US Army Corps
of Engineers ®

Fort Worth District

LEWISVILLE DAM AND LAKE
ELM FORK
TRINITY RIVER BASIN, TEXAS

WATER CONTROL MANUAL
APPENDIX D
MASTER RESERVOIR REGULATION MANUAL

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
FORT WORTH DISTRICT

SEPTEMBER 2018

ORIGINAL SEPTEMBER 1956
REVISED OCTOBER 1990
REVISED APRIL 1997

LEWISVILLE DAM AND LAKE

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be used in loose-leaf form, and only those sections or parts thereof requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current. All elevations referred to in this Water Control Manual, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to NAVD88 is: NGVD29 + 0.0 feet = NAVD88 for Lewisville Dam and Lake.

EMERGENCY REGULATION ASSISTANCE PROCEDURES

Assistance with the flood control regulations of Lewisville Dam will be provided during duty hours by the Fort Worth District Water Management Branch 817-886-1551. During non-duty hours, assistance can be obtained by contacting the Primary Regulator (817) 791-0973 cell number and in the order listed, one of the following persons:

EMERGENCY PERSONNEL ROSTER

Title and Name	Residence/Cell Telephone
Primary Regulator	817-791-0973
Chief, Water Resources Branch Redacted PII	817-886-1542
Chief, Water Management Section Redacted PII	817-886-1682
Chief, E&C Division Redacted PII	Redacted PII
Chief, Operations Division Redacted PII	Redacted PII
Manager, Trinity Regional Vacant	
Manager, Lewisville Lake Redacted PII	Redacted PII
Water Management, Southwestern Division–Dallas CESWD-RBT-W (Water Management and Infrastructure Safety) Chief, Redacted PII	Redacted PII
Hydraulic Engineer, Redacted PII	Redacted PII

LEWISVILLE DAM AND LAKE
TRINITY RIVER BASIN, TEXAS

TABLE OF CONTENTS

CHAPTER V – DATA COLLECTION AND COMMUNICATIONS NETWORKS

EXHIBITS

TABLES

TABLES (CONT'D)

PLATES

PLATES (CONT'D)

FIGURES

Pertinent Data – Lewisville Dam and Lake

(See Exhibit A for Supplementary Pertinent Data)

LOCATION: In Denton County, R.M. 30.0 on the Elm Fork of the Trinity River, 2.4 miles northeast of Lewisville, Texas, and 22 miles northwest of Dallas, Texas.

DRAINAGE AREA:

1,660 square miles (total);	
One inch of runoff	88,533 acre-feet
968 square miles (below Ray Roberts Dam)	
One inch of runoff	51,627 acre-feet

DAM:

Type:	Rolled earth fill
Length (including spillway):	32,888 feet
Maximum Height:	125 feet
Top Width:	20 feet

SPILLWAY:

Crest Elev.:	532.0 feet NGVD29
Width:	560 feet
Type:	Ogee

POWER FEATURE:

Units:	1-2,892 KW

INFLOW:

Spillway Design Flood peak, cfs (1947 Study)	633,200
Spillway Design Flood volume, ac-ft (1947 Study)	1,815,000
Spillway Design Flood runoff, inches (1947 Study)	20.30
Probable Maximum Flood peak, cfs (2017 IDF Study)	1,070,368
Probable Maximum Flood volume, ac-ft (2017 IDF Study)	2,956,691
Probable Maximum Flood runoff, inches (2017 IDF Study)	33.31

OUTFLOW:

Total peak outflow, cfs (1951 Study at Max Design Water Surface)	216,800
Probable Maximum Flood total, cfs (2017 IDF Study)	218,347

OUTLET WORKS:

Type:	One conduit with three inlets
Dimensions:	16 feet diameter
Invert Elev:	448.0 feet NGVD29
Control:	3 Broome-type gates, 6.5 feet x 13 feet

LOW FLOW OUTLET:

Type:	Two steel pipes
Dimensions:	60 inches diameter
Lowest Invert Elev:	481.0 feet NGVD29
Control:	48 inches valve on each pipe

Feature	Elev Feet* (NGVD29)	Reservoir Area (acres)	Reservoir Capacity		Spillway Capacity (cfs)	Outlet Works Capacity (cfs)	Low Flow Outlet Capacity (cfs)
			Accumu-lative (ac-ft)	Runoff (inches)			
Top of Dam	560.0						
PMF Water Surface (2017 IDF Study)	554.10	67,073	2,082,608	23.52	218,347		
Max. Design Water Surface (1951 Study)**	553.0	66,100	2,051,200	23.34	216,800	12,600	
Top of Flood Control Pool and Spillway Crest (1965 Survey)	532.0	39,168	981,763	11.09		10,700	
Top of Conservation Pool (2007 Survey)	522.0	27,175	598,902	7.24		10,100	
Invert of Low Flow Outlet (lowest) (2007 Survey)	481.0	4,410	35,674				
Invert of Floodwater Outlet Works (2007 Survey)	448.0	0	0				
Streambed (2007 Survey)	435.0	0	0				

* The elevations listed on the pertinent data sheet is based on the datum of NGVD29. The datum conversion from NGVD29 to NAVD88 is: NGVD29 + 0.0 feet = NAVD88.

**The 1947 DPR Maximum Design Water Surface was 553.0 feet. The 1951 study modified the spillway from 600 to 560 feet wide, not computing a new Design Water Surface elevation. The maximum spillway flow was adjusted, however, from 219,100 to 216,800 cfs.

AUTHORIZATION: Federal River and Harbor Act of 2 March 1945 (PL 79-14); Permit No. 1476 (A-1579) Jan 20, 1949; Permit No. 1706 (A-1590) 17 June 1954; PL 84-329 (HR 6102) Approved 9 Aug 1955; Federal River and Harbor Act of 1965 (PL 89-298).*

FINAL PROJECT COST:

Federal:	$25,826,000.00
Non-Federal:	Not Available
Total:	$25,826,000.00

ANNUAL O&M COST (FY 14):

Federal:	$3,233,800
Non-Federal:	$423,637
Total:	$3,657,437

COST ALLOCATION METHOD: Separable costs – remaining benefits

LOCAL AGENCY: The Cities of Dallas and Denton

LAND ACQUISITION:

	: Guide Contour (NGVD29)	: Area (Acres)
Fee Simple	537.0	45,533
Easement		5,746
Total		51,279

FLOOD DATA:

Date	Peak Inflow*** (cfs)
April 1957	113,000
October 1974	104,500
October 1981	284,000
May 1982	286,000
June 1989	80,000
May 1990	235,000
December 1991	82,000
May 2015	110,000

Bankfull capacities: Elm Fork, Lewisville Dam to Carrollton gage - 8,000 cfs; Carrollton Gage to mouth of Elm Fork Trinity River - 8,000 cfs

***Inflows based on hourly changes in storage.

STATUS OF PROJECT: Construction began 28 Nov 1948. Main dam and spillway completed in Aug 1955. Deliberate impoundment started 1 Nov 1954. Project is complete and operational.

**NON-FEDERAL PARTICIPATION AND LOCAL COOPERATION:
The Cities of Dallas and Denton have water supply storage contracts dated 18 May 1953 and 10 December 1953 for 415,000 ac-ft and 21,000 ac-ft respectively below elevation 515.0 NGVD29. Additional contracts approved16 September 1980 entitle the City of Dallas to 131,400 ac-ft and the City of Denton to 46,200 ac-ft between elevations 515.0 NGVD29 and 522.0 NGVD29. The City of Lewisville has contracted with the City of Dallas for water supply withdrawals from Lewisville Lake.

REMARKS: *Federal River and Harbor Act 2 March 1945 (PL 79-14) authorized the initiation of the project. PL 84-329 authorized the name change from "Garza - Little Elm" to "Lewisville" dam. PL 89-928 authorized the modification of Lewisville Lake.

HYDROPOWER FACILITIES:
The City of Denton installed a hydropower facility at Lewisville Dam. The construction of the hydropower facility was completed on 23 Oct 1991. The facility consists of one Horizontal S-shaped Kaplan Unit capable of producing 2,892 Kilowatts. The unit is a Run-of-river facility, where downstream water supply and small flood releases will be used to generate power. The hydropower facility is connected to the Brazos River Authority distribution network. Power and energy marketed by Garland Power & Light. Power distributed by Brazos Electric Power Cooperative, Inc., Waco, Texas.

Dependable Yield: 123 cfs or 79.5 MGD (1), based on 1985 conditions.

Dependable Yield: 110 cfs or 71 MGD (1), based on 2085 conditions.

(1) The Combined yield from Ray Roberts-Lewisville Lakes system was 275 cfs under 1985 condition and would be 249 cfs under 2085 conditions.

Annual Visitation (10-year average projected, 2002-2012): 3,186,554

Shoreline at top of conservation pool: 250 miles

LEWISVILLE DAM AND LAKE
ELM FORK TRINITY RIVER, TEXAS
WATER CONTROL MANUAL

CHAPTER I – INTRODUCTION

1-01. Authorization. This manual is submitted as required by Engineering Regulation (ER) 1110-2-240, Water Control Management, dated 30 May 2016, and is prepared in accordance with ER 1110-2-8156, Engineering and Design, Preparation of Water Control Manuals, dated 31 August 1995.

1-02. Purpose and Scope. The purpose of this manual is to document the Lewisville Dam and Lake Regulation plan. This manual also provides a concise reference source for higher authority personnel who will be concerned with or responsible for reservoir regulations during the life of the project. This manual also includes the regulation plan for Lewisville Dam and Lake and the background material necessary to understand the purpose and application of the plan. Lewisville Dam and Lake were originally identified as "Garza-Little Elm Dam and Reservoir".

1-03. Related Manuals and Reports. This manual is Appendix D to the Trinity River Basin Water Control Master Manual. The initiation and partial construction of Lewisville Dam and Lake on the Trinity River was authorized by the River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session). The River and Harbor Act of 1945 was approved in accordance with recommendations made by the Chief of Engineers contained in House Document Number 403 (77th Congress, 1st Session). Authority to initiate advance planning is contained in a letter by the Chief of Engineers to the Division Engineer, Southwestern Division (SWD), dated 2 April 2 1945, subject "Advance Planning of River and Harbor Projects Authorized in the Act Approved 2 March 1945". The preliminary examination titled "Preliminary Report on Hydrology of Elm Fork Trinity River and Spillway Design Flood for Garza-Little Elm Dam and Reservoir" was published on February 1947. The Definite Project Report for Lewisville Dam was submitted to the Chief of Engineers in October 1947. Public Law 329, 84th Congress, 1st Session changed the name of the dam from "Garza-Little Elm" to "Lewisville" dam. Congressional authority for the modification of Lewisville Lake including the construction of Ray Roberts Lake (formerly Aubrey Lake) is contained in the River and Harbor Act of 1965 (PL 89 298) in accordance with the total plan of improvements for the Trinity River as presented in House Document No. 276 (89th Congress, 1st Session). In September 1956, the Fort Worth District (SWF) of the United States Army Corps of Engineers (USACE) published a reservoir regulation manual for Lewisville Dam and Lake. The manual contains plans and procedures for regulation of the reservoir during both normal and flood conditions. In addition, portions of the September 1956 Lewisville Lake Water Control Manual were revised in October 1990 and April 1997.

The reports and design memorandums important to the regulation of Lewisville Dam and Lake are listed in Table 1-1.

TABLE 1-1

Related Manuals and Reports for Lewisville Dam and Lake

	Title	Date
1.	Preliminary Report on Hydrology of Elm Fork Trinity River, and Spillway Design Flood for Garza-Little Elm Dam and Reservoir	February 1947
2.	Preliminary Report on Investigation of Proposed Reservoirs for Flood Control and Water Conservation on Elm Fork Trinity River	March 1947
3.	Definite Project Report	October 1947
4.	Design Memorandum for the East Portion of Embankment Garza-Little Elm Dam and Reservoir	August 1949
5.	Real Estate Planning Report, Part I	September 1949
6.	Analysis of Design for Construction of Outlet Works Garza-Little Elm Dam and Reservoir	September 1950
7.	Real Estate Planning Report, Part II	January 1950
8.	Design Memorandum for Construction of Spillway Garza Little Elm Dam and Reservoir	November 1951
9.	Design Memorandum for Reservoir Clearing Garza-Little Elm Dam and Reservoir	September 1952
10.	Design Analysis for Completion of Embankment and Construction of Service Bridge	September 1952
11.	Plan for Reservoir Regulation - Garza-Little Elm Reservoir	September 1956
12.	Draft Master Plan	September 1959
13.	Report of Sedimentation Resurvey Garza-Little Elm Reservoir	April 1960
14.	Design Memorandum No. 1C - Updated Master Plan	April 1966
15.	Aubrey Lake - Design Memorandum No. 1 - Hydrology - Supplement No. 1 - Supplement No. 2 - Supplement No. 3	August 1972 February 1973 September 1973 October 1974
16.	Revised Design Memorandum No. 1C - Updated Master Plan	January 1973
17.	Design Memorandum No. 2 - Real Estate Addition Reservoir Land	October 1973
18.	Environmental Impact Statement - Lewisville Lake	December 1973
19.	Aubrey Lake - Design Memorandum No. 5 - Embankment and Spillway	July 1974
20.	Revised Aubrey Lake - Design Memorandum No. 5 - Embankment and Spillway	June 1976
21.	Report on Sedimentation - Lewisville Lake - Resurvey of September 1965	July 1975
22.	Aubrey Lake - Design Memorandum No. 6 - Outlet Works	September 1976

TABLE 1-1

Related Manuals and Reports for Lewisville Dam and Lake (CONTINUED)

	Title	Date
23.	Design Memorandum No. 3 - Lewisville Dam - Modification of Embankment	October 1976
24.	Reconnaissance Report - Lewisville Dam - Modification of Embankment	June 1977
25.	Design Memorandum No. 3 - Lewisville Dam - Modification of Embankment Supplement No. 1	April 1979
26.	Spillway Design Flood Study - Lewisville Lake	August 1981
27.	Reconnaissance Report - Adding Hydropower to Lewisville Dam	September 1981
28.	Design Memorandum No. 3 - Lewisville Dam - Modification of Embankment - Supplement No. 2	November 1982
29.	Dam Safety Assurance Study - Lewisville Lake - Hydrology and Hydraulics (With Ray Roberts)	March 1983
30.	Lewisville Lake - Operation and Maintenance Manual - Volume II - Flood Emergency Plan	June 1984
31.	Design Memorandum No. 1C - Master Plan Lewisville Lake	June 1985
32.	Drought Contingency Plan - Trinity River Basin, Texas - (including Lewisville Lake)	August 1991
33.	Ray Roberts Lake - Operation and Maintenance Manual - Flood Emergency Plan	February 1993
34.	Flood Insurance Study - Denton County, Texas - Unincorporated Areas - Revised	June 1994
35.	Water Quality Report - Lewisville Lake	February 1996
36.	Sediment Survey of 2007 TWDB	December 2008
37.	Periodic Inspection Report #10	November 2014
38.	Dam Safety Modification Report (DSMR)	March 2017

1-04. Project Owner. USACE-SWF owns and operates Lewisville Dam and Lake.

1-05. Operating Agency. USACE-SWF is the operating agency for Lewisville Dam and Lake. The Lake Manager at Lewisville Dam has the responsibility for its operations and management of the lake. The Fort Worth District Engineer, through the Water Resources Branch of the Engineering and Construction Division, directs water control activities.

The City of Denton, Texas was given a license by the Federal Energy Regulatory Commission for the operation of a 5 megawatt or less hydroelectric power project. The city is responsible for the operation and maintenance of the hydropower plant.

The project is staffed during normal working hours throughout the year. The Lake Manager at Lewisville Dam has the responsibility for its operations. Park Rangers are also available on holidays and weekends to provide assistance with the lake operations. The project will be staffed 24 hours a day when the lake level is, or is forecast to rise above elevation 530.0 feet.

The Lake Manager will have a current list of the Water Resources Branch personnel including home telephone numbers to contact when necessary. The Lake Manager will furnish the Water Resources Branch a list of project personnel, giving their office and home telephone numbers. The Lake Manager resides as close to the project as is considered prudent to carry out his official duties.

1-06. Regulating Agencies. USACE is the regulatory agency for Lewisville Dam and Lake. The regulation of the dam is the responsibility of the Water Resources Branch of the Engineering and Construction Division, Fort Worth District.

CHAPTER II – DESCRIPTION OF PROJECT

2-01. Location. Lewisville Dam and Lake are located on the Elm Fork of the Trinity River at river mile 30. The dam site is approximately 2.4 miles northeast of Lewisville, Texas, and 22 miles northwest of Dallas, Texas. The dam site is located within the Trinity River Basin, Denton County, Texas. The total drainage area above Lewisville Dam is 1,660 square miles. The location of the dam and lake are shown on Plates 2-1a and 2-1b, respectively.

2-02. Purpose. Lewisville Dam and Lake are a multi-purpose project used for flood control, water supply, hydropower, fish and wildlife, and recreation. The project is a unit of the Trinity River Basin System, which consists of eight USACE lakes and various channel improvements and levees operated to provide flood protection along the Trinity River. Lewisville Dam and Lake operates in conjunction with Ray Roberts Dam on the Elm Fork of the Trinity River to provide flood control for the lower Elm Fork Trinity River and the mainstem Trinity River through Dallas and downstream. The lake provides water supply to the city of Denton, city of Dallas, and surrounding areas. An aerial view of Lewisville Dam is shown in Figure 2-1.

Figure 2-1. Aerial View of Lewisville Dam

2-03. Physical Components. Lewisville Dam consists of a compacted earthfill embankment, an uncontrolled concrete ogee spillway, outlet works, and hydropower facility. The total length of the dam is 32,888 feet including the uncontrolled spillway area. The general plan of the embankment and spillway is shown on Plate 2-2. Additional information on Lewisville Dam and

Lake is provided in Exhibit A, Supplementary Pertinent Data.

a. Embankment. The embankment consists of a 32,328 feet long rolled, earthfill embankment not including the spillway. The maximum height of the embankment is 125 feet. The top width of the crest is 20 feet. The top of the dam section is at elevation 560.0 feet. The embankment is essentially a homogeneous fill constructed of impervious clays and shales. The portion of the embankment between station 163+70 and station 328+88 was constructed with shale from the spillway excavation and the remaining portion of the embankment was constructed with clay materials from borrow areas. Side slopes on most of the original embankment are between 1V to 2H and 1V to 4H. The upstream face of the original embankment was protected by riprap. Approximately two feet of riprap was placed on a crushed rock filter. Two drainage blankets, three feet thick, are located under the embankment. The blankets start at the toe of the downstream embankment and extend horizontally 200 feet into the dam. The first blanket extends from station 79+07 to station 177+70, the second blanket is from station 210+70 to station 241+30.

From 1966 to 1984, a total of 28 significant slides have occurred on both the upstream and downstream sides of the embankment. All of the slides have occurred between station 174+20 and station 271+91. Subsequently, the upstream face was modified and repaired between stations 172+00 and 192+50, and between stations 214+00 and 242+50. This was done by placement of dumped fill below elevation 518.0 feet on a 1 to 4 slope. Uncompacted fill was placed on a 1 to 8 slope between elevations 518.0 and 537.0 feet. Modification to the upstream embankment included placement of uncompacted fill on a 1 to 8 slope from existing ground to the top of the dam from station 243+50 to station 277+90. The downstream face of the embankment between stations 175+00 and 242+20 was modified by the placement of compacted fill below elevation 530.0 feet on a slope of 1 to 4. Further modifications included placement of compacted fill from elevation 530.0 feet to the top of dam on a slope of about 1 to 3.2.

Prior to raising the conservation pool elevation, the riprap on the upstream face of Lewisville Dam was repaired and improved. The thickness of the riprap blanket was increased from 24 inches to 36 inches between elevation 516.0 and 538.0 feet to accommodate the raised conservation pool and corresponding wave heights. The typical sections of embankment are shown on Plate 2-3. The upstream and downstream views of embankment are shown in Figure 2-2, 2-3 and 2-4, respectively.

In June 2015, another significant slide occurred. Figure 2-5 shows the embankment slide of 2015 flood. This significant skin slide occurred on the lake side embankment from Station 181+50 to 183+50. This slide occurred due to the Lewisville Lake watershed receiving record rainfall from April to June. The heavy rains in May also caused the lake level to rise to a new record pool level of elevation 536.86 on May 30th. This high pool level and subsequent rains caused a major lake side skin slide of 162 feet wide to occur on June 23rd on the lake side from the roadway down to the lake's edge. An immediate emergency fix was implemented to cover the skin slide with plastic sheathing to keep additional rainfall from seeping into the slide. After the flooding

subsided, a contract was awarded to make repairs to this slide and other small boils that occurred from the high pool elevations and subsequent heavy rainfalls that had occurred in the spring of 2015.

Figure 2-2. Upstream Side of Embankment

Figure 2-3. Upstream Side of Embankment

Figure 2-4. Downstream Side of Embankment

Figure 2-5. Embankment Slide of August 2015 Flood

b. Spillway. The spillway consists of a 560 feet wide uncontrolled ogee weir with a crest at elevation 532.0 feet and a 1300 feet long approach channel. Flow over the spillway discharges into a 3,200 feet long pilot channel. The spillway was modified by extending the concrete spillway apron 60 feet downstream. The discharge capacity of the spillway is 216,800 cubic feet per second (cfs) when the water surface elevation is at 553.0 feet. The spillway plan and sections are shown on Plate 2-4. The spillway apron is shown on Plate 2-5. The top of spillway and spillway with water flowing over are shown in Figures 2-6 and 2-7, respectively.

Figure 2-6. Top of Spillway

Figure 2-7. Top of Spillway

c. Outlet Works. The outlet works consist of an approach channel, an intake structure, a 16-foot diameter concrete conduit through the dam, stilling basin and a discharge channel. The discharge conduit is 532 feet long and passes through the embankment at station 149+16. The intake structure is equipped with gates and a trash rack. The conduit discharge is controlled by three 6.5 feet by 13 feet broome type gates with sills at invert elevation of 448.0 feet. Each gate is operated by a two speed cable drum hoist capable of raising the gate at 1.5 and 3 feet per minute. The hoists and their controls are located on the operation deck of the intake tower. When necessary, one gate may be replaced by an emergency gate operated by an overhead traveling crane. Plate 2-6 shows the outlet structure plan and sections. The intake structure sections are shown in Plate 2-7. The intake structure and access bridge are shown in Figures 2-8 and 2-9. The outlet conduit is shown in Figure 2-10, and the outlet discharge tunnel is shown in Figure 2-11.

Figure 2-8. Intake Tower

Figure 2-9. Intake Tower and Access Bridge

Figure 2-10. Outlet Conduit

Figure 2-11. Outlet Discharge Tunnel

d. Stilling Basin. The stilling basin is 75 feet long and 50 feet wide. The elevation of the conduit invert at the exit portal is 445.8 feet and the floor of the stilling basin is at elevation of 438.8 feet. The basin has two rows of baffle blocks and an end sill to assist in the dissipation of kinetic energy and reduce erosion velocities in the existing downstream channel. The stilling basin plan and section are shown on Plate 2-8. The stilling basin and downstream view of the discharge channel are shown in Figure 2-12.

e. Low Flow System. The low flow system is primarily used for water supply releases. The low flow system consists of four intake gates, two wet wells in the intake tower, and two 60-inch diameter steel pipes. Intakes to the wet wells are located at different elevations, allowing for selective withdrawals to control outflow temperature and water quality.

Inverts to two of the four intakes to the wet wells are at elevation 481.0 feet. The other two invert intakes are at elevations 496.0 feet and 503.0 feet. Inlet sluice gates are operated either by hand or by use of a portable electric gate hoist. The normal position of the inlet gates is either closed or fully opened. The 60-inch diameter low flow pipes are located at each side of and parallel to the 16 foot diameter conduit. Low flow control is provided by two 48 inch butterfly valves located near the discharge ends of the low flow pipes and the stilling basin. The low flow pipes were modified to allow the flow to be diverted through the hydropower facilities. The low flow vault is shown in Figure 2-13.

At the top of the flood control pool (elevation 532.0 feet) the maximum low flow discharge is approximately 530 cfs. Refer to Plate 7-8 for more details.

Figure 2-12. Stilling Basin and Discharge Channel

Figure 2-13. Low Flow Vault

f. Hydropower Facilities. The hydropower facility at Lewisville Dam is named the Lewisville Hydroelectric Power Plant. The city of Denton was given a license by the Federal Energy Regulatory Commission (FERC) on 27 March 1984 for the construction and operation of a 5 megawatt or less hydroelectric power project to be located contiguous to the outlet works. The construction of the hydroelectric facility at Lewisville Dam was completed on 23 October 1991. The basic components of the hydroelectric facility include a powerhouse, penstock, tailrace, and an electrical distribution line. The power is produced by one type horizontal S-shape, Kaplan turbine capable of a maximum output of 2,892 kilowatts (KW) with a head of 76 feet. Plates 2-9 and 2-10 show the hydropower facilities and the plan/sectional view of the low flow connection into the powerhouse at Lewisville Dam.

g. Water Supply Facilities. The cities of Denton and Lewisville have water intake facilities located at Lewisville Lake. The city of Denton's intake structure is located at Hickory Creek Arm. The city of Lewisville's intake structure is located at the west end of the Lewisville Dam embankment. Water supply releases for the city of Dallas are made through the low flow system and/or the hydropower facilities. Provisions have been made for tying into the outlet ends of the low flow pipes by 60-inch and 12-inch flanged connections for future water uses. The city of Lewisville's intake pumping station is shown in Figure 2-14.

The cities of Dallas and Denton have contracts with the USACE for the use of Lewisville Lake conservation storage below elevation 515.0 feet, dated 18 May 1953 and 10 December 1953 respectively. The city of Dallas is entitled to an undivided 95.2 percent of the storage space between elevation 481.0 and 515.0 feet (estimated to be 415,000 acre-feet) and the city of Denton is entitled to the remaining undivided 4.8 percent of the storage (estimated to be 21,000 acre-feet). The city of Lewisville has contracted with the city of Dallas for water supply withdrawals from Lake Lewisville.

Since the construction of Ray Roberts Dam and the raising of the conservation pool elevation at Lewisville Lake from 515.0 feet to 522.0 feet, the cities of Dallas and Denton have contracted for additional water supply storage volume in Lewisville Lake. These contracts are dated 15 August 1980, and were approved by the USACE on 16 September 1980. The contracts entitle the city of Dallas to an undivided 74 percent of the storage space between elevation 515.0 and 522.0 feet (estimated to be 134,400 acre-feet). The city of Denton is entitled to the remaining undivided 26 percent of the conservation pool storage between elevation 515.0 and 522.0 feet (estimated to be 46,200 acre-feet).

Figure 2-14. Pumping Station for city of Lewisville

2-04. Related Control Facilities. The Lewisville Dam and Lake Project is part of the USACE master plan for flood control on the Trinity River and its tributaries. The plan presently consists of eight USACE dam and lake projects and various channelization and levee projects operated to control floods on the Trinity River Basin System. Another unit of the system, Ray Roberts Dam, is located on the Elm Fork of the Trinity River 30.0 miles upstream of Lewisville Dam. The construction of Ray Roberts Dam and subsequent transfer of flood control storage allowed the conservation pool of Lewisville Lake to be raised from 515.0 feet to 522.0 feet. This increased the "year 2080 estimated conservation storage" from 367,000 acre-feet to 618,400 acre-feet at Lewisville Lake. Lewisville Dam controls 1,660 square miles of this drainage area including the 692 square miles of drainage area above Lake Ray Roberts.

2-05. Real Estate Acquisition. A total of 45,533 acres for fee simple and 5,746 acres for flood flowage easement were acquired for the construction of the Lewisville Dam and Lake. The real estate fee take line is based on a lake guide contour elevation of 537.0 feet. This real estate acquisition gives a total of 51,279 acres for the Lewisville Lake project.

2-06. Public Facilities. Fourteen recreation areas around the lake are operated by USACE for public use and an additional nine areas are operated by local cities and two by community organizations, for a total of 25 recreational areas at Lewisville Lake. The areas are listed in Table 2-1 and the parks operated by USACE are shown on Plate 2-11. Facilities provided at these parks consist of roads, parking areas, boat ramps, camping and picnicking facilities, and golf course, marina and sports fields.

TABLE 2-1

Recreation Areas at Lewisville Dam and Lake

1. Arrowhead Park
2. Big Sandy Park
3. Copperas Br. Park (west)*
4. Corinthian Yacht Club*
5. Cottonwood Park*
6. Crescent Oaks*
7. Doe Branch Park
8. East Hill Park
9. Eastvale Park
10. Fish Trap Park
11. Harbor Lane Park*
12. Hickory Creek Park
13. Hidden Cove Park*
14. Lewisville Lake Park*
15. Little Elm Park*
16. Oakland Park
17. Pilot Knoll Park
18. Point Vista Access Area
19. Stewart Creek Park*
20. Sycamore Bend Park
21. Tower Bay Access Area
22. Westlake Park
23. Willow Grove Park
24. Wynnewood Park*
25. YMCA Metropolitan-Dallas*

Note: * Indicates parks operated by Denton County and private individuals.

CHAPTER III – HISTORY OF PROJECT

3-01. Authorization. Congressional authorization for the initiation and construction of Lewisville Dam and Lake (formerly Garza-Little Elm Reservoir) on the Elm Fork of the Trinity River was authorized by the River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session). The River and Harbor Act of 1945 was approved in accordance with recommendations made by the Chief of Engineers contained in House Document Number 403 (77th Congress, 1st Session). Authority to initiate advance planning is contained in a letter by the Chief of Engineers to the Division Engineer, Southwestern Division, dated 2 April 1945, subject "Advance Planning of River and Harbor Projects Authorized in the Act Approved 2 March 1945".

Public Law 329, 84th Congress, 1st Session changed the name of the dam from "Garza-Little Elm" to "Lewisville" dam. Congressional authority for the modification of Lewisville Lake including the construction of Ray Roberts Lake is contained in the River and Harbor Act of 1965 (PL 89 298) in accordance with the total plan of improvements for the Trinity River as presented in House Document No. 276 (89th Congress, 1st Session).

3-02. Planning and Design. Lewisville Lake was authorized in 1945 as a dual purpose lake for flood control and water supply. In general, the design of the completed lake was very similar to that set out in the "Definite Project Report" dated October 1947.

Public hearings were held at Denton, Texas on 16 August 1946. The growth of the City of Dallas convinced the officials the need to augment their municipal water supply. During the hearing, in connection with a comprehensive review of the reports contained in house Document number 403, representatives of the City of Dallas submitted a brief urging the full development of the water resources of the Elm Fork basin. At this same hearing, the city officials of Denton stated that the lowering ground water level was making it increasingly difficult to obtain adequate supply of water from wells and requested that the city's need for a surface water supply in the future be considered in the development of a plan for federal reservoirs on the Elm Fork. The foregoing changed conditions were considered during the studies made in connection with resolution adopted 30 November 1945 by the Committee on Rivers and Harbors, House of Representatives which requested a review of House Document No. 403 (77th Congress, 1st Session) to determine whether any changes are advisable at and above Lewisville Dam.

3-03. Construction. The construction of Lewisville Dam began in November 1948 and was completed in August 1955. Deliberate impoundment began on 1 November 1954. Work on the first of a series of repairs and modifications to the embankment and spillway began in July 1979 and the last one was completed in June 1996. The hydroelectric facility at Lewisville Dam was completed and went on-line in October 1991. The construction cost of the project was $25,826,000. Table 3-1 outlines the important dates in the construction and repair of Lewisville Dam. Figure 3-1 through Figure 3-4 show different phases of dam construction.

Figure 3-1. Spillway Construction, December 1952

Figure 3-2. Cleared Area, December 1952

Figure 3-3. Embankment Construction, September 1953

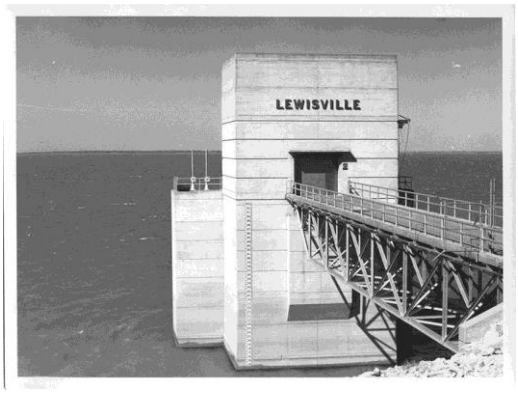

Figure 3-4. Intake Tower

TABLE 3-1

Resume of Construction Activities

Activity	Date
Construction began	28 November 1948
Deliberate impoundment began	1 November 1954
Construction completed	August 1955
Conservation pool filled to elevation 515.0	May 1957
Construction of modifications to the upstream berm began	July 1979
Construction of modifications to the upstream berm completed	May 1980
Construction of modifications to the downstream berm began	March 1981
Construction of modifications to the downstream berm completed	November 1983
Construction of modifications for upper slope repair began	June 1983
Construction of modifications for upper slope repair completed	April 1984
Construction of spillway repair began	August 1987
Construction of spillway repair completed	August 1988
Construction of hydropower facility began	June 1990
Construction of hydropower facility completed	October 1991
Construction of modifications to the upstream berm began	November 1995
Construction of modifications to the upstream berm completed	June 1996

3-04. Related Projects. The Lewisville Dam and Lake Project is an integral part of USACE plan for flood control and water conservation plan in the Trinity River Basin. The plan presently consists of eight major USACE flood control projects, known as Benbrook Dam, Bardwell Dam, Grapevine Dam, Joe Pool Dam, Lavon Dam, Lewisville Dam, Navarro Mills Dam, and Ray Roberts Dam. Lewisville Dam operates with Ray Roberts Dam on the Elm Fork of the Trinity River to provide flood control to the lower Elm Fork Trinity River and the mainstem Trinity River including the City of Dallas, Texas. The eight USACE dam projects in the Trinity River system contain approximately 1,591,300 acre-feet of flood control storage. Lewisville Dam reduces flood risk from 1,660 square miles of drainage area. The Trinity River Basin Master Reservoir Regulation Manual presents the proposed plan and individual projects in more detail.

The Trinity River Authority of Texas (TRA), an agency of the State of Texas, serves as a facilitator to assist federal, state, regional, and local entities develop water supply and wastewater projects based on the needs of their populations. In 1969, TRA completed construction on Lake Livingston to help the City of Houston satisfy its water demand. In addition, TRA acts as a local sponsor for major water supply projects and four major USACE projects: Bardwell Lake, Joe Pool Lake, Navarro Mills Lake, and the Wallisville Saltwater Barrier.

The United States Natural Resource Conservation Service (NRCS) previously known as the Soil Conservation Service (SCS) has built 130 small floodwater retarding reservoirs to control flooding problems in the Elm Fork of the Trinity River watershed upstream from Lewisville Dam. These reservoirs have a combined drainage area of 313 square miles. The 130 structures will provide a sediment storage of 15,434 acre-feet. Also, the structures will allow a total cumulative flood storage of 85,133 acre-feet.

There are 15 additional structures planned for locations upstream of Lewisville Lake. The planned structures will have a total drainage area of 73 square miles. These 15 structures will have 2,577 acre-feet of water storage below their lowest outlet and 3,897 acre-feet of storage below their primary outlet. Additionally, they will have a total flood retarding capacity of 18,248 acre-feet. The dam and lake projects of the Trinity River basin are listed in Table 3-2.

TABLE 3-2

Trinity River Basin Projects

Project	Stream	Year of Completion / Status
Anahuac Channel	Trinity River	1914
Benbrook Dam	Clear Fork of the Trinity River	1952
Grapevine Dam	Denton Creek	1952
Lavon Dam	East Fork of the Trinity River	1953
Lewisville Dam	Elm Fork of the Trinity River	1955
Navarro Mills Dam	Richland Creek	1963
Bardwell Dam	Waxahachie Creek	1965
Big Fossil Creek Floodway	Big Fossil Creek	1968
Lake Livingston Dam, TRA Project	Trinity River	1969
Fort Worth Floodway	West and Clear Forks of the Trinity River	1970
Joe Pool Dam	Mountain Creek	1986
Ray Roberts Dam	Elm Fork of the Trinity River	1987
Wallisville Saltwater Barrier	Trinity River	1998
Duck Creek Channel Improvement	Duck Creek	1998
Dallas Floodway Extension	Trinity River	Under Construction
Liberty Local Flood Protection	Trinity River	Authorized

3-05. Modification to Regulations. The top of water supply pool elevation has been modified once since construction. The Plan for Reservoir Regulation Garza-Little Elm Reservoir, September 1956 establishes the conservation storage for Lewisville Dam below elevation 515.0 feet. Congressional authority for the construction of Ray Roberts Lake included authorization to raise the conservation pool level at Lewisville Lake, and in 1988 it was raised from 515.0 to 522.0 feet. This authorization allowed for Lewisville Lake to increase its water supply yield and reallocate an equivalent amount of flood control storage to upstream Ray Roberts Lake.

3-06. Principal Regulation Problems. During the life of the dam, there have been a series of surface sloughs on the downstream and upstream faces of the embankment. The locations of these sloughs have been restricted to those portions of the embankment between Stations 163+70 and 328+88 which were constructed with the clay shale materials from the spillway excavation. Upstream and downstream stability berms were added in these areas to prevent future slides.

Flood flows in October and November of 1981 resulted in structural damage to the downstream end of the spillway apron sill caused by undermining and erosion of bedding materials. After these floods, it was necessary to extend the spillway apron approximately 60 feet downstream. The spillway extension started in August 1987 and was completed in August 1988.

Based upon the most recent risk assessment of Lewisville Dam in 2014, USACE considers Lewisville Dam to be a high risk dam among its more than 700 dams because of the risk associated with stability of the spillway during very high flows in the spillway associated with rare flood events and seepage that could lead to internal erosion of the foundation and/or embankment. USACE has implemented both interim and long term risk reduction measures to reduce this risk.

CHAPTER IV – WATERSHED CHARACTERISTICS

4-01. General Characteristics. The Elm Fork of the Trinity River originates in eastern Montague County, Texas and flows in a southeasterly direction for approximately 110 miles through Cooke, Denton and Dallas Counties to its confluence with the West Fork of the Trinity in the City of Dallas. The watershed lies in the north central portion of Texas extending across the state between north latitudes 33°44′ and 32°42′ and west longitudes 96°43′ and 97°50′. The watershed is comprised of parts of Montague, Cooke, Grayson, Collin, Wise, Tarrant, Denton and Dallas Counties. It is about 80 miles long along its axis and has a maximum width of 60 miles. The watershed of the Elm Fork of the Trinity River has a total drainage area of 2,577 square miles of which 917 square miles are downstream from Lewisville Dam. Lewisville Lake controls 1,660 square miles of the drainage area.

Lewisville Dam is located on the Elm Fork of the Trinity River at river mile 30.0. The river drops from an elevation of about 1,210 feet at its source to 435 feet at the Lewisville Dam site. The Elm Fork continues to drop to elevation 387 feet at its confluence with the West Fork in Irving/Dallas. The average slope of the stream bed is 7.5 feet per mile, and the average slope downstream of Lewisville dam is 1.6 feet per mile.

The principal tributaries contributing to the Elm Fork of the Trinity River are the right bank tributaries, Denton Creek, Hickory Creek and Clear Creek, and the left bank tributaries, Isle Du Bois Creek and Little Elm Creek. With the exception of Denton Creek, all of these principal tributaries are located upstream of Lewisville Lake. The watershed and the location of the dam are shown on Plate 4-1.

The Elm Fork basin has gently rolling hills and broad river valleys, with generally greater relief in the upper reaches. Basin vegetation is divided between the tall prairie grasses of the Grand Prairie physiographic region and the dense growth of Blackjack and Post Oaks of the Eastern Cross Timbers Region. The majority of the Lewisville Lake watershed lies within the Cross Timbers ecoregion to the west, and the Texas Blackland Prairie ecoregion to the east.[1] The Trinity River basin is supported by numerous industries, including trade, transportation and utilities, professional business service, and education and healthcare. The population of the basin was approximately 6,540,090 in 2010.

4-02. Topography. Lewisville Lake and its tributaries are located in the Blackland Prairie, East Cross Timbers, Grand Prairie, and West Cross Timbers subdivisions of the Gulf Coastal Plain physiographic province. The topography throughout the basin is predominantly gently rolling. Basin topography varies from level or gently rolling in the lower reaches to broken prairie in the north and northwestern reaches. Some rough land occurs along the streams in the lower reaches.

[1] archive.epa.gov/wed/ecoregions/web/html/tx_eco.html

In the Eastern Cross Timbers area, soils are mainly red and yellow sands that have been leached of nutrients. Post oaks and blackjack oaks have adapted to life in sandy soils and they dominate the overstory, with scattered honey mesquite and grasses, such as little bluestem and threeawn, growing beneath them. Although the rural land use is predominantly cattle grazing, there is some farming for peanuts, grain sorghum, pecans, peaches, and vegetables.

In the Blackland Prairie, Soils are mostly fine-textured, dark, calcareous, and productive Vertisols. Historical vegetation was dominated by little bluestem, big bluestem, yellow Indiangrass, and tall dropseed. The rolling to nearly level plains of the Northern Blackland Prairie ecoregion are underlain by interbedded chalks, marls, limestones, and shales of Cretaceous age. This region now contains a higher percentage of cropland than adjacent regions; pasture and forage production for livestock is common. Large areas of the region are being converted to urban and industrial uses.

4-03. Geology and Soils. Lewisville Lake is founded on the basal Eagle Ford Formation and the upper part of the underlying Woodbine Formation. The eastern abutment of the dam and most of the valley embankment is underlain by Eagle Ford Shale an Eagle Ford residual overburden.[2]

The western abutment is composed of Woodbine sandstone shale and residual soil material. The trace of contact between these two upper Cretaceous Formations begins near the west abutment tending northward across the divide between Elm Fork and Pecan Creek, then northeastward along the lower reaches of Little Elm Creek. The regional strike of these formations is 12^{o} east and the drop is to the southeast at 50 to 60 feet per mile. The lower Eagle Ford Shale is selenic, bituminous and medium to dark gray, weathering to tan. It contains calcareous concretions, setaria, and marine megafossils. Overburden consists of residual clay and reworked Eagle Ford Shale. The Woodbine Formation consists of 70 to 80 feet of glaconitic shale with sand lenses, underlain by about 260 feet of sandstone. The sandstone beds are highly variable, featuring cross bedding, minor shale beds, tuffaceous clay lenses, carbonaceous clay, and lignite. The upper sandstones are glaconitic and contain fossil oyster reefs and other megafossils. Overburden on the Woodbine generally consists of clay sands and silts. The maximum overburden thickness on the periphery of the lake is about 50 feet.[3]

Soils in the primary strata along the sides of the valley of the Elm Fork are terraces of sandy clay, sands, and gravel that were deposited during the Pleistocene geologic age. These terrace deposits cover the flood plain east of the Elm Fork, reaching a thickness of approximately 35 feet. The valley of the Elm Fork and its tributaries are filled with recent flood plain deposits consisting of clay and sandy clay. These overlay the sand and gravel of the Pleistocene deposits.

Many different soils, comprising more than 15 major series, occur in the Lewisville Lake vicinity. Residual soils east of the Elm Fork overlaying the Eagle Ford formation are

[2] archive.epa.gov/wed/ecoregions/web/html/tx_eco.html
[3] http://mrdata.usgs.gov/sgmc/tx.html

predominantly clay soils. Soils west of the Elm Fork overlying the Woodbine formation are somewhat sandy. The sandy soils are fairly shallow and overlie clay based subsoil with a deep profile to bedrock.

4-04. Sediment. A system of 110 sedimentation ranges and 9 degradation ranges were established and surveyed with monuments placed within the reservoir area and below the dam during the design of the dam. Initial storage allocations, in the Definite Project Report dated October 1947, provided for a total of 53,500 acre feet of sediment deposition in the lake. The storage allocation was expected to provide for 57 years of sediment accumulations. At the time of the 1965 sediment re-survey 31,849 acre feet of the original 53,500 acre foot sediment pool remained in the lake. Sedimentation in the lake and degradation downstream from the dam are monitored using the ranges shown on Plate 4 2.

The storage in Lewisville Lake was reallocated after the construction of Ray Roberts Dam in June 1987. An estimated 35,200 acre-feet of sediment was deposited in Lewisville Lake prior to the completion of Ray Roberts Dam. It is estimated that an additional 73,800 acre-feet of sediment will accumulate in Lewisville Lake during the ensuing 100-year period. Approximately 63,400 acre-feet of this sediment is expected to be deposited in the conservation pool and the remaining 10,400 acre-feet will be deposited in the flood control pool. A schedule prepared in the Office of the Division Engineer, SWD indicates that resurveys were planned for about 5-year intervals. However, currently sediment surveys are done periodically depending on need and available funding. The locations of the ranges are shown on Plate 4-2.

In 1991, the Texas Legislature authorized the Texas Water Development Board (TWDB) to develop a non-profit, self-supporting, reservoir volumetric survey program, which is named the Hydrographic Survey Program. The program includes a standard volumetric survey and a sedimentation survey. Since 1992, TWDB's Hydrographic Survey Program has completed 161 hydrographic surveys on 106 unique reservoirs. This includes 85 of the 114 water supply reservoirs monitored for inclusion in TWDB's monthly Water Conditions Report. The TWDB web site is: (http://www.twdb.texas.gov/surfacewater/surveys/index.asp).

The TWDB last performed a standard volumetric survey for Lewisville Lake in 2007.[4] Results from the survey indicate Lewisville Lake encompasses 27,175 surface acres and contains a total volume of 598,902 acre-feet at conservation pool elevation 522.0 feet.

Original design information was based on topographic maps with a 10-foot contour interval. The storage at the current top of conservation pool elevation of 522.0 feet, was estimated as 670,000 acre-feet and a corresponding surface area of 29,000 acres. In 1960, USACE performed a survey for Lewisville Lake. Records indicate that Lewisville Lake had a volume of 648,400 acre-feet of water at the top of conservation pool elevation 522.0 feet. In 1965, USACE resurveyed Lewisville Lake and estimated the capacity to be 640,986 acre-feet. In 1989, Turner Collie & Braden Inc. calculated a reservoir capacity of 571,926 acre-feet. Due to differences in the

[4] http://www.twdb.texas.gov/hydro_survey/lewisville/2007-09/Lewisville2007_FinalReport.pdf

methodologies used in this and previous USACE surveys, values by Turner Collie & Braden Inc. are not recommended by the TWDB. Between the 1960 USACE survey and the 2007 TWDB volumetric survey, Lewisville Lake lost 49,498 acre-feet of water or 7.63 percent in conservation storage. The difference in storage indicated the sediment fill during the fiscal years from 1960 to 2007. Comparisons between the 1960 USACE survey, the 1965 USACE survey, and the 2007 TWDB volumetric survey are presented in Table 4-1.

TABLE 4-1

Area and Capacity Comparisons of Lewisville Lake

Feature	USACE DPR	USACE Survey	USACE Survey	TWDB Latest Survey
Year	1947	1960	1965	2007
Surface Area at Conservation Pool Elevation 522.0 feet NGVD29 (acres)	29,500	N/A	N/A	27,175
Volume at Conservation Pool Elevation 522.0 feet NGVD29 (acre-feet)	670,000	648,400	640,986	598,902

NOTE: Data is obtained from "Volumetric and Sedimentation Survey of Lewisville Lake, TWDB September 2007."

4-05. Climate. The Elm Fork watershed is in the north central part of the state of Texas. The climate varies over the watershed from subtropical with cool winters and hot humid summers. Tropical maritime air masses from the Gulf of Mexico play a dominant role in the climate from late spring through early fall, while polar air masses determine the winter climate. Warm seasonal rainfall is largely the result of thunderstorm activity, with amounts varying considerably in both intensity and location.

a. Temperature. The mean annual temperature over the basin is about 65 degrees Fahrenheit. January, the coldest month, has an average minimum daily temperature of about 33 degrees. August, the warmest month, has an average maximum daily temperature of about 96 degrees. Temperatures in the watershed have ranged from a maximum of 118 degrees recorded to a minimum of minus 7 degrees recorded at McKinney.[5] The average length of the growing season between killing frosts varies from 226 days at Gainesville in the upper part of the

[5] www.ncdc.noaa.gov/cdo-web/datasets

watershed to 267 days at Dallas near the lower watershed boundary.[6] Table 4-2 gives temperature data for several National Weather Service (NWS) stations in or near the Elm Fork Trinity River basin.

TABLE 4-2

Temperatures in/near the Elm Fork Trinity River Basin

Station	Period of Record	Temperatures (°F)				
		Mean Annual	Average January Minimum	Average August Maximum	Minimum Recorded	Maximum Recorded
Dallas FAA Airport	1939-2016	66.5	35.7	96.2	0	112
Denton 2 SE	1913-2016	64.7	33.2	95.9	-3	113
Gainesville 5 ENE*	1897-2016	63.6	30.5	96.1	-7	114
Sanger	1991-1999	64.2	32.2	93.6	0	109
McKinney** Municipal Airport	1903-2016	64.9	32.8	96.5	-7	118

*Data for period from 1897 through 1987 are from different Gainesville stations.
**Period of available NOAA data (1903-2016) is retrieved from a different station named McKinney.

b. Precipitation. The normal annual precipitation over the Elm Fork Trinity River watershed varies from approximately 36 inches at Carrollton in the southeastern part of the watershed, to 41 inches at Pilot Point, in the north central portion of the watershed.[7] Across the watershed, precipitation levels are higher in the late-spring, early-summer months, peaking in May-June and lowest in November-February. Because of the preponderance of tropical maritime air, heavy showers of short duration may occur at any time during the year. The monthly distribution of the average annual precipitation at eight NWS stations in the watershed area is shown in Table 4-3.

[6] texasalmanac.com/sites/default/files/images/almanac-feature/countyweatherA.pdf
[7] www.ncdc.noaa.gov/cdo-web/datasets

TABLE 4-3

Average Monthly and Annual Rainfall in/near the Elm Fork Trinity River Basin

Month	Precipitation (Inches)			
	Pilot Point Isl Du Boi 1916-2003	Denton 2 SE 1913-2016	Carrollton 1923-2016*	Gainesville 1897-2016**
January	2.09	1.93	2.18	1.90
February	2.70	2.42	2.53	2.21
March	3.44	2.74	2.90	3.03
April	3.97	3.80	4.00	3.73
May	5.79	4.97	5.25	5.06
June	4.27	3.26	3.36	3.85
July	2.44	2.20	2.28	2.58
August	2.50	2.21	1.90	2.46
September	3.86	3.02	2.89	3.47
October	3.96	3.76	3.54	3.60
November	3.07	3.30	2.75	2.48
December	2.52	2.59	2.60	2.27
Total	40.61	36.17	36.18	36.63
Precipitation Minimum Yearly	16.39 (2003)	15.11 (1963)	16.41 (1963)	16.19 (1963)
Precipitation Maximum Yearly	66.69 (1982)	65.07 (2015)	64.07 (2015)	87.72 (2015)

NOTES: 1. The total annual precipitation is computed by summation of the monthly averages.

2. Data reflect "Climatological Data" from the NWS. *Data from 2012-2016 were retrieved from Carrollton 2 NNE. **Data from 1987-2016 were retrieved from Gainesville 5 ENE gage.

TABLE 4-3 (CONTINUED)

Average Monthly and Annual Rainfall in/near the Elm Fork Trinity River Basin

Month	Precipitation (Inches)			
	Muenster 1941-2016	Gunter 5S 1948-2000	Valley View 1947-2002	Lewisville Dam 1949-2016
January	1.73	1.90	1.77	2.33
February	2.24	2.81	2.37	2.19
March	3.01	2.93	2.90	3.90
April	3.64	3.94	3.75	3.48
May	5.24	5.42	5.04	4.55
June	3.76	3.77	3.55	3.48
July	2.22	2.28	2.17	2.12
August	2.20	2.39	2.04	1.64
September	3.82	3.91	3.92	2.49
October	3.76	3.78	3.60	4.01
November	2.44	2.80	2.69	2.63
December	2.14	2.47	2.16	2.65
Total	36.21	38.42	35.95	35.48
Precipitation Minimum Yearly	19.06 (1956)	18.61 (1963)	19.69 (1956)	13.91 (1963)
Precipitation Maximum Yearly	77.78 (2015)	68.36 (1982)	58.21 (1957)	61.24 (1990)

NOTES: 1. The total annual precipitation is computed by summation of the monthly averages.
2. Data reflect “Climatological Data” from the NWS.

c. Snowfall. Minor accumulations of snowfall (about 2.5 inches) occur periodically during the winter months; however, snowfall does not contribute significantly to area precipitation or runoff.

d. Evaporation. There is no evaporation pan currently at Lewisville Lake. A NWS "Class A" evaporation pan at Grapevine Lake is used to estimate evaporation at Lewisville Lake since the two dams are close to each other. The evaporation pan at Grapevine Lake is 10-inch deep with 47.5-inch diameter (Figure 4-5). From measurements collected between August 1953 and September 2012, the estimated average annual evaporation from the lake is about 83 inches. The average monthly and annual evaporation from Lewisville Lake are given in Table 4-4A. The highest recorded annual evaporation was 113.4 inches in 1956, while the lowest was 69.59 in 2007. The highest evaporation during a single month was 13.86 inches in July 2011. The evaporation pan heats up much faster than the lake, thus pan evaporation is much higher than the actual evaporation, and a coefficient must be used to estimate actual lake evaporation.

The TWDB has also collected lake evaporation data from 1954 through 2015 from the National Oceanic and Atmospheric Administration (NOAA) and the National Climatic Data Center (NCDC).[8] The average monthly and annual evaporation from TWDB data are given in Table 4-4B. The evaporation rates for the Elm Fork Trinity River watershed are computed using the pan coefficients in the ThEvap program for quadrangle 410.

Figures 4-1 through 4-5 show the instruments and equipment of weather station at Grapevine Lake.

Figure 4-1. Weather Station

Figure 4-2. Weather Station

[8] www.twdb.texas.gov/surfacewater/conditions/evaporation/

Figure 4-3. Rain Gauge

Figure 4-4. Rain Gauge

Figure 4-5. Evaporation Pan

TABLE 4-4A

Lewisville Lake Average Monthly and Annual Evaporation (Aug 1953 - Sep 2012)

Month	Reservoir Evaporation (Inches)		
	Measured Pan Evaporation	Monthly Pan Coefficient	Calculated Reservoir Evaporation
January	2.85	0.74	2.11
February	3.76	0.71	2.67
March	5.97	0.70	4.18
April	7.29	0.68	4.96
May	8.67	0.61	5.29
June	10.21	0.68	6.94
July	11.89	0.70	8.32
August	11.33	0.71	8.04
September	8.21	0.74	6.08
October	6.36	0.78	4.96
November	4.12	0.81	3.34
December	3.05	0.78	2.38
Annual	83.21	0.71	59.08

NOTES: The Pan coefficients were developed by the USACE. The calculation was based on Grapevine Lake measured pan evaporation data, which is recorded approximately 10 miles to the southwest from Lewisville Dam.

Since 2017, the evaporation readings used at Lewisville Lake are calculated at Grapevine Dam by using an empirical formula (unmodified Hamom formula). This formula is based on a coefficient that uses historical readings that are based on day of year, latitude, and average temperature in order to calculate Lewisville Lake daily evaporation readings.

TABLE 4-4B

TWDB Average Monthly and Annual Evaporation Lewisville Lake, 1954-2015

Month	Quadrangular lake Evaporation rate (inches)	Monthly Pan Coefficients for quadrangle 410 of ThEvap Program
January	2.04	0.73
February	2.40	0.70
March	3.90	0.69
April	4.74	0.67
May	4.93	0.60
June	6.64	0.67
July	7.62	0.69
August	7.47	0.70
September	5.66	0.73
October	4.58	0.77
November	3.15	0.80
December	2.28	0.77
Annual	55.40	0.71

e. Wind. The prevailing winds over the watershed are from the south during the spring, summer, and fall months, while northerly winds prevail during the winter months. Severe winds have been experienced near Lewisville Lake. Gusts as fast as 110 miles per hour have been recorded near the NWS Station in Denton, approximately 16 miles northwest of the dam site on 13 June 1989.[9] (Data provided by NOAA NCDC for the period 1950-2016).

From the "Elm Fork of Trinity River, Texas, Spillway Design Flood Study, Lewisville Lake, Hydrology, August 1981" report, the design wind speed is 54 mph, the fetch for wind setup is 15.42 miles and the computed required freeboard is 5.9 feet. This freeboard was computed for the 2017 Inflow Design Flood elevation of 560.0 feet, which is adequate and equal to the top of dam. The average annual wind movement at Dallas, Texas, 29 miles southeast of the Lewisville Dam, is 96,360 miles, or an average wind speed of 11 miles per hour for entire year.[10] Tornadoes are a somewhat rare occurrence in the watershed. In December 2015, a series of tornados reaching EF4 level left 13 people dead and injured over 300 people across parts of North and Central Texas.

[9] http://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=10137948
[10] https://www.ncdc.noaa.gov/IPS/lcd/lcd.html

4-06. Storms and Floods. The Elm Fork Trinity River watershed is subject to three general types of flood-producing rainfall: thunderstorms, frontal rainfall, and tropical cyclones. The topography, soils and typical rainfall patterns of the watershed lead to rapid runoff and sharp crested flood hydrographs. Floods occur frequently and at almost any time of year. Generally, the highest 24-hour and monthly precipitation periods have occurred during major thunderstorms. However, there are some instances of heavy precipitation resulting from local thunder storms. The maximum 24-hour rainfall reported in or adjacent to the basin was 13.00 inches, which occurred at Pilot Point, a small town in Denton County, on 13 May 1982. The maximum monthly rainfall reported was 30.30 inches for May 1982 at Pilot Point.[11] Generally the Elm Fork Trinity River's large floods are long-duration type having two or more peaks spaced as close as ten days apart. However, it is possible that large peak and volume floods could occur in about two weeks duration. The major storms experienced over the watershed for which rainfall data are available, together with the average rainfall depths produced on the watershed above the dam, are listed in Table 4-5.

Table 4-6 lists the pertinent data for major lakes and dams and gages in the Elm Fork Trinity River basin. Table 4-7 gives stages and discharges for top 15 major floods recorded at gages on the Elm Fork Trinity River.

[11] www.ncdc.noaa.gov/cdo-web/datasets

TABLE 4-5

Major Storms on the Elm Fork Trinity River Watershed, 1908–2015

Storm Date	Precipitation in Inches							
	Pilot Point	Denton 2 SE Gage	Carroll-ton Gage	Gaines-ville Gage	Muen-ster Gage	Gunter 5S Gage	Valley View Gage	Lewisville Dam Gage
1908, May 22-26	—	—	—	8.30	—	—	—	—
1935, May	~10.0	~12.0	~11.0	—	—	—	—	—
1942, Apr 5-30	—	11.55*	15.66	16.40	15.28	—	—	—
1957, Apr 18-May 5	14.01	13.39	14.60	11.81	12.72	17.26	13.33	13.33
1957, May 22-26	8.63	11.63	7.52	5.82	3.11	7.26	6.09	6.21
1958, Apr 26-May 3	6.38	8.52	6.68	9.09	7.41	7.81	6.78	7.62
1962, Sep 1-8	11.12	11.74	4.64	8.90	8.99	11.35	13.65	4.43
1964, Sep 15-28	11.34	10.76*	18.29	8.36	10.68	9.57	10.10	15.51
1966, May 22-Jun 2	14.45	9.85	15.03	7.97	9.20	10.00	8.96	10.84
1971, Dec 1-10	6.80	7.17	8.96	6.36	4.42	6.67	5.80	7.29
1980, Sep 24-30	10.30	7.72	6.70	10.25	7.91	10.54	9.10	8.54
1981, Oct 6-18	15.35	16.94	7.85	20.71	19.23	16.03	14.90	13.11
1982, May 11-19	18.60	14.66	8.07	5.86	4.27	13.34	9.62	10.16
1986, Feb 3-10	7.60	8.67	—	3.05	2.42	7.34	3.50	1.58
1987, May 22-30	6.70	7.26	3.14	6.97	7.57	3.59	8.11	3.23
1989, May 3-Jun 15	18.80	13.53	24.19	25.07	19.60	15.42	19.67	20.19
1990, Apr 13-May 4	13.70	10.30	13.59	16.12	16.34	13.41	15.80	7.36
1991, Dec 18-23	5.80	4.27	6.14	5.79	4.58	6.41	6.11	6.61
1996, Nov 3-27	12.86	10.57	5.02	4.86	4.17	9.30	7.24	—
2000, Nov 3-24	7.34	7.16	7.20	6.45	6.23	4.84	6.34	6.20
2004, Jun 2-30	—	10.39	—	11.15	12.15	—	—	9.17
2007, Jun 4-30	—	12.21	—	20.01	12.98	—	—	12.00
2009, Oct 4-27	—	12.59	—	11.99	7.25	—	—	8.65
2015, May 6-31	—	13.52	17.71	28.90	23.92	—	—	9.67
2015, Oct 23-Nov 30	—	18.60	20.55	20.56	17.64	—	—	6.04
2016, May 9-Jun 14	—	10.59	11.33	12.51	10.85	—	—	11.58

NOTE: The rainfall data were tabulated from published precipitation records from the NWS.

TABLE 4-6

Pertinent Data for Major Lakes and Dams and Gages in the Elm Fork Trinity River Basin

Station	Stream	Period of Record	Miles Above Mouth	Datum (ft)	Drainage Area (Sq. Mi.)	Maximum Floods of Record		
						Date	Gage Height (ft)	Peak Discharge (cfs)
near Pilot Point	Isle Du Bois Creek	1949-1983	6.3	555.48	266	31 Oct 1974	29.43	40,000
						16 Oct 1981	29.84	39,900
						27 Mar 1977	28.91	29,900
near Sanger	Elm Fork	1949-1989	—	548.72	381	Oct 13 1981	33.50	150,000
						Oct 1974	29.10	50,000
						Feb 1966	27.71	35,000
near Carrollton	Elm Fork	1907-2015	18.2	433.40	2459	25 May 1908	17.00	145,000
						26 Apr 1942	16.50	90,700
						19 May 1935	13.00	82,100
near Sanger	Clear Creek	1949-2015	—	582.23	295	13 Oct 1981	35.70	104,000
						26 Apr 1990	29.94	24,300
						8 May 2015	28.92	18,900
Near Lewisville	Elm Fork	1950-2015	28.2	432.39	1,673	15 Sep 1950	30.75	21,700
						4 May 1990	30.15	19,600
						31 May 2015	30.98	18,600

TABLE 4-6 (CONTINUED)

Pertinent Data for Major Lakes and Dams and Gages in the Elm Fork Trinity River Basin

Lake	Stream	Period of Record	Miles Above Mouth	Datum (ft)	Drainage Area (Sq. Mi.)	Maximum Lake Elevation		
						Date	Elev. (ft)	Volume (ac-ft)
Lewisville Lake	Elm Fork	1964-2016	30.0	—	1,660	31 May 2015	536.94	1,181,000
Ray Roberts Lake	Elm Fork	1987-2016	—	—	692	3 May 1990	644.44	1,223,000
Fraiser Dam	Elm Fork	1999-2016	—	—	2,557	31 May 2015	419.52	—

NOTE: The information is derived from USACE records and the United States Geological Survey (USGS) Annual Water-Data Reports.

TABLE 4-7
Top 17 Recorded Major Floods on the Elm Fork Trinity River Watershed, 1908-2016

Date	Isle du Bois Creek near Pilot Point		Elm Fork near Sanger		Elm Fork Trinity River near Carrollton*		Clear Creek near Sanger		Elm Fork Trinity River near Lewisville	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1908, May	—	—	30.70	—	19.00	145,000	36.50	—	—	—
1935, May	—	—	29.70	—	13.00	82,100	34.00	—	—	—
1942, April	—	—	—	—	14.50	90,700	—	—	—	—
1950, Sep	26.35	17,200	27.14	20,100	—	—	29.80	18,200	30.75	21,700
1957, Apr-Jun	27.08	22,700	27.40	20,800	8.54	13,700	29.27	16,100	26.72	11,400
1958, Apr-May	27.30	16,000	29.10	27,500	6.65	7,720	29.65	17,400	24.09	5,440
1962, Sep	27.81	19,000	28.10	22,500	—	—	24.30	16,200	—	—
1964, Nov	26.09	11,100	27.10	17,500	—	—	29.00	15,000	23.69	5,260
1974, Oct	29.43	40,000	29.10	50,000	—	—	28.82	14,500	—	—
1977, Mar-Apr	28.91	29,900	27.80	25,700	7.71	11,300	27.49	8,190	22.61	5,290
1981, Oct	29.84	39,900	33.50	150,000	—	—	35.70	104,000	—	—
1981, Nov	—	—	26.80	14,900	10.65	21,100	—	—	27.83	15,000
1982, May	29.80	39,400	26.70	18,700	—	—	—	—	—	—
1990, May	—	—	—	—	13.48	27,600	—	—	30.15	19,600
2007, Jun	—	—	—	—	9.68	9,970	27.11	12,800	—	—
2015, May	—	—	—	—	13.12	26,700	28.92	18,900	30.98	18,600
2015, Nov	—	—	—	—	10.82	12,800	25.07	8,940	—	—

NOTES: 1. Data retrieved from USGS Peak Streamflow for Texas database.

2. The Top 17 floods were generally basin wide flood events at most of the gages, however certain gages may not have experienced a Top 17 Flood during the same event. For more details on all major floods refer to Table 4-8 (pg. 4.8-1). *Peak flood flows at this gage were affected by impoundment of Lake Dallas from 1928-1954, by Lake Dallas and Grapevine Lake from July 1952 to November 1954, and by Grapevine and Lewisville Lakes from November 1954 to 1987, and by Grapevine, Lewisville, and Ray Roberts Lakes from 1987-Present.

Historical descriptions of the major floods that have been experienced in the Elm Fork watershed are as follows:

a. Storm of May 1908. The storm of May 22-26 1908 was unique because it originated on the Pacific coast. The center of this storm was at Chattanooga in southern Oklahoma where rainfall of 9.4 inches was recorded for the storm period. This storm covered the entire headwaters of the Trinity River down to the mouth of the East Fork with the heaviest concentration over the Elm Fork watershed. Between 8 and 9 inches of rain fell over the upper portion of the Elm Fork watershed and from 4 to 8 inches over the greater part of the Trinity River above Dallas. Practically no rainfall was recorded on the Trinity River Basin below the mouth of the East Fork. Some of the rainfall amounts on the Upper Trinity River Basin were as follows: Gainesville, 8.02 inches; Fort Worth, 7.3 inches; Weatherford, 6.4 inches; and Dallas, 4.0 inches.

The maximum known discharge on the Elm Fork occurred on 25 May 1908. A stage of 30.7 feet at the Elm Fork gage near Sanger was estimated based on information provided by local residents. The U. S. Army Corps of Engineers estimated a stage equivalent to about 17.0 feet with a discharge of approximately 145,000 cubic feet per second (cfs) at the present location of the Carrollton gage based on information provided by local residents. The peak discharge on the Trinity River at Dallas from the May 1908 storm is the maximum and has been estimated by the U. S. Geological Survey to have been 184,000 cfs from a stage of 41.1 feet. The flood in 1866 reached about the same stage as the 1908 flood. Property damage exceeded $5,000,000 and 11 lives were lost in the Dallas vicinity.

b. Storm of May 1935. The flood produced by the May 1935 Storm reached stages of 29.70 feet at Elm Fork Trinity River near Sanger gage, 13.0 feet at Elm Fork Trinity River near Carrollton gage, and 34.0 feet at Clear Creek near Sanger gage. The recorded rainfalls for this storm were 12 inches near Denton 2 SE gage, 10 inches near Pilot Point gage, 13 inches near Gainesville gage, and 11 inches near Carrollton gage. The peak discharges at Elm Fork Trinity River near Carrollton gage was 82,100 cfs.

c. Storm of April 1942. This storm covered the entire Trinity River Basin. Storm centers were scattered throughout the basin; however, the heaviest concentration of rainfall was experienced in the upper basin. The storm of April 5-30, 1942 consisted of four distinct periods of rainfall. These periods were as follows: April 5-9, April 12-14, April 18-20, and April 23-30.

Precipitation during the first period fell at moderate rates on relatively dry ground and did not produce excessive runoff on the tributaries. The second period consisted of light rains of little significance. The third and fourth periods consisted of several short periods of intense precipitation and generally produced the high discharge experienced in the basin. Some of the rainfall amounts recorded in the basin during the total storm period of April 5-30 were as follows: Roanoke, 18.8 inches; Gainesville, 16.4 inches; Fort Worth, 17.0 inches; Dallas, 12.4 inches; McKinney, 17.1 inches; Rosser, 13.7 inches; Trinidad, 8.3 inches; Long Lake, 8.0 inches; and Liberty, 8.5 inches.

The maximum stage height as recorded by the Elm Fork Gage near Carrollton (1923 to present) was 14.5 ft. with a corresponding discharge of 90,700 cfs and occurred on April 26, 1942.

d. Storm of September 1950. The flood produced by the September 1950 Storm reached stages of 26.35 feet at Isle du bois near Pilot Point gage, 27.14 feet at Elm Fork Trinity River near Sanger gage, 29.80 feet at Clear Creek near Sanger gage, and 30.75 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Isle du bois near Pilot Point gage, Elm Fork Trinity River near Sanger gage, Clear Creek near Sanger gage, and Elm Fork Trinity River near Lewisville gage were 17,200, 20,100, 18,200, and 21,700 cfs, respectively.

e. Storm of April-June 1957. Torrential rains caused flooding throughout the area east of the Pecos River to the Sabine River. The storm which began over Texas on April 19 produced rainfalls during the month varying from about 8 inches in the lower Trinity River Basin, to about 10 inches in the center portion of the basin, and a maximum of about 20 inches in the upper basin near Lewisville Lake, formerly Garza Little Elm Reservoir. The storms continued into the month of May producing rainfalls varying from about 2 inches near the mouth to about 4 inches in the central basin near Oakwood to about 16 inches in the upper watershed. During May more than 4,000 people were evacuated from unprotected lowlands on the West Fork of the Trinity River above Fort Worth and along creeks in Fort Worth. The heavy general rains ended about June 5 and ranged from about 2 inches in the upper basin to about 10 inches at the extreme lower end of the basin.

The floods of April-June 1957 on the Trinity River Basin above Dallas produced about 3,888,000 acre feet of runoff (adjusted for storage in upstream reservoirs), whereas the floods of April-June 1908 produced only about 2,400,000 acre feet of runoff. This flood produced about one and one half times as much flood runoff as occurred in the 1908 flood, which produced the maximum known peak discharge at Dallas. The West Fork watershed above Fort Worth produced about 1,278,000 acre feet of runoff (adjusted for storage), during the April-June 1957 floods. This is about five times the flood volume of the April-June 1949 flood (255,000 acre feet) which produced the maximum known peak discharge on the Clear Fork at Fort Worth.

f. Storm of April-May 1958. The flood produced by the April-May 1958 Storm reached stages of 27.30 feet at Isle du bois near Pilot Point gage, 29.10 feet at Elm Fork Trinity River near Sanger gage, 6.65 feet at Elm Fork Trinity River near Carrollton gage, 29.65 feet at Clear Creek near Sanger gage, and 24.09 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Isle du bois near Pilot Point gage, Elm Fork Trinity River near Sanger gage, Elm Fork Trinity River near Carrollton gage, Clear Creek near Sanger gage, and Elm Fork Trinity River near Lewisville gage were 16,000, 27,500, 7,720, 17,400, and 5,440 cfs, respectively.

g. Storm of September 1962. The flood produced by the September 1962 Storm reached stages of 27.81 feet at Isle du bois near Pilot Point gage, 28.10 feet at Elm Fork Trinity River near Sanger gag, and 29.30 feet at Clear Creek near Sanger gage. The peak discharges at Isle du bois

near Pilot Point gage, Elm Fork Trinity River near Sanger gage, and Clear Creek near Sanger gage were 19,000, 22,500, and 16,200 cfs, respectively.

h. Storm of November 1964. The flood produced by the November 1964 Storm reached stages of 26.09 feet at Isle du bois near Pilot Point gage, 27.10 feet at Elm Fork Trinity River near Sanger gage, 29.0 feet at Clear Creek near Sanger gage, and 23.69 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Isle du bois near Pilot Point gage, Elm Fork Trinity River near Sanger gage, Clear Creek near Sanger gage, and Elm Fork Trinity River near Lewisville gage were 11,000, 17,500, 15,000, and 5,260 cfs, respectively.

i. Storm of May-June 1967. The flood produced by the May-June 1967 Storm reached stages of 27.80 feet at Isle du Bois near Pilot Point gage, 26.10 feet at Elm Fork Trinity River near Sanger gage, 5.64 feet at Elm Fork Trinity River near Carrollton gage, 27.70 feet at Clear Creek near Sanger gage, and 21.91 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Isle du Bois near Pilot Point gage, at Elm Fork Trinity River near Sanger gage, Elm Fork Trinity River near Carrollton gage, Clear Creek near Sanger gage, and Elm Fork Trinity River near Lewisville gage were 19,000, 12,600, 5,590, 11,500, and 4,510 cfs, respectively.

j. Storm of October 1974. The flood produced by the October 1974 Storm reached stages of 29.43 feet at Isle du bois near Pilot Point gage, 29.10 feet at Elm Fork Trinity River near Sanger gag, and 28.82 feet at Clear Creek near Sanger gage. The peak discharges at Isle du bois near Pilot Point gage, Elm Fork Trinity River near Sanger gage, and Clear Creek near Sanger gage were 40,000, 50,000, and 14,500 cubic feet per second, respectively.

k. Storm of March-April 1977. The flood produced by the March-April 1977 Storm reached stages of 28.91 feet at Isle du bois near Pilot Point gage, 27.80 feet at Elm Fork Trinity River near Sanger gage, 7.71 feet at Elm Fork Trinity River near Carrollton gage, 27.49 feet at Clear Creek near Sanger gage, and 22.61 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Isle du bois near Pilot Point gage, Elm Fork Trinity River near Sanger gage, Elm Fork Trinity River near Carrollton gage, Clear Creek near Sanger gage, and Elm Fork Trinity River near Lewisville gage were 29,000, 25,700, 11,300, 8,190, and 5,290 cubic feet per second, respectively.

l. Storm of October 1981. Scattered rain prior to the major storm occurred on 6-9 October throughout North Central Texas. The rains ceased for 2 days and then resumed with widely scattered thundershowers developing over West Texas on 11 October. This activity moved into North Texas. Thunderstorm cell movement was southwest to northeast which resulted in several areas experiencing repeated thunderstorm activity. By the afternoon of 12 October an outflow boundary from Hurricane Norma merged with the remains of the warm front and thunderstorms began developing between Fort Worth and Abilene. Thunderstorms continued through the night of 12 October. Once again thunderstorm cell movement was southwest to northeast and many areas experienced continuous thunderstorms. The thunderstorms were fed by high level moisture from Hurricane Norma and by low level moist air from the Gulf. Thunderstorms and heavy rain continued throughout North Texas the morning of

the 13th. The remains of Hurricane Norma merged with a minor trough and an upper air disturbance over North Central Texas, thus causing additional severe thunderstorms. Rainfall in excess of 15 inches occurred over a widespread area in the Elm Fork watershed. With the ground saturated from the earlier rains, followed by the intense rainfall which began on 11 October, excessive runoff was experienced in the Elm Fork of the Trinity.

This flood produced the highest observed stage and discharge at the Sanger Gage on the Elm Fork. The peak stage was 33.5 feet with a measured flow of 150,000 cubic feet per second on 13 October 1981. This storm was also responsible for a peak inflow of approximately 284,000 cubic feet per second into Lewisville Lake. This inflow raised Lewisville Lake to an elevation of 535.62 feet, 3.62 feet over the spillway. The peak flow over the spillway was approximately 10,600 cubic feet per second. (NOTE: Due to the high lake level and a subsequent storm of approximately 3 inches of rain on 1 November, Lewisville Lake's elevation peaked at an elevation of 536.46 feet, which is 4.46 feet over the spillway. The corresponding outflow peak was approximately 15,400 cubic feet per second). Due to the limited rainfall over the prior year, many area lakes in the Trinity Basin were low prior to the October rain. Many of the non-Corps lakes were built primarily for water supply and recreation and thus did not set aside a portion of their storage capacity for flood control purposes as is typically done on Corps lakes. This was a fortunate coincidence in that their low condition helped to reduce flooding downstream. Even so, many lake side homes were flooded at various non Corps lakes.

As a result of the October storm, extensive flood losses occurred to numerous communities and rural areas in the North Central Texas area. Residential, commercial, and industrial properties together with streets, utilities, and public property were heavily damaged in many cities. In the rural areas, crops were destroyed, livestock drowned, county roads and bridges washed away, and numerous rural dwellings and related farm properties were severely damaged. Many individuals had to temporarily evacuate their homes until the floodwater receded. A total of seven deaths were attributed to the 11-13 October storm and resultant flooding.

m. Storm of November 1981. The flood produced by the November 1981 Storm reached stages of 26.80 feet at Elm Fork Trinity River near Sanger gage, 10.65 feet at Elm Fork Trinity River near Carrollton gage, and 27.83 feet at Elm Fork Trinity River near Lewisville gage. The peak discharges at Elm Fork Trinity River near Carrollton gage was 82,100 cubic feet per second. The peak discharges at Elm Fork Trinity River near Sanger gage, Elm Fork Trinity River near Carrollton gage, and Elm Fork Trinity River near Lewisville gage were 14,900, 21,100, and 15,000 cubic feet per second, respectively.

n. Storm of May 1982. Heavy rains from a slow-moving cool front caused flash floods throughout North Central and northern East Texas. General rains of 10 to 12 inches caused widespread urban flooding north and northeast of the Dallas-Fort Worth area. Rainfall accumulations for the period between May 11-15 in the Elm Fork watershed were as follows; Carrollton 7.61 inches, Denton 14.44 inches, Pilot Point 13.30 inches, and the Lewisville Lake Project 8.78 inches. The gage on Isle du Bois Creek near Pilot Point recorded a stage height of 29.8 feet with a flow of 39,400 cubic feet per second. The Elm Fork near Sanger gage peaked at

26.7 feet with a flow of 18,700 cubic feet per second. The peak flow into Lake Lewisville was estimated at 286,000 cubic feet per second, approximately equal to the peak inflow from the 1981 flood. Lake Lewisville reached a peak elevation of 535.25 feet NAV88 or 3.25 feet above the spillway. As a result of Grapevine and Lewisville Lakes and their storage capacity, the flow at the Carrollton Gage was reduced to 17,400 cubic feet per second and the flow at the Dallas Gage was reduced to 29,800 cubic feet per second.

o. Storm of May-June 1989. Scattered rains occurred throughout North Central Texas prior to the major storms which began on 3 May. There were three distinguishable rainfall periods; 3-5 May, 16-18 May, and 1-15 June. On 3-5 May the upper Trinity River Basin received in excess of 4 inches of rain with amounts of 5.5 inches reported in the Mid-cities. This rainfall saturated the watershed which resulted in most of the lakes levels approaching or going into the flood pool. On 16-17 May the 24 hour recorded rainfall was 5.34 inches at the DFW Airport. During the morning of 16 May, Bowie received 10.25 inches of rain. Most of the upper watershed received in excess of 6 inches of rain. Late May produced some light rains but these rains were insignificant. The rainfall, through 1 June 1989 for DFW Airport was 21.45 inches or 7.56 inches above normal. The rainfall and run-off nearly filled all of the lakes in North Texas. Lewisville, Grapevine and Lavon Lakes went well into the flood pool.

Rains continued into June throughout North Texas. It rained somewhere in North and East Texas every day from 1-14 June. Rainfall amounts of 2 to 4 inches were common with isolated amounts of near 6 inches. The DFW Airport received 8.75 inches of rainfall in June. DFW Airport reported 30.21 inches in the first 6 months of 1989, where the average annual rainfall is 35.18 inches (1966-1995, 30 year average). The two month total, May to June, for Pilot Point was 23.93 inches and for the Lewisville Project Office was 19.03 inches. Lewisville Lake reached an elevation of 532.31 feet during this time. The peak inflow was approximately 80,000 cfs. During the month of June, Benbrook, Grapevine, and Lewisville Dams all had water flowing through their service spillways concurrently. This was the first time this had happened in the history of the projects. The Trinity River at Dallas crested at 42.97 feet (flood stage is 30 feet) which was the highest crest since the construction of Benbrook, Lewisville, and Grapevine Dams. Flooding occurred in South Dallas where many families had to be relocated and major damage was experienced. The flood wave then proceeded downstream where the gage at Rosser crested at 36.15 feet (flood stage is 26 feet), Trinidad crested at 42.72 feet (flood stage is 28 feet), and Long Lake crested at 45.5 feet (flood stage is 35 feet). Downstream flooding forced many ranchers to move herds of livestock out of the flood plain. From newspaper accounts, 25 deaths were attributed to the flood.

p. Storm of April-May 1990. A large portion of State of Texas experienced above normal rainfall January through April and into May of 1990. The major storm systems in the latter part of April were the result of a cold front mixed with an upper level low and produced two frontal type storms which formed over north and west Texas from 17-20 April and 24-27 April 1990. The storm which occurred on 1-4 May 1990 was the result of cool surface air mixing with warm rising air from the south-southwest. The upper Trinity River Basin received 2 to 3 inches of rain from the April 17-20 storm. The April 24-27 storm was such that much of the

upper basin received 6 to 8 inches. Precipitation at the Dallas/Fort Worth Airport (DFW) for the first four months of 1990 was 22.05 inches (12.42 inches above normal). The April precipitation at DFW was 6.90 inches (3.27 inches above normal). The May 1-4 storm resulted in most of the upper Trinity Basin receiving 4 to 6 inches of rain. Some rainfall extremes for May were; Carrollton 6.55 inches, Frisco 7.04 inches, Gordonville 6.91 inches, Gunter 7.22 inches, and Pilot Point 6.1 inches.

Ray Roberts Lake peaked at elevation 644.44 feet or 157 percent of flood control storage on 03 May 1990, setting a new record elevation. This elevation is 3.94 feet above the top of the flood control pool and is only 1.06 feet below the spillway crest. The peak inflow into the lake was approximately 115,000 cfs. Lewisville Lake peaked at elevation 536.73 feet or 158 percent of flood control storage on May 4, 1990, setting a new record elevation. This elevation is 4.73 feet above the service spillway and produced an uncontrolled flow of 19,300 cubic feet per second as compared to peak inflow of approximately 235,000 cubic feet per second. Of the eight flood control lakes in the Trinity Basin, six attained new record peak elevations and four exceeded the top of their flood control pool.

The flooding resulted in the closing of many roads and bridges. Numerous levee systems along the Trinity River between Dallas County and Liberty County were overtopped and scoured. About 200 homes and businesses were flooded in the Rochester Park area of South Dallas. An estimated $30 million in damages was caused by the flooding in Dallas County. The Clear Creek gage near Sanger crested at 31 feet, which corresponded to a flow of approximately 15,000 cubic feet per second. The water level at this stage height was 6 feet above the top of bank. The Carrollton gage on the Elm Fork crested at 13.48 feet with a corresponding flow of 27,600 cubic feet per second. If it had not been for the three Corps lakes on the Elm Fork it is estimated that the flow at Carrollton would have been 255,000 cubic feet per second. The Dallas gage peaked at 47 feet with an observed flow of 81,000 cubic feet per second. It was estimated that without the upstream reservoirs Dallas would have reached a stage of 60 feet with a corresponding flow of 260,000 cubic feet per second. Releases from Lake Livingston reached a maximum of 100,800 cubic feet per second. This release surpassed the previous high release of 75,000 cubic feet per second in the 1973 flood. These releases produced a flow of 106,000 cubic feet per second with a record crest elevation of 30.07 feet at Liberty in southeast Texas.

q. Storm of December 1991. An upper level low over Arizona forced the jet streams through Mexico and into Texas drawing moisture out of the Pacific. The moist air in the mid and upper layers of the system was the catalyst for the rains that occurred over the next several days. This resulted in some 100,000 square miles in the eastern-half of Texas receiving in excess of 4 inches of rainfall. The heaviest rainfall totals fell along the Edwards Plateau where 12 to 16 inches amounts were common. December also saw one of its largest floods in terms of water volume.

Most of the Trinity River Basin received rainfall amounts of between 4 to 6 inches during this 6 day period Some of the recorded rainfall amounts in the Elm Fork watershed were as follows: Denton 2SE 4.27 inches, Forestburg 5.60 inches, Frisco 6.11 inches, Gunter 6.41 inches,

Lewisville Dam 6.61 inches, Muenster 4.58 inches, Pilot Point 5.80 inches, Slidell 6.09 inches, and Valley View 6.11 inches. This rainfall produced about 250,000 acre-feet of runoff, which raised Lewisville Lake from elevation 523 feet to 530 feet. The peak inflow into the lake was approximately 82,000 cfs. The Carrollton Gage on the Elm Fork crested at 10.32 feet with a flow of 11,500 cfs. If it had not been for the three USACE lakes on the Elm Fork it is estimated the flow at the Carrollton Gage would have been 182,000 cfs.

r. Storm of June 2007. From 4 to 30 June 2007, heavy rains occurred over the Elm Fork Trinity River Basin, with 12.21, 20.01, 12.98, and 12.00 inches recorded at the Denton, Gainesville, Muenster, and Lewisville gages, respectively. The flood produced by the June 2007 Storm reached stages of 9.68 feet at Elm Fork Trinity River near Carrollton gage, and 27.11 feet at Clear Creek near Sanger gage. The peak discharges at Elm Fork Trinity River near Carrollton gage, and Clear Creek near Sanger gage were 9,970, and 12,800 cubic feet per second, respectively.

s. Storm of May 2015. Consistent rain in Central Texas during one of the wettest months on record led to widespread flooding in the Dallas-Fort Worth and Houston areas, killing a total 31 people in Texas and Oklahoma, and ending a four year-long drought. The statewide average monthly rainfall was a record 8.81 inches, and multiple local rainfall records were also set during the month. Stations in the Elm Fork Trinity River Basin received 9-28 inches in a 3-week period, with a center at Gainesville, which received 28.9 inches. The flood resulting from this storm reached a stage of 13.12 feet at Elm Fork Trinity River near Carrollton gage, 28.92 feet at Clear Creek near Sanger, and 30.98 feet at Elm Fork Trinity River near Lewisville. The peak discharges for this storm at Carrollton, Sanger, and Lewisville were 26,700, 18,900, and 18,500 cubic feet per second, respectively. Lewisville Lake elevation peaked at a new record of 537.01 feet, 5.01 feet above the spillway.

t. Storm of May-June 2016. A slow moving upper-level low pressure area caused significant rainfall followed by flood throughout North Texas during the first week of June 2016. Due to seemingly incessant rainfall in the Elm Fork Trinity River watershed, the elevation in Lewisville Lake was increased by almost four feet. The Lewisville Lake elevation increased from 523 feet to 527.12 feet from May 27-June 3, and two feet of that increase took place in less than 24 hours. Water continued to rise at a rapid rate as the streams and rivers kept feeding the Lake due to the rainfall. The flood resulting from this storm reached a stage of 26.87 feet at Elm Fork Trinity River near Lewisville. The recorded peak discharges for this storm at Lewisville was 7,330 cfs.

The USGS historical information of all Major Floods is listed in Supplementary Table 4-8 (pg. T4.8-1). The data shown in the table covers the period 1908 to 2015.

Figures 4-6 through 4-17 are scenes of 2007 and 2015 floods at Lewisville Lake.

Figure 4-6. 2007 Flood - Boat Ramp

Figure 4-7. 2007 Flood - Fishtrap Road

Figure 4-8. 2007 Flood - Park Road

Figure 4-9. 2007 Flood - Park Road

Figure 4-10. 2007 Flood - Parking Lot

Figure 4-11. 2007 Flood - Boat Dock Area

Figure 4-12. 2015 Flood - Aerial View

Figure 4-13. 2015 Flood - Lake High Water

Figure 4-14. 2015 Flood - Park Entrance

Figure 4-15. 2015 Flood - Park Road

Figure 4-16. 2015 Flood - Picnic Area

Figure 4-17. 2015 Flood - Little Elm Amphitheater

4-07. Runoff Characteristics. Floods may occur at almost any time of year in the Elm Fork Trinity River watershed. Steep slopes in the upper part of the Elm Fork Basin produce high runoff during periods of heavy rainfall. Initial rainfall losses range from 0.30 inches to 1.00 inches, with uniform infiltration rates between .04 to .15 inches per hour. A Dam Safety Assurance study to determine the probable maximum flood used the 30-31 October, 1974 storm event to determine Snyder's unit hydrograph coefficients. The adopted Snyder's values for a unit hydrograph are; C_t of 1.3 and a C_p of 0.75. For design purposes an initial loss rate of 0.50 and a constant infiltration rate of .05 inches per hour were used. Unit hydrograph determinations for Lewisville Lake were developed using the Elm Fork Trinity River Watershed storm of October 30-31, 1974. This storm produced the flood of record as measured by the gage on the Elm Fork Trinity River near Sanger, effective at the time of the Dam Safety Assurance Study.

The computed monthly and annual inflow volumes, based on change in lake storage, are shown in Table 4-9 (pg. T4.9-1). The monthly inflow volume exceedence frequency curves, based on data from 1954 to 2016 are shown on Plates 4-4 through 4-15. Table 4-10 shows the monthly inflow volume frequency for the 5-, 10-, 25-, and 50-year events.

TABLE 4-10

Lewisville Lake Monthly Inflow Volume Frequency

	Inflow Volume in Acre-Feet Frequency of Occurrence in Years			
MONTH	5	10	25	50
January	70,782	106,057	152,688	187,963
February	101,789	152,068	218,533	268,811
March	133,223	191,961	269,609	328,347
April	147,884	221,576	318,992	392,684
May	231,948	355,419	518,639	642,110
June	142,090	215,760	313,146	386,816
July	69,455	108,579	160,299	199,424
August	36,866	55,640	80,459	99,234
September	67,987	107,166	158,959	198,138
October	125,887	205,103	309,820	389,036
November	103,296	162,991	241,903	301,597
December	91,687	143,440	211,853	263,605

NOTE: Based on computed inflows for period November 1954 to September 2016.

4-08. <u>Water Quality</u>. Texas Commission on Environmental Quality (TCEQ) publishes the assessment reports for the quality of surface waters for Trinity River basin in the biennial Integrated Report (formerly called the "Texas Water Quality Inventory and 303(d) List") that evaluates the quality of all surface waters in Texas. The Integrated Report is prepared according to Clean Water Act Sections 305(b) and 303(d). In the report, the TCEQ classifies water bodies based on the body's ability to support its designated uses. In other words its "Level of Support".[12]

The designated uses for Lewisville Lake are flood control, water supply, aquatic habitat, and contact recreation. According to the 2014 TCEQ report, Lewisville Lake (Segment ID 0823) had no water quality issues with the exception of a "Screening Level Concern" for Chlorophyll-a. All other monitored parameters were classified as either "Fully Supporting" their designated uses of public water supply and fish consumption, "No Concern", or "Not Assessed". The results of the 2014 report are reproduced in Tables 4-11A and 4-11B.

The United States Environmental Protection Agency (EPA) also released the water body reports and water quality assessment for Lewisville Lake for period 2002 to 2010. The designated uses of the lake were assessed, and all of them were found to be "good".[13]

The USGS sampled eight sites for Lewisville Lake on three different occasions in 1997 (23 January 1997, 13 May 1997, 2 July 1997) for various biological and chemical parameters.[14] The mean concentrations of the various parameters for four of those sites are shown in Table 4-11C. The sampling results indicate that the levels of the various biological and chemical constituents monitored are generally within the criteria set by the Texas Department of Water Resources, and does not have any present or potential water quality problems.

For calendar years 1988-1993, the turbidity readings taken by the Dallas Water Utilities are shown in Table 4-11D. Turbidity is measured in Nephelometric Turbidity Units (NTU). An NTU count of less than 5 NTU's is not noticeable to the human eye.

Lewisville Lake receives effluent from eighteen municipal wastewater treatment plants under permits from the Texas Commission on Environmental Quality. In addition, Lewisville Lake has a substantial amount of shoreline development which contributes to nonpoint source pollution. A major potential contributor of non-point source loading is the nearby city of Denton. The point source dischargers and nonpoint pollutant sources plus modest loadings of nitrogen and suspended solids from tributary streams supply sufficient nutrient concentrations to support substantial phytoplankton communities.

[12] https://www.tceq.texas.gov/waterquality/assessment/14twqi/14txir

[13]https://iaspub.epa.gov/waters10/attains_watershed.control?p_huc=12030103&p_state=TX&p_cycle=2002&p_report_type=A

[14]http://waterdata.usgs.gov/nwis/inventory?search_station_nm=lewisville&search_station_nm_match_type=beginning&state_cd=tx&format=station_list&group_key=county_cd&list_of_search_criteria=state_cd%2Csearch_station_nm

The phytoplankton populations are potentially responsible for occasional taste and odor problems in the Dallas water supply. Measured chlorophyll concentrations have indicated relatively high levels of phytoplankton. During several summer seasons phytoplankton productivity has been especially high. At those times, blue green algae generally predominated over green algae and diatoms. According to the Waterways Experiment Station (WES) Aquatic Plant Research Facility at Lewisville Lake, Hydrilla infestation exists in Lewisville Lake around the Arrowhead Park area. In 1996 the total area of infestation was estimated to be approximately 30 acres.

TABLE 4-11A

TCEQ Integrated Assessment Report General Use and Aquatic Life, 2014

Major Constituents	Mean Concentration	LOS
Dissolved Oxygen Screening Level (mg/l)	3.4	NC
E. coli (colonies/100 ml)	—	FS
Total Dissolved Solids (mg/l)	271.6	FS
pH (Standard Units)	7.0	FS
Temperature (F)	91.6	FS
Ammonia Nitrogen (mg/l as N)	0.2	NC
Sulfate (SO4) (mg/l)	—	FS
Orthophosphorus (µg/l)	—	FS
Nitrate (NO4) (µg/l)	0.5	NC
Chloride (Cl^-) (mg/l)	—	FS
Chlorophyll-a	68.7	CS
Phosphorus (mg/l)	0.6	NC
Copper (µg/l)	2.1	FS
Zinc (µg/l)	8.0	FS

LOS: Level of Support
FS: Fully Supporting
NC: No Concern
CS: Screening Level Concern

TABLE 4-11B

TCEQ Integrated Assessment Report Public Water Supply Use and Fish Consumption Use, 2014

Major Constituents	Mean Concentration	LOS
Lead (µg/l)	0.5	FS
Barium (µg/l)	38.6	FS
Selenium (µg/l)	—	FS
Arsenic (µg/l)	2.5	FS
Cadmium (µg/l)	0.2	FS
Nickel (µg/l)	2.7	FS
Nitrate (µg/l)	0.2	FS
Chromium (µg/l)	2.5	FS

LOS: Level of Support
FS: Fully Supporting

TABLE 4-11C

USGS Water Quality Sampling, 1997

Major Constituents	Mean Concentrations (1)			
	Station AC	Station EC	Station FC	Station GC
Dissolved Oxygen @ 1.0 ft depth	10.3	9.4	9.7	10.8
Dissolved Oxygen @ 10.0 ft depth	9.7	8.9	9.2	9.8
Specific Conductance, mho/cm	303.7	294.0	304.3	299.7
Total Dissolved Solids (mg/l)	173.3	170.3		171.3
pH (Standard Units)	8.4	8.2	8.2	8.3
Temperature (F)	66.2	66.2	65.6	65.5
Carbon Dioxide (CO2)	1.1	1.4	—	1.1
Alkalinity (mg/l as CaCO3)	97.7	96.3	—	110.0
Hardness, non-carbonate (mg/l as CaCO3)	7.0	8.3	—	3.7
Transparency (Secchi disc, m)	0.1	0.4	—	0.5
Ammonia Nitrogen (mg/l as N)	0.34	0.03	0.05	0.4
Nitrate + Nitrite Nitrogen (NO2 + NO3) (mg/l as N)	0.4	0.5	0.2	0.2
Sodium (dissolved) (mg/l as Na)	19.0	17.1	—	17.0
Potassium (dissolved) K (mg/l)	4.2	4.4	—	4.4
Chloride (CL) (mg/l)	14.1	12.6	—	17.2
Sulfate (SO4) (mg/l)	31.5	31.8	—	20.4
Calcium (Ca) (mg/l)	36.3	36.6	—	39.0
Magnesium (Mg) (mg/l)	3.6	3.5	—	4.0
Silica (SiO2) (mg/l)	3.2	3.1	—	2.6
Fluoride (F) (mg/l)	0.3	0.3	—	0.3
Manganese (Mn) (µg/L)	17.5	3.0	1.5	<1
Fecal Coliform (2)	(colony count/100 ml)			
Winter	E15	E12	—	E8
Spring	E2	E10	—	20
Summer	E1	E2	—	E1

(1) Measurements are in mg/L unless otherwise stated. Mean averages are taken at a 1.0-foot depth unless otherwise stated. The water quality sampling for all parameters was conducted on the following dates: Winter: 1 Jan 97; Spring: 13 May 97; and Summer: 2 Jul 97. (2) "E" stands for estimated value.

TABLE 4-11D

Dallas Water Utilities Turbidity Data , 1988-1993

Station	L5 (Elm Fork Trinity Branch)	L6 (Little Elm Fork Branch)	L7 (Hickory Creek Branch)
Average NTU	18.00	12.00	13.00
Average NTU	47.00	59.00	76.00
Average NTU	7.00	2.30	2.00
Standard Deviation from Average	10.00	8.00	11.00

Note: Values for Standard Deviation are also in units of NTU's.

4-09. Channel and Floodway Characteristics. The Trinity River downstream of Lewisville Lake has a channel capacity ranging from 7,000 cfs in the Elm Fork at Carrollton, to 13,000 cfs in the Trinity River at Dallas, and 24,000 cfs in the Trinity River at Oakwood. Channel improvements and levee construction has been authorized on the Elm Fork downstream of Lewisville Lake and on several areas along the Trinity River. However, there are no plans to design and construct the Elm Fork Floodway at this time. The existing channel capacities are shown in Table 4-12.

The Upper Trinity and the Dallas Floodway Extension Projects are both in the feasibility study phase of design. The Upper Trinity Feasibility Study was approved by the Dallas City Council and will focus on two main areas in the next 3 years. These areas are the existing Dallas Floodway (near the confluence of the Elm Fork and the West Fork of the Trinity River) and the North Stemmons Industrial Area.

The other project is the Dallas Floodway Extension which proposes to extend the existing channel/levee system for a distance of 9 miles on the main stem of the Trinity River, south of downtown Dallas. This project is proposing to have wetlands, swales, and recreational areas located within it. Also included in the original project were 4.1 miles of channel improvements along White Rock Creek, and 5.4 miles of channel improvements to divert and channelize Five Mile Creek. These channel projects would increase the discharge that can be carried without flood damages. Existing and proposed channel capacities along the Elm Fork and Trinity River are given in Table 4-12.

The estimated travel time for flood flows from Lewisville Lake to the Elm Fork River near Carrollton gage is about 8 hours, to Trinity River at Dallas gage (river mile 500.3) is about 32 hours, to Trinity River near Rosser gage (river mile 451.4) is about 92 hours, to Trinity River at Trinidad gage (river mile 390.3) is about 164 hours, and to Trinity River near Oakwood gage (river mile 313.4) is about 236 hours. The flood peak travel times in the Trinity River basin are shown in Table 4-13 and Plate 4-19.

The locations of the USGS stream gages in the Trinity River basin are shown on Plate 5-1a and 5-1b, respectively. Discharge rating curves for the key control points are shown on Plates 4-15 through 4-18. These curves are only valid for rough use. The rating curves used by the Water Resources Branch are adjusted by the USGS for changing conditions and reflect the current stage-flow relationships at the gages.

TABLE 4-12

Channel Capacities on the Elm Fork and Trinity River

Reach	Channel Capacity -Existing (cfs)
Elm Fork Lewisville Dam to Carrollton Gage	7,000
Carrollton Gage to mouth of Elm Fork*	7,000
Trinity River, Dallas Gage	13,000
Trinity River, Rosser Gage	15,000
Trinity River, Oakwood Gage	24,000

NOTE: *Flows above 5,500 are known to limit the use of the Indian Creek Golf Club), Dallas Gun Club, and Luna Vista Golf Course.

Table 4-13 and Plate 4-19 show flood peak travel times between upstream gages and Lewisville Lake and between Lewisville Lake and downstream gages on the Elm Fork Trinity River.

TABLE 4-13

Flood Peak Travel Times between Lewisville Lake and the

Trinity River near Oakwood Gage

Stream Gaging Station and Stream	Travel Time in Hours	Cumulative Travel Time in Hours
Lewisville Lake to the Elm Fork near Carrollton gage	8	8
The Elm Fork near Carrollton gage to the Trinity at Dallas gage	24	32
The Trinity at Dallas gage to the Trinity near Rosser gage	60	92
The Trinity near Rosser gage to the Trinity at Trinidad gage	72	164
Trinity at Trinidad gage to the Trinity near Oakwood gage	72	236

NOTE: Based on "Lewisville Dam and Lake Water Control Manual", revised on October 1990.

4-10. Upstream Structures. The U.S. National Resource Conservation Service has constructed 130 flood retention dam sites in the Elm Fork watershed upstream of Lewisville Dam and have plans for one additional structure. The NRCS reservoirs have a cumulative flood storage of 85,133 acre-feet and partially control runoff from 313 square miles. This includes both the Lewisville and Ray Roberts's watersheds. The NRCS structures will have small impact upon flood flows but will reduce inflow to Lewisville Lake during normal and low flow periods. The SCS structures also trap sediment produced from upstream watersheds. The cumulative sediment storage is estimated at 15,434 acre-feet from both watersheds.

Ray Roberts Dam is located 30.0 miles upstream from Lewisville Dam. The drainage area between the dams is 968 square miles; the total Ray Roberts Lake drainage is 692 square miles. Ray Roberts Lake is regulated by the Fort Worth District of the Corps of Engineers and is operated in conjunction with Lewisville Lake.

4-11. Downstream Structures. Lewisville Lake is part of the Trinity River basin system, which presently consists of eight major USACE flood control projects. None of the eight are on the mainstem of the Trinity River. Six of these Corps projects are located effectively downstream from Lewisville Lake, which are Benbrook Dam, Bardwell Dam, Grapevine Dam, Joe Pool Dam, Lavon Dam, and Navarro Mills Dam.

4-12. Economic Data. The Trinity River watershed is predominantly urban, with an economy based on trade, transportation and utilities, professional business service, and education and healthcare. Medium- to large-sized metropolitan areas such as those in Dallas, Denton, Tarrant counties are located within the basin.

Based on the information published by U.S. Census Bureau, the population within the Trinity River basin has continually increased over the last 50 years in most counties. Counties that are more metropolitan have grown more rapidly than the rural counties - some of which have grown very little. Population projections indicate that growth is anticipated to continue. County Business Patterns (CBP), a database published by the U.S. Census Bureau, provides valuable information on the number of industrial and business establishments within a particular county.[15] Sectors that are typically heavy consumers of water include: agriculture and livestock, steam-electric, mining, manufacturing, professional, scientific and technical services, health care and social assistance, accommodation and food services, and military installations. For some of the major counties in the basin, CBP data was reviewed for a 12-year period from 2000 to 2012. Water use in the watershed area is approximately 90 percent municipal, 3 percent manufacturing, and 7 percent mining, agricultural and steam-electric.[16] The most concentrated water uses in the area are municipal use in Dallas County, steam-electric use in Freestone County, and mining use in Wise County.

[15] www.census.gov/econ/cbp/

[16] http://www.twdb.texas.gov/waterplanning/rwp/regions/c/index.asp

The following sections provide information on population, agricultural production, and industries in the counties within the Trinity River basin and surrounding areas.

a. Population. Lewisville Lake watershed comprises parts of Denton, Cooke, Collin, Grayson, Montague and Wise Counties. Based on the 2016 U.S. Census Bureau data, Denton County has a population of 806,180, of which 17 percent (or 134,385) is in Denton, the county seat. Collin County has a population of 939,585, of which 18 percent (or 172,984) is in McKinney. Grayson is 59 miles northeast of the lake and Wise is 51 miles west of the lake.

The population growth of the 18 major counties within the Trinity River basin since the construction of Lewisville Lake is shown in Table 4-14. Although varying proportions of the total population of the counties listed lie within the watershed boundaries, the entire population of each county is provided.

TABLE 4-14

Population Growth of Counties within the Trinity River Basin

County	1960	1970	1980	1990	2000	2016
Cooke	22,560	23,471	27,656	30,777	36,462	39,266
Collin	41,247	66,920	144,576	264,036	491,675	939,585
Dallas	951,527	1,327,321	1,556,390	1,852,810	2,218,899	2,587,462
Denton	47,432	75,633	143,126	273,525	432,976	806,180
Ellis	43,395	46,638	59,743	85,167	111,360	168,381
Fannin	23,880	22,705	24,285	24,804	31,242	33,855
Freestone	12,525	11,116	14,830	15,818	17,867	19,647
Grayson	73,043	83,225	89,796	95,021	110,595	128,235
Henderson	21,786	26,466	42,606	58,543	73,277	80,034
Jack	7,418	6,711	7,408	6,981	8,763	8,766
Kaufman	29,931	32,392	39,015	52,220	71,313	118,046
Liberty	31,595	33,014	47,088	52,726	70,154	81,377
Montague	14,893	15,326	17,410	17,274	19,117	19,414
Navarro	34,423	31,150	35,323	39,926	45,124	48,375
Parker	22,880	33,888	44,609	64,785	88,495	128,861
Rockwall	5,878	7,046	14,528	25,604	43,080	93,419
Tarrant	538,495	716,317	860,880	1,170,103	1,446,219	2,021,746
Wise	17,012	19,687	26,575	34,679	48,793	64,455

NOTE: Source: Census.gov

b. Agriculture. According to the 2016 Region C Water Plan, municipal supply comprises about 90 percent of the region's water use.[17] This amount of water use is projected to grow in coming decades. It is interesting to note that Region C, with over 25 percent of Texas' population, had only 8.3 percent of the state's water use in 2011. Table 4-15 lists the acreage of cropland planted in each major crop, the total agricultural acreage, the quantity of livestock, and the agricultural income for each county during the year 2012.

TABLE 4-15

Agricultural Production for Major Counties in the Lewisville Lake Watershed, 2012

Product	Montague County	Cooke County	Grayson County	Wise County	Denton County	Collin County
Corn (acres)	D	1,173	19,644	D	4,782	20,379
Cotton (acres)	D	D	1,045	—	D	D
Oats (acres)	370	3,536	749	D	979	646
Sorghum (acres)	50	6,642	6,548	1,745	7,329	15,535
Wheat (acres)	5,633	19,706	48,010	7,745	29,580	36,529
Cropland Planted (acres)	74,027	132,431	176,390	114,295	131,894	136,635
Land in Farms and Ranches (acres)	488,672	503,827	431,268	487,078	383,533	312,806
Cattle (1000 head)	58	64	46	58	41	36
Crop Market Value*	8,419	18,507	66,859	16,410	35,317	50,811
Livestock Market Value*	36,512	44,812	25,089	33,457	101,679	27,001
All Agriculture Market Value*	44,931	63,319	91,948	49,867	136,995	77,812

NOTES: 1. (D) Withheld to avoid disclosing data for individual farms.
2. Data from 2012 Census of Agriculture, prepared by National Agricultural Statistics Service, U.S. Department of Agriculture.
3. *Quantity given in $1,000s.

[17] www.twdb.texas.gov/waterplanning/rwp/regions/c

c. Industry. Due to the size of the Trinity River basin, a large variety of industries are represented in the area. According to U.S. Census employment data, the major industries in the region are wholesale and retail trade, manufacturing, and arts, leisure and hospitality. A 2012 U.S. Bureau of Labor Statistics report indicates that chemical, industrial, and electronics manufacturing, and food and beverage processing are the industries most concentrated in the watershed. According to the 2016 Region C Water Plan, municipal use comprises about 90% of the region's total water use, and is projected to increase to 60 percent by 2060.[18] Table 4-16 gives the estimated number of people employed in various industries in each county, as compiled by the 2012 United States Census.

[18] www.twdb.texas.gov/waterplanning/rwp/regions/g/

TABLE 4-16

Employment in Counties within the Trinity River Basin, 2014

Industry	Number Employed						
	Cooke County	Collin County	Dallas County	Denton County	Ellis County	Fannin County	Freestone County
Agriculture, Forestry, Fishing & Hunting	2	20	724	77	10	10	0
Construction, Mining, Oil & Gas	1,981	16,200	75,896	9,908	2,836	347	648
Manufacturing	3,138	18,662	98,299	12,304	9,679	692	240
Trade, Transportation & Utilities	4,226	67,049	282,596	50,550	9,645	1,149	1,201
Finance, Insurance, & Real Estate	453	48,149	135,764	16,208	1,219	170	409
Professional, Scientific & Business Services	317	59,034	196,355	15,594	1,269	173	81
Education & Healthcare	1,129	46,786	195,001	27,733	4,035	1,243	331
Arts, Leisure & Hospitality	1,475	44,387	135,391	29,467	4,467	525	579
Communication & Information	118	12,897	49,558	3,637	326	49	43
Public Administration	330	25,991	141,335	15,732	2,131	182	84
Other Services	628	15,547	50,628	10,326	2,066	260	213
Total	13,797	354,722	1,361,547	191,536	37,683	4,800	3,829

NOTE: Data from the United States Census, 2014.

TABLE 4-16 (CONTINUED)

Employment in Counties within the Trinity River Basin, 2012

Industry	Number Employed						
	Grayson County	Henderson County	Jack County	Kaufman County	Liberty County	Montague County	Navarro County
Agriculture, Forestry, Fishing & Hunting	100	5	60	0	86	0	20
Construction, Mining, Oil & Gas	1,980	725	1,062	1,984	1,750	1,352	1,253
Manufacturing	7,088	1,723	60	3,670	1,683	207	2,990
Trade, Transportation & Utilities	8,841	3,409	384	6,898	3,739	978	3,635
Finance, Insurance, & Real Estate	2,251	685	90	797	533	179	542
Professional, Scientific & Business Services	999	760	57	603	384	250	476
Education & Healthcare	9,219	2,169	47	3,655	1,884	528	2,529
Arts, Leisure & Hospitality	4,814	2,003	177	3,021	1,527	494	1,370
Communication & Information	428	147	10	150	40	30	117
Public Administration	2,559	382	175	824	412	0	621
Other Services	1,419	794	94	1,211	1,236	224	451
Total	39,698	12,802	2,216	22,813	13,274	4,242	14,004

NOTE: Data from the United States Census, 2012.

TABLE 4-16 (CONTINUED)

Employment in Counties within the Trinity River Basin, 2012

Industry	Number Employed			
	Parker County	Rockwall County	Tarrant County	Wise County
Agriculture, Forestry, Fishing & Hunting	61	0	165	0
Construction, Mining, Oil & Gas	4,735	1,525	46,687	5,804
Manufacturing	2,596	1,149	77,741	1,869
Trade, Transportation & Utilities	8,667	5,878	193,389	4,599
Finance, Insurance, & Real Estate	961	932	56,617	628
Professional, Scientific & Business Services	1,178	1,150	56,436	374
Education & Healthcare	3,274	4,257	107,492	2,684
Arts, Leisure & Hospitality	3,706	4,361	101,223	1,705
Communication & Information	251	193	16,894	70
Public Administration	1,124	1,131	63,308	617
Other Services	1,731	1,458	36,341	1,302
Total	28,284	22,034	756,293	19,652

NOTE: Data from the United States Census, 2012.

d. Flood Damages. The flood damages prevented in the Elm Fork Trinity River basin by Lewisville Dam and Lake during fiscal year 2015 were estimated to be $3,616,516,200. The cumulative damages prevented since the completion of the project in 1955 through 2015 are $35,276,767,800, and the average is $578 million per year. Table 4-17 and Table 4-18 show discharge versus damages incurred for agricultural and non-agricultural on the Elm Fork Trinity River at Pilot Point and Carrollton. The damages shown in the tables are estimated to occur at the various discharge levels, as the exact amount of damage will vary.

TABLE 4-17

Discharge versus Damages on Elm Fork Trinity River at Pilot Point, 2016

Discharge (cfs)	Damages (X$1,000)						
	Crops (1)	Crops (2)	Crops (3)	Crops (4)	Crops (C)	Other ag.	Non-ag.
6,300	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
9,400	$2.8	$11.4	$19.9	$42.6	$20.1	$72.8	$122.8
15,000	$5.0	$20.0	$35.0	$75.0	$35.4	$89.3	$181.3
20,000	$6.3	$25.3	$44.2	$94.8	$44.7	$100.4	$280.4
27,000	$7.1	$28.4	$49.6	$106.3	$50.1	$139.1	$554.9
35,000	$7.5	$35.0	$60.0	$123.0	$59.6	$163.0	$1,130.0
57,400	$26.7	$107.0	$187.2	$401.1	$189.1	$184.2	$4,300.0
100,000	$48.6	$189.2	$332.3	$718.4	$336.8	$208.4	$7,917.2
200,000	$79.5	$304.9	$536.8	$1,165.4	$544.8	$242.5	$13,011.8

Crops (1) = Jan, Nov, Dec
Crops (2) = Aug, Sep, Oct
Crops (3) = Feb, Mar, Apr
Crops (4) = May, Jun, Jul

NOTES: 1. This table is estimated on roughly available data.
2. Price levels are for September 2016. To convert the prices to a different year, average annual cost indexes must be applied.

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TABLE 4-18

Discharge versus Damages on Elm Fork Trinity River at Carrollton, 2016

Discharge (cfs)	Damages (X$1,000)						
	Crops (1)	Crops (2)	Crops (3)	Crops (4)	Crops (C)	Other ag.	Non-ag.
7,500	—	—	—	—	—	—	$0.0
12,000	—	—	—	—	—	—	$18,377.0
17,300	—	—	—	—	—	—	$34,819.0
24,400	—	—	—	—	—	—	$45,961.0
32,500	—	—	—	—	—	—	$58,554.0
39,900	—	—	—	—	—	—	$76,980.0
48,600	—	—	—	—	—	—	$102,348.0
91,200	—	—	—	—	—	—	$1,324,813.0
200,000	—	—	—	—	—	—	$1,949,245.8

NOTES: 1. This table is estimated on roughly available data.
2. Price levels are for September 2016. To convert the prices to a different year, average annual cost indexes must be applied.

CHAPTER V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Hydrometeorological Stations.

a. Facilities**.** The Water Resources Branch of the USACE, Fort Worth District, the NWS, and the USGS cooperate to collect hydrometeorological data and maintain a reliable communication network. Plates 5-1a through 5-1c show the locations of the USGS stream gages in the Trinity River basin, and Plate 5-1d shows the USGS stream gages in the Elm Fork Trinity River basin. Commercial television weather services provide current radar and forecasted weather conditions to assist the Water Resource Branch in monitoring storm events.

1. Precipitation Gages. The NWS and USGS maintain a network of rain gages and observers throughout the Trinity River basin. The NWS precipitation gages used to forecast runoff in the Elm Fork Trinity River watershed are listed in Table 5-1 and are shown on Plate 5-3, respectively.

TABLE 5-1

Upstream NWS Precipitation Gages

Name of Station	Description
Argyle 1.6 NNW	Discontinued
Carrollton	Recording
Celina 7.3 NE	Discontinued
Denton 2 SE	Recording
Flower Mound 2.3 NE	Recording
Forestburg 5.5	Recording
Frisco	Recording
Gainesville	Recording
Gunter 5S	Discontinued
Lewisville Dam	Recording
Little Elm 2.5 NE	Discontinued
Muenster	Recording
Oak Point	Recording
Pilot Point	Discontinued
Ray Roberts Lake	Discontinued
Sanger 1.8 WSW	Discontinued
Shady Shores 3.9N	Recording
Slidell	Discontinued
Valley View	Discontinued

2. Weather Radar Sites. The NWS maintains 12 Doppler radar sites across Texas for surveillance of immediate weather conditions. The NWS also cooperates with the Department of Defense to obtain radar information from four military sites in Texas.

3. Stream Gages. The USGS maintains 19 stream gages in the Elm Fork Trinity River basin. The gages are listed in Table 5-2A. The stream gages designated as key stations for forecasting and regulating Lewisville Dam are listed in Table 5-2B. A hydrologic gage network was established for use in connection with the operation of the Lewisville Dam. The hydrologic gage network for the Elm Fork Trinity River basin above Lewisville Lake is shown on Plate 5-1d. The travel times for flows is shown on Plate 5-2.

TABLE 5-2A

USGS Stream Gages in the Elm Fork Trinity River Basin

Station Number	Name of Station	Description
08050200	Elm Fork Trinity SWS No 6 near Muenster	Discontinued
08050300	Elm Fork Trinity River near Muenster	Discontinued
08050400	Elm Fork Trinity River at Gainesville	Recording
08050500	Elm Fork Trinity River near Sanger	Discontinued
08050800	Timber Creek near Collinsville	Recording
08050840	Range Creek near Collinsville	Recording
08051000	Isle Du Bois Creek near Pilot point	Discontinued
08051100	Ray Roberts Lake near Pilot Point	Recording
08051135	Elm Fork Trinity River at Greenbelt near Pilot Point	Recording
08051190	Elm Fork Trinity River Above Aubrey	Discontinued
08051500	Clear Creek near Sanger	Recording
08050200	Elm Fork Trinity River near Denton	Discontinued
08052630	Little Elm Creek SWS No 10 near Gunter	Discontinued
08052650	Little Elm Creek near Celina	Discontinued
08052700	Little Elm Creek near Aubrey	Recording
08052745	Doe Br at US Hwy 380 near Prosper	Recording
08052780	Hickory Creek at Denton	Recording
08052800	Lewisville Lake near Lewisville	Recording
08053000	Elm Fork Trinity River near Lewisville	Recording
08053009	Indian Creek at FM 2281, Carrollton	Recording
08053010	Indian Creek at Herbron Parkway, Carrollton	Discontinued
08053030	Furneaux Creek at Josey Lane, Carrollton	Discontinued
08053090	Hutton Branch at Broadway, Carrollton,	Discontinued
08053100	Jones Valley Creek Trib near Forestburg	Discontinued
08053430	Denton Creek At Cr 2513 near Decatur	Recording
08053500	Denton Creek near Justin	Recording
08054000	Denton Creek near Roanoke	Discontinued

TABLE 5-2A (CONTINUED)

USGS Stream Gages in the Elm Fork Trinity River Basin

Station Number	Name of Station	Description
08054200	Gamble Branch near Argyle	Discontinued
08054500	Grapevine Lake near Grapevine	Recording
08055000	Denton Creek near Grapevine	Recording
08055500	Elm Fork Trinity River near Carrollton	Recording
08055560	Elm Fork Trinity River at Spur 348 Irving	Recording
08055600	Joes Creek at Dallas	Discontinued
08055700	Bachman Branch at Dallas	Discontinued
08056000	Elm Fork Trinity River at Frasier Dam	Recording

TABLE 5-2B

Key Regulating Stations for Lewisville Dam

Station Number	USGS Gage Station	Method of Reporting
08055000	Denton Creek near Grapevine	Recording
08055500	Elm Fork Trinity River near Carrollton	Recording
08057000	Trinity River at Dallas	Recording
08062500	Trinity River near Rosser	Recording
08065000	Trinity River near Oakwood	Recording

b. Reporting. Data Collection Platforms (DCPs) have been installed at all USACE Fort Worth District lakes, and at numerous stream gages and precipitation stations. The DCPs transmit hydrometeorological data using the Geostationary Operational Environmental Satellite (GOES) to the NOAA Center in Wallops Island, Virginia. The data are then decoded and re-transmitted using Domestic Satellites (DOMSATs), making the data available for nationwide reception. The Water Management Office captures, processes, and stores the data in the Fort Worth District's Water Control Data System (WCDS).

The Water Management Office collects and stores the majority of hydrometeorological data in the WCDS. Thus, hourly lake elevations and stream gage stages are stored in the WCDS network. Some meteorological and hydropower data are collected by telephone. Project personnel collect precipitation, evaporation, and, maximum and minimum air temperature data from weather stations. The information is reported to the Water Management Office by e-mail or sometimes by facsimile and telephone.

The Water Management Office personnel use the data in the WCDS to operate the 27 lakes that the Fort Worth District manages. All the data entered into the WCDS is stored in a database and used for water management decisions, to generate reports, and to conduct hydrologic studies. The Water Management Office also serves as a source of hydrologic data for state and local government agencies and the general public.

c. Maintenance. Maintenance costs are shared among the USGS, NWS, USACE, TWDB, and various river authorities. Maintenance and repair of the weather station instrumentation are the responsibilities of the NWS. Maintenance and repair of stream gaging stations are the responsibility of the USGS. Assistance in gage repair can be obtained by contacting the USGS in Fort Worth, Texas, at (817) 263-9545.

5-02. Water Quality Stations. The USGS collects data and monitors the water quality in Lewisville Lake at one station near the dam. In addition, TCEQ monitors water quality using 180 active monitoring stations through Trinity River basin.[19]

a. Facilities. The eight designated sites where USGS water quality samples are taken for Lewisville Lake are Stations AC, Al, BC, CC, DC, EC, FC, and GC. The chemical, biological, and field parameters are measured at these eight sites. Table 4-11C shows the most recent data for constituents sampled on Lewisville Lake.

The Trinity River basin is divided into 41 segmented water bodies by TCEQ to report water quality information. The Segment 0823, "Lewisville Lake", is designated to provide the water quality data for the reservoir.

b. Reporting. The USGS summarizes and publishes its collected water quality data annually in the "Water Resources Data: Texas" book for its current sampling locations. However, Lewisville Lake is not sampled yearly and only years for which it was sampled are published in the yearly data book. Sampling was historically funded by the USACE. Funding is no longer available.

The "Texas Integrated Report of Surface Water Quality," formerly called the "Texas Water Quality Inventory and 303(d) List," evaluates the quality of surface waters in Texas, and provides resource managers with a tool for making informed decisions when directing agency programs. The TCEQ publishes the report every 2 years (in even-numbered years). The water quality assessment results for Lewisville Lake are included in the report.

The City of Dallas Water Utilities also has seven water quality sites (Stations L1-L7) in and around Lewisville Lake. Three of these sites are located in Lewisville Lake. The other four locations are on tributaries that flow into the lake. Table 5-2C lists the locations of these seven water quality sites by physical location and by Longitude and Latitude.

c. Maintenance. Maintenance and calibration of the equipment related to water quality are conducted or monitored by USGS and TCEQ.

[19] https://www.tceq.texas.gov/waterquality/assessment/02twqi/basins/trinity.html

TABLE 5-2C

City of Dallas Water Quality Stations in/near Lewisville Dam

Station Number	Upstream Watershed Locations	Coordinate
L1	Clear Creek at I-35 (South of Sanger, TX)	Latitude 33°07'12" Longitude 97°10'44"
L2	Elm Fork Trinity River just below Ray Roberts Dam	Latitude 33°21'15" Longitude 97°02'57"
L3	Little Elm Creek at F.M. 1385	Latitude 33°17'01" Longitude 96°53'33"
L4	Stewart Creek at F.M. 423 (North of the Colony)	Latitude 33°06'32" Longitude 96°53'32"
L5	Lewisville Lake adjacent to the Lake Dallas Community (In the Elm Fork Trinity River branch)	Latitude 33°07'09" Longitude 96°59'31"
L6	Lewisville Lake at the mouth of Little Elm Creek	Latitude 33°06'53" Long. 96°57'17"
L7	Lewisville Lake at the mouth of Hickory Creek (East of I-35E)	Latitude 33°05'50" Long. 97°01'23"

5-03. Sedimentation and Degradation Ranges.

a. Facilities. The sedimentation ranges, which are needed to determine the rate of sedimentation and the location of sediment deposits, were established as directed in Engineer Regulation (ER) 1100-2-240 and Engineer Manual (EM) 1100-2-4000.

1. Sedimentation Ranges. There are 110 sedimentation ranges in the Lewisville Lake area (Plate 4-2). The ranges cross the lake normal to the original stream flow as practical. The elevations and locations of the monuments are referenced to appropriate datum systems established by other Federal agencies. Monuments are used at multiple locations for future survey at common reference points. Sedimentation ranges have not been utilized at Lewisville Lake since the 1965 survey. The TWDB uses bathymetric survey independent of the USACE established sedimentation ranges. This leaves the erosion/sedimentation undefined for the flood pool.

2. Degradation Ranges. There are 9 degradation ranges downstream of Lewisville Dam (Plate 4-2). Each range consists of two or more permanent monuments placed at selected locations along the discharge channel downstream of the dam.

b. Reporting. The frequency of sedimentation surveys will depend on hydrologic conditions and the need for determining sediment deposition and storage depletion. Normally, a period of no more than 20 years would elapse between sedimentation surveys. However, sedimentation surveys are currently done periodically depending on need and funding availability. Complete or partial surveys will be made of degradation ranges, as found necessary on the basis of reconnaissance.

For Lewisville Lake, four surveys have been performed since 1960, including the historical 1960 USACE survey, the 1965 survey, the 1989 Turner Collie & Braden survey, and the 2007 TWDB volumetric survey. The 2007 TWDB survey results indicated that the volume reduced from 648,400 acre-feet of water in the 1960 survey to 598,902 acre-feet of water at the top of the conservation pool elevation 522.0 feet.

c. Maintenance. Project personnel will inspect the survey monuments to determine their respective conditions. A report will be forwarded to the Water Management Office following the inspection that describes the condition of the monuments not found, destroyed, or otherwise disturbed. Monuments and witness points that have been damaged or are missing will be replaced and reset. Completion of monument surveys is dependent on funds and personnel availability.

5-04. Recording Hydrologic Data. Hydrologic information is recorded as the Water Management Office receives it. The recording procedures for each type of data are as follows:

a. Stages and Lake Elevations. Stream stage and lake stage data are recorded every 15 minutes and transmitted every hour by the DCPs through a GOES Satellite to Wallops Island, VA, then retransmitted to a DOMSAT. The District's WCDS accesses the data by a downlink. The recorded data and monthly data summaries are kept in the reservoir logbooks and in other Water Management Office files. Additional data sets from non-Corps reservoirs are received from the Internet, by facsimile, and/or by telephone.

b. Precipitation. Hourly precipitation data from numerous DCPs across the state are transmitted to the Water Management Office in the manner described in paragraph 5-04.a. The Water Management Office also receives precipitation data from the NWS and other precipitation observers through the Automated Field Observations and Services (AFOS) system and stores the data in the WCDS. The NWS daily state precipitation summary is filed and retained for approximately 1 year. The Water Management Office receives daily rainfall and weather reports from 22 of the 25 District lakes, including Lewisville Lake.

c. Temperature Data. The lake personnel record the daily maximum and minimum air temperatures at the lake.

d. Radar Reports. The Water Management Office receives radar images and weather information from commercial weather services by cable TV. This information is used primarily for short-term decision making. The weather reports are updated throughout the day by the NWS.

e. Hydropower. The Water Management Office requires hydropower release data and megawatts produced. The data is provided daily (Monday through Thursday) by email or fax from the powerhouse to the Water Management Office for hydropower generation occurring during the previous 24 hour period.

5-05. Communication Network. Lewisville Lake is served by telephone, facsimile, email, and cell phone. The telephone number for the Lewisville Lake project office is (469) 645-9100.

The National Telecommunications and Information Administration (NTIA), Department of Commerce, assigned radio frequencies exclusively to the USACE. The assigned VHF FM frequencies are 163.5125 and 163.4375 MHz. Both of the VHF FM frequencies are maintained at most project offices and in some vehicles assigned to the Fort Worth District. The radio equipment using the VHF FM frequencies will only transmit about 20 miles. Therefore, radio communications cannot be made between the Lewisville project office and the Fort Worth District Office, or between the other district lakes.

If necessary, the Fort Worth District Emergency Operation Center (EOC) can contact other districts in the SWD by HF side-band radio during an emergency. This radio frequency is good for communications between the EOCs in Fort Worth, Texas, Galveston, Texas, Little Rock, Arkansas, and Tulsa, Oklahoma.

5-06. Communication with the Project.

a. Water Resources Branch with Project Office. The primary mode of communication between the Lewisville Lake project office and the Water Resources Branch is by telephone. In addition, the project is served by facsimile, email, and cell phone as backups to the primary mode of telephone. Should communication between the project and the District be disrupted, the Lake Manager would direct regulation of the lake on his or her own initiative in accordance with the Emergency Rules and Regulations listed in Section 7-05 and Exhibit E of this manual.

b. Between Project Office and Others. The Lake Manager will maintain a current list of the residents and/or property endangered or inconvenienced by large and/or prolonged releases in order to give adequate warning before such releases. Warning of possible flood conditions can be conveyed by telephone, radio, television, citizens-band radio, use of law enforcement personnel, and civil defense agencies and their communications systems. National Guard, Reserve Military Units, and citizen volunteers may also be needed to convey warning messages. Plate 5-4 shows a schematic of the primary lines of communication for use in routine communications and in case of an emergency.

5-07. Project Reporting Instructions. Both daily lake operation information and emergency lake operation information will be submitted to the Water Management Office of the Fort Worth District.

a. Daily Operations. Daily reservoir data will be submitted to the Water Management Office on regular working days by facsimile or electronic mailing between 0800 and 0845 hours each morning for transmission of hydrologic data. For electronic mailing, the Internet Web site is: (http://www.swf-wc.usace.army.mil). Project personnel will confirm gate changes and promptly report all scheduled or unscheduled equipment outages affecting water control by telephone at (817) 886-1551 or by facsimile at (817) 886-6472 or by email at CESWF-OD-L@usace.army.mil. The Water Resources Branch may request additional information as needed.

Daily data reported to the District Office include the following: (1) As of 0800 hours – Reservoir elevation: number of gates open and increments of opening, precipitation and evaporation for the preceding 24 hours, weather conditions and maximum and minimum temperatures, if required. (2) Each gate operation – All changes in gate operation, including time of gate operation, increments of opening, and reservoir elevation at time of each gate operation for the preceding 24 hours. (3) Stage report – During flood periods, besides the regular 0800-hour reading from the reservoir and reporting gages, include the 0000-hour (midnight) reading, which may be read from the recorder charts. The Lewisville powerhouse provides the daily data (Monday through Thursday) of hydropower generation occurring during the previous 24 hour period by email or fax.

b. Emergency Operations. In the event of an emergency or flood situation, the Lake Manager will notify key personnel in the Fort Worth District Water Management Office. A list of these names will be posted on the project bulletin board. These names are shown on page iii,

Notice to Users of This Manual. If unusual conditions arise during non-working hours, one of the persons listed on page iii should be contacted.

5-08. Warnings. Before any major increase in discharge due to operation of the gates, warning of such operation shall be given to parties in the immediate area downstream of the dam. A warning horn will be sounded for 10 seconds to alert people downstream at least 2 minutes before any appreciable increase or decrease in the release rate from the dam. After the horn sounds, the operator will observe the downstream area to ensure that no one remains there. Signs in the discharge area shall state the meaning of the warning signal. A warning horn will be sounded from the powerhouse only during the initial releases. The law enforcement agencies shown in Table 5-3 may also be contacted to assist in warning the public and evacuating downstream areas.

TABLE 5-3

Law Enforcement and Key Lewisville Project Telephone Numbers

Agency	Telephone Number
Texas Department of Public Safety, Lewisville, Texas	(972) 221-8081
City of Lewisville Police	(972) 219-3600
City of Denton Police	(940) 349-8181
Lewisville Lake Manager	(469) 645-9100
Lewisville Lake Rangers	(877) 444-6777
TRA Office Dispatch	(817) 467-4343
Sheriff, Denton County	(940) 349-1700

CHAPTER VI – HYDROLOGIC FORECASTS

6-01. General. Hydrologic forecasts of stream flow amounts are made daily to maintain the current status of the Trinity River basin for flood control and water supply.

a. Role of Corps of Engineers. Hydrologic forecasts are made by the Water Management Office for use in the regulation of lakes to maximize flood control, water supply, and other authorized purposes. The forecasts are furnished to project personnel and other USACE personnel with a need for this information. Planned changes in the release rates are furnished to the National Weather Service River Forecast Center (NWS-RFC) in Fort Worth, Texas. The Public Affairs Office, which is kept informed of the lake conditions, makes news releases.

b. Role of Other Agencies. The NWS-RFC provides information about river flow and flood forecasts to the USACE and the general public. The NWS Weather Wire circuit disseminates this information to subscribing government agencies and news media. The National Weather Service–Weather Service Forecast Offices (NWS-WSFO) issues routine reports containing the following information:

1. Weather forecasts (daily forecasts, severe weather forecasts, and 5-day extended forecasts).

2. Quantitative precipitation forecasts: Four successive 6-hour precipitation forecasts are updated every 12 hours. Three successive 24-hour precipitation forecasts are updated every 12 hours.

3. Three-day river stage forecasts, when conditions warrant, from the NWS-RFC.

4. Urgent priority messages such as severe weather warnings, severe weather watches and statements, and instructions from civil defense centers during emergency situations.

5. Other information reports, on a periodic basis:

(a). Winter weather and road conditions

(b). River and flood warning bulletins

(c). Damage reports

(d). Thirty-day weather forecasts

6-02. Flood Control Forecasts.

a. Requirements. Flood forecasts are required whenever substantial rainfall has fallen above or below Lewisville Dam or during the evacuation of the flood pool from Lewisville Lake.

b. Methods. Water Managers continually monitor and adjust water releases at USACE projects based on ever-changing hydrometeorological conditions. The Corps Water Management System (CWMS) is the automated decision support tool developed for USACE Water Managers. CWMS tracks the hydrologic cycle and performs scenario-based forecasts that can include stage and flow forecasts, project release scheduling and release review, emergency activation alerts, inundation mapping and economic damage reporting. The CWMS Automated Information System was developed by USACE Hydrologic Engineering Center (HEC) under funding from the Water Management Community of Practice and has been implemented to varying degrees at various USACE Water Management Offices. A CWMS forecasting model has been developed for the Elm Fork Trinity River basin by the Fort Worth District, HEC, and USACE MMC (Modeling, Mapping, and Consequences) Production Center. The USACE makes the following forecasts with assistance from the NWS.

1. Predicting Inflow into Lewisville Lake. A rainfall-runoff HEC-HMS model was developed within CWMS by the Fort Worth District for the Elm Fork Trinity River basin above Carrollton Gage. This model is used to predict the inflow into Lewisville Lake. The inflow forecasting model consists of HEC-METVUE and HEC-HMS models that are linked to real-time data with CWMS. Both models use a 1-hour time interval.

Precipitation estimates are available from two main sources: precipitation gages and radar. The NWS uses the data from these sources to produce a suite of hydrologic forecasts. Weather Surveillance Radar–1988 Doppler (WSR-88D), also known as Next Generation Weather Radar (NEXRAD), observes the presence of severe weather and calculates the speed and direction of the weather. The WSR-88D also provides estimated quantitative area precipitation amounts.

The NWS adds to the accuracy of the WSR-88D quantitative precipitation estimates (QPE) through a procedure for improving the radar estimates of rainfall that is referred to as "ground truthing." The precipitation data set produced from the ground truthing is known as the Multi-sensor Precipitation Estimate (MPE). The NWS and other agencies may poll some automated gages on a 4-hour basis, and the poll results may also be used for ground truthing.

Hourly NWS gridded rainfall data is downloaded from the NWS West Gulf Forecasting Center in real-time and processed into HEC-DSS format using HEC-METVUE. The HEC-HMS model is then used to compute runoff from the gridded precipitation. Initial and uniform losses are adjusted to real-time basin conditions within CWMS. These losses are subtracted from the precipitation hyetograph at each subbasin grid cell to obtain the rainfall runoff hyetograph. Each grid cell hyteograph is then routed and combined by the HEC-HMS model to obtain the total inflow hydrograph for Lewisville Lake. A map of the Elm Fork Trinity River Model subbasins is shown on Plate 4-1.

There is a DCP at Lewisville Lake which records the lake elevation. An inflow hydrograph can be computed using observed lake elevations, an elevation-capacity table, and hourly lake releases.

The HEC-HMS model is executed with forecast time and an initial estimate of loss rates as determined by the user. The computed hydrographs at Lewisville Lake are compared with observed runoff volume, shape, and time of peak. If the comparison is not favorable, then subbasin loss rates are adjusted accordingly and the HEC-HMS model is re-executed. This calibration process is repeated until the comparisons are favorable. This process ultimately results in a forecasted inflow into Lewisville Lake.

2. Predicting Lake Levels. The forecasted inflows as computed by the HEC-HMS model are routed into Lewisville Lake. The model will add the routed inflows to the storage in the lake and subtract the releases to forecast the lake elevations.

3. Predicting Flow at Downstream Control Points. The flood forecasting system is used to predict flows in the Elm Fork Trinity River near Carrollton, and mainstem Trinity River at Dallas, Rosser and Oakwood gages. The predicted flows for the control points located downstream of the project are computed by combining the estimated local flow in the river channel and the potential routed releases from Grapevine and Lewisville Lake. If the predicted flows exceed the downstream channel capacity, no releases will be made.

(a). Estimating Local Flow. Local flow forecasts can be obtained from two sources: the NWS-RFC's river forecast model or Water Management Office HEC-HMS model. If the latter method is used, the subbasin hydrographs for the uncontrolled areas above Lewisville Lake are computed using the same procedure discussed in paragraph 6-02.b.(1).

(b). Routing Reservoir Releases to Downstream Control Points. The HEC-HMS model is used to route releases from Grapevine Lake and Lewisville Lake to downstream points by using the Modified Puls and Muskingum flow routing methods. The releases are determined based on the predicted available channel capacity at the downstream control points. The determined releases are then incorporated into the HEC-HMS model. The observed flows at the downstream control points on the Elm Fork Trinity River are provided by stream gages. The downstream control points are located on the Elm Fork Trinity River near Carrollton, and mainstem Trinity River at Dallas, Rosser and Oakwood gages. Plate 4-19 shows flood crest travel times for the Elm Fork and Trinity River mainstem from Lewisville Lake near Lewisville to the Trinity River near Oakwood gage.

(c). Regulated Flow. The releases from Grapevine Lake and Lewisville Lake combine with local flows from the Elm Fork Trinity River watershed below the lakes and are measured by the gage on the Elm Fork Trinity River near Carrollton.

6-03. Conservation Purpose Forecast. The city of Dallas and the city of Denton has contracted for conservation water supply storage in Lewisville Lake of 415,000 acre-feet (74%) and 21,000 acre-feet (26%) respectively below elevations 515.0 feet. The conservation storage is used for water supply, hydropower, fish and wildlife, and general recreation. Conservation storage forecasts are made when needed based on forecasted inflow, historical average evaporation, and estimated demand. The city of Dallas and city of Denton contracted on 16 September 1980 for 131,400 acre-feet and 46,200 acre-feet of the conservation storage, respectively, between elevations 515.0 feet and 522.0 feet. Releases from Lewisville Lake for conservation purposes will be made through the turbines on receipt of written daily requests made from the city of Dallas. In the event that the city of Dallas finds it necessary to modify its schedules for releases because of varied demands during any period, then its designated representative will contact Water Management Office and indicate the revised demands, a confirmation of which will be furnished in writing to the Water Management Office.

6-04. Long-Range Forecast. Long-range weather forecasts are made by the NWS Climate Prediction Center, and available at the "Outlooks Index" in the website http://www.cpc.ncep.noaa.gov/products/OUTLOOKS_index.shtml. The Outlooks website contains both temperature and precipitation forecast for "Monthly to Seasonal" and "Extended Range" categories. Special products, such as current UV Index forecasts and soil moisture outlooks are also available on this website.

6-05. Drought Forecast. Appendix IX, Drought Contingency Plan, for the Trinity River Basin Master Manual provides information on historical droughts in the basin and methods to determine the severity of a drought. In general, the three factors used to determine the severity of a drought are the lake content, lake inflow, and the Palmer Drought Severity Index (PDSI). The PDSI reflects the cumulative excess or deficiency in moisture relative to seasonal norms and typically ranges from +4 to -4 but may exceed these values. A PDSI of -4 indicates that abnormally dry conditions have prevailed. The NWS publishes the PDSI about once a week. Drought conditions can be accessed at this website: http://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

CHAPTER VII – WATER CONTROL PLAN

7-01. General Objectives. Lewisville Dam and Lake was authorized for flood control, recreation, fish and wildlife and water conservation storage for water supply on the Elm Fork Trinity River. Flood control releases from Lewisville Dam require coordination with the other flood control projects within the Trinity River basin to optimize maximum basin wide benefits. Emergency regulations must be coordinated with the Fort Worth District Water Management Office as discussed in paragraph 7-04.

All elevations referred to in Chapter 7, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to North American Vertical Datum of 1988 (NAVD88) is: NGVD29 + 0.0 feet = NAVD88 for Lewisville Dam and Lake.

7-02. Project Constraints. At elevation 522.0, with the three slide gates fully open, the discharge is 10,100 cfs. At the top of flood pool elevation 532.0 with the three slide gates fully open, the discharge is 10,700 cfs. The outlet works rating curves are shown on Plate 7-3.

a. Outlet Works. The outlet works consist of a 16.0 foot diameter conduit with an invert at elevation of 448.0 feet. The outflow is controlled by three 6.5' x 13.0' broome type gates. The rate of change in opening and closing the gates should not be more than 0.5 gate-foot per half hour. The gates should be operated as symmetrical as practical with an allowable difference in gate openings not to exceed one foot. The gates should not be set for continuous operation at any opening height between 7 feet and 13 feet (full open). Once all three gates are open to 7 feet and additional gated discharge is required, each gate in turn should be raised from 7 feet to full open in one continuous operation. When all three gates are at full open and a reduction in gated discharge is required, each gate in turn should be lowered from full open to 7 feet opening height in one continuous operation.

The normal rates of change in release may be exceeded at the discretion of the Chief, Water Management Office. Additionally, the Fort Worth District Water Management Office, or the Lake Manager, at their discretion, may exceed the normal rates of change in release in the event of drowning, accidents, failure of operational facilities, severe weather, or other emergencies deemed to require a more rapid rate of increase or decrease in the rate of release. On the Elm Fork below Lewisville Dam damages to structures begin at a flow of 7,000 cfs. Flows above 5,500 cfs will limit the use of two golf courses and one shooting range.

b. Spillway. The spillway consists of a 560.0 foot wide uncontrolled ogee spillway with a 1,300 foot long approach channel. The top of the flood control pool and the spillway crest is at elevation 532.0 feet. The spillway is located near the east end of the embankment. Flow over the spillway is discharged into a 3200-foot long pilot channel. The spillway was modified in 1985, by extending the concrete spillway apron 60 feet downstream. The 1947 Study Maximum Design Water Surface elevation is 553.0 feet, in which the spillway discharge capacity is 216,800

cfs. The 2017 Dam Safety Modification Report defines the Inflow Design Flood (IDF) proposing to stabilize and strengthen the spillway and spillway apron. The design for the anchoring of the apron is ongoing in 2018. The design report, and plans and specifications are scheduled to be completed and approved for construction in April 2021. The IDF corresponds to a Maximum Design Water Surface elevation of 554.10 feet and approximately a spillway flow of 218,347 cfs. A spillway rating curve is available on Plate 7-4 which shows both the existing spillway rating curve and the "future to be modified" spillway rating curve.

7-03. Overall Plan for Water Control. There are eight multi-purpose projects operated by the Fort Worth District Water Management Office within the Trinity River basin. These eight projects are: Bardwell, Benbrook, Grapevine, Joe Pool, Lavon, Lewisville, Navarro Mills, and Ray Roberts. Lewisville Dam and Lake is an integral part of the USACE plan for flood control in the Trinity River basin.

7-04. Standing Instructions to Project Personnel. The Fort Worth District Water Management Office will give instructions for making releases from Lewisville Dam to project personnel, as applicable. For gated releases, project personnel will make gate changes as necessary to provide the required rate of release. The Fort Worth District Water Management Office should be notified if irregularities are observed such as abnormal turbulence, abnormal flow patterns, riprap displacement, and/or significant erosion. The lake will normally be regulated in accordance with the plan of regulation presented in paragraph 7-05 of this chapter.

Should an emergency situation occur, such as a power outage, inoperable gates, or a drowning accident, the Fort Worth District Water Management Office will be notified immediately. In the event communications with the Fort Worth District Water Management Office are disrupted, the lake regulation will become the responsibility of the Lake Manager, in accordance with Plate 7-2, "Emergency Regulation Plan" and Exhibit D, "Standing Instruction for Lake Manager" of this manual. The Lake Manager will immediately make every effort to re-establish communications with the Fort Worth District Water Management Office.

7-05. Flood Control.

a. General. Release of flood water from Lewisville Dam and Lake will be coordinated with releases from the other seven Trinity River basin flood control projects to reduce flooding in the Trinity River basin. The lake levels will be lowered to their respective conservation pools at the earliest practical date in order to provide flood protection against potential subsequent storms.

Releases from Lewisville Dam and Lake will generally be made at a rate, so that when combined with the runoff from downstream areas, will not exceed the control point capacities at the gage locations shown in Table 7-1, "Downstream Control Points". Control point capacities will not be modified for minor stage shifts, however, control point capacities will be reassessed for significant stage changes that impact structures and/or property. Should the Fort Worth District Water Management Office need to deviate from the reservoir regulation release plan, the Southwestern Division Water Management Office will need to be contacted for a deviation

approval. Refer to Section 7-15 (Deviation from Normal Regulation) for more details regarding deviations.

b. Normal Regulation for Flood Control. Lewisville Dam and Lake will be regulated to reduce flooding downstream from the dam. Gates will be closed and will remain closed until it has been determined that the flow downstream from the dam has crested or is forecast to crest below the control point capacities shown in Table 7-1. For flow travel times from the dam to respective downstream control points see Table 7-2. General guidance for tapering down releases while evacuating the last approximately 5% of flood storage space under a condition of relatively low inflow is shown in Table 7-3. The Normal Regulation for Flood Control schedule is described below and is also shown on Plate 7-1.

TABLE 7-1

Downstream Control Points

River Channel and USGS Gaging Station	Control Capacity (cfs)
Elm Fork Trinity River near Carrollton	7,000
Trinity River at Dallas	13,000
Trinity River near Rosser	15,000
Trinity River near Oakwood	24,000

TABLE 7-2

Travel Times

River Channel and USGS Gaging Station	Estimate Travel Time	Cumulative Travel Time
Elm Fork Trinity River near Carrollton	8 hrs	8 hrs
Trinity River at Dallas	16 hrs	1 day
Trinity River near Rosser	2 days	3 days
Trinity River near Oakwood	8 days	11 days

TABLE 7-3

Low Flood Pool Release Guidance

Pool Elevation Range (ft)	Flood Pool Range (%)	Release Rates* (cfs)
522.0 – 522.2	0.0 – 1.8	250**
522.2 – 522.4	1.8 – 3.5	250 – 450***
522.4 – 522.6	3.5 – 5.0	450 – 1000

*Desired rate of release will vary with prevailing rates of inflow, lake evaporation, and water supply withdrawals. General objective is to evacuate from 5.0% to 3.5% of the flood pool in about one week, from 3.5% to 1.8% the following week, then from 1.8% to top of conservation pool (522.0) over an additional two to three week period.
**Minimum turbine release.
***Maximum turbine release.

(a). **Lake elevation at or below 522.0.** No flood control releases will be made when the lake level is at or below the top of conservation pool (elevation 522.0). Releases from the conservation storage will be made as instructed by the Fort Worth District Water Management Office at the request of the city of Dallas. Releases from conservation storage will normally be made via hydropower generation discharge insofar as hydropower can support the required rates of release. Currently, releases ranging from about 250 cfs to 450 cfs can be made through the Lewisville Lake Hydropower turbine.

(b). **Lake elevation between 522.0 and 523.0.** If the lake elevation is between elevations 522.0 feet (top of conservation pool) and forecasted to remain below

elevation 523.0 feet (10 percent of flood pool), flood releases will be made not to exceed 4,000 c.f.s. This is done to evacuate flood water as quickly as possible. These releases will be coordinated with other flows in the Elm Fork system so as not to exceed 4,000 cfs at the Carrollton gage on the Elm Fork and 13,000 cfs at Dallas, 15,000 cfs at Rosser and 24,000 cfs at Oakwood gages on the main channel of the Trinity River. **Refer to Section 7-14, for information on downstream impacts.**

(c). **Lake elevation between 523.0 and 526.0.** If the lake elevation is between elevations 523.0 feet and forecasted to remain below elevation 526.0 feet, flood releases when combined with downstream flows should not exceed 5,500 cfs at the Carrollton gage on the Elm Fork and 13,000 cfs at Dallas, 15,000 cfs at Rosser and 24,000 cfs at Oakwood gages on the main channel of the Trinity River.

(d). **Lake elevation between 526.0 and 532.0.** If the lake elevation is between elevations 526.0 feet and forecasted to remain below elevation 532.0 feet, flood releases when combined with downstream flows should not exceed 7,000 cfs at the Carrollton gage on the Elm Fork and 13,000 cfs at Dallas, 15,000 cfs at Rosser and 24,000 cfs at Oakwood gages on the main channel of the Trinity River.

(a). **Lake elevation above 532.0 and rising.** As the lake elevation rises above top of flood pool and spillway crest elevation 532.0 feet the gated release shall be adjusted as required such that the combination of spillway discharge and gated release does not cause the control point capacities listed in Table 7-1 to be exceeded. All gates will be closed at such time as spillway discharge alone is sufficient to cause the control point capacities listed in Table 7-1 to be met or exceeded.

(b). **Lake elevation above 532.0 and falling.** Gated release when combined with spillway discharges should not exceed the control point capacities listed in Table 7-1 above. As the lake elevation begins to fall and the spillway flows decrease, the gated releases may be increased as long as the combined gated plus spillway release does not cause the control point capacities shown in Table 7-1 to be exceeded.

c. Emergency Regulation for Flood Control. If communications between the Fort Worth District Water Management Office and the Lewisville Dam Project Office are disrupted, the Lake Manager, on his own initiative, will direct regulation of the reservoir as described in Exhibit D - Standing Instructions to Lake Manager until communication is restored. The term "emergency reservoir regulation" applies at any time when personnel at the dam have lost communications with the District Office personnel who normally direct regulation procedures. In the event of a communication failure during imminent failure of the dam due to any of the possible failure modes as described in Chapter 5 of the "Lewisville Dam - Operation and Maintenance Manual", the Project Manager may open or close the outlet work gates as deemed necessary in an attempt to prevent a dam failure. Continued efforts will be made to re-establish communications with the Fort Worth District Water Management Office. The Emergency Regulation Plan is shown on Plate 7-2.

d. Trinity River System Balancing.

1. Unbalanced System. In general, the Trinity River projects will be operated to approximately balance the percent flood pool utilized at each project. During the time that Trinity River projects are not balanced, priority of releases will be given to the project with the least amount of storage capacity left in percent of storage space. Next priority goes to the project having the second least amount of capacity in percent of storage space and so forth, until all lakes are balanced or all channel capacity in the Trinity River is used. For tandem projects (e.g., Ray Roberts Lake and Lewisville Lake), or projects which have significantly greater flood storage capacity, additional weighting may be given.

2. Balanced System. Lakes in the system will be regulated insofar as practical, to maintain approximately the same available storage space (within +/- 5%) in their respective flood control pools as measured in terms of percent flood storage occupied. For tandem projects (e.g., Ray Roberts Lake, Lewisville Lake, and Grapevine Lake), or projects which have significantly greater flood storage capacity, additional weighting resulting in a beneficial imbalance may be given.

7-06. Recreation. Recreation is an authorized project purpose, however, there is no storage or releases specifically designated for recreation. Requests for special releases will be considered as the situation warrants. All recreation area access roads are constructed above the top of conservation pool, elevation 522.0. Some access roads will be inundated as the lake level rises into the flood control pool but parks will still be accessible.

7-07. Water Quality. Water quality is not an authorized project purpose. Lewisville Dam contains a low flow system with multi-level intakes. Lower flows are released through the power plant or the low flow outlet works. Although water quality is not an authorized purpose for Lewisville Dam, compliance with Public Law 92-500 requires that all federal facilities be managed, operated, and maintained to protect and enhance the quality of water and land resources through conformance with applicable federal, state, interstate, and local substantive standards.

7-08. Fish and Wildlife. There are no special operational provisions for fish and wildlife. The fish and wildlife function is an authorized purpose. Originally, a fish hatchery was built downstream which has since been converted into a USACE wetlands research center and public outdoor learning center.

7-09. Water Supply. The cities of Dallas and Denton have water supply storage contracts dated 18 May 1953 and 10 December 1953 for 415,000 acre-feet (74%) and 21,000 acre-feet (26%) respectively below elevation 515 feet. Additional contracts dated 15 August 1980 entitle the city of Dallas to 134,400 acre-feet (74%) and the city of Denton to 46,200 acre-feet (26%) of storage between elevations 515 feet and 522 feet. The city of Lewisville, the city of Irving, and the

Upper Trinity regional Water District (UTRWD) have contracted with the city of Dallas for water supply from Lewisville Lake.

The city of Denton, the city of Lewisville, and the UTRWD pump directly from Lewisville Lake on an as needed basis. The UTRWD also transfers water from Jim Chapman Lake to Lewisville Lake by pipeline for their customers and the city of Irving. The daily amount of water pumped into and out of Lewisville Lake by each entity is reported to the Fort Worth District Water Management Office the following morning. Releases from the outlet works are made to supply water for withdrawals by downstream users. The city of Dallas forwards release requests from Lewisville Dam and Lake to the Fort Worth District Water Management Office for their respective water supply needs.

a. Contract No. DACW63-80-C-0103, 15 August 1980 with Dallas was approved by the Secretary of the Army on 16 September 1980. Refer to Exhibit B1.

b. Contract No. DA-41-443-ENG-2453, 18 May 1953, with Dallas was approved by the Secretary of the Army on 16 July 1953. Refer to Exhibit B2.

c. Contract No. DACW63-80-C-0104, 15 August 1980 with Denton was approved by the Secretary of the Army on 16 September 1980. Refer to Exhibit C1.

d. Contract No. DA-41-443-ENG-1098, 10 December 1953, with Denton was approved by the Secretary of the Army on 20 May 1954. Refer to Exhibit C2.

7-10. Hydroelectric Power. Non-Federal Hydropower was approved and added to the project of Lewisville Dam and Lake. The Lewisville Dam Hydroelectric Power Station is owned and operated by Garland Power & Light and began operations in October 1991. Personnel at the Ray Olinger Power Station remotely operate the Lewisville Dam Hydroelectric Power Station. The flow passes from the Lewisville Dam low flow conduits through 2-60 inch butterfly valves which flows into an 84-inch pipeline to the turbines. The turbines are capable of making releases at a rate between 250 and 450 cfs. If the city of Dallas water supply request exceeds 450 cfs, then the low flows are opened in addition to the hydropower releases to meet their water supply needs. If no flood releases are being made and the flows in the river below the dam at the Elm Fork Trinity River near Carrollton gage exceeds 7,000 cfs, then no hydropower releases will be made. No releases are made specifically for hydropower. Hydropower can operate when water supply or flood control release requirements are within the operating flow range.

7-11. Navigation. Navigation is not a project purpose.

7-12. Drought Contingency Plans. When the Elm Fork Trinity River basin is in a drought condition and the lake levels are lower than normal, refer to the Drought Contingency Plan for the Elm Fork Trinity Basin, Appendix IX of the Trinity River Master Manual. The plan presents a broad outline of actions necessary to manage the water resources in the Fort Worth District Water Management Office during a drought.

7-13. Emergency Action Plan. The Emergency Action Plan (EAP) contains detailed instructions and procedures to be followed by USACE personnel at the Lewisville Dam Project Office to properly handle any event at the project that could develop into an emergency condition. The most current edition of the EAP is located in the Geotechnical Branch, Fort Worth District and is dated September 2017. The contact information in the EAP is updated annually. Copies of this EAP are also available in the Fort Worth District Water Management Office and at the Lewisville Lake Project Office.

7-14. Other. On the Elm Fork below Lewisville Dam, flows above 5,500 cfs are known to limit the use of one golf course (Indian Creek Golf Club) and one shooting range (Dallas Gun Club). As the flow rises above 5, 500 cfs the Luna Vista Golf Course must close a flood gate to prevent flooding of a portion of its facilities. These businesses should be informed prior to making releases from Lewisville Dam in excess of 4,000 cfs, and kept informed of any subsequent increases in releases from Lewisville Dam. There are no known significant impacts to structures for flows up to the 7,000 cfs control at the Carrollton gage.

7-15. Deviation from Normal Regulation. There are occasions when it is necessary or desirable to deviate from the water control plan for short periods of time. Prior approval for a deviation is obtained from the Southwestern Division Water Management Office (CESWD-RBT-W). The requirement for prior approval of action from CESWD may be suspended in extreme emergencies. All deviations will be recorded and will be stored in electronic format. Analysis of the expected impacts of a proposed deviation will include consideration of its effect on dam safety. Deviation requests usually fall into the following categories:

a. Emergencies. Emergencies that can occur are drowning(s), failure of the operation facilities, and flushing of pollutants. Under emergency conditions necessary action is taken immediately by the Lake Manager, unless such an action creates an equal or worse condition. For emergencies, the Fort Worth District Water Management Office will be informed as soon as practicable as to the nature of the emergency and the subsequent response by telephone, email, or fax. Follow-up written documentation explaining the deviation will be furnished to the Southwestern Division Water Management Office as soon as practical.

b. Unplanned Minor Deviations. There are unplanned instances that create a temporary need for minor deviations from the normal regulation of the lake. These unplanned instances are not considered emergencies and require prior approval for deviations. Construction accounts for the majority of unplanned deviations. Possible reasons for unplanned deviations include stream crossings of pipelines, bridge work, embankment repair, utility placement, and other major construction contracts. Requests for changing release rates can vary from a few hours to a few days.

Each request is analyzed on its own merit. Consideration is given to upstream and downstream watershed conditions, potential flood threats, conditions of the lake, and possible alternative measures. In the interest of maintaining good public relations, the requests for deviation are

usually approved, provided that there are no adverse effects on the overall operation of the project, or other projects. Approval of these minor deviations will be obtained from the Southwestern Division Water Management Office.

c. Unplanned Major Deviations. There are unplanned instances that may be considered for major deviations from the normal regulation plan, but are not emergencies. Requests for changes in release rates generally involve short time periods ranging from a few hours to a few days in an effort to minimize damages or optimize benefits. Flood control releases account for the major portion of these incidents and typical examples include project pre-releases or flows exceeding downstream channel capacity.

Each request is analyzed on its own merit. In evaluating the proposed deviation, consideration must be given to the upstream and downstream watershed conditions, potential flood threats, condition of the lakes, and possible alternative measures that can be taken. Approval of these major deviations will be obtained from the Southwestern Division Water Management Office.

d. Planned Deviations. Each planned deviation is analyzed on its own merit. Sufficient data on flood potential, lake and watershed conditions, possible alternate measures, benefits to be expected and possible effects on other authorized and useful purposes will be presented with each deviation. Each recommended deviation is submitted in writing to the Southwestern Division Water Management Office for review and approval. An example of a planned deviation is a need to maintain or inspect an aspect of the project. Approval of such deviations will only be granted when the evaluations have been fully reviewed and verified to be necessary. Any concerns with "Dam Safety" will be taken into consideration as well with deviation approvals.

7-16. Operation Curves and Tables. The Evaporation Curves are shown on Plate 7-5. The Tailwater Rating Curve for the flood outlet works and the spillway are shown on Plates 7-6 and 7-7, respectively. The Low Flow Outlets Rating Curves are shown on Plate 7-8. The Area Capacity Curves are shown on Plate 7-9. The tabulated values are shown on pages T7.4-1 thru T7.4-44 of this water control manual.

CHAPTER VIII – EFFECT OF WATER CONTROL PLAN

8-01. General. Lewisville Lake is a multiple-purpose project that is designed for flood control regulation and is operated in conjunction with eight other USACE dams and various channel improvements and levees operated to provide flood protection along the Trinity River. Lewisville Dam and Lake operates in conjunction with Ray Roberts Dam on the Elm Fork of the Trinity River to provide flood control to the Elm Fork Trinity River at Carrollton, Texas, and to supply water to the city of Denton and city of Dallas, Texas areas.

8-02. Flood Control.

a. Spillway Design Flood. A Spillway Design Flood study was performed for Lewisville Dam at the time it was initially designed. A Definite Project Report on "Garza-Little Elm Dam and Reservoir, Elm Fork of Trinity River, Texas" was prepared by USACE, Galveston District in December 1947. The spillway design flood hydrographs for Lewisville Dam and Lake were discussed in Appendix I, Hydrology of the Report.

1. Spillway Design Storm. The selection of the Spillway Design Storm was based on the maximum storms that have occurred in the region of the upper Trinity River basin. Rainfall-depth-duration curves for those storms were submitted to the Hydrometeorological Section of the River and Flood Division, United States Weather Bureau, for analysis. The Office of the Chief of Engineers, in a letter dated 11 February 1946, subject: "Preliminary Estimates of Maximum Possible Storm Precipitation for the Upper Trinity River, Texas," transmitted the approved spillway design-storm rainfall for a drainage area of about 1,648 square miles or the drainage area of the Lewisville Lake. The result of the design storm was a total average depth of 23.2 inches in 60 hours. The time-depth relation recommended by the Hydrometeorological Section and approved by the Office, Chief of Engineers has been adopted as the Spillway Design Storm.

2. Minimum Infiltration Rates. The computed infiltration rates for the Elm Fork watershed above Lewisville Lake following the method described in Part III, Chapter 5 of the Engineering Manual. The infiltration indices vary from a minimum of 0.035 to a maximum of 0.15 inches per hour. An infiltration rate of 0.05 inch per hour is assumed to be about the minimum that may be expected during extended heavy rainfall above Lewisville Lake and was selected for the Spillway Design Storm. This gave an estimated runoff of 20.3 inches or 87.5 percent of the rainfall for the Spillway Design Storm. The rainfall-excess for the Spillway Design Storm is shown on Plate 8-1.

3. Unit Hydrographs. Hydrographs of inflow into the Lewisville Lake were derived from recorded lake levels, excluding rain on the reservoir, and allowing for the effects of wind action. Unit hydrograph determinations of flow into the Lewisville Lake were made for the storms of 9-10 June, 1941 and 19-21 February, 1945, in a manner suggested by the letter dated 23 October 1943, from the Office, Chief of Engineers, subject: "Compilation of Basic Data for

Determination of Unit Hydrographs." The duration of rainfall-excess in each of the above unit hydrographs was 6 hours and size of watershed predicated the use of 6 hours as the time interval for unit hydrograph development. The following empirical unit hydrograph coefficients were computed: $C_t = 1.95$ and C_p 640 = 508.0. The coefficients are in general agreement with constants determined for other projects at gaging stations in the upper Trinity River basin.

Six-hour synthetic unit hydrographs were developed for the Elm Fork, Clear Creek, and Hickory Creek, at the head of the Lewisville Lake, utilizing empirical constants of the unit hydrograph of inflow into Lewisville Lake. The Little Elm Creek and Doe Branch unit hydrographs were computed from lags obtained from temporary staff gages and unit hydrograph constants from similar upper Trinity Basin watersheds. Unit hydrographs developed for Panther, Cottonwood, Stewarts, and Pecan Creeks and the area adjacent to the reservoir were based on empirical constants of the unit hydrograph of inflow into Lewisville Lake and other upper Trinity Basin watersheds. The adopted 6-hour unit hydrograph of inflow into full reservoir was developed by summating directly the unit hydrographs of the Elm Fork, Clear Creek, Hickory Creek, Little Elm Creek, Doe Branch, Panther Creek, Cottonwood Creek, Stewarts Creek, Pecan Creek, and the area adjacent to the reservoir. The adopted unit hydrograph has a peak discharge of 37,290 cfs and a lag of 16 hours.

A synthetic 6-hour unit hydrograph was developed for natural flow at the dam site, utilizing empirical constants of the unit hydrograph into Lewisville Lake. In order to substantiate this synthetic unit hydrograph, unit hydrographs at Lewisville Dam, Little Elm Dam site, Hickory Creek at mouth, and marginal areas were summated with peaks reduced after lagged at the Lewisville Dam site. The unit hydrograph at the dam site has a peak discharge of 32,800 cfs with a lag of 22.5 hours.

4. Spillway Design Flood Hydrographs. In order to determine the critical conditions of Spillway Design Flood at the Lewisville Dam site, the Spillway Design Storm was distributed uniformly over the watershed above Lewisville Dam and two flood hydrographs were computed. The first hydrograph was determined for natural flow at the dam site based on the distribution graph discussed in in Section 8-02, a.3. The computed hydrograph has a peak inflow of 569,400 cfs and volume of 1,800,000 ac-ft. The second hydrograph representing flow into full reservoir was computed using the unit hydrograph derived for flow into full reservoir plus the run off from the 97 square miles reservoir surface at a rate equal to the rate of rainfall, and a base flow of 1,000 cfs. The computed hydrograph with a peak inflow of 633,200 cfs and volume of 1,815,000 acre-feet was adopted as the Spillway Design Flood.

The routing computations showed that the lake would reach a maximum elevation of 552.85 feet and the peak outflow was 216,500 cfs. For design purposes, the Maximum Design Water Surface was rounded up to 553.0 feet. At that elevation, the spillway rating for the proposed 600-foot wide spillway was 219,100 cfs. In the 1951 Spillway Construction document, the spillway was modified and built to 560 feet wide. The Spillway Design Water Surface was retained for the 560-foot wide spillway as 553.0 feet with a peak outflow of 216,800 cfs. The Spillway Design Flood Hydrograph was not routed for the existing 560-foot wide spillway. The

rating curves for the 600-foot wide spillway at the computed maximum water surface of 552.85 feet, and the 560-foot wide spillway at the adopted design water surface of 553.0 feet are basically equal. A decision was made to not route the Spillway Design Flood due to the proximity of the two rating curves at the respective elevations. Plate 8-1 shows the lake elevation and Spillway Design Flood hydrographs computed in the 1947 study.

c. Standard Project Flood. In March 1983, a Spillway Design Flood study for Lewisville Lake including Ray Roberts, was prepared under the Dam Safety Assurance Program outlined in Draft ER 1130-2-417. The purpose of the study was to review the adequacy of Lewisville Dam with respect to the hydrologic criteria provided in Hydrometeorological Report No. 51 (HMR-51), June 1978, subject: "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian". The study consisted of hydrologic analysis for Lewisville Dam Probable Maximum Flood (PMF) and Standard Project Flood (SPF). For the SPF study, it was assumed that a Standard Project Storm would occur 5 days prior to the Probable Maximum Storm (discussed in Section 8-02, d.1). The antecedent Standard Project Storm was assumed to have a total rainfall amount equal to 50 percent of the full Probable Maximum Storm rainfall amount. The Standard Project Storm rainfall was 15.41 inches or 50 percent of the full Probable Maximum Storm rainfall of 30.81 inches. It was assumed that the Standard Project Storm was centered in the same location as the Probable Maximum Storm and possessed the same ellipse characteristics as the Probable Maximum Storm. The details of Probable Maximum Storm are discussed in Section 8-02, d.1.

The SPF hydrograph representing flow into full pool was computed using the same parameters as in the PMF analysis discussed in Section 8-02, c.4 except rainfall was one-half of the Probable Maximum Storm rainfall distributed according to the SWD distribution. The computed SPF hydrograph has a peak discharge of 357,355 cfs and a total volume of 1,045,228 acre-feet. The SPF was routed through Lewisville Lake through the emergency spillway and flood control gates. The reservoir level reached a maximum elevation of 538.19 feet and receded to 537.5 feet by the beginning of the Probable Maximum Storm.

d. 2017 Inflow Design Flood Study. The following paragraphs describe the details of the IDF and PMP analysis as defined in the 2017 Dam Safety Modification Report (DSMR).

1. Probable Maximum Storm. Due to Hurricane Harvey causing rainfall depths in excess of the Texas Commission on Environmental Quality (TCEQ) Probable Maximum Precipitation (PMP) estimates, the U.S. Army Corps of Engineers (USACE) will use the Hydrometeorological Report No. 51 and 52 (HMR51/52). This action is also in accordance with other USACE dam safety studies on the Trinity River.

The Probable Maximum Storm rainfall above the Lewisville Dam Site with Ray Roberts in place was determined in accordance with the method described in HMR-51 and HMR-52. The resulting average over area 72 hour rainfall total is based on the most critical centering of the hypothetical elliptical Probable Maximum Precipitation (PMP) at a location approximately 5 miles northeast of the town of Sanger, Texas. The storm pattern is shown on

Plate 8-2.

The hydrologic conditions and assumptions are listed below:

Starting pool elevations at the Top of Conservation for both Ray Roberts and Lewisville Dams. This corresponds to approximately the 25% pool elevation for both reservoirs. The antecedent storm 50% of PMF volume was used. The 35% Unit Hydrograph Peaking at the reservoirs was adopted. An initial loss rates of 0.5 inches was used. Work is ongoing in 2018 to stabilize and strengthen the spillway. The updated spillway rating curve for Lewisville Dam can be found on Plate 7-4. An updated geometric estimate for the elevation-capacity table for Lewisville Dam was utilized for the 2017 IDF. HMR51/52 were used for the probable maximum precipitation.

2. Minimum Infiltration Rates. The adopted infiltration indices are taken from the "Definite Project Report on Garza-Little Elm Dam and Reservoir, Elm Fork Basin of the Trinity River, Texas – Appendix I, Hydrology" dated October 1947. An initial loss of 0.5 inch and an infiltration rate of 0.05 inch per hour were adopted. Application of these assumed losses to the Inflow Design Flood rainfall produced an estimated runoff of 33.31 inches, or 82 percent of the total rainfall of 40.63 inches for the Inflow Design Flood. The IDF study rainfall, losses and rainfall excess are shown on Plate 8-3.

3. Unit Hydrographs. Unit hydrograph determinations were made for Elm Fork Trinity River watershed through calibration of multiple events, February 2001, March 2002, June 2007, April 2009 and September 2010. These storms were selected because of their rainfall amounts and extensive areal coverage. Using the Snyder Unit Hydrograph method, the unit hydrographs were peaked by 35% for the IDF.

4. Unit Hydrograph for Flow into Full Lake. The total drainage area of 1,660 square miles above the Lewisville Dam site was divided into 62 sub-basins in the model. Unit hydrographs for the sub-basins were determined using the method mentioned in Section 8-02, c.3. The unit hydrographs for the PFM is shown on Plate 8-2.

5. Routing Reach Parameters. Twenty-five routing reaches were used in the development of Lewisville Lake hydrologic model. Reach routings were performed using a modified puls method based upon storage-discharge relationships for each reach. The storage-discharge relationships were developed using a typical valley cross section for each reach and applying Manning's equation. Routing through the remaining reaches (except through the reservoirs) was assumed to be instantaneous, i.e., the hydrographs were translated to the next control point with no attenuation of the flood.

6. Probable Maximum Flood Hydrographs. The PMF hydrographs representing flow into full pool was computed using the unit hydrograph developed for each sub-area, the routing reach parameters discussed above, the rainfall from HMR-51/52, the infiltration rates discussed above, and the runoff equal to the rate of rainfall from the lake surfaces. The routing computations (2017 Study) for flow into a full reservoir indicated that the lake would rise to a maximum level of 554.10 feet and the peak inflow would be 1,070,368 cfs with a volume

2,956,691 acre-feet. Plate 8-3 shows the PMF inflow-outflow hydrographs and the reservoir surface elevations.

e. Other Floods. Based on historical data, since Lewisville Lake was impounded, the May 1982 peak inflow of 286,000 cfs is the largest observed. The October 1981 peak inflow of 284,000 cfs was almost the same value. The peak inflow of May 1990 was 235,000 cfs. The maximum lake elevation attained was 536.94 feet in May 2015. Additional information on historical floods can be found in Section 4-06 of this manual.

8-03. Recreation. Facilities such as public boat ramps, docks, restrooms, picnic shelters, fishing piers, and campsites have been provided. Public use of USACE lakes is governed by Title 36 of the Code of Federal Regulations. The 10-year average annual visitation to Lewisville Lake is 3,186,554.

A rise or fall in the lake elevation at Lewisville Lake has some effect on the lands surrounding the lake, recreational facilities, and project visitation. A rise above elevation 532.0 temporarily restricts the use of many recreational facilities due to inundation or loss of access. Other effects associated with high water levels include the accumulation of driftwood, the degradation of surrounding vegetation, and increased shoreline erosion.

A substantial lowering of the pool elevation, due to water supply or hydropower requirements or drought, exposes aesthetically unpleasing banks and mud flats, and creates a boating hazard due to increased shallow areas. Boat ramps and beaches may also become unusable during drawdown periods. Although fluctuation of the pool level is unavoidable, the effects on recreational opportunities can be reduced by placing roads, utilities, and recreational facilities in locations less prone to flooding.

8-04. Water Quality. Water quality is not an authorized project purpose. Lewisville Dam contains a low flow system with multi-level intakes. Lower flows are released through the power plant or the low flow outlet works. Although water quality is not an authorized purpose for Lewisville Dam, compliance with Public Law 92-500 requires that all federal facilities be managed, operated, and maintained to protect and enhance the quality of water and land resources through conformance with applicable federal, state, interstate, and local substantive standards. Additional water quality data can be found in Section 4-08.

8-05. Fish and Wildlife. The management of fish and wildlife resources is conducted in cooperation with the Texas Parks and Wildlife Department and U.S. Fish and Wildlife. The species of fish that the Texas Parks and Wildlife Department has stocked the lake with are: largemouth bass, smallmouth bass, channel and blue catfish, flathead catfish, crappie, white bass, hybrid striped bass and sunfish. There are a number of small wildlife management areas surrounding the lake, within which hunting dove, waterfowl, quail, rabbit, squirrel, turkey, feral hog and deer are permitted. Other species of wildlife found in the area include white-tailed deer, gray and red foxes, coyotes, fox squirrels, armadillos, owls, and more than a hundred bird species.

8-06. Water Supply. The cities of Dallas and Denton have water supply storage contracts dated 18 May 1953 and 10 December 1953 for 415,000 acre-feet (74%) and 21,000 acre-feet (26%) respectively below elevation 515.0 feet. Additional contracts approved 16 September 1980 entitle the city of Dallas to 131,400 acre-feet (74%) and the city of Denton to 46,200 acre-feet (26%) between elevations 515.0 and 522.0 feet for the conservation water supply storage. The city of Lewisville has contracted with the City of Dallas for water supply withdrawals from Lewisville Lake.

8-07. Hydroelectric Power. The city of Denton installed a hydropower facility at Lewisville Dam. The construction of the hydropower facility was completed on 23 October 1991. The facility consists of one Horizontal S-shaped Kaplan Unit capable of producing 2,892 Kilowatts. The unit is a Run-of-river facility, where downstream water supply and small flood releases will be used to generate power. Power and energy is marketed by Garland Power & Light.

8-08. Navigation. Navigation is not a project purpose.

8-09. Drought Contingency Plans. The purpose of the Drought Contingency Plan for the Trinity River basin, Appendix X of the Trinity River Master Manual, is to provide a basic reference for water management decisions and responses to a water shortage in the Trinity River basin due to a drought. The Drought Contingency Plan provides a plan for implementing actions necessary for conservation of water supply depending on the severity of the drought and the reservoir level. This plan enables the Water Resources Branch to effectively coordinate with the public and other district elements during drought conditions. The latest Drought Contingency Plan for Lewisville Lake is dated August 1991.

8-10. Emergency Action Plan. The Emergency Action Plan (EAP) contains detailed instructions and procedures to be followed by USACE personnel at the Lewisville Dam Project Office to properly handle any event at the project that could develop into an emergency condition. The most current edition of the EAP is located at the Geotechnical Office – Fort Worth District and is dated September 2017. Copies of this EAP are also available in the Fort Worth District Water Management Office and at the Lewisville Lake Project Office.

8-11. Frequencies. Lewisville Lake levels (USACE) for the period of record, since deliberate impoundment began on 1 November 1954, are displayed on Plate 8-4.

a. Annual Peak Elevation Frequency. The annual peak lake levels for the period 1954 through 2016 were tabulated. The annual peak elevations were arranged in descending order and assigned median plotting positions. The elevation probability was derived from studies based on methods discussed in "Statistical Methods in Hydrology," by Leo R. Beard, dated January 1962. The annual peak elevation frequency curve is shown on Plate 8-5. Data from this analysis indicated that the 50-year and the 100-year flood frequency pool level to be 536.2 feet and 538.0 feet, respectively.

b. Lake Elevation Duration. The lake-elevation-duration curve shown on Plate 8-6 is based on the midnight lake elevations for the period 18 May 1989 to 6 October 2016. The conservation pool elevation at Lewisville Lake was raised from 515.0 feet to 522.0 feet on 30 November 1988. Lewisville Lake reached the top of the conservation pool for the first time on 18 May 1989. The lake-elevation-duration curve shows the percent of time that the lake level equals or exceeds a given elevation.

c. Control Points. Control points are located on Elm Fork Trinity River near Carrollton, Trinity River at Dallas, Trinity River near Rosser, and Trinity River near Oakwood. Rating curves for the key control points are shown on Plates 4-15 through 4-18, respectively.

8-12. Other Studies. The vision for the CWMS National Implementation Effort is to have all USACE watersheds fully modeled within CWMS. These models will be operated daily to provide decision support to local Water Managers and to have results automatically consolidated into standardized briefing tools within a CorpsMap for executive and public use. CorpsMap viewer supports visualization and analysis of the USACE infrastructure, and real-time display of atmospheric, coastal, critical infrastructure, and watershed data.

The CWMS Automated Information System was developed by the HEC under funding from the Water Management Community of Practice and has been implemented to varying degrees at USACE Water Management Offices. USACE offices apply CWMS data flow elements (data acquisition, verification, validation, transformation, storage, visualization, dissemination elements). For this effort, USACE Leadership, the Critical Infrastructure Protection and Resilience (CIPR) Program, and the Dam Safety Program have recognized the value of these watershed models to the Nation and have committed funding for watershed model development to support the needs of multiple programs.

CHAPTER IX - WATER CONTROL MANAGEMENT

9-01. Responsibilities and Organizations.

a. Corps of Engineers. Lewisville Lake is owned by the USACE. As the owner of the project, the Corps of Engineers is responsible for the overall operation and maintenance of the lake. The Lake Manager, operating through the Lewisville Lake Office, Lewisville, Texas, and the Engineering and Construction Division, is directly responsible for the Lake's maintenance and operation. Project reporting instructions are presented in Chapter V, and project operating instructions are presented in Chapter VII of this manual.

1. Responsibilities and Duties During Normal Operations. The Water Resources Branch, Engineering and Construction Division, Fort Worth District is charged with the following responsibilities and duties under the general supervision of the SWD Office in Dallas, Texas.

(a). Regulation of lakes and dissemination of data.

(b). Investigations and refinement of regulation procedures, including the following:

(1). Analysis of past floods.

(2). Reconnaissance to determine channel capacities.

(3). Improvement of forecasting techniques.

(4). Plan and coordinate the hydrometeorologic reporting network with the NWS and the USGS.

(c). Train personnel in flood control duties, including the following:

(1). Periodic visits to projects by the branch personnel to familiarize themselves with regulation facilities and become acquainted with the operating personnel.

(2). Instruct personnel of other branches in flood control procedures to supplement the Water Resources Branch during flood emergencies, when necessary.

(d). Prepare reports on lake regulation.

(1). Recurring reports.

(2). Water Control Manuals.

(3). Post Flood reports.

2. Responsibilities and Duties During Flood Emergencies. During flood emergency, the Water Resources Branch is responsible for the following:

(a). Evaluation of current meteorologic, hydrologic, and hydraulic data.

(b). Provide analysis of the storm and effects of the flooding to the District Engineer and other District personnel.

(c). When necessary, furnish personnel to assist lake personnel in flood regulations.

(d). Regulation of lakes in accordance with flood control schedules.

(e). Furnish information to higher authority, which will include:

(1). Initial reports to the SWD and Office of the Chief of Engineers by telephone or E-mail.

(2). Provide information for situation reports.

3. Assignment of Personnel. During non-flood periods, personnel of the Water Resources Branch issue instructions for the routine regulation of the lake. However, during flood periods, assistance from other personnel may be required to maintain effective regulation of the lakes. The area and magnitude of the flood will determine the number of people engaged in each particular activity. Plate 9-1 shows the organization during flood control regulation.

4. Provision for 24-Hour Alert. The NWS and Lake Manager have been provided with a list of names and telephone numbers of key personnel of the Engineering and Construction Division with instruction to provide warning if unusual conditions occur. Responsible personnel are on duty at the Fort Worth District Office 24 hours a day during flood emergencies and/or whenever project conditions warrant. Responsible personnel will be on duty or on call at the lake at all times.

5. Role of the Lake Manager. The Lake Manager will regulate the lake according to instructions issued by personnel of the Water Resources Branch. The instructions will follow the "Normal Regulations for Flood Control" and "Emergency Regulations for Flood Control" contained in Chapter VII and Exhibit D of this manual. If the Lake Manager loses communication with the District Office, he will immediately make every effort to reestablish communication while initiating emergency regulations for flood control. The Lake Manager will

make daily observations at the lake project's weather station and report those observations as directed in paragraph 5-07.

b. Other Federal Agencies. The NWS is officially responsible for issuing flood warnings to the public. The NWS provides weather and river forecast information, which is used to make real time operation decisions for Lewisville Lake. The USGS develops and maintains stage versus discharge curves for each stream gage. The USGS also collects and maintains reservoir storage and water quality data for the USACE lakes in the Fort Worth District.

9-02. Interagency Coordination. The USACE, NWS, and the USGS cooperate to accumulate rainfall and streamflow data used in forecasting river stages, stream flows and lake levels. The Fort Worth District's Supplement A to ER 500-1-1 gives a list of Federal Agencies with which the District will coordinate in emergencies. The City of Denton coordinates with USACE regarding releases from the project through the hydropower turbines.

a. Local Press and Corps Bulletins. The USACE, through their Public Affairs Office, makes press releases to the news media of flood situations in the area of concern. The Water Resources Branch may supplement this information with observed conditions and technical advice to enable local interests to obtain optimum flood protection and to perform rescue and relief functions. USACE further assists in flood fighting, through the office of the Emergency Operations, who furnishes sandbags and other necessary equipment based on equipment on hand and need.

b. National Weather Service. The NWS and USACE exchange hydrometeorologic data and reports in obtaining and disseminating data. This exchange of data is discussed in great detail in Chapter VI of this manual.

c. United States Geological Survey. The USGS and USACE cooperate in a program for the operation and maintenance of stream gages throughout the Fort Worth District. During floods, the USGS and USACE coordinate field activities to maximize the number of stream discharge measurements.

d. Other Federal, State, or Local Agencies. The Fort Worth District exchanges information with State government officials, Texas Department of Public Safety (TxDPS) Highway Patrol Division, and others during flood emergencies. The Fort Worth District also coordinates with State agencies concerning fish and wildlife throughout normal operation.

Releases from Lewisville Lake are coordinated with the releases from other reservoirs in the Trinity River basin system. These reservoirs are listed in Table 3-2.

9-03. Interagency Agreements. The water supply storage contract with the city of Dallas for storage 415,000 acre-feet (74%) below elevation 515.0 feet was approved on 16 July 1953. The water supply storage contract with the city of Denton for 21,000 acre-feet (26%) below elevation 515.0 feet was approved on 20 May 1954. Additional contracts approved 16 September 1980

entitle the city of Dallas to use 131,400 acre-feet (74%) and the city of Denton to use 46,200 acre-feet (26%) between elevations 515.0 feet and 522.0 feet. The city of Lewisville has also contracted with the city of Dallas for water supply withdrawals from Lewisville Lake.

9-04. Commissions, River Authority, Compacts, and Committees. The TCEQ issues and regulates permits for water use in the State of Texas. The city of Dallas and Denton are informed of lake conditions and operations at Lewisville Lake, but exercises no authority over flood control operations.

9-05. Non-Federal Hydropower. The city of Denton, Texas was given a license by the Federal Energy Regulatory Commission for the operation of a 5 megawatt or less hydroelectric power project. However, the Lewisville Dam hydropower station is now owned and operated by Garland Power and Light. The city of Garland is responsible for the operation and maintenance of the hydropower plant. During flood conditions hydropower production can be curtailed if necessary, by the USACE to prevent further flooding and damages downstream of the project.

9-06. Reports. Table 9-1 lists reports prepared by the Water Resources Branch. The tabulation also describes when each report is required and the regulation requiring the report.

TABLE 9-1

Tabulation of Reports

Name of Report	When Required	Regulation Requiring Report
Daily Report	Daily	—
Monthly Reservoir Report	Monthly	ER 1110-2-240
Flood Situation Reports	During Floods	ER 500-1-1
Post Flood Reports	Following a Flood Causing Major Damage	ER 500-1-1
Annual Reports	Annually	ER 1110-2-240

a. Daily Report. The daily report is prepared by the Water Resources Branch. It contains water control information on most of the major lakes in the Fort Worth District. An example of daily report is shown on Plate 9-2. Copies of the report are sent to all subscribing offices and agencies. The daily report is also posted on the Internet at the following URL address: http://www.swf-wc.usace.army.mil/.

b. Monthly Reports. The Water Resources Branch prepares monthly reservoir reports in accordance with ER 1110-2-240. The monthly report, shown on Plate 9-3, is a tabular record of lake operations. It is prepared for all lakes under the supervision or of direct interest to the Fort Worth District.

c. Flood Situation Reports. The Water Resources Branch supplies the Emergency Operations Center (EOC) in the Fort Worth District with information in accordance with ER 500-1-1. This report contains hydrometeorological conditions for the area, the name of the lake, pertinent lake data, lake elevation, predicted maximum elevation and anticipated data, inflow and outflow rates in cfs, percent of flood control storage utilized to date, and any other data relevant to the flood situation. The EOC then provides the information to the appropriate government officials and community organizations concerned or effected by the flooding.

d. Post Flood Reports. The post flood reports are prepared in accordance with ER 500-1-1, when a flood has resulted in major damage. The report describes flood emergency operations performed by the USACE. Included are available hydrologic information, damage estimates, and other engineering data considered essential for flood control and flood plain studies performed to review possible damage claims against the United States. The report is prepared using information compiled by the Water Resources Branch and when completed, includes a paragraph on the final damage costs from the flood event, including damages to USACE property, parks, and other structures.

e. Annual Report. The Water Resources Branch prepares an annual report for the SWD Reservoir Control Center. The report summarizes general river basin conditions and the activities and accomplishments of the Water Resources Branch during the preceding year.

EXHIBIT A

SUPPLEMENTARY PERTINENT DATA

LEWISVILLE DAM AND LAKE

EXHIBIT A

SUPPLEMENTARY PERTINENT DATA

LEWISVILLE DAM AND LAKE

TABLE OF CONTENTS

1. GENERAL INFORMATION

Item	Description
Other Name for Project	Formerly Garza-Little Elm Reservoir
Location	Trinity River Basin, Texas Elm Fork Trinity River, at river mile 30.0
Type of Project	Dam and Lake
Objective of Regulations	Multipurpose lake project for Flood Control, Water Supply, Hydropower, Fish and Wildlife, and Recreation.
Project Owner	USACE
Operating Agency	USACE The working hours of operation for weekdays are 0800 to 1645; Working hours for weekends and holiday vary. During flood emergency conditions 24-hour per day duty is the general procedure.
Regulating Agency	USACE
Water Supply Contracts	The cities of Dallas and Denton have contracts with USACE for water supply storage dated 18 May 1953 and 10 December 1953 for 415,000 ac-ft (74%) and 21,000 ac-ft (26%) respectively below elevation 515.0 feet. Additional contracts approved 16 September 1980 entitle the city of Dallas to 131,400 ac-ft (74%) and the city of Denton to 46,200 ac-ft (26%) between elevations 515.0 and 522.0 feet.
Project Cost	$25,826,000
Deliberate Impoundment Date	1 November 1954
Federal Power Marketing Administration	Garland Power and Light

2. LAKE INFORMATION

Feature	Elevation (Feet NGVD29)	Lake Area (Acres)	Storage (Acre-Feet)	Runoff (Inches)
Top of Dam	560.0	–	–	–
IDF Design Water Surface Elevation (2017 Study)	554.10	67,073	2,082,608	23.52
Maximum Design Water Surface Elevation (1947 Study)	553.0	66,100	2,051,200	23.34
Top of Flood Control Pool and Spillway Crest	532.0	39,168	981,763	11.09
Top of Conservation Pool (2007 Survey)	522.0	27,175	598,902	7.24
Invert of Low Flow Outlet (lowest) (2007 Survey)	481.0	4,410	35,674	—
Invert of Floodwater Outlet Works (2007 Survey)	448.0	0	0	—
Streambed (2007 Study)	435.0	0	0	—

Item	Description
Real Estate (Fee Title)	Upper guide contour of elevation 537.0 feet. Fee simple title includes 45,533 acres
Real Estate (Flowage Easement)	Upper guide contour of elevation 537.0 feet. Flowage easement includes 5,746 acres
Range of Clearing	Below elevation 522.0 feet

2. LAKE INFORMATION (CONTINUED)

Item	Description
Lake length at top of conservation pool	17.5 miles from the dam to the most upstream shoreline
Shoreline length at top of conservation pool	250 miles
Safety aspects	A warning horn will sound for 10 seconds to alert those downstream at least 2 minutes before significant changes in discharge releases through the outlet works begin. Access roads where practicable are constructed above elevation 537.0 feet.
Emergency Drawdown	Assuming an average inflow of 780 cfs and initial water surface at the spillway crest, the lake may be drawn to 10% of the initial flood storage in 140 days by releasing 4,000 cfs continuously.
Datum	All elevations referred to in Exhibit A, unless noted otherwise, are in feet, National Geodetic Vertical Datum of 1929 (NGVD29). The datum conversion from NGVD29 to NAVD88 is: NGVD29 + 0.0 feet = NAVD88 for Lewisville Dam and Lake.

3. HYDROLOGY

Item	Description
Drainage Area	1,660 square miles
Volume from One-Inch Runoff	88,533 ac-ft
Spillway Design Flood (1947 Study)	
Design water surface elev. (Adopted)	553.00 feet
Design water surface elev. (Computed)	552.85 feet
Duration of Storm	60 hours
Average Infiltration Rate	0.05 inches/hour
Total Volume of Rainfall	23.2 inches
Total Volume of Runoff	20.3 inches
Peak Inflow	633,200 cfs
Storm Type	Spillway Design Storm
Inflow Design Flood (2017 Study)	
Maximum Water Design Surface elev.	554.10 feet
Duration of Storm	72 hours
Average Infiltration Rate	0.05 inches/hour
Total Volume of Rainfall	40.63 inches
Total Volume of Runoff	33.31 inches
Volume into full pool	2,956,691 ac-ft
Peak Inflow to full pool	1,070,368 cfs
Peak Outflow (reservoir level 554.10 feet)	
Total	218,347 cfs
Storm Type	Probable Maximum Storm determined from HMR- 51/52 guidelines
Standard Project Flood (1983 Study)	
Maximum Water Surface elev.	538.19 feet
Duration of Storm	96 hours
Total Volume of Rainfall	15.41 inches
Peak Inflow	357,355 cfs
Total Volume	1,045,228 ac-ft
Climate	Moderate, with hot summers, and cool winters

3. HYDROLOGY (CONTINUED)

Item	Description
Average Precipitation (Gages listed in Table 4-3)	36.96 inches per year (1897-2016)
Average Evaporation from lake (Data listed in Table 4-4A)	59.08 inches per year (1953-2012)
Storm Type	Primarily local thunderstorms, frontal storms, and tropical cyclones
Flood Seasons	Primarily March through June, but floods can occur at any time of year
Low Flood Seasons	July, August and November through February
Minimum Monthly Inflow and Date of Occurrence	0 acre-feet (Apr 2005)
Minimum Annual Inflow and Date of Occurrence	77,158 ac-ft (in CY 1956)
Mean Annual Inflow	677,569 ac-ft (Jan 1955-Dec 2016 records)
Maximum Annual Inflow and Date of Occurrence	2,550,673 ac-ft (CY 2015)
Maximum Monthly Inflow and Date of Occurrence	974,521 ac-ft (Oct 1981)
Maximum Average Daily Inflow and Date of Occurrence	157,000 cfs (May 13, 1982)
Maximum Instantaneous Inflow and Date of Occurrence	286,000 cfs (May 1982)
Maximum Flood Volume and Date of Occurrence	1,455,354 ac-ft (Apr-Jun 2015)

3. HYDROLOGY (CONTINUED)

Item	Description
Names and Locations of Key Stream Flow Stations	Upstream Elm Fork Trinity River at Gainesville Timber Creek near Collinsville Range Creek near Collinsville Ray Roberts Lake near Pilot Point Elm Fork Trinity River at Greenbelt near Pilot Point Clear Creek near Sanger Little Elm Creek near Aubrey Doe Br at US Hwy 380 near Prosper Hickory Creek at Denton Lewisville Lake near Lewisville Downstream Elm Fork Trinity River near Lewisville Indian Creek at FM 2281, Carrollton Denton Creek near Grapevine Elm Fork Trinity River near Carrollton Elm Fork Trinity River at Spur 348 Irving Trinity River at Dallas Trinity River near Rosser Trinity River near Oakwood
Type of Hydrometeorologic Data Recorded at Damsite	Automatic water stage recorders to furnish continuous records of lake levels and river stage below the dam. Tile staff gages provide lake level and tailwater elevations. NWS station at the dam consists of: a rain gage, recording rain gage, Type A evaporation pan located at Grapevine Project office, anemometer and maximum-minimum thermometer.

3. HYDROLOGY (CONTINUED)

Item	Description
Precipitation Stations Used in Hydrologic Forecasting (NWS)	Denton 2 SE - Recording gage Forestburg 5.5 - Recording gage Frisco- Recording gage Gainesville 5 ENE - Non-Recording gage Gunter 5S - Non-Recording gage Lewisville Dam - Recording gage Muenster - Recording gage Pilot Point Isl Du Boi - Non-Recording gage Ray Roberts Lake - Non-Recording gage Slidell - Non-Recording gage Valley View - Non-Recording gage Celina 7.3 NE - Non-Recording gage Shady Shores 3.9N - Recording gage Flower Mound 2.3 NE - Recording gage Sanger 1.8 WSW - Non-Recording gage Flower Mound 2.3 NE - Recording gage Sanger 1.8 WSW - Non-Recording gage Oak Point 1.4 NNW- Recording gage Carrollton 2 NNE - Recording gage Little Elm 2.5 NE - Non-Recording gage Argyle 1.6 NNW - Non-Recording
Number of Sediment Ranges	110 (Periodic surveys)
Number of Degradation Ranges	9 (Periodic surveys)

4. EMBANKMENTS

Item	Description
Location	Elm Fork Trinity River of the Trinity River Basin at river mile 30.0
Purpose	Impoundment and protection of agricultural, community structures and against loss of life
Type	Non-overflow embankment
Type of Fill	Rocked fill
Slope Protection	Riprap upstream and seeded downstream
Height	125 feet above streambed
Length	32,888 feet including spillway
Top Elevation	560 feet
Freeboard	5.9 feet
Used for Roadway	Service road access only
Elevation of Streambed	435.0 feet
Completion	August 1955
Deliberate Impoundment	1 November 1954

5. EMERGENCY SPILLWAY

Item	Description
Location	Near east abutment
Uncontrolled Spillway	
Crest Elevation	532.0 feet
Approach channel length	1,300 feet long
Width	560 feet wide
Type	Ogee
Control	None
Total Routed Capacity (1951 Study, Lake elev. 553.0 feet, Adopted Design)	216,800 cfs includes flow over spillway and outlet works.
Total Maximum Outflow (2017 Study, Lake elev. 554.10 feet)*	218,347 cfs
Type of Energy Dissipator	Stilling basin with baffle blocks

*Reflects the spillway stabilization and strengthening (thicker) of 2018.

6. OUTLET FACILITIES

Item	Description
A. Control Gates	
Location	On Service spillway structure
Purpose	Regulation of outflow
Type	Gate controlled conduit
Number and Size of Gates	Three 6.5 feet by 13 feet broome-type gates operated by 2-speed cable drum hoists
Entrance Invert Elevation	448.0 feet
Maximum Discharge at Pertinent Elevations:	Top Flood Control Pool Elevation 532.0 feet - 10,700 cfs
	Top of Conservation Pool Elevation 522.0 feet - 10,100 cfs
Minimum Time Required to Open and Close Flood Gates:	
Emergency Conditions	Under emergency conditions, one service gate may be opened or closed in 20 minutes, two gates in 40 minutes, and all three gates in 60 minutes
Normal Conditions	Under normal conditions, a gate is opened at a rate of half foot per 30 minutes for 6.0 hours, until it is half way open, and then at a rate of 1 foot per minute until fully open. Total opening time is 6 hours and 7 minutes
Type of Energy Dissipater	Concrete Baffled Stilling Basin.

6. OUTLET FACILITIES (CONTINUED)

Item	Description
B. Low Flow Outlet Works	
Location	Four gated intakes are located in the outlet structure
Purpose	Discharge for water supply and water quality
Type	Two 60-inch circular steel pipes
Number and Size of Gates	Two 48-inch values at downstream end of 60-inch pipe
Invert Elevation	Two at 481.0 feet One at 496.0 feet One at 503.0 feet
Maximum Low flow Discharge At Pertinent Elevation	Top of conservation pool Elev. 522.0 feet - 500 cfs Top of flood control pool Elev. 532.0 feet - 530 cfs

7. HYDROELECTRIC POWER FACILITIES

Item	Description
Location	Adjacent to stilling basin. Low Flow conduit is used as a penstock
Purpose	Discharge for water supply and hydroelectric power generation
Type of Facility	Run-of-river
Maximum Output Capacity	2,892 Kilowatts generators
Type of Unit	One Horizontal S-shaped Kaplan turbine
Power on Line Date	23 October, 1991
Normal Plan for Generation	Demand for downstream water supply and small flood releases will be used to generated power
Speed	360 RPM
Rated Head	60 feet
Maximum Head	76 feet
Minimum Head	25 feet
Rated flow	470 cfs
Maximum Flow through Turbine	623 cfs
Runner Centerline Elevation	442.83 feet

8. CONTROL POINTS

Item	Description
A. Elm Fork of the Trinity River near Carrollton Gage, No. 08055500	
Location	River mile 18.2 on the Elm Fork of Trinity River, upstream of Carrollton Dam, near Carrollton, TX
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs (Grapevine and Lewisville Lake) and local flow
Channel description	The stream is slow moving, normally about 15 feet deep in black clay and sandy loam.
Drainage area	2,459 square miles
Treatment of uncontrolled runoff.	Contributes to target flow at gage
Target Flow Rate	7,000 cfs
Time of Water Travel From Lewisville Lake	8 hours
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	Dallas Floodway starting near and downstream from confluence of Elm and West Forks in the City of Dallas. Levees are grass covered earth, non-overtopping, built for flood protection.
Related Control Structures	None

8. CONTROL POINTS (CONTINUED)

Item	Description
B. Trinity River at Dallas Gage, No. 08057000	
Location	River mile 500.3 on the Trinity River downstream of Commerce Street viaduct and 5.2 miles downstream of confluent of West and Elm Forks in Dallas, TX
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	The channel is composed of a grass lined levee channel.
Drainage area	6,106 square miles
Treatment of uncontrolled runoff.	Contributes to target flow at gage
Target Flow Rate	13,000 cfs
Time of Water Travel From Lewisville Lake	32 hours
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	Dallas Floodway from near and downstream from confluence of Elm and West Forks and downstream along the Trinity River in the City of Dallas. Levees are grass covered earth, non-overtopping, built for flood protection
Related Control Structures	None

8. CONTROL POINTS (CONTINUED)

Item	Description
C. Trinity River near Rosser, No. 08062500	
Location	River mile 451.4 of the Trinity River and 8.5 miles downstream of East Fork Trinity River, 2.5 miles south of Rosser, Texas
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	Leveed channel and floodplain, with parallel levees 1,700 feet apart at the gage. Channel bed of clay overlain with sludge and silt, sand and gravel at some cross sections. The floodplain between the levees is heavily grown.
Drainage area	8,147 square miles
Treatment of uncontrolled runoff	Contributes to target flow at gage
Target Flow Rate	15,000 cfs
Time of Water Travel From Lewisville Lake	92 hours
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	Levees with similar characteristics to Dallas Floodway. Levees are grass covered earth, non-overtopping, built for flood protection.
Related Control Structures	None

8. CONTROL POINTS (CONTINUED)

Item	Description
D. Trinity River near Oakwood Gage, No. 08065000	
Location	River mile 313.4 of the Trinity River, downstream of U.S. Highways 79 and 84 near Oakwood, TX
Purpose of control	To indicate the total flow at the gage, including releases from upstream reservoirs and local flow
Channel description	Streambed is in relatively stable clean sand and mud. Channel is straight for 0.25 miles upstream and downstream of gage.
Drainage area	12,833 square miles
Treatment of uncontrolled runoff	Contributes to target flow at gage
Target Flow Rate	24,000 cfs
Time of Water Travel From Lewisville Lake	236 hours
Monitoring provisions	Recording river gage with DCP
Dikes or levees downstream	Levees with similar characteristics to Dallas Floodway. Levees are grass covered earth, non-overtopping, built for flood protection
Related Control Structures	None

EXHIBIT B1

CONTRACT BETWEEN THE UNITED STATES OF AMERICA

AND

THE CITY OF DALLAS, TEXAS

FOR

LEWISVILLE DAM AND LAKE, TEXAS

CONTRACT BETWEEN THE UNITED STATES OF AMERICA
AND
THE CITY OF DALLAS, TEXAS
FOR
WATER STORAGE SPACES IN AUBREY AND LEWISVILLE LAKES, TEXAS

THIS CONTRACT, entered into this 15th day of August 1980, by and between the United States of America (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the City of Dallas, Dallas County, Texas (hereinafter called the City), WITNESSETH THAT:

WHEREAS, the River and Harbor Act of 1965 (Public Law 89-298, 79 Stat. 1091) authorized the construction, operation, and maintenance of Aubrey Lake including modification of Garza-Little Elm Reservoir, since renamed Lewisville Lake, (hereinafter called the Project) on the Elm Fork of the Trinity River in the State of Texas; and

WHEREAS, in accordance with the authorized modification, Lewisville Lake (located immediately downstream from the Aubrey Dam) will be modified to permit the transfer of flood control storage from Lewisville Lake to Aubrey Lake for an equivalent amount of water supply storage in Lewisville Lake for municipal and industrial uses; and

WHEREAS, the City desires to contract with the Government for the use of storage included in Aubrey Lake and the additional storage to be made available in Lewisville Lake for municipal and industrial water supply and for payment of the cost thereof in accordance with the provisions of the Water Supply Act of 1958, as amended (43 U.S.C. 390b); and

WHEREAS, the City is empowered so to contract with the Government and is vested with all the necessary powers for accomplishment of the purposes of this contract, including those required by Section 221 of the Flood Control Act of 1970 (42 U.S.C. 1962d-5b);

NOW, THEREFORE, the Government and the City agree as follows:

ARTICLE 1. Water storage space.

a. Project construction. The Government, subject to the directions of Federal law and any limitations imposed thereby, shall design and construct the Project so as to include in Aubrey Lake space for the storage of water by the City and space for the storage of floodwaters which will permit the reallocation of flood control storage in Lewisville Lake to municipal and industrial water supply storage, a portion of which will also be utilized by the City.

b. Rights of the City.

(1) The City shall have the right to utilize (a) an undivided 74.0 percent (estimated to contain 591,700 acre-feet gross storage, including storage for sediment deposits) of the total storage space in Aubrey Lake below

elevation 632.5 feet above mean sea level, which total storage space is estimated to contain 799,600 acre-feet gross storage, including storage for sediment deposits, and (b) an undivided 74.0 percent (estimated to contain 131,400 acre-feet gross storage, including storage for sediment deposits) of the total storage space in Lewisville Lake between elevations 515.0 feet above mean sea level and 522.0 feet above mean sea level, which total storage space is estimated to contain 177,600 acre-feet gross storage, including storage for sediment deposits. The storage space in Lewisville Lake is to be used to impound water for present demand or need for municipal and industrial water supply; and the storage space in Aubrey Lake is to be used to impound water for present and anticipated future demands or needs for municipal and industrial water supply. In Aubrey Lake, 52 percent (an estimated 307,700 acre-feet) of the space which the City has a right to utilize is for present use water storage, and 48 percent (an estimated 284,000 acre-feet) is for future use water storage.

(2) The City shall have the right to withdraw or transfer water from or transfer water into either or both of the two lakes, or to order releases to be made by the Government through the outlet works in the dams, subject to the provisions of Article 1c and to the extent the aforesaid storage spaces will provide. The City shall have the right to construct all such works, plants, pipelines, and appliances as may be necessary and convenient for the purpose of transfers or withdrawals, subject to the approval of the Contracting Officer as to design and location. The grant of rights-of-way across, in, and upon land of the Government at Aubrey Lake and at Lewisville Lake shall be by separate instrument in a form satisfactory to the Secretary of the Army, without additional cost to the City, under the authority of and in accordance with the provisions of 10 U.S.C. 2669. Subject to the conditions of such grants, the City shall have the right to use so much of Aubrey Lake and Lewisville Lake lands as may reasonably be required in the exercise of the rights and privileges herein granted.

c. Rights reserved. The Government reserves the right to lower the water in Aubrey Lake to elevation 632.5 feet above mean sea level and to lower the water in Lewisville Lake to elevation 522.0 feet above mean sea level during such periods of time as is deemed necessary, in its sole discretion, for flood control purposes. The Government further reserves the right to take such measures as may be necessary in the operation of Aubrey Lake and Lewisville Lake to preserve life or property.

d. Quality or availability of water. The City recognizes that this contract provides storage spaces for raw water only. The Government makes no representations with respect to the quality or availability of water and assumes no responsibility therefor or for the treatment of water.

ARTICLE 2. Regulation of and right to use of water. The regulation of the use of water withdrawn or released from or transferred to or from the aforesaid storage spaces shall be the sole responsibility of the City. The City has the full responsibility to acquire in accordance with State laws and regulations, and if necessary to establish or defend, any and all water rights needed for utilization of the storages provided under this contract. The Government shall not be responsible for withdrawals, transfers, or

diversions by others, nor will it become a party to any controversies involving the use of the storage spaces by the City except as such controversies may affect the operations of the Government.

ARTICLE 3. Operation and maintenance. The Government shall operate and maintain Aubrey Lake and Lewisville Lake, and the City shall pay to the Government a share of the costs of such operation and maintenance as provided in Article 5c. The City shall be responsible for operation and maintenance of all installations and facilities which it may construct for the transfer into or out of or withdrawal of water from either or both of the two lakes and shall bear all costs of construction, operation, and maintenance of such installations and facilities.

ARTICLE 4. Measurement of withdrawals and releases. The City agrees to furnish and install, without cost to the Government, suitable meters or measuring devices satisfactory to the Contracting Officer for the measurement of water which is transferred into Aubrey Lake or Lewisville Lake or is withdrawn or transferred from Aubrey Lake or Lewisville Lake by any means other than through Aubrey Lake or Lewisville Lake outlet works. The City shall furnish to the Government monthly statements of all such withdrawals or transfers. Releases from the water supply storage spaces through Aubrey Lake or Lewisville Lake outlet works shall be made in accordance with written schedules furnished by the City and approved by the Contracting Officer and shall be subject to Article 1c. The measure of all such releases shall be by means of a rating curve of the outlet works or by such other suitable means as may be agreed upon prior to use of the water supply storage space or spaces.

ARTICLE 5. Payments. In consideration of the right to utilize the aforesaid storage spaces in Aubrey Lake and Lewisville Lake for municipal and industrial water supply purposes, the City shall pay the following sums to the Government:

a. Project investment costs.

(1) The City shall repay to the Government, at the times and with interest on the unpaid balance as hereinafter specified, the amounts stated below which, as shown in Exhibit A of this contract, constitute the entire estimated amount of the construction costs, including interest during construction, allocated to the water storage rights acquired by the City under this contract. The interest rate to be used for purposes of computing interest during construction and interest on the unpaid balance will be determined by the Secretary of the Treasury as of the beginning of the Government fiscal year in which construction of the Project is initiated on the basis set forth in the Water Supply Act of 1958, as amended. Such interest rate at the time of negotiation of this contract (Government fiscal year 1980) is 7.210 percent. The City shall repay:

74 percent of the construction cost of specific water supply facilities, estimated at	$ 161,300
52.34 percent of the total Project joint use construction cost, estimated at	92,965,500
Interest during construction, estimated at	13,428,900
Total estimated amount of Project investment cost allocated to 74 percent of the water supply	$106,555,700

(2) The Project investment costs allocated to the storage space indicated in Article 1(b)(1) as being provided for present demand is currently estimated at $55,903,100, on the basis of the costs presented in Exhibit "A". The amount of the Project Investment costs allocated to the storage for present demand shall be paid in 50 consecutive annual installments, the first of which shall be due and payable within 30 days after the City is notified by the Contracting Officer that the Project is completed and operational for water supply purposes. Annual installments thereafter will be due and payable on the anniversary date of the first payment. Except for the first payment which will be applied solely to the retirement of principal, all installments shall include accrued interest on the unpaid balance at the rate provided above. The last annual installment shall be adjusted upward or downward when due to assure repayment of all of the investment costs allocated to the storage for present demand within 50 years.

(3) The Project investment cost allocated to the remaining portion of the storage space, that provided in Aubrey Lake for future use, is currently estimated at $50,652,600 on the basis of the costs presented in Exhibit A of this contract. No principal or interest payment with respect to this storage for future water supply is required to be made during the first 10 years following the date the Project is operational for water supply purposes unless all or a portion of such storage is used for purposes of withdrawal of water from or transfer of water into Aubrey Lake during this period. The amount to be paid for any portion of such storage which is used shall be determined by multiplying the percentage of the total storage for future water supply which is placed in use by the total amount of the Project investment cost allocated to future water supply. Interest at the rate provided above will be charged on the amount of the Project investment cost allocated to the storage for future water supply which is not being used from the tenth (10th) year following the date the Project is operational for water supply purposes until the time when such storage is first used. The City may at its option pay the interest as it becomes due or allow the interest to accumulate until the storage is used. If this latter option is exercised, the interest will be compounded annually and added to the principal amount. When any portion of the storage for future water supply is used, the amount of the Project investment cost allocated thereto plus interest applicable to such portion as provided above will be due and payable on the date of first use of such portion. The said amount due shall be paid within the life of the Project in not to exceed 50 consecutive annual payments beginning on the next anniversary date established in accordance with the provisions of Article 5a(2) above. Annual payments thereafter for such portion will be due and payable on said anniversary date. For any portion, all payments shall include accrued interest on the unpaid balance at the rate provided above, with interest accruing from the said date of first use of such portion. The last annual payment for any portion shall be adjusted upward or downward when due to assure repayment of all the investment cost allocated to such portion within the repayment period.

(4) An estimated schedule of annual payments for the storages provided for present demand is attached as Exhibit B of this contract. The annual payments as provided therein shall be made until an interim estimated determination

of cost or a final determination of cost is made as provided in Article 6. Payment schedules for the storage provided for future water supply demands will be furnished by the Contracting Officer when use of such storage is started, and if based on estimated costs will be subject to revision, as provided in Article 6, until actual costs are known.

(5) The City shall have the right at any time it so elects to prepay the indebtedness under this Article 5a, in whole or in part, with accrued interest thereon to the date of such prepayment.

b. Major capital replacement costs and sedimentation resurveys costs. The City will be required to pay to the Government 74 percent of the cost for any major capital replacement of specific water supply facilities at Aubrey Lake. In addition, the City shall pay to the Government 19.240 percent of the costs of joint use major capital replacement items at Aubrey Lake until such time as the storage for future water supply is first used. As the storage provided for future water supply is used, the share of the joint use major capital replacement items costs, which the City will be required to pay in addition to the major capital replacement costs of the specific water supply facilities, will be increased commensurate with the percentage of the total water supply storage being used up to a total of 37.000 percent of such costs. The City will also be required to pay to the Government 28.902 percent of the costs of sedimentation resurveys at Aubrey Lake until such time as the storage for future water supply is used. As the storage provided for future water supply demands is used, the share of the sedimentation resurveys costs which the City will be required to pay will be increased commensurate with the percentage of the total water supply storage being used up to a total of 55.580 percent of such costs. Payment shall be made either in lump sum on demand at the time such costs are incurred or annually with interest on the unpaid balance. If paid annually, the City's share shall be paid within the life of the Project not to exceed 25 consecutive annual payments beginning on the next anniversary date established in accordance with the provisions of Article 5a(2) above following the date demand is made for payment of said major capital replacement costs or sedimentation resurveys costs. Annual payments thereafter will be due and payable on said anniversary date. All payments shall include accrued interest on the unpaid balance at the rate determined by the Secretary of the Treasury on the basis of the Water Supply Act of 1958, as amended, for use in the Government fiscal year in which major capital replacement is initiated, with interest accruing from the date said major capital replacement is initiated. The last annual payment shall be adjusted upward or downward when due to assure repayment of all the incurred costs within the repayment period.

c. Annual operation and maintenance costs.

(1) The City will be required to pay to the Government 74 percent of the annual experienced operation and maintenance costs of specific water supply facilities at Aubrey Lake. In addition, the City shall pay to the Government 22.084 percent of the annual experienced joint use operation and maintenance costs of Aubrey Lake until such time as the storage for future water supply is first used. As the storage provided for future water supply demands is used, the share of the annual experienced joint use operation and maintenance costs, which the City will be required to pay in addition to the operation and maintenance costs

of the specific water supply facilities, will be increased commensurate with the percentage of the total water supply storage being used up to a total of 42.469 percent of such costs. Twelve months prior to the expected date that the Contracting Officer shall notify the City that the Project is complete and operational for the water supply purpose, the Government shall provide the City an estimate of the first advance payment for operation and maintenance costs. The first payment for operation and maintenance costs of present use water supply storage in Aubrey Lake will be due and payable in advance within 90 days after the Contracting Officer notifies the City that the Project is completed and operational for water supply purposes, will be for the period beginning on the date the Project is operational for water supply purposes and ending on 30 September following, and will amount to the sum of the first payment for specific water supply facilities costs and the first payment for joint use costs. Annual payments thereafter, for each Government fiscal year ending 30 September, will be due and payable in advance on 2 January following the close of the prior Government fiscal year. Payment by the City and payment adjustments by the Government shall be in accordance with Exhibit A, IV, B.

(2) When each and any portion of the future water supply storage is placed in use, the first payment of the additional amount of the joint use operation and maintenance costs required to be paid for such storage use will be due and payable in advance within 30 days after first use of such storage and will be for the period beginning on the date of said first use and ending on 30 September following. Annual payments thereafter, for each Government fiscal year ending 30 September, will be due and payable in advance on 2 January following the close of the prior Government fiscal year.

d. Charges for delinquent payments. If the City shall fail to make any of the aforesaid payments when due, then the overdue payments shall bear interest compounded annually until paid. The interest rate to be used for overdue payments due under the provisions of Articles 5a, 5b, and 5c above shall be that determined by the Secretary of the Treasury on the basis of the Water Supply Act of 1958, as amended, for use in the Government fiscal year in which each period of delinquency occurs. The amount charged on payments overdue for a period of less than one year shall be figured on a monthly basis. For example, if the payment is made within the first month after being overdue (31 to 60 days after the anniversary date of the date of notification) one month's interest shall be charged. This provision shall not be construed as giving the City a choice of either making payments when due or paying interest, nor shall it be construed as waiving any other rights of the Government, at law or in equity, which might result from any default by the City.

e. Assurance of funds for contract payments. The City warrants that all payments contracted hereunder shall be secured by a pledge of surplus revenues of the City's combined Waterworks and Sanitary Sewer System remaining after payment of all expenses of operating and maintaining such system and after providing for payment of all debt service, reserve, or other requirements in connection with the City's Waterworks and Sanitary Sewer System Revenue Bonds now outstanding or those hereafter issued on a first lien basis or on such other basis as may be approved by the Contracting Officer, provided, that in the event such surplus revenues may become or are insufficient to meet the payments contracted hereunder, the City shall fix and collect such rates and charges for

services of said combined system as will make possible the prompt payment of all the aforementioned requirements including payments contracted hereunder. Payments made by the City as Project investment cost and as major capital replacement costs shall be regarded as capital expenditures.

ARTICLE 6. Construction cost adjustments. All construction cost dollar amounts in this contract, including those in the Exhibits, are tentative only based on the Government's best estimates. They will be adjusted upward or downward by the Contracting Officer when final construction costs become known, and the contract will be modified to reflect the adjustments. Within two years after the Project is completed and operational for water supply purposes, the Contracting Officer shall make a revised interim estimated determination of construction costs, including interest during construction and taking into account the actual costs to the extent they are then known. In like manner, further interim determinations shall be made at two year intervals until all actual costs are known, at which time the Contracting Officer shall prepare a final cost determination, including interest during construction. On each occasion of an interim determination, or on final determination, the annual payments thereafter due shall be changed so as to provide for the payment of the balance due in equal payments during the remaining life of the repayment period; and a revised schedule, or schedules as necessary, of annual payments shall be furnished to the City.

ARTICLE 7. Duration of contract. This contract shall be effective when approved by the Secretary of the Army and shall continue in full force and effect for the life of Aubrey Lake and Lewisville Lake. Both Aubrey Lake and the additional storage to be made available in Lewisville Lake have been formulated on the basis of 100 years economic life.

ARTICLE 8. Permanent rights to storage. Upon completion of payments by the City as provided in Article 5a herein, the City shall have a permanent right, under the provisions of the Act of 16 October 1963 (Public Law 88-140, 43 U.S.C. 390e), to the use of the water supply storage spaces in Aubrey Lake and Lewisville Lake as provided in Article 1, subject to the following:

a. The City shall continue payment of its share, as provided in Article 5c, of the annual operation and maintenance costs allocated to water supply.

b. The City shall bear 74 percent of the costs allocated to (1) water supply for Aubrey Lake and (2) the total storage space between elevations 515.0 feet above mean sea level and 522.0 feet above mean sea level for Lewisville Lake of any necessary reconstruction, rehabilitation, or replacement of Aubrey Lake or Lewisville Lake features which may be required to continue satisfactory operation of Aubrey Lake or Lewisville Lake. Such costs will be established by the Contracting Officer and repayment arrangements shall be in writing in accordance with the terms and conditions set forth in Article 5(b) for major capital replacement costs.

c. Upon completion of payments by the City as provided in Article 5a herein, the Contracting Officer shall redetermine the storage space for municipal and industrial water supply in Aubrey Lake, taking into account such equitable reallocation of lake storage capacities among the purposes served

by Aubrey Lake as may be necessary due to sedimentation. Such findings, and the storage space allocated to municipal and industrial water supply, shall be defined and described in an exhibit which will be made a part of this contract. Following the same principle, such reallocation of lake storage capacities may be further adjusted from time to time as the result of sedimentation resurveys to reflect actual rates of sedimentation and the exhibit revised to show the revised storage space allocated to municipal and industrial water supply.

d. The permanent rights of the City under this contract shall be continued so long as the Government continues to operate Aubrey Lake and/or Lewisville Lake. In the event the Government no longer operates Aubrey Lake or Lewisville Lake, such rights may be continued subject to the execution of a separate contract, or supplemental agreement, providing for:

(1) Continued operation by the City of such part of the facility as is necessary for utilization of the water supply storage spaces allocated to it;

(2) Terms which will protect the public interest; and

(3) Effective absolvement of the Government by the City from all liability in connection with such continued operation.

ARTICLE 9. Release of claims. The City shall hold and save the Government, including its officers, agents, and employees, harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as a result of the storages in Aubrey Lake and/or Lewisville Lake, or withdrawal or release of water from or transfer of water to or from Aubrey Lake or Lewisville Lake made or ordered by the City, or as a result of the construction, operation, or maintenance of the features and appurtenances owned and operated by the City, provided, that this shall not be construed as obligating the City to hold and save the Government harmless from damages or liability resulting from the sole negligence of the Government or its officers, agents, or employees and not involving negligence on the part of the City or its officers, agents, or employees.

ARTICLE 10. Assignment. The City shall not transfer or assign this contract or any rights acquired hereunder, nor sub-allot said water supply storage spaces or any part thereof, nor grant any interest, privilege, or license whatsoever in connection with this contract, without the approval of the Secretary of the Army, provided, that unless contrary to the public interest, this restriction shall not be construed to apply to any water that may be obtained from the water supply storage spaces by the City and furnished to any third party or parties, nor any method of allocation thereof.

ARTICLE 11. Officials not to benefit. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise herefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 12. Covenant against contingent fees. The City warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon agreement or understanding for a commission, percentage, brokerage, or contingent fee excepting bona fide employees or bona fide established commercial or selling agencies maintained by the City for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or in its discretion to add to the contract price or consideration or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 13. Environmental quality. During any construction, operation, and maintenance by the City of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State, and local laws and regulations concerning environmental pollution. Particular attention should be given to (1) reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases and smoke from temporary heaters; (2) reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation from erosion; (3) minimization of noise levels; (4) onsite and offsite disposal of waste and spoil; and (5) prevention of landscape defacement and damage.

ARTICLE 14. Federal and State laws.

a. In acting under its rights and obligations hereunder, the City agrees to comply with all applicable Federal and State laws and regulations, including but not limited to the provisions of the Davis-Bacon Act (40 U.S.C. 276a et seq.); the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333); and Title 29, Code of Federal Regulations, Part 3.

b. The City furnishes as part of this contract an assurance (Exhibit C) that it will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 241, 42 U.S.C. 2000d et seq.) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations.

ARTICLE 15. Water conservation. There is a strong Federal interest in the efficient use of Federal projects, and this objective may be served by effective management of the use of water from the system into which a Federal project is integrated. Therefore, prior to the first use of storage space indicated in Article 1(b)(1), the City shall submit to the Contracting Officer for his approval a management plan which incorporates loss reduction measures and demand management practices which insure that the available supply is used in an economically efficient and environmentally sensitive manner. The plan shall contain a program for implementation of specific time-phased measures. At not-to-exceed five-year intervals, the City and the Contracting Officer shall review and modify the plan as the results of the implementation of measures are made apparent and as the system supplies and user demands change.

ARTICLE 16. Definitions.

a. Joint use costs. The costs of features used for any two or more Project purposes.

b. Project investment costs. The initial cost of the Project, including: land acquisition; construction; interest during construction on the cost of land, labor, and materials used for planning and construction of the Project.

c. Specific costs. The costs of Project features normally serving only one particular Project purpose.

d. Interest during construction. An amount of interest which accrues on expenditures for the establishment of Project services during the period between the actual outlay and the time the Project is first made available to the City for water storage.

ARTICLE 17. Approval. This contract is subject to the written approval of the Secretary of the Army, and it shall not be binding until so approved.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

APPROVED:

Assistant
Secretary of the Army (CW)

Date 15 SEP 1980

THE UNITED STATES OF AMERICA

By
Donald J. Palladino
Colonel, CE
Contracting Officer

Date 15 August 1980

COUNTERSIGNED:

Tommy J. Tompkins, City Controller
City of Dallas, Texas

CITY OF DALLAS, TEXAS

By
George R. Schrader
City Manager

APPROVED AS TO FORM:

Lee E. Holt, City Attorney
City of Dallas, Texas

I, Robert S. Sloan, certify that I am the City Secretary of the City of Dallas, Dallas County, Texas, named as City herein; that George R. Schrader who signed this contract on behalf of the City of Dallas was then City Manager of the City of Dallas, Texas; that said contract was duly signed for and on behalf of the City of Dallas, Texas by authority of its governing body and is within the scope of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said City of Dallas, Texas this 21st day of August, 1980.

Robert S. Sloan
Secretary
City of Dallas, Texas

CORPORATE SEAL

Conformed for Con... Procurement Pri... and Regulations

Contract No. DACW63-80-C-0103

AUBREY AND LEWISVILLE LAKES

EXHIBIT A

I - LAKE STORAGES

Aubrey Lake

Feature	Elevation (feet msl)	Gross storage (acre-feet)	Percent of gross storage	Percent of water supply storage
Flood control	632.5-640.5	265,000	24.892	
Water supply	below 632.5	799,600	75.108	100.0
(City of Dallas)	below 632.5	(591,700)	(55.580)	(74.0)
(City of Denton)	below 632.5	(207,900)	(19.528)	(26.0)
Totals		1,064,600	100.000	

Lewisville Lake

Feature	Elevation (feet msl)	Gross storage (1) (acre-feet)	Percent of gross storage(2)	Percent of water supply storage
Flood control	522.0-532.0	336,100	65.427	
Water supply	515.0-522.0	177,600	34.573	100.0
(City of Dallas)	515.0-522.0	(131,400)	(25.579)	(74.0)
(City of Denton)	515.0-522.0	(46,200)	(8.994)	(26.0)
Totals		513,700(2)	100.000	

(1) 1985 condition.
(2) Between elevations 515.0 and 532.0 feet msl.

II - PROJECT ESTIMATED CONSTRUCTION INVESTMENT TO BE ALLOCATED

Federal construction cost	$211,234,000
Nonreimbursable costs (unallocable) (1)	9,826,000
Project cost to be allocated	$201,408,000
Interest during construction on allocable cost (2)	23,991,800
Project construction investment to be allocated	$225,399,800

(1) Relocation of roads above replacement-in-kind standards.
(2) Interest rate for Federal share of recreation - 3.25%.
Interest rate for water supply and non-Federal share of recreation - 7.210%.

III - ALLOCATION OF ESTIMATED CONSTRUCTION INVESTMENT
(Separable costs - remaining benefits method)

	Water supply	Recreation	Totals
1. Specific facilities cost	$ 218,000	$23,566,000	$ 23,784,000
Aubrey Lake	(218,000)	(19,985,000)	(20,203,000)
Lewisville Lake	(0)	(3,581,000)	(3,581,000)
2. Joint use facilities cost	125,629,000	51,995,000	177,624,000
Aubrey Lake	(124,413,200)	(51,491,800)	(175,905,000)
Lewisville Lake	(1,215,800)	(503,200)	(1,719,000)
Subtotals - cost	$125,847,000	$75,561,000	$201,408,000
3. Interest during construction	18,147,100	5,844,700	23,991,800
Aubrey Lake	(17,971,800)	(5,437,400)	(23,409,200)
Lewisville Lake	(175,300)	(407,300)	(582,600)
4. Total allocation-investment	$143,994,100	$ 81,405,700	$225,399,800
Aubrey Lake	(142,603,000)	(76,914,200)	(219,517,200)
Lewisville Lake	(1,391,100)	(4,491,500)	(5,882,600)

(1) Interest rate for water supply - 7.210% (fiscal year 1980). Interest rate for reimbursement for water supply storage will be set as of the beginning of the Government fiscal year in which construction of the Project is started.

(2) Investment cost to be repaid by:	Lewisville Lake	Aubrey Lake	Totals
City of Dallas - 74%	$1,029,400	$105,526,300	$106,555,700
Present water supply	(1,029,400)	(54,873,700)	(55,903,100)
Future water supply	(0)	(50,652,600)	(50,652,600)
City of Denton - 26%	361,700	37,076,700	37,438,400
Present water supply	(361,700)	(19,279,900)	(19,641,600)
Future water supply	(0)	(17,796,800)	(17,796,800)
Totals	$1,391,100	$142,603,000	$143,994,100

IV - ALLOCATION OF ESTIMATED OPERATION AND MAINTENANCE COSTS

Aubrey Lake

A. Allocation of estimated total annual costs:

	Water supply	Recreation	Total
1. Specific cost	$ 70,400	$642,000	$712,400
2. Distribution of joint use cost (percent)	57.39	42.61	100.00
3. Allocated joint use cost	102,100	75,800	177,900
4. Total allocation	$172,500	$717,800	$890,300

To be paid by the City of Dallas:	
74% of specific cost for water supply facilities	$ 52,100
Aubrey Lake joint use cost:	
Present use w/s storage (0.52 x 0.74 x 0.5739 x $177,900)	39,300
Future use w/s storage (0.48 x 0.74 x 0.5739 x $177,900)	36,300
Total	$127,700

JUL 15 1980

B. Annual payment adjustment:

Payment for the City of Dallas' share of the annual operation and maintenance costs allocated to water supply storage for each Government fiscal year will be made by the City in advance on 2 January following close of the prior Government fiscal year. For present use water supply storage, the first payment for such costs will be estimated based on the Contracting Officer's annual estimates therefor, prorated as necessary for a partial year of Project operation. Each annual payment thereafter will include (1) an advance payment for the current fiscal year, estimated based on the actual operation and maintenance costs incurred for the preceding fiscal year (except as noted for particular conditions), and (2) an amount (plus or minus) to adjust the estimated advance payment for the preceding fiscal year for the actual costs incurred for such preceding fiscal year. For future use water supply storage, all advance payments will be estimated based on the actual operation and maintenance costs incurred for the preceding fiscal year (except as noted for particular conditions). The first advance payment will be prorated as necessary for a partial year of storage use; and each annual payment thereafter will include an advance payment for the current fiscal year and an amount (plus or minus) to adjust the estimated advance payment for the preceding fiscal year for the actual costs incurred for such preceding fiscal year.

V - ALLOCATION OF ESTIMATED MAJOR CAPITAL REPLACEMENTS COSTS AND SEDIMENTATION RESURVEYS COSTS

A. Major capital replacements costs: (1)

Aubrey Lake

	Water supply	Recreation	Total
1. Specific cost	$21,900	$133,000	$154,900
2. Distribution of joint use cost (percent)	50.00	50.00	100.00
3. Allocated joint use cost	7,100	7,100	14,200
4. Total allocation	$29,000	$140,100	$169,100

To be paid by the City of Dallas:	
74% of specific cost for water supply facilities	$16,200
Aubrey Lake joint use cost:	
Present use w/s storage (0.52 x 0.74 x 0.5000 x $14,200)	2,700
Future use w/s storage (0.48 x 0.74 x 0.5000 x $14,200) (2)	2,500
Total	$21,400

(1) Estimates of average annual charges are used for determination of allocated percentages. All charges will be based on the indicated percentages of actual costs if and when they are incurred.

(2) Additional amounts of joint use cost required to be paid as future water supply storage is used will be computed as follows:

$$\frac{\text{Percent of future w/s storage placed in use}}{100} \times 0.48 \times 0.37000 \times \text{actual joint use cost}$$

B. Sedimentation resurveys costs:

Aubrey Lake

Sedimentation resurveys costs allocated to water supply and to be paid by the City of Dallas in accordance with Article 5c(3) are based on the percentage of the gross storage in Aubrey Lake represented by the storage right of the City - see section I of this Exhibit A.

Present use water supply storage = 0.52 x 55.580% = 28.902%

$$\text{Future use water supply storage} = \frac{\text{Percent of future w/s storage placed in use}}{100} \times 26.678\%$$

AUG 1 5 1980

VI - COMPUTATIONS FOR ANNUAL PAYMENTS FOR INTEREST AND AMORTIZATION

Present use water supply storage:

Amount to be amortized:

Lewisville Lake	$ 1,391,100 x 0.74	$ 1,029,400
Aubrey Lake	142,603,000 x 0.74 x 0.52	54,873,700
Total		$55,903,100

Based on 50 equal payments, 49 of which bear interest on the unpaid balance at the rate of 7.210 percent.

$P = (A - P)(i + c)$

$P = (A - P)(.0745602419P)$

$P = 0.0745602419A - 0.0745602419P$

$1.0745602419P = .0745602419A$

$$P = \frac{.0745602419(\$55,903,100)}{1.0745602419}$$

$P = \$3,878,934.37$

Where: P = annual payment
A = amount to be repaid = $55,903,100
i = interest rate = 7.210%
(i+c) = interest rate plus amortization coefficient for 49 years = .0745602419

EXHIBIT B

PMT. NO.	PAYMENT TO INTEREST	PAYMENT TO PRINCIPAL	TOTAL PAYMENT	BALANCE DUE
				55903100.00
1	0.00	3878934.37	3878934.37	52024165.63
2	3750942.34	127992.03	3878934.37	51896173.60
3	3741714.12	137220.25	3878934.37	51758953.35
4	3731820.54	147113.83	3878934.37	51611839.52
5	3721213.63	157720.74	3878934.37	51454118.78
6	3709841.96	169092.41	3878934.37	51285026.37
7	3697650.40	181283.97	3878934.37	51103742.40
8	3684579.83	194354.54	3878934.37	50909387.86
9	3670566.86	208367.51	3878934.37	50701020.35
10	3655543.57	223390.80	3878934.37	50477629.55
11	3639437.09	239497.28	3878934.37	50238132.27
12	3622169.34	256765.03	3878934.37	49981367.24
13	3603656.58	275277.79	3878934.37	49706089.45
14	3583809.05	295125.32	3878934.37	49410964.13
15	3562530.51	316403.86	3878934.37	49094560.27
16	3539717.80	339216.57	3878934.37	48755343.70
17	3515260.28	363674.09	3878934.37	48391669.61
18	3489039.38	389894.99	3878934.37	48001774.62
19	3460927.95	418006.42	3878934.37	47583768.20
20	3430789.69	448144.68	3878934.37	47135623.52
21	3398478.46	480455.91	3878934.37	46655167.61
22	3363837.58	515096.79	3878934.37	46140070.82
23	3326699.11	552235.26	3878934.37	45587835.56
24	3286882.94	592051.43	3878934.37	44995784.13
25	3244196.04	634738.33	3878934.37	44361045.80
26	3198431.40	680502.97	3878934.37	43680542.83
27	3149367.14	729567.23	3878934.37	42950975.60
28	3096765.34	782169.03	3878934.37	42168806.57
29	3040370.95	838563.42	3878934.37	41330243.15
30	2979910.53	899023.84	3878934.37	40431219.31
31	2915090.91	963843.46	3878934.37	39467375.85
32	2845597.80	1033336.57	3878934.37	38434039.28
33	2771094.23	1107840.14	3878934.37	37326199.14
34	2691218.96	1187715.41	3878934.37	36138483.73
35	2605584.68	1273349.69	3878934.37	34865134.04
36	2513776.16	1365158.21	3878934.37	33499975.83
37	2415348.26	1463586.11	3878934.37	32036389.72
38	2309823.70	1569110.67	3878934.37	30467279.05
39	2196690.82	1682243.55	3878934.37	28785035.50
40	2075401.06	1803533.31	3878934.37	26981502.19
41	1945366.31	1933568.06	3878934.37	25047934.13
42	1805956.05	2072978.32	3878934.37	22974955.81
43	1656494.31	2222440.06	3878934.37	20752515.75
44	1496256.39	2382677.98	3878934.37	18369837.77
45	1324465.30	2554469.07	3878934.37	15815368.70
46	1140288.08	2738646.29	3878934.37	13076722.41
47	942831.69	2936102.68	3878934.37	10140619.73
48	731138.68	3147795.69	3878934.37	6992824.04
49	504182.61	3374751.76	3878934.37	3618072.28
50	260863.01	3618072.28	3878935.29	0.00

AUG 1 5 1980

Contract No. DACW63-80-C-0103

AUBREY AND LEWISVILLE LAKES

EXHIBIT C

ASSURANCE OF COMPLIANCE WITH THE
DEPARTMENT OF DEFENSE DIRECTIVE UNDER
TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

The City of Dallas, Dallas County, Texas (hereinafter called "Applicant-Recipient") HEREBY AGREES THAT it will comply with title VI of the Civil Rights Act of 1964 (Public Law 88-352) and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 300, issued as Department of Defense Directive 5500.11, December 28, 1964) issued pursuant to that title, to the end that, in accordance with title VI of that Act and the Directive, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under, any program or activity for which the Applicant-Recipient receives Federal financial assistance from the U. S. Army Corps of Engineers and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant-Recipient by the U. S. Army Corps of Engineers, assurance shall obligate the Applicant-Recipient, or in the case of any transfer of such property, any transferee, for the period during which the real propery or structure is used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided this assurance shall obligate the Applicant-Recipient for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant-Recipient for the period during which the Federal financial assistance is extended to it by the U. S. Army Corps of Engineers.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the Applicant-Recipient by the Department, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date.

The Applicant-Recipient recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek

judicial enforcement of this assurance. This assurance is binding on the Applicant-Recipient, its successors, transferees, and assignees; and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Applicant-Recipient.

THE CITY OF DALLAS, TEXAS

Dated 8 August 1980

By _____
George R. Schrader
City Manager

COUNTERSIGNED:

_____
Tommy J. Tompkins, City Controller
City of Dallas, Texas

ATTEST:

_____
Robert S. Sloan
Secretary
City of Dallas, Texas

APPROVED AS TO FORM:

_____
Lee E. Holt, City Attorney
City of Dallas, Texas

Contract No. DACW63-80-C-0103

AUBREY AND LEWISVILLE LAKES

EXHIBIT D

OPINION OF COUNSEL

I have reviewed and approved contract number DACW63-80-C-0103 between the United States of America and the City of Dallas, Texas. Particularly I have considered the effect of Section 221 of Public Law 91-611 (42 U.S.C. 1962d-5b) and am of the opinion that the City of Dallas, Texas, has the requisite legal authority to enter into and comply with this agreement as required by the aforementioned statute.

Dated 11 August 1980

Lee E. Holt
City Attorney
City of Dallas, Texas

EXHIBIT B2

CONTRACT BETWEEN THE UNITED STATES OF AMERICA

AND

THE CITY OF DALLAS, TEXAS

FOR

LEWISVILLE DAM AND LAKE, TEXAS

OFFICIAL RECORD COPY

Contract No. DA-41-443-eng-2453

CONTRACT

CONSERVATION STORAGE

GARZA-LITTLE ELM DAM AND RESERVOIR

THIS CONTRACT, entered into this 18 day of May A. D. 1953, by and between the UNITED STATES OF AMERICA (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the CITY OF DALLAS, an instrumentality of the State of Texas (hereinafter called the City), WITNESSETH THAT:

WHEREAS, the Government is constructing the Garza-Little Elm Dam and Reservoir on the Elm Fork of the Trinity River in Denton County, Texas, (hereinafter called the Project) pursuant to the authority contained in the River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session); and,

WHEREAS, the Secretary of War is authorized by the War Department Civil Appropriation Act 1938, approved 19 July 1937, (Public Law 208, 75th Congress, 1st Session), "to receive from States and political subdivisions thereof, such funds as may be contributed by them to be expended in connection with funds appropriated by the United States for any authorized flood control work whenever such work and expenditure may be considered by the Secretary of War, on recommendation of the Chief of Engineers, as advantageous in the public interest, and the plans for any reservoir project may, in the discretion of the Secretary of War, on recommendation of the Chief of Engineers, be modified to provide additional storage capacity for domestic water supply or other conservation storage, on condition that the cost of such increased storage capacity is contributed by local agencies and that the local agencies agree to utilize such additional storage capacity in a manner consistent with Federal uses and purposes; And, provided further, that when contributions made by States and Political subdivisions thereof, are in excess of the actual cost of the work contemplated and properly chargeable to such contributions, such excess contributions may, with the approval of the Secretary of War, be returned to the proper representatives of the contributing interests," and,

WHEREAS, the City by Resolution enacted 28 September 1948 by the City Council assured the Secretary of the Army that it would purchase 310,000 acre-feet of conservation storage space in the proposed project by contributing the incremental cost of such storage space in the approximate amount of $3,500,000; and,

Approved by authority of Chief of Engineers

A. E. HARRIS
Colonel, JAGC (CE)
Chief, Legal Division, OCE

WHEREAS, the City by Resolution enacted MAY 18 1953 by the City Council assured the Secretary of the Army that it would convey to the Government all of its right, title, interest and estate in and to all of the lands and appurtenances heretofore acquired by the City of Dallas in connection with the establishment, construction and maintenance of that part of the City's water system generally known as Garza Dam and the Reservoir known as Lake Dallas in Denton County, Texas, save and except a tract of land containing 453.37 acres acquired by the City of Dallas on February 7, 1925, by deed recorded in Book 197, at page 350, of the Deed Records of Denton County, Texas; and,

WHEREAS, pursuant to the Resolution hereinabove referred to and pursuant to the War Department Civil Appropriation Act, 1938, approved 19 July 1937, (Public Law 208, 75th Congress, 1st Session) the City contributed funds in the amount of $500,000.00 to the Government; and,

WHEREAS, heretofore on the 22nd day of October 1948, the Secretary of the Army approved the acceptance of contributed funds in the amount of $500,000.00 from the City, to be applied as part payment on the cost of providing storage space for the domestic water supply; and,

WHEREAS, heretofore on the 11th day of November 1952, pursuant to the War Department Civil Appropriation Act, 1938, approved 19 July 1937 (Public Law 208, 75th Congress, 1st Session) the City contributed additional funds in the amount of $267,000.00 to the Government; and,

WHEREAS, the City desires to acquire storage space in the reservoir in the amount of 415,000 acre-feet consisting of 105,000 acre-feet of exchange storage space and 310,000 acre-feet of storage space to be acquired at the cost of providing same; and,

WHEREAS, on 20 January 1949, the Board of Water Engineers for the State of Texas granted a permit to the City of Dallas to impound 415,000 acre-feet of water in the Garza-Little Elm Reservoir and to divert and appropriate public waters therefrom in an amount not to exceed 415,000 acre-feet of water per annum, subject to the authorization of the U. S. Corps of Engineers and such restrictions, conditions, and limitations as the said Board may deem proper under the law, rules and regulations of the Board and subject to the rights of prior appropriators.

NOW, THEREFORE, the parties hereto do mutually agree as follows:

ARTICLE 1. WATER STORAGE SPACE. The City shall have the right to utilize an undivided 95.2 per cent of the storage space in the Project between elevation 481.0 feet above mean sea level and elevation 515.0 feet above mean sea level as deemed necessary by the City to impound in the Project and make such diversions as granted to the City by the Board of Water Engineers for the State of Texas, or its successors, to the extent that such storage space will provide, and subject to the retention by the Government and others of the remaining undivided 4.8 per cent of

the storage space for such purposes as the Government may deem advisable. The Government shall not be responsible for diversion by others, nor will it become a party to any controversies between users of the aforesaid storage space.

The City shall have the right to use the water supply outlet facilities for said diversions from the Project as constructed by the Government in accordance with plans approved by the City on 16 August 1950, hereinafter called the outlet facilities.

The design and location of any future City installations and facilities that the City may construct for the purpose of connecting to the conservation storage shall be subject to the approval of the Contracting Officer, and the cost of such installations or facilities shall be borne by the City. The City of Dallas shall have the right to take the water below the Garza-Little Elm Dam at the outlet, or at other suitable places, through closed conduits if the City so desires, and transport the water to such locations as the City may desire for its own use.

The Government reserves the right to take such measures as may be necessary in the operation of the Project to preserve life and/or property.

ARTICLE 2. REAL ESTATE. (a) The City shall without any additional consideration convey by good and sufficient deed of conveyance, all of its rights, title, interest and estate in and to all of the lands and appurtenances heretofore acquired by the City in connection with the establishment, construction, and maintenance of that part of the City's water system generally known as Garza Dam and the Reservoir known as Lake Dallas, in Denton County, Texas, it being intended that the conveyance shall include the Dam and all lands and appurtenances lying and situate within the Government Project known as Garza-Little Elm Reservoir, with the exception of a certain tract of land below Garza Dam consisting of 453.37 acres acquired by the City February 7, 1925, by Deed recorded in Book 197 at Page 350 of the Denton County Records, subject to existing easements for public roads and highways, public utilities, railroads and pipe lines, excepting and reserving to the City however, all oil, gas, gravel, sand, or other minerals in and under said land and subject to all outstanding mineral leases and royalty interests, if any, whatsoever, together with the right of ingress and egress for the purpose of drilling for and producing oil, gas, and other minerals and for mining and removing sand and gravel; provided, that the Contracting Officer shall approve in furtherance of such exploitation the location of any structures and/or appurtenances thereto existing or to be erected or constructed in connection with such exploitation, and providing further that any exploitation within the reservoir area be and is subordinated to the rights of the United States to flood the area permanently or intermittently in connection with the operation and maintenance of the Garza-Little Elm Reservoir Project on the Elm Fork of the Trinity River in the Trinity River Basin, Texas, and

and to such other terms and conditions as the Secretary of the Army shall prescribe from time to time in order to properly protect the interest of the United States in adjacent Government-owned lands and avoid the violation of the rights which others may have therein,

provided further, subject to the same restrictions, conditions and limitations hereinabove set out, the City shall have the right to locate drilling rigs on adjacent Government owned land for the purpose of performing directional drilling to recover oil on lands now owned by the City and which will be transferred to the Government.

(b) In the event the lands and appurtenances to be conveyed by the City to the Government as provided herein shall no longer be used by the Government for the purposes for which conveyed, namely flood control and allied purposes, the interest in such lands conveyed by the City to the Government shall then revert to and become the property of the City, and the City shall have the right to re-enter and take possession of the property and utilize it for such purposes as it may desire, or it may dispose of the same as hereinafter provided. In the event there should be a gradual filling in of the Reservoir and at such time should that portion of the properties which the City of Dallas is conveying to the Government no longer be needed or used for flood control and allied purposes, then and in that event the City and the Government will negotiate for a return of any such portion of the lands to the City of Dallas.

(c) The form of the deed to be used in the conveyance from the City to the Government is attached hereto as Exhibit "A" and is a part of this contract.

(d) The City shall have the right to remove at its expense all buildings, houses, the bridge over the present Dam and Spillway, control works and other improvements located on the said property within 180 days after notice of removal in writing has been served on the City by the Government. In the event the buildings, houses, the bridge over the present Dam and Spillway, control works and other improvements are not removed within the time specified above, title thereto shall vest in the Government. When and if determined necessary by the Government, breaching of the existing Garza Dam shall be performed by the Government at its cost, but such breach of the Dam shall not be accomplished until the conservation storage and outlet facilities in Garza-Little Elm are operable for delivery of water without detriment to the City, and acceptable to the City.

(e) The City shall fully perform its obligations as set forth in this Article 2 within a reasonable time after date of execution of this contract and in any event not later than such time as the Project becomes operative for water conservation purposes as agreed upon by the Contracting Officer and the City of Dallas.

(f) In the event for any reason the right, title, interest and extent of the estate in and to the lands that the City will convey to the Government shall be questioned, and additional eminent domain or judicial proceedings are necessary to be instituted by the Government, the City shall cooperate in the prosecution of the proceedings and this agreement shall, without more, constitute a stipulation which may be filed in the proceedings and be final

and conclusive evidence that the award for the taking of such interest in said lands shall be one dollar and the benefits to the City provided in this contract. In the event this agreement is filed in such proceedings, it shall constitute an appearance and waiver of all rights, to service of summons or other process and the right to the appointment of Commissioners or a jury to fix an award. All such proceedings shall be without cost to the City of Dallas.

(g) The City shall furnish with the delivery of the deed to said lands, all abstracts of title, certificates of title, curative instruments, deeds, judgments and other indicia of title obtained by the City at the time of the acquisition of said lands by the City, all of which shall be returned to the City by the Government upon approval of the title and the conveyance thereof contemplated herein by the Attorney General of the United States, the Judge Advocate General of the Army or other authorized official. The City shall be under no obligation to bring the abstracts of title up to date, but the same will be furnished as of the time the City acquired the property.

ARTICLE 3. FEDERAL USAGE. The City agrees that the utilization of such storage space shall not conflict with the use of the Project by the Government for flood control and allied purposes.

ARTICLE 4. REGULATION OF USE OF WATER STORED IN SUBJECT SPACE. The regulation of use of water stored in the aforesaid storage space shall not be considered a part of this contract. The City shall have the right of ingress and egress for the purpose of making full use of the rights provided herein, including the right to protect its water supply.

ARTICLE 5. CONSIDERATION. For and in consideration of the following:

(1) The contributions by the City of the cost of providing that portion of the storage space to be utilized by the City as stated in Article 1 in excess of the storage capacity in Lake Dallas, receipt of $767,000 as part of the contribution on said cost being hereby acknowledged; and,

(2) The contribution by the City of that part of the cost of constructing said outlet facilities which represents a betterment to the City's existing similar type facilities at Lake Dallas; and,

(3) The contribution by the City of the cost of operation and maintenance of the said storage space and outlet facilities set forth in Article 1, as defined under Article 6.

(4) The conveyance by the City to the Government of all its right, title and interest to all lands and appurtenances acquired in connection with the establishment, construction and maintenance of that part of the City's water system generally known as Lake Dallas in Denton County, Texas, subject to the reservations set forth in Article 2;

THE GOVERNMENT shall provide the City the storage space and outlet facilities as set forth in Article 1.

ARTICLE 6. PAYMENT. (a) In accordance with the provisions of Article 5 of this contract the City shall contribute the following sums to the Government:

(1) $2,643,065.50 which is the remaining estimated balance of the cost of providing that portion of the storage space to be utilized by the City as stated in Article 1, in excess of the storage capacity in Lake Dallas, including the additional cost of constructing said outlet facilities suitable to the City's present needs, which sums shall be contributed in the following installments:

$1,233,000.00 on or before 30 June 1953;
700,000.00 on or before 1 December 1953;
700,000.00 on or before 1 March 1954;

and $10,065.50 upon determination of final project costs. It is further provided that the City shall have the option of paying $1,400,000.00 in one installment on or before 1 February 1954 in lieu of the aforesaid installments due on or before 1 December 1953 and 1 March 1954. In the event of default in the contributions of any one of the aforementioned installments, the City shall pay interest on such overdue installments at the rate of three percent (3%) per annum thereon; and such interest shall be charged from the date such installment is due until paid.

(2) 21.9% of the annual actual experienced cost of operation and maintenance of the Project which includes the entire operation and maintenance cost of the said outlet facilities and excludes operation and maintenance cost for land management and public utilization. An advance payment in the amount of $12,575.00 shall be made on the first day (October 1) of the water year that the Project will become operative for water conservation purposes as determined by the Contracting Officer and the City of Dallas, and annually thereafter an amount equal to the said annual actual experienced cost of operation and maintenance for the preceding Government fiscal year shall be paid in advance on the 1st day of October for each succeeding year during the contract period. The advance payment for the second year shall be increased or decreased in an amount to reflect the difference between the initial payment of $12,575.00 paid for the first year and 21.9% of the annual actual experienced cost of operation and maintenance for the first year or portion thereof as set forth above. It is further provided that additional contributions shall be made by the City for maintenance cost not annually recurring, at the same rate of 21.9% of actual cost. Items of operation and maintenance which form basis of computation and which will be used in future computation of operation and maintenance charge are included as Exhibit "B".

The extent of operation and maintenance of the Project shall be determined by the Contracting Officer and all records and accounting shall be maintained by the Contracting Officer. In the event the City should require additional operation and maintenance for the conservation storage over and above that

determined by the Contracting Officer and over and above that which formed the basis for determination of the above percentage, as set out in Exhibit "B", which includes the entire operation and maintenance of the outlet facilities, the City shall bear the entire cost of such additional expense.

(3) 27% of the major replacement costs on the outlet structure when incurred.

(4) 47.6% of the total sedimentation resurvey costs when incurred.

(5) In the event of default in the payment of the costs contained in Article 6 (a) (2) (3) and (4), the City shall pay interest on such overdue payments at the rate of three percent (3%) per annum thereon; and such interest shall be charged from the date such payments are due until paid.

(b) In the event the actual cost of construction to provide storage space to be utilized by the City as stated in Article 1, in excess of the storage capacity in Lake Dallas, including the said additional cost of constructing said outlet facilities set out herein exceeds the estimated cost of $3,410,065.50 the aforesaid unpaid estimated balance of $10,065.50 shall be increased to reflect the said actual first cost of construction as determined by the Contracting Officer. If such actual cost is less than the estimated cost of $3,410,065.50, the aforesaid estimated balance of $10,065.50 shall be decreased to reflect the actual first cost of construction as determined by the Contracting Officer.

ARTICLE 7. PERIOD OF CONTRACT. (a) This contract shall become effective as of the date on which the Government commences operation of the Project or the date on which the City first receives water from the Project, whichever occurs the later; and shall continue in full force and effect thereafter during the useful life of the Project. The City shall have the full use and benefit of the said storage space during such period.

(b) It is the understanding of the parties hereto that the Government does not hereby obligate itself to continue operation of the Project for a period in excess of 50 years, or beyond the useful life of the Project for flood control and allied purposes, whichever first occurs. It is the expectation of the parties, however, that the Project may have a useful life for such purposes in excess of 50 years; and it is understood and agreed that the Government may continue operation of the Project for any additional term beyond such time, subject to termination at the Government's election. In any event, should the Government permanently abandon or discontinue the Project as no longer useful for flood control and allied purposes, or for any other cause, the reversion provided for in Article 2 shall become effective at that time; and, as between the Government and the City, the right of the latter is hereby recognized thereafter to utilize the storage space to the full extent provided for in this contract for the purposes for which the City hereunder is contributing its money without further obligation on the part of the Government.

ARTICLE 8. OPERATION AND MAINTENANCE. The Government shall operate and maintain the Project owned by the Government. The City shall be responsible for the operation and maintenance of all features and appurtenances to be provided and owned by the City for withdrawal of water from the reservoir. The City shall have the right to make withdrawals of water for its purposes as needed in accordance with Article 1. In the event the Government should temporarily suspend maintenance and operation of the Project due to lack of appropriated funds, then and in that event the City shall be privileged and shall have the right to enter upon the premises and operate the same for its own use and benefit in supplying itself with water to the extent provided in this contract.

ARTICLE 9. RELEASE OF CLAIMS. The City shall hold and save the Government, including its officers, agents, and employees, harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as a result of withdrawal of water from the Reservoir by the City, or as a result of the construction, operation, or maintenance of the features or appurtenances owned, operated or added by the City. However, it is agreed and understood that it is not the intention of the foregoing to impose liability upon the City for claims that may be asserted by the Government concessionaires.

ARTICLE 10. TRANSFER OR ASSIGNMENT. The City shall not transfer or assign this contract, nor any rights acquired thereunder, nor suballot said conservation storage space or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this agreement, without permission in writing from the Secretary of the Army; provided that this restriction shall not be construed to apply to any water which may be obtained from the conservation storage by the City and furnished to any third party or parties nor any method of allocation thereof.

ARTICLE 11. OFFICIALS NOT TO BENEFIT. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 12. COVENANT AGAINST CONTINGENT FEES. The City warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the City for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to add to the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 13. DISPUTES. Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the City. Within 30 days from the date of receipt of such copy, the City may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Secretary of the Army, and the decision of the Secretary of the Army or his duly authorized representative for the hearing of such appeals shall, unless determined by a Court of competent jurisdiction to have been fraudulent, arbitrary, capricious, or so grossly erroneous as necessarily to imply bad faith, be final and conclusive; provided that, if no such appeal is taken, the decision of the Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this clause, the City shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the City shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

ARTICLE 14. APPROVAL OF CONTRACT. This contract shall be subject to the written approval of the Secretary of the Army, or his duly authorized representative, and shall not be binding until so approved.

ARTICLE 15. DEFINITIONS. (a) The terms "Secretary of War", "Secretary of the Army" or "Head of the Department" as used herein shall have one and the same meaning; and the terms "his duly authorized representative" shall mean the Chief of Engineers, Department of the Army, or an individual or board designated by him.

(b) Except for the original signing of this contract and except as otherwise stated herein, the terms "Contracting Officer" as used herein shall include his duly appointed successor or his authorized representative.

ARTICLE 16. NEGOTIATED CONTRACT. This contract is authorized by and negotiated under the following laws: The River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session); and War Department Civil Appropriation Act 1938 approved 19 July 1937 (Public Law 208, 75th Congress, 1st Session).

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

TWO WITNESSES:

_____

_____

THE UNITED STATES OF AMERICA

By: H. R. Hallock
Contracting Officer
H. R. HALLOCK
Colonel, CE
Contracting Officer

CITY OF DALLAS, TEXAS

By: Elgin E. Crull
City Manager

ATTEST:

Harold G. Shank
City Secretary, City of Dallas

APPROVED:
16 JUL 53

APPROVED AS TO FORM:

H. P. Kucera
H. P. Kucera, City Attorney

I, HAROLD G. SHANK, certify that I am the City Secretary of the City of Dallas, Texas, named as City herein; that ELGIN E. CRULL who signed this contract on behalf of the City was then City Manager of said City of Dallas, Texas; that said contract was duly signed for and on behalf of said City of Dallas, Texas, by authority of its governing body and is within the scope of its legal powers.

In witness whereof, I have hereunto affixed my hand and the seal of said City of Dallas, Texas, this 18 day of May, 1953.

CORPORATE SEAL

Harold G. Shank
City Secretary

EXHIBIT C1

CONTRACT BETWEEN THE UNITED STATES OF AMERICA

AND

THE CITY OF DENTON, TEXAS

FOR

LEWISVILLE DAM AND LAKE, TEXAS

SUPPL ENTAL AGREEMENT NO. P00001
TO
CONTRACT NO. DACW63-80-C-0104
(THE CITY OF DENTON AND THE
CORPS OF ENGINEERS DATED 15 AUGUST 1980)

THIS SUPPLEMENTAL AGREEMENT, entered into this 14th day of May 1982, by and between the Government, represented by the Contracting Officer executing this agreement, and the City, WITNESSETH:

WHEREAS, on the 15th day of August 1980, the parties hereto entered into Contract No. DACW63-80-C-0104 for Water Storage Space in Aubrey and Lewisville Lakes.

WHEREAS, Public Law 96-384, 94 STAT. 1527, changed the name of Aubrey Lake to Ray Roberts Lake, effective January 4, 1981.

NOW, THEREFORE, the parties agree as follows:

1. Contract ARTICLE 15, Water Conservation, is deleted in its entirety.

2. All other terms and conditions of the original contract shall remain unchanged.

IN WITNESS WHEREOF, the parties hereto have executed this supplemental agreement as of the day and year first above written.

CITY OF DENTON, TEXAS

By _____
Richard O. Stewart
Mayor

THE UNITED STATES OF AMERICA

By _____
Donald J. Palladino
Colonel, CE
Contracting Officer

Charlotte Allen

I, ~~Brooks Moore~~ certify that I am the City Secretary of the City of Denton, Denton County, Texas, named as City herein; that Richard O. Stewart who signed this supplemental agreement on behalf of the City of Denton was then Mayor of the City of Denton, Texas; that said supplemental agreement was duly signed for and on behalf of the City of Denton, Texas by authority of its governing body and is within the scope of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said City of Denton, Texas this 1st day of April, 1982.

_____
~~Brooks Moore~~ Charlotte Allen
Secretary
City of Denton, Texas

CORPORATE SEAL

CONTRACT BETWEEN THE UNITED STATES OF AMERICA
AND
THE CITY OF DENTON, TEXAS
FOR
WATER STORAGE SPACES IN AUBREY AND LEWISVILLE LAKES, TEXAS

THIS CONTRACT, entered into this 15th day of August 1980, by and between the United States of America (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the City of Denton, Denton County, Texas (hereinafter called the City), WITNESSETH THAT:

WHEREAS, the River and Harbor Act of 1965 (Public Law 89-298, 79 Stat. 1091) authorized the construction, operation, and maintenance of Aubrey Lake including modification of Garza-Little Elm Reservoir, since renamed Lewisville Lake, (hereinafter called the Project) on the Elm Fork of the Trinity River in the State of Texas; and

WHEREAS, in accordance with the authorized modification, Lewisville Lake (located immediately downstream from the Aubrey Dam) will be modified to permit the transfer of flood control storage from Lewisville Lake to Aubrey Lake for an equivalent amount of water supply storage in Lewisville Lake for municipal and industrial uses; and

WHEREAS, the City desires to contract with the Government for the use of storage included in Aubrey Lake and the additional storage to be made available in Lewisville Lake for municipal and industrial water supply and for payment of the cost thereof in accordance with the provisions of the Water Supply Act of 1958, as amended (43 U.S.C. 390b); and

WHEREAS, the City is empowered so to contract with the Government and is vested with all the necessary powers for accomplishment of the purposes of this contract, including those required by Section 221 of the Flood Control Act of 1970 (42 U.S.C. 1962d-5b);

NOW, THEREFORE, the Government and the City agree as follows:

ARTICLE 1. Water storage space.

a. Project construction. The Government, subject to the directions of Federal law and any limitations imposed thereby, shall design and construct the Project so as to include in Aubrey Lake space for the storage of water by the City and space for the storage of floodwaters which will permit the reallocation of flood control storage in Lewisville Lake to municipal and industrial water supply storage, a portion of which will also be utilized by the City.

b. Rights of the City.

(1) The City shall have the right to utilize (a) an undivided 26.0 percent (estimated to contain 207,900 acre-feet gross storage, including storage for sediment deposits) of the total storage space in Aubrey Lake below

elevation 632.5 feet above mean sea level, which total storage space is estimated to contain 799,600 acre-feet gross storage, including storage for sediment deposits, and (b) an undivided 26.0 percent (estimated to contain 46,200 acre-feet gross storage, including storage for sediment deposits) of the total storage space in Lewisville Lake between elevations 515.0 feet above mean sea level and 522.0 feet above mean sea level, which total storage space is estimated to contain 177,600 acre-feet gross storage, including storage for sediment deposits. The storage space in Lewisville Lake is to be used to impound water for present demand or need for municipal and industrial water supply; and the storage space in Aubrey Lake is to be used to impound water for present and anticipated future demands or needs for municipal and industrial water supply. In Aubrey Lake, 52 percent (an estimated 108,100 acre-feet) of the space which the City has a right to utilize is for present use water storage and 48 percent (an estimated 99,800 acre-feet) is for future use water storage.

(2) The City shall have the right to withdraw or transfer water from or transfer water into either or both of the two lakes, or to order releases to be made by the Government through the outlet works in the dams, subject to the provisions of Article 1c and to the extent the aforesaid storage spaces will provide. The City shall have the right to construct all such works, plants, pipelines, and appliances as may be necessary and convenient for the purpose of transfers or withdrawals, subject to the approval of the Contracting Officer as to design and location. The grant of rights-of-way across, in, and upon land of the Government at Aubrey Lake and at Lewisville Lake shall be by separate instrument in a form satisfactory to the Secretary of the Army, without additional cost to the City, under the authority of and in accordance with the provisions of 10 U.S.C. 2669. Subject to the conditions of such grants, the City shall have the right to use so much of Aubrey Lake and Lewisville Lake lands as may reasonably be required in the exercise of the rights and privileges herein granted.

c. Rights reserved. The Government reserves the right to lower the water in Aubrey Lake to elevation 632.5 feet above mean sea level and to lower the water in Lewisville Lake to elevation 522.0 feet above mean sea level during such periods of time as is deemed necessary, in its sole discretion, for flood control purposes. The Government further reserves the right to take such measures as may be necessary in the operation of Aubrey Lake and Lewisville Lake to preserve life or property.

d. Quality or availability of water. The City recognizes that this contract provides storage spaces for raw water only. The Government makes no representations with respect to the quality or availability of water and assumes no responsibility therefor or for the treatment of water.

ARTICLE 2. Regulation of and right to use of water. The regulation of the use of water withdrawn or released from or transferred to or from the aforesaid storage spaces shall be the sole responsibility of the City. The City has the full responsibility to acquire in accordance with State laws and regulations, and if necessary to establish or defend, any and all water rights needed for utilization of the storages provided under this contract. The Government shall not be responsible for withdrawals, transfers, or diversions by others, nor will it become a party to any controversies

involving the use of the storage spaces by the City except as such controversies may affect the operations of the Government.

ARTICLE 3. Operation and maintenance. The Government shall operate and maintain Aubrey Lake and Lewisville Lake, and the City shall pay to the Government a share of the costs of such operation and maintenance as provided in Article 5c. The City shall be responsible for operation and maintenance of all installations and facilities which it may construct for the transfer into or out of or withdrawal of water from either or both of the two lakes and shall bear all costs of construction, operation, and maintenance of such installations and facilities.

ARTICLE 4. Measurement of withdrawals and releases. The City agrees to furnish and install, without cost to the Government, suitable meters or measuring devices satisfactory to the Contracting Officer for the measurement of water which is transferred into Aubrey Lake or Lewisville Lake or is withdrawn or transferred from Aubrey Lake or Lewisville Lake by any means other than through Aubrey Lake or Lewisville Lake outlet works. The City shall furnish to the Government monthly statements of all such withdrawals or transfers. Releases from the water supply storage spaces through Aubrey Lake or Lewisville Lake outlet works shall be made in accordance with written schedules furnished by the City and approved by the Contracting Officer and shall be subject to Article 1c. The measure of all such releases shall be by means of a rating curve of the outlet works or by such other suitable means as may be agreed upon prior to use of the water supply storage space or spaces.

ARTICLE 5. Payments. In consideration of the right to utilize the aforesaid storage spaces in Aubrey Lake and Lewisville Lake for municipal and industrial water supply purposes, the City shall pay the following sums to the Government:

a. Project investment costs.

(1) The City shall repay to the Government, at the times and with interest on the unpaid balance as hereinafter specified, the amounts stated below which, as shown in Exhibit A of this contract, constitute the entire estimated amount of the construction costs, including interest during construction, allocated to the water storage rights acquired by the City under this contract. The interest rate to be used for purposes of computing interest during construction and interest on the unpaid balance will be determined by the Secretary of the Treasury as of the beginning of the Government fiscal year in which construction of the Project is initiated on the basis set forth in the Water Supply Act of 1958, as amended. Such interest rate at the time of negotiation of this contract (Government fiscal year 1980) is 7.210 percent. The City shall repay:

26 percent of the construction cost of specific water supply facilities, estimated at	$ 56,700
18.39 percent of the total Project joint use construction cost, estimated at	32,663,500
Interest during construction, estimated at	4,718,200
Total estimated amount of Project investment cost allocated to 26 percent of the water supply	$37,438,400

AUG 1 5 1980

(2) The Project investment costs allocated to the storage space indicated in Article 1(b)(1) as being provided for present demand is currently estimated at $19,641,600, on the basis of the costs presented in Exhibit "A". The amount of the Project Investment costs allocated to the storage for present demand shall be paid in 50 consecutive annual installments, the first of which shall be due and payable within 30 days after the City is notified by the Contracting Officer that the Project is completed and operational for water supply purposes. Annual installments thereafter will be due and payable on the anniversary date of the first payment. Except for the first payment which will be applied solely to the retirement of principal, all installments shall include accrued interest on the unpaid balance at the rate provided above. The last annual installment shall be adjusted upward or downward when due to assure repayment of all of the investment costs allocated to the storage for present demand within 50 years.

(3) The Project investment cost allocated to the remaining portion of the storage space, that provided in Aubrey Lake for future use, is currently estimated at $17,796,800 on the basis of the costs presented in Exhibit A of this contract. No principal or interest payment with respect to this storage for future water supply is required to be made during the first 10 years following the date the Project is operational for water supply purposes unless all or a portion of such storage is used for purposes of withdrawal of water from or transfer of water into Aubrey Lake during this period. The amount to be paid for any portion of such storage which is used shall be determined by multiplying the percentage of the total storage for future water supply which is placed in use by the total amount of the Project investment cost allocated to future water supply. Interest at the rate provided above will be charged on the amount of the Project investment cost allocated to the storage for future water supply which is not being used from the tenth (10th) year following the date the Project is operational for water supply purposes until the time when such storage is first used. The City may at its option pay the interest as it becomes due or allow the interest to accumulate until the storage is used. If this latter option is exercised, the interest will be compounded annually and added to the principal amount. When any portion of the storage for future water supply is used, the amount of the Project investment cost allocated thereto plus interest applicable to such portion as provided above will be due and payable on the date of first use of such portion. The said amount due shall be paid within the life of the Project in not to exceed 50 consecutive annual payments beginning on the next anniversary date established in accordance with the provisions of Article 5a(2) above. Annual payments thereafter for such portion will be due and payable on said anniversary date. For any portion, all payments shall include accrued interest on the unpaid balance at the rate provided above, with interest accruing from the said date of first use of such portion. The last annual payment for any portion shall be adjusted upward or downward when due to assure repayment of all the investment cost allocated to such portion within the repayment period.

(4) An estimated schedule of annual payments for the storages provided for present demand is attached as Exhibit B of this contract. The annual payments as provided therein shall be made until an interim estimated determination of cost or a final determination of cost is made as provided in Article 6. Payment schedules for the storage provided for future water supply demands will

be furnished by the Contracting Officer when use of such storage is started, and if based on estimated costs will be subject to revision, as provided in Article 6, until actual costs are known.

(5) The City shall have the right at any time it so elects to prepay the indebtedness under this Article 5a, in whole or in part, with accrued interest thereon to the date of such prepayment.

b. Major capital replacement costs and resedimentation surveys costs. The City will be required to pay to the Government 26 percent of the cost for any major capital replacement of specific water supply facilities at Aubrey Lake. In addition, the City shall pay to the Government 6.760 percent of the costs of joint use major capital replacement items at Aubrey Lake until such time as the storage for future water supply is first used. As the storage provided for future water supply is used, the share of the joint use major capital replacement items costs, which the City will be required to pay in addition to the major capital replacement costs of the specific water supply facilities, will be increased commensurate with the percentage of the total water supply storage being used up to a total of 13.000 percent of such costs. The City will also be required to pay to the Government 10.155 percent of the costs of sedimentation resurveys at Aubrey Lake until such time as the storage for future water supply is used. As the storage provided for future water supply demands is used, the share of the sedimentation resurveys costs which the City will be required to pay will be increased commensurate with the precentage of the total water supply storage being used up to a total of 19.528 percent of such costs. Payment shall be made either in lump sum on demand at the time such costs are incurred or annually with interest on the unpaid balance. If paid annually, the City's share shall be paid within the life of the Project not to exceed 25 consecutive annual payments beginning on the next anniversary date established in accordance with the provisions of Article 5a(2) above following the date demand is made for payment of said major capital replacement costs and resedimentation surveys. Annual payments thereafter will be due and payable on said anniversary date. All payments shall include accrued interest on the unpaid balance at the rate determined by the Secretary of the Treasury on the basis of the Water Supply Act of 1958, as amended, for use in the Government fiscal year in which major capital replacement is initiated, with interest accruing from the date said major capital replacement is initiated. The last annual payment shall be adjusted upward or downward when due to assure repayment of all the incurred costs within the repayment period.

c. Annual operation and maintenance costs.

(1) The City will be required to pay to the Government 26 percent of the annual experienced operation and maintenance costs of specific water supply facilities at Aubrey Lake. In addition, the City shall pay to the Government 7.759 percent of the annual experienced joint use operation and maintenance costs of Aubrey Lake until such time as the storage for future water supply is first used. As the storage provided for future water supply demands is used, the share of the annual experienced joint use operation and maintenance costs, which the City will be required to pay in addition to the operation and maintenance costs of the specific water supply facilities, will be increased commensurate with the percentage of the total water supply storage being used

up to a total of 14.921 percent of such costs. Twelve months prior to the expected date that the Contracting Officer shall notify the City that the Project is complete and operational for the water supply purpose, the Government shall provide the City an estimate of the first advance payment for operation and maintenance costs. The first payment for operation and maintenance costs of present use water supply storage in Aubrey Lake will be due and payable in advance within 90 days after the Contracting Officer notifies the City that the Project is completed and operational for water supply purposes, will be for the period beginning on the date the Project is operational for water supply purposes and ending on 30 September following, and will amount to the sum of the first payment for specific water supply facilities costs and the first payment for joint use costs. Annual payments thereafter, for each Government fiscal year ending 30 September, will be due and payable in advance on 2 January following the close of the prior Government fiscal year. Payment by the City and payment adjustments by the Government shall be in accordance with Exhibit A, IV, B.

(2) When each and any portion of the future water supply storage is placed in use, the first payment of the additional amount of the joint use operation and maintenance costs required to be paid for such storage use will be due and payable in advance within 30 days after first use of such storage and will be for the period beginning on the date of said first use and ending on 30 September following. Annual payments thereafter, for each Government fiscal year ending 30 September, will be due and payable in advance on 2 January following the close of the prior Government fiscal year.

d. Charges for delinquent payments. If the City shall fail to make any of the aforesaid payments when due, then the overdue payments shall bear interest compounded annually until paid. The interest rate to be used for overdue payments due under the provisions of Articles 5a, 5b, and 5c above shall be that determined by the Secretary of the Treasury on the basis of the Water Supply Act of 1958, as amended, for use in the Government fiscal year in which each period of delinquency occurs. The amount charged on payments overdue for a period of less than one year shall be figured on a monthly basis. For example, if the payment is made within the first month after being overdue (31 to 60 days after the anniversary date of the date of notification) one month's interest shall be charged. This provision shall not be construed as giving the City a choice of either making payments when due or paying interest, nor shall it be construed as waiving any other rights of the Government, at law or in equity, which might result from any default by the City.

e. Assurance of funds for contract payments. The City warrants that all payments contracted hereunder shall be secured by a pledge of surplus revenues of the City's combined Waterworks and Sanitary Sewer System remaining after payment of all expenses of operating and maintaining such system and after providing for payment of all debt service, reserve, or other requirements in connection with the City's Waterworks and Sanitary Sewer System Revenue Bonds now outstanding or those hereafter issued on a first lien basis or on such other basis as may be approved by the Contracting Officer, provided, that in the event such surplus revenues may become or are insufficient to meet the payments contracted hereunder, the City shall fix and collect such rates and charges for services of said combined system as will make possible the prompt payment of

all the aforementioned requirements including payments contracted hereunder. Payments made by the City as Project investment cost and as major capital replacement costs shall be regarded as capital expenditures.

ARTICLE 6. Construction cost adjustments. All construction cost dollar amounts in this contract, including those in the Exhibits, are tentative only based on the Government's best estimates. They will be adjusted upward or downward by the Contracting Officer when final construction costs become known, and the contract will be modified to reflect the adjustments. Within two years after the Project is completed and operational for water supply purposes, the Contracting Officer shall make a revised interim estimated determination of construction costs, including interest during construction and taking into account the actual costs to the extent they are then known. In like manner, further interim determinations shall be made at two year intervals until all actual costs are known, at which time the Contracting Officer shall prepare a final cost determination, including interest during construction. On each occasion of an interim determination, or on final determination, the annual payments thereafter due shall be changed so as to provide for the payment of the balance due in equal payments during the remaining life of the repayment period; and a revised schedule, or schedules as necessary, of annual payments shall be furnished to the City.

ARTICLE 7. Duration of contract. This contract shall be effective when approved by the Secretary of the Army and shall continue in full force and effect for the life of Aubrey Lake and Lewisville Lake. Both Aubrey Lake and the additional storage to be made available in Lewisville Lake have been formulated on the basis of 100 years economic life.

ARTICLE 8. Permanent rights to storage. Upon completion of payments by the City as provided in Article 5a herein, the City shall have a permanent right, under the provisions of the Act of 16 October 1963 (Public Law 88-140, 43 U.S.C. 390e), to the use of the water supply storage spaces in Aubrey Lake and Lewisville Lake as provided in Article 1, subject to the following:

a. The City shall continue payment of its share, as provided in Article 5c, of the annual operation and maintenance costs allocated to water supply.

b. The City shall bear 26 percent of the costs allocated to (1) water supply for Aubrey Lake and (2) the total storage space between elevations 515.0 feet above mean sea level and 522.0 feet above mean sea level for Lewisville Lake of any necessary reconstruction, rehabilitation, or replacement of Aubrey Lake or Lewisville Lake features which may be required to continue satisfactory operation of Aubrey Lake or Lewisville Lake. Such costs will be established by the Contracting Officer and repayment arrangements shall be in writing in accordance with the terms and conditions set forth in Article 5(b) for major capital replacement costs.

c. Upon completion of payments by the City as provided in Article 5a herein, the Contracting Officer shall redetermine the storage space for municipal and industrial water supply in Aubrey Lake, taking into account such equitable reallocation of lake storage capacities among the purposes served

by Aubrey Lake as may be necessary due to sedimentation. Such findings, and the storage space allocated to municipal and industrial water supply, shall be defined and described in an exhibit which will be made a part of this contract. Following the same principle, such reallocation of lake storage capacities may be further adjusted from time to time as the result of sedimentation resurveys to reflect actual rates of sedimentation and the exhibit revised to show the revised storage space allocated to municipal and industrial water supply.

d. The permanent rights of the City under this contract shall be continued so long as theGovernment continues to operate Aubrey Lake and/or Lewisville Lake. In the event the Government no longer operates Aubrey Lake or Lewisville Lake, such rights may be continued subject to the execution of a separate contract, or supplemental agreement, providing for:

(1) Continued operation by the City of such part of the facility as is necessary for utilization of the water supply storage spaces allocated to it;

(2) Terms which will protect the public interest; and

(3) Effective absolvement of the Government by the City from all liability in connection with such continued operation.

ARTICLE 9. Release of claims. The City shall hold and save the Government, including its officers, agents, and employees, harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as a result of the storages in Aubrey Lake and/or Lewisville Lake, or withdrawal or release of water from or transfer of water to or from Aubrey Lake or Lewisville Lake made or ordered by the City, or as a result of the construction, operation, or maintenance of the features and appurtenances owned and operated by the City, provided, that this shall not be construed as obligating the City to hold and save the Government harmless from damages or liability resulting from the sole negligence of the Government or its officers, agents, or employees and not involving negligence on the part of the City or its officers, agents, or employees.

ARTICLE 10. Assignment. The City shall not transfer or assign this contract or any rights acquired hereunder, nor sub-allot said water supply storage spaces or any part thereof, nor grant any interest, privilege, or license whatsoever in connection with this contract, without the approval of the Secretary of the Army, provided, that unless contrary to the public interest, this restriction shall not be construed to apply to any water that may be obtained from the water supply storage spaces by the City and furnished to any third party or parties, nor any method of allocation thereof.

ARTICLE 11. Officials not to benefit. No member of or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise herefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 12. Covenant against contingent fees. The City warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon agreement or understanding for a commission, percentage, brokerage, or contingent fee excepting bona fide employees or bona fide established commercial or selling agencies maintained by the City for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or in its discretion to add to the contract price or consideration or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 13. Environmental quality. During any construction, operation, and maintenance by the City of any facilities, specific actions will be taken to control environmental pollution which could result from such activity and to comply with applicable Federal, State, and local laws and regulations concerning environmental pollution. Particular attention should be given to (1) reduction of air pollution by control of burning, minimization of dust, containment of chemical vapors, and control of engine exhaust gases and smoke from temporary heaters; (2) reduction of water pollution by control of sanitary facilities, storage of fuels and other contaminants, and control of turbidity and siltation from erosion; (3) minimization of noise levels; (4) onsite and offsite disposal of waste and spoil; and (5) prevention of landscape defacement and damage.

ARTICLE 14. Federal and State laws.

a. In acting under its rights and obligations hereunder, the City agrees to comply with all applicable Federal and State laws and regulations, including but not limited to the provisions of the Davis-Bacon Act (40 U.S.C. 276a et seq.); the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333); and Title 29, Code of Federal Regulations, Part 3.

b. The City furnishes as part of this contract an assurance (Exhibit C) that it will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 241, 42 U.S.C. 2000d et seq.) and Department of Defense Directive 5500.11 issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations.

ARTICLE 15. Water conservation. There is a strong Federal interest in the efficient use of Federal projects, and this objective may be served by effective management of the use of water from the system into which a Federal project is integrated. Therefore, prior to the first use of storage space indicated in Article 1(b)(1), the City shall submit to the Contracting Officer for his approval a management plan which incorporates loss reduction measures and demand management practices which insure that the available supply is used in an economically efficient and environmentally sensitive manner. The plan shall contain a program for implementation of specific time-phased measures. At not-to-exceed five-year intervals, the City and the Contracting Officer shall review and modify the plan as the results of the implementation of measures are made apparent and as the system supplies and user demands change.

ARTICLE 16. Definitions.

a. Joint use costs. The costs of features used for any two or more Project purposes.

b. Project investment costs. The initial cost of the Project, including: land acquisition; construction; interest during construction on the cost of land, labor, and materials used for planning and construction of the Project.

c. Specific costs. The costs of Project features normally serving only one particular Project purpose.

d. Interest during construction. An amount of interest which accrues on expenditures for the establishment of Project services during the period between the actual outlay and the time the Project is first made available to the City for water storage.

ARTICLE 17. Approval. This contract is subject to the written approval of the Secretary of the Army, and it shall not be binding until so approved.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

APPROVED:

Assistant
Secretary of the Army (CW)

Date 16 SEP 1980

THE UNITED STATES OF AMERICA

By _____
Donald J. Palladino
Colonel, CE
Contracting Officer

Date 15 August 1980

CITY OF DENTON, TEXAS

By _____
Richard O. Stewart
Mayor

I, Brooks Holt, certify that I am the City Secretary of the City of Denton, Denton County, Texas, named as City herein; that Richard O. Stewart who signed this contract on behalf of the City of Denton was then Mayor of the City of Denton, Texas; that said contract was duly signed for and on behalf of the City of Denton, Texas by authority of its governing body and is within the scope of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said City of Denton, Texas this 5 day of August 1980.

Brooks Holt
Secretary
City of Denton, Texas

CORPORATE SEAL

Reviewed for Compliance
w/Procurement Principles
and Regulations

Contract No. DACW63-80-C-0104

AUBREY AND LEWISVILLE LAKES

EXHIBIT A

I - LAKE STORAGES

Aubrey Lake

Feature	Elevation (feet msl)	Gross storage (acre-feet)	Percent of gross storage	Percent of water supply storage
Flood control	632.5-640.5	265,000	24.892	
Water supply	below 632.5	799,600	75.108	100.0
(City of Dallas)	below 632.5	(591,700)	(55.580)	(74.0)
(City of Denton)	below 632.5	(207,900)	(19.528)	(26.0)
Totals		1,064,600	100.000	

Lewisville Lake

Feature	Elevation (feet msl)	Gross storage (1) (acre-feet)	Percent of gross storage(2)	Percent of water supply storage
Flood control	522.0-532.0	336,100	65.427	
Water supply	515.0-522.0	177,600	34.573	100.0
(City of Dallas)	515.0-522.0	(131,400)	(25.579)	(74.0)
(City of Denton)	515.0-522.0	(46,200)	(8.994)	(26.0)
Totals		513,700(2)	100.000	

(1) 1985 condition.
(2) Between elevations 515.0 and 532.0 feet msl.

II - PROJECT ESTIMATED CONSTRUCTION INVESTMENT TO BE ALLOCATED

Federal construction cost	$211,234,000
Nonreimbursable costs (unallocable) (1)	9,826,000
Project cost to be allocated	$201,408,000
Interest during construction on allocable cost (2)	23,991,800
Project construction investment to be allocated	$225,399,800

(1) Relocation of roads above replacement-in-kind standards.
(2) Interest rate for Federal share of recreation - 3.25%.
Interest rate for water supply and non-Federal share of recreation - 7.210%.

AUG 1 5 1980

III - ALLOCATION OF ESTIMATED CONSTRUCTION INVESTMENT
(Separable costs - remaining benefits method)

	Water supply	Recreation	Totals
1. Specific facilities cost	$ 218,000	$23,566,000	$ 23,784,000
Aubrey Lake	(218,000)	(19,985,000)	(20,203,000)
Lewisville Lake	(0)	(3,581,000)	(3,581,000)
2. Joint use facilities cost	125,629,000	51,995,000	177,624,000
Aubrey Lake	(124,413,200)	(51,491,800)	(175,905,000)
Lewisville Lake	(1,215,800)	(503,200)	(1,719,000)
Subtotals - cost	$125,847,000	$75,561,000	$201,408,000
3. Interest during construction	18,147,100	5,844,700	23,991,800
Aubrey Lake	(17,971,800)	(5,437,400)	(23,409,200)
Lewisville Lake	(175,300)	(407,300)	(582,600)
4. Total allocation-investment	$143,994,100	$ 81,405,700	$225,399,800
Aubrey Lake	(142,603,000)	(76,914,200)	(219,517,200)
Lewisville Lake	(1,391,100)	(4,491,500)	(5,882,600)

(1) Interest rate for water supply - 7.210% (fiscal year 1980). Interest rate for reimbursement for water supply storage will be set as of the beginning of the Government fiscal year in which construction of the Project is started.

(2) Investment cost to be repaid by:	Lewisville Lake	Aubrey Lake	Totals
City of Dallas - 74%	$1,029,400	$105,526,300	$106,555,700
Present water supply	(1,029,400)	(54,873,700)	(55,903,100)
Future water supply	(0)	(50,652,600)	(50,652,600)
City of Denton - 26%	361,700	37,076,700	37,438,400
Present water supply	(361,700)	(19,279,900)	(19,641,600)
Future water supply	(0)	(17,796,800)	(17,796,800)
Totals	$1,391,100	$142,603,000	$143,994,100

IV - ALLOCATION OF ESTIMATED OPERATION AND MAINTENANCE COSTS

Aubrey Lake

A. Allocation of estimated total annual costs:

	Water supply	Recreation	Total
1. Specific cost	$ 70,400	$642,000	$712,400
2. Distribution of joint use cost (percent)	57.39	42.61	100.00
3. Allocated joint use cost	102,100	75,800	177,900
4. Total allocation	$172,500	$717,800	$890,300

To be paid by the City of Denton:	
26% of specific cost for water supply facilities	18,300
Aubrey Lake joint use cost:	
Present use w/s storage (0.52 x 0.26 x 0.5739 x $177,900)	13,800
Future use w/s storage (0.48 x 0.26 x 0.5739 x $177,900)	12,700
Total	$ 44,800

B. Annual payment adjustment:

Payment for the City of Denton's share of the annual operation and maintenance costs allocated to water supply storage for each Government fiscal year will be made by the City in advance on 2 January following close of the prior Government fiscal year. For present use water supply storage, the first payment for such costs will be estimated based on the Contracting Officer's annual estimates therefor, prorated as necessary for a partial year of Project operation. Each annual payment thereafter will include (1) an advance payment for the current fiscal year, estimated based on the actual operation and maintenance costs incurred for the preceding fiscal year (except as noted for particular conditions), and (2) an amount (plus or minus) to adjust the estimated advance payment for the preceding fiscal year for the actual costs incurred for such preceding fiscal year. For future use water supply storage, all advance payments will be estimated based on the actual operation and maintenance costs incurred for the preceding fiscal year (except as noted for particular conditions). The first advance payment will be prorated as necessary for a partial year of storage use; and each annual payment thereafter will include an advance payment for the current fiscal year and an amount (plus or minus) to adjust the estimated advance payment for the preceding fiscal year for the actual costs incurred for such preceding fiscal year.

V - ALLOCATION OF ESTIMATED MAJOR CAPITAL REPLACEMENTS COSTS AND SEDIMENTATION RESURVEYS COSTS

A. Major capital replacements costs: (1)

Aubrey Lake

	Water supply	Recreation	Total
1. Specific cost	$21,900	$133,000	$154,900
2. Distribution of joint use cost (percent)	50.00	50.00	100.00
3. Allocated joint use cost	7,100	7,100	14,200
4. Total allocation	$29,000	$140,100	$169,100

To be paid by the City of Denton:	
26% of specific cost for water supply facilities	5,700
Aubrey Lake joint use cost:	
Present use w/s storage (0.52 x 0.26 x 0.5000 x $14,200)	1,000
Future use w/s storage (0.48 x 0.26 x 0.5000 x $14,200) (2)	900
Total	$ 7,600

(1) Estimates of average annual charges are used for determination of allocated percentages. All charges will be based on the indicated percentages of actual costs if and when they are incurred.

(2) Additional amounts of joint use cost required to be paid as future water supply storage is used will be computed as follows:

$$\frac{\text{Percent of future w/s storage placed in use}}{100} \times 0.48 \times 0.13000 \times \text{actual joint use cost}$$

B. Sedimentation resurveys costs:

Aubrey Lake

Sedimentation resurveys costs allocated to water supply and to be paid by the City of Denton in accordance with Article 5c(3) are based on the percentage of the gross storage in Aubrey Lake represented by the storage right of the City - see section I of this Exhibit A.

Present use water supply storage = 0.52 x 19.528% = 10.155%

$$\text{Future use water supply storage} = \frac{\text{Percent of future w/s storage placed in use}}{100} \times 9.373\%$$

VI - COMPUTATIONS FOR ANNUAL PAYMENTS FOR INTEREST AND AMORTIZATION

Present use water supply storage:

Amount to be amortized:

Lewisville Lake	$ 1,391,100 x 0.26	$ 361,700
Aubrey Lake	$142,603,000 x 0.26 x 0.52	19,279,900
Total		$19,641,600

Based on 50 equal payments, 49 of which bear interest on the unpaid balance at the rate of 7.210 percent.

$P = (A - P)(i + c)$

$P = (A - P)(.0745602419P)$

$P = .0745602419A - 0.0745602419P$

$1.0745602419P = 0.0745692419A$

$$P = \frac{.0745602419(\$19,641,600)}{1.0745602419}$$

$P = \$1,362,866.77$

Where: P = annual payment
A = amount to be repaid = $19,641,600
i = interest rate = 7.210%
(i+c) = interest rate plus amortization coefficient for 49 years = 0.0745602419

EXHIBIT B

PMT. NO.	PAYMENT TO INTEREST	PAYMENT TO PRINCIPAL	TOTAL PAYMENT	BALANCE DUE
				19641600.00
1	0.00	1362866.77	1362866.77	18278733.23
2	1317896.67	44970.10	1362866.77	18233763.13
3	1314654.32	48212.45	1362866.77	18185550.68
4	1311178.20	51688.57	1362866.77	18133862.11
5	1307451.46	55415.31	1362866.77	18078446.80
6	1303456.01	59410.76	1362866.77	18019036.04
7	1299172.50	63694.27	1362866.77	17955341.77
8	1294580.14	68286.63	1362866.77	17887055.14
9	1289656.68	73210.09	1362866.77	17813845.05
10	1284378.23	78488.54	1362866.77	17735356.51
11	1278719.20	84147.57	1362866.77	17651208.94
12	1272652.16	90214.61	1362866.77	17560994.33
13	1266147.69	96719.08	1362866.77	17464275.25
14	1259174.25	103692.52	1362866.77	17360582.73
15	1251698.01	111168.76	1362866.77	17249413.97
16	1243682.75	119184.02	1362866.77	17130229.95
17	1235089.58	127777.19	1362866.77	17002452.76
18	1225876.84	136989.93	1362866.77	16865462.83
19	1215999.87	146866.90	1362866.77	16718595.93
20	1205410.77	157456.00	1362866.77	16561139.93
21	1194058.19	168808.58	1362866.77	16392331.35
22	1181887.09	180979.68	1362866.77	16211351.67
23	1168838.46	194028.31	1362866.77	16017323.36
24	1154849.01	208017.76	1362866.77	15809305.60
25	1139850.93	223015.84	1362866.77	15586289.76
26	1123771.49	239095.28	1362866.77	15347194.48
27	1106532.72	256334.05	1362866.77	15090860.43
28	1088051.04	274815.73	1362866.77	14816044.70
29	1068236.82	294629.95	1362866.77	14521414.75
30	1046994.00	315872.77	1362866.77	14205541.98
31	1024219.58	338647.19	1362866.77	13866894.79
32	999803.11	363063.66	1362866.77	13503831.13
33	973626.22	389240.55	1362866.77	13114590.58
34	945561.98	417304.79	1362866.77	12697285.79
35	915474.31	447392.46	1362866.77	12249893.33
36	883217.31	479649.46	1362866.77	11770243.87
37	848634.58	514232.19	1362866.77	11256011.68
38	811558.44	551308.33	1362866.77	10704703.35
39	771809.11	591057.66	1362866.77	10113645.69
40	729193.85	633672.92	1362866.77	9479972.77
41	683506.04	679360.73	1362866.77	8800612.04
42	634524.13	728342.64	1362866.77	8072269.40
43	582010.62	780856.15	1362866.77	7291413.25
44	525710.90	837155.87	1362866.77	6454257.38
45	465351.96	897514.81	1362866.77	5556742.57
46	400641.14	962225.63	1362866.77	4594516.94
47	331264.67	1031602.10	1362866.77	3562914.84
48	256886.16	1105980.61	1362866.77	2456934.23
49	177144.96	1185721.81	1362866.77	1271212.42
50	91654.42	1271212.42	1362866.84	0.00

Contract No. DACW63-80-C-0104

AUBREY AND LEWISVILLE LAKES

EXHIBIT C

ASSURANCE OF COMPLIANCE WITH THE
DEPARTMENT OF DEFENSE DIRECTIVE UNDER
TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

The City of Denton, Denton County, Texas (hereinafter called "Applicant-Recipient") HEREBY AGREES THAT it will comply with title VI of the Civil Rights Act of 1964 (Public Law 88-352) and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 300, issued as Department of Defense Directive 5500.11, December 28, 1964) issued pursuant to that title, to the end that, in accordance with title VI of that Act and the Directive, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under, any program or activity for which the Applicant-Recipient receives Federal financial assistance from the U. S. Army Corps of Engineers and HEREBY GIVES ASSURANCE THAT it will immediately take any measures necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant-Recipient by the U. S. Army Corps of Engineers, assurance shall obligate the Applicant-Recipient, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant-Recipient for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant-Recipient for the period during which the Federal financial assistance is extended to it by the U. S. Army Corps of Engineers.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the Applicant-Recipient by the Department, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date.

The Applicant-Recipient recognizes and agrees that such Federal assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek

judicial enforcement of this assurance. This assurance is binding on the Applicant-Recipient, its successors, transferees, and assignees; and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Applicant-Recipient.

THE CITY OF DENTON, TEXAS

Dated August 5, 1980

By Richard O. Stewart
Richard O. Stewart
Mayor

ATTEST:

Brooks Holt
Brooks Holt
Secretary
City of Denton, Texas

EXHIBIT C2

CONTRACT BETWEEN THE UNITED STATES OF AMERICA

AND

THE CITY OF DENTON, TEXAS

FOR

LEWISVILLE DAM AND LAKE, TEXAS

OFFICIAL RECORD COPY

Contract No. DA-41-443-eng-1098

CONTRACT
CONSERVATION STORAGE
GARZA-LITTLE ELM DAM AND RESERVOIR

THIS CONTRACT, entered into this 10th day of December 1953, by and between the UNITED STATES OF AMERICA (hereinafter called the Government), represented by the Contracting Officer executing this contract, and the City of Denton, an instrumentality of the State of Texas (hereinafter called the City), WITNESSETH THAT:

WHEREAS, the Government is constructing the Garza-Little Elm Dam and Reservoir on the Elm Fork of the Trinity River in Denton County, Texas, (hereinafter called the Project) pursuant to the authority contained in the River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session); and,

WHEREAS, storage space exists in the reservoir between elevation 481 feet above mean sea level and elevation 515 feet above mean sea level which will be surplus to the requirements of the Government for operation of the Project; and,

WHEREAS, the City desires to acquire storage space in the reservoir in the amount of 21,000 acre-feet; and,

WHEREAS, on 14 March 1949, the Board of Water Engineers for the State of Texas granted a permit to the City to impound 21,000 acre-feet of water in the Garza-Little Elm Reservoir and to divert and appropriate public waters therefrom in an amount not to exceed 11,000 acre-feet of water per annum, subject to the authorization of the U. S. Army Corps of Engineers and such restrictions, conditions and limitations as the Board may deem proper under the law, rules and regulations of the Board, and subject to the rights of prior appropriators whatever they may be; and

WHEREAS, the Government is authorized by the Act approved May 23, 1952 (Public Law 360, 82nd Congress, 2nd Session) which revived and reenacted the authorizing provisions of the Flood Control Act approved December 22, 1944, (Public Law 534, 78th Congress, 2nd Session), to make contracts with States, municipalities, private concerns, or individuals at such prices and on such terms as are deemed reasonable, for domestic and industrial uses for surplus water that may be available at any reservoir under the control of the Department of the Army; and,

WHEREAS, pursuant to the requirements of Section 5 and Section 7 of Article 11 of the Constitution of the State of Texas and as a condition precedent to the validity of this contract, the City has duly passed and approved Ordinance No. 53-29 on the 10th day of December 1953 at a ~~regular~~ (~~or~~ special) meeting of the City Council of Denton, Texas, and has therein provided for the annual assessment and collection of a sufficient tax to pay the interest hereinafter provided on such debt or debts as are created by this contract and provide a sinking fund of at least two percent (2%) thereon;

NOW THEREFORE, the parties hereto do mutually agree as follows:

ARTICLE 1. WATER STORAGE SPACE.- Upon completion of the Project the City shall have the right to utilize an undivided 4.8 percent of the storage space in the Project between elevation 481.0 feet above mean sea level and elevation 515.0 feet above mean sea level as deemed necessary by the City to impound in the Project and make such diversions as presently granted or as may hereinafter be granted to the City by the Board of Water Engineers for the State of Texas, or its successors, to the extent that such storage space will provide, and subject to the retention by the Government and others of the remaining undivided 95.2 per cent of the storage space for such purposes as the Government may deem advisable. The Government shall not be responsible for diversion by others, nor will it become a party to any controversies between users of the aforesaid storage space.

Withdrawals from the reservoir will be made by the City at outlet installations and facilities to be constructed by the City at its expense. The design and location of said City installations and facilities shall be subject to the approval of the Contracting Officer.

The Government reserves the right to take such measures as may be necessary in the operation of the Project to preserve life and/or property.

ARTICLE 2. FEDERAL USAGE.- The City agrees that the utilization of such storage space shall not conflict with the use of the Project by the Government for flood control and allied purposes.

ARTICLE 3.- REGULATION OF USE OF WATER STORED IN SUBJECT SPACE.- The regulation of use of water stored in the aforesaid space shall not be considered a part of this contract. The City shall have the right of ingress and egress for the purpose of making full use of the rights provided herein, including the right to protect its water supply.

ARTICLE 4. CONSIDERATION.- In consideration of the payments provided in this contract to be paid by the City to the Government it is agreed that the Government will provide storage space in the Project as provided in Article 1. In consideration of the Government's providing the aforementioned storage space to the City, it is agreed that the City shall pay to the Government;

Delete one

(1) The incremental cost of providing the said storage space, and interest at the rate of two and one-half percent (2½%) per annum on the incremental cost for one-half (½) of the construction period of the project; and

(2) The prorata share of the annual cost of operation and maintenance of the said storage space as defined under Article 5.

ARTICLE 5. PAYMENT.- In accordance with the provisions of Article 4 of this contract the City shall pay the following sums to the Government:

(1) $235,908.75, the estimated incremental first cost of construction, with interest, to be paid annually in twenty (20) consecutive yearly installments, including accrued interest at the rate of two and one-half percent (2½%) per annum on the unpaid balance. The first installment in the amount of $14,763.78 shall be due and payable on 1 January 1955 (estimated date of completion of Project). Annually thereafter during each year the City binds itself to set aside the sum of $14,763.78 and to pay the same to the Government on the next succeeding January 1st of each year up to and including 1974. Said sum of $14,763.78 so to be paid annually from 1 January 1956 until 1 January 1974, includes interest at the rate of two and one-half percent (2½%) per annum from 1 January 1955 (estimated date of completion of Project) on the unpaid balance until 1 January 1974. The City shall have the right to pay the aforementioned interest bearing payments in consecutive order on, or prior to, due dates stated and payments so made shall be credited with unearned interest.

In the event the actual incremental first cost of construction to provide the storage space set out herein exceeds the estimated cost of $219,450.00 (exclusive of interest during construction) the aforesaid annual payments shall be increased to reflect the actual incremental first cost including interest during construction as determined by the Contracting Officer. If such actual cost is less than the estimate, the aforesaid annual payments shall be decreased to reflect the actual incremental first cost including interest during construction as determined by the Contracting Officer.

In the event the annual payments are increased or decreased, as provided above, an adjustment, as determined by the Contracting Officer, of payments made prior to the determination of the actual incremental first cost shall be made in the first payment due after the final project costs are determined.

(2) 1.0 percent of the annual actual experienced cost of operation and maintenance of the Project exclusive of the operation and maintenance cost for land management and public utilization and outlet facilities provided for City of Dallas. An advance payment in the amount of $554.00 shall be made on the first day of the year that the Project will become operative for water conservation purposes as determined by the Contracting Officer, and annually thereafter an amount equal to 1.0 percent of the said actual experienced cost of operation and maintenance for the preceding Government fiscal year shall be

paid in advance on the 1st day of January for each succeeding year during the contract period. The advance payment for the second year shall be increased or decreased in an amount to reflect the difference between the initial payment of $554.00 paid for the first year and 1.0 percent of the annual actual experienced cost of operation and maintenance for the first year or portion thereof as set forth above. It is further provided that additional contributions shall be made by the City for maintenance cost not annually recurring, at the same rate of 1.0 percent of actual cost. Items of operation and maintenance which form basis of computation and which will be used in future computation of maintenance and operation charges are included as Exhibit "A".

Records of cost of operation and maintenance of the Project shall be available for inspection and examination by the City.

The extent of operation and maintenance of the Project shall be determined by the Contracting Officer and all records and accounting shall be maintained by the Contracting Officer. In the event that the City should require additional operation and maintenance for the conservation storage over and above that determined by the Contracting Officer and over and above that which formed the basis for determination of the above percentage as set out in Exhibit "A", the City shall bear the entire cost of such additional expense.

(3) 2.4 percent of the total sedimentation resurvey costs when incurred.

(4) In the event of default in the payment of the costs contained in Article 5 (1), (2), and (3), the City shall pay interest bi-monthly on such overdue payments at the rate of two and one-half percent (2½%) per annum thereon; and such interest shall be charged from the date such payments are due until paid.

ARTICLE 6. PERIOD OF CONTRACT.- The period of this contract shall be fifty (50) years from the date hereof.

ARTICLE 7. RENEWALS.- It is the understanding and expectation of the parties hereto that upon expiration of this contract the City shall have the prior right, subject to any required approval of appropriate State authorities, to negotiate for further use of storage space then available for water supply purposes. The terms of the new contract shall be subject to mutual agreement at the time, it being the further expectation of the parties that in determining the properly allocable charges to be specified in such new contract due consideration will be given to the fact that the original investment of the Government may have been reimbursed. Consideration will also be given to any extraordinary expenditutes made or expected to be made by the Government and which are not recovered during the original contract period.

ARTICLE 8. DEFAULT.- In the event the City refuses or fails to comply with the foregoing provisions with respect to payments and transfer and assignment, the Government reserves the right to terminate this contract.

ARTICLE 9. OPERATION AND MAINTENANCE.- The Government shall operate and maintain the project owned by the Government. The City shall be responsible for the operation and maintenance of all features and appurtenances to be provided and owned by the City for withdrawal of water from the reservoir. The City shall have the right to make withdrawals of water for its purposes as needed in accordance with Article 1. In the event the Government should temporarily suspend maintenance and operation of the Project due to lack of appropriated funds, then and in that event the City shall be privileged and shall have the right to enter upon the premises and operate the same for its own use and benefit in supplying itself with water to the extent provided in this contract.

ARTICLE 10. RIGHTS-OF-WAY.- The granting of such rights-of-way over or other interests in Government-owned land required for withdrawal and/or transmission of the water from the Project by the City and as approved by the Contracting Officer will be accomplished by separate instruments, subject to approval by the Secretary of the Army.

ARTICLE 11. RELEASE OF CLAIMS.- The City shall hold and save the Government including its officers, agents and employees, harmless from liability of any nature or kind for or on account of any claim for damages which may be filed or asserted as result of withdrawal of water from the Project by the City, or as a result of the construction, operation, and/or maintenance of the features and appurtenances owned and operated by the City. However, it is agreed and understood that it is not the intention of the foregoing to impose liability upon the City for claims that may be asserted by the Government concessionaires.

ARTICLE 12. TRANSFER OR ASSIGNMENT.- The City shall not transfer or assign this contract nor any rights acquired thereunder, nor suballot said conservation storage space or any part thereof, nor grant any interest, privilege or license whatsoever in connection with this contract, without permission in writing from the Secretary of the Army; provided, that this restriction shall not be construed to apply to any water which may be obtained from the conservation storage space by the City and furnished to any third party or parties nor any method of allocation thereof.

ARTICLE 13. OFFICIALS NOT TO BENEFIT.- No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

ARTICLE 14. COVENANT AGAINST CONTINGENT FEES.- The City warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the City for the

purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to add to the contract price or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE 15. DISPUTES.- Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the City. Within 30 days from the date of receipt of such copy, the City may appeal by mailing or otherwise furnishing to the Contracting Officer a written appeal addressed to the Secretary of the Army, and the decision of the Secretary of the Army or his duly authorized representative for the hearing of such appeals shall, unless determined by a court of competent jurisdiction to have been fraudulent, arbitrary, capricious, or so grossly erroneous as necessarily to imply bad faith, be final and conclusive; provided that, if no such appeal is taken, the decision of the Contracting Officer shall be final and conclusive. In connection with any appeal proceeding under this clause, the City shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the City shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

ARTICLE 16. APPROVAL OF CONTRACT.- This contract shall be subject to the written approval of the Secretary of the Army, or his duly authorized representative and shall not be binding until so approved.

ARTICLE 17. DEFINITIONS.- (a) The term "Secretary" means the Secretary of the Army; the terms "Secretary of the Army" or "Head of the Department" as used herein shall have one and the same meaning; and the term "his duly authorized representative" means the Chief of Engineers, Department of the Army, or an individual or board designated by him.

(b) Except for the original signing of this contract and except as otherwise stated herein, the term "Contracting Officer" as used herein shall include his duly appointed successor or his authorized representative.

ARTICLE 18. NEGOTIATED CONTRACT.- This contract is authorized by and negotiated under the following laws: The River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session), and the Act approved May 23, 1952 (Public Law 360, 82nd Congress, 2nd Session), which revived and re-enacted the authorizing provisions of the Flood Control Act approved December 22, 1944 (Public Law 534, 78th Congress, 2nd Session).

ARTICLE 19. ALTERATIONS IN CONTRACT.- The following alterations have been made in the provisions of this contract.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

APPROVED: 20 MAY 54

By direction of the
Secretary of the Army

SHERRY B. MYERS
Lt. Col., JAGC
Chief, Legal Br
OUSA

THE UNITED STATES OF AMERICA

By _____
(Contracting Officer H. R. HALLOCK
Colonel, CE
Contracting Officer

CITY OF DENTON, TEXAS

By _____
Mayor
City of Denton, Texas

ATTEST:

_____
City Secretary
City of Denton, Texas

APPROVED AS TO FORM:

_____
City Attorney
City of Denton, Texas

STATE OF TEXAS)

COUNTY OF DENTON)

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared Mark Hannah, Mayor of the City, of Denton, known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said City of Denton, Texas, and that he executed the same for the purposes and consideration therein expressed, and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 10th day of December, A. D. 1953.

Robt. H. Caldwell, Jr.

NOTARY PUBLIC IN AND FOR THE COUNTY OF DENTON STATE OF TEXAS

ROBT. H. CALDWELL, JR.
Attorney-at-Law
DENTON, TEXAS

My commission expires the 1st day of June, 1955.

EXHIBIT D

STANDING INSTRUCTIONS TO LAKE MANAGER

LEWISVILLE DAM AND LAKE

EXHIBIT D

STANDING INSTRUCTIONS TO LAKE MANAGER

LEWISVILLE DAM AND LAKE

TABLE OF CONTENTS

STANDING INSTRUCTIONS TO LAKE MANAGER
LEWISVILLE DAM AND LAKE

I. GENERAL

1. Instructions. Detailed instructions to the project personnel at Lewisville Dam and Lake are presented below.

a. Regulation. The Fort Worth District Water Management Office will normally issue instructions for the storage and discharge of water. In the event communications with the Fort Worth District Water Management Office are disrupted, the Lake Manager will direct regulation in accordance with the Emergency Regulation guidance provided in Section II of this exhibit.

b. Data Reporting. The Water Management Office is staffed from 0700 hours to 1600 hours daily, and 0700 hours to 1100 hours on weekends and holidays (except Christmas Day). During these hours reservoir regulators may be reached via telephone at 817-886-1551, via e-mail at ceswf-od-l@usace.army.mil, or (as a backup) via FAX at 817-886-6472. Outside of these hours the Water Management Office Duty Regulator may be reached via mobile telephone at 817-791-0973, or, as a backup, via the above e-mail address.

(1). Daily Report. Each day lake and hydrometeorological data will be submitted to the Fort Worth District Water Management Office between 0800 and 0830 hours. The primary means of submission will be the Internet at http://www.swf-wc.usace.army.mil. The secondary means of submission will be via telephone, and FAX may be used as a backup. The following data should be included in the daily report.

(a). Weather. For the 24-hour period preceding 0800 hours each day, report cumulative precipitation and evaporation values, in inches, and the maximum and minimum experienced temperature readings.

(b). Gate Settings. Gate number of each open gate, with the height of opening in feet as of 0800 hours on the date of report.

(c). Spillway Discharge. In the event discharge occurs over the tainter gate spillway, report the respective dates and times discharge begins and ends.

(d). Hydropower. Hydropower information will be reported daily to include the generation time for each unit, megawatt hours produced, and volume of water released through the turbines.

(2). Reporting Severe Weather. During normal project duty hours, including weekends as applicable, severe weather will be reported as it develops, to include information and data that may be requested by the Water Management Office. Severe weather conditions outside of

normal project duty hours will be reported when and as requested by the Water Management Office.

(3). Reporting Gate Operations. Upon completion of any change in gate settings, details of the gate operations will be reported to the Water Management Office via telephone, e-mail, or FAX (as backup), and to the Lewisville Powerhouse Duty Operator via telephone or FAX. The report shall include the gate settings prior to change, the date and time of beginning of change, the date and time of completion of change, and the gate settings upon completion of change.

c. Reporting Unusual Events. Events or conditions not normally encountered in the routine operation of the dam and lake that might endanger the integrity of the dam or necessitate temporary or permanent revision of the operating procedures shall be promptly reported to the Operations Division and the Water Management Office. Settlement, movement, or cracking of the earth embankment or abutments, unusual change in seepage rates or development of new seepage areas, landslides, rockslides, displacement of riprap, or indication of an impending movement should be reported to the Dam Safety Program Manager in the Geotechnical Office. Any changes to the outlet works or spillway including structural settlement or movement, cracking, or vibrations; mechanical malfunction or failure shall be reported immediately to the Water Management Office and the Dam Safety Coordinator. Reference the Lewisville Dam **Flood Emergency Plan** should an event occur indicating any degree of jeopardy to the safety of the dam or to the safety of the public. The stilling basin and protected/armored downstream areas must be visually monitored closely during all high releases. Outside of normal duty hours one of the persons listed on the Fort Worth District Notification List for Lewisville Lake will be notified, and the Duty Regulator of the Water Management Office will be notified at mobile phone 817-791-0973.

d. Warnings. It is the responsibility of the Lake Manager to maintain a list in current status of residents, and/or property, which would be endangered or inconvenienced by large and/or prolonged releases, and to give adequate warning of such impending releases. Notification will be made by whatever means are available, in accordance with current Fort Worth District emergency notifications protocol. In every case, before an increase in release rate is made, a warning horn shall be sounded and the area immediately below the stilling basin visually checked for person(s) in a dangerous area.

e. Gate Changes. Gate changes will normally be directed by the Water Management Office. In the event communications with the Fort Worth District Office are disrupted, the Lake Manager will direct gate changes. During flood periods, gate changes may be required as often as every half hour. Only under unusual circumstances will gate changes be required more frequently than every half hour. Examples of such unusual circumstances include unexpectedly high rates of change in inflow to the reservoir, or a required response to a dam safety issue. The gates will be operated in a manner prescribed by the manufacturer. A complete log of all gate operations will be kept for each gate.

II. REGULATION PROCEDURES

1. Normal Regulation. Normally, instructions for storage and release of water for conservation and flood control purposes will be issued by the Water Management Office in accordance with the plan of regulation prescribed in Chapter 7 of this water control manual.

2. Emergency Regulation. In the event of disruption of communications with the Fort Worth District Water Management Office, the Lake Manager will, on his own initiative, direct operation of the reservoir in accordance with the rules outlined below:

a. Continue releases as last directed by the Fort Worth District Water Management Office.

b. Take immediate steps to re-establish communication with the Fort Worth District Water Management Office.

c. Until communications are restored, regulate the reservoir in accordance with Chapter 7, Plate 7-2, and Emergency Regulation Plan for Flood Control for Lewisville Dam and Lake.

3. Temporary Deviations. During the course of normal or emergency regulation of the reservoir, the Lake Manager may temporarily deviate from the current release rates in the event an immediate short-term departure is deemed necessary to protect the safety of the dam, or to avoid serious hazards to life. As soon as practicable, the Fort Worth District Water Management Office will be informed via telephone, e-mail, or FAX, as to the nature of the emergency and the subsequent response. If the deviation is conducted in the interest of dam safety, the Dam Safety Coordinator will also be notified as soon as practicable. Such actions shall be confirmed in writing, as soon as practicable, to the Fort Worth District Water Management Office and the Southwestern Division Water Management Office, and shall include justification for the action.

EXHIBIT E

URS-FNI-HZ TEAM

QUALITY MANAGEMENT SYSTEM (QMS) FORMS

EXHIBIT E

URS-FNI-HZ TEAM

QUALITY MANAGEMENT SYSTEM (QMS) FORMS

TABLE OF CONTENTS

URS | Quality - It's Good Business

QMS Form 3-4 (MM)
Rev. 2013 QMS
Date: 28 Feb 2013

IE QMS - Americas

Detail Check

Project Name	Update Water Control Manual for Lewisville Dam and Lake	**Client**	USACE Fort Worth District
Project Location	Denton County, Texas	**PM**	Jinwei Qiu, PE
Project Number	60440846	**PIC**	

Identifying Information

(This section is to be completed by the Project Manager or the PM's Designee.)

Assigned Checker: Janis Murphy, PE — Comments Required by: November 28, 2016

Work Product Originator: Jinwei Qiu, Rifat Alam and Dawit Zeweldi

Work Product to be Checked: Lewisville Dam and Lake Water Control Manual Chapters 1 to 3

☒ This Detail Check is a check for correctness, completeness and technical accuracy.

☐ This Detail Check is only a technical edit for format, spelling, grammar, pagination and readability.

Specific Instructions: Enter specific instructions for the work product.

Submitted by: Jinwei Qiu — 11/21/2016
Project Manager Signature — **Date**

Comments

(This Section is to be completed by the Checker.)

Select:

A. ☐ Checker has no comments.

or

B. ☒ Comments have been provided on:

- ☒ Marked directly on work product
- ☐ Comment and Disposition Form 3-5
- ☐ Other; Specify: Click here to enter text.

Janis C. Murphy — 11/22/16
Checker Signature — **Date**

Verification

(This section is to be completed by the Checker after verification of comment incorporation, if box B is checked off above.)

Select:

C. ☒ Verification of comment incorporation has been performed by Checker. There are no outstanding issues.

or

D. ☐ Verification of comment incorporation has been performed by Checker. Unresolved issues have been submitted to the Project Manager or Designee for final resolution.

and

E. ☒ Checker asserts that the work product review is complete.

Janis C. Murphy — 3/26/18
Checker Signature — **Date**

APPROVAL and DISTRIBUTION

☒ Detail Check is complete.

Jinwei Qiu — 4/3/2018
Project Manager or Designee Signature — **Date**

Distribution:

Project Central File – Quality File Folder

Other – Specify: Enter names here.

URS Quality - It's Good Business	QMS Form 3-6 (MM) Rev. 2013 QMS Date: 28 Feb 2013
IE QMS - Americas	**Independent Technical Review**

Project Name	Update Water Control Manual for Lewisville Dam and Lake	**Client**	USACE Fort Worth District
Project Location	Denton County, Texas	**PM**	Jinwei Qiu, PE
Project Number	60440846	**PIC**	Enter PIC Name

Identifying Information

(This section is to be completed by the Project Manager or the PM's Designee.)

Assigned Reviewer: Anand Prakash, PE — Comments Required by: November 28, 2016

Work Product Originator: Jinwei Qiu, Rifat Alam and Dawit Zeweldi

Work Product to be Reviewed: Lewisville Dam and Lake Water Control Manual Chapters 1 to 3

Review Scope: Review for correctness, completeness and technical accuracy

Specific Instructions: Enter specific instructions for the work product

Submitted by: Jinwei Qiu — 11/21/2016

Project Manager Signature — Date

Comments

(This Section is to be completed by the Reviewer.)

Select:

A. ☐ Reviewer has no comments.

or

B. ☒ Comments have been provided on:

- ☒ Marked directly on work product
- ☐ Comment and Disposition Form 3-5
- ☐ Other; Specify: Click to enter text

Anand Prakash — 11/28/2016

Reviewer Signature — Date

Verification

(This section is to be completed by the Reviewer after verification of comment incorporation, if box B is checked off above.)

Select:

C. ☒ Verification of comment incorporation has been performed by Reviewer. There are no outstanding issues.

or

D. ☐ Verification of comment incorporation has been performed by Reviewer. Unresolved issues have been submitted to the Project Manager or Designee for resolution.

and

E. ☒ Reviewer asserts that the work product ITR is complete.

Anand Prakash — 4/03/2018

Reviewer Signature — Date

APPROVAL and DISTRIBUTION

☒ ITR is complete.

Jinwei Qiu — 04/04/2018

Project Manager or Designee Signature — Date

Distribution:

Project Central File – Quality File Folder

Other – Specify: Enter names here

URS Quality - It's Good Business

QMS Form 3-4 (MM)
Rev. 2013 QMS
Date: 28 Feb 2013

IE QMS - Americas

Detail Check

Project Name	Update Water Control Manual for Lewisville Dam and Lake	Client	USACE Fort Worth District
Project Location	Denton County, Texas	PM	Jinwei Qiu, PE
Project Number	60440846	PIC	

Identifying Information

(This section is to be completed by the Project Manager or the PM's Designee.)

Assigned Checker: Janis Murphy, PE Comments Required by: March 28, 2018

Work Product Originator: Jinwei Qiu, Rifat Alam and Dawit Zeweldi

Work Product to be Checked: Lewisville Dam and Lake Water Control Manual Chapters 1 to 9

☒ This Detail Check is a check for correctness, completeness and technical accuracy.

☐ This Detail Check is only a technical edit for format, spelling, grammar, pagination and readability.

Specific Instructions: Enter specific instructions for the work product.

Submitted by: Jinwei Qiu — 03/24/2018

Project Manager Signature — Date

Comments

(This Section is to be completed by the Checker.)

Select:

A. ☐ Checker has no comments.

or

B. ☒ Comments have been provided on:

- ☒ Marked directly on work product
- ☐ Comment and Disposition Form 3-5
- ☐ Other; Specify: Click here to enter text

Janis C. Murphy — 3/26/18

Checker Signature — Date

Verification

(This section is to be completed by the Checker after verification of comment incorporation, if box B is checked off above.)

Select:

C. ☐ Verification of comment incorporation has been performed by Checker. There are no outstanding issues.

or

D. ☒ Verification of comment incorporation has been performed by Checker. Unresolved issues have been submitted to the Project Manager or Designee for final resolution.

and

E. ☒ Checker asserts that the work product review is complete.

Janis C. Murphy — 4/2/18

Checker Signature — Date

APPROVAL and DISTRIBUTION

☒ Detail Check is complete.

Jinwei Qiu — 04/03/2018

Project Manager or Designee Signature — Date

Distribution:

Project Central File – Quality File Folder

Other – Specify: Enter names here

URS | Quality - It's Good Business

QMS Form 3-6 (MM)
Rev. 2013 QMS
Date: 28 Feb 2013

IE QMS - Americas

Independent Technical Review

Project Name	Update Water Control Manual for Lewisville Dam and Lake	**Client**	USACE Fort Worth District
Project Location	Denton County, Texas	**PM**	Jinwei Qiu, PE
Project Number	60440846	**PIC**	P me

Identifying Information

(This section is to be completed by the Project Manager or the PM's Designee.)

Assigned Reviewer: Anand Prakash, PE — Comments Required by: March 28, 2018

Work Product Originator: Jinwei Qiu, Rifat Alam and Dawit Zeweldi

Work Product to be Reviewed: Lewisville Dam and Lake Water Control Manual Chapters 1 to 9

Review Scope: Review for correctness, completeness and technical accuracy

Specific Instructions: Enter specific instructions for the reviewer duc

Submitted by: Jinwei Qiu — 03/23/2018
Project Manager Signature — Date

Comments

(This Section is to be completed by the Reviewer.)

Select:

A. ☒ Reviewer has no comments.

or

B. ☐ Comments have been provided on:
- ☐ Marked directly on work product
- ☐ Comment and Disposition Form 3-5
- ☐ Other; Specify: Ent nter t

Anand Prakash — 4/03/2018
Reviewer Signature — Date

Verification

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Select:

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D. ☒ Verification of comment incorporation has been performed by Reviewer. Unresolved issues have been submitted to the Project Manager or Designee for resolution.

and

E. ☒ Reviewer asserts that the work product ITR is complete.

Anand Prakash — 4/03/2018
Reviewer Signature — Date

APPROVAL and DISTRIBUTION

☒ ITR is complete.

Jinwei Qiu — 04/04/2018
Project Manager or Designee Signature — Date

Distribution:

Project Central File – Quality File Folder

Other – Specify: Enter names here

CORPS OF ENGINEERS

U.S. ARMY

LAVON LAKE

LEWISVILLE LAKE

RAY ROBERTS LAKE

GRAPEVINE LAKE

BRIDGEPORT LAKE

EAGLE MOUNTAIN LAKE

MOUNTAIN CREEK LAKE

CEDAR CREEK RESERVOIR

RICHLAND-CHAMBERS RESERVOIR

JOE POOL LAKE

BARDWELL LAKE

BENBROOK LAKE

NAVARRO MILLS LAKE

LAKE LIVINGSTON

WALLISVILLE LAKE

Miles

0 10 20 40 60

LEGEND

- RIVER BASIN BOUNDARY
- RIVERS
- LAKE BOUNDARY

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

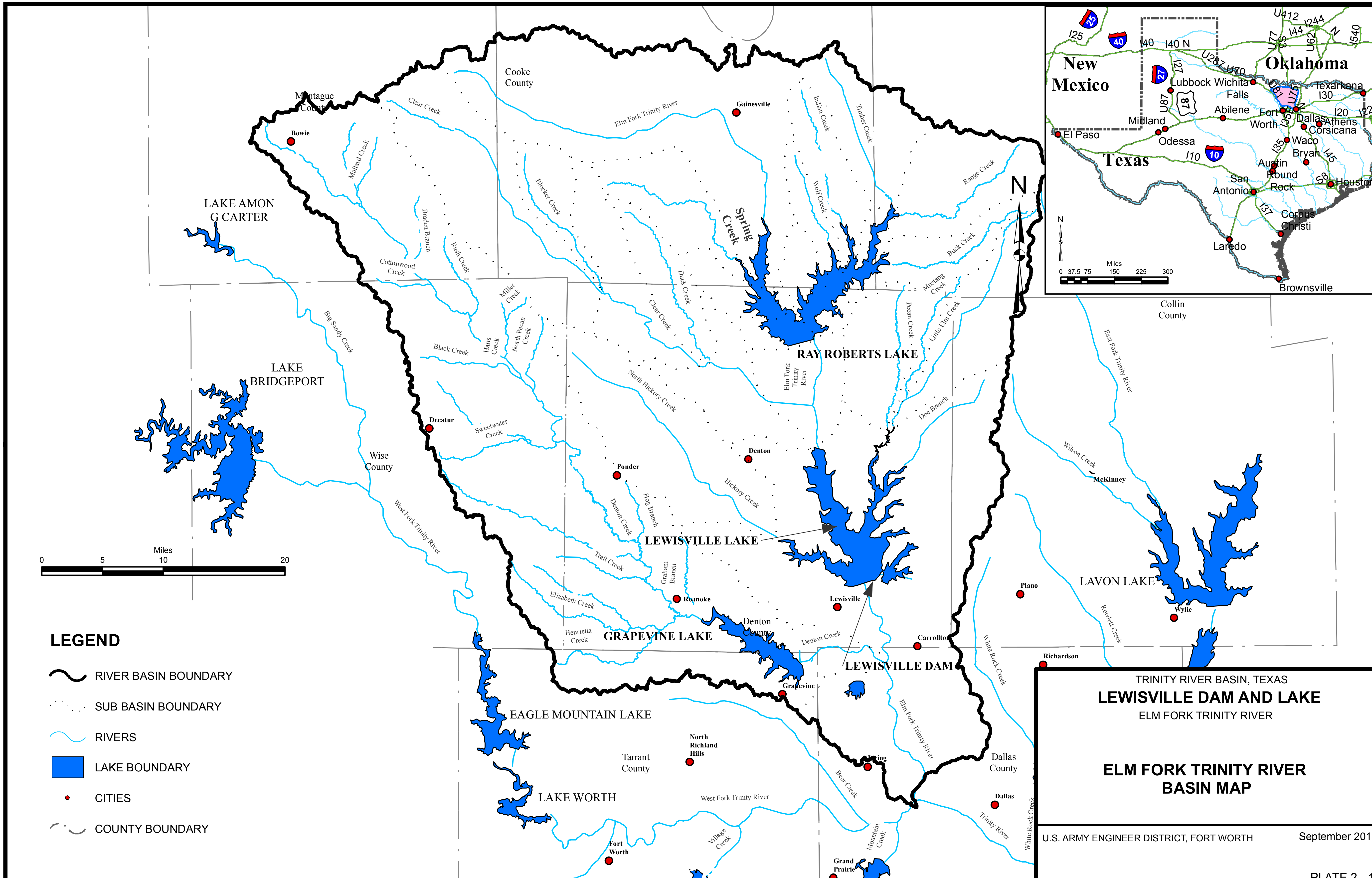
ELM FORK TRINITY RIVER

WATERSHED MAP
TRINITY RIVER BASIN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 2 - 1a



Miles
0 5 10 20

LEGEND

- RIVER BASIN BOUNDARY
- SUB BASIN BOUNDARY
- RIVERS
- LAKE BOUNDARY
- CITIES
- COUNTY BOUNDARY

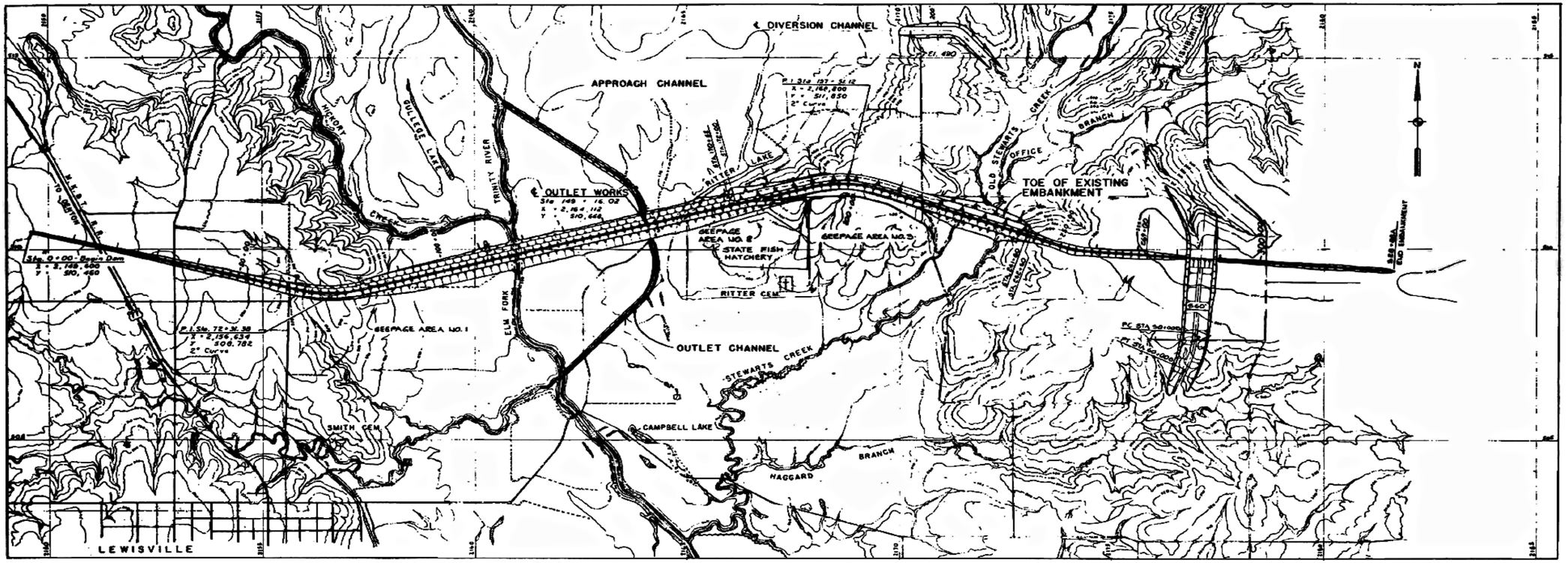
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

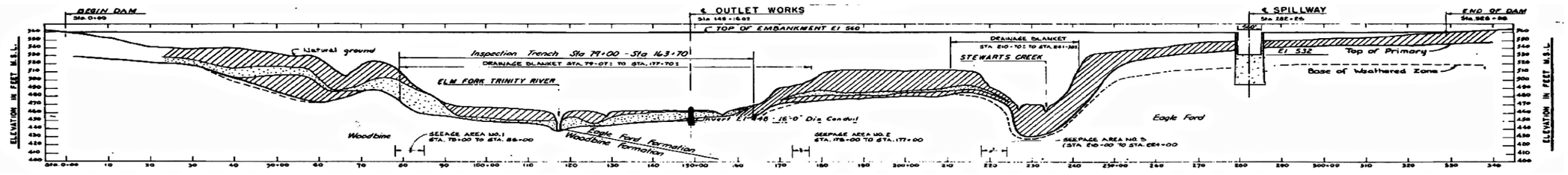
ELM FORK TRINITY RIVER BASIN MAP

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



PLAN

SCALE IN FEET



PROFILE

LEGEND

Semi-pervious and pervious materials

Impervious materials

NOTES:

1. THE ELEVATION CONTOURS ON THIS PLATE WERE OBTAINED BEFORE CONSTRUCTION. CHANGES HAVE OCCURRED IN SOME AREAS.
2. FOR TYPICAL EMBANKMENT SECTIONS SEE PLATE 3

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

TRINITY RIVER BASIN, TEXAS

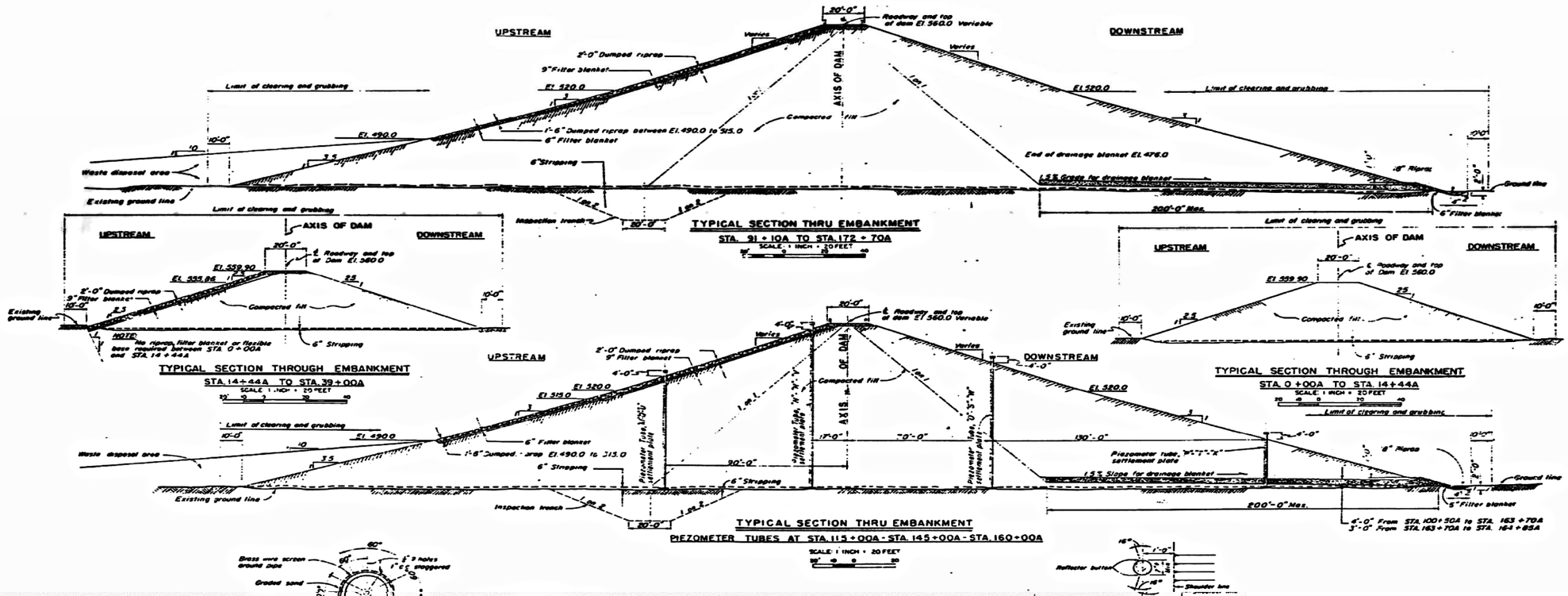
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

GENERAL EMBANKMENT PLAN AND PROFILE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

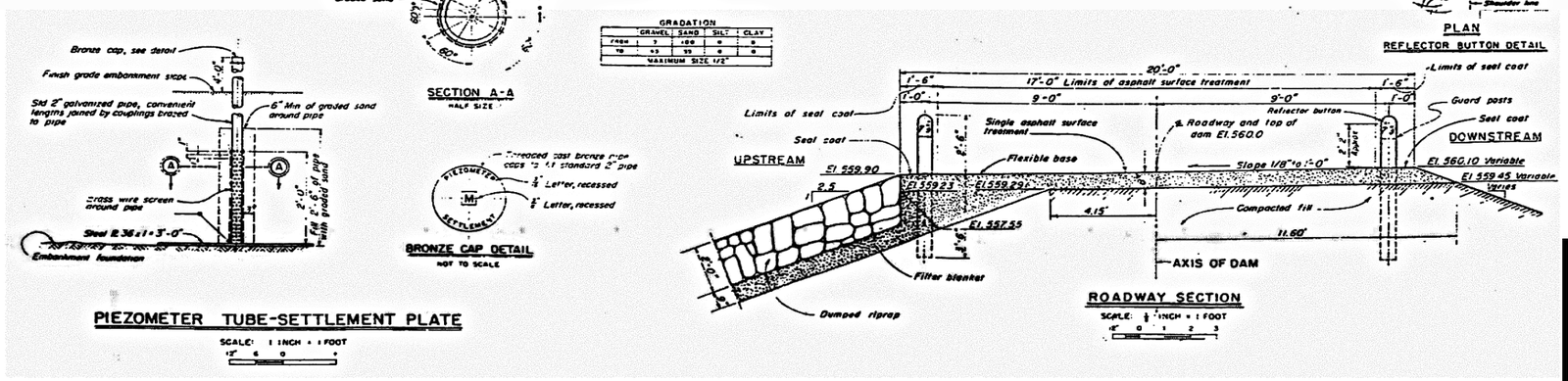


TYPICAL SECTION THRU EMBANKMENT
STA. 91+10A TO STA. 172+70A
SCALE: 1 INCH = 20 FEET

TYPICAL SECTION THROUGH EMBANKMENT
STA. 14+44A TO STA. 39+00A
SCALE: 1 INCH = 20 FEET

TYPICAL SECTION THROUGH EMBANKMENT
STA. 0+00A TO STA. 14+44A
SCALE: 1 INCH = 20 FEET

TYPICAL SECTION THRU EMBANKMENT
PIEZOMETER TUBES AT STA. 115+00A - STA. 145+00A - STA. 160+00A
SCALE: 1 INCH = 20 FEET



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TRINITY RIVER BASIN, TEXAS

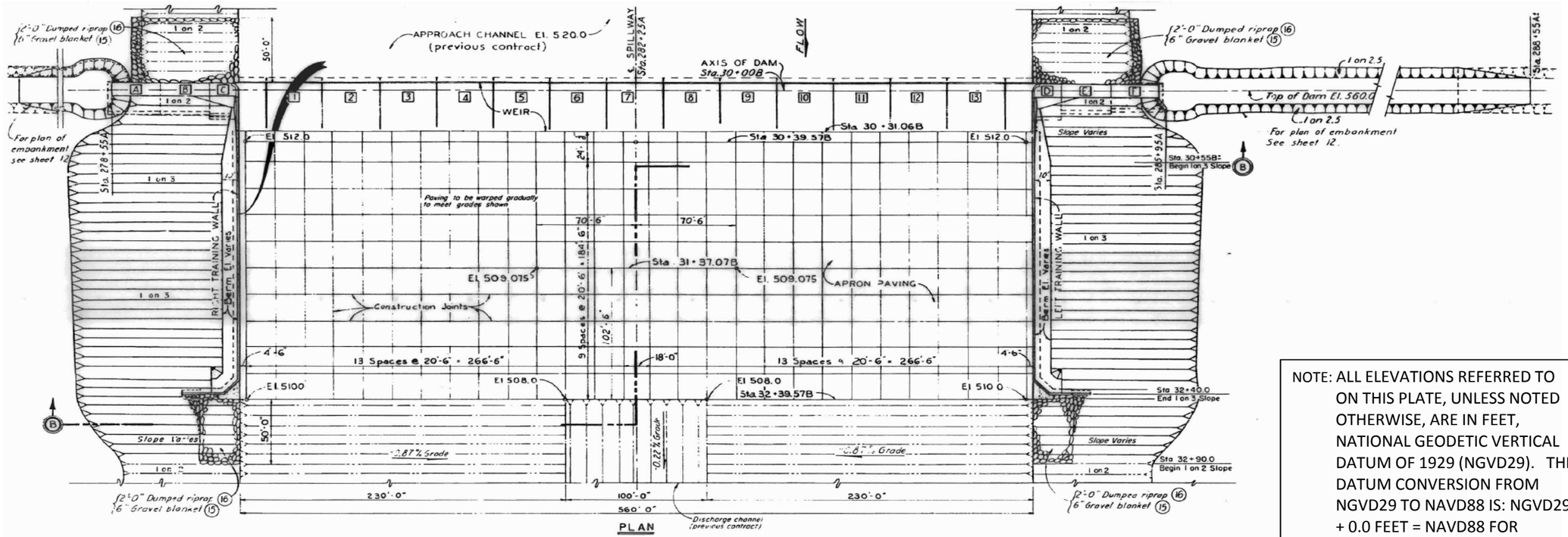
LEWISVILLE LAKE

ELM FORK TRINITY RIVER

EMBANKMENT TYPICAL SECTIONS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018



NOTE: ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

NOTE:
All cement will be paid for under pay item (10)

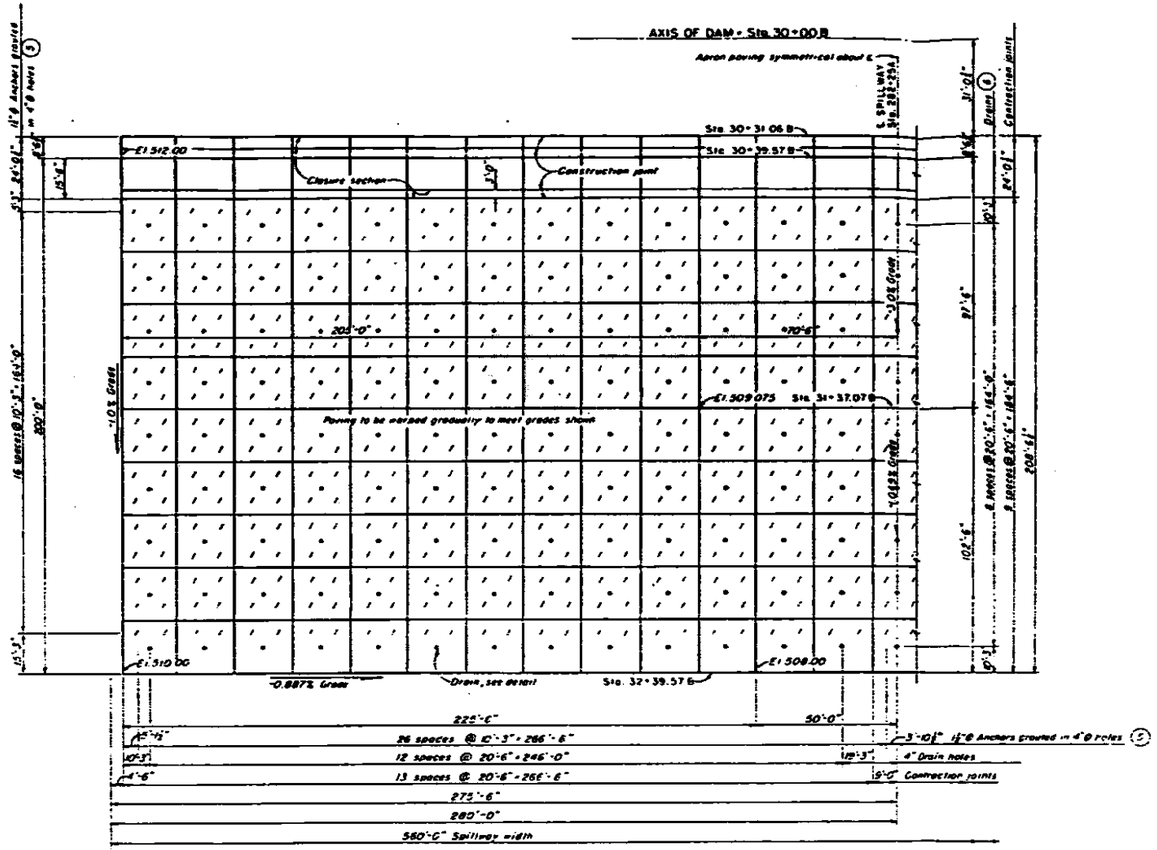
TRINITY RIVER BASIN, TEXAS

LEWISVILLE LAKE

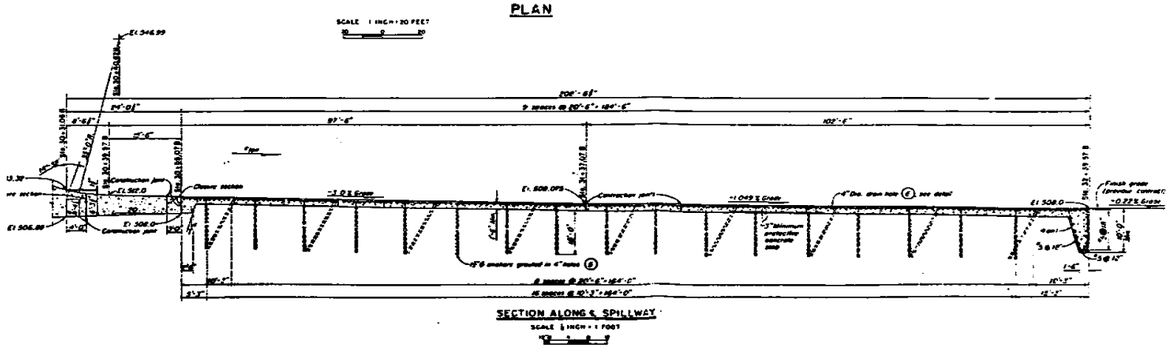
ELM FORK TRINITY RIVER

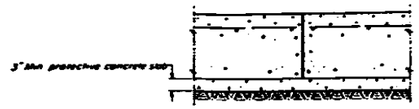
SPILLWAY PLAN AND SECTIONS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018



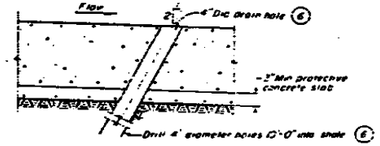
PLAN





SLAB-LONGITUDINAL-TRAVERSE CONTRACTION JOINT

SCALE 1 INCH = 1 FOOT



4" DIAM. DRAIN

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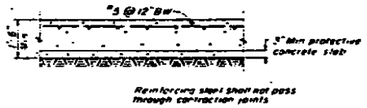


PAVING REINFORCEMENT

SCALE ½ INCH = 1 FOOT

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

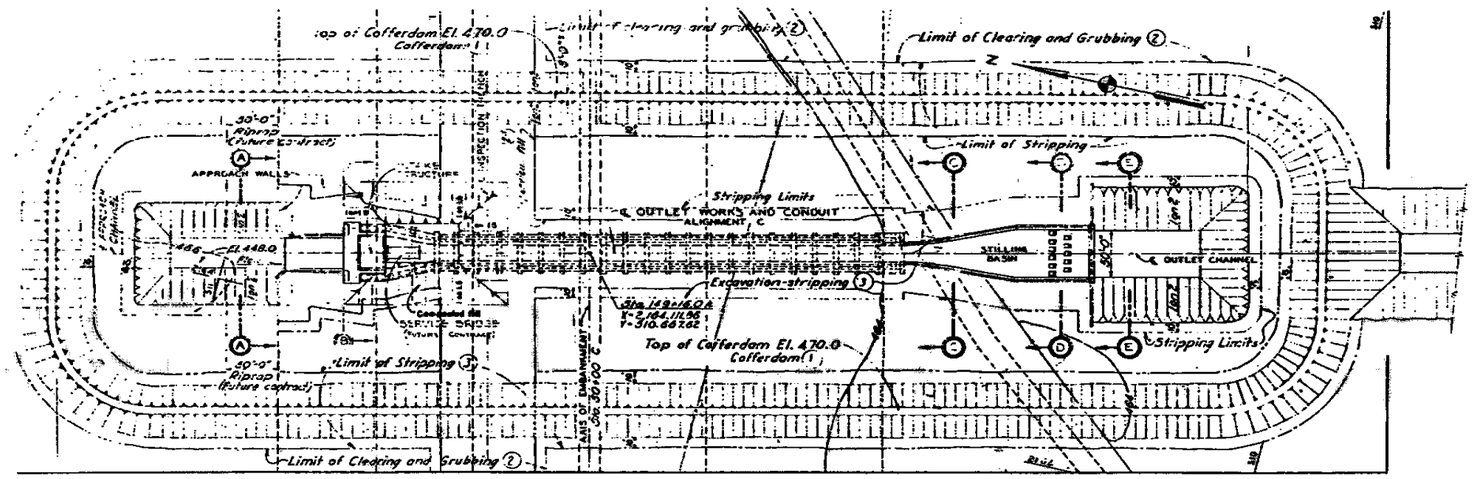
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

SPILLWAY APRON PLAN AND SECTIONS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

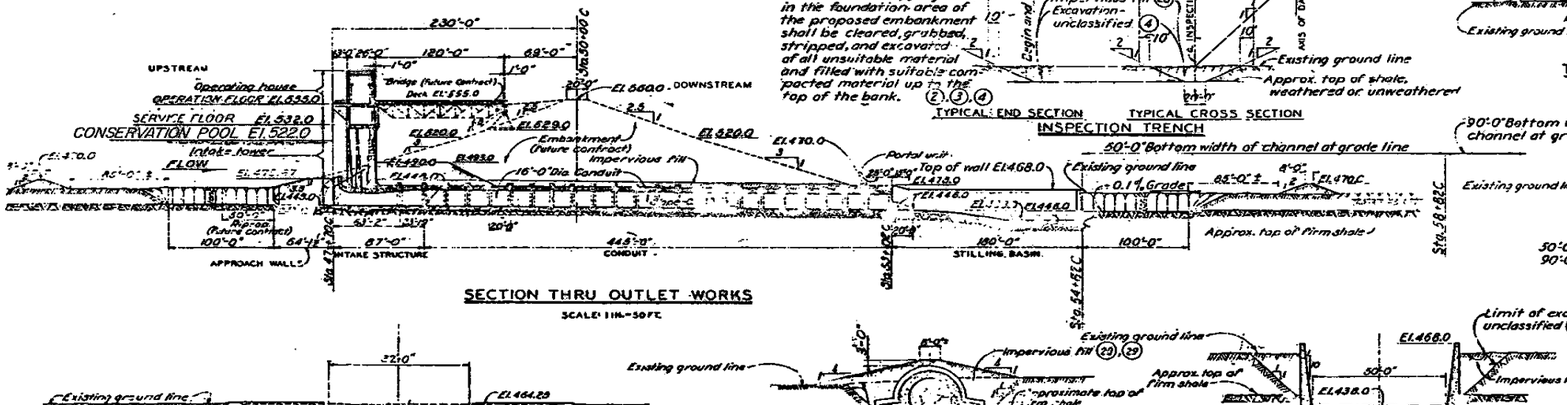


PLAN
SCALE: 1 IN.=50 FT.

GENERAL NOTES:

1. Pay items are shown thus (1). The number indicates Pay item under which payment will be made.
2. Elevations refer to mean sea level.
3. Contours may have been altered by construction operations under a previous contract.
4. Elevations of masonry foundations are given to the minimum required depths and may be changed to suit field conditions as determined by the contracting officer.
5. All concrete shall conform to spec. requirements.
6. Contact surface of contraction joints shall be given [illegible] coat of bituminous paint.
7. All exposed corners of concrete shall be chamfered ¾" except as noted or directed by the contracting officer.
8. All reinforcement shall be placed with a minimum clear distance of 3 inches from the face of concrete to steel bars for formed surfaces and 6 inches for all surfaces adjacent to rock unless otherwise noted.
9. All splices in reinforcement shall be lapped to 43 diameters of the bar unless otherwise noted.
10. All hooks in reinforcement shall be made around a pin with a radius equal to 3 diameters of the bar unless otherwise noted.
11. All right angles or other abrupt bends in reinforcement shall be made around a pin with a radius equal to 4 diameters of the bar.
12. All cement will be paid for under pay item (1).
13. All operations performed in accomplishing the work under this contract shall be done in accordance with the applicable provisions of the Corps of Engineers Handbook "Safety Requirements" and the contract specifications.

NOTE:
The entire area within the banks of Ritter Lake, as located on sheet 2, lying within the foundation area of the proposed embankment shall be cleared, grubbed, stripped, and excavated of all unsuitable material and filled with suitable compacted material up to the top of the bank. (2),(3),(4)



SECTION THRU OUTLET WORKS
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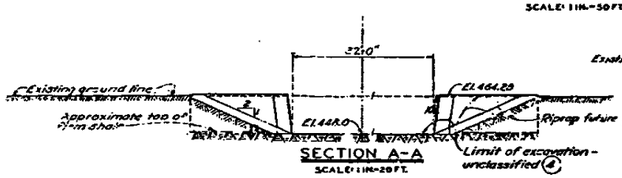

SECTION A-A
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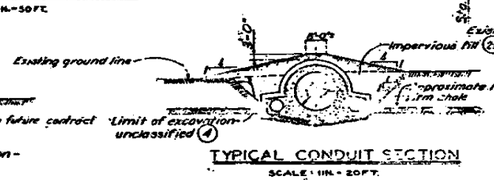

TYPICAL CONDUIT SECTION
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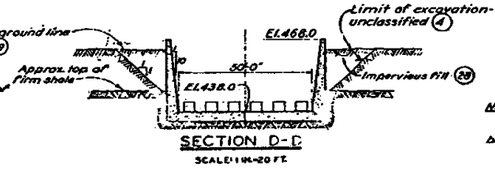

SECTION D-D
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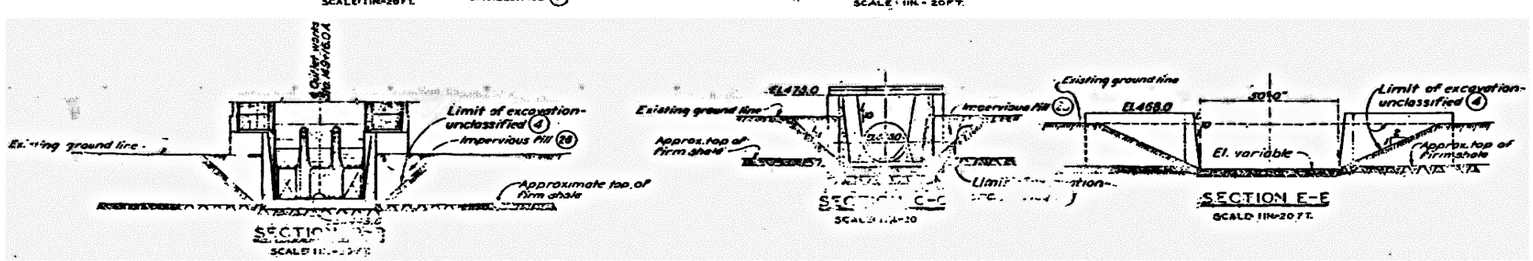

SECTION C-C
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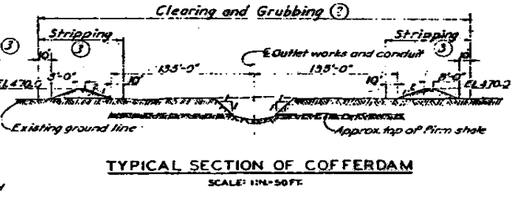
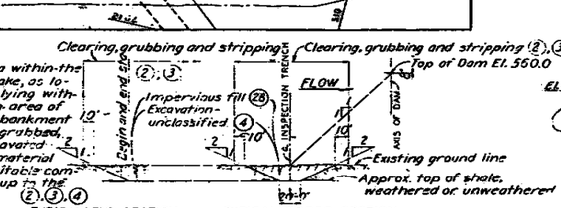
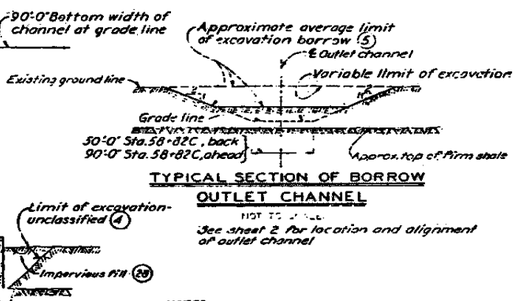
SECTION E-E
SCALE: 1 IN.=20 FT.



TYPICAL SECTION OF COFFERDAM
SCALE: 1 IN.=50 FT.



TYPICAL END SECTION TYPICAL CROSS SECTION
INSPECTION TRENCH



TYPICAL SECTION OF BORROW
OUTLET CHANNEL
NOT TO SCALE

See sheet 2 for location and alignment of outlet channel

NOTES:
See General Notes on this sheet for location of subsurface exploration borings. See sheet 43

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

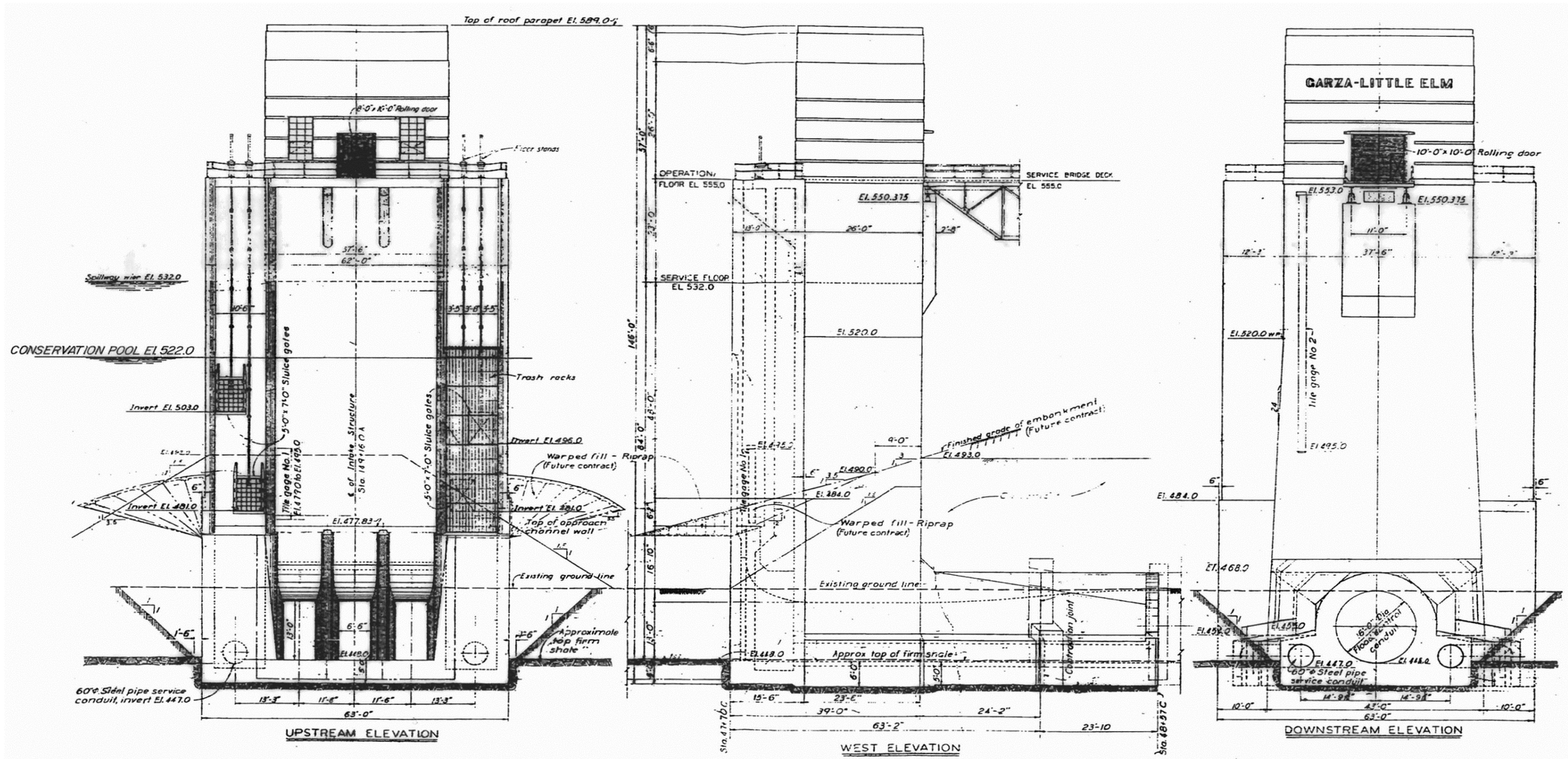
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OUTLET WORKS PLAN AND SECTIONS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018



Notes:
For General Notes see sheet 5
All concrete (except cement) shown on this sheet will be paid for as follows:
Below El. 532.0 under pay item (10)
Above El. 532.0 under pay item (19)
All cement will be paid for under pay item (13)

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

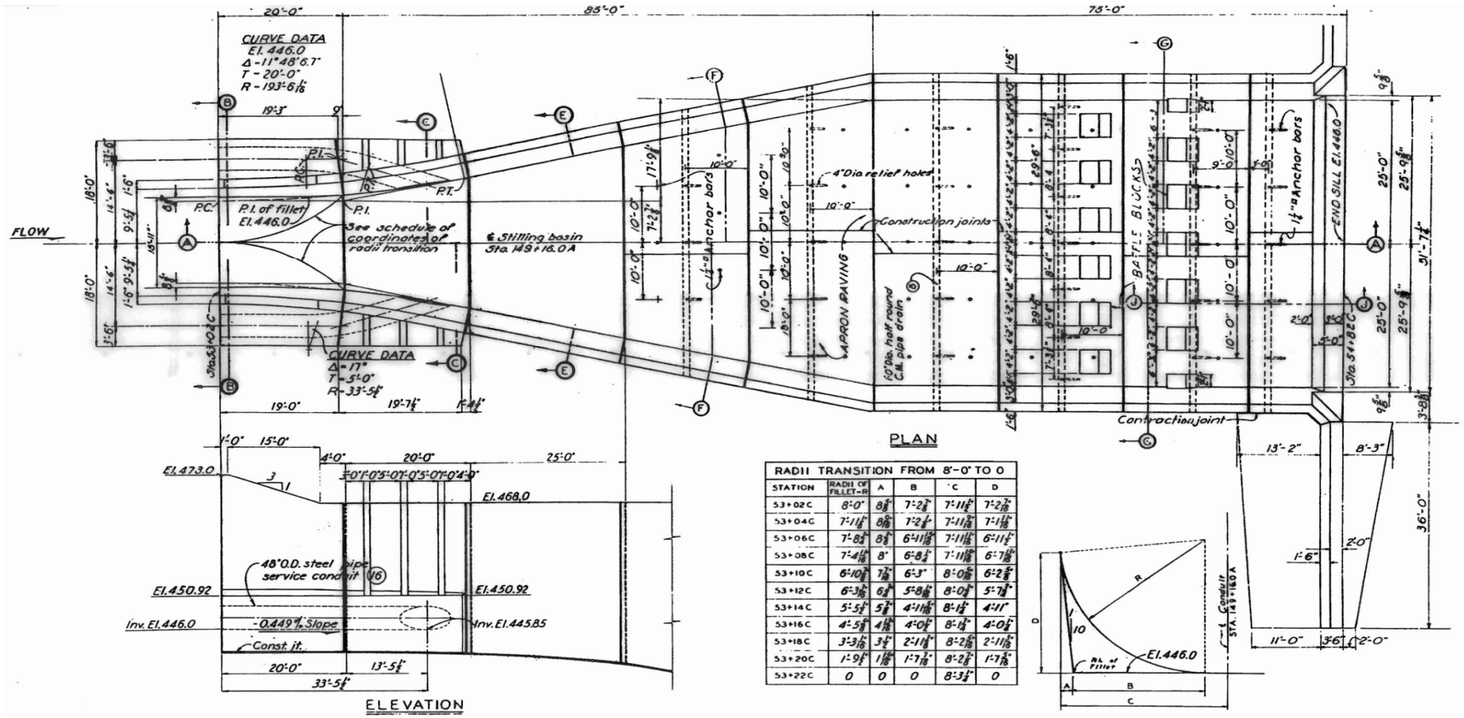
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OUTLET WORKS
INTAKE STRUCTURE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



NOTES:
For General Notes see sheet 5
For sections and details see sheets 31 and 32.
All concrete shown on this sheet for apron paving, end sill, and baffle blocks will be paid for under pay item (2)
All concrete shown on this sheet for walls will be paid for under pay item (9)
All reinforcing steel shown on this sheet will be paid for under pay item (14)
Use ¾" edging tool on all slab joints.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

TRINITY RIVER BASIN, TEXAS

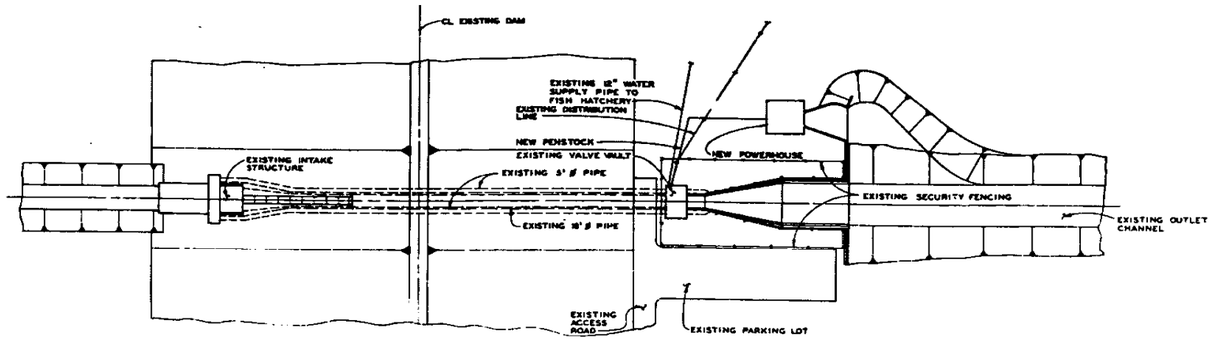
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

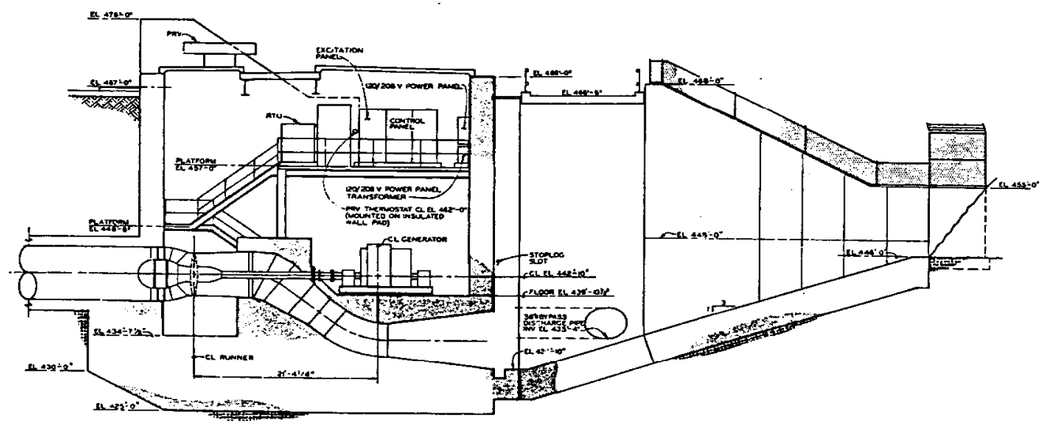
OUTLET WORKS
STILLING BASIN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

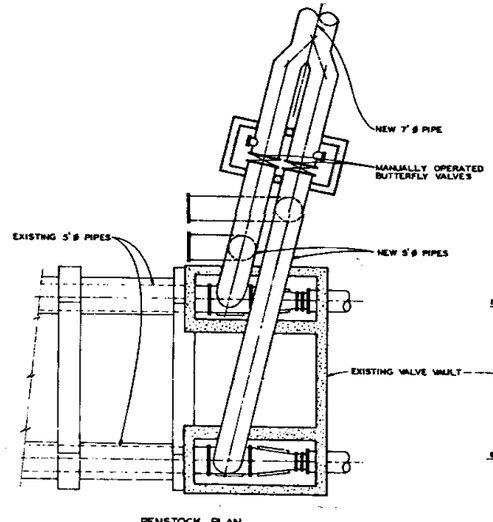
September 2018



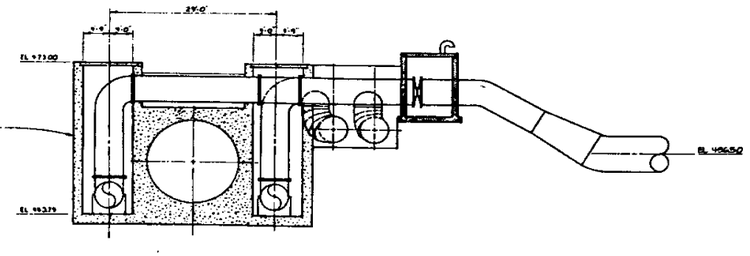
PLAN
SCALE: 1" = 50'



SECTIONAL ELEVATION



PENSTOCK PLAN
SCALE: 1/8" = 1'-0"



PENSTOCK SECTION
SCALE: 1/8" = 1'-0"

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

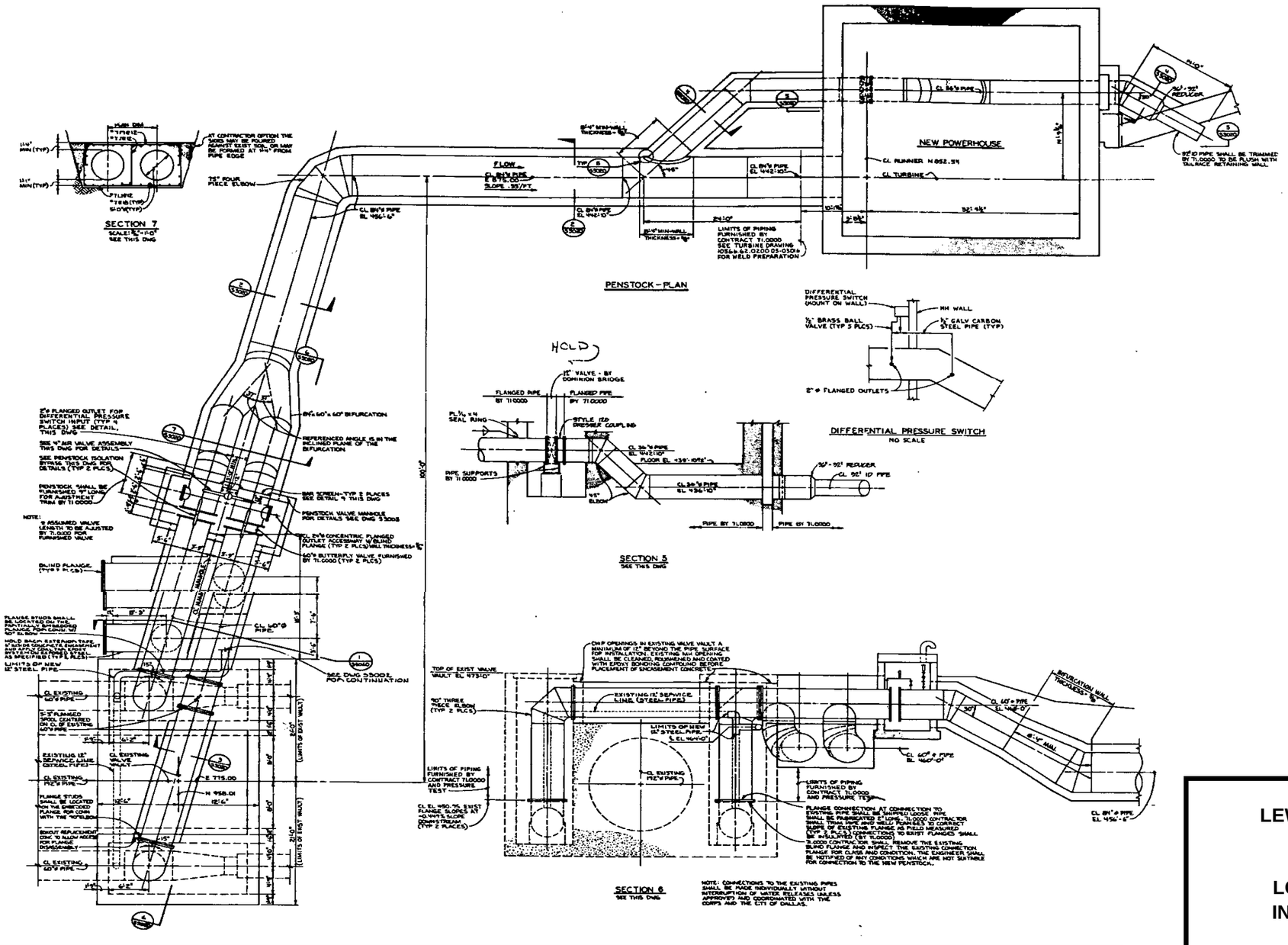
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

HYDROPOWER UNIT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

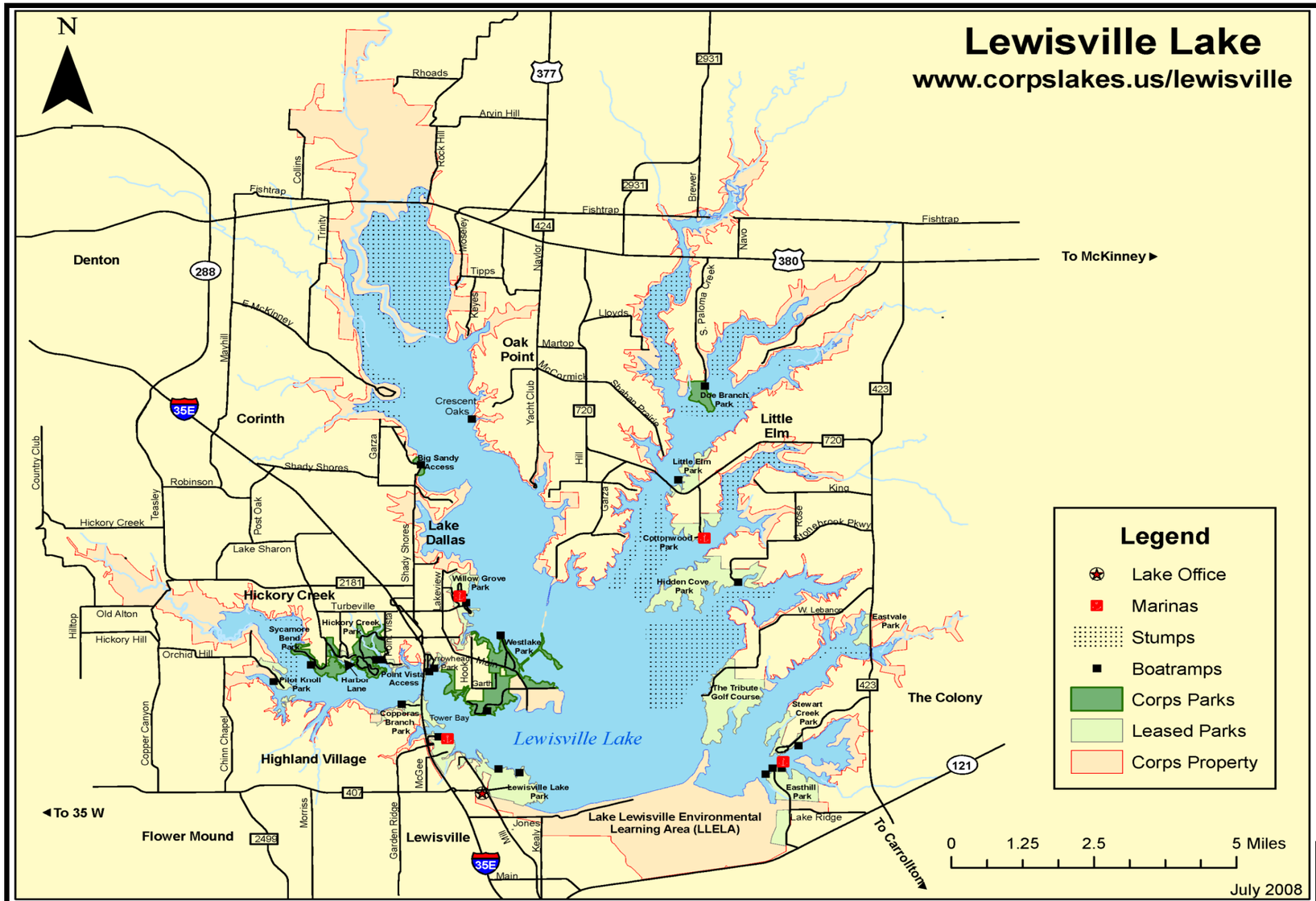
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

LOW FLOW CONNECTION INTO HYDROPOWER UNIT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

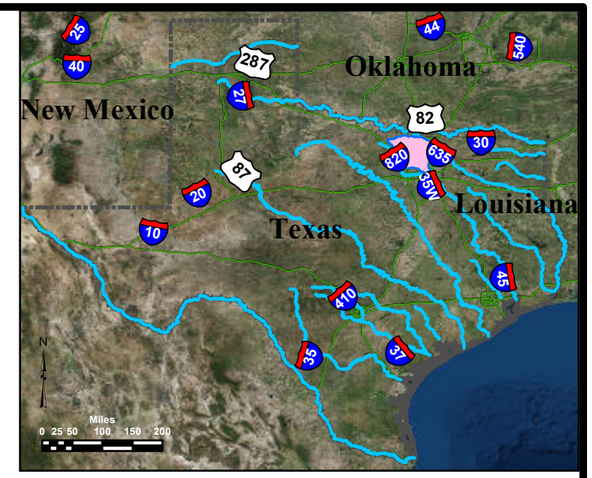
PUBLIC USE AREAS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018

PLATE 2 - 11

CORPS OF ENGINEERS

U.S. ARMY



Love County

Montague County

Cooke County

Grayson County

Denton County

Collin County

Wise County

Jack County

Parker County

Tarrant County

Dallas County

Bowie

Gainesville

Decatur

Ponder

Denton

Roanoke

Lewisville

Carrollton

Plano

Richardson

Grapevine

Irving

Dallas

Garland

McKinney

Mesquite

Fort Worth

North Richland Hills

LAKE AMON G CARTER

LAKE BRIDGEPORT

EAGLE MOUNTAIN LAKE

LAKE WORTH

RAY ROBERTS LAKE

LEWISVILLE LAKE

LEWISVILLE DAM

GRAPEVINE LAKE

LAVON LAKE

LAKE RAY HUBBARD

Mallard Creek

Braden Branch

Rush Creek

Cottonwood Creek

Miller Creek

Harts Creek

North Pecan Creek

Black Creek

Big Sandy Creek

Sweetwater Creek

West Fork Trinity River

Hog Branch

Denton Creek

Trail Creek

Graham Branch

Elizabeth Creek

Henrietta Creek

Blocker Creek

Spring Creek

Duck Creek

Indian Creek

Wiley Creek

Range Creek

Buck Creek

Mustang Creek

Pecan Creek

Little Elm Creek

Doe Branch

East Fork Trinity River

Wilson Creek

Rowlett Creek

White Rock Creek

Bear Creek

Village Creek

Mountain Creek

Trinity River

Notes: Sub-basins are from 2012 PMF Study

Miles
0 5 10 20

N

LEGEND

- RIVER BASIN BOUNDARY
- SUB BASIN BOUNDARY
- RIVERS
- LAKES
- CITIES
- INTERSTATE
- METRO AREAS

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

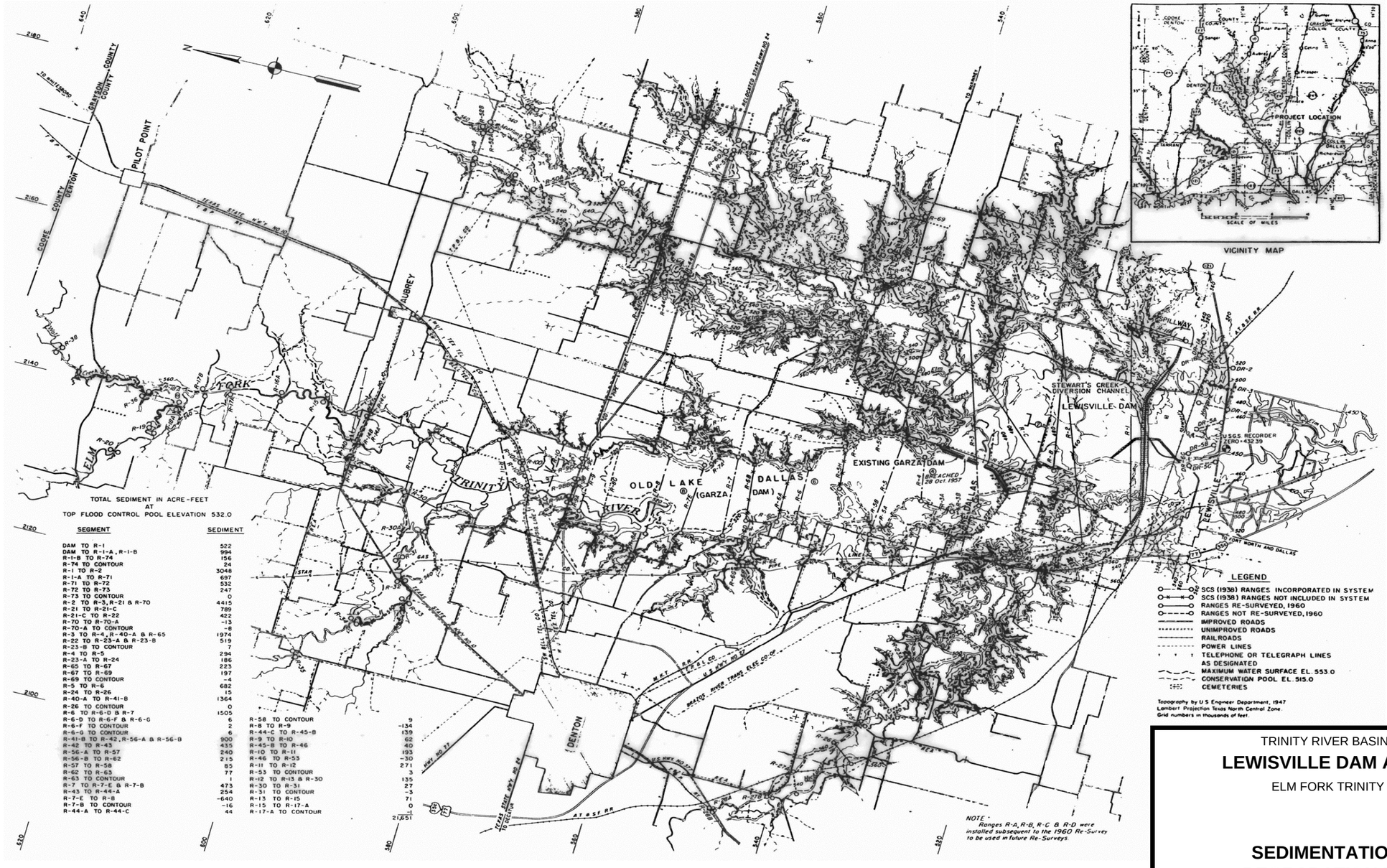
ELM FORK TRINITY RIVER

LOCAL WATERSHED MAP

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 4 - 1



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TRINITY RIVER BASIN, TEXAS

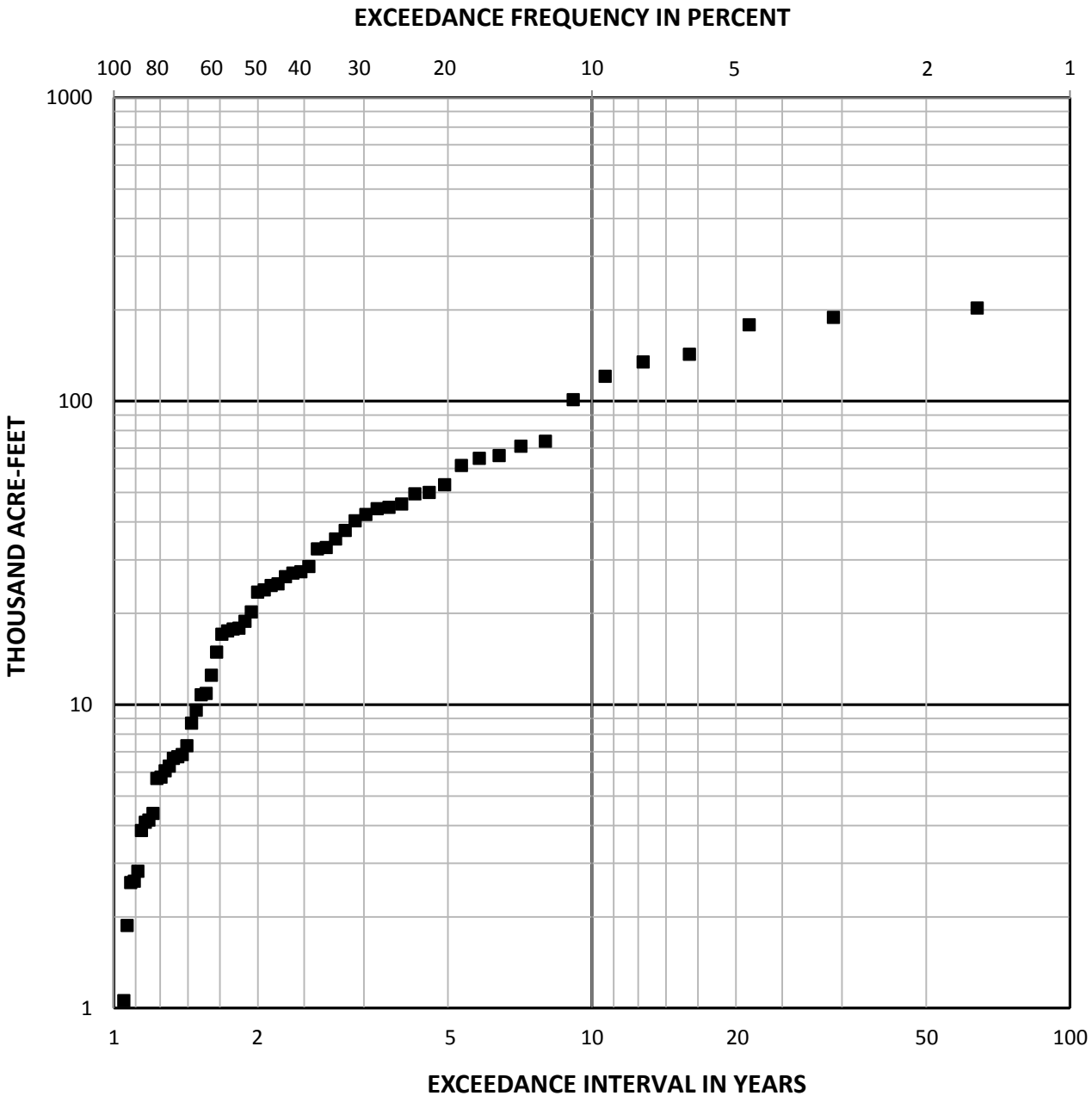
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

SEDIMENTATION AND DEGRADATION RANGES

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 2



TRINITY RIVER BASIN, TEXAS

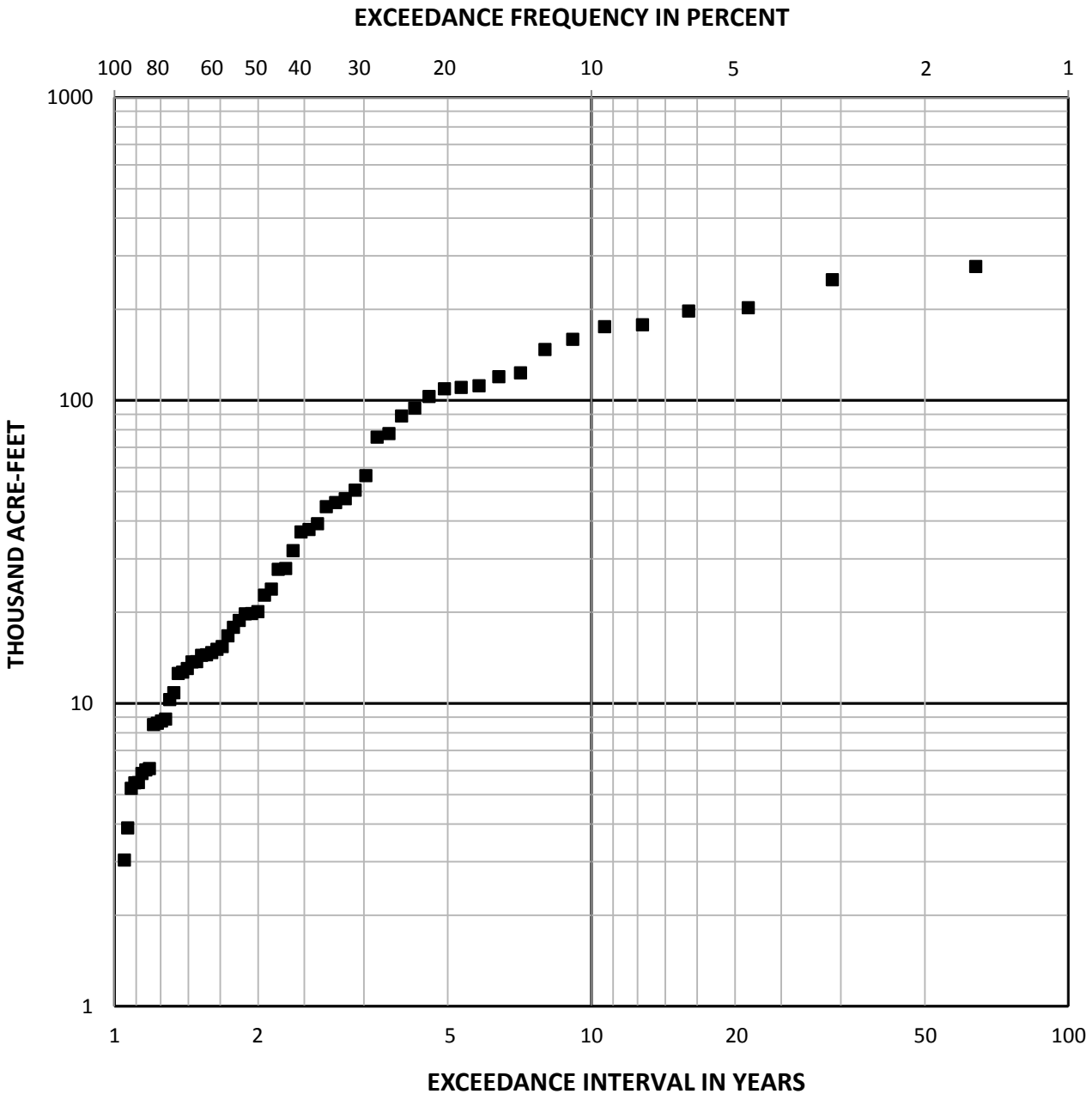
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

JANUARY INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 3



TRINITY RIVER BASIN, TEXAS

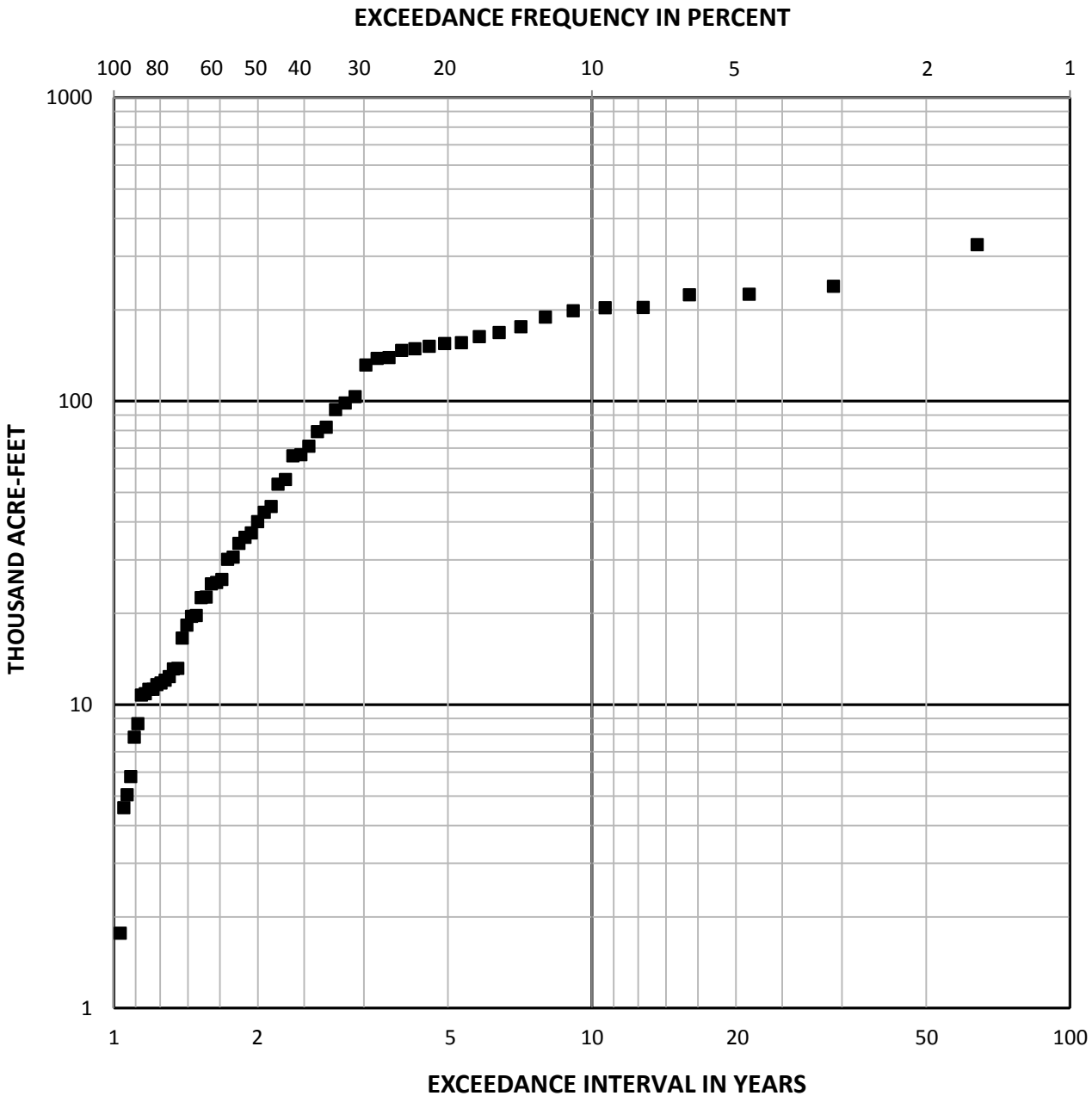
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

FEBRUARY INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 4



TRINITY RIVER BASIN, TEXAS

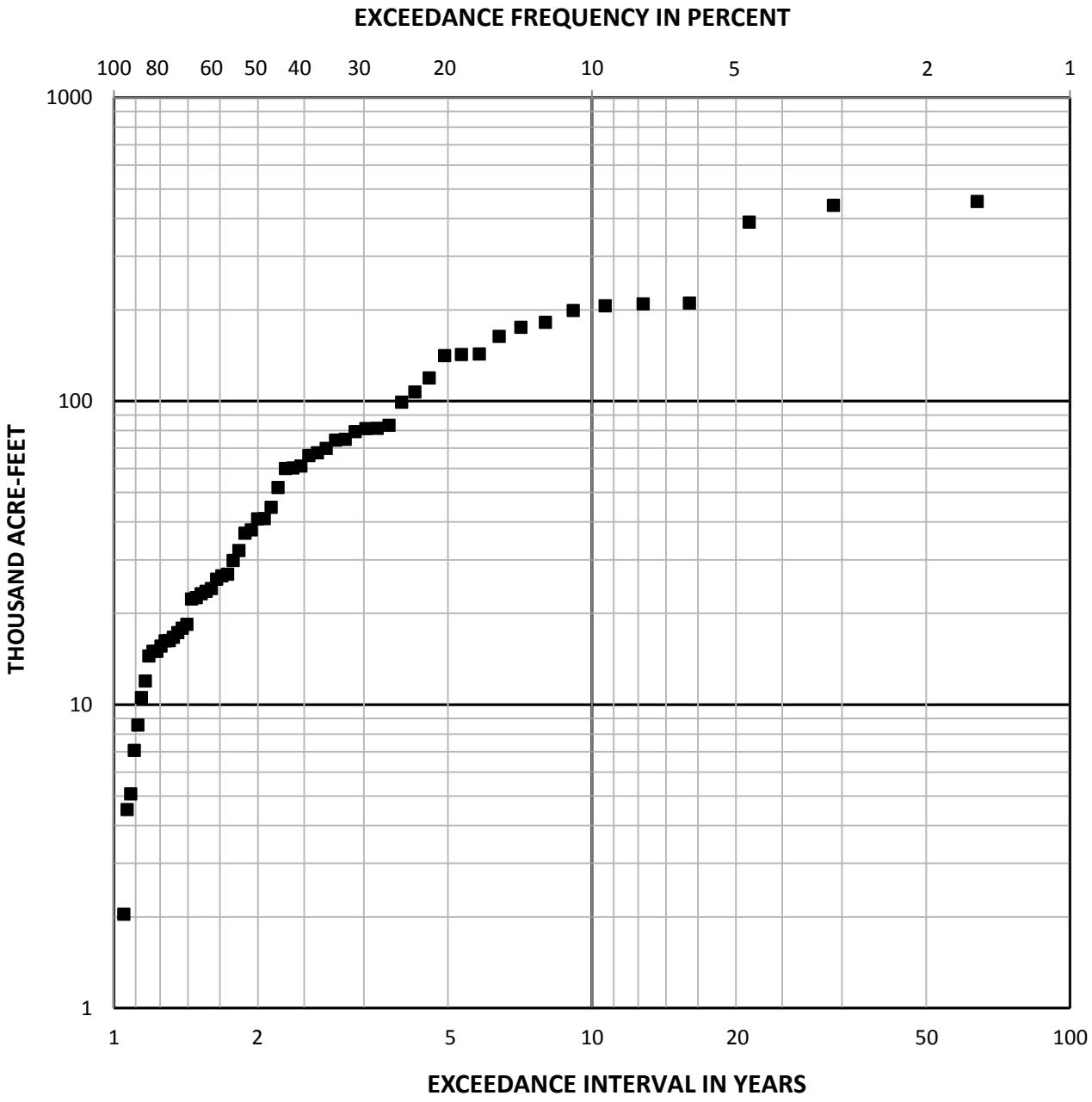
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

MARCH INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 5



TRINITY RIVER BASIN, TEXAS

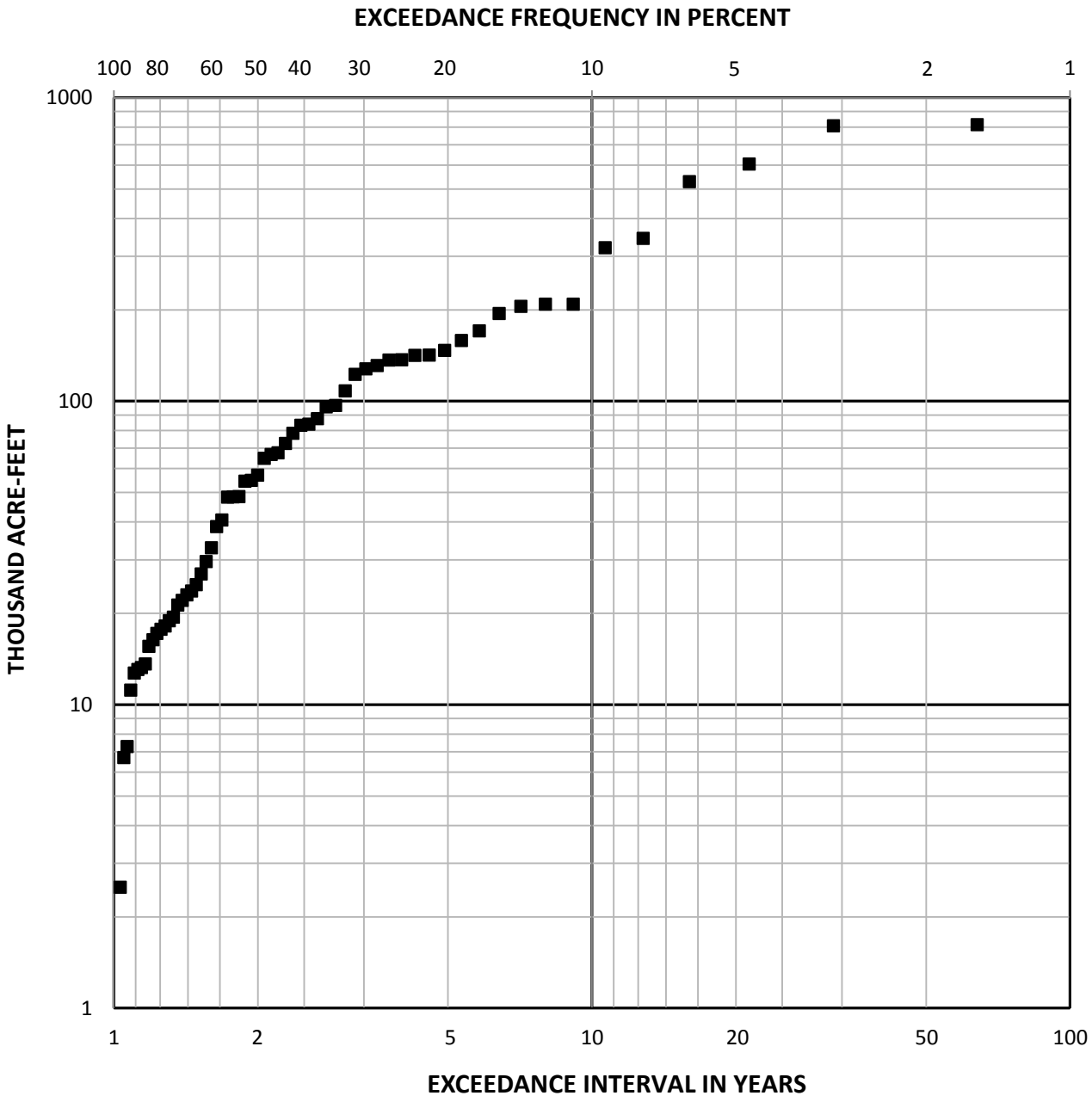
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

APRIL INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 6



TRINITY RIVER BASIN, TEXAS

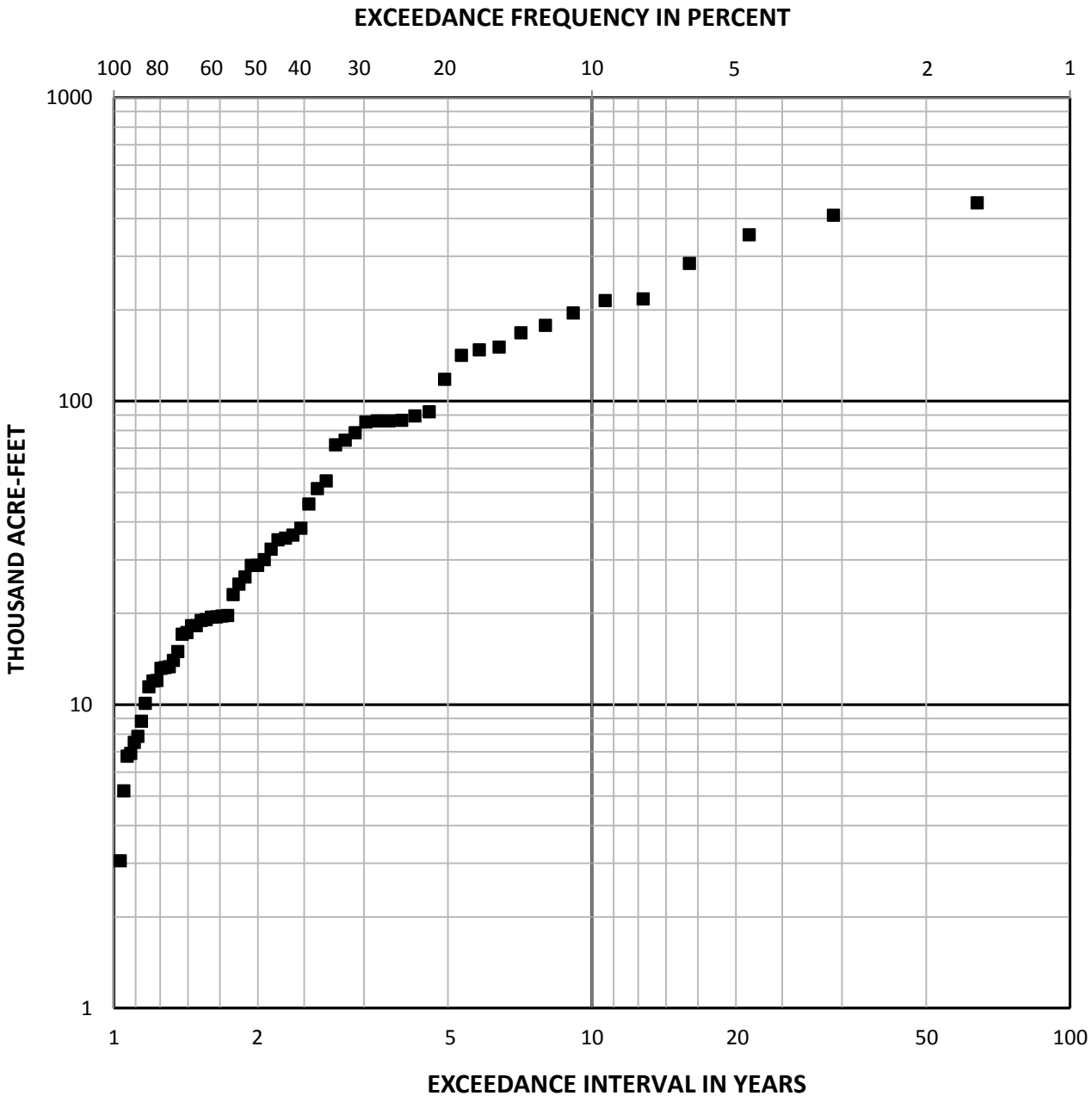
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

MAY INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 7



TRINITY RIVER BASIN, TEXAS

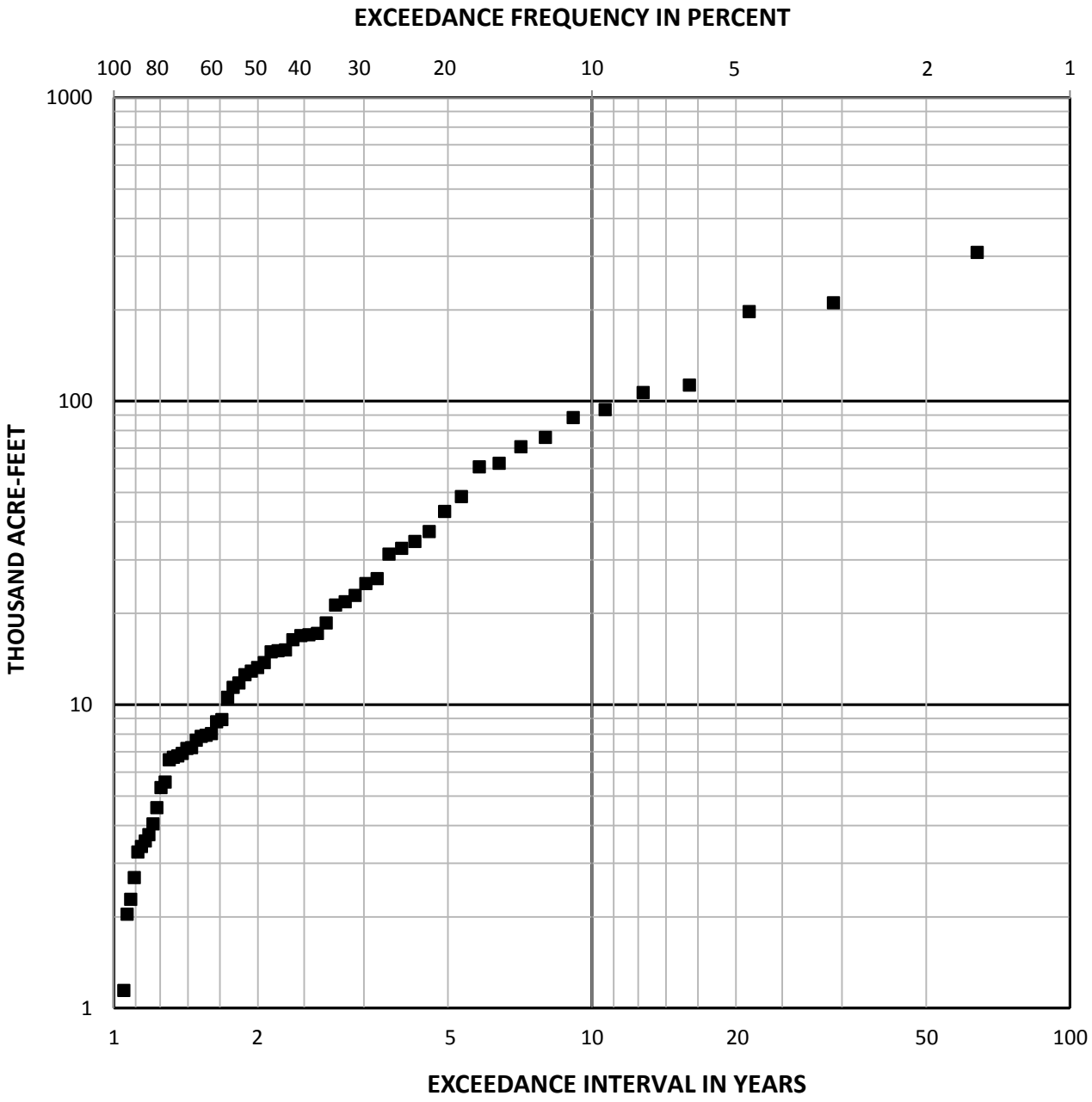
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

JUNE INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 8



TRINITY RIVER BASIN, TEXAS

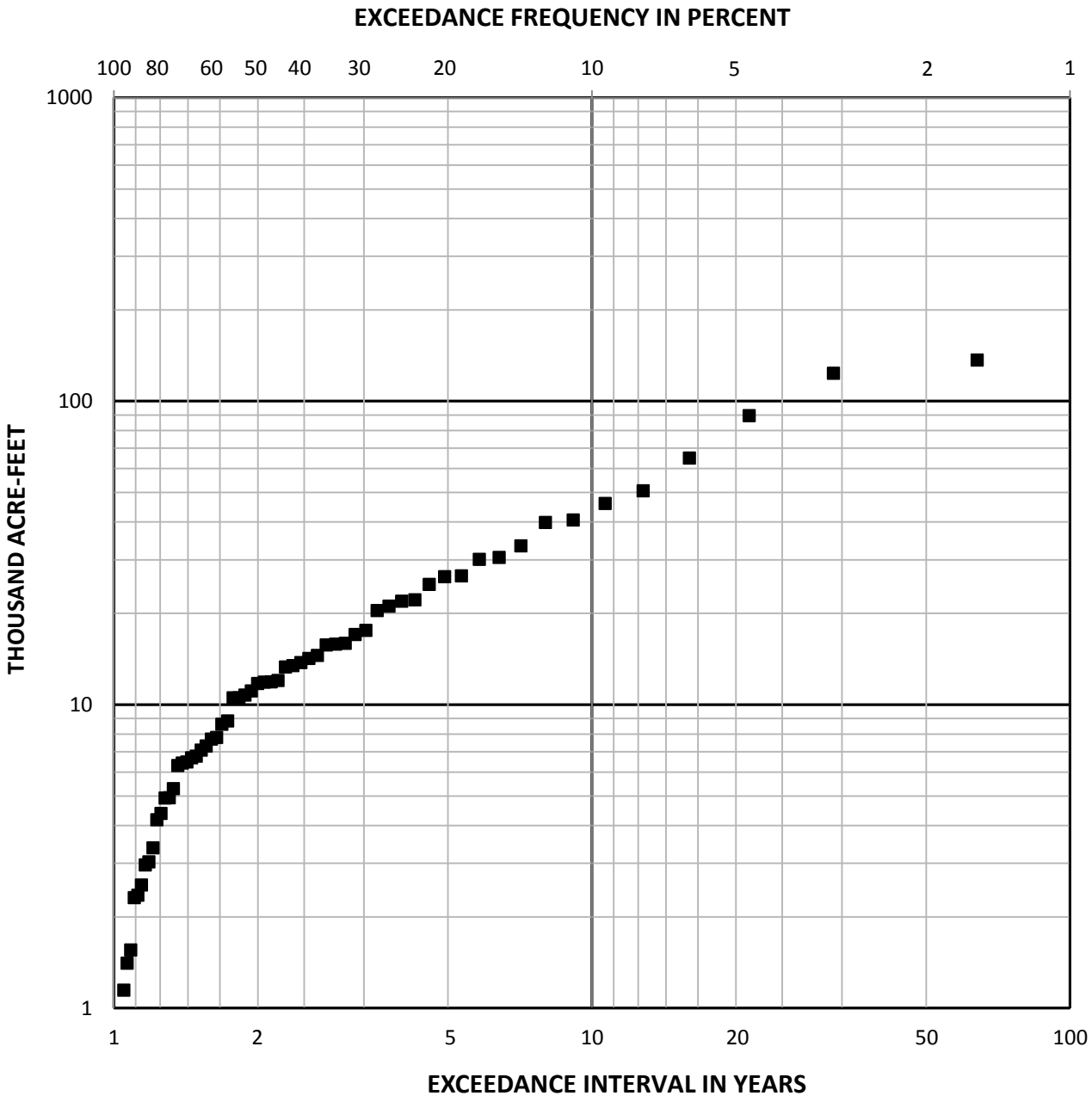
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

JULY INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 9



TRINITY RIVER BASIN, TEXAS

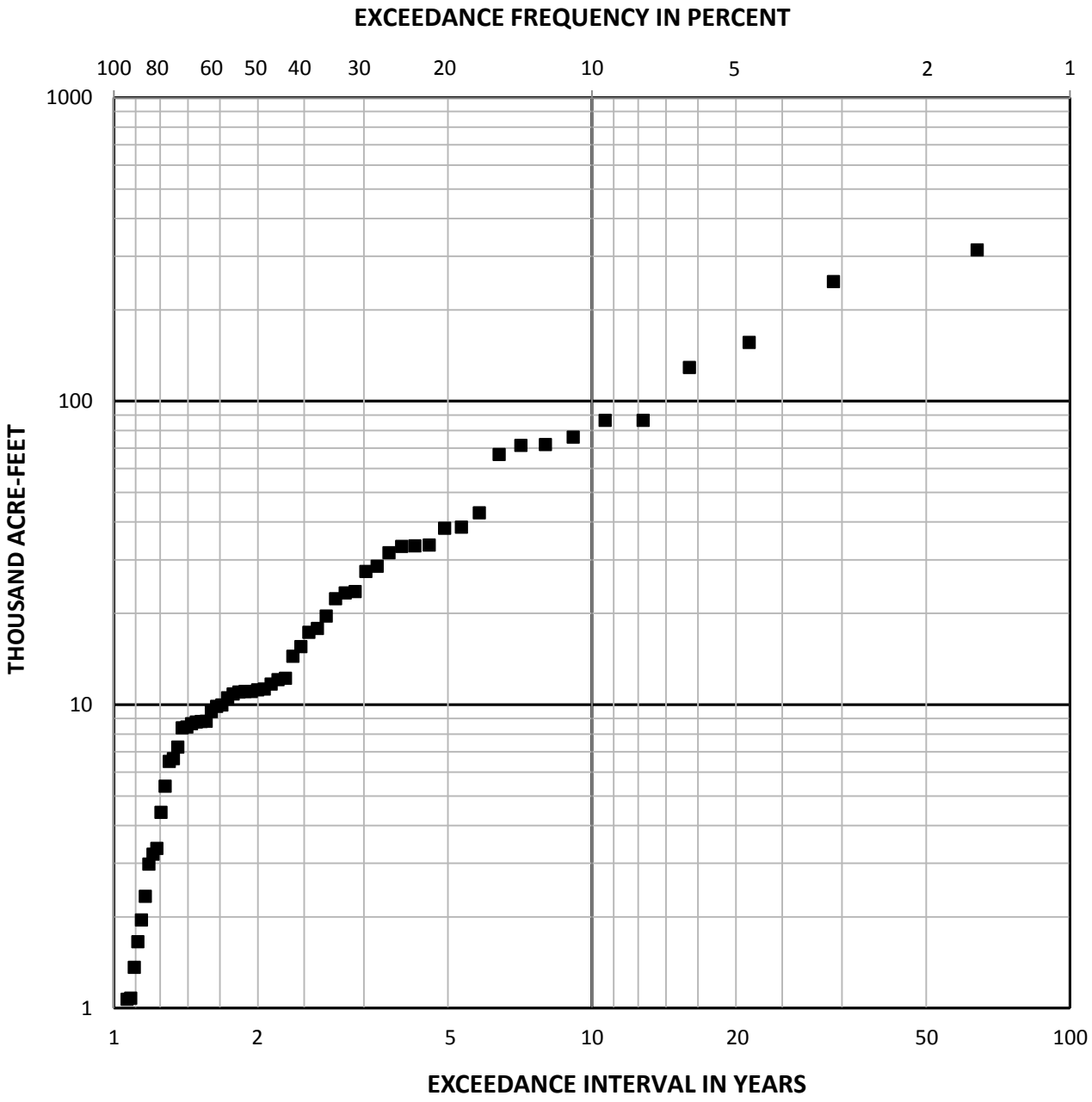
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

AUGUST INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 10



TRINITY RIVER BASIN, TEXAS

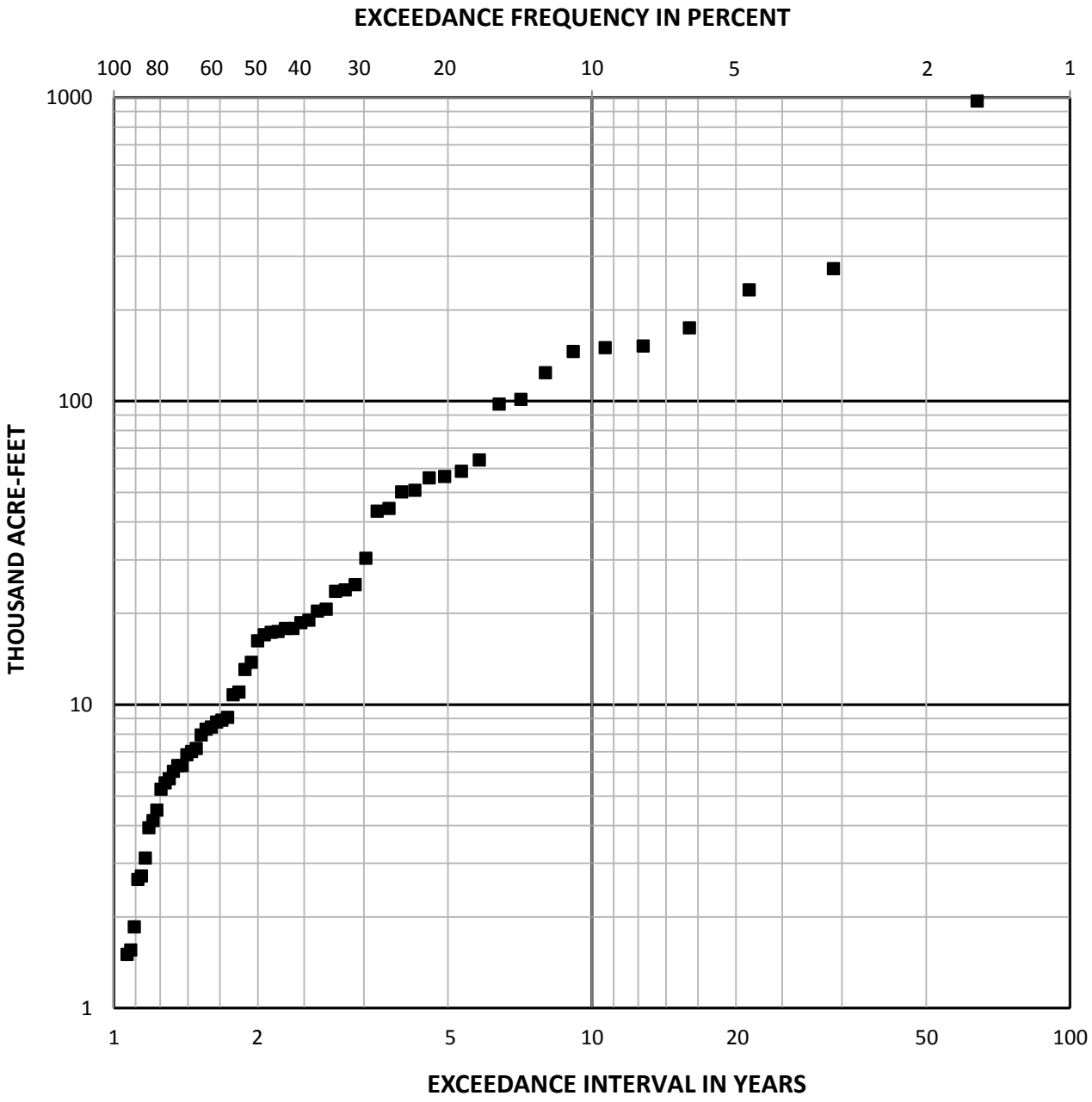
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

SEPTEMBER INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 11



TRINITY RIVER BASIN, TEXAS

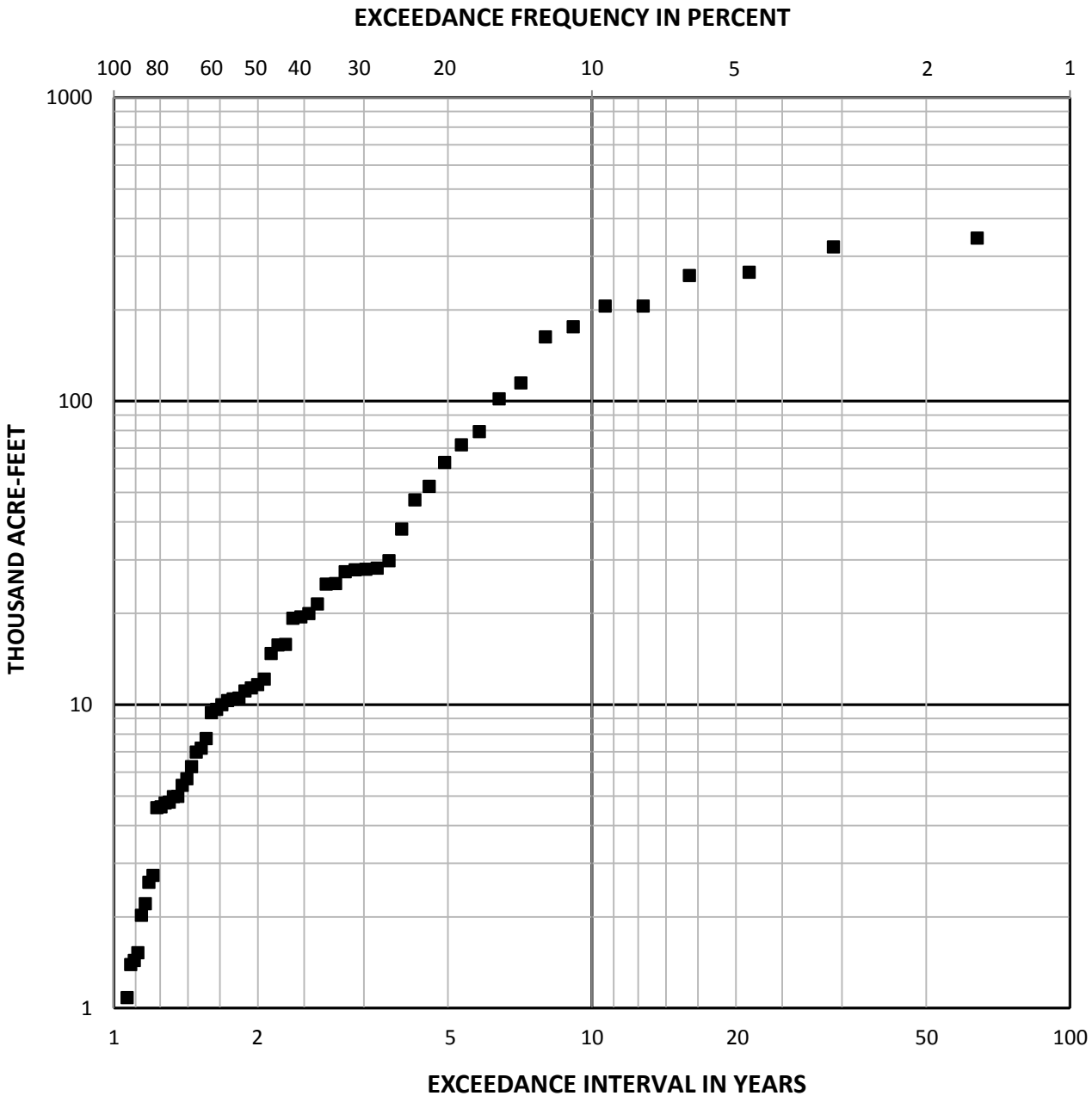
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OCTOBER INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 12



TRINITY RIVER BASIN, TEXAS

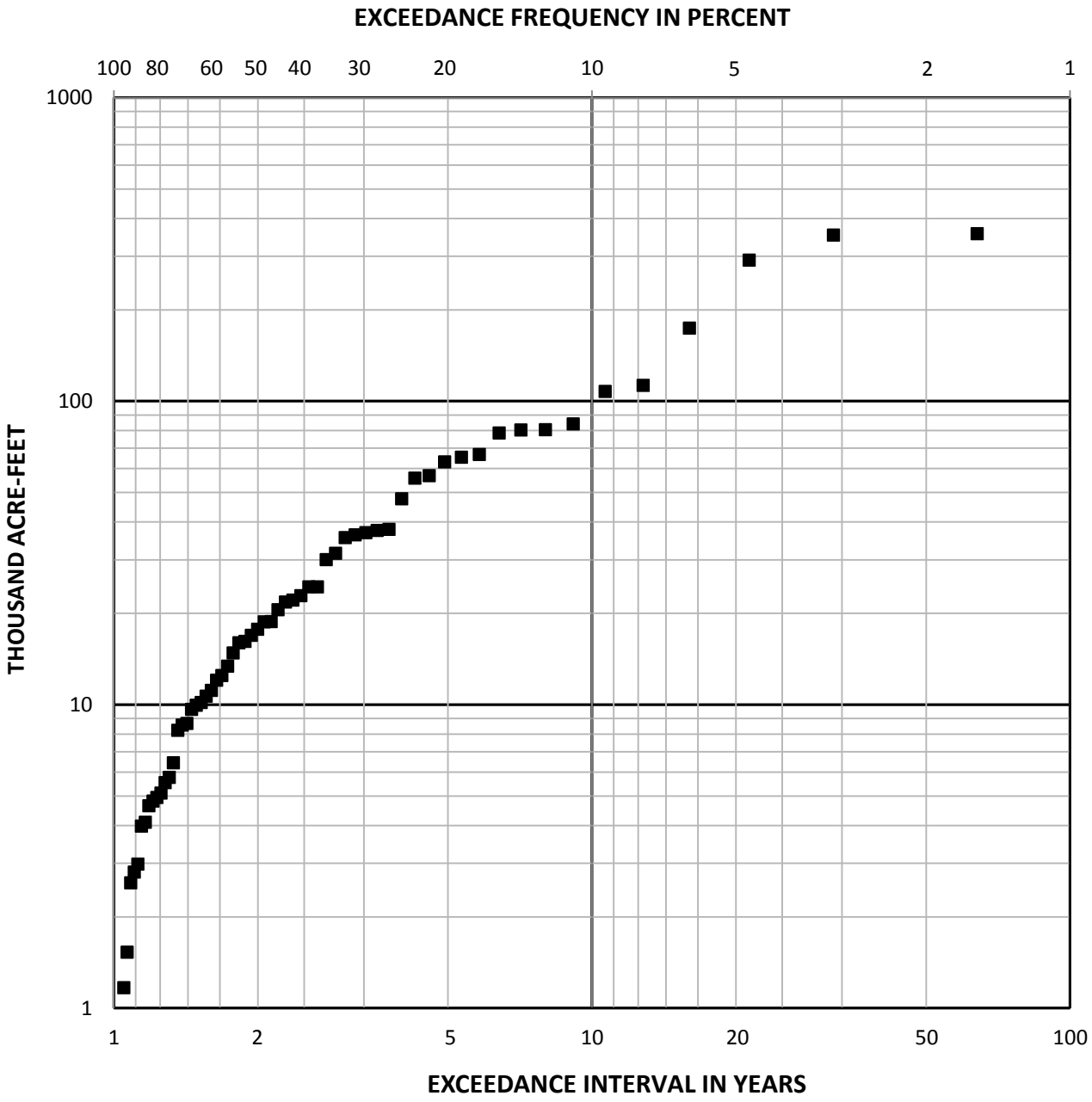
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

NOVEMBER INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 13



TRINITY RIVER BASIN, TEXAS

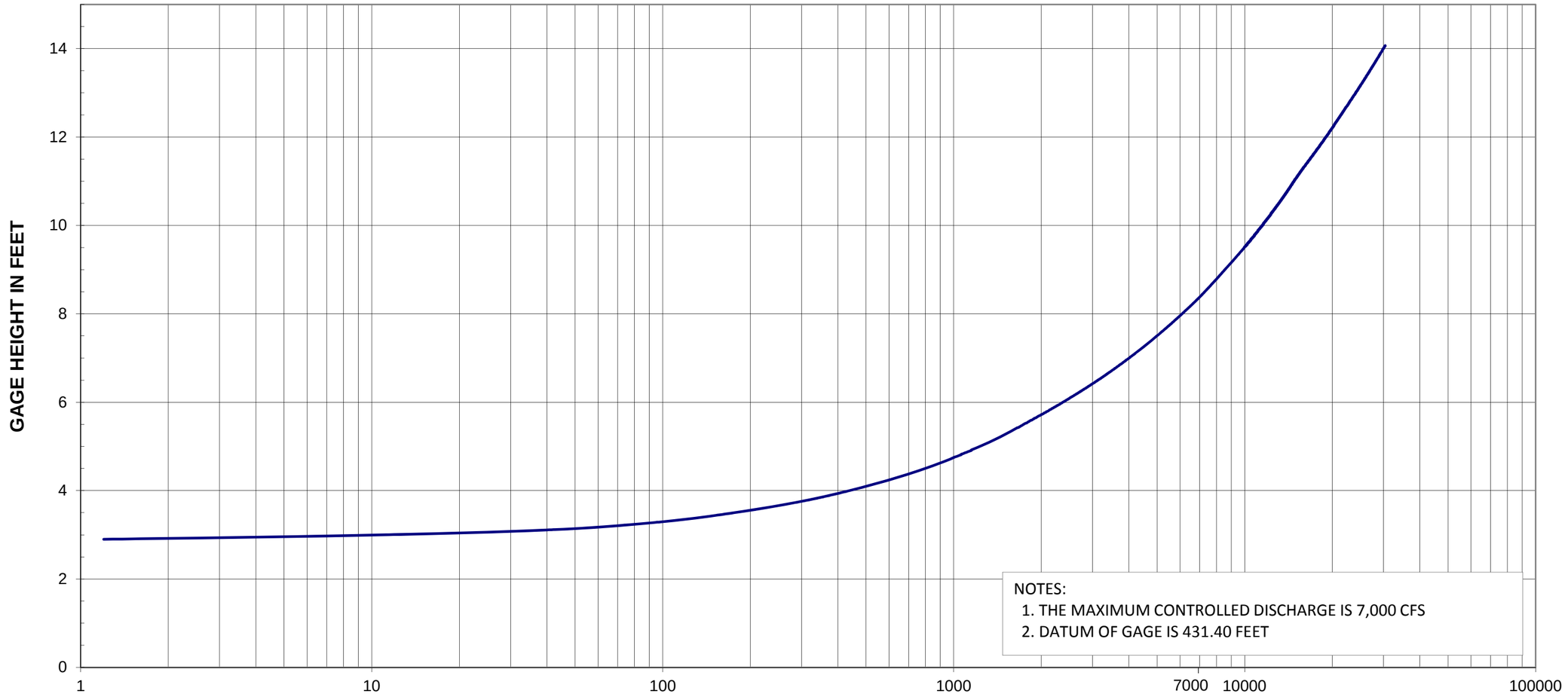
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

DECEMBER INFLOW FREQUENCY
1954-2016

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 4 - 14



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TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

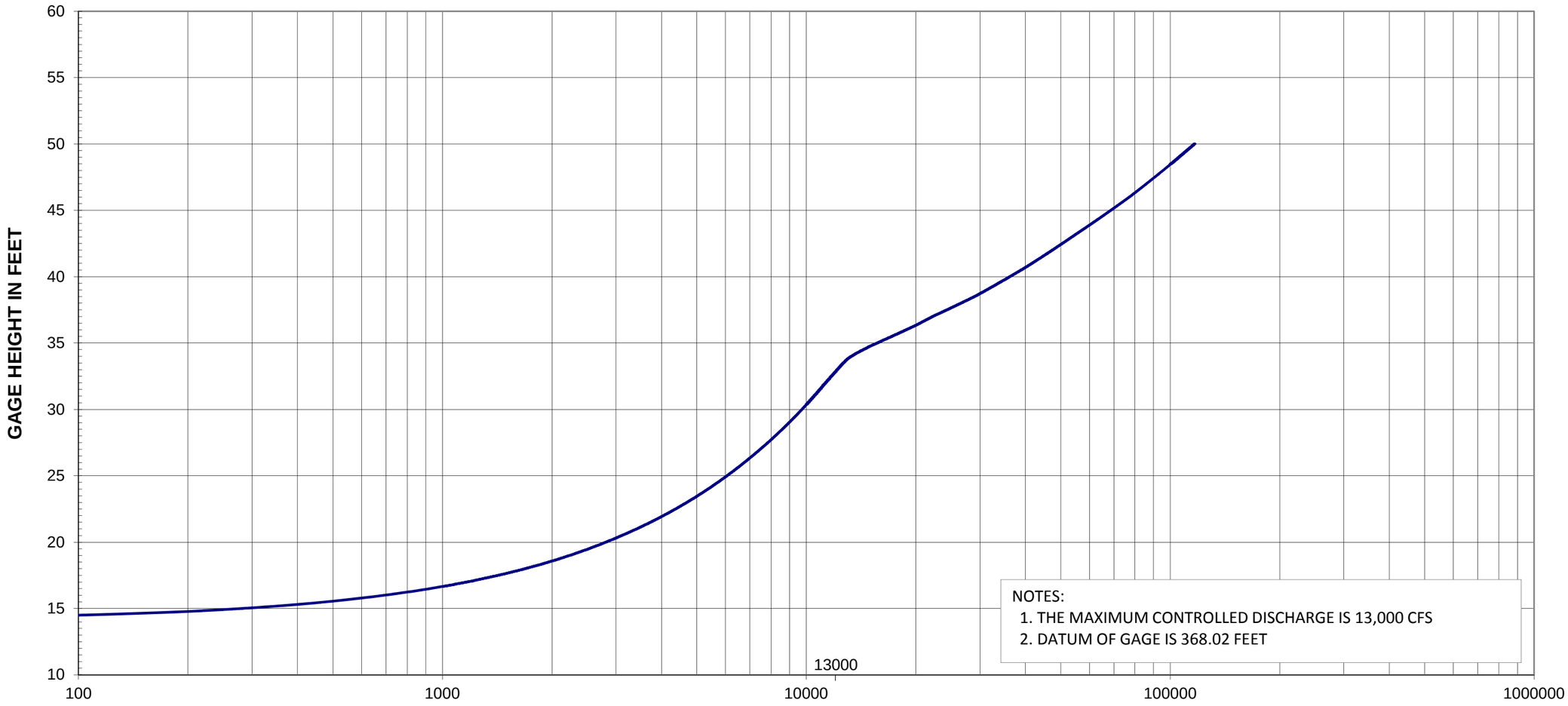
RATING CURVE

ELM FORK TRINITY RIVER NEAR CARROLLTON

USGS GAGE NO. 08055500

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

CORPS OF ENGINEERS U.S. ARMY



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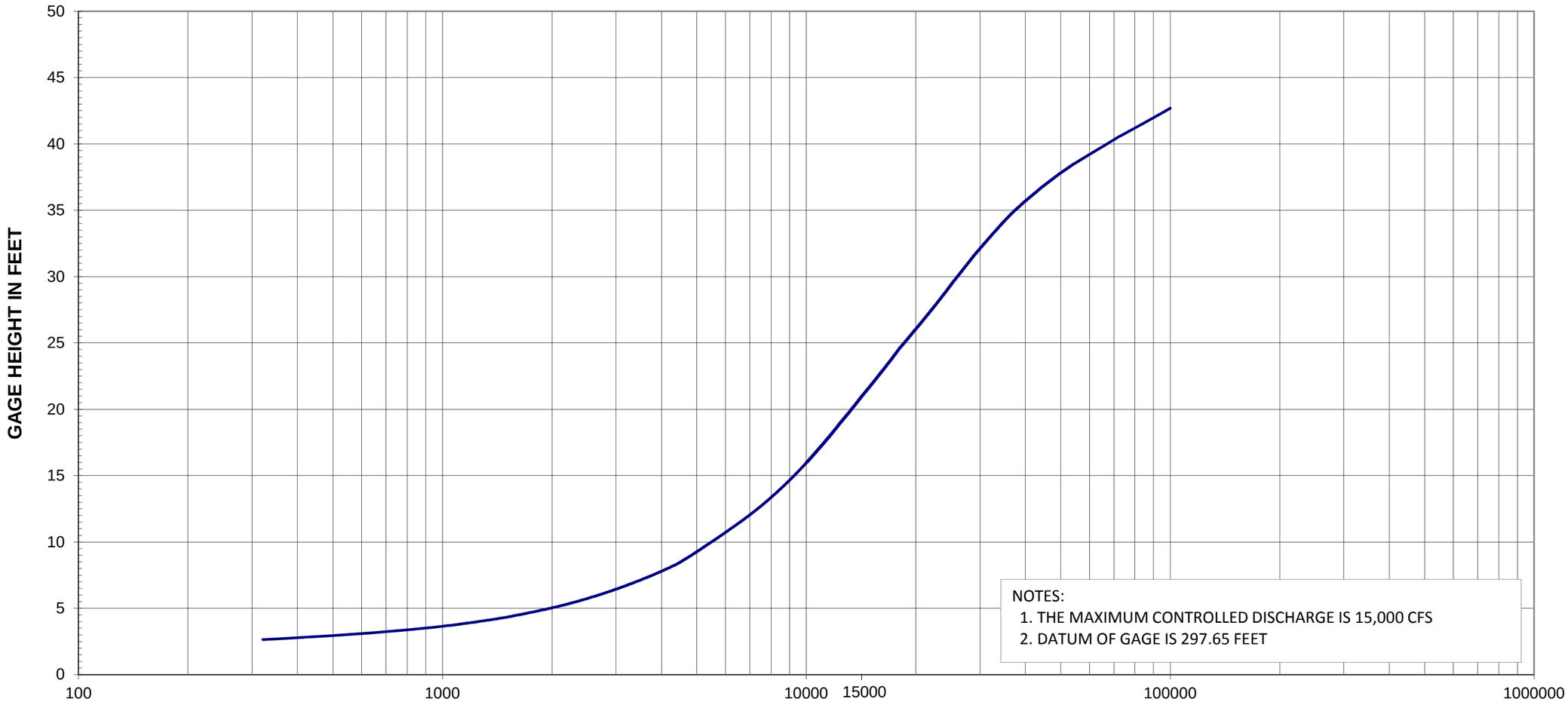
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

RATING CURVE
TRINITY RIVER AT DALLAS
USGS GAGE NO. 08057000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



DISCHARGE IN CUBIC FEET PER SECOND

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

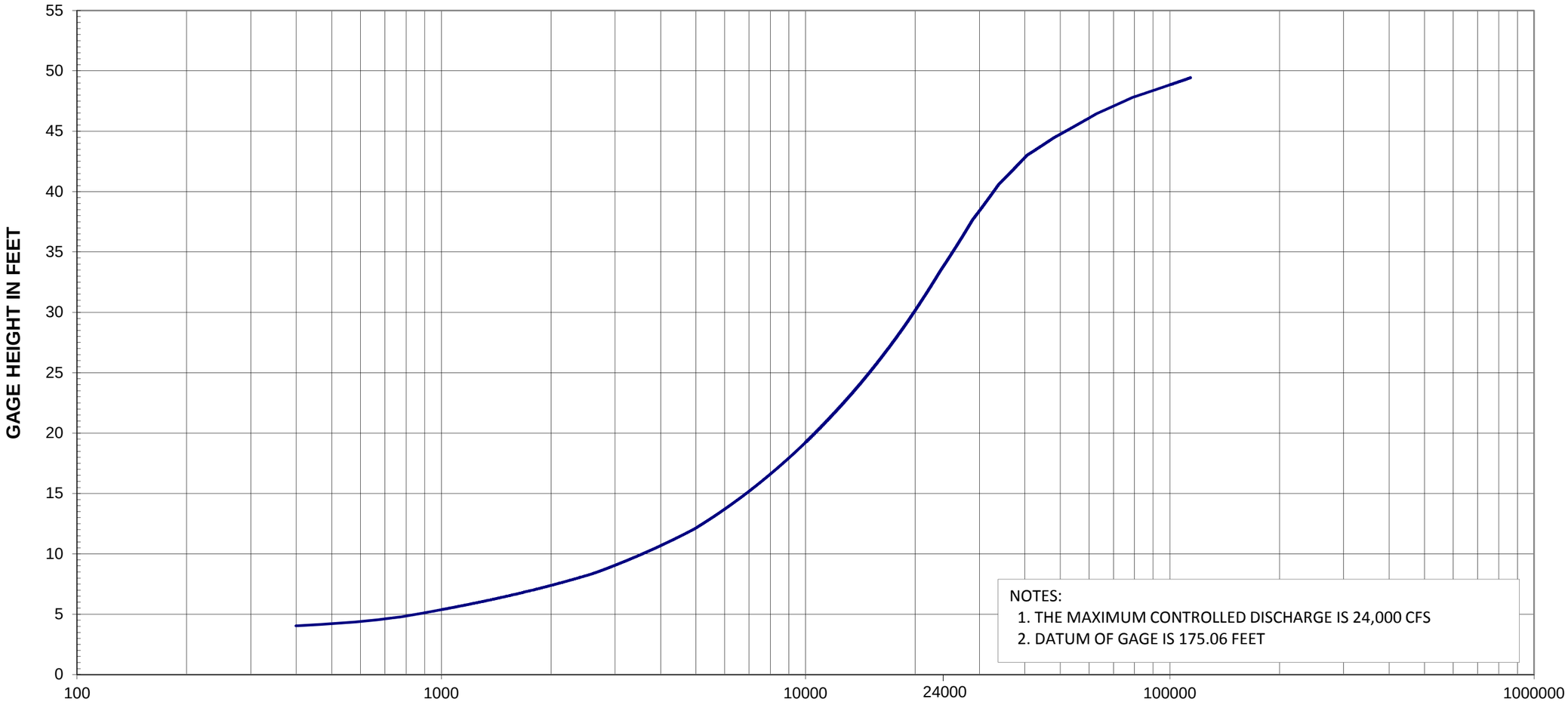
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

RATING CURVE
TRINITY RIVER NEAR ROSSER
USGS GAGE NO. 08062500

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018



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TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

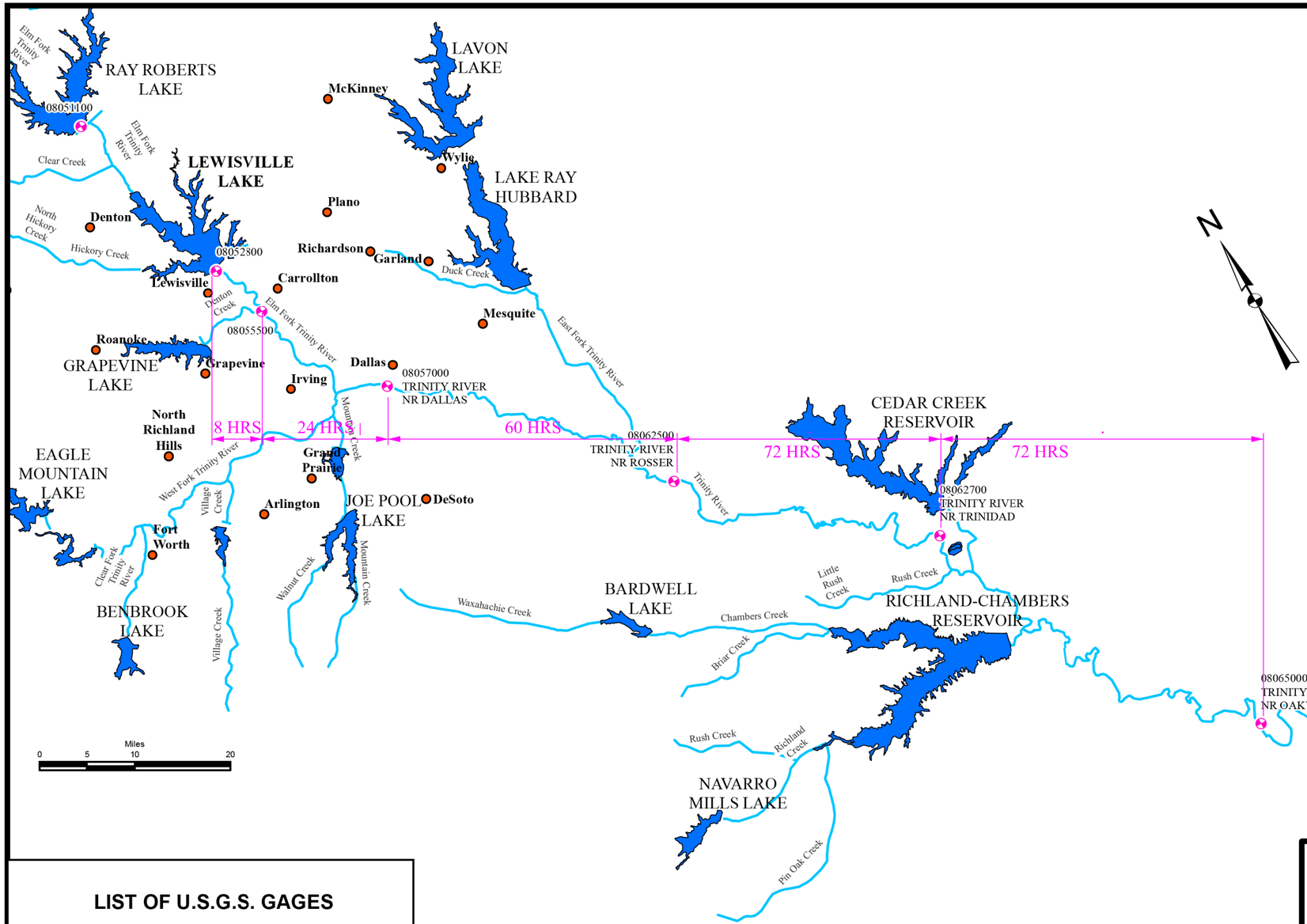
ELM FORK TRINITY RIVER

RATING CURVE

TRINITY RIVER NEAR OAKWOOD

USGS GAGE NO. 08065000

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:
08052800	LEWISVILLE LAKE NEAR LEWISVILLE, TX
08055500	ELM FORK TRINITY RIVER NEAR CARROLLTON, TX
08057000	TRINITY RIVER AT DALLAS, TX
08062500	TRINITY RIVER NEAR ROSSER, TX
08062700	TRINITY RIVER AT TRINIDAD, TX
08065000	TRINITY RIVER NEAR OAKWOOD, TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

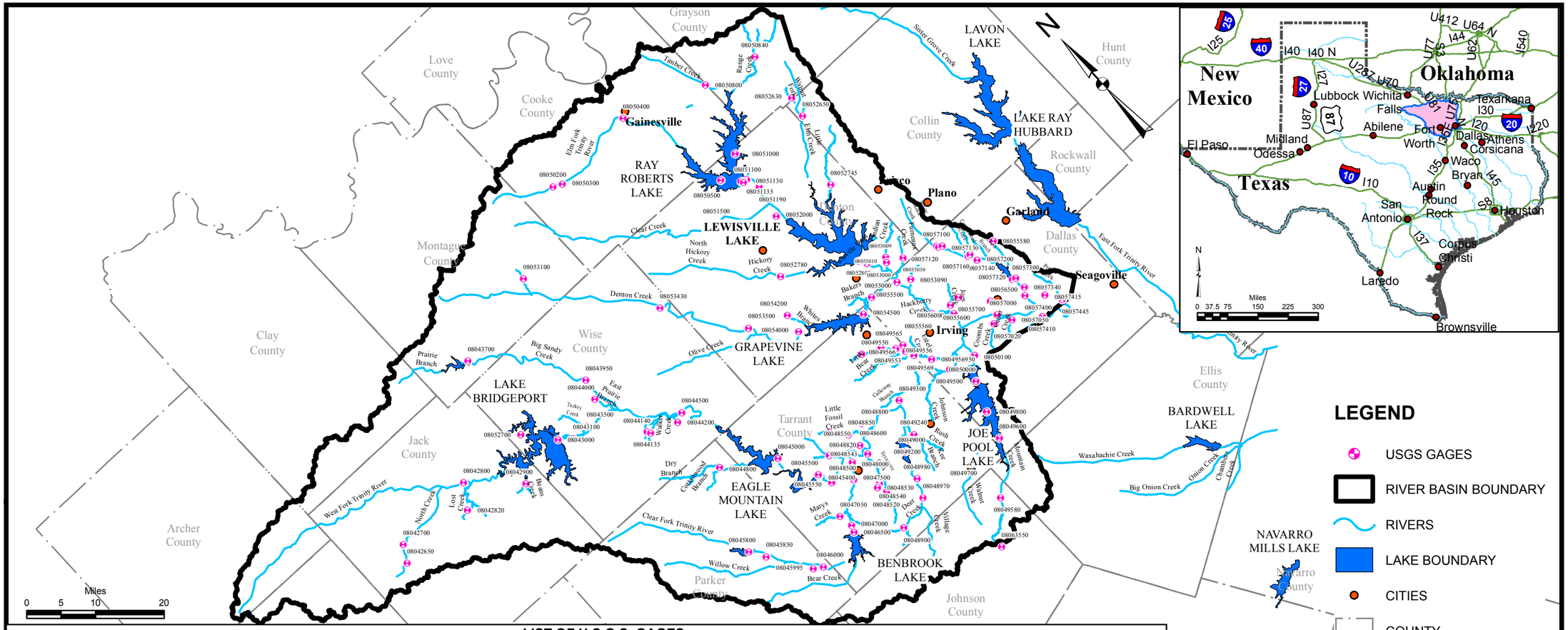
TRAVEL TIMES FROM LEWISVILLE DAM TO THE TRINITY RIVER AT OAKWOOD GAGE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- USGS GAGES
- RIVER BASIN BOUNDARY
- RIVERS
- LAKE BOUNDARY
- CITIES
- COUNTY

LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:
08042650	NORTH CREEK SWS NO. 28A NEAR JERMYN, TX (DISCONTINUED)
08042700	NORTH CREEK NEAR JACKSBORO, TX (DISCONTINUED)
08042800	W FORK TRINITY RIVER NEAR JACKSBORO, TX
08042820	LOST CREEK RES NEAR JACKSBORO, TX
08042900	BEANS CREEK AT WIZARD WELLS, TX (DISCONTINUED)
08043000	BRIDGEPORT RES ABOVE BRIDGEPORT, TX
08043100	W FORK TRINITY RIVER AT US HWY 380, BRIDGEPORT, TX
08043500	W FORK TRINITY RIVER AT BRIDGEPORT, TX (DISCONTINUED)
08043700	LAKE AMON G CARTER NEAR BOWIE, TX
08043950	BIG SANDY CREEK NEAR CHICO, TX
08044000	BIG SANDY CREEK NEAR BRIDGEPORT, TX
08044135	GARRETT CREEK NEAR PARADISE, TX (DISCONTINUED)
08044140	SALT CREEK NEAR PARADISE, TX (DISCONTINUED)
08044200	WALKER CREEK NEAR BOYD, TX (DISCONTINUED)
08044500	W FORK TRINITY RIVER NEAR BOYD, TX
08044800	WALNUT CREEK AT RENO, TX
08045000	EAGLE MTN RES ABOVE FT WORTH, TX
08045400	LAKE WORTH ABOVE FT WORTH, TX
08045500	W FORK TRINITY RIVER AT LAKE WORTH DAM ABOVE FT WORTH, TX (DISCONTINUED)
08045550	W FORK TRINITY RIVER AT WHITE SETTLEMENT RD, TX
08045800	LAKE WEATHERFORD NEAR WEATHERFORD, TX
08045850	CLEAR FORK TRINITY RIVER NEAR WEATHERFORD, TX
08045995	CLEAR FORK TRINITY RIVER AT KELLY RD NEAR ALEDO, TX
08046000	CLEAR FORK TRINITY RIVER NEAR ALEDO, TX (DISCONTINUED)
08046500	BENBROOK LAKE NEAR BENBROOK, TX
08047000	CLEAR FORK TRINITY RIVER NEAR BENBROOK. TX
08047050	MARYS CREEK AT BENBROOK, TX
08047500	CLEAR FORK TRINITY RIVER AT FT WORTH, TX
08048000	W FORK TRINITY RIVER AT FT WORTH, TX
08048500	MARINE CREEK AT FT WORTH, TX
08048520	SYCAMORE CREEK AT IH 35W, FT WORTH, TX
08048530	SYCAMORE CREEK TRIB ABV SEM ST SHOP CEN, FT WORTH, TX
08048540	SYCAMORE CREEK TRIB AT IH 35W, FT WORTH, TX
08048543	W FORK TRINITY RIVER AT BEACH ST, FT WORTH, TX
08048550	DRY BRANCH AT BLANDIN ST, FT WORTH, TX
08048600	DRY BRANCH AT FAIN ST, FT WORTH, TX
08048800	BIG FOSSIL CREEK AT HALTOM CITY, TX
08048820	LITTLE FOSSIL CREEK AT IH 820, FT WORTH, TX
08048850	LITTLE FOSSIL CREEK AT MESQUITE ST, FT WORTH, TX

GAGE ID:	LOCATION:
08048900	DEER CREEK TRIB NEAR CROWLEY, TX (DISCONTINUED)
08048970	VILLAGE CREEK AT EVERMAN, TX
08048980	VILLAGE CREEK AT KENNEDALE, TX
08049000	VILLAGE CREEK NEAR HANDLEY, TX
08049200	LAKE ARLINGTON AT ARLINGTON, TX
08049240	RUSH CREEK AT WOODLAND PARK BLVD, ARLINGTON, TX
08049300	W FORK TRINITY RIVER AT GREENBELT RD, FORT WORTH, TX
08049500	W FORK TRINITY RIVER AT GRAND PRAIRIE, TX
08049550	BIG B BEAR CREEK NEAR GRAPEVINE, TX (DISCONTINUED)
08049553	BIG BEAR CREEK AT EULESS RD NEAR GRAPEVINE,TX
08049556	UNM TRIB BIG BEAR CREEK (OFL 19) NEAR EULESS, TX
08049565	TRIGG BRANCH AT DFW AIRPORT NEAR EULESS, TX
08049566	TRIGG LAKE AT DFW AIRPORT NEAR FT WORTH, TX
08049569	BEAR CREEK AT SH 183 NEAR EULESS, TX
08049580	MOUNTAIN CREEK NEAR VENUS, TX
08049600	MOUNTAIN CREEK NEAR CEDAR HILL, TX
08049700	WALNUT CREEK NEAR MANSFIELD, TX
08049800	JOE POOL LAKE NEAR DUNCANVILLE, TX
08050000	MOUNTAIN CREEK NEAR GRAND PRAIRIE, TX
08050100	MOUNTAIN CREEK AT GRAND PRAIRIE, TX
08050200	ELM FORK TRINITY SWS NO. 6-0 NEAR MUENSTER, TX (DISCONTINUED)
08050300	ELM FORK TRINITY RIVER NEAR MUENSTER, TX
08050400	ELM FORK TRINITY RIVER AT GAINESVILLE, TX
08050500	ELM FORK TRINITY RIVER NEAR SANGER, TX (DISCONTINUED)
08050800	TIMBER CREEK NEAR COLLINSVILLE, TX
08050840	RANGE CREEK NEAR COLLINSVILLE, TX
08051000	ISLE DU BOIS CREEK NEAR PILOT POINT, TX (DISCONTINUED)
08051100	RAY ROBERTS LAKE NEAR PILOT POINT, TX
08051130	ELM FORK TRINITY RIVER NEAR PILOT POINT, TX
08051135	ELM FORK TRINITY RIVER AT GREENBELT NEAR PILOT POINT, TX
08051190	ELM FORK TRINITY RIVER ABOVE AUBREY, TX (DISCONTINUED)
08051500	CLEAR CREEK NEAR SANGER, TX
08052000	ELM FORK TRINITY RIVER NEAR DENTON, TX (DISCONTINUED)
08052630	LITTLE ELM CREEK SWS NO. 10 NEAR GUNTER, TX (DISCONTINUED)
08052650	LITTLE ELM CREEK NEAR CELINA, TX (DISCONTINUED)
08052700	LITTLE ELM CREEK NEAR AUBREY, TX
08052745	DOE BRANCH AT US HWY 380 NEAR PROSPER, TX
08052780	HICREEKORY CREEK AT DENTON, TX

GAGE ID:	LOCATION:
08052800	LEWISVILLE LAKE NEAR LEWISVILLE, TX
08053000	ELM FORK TRINITY RIVER NEAR LEWISVILLE, TX
08053009	INDIAN CREEK AT FM 2281, CARROLLTON, TX
08053010	INDIAN CREEK AT HEBRON PKWY, CARROLLTON, TX (DISCONTINUED)
08053030	FURNEAUX CREEK AT JOSEY LANE, CARROLLTON, TX (DISCONTINUED)
08053090	HUTTON BRANCH AT BROADWAY, CARROLLTON, TX (DISCONTINUED)
08053100	JONES VALLEY CREEK TRIB NEAR FORESTBURG, TX (DISCONTINUED)
08053430	DENTON CREEK AT CR 2513 NEAR DECATUR, TX
08053500	DENTON CREEK NEAR JUSTIN, TX
08054000	DENTON CREEK NEAR ROANOKE, TX (DISCONTINUED)
08054200	GAMBLE BRANCH NEAR ARGYLE, TX (DISCONTINUED)
08054500	GRAPEVINE LAKE NEAR GRAPEVINE, TX
08055000	DENTON CREEK NEAR GRAPEVINE, TX
08055500	ELM FORK TRINITY RIVER NEAR CARROLLTON, TX
08055560	ELM FORK TRINITY RIVER AT SPUR 348, IRVING, TX
08055580	JOES CREEK AT ROYAL LANE, DALLAS, TX
08055600	JOES CREEK AT DALLAS, TX (DISCONTINUED)
08055700	BACHMAN BRANCH AT DALLAS, TX (DISCONTINUED)
08056000	ELM FORK TRINITY RIVER AT FRASIER DAM, TX
08056500	TURTLE CREEK AT DALLAS, TX
08057000	TRINITY RIVER AT DALLAS, TX
08057020	COOMBS CREEK AT SYLVAN AVE, DALLAS, TX
08057050	CEDAR CREEK AT BONNIE VIEW RD, DALLAS, TX
08057100	WHITE ROCK CREEK AT KELLER SPGS RD, DALLAS, TX
08057120	MCKAMEY CREEK AT PRESTON RD, DALLAS, TX
08057130	RUSH BRANCH AT ARAPAHO RD, DALLAS, TX
08057140	COTTONWOOD CREEK AT FOREST LANE, DALLAS, TX
08057160	FLOYD BRANCH AT FOREST LANE, DALLAS, TX
08057200	WHITE ROCK CREEK AT GREENVILLE AVE, DALLAS, TX
08057300	WHITE ROCK CREEK AT WHITE ROCK LAKE, DALLAS, TX
08057320	ASH CREEK AT HIGHLAND RD, DALLAS, TX
08057340	FORNEY CREEK AT LAWNVIEW AVE, DALLAS, TX
08057400	WHITE ROCK CREEK AT SCYENE RD, DALLAS, TX
08057410	TRINITY RIVER BELOW DALLAS, TX
08057415	ELAM CREEK AT SECO BLVD, DALLAS, TX
08057445	PRAIRIE CREEK AT US HWY 175, DALLAS, TX
08063550	ALVARADO BR NEAR ALVARADO, TX
0804956950	BEAR CREEK AT SHADY GROVE RD, GRAND PRAIRIE, TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

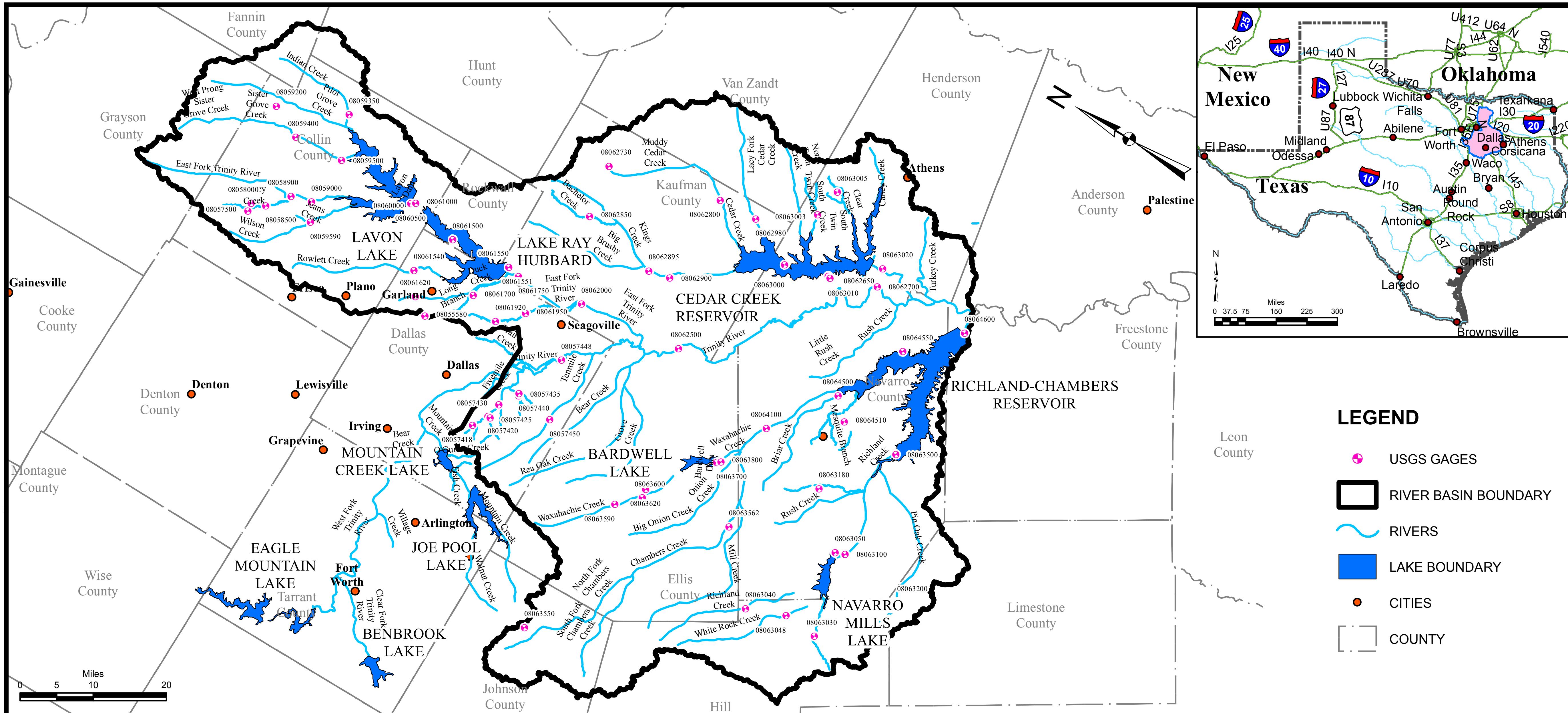
ELM FORK TRINITY RIVER

HYDROLOGIC NETWORK
UPPER TRINITY RIVER BASIN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 1a



LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:	GAGE ID:	LOCATION:	GAGE ID:	LOCATION:
08055580	JOES CREEK AT ROYAL LANE, DALLAS, TX (DISCONTINUED)	08061500	E FORK TRINITY RIVER NEAR ROCKWALL, TX (DISCONTINUED)	08063030	ASH CREEK AT HWY 171 NEAR MALONE, TX
08057418	FIVEMILE CREEK AT KIEST BLVD, DALLAS, TX (DISCONTINUED)	08061540	ROWLETT CREEK NEAR SACHSE, TX	08061550	LAKE RAY HUBBARD NEAR FORNEY, TX
08057420	FIVEMILE CREEK AT US HWY 77W, DALLAS, TX (DISCONTINUED)	08061620	DUCK CREEK AT BUCKINGHAM RD, GARLAND, TX (DISCONTINUED)	08061551	E FORK TRINITY RIVER BELOW LAKE RAY HUBBARD, TX
08057425	WOODY BR AT US HWY 77, DALLAS, TX (DISCONTINUED)	08061700	DUCK CREEK NEAR GARLAND, TX (DISCONTINUED)	08063040	RICHLAND CREEK AT HWY 22 NEAR MERTENS, TX
08057430	FIVEMILE CREEK AT LANCASTER RD, DALLAS, TX (DISCONTINUED)	08061750	E FORK TRINITY RIVER NEAR FORNEY, TX	08063048	WHITE ROCK CREEK AT FM 308 NEAR IRENE, TX
08057435	NEWTON CREEK AT IH 635, DALLAS, TX (DISCONTINUED)	08061920	S MESQUITE CREEK AT SH 352, MESQUITE, TX (DISCONTINUED)	08063050	NAVARRO MILLS LAKE NEAR DAWSON, TX
08057440	WHITES BRANCH AT IH 625, DALLAS, TX (DISCONTINUED)	08061950	S MESQUITE CREEK AT MERCURY RD, N MESQUITE, TX (DISCONTINUED)	08063100	RICHLAND CREEK NEAR DAWSON, TX
08057448	TRINITY RIVER NEAR WILMER, TX (DISCONTINUED)	08062000	E FORK TRINITY RIVER NEAR CRANDAL, TX	08063180	BRIAR CREEK TRIB NEAR CORSICANA, TX (DISCONTINUED)
08057450	TENMILE CREEK AT SH 342, LANCASTER, TX (DISCONTINUED)	08062500	TRINITY RIVER NEAR ROSSER, TX	08063200	PIN OAK CREEK NEAR HUBBARD, TX (DISCONTINUED)
08057500	HONEY CREEK SWS NO. 11 NEAR MCKINNEY, TX (DISCONTINUED)	08062650	CEDAR CREEK RESERVOIR SPILLWAY OUTFLOW NEAR TRINIDAD, TX (DISCONTINUED)	08063500	RICHLAND CREEK NEAR RICHLAND, TX (DISCONTINUED)
08058000	HONEY CREEK SWS NO. 12 NEAR MCKINNEY, TX (DISCONTINUED)	08062700	TRINITY RIVER AT TRINIDAD, TX	08063550	ALVARADO BRANCH NEAR ALVARADO, TX (DISCONTINUED)
08058500	HONEY CREEK NEAR MCKINNEY, TX (DISCONTINUED)	08062730	NEW TERRELL CITY LAKE NEAR TERRELL, TX	08063562	CHAMBERS CREEK AT FM 55 NEAR AVALON, TX
08058900	E FORK TRINITY RIVER AT MCKINNEY, TX (DISCONTINUED)	08062800	CEDAR CREEK NEAR KEMP, TX	08063590	WAXAHACHIE CREEK AT WAXAHACHIE, TX
08059000	E FORK TRINITY RIVER NEAR MCKINNEY, TX	08062850	BACHELOR CREEK NEAR TERRELL, TX (DISCONTINUED)	08063600	LAKE WAXAHACHIE NEAR WAXAHACHIE, TX
08059200	ARLS BRANCH NEAR WESTMINSTER, TX (DISCONTINUED)	08062895	KINGS CREEK AT SH 34 NEAR KAUFMAN, TX	08063620	KINGS BRANCH NEAR REAGOR SPRINGS, TX (DISCONTINUED)
08059350	INDIAN CREEK AT SH 78 NEAR FARMERSVILLE, TX	08062900	KINGS CREEK NEAR KAUFMAN, TX (DISCONTINUED)	08063700	BARDWELL LAKE NEAR ENNIS, TX
08059400	SISTER GROVE CREEK NEAR BLUE RIDGE, TX	08062980	LACEY FORK NEAR MABANK, TX (DISCONTINUED)	08063800	WAXAHACHIE CREEK NEAR BARDWELL, TX
08059500	SISTER GROVE CREEK NEAR PRINCETON, TX (DISCONTINUED)	08063000	CEDAR CREEK NEAR MABANK, TX (DISCONTINUED)	08064100	CHAMBERS CREEK NEAR RICE, TX
08059590	WILSON CREEK DWS OF HWY 75 AT MCREEKINNEY, TX	08063003	S TWIN CREEK NEAR EUSTACE, TX (DISCONTINUED)	08064500	CHAMBERS CREEK NEAR CORSICANA, TX (DISCONTINUED)
08060000	E FORK TRINITY RIVER ABOVE PILOT GROVE NEAR LAVON, TX (DISCONTINUED)	08063005	RED OAK BRANCH NEAR EUSTACE, TX (DISCONTINUED)	08064510	HALBERT LAKE NEAR CORSICANA, TX
08060500	LAVON LAKE NEAR LAVON, TX	08063010	CEDAR CREEK RES NEAR TRINIDAD, TX (DISCONTINUED)	08064550	RICHLAND-CHAMBERS RES NEAR KERENS, TX
08061000	E FORK TRINITY RIVER NEAR LAVON, TX (DISCONTINUED)	08063020	CEDAR CREEK AT TRINIDAD, TX	08064600	RICHLAND CREEK NEAR FAIRFIELD, TX (DISCONTINUED)

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

HYDROLOGIC NETWORK
MIDDDLE TRINITY RIVER BASIN

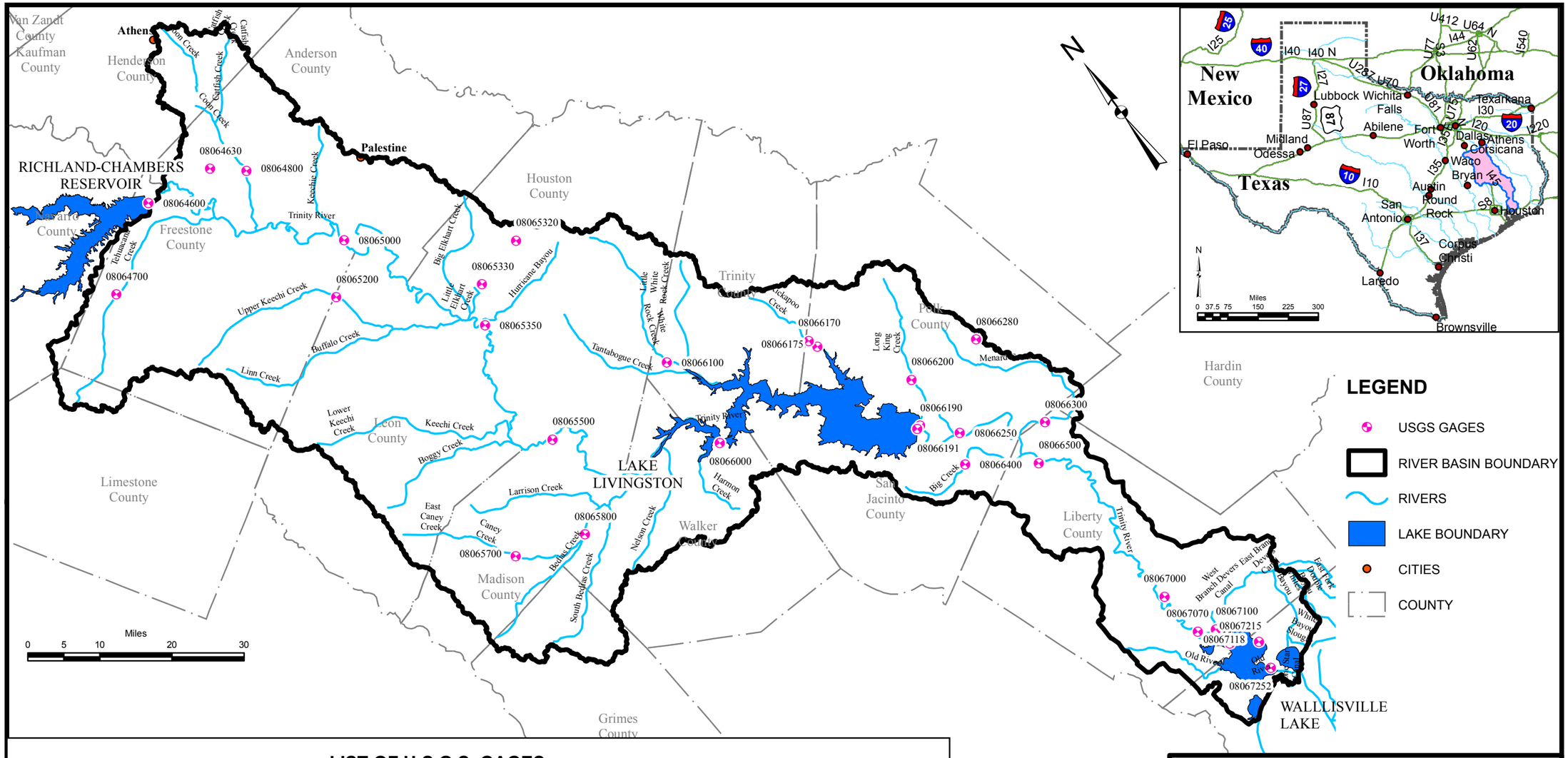
U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 1b

CORPS OF ENGINEERS

U.S. ARMY



GAGE ID:	LOCATION:
08064600	RICHLAND CREEK NEAR FAIRFIELD, TX (DISCONTINUED)
08064630	SALINE BR TRIB NEAR BETHEL, TX (DISCONTINUED)
08064700	TEHUACANA CREEK NEAR STREETMAN, TX
08064800	CATFISH CREEK NEAR TENNESSEE COLONY, TX (DISCONTINUED)
08065000	TRINITY RIVER NEAR OAKWOOD, TX
08065200	UPPER KEECHI CREEK NEAR OAKWOOD, TX
08065320	MAYES BR NEAR LATEXO, TX (DISCONTINUED)
08065330	HOUSTON COUNTY LAKE NEAR CROCKETT, TX
08065350	TRINITY RIVER NEAR CROCKETT, TX
08065500	TRINITY RIVER NEAR MIDWAY, TX (DISCONTINUED)
08065700	CANEY CREEK NEAR MADISONVILLE, TX (DISCONTINUED)
08065800	BEDIAS CREEK NEAR MADISONVILLE, TX
08066000	TRINITY RIVER AT RIVERSIDE, TX
08066100	WHITE ROCK CREEK NEAR TRINITY, TX (DISCONTINUED)
08066170	KICKAPOO CREEK NEAR ONALASKA, TX

GAGE ID:	LOCATION:
08066175	KICKAPOO CREEK AT ONALASKA, TX
08066190	LIVINGSTON RESERVOIR NEAR GOODRICH, TX
08066191	LIVINGSTON RESERVOIR OUTFLOW WEIR NEAR GOODRICH, TX (DISCONTINUED)
08066200	LONG KING CREEK AT LIVINGSTON, TX
08066250	TRINITY RIVER NEAR GOODRICH, TX
08066280	BLUFF CREEK TRIB NEAR LIVINGSTON, TX (DISCONTINUED)
08066300	MENARD CREEK NEAR RYE, TX
08066400	BIG CREEK NEAR SHEPHERD, TX (DISCONTINUED)
08066500	TRINITY RIVER AT ROMAYOR, TX
08067000	TRINITY RIVER AT LIBERTY, TX
08067070	CWA CANAL NEAR DAYTON, TX
08067100	TRINITY RIVER NEAR MOSS BLUFF, TX
08067118	LAKE CHARLOTTE NEAR ANAHUAC, TX
08067215	OLD RIVER CUTOFF NEAR MOSS BLUFF, TX
08067252	TRINITY RIVER AT WALLISVILLE, TX

LIST OF U.S.G.S. GAGES

LEGEND

- USGS GAGES
- RIVER BASIN BOUNDARY
- RIVERS
- LAKE BOUNDARY
- CITIES
- COUNTY

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

HYDROLOGIC NETWORK
LOWER TRINITY RIVER BASIN

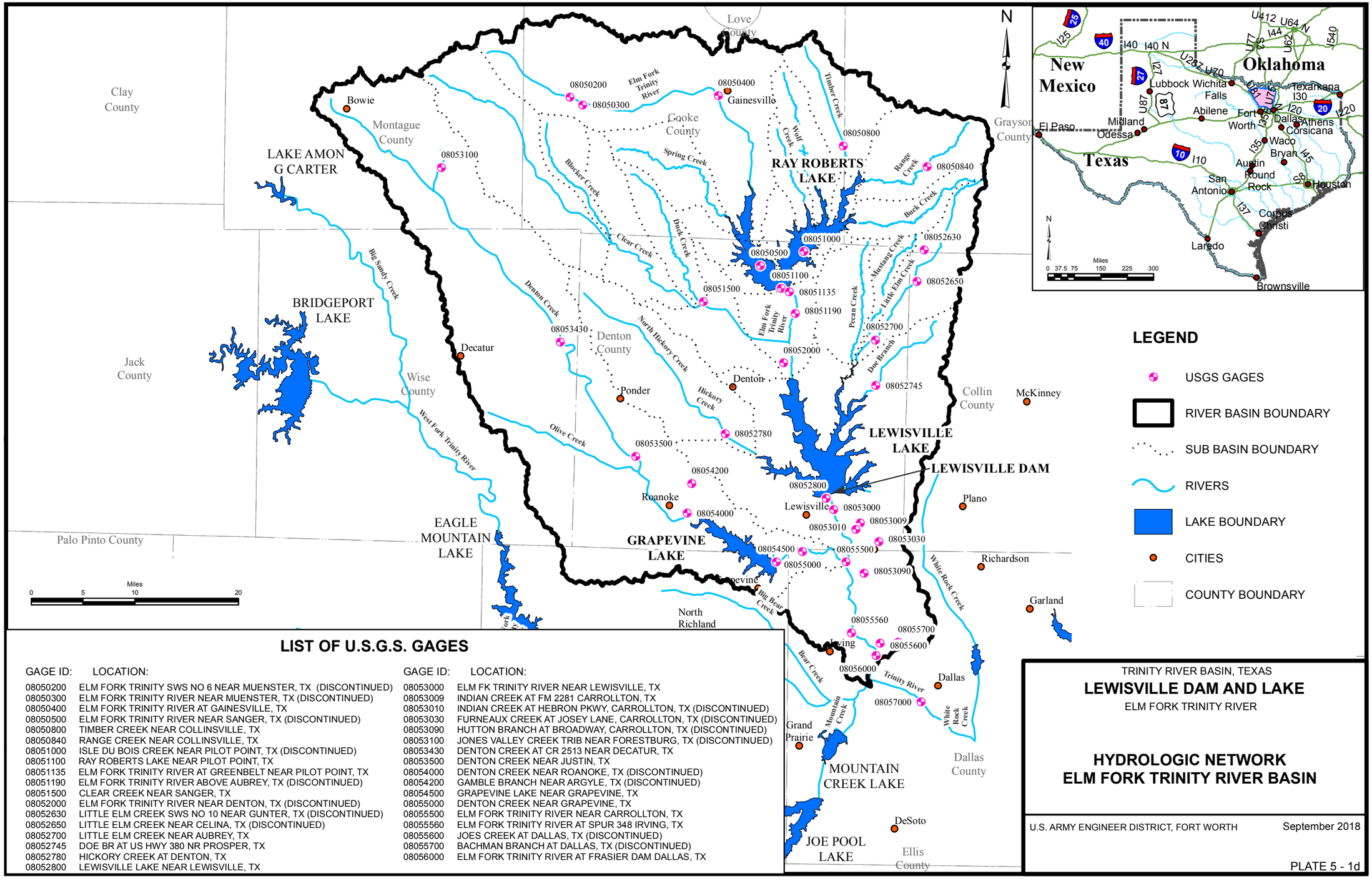
U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 1c

CORPS OF ENGINEERS

U.S. ARMY



LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:
08050200	ELM FORK TRINITY SWS NO 6 NEAR MUENSTER, TX (DISCONTINUED)
08050300	ELM FORK TRINITY RIVER NEAR MUENSTER, TX (DISCONTINUED)
08050400	ELM FORK TRINITY RIVER AT GAINESVILLE, TX
08050500	ELM FORK TRINITY RIVER NEAR SANGER, TX (DISCONTINUED)
08050800	TIMBER CREEK NEAR COLLINSVILLE, TX
08050840	RANGE CREEK NEAR COLLINSVILLE, TX
08051000	ISLE DU BOIS CREEK NEAR PILOT POINT, TX (DISCONTINUED)
08051100	RAY ROBERTS LAKE NEAR PILOT POINT, TX
08051135	ELM FORK TRINITY RIVER AT GREENBELT NEAR PILOT POINT, TX
08051190	ELM FORK TRINITY RIVER ABOVE AUBREY, TX (DISCONTINUED)
08051500	CLEAR CREEK NEAR SANGER, TX
08052000	ELM FORK TRINITY RIVER NEAR DENTON, TX (DISCONTINUED)
08052630	LITTLE ELM CREEK SWS NO 10 NEAR GUNTER, TX (DISCONTINUED)
08052650	LITTLE ELM CREEK NEAR CELINA, TX (DISCONTINUED)
08052700	LITTLE ELM CREEK NEAR AUBREY, TX
08052745	DOE BR AT US HWY 380 NR PROSPER, TX
08052780	HICKORY CREEK AT DENTON, TX
08052800	LEWISVILLE LAKE NEAR LEWISVILLE, TX

GAGE ID:	LOCATION:
08053000	ELM FK TRINITY RIVER NEAR LEWISVILLE, TX
08053009	INDIAN CREEK AT FM 2281 CARROLLTON, TX
08053010	INDIAN CREEK AT HEBRON PKWY, CARROLLTON, TX (DISCONTINUED)
08053030	FURNEAUX CREEK AT JOSEY LANE, CARROLLTON, TX (DISCONTINUED)
08053090	HUTTON BRANCH AT BROADWAY, CARROLLTON, TX (DISCONTINUED)
08053100	JONES VALLEY CREEK TRIB NEAR FORESTBURG, TX (DISCONTINUED)
08053430	DENTON CREEK AT CR 2513 NEAR DECATUR, TX
08053500	DENTON CREEK NEAR JUSTIN, TX
08054000	DENTON CREEK NEAR ROANOKE, TX (DISCONTINUED)
08054200	GAMBLE BRANCH NEAR ARGYLE, TX (DISCONTINUED)
08054500	GRAPEVINE LAKE NEAR GRAPEVINE, TX
08055000	DENTON CREEK NEAR GRAPEVINE, TX
08055500	ELM FORK TRINITY RIVER NEAR CARROLLTON, TX
08055560	ELM FORK TRINITY RIVER AT SPUR 348 IRVING, TX
08055600	JOES CREEK AT DALLAS, TX (DISCONTINUED)
08055700	BACHMAN BRANCH AT DALLAS, TX (DISCONTINUED)
08056000	ELM FORK TRINITY RIVER AT FRASIER DAM DALLAS, TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

HYDROLOGIC NETWORK
ELM FORK TRINITY RIVER BASIN

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 1d

CORPS OF ENGINEERS

U.S. ARMY

RAY ROBERTS LAKE

08051100 RAY ROBERTS LK NR PILOT POINT

Elm Fork Trinity River

LEWISVILLE LAKE

Lewisville Dam

08052800 LEWISVILLE LAKE NR LEWISVILLE

08055500 ELM FK TRINITY RV NR CARROLLTON

Denton Creek

12 HRS

8 HRS

24 HRS

60 HRS

Ponder

Denton

McKinney

Wylie

Plano

Richardson

Garland

Carrollton

Lewisville

Mesquite

GRAPEVINE LAKE

Roanoke

Grapevine

Dallas

08057000 TRINITY RV AT DALLAS

Irving

Trinity River

08062500 TRINITY RV NR ROSSER

West Fork Trinity River

Mountain Creek

MOUNTAIN CREEK LAKE

Grand Prairie

Kirby Creek

DeSoto

Village Creek

Arlington

JOE POOL LAKE

LAKE ARLINGTON

Walnut Creek

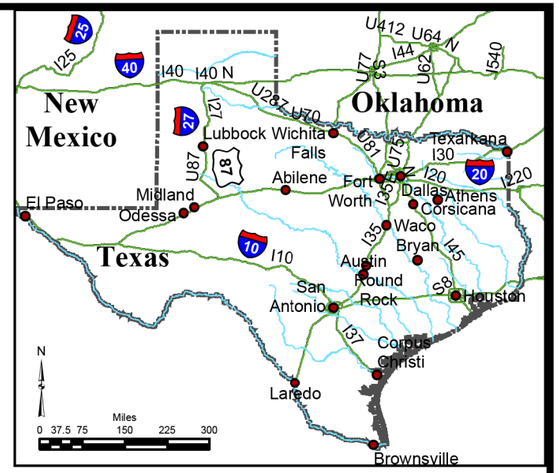
Mountain Creek

Newton Branch

North Richland Hills

Miles

0 5 10 20



LEGEND

- USGS GAGES
- RIVERS
- LAKE BOUNDARY
- CITIES

LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:
08051100	RAY ROBERTS LAKE NEAR PILOT POINT, TX
08052800	LEWISVILLE LAKE NEAR LEWISVILLE, TX
08055500	ELM FORK TRINITY RIVER NEAR CARROLLTON, TX
08057000	TRINITY RIVER AT DALLAS, TX
08062500	TRINITY RIVER NEAR ROSSER, TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

TRAVEL TIMES FROM RAY ROBERTS DAM TO THE TRINITY RIVER NEAR ROSSER GAGE

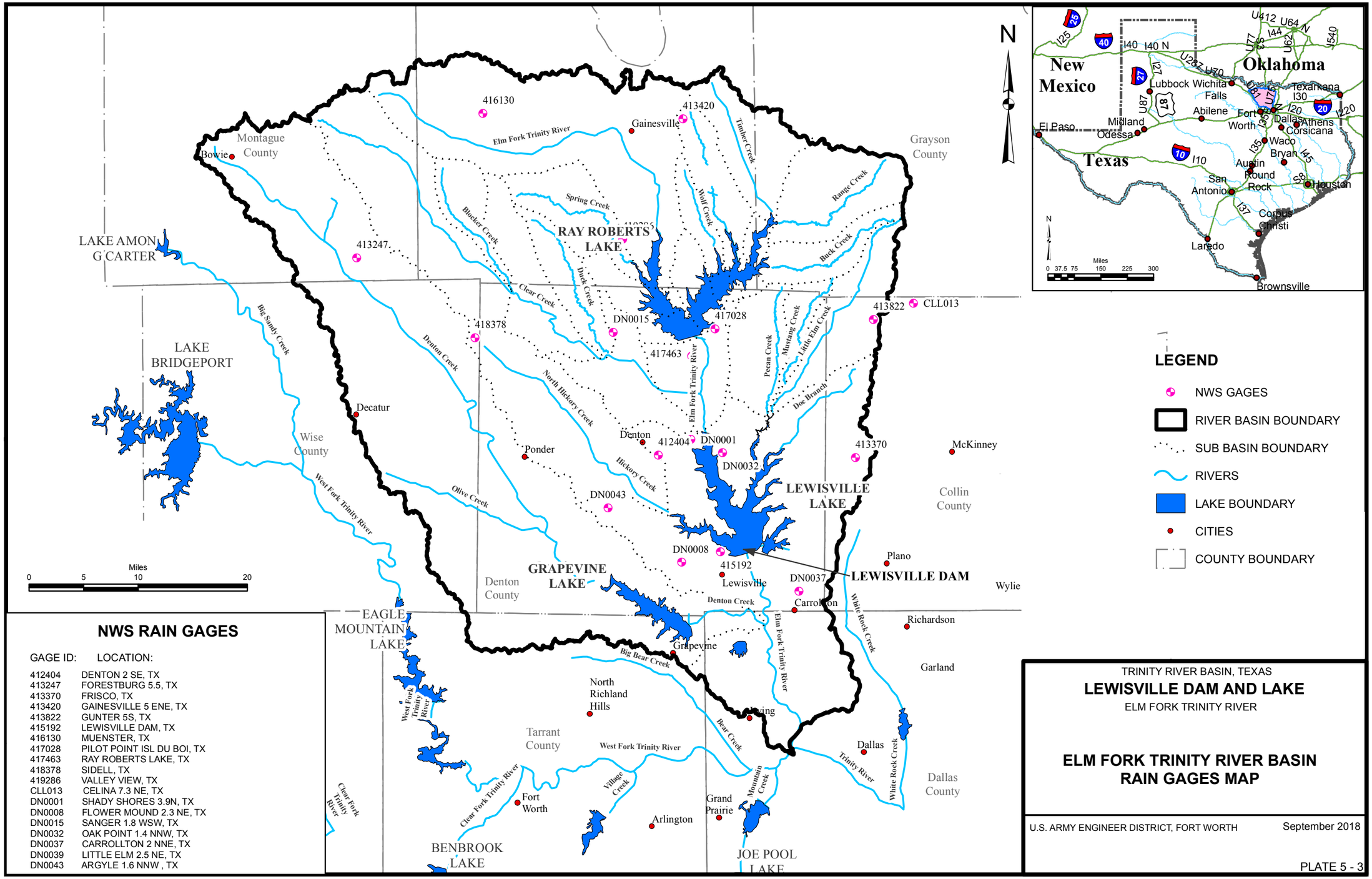
U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 2

CORPS OF ENGINEERS

U.S. ARMY



NWS RAIN GAGES

GAGE ID:	LOCATION:
412404	DENTON 2 SE, TX
413247	FORESTBURG 5.5, TX
413370	FRISCO, TX
413420	GAINESVILLE 5 ENE, TX
413822	GUNTER 5S, TX
415192	LEWISVILLE DAM, TX
416130	MUENSTER, TX
417028	PILOT POINT ISL DU BOI, TX
417463	RAY ROBERTS LAKE, TX
418378	SIDELL, TX
419286	VALLEY VIEW, TX
CLL013	CELINA 7.3 NE, TX
DN0001	SHADY SHORES 3.9N, TX
DN0008	FLOWER MOUND 2.3 NE, TX
DN0015	SANGER 1.8 WSW, TX
DN0032	OAK POINT 1.4 NNW, TX
DN0037	CARROLLTON 2 NNE, TX
DN0039	LITTLE ELM 2.5 NE, TX
DN0043	ARGYLE 1.6 NNW , TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

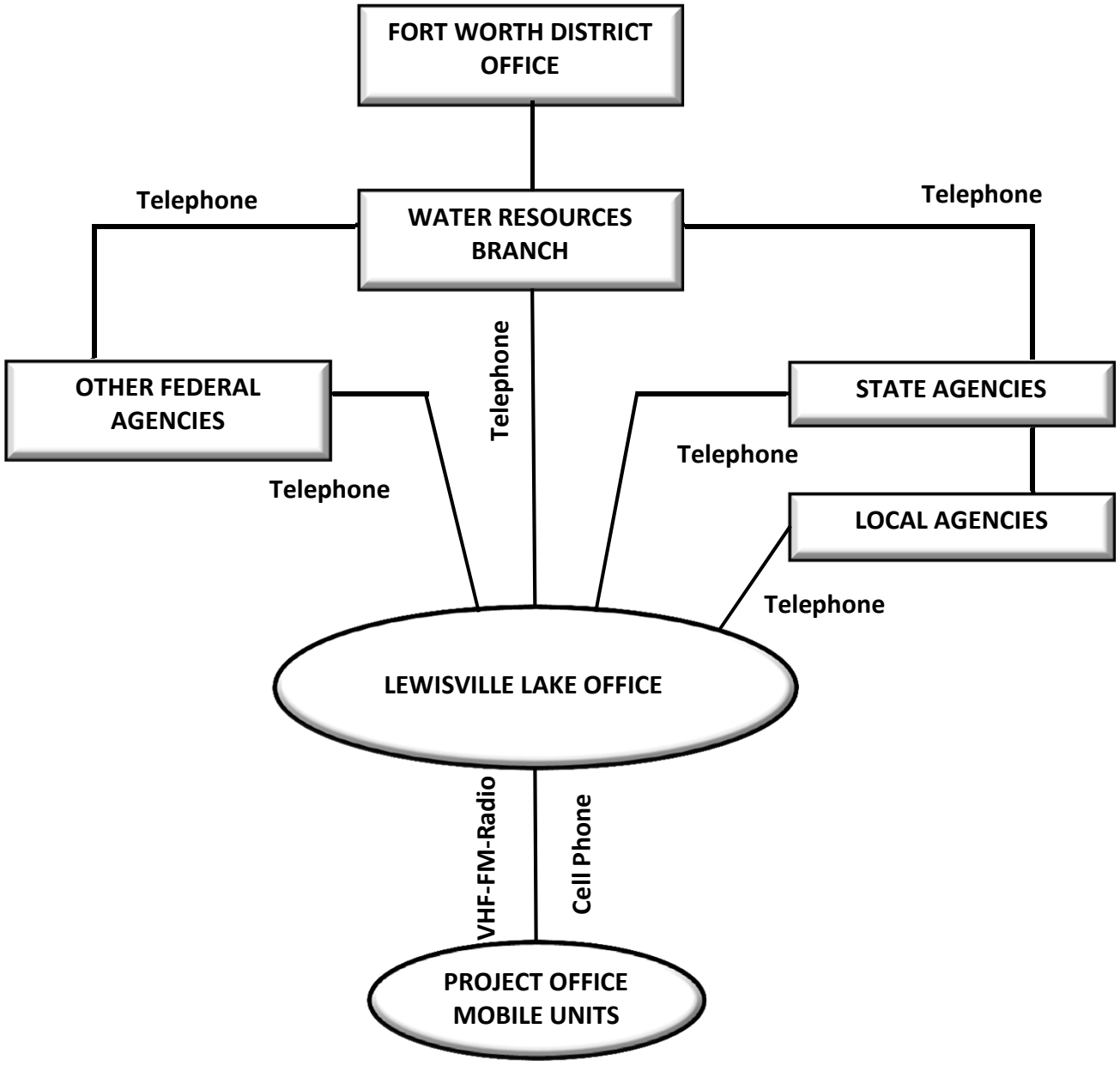
ELM FORK TRINITY RIVER

ELM FORK TRINITY RIVER BASIN RAIN GAGES MAP

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 5 - 3



TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

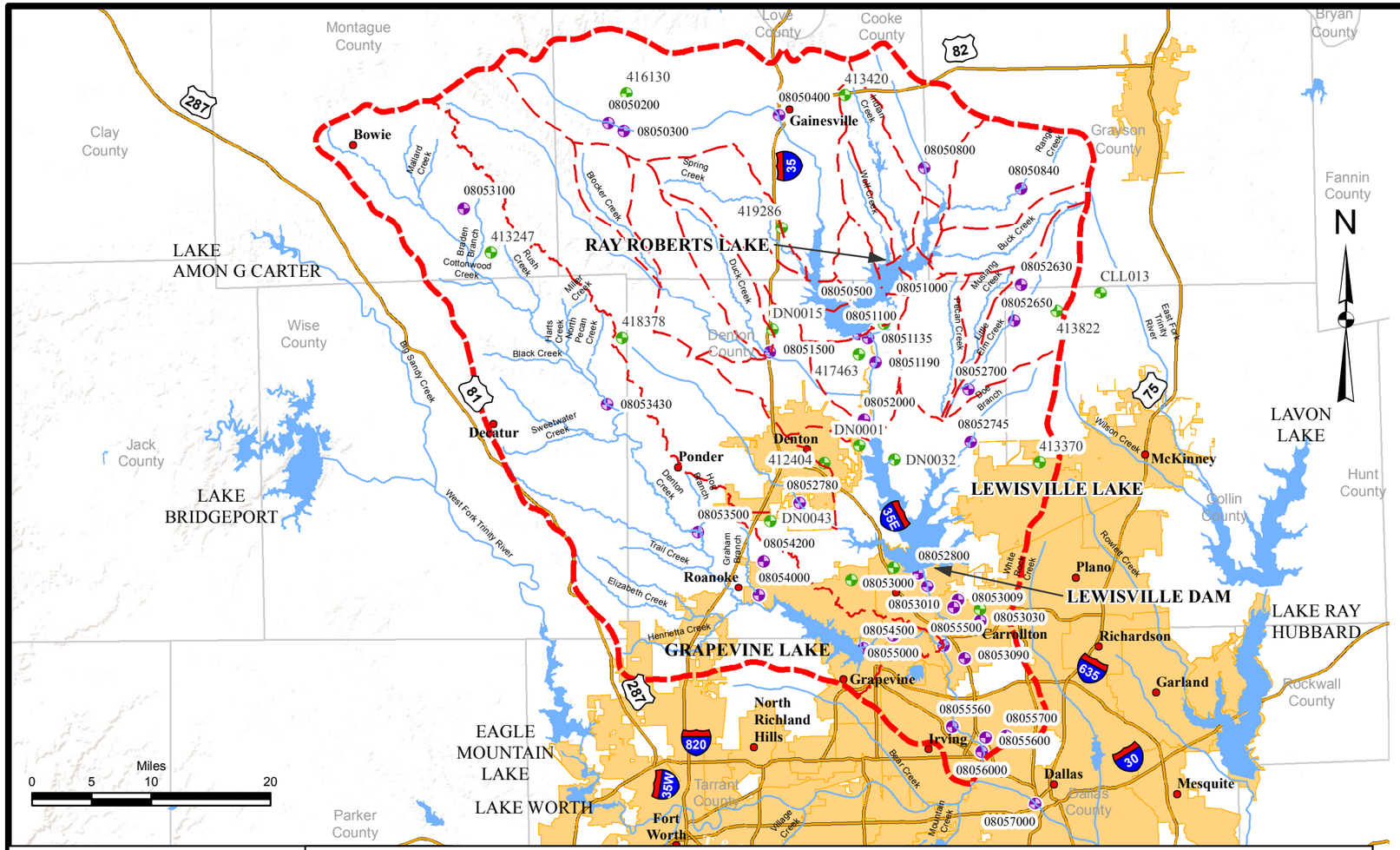
LINES OF COMMUNICATION

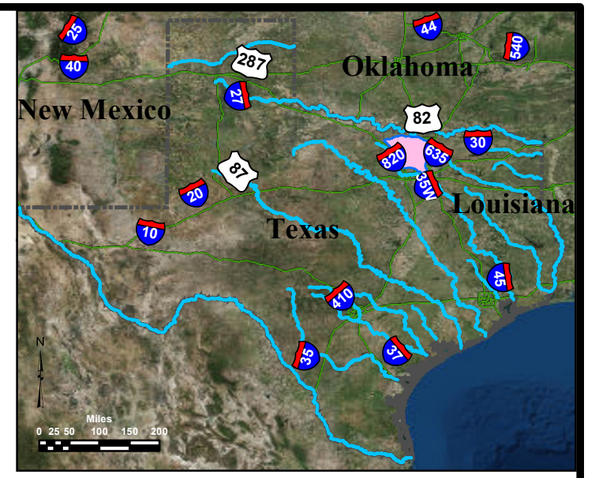
U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 5 - 4

CORPS OF ENGINEERS

U.S. ARMY





LEGEND

- RIVER BASIN BOUNDARY
- SUB BASIN BOUNDARY
- RIVERS
- LAKES
- NWS GAGES
- USGS GAGES
- CITIES
- INTERSTATE
- METRO AREAS

NWS RAIN GAGES

GAGE ID:	LOCATION:
412404	DENTON 2 SE, TX
413247	FORESTBURG 5.5, TX
413370	FRISCO, TX
413420	GAINESVILLE 5 ENE, TX
413822	GUNTER 5S, TX
415192	LEWISVILLE DAM, TX
416130	MUENSTER, TX
417028	PILOT POINT ISL DU BOI, TX
417463	RAY ROBERTS LAKE, TX
418378	SIDELL, TX
419286	VALLEY VIEW, TX
CLL013	CELINA 7.3 NE, TX
DN0001	SHADY SHORES 3.9N, TX
DN0008	FLOWER MOUND 2.3 NE, TX
DN0015	SANGER 1.8 WSW, TX
DN0032	OAK POINT 1.4 NNW, TX
DN0037	CARROLLTON 2 NNE, TX
DN0039	LITTLE ELM 2.5 NE, TX
DN0043	ARGYLE 1.6 NNW, TX

LIST OF U.S.G.S. GAGES

GAGE ID:	LOCATION:
08050200	ELM FORK TRINITY SWS NO 6 NEAR MUENSTER, TX (DISCONTINUED)
08050300	ELM FORK TRINITY RIVER NEAR MUENSTER, TX (DISCONTINUED)
08050400	ELM FORK TRINITY RIVER AT GAINESVILLE, TX
08050500	ELM FORK TRINITY RIVER NEAR SANGER, TX (DISCONTINUED)
08050800	TIMBER CREEK NEAR COLLINSVILLE, TX
08050840	RANGE CREEK NEAR COLLINSVILLE, TX
08051000	ISLE DU BOIS CREEK NEAR PILOT POINT, TX (DISCONTINUED)
08051100	RAY ROBERTS LAKE NEAR PILOT POINT, TX
08051135	ELM FORK TRINITY RIVER AT GREENBELT NEAR PILOT POINT, TX
08051190	ELM FORK TRINITY RIVER ABOVE AUBREY, TX (DISCONTINUED)
08051500	CLEAR CREEK NEAR SANGER, TX
08052000	ELM FORK TRINITY RIVER NEAR DENTON, TX (DISCONTINUED)
08052630	LITTLE ELM CREEK SWS NO 10 NEAR GUNTER, TX (DISCONTINUED)
08052650	LITTLE ELM CREEK NEAR CELINA, TX (DISCONTINUED)
08052700	LITTLE ELM CREEK NEAR AUBREY, TX
08052745	DOE BR AT US HWY 380 NR PROSPER, TX
08052780	HICKORY CREEK AT DENTON, TX
08052800	LEWISVILLE LAKE NEAR LEWISVILLE, TX

GAGE ID:	LOCATION:
08053000	ELM FK TRINITY RIVER NEAR LEWISVILLE, TX
08053009	INDIAN CREEK AT FM 2281 CARROLLTON, TX
08053010	INDIAN CREEK AT HEBRON PKWY, CARROLLTON, TX (DISCONTINUED)
08053030	FURNEAUX CREEK AT JOSEY LANE, CARROLLTON, TX (DISCONTINUED)
08053090	HUTTON BRANCH AT BROADWAY, CARROLLTON, TX (DISCONTINUED)
08053100	JONES VALLEY CREEK TRIB NEAR FORESTBURG, TX (DISCONTINUED)
08053430	DENTON CREEK AT CR 2513 NEAR DECATUR, TX
08053500	DENTON CREEK NEAR JUSTIN, TX
08054000	DENTON CREEK NEAR ROANOKE, TX (DISCONTINUED)
08054200	GAMBLE BRANCH NEAR ARGYLE, TX (DISCONTINUED)
08054500	GRAPEVINE LAKE NEAR GRAPEVINE, TX
08055000	DENTON CREEK NEAR GRAPEVINE, TX
08055500	ELM FORK TRINITY RIVER NEAR CARROLLTON, TX
08055560	ELM FORK TRINITY RIVER AT SPUR 348 IRVING, TX
08055600	JOES CREEK AT DALLAS, TX (DISCONTINUED)
08055700	BACHMAN BRANCH AT DALLAS, TX (DISCONTINUED)
08056000	ELM FORK TRINITY RIVER AT FRASIER DAM DALLAS, TX

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

REAL TIME WATER CONTROL BASE MAP

U.S. ARMY ENGINEER DISTRICT, FORT WORTH

September 2018

PLATE 6 - 1

LEWISVILLE DAM AND LAKE
NORMAL SCHEDULE FOR LAKE REGULATION

FORECASTED LAKE ELEVATION	DOWNSTREAM CONTROL POINT CAPACITIES	SCHEDULE OF CONTROL OPERATIONS
1. Conservation Water Control		
Below 522.00	*Total flows not exceed: 4,000 cfs @ Carrollton 13,000 cfs @ Dallas	Municipal releases for Dallas Water Utilities or the City of Denton. Low-flow gates or flood gates discharges to meet requested releases into Elm Fork.
2. Flood Water Control		
a. Above 522.00 Below 523.00	Gage flows less than: 4,000 cfs @ Carrollton or 13,000 cfs @ Dallas Or 24,000 cfs @ Long Lake	Initiate releases in amounts not to exceed gaged flows stated and return to elevation 522.00. Consider turbine releases, 100-623 cfs, for Hydropower
b. Above 523.00 Below 526.00	Gaged flows less than: 5,500 cfs @ Carrollton or 13,000 cfs @ Dallas or 24,000 cfs @ Long Lake	Initiate releases not to exceed gaged flows stated; maintain until lake stage returns to elevation 523.00; then adjust release to schedule 2.a.
c. Above 526.00 Below 532.00	Gaged flows less than: 7,000 cfs @ Carrollton or 13,000 cfs @ Dallas or 24,000 cfs @ Long Lake	Initiate releases not to exceed gaged flows stated: maintain until lake stage returns to elevation 526.00; then adjust release to schedule 2.b.
d. Above 532.00	Gaged flows less than: 7,000 cfs @ Carrollton or 13,000 cfs @ Dallas or 24,000 cfs @ Long Lake	Initiate releases so when combined with spillway discharges do no exceed gaged flows stated; adjust release to compensate for changes in spillway discharge until lake stages returns to elevation 532.00; then adjust release to schedule 2.c.

TABLE 7-1

Downstream Control Points

River Channel and USGS Gaging Station	Control Capacity (cfs)
Elm Fork Trinity River near Carrollton	7,000
Trinity River at Dallas	13,000
Trinity River near Rosser	15,000
Trinity River near Oakwood	24,000

TABLE 7-3

Low Flood Pool Release Guidance

Pool Elevation Range (ft)	Flood Pool Range (%)	Release Rates* (cfs)
522.0 – 522.2	0.0 – 1.8	250**
522.2 – 522.4	1.8 – 3.5	250 – 450***
522.4 – 522.6	3.5 – 5.0	450 – 1000

*Desired rate of release will vary with prevailing rates of inflow, lake evaporation, and water supply withdrawals. General objective is to evacuate from 4.4% to 3.5% of the flood pool in about one week, from 3.5% to 1.8% the following week, then from 1.8% to top of conservation pool (462.0) over an additional two to three week period.
**Minimum turbine release.
***Maximum turbine release.

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

NORMAL REGULATION PLAN FOR FLOOD CONTROL

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 1

LEWISVILLE DAM AND LAKE
EMERGENCY REGULATION PLAN
INSTRUCTIONS TO LAKE MANAGER FOR USE WHEN COMMUNICATIONS WITH DISTRICT OFFICE FAIL

LAKE STAGE	LAKE CONDITIONS	OPERATION
A. Below elevation 522.0	Rising, Standing, or Falling	Continue the releases from the conservation pool as previously instructed by Fort Worth District Water Management Office.
B. Lake elevation between 522.0 and 532.0	Rising, Standing, or Falling	Maintain releases in effect at the time communications was lost. The Lake Manager will initiate gate closing operations as soon as one of the following conditions occurs: 1. Should the Lake Manager have knowledge of pending flood condition on the Elm Fork Trinity River below the project, or 2. Two or more inches of rain has been recorded at the dam in a two hour period or less, or 3. Six hours of time has elapsed after losing communications.
C. Above elevation 532.0	Rising, Standing, or Falling	Close gates and leave closed until communications have been restored with Fort Worth District Water Management Office.

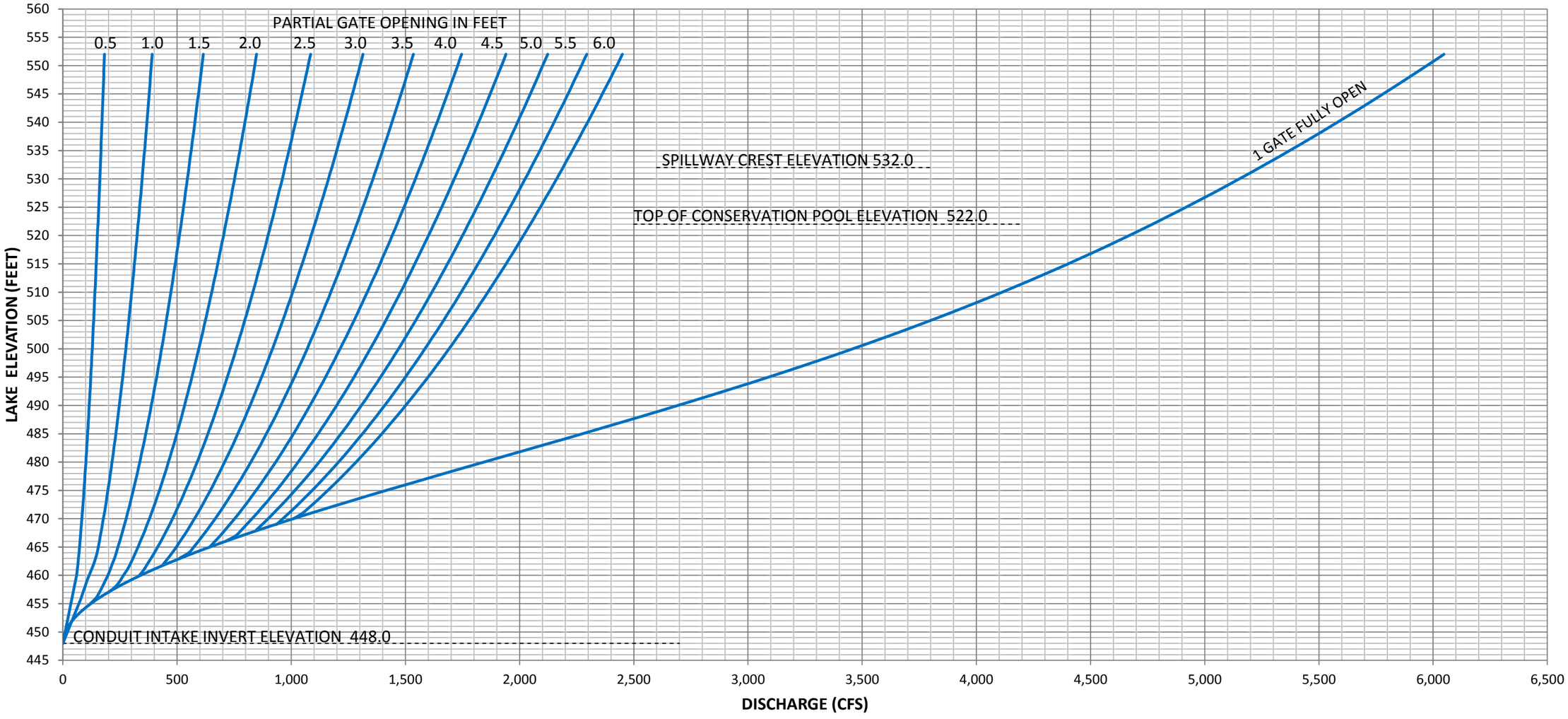
Note: Gate changes are limited to a maximum rate of one-half gate-foot per half hour. Once the gates have been closed, they will remain closed until communications have been restored with the Fort Worth District Water Management Office.

TRINITY RIVER BASIN, TEXAS
LEWISVILLE DAM AND LAKE
ELM FORK TRINITY RIVER

EMERGENCY REGULATION PLAN FOR CONSERVATION AND FLOOD CONTROL OPERATIONS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

CORPS OF ENGINEERS U.S. ARMY



1. THE FLOOD CONTROL OUTLET WORKS CONSISTS OF 1 - 16' DIAMETER CONDUIT CONTROLLED BY 3 - 6.5' X 13' GATES. THE GATES SHOULD BE OPERATED EITHER FULLY OPEN OR AT 7 FEET OR LESS OPENING HEIGHT. ALL GATE OPERATION SHOULD BE SYMMETRICAL WITHAN ALLOWABLE DIFFERENCE IN GAGE OPENING HEIGHT NOT TO EXCEED ONE FOOT. UPSTREAM CONDUIT INVERT AT ELEV. 448, DOWNSTREAM CONDUIT INVERT AT ELEV. 446, $K_{s=}$0.002

2. THE RATING CURVES FOR THE THREE GATES FULLY OPEN AND THE RATING CURVES FOR ONE GATE PARTIALLY OPEN ARE SHOWN. ADD THE INDICATED DISCHARGE FOR ONE GATE PARTIALLY OPEN TO OBTAIN THE TOTAL DISCHARGE FOR 2 OR 3 GATES PARTIALLY OPEN.

3. ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

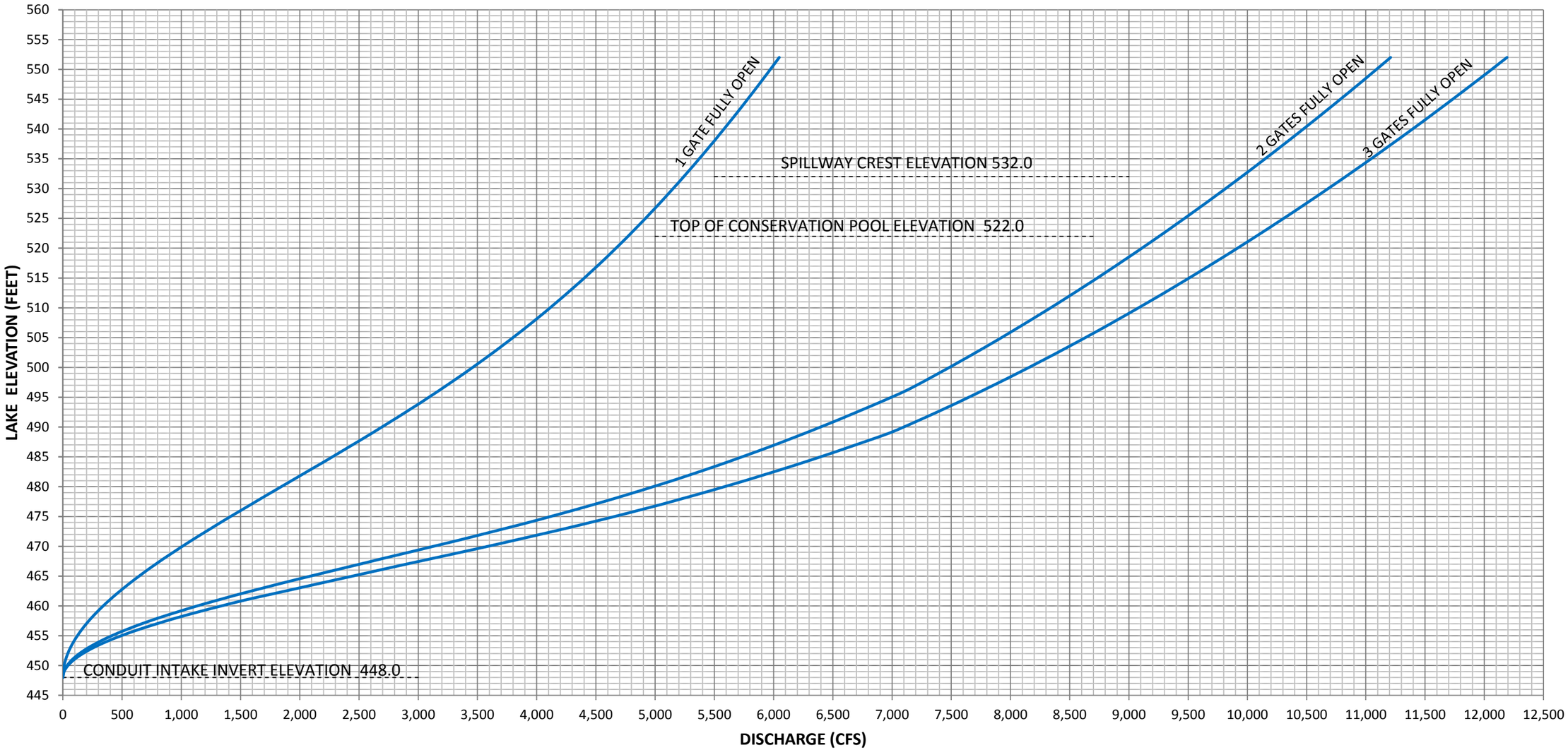
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OUTLET WORKS GATE RATING CURVES
3 - 6.5' X 13' FLOOD CONTROL GATES
PARTIAL GATE
16.0' DIAMETER CONDUIT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 3A



1. THE FLOOD CONTROL OUTLET WORKS CONSISTS OF 1 - 16' DIAMETER CONDUIT CONTROLLED BY 3 - 6.5' X 13' GATES. THE GATES SHOULD BE OPERATED EITHER FULLY OPEN OR AT 7 FEET OR LESS OPENING HEIGHT. ALL GATE OPERATION SHOULD BE SYMMETRICAL WITHAN ALLOWABLE DIFFERENCE IN GAGE OPENING HEIGHT NOT TO EXCEED ONE FOOT. UPSTREAM CONDUIT INVERT AT ELEV. 448, DOWNSTREAM CONDUIT INVERT AT ELEV. 446, $K_{S=}$0.002

2. THE RATING CURVES FOR THE THREE GATES FULLY OPEN AND THE RATING CURVES FOR ONE GATE PARTIALLY OPEN ARE SHOWN. ADD THE INDICATED DISCHARGE FOR ONE GATE PARTIALLY OPEN TO OBTAIN THE TOTAL DISCHARGE FOR 2 OR 3 GATES PARTIALLY OPEN.

3. ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

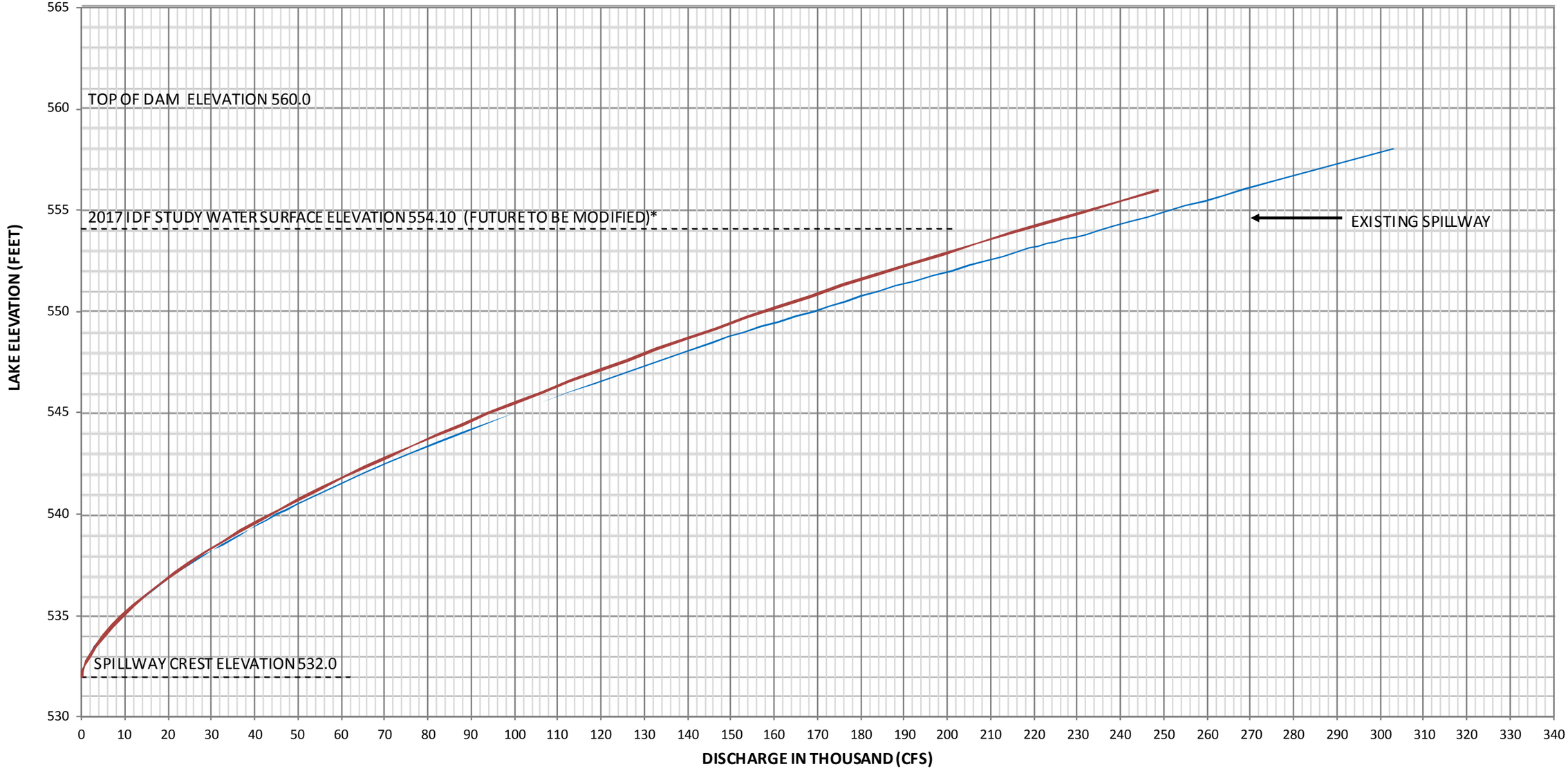
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OUTLET WORKS GATE RATING CURVES
3 - 6.5' X 13' FLOOD CONTROL GATES
FULLY OPEN
16.0' DIAMETER CONDUIT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 3B



THE SPILLWAY IS AN UNCONTROLLED, CONCRETE OGEE WEIR. WEIR LENGTH = 560 FEET.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88.

SPILLWAY APRON IS BEING ANCHORED AND STRENGTHENED IN 2018 ANALYSIS WITH DESIGN BEING COMPLETED FOR CONSTRUCTION IN 2021.

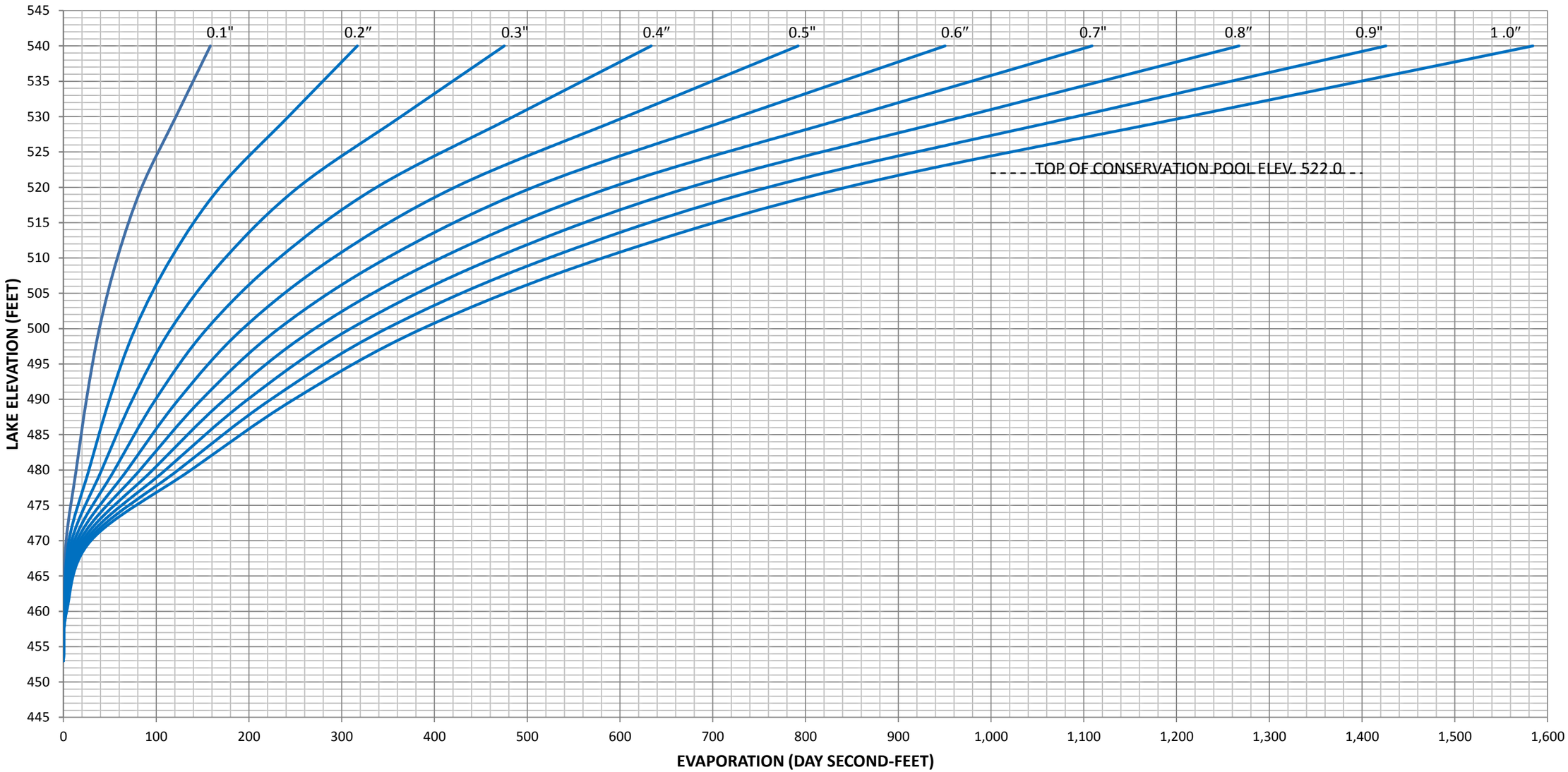
TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

SPILLWAY RATING CURVE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018



ONE DAY SECOND-FEET = 1.9835 ACRE FEET

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

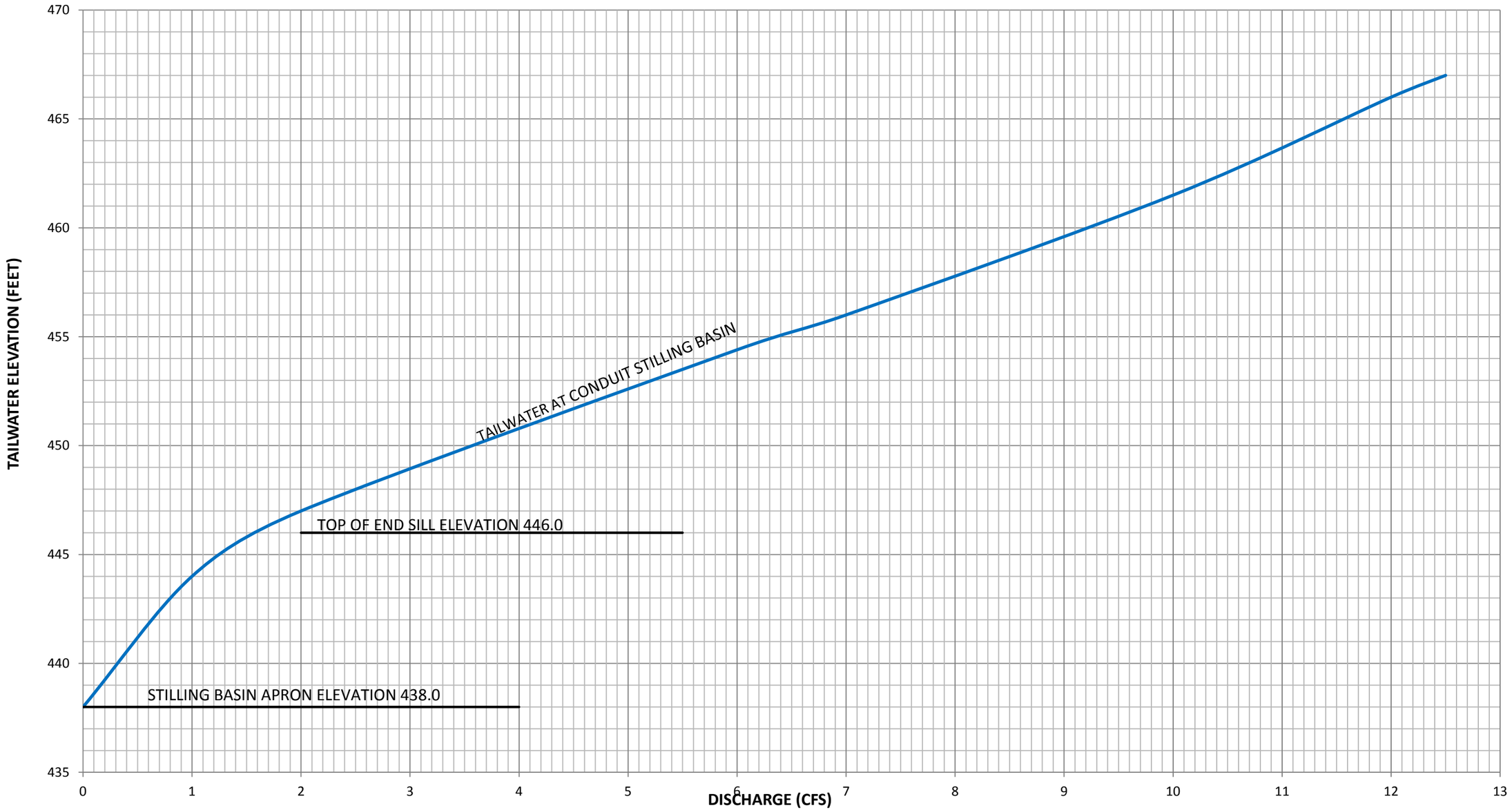
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

LAKE EVAPORATION CURVES

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 5



Note:

1. Tailwater curve for Conduit Stilling Basin developed by backwater computations from USGS gaging station near Carrollton, Texas 20.8 miles downstream from dam site.

TRINITY RIVER BASIN, TEXAS

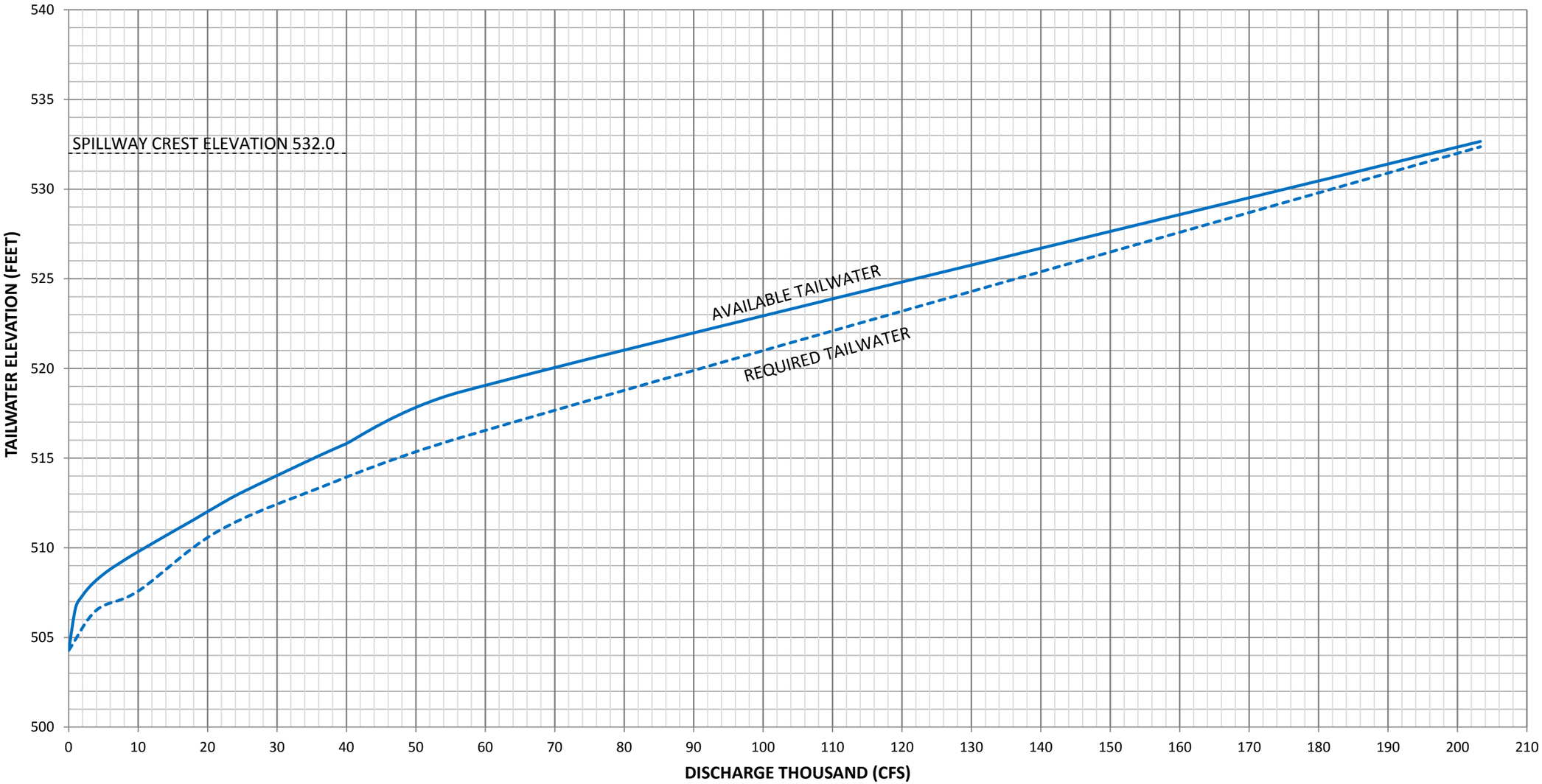
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

OUTLET WORKS
TAILWATER RATING CURVE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 -6



THE SPILLWAY IS AN UNCONTROLLED, CONCRETE OGEE WEIR. WEIR LENGTH = 560 FEET. DATA DEVELOPED FROM AUGUST 2011 ANALYSIS. DATA FROM AUGUST 2011 HYDRAULICS MODEL.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

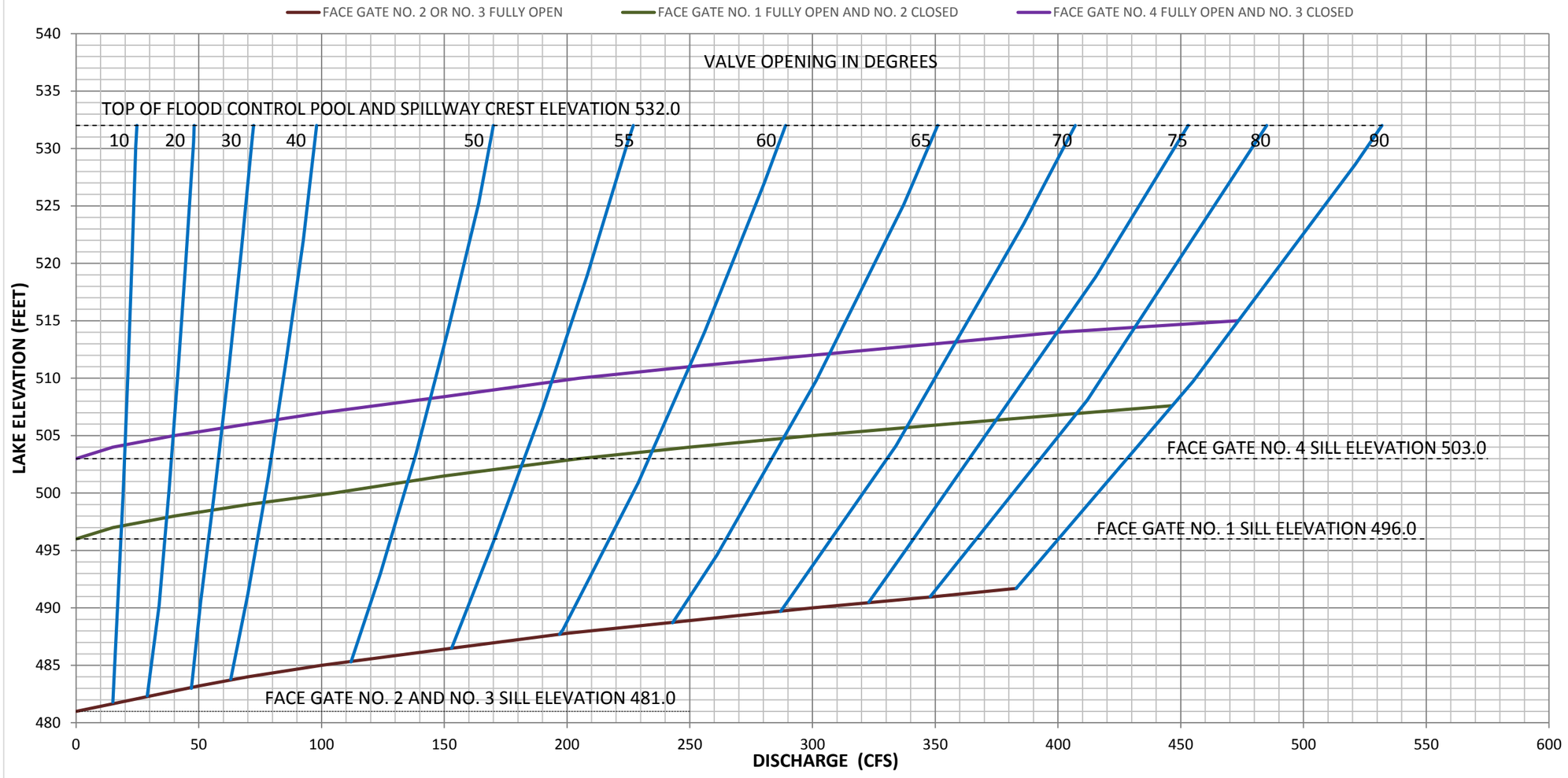
ELM FORK TRINITY RIVER

SPILLWAY TAILWATER RATING CURVE

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 7

CORPS OF ENGINEERS U.S. ARMY



1. ADD DISCHARGES FOR LOW FLOW OUTLETS NO. 1 AND NO. 2 TO OBTAIN TOTAL DISCHARGE.

2. EACH 60-INCH DIAMTER LOW FLOW OUTLET HAS A 48-INCH BUTTERFLY VALVE AT ITS OUTFALL.

3. ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

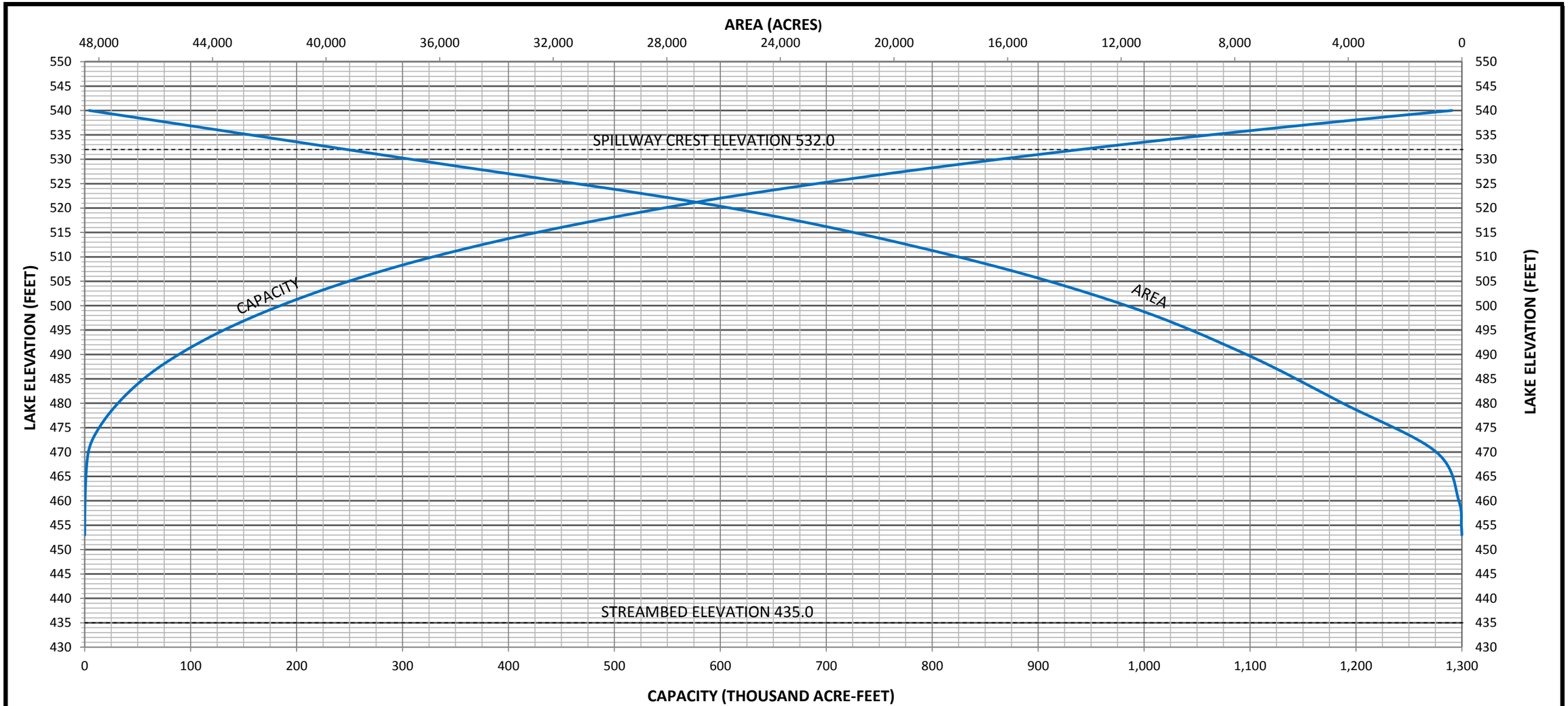
ELM FORK TRINITY RIVER

LOW FLOW OUTLETS RATING CURVES

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 7 - 8

CORPS OF ENGINEERS U.S. ARMY



LEWISVILLE LAKE VOLUMETRIC SURVEY PERFORMED BY THE TEXAS WATER DEVELOPMENT BOARD IN SEPTEMBER 2007.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 FOR LEWISVILLE DAM AND LAKE IS: NGVD29 + 0.0 FEET = NAVD88

TRINITY RIVER BASIN, TEXAS

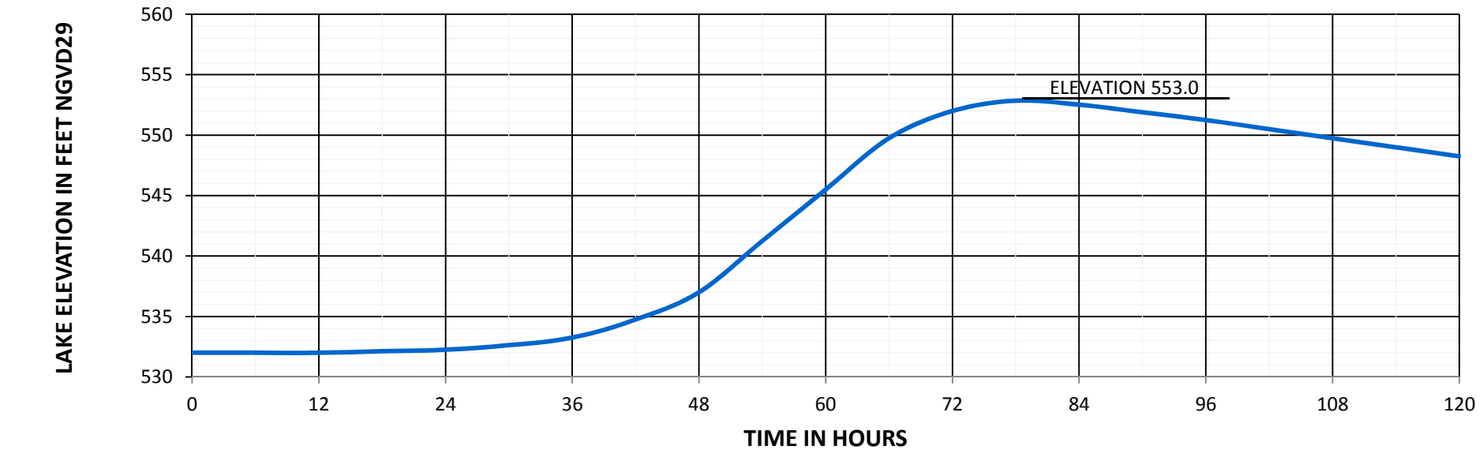
LEWISVILLE DAM AND LAKE

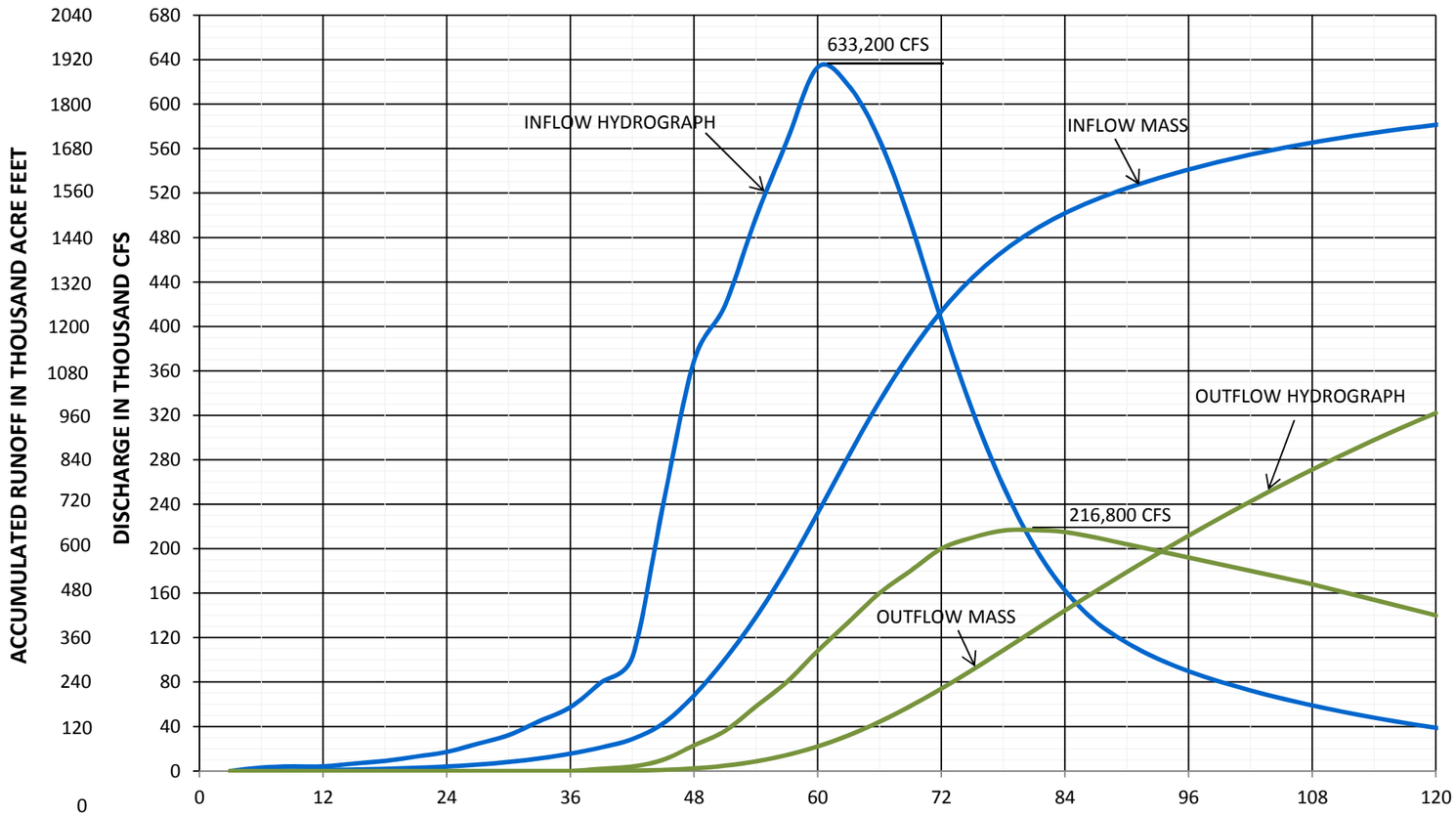
ELM FORK TRINITY RIVER

AREA AND CAPACITY CURVES

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018

PLATE 7 - 9

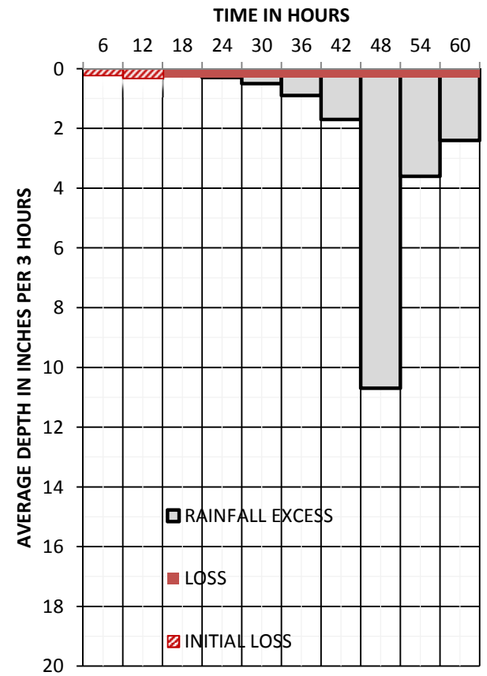




NOTE: 1951 SPILLWAY CONSTRUCTION DOCUMENT CHANGED SPILLWAY FROM 600 FEET TO 560 FEET AND DID NOT RECOMPUTE THE MAXIMUM DESGIN WATER SURFACE.

HYETOGRAPH (INCHES)

RAINFALL TOTAL	23.20
LOSS TOTAL	2.90
RAINFALL - EXCESS TOTAL	20.30
INFILTRATION INDEX (F.A.V.G) (IN/HR)	0.05



NOTE: DATA IS FROM 1947 "DEFINITE PROJECT REPORT ON GARZA-LITTLE ELM DAM AND RESERVOIR, ELM FORK TRINITY RIVER, TEXAS".

TRINITY RIVER BASIN, TEXAS

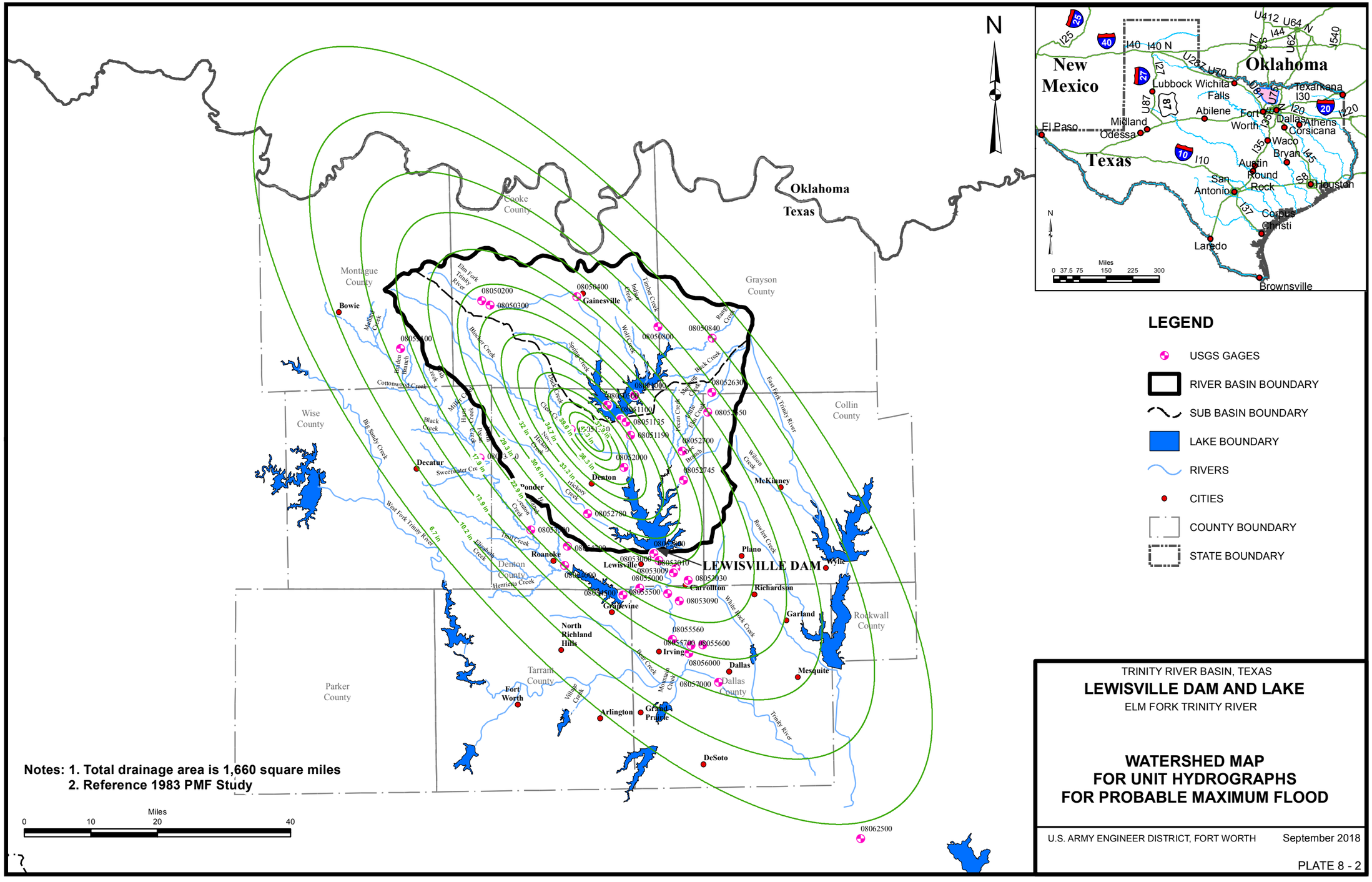
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

SPILLWAY DESIGN FLOOD

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 8 - 1



LEGEND

- USGS GAGES
- RIVER BASIN BOUNDARY
- SUB BASIN BOUNDARY
- LAKE BOUNDARY
- RIVERS
- CITIES
- COUNTY BOUNDARY
- STATE BOUNDARY

Notes: 1. Total drainage area is 1,660 square miles
2. Reference 1983 PMF Study

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

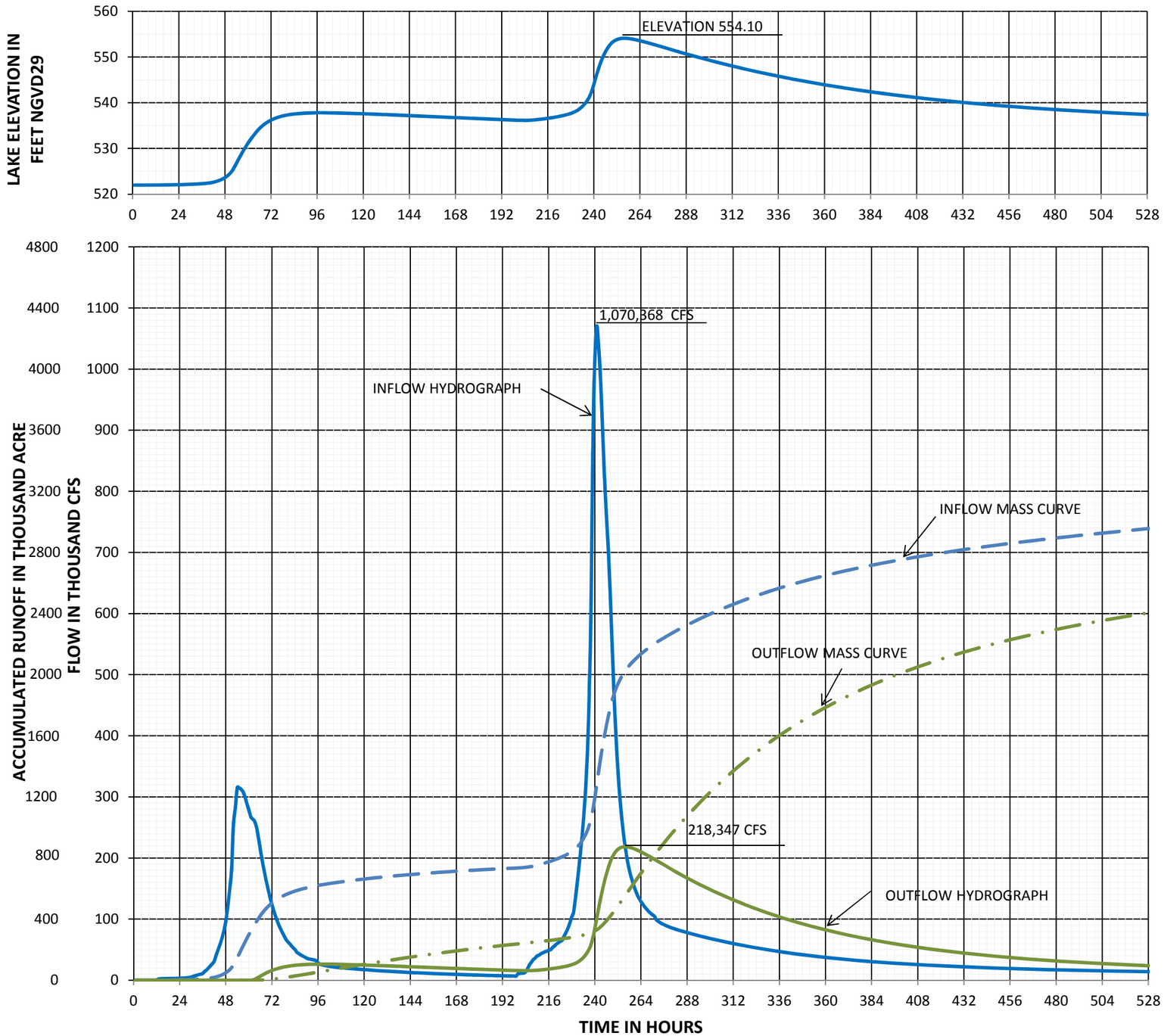
ELM FORK TRINITY RIVER

WATERSHED MAP FOR UNIT HYDROGRAPHS FOR PROBABLE MAXIMUM FLOOD

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018

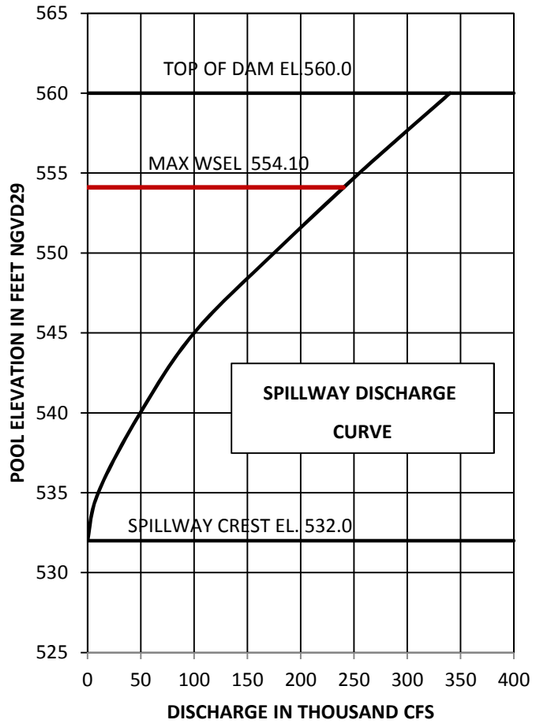
PLATE 8 - 2

CORPS OF ENGINEERS U.S. ARMY



HYETOGRAPH (INCHES)

RAINFALL	40.63
LOSS	7.32
RAINFALL - EXCESS	33.31
INITIAL LOSS	0.50
INFILTRATION INDEX (F.A.V.G.) (IN/HR)	0.05



NOTE: FROM USACE 2017 INFLOW DESIGN FLOOD STUDY.

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

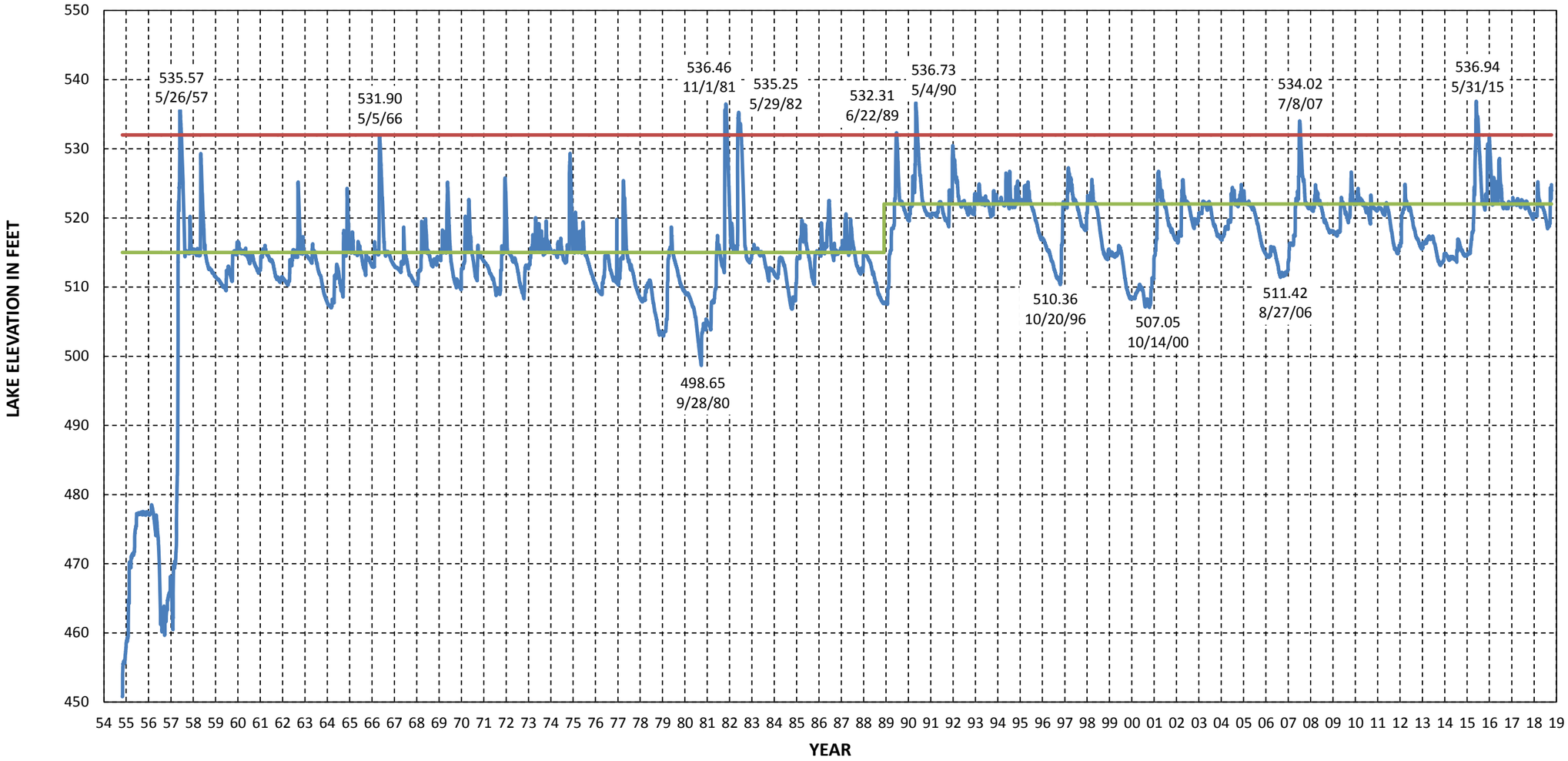
ELM FORK TRINITY RIVER

INFLOW DESIGN FLOOD
INFLOW-OUTFLOW HYDROGRAPHS

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 8 - 3

CORPS OF ENGINEERS U.S. ARMY



LAKE ELEVATION

SPILLWAY CREST ELEVATION 532.0

TOP OF CONSERVATION POOL ELEVATION 522.0

DELIBERATE IMPOUNDMENT BEGAN: 11/01/1954

RECORD LAKE ELEVATION AND DATE: 536.94 NGVD29, 05/31/2015

THE CONSERVATION POOL WAS RASIED ON NOVEMBER 30, 1988 FROM ELEVATION 515.0 TO ELEVATION 522.0 FEET NGVD29.

ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

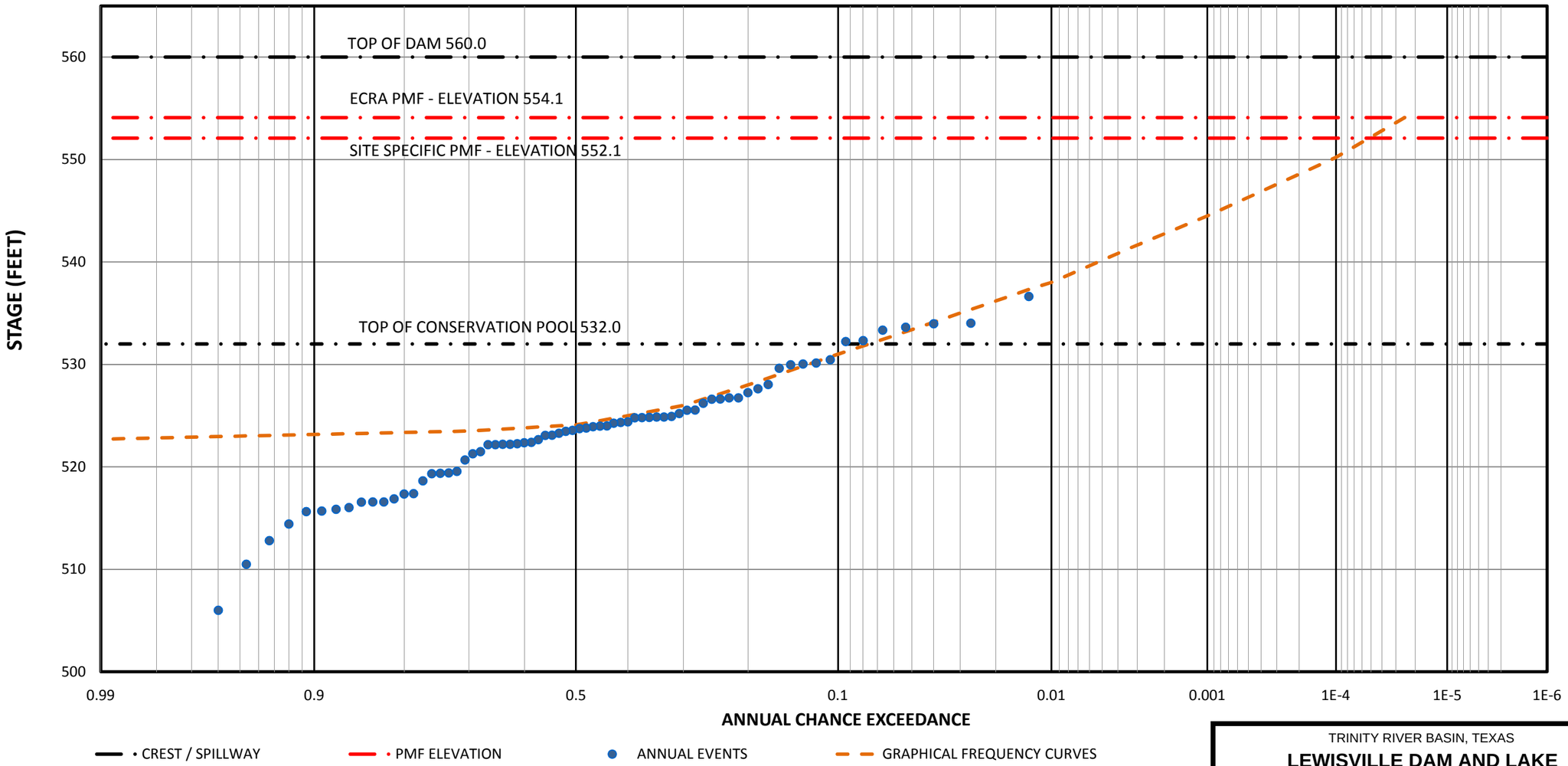
ELM FORK TRINITY RIVER

PERIOD OF RECORD LAKE LEVEL

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 8 - 4

LEWISVILLE DAM STAGE FREQUENCY



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

TRINITY RIVER BASIN, TEXAS

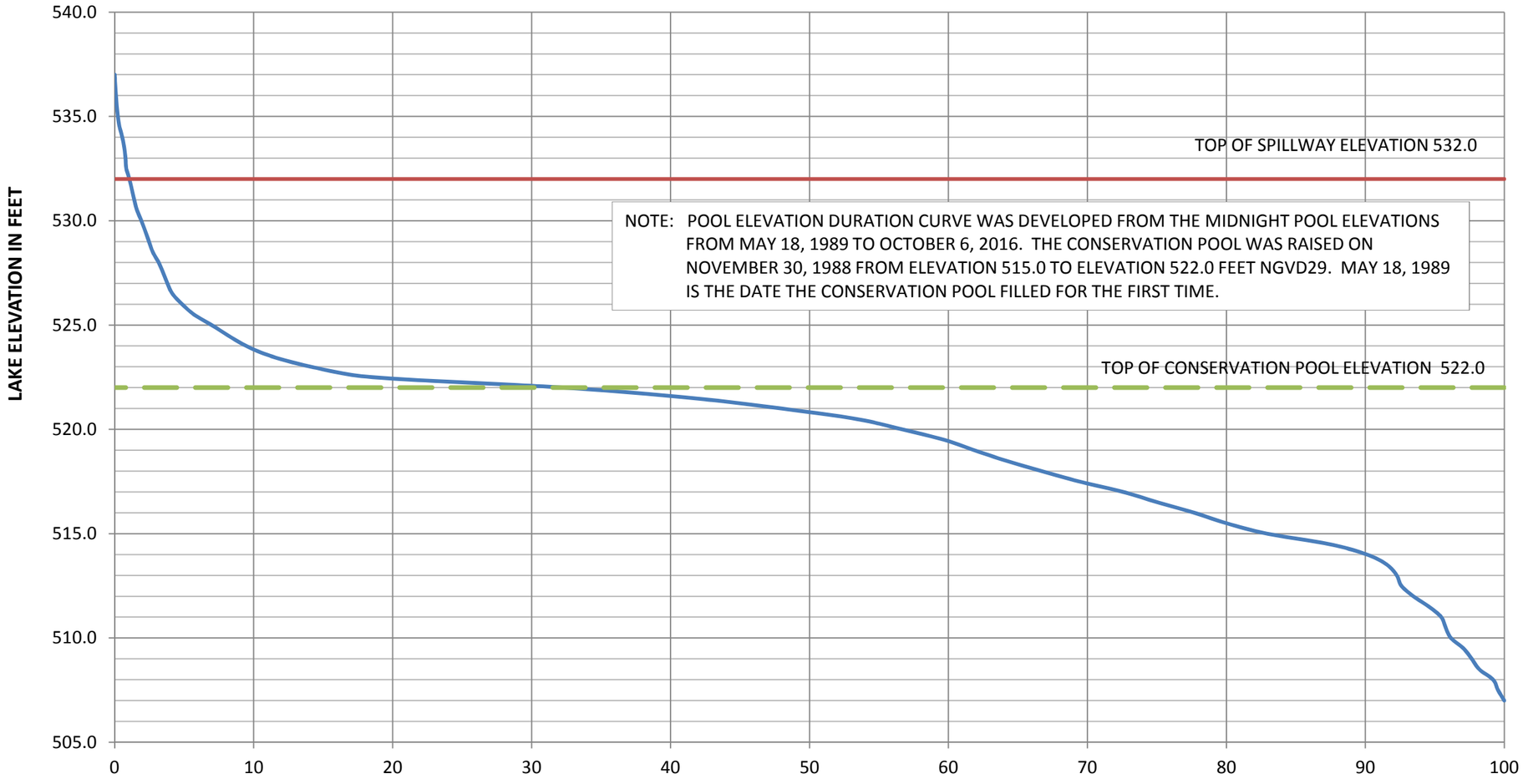
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

ANNUAL PEAK ELEVATION FREQUENCY

U.S. ARMY ENGINEER DISTRICT, FORT WORTH — September 2018

LEWISVILLE LAKE



ALL ELEVATIONS REFERRED TO ON THIS PLATE, UNLESS NOTED OTHERWISE, ARE IN FEET, NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). THE DATUM CONVERSION FROM NGVD29 TO NAVD88 IS: NGVD29 + 0.0 FEET = NAVD88 FOR LEWISVILLE DAM AND LAKE.

TRINITY RIVER BASIN, TEXAS

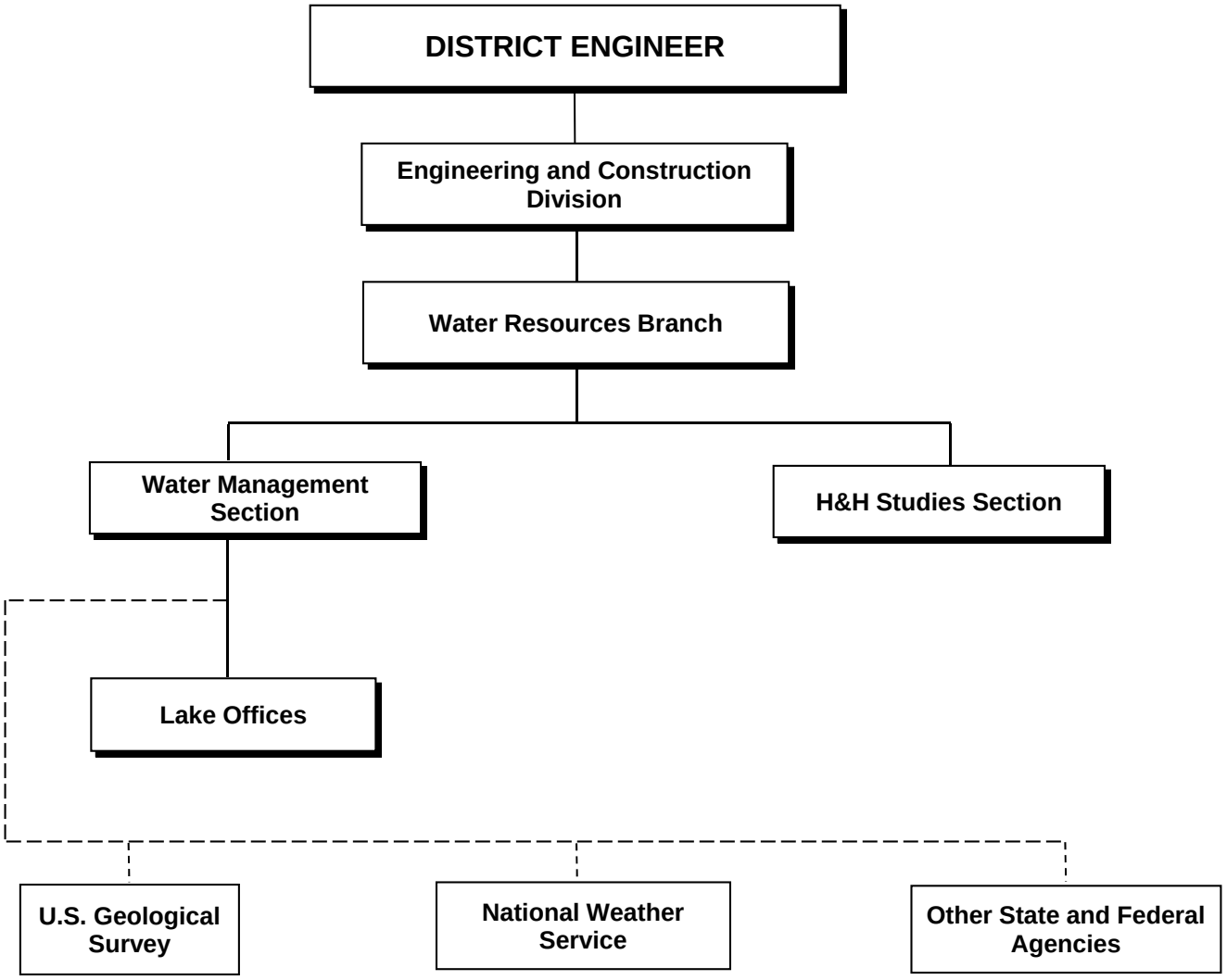
LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

LAKE ELEVATION DURATION

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

FORT WORTH DISTRICT
ORGANIZATION FOR LAKE REGULATION



LINES OF COMMAND AUTHORITY

LINES OF DIRECT COMMUNICATION

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

ORGANIZATION FOR FLOOD CONTROL REGULATION

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

PLATE 9 - 1

FORT WORTH DISTRICT CORPS OF ENGINEERS
RESERVOIR REPORT FOR SATURDAY 01AUG2015

RESERVOIR	ELEVATION 0800 FT-NGVD	TOP CONS POOL	MEAN INFLOW DSF	MEAN TURBINE DSF	DAILY RELEASES PUMP MGD	OTHER DSF	RAIN INCHES	EVAP	0800 RELEASE CFS	POOL OCCUPIED %		A-F
RED RIVER BASIN												
Cooper	439.78	440.0	-162	--	18.618	5	0.00	.31	5	98	C	256411
Wright Patm	235.53	226.3	9205	--	49.706	9907	0.00	.16	10352	16	F	367034
Bob Sandlin	337.08	337.5	-239	--	--	0	--	--	0	98	C	198196
Lake O Pine	230.81	230.0	-221	--	--	301	0.00	--	301	3	F	16271
Caddo	169.30	168.5	1962	--	--	3141	0.00	--	2918	8	S	22059
NECHES RIVER BASIN												
Sam Rayburn	166.72	164.4	3597	1671	--	9487	0.00	.23	12744	25	F	251677
B.A. Steinh	82.06	83.0	9841	872	--	10477	0.32	.49	10886	86	C	57375
TRINITY RIVER BASIN												
Bridgeport	835.67	836.0	-494	--	--	0	0.02	--	0	99	C	356972
Eagle Mount	648.96	649.0	168	--	61.781	169	0.00	--	169	100	C	181265
Lake Worth	593.14	594.0	106	--	82.316	0	0.00	--	0	92	C	33791
Benbrook	695.18	694.0	-21	--	167.659	0	0.00	.64	0	6	F	4443
Joe Pool	532.15	522.0	23	--	9.236	358	0.00	.34	358	69	F	87158
Mountain Ck	458.14	457.0	307	--	--	0	--	--	794	--	S	3312
Ray Roberts	637.82	632.5	-273	--	11.629	1939	--	--	1938	64	F	169234
Lewisville	528.47	522.0	2092	0	76.759	4844	0.00	--	4839	61	F	207643
Grapevine	553.33	535.0	-927	--	--	1898	0.00	.37	1894	68	F	164553
Lavon	492.66	492.0	-123	--	410.157	394	0.00	.25	393	5	F	13893
Ray Hubbard	435.45	435.5	153	--	212.700	0	0.00	--	0	100	C	488563
Cedar Creek	321.39	322.0	50	--	28.040	0	0.00	--	0	97	C	648093
Navarro Mil	429.39	424.5	-294	--	9.420	1484	0.00	.52	1464	19	F	28189
Bardwell	421.51	421.0	-4	--	6.470	173	0.00	.40	91	2	F	1674
Richland Cr	315.32	315.0	2191	--	63.240	1870	0.00	--	1864	--	S	13463
BRAZOS RIVER BASIN												
Possum King	999.34	999.0	422	--	--	201	0.00	.29	201	--	C	5522
Granbury	692.64	692.7	-161	--	72.250	2	0.00	.34	2	100	C	126327
Whitney	532.96	533.0	277	846	--	25	0.00	.34	25	100	P	232827
Aquilla	537.22	537.5	-14	--	--	1	--	--	1	97	C	30412
Waco	461.92	462.0	81	--	46.791	60	0.00	.30	60	100	C	180188
Proctor	1168.98	1162.0	111	--	3.176	1456	0.00	.41	1410	12	F	37753
Belton	594.92	594.0	1089	--	58.305	1293	--	--	1031	2	F	11271
Stillhouse	622.11	622.0	-19	--	0.000	1	0.00	.41	1	0	F	714
Georgetown	790.27	791.0	6	--	51.045	0	0.00	.27	0	97	C	35900
Granger	504.48	504.0	56	--	4.408	121	0.00	.47	91	1	F	2054
Somerville	247.68	238.0	122	--	4.377	2166	0.00	.34	2159	39	F	136049
Limestone	362.08	363.0	-137	--	--	29	0.00	.05	28	94	C	192490
COLORADO RIVER BASIN												
Twin Buttes	1900.36	1940.2	-9	--	--	0	0.00	--	0	9	C	15073
O.C. Fisher	1873.74	1908.0	-9	--	0.000	0	0.00	.45	0	39	D	14239
O.H. Ivie	1510.48	1551.5	--	--	--	--	--	--	--	16	C	90730
Hords Creek	1886.20	1900.0	1	--	0.000	1	0.00	.44	1	27	C	1820
Buchanan	1007.43	1020.5	--	--	--	--	--	--	--	68	C	571665
Marshall Fo	670.40	681.0	-216	202	--	0	0.00	.34	0	83	C	927623
GUADALUPE RIVER BASIN												
Canyon	909.27	909.0	176	260	--	0	0.17	.17	256	1	F	2246

Pumpage below dam (MGD): Grapevine 7.515, and Belton 24.453.
Total outflow includes this and pumpage tabulated.
Preliminary data--Inflow not adjusted for wind effect, etc.

D = Sediment Pool
C = Conservation Pool
P = Power Pool
F = Flood Pool
S = Surcharge Pool
nr = Not reported today

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

DAILY REPORT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

Lewisville
Monthly Report
SEP2013

DAY:	ELEVATIONS 0800	ELEVATIONS 2400	STORAGE: 2400	EVAP:	PUMP:	RELEASES TURBINE	RELEASES OTHER	ADJ. INFLOW:	RAIN
	FEET-NGVD		A-F	DSF:	DSF:	DSF	DSF	DSF	INCH
1	514.43	514.46	415113	197	30.6	0	472	128	0.00
2	514.42	514.40	413837	290	27.5	0	471	146	0.10
3	514.45	514.45	414900	259	0.9	0	383	1179	0.05
4	514.41	514.43	414475	165	-3.0	0	309	299	0.00
5	514.36	514.38	413412	259	2.1	0	309	257	0.00
6	514.31	514.33	412352	431	21.9	0	380	225	0.00
7	514.25	514.27	411083	179	22.9	0	430	175	0.00
8	514.20	514.20	409607	311	8.4	0	430	150	0.00
9	514.15	514.16	408765	373	19.3	0	430	125	0.00
10	514.09	514.09	407296	271	24.5	0	385	125	0.00
11	514.04	514.05	406459	224	15.6	0	353	115	0.00
12	514.00	514.01	405623	278	17.5	0	353	110	0.00
13	513.96	513.98	404997	269	19.7	0	353	110	0.00
14	513.94	513.94	404164	284	22.2	0	412	100	0.00
15	513.83	513.85	402295	307	10.9	0	434	100	0.00
16	513.79	513.80	401260	252	11.4	0	470	100	0.00
17	513.74	513.75	400227	183	24.8	0	382	100	0.00
18	513.70	513.72	399609	213	16.0	0	336	100	0.00
19	513.64	513.67	398581	235	11.0	0	352	100	0.00
20	513.76	513.69	398992	75	20.6	0	352	656	1.40
21	513.87	513.87	402709	83	-4.1	0	117	2071	0.46
22	513.85	513.85	402295	45	-15.2	0	145	300	0.00
23	513.81	513.82	401673	176	-5.8	0	248	222	0.00
24	513.78	513.78	400847	305	2.3	0	309	161	0.00
25	513.75	513.75	400227	228	6.2	0	299	134	0.00
26	513.71	513.72	399609	220	4.9	0	247	61	0.00
27	513.67	513.68	398786	281	20.6	0	247	54	0.00
28	513.62	513.64	397965	113	21.7	0	283	5	0.60
29	513.71	513.71	399403	75	9.7	0	308	1119	0.00
30	513.68	513.68	398786	159	-7.0	0	214	260	0.00
MONTHLY TOTAL	(DSF)		6757	358	0.	10213.	8790.	2.61	
	(A-F)	-16776	13404	710	0	20257	17434		

TRINITY RIVER BASIN, TEXAS

LEWISVILLE DAM AND LAKE

ELM FORK TRINITY RIVER

MONTHLY RESERVOIR REPORT

U.S. ARMY ENGINEER DISTRICT, FORT WORTH September 2018

TABLE 4-8

All Recorded Major Floods at USGS Gages in the Elm Fork Trinity River Watershed, 1908-2016

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrollton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1908, May	29.30	—	30.70	—	19.00	145,000
1923, Dec 14	—	—	—	—	12.75	76,000
1925, May 10	—	—	—	—	7.80	12,200
1926, Jul. 29	—	—	—	—	6.74	8,660
1927, Jul 15	—	—	—	—	8.60	15,200
1928, Apr 06	—	—	—	—	5.70	6,190
1929, May 15	—	—	—	—	9.40	19,000
1930, May 14	—	—	—	—	7.20	10,100
1930, Dec 05	—	—	—	—	6.46	8,100
1932, Jan 23	—	—	—	—	11.30	30,600
1933, Mar 06	—	—	—	—	7.33	10,900
1934, Mar 01	—	—	—	—	6.10	7,460
1935, May	—	—	29.70	—	13.00	82,100
1936, Sep 29	—	—	—	—	8.90	16,000
1936, Oct 26	—	—	—	—	7.28	10,500
1938, Feb 18	—	—	—	—	12.10	56,700
1939, Apr 18	—	—	—	—	12.78	10,700
1940, Jun 17	—	—	—	—	12.33	8,980
1941, Jun 12	—	—	—	—	20.53	76,400
1942, Apr 26	—	—	—	—	16.50	90,700
1943, Mar 26	—	—	—	—	14.13	18,600
1944, May 3	—	—	—	—	13.31	13,600
1945, Feb 22	—	—	—	—	16.96	37,800
1946, Jun 02	—	—	—	—	18.11	42,800
1946, Dec 13	—	—	—	—	14.95	23,000
1948, Feb 27	—	—	—	—	16.59	27,600
1949, May 17-18	—	5,700	—	—	15.36	23,600
1950, May 4	—	—	—	—	15.17	22,300

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrollton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1950, Sep 13-15	26.35	17,200	27.14	20,100	—	—
1951, Jun 12-13	21.62	3,480	—	—	11.30	6,030
1952, Apr 22-24	21.05	3,130	—	—	10.84	5,740
1953, Apr 29- May 16	20.65	3,570	—	—	11.42	6,130
1953, Oct 26	—	—	—	—	—	—
1954, May 13-14	19.87	3,280	—	—	8.12	4,370
1954, Oct 2	—	—	—	—	—	—
1955, Mar 20	—	—	—	—	3.23	1,180
1955, May 19-21	21.65	4,100	26.20	11,000	—	—
1956, May 1-2	9.91	754			3.66	2,740
1957, Apr 26- Jun 05	27.08	22,700	27.40	20,800	8.54	13,700
1957, Nov	—	—	26.00	12,200	—	—
1958, Apr 27- May 17	27.30	16,000	29.10	27,500	6.65	7,720
1959, Jun 23-27	17.82	2,700	27.59	20,000	—	—
1959, Jul 20	—	—	—	—	4.04	2,960
1959, Oct 4-5	22.92	5,060	—	—	4.95	4,200
1960, Jan 22	—	—	—	—	—	—
1961, Jan 8	12.84	1,470	—	—	—	—
1961, Mar 22-26	—	—	—	—	4.25	3,080
1962, Jul 27	—	—	—	—	7.32	9,540
1962, Sep 8	27.81	19,000	28.10	22,500	—	—
1962, Oct 08	—	—	—	—	5.26	4,800
1962, Nov 26-27	23.49	5,710	—	—	—	—
1962, Sep 14	—	—	—	—	—	—
1963, May 10	—	—	—	—	—	—
1964, Sep 21-22	21.43	4,050	—	—	10.95	33,000
1964, Nov 18-25	26.09	11,100	27.10	17,500	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrollton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1965, Feb 09	—	—	—	—	6.70	7,960
1966, Feb 9	—	—	27.71	35,000	—	—
1966, Apr 30	27.62	19,800	26.90	20,400	7.41	9,820
1966, May 21-31	27.79	19,000	—	—	—	—
1967, May 31- Jun 9	—	—	26.10	12,600	5.64	5,590
1968, Mar 20-31	25.08	8,360	—	—	7.06	8,980
1968, Apr 19	—	—	26.14	12,000	—	—
1969, May 7-27	25.17	9,170	26.30	13,400	7.49	10,100
1970, Apr 25-26	26.71	13,500	—	—	—	—
1970, May 31- Jun 6	—	—	—	—	5.60	6,330
1970, Sep-Oct 2	—	—	26.39	14,300	4.76	4,400
1971, Aug 14-15	12.50	1,400	—	—	—	—
1971, Oct 20	—	—	—	—	6.95	9,530
1971, Dec 10-29	25.67	9,860	26.50	15,100	—	—
1973, Apr 24	—	—	26.54	15,900	6.95	8,980
1973, Jul 30- Aug 7	—	—	—	—	—	—
1973, Sep 28	24.13	6,700	—	—		
1973, Oct 13-21	18.50	2,930	—	—	6.01	7,270
1974, Oct 31	29.43	40,000	29.10	50,000	—	—
1974, Nov 10	—	—	—	—	7.32	10,300
1976, April 20- Jun 1	18.71	3,000	—	—	2.50	992
1976, Aug 10	—	—	—	—	—	—
1977, Mar 27- Apr 6	28.91	29,900	27.80	25,700	7.71	11,300
1977, Oct 28	—	—	—	—	—	—
1978, Apr 11- Jun 6	8.74	725	—	—	2.31	795
1979, May 22-30	25.79	10,300	—	—	5.28	5,360
1980, Jan 22	—	—	—	—	2.26	778
1980, Aug 21	—	—	—	—	—	—
1980, Sep 29	25.96	10,700	26.00	11,000	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrolton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1981, May 27- Jun 20	20.67	4,180	—	—	5.06	4,970
1981, Oct 13-16	29.84	39,900	33.50	150,000	—	—
1981, Nov 02	—	—	26.80	14,900	10.65	21,100
1982, May	29.80	39,400	26.70	18,700		
1983, Jan 31	—	—	—	—	3.79	2,560
1983, Feb 1-5	16.10	2,370	—	—	—	—
1983, Mar 5	—	—	—	—	—	—
1983, Oct 8	—	—	—	—	—	—
1984, Mar 19	12.19	1,570	—	—		
1984, May 1-2	—	—	—	—	3.70	2,420
1984, Nov 2	19.50	3,360	—	—		
1985, Mar 20	—	—	—	—	—	—
1985, Apr 28	—	—	—	—	5.64	6,170
1985, May 31	—	—	—	—	—	—
1986, Jun 2-20	—	—	—	—	5.97	6,750
1987, May 29- Jun 16	—	—	—	—	5.40	5,750
1987, Dec 26	—	—	—	—	5.33	1,670
1988, Apr 30	—	—	—	—	—	—
1989, May 17	—	—	—	—	9.73	8,720
1989, Jul 3	—	—	—	—	—	—
1990, Apr 26	—	—	—	—	—	—
1990, May 4-5	—	—	—	—	13.48	27,600
1991, Apr 12	—	—	—	—	—	—
1991, Jun 2-3	—	—	—	—	6.39	3,620
1991, Dec. 20	—	—	—	—	10.32	11,500
1992, Jan 27	—	—	—	—	—	—
1993, Feb 25	—	—	—	—	8.33	7,460
1993, Mar 16	—	—	—	—	—	—
1993, Jun 9	—	—	—	—	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrollton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1993, Oct 19	—	—	—	—	—	—
1994, Jul 11-15	—	—	—	—	9.58	7,520
1995, Mar 13	—	—	—	—	8.54	7,880
1995, May 8-14	—	—	—	—	—	—
1996, Jan 8	—	—	—	—	—	—
1996, Aug 31	—	—	—	—	5.26	1,800
1996, Sep 15	—	—	—	—	—	—
1997, Feb 19-20	—	—	—	—	8.29	7,240
1997, Mar 8	—	—	—	—	—	—
1998, Jan 05	—	—	—	—	8.92	8,640
1998, Mar 2-16	—	—	—	—	—	—
1998, Dec 4	—	—	—	—	6.73	4,310
1999, Mar 10	—	—	—	—	—	—
2000, Feb. 23	—	—	—	—	6.29	3,420
2000, Mar 10	—	—	—	—	—	—
2000, May 19	—	—	—	—	—	—
2001, Feb 16	—	—	—	—	—	—
2001, Mar 24	—	—	—	—	8.33	7,140
2001, Apr 23	—	—	—	—	—	—
2002, Mar 19	—	—	—	—	9.69	9,990
2002, Apr 7-8	—	—	—	—	—	—
2002, Oct 19	—	—	—	—	8.10	6,420
2003, Jun 15	—	—	—	—	—	—
2004, Jun 7	—	—	—	—	—	—
2004, Jul 29	—	—	—	—	8.08	6,380
2004, Aug 4	—	—	—	—	—	—
2004, Nov 30- Dec 7	—	—	—	—	7.61	5,460
2005, Apr	—	—	—	—	—	—
2006, Mar 19	—	—	—	—	7.27	4,830

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Isle du Bois Creek near Pilot Point* (1908-1984)		Elm Fork near Sanger* (1908-1982)		Elm Fork Trinity River near Carrollton** (1908-2015)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
2006, Apr 29	—	—	—	—	—	—
2007, Jun 26-27	—	—	—	—	9.68	9,970
2007, Jul 21	—	—	—	—	—	—
2007, Oct 3	—	—	—	—	—	—
2008, Mar 18	—	—	—	—	8.21	6,650
2009, Apr 30	—	—	—	—	—	—
2009, May 3-21	—	—	—	—	6.86	4,130
2009, Nov 2	—	—	—	—	—	—
2010, Sep 8	—	—	—	—	10.22	11,300
2011, May 2-26	—	—	—	—	6.53	3,600
2012, Jan 25	—	—	—	—	8.53	7,340
2012, Mar 20-31	—	—	—	—	—	—
2013, Jan 9	—	—	—	—	7.21	4,730
2013, Jun 6	—	—	—	—	—	—
2014, Jul 17	—	—	—	—	—	—
2014, Aug 17	—	—	—	—	7.38	5,060
2015, May 8-31	—	—	—	—	13.12	26,700
2015, Nov 27	—	—	—	—	10.82	12,800

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1908, May	36.50	—	—	—
1923, Dec 14	—	—	—	—
1925, May 10	—	—	—	—
1926, Jul. 29	—	—	—	—
1927, Jul 15	—	—	—	—
1928, Apr 06	—	—	—	—
1929, May 15	—	—	—	—
1930, May 14	—	—	—	—
1930, Dec 05	—	—	—	—
1932, Jan 23	—	—	—	—
1933, Mar 06	—	—	—	—
1934, Mar 01	—	—	—	—
1935, May	34.00	—	—	—
1936, Sep 29	—	—	—	—
1936, Oct 26	—	—	—	—
1938, Feb 18	—	—	—	—
1939, Apr 18	—	—	—	—
1940, Jun 17	—	—	—	—
1941, Jun 12	—	—	—	—
1942, Apr 26	—	—	—	—
1943, Mar 26	—	—	—	—
1944, May 3	—	—	—	—
1945, Feb 22	—	—	—	—
1946, Jun 02	—	—	—	—
1946, Dec 13	—	—	—	—
1948, Feb 27	—	—	—	—
1949, May 17-18	26.10	6,880	—	—
1950, May 4	—	—	—	—
1950, Sep 13-15	29.80	18,200	30.75	21,700

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1951, Jun 12-13	14.95	1,950	26.34	6,840
1952, Apr 22-24	14.16	1,710	25.63	6,180
1953, Apr 29- May 16	16.58	2,510	27.00	6,880
1953, Oct 26	23.10	5,250	—	—
1954, May 13-14	—	—	22.95	4,600
1954, Oct 2	—	—	10.32	874
1955, Mar 20	—	—	—	—
1955, May 19-21	27.81	11,000	—	—
1956, May 1-2	8.31	224	8.58	595
1957, Apr 26- Jun 05	29.27	16,100	26.72	11,400
1958, Apr 27- May 17	29.65	17,400	24.09	5,440
1959, Jun 23-27	26.00	7,210	—	—
1959, Jul 20	—	—	8.93	666
1959, Oct 4-5	25.70	8,280	—	—
1960, Jan 22	—	—	20.31	3,820
1961, Jan 8	—	—	—	—
1961, Mar 22-26	16.16	2,330	18.45	3,100
1962, Jul 27	—	—	—	—
1962, Sep 8	29.30	16,200	—	—
1962, Oct 08	—	—	—	—
1962, Nov 26-27	24.74	7,780	—	—
1962, Sep 14	—	—	20.82	3,700
1963, May 10	—	—	20.28	3,630
1964, Sep 21-22	19.37	4,130	22.17	4,630
1964, Nov 18-25	29.00	15,000	23.69	5,260
1965, Feb 09	—	—	—	—
1966, Feb 9	27.35	11,200	—	—
1966, Apr 30	—	—	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1966, May 21-31	—	—	24.58	5,680
1967, May 31- Jun 9	27.70	11,500	21.91	4,510
1968, Mar 20-31	—	—	21.94	4,960
1968, Apr 19	25.35	7,860	—	—
1969, May 7-27	26.23	8,720	20.93	4,780
1970, Apr 25-26	24.42	6,620	—	—
1970, May 31- Jun 6	—	—	20.27	4,460
1970, Sep-Oct 2	—	—	17.94	3,260
1971, Aug 14-15	10.08	710	—	—
1971, Oct 20	—	—	—	—
1971, Dec 10-29	25.95	8,340	22.02	5,010
1973, Apr 24	—	—	—	—
1973, Jul 30- Aug 7	25.16	7,390	25.77	6,360
1973, Sep 28				
1973, Oct 13-21	19.82	3,550	24.80	6,370
1974, Oct 31	28.83	14,500	—	—
1974, Nov 10	—	—	24.70	5,820
1976, April 20- Jun 1	11.80	858	—	—
1976, Aug 10	—	—	7.57	609
1977, Mar 27- Apr 6	27.49	8,190	22.61	5,290
1977, Oct 28	—	—	7.30	503
1978, Apr 11- Jun 6	10.25	515	—	—
1979, May 22-30	22.47	3,970	22.58	5,280
1980, Jan 22	—	—	—	—
1980, Aug 21	—	—	7.13	462
1980, Sep 29	12.58	984	—	—
1981, May 27- Jun 20	25.09	5,460	19.98	4,110
1981, Oct 13-16	35.70	104,000	—	—
1981, Nov 02	—	—	27.83	15,000

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1982, May	—	—	—	—
1983, Jan 31	—	—	—	—
1983, Feb 1-5	—	—	10.43	1,070
1983, Mar 5	9.59	401	—	—
1983, Oct 8	16.15	2,190	—	—
1984, Mar 19	—	—	—	—
1984, May 1-2	—	—	9.19	814
1984, Nov 2	—	—	—	—
1985, Mar 20	18.78	3,130	—	—
1985, Apr 28	—	—	—	—
1985, May 31	—	—	20.12	4,250
1986, Jun 2-20	23.42	5,020	20.50	4,420
1987, May 29- Jun 16	26.44	7,600	20.11	4,250
1987, Dec 26	15.92	2,470	—	—
1988, Apr 30	—	—	11.62	1,350
1989, May 17	28.32	11,300	—	—
1989, Jul 3	—	—	23.04	5,880
1990, Apr 26	29.94	24,300	—	—
1990, May 4-5	—	—	30.15	19,600
1991, Apr 12	22.75	5,880	—	—
1991, Jun 2-3	—	—	10.88	1,130
1991, Dec. 20	26.96	11,300	—	—
1992, Jan 27	—	—	23.55	7,300
1993, Feb 25	—	—	—	—
1993, Mar 16	—	—	20.28	4,320
1993, Jun 9	24.12	6,970	—	—
1993, Oct 19	19.71	4,380	—	—
1994, Jul 11-15	—	—	22.21	5,320
1995, Mar 13	—	—	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
1995, May 8-14	22.92	7,970	20.62	4,480
1996, Jan 8	—	—	16.38	2,750
1996, Aug 31	—	—	—	—
1996, Sep 15	10.57	1,080	—	—
1997, Feb 19-20	26.14	12,200	—	—
1997, Mar 8	—	—	22.40	5,440
1998, Jan 05	—	—	—	—
1998, Mar 2-16	20.47	6,040	19.19	3,850
1998, Dec 4	—	—	11.34	1,280
1999, Mar 10	12.51	1,790	—	—
2000, Feb. 23	—	—	—	—
2000, Mar 10	9.65	778	—	—
2000, May 19	—	—	9.42	900
2001, Feb 16	24.07	8,800	—	—
2001, Mar 24	—	—	—	—
2001, Apr 23	—	—	19.32	4,240
2002, Mar 19	—	—		
2002, Apr 7-8	21.36	6,280	21.66	5,120
2002, Oct 19	—	—	13.41	1,930
2003, Jun 15	11.46	1,190	—	—
2004, Jun 7	22.99	8,190	—	—
2004, Jul 29	—	—	—	—
2004, Aug 4	—	—	18.33	3,550
2004, Nov 30- Dec 7	—	—	21.43	5,330
2005, Apr	17.35	4,120	—	—
2006, Mar 19	—	—	11.55	1,540
2006, Apr 29	14.26	2,540	—	—

Table 4-8 All Recorded Major Floods at USGS Gages In The Elm Fork Trinity River Watershed, 1908-2016 (Continued)

Date	Clear Creek near Sanger (1908-2015)		Elm Fork Trinity River near Lewisville (1950-2016)	
	Gage Height (ft)	Peak Discharge (cfs)	Gage Height (ft)	Peak Discharge (cfs)
2007, Jun 26-27	27.11	12,800	—	—
2007, Jul 21	—	—	26.05	7,290
2007, Oct 3	—	—	20.16	3,950
2008, Mar 18	19.75	4,480	—	—
2009, Apr 30	19.09	4,140	—	—
2009, May 3-21	—	—	14.88	2,330
2009, Nov 2	—	—	23.53	5,820
2010, Sep 8	24.71	8,430	—	—
2011, May 2-26	10.65	1,020	10.63	1,270
2012, Jan 25	—	—	—	—
2012, Mar 20-31	22.29	6,180	20.00	3,900
2013, Jan 9	—	—	8.36	781
2013, Jun 6	11.78	1,500	—	—
2014, Jul 17	26.87	9,720	—	—
2014, Aug 17	—	—	11.62	1,500
2015, May 8-31	28.92	18,900	30.98	18,600
2015, Nov 28	25.07	8,940	—	—
2016, Jun 17	—	—	26.87	7,330

Notes:

1. *Gage was removed in 1984.
2. **River stages at the Elm Fork near Carrollton Gage were effected by reduced flows due to the impoundment of Lake Dallas from 1928 to 1954, by Lake Dallas and Grapevine Lake from July 1952 to November 1954, and by Grapevine and Lewisville Lakes from November 1954 to 1987, and by Grapevine, Lewisville, and Ray Roberts Lakes from 1987 to Present.

TABLE 4-9

Lewisville Dam and Lake Monthly and Annual Inflow Volumes in Acre-feet

TABLE 4-9

Lewisville Dam and Lake Monthly and Annual Inflow Volumes in Acre-Feet

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1954											2,735	2,588	5,324
1955	1,057	795	4,570	4,507	17,689	17,268	15,051	15,727	10,524	8,434	7,718	4,941	108,281
1956	5,770	8,733	1,765	2,037	11,163	3,057	8,920	11,996	8,803	5,701	4,574	4,639	77,158
1957	466	10,842	11,239	454,247	603,910	167,848	62,419	50,573	28,543	9,078	205,336	20,511	1,625,012
1958	49,964	15,073	81,948	141,253	343,709	28,717	32,698	5,284	6,631	2,723	4,977	1,166	714,143
1959	1,870	5,238	7,803	7,067	13,232	71,680	34,436	2,354	3,213	97,614	9,985	56,784	311,277
1960	101,123	23,808	22,491	14,977	32,853	8,805	43,302	26,561	1,654	3,118	1,083	18,728	298,503
1961	49,488	47,338	70,997	17,254	13,053	19,666	7,208	367	6,490	13,059	10,306	16,921	272,150
1962	2,590	5,865	10,739	83,148	7,270	85,366	31,314	8,829	314,980	13,787	71,739	24,423	660,049
1963	4,165	5,457	11,629	60,001	54,798	5,193	7,168	3,031	1,000	1,555	1,434	1,527	156,958
1964	6,845	3,037	30,601	81,230	54,445	10,084	4,578	10,743	247,386	8,287	322,148	22,820	802,205
1965	53,027	102,967	19,528	16,648	95,609	51,436	2,692	8,612	71,420	5,260	11,092	2,981	441,271
1966	5,710	111,735	24,970	441,400	122,330	34,886	3,404	33,333	23,322	1,853	2,208	2,805	807,955
1967	4,098	3,882	13,107	44,649	87,464	86,036	3,552	1,553	8,759	6,022	1,390	5,754	266,267
1968	44,190	12,663	224,723	119,125	170,408	45,775	18,562	4,929	31,641	16,209	27,882	10,645	726,752
1969	37,464	94,391	151,391	67,499	320,133	36,139	2,281	6,419	5,385	30,324	1,521	63,063	816,010
1970	17,040	123,098	146,936	208,966	64,799	32,516	3,265	7,075	129,106	8,892	994	5,109	747,795
1971	6,732	8,589	5,788	10,544	15,561	7,496	16,346	21,095	12,199	149,976	28,162	355,767	638,253
1972	24,994	10,277	11,772	16,211	23,001	6,760	1,142	4,925	8,426	55,834	52,364	3,977	219,683
1973	45,775	50,532	103,344	163,480	72,533	147,320	75,958	26,404	86,306	145,561	62,698	21,773	1,001,685
1974	10,891	18,758	13,157	69,843	40,596	74,258	4,046	15,928	71,924	232,484	265,698	24,419	842,002
1975	35,112	175,000	98,536	99,225	127,692	117,992	16,973	6,294	1,069	97	2,021	5,530	685,541
1976	2,823	6,026	8,640	41,003	78,356	54,526	22,864	2,311	2,979	8,757	4,987	8,553	241,824
1977	28,521	77,690	327,761	74,336	16,350	13,153	6,575	24,871	1,079	2,652	248	129	573,364
1978	2,618	15,392	33,932	26,541	38,583	11,431	2,037	2,959	1,361	309	10,493	829	146,485
1979	12,500	17,820	162,945	74,830	158,265	26,323	5,556	6,766	113	4,487	171	6,431	476,205
1980	6,046	8,874	5,048	5,074	6,684	7,855	3,731	1,406	42,786	56,450	4,739	31,504	180,197
1981	3,846	6,093	79,251	23,592	136,836	92,243	21,287	1,146	11,689	974,521	205,564	18,764	1,574,832
1982	202,388	119,748	44,968	26,863	814,151	177,684	48,467	2,543	2,335	6,296	21,463	37,504	1,504,409
1983	23,887	39,138	35,536	16,251	29,564	19,434	11,387	11,845	3,360	50,230	10,431	4,812	255,877
1984	8,682	19,793	66,527	11,947	13,609	13,317	0	3,370	1,952	20,303	29,804	78,473	267,776
1985	66,096	75,597	138,165	107,137	108,055	89,254	6,901	4,376	10,832	101,323	27,394	10,159	745,288
1986	6,653	177,670	16,546	81,058	194,399	216,808	14,928	7,797	86,381	24,851	25,054	30,056	882,201
1987	73,737	109,087	168,227	23,157	141,769	141,422	21,826	7,297	9,481	3,927	27,781	65,303	793,013
1988	20,208	12,544	11,233	8,561	2,499	11,943	8,773	4,171	11,179	1,502	6,978	12,458	112,048
1989	44,623	110,306	93,655	17,840	136,582	353,002	60,703	14,515	19,571	7,936	2,594	4,096	865,423
1990	42,298	44,549	198,483	388,637	528,678	195,010	106,671	89,569	7,236	10,985	19,956	9,648	1,641,719
1991	27,118	16,703	12,034	37,641	66,739	28,759	6,776	13,424	15,507	151,851	114,694	352,385	843,630
1992	188,542	147,130	139,091	40,892	48,274	86,372	15,134	11,726	66,669	4,147	9,646	173,963	931,586
1993	40,305	196,922	154,790	60,140	130,907	150,522	197,285	6,680	33,309	174,209	37,879	112,611	1,295,559
1994	26,398	56,407	55,088	22,265	208,464	14,954	210,606	20,418	38,401	124,038	162,528	66,626	1,006,192
1995	32,543	22,723	155,534	174,990	208,480	78,598	16,886	22,138	9,854	5,516	5,697	9,955	742,914
1996	9,580	5,472	10,868	14,991	12,698	19,026	17,163	17,552	14,428	43,359	258,916	80,235	504,289
1997	6,272	250,193	175,758	210,084	141,356	85,999	13,740	13,283	8,642	18,982	4,604	84,154	1,013,067
1998	142,705	88,750	224,070	61,020	22,037	12,012	7,914	7,688	8,380	17,816	19,428	47,610	659,430
1999	18,806	14,470	18,268	29,822	57,032	19,573	10,570	13,748	8,791	17,403	14,720	22,084	245,286
2000	17,485	20,051	25,262	25,863	26,922	19,418	6,702	64,952	33,517	23,629	79,316	80,411	423,529
2001	64,803	276,700	148,556	79,336	83,866	23,011	8,017	14,176	11,038	16,985	5,417	15,993	747,899
2002	32,910	19,736	239,083	205,953	83,275	38,109	25,028	6,468	4,417	50,795	6,248	55,683	767,706
2003	17,746	45,930	53,207	14,454	48,409	30,042	5,324	15,816	23,574	6,290	19,256	11,129	291,178
2004	24,685	36,774	30,112	51,928	24,822	214,478	88,240	45,954	22,340	58,680	175,700	107,460	881,172
2005	134,426	37,433	36,734	0	21,291	18,177	13,230	21,908	11,246	7,170	9,406	8,674	319,695
2006	14,870	14,696	42,963	15,596	19,393	6,895	12,883	30,108	27,475	17,824	24,935	35,479	263,115
2007	71,039	8,513	40,073	142,358	96,600	409,238	308,700	136,596	76,085	44,262	7,176	16,152	1,356,791
2008	4,380	27,830	203,204	143,042	48,344	13,246	11,792	30,554	10,987	6,827	15,769	8,232	524,205
2009	7,323	14,400	22,614	32,192	146,789	35,370	26,004	10,524	33,208	273,068	101,595	37,766	740,853
2010	61,387	201,952	189,073	66,174	23,671	13,970	37,157	10,517	155,937	10,776	11,336	13,389	795,338
2011	17,834	13,720	12,359	22,531	67,495	18,185	7,629	17,022	11,032	18,623	12,119	36,861	255,409
2012	120,664	27,702	131,510	36,707	18,137	18,934	7,859	11,887	9,977	7,000	4,768	14,785	409,930
2013	27,402	13,678	25,831	18,365	18,871	24,939	12,538	11,088	17,288	20,603	15,703	36,262	242,568
2014	10,778	13,020	19,641	24,107	17,139	17,062	70,718	39,789	12,083	17,302	11,645	12,040	265,325
2015	23,451	31,877	66,023	198,971	807,013	449,370	112,873	123,419	38,091	63,970	344,131	291,485	2,550,673
2016	178,208	159,045	202,979	181,879	205,011	284,329	93,708	40,531	17,800	23,877	47,263	17,719	1,452,349
2017	77,446	38,615											
TOTAL	2,452,406	3,478,845	4,892,673	4,961,436	7,349,663	4,612,286	2,081,492	1,214,942	2,011,192	3,315,402	3,015,616	2,744,734	
AVG	39,538	56,098	80,133	81,261	120,196	75,328	33,876	19,659	32,798	54,213	49,265	44,872	677,569

TABLE 7-4

Tabulated Area and Capacity Curves

TABLE 7-4

Tabulated Area and Capacity Curves

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
453.0	0.000	0.070	0.140	0.210	0.280	0.350	0.420	0.490	0.560	0.630
453.1	0.700	0.770	0.840	0.910	0.980	1.050	1.120	1.190	1.260	1.330
453.2	1.400	1.470	1.540	1.610	1.680	1.750	1.820	1.890	1.960	2.030
453.3	2.100	2.170	2.240	2.310	2.380	2.450	2.520	2.590	2.660	2.730
453.4	2.800	2.870	2.940	3.010	3.080	3.150	3.220	3.290	3.360	3.430
453.5	3.500	3.570	3.640	3.710	3.780	3.850	3.920	3.990	4.060	4.130
453.6	4.200	4.270	4.340	4.410	4.480	4.550	4.620	4.690	4.760	4.830
453.7	4.900	4.970	5.040	5.110	5.180	5.250	5.320	5.390	5.460	5.530
453.8	5.600	5.670	5.740	5.810	5.880	5.950	6.020	6.090	6.160	6.230
453.9	6.300	6.370	6.440	6.510	6.580	6.650	6.720	6.790	6.860	6.930
454.0	7.000	7.100	7.200	7.300	7.400	7.500	7.600	7.700	7.800	7.900
454.1	8.000	8.100	8.200	8.300	8.400	8.500	8.600	8.700	8.800	8.900
454.2	9.000	9.100	9.200	9.300	9.400	9.500	9.600	9.700	9.800	9.900
454.3	10.000	10.100	10.200	10.300	10.400	10.500	10.600	10.700	10.800	10.900
454.4	11.000	11.100	11.200	11.300	11.400	11.500	11.600	11.700	11.800	11.900
454.5	12.000	12.100	12.200	12.300	12.400	12.500	12.600	12.700	12.800	12.900
454.6	13.000	13.100	13.200	13.300	13.400	13.500	13.600	13.700	13.800	13.900
454.7	14.000	14.100	14.200	14.300	14.400	14.500	14.600	14.700	14.800	14.900
454.8	15.000	15.100	15.200	15.300	15.400	15.500	15.600	15.700	15.800	15.900
454.9	16.000	16.100	16.200	16.300	16.400	16.500	16.600	16.700	16.800	16.900
455.0	17.000	17.110	17.220	17.330	17.440	17.550	17.660	17.770	17.880	17.990
455.1	18.100	18.210	18.320	18.430	18.540	18.650	18.760	18.870	18.980	19.090
455.2	19.200	19.310	19.420	19.530	19.640	19.750	19.860	19.970	20.080	20.190
455.3	20.300	20.410	20.520	20.630	20.740	20.850	20.960	21.070	21.180	21.290
455.4	21.400	21.510	21.620	21.730	21.840	21.950	22.060	22.170	22.280	22.390
455.5	22.500	22.610	22.720	22.830	22.940	23.050	23.160	23.270	23.380	23.490
455.6	23.600	23.710	23.820	23.930	24.040	24.150	24.260	24.370	24.480	24.590
455.7	24.700	24.810	24.920	25.030	25.140	25.250	25.360	25.470	25.580	25.690
455.8	25.800	25.910	26.020	26.130	26.240	26.350	26.460	26.570	26.680	26.790
455.9	26.900	27.010	27.120	27.230	27.340	27.450	27.560	27.670	27.780	27.890
456.0	28.000	28.080	28.160	28.240	28.320	28.400	28.480	28.560	28.640	28.720
456.1	28.800	28.880	28.960	29.040	29.120	29.200	29.280	29.360	29.440	29.520
456.2	29.600	29.680	29.760	29.840	29.920	30.000	30.080	30.160	30.240	30.320
456.3	30.400	30.480	30.560	30.640	30.720	30.800	30.880	30.960	31.040	31.120
456.4	31.200	31.280	31.360	31.440	31.520	31.600	31.680	31.760	31.840	31.920
456.5	32.000	32.080	32.160	32.240	32.320	32.400	32.480	32.560	32.640	32.720
456.6	32.800	32.880	32.960	33.040	33.120	33.200	33.280	33.360	33.440	33.520
456.7	33.600	33.680	33.760	33.840	33.920	34.000	34.080	34.160	34.240	34.320
456.8	34.400	34.480	34.560	34.640	34.720	34.800	34.880	34.960	35.040	35.120
456.9	35.200	35.280	35.360	35.440	35.520	35.600	35.680	35.760	35.840	35.920
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
457.0	36.000	36.280	36.560	36.840	37.120	37.400	37.680	37.960	38.240	38.520
457.1	38.800	39.080	39.360	39.640	39.920	40.200	40.480	40.760	41.040	41.320
457.2	41.600	41.880	42.160	42.440	42.720	43.000	43.280	43.560	43.840	44.120
457.3	44.400	44.680	44.960	45.240	45.520	45.800	46.080	46.360	46.640	46.920
457.4	47.200	47.480	47.760	48.040	48.320	48.600	48.880	49.160	49.440	49.720
457.5	50.000	50.280	50.560	50.840	51.120	51.400	51.680	51.960	52.240	52.520
457.6	52.800	53.080	53.360	53.640	53.920	54.200	54.480	54.760	55.040	55.320
457.7	55.600	55.880	56.160	56.440	56.720	57.000	57.280	57.560	57.840	58.120
457.8	58.400	58.680	58.960	59.240	59.520	59.800	60.080	60.360	60.640	60.920
457.9	61.200	61.480	61.760	62.040	62.320	62.600	62.880	63.160	63.440	63.720
458.0	64.000	64.210	64.420	64.630	64.840	65.050	65.260	65.470	65.680	65.890
458.1	66.100	66.310	66.520	66.730	66.940	67.150	67.360	67.570	67.780	67.990
458.2	68.200	68.410	68.620	68.830	69.040	69.250	69.460	69.670	69.880	70.090
458.3	70.300	70.510	70.720	70.930	71.140	71.350	71.560	71.770	71.980	72.190
458.4	72.400	72.610	72.820	73.030	73.240	73.450	73.660	73.870	74.080	74.290
458.5	74.500	74.710	74.920	75.130	75.340	75.550	75.760	75.970	76.180	76.390
458.6	76.600	76.810	77.020	77.230	77.440	77.650	77.860	78.070	78.280	78.490
458.7	78.700	78.910	79.120	79.330	79.540	79.750	79.960	80.170	80.380	80.590
458.8	80.800	81.010	81.220	81.430	81.640	81.850	82.060	82.270	82.480	82.690
458.9	82.900	83.110	83.320	83.530	83.740	83.950	84.160	84.370	84.580	84.790
459.0	85.000	85.210	85.420	85.630	85.840	86.050	86.260	86.470	86.680	86.890
459.1	87.100	87.310	87.520	87.730	87.940	88.150	88.360	88.570	88.780	88.990
459.2	89.200	89.410	89.620	89.830	90.040	90.250	90.460	90.670	90.880	91.090
459.3	91.300	91.510	91.720	91.930	92.140	92.350	92.560	92.770	92.980	93.190
459.4	93.400	93.610	93.820	94.030	94.240	94.450	94.660	94.870	95.080	95.290
459.5	95.500	95.710	95.920	96.130	96.340	96.550	96.760	96.970	97.180	97.390
459.6	97.600	97.810	98.020	98.230	98.440	98.650	98.860	99.070	99.280	99.490
459.7	99.700	99.910	100.120	100.330	100.540	100.750	100.960	101.170	101.380	101.590
459.8	101.800	102.010	102.220	102.430	102.640	102.850	103.060	103.270	103.480	103.690
459.9	103.900	104.110	104.320	104.530	104.740	104.950	105.160	105.370	105.580	105.790
460.0	106.000	106.240	106.480	106.720	106.960	107.200	107.440	107.680	107.920	108.160
460.1	108.400	108.640	108.880	109.120	109.360	109.600	109.840	110.080	110.320	110.560
460.2	110.800	111.040	111.280	111.520	111.760	112.000	112.240	112.480	112.720	112.960
460.3	113.200	113.440	113.680	113.920	114.160	114.400	114.640	114.880	115.120	115.360
460.4	115.600	115.840	116.080	116.320	116.560	116.800	117.040	117.280	117.520	117.760
460.5	118.000	118.240	118.480	118.720	118.960	119.200	119.440	119.680	119.920	120.160
460.6	120.400	120.640	120.880	121.120	121.360	121.600	121.840	122.080	122.320	122.560
460.7	122.800	123.040	123.280	123.520	123.760	124.000	124.240	124.480	124.720	124.960
460.8	125.200	125.440	125.680	125.920	126.160	126.400	126.640	126.880	127.120	127.360
460.9	127.600	127.840	128.080	128.320	128.560	128.800	129.040	129.280	129.520	129.760
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
461.0	130.000	130.230	130.460	130.690	130.920	131.150	131.380	131.610	131.840	132.070
461.1	132.300	132.530	132.760	132.990	133.220	133.450	133.680	133.910	134.140	134.370
461.2	134.600	134.830	135.060	135.290	135.520	135.750	135.980	136.210	136.440	136.670
461.3	136.900	137.130	137.360	137.590	137.820	138.050	138.280	138.510	138.740	138.970
461.4	139.200	139.430	139.660	139.890	140.120	140.350	140.580	140.810	141.040	141.270
461.5	141.500	141.730	141.960	142.190	142.420	142.650	142.880	143.110	143.340	143.570
461.6	143.800	144.030	144.260	144.490	144.720	144.950	145.180	145.410	145.640	145.870
461.7	146.100	146.330	146.560	146.790	147.020	147.250	147.480	147.710	147.940	148.170
461.8	148.400	148.630	148.860	149.090	149.320	149.550	149.780	150.010	150.240	150.470
461.9	150.700	150.930	151.160	151.390	151.620	151.850	152.080	152.310	152.540	152.770
462.0	153.000	153.250	153.500	153.750	154.000	154.250	154.500	154.750	155.000	155.250
462.1	155.500	155.750	156.000	156.250	156.500	156.750	157.000	157.250	157.500	157.750
462.2	158.000	158.250	158.500	158.750	159.000	159.250	159.500	159.750	160.000	160.250
462.3	160.500	160.750	161.000	161.250	161.500	161.750	162.000	162.250	162.500	162.750
462.4	163.000	163.250	163.500	163.750	164.000	164.250	164.500	164.750	165.000	165.250
462.5	165.500	165.750	166.000	166.250	166.500	166.750	167.000	167.250	167.500	167.750
462.6	168.000	168.250	168.500	168.750	169.000	169.250	169.500	169.750	170.000	170.250
462.7	170.500	170.750	171.000	171.250	171.500	171.750	172.000	172.250	172.500	172.750
462.8	173.000	173.250	173.500	173.750	174.000	174.250	174.500	174.750	175.000	175.250
462.9	175.500	175.750	176.000	176.250	176.500	176.750	177.000	177.250	177.500	177.750
463.0	178.000	178.290	178.580	178.870	179.160	179.450	179.740	180.030	180.320	180.610
463.1	180.900	181.190	181.480	181.770	182.060	182.350	182.640	182.930	183.220	183.510
463.2	183.800	184.090	184.380	184.670	184.960	185.250	185.540	185.830	186.120	186.410
463.3	186.700	186.990	187.280	187.570	187.860	188.150	188.440	188.730	189.020	189.310
463.4	189.600	189.890	190.180	190.470	190.760	191.050	191.340	191.630	191.920	192.210
463.5	192.500	192.790	193.080	193.370	193.660	193.950	194.240	194.530	194.820	195.110
463.6	195.400	195.690	195.980	196.270	196.560	196.850	197.140	197.430	197.720	198.010
463.7	198.300	198.590	198.880	199.170	199.460	199.750	200.040	200.330	200.620	200.910
463.8	201.200	201.490	201.780	202.070	202.360	202.650	202.940	203.230	203.520	203.810
463.9	204.100	204.390	204.680	204.970	205.260	205.550	205.840	206.130	206.420	206.710
464.0	207.000	207.350	207.700	208.050	208.400	208.750	209.100	209.450	209.800	210.150
464.1	210.500	210.850	211.200	211.550	211.900	212.250	212.600	212.950	213.300	213.650
464.2	214.000	214.350	214.700	215.050	215.400	215.750	216.100	216.450	216.800	217.150
464.3	217.500	217.850	218.200	218.550	218.900	219.250	219.600	219.950	220.300	220.650
464.4	221.000	221.350	221.700	222.050	222.400	222.750	223.100	223.450	223.800	224.150
464.5	224.500	224.850	225.200	225.550	225.900	226.250	226.600	226.950	227.300	227.650
464.6	228.000	228.350	228.700	229.050	229.400	229.750	230.100	230.450	230.800	231.150
464.7	231.500	231.850	232.200	232.550	232.900	233.250	233.600	233.950	234.300	234.650
464.8	235.000	235.350	235.700	236.050	236.400	236.750	237.100	237.450	237.800	238.150
464.9	238.500	238.850	239.200	239.550	239.900	240.250	240.600	240.950	241.300	241.650
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
465.0	242.000	242.520	243.040	243.560	244.080	244.600	245.120	245.640	246.160	246.680
465.1	247.200	247.720	248.240	248.760	249.280	249.800	250.320	250.840	251.360	251.880
465.2	252.400	252.920	253.440	253.960	254.480	255.000	255.520	256.040	256.560	257.080
465.3	257.600	258.120	258.640	259.160	259.680	260.200	260.720	261.240	261.760	262.280
465.4	262.800	263.320	263.840	264.360	264.880	265.400	265.920	266.440	266.960	267.480
465.5	268.000	268.520	269.040	269.560	270.080	270.600	271.120	271.640	272.160	272.680
465.6	273.200	273.720	274.240	274.760	275.280	275.800	276.320	276.840	277.360	277.880
465.7	278.400	278.920	279.440	279.960	280.480	281.000	281.520	282.040	282.560	283.080
465.8	283.600	284.120	284.640	285.160	285.680	286.200	286.720	287.240	287.760	288.280
465.9	288.800	289.320	289.840	290.360	290.880	291.400	291.920	292.440	292.960	293.480
466.0	294.000	294.550	295.100	295.650	296.200	296.750	297.300	297.850	298.400	298.950
466.1	299.500	300.050	300.600	301.150	301.700	302.250	302.800	303.350	303.900	304.450
466.2	305.000	305.550	306.100	306.650	307.200	307.750	308.300	308.850	309.400	309.950
466.3	310.500	311.050	311.600	312.150	312.700	313.250	313.800	314.350	314.900	315.450
466.4	316.000	316.550	317.100	317.650	318.200	318.750	319.300	319.850	320.400	320.950
466.5	321.500	322.050	322.600	323.150	323.700	324.250	324.800	325.350	325.900	326.450
466.6	327.000	327.550	328.100	328.650	329.200	329.750	330.300	330.850	331.400	331.950
466.7	332.500	333.050	333.600	334.150	334.700	335.250	335.800	336.350	336.900	337.450
466.8	338.000	338.550	339.100	339.650	340.200	340.750	341.300	341.850	342.400	342.950
466.9	343.500	344.050	344.600	345.150	345.700	346.250	346.800	347.350	347.900	348.450
467.0	349.000	350.060	351.120	352.180	353.240	354.300	355.360	356.420	357.480	358.540
467.1	359.600	360.660	361.720	362.780	363.840	364.900	365.960	367.020	368.080	369.140
467.2	370.200	371.260	372.320	373.380	374.440	375.500	376.560	377.620	378.680	379.740
467.3	380.800	381.860	382.920	383.980	385.040	386.100	387.160	388.220	389.280	390.340
467.4	391.400	392.460	393.520	394.580	395.640	396.700	397.760	398.820	399.880	400.940
467.5	402.000	403.060	404.120	405.180	406.240	407.300	408.360	409.420	410.480	411.540
467.6	412.600	413.660	414.720	415.780	416.840	417.900	418.960	420.020	421.080	422.140
467.7	423.200	424.260	425.320	426.380	427.440	428.500	429.560	430.620	431.680	432.740
467.8	433.800	434.860	435.920	436.980	438.040	439.100	440.160	441.220	442.280	443.340
467.9	444.400	445.460	446.520	447.580	448.640	449.700	450.760	451.820	452.880	453.940
468.0	455.000	456.830	458.660	460.490	462.320	464.150	465.980	467.810	469.640	471.470
468.1	473.300	475.130	476.960	478.790	480.620	482.450	484.280	486.110	487.940	489.770
468.2	491.600	493.430	495.260	497.090	498.920	500.750	502.580	504.410	506.240	508.070
468.3	509.900	511.730	513.560	515.390	517.220	519.050	520.880	522.710	524.540	526.370
468.4	528.200	530.030	531.860	533.690	535.520	537.350	539.180	541.010	542.840	544.670
468.5	546.500	548.330	550.160	551.990	553.820	555.650	557.480	559.310	561.140	562.970
468.6	564.800	566.630	568.460	570.290	572.120	573.950	575.780	577.610	579.440	581.270
468.7	583.100	584.930	586.760	588.590	590.420	592.250	594.080	595.910	597.740	599.570
468.8	601.400	603.230	605.060	606.890	608.720	610.550	612.380	614.210	616.040	617.870
468.9	619.700	621.530	623.360	625.190	627.020	628.850	630.680	632.510	634.340	636.170
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
469.0	638.000	640.650	643.300	645.950	648.600	651.250	653.900	656.550	659.200	661.850
469.1	664.500	667.150	669.800	672.450	675.100	677.750	680.400	683.050	685.700	688.350
469.2	691.000	693.650	696.300	698.950	701.600	704.250	706.900	709.550	712.200	714.850
469.3	717.500	720.150	722.800	725.450	728.100	730.750	733.400	736.050	738.700	741.350
469.4	744.000	746.650	749.300	751.950	754.600	757.250	759.900	762.550	765.200	767.850
469.5	770.500	773.150	775.800	778.450	781.100	783.750	786.400	789.050	791.700	794.350
469.6	797.000	799.650	802.300	804.950	807.600	810.250	812.900	815.550	818.200	820.850
469.7	823.500	826.150	828.800	831.450	834.100	836.750	839.400	842.050	844.700	847.350
469.8	850.000	852.650	855.300	857.950	860.600	863.250	865.900	868.550	871.200	873.850
469.9	876.500	879.150	881.800	884.450	887.100	889.750	892.400	895.050	897.700	900.350
470.0	903.000	908.010	913.020	918.030	923.040	928.050	933.060	938.070	943.080	948.090
470.1	953.100	958.110	963.120	968.130	973.140	978.150	983.160	988.170	993.180	998.190
470.2	1003.200	1008.210	1013.220	1018.230	1023.240	1028.250	1033.260	1038.270	1043.280	1048.290
470.3	1053.300	1058.310	1063.320	1068.330	1073.340	1078.350	1083.360	1088.370	1093.380	1098.390
470.4	1103.400	1108.410	1113.420	1118.430	1123.440	1128.450	1133.460	1138.470	1143.480	1148.490
470.5	1153.500	1158.510	1163.520	1168.530	1173.540	1178.550	1183.560	1188.570	1193.580	1198.590
470.6	1203.600	1208.610	1213.620	1218.630	1223.640	1228.650	1233.660	1238.670	1243.680	1248.690
470.7	1253.700	1258.710	1263.720	1268.730	1273.740	1278.750	1283.760	1288.770	1293.780	1298.790
470.8	1303.800	1308.810	1313.820	1318.830	1323.840	1328.850	1333.860	1338.870	1343.880	1348.890
470.9	1353.900	1358.910	1363.920	1368.930	1373.940	1378.950	1383.960	1388.970	1393.980	1398.990
471.0	1404.000	1408.250	1412.500	1416.750	1421.000	1425.250	1429.500	1433.750	1438.000	1442.250
471.1	1446.500	1450.750	1455.000	1459.250	1463.500	1467.750	1472.000	1476.250	1480.500	1484.750
471.2	1489.000	1493.250	1497.500	1501.750	1506.000	1510.250	1514.500	1518.750	1523.000	1527.250
471.3	1531.500	1535.750	1540.000	1544.250	1548.500	1552.750	1557.000	1561.250	1565.500	1569.750
471.4	1574.000	1578.250	1582.500	1586.750	1591.000	1595.250	1599.500	1603.750	1608.000	1612.250
471.5	1616.500	1620.750	1625.000	1629.250	1633.500	1637.750	1642.000	1646.250	1650.500	1654.750
471.6	1659.000	1663.250	1667.500	1671.750	1676.000	1680.250	1684.500	1688.750	1693.000	1697.250
471.7	1701.500	1705.750	1710.000	1714.250	1718.500	1722.750	1727.000	1731.250	1735.500	1739.750
471.8	1744.000	1748.250	1752.500	1756.750	1761.000	1765.250	1769.500	1773.750	1778.000	1782.250
471.9	1786.500	1790.750	1795.000	1799.250	1803.500	1807.750	1812.000	1816.250	1820.500	1824.750
472.0	1829.000	1834.220	1839.440	1844.660	1849.880	1855.100	1860.320	1865.540	1870.760	1875.980
472.1	1881.200	1886.420	1891.640	1896.860	1902.080	1907.300	1912.520	1917.740	1922.960	1928.180
472.2	1933.400	1938.620	1943.840	1949.060	1954.280	1959.500	1964.720	1969.940	1975.160	1980.380
472.3	1985.600	1990.820	1996.040	2001.260	2006.480	2011.700	2016.920	2022.140	2027.360	2032.580
472.4	2037.800	2043.020	2048.240	2053.460	2058.680	2063.900	2069.120	2074.340	2079.560	2084.780
472.5	2090.000	2095.220	2100.440	2105.660	2110.880	2116.100	2121.320	2126.540	2131.760	2136.980
472.6	2142.200	2147.420	2152.640	2157.860	2163.080	2168.300	2173.520	2178.740	2183.960	2189.180
472.7	2194.400	2199.620	2204.840	2210.060	2215.280	2220.500	2225.720	2230.940	2236.160	2241.380
472.8	2246.600	2251.820	2257.040	2262.260	2267.480	2272.700	2277.920	2283.140	2288.360	2293.580
472.9	2298.800	2304.020	2309.240	2314.460	2319.680	2324.900	2330.120	2335.340	2340.560	2345.780
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
473.0	2351.000	2354.180	2357.360	2360.540	2363.720	2366.900	2370.080	2373.260	2376.440	2379.620
473.1	2382.800	2385.980	2389.160	2392.340	2395.520	2398.700	2401.880	2405.060	2408.240	2411.420
473.2	2414.600	2417.780	2420.960	2424.140	2427.320	2430.500	2433.680	2436.860	2440.040	2443.220
473.3	2446.400	2449.580	2452.760	2455.940	2459.120	2462.300	2465.480	2468.660	2471.840	2475.020
473.4	2478.200	2481.380	2484.560	2487.740	2490.920	2494.100	2497.280	2500.460	2503.640	2506.820
473.5	2510.000	2513.180	2516.360	2519.540	2522.720	2525.900	2529.080	2532.260	2535.440	2538.620
473.6	2541.800	2544.980	2548.160	2551.340	2554.520	2557.700	2560.880	2564.060	2567.240	2570.420
473.7	2573.600	2576.780	2579.960	2583.140	2586.320	2589.500	2592.680	2595.860	2599.040	2602.220
473.8	2605.400	2608.580	2611.760	2614.940	2618.120	2621.300	2624.480	2627.660	2630.840	2634.020
473.9	2637.200	2640.380	2643.560	2646.740	2649.920	2653.100	2656.280	2659.460	2662.640	2665.820
474.0	2669.000	2671.670	2674.340	2677.010	2679.680	2682.350	2685.020	2687.690	2690.360	2693.030
474.1	2695.700	2698.370	2701.040	2703.710	2706.380	2709.050	2711.720	2714.390	2717.060	2719.730
474.2	2722.400	2725.070	2727.740	2730.410	2733.080	2735.750	2738.420	2741.090	2743.760	2746.430
474.3	2749.100	2751.770	2754.440	2757.110	2759.780	2762.450	2765.120	2767.790	2770.460	2773.130
474.4	2775.800	2778.470	2781.140	2783.810	2786.480	2789.150	2791.820	2794.490	2797.160	2799.830
474.5	2802.500	2805.170	2807.840	2810.510	2813.180	2815.850	2818.520	2821.190	2823.860	2826.530
474.6	2829.200	2831.870	2834.540	2837.210	2839.880	2842.550	2845.220	2847.890	2850.560	2853.230
474.7	2855.900	2858.570	2861.240	2863.910	2866.580	2869.250	2871.920	2874.590	2877.260	2879.930
474.8	2882.600	2885.270	2887.940	2890.610	2893.280	2895.950	2898.620	2901.290	2903.960	2906.630
474.9	2909.300	2911.970	2914.640	2917.310	2919.980	2922.650	2925.320	2927.990	2930.660	2933.330
475.0	2936.000	2937.940	2939.880	2941.820	2943.760	2945.700	2947.640	2949.580	2951.520	2953.460
475.1	2955.400	2957.340	2959.280	2961.220	2963.160	2965.100	2967.040	2968.980	2970.920	2972.860
475.2	2974.800	2976.740	2978.680	2980.620	2982.560	2984.500	2986.440	2988.380	2990.320	2992.260
475.3	2994.200	2996.140	2998.080	3000.020	3001.960	3003.900	3005.840	3007.780	3009.720	3011.660
475.4	3013.600	3015.540	3017.480	3019.420	3021.360	3023.300	3025.240	3027.180	3029.120	3031.060
475.5	3033.000	3034.940	3036.880	3038.820	3040.760	3042.700	3044.640	3046.580	3048.520	3050.460
475.6	3052.400	3054.340	3056.280	3058.220	3060.160	3062.100	3064.040	3065.980	3067.920	3069.860
475.7	3071.800	3073.740	3075.680	3077.620	3079.560	3081.500	3083.440	3085.380	3087.320	3089.260
475.8	3091.200	3093.140	3095.080	3097.020	3098.960	3100.900	3102.840	3104.780	3106.720	3108.660
475.9	3110.600	3112.540	3114.480	3116.420	3118.360	3120.300	3122.240	3124.180	3126.120	3128.060
476.0	3130.000	3132.440	3134.880	3137.320	3139.760	3142.200	3144.640	3147.080	3149.520	3151.960
476.1	3154.400	3156.840	3159.280	3161.720	3164.160	3166.600	3169.040	3171.480	3173.920	3176.360
476.2	3178.800	3181.240	3183.680	3186.120	3188.560	3191.000	3193.440	3195.880	3198.320	3200.760
476.3	3203.200	3205.640	3208.080	3210.520	3212.960	3215.400	3217.840	3220.280	3222.720	3225.160
476.4	3227.600	3230.040	3232.480	3234.920	3237.360	3239.800	3242.240	3244.680	3247.120	3249.560
476.5	3252.000	3254.440	3256.880	3259.320	3261.760	3264.200	3266.640	3269.080	3271.520	3273.960
476.6	3276.400	3278.840	3281.280	3283.720	3286.160	3288.600	3291.040	3293.480	3295.920	3298.360
476.7	3300.800	3303.240	3305.680	3308.120	3310.560	3313.000	3315.440	3317.880	3320.320	3322.760
476.8	3325.200	3327.640	3330.080	3332.520	3334.960	3337.400	3339.840	3342.280	3344.720	3347.160
476.9	3349.600	3352.040	3354.480	3356.920	3359.360	3361.800	3364.240	3366.680	3369.120	3371.560
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
477.0	3374.000	3377.210	3380.420	3383.630	3386.840	3390.050	3393.260	3396.470	3399.680	3402.890
477.1	3406.100	3409.310	3412.520	3415.730	3418.940	3422.150	3425.360	3428.570	3431.780	3434.990
477.2	3438.200	3441.410	3444.620	3447.830	3451.040	3454.250	3457.460	3460.670	3463.880	3467.090
477.3	3470.300	3473.510	3476.720	3479.930	3483.140	3486.350	3489.560	3492.770	3495.980	3499.190
477.4	3502.400	3505.610	3508.820	3512.030	3515.240	3518.450	3521.660	3524.870	3528.080	3531.290
477.5	3534.500	3537.710	3540.920	3544.130	3547.340	3550.550	3553.760	3556.970	3560.180	3563.390
477.6	3566.600	3569.810	3573.020	3576.230	3579.440	3582.650	3585.860	3589.070	3592.280	3595.490
477.7	3598.700	3601.910	3605.120	3608.330	3611.540	3614.750	3617.960	3621.170	3624.380	3627.590
477.8	3630.800	3634.010	3637.220	3640.430	3643.640	3646.850	3650.060	3653.270	3656.480	3659.690
477.9	3662.900	3666.110	3669.320	3672.530	3675.740	3678.950	3682.160	3685.370	3688.580	3691.790
478.0	3695.000	3697.760	3700.520	3703.280	3706.040	3708.800	3711.560	3714.320	3717.080	3719.840
478.1	3722.600	3725.360	3728.120	3730.880	3733.640	3736.400	3739.160	3741.920	3744.680	3747.440
478.2	3750.200	3752.960	3755.720	3758.480	3761.240	3764.000	3766.760	3769.520	3772.280	3775.040
478.3	3777.800	3780.560	3783.320	3786.080	3788.840	3791.600	3794.360	3797.120	3799.880	3802.640
478.4	3805.400	3808.160	3810.920	3813.680	3816.440	3819.200	3821.960	3824.720	3827.480	3830.240
478.5	3833.000	3835.760	3838.520	3841.280	3844.040	3846.800	3849.560	3852.320	3855.080	3857.840
478.6	3860.600	3863.360	3866.120	3868.880	3871.640	3874.400	3877.160	3879.920	3882.680	3885.440
478.7	3888.200	3890.960	3893.720	3896.480	3899.240	3902.000	3904.760	3907.520	3910.280	3913.040
478.8	3915.800	3918.560	3921.320	3924.080	3926.840	3929.600	3932.360	3935.120	3937.880	3940.640
478.9	3943.400	3946.160	3948.920	3951.680	3954.440	3957.200	3959.960	3962.720	3965.480	3968.240
479.0	3971.000	3973.250	3975.500	3977.750	3980.000	3982.250	3984.500	3986.750	3989.000	3991.250
479.1	3993.500	3995.750	3998.000	4000.250	4002.500	4004.750	4007.000	4009.250	4011.500	4013.750
479.2	4016.000	4018.250	4020.500	4022.750	4025.000	4027.250	4029.500	4031.750	4034.000	4036.250
479.3	4038.500	4040.750	4043.000	4045.250	4047.500	4049.750	4052.000	4054.250	4056.500	4058.750
479.4	4061.000	4063.250	4065.500	4067.750	4070.000	4072.250	4074.500	4076.750	4079.000	4081.250
479.5	4083.500	4085.750	4088.000	4090.250	4092.500	4094.750	4097.000	4099.250	4101.500	4103.750
479.6	4106.000	4108.250	4110.500	4112.750	4115.000	4117.250	4119.500	4121.750	4124.000	4126.250
479.7	4128.500	4130.750	4133.000	4135.250	4137.500	4139.750	4142.000	4144.250	4146.500	4148.750
479.8	4151.000	4153.250	4155.500	4157.750	4160.000	4162.250	4164.500	4166.750	4169.000	4171.250
479.9	4173.500	4175.750	4178.000	4180.250	4182.500	4184.750	4187.000	4189.250	4191.500	4193.750
480.0	4196.000	4198.140	4200.280	4202.420	4204.560	4206.700	4208.840	4210.980	4213.120	4215.260
480.1	4217.400	4219.540	4221.680	4223.820	4225.960	4228.100	4230.240	4232.380	4234.520	4236.660
480.2	4238.800	4240.940	4243.080	4245.220	4247.360	4249.500	4251.640	4253.780	4255.920	4258.060
480.3	4260.200	4262.340	4264.480	4266.620	4268.760	4270.900	4273.040	4275.180	4277.320	4279.460
480.4	4281.600	4283.740	4285.880	4288.020	4290.160	4292.300	4294.440	4296.580	4298.720	4300.860
480.5	4303.000	4305.140	4307.280	4309.420	4311.560	4313.700	4315.840	4317.980	4320.120	4322.260
480.6	4324.400	4326.540	4328.680	4330.820	4332.960	4335.100	4337.240	4339.380	4341.520	4343.660
480.7	4345.800	4347.940	4350.080	4352.220	4354.360	4356.500	4358.640	4360.780	4362.920	4365.060
480.8	4367.200	4369.340	4371.480	4373.620	4375.760	4377.900	4380.040	4382.180	4384.320	4386.460
480.9	4388.600	4390.740	4392.880	4395.020	4397.160	4399.300	4401.440	4403.580	4405.720	4407.860
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
481.0	4410.000	4412.650	4415.300	4417.950	4420.600	4423.250	4425.900	4428.550	4431.200	4433.850
481.1	4436.500	4439.150	4441.800	4444.450	4447.100	4449.750	4452.400	4455.050	4457.700	4460.350
481.2	4463.000	4465.650	4468.300	4470.950	4473.600	4476.250	4478.900	4481.550	4484.200	4486.850
481.3	4489.500	4492.150	4494.800	4497.450	4500.100	4502.750	4505.400	4508.050	4510.700	4513.350
481.4	4516.000	4518.650	4521.300	4523.950	4526.600	4529.250	4531.900	4534.550	4537.200	4539.850
481.5	4542.500	4545.150	4547.800	4550.450	4553.100	4555.750	4558.400	4561.050	4563.700	4566.350
481.6	4569.000	4571.650	4574.300	4576.950	4579.600	4582.250	4584.900	4587.550	4590.200	4592.850
481.7	4595.500	4598.150	4600.800	4603.450	4606.100	4608.750	4611.400	4614.050	4616.700	4619.350
481.8	4622.000	4624.650	4627.300	4629.950	4632.600	4635.250	4637.900	4640.550	4643.200	4645.850
481.9	4648.500	4651.150	4653.800	4656.450	4659.100	4661.750	4664.400	4667.050	4669.700	4672.350
482.0	4675.000	4678.110	4681.220	4684.330	4687.440	4690.550	4693.660	4696.770	4699.880	4702.990
482.1	4706.100	4709.210	4712.320	4715.430	4718.540	4721.650	4724.760	4727.870	4730.980	4734.090
482.2	4737.200	4740.310	4743.420	4746.530	4749.640	4752.750	4755.860	4758.970	4762.080	4765.190
482.3	4768.300	4771.410	4774.520	4777.630	4780.740	4783.850	4786.960	4790.070	4793.180	4796.290
482.4	4799.400	4802.510	4805.620	4808.730	4811.840	4814.950	4818.060	4821.170	4824.280	4827.390
482.5	4830.500	4833.610	4836.720	4839.830	4842.940	4846.050	4849.160	4852.270	4855.380	4858.490
482.6	4861.600	4864.710	4867.820	4870.930	4874.040	4877.150	4880.260	4883.370	4886.480	4889.590
482.7	4892.700	4895.810	4898.920	4902.030	4905.140	4908.250	4911.360	4914.470	4917.580	4920.690
482.8	4923.800	4926.910	4930.020	4933.130	4936.240	4939.350	4942.460	4945.570	4948.680	4951.790
482.9	4954.900	4958.010	4961.120	4964.230	4967.340	4970.450	4973.560	4976.670	4979.780	4982.890
483.0	4986.000	4989.010	4992.020	4995.030	4998.040	5001.050	5004.060	5007.070	5010.080	5013.090
483.1	5016.100	5019.110	5022.120	5025.130	5028.140	5031.150	5034.160	5037.170	5040.180	5043.190
483.2	5046.200	5049.210	5052.220	5055.230	5058.240	5061.250	5064.260	5067.270	5070.280	5073.290
483.3	5076.300	5079.310	5082.320	5085.330	5088.340	5091.350	5094.360	5097.370	5100.380	5103.390
483.4	5106.400	5109.410	5112.420	5115.430	5118.440	5121.450	5124.460	5127.470	5130.480	5133.490
483.5	5136.500	5139.510	5142.520	5145.530	5148.540	5151.550	5154.560	5157.570	5160.580	5163.590
483.6	5166.600	5169.610	5172.620	5175.630	5178.640	5181.650	5184.660	5187.670	5190.680	5193.690
483.7	5196.700	5199.710	5202.720	5205.730	5208.740	5211.750	5214.760	5217.770	5220.780	5223.790
483.8	5226.800	5229.810	5232.820	5235.830	5238.840	5241.850	5244.860	5247.870	5250.880	5253.890
483.9	5256.900	5259.910	5262.920	5265.930	5268.940	5271.950	5274.960	5277.970	5280.980	5283.990
484.0	5287.000	5290.270	5293.540	5296.810	5300.080	5303.350	5306.620	5309.890	5313.160	5316.430
484.1	5319.700	5322.970	5326.240	5329.510	5332.780	5336.050	5339.320	5342.590	5345.860	5349.130
484.2	5352.400	5355.670	5358.940	5362.210	5365.480	5368.750	5372.020	5375.290	5378.560	5381.830
484.3	5385.100	5388.370	5391.640	5394.910	5398.180	5401.450	5404.720	5407.990	5411.260	5414.530
484.4	5417.800	5421.070	5424.340	5427.610	5430.880	5434.150	5437.420	5440.690	5443.960	5447.230
484.5	5450.500	5453.770	5457.040	5460.310	5463.580	5466.850	5470.120	5473.390	5476.660	5479.930
484.6	5483.200	5486.470	5489.740	5493.010	5496.280	5499.550	5502.820	5506.090	5509.360	5512.630
484.7	5515.900	5519.170	5522.440	5525.710	5528.980	5532.250	5535.520	5538.790	5542.060	5545.330
484.8	5548.600	5551.870	5555.140	5558.410	5561.680	5564.950	5568.220	5571.490	5574.760	5578.030
484.9	5581.300	5584.570	5587.840	5591.110	5594.380	5597.650	5600.920	5604.190	5607.460	5610.730
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
485.0	5614.000	5617.920	5621.840	5625.760	5629.680	5633.600	5637.520	5641.440	5645.360	5649.280
485.1	5653.200	5657.120	5661.040	5664.960	5668.880	5672.800	5676.720	5680.640	5684.560	5688.480
485.2	5692.400	5696.320	5700.240	5704.160	5708.080	5712.000	5715.920	5719.840	5723.760	5727.680
485.3	5731.600	5735.520	5739.440	5743.360	5747.280	5751.200	5755.120	5759.040	5762.960	5766.880
485.4	5770.800	5774.720	5778.640	5782.560	5786.480	5790.400	5794.320	5798.240	5802.160	5806.080
485.5	5810.000	5813.920	5817.840	5821.760	5825.680	5829.600	5833.520	5837.440	5841.360	5845.280
485.6	5849.200	5853.120	5857.040	5860.960	5864.880	5868.800	5872.720	5876.640	5880.560	5884.480
485.7	5888.400	5892.320	5896.240	5900.160	5904.080	5908.000	5911.920	5915.840	5919.760	5923.680
485.8	5927.600	5931.520	5935.440	5939.360	5943.280	5947.200	5951.120	5955.040	5958.960	5962.880
485.9	5966.800	5970.720	5974.640	5978.560	5982.480	5986.400	5990.320	5994.240	5998.160	6002.080
486.0	6006.000	6010.320	6014.640	6018.960	6023.280	6027.600	6031.920	6036.240	6040.560	6044.880
486.1	6049.200	6053.520	6057.840	6062.160	6066.480	6070.800	6075.120	6079.440	6083.760	6088.080
486.2	6092.400	6096.720	6101.040	6105.360	6109.680	6114.000	6118.320	6122.640	6126.960	6131.280
486.3	6135.600	6139.920	6144.240	6148.560	6152.880	6157.200	6161.520	6165.840	6170.160	6174.480
486.4	6178.800	6183.120	6187.440	6191.760	6196.080	6200.400	6204.720	6209.040	6213.360	6217.680
486.5	6222.000	6226.320	6230.640	6234.960	6239.280	6243.600	6247.920	6252.240	6256.560	6260.880
486.6	6265.200	6269.520	6273.840	6278.160	6282.480	6286.800	6291.120	6295.440	6299.760	6304.080
486.7	6308.400	6312.720	6317.040	6321.360	6325.680	6330.000	6334.320	6338.640	6342.960	6347.280
486.8	6351.600	6355.920	6360.240	6364.560	6368.880	6373.200	6377.520	6381.840	6386.160	6390.480
486.9	6394.800	6399.120	6403.440	6407.760	6412.080	6416.400	6420.720	6425.040	6429.360	6433.680
487.0	6438.000	6442.400	6446.800	6451.200	6455.600	6460.000	6464.400	6468.800	6473.200	6477.600
487.1	6482.000	6486.400	6490.800	6495.200	6499.600	6504.000	6508.400	6512.800	6517.200	6521.600
487.2	6526.000	6530.400	6534.800	6539.200	6543.600	6548.000	6552.400	6556.800	6561.200	6565.600
487.3	6570.000	6574.400	6578.800	6583.200	6587.600	6592.000	6596.400	6600.800	6605.200	6609.600
487.4	6614.000	6618.400	6622.800	6627.200	6631.600	6636.000	6640.400	6644.800	6649.200	6653.600
487.5	6658.000	6662.400	6666.800	6671.200	6675.600	6680.000	6684.400	6688.800	6693.200	6697.600
487.6	6702.000	6706.400	6710.800	6715.200	6719.600	6724.000	6728.400	6732.800	6737.200	6741.600
487.7	6746.000	6750.400	6754.800	6759.200	6763.600	6768.000	6772.400	6776.800	6781.200	6785.600
487.8	6790.000	6794.400	6798.800	6803.200	6807.600	6812.000	6816.400	6820.800	6825.200	6829.600
487.9	6834.000	6838.400	6842.800	6847.200	6851.600	6856.000	6860.400	6864.800	6869.200	6873.600
488.0	6878.000	6881.760	6885.520	6889.280	6893.040	6896.800	6900.560	6904.320	6908.080	6911.840
488.1	6915.600	6919.360	6923.120	6926.880	6930.640	6934.400	6938.160	6941.920	6945.680	6949.440
488.2	6953.200	6956.960	6960.720	6964.480	6968.240	6972.000	6975.760	6979.520	6983.280	6987.040
488.3	6990.800	6994.560	6998.320	7002.080	7005.840	7009.600	7013.360	7017.120	7020.880	7024.640
488.4	7028.400	7032.160	7035.920	7039.680	7043.440	7047.200	7050.960	7054.720	7058.480	7062.240
488.5	7066.000	7069.760	7073.520	7077.280	7081.040	7084.800	7088.560	7092.320	7096.080	7099.840
488.6	7103.600	7107.360	7111.120	7114.880	7118.640	7122.400	7126.160	7129.920	7133.680	7137.440
488.7	7141.200	7144.960	7148.720	7152.480	7156.240	7160.000	7163.760	7167.520	7171.280	7175.040
488.8	7178.800	7182.560	7186.320	7190.080	7193.840	7197.600	7201.360	7205.120	7208.880	7212.640
488.9	7216.400	7220.160	7223.920	7227.680	7231.440	7235.200	7238.960	7242.720	7246.480	7250.240
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
489.0	7254.000	7257.330	7260.660	7263.990	7267.320	7270.650	7273.980	7277.310	7280.640	7283.970
489.1	7287.300	7290.630	7293.960	7297.290	7300.620	7303.950	7307.280	7310.610	7313.940	7317.270
489.2	7320.600	7323.930	7327.260	7330.590	7333.920	7337.250	7340.580	7343.910	7347.240	7350.570
489.3	7353.900	7357.230	7360.560	7363.890	7367.220	7370.550	7373.880	7377.210	7380.540	7383.870
489.4	7387.200	7390.530	7393.860	7397.190	7400.520	7403.850	7407.180	7410.510	7413.840	7417.170
489.5	7420.500	7423.830	7427.160	7430.490	7433.820	7437.150	7440.480	7443.810	7447.140	7450.470
489.6	7453.800	7457.130	7460.460	7463.790	7467.120	7470.450	7473.780	7477.110	7480.440	7483.770
489.7	7487.100	7490.430	7493.760	7497.090	7500.420	7503.750	7507.080	7510.410	7513.740	7517.070
489.8	7520.400	7523.730	7527.060	7530.390	7533.720	7537.050	7540.380	7543.710	7547.040	7550.370
489.9	7553.700	7557.030	7560.360	7563.690	7567.020	7570.350	7573.680	7577.010	7580.340	7583.670
490.0	7587.000	7590.730	7594.460	7598.190	7601.920	7605.650	7609.380	7613.110	7616.840	7620.570
490.1	7624.300	7628.030	7631.760	7635.490	7639.220	7642.950	7646.680	7650.410	7654.140	7657.870
490.2	7661.600	7665.330	7669.060	7672.790	7676.520	7680.250	7683.980	7687.710	7691.440	7695.170
490.3	7698.900	7702.630	7706.360	7710.090	7713.820	7717.550	7721.280	7725.010	7728.740	7732.470
490.4	7736.200	7739.930	7743.660	7747.390	7751.120	7754.850	7758.580	7762.310	7766.040	7769.770
490.5	7773.500	7777.230	7780.960	7784.690	7788.420	7792.150	7795.880	7799.610	7803.340	7807.070
490.6	7810.800	7814.530	7818.260	7821.990	7825.720	7829.450	7833.180	7836.910	7840.640	7844.370
490.7	7848.100	7851.830	7855.560	7859.290	7863.020	7866.750	7870.480	7874.210	7877.940	7881.670
490.8	7885.400	7889.130	7892.860	7896.590	7900.320	7904.050	7907.780	7911.510	7915.240	7918.970
490.9	7922.700	7926.430	7930.160	7933.890	7937.620	7941.350	7945.080	7948.810	7952.540	7956.270
491.0	7960.000	7963.340	7966.680	7970.020	7973.360	7976.700	7980.040	7983.380	7986.720	7990.060
491.1	7993.400	7996.740	8000.080	8003.420	8006.760	8010.100	8013.440	8016.780	8020.120	8023.460
491.2	8026.800	8030.140	8033.480	8036.820	8040.160	8043.500	8046.840	8050.180	8053.520	8056.860
491.3	8060.200	8063.540	8066.880	8070.220	8073.560	8076.900	8080.240	8083.580	8086.920	8090.260
491.4	8093.600	8096.940	8100.280	8103.620	8106.960	8110.300	8113.640	8116.980	8120.320	8123.660
491.5	8127.000	8130.340	8133.680	8137.020	8140.360	8143.700	8147.040	8150.380	8153.720	8157.060
491.6	8160.400	8163.740	8167.080	8170.420	8173.760	8177.100	8180.440	8183.780	8187.120	8190.460
491.7	8193.800	8197.140	8200.480	8203.820	8207.160	8210.500	8213.840	8217.180	8220.520	8223.860
491.8	8227.200	8230.540	8233.880	8237.220	8240.560	8243.900	8247.240	8250.580	8253.920	8257.260
491.9	8260.600	8263.940	8267.280	8270.620	8273.960	8277.300	8280.640	8283.980	8287.320	8290.660
492.0	8294.000	8297.570	8301.140	8304.710	8308.280	8311.850	8315.420	8318.990	8322.560	8326.130
492.1	8329.700	8333.270	8336.840	8340.410	8343.980	8347.550	8351.120	8354.690	8358.260	8361.830
492.2	8365.400	8368.970	8372.540	8376.110	8379.680	8383.250	8386.820	8390.390	8393.960	8397.530
492.3	8401.100	8404.670	8408.240	8411.810	8415.380	8418.950	8422.520	8426.090	8429.660	8433.230
492.4	8436.800	8440.370	8443.940	8447.510	8451.080	8454.650	8458.220	8461.790	8465.360	8468.930
492.5	8472.500	8476.070	8479.640	8483.210	8486.780	8490.350	8493.920	8497.490	8501.060	8504.630
492.6	8508.200	8511.770	8515.340	8518.910	8522.480	8526.050	8529.620	8533.190	8536.760	8540.330
492.7	8543.900	8547.470	8551.040	8554.610	8558.180	8561.750	8565.320	8568.890	8572.460	8576.030
492.8	8579.600	8583.170	8586.740	8590.310	8593.880	8597.450	8601.020	8604.590	8608.160	8611.730
492.9	8615.300	8618.870	8622.440	8626.010	8629.580	8633.150	8636.720	8640.290	8643.860	8647.430
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
493.0	8651.000	8655.200	8659.400	8663.600	8667.800	8672.000	8676.200	8680.400	8684.600	8688.800
493.1	8693.000	8697.200	8701.400	8705.600	8709.800	8714.000	8718.200	8722.400	8726.600	8730.800
493.2	8735.000	8739.200	8743.400	8747.600	8751.800	8756.000	8760.200	8764.400	8768.600	8772.800
493.3	8777.000	8781.200	8785.400	8789.600	8793.800	8798.000	8802.200	8806.400	8810.600	8814.800
493.4	8819.000	8823.200	8827.400	8831.600	8835.800	8840.000	8844.200	8848.400	8852.600	8856.800
493.5	8861.000	8865.200	8869.400	8873.600	8877.800	8882.000	8886.200	8890.400	8894.600	8898.800
493.6	8903.000	8907.200	8911.400	8915.600	8919.800	8924.000	8928.200	8932.400	8936.600	8940.800
493.7	8945.000	8949.200	8953.400	8957.600	8961.800	8966.000	8970.200	8974.400	8978.600	8982.800
493.8	8987.000	8991.200	8995.400	8999.600	9003.800	9008.000	9012.200	9016.400	9020.600	9024.800
493.9	9029.000	9033.200	9037.400	9041.600	9045.800	9050.000	9054.200	9058.400	9062.600	9066.800
494.0	9071.000	9076.240	9081.480	9086.720	9091.960	9097.200	9102.440	9107.680	9112.920	9118.160
494.1	9123.400	9128.640	9133.880	9139.120	9144.360	9149.600	9154.840	9160.080	9165.320	9170.560
494.2	9175.800	9181.040	9186.280	9191.520	9196.760	9202.000	9207.240	9212.480	9217.720	9222.960
494.3	9228.200	9233.440	9238.680	9243.920	9249.160	9254.400	9259.640	9264.880	9270.120	9275.360
494.4	9280.600	9285.840	9291.080	9296.320	9301.560	9306.800	9312.040	9317.280	9322.520	9327.760
494.5	9333.000	9338.240	9343.480	9348.720	9353.960	9359.200	9364.440	9369.680	9374.920	9380.160
494.6	9385.400	9390.640	9395.880	9401.120	9406.360	9411.600	9416.840	9422.080	9427.320	9432.560
494.7	9437.800	9443.040	9448.280	9453.520	9458.760	9464.000	9469.240	9474.480	9479.720	9484.960
494.8	9490.200	9495.440	9500.680	9505.920	9511.160	9516.400	9521.640	9526.880	9532.120	9537.360
494.9	9542.600	9547.840	9553.080	9558.320	9563.560	9568.800	9574.040	9579.280	9584.520	9589.760
495.0	9595.000	9598.960	9602.920	9606.880	9610.840	9614.800	9618.760	9622.720	9626.680	9630.640
495.1	9634.600	9638.560	9642.520	9646.480	9650.440	9654.400	9658.360	9662.320	9666.280	9670.240
495.2	9674.200	9678.160	9682.120	9686.080	9690.040	9694.000	9697.960	9701.920	9705.880	9709.840
495.3	9713.800	9717.760	9721.720	9725.680	9729.640	9733.600	9737.560	9741.520	9745.480	9749.440
495.4	9753.400	9757.360	9761.320	9765.280	9769.240	9773.200	9777.160	9781.120	9785.080	9789.040
495.5	9793.000	9796.960	9800.920	9804.880	9808.840	9812.800	9816.760	9820.720	9824.680	9828.640
495.6	9832.600	9836.560	9840.520	9844.480	9848.440	9852.400	9856.360	9860.320	9864.280	9868.240
495.7	9872.200	9876.160	9880.120	9884.080	9888.040	9892.000	9895.960	9899.920	9903.880	9907.840
495.8	9911.800	9915.760	9919.720	9923.680	9927.640	9931.600	9935.560	9939.520	9943.480	9947.440
495.9	9951.400	9955.360	9959.320	9963.280	9967.240	9971.200	9975.160	9979.120	9983.080	9987.040
496.0	9991.000	9995.360	9999.720	10004.080	10008.440	10012.800	10017.160	10021.520	10025.880	10030.240
496.1	10034.600	10038.960	10043.320	10047.680	10052.040	10056.400	10060.760	10065.120	10069.480	10073.840
496.2	10078.200	10082.560	10086.920	10091.280	10095.640	10100.000	10104.360	10108.720	10113.080	10117.440
496.3	10121.800	10126.160	10130.520	10134.880	10139.240	10143.600	10147.960	10152.320	10156.680	10161.040
496.4	10165.400	10169.760	10174.120	10178.480	10182.840	10187.200	10191.560	10195.920	10200.280	10204.640
496.5	10209.000	10213.360	10217.720	10222.080	10226.440	10230.800	10235.160	10239.520	10243.880	10248.240
496.6	10252.600	10256.960	10261.320	10265.680	10270.040	10274.400	10278.760	10283.120	10287.480	10291.840
496.7	10296.200	10300.560	10304.920	10309.280	10313.640	10318.000	10322.360	10326.720	10331.080	10335.440
496.8	10339.800	10344.160	10348.520	10352.880	10357.240	10361.600	10365.960	10370.320	10374.680	10379.040
496.9	10383.400	10387.760	10392.120	10396.480	10400.840	10405.200	10409.560	10413.920	10418.280	10422.640
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
497.0	10427.000	10431.130	10435.260	10439.390	10443.520	10447.650	10451.780	10455.910	10460.040	10464.170
497.1	10468.300	10472.430	10476.560	10480.690	10484.820	10488.950	10493.080	10497.210	10501.340	10505.470
497.2	10509.600	10513.730	10517.860	10521.990	10526.120	10530.250	10534.380	10538.510	10542.640	10546.770
497.3	10550.900	10555.030	10559.160	10563.290	10567.420	10571.550	10575.680	10579.810	10583.940	10588.070
497.4	10592.200	10596.330	10600.460	10604.590	10608.720	10612.850	10616.980	10621.110	10625.240	10629.370
497.5	10633.500	10637.630	10641.760	10645.890	10650.020	10654.150	10658.280	10662.410	10666.540	10670.670
497.6	10674.800	10678.930	10683.060	10687.190	10691.320	10695.450	10699.580	10703.710	10707.840	10711.970
497.7	10716.100	10720.230	10724.360	10728.490	10732.620	10736.750	10740.880	10745.010	10749.140	10753.270
497.8	10757.400	10761.530	10765.660	10769.790	10773.920	10778.050	10782.180	10786.310	10790.440	10794.570
497.9	10798.700	10802.830	10806.960	10811.090	10815.220	10819.350	10823.480	10827.610	10831.740	10835.870
498.0	10840.000	10845.360	10850.720	10856.080	10861.440	10866.800	10872.160	10877.520	10882.880	10888.240
498.1	10893.600	10898.960	10904.320	10909.680	10915.040	10920.400	10925.760	10931.120	10936.480	10941.840
498.2	10947.200	10952.560	10957.920	10963.280	10968.640	10974.000	10979.360	10984.720	10990.080	10995.440
498.3	11000.800	11006.160	11011.520	11016.880	11022.240	11027.600	11032.960	11038.320	11043.680	11049.040
498.4	11054.400	11059.760	11065.120	11070.480	11075.840	11081.200	11086.560	11091.920	11097.280	11102.640
498.5	11108.000	11113.360	11118.720	11124.080	11129.440	11134.800	11140.160	11145.520	11150.880	11156.240
498.6	11161.600	11166.960	11172.320	11177.680	11183.040	11188.400	11193.760	11199.120	11204.480	11209.840
498.7	11215.200	11220.560	11225.920	11231.280	11236.640	11242.000	11247.360	11252.720	11258.080	11263.440
498.8	11268.800	11274.160	11279.520	11284.880	11290.240	11295.600	11300.960	11306.320	11311.680	11317.040
498.9	11322.400	11327.760	11333.120	11338.480	11343.840	11349.200	11354.560	11359.920	11365.280	11370.640
499.0	11376.000	11380.310	11384.620	11388.930	11393.240	11397.550	11401.860	11406.170	11410.480	11414.790
499.1	11419.100	11423.410	11427.720	11432.030	11436.340	11440.650	11444.960	11449.270	11453.580	11457.890
499.2	11462.200	11466.510	11470.820	11475.130	11479.440	11483.750	11488.060	11492.370	11496.680	11500.990
499.3	11505.300	11509.610	11513.920	11518.230	11522.540	11526.850	11531.160	11535.470	11539.780	11544.090
499.4	11548.400	11552.710	11557.020	11561.330	11565.640	11569.950	11574.260	11578.570	11582.880	11587.190
499.5	11591.500	11595.810	11600.120	11604.430	11608.740	11613.050	11617.360	11621.670	11625.980	11630.290
499.6	11634.600	11638.910	11643.220	11647.530	11651.840	11656.150	11660.460	11664.770	11669.080	11673.390
499.7	11677.700	11682.010	11686.320	11690.630	11694.940	11699.250	11703.560	11707.870	11712.180	11716.490
499.8	11720.800	11725.110	11729.420	11733.730	11738.040	11742.350	11746.660	11750.970	11755.280	11759.590
499.9	11763.900	11768.210	11772.520	11776.830	11781.140	11785.450	11789.760	11794.070	11798.380	11802.690
500.0	11807.000	11810.930	11814.860	11818.790	11822.720	11826.650	11830.580	11834.510	11838.440	11842.370
500.1	11846.300	11850.230	11854.160	11858.090	11862.020	11865.950	11869.880	11873.810	11877.740	11881.670
500.2	11885.600	11889.530	11893.460	11897.390	11901.320	11905.250	11909.180	11913.110	11917.040	11920.970
500.3	11924.900	11928.830	11932.760	11936.690	11940.620	11944.550	11948.480	11952.410	11956.340	11960.270
500.4	11964.200	11968.130	11972.060	11975.990	11979.920	11983.850	11987.780	11991.710	11995.640	11999.570
500.5	12003.500	12007.430	12011.360	12015.290	12019.220	12023.150	12027.080	12031.010	12034.940	12038.870
500.6	12042.800	12046.730	12050.660	12054.590	12058.520	12062.450	12066.380	12070.310	12074.240	12078.170
500.7	12082.100	12086.030	12089.960	12093.890	12097.820	12101.750	12105.680	12109.610	12113.540	12117.470
500.8	12121.400	12125.330	12129.260	12133.190	12137.120	12141.050	12144.980	12148.910	12152.840	12156.770
500.9	12160.700	12164.630	12168.560	12172.490	12176.420	12180.350	12184.280	12188.210	12192.140	12196.070
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
501.0	12200.000	12204.310	12208.620	12212.930	12217.240	12221.550	12225.860	12230.170	12234.480	12238.790
501.1	12243.100	12247.410	12251.720	12256.030	12260.340	12264.650	12268.960	12273.270	12277.580	12281.890
501.2	12286.200	12290.510	12294.820	12299.130	12303.440	12307.750	12312.060	12316.370	12320.680	12324.990
501.3	12329.300	12333.610	12337.920	12342.230	12346.540	12350.850	12355.160	12359.470	12363.780	12368.090
501.4	12372.400	12376.710	12381.020	12385.330	12389.640	12393.950	12398.260	12402.570	12406.880	12411.190
501.5	12415.500	12419.810	12424.120	12428.430	12432.740	12437.050	12441.360	12445.670	12449.980	12454.290
501.6	12458.600	12462.910	12467.220	12471.530	12475.840	12480.150	12484.460	12488.770	12493.080	12497.390
501.7	12501.700	12506.010	12510.320	12514.630	12518.940	12523.250	12527.560	12531.870	12536.180	12540.490
501.8	12544.800	12549.110	12553.420	12557.730	12562.040	12566.350	12570.660	12574.970	12579.280	12583.590
501.9	12587.900	12592.210	12596.520	12600.830	12605.140	12609.450	12613.760	12618.070	12622.380	12626.690
502.0	12631.000	12636.140	12641.280	12646.420	12651.560	12656.700	12661.840	12666.980	12672.120	12677.260
502.1	12682.400	12687.540	12692.680	12697.820	12702.960	12708.100	12713.240	12718.380	12723.520	12728.660
502.2	12733.800	12738.940	12744.080	12749.220	12754.360	12759.500	12764.640	12769.780	12774.920	12780.060
502.3	12785.200	12790.340	12795.480	12800.620	12805.760	12810.900	12816.040	12821.180	12826.320	12831.460
502.4	12836.600	12841.740	12846.880	12852.020	12857.160	12862.300	12867.440	12872.580	12877.720	12882.860
502.5	12888.000	12893.140	12898.280	12903.420	12908.560	12913.700	12918.840	12923.980	12929.120	12934.260
502.6	12939.400	12944.540	12949.680	12954.820	12959.960	12965.100	12970.240	12975.380	12980.520	12985.660
502.7	12990.800	12995.940	13001.080	13006.220	13011.360	13016.500	13021.640	13026.780	13031.920	13037.060
502.8	13042.200	13047.340	13052.480	13057.620	13062.760	13067.900	13073.040	13078.180	13083.320	13088.460
502.9	13093.600	13098.740	13103.880	13109.020	13114.160	13119.300	13124.440	13129.580	13134.720	13139.860
503.0	13145.000	13150.000	13155.000	13160.000	13165.000	13170.000	13175.000	13180.000	13185.000	13190.000
503.1	13195.000	13200.000	13205.000	13210.000	13215.000	13220.000	13225.000	13230.000	13235.000	13240.000
503.2	13245.000	13250.000	13255.000	13260.000	13265.000	13270.000	13275.000	13280.000	13285.000	13290.000
503.3	13295.000	13300.000	13305.000	13310.000	13315.000	13320.000	13325.000	13330.000	13335.000	13340.000
503.4	13345.000	13350.000	13355.000	13360.000	13365.000	13370.000	13375.000	13380.000	13385.000	13390.000
503.5	13395.000	13400.000	13405.000	13410.000	13415.000	13420.000	13425.000	13430.000	13435.000	13440.000
503.6	13445.000	13450.000	13455.000	13460.000	13465.000	13470.000	13475.000	13480.000	13485.000	13490.000
503.7	13495.000	13500.000	13505.000	13510.000	13515.000	13520.000	13525.000	13530.000	13535.000	13540.000
503.8	13545.000	13550.000	13555.000	13560.000	13565.000	13570.000	13575.000	13580.000	13585.000	13590.000
503.9	13595.000	13600.000	13605.000	13610.000	13615.000	13620.000	13625.000	13630.000	13635.000	13640.000
504.0	13645.000	13650.020	13655.040	13660.060	13665.080	13670.100	13675.120	13680.140	13685.160	13690.180
504.1	13695.200	13700.220	13705.240	13710.260	13715.280	13720.300	13725.320	13730.340	13735.360	13740.380
504.2	13745.400	13750.420	13755.440	13760.460	13765.480	13770.500	13775.520	13780.540	13785.560	13790.580
504.3	13795.600	13800.620	13805.640	13810.660	13815.680	13820.700	13825.720	13830.740	13835.760	13840.780
504.4	13845.800	13850.820	13855.840	13860.860	13865.880	13870.900	13875.920	13880.940	13885.960	13890.980
504.5	13896.000	13901.020	13906.040	13911.060	13916.080	13921.100	13926.120	13931.140	13936.160	13941.180
504.6	13946.200	13951.220	13956.240	13961.260	13966.280	13971.300	13976.320	13981.340	13986.360	13991.380
504.7	13996.400	14001.420	14006.440	14011.460	14016.480	14021.500	14026.520	14031.540	14036.560	14041.580
504.8	14046.600	14051.620	14056.640	14061.660	14066.680	14071.700	14076.720	14081.740	14086.760	14091.780
504.9	14096.800	14101.820	14106.840	14111.860	14116.880	14121.900	14126.920	14131.940	14136.960	14141.980
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
505.0	14147.000	14153.630	14160.260	14166.890	14173.520	14180.150	14186.780	14193.410	14200.040	14206.670
505.1	14213.300	14219.930	14226.560	14233.190	14239.820	14246.450	14253.080	14259.710	14266.340	14272.970
505.2	14279.600	14286.230	14292.860	14299.490	14306.120	14312.750	14319.380	14326.010	14332.640	14339.270
505.3	14345.900	14352.530	14359.160	14365.790	14372.420	14379.050	14385.680	14392.310	14398.940	14405.570
505.4	14412.200	14418.830	14425.460	14432.090	14438.720	14445.350	14451.980	14458.610	14465.240	14471.870
505.5	14478.500	14485.130	14491.760	14498.390	14505.020	14511.650	14518.280	14524.910	14531.540	14538.170
505.6	14544.800	14551.430	14558.060	14564.690	14571.320	14577.950	14584.580	14591.210	14597.840	14604.470
505.7	14611.100	14617.730	14624.360	14630.990	14637.620	14644.250	14650.880	14657.510	14664.140	14670.770
505.8	14677.400	14684.030	14690.660	14697.290	14703.920	14710.550	14717.180	14723.810	14730.440	14737.070
505.9	14743.700	14750.330	14756.960	14763.590	14770.220	14776.850	14783.480	14790.110	14796.740	14803.370
506.0	14810.000	14816.790	14823.580	14830.370	14837.160	14843.950	14850.740	14857.530	14864.320	14871.110
506.1	14877.900	14884.690	14891.480	14898.270	14905.060	14911.850	14918.640	14925.430	14932.220	14939.010
506.2	14945.800	14952.590	14959.380	14966.170	14972.960	14979.750	14986.540	14993.330	15000.120	15006.910
506.3	15013.700	15020.490	15027.280	15034.070	15040.860	15047.650	15054.440	15061.230	15068.020	15074.810
506.4	15081.600	15088.390	15095.180	15101.970	15108.760	15115.550	15122.340	15129.130	15135.920	15142.710
506.5	15149.500	15156.290	15163.080	15169.870	15176.660	15183.450	15190.240	15197.030	15203.820	15210.610
506.6	15217.400	15224.190	15230.980	15237.770	15244.560	15251.350	15258.140	15264.930	15271.720	15278.510
506.7	15285.300	15292.090	15298.880	15305.670	15312.460	15319.250	15326.040	15332.830	15339.620	15346.410
506.8	15353.200	15359.990	15366.780	15373.570	15380.360	15387.150	15393.940	15400.730	15407.520	15414.310
506.9	15421.100	15427.890	15434.680	15441.470	15448.260	15455.050	15461.840	15468.630	15475.420	15482.210
507.0	15489.000	15495.530	15502.060	15508.590	15515.120	15521.650	15528.180	15534.710	15541.240	15547.770
507.1	15554.300	15560.830	15567.360	15573.890	15580.420	15586.950	15593.480	15600.010	15606.540	15613.070
507.2	15619.600	15626.130	15632.660	15639.190	15645.720	15652.250	15658.780	15665.310	15671.840	15678.370
507.3	15684.900	15691.430	15697.960	15704.490	15711.020	15717.550	15724.080	15730.610	15737.140	15743.670
507.4	15750.200	15756.730	15763.260	15769.790	15776.320	15782.850	15789.380	15795.910	15802.440	15808.970
507.5	15815.500	15822.030	15828.560	15835.090	15841.620	15848.150	15854.680	15861.210	15867.740	15874.270
507.6	15880.800	15887.330	15893.860	15900.390	15906.920	15913.450	15919.980	15926.510	15933.040	15939.570
507.7	15946.100	15952.630	15959.160	15965.690	15972.220	15978.750	15985.280	15991.810	15998.340	16004.870
507.8	16011.400	16017.930	16024.460	16030.990	16037.520	16044.050	16050.580	16057.110	16063.640	16070.170
507.9	16076.700	16083.230	16089.760	16096.290	16102.820	16109.350	16115.880	16122.410	16128.940	16135.470
508.0	16142.000	16150.330	16158.660	16166.990	16175.320	16183.650	16191.980	16200.310	16208.640	16216.970
508.1	16225.300	16233.630	16241.960	16250.290	16258.620	16266.950	16275.280	16283.610	16291.940	16300.270
508.2	16308.600	16316.930	16325.260	16333.590	16341.920	16350.250	16358.580	16366.910	16375.240	16383.570
508.3	16391.900	16400.230	16408.560	16416.890	16425.220	16433.550	16441.880	16450.210	16458.540	16466.870
508.4	16475.200	16483.530	16491.860	16500.190	16508.520	16516.850	16525.180	16533.510	16541.840	16550.170
508.5	16558.500	16566.830	16575.160	16583.490	16591.820	16600.150	16608.480	16616.810	16625.140	16633.470
508.6	16641.800	16650.130	16658.460	16666.790	16675.120	16683.450	16691.780	16700.110	16708.440	16716.770
508.7	16725.100	16733.430	16741.760	16750.090	16758.420	16766.750	16775.080	16783.410	16791.740	16800.070
508.8	16808.400	16816.730	16825.060	16833.390	16841.720	16850.050	16858.380	16866.710	16875.040	16883.370
508.9	16891.700	16900.030	16908.360	16916.690	16925.020	16933.350	16941.680	16950.010	16958.340	16966.670
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
509.0	16975.000	16982.630	16990.260	16997.890	17005.520	17013.150	17020.780	17028.410	17036.040	17043.670
509.1	17051.300	17058.930	17066.560	17074.190	17081.820	17089.450	17097.080	17104.710	17112.340	17119.970
509.2	17127.600	17135.230	17142.860	17150.490	17158.120	17165.750	17173.380	17181.010	17188.640	17196.270
509.3	17203.900	17211.530	17219.160	17226.790	17234.420	17242.050	17249.680	17257.310	17264.940	17272.570
509.4	17280.200	17287.830	17295.460	17303.090	17310.720	17318.350	17325.980	17333.610	17341.240	17348.870
509.5	17356.500	17364.130	17371.760	17379.390	17387.020	17394.650	17402.280	17409.910	17417.540	17425.170
509.6	17432.800	17440.430	17448.060	17455.690	17463.320	17470.950	17478.580	17486.210	17493.840	17501.470
509.7	17509.100	17516.730	17524.360	17531.990	17539.620	17547.250	17554.880	17562.510	17570.140	17577.770
509.8	17585.400	17593.030	17600.660	17608.290	17615.920	17623.550	17631.180	17638.810	17646.440	17654.070
509.9	17661.700	17669.330	17676.960	17684.590	17692.220	17699.850	17707.480	17715.110	17722.740	17730.370
510.0	17738.000	17744.850	17751.700	17758.550	17765.400	17772.250	17779.100	17785.950	17792.800	17799.650
510.1	17806.500	17813.350	17820.200	17827.050	17833.900	17840.750	17847.600	17854.450	17861.300	17868.150
510.2	17875.000	17881.850	17888.700	17895.550	17902.400	17909.250	17916.100	17922.950	17929.800	17936.650
510.3	17943.500	17950.350	17957.200	17964.050	17970.900	17977.750	17984.600	17991.450	17998.300	18005.150
510.4	18012.000	18018.850	18025.700	18032.550	18039.400	18046.250	18053.100	18059.950	18066.800	18073.650
510.5	18080.500	18087.350	18094.200	18101.050	18107.900	18114.750	18121.600	18128.450	18135.300	18142.150
510.6	18149.000	18155.850	18162.700	18169.550	18176.400	18183.250	18190.100	18196.950	18203.800	18210.650
510.7	18217.500	18224.350	18231.200	18238.050	18244.900	18251.750	18258.600	18265.450	18272.300	18279.150
510.8	18286.000	18292.850	18299.700	18306.550	18313.400	18320.250	18327.100	18333.950	18340.800	18347.650
510.9	18354.500	18361.350	18368.200	18375.050	18381.900	18388.750	18395.600	18402.450	18409.300	18416.150
511.0	18423.000	18430.370	18437.740	18445.110	18452.480	18459.850	18467.220	18474.590	18481.960	18489.330
511.1	18496.700	18504.070	18511.440	18518.810	18526.180	18533.550	18540.920	18548.290	18555.660	18563.030
511.2	18570.400	18577.770	18585.140	18592.510	18599.880	18607.250	18614.620	18621.990	18629.360	18636.730
511.3	18644.100	18651.470	18658.840	18666.210	18673.580	18680.950	18688.320	18695.690	18703.060	18710.430
511.4	18717.800	18725.170	18732.540	18739.910	18747.280	18754.650	18762.020	18769.390	18776.760	18784.130
511.5	18791.500	18798.870	18806.240	18813.610	18820.980	18828.350	18835.720	18843.090	18850.460	18857.830
511.6	18865.200	18872.570	18879.940	18887.310	18894.680	18902.050	18909.420	18916.790	18924.160	18931.530
511.7	18938.900	18946.270	18953.640	18961.010	18968.380	18975.750	18983.120	18990.490	18997.860	19005.230
511.8	19012.600	19019.970	19027.340	19034.710	19042.080	19049.450	19056.820	19064.190	19071.560	19078.930
511.9	19086.300	19093.670	19101.040	19108.410	19115.780	19123.150	19130.520	19137.890	19145.260	19152.630
512.0	19160.000	19167.200	19174.400	19181.600	19188.800	19196.000	19203.200	19210.400	19217.600	19224.800
512.1	19232.000	19239.200	19246.400	19253.600	19260.800	19268.000	19275.200	19282.400	19289.600	19296.800
512.2	19304.000	19311.200	19318.400	19325.600	19332.800	19340.000	19347.200	19354.400	19361.600	19368.800
512.3	19376.000	19383.200	19390.400	19397.600	19404.800	19412.000	19419.200	19426.400	19433.600	19440.800
512.4	19448.000	19455.200	19462.400	19469.600	19476.800	19484.000	19491.200	19498.400	19505.600	19512.800
512.5	19520.000	19527.200	19534.400	19541.600	19548.800	19556.000	19563.200	19570.400	19577.600	19584.800
512.6	19592.000	19599.200	19606.400	19613.600	19620.800	19628.000	19635.200	19642.400	19649.600	19656.800
512.7	19664.000	19671.200	19678.400	19685.600	19692.800	19700.000	19707.200	19714.400	19721.600	19728.800
512.8	19736.000	19743.200	19750.400	19757.600	19764.800	19772.000	19779.200	19786.400	19793.600	19800.800
512.9	19808.000	19815.200	19822.400	19829.600	19836.800	19844.000	19851.200	19858.400	19865.600	19872.800
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
513.0	19880.000	19889.900	19899.800	19909.700	19919.600	19929.500	19939.400	19949.300	19959.200	19969.100
513.1	19979.000	19988.900	19998.800	20008.700	20018.600	20028.500	20038.400	20048.300	20058.200	20068.100
513.2	20078.000	20087.900	20097.800	20107.700	20117.600	20127.500	20137.400	20147.300	20157.200	20167.100
513.3	20177.000	20186.900	20196.800	20206.700	20216.600	20226.500	20236.400	20246.300	20256.200	20266.100
513.4	20276.000	20285.900	20295.800	20305.700	20315.600	20325.500	20335.400	20345.300	20355.200	20365.100
513.5	20375.000	20384.900	20394.800	20404.700	20414.600	20424.500	20434.400	20444.300	20454.200	20464.100
513.6	20474.000	20483.900	20493.800	20503.700	20513.600	20523.500	20533.400	20543.300	20553.200	20563.100
513.7	20573.000	20582.900	20592.800	20602.700	20612.600	20622.500	20632.400	20642.300	20652.200	20662.100
513.8	20672.000	20681.900	20691.800	20701.700	20711.600	20721.500	20731.400	20741.300	20751.200	20761.100
513.9	20771.000	20780.900	20790.800	20800.700	20810.600	20820.500	20830.400	20840.300	20850.200	20860.100
514.0	20870.000	20879.350	20888.700	20898.050	20907.400	20916.750	20926.100	20935.450	20944.800	20954.150
514.1	20963.500	20972.850	20982.200	20991.550	21000.900	21010.250	21019.600	21028.950	21038.300	21047.650
514.2	21057.000	21066.350	21075.700	21085.050	21094.400	21103.750	21113.100	21122.450	21131.800	21141.150
514.3	21150.500	21159.850	21169.200	21178.550	21187.900	21197.250	21206.600	21215.950	21225.300	21234.650
514.4	21244.000	21253.350	21262.700	21272.050	21281.400	21290.750	21300.100	21309.450	21318.800	21328.150
514.5	21337.500	21346.850	21356.200	21365.550	21374.900	21384.250	21393.600	21402.950	21412.300	21421.650
514.6	21431.000	21440.350	21449.700	21459.050	21468.400	21477.750	21487.100	21496.450	21505.800	21515.150
514.7	21524.500	21533.850	21543.200	21552.550	21561.900	21571.250	21580.600	21589.950	21599.300	21608.650
514.8	21618.000	21627.350	21636.700	21646.050	21655.400	21664.750	21674.100	21683.450	21692.800	21702.150
514.9	21711.500	21720.850	21730.200	21739.550	21748.900	21758.250	21767.600	21776.950	21786.300	21795.650
515.0	21805.000	21813.730	21822.460	21831.190	21839.920	21848.650	21857.380	21866.110	21874.840	21883.570
515.1	21892.300	21901.030	21909.760	21918.490	21927.220	21935.950	21944.680	21953.410	21962.140	21970.870
515.2	21979.600	21988.330	21997.060	22005.790	22014.520	22023.250	22031.980	22040.710	22049.440	22058.170
515.3	22066.900	22075.630	22084.360	22093.090	22101.820	22110.550	22119.280	22128.010	22136.740	22145.470
515.4	22154.200	22162.930	22171.660	22180.390	22189.120	22197.850	22206.580	22215.310	22224.040	22232.770
515.5	22241.500	22250.230	22258.960	22267.690	22276.420	22285.150	22293.880	22302.610	22311.340	22320.070
515.6	22328.800	22337.530	22346.260	22354.990	22363.720	22372.450	22381.180	22389.910	22398.640	22407.370
515.7	22416.100	22424.830	22433.560	22442.290	22451.020	22459.750	22468.480	22477.210	22485.940	22494.670
515.8	22503.400	22512.130	22520.860	22529.590	22538.320	22547.050	22555.780	22564.510	22573.240	22581.970
515.9	22590.700	22599.430	22608.160	22616.890	22625.620	22634.350	22643.080	22651.810	22660.540	22669.270
516.0	22678.000	22686.780	22695.560	22704.340	22713.120	22721.900	22730.680	22739.460	22748.240	22757.020
516.1	22765.800	22774.580	22783.360	22792.140	22800.920	22809.700	22818.480	22827.260	22836.040	22844.820
516.2	22853.600	22862.380	22871.160	22879.940	22888.720	22897.500	22906.280	22915.060	22923.840	22932.620
516.3	22941.400	22950.180	22958.960	22967.740	22976.520	22985.300	22994.080	23002.860	23011.640	23020.420
516.4	23029.200	23037.980	23046.760	23055.540	23064.320	23073.100	23081.880	23090.660	23099.440	23108.220
516.5	23117.000	23125.780	23134.560	23143.340	23152.120	23160.900	23169.680	23178.460	23187.240	23196.020
516.6	23204.800	23213.580	23222.360	23231.140	23239.920	23248.700	23257.480	23266.260	23275.040	23283.820
516.7	23292.600	23301.380	23310.160	23318.940	23327.720	23336.500	23345.280	23354.060	23362.840	23371.620
516.8	23380.400	23389.180	23397.960	23406.740	23415.520	23424.300	23433.080	23441.860	23450.640	23459.420
516.9	23468.200	23476.980	23485.760	23494.540	23503.320	23512.100	23520.880	23529.660	23538.440	23547.220
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
517.0	23556.000	23564.080	23572.160	23580.240	23588.320	23596.400	23604.480	23612.560	23620.640	23628.720
517.1	23636.800	23644.880	23652.960	23661.040	23669.120	23677.200	23685.280	23693.360	23701.440	23709.520
517.2	23717.600	23725.680	23733.760	23741.840	23749.920	23758.000	23766.080	23774.160	23782.240	23790.320
517.3	23798.400	23806.480	23814.560	23822.640	23830.720	23838.800	23846.880	23854.960	23863.040	23871.120
517.4	23879.200	23887.280	23895.360	23903.440	23911.520	23919.600	23927.680	23935.760	23943.840	23951.920
517.5	23960.000	23968.080	23976.160	23984.240	23992.320	24000.400	24008.480	24016.560	24024.640	24032.720
517.6	24040.800	24048.880	24056.960	24065.040	24073.120	24081.200	24089.280	24097.360	24105.440	24113.520
517.7	24121.600	24129.680	24137.760	24145.840	24153.920	24162.000	24170.080	24178.160	24186.240	24194.320
517.8	24202.400	24210.480	24218.560	24226.640	24234.720	24242.800	24250.880	24258.960	24267.040	24275.120
517.9	24283.200	24291.280	24299.360	24307.440	24315.520	24323.600	24331.680	24339.760	24347.840	24355.920
518.0	24364.000	24371.420	24378.840	24386.260	24393.680	24401.100	24408.520	24415.940	24423.360	24430.780
518.1	24438.200	24445.620	24453.040	24460.460	24467.880	24475.300	24482.720	24490.140	24497.560	24504.980
518.2	24512.400	24519.820	24527.240	24534.660	24542.080	24549.500	24556.920	24564.340	24571.760	24579.180
518.3	24586.600	24594.020	24601.440	24608.860	24616.280	24623.700	24631.120	24638.540	24645.960	24653.380
518.4	24660.800	24668.220	24675.640	24683.060	24690.480	24697.900	24705.320	24712.740	24720.160	24727.580
518.5	24735.000	24742.420	24749.840	24757.260	24764.680	24772.100	24779.520	24786.940	24794.360	24801.780
518.6	24809.200	24816.620	24824.040	24831.460	24838.880	24846.300	24853.720	24861.140	24868.560	24875.980
518.7	24883.400	24890.820	24898.240	24905.660	24913.080	24920.500	24927.920	24935.340	24942.760	24950.180
518.8	24957.600	24965.020	24972.440	24979.860	24987.280	24994.700	25002.120	25009.540	25016.960	25024.380
518.9	25031.800	25039.220	25046.640	25054.060	25061.480	25068.900	25076.320	25083.740	25091.160	25098.580
519.0	25106.000	25112.500	25119.000	25125.500	25132.000	25138.500	25145.000	25151.500	25158.000	25164.500
519.1	25171.000	25177.500	25184.000	25190.500	25197.000	25203.500	25210.000	25216.500	25223.000	25229.500
519.2	25236.000	25242.500	25249.000	25255.500	25262.000	25268.500	25275.000	25281.500	25288.000	25294.500
519.3	25301.000	25307.500	25314.000	25320.500	25327.000	25333.500	25340.000	25346.500	25353.000	25359.500
519.4	25366.000	25372.500	25379.000	25385.500	25392.000	25398.500	25405.000	25411.500	25418.000	25424.500
519.5	25431.000	25437.500	25444.000	25450.500	25457.000	25463.500	25470.000	25476.500	25483.000	25489.500
519.6	25496.000	25502.500	25509.000	25515.500	25522.000	25528.500	25535.000	25541.500	25548.000	25554.500
519.7	25561.000	25567.500	25574.000	25580.500	25587.000	25593.500	25600.000	25606.500	25613.000	25619.500
519.8	25626.000	25632.500	25639.000	25645.500	25652.000	25658.500	25665.000	25671.500	25678.000	25684.500
519.9	25691.000	25697.500	25704.000	25710.500	25717.000	25723.500	25730.000	25736.500	25743.000	25749.500
520.0	25756.000	25761.850	25767.700	25773.550	25779.400	25785.250	25791.100	25796.950	25802.800	25808.650
520.1	25814.500	25820.350	25826.200	25832.050	25837.900	25843.750	25849.600	25855.450	25861.300	25867.150
520.2	25873.000	25878.850	25884.700	25890.550	25896.400	25902.250	25908.100	25913.950	25919.800	25925.650
520.3	25931.500	25937.350	25943.200	25949.050	25954.900	25960.750	25966.600	25972.450	25978.300	25984.150
520.4	25990.000	25995.850	26001.700	26007.550	26013.400	26019.250	26025.100	26030.950	26036.800	26042.650
520.5	26048.500	26054.350	26060.200	26066.050	26071.900	26077.750	26083.600	26089.450	26095.300	26101.150
520.6	26107.000	26112.850	26118.700	26124.550	26130.400	26136.250	26142.100	26147.950	26153.800	26159.650
520.7	26165.500	26171.350	26177.200	26183.050	26188.900	26194.750	26200.600	26206.450	26212.300	26218.150
520.8	26224.000	26229.850	26235.700	26241.550	26247.400	26253.250	26259.100	26264.950	26270.800	26276.650
520.9	26282.500	26288.350	26294.200	26300.050	26305.900	26311.750	26317.600	26323.450	26329.300	26335.150
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
521.0	26341.000	26349.340	26357.680	26366.020	26374.360	26382.700	26391.040	26399.380	26407.720	26416.060
521.1	26424.400	26432.740	26441.080	26449.420	26457.760	26466.100	26474.440	26482.780	26491.120	26499.460
521.2	26507.800	26516.140	26524.480	26532.820	26541.160	26549.500	26557.840	26566.180	26574.520	26582.860
521.3	26591.200	26599.540	26607.880	26616.220	26624.560	26632.900	26641.240	26649.580	26657.920	26666.260
521.4	26674.600	26682.940	26691.280	26699.620	26707.960	26716.300	26724.640	26732.980	26741.320	26749.660
521.5	26758.000	26766.340	26774.680	26783.020	26791.360	26799.700	26808.040	26816.380	26824.720	26833.060
521.6	26841.400	26849.740	26858.080	26866.420	26874.760	26883.100	26891.440	26899.780	26908.120	26916.460
521.7	26924.800	26933.140	26941.480	26949.820	26958.160	26966.500	26974.840	26983.180	26991.520	26999.860
521.8	27008.200	27016.540	27024.880	27033.220	27041.560	27049.900	27058.240	27066.580	27074.920	27083.260
521.9	27091.600	27099.940	27108.280	27116.620	27124.960	27133.300	27141.640	27149.980	27158.320	27166.660
522.0	27175.000	27206.460	27237.920	27269.380	27300.840	27332.300	27363.760	27395.220	27426.680	27458.140
522.1	27489.600	27521.060	27552.520	27583.980	27615.440	27646.900	27678.360	27709.820	27741.280	27772.740
522.2	27804.200	27835.660	27867.120	27898.580	27930.040	27961.500	27992.960	28024.420	28055.880	28087.340
522.3	28118.800	28150.260	28181.720	28213.180	28244.640	28276.100	28307.560	28339.020	28370.480	28401.940
522.4	28433.400	28464.860	28496.320	28527.780	28559.240	28590.700	28622.160	28653.620	28685.080	28716.540
522.5	28748.000	28779.460	28810.920	28842.380	28873.840	28905.300	28936.760	28968.220	28999.680	29031.140
522.6	29062.600	29094.060	29125.520	29156.980	29188.440	29219.900	29251.360	29282.820	29314.280	29345.740
522.7	29377.200	29408.660	29440.120	29471.580	29503.040	29534.500	29565.960	29597.420	29628.880	29660.340
522.8	29691.800	29723.260	29754.720	29786.180	29817.640	29849.100	29880.560	29912.020	29943.480	29974.940
522.9	30006.400	30037.860	30069.320	30100.780	30132.240	30163.700	30195.160	30226.620	30258.080	30289.540
523.0	30321.000	30327.400	30333.800	30340.200	30346.600	30353.000	30359.400	30365.800	30372.200	30378.600
523.1	30385.000	30391.400	30397.800	30404.200	30410.600	30417.000	30423.400	30429.800	30436.200	30442.600
523.2	30449.000	30455.400	30461.800	30468.200	30474.600	30481.000	30487.400	30493.800	30500.200	30506.600
523.3	30513.000	30519.400	30525.800	30532.200	30538.600	30545.000	30551.400	30557.800	30564.200	30570.600
523.4	30577.000	30583.400	30589.800	30596.200	30602.600	30609.000	30615.400	30621.800	30628.200	30634.600
523.5	30641.000	30647.400	30653.800	30660.200	30666.600	30673.000	30679.400	30685.800	30692.200	30698.600
523.6	30705.000	30711.400	30717.800	30724.200	30730.600	30737.000	30743.400	30749.800	30756.200	30762.600
523.7	30769.000	30775.400	30781.800	30788.200	30794.600	30801.000	30807.400	30813.800	30820.200	30826.600
523.8	30833.000	30839.400	30845.800	30852.200	30858.600	30865.000	30871.400	30877.800	30884.200	30890.600
523.9	30897.000	30903.400	30909.800	30916.200	30922.600	30929.000	30935.400	30941.800	30948.200	30954.600
524.0	30961.000	30968.220	30975.440	30982.660	30989.880	30997.100	31004.320	31011.540	31018.760	31025.980
524.1	31033.200	31040.420	31047.640	31054.860	31062.080	31069.300	31076.520	31083.740	31090.960	31098.180
524.2	31105.400	31112.620	31119.840	31127.060	31134.280	31141.500	31148.720	31155.940	31163.160	31170.380
524.3	31177.600	31184.820	31192.040	31199.260	31206.480	31213.700	31220.920	31228.140	31235.360	31242.580
524.4	31249.800	31257.020	31264.240	31271.460	31278.680	31285.900	31293.120	31300.340	31307.560	31314.780
524.5	31322.000	31329.220	31336.440	31343.660	31350.880	31358.100	31365.320	31372.540	31379.760	31386.980
524.6	31394.200	31401.420	31408.640	31415.860	31423.080	31430.300	31437.520	31444.740	31451.960	31459.180
524.7	31466.400	31473.620	31480.840	31488.060	31495.280	31502.500	31509.720	31516.940	31524.160	31531.380
524.8	31538.600	31545.820	31553.040	31560.260	31567.480	31574.700	31581.920	31589.140	31596.360	31603.580
524.9	31610.800	31618.020	31625.240	31632.460	31639.680	31646.900	31654.120	31661.340	31668.560	31675.780
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
525.0	31683.000	31692.750	31702.500	31712.250	31722.000	31731.750	31741.500	31751.250	31761.000	31770.750
525.1	31780.500	31790.250	31800.000	31809.750	31819.500	31829.250	31839.000	31848.750	31858.500	31868.250
525.2	31878.000	31887.750	31897.500	31907.250	31917.000	31926.750	31936.500	31946.250	31956.000	31965.750
525.3	31975.500	31985.250	31995.000	32004.750	32014.500	32024.250	32034.000	32043.750	32053.500	32063.250
525.4	32073.000	32082.750	32092.500	32102.250	32112.000	32121.750	32131.500	32141.250	32151.000	32160.750
525.5	32170.500	32180.250	32190.000	32199.750	32209.500	32219.250	32229.000	32238.750	32248.500	32258.250
525.6	32268.000	32277.750	32287.500	32297.250	32307.000	32316.750	32326.500	32336.250	32346.000	32355.750
525.7	32365.500	32375.250	32385.000	32394.750	32404.500	32414.250	32424.000	32433.750	32443.500	32453.250
525.8	32463.000	32472.750	32482.500	32492.250	32502.000	32511.750	32521.500	32531.250	32541.000	32550.750
525.9	32560.500	32570.250	32580.000	32589.750	32599.500	32609.250	32619.000	32628.750	32638.500	32648.250
526.0	32658.000	32672.050	32686.100	32700.150	32714.200	32728.250	32742.300	32756.350	32770.400	32784.450
526.1	32798.500	32812.550	32826.600	32840.650	32854.700	32868.750	32882.800	32896.850	32910.900	32924.950
526.2	32939.000	32953.050	32967.100	32981.150	32995.200	33009.250	33023.300	33037.350	33051.400	33065.450
526.3	33079.500	33093.550	33107.600	33121.650	33135.700	33149.750	33163.800	33177.850	33191.900	33205.950
526.4	33220.000	33234.050	33248.100	33262.150	33276.200	33290.250	33304.300	33318.350	33332.400	33346.450
526.5	33360.500	33374.550	33388.600	33402.650	33416.700	33430.750	33444.800	33458.850	33472.900	33486.950
526.6	33501.000	33515.050	33529.100	33543.150	33557.200	33571.250	33585.300	33599.350	33613.400	33627.450
526.7	33641.500	33655.550	33669.600	33683.650	33697.700	33711.750	33725.800	33739.850	33753.900	33767.950
526.8	33782.000	33796.050	33810.100	33824.150	33838.200	33852.250	33866.300	33880.350	33894.400	33908.450
526.9	33922.500	33936.550	33950.600	33964.650	33978.700	33992.750	34006.800	34020.850	34034.900	34048.950
527.0	34063.000	34075.720	34088.440	34101.160	34113.880	34126.600	34139.320	34152.040	34164.760	34177.480
527.1	34190.200	34202.920	34215.640	34228.360	34241.080	34253.800	34266.520	34279.240	34291.960	34304.680
527.2	34317.400	34330.120	34342.840	34355.560	34368.280	34381.000	34393.720	34406.440	34419.160	34431.880
527.3	34444.600	34457.320	34470.040	34482.760	34495.480	34508.200	34520.920	34533.640	34546.360	34559.080
527.4	34571.800	34584.520	34597.240	34609.960	34622.680	34635.400	34648.120	34660.840	34673.560	34686.280
527.5	34699.000	34711.720	34724.440	34737.160	34749.880	34762.600	34775.320	34788.040	34800.760	34813.480
527.6	34826.200	34838.920	34851.640	34864.360	34877.080	34889.800	34902.520	34915.240	34927.960	34940.680
527.7	34953.400	34966.120	34978.840	34991.560	35004.280	35017.000	35029.720	35042.440	35055.160	35067.880
527.8	35080.600	35093.320	35106.040	35118.760	35131.480	35144.200	35156.920	35169.640	35182.360	35195.080
527.9	35207.800	35220.520	35233.240	35245.960	35258.680	35271.400	35284.120	35296.840	35309.560	35322.280
528.0	35335.000	35343.500	35352.000	35360.500	35369.000	35377.500	35386.000	35394.500	35403.000	35411.500
528.1	35420.000	35428.500	35437.000	35445.500	35454.000	35462.500	35471.000	35479.500	35488.000	35496.500
528.2	35505.000	35513.500	35522.000	35530.500	35539.000	35547.500	35556.000	35564.500	35573.000	35581.500
528.3	35590.000	35598.500	35607.000	35615.500	35624.000	35632.500	35641.000	35649.500	35658.000	35666.500
528.4	35675.000	35683.500	35692.000	35700.500	35709.000	35717.500	35726.000	35734.500	35743.000	35751.500
528.5	35760.000	35768.500	35777.000	35785.500	35794.000	35802.500	35811.000	35819.500	35828.000	35836.500
528.6	35845.000	35853.500	35862.000	35870.500	35879.000	35887.500	35896.000	35904.500	35913.000	35921.500
528.7	35930.000	35938.500	35947.000	35955.500	35964.000	35972.500	35981.000	35989.500	35998.000	36006.500
528.8	36015.000	36023.500	36032.000	36040.500	36049.000	36057.500	36066.000	36074.500	36083.000	36091.500
528.9	36100.000	36108.500	36117.000	36125.500	36134.000	36142.500	36151.000	36159.500	36168.000	36176.500
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
529.0	36185.000	36193.220	36201.440	36209.660	36217.880	36226.100	36234.320	36242.540	36250.760	36258.980
529.1	36267.200	36275.420	36283.640	36291.860	36300.080	36308.300	36316.520	36324.740	36332.960	36341.180
529.2	36349.400	36357.620	36365.840	36374.060	36382.280	36390.500	36398.720	36406.940	36415.160	36423.380
529.3	36431.600	36439.820	36448.040	36456.260	36464.480	36472.700	36480.920	36489.140	36497.360	36505.580
529.4	36513.800	36522.020	36530.240	36538.460	36546.680	36554.900	36563.120	36571.340	36579.560	36587.780
529.5	36596.000	36604.220	36612.440	36620.660	36628.880	36637.100	36645.320	36653.540	36661.760	36669.980
529.6	36678.200	36686.420	36694.640	36702.860	36711.080	36719.300	36727.520	36735.740	36743.960	36752.180
529.7	36760.400	36768.620	36776.840	36785.060	36793.280	36801.500	36809.720	36817.940	36826.160	36834.380
529.8	36842.600	36850.820	36859.040	36867.260	36875.480	36883.700	36891.920	36900.140	36908.360	36916.580
529.9	36924.800	36933.020	36941.240	36949.460	36957.680	36965.900	36974.120	36982.340	36990.560	36998.780
530.0	37007.000	37018.770	37030.540	37042.310	37054.080	37065.850	37077.620	37089.390	37101.160	37112.930
530.1	37124.700	37136.470	37148.240	37160.010	37171.780	37183.550	37195.320	37207.090	37218.860	37230.630
530.2	37242.400	37254.170	37265.940	37277.710	37289.480	37301.250	37313.020	37324.790	37336.560	37348.330
530.3	37360.100	37371.870	37383.640	37395.410	37407.180	37418.950	37430.720	37442.490	37454.260	37466.030
530.4	37477.800	37489.570	37501.340	37513.110	37524.880	37536.650	37548.420	37560.190	37571.960	37583.730
530.5	37595.500	37607.270	37619.040	37630.810	37642.580	37654.350	37666.120	37677.890	37689.660	37701.430
530.6	37713.200	37724.970	37736.740	37748.510	37760.280	37772.050	37783.820	37795.590	37807.360	37819.130
530.7	37830.900	37842.670	37854.440	37866.210	37877.980	37889.750	37901.520	37913.290	37925.060	37936.830
530.8	37948.600	37960.370	37972.140	37983.910	37995.680	38007.450	38019.220	38030.990	38042.760	38054.530
530.9	38066.300	38078.070	38089.840	38101.610	38113.380	38125.150	38136.920	38148.690	38160.460	38172.230
531.0	38184.000	38193.840	38203.680	38213.520	38223.360	38233.200	38243.040	38252.880	38262.720	38272.560
531.1	38282.400	38292.240	38302.080	38311.920	38321.760	38331.600	38341.440	38351.280	38361.120	38370.960
531.2	38380.800	38390.640	38400.480	38410.320	38420.160	38430.000	38439.840	38449.680	38459.520	38469.360
531.3	38479.200	38489.040	38498.880	38508.720	38518.560	38528.400	38538.240	38548.080	38557.920	38567.760
531.4	38577.600	38587.440	38597.280	38607.120	38616.960	38626.800	38636.640	38646.480	38656.320	38666.160
531.5	38676.000	38685.840	38695.680	38705.520	38715.360	38725.200	38735.040	38744.880	38754.720	38764.560
531.6	38774.400	38784.240	38794.080	38803.920	38813.760	38823.600	38833.440	38843.280	38853.120	38862.960
531.7	38872.800	38882.640	38892.480	38902.320	38912.160	38922.000	38931.840	38941.680	38951.520	38961.360
531.8	38971.200	38981.040	38990.880	39000.720	39010.560	39020.400	39030.240	39040.080	39049.920	39059.760
531.9	39069.600	39079.440	39089.280	39099.120	39108.960	39118.800	39128.640	39138.480	39148.320	39158.160
532.0	39168.000	39178.320	39188.640	39198.960	39209.280	39219.600	39229.920	39240.240	39250.560	39260.880
532.1	39271.200	39281.520	39291.840	39302.160	39312.480	39322.800	39333.120	39343.440	39353.760	39364.080
532.2	39374.400	39384.720	39395.040	39405.360	39415.680	39426.000	39436.320	39446.640	39456.960	39467.280
532.3	39477.600	39487.920	39498.240	39508.560	39518.880	39529.200	39539.520	39549.840	39560.160	39570.480
532.4	39580.800	39591.120	39601.440	39611.760	39622.080	39632.400	39642.720	39653.040	39663.360	39673.680
532.5	39684.000	39694.320	39704.640	39714.960	39725.280	39735.600	39745.920	39756.240	39766.560	39776.880
532.6	39787.200	39797.520	39807.840	39818.160	39828.480	39838.800	39849.120	39859.440	39869.760	39880.080
532.7	39890.400	39900.720	39911.040	39921.360	39931.680	39942.000	39952.320	39962.640	39972.960	39983.280
532.8	39993.600	40003.920	40014.240	40024.560	40034.880	40045.200	40055.520	40065.840	40076.160	40086.480
532.9	40096.800	40107.120	40117.440	40127.760	40138.080	40148.400	40158.720	40169.040	40179.360	40189.680
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
533.0	40200.000	40213.530	40227.060	40240.590	40254.120	40267.650	40281.180	40294.710	40308.240	40321.770
533.1	40335.300	40348.830	40362.360	40375.890	40389.420	40402.950	40416.480	40430.010	40443.540	40457.070
533.2	40470.600	40484.130	40497.660	40511.190	40524.720	40538.250	40551.780	40565.310	40578.840	40592.370
533.3	40605.900	40619.430	40632.960	40646.490	40660.020	40673.550	40687.080	40700.610	40714.140	40727.670
533.4	40741.200	40754.730	40768.260	40781.790	40795.320	40808.850	40822.380	40835.910	40849.440	40862.970
533.5	40876.500	40890.030	40903.560	40917.090	40930.620	40944.150	40957.680	40971.210	40984.740	40998.270
533.6	41011.800	41025.330	41038.860	41052.390	41065.920	41079.450	41092.980	41106.510	41120.040	41133.570
533.7	41147.100	41160.630	41174.160	41187.690	41201.220	41214.750	41228.280	41241.810	41255.340	41268.870
533.8	41282.400	41295.930	41309.460	41322.990	41336.520	41350.050	41363.580	41377.110	41390.640	41404.170
533.9	41417.700	41431.230	41444.760	41458.290	41471.820	41485.350	41498.880	41512.410	41525.940	41539.470
534.0	41553.000	41566.780	41580.560	41594.340	41608.120	41621.900	41635.680	41649.460	41663.240	41677.020
534.1	41690.800	41704.580	41718.360	41732.140	41745.920	41759.700	41773.480	41787.260	41801.040	41814.820
534.2	41828.600	41842.380	41856.160	41869.940	41883.720	41897.500	41911.280	41925.060	41938.840	41952.620
534.3	41966.400	41980.180	41993.960	42007.740	42021.520	42035.300	42049.080	42062.860	42076.640	42090.420
534.4	42104.200	42117.980	42131.760	42145.540	42159.320	42173.100	42186.880	42200.660	42214.440	42228.220
534.5	42242.000	42255.780	42269.560	42283.340	42297.120	42310.900	42324.680	42338.460	42352.240	42366.020
534.6	42379.800	42393.580	42407.360	42421.140	42434.920	42448.700	42462.480	42476.260	42490.040	42503.820
534.7	42517.600	42531.380	42545.160	42558.940	42572.720	42586.500	42600.280	42614.060	42627.840	42641.620
534.8	42655.400	42669.180	42682.960	42696.740	42710.520	42724.300	42738.080	42751.860	42765.640	42779.420
534.9	42793.200	42806.980	42820.760	42834.540	42848.320	42862.100	42875.880	42889.660	42903.440	42917.220
535.0	42931.000	42942.810	42954.620	42966.430	42978.240	42990.050	43001.860	43013.670	43025.480	43037.290
535.1	43049.100	43060.910	43072.720	43084.530	43096.340	43108.150	43119.960	43131.770	43143.580	43155.390
535.2	43167.200	43179.010	43190.820	43202.630	43214.440	43226.250	43238.060	43249.870	43261.680	43273.490
535.3	43285.300	43297.110	43308.920	43320.730	43332.540	43344.350	43356.160	43367.970	43379.780	43391.590
535.4	43403.400	43415.210	43427.020	43438.830	43450.640	43462.450	43474.260	43486.070	43497.880	43509.690
535.5	43521.500	43533.310	43545.120	43556.930	43568.740	43580.550	43592.360	43604.170	43615.980	43627.790
535.6	43639.600	43651.410	43663.220	43675.030	43686.840	43698.650	43710.460	43722.270	43734.080	43745.890
535.7	43757.700	43769.510	43781.320	43793.130	43804.940	43816.750	43828.560	43840.370	43852.180	43863.990
535.8	43875.800	43887.610	43899.420	43911.230	43923.040	43934.850	43946.660	43958.470	43970.280	43982.090
535.9	43993.900	44005.710	44017.520	44029.330	44041.140	44052.950	44064.760	44076.570	44088.380	44100.190
536.0	44112.000	44122.110	44132.220	44142.330	44152.440	44162.550	44172.660	44182.770	44192.880	44202.990
536.1	44213.100	44223.210	44233.320	44243.430	44253.540	44263.650	44273.760	44283.870	44293.980	44304.090
536.2	44314.200	44324.310	44334.420	44344.530	44354.640	44364.750	44374.860	44384.970	44395.080	44405.190
536.3	44415.300	44425.410	44435.520	44445.630	44455.740	44465.850	44475.960	44486.070	44496.180	44506.290
536.4	44516.400	44526.510	44536.620	44546.730	44556.840	44566.950	44577.060	44587.170	44597.280	44607.390
536.5	44617.500	44627.610	44637.720	44647.830	44657.940	44668.050	44678.160	44688.270	44698.380	44708.490
536.6	44718.600	44728.710	44738.820	44748.930	44759.040	44769.150	44779.260	44789.370	44799.480	44809.590
536.7	44819.700	44829.810	44839.920	44850.030	44860.140	44870.250	44880.360	44890.470	44900.580	44910.690
536.8	44920.800	44930.910	44941.020	44951.130	44961.240	44971.350	44981.460	44991.570	45001.680	45011.790
536.9	45021.900	45032.010	45042.120	45052.230	45062.340	45072.450	45082.560	45092.670	45102.780	45112.890
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. AREA

ELEVATIONS IN FEET-NGVD, AREA (IN ACRES)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
537.0	45123.000	45131.820	45140.640	45149.460	45158.280	45167.100	45175.920	45184.740	45193.560	45202.380
537.1	45211.200	45220.020	45228.840	45237.660	45246.480	45255.300	45264.120	45272.940	45281.760	45290.580
537.2	45299.400	45308.220	45317.040	45325.860	45334.680	45343.500	45352.320	45361.140	45369.960	45378.780
537.3	45387.600	45396.420	45405.240	45414.060	45422.880	45431.700	45440.520	45449.340	45458.160	45466.980
537.4	45475.800	45484.620	45493.440	45502.260	45511.080	45519.900	45528.720	45537.540	45546.360	45555.180
537.5	45564.000	45572.820	45581.640	45590.460	45599.280	45608.100	45616.920	45625.740	45634.560	45643.380
537.6	45652.200	45661.020	45669.840	45678.660	45687.480	45696.300	45705.120	45713.940	45722.760	45731.580
537.7	45740.400	45749.220	45758.040	45766.860	45775.680	45784.500	45793.320	45802.140	45810.960	45819.780
537.8	45828.600	45837.420	45846.240	45855.060	45863.880	45872.700	45881.520	45890.340	45899.160	45907.980
537.9	45916.800	45925.620	45934.440	45943.260	45952.080	45960.900	45969.720	45978.540	45987.360	45996.180
538.0	46005.000	46017.540	46030.080	46042.620	46055.160	46067.700	46080.240	46092.780	46105.320	46117.860
538.1	46130.400	46142.940	46155.480	46168.020	46180.560	46193.100	46205.640	46218.180	46230.720	46243.260
538.2	46255.800	46268.340	46280.880	46293.420	46305.960	46318.500	46331.040	46343.580	46356.120	46368.660
538.3	46381.200	46393.740	46406.280	46418.820	46431.360	46443.900	46456.440	46468.980	46481.520	46494.060
538.4	46506.600	46519.140	46531.680	46544.220	46556.760	46569.300	46581.840	46594.380	46606.920	46619.460
538.5	46632.000	46644.540	46657.080	46669.620	46682.160	46694.700	46707.240	46719.780	46732.320	46744.860
538.6	46757.400	46769.940	46782.480	46795.020	46807.560	46820.100	46832.640	46845.180	46857.720	46870.260
538.7	46882.800	46895.340	46907.880	46920.420	46932.960	46945.500	46958.040	46970.580	46983.120	46995.660
538.8	47008.200	47020.740	47033.280	47045.820	47058.360	47070.900	47083.440	47095.980	47108.520	47121.060
538.9	47133.600	47146.140	47158.680	47171.220	47183.760	47196.300	47208.840	47221.380	47233.920	47246.460
539.0	47259.000	47269.820	47280.640	47291.460	47302.280	47313.100	47323.920	47334.740	47345.560	47356.380
539.1	47367.200	47378.020	47388.840	47399.660	47410.480	47421.300	47432.120	47442.940	47453.760	47464.580
539.2	47475.400	47486.220	47497.040	47507.860	47518.680	47529.500	47540.320	47551.140	47561.960	47572.780
539.3	47583.600	47594.420	47605.240	47616.060	47626.880	47637.700	47648.520	47659.340	47670.160	47680.980
539.4	47691.800	47702.620	47713.440	47724.260	47735.080	47745.900	47756.720	47767.540	47778.360	47789.180
539.5	47800.000	47810.820	47821.640	47832.460	47843.280	47854.100	47864.920	47875.740	47886.560	47897.380
539.6	47908.200	47919.020	47929.840	47940.660	47951.480	47962.300	47973.120	47983.940	47994.760	48005.580
539.7	48016.400	48027.220	48038.040	48048.860	48059.680	48070.500	48081.320	48092.140	48102.960	48113.780
539.8	48124.600	48135.420	48146.240	48157.060	48167.880	48178.700	48189.520	48200.340	48211.160	48221.980
539.9	48232.800	48243.620	48254.440	48265.260	48276.080	48286.900	48297.720	48308.540	48319.360	48330.180
540.0	48341.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
453.0	0.00	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18
453.1	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38
453.2	0.40	0.42	0.44	0.46	0.48	0.50	0.52	0.54	0.56	0.58
453.3	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.74	0.76	0.78
453.4	0.80	0.82	0.84	0.86	0.88	0.90	0.92	0.94	0.96	0.98
453.5	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18
453.6	1.20	1.22	1.24	1.26	1.28	1.30	1.32	1.34	1.36	1.38
453.7	1.40	1.42	1.44	1.46	1.48	1.50	1.52	1.54	1.56	1.58
453.8	1.60	1.62	1.64	1.66	1.68	1.70	1.72	1.74	1.76	1.78
453.9	1.80	1.82	1.84	1.86	1.88	1.90	1.92	1.94	1.96	1.98
454.0	2.00	2.12	2.24	2.36	2.48	2.60	2.72	2.84	2.96	3.08
454.1	3.20	3.32	3.44	3.56	3.68	3.80	3.92	4.04	4.16	4.28
454.2	4.40	4.52	4.64	4.76	4.88	5.00	5.12	5.24	5.36	5.48
454.3	5.60	5.72	5.84	5.96	6.08	6.20	6.32	6.44	6.56	6.68
454.4	6.80	6.92	7.04	7.16	7.28	7.40	7.52	7.64	7.76	7.88
454.5	8.00	8.12	8.24	8.36	8.48	8.60	8.72	8.84	8.96	9.08
454.6	9.20	9.32	9.44	9.56	9.68	9.80	9.92	10.04	10.16	10.28
454.7	10.40	10.52	10.64	10.76	10.88	11.00	11.12	11.24	11.36	11.48
454.8	11.60	11.72	11.84	11.96	12.08	12.20	12.32	12.44	12.56	12.68
454.9	12.80	12.92	13.04	13.16	13.28	13.40	13.52	13.64	13.76	13.88
455.0	14.00	14.23	14.46	14.69	14.92	15.15	15.38	15.61	15.84	16.07
455.1	16.30	16.53	16.76	16.99	17.22	17.45	17.68	17.91	18.14	18.37
455.2	18.60	18.83	19.06	19.29	19.52	19.75	19.98	20.21	20.44	20.67
455.3	20.90	21.13	21.36	21.59	21.82	22.05	22.28	22.51	22.74	22.97
455.4	23.20	23.43	23.66	23.89	24.12	24.35	24.58	24.81	25.04	25.27
455.5	25.50	25.73	25.96	26.19	26.42	26.65	26.88	27.11	27.34	27.57
455.6	27.80	28.03	28.26	28.49	28.72	28.95	29.18	29.41	29.64	29.87
455.7	30.10	30.33	30.56	30.79	31.02	31.25	31.48	31.71	31.94	32.17
455.8	32.40	32.63	32.86	33.09	33.32	33.55	33.78	34.01	34.24	34.47
455.9	34.70	34.93	35.16	35.39	35.62	35.85	36.08	36.31	36.54	36.77
456.0	37.00	37.32	37.64	37.96	38.28	38.60	38.92	39.24	39.56	39.88
456.1	40.20	40.52	40.84	41.16	41.48	41.80	42.12	42.44	42.76	43.08
456.2	43.40	43.72	44.04	44.36	44.68	45.00	45.32	45.64	45.96	46.28
456.3	46.60	46.92	47.24	47.56	47.88	48.20	48.52	48.84	49.16	49.48
456.4	49.80	50.12	50.44	50.76	51.08	51.40	51.72	52.04	52.36	52.68
456.5	53.00	53.32	53.64	53.96	54.28	54.60	54.92	55.24	55.56	55.88
456.6	56.20	56.52	56.84	57.16	57.48	57.80	58.12	58.44	58.76	59.08
456.7	59.40	59.72	60.04	60.36	60.68	61.00	61.32	61.64	61.96	62.28
456.8	62.60	62.92	63.24	63.56	63.88	64.20	64.52	64.84	65.16	65.48
456.9	65.80	66.12	66.44	66.76	67.08	67.40	67.72	68.04	68.36	68.68
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)
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ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
457.0	69.00	69.48	69.96	70.44	70.92	71.40	71.88	72.36	72.84	73.32
457.1	73.80	74.28	74.76	75.24	75.72	76.20	76.68	77.16	77.64	78.12
457.2	78.60	79.08	79.56	80.04	80.52	81.00	81.48	81.96	82.44	82.92
457.3	83.40	83.88	84.36	84.84	85.32	85.80	86.28	86.76	87.24	87.72
457.4	88.20	88.68	89.16	89.64	90.12	90.60	91.08	91.56	92.04	92.52
457.5	93.00	93.48	93.96	94.44	94.92	95.40	95.88	96.36	96.84	97.32
457.6	97.80	98.28	98.76	99.24	99.72	100.20	100.68	101.16	101.64	102.12
457.7	102.60	103.08	103.56	104.04	104.52	105.00	105.48	105.96	106.44	106.92
457.8	107.40	107.88	108.36	108.84	109.32	109.80	110.28	110.76	111.24	111.72
457.9	112.20	112.68	113.16	113.64	114.12	114.60	115.08	115.56	116.04	116.52
458.0	117.00	117.75	118.50	119.25	120.00	120.75	121.50	122.25	123.00	123.75
458.1	124.50	125.25	126.00	126.75	127.50	128.25	129.00	129.75	130.50	131.25
458.2	132.00	132.75	133.50	134.25	135.00	135.75	136.50	137.25	138.00	138.75
458.3	139.50	140.25	141.00	141.75	142.50	143.25	144.00	144.75	145.50	146.25
458.4	147.00	147.75	148.50	149.25	150.00	150.75	151.50	152.25	153.00	153.75
458.5	154.50	155.25	156.00	156.75	157.50	158.25	159.00	159.75	160.50	161.25
458.6	162.00	162.75	163.50	164.25	165.00	165.75	166.50	167.25	168.00	168.75
458.7	169.50	170.25	171.00	171.75	172.50	173.25	174.00	174.75	175.50	176.25
458.8	177.00	177.75	178.50	179.25	180.00	180.75	181.50	182.25	183.00	183.75
458.9	184.50	185.25	186.00	186.75	187.50	188.25	189.00	189.75	190.50	191.25
459.0	192.00	192.96	193.92	194.88	195.84	196.80	197.76	198.72	199.68	200.64
459.1	201.60	202.56	203.52	204.48	205.44	206.40	207.36	208.32	209.28	210.24
459.2	211.20	212.16	213.12	214.08	215.04	216.00	216.96	217.92	218.88	219.84
459.3	220.80	221.76	222.72	223.68	224.64	225.60	226.56	227.52	228.48	229.44
459.4	230.40	231.36	232.32	233.28	234.24	235.20	236.16	237.12	238.08	239.04
459.5	240.00	240.96	241.92	242.88	243.84	244.80	245.76	246.72	247.68	248.64
459.6	249.60	250.56	251.52	252.48	253.44	254.40	255.36	256.32	257.28	258.24
459.7	259.20	260.16	261.12	262.08	263.04	264.00	264.96	265.92	266.88	267.84
459.8	268.80	269.76	270.72	271.68	272.64	273.60	274.56	275.52	276.48	277.44
459.9	278.40	279.36	280.32	281.28	282.24	283.20	284.16	285.12	286.08	287.04
460.0	288.00	289.18	290.36	291.54	292.72	293.90	295.08	296.26	297.44	298.62
460.1	299.80	300.98	302.16	303.34	304.52	305.70	306.88	308.06	309.24	310.42
460.2	311.60	312.78	313.96	315.14	316.32	317.50	318.68	319.86	321.04	322.22
460.3	323.40	324.58	325.76	326.94	328.12	329.30	330.48	331.66	332.84	334.02
460.4	335.20	336.38	337.56	338.74	339.92	341.10	342.28	343.46	344.64	345.82
460.5	347.00	348.18	349.36	350.54	351.72	352.90	354.08	355.26	356.44	357.62
460.6	358.80	359.98	361.16	362.34	363.52	364.70	365.88	367.06	368.24	369.42
460.7	370.60	371.78	372.96	374.14	375.32	376.50	377.68	378.86	380.04	381.22
460.8	382.40	383.58	384.76	385.94	387.12	388.30	389.48	390.66	391.84	393.02
460.9	394.20	395.38	396.56	397.74	398.92	400.10	401.28	402.46	403.64	404.82
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
461.0	406.00	407.41	408.82	410.23	411.64	413.05	414.46	415.87	417.28	418.69
461.1	420.10	421.51	422.92	424.33	425.74	427.15	428.56	429.97	431.38	432.79
461.2	434.20	435.61	437.02	438.43	439.84	441.25	442.66	444.07	445.48	446.89
461.3	448.30	449.71	451.12	452.53	453.94	455.35	456.76	458.17	459.58	460.99
461.4	462.40	463.81	465.22	466.63	468.04	469.45	470.86	472.27	473.68	475.09
461.5	476.50	477.91	479.32	480.73	482.14	483.55	484.96	486.37	487.78	489.19
461.6	490.60	492.01	493.42	494.83	496.24	497.65	499.06	500.47	501.88	503.29
461.7	504.70	506.11	507.52	508.93	510.34	511.75	513.16	514.57	515.98	517.39
461.8	518.80	520.21	521.62	523.03	524.44	525.85	527.26	528.67	530.08	531.49
461.9	532.90	534.31	535.72	537.13	538.54	539.95	541.36	542.77	544.18	545.59
462.0	547.00	548.65	550.30	551.95	553.60	555.25	556.90	558.55	560.20	561.85
462.1	563.50	565.15	566.80	568.45	570.10	571.75	573.40	575.05	576.70	578.35
462.2	580.00	581.65	583.30	584.95	586.60	588.25	589.90	591.55	593.20	594.85
462.3	596.50	598.15	599.80	601.45	603.10	604.75	606.40	608.05	609.70	611.35
462.4	613.00	614.65	616.30	617.95	619.60	621.25	622.90	624.55	626.20	627.85
462.5	629.50	631.15	632.80	634.45	636.10	637.75	639.40	641.05	642.70	644.35
462.6	646.00	647.65	649.30	650.95	652.60	654.25	655.90	657.55	659.20	660.85
462.7	662.50	664.15	665.80	667.45	669.10	670.75	672.40	674.05	675.70	677.35
462.8	679.00	680.65	682.30	683.95	685.60	687.25	688.90	690.55	692.20	693.85
462.9	695.50	697.15	698.80	700.45	702.10	703.75	705.40	707.05	708.70	710.35
463.0	712.00	713.92	715.84	717.76	719.68	721.60	723.52	725.44	727.36	729.28
463.1	731.20	733.12	735.04	736.96	738.88	740.80	742.72	744.64	746.56	748.48
463.2	750.40	752.32	754.24	756.16	758.08	760.00	761.92	763.84	765.76	767.68
463.3	769.60	771.52	773.44	775.36	777.28	779.20	781.12	783.04	784.96	786.88
463.4	788.80	790.72	792.64	794.56	796.48	798.40	800.32	802.24	804.16	806.08
463.5	808.00	809.92	811.84	813.76	815.68	817.60	819.52	821.44	823.36	825.28
463.6	827.20	829.12	831.04	832.96	834.88	836.80	838.72	840.64	842.56	844.48
463.7	846.40	848.32	850.24	852.16	854.08	856.00	857.92	859.84	861.76	863.68
463.8	865.60	867.52	869.44	871.36	873.28	875.20	877.12	879.04	880.96	882.88
463.9	884.80	886.72	888.64	890.56	892.48	894.40	896.32	898.24	900.16	902.08
464.0	904.00	906.23	908.46	910.69	912.92	915.15	917.38	919.61	921.84	924.07
464.1	926.30	928.53	930.76	932.99	935.22	937.45	939.68	941.91	944.14	946.37
464.2	948.60	950.83	953.06	955.29	957.52	959.75	961.98	964.21	966.44	968.67
464.3	970.90	973.13	975.36	977.59	979.82	982.05	984.28	986.51	988.74	990.97
464.4	993.20	995.43	997.66	999.89	1002.12	1004.35	1006.58	1008.81	1011.04	1013.27
464.5	1015.50	1017.73	1019.96	1022.19	1024.42	1026.65	1028.88	1031.11	1033.34	1035.57
464.6	1037.80	1040.03	1042.26	1044.49	1046.72	1048.95	1051.18	1053.41	1055.64	1057.87
464.7	1060.10	1062.33	1064.56	1066.79	1069.02	1071.25	1073.48	1075.71	1077.94	1080.17
464.8	1082.40	1084.63	1086.86	1089.09	1091.32	1093.55	1095.78	1098.01	1100.24	1102.47
464.9	1104.70	1106.93	1109.16	1111.39	1113.62	1115.85	1118.08	1120.31	1122.54	1124.77
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
465.0	1127.00	1129.67	1132.34	1135.01	1137.68	1140.35	1143.02	1145.69	1148.36	1151.03
465.1	1153.70	1156.37	1159.04	1161.71	1164.38	1167.05	1169.72	1172.39	1175.06	1177.73
465.2	1180.40	1183.07	1185.74	1188.41	1191.08	1193.75	1196.42	1199.09	1201.76	1204.43
465.3	1207.10	1209.77	1212.44	1215.11	1217.78	1220.45	1223.12	1225.79	1228.46	1231.13
465.4	1233.80	1236.47	1239.14	1241.81	1244.48	1247.15	1249.82	1252.49	1255.16	1257.83
465.5	1260.50	1263.17	1265.84	1268.51	1271.18	1273.85	1276.52	1279.19	1281.86	1284.53
465.6	1287.20	1289.87	1292.54	1295.21	1297.88	1300.55	1303.22	1305.89	1308.56	1311.23
465.7	1313.90	1316.57	1319.24	1321.91	1324.58	1327.25	1329.92	1332.59	1335.26	1337.93
465.8	1340.60	1343.27	1345.94	1348.61	1351.28	1353.95	1356.62	1359.29	1361.96	1364.63
465.9	1367.30	1369.97	1372.64	1375.31	1377.98	1380.65	1383.32	1385.99	1388.66	1391.33
466.0	1394.00	1397.21	1400.42	1403.63	1406.84	1410.05	1413.26	1416.47	1419.68	1422.89
466.1	1426.10	1429.31	1432.52	1435.73	1438.94	1442.15	1445.36	1448.57	1451.78	1454.99
466.2	1458.20	1461.41	1464.62	1467.83	1471.04	1474.25	1477.46	1480.67	1483.88	1487.09
466.3	1490.30	1493.51	1496.72	1499.93	1503.14	1506.35	1509.56	1512.77	1515.98	1519.19
466.4	1522.40	1525.61	1528.82	1532.03	1535.24	1538.45	1541.66	1544.87	1548.08	1551.29
466.5	1554.50	1557.71	1560.92	1564.13	1567.34	1570.55	1573.76	1576.97	1580.18	1583.39
466.6	1586.60	1589.81	1593.02	1596.23	1599.44	1602.65	1605.86	1609.07	1612.28	1615.49
466.7	1618.70	1621.91	1625.12	1628.33	1631.54	1634.75	1637.96	1641.17	1644.38	1647.59
466.8	1650.80	1654.01	1657.22	1660.43	1663.64	1666.85	1670.06	1673.27	1676.48	1679.69
466.9	1682.90	1686.11	1689.32	1692.53	1695.74	1698.95	1702.16	1705.37	1708.58	1711.79
467.0	1715.00	1718.92	1722.84	1726.76	1730.68	1734.60	1738.52	1742.44	1746.36	1750.28
467.1	1754.20	1758.12	1762.04	1765.96	1769.88	1773.80	1777.72	1781.64	1785.56	1789.48
467.2	1793.40	1797.32	1801.24	1805.16	1809.08	1813.00	1816.92	1820.84	1824.76	1828.68
467.3	1832.60	1836.52	1840.44	1844.36	1848.28	1852.20	1856.12	1860.04	1863.96	1867.88
467.4	1871.80	1875.72	1879.64	1883.56	1887.48	1891.40	1895.32	1899.24	1903.16	1907.08
467.5	1911.00	1914.92	1918.84	1922.76	1926.68	1930.60	1934.52	1938.44	1942.36	1946.28
467.6	1950.20	1954.12	1958.04	1961.96	1965.88	1969.80	1973.72	1977.64	1981.56	1985.48
467.7	1989.40	1993.32	1997.24	2001.16	2005.08	2009.00	2012.92	2016.84	2020.76	2024.68
467.8	2028.60	2032.52	2036.44	2040.36	2044.28	2048.20	2052.12	2056.04	2059.96	2063.88
467.9	2067.80	2071.72	2075.64	2079.56	2083.48	2087.40	2091.32	2095.24	2099.16	2103.08
468.0	2107.00	2112.43	2117.86	2123.29	2128.72	2134.15	2139.58	2145.01	2150.44	2155.87
468.1	2161.30	2166.73	2172.16	2177.59	2183.02	2188.45	2193.88	2199.31	2204.74	2210.17
468.2	2215.60	2221.03	2226.46	2231.89	2237.32	2242.75	2248.18	2253.61	2259.04	2264.47
468.3	2269.90	2275.33	2280.76	2286.19	2291.62	2297.05	2302.48	2307.91	2313.34	2318.77
468.4	2324.20	2329.63	2335.06	2340.49	2345.92	2351.35	2356.78	2362.21	2367.64	2373.07
468.5	2378.50	2383.93	2389.36	2394.79	2400.22	2405.65	2411.08	2416.51	2421.94	2427.37
468.6	2432.80	2438.23	2443.66	2449.09	2454.52	2459.95	2465.38	2470.81	2476.24	2481.67
468.7	2487.10	2492.53	2497.96	2503.39	2508.82	2514.25	2519.68	2525.11	2530.54	2535.97
468.8	2541.40	2546.83	2552.26	2557.69	2563.12	2568.55	2573.98	2579.41	2584.84	2590.27
468.9	2595.70	2601.13	2606.56	2611.99	2617.42	2622.85	2628.28	2633.71	2639.14	2644.57
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
469.0	2650.00	2657.56	2665.12	2672.68	2680.24	2687.80	2695.36	2702.92	2710.48	2718.04
469.1	2725.60	2733.16	2740.72	2748.28	2755.84	2763.40	2770.96	2778.52	2786.08	2793.64
469.2	2801.20	2808.76	2816.32	2823.88	2831.44	2839.00	2846.56	2854.12	2861.68	2869.24
469.3	2876.80	2884.36	2891.92	2899.48	2907.04	2914.60	2922.16	2929.72	2937.28	2944.84
469.4	2952.40	2959.96	2967.52	2975.08	2982.64	2990.20	2997.76	3005.32	3012.88	3020.44
469.5	3028.00	3035.56	3043.12	3050.68	3058.24	3065.80	3073.36	3080.92	3088.48	3096.04
469.6	3103.60	3111.16	3118.72	3126.28	3133.84	3141.40	3148.96	3156.52	3164.08	3171.64
469.7	3179.20	3186.76	3194.32	3201.88	3209.44	3217.00	3224.56	3232.12	3239.68	3247.24
469.8	3254.80	3262.36	3269.92	3277.48	3285.04	3292.60	3300.16	3307.72	3315.28	3322.84
469.9	3330.40	3337.96	3345.52	3353.08	3360.64	3368.20	3375.76	3383.32	3390.88	3398.44
470.0	3406.00	3417.78	3429.56	3441.34	3453.12	3464.90	3476.68	3488.46	3500.24	3512.02
470.1	3523.80	3535.58	3547.36	3559.14	3570.92	3582.70	3594.48	3606.26	3618.04	3629.82
470.2	3641.60	3653.38	3665.16	3676.94	3688.72	3700.50	3712.28	3724.06	3735.84	3747.62
470.3	3759.40	3771.18	3782.96	3794.74	3806.52	3818.30	3830.08	3841.86	3853.64	3865.42
470.4	3877.20	3888.98	3900.76	3912.54	3924.32	3936.10	3947.88	3959.66	3971.44	3983.22
470.5	3995.00	4006.78	4018.56	4030.34	4042.12	4053.90	4065.68	4077.46	4089.24	4101.02
470.6	4112.80	4124.58	4136.36	4148.14	4159.92	4171.70	4183.48	4195.26	4207.04	4218.82
470.7	4230.60	4242.38	4254.16	4265.94	4277.72	4289.50	4301.28	4313.06	4324.84	4336.62
470.8	4348.40	4360.18	4371.96	4383.74	4395.52	4407.30	4419.08	4430.86	4442.64	4454.42
470.9	4466.20	4477.98	4489.76	4501.54	4513.32	4525.10	4536.88	4548.66	4560.44	4572.22
471.0	4584.00	4600.17	4616.34	4632.51	4648.68	4664.85	4681.02	4697.19	4713.36	4729.53
471.1	4745.70	4761.87	4778.04	4794.21	4810.38	4826.55	4842.72	4858.89	4875.06	4891.23
471.2	4907.40	4923.57	4939.74	4955.91	4972.08	4988.25	5004.42	5020.59	5036.76	5052.93
471.3	5069.10	5085.27	5101.44	5117.61	5133.78	5149.95	5166.12	5182.29	5198.46	5214.63
471.4	5230.80	5246.97	5263.14	5279.31	5295.48	5311.65	5327.82	5343.99	5360.16	5376.33
471.5	5392.50	5408.67	5424.84	5441.01	5457.18	5473.35	5489.52	5505.69	5521.86	5538.03
471.6	5554.20	5570.37	5586.54	5602.71	5618.88	5635.05	5651.22	5667.39	5683.56	5699.73
471.7	5715.90	5732.07	5748.24	5764.41	5780.58	5796.75	5812.92	5829.09	5845.26	5861.43
471.8	5877.60	5893.77	5909.94	5926.11	5942.28	5958.45	5974.62	5990.79	6006.96	6023.13
471.9	6039.30	6055.47	6071.64	6087.81	6103.98	6120.15	6136.32	6152.49	6168.66	6184.83
472.0	6201.00	6222.12	6243.24	6264.36	6285.48	6306.60	6327.72	6348.84	6369.96	6391.08
472.1	6412.20	6433.32	6454.44	6475.56	6496.68	6517.80	6538.92	6560.04	6581.16	6602.28
472.2	6623.40	6644.52	6665.64	6686.76	6707.88	6729.00	6750.12	6771.24	6792.36	6813.48
472.3	6834.60	6855.72	6876.84	6897.96	6919.08	6940.20	6961.32	6982.44	7003.56	7024.68
472.4	7045.80	7066.92	7088.04	7109.16	7130.28	7151.40	7172.52	7193.64	7214.76	7235.88
472.5	7257.00	7278.12	7299.24	7320.36	7341.48	7362.60	7383.72	7404.84	7425.96	7447.08
472.6	7468.20	7489.32	7510.44	7531.56	7552.68	7573.80	7594.92	7616.04	7637.16	7658.28
472.7	7679.40	7700.52	7721.64	7742.76	7763.88	7785.00	7806.12	7827.24	7848.36	7869.48
472.8	7890.60	7911.72	7932.84	7953.96	7975.08	7996.20	8017.32	8038.44	8059.56	8080.68
472.9	8101.80	8122.92	8144.04	8165.16	8186.28	8207.40	8228.52	8249.64	8270.76	8291.88
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
473.0	8313.00	8338.17	8363.34	8388.51	8413.68	8438.85	8464.02	8489.19	8514.36	8539.53
473.1	8564.70	8589.87	8615.04	8640.21	8665.38	8690.55	8715.72	8740.89	8766.06	8791.23
473.2	8816.40	8841.57	8866.74	8891.91	8917.08	8942.25	8967.42	8992.59	9017.76	9042.93
473.3	9068.10	9093.27	9118.44	9143.61	9168.78	9193.95	9219.12	9244.29	9269.46	9294.63
473.4	9319.80	9344.97	9370.14	9395.31	9420.48	9445.65	9470.82	9495.99	9521.16	9546.33
473.5	9571.50	9596.67	9621.84	9647.01	9672.18	9697.35	9722.52	9747.69	9772.86	9798.03
473.6	9823.20	9848.37	9873.54	9898.71	9923.88	9949.05	9974.22	9999.39	10024.56	10049.73
473.7	10074.90	10100.07	10125.24	10150.41	10175.58	10200.75	10225.92	10251.09	10276.26	10301.43
473.8	10326.60	10351.77	10376.94	10402.11	10427.28	10452.45	10477.62	10502.79	10527.96	10553.13
473.9	10578.30	10603.47	10628.64	10653.81	10678.98	10704.15	10729.32	10754.49	10779.66	10804.83
474.0	10830.00	10858.04	10886.08	10914.12	10942.16	10970.20	10998.24	11026.28	11054.32	11082.36
474.1	11110.40	11138.44	11166.48	11194.52	11222.56	11250.60	11278.64	11306.68	11334.72	11362.76
474.2	11390.80	11418.84	11446.88	11474.92	11502.96	11531.00	11559.04	11587.08	11615.12	11643.16
474.3	11671.20	11699.24	11727.28	11755.32	11783.36	11811.40	11839.44	11867.48	11895.52	11923.56
474.4	11951.60	11979.64	12007.68	12035.72	12063.76	12091.80	12119.84	12147.88	12175.92	12203.96
474.5	12232.00	12260.04	12288.08	12316.12	12344.16	12372.20	12400.24	12428.28	12456.32	12484.36
474.6	12512.40	12540.44	12568.48	12596.52	12624.56	12652.60	12680.64	12708.68	12736.72	12764.76
474.7	12792.80	12820.84	12848.88	12876.92	12904.96	12933.00	12961.04	12989.08	13017.12	13045.16
474.8	13073.20	13101.24	13129.28	13157.32	13185.36	13213.40	13241.44	13269.48	13297.52	13325.56
474.9	13353.60	13381.64	13409.68	13437.72	13465.76	13493.80	13521.84	13549.88	13577.92	13605.96
475.0	13634.00	13664.35	13694.70	13725.05	13755.40	13785.75	13816.10	13846.45	13876.80	13907.15
475.1	13937.50	13967.85	13998.20	14028.55	14058.90	14089.25	14119.60	14149.95	14180.30	14210.65
475.2	14241.00	14271.35	14301.70	14332.05	14362.40	14392.75	14423.10	14453.45	14483.80	14514.15
475.3	14544.50	14574.85	14605.20	14635.55	14665.90	14696.25	14726.60	14756.95	14787.30	14817.65
475.4	14848.00	14878.35	14908.70	14939.05	14969.40	14999.75	15030.10	15060.45	15090.80	15121.15
475.5	15151.50	15181.85	15212.20	15242.55	15272.90	15303.25	15333.60	15363.95	15394.30	15424.65
475.6	15455.00	15485.35	15515.70	15546.05	15576.40	15606.75	15637.10	15667.45	15697.80	15728.15
475.7	15758.50	15788.85	15819.20	15849.55	15879.90	15910.25	15940.60	15970.95	16001.30	16031.65
475.8	16062.00	16092.35	16122.70	16153.05	16183.40	16213.75	16244.10	16274.45	16304.80	16335.15
475.9	16365.50	16395.85	16426.20	16456.55	16486.90	16517.25	16547.60	16577.95	16608.30	16638.65
476.0	16669.00	16701.51	16734.02	16766.53	16799.04	16831.55	16864.06	16896.57	16929.08	16961.59
476.1	16994.10	17026.61	17059.12	17091.63	17124.14	17156.65	17189.16	17221.67	17254.18	17286.69
476.2	17319.20	17351.71	17384.22	17416.73	17449.24	17481.75	17514.26	17546.77	17579.28	17611.79
476.3	17644.30	17676.81	17709.32	17741.83	17774.34	17806.85	17839.36	17871.87	17904.38	17936.89
476.4	17969.40	18001.91	18034.42	18066.93	18099.44	18131.95	18164.46	18196.97	18229.48	18261.99
476.5	18294.50	18327.01	18359.52	18392.03	18424.54	18457.05	18489.56	18522.07	18554.58	18587.09
476.6	18619.60	18652.11	18684.62	18717.13	18749.64	18782.15	18814.66	18847.17	18879.68	18912.19
476.7	18944.70	18977.21	19009.72	19042.23	19074.74	19107.25	19139.76	19172.27	19204.78	19237.29
476.8	19269.80	19302.31	19334.82	19367.33	19399.84	19432.35	19464.86	19497.37	19529.88	19562.39
476.9	19594.90	19627.41	19659.92	19692.43	19724.94	19757.45	19789.96	19822.47	19854.98	19887.49
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
477.0	19920.00	19955.29	19990.58	20025.87	20061.16	20096.45	20131.74	20167.03	20202.32	20237.61
477.1	20272.90	20308.19	20343.48	20378.77	20414.06	20449.35	20484.64	20519.93	20555.22	20590.51
477.2	20625.80	20661.09	20696.38	20731.67	20766.96	20802.25	20837.54	20872.83	20908.12	20943.41
477.3	20978.70	21013.99	21049.28	21084.57	21119.86	21155.15	21190.44	21225.73	21261.02	21296.31
477.4	21331.60	21366.89	21402.18	21437.47	21472.76	21508.05	21543.34	21578.63	21613.92	21649.21
477.5	21684.50	21719.79	21755.08	21790.37	21825.66	21860.95	21896.24	21931.53	21966.82	22002.11
477.6	22037.40	22072.69	22107.98	22143.27	22178.56	22213.85	22249.14	22284.43	22319.72	22355.01
477.7	22390.30	22425.59	22460.88	22496.17	22531.46	22566.75	22602.04	22637.33	22672.62	22707.91
477.8	22743.20	22778.49	22813.78	22849.07	22884.36	22919.65	22954.94	22990.23	23025.52	23060.81
477.9	23096.10	23131.39	23166.68	23201.97	23237.26	23272.55	23307.84	23343.13	23378.42	23413.71
478.0	23449.00	23487.43	23525.86	23564.29	23602.72	23641.15	23679.58	23718.01	23756.44	23794.87
478.1	23833.30	23871.73	23910.16	23948.59	23987.02	24025.45	24063.88	24102.31	24140.74	24179.17
478.2	24217.60	24256.03	24294.46	24332.89	24371.32	24409.75	24448.18	24486.61	24525.04	24563.47
478.3	24601.90	24640.33	24678.76	24717.19	24755.62	24794.05	24832.48	24870.91	24909.34	24947.77
478.4	24986.20	25024.63	25063.06	25101.49	25139.92	25178.35	25216.78	25255.21	25293.64	25332.07
478.5	25370.50	25408.93	25447.36	25485.79	25524.22	25562.65	25601.08	25639.51	25677.94	25716.37
478.6	25754.80	25793.23	25831.66	25870.09	25908.52	25946.95	25985.38	26023.81	26062.24	26100.67
478.7	26139.10	26177.53	26215.96	26254.39	26292.82	26331.25	26369.68	26408.11	26446.54	26484.97
478.8	26523.40	26561.83	26600.26	26638.69	26677.12	26715.55	26753.98	26792.41	26830.84	26869.27
478.9	26907.70	26946.13	26984.56	27022.99	27061.42	27099.85	27138.28	27176.71	27215.14	27253.57
479.0	27292.00	27332.83	27373.66	27414.49	27455.32	27496.15	27536.98	27577.81	27618.64	27659.47
479.1	27700.30	27741.13	27781.96	27822.79	27863.62	27904.45	27945.28	27986.11	28026.94	28067.77
479.2	28108.60	28149.43	28190.26	28231.09	28271.92	28312.75	28353.58	28394.41	28435.24	28476.07
479.3	28516.90	28557.73	28598.56	28639.39	28680.22	28721.05	28761.88	28802.71	28843.54	28884.37
479.4	28925.20	28966.03	29006.86	29047.69	29088.52	29129.35	29170.18	29211.01	29251.84	29292.67
479.5	29333.50	29374.33	29415.16	29455.99	29496.82	29537.65	29578.48	29619.31	29660.14	29700.97
479.6	29741.80	29782.63	29823.46	29864.29	29905.12	29945.95	29986.78	30027.61	30068.44	30109.27
479.7	30150.10	30190.93	30231.76	30272.59	30313.42	30354.25	30395.08	30435.91	30476.74	30517.57
479.8	30558.40	30599.23	30640.06	30680.89	30721.72	30762.55	30803.38	30844.21	30885.04	30925.87
479.9	30966.70	31007.53	31048.36	31089.19	31130.02	31170.85	31211.68	31252.51	31293.34	31334.17
480.0	31375.00	31417.99	31460.98	31503.97	31546.96	31589.95	31632.94	31675.93	31718.92	31761.91
480.1	31804.90	31847.89	31890.88	31933.87	31976.86	32019.85	32062.84	32105.83	32148.82	32191.81
480.2	32234.80	32277.79	32320.78	32363.77	32406.76	32449.75	32492.74	32535.73	32578.72	32621.71
480.3	32664.70	32707.69	32750.68	32793.67	32836.66	32879.65	32922.64	32965.63	33008.62	33051.61
480.4	33094.60	33137.59	33180.58	33223.57	33266.56	33309.55	33352.54	33395.53	33438.52	33481.51
480.5	33524.50	33567.49	33610.48	33653.47	33696.46	33739.45	33782.44	33825.43	33868.42	33911.41
480.6	33954.40	33997.39	34040.38	34083.37	34126.36	34169.35	34212.34	34255.33	34298.32	34341.31
480.7	34384.30	34427.29	34470.28	34513.27	34556.26	34599.25	34642.24	34685.23	34728.22	34771.21
480.8	34814.20	34857.19	34900.18	34943.17	34986.16	35029.15	35072.14	35115.13	35158.12	35201.11
480.9	35244.10	35287.09	35330.08	35373.07	35416.06	35459.05	35502.04	35545.03	35588.02	35631.01
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
481.0	35674.00	35719.31	35764.62	35809.93	35855.24	35900.55	35945.86	35991.17	36036.48	36081.79
481.1	36127.10	36172.41	36217.72	36263.03	36308.34	36353.65	36398.96	36444.27	36489.58	36534.89
481.2	36580.20	36625.51	36670.82	36716.13	36761.44	36806.75	36852.06	36897.37	36942.68	36987.99
481.3	37033.30	37078.61	37123.92	37169.23	37214.54	37259.85	37305.16	37350.47	37395.78	37441.09
481.4	37486.40	37531.71	37577.02	37622.33	37667.64	37712.95	37758.26	37803.57	37848.88	37894.19
481.5	37939.50	37984.81	38030.12	38075.43	38120.74	38166.05	38211.36	38256.67	38301.98	38347.29
481.6	38392.60	38437.91	38483.22	38528.53	38573.84	38619.15	38664.46	38709.77	38755.08	38800.39
481.7	38845.70	38891.01	38936.32	38981.63	39026.94	39072.25	39117.56	39162.87	39208.18	39253.49
481.8	39298.80	39344.11	39389.42	39434.73	39480.04	39525.35	39570.66	39615.97	39661.28	39706.59
481.9	39751.90	39797.21	39842.52	39887.83	39933.14	39978.45	40023.76	40069.07	40114.38	40159.69
482.0	40205.00	40253.38	40301.76	40350.14	40398.52	40446.90	40495.28	40543.66	40592.04	40640.42
482.1	40688.80	40737.18	40785.56	40833.94	40882.32	40930.70	40979.08	41027.46	41075.84	41124.22
482.2	41172.60	41220.98	41269.36	41317.74	41366.12	41414.50	41462.88	41511.26	41559.64	41608.02
482.3	41656.40	41704.78	41753.16	41801.54	41849.92	41898.30	41946.68	41995.06	42043.44	42091.82
482.4	42140.20	42188.58	42236.96	42285.34	42333.72	42382.10	42430.48	42478.86	42527.24	42575.62
482.5	42624.00	42672.38	42720.76	42769.14	42817.52	42865.90	42914.28	42962.66	43011.04	43059.42
482.6	43107.80	43156.18	43204.56	43252.94	43301.32	43349.70	43398.08	43446.46	43494.84	43543.22
482.7	43591.60	43639.98	43688.36	43736.74	43785.12	43833.50	43881.88	43930.26	43978.64	44027.02
482.8	44075.40	44123.78	44172.16	44220.54	44268.92	44317.30	44365.68	44414.06	44462.44	44510.82
482.9	44559.20	44607.58	44655.96	44704.34	44752.72	44801.10	44849.48	44897.86	44946.24	44994.62
483.0	45043.00	45094.39	45145.78	45197.17	45248.56	45299.95	45351.34	45402.73	45454.12	45505.51
483.1	45556.90	45608.29	45659.68	45711.07	45762.46	45813.85	45865.24	45916.63	45968.02	46019.41
483.2	46070.80	46122.19	46173.58	46224.97	46276.36	46327.75	46379.14	46430.53	46481.92	46533.31
483.3	46584.70	46636.09	46687.48	46738.87	46790.26	46841.65	46893.04	46944.43	46995.82	47047.21
483.4	47098.60	47149.99	47201.38	47252.77	47304.16	47355.55	47406.94	47458.33	47509.72	47561.11
483.5	47612.50	47663.89	47715.28	47766.67	47818.06	47869.45	47920.84	47972.23	48023.62	48075.01
483.6	48126.40	48177.79	48229.18	48280.57	48331.96	48383.35	48434.74	48486.13	48537.52	48588.91
483.7	48640.30	48691.69	48743.08	48794.47	48845.86	48897.25	48948.64	49000.03	49051.42	49102.81
483.8	49154.20	49205.59	49256.98	49308.37	49359.76	49411.15	49462.54	49513.93	49565.32	49616.71
483.9	49668.10	49719.49	49770.88	49822.27	49873.66	49925.05	49976.44	50027.83	50079.22	50130.61
484.0	50182.00	50236.47	50290.94	50345.41	50399.88	50454.35	50508.82	50563.29	50617.76	50672.23
484.1	50726.70	50781.17	50835.64	50890.11	50944.58	50999.05	51053.52	51107.99	51162.46	51216.93
484.2	51271.40	51325.87	51380.34	51434.81	51489.28	51543.75	51598.22	51652.69	51707.16	51761.63
484.3	51816.10	51870.57	51925.04	51979.51	52033.98	52088.45	52142.92	52197.39	52251.86	52306.33
484.4	52360.80	52415.27	52469.74	52524.21	52578.68	52633.15	52687.62	52742.09	52796.56	52851.03
484.5	52905.50	52959.97	53014.44	53068.91	53123.38	53177.85	53232.32	53286.79	53341.26	53395.73
484.6	53450.20	53504.67	53559.14	53613.61	53668.08	53722.55	53777.02	53831.49	53885.96	53940.43
484.7	53994.90	54049.37	54103.84	54158.31	54212.78	54267.25	54321.72	54376.19	54430.66	54485.13
484.8	54539.60	54594.07	54648.54	54703.01	54757.48	54811.95	54866.42	54920.89	54975.36	55029.83
484.9	55084.30	55138.77	55193.24	55247.71	55302.18	55356.65	55411.12	55465.59	55520.06	55574.53
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
485.0	55629.00	55687.02	55745.04	55803.06	55861.08	55919.10	55977.12	56035.14	56093.16	56151.18
485.1	56209.20	56267.22	56325.24	56383.26	56441.28	56499.30	56557.32	56615.34	56673.36	56731.38
485.2	56789.40	56847.42	56905.44	56963.46	57021.48	57079.50	57137.52	57195.54	57253.56	57311.58
485.3	57369.60	57427.62	57485.64	57543.66	57601.68	57659.70	57717.72	57775.74	57833.76	57891.78
485.4	57949.80	58007.82	58065.84	58123.86	58181.88	58239.90	58297.92	58355.94	58413.96	58471.98
485.5	58530.00	58588.02	58646.04	58704.06	58762.08	58820.10	58878.12	58936.14	58994.16	59052.18
485.6	59110.20	59168.22	59226.24	59284.26	59342.28	59400.30	59458.32	59516.34	59574.36	59632.38
485.7	59690.40	59748.42	59806.44	59864.46	59922.48	59980.50	60038.52	60096.54	60154.56	60212.58
485.8	60270.60	60328.62	60386.64	60444.66	60502.68	60560.70	60618.72	60676.74	60734.76	60792.78
485.9	60850.80	60908.82	60966.84	61024.86	61082.88	61140.90	61198.92	61256.94	61314.96	61372.98
486.0	61431.00	61493.27	61555.54	61617.81	61680.08	61742.35	61804.62	61866.89	61929.16	61991.43
486.1	62053.70	62115.97	62178.24	62240.51	62302.78	62365.05	62427.32	62489.59	62551.86	62614.13
486.2	62676.40	62738.67	62800.94	62863.21	62925.48	62987.75	63050.02	63112.29	63174.56	63236.83
486.3	63299.10	63361.37	63423.64	63485.91	63548.18	63610.45	63672.72	63734.99	63797.26	63859.53
486.4	63921.80	63984.07	64046.34	64108.61	64170.88	64233.15	64295.42	64357.69	64419.96	64482.23
486.5	64544.50	64606.77	64669.04	64731.31	64793.58	64855.85	64918.12	64980.39	65042.66	65104.93
486.6	65167.20	65229.47	65291.74	65354.01	65416.28	65478.55	65540.82	65603.09	65665.36	65727.63
486.7	65789.90	65852.17	65914.44	65976.71	66038.98	66101.25	66163.52	66225.79	66288.06	66350.33
486.8	66412.60	66474.87	66537.14	66599.41	66661.68	66723.95	66786.22	66848.49	66910.76	66973.03
486.9	67035.30	67097.57	67159.84	67222.11	67284.38	67346.65	67408.92	67471.19	67533.46	67595.73
487.0	67658.00	67724.53	67791.06	67857.59	67924.12	67990.65	68057.18	68123.71	68190.24	68256.77
487.1	68323.30	68389.83	68456.36	68522.89	68589.42	68655.95	68722.48	68789.01	68855.54	68922.07
487.2	68988.60	69055.13	69121.66	69188.19	69254.72	69321.25	69387.78	69454.31	69520.84	69587.37
487.3	69653.90	69720.43	69786.96	69853.49	69920.02	69986.55	70053.08	70119.61	70186.14	70252.67
487.4	70319.20	70385.73	70452.26	70518.79	70585.32	70651.85	70718.38	70784.91	70851.44	70917.97
487.5	70984.50	71051.03	71117.56	71184.09	71250.62	71317.15	71383.68	71450.21	71516.74	71583.27
487.6	71649.80	71716.33	71782.86	71849.39	71915.92	71982.45	72048.98	72115.51	72182.04	72248.57
487.7	72315.10	72381.63	72448.16	72514.69	72581.22	72647.75	72714.28	72780.81	72847.34	72913.87
487.8	72980.40	73046.93	73113.46	73179.99	73246.52	73313.05	73379.58	73446.11	73512.64	73579.17
487.9	73645.70	73712.23	73778.76	73845.29	73911.82	73978.35	74044.88	74111.41	74177.94	74244.47
488.0	74311.00	74381.74	74452.48	74523.22	74593.96	74664.70	74735.44	74806.18	74876.92	74947.66
488.1	75018.40	75089.14	75159.88	75230.62	75301.36	75372.10	75442.84	75513.58	75584.32	75655.06
488.2	75725.80	75796.54	75867.28	75938.02	76008.76	76079.50	76150.24	76220.98	76291.72	76362.46
488.3	76433.20	76503.94	76574.68	76645.42	76716.16	76786.90	76857.64	76928.38	76999.12	77069.86
488.4	77140.60	77211.34	77282.08	77352.82	77423.56	77494.30	77565.04	77635.78	77706.52	77777.26
488.5	77848.00	77918.74	77989.48	78060.22	78130.96	78201.70	78272.44	78343.18	78413.92	78484.66
488.6	78555.40	78626.14	78696.88	78767.62	78838.36	78909.10	78979.84	79050.58	79121.32	79192.06
488.7	79262.80	79333.54	79404.28	79475.02	79545.76	79616.50	79687.24	79757.98	79828.72	79899.46
488.8	79970.20	80040.94	80111.68	80182.42	80253.16	80323.90	80394.64	80465.38	80536.12	80606.86
488.9	80677.60	80748.34	80819.08	80889.82	80960.56	81031.30	81102.04	81172.78	81243.52	81314.26
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
489.0	81385.00	81459.19	81533.38	81607.57	81681.76	81755.95	81830.14	81904.33	81978.52	82052.71
489.1	82126.90	82201.09	82275.28	82349.47	82423.66	82497.85	82572.04	82646.23	82720.42	82794.61
489.2	82868.80	82942.99	83017.18	83091.37	83165.56	83239.75	83313.94	83388.13	83462.32	83536.51
489.3	83610.70	83684.89	83759.08	83833.27	83907.46	83981.65	84055.84	84130.03	84204.22	84278.41
489.4	84352.60	84426.79	84500.98	84575.17	84649.36	84723.55	84797.74	84871.93	84946.12	85020.31
489.5	85094.50	85168.69	85242.88	85317.07	85391.26	85465.45	85539.64	85613.83	85688.02	85762.21
489.6	85836.40	85910.59	85984.78	86058.97	86133.16	86207.35	86281.54	86355.73	86429.92	86504.11
489.7	86578.30	86652.49	86726.68	86800.87	86875.06	86949.25	87023.44	87097.63	87171.82	87246.01
489.8	87320.20	87394.39	87468.58	87542.77	87616.96	87691.15	87765.34	87839.53	87913.72	87987.91
489.9	88062.10	88136.29	88210.48	88284.67	88358.86	88433.05	88507.24	88581.43	88655.62	88729.81
490.0	88804.00	88881.71	88959.42	89037.13	89114.84	89192.55	89270.26	89347.97	89425.68	89503.39
490.1	89581.10	89658.81	89736.52	89814.23	89891.94	89969.65	90047.36	90125.07	90202.78	90280.49
490.2	90358.20	90435.91	90513.62	90591.33	90669.04	90746.75	90824.46	90902.17	90979.88	91057.59
490.3	91135.30	91213.01	91290.72	91368.43	91446.14	91523.85	91601.56	91679.27	91756.98	91834.69
490.4	91912.40	91990.11	92067.82	92145.53	92223.24	92300.95	92378.66	92456.37	92534.08	92611.79
490.5	92689.50	92767.21	92844.92	92922.63	93000.34	93078.05	93155.76	93233.47	93311.18	93388.89
490.6	93466.60	93544.31	93622.02	93699.73	93777.44	93855.15	93932.86	94010.57	94088.28	94165.99
490.7	94243.70	94321.41	94399.12	94476.83	94554.54	94632.25	94709.96	94787.67	94865.38	94943.09
490.8	95020.80	95098.51	95176.22	95253.93	95331.64	95409.35	95487.06	95564.77	95642.48	95720.19
490.9	95797.90	95875.61	95953.32	96031.03	96108.74	96186.45	96264.16	96341.87	96419.58	96497.29
491.0	96575.00	96656.29	96737.58	96818.87	96900.16	96981.45	97062.74	97144.03	97225.32	97306.61
491.1	97387.90	97469.19	97550.48	97631.77	97713.06	97794.35	97875.64	97956.93	98038.22	98119.51
491.2	98200.80	98282.09	98363.38	98444.67	98525.96	98607.25	98688.54	98769.83	98851.12	98932.41
491.3	99013.70	99094.99	99176.28	99257.57	99338.86	99420.15	99501.44	99582.73	99664.02	99745.31
491.4	99826.60	99907.89	99989.18	100070.47	100151.76	100233.05	100314.34	100395.63	100476.92	100558.21
491.5	100639.50	100720.79	100802.08	100883.37	100964.66	101045.95	101127.24	101208.53	101289.82	101371.11
491.6	101452.40	101533.69	101614.98	101696.27	101777.56	101858.85	101940.14	102021.43	102102.72	102184.01
491.7	102265.30	102346.59	102427.88	102509.17	102590.46	102671.75	102753.04	102834.33	102915.62	102996.91
491.8	103078.20	103159.49	103240.78	103322.07	103403.36	103484.65	103565.94	103647.23	103728.52	103809.81
491.9	103891.10	103972.39	104053.68	104134.97	104216.26	104297.55	104378.84	104460.13	104541.42	104622.71
492.0	104704.00	104788.65	104873.30	104957.95	105042.60	105127.25	105211.90	105296.55	105381.20	105465.85
492.1	105550.50	105635.15	105719.80	105804.45	105889.10	105973.75	106058.40	106143.05	106227.70	106312.35
492.2	106397.00	106481.65	106566.30	106650.95	106735.60	106820.25	106904.90	106989.55	107074.20	107158.85
492.3	107243.50	107328.15	107412.80	107497.45	107582.10	107666.75	107751.40	107836.05	107920.70	108005.35
492.4	108090.00	108174.65	108259.30	108343.95	108428.60	108513.25	108597.90	108682.55	108767.20	108851.85
492.5	108936.50	109021.15	109105.80	109190.45	109275.10	109359.75	109444.40	109529.05	109613.70	109698.35
492.6	109783.00	109867.65	109952.30	110036.95	110121.60	110206.25	110290.90	110375.55	110460.20	110544.85
492.7	110629.50	110714.15	110798.80	110883.45	110968.10	111052.75	111137.40	111222.05	111306.70	111391.35
492.8	111476.00	111560.65	111645.30	111729.95	111814.60	111899.25	111983.90	112068.55	112153.20	112237.85
492.9	112322.50	112407.15	112491.80	112576.45	112661.10	112745.75	112830.40	112915.05	112999.70	113084.35
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
493.0	113169.00	113257.48	113345.96	113434.44	113522.92	113611.40	113699.88	113788.36	113876.84	113965.32
493.1	114053.80	114142.28	114230.76	114319.24	114407.72	114496.20	114584.68	114673.16	114761.64	114850.12
493.2	114938.60	115027.08	115115.56	115204.04	115292.52	115381.00	115469.48	115557.96	115646.44	115734.92
493.3	115823.40	115911.88	116000.36	116088.84	116177.32	116265.80	116354.28	116442.76	116531.24	116619.72
493.4	116708.20	116796.68	116885.16	116973.64	117062.12	117150.60	117239.08	117327.56	117416.04	117504.52
493.5	117593.00	117681.48	117769.96	117858.44	117946.92	118035.40	118123.88	118212.36	118300.84	118389.32
493.6	118477.80	118566.28	118654.76	118743.24	118831.72	118920.20	119008.68	119097.16	119185.64	119274.12
493.7	119362.60	119451.08	119539.56	119628.04	119716.52	119805.00	119893.48	119981.96	120070.44	120158.92
493.8	120247.40	120335.88	120424.36	120512.84	120601.32	120689.80	120778.28	120866.76	120955.24	121043.72
493.9	121132.20	121220.68	121309.16	121397.64	121486.12	121574.60	121663.08	121751.56	121840.04	121928.52
494.0	122017.00	122110.54	122204.08	122297.62	122391.16	122484.70	122578.24	122671.78	122765.32	122858.86
494.1	122952.40	123045.94	123139.48	123233.02	123326.56	123420.10	123513.64	123607.18	123700.72	123794.26
494.2	123887.80	123981.34	124074.88	124168.42	124261.96	124355.50	124449.04	124542.58	124636.12	124729.66
494.3	124823.20	124916.74	125010.28	125103.82	125197.36	125290.90	125384.44	125477.98	125571.52	125665.06
494.4	125758.60	125852.14	125945.68	126039.22	126132.76	126226.30	126319.84	126413.38	126506.92	126600.46
494.5	126694.00	126787.54	126881.08	126974.62	127068.16	127161.70	127255.24	127348.78	127442.32	127535.86
494.6	127629.40	127722.94	127816.48	127910.02	128003.56	128097.10	128190.64	128284.18	128377.72	128471.26
494.7	128564.80	128658.34	128751.88	128845.42	128938.96	129032.50	129126.04	129219.58	129313.12	129406.66
494.8	129500.20	129593.74	129687.28	129780.82	129874.36	129967.90	130061.44	130154.98	130248.52	130342.06
494.9	130435.60	130529.14	130622.68	130716.22	130809.76	130903.30	130996.84	131090.38	131183.92	131277.46
495.0	131371.00	131468.93	131566.86	131664.79	131762.72	131860.65	131958.58	132056.51	132154.44	132252.37
495.1	132350.30	132448.23	132546.16	132644.09	132742.02	132839.95	132937.88	133035.81	133133.74	133231.67
495.2	133329.60	133427.53	133525.46	133623.39	133721.32	133819.25	133917.18	134015.11	134113.04	134210.97
495.3	134308.90	134406.83	134504.76	134602.69	134700.62	134798.55	134896.48	134994.41	135092.34	135190.27
495.4	135288.20	135386.13	135484.06	135581.99	135679.92	135777.85	135875.78	135973.71	136071.64	136169.57
495.5	136267.50	136365.43	136463.36	136561.29	136659.22	136757.15	136855.08	136953.01	137050.94	137148.87
495.6	137246.80	137344.73	137442.66	137540.59	137638.52	137736.45	137834.38	137932.31	138030.24	138128.17
495.7	138226.10	138324.03	138421.96	138519.89	138617.82	138715.75	138813.68	138911.61	139009.54	139107.47
495.8	139205.40	139303.33	139401.26	139499.19	139597.12	139695.05	139792.98	139890.91	139988.84	140086.77
495.9	140184.70	140282.63	140380.56	140478.49	140576.42	140674.35	140772.28	140870.21	140968.14	141066.07
496.0	141164.00	141266.10	141368.20	141470.30	141572.40	141674.50	141776.60	141878.70	141980.80	142082.90
496.1	142185.00	142287.10	142389.20	142491.30	142593.40	142695.50	142797.60	142899.70	143001.80	143103.90
496.2	143206.00	143308.10	143410.20	143512.30	143614.40	143716.50	143818.60	143920.70	144022.80	144124.90
496.3	144227.00	144329.10	144431.20	144533.30	144635.40	144737.50	144839.60	144941.70	145043.80	145145.90
496.4	145248.00	145350.10	145452.20	145554.30	145656.40	145758.50	145860.60	145962.70	146064.80	146166.90
496.5	146269.00	146371.10	146473.20	146575.30	146677.40	146779.50	146881.60	146983.70	147085.80	147187.90
496.6	147290.00	147392.10	147494.20	147596.30	147698.40	147800.50	147902.60	148004.70	148106.80	148208.90
496.7	148311.00	148413.10	148515.20	148617.30	148719.40	148821.50	148923.60	149025.70	149127.80	149229.90
496.8	149332.00	149434.10	149536.20	149638.30	149740.40	149842.50	149944.60	150046.70	150148.80	150250.90
496.9	150353.00	150455.10	150557.20	150659.30	150761.40	150863.50	150965.60	151067.70	151169.80	151271.90
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
497.0	151374.00	151480.37	151586.74	151693.11	151799.48	151905.85	152012.22	152118.59	152224.96	152331.33
497.1	152437.70	152544.07	152650.44	152756.81	152863.18	152969.55	153075.92	153182.29	153288.66	153395.03
497.2	153501.40	153607.77	153714.14	153820.51	153926.88	154033.25	154139.62	154245.99	154352.36	154458.73
497.3	154565.10	154671.47	154777.84	154884.21	154990.58	155096.95	155203.32	155309.69	155416.06	155522.43
497.4	155628.80	155735.17	155841.54	155947.91	156054.28	156160.65	156267.02	156373.39	156479.76	156586.13
497.5	156692.50	156798.87	156905.24	157011.61	157117.98	157224.35	157330.72	157437.09	157543.46	157649.83
497.6	157756.20	157862.57	157968.94	158075.31	158181.68	158288.05	158394.42	158500.79	158607.16	158713.53
497.7	158819.90	158926.27	159032.64	159139.01	159245.38	159351.75	159458.12	159564.49	159670.86	159777.23
497.8	159883.60	159989.97	160096.34	160202.71	160309.08	160415.45	160521.82	160628.19	160734.56	160840.93
497.9	160947.30	161053.67	161160.04	161266.41	161372.78	161479.15	161585.52	161691.89	161798.26	161904.63
498.0	162011.00	162121.87	162232.74	162343.61	162454.48	162565.35	162676.22	162787.09	162897.96	163008.83
498.1	163119.70	163230.57	163341.44	163452.31	163563.18	163674.05	163784.92	163895.79	164006.66	164117.53
498.2	164228.40	164339.27	164450.14	164561.01	164671.88	164782.75	164893.62	165004.49	165115.36	165226.23
498.3	165337.10	165447.97	165558.84	165669.71	165780.58	165891.45	166002.32	166113.19	166224.06	166334.93
498.4	166445.80	166556.67	166667.54	166778.41	166889.28	167000.15	167111.02	167221.89	167332.76	167443.63
498.5	167554.50	167665.37	167776.24	167887.11	167997.98	168108.85	168219.72	168330.59	168441.46	168552.33
498.6	168663.20	168774.07	168884.94	168995.81	169106.68	169217.55	169328.42	169439.29	169550.16	169661.03
498.7	169771.90	169882.77	169993.64	170104.51	170215.38	170326.25	170437.12	170547.99	170658.86	170769.73
498.8	170880.60	170991.47	171102.34	171213.21	171324.08	171434.95	171545.82	171656.69	171767.56	171878.43
498.9	171989.30	172100.17	172211.04	172321.91	172432.78	172543.65	172654.52	172765.39	172876.26	172987.13
499.0	173098.00	173214.04	173330.08	173446.12	173562.16	173678.20	173794.24	173910.28	174026.32	174142.36
499.1	174258.40	174374.44	174490.48	174606.52	174722.56	174838.60	174954.64	175070.68	175186.72	175302.76
499.2	175418.80	175534.84	175650.88	175766.92	175882.96	175999.00	176115.04	176231.08	176347.12	176463.16
499.3	176579.20	176695.24	176811.28	176927.32	177043.36	177159.40	177275.44	177391.48	177507.52	177623.56
499.4	177739.60	177855.64	177971.68	178087.72	178203.76	178319.80	178435.84	178551.88	178667.92	178783.96
499.5	178900.00	179016.04	179132.08	179248.12	179364.16	179480.20	179596.24	179712.28	179828.32	179944.36
499.6	180060.40	180176.44	180292.48	180408.52	180524.56	180640.60	180756.64	180872.68	180988.72	181104.76
499.7	181220.80	181336.84	181452.88	181568.92	181684.96	181801.00	181917.04	182033.08	182149.12	182265.16
499.8	182381.20	182497.24	182613.28	182729.32	182845.36	182961.40	183077.44	183193.48	183309.52	183425.56
499.9	183541.60	183657.64	183773.68	183889.72	184005.76	184121.80	184237.84	184353.88	184469.92	184585.96
500.0	184702.00	184821.98	184941.96	185061.94	185181.92	185301.90	185421.88	185541.86	185661.84	185781.82
500.1	185901.80	186021.78	186141.76	186261.74	186381.72	186501.70	186621.68	186741.66	186861.64	186981.62
500.2	187101.60	187221.58	187341.56	187461.54	187581.52	187701.50	187821.48	187941.46	188061.44	188181.42
500.3	188301.40	188421.38	188541.36	188661.34	188781.32	188901.30	189021.28	189141.26	189261.24	189381.22
500.4	189501.20	189621.18	189741.16	189861.14	189981.12	190101.10	190221.08	190341.06	190461.04	190581.02
500.5	190701.00	190820.98	190940.96	191060.94	191180.92	191300.90	191420.88	191540.86	191660.84	191780.82
500.6	191900.80	192020.78	192140.76	192260.74	192380.72	192500.70	192620.68	192740.66	192860.64	192980.62
500.7	193100.60	193220.58	193340.56	193460.54	193580.52	193700.50	193820.48	193940.46	194060.44	194180.42
500.8	194300.40	194420.38	194540.36	194660.34	194780.32	194900.30	195020.28	195140.26	195260.24	195380.22
500.9	195500.20	195620.18	195740.16	195860.14	195980.12	196100.10	196220.08	196340.06	196460.04	196580.02
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
501.0	196700.00	196824.10	196948.20	197072.30	197196.40	197320.50	197444.60	197568.70	197692.80	197816.90
501.1	197941.00	198065.10	198189.20	198313.30	198437.40	198561.50	198685.60	198809.70	198933.80	199057.90
501.2	199182.00	199306.10	199430.20	199554.30	199678.40	199802.50	199926.60	200050.70	200174.80	200298.90
501.3	200423.00	200547.10	200671.20	200795.30	200919.40	201043.50	201167.60	201291.70	201415.80	201539.90
501.4	201664.00	201788.10	201912.20	202036.30	202160.40	202284.50	202408.60	202532.70	202656.80	202780.90
501.5	202905.00	203029.10	203153.20	203277.30	203401.40	203525.50	203649.60	203773.70	203897.80	204021.90
501.6	204146.00	204270.10	204394.20	204518.30	204642.40	204766.50	204890.60	205014.70	205138.80	205262.90
501.7	205387.00	205511.10	205635.20	205759.30	205883.40	206007.50	206131.60	206255.70	206379.80	206503.90
501.8	206628.00	206752.10	206876.20	207000.30	207124.40	207248.50	207372.60	207496.70	207620.80	207744.90
501.9	207869.00	207993.10	208117.20	208241.30	208365.40	208489.50	208613.60	208737.70	208861.80	208985.90
502.0	209110.00	209238.76	209367.52	209496.28	209625.04	209753.80	209882.56	210011.32	210140.08	210268.84
502.1	210397.60	210526.36	210655.12	210783.88	210912.64	211041.40	211170.16	211298.92	211427.68	211556.44
502.2	211685.20	211813.96	211942.72	212071.48	212200.24	212329.00	212457.76	212586.52	212715.28	212844.04
502.3	212972.80	213101.56	213230.32	213359.08	213487.84	213616.60	213745.36	213874.12	214002.88	214131.64
502.4	214260.40	214389.16	214517.92	214646.68	214775.44	214904.20	215032.96	215161.72	215290.48	215419.24
502.5	215548.00	215676.76	215805.52	215934.28	216063.04	216191.80	216320.56	216449.32	216578.08	216706.84
502.6	216835.60	216964.36	217093.12	217221.88	217350.64	217479.40	217608.16	217736.92	217865.68	217994.44
502.7	218123.20	218251.96	218380.72	218509.48	218638.24	218767.00	218895.76	219024.52	219153.28	219282.04
502.8	219410.80	219539.56	219668.32	219797.08	219925.84	220054.60	220183.36	220312.12	220440.88	220569.64
502.9	220698.40	220827.16	220955.92	221084.68	221213.44	221342.20	221470.96	221599.72	221728.48	221857.24
503.0	221986.00	222119.95	222253.90	222387.85	222521.80	222655.75	222789.70	222923.65	223057.60	223191.55
503.1	223325.50	223459.45	223593.40	223727.35	223861.30	223995.25	224129.20	224263.15	224397.10	224531.05
503.2	224665.00	224798.95	224932.90	225066.85	225200.80	225334.75	225468.70	225602.65	225736.60	225870.55
503.3	226004.50	226138.45	226272.40	226406.35	226540.30	226674.25	226808.20	226942.15	227076.10	227210.05
503.4	227344.00	227477.95	227611.90	227745.85	227879.80	228013.75	228147.70	228281.65	228415.60	228549.55
503.5	228683.50	228817.45	228951.40	229085.35	229219.30	229353.25	229487.20	229621.15	229755.10	229889.05
503.6	230023.00	230156.95	230290.90	230424.85	230558.80	230692.75	230826.70	230960.65	231094.60	231228.55
503.7	231362.50	231496.45	231630.40	231764.35	231898.30	232032.25	232166.20	232300.15	232434.10	232568.05
503.8	232702.00	232835.95	232969.90	233103.85	233237.80	233371.75	233505.70	233639.65	233773.60	233907.55
503.9	234041.50	234175.45	234309.40	234443.35	234577.30	234711.25	234845.20	234979.15	235113.10	235247.05
504.0	235381.00	235519.98	235658.96	235797.94	235936.92	236075.90	236214.88	236353.86	236492.84	236631.82
504.1	236770.80	236909.78	237048.76	237187.74	237326.72	237465.70	237604.68	237743.66	237882.64	238021.62
504.2	238160.60	238299.58	238438.56	238577.54	238716.52	238855.50	238994.48	239133.46	239272.44	239411.42
504.3	239550.40	239689.38	239828.36	239967.34	240106.32	240245.30	240384.28	240523.26	240662.24	240801.22
504.4	240940.20	241079.18	241218.16	241357.14	241496.12	241635.10	241774.08	241913.06	242052.04	242191.02
504.5	242330.00	242468.98	242607.96	242746.94	242885.92	243024.90	243163.88	243302.86	243441.84	243580.82
504.6	243719.80	243858.78	243997.76	244136.74	244275.72	244414.70	244553.68	244692.66	244831.64	244970.62
504.7	245109.60	245248.58	245387.56	245526.54	245665.52	245804.50	245943.48	246082.46	246221.44	246360.42
504.8	246499.40	246638.38	246777.36	246916.34	247055.32	247194.30	247333.28	247472.26	247611.24	247750.22
504.9	247889.20	248028.18	248167.16	248306.14	248445.12	248584.10	248723.08	248862.06	249001.04	249140.02
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
505.0	249279.00	249423.52	249568.04	249712.56	249857.08	250001.60	250146.12	250290.64	250435.16	250579.68
505.1	250724.20	250868.72	251013.24	251157.76	251302.28	251446.80	251591.32	251735.84	251880.36	252024.88
505.2	252169.40	252313.92	252458.44	252602.96	252747.48	252892.00	253036.52	253181.04	253325.56	253470.08
505.3	253614.60	253759.12	253903.64	254048.16	254192.68	254337.20	254481.72	254626.24	254770.76	254915.28
505.4	255059.80	255204.32	255348.84	255493.36	255637.88	255782.40	255926.92	256071.44	256215.96	256360.48
505.5	256505.00	256649.52	256794.04	256938.56	257083.08	257227.60	257372.12	257516.64	257661.16	257805.68
505.6	257950.20	258094.72	258239.24	258383.76	258528.28	258672.80	258817.32	258961.84	259106.36	259250.88
505.7	259395.40	259539.92	259684.44	259828.96	259973.48	260118.00	260262.52	260407.04	260551.56	260696.08
505.8	260840.60	260985.12	261129.64	261274.16	261418.68	261563.20	261707.72	261852.24	261996.76	262141.28
505.9	262285.80	262430.32	262574.84	262719.36	262863.88	263008.40	263152.92	263297.44	263441.96	263586.48
506.0	263731.00	263882.53	264034.06	264185.59	264337.12	264488.65	264640.18	264791.71	264943.24	265094.77
506.1	265246.30	265397.83	265549.36	265700.89	265852.42	266003.95	266155.48	266307.01	266458.54	266610.07
506.2	266761.60	266913.13	267064.66	267216.19	267367.72	267519.25	267670.78	267822.31	267973.84	268125.37
506.3	268276.90	268428.43	268579.96	268731.49	268883.02	269034.55	269186.08	269337.61	269489.14	269640.67
506.4	269792.20	269943.73	270095.26	270246.79	270398.32	270549.85	270701.38	270852.91	271004.44	271155.97
506.5	271307.50	271459.03	271610.56	271762.09	271913.62	272065.15	272216.68	272368.21	272519.74	272671.27
506.6	272822.80	272974.33	273125.86	273277.39	273428.92	273580.45	273731.98	273883.51	274035.04	274186.57
506.7	274338.10	274489.63	274641.16	274792.69	274944.22	275095.75	275247.28	275398.81	275550.34	275701.87
506.8	275853.40	276004.93	276156.46	276307.99	276459.52	276611.05	276762.58	276914.11	277065.64	277217.17
506.9	277368.70	277520.23	277671.76	277823.29	277974.82	278126.35	278277.88	278429.41	278580.94	278732.47
507.0	278884.00	279042.09	279200.18	279358.27	279516.36	279674.45	279832.54	279990.63	280148.72	280306.81
507.1	280464.90	280622.99	280781.08	280939.17	281097.26	281255.35	281413.44	281571.53	281729.62	281887.71
507.2	282045.80	282203.89	282361.98	282520.07	282678.16	282836.25	282994.34	283152.43	283310.52	283468.61
507.3	283626.70	283784.79	283942.88	284100.97	284259.06	284417.15	284575.24	284733.33	284891.42	285049.51
507.4	285207.60	285365.69	285523.78	285681.87	285839.96	285998.05	286156.14	286314.23	286472.32	286630.41
507.5	286788.50	286946.59	287104.68	287262.77	287420.86	287578.95	287737.04	287895.13	288053.22	288211.31
507.6	288369.40	288527.49	288685.58	288843.67	289001.76	289159.85	289317.94	289476.03	289634.12	289792.21
507.7	289950.30	290108.39	290266.48	290424.57	290582.66	290740.75	290898.84	291056.93	291215.02	291373.11
507.8	291531.20	291689.29	291847.38	292005.47	292163.56	292321.65	292479.74	292637.83	292795.92	292954.01
507.9	293112.10	293270.19	293428.28	293586.37	293744.46	293902.55	294060.64	294218.73	294376.82	294534.91
508.0	294693.00	294858.44	295023.88	295189.32	295354.76	295520.20	295685.64	295851.08	296016.52	296181.96
508.1	296347.40	296512.84	296678.28	296843.72	297009.16	297174.60	297340.04	297505.48	297670.92	297836.36
508.2	298001.80	298167.24	298332.68	298498.12	298663.56	298829.00	298994.44	299159.88	299325.32	299490.76
508.3	299656.20	299821.64	299987.08	300152.52	300317.96	300483.40	300648.84	300814.28	300979.72	301145.16
508.4	301310.60	301476.04	301641.48	301806.92	301972.36	302137.80	302303.24	302468.68	302634.12	302799.56
508.5	302965.00	303130.44	303295.88	303461.32	303626.76	303792.20	303957.64	304123.08	304288.52	304453.96
508.6	304619.40	304784.84	304950.28	305115.72	305281.16	305446.60	305612.04	305777.48	305942.92	306108.36
508.7	306273.80	306439.24	306604.68	306770.12	306935.56	307101.00	307266.44	307431.88	307597.32	307762.76
508.8	307928.20	308093.64	308259.08	308424.52	308589.96	308755.40	308920.84	309086.28	309251.72	309417.16
508.9	309582.60	309748.04	309913.48	310078.92	310244.36	310409.80	310575.24	310740.68	310906.12	311071.56
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
509.0	311237.00	311410.65	311584.30	311757.95	311931.60	312105.25	312278.90	312452.55	312626.20	312799.85
509.1	312973.50	313147.15	313320.80	313494.45	313668.10	313841.75	314015.40	314189.05	314362.70	314536.35
509.2	314710.00	314883.65	315057.30	315230.95	315404.60	315578.25	315751.90	315925.55	316099.20	316272.85
509.3	316446.50	316620.15	316793.80	316967.45	317141.10	317314.75	317488.40	317662.05	317835.70	318009.35
509.4	318183.00	318356.65	318530.30	318703.95	318877.60	319051.25	319224.90	319398.55	319572.20	319745.85
509.5	319919.50	320093.15	320266.80	320440.45	320614.10	320787.75	320961.40	321135.05	321308.70	321482.35
509.6	321656.00	321829.65	322003.30	322176.95	322350.60	322524.25	322697.90	322871.55	323045.20	323218.85
509.7	323392.50	323566.15	323739.80	323913.45	324087.10	324260.75	324434.40	324608.05	324781.70	324955.35
509.8	325129.00	325302.65	325476.30	325649.95	325823.60	325997.25	326170.90	326344.55	326518.20	326691.85
509.9	326865.50	327039.15	327212.80	327386.45	327560.10	327733.75	327907.40	328081.05	328254.70	328428.35
510.0	328602.00	328782.81	328963.62	329144.43	329325.24	329506.05	329686.86	329867.67	330048.48	330229.29
510.1	330410.10	330590.91	330771.72	330952.53	331133.34	331314.15	331494.96	331675.77	331856.58	332037.39
510.2	332218.20	332399.01	332579.82	332760.63	332941.44	333122.25	333303.06	333483.87	333664.68	333845.49
510.3	334026.30	334207.11	334387.92	334568.73	334749.54	334930.35	335111.16	335291.97	335472.78	335653.59
510.4	335834.40	336015.21	336196.02	336376.83	336557.64	336738.45	336919.26	337100.07	337280.88	337461.69
510.5	337642.50	337823.31	338004.12	338184.93	338365.74	338546.55	338727.36	338908.17	339088.98	339269.79
510.6	339450.60	339631.41	339812.22	339993.03	340173.84	340354.65	340535.46	340716.27	340897.08	341077.89
510.7	341258.70	341439.51	341620.32	341801.13	341981.94	342162.75	342343.56	342524.37	342705.18	342885.99
510.8	343066.80	343247.61	343428.42	343609.23	343790.04	343970.85	344151.66	344332.47	344513.28	344694.09
510.9	344874.90	345055.71	345236.52	345417.33	345598.14	345778.95	345959.76	346140.57	346321.38	346502.19
511.0	346683.00	346870.85	347058.70	347246.55	347434.40	347622.25	347810.10	347997.95	348185.80	348373.65
511.1	348561.50	348749.35	348937.20	349125.05	349312.90	349500.75	349688.60	349876.45	350064.30	350252.15
511.2	350440.00	350627.85	350815.70	351003.55	351191.40	351379.25	351567.10	351754.95	351942.80	352130.65
511.3	352318.50	352506.35	352694.20	352882.05	353069.90	353257.75	353445.60	353633.45	353821.30	354009.15
511.4	354197.00	354384.85	354572.70	354760.55	354948.40	355136.25	355324.10	355511.95	355699.80	355887.65
511.5	356075.50	356263.35	356451.20	356639.05	356826.90	357014.75	357202.60	357390.45	357578.30	357766.15
511.6	357954.00	358141.85	358329.70	358517.55	358705.40	358893.25	359081.10	359268.95	359456.80	359644.65
511.7	359832.50	360020.35	360208.20	360396.05	360583.90	360771.75	360959.60	361147.45	361335.30	361523.15
511.8	361711.00	361898.85	362086.70	362274.55	362462.40	362650.25	362838.10	363025.95	363213.80	363401.65
511.9	363589.50	363777.35	363965.20	364153.05	364340.90	364528.75	364716.60	364904.45	365092.30	365280.15
512.0	365468.00	365663.23	365858.46	366053.69	366248.92	366444.15	366639.38	366834.61	367029.84	367225.07
512.1	367420.30	367615.53	367810.76	368005.99	368201.22	368396.45	368591.68	368786.91	368982.14	369177.37
512.2	369372.60	369567.83	369763.06	369958.29	370153.52	370348.75	370543.98	370739.21	370934.44	371129.67
512.3	371324.90	371520.13	371715.36	371910.59	372105.82	372301.05	372496.28	372691.51	372886.74	373081.97
512.4	373277.20	373472.43	373667.66	373862.89	374058.12	374253.35	374448.58	374643.81	374839.04	375034.27
512.5	375229.50	375424.73	375619.96	375815.19	376010.42	376205.65	376400.88	376596.11	376791.34	376986.57
512.6	377181.80	377377.03	377572.26	377767.49	377962.72	378157.95	378353.18	378548.41	378743.64	378938.87
512.7	379134.10	379329.33	379524.56	379719.79	379915.02	380110.25	380305.48	380500.71	380695.94	380891.17
512.8	381086.40	381281.63	381476.86	381672.09	381867.32	382062.55	382257.78	382453.01	382648.24	382843.47
512.9	383038.70	383233.93	383429.16	383624.39	383819.62	384014.85	384210.08	384405.31	384600.54	384795.77
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
513.0	384991.00	385194.65	385398.30	385601.95	385805.60	386009.25	386212.90	386416.55	386620.20	386823.85
513.1	387027.50	387231.15	387434.80	387638.45	387842.10	388045.75	388249.40	388453.05	388656.70	388860.35
513.2	389064.00	389267.65	389471.30	389674.95	389878.60	390082.25	390285.90	390489.55	390693.20	390896.85
513.3	391100.50	391304.15	391507.80	391711.45	391915.10	392118.75	392322.40	392526.05	392729.70	392933.35
513.4	393137.00	393340.65	393544.30	393747.95	393951.60	394155.25	394358.90	394562.55	394766.20	394969.85
513.5	395173.50	395377.15	395580.80	395784.45	395988.10	396191.75	396395.40	396599.05	396802.70	397006.35
513.6	397210.00	397413.65	397617.30	397820.95	398024.60	398228.25	398431.90	398635.55	398839.20	399042.85
513.7	399246.50	399450.15	399653.80	399857.45	400061.10	400264.75	400468.40	400672.05	400875.70	401079.35
513.8	401283.00	401486.65	401690.30	401893.95	402097.60	402301.25	402504.90	402708.55	402912.20	403115.85
513.9	403319.50	403523.15	403726.80	403930.45	404134.10	404337.75	404541.40	404745.05	404948.70	405152.35
514.0	405356.00	405569.23	405782.46	405995.69	406208.92	406422.15	406635.38	406848.61	407061.84	407275.07
514.1	407488.30	407701.53	407914.76	408127.99	408341.22	408554.45	408767.68	408980.91	409194.14	409407.37
514.2	409620.60	409833.83	410047.06	410260.29	410473.52	410686.75	410899.98	411113.21	411326.44	411539.67
514.3	411752.90	411966.13	412179.36	412392.59	412605.82	412819.05	413032.28	413245.51	413458.74	413671.97
514.4	413885.20	414098.43	414311.66	414524.89	414738.12	414951.35	415164.58	415377.81	415591.04	415804.27
514.5	416017.50	416230.73	416443.96	416657.19	416870.42	417083.65	417296.88	417510.11	417723.34	417936.57
514.6	418149.80	418363.03	418576.26	418789.49	419002.72	419215.95	419429.18	419642.41	419855.64	420068.87
514.7	420282.10	420495.33	420708.56	420921.79	421135.02	421348.25	421561.48	421774.71	421987.94	422201.17
514.8	422414.40	422627.63	422840.86	423054.09	423267.32	423480.55	423693.78	423907.01	424120.24	424333.47
514.9	424546.70	424759.93	424973.16	425186.39	425399.62	425612.85	425826.08	426039.31	426252.54	426465.77
515.0	426679.00	426901.43	427123.86	427346.29	427568.72	427791.15	428013.58	428236.01	428458.44	428680.87
515.1	428903.30	429125.73	429348.16	429570.59	429793.02	430015.45	430237.88	430460.31	430682.74	430905.17
515.2	431127.60	431350.03	431572.46	431794.89	432017.32	432239.75	432462.18	432684.61	432907.04	433129.47
515.3	433351.90	433574.33	433796.76	434019.19	434241.62	434464.05	434686.48	434908.91	435131.34	435353.77
515.4	435576.20	435798.63	436021.06	436243.49	436465.92	436688.35	436910.78	437133.21	437355.64	437578.07
515.5	437800.50	438022.93	438245.36	438467.79	438690.22	438912.65	439135.08	439357.51	439579.94	439802.37
515.6	440024.80	440247.23	440469.66	440692.09	440914.52	441136.95	441359.38	441581.81	441804.24	442026.67
515.7	442249.10	442471.53	442693.96	442916.39	443138.82	443361.25	443583.68	443806.11	444028.54	444250.97
515.8	444473.40	444695.83	444918.26	445140.69	445363.12	445585.55	445807.98	446030.41	446252.84	446475.27
515.9	446697.70	446920.13	447142.56	447364.99	447587.42	447809.85	448032.28	448254.71	448477.14	448699.57
516.0	448922.00	449153.21	449384.42	449615.63	449846.84	450078.05	450309.26	450540.47	450771.68	451002.89
516.1	451234.10	451465.31	451696.52	451927.73	452158.94	452390.15	452621.36	452852.57	453083.78	453314.99
516.2	453546.20	453777.41	454008.62	454239.83	454471.04	454702.25	454933.46	455164.67	455395.88	455627.09
516.3	455858.30	456089.51	456320.72	456551.93	456783.14	457014.35	457245.56	457476.77	457707.98	457939.19
516.4	458170.40	458401.61	458632.82	458864.03	459095.24	459326.45	459557.66	459788.87	460020.08	460251.29
516.5	460482.50	460713.71	460944.92	461176.13	461407.34	461638.55	461869.76	462100.97	462332.18	462563.39
516.6	462794.60	463025.81	463257.02	463488.23	463719.44	463950.65	464181.86	464413.07	464644.28	464875.49
516.7	465106.70	465337.91	465569.12	465800.33	466031.54	466262.75	466493.96	466725.17	466956.38	467187.59
516.8	467418.80	467650.01	467881.22	468112.43	468343.64	468574.85	468806.06	469037.27	469268.48	469499.69
516.9	469730.90	469962.11	470193.32	470424.53	470655.74	470886.95	471118.16	471349.37	471580.58	471811.79
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
517.0	472043.00	472282.66	472522.32	472761.98	473001.64	473241.30	473480.96	473720.62	473960.28	474199.94
517.1	474439.60	474679.26	474918.92	475158.58	475398.24	475637.90	475877.56	476117.22	476356.88	476596.54
517.2	476836.20	477075.86	477315.52	477555.18	477794.84	478034.50	478274.16	478513.82	478753.48	478993.14
517.3	479232.80	479472.46	479712.12	479951.78	480191.44	480431.10	480670.76	480910.42	481150.08	481389.74
517.4	481629.40	481869.06	482108.72	482348.38	482588.04	482827.70	483067.36	483307.02	483546.68	483786.34
517.5	484026.00	484265.66	484505.32	484744.98	484984.64	485224.30	485463.96	485703.62	485943.28	486182.94
517.6	486422.60	486662.26	486901.92	487141.58	487381.24	487620.90	487860.56	488100.22	488339.88	488579.54
517.7	488819.20	489058.86	489298.52	489538.18	489777.84	490017.50	490257.16	490496.82	490736.48	490976.14
517.8	491215.80	491455.46	491695.12	491934.78	492174.44	492414.10	492653.76	492893.42	493133.08	493372.74
517.9	493612.40	493852.06	494091.72	494331.38	494571.04	494810.70	495050.36	495290.02	495529.68	495769.34
518.0	496009.00	496256.39	496503.78	496751.17	496998.56	497245.95	497493.34	497740.73	497988.12	498235.51
518.1	498482.90	498730.29	498977.68	499225.07	499472.46	499719.85	499967.24	500214.63	500462.02	500709.41
518.2	500956.80	501204.19	501451.58	501698.97	501946.36	502193.75	502441.14	502688.53	502935.92	503183.31
518.3	503430.70	503678.09	503925.48	504172.87	504420.26	504667.65	504915.04	505162.43	505409.82	505657.21
518.4	505904.60	506151.99	506399.38	506646.77	506894.16	507141.55	507388.94	507636.33	507883.72	508131.11
518.5	508378.50	508625.89	508873.28	509120.67	509368.06	509615.45	509862.84	510110.23	510357.62	510605.01
518.6	510852.40	511099.79	511347.18	511594.57	511841.96	512089.35	512336.74	512584.13	512831.52	513078.91
518.7	513326.30	513573.69	513821.08	514068.47	514315.86	514563.25	514810.64	515058.03	515305.42	515552.81
518.8	515800.20	516047.59	516294.98	516542.37	516789.76	517037.15	517284.54	517531.93	517779.32	518026.71
518.9	518274.10	518521.49	518768.88	519016.27	519263.66	519511.05	519758.44	520005.83	520253.22	520500.61
519.0	520748.00	521002.41	521256.82	521511.23	521765.64	522020.05	522274.46	522528.87	522783.28	523037.69
519.1	523292.10	523546.51	523800.92	524055.33	524309.74	524564.15	524818.56	525072.97	525327.38	525581.79
519.2	525836.20	526090.61	526345.02	526599.43	526853.84	527108.25	527362.66	527617.07	527871.48	528125.89
519.3	528380.30	528634.71	528889.12	529143.53	529397.94	529652.35	529906.76	530161.17	530415.58	530669.99
519.4	530924.40	531178.81	531433.22	531687.63	531942.04	532196.45	532450.86	532705.27	532959.68	533214.09
519.5	533468.50	533722.91	533977.32	534231.73	534486.14	534740.55	534994.96	535249.37	535503.78	535758.19
519.6	536012.60	536267.01	536521.42	536775.83	537030.24	537284.65	537539.06	537793.47	538047.88	538302.29
519.7	538556.70	538811.11	539065.52	539319.93	539574.34	539828.75	540083.16	540337.57	540591.98	540846.39
519.8	541100.80	541355.21	541609.62	541864.03	542118.44	542372.85	542627.26	542881.67	543136.08	543390.49
519.9	543644.90	543899.31	544153.72	544408.13	544662.54	544916.95	545171.36	545425.77	545680.18	545934.59
520.0	546189.00	546449.47	546709.94	546970.41	547230.88	547491.35	547751.82	548012.29	548272.76	548533.23
520.1	548793.70	549054.17	549314.64	549575.11	549835.58	550096.05	550356.52	550616.99	550877.46	551137.93
520.2	551398.40	551658.87	551919.34	552179.81	552440.28	552700.75	552961.22	553221.69	553482.16	553742.63
520.3	554003.10	554263.57	554524.04	554784.51	555044.98	555305.45	555565.92	555826.39	556086.86	556347.33
520.4	556607.80	556868.27	557128.74	557389.21	557649.68	557910.15	558170.62	558431.09	558691.56	558952.03
520.5	559212.50	559472.97	559733.44	559993.91	560254.38	560514.85	560775.32	561035.79	561296.26	561556.73
520.6	561817.20	562077.67	562338.14	562598.61	562859.08	563119.55	563380.02	563640.49	563900.96	564161.43
520.7	564421.90	564682.37	564942.84	565203.31	565463.78	565724.25	565984.72	566245.19	566505.66	566766.13
520.8	567026.60	567287.07	567547.54	567808.01	568068.48	568328.95	568589.42	568849.89	569110.36	569370.83
520.9	569631.30	569891.77	570152.24	570412.71	570673.18	570933.65	571194.12	571454.59	571715.06	571975.53
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
521.0	572236.00	572502.66	572769.32	573035.98	573302.64	573569.30	573835.96	574102.62	574369.28	574635.94
521.1	574902.60	575169.26	575435.92	575702.58	575969.24	576235.90	576502.56	576769.22	577035.88	577302.54
521.2	577569.20	577835.86	578102.52	578369.18	578635.84	578902.50	579169.16	579435.82	579702.48	579969.14
521.3	580235.80	580502.46	580769.12	581035.78	581302.44	581569.10	581835.76	582102.42	582369.08	582635.74
521.4	582902.40	583169.06	583435.72	583702.38	583969.04	584235.70	584502.36	584769.02	585035.68	585302.34
521.5	585569.00	585835.66	586102.32	586368.98	586635.64	586902.30	587168.96	587435.62	587702.28	587968.94
521.6	588235.60	588502.26	588768.92	589035.58	589302.24	589568.90	589835.56	590102.22	590368.88	590635.54
521.7	590902.20	591168.86	591435.52	591702.18	591968.84	592235.50	592502.16	592768.82	593035.48	593302.14
521.8	593568.80	593835.46	594102.12	594368.78	594635.44	594902.10	595168.76	595435.42	595702.08	595968.74
521.9	596235.40	596502.06	596768.72	597035.38	597302.04	597568.70	597835.36	598102.02	598368.68	598635.34
522.0	598902.00	599201.57	599501.14	599800.71	600100.28	600399.85	600699.42	600998.99	601298.56	601598.13
522.1	601897.70	602197.27	602496.84	602796.41	603095.98	603395.55	603695.12	603994.69	604294.26	604593.83
522.2	604893.40	605192.97	605492.54	605792.11	606091.68	606391.25	606690.82	606990.39	607289.96	607589.53
522.3	607889.10	608188.67	608488.24	608787.81	609087.38	609386.95	609686.52	609986.09	610285.66	610585.23
522.4	610884.80	611184.37	611483.94	611783.51	612083.08	612382.65	612682.22	612981.79	613281.36	613580.93
522.5	613880.50	614180.07	614479.64	614779.21	615078.78	615378.35	615677.92	615977.49	616277.06	616576.63
522.6	616876.20	617175.77	617475.34	617774.91	618074.48	618374.05	618673.62	618973.19	619272.76	619572.33
522.7	619871.90	620171.47	620471.04	620770.61	621070.18	621369.75	621669.32	621968.89	622268.46	622568.03
522.8	622867.60	623167.17	623466.74	623766.31	624065.88	624365.45	624665.02	624964.59	625264.16	625563.73
522.9	625863.30	626162.87	626462.44	626762.01	627061.58	627361.15	627660.72	627960.29	628259.86	628559.43
523.0	628859.00	629165.41	629471.82	629778.23	630084.64	630391.05	630697.46	631003.87	631310.28	631616.69
523.1	631923.10	632229.51	632535.92	632842.33	633148.74	633455.15	633761.56	634067.97	634374.38	634680.79
523.2	634987.20	635293.61	635600.02	635906.43	636212.84	636519.25	636825.66	637132.07	637438.48	637744.89
523.3	638051.30	638357.71	638664.12	638970.53	639276.94	639583.35	639889.76	640196.17	640502.58	640808.99
523.4	641115.40	641421.81	641728.22	642034.63	642341.04	642647.45	642953.86	643260.27	643566.68	643873.09
523.5	644179.50	644485.91	644792.32	645098.73	645405.14	645711.55	646017.96	646324.37	646630.78	646937.19
523.6	647243.60	647550.01	647856.42	648162.83	648469.24	648775.65	649082.06	649388.47	649694.88	650001.29
523.7	650307.70	650614.11	650920.52	651226.93	651533.34	651839.75	652146.16	652452.57	652758.98	653065.39
523.8	653371.80	653678.21	653984.62	654291.03	654597.44	654903.85	655210.26	655516.67	655823.08	656129.49
523.9	656435.90	656742.31	657048.72	657355.13	657661.54	657967.95	658274.36	658580.77	658887.18	659193.59
524.0	659500.00	659813.22	660126.44	660439.66	660752.88	661066.10	661379.32	661692.54	662005.76	662318.98
524.1	662632.20	662945.42	663258.64	663571.86	663885.08	664198.30	664511.52	664824.74	665137.96	665451.18
524.2	665764.40	666077.62	666390.84	666704.06	667017.28	667330.50	667643.72	667956.94	668270.16	668583.38
524.3	668896.60	669209.82	669523.04	669836.26	670149.48	670462.70	670775.92	671089.14	671402.36	671715.58
524.4	672028.80	672342.02	672655.24	672968.46	673281.68	673594.90	673908.12	674221.34	674534.56	674847.78
524.5	675161.00	675474.22	675787.44	676100.66	676413.88	676727.10	677040.32	677353.54	677666.76	677979.98
524.6	678293.20	678606.42	678919.64	679232.86	679546.08	679859.30	680172.52	680485.74	680798.96	681112.18
524.7	681425.40	681738.62	682051.84	682365.06	682678.28	682991.50	683304.72	683617.94	683931.16	684244.38
524.8	684557.60	684870.82	685184.04	685497.26	685810.48	686123.70	686436.92	686750.14	687063.36	687376.58
524.9	687689.80	688003.02	688316.24	688629.46	688942.68	689255.90	689569.12	689882.34	690195.56	690508.78
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
525.0	690822.00	691143.70	691465.40	691787.10	692108.80	692430.50	692752.20	693073.90	693395.60	693717.30
525.1	694039.00	694360.70	694682.40	695004.10	695325.80	695647.50	695969.20	696290.90	696612.60	696934.30
525.2	697256.00	697577.70	697899.40	698221.10	698542.80	698864.50	699186.20	699507.90	699829.60	700151.30
525.3	700473.00	700794.70	701116.40	701438.10	701759.80	702081.50	702403.20	702724.90	703046.60	703368.30
525.4	703690.00	704011.70	704333.40	704655.10	704976.80	705298.50	705620.20	705941.90	706263.60	706585.30
525.5	706907.00	707228.70	707550.40	707872.10	708193.80	708515.50	708837.20	709158.90	709480.60	709802.30
525.6	710124.00	710445.70	710767.40	711089.10	711410.80	711732.50	712054.20	712375.90	712697.60	713019.30
525.7	713341.00	713662.70	713984.40	714306.10	714627.80	714949.50	715271.20	715592.90	715914.60	716236.30
525.8	716558.00	716879.70	717201.40	717523.10	717844.80	718166.50	718488.20	718809.90	719131.60	719453.30
525.9	719775.00	720096.70	720418.40	720740.10	721061.80	721383.50	721705.20	722026.90	722348.60	722670.30
526.0	722992.00	723325.61	723659.22	723992.83	724326.44	724660.05	724993.66	725327.27	725660.88	725994.49
526.1	726328.10	726661.71	726995.32	727328.93	727662.54	727996.15	728329.76	728663.37	728996.98	729330.59
526.2	729664.20	729997.81	730331.42	730665.03	730998.64	731332.25	731665.86	731999.47	732333.08	732666.69
526.3	733000.30	733333.91	733667.52	734001.13	734334.74	734668.35	735001.96	735335.57	735669.18	736002.79
526.4	736336.40	736670.01	737003.62	737337.23	737670.84	738004.45	738338.06	738671.67	739005.28	739338.89
526.5	739672.50	740006.11	740339.72	740673.33	741006.94	741340.55	741674.16	742007.77	742341.38	742674.99
526.6	743008.60	743342.21	743675.82	744009.43	744343.04	744676.65	745010.26	745343.87	745677.48	746011.09
526.7	746344.70	746678.31	747011.92	747345.53	747679.14	748012.75	748346.36	748679.97	749013.58	749347.19
526.8	749680.80	750014.41	750348.02	750681.63	751015.24	751348.85	751682.46	752016.07	752349.68	752683.29
526.9	753016.90	753350.51	753684.12	754017.73	754351.34	754684.95	755018.56	755352.17	755685.78	756019.39
527.0	756353.00	756699.99	757046.98	757393.97	757740.96	758087.95	758434.94	758781.93	759128.92	759475.91
527.1	759822.90	760169.89	760516.88	760863.87	761210.86	761557.85	761904.84	762251.83	762598.82	762945.81
527.2	763292.80	763639.79	763986.78	764333.77	764680.76	765027.75	765374.74	765721.73	766068.72	766415.71
527.3	766762.70	767109.69	767456.68	767803.67	768150.66	768497.65	768844.64	769191.63	769538.62	769885.61
527.4	770232.60	770579.59	770926.58	771273.57	771620.56	771967.55	772314.54	772661.53	773008.52	773355.51
527.5	773702.50	774049.49	774396.48	774743.47	775090.46	775437.45	775784.44	776131.43	776478.42	776825.41
527.6	777172.40	777519.39	777866.38	778213.37	778560.36	778907.35	779254.34	779601.33	779948.32	780295.31
527.7	780642.30	780989.29	781336.28	781683.27	782030.26	782377.25	782724.24	783071.23	783418.22	783765.21
527.8	784112.20	784459.19	784806.18	785153.17	785500.16	785847.15	786194.14	786541.13	786888.12	787235.11
527.9	787582.10	787929.09	788276.08	788623.07	788970.06	789317.05	789664.04	790011.03	790358.02	790705.01
528.0	791052.00	791409.60	791767.20	792124.80	792482.40	792840.00	793197.60	793555.20	793912.80	794270.40
528.1	794628.00	794985.60	795343.20	795700.80	796058.40	796416.00	796773.60	797131.20	797488.80	797846.40
528.2	798204.00	798561.60	798919.20	799276.80	799634.40	799992.00	800349.60	800707.20	801064.80	801422.40
528.3	801780.00	802137.60	802495.20	802852.80	803210.40	803568.00	803925.60	804283.20	804640.80	804998.40
528.4	805356.00	805713.60	806071.20	806428.80	806786.40	807144.00	807501.60	807859.20	808216.80	808574.40
528.5	808932.00	809289.60	809647.20	810004.80	810362.40	810720.00	811077.60	811435.20	811792.80	812150.40
528.6	812508.00	812865.60	813223.20	813580.80	813938.40	814296.00	814653.60	815011.20	815368.80	815726.40
528.7	816084.00	816441.60	816799.20	817156.80	817514.40	817872.00	818229.60	818587.20	818944.80	819302.40
528.8	819660.00	820017.60	820375.20	820732.80	821090.40	821448.00	821805.60	822163.20	822520.80	822878.40
528.9	823236.00	823593.60	823951.20	824308.80	824666.40	825024.00	825381.60	825739.20	826096.80	826454.40
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
529.0	826812.00	827177.96	827543.92	827909.88	828275.84	828641.80	829007.76	829373.72	829739.68	830105.64
529.1	830471.60	830837.56	831203.52	831569.48	831935.44	832301.40	832667.36	833033.32	833399.28	833765.24
529.2	834131.20	834497.16	834863.12	835229.08	835595.04	835961.00	836326.96	836692.92	837058.88	837424.84
529.3	837790.80	838156.76	838522.72	838888.68	839254.64	839620.60	839986.56	840352.52	840718.48	841084.44
529.4	841450.40	841816.36	842182.32	842548.28	842914.24	843280.20	843646.16	844012.12	844378.08	844744.04
529.5	845110.00	845475.96	845841.92	846207.88	846573.84	846939.80	847305.76	847671.72	848037.68	848403.64
529.6	848769.60	849135.56	849501.52	849867.48	850233.44	850599.40	850965.36	851331.32	851697.28	852063.24
529.7	852429.20	852795.16	853161.12	853527.08	853893.04	854259.00	854624.96	854990.92	855356.88	855722.84
529.8	856088.80	856454.76	856820.72	857186.68	857552.64	857918.60	858284.56	858650.52	859016.48	859382.44
529.9	859748.40	860114.36	860480.32	860846.28	861212.24	861578.20	861944.16	862310.12	862676.08	863042.04
530.0	863408.00	863783.95	864159.90	864535.85	864911.80	865287.75	865663.70	866039.65	866415.60	866791.55
530.1	867167.50	867543.45	867919.40	868295.35	868671.30	869047.25	869423.20	869799.15	870175.10	870551.05
530.2	870927.00	871302.95	871678.90	872054.85	872430.80	872806.75	873182.70	873558.65	873934.60	874310.55
530.3	874686.50	875062.45	875438.40	875814.35	876190.30	876566.25	876942.20	877318.15	877694.10	878070.05
530.4	878446.00	878821.95	879197.90	879573.85	879949.80	880325.75	880701.70	881077.65	881453.60	881829.55
530.5	882205.50	882581.45	882957.40	883333.35	883709.30	884085.25	884461.20	884837.15	885213.10	885589.05
530.6	885965.00	886340.95	886716.90	887092.85	887468.80	887844.75	888220.70	888596.65	888972.60	889348.55
530.7	889724.50	890100.45	890476.40	890852.35	891228.30	891604.25	891980.20	892356.15	892732.10	893108.05
530.8	893484.00	893859.95	894235.90	894611.85	894987.80	895363.75	895739.70	896115.65	896491.60	896867.55
530.9	897243.50	897619.45	897995.40	898371.35	898747.30	899123.25	899499.20	899875.15	900251.10	900627.05
531.0	901003.00	901389.76	901776.52	902163.28	902550.04	902936.80	903323.56	903710.32	904097.08	904483.84
531.1	904870.60	905257.36	905644.12	906030.88	906417.64	906804.40	907191.16	907577.92	907964.68	908351.44
531.2	908738.20	909124.96	909511.72	909898.48	910285.24	910672.00	911058.76	911445.52	911832.28	912219.04
531.3	912605.80	912992.56	913379.32	913766.08	914152.84	914539.60	914926.36	915313.12	915699.88	916086.64
531.4	916473.40	916860.16	917246.92	917633.68	918020.44	918407.20	918793.96	919180.72	919567.48	919954.24
531.5	920341.00	920727.76	921114.52	921501.28	921888.04	922274.80	922661.56	923048.32	923435.08	923821.84
531.6	924208.60	924595.36	924982.12	925368.88	925755.64	926142.40	926529.16	926915.92	927302.68	927689.44
531.7	928076.20	928462.96	928849.72	929236.48	929623.24	930010.00	930396.76	930783.52	931170.28	931557.04
531.8	931943.80	932330.56	932717.32	933104.08	933490.84	933877.60	934264.36	934651.12	935037.88	935424.64
531.9	935811.40	936198.16	936584.92	936971.68	937358.44	937745.20	938131.96	938518.72	938905.48	939292.24
532.0	939679.00	940075.84	940472.68	940869.52	941266.36	941663.20	942060.04	942456.88	942853.72	943250.56
532.1	943647.40	944044.24	944441.08	944837.92	945234.76	945631.60	946028.44	946425.28	946822.12	947218.96
532.2	947615.80	948012.64	948409.48	948806.32	949203.16	949600.00	949996.84	950393.68	950790.52	951187.36
532.3	951584.20	951981.04	952377.88	952774.72	953171.56	953568.40	953965.24	954362.08	954758.92	955155.76
532.4	955552.60	955949.44	956346.28	956743.12	957139.96	957536.80	957933.64	958330.48	958727.32	959124.16
532.5	959521.00	959917.84	960314.68	960711.52	961108.36	961505.20	961902.04	962298.88	962695.72	963092.56
532.6	963489.40	963886.24	964283.08	964679.92	965076.76	965473.60	965870.44	966267.28	966664.12	967060.96
532.7	967457.80	967854.64	968251.48	968648.32	969045.16	969442.00	969838.84	970235.68	970632.52	971029.36
532.8	971426.20	971823.04	972219.88	972616.72	973013.56	973410.40	973807.24	974204.08	974600.92	974997.76
532.9	975394.60	975791.44	976188.28	976585.12	976981.96	977378.80	977775.64	978172.48	978569.32	978966.16
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
533.0	979363.00	979771.77	980180.54	980589.31	980998.08	981406.85	981815.62	982224.39	982633.16	983041.93
533.1	983450.70	983859.47	984268.24	984677.01	985085.78	985494.55	985903.32	986312.09	986720.86	987129.63
533.2	987538.40	987947.17	988355.94	988764.71	989173.48	989582.25	989991.02	990399.79	990808.56	991217.33
533.3	991626.10	992034.87	992443.64	992852.41	993261.18	993669.95	994078.72	994487.49	994896.26	995305.03
533.4	995713.80	996122.57	996531.34	996940.11	997348.88	997757.65	998166.42	998575.19	998983.96	999392.73
533.5	999801.50	1000210.27	1000619.04	1001027.81	1001436.58	1001845.35	1002254.12	1002662.89	1003071.66	1003480.43
533.6	1003889.20	1004297.97	1004706.74	1005115.51	1005524.28	1005933.05	1006341.82	1006750.59	1007159.36	1007568.13
533.7	1007976.90	1008385.67	1008794.44	1009203.21	1009611.98	1010020.75	1010429.52	1010838.29	1011247.06	1011655.83
533.8	1012064.60	1012473.37	1012882.14	1013290.91	1013699.68	1014108.45	1014517.22	1014925.99	1015334.76	1015743.53
533.9	1016152.30	1016561.07	1016969.84	1017378.61	1017787.38	1018196.15	1018604.92	1019013.69	1019422.46	1019831.23
534.0	1020240.00	1020662.42	1021084.84	1021507.26	1021929.68	1022352.10	1022774.52	1023196.94	1023619.36	1024041.78
534.1	1024464.20	1024886.62	1025309.04	1025731.46	1026153.88	1026576.30	1026998.72	1027421.14	1027843.56	1028265.98
534.2	1028688.40	1029110.82	1029533.24	1029955.66	1030378.08	1030800.50	1031222.92	1031645.34	1032067.76	1032490.18
534.3	1032912.60	1033335.02	1033757.44	1034179.86	1034602.28	1035024.70	1035447.12	1035869.54	1036291.96	1036714.38
534.4	1037136.80	1037559.22	1037981.64	1038404.06	1038826.48	1039248.90	1039671.32	1040093.74	1040516.16	1040938.58
534.5	1041361.00	1041783.42	1042205.84	1042628.26	1043050.68	1043473.10	1043895.52	1044317.94	1044740.36	1045162.78
534.6	1045585.20	1046007.62	1046430.04	1046852.46	1047274.88	1047697.30	1048119.72	1048542.14	1048964.56	1049386.98
534.7	1049809.40	1050231.82	1050654.24	1051076.66	1051499.08	1051921.50	1052343.92	1052766.34	1053188.76	1053611.18
534.8	1054033.60	1054456.02	1054878.44	1055300.86	1055723.28	1056145.70	1056568.12	1056990.54	1057412.96	1057835.38
534.9	1058257.80	1058680.22	1059102.64	1059525.06	1059947.48	1060369.90	1060792.32	1061214.74	1061637.16	1062059.58
535.0	1062482.00	1062917.21	1063352.42	1063787.63	1064222.84	1064658.05	1065093.26	1065528.47	1065963.68	1066398.89
535.1	1066834.10	1067269.31	1067704.52	1068139.73	1068574.94	1069010.15	1069445.36	1069880.57	1070315.78	1070750.99
535.2	1071186.20	1071621.41	1072056.62	1072491.83	1072927.04	1073362.25	1073797.46	1074232.67	1074667.88	1075103.09
535.3	1075538.30	1075973.51	1076408.72	1076843.93	1077279.14	1077714.35	1078149.56	1078584.77	1079019.98	1079455.19
535.4	1079890.40	1080325.61	1080760.82	1081196.03	1081631.24	1082066.45	1082501.66	1082936.87	1083372.08	1083807.29
535.5	1084242.50	1084677.71	1085112.92	1085548.13	1085983.34	1086418.55	1086853.76	1087288.97	1087724.18	1088159.39
535.6	1088594.60	1089029.81	1089465.02	1089900.23	1090335.44	1090770.65	1091205.86	1091641.07	1092076.28	1092511.49
535.7	1092946.70	1093381.91	1093817.12	1094252.33	1094687.54	1095122.75	1095557.96	1095993.17	1096428.38	1096863.59
535.8	1097298.80	1097734.01	1098169.22	1098604.43	1099039.64	1099474.85	1099910.06	1100345.27	1100780.48	1101215.69
535.9	1101650.90	1102086.11	1102521.32	1102956.53	1103391.74	1103826.95	1104262.16	1104697.37	1105132.58	1105567.79
536.0	1106003.00	1106449.18	1106895.36	1107341.54	1107787.72	1108233.90	1108680.08	1109126.26	1109572.44	1110018.62
536.1	1110464.80	1110910.98	1111357.16	1111803.34	1112249.52	1112695.70	1113141.88	1113588.06	1114034.24	1114480.42
536.2	1114926.60	1115372.78	1115818.96	1116265.14	1116711.32	1117157.50	1117603.68	1118049.86	1118496.04	1118942.22
536.3	1119388.40	1119834.58	1120280.76	1120726.94	1121173.12	1121619.30	1122065.48	1122511.66	1122957.84	1123404.02
536.4	1123850.20	1124296.38	1124742.56	1125188.74	1125634.92	1126081.10	1126527.28	1126973.46	1127419.64	1127865.82
536.5	1128312.00	1128758.18	1129204.36	1129650.54	1130096.72	1130542.90	1130989.08	1131435.26	1131881.44	1132327.62
536.6	1132773.80	1133219.98	1133666.16	1134112.34	1134558.52	1135004.70	1135450.88	1135897.06	1136343.24	1136789.42
536.7	1137235.60	1137681.78	1138127.96	1138574.14	1139020.32	1139466.50	1139912.68	1140358.86	1140805.04	1141251.22
536.8	1141697.40	1142143.58	1142589.76	1143035.94	1143482.12	1143928.30	1144374.48	1144820.66	1145266.84	1145713.02
536.9	1146159.20	1146605.38	1147051.56	1147497.74	1147943.92	1148390.10	1148836.28	1149282.46	1149728.64	1150174.82
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

TABLE 7-4 (Continued)

LEWISVILLE DAM AND LAKE - ELEVATION vs. CAPACITY

ELEVATIONS IN FEET-NGVD, CAPACITY (IN ACRE-FEET)

ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
537.0	1150621.00	1151076.64	1151532.28	1151987.92	1152443.56	1152899.20	1153354.84	1153810.48	1154266.12	1154721.76
537.1	1155177.40	1155633.04	1156088.68	1156544.32	1156999.96	1157455.60	1157911.24	1158366.88	1158822.52	1159278.16
537.2	1159733.80	1160189.44	1160645.08	1161100.72	1161556.36	1162012.00	1162467.64	1162923.28	1163378.92	1163834.56
537.3	1164290.20	1164745.84	1165201.48	1165657.12	1166112.76	1166568.40	1167024.04	1167479.68	1167935.32	1168390.96
537.4	1168846.60	1169302.24	1169757.88	1170213.52	1170669.16	1171124.80	1171580.44	1172036.08	1172491.72	1172947.36
537.5	1173403.00	1173858.64	1174314.28	1174769.92	1175225.56	1175681.20	1176136.84	1176592.48	1177048.12	1177503.76
537.6	1177959.40	1178415.04	1178870.68	1179326.32	1179781.96	1180237.60	1180693.24	1181148.88	1181604.52	1182060.16
537.7	1182515.80	1182971.44	1183427.08	1183882.72	1184338.36	1184794.00	1185249.64	1185705.28	1186160.92	1186616.56
537.8	1187072.20	1187527.84	1187983.48	1188439.12	1188894.76	1189350.40	1189806.04	1190261.68	1190717.32	1191172.96
537.9	1191628.60	1192084.24	1192539.88	1192995.52	1193451.16	1193906.80	1194362.44	1194818.08	1195273.72	1195729.36
538.0	1196185.00	1196651.32	1197117.64	1197583.96	1198050.28	1198516.60	1198982.92	1199449.24	1199915.56	1200381.88
538.1	1200848.20	1201314.52	1201780.84	1202247.16	1202713.48	1203179.80	1203646.12	1204112.44	1204578.76	1205045.08
538.2	1205511.40	1205977.72	1206444.04	1206910.36	1207376.68	1207843.00	1208309.32	1208775.64	1209241.96	1209708.28
538.3	1210174.60	1210640.92	1211107.24	1211573.56	1212039.88	1212506.20	1212972.52	1213438.84	1213905.16	1214371.48
538.4	1214837.80	1215304.12	1215770.44	1216236.76	1216703.08	1217169.40	1217635.72	1218102.04	1218568.36	1219034.68
538.5	1219501.00	1219967.32	1220433.64	1220899.96	1221366.28	1221832.60	1222298.92	1222765.24	1223231.56	1223697.88
538.6	1224164.20	1224630.52	1225096.84	1225563.16	1226029.48	1226495.80	1226962.12	1227428.44	1227894.76	1228361.08
538.7	1228827.40	1229293.72	1229760.04	1230226.36	1230692.68	1231159.00	1231625.32	1232091.64	1232557.96	1233024.28
538.8	1233490.60	1233956.92	1234423.24	1234889.56	1235355.88	1235822.20	1236288.52	1236754.84	1237221.16	1237687.48
538.9	1238153.80	1238620.12	1239086.44	1239552.76	1240019.08	1240485.40	1240951.72	1241418.04	1241884.36	1242350.68
539.0	1242817.00	1243295.00	1243773.00	1244251.00	1244729.00	1245207.00	1245685.00	1246163.00	1246641.00	1247119.00
539.1	1247597.00	1248075.00	1248553.00	1249031.00	1249509.00	1249987.00	1250465.00	1250943.00	1251421.00	1251899.00
539.2	1252377.00	1252855.00	1253333.00	1253811.00	1254289.00	1254767.00	1255245.00	1255723.00	1256201.00	1256679.00
539.3	1257157.00	1257635.00	1258113.00	1258591.00	1259069.00	1259547.00	1260025.00	1260503.00	1260981.00	1261459.00
539.4	1261937.00	1262415.00	1262893.00	1263371.00	1263849.00	1264327.00	1264805.00	1265283.00	1265761.00	1266239.00
539.5	1266717.00	1267195.00	1267673.00	1268151.00	1268629.00	1269107.00	1269585.00	1270063.00	1270541.00	1271019.00
539.6	1271497.00	1271975.00	1272453.00	1272931.00	1273409.00	1273887.00	1274365.00	1274843.00	1275321.00	1275799.00
539.7	1276277.00	1276755.00	1277233.00	1277711.00	1278189.00	1278667.00	1279145.00	1279623.00	1280101.00	1280579.00
539.8	1281057.00	1281535.00	1282013.00	1282491.00	1282969.00	1283447.00	1283925.00	1284403.00	1284881.00	1285359.00
539.9	1285837.00	1286315.00	1286793.00	1287271.00	1287749.00	1288227.00	1288705.00	1289183.00	1289661.00	1290139.00
540.0	1290617.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ELEV	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09