RESERVOIR DESIGN SECTION

RED RIVER BELOW DENISON DAM
ARKANSAS, LOUISIANA, OKLAHOMA, AND TEXAS

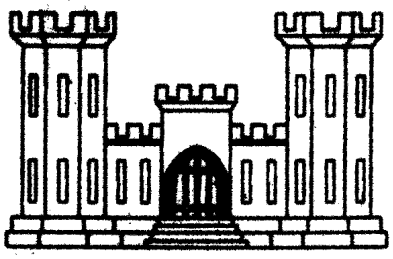
WALLACE LAKE

CYPRESS BAYOU, LOUISIANA

APPENDIX II

MASTER RESERVOIR REGULATION MANUAL

RED RIVER BASIN
NEW ORLEANS DISTRICT



DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

MAY 1975

24

RED RIVER BELOW DENISON DAM
ARKANSAS, LOUISIANA, OKLAHOMA, AND TEXAS

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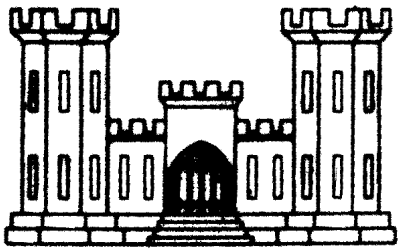

DEPARTMENT OF THE ARMY
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MAY 1975

APPENDIX II

WALLACE LAKE REGULATION MANUAL

NEW ORLEANS DISTRICT

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

TABLE INDEX

TABLE OF CONTENTS (cont'd)

PLATE INDEX

PERTINENT DATA

WALLACE LAKE

DRAINAGE AREA	sq mi	260
CONSERVATION POOL		
Elevation	ft m.s.l.	142.0
Area	acre	2,300
Storage	acre-ft	7,800
Equivalent runoff	in	0.6
FLOOD CONTROL POOL		
Elevation	ft m.s.l.	158.0
Area	acre	9,300
Storage	acre-ft	88,300
Equivalent runoff	in	6.4
Outlet capacity at pool elev 158.0	c.f.s.	2,600
Design flood (September 1913)		
Estimated peak inflow	s-ft/d	12,700
Design peak outflow	c.f.s.	2,400
Estimated volume	acre-ft	183,000
Equivalent runoff	in	13.2
SURCHARGE POOL		
Elevation	ft m.s.l.	170.7
Area	acre	18,000
Storage	acre-ft	171,600
Equivalent runoff	in	12.4
Design flood hydrograph		
Estimated peak inflow	c.f.s.	197,000
Estimated peak outflow	c.f.s.	(a) 112,700
Estimated volume	acre-ft	494,300
Average rainfall	in	38.4
Average runoff	in	35.6
FREEBOARD		
Elevation, top of dam	ft m.s.l.	176.0
Area	acre	22,000
Storage	acre-ft	105,700
Equivalent runoff	in	7.6
Height	ft	5.3

PERTINENT DATA (cont'd)

OUTLET STRUCTURE (combined with spillway)		
Conduits, number and size		4 - 3'x8.25' (b)
Conduit intake invert elevation ft m.s.l.		140.0
Conduit outlet invert elevation ft m.s.l.		140.0
SPILLWAY (combined with outlet structure)		
Width	ft	644
Elevation of crest	ft m.s.l.	158.0
Conduits, 4 each	ft	3x8.25
DAM		
Elevation of crest	ft m.s.l.	176.0
Height above valley	ft	30
Length at crest (excl. spillway)	ft	4,300

(a) Including conduit discharge

(b) Stop logs at entrance to outlet structure permit the raising and lowering of the conservation pool to elevation 142.0 ft and 140.0 ft, respectively

APPENDIX II

WALLACE LAKE REGULATION MANUAL

NEW ORLEANS DISTRICT

SECTION I - INTRODUCTION

1-01. Purpose and scope. The purpose of this manual is to present detailed information pertinent to Wallace Lake.

1-02. Authority. This manual is submitted in accordance with ER 1110-2-240 and prepared in accordance with EM 1110-2-3600, both titled "Engineering and Design, Reservoir Regulation."

1-03. Project authorization. Construction of Wallace Lake was authorized by the Flood Control Act approved 22 June 1936 (Public Law No. 738, 74th Congress), as amended by an Act approved 28 June 1938 (Public Law No. 761, 75th Congress, Chapter 795, 3d Session) which provides for construction of an earth dam and reservoir for flood storage to improve protection of population and lands below, in accordance with House Document No. 378, 74th Congress, 2d Session, and supplemental report in the Office of the Chief of Engineers, referred to in paragraph 2-02b. The project was later incorporated under the new comprehensive project "Red River, Texas, Oklahoma, Arkansas and Louisiana, below Denison Dam, Texas and Oklahoma," authorized by the 1946 Flood Control Act, approved 24 July 1946 (Public Law No. 526, 79th Congress, 2d Session), in accordance with the recommendations of the Chief of Engineers in House Document No. 602, 79th Congress, 2d Session.

1-04. Project location. Wallace Lake Dam is located on Cypress Bayou (Wallace Bayou), in Caddo and DeSoto Parishes, Louisiana, about 3 mi above the confluence of Cypress Bayou with Bayou Pierre and 67 mi above the junction of Bayou Pierre and Red River. The dam may be reached by driving approximately 14 mi southeast of Shreveport, Louisiana, on Louisiana State Hwy No. 523. The lake area may be reached from the north over Norris Ferry Road, Wallace Lake Road and Linwood Avenue, and US Hwy No. 171; and from the west over Barron Road and Keithville-Kingston Road, as shown on plate 2.

SECTION II - PROJECT HISTORY

2-01. History of project. Early history of the project is given in para 8-9 of the Master Reservoir Regulation Manual. The Definite Project Report, para 2-02c, was based on preliminary information and was prepared prior to issuance of various directives pertaining to reservoir design, particularly spillway requirements, and therefore a revised Definite Project Report, para 2-02d, was submitted. The plan proposed in the latter report provided essentially the same degree of flood control as used in the adopted plan, but contemplated construction of a gated service spillway and an auxiliary channel spillway, both of which had some undesirable operating features, but were retained as parts of the plan submitted in the Bases of Design Report, para 2-02e. By 1st Wrapper Indorsement, dated 9 September 1939, the Division Engineer, Lower Mississippi Valley Division, recommended a review of the project in an effort to eliminate some of the undesirable elements of the proposed plan. By 2d Wrapper Indorsement, dated 22 November 1939, the District Engineer submitted results of a comparative study which included the plan as submitted in the Bases of Design Report and five alternates, together with their estimated costs, and a recommendation which led to the adoption of the general plan covered by that report. By 2d Indorsement to the report on Hydrology of the Basin as Related to Spillway Requirements, para 2-02f, the Chief of Engineers suggested that the outlet works be revised to the extent of widening the notch to 17 ft in order to increase discharge to 3,000 c.f.s. when the reservoir is full to spillway crest level, and installation of two-gated sluiceways for the purpose of regulating the discharge and thereby materially decreasing the period of storage evacuation. By 4th Indorsement, the District Engineer made a counter proposal suggesting that the notch be eliminated and that a battery of ungated sluiceways through the spillway weir be substituted therefor. By 6th Indorsement dated 17 February 1941, the Chief of Engineers approved the District Engineer's proposal provided that the maximum outlet discharge be limited to 2,600 c.f.s. when the reservoir stage is at spillway crest elevation.

2-02. Prior reports. Reports on the project have been submitted as follows:

a. Condensed report on Red River and Tributaries, Louisiana, Arkansas, Oklahoma and Texas, dated 7 March 1934 (NOD-E39-12/206.1).

b. House Document No. 378, 74th Congress, 2d Session dated 3 January 1936.

c. Report on Definite Project for the construction of a dam at Wallace Lake, DeSoto and Caddo Parishes, Louisiana, dated 21 December 1936.

d. Report on Definite Project for the construction of a dam at Wallace Lake, DeSoto and Caddo Parishes, Louisiana, (Revised) dated 15 June 1937.

e. Bases of Design for a dam at Wallace Lake, DeSoto and Caddo Parishes, Louisiana, dated 12 June 1939, and subsequent indorsements thereto.

f. Wallace Lake Dam, Cypress Bayou, Caddo and DeSoto Parishes, La. - Hydrology of the Basin as Related to Spillway Requirements, dated 21 June 1940 and revised under date of 15 March 1941.

g. Report of the Analysis of Design for Wallace Lake Dam, dated 15 March 1941.

h. House Document No. 602, 79th Congress, 2d Session dated 20 May 1946.

i. Definite Project Report on Bayou Pierre in the vicinity of Shreveport, La., June 1948.

j. "Master Reservoir Regulation Manual, Appendix II, Wallace Lake Reservoir, Cypress Bayou (Wallace Bayou), Louisiana." This publication is revised and updated herein.

k. "Summary Report on Review of Design Features of Existing Dams in the New Orleans District" dated February 1970. The purpose of this report is to determine whether or not existing dams in the New Orleans District conforms adequately with current policies and criteria with respect to safety and functional reliability.

SECTION III - PROJECT DESCRIPTION

3-01. Project purpose. Wallace Lake and Dam was constructed for the control of floods. The project will provide substantial protection to approximately 90,000 acres of agricultural lands below the dam along Cypress Bayou and Bayou Pierre. It was the first reservoir unit to be constructed under the comprehensive plan for flood control on the Red River below Denison, Texas. The drainage area of 260 sq mi above the damsite is approximately 23 percent of the total drainage area of Bayou Pierre.

3-02. Dam embankment. The dam is a compacted impervious earthfill structure 4,290 ft in length, exclusive of the spillway, with a crest width of 20 ft at elevation 176.0 ft m.s.l., the datum to which all elevations in this appendix will be referred. The maximum height above the streambed is 48 ft. Approximately 550,000 cu. yd. of rolled earthfill were used in its construction. Plan, profile, and typical sections of the structures are shown on plate 3, and pertinent data is given in table on page iv.

3-03. Spillway and outlet structure. The spillway and outlet works are a combined structure, automatic in operation, consisting of an uncontrolled, overfall concrete spillway and an uncontrolled outlet structure. The spillway is 644 ft in width and is located in the dam near the south abutment. The outlet works are located in the center of the spillway and consists of an entrance section, four rectangular conduits, 3 x 8.25 ft, and a separate stilling basin. The discharge capacity of the spillway with the surcharge pool at maximum elevation 170.7 ft is 112,700 c.f.s., including conduit discharge. The discharge capacity of the conduits with the pool at elevation 158.0, spillway crest, is 2,600 c.f.s. Stop logs located at the entrance to the outlet structure permit the raising and lowering of the conservation pool to elevation 142.0 ft and 140.0 ft, respectively. Hydrographs for the spillway design flood are shown on plate 8, and the flood discussed in para 3-05b.

3-04. Reservoir. At flood control pool elevation 158.0 ft, waters detained for flood control purposes will amount to 88,300 acre-ft, a volume equivalent to 6.4 inches of rainfall-runoff from the 260 sq mi watershed. The lake formed at this elevation will cover an area of 9,300 acres and will extend approximately 10 mi upstream from the dam. The conservation pool at elevation 142.0 ft has an area of 2,300 acres and provides a lake 7 mi long

containing 7,800 acre-ft of water. Hydrographs for the September 1913 flood, the reservoir design flood, are shown on plate 7, and the flood discussed in para 3-05a.

3-05. Design floods. The design flood for the comprehensive flood control plan on the Red River below Denison, Texas, is described in para 13 of the Master Manual. However, the design of Wallace Lake antedates the development of these flood criteria, and other floods were used in the design of this reservoir. The development of the distribution graphs shown on plates 7 and 8 were based on data observed at the Cypress Bayou near Keithville, La., gaging station for the 22-23 December 1939 storm. The reservoir design storm and the computed spillway flood were derived by the application of selected rainfall excesses to these distribution graphs.

a. Flood control pool. The most severe storm of record for the drainage area was that of July 1933, described in para 4-05b. The use of this storm for design of flood control storage capacities was not considered because of the remote possibility of the recurrence of a similar storm over the reservoir drainage basin. The storm rainfall of September 1913, described in para 4-05a,is the second in magnitude of storm rainfall critical to design of flood control storage capacity and was selected as the limit of practical flood control design. Reservoir design hydrographs for the 1913 flood are shown on plate 7.

b. Spillway. Two storms were considered in the development of the spillway design storm. Isohyets for the 27 June-1 July 1899 (Hearne, Texas) storm and for the 23-25 July 1933 (Logansport and Shreveport, La.) storm were transposed over the Wallace Lake drainage area. The total average rainfall over the drainage area above the damsite, for these two storms, computed in this manner, was 29.2 and 28.1 inches, respectively. A study of the distribution of rainfall and other characteristics of the two storms indicates that the 1899 storm is the more critical for the basin and it was, therefore, selected for spillway design. The computed spillway flood was derived through the application of this rainfall-runoff to the distribution graph. This computed spillway flood was based on an infiltration capacity of 0.05 inch per hour. The hydrograph peaks at 146,000 c.f.s., which is equivalent to a runoff of 560 c.f.s./sq mi for the drainage area above the damsite. Routing of this flood through the reservoir,

assuming an initial pool stage of 158.0 ft, results in a peak pool stage of 168.0 ft, with a maximum spillway discharge of 80,000 c.f.s. The ordinates of the hydrograph representing this flood were then increased by 25, 35, and 100 percent, and the floods represented thereby were routed through the reservoir in the same manner. The increase of 35 percent to the computed spillway flood resulted in an increase of 2.7 ft in the maximum pool elevation. An increase of approximately 100 percent is required for a maximum pool equal in elevation to the top of the dam. After careful consideration it was decided that an addition of 35 percent to the computed spillway flood would be an adequate factor of safety in the selection of the spillway design flood. This flood, having a peak reservoir inflow of 197,000 c.f.s., would result in a maximum pool stage of 170.7 ft, and a maximum combined spillway and outlet conduits discharge of 112,700 c.f.s. Hydrographs for the flood are shown on plate 8.

3-06. Malaria control. Malaria control on this reservoir is the responsibility of the Board of Commissioners, Caddo Levee District, Shreveport, Louisiana. At the request of the Caddo Levee Board, the Corps of Engineers, in cooperation with the United States Public Health Service and State and local health authorities, made preimpoundment malaria studies. These studies included joint surveys of the area to be flooded, entomological studies consisting of weekly collection of mosquitoes from strategically located adult resting stations, and epidemiological studies consisting of blood surveys to determine the prevalence of malaria in the vicinity of the reservoir. Postimpoundment entomological studies consisting of biweekly collection and identification of mosquitoes from resting stations were continued by the Corps of Engineers for the period May 1947 to May 1951, inclusive. Since the impoundment had not resulted in an increase in malaria and since the Caddo Levee Board is responsible for the possible creation of a malaria problem in the area. The postimpoundment entomological studies were discontinued.

3-07. Recreation. By exercising flowage easement rights on the lands when flooded, the Federal Government controls the lake, hence, the lake is available for public use, subject to applicable State and Federal laws. The permanent pool offers many opportunities for public use including fishing, hunting, and boating. An asphalt road to the spillway below the dam has been provided for the convenience of the visiting public. Access to the lake is over public and

private roads. The public possesses no right to the use or occupancy of, or passage over, privately-owned lands bordering the lake, except with the consent of the owners, or pursuant to the laws of the State of Louisiana. Permission to construct camp sites, buildings, etc., above elevation 158 ft m.s.l. must be obtained from the individual property owners. Owners or lessors of privately-owned areas have developed boat landings and areas for public use. These areas and the Government-owned area at the damsite are shown on plate 2.

3-08. Land acquisition. Lands owned in fee are limited to the damsite area and on each side of the Kansas City Southern Railway right-of-way crossing the reservoir. The rest of the reservoir area is privately-owned land over which the Government has been granted perpetual flowage easements. These easements, in general, forbid construction below elevation 158 ft m.s.l., but structures may be built between 158 and 165 ft m.s.l., at the risk of the owner. The Real Estate Division shall periodically notify all owners of the property on which the Government has acquired flowage easements that their lands are subject to flooding and that any structure thereon below elevation 165 ft m.s.l. is erected at the risk of the owner under the terms of the easement. The notices will be issued biannually by publication of public notice in local newspapers and by individual notices mailed to the Board of Commissioners, Caddo Levee District, Shreveport, La., and the Caddo Parish Police Jury, Shreveport, La. Individual notices will be issued on a one-time basis to property owners violating construction restrictions when found and reported by the Field Assistant during the semiannual inspection of the reservoir area, in conformance with instructions prescribed in the Wallace Lake Dam Maintenance Manual.

3-09. Sedimentation ranges. Wallace Lake has 38 sedimentation ranges (see plate 6) that are used to determine the extent of silting in the reservoir. Sedimentation ranges 1, 7A, 18, and 22A have been selected as check ranges to be maintained on a 4-year interval, and resurveyed on an 8-year interval. A complete resurvey of all sedimentation ranges will be performed when appreciable sedimentation is indicated on resurveys of the check ranges. Sedimentation ranges were originally surveyed in 1946. Several of the sedimentation ranges were resurveyed in October 1951, April 1961, May 1971, and April 1972. Comparison of the original survey with the resurveys indicates that appreciable sedimentation had not occurred.

3-10. Relation with overall plan of development. The Flood Control Act of 24 July 1946 approved a general plan for flood control on Red River below Denison Dam which provided for construction of six flood control reservoirs in combination with existing or authorized Federal and non-Federal levee improvements, modified as required, and construction of bank protection works at locations where levee setbacks are impossible or uneconomical. The Act further provided for incorporation into the project of several separate authorized Federal projects for flood control along Red River below Denison Dam. By Flood Control Acts of 3 August 1955, 3 July 1958, 14 July 1960, and 23 October 1962, the project was amended to include a number of additional reservoirs on tributaries, and other local protection works. Wallace Lake is an integral part of this plan for flood control. Wallace Lake Dam controls runoff from about 1 percent of the drainage area of Red River below Denison Dam. It is a part of the comprehensive plan for basin development presented in the "Comprehensive Basin Study, Red River Below Denison Dam, Arkansas, Louisiana, Oklahoma, and Texas, June 1968."

SECTION IV - DESCRIPTION OF DRAINAGE BASIN

4-01. Topography. The drainage basin above the damsite covers an area of 260 sq mi that is roughly rectangular in shape, the sides of which are approximately 15 x 17 mi in length, as shown on plate 1. It is a region of low hills ranging in elevation from 200 to 400 ft m.s.l. Below the damsite the drainage basin of Cypress Bayou (Wallace Bayou) ranges from rolling to flat alluvial plains which is typical of the Red River Valley.

4-02. Channel capacities. The channel capacities of Cypress and Boggy Bayous at the discharge stations on the streams near Keithville, La., are approximately 600 c.f.s. and 400 c.f.s., respectively. At the Frierson discharge range, 1.3 mi below Wallace Lake Dam, the capacity of the channel is 2,200 c.f.s. Flood flows from the hill areas above the damsite greatly exceeded channel capacities before the dam was built. Below Hanna, La., Bayou Pierre is affected by Red River backwater. Flood protection improvements in Cypress Bayou basin since construction of the dam consist of clearing and snagging Cypress Bayou (Wallace Bayou) from the damsite to the mouth. This work, completed in 1951, has improved the channel discharge capacities and reduced peak stages and durations. The effect of this improvement is shown on plate 12. The junction of Cypress Bayou (Wallace Bayou) and Bayou Pierre is at mile 64 above the mouth of Bayou Pierre. The plan of improvement on Bayou Pierre above the junction of Cypress Bayou provides for channel improvement and enlargement of Ockley Drive ditch on the outskirts of Shreveport, La., and of Bayou Pierre at intervals between Shreveport and the junction of Cypress Bayou (see para 2-02i). Channel paving of Ockley Drive Ditch from mile 0.0 to a point beyond mile 0.37 was completed by local interests. The Flood Control Act of 22 June 1936 provides for channel enlargement of Bayou Pierre at intervals from Bayou Wincey (approximately mi 28.5) to mouth at Grand Ecore, La. These projects have been completed. Flows in Cypress Bayou have little effect on flood stages in the Red River at Shreveport and Alexandria, La., the large damage centers for the overall Red River below Denison project. Available stream flow records in the basin are shown on plate 4, and drainage areas and channel distances for Bayou Pierre and the tributary Cypress and Boggy Bayous are shown in table 1.

TABLE 1

DRAINAGE AREAS AND CHANNEL DISTANCES

Stream and Location	mi above mouth Bayou Pierre	Drainage area sq mi
BAYOU PIERRE		
At mouth, Mi 210.3, Red R	0	1,138
Jct B. Pierre & Cypress B.	64	44
CYPRESS BAYOU (WALLACE BAYOU)		
Jct B. Pierre & Cypress B.	64	276
NE Frierson (Sta 57)	66	268
Wallace Lake Dam	67	260
CYPRESS BAYOU		
Jct Boggy B. & Cypress B.	75	84
S. of Keithville	82	66
Source	101	0
BOGGY BAYOU		
Jct Boggy B. & Cypress B.	75	151
N. of Keithville	83	79
Source	103	0

(Areas and distances in above table based on AWR "Drainage Area Data").

4-03. Economic development. That part of the basin extending above Wallace Lake is basically rural in character, consisting of rolling hills with scattered farm sites and numerous small communities. There are six towns with populations ranging between 40 and 500; the southwestern portion of the city of Shreveport, containing approximately 18,000 inhabitants, also is situated in the basin. This section of the city is comprised largely of residential areas, parks, and open spaces, as well as public and semipublic lands, including the Greater Shreveport Municipal Airport. Industry has recently gravitated into the area. Based on existing development, future growth in this area is expected to be largely residential; however, more industrial expansion in the vicinity of the airport is also projected. Overall, the population density throughout the upper basin is about 35 persons per square mile. Approximately 60 percent of the total area is wooded with another 15 percent in crops cultivation, and the remaining 25 percent in pasture. Agricultural pursuits mainly include cotton and pasture, while timber species are short leaf pine, loblolly pine, cypress, willow, honey locust, green ash, hawthorne, willow oak, water oak, overcup oak and hickory. That portion of the watershed below

Wallace Lake lies between a hill line to the west of Bayou Pierre and the natural and manmade levees bordering the Red River. The area contains portions of Caddo, De Soto, Natchitoches, and Red River parishes and numbers approximately 6,000 in population. There is little concentration of inhabitants with Powhatan, the largest town in the area, having a population of 277 in 1970. As opposed to the topography of the watershed above Wallace Lake, this portion is largely characterized by fertile alluvial bottoms, natural lakes and sluggish bayous. Development is generally concentrated along Louisiana State Highway 1, the main north-south artery. The Texas and Pacific Railroad also has a line running adjacent to this road throughout the entire area. Largely, the economy is dependent upon agriculture with the major crops being soybeans, cotton, corn, feed grains, and hay. Cattle production is also important. With the exception of soybeans and sorghums, other agricultural outputs have steadily declined in the last decade. There are no important industries located within this lower portion of the watershed.

4-04. Climate.

a. Temperature. The climate of the basin is mild with short and moderate winters and long summers with high temperatures. The average annual temperature is about 66°F. The average monthly temperature ranges from a maximum of 83° during July and August to a minimum of 48° during January. During the period of available climatological records, 1875 through 1973, the maximum observed temperature at Shreveport, La., was 110° on 18 August 1909 and the minimum observed temperature was -5° on 12 February 1899. Such extremes are of very rare occurrence.

b. Rainfall. The average annual rainfall over the drainage basin above the damsite, for the period 1890 through 1973, is about 45 inches. During this period, the annual precipitation ranged from a maximum of 65 inches in 1933 to a minimum of 28 inches in 1936. The driest season of the year usually occurs in the period, August to October, and the wettest season in the period, January through May. Flood producing rains, however, may occur during any season of the year. Monthly average rainfall over the drainage area is shown in table 2.

c. Snowfall. Snow falls in the basin on an average of once a year. Although the average annual depth is about 2 inches, a maximum depth of 11 inches has been recorded at Shreveport, La., on 22 December 1929.

TABLE 2

MONTHLY AVERAGE RAINFALL(1)

WALLACE LAKE DRAINAGE BASIN

Month	Inches	Month	Inches
January	3.85	July	3.40
February	3.70	August	2.23
March	3.75	September	3.42
April	4.37	October	2.85
May	4.65	November	3.53
June	3.29	December	4.12

(1)Period of record 1947-1973.

d. Evaporation. Maximum evaporation generally occurs during the months of July and August while the minimum evaporation is experienced in December and January. The evaporation station nearest the center of the basin is Daingerfield, Texas. The average annual pan evaporation for 13 years of record at Daingerfield is 75 inches. The minimum monthly average evaporation at Daingerfield is 2.6 inches, occurring in December and January, while the maximum monthly average evaporation is 9.0 inches, occurring in July. The average annual pan evaporation for other stations, located farther away from the basin's center, ranges from 53 inches to 83 inches.

e. Wind. Records of wind data are available for 90 years at the Weather Bureau Station near Shreveport, La., located about 12 miles northeast of the center of Wallace Lake Basin. During this period, the prevailing direction was from the southeast with an average speed of 8.2 miles per hour. Wind summaries were computed for the period 1937 through 1948. These summaries indicate approximately 68 percent of wind velocity readings in the grouping 4-12 miles per

hour (mi/h); 15 percent each for the 1-3 mi/h and 13-24 mi/h groups; and about 2 percent to be calm. The maximum velocity recorded for the fastest mile was 59 mi/h from the east in September 1951. Monthly values and directions for the fastest mile are shown in table 3.

f. Humidity. Records of humidity representative of the basin are available for the U. S. Weather Bureau Station at Texarkana Airport, Arkansas, and Shreveport, Louisiana. Humidity averages about 58 percent at noon and 86 percent at 6 a.m. for Texarkana and 58 percent and 84 percent for Shreveport. Average humidity for various times of the day are shown in table 4.

TABLE 3

MAXIMUM RECORDED WIND VELOCITIES

Month	Maximum Wind Velocities and Direction		
	Shreveport La.(1) (mi/h)	Texarkana Ark.(2) (mi/h)	Dallas Tex.(3) (mi/h)
January	47 NW	44 S	66 SW
February	45 NW	46 WSW	61 SW
March	57 S	55 WSW	59 W
April	52 N	43 WSW	58 N
May	47 NW	40 W	65 S
June	50 E	60 SW	65 N
July	46 NW	32 N	77 N
August	52 W	40 NW	56 NW
September	59 E	44 NNE	48 W
October	47 NW	40 NE	61 NW
November	50 SW	34 W	56 W
December	52 NW	41 ENE	47 S
Maximum	59 E	60 SW	77 N

(1) Approx. 90 years of record, ending 1973.

(2) February 1934 through December 1941;
August 1946 through December 1950.

(3) Years 1914 through 1963.

TABLE 4

HUMIDITY

Observation Time (CST)	Years of Record		Average Relative Humidity in Percent	
	Texarkana	Shreveport	Texarkana	Shreveport
Midnight	15	33	79	80
6 a.m.	21	84	86	84
Noon	16	55	58	58
6 p.m.	16	84	61	61

4-05. Floods. The greatest floods for the period 1913, 1927-1946 were those of September 1913, July 1933, May 1935, and November 1940. Data concerning these floods were obtained from field investigations and available stage, discharge, and rainfall records along Bayou Pierre and Cypress Bayou. The reservoir was placed in operation 15 December 1946. From 1947 through 1973, the greatest floods were those of October 1949, May 1953, August 1955, May 1957, December 1961, and January 1968. Data regarding maximum annual floods in the drainage area above the dam are given in table 5.

a. Flood of September 1913. This storm, the second greatest in magnitude of storm rainfall critical to design of flood control storage capacity, occurred in two individual storm periods. The average rainfall over the reservoir area during the month was 14.3 inches. The first period, 10-15 September, had a total rainfall of 6.5 inches, of which 2.8 inches fell in a 24-hour period on 13 September. The second period, 25-29 September had a total rainfall of 7.0 inches, of which 2.8 inches fell during a 24-hour period on 26 September. The computed peak discharge for this flood is estimated at 12,700 c.f.s. See plate 7.

b. Flood of July 1933. In the month of July 1933, the average rainfall over the reservoir drainage area was 20.4 inches, of which 9.1 inches fell on 24 July and 15.1 inches during the 5-day period 22-26 July. This storm was a portion of the severe storm that centered over Logansport, La., and Shreveport, La., with rainfalls of 18.0 inches and 12.1 inches, respectively, on 24 July and 21.3 and 19.5 inches, respectively, during the 5-day period 22-26 July. The estimated peak mean daily discharge for this flood at the Kansas City Southern railroad

TABLE 5

MAXIMUM ANNUAL FLOODS

Cypress Bayou at Wallace Lake Dam

Year	Date of peak stage (a)	Maximum pool elev ft m.s.l.	Peak mean daily inflow s.f.d.(b)
	Theoretical Operation		
1913	29 Sep	155.9	12,700
1927	6 Mar	145.7	3,640
1928	18 Dec	148.3	6,550
1929	9 Jan	144.9	2,340
1930	14 May	153.3	11,230
1931	26 Dec	144.4	1,230
1932	7 Jan	148.2	5,150
1933	25 Jul	161.4	39,940
1934	6 Mar	144.8	1,920
1935	29 Apr	147.9	6,320
1936	21 May	143.2	550
1937	23 Dec	148.9	7,960
1938	24 Jan	151.8	12,640
1939	8 Feb	150.3	5,610
1940	30 Nov	151.7	8,600
1941	5 Jan	151.9	4,580
1942	24 May	148.5	5,240
1943	30 Mar	143.1	540
1944	8 May	151.5	6,020
1945	8 Mar	148.7	4,940
1946	12 Jan	153.5	7,940
	Actual Operation		
1947	15 Mar	147.7	5,040
1948	15 Feb	147.2	4,030
1949	7 Oct	149.8	10,620
1950	15 Feb	149.3	7,720
1951	21 Feb	145.2	1,890 (c)
1952	14 Feb	149.1	7,630
1953	18 May	153.0	13,340
1954	14 May	147.0	5,550
1955	5 Aug	151.7	13,130
1956	8 Apr	149.3	2,430 (c)
1957	3 May	151.2	6,690
1958	5 May	148.6	3,790 (c)
1959	17 Feb	146.2	3,380
1960	11 Dec	149.5	6,490
1961	19 Dec	151.3	6,920
1962	3 May	146.7	3,270 (c)
1963	9 Apr	142.6	351
1964	29 Apr	145.2	2,540
1965	1 Apr	147.3	5,030
1966	3 May	149.6	6,930
1967	2 Jun	147.8	7,010
1968	12 Jan	150.1	8,040
1969	19 Apr	149.6	6,830
1970	6 Mar	146.1	2,600 (c)
1971	15 May	144.4	2,000
1972	17 Dec	147.3	4,070
1973	10 Jan	148.2	4,960 (c)

(a) Stream closure effected and reservoir placed in operation 15 Dec 46.

(b) For corresponding flood.

(c) Exceeded during same year by another flood producing lesser peak stage.

bridge across Wallace Lake is 39,940 s.f.d, which is equivalent to 150 c.f.s. per square mile. This discharge was estimated from an extended rating curve which was based on a high-water mark. It is not as great as would ordinarily be expected from such a drainage area because of the regulating effect of the large preproject channel storage in Wallace Lake. This storm is the most severe storm of record for the reservoir drainage area. Further, it is the most severe storm rainfall experienced in this section of the country and by far exceeds storm rainfall normally used in this vicinity for designing flood control storage capacities. The remote possibility of the recurrence of a similar storm rainfall over the reservoir drainage area prohibits its use for flood control design purposes. The storm was of such great magnitude and low frequency that the cost of a reservoir that would completely control it is not economically justified. Reservoir operation hydrographs for this flood are shown on plate 21.

c. Flood of May 1935. In May 1935, there was an average rainfall over the reservoir drainage area of 10.0 inches, of which 2.7 inchs fell on 5 May and 6.9 inches in the 5-day period 2-6 May. The estimated peak mean daily discharge at the Kansas City Southern Railroad bridge is 6,320 s.f.d.

d. Flood of November 1940. In November 1940, there was an average rainfall over the reservoir drainage area of 11.0 inches, of which 4.1 inches fell on 23 November, 8.1 inches in the 2-day period 23-24 November and 10.4 inches in the 5-day period 22-26 November. The estimated peak mean daily inflow to the reservoir area was 8,600 s.f.d.

e. Flood of October 1949. In October 1949, there was an average rainfall over the reservoir drainage area of 15.6 inches, of which 4.7 inches fell on 5 October, 8.1 inches in the 2-day period 4-5 October, and 8.4 inches in the 5-day period 2-6 October. The computed peak reservoir inflow was 10,620 s.f.d.

f. Flood of May 1953. This storm occurred in two individual storm periods. In April 1953, there was an average rainfall over the reservoir drainage area of 8.0 inches, of which 5.0 inches fell on 29 April, 5.2 inches in the 2-day period 29-30 April and 5.2 inches in a 5-day period including the latter two dates. The peak computed reservoir inflow for this rainfall period was 13,340 s.f.d. The second period occurred during the month of May, which had a total rainfall of 7.9 inches. Of this monthly total, 1.2 inches fell on 12 May, 2.7 inches in the 2-day period 12-13 May and 5.3 inches in the 5-day period 12-16 May.

g. Flood of August 1955. The storm of 3-4 August had an average rainfall of 5.6 inches over the drainage basin. The flood produced a peak inflow of 13,130 c.f.s. and a total runoff of 3.9 inches during the period 3-14 August. The peak pool stage was 151.7 ft m.s.l. on 5 August.

h. Flood of May 1957. The storm of 21 April-4 May had an average rainfall of 7.3 inches over the drainage basin. The flood produced a peak inflow of 6,690 c.f.s. and a total runoff of 5.9 inches from 21 April to 13 May. The peak pool stage was 151.2 ft m.s.l. on 3 May.

i. Flood of December 1961. The storms of 5-6, 9-12, and 15-18 December had an average rainfall of 8.3 inches over the drainage basin. The flood produced a peak inflow of 6,920 c.f.s. and a total runoff of 6.0 inches during the period 5-23 December. The peak pool stage was 151.3 ft m.s.l. on 19 December.

j. Flood of January 1968. The storms of 31 December 1967-6 January 1968, and 9-10 January had an average rainfall of 9.0 inches over the drainage basin. The flood produced a peak inflow of 8,040 c.f.s. and a total runoff of 3.9 inches from 31 December 1967 to 18 January 1968. The peak pool stage was 150.1 ft m.s.l. on 12 January.

4-06. Flood damages. The maximum flood of record occurred in July 1933 before the dam was placed in operation. During this flood 102,000 acres of land were inundated of which 47,000 acres were cultivated. Damages at that time were estimated at $1,518,000. Another major flood occurred in May 1935 when 31,400 acres (including 11,000 acres cultivated) were overflowed with damages amounting to an estimated $100,000. Since the construction of the project, flood damages below the dam from headwater overflow have been negligible. Under present conditions 90,000 acres of agricultural land in Caddo and DeSoto Parishes are subject to overflow. Damages would be incurred by loss of soybean, cotton, and corn crops, as well as pasture. Loss of livestock, road and bridge damage, and damage to rural residences and farm buildings would occur. Economic losses would be due to rerouting highway traffic, flood fighting, care of livestock, and local business disruptions. Flood damages prevented by the project through Fiscal Year 1974 amounted to $1,067,000. Damages prevented by fiscal years are shown in table 6.

TABLE 6

Flood Damage Prevented by Wallace Lake

Fiscal Year	Damage Prevented
1949	$156,000
1950	65,000
1952	15,000
1953	258,000
1957	76,000
1958	34,000
1961	13,000
1966	181,000
1968	171,000
1969	98,000
	$1,067,000

SECTION V - FORECASTING PROCEDURES

5-01. Observation stations. All pertinent reporting observation stations are in Louisiana, and are shown on plate 1. Precipitation stations comprising the Wallace Lake Reporting Network are Shreveport, Keithville, Gloster, and Bethany. Daily rainfall records for these stations are received on cards from the National Weather Service, if rainfall is in excess of 0.5 inch. Rainfall is also reported by the Shreveport, La., National Weather Service via a "Service C" teletypewriter receiver located in the Hydraulics and Hydrologic Branch, Engineering Division.

5-02. Prediction of reservoir pool stages. Average rainfall over the drainage area is estimated by adding weighted rainfall from individual precipitation stations. Runoff is then estimated by use of a unit hydrograph applied to rainfall excess. Prediction of reservoir stages is accomplished by routing the runoff through the reservoir. Release rates will be predicted from these routings. Tabulations of rainfall and reservoir data are shown on plates 9 and 10 and a monthly reservoir operation chart is shown on plate 11. Tail water rating curves are shown on plate 12, while conduits and spillway discharge curves are shown on plate 13. The unit hydrograph determination is shown on plates 14 and 15 and examples of computation of hypothetical hydrograph and daily reservoir routings are shown on plates 16 and 17. Reservoir areas and storages are shown in table 7.

5-03. Forecasting of river stages. The National Weather Service Forecast Center is the official agency making forecasts which are released to the public. Stream discharge and stage forecasts are made by the Hydrologic Engineering Section and Reservoir Design Section, Hydraulics and Hydrologic Branch, Engineering Division for use in the operation of reservoirs and for the benefit of Corps of Engineers construction projects and flood-fighting activities. Forecasting of river stages is discussed in paragraph 25 of the Master Reservoir Regulation Manual for Red River below Denison Dam, New Orleans District. Discharge rating curves at key stations are shown on plate 18.

TABLE 7

WALLACE LAKE

Cypress Bayou, Louisiana

AREA AND STORAGE

Elev ft m.s.l.	Area acres	Storage acre-ft	Elev ft m.s.l.	Area acres	Storage acre-ft
130	0	0	154	7,140	63,400
131	4	2	155	7,640	70,790
132	16	12	156	8,170	78,700
133	32	36	157	8,700	87,130
134	58	81	158	9,250	96,100
135	110	165	159	9,850	105,660
136	310	375	160	10,450	115,800
137	580	820	161	11,080	126,600
138	870	1,550	162	11,750	138,000
139	1,190	2,580	163	12,470	150,100
140	1,530	3,940	164	13,220	162,900
141	1,910	5,660	165	13,960	176,500
142	2,300	7,760	166	14,680	190,900
143	2,700	10,260	167	15,400	205,900
144	3,100	13,160	168	16,120	221,700
145	3,510	16,470	169	16,800	238,100
146	3,890	20,170	170	17,490	255,260
147	4,240	24,230	171	18,200	273,100
148	4,580	28,640	172	18,940	291,700
149	4,940	33,400	173	19,700	311,000
150	5,340	38,540	174	20,440	331,100
151	5,760	44,100	175	21,200	351,900
152	6,200	50,100	176	22,000	373,500
153	6,660	56,500			

Area and storage data based on 1949 reservoir survey.

Elev 142, Conservation pool
Elev 158, Flood Control pool
Elev 170.7, Surcharge pool
Elev 176, Top of dam

SECTION VI - REGULATION

6-01. Basis of regulation plan. Wallace Lake provides complete control of all floods of record in the drainage basin except one, that of 1933. This flood, with an estimated runoff volume of 205,000 acre-feet, was of such great magnitude and low frequency that its control was not economically justified. The next most critical flood of record was that of September 1913, with an estimated runoff volume of 183,000 acre-feet. Routing of this storm through the reservoir with maximum outflow limited to 2,400 c.f.s., estimated bankfull capacity for the outlet channel below the dam, results in a peak reservoir stage of 158.0 ft m.s.l. Subsequent revision in the design of the outlet has lowered the maximum pool elevation from 158.0 to 155.9 ft. Conduit capacity at elevation 158.0 is 2,600 c.f.s.

6-02. Method of regulation. Flood control regulation by the reservoir is achieved through the uncontrolled structure,described in para 3-03 above.

6-03. Regulation schedules. Uncontrolled operation obivates regulation schedules of this reservoir.

6-04. Examples of regulation. Uncontrolled operation of the reservoir precludes the presentation of examples of restrictive regulation. However, inflow-outflow and pool stage operational hydrographs are shown on plates 19 and 20 and operational pool stage durations for the period 1927-1973 are shown in table 8. Reservoir operational hydrographs for the occurrence of the spillway design storm are shown on plate 8.

6-05. Instructions to dam tenders. A dam tender will be in attendance at the dam only while reservoir pool stages exceeding 152.0 ft prevail. His principal duty will be patrolling of the dam and appurtenant structures to determine the existence of adverse conditions which endanger the structure. In addition to his surveillance, it shall be the responsibility of the dam tender to furnish reservoir stage data twice daily to the Field Assistant at Shreveport by a means of communication to be designated by him. The Field Assistant will in turn relay the information to the District office by telephone, telegraph, or radio when the latter is available.

TABLE 8

WALLACE LAKE

POOL ELEVATION DURATION

Number of days equaled or exceeded

Water Year	Pool elevation, ft m.s.l. 142	143	145	147	149	151	153	155	157	159	161
Theoretical Operation											
1927	365	109	8	-	-	-	-	-	-	-	-
1928	366	51	10	-	-	-	-	-	-	-	-
1929	365	140	15	8	-	-	-	-	-	-	-
1930	365	60	27	20	15	11	4	-	-	-	-
1931	365	8	-	-	-	-	-	-	-	-	-
1932	366	94	41	5	-	-	-	-	-	-	-
1933	365	115	38	32	24	19	15	11	7	3	1
1934	365	66	-	-	-	-	-	-	-	-	-
1935	365	51	16	7	-	-	-	-	-	-	-
1936	366	15	-	-	-	-	-	-	-	-	-
1937	365	68	8	-	-	-	-	-	-	-	-
1938	365	86	42	23	8	4	-	-	-	-	-
1939	365	67	47	22	7	-	-	-	-	-	-
1940	366	73	36	5	-	-	-	-	-	-	-
1941	365	151	99	58	46	16	-	-	-	-	-
1942	365	114	33	9	-	-	-	-	-	-	-
1943	365	3	-	-	-	-	-	-	-	-	-
1944	366	138	40	16	12	5	-	-	-	-	-
1945	365	118	65	16	-	-	-	-	-	-	-
1946	365	171	89	44	23	18	9	-	-	-	-
Actual Operation											
1947	182	66	15	2	-	-	-	-	-	-	-
1948	63	17	10	2	-	-	-	-	-	-	-
1949	347	78	31	10	2	-	-	-	-	-	-
1950	357	71	36	16	2	-	-	-	-	-	-
1951	250	38	2	-	-	-	-	-	-	-	-
1952	218	63	24	5	1	-	-	-	-	-	-
1953	190	69	41	34	21	10	1	-	-	-	-
1954	164	11	5	1	-	-	-	-	-	-	-
1955	222	57	28	16	6	2	-	-	-	-	-
1956	165	50	18	7	2	-	-	-	-	-	-
1957	243	140	62	15	9	2	-	-	-	-	-
1958	332	111	43	9	-	-	-	-	-	-	-
1959	305	35	7	-	-	-	-	-	-	-	-
1960	328	77	30	14	3	-	-	-	-	-	-
1961	329	127	59	18	10	2	-	-	-	-	-
1962	230	74	15	-	-	-	-	-	-	-	-
1963	151	-	-	-	-	-	-	-	-	-	-
1964	154	28	2	-	-	-	-	-	-	-	-
1965	222	35	7	2	-	-	-	-	-	-	-
1966	234	41	20	11	3	-	-	-	-	-	-
1967	221	14	6	3	-	-	-	-	-	-	-
1968	347	118	40	9	4	-	-	-	-	-	-
1969	211	116	48	16	3	-	-	-	-	-	-
1970	293	57	7	-	-	-	-	-	-	-	-
1971	256	8	-	-	-	-	-	-	-	-	-
1972	315	93	15	2	-	-	-	-	-	-	-
1973	309	153	56	9	-	-	-	-	-	-	-
Total	13,943	3,445	1,241	466	201	89	29	11	7	3	1
% of Time	81	20	7.2	2.7	1.2	.52	.17	.06	.04	.02	.01
Av/yr	296.7	73.3	26.4	9.9	4.3	1.9	.62	.23	.15	.06	.02

Reservoir placed in operation 15 Dec 46.

6-06. Organization for reservoir regulation. Operation of Wallace Lake requires the services of organizational elements as shown on figure 1. In addition, other organizational elements are needed in case of flood emergencies, special construction, or design problems.

a. Hydraulics and Hydrologic Branch, Reservoir Design Section, and Environmental Resources Branch. All functions of regulation are assigned to the Reservoir Design Section with the cooperation of the Environmental Resources Branch. The duties of these sections include: direct communications with the dam tender during flood emergencies; review of reservoir operations; planning the collection of hydrologic data; coordination of cooperative hydrologic and stream gaging programs; computation of discharges and the compilation of streamflow and stage data; evaluation of weather conditions, both current and forecast, and of streamflow and stages; preparation of forecasts of reservoir stages and releases, and of stages on streams below the reservoir; investigations and studies of hydrologic nature required for reservoir operation; mosquito control, water quality control and conservation activities pertaining to the reservoir; planning improvements in operational procedures; and training of additional personnel required during flood emergency operation. Upon receipt of pertinent rainfall, stages, flow data, and forecasts of weather conditions, the Reservoir Design Section makes predictions of reservoir stages and releases.

b. Recreation-Resource Management Branch. The duties of this branch consist of providing all planning, programming, and technical services required in the operation and maintenance of the reservoir. In addition, this branch must see that all operation and maintenance are carried out properly.

c. Management and Disposal Branch. The Management and Disposal Branch is responsible for negotiating, granting and administering all out-grants, except permits for special events; making compliance and utilization inspections; and disposal of land, buildings, and timber. All of these activities are coordinated with Engineering Division and the Operations Division.

d. Reservoir Operation and Maintenance Unit. Wallace Lake is a statellite project to Lake O' the Pines; therefore, the Reservoir Operation and Maintenance Unit at Lake O' the Pines

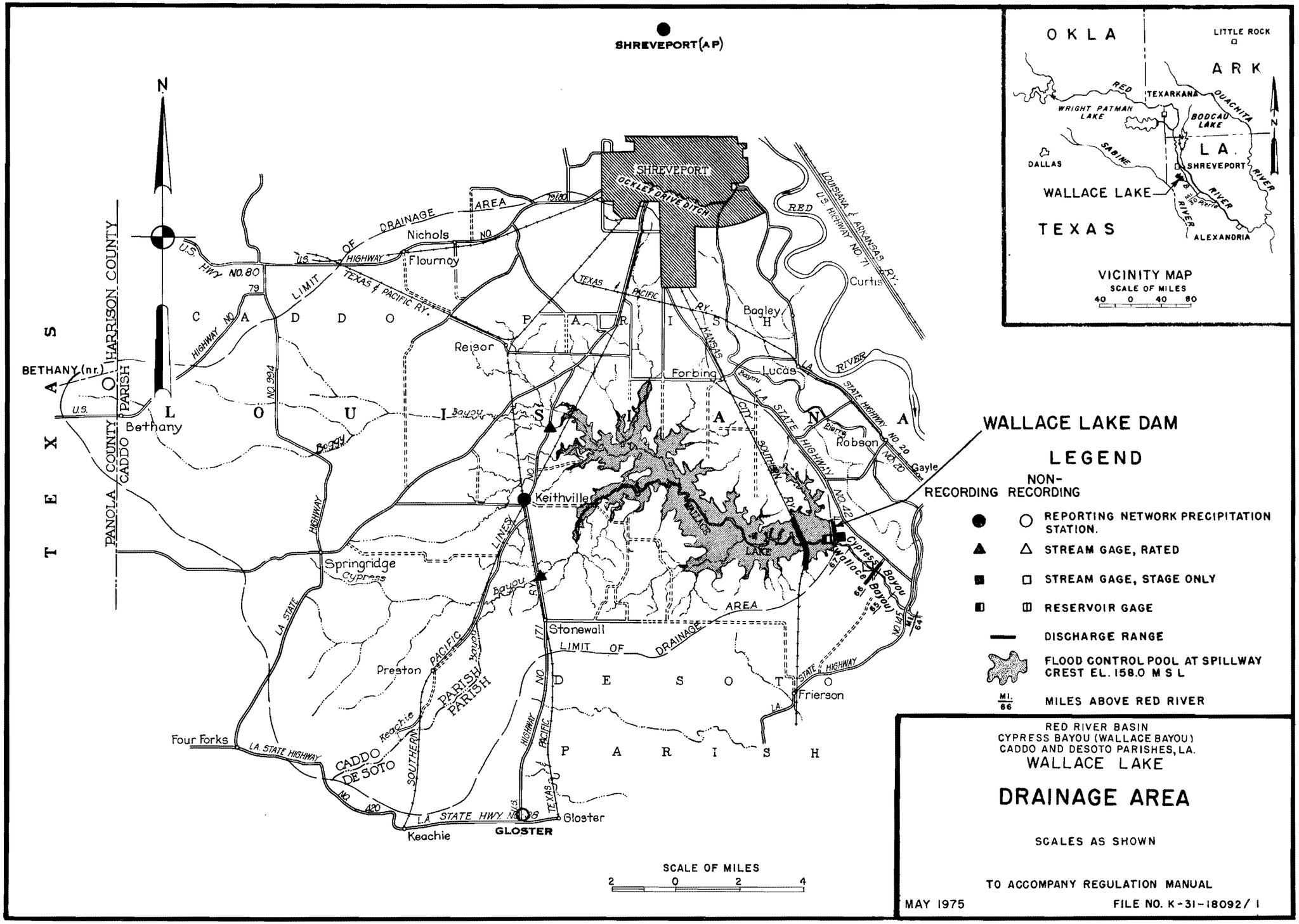
performs operation and maintenance requirements necessary to properly manage the lake project. Major items of work include maintenance of all physical plants, roads and structures, operation and maintenance of all recreational public use areas and facilities, protection of the Government's interest by inspecting all contract, lease, and permit requirements to see that they are properly complied with and maintaining liaison with other Federal, State and local agencies who render services to the Government and general public.

e. Other organizational elements. The Survey Branch of the Engineering Division establishes and maintains all gaging stations, furnishes discharge observations and recording gage charts, and performs all required field surveys. The General Service Branch is responsible for the coordination and operation of fixed communication services such as telephone, teletype and telegraph, but excluding civil works radio facilities. The Radio Communications Section of the Operations Division is responsible for the coordination, operation, and maintenance of all District civil works radio facilities. The Design Branch of the Engineering Division is responsible for special design problems and the Construction Division is responsible for special construction.

SECTION VII - MISCELLANEOUS

7-01. Coordination with other agencies. The relation of Wallace Lake to other projects comprising the overall project for flood protection on the main stem of Red River below Denison Dam is described in para 3-10. There are no local protection works in the basin requiring coordinated operation with the overall plan. However, the following projects, in addition to Wallace Lake, for the alleviation of floods in the basin are: clearing and snagging of Cypress Bayou (Wallace Bayou) from the damsite to the mouth; channel improvement and enlargement of Ockley Drive Ditch in the outskirts of Shreveport, La. and of Bayou Pierre at intervals between Shreveport and the junction of Cypress Bayou; and channel enlargement of Bayou Pierre at intervals from Bayou Wincey to mouth at Grand Ecore, La. Details of the above projects are covered in para 4-02. A cooperative arrangement has been made with the U. S. Department of Commerce, Shreveport, Louisiana, National Weather Service, to furnish rainfall and streamflow data to the New Orleans District. The U. S. Department of Interior, Geological Survey, Baton Rouge, Louisiana, operates two stage and discharge stations in the Cypress Bayou Basin on a cooperative basis, Cypress Bayou near Keithville, La. and Boggy Bayou near Keithville, La. The data furnished by Geological Survey are used for general hydrological studies and not used specifically for the prediction of stages in the Wallace Lake Basin. Daily Service Reports, weather maps, and other meteorological data are also furnished the District by the National Weather Service.

7-02. Studies in progress or planned. It is planned to continue studies to determine rainfall-runoff-stage relationships to facilitate more accurate predictions of reservoir stages and discharges. Future storms will be studied to improve the unit hydrographs now in use. A water quality data collection program is scheduled to begin in FY 1975.



WALLACE LAKE DAM

LEGEND

NON-RECORDING	RECORDING	
●	○	REPORTING NETWORK PRECIPITATION STATION.
▲	△	STREAM GAGE, RATED
■	□	STREAM GAGE, STAGE ONLY
◧	◫	RESERVOIR GAGE
		DISCHARGE RANGE
		FLOOD CONTROL POOL AT SPILLWAY CREST EL. 158.0 M S L
		MI. / 66 — MILES ABOVE RED RIVER

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.
WALLACE LAKE

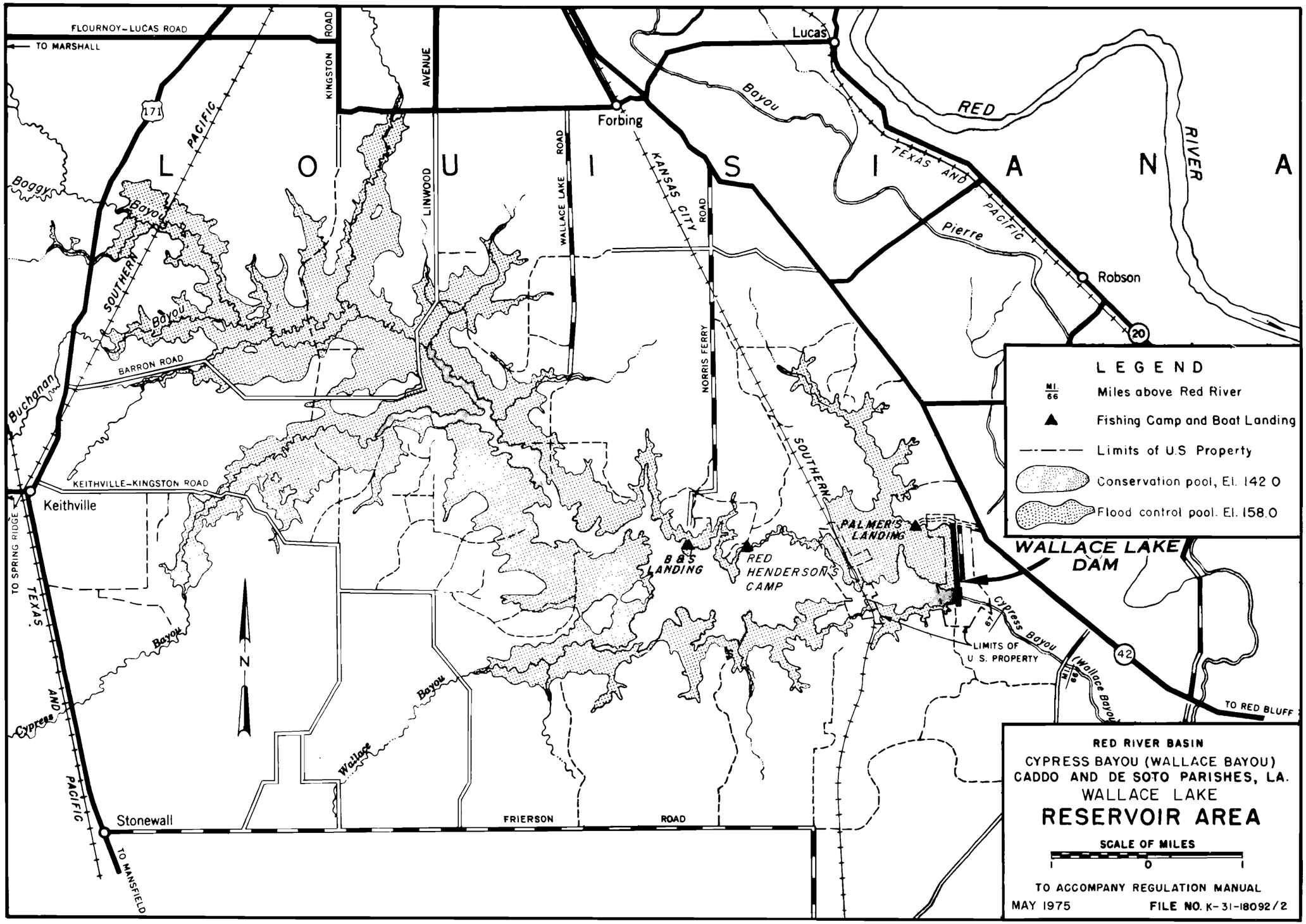
DRAINAGE AREA

SCALES AS SHOWN

TO ACCOMPANY REGULATION MANUAL

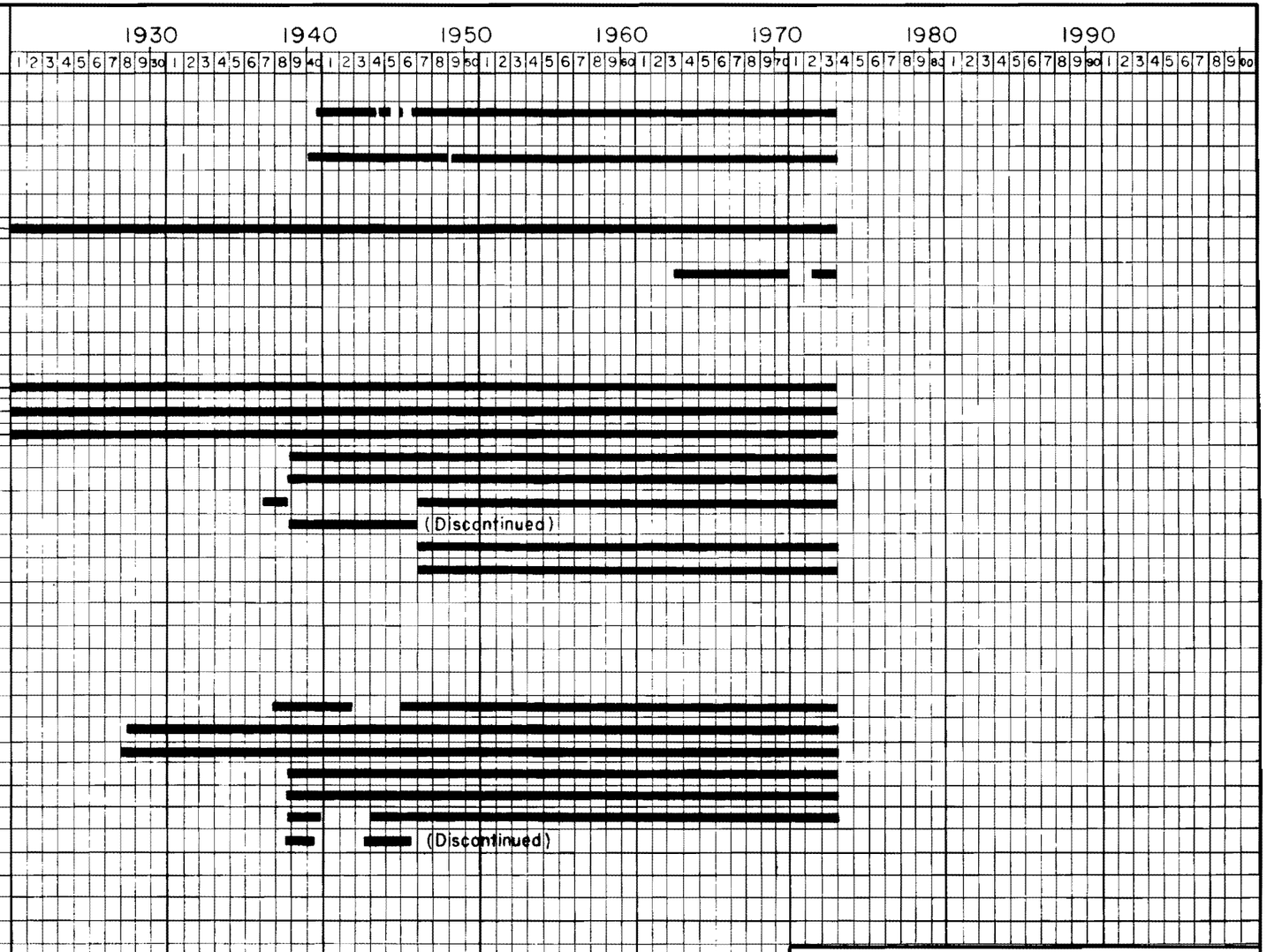
MAY 1975 FILE NO. K-31-18092/1

APPENDIX II PLATE 1



APPENDIX II PLATE 2

LOCATION	Continuous Records Available
Rainfall Stations	
Gloster, La.	
Keithville, La.	
Shreveport, La.	To March 1892
Bethany, La.	
Stream Gaging Stations	
Red River at Fulton, Ark.	To January 1885
Red River at Shreveport, La.	To May 1873
Red River at Alexandria, La.	To January 1872
Boggy Bayou nr Keithville, La.	
Cypress Bayou nr Keithville, La.	
Cypress Bayou nr Shreveport, La. (4)	
Wallace Lake at K.C.S. RR. Bridge	(Discontinued)
Wallace Lake (Intake)	
Wallace Lake (Outlet)	
Stream Discharge Stations (Daily Discharges)	
Red River at Fulton, Ark. (1)	
Red River at Shreveport, La. (2)	
Red River at Alexandria, La. (3)	
Boggy Bayou nr Keithville, La.	
Cypress Bayou nr Keithville, La.	
Cypress Bayou nr Shreveport, La. (4)	
Wallace Lake at Stonewall, La. (K.C.S. RR. Bridge) (5)	(Discontinued)



(1) Intermittent Record October 1931 - August 1938
October 1942 - December 1945

(2) Intermittent Record February 1872 - June 1905

(3) Intermittent Record February 1858 - June 1927

(4) Intermittent Record April 1937 - April 1938; prior to 1959, station known as Cypress Bayou near Frierson, La.

(5) Intermittent Record June 1940 - March 1943

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

WALLACE LAKE

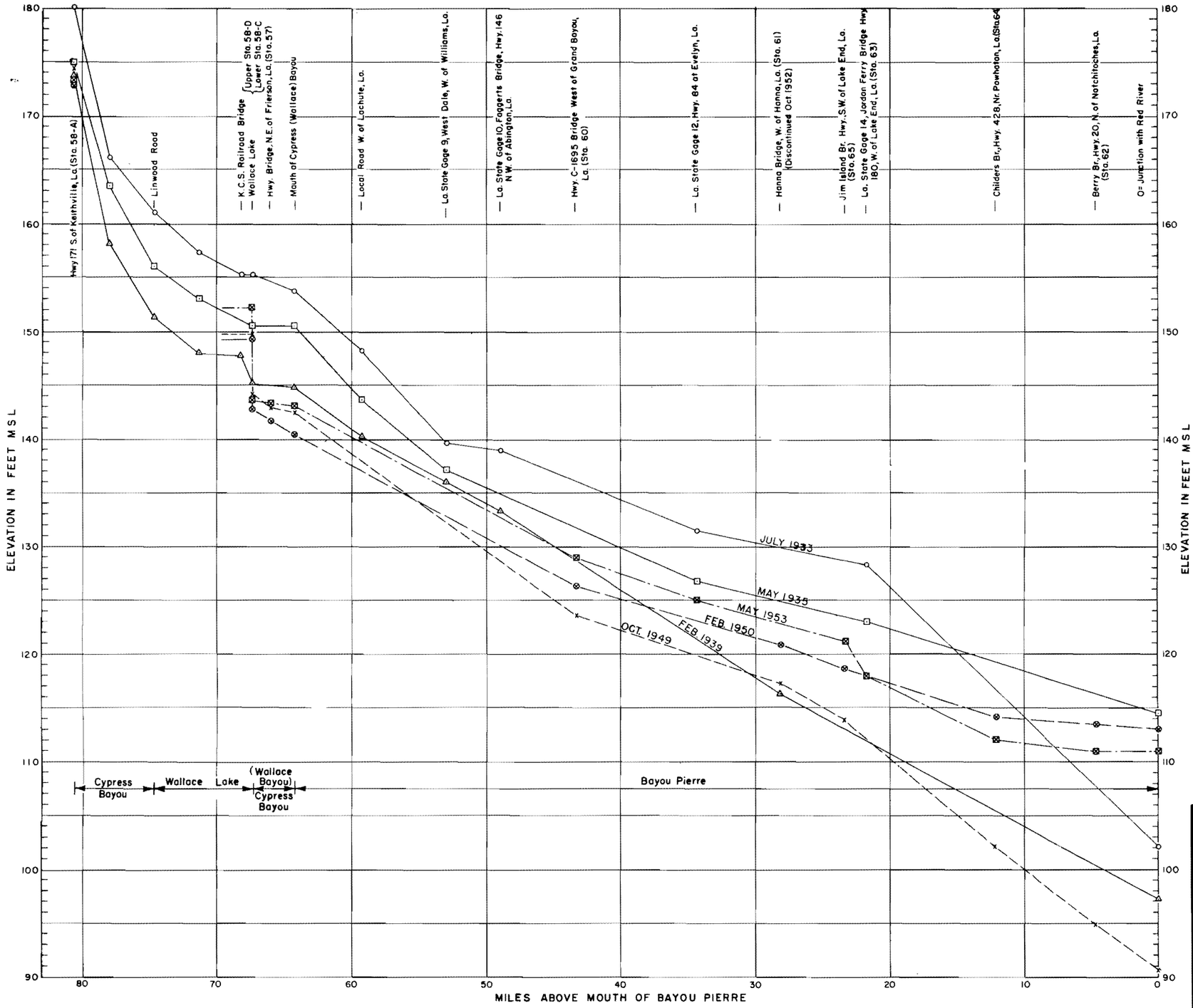
HYDROLOGIC STATIONS

PERIOD OF RECORD

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/4

APPENDIX II PLATE 4



Note:
Dam closure and stream diversion through outlet structure effective 15 December 1946

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

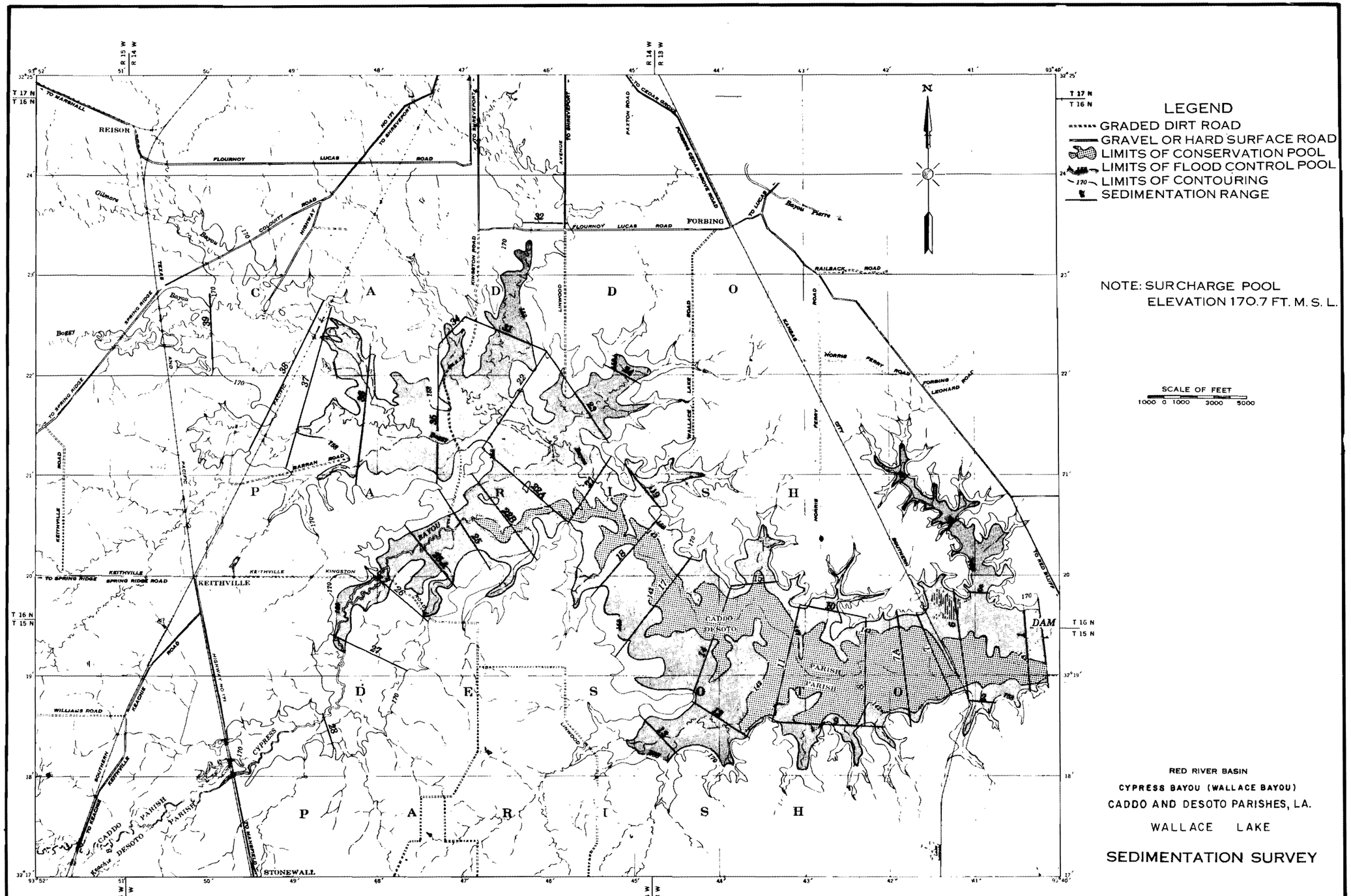
HIGHWATER PROFILES

TO ACCOMPANY REGULATION MANUAL

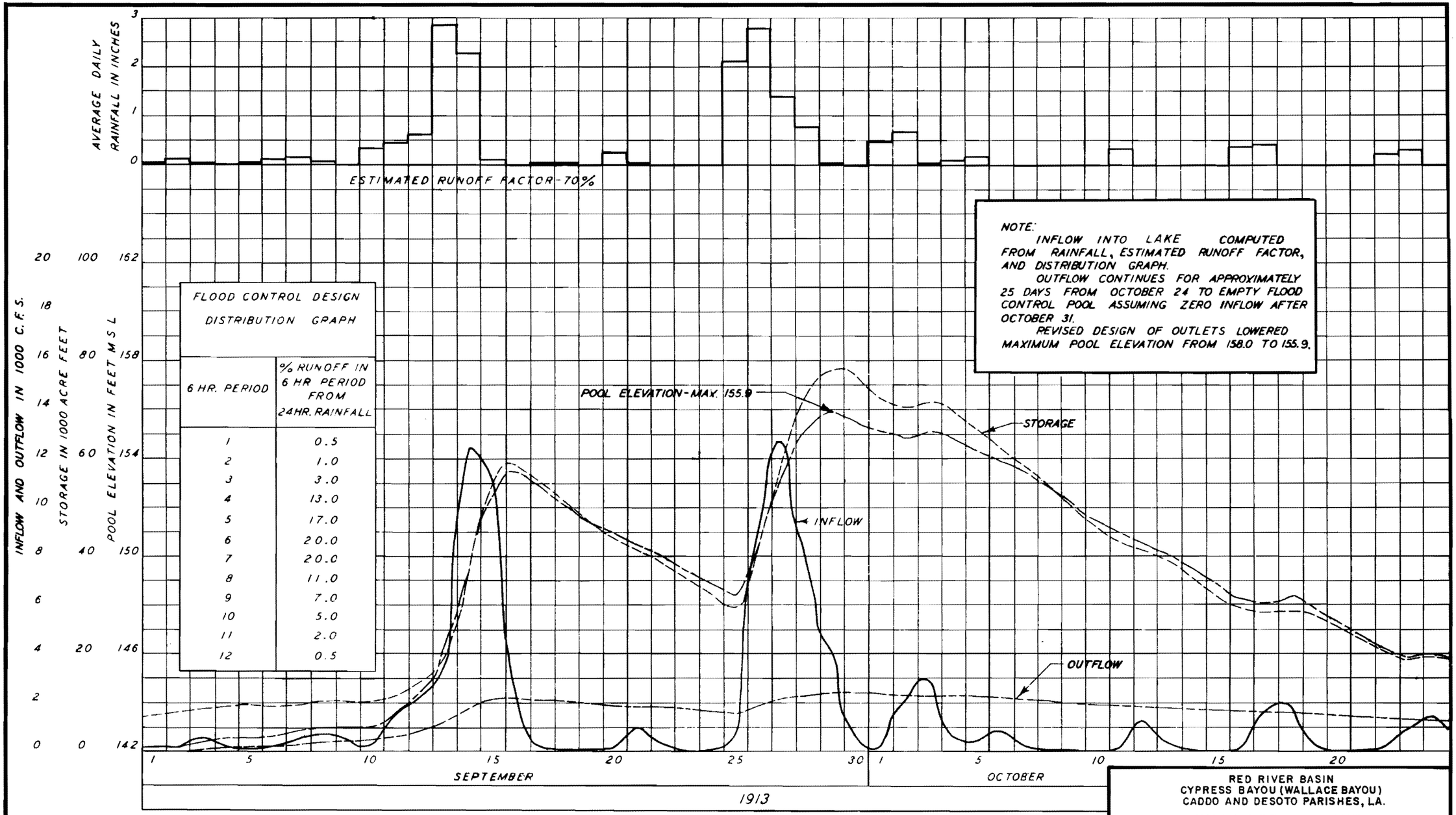
MAY 1975

FILE NO. K-31-18092/5

APPENDIX II PLATE 5



APPENDIX II PLATE 6



FLOOD CONTROL DESIGN

DISTRIBUTION GRAPH

6 HR. PERIOD	% RUNOFF IN 6 HR PERIOD FROM 24HR. RAINFALL
1	0.5
2	1.0
3	3.0
4	13.0
5	17.0
6	20.0
7	20.0
8	11.0
9	7.0
10	5.0
11	2.0
12	0.5

NOTE:

INFLOW INTO LAKE COMPUTED FROM RAINFALL, ESTIMATED RUNOFF FACTOR, AND DISTRIBUTION GRAPH.

OUTFLOW CONTINUES FOR APPROXIMATELY 25 DAYS FROM OCTOBER 24 TO EMPTY FLOOD CONTROL POOL ASSUMING ZERO INFLOW AFTER OCTOBER 31.

REVISED DESIGN OF OUTLETS LOWERED MAXIMUM POOL ELEVATION FROM 158.0 TO 155.9.

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

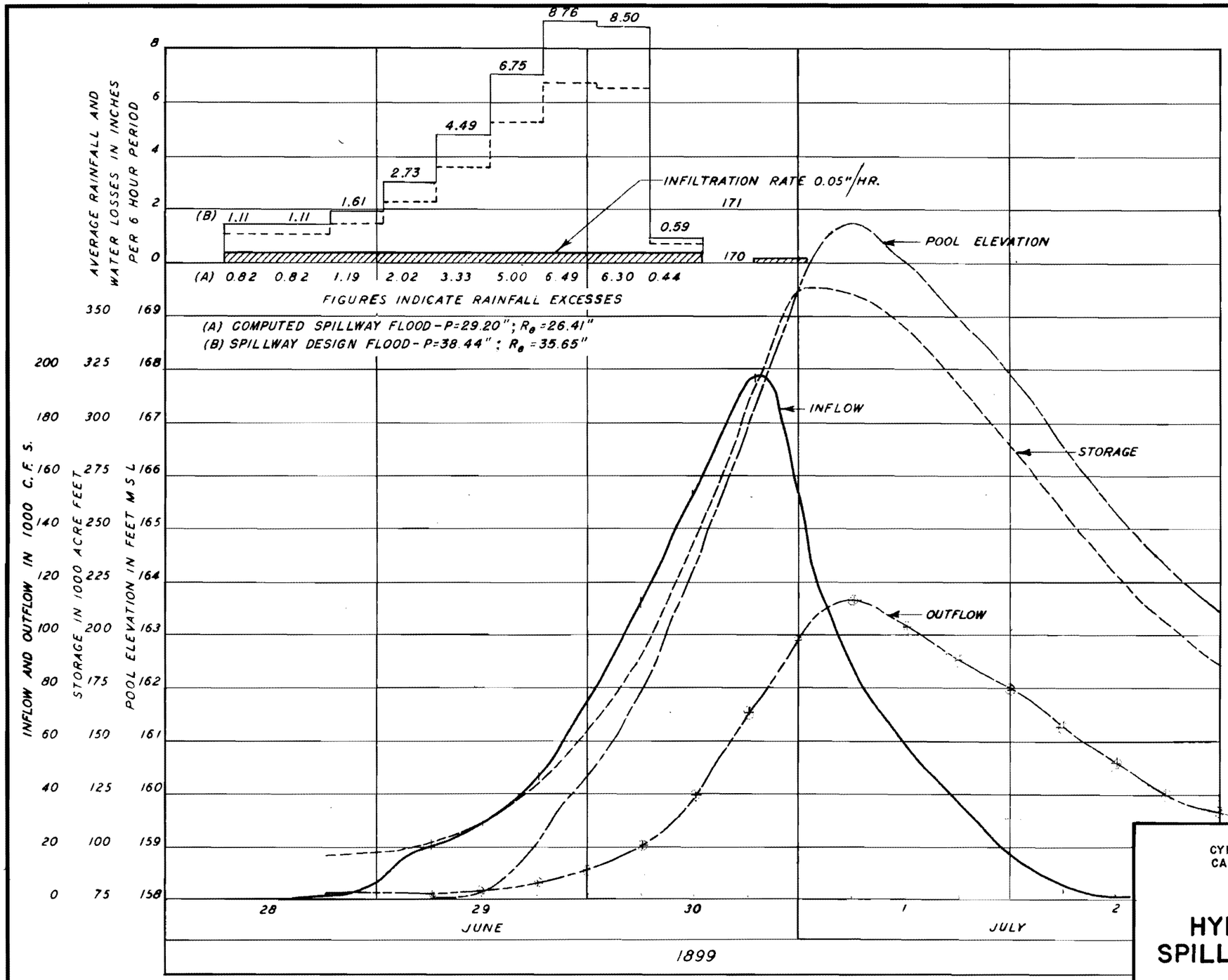
WALLACE LAKE

RESERVOIR DESIGN HYDROGRAPHS-1913 FLOOD

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/7

APPENDIX II PLATE 7



SPILLWAY DESIGN DISTRIBUTION GRAPH	
6 HR. PERIOD	% RUNOFF IN 6 HR. PERIOD FROM 6 HR. RAINFALL
1	1
2	2
3	9
4	42
5	16
6	12
7	9
8	6
9	3

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

WALLACE LAKE

HYDROGRAPHS FOR SPILLWAY DESIGN FLOOD

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/8

APPENDIX II PLATE 8

BASIN RAINFALL DATA Wallace Lake

April 19 73

DATE	CASE	Shreveport		Bethany		Keithville		Gloster								BASIN AVERAGE (24 Hr)	DATE
		7am	Wtd	7am	Wtd	7am	Wtd	7am	Wtd	7am	Wtd	7am	Wtd	7am	Wtd		
1																	1
2																	2
3	5					.39	.18	.13	.02							.20	3
4																	4
5																	5
6																	6
7	5			.66	.16	.63	.30	.80	.09							.55	7
8																	8
9	1	.72	.13	.68	.16	.85	.40	.61	.07							.76	9
10																	10
11																	11
12																	12
13																	13
14																	14
15	2	.02	-			.13	.06	.17	.02							.08	15
16	1	1.58	.28	1.75	.41	1.04	.49	1.78	.21							1.39	16
17																	17
18	1	.40	.07	.71	.17	.66	.31	1.05	.12							.67	18
19		.01	-														19
20	2	.02	-			.02	.01	T	-							.01	20
21	1					.11	.05									.05	21
22																	22
23	1			1.66	.39	T	-									.39	23
24	2	.72	.13			.14	.07	.28	.03							.23	24
25	1	2.04	.36	2.35	.55	2.11	.99	1.61	.19							2.09	25
26																	26
27																	27
28																	28
29																	29
30																	30
31																	31

NR - No record T - Trace * - Received too late Total 6.42 in.

LMN Form 623
6 June 61

APPNEDIX II PLATE 9

BASIN RESERVOIR DATA: Wallace Lake RESERVOIR DATE: April 1973

DATE	RAIN FALL AVE.	INFLOW	POOL ELEV.	STORAGE	STORAGE	STORAGE CHANGE	GATES OPEN				TIME GATE CHANGE	OUTLET GAGE	7 AM DISCH.	AVG. DISCH.	OBS. DISCH.
							1	2	3	4					
	in.	c.f.s.	ft. msl	acre-ft.	d.s.f.	d.s.f.						ft.msl	c.f.s.		
1		186	144.24	13954	6977	-729						132.81	854	915	
2		134	143.82	12638	6319	-658						132.18	731	792	
3	.20	282	143.54	11826	5913	-406						131.81	644	688	
4		271	143.31	11159	5580	-333						131.27	564	604	
5		219	143.10	10550	5275	-305						130.78	485	524	
6		151	142.89	9985	4992	-283						130.22	384	434	
7	.55	262	142.81	9785	4892	-100						130.17	340	362	
8		248	142.75	9635	4818	-74						129.67	305	322	
9	.76	473	142.86	9910	4955	137						130.46	368	336	
10		629	143.03	10347	5174	219						130.74	453	410	
11		764	143.23	10927	5464	290						130.93	536	494	
12		568	143.25	10985	5492	28						130.96	543	540	
13		248	143.07	10463	5232	-260						130.61	472	508	
14		188	142.89	9985	4992	-240						130.08	384	428	
15	.08	155	142.74	9610	4805	-187						129.41	299	342	
16	1.39	453	142.84	9860	4930	125						131.44	357	328	
17		947	143.21	10869	5434	504						131.86	529	443	
18	.67	1690	143.93	12957	6478	1044						132.58	764	646	
19		1793	144.51	14848	7424	946						133.12	930	847	
20	.01	1770	144.98	16403	8202	778						133.63	1054	992	
21	.05	912	144.90	16139	8070	-132						133.62	1033	1044	
22		550	144.63	15245	7622	-448						133.27	963	998	
23	.39	354	144.29	14119	7060	-562						132.76	868	916	
24	.23	490	144.08	13424	6712	-348						132.66	809	838	
25	2.09	2794	145.17	17099	8550	1838						137.01	1102	956	
26		4755	146.95	24027	12014	3464						136.50	1480	1291	
27		2369	147.34	25729	12864	850						136.31	1558	1519	
28		775	147.00	24230	12115	-749						135.95	1490	1524	
29		361	146.47	22078	11039	-1076						135.50	1384	1437	
30		185	145.90	19800	9900	-1139						134.92	1265	1324	
31															

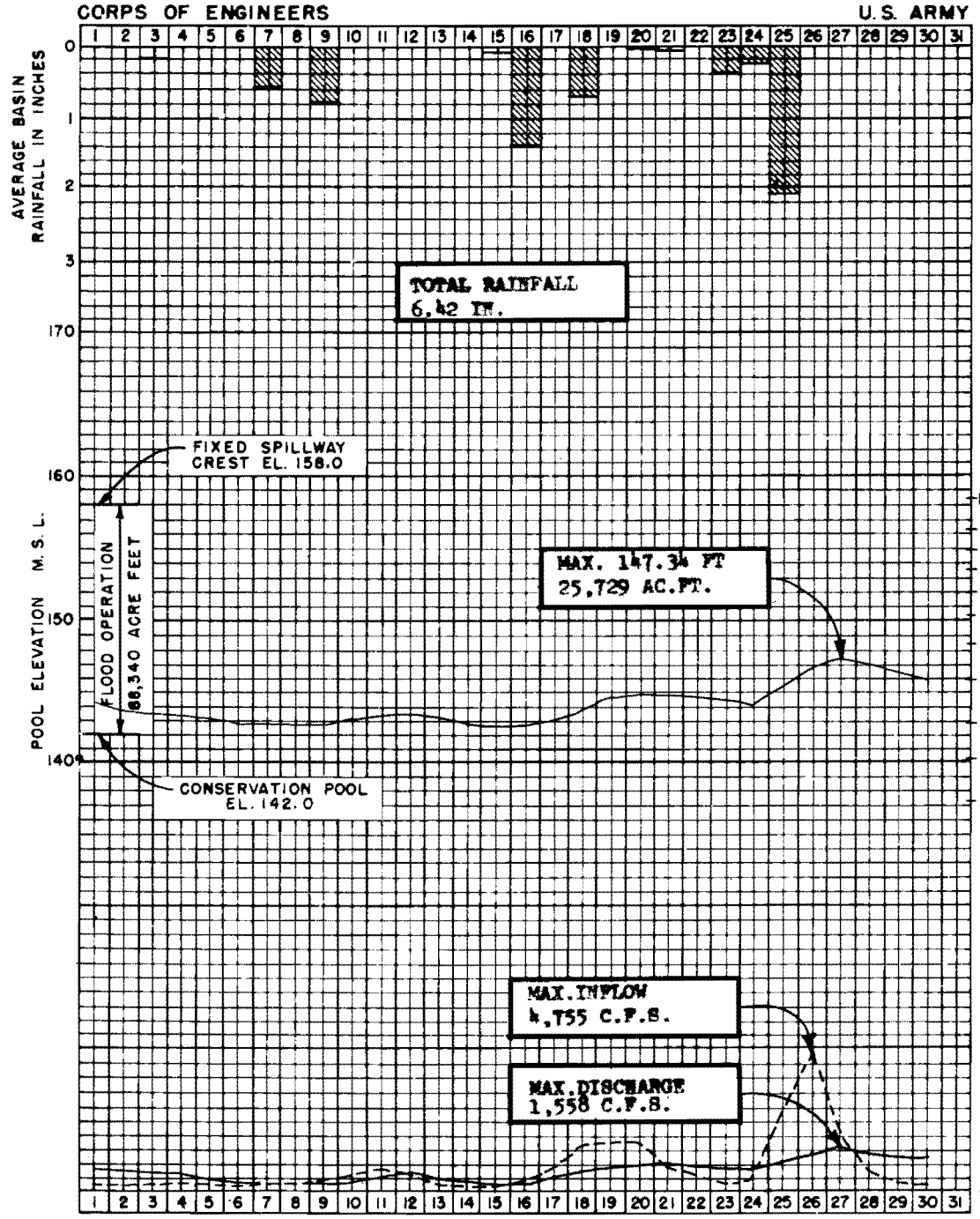
Total 6.42 in.

LMN Form 639 7 Feb 62

APPENDIX II PLATE 10

Control Approval Symbol ENGCW-E-6

CORPS OF ENGINEERS U.S. ARMY



MONTH OF APRIL 1973

	ELEVATION	GROSS STORAGE AC. FT.
CONSERVATION POOL	142.0	7,760
FLOOD CONTROL POOL	158.0	96,100
OUTLET CAPACITY AT F.C. POOL		2,600 C.F.S.

MONTHLY RESERVOIR OPERATION

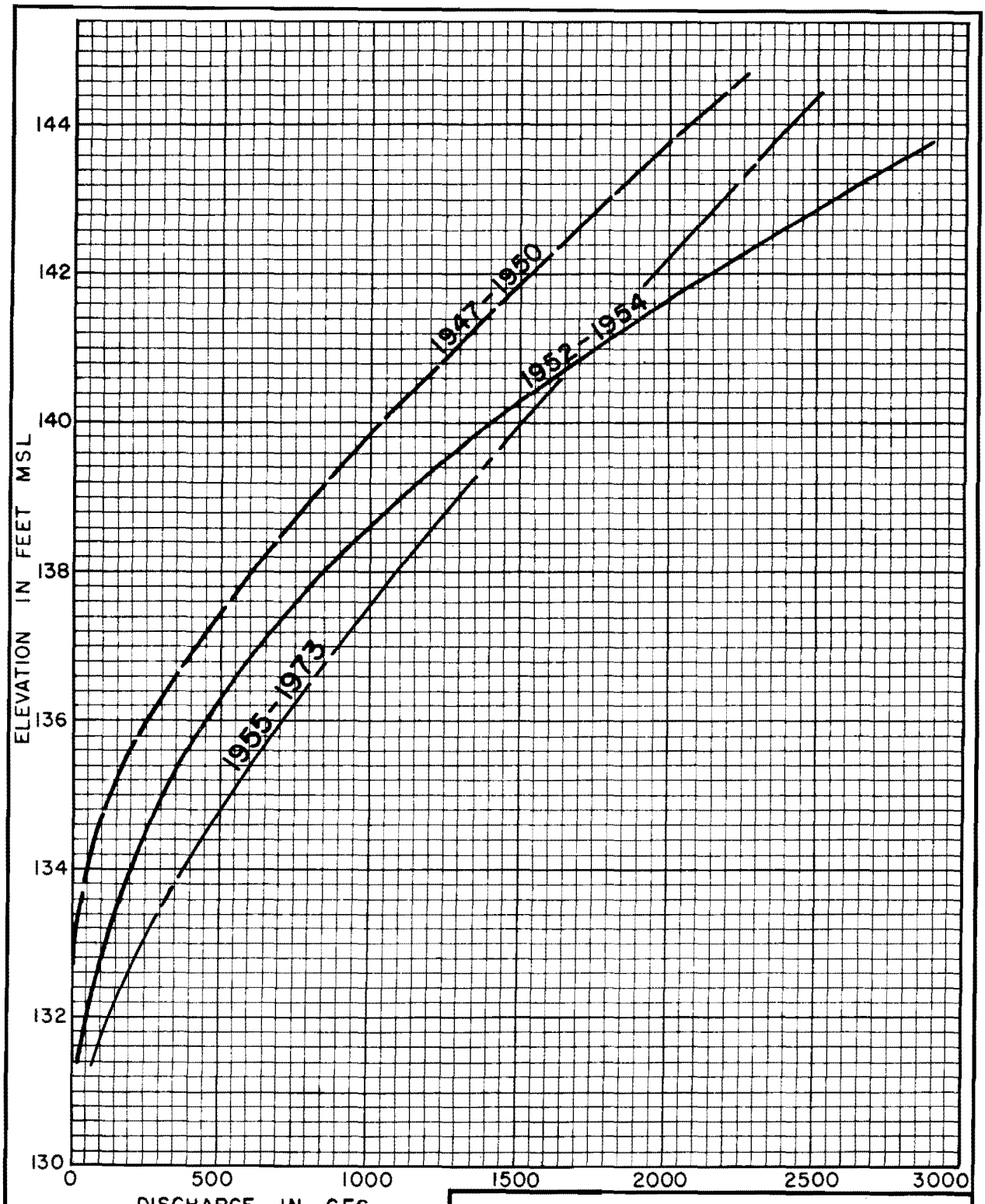
WALLACE LAKE RESERVOIR

CYPRESS BAYOU BASIN

D. A. 260 SQ. MILES

LOWER MISSISSIPPI VALLEY DIVISION
NEW ORLEANS DISTRICT

APPENDIX II PLATE II



RED RIVER BASIN
CYPRESS BAYOU(WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

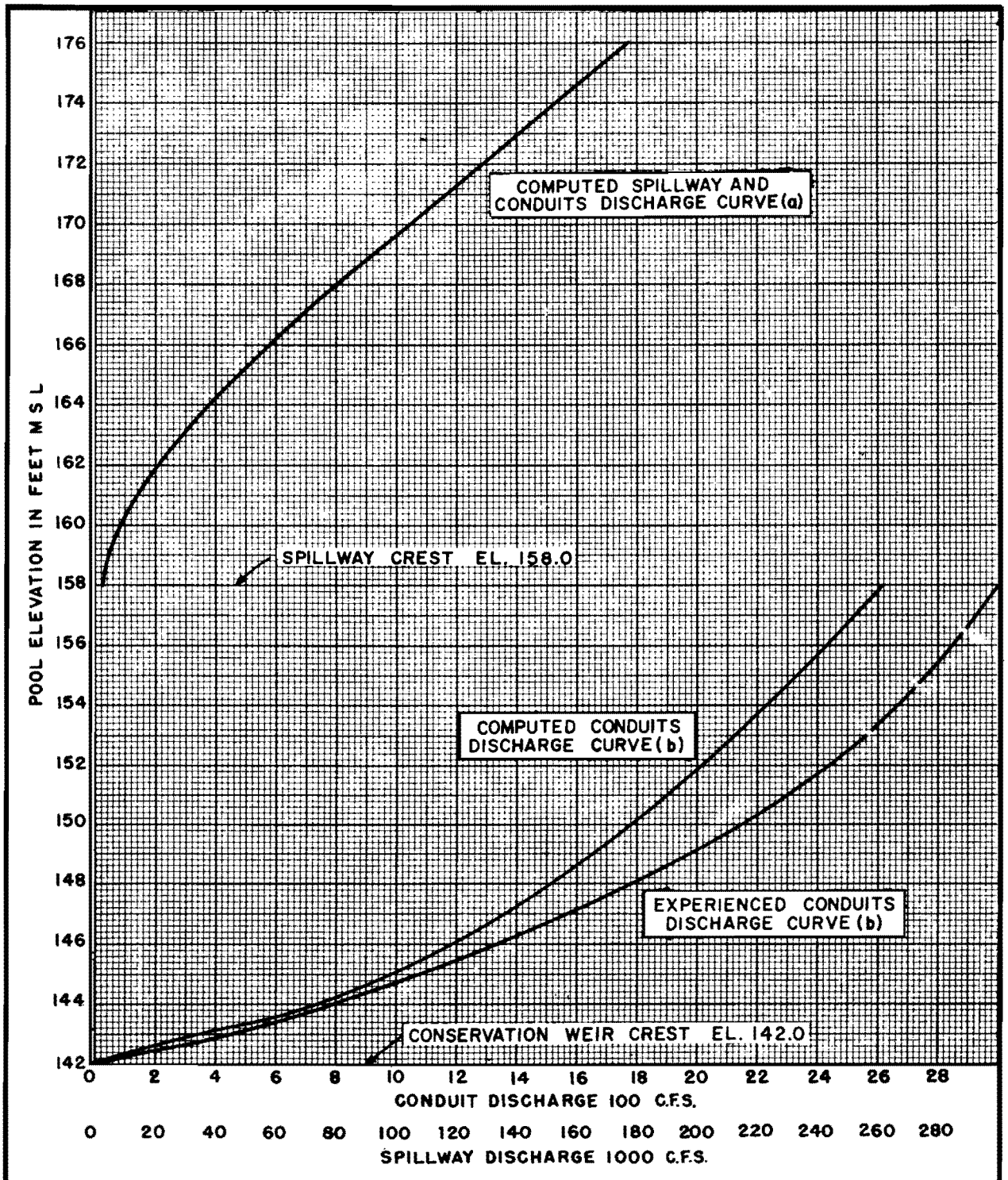
WALLACE LAKE

TAIL WATER RATING CURVE

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/12

APPENDIX II PLATE 12



NOTES:
(a) Includes the discharge of 644 ft. spillway with crest at el. 158.0 and 4-3x8.25 ft. conduits with invert at el. 140.0.
(b) Includes only the discharge of the 4-3x8.25 conduits with invert el. at 140.0 and conservation weir with crest at el. 142.0.

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

WALLACE LAKE

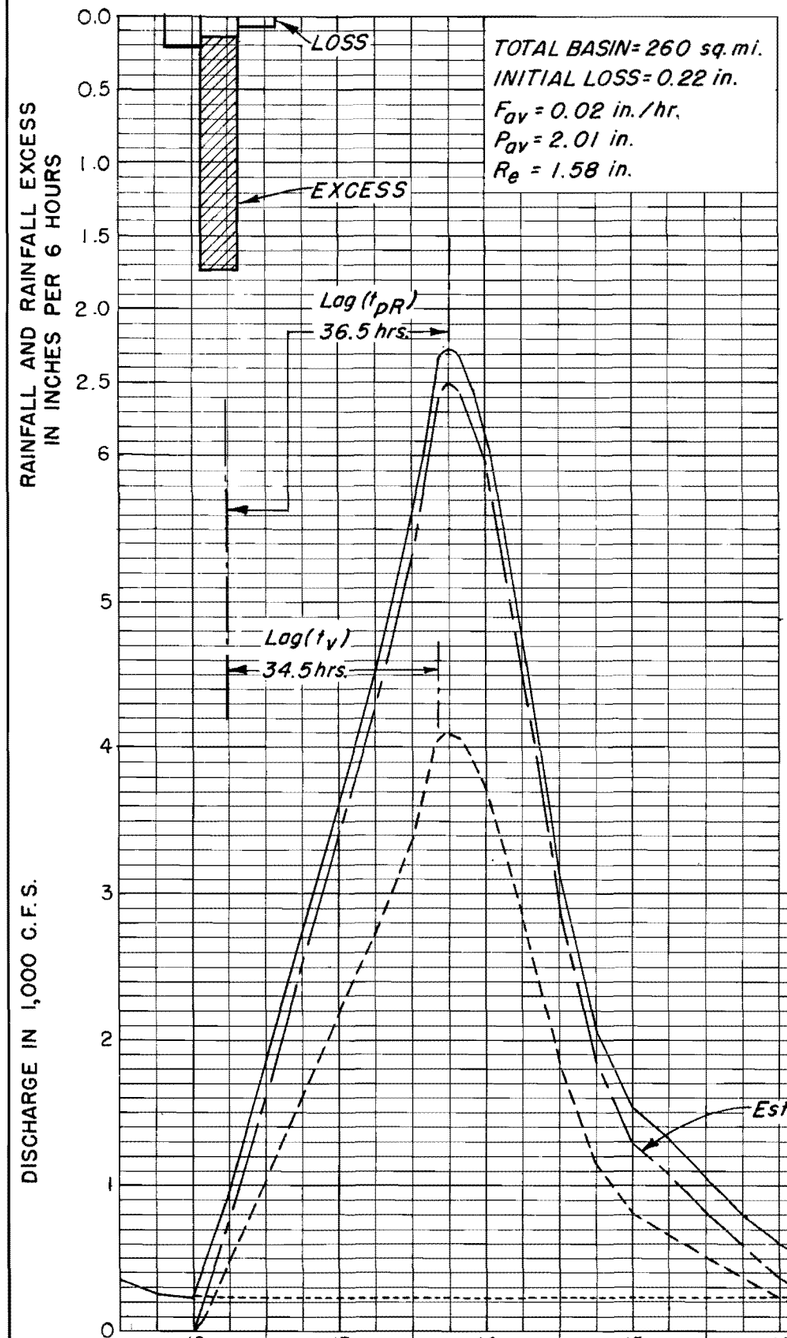
CONDUITS AND SPILLWAY DISCHARGE CURVES

TO ACCOMPANY REGULATION MANUAL

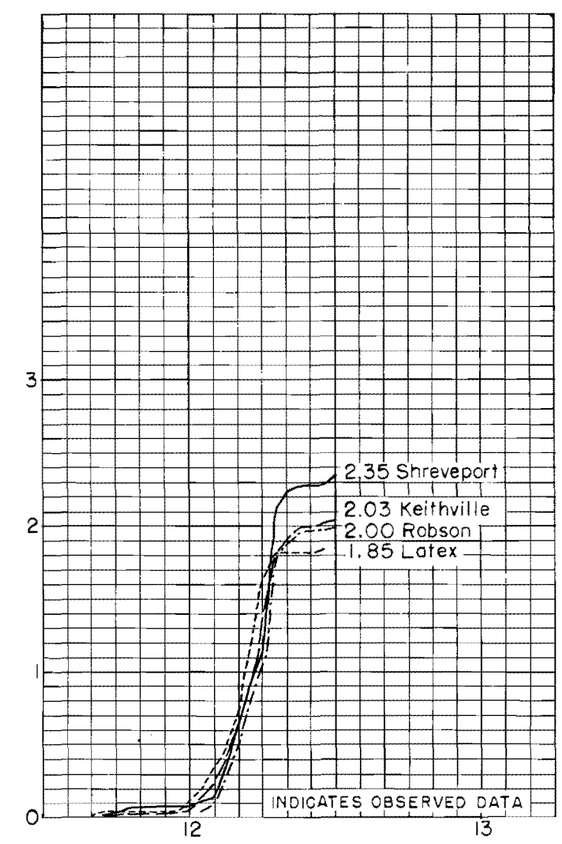
MAY 1975 FILE NO. K-31-18092/13

APPENDIX II PLATE 13

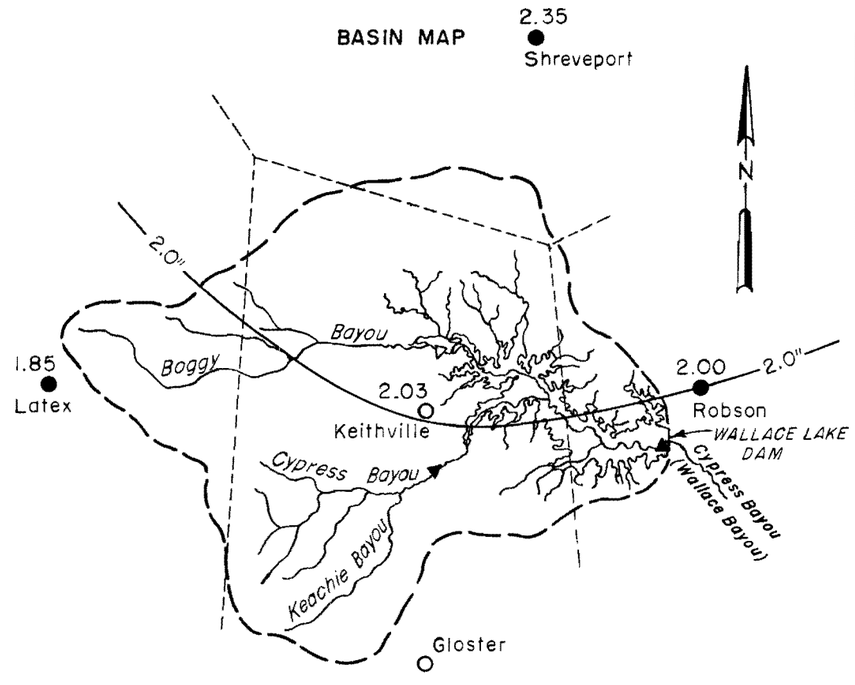
HYETOGRAPH



MASS RAINFALL CURVES



BASIN MAP



LEGEND

	REC.	NON. REC.
PRECIPITATION GAGES	●	○
STREAM GAGES	▲	△
ISOHYETS	2.0"	
THIESSEN POLYGON		
ZONE BOUNDARY		

NOTES:

Hydrograph of observed flow computed from observed hourly stages.

Duration of rainfall excess is 6 hours, beginning at 2 p.m. and ending at 8 p.m., 12 March 1947.

Peak discharge of observed hydrograph is 6,719 c.f.s.

ENGINEERING INVESTIGATIONS
UNIT HYDROGRAPH

CYPRESS BAYOU (WALLACE BAYOU) AT WALLACE LAKE DAM SITE

12 MARCH 1947

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/14

DEPARTMENT OF THE ARMY — CORPS OF ENGINEERS

UNIT HYDROGRAPH BASIC DATA SHEET

(7) STREAM AND STATION Cypress Bayou at Wallace Lake Dam LAT. 32°19' LONG. 93°40'

(8) DATE OF STORM 12 March 1947 (9) OFFICE New Orleans District

(10) DRAINAGE AREA 260 SQ.MI. (11) L 27.25 MI. (12) L_{ca} 13.7 MI. (13) $(LL_{ca})^{0.3}$ 5.92

(14) AVERAGE RAINFALL 2.01 IN. (15) t_R 6 HRS. (16) DIRECT RUNOFF 1.58 IN.

(17) Q_{pR} 4,107 CFS. (18) q_{pR} 16 CFS/SQ.MI. (19) Q_p 4,098 CFS. (20) t_{pR} 36.5 HRS.

(21) t_p 39 HRS. (22) t_v 34.5 HRS. (23) C_{tR} 6.2 (24) C_{p640} 584 W_{50} 36 HRS. W_{75} 19.5 HRS.

TIME March 1947 (25)	OBSERVED DISCHARGE (XXX CFS) (26)	ESTIMATED BASE FLOW (XXX CFS) (27)	DIRECT RUNOFF (XXX CFS) (28)	OBSERVED 6 HR UNIT HYDROGRAPH (XXX CFS) (29)	ADJUSTED 6 HR UNIT HYDROGRAPH (XXX CFS) (30)	REPRODUCED STORM HYDROGRAPH (XXX CFS) (31)	(32)	(33)
12M-12	230	230	0	0	0			
6P	950	230	720	456	455			
12P	1,860	230	1,630	1,032	1,030			
6A-13	2,790	230	2,560	1,620	1,617			
12M	3,660	230	3,430	2,171	2,166			
6P	4,500	230	4,270	2,703	2,697			
12P	5,590	230	5,360	3,392	3,385			
6A-14	6,719	230	6,489	4,107	4,098			
12M	6,151	230	5,921	3,747	3,739			
6P	4,702	230	4,472	2,830	2,824			
12P	3,131	230	2,901	1,836	1,832			
6A-15	2,073	230	1,843	1,166	1,164			
12M	1,525	230	1,295	820	818			
6P	1,322	230	1,092	691	690			
12P	1,064	230	834	528	527			
6A-16	800	230	570	361	360			
12M	600	230	370	234	234			
6P	440	230	210	133	133			
12P	330	230	100	63	63			
6A-17	290	230	60	38	38			
12M	280	230	50	32	32			
6P	270	230	40	25	25			
12P	230	230	0	0	0			

DATE: NOVEMBER 1954 — COMPUTED BY: P.A.B.

HYPOTHETICAL HYDROGRAPH

MONTH AND YEAR	STREAM
April 1973	Wallace Lake
DRAINAGE AREA(Sq.Mi.)	REACH
260	

TOTAL RAINFALL		INFILTRATION	SURFACE RUNOFF (In.)	DATE COMPUTED	BY (Initials)	DATE CHECKED	BY (Initials)
INCHES	HOURS	Initial loss=0.50"					
4.77	120	Fav=0.05"/h	2.22				

PERIODS	TIME IN Date April 1973	UNIT GRAPH	SUPPLY (In.)		SURFACE RUNOFF FROM RAINFALL-EXCESS (R_e)										BASE FLOW	TOTAL
			R	R_e	.39	.37	.12	1.34								
1	16	776	1.39	.39	303										200	503
2	17	3087			1204										200	1404
3	18	2390	.67	.37	932	287									200	1419
4	19	599			234	1142									200	1576
5	20	117			46	884									200	1130
6	21	14			5	222									200	427
7	22					43									200	243
8	23		.39			5									200	205
9	24		.23	.12			93								200	293
10	25		2.09	1.34			370	1040							200	1610
11	26						287	4137							200	4624
12	27						72	3203							200	3475
13	28						14	803							200	1017
14	29						2	157							200	359
15	30							19							200	219
16																
17																
18																
19																
20																
21																
22																
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31																

LMV FORM 169
1 AUG. 1946

APPENDIX II PLATE 16

LMVD Form 45
2 June 1945

Daily Reservoir Routing

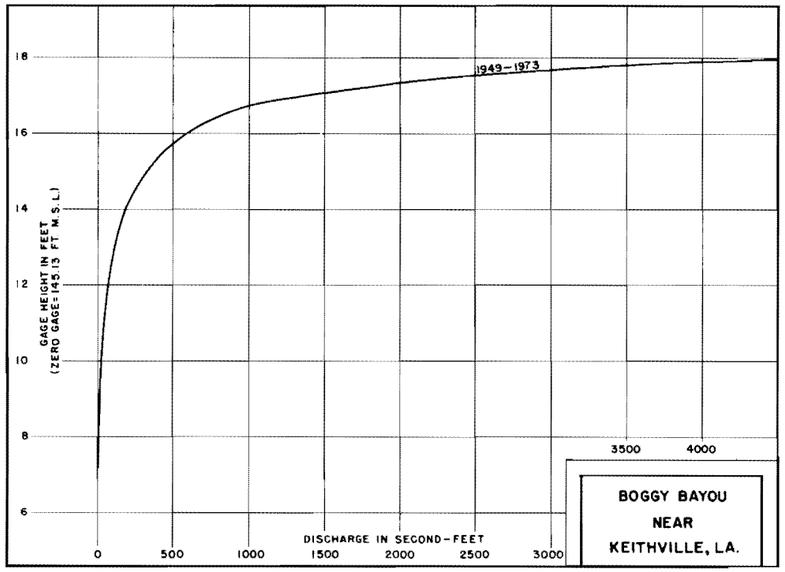
WALLACE LAKE

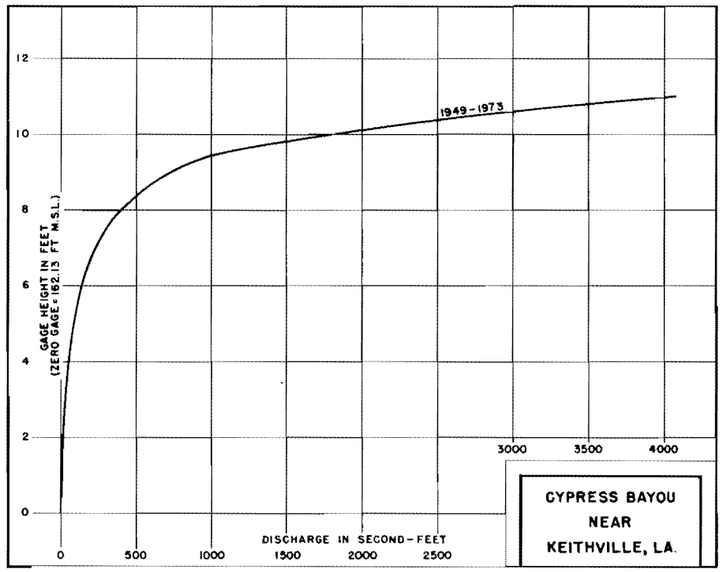
ROUTING OF

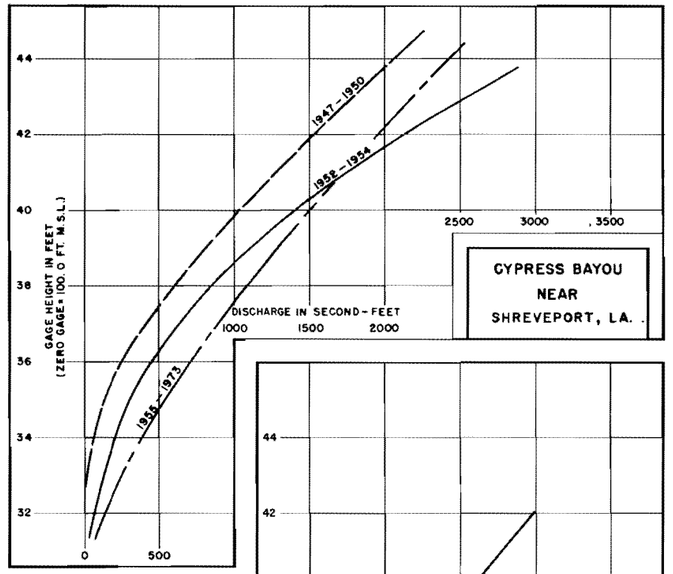
16-30 April 1973

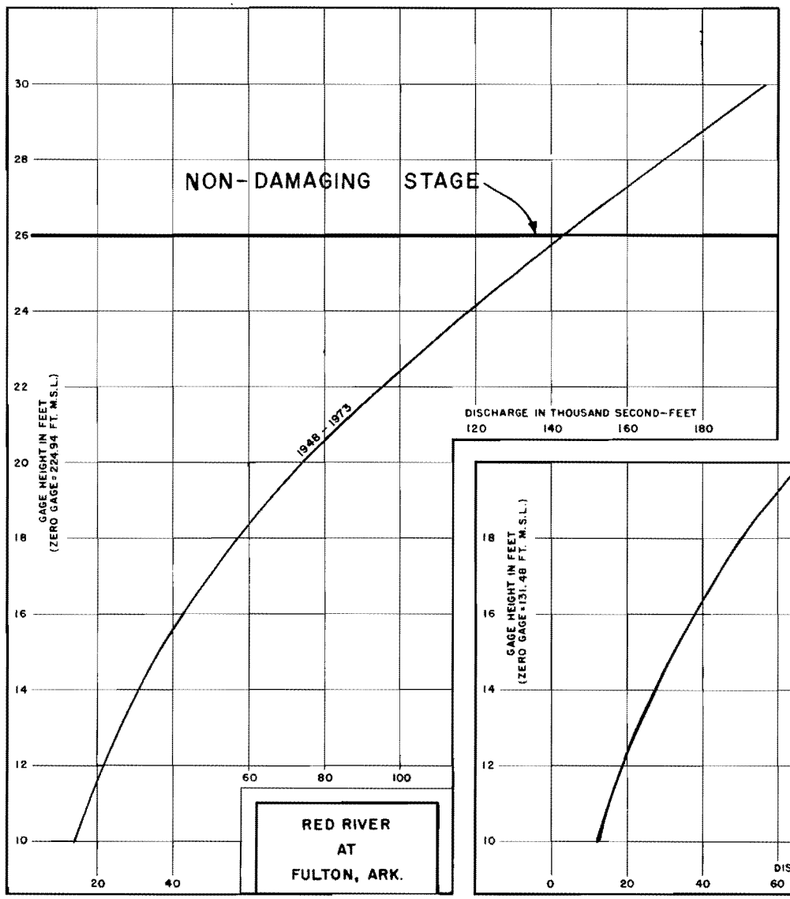
Computed by	Date	Checked by	Date

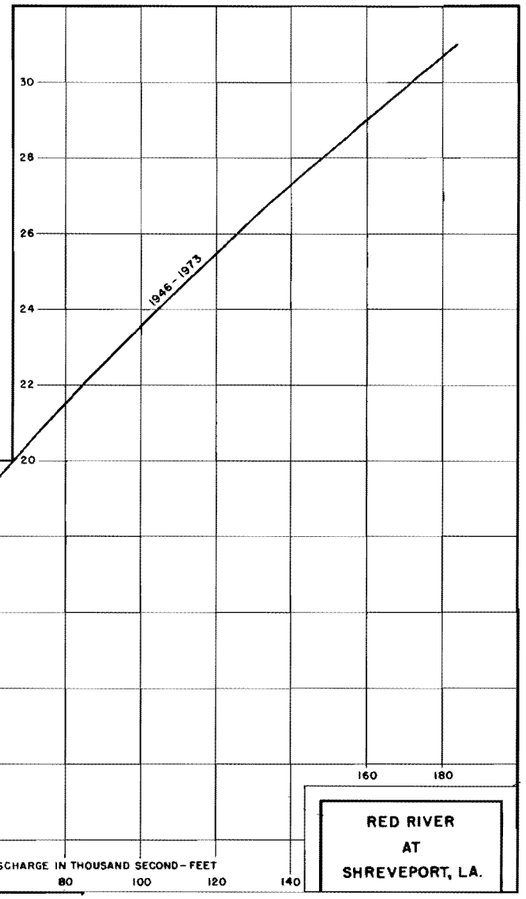
Date	Unregulated Discharge		Inflow S.F.D.	Total Storage S.F.D.	Pool Elevation In Feet
	At End of Day—C.F.S.	Total Daily S.F.D.			
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.	357		503	4,930	142.84
17.	630	493	1,404	5,840	143.50
18.	779	704	1,419	6,555	143.98
19.	907	843	1,576	7,288	144.43
20.	1,007	957	1,130	7,907	144.80
21.	921	964	427	7,370	144.48
22.	815	868	243	6,745	144.10
23.	704	759	205	6,190	143.73
24.	623	663	293	5,820	143.48
25.	809	716	1,610	6,714	144.08
26.	1,307	1,058	4,624	10,280	146.10
27.	1,510	1,408	3,475	12,346	147.10
28.	1,466	1,488	1,017	11,875	146.88
29.	1,362	1,414	359	10,820	146.36
30.	1,246	1,304	219	9,735	145.81
31.					

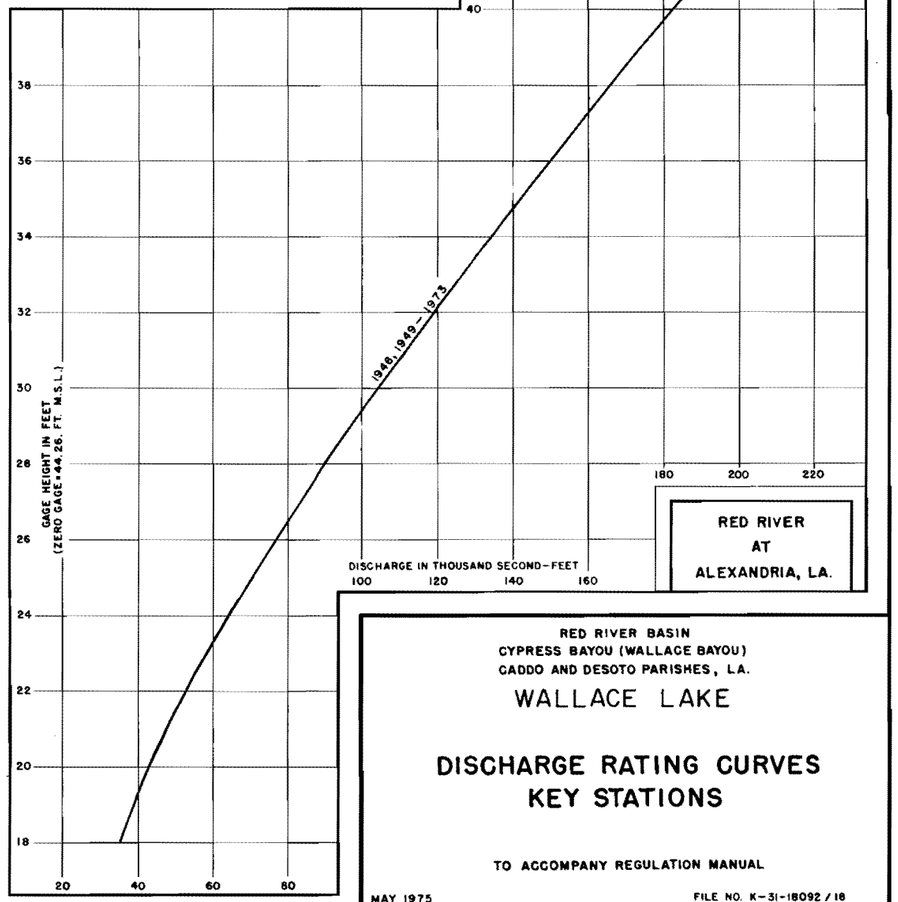












RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

WALLACE LAKE

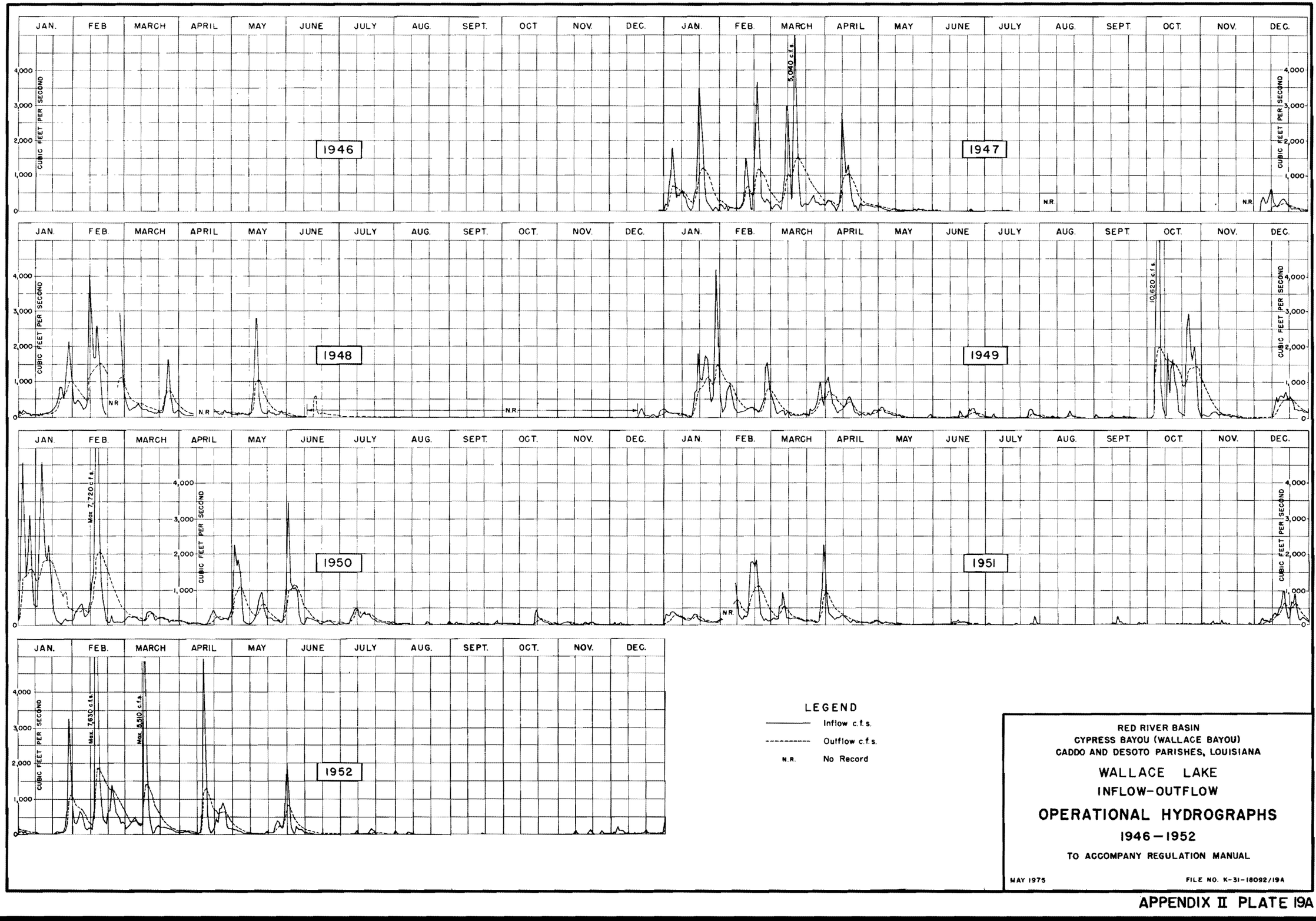
DISCHARGE RATING CURVES KEY STATIONS

TO ACCOMPANY REGULATION MANUAL

MAY 1975

FILE NO. K-31-18092/18

APPENDIX II PLATE 18



LEGEND

——— Inflow c.f.s.

---------- Outflow c.f.s.

N.R. No Record

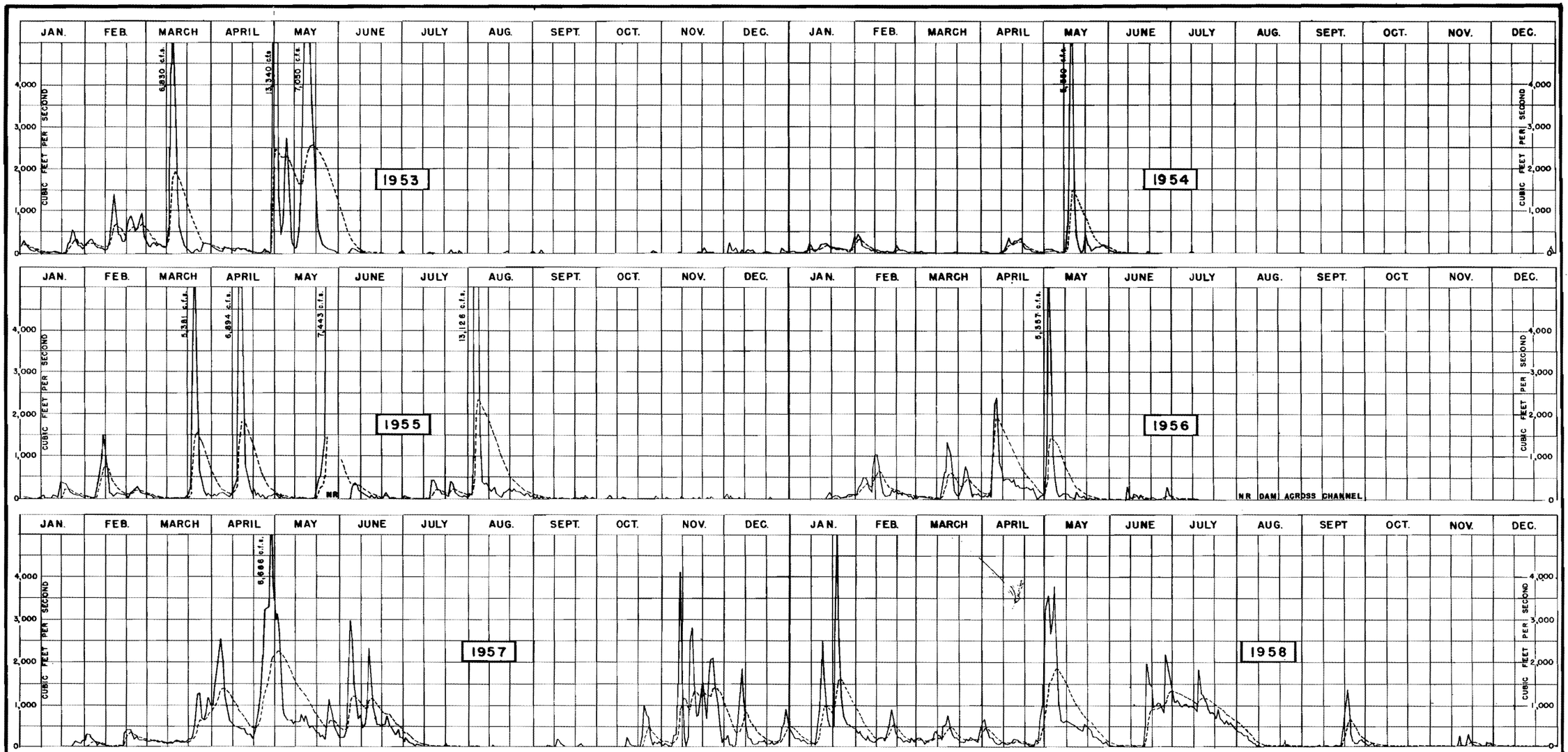
RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE
INFLOW-OUTFLOW
OPERATIONAL HYDROGRAPHS
1946—1952

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/19A

APPENDIX II PLATE 19A



LEGEND

——— Inflow c.f.s.

- - - - - - - - Outflow c.f.s.

N.R. No Record

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

INFLOW-OUTFLOW

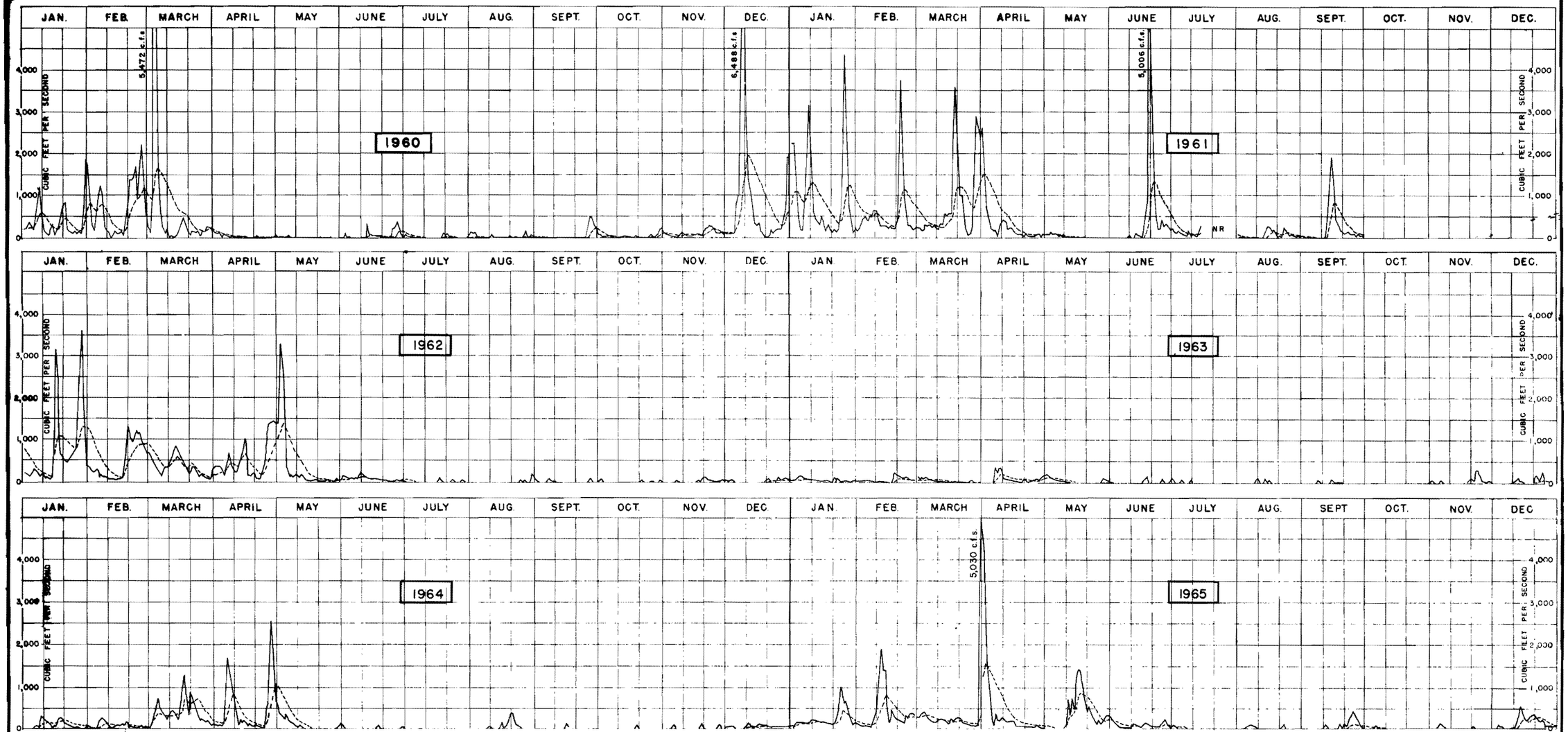
OPERATIONAL HYDROGRAPHS

1953 — 1959

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/198

APPENDIX II PLATE 19B



LEGEND

——— Inflow c.f.s.

- - - - - - - - Outflow c.f.s.

N.R. No Record

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

INFLOW-OUTFLOW

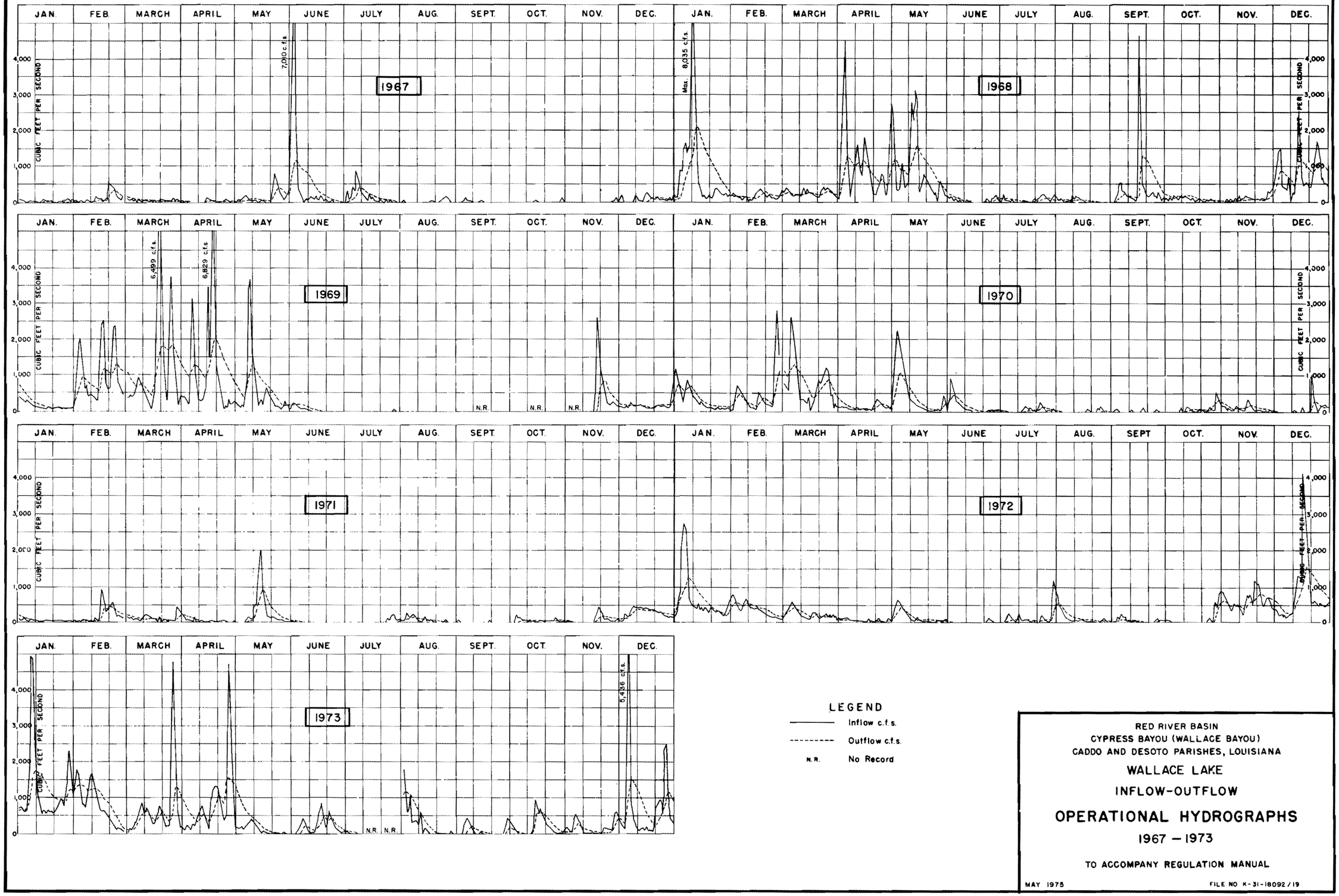
OPERATIONAL HYDROGRAPHS

1960 — 1966

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/19C

APPENDIX II PLATE 19 C



RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

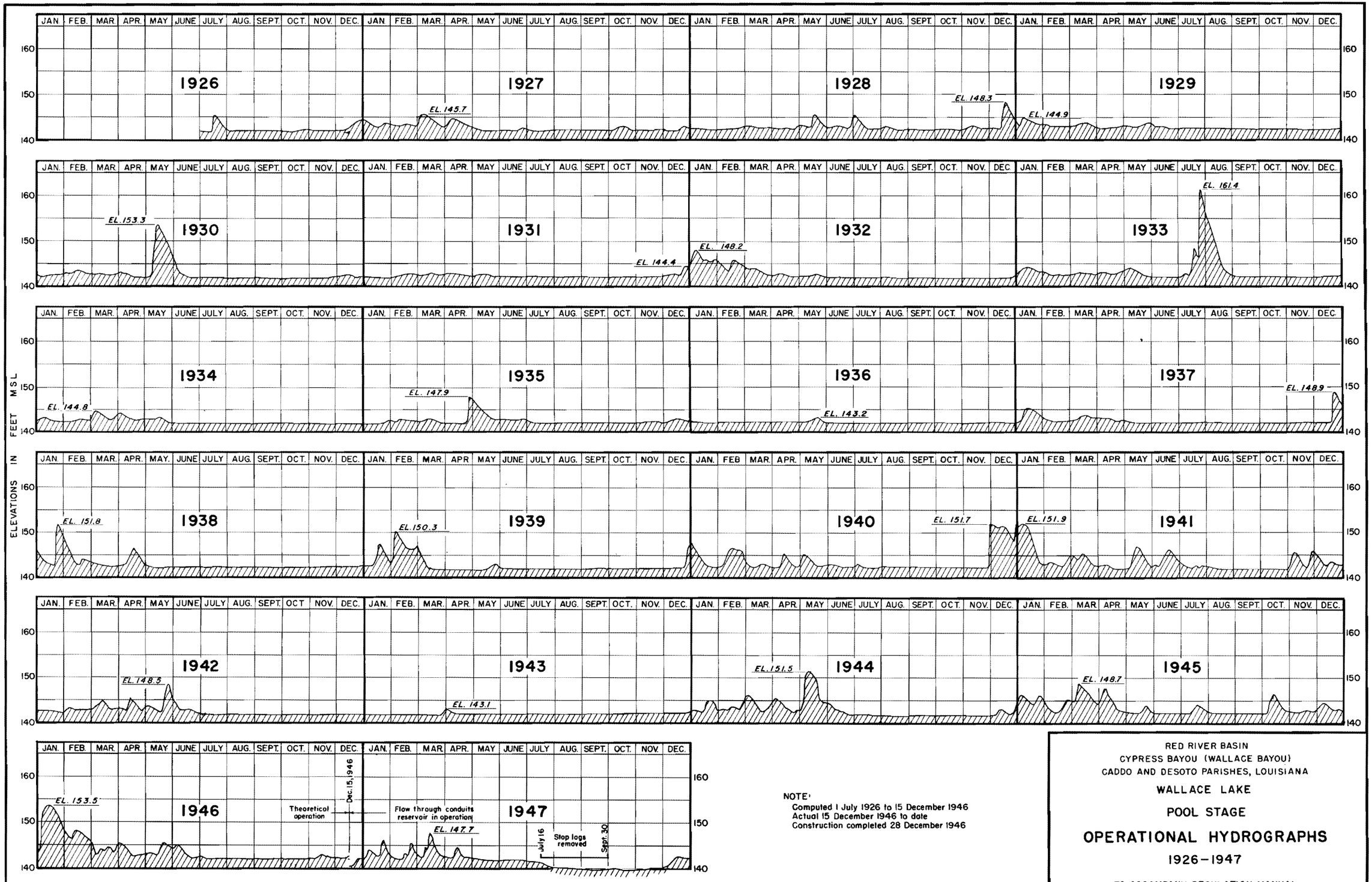
WALLACE LAKE
INFLOW-OUTFLOW
OPERATIONAL HYDROGRAPHS
1967 – 1973

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO K-31-18092/19

APPENDIX II PLATE 19 D

ELEVATIONS IN FEET MSL



NOTE:
Computed 1 July 1926 to 15 December 1946
Actual 15 December 1946 to date
Construction completed 28 December 1946

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

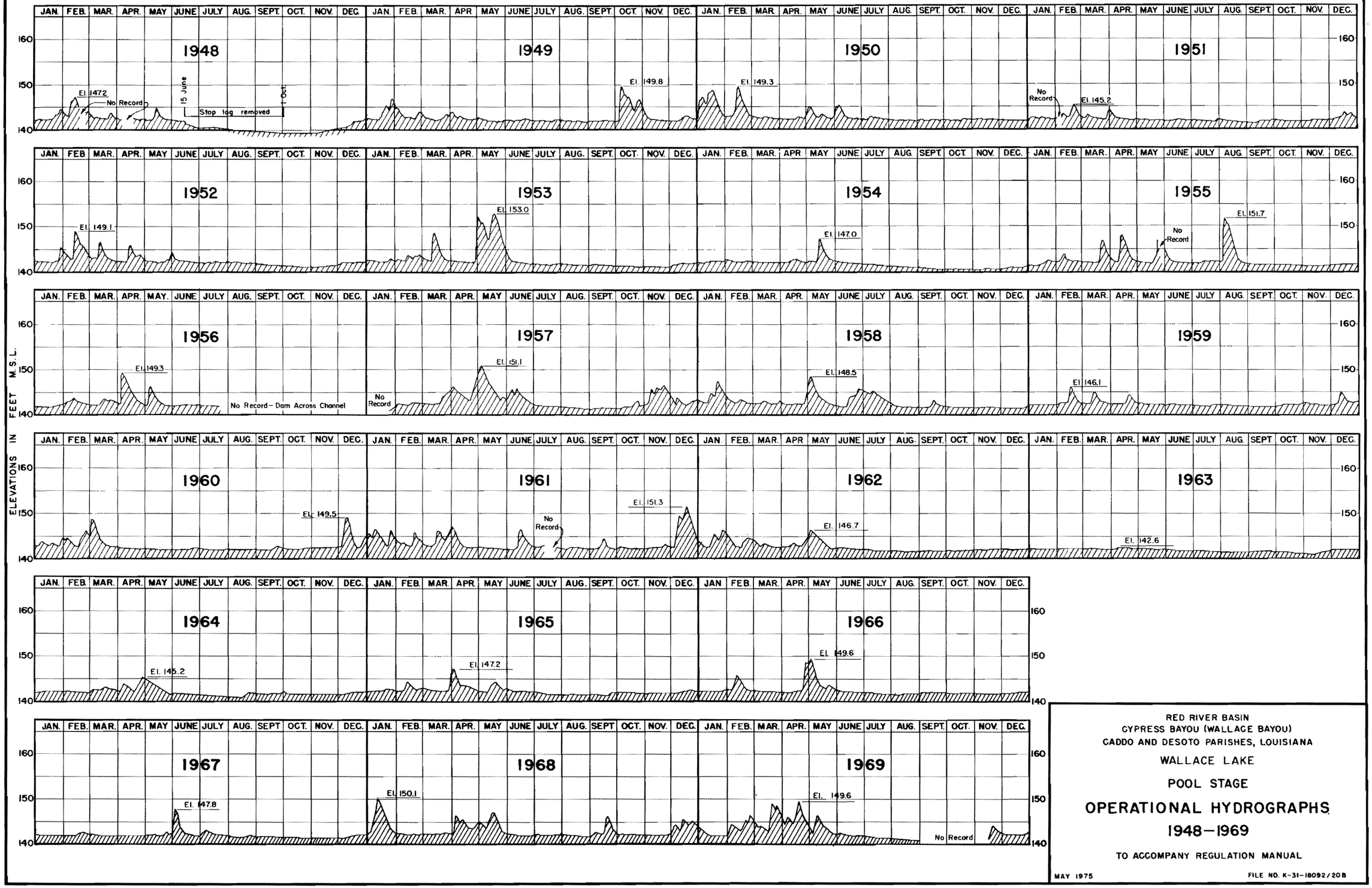
POOL STAGE

OPERATIONAL HYDROGRAPHS

1926-1947

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/20A



RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

POOL STAGE

OPERATIONAL HYDROGRAPHS 1948–1969

TO ACCOMPANY REGULATION MANUAL

MAY 1975

FILE NO. K-31-18092/208

APPENDIX II PLATE 20B

RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LOUISIANA

WALLACE LAKE

POOL STAGE

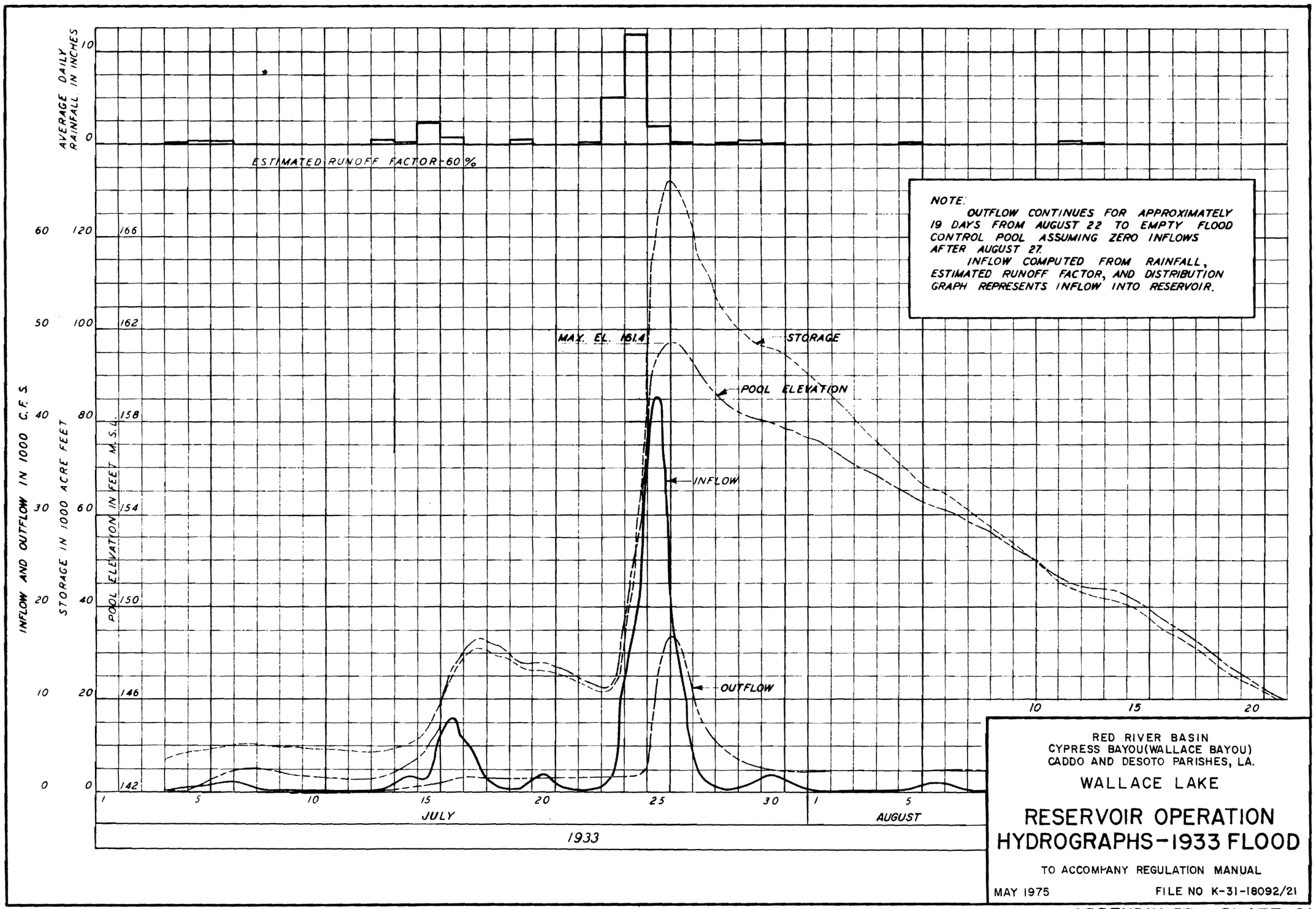
OPERATIONAL HYDROGRAPHS

1970 — 1973

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/20

APPENDIX II PLATE 20 C



RED RIVER BASIN
CYPRESS BAYOU(WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

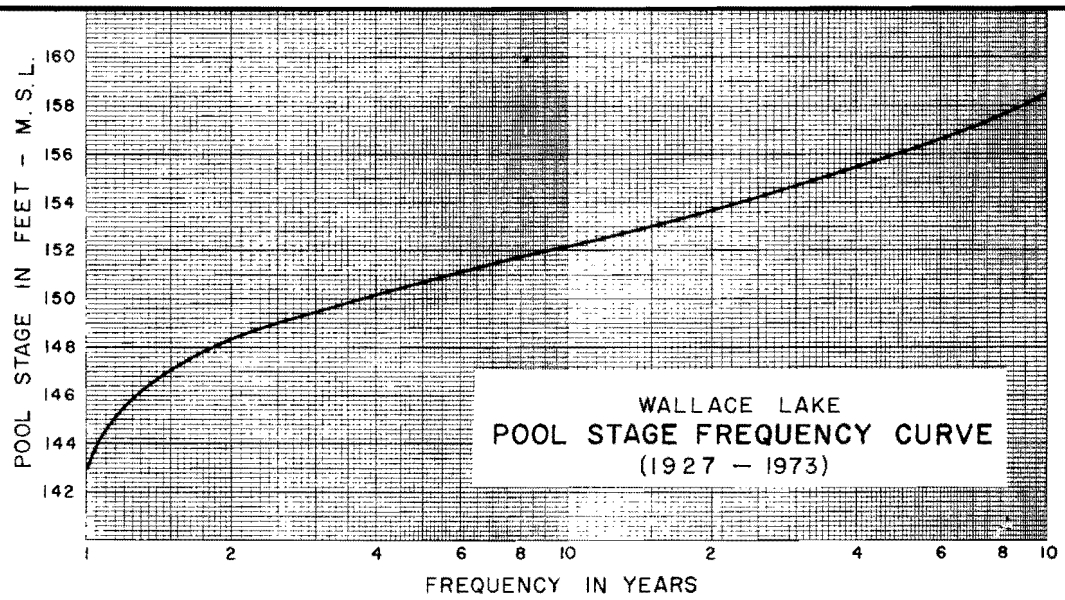
WALLACE LAKE

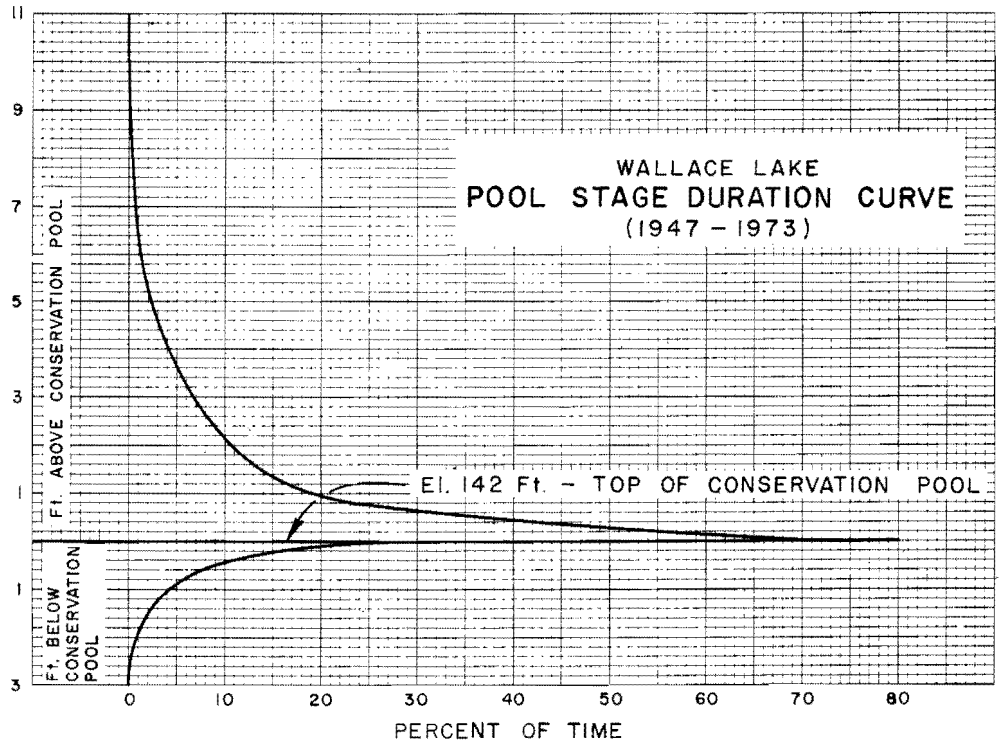
RESERVOIR OPERATION HYDROGRAPHS-1933 FLOOD

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO K-31-18092/21

APPENDIX II PLATE 21





RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

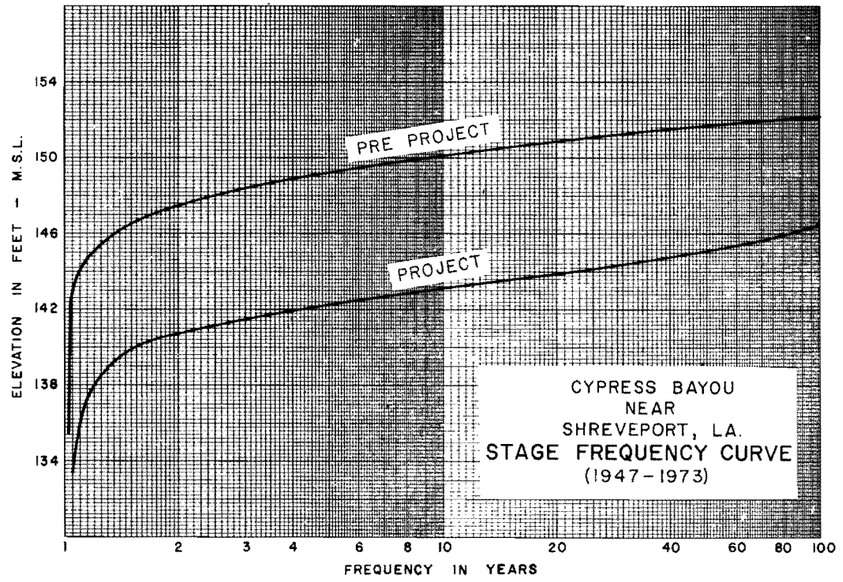
WALLACE LAKE

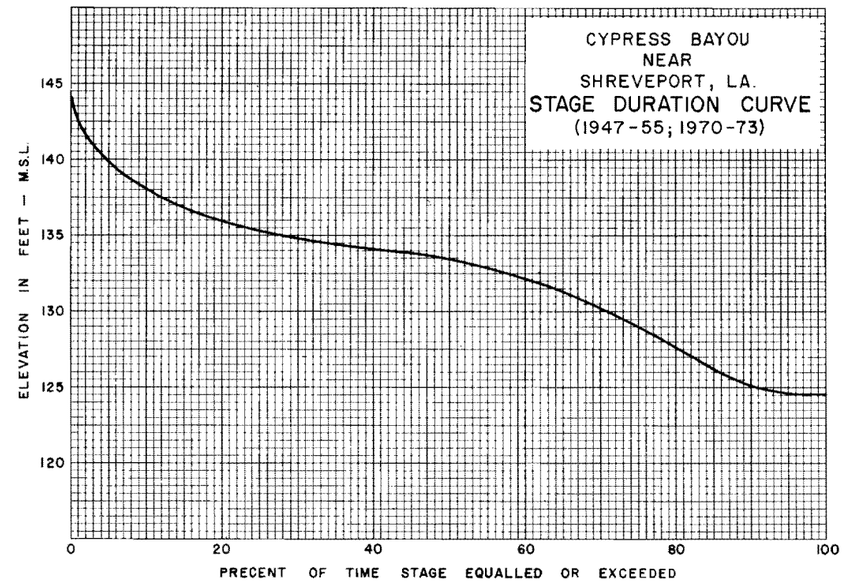
POOL STAGE FREQUENCY AND DURATION CURVES

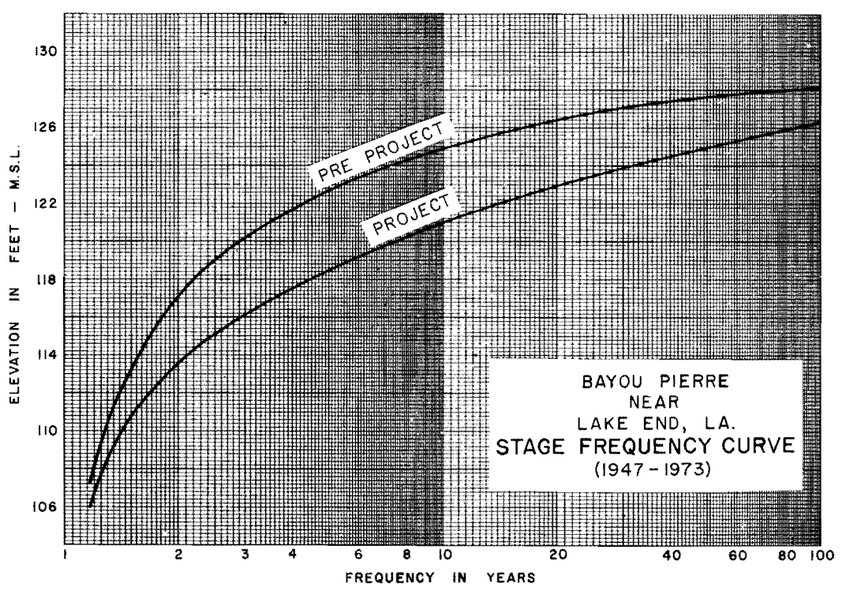
TO ACCOMPANY REGULATION MANUAL

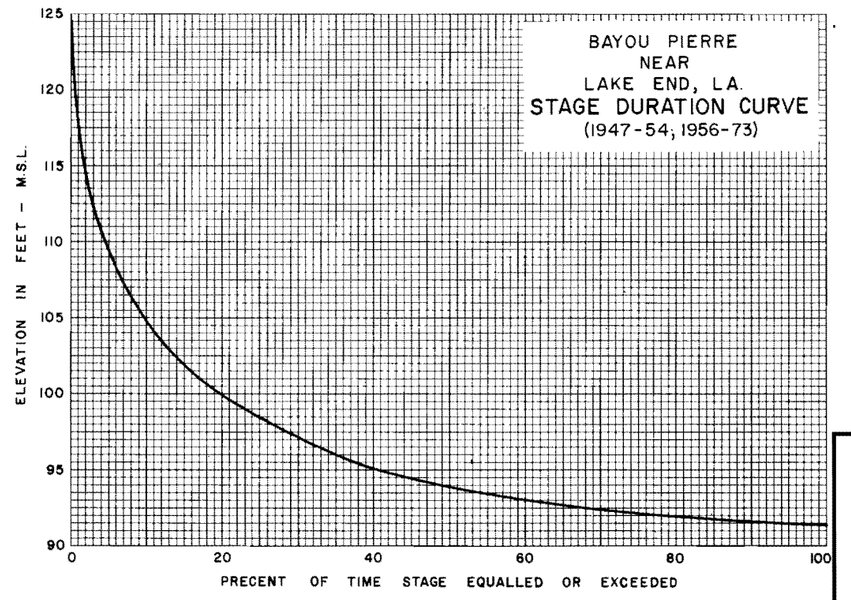
MAY 1975 FILE NO. K-31-18092/22

APPENDIX II PLATE 22









RED RIVER BASIN
CYPRESS BAYOU (WALLACE BAYOU)
CADDO AND DESOTO PARISHES, LA.

WALLACE LAKE
STAGE FREQUENCY AND DURATION CURVES

TO ACCOMPANY REGULATION MANUAL

MAY 1975 FILE NO. K-31-18092/23

APPENDIX II PLATE 23