Annual Compilation and Analysis of Hydrologic Data for Calaveras Creek San Antonio River Basin, Texas 1970

By D.R. Reddy

U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
Texas District Open-File Report
I.D. Yost, District Chief

Prepared in cooperation with the Texas Water Development Board, the San Antonio River Authority, and the U.S. Soil Conservation Service

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CONTENTS

CONTENTS--Continued

ILLUSTRATIONS

TABLES

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR CALAVERAS CREEK, SAN ANTONIO RIVER BASIN, TEXAS 1970

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INTRODUCTION

History of Small Watershed Projects in Texas

The U.S. Soil Conservation Service is actively engaged in the installation of flood and soil erosion reducing measures in Texas under the authority of "The Flood Control Act of 1936 and 1944" and "Watershed Protection and Flood Prevention Act" (Public Law 566), as amended. The Soil Conservation Service has found a total of approximately 3,500 floodwater-retarding structures to be physically and economically feasible in Texas. As of September 30, 1970, 1,439 of these structures had been built.

This watershed-development program will have varying but important effects on the natural surface- and ground-water resources of river basins, especially where a large number of the floodwater-retarding structures are built. Basic hydrologic data under natural and developed conditions are needed to appraise the effects of the structures on the yield and mode of occurrence of runoff.

Hydrologic investigations of these small watersheds were begun by the Geological Survey in 1951 and are now being made in 12 areas (fig. 1). These studies are being made in cooperation with the Texas Water Development Board, the Soil Conservation Service, the San Antonio River Authority, the city of Dallas, and the Tarrant County Water Control and Improvement District No. 1. The 12 study areas were chosen to sample watersheds having different rainfall, topography, geology, and soils. In five of the study areas (North, Little Elm, Mukewater, Little Pond-North Elm, and Pin Oak Creeks), streamflow and rainfall records were collected prior to construction of the floodwater-retarding structures, thus affording the opportunity for analyses of the conditions "before and after" development. Structures have now been built in four of these study areas. A summary of the development of the floodwater-retarding structures in each study area as of September 30, 1970, is shown in table 1.

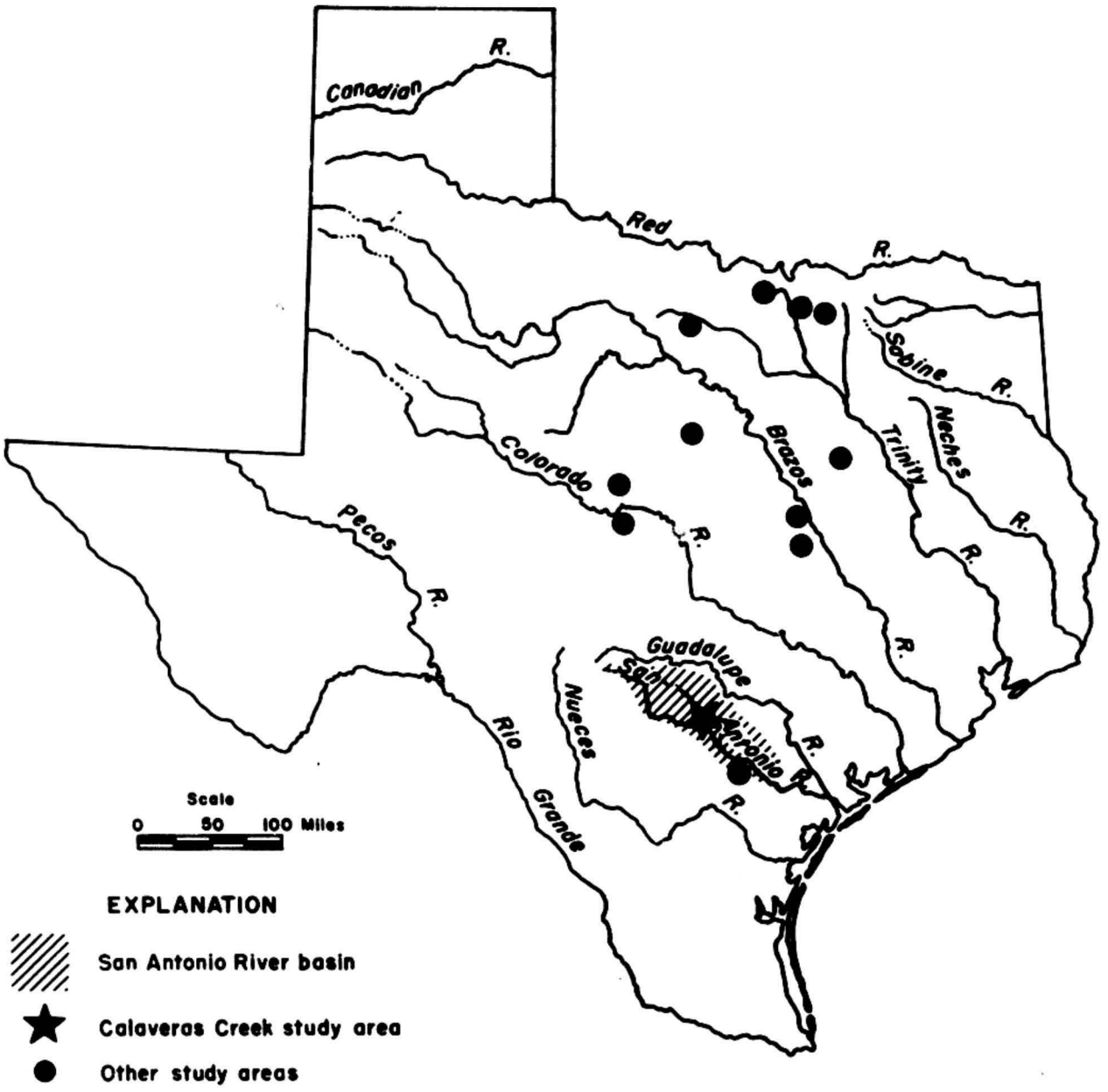

Figure 1. – Location of the Calaveras Creek study area

Table 1.--Small watershed study areas in Texas as of September 30, 1970

Watershed	Drainage area above stream-gaging station (sq mi)	Hydrologic data collection began	Floodwater-retarding structures above stream-gaging station	Period the structures were built
Trinity River basin:				
North Creek near Jacksboro	21.6	Aug. 1956	1	1970
Elm Fork Trinity River near Muenster	46.0	July 1956	14	1954-57, 63
Little Elm Creek near Aubrey	75.5	June 1956	11	1966, 70
Honey Creek near McKinney	39.0	July 1951	13	1951-57, 69
Pin Oak Creek near Hubbard	17.6	Sept. 1956	6	1962-63, 65
Brazos River basin:				
Green Creek near Alexander	46.1	Oct. 1954	8	1954-56
Cow Bayou at Mooreville	85.0	Sept. 1954	26	1955-58, 64-65
1/Little Pond Creek at Burlington	22.2	Oct. 1962	None	-
1/North Elm Creek near Cameron	48.6	Oct. 1962	None	-
Colorado River basin:				
Mukewater Creek at Trickham	70.0	Aug. 1951	6	1961-62, 65
Deep Creek near Mercury	a/43.9	June 1951	5	1951-53
San Antonio River basin:				
Calaveras Creek near Elmendorf	77.2	Aug. 1954	c/7	1954-58
Escondido Creek at Kenedy	b/72.4	July 1954	10	1954-58

1/ Adjacent watersheds; considered as one study area.
a/ 8.31 sq mi above Dry Prong Deep Creek near Mercury not included in this total.
b/ 8.43 sq mi above Escondido Creek subwatershed No. 11 (Dry Escondido Creek) near Kenedy not included in this total.
c/ Six of the floodwater-retarding structures above Calaveras Creek near Elmendorf are in part of a 65.0 sq mi area controlled by Calaveras Creek Dam.

Objectives of the Texas Small Watershed Project

The purpose of these investigations is to collect sufficient data to meet the following objectives:

1. To determine the net effect of floodwater-retarding structures on the regimen of streamflow at downstream points.

2. To determine the effectiveness of the structures as groundwater recharge facilities.

3. To determine the effect of the structures on the sediment yield at downstream points.

4. To develop relationships between maximum rates and/or volumes of runoff with rainfall in small natural watersheds.

5. To develop a stream-system model for basins with floodwater-retarding structures.

6. To determine the minimum instrumentation necessary for estimating the flood hydrographs below a system of structures, as needed for downstream water-management operation.

Purpose and Scope of this Basic-Data Report

This report, which is the eleventh in a series of basic-data reports published annually for the Calaveras Creek study area, contains the rainfall, runoff, and storage data collected during the 1970 water year for the 77.2-square-mile area above the stream-gaging station Calaveras Creek near Elmendorf, Texas. The locations of floodwater-retarding structures and hydrologic-instrument installations in the area are shown as figure 2.

The investigation was scheduled to continue through periods of both above- and below-normal precipitation, but on September 1, 1967, the San Antonio City Public Service Board began construction of Calaveras Creek Dam. This reservoir will serve as a cooling basin for power plants to be built in the future, with most of the water to be pumped from the San Antonio River. In the interim, it is being used as a recreation facility. The dam was completed in December 1968, and pumpage into Calaveras Lake from the San Antonio River started in January 1969. Much of the study area is inundated by the reservoir, which covers about 4,300 acres (fig. 2). The reservoir controls 65 square miles of the area above the stream-gaging station Calaveras Creek near Elmendorf.

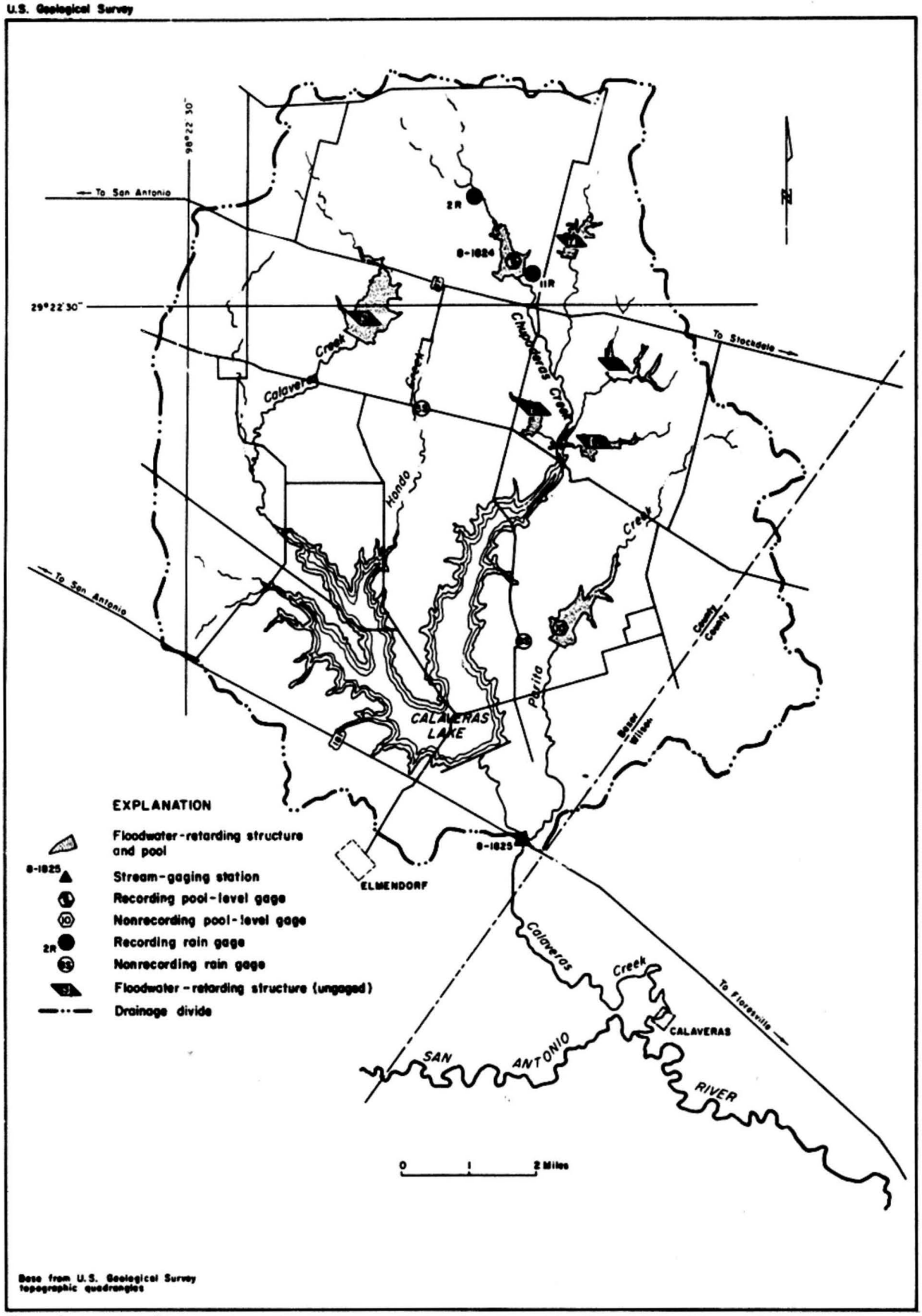

Figure 2.—Locations of floodwater-retarding structures and hydrologic-instrument installations in the Calaveras Creek study area

The recording gage at Calaveras Creek floodwater-retarding structure No. 6 is continued in operation to monitor time-associated hydrologic changes on a drainage area of this size.

The staff gages at floodwater-retarding structure No. 10 were continued in operation to provide an index to flow below Calaveras Lake. The two recording rain gages (2R, 11R) and two of the standard rain gages (5S, 8S) were continued in operation.

In subsequent years, data for Calaveras Creek and Escondido Creek subwatersheds, which are both in the San Antonio River Basin, will be published under one cover because the work in both subbasins has been decreased.

To facilitate the publication and distribution of this report at the earliest feasible time, certain material contained herein does not conform to the formal publication standards of the U.S. Geological Survey.

DESCRIPTION OF THE WATERSHED

The headwaters of Calaveras Creek originate about 4 miles east of suburban San Antonio in Bexar County. The creek flows southeasterly for about 12 miles to the San Antonio River near the town of Calaveras in Wilson County. Its three principal tributaries are Hondo, Chupaderas, and Parita Creeks. Calaveras Creek drains an approximately rectangular basin with a drainage area of 77.2 square miles above the Geological Survey stream-gaging station at the bridge on U.S. Highway 181 near Elmendorf, Texas.

The Soil Conservation Service has classified the watershed as 85 percent Rio Grande Plain and 15 percent Forested Coastal Plain. The part of the basin in the Rio Grande Plain is covered mostly by fine-to-medium textured deep clay soils. These soils are black to dark gray and have a low permeability. The part of the basin in the Forested Coastal Plain is covered with brown or reddish-brown fine sandy loams that have a clay subsoil with a low permeability.

The topography ranges from rolling hills along the divides to flat plains in the central section. Altitudes range from 700 feet above mean sea level at the headwaters of Calaveras Creek to 362 feet at the mouth. The total length of the creek is approximately 23 miles; the average gradient is about 15 feet per mile.

The climate of the area is temperate and subhumid with a prevailing south wind. Thunderstorms occur frequently in the spring and summer. Long-duration, low-intensity storms triggered by southward-moving continental polar fronts occur during the fall and winter. Some of the heaviest rainfall occurs in late summer and early fall as a result of hurricanes moving inland from the Gulf of Mexico. Individual storms causing serious flooding may occur during any season, but are most frequent in the spring. The normal rainfall (based on National Weather Service records for the period 1931-60) for San Antonio is 27.84 inches, with the largest monthly rainfall occurring in May, June, and September. The minimum annual rainfall was 13.70 inches in 1954, and the maximum was 50.30 inches in 1919.

FLOODWATER-RETARDING STRUCTURES

There are seven floodwater-retarding structures in the Calaveras Creek watershed (fig. 2). Three of the structures were completed in 1954, one in 1955, two in 1956, and one in 1958. These structures have a capacity for temporary storage of 8,640 acre-feet of flood runoff from 26.6 of the 77.2-square-mile study area. All of the structures, except the one on Subwatershed No. 10, are upstream from Calaveras Lake.

Two other structures, completed in 1955 and 1958, were removed when the San Antonio City Public Service Board began construction on the dam for Calaveras Lake in September, 1967.

Table 2 contains a summary of the physical data at each of the seven floodwater-retarding structures.

HYDROLOGIC INSTRUMENTS

Instruments to collect rainfall and stage data in the study area consist of rain gages, staff gages, and water-stage recorders. Location of instruments are shown on figure 2.

There are two recording and two nonrecording rain gages located in the study area.

A recording pool-level gage is operated at floodwater-retarding structure site 6. Data collection began at this site on December 18, 1956. The records include contents, surface area, inflow, and outflow. Weekly readings of the staff gages at floodwater-retarding structure site 10 are also obtained.

Table 2.--Floodwater-retarding structure data, Calaveras Creek study area

Site number	Drainage area (sq mi)	Date dam completed	Date gage established	Datum of gage above mean sea level	Emergency spillway			Drop outlet		Portholes			Controlled opening		Pipe diameter through dam (in)	Range of staff gages (ft)
					Number and width (ft)	Gage height (ft)	Content (ac-ft)	Gage height (ft)	Pool contents (ac-ft)	Number and size (in)	Gage height at bottom (ft)	Pool contents (ac-ft)	Gage height at bottom (ft)	Pool contents (ac-ft)		
3	5.43	10-27-54	3- 3-55	557.0	2 240, 160	Both 30.3	2,040	18.0	325	1 10"dia.	15.98	216	None	-	17	-
5	1.36	9- 9-54	3- 4-55	485.0	1 175	28.0	616	18.0	104	None	-	-	8.5	0 est	12	-
6	7.01	12-15-56	12-18-56	516.06	2 250, 250	34.3 34.5	1,640 1,680	18.0	107	4 8x8	14.8	48	8.52	9.4	17	6.8- 40.7
7	2.83	3- 2-56	7-16-56	530.3	1 275	31.4	1,040	18.0	162	None	-	-	11.5	38	17	-
8	2.39	9-27-54	3- 3-55	499.0	2 125, 125	Both 29.0	893	18.0	198	None	-	-	10.5	12 est	14	-
9	1.46	9-14-55	7-16-56	488.0	1 200	28.0	538	18.0	107	None	-	-	9.5	2 est	22	-
10	6.12	6-17-58	3-10-59	473.3	1 350	30.9	1,870	18.0	334	1 10x22	15.7	199	4.5	4.8	17	4.2- 33.9

A continuous water-stage recorder at the stream-gaging station on Calaveras Creek near Elmendorf records the stage, which together with measurements of streamflow allows the computation of runoff from the study area. Streamflow records at this gage began in August 1954.

The San Antonio Public Service Board has furnished records of pumpage from the San Antonio River into Calaveras Lake and month-end lake elevations since December 31, 1968.

SUMMARY OF DATA FOR THE 1970 WATER YEAR

Rainfall and runoff above subwatershed No. 6 were tabulated based on records obtained from the water-stage recorder at the site and recording rainfall gages 2R and 11R.

As most of the flow into Calaveras Lake was the result of pumpage from the San Antonio River, rainfall records at standard rainfall gage 5S (fig. 2) were not used in the storm analyses.

Weighting factors for recording rain gages 2R and 11R as related to site 6 have not changed but weighting factors for the remainder of the basin were not developed and mean rainfalls were used.

The mean rainfall in the study area for the 1970 water year was 29.64 inches, or 107 percent of the 14 year (1955-68) weighted-mean average and 106 percent of the 16-year (1955-70) average. This 16-year average is based on the weighted mean of nine standard and two recording rain gages for 14 years and the mean of two standard and two recording rain gages for 2 years. The average monthly rainfall totals ranged from 0.42 inch in June to 7.74 inches in May. Yearly mean discharge at the stream-gaging station, Calaveras Creek near Elmendorf, was 0.59 cfs (cubic feet per second). This shows the effect of Calaveras Dam on the basin as the average discharge for the 14 years (1955-68) was 10.7 cfs. Annual runoff at the stream-gaging station was 427 acre-feet, or 0.10 inch. Excluding the 65 square miles controlled by Calaveras Lake and deducting the 93 acre-feet released from Calaveras Lake, the runoff would be 334 acre-feet, or 0.51 inch.

Weighted-mean rainfall above subwatershed No. 6 was 30.62 inches and runoff 892 acre-feet. This runoff represents an equivalent depth of 2.39 inches.

A storm event is defined as a period of rainfall separated by at least 6 hours from other rainfall. Storms are selected for detailed rainfall-runoff computations on the basis of rainfall totals and distribution, the peak discharge produced from the rainfall at the stream-gaging station, and the assurance of good rainfall and runoff records for the storm periods selected.

For the 1970 water year, six storms were selected for detailed computations. These computations include detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are drawn for illustrations. The storms selected occurred October 6, October 12, December 5-6, 1969, May 23, May 26, and May 28, 1970.

Because Calaveras Lake controls 65 square miles of the Calaveras Creek basin, a drainage area of 12.2 square miles has been used for the 1970 water year computations. The rainfall record from standard rain gage 8-S, with distribution based on the two recording rain gages, is considered applicable to the 12.2 square miles. No water was released from Calaveras Lake during the selected storm periods.

A summary of rainfall-runoff data is shown in table 3.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY-TEXAS DISTRICT

ANNUAL STORM RAINFALL-RUNOFF SUMMARY DATA

Table 3.--Storm rainfall-runoff data, 1970 water year

Date of Storm	Rainfall (inches)					Runoff (inches)	Ratio runoff to rainfall	Maximum discharge (cfs)
	Duration (hours)	Total	Maximum increment					
			15-minute	30-minute	60-minute			
Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex. (Drainage area 7.01 sq mi)								
Oct. 6, 1969	1.1	1.65	1.20	1.46	1.63	0.31	0.19	591
Oct. 12, 1969	6.0	1.22	.30	.40	.72	.17	.14	163
Dec. 5-6, 1969	7.0	.79	.22	.37	.44	.10	.13	74.9
May 23, 1970	9.0	1.70	.40	.67	1.03	.40	.24	413
May 26, 1970	4.0	1.39	.69	.86	1.10	.49	.35	534
May 28, 1970	9.8	1.34	.58	.97	1.05	.77	.57	725
Calaveras Creek near Elmendorf, Tex. (Drainage area 77.2 sq mi, of which 65 sq mi is above Calaveras Dam)								
Oct. 6, 1969	1.1	.43	.32	.38	.43	.03	.07	82
Oct. 12, 1969	6.0	.87	.21	.28	.51	.02	.02	63
Dec. 5-6, 1969	7.0	.80	.23	.38	.45	.04	.05	98
May 23, 1970	9.0	.84	.19	.33	.51	.01	.01	26
May 26, 1970	4.0	1.17	.58	.73	.92	.17	.15	160
May 28, 1970	9.8	.53	.23	.38	.42	.06	.11	22

COMPILATION AND ANALYSIS OF DATA

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex.

LOCATION.--Lat 29°22'49", long 98°17'33", Bexar County, near center of dam on Chupaderas Creek, a tributary to Calaveras Creek, 0.5 mile north of Sayer, 9.1 miles north of Elmendorf, and 9.2 miles upstream from mouth.

DRAINAGE AREA.--7.01 sq mi.

PERIOD OF RECORD.--December 1956 to current year.

GAGE.--Water-stage recorder and concrete drop-inlet control. Datum of gage is 516.06 ft above mean sea level (levels by Soil Conservation Service).

AVERAGE INFLOW.--13 years (1957-70), 758 acre-ft per year.

AVERAGE OUTFLOW.--13 years (1957-70), 740 acre-ft per year.

EXTREMES.--Current year: Maximum outflow, 39.8 cfs May 28 (gage height, 24.22 ft); no outflow for most of year. Maximum inflow, 725 cfs (average for 5-minute interval) May 28, computed from change in reservoir contents and adjusted for outflow and rainfall on pool surface; no inflow for many days.
Period of record: Maximum outflow, 47.2 cfs Jan. 21, 1968 (gage height, 31.59 ft); no outflow for many days each year. Maximum inflow, 4,270 cfs (average for 5-minute interval) Jan. 18, 1968, computed from change in reservoir contents and adjusted for outflow and rainfall on pool surface; no inflow at times.

REMARKS.--Records good. Pool is formed by an earthfill dam that was completed Dec. 15, 1956. The outlet structure is a 36-inch square concrete drop inlet connected to a 17-inch concrete outlet pipe. The top of the drop inlet is at a gage height of 18.0 ft; the bottom of four 8- by 8-inch uncontrolled openings are at a gage height of 14.80 ft; the right emergency spillway is at a gage height of 34.3 ft; the left emergency spillway is at a gage height of 34.5 ft. A controlled 8-inch sluice gate is located in the upstream face of the drop-inlet structure at a gage height of 8.52 ft. Pool capacity, 1,640 acre-ft at spillway crest, 107 acre-ft at top of the drop inlet, and 4.2 acre-ft at bottom of sluice gate. The capacity table is based on a survey made March 12, 1968. Two recording rain gages are located in the watershed; one at and one above the station.

REVISIONS (WATER YEARS).--WSP 1923: 1957-60.

POOL WATER BUDGET, IN ACRE-FEET, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.
Inflow 1/	180	1.6	39.4	0.5	5.2	18.3	4.0	639	2.7	0	0	1.2
Outflow	131	0	28.3	0	0	14.0	0	509	118	0	0	0
(††)	5.46	1.62	2.63	.97	2.71	1.75	1.49	8.64	.54	.82	.91	3.08

CAL YR 1969: Inflow 565 Outflow 478 †† 31.25
WTR YR 1970: Inflow 892 Outflow 800 †† 30.62

PEAK INFLOW (BASE, 100 CFS)

DATE	TIME	DISCHARGE
10- 6	2040	*591
10-12	1730	*163
5-23	1955	*413
5-26	1830	*534
5-28	0520	*725

1/ Inflow adjusted for rainfall on pool and pool losses.
†† Weighted mean rainfall, in inches, based on two rain gages.
* Average for 5-minute interval.

9-229c
(Oct. 1951)

UNITED STATES
DEPARTMENT OF THE INTERIOR
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WATER RESOURCES DIVISION

Sheet 1 of 1 Sheets

08-1824.00

Monthly and yearly weighted-mean rainfall, in inches, of Calaveras Creek Subwatershed No. 6 near Elmendorf, Texas
[Drainage area, 7.01 square miles]

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	CAL. YR.
1957	1.16	0.92	3.59	0.57	2.48	3.28	7.79	7.04	1.51	0.14	0.06	11.22	39.76	42.57
1958	4.01	3.23	1.24	4.70	5.22	.74	1.16	5.24	2.65	2.20	.74	5.22	36.35	35.28
1959	4.49	1.99	.93	.31	2.28	.48	3.66	4.92	2.91	.84	*3.26	.75	*26.82	*29.05
1960	5.89	1.49	2.26	1.39	1.25	1.70	1.13	1.24	4.58	1.41	2.19	.56	25.09	30.02
1961	9.79	1.93	2.85	.65	1.49	.07	.42	0	8.20	6.50	.63	2.60	35.13	27.82
1962	2.91	3.92	.43	.39	.98	.58	3.67	1.47	1.49	0	1.45	.98	18.27	14.60
1963	.03	2.41	1.15	.17	2.45	.13	2.26	.40	1.65	.18	.18	2.37	13.38	18.71
1964	4.66	3.20	1.06	2.79	3.27	2.43	1.21	1.51	1.00	.43	2.67	1.92	26.15	23.63
1965	2.33	2.76	1.31	1.43	5.98	1.80	1.47	6.71	.93	.10	.79	2.74	28.35	31.76
1966	3.55	1.49	4.77	1.05	2.18	1.67	2.88	4.07	2.16	.65	2.18	2.95	29.60	20.35
1967	.38	0	.18	.24	.77	1.83	.63	.90	0	2.26	1.05	9.82	18.06	25.26
1968	2.50	4.19	1.07	7.97	1.74	.70	4.15	3.26	4.05	1.52	1.32	3.43	35.90	35.56
1969	.85	6.20	.37	.92	4.09	1.76	3.06	3.78	2.66	.21	3.08	1.98	28.96	31.25
1970	5.46	1.62	2.63	.97	2.71	1.75	1.49	8.64	.54	.82	.91	3.08	30.62	

*Revised to agree with interpretative report by Mills.

9-329c
(Oct. 1951)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sheet ____ of ____ Sheets

08182400

Monthly and/~~annual discharge~~ yearly net inflow, in acre-feet, of Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex.
[Drainage area, 7.01 square miles]

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	CAL. YR.
	Station established Dec. 20, 1956. Net inflow was adjusted for consumption and rainfall on pool.													
1957	-	-	*275	0	*103	*175	*1,140	*962	*237	0	0	1,230	-	*4,290
1958	*329	*107	*6.9	*382	*897	*9.8	*5.3	*551	*29.6	*12.4	*1.0	*7.4	*2,340	*1,900
1959	*2.3	*4.4	*1.4	*.6	*1.4	*1.2	*107	*77.0	*3.5	*1.6	*6.4	*1.7	*208	*301
1960	*91.2	*1.5	*7.6	*28.9	1.3	*3.5	*1.7	*1.6	*8.6	*1.5	*.9	*0	*148	*498
1961	*396	*18.4	*35.8	*3.8	*19.9	*0	*0	*0	*450	*282	*0	*2.4	*1,210	*906
1962	.7	*147	*.4	*.4	*.8	*.4	*6.1	.4	*2.5	0	.2	*0	*159	*15.3
1963	0	*4.5	0	0	*1.3	0	*8.4	0	*.2	0	0	*.5	*14.9	*312
1964	*262	*38.8	*1.0	*87.3	345	*181	*.6	*.9	0	*.2	*.2	*.2	*917	*725
1965	*9.1	*99.7	*.6	.6	*298	*6.4	*3.6	*598	*1.7	0	0	*.3	*1,020	*999
1966	*19.1	.3	*71.2	*.1	*1.5	*5.7	*29.8	*34.3	0	0	*.1	*.1	*162	*71.7
1967	.1	*0	*0	0	0	0	0	0	0	0	0	*429	*429	*679
1968	2.0	248	.2	1,440	2.9	2.7	106	206	37.3	11.3	.2	9.1	2,070	2,110
1969	0	277	17.7	2.8	250	4.7	.2	84.3	.9	0	1.4	0	639	565
1970	180	1.6	39.4	.5	5.2	18.3	4.0	639	2.7	0	0	1.2	892	

*Revised to agree with interpretative report by Mills.

(Oct. 1951)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sheet 1 of 1 Sheets

08182400

yearly outflow
Monthly and/annual discharge, in acre-feet, of Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex.
[Drainage area, 7.01 square miles]

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	CAL. YR.
	Station established Dec. 20, 1956.													
1957	-	-	224	0	*76.0	*156	845	*736	*746	0	0	691	-	*4,200
1958	*843	*104	*3.0	*378	667	*240	.8	*542	18.0	6.9	0	0	*2,800	*1,850
1959	0	0	0	0	0	0	*79.3	*69.6	0	0	0	0	*149	*217
1960	68.2	0	0	25.8	0	0	0	0	0	0	0	0	94.0	*436
1961	*283	*94.4	33.1	3.4	17.8	0	0	0	*418	*269	*0	0	*1,120	*832
1962	0	*124	0	0	0	0	0	0	0	0	0	0	*124	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	*247
1964	*213	33.7	0	49.0	*366	*176	0	0	0	0	0	0	*838	*650
1965	0	58.5	0	0	274	0	*0	579	0	0	0	0	912	*889
1966	0	0	36.4	0	0	0	14.3	29.0	0	0	0	0	79.7	43.3
1967	0	0	0	0	0	0	0	0	0	0	0	384	384	623
1968	.2	239	0	1,190	264	.3	98.2	203	24.2	3.8	0	0	2,020	2,040
1969	0	77.0	184	0	244	3.0	0	72.1	0	0	0	0	580	478
1970	131	0	28.3	0	0	14.0	0	509	118	0	0	0	800	

*Revised to agree with interpretative report by Mills.

A-74a
Rev 7-65

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

WATER BUDGET OF POOL

ANNUAL SUMMARY

1970 WATER YEAR

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. Drainage Area 7.01 sq mi

Continuous water-stage recorder: ratio 10:12. Date of last sediment survey Mar. 12, 1968.

Maxima: gage height, 24.22; outflow, 39.8 c.f.s.; surface area, 69.0 acres; contents, 385 acre-feet; on May 28

Minima: gage height, 9.08; surface area, 3.1 acres; contents, 5.8 acre-feet; on Oct. 4.

Maximum inflow, 725 c.f.s (averaged for 5-min. interval and adjusted for rainfall on pool surface) on May 28

Averages: 13 water years, (1957-70); inflow, 785 acre-feet/year; outflow, 762 acre-feet/year; rainfall, 28.03 inches/year.

Pool water budget, in acre-feet, water year October 1969 to September 1970.

	Oct	Nov.	Dec.	Calendar year 1969	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Water year 1970
Total Inflow 1/	180	1.6	39.4	565	0.5	5.2	18.3	4.0	639	2.7	0	0	1.2	892
Total Outflow	131	0	28.3	478	0	0	14.0	0	509	118	0	0	0	800
Total Consumption	14.3	9.2	5.3	112	4.4	4.3	6.1	9.6	15.6	14.6	13.6	11.5	7.1	116
†	+37.3	-6.5	+8.0	+0.4	-3.0	+2.9	-0.5	-4.4	+128	-129	-12.9	-11.1	-5.0	+3.8
‡	11.0	10.8	11.8	10.3	11.7	11.3	12.2	11.3	15.6	12.2	9.7	7.3	5.1	10.8
††	5.46	1.62	2.63	31.25	0.97	2.71	1.75	1.49	8.64	0.54	0.82	0.91	3.08	30.62

1/ Inflow adjusted for rainfall on pool and pool losses.
† Change in contents, in acre-feet.
‡ Mean surface area, in acres.
†† Weighted mean rainfall, in inches.

Peak inflow - (base, 100 c.f.s)

Date	Time	Discharge	Date	Time	Discharge
10- 6	2040	*591			
10-12	1730	*163			
5-23	1955	*413			
5-26	1830	*534			
5-28	0520	*725			

*Averaged for 5-minute interval.

08182500 Calaveras Creek near Elmendorf, Tex.

LOCATION.--Lat 29°15'38", long 98°17'34", Bexar County, near center of span at downstream side of upstream bridge of two bridges on U.S. Highway 181, 1.6 miles downstream from Calaveras dam, 2.5 miles east of Elmendorf, 7.2 miles (revised) upstream from mouth, and 9 miles southeast from city limits of San Antonio.

DRAINAGE AREA.--77.2 sq mi.

PERIOD OF RECORD.--August 1954 to current year.

GAGE.--Water-stage recorder. Datum of gage is 406.45 ft above mean sea level.

AVERAGE DISCHARGE.--16 years, 9.50 cfs (1.67 inches per year, 6,880 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 319 cfs Oct. 9 (gage height, 11.98 ft); no flow many days..
Period of record: Maximum discharge, 5,310 cfs Sept. 25, 1957 (gage height, 21.83 ft); no flow at times.
Maximum stage since at least 1860, 35 ft Sept. 29, 1946, from information by local residents.

REMARKS.--Records fair. At end of year, flow from 71.1 sq mi above this station was partly controlled by Calaveras Lake (drainage area, 65 sq mi), capacity 63,000 acre-ft and one floodwater-retarding structure (drainage area, 6.12 sq mi), with a capacity of 1,870 acre-ft, of which 1,670 acre-ft is floodwater-retarding capacity and 200 acre-ft is sediment-pool capacity. The capacity in this pool allocated to sediment storage will be used for conservation storage until eliminated by sedimentation. Records furnished by the San Antonio City Public Service Board show that during the year 21,100 acre-ft was diverted from the San Antonio River into Calaveras Lake.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	.02	.01	.08	.02	.02	.03	15			0
2	0	0	.01	.02	.08	.03	.01	0	.94			0
3	0	0	0	.03	.05	.04	0	0	.16			0
4	0	0	0	.04	.04	.02	0	0	.05			0
5	2.1	0	.75	.92	.04	.01	0	0	.02			0
6	8.5	0	12	.20	.72	7.2	0	0	0			0
7	.82	0	.13	.07	1.1	1.9	0	0	0			0
8	0	0	.04	.04	.08	.11	0	0	0			0
9	46	0	.02	.03	.02	.03	.05	0	0			0
10	.69	0	.02	.05	.01	.02	.07	0	0			0
11	.32	0	.02	.06	.01	.05	.04	0	0			0
12	8.0	0	.01	.05	0	.02	.03	0	0			0
13	.45	0	.01	.06	0	.01	.02	0	0			0
14	.11	0	.01	.07	.01	0	0	.07	0			0
15	0	0	.01	.08	.01	0	.02	3.7	0			0
16	0	0	.01	.12	.02	.09	.07	.13	0			0
17	0	0	.01	.11	.01	4.6	.06	.04	0			0
18	0	.18	.01	.08	0	.12	.05	0	0			0
19	0	.14	.01	.08	0	.06	.22	0	0			0
20	0	.02	.01	.08	0	.04	.07	0	0			0
21	0	0	.01	.08	0	.04	.02	0	0			0
22	0	0	.01	.08	0	.02	0	.04	0			0
23	0	0	0	.09	.17	.02	0	2.5	0			0
24	0	.02	0	.08	1.4	.02	0	1.6	0			0
25	0	.03	0	.08	.26	.02	.01	.15	0			5.1
26	0	.08	.02	.08	.06	.02	0	22	0			.29
27	0	.22	0	.07	.02	0	0	33	0			.03
28	.01	.07	.02	.07	.03	.03	.01	15	0			0
29	.08	.04	.16	.06	------	.02	.01	4.1	0			0
30	.06	.03	.25	.07	------	.02	0	.79	0			0
31	.03	------	.04	.04	------	.02	------	6.1	------			------
TOTAL	67.17	.83	13.61	3.00	4.22	14.60	.78	89.25	16.17	0	0	5.42
MEAN	2.17	.028	.44	.097	.15	.47	.026	2.88	.54	0	0	.18
MAX	46	.22	12	.92	1.4	7.2	.22	33	15	0	0	5.1
MIN	0	0	0	.01	0	0	0	0	0	0	0	0
AC-FT	133	1.7	27	6.0	8.4	29	1.6	177	32	0	0	11

CAL YR 1969 TOTAL 447.42 MEAN 1.23 MAX 145 MIN 0 ACFT 887
WAT YR 1970 TOTAL 215.05 MEAN .59 MAX 46 MIN 0 ACFT 427

9-229c
(Oct. 1951)

Sheet 1 of 1 Sheets

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

yearly weighted-mean rainfall
Monthly [redacted], in inches, of Calaveras Creek River near Elmendorf, Tex.
[Drainage area, 77.2 square miles] of which 37.1 sq mi above 9 floodwater-retarding structures.

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL	CAL. YR.
1955	0.59	0.91	0.04	1.61	2.79	1.27	0.15	3.02	2.35	0.79	2.53	0.42	16.47	
1956	1.24	.64	1.75	.82	.82	.26	.43	2.09	.24	1.54	2.18	.38	12.39	
1957	1.52	.91	4.30	.56	2.09	3.40	8.44	6.64	1.72	.14	.49	10.20	40.41	
1958	3.58	3.80	1.08	4.83	5.17	.96	1.21	5.38	2.62	3.01	.43	6.49	38.56	
1959	5.58	1.96	1.17	.34	2.46	.12	3.91	5.82	2.78	1.04	2.55	1.55	29.28	
1960	6.16	1.76	2.11	1.60	1.54	2.12	1.79	1.54	4.72	1.75	1.89	.38	27.36	
1961	9.11	2.39	3.54	.79	1.70	.06	.55	0	8.19	5.46	.74	2.15	34.68	
1962	3.68	4.00	.52	.63	.98	.75	4.23	1.36	2.43	0	1.62	1.27	21.47	
1963	.07	1.94	1.19	.19	2.91	.11	2.45	.48	1.98	.32	.15	2.86	14.65	
1964	3.81	4.16	1.30	3.03	2.34	2.43	1.23	2.37	1.04	.70	3.56	2.20	28.17	
1965	2.49	3.27	1.26	1.36	6.08	1.46	1.44	7.79	1.00	.04	.92	3.31	30.42	
1966	3.53	1.51	5.04	1.27	2.71	1.41	3.07	3.95	3.43	1.08	2.57	4.08	33.65	
1967	1.09	.01	.35	.27	.63	2.05	.88	1.23	.01	1.93	2.27	10.89	21.61	
1968	2.73	4.56	1.20	7.99	2.00	.96	4.15	3.81	3.17	1.62	1.28	3.51	36.98	
1969	1.36	6.02	.46	1.28	4.30	1.49	2.96	4.27	3.07	.42	3.64	1.64	30.91	
1970	5.14	1.62	2.68	1.12	2.62	1.81	1.23	7.74	.42	.91	1.07	3.29	29.64	

Note: Since 1969 water year rainfall is average of 4 gages (not weighted).

9-329 c
(Oct. 1961)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Sheet 1 of 1 Sheets

8-1825

Monthly and yearly mean discharge, in cfs, of Calaveras Creek River at near Elmendorf, Tex.

[Drainage area, 77.2 square miles] of which 37.1 sq mi is above 9 flood-detention structures

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	ANNUAL
	Station established Aug. 20, 1954												
1954	-	-	-	-	-	-	-	-	-	-	-	0	-
1955	0.10	1.90	0	2.39	10.0	5.51	0	22.1	5.69	0.11	4.64	.63	4.40
1956	3.64	0	4.20	0	0	0	0	2.76	0	4.08	.42	3.62	1.57
1957	3.33	.09	49.2	.02	1.80	10.9	145	92.1	52.6	0	0	160	42.7
1958	49.5	17.5	.84	52.1	143	13.5	.72	65.9	2.60	12.2	.41	6.71	29.7
1959	4.19	5.50	.17	.21	.29	.02	4.26	17.2	2.04	.03	.003	.007	2.84
1960	22.5	.39	.72	3.26	.09	1.15	.57	0	2.78	0	0	0	2.66
1961	50.1	8.59	10.4	1.22	4.29	.24	0	0	43.9	11.0	.49	.003	10.9
1962	.10	18.3	0	0	.03	0	2.95	.11	12.0	0	0	0	2.75
1963	0	2.99	1.82	0	3.04	0	1.19	0	0	.003	0	2.21	.91
1964	13.6	18.4	.01	8.71	17.1	22.3	.03	.4	.80	0	8.28	.01	7.45
1965	4.77	14.8	0	0	20.1	0	.14	86.3	.67	0	0	.19	10.6
1966	2.23	.142	5.87	2.81	.787	0	3.21	1.30	.591	.558	.055	1.39	1.59
1967	.844	0	0	0	0	.101	0	3.40	0	0	.107	81.7	7.09
1968	1.10	45.8	.069	178	19.3	1.10	16.1	36.3	1.85	0	0	0	25.1
1969	0	1.82	.088	0	2.19	.008	0	9.03	.10	0	.69	.003	1.16
1970	2.17	.028	.44	.097	.15	.47	.026	2.88	.54	0	0	.18	.59

[illegible]

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

WATER BUDGET OF POOL

ANNUAL SUMMARY

1970 WATER YEAR

[illegible] [illegible] No. 10 near Elmendorf, Tex Drainage Area 6.13 sq mi

[illegible] ratio - Date of last sediment survey Sept. 3, 1958.

[illegible] gage height [illegible], outflow [illegible] cfs; surface area, 70.9 acres; contents, 383 acre-feet; on May 26

[illegible] gage height [illegible], surface area, [illegible] acres; contents, 155 acre-feet; on Oct. 4.

[illegible] outflow - cfs (averaged for 5-min. interval and adjusted for rainfall on pool surface) on -.

[illegible] - water years, [illegible] - [illegible]: inflow, - acre-feet/year; outflow, - acre-feet/year; rainfall, - inches/year.

[illegible], water year October 1969 to September 1970.

	[illegible]	[illegible]	[illegible]	[illegible] 1969	[illegible]	Feb	Mar	Apr	May	June	July	Aug.	Sept	Water year 1970
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.6	0.2	78.0	0	272	0	17.1	0	5.4	481
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	154	11.9	0	e18.8	e10.0	195
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	18.1	17.7	28.0	33.0	43.8	64.5	57.8	48.8	31.5	420
[illegible]	[illegible]	[illegible]	-5.2	[illegible]	-10.4	-5.2	+61.4	-29.4	+104	-74.4	-35.0	-59.8	-22.0	+0.2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	54.8	53.6	58.4	59.0	58.4	63.9	57.8	54.2	45.0	55.8
[illegible]	[illegible]	[illegible]	[illegible]	32.30	1.32	2.75	2.43	0.79	5.93	0.38	1.20	1.65	3.83	29.47

[illegible]

Peak inflow - (base, - cfs)

Date	Time	Discharge	Date	Time	Discharge

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT

SAN ANTONIO BASIN

Monthly reservoir data, water year October 1969 to September 1970

Calaveras Lake near Elmendorf, Tex.
Drainage area, 65 sq mi

Date	Diversions from San Antonio River (acre-feet)	Outflow (acre-feet)	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	-	0	475.5	34,330	-
Oct. 31	54.0	92.6	477.8	40,100	+ 5,770
Nov. 30	6,100	0	479.6	45,030	+ 4,930
Dec. 31	6,480	0	481.5	50,620	+ 5,590
Calendar year 1969	51,210	116	-	-	+49,900
Jan. 31	1,430	0	482.0	52,150	+ 1,530
Feb. 28	0	0	482.0	52,150	0
Mar. 31	0	0	481.8	51,530	- 620
Apr. 30	0	0	481.3	50,010	- 1,520
May 31	53.3	0	482.3	53,090	+ 3,080
June 30	303	0	482.0	52,150	- 940
July 31	4,030	0	482.5	53,720	+ 1,570
Aug. 31	1,270	0	482.1	52,460	- 1,260
Sept. 30	1,430	0	482.1	52,460	0
Water year 1970	21,150	92.6	-	-	+18,130

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK 1970 WATER YEAR

RAIN GAGES

Date of Storm	2-R	5-S	8-S	11-R	Average
Oct. 4, 1969	0.32	0.32	0.58	0.15	
5	1.45	1.57	1.42	1.25	
6	1.58	1.30	.43	2.00	
7	0	0	.46	.05	
12	1.29	1.24	.87	.93	
27	.32	.38	.29	.12	
28-29	.54	.23	.17	.50	
29	.05	.30	.42	.05	
October Totals	5.55	5.34	4.64	5.05	5.14
Nov. 16, 1969	.08	.01	0	0	
17	0	.02	.08	0	
18	.88	.81	.93	.55	
23-24	.17	.14	.13	.10	
26-27	.58	.69	.69	.58	
28	0	0	.04	0	
November Totals	1.71	1.67	1.87	1.23	1.62

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK — 1970 WATER YEAR

Date of Storm	RAIN GAGES 2-R	5-S	8-S	11-R	Average
Dec. 5, 1969	0.95	1.15	1.06	1.05	
5-6	.77	.94	.80	.85	
29-30	.96	.85	.82	.50	
December Totals	2.68	2.94	2.68	2.40	2.68
1969 Calendar Year Total	31.33	35.50	32.30	30.91	32.51
Jan. 2, 1970	.11	.16	.24	.15	
4-5	.64	.74	.27	.60	
10	0	.11	0	.06	
11	.07	0	.55	0	
14	.07	.04	.07	0	
16	.08	.18	.19	.15	
January Totals	.97	1.23	1.32	.96	1.12
Feb. 1, 1970	.14	.20	.24	.12	
5	.41	.65	.30	.10	
6	.38	.05	.48	.55	
15	.10	.11	.09	0	
21	0	.04	.01	0	
22-24	1.69	1.60	1.51	1.30	
27	.10	.10	.12	.10	
February Totals	2.82	2.75	2.75	2.17	2.62

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK — 1970 WATER YEAR

Date of Storm	RAIN GAGES 2-R	5-S	8-S	11-R	Average
Mar. 2, 1970	0.40	0.27	0.16	0.31	
3	0	0	.07	0	
4	0	0	.04	.05	
6	.87	.89	.95	.57	
10	.10	.07	.17	.08	
16	.12	.07	.67	.08	
21	.24	.23	0	.22	
28	.11	.12	.37	0	
March Totals	1.84	1.65	2.43	1.31	1.81
Apr. 9, 1970	.55	.37	.04	.50	
10	0	0	.08	0	
15	.14	.11	.01	.04	
16	0	.01	.07	0	
18-19	.76	.77	.59	.75	
30	.08	.05	0	0	
April Totals	1.53	1.31	.79	1.29	1.23

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK 1970 WATER YEAR

Date of Storm	RAIN GAGES 2-R	5-S	8-S	11-R	Average
May 13, 1970	0	0.01	0.01	0	
14	.45	.47	.71	.50	
15	1.60	1.47	1.61	1.48	
22	1.40	.47	.24	.95	
23	1.80	1.44	.84	1.20	
24	.15	.10	0	.10	
26	1.26	2.31	1.17	2.00	
28	1.38	.92	.53	1.17	
30-31	.68	.86	.82	.85	
May Totals	8.72	8.05	5.93	8.25	7.74
June 1, 1970	.20	.07	.06	0	
21	.12	.25	.20	0	
24	.32	.26	.12	.08	
June Totals	.64	.58	.38	.08	.42
July 14, 1970	.10	.05	0	.04	
15	.17	.16	.69	.13	
16	.51	.50	.48	.60	
17	0	0	.03	.10	
25	.03	.03	0	0	
27	0	.01	0	0	
July Totals	.81	.75	1.20	.87	.91

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK — 1970 WATER YEAR

Date of Storm	RAIN GAGES 2-R	5-S	8-S	11-R	Average
Aug. 3, 1970	0.06	0.10	0.49	0	
4	.54	.81	1.13	.30	
11	.11	0	0	0	
15	.13	.06	.03	.10	
23	.12	.01	0	.28	
August Totals	.96	.98	1.65	.68	1.07
Sept. 1, 1970	0	.04	.05	.24	
12	.28	0	.67	0	
13	.24	.62	.17	.16	
19	0	0	.04	0	
20	.12	09	.01	.05	
21	.05	.04	.02	0	
23	.76	.84	.68	.48	
25	1.40	1.74	1.65	1.10	
26	.40	.41	.48	.28	
27	0	0	.06	0	
September Totals	3.25	3.78	3.83	2.31	3.29
1970 Water Year Totals	31.48	31.03	29.47	26.60	29.64

Form A-88
Rev. 1-63

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey - Water Resources Division

RAINFALL DATA SUMMARY

STUDY AREA CALAVERAS CREEK — 1970 WATER YEAR

Date of Storm	RAIN GAGES 2-R	5-S	8-S	11-R	Average
Aug. 3, 1970	0.06	0.10	0.49	0	
4	.54	.81	1.13	.30	
11	.11	0	0	0	
15	.13	.06	.03	.10	
23	.12	.01	0	.28	
August Totals	.96	.98	1.65	.68	1.07
Sept. 1, 1970	0	.04	.05	.24	
12	.28	0	.67	0	
13	.24	.62	.17	.16	
19	0	0	.04	0	
20	.12	09	.01	.05	
21	.05	.04	.02	0	
23	.76	.84	.68	.48	
25	1.40	1.74	1.65	1.10	
26	.40	.41	.48	.28	
27	0	0	.06	0	
September Totals	3.25	3.78	3.83	2.31	3.29
1970 Water Year Totals	31.48	31.03	29.47	26.60	29.64

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

Sheet 1 of 1

INFLOW AND OUTFLOW COMPUTATIONS

Storm period Oct 6-7, 1969

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height ft	Storage ac-ft	Time int. hrs	Change in storage ac-ft	Change in storage cfs	Mean G. Ht. ft	Outflow cfs	Total inflow cfs	Rainfall on Pool in	Rainfall on Pool area ac	Rainfall on Pool Storage ac-ft	Rainfall on Pool Storage cfs	Net Inflow Rate cfs	Net Inflow Rate in/hr	Net Inflow in	Net Inflow Acc in
Oct 6																
0000	9.286															
17.00	9.217	6.21	17.0	-	0			0					0.	0	0	
30	9.223	6.23	.5	+0.02	48	9.22		.48					.48	.0001	0	
18.00	9.723	7.99	.5	+1.76	42.6	9.47		42.6	1.7%	3.2	0.47	11.4	31.2	.0069	.0034	.0034
19.00	10.710	12.44	1.0	+4.45	538	10.22		538	.2%	4.5	.09	1.1	52.7	.0116	.0116	.0150
20.00	12.270	22.53	1.0	+10.09	122	11.49		122					122	.0270	.0270	.0420
20	13.400	32.30	.333	+ 9.77	355	12.84		355					355	.0785	.0262	.0682
30	14.000	38.38	.167	+6.08	441	13.70		441					441	.0975	.0442	.0844
35	14.935	42.16	.083	+3.78	549	14.17	0	549					549	.1213	.0101	.0945
40	14.625	46.23	.083	+4.07	521	14.52	0	521					521	.1306	.0102	.1054
45	15.010	50.11	.083	+3.88	563	14.85	.09	563					563	.1244	.0104	.1158
21.00	15.435	58.82	.25	+8.71	422	15.32	2.8	425					425	.0939	.0235	.1393
22.00	17.245	89.30	1.0	+30.48	369	16.44	11.0	380					380	.0840	.0840	.2233
23.00	17.730	101.78	1.0	+12.48	151	17.52	17.0	168					168	.0371	.0371	.2604
2400	18.018	107.35	1.0	+5.57	674	17.90	19.2	864					86.6	.0121	.0121	.2725
							24 47.21									
							E.D									
Oct 7																
02.00	18.109	109.63	2.0	+2.28	19.8	18.06	21.6	35.4					35.4	.0078	.0156	.2951
04.00	18.073	108.72	2.0	-.91	-5.5	18.09	22.5	17.0					17.0	.0038	.0076	.3027
06.00	17.990	106.65	2.0	-2.07	-12.5	18.03	20.7	8.2					8.2	.0018	.0036	.3063
08.00	17.895	104.32	2.0	-2.33	-14.1	17.94	19.4	5.3					5.3	.0012	.0024	.3087
12.00	17.670	98.96	4.0	-5.38	-16.3	17.78	18.5	2.2					2.2	.0005	.0020	.3107
18.00	17.314	90.82	6.0	-8.12	-16.4	17.49	16.9	.50					.50	.0001	.0006	.3113
2400	16.950	82.98	6.0	-7.84	-16.8	17.13	14.9	0					0	0	0	.3113
							24 483.2									
							18.0									
													Runoff for storm period =		116 ac-ft	

comp by DRR 11/5/70 ed by EPP 11/19/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

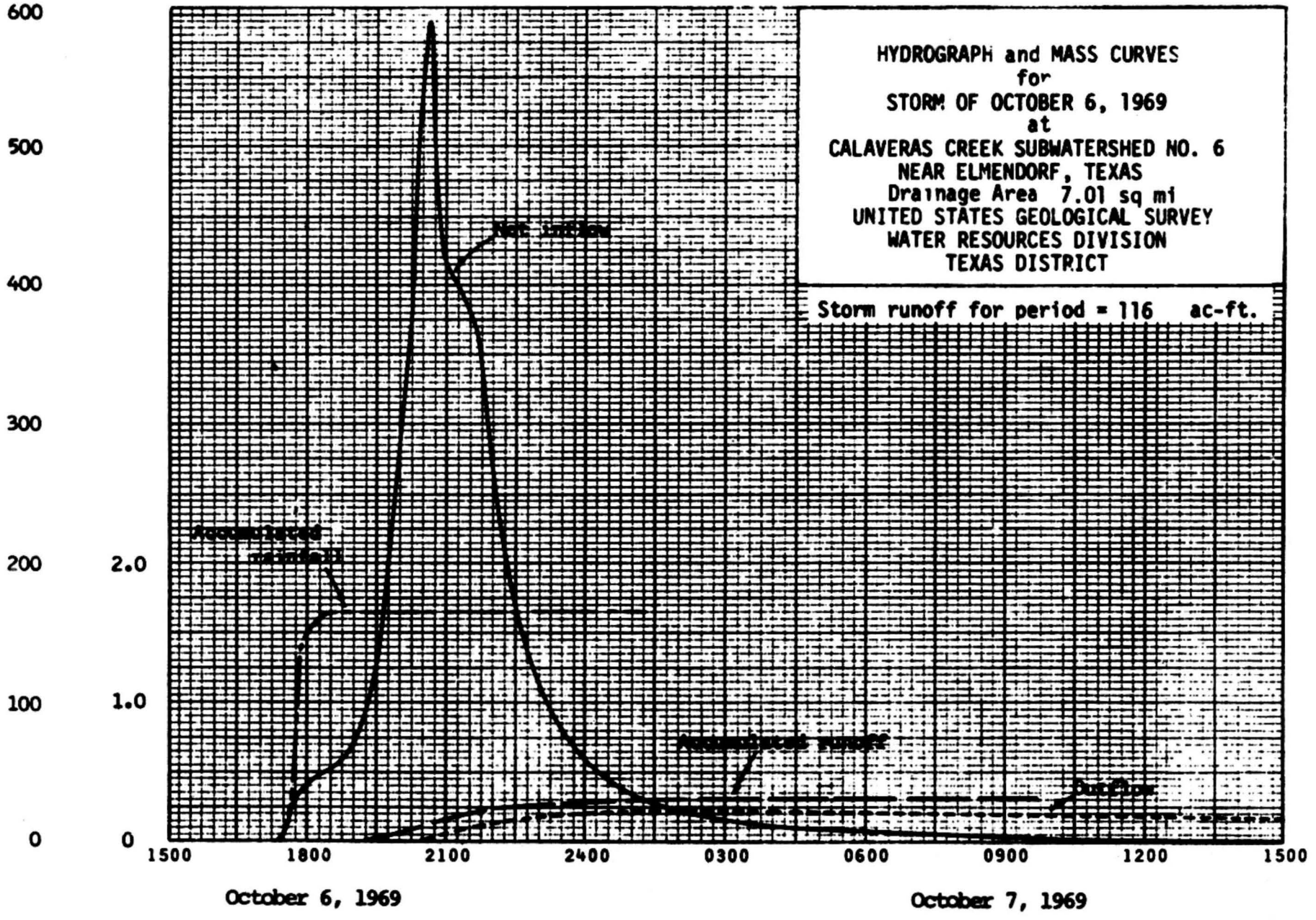
Sheet 1 of 1
Comp. by ARR
Date 4/20/71
Check by EBP
Date 4/21/71

Study Area *Calaveras Creek subwatershed No 6 near Elmendorf, Tex* Date of storm *Oct 6, 1969*

	Accumulated Precipitation in Inches for Recording Rain Gages												Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 2-R		Gage 11-R		Gage		Gage		Gage		Gage			
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recording Gages All Gages	(Rec. Gages x K) All Gages
Oct 6, 1969														
1725	0	0	0	0									0	
30	.06	.05	0	0									.05	
35	.10	.08	.05	.01									.09	
40	.50	.41	.55	.10									.51	
45	.88	.73	.89	.16									.89	
50	1.23	1.02	1.55	.27									1.29	
55	1.39	1.15	1.75	.31									1.46	
1800	1.42	1.17	1.85	.32									1.49	
15	1.53	1.26	1.95	.34									1.60	
30	1.58	1.30	2.00	.35									1.65	

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
										WMR	1.65

WMR : Sum of Precipitation x Weight Factor   K : WMR / Total Recording Gages Weighted Precipitation :


HYDROGRAPH and MASS CURVES
for
STORM OF OCTOBER 6, 1969
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 116 ac-ft.
Net inflow
Accumulated rainfall
Runoff
Outflow
600
500
400
300
200
100
0
2.0
1.0
0
1500
1800
2100
2400
0300
0600
0900
1200
1500
October 6, 1969
October 7, 1969

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek nr Elmendorf, Texas

Period of Record Oct. 6 - 7, 1969 Drainage Area 12.2 sq. mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
Oct 6, 1969							
0000	5.53	0	0.18	12	0		
0600	5.47		.09	24	0		
1200	5.42		.04	18	0		
1500	5.38		.01	7	0		
30	5.42		.04	2	0		
1600	5.41		.03	3	0		
1700	5.60		.30	3	0		
30	5.61		.32	3	0		
1830	5.77		.77	3	.0001	0.0001	0.0001
1900	5.95		1.6	2	.0002	.0001	.0002
30	6.29		4.2	2	.0005	.0002	.0004
2000	6.39		5.4	2	.0007	.0004	.0008
30	7.75		47	2	.0060	.0030	.0038
2100	8.54		82	2	.0104	.0082	.0090
30	8.49		80	2	.0102	.0051	.0141
2200	8.20		65	3	.0083	.0062	.0203
2300	7.48		36	4	.0046	.0046	.0249
2400	6.83	0	13	2	.0017	.0008	.0257
			84.85	96			
			8.8				

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
Oct 7, 1969							
0000	6.83	0	13	1	0.0017	0.0008	0.0265
0100	6.38		5.3	2	.0007	.0007	.0272
0200	6.12		2.7	2	.0003	.0003	.0275
0300	5.91		1.4	2	.0002	.0002	.0277
0400	5.80		.86	3	.0001	.0002	.0279
0600	5.63		.36	5	0		
0900	5.54		.19	6	0		
1200	5.50		.13	9	0		
1800	5.43		.05	12	0		
2400	5.38	0	.01	6	0		
			23.15	48			
			.88				

Runoff for storm period = 182 ac-ft

Computed by DAR Date 9/24/70 Checked by EBL Date 10/1/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

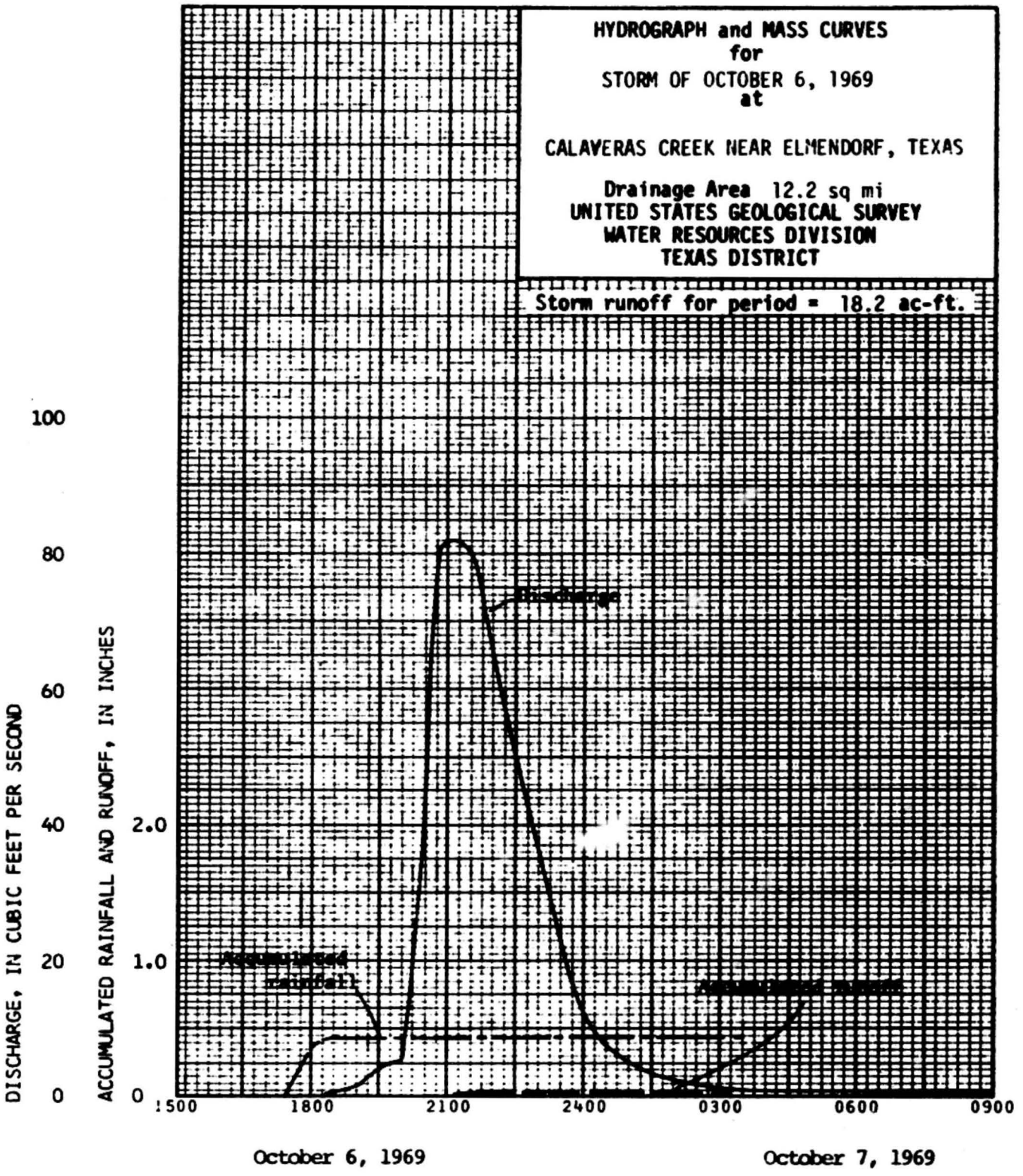
Sheet 1 of 1
Comp. by CRR
Date 4/21/71
Check by DRR
Date 4/26/71

Study Area Calaveras Creek near Elmendorf, Tex. Date of storm Oct. 6, 1969

Accumulated Precipitation in Inches for Recording Rain Gages												Accumulated Weighted Precipitation	
Weight Factor		0.8254		0.1746									
	Gage	B-R	Gage	M-R	Gage		Gage		Gage		Gage		Recording Gages	Rec. Gages + All Gages
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	All Gages	
Oct. 6, 1969														
1725	0	0	0	0									0	0
30	.06	.05	0	0									.05	.01
35	.10	.08	.05	.01									.09	.02
40	.50	.41	.55	.10									.51	.13
45	.88	.73	.89	.16									.89	.23
50	1.22	1.02	1.55	.27									1.29	.34
55	1.39	1.15	1.75	.31									1.46	.38
1800	1.42	1.17	1.85	.32									1.49	.39
15	1.53	1.26	1.95	.34									1.60	.42
30	1.58	1.30	2.00	.35									1.65	.43

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
B-S	1.00	0.43	0.43								
										Σ_{WMR}	0.43

Σ_{WMR} : Sum of Precipitation x Weight Factor K : Σ_{WMR} / Total Recording Gages Weighted Precipitation = .43 / 1.65 = 0.261


HYDROGRAPH and MASS CURVES
for
STORM OF OCTOBER 6, 1969
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 18.2 ac-ft.
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
100
80
60
40
20
0
2.0
1.0
0
1500
1800
2100
2400
0300
0600
0900
October 6, 1969
October 7, 1969

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

INFLOW AND OUTFLOW COMPUTATIONS

Storm period Oct 12-13, 1969

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height ft	Storage ac-ft	Time int. hrs	Change in storage ac-ft	Change in storage cfs	Mean G. Ht. ft	Outflow cfs	Total inflow cfs	Rainfall on Pool in	Rainfall on Pool area ac	Rainfall on Pool Storage ac-ft	Rainfall on Pool Storage cfs	Net Inflow Rate cfs	Net Inflow Rate in/hr	Net Inflow in	Net Inflow Acc in
Oct	12															
0000	14.897	48.69														
1300	14.867	48.32	13.0	-0.37	-0.34	14.88	0.18	0					0	0	0	0
1400	15.000	49.98	1.0	+1.66	20.1	14.93	.37	20.5	0.93	12.6	0.97	11.7	8.8	.0019	.0019	.0019
1500	15.150	51.92	1.0	+1.94	23.5	15.08	1.1	24.6					24.6	.0054	.0054	.0073
30	15.265	53.45	.5	+1.53	37.0	15.21	1.9	38.9					38.9	.0086	.0043	.0116
1600	15.462	56.22	.5	+2.77	67.0	15.36	3.2	70.2					70.2	.0155	.0078	.0194
30	15.740	60.46	.5	+4.24	103	15.60	5.4	108					108	.0239	.0120	.0314
1700	16.070	65.99	.5	+5.53	134	15.90	7.8	142					142	.0314	.0157	.0471
15	16.240	69.03	.25	+3.04	147	16.16	9.5	156					156	.0345	.0086	.0557
20	16.296	70.06	.083	+1.03	150	16.27	10.1	160					160	.0354	.0030	.0587
25	16.352	71.10	.083	+1.04	151	16.32	10.4	161					161	.0356	.0030	.0617
30	16.408	72.15	.083	+1.05	152	16.38	10.7	163					163	.0360	.0030	.0647
35	16.463	73.20	.083	+1.05	152	16.44	11.0	163					163	.0360	.0030	.0677
45	16.569	75.26	.167	+2.06	150	16.52	11.4	161					161	.0356	.0059	.0736
1800	16.722	78.29	.25	+3.03	147	16.65	12.0	159					159	.0351	.0088	.0824
30	16.983	83.65	.5	+5.36	130	16.85	13.2	143					143	.0316	.0158	.0982
1900	17.155	87.34	.5	+3.69	89.3	17.07	14.5	104					104	.0230	.0115	.1097
2000	17.392	92.56	1.0	+5.22	63.2	17.27	15.7	78.9					78.9	.0174	.0174	.1271
2200	17.596	97.21	2.0	+4.65	28.1	17.49	16.9	45.0					45.0	.0099	.0198	.1469
2400	17.631	98.03	2.0	+.82	5.0	17.61	17.5	22.5					22.5	.0050	.0100	.1569
						24)	122.09									
							5.1									
Oct	13															
0600	17.460	94.10	6.0	-3.93	-7.9	17.54	17.1	9.2					9.2	.0020	.0120	.1689
1200	17.155	87.34	6.0	-6.76	-13.6	17.31	16.0	2.4					2.4	.0005	.0030	.1719
1800	16.830	80.49	6.0	-6.85	-13.8	16.99	14.0	.20					.20	0	0	.1719
2400	16.505	74.89	6.0	-5.60	-11.3	16.67	12.1	.80					.80	.0002	.0012	.1731
						4	59.2									
							14.8									
												Runoff for storm period			= 64	7 ac-ft

Comp by DAR 11/9/70 ck'd [illegible] 11/10/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

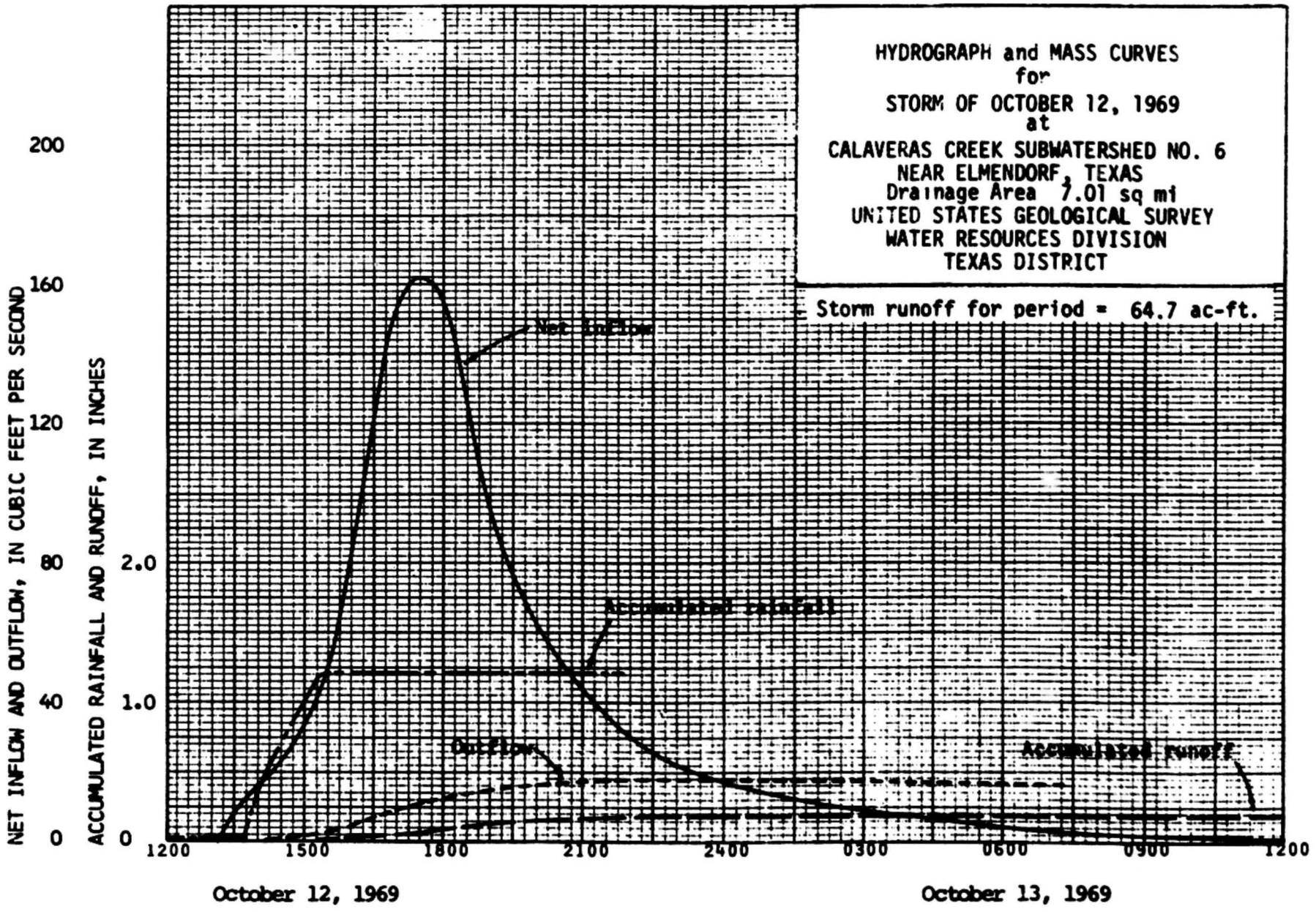
Sheet 1 of 1
Comp. by: DRR
Date 4/20/71
Check by RRP
Date 4/21/71

Study Area Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex. Date of storm Oct 12, 1969

Weight Factor													Accumulated Weighted Precipitation	
	Accumulated Precipitation in Inches for Recording Rain Gages													
	Gage 2-R 0.8234		Gage 11-R 0.1746		Gage		Gage		Gage		Gage		Recording Gages	Rec. Gages x K)
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	All Gages	All Gages
Oct 12, 1969														
0930	0	0	0	0									0	
1000	.03	.02	0	0									.02	
1100	.03	.02	0	0									.02	
1130	.05	.04	0	0									.04	
1340	.05	.04	0	0									.04	
45	.10	.08	.25	.04									.12	
50	.18	.15	.50	.09									.24	
55	.22	.18	.99	.16									.34	
1400	.27	.23	.99	.16									.38	
15	.44	.36	.99	.16									.52	
30	.62	.51	.99	.16									.67	
45	.82	.68	.99	.16									.84	
1500	1.05	.87	.99	.16									1.03	
15	1.26	1.04	.99	.16									1.20	
30	1.29	1.06	.99	.16									1.22	

Main Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Main Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Main Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
											SWP: 1.22

SWP : Sum of Precipitation x Weight Factor K : SWP / Total Recording Gages Weighted Precipitation :


HYDROGRAPH and MASS CURVES
for
STORM OF OCTOBER 12, 1969
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 64.7 ac-ft.
Net Inflow
Accumulated rainfall
Outflow
Accumulated runoff
NET INFLOW AND OUTFLOW, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
200
160
120
80
40
0
2.0
1.0
0
1200
1500
1800
2100
2400
0300
0600
0900
1200
October 12, 1969
October 13, 1969

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek near Elmendorf, Texas

Period of Record Oct. 12-15, 1969 Drainage Area 18.2 sq mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Inc.	In/hr.	Runoff Inches	Acc. In.
Oct. 12, 1969							
0000	5.59	0	0.28	28	0		
1400	5.58		27	29	0		
30	5.64		38	2	0		
1500	5.87		1.2	2	.0002	.0001	.0001
30	6.45		6.2	2	.0008	.0004	.0005
1600	7.00		18	2	.0023	.0012	.0017
30	7.65		43	2	.0055	.0028	.0045
1700	8.10		61	2	.0077	.0038	.0083
30	8.15		63	2	.0080	.0040	.0123
1800	7.88		52	2	.0066	.0033	.0156
30	7.59		41	2	.0052	.0026	.0182
1900	7.30		29	2	.0037	.0018	.0200
30	6.98		17	2	.0022	.0011	.0211
2000	6.73		11	3	.0014	.0010	.0221
2100	6.38		5.3	4	.0007	.0007	.0228
2200	6.28		4.1	4	.0005	.0005	.0233
2300	6.14		2.8	4	.0004	.0004	.0237
2400	6.01	0	2.0	2	.0003	.0002	.0239
			765.03	96			
			8.0				
Oct. 13, 1969							
0000	6.01	0	2.0	1	.0003	.0002	.0241
0100	5.91		1.4	2	.0002	.0002	.0243
0200	5.83		.98	3	.0001	.0002	.0245
0400	5.73		.65	4	.0001	.0002	.0247
0600	5.68		.50	5	.0001	.0002	.0249
0900	5.63		.36	6	0		
1200	5.61		.32	9	0		
1800	5.56	0	.23	12	0		

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Inc.	In/hr.	Runoff Inches	Acc. In.
Oct. 13 Cont.							
2400	5.53	0	0.18	6	0		
			21.72	48			
			.45				
Oct. 14, 1969							
0000	5.53	0	0.18	2	0		
0600	5.51		.15	4	0		
1200	5.48		.11	4	0		
1800	5.46		.08	3	0		
2100	5.42		.04	2	0		
2400	5.38	0	.01	1	0		
			1.73	16			
			.11				
Oct. 15, 1969							
0000	5.38	0	0.01	1	0		
0300	5.33	0	0	8	0		
2400	5.14	0	0	7	0		
			.01	16			
			0				

Runoff for storm period = 16.2 ac-ft

Computed by EEL Date 10/19/70 Checked by DAL Date 10/20/70

TX-78 (Revised July 1969)

Sheet 1 of 1
Comp. by: EBB
Date 4/21/71
Check by DGR
Date 4/26/71

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

WEIGHTED-PRECIPITATION RECORD

Study Area Calaveras Creek near Elmendorf, Tex. Date of storm Oct. 12, 1969

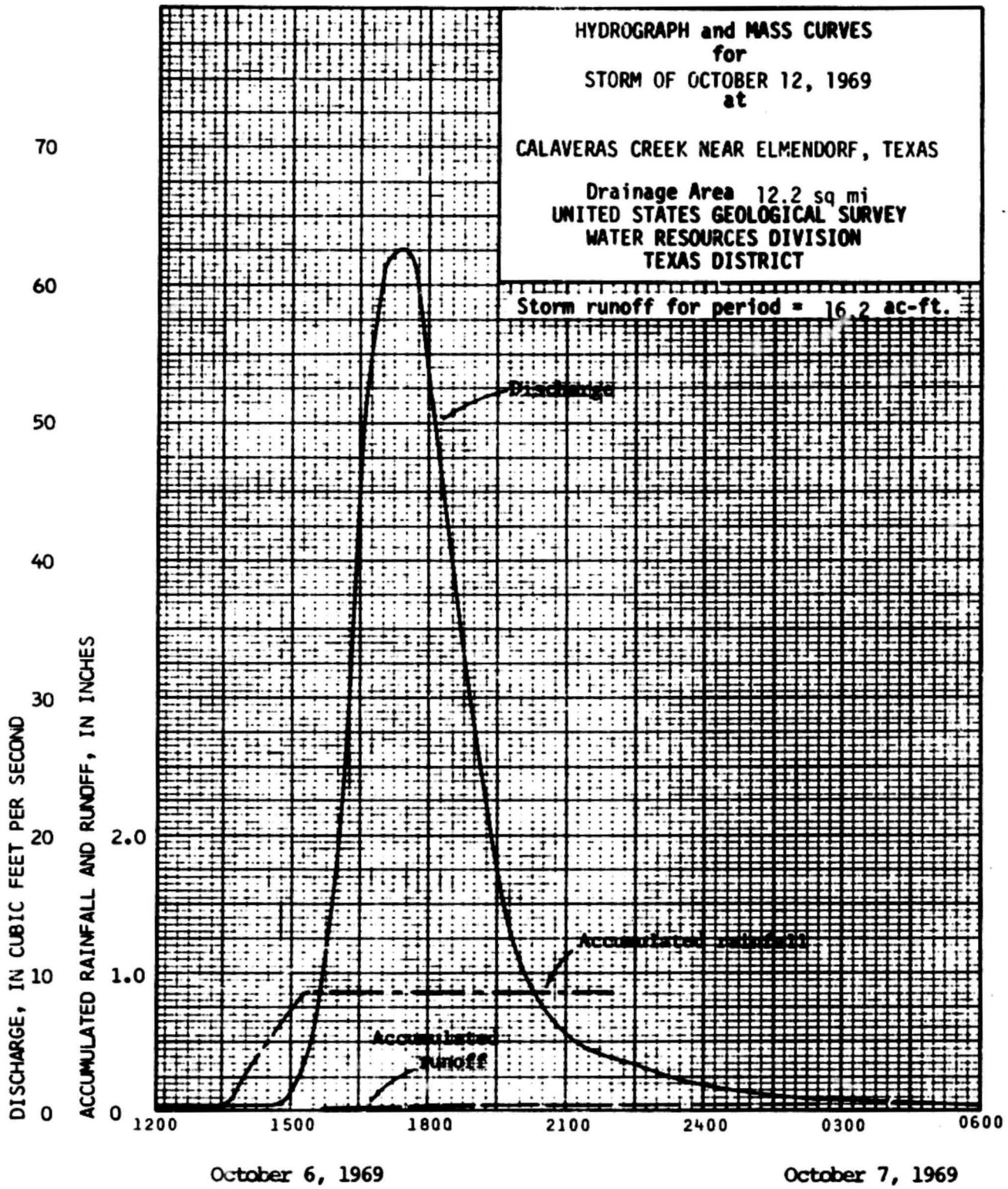
	Accumulated Precipitation in Inches for Recording Rain Gages												Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 2-R		Gage 11-R		Gage		Gage		Gage		Gage		Recording Gages	(Rec. Gages x K)
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	All Gages	All Gages
Oct. 12, 1969														
0930	0	0	0	0									0	0
1000	.03	.02	0	0									.02	.01
1100	.03	.02	0	0									.02	.01
1130	.05	.04	0	0									.04	.03
1340	.05	.04	0	0									.04	.03
45	.10	.08	.25	.04									.12	.09
50	.18	.15	.50	.09									.24	.17
55	.22	.18	.93	.16									.34	.24
1400	.27	.22	.93	.16									.38	.27
15	.44	.36	.93	.16									.52	.37
30	.62	.51	.93	.16									.67	.48
45	.82	.68	.93	.16									.84	.60
1500	1.05	.87	.93	.16									1.03	.73
15	1.26	1.04	.93	.16									1.20	.86
30	1.29	1.06	.93	.16									1.22	.87

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
8-S	1.00	0.87	0.87								

WWR = 0.87

WWR = Sum of Precipitation x Weight Factor   K = WWR / Total Recording Gages Weighted Precipitation = 0.87/1.22 = 0.713

-38-


HYDROGRAPH and MASS CURVES
for
STORM OF OCTOBER 12, 1969
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 16.2 ac-ft.
Discharge
Accumulated rainfall
Accumulated runoff
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
70
60
50
40
30
20
10
0
2.0
1.0
0
1200
1500
1800
2100
2400
0300
0600
October 6, 1969
October 7, 1969

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

Sheet 1 of 1

INFLOW AND OUTFLOW COMPUTATIONS

Storm period Dec. 6, 1969

08182400 Calaveras Creek subwaterabed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height ft	Storage ac-ft	Time int. hrs	Change in storage ac-ft	Change in storage cfs	Mean G. Ht. ft	Outflow cfs	Total inflow cfs	Rainfall on Pool in	Rainfall on Pool area ac	Rainfall on Pool Storage ac-ft	Rainfall on Pool Storage cfs	Net Inflow Rate cfs	Net Inflow Rate in/hr	Net Inflow in	Net Inflow Acc in
Dec 6																
0000	14.075	39.18														
0330	14.149	39.98	3.5	+0.80	2.8	14.11	0	2.8					2.8	0.0006	0.0021	0.0021
0500	14.353	42.02	1.5	+2.04	16.5	14.24	0	16.5	0.53	11.1	0.49	40	12.5	.0028	.0042	.0063
0600	14.534	44.33	1.0	+2.31	28.0	14.43	0	28.0	.05	11.4	.05	.60	27.4	.0061	.0061	.0124
30	14.729	46.57	.5	+2.24	54.2	14.63	0	54.2					54.2	.0120	.0060	.0184
45	14.840	47.99	.25	+1.42	68.7	14.78	0	68.7					68.7	.0152	.0038	.0222
0700	14.960	49.46	.25	+1.49	72.1	14.90	.25	72.4					72.4	.0160	.0040	.0262
05	15.000	49.96	.083	+.50	72.6	14.98	.58	73.2					73.2	.0162	.0014	.0276
10	15.040	50.49	.083	+.51	74.1	15.02	.76	74.9					74.9	.0166	.0014	.0290
15	15.079	50.99	.083	+.50	72.6	15.06	.97	73.6					73.6	.0163	.0014	.0304
30	15.191	52.45	.25	+1.46	70.7	15.14	1.4	72.1					72.1	.0159	.0040	.0344
0800	15.295	56.25	.5	+2.80	67.8	15.28	2.6	70.4					70.4	.0156	.0078	.0422
0900	15.724	60.30	1.0	+4.05	59.9	15.56	5.0	64.9					64.9	.0143	.0143	.0565
1000	15.958	64.06	1.0	+3.86	46.7	15.84	7.4	54.1					54.1	.0120	.0120	.0685
1200	16.200	68.30	2.0	+4.24	25.7	16.08	9.0	34.7					34.7	.0077	.0154	.0839
1500	16.270	69.58	3.0	+1.28	5.2	16.24	10.0	15.2					15.2	.0034	.0102	.0941
1800	16.322	68.70	3.0	−.88	-3.5	16.25	10.0	6.5					6.5	.0014	.0042	.0983
2100	16.135	67.13	3.0	−1.57	-6.3	16.18	9.6	3.3					3.3	.0007	.0021	.1004
2400	16.032	65.33	3.0	−1.80	-7.3	16.08	9.0	1.7					1.7	.0004	.0012	.1016
							24) 148.10									
							6.2									

Runoff for storm period = 380 ac-Ft

Comp by DRR 11/6/70

Ved SLL 11/18/70

IV -8 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

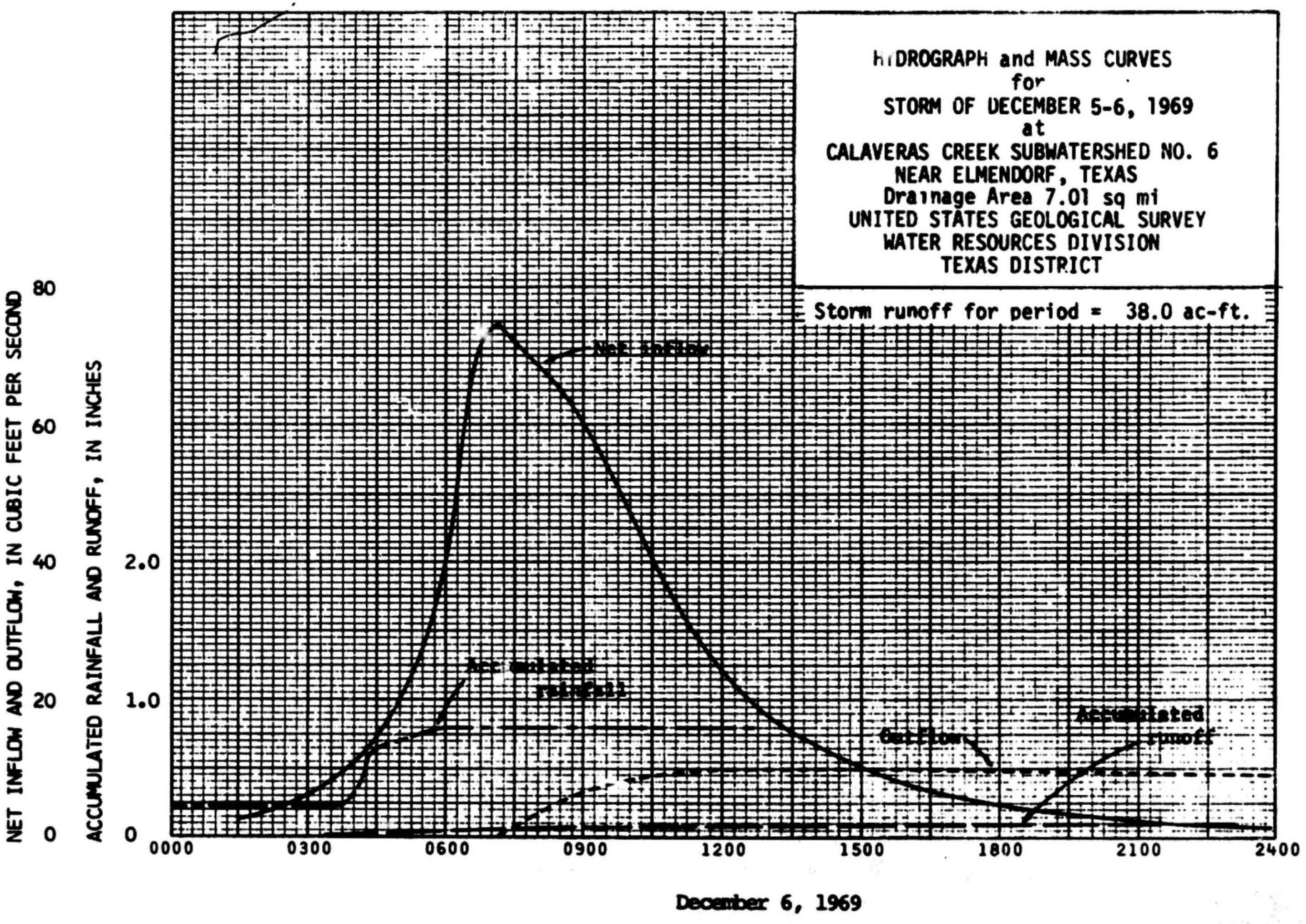
Sheet 1 of 1
Comp. by DRR
Date 4/20/71
Check by EBP
Date 4/21/71

Study Area Calaveras Creek Subwatershed No 6 near Elmendorf, Tex Date of storm Dec 5-6, 1969

Accumulated Precipitation in Inches for Recording Rain Gages													Accumulated Weighted Precipitation	
Weight Factor		0.8254		0.1746										
	Gage	2-R	Gage	11-R	Gage		Gage		Gage		Gage		Recording Gages	(Rec. Gages x K)
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	All Gages	All Gages
Dec 5, 1969														
2300	0	0	0	0									0	
15	0	0	.05	.01									.01	
30	.05	.04	.15	.03									.07	
45	.19	.16	.28	.05									.21	
2400	.23	.19	.28	.05									.24	
Dec 6, 1969														
0345	.23	.19	.28	.05									.24	
0400	.23	.19	.52	.09									.28	
15	.45	.37	.75	.13									.50	
30	.62	.51	.78	.14									.65	
45	.65	.54	.79	.14									.68	
0500	.66	.54	.82	.14									.68	
15	.69	.57	.85	.15									.72	
30	.73	.60	.85	.15									.75	
45	.75	.62	.85	.15									.77	
0600	.77	.64	.85	.15									.79	

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
											ΣWR 0.79

ΣWR : Sum of Precipitation x Weight Factor K : ΣWR / Total Recording Gages Weighted Precipitation :


HYDROGRAPH and MASS CURVES
for
STORM OF DECEMBER 5-6, 1969
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 38.0 ac-ft.
Net inflow
Accumulated rainfall
Outflow
Accumulated runoff
NET INFLOW AND OUTFLOW, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
0
20
40
60
80
0
1.0
2.0
0000
0300
0600
0900
1200
1500
1800
2100
2400
December 6, 1969

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek nr Elmendorf, Texas

Period of Record Dec. 6-7, 1969 Drainage Area 12.2 sq.mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
Dec	6	1969					
0000	5.64	0	0.38	8	0		
0400	5.61		.32	9	0		
30	5.68		.50	2	.0001	0	0
0500	6.56		7.9	3	.0010	0.0008	.0008
0600	6.55		7.8	3	.0010	.0008	.0016
30	8.60		85	2	.0108	.0054	.0070
0700	8.86		98	2	.0124	.0062	.0132
30	8.69		90	2	.0114	.0057	.0189
0800	8.41		76	2	.0097	.0048	.0237
30	8.05		59	2	.0075	.0038	.0275
0900	7.61		41	2	.0052	.0026	.0301
30	7.29		29	2	.0037	.0018	.0319
1000	6.95		16	3	.0020	.0015	.0334
1100	6.55		7.8	4	.0010	.0010	.0344
1200	6.92		4.5	4	.0006	.0006	.0350
1300	6.20		3.9	4	.0004	.0004	.0354
1400	6.10		2.5	6	.0003	.0004	.0358
1600	5.95		1.6	8	.0002	.0004	.0362
1800	5.82		.94	10	.0001	.0002	.0364
2100	5.68		.50	12	.0001	.0003	.0367
2400	5.62	0	.34	6	0		
		1,165.46	96				
			12				

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
		Dec.	7, 1970				
0000	5.62	0	0.34	3	0		
0300	5.57		.25	6	0		
0600	5.52		.16	9	0		
1200	5.48		.11	12	0		
1800	5.45		.07	12	0		
2400	5.42	0	.04	6	0		
			6.36	48			
			.13				

Runoff for storm period = 239 ac-ft

Computed by DRR Date 9/24/70 Checked by LEP Date 10/1/70

TX-78 (Revised July 1969)

Sheet 1 of 1
Comp. by: EBE
Date 4/21/71
Check by DRR
Date 4/26/71

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

WEIGHTED-PRECIPITATION RECORD

Study Area Calaveras Creek near Elmendorf, Tex. Date of storm Dec. 5-6, 1969

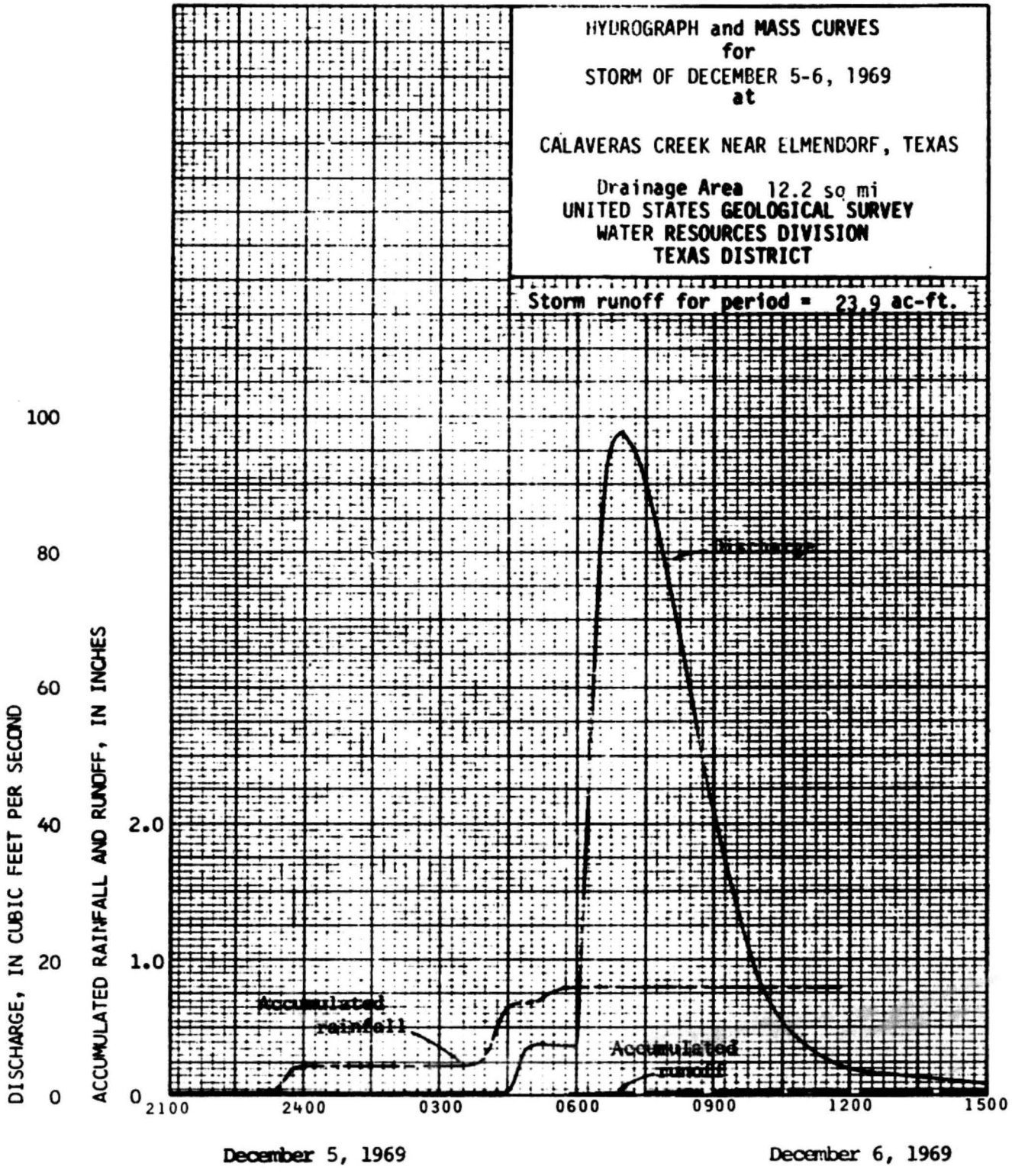
	Accumulated Precipitation in Inches for Recording Rain Gage												Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 8-R		Gage 11-R		Gage		Gage		Gage		Gage			
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recording Gages All Gages	Rec. Gages x K All Gages
Dec. 5, 1969														
2300	0	0	0	0									0	0
15	0	0	.05	.01									.01	.01
30	.05	.04	.15	.03									.07	.07
45	.19	.16	.28	.05									.21	.21
2400	.23	.19	.28	.05									.24	.24
Dec 6														
0345	.23	.19	.28	.05									.24	.24
0400	.23	.19	.52	.09									.28	.28
15	.45	.37	.75	.13									.50	.51
30	.62	.51	.78	.14									.65	.66
45	.65	.54	.79	.14									.68	.69
0500	.66	.54	.82	.14									.68	.69
15	.69	.57	.85	.15									.72	.73
30	.73	.60	.85	.15									.75	.76
45	.75	.62	.85	.15									.77	.78
0600	.77	.64	.85	.15									.79	.80

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
8-S	1.00	0.80	0.80								

WWR 0.80

WWR = Sum of Precipitation x Weight Factor

K = WWR / Total Recording Gages Weighted Precipitation = 0.80/.79 = 1.013


HYDROGRAPH and MASS CURVES
for
STORM OF DECEMBER 5-6, 1969
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 23.9 ac-ft.
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
100
80
60
40
20
0
2.0
1.0
0
Discharge
Accumulated rainfall
Accumulated runoff
2100
2400
0300
0600
0900
1200
1500
December 5, 1969
December 6, 1969

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

Sheet 1 of 1

INFLOW AND OUTFLOW COMPUTATIONS

Storm period May 23-24, 1970

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height ft	Storage ac-ft	Time int. hrs	Change in storage ac-ft	Change in storage cfs	Mean G. Ht. ft	Outflow cfs	Total inflow cfs	Rainfall on Pool in	Rainfall on Pool area ac	Rainfall on Pool Storage ac-ft	Rainfall on Pool Storage cfs	Net Inflow Rate cfs	Net Inflow Rate in/hr	Net Inflow in	Net Inflow Acc in
May 23																
0000	14.614	45.27														
16.30	14.701	46.30	16.5	+1.03	0.75	14.66	0	0.75	0.05	14.9	0.05	0.04	0.71	0.0008	0.0033	0.0033
18.00	15.045	50.56	1.5	+4.26	34.4	14.87	.14	34.5	.90	12.3	.92	7.4	27.1	.0060	.0090	.0123
19.00	15.760	60.78	1.0	+10.22	124	15.40	3.6	128	.12	14.2	.14	1.7	126	.0278	.0278	.0401
15	16.085	66.25	.25	+5.47	265	15.92	7.9	273	.02	16.8	.05	1.5	272	.0681	.0150	.0551
30	16.420	73.72	.25	+7.47	362	16.29	10.2	372	.01	18.5	.02	1.0	371	.0880	.0205	.0756
35	16.620	76.26	.083	+2.54	369	16.56	11.6	381					381	.0842	.0070	.0826
40	16.752	78.90	.083	+2.64	383	16.69	12.2	395	.02	20.0	.03	4.4	391	.0864	.0072	.0898
45	16.884	81.60	.083	+2.70	392	16.82	13.0	405					405	.0895	.0075	.0973
50	17.016	84.36	.083	+2.76	401	16.95	13.8	415	.01	20.9	.02	2.9	412	.0911	.0076	.1049
55	17.145	87.12	.083	+2.76	401	17.08	14.6	416	.01	21.4	.02	2.9	413	.0913	.0076	.1125
2000	17.270	89.85	.083	+2.73	396	17.21	15.4	411	.01	21.8	.02	2.9	408	.0902	.0075	.1200
05	17.391	92.54	.083	+2.69	391	17.33	16.1	407	.01	22.2	.02	2.9	404	.0893	.0074	.1274
10	17.508	95.18	.083	+2.64	383	17.45	16.7	400	.01	22.6	.02	2.9	397	.0877	.0073	.1347
15	17.620	97.77	.083	+2.59	376	17.56	17.2	393	.01	23.0	.02	2.9	390	.0862	.0072	.1419
30	17.980	105.18	.25	+7.41	359	17.78	18.5	378	.02	23.9	.02	1.0	377	.0833	.0208	.1627
21.00	18.448	118.51	.5	+13.33	323	18.19	25.0	348					348	.0769	.0384	.2011
30	18.833	129.38	.5	+10.87	363	18.64	32.3	295					295	.0652	.0326	.2337
22.00	19.122	138.13	.5	+8.75	212	18.98	32.4	245					245	.0541	.0270	.2607
23.00	19.505	150.51	1.0	+12.38	150	19.31	32.8	183					183	.0404	.0404	.3011
24.00	19.722	157.93	1.0	+7.42	89.8	19.61	33.1	123					123	.0272	.0272	.3283
							24	1347.5								
May 24							5.6									
0300	19.902	164.31	3.0	+6.38	25.7	19.81	33.3	59.0					59.0	.0130	.0390	.3673
0600	19.845	162.28	3.0	-2.03	-8.2	19.87	33.4	25.2					25.2	.0056	.0168	.3841
0900	19.698	157.09	3.0	-5.19	-20.9	19.77	33.3	12.4	.10	25.2	.29	1.2	11.2	.0025	.0075	.3916
1200	19.505	150.51	3.0	-6.58	-26.6	19.60	33.1	6.6					6.6	.0015	.0045	.3961
1500	19.267	142.71	3.0	-7.80	-31.5	19.39	32.9	1.4					1.4	.0003	.0009	.3970
1800	19.005	134.52	3.0	-8.19	-33.0	19.14	32.7	0					0	0	0	.3970
2100	18.722	126.14	3.0	-8.38	-33.7	18.86	32.5									
2400	18.423	118.10	3.0	-8.06	-32.5	18.58	32.9									
							24	706.3								
								38.8								

Runoff for storm period = 148 ac-ft

Comp by DAR 11/9/70

Ck'd [illegible] 11/9/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

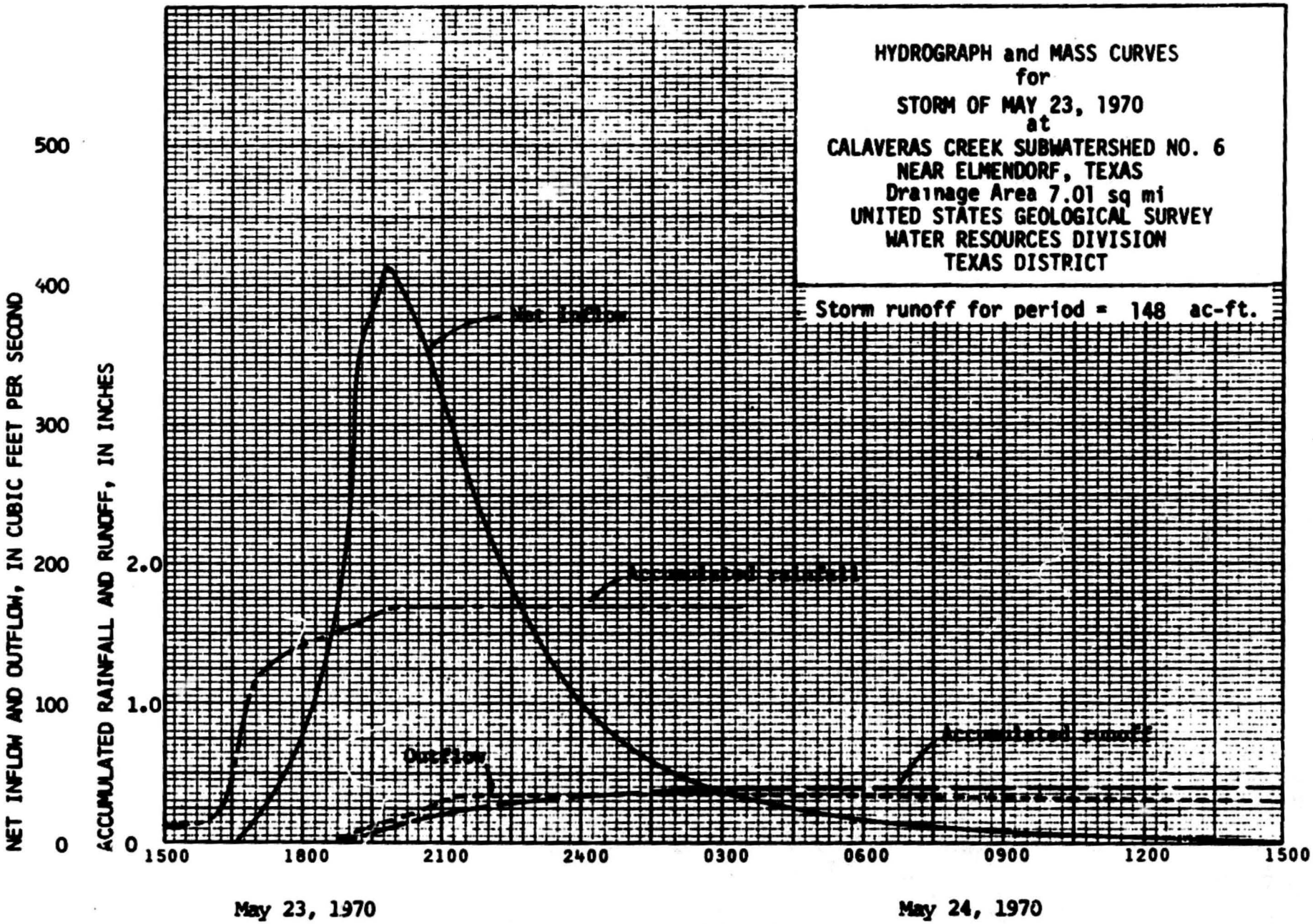
Sheet 1 of 1
Comp. by: DAR
Date 4/21/71
Check by EBR
Date 4/21/71

Study Area Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex. Date of storm May 23, 1970

Accumulated Precipitation in Inches for Recording Rain Gages														Accumulated Weighted Precipitation	
Weight Factor		0.8254		0.1746											
	Gage	2-R	Gage	11-R	Gage		Gage		Gage		Gage				
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recording Gages	(Rec. Gages x K) All Gages
May 23, 1970															
1100	0	0	0	0									0		
30	.12	.10	.05	.01									.11		
1400	.12	.10	.05	.01									.11		
15	.14	.12	.05	.01									.13		
1545	.14	.12	.05	.01									.13		
1600	.17	.14	.05	.01									.15		
15	.27	.22	.05	.01									.23		
30	.57	.47	.05	.01									.48		
45	1.00	.83	.24	.05									.88		
1700	1.30	1.07	.48	.08									1.15		
15	1.36	1.12	.83	.14									1.26		
30	1.43	1.18	.86	.15									1.33		
1800	1.50	1.24	.95	.17									1.41		
30	1.56	1.29	1.00	.17									1.46		
1900	1.64	1.35	1.05	.18									1.53		
30	1.72	1.42	1.10	.19									1.61		
2000	1.80	1.49	1.20	.21									1.70		

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
										WMR	1.70

WMR : Sum of Precipitation x Weight Factor K : WMR / Total Recording Gages Weighted Precipitation :


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 23, 1970
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 148 ac-ft.
NET INFLOW AND OUTFLOW, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
500
400
300
200
100
0
2.0
1.0
0
Net inflow
Accumulated rainfall
Outflow
Accumulated runoff
1500
1800
2100
2400
0300
0600
0900
1200
1500
May 23, 1970
May 24, 1970

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek near Elmendorf, Texas.

Period of Record May 23-24, 1970 Drainage Area 12.2 sq.mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May	23,	1970				
0000	5.44	+.02	0.08	33	0		
1630	5.46		.06	35	0		
1730	5.44		.08	3	0		
1800	5.48	+.02	.13	3	0		
1900	5.69	0	.53	4	.0001	0.0001	0.0001
2000	5.77		.77	4	.0001	.0001	.0002
2100	5.80		.86	3	.0001	.0001	.0003
30	6.88		14	2	.0018	.0009	.0012
2200	7.14		23	2	.0029	.0014	.0026
30	7.22		26	2	.0033	.0016	.0042
2300	7.17		24	3	.0030	.0022	.0064
2400	6.92	0	16	2	.0020	.0010	.0074
			243.15	96			
			2.5				

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May	24,	1970				
0000	6.92	0	16	2	0.0020	0.0010	0.0084
0100	6.65		9.5	4	.0012	.0012	.0096
0200	6.39		5.4	4	.0007	.0007	.0103
0300	6.22		3.5	4	.0004	.0004	.0107
0400	6.06		2.3	4	.0003	.0003	.0110
0500	5.92		1.4	4	.0002	.0002	.0112
0600	5.84		1.0	4	.0001	.0001	.0113
0700	5.77		.77	4	.0001	.0001	.0114
0800	5.74		.68	3	.0001	.0001	.0115
30	5.74		.68	3	.0001	.0001	.0116
0930	5.82		.94	5	.0001	.0001	.0117
1100	5.77		.77	7	.0001	.0002	.0119
1300	5.68		.50	8	.0001	.0002	.0121
1500	5.64	0	.38	10	0		
1800	5.58	+.01	.28	18	0		
2400	5.53	+.01	.19	12	0		
			156.77	96			
			1.6				

Runoff for storm period = 7.9 acft

Computed by LEL Date 10/19/70 Checked by JRR Date 10/20/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

Sheet 1 of 1
Comp. by: [illegible]
Date 4/21/71
Check by [illegible]
Date 4/26/71

Study Area Calaveras Creek near Elmendorf, Tex. Date of storm May 23, 1970

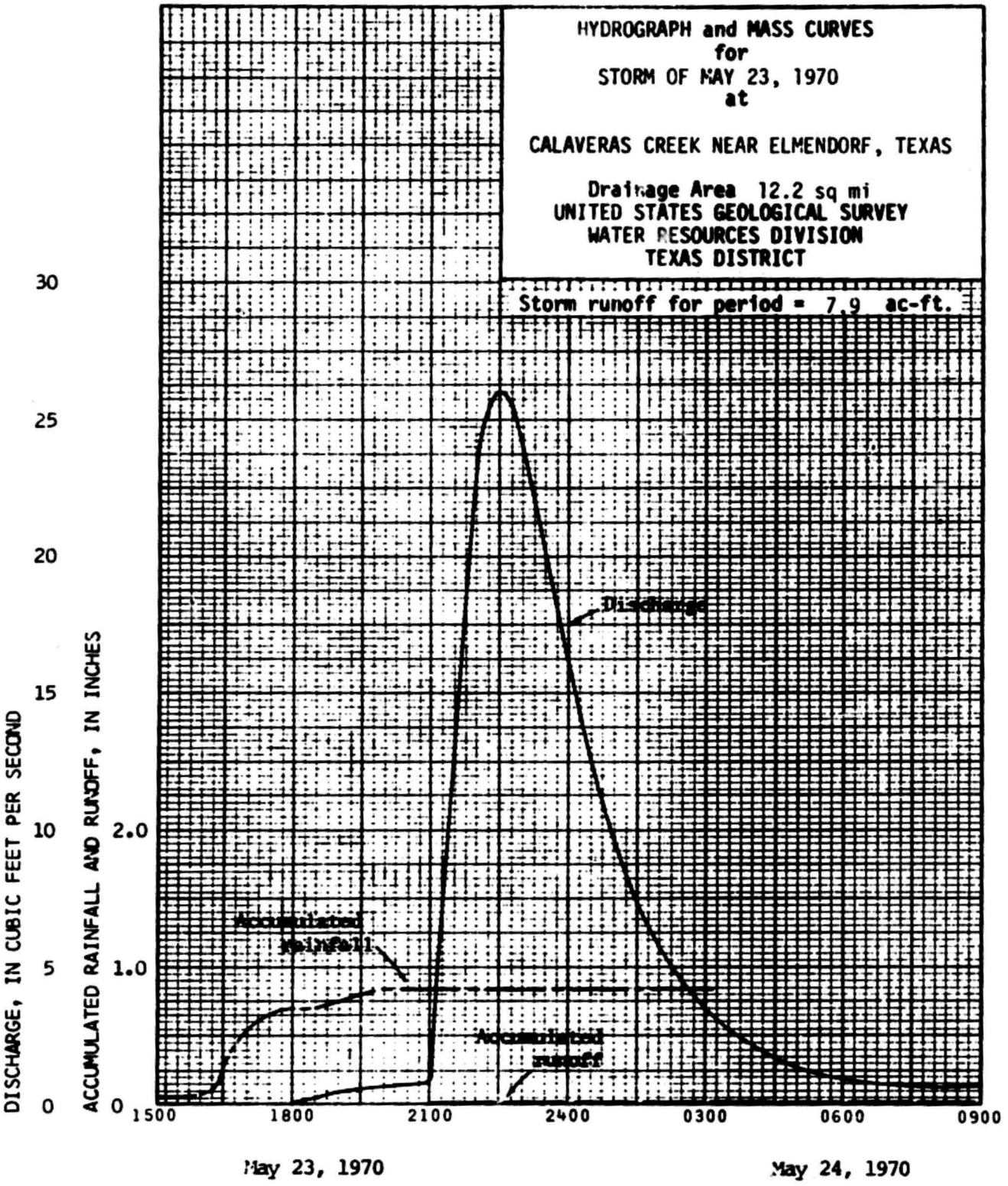
	Accumulated Precipitation in Inches for Recording Rain Gages										Accumulated Weighted Precipitation	
Weight factor	0.8254		0.1746									
	Gage 2-R		Gage 11-R		Gage		Gage		Gage		Recording Gages	Rec. Gages x K
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	All Gages	All Gages
May 23, 1970												
1100	0	0	0	0							0	0
30	.12	.10	.05	.01							.11	.05
1400	.12	.10	.05	.01							.11	.05
15	.14	.12	.05	.01							.13	.06
1545	.14	.12	.05	.01							.13	.06
1600	.17	.14	.05	.01							.15	.07
15	.27	.22	.05	.01							.23	.11
30	.57	.47	.05	.01							.48	.24
45	1.00	.83	.26	.05							.88	.43
1700	1.30	1.07	.48	.08							1.15	.57
15	1.36	1.12	.83	.14							1.26	.62
30	1.43	1.18	.86	.15							1.33	.66
1800	1.50	1.24	.95	.17							1.41	.70
30	1.56	1.29	1.00	.17							1.46	.72
1900	1.64	1.35	1.05	.18							1.53	.76
30	1.72	1.42	1.10	.19							1.61	.80
2000	1.80	1.49	1.20	.21							1.70	.84

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
8-S	1.00	0.84	0.84								

WWR 0.84

WWR : Sum of Precipitation x Weight Factor

K : WWR / Total Recording Gages Weighted Precipitation : 0.84 / 1.70 = 0.494


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 23, 1970
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 7.9 ac-ft.
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
30
25
20
15
10
5
0
2.0
1.0
0
Discharge
Accumulated rainfall
Accumulated runoff
1500
1800
2100
2400
0300
0600
0900
May 23, 1970
May 24, 1970

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

Sheet 1 of 1

INFLOW AND OUTFLOW COMPUTATIONS

Storm period May 26-27, 1970

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height ft	Storage ac-ft	Time int. hrs	Change in storage ac-ft	Change in storage cfs	Mean G. Ht. ft	Outflow cfs	Total inflow cfs	Rainfall on Pool in	Rainfall on Pool area ac	Rainfall on Pool Storage ac-ft	Rainfall on Pool Storage cfs	Net Inflow Rate cfs	Net Inflow Rate in/hr	Net Inflow in	Acc in
May 26																
0000	16.817	6822														
1600	16.939	6879	16.0	-16.49	-12.5	16.38	10.7	0					0	0	0	0
1700	16.525	7640	1.0	+10.67	129	16.23	9.9	139	1.99	18.2	2.96	55.9	103	.0288	.0288	.0288
30	17.180	8788	.5	+13.48	326	16.85	13.2	339	.83	28.6	.09	2.2	337	.0945	.0233	.0600
1800	17.875	10384	.5	+15.96	386	17.53	17.1	403					403	.0891	.0446	.1046
15	18.215	11234	.25	+8.50	411	18.04	210	432					432	.0955	.0239	.1285
25	18.469	11908	.167	+6.74	489	18.34	227	517					517	.1143	.0190	.1475
30	18.685	12263	.083	+3.47	504	18.53	287	534					534	.1180	.0098	.1573
35	18.715	12595	.083	+3.40	496	18.66	32.8	526					526	.1162	.0097	.1670
45	18.990	13256	.167	+6.61	480	18.83	32.6	513					513	.1134	.0189	.1859
1900	19.260	14185	.25	+9.29	480	19.09	32.6	483					483	.1067	.0267	.2126
30	19.760	15927	.5	+17.42	402	19.60	38.0	440					440	.1006	.0283	.2409
2000	20.158	17374	.5	+14.47	330	19.96	38.5	394					394	.0849	.0404	.2813
2100	20.666	19367	1.0	+19.93	241	20.41	34.0	275					275	.0608	.0608	.3421
2200	20.923	20437	1.0	+10.70	129	20.79	38.7	168					168	.0368	.0368	.3789
2400	21.119	21280	2.0	+8.43	51.0	21.02	38.1	86.1					86.1	.0190	.0380	.4169
							24	39703								
								16.5								
May 27																
0800	21.145	21395	8.0	+1.15	7.0	21.13	16.3	42.9					42.9	.0023	.0184	.4353
1600	21.045	20959	8.0	-4.36	-13.2	21.10	38.3	22.1					22.1	.0049	.0196	.4549
1800	20.705	19526	2.0	-14.33	-86.0	20.87	24.9	6.0					6.0	.0013	.0078	.4627
2000	20.300	17914	2.0	-16.12	-82.5	20.50	24.2	1.7					1.7	.0004	.0024	.4651
2400	19.892	16181	4.0	-17.33	-36.0	20.07	23.6	0					0	0	0	.4651
							24	88.0								
								36.5								

Runoff for storm period = 183 ac-ft

comp by DRR 11/9/70

-52-

TX-78 (Revised July 1969)

Sheet 1 of 1
Comp. by: DRR
Date Apr 20, 1971
Check by EPP
Date 4/21/71

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

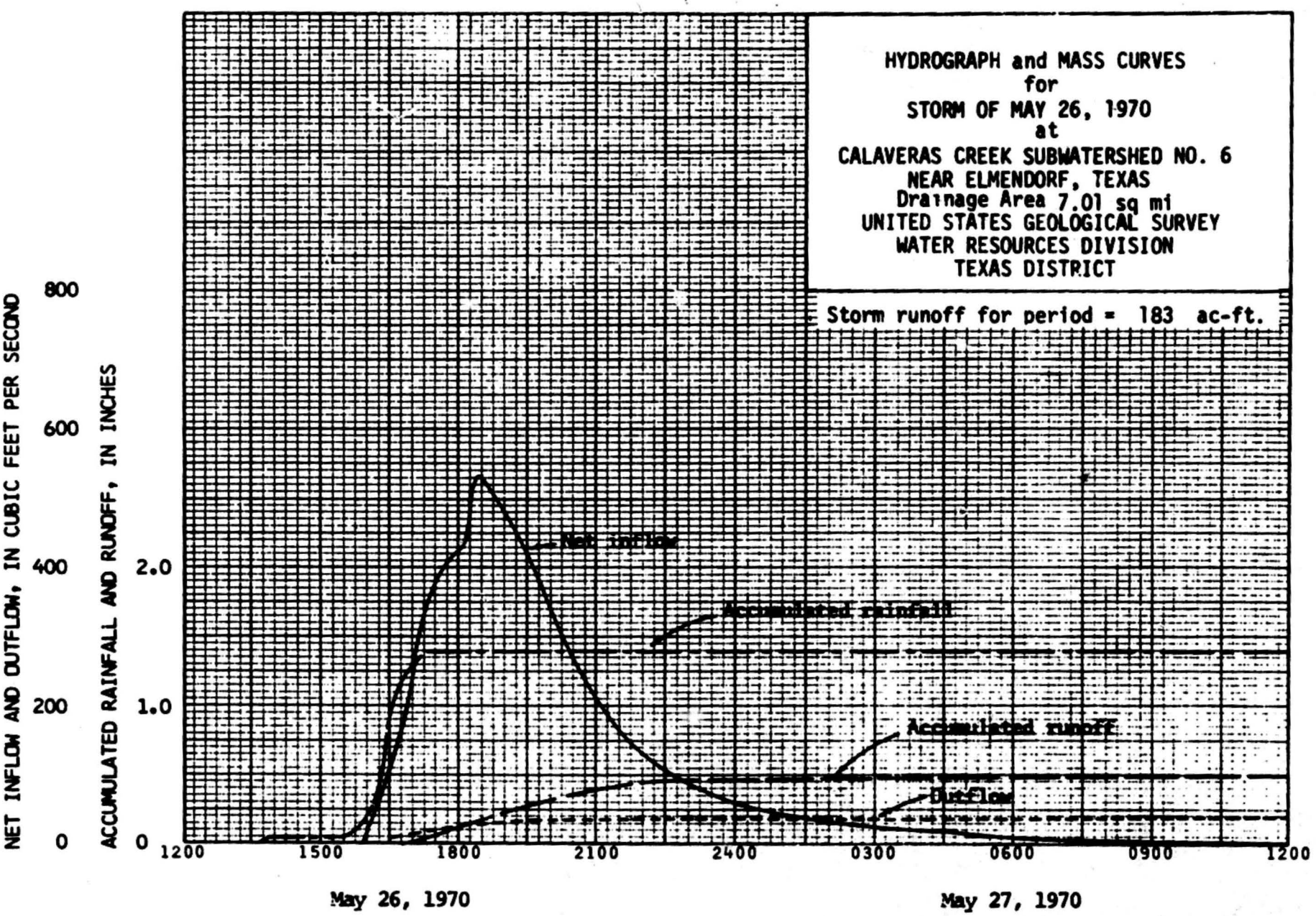
WEIGHTED-PRECIPITATION RECORD

Study Area Calaveras Creek Subwatershed No. 6 near Elmendorf, Tex. Date of storm May 26, 1970

	Accumulated Precipitation in Inches for Recording Rain Gages												Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 6-R		Gage 11-R		Gage		Gage		Gage		Gage			
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recording Gages All Gages	(Rec. Gages x K) All Gages
May 26, 1970														
1330	0	0	0	0									0	
1400	.05	.04	0	0									.04	
1530	.05	.04	0	0									.04	
1600	.18	.15	0	0									.15	
15	.20	.17	.70	.12									.29	
30	.90	.74	1.35	.24									.98	
45	1.00	.83	1.85	.32									1.15	
1700	1.10	.91	1.95	.34									1.25	
15	1.24	1.02	1.98	.35									1.37	
30	1.26	1.04	2.00	.35									1.39	

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
										WMR	1.39

WMR : Sum of Precipitation x Weight Factor K : WMR/Total Recording Gages Weighted Precipitation :


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 26, 1970
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 183 ac-ft.
NET INFLOW AND OUTFLOW, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
800
600
400
200
0
2.0
1.0
0
Net inflow
Accumulated rainfall
Accumulated runoff
Outflow
1200
1500
1800
2100
2400
0300
0600
0900
1200
May 26, 1970
May 27, 1970

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek near Elmendorf, Tex.

Period of Record May 26-27, 1970 Drainage Area 12.2 sq. mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May 26, 1970						
0000	5.45	+.02	.09	33	0		
1630	5.43	+.02	.07	34	0		
1700	5.50	+.01	.15	3	0		
1800	5.68	0	[illegible]	3	.0001	0.0001	0.0001
30	9.30	-.45	98	2	[illegible]	[illegible]	[illegible]
1900	10.10		144	2	[illegible]	[illegible]	.0135
30	10.35		160	2	[illegible]	[illegible]	.0257
2000	10.14		146	2	.0185	[illegible]	.0349
30	9.75		123	2	[illegible]	[illegible]	.0427
2100	9.26		96	2	.0122	.0061	.0488
30	8.82		74	2	.0094	.0047	.0535
2200	8.42		56	2	.0071	.0036	.0571
30	8.19		47	2	.0060	.0030	.0601
2300	8.16		45	2	.0057	[illegible]	.0629
30	8.16		45	2	.0057	.0028	.0657
2400	8.18	-.45	44	1	[illegible]	.0014	.0671
			2,121.30	96			
			22				

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May 27, 1970						
0000	8.18	-.45	46	1	.0058	.0029	0.0700
0100	8.13		44	2	.0056	.0056	.0756
0300	8.07		42	4	.0053	.0106	.0862
0500	8.00		39	5	.0050	.0125	.0987
0700	7.98		38	6	.0048	.0144	.1131
1100	7.98	-.45	38	7	.0048	.0168	.1299
1400	7.89	-.42	36	5	.0046	.0115	.1414
1600	7.68	-.34	31	4	.0039	[illegible]	.1492
1800	7.44	-.24	25	5	.0032	.0080	.1572
2100	7.20	-.14	20	6	.0025	.0075	.1647
2400	6.99	-.06	16	3	.0020	.0030	.1677
			1,588	48			
			33				

Runoff for storm period = 109 ac-ft*

*Does not include flow after May 27

Computed by DPR Date 10/1/70 Checked by [illegible] Date 10/1/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

Sheet 1 of 1
Comp. by: [initials illegible]
Date 6/21/71
Check by DRK (?)
Date 6/26/71 (?)

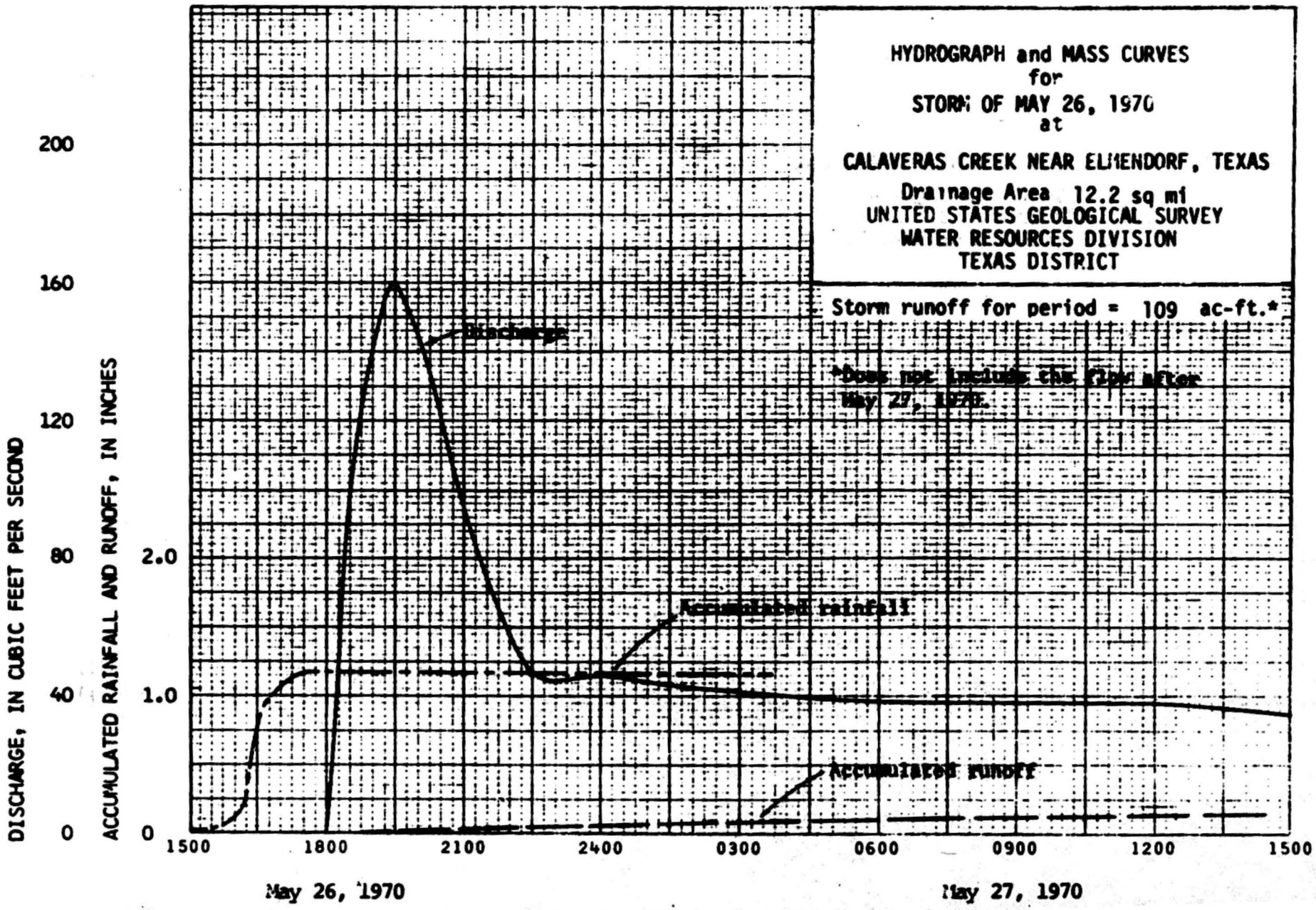
Study Area Calaveras Creek near Elmendorf, Tex. Date of storm May 26, 1970

	Accumulated Precipitation in Inches for Recording Rain Gages												Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 8-R (?)		Gage 11-R		Gage		Gage		Gage		Gage			
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recording Gages All Gages	(Rec. Gages x K) All Gages
May 26, 1970 (?)														
1330	0	0	0	0									0	0
1400	.05	.04	0	0									.04	.03
1530	.05	.04	0	0									.04	.03
1600	.18	.15	0	0									.15	.13
15	.20	.17	.70	.12									.29	.24
30	.90	.74	1.35	.24									.98	.82
45	1.00	.83	1.85	.32									1.15	.97
1700	1.10	.91	1.95	.34									1.25	1.05
15	1.24	1.02	1.98	.35									1.37	1.15
30	1.26	1.04	2.00	.35									1.39	1.17

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
B-5	1.00	1.17	1.17								

SWR 1.17

SWR : Sum of Precipitation x Weight Factor K : SWR/Total Recording Gages Weighted Precipitation - 1.17/1.39 = 0.842


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 26, 1970
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 109 ac-ft.*
*Does not include the flow after May 27, 1970.
Discharge
Accumulated rainfall
Accumulated runoff
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
200
160
120
80
40
0
2.0
1.0
0
1500
1800
2100
2400
0300
0600
0900
1200
1500
May 26, 1970
May 27, 1970

Form A-64
(Rev. 5-65)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY - TEXAS DISTRICT

Sheet 1 of 1

INFLOW AND OUTFLOW COMPUTATIONS

Storm period May 28-29, 1970

08182400 Calaveras Creek subwatershed No. 6 near Elmendorf, Tex. D.A. 7.01 sq mi

Date and time	Gage height	Storage	Time int.	Change in storage		Mean G. Ht.	Outflow	Total inflow	Rainfall on Pool				Net Inflow			
										area	Storage		Rate			Acc
	ft	ac-ft	hrs	ac-ft	cfs	ft	cfs	cfs	in	ac	ac-ft	cfs	cfs	in/hr	in	in
May 28																
0000	19.832	161.81														
0230	19.620	154.41	2.5	-7.40	-38.2	19.73	33.2	0	0				0	0	0	0
0300	19.818	161.31	.5	+6.90	167	19.72	33.2	200	.85	34.7	2.46	59.5	140	.0309	.0154	0.0154
0400	20.510	187.37	1.0	+26.06	315	20.16	33.7	349	.10	37.3	.31	3.8	345	.0762	.0762	.0916
0500	21.670	237.86	1.0	+50.49	611	21.09	35.3	646	.06	43.5	.22	2.7	643	.1421	.1421	.2337
05	21.767	242.47	.083	+4.61	669	21.72	36.4	705	0				705	.1558	.0130	.2467
10	21.864	247.16	.083	+4.69	681	21.82	36.5	718	0				718	.1587	.0132	.2599
15	21.960	251.87	.083	+4.71	684	21.91	36.7	721	0				721	.1593	.0133	.2732
20	22.055	256.61	.083	+4.74	688	22.01	36.8	725	0				725	.1602	.0134	.2866
25	22.148	261.32	.083	+4.71	684	22.10	36.9	721	0				721	.1593	.0133	.2999
30	22.238	265.94	.083	+4.62	671	22.19	37.1	708	0				708	.1565	.0130	.3129
0600	22.720	291.79	.5	+25.85	626	22.48	37.5	664	.05	53.6	.22	5.3	659	.1456	.0728	.3857
0700	23.330	330.95	1.0	+39.16	474	23.06	38.3	512	.08	58.5	.39	4.7	507	.1120	.1120	.4977
0800	23.715	351.37	1.0	+20.42	247	23.55	39.0	286	0				286	.0632	.0632	.5609
1000	24.058	373.98	2.0	+22.61	137	23.89	39.4	176	0				176	.0389	.0778	.6387
1200	24.190	382.96	2.0	+8.98	54.3	24.12	39.6	92.9	.05	68.1	.17	1.0	92.9	.0205	.0410	.6797
1400	24.230	385.03	2.0	+2.07	12.5	24.20	39.7	52.2					52.2	.0115	.0230	.7027
1600	24.213	384.54	2.0	-.49	-3.0	24.22	39.8	36.8					36.8	.0081	.0162	.7189
1800	24.170	381.59	2.0	-2.95	-17.8	24.19	39.7	21.9					21.9	.0048	.0096	.7285
2100	24.083	375.70	3.0	-5.89	-23.8	24.13	39.7	15.9					15.9	.0035	.0105	.7390
2400	23.981	368.81	3.0	-6.89	-27.8	24.03	39.5	11.7					11.7	.0026	.0078	.7468
						24)	916.24									
							38.2									
May 29																
0600	23.731	352.40	6.0	-16.41	-33.1	23.86	39.3	6.2					6.2	.0014	.0084	.7552
1200	23.465	335.58	6.0	-16.82	-34.0	23.60	39.0	5.0					5.0	.0011	.0066	.7618
1800	23.172	317.79	6.0	-17.79	-35.9	23.32	38.6	2.7					2.7	.0006	.0036	.7654
2400	22.848	298.99	6.0	-18.80	-38.0	23.01	38.2	.20					.20		0	.7654
						24)	930.6									
							38.8									

Runoff for storm period = 386 ac-ft

Comp by DRR 11/14/70

Ckd RBC 11/18/70

TX-78 (Revised July 1969)

Sheet 1 of 1
Comp. by: [illegible]
Date 4/21/71
Check by [illegible]
Date 4/21/71

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

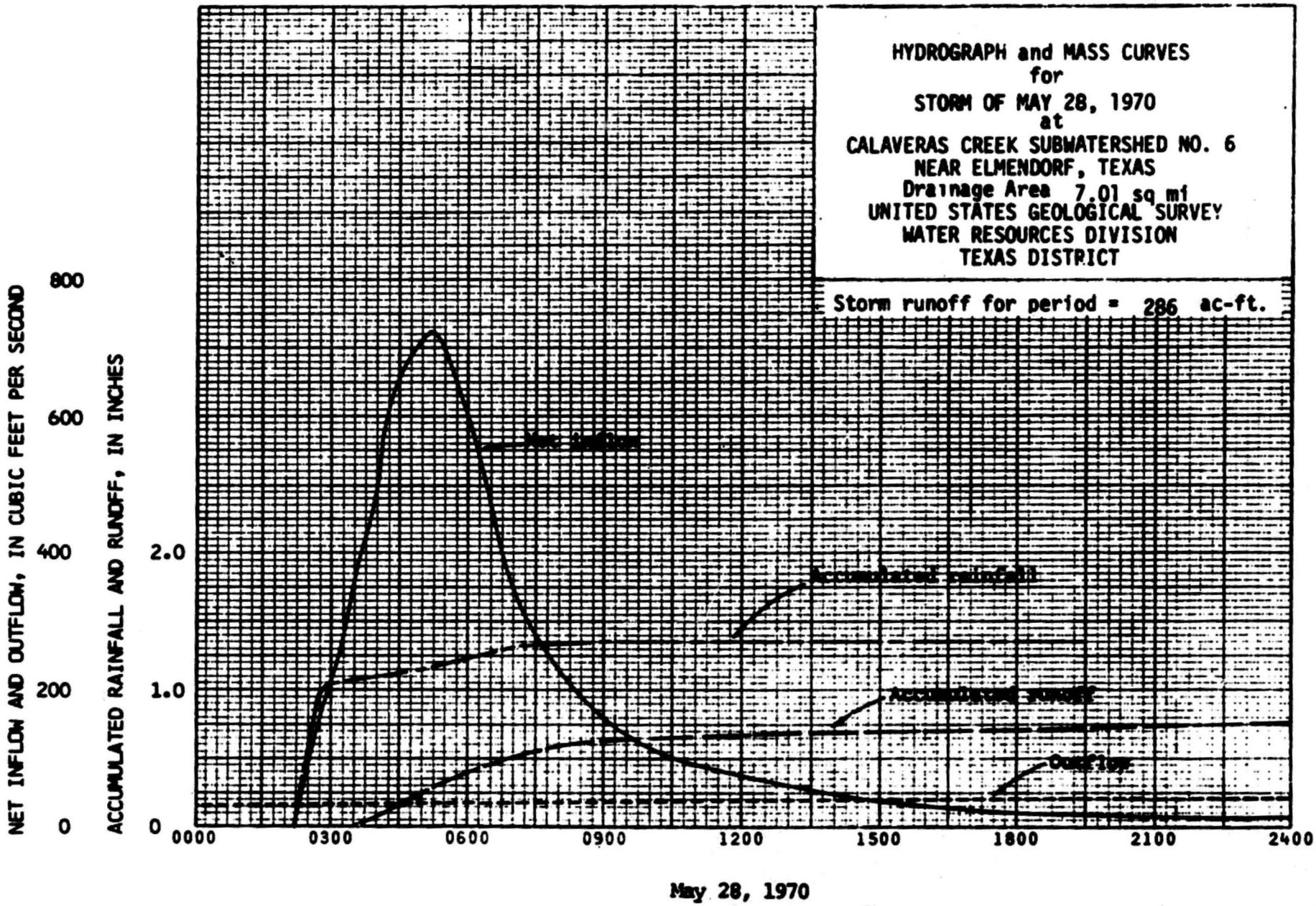
WEIGHTED-PRECIPITATION RECORD

Study Area Calaveras Creek Subwatershed No 6 near Elmendorf, Tex Date of storm May 28, 1970

Accumulated Precipitation in Inches for Recording Rain Gages													Accumulated Weighted Precipitation	
Weight Factor	0.8254		0.1746											
	Gage 2-R		Gage 11-R		Gage		Gage		Gage		Gage		Recording Gages All Gages	(Rec. Gages x K) All Gages
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor		
May 28, 1970														
0215	0	0.	0	0									0	
20	.70	.58	0	0									.58	
45	1.02	.84	.75	.13									.97	
0300	1.07	.88	.85	.15									1.03	
15	1.09	.90	.88	.15									1.05	
0400	1.15	.95	.95	.17									1.12	
0500	1.16	.96	1.01	.18									1.14	
30	1.20	.99	1.03	.18									1.17	
0600	1.28	1.06	1.06	.19									1.25	
0700	1.36	1.12	1.14	.20									1.32	
1200	1.38	1.14	1.17	.20									1.34	

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
											WMR: 1.34

WMR : Sum of Precipitation x Weight Factor   K : WMR / Total Recording Gages Weighted Precipitation -


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 28, 1970
at
CALAVERAS CREEK SUBWATERSHED NO. 6
NEAR ELMENDORF, TEXAS
Drainage Area 7.01 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 286 ac-ft.
NET INFLOW AND OUTFLOW, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
800
600
400
200
0
2.0
1.0
0
0000
0300
0600
0900
1200
1500
1800
2100
2400
May 28, 1970

TX-65
(Rev.6-68)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY-TEXAS DISTRICT

RUNOFF COMPUTATIONS

Station 08182500 Calaveras Creek near Elmendorf, Tex.

Period of Record May 28 - 29, 1970 Drainage Area 12.2 sq mi.

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May	28,	1970				
0000	6.99	-.06	16	5	0.0020	0.0025	0.0025
0230	6.84	-.02	13	8	.0017	.0024	.0059
0400	6.99	-.04	15	5	.0019	.0024	.0083
0500	6.88	-.03	14	4	.0018	.0018	.0101
0600	7.02	-.07	16	4	.0020	.0020	.0121
0700	7.12	-.11	18	4	.0023	.0023	.0144
0800	7.10	-.10	18	4	.0023	.0023	.0167
0900	7.19	-.14	20	5	.0025	.0031	.0198
1030	7.27	-.17	22	6	.0028	.0042	.0240
1200	7.15	-.12	19	7	.0024	.0042	.0282
1400	6.96	-.05	15	8	.0019	.0038	.0320
1600	6.89	-.03	14	8	.0018	.0036	.0356
1800	6.81	-.02	12	10	.0015	.0038	.0394
2100	6.72	-.01	11	12	.0014	.0042	.0436
2400	6.61	0	8.7	6	.0011	.0016	.0452
			1,424.2	96			
			15				

Time	G. Ht. Feet	Sh. Adj.	Discharge c.f.s.	Discharge Inc.	Discharge In/hr.	Runoff Inches	Runoff Acc. In.
	May	29,	1970				
0000	6.61	0	8.7	1	0.0011	0.0011	0.0463
0600	6.89		54	2	.0087	.0042	.0505
1200	6.28		3.5	2	.0004	.0024	.0529
1800	6.06		2.3	2	.0003	.0018	.0547
2400	5.92	0	1.4	1	.0002	.0006	.0553
			82.5	8			
			4.1				

Runoff for storm period = 37.4 acre-in*

*Includes part of recession from storm of May 26, 1970

Computed by DRR Date 10/1/70 Checked by LBC Date 10/1/70

TX-78 (Revised July 1969)

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

WEIGHTED-PRECIPITATION RECORD

Sheet 1 of 1
Comp. by: EBB
Date 4/21/71
Check by DJL
Date 4/26/71

Study Area Calaveras Creek near Elmendorf, Tex. Date of storm May 28, 1970

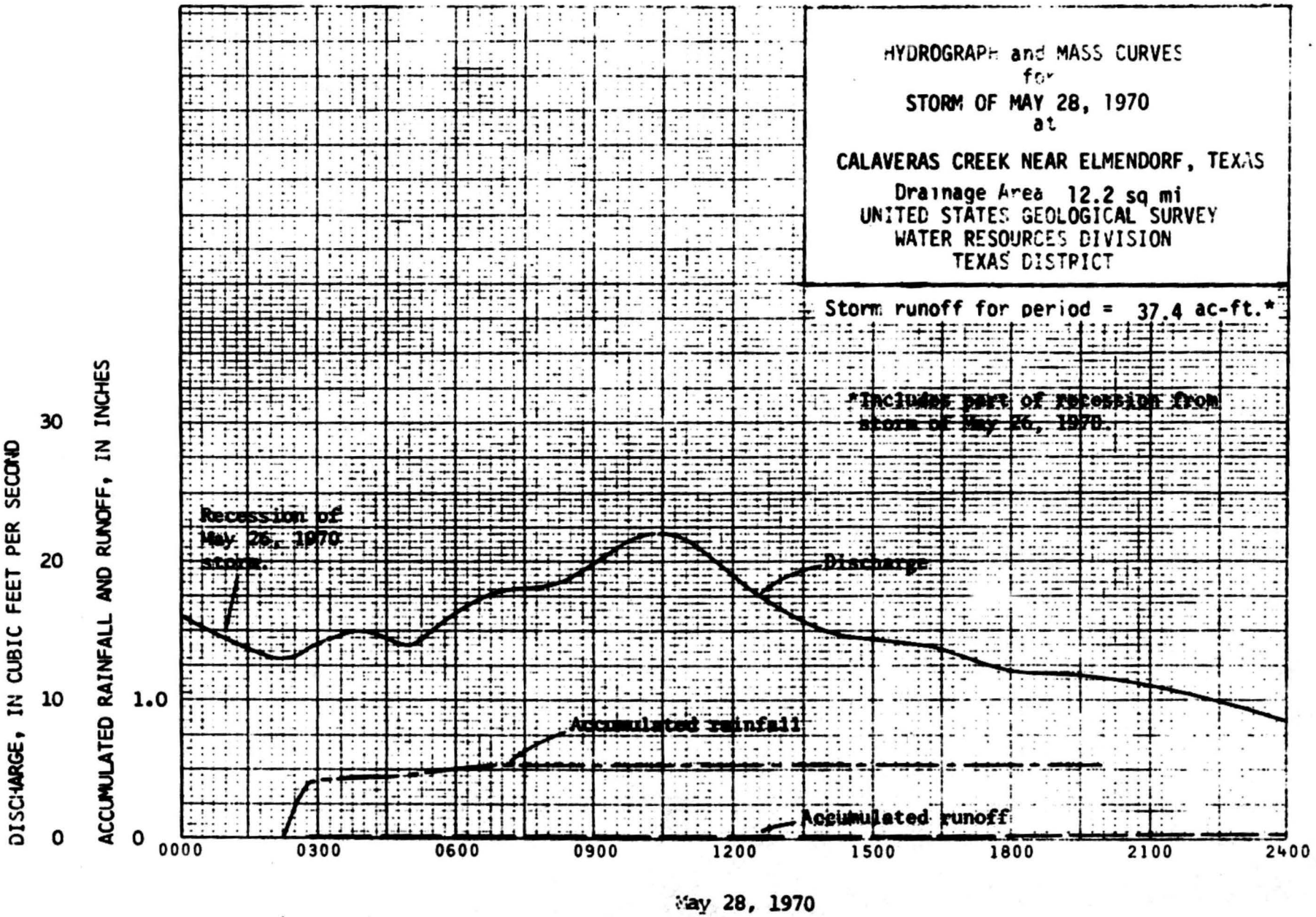
Height Factor		0.5254		0.1746										Accumulated Weighted Precipitation	
	Accumulated Precipitation in Inches for Recording Rain Gages														
	Gage		Gage		Gage		Gage		Gage		Gage				
Date & Time	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor	Recorded	x Factor		Recording Gages All Gages	(Rec. Gages x K) All Gages
May 28, 1970															
0215	0	0	0	0										0	0
30	.70	.58	0	0										.58	.23
45	1.02	.84	.75	.13										.97	.38
0300	1.07	.88	.85	.15										1.03	.41
15	1.09	.90	.88	.15										1.05	.42
0400	1.15	.95	.95	.17										1.12	.44
0500	1.16	.96	1.01	.18										1.14	.45
30	1.20	.99	1.03	.18										1.17	.46
0600	1.28	1.06	1.06	.19										1.25	.50
0700	1.36	1.12	1.14	.20										1.32	.52
1200	1.38	1.14	1.17	.20										1.34	.53

Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor	Rain Gage	Weight Factor	Precipitation	Precipitation x Weight Factor
B-5	1.00	0.53	0.53								

WMR : Sum of Precipitation x Weight Factor

K : WMR / Total Recording Gages Weighted Precipitation : 0.53 / 1.34 = 0.396

WMR: 0.53


HYDROGRAPH and MASS CURVES
for
STORM OF MAY 28, 1970
at
CALAVERAS CREEK NEAR ELMENDORF, TEXAS
Drainage Area 12.2 sq mi
UNITED STATES GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
TEXAS DISTRICT
Storm runoff for period = 37.4 ac-ft.*
*Includes part of recession from storm of May 26, 1970.
Recession of May 25, 1970 storm.
Discharge
Accumulated rainfall
Accumulated runoff
DISCHARGE, IN CUBIC FEET PER SECOND
ACCUMULATED RAINFALL AND RUNOFF, IN INCHES
30
20
10
0
1.0
0
0000
0300
0600
0900
1200
1500
1800
2100
2400
May 28, 1970