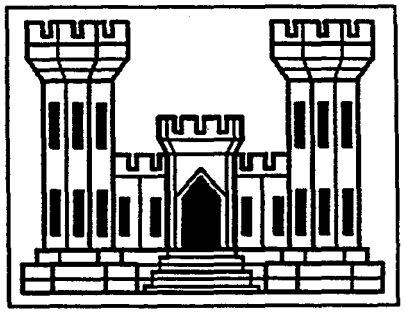
SAN GABRIEL RIVER BASIN, CALIF.

RESERVOIR REGULATION MANUAL

FOR

WHITTIER NARROWS

FLOOD CONTROL RESERVOIR



U. S. ARMY ENGINEER DISTRICT, LOS ANGELES

CORPS OF ENGINEERS

1 OCTOBER 1957

SPLGP-H 7 November 1957

SUBJECT: Reservoir Regulation Manual for Whittier Narrows Flood-Control Reservoir

TO: Division Engineer
U. S. Army Engineer Division, South Pacific
San Francisco, California

1. Inclosed are five copies of the "Reservoir Regulation Manual for Whittier Narrows Flood-Control Reservoir," dated 1 October 1957.

2. The manual contains revisions suggested in your 3d Indorsement, SPDGT-H 800.21 (Whittier Narrows Dam) LA, dated 22 August 1957, to our letter, SPLOC 800.3 (Whittier Narrows), dated 14 March 1956, subject: "Draft of Reservoir Regulation Manual for Whittier Narrows Flood-Control Reservoir." HWT

JGJ

FOR THE DISTRICT ENGINEER:

LRH

Incl (in quint)
Res Reg Manual for
Whittier Narrows F-C Res,
dtd 1 Oct 1957

H. W. THOMPSON
Chief, Engineering Division

SFC

FET

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WRITER'S COPY
HYDRO & RES REG SEC

AN/lp

SPDGT-H 800.21 Whittier Narrows Dam LA 1st Ind

SUBJECT: Reservoir Regulation Manual for Whittier Narrows Flood-Control Reservoir (Basic: 7 November 1957)

U. S. Army Engineer Division, South Pacific, San Francisco, California
18 November 1957

TO: Chief of Engineers, Department of the Army, Washington 25, D. C.

The Division Engineer recommends approval of the subject manual.

FOR THE DIVISION ENGINEER:

/s/ F. C. Kendall

F. C. KENDALL
Chief, Engineering Division

1 Incl
w/d - 3 cys

ENGWE

SUBJECT: Reservoir Regulation Manual for Whittier Narrows Flood-Control Reservoir (ltr LADO to SPD 7 Nov 57) & SPD 1st Ind 18 Nov 57)

2d Ind

Office of the Chief of Engineers, Washington 25, D. C., 19 December 1957

TO: Division Engineer, U.S. Army Engineer Division, South Pacific
San Francisco, California

The Reservoir Regulation Manual for Whittier Narrows Reservoir is approved subject to review of the section on conservation operation when it is submitted.

FOR THE CHIEF OF ENGINEERS:

Incl

/s/t/ A. L. Parsons, Jr.

A. L. PARSONS, JR.
Lt. Col, Corps of Engineers
Assistant Chief of Civil Works

SPDGT-H
3d Ind
Date 27 Dec 57
USAEDIV, SP
To Los Angeles District
(cannot make out initials)

LOS ANGELES DISTRICT
MANUAL NO. 1130-2-2

U. S. ARMY ENGINEER DISTRICT,
LOS ANGELES, 1 OCTOBER 1957

F O R E W O R D

1. Purpose and scope. The purpose of this manual is to present information necessary for the optimum hydraulic operation of Whittier Narrows Dam. The manual contains: (a) general descriptive information pertaining to the drainage area and project, (b) detailed information on the Los Angeles District's organization and methods for effecting the hydraulic operation of the project, (c) an explanation of the plan of operation, and (d) pertinent data required for the operation of the dam.

2. The Hydrology and Reservoir Regulation Section of the Planning and Reports Branch, Engineering Division, is responsible for the preparation of this manual and for keeping the manual up to date. Suggested revisions should be forwarded, through channels, to that Section.

FOR THE DISTRICT ENGINEER:

LEO E. DUNHAM, JR.
Colonel, Corps of Engineers
Executive Officer

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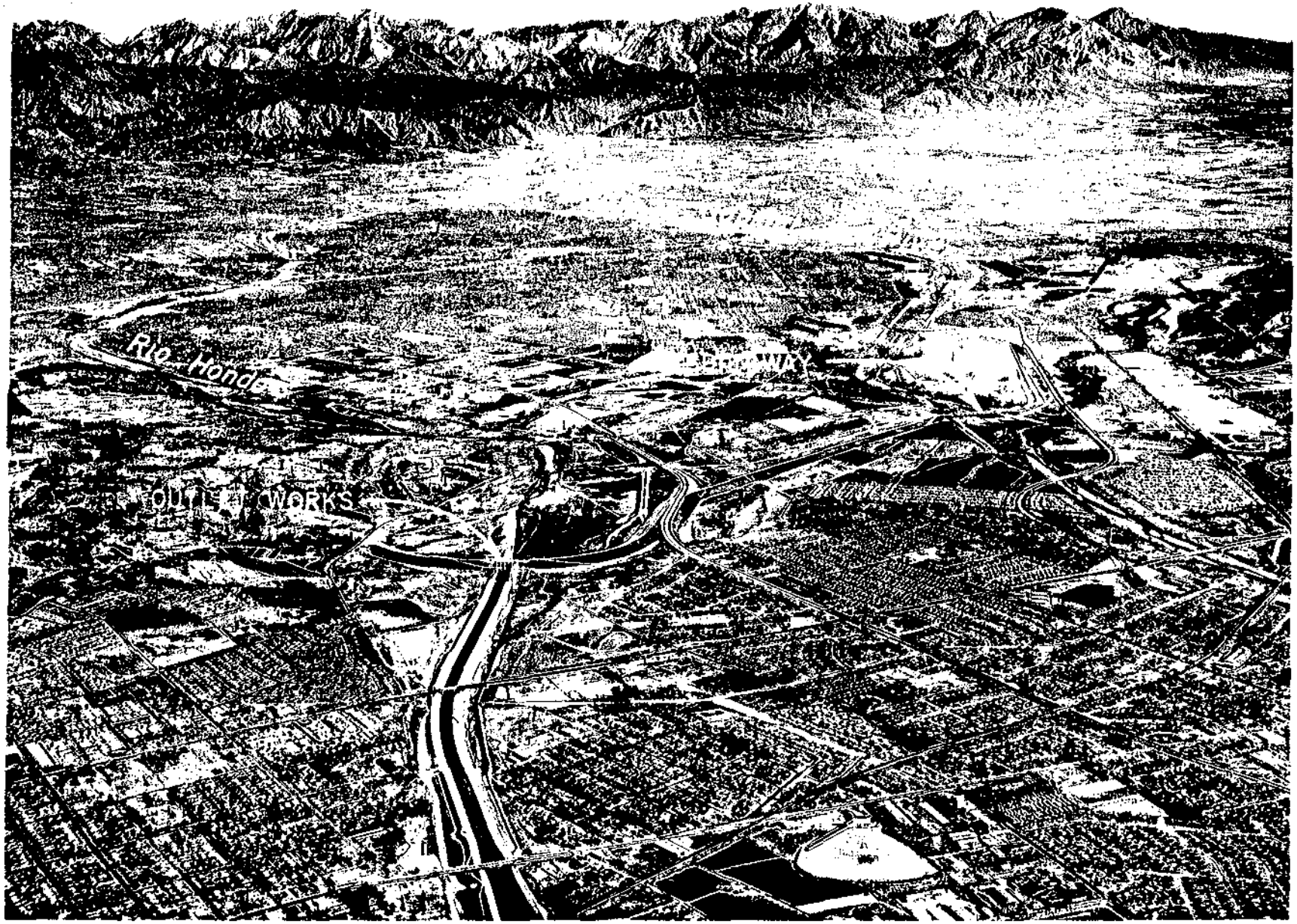

WHITTIER NARROWS DAM

L.A. DISTRICT MANUAL 1130-2-2

U.S. ARMY ENGINEER DISTRICT, LOS ANGELES

CORPS OF ENGINEERS

RESERVOIR REGULATION MANUAL

FOR

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR
SAN GABRIEL RIVER BASIN, CALIF.

APPENDIX VII

TO MASTER RESERVOIR REGULATION MANUAL

1 OCTOBER 1957

PREPARED UNDER THE DIRECTIONOF

CARROLL TO NEWTON
COLONEL, CORPS OF ENGINEERS
DISTRICT ENGINEER

Acknowledgement

This reservoir regulation manual was prepared by Mr. French C. Brown hydraulic engineer, under the supervision of Mr. Gerald B. Levin, chief, Reservoir Regulation Group, and under the direction of Mr. Fred E. Tatum, chief, Hydrology and Reservoir Regulation Section.

RESERVOIR REGULATION MANUAL

FOR

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR
SAN GABRIEL RIVER BASIN, CALIF.

APPENDIX VII

PART A

GENERAL INFORMATION

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR

SAN GABRIEL RIVER BASIN, CALIF.

1 OCTOBER 1957

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GENERAL INFORMATION

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PART A

GENERAL INFORMATION

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR
SAN GABRIEL RIVER BASIN, CALIF.

1. Authority.--The authority for the preparation of this manual is contained in paragraph 4220.01, Orders and Regulations, Office, Chief of Engineers (ER 1110-2-240, 1130-2-301). Detailed instructions pertaining to the contents of the manual are contained in part CXXXVI of the Engineering Manual, Civil Works Construction, dated August 1951 and title "Reservoir Regulation" (EM 1110-2-3600).

2. Scope.--This manual contains general descriptive information pertaining to the drainage area and project, information on the Los Angeles District's organization and methods for effecting hydraulic operation of the project, detailed information on plans of operation, and pertinent data required for the operation of the project.

3. Project history and authorization.--The San Gabriel River and the Rio Hondo flow through a natural gap in the hills that form the southern boundary of the San Gabriel Valley. This gap is known as Whittier Narrows. A dam across the Narrows for the purpose of flood control and conservation was considered by the Los Angeles County Flood Control District early in 1930. This organization made studies and prepared plans for construction of the dam until about 1934 when an application was made to the Federal Emergency Administration of the Public Works for loans and grants to construct the dam. A special board of review, appointed by the Public Works Administration to review the application, rendered an adverse report due to technical reasons. On 27 March 1935, the application was withdrawn.

4. The Flood Control Act of 22 June 1936 included authorization for work on the San Gabriel River and Rio Hondo as approved by the Chief of Engineers U.S. Army. The Whittier Narrows project was included as a unit of the general comprehensive plan for flood control in the Los Angeles County drainage area in the district engineer's report of 5 February 1940 titled "Survey Report, Flood Control, Los Angeles and San Gabriel Rivers and Their Tributaries and Ballona Creek, California." The above comprehensive plan was approved in the Flood Control Act of 18 August 1941.

5. Considerable local opposition developed to the construction of the dam, and appropriations for construction were delayed. The House Committee on Flood Control on 16 April 1946 requested the Chief of Engineers to make a restudy of the Whittier Narrows project. Alternate plans were developed and after several meetings and hearings the final plan was adopted. The 1949 Appropriations Bill included $250,000 to start construction on the project. Subsequent appropriations were made and the project is scheduled for completion in 1957.

6. Physiographic characteristics.--Whittier Narrows flood-control reservoir is located on the San Gabriel River and the Rio Hondo, approximately 10 miles east of the city of Los Angeles and 3 miles south of the city of El Monte. Location of the Project is shown on plate A-1. The drainage area of 554 square miles is 60 percent mountains, 30 percent valley, and 10 percent hills. The rugged San Gabriel Mountains form the northern boundary of the drainage area. Most of the valley area is between the mountains and a range of low hills along the east, south, and west sides of the drainage area. Elevations in the drainage area vary from about 200 feet above sea level at Whittier Narrows to more than 10,000 feet at San Antonio Peak on the northeast boundary, and from about 400 to 1,400 feet along the hills forming the southern boundary. A topographic map of the area is shown on plate A-2.

7. San Gabriel River originates on the southern slopes of the San Gabriel Mountains. It flows through precipitous canyons to the base of the mountains, and thence across a broad alluvial cone and the San Gabriel Valley to Whittier Narrows. The Rio Hondo, a distributary of San Gabriel River, branches from the river near the middle of the San Gabriel Valley and flows southwest to Whittier Narrows. From the Whittier Narrows, San Gabriel River flows south to the Pacific Ocean, and the Rio Hondo flows southwest to the Los Angeles River. The steep, high southern front of the San Gabriel Mountains is drained by several tributaries of the San Gabriel River and the Rio Hondo. The longest watercourse above Whittier Narrows Dam is 39.5 miles. The average gradient of San Gabriel River in the mountains is 260 feet per mile. The average gradients of San Gabriel River and the Rio Hondo in the valley are 41 and 27 feet per mile, respectively.

8. Soils of the drainage area are primarily residual, derived from metamorphic and igneous rocks. The mountain soil is coarse, porous, rocky, and generally shallow, with large areas of bare rock outcrop. The hill soils are shallow, but generally less pervious than mountain soil. The valley soil, classified as recent alluvium and older alluvium, varies from coarse sand and gravel in the stream channels and at the canyon mouths to silty clay and clay loam in the lower (southern) part of the valley, and clay on the east and west sides. Long the summits and in the higher ravines of the mountains there is a fairly well-developed growth of ponderosa pine, incense cedar, juniper, and oak. Cottonwoods, box elders, sycamores,

oaks, willows, and alders are found along the watercourses at lower elevations. In general, the remainder of the mountains is covered with brush, varying in density from scattered bushes to nearly impenetrable thickets. These consist of California lilac, scrub oak, mountain mahogany, sumac, laurel, sage, and manzanita. The dense chaparral growth and long, dry summers render the region extremely susceptible to fires which are difficult to control, frequently resulting in complete denudation of extensive areas. The hills are without trees except for a few, such as oaks, sycamores, and cottonwoods along the stream channels. Grasses are the principal natural vegetation on the hills. On much of the hill land and nearly all the valley land the natural vegetation has been replaced by cultivated field, orchard, and truck crops, and, especially in the valley west of the Rio Hondo, by urban and suburban development. As a result of the urban development, much of the valley has become all-impervious to rainfall infiltration and storm-runoff percolation. The percentage of all-impervious area is increasing rapidly with continuing development.

9. Downstream development.--The overflow area downstream from Whittier Narrows flood-control basin prior to construction of the dam comprised about 60,000 acres of highly developed industrial, residential, and agricultural property in the south eastern part of Los Angeles County. This area has an estimated value of about $300,000,000 and is occupied by about 1,000,000 persons. Included in the overflow area are parts of the cities of Long Beach, Artesia, Compton, Downey, Lakewood, Lynwood, Montebello, South Gate, and numerous other communities. Facilities vital to defense mobilization and national economy are subject to serious damage or disruption by floods. These facilities include major aircraft plants, including North American and Douglas plants; oil refineries, including those of Richfield, Union, Shell, General Petroleum, Texas, Tidewater Associated, and Standard Oil Companies; automobile factories and assembly plants, including those of Ford, General Motors, and Studebaker Companies; important harbor facilities and shipyards; main transcontinental railroads and highways; United States Naval installation, including the Los Alamitos Air Station and Ammunition and Net Storage Depot near Seal Beach; and many other smaller but important facilities.

10. Hydrometeorological characteristics.--The climate in the drainage area is subtropical and semiarid in the valleys and hills and is temperate and humid in the mountains. Most precipitation in the drainage area is associated with general winter storms that result from extratropical cyclones of north Pacific origin. During the months of November through April, these storms move south over the Pacific Ocean to the latitudes of southern California and thence inland and result in precipitation over large areas. Major storms consist of one or more cyclonic disturbances and occasionally last 4 days or more. Thunderstorms, which may result in intense precipitation over small areas during short periods, occasionally occur

either in association with general winter storms or independently. Summer thunderstorms are infrequent. The greatest floods from the entire drainage area above Whittier Narrows floods-control basin result from general winter storms, but the greatest floods from a small sub-basin result from thunderstorms. The mean seasonal precipitation in the drainage area ranges from 16 inches at the dam to more than 45 inches at the crest along the northern boundary of the area (pl. A-3). Most of the precipitation falls during the months of November to April, inclusive. Rainless periods of several months during the summer are common. The monthly distribution of precipitation and other meteorological elements for Los Angeles and Mount Wilson, considered representative of the valley and mountainous areas, are shown in tables A-1 and A-2. The location of these stations are shown on plate A-1.

11. Snow falls frequently during the winter at elevations above 5,000 feet but melts rapidly except on the protected northern slopes and on the higher peaks. Snow rarely falls in the valley. Generally, the effects of snow upon flood runoff is considered slight. However, appreciable effect is possible and current information is obtained during storms for optimum operation of the reservoir. The maximum snow cover in the mountains above Whittier Narrows Dam, based on a record extending back 23 years, occurred in March 1944. The snowline at that time was at an elevation of 4,000 feet. Above this elevation, the average snow depth was 61.3 inches over an area of 75,360 acres. The average water content of snow over the area was 18.4 inches using a snow density of 30 percent. Monthly snow data for Mount Wilson considered representative of the mountain area, are shown in table A-2.

12. Runoff from the drainage area is characterized by unusually high flood peaks of short duration. The physiographic features of the region serve to intensify rainfall rates. High rainfall intensities, combined with effect of shallow surface soils underlain by impervious bedrock, fanshaped collecting systems, occasional denudation by fire, and steepness of gradients, produce floods heavily laden with debris below the canyon mouths. Most streams in the drainage area are intermittent. During normal dry weather the discharge of many streams in increased by regulated outflow from dams in the mountains. Hydrographs of the Rio Hondo above Mission Bridge (1 mile above the dam) for the years 1938 through 1952, and for the San Gabriel River at Beverly Boulevard (1-1/4 miles below the dam) for the years 1937 through 1951 are shown on plates A-4 and A-5, respectively.

13. Floods of record.--During the period for which daily hydrologic data are available (1880-1955), medium to large floods occurred at Whittier Narrows in 1884, 1886, 1889, 1890, 1891, 1905, 1906, 1910, 1911, 1914, 1916, 1921, 1926, 1927, 1934, 1938, and 1943. Hydrographs for the more recent of these floods are shown on plate A-6. Hyetographs for corresponding storms are shown on plate A-7. The floods

of 1884, 1889, March 1938, and January 1943 were outstanding, and the flood of 1934 was large on some of the tributary streams. The flood of January 1952, although small at Whittier Narrows, was the second largest flood of record on the lower reaches of the Los Angeles River.

14. The greatest flood of record at Whittier Narrows was caused by the storm of 27 February - 3 March 1938. This flood resulted from intense rainfall on 2 March, preceded by continuous moderate rainfall that commenced on 27 February. Average rainfall depth over the drainage area was 17.3 inches for the storm. Low rainfall-loss rates and the unusually large rainfall of the storm caused high rates of runoff, especially in the mountains. Past peak discharges were exceeded at all existing stream-gaging stations, with the exception of a few valley stations. Many stream-gaging stations were destroyed as a result of the high discharges of this flood. Estimated peak discharge at Whittier Narrows was 47,000 cubic feet per second. The estimated flood hydrograph and other pertinent hydrologic data area shown on plate A-6. This flood caused damages estimated at more than $2,000,000 downstream from Whittier Narrows Dam. The damages that would be caused under present conditions of development by a flood which would inundate areas similar to those flooded in 1938 are estimated at over $11,000,000.

15. The storm of 21-24 January 1943 was in many respects the most severe of record for the San Gabriel River Basin. In the mountains the recorded intensities for durations greater than 12 hours exceeded all previous recorded intensities in the area. At Hoegee's Camp, the maximum 24-hour precipitation was 25.83 inches. Average rainfall depth over the drainage area above Whittier Narrows was 18.3 inches for the storm. Peak discharge at Whittier Narrows was estimated at 26,200 cubic feet per second. The estimated flood hydrograph and other pertinent hydrologic data are shown on plate A-6.

16. Upstream regulation.--There area numerous reservoirs and diversion structures in the drainage area tributary to Whittier Narrows Reservoir. The only structure operated solely for flood control is Santa Fe flood-control reservoir. This structure, completed in 1949, is under the jurisdiction of the U.S. Army Corps of Engineers. It has a capacity of 34,300 acre-feet at spillway crest. The 16-gated outlets, which discharge into San Gabriel River, have a combined capacity of 41,000 cubic feet per second with reservoir water surface at spillway crest. At present Santa Fe Reservoir is operated on an interim operation schedule designed to minimize damage along the unimproved downstream channel. For further information concerning the operation of this reservoir, reference is made to Appendix III of the Master Reservoir Regulation Manual.

17. Four other large reservoirs are in the drainage area above Whittier Narrows. They are Morris, San Gabriel, and Cogswell Reservoirs on San Gabriel River, and Puddingstone Reservoir on upper Walnut Creek. Morris Reservoir is operated by the Metropolitan

Water District for water supply and is normally full to spillway crest. The Los Angeles County Flood Control District operates the San Gabriel, Cogswell, and Puddingstone Reservoirs. San Gabriel and Cogswell Reservoirs are flood-control and conservation reservoirs. Current operation plans for the San Gabriel and Cogswell Reservoirs will make 33,000 and 9,600 acre-feet, respectively, available for flood control at the beginning of floods. Puddingstone Reservoir is also operated for flood control and conservation. An allotment of 5,000 acre-feet of storage will be available for flood control at the beginning of floods.

18. Eight small combination flood-control and water-conservation reservoirs are in operation in the drainage area and numerous debris basins have been constructed. Several diversions are made upstream from Whittier Narrows for irrigation, spreading, water supply, and production of power. However, major floodflows are not appreciably affected by the operation of these structures. Pertinent data on existing reservoirs in the drainage area are given in table A-3, and their locations are shown on plate A-1.

19. Hydrologic basis of design.--Selection of the reservoir capacity for Whittier Narrows Reservoir was based primarily on controlling the greatest flood (standard project) that may reasonably be expected to occur to nondamaging flows below the dam. The method of developing the standard project flood is outlined in the report titled "Hydrology, San Gabriel River and the Rio Hondo above Whittier Narrows Flood-Control Basin with Addendum on the Hydrologic Effect of Diverting Outflow from Whittier Narrows Flood-Control Basin to Los Angeles River via the Rio Hondo," dated 20 December 1944 and revised 10 July 1946. It is based on the assumed occurrence of a storm equivalent to the storm of January 1943 at a time when the ground conditions would be reasonably conducive to runoff. In developing the flood, all upstream reservoirs except San Gabriel and Santa Fe were assumed full to spillway crest at the beginning of the storm. San Gabriel Reservoir was assumed to have 12,500 acre-feet of water in storage at the beginning of the storm, and the outflow was assumed to be controlled to 4,000 cubic feet per second until there was 22,000 acre-feet of water in storage. At this point, the outflow was increased by increments of 1,000 cubic feet per second until it reached 10,000 cubic feet per second. This maximum outflow was assumed constant until the amount of water in storage decreased to 12,500 acre-feet. Santa Fe flood-control basin was assumed empty at the beginning of the flood and the outlets were assumed completely open during the flood. The regulating effect of the outlet conduits at all other existing upstream reservoirs was assumed negligible during the flood. The resulting flood with a peak of 70,000 cubic feet per second and a 4-day volume of 250,000 acre-feet was routed through the reservoir assuming the following conditions: (a) the outlet gates fully open until the outflow reached 40,000 cubic feet per second and then throttled to maintain that outflow, and (b) the spillway gates closed. This resulted in a

maximum water-surface elevation of 228.5 feet and a corresponding storage of about 33,000 acre-feet. The top of the spillway gates was thus set at elevation 229 feet. No allowance was made for sedimentation in the reservoir capacity. The rate of debris inflow is expected to be small because debris flows from the mountain and foothill areas are largely controlled by Santa Fe flood-control reservoir and numerous other flood-control reservoirs and debris basin. Only 178 square miles of low sediment-producing valley area will be contributing sediment to Whittier Narrows Reservoir. The regulated outflow of 40,000 cubic feet per second was selected after extensive economic studies were made of the cost of the project with various combinations of outflow and height of dam.

20. The development of the maximum probable flood was similar to the development of the standard project flood. The maximum probable flood is defined as the flood that would result if the maximum possible storm rainfall for the drainage area were to occur at a time when ground conditions in the area were conducive to maximum runoff. The maximum possible storm was based on information given in the report title "Revised Report on Maximum Possible Precipitation, Los Angeles Area, Calfornia," dated 29 December 1945 and prepared by the Hydrometeorological Section of the Untied States Weather Bureau. The rainfall pattern was based on the 1943 storm. In developing the flood, all upstream reservoirs were assumed full to spillway crest at the start of the storm. The resulting flood with a peak of 305,000 cubic feet per second and a 4-day volume of 690,000 acre-feet was routed through Whittier Narrows Reservoir under the following conditions: (a) the regulated outflow through the outlets would be 40,000 cubic feet, (b) the reservoir water surface would be at elevation 228.5 feet above mean sea level at the start of the flood, and (c) the spillway gates would operate automatically on a predetermined schedule. The outlet gates were assumed operative due to the remote possibility that one or more of the large radial gates would become partially blocked or stuck. The routing resulted in a reservoir water-surface elevation of 234 feet. With a 5-foot freeboard, the top of the dam was set at elevation 239 feet.

21. Description of the project.--The project includes: (a) a dam and outlet works on the San Gabriel River and the Rio Hondo at Whittier Narrows, (b) Rio Hondo channel improvements above the dam from Rush Avenue to Rubio Wash with a capacity of 51,000 cubic feet per second, (c) San Gabriel River channel improvement from about 1 mile above the dam to the San Jose Creek diversion channel with a capacity of 99,000 cubic feet per second, (d) a floodflow channel in the reservoir to divert flows from the San Gabriel River to Rio Hondo with a capacity of 30,000 cubic feet per second when the Rio Hondo pool is below elevation 197.5 feet, (e) a diversion channel for diverting San Jose Creek flows into the reservoir with a capacity of 38,000 cubic feet per second, (f) Rio Hondo channel improvement below the dam to the Los Angels River with a capacity ranging from

40,000 to 42,500 cubic feet per second, and (g) the relocation of streets and utilities within the project area. The general plan of the project is shown on plate A-8. Pertinent data are tabulated in table A-4.

22. The reservoir is formed by an earth (rolled fill) dam having a crest length of 16,960 feet at elevation 239.0 (top of dam), and a maximum height above the Rio Hondo streambed of 56 feet (pl. A-9). The area and capacity of the reservoir at elevation 229.0 (top of spillway gates when closed) are 2,470 acres and 36,160 acre-feet, respectively; at the top of the dam, the area is 3,630 acres and the capacity is 67,060 acre-feet. (Area and capacity values are based on survey ending in March 1957.) Rosemead Boulevard passes over the dam and across the reservoir. The roadway is elevated within the reservoir area with a minimum elevation of 211.0. Below this elevation, the Mission Creek pool and the Rio Hondo pool are divided by Rosemead Boulevard with only the floodflow channel (invert elev. 197.5) connecting the two pools. The Rio Hondo pool at stages below elevation 188 is divided into two pools by a diversion dike in the Rio Hondo channel just above the dam. San Gabriel River channel is separated from the Mission Creek pool below elevation 208 (invert of floodflow channel at San Gabriel River).

23. Seventy-three productive oil wells are located below elevation 230 within Whittier Narrows Reservoir. Approximate elevations of these wells are tabulated in table A-5. The Los Angeles District Office of the U.S. Army Corps of Engineers is negotiating contracts with owners of the oil wells to compensate them for possible damages caused by the construction and operation of Whittier Narrows Dam.

24. The outlet works are located near the right abutment of the dam so that discharges are directed into the Rio Hondo (pl. A-10). Four radial gates, 30 feet wide by 20 feet high, when closed, seal gate openings 30 feet wide by 19 feet high. The gates are numbered from left to right looking downstream. Gate sills are at elevation 184. Regulated outflow (40,000 cubic feet per second) is reached at elevation 208.4. Maximum discharge capacity (reservoir elevation 229.0) is 74,700 cubic feet per second. Trash racks are not provided because the outlets are sufficiently large to pass the anticipated maximum size of debris. The piers between the gates are designed to withstand unequal water pressures caused by any gate being closed while the adjoining gate is open. Each gate is equipped with a single $7^{1}/_{2}$-horsepower motor. Reduction units provided give a hoisting speed of approximately 1 foot per minute. Although provision is made for control of the consists by push-button stations at the motors, they will generally be operated from a control board located in the control house. Automatic electrical operation of gate No. 1 is provided to open the gate when the water surface reaches elevation 189 and close the gate when the water surface falls below elevation187. In addition, an automatic device

is installed that will ring an alarm in the dam tender's residence and will stop a clock and flash a light in the district office when the reservoir water surface reaches an elevation of approximately 187 feet.

25. The spillway structure, consisting of nine 50- by 29-foot radial gates, separated by six 8-foot wide and two 16-foot wide piers, is located so as to discharge into San Gabriel River (pl. A-11). Gates are numbered from left to right looking downstream. The gate sills are at elevation 200 feet. The gates are automatically operated by floats and counterweights above water-surface elevation 228.5 where they commence opening and continue until fully open at water-surface elevation 233.5. At reservoir water-surface elevation 234, the design discharge is 251,000 cubic feet per second, and at elevation 239, the discharge is 308,000 cubic feet per second. In addition to the automatic control system, the spillway gates are equipped with mechanical hoists for use in routine maintenance and in emergencies if the automatic control system should fail. Each gate is hoisted by a unit containing a 3-horsepower motor and gear reductions designed to lift the gate at a speed of approximately 1 foot per minute. The motor is connected to the hoist mechanism through a clutch designed to disengage when the automatic float system is in operation. Controls for the mechanical hoists are located on the bridge adjacent to each motor.

26. Commercial electrical power is available for lights, the automatic operation of outlet gate No. 1, and minor power devices. A 30-kW generator provides standby power in the event of commercial power failure. Electrical power for gate hoists and other heavy power units is obtained from a diesel-driven, 75-kW-a generator, with a 75-kW-a standby unit.

27. A 30-inch reinforced concrete pipe is provided to pass Mission Creek flows through the dam. The main flow in mission Creek originates from rising ground water within the reservoir area. Flow of the creek is continuous and normally less than 5 cubic feet per second. Mission Creek flow constitutes a part of the water reaching the Arroyo Ditch and Water Company's intake downstream from the dam. The Mission Creek conduit is located in the central embankment of the dam, just east of Rosemead Boulevard. The intake structure contains trash rack, a sand trap, and a manually operated 36-inch slide gate. Top of the intake structure and operating mechanism is at elevation 202.5, which will permit operation of the gate during all but major floods. A 30-inch, low-pressure gate valve is provided near the downstream end of the conduit for regulating the outflow during times that the 36-inch gate is flooded. The conduit was designed to pass 30 cubic feet per second when reservoir water surface reaches about elevation 191. Invert of the intake structure is at elevation 187.5.

28. Hydrologic facilities.--Facilities for obtaining hydrologic data required in the operation of Whittier Narrows Dam include: (a) a glass-tube rain gage and a recording rain gage located at the dam; (b) rain gages, from which radio reports are received, located in or near the drainage area at Chilao, Crystal lake, Big Pines, Mt. Baldy, San Dimas, Sierra Madre, and Santa Fe Dam; (c) rain gages, operated by the Los Angeles County Flood Control District, located at Sierra Madre Dam, Sawpit Dam, Cogswell Dam, San Gabriel Dam, Morris Dam, Opid's Camp, and Colby's Ranch; (d) reservoir water-surface recorders located in the outlet control house, the spillway control house, and in the floodflow channel at Rosemead Boulevard; (e) reservoir staff gages; (f) outlet gate position recorders and indicators in the outlet control house and spillway gate position recorders in the spillway piers and indicators in the spillway control house; (g) inflow gaging stations located on Alhambra Wash near Klingerman Street (Los Angeles County Flood Control District station), on the Rio Hondo below Garvey Avenue, and on the San Gabriel River at Parkway Bridge; and (h) outflow gaging stations located on the Rio Hondo below the dam, on San Gabriel River at Beverly Boulevard (Los Angeles County Flood Control District station), and on Mission Creek below the dam. The locations of the above facilities are shown on plate A-1.

29. The outflow gaging station on the Rio Hondo is equipped with telemetering equipment to transmit gage heights to the outlet control house. The inflow gaging stations on the Rio Hondo below Garvey Avenue and on Alhambra Wash near Klingerman Street are being equipped with Telemarks connected to a commercial telephone system. It is planned to install the same type equipment at the inflow gaging station on the San Gabriel River at Parkway Bridge. No Telemark installation is contemplated for the Mission Creek gaging station.

30. Communication facilities.--The following communication facilities have been installed at Whittier Narrows Dam for reporting hydraulic data: (a) commercial telephone service in the outlet control house, (b) a telephone system between the outlet control house, the spillway control house and the individual spillway gate controls, (c) a telephone system, owned by the Los Angeles County Flood Control District, between their spreading grounds in the Rio Hondo, the outlet control house, and the spillway control house, (d) a sound-powered telephone system between the outlet control house and the gaging station on the Rio Hondo below the dam, and (e) a two-way radio in the outlet control house, and a remote-control radio unit in the spillway control house for communicating with the district office.

31. Sedimentation measurements.--An initial survey to be used as the basis for future determinations of sedimentation was completed in March 1957. The contours for this survey are at 2-foot intervals. In order to obtain information on the depth of sediment in the

reservoir to determine whether anew survey is required, two permanent monumented ranges were established as shown on plate A-8. Future surveys will be made after each major flood or at intervals of not over 10 years.

32. Diversion structures.--Several water-conservation facilities in the vicinity of Whittier Narrows Dam, but not part of that project, were affected by the construction and operation of the dam. Downstream from the dam on the Rio Hondo, the Los Angeles County Flood Control District operates a spreading ground of 443 acres located on the east side of the Rio Hondo channel between the Union Pacific Railroad and Slauson Avenue (pl. A-12). The sustained percolation capacity of these grounds is approximately 600 cubic feet per second. In order to facilitate operation of the spreading grounds, a permanent headworks consisting of 3 power-operated Tainter gates, 12 feet high, has been constructed in the channel. Included in the diversion headworks are four 5- by 4-foot vertical slide gates (capacity 750 cubic feet per second) in the left bank which control flows into the spreading grounds, and two 4- by 4-foot vertical slide gates (capacity 150 cubic feet per second) in the right bank which control flows into the natural channel percolation area along the west bank of the concrete channel.

33. Water rights to the rising water flow in the Rio Hondo are satisfied by a diversion conduit in the left abutment of the outlet works. This conduit discharges low flows to the unimproved ditch behind the left levee of the downstream channel. Invert of the conduit is at elevation 184.0. It is 3 feet in diameter, and is controlled by a manually operated slide gate. Two trash racks are provided for the conduit intake. Operation of the gate is from a stand near the top of the dam. The Los Angeles County Flood Control District will operate the gate for diverting and spreading water. Construction of a low grouted-cobblestone dike to divert low flows to the diversion conduit was completed about November 1956. The dike has a top elevation of 188.0, and extends 2,000 feet upstream from the left pier of the outlet works to the right bank of the Rio Hondo.

34. Local interests are using the natural bed of the Rio Hondo between Beverly Boulevard and Anaheim-Telegraph Road for percolation purposes. In order to continue the use of the abandoned streambed west of the channel improvement for this purpose, a 54-inch gated siphon was constructed under the channel a short distance downstream from Beverly Boulevard to divert up to 150 cubic feet per second to this area.

35. The Arroyo Ditch and Water Company has developed facilities in the left levee of the original Rio Hondo channel just downstream from Beverly Boulevard for diverting approximately 25 cubic feet per second to its ditch system (pl. A-12). Water for these facilities

will be supplied through the diversion conduit in the left abutment of the outlet works. The right of other water users to low flows is subject to the prior right of the Arroyo Ditch and Water Company.

36. The Los Angeles County Flood Control District operates spreading grounds on the west side of San Gabriel River between Whittier Boulevard and Washington Boulevard. This spreading grounds has a gross area of 111 acres, an intake capacity of 200 cubic feet per second, and a percolation capacity of approximately 85 cubic feet per second.

37. The San Jose Creek diversion channel which diverts flows from San Jose Creek into San Gabriel River above Whittier Narrows Dam was constructed as a part of the Whittier Narrows project. The capacity of this diversion channel is 38,000 cubic feet per second.

38. The floodflow channel is trapezoidal in section with a base width of 400 feet and side slopes of 1 on 2.5. The invert elevation of the floodflow channel at the San Gabriel River is 208.0 feet. Invert elevation at the Rosemead Boulevard Bridge is 199.0 feet with a low-flow channel 40 feet wide having an invert elevation of 197.5 feet.

39. Downstream channels.--The Rio Hondo channel improvement from Whittier Narrows Dam to the Los Angeles River has been completed, and capacities range from 40,000 to 42,500 cubic feet per second. The Los Angeles River channel improvement from the confluence with the Rio Hondo to the Pacific Ocean is scheduled for completion by December 1957. At that time, the channel capacity will vary from 140,000 to 146,000 cubic feet per second. The capacity of the San Gabriel River channel from Whittier Narrows Dam to the Pacific Ocean is estimated at 10,000 cubic feet per second for a sustained flow. However, it is believed that some maintenance would be required. Current plans call for the expenditure of about $10,000,000 to improve the San Gabriel River channel. When improvements are completed, the channel will have a capacity of 15,000 cubic feet per second from the dam to the confluence with Coyote Creek and a capacity of 30,000 cubic feet per second from Coyote Creek to the ocean.

40. Changes to authorized plan.--The final project plan differs from the plan prepared in 1940 due primarily to (a) the changed location of the dam to meet objection raised mostly by local interests in El Monte, adjacent to the upper reservoir area, (b) changes made necessary by building construction and highway improvements which took place in the reservoir area, and (c) design modifications. In 1946 the dam was redesigned to provide outlet works which would discharge into the Rio Hondo rather than into the San Gabriel River. The controlled outflow was increased, a gated spillway was provided, and the alignment was revised slightly. In 1948, the dam site was moved downstream a distance of one-half mile in order to avoid the flooding of 300 private homes and property and adjacent to the city of El Monte in the upstream reservoir area.

41. Construction history.--Construction of the dam began on 23 March 1950 and closure was made on 15 November 1955. Construction of the project is scheduled for completion in 1957. The total Federal cost for the project is expected to be $32,300,000.

42. Development of reservoir area.--Extensive development of the reservoir area for recreation is planned. The Los Angeles County Parks and Recreation Department will develop most of the area. Facilities planned by this organization include picnic areas, golf course, amusement area, equestrian trials, and facilities for athletic events. A fishing lake has already been established. The National Audubon Society operates a wildlife sanctuary and nature center, and the Los Angeles Rifle and Revolver Club and the City of Alhambra Pistol Club operate ranges in the reservoir area.

Table A-1

Summary of climatological data at Los Angeles, California*

Month	Temperature			Precipitation			Snow		
	Mean monthly	Record highest	Record lowest	Mean monthly	Maximum monthly	Minimum monthly	Mean monthly	Maximum monthly	Minimum monthly
	Degrees Fahrenheit	Degrees Fahrenheit	Degrees Fahrenheit	Inches	Inches	Inches	Inches	Inches	Inches
Jan.	55.0	90	28	2.38	13.30	T	T	2.0	0
Feb.	56.4	92	28	3.37	13.37	0	T	T	0
Mar.	58.9	99	31	2.36	12.36	T	T	T	0
Apr.	61.5	100	36	1.17	7.53	T	0	0	0
May	64.8	103	40	.26	3.57	0	0	0	0
Jun.	67.8	105	46	.07	1.39	0	0	0	0
Jul.	72.5	109	49	T	.27	0	0	0	0
Aug.	72.9	106	49	.02	.61	0	0	0	0
Sep.	71.0	108	44	.27	5.67	0	0	0	0
Oct.	66.6	104	40	.50	6.96	0	0	0	0
Nov.	62.1	96	34	1.03	6.53	0	T	T	0
Dec.	57.3	92	30	3.11	15.80	0	T	T	0
Period of record	63.9	109	28	**14.54	15.80	0	**T	2.0	0

* Latitude 34° 03' N; longitude 118° 14' W.; elevation 312 feet above mean sea level.
** Mean seasonal.

NOTE: Period of record for mean values 30 years (1921-1950). Period of record for maximum and minimum values 77 years (1877-1954). "T" refers to trace.

Table A-2

Summary of climatological data at Mount Wilson, California*

Month	Temperature			Precipitation			Snow		
	Mean monthly	Record highest	Record lowest	Mean monthly	Maximum monthly	Minimum monthly	Mean monthly	Maximum monthly	Minimum monthly
	Degrees Fahrenheit	Degrees Fahrenheit	Degrees Fahrenheit	Inches	Inches	Inches	Inches	Inches	Inches
Jan.	42.1	75	7	5.54	28.59	0.03	13.0	82.0	0
Feb.	42.3	73	14	7.76	24.61	0	10.8	71.7	0
Mar.	45.2	80	14	5.58	22.80	.02	6.5	54.0	0
Apr.	50.9	85	14	2.86	17.55	0	2.9	13.0	0
May	56.8	91	21	.81	11.04	0	.9	11.0	0
June	65.2	98	29	.13	1.39	0	T	T	0
July	73.1	99	42	.02	.40	0	0	0	0
Aug.	72.3	101	38	.11	1.24	0	0	0	0
Sept.	67.2	98	34	.64	11.78	0	0	0	0
Oct.	57.8	91	21	1.57	6.97	0	.5	5.5	0
Nov.	51.0	80	15	2.52	11.31	0	1.9	10.0	0
Dec.	44.7	75	13	6.33	29.40	0	7.2	28.0	0
Period of record	55.7	101	7	**33.87	29.40	0	**42.7	82.0	0

* Latitude 34° 14' N.; longitude 118° 04' W.; elevation 5,707 feet above mean sea level.
** Mean seasonal.

NOTE: Period of record for mean values 34 years (1916-1950). Period of record for maximum and minimum values 50 years (1904-1954). "T" refers to trace.

Table A-3

Pertinent data for existing dams in drainage area above Whittier Narrows flood-control reservoir

Dam*	Purpose	Year completed	Drainage area**	Storage capacity		Maximum outflow	
				Spillway crest	Top of dam	Outlets***	Spillway#
ON SAN GABRIEL RIVER			Square miles	Acre-feet	Acre-feet	Cubic feet per second	Cubic feet per second
Cogswell Dam	Flood Control and Water Conservation	1934	39.2	10,600	13,800	11,800	57,300
San Gabriel Dam	...do	1939	202.7	43,900	60,600	12,600	297,000
Morris Dam	Water supply	1934	211.3	28,600	37,200	5,800	77,600
Santa Fe Dam	Flood control	1949	236	34,300	55,000	41,000	331,400
ON OTHER STREAMS							
Big Dalton Dam	Flood Control and Water Conservation	1929	4.5	950	##1,150	1,500	##5,310
Big Santa Anita Dam	...do	1927	10.8	580	##760	550	##5,550
Eaton Wash Dam	Flood Control and Debris Control	1937	9.5	700	1,410	5,040	58,800
Live Oak Dam	Flood Control and Water Conservation	1922	2.3	220	##310	370	##6,730
Puddingstone Diversion Dam	Diversion	1928	2.6	140	340	3,500	27,700
Puddingstone Dams 1,2, and 3	Flood Control and Water Conservation	1926	32.1	17,200	23,700	810	28,500
San Dimas Dam	...do	1922	16.2	1,040	##1,440	2,160	##3,260
Sawpit Dam	...do	1927	3.3	310	##490	220	##2,070
Thompson Creek Dam	...do	1928	3.5	570	1,060	390	6,200
Sierra Madre Dam	Flood Control and Debris Control	1928	2.4	42	##54	200	##3,840

* All structures are operated by the Los Angeles County Flood Control District, except Santa Fe flood-control basin, which is operated by the Corps of Engineers and Morris Dam which is operated by the Metropolitan Water District. Data for all structures except Santa Fe flood-control basin furnished by Los Angeles County Flood Control District.

** Each drainage area includes all upstream drainage area.

*** Water surface elevation at spillway crest.

\# Water surface elevation at top of dam.

Water surface elevation at top of parapet.

Table A-4

Pertinent data, Whittier Narrows flood-control reservoir

Item	Quantity
Drainage area	554 sq. mi.
Reservoir:	
Elevation -	
Rio Hondo Streambed at centerline of dam	183.0 ft. m.s.l.
San Gabriel River at centerline of dam	200.0 ft. m.s.l.
Crest of Rosemead Blvd. fill	210.0 ft. m.s.l.
Spillway design surcharge level	234.0 ft. m.s.l.
Area -	
At elevation 229.0	2,470 ac.
At spillway design surcharge level	3,120 ac.
At top of dam	3,630 ac.
Capacity -	
At elevation 229.0	36,160 ac.-ft. 36660
At spillway design surcharge level (elev. 234)	50,150 ac.-ft. 50065
At top of dam elev. 239	67,060 ac.-ft. 66973
Dam:	
Type	Earth
Height above streambed (Rio Hondo)	56.0 ft.
Top length	16,960 ft.
Top elevation	239.0 ft. m.s.l.
Outlets:	
Type of gates	Tainter
Number of gates	4
Size of gates	30 x 20 ft.
Size of outlets	30 x 19 ft.
Gate sill elevation	184.0 ft. m.s.l.
Gate headwall, bottom elevation	203.0 ft. m.s.l.
Regulated outflow (elevation 208.4 to 239.0)	40,000 c.f.s.
Maximum capacity (elevation 229.0)	74,700 c.f.s.
Spillway:	
Type	Gated
Type of gates	Tainter
Number of gates	9
Size of gates	50 x 29 ft.
Gate sill elevation	200.0 ft. m.s.l.
Top of gates (gates closed) elevation	229 ft. m.s.l.
Discharge at design surcharge (elevation 234.0)	251,000 c.f.s.
Maximum discharge capacity (elevation 239.0)	307,900 c.f.s.

Table A-4--Continued

Pertinent data, Whittier Narrows flood-control reservoir

Item	Quantity
Flood-flow channel:	
Elevation -	
Sill at San Gabriel River channel	208.0 ft. m.s.l.
Invert of low flow channel at Rosemead Blvd. Bridge.	197.5 ft. m.s.l.
Regulation (Reservoir design flood):	
Length of storm	2.5 days
Total storm inflow	256,000 ac.-ft.
Inflow peak	70,000 c.f.s.
Outflow peak	40,300 c.f.s.
Maximum pool elevation	228.5 ft. m.s.l.

Table A-5

Oil well elevations within Whittier Narrows Reservoir

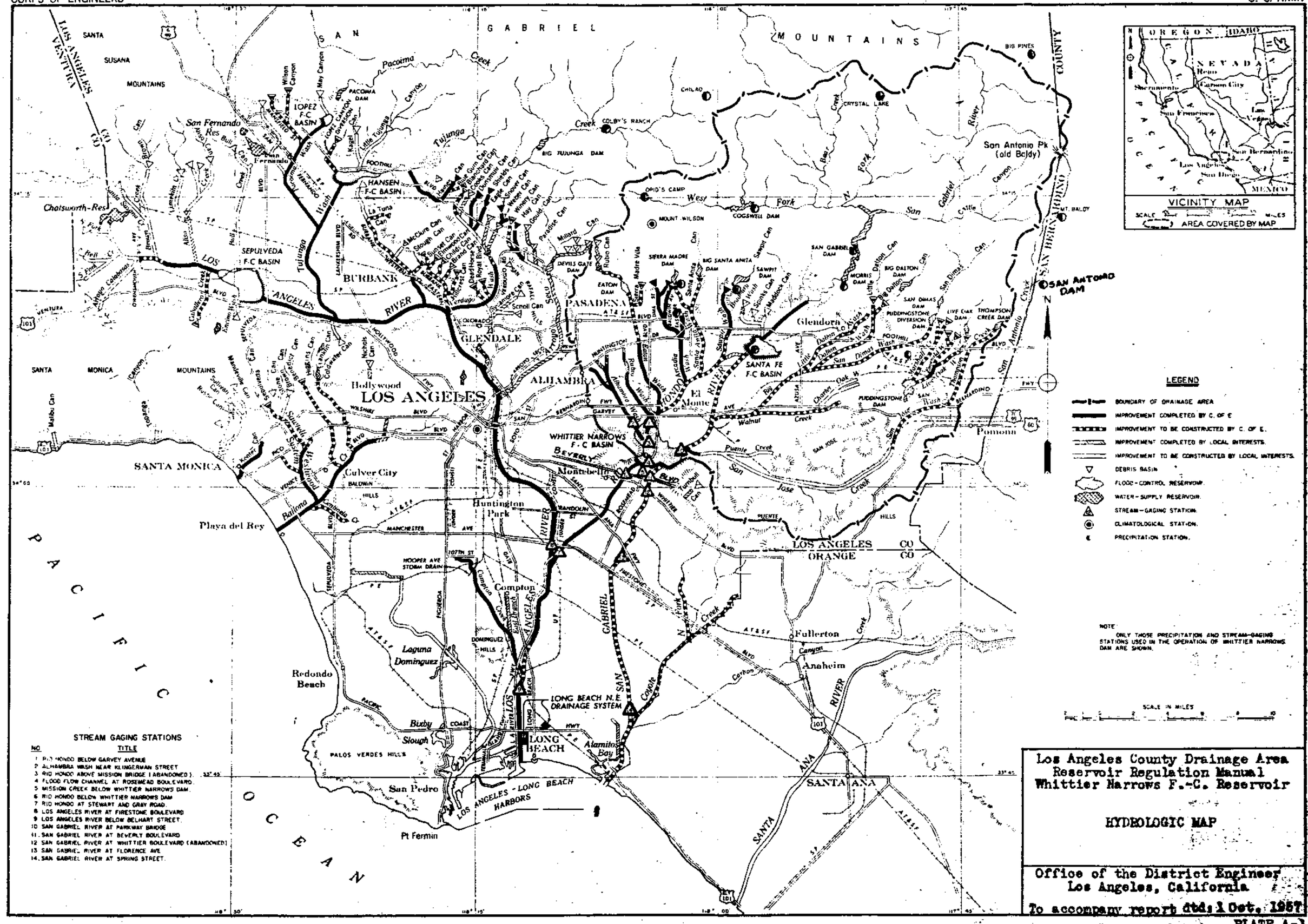
Elevation	Number of wells below given elevation		Elevation	Number of wells below given elevation	
	Rio Hondo side*	San Gabriel River side**		Rio Hondo side*	San Gabriel River side**
Feet above mean sea level			Feet above mean sea level		
193.0	0	0	212.0	52	12
193.5	1	0	212.5	52	12
194.0	2	0	213.0	53	12
194.5	3	0	213.5	54	12
195.0	3	0	214.0	54	12
195.5	5	0	214.5	54	12
196.0	9	0	215.0	54	12
196.5	9	0	215.5	54	12
197.0	11	0	216.0	54	12
197.5	15	0	216.5	54	12
198.0	19	0	217.0	54	12
198.5	21	0	217.5	54	12
199.0	22	0	218.0	54	12
199.5	22	0	218.5	54	12
200.0	23	0	219.0	54	12
200.5	28	0	219.5	54	12
201.0	29	0	220.0	54	12
201.5	30	0	220.5	54	12
202.0	31	0	221.0	54	12
202.5	32	0	221.5	54	12
203.0	32	0	222.0	56	12
203.5	32	0	222.5	57	12
204.0	34	0	223.0	57	12
204.5	42	0	223.5	57	12
205.0	44	1	224.0	58	12
205.5	45	1	224.5	58	12
206.0	46	3	225.0	59	12
206.5	48	4	225.5	59	12
207.0	49	4	226.0	60	12
207.5	49	5	226.5	60	12
208.0	49	5	227.0	60	12
208.5	49	6	227.5	60	12
209.0	49	6	228.0	60	12
209.5	49	8	228.5	60	12
210.0	50	9	229.0	60	12
210.5	51	12	229.5	60	12
211.0	52	12	230.0	61	12
211.5	52	12			

* Area west of Rosemead Boulevard.

** Area east of Rosemead Boulevard.

CORPS OF ENGINEERS

U. S. ARMY



VICINITY MAP

SCALE — MILES

AREA COVERED BY MAP

LEGEND

- BOUNDARY OF DRAINAGE AREA
- IMPROVEMENT COMPLETED BY C. OF E.
- IMPROVEMENT TO BE CONSTRUCTED BY C. OF E.
- IMPROVEMENT COMPLETED BY LOCAL INTERESTS.
- IMPROVEMENT TO BE CONSTRUCTED BY LOCAL INTERESTS.
- DEBRIS BASIN
- FLOOD-CONTROL RESERVOIR.
- WATER-SUPPLY RESERVOIR.
- STREAM-GAGING STATION.
- CLIMATOLOGICAL STATION.
- PRECIPITATION STATION.

NOTE:

ONLY THOSE PRECIPITATION AND STREAM-GAGING STATIONS USED IN THE OPERATION OF WHITTIER NARROWS DAM ARE SHOWN.

SCALE IN MILES

STREAM GAGING STATIONS

NO	TITLE
1	RIO HONDO BELOW GARVEY AVENUE
2	ALHAMBRA WASH NEAR KLINGERMAN STREET
3	RIO HONDO ABOVE MISSION BRIDGE (ABANDONED)
4	FLOOD FLOW CHANNEL AT ROSEMEAD BOULEVARD
5	MISSION CREEK BELOW WHITTIER NARROWS DAM
6	RIO HONDO BELOW WHITTIER NARROWS DAM
7	RIO HONDO AT STEWART AND GRAY ROAD
8	LOS ANGELES RIVER AT FIRESTONE BOULEVARD
9	LOS ANGELES RIVER BELOW BELHART STREET
10	SAN GABRIEL RIVER AT PARKWAY BRIDGE
11	SAN GABRIEL RIVER AT BEVERLY BOULEVARD
12	SAN GABRIEL RIVER AT WHITTIER BOULEVARD (ABANDONED)
13	SAN GABRIEL RIVER AT FLORENCE AVE.
14	SAN GABRIEL RIVER AT SPRING STREET.

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HYDROLOGIC MAP

Office of the District Engineer
Los Angeles, California

To accompany report dtd: 1 Oct. 1957

PLATE A-1

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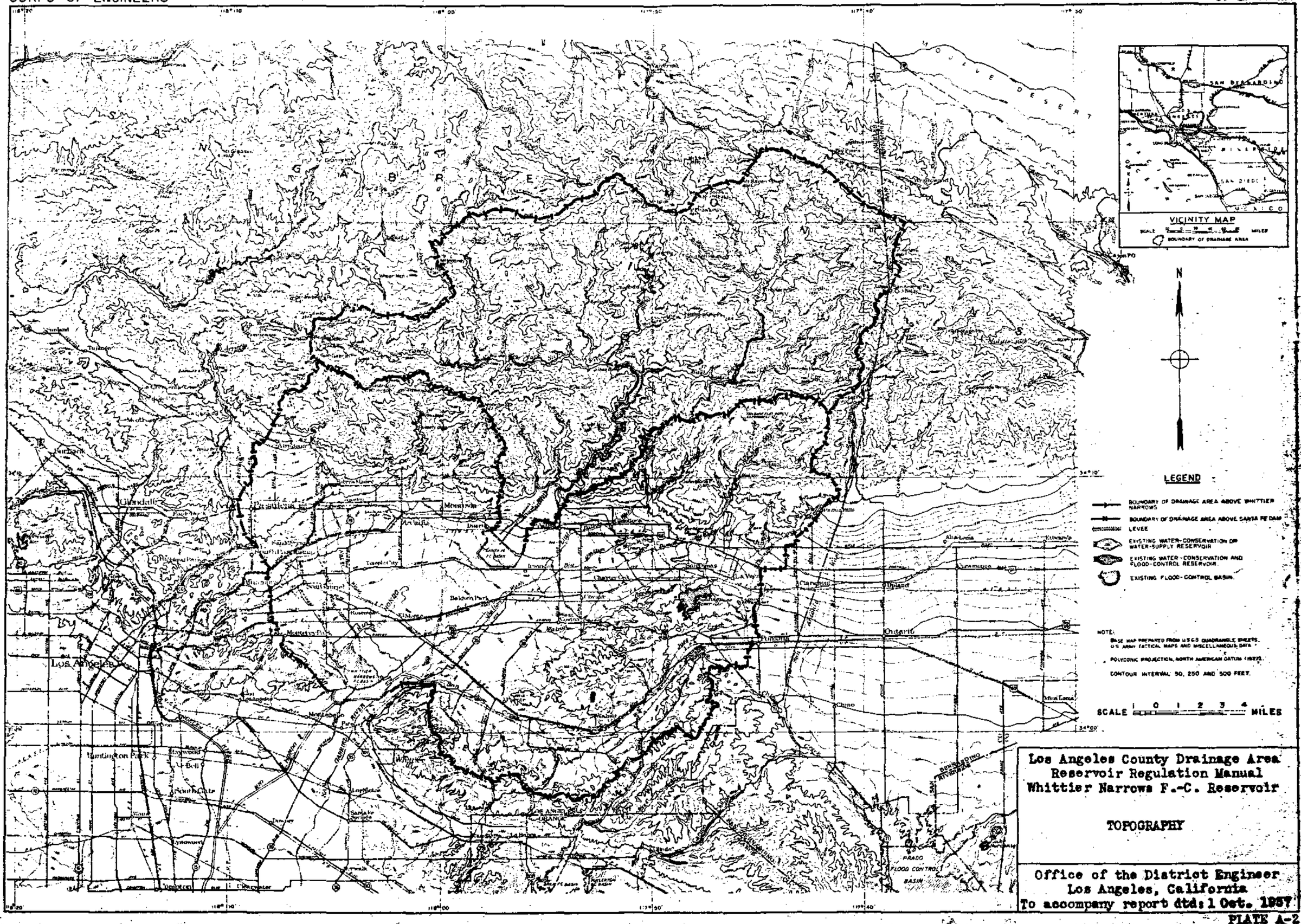

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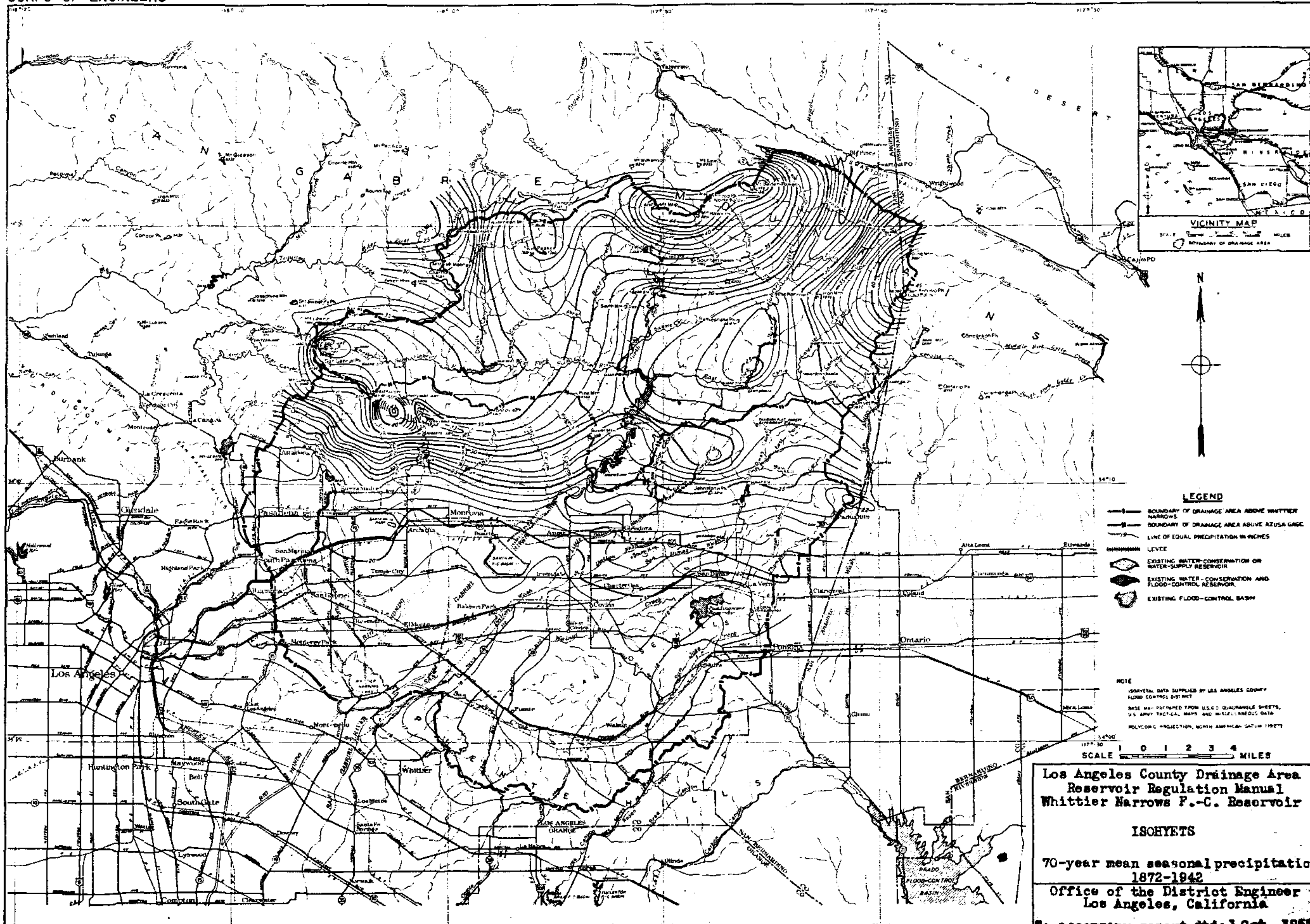
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

TOPOGRAPHY

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-2



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

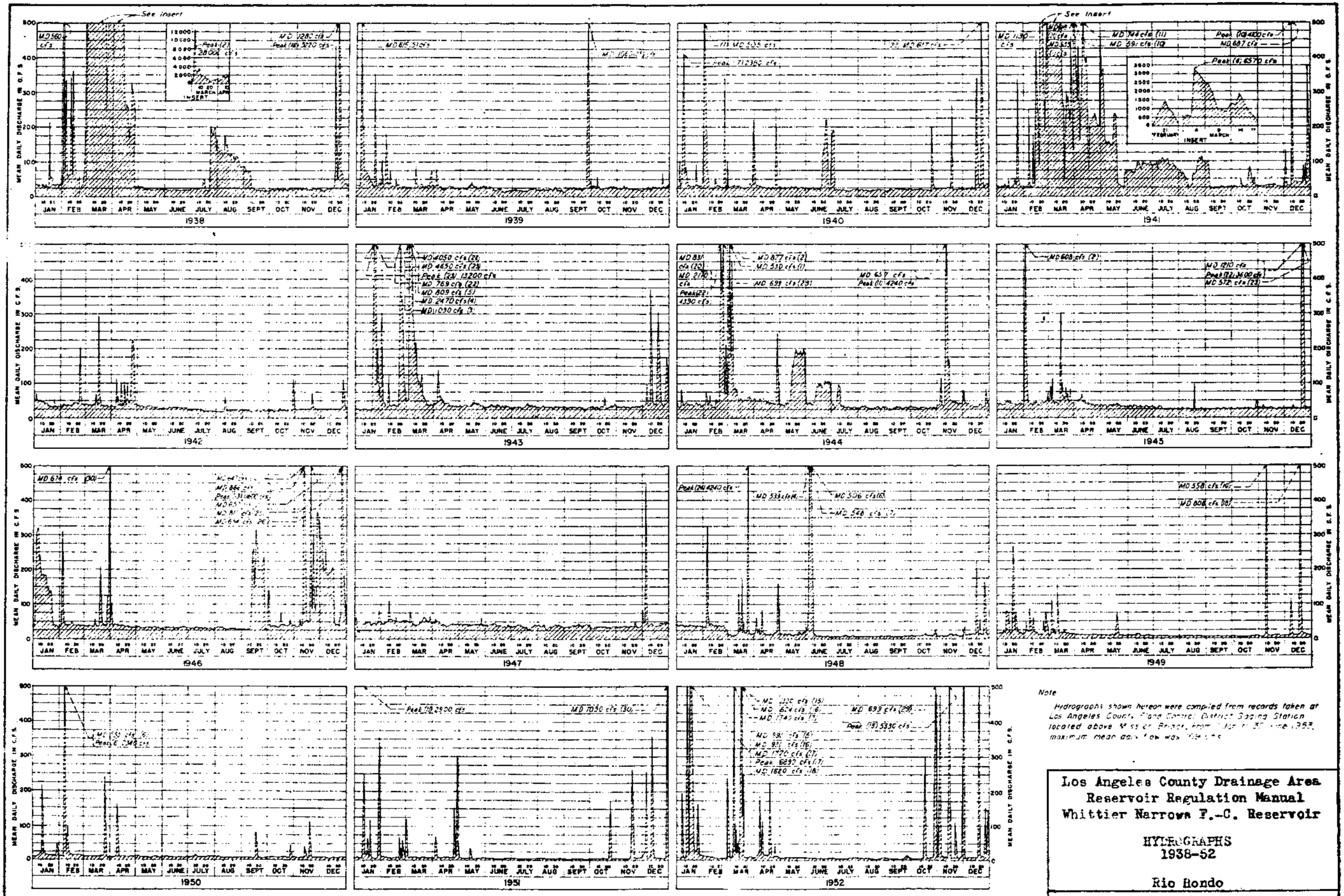
ISOHYETS

70-year mean seasonal precipitation
1872-1942

Office of the District Engineer
Los Angeles, California

To accompany report dtd: 1 Oct. 1957

PLATE A-3



Note

Hydrographs shown hereon were compiled from records taken at Los Angeles County Flood Control District Gaging Station located above Mouth of Bridge, from [illegible] June 1953, maximum mean daily flow was [illegible] c.f.s.

Los Angeles County Drainage Area
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HYDROGRAPHS
1938-52

Rio Hondo

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-4

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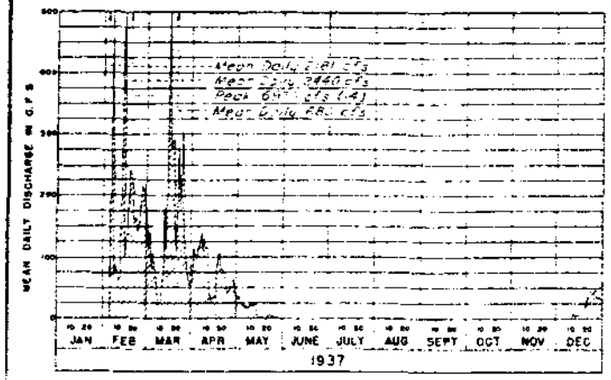

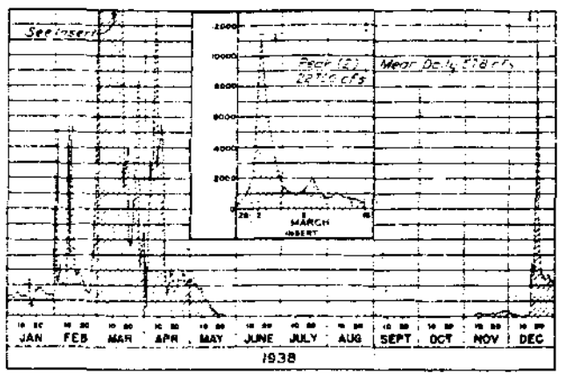

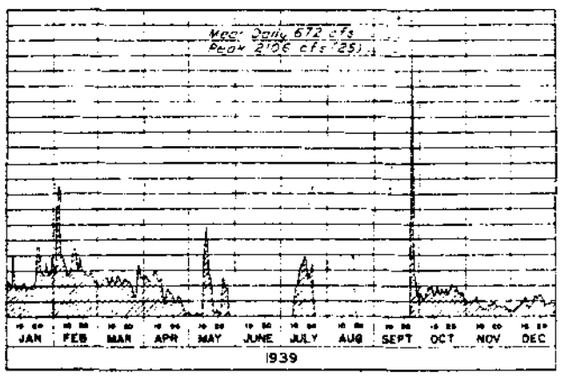

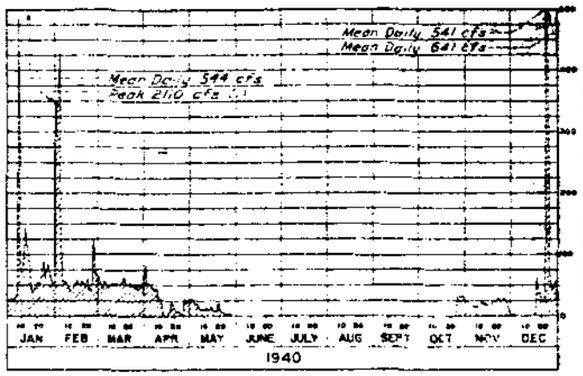

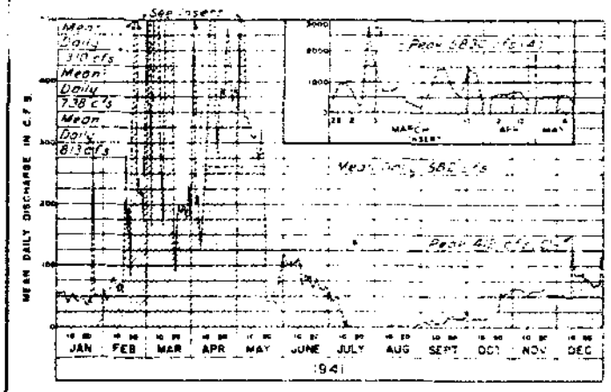

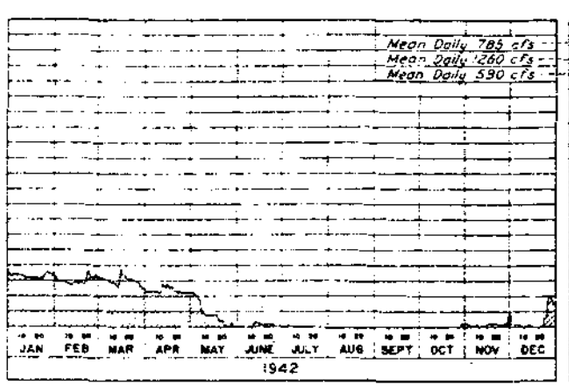

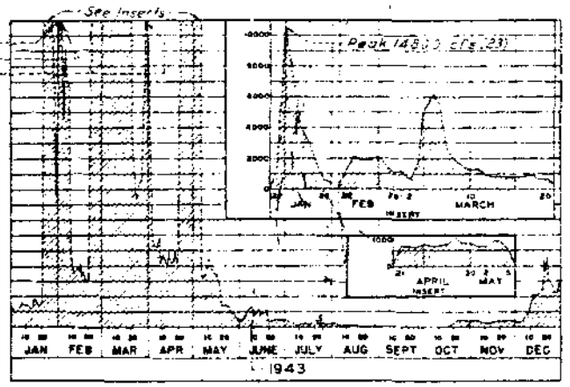

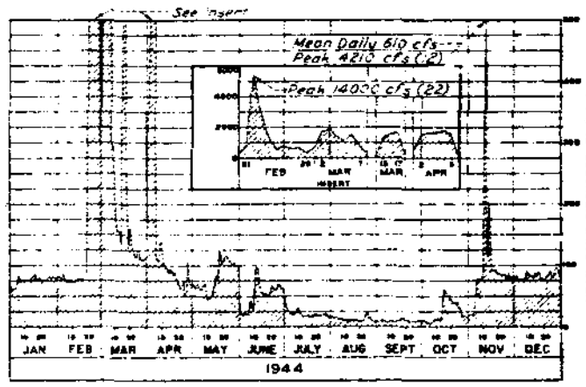

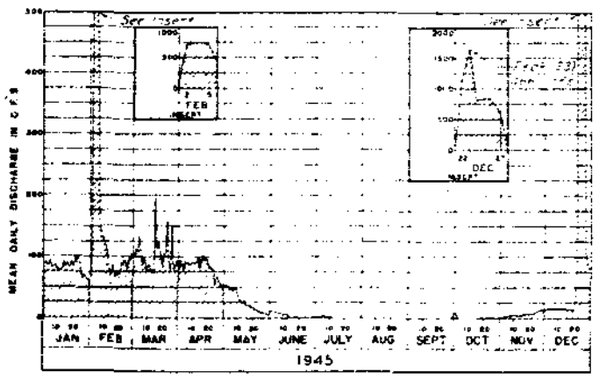

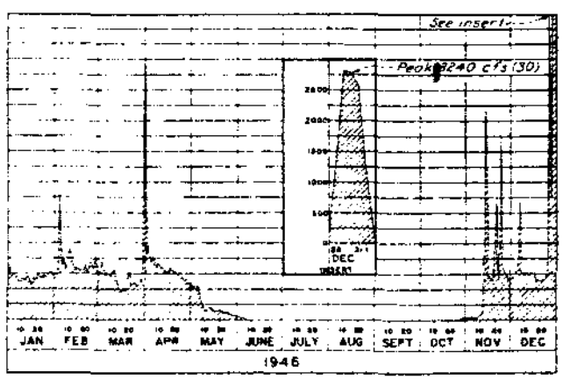

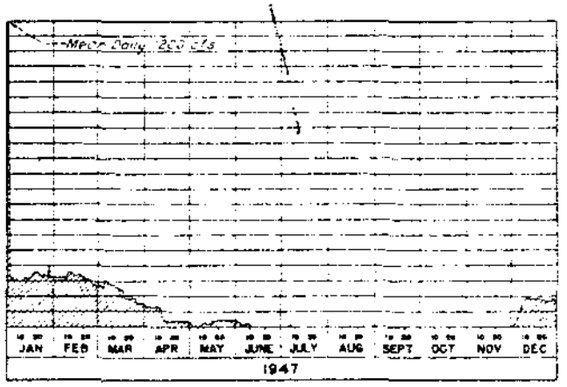

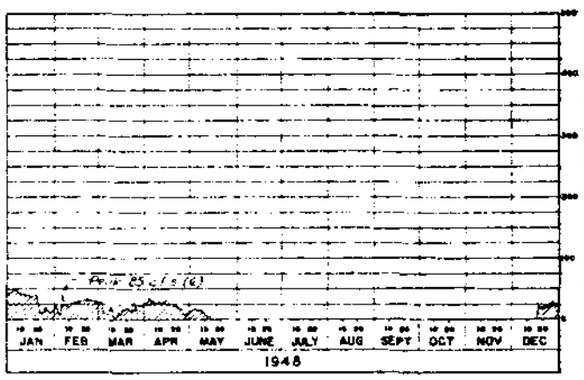

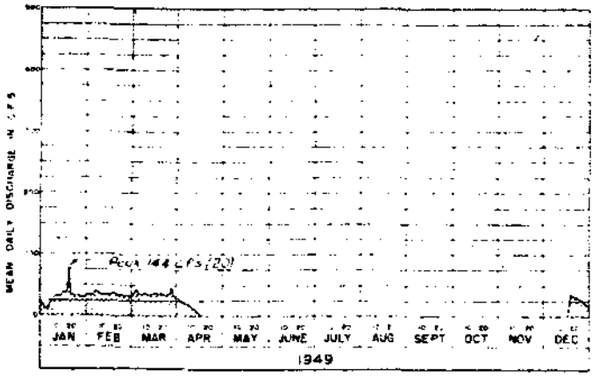

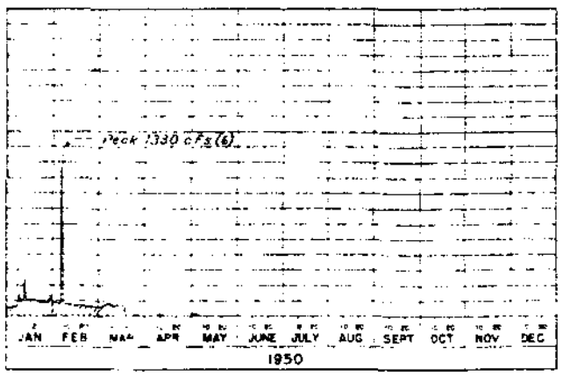

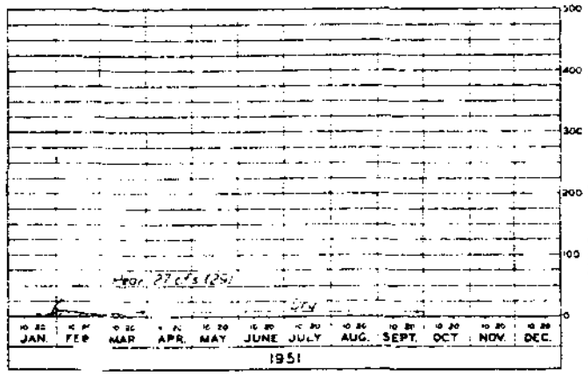

Note
Hydrographs shown hereon were compiled from records taken from the Los Angeles County Flood Control District gaging station at Beverly Boulevard. Flow is partially regulated by [illegible] Dams.

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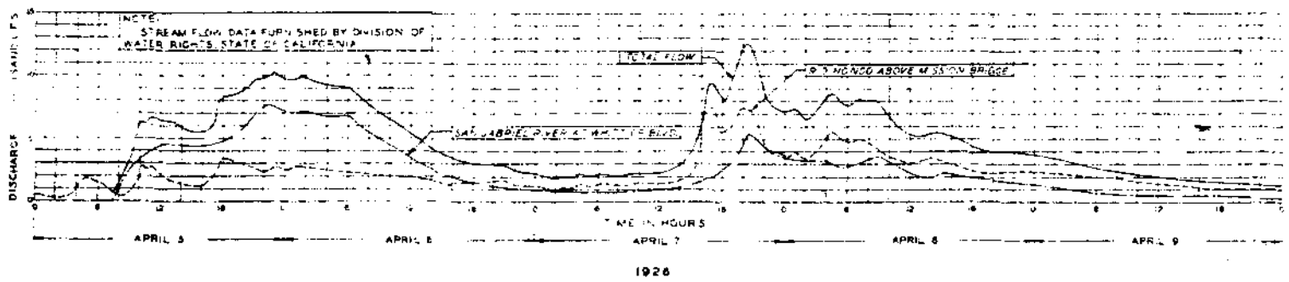
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

HYDROGRAPHS
1937-51

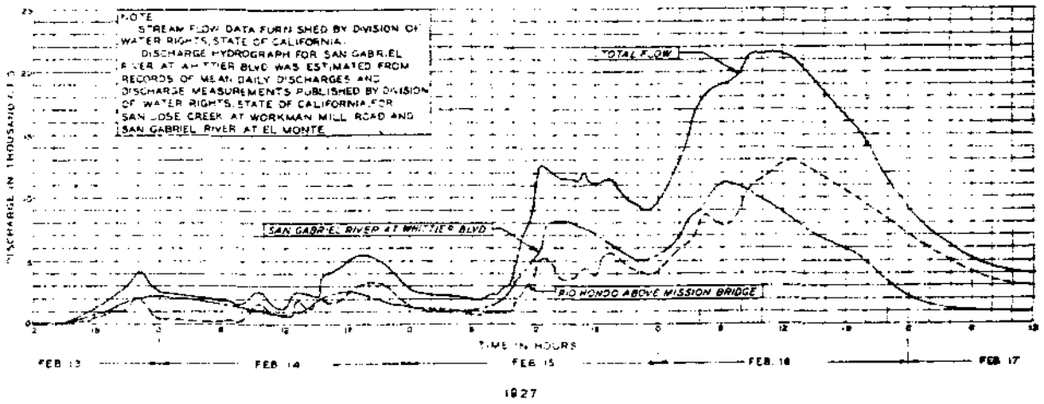
San Gabriel River

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

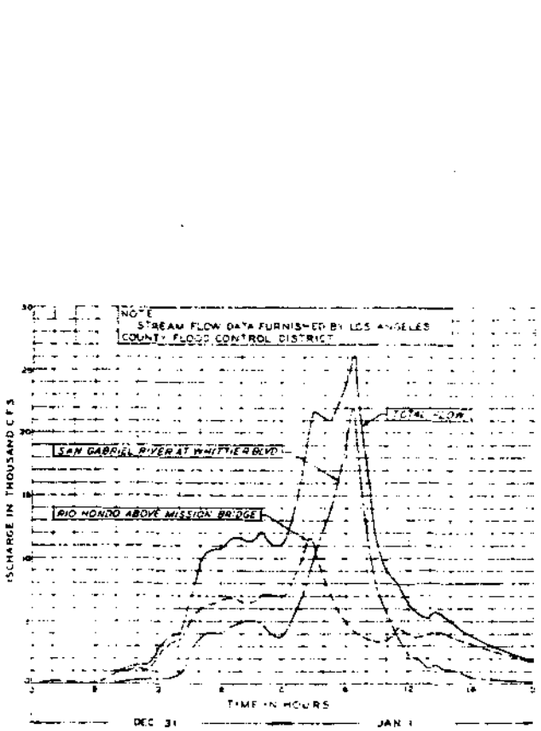
PLATE A-6



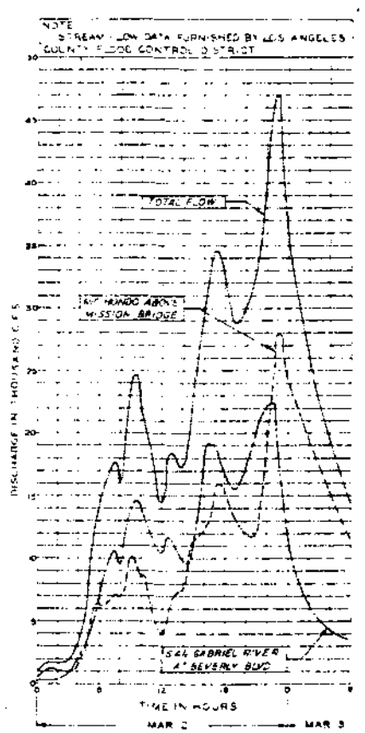
1926



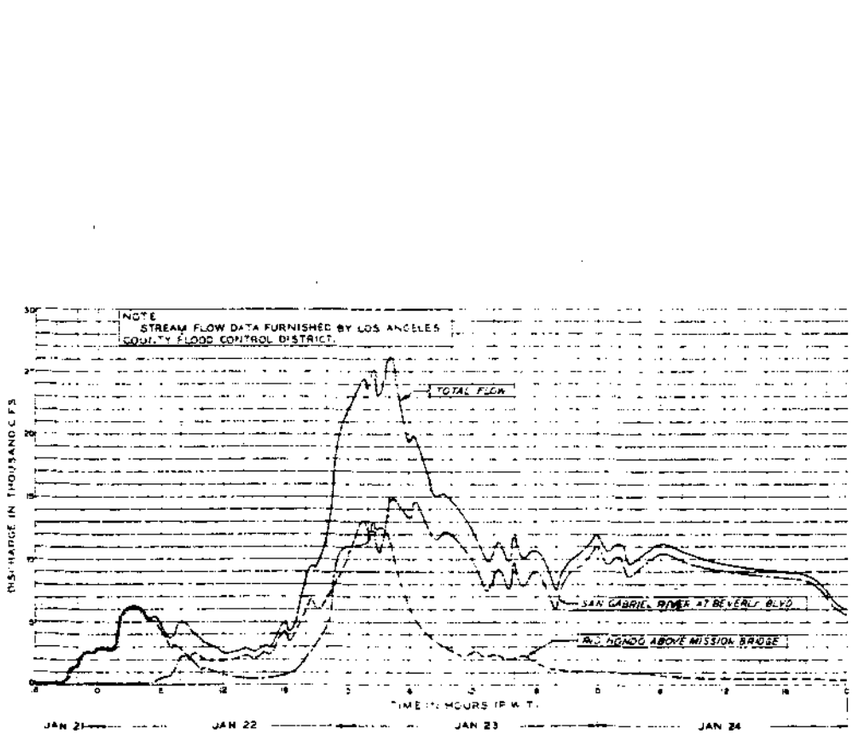
1927



1933 1934



1935



1943

FLOOD	PEAK DISCHARGE	MAX 24-HR VOLUME		MAX. 2-DAY VOLUME		MAX 4-DAY VOLUME	
	C.F.S.	AC.-FT.	DEPTH (2)	AC.-FT.	DEPTH (2)	AC.-FT.	DEPTH (2)
1926	12,600	18,000	.5	21,000	.7	43,000	1.5
1927	21,800	33,000	1.1	48,000	1.6	63,000	2.1
1934	26,200	25,000	.8	30,000	1.0	31,000	1.1
1938	47,000	51,000	1.7	78,000	2.6	99,000	3.4
1943	26,200	31,000	1.1	48,000	1.6	66,000	2.3

(1) CALENDAR DAY
(2) AVERAGE DEPTH IN INCHES OVER THE DRAINAGE AREA

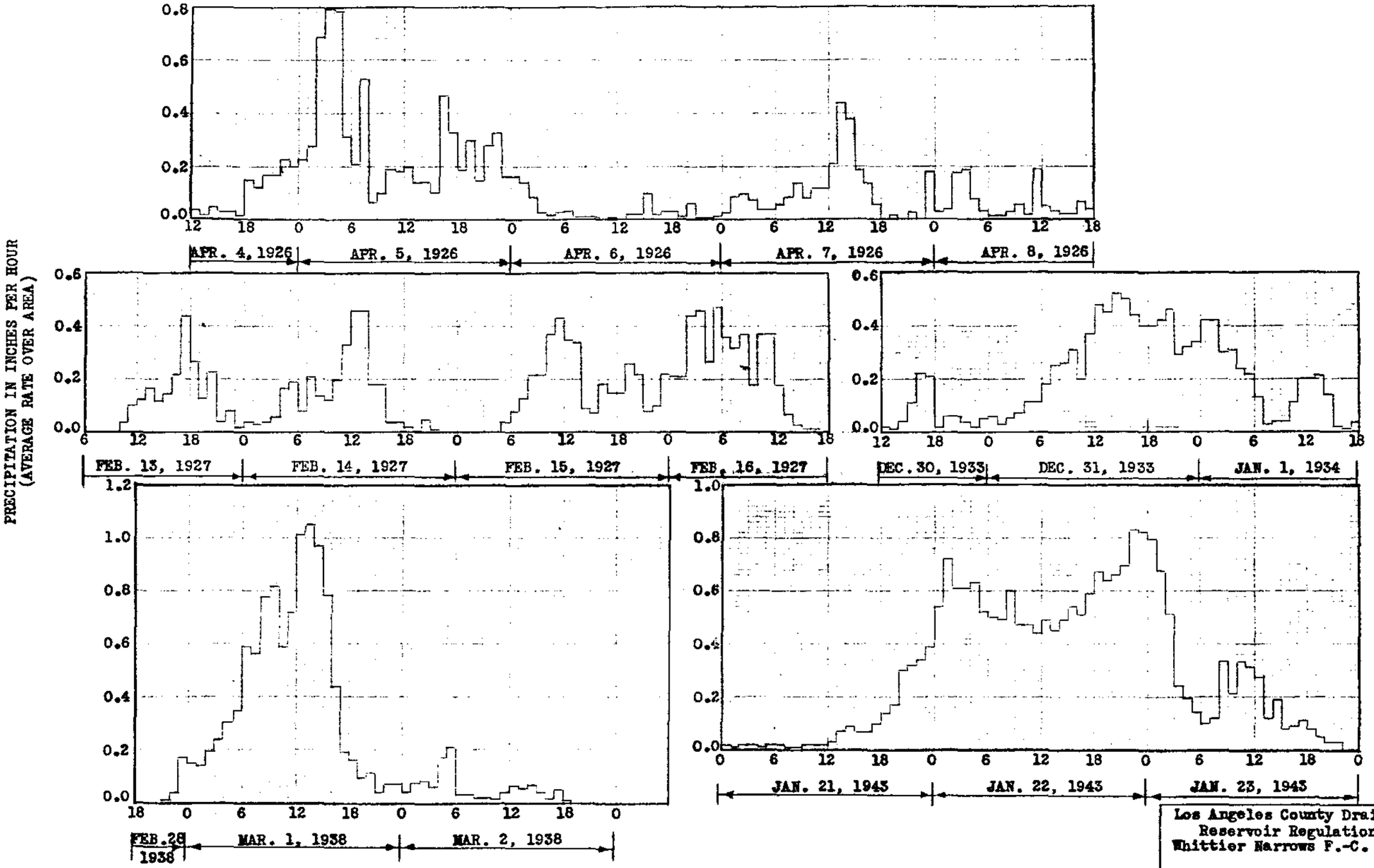
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

ESTIMATED FLOOD HYDROGRAPHS

at Whittier Narrows

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-6



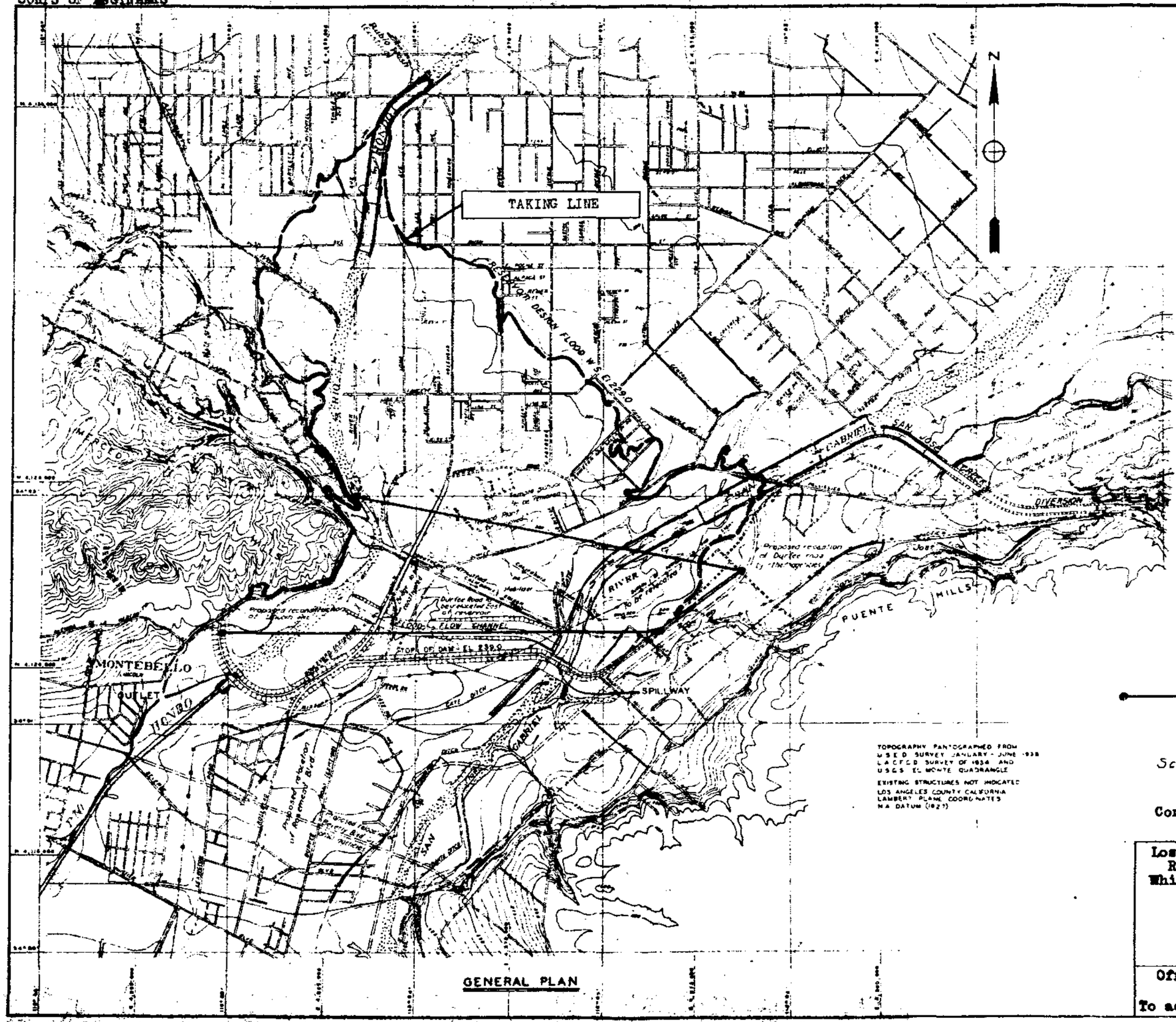
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

HYETOGRAPHS
FOR MAJOR STORMS

Above Whittier Narrows Dam

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-7



GENERAL PLAN

LEGEND

Sedimentation Ranges (Monumented)

Scale 1000 0 1000 2000 3000 Feet

Datum is Mean Sea Level

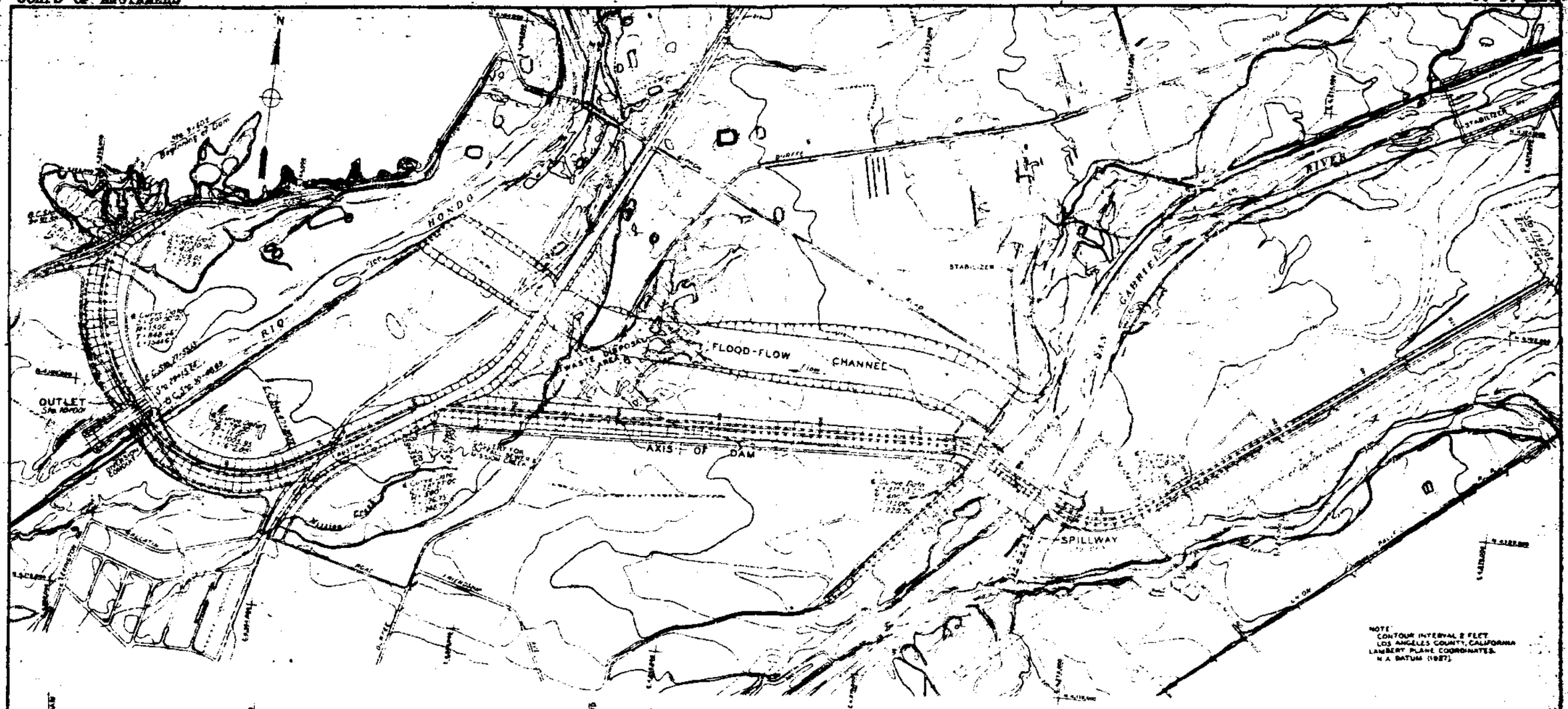
Contour Interval 5 and 25 Feet

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

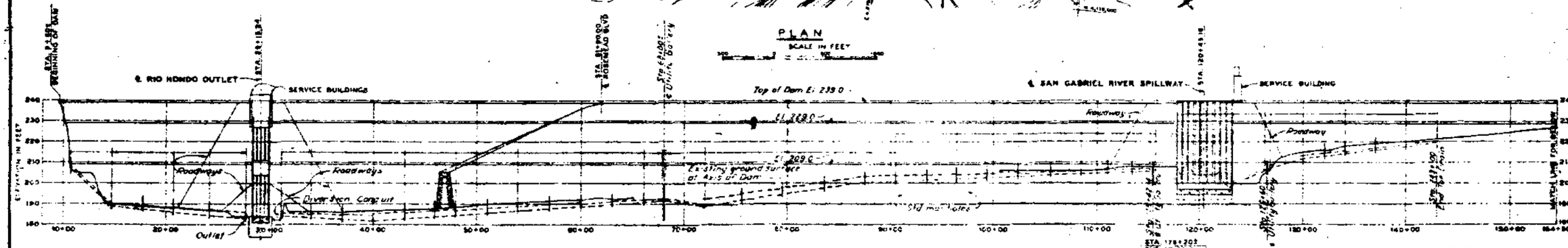
GENERAL PLAN

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

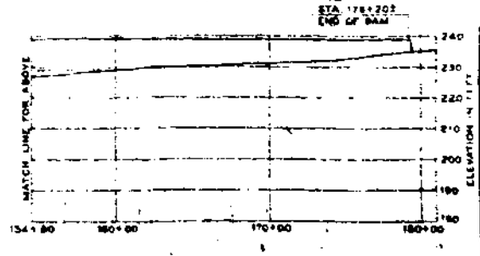
PLATE A-8



PLAN
SCALE IN FEET



DOWNSTREAM ELEVATION
SCALES IN FEET
HOR
VERT



DATUM IS MEAN SEA LEVEL

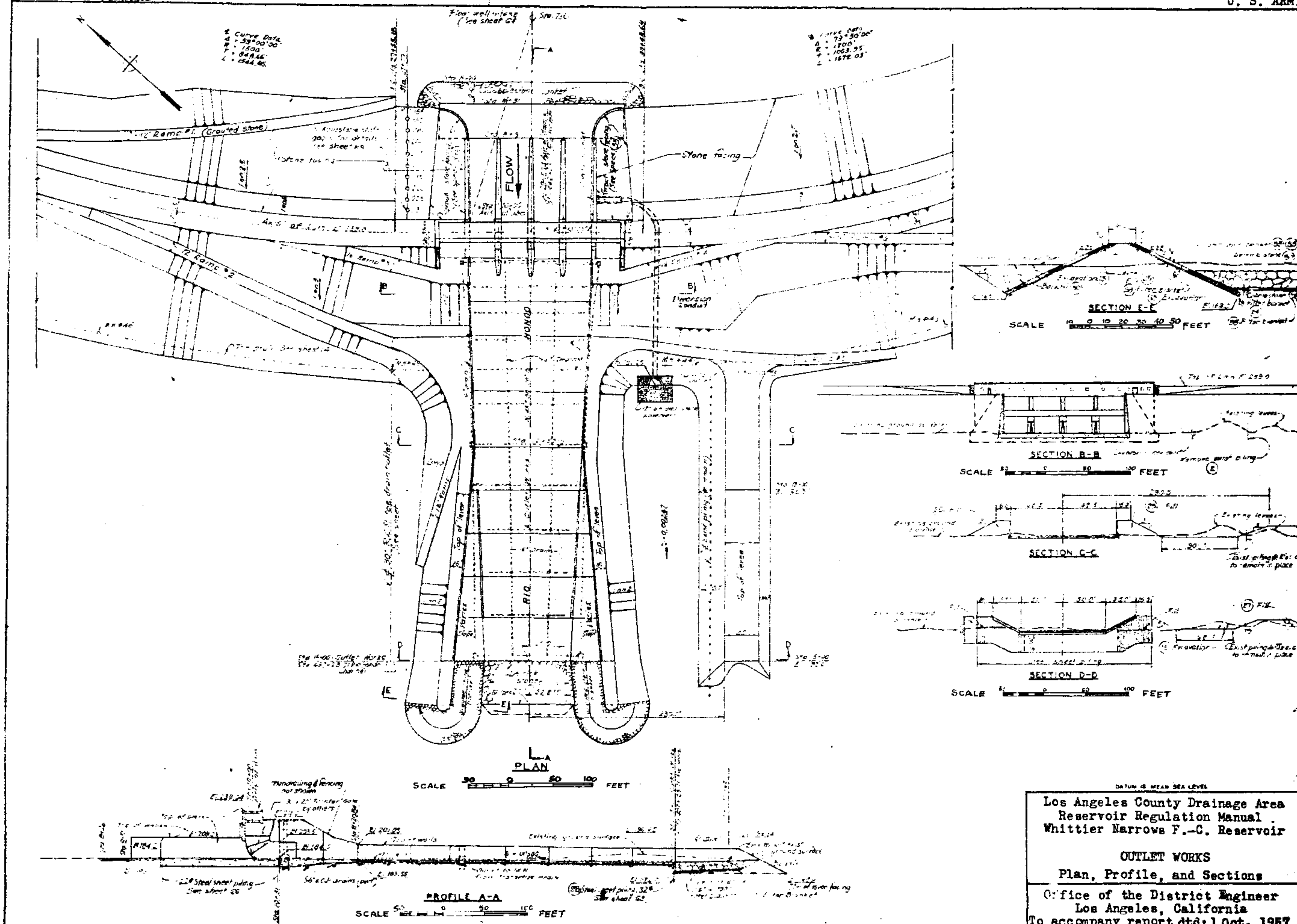
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

EMBANKMENT

Plan and Elevation

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-9



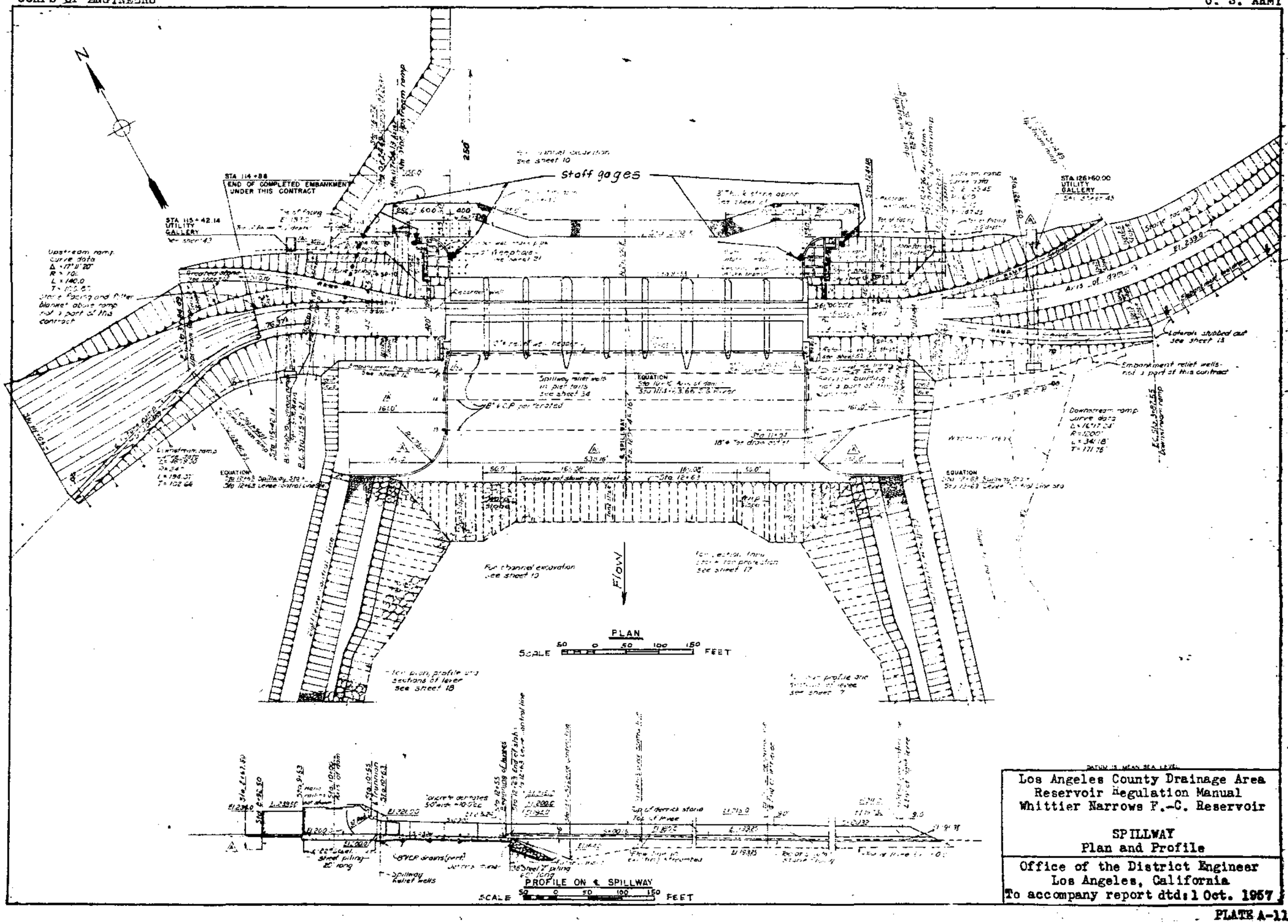
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OUTLET WORKS
Plan, Profile, and Sections

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

CORPS OF ENGINEERS

U. S. ARMY

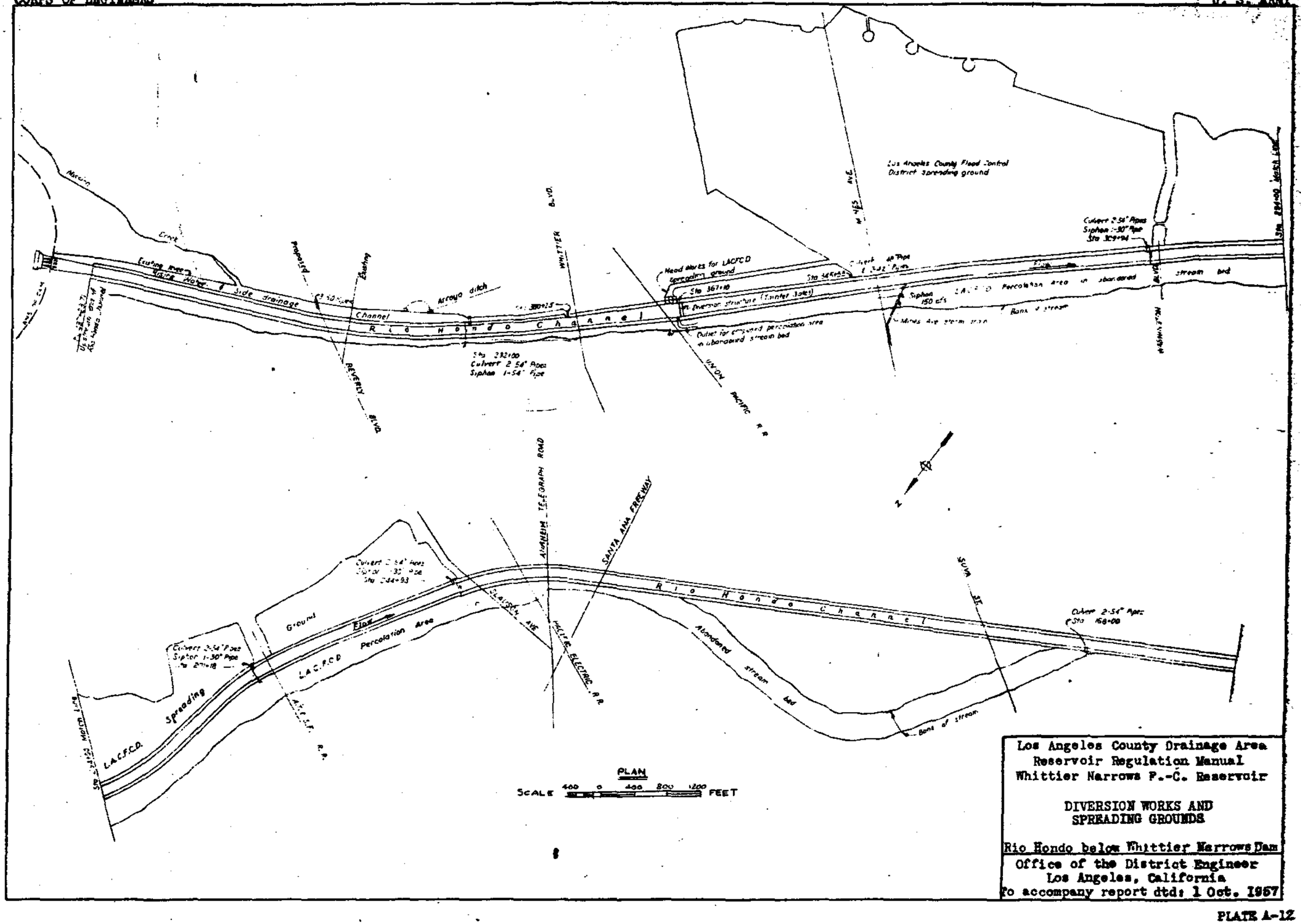


Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

SPILLWAY
Plan and Profile

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-11



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows P.-C. Reservoir

DIVERSION WORKS AND SPREADING GROUNDS

Rio Hondo below Whittier Narrows Dam

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE A-12

FLOOD OPERATION

PART B

PLAN OF OPERATION

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR

SAN GABRIEL RIVER BASIN, CALIF.

1 OCTOBER 1957

TABLE OF CONTENTS

PART B

PLAN OF OPERATION

TABLES

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PLATES

PART B

PLAN OF OPERATION

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR
SAN GABRIEL RIVER BASIN, CALIF.

1. Operation requirements.--Whittier Narrows Reservoir will be operated for flood control and conservation in accordance with the regulation plan contained herein to achieve the following objectives:

a. To eliminate or minimize flood damaging flows along the Rio Hondo from the dam to the Los Angeles River and along the Los Angeles River from the Rio Hondo confluence to the Pacific Ocean.

b. To eliminate or minimize flood damaging flows along the San Gabriel River from the dam tot he Pacific Ocean.

c. To release San Gabriel River flows up to 5,000 cubic feet per second downs the San Gabriel River channel to satisfy water rights.

d. To divert rising water in the Rio Hondo above the dam to the original streambed below the dam.

e. To provide sufficient conservation storage to compensate for the estimated percolation that occurred in the natural Rio Hondo channel prior to the construction of the concrete-lined channel.

2. Prior plan of operation.--A plan of operation for Whittier Narrows flood-control basin was described in the report titled "Analysis of Design on San Gabriel River Improvement, Whittier Narrows Flood Control Basin, Volume I," dated January 1950 and approved by the Chief of Engineers. Under this plan, operation for flood control is flexible and depends upon the relative magnitude and synchronization of streamflow in the Los Angeles and San Gabriel Rivers and the Rio Hondo. The basic plan of operation provides for inflow to be passed through the outlet structure to the Rio Hondo with gates open until the reservoir water surface reaches elevation 208.4 when the outflow would reach 40,000 cubic feet per second. Above water-surface elevation 208.4, the outlet gates are operated to control the outflow to 40,000 cubic feet per second. This operation is reversed during falling stages.

3. The spillway gates discharge natural streamflow down the San Gabriel River up to 5,000 cubic feet per second to satisfy existing downstream water rights. During minor floodflows, releases are limited to 5,000 cubic feet person second to achieve a large amount of the natural streambed percolation without causing appreciable damage. However, the spillway gates might be closed during floodflows if, for example, the San Gabriel River channel from Coyote Creek to the Pacific Ocean were filled to capacity by floodflows from Coyote Creek and adjacent local drainage areas. If the water surface should rise to elevation 228.5, the spillway gates will automatically commence opening and continue until fully open at water-surface elevation 233.5. At elevation 234.0 (spillway design surcharge elevation) the discharge through the spillway gates is 251,000 cubic feet per second. During falling stages, the spillway gate operation is reversed.

4. If a cloudburst-type storm should center in those parts of the Los Angeles River drainage area that are uncontrolled by flood-control dams, the simultaneous flood above Whittier Narrows Dam would be smaller than the reservoir design flood and storage capacity which would be available in Whittier Narrows and Santa Fe Reservoirs. Under these conditions, the discharge through the outlets could be curtailed if necessary for several hours until the peak discharge on the Los Angeles River had occurred. As a safety factor, up to 12,000 cubic feet per second could be released for a short time through the spillway gates to the partially improved San Gabriel River, depending upon the available downstream channel capacity.

5. Flood-control operation.--The flood-control operation plan is identical to the plan described above. The operation for diversion and conservation below elevation 195.5 is described in part C of this appendix. The outlet gate operation schedule for the flood-control operation plan is shown in table B-1, and the spillway gate operation schedule is shown in table B-2. Prior to the completion of downstream channel improvements, the interim plan of operation described in part D of this appendix will be used. The final section of the down-stream channel improvement is currently scheduled for completion in December 1957.

6. Limitation on storage.--There is no legal authority for the storage of water above taking line (elev. 229.0) shown on plate A-8. Water may be stored for conservation to elevation 195.5 feet (approximately 1,000 acre-feet).

7. Limitations on releases.--Generally speaking, the only limitations on releases from the dam are imposed by downstream channel capacities, except during operation for conservation. However, if flood damage is occurring on the Rio Hondo below the dam or on the lower Los Angeles River, releases to the Rio Hondo will not exceed the Rio Hondo inflow as determined at inflow gaging stations except when

the safety at the dam is threatened. If flood damage is also occurring along the San Gabriel River channel, releases to the San Gabriel River will not exceed the San Gabriel inflow as determined at the inflow gaging station, except when the safety of the dam is threatened.

8. Division of responsibility for operation.--The primary responsibilities for operating Whittier Narrows Reservoir are delegated to units of the Engineering Division and Construction Division. Responsibility for the hydraulic operation of the reservoir has been delegated through channels to the chief, Hydrology and Reservoir Regulation Section. he is assisted in fulfilling this responsibility by the section's Reservoir Regulation Group and Hydrography Unit. The chief, Reservoir Regulation Group, during normal operation, is responsible for: (a) collecting hydraulic data, (b) transmitting operating instructions, (c) investigating and improving operating techniques, (d) training personnel for assignments during flood emergencies, (e) keeping the district's Flood-Emergency Manual current, (f) preparing reservoir regulation manuals, and keeping them current, and (g) maintaining prescribed records. The chief, Hydrography Unit, during normal operations, is responsible for: (a) collecting rainfall and runoff data, (b) maintaining a record of reservoir operations, (c) installing and servicing instruments, and (d) preparing required reports for higher authority.

9. During flood emergencies, the organization for effecting hydraulic operations is expanded and implemented by district employees that have been trained in their respective flood-emergency duties. A Hydraulic Operations Center is established, under the supervision of the chief, Hydrology and Reservoir Regulation Section, to supervise the operation of a Control Group and Hydrography Group. The Control Group contains a Flood Prediction Unit for forecasting flood inflows, a Dam Operation Unit to supervise operation of the dam, and River Patrol Unit to observe flow conditions in downstream channels. The Control Group also operates the district's communications system for flood operations. The Hydrography Group, which is primarily responsible for obtaining hydrographic data during flood emergencies, operates a Stream-Gaging Unit for measuring streamflow at pertinent locations. For more detailed information on organization and personnel assignments in the Los Angeles District during flood emergencies, reference is made to the district's current "Flood-Emergency Manual."

10. Responsibility for the physical operation of Whittier Narrows Reservoir has been delegated to the Construction Division. The duties of the Construction Division include: (a) safeguarding the project at all times, (b) maintaining the project in good working condition, (c) performing routine tests of equipment, (d) operating hydrologic and hydraulic equipment, (e) maintaining records as prescribed by the Hydrology and Reservoir Regulation Section, and (f) keeping informed of the information contained in the Reservoir Regulation Manual.

11. Normal organization.--The organization for effecting the operation at Whittier Narrows Dam during normal periods is shown on plate B-1. The names and telephone numbers of key personnel are shown on plate B-2.

12. Flood-emergency organization.--The organization for effecting the operation of Whittier Narrows Dam during flood emergencies is shown on plate B-3. The names and telephone numbers of key personnel are shown on plate B-4.

13. Instructions to dam tenders.--The dam tender at Whittier Narrows Dam is required to:

a. Be present at the dam when rainfall or runoff is occurring.

b. Furnish the Control Group at the district office a phone number through which he can be reached, whenever an assistant is not on duty.

c. See that all equipment at the reservoir including recorders, indicating gages, gate mechanisms, power units, radios, etc., is in operating condition.

d. Operate gates in accordance with instructions from the Control Group.

e. Keep the Control Group notified of any unusual developments such as trash accumulation, power failure, mechanical difficulties, etc.

f. Follow the fixed-gate operation schedule posted in the control house in the absence of communications with the Control Group or in the absence of a representative from that group.

g. Assist engineers, dispatched by the Control Group during flood emergencies, in every possible way.

h. Maintain routine records on prescribed forms, including water-surface elevations, inflow and outflow gage heights, precipitation amounts, gate openings, and a daily log.

i. Notify local authorities of anticipated releases when instructed to do so by the Control Group.

14. Modification of regulations.--The operation schedules serve as guides for personnel operating Whittier Narrows Dam during flood conditions. These schedules represent the best method of operation under a given set of predetermined conditions. The fixed schedules are predicated upon the control of a flood of given magnitude and will probably effect the best overall control. Deviations based upon the results of flood prediction may be made if there is high confidence in the prediction of runoff and future weather conditions. Deviations upon this basis should be made only under circumstances

that will clearly result in better control of a flood under the conditions which exist at the time. Careful consideration must be given to the consequences of deviation should that flood be of smaller or larger magnitude that that predicted.

15. Deviation from the fixed schedule of operation will normally be made only by the Reservoir Regulation Group of the district office. In the event of communication failure, the engineer dispatched from the district office will assume responsibility for deviating from the fixed schedule. Only under extreme circumstances involving levee failure or possible loss of lives should the outflow from the reservoir be throttled or completely stopped, and then only for a few hours. As soon as the emergency is over, the gates should be slowly opened to agree with the fixed schedule.

16. Coordination with other agencies.--During a flood situation, the Control Group on the district office maintains direct communications with other flood-control agencies for the exchange of hydraulic operations data. The Los Angeles Count6y Flood Control District operates several dams upstream from Whittier Narrows Dam and Spreading grounds below the dam. A teletype circuit and direct telephone line connect the Control Group with this agency. The Los Angeles County Flood Control District has furnished the following information pertaining to the operation of upstream reservoirs during flood periods:

a. Morris Dam.--

(1) Reservoir full to permanent spillway crest at start of flood.

(2) All outlets are closed

(3) Center spillway gate is down (open) and the two outside gates are up until reservoir elevation 1,170 is reached. Above elevation 1,170 outside gates are gradually lowered.

b. San Gabriel Dam.--

(1) 10,000 acre-feet in storage at start of flood.

(2) Outflow equals inflow until outlet capacity is reached; then outlets are wide open until spillway crest is reached.

(3) Above spillway crest, outlets are gradually closed to keep outflow constant until spillway discharge equals outlet capacity and outlets are completely closed.

c. Cogswell Dam.--

(1) 1,000 acre-feet in storage at start of flood.

(2) Outflow equals one-half of inflow until 2,000 cubic feet per second outflow is reached; then 2,000 cubic feet per second outflow is maintained until spillway is reached.

(3) Above spillway crest, outlets are closed.

d. Puddingstone Dam.--

(1) 12,000 acre-feet in storage at start of flood.

(2) Gates are wide open below spillway crest, outlet capacity at spillway crest 814 cubic feet per second.

(3) Above spillway crest, outlets are gradually closed to maintain 814 cubic feet per second total outflow until outlets are completely closed.

17. Coordination with other projects.--The operation of Whittier Narrows Reservoir will not require coordination with other projects after completion of the lower Los Angeles River channel, except during emergencies. The channel has been designed to contain the total discharge from upstream reservoirs and from uncontrolled areas during the occurrence of the standard project flood. During emergencies, the operation of Sepulveda, Hansen, Santa Fe, Whittier Narrows, Break, and Fullerton Reservoirs will be coordinated to give maximum protection to all channels and dams. Plans for coordinated operation with other projects prior to completion of the downstream channel are described in part D of this appendix.

18. Examples of regulation.--The reservoir design (standard project) flood and their spillway design (maximum probable) flood were routed through the reservoir under the flood operation plan, but the spillway gates were assumed closed until the reservoir filled to elevation 228.5 feet. This condition might develop with excessive local inflow into the San Gabriel River below the dam. The results of the routings are shown on plates B-5 and B-6. The maximum water surface for each flood would be somewhat lower if the spillway gates were regulated to release 5,000 cubic feet per second to elevation 228.5 feet as planned for flood operation.

19. The flood of 2-3 March 1938 (estimated 99,000 cubic feet per second peak at Pacific Coast Highway) was the largest flood of record on the Los Angeles and San Gabriel Rivers and on the Rio Hondo. Observed or reconstructed hydrographs for that flood were modified to account for the effect of reservoirs constructed since 1938. Substantial increases in the hydrographs were also made to reflect the increases in the amount of all-impervious valley area. In the modifications, unit-hydrograph procedures were incorporated wherever appropriate. At the beginning of the flood, Santa Fe flood-control reservoir was assumed to be empty. According to information supplied by Los Angeles County Flood Control District, San Gabriel Dam was

assumed to have 33,800 acre-feet of available flood-control storage, Cogswell Dam was assumed to have 9,600 acre-feet of storage available for flood control, and Morris Dam was assumed full to spillway crest. The operation of the upstream reservoirs, operated by the Los Angeles County Flood Control District, was in accordance with information obtained from them. A routing of the modified 2-3 March 1938 flood is shown on plate B-7. The spillway gates were assumed closed for this routing. A peak flow of 78,000 cubic feet per second in the Los Angels River below the Rio Hondo would result from this operation. Additional pertinent data are tabulated in table B-3.

20. The flood of 15-18 January 1952 (48,000 cubic feet per second peak at Pacific Coast Highway) was the second largest flood of record on the lower reaches of the Los Angeles River. Observed hydrographs were used to reconstruct the flood at Whittier Narrows Reservoir. Table B-3 contains the results of routing this flood through Whittier Narrows Dam under the flood operation plan. In the routing, it was assumed that no water was released to the San Gabriel River.

21. Operation reports.--The dam tender reports by radio or telephone to the Hydrology and Reservoir Regulation Section at about 0800 hours each workday or more frequently during storms as directed by the Hydrology and Reservoir Regulation section. He reports the pertinent operational data indicated in the forms shown on plates B-8 and B-9, and the rainfall as indicated on the form shown on plate B-10. The originals of these reports are forwarded to the Hydrology and Reservoir Regulation Section immediately following the end of the month. The data reported are tabulated on the form shown on plate B-11 and transferred to the forms shown on plates B-12 and B-13 for computing necessary data. Radio reports of precipitation are received daily by radio from the field or by telephone or teletype from the Los Angeles County Flood Control District. Reports are obtained at approximately 0800 hours each workday but more frequently during storms. Reports are entered on the form shown on plate B-14.

22. The hydrology and Reservoir Regulation Section prepares monthly operation reports and such other reports relative to the reservoir operation as may be necessary.

23. Operation record.--The operation record of Whittier Narrows Reservoir is maintained in the Hydrology and Reservoir Regulation Section files. A provisional record of operation is submitted to the Division office and tot he Chief of Engineers, using the forms on plate B-15. The record is submitted by the 15th of each month and contains data for the preceding month. Daily flows at the following gaging stations pertinent to the operation of Whittier Narrows Reservoir are published annually in the United States Geological Survey water supply papers:

a. Rio Hondo below Whittier Narrows Dam.

b. Rio Hondo above Whittier Narrows Dam.

c. San Gabriel River above Whittier Narrows Dam.

d. San Gabriel River bypass at Whittier Narrows Dam.

e. Mission Creek below Whittier Narrows Dam.

24. Weather forecasts.--The Control Center in the district office receives daily weather forecasts by teletype from the United States Weather Bureau office at the International Airport in Los Angels. Special forecasts are prepared when necessary. In addition to these predictions, weather forecasts are received from a private weather service. All forecasts are especially prepared for flood control use and contain predictions of precipitation amounts.

25. Flood predictions.--For predicting runoff from the drainage area above Whittier Narrows Dam, average recorded rainfall amounts, unit hydrographs, upstream-flow data, and forecasts of rainfall are used.

26. Studies in progress on planned.--Studies to improve the technique of predicting runoff from forecasted precipitation over the drainage area above Whittier Narrows Reservoir, utilizing an electronic computer are planned. It is essential that a reliable runoff prediction be available before any deviation from the fixed operation schedule is made.

27. Pertinent data.--Pertinent information and necessary operating curves for Whittier Narrows Dam, not mentioned elsewhere in this appendix, are listed in the following tabulation:

a. Table B-4, Whittier Narrows flood-control reservoir area and capacity table.

b. Plate B-16, Area and capacity curves, based on original survey of Dec. 1948 and bottom resurvey ending Mar. 1957.

c. Plate B-17, Rating curves, floodflow channel at Rosemead Blvd.

d. Plate B-18, Spillway discharge curves, one 50'x29' gate.

e. Plate B-19, Outlet discharge curves, on e 30'x19' gated outlet.

f. Plate B-20, Rating curve, Alhambra Wash near Klingerman Street.

g. Plate B-21, Rating curve, Rio Hondo below Garvey Avenue.

h. Plate B-22, Rating curve, San Gabriel River at Parkway Bridge.

i. Plate B-23, Rating curve, Rio Hondo below Whittier Narrows Dam.

j. Plate B-24, Rating curve, San Gabriel River at Beverly Boulevard.

k. Plate B-25, Rating curve, Rio Hondo at Stewart and Gray Road.

l. Plate B-26, Rating curve, Los Angeles River at Firestone Boulevard.

m. Plate B-27, Rating curve, Los Angeles River below Belhart Street.

n. Plate B-28, Rating curve, San Gabriel River at Florence Avenue.

o. Plate B-29, Rating curve, San Gabriel River at Spring Street.

p. Plate B-30, Discharge curve, Mission Creek upper 36" gate.

q. Plate B-31, Discharge curve, Mission Creek lower 30" gate.

r. Plate B-32, Rating curve, Mission Creek below Whittier Narrows Dam.

s. Plate B-33, Rating curve, 36" gate (diversion of rising water).

t. Plate B-34, Rating curve, floodflow channel at San Gabriel River.

28. Five large upstream reservoirs affect floodflows into Whittier Narrows Reservoir. Pertinent curves used for the operation of theses reservoirs are shown on the following plates:

a. Plate B-35, Operating curves, Santa Fe flood-control reservoir.

b. Plate B-36, Operating curves, Morris Dam.

c. Plate B-37, Operating curves, San Gabriel flood-control reservoir.

d. Plate B-38, Operating curves, Cogswell flood-control reservoir.

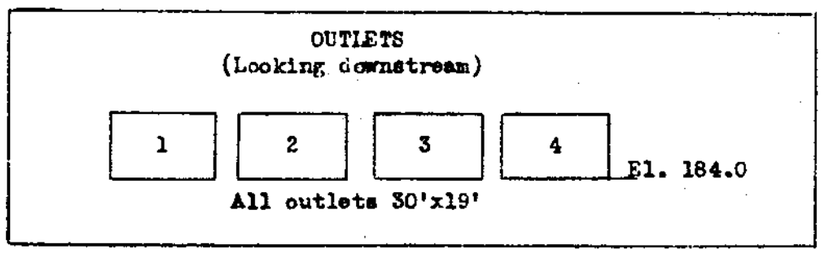
e. Plate B-39, Operating curves, Puddingstone flood-control reservoir.

Table B-1

Whittier Narrows flood-control reservoir outlet gate operation schedule for ultimate operation plan*

Step No.	When reservoir water surface is between elevations		Gate setting for gates as indicated				Outlet discharge	Downstream gage height
			No. 1	No. 2	No. 3	No. 4		
	Feet above mean sea level		Feet of opening	Feet of opening	Feet of opening	Feet of opening	Cubic feet per second	Feet
1	184.0 -	196.0	For conservation operation see table C-1					
2	196.0 -	208.7	19.0	19.0	19.0	19.0	13,800 - 40,900	8.21 - 13.66
3	208.7 -	209.8	19.0	[15.2]	[15.2]	19.0	39,000 - 41,000	13.34 - 13.68
4	209.8 -	211.2	[15.7]	15.2	15.2	[15.7]	39,000 - 41,000	13.34 - 13.68
5	211.2 -	212.9	[13.5]	[15.2]	[15.2]	[13.5]	39,000 - 41,000	13.34 - 13.68
6	212.9 -	214.7	13.5	[13.2]	[13.2]	13.5	39,000 - 41,000	13.34 - 13.68
7	214.7 -	217.0	[12.0]	13.2	13.2	[12.0]	39,000 - 41,000	13.34 - 13.68
8	217.0 -	219.5	12.0	[11.8]	[11.8]	12.0	39,000 - 41,000	13.34 - 13.68
9	219.5 -	221.9	[10.6]	11.8	11.8	[10.6]	39,000 - 41,000	13.34 - 13.68
10	221.9 -	224.7	10.6	[10.3]	[10.3]	10.6	39,000 - 41,000	13.34 - 13.68
11	224.7 -	227.5	[9.4]	10.3	10.3	[9.4]	39,100 - 41,000	13.36 - 13.68
12	227.5 -	230.5	9.4	[9.2]	[9.2]	9.4	39,100 - 41,000	13.36 - 13.68
13	230.5 -	234.2	[8.4]	9.2	9.2	[8.4]	39,000 - 41,000	13.34 - 13.68
14	234.2 -	239.0	8.4	[8.3]	[8.3]	8.4	39,100 - 41,400	13.36 - 13.75

* Schedule applicable for rising or falling stages.



INSTRUCTIONS

1. Communications with the district office existing.

a. Notify the hydraulic operations center when a gate change will be required according to the schedule.

b. To report gate settings, while operating on schedule, give the applicable step number only.

c. Notify the hydraulic operations center if unable to set the gates as instructed.

2. Communications with the district office interrupted.

a. Follow the gate operation schedule.

b. If one or more of the gates cannot be operated, adjust the remaining gates gradually and uniformly until the downstream gage height agrees with scheduled values. Keep a close check on gage height and change the gate openings as often as required. If the downstream gage height is not obtainable, 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.

Table B-2

Whittier Narrows flood-control reservoir spillway gate operation schedule*

Step No.	When reservoir water surface is between elevations	Gate setting for gates as indicated									Computed discharge	Downstream gage height
		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9		
	Feet above mean sea level	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Cubic feet per second	Feet
1	200.0 - 206.0	**2.1	0	0	**2.1	0	**2.1	0	0	**2.1	0 - 5,250	0 - 9.70
2	206.0 - 207.4	[1.5]	0	0	2.1	0	2.1	0	0	[1.5]	4,750 - 5,250	9.58 - 9.70
3	207.4 - 209.2	1.5	0	0	[1.5]	0	[1.5]	0	0	1.5	4,750 - 5,250	9.58 - 9.70
4	209.2 - 211.0	1.5	0	0	[1.3]	0	[1.3]	0	0	1.5	4,750 - 5,250	9.58 - 9.70
5	211.0 - 214.0	[1.2]	0	0	1.3	0	1.3	0	0	[1.2]	4,750 - 5,250	9.58 - 9.70
6	214.0 - 217.0	1.2	0	0	[1.0]	0	[1.0]	0	0	1.2	4,750 - 5,250	9.58 - 9.70
7	217.0 - 219.0	[1.0]	0	0	1.0	0	1.0	0	0	[1.0]	4,750 - 5,250	9.58 - 9.70
8	219.0 - 221.0	[0.8]	0	0	1.0	0	1.0	0	0	[0.8]	4,750 - 5,250	9.58 - 9.70
9	221.0 - 223.8	[0.7]	0	0	1.0	0	1.0	0	0	[0.7]	4,750 - 5,250	9.58 - 9.70
10	223.8 - 226.4	[0.6]	0	0	1.0	0	1.0	0	0	[0.6]	4,750 - 5,250	9.58 - 9.70
11	226.4 - 228.0	[0.5]	0	0	1.0	0	1.0	0	0	[0.5]	4,750 - 5,250	9.58 - 9.70
12	228.0 - ***228.5	[0.4]	(***)	(***)	1.0	(***)	1.0	(***)	(***)	[0.4]	4,750 - 5,250	9.58 - 9.70

* Schedule applicable for rising or falling stages.
** Gates No. 1, 4, 6, and 9 set at 1.6 prior to arrival of dam tender.
*** Automatic gate operation commences at elevation 228.5.

SPILLWAY
(Looking downstream)

El. 200 [1] [2] [3] [4] [5] [6] [7] [8] [9]

All gates 50'x29'

INSTRUCTIONS

1. Communications with the district office, existing.

a. Notify the hydraulic operations center when a gate change will be required according to the schedule.

b. To report gate settings, while operating on schedule, give the applicable step number only.

c. Notify the hydraulic operations center if unable to set the gates as instructed.

2. Communications with the district office, interrupted.

a. Follow the gate operation schedule.

b. If one or more of the gates cannot be operated, adjust the remaining gates gradually and uniformly until the downstream gage height agrees with scheduled values. Keep a close check on gage height and change the gate openings as often as required. If the downstream gage height is not obtainable, 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.

Table B-3

Summary of flood routings, flood control operation plan

Location and items	Modified 2-3 March 1938 flood	15-18 January 1952 flood	Reservoir design flood	Spillway design flood
Whittier Narrows Dam:				
Rio Hondo--				
Maximum inflow.....c.f.s..	20,500	6,500	#31,000	##148,000
Maximum outflow.....c.f.s..	38,500	16,000	40,000	40,000
Maximum res. w.-s. elevation.....ft., m.s.l..	207.9	197.4	228.5	234.0
San Gabriel River--				
Maximum inflow.....c.f.s..	26,000	13,800	#51,000	##158,000
Maximum outflow.....c.f.s..	0	0	300	251,000
Maximum res. w.-s. elevation.....ft., m.s.l..	210.4	*205.2	228.5	234.0
Hansen Dam:**				
Maximum inflow.....c.f.s..	48,500	3,000	(***)	(***)
Maximum outflow.....c.f.s..	20,200	6,000	(***)	(***)
Maximum res. w.-s. elevation.....ft., m.s.l..	1,062.6	1,013.4	(***)	(***)
Sepulveda Dam:**				
Maximum inflow.....c.f.s..	18,100	12,700	(***)	(***)
Maximum outflow.....c.f.s..	11,000	11,500	(***)	(***)
Maximum res. w.-s. elevation.....ft., m.s.l..	702.7	694.7	(***)	(***)
Los Angeles River peak discharge:				
Below the Rio Hondo.....c.f.s..	78,000	46,000	(***)	(***)
Near mouth.....c.f.s..	79,000	55,000	(***)	(***)

* Elevation of Mission Creek pool.
** Hansen and Sepulveda Dams operated according to revised interim operation plan.
*** Not tabulated since routing was made to show operation at Whittier Narrows Dam only.
# Combined peak inflow 70,000 cubic feet per second.
Combined peak inflow 305,000 cubic feet per second.

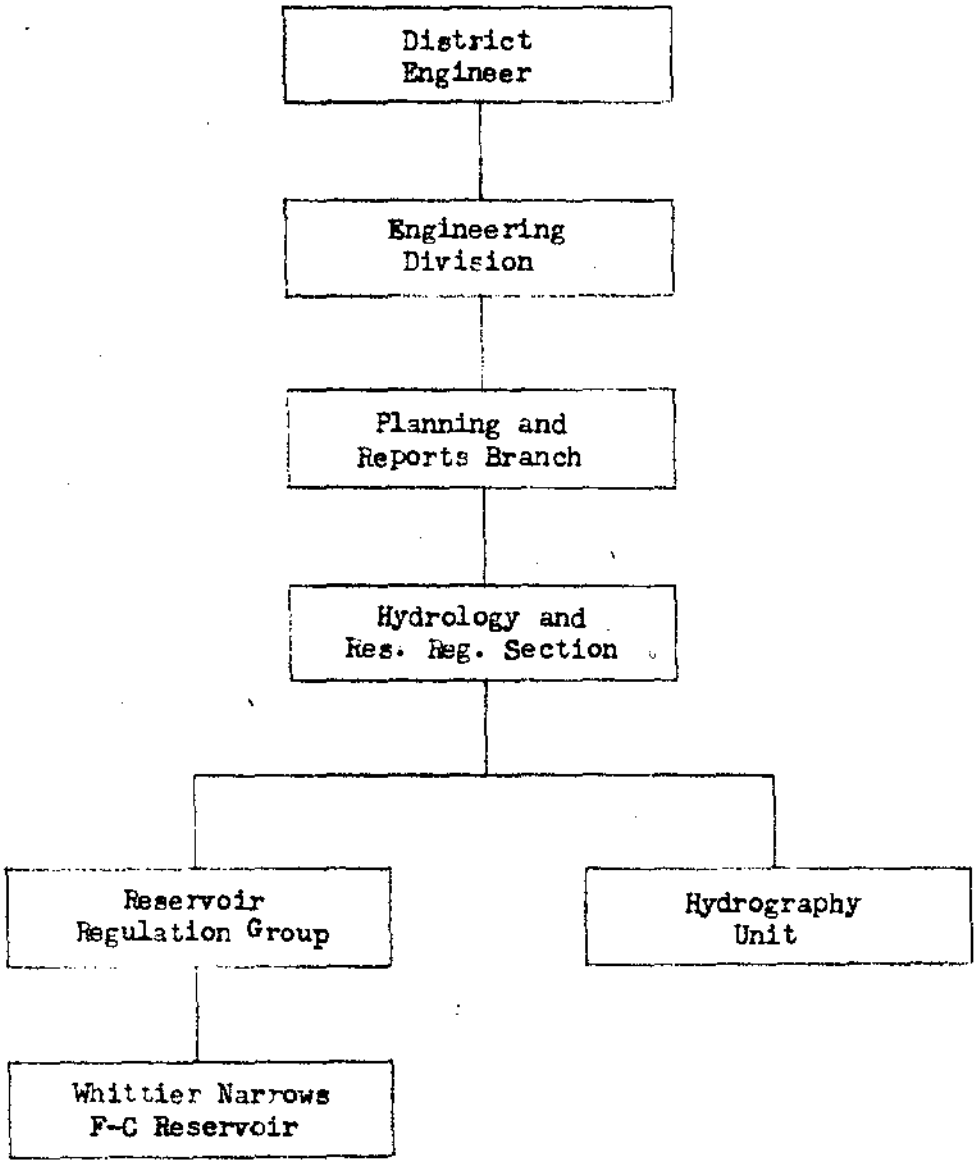
Table B-4

Whittier Narrows flood-control reservoir area and capacity table

Elevation	Area total reservoir	Capacity			
		Total reservoir	Rio Hondo pool	Mission Creek pool	San Gabriel pool
Feet above mean sea level	Acres	Acre-feet	Acre-feet	Acre-feet	Acre-feet
184	0	0	0	0	0
185	12	6	6	0	0
186	25	25	25	0	0
187	53	67	67	0	0
188	81	131	131	0	0
189	99	218	218	0	0
190	117	330	329	1	0
191	133	456	453	2	0
192	148	595	590	5	0
193	160	747	737	10	0
194	171	914	898	18	0
195	186	1,093	1,065	28	0
196	200	1,285	1,242	43	0
197	223	1,496	1,434	62	0
198	246	1,731	1,642	89	0
199	263	1,985	1,865	120	0
200	280	2,257	2,097	160	0
201	302	2,549	2,340	204	5
202	325	2,861	2,593	256	12
203	356	3,198	2,857	316	25
204	386	3,569	3,136	389	45
205	438	3,979	3,436	473	71
206	489	4,445	3,764	580	101
207	577	4,981	4,117	727	137
208	665	5,699	4,490	928	181
209	724	6,287	4,888	1,165	234
210	785	7,047	5,313	1,439	295
211	845	7,862	5,763	1,735	364
212	906	8,736	6,239	2,054	443
213	972	9,676	6,736	2,408	532
214	1,038	10,680	(*)	(*)	(*)
215	1,114	11,780	(*)	(*)	(*)
216	1,190	12,908	(*)	(*)	(*)
217	1,273	14,158	(*)	(*)	(*)
218	1,356	15,454	(*)	(*)	(*)
219	1,445	16,834	(*)	(*)	(*)
220	1,534	18,345	(*)	(*)	(*)
221	1,612	19,940	(*)	(*)	(*)
222	1,690	21,669	(*)	(*)	(*)
223	1,809	23,512	(*)	(*)	(*)
224	1,928	25,187	(*)	(*)	(*)
225	2,032	27,182	(*)	(*)	(*)
226	2,135	29,251	(*)	(*)	(*)
227	2,242	31,428	(*)	(*)	(*)
228	2,348	33,734	(*)	(*)	(*)
229	2,474	36,160	(*)	(*)	(*)
230	2,599	38,681	(*)	(*)	(*)
231	2,738	41,340	(*)	(*)	(*)
232	2,876	44,150	(*)	(*)	(*)
233	2,998	47,090	(*)	(*)	(*)
234	3,120	50,150	(*)	(*)	(*)
235	3,229	53,360	(*)	(*)	(*)
236	3,338	56,610	(*)	(*)	(*)
237	3,436	59,970	(*)	(*)	(*)
238	3,531	63,480	(*)	(*)	(*)
239	3,633	67,060	(*)	(*)	(*)
240	3,734	70,740	(*)	(*)	(*)

* Above elevation 213 pools become as one reservoir.

NORMAL ORGANIZATION FOR WHITTIER NARROWS RESERVOIR REGULATION



NOTE.--See plate B-2 for names and telephone numbers.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

NORMAL ORGANIZATION

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

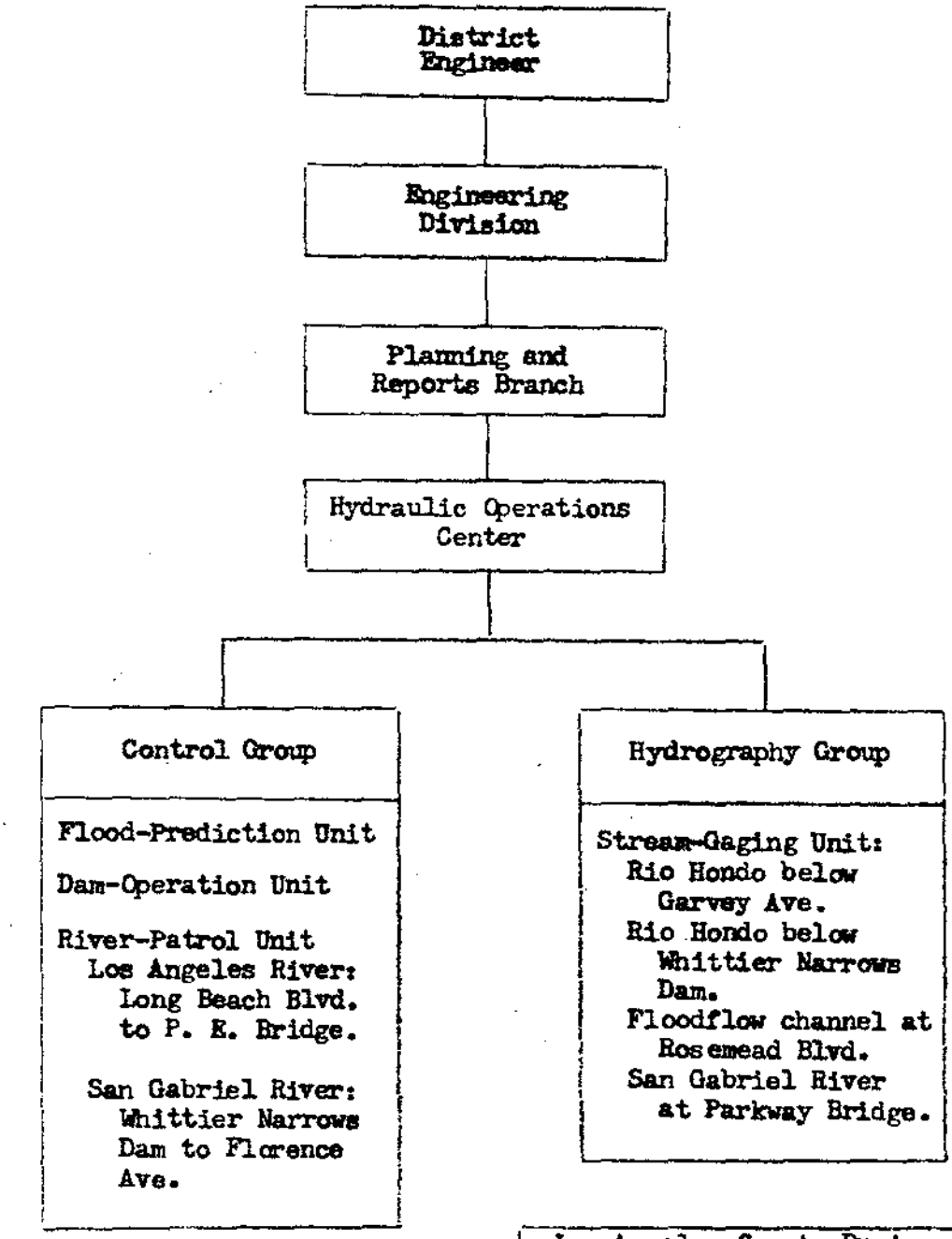
PLATE B-1

WHITTIER NARROWS RESERVOIR, LOS ANGELES COUNTY DRAINAGE AREA
PERSONNEL CONCERNED WITH OPERATION DURING NORMAL PERIODS

TITLE	NAME	OFFICE PHONE	HOME PHONE
District Engineer	Newton, C. T., Col.	TUcker 1311, Ext. 311 After duty hours: TUcker 4760	NOrmandy 3-6613
Chief, Engineering Division	Thompson, H. W.	TUcker 1311, Ext. 493	DIckens 3-7062
Chief, Planning and Reports Branch	Cramer, S. F.	TUcker 1311, Ext. 502	SYcamore 4-5663
Chief, Hydrology and Res. Reg. Section	Tatum, F. E.	TUcker 1311, Ext. 491 After duty hours: TUcker 5141	CItrus 1-4772
Chief, Reservoir Regulation Group	Levin, G. B.	TUcker 1311, Ext. 345 After duty hours: TUcker 5141	ATlantic 0-9879
Chief, Hydrography Unit	Hauser, D. P.	TUcker 1311, Ext. 347 After duty hours: TUcker 5141	CLinton 7-2370
Dam Tender, Whittier Narrows F.-C. Reservoir	Stader, W. A.	Control house PArkview 1-8621	PArkview 1-8621

PLATE B-2

ORGANIZATION DURING FLOOD EMERGENCIES FOR WHITTIER NARROWS RESERVOIR REGULATION



NOTE.--See plate B-4 for names and telephone numbers.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

ORGANIZATION DURING FLOOD EMERGENCIES

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-3

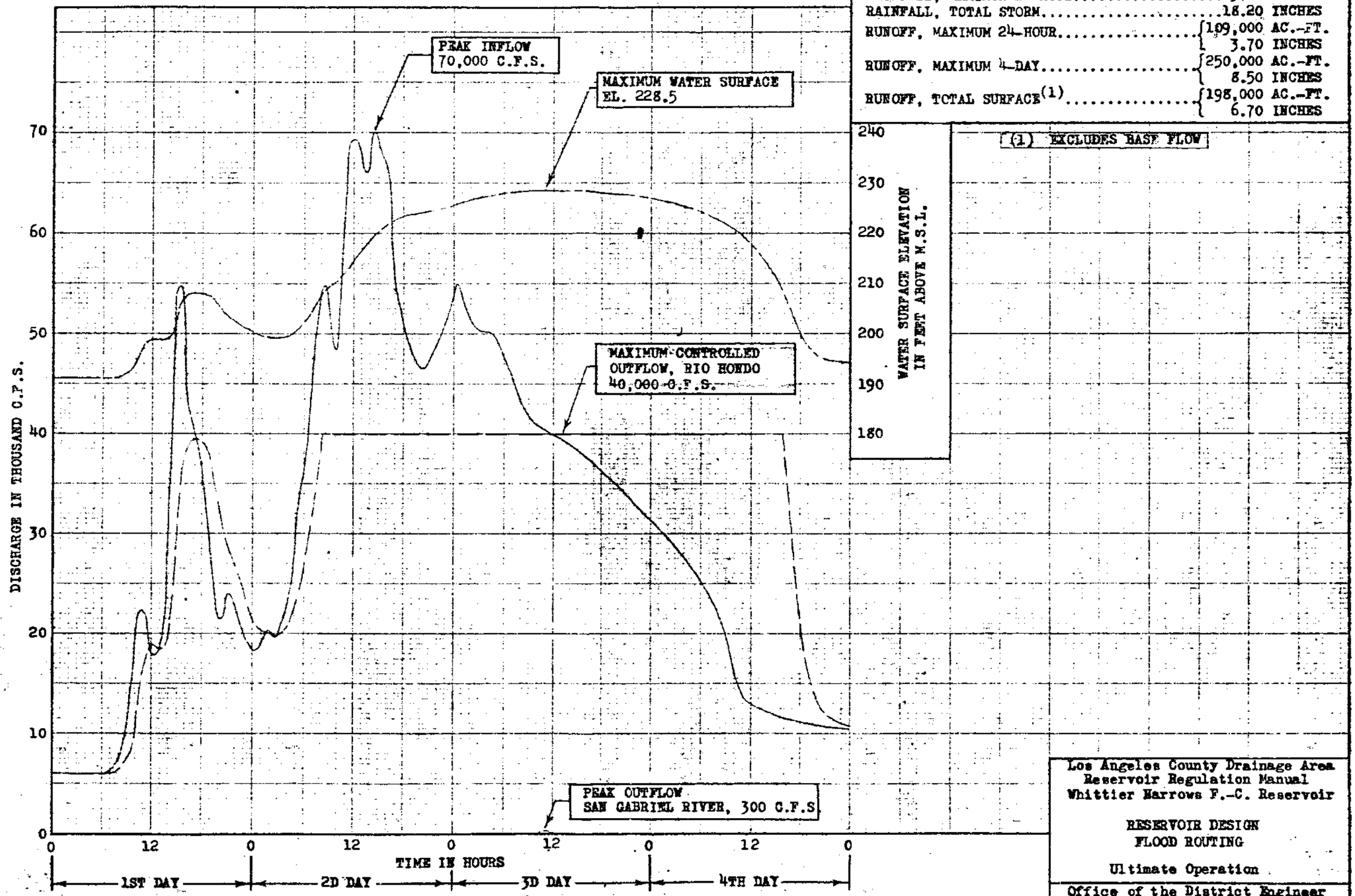
WHITTIER NARROWS RESERVOIR, LOS ANGELES COUNTY DRAINAGE AREA
PERSONNEL CONCERNED WITH OPERATION DURING FLOOD EMERGENCIES

TITLE	NAME	OFFICE PHONE	HOME PHONE
District Engineer	Newton, C. T., Col.	TUcker 1311, Ext. 311 After duty hours: TUcker 4760	NOrmandy 3-6613
Chief, Engineering Division	Thompson, H. W.	TUcker 1311, Ext. 493	DIckens 3-7062
Chief, Planning and Reports Branch	Cramer, S. F.	TUcker 1311, Ext. 502	SYcamore 4-5663
Chief, Hydraulic Operations Center	Tatum, F. E.	TUcker 1311, Ext. 491 After duty hours: TUcker 5141	CItrus 1-4772
Chief, Control Group	Levin, G. B.	TUcker 1311, Ext. 345 After duty hours: TUcker 5141	ATlantic 0-9879
Chief, Hydrography Group	Hauser, D. P.	TUcker 1311, Ext. 347 After duty hours: TUcker 5141	CLinton 7-2370

PLATE B-4

TOTAL DRAINAGE AREA	554 SQ. MI.
RAINFALL, MAXIMUM 24-HOUR	13.10 INCHES
RAINFALL, TOTAL STORM	18.20 INCHES
RUNOFF, MAXIMUM 24-HOUR	109,000 AC.-FT. / 3.70 INCHES
RUNOFF, MAXIMUM 4-DAY	250,000 AC.-FT. / 8.50 INCHES
RUNOFF, TOTAL SURFACE(1)	198,000 AC.-FT. / 6.70 INCHES

(1) EXCLUDES BASE FLOW



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

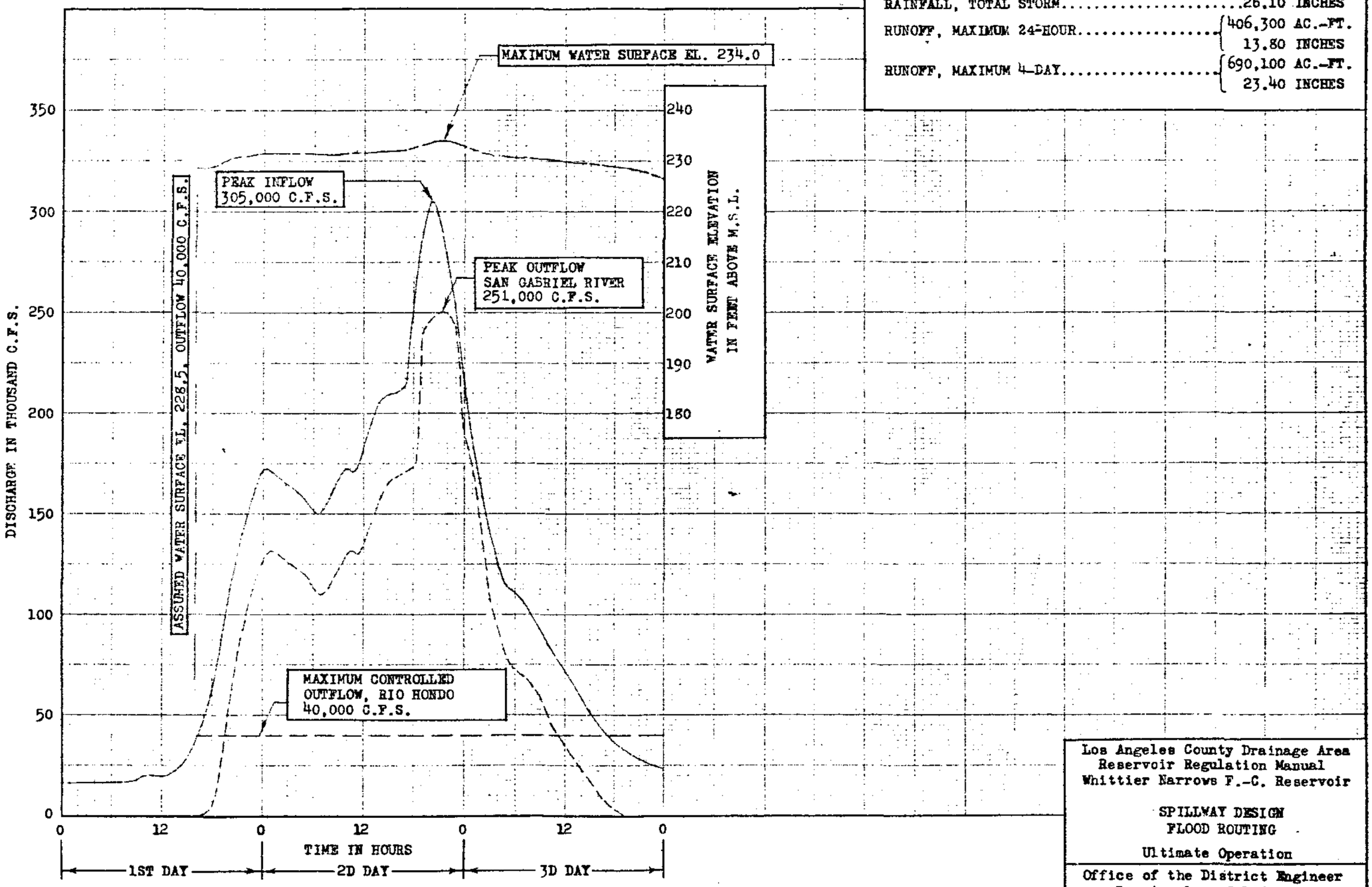
RESERVOIR DESIGN
FLOOD ROUTING

Ultimate Operation

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-6

TOTAL DRAINAGE AREA	554 SQ. MI.
RAINFALL, MAXIMUM 24-HOUR	17.40 INCHES
RAINFALL, TOTAL STORM	26.10 INCHES
RUNOFF, MAXIMUM 24-HOUR	406,300 AC.-FT. 13.80 INCHES
RUNOFF, MAXIMUM 4-DAY	690,100 AC.-FT. 23.40 INCHES



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

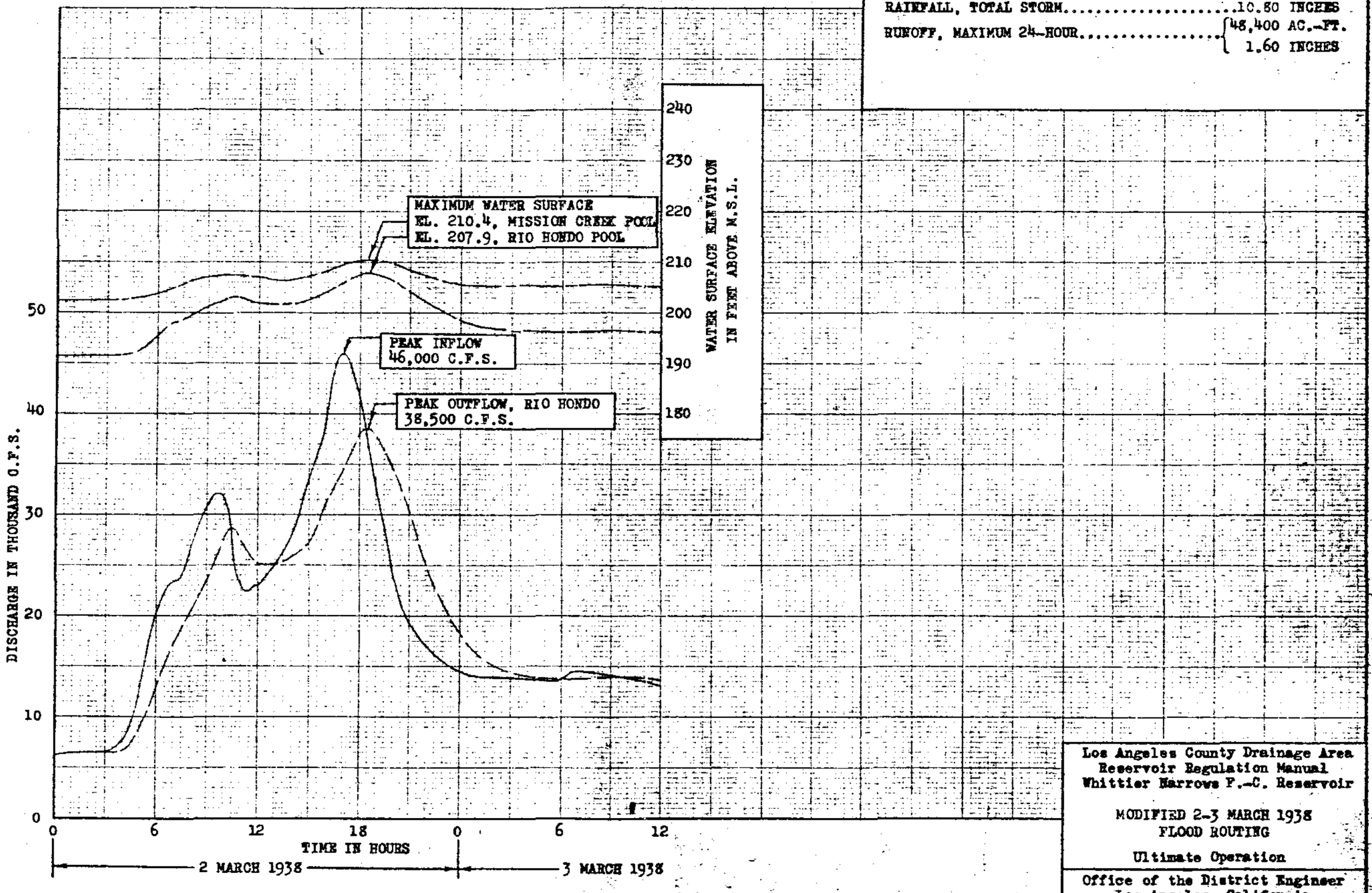
SPILLWAY DESIGN
FLOOD ROUTING

Ultimate Operation

Office of the District Engineer
Los Angeles, California
To accompany report dtd; 1 Oct. 1957

PLATE B-6

TOTAL DRAINAGE AREA	554 SQ. MI.
RAINFALL, MAXIMUM 24-HOUR	9.30 INCHES
RAINFALL, TOTAL STORM	10.80 INCHES
RUNOFF, MAXIMUM 24-HOUR	48,400 AC.-FT.
	1.60 INCHES



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

MODIFIED 2-3 MARCH 1938
FLOOD ROUTING

Ultimate Operation

Office of the District Engineer
Los Angeles, California.
To accompany report dtd: 1 Oct. 1957

PLATE B-7

WHITTIER NARROWS F. C. B. OPERATION REPORT

San Gabriel Spillway

Month
Year

Day	RES. W. S. ELEV. GAGE READING IN FEET			OUTLET CHANNEL		INFLOW CHANNEL		TAINTER GATE OPERATION GATE OPENING IN FEET									OBSERVER	REMARKS
	Time	Type of Gage	Gage reading in feet	Time	San Gabriel at Beverly G. Ht.	Time	San Gabriel at Parkway G. Ht.	Time	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	

PLATE B-8

LA Form 257 one Time
3 Apr 56

ARMY – C. of E. – Los Angeles

WHITTIER NARROWS F. C. B. OPERATION REPORT
Rio Hondo Outlet Works

Month
Year

Day	Time	Type of Gage	RESERVOIR W. S. ELEV. GAGE READING IN FEET: Rio Hondo Pool		Mission Creek Pool	OUTLET CHANNELS			INFLOW CHANNELS				SERVICE GATES OPENING IN FEET				Tainter Gate Operation GATE OPENING IN FEET					OBSERVER
			West	East		Time	Rio Hondo G. Ht. Feet	Mission Creek G. Ht. Feet	Time	Flood Flow G. Ht. Feet	Alhambra Wash G. Ht. Feet	Rio Hondo G. Ht. Feet	Time	Mission Creek Intake 36"	Mission Creek Outlet 30"	Rising Water Diversion Intake	Time	No. 1	No. 2	No. 3	No. 4	

REMARKS:

LA Form 286 One Time
3 Apr 56

ARMY – C. of E. – Los Angeles

RAINFALL REPORTING NETWORK

OBSERVER'S DAILY REPORTS

Station:						Month:		Year:	
Day	Normal time	Exact time	Reading	Emptied	Seasonal total	Temperature Wet	Temperature Dry	Observer	Remarks
1	0800								
2	0800								
3	0800								
4	0800								
5	0800								
6	0800								
7	0800								
8	0800								
9	0800								
10	0800								
11	0800								
12	0800								
13	0800								
14	0800								
15	0800								
16	0800								
17	0800								
18	0800								
19	0800								
20	0800								
21	0800								
22	0800								
23	0800								
24	0800								
25	0800								
26	0800								
27	0800								
28	0800								
29	0800								
30	0800								
31	0800								
TOTAL									

SPL Form 31
1 Sep 51

ARMY - C. of E. - Los Angeles

PLATE B-10

.O LOG

RESERVOIR OPERATION REPORT

Date _____ 19 ___

Hour _____

Radio call sign	Dam		Time of reading	Reservoir water-surface elevation	Outflow gage height	Rainfall		Gates at step No.	Remarks
						Since last report	Season total		
WUK 424	Sepulveda			Ft, msl	Feet	Inches	Inches		
WUK 410	Hansen			West East Comb					
WUK 423	Santa Fe								
WUK 405	Brea								
WUK 431	Fullerton								
WUK 419	Prado								
WUK 415	San Antonio								
WUK 417	Whittier Narrows	Rio Hondo Pool		West East Comb					LACFCD Diversion Gate open _____ ft.
		Mission Creek Pool				—	—	—	Upper Gate open _____ ft. Lower Gate open _____ ft.
		San Gabriel Pool				—	—		

Inflow Gaging Station	Gage Height-Feet	Time of Reading
Alhambra Wash near Klingerman St.	_____	_____
Rio Hondo below Garvey Blvd.	_____	_____
San Gabriel River at Parkway Bridge	_____	_____

PLATE B-11

LA Form 283
16 Apr 56

Temporary

ARMY - C of E - Los Angeles

WHITTIER NARROWS RESERVOIR
OBSERVED STREAMFLOW DATA

Add Time column

Date _____ 19__

Day or hour	RIO HONDO SIDE									SAN GABRIEL RIVER SIDE									Remarks
	Inflow							Outflow		Inflow		Outflow							
	Alhambra Wash near Klingerman St.		Rio Hondo below Garvey Ave.		Flood-flow channel at Rosemead Blvd.		Total	Rio Hondo below the dam		San Gabriel R. at Parkway Bridge		San Gabriel R. at Beverly Blvd.		Flood-flow channel at San Gabriel R.		Mission Creek below dam		Total	
	G.ht.	Disch.	G. ht.	Disch.	G.ht.	Disch.		G.ht.	Disch.	G. ht.	Disch.	G.ht.	Disch.	G.ht.	Disch.	G.ht.	Disch.		
	Feet	C.f.s.	Feet	C.f.s.	Feet	C.f.s.	C.f.s.	Feet	C.f.s.	Feet	C.f.s.	Feet	C.f.s.	Feet	C.f.s.	Feet	C.f.s.	C.f.s.	

WHITTIER NARROWS RESERVOIR COMPUTATIONS
(Use when water-surface elevation is below 213)

Date _____ 19__

Day or Hour	RIO HONDO SIDE											SAN GABRIEL RIVER SIDE													Remarks
	Water-surface elev.	Outflow					Storage Rio Hondo pool	Storage change		Average outflow	Average inflow	Total storm rainfall	Outflow								Storage			Storage change		Average outflow	Average inflow	
		Rio Hondo		Diversion		Total							San Gabriel			Mission Creek			Flood-flow channel at Rosemead Blvd.	Total	San Gabriel Pool	Mission Creek Pool	Total				
		Gates at step No.	Disch.	Gate opening	Disch.								Water-surface elev.	Gates at step No.	Disch.	Water-surface elev.	Gate opening	Disch.								
	Ft, msl		C.f.s.	Feet	C.f.s.	C.f.s.	Ac.-ft.	Ac.-ft.	C.f.s.	C.f.s.	C.f.s.	Inches	Ft, msl		C.f.s.	Ft, msl	Feet	C.f.s.	C.f.s.	C.f.s.	Ac.-ft.	Ac.-ft.	Ac.-ft.	Ac.-ft.	C.f.s.	C.f.s.	C.f.s.	

LA Form 286

ARMY - C of E - Los Angeles

PLATE B-15

PRECIPITATION REPORTS

☐ HOURLY ☐ DAILY

DATE

HOUR	DAY																		
		AMT	SEAS	SNOW	AMT	SEAS	SNOW	AMT	SEAS	SNOW	AMT	SEAS	SNOW	AMT	SEAS	SNOW	AMT	SEAS	SNOW
PREV. TOT.																			
0100	1																		
0200	2																		
0300	3																		
0400	4																		
0500	5																		
0600	6																		
0700	7																		
0800	8																		
0900	9																		
1000	10																		
1100	11																		
1200	12																		
1300	13																		
1400	14																		
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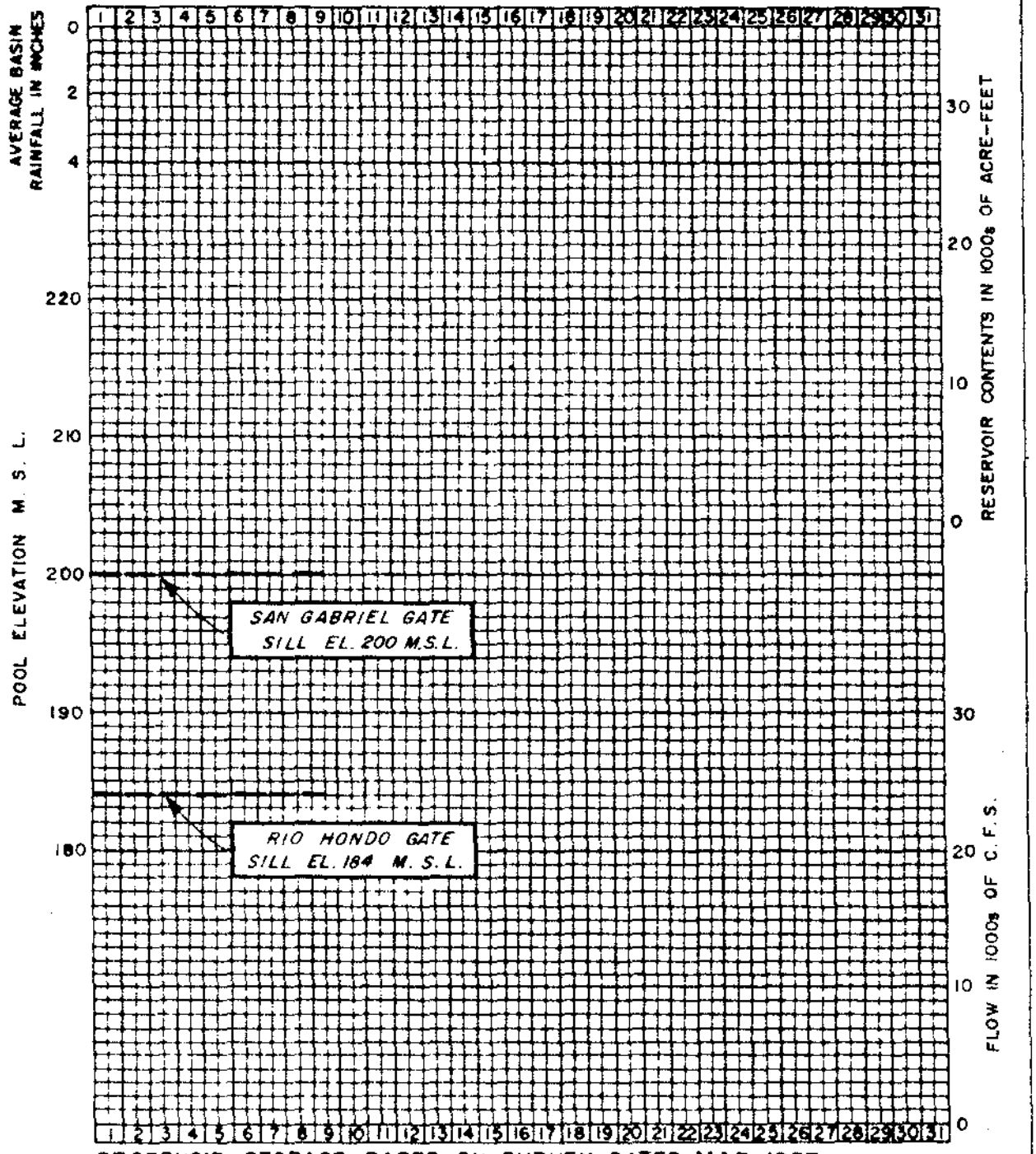
2300	23																		
2400	24																		
	25																		
	26																		
	27																		
	28																		
	29																		
	30																		
	31																		
TOTAL																			

FORM
SPL 9 Jan 57 277

ARMY – C. of E. – Los Angeles

PLATE B-14

ENGKW-51



RESERVOIR STORAGE BASED ON SURVEY DATED MAR. 1957

MONTH OF 19

	ELEVATION M S L	GROSS STORAGE Ac-Ft
Conservation Pool		NONE
Full Pool	229	36,200 *

Outlet Capacity at Full Pool 74,700 c f s

* Rio Hondo Outlet

MONTHLY RESERVOIR OPERATION

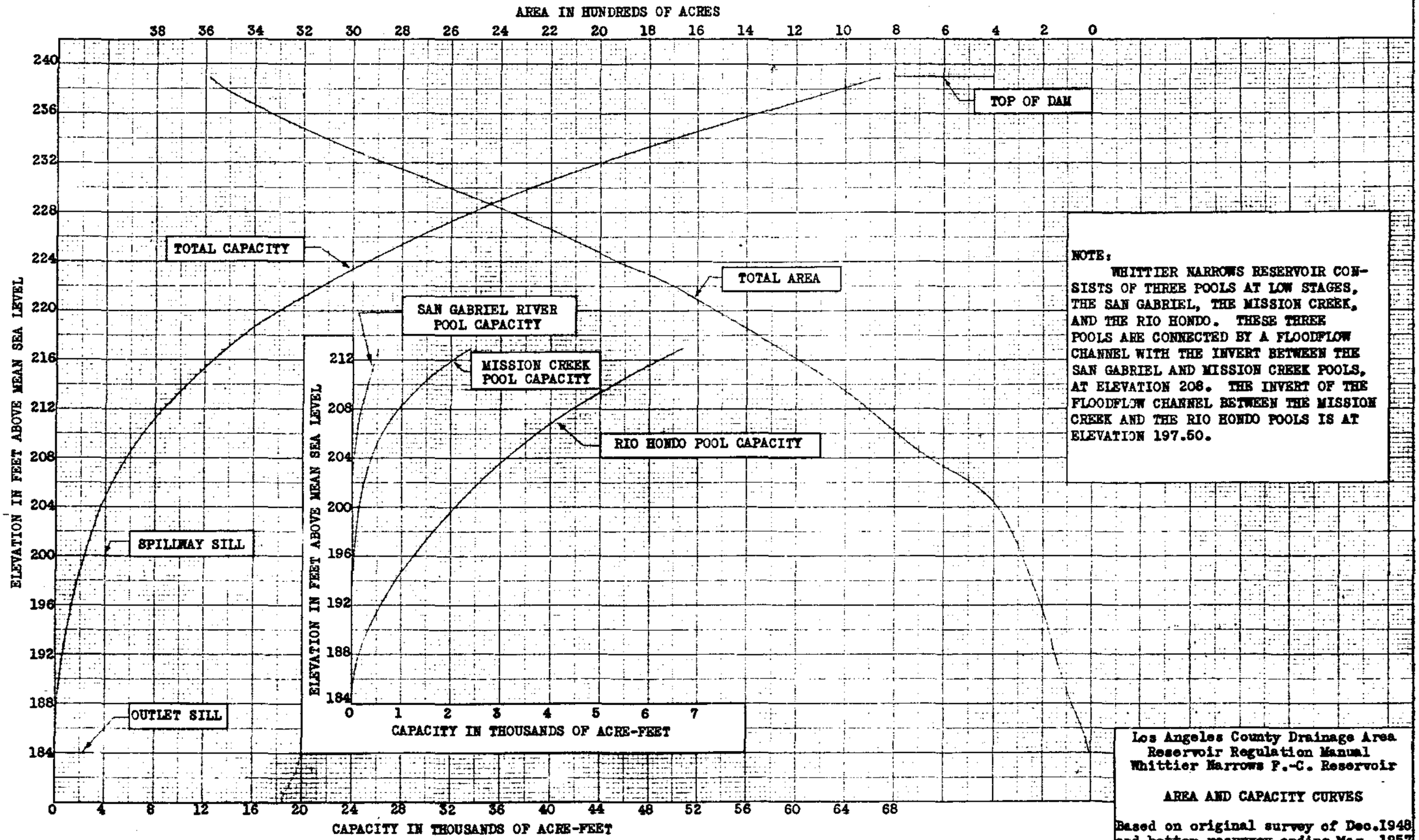
WHITTIER NARROWS FLOOD-CONTROL BASIN

SAN GABRIEL RIVER BASIN

D. A. 554 SQ. MILES

OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

FILE NO RO 07/



NOTE:

WHITTIER NARROWS RESERVOIR CONSISTS OF THREE POOLS AT LOW STAGES, THE SAN GABRIEL, THE MISSION CREEK, AND THE RIO HONDO. THESE THREE POOLS ARE CONNECTED BY A FLOODFLOW CHANNEL WITH THE INVERT BETWEEN THE SAN GABRIEL AND MISSION CREEK POOLS, AT ELEVATION 208. THE INVERT OF THE FLOODFLOW CHANNEL BETWEEN THE MISSION CREEK AND THE RIO HONDO POOLS IS AT ELEVATION 197.50.

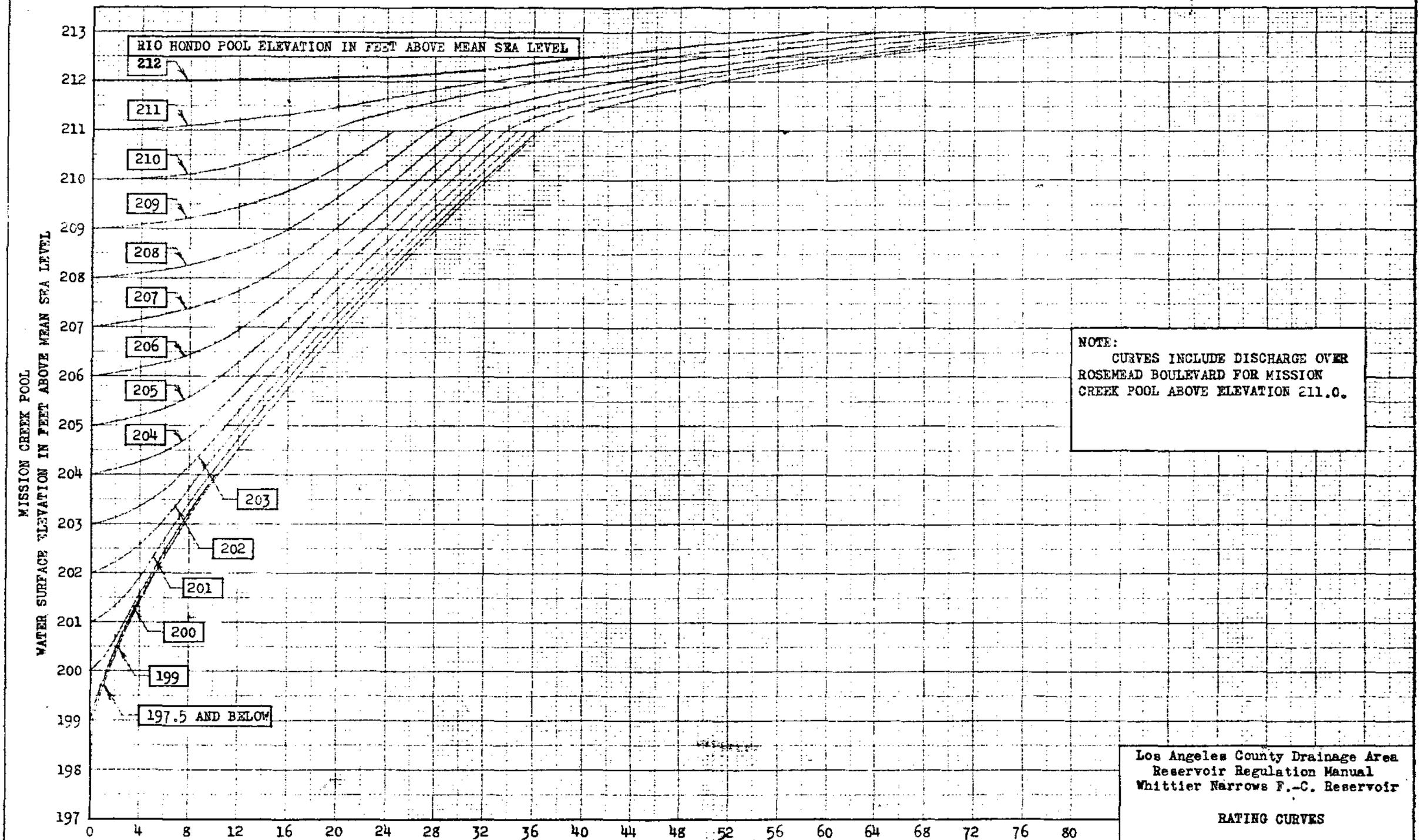
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

AREA AND CAPACITY CURVES

Based on original survey of Dec.1948 and bottom resurvey ending Mar. 1957

Office of the Distr[illegible] Engineer
Los Angeles, Ca[illegible]fornia
To accompany report dt[illegible] 1 Oct. 1957

PLATE B-16



NOTE:
CURVES INCLUDE DISCHARGE OVER ROSEMEAD BOULEVARD FOR MISSION CREEK POOL ABOVE ELEVATION 211.0.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVES

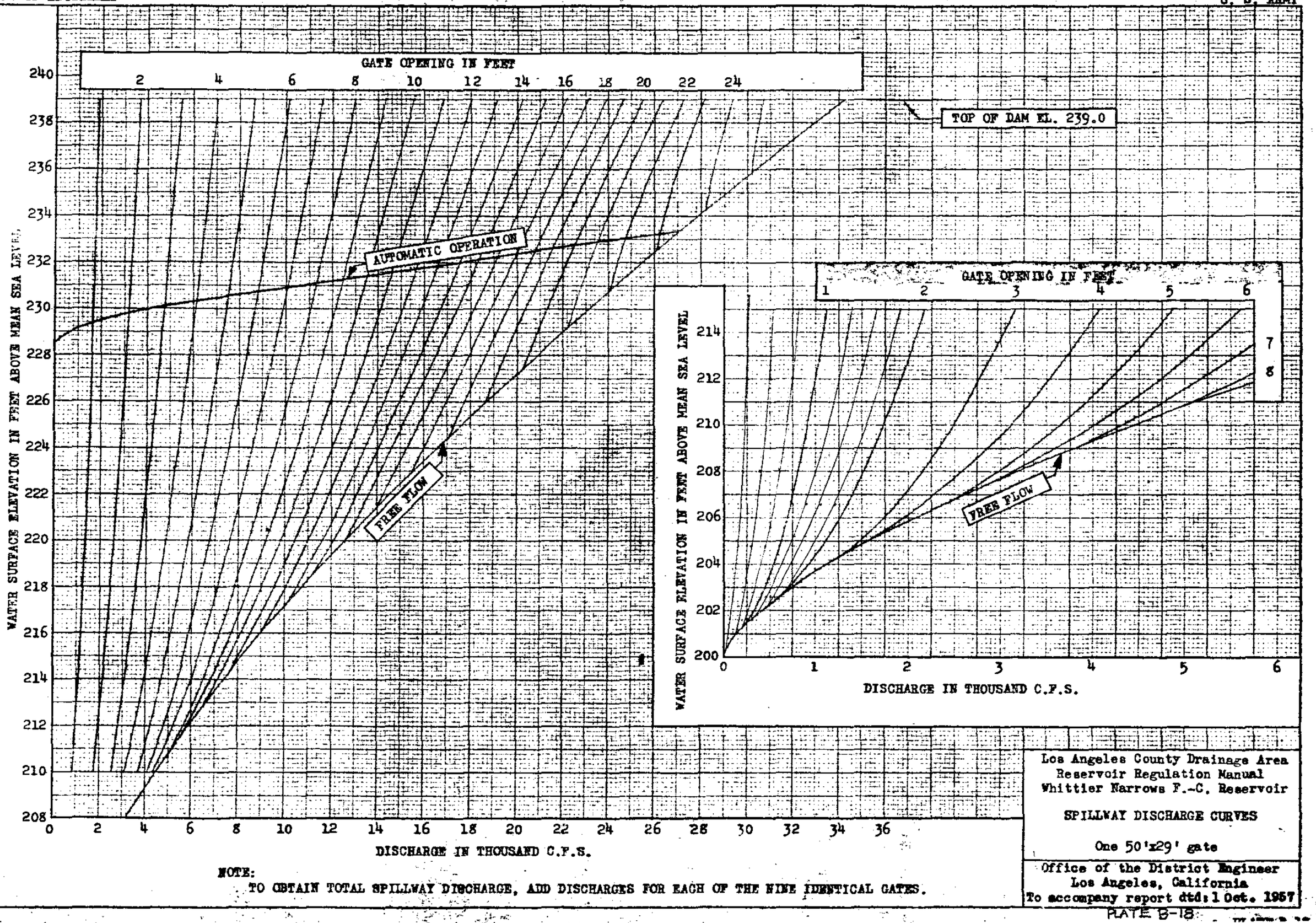
Flood flow channel at Rosemead Blvd.

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-17

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
TO OBTAIN TOTAL SPILLWAY DISCHARGE, ADD DISCHARGES FOR EACH OF THE NINE IDENTICAL GATES.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

SPILLWAY DISCHARGE CURVES

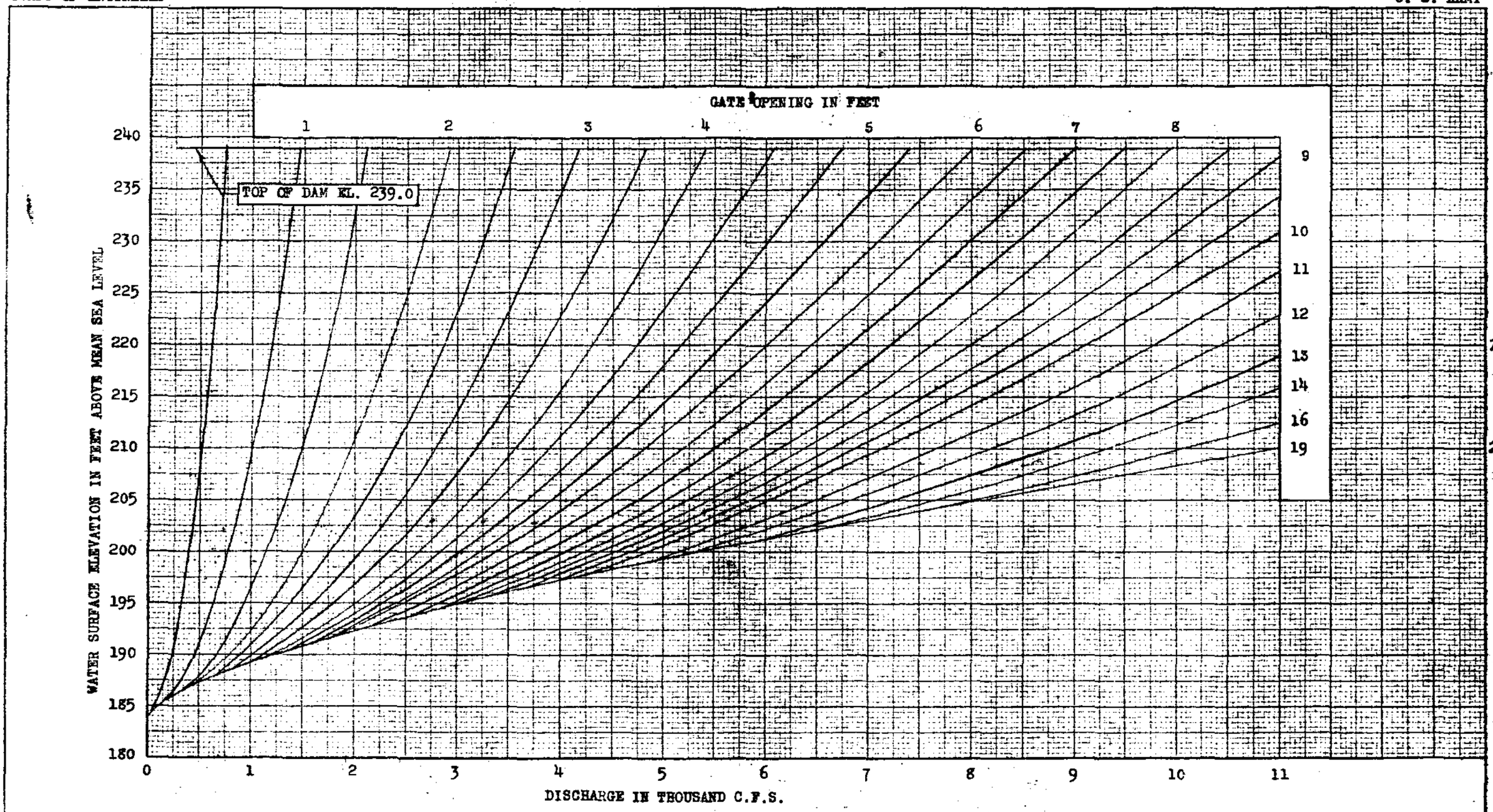
One 50'x29' gate

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-18

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
TO OBTAIN TOTAL OUTLET DISCHARGE, ADD DISCHARGES FOR EACH OF THE FOUR IDENTICAL GATES.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OUTLET DISCHARGE CURVES

One 30'x19' gated outlet

Office of the District Engineer
Los Angeles, California
To accompany report dtd 1 Oct. 1957

PLATE D-19

CORPS OF ENGINEERS

U. S. ARMY

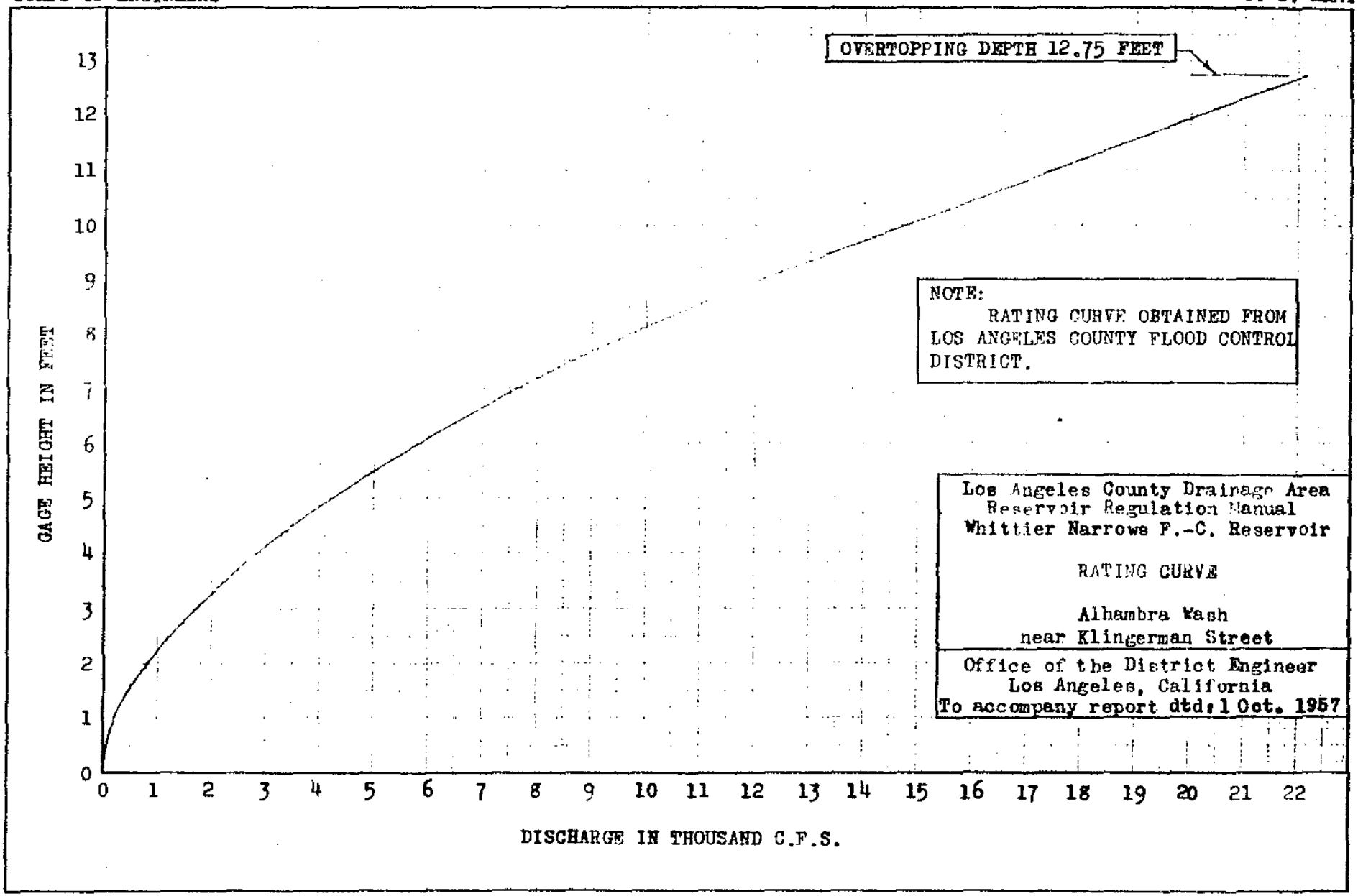


PLATE E-20

CORPS OF ENGINEERS

U. S. ARMY

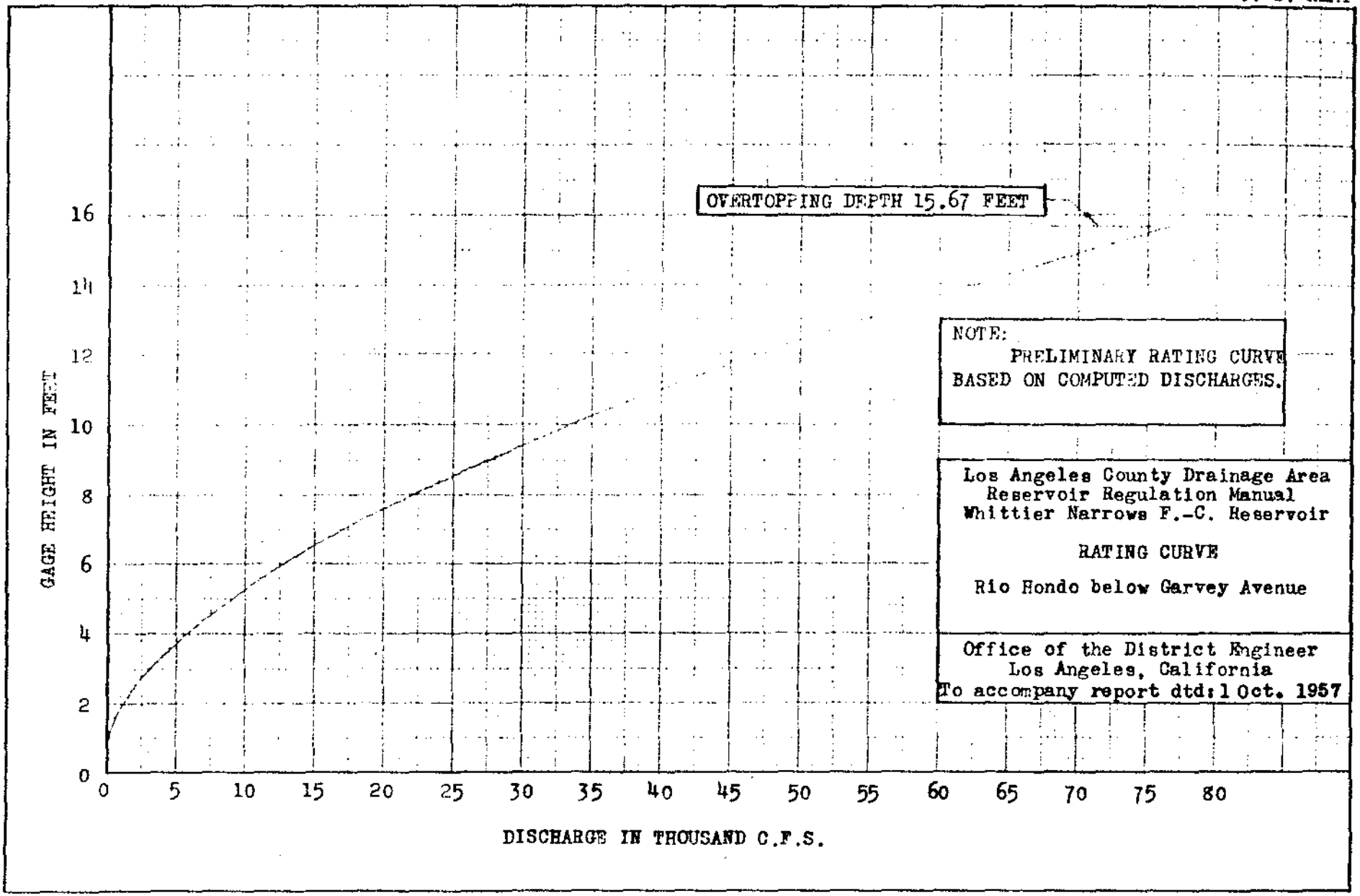
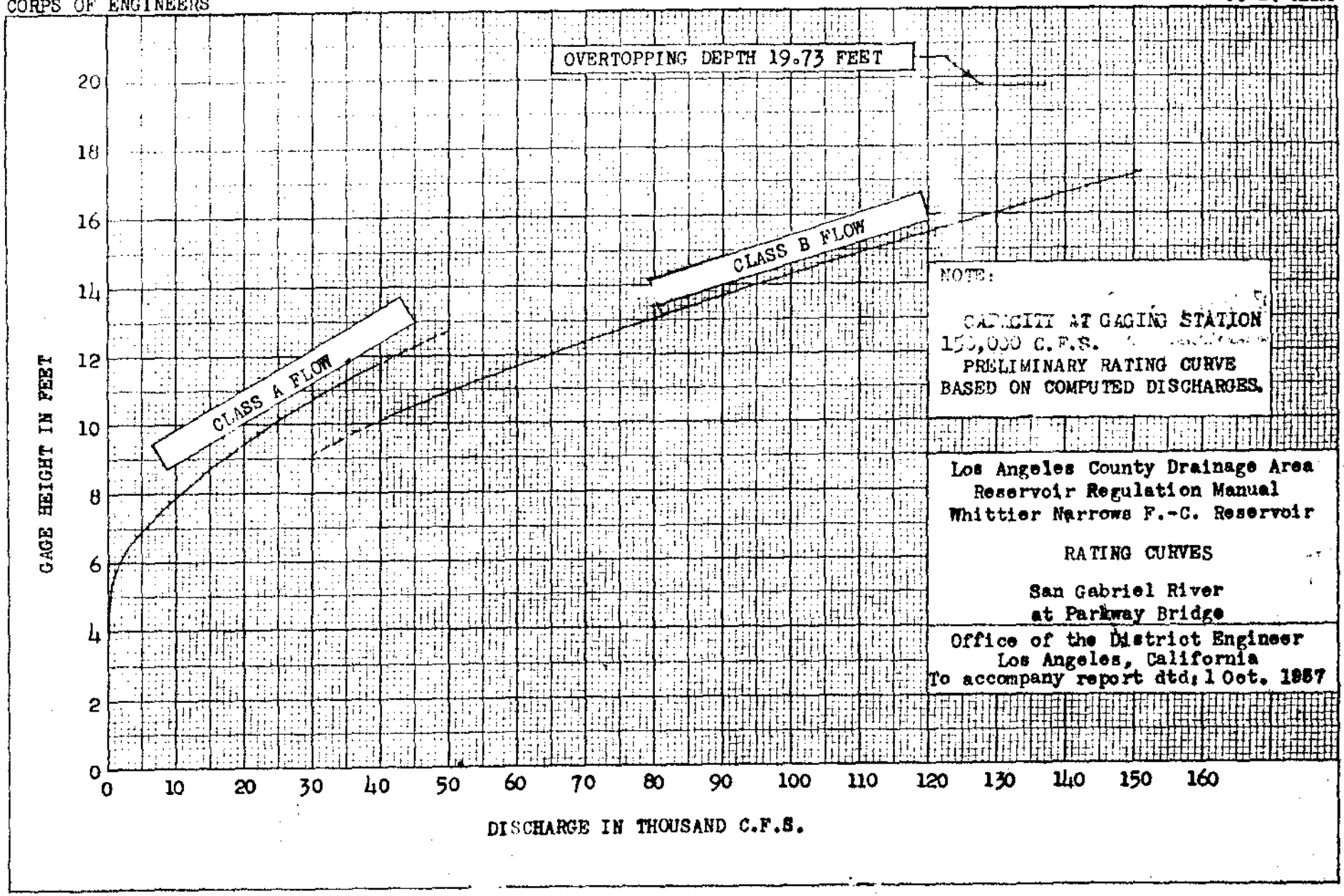


PLATE B-21

CORPS OF ENGINEERS

U. S. ARMY



NOTE:

CAPACITY AT GAGING STATION 150,000 C.F.S.

PRELIMINARY RATING CURVE BASED ON COMPUTED DISCHARGES.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

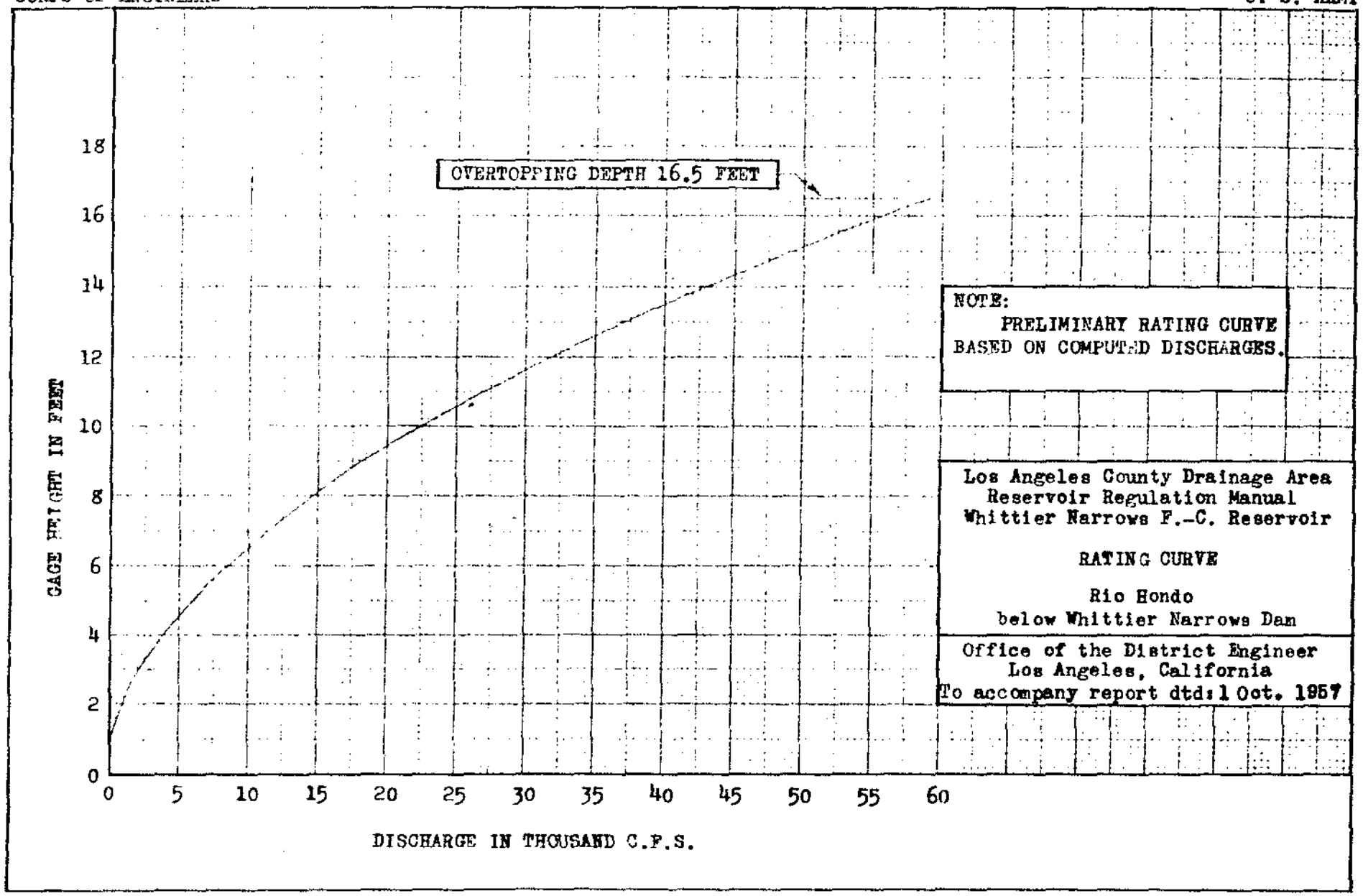
RATING CURVES

San Gabriel River
at Parkway Bridge

Office of the District Engineer
Los Angeles, California
To accompany report dtd; 1 Oct. 1957

PLATE B-22

CORPS OF ENGINEERS U. S. ARMY



NOTE:
PRELIMINARY RATING CURVE
BASED ON COMPUTED DISCHARGES.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

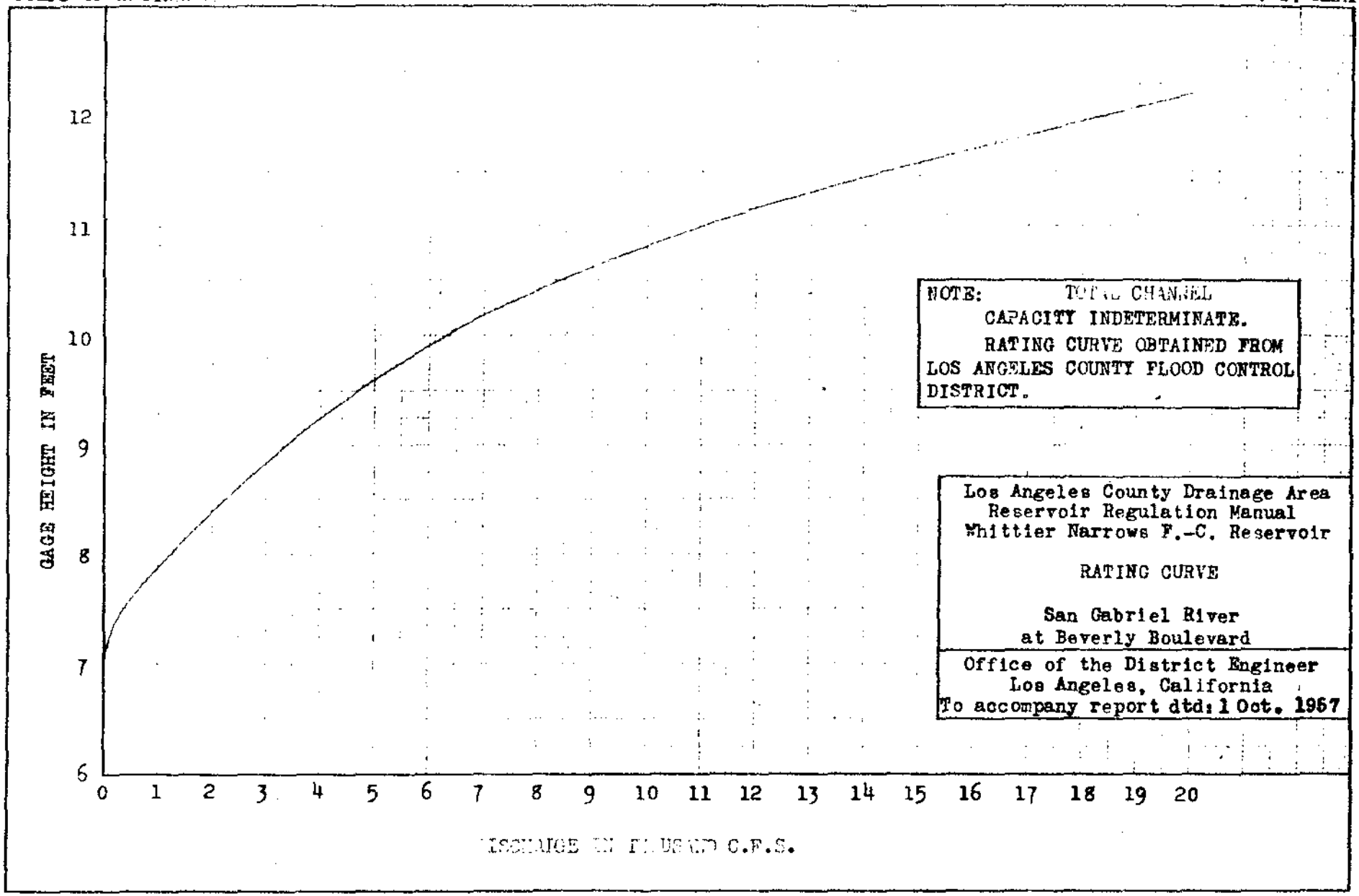
RATING CURVE

Rio Hondo
below Whittier Narrows Dam

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-23

CORPS OF ENGINEERS U. S. ARMY



NOTE: TOTAL CHANNEL CAPACITY INDETERMINATE. RATING CURVE OBTAINED FROM LOS ANGELES COUNTY FLOOD CONTROL DISTRICT.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

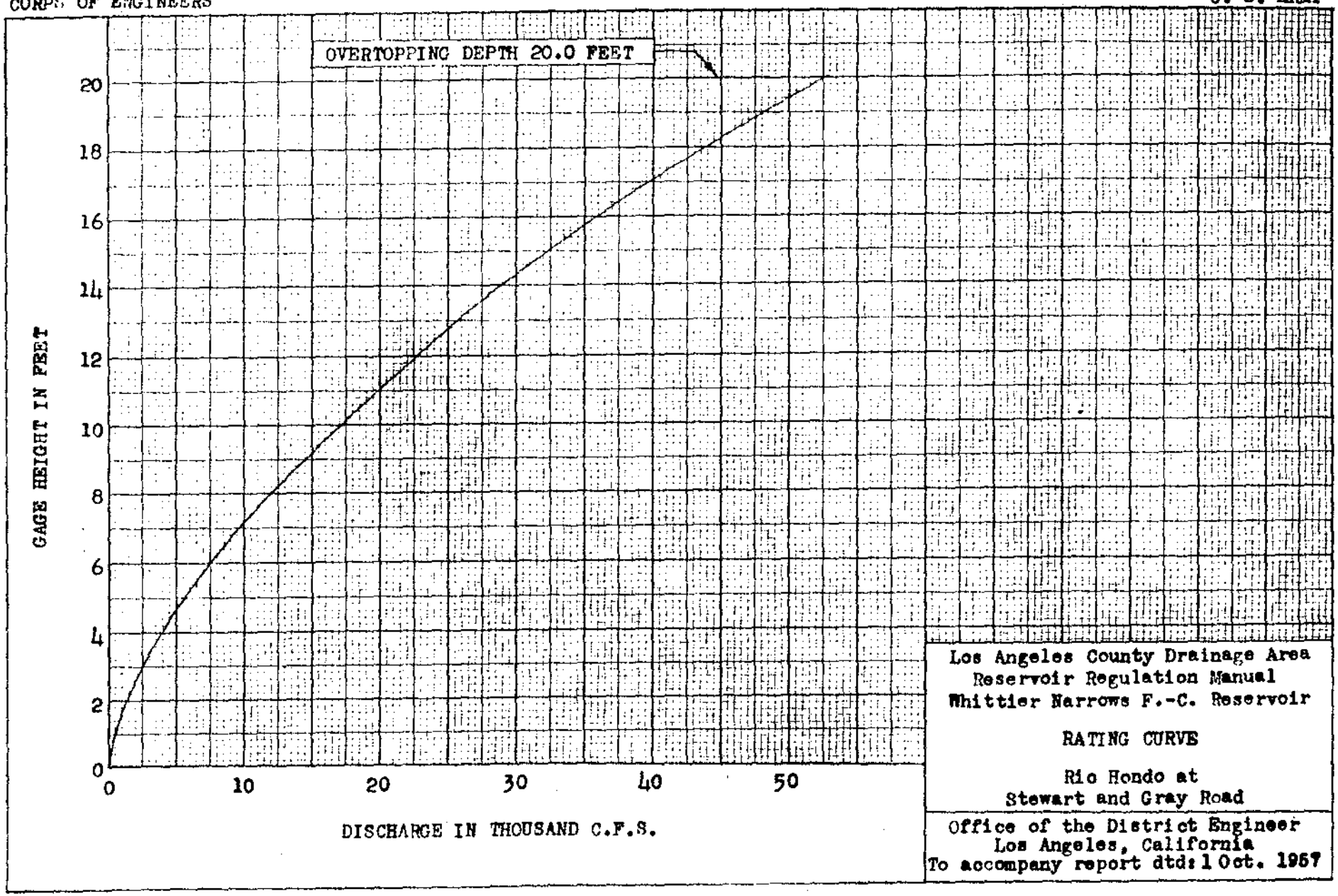
San Gabriel River
at Beverly Boulevard

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-24

CORPS OF ENGINEERS

U. S. ARMY



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

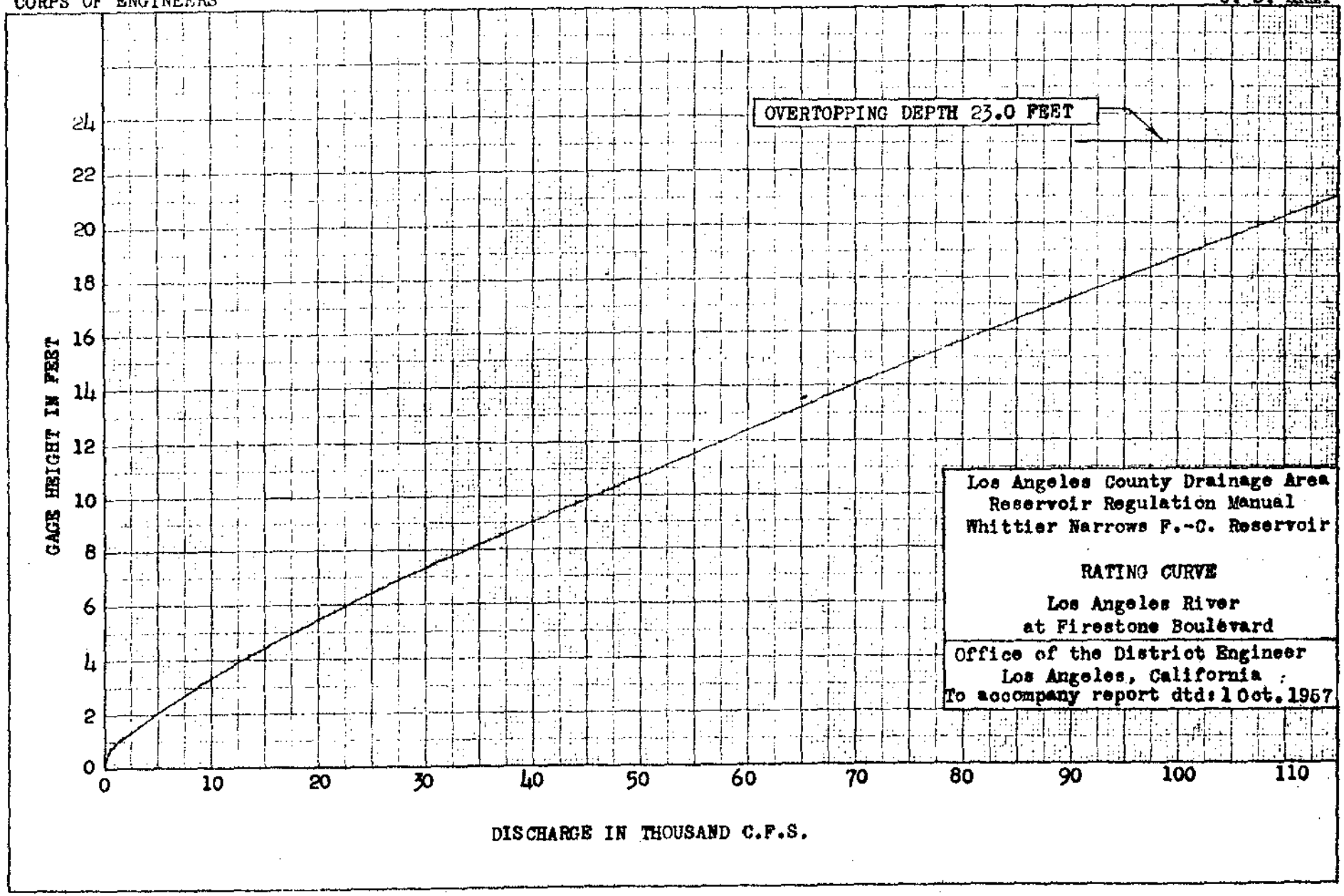
Rio Hondo at
Stewart and Gray Road

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-25

CORPS OF ENGINEERS

U. S. ARMY



Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

Los Angeles River
at Firestone Boulevard

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-26

CORPS OF ENGINEERS

U. S. ARMY

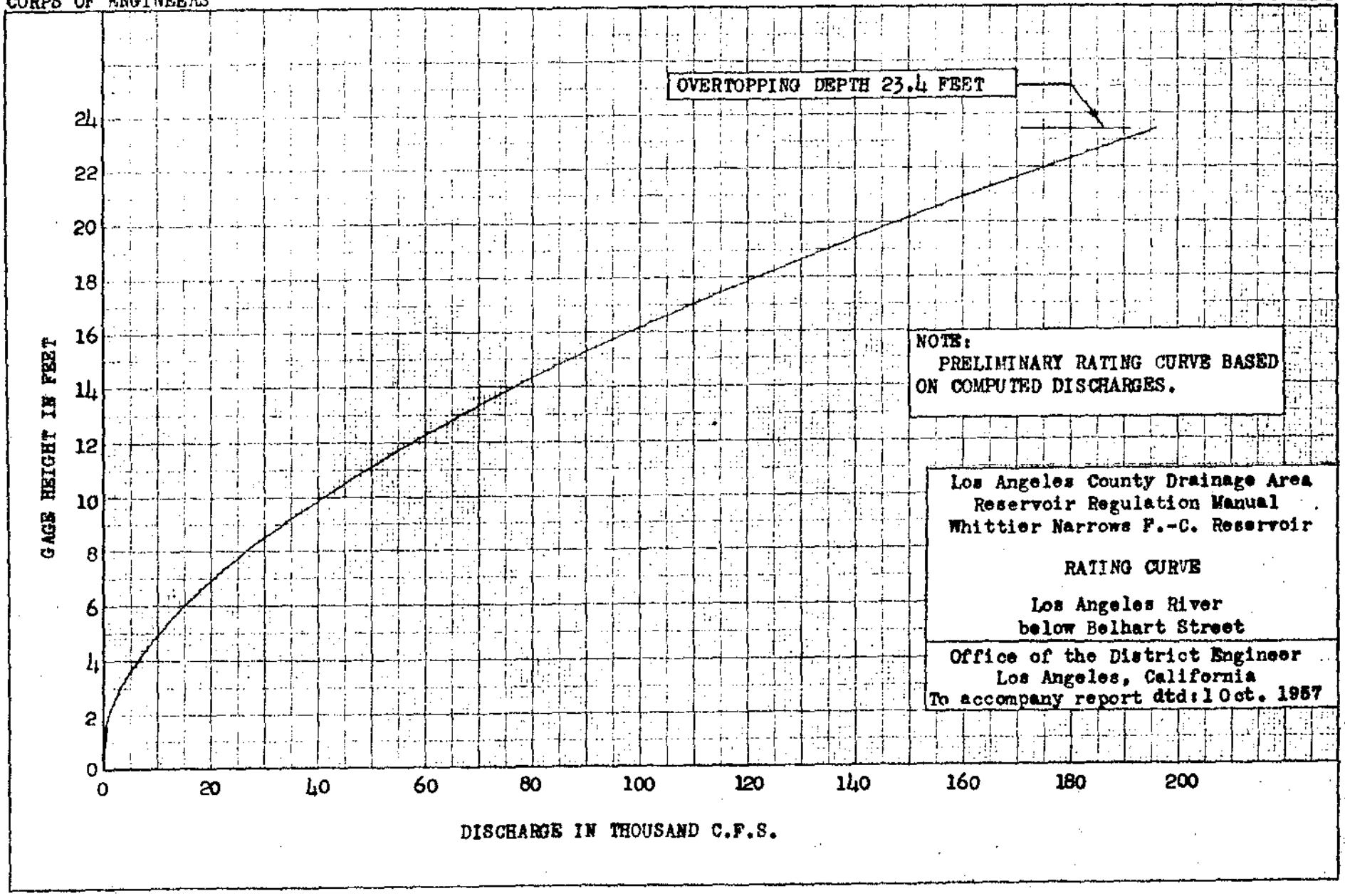
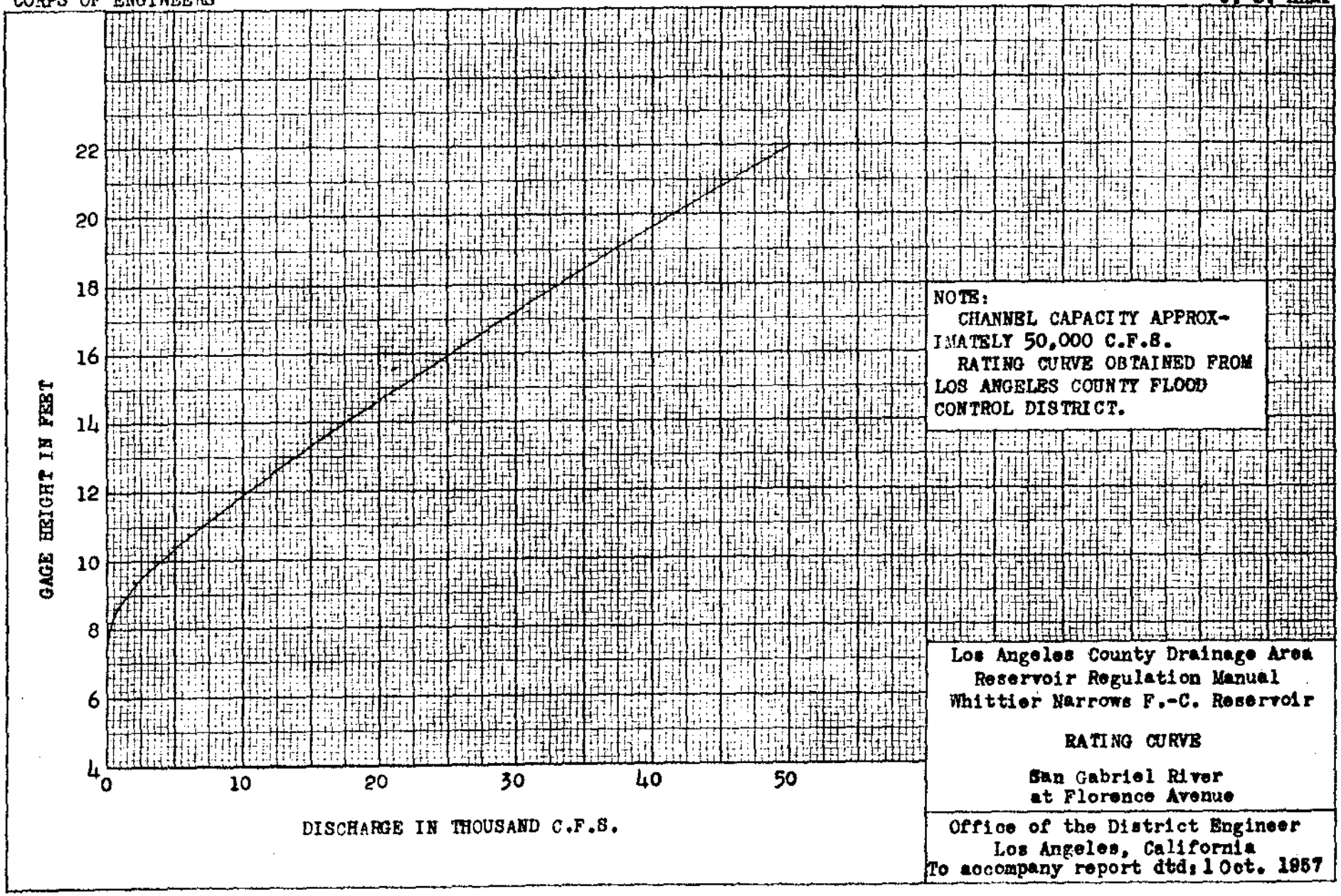


PLATE B-27

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
CHANNEL CAPACITY APPROXIMATELY 50,000 C.F.S.
RATING CURVE OBTAINED FROM LOS ANGELES COUNTY FLOOD CONTROL DISTRICT.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

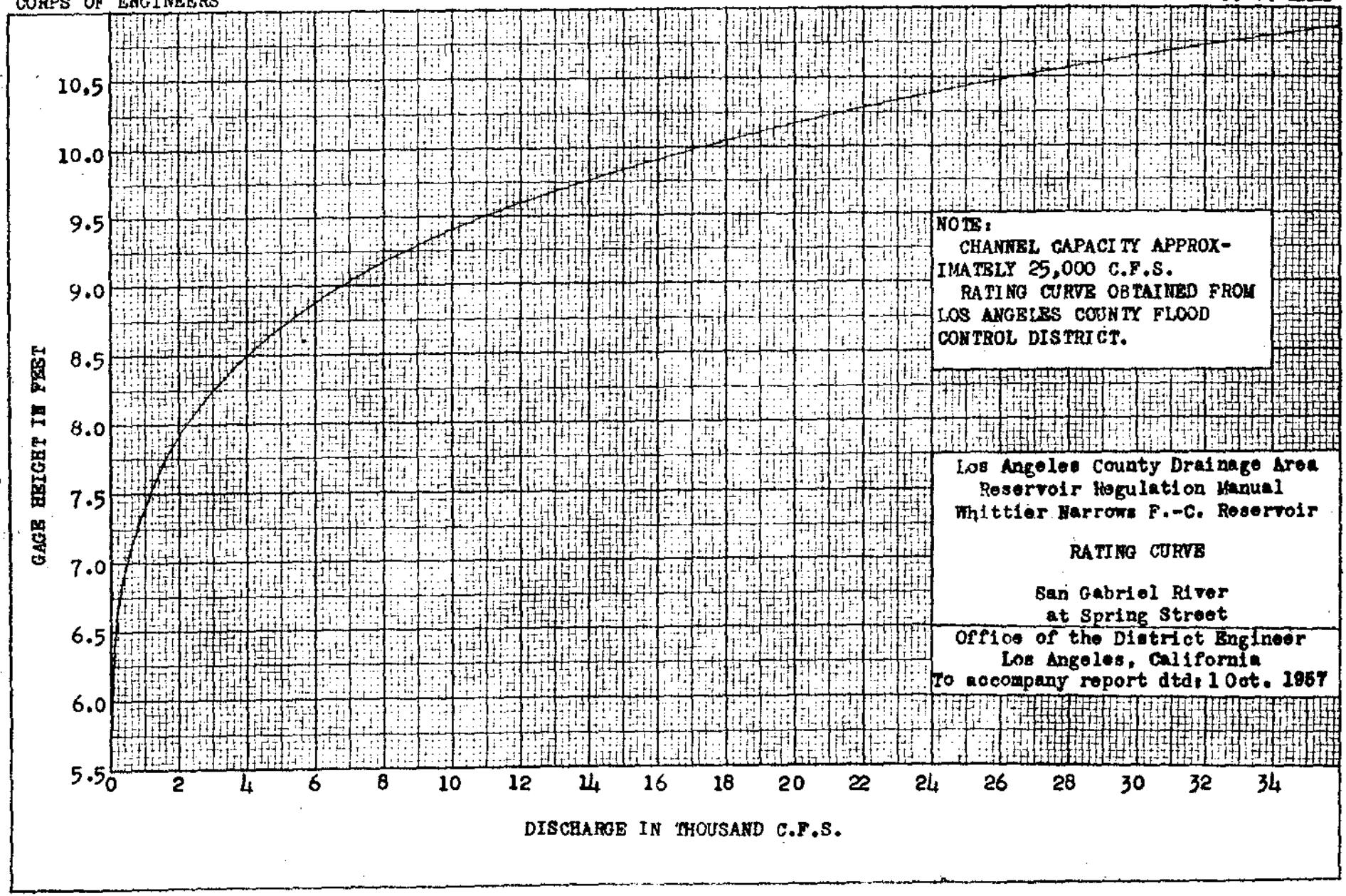
San Gabriel River
at Florence Avenue

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-28

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
CHANNEL CAPACITY APPROXIMATELY 25,000 C.F.S.
RATING CURVE OBTAINED FROM LOS ANGELES COUNTY FLOOD CONTROL DISTRICT.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

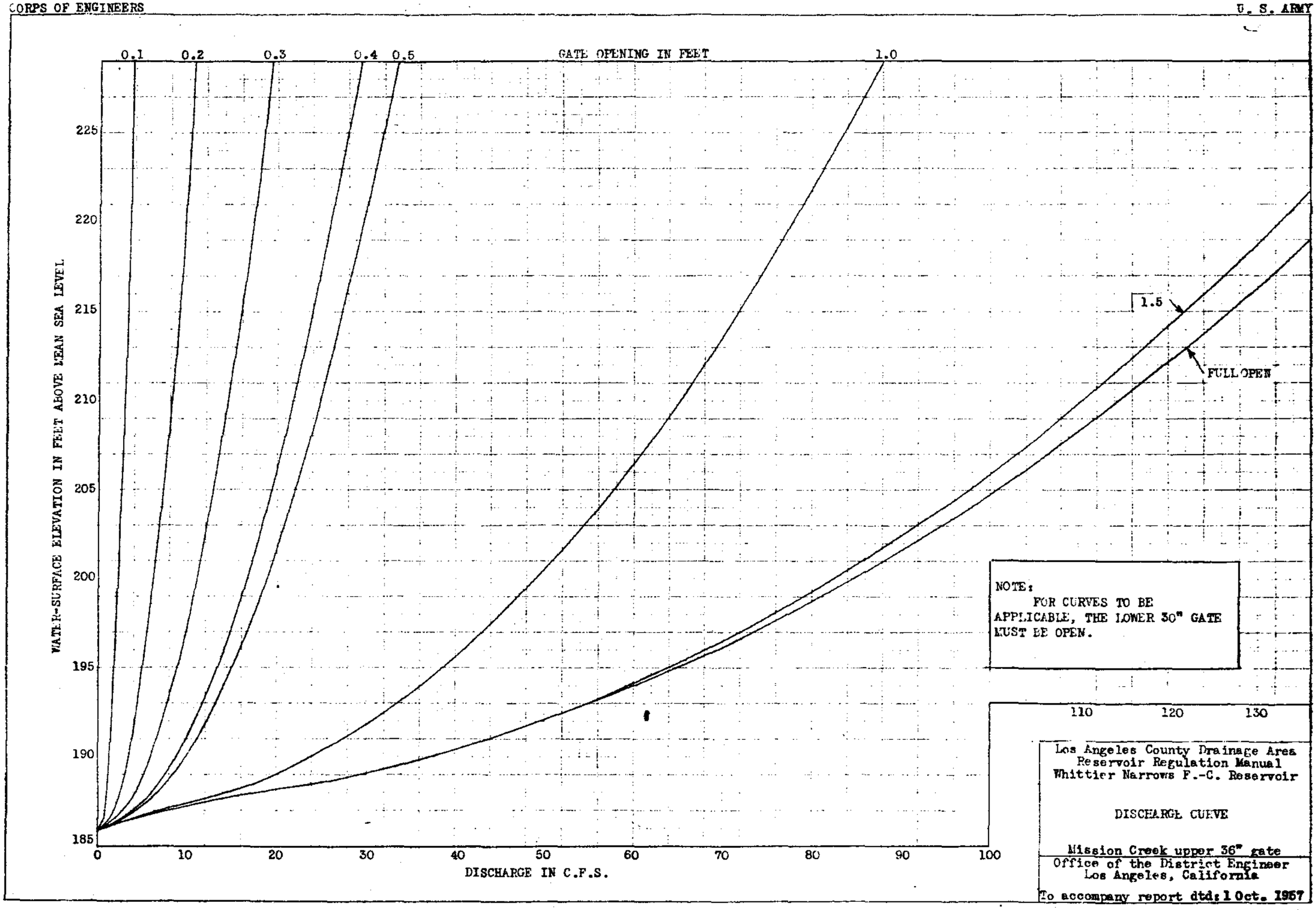
San Gabriel River
at Spring Street

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-29

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
FOR CURVES TO BE APPLICABLE, THE LOWER 30" GATE MUST BE OPEN.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

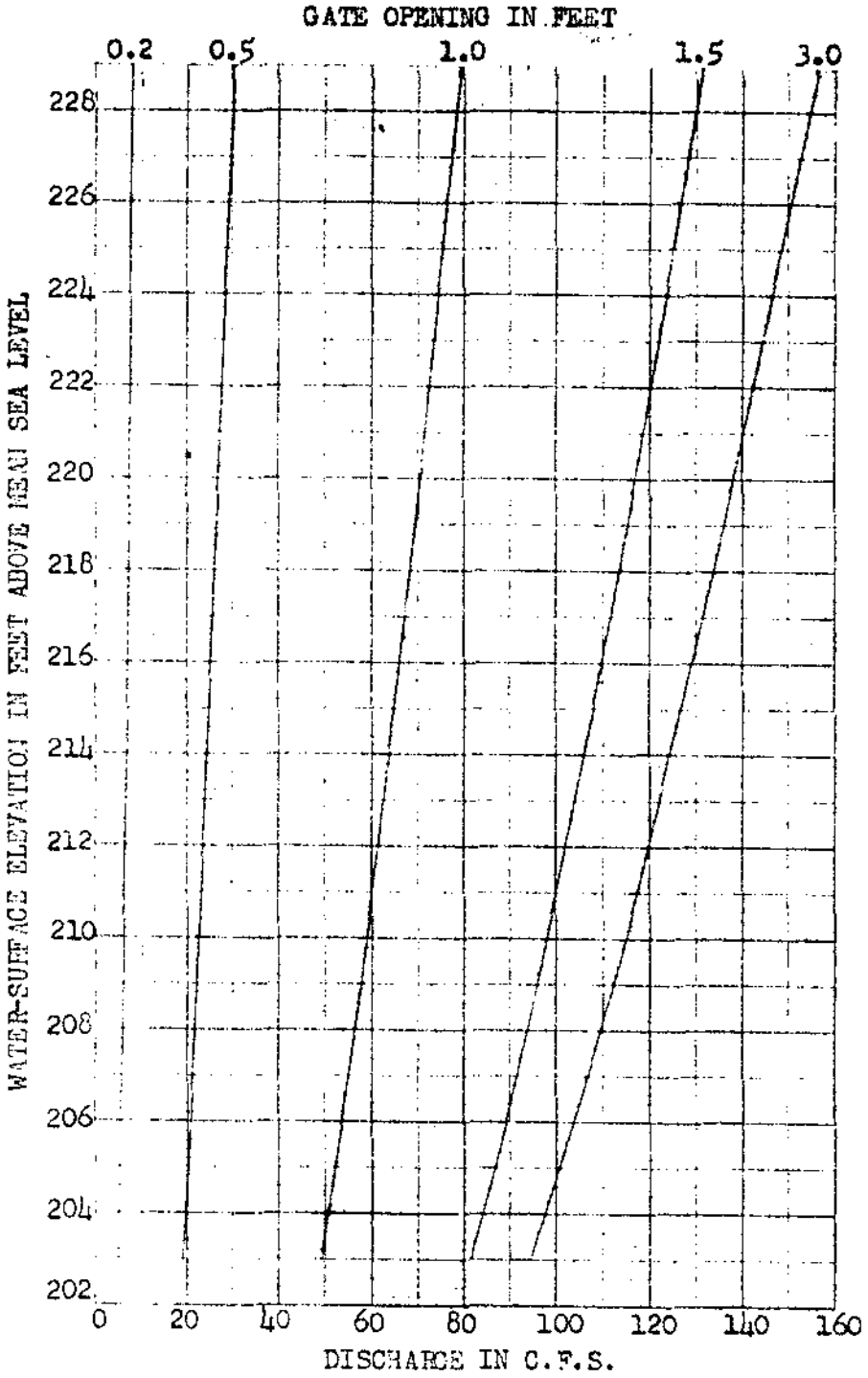
DISCHARGE CURVE

Mission Creek upper 36" gate

Office of the District Engineer
Los Angeles, California

To accompany report dtd: 1 Oct. 1957

PLATE B-30



NOTE:
FOR CURVES TO BE APPLICABLE, THE UPPER 36" GATE MUST BE OPEN.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

DISCHARGE CURVE

Mission Creek lower 30" gate

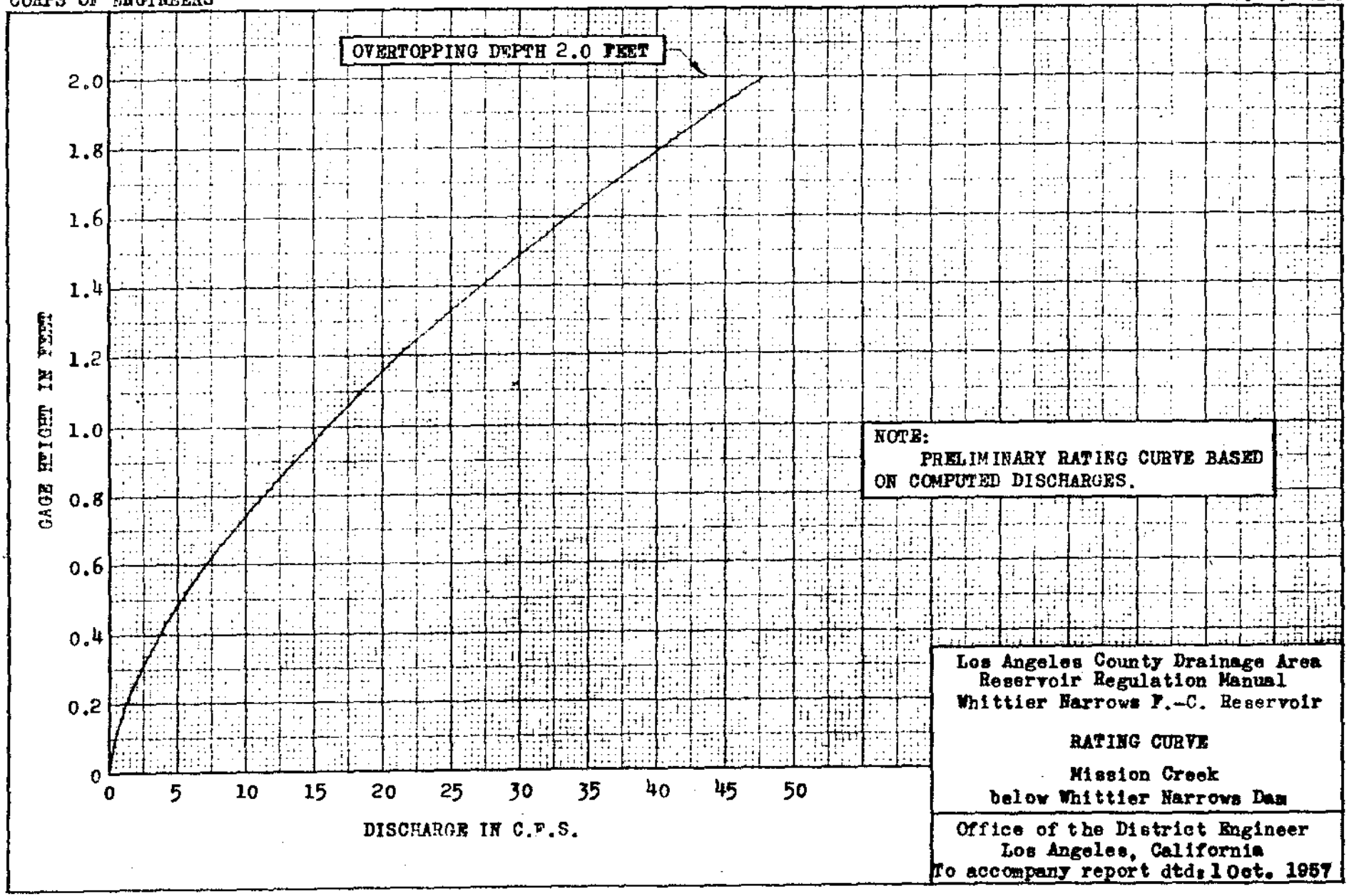
Office of the District Engineer
Los Angeles, California

To accompany report dtd: 1 Oct. 1957

PLATE B-31

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
PRELIMINARY RATING CURVE BASED ON COMPUTED DISCHARGES.

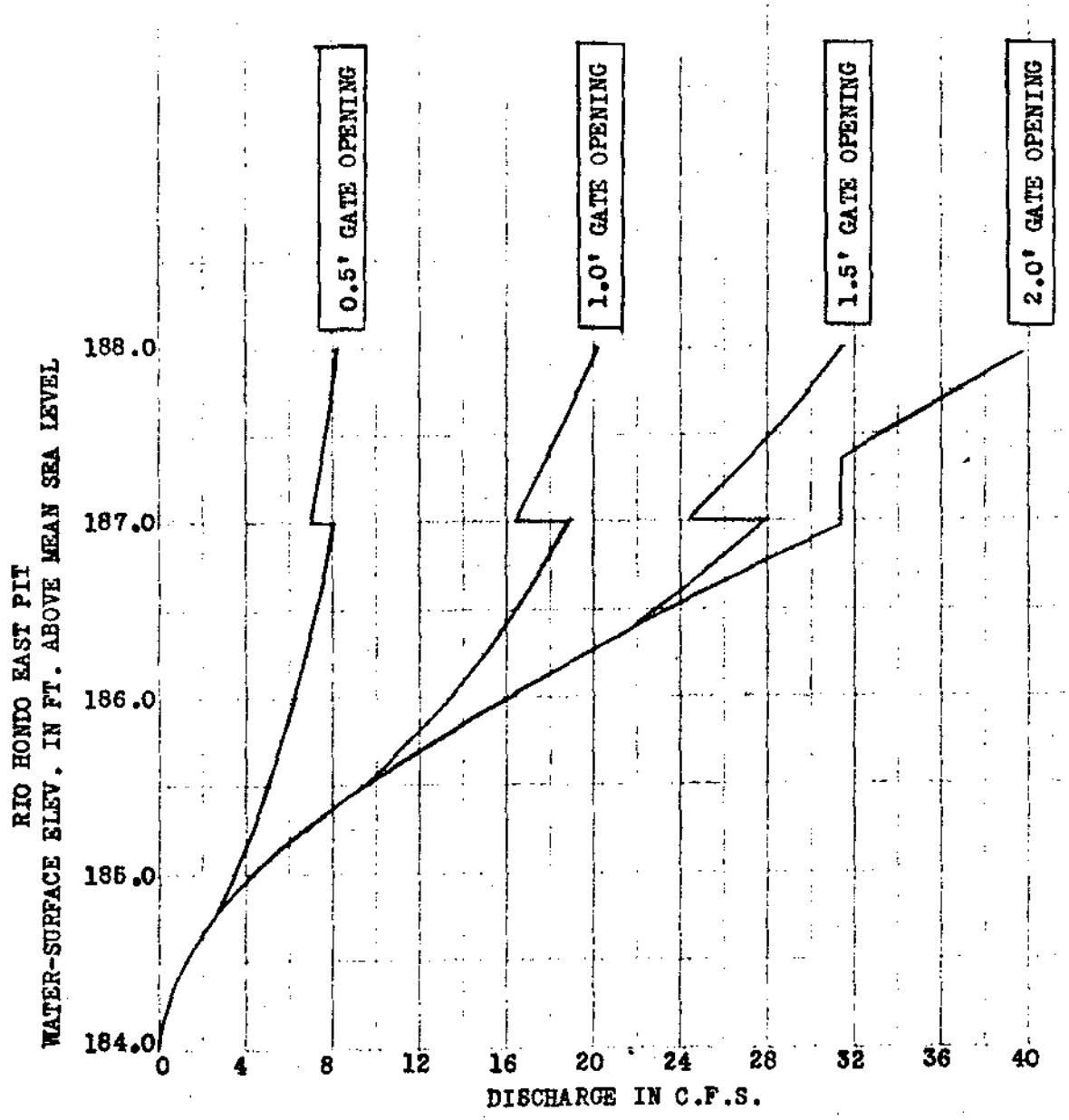
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

Mission Creek
below Whittier Narrows Dam

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-32

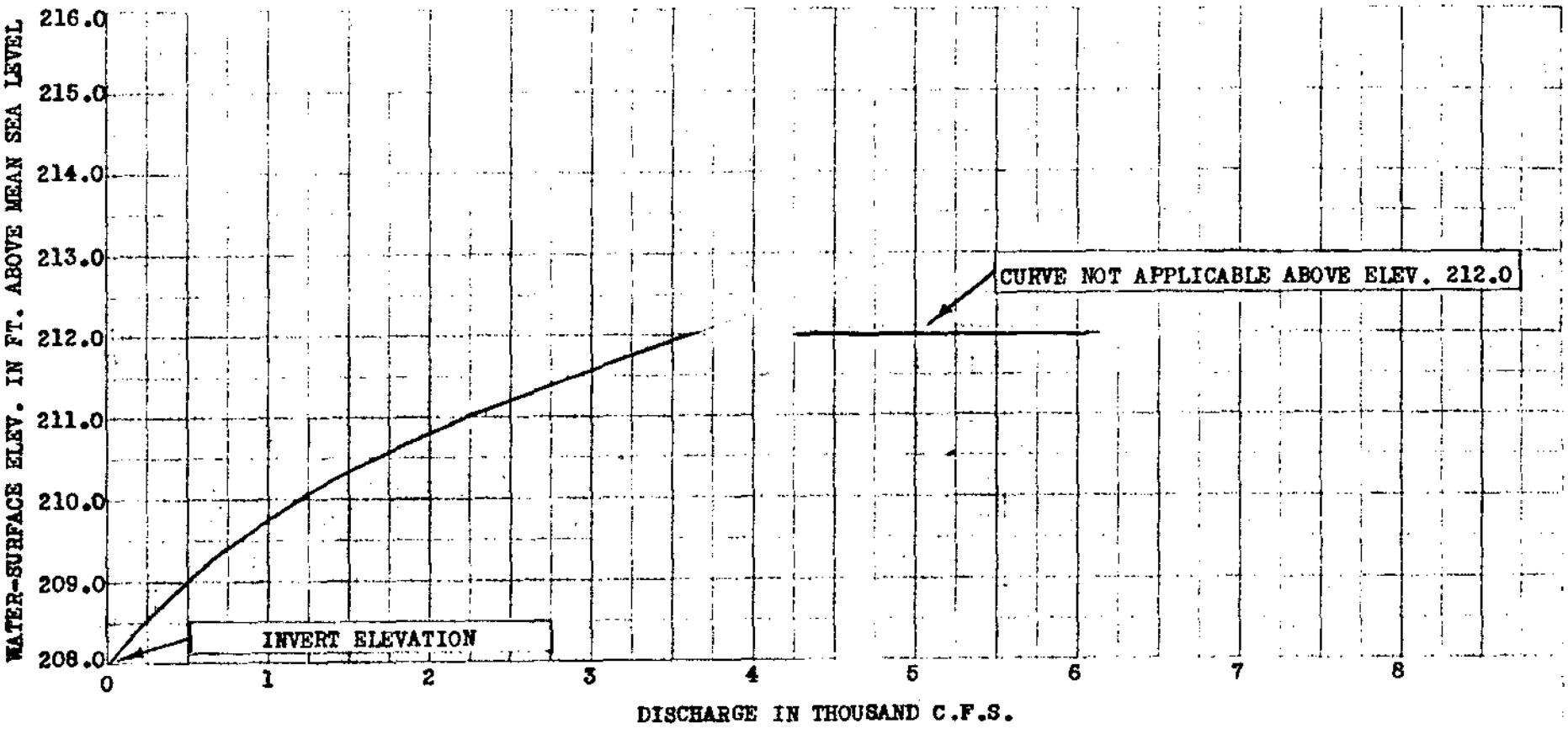


Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

36" Gate
(Diversion of Rising Water)
Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-33



NOTE:

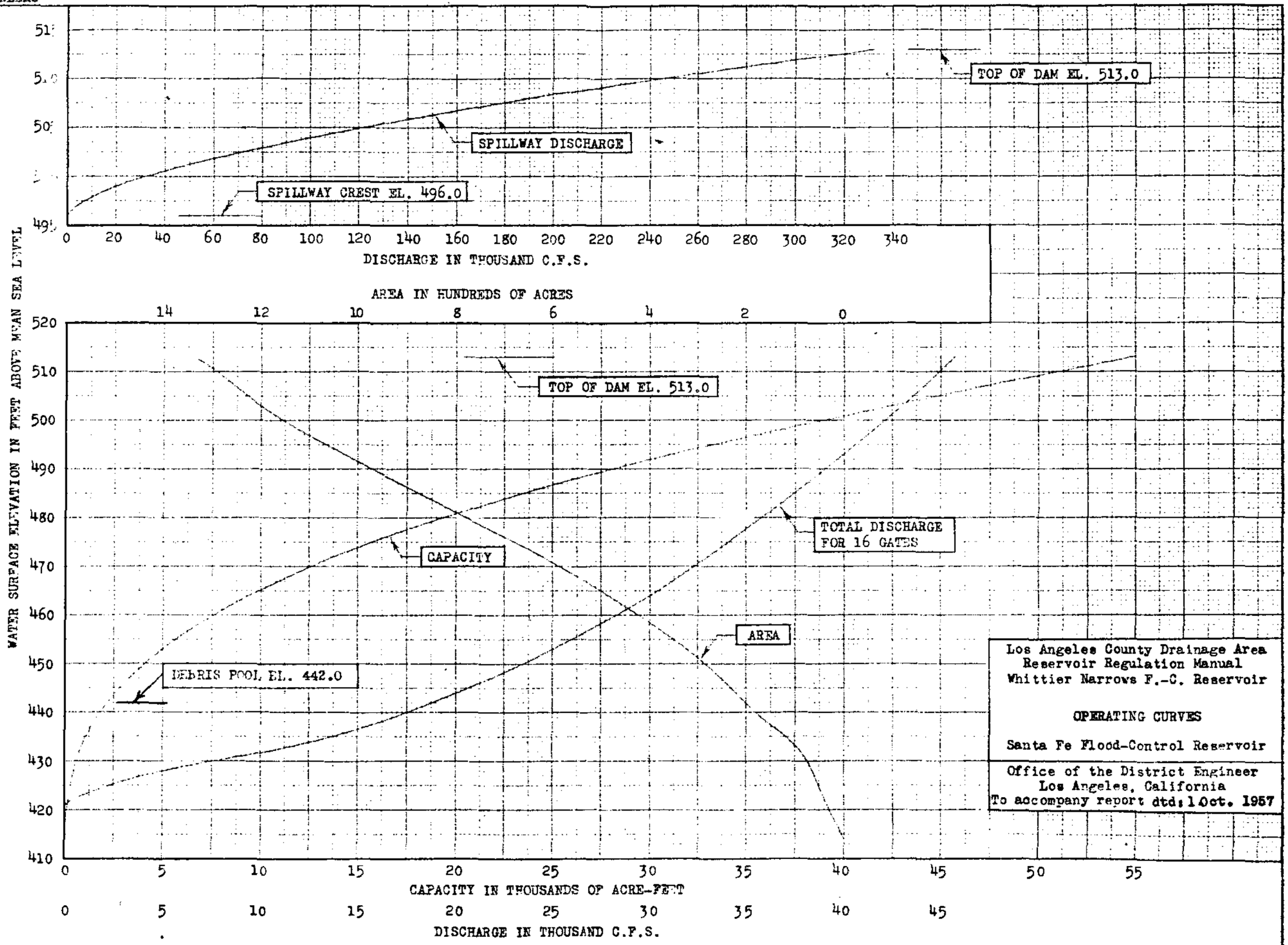
THIS CURVE TO BE USED ONLY WHEN MISSION CREEK POOL IS BELOW WATER-SURFACE ELEV. 208.0.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

RATING CURVE

Floodflow Channel
At San Gabriel River
Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-34

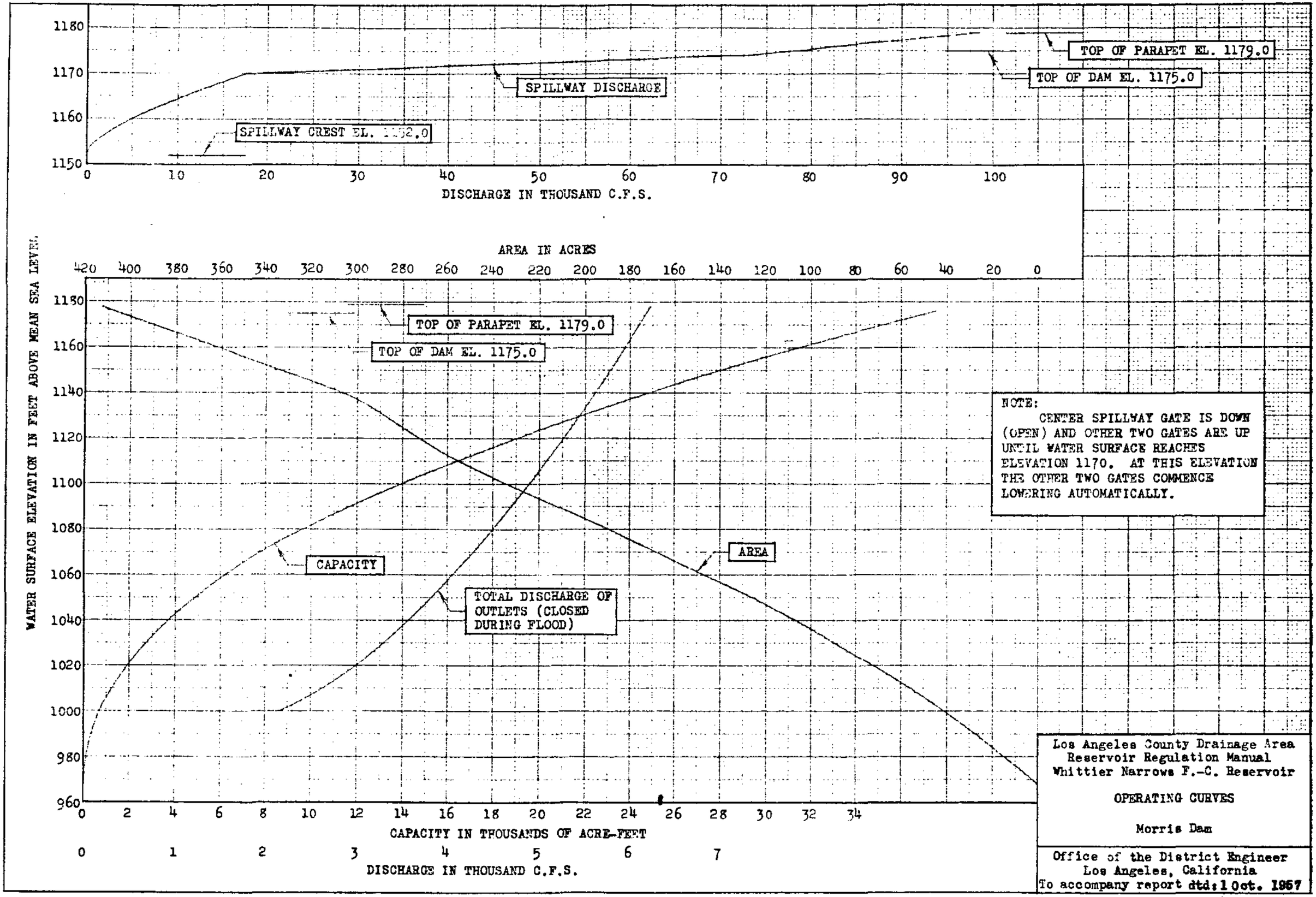


Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OPERATING CURVES

Santa Fe Flood-Control Reservoir

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957



NOTE:
CENTER SPILLWAY GATE IS DOWN (OPEN) AND OTHER TWO GATES ARE UP UNTIL WATER SURFACE REACHES ELEVATION 1170. AT THIS ELEVATION THE OTHER TWO GATES COMMENCE LOWERING AUTOMATICALLY.

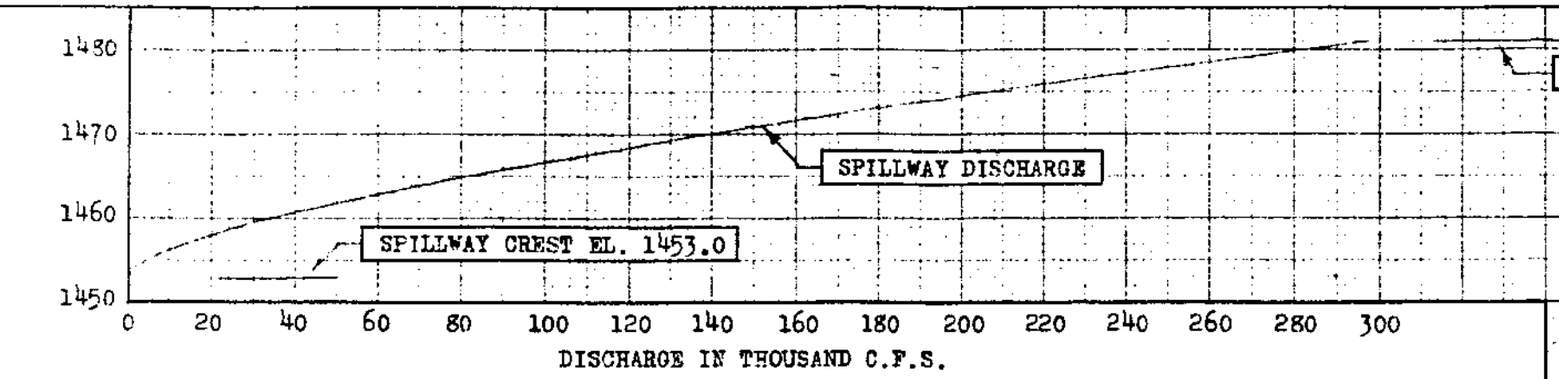
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

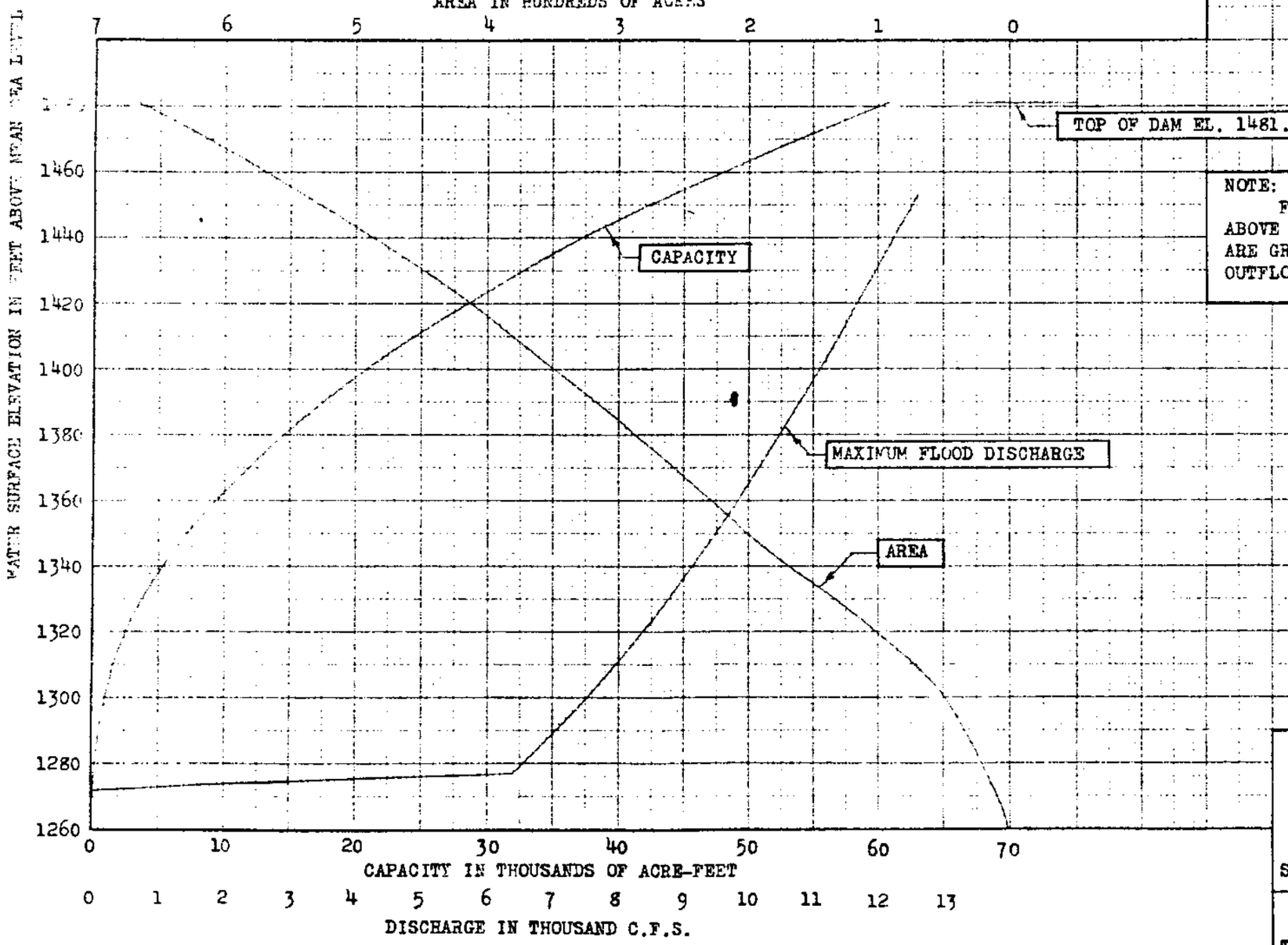
OPERATING CURVES

Morris Dam

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-56





NOTE:
FOR WATER SURFACE ELEVATIONS ABOVE SPILLWAY CREST, THE GATES ARE GRADUALLY CLOSED TRANSFERRING OUTFLOW TO THE SPILLWAY.

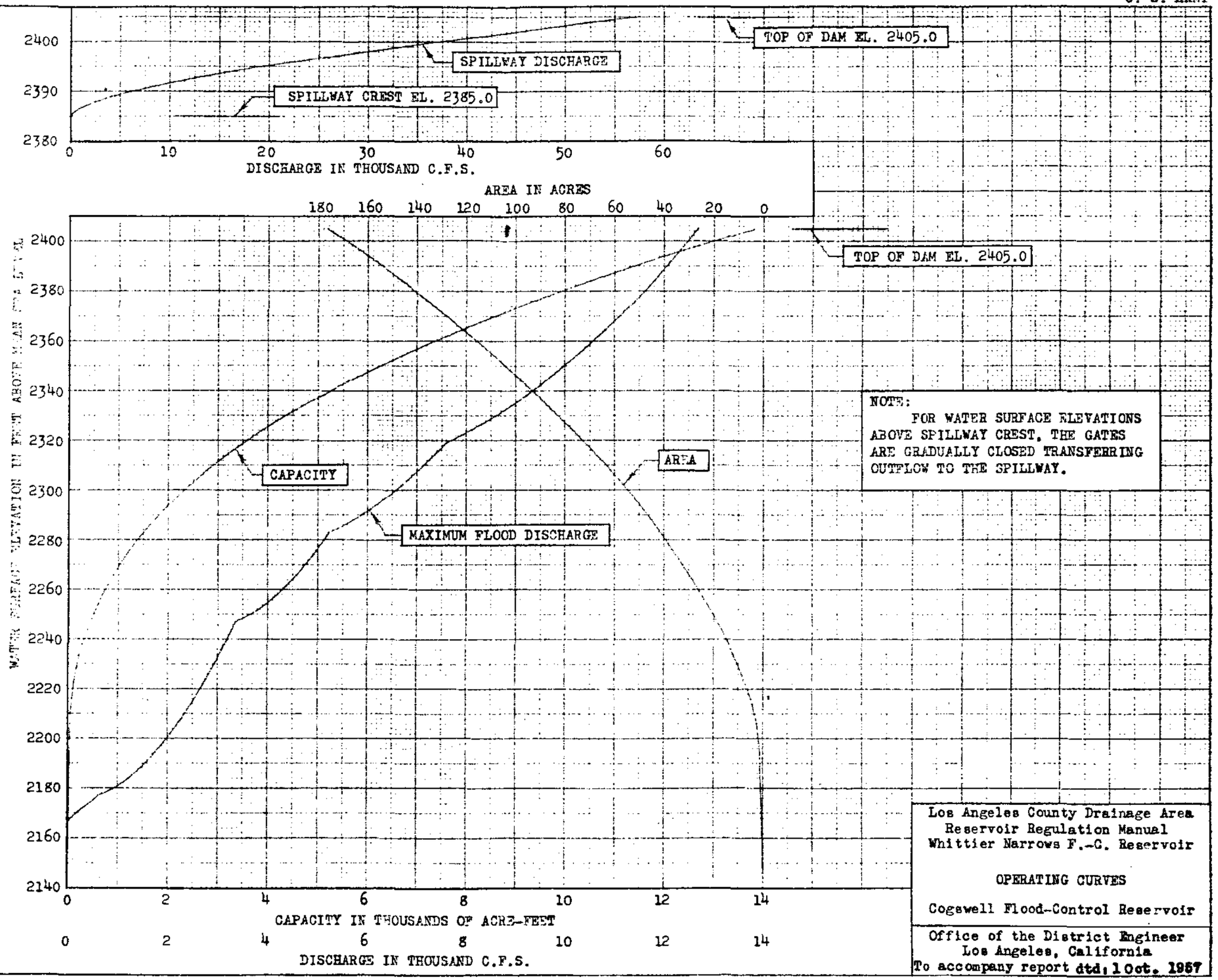
Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OPERATING CURVES

San Gabriel Flood-Control Reservoir

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1967

PLATE B-37



NOTE:
FOR WATER SURFACE ELEVATIONS ABOVE SPILLWAY CREST, THE GATES ARE GRADUALLY CLOSED TRANSFERRING OUTFLOW TO THE SPILLWAY.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OPERATING CURVES

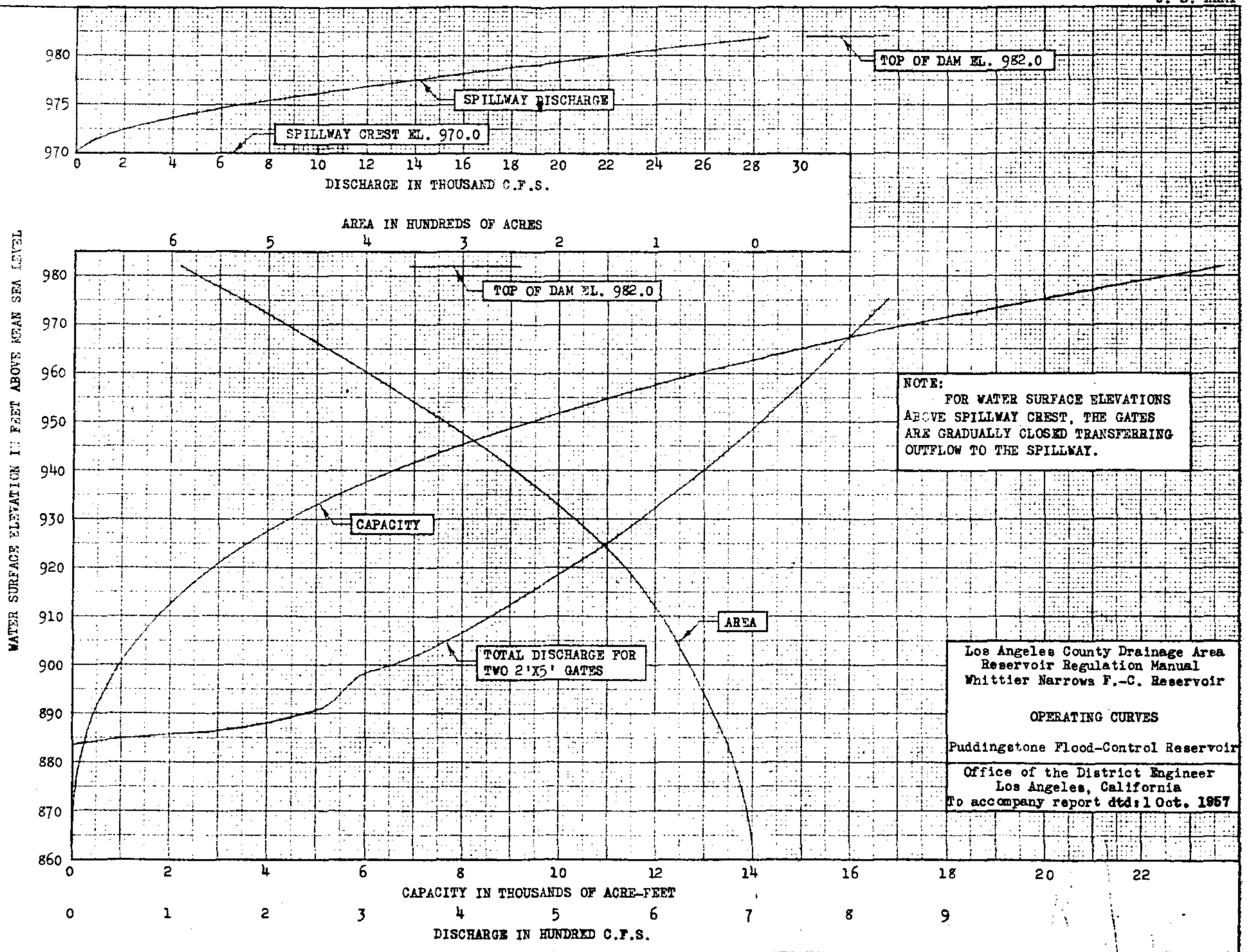
Cogswell Flood-Control Reservoir

Office of the District Engineer
Los Angeles, California
To accompany report dtd; 1 Oct. 1957

PLATE B-38

CORPS OF ENGINEERS

U. S. ARMY



NOTE:
FOR WATER SURFACE ELEVATIONS ABOVE SPILLWAY CREST, THE GATES ARE GRADUALLY CLOSED TRANSFERRING OUTFLOW TO THE SPILLWAY.

Los Angeles County Drainage Area
Reservoir Regulation Manual
Whittier Narrows F.-C. Reservoir

OPERATING CURVES

Puddingstone Flood-Control Reservoir

Office of the District Engineer
Los Angeles, California
To accompany report dtd: 1 Oct. 1957

PLATE B-30

PART C

CONSERVATION USE AND OPERATION FOR DIVERSION OF WATER

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR

SAN GABRIEL RIVER BASIN, CALIF.

1 OCTOBER 1957

TABLE OF CONTENTS

PART C

CONSERVATION USE AND OPEATION FOR DIVERSION WATER

TABLES

PART C

CONSERVATION USE AND OPERATION FOR DIVERSION OF WATER

WHITTIER NARROWS FLOOD-CONTROL RESERVOIR
SAN GABRIEL RIVER BASIN, CALIF.

1. Authority.--Authority for conservation operation at Whittier Narrows Reservoir is contained in the 2d endorsement from the Office, Chief of Engineers, dated 18 October 1956 to basin letter from this office, subject: "Conservation Storage in Whittier Narrows Dam Project," dated 12 September 1956.

2. Operational requirements.--Conservation operation at Whittier Narrows Reservoir is accomplished in accordance with regulations contained herein to achieve the following objectives:

a. To pass the normal flow of the San Gabriel River, up to 5,000 cubic feet per second, through the spillway gates to satisfy existing downstream water rights.

b. To pass rising water flows in Mission Creek through the dam in accordance with the desires of local interests.

c. To divert rising water flows (up to 50 cubic feet per second) from the Rio Hondo approach channel through the 36-inch diversion conduit in the left abutment of the outlet works to the original Rio Hondo channel behind the left bank of the concrete outlet channel.

d. To develop, during the storm runoff, a conservation pool for downstream spreading by the Los Angeles County Flood Control District. This pool is developed above the Rio Hondo outlets to elevation 195.5 (about 1,000 acre-feet) during rising stages by limiting the outflows to an average of 600 cubic feet per second. It is maintained by making outflow equal inflow up to a combined Rio Hondo and flood flow channel inflow of 10,000 cubic feet per second. A conservation pool is again developed to elevation 195.5 during falling stages when the inflow recedes to 10,000 cubic feet per second. This pool is maintained by making outflow approximately equal to inflow until the inflow recedes to 600 cubic feet per second.

3. The above operational requirements are necessary to satisfy downstream water rights and to compensate for the normal percolation in the Rio Hondo channel that occurred prior to construction of the concrete-lined channel below the dam.

4. Cooperation with other agencies.--The Los Angeles County Flood Control District is the representative of the various water users affected by the operation of the Whittier Narrows project. This

office and that organization are connected by teletype and a direct private telephone line to assure uninterrupted communications for flood control and conservation operation of Whittier Narrows Reservoir.

5. The Los Angeles County Flood Control District operates the Rio Hondo Coastal Basin spreading grounds downstream from the reservoir (pl. A-12). Diversion of low flows into the spreading grounds is affected by means of a headworks consisting of 3 tainter gates in the floodflow channel and 4 slide gates in the left levee. The tainter gates are kept in a fully raised position, (above the channel) except when the spreading grounds are being operated. An operator from the Los Angeles Country Flood Control District is required to be on duty whenever the tainter gates are closed. A direct-line telephone has been installed between the diversion headworks and the outlet control house at the dam so that operations during spreading periods can be coordinated.

6. Conservation operation.--Whittier Narrows Reservoir is operated for conservation as follows:

a. Spillway gates Nos. 1, 4, 6 and 9 are open 1.6 feet and the other gates are closed prior to the occurrence of a storm. These gate settings restrict the discharge to 5,000 cubic feet per second at reservoir water-surface elevation 208 (sill of floodflow channel) in the event that an unexpected flash flood should occur prior to the arrival of the operator for the spillway gates. This is required for downstream protection until the channel is constructed. At the beginning of a storm, gates Nos. 1, 4, 6, and 9 are set at 2.1 feet and remain at that opening until the reservoir water surface reaches elevation 206.0 feet (outflow approximately 5,000 cubic feet per second). When the water surface exceeds elevation 206.0 feet, the gates are operated so as to limit outflow into the San Gabriel River to 5,000 cubic feet per second (table B-2).

b. The Mission Creek conduit is used to pass rising water through the dam in accordance with the desires of local interests. They have requested that flows be limited to 5 cubic feet per second during storms. When heavy runoff is occurring, the gate at the intake structure of the conduit is closed to prevent water with high silt content from entering Mission Creek. This gate can be operated until the reservoir

water surface reaches elevation 202.5 feet, above which the gate control becomes inundated. (If flows have not been throttled before the gate control is inundated, emergency control can be effected by closing the slide gate in the access gallery at the downstream end of the conduit.)

c. The outlet works and diversion conduit through the left abutment of the outlet works are operated to divert rising water from the Rio Hondo approach channel into the original Rio Hondo channel behind the left levee of the concrete floodflow channel. The dike extending upstream from the left pier directs low flows through the left gate (gate No. 1). Normally, gate No. 1 is closed and the gate on the 36-inch diversion conduit is open. Under this system of operation, the depth of water in the approach channel above the left gate will provide sufficient head to insure passage of 50 cubic feet per second through the conduit before overtopping of the diversion dike occurs (elev. 188 feet). Automatic equipment has been installed on gate No. 1 so that in an emergency it will rise automatically to the normal position for flood operation whenever the reservoir pool reaches elevation 189 feet. It will automatically close to conserve water when the pool recedes to elevation 187 feet. The gate on the 36-inch diversion conduit is closed during high flows.

d. The Rio Hondo outlet gates are operated to conserve storm runoff by developing a conservation pool to elevation 195.5, when the inflow is 10,000 cubic feet per second or less, during rising of falling stages. When the inflow recedes to 600 cubic feet per second, the pool is drained at that rate. During operations for conservation, a qualified engineer from the Los Angeles District will direct gate operations from the District Office, or from the dam if communications should fail. All gate changes will be coordinated with the Los Angeles County Flood Control District's dispatch office and Rio Hondo diversion headworks.

(1) During rising stages, the gate operation schedule for conservation shown in table C-1 is followed. Under this operation plan, releases are restricted to an average of 600 cubic feet per second (capacity of spreading grounds) to water-surface elevation 194.5. Above this elevation, releases are gradually increased to 10,000 cubic feet per second at water-surface elevation 195.5. If the inflow exceeds 10,000 cubic feet per second, causing the water-surface elevation to rise above 195.5, the outlet gates are fully opened and the current flood-operations schedule followed.

(2) During falling stages, the current flood-operations schedule is followed in reverse to water-surface

elevation 195.5. Between water-surface elevations 195.5 and 193.5, the outlet gates remain fully open. If the water-surface falls below 193.5, indicating that the inflow has receded to 10,000 cubic feet per second, a conservation pool is developed to elevation 195.5 and maintained by making outflow approximately equal inflow. The outflow is determined from the combined inflow as measured at gaging stations located on Alhambra Wash near Klingerman Street, on the Rio Hondo below Garvey Avenue, and on the floodflow channel at Rosemead Boulevard. This inflow is plotted and extrapolated one period to determine required outflow. Average inflow may be computed using storage change and outflow. When the inflow recedes to under 600 cubic feet per second, the pool is drained at that rate. After the inflow recedes to 100 cubic feet per second or less, gate No. 1 may be closed, if the Los Angeles County Flood Control District requests such a closure, to facilitate diversion of water through the 36-inch diversion conduit.

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, on the Rio
at Rosemead
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under 600 cubic
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may be
requests
the 36-inch

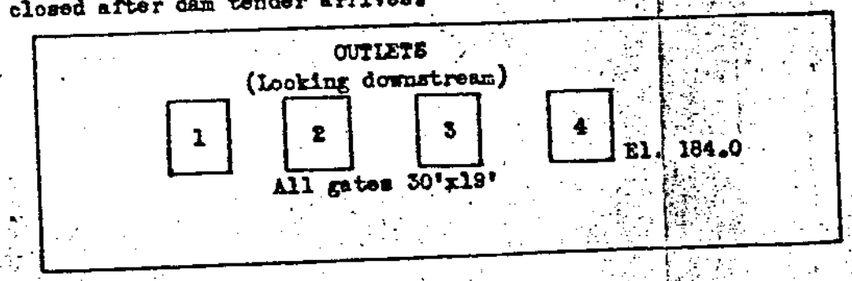
Table C-1

Whittier Narrows flood-control reservoir outlet gate operation schedule for conservation

Step No.	When reservoir water surface is between elevations	Gate setting for gates as indicated: No. 1*	No. 2	No. 3	No. 4	Outlet discharge
	Feet above mean sea level	Feet of opening	Feet of opening	Feet of opening	Feet of opening	Cubic feet per second
1	184 - 188	2.5	**0	**0	**0	0 - 550
2	188 - 189	1.8	0	0	0	550 - 650
3	189 - 190	1.4	0	0	0	550 - 650
4	190 - 191	1.3	0	0	0	550 - 650
5	191 - 194.5	1.1	0	0	0	530 - 670
6	194.5 - 194.7	1.5	0	0	0	980 - 1,000
7	194.7 - 194.9	1.6	0.8	0.8	1.6	2,960 - 3,000
8	194.9 - 195.1	2.1	2.1	2.1	2.1	4,960 - 5,000
9	195.1 - 195.3	3.3	3.3	3.3	3.3	6,800 - 7,000
10	195.3 - 195.5	5.5	5.5	5.5	5.5	9,880 - 10,000
11	195.5 - 208.7	19.0	19.0	19.0	19.0	13,000 - 40,800
12	Above 208.7	See flood-operations schedule				

* For conservation of rising water, gate No. 1 opens automatically at elevation 189.0 on rising stages and closes at elevation 187.0 on falling stages. Automatic operation is shut off when dam tender is on duty.

** Gates Nos. 2, 3, and 4 open to 19.0 feet prior to arrival of dam tender. These gates closed after dam tender arrives.



NOTE: Gates are regulated for flood operations above elevation 195.5.

INSTRUCTIONS

1. Communication with the district office, existing.

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

b. To report gate settings, while operating on schedule, give the applicable step number only.

c. Notify the Hydraulic Operations Center if unable to set the gates as instructed.

2. Communications with the district office interrupted.

a. Follow the gate operation schedule.

3. Notification to Los Angeles County Flood Control District.

a. Notify personnel at the Los Angeles County Flood Control District spreading grounds prior to making each gate change.

4. During falling stages.

a. Gate operation schedule followed in reverse to water-surface elevation 195.5. Between elevations 195.5 and 193.5, the outlet gates remain fully open. When the water-surface elevation recedes to 193.5, a conservation pool is developed to elevation 195.5 and maintained by making outflow equal inflow. After the inflow recedes to 600 cubic feet per second, the reservoir is drained at that rate.

December 1958

Revised 26 February 1959

Water Conservatic Mr. Reinhard)

A1

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

P.O. BOX 2418, TERMINAL ANNEX
LOS ANGELES, CALIFORNIA 90051

TELEPHONE 225-4101

A. E. BRUINGTON
CHIEF ENGINEER

EDWARD M. HAILE
DEPUTY ENGINEER

ASST. CHIEF DEPUTY ENGINEERS
CYRIL D. HALL
CHESTER MAGNESS
JOHN M. TETTEMER

ADMINISTRATIVE DEPUTY
XXXXXXXXXXXX
James T. Davis

February 22, 1977

IN REPLY PLEASE REFER TO
FILE NO 70.41

Whittier Narrows Dam and Reserv
Request for Trial Implementatic
of Alterations in the Operatior
Schedule of Outlet Gates

Col. Hugh G. Robinson
District Engineer
U.S. Army Engineer District, Los Angeles
300 North Los Angeles Street
Los Angeles, CA 90012

Dear Colonel Robinson:

The current drought in Northern California and the less than normal rainfall amounts State-wide cause us to propose the immediate implementation of an additional conservation measure that we have been investigating. This proposal, which can be readily implemented, is to reduce the amount of storm run-off reaching the ocean through the Rio Hondo and San Gabriel River Channels.

In past years, storm run-off in amounts averaging 15,000 acre-feet per year have been released from Whittier Narrows Dam to the San Gabriel River and have been "wasted" to the ocean. This "wasted" water could have been conserved if the flow rates had been equal to or less than the intake capacity of the San Gabriel River Coastal Basin Spreading Grounds plus the infiltration capacity of the San Gabriel River from the Whittier Narrows Dam to Florence Avenue. Whenever the flow rates exceed about 300 cfs, water is "wasted" to the ocean.

During periods of "wasting" water to the ocean on the San Gabriel River system, the Rio Hondo spreading system often had additional capacity for conservation. Because of this condition, we undertook a study on minimizing the "waste" by changing gate operations at Whittier Narrows Dam and diverting storm water from the San Gabriel River to the Rio Hondo system.

The theoretical computations for the study have been completed and a report is now in the preparation stage. The results of the study indicate that the average annual conservation benefit attributable to our proposed gate operations is about 3,000 acre-feet of local water. Under current water values, the savings to water users is about $150,000 per year and even greater savings are anticipated in the future as the water costs have been projected to more than double. One of the criteria of our study was to not change the flood routing through the Whittier Narrows Reservoir during major storms.

Based on the results of our study, we are requesting that changes in the gate operation schedules of the San Gabriel River and the Rio Hondo be implemented during the 1976-77 storm season. This schedule will allow diverting excess conservable water from the San Gabriel River system to the Rio Hondo Conservation Pool. At the Rio Hondo side, we propose a revised conservation release schedule averaging 700 cfs. This will permit more conservation at the downstream facilities before flood releases are made from the dam which would bypass the Rio Hondo Coastal Basin Spreading Grounds.

We have discussed this proposal with Mr. Robert Land, Chief of your Operation Branch, who has been very cooperative in assisting with our conservation program.

Enclosed is our proposed operation schedule for the Whittier Narrows Reservoir. If you have any questions regarding this proposal, please contact Mr. C. J. Reinhard at 226-4381.

Yours very truly,

A. E. Bruington, Chief Engineer

ERL:go

Enc.

cc: Mr. William M. Whiteside, Secretary (Enc.)
San Gabriel Valley Protective Association
P.O. Box 1026, Perry Annex
Whittier, CA 90603

Addressee (2)
Hydraulic
Water Conservation (3) (Messrs. Ostrom and Reinhard, W/C Files)

A2

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

SPLCO-O

28 March 1977

70.41

Mr. A. E. Bruington, Chief Engineer
Los Angeles County Flood Control District
P.O. Box 2418, Terminal Annex
Los Angeles, California 90051

Dear Mr. Bruington:

Please refer to your File No. 70.41, Whittier Narrows Dam and Reservoir, Request for Trial Implementation of Alterations in the Operations Schedule of Outlet Gates.

We have reviewed your proposed operation plan and agree it will save a substantial amount of water that would ordinarily be "wasted" to the ocean. The plan should be implemented, on a trial basis, this coming flood season. However, to insure proper operation of the L. A. Telemetry System, the operation of gates Nos. 2, 3, 5 & 7 is recommended as shown on Whittier Narrows Flood Control Reservoir Spillway Gate Operation Schedule for San Gabriel Conservation Pool.

Under certain storage conditions in San Gabriel and Cogswell Dams, water could be stored behind Santa Fe Dam for conservation purposes. The conservation plan, as outlined in the Santa Fe Reservoir Regulation Manual could be implemented at the beginning of next flood season along with the Whittier Narrows plan. Los Angeles County Flood Control District personnel could operate Santa Fe Dam for conservation in a manner similar to their conservation operation of Whittier Narrows Dam. The details of operation can be worked out prior to next flood season.

While implementing the above interim plans, the Los Angeles County Flood Control District and the Corps could look into the possibility of infringing slightly upon flood control storage on the San Gabriel River system with the idea of greatly improving water conservation benefits.

Please contact Mr. Robert Land at (213) 688-5620, to establish conservation operating criteria for Santa Fe Dam and to initiate discussions on the additional conservation.

Sincerely yours,

HUGH G. ROBINSON
COL, CE
District Engineer

RLL 4/22
MB 4/21

2726

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
P.O. BOX 2418, TERMINAL ANNEX
LOS ANGELES, CALIFORNIA 90051
TELEPHONE 226-4101

A. E. BRUINGTON
CHIEF ENGINEER

HOWARD H. HAILE
CHIEF DEPUTY ENGINEER

ASST. CHIEF DEPUTY ENGINEERS
JAMES D. HALL
CHESTER MAGNESS
JOHN M. TETTEMER

ADMINISTRATIVE DEPUTY
JAMES T. DAVIS

June 2, 1977

IN REPLY PLEASE REFER TO
FILE NO 70.41
Whittier Narrows Dam
and Reservoir
Request for Implementation
of 2,500 Acre-Foot Pool

Col. Hugh G. Robinson
District Engineer
U.S. Army Engineer District, Los Angeles
300 North Los Angeles Street
Los Angeles, CA 90012

Dear Colonel Robinson:

The Flood Control District proposes to enlarge the conservation pool at Whittier Narrows Dam and Reservoir. The results of our study, in conjunction with the recently implemented alterations in the operation schedule of outlet gates, indicate that enlarging the storage capacity to 2,500 acre-feet will result in an average annual water conservation benefit of about 4,500 acre-feet or a savings to water users of about $225,000 per year at current water values.

The 1,000 acre-foot conservation pool, for which we currently have a license, inundates the area west of Rosemead Boulevard and south of San Gabriel Boulevard below Elevation 194.5 feet. The proposed 2,500 acre-foot pool would inundate that same area up to Elevation 201.6 feet. Inundation areas and improvements needed to be made by the District are shown on the enclosed "Map A".

The existing oil wells and any other structures within the proposed inundation area will need to be protected by earth levees except as noted below. These levees will be constructed to Elevation 205 feet, providing more than 3 feet of freeboard (approximately 900 acre-feet of additional available storage) above the proposed maximum water surface elevation. The approximate locations of these levees are shown on enclosed "Map A".

One well, Century Oil Management Company Well No. 1A, located south of the flood flow channel, is too distant from the bulk of the others for a levee protection to be practical. The most economic alternate appears to be raising the well. The concrete pads for Century Oil Management Company Well Nos. 21 and 22 are presently at Elevations 204.2 feet and 205.0 feet, respectively, and are considered protected "as is".

Suitable material for use in constructing the protective levees is available from within the existing 1,000 acre-foot area. We propose using the grading plan from the previous clean-out operations as the basis for removal of material.

Based on the results of our study, we are requesting that (1) your office make an evaluation of the flood routing through the reservoir for your "Project Flood" with a 2,500 acre-foot conservation pool and (2) negotiations be started by your Real Estate Division with the oil companies and other parties presently under lease with your department. Assistance will be provided by our staff in these negotiations through explanations of the concepts. Gate operation schedules for the Rio Hondo and San Gabriel River were developed as part of our study to enlarge the conservation pool and are enclosed for your review.

This project has been included in our 1977-78 Budget request and may be eligible for funding by the Economic Development Administration (EDA) through the Local Public Works Employment Act (LPW) as a drought project. In order to meet LPW criteria, this project must be ready for construction not later than August 1977. This accelerated timetable requires approval of the design and environmental assessment parameters by your department not later than mid-June. The following parameters are currently being used in our design phase:

Pool operating water surface elevation	201.6 feet
Levee top elevations	205.0 feet
Levee side slopes (subject to pending soils analysis)	2½:1

The storm of May 8-10, 1977 provided an excellent opportunity to review the benefit attributable to the recently implemented gate operations changes. During this storm alone, approximately 3,000 acre-feet of water flowed into the conservation pool from the San Gabriel River at rates up to 3,000 cfs. Only about 750 acre-feet of excess water was "wasted" to the ocean. Without this new operation, however, 3,000 acre-feet would have been "wasted". Therefore, the net benefit attributable to the new gate operation schedules was 2,250 acre-feet.

We certainly appreciate the cooperation given the Flood Control District in our conservation efforts and look forward to establishing conservation plans at other facilities.

Enclosed are copies of our proposed gate operation schedules for the Rio Hondo and San Gabriel River and a map showing levee locations and inundation areas. If you have any questions regarding this proposal, please contact Mr. C. J. Reinhard at 226-4381.

Yours very truly,

For and in the absence of
A. E. Bruington, Chief Engineer

Howard H. Haile
Chief Deputy Engineer

BRL:go

Enc. 3

cc: Mr. William M. Whiteside, Secretary (Enc. 3)
San Gabriel Valley Protective Association
P.O. Box 1026, Perry Annex
Whittier, CA 90603

Addressee (2)
Mr. Hall
Mr. Magness
Mr. Tettemer
Design
Hydraulic
Management Systems
Project Planning
R/W Acquisition
R/W Engineering
Water Conservation (3) (Messrs. Ostrom and Reinhard; W/C Files)

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

SPLRE-MM-(F)

16 August 1977

Mr. A. E. Bruington, Chief Engineer
Los Angeles County Flood Control District
P. O. Box 2418, Terminal Annex
Los Angeles, California 90051

Dear Mr. Bruington:

Reference is made to your letter, dated 2 June 1977, regarding the Los Angeles County Flood Control District proposal to enlarge the conservation pool to 2,500 acre-feet at Whittier Narrows Flood Control Basin.

Pursuant to authority vested by the Secretary of the Army, approval by our Engineering Evaluation and Maintenance Section and the enlargement of the conservation pool being in the public interest, right of entry is hereby granted to the Los Angeles County Flood Control District to construct levees to enlarge the storage capacity of the conservation pool to 2,500 acre-feet as described in above-referenced letter and drawings submitted by the County showing in detail proposed levees, said letter and drawings being on file at the Los Angeles District Corps of Engineers, 300 North Los Angeles Street, Los Angeles, California.

This right of entry is granted subject to the following conditions:

a. That the grantee shall furnish a legal description and drawing delineating the area that encroaches beyond the 229.08 acres granted to the County under Easement No. DA-04-353-CIVENG-62-152 to the Chief, Real Estate Division, U. S. Army Corps of Engineers, Los Angeles District, P. O. Box 2711, Los Angeles, California 90053.

b. That the grantee shall execute an amendment to Easement No. DA-04-353-CIVENG-62-152 incorporating the additional area required.

c. That the above-mentioned construction shall be subject to the general supervision of the chief of the Engineering Evaluation and Maintenance Section, Mr. Robert L. Gray, or his representative; and that prior to the start of construction Mr. Gray shall be contacted at (213) 283-2759.

d. That any deviation from proposed constrction plans or problems arising therefrom shall be subject to the approval and/or coordination of said section chief.

d. That any deviation from proposed construction plans or problems arising therefrom shall be subject to the approval and/or coordination of said section chief.

e. That the exercise of the privileges hereby granted shall be without cost or expense to the United States.

f. That any property of the United States damaged or destroyed by the grantee incident to the exercise of the privileges herein granted shall be promptly repaired or replaced by the grantee to the satisfaction of the United States; or in lieu of such repair or replacement the grantee shall, if so required by the United States, pay the United States money in an amount sufficient to compensate for the loss sustained by the United States by reason of damage to or destruction of Government property.

g. That the United States shall not be responsible for damages to property or injuries to persons which may arise from or be incident to the exercise of the privileges herein granted, or for damages to the property of the grantee, or for injuries to the person of the grantee, or for damages to the property or injuries to the person of the grantee's officers, agents, servants, or employees or others who may be on Government premises at their invitation or the invitation of any one of them, arising from governmental activities on the said premises, and the grantee shall hold the United States harmless from any and all such claims.

h. That it is to be understood that this grant is effective only insofar as the rights of the United States in the property involved are concerned, and that the grantee shall obtain such permission as may be necessary on account of any other existing rights, if any.

We ask that the duplicate copy of this letter be executed in the space provided below by your authorized representative and returned to us as soon as possible.

Sincerely yours,

Edgar H. Miller

EDGAR H. MILLER
Acting Chief, Real Estate Division

This authorization is accepted this _____ day of _____ 1977

subject to the conditions set forth herein.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

By: _____

Title: _____

Whittier Narrows Flood Control Reservoir Outlet Gate Operation Schedule for Rio Hondo Conservation Pool

Step No.	When reservoir water surface is between elevations	Gate setting for gates as indicated				Outlet Discharge
		No. 1*	No. 2	No. 3	No. 4	
	Feet Above Mean Sea Level	Feet of Opening	Feet of Opening	Feet of Opening	Feet of Opening	Cubic Feet Per Second
1	184 - 188	2.6	**0	**0	**0	0 - 700
2	188 - 189	2.3	0	0	0	650 - 750
3	189 - 190	1.8	0	0	0	650 - 750
4	190 - 191	1.5	0	0	0	650 - 750
5	191 - 192.5	1.4	0	0	0	650 - 750
6	192.5 - 195.5	1.2	0	0	0	650 - 750
7	195.5 - 197.5	1.1	0	0	0	650 - 750
8	197.5 - 199.5	1.0	0	0	0	650 - 750
9	199.5 - 200.5	0.9	0	0	0	650 - 750
10	200.5 - 201.6	0.8	0	0	0	650 - 750
11	201.6 - 201.8	1.2	0	0	0	980 - 1,000
12	201.8 - 202.0	1.2	0.6	0.6	1.2	2,960 - 3,000
13	202.0 - 202.2	1.5	1.5	1.5	1.5	4,960 - 5,000
14	202.2 - 202.4	2.2	2.2	2.2	2.2	6,800 - 7,000
15	202.4 - 202.6	3.4	3.4	3.4	3.4	9,880 - 10,000
16	202.6 - 208.7	19	19	19	19	27,000 - 40,800
17	Above 208.7	Go to Table B-1, Step 3				

* For conservation of rising water, Gate No. 1 opens automatically at Elevation 189.0 on rising stages and closes at Elevation 187.0 on falling stages. Automatic operation is shut off when dam tender is on duty.

** Gate Nos. 2, 3, and 4 open to 19.0 feet prior to arrival of dam tender. These gates closed after dam tender arrives.

NOTE: Gates are regulated for flood operations above Elevation 202.6.

INSTRUCTIONS

1. Communication with the District office, existing.
   a. Notify the Hydraulic Operations Center when a gate change will be required according to the schedule.
   b. To report gate settings, while operating on schedule, give the applicable step number only.
   c. Notify the Hydraulic Operations Center if unable to set the gates as instructed.
2. Communications with the District office, interrupted.
   a. Follow the gate operation schedule.
3. Notification to Los Angeles County Flood Control District.
   a. Notify personnel at the Los Angeles County Flood Control District spreading grounds prior to making each gate change.
4. During falling stages.
   a. Gate operation schedule followed in reverse to water surface Elevation 202.6. Between Elevations 202.6 and 199.5 the outlet gates remain fully open. When the water surface elevation recedes to 199.5, a conservation pool is developed to Elevation 202.6 and maintained by making outflow equal inflow. After the inflow recedes to 700 cubic feet per second, the reservoir is drained at that rate.