HYDROLOGIC AND GEOLOGIC DATA FOR THE EDWARDS AQUIFER RECHARGE ZONE NEAR GEORGETOWN, WILLIAMSON COUNTY, TEXAS, 1986-87

By M.E. Dorsey and Diana L. Slagle

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CONTENTS

	Page
Abstract	1
Introduction	2
Purpose and scope	2
Approach	2
Well-numbering system	4
Hydrologic setting	6
Streams	6
Hydrogeology	6
Hydrologic and geologic data	6
Streamflow	6
Ground-water levels	8
Test-well sites	8
Water quality	43
Reference cited	66

ILLUSTRATIONS

Figure	1.	Map showing location of the study area	3
	2.	Diagram showing well-numbering system	5
	3.	Generalized hydrogeologic section along the dip of the Edwards aquifer	7
	4.	Map showing locations of data-collection sites	9
	5.	Discharge hydrographs at selected streamflow gaging stations	10
	6.	Diagram showing streamflow gain and loss along the San Gabriel River and Berry Creek, July 28, 1986	11
	7.	Diagram showing streamflow gain and loss along the San Gabriel River and Berry Creek, March 30 to April 1, 1987	12
	8.	Water-level hydrographs at selected wells	13
	9.	Map showing ground-water levels, July 28 to 29, 1986	14
	10.	Map showing ground-water levels, March 30 to April 1, 1987	15
	11.	Diagram showing locations, well completion, and water-level data, Berry Creek test-well site	16
	12.	Diagram showing geologic, geophysical, and hydraulic properties of the cored interval at the Berry Creek test-well site	17
	13.	Water-level hydrographs at the Berry Creek test-well site	44
	14.	Diagram showing location, well completion, and water-level data, San Gabriel River test-well site	45
	15.	Diagram showing geologic, geophysical and hydraulic properties of the cored interval at the San Gabriel River test-well site	46
	16.	Water-level hydrographs at the San Gabriel River test well site	47

ILLUSTRATIONS--Continued

Page

Figure 17. Diagram showing location, well completion, and water-level data, Chandler Branch test-well site---------- 48
18. Diagram showing geologic, geophysical, and hydraulic properties of the cored interval at the Chandler Branch test-well site---------- 49
19. Water-level hydrographs at Chandler Branch test-well site---------- 50
20. Map showing variations in specific conductance in streams and the Edwards aquifer, May 4 to 8, 1987--------- 59
21. Trilinear diagram of selected water-quality analyses-------- 60

TABLES

Table 1. Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River---------- 18
2. Hydrologic data and well descriptions for the ground-water-level surveys---------- 25
3. Daily mean water levels at test-well sites---------- 35
4. Description of cores from test wells---------- 51
5. Field data for recovery tests at test-well sites---------- 57
6. Water-quality data from selected wells and stream sites----- 61

METRIC CONVERSIONS

The inch-pound units of measurement used in this report may be converted to metric (International System) units by using the following conversion factors:

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
mile	1.609	kilometer
square mile (mi^2)	2.509	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

HYDROLOGIC AND GEOLOGIC DATA FOR THE EDWARDS AQUIFER RECHARGE ZONE NEAR GEORGETOWN, WILLIAMSON COUNTY, TEXAS, 1986-87

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ABSTRACT

This report presents a compilation and summary of data related to the interchange of water between the Edwards aquifer and streams, and to the hydraulics of vertical movement of water in the Georgetown Limestone in the Georgetown area of Williamson County. It presents hydrologic, geologic, hydraulic, physical, geophysical, and water-quality data collected from selected wells and stream sites in the study area from January 1986 to June 1987. Included are the results from six streamflow gain and loss surveys, two ground-water-level surveys representing low and high water-level conditions, inorganic chemical analyses of water from selected wells and streams, and bulk specific gravity and permeability tests of cores taken at three test-well sites. Water-level altitudes differed by an average of 38 feet between low and high water-level conditions in the confined zone, and by an average of 13 feet in the unconfined zone. Dissolved solids of water from selected wells ranged from 320 to 1,300 milligrams per liter and from 251 to 290 milligrams per liter in water from selected streams.

INTRODUCTION

On March 20, 1985, the Texas Water Development Board (TWDB) adopted rules for regulating activities that have the potential for causing pollution of the Edwards aquifer in Williamson County, Texas. During public hearings prior to the adoption of the Williamson County Rules, several concerns were raised about the extent of the recharge zone. Included in the Edwards aquifer is the Edwards Limestone, the overlying Georgetown Limestone, and the underlying Comanche Peak Limestone (Baker and others, 1986). The Edwards Limestone is the major water-bearing unit of the Edwards aquifer. Most of the concerns are related to the justification of including the Georgetown Limestone in the Edwards aquifer. If water does not readily move through this formation then concerns about including it in the aquifer and the recharge zone of the aquifer are justified and reconsideration of the geologic formations that comprise the Edwards aquifer in the area is in order. In March, 1986, in order to address the issue of possible recharge to the major water bearing unit of the Edwards aquifer through the Georgetown Limestone, the TWDB agreed to fund a study of the Edwards aquifer at and in the immediate vicinity of the city of Georgetown (fig. 1).

Purpose and Scope

The purpose of the study of the Edwards aquifer is to determine if the aquifer is recharged by percolation of water through the Georgetown Limestone in the vicinity of Georgetown. If percolation is significant, a secondary objective is to determine how readily water migrates vertically through this formation and what are the geologic features that convey the water from the surface to the main producing zone of the aquifer. The purpose of this report is to compile and summarize data related to the interchange of water between the aquifer and the stream system and the hydraulics of vertical movement of water in the Georgetown Limestone. The scope of this report and study is limited to the Georgetown area and to data collected by the Geological Survey from January 1986 to June 1987. The report includes hydrologic, geologic, hydraulic, physical, geophysical, and water-quality data from selected wells and stream sites in the study area.

Approach

The study was conducted in a cooperative effort by the U.S. Geological Survey, the Texas Water Development Board, and the Texas Bureau of Economic Geology. The Geological Survey conducted hydrologic investigations related to determining the interchange of water between the aquifer and streams, with emphasis on the vertical movement of water in the Georgetown Limestone. The approach used by the Geological Survey in its part of the study included the following:

1. Six streamflow and ground-water-[illegible] surveys were conducted to identify subreaches where streamflow gains and losses occur;

2. Three clusters of three observation wells and water-level monitoring equipment were installed to test the hydraulic properties of the

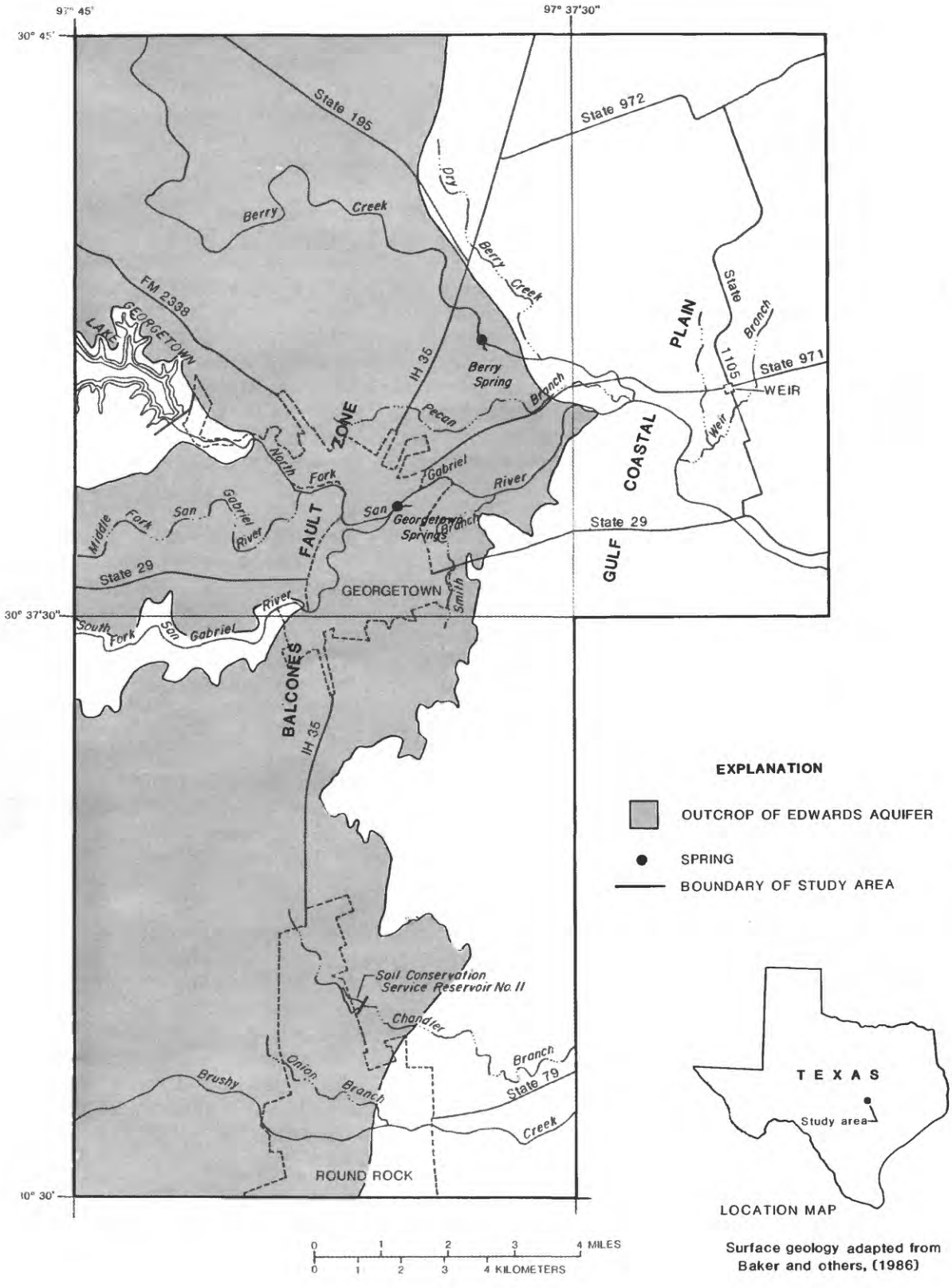


Figure 1.--Location of study area.

Georgetown Limestone where it occurs between the streams and the Edwards Limestone; and

3. Water-quality samples from selected wells and stream sites were analyzed for inorganic constituents, pH, specific conductance, and temperature to establish a correlation of water-quality characteristics, if any, in the streams and aquifer in local areas.

The Texas Water Development Board's Water Research and Planning Fund provided funding. The Texas Water Development Board, Water Data Collection, Study and Planning Division, performed the observation-well installation, geophysical logging, coring, and laboratory analyses of bulk specific gravity and permeability tests on selected zones of cores taken at each observation-well site. The observation-well clusters were installed near major streams in the study area in order to help define the surface water-ground water relationship. Recorders were installed on each of the observation wells to continuously monitor water levels. Additionally, water-quality samples were collected from a closely spaced network of wells and stream sites. Specific conductance, pH, and temperature were measured at stream sites and selected wells during streamflow surveys.

The study conducted by the Bureau of Economic Geology included fracture analysis, geologic mapping of the study area, recording water levels, and chemical analysis of water from selected springs and wells. Water-level recorders were installed on a network of wells and rain gages in order to determine relationships between recharge and rainfall. Water from selected springs and wells was analyzed for inorganic water-quality constituents in order to determine recharge and discharge patterns of the aquifer.

Well-Numbering System

The well-numbering system that is used in this report (fig. 2) was developed by the Texas Water Development Board for use throughout the State. It is based on latitude and longitude and consists of a two-letter county-designation prefix plus a seven-digit well number. The two-letter prefix for Williamson County is ZK.

Each 1-degree quadrangle in the State is given a number consisting of two digits from 01 through 89. These are the first two digits of the well number. Each 1-degree quadrangle is divided into 7-1/2-minute quadrangles which are given two-digit numbers from 01 through 64. These are the third and fourth digits of the well number. Each 7-1/2-minute quadrangle is divided into 2-1/2-minute quadrangles which are given a single-digit number from 1 through 9. This is the fifth digit of the well number. Each well or spring that is located within a 2-1/2-minute quadrangle is given a two-digit number beginning with 01, according to the order in which it was inventoried. These are the last two digits of the numbering system.

Only the last three digits of the well-numbering system are shown on the maps of the well, spring, and test-hole sites; the second two digits are shown in or near the northwest corner of each 7-1/2-minute quadrangle; and the first two digits are shown by large block numbers. For example, a well

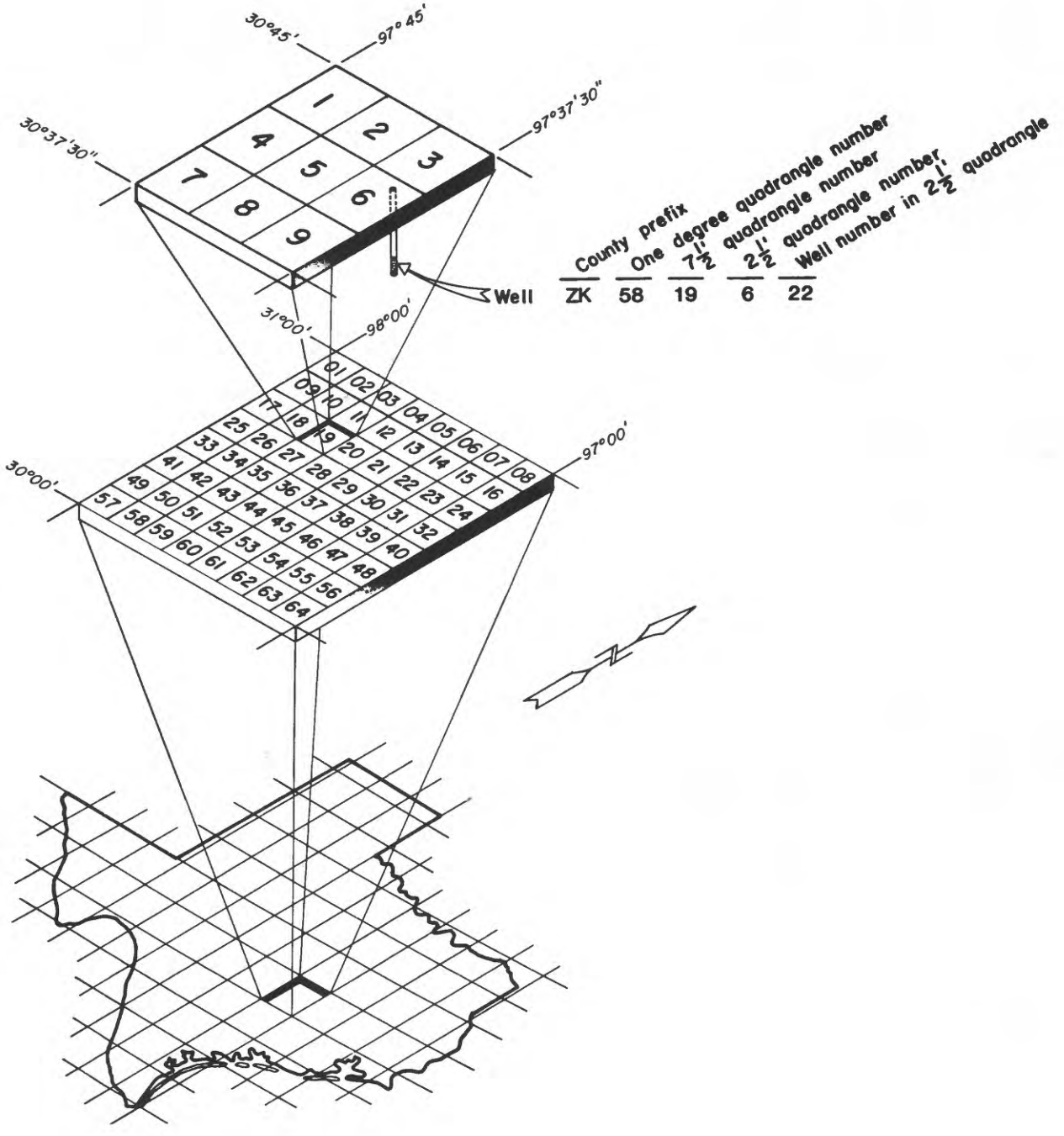


Figure 2.--Well-numbering system.

that is designated as well ZK-58-19-622 is shown in figure 4 with the number 622 beside the well symbol in the 7-1/2-minute quadrangle that bears the number 19. The large block number 58 designates the 1-degree quadrangle.

HYDROLOGIC SETTING

The study area encompassed about 150 square miles centering on the city of Georgetown. The majority of the 15,000 people living in the area depend on the Edwards aquifer for their domestic water supply.

Streams

The study area is located within the San Gabriel River drainage basin. Streams flow generally to the east across the Edwards Plateau and intersect the Balcones fault zone near the city of Georgetown. The principle streams and tributaries crossing the study area are North Fork San Gabriel River, South Fork San Gabriel River, San Gabriel River, Berry Creek, Dry Berry Creek, Pecan Branch, Smith Branch, Weir Branch, and Chandler Branch. Chandler Branch is a tributary to Brushy Creek, near Round Rock, which flows into the San Gabriel River downstream from the study area. Lake Georgetown is on the North Fork of the San Gabriel River. In general, small flow losses occur in streams crossing the aquifer outcrop west of the Balcones fault zone, and gains in flow occur as springflow at the eastern edge of the outcrop (Baker and others, 1986).

Hydrogeology

The entire study area is underlain by the Edwards aquifer. The aquifer is made up of three formations of Cretaceous age, the Edwards Limestone which is the major water-bearing unit, the Georgetown Limestone, and the Comanche Peak Limestone. The uneroded thickness of the aquifer decreases from south to north which is along the strike and increases from west to east which is downdip (fig. 3). The approximate location of the outcrop is shown in figure 1. The updip boundary of the outcrop lies mostly to the west of the study area. The outcrop of the aquifer approximates the recharge area for the aquifer. The aquifer gains water from the infiltration of precipitation and streamflow in the outcrop and loses water as springflow at the eastern edge of the outcrop. Georgetown and Berry Springs (fig. 1) are major discharge points for ground water in the area. A relatively small volume of discharge occurs as pumpage from wells. An unknown volume of water is discharged by evapotranspiration. The predominant direction of ground water flow in the study area is to the east (Baker and others, 1986).

HYDROLOGIC AND GEOLOGIC DATA

The available data were collected in six streamflow and ground-water level surveys, installation and operation of three clusters of test wells, and water-quality sampling of selected wells and stream sites.

Streamflow

The Geological Survey operates four full range, continuous record, stage

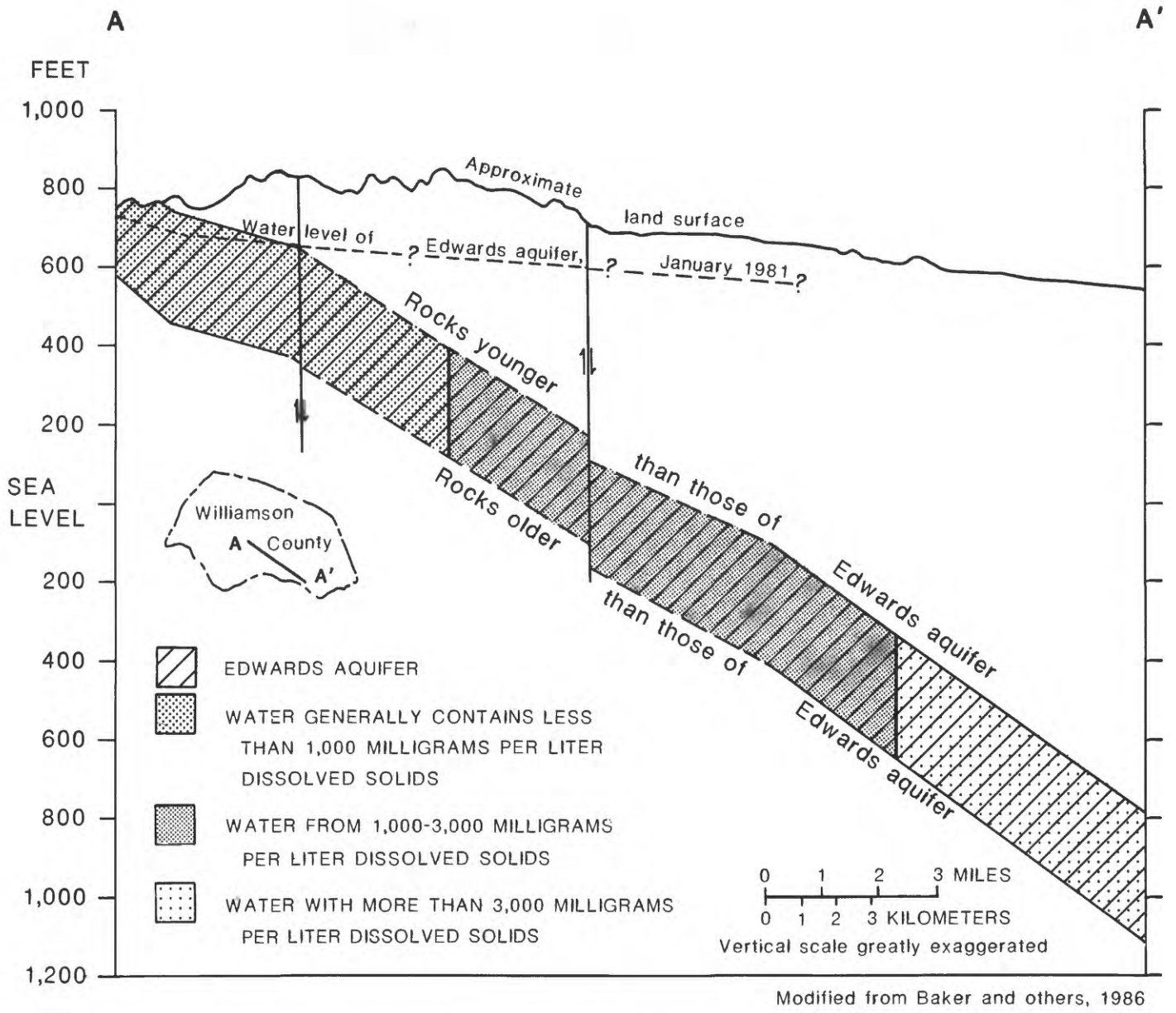


Figure 3.--Generalized hydrogeologic section along dip of the Edwards aquifer.

and discharge streamflow gages in the study area (fig. 4). The discharge relationships of the North Fork San Gabriel River, South Fork San Gabriel River, San Gabriel River, and Berry Creek are shown in figure 5. In the reach below Lake Georgetown, the flow is partly regulated much of the time. In addition, data from three partial-record streamflow gages are available for this study. The test well sites are located near two of them. These gages provide continuous record of the stream stage between altitudes of 644 and 651 feet and discharges of 9.90 and 200 cubic feet per second at the San Gabriel River site, and between altitudes of 613 and 616 feet, and discharges of 1.0 and 150 cubic feet per second at the Berry Creek site. Six gain and loss surveys were conducted along the principle streams and tributaries transecting the study area (fig. 4 and table 1). The graph of the survey conducted on July 28, 1986 (fig. 6) represents streamflow gains and losses during a period of low water-level conditions in the aquifer. The graph of the survey conducted March 30 to April 1, 1987 (fig. 7), represents streamflow gains and losses during high water-level conditions in the aquifer.

Ground-Water Levels

To illustrate the variation of hydrologic conditions of the Edwards aquifer during the study, hydrographs of periodic water-level measurements from selected wells are presented in figure 8. These data were provided by the Bureau of Economic Geology from their network of observation wells.

Water levels in a network of selected wells (fig. 4 and table 2) were measured concurrently with the streamflow gain and loss surveys. Two water-level contour maps, during low water-level conditions (fig. 9) and high water level conditions (fig. 10) are presented to show the configuration of the ground-water levels and to compare the changes between the two conditions. Water levels differed by an average of 38 feet between low and high water-level conditions in the confined zone, and by an average of 13 feet in the unconfined zone.

Test-Well Sites

Three test sites with three observation wells each were installed by the Texas Water Development Board adjacent to major streams in the study area (fig. 4). Each of the three wells at a test site was completed to a different zone--the deepest well is open to the Edwards Limestone and the other two wells are open to different zones within the Georgetown Limestone, one near the Georgetown-Edwards contact, the other near the middle of the formation. Continuous water-level recorders were installed on all nine observation wells. Table 3 lists daily mean water levels for these wells. These water levels and the levels of the adjacent stream at each test-well site are hydrographically presented in the following sections of the report.

The Berry Creek test-well site is located on State Highway (SH) 971 right of way and on the east bank of Berry Creek. Partial-record streamflow gage 08105200, Berry Creek at SH 971 near Georgetown, is located at the site. The test-well drilling, coring, geophysical logging, and installation was conducted during November 1986. Figure 11 shows location, well completion, and water-level data; figure 12 shows a summary of geologic, geophysical, and

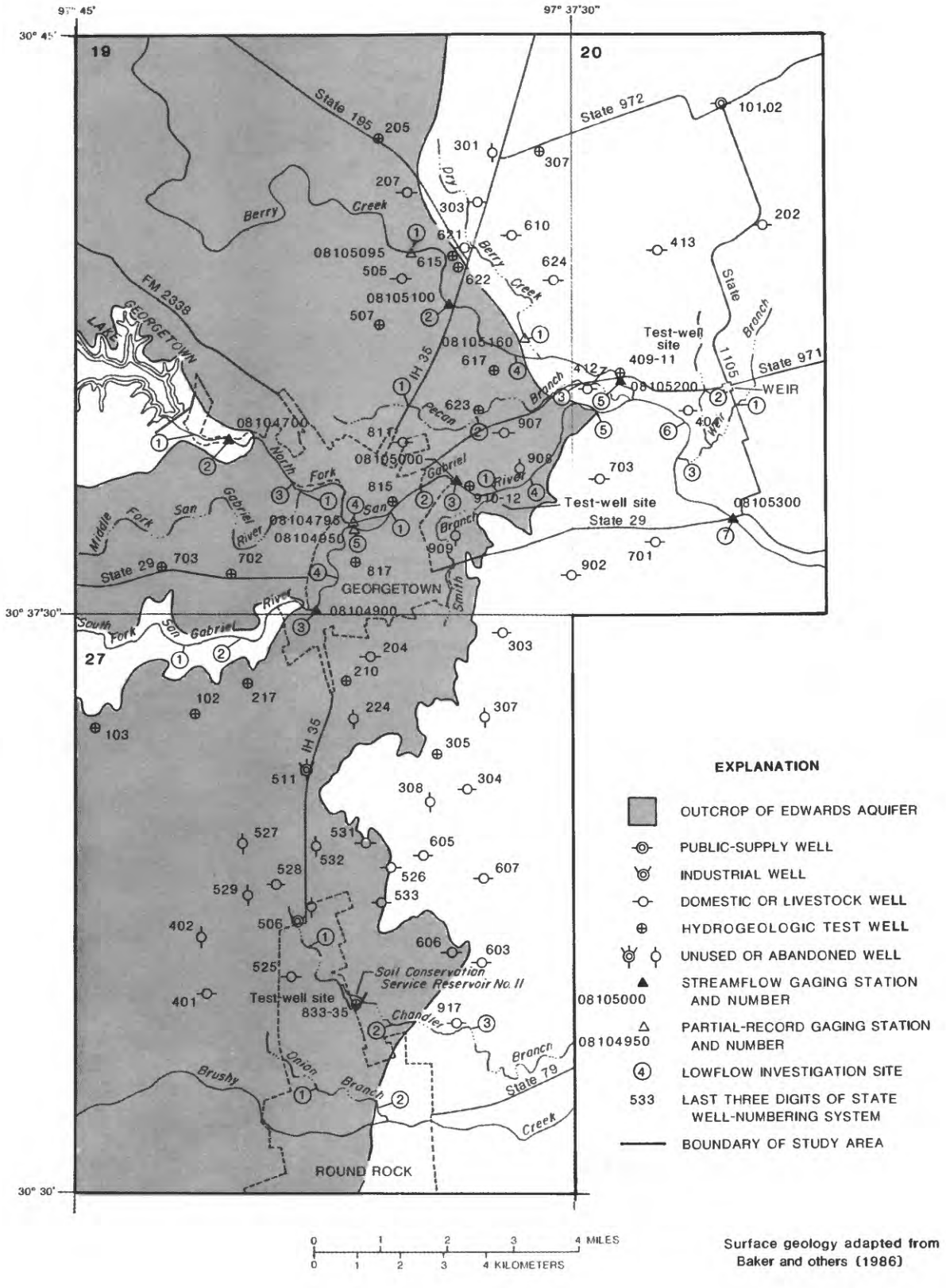


Figure 4.--Location of data-collection sites.

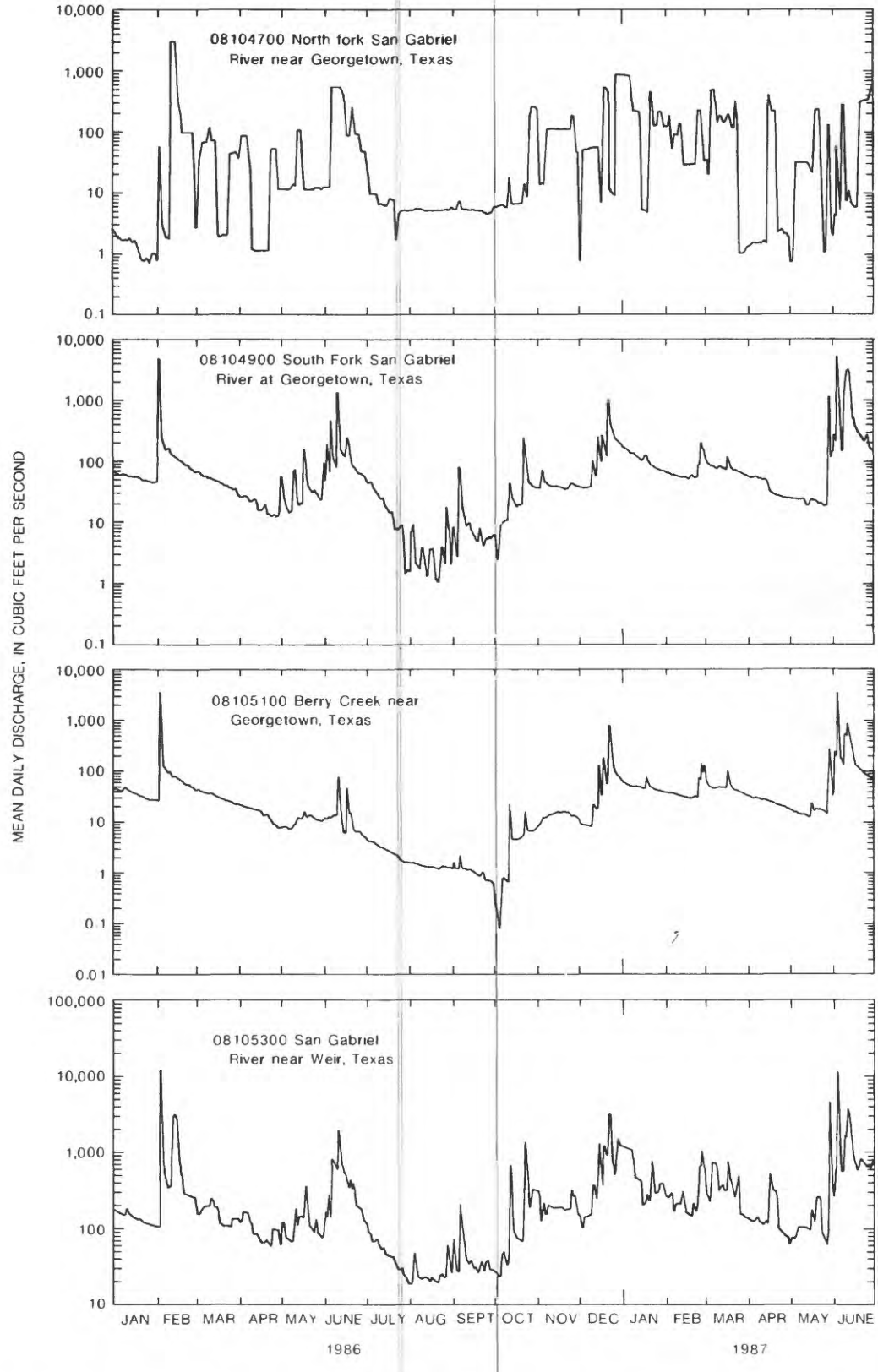


Figure 5.--Discharge hydrographs at selected streamflow-gaging stations.

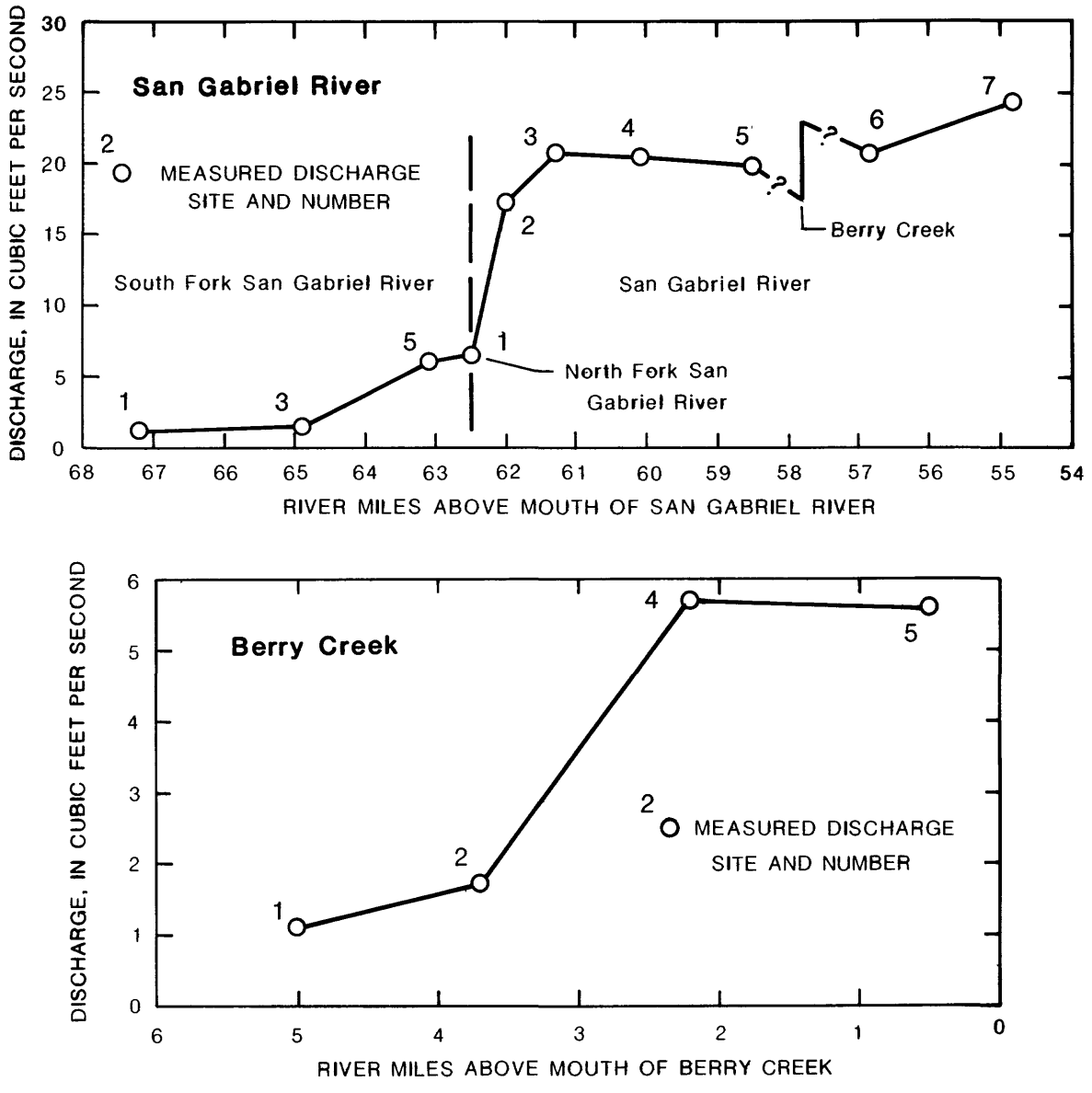


Figure 6.--Streamflow gain and loss along San Gabriel River and Berry Creek, July 28, 1986.

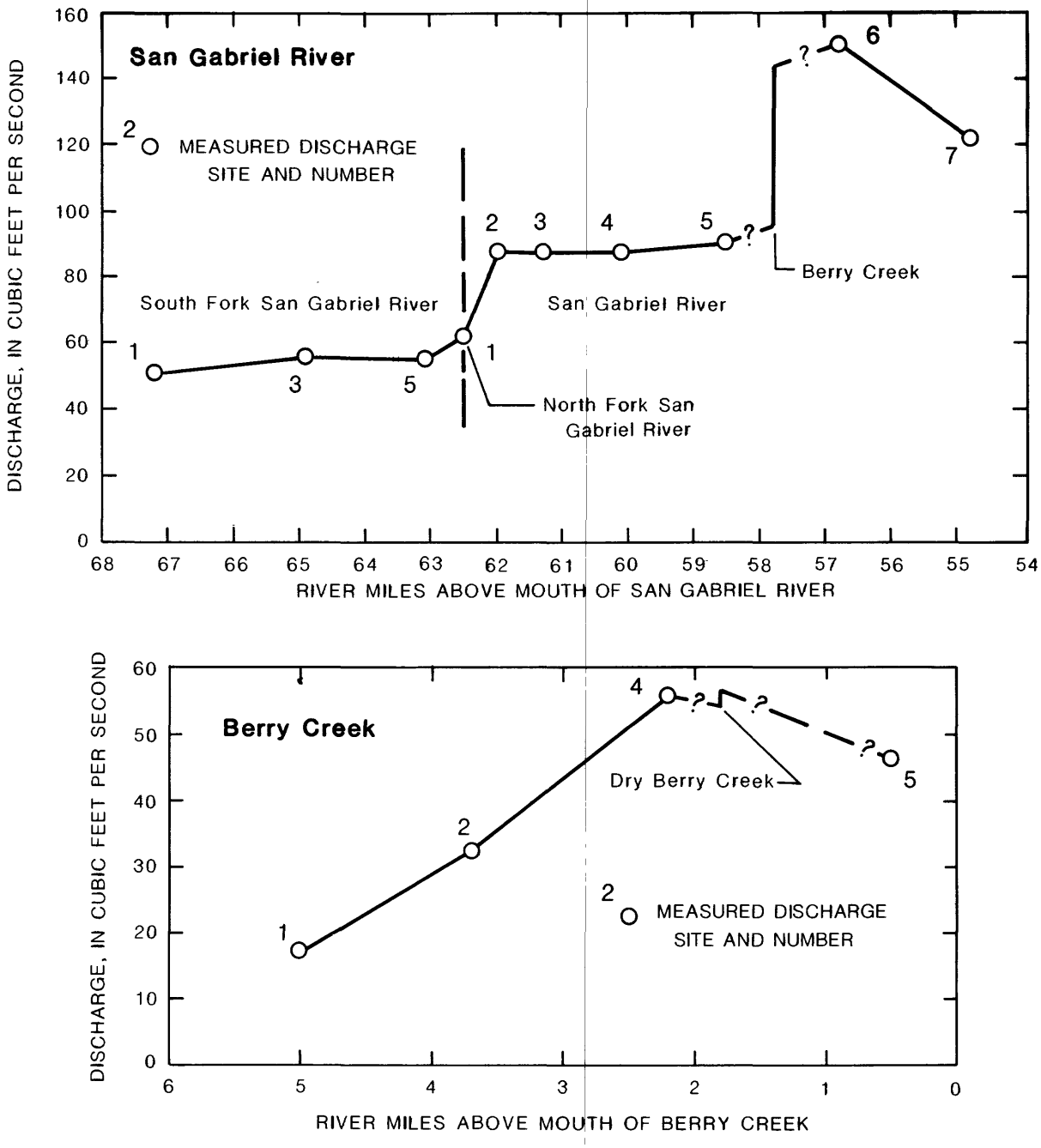
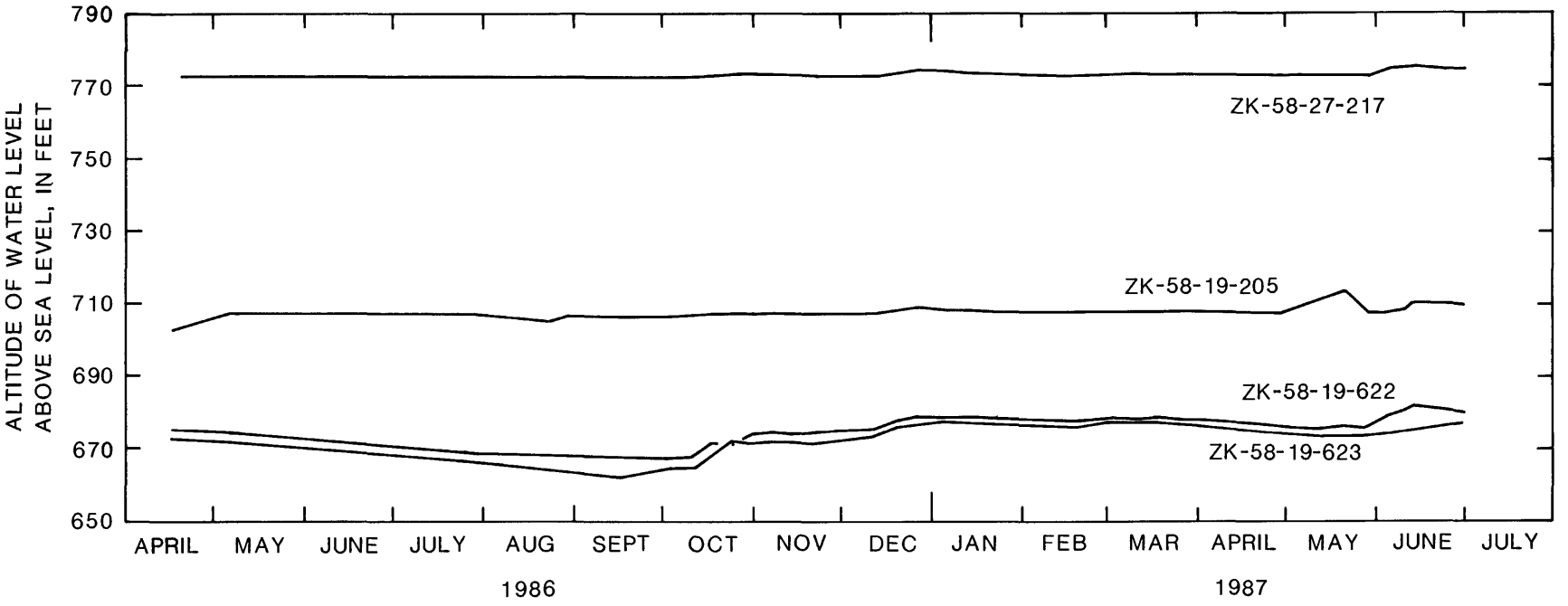


Figure 7.--Streamflow gain and loss along San Gabriel River and Berry Creek, March 30-April 1, 1987.



Water-level data from Bureau of Economic Geology

Figure 8.--Water-level hydrographs at selected wells.

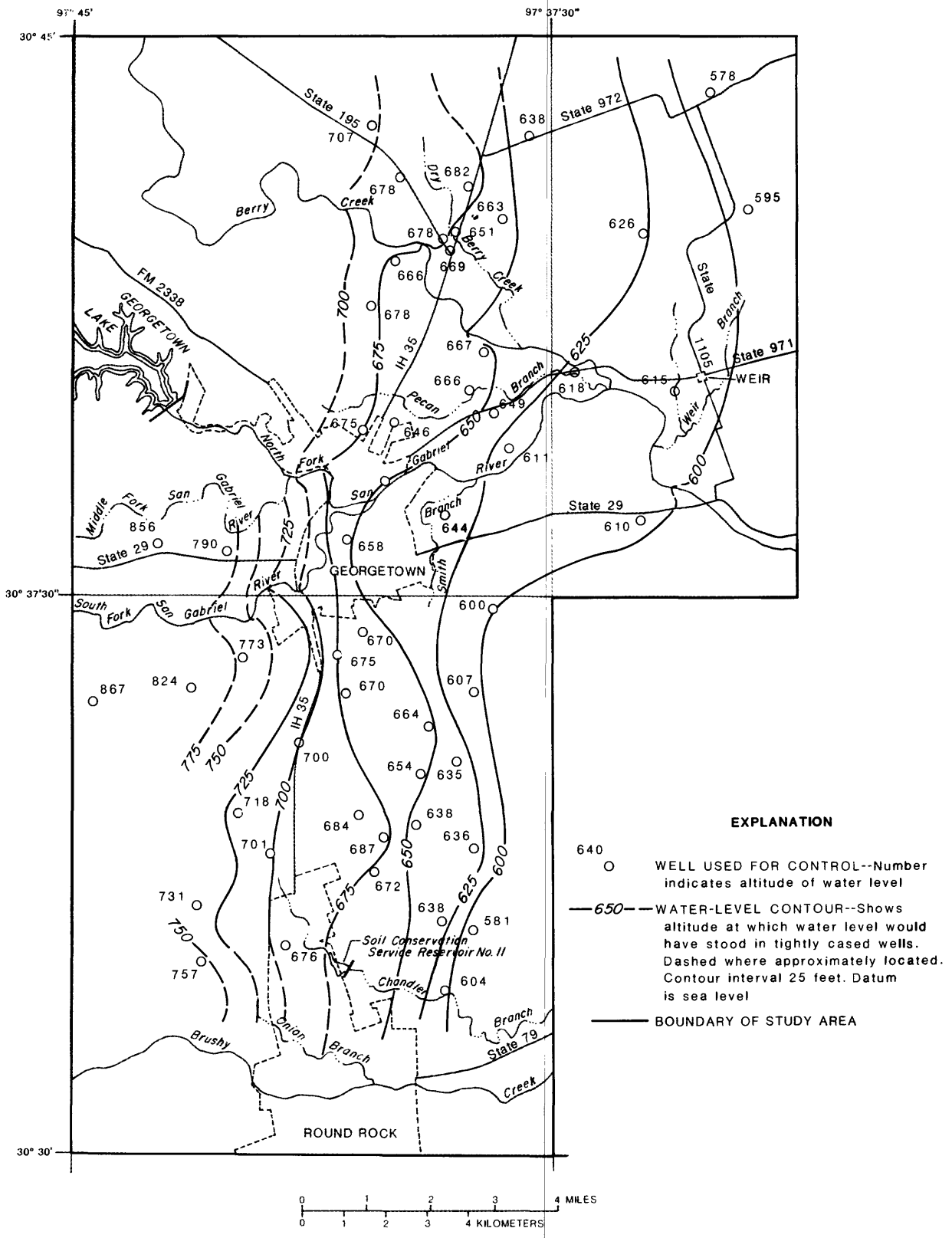


Figure 9.--Ground-water levels, July 28-29, 1986.

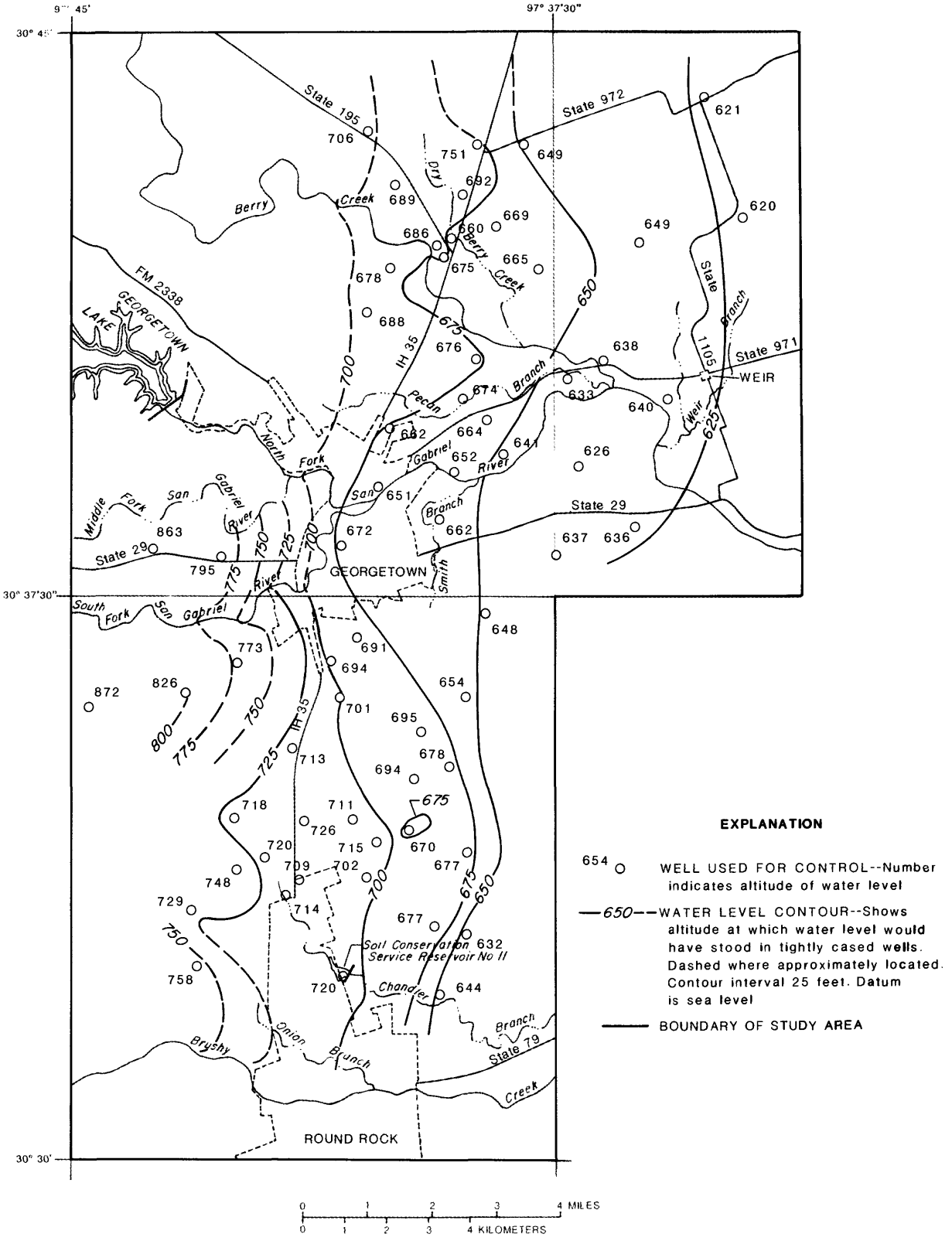


Figure 10.--Ground-water levels, March 30-April 1, 1987.

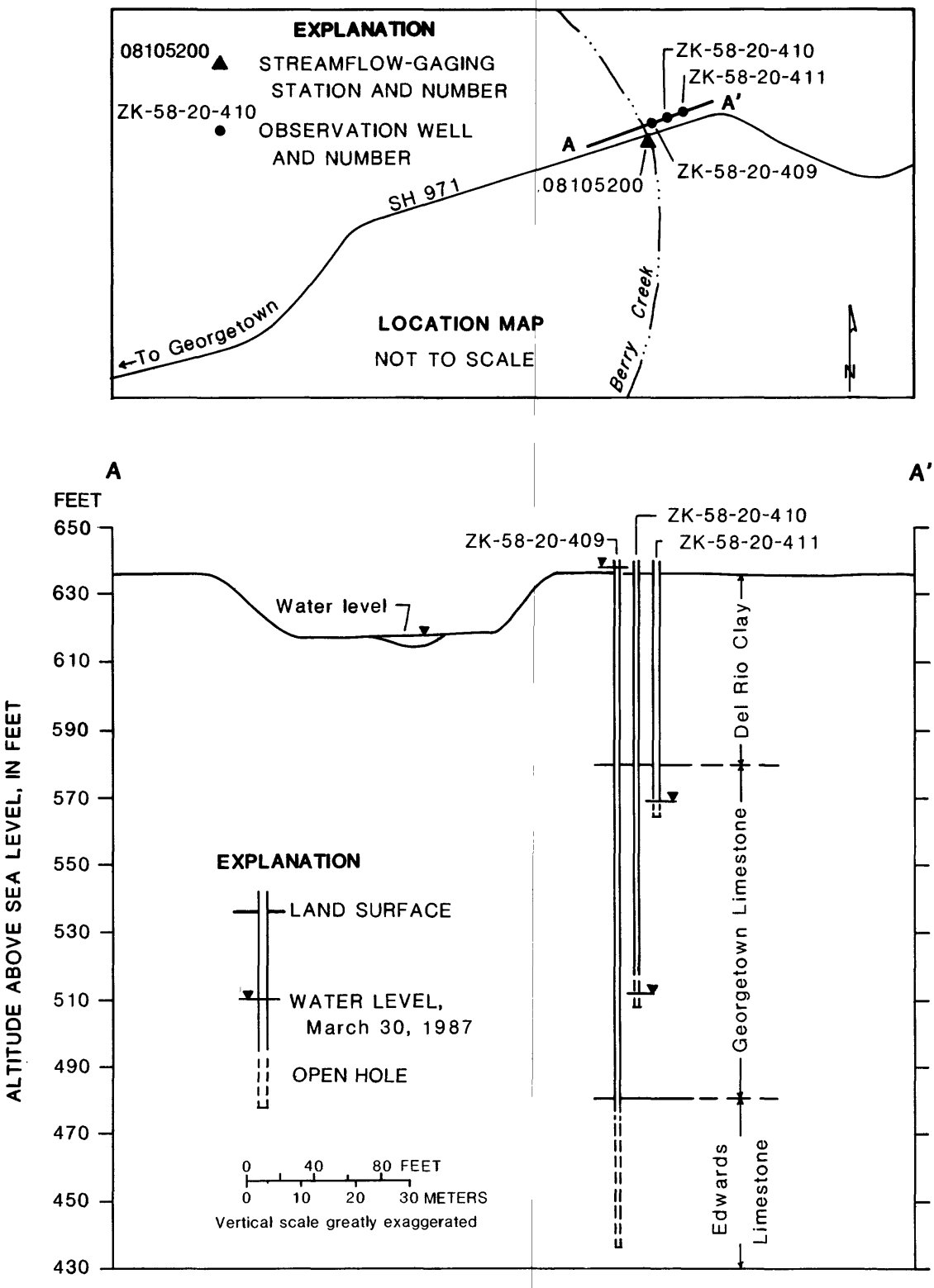


Figure 11.--Location, well completion, and water-level data, Berry Creek test-well site.

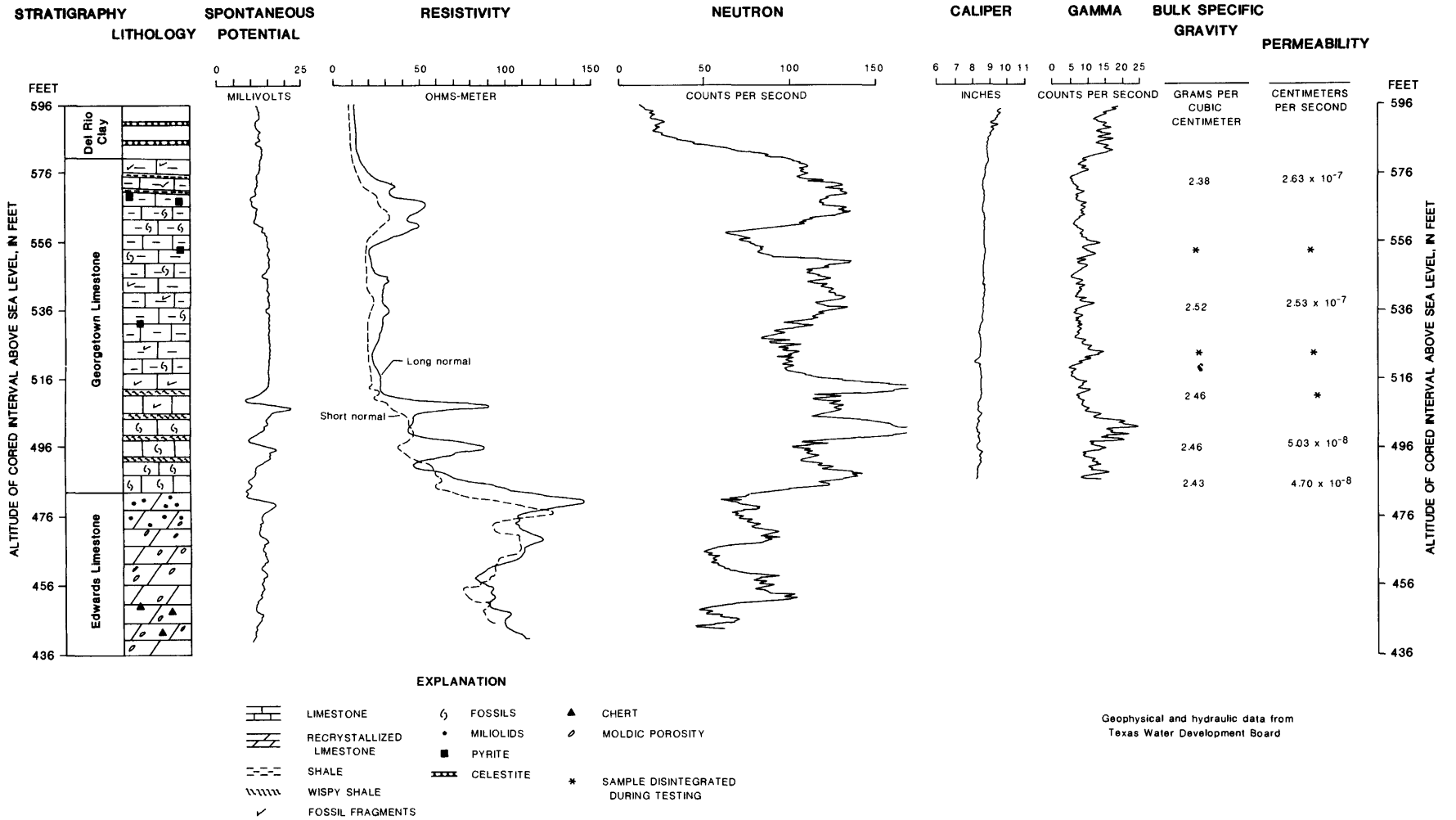


Figure 12.—Geologic, geophysical, and hydraulic properties of the cored interval at the Berry Creek test-well site.

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River

[ft3/s, cubic feet per second; °C, degree Celsius; ft, feet; mi, miles]

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
1	North Fork San Gabriel River	Lat. 30°39'53", Long. 97°43'27", 1,500 ft downstream from Lake Georgetown	66.6	May 5, 1986	10.1	--	1,340	22.0	--	Limestone bedrock some medium size gravel.
2	North Fork San Gabriel River	Lat. 30°39'42", Long. 97°42'40", 5,000 ft downstream from Lake Georgetown, at gaging station 08104700	65.9	May 5, 1986	11.0	--	385	21.5	--	Limestone bedrock some medium size gravel.
				July 28, 1986	a/5.05	--	373	27.0	--	
				July 29, 1986	5.30	--	--	29.5	--	
				Dec. 1, 1986	3.54	--	--	16.5	8.4	
				Dec. 2, 1986	0.77	--	521	10.5	8.2	
				Feb. 17, 1987	a/28.1	--	428	12.5	7.6	
				Feb. 23, 1987	28.5	--	--	9.0	--	
				Apr. 1, 1987	a/1.56	--	499	21.6	7.9	
				Apr. 2, 1987	1.44	--	--	17.0	--	
				May 6, 1987	a/29.8	--	404	23.0	7.7	
				May 7, 1987	29.8	--	--	23.0	--	
3	North Fork San Gabriel River	Lat. 30°39'11" Long. 97°41'45" 1.3 mi upstream from IH 35	64.6	May 5, 1986	11.2	--	368	22.5	--	Limestone bedrock a few large rocks.
				July 28, 1986	5.33	--	362	27.0	--	
				Dec. 1, 1986	13.6	--	--	14.0	8.3	
				Dec. 2, 1986	4.00	--	383	12.5	8.3	
				Feb. 17, 1987	31.8	--	437	12.0	7.7	
				Apr. 1, 1987	3.54	--	499	12.2	7.5	
				May 6, 1987	35.0	--	422	22.5	7.3	
1	Middle Fork San Gabriel River	Lat. 30°39'03", Long. 97°41'40", 0.1 mi upstream from mouth	b/64.4	May 6, 1986	--	2.96	525	22.0	--	Limestone bedrock (mouth is 1.9 mi upstream from mouth of North Fork San Gabriel River)
				July 28, 1986	--	.12	575	26.0	--	
4	North Fork San Gabriel River	Lat. 30°38'44" Long. 97°40'49", 0.2 mi upstream from S.H. 418 and at partial-record streamflow Station 08104795	63.0	May 5, 1986	13.6	--	419	23.0	--	Limestone bedrock with poorly sorted medium to coarse gravel.
				July 28, 1986	5.07	--	358	27.5	--	
				Dec. 1, 1986	14.7	--	--	14.0	8.5	
				Dec. 2, 1986	8.24	--	481	11.0	8.3	
				Feb. 17, 1987	39.3	--	450	11.5	7.8	
				Apr. 1, 1987	9.36	--	475	10.8	7.4	
				May 6, 1987	37.8	--	423	22.5	7.3	

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
1	South Fork San Gabriel River	Lat. 30°37'07", Long. 97°43'12", 1.8 mi west of IH 35 at intersection with FM 2243, 4.7 mi upstream from mouth	b/62.5	May 5, 1986	16.2	--	395	21.5	--	Well sorted coarse gravel.
				July 28, 1986	1.22	--	375	33.0	--	
				Dec. 1, 1986	32.0	--	474	10.0	8.1	
				Feb. 17, 1987	50.5	--	474	11.5	6.9	
				Apr. 1, 1987	51.2	--	495	11.5	8.3	
				May 6, 1987	22.4	--	433	22.5	8.0	
2	South Fork San Gabriel River	Lat. 30°37'13", Long. 97°42'30", 1.5 mi upstream from IH 35, 3.9 mi upstream from mouth	b/62.5	May 5, 1986	17.5	--	398	21.5	--	Limestone bedrock with well sorted gravel bars.
3	South Fork San Gabriel River	Lat. 30°37'32", Long. 97°41'27", at downstream side IH 35 bridge and at streamflow station 08104900, 2.4 mi upstream from mouth	b/62.5	May 5, 1986	16.9	--	402	23.5	--	Limestone bedrock with well sorted gravel bars.
				July 28, 1986	a/ 7.85	--	--	27.5	--	
				July 29, 1986	1.48	--	--	28.0	--	
				Dec. 1, 1986	36.7	--	464	10.0	8.3	
				Dec. 2, 1986	32.8	--	--	--	--	
				Feb. 17, 1987	47.2	--	--	--	--	
				Feb. 20, 1987	56.2	--	--	9.0	--	
				Mar. 31, 1987	56.4	--	--	16.5	--	
				Apr. 1, 1987	55.2	--	492	11.0	7.6	
				May 6, 1987	23.6	--	412	24.5	7.9	
4	South Fork San Gabriel River	Lat. 30°37'58", Long. 97°41'03", at SH 29, Georgetown, 1.7 mi upstream from mouth	b/62.5	May 5, 1986	17.8	--	394	22.0	--	Limestone bedrock with well sorted gravel bars.
5	South Fork San Gabriel River	Lat. 30°38'38" Long. 97°40'50", 0.2 mi upstream from SH 418, at partial-record streamflow station 08104950, 0.6 mi upstream from mouth	b/62.5	May 5, 1986	16.4	--	412	22.5	--	Limestone bedrock with a lot of poorly sorted medium to coarse gravel.
				July 28, 1986	5.22	--	369	30.0	--	
				Dec. 1, 1986	38.5	--	460	11.0	8.3	
				Feb. 17, 1987	51.5	--	464	12.0	7.5	
				Apr. 1, 1987	55.4	--	490	13.0	7.9	
				May 6, 1987	21.6	--	420	24.0	7.9	

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
1	San Gabriel River	Lat. 30°38'47", Long. 97°40'16", 0.4 mi downstream from SH 418	62.5	May 6, 1986	34.5	--	403	24.0	--	Limestone bedrock with very poorly sorted gravel.
				July 28, 1986	6.58	--	385	28.0	--	
				Dec. 1, 1986	52.1	--	427	17.0	8.3	
				Dec. 2, 1986	43.2	--	427	11.0	8.3	
				Feb. 17, 1987	83.5	--	471	13.0	7.5	
				Apr. 1, 1987	62.1	--	588	17.0	8.0	
				May 6, 1987	62.3	--	447	23.0	7.9	
2	San Gabriel River	Lat. 30°39'07", Long. 97°39'50", 1.0 mi downstream from SH 418	62.0	May 6, 1986	41.9	--	487	23.0	--	Limestone bedrock with some poorly sorted gravel bars.
				July 28, 1986	17.2	--	462	31.5	--	
				Dec. 1, 1986	80.2	--	502	15.0	8.1	
				Feb. 17, 1987	106	--	482	16.5	7.4	
				Apr. 1, 1987	87.9	--	518	17.5	8.0	
				May 6, 1987	76.1	--	480	23.5	7.3	
3	San Gabriel River	Lat. 30°39'14", Long. 97°39'18", 100 ft downstream from MK RR bridge 1.2 mi downstream from the confluence of North and South Forks and at streamflow station 08105000	61.3	May 5, 1986	47.6	--	514	23.0	--	Limestone bedrock with well sorted gravel bars.
				July 28, 1986	20.8	--	519	28.5	--	
				Dec. 1, 1986	81.0	--	490	15.0	7.9	
				Dec. 2, 1986	a/67.7	--	--	--	--	
				Feb. 17, 1987	a/105	--	--	--	--	
				Feb. 23, 1987	107	--	--	15.5	--	
				Apr. 1, 1987	a/87.5	--	545	17.5	7.4	
				Apr. 3, 1987	84.1	--	--	14.0	--	
				May 6, 1987	a/72.9	--	483	21.5	7.6	
				May 7, 1987	75.7	--	--	21.5	--	
1	Smith Branch	Lat. 30°38'26", Long. 97°39'27", at county road 0.4 mi downstream from SH 29, and 1.4 mi upstream from mouth	b/60.6	May 5, 1986	--	0.08	560	23.5	--	Limestone bedrock (mouth is 60.6 mi upstream from mouth of San Gabriel River).
				July 28, 1986	--	0	--	--	--	
				Dec. 1, 1986	--	.67	674	11.0	7.8	
				Feb. 17, 1987	--	.28	738	12.0	7.9	
				Apr. 1, 1987	--	.56	622	15.0	7.6	
				May 6, 1987	--	.05	736	21.0	7.3	
4	San Gabriel River	Lat. 30°39'18", Long. 97°38'17", 2.9 mi downstream from SH 418, at Stiles Ranch	60.1	May 6, 1986	46.2	--	474	22.0	--	Well sorted medium gravel.
				July 28, 1986	20.6	--	499	30.5	--	
				Dec. 2, 1986	63.6	--	523	13.0	8.3	
				Feb. 17, 1987	110	--	514	14.5	7.0	
				Apr. 1, 1987	87.8	--	550	18.5	7.9	
				May 6, 1987	75.8	--	499	25.0	7.7	
5	San Gabriel River	Lat. 30°40'08", Long. 97°37'12", 0.7 mi upstream from Berry Creek, 4.6 mi downstrem from SH 418, and at Gibson Ranch	58.5	May 6, 1986	53.8	--	440	24.0	--	Well sorted medium to coarse gravel.
				July 28, 1986	19.9	--	488	34.5	--	
				Dec. 1, 1986	103	--	469	14.0	--	
				Feb. 17, 1987	111	--	498	14.0	8.3	
				Apr. 1, 1987	90.5	--	448	16.3	7.6	
				May 6, 1987	82.9	--	489	23.0	7.4	

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
1	Pecan Branch	Lat. 30°40'10", Long. 97°39'53", at bridge on SH 418, 2.5 mi north of Georgetown, and 4.3 mi upstream from mouth	b/57.9	May 5, 1986	--	0.28	431	24.0	--	Limestone bedrock with some silt.
				July 28, 1986	--	0	--	--	--	
				Dec. 2, 1986	--	0	--	--	--	
				Feb. 17, 1987	--	0	--	--	--	
				Apr. 1, 1987	--	0	--	--	--	
				May 6, 1987	--	0	--	--	--	
2	Pecan Branch	Lat. 30°40'03", Long. 97°38'58", at County Road, 1.2 mi downstream from SH 418, 3.1 mi upstream from mouth	b/57.9	May 5, 1986	--	0	--	--	--	Silt and gravel.
				July 28, 1986	--	0	--	--	--	
				Dec. 2, 1986	--	.55	552	11.0	7.8	
				Feb. 17, 1987	--	.16	534	9.0	7.4	
				Apr. 1, 1987	--	.12	502	13.0	7.6	
				May 6, 1987	--	0	--	--	--	
3	Pecan Branch	Lat. 30°40'29", Long. 97°37'22", at SH 971, 0.9 mi upstream from mouth and 2.9 mi west of Weir	b/57.9	May 5, 1986	--	0	--	--	--	Well sorted medium to fine gravel. (mouth is 57.8 mi upstream from mouth San Gabriel River.
				July 28, 1986	--	0	--	--	--	
				Dec. 2, 1986	--	.44	526	11.0	8.1	
				Feb. 17, 1987	--	.08	518	9.5	8.0	
				Apr. 1, 1987	--	.21	472	11.5	7.8	
				May 6, 1987	--	0	--	--	--	
1	Berry Creek	Lat. 30°42'11", Long. 97°39'59", 1.4 mi upstream from IH 35, and 5 mi upstream from mouth at partial-record streamflow station 08105095	b/57.8	May 5, 1986	--	1.10	554	18.5	--	Poorly sorted gravel and silt.
				July 28, 1986	--	0	--	--	--	
				Dec. 2, 1986	--	3.09	484	10.0	7.9	
				Feb. 17, 1987	--	15.0	487	13.5	7.7	
				Apr. 1, 1987	--	17.0	428	14.0	7.4	
				May 6, 1987	--	2.45	478	22.0	7.1	
2	Berry Creek	Lat. 30°41'28", Long. 97°39'21", at bridge on upstream service road of IH 35, 3.6 mi upstream from mouth, and at streamflow station 08105100, 3.7 mi upstream from mouth	b/57.8	May 5, 1986	--	7.58	572	21.5	--	Very poorly sorted gravel, sand, and silt.
				July 28, 1986	--	a/ 1.71	545	--	--	
				July 29, 1986	--	1.61	--	28.0	--	
				Dec. 2, 1986	--	8.36	553	14.0	7.6	
				Feb. 17, 1987	--	a/28.7	543	15.0	6.8	
				Feb. 20, 1987	--	30.7	--	14.0	--	
				Apr. 1, 1987	--	32.3	548	14.9	7.1	
				May 6, 1987	--	a/13.4	564	20.0	7.1	
				May 7, 1987	--	13.4	564	20.0	7.1	

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Mainstream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
4	Berry Creek	Lat. 30°42'11", Long. 97°39'59", at county road, 1.4 mi downstream from IH 35, 2.2 mi upstream from mouth	b/57.8	May 5, 1986	--	19.0	582	20.0	--	Limestone bedrock with poorly sorted gravel bars.
				July 28, 1986	--	5.71	576	24.0	--	
				Dec. 2, 1986	--	18.6	573	14.0	7.7	
				Feb. 17, 1987	--	33.9	565	14.5	7.7	
				Apr. 1, 1987	--	55.4	545	15.5	7.6	
				May 6, 1987	--	21.5	599	20.5	7.9	
1	Dry Berry Creek	Lat. 30°40'52", Long. 97°38'24", at county road 0.4 mi upstream from mouth and 4.0 mi northwest of Georgetown, 0.4 mi upstream from mouth at partial record streamflow station 08105160	b/59.6	May 5, 1986	--	0.23	520	20.0	--	Limestone bedrock with poorly sorted gravel bars.
				July 28, 1986	--	0.01	474	30.5	--	
				Dec. 2, 1986	--	4.93	506	12.0	7.8	
				Feb. 17, 1987	--	1.57	497	11.0	7.8	
				Apr. 1, 1987	--	2.59	404	16.3	7.6	
				May 6, 1987	--	0.54	535	22.0	7.4	
5	Berry Creek	Lat. 30°40'33", Long. 97°36'51", at bridge on SH 971, 4.7 mi northeast of Georgetown, and at streamflow station 08105200 0.5 mi upstream from mouth	b/57.8	May 5, 1986	--	15.6	538	21.5	--	Poorly sorted gravel and silt. (Mouth is 57.9 mi upstream from mouth of San Gabriel River.)
				July 28, 1986	--	5.60	477	29.0	--	
				Dec. 2, 1986	--	24.0	538	14.0	8.1	
				Feb. 17, 1987	--	41.8	531	15.0	7.2	
				Apr. 1, 1987	--	45.7	548	15.5	7.6	
				May 6, 1987	--	23.0	558	21.0	7.4	
6	San Gabriel River	Lat. 30°39'58", Long. 97°35'49", 0.5 mi downstream from mouth of Berry Creek, and 2.0 mi upstream from SH 29	56.8	May 6, 1986	63.0	--	481	22.0	--	Well sorted gravel.
				July 28, 1986	20.8	--	484	34.5	--	
				Dec. 2, 1986	97.9	--	519	16.5	8.6	
				Feb. 17, 1987	153	--	525	14.0	8.0	
				Apr. 1, 1987	151	--	473	17.9	7.3	
				May 6, 1987	100	--	521	24.0	7.6	
1	Weir Branch	Lat. 30°40'12", Long. 97°35'03", at FM 1105 bridge, 1.5 mi upstream from mouth	b/56.2	May 5, 1986	--	0	--	--	--	Limestone bedrock with poorly sorted gravel bars.

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
2	Weir Branch	Lat. 30°40'25", Long. 97°35'32", at SH 971 bridge, 0.9 mi upstream from mouth	b/56.2	May 5, 1986	--	0.52	463	21.0	--	Silt and gravel.
3	Weir Branch	Lat. 30°39'30", Long. 97°35'55", 0.2 mi upstream from mouth	b/56.2	May 6, 1986	--	.28	372	22.5	--	Silt and gravel. (Mouth is 56.2 mi upstream from mouth of San Gabriel.
7	San Gabriel River	Lat. 30°38'45", Long. 97°35'06", at downstream side SH 29 bridge, 0.5 mi upstream from Monske Branch and at stream-flow station 08105300	54.8	May 5, 1986	68.4	--	460	22.0	--	Limestone bedrock with silt and gravel
				July 28, 1986	24.5	--	457	31.0	--	
				Dec. 2, 1986	99.2	--	507	10.0	8.3	
				Feb. 17, 1987	a/155	--	504	14.0	7.0	
				Feb. 23, 1987	157	--	--	14.0	--	
				Apr. 1, 1987	a/133	--	528	17.0	7.7	
				Apr. 3, 1987	122	--	--	15.5	--	
				May 6, 1987	a/ 98.6	--	519	23.0	7.8	
				May 7, 1987	101	--	--	23.0	--	
1	Onion Branch	Lat. 30°31'22", Long. 97°41'21", at IH 35, 0.4 mi north of US Hwy 79, Round Rock, and 1.4 mi upstream from mouth	60.3	May 5, 1986	--	0	--	--	--	Very poorly sorted gravel and mud.
				July 28, 1986	--	0	--	--	--	
				Dec. 2, 1986	--	.22	553	14.5	7.7	
				Feb. 17, 1987	--	.05	679	14.0	7.7	
				Apr. 1, 1987	--	0	--	--	--	
				May 6, 1987	--	0	--	--	--	
2	Onion Branch	Lat. 30°31'07", Long. 97°40'25", 0.8 mi east of IH 35 on US Hwy 79, Round Rock, and 0.2 mi upstream from mouth	b/60.3	May 6, 1986	--	0	--	--	--	Very poorly sorted gravel. (Tributary to Brushy Creek, and mouth of Brushy Creek is 5.2 mi upstream from mouth of San Gabriel River.)
				July 28, 1986	--	0	--	--	--	
				Dec. 1, 1986	--	0	--	--	--	
				Feb. 17, 1987	--	.14	665	13.5	8.0	
				Apr. 1, 1987	--	.14	626	21.0	7.6	
				May 6, 1987	--	.03	723	25.0	7.6	
1	Chandler Branch	Lat. 30°33''12", Long. 97°41'32", at IH 35, 3.0 mi north of Round Rock, and 6.3 mi upstream from mouth	b/56.3	May 5, 1986	--	0	--	--	--	Very poorly sorted gravel and silt.
				July 28, 1986	--	0	--	--	--	
				Dec. 1, 1986	--	0	--	--	--	
				Feb. 17, 1987	--	0	--	--	--	
				Apr. 1, 1987	--	0	--	--	--	
				May 6, 1987	--	0	--	--	--	

Table 1.--Hydrologic data and site descriptions for gain and loss surveys in Berry Creek, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River--Continued

Site number	Stream	Location	River miles above mouth	Date	Discharge (ft^3/s) Main-stream	Discharge (ft^3/s) Tributary	Specific conductance (microsiemens per centimeter at 25 °C)	Water temperature (°C)	pH	Cross-section bed material
2	Chandler Branch	Lat. 30°32'11", Long. 97°40'12", at Sunshine Road, 2.2 mi downstream from IH 35 at Round Rock, and 4.2 mi upstream from mouth	b/56.3	May 5, 1986	--	0.33	458	22.5	--	Silt and gravel.
				July 28, 1986	--	.26	--	--	--	
				Dec. 1, 1986	--	.60	528	14.5	7.7	
				Feb. 17, 1987	--	.14	621	14.0	7.9	
				Apr. 1, 1987	--	.23	575	18.0	7.7	
				May 6, 1987	--	.17	600	25.0	7.5	
3	Chandler Branch	Lat. 30°31'56", Long. 97°39'01", 0.2 mi downstream from FM 1460, 1.3 mi north of US Hwy 79, Round Rock, and 2.9 mi upstream from mouth	b/56.3	May 6, 1986	--	.52	462	21.5	--	Gravel and silt. (Tributary to Brushy Creek and mouth of Brushy Creek is 5.2 mi upstream from mouth of San Gabriel River.)
				July 28, 1986	--	0	--	--	--	
				Dec. 1, 1986	--	1.30	645	12.0	7.6	
				Feb. 17, 1987	--	.83	686	11.5	7.6	
				Apr. 1, 1987	--	1.09	574	15.5	7.8	
				May 6, 1987	--	.36	505	25.0	7.6	

a/ Discharge from rating table.
b/ River miles at mouth.

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys

All wells are drilled unless otherwise noted in remarks column

Water-bearing unit : Kceb, Edwards Limestone and associated limestones (Balcones fault zone aquifer)
Water levels : Reported water levels given in feet; measured water levels given to the nearest tenth or hundredth of a foot.
Method of lift and type of power: C, cylinder; E, electric; N, none; S, submersible; W, windmill.
Use of water : D, domestic; Irr, irrigation; N, none; P, public supply; S, livestock.

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-19-205	Texas Water Development Board	Texas Water Development Board	6-17-80	121	3	20	Kceb	800	92.7	5-05-86	N	N	1/, 2/
									92.6	7-28-86			
									93.8	12-01-86			
									93.8	2-14-87			
									93.6	4-01-87			
									93.83	5-04-87			
									89.81	6-23-87			
ZK-58-19-207	N.C. Sybert	Faught Drilling	10-23-74	108	6	20	Kceb	750	68.2	5-05-86	S	D	--
									72.2	7-28-86			
									73.6	12-01-86			
									61.0	2-17-87			
									61.0	3-30-87			
									65.10	5-04-87			
ZK-58-19-301	James Chrislip	--	--	100	8	--	Kceb	760	64.7	5-05-86	N	N	1/
									40.8	7-28-86			
									7.8	12-01-86			
									10.11	2-17-87			
									8.67	3-30-87			
									82.67	5-08-87			
ZK-58-19-303	Donald Hoyle	Verley Hunt	5- -72	175	7	23	Kceb	730	43.4	5-05-86	S	D	1/, 3/
									47.8	7-28-86			
									31.9	12-02-86			
									39.07	2-17-87			
									38.49	3-30-87			
									41.11	5-08-87			
ZK-58-19-307	Bobby Stanton	Wright Water Wells	2-20-85	165	8-1/8	20	Kceb	780	138.00	5-05-86	N	N	4/
									142.30	7-28-86			
									133.30	12-01-86			
									128.54	2-17-87			
									130.86	3-30-87			
									138.61	5-08-87			
ZK-58-19-505	Ralph Petty	R. B. Bonnet	7- -78	90	8	58	Kceb	720	48.40	5-05-86	C, E	D	1/
									53.60	7-28-86			
									50.20	12-01-86			
									46.0	2-17-87			
									41.96	3-30-87			
									45.51	5-08-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water Level Above (+) below land surface datum (ft)	Water Level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-19-507	City of Georgetown	Byron Boucher	1979	180	12	160	Kceb	765	81.80	5-05-86	N	N	2/, 4/
									87.50	7-28-86			
									83.80	12-01-86			
									77.10	2-17-87			
									77.25	4-01-87			
									79.40	5-04-87			
ZK-58-19-610	James McElhannon	Tom Arnold	1- 3-73	270	4	140	Kceb	740	69.48	5-05-86	S	D	--
									76.80	7-28-86			
									62.55	12-01-86			
									66.44	2-17-87			
									70.88	3-30-87			
									69.36	5-08-87			
ZK-58-19-615	Boby Stanton	Tom Arnold	9- -78	207	10-3/4	6	Kceb	715	32.30	5-05-86	N	N	3/, 4/
									36.80	7-28-86			
									31.80	12-01-86			
									28.65	2-17-87			
									28.52	3-30-87			
									31.92	5-08-87			
ZK-58-19-617	Arthur Klein	Wright Water Wells	2-20-85	270	8-1/8	20	Kceb	712	39.78	5-05-86	N	N	4/
									45.10	7-28-86			
									39.80	12-01-86			
									36.68	2-17-87			
									36.44	3-30-87			
									38.42	5-08-87			
ZK-58-19-621	Leroy Buckhorn	Morgan & Hunt	3- -47	147	8	18	Kceb	685	28.80	5-05-86	S	D, S	3/
									33.60	7-28-86			
									27.50	12-01-86			
									26.70	2-17-87			
									24.60	3-30-87			
									27.30	5-04-87			
ZK-58-19-622	Bobby Stanton	Tom Arnold	3- 7-85	200	12	100	Kceb	707	32.50	5-05-86	N	N	3/, 5/
									38.30	7-28-86			
									32.10	12-01-86			
									29.50	2-17-87			
									29.37	3-30-87			
									31.16	5-08-87			
ZK-58-19-623	Garrett	--	--	--	--	--	--	688	15.44	5-05-86	N	N	2/, 4/
									21.50	7-28-86			
									17.50	12-01-86			
									14.20	2-13-87			
									13.52	4-01-87			
									15.94	5-04-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-19-624	W. C. Alff	Bert Arnold	--	240	--	--	Kceb	715	53.60	12-01-86	S	D	--
									50.35	2-17-87			
									49.70	3-30-87			
									54.84	5-08-87			
ZK-58-19-702	Texas Water Development Board	Texas Water Development Board	5- 2-80	106	3	62	Kceb	870	82.30	5-05-86	N	N	1/
									79.50	7-28-86			
									78.50	12-02-86			
									78.53	2-17-87			
									75.40	3-30-87			
									78.50	5-08-87			
ZK-58-19-703	Texas Water Development Board	Texas Water Development Board	6- 2-80	108	3	21	Kceb	905	41.90	5-05-86	N	N	1/
									48.90	7-28-86			
									41.00	12-02-86			
									41.94	2-17-87			
									41.93	3-30-87			
									82.11	5-08-87			
ZK-58-19-811	Sanders Oil Co.	Hunt Drilling Co.	3- -68	185	7	26	Kceb	710	59.42	5-05-86	S	D	--
									63.90	7-28-86			
									69.60	12-01-86			
									46.09	2-17-87			
									47.64	3-30-87			
									61.44	5-08-87			
ZK-58-19-815	City of Georgetown	Bryon Boucher	1979	205	8	10	Kceb	668	17.47	5-05-86	N	N	4/
									18.10	7-28-86			
									16.95	12-01-86			
									17.07	2-17-87			
									16.68	3-30-87			
									16.67	5-08-87			
ZK-58-19-817	City of.Georgetown	Bryon Boucher	1-22-79	219	16	120	Kceb	745	84.50	5-05-86	N	N	2/, 4/
									87.20	7-28-86			
									85.10	12-01-86			
									77.26	2-17-87			
									72.76	3-30-87			
									72.21	5-08-87			
ZK-58-19-902	Norman Domel	Thomas Arnold	1971	300	4	210	Kceb	708	102.60	12-02-86	S	D, S	--
									95.23	2-17-87			
									92.79	3-30-87			
									108.87	5-08-87			
ZK-58-19-907	Leon Perriaz	Verley Hunt	1956	200	6	20	Kceb	685	28.17	5-05-86	C, W	D	1/
									36.00	7-28-86			
									24.90	12-01-86			
									21.76	2-17-87			
									21.06	3-30-87			
									25.17	5-08-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level survveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-19-908	Stiles	--	--	--	--	--	Kceb	660	31.18	5-05-86	N	N	--
									48.60	7-28-86			
									25.70	12-01-86			
									20.63	2-17-87			
									19.19	3-30-87			
									28.21	5-08-87			
ZK-58-19-909	--	--	--	--	--	--	Kceb	710	56.40	5-05-86	N	N	--
									66.50	7-28-86			
									57.60	12-02-86			
									48.95	2-17-87			
									48.35	3-30-87			
									54.28	5-08-87			
ZK-58-19-910	U.S. Geological Survey	Texas Water Development Report	1- -87	165	6-5/8	120	Kceb	695	29.70	2-17-87	N	N	2/, 3/, 6/
									28.32	4-01-87			
									29.34	5-05-87			
									29.34	6-25-87			
ZK-58-19-911	U.S. Geological Survey	Texas Water Development Report	1- -87	91	6-5/8	83	Kceb	695	Dry	2-17-87	N	N	2/, 6/ Well completed in Georgetown Limestone
									Dry	4-01-87			
									Dry	5-05-87			
									78.63	6-26-87			
ZK-58-19-912	U.S. Geological Survey	Texas Water Development Report	1- -87	60	6-5/8	50	Kceb	695	Dry	2-17-87	N	N	2/, 6/ Well completed in Georgetown Limestone
									Dry	4-01-87			
									Dry	5-05-87			
									Dry	6-26-87			
ZK-58-20-101	City of Wallberg	Brown Bros.	1908	590	6	--	Kceb	855	276.70	7-28-86	S	P, S	1/ Supplies Walburg, Texas.
ZK-58-20-102	City of Wallberg	--	1957	603	6	447	Kceb	855	240.70	5-06-86	S	P, S	1/ Supplies Walburg, Texas.
									242.70	12-02-86			
									234.10	2-17-87			
									234.00	3-30-87			
									241.50	5-04-87			
ZK-58-20-202	York	W. F. Gibson	4- 4-73	580	7	405	Kceb	825	210.80	5-06-86	S	D	--
									229.90	7-28-86			
									211.20	12-02-86			
									206.25	2-17-87			
									205.45	3-30-87			
									211.10	5-04-87			
ZK-58-20-404	Rex Anderson	Tom Arnold	1-26-77	340	4	180	Kceb	663	34.30	5-06-86	S	D, S	--
									48.30	7-28-86			
									32.90	12-02-86			
									UTM	2-17-87			
									22.90	3-30-87			
									31.10	5-04-87			
									recently pumped				

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water Level Above (+) below land surface datum (ft	Water Level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-20-409	U.S. Geological Survey	Texas Water Development Board	11- -86	200	6-5/8	161	Kceb	635	+1.20	2-17-87	N	N	2/, 3/, 6/
									+1.86	3-30-87			
									6.90	5-05-87			
									2.03	6-25-87			
ZK-58-20-410	U.S. Geological Survey	Texas Water Development Board	11- -86	128	6-5/8	120	Kceb	635	125.90	2-17-87	N	N	2/, 3/ 6/ Well completed in Georgetown Limestone
									123.55	3-30-87			
									120.90	5-05-87			
									117.62	6-25-87			
ZK-58-20-411	U.S. Geological Survey	Texas Water Development Board	11- -86	72	6-5/8	62	Kceb	635	68.25	2-17-87	N	N	2/, 3/, 6/ Well completed in Georgetown Limestone
									66.55	3-30-87			
									64.93	5-05-87			
									62.44	6-25-87			
ZK-58-20 412	Gibson	--	1960	--	6	--	Kceb	652	23.00	5-06-86	S	D	--
									33.60	7-28-86			
									22.50	12-01-86			
									19.85	2-17-87			
									19.20	3-30-87			
									64.93	5-05-87			
ZK-58-20-413	Ernest Farrack	--	1960	360	6	--	Kceb	755	120.30	5-06-86	S	D	--
									129.30	7-28-86			
									110.50	12-02-86			
									107.35	2-17-87			
									106.45	3-30-87			
									117.00	5-04-87			
ZK-58-20-701	Carl Buchhorn	--	1970	--	--	--	Kceb	705	95.30	7-29-86	--	--	--
									77.50	12-02-86			
									71.50	2-18-87			
									69.20	3-30-87			
									79.20	5-04-87			
ZK-58-20-703	Bloomquist Bros.	R. B. Bonnet	1970	311	7	160	Kceb	700	80.00	12-02-86	S, E	D,	--
									77.50	2-18-87			
									73.65	3-30-87		Irr	
									84.20	5-04-87			
ZK-58-27-102	Texas Water Development Board	Texas Water Development Board	4-29-80	105	3	83	Kceb	905	79.20	5-05-86	N	N	1/
									81.30	7-28-86			
									79.20	12-03-86			
									78.80	2-18-87			
									78.80	3-30-87			
									79.10	5-05-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-27-103	Texas Water Development Board	Texas Water Development Board	5- 1-80	108	3	--	Kceb	940	68.60	5-05-86	N	N	1/
									73.20	7-28-86			
									69.10	12-03-86			
									68.70	2-18-87			
									68.50	3-30-87			
									68.60	5-05-87			
ZK-58-27-204	Ben Hartman	Texas Water Development Board	--	130	5	20	Kceb	761	84.40	5-05-86	C, W	D, S	1/
									90.90	7-28-86			
									92.60	12-03-86			
									73.70	2-18-87			
									69.85	3-30-87			
									92.60	5-04-87			
ZK-58-27-210	City of Georgetwon	Byron Boucher	1- -79	165	8	10	Kceb	773	84.80	5-05-86	N	N	2/, 4/
									97.20	7-28-86			
									79.04	4-01-87			
									87.07	5-04-87			
ZK-58-27-217	Texas Water Development Board	Texas Water Development Board	4-18-80	121	4	82	Kceb	855	82.30	5-05-86	N	N	1/
									82.40	7-28-86			
									82.20	12-03-86			
									82.30	2-18-87			
									81.80	3-30-87			
									82.20	5-05-87			
									80.64	6-23-87			
ZK-58-27-224	Mrs. Owen Sherrill	--	1940	160	6	20	Kceb	805	116.30	5-06-86	S	D	--
									135.10	7-28-86			
									113.70	12-04-86			
									104.50	2-18-87			
									103.90	3-30-87			
									107.90	5-04-87			
ZK-58-27-303	Virgil Barnes	W. H. Glass	1978	306	5	184	Kceb	805	168.50	5-07-86	S	D	Reported yield of 20 gallons per minute on 12-15-78. Cemented from 184 feet to surface. Pump set at 250 feet.
									205.10	7-28-86			
									174.00	12-01-86			
									158.30	2-17-87			
									156.80	3-30-87			
									179.70	5-04-87			
									recently pumped				
ZK-58-27-304	Samuel Hullum	Thomas Arnold	1971	340	4	--	Kceb	840	183.80	5-07-86	S	D	--
									204.90	7-28-86			
									175.00	12-01-86			
									163.90	2-18-87			
									162.50	3-30-87			
									180.90	5-04-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water Level Above (+) below land surface datum (ft)	Water Level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-27-305	Texas Water Development Board	Texas Water Development Board	1980	314	6	204	Kceb	840	162.60	5-07-86	N	N	1/, 2/
									176.50	7-28-86			
									158.00	12-03-86			
									147.30	2-17-87			
									144.90	4-03-87			
									154.20	5-04-87			
ZK-58-27-307	Harold Mikan	--	--	360	--	--	Kceb	832	196.60	5-06-86	N	N	--
									224.60	7-29-86			
									190.25	12-03-86			
									177.80	2-18-87			
									177.90	3-30-87			
									196.75	5-04-87			
ZK-58-27-308	Nash Ranch	--	--	210	--	--	Kceb	880	207.70	5-05-86	N	N	--
									226.20	7-28-86			
									197.50	12-01-86			
									195.20	2-17-87			
									186.40	3-31-87			
									202.80	5-04-87			
ZK-58-27-401	Leon Behrens	H. E. Samford	1968	430	8	46	Kceb	788	UTM	5-07-86	C, W	S	--
									30.60	7-29-86			
									30.60	12-03-86			
									30.05	2-18-87			
									29.90	3-30-87			
									30.00	5-04-87			
ZK-58-27-402	Texas Crushed Stone	--	--	--	--	--	Kceb	846	112.80	5-07-86	N	N	--
									115.20	7-29-86			
									119.60	12-03-86			
									116.70	2-18-87			
									117.00	3-31-87			
									113.60	5-05-87			
ZK-58-27-506	Texas Crushed Stone	--	--	345	--	--	Kceb	750	48.70	12-03-86	N	N	Well used in construction of IH Hwy. 35.
									38.70	2-18-87			
									35.55	3-30-87			
									39.55	5-04-87			
ZK-58-27-511	Texas Crushed Stone	W. H. Glass	1966	233	7	154	Kceb	834	128.60	5-07-86	N	N	--
									133.90	7-29-86			
									129.60	12-03-86			
									122.00	2-18-87			
									120.65	3-31-87			
									123.33	5-05-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-27-525	Leon Behrens	Hugh Glass	1941	350	8	45	Kceb	758	72.70	5-07-86	S	D	--
									81.70	7-29-86			
									75.20	12-03-86			
									62.75	2-18-87			
									UTM	3-30-87			
									62.85	5-04-87			
ZK-58-27-526	Nash Ranch	W. H. Glass	1977	304	5	150	Kceb	873	174.90	5-06-86	S	D	--
									185.80	7-28-86			
									169.90	12-01-86			
									162.40	2-18-87			
									157.60	3-30-87			
									163.90	5-05-87			
ZK-58-27-527	Texas Crushed Stone	--	--	--	--	--	Kceb	785	UTM	5-07-86	N	N	--
									66.50	7-29-86			
									62.40	12-03-86			
									67.30	2-18-87			
									66.50	3-31-87			
									65.75	5-05-87			
ZK-58-27-528	Texas Crushed Stone	--	--	--	--	--	Kceb	772	65.30	5-07-86	S	D	--
									70.60	7-29-86			
									66.60	12-03-86			
									54.85	2-18-87			
									51.80	3-31-87			
									56.00	5-05-87			
ZK-58-27-529	Texas Crushed Stone	--	--	--	--	--	Kceb	821	76.10	5-07-86	N	N	--
									74.60	12-03-86			
									73.1	2-18-87			
									72.55	3-31-87			
									74.40	5-05-87			
ZK-58-27-530	Nash Ranch	--	--	200	--	--	Kceb	757	63.30	5-05-86	N	N	--
									UTM	7-28-86			
									62.60	12-01-86			
									52.30	2-17-87			
									48.00	3-30-87			
									54.10	5-04-87			
ZK-58-27-531	Norma Steele	--	--	--	6	--	Kceb	842	146.70	5-06-86	N	N	--
									157.50	7-28-87			
									146.90	12-04-86			
									133.40	2-18-87			
									130.70	3-30-87			
									140.30	5-04-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-27-532	Ray Issac	--	--	--	6	--	Kceb	829	118.50	5-07-86	N	N	--
									--	7-28-86			
									118.70	12-01-86			
									106.40	2-17-87			
									103.40	3-30-87			
									109.50	5-04-87			
ZK-58-27-533	Logan Bartz	Roggenkamp Drilling	1984	280	4	160	Kceb	815	131.20	5-07-86	S	D	--
									142.80	7-28-86			
									125.40	12-03-86			
									117.30	2-18-87			
									113.20	3-30-87			
									119.10	5-05-87			
ZK-58-27-603	Rudolph Wallin	Thomas Arnold	1973	380	5	250	Kceb	733	132.50	5-05-86	S	D	--
									151.70	7-28-87			
									127.60	12-01-87			
									106.10	2-17-87			
									101.50	3-30-87			
									110.70	5-04-87			
ZK-58-27-605	Nash Ranch	W. H. Glass	1977	303	5	151	Kceb	825	171.80	5-06-86	S	S	--
									186.70	7-28-86			
									168.60	12-01-86			
									154.10	2-17-87			
									155.00	3-30-87			
									162.60	5-04-87			
ZK-58-27-606	Don Quick	--	--	--	--	--	Kceb	750	96.60	5-05-86	S	D	--
									112.40	7-28-86			
									89.50	12-01-86			
									77.50	2-17-87			
									73.40	3-30-87			
									84.10	5-04-87			
ZK-58-27-607	Tommy Nelson	--	1976	300	--	--	Kceb	795	142.70	5-05-86	S	D	--
									158.90	7-28-86			
									132.30	12-01-86			
									121.90	2-17-87			
									117.90	3-30-87			
									UTM	5-04-87			
ZK-58-27-833	U.S. Geological Survey	Texas Water Development Board	2- -87	135	6-5/8	65	Kceb	725	12.30	2-18-87	N	N	2/, 3/, 6/
									9.55	3-31-87			
									14.95	5-05-87			
									5.18	6-25-87			
ZK-58-27-834	U.S. Geological Survey	Texas Water Development Board	2- -87	50	6-5/8	--	Kceb	725	48.90	2-18-87	N	N	2/, 3/, 6/ Well completed in Georgetown limestone
									48.10	3-31-87			
									47.20	5-05-87			
									46.12	6-25-87			

Table 2.--Hydrologic data and well descriptions for the ground-water-level surveys--Continued

Well no.	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in.)	Casing Depth (ft)	Water bearing unit	Water Altitude of land surface	Water level Above (+) below land surface datum (ft)	Water level Date of measurement	Method of lift	Use of water	Remarks
ZK-58-27-835	U.S. Geological Survey	Texas Water Development Board	2- -87	20	6-5/8	15	Kceb	725	3.95 3.25 4.95 3.04	2-18-87 3-31-87 5-05-87 6-25-87	N	N	2/, 3/, 6/ Well completed in Georgetown limestone
ZK-58-27-917	Dusty Rhodes	Tom Arnold	1983	360	4	200	Kceb	698	84.80 94.20 90.70 53.80 53.50 58.40	5-05-86 7-28-86 12-01-86 2-18-87 3-31-87 5-04-87	S	D	--

1/ Texas Water Development Board observation well.
2/ Water-level recorder.
3/ Water-quality sample site.
4/ City of Georgetown test well.
5/ Berry Creek Estates test well.
6/ U.S. Geological Survey test well.

Table 3.--Daily mean water levels in wells at test-well sites

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-19-910 Depth: 165 feet Altitude of land surface: 695 feet					
1	--	--	--	28.73	34.92	25.80
2	--	--	--	28.00	35.66	26.00
3	--	--	--	29.44	34.35	26.01
4	--	--	--	29.03	32.03	25.09
5	--	--	--	27.71	32.39	24.15
6	--	--	--	26.36	30.63	23.75
7	--	--	--	26.46	33.17	24.71
8	--	--	--	27.97	30.79	25.50
9	--	--	--	29.28	34.38	24.37
10	--	--	--	28.77	34.67	23.45
11	--	--	--	30.48	35.03	22.89
12	--	--	--	32.03	33.11	22.50
13	--	--	--	28.06	34.37	22.11
14	--	--	--	28.54	34.20	21.72
15	--	--	--	29.70	32.53	21.65
16	--	--	--	30.74	31.25	24.32
17	--	--	--	29.17	29.19	25.91
18	--	--	25.56	30.96	29.50	25.53
19	--	--	27.64	33.87	28.39	25.86
20	--	--	28.88	34.54	28.24	27.52
21	--	--	27.68	34.87	29.88	27.49
22	--	--	28.93	33.29	30.82	28.02
23	--	--	26.57	33.93	31.02	28.61
24	--	--	28.03	34.91	31.44	29.15
25	--	--	31.07	34.61	29.70	29.78
26	--	--	28.75	31.77	31.23	30.80
27	--	--	29.76	31.81	32.39	29.75
28	--	--	27.88	33.43	31.17	28.44
29	--	--	28.43	34.84	29.11	30.99
30	--	--	31.23	35.41	27.10	28.88
31			31.51	---	26.14	---
Mean	--	--	---	31.0	31.6	26.0

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-19-911 Depth: 91 feet Altitude of land surface: 695 feet					
1	--	--	--	--	--	--
2	--	--	--	--	--	--
3	--	--	--	--	--	--
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	--	--	--	--	--	--
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	--	--	--	--	--	--
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	--	--	--	--	--	--
19	--	--	--	--	--	--
20	--	--	--	--	--	--
21	--	--	--	--	--	--
22	--	--	--	--	--	--
23	--	--	--	--	--	--
24	--	--	--	--	--	--
25	--	--	--	--	--	--
26	--	--	--	--	--	--
27	--	--	--	--	--	78.56
28	--	--	--	--	--	78.49
29	--	--	--	--	--	78.38
30	--	--	--	--	--	78.31
31	--	--	--	--	--	--
Mean	--	--	--	--	--	--

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-20-409 Depth: 200 feet Altitude of land surface: 635 feet					
1	--	--	+2.43	+1.83	---	3.32
2	--	--	+2.42	+1.70	---	3.02
3	--	--	---	+1.72	---	2.80
4	--	--	---	+1.50	---	2.58
5	--	--	+2.29	+1.30	---	2.38
6	--	--	+2.47	+1.36	6.48	2.03
7	--	--	+2.46	+1.42	6.10	1.72
8	--	--	+2.21	+1.48	6.08	1.51
9	--	--	+1.99	+1.38	6.01	1.19
10	--	--	+1.77	-1.28	6.08	.82
11	--	--	+1.79	---	6.31	.57
12	--	--	+1.99	---	6.30	.28
13	--	--	+2.21	---	6.30	.05
14	--	--	+2.31	---	6.33	-.25
15	--	--	+2.20	---	6.34	-.27
16	--	--	+2.20	---	6.34	-.29
17	--	--	+2.19	---	6.15	-.42
18	--	--	+2.17	---	6.03	-.49
19	--	--	+2.14	---	5.76	-.40
20	--	--	+2.15	---	5.41	-.24
21	--	+2.01	+2.23	---	5.10	-.05
22	--	+2.04	+2.24	---	4.88	.25
23	--	+2.11	+2.26	---	4.87	.91
24	--	+2.38	+2.23	---	4.52	.98
25	--	+2.55	+2.08	---	3.92	1.63
26	--	+2.83	+2.05	---	3.75	2.69
27	--	+2.60	+2.22	---	4.40	3.27
28	--	+2.52	+2.12	---	4.40	3.93
29	--	---	+1.67	---	4.35	4.46
30	--	---	+1.79	---	3.98	4.84
31	--	---	+1.90	---	3.80	---
Mean	--	---	---	-1.35	4.48	1.43

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-20-410 Depth: 128 feet Altitude of land surface: 635 feet					
1	--	--	125.00	123.39	121.20	119.18
2	--	--	124.92	123.30	121.13	119.11
3	--	--	125.22	123.22	121.07	119.05
4	--	--	125.64	123.14	121.00	119.00
5	--	--	125.55	123.07	120.93	118.93
6	--	--	125.48	122.99	120.86	118.86
7	--	--	125.41	122.92	120.80	118.80
8	--	--	125.33	122.84	120.73	118.74
9	--	--	125.26	122.77	120.66	118.68
10	--	--	125.19	122.69	120.60	118.62
11	--	--	125.12	122.61	120.53	118.56
12	--	--	125.04	122.54	120.46	118.49
13	--	126.20	124.97	122.46	120.40	118.43
14	--	126.12	124.90	122.39	120.33	118.37
15	--	126.05	124.83	122.31	120.27	118.30
16	--	125.97	124.76	122.23	120.20	118.24
17	129.54	125.90	124.68	122.15	120.14	118.18
18	129.47	125.82	124.60	122.08	120.07	118.12
19	125.40	125.74	124.53	122.01	120.01	118.05
20	--	125.67	124.45	121.94	119.94	117.99
21	--	125.60	124.37	121.87	119.87	117.93
22	--	125.53	124.29	121.80	119.81	117.87
23	--	125.45	124.21	121.73	119.74	117.81
24	--	125.38	124.14	121.67	119.68	117.74
25	--	125.30	124.06	121.60	119.62	117.68
26	--	125.23	123.98	121.53	119.55	117.62
27	--	125.15	123.91	121.47	119.49	117.56
28	--	125.08	123.83	121.40	119.43	117.49
29	--	---	123.76	121.33	119.37	117.44
30	--	---	123.58	121.26	119.31	117.38
31	--	---	123.47	---	119.24	---
Mean	--	---	125	122	120	118

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-20-411 Depth: 72 feet Altitude of land surface: 635 feet					
1	--	69.45	--	66.45	64.98	63.68
2	--	69.37	--	66.39	64.94	63.63
3	--	69.29	--	66.34	64.89	63.57
4	--	69.22	--	66.29	64.85	63.52
5	--	69.15	--	66.24	64.88	63.46
6	--	69.07	--	66.19	64.88	63.41
7	--	68.99	--	66.14	64.83	63.36
8	--	68.92	--	66.09	64.79	63.30
9	--	68.84	--	66.04	64.75	63.25
10	--	68.77	--	65.99	64.70	63.20
11	--	68.70	--	65.94	64.66	63.15
12	--	68.62	--	65.89	64.61	63.10
13	--	68.55	--	65.84	64.57	63.04
14	--	68.47	--	65.80	64.52	62.99
15	--	68.39	--	65.75	64.48	62.94
16	--	68.32	--	65.70	64.44	62.89
17	70.66	67.53	--	65.65	64.40	62.84
18	70.58	---	--	65.60	64.35	62.79
19	70.50	---	--	65.56	64.30	62.74
20	70.41	---	--	65.51	64.26	62.69
21	70.33	---	--	65.46	64.21	62.64
22	70.25	---	--	65.41	64.16	62.60
23	70.16	---	--	65.36	64.11	62.55
24	70.08	---	--	65.31	64.07	62.50
25	70.00	---	--	65.26	64.02	62.46
26	69.92	---	--	65.22	63.98	62.41
27	69.84	---	--	65.17	63.93	62.36
28	69.77	---	--	65.12	63.88	62.32
29	69.69	---	--	65.08	63.84	62.27
30	69.60	---	--	65.03	63.79	62.23
31	69.53	---	--	---	63.73	---
Mean	---	---	--	65.7	64.4	62.9

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-27-833 Depth: 114.6 feet Altitude of land surface: 725 feet					
1	--	--	--	9.60	--	--
2	--	--	--	9.99	--	--
3	--	--	--	10.16	--	--
4	--	--	--	10.18	--	--
5	--	--	--	10.24	--	--
6	--	--	--	10.31	--	3.67
7	--	--	--	10.25	--	4.63
8	--	--	--	10.39	--	5.12
9	--	--	--	10.63	--	5.14
10	--	--	--	10.77	--	4.25
11	--	--	--	10.96	--	3.03
12	--	--	--	10.91	15.61	1.68
13	--	--	--	11.11	15.69	1.96
14	--	--	--	11.19	16.04	2.31
15	--	--	--	11.30	16.36	2.73
16	--	--	--	11.63	16.48	3.11
17	--	--	--	11.76	16.26	3.48
18	--	--	--	12.03	16.10	3.73
19	--	--	--	12.30	15.99	3.88
20	--	--	--	12.55	15.80	4.11
21	--	--	--	12.63	15.80	4.25
22	--	--	--	12.59	15.82	4.52
23	--	--	--	12.60	15.75	4.87
24	--	--	--	---	15.94	4.94
25	--	--	--	---	16.04	--
26	--	--	--	---	15.97	4.99
27	--	--	9.46	---	16.02	4.98
28	--	--	9.66	---	16.11	5.11
29	--	--	10.06	---	---	5.27
30	--	--	10.30	---	---	5.50
31	--	--	9.86	---	---	--
Mean	--	--	--	---	---	--

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-27-834 Depth: 50 feet Altitude of land surface: 725 feet					
1	--	--	--	48.03	47.49	46.62
2	--	--	--	48.01	47.47	46.60
3	--	--	--	47.99	47.46	46.59
4	--	--	--	47.97	47.44	46.57
5	--	--	--	47.95	47.31	46.54
6	--	--	--	47.94	47.19	46.52
7	--	--	--	47.92	47.17	46.50
8	--	--	--	47.90	47.15	46.48
9	--	--	--	47.88	47.14	46.46
10	--	--	--	47.86	47.12	46.44
11	--	--	--	47.84	47.10	46.42
12	--	--	--	47.82	47.08	46.40
13	--	--	--	47.81	47.07	46.37
14	--	--	--	47.79	47.05	46.35
15	--	--	--	47.77	47.03	46.33
16	--	--	--	47.75	47.02	46.31
17	--	--	--	47.73	47.00	46.29
18	--	--	--	47.71	46.99	46.27
19	--	--	--	47.69	46.97	46.24
20	--	--	--	47.68	46.95	46.22
21	--	--	--	47.66	46.94	46.20
22	--	--	--	47.64	46.92	46.18
23	--	--	--	47.62	46.90	46.16
24	--	--	--	47.61	46.89	46.14
25	--	--	--	47.59	46.87	46.12
26	--	--	--	47.57	46.86	46.09
27	--	--	48.12	47.56	46.84	46.07
28	--	--	48.10	47.54	46.83	46.05
29	--	--	48.08	47.52	46.76	46.03
30	--	--	48.07	47.51	46.67	46.01
31	--	--	48.04	---	46.64	---
Mean	--	--	---	47.8	47.0	46.3

Table 3.--Daily mean water levels in wells at test-well sites--Continued

Day	Depth below land surface (feet), 1987, mean value					
	Jan.	Feb.	March	Apr.	May	June
	Well ZK-58-27-835 Depth: 25 feet Altitude of land surface: 725 feet					
1	--	--	--	3.24	4.66	--
2	--	--	--	3.27	4.73	--
3	--	--	--	3.31	4.79	--
4	--	--	--	3.35	4.83	--
5	--	--	--	3.38	4.88	--
6	--	--	--	3.36	4.95	1.41
7	--	--	--	3.38	5.03	2.10
8	--	--	--	3.41	5.10	2.46
9	--	--	--	3.44	5.17	2.51
10	--	--	--	3.48	5.25	2.33
11	--	--	--	3.52	5.33	1.89
12	--	--	--	3.56	5.39	1.69
13	--	--	--	3.57	5.46	2.00
14	--	--	--	3.62	5.55	2.25
15	--	--	--	3.67	5.64	2.52
16	--	--	--	3.72	5.65	2.64
17	--	--	--	3.77	5.64	2.75
18	--	--	--	3.82	5.72	2.80
19	--	--	--	3.89	5.78	2.86
20	--	--	--	3.95	5.84	2.91
21	--	--	--	4.01	5.92	2.93
22	--	--	--	4.07	5.99	2.95
23	--	--	--	4.13	6.08	2.96
24	--	--	--	4.19	6.14	2.96
25	--	--	--	4.25	6.18	2.99
26	--	--	--	4.32	6.26	3.01
27	--	--	2.74	4.38	6.31	3.02
28	--	--	3.10	4.45	6.34	3.04
29	--	--	3.14	4.52	4.71	3.05
30	--	--	3.18	4.59	--	3.05
31	--	--	3.21	--	--	--
Mean	--	--	--	3.79	5.43	2.82

hydraulic properties of the site; and figure 13 shows a comparison of water-level hydrographs for each observation well and for Berry Creek. The water-level hydrographs for the wells developed in the Georgetown Limestone, well numbers ZK-58-20-410 and ZK-58-20-411, show a gradual increase in water level during the entire study period.

The San Gabriel River test-well site is located on the east bank of the San Gabriel River approximately 600 feet downstream from the Missouri-Kansas Railroad bridge that crosses the San Gabriel River. Partial-record streamflow gage 08105000, San Gabriel River at Georgetown, is located approximately 500 feet upstream from the site. The test-well drilling, coring, geophysical logging, and installation was done during January 1987. Figure 14 shows location, well completion, and water-level data; figure 15 shows a summary of geologic, geophysical, and hydraulic properties of the site; and figure 16 shows a comparison of water-level hydrographs for the observation wells and for the San Gabriel River. The hydrograph for the Edwards well, number ZK-58-19-910, shows that the water level probably was influenced by a nearby pumping well. The well completed near the Georgetown-Edwards contact, number ZK-58-19-911, was partially obstructed by silt during the study period. However, water was first observed in the well on June 5, 1987. The hydrograph shows that the water level gradually increased through the end of the study period. No hydrograph is shown for the well completed near the middle of the Georgetown Limestone, number ZK-58-19-912, because it was dry for the duration of the study period.

The Chandler Branch test-well site is located on the upstream side of the dam at the Soil Conservation Service (SCS) reservoir #11, northeast of the city of Round Rock. A stage recorder is located on the outflow structure of the reservoir. The test-well drilling, coring, geophysical logging, and installation was conducted during January and February 1987. Figure 17 shows the location, well completion, and water-level data; figure 18 shows a summary of geologic, geophysical, and hydraulic properties of the site; and figure 19 shows a comparison of the water-level hydrographs for the observation wells and for the SCS reservoir. A comparison of the hydrographs shows that the water level in the Edwards well, number ZK-58-27-833, has a pattern similar to water levels measured in the reservoir. The hydrograph for the well completed near the Georgetown-Edwards contact, number ZK-58-27-834, shows a gradual increase in water level throughout the study period. The hydrograph for the well completed near the middle of the Georgetown Limestone closely reflects the stage hydrograph for the reservoir. It should be noted that this is a very shallow well which is open to a zone of unconsolidated material.

Table 4 presents a geologic description of the cores from each site. Results from recovery tests conducted on each deep observation well between March 3 and 4, 1987, are listed in table 5.

Water Quality

The Edwards aquifer in the study area generally has water suitable for all uses; however, mineralization of the water increases in the downdip direction (Baker and others, 1986). In an attempt to better understand the movement of water between the aquifer and streams, samples were collected from

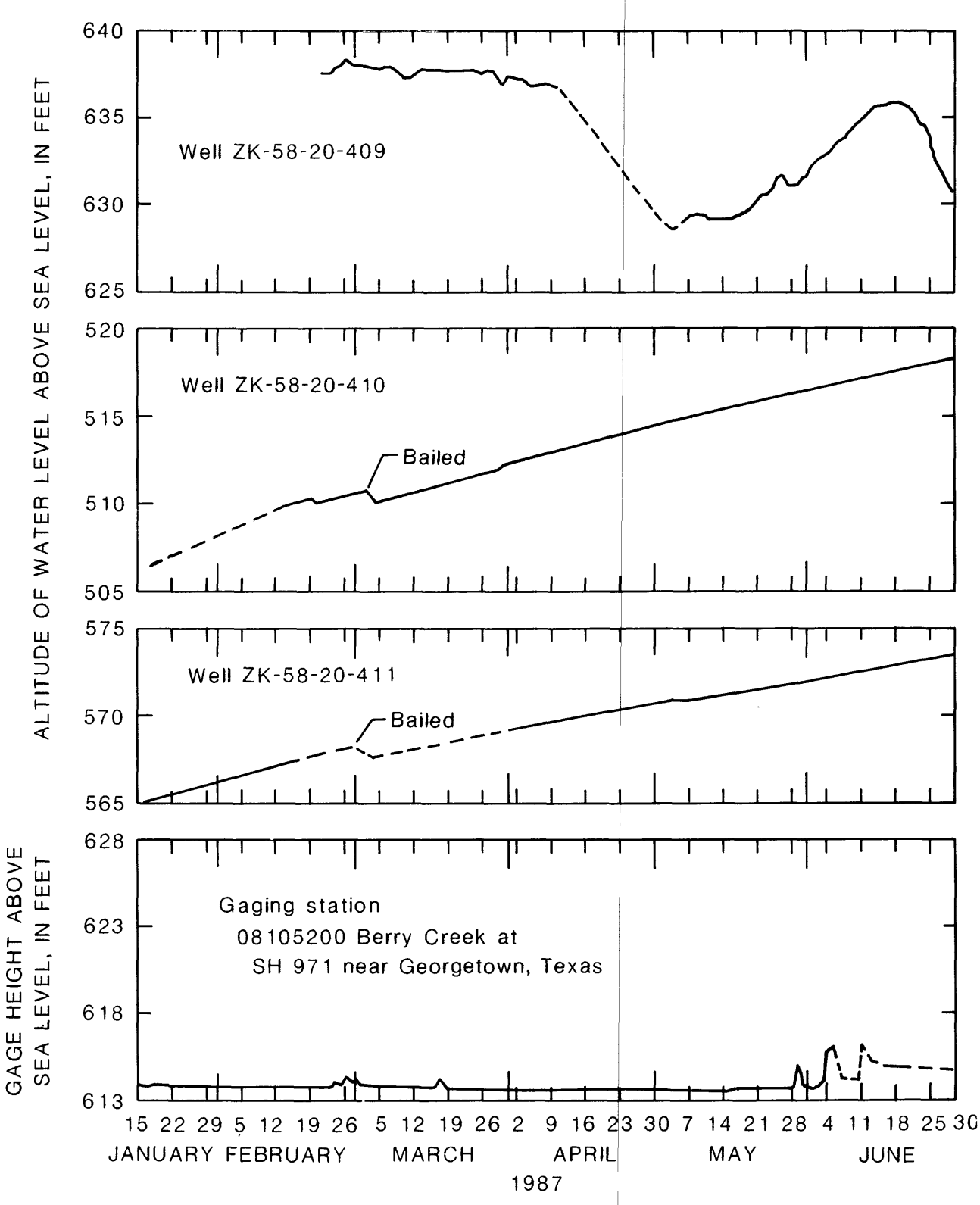


Figure 13.--Water-level hydrographs at the Berry Creek test-well site.

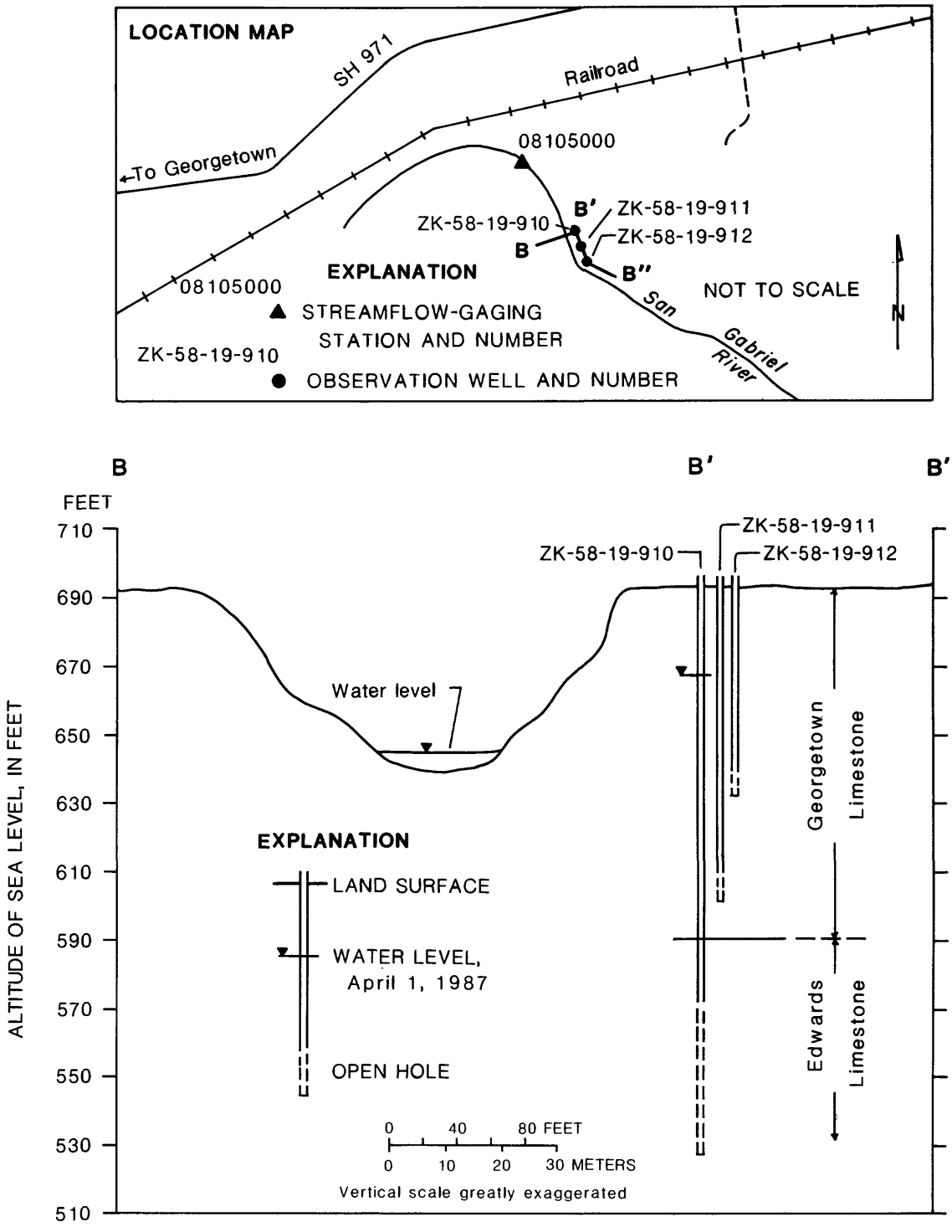


Figure 14.--Location, well completion, and water-level data, San Gabriel River test-well site.

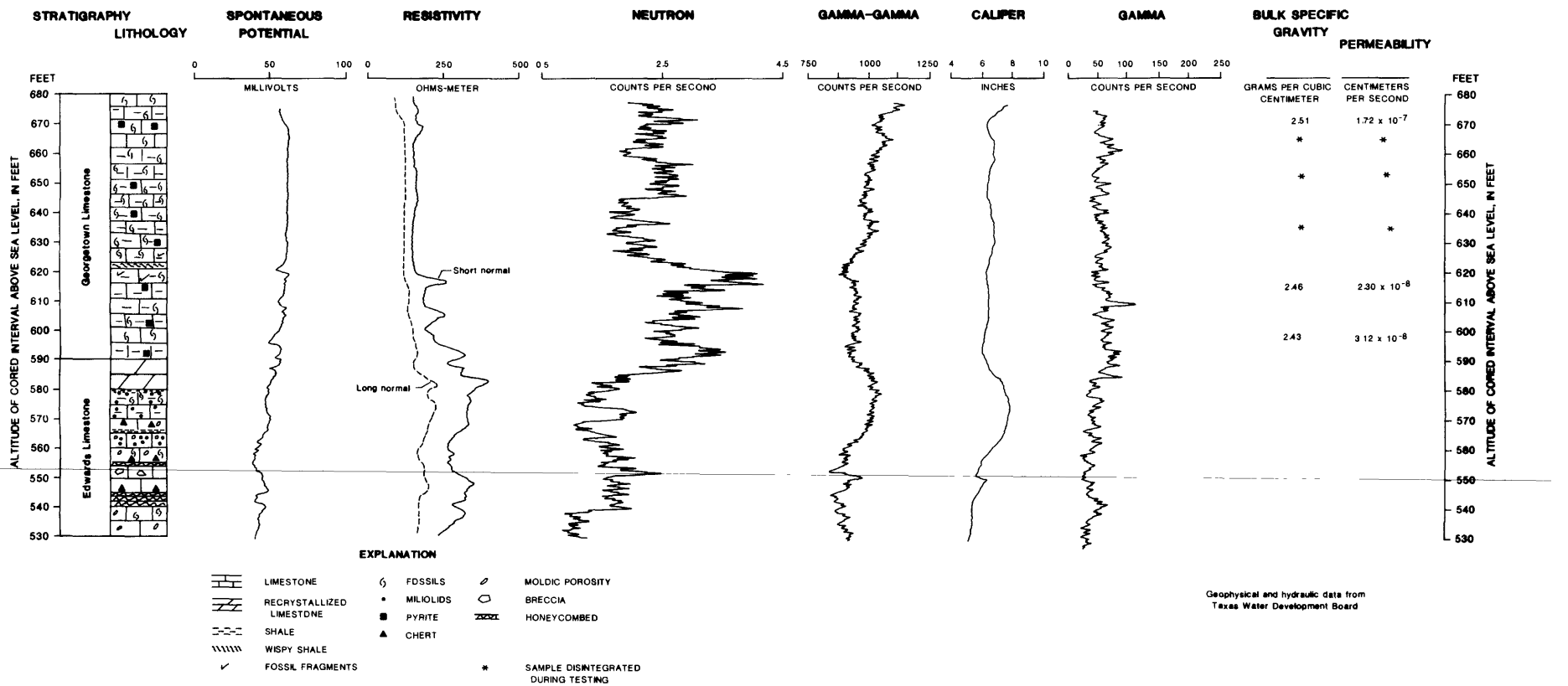


Figure 15.--Geologic, geophysical, and hydraulic properties of the cored interval at San Gabriel River test-well site.

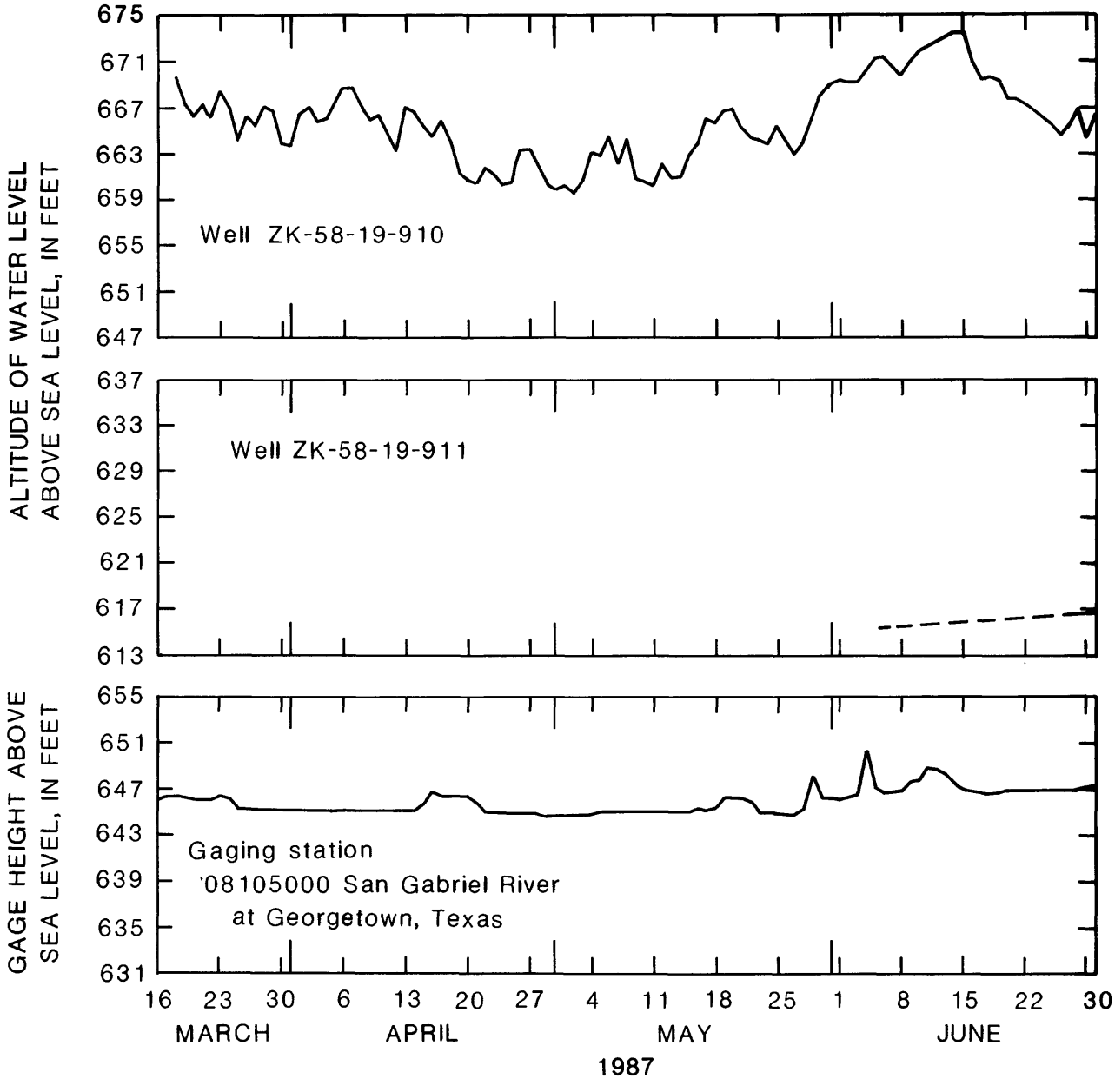
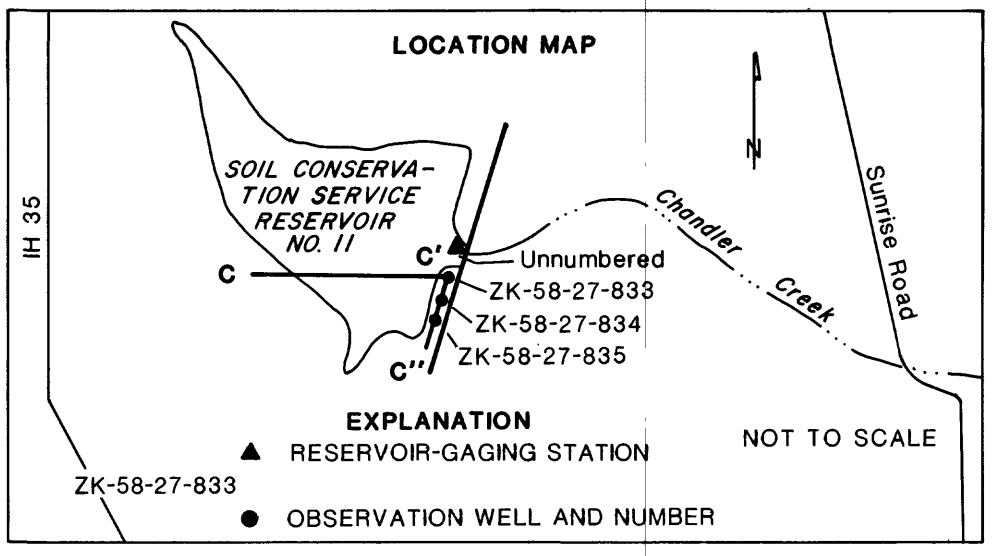


Figure 16.--Water-level hydrographs at the San Gabriel River test-well site.



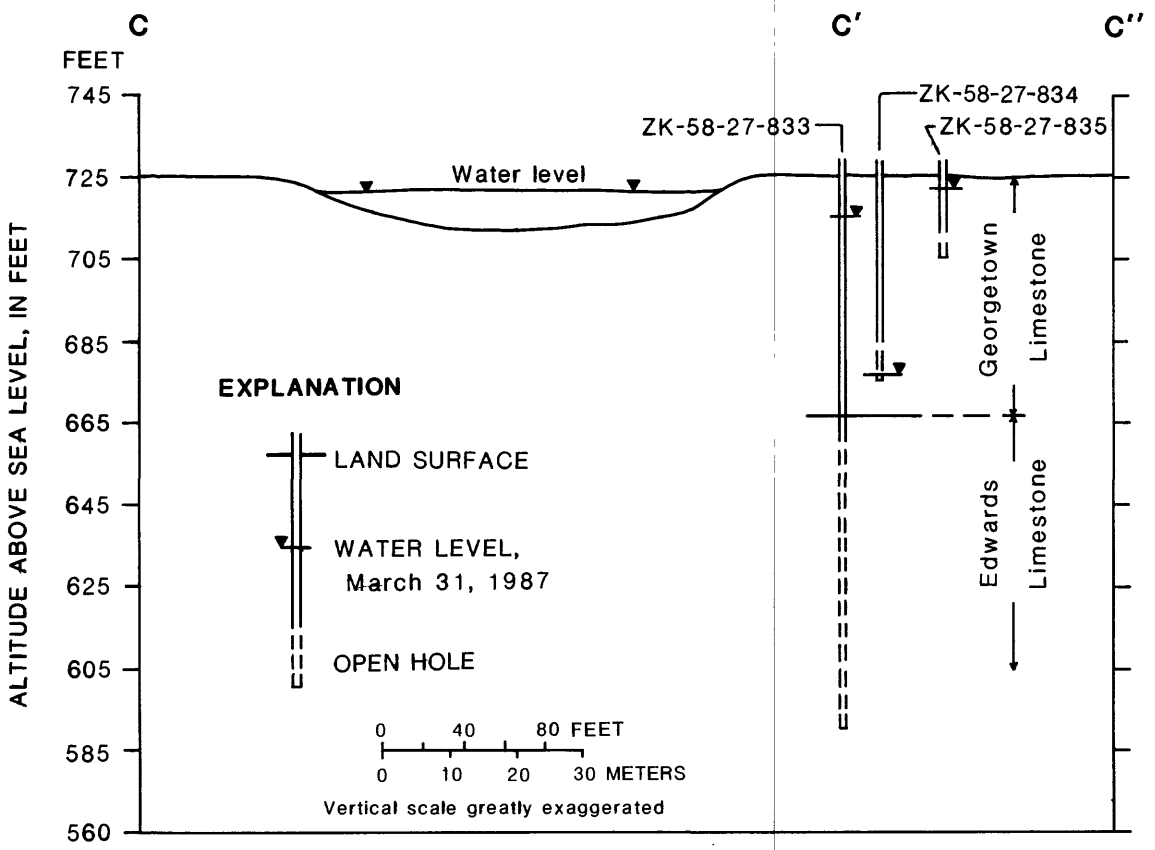


Figure 17.--Location, well completion, and water-level data, Chandler Creek test-well site.

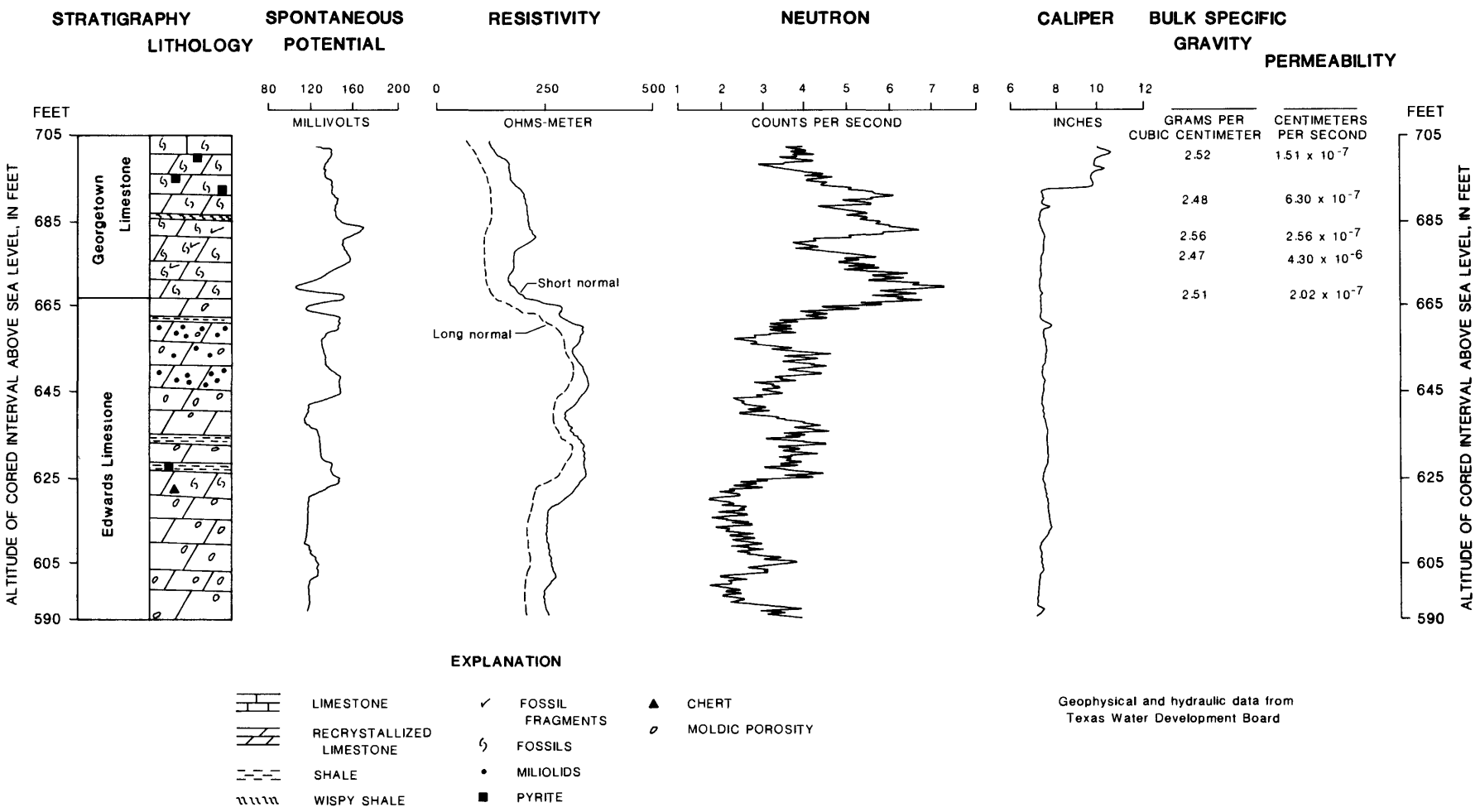


Figure 18.--Geologic, geophysical, and hydraulic properties of the cored interval at the Chandler Creek test-well site.

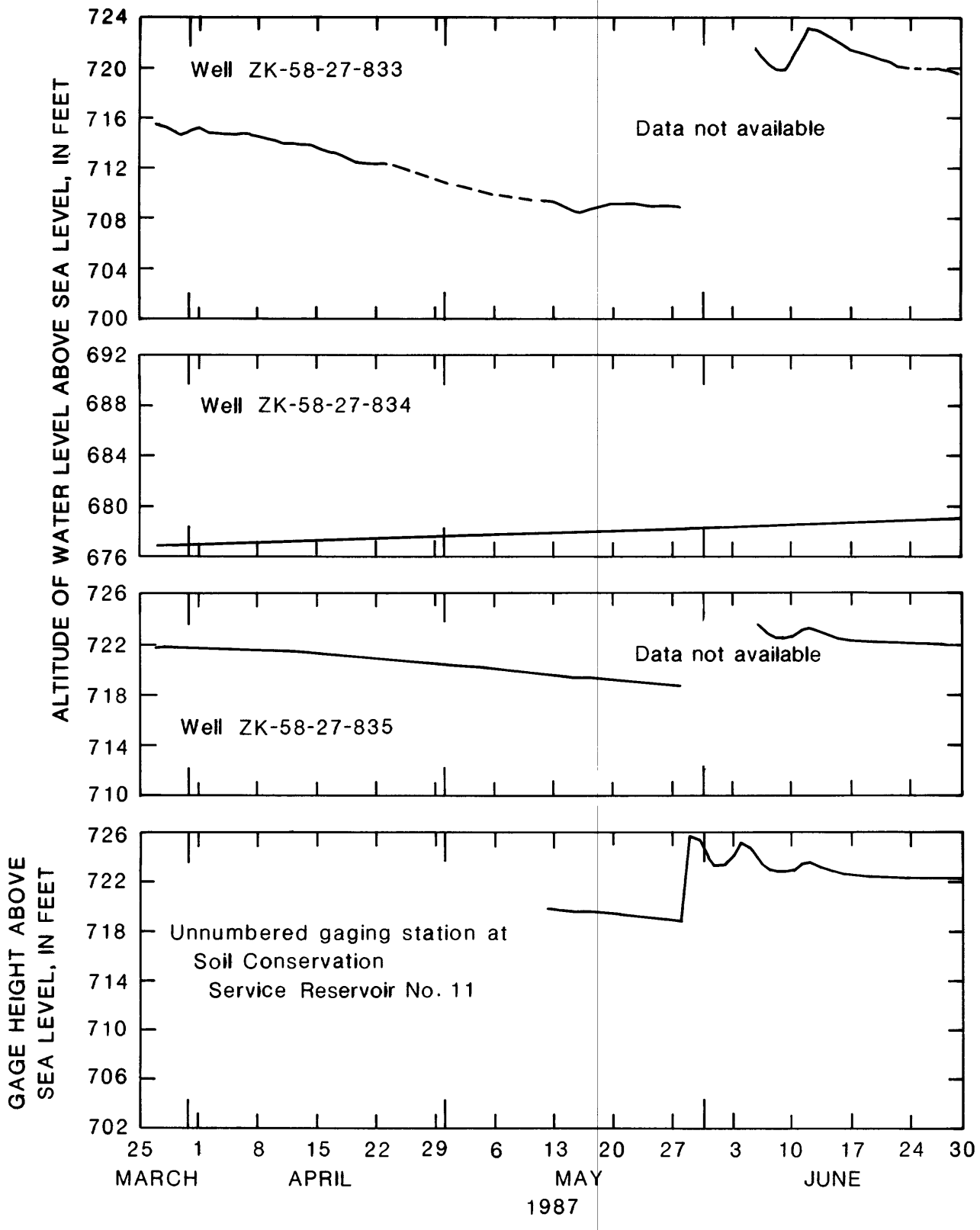


Figure 19.--Water-level hydrographs at Chandler Creek test-well site.

Table 4.--Description of cores from test wells

	Thickness (feet)	Depth (feet)
WELL ZK-58-20-409 Owner: U.S. Geological Survey Driller: Texas Water Development Board		
Clay, dark gray, interbedded with several layers of celestite	10	42
Clay, dark gray	3	52
Limestone, dark gray, shale common, fossil fragments in thin layers at 59 and 61	6	55
Limestone, dark gray, shale common, fossiliferous	1	61
Limestone, light gray, wispy shale common, pyrite, fossil fragments, oysters, stylolites	2	62
Limestone, dark gray, shale common, pyrite, fossil fragments	1	64
Limestone, light gray, wispy shale common, pyrite, fossil fragments	7	65
Limestone, light gray, hard, interbedded with shale, pyrite, oysters, brachiopods, thin clay layer at 77	7	72
Limestone, light gray, shale common	2	79
Gap, core missing	1	81
Limestone, light gray, hard, pyrite, fossil fragments, wispy shale common, thin clay layers at 82 and 83	2	82
Limestone, interbedded with shale, fossils in limestone	4	84
Limestone, dark gray, shale common	1	88
Limestone, light gray, hard, few fossils	1	89
Limestone, light gray, shale common	2	90
Limestone, light gray, fossiliferous, thin clay layer at 92	2	92
Limestone interbedded with shale, light gray, hard, fossils, pyrite, denser at bottom	8	94
Gap, missing core	2	102
Limestone, light gray, hard, shale common, pyrite, fossils, thin clay layer at 107	3	104
Limestone, light gray, hard, fossiliferous, shale common	4	107
Limestone, light gray, hard, 6" clay at 111	1	111
Limestone, dark gray, few fossils, shale common	2	112
Limestone, dark gray, clay common	1	114
Limestone, dark gray, shale common	1	115
Limestone, dark gray, shale common, fossil hash in thin darker layers, thin clay layers at 116 and 117	2	116
Limestone, gray, hard, thin shale layers common, few fossil fragments	9	118
Gap, core missing	1	127

Table 4.--Description of cores from test wells--Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-20-409--Continued		
Limestone, light gray, wispy shale common	9	128
Limestone, light gray, shale common	1	137
Limestone, gray, hard, wispy shale common, gaps between 141-148	10	138
Limestone, gray, hard, some shale, few fossils	5	148
Limestone, gray to white, hard, few fossils, calcite, clay at 154	1	153
Limestone, white to light gray, recrystallized, dense, some wispy shale, thin layer dark gray "pelletal grainstone", grains may be miliolids, at 154	1	154
Gap, missing core	3	155
Limestone, light gray, recrystallized, dense, some moldic porosity	5	158
Limestone, gray, recrystallized, dense, miliolids common	4	163
Limestone, gray, recrystallized, moldic porosity, some fossils at 169, loaded with fossil fragments at 170	3	167
Limestone, gray, recrystallized, dense, miliolids common, calcite, fossil hash, some moldic porosity, porosity increasing with depth to 174	4	170
Limestone, white, recrystallized, fossil fragments, shale common	1	174
Limestone, white, recrystallized, calcite, shale common	1	175
Limestone, white, recrystallized, increasing porosity with depth	3	176
Limestone, dark gray, shale common	1	179
Limestone, white, shale common	1	180
Limestone, light gray, shale common, some moldic porosity, clay at 182	3	181
Limestone, gray, recrystallized, dense, fossiliferous, chert at 184	3	184
Limestone, gray, shale common, fossils, some moldic porosity	2	187
Gap, missing core	1	189
Limestone, light gray, dense, little porosity, chert at 191	2	190
Limestone, white, recrystallized, moldic porosity	8	192
Total depth		200
Well ZK-58-19-910 Owner: U.S. Geological Survey Driller: Texas Water Development Board		
Limestone, tan, fossiliferous, iron stains	3	15
Limestone, gray, thin shale layers common, fossils, pyrite, calcite	7	18

Table 4.--Description of cores from test wells--Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-910--Continued		
Limestone, gray, fossil fragments, pyrite	2	25
Limestone, gray, thin shale layers common, fossils, pyrite	8	35
Limestone, gray, shale common, fossiliferous	3	41
Limestone, gray, fossiliferous, thin shale layers common	1	44
Limestone, gray, fossiliferous, pyrite	10	45
Limestone, gray, dense, few thin shale layers with fossils and pyrite	10	55
Limestone, gray, hard, few fossils, pyrite	3	65
Limestone, dark gray, thin shale layers, some fossils, pyrite	5	68
Limestone, white to light gray, some wispy shale layers, few fossils, pyrite	2	73
Limestone, light gray, hard, fossils and fragments, some wispy shale layers, pyrite	2	75
Limestone, medium gray, fossils and fragments, pyrite	8	77
Limestone, gray, hard, thin shale layers, fossils, some pyrite	4	85
Limestone, light gray, hard, thin shale layer at 89, wispy shale layers common	1	89
Limestone, light gray, few fossils, pyrite, thin vertical cracks filled with calcite at 90	2	90
Shale, dark gray, few fossils	1	92
Limestone, light gray, hard, pyrite, few fossils	1	93
Limestone, light gray, dense, few wispy shale layers, few fossils, pyrite, thin clay layer at 98	5	95
Limestone, light gray to white dense, a few thin very dark shale layers, pyrite in shale layers, stylolites, calcite filling cracks, few small fossils, at 102 fossils partially eroded leaving fairly large pores, also looks like burrows filled in with a dark matieral and have a blue-green lining.	5	100
Limestone, white, dense, fine-grained, recrystallized, coarser grains with depth	2	105
Limestone, medium gray, shale common	1	107
Limestone, light gray, recrystallized, several thin shale layers	4	108
Limestone, light gray to tan, friable (almost a sandy texture	2	112
Limestone, white, dense, fine-grained, some calcite, very little porosity	1	114

Table 4.--Description of cores from test wells--Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-910--Continued		
Limestone, light gray, medium-grained, abundant miliolids, fossils, few thin shale layers	5	115
Limestone, light gray to white, dense, thin layer containing mud clasts and miliolids at 120, very thin shale layers interbedded, calcite filled cracks	1	120
Limestone, light gray to tan, calcite, miliolids	2	121
Gap, missing core	2	123
Limestone, light gray to tan, chert at 126, little porosity	2	125
Limestone, tan and dark gray, mottled, thin shale layers at 128	1	127
Limestone, tan medium-grained, miliolids, porous at 130	2	128
Limestone, dark gray, dense	1	130
Gap, core missing	4	131
Limestone, tan, dense, chert at 135, a few large white fossils, "honeycombed" at 140	5	135
Limestone, tan, dense, chert	2	140
Limestone, tan to buff, friable, moldic porosity	3	142
Limestone, tan and gray, mottled, moldic porosity, broken chert with calcite crystals in openings at 148	4	145
Limestone, interbedded tan and gray, dense	1	149
Limestone, tan, chert at 151	1	150
Limestone, tan to brown, fossiliferous, porous (almost a "honeycombed" look)	1	151
Gap, missing core	3	152
Limestone, tan, fossiliferous, "honeycombed" appearance	6	155
Limestone, tan, dense, some small porous	2	161
Limestone, tan, friable, some porosity	2	163
Total depth		165
Well ZK-58-27-833 Owner: U.S. Geological Survey Driller: Texas Water Development Board		
Limestone, tan to yellow, abundant fossils--brachiopods	2	20
Limestone, gray, fossiliferous	1	22
Limestone, gray, fossiliferous, recrystallized, with thin shale layers, cracks filled with calcite, pyrite, thin broken layer filled with shaley limestone and fossils at 23	2	23

Table 4.--Description of cores from test wells--Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-27-833--Continued		
Limestone, light gray, recrystallized, some fossils, stylolites, pyrite, a few thin shale layers	4	25
Limestone, gray limestone, pyrite, calcite, brachiopods	1	29
Limestone, medium gray, recrystallized, some fossils, pyrite, calcite, some thin shale layres	3	30
Limestone, gray, recrystellized, fossil fragments.	2	33
Limestone, dark gray, fossils, calcite, pyrite	1	35
Limestone, light gray, recrystallized, fossils and	1	36
Fragments, calcite, few thin shale layers		
Gap, missing core	3	37
Limestone, medium gray, recrystallized, fossils, thin wispy shale layers containing fossil fragments	4	40
Limestone, dark gray, shale common, many fossils and fossil fragments, thin interbeds of light gray, recrystallized limestone	3	44
Limestone, light gray, dense, recrystallized, fossil fragments common	1	47
Limestone, light gray, fossiliferous, recrystallized, pyrite common	1	48
Limestone, dark gray, shale common, interbedded with light gray dense limestone, fossil fragments common	2	49
Limestone, light gray, recrystallized, dense, calcite, fossiliferous	3	51
Limestone, light gray, recrystallized, thin shale layers common, shaliness increasing with depth, some fossils and fossil fragments	2	54
Limestone, light gray, dense, recrystallized, few fossils	1	56
Limestone, white, dense, recrystallized, little moldic porosity at 62	3	57
Limestone, medium gray, recrystallized, shale common, some fossils	3	60
Limestone, white, recrystallized, dense	4	63
Limestone, white, recrystallized, stylolites at 67, miliolids common, very little moldic porosity	1	67
Limestone, light gray to white, recrystallized, some moldic porosity	1	68
Limestone, white, recrystallized, dense, some moldic porosity, 6" light gray thin layers interbedded with tan layers, miliolids in tan layers	1	69
Limestone, light gray, dense, some moldic porosity	2	70

Table 4.--Description of cores from test wells--Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-27-833--Continued		
Limestone, light gray, dense, miliolids common, very little porosity, if any	5	72
Gap, missing core	3	77
Limestone, light gray, dense, miliolids common, very little porosity, chert at 82	2	80
Limestone, light gray, very hard, dense, miliolids common	2	82
Limestone, light gray, recrystallized, very hard, dense, some porosity at 84	2	84
Limestone, light gray, dense, recrystallized, calcite crystals common at 86	4	86
Limestone, tan and gray, dense, recrystallized, very hard, very little moldic porosity, few thin dark shale layers, pyrite	5	90
Limestone, tan and gray, recrystallized, some moldic porostiy at 95	3	95
Limestone, tan, recrystallized, some moldic porosity and small vugs with calcite crystals, few thin dark layers containing pyrite	1	98
Limestone, tan, hard, recrystallized, moldic porosity, calcite	1	99
Limestone, light gray, recrystallized, some moldic porostiy, some small vugs	3	100
Limestone, light gray, recrystallized, dense, fossils--toucasia	2	103
Limestone, tan to brown, recrystallized, fossils, chert	1	105
Limestone, tan to brown, recrystallized, very little porosity	4	106
Limestone, tan, recrystallized, fossils filled with calcite, little porosity at 112 and 114	4	110
Limestone, tan to brown, recrystallized, porous at 115	4	114
Porous zone--recovered only 1 foot of core	4	118
Limestone, tan to brown, recrystallized, some porosity, friable	3	122
Limestone, tan, recrystallized, little porosity, porous zone at 126	2	125
Limestone, tan to buff, recrystallized, some porosity	2	127

Table 5.--Field data for recovery tests at test-well sites

[ft, feet]

Date and time	Water level above (+) below land-surface	Remarks
	Well: ZK-58-19-910	
March 4, 1987	26.50	Static water level.
0820	--	Start pump.
0940	50.10	Stop pump.
0942	44.47	--
0948	33.32	--
0954	29.20	End of test.
	Well: ZK-58-20-409	
March 3, 1987	+2.30	Static water level.
1200	--	Start pump.
1300	--	Stop pump.
1304	119.10	--
1307	--	Remove pump.
1311	119.67	--
1320	113.40	--
1339	102.10	--
1356	92.49	--
1423	79.16	--
1500	65.48	--
1600	45.91	--
1700	32.78	--
1800	23.97	End of test.
	Well: ZK-58-27-833	
March 4, 1987	9.00	Static water level.
1430	--	Start pump.
1535	56.85	Stop pump.
1551	15.80	--
1602	11.20	--
1612	9.27	End of test.

11 wells and 4 stream sites for inorganic chemical analysis. These data are presented in table 6. In addition to laboratory analyses of water samples from selected sites, field measurements of specific conductance, pH, and temperature were usually made at stream sites and selected wells. The specific conductance data collected from the wells and streams during the survey on May 4-8, 1987, which represents approximate average water level conditions during the study period, are shown in figure 20. The results of inorganic chemical analyses for samples listed in table 5 are plotted on a trilinear diagram in figure 21 to compare the water-quality characteristics at each well and stream site. Dissolved solids in samples from wells ranged from 320 to 1,300 milligrams per liter and from 251 to 290 milligrams per liter in samples from streams.

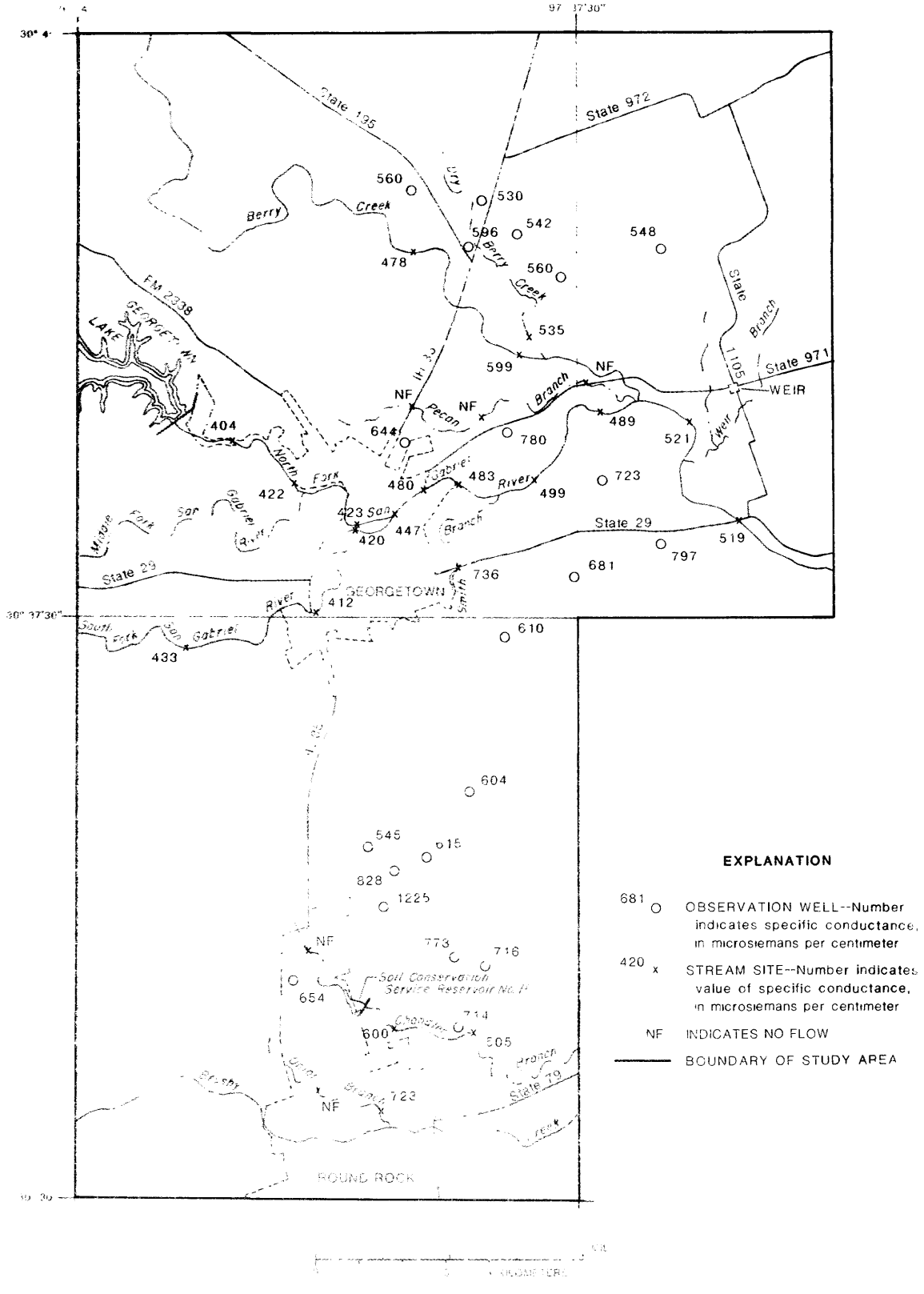


Figure 20.--Variations in specific conductance in streams and Edwards aquifer, May 4-8, 1987.

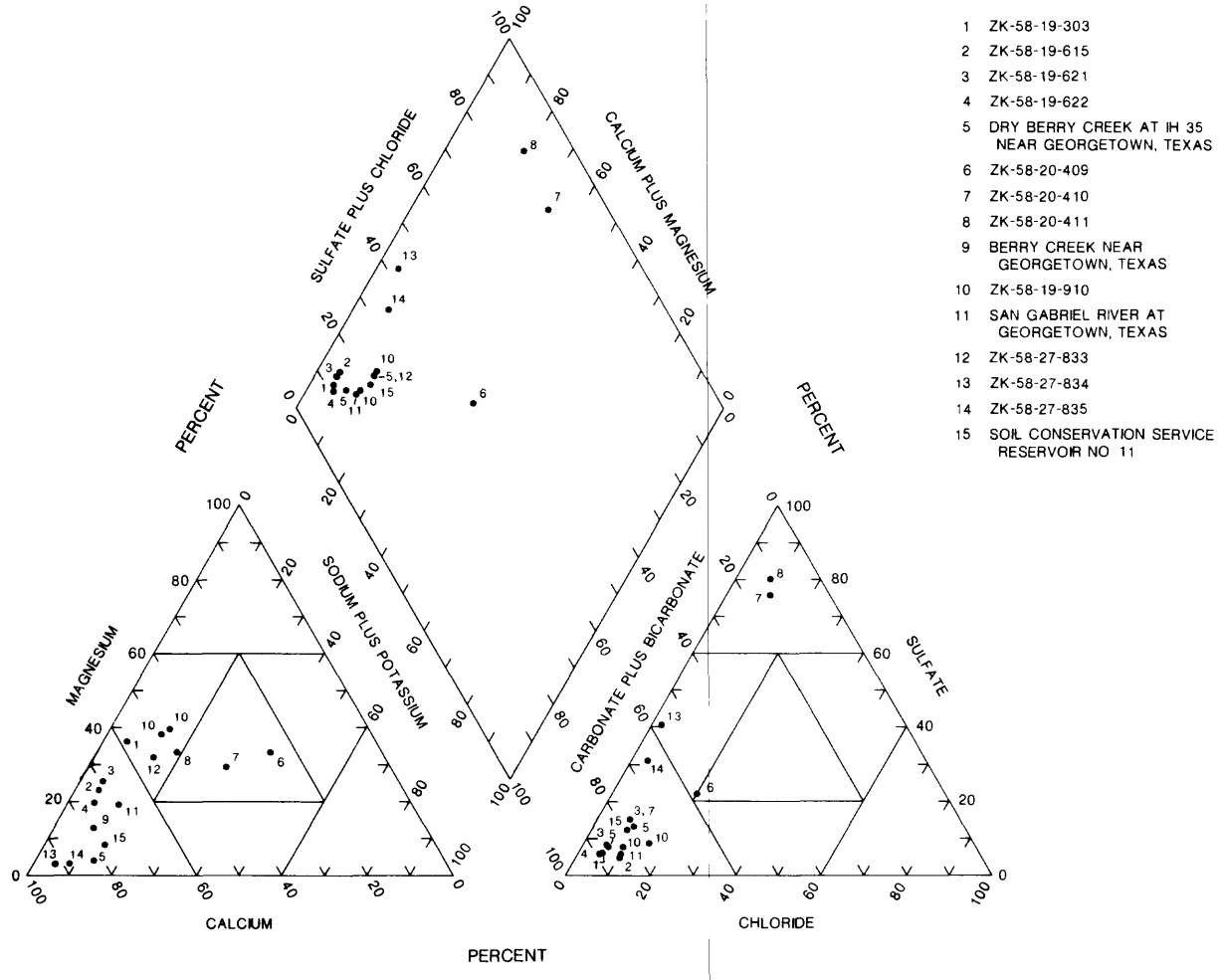


Figure 21.--Trilinear diagram of selected water-quality analyses

Table 6.--Water-quality data for selected wells and streams

Well number	Date	Time	Depth of well, total (ft)	Specific conductance (^{3}S/cm)	PH (Standard units)
		Stream sites			
Dry Berry Creek at IH-35 near Georgetown	03-06-87	1200	--	467	7.70
San Gabriel River at Georgetown	07-20-87	1015	--	422	7.60
Berry Creek near Georgetown	03-04-87	1325	--	502	7.50
		Wells			
ZK-58-19-303	03-06-87	1050	175.00	568	7.10
ZK-58-19-615	03-04-87	1115	200.00	634	7.20
ZK-58-19-621	03-06-87	1134	147.00	593	7.00
ZK-58-19-622	03-04-87	1315	200.00	575	7.00
ZK-58-19-910	03-04-87	0920	165.00	570	7.20
	07-20-87	1000	165.00	578	7.30
ZK-58-20-409	03-03-87	1230	200.00	703	7.90
ZK-58-20-410	03-03-87	1300	128.00	1,280	7.90
ZK-58-20-411	03-03-87	1330	72.00	1,530	7.40

Table 6.--Water-quality data for selected wells and streams--Continued

Well number	Temperature water (°C)	Hardness (mg/L as $CaCO_3$)	Hardness noncarbonate whole water total field (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio
			Stream sites				
Dry Berry Creek at IH-35 near Georgetown	15.5	220	28	83	2.4	15	.5
San Gabriel River at Georgetown	25.5	210	15	66	11	12	.4
Berry Creek near Georgetown	17.0	250	20	86	8.6	11	.3
			Wells				
ZK-58-19-303	21.5	300	18	75	28	7.5	0.2
ZK-58-19-615	21.0	320	38	98	19	8.0	.2
ZK-58-19-621	22.0	320	35	93	21	7.2	.2
ZK-58-19-622	21.0	300	26	94	15	8.5	.2
ZK-58-19-910	21.5	270	17	59	30	19	.5
	24.0	270	18	62	29	17	.5
ZK-58-20-409	22.5	220	0	39	30	66	2
ZK-58-20-410	22.0	480	370	110	49	92	2
ZK-58-20-411	21.0	760	640	180	75	69	1

Table 6.--Water-quality data for selected wells and streams--Continued

Well number	Potassium, dissolved (mg/L as K)	Alkalinity whole water total field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Solids, sum of constituents, dissolved (mg/L)
			Stream sites				
Dry Berry Creek at IH-35 near Georgetown	1.6	189	31	15	.40	3.9	270
San Gabriel River at Georgetown	2.4	195	13	16	.30	13	250
Berry Creek near Georgetown	1.2	230	20	11	.30	9.2	290
			Wells				
ZK-58-19-303	0.90	285	19	11	0.80	11	320
ZK-58-19-615	.90	285	15	23	.60	10	350
ZK-58-19-621	.90	284	28	11	.50	11	340
ZK-58-19-622	1.0	271	17	10	.40	10	320
ZK-58-19-910	2.0 2.1	254 256	28 23	30 16	2.9 2.5	12 12	340 320
ZK-58-20-409	6.1	226	82	48	3.4	7.9	420
ZK-58-20-410	24	111	550	51	2.9	6.8	950
ZK-58-20-411	20	122	780	53	2.6	6.0	1,300

Table 6.--Water-quality data for selected wells and streams--Continued

Well number	Date	Time	Depth of well, total (feet)	Specific conductance (µS/cm)	PH (Standard units)
ZK-58-27-833	03-04-87	1525	114.60	538	7.20
ZK-58-27-834	03-04-87	1600	50.00	666	7.10
ZK-58-27-835	07-20-87	0900	25.00	593	7.00
Soil Conservation Service reservior 11	07-20-87	0830	--	298	7.90

Well number	Temperature water (°C)	Hardness (mg/L as $CaCO_3$)	Hardness noncarbonate whole water total field (mg/L as $CaCO_3$)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio
ZK-58-27-833	21.5	260	26	65	23	18	0.5
ZK-58-27-834	17.0	360	130	140	2.8	8.3	.2
ZK-58-27-835	24.0	310	100	120	2.6	12	.3
Soil Conservation Service Reservoir 11	28.5	140	15	49	3.2	7.7	.3

Table 6.--Water-quality data for selected wells and streams--Continued

Well number	Potassium, dissolved (mg/L as K)	Alkalinity whole water total field (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Solids, sum of constituents, dissolved (mg/L)
ZK-58-27-833	1.9	231	43	12	2.0	10	310
ZK-58-27-834	1.1	236	160	6.0	.30	7.2	470
ZK-58-27-835	1.9	210	96	7.5	.50	9.6	380
Soil Conservation Service Reservoir 11	4.4	121	18	8.3	.30	12	180

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