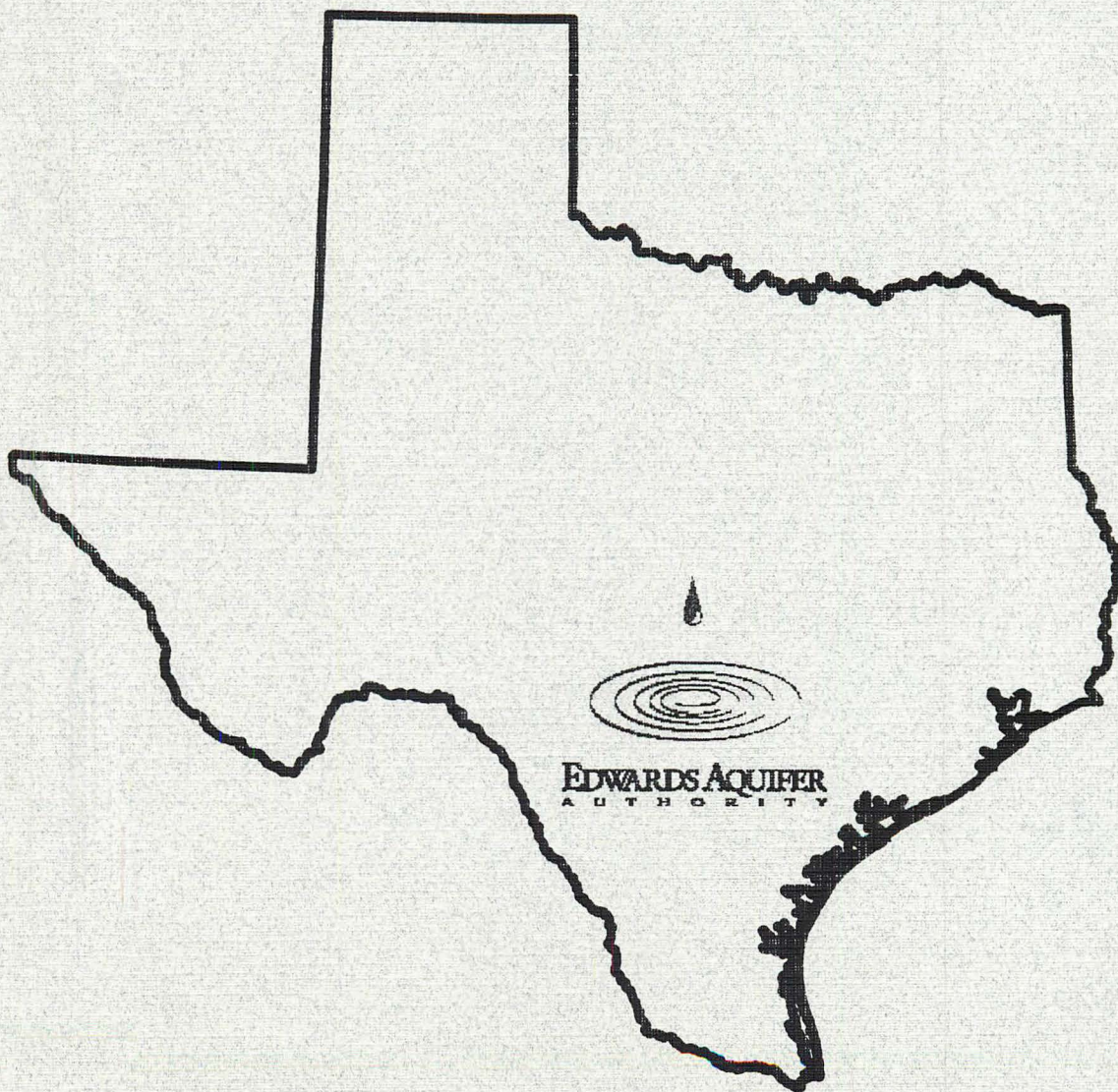


EDWARDS AQUIFER AUTHORITY
1615 N. St. Mary's
San Antonio, Texas 78212

Report 99-02

**Edwards Aquifer Hydrogeologic
Report for 1998**





EDWARDS AQUIFER
A U T H O R I T Y

1615 N. St. Mary's
San Antonio, Texas 78215

<http://www.e-aquifer.com>

EDWARDS AQUIFER HYDROGEOLOGIC REPORT FOR 1998

Compiled by:

Roberto Esquilin, Hydrogeologist

December 1999

CONTENTS

ACKNOWLEDGEMENTS	v
1.0 INTRODUCTION	1
2.0 WATER LEVELS	3
3.0 PRECIPITATION.....	7
3.1 Precipitation in the Edwards Aquifer Region.....	7
3.2 Precipitation Enhancement Program.....	11
4.0 GROUNDWATER RECHARGE.....	12
5.0 GROUNDWATER DISCHARGE & USAGE.....	18
6.0 WATER QUALITY.....	25
6.1 Water Quality in the Edwards Aquifer	25
Primary and Secondary Drinking Water Standards.....	28
6.2 Freshwater/Saline-water Interface Study.....	29
6.3 Surface Water Quality Data	30
7.0 SUMMARY	31
8.0 DEFINITIONS.....	32
9.0 REFERENCES	35

TABLES

2.1 Annual water level highs and lows for selected index wells in the San Antonio Region of the Edwards Aquifer, 1934-1998.....	4
3.1 Annual water precipitation for selected rain gauges in the Edwards Aquifer Region, 1934-1998.....	9
3.2 Monthly precipitation data from Edwards Aquifer Authority rain gauge network and National Oceanic and Atmospheric Administration precipitation gauging stations, 1998	10
4.1 Drainage basins that cross the Edwards Aquifer Recharge Zone	12
4.2 Estimated annual groundwater recharge to the Edwards Aquifer by drainage basin, 1934-1998.....	14
4.3 Monthly groundwater recharge at Parker Creek recharge structure, 1998.....	15

4.4	Estimated annual Edwards Aquifer recharge from Edwards Aquifer Authority recharge projects.....	17
5.1	Annual estimated groundwater discharge data by county for the Edwards Aquifer, 1934-1998.....	20
5.2	Estimated spring discharge from the Edwards Aquifer, 1998.....	21
5.3	Total groundwater discharge from the Edwards Aquifer, 1998	22
5.4	Annual estimated Edwards Aquifer groundwater discharge by use, 1955-1998	23
6.1	Groundwater quality standards.....	26
6.2	Secondary drinking water standards.....	28
6.3	Classification of groundwater quality based on total dissolved solids.....	29

FIGURES

1.1	Edwards Aquifer and other physiographic features in the San Antonio Region.....	2
2.1	Water level comparison between the monthly average of record (1934–1998) and the monthly highs for 1998 at the Bexar County index well, AY-68-37-203	6
3.1	Sites in the Real Time Data Network used by the Edwards Aquifer Authority to monitor precipitation	7
3.2	Annual and average precipitation for San Antonio, 1934-1998.....	8
4.1	Major drainage basins and Edwards Aquifer Authority recharge structures in the San Antonio Region of the Edwards Aquifer	13
4.2	Estimated annual recharge and ten-year floating average recharge for the San Antonio area of the Edwards Aquifer (1934-1998).....	16
5.1	Major springs in the San Antonio Region of the Edwards Aquifer	19
5.2	Groundwater pumping compared to springflow in the Edwards Aquifer 1934-1998.....	22

APPENDICES

APPENDIX A – WATER LEVEL DATA.....37

**A-1 City of Kyle well (LR-67-01-809) daily high water levels
(in feet above MSL), 199838**

**A-2 Landa Park well (DX-68-23-302) daily high water levels
(in feet above MSL), 199838**

**A-3 City of Castroville well (TD-68-41-301) daily high water levels
(in feet above MSL), 199839**

**A-4 City of Hondo index well (TD-69-47-306) daily high water levels
(in feet above MSL), 199839**

**A-5 J-17, Bexar County index well (AY-68-37-203) daily high water levels
(in feet above MSL), 199840**

**A-6 City of Uvalde index well (YP-69-50-302) daily high water levels
(in feet above MSL), 199840**

APPENDIX B – WATER QUALITY DATA.....41

PLATES (Located in pocket at back of report)

2.1 Water level observation network

3.1 Real Time Data collection network

6.1 Water quality – wells, springs and streams sampled

ACKNOWLEDGMENTS

The Authority staff extends our appreciation to municipalities, agencies (federal, state, and local), and other well owners who participated in this study by granting access to their wells, land, and records. Particular thanks are extended to the members of the south central Texas study unit of the United States Geological Survey - National Water Quality Assessment (USGS-NAWQA) for their efforts in the collection and analysis of some of the data presented in this report. Also, Authority staff extends our gratitude to the United States Geological Survey - Water Resources Division (San Antonio Subdistrict) for their work in compiling and calculating the recharge to and discharge from the Edwards Aquifer.

1.0 INTRODUCTION

The Edwards Aquifer is one of the most permeable and productive limestone aquifers in the United States. In the San Antonio region, the aquifer extends from the groundwater divide near Brackettville in Kinney County to the groundwater divide near Kyle in Hays County (Figure 1.1) The aquifer provides potable water to approximately one and one half million people in the region.

The Edwards Aquifer Authority (the Authority) encompasses all or parts of an eight-county area of south central Texas, including Uvalde, Medina, Bexar, Atascosa, Comal, Hays, Guadalupe, and Caldwell counties. The Authority was created by the Texas Legislature in 1993 to replace the Edwards Underground Water District (EUWD) and to manage, preserve and protect the Edwards Aquifer. The Authority is governed by a 17-member board of directors, with voting members elected to represent the 15 districts across the region, and two non-voting members appointed by other entities. Directors represent agricultural, industrial, municipal, spring and downstream user groups. The Legislature also created a South Central Texas Water Advisory Committee to interact with the Authority when issues related to downstream water rights are addressed.

The Legislature mandated the Authority take all necessary measures to effectively control the resource to protect domestic and municipal water supplies, the operation of existing agriculture and industries, terrestrial and aquatic life, and the economic development of the region. To accomplish these goals, the Authority is vested with all of the powers, rights and privileges necessary to manage, conserve, preserve and protect the Edwards Aquifer, and to increase the recharge of, and prevent the waste or pollution of water in, the aquifer.

This report addresses the San Antonio Region of the Edwards Aquifer. It presents quantitative and qualitative data collected in 1998, as well as an historical perspective by providing annual data for the period of record (1934-1998). Information concerning water levels and water quality are provided in this report.



2.0 WATER LEVELS

Periodic water level measurements from a variety of wells have been compiled since 1929 in the San Antonio region of the Edwards Aquifer. These periodic measurements were enhanced with the introduction of continuous water level recorders in some of the observation wells in the 1930s by the United States Geological Survey (USGS). The Authority has further enhanced its ability to collect the data with the introduction of continuous digital recorders, developing a groundwater network from eastern Kinney County to central Hays County. Plate 2.1 shows the locations of the Authority's observation well network within the Edwards Aquifer region. The water level observation network consists of wells equipped with water level recorders located in both the water table (unconfined) and the artesian (confined) zones of the Edwards Aquifer. All water level measurements are made in feet above mean sea level (MSL).

More than 850,000 water level measurements from 25 digital recorder-equipped observation wells, as well as monthly measurements from 17 periodic observation wells were recorded in 1998 as part of the Authority's water level data collection program. The digital recorders measure water levels across the aquifer every 15 minutes, 365 days a year. These wells are equipped with a float device or a pressure transducer for water level readings. Data is recorded on digital storage cards and then downloaded during a monthly site inspection, or by modem to the Authority's office. To augment the water level observation network, Authority staff measures water levels at 17 observation wells on a monthly basis during normal aquifer conditions, and at least 50 additional wells during periods of extreme high or low water level conditions. These periodic measurements are made manually with steel tape and electric line measuring devices. Water level data collected by the Authority is also forwarded to federal, state and regional agencies.

The Authority, and its predecessor the EUWD, have also collected water level data from the Trinity Aquifer (Glen Rose Formation) in northern Bexar County since 1991, and alluvial aquifers of the Leona Formation in southern Uvalde County since 1966. The Edwards and Trinity aquifers are hydraulically connected, allowing pathways for groundwater flow to and from the Edwards Aquifer. The Leona Formation in the vicinity of the Leona River in southern Uvalde County is recharged by the Edwards Aquifer. Water level monitoring of the Edwards Aquifer and associated hydrogeologic units adds to the base of scientific knowledge, and helps in the management of this regional water resource.

Historical water level trends in observation wells, along with corresponding precipitation and discharge information, are necessary to determine the volume of groundwater in the aquifer during any given period. Water level increases generally indicate greater quantities of water are recharging the aquifer than are being discharged. During periods when groundwater recharge is greater than discharge, springflow increases in proportion to increases in groundwater levels. Likewise, during drought or high-demand conditions, water levels and springflows generally decline, reflecting greater groundwater discharge than groundwater recharge. Table 2.1 shows the annual records of high and low water levels measured in five selected Edwards Aquifer observation wells.

In 1998, total recharge was generally greater than total discharge as demonstrated by the increased water levels from January to March, and August to December. There was a decrease in the water levels between April and July (Appendix A: Tables A-1 – A-6). The net increase in water levels at the Bexar County index well [J-17 (AY-68-37-203)] between January and March was 10.0 feet (671.5 feet above MSL in January to 681.5 feet above MSL in March). The net increase in water levels at the J-17 well between August and November was 48.9 feet above MSL (640.0 ft above MSL in August to 688.9 ft above MSL in November).

Table 2.1 Highest and lowest recorded water levels for selected index wells in the San Antonio Region of the Edwards Aquifer, 1934-1998 (measured in feet above Mean Sea Level).

Year	City of Uvalde Uvalde County YP-69-50-302 _a (J-27)		Castroville Medina County TD-68-41-301 _b		San Antonio Bexar County AY-68-37-203 _c (J-17)		New Braunfels Comal County DX-68-23-302 _d		Kyle Well Hays County LR-67-01-304 _e	
	High	Low	High	Low	High	Low	High	Low	High	Low
1934	—	—	—	—	675.2	666.8	—	—	—	—
1935	—	—	—	—	681.3	666.8	—	—	—	—
1936	876.6	876.5	—	—	683.0	676.6	—	—	—	—
1937	878.1	877.1	—	—	682.1	674.9	—	—	583.4	581.6
1938	875.8	874.0	—	—	681.4	673.6	—	—	590.6	581.5
1939	873.4	869.6	—	—	674.1	665.7	—	—	580.6	569.6
1940	872.3	868.5	—	—	671.4	661.0	—	—	572.2	568.7
1941	875.7	867.7	—	—	682.5	668.3	—	—	587.7	578.6
1942	875.8	871.9	—	—	685.4	669.7	—	—	580.8	573.7
1943	874.5	868.0	—	—	679.6	668.5	—	—	578.2	574.6
1944	869.3	866.8	—	—	677.6	667.1	—	—	580.5	579.3
1945	870.1	865.2	—	—	681.9	668.8	—	—	—	—
1946	867.1	862.9	—	—	681.2	663.6	—	—	—	—
1947	870.7	867.1	—	—	680.7	665.8	—	—	577.3	577.0
1948	868.4	860.5	—	—	667.7	653.7	624.4	624.3	560.5	559.4
1949	871.2	859.1	—	—	671.6	655.6	626.7	624.1	562.3	561.8
1950	871.2	861.8	687.0	674.9	665.4	653.8	625.2	624.0	575.8	575.2
1951	861.8	846.8	675.2	659.9	656.0	640.6	624.2	622.5	575.3	569.4
1952	846.8	834.9	663.8	649.9	650.5	633.4	623.0	621.5	573.0	569.1
1953	835.2	817.8	665.1	647.7	651.5	630.5	623.6	621.1	584.5	573.2
1954	836.7	823.1	660.3	642.4	646.3	628.9	623.1	620.5	581.8	562.8
1955	834.3	824.1	649.1	635.6	638.5	624.2	621.9	619.8	575.7	558.4
1956	834.2	814.2	641.6	622.3	632.2	612.5	621.0	613.3	569.8	542.2
1957	840.9	811.0	666.1	633.0	653.8	624.4	624.7	620.1	584.9	568.3
1958	866.1	840.8	704.4	665.7	679.6	653.3	626.6	624.6	593.6	580.8
1959	876.1	866.2	703.8	689.0	677.7	661.5	627.1	625.1	591.4	580.5
1960	876.9	873.1	706.3	686.0	679.4	657.9	627.1	624.9	589.4	584.3
1961	878.5	875.6	710.3	693.4	681.2	663.9	627.3	625.7	591.6	573.2
1962	878.3	867.7	703.6	676.3	675.5	646.9	626.3	623.2	584.1	565.0
1963	869.7	860.9	689.1	659.2	665.8	635.0	625.0	621.7	581.6	560.0
1964	860.9	849.0	676.3	654.8	657.1	632.8	624.1	621.6	578.2	562.8
1965	865.8	860.3	689.6	666.8	675.0	645.6	626.6	623.5	590.1	573.4
1966	867.2	860.2	686.1	665.0	668.8	642.7	625.9	623.1	589.0	566.6
1967	867.4	856.4	679.4	645.2	659.7	624.9	624.6	620.0	582.8	556.6
1968	873.3	864.8	702.0	679.2	678.3	655.9	627.2	624.6	593.8	574.4
1969	875.0	866.5	694.8	670.5	676.1	642.8	626.3	623.4	588.7	567.7
1970	876.1	871.3	700.7	678.8	677.1	650.4	627.2	624.3	593.2	575.0
1971	877.7	864.0	701.3	646.4	674.6	627.9	626.2	621.0	577.1	551.3
1972	877.8	874.6	704.6	676.7	679.0	651.2	626.7	624.1	579.7	576.3
1973	881.6	874.5	731.2	690.1	696.5	665.9	629.8	626.1	589.9	572.3
1974	881.4	876.0	723.8	696.0	689.2	660.9	629.1	625.8	593.6	558.5
1975	882.1	879.4	721.0	708.2	686.9	672.0	629.3	626.5	589.8	571.4
1976	884.9	876.0	732.4	694.9	693.1	663.8	629.4	625.8	584.6	571.2
1977	886.2	881.3	737.8	715.3	696.0	675.6	630.2	627.6	587.4	562.1
1978	882.6	875.6	722.4	681.7	684.1	650.1	628.1	624.5	572.0	540.4
1979	882.0	876.1	728.2	710.3	690.5	676.4	629.0	627.3	584.9	572.0
1980	879.1	868.0	716.1	666.8	680.3	640.8	627.5	623.0	572.0	551.8
1981	881.8	867.9	723.2	698.8	686.0	668.6	628.0	625.5	586.2	565.5
1982	881.8	876.4	717.1	682.8	680.5	645.3	627.3	623.6	584.7	544.7
1983	877.1	871.3	698.2	667.7	670.0	642.1	625.6	623.0	588.7	560.4
1984	873.3	856.9	684.5	642.0	657.0	623.3	624.4	619.6	582.5	544.3
1985	876.9	862.2	699.0	670.7	674.5	644.1	626.8	623.3	591.4	561.8
1986	877.8	872.2	704.6	674.2	685.6	649.8	627.7	624.1	595.0	576.3
1987	889.1	877.9	743.5	711.1	699.2	676.9	630.4	627.2	595.9	583.5
1988	887.0	878.0	725.3	679.9	684.9	647.7	627.9	623.9	593.2	585.9
1989	879.0	866.6	695.3	650.5	663.9	626.4	624.9	620.5	571.7	571.5
1990	872.9	861.6	679.5	640.8	658.1	622.7	624.3	620.3	577.6	561.2
1991	873.8	865.4	703.8	666.1	680.3	640.5	627.0	623.3	593.8	575.1
1992	885.2	872.9	743.6	704.3	703.3	680.7	630.9	627.0	595.4	586.2
1993	884.9	877.3	730.2	706.6	692.8	672.0	629.4	626.9	593.7	575.9
1994	—	—	718.6	684.1	679.2	652.1	627.2	624.7	575.0	545.3
1995	877.2	871.1	703.0	681.8	676.5	651.1	626.8	624.5	575.4	552.4

(Table 2.1 continued)

Year	City of Uvalde Uvalde County YP-69-50-302 _a		Castroville Medina County TD-68-41-301 _b		San Antonio Bexar County AY-68-37-203 _c		New Braunfels Comal County DX-68-23-302 _d		Kyle Well Hays County LR-67-01-304 _e	
	High	Low	High	Low	High	Low	High	Low	High	Low
1996	874.2	859	693.0	650.2	664.9	627.5	625.3	621.2	573.2	551.3
1997	882.3	868.2	700.5	672.7	677.9	648.7	626.4	623.6	575.8	559.0
1998	880.6	868.7	717.1	669.1	688.9	640.0	629.6	622.9	575.6	552.4
Average	High 872.3	Low 863.2	High 701.1	Low 672.2	High 675.3	Low 651.9	High 626.6	Low 623.4	High 583.0	Low 567.1
Record	High	Low	High	Low	High	Low	High	Low	High	Low
Level	889.1	811.0	743.6	622.3	703.3	612.5	630.9	613.3	595.9	540.4
Month	June	April	June	Aug.	June	Aug.	June	Aug.	Sept.	July
Year	1987	1957	1992	1956	1992	1956	1992	1956	1987	1978

Data source: USGS, and Edwards Aquifer Authority, 1999.

"a" Continuous monitoring equipment established on October 24, 1940.

"b" Continuous monitoring equipment established on May 25, 1950.

"c" Continuous monitoring equipment established on January 1, 1963.

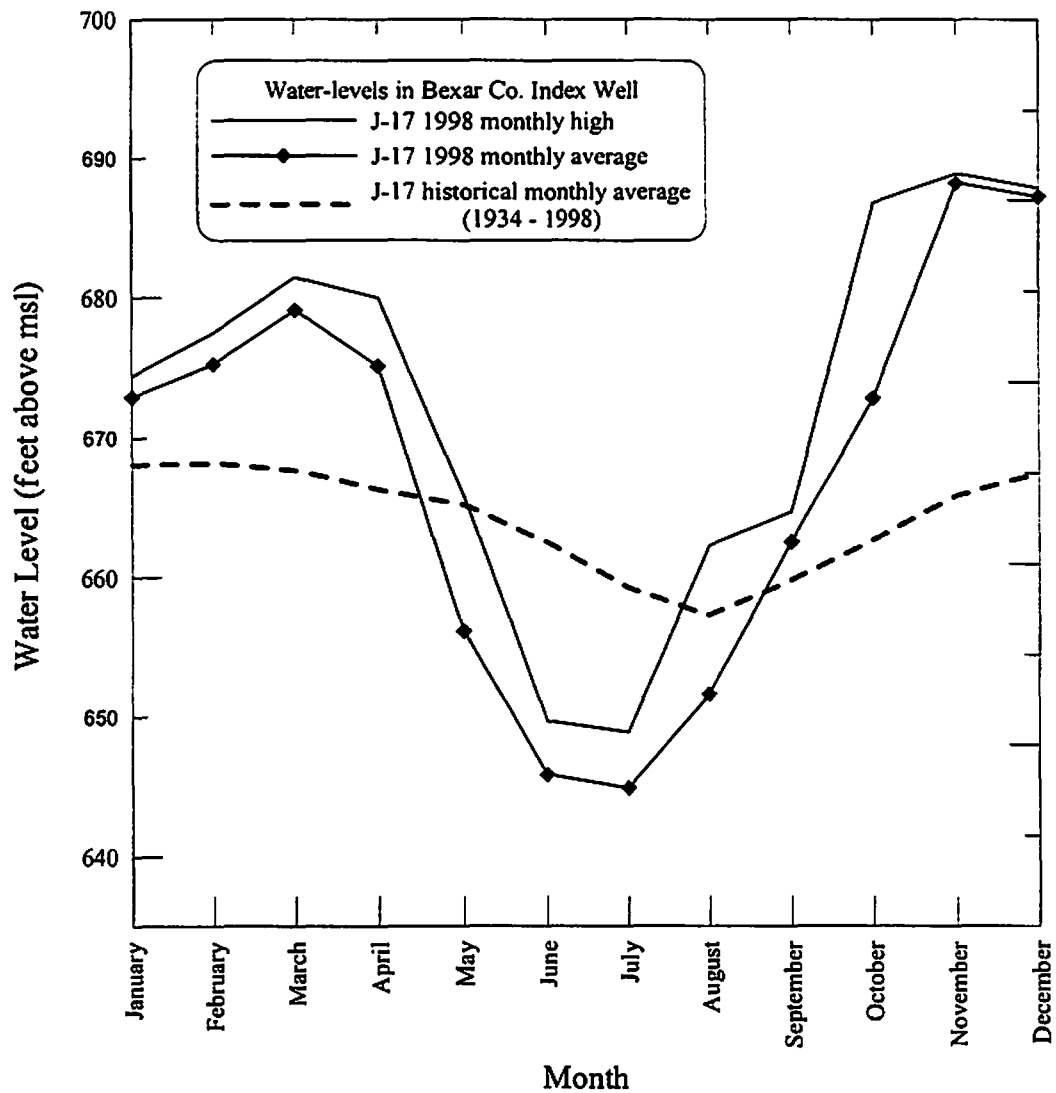
"d" Continuous monitoring equipment established on November 4, 1948.

"e" Values based on monthly tape down measurements (No continuous monitoring equipment installed in this well).

In October 1998, a weather system brought over 12 inches of rainfall to southeastern Texas. San Antonio received 18.07 inches of rain between October 17 and 18 (NOAA, 1998), and the water levels in the Bexar County index well [J-17 (AY-68-37-203)] rose 6.72 feet within a 24-hour period. The water level measured at J-17 was 686.3 feet above MSL by the end of the year (Figure 2.1).

Overall, the water levels in the Edwards Aquifer increased slightly during 1998 relative to the levels recorded in 1997 (Table 2.1). The average annual water level for 1998 (667.7 feet above MSL) at J-17 was higher than the average historic level of 664.2 feet above MSL. The Edwards Aquifer water levels were below the trigger level at J-17 for Stage I of the Authority's Critical Period Management Plan (i.e., at or below 650 feet MSL) from June 1, 1998 until July 26, 1998. The water levels were below the J-17 trigger level for Stage II of the Critical Period Management Plan (i.e., at or below 642 feet MSL) during the last week of July and the first week of August 1998, then returned to Stage I levels until the last week of August. The Critical Period Management Plan was implemented in February 1997 when the groundwater levels fluctuated between 650 ft and 648.8 ft above MSL. The Critical Period Management Plan became effective in April 1998 (Rick Illgner, personal communication, 1998). Figure 2.1 compares the average water level for the period of record and maximum water levels for the year 1998. Tables A-1 through A-6 in Appendix A show 1998 water levels for selected observation wells.

Figure 2.1 Water level comparison between the monthly average of record (1934-1998), the monthly highs for 1998, and the monthly average at the Bexar County index well, AY-68-37-203 (J-17)



3.0 PRECIPITATION

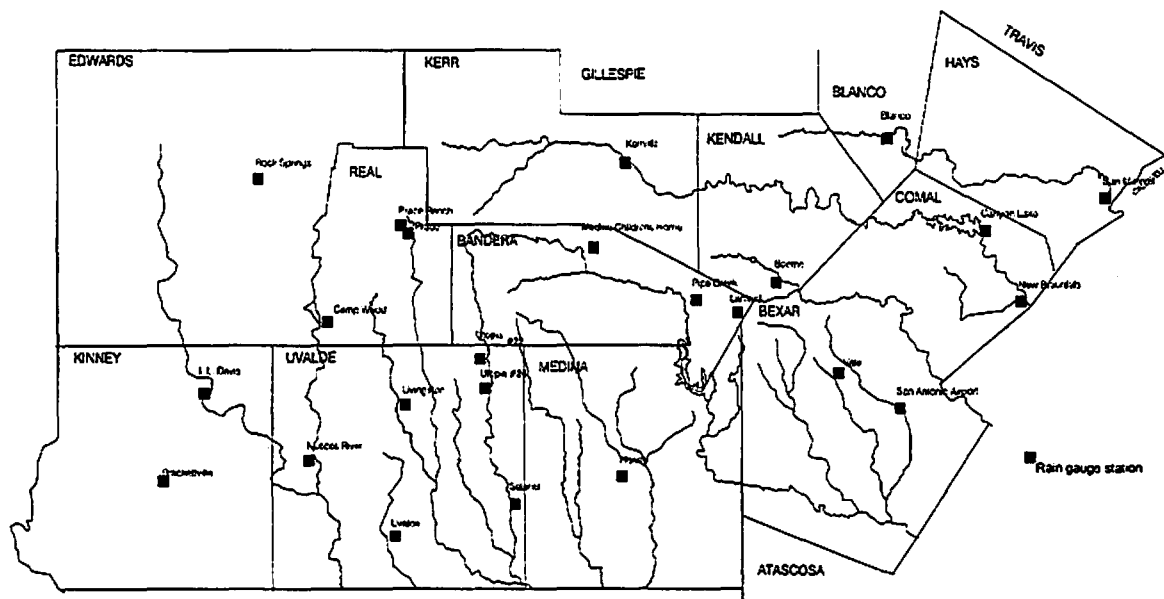
3.1 Precipitation in the Edwards Aquifer Region

Precipitation is the primary source of recharge to the Edwards Aquifer. Water levels monitored by the Authority's network of observation wells across the Artesian Zone rise within hours of a heavy rainfall event on the Edwards Aquifer Recharge Zone (EARZ) or associated upstream drainage basins in the central Texas Hill Country.

Annual precipitation in the Edwards Aquifer region is monitored by the Authority to determine the volume of groundwater recharge to the aquifer. Precipitation data is gathered from Authority rain gauge stations, National Oceanic and Atmospheric Administration (NOAA) weather stations, and the USGS rain gauge stations located across the EARZ and upstream drainage basins. Figure 3.1 is a map showing the locations of the precipitation gauging stations the Authority uses to record area rainfall.

A Real Time Data Network, consisting of 68 rain gauge observation sites, reports precipitation data at six-minute intervals to the Authority's office. In addition, daily precipitation data is forwarded every month to the Authority from seven rain gauge observation sites located on the EARZ. This information is augmented with data from numerous weather and rain gauge stations maintained by NOAA and the USGS. The precipitation information is used to calculate recharge and to monitor any precipitation trends that may affect recharge to the Edwards Aquifer. Plate 3.1 indicates the locations of all Real Time Data Network sites.

Figure 3.1 Sites in the Real Time Data Network used by the Edwards Aquifer Authority to monitor precipitation.



Precipitation data for San Antonio has been maintained since 1871 by national weather service agencies. Historical aquifer water levels, recharge and springflow are closely related to precipitation and decrease during periods of low precipitation.

The amount of rainfall received in the San Antonio region in 1998 was approximately 39% above normal. Average precipitation in San Antonio for the period between 1934 and 1998 is 30.23 inches. In 1998, total precipitation measured at the San Antonio International Airport was 42.10 inches. However, 14.42 inches fell within a two-day period in October 1998 in the San Antonio area (NOAA, 1999). When comparing the Edwards Aquifer water levels from the low levels observed in 1997, recovery in 1998 can be directly attributed to increased precipitation within the Edwards Aquifer recharge and catchment zones. **Figure 3.2** demonstrates a hydrograph of precipitation for San Antonio from 1934 to 1998. **Table 3.1** shows annual precipitation for selected rain gauges in the region. **Table 3.2** shows monthly measurements for 1998 at selected rain gauge stations across the region.

Figure 3.2 Annual precipitation and average precipitation for San Antonio, 1934-1998.

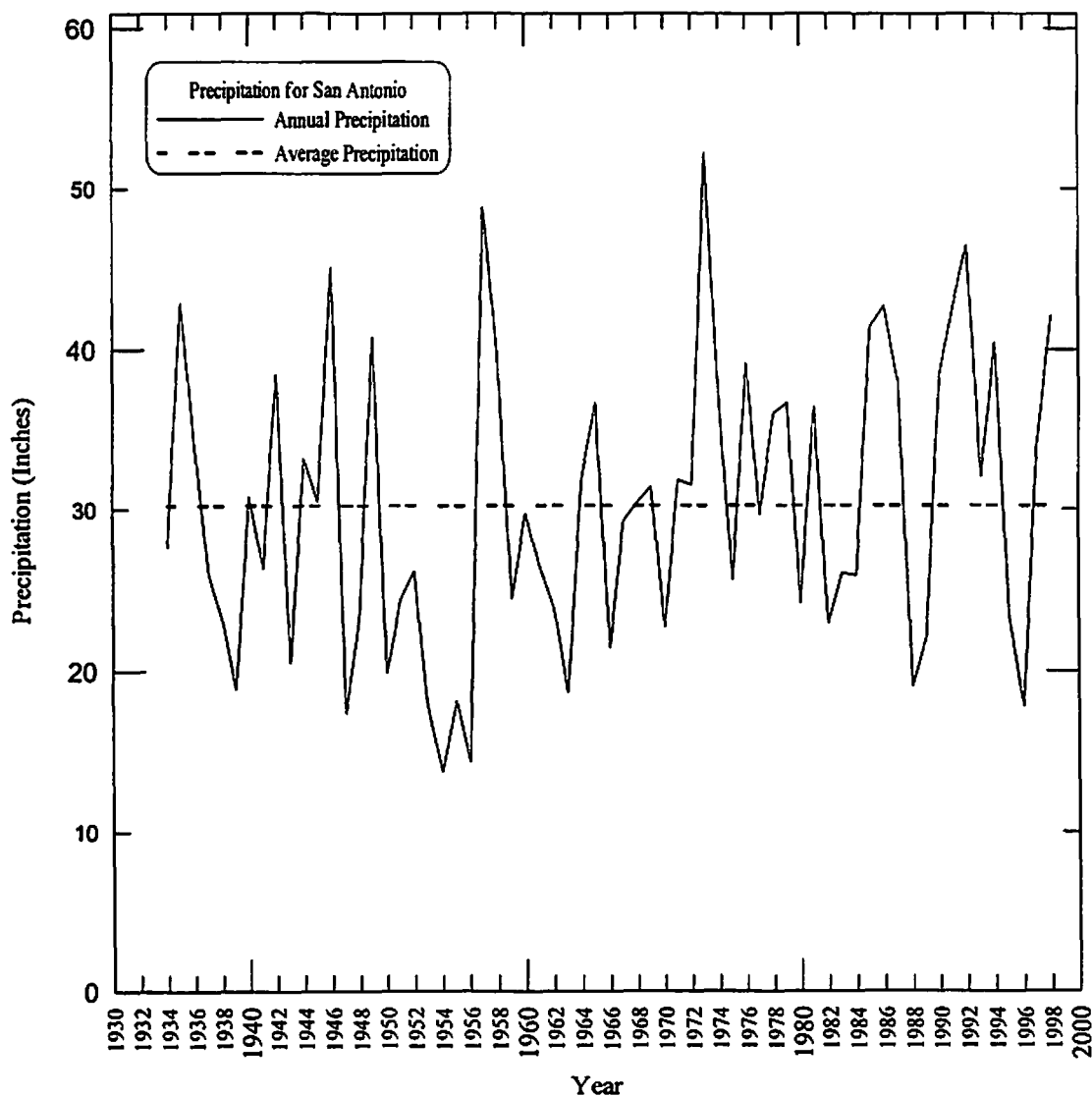


Table 3.1 Annual precipitation for selected rain gauges in the Edwards Aquifer Region, 1934-1998
(measured in inches).

Year	Bracketville	Uvalde	Sabinal	Hondo	San Antonio	Boerne	New Braunfels	San Marcos
1934	—	16.70	18.07	23.97	27.65	26.78	30.80	35.67
1935	—	41.17	48.21	58.73	42.93	52.93	41.67	41.09
1936	22.34	24.53	26.53	35.27	34.11	47.59	30.41	33.48
1937	16.85	17.88	9.57a	22.93	26.07	32.81	29.19	26.03a
1938	19.97	13.12	15.39	27.56	23.26	24.14	28.32	28.17
1939	18.38	25.30	13.98b	23.14	18.83	26.20	13.35	18.59
1940	22.43	27.66	27.51	28.13	30.79	32.29	38.11	43.57
1941	21.52	31.79	33.74a	44.07	26.34	41.60	42.99	48.41
1942	21.01	19.01	11.37a	34.83	38.46	31.12	42.08	44.65
1943	23.39b	20.63	17.21	31.43	20.51	26.33	29.93	25.45
1944	24.76	32.76	27.62a	32.46	33.19	42.98	43.14	47.42
1945	15.69	22.37	26.60	29.57	30.46	33.50	39.38	31.74b
1946	19.10	26.41	14.16a	29.65	45.17	45.62	61.60	52.24
1947	22.92b	22.67	—	18.98	17.32	21.89	27.52	27.53
1948	20.02a	18.31	—	28.82	23.64	23.77	19.88b	21.27a
1949	31.32	34.41	—	39.90	40.81	41.15	43.21	36.22
1950	17.70	18.27	15.28a	24.91	19.86	24.94	21.13	21.10
1951	14.71	16.07	15.63	24.05a	24.44	18.76	24.84	30.88
1952	12.26	18.24	23.16	25.56	26.24	37.54	33.87	39.91
1953	10.12	18.34	21.44	20.61	17.56	21.42	30.06	33.39
1954	19.38	15.60	14.72	11.92	13.70	10.29	10.12	13.42
1955	26.55	18.36	20.87	21.21	18.18	19.27	23.12	26.44
1956	7.58	9.29	11.29	15.54	14.31	12.05	18.41	18.37
1957	34.21	39.30	40.03	35.09	48.83	52.55	51.88	46.51
1958	45.37	39.03	41.18	41.60	39.69	40.94	36.40	39.08
1959	27.51	31.51	27.02	30.68	24.50	35.64	40.45	43.47
1960	19.12	23.98	26.24	32.37	29.76	32.55	34.28	45.48
1961	17.91	26.26	27.24	27.36	26.47	25.45	15.70a	30.02
1962	10.87	14.12	13.58	17.85	23.90	25.26	27.40	28.47
1963	15.07	16.70	18.99	18.90	18.65	20.66	23.41	19.90
1964	20.75	22.30	23.78	28.29	31.88	27.36	30.65	30.27
1965	21.48	26.21	29.41	30.80	36.65	42.41	45.16	45.00
1966	21.63	20.87	21.54	29.46	21.44	29.05	25.98	27.12
1967	21.95	20.10	23.89	30.33	29.26	26.75	31.74	26.41
1968	17.26	25.20	29.88b	31.91	30.40	35.14	35.97	37.13
1969	28.53	33.38	33.05	32.30	31.42	38.07	33.01	36.59
1970	16.50	13.59	22.13	30.96	22.74	27.79	35.23	32.30
1971	29.46	31.01	31.00	32.96	31.80	45.24	29.43	31.10
1972	21.21	15.49	21.10	25.43	31.49	35.09	42.02	31.90
1973	30.61	30.85	35.14b	47.82	52.28	50.93	51.66	47.91
1974	18.25	30.94	20.93b	36.41b	37.00	41.80	42.85	37.28a
1975	26.62	24.92	23.65	25.84a	25.67	33.49	35.82	48.64
1976	34.40	46.04	40.82	45.21	39.13	45.24	49.06	47.46
1977	15.06	19.90	17.06	19.40	29.64	32.43	24.83	29.69
1978	19.04	18.48	21.28	24.64	35.99	35.17	36.35b	33.08
1979	16.34	32.35	31.44	28.83	36.64	39.97	36.72	38.74
1980	18.33	23.05	22.67	21.27	24.23	39.02	33.69	29.56
1981	28.73	26.24	30.19	27.40	36.37	41.05	43.23	49.62
1982	19.10	23.35	18.44	21.99	22.96	27.64	21.04	22.47b
1983	19.35	24.45a	23.33	20.92b	26.11	34.60	34.13	36.95
1984	16.24	15.33b	20.67	21.19a	25.95	26.97	20.90	8.26a
1985	18.93	5.76a	23.67	21.94	41.49	37.77	37.26	33.54
1986	27.44	29.86b	29.62b	36.01b	42.73	43.52	47.14	42.20
1987	39.45	36.39	38.36	40.09	37.96	39.86	37.33a	37.94
1988	12.08	15.20	13.52	9.81b	19.01	19.49	16.27b	21.50
1989	16.98	18.65	17.26	16.10	22.14	25.14	20.99	25.46
1990	38.24b	24.73	30.06	27.01	38.31	42.51	24.58a	35.14b
1991	23.11	21.77	31.12	34.55	42.76	48.22	56.55	51.07
1992	22.22	27.85a	37.73	45.34	46.49	64.17	38.84b	40.33b
1993	15.18	9.32c	13.20	16.60	32.00	24.02	19.54b	24.01b
1994	22.85a	39.61	29.32	22.38b	40.42	40.98	35.76a	40.85

(Table 3.1 continued)

Year	Bracketville	Uvalde	Sabinal	Hondo	San Antonio	Boerne	New Braunfels	San Marcos
1995	25.87	19.47	27.55	24.55	23.20	30.29	23.29	32.57
1996	20.32b	16.20	14.20	15.50	17.80	24.57	19.00	28.20
1997	---	27.77	35.74	37.54	33.94	---	41.65	43.56
1998	24.15	27.40b	20.66b	30.44a	42.10	45.74	52.98	58.51
Years of Record	96	95	80	94	114	94	99	95
Yearly Average	21.71	23.75	24.36	28.44	30.23	33.90	33.28	34.47

Data source: US Department of Commerce (1999), NOAA (1934-1998).

"a/" Partial record not included in long-term average; missing one month.

"b/" Partial record not included in long-term average; missing more than one month.

"---" indicates no data available.

Table 3.2 Monthly precipitation data from Edwards Aquifer Authority rain gauge network and National Oceanic and Atmospheric Administration precipitation-gauging stations, 1998 (measured in inches).

Gauge	County	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
San Antonio Intl. Airport	Bexar	3.22	3.38	2.85	0.05	0.34	0.81	0.21	7.78	1.58	18.07	3.41	0.40	42.10
Vanderpool 10N	Bandera	2.91	2.21	3.25	0.0	1.17	3.46	1.55	11.15	0.79	4.56	4.09	1.50	36.64
Children's Home	Bandera	3.70	2.32	3.61	0.0	1.35	2.65	0.55	0.55	0.55	11.13	4.03	1.68	32.12
New Braunfels	Comal	1.03	4.35	3.21	0.35	0.60	0.90	2.04	4.83	4.47	26.75	3.21	1.24	52.98
San Marcos	Hays	2.32	3.21	2.17	0.50	0.31	0.88	3.17	7.72	8.73	25.31	3.06	1.13	58.51
Uvalde	Uvalde	0.33	2.34	2.16	0.04	0.0	4.25	0.03	10.54	---	6.01	1.70	0.0	27.4
Kerrville	Kerr	1.56	3.52	2.75	0.28	0.68	2.39	1.52	6.38	1.96	5.71	3.91	1.73	32.39
Hondo	Medina	0.87	3.92	3.73	0.06	0.24	2.62	1.20	13.37	1.15	---	2.79	0.49	30.44
Prade Ranch	Real	---	---	---	---	---	---	0.0	13.63	2.40	4.15	1.52	0.45	22.15
Livingston	Uvalde	3.51	1.94	1.44	---	---	---	---	---	---	---	---	---	6.89
Utopia 22	Uvalde	3.38	2.22	2.47	0.0	0.35	2.30	0.45	10.75	0.65	9.84	2.89	0.73	36.03
Utopia 24	Uvalde	6.90	2.29	3.06	0.0	0.30	2.35	0.95	12.54	0.20	7.70	3.40	0.80	40.49
Sabinal	Uvalde	0.70	4.03	3.07	0.03	0.0	2.20	0.38	10.25	---	---	---	---	20.66

Data source: Edwards Aquifer Authority and US Department of Commerce (NOAA), 1999.

"---" indicates missing or incomplete data for the month.

The San Antonio region is situated between a semi-arid area to the west and a wetter more humid area to the east. This location allows for large variations in monthly and annual precipitation amounts. The average annual precipitation for San Antonio is approximately 30 inches, however annual precipitation has ranged from 10 inches to near 50 inches (NOAA, 1999). Weather systems moving across the area in October 1998 provided a large percentage of the regions 1998 rainfall. In October 1998, San Antonio received 8 days of rainfall, totaling 18.07 inches -- nearly twice the record high amount of rainfall previously recorded for October (9.74 inches in 1994). October 17, 1998, set a single day record rainfall event for San Antonio at 11.26 inches (NOAA, 1999). Over the past 30 years for the month of October, the San Antonio region of the Edwards Aquifer has averaged about 7 days of rain, totaling 2.62 inches.

The Edwards Aquifer Authority's automated rain gauge system recorded from 2.5 inches of rain in Uvalde County to 24 inches of rain in Comal County during the weekend of October 17. The greatest intensity of the rainfall was distributed through central and northwest Comal County. The National Weather Service reported up to 24 inches of rain from October 17 through 19 near New Braunfels. Individual weather observers reported up to 27 inches northwest of New

Braunfels during the same time period, with the greatest amount falling on October 17 (NOAA, 1999).

The record rainfall event in the San Antonio region during the weekend of October 17, 1998 resulted in a record rate of increase in the Edwards Aquifer water level, as measured at J-17, of 6.72 feet over a 24-hour period. Likewise, the October 1998 water level in the Hondo monitor well also rose markedly in synchronization with the record rainfall event, while the water level in the Uvalde monitor well rose approximately one foot (Appendix A).

3.2 Precipitation Enhancement Program (PEP)

The Edwards Aquifer Authority Board of Directors voted in the Fall of 1997 to obtain a permit from the Texas Natural Resources Conservation Commission (TNRCC) to conduct precipitation enhancement (cloud-seeding). The permit was granted by the TNRCC in October 1998 and is valid for four years beginning in January 1999 and ending in December 2002. The permit allows the Authority to conduct precipitation enhancement anytime during the year, including the traditional period of April through September.

Research indicates that precipitation enhancement can result in increased rainfall of approximately 10 to 15 percent. The Authority believes this increase in rainfall could add 10 percent of additional recharge to the Edwards Aquifer. Additional benefits may be realized if the rain does not fall over the aquifer's Recharge Zone since increased rainfall also decreases pumpage demand for lawn watering and crop irrigation.

4.0 GROUNDWATER RECHARGE

The segment of the Edwards Aquifer Recharge Zone (EARZ) that supplies groundwater to the San Antonio region of the Edwards Aquifer extends from central Kinney County to central Hays County. **Figure 4.1** identifies the major drainage basins that cross the EARZ. These basins are also listed below in **Table 4.1**.

Table 4.1 Drainage basins that cross the Edwards Aquifer Recharge Zone.

Nueces-West Nueces River basin
Frio-Dry Frio River basin
Sabinal River basin
Area between Sabinal River and Medina River basins
Medina River basin
Area between Medina River and Cibolo-Dry Comal Creek basins
Cibolo Creek and Dry Comal Creek basin
Guadalupe River basin
Blanco River basin

Although some recharge to the Edwards Aquifer is provided by other hydraulically connected aquifers, this type of recharge has not been quantified. Only surface water data from precipitation and streamflows are utilized to calculate total recharge.

The USGS has been calculating groundwater recharge to the Edwards Aquifer since 1934. **Table 4.2** shows estimated annual recharge by river basin from 1934 through 1998, based on USGS calculations. The USGS estimates that annual recharge for the period of record (1934 to 1998) ranges from 43,700 acre-feet at the height of the drought of record in 1956, to 2,486,000 acre-feet in 1992. In 1998, estimated recharge was 1,142,300 acre-feet. Average annual recharge from 1934 to 1998 was 683,100 acre-feet. However, since 1989, the ten-year average annual recharge has been estimated to be approximately 945,000 acre-feet. **Figure 4.2** depicts a graph of yearly recharge and the ten-year floating average recharge estimate for the San Antonio region of the Edwards Aquifer from 1934 to 1998.

Recharge directly affects groundwater levels in the aquifer. Water levels rise during years of higher-than-normal recharge, and generally decline during periods of below-normal recharge. Since recharge is a direct result of precipitation, water levels in the aquifer are greatly affected by rainfall. Higher than normal rainfall conditions in 1998 resulted in a slight increase of recharge to the Edwards Aquifer relative to the 1997 recharge estimate.

The Authority operates four recharge dams across the EARZ. The locations of the recharge structures are shown in **Figure 4.1**. In, 1998, gauges were operational at only one of these recharge structures, Parker Creek Dam. **Table 4.3** shows the 1998 monthly recharge to the Edwards Aquifer from the Parker Creek recharge structure. The USGS collected recharge data, and estimated the recharge amount for Parker Creek Dam through September 1998. The available 1998 Parker Creek Dam recharge data are provisional. **Table 4.4** shows the annual historical recharge recorded, or estimated for each site since construction.

Figure 4.1 Major drainage basins and Edwards Aquifer Authority recharge structures in the San Antonio Region of the Edwards Aquifer.

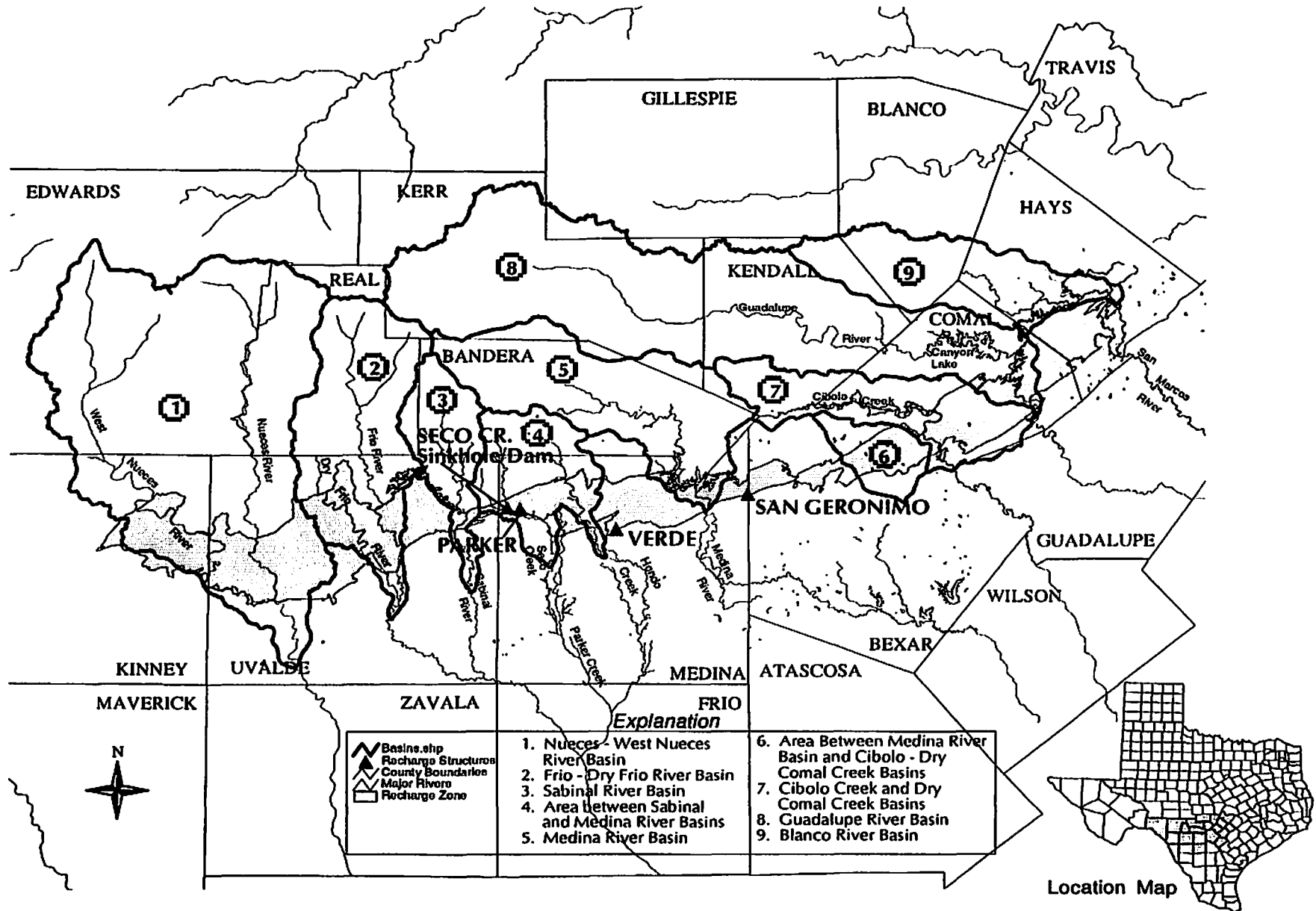


Table 4.2 Estimated annual groundwater recharge to the Edwards Aquifer by drainage basin, 1934-1998 (measured in thousands of acre-feet).

Year	Nueces River- West Nueces River basin	Frio River- Dry Frio River basin	Sabinal River basin	Area between Sabinal River and Medina River basin	Medina River basin	Area between Medina River and Cibolo Creek - Dry Comal Creek basin	Cibolo Creek - Dry Comal Creek basin	Blanco River basin	*Total
1934	8.6	27.9	7.5	19.9	46.5	21	28.4	19.8	179.6
1935	411.3	192.3	56.6	166.2	71.1	138.2	182.7	39.8	1258.2
1936	176.5	157.4	43.5	142.9	91.6	108.9	146.1	42.7	909.6
1937	28.8	75.7	21.5	61.3	80.5	47.8	63.9	21.2	400.7
1938	63.5	69.3	20.9	54.1	65.5	46.2	76.8	36.4	432.7
1939	227	49.5	17	33.1	42.4	9.3	9.6	11.1	399
1940	50.4	60.3	23.8	56.6	38.8	29.3	30.8	18.8	308.8
1941	89.9	151.8	50.6	139	54.1	116.3	191.2	57.8	850.7
1942	103.5	95.1	34	84.4	51.7	66.9	93.6	28.6	557.8
1943	36.5	42.3	11.1	33.8	41.5	29.5	58.3	20.1	273.1
1944	64.1	76	24.8	74.3	50.5	72.5	152.5	46.2	560.9
1945	47.3	71.1	30.8	78.6	54.8	79.6	129.9	35.7	527.8
1946	80.9	54.2	16.5	52	51.4	105.1	155.3	40.7	556.1
1947	72.4	77.7	16.7	45.2	44	55.5	79.5	31.6	422.6
1948	41.1	25.6	26	20.2	14.8	17.5	19.9	13.2	178.3
1949	166	86.1	31.5	70.3	33	41.8	55.9	23.5	508.1
1950	41.5	35.5	13.3	27	23.6	17.3	24.6	17.4	200.2
1951	18.3	28.4	7.3	26.4	21.1	15.3	12.5	10.6	139.9
1952	27.9	15.7	3.2	30.2	25.4	50.1	102.3	20.7	275.5
1953	21.4	15.1	3.2	4.4	36.2	20.1	42.3	24.9	167.6
1954	61.3	31.6	7.1	11.9	25.3	4.2	10	10.7	162.1
1955	128	22.1	0.6	7.7	16.5	4.3	3.3	9.5	192
1956	15.6	4.2	1.6	3.6	6.3	2	2.2	8.2	43.7
1957	108.6	133.6	65.4	129.5	55.6	175.6	397.9	76.4	1142.6
1958	266.7	300	223.8	294.9	95.5	190.9	268.7	70.7	1711.2
1959	109.6	158.9	61.6	96.7	94.7	57.4	77.9	33.6	690.4
1960	88.7	128.1	64.9	127	104	89.7	160	62.4	824.8
1961	85.2	151.3	57.4	105.4	88.3	69.3	110.8	49.4	717.1
1962	47.4	46.6	4.3	23.5	57.3	16.7	24.7	18.9	239.4
1963	39.7	27	5	10.3	41.9	9.3	21.3	16.2	170.7
1964	126.1	57.1	16.3	61.3	43.3	35.8	51.1	22.2	413.2
1965	97.9	83	23.2	104	54.6	78.8	115.3	66.7	623.5
1966	169.2	134	37.7	78.2	50.5	44.5	66.5	34.6	615.2
1967	82.2	137.9	30.4	64.8	44.7	30.2	57.3	19	466.5
1968	130.8	176	66.4	198.7	59.9	83.1	120.5	49.3	884.7
1969	119.7	113.8	30.7	84.2	55.4	60.2	99.9	46.6	610.5
1970	112.6	141.9	35.4	81.6	68	68.8	113.8	39.5	661.6
1971	263.4	212.4	39.2	155.6	68.7	81.4	82.4	22.2	925.3
1972	108.4	144.6	49	154.6	87.9	74.3	104.2	33.4	756.4
1973	190.6	256.9	123.9	286.4	97.6	237.2	211.7	82.2	1486.5
1974	91.1	135.7	36.1	115.3	96.2	68.1	76.9	39.1	658.5
1975	71.8	143.6	47.9	195.9	93.4	138.8	195.7	85.9	973
1976	150.7	238.6	68.2	182	94.5	47.9	54.3	57.9	894.1
1977	102.9	193	62.7	159.5	77.7	97.9	191.6	66.7	952
1978	69.8	73.1	30.9	103.7	76.7	49.6	72.4	26.3	502.5
1979	128.4	201.4	68.6	203.1	89.4	85.4	266.3	75.2	1117.8
1980	58.6	85.6	42.6	25.3	88.3	18.8	55.4	31.8	406.4
1981	205	365.2	105.6	252.1	91.3	165	196.8	67.3	1448.3
1982	19.4	123.4	21	90.9	76.8	22.6	44.8	23.5	422.4
1983	79.2	85.9	20.1	42.9	74.4	31.9	62.5	23.2	420.1
1984	32.4	40.4	8.8	18.1	43.9	11.3	16.9	25.9	197.7
1985	105.9	186.9	50.7	148.5	64.7	136.7	259.2	50.7	1003.3
1986	188.4	192.8	42.2	173.6	74.7	170.2	267.4	44.5	1153.8
1987	308.5	473.3	110.7	405.5	90.4	229.3	270.9	114.9	2003.5
1988	59.2	117.9	17	24.9	69.9	12.6	28.5	25.5	355.5

(Table 4.2 continued)

Year	Nueces River- West Nueces River basin	Frio River- Dry Frio River basin	Sabinal River basin	Area between Sabinal River and Medina River basin	Medina River basin	Area between Medina River and Cibola Creek- Dry Comal Creek basin	Cibola Creek - Dry Comal Creek basin	Blanco River basin	*Total
1989	52.6	52.6	8.4	13.5	46.9	4.6	12.3	23.6	214.4
1990	479.3	255	54.6	131.2	54	35.9	71.8	41.3	1123.1
1991	325.2	421	103.1	315.2	52.8	84.5	109.7	96.9	1508.4
1992	234.1	586.9	201.1	566.1	91.4	290.6	286.6	226.9	2486
1993	32.6	78.5	29.6	60.8	78.5	38.9	90.9	37.8	447.6
1994	124.6	151.5	29.5	45.1	61.1	34.1	55.6	36.6	538.1
1995	107.1	147.6	34.7	62.4	61.7	36.2	51.1	30.6	531.3
1996	130.0	92.0	11.4	9.4	42.3	10.6	14.7	13.9	324.3
1997	176.9	209.1	57	208.4	63.3	193.4	144.2	82.3	1134.6
1998	141.5	214.8	72.5	201.4	80.3	86.2	240.9	104.7	1142.3

For the period of record 1934-1998:

Average	117.0	134.4	42.1	108.5	61.4	70.8	106.0	42.9	683.1
Median	97.9	117.9	30.9	78.6	59.9	50.1	77.9	34.6	556.1

For the period of record 1989-1998:

Average	180.4	220.9	60.2	161.4	63.2	81.5	107.8	69.5	945.0
Median	135.8	180.3	44.7	96.8	61.4	37.6	81.4	39.6	830.6

Data source: USGS, 1999.

*Total may not be equal to sum of basin values due to rounding.

Table 4.3 Monthly groundwater recharge at Parker Creek recharge structure, 1998 (measured in acre-feet).

Month	Parker Creek Dam
January	0.62a
February	0.65a
March	392.04a
April	0.0a
May	0.0a
June	0.0a
July	0.0a
August	935.50a
September	0.0a
October	---
November	139.93b
December	0.0b
Yearly Total	1,468.74

Data source: "a" USGS, 1999, provisional data.

"b" EAA, 1999, estimated by linear regression.

"—" indicates no data available.

Figure 4.2 Estimated annual recharge and ten-year floating average recharge for the San Antonio area of the Edwards Aquifer (1934-1998).

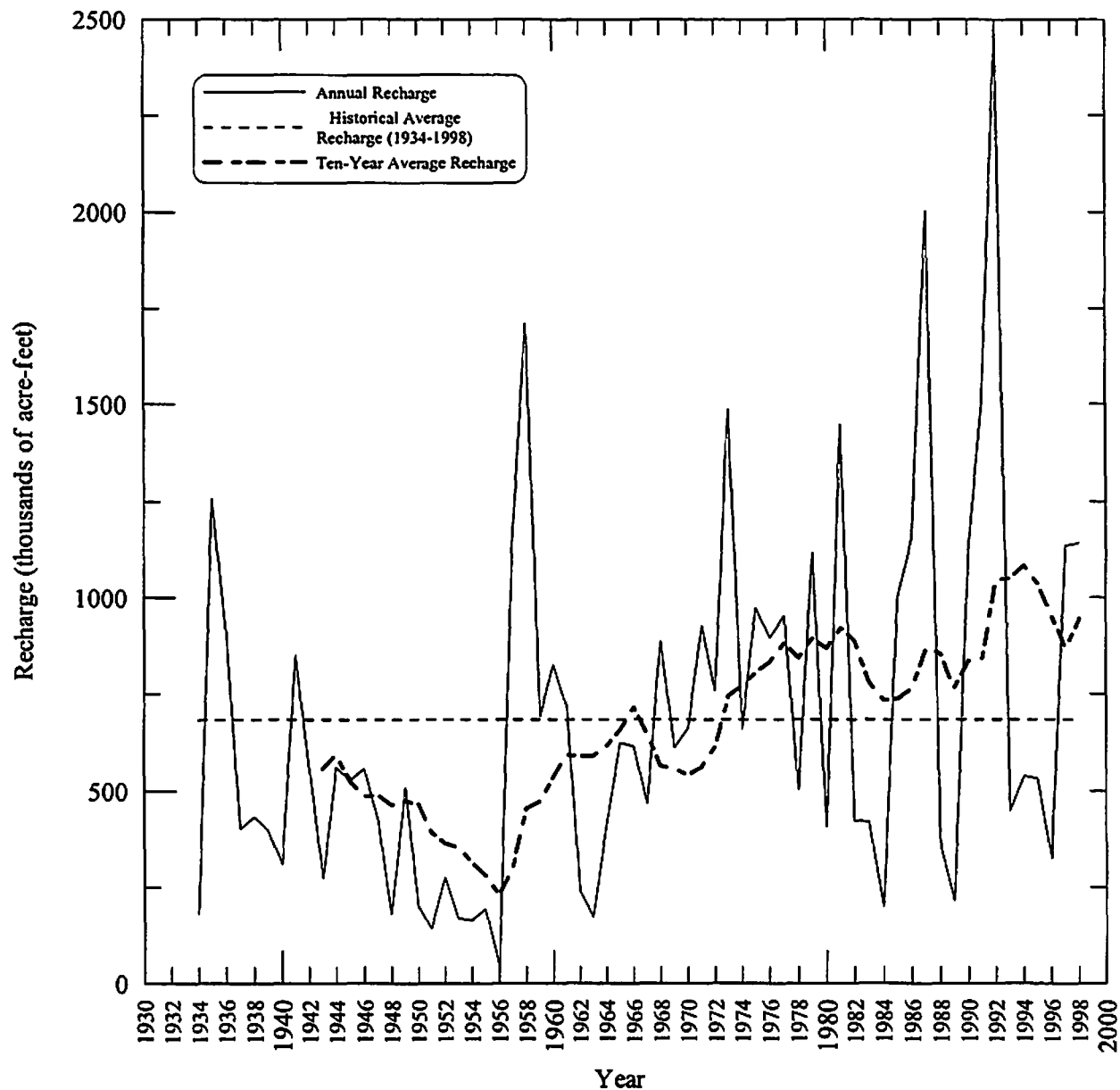


Table 4.4 Estimated annual Edwards Aquifer recharge from Edwards Aquifer Authority recharge projects (measured in acre-feet).

Year	Parker (4-20-74)	Verde (4-28-78)	San Geronimo (11-13-79)	Seco (10-21-82)	Yearly Total
1974	160	---	---	---	160
1975	620	---	---	---	620
1976	2,018	---	---	---	2,018
1977	6	---	---	---	6
1978	98	150	---	---	248
1979	2,315	1,725	0	---	4,040
1980	0	371	903	---	1,274
1981	772	1,923	1,407	---	4,102
1982	3	112	91	0	206
1983	0	254	0	0	254
1984	251	246	0	143	640
1985	232	440	1,097	643	2,412
1986	217	889	963	1,580	3,649
1987	2,104	4,141	1,176	12,915	20,336
1988	0	0	0	0	0
1989	0	0	0	0	0
1990	49	176	41	479	745
1991	647	966	1,647	2,160	5,420
1992	723	2,775	2,874	14,631	21,003
1993	0	0	334	508	842
1994	159	0	0	5	164
1995	18	79	51	880	1,028
1996	0	0	0	0	0
1997	2,941a	907b	1,383b	---	5,231
1998	1469ab	1160b	872b	3796b	7297
Total	14,802	16,314	12,839	37,740	81,695
Average	592	777	642	2,359	3,268
Median	160	254	213	494	842

Data source: USGS and Edwards Aquifer Authority, 1999.

"a" Provisional data.

"b" Determined by linear regression analysis.

"---" indicates no data available.

The 1998 recharge calculations shown in Table 4.4 for Verde Creek, San Geronimo, and Seco Creek dams were determined by a linear regression analysis, using the "least squares" method. The "linear regression" method was also implemented for the remaining three months of Parker Creek Dam (Table 4.3). For each area, a comparison of rainfall data in the relevant drainage basin (obtained from the National Weather Service) to historical recharge data for the dam was used as data input. The resulting data were used to generate a linear regression equation. This equation was used to predict the amount of recharge at each of the four recharge structures for a given rainfall within the basin. A comparison of the resulting data to historical recharge indicates the regression results are reasonable (Gregory James, written communication, 1998).

The historical average annual recharge attributed to the recharge dams is based on a period of record that reflects the date of construction through 1998. The historical average annual recharge contributed by the combined structures is 3,268 acre-feet.

5.0 GROUNDWATER DISCHARGE AND USAGE

The Edwards Aquifer provides water for many diverse uses in South Central Texas, including irrigation, municipal, industrial, and domestic/recreational needs. Groundwater is discharged from the Edwards Aquifer as springflow or through wells.

Springflow supports recreational economies in New Braunfels and San Marcos, and provides habitat for threatened and endangered animal and plant species. The amount of groundwater discharged as springflow is greater than the amount discharged through wells for any of the above-mentioned uses. Springflow is calculated by measuring the downstream flow from springs, or by measuring water levels in observation wells near the springs, and then making the necessary corrections from these values. **Figure 5.1** is the location map of the major springs of the Edwards Aquifer. The groundwater discharge resulting from pumping is calculated by tabulating reported water use data from public supply, irrigation, agricultural, industrial, commercial and domestic wells.

Estimates of annual groundwater discharge from springflow and pumping for the San Antonio area of the Edwards Aquifer are available from 1934 to 1998 (**Table 5.1**). Annual groundwater discharges range from the calculated low of 388,800 acre-feet in 1955 to the calculated high of 1,130,000 acre-feet in 1992. In 1998, total groundwater discharge from the Edwards Aquifer from wells and springs was estimated at 917,600 acre-feet.

Springflow from 1934 to 1998 has varied from a low of 69,800 acre-feet in 1956 to a high of 802,800 acre-feet in 1992 (**Table 5.1**). **Table 5.2** shows the monthly estimated discharge in 1998 for six primary Edwards Aquifer springs. Spring discharge from the Edwards Aquifer for 1998 was calculated at 464,100 acre-feet. Spring discharge accounted for 51 percent of total discharge from the Edwards Aquifer in 1998 (**Tables 5.1 and 5.2**).

While springflow can vary greatly from year to year and is dependent on precipitation and aquifer water levels, groundwater pumping has progressively increased over the years. **Figure 5.2** is a graph comparing Edwards Aquifer groundwater withdrawal to springflow. The lowest estimated annual aquifer pumping level was 101,900 acre-feet recorded in 1934. Since 1934, pumping from the Edwards Aquifer has increased to 453,500 acre-feet, or an increase of approximately 300 percent. Average annual well production was estimated to be 298,500 acre-feet per year for the period of record from 1934 to 1998, while the estimated floating 10-year average for pumping from 1989 through 1998 was 435,100 acre-feet (**Table 5.1**). Reported groundwater pumping accounted for 453,500 acre-feet of water discharged from the Edwards Aquifer in 1998.

Table 5.3 shows the 1998 discharge data by use for the counties in the region. The discharge estimates were compiled from pumpage data reported by public water supply, industry, military, and irrigators to the Authority, TWDB, and USGS. Pumpage from domestic supply, stock, and miscellaneous use were estimated by the USGS (USGS, 1999), and the Authority. **Table 5.4** shows annual estimated Edwards Aquifer groundwater discharge by use from 1955 to 1999.

Figure 5.1 Major springs in the San Antonio Region of the Edwards Aquifer.

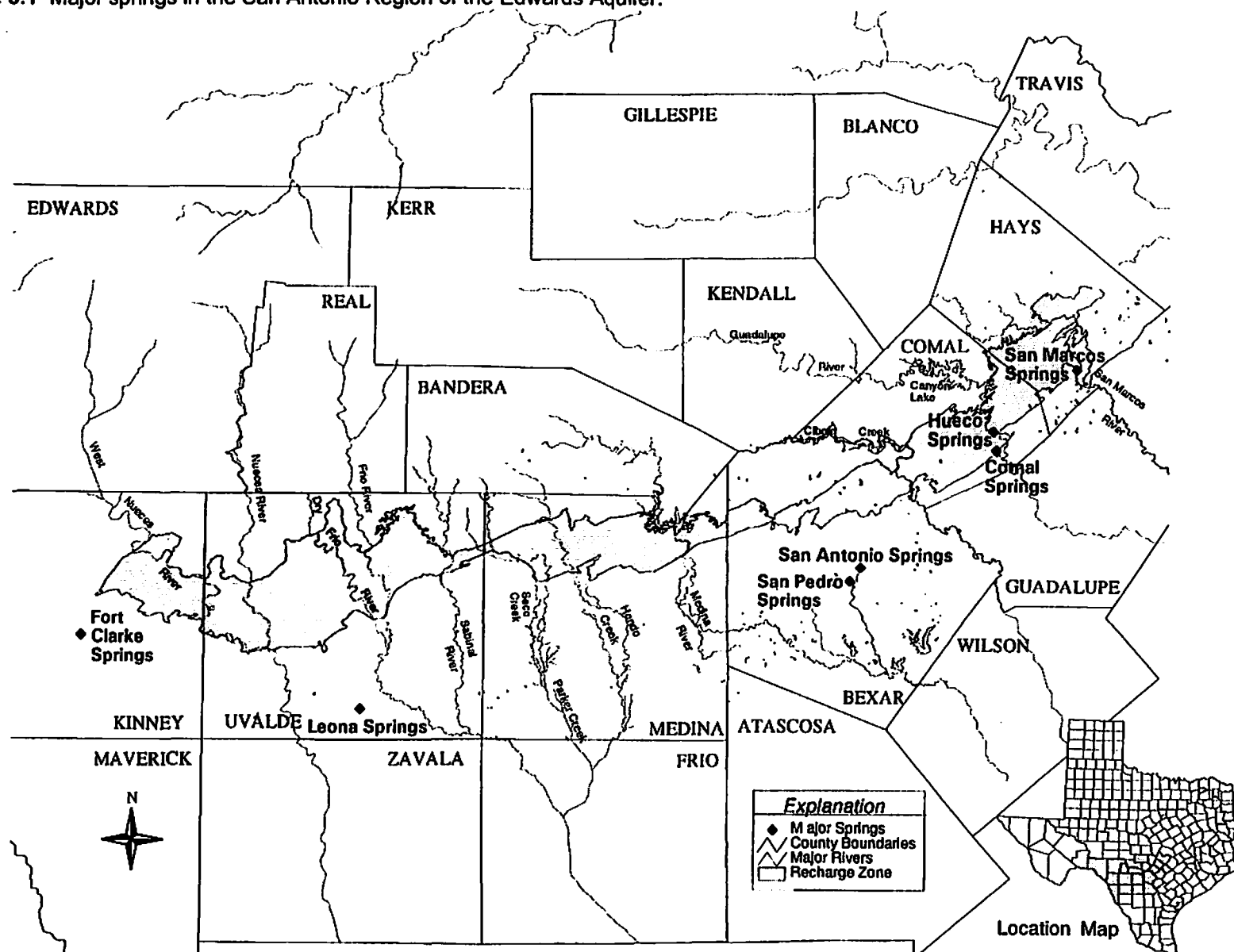


Table 5.1 Annual estimated groundwater discharge data by county for the Edwards Aquifer, 1934-1998 (measured in thousands of acre-feet).

Year	Kinney, Uvalde	Medina	Bexar	Comal	Hays	Total	Total Wells	Total Springs
1934	12.6	1.3	109.3	229.1	85.6	437.9	101.9	336.0
1935	12.2	1.5	171.8	237.2	96.9	519.6	103.7	415.9
1936	26.6	1.5	215.2	261.7	93.2	598.2	112.7	485.5
1937	28.3	1.5	201.8	252.5	87.1	571.2	120.2	451.0
1938	25.2	1.6	187.6	250.0	93.4	557.8	120.1	437.7
1939	18.2	1.6	122.5	219.4	71.1	432.8	118.9	313.9
1940	16.1	1.6	116.7	203.8	78.4	416.6	120.1	296.5
1941	17.9	1.6	197.4	250.0	134.3	601.2	136.8	464.4
1942	22.5	1.7	203.2	255.1	112.2	594.7	144.6	450.1
1943	19.2	1.7	172.0	249.2	97.2	539.3	149.1	390.2
1944	11.6	1.7	166.3	252.5	135.3	567.4	147.3	420.1
1945	12.4	1.7	199.8	263.1	137.8	614.8	153.3	461.5
1946	6.2	1.7	180.1	261.9	134.0	583.9	155.0	428.9
1947	13.8	2.0	193.3	256.8	127.6	593.5	167.0	426.5
1948	9.2	1.9	159.2	203.0	77.3	450.6	168.7	281.9
1949	13.2	2.0	165.3	209.5	89.8	479.8	179.4	300.4
1950	17.8	2.2	177.3	191.1	78.3	466.7	193.8	272.9
1951	16.9	2.2	186.9	150.5	69.1	425.6	209.7	215.9
1952	22.7	3.1	187.1	133.2	78.8	424.9	215.4	209.5
1953	27.5	4.0	193.7	141.7	101.4	468.3	229.8	238.5
1954	26.6	6.3	208.9	101.0	81.5	424.3	246.2	178.1
1955	28.3	11.1	215.2	70.1	64.1	388.8	261.0	127.8
1956	59.6	17.7	229.6	33.6	50.4	390.9	321.1	69.8
1957	29.0	11.9	189.4	113.2	113.0	456.5	237.3	219.2
1958	23.7	6.6	199.5	231.8	155.9	617.5	219.3	398.2
1959	43.0	8.3	217.5	231.7	118.5	619.0	234.5	384.5
1960	53.7	7.6	215.4	235.2	143.5	655.4	227.1	428.3
1961	56.5	6.4	230.3	249.5	140.8	683.5	228.2	455.3
1962	64.6	8.1	220.0	197.5	98.8	589.0	267.9	321.1
1963	51.4	9.7	217.3	155.7	81.9	516.0	276.4	239.6
1964	49.3	8.6	201.0	141.8	73.3	474.0	260.2	213.8
1965	46.8	10.0	201.1	194.7	126.3	578.9	256.1	322.8
1966	48.5	10.4	198.0	198.9	115.4	571.2	255.9	315.3
1967	81.1	15.2	239.7	139.1	82.3	557.4	341.3	216.1
1968	58.0	9.9	207.1	238.2	146.8	660.0	251.7	408.3
1969	88.5	13.6	216.3	218.2	122.1	658.7	307.5	351.2
1970	100.9	16.5	230.6	229.2	149.9	727.1	329.4	397.7
1971	117.0	32.4	262.8	168.2	99.1	679.5	406.8	272.7
1972	112.6	28.8	247.7	234.3	123.7	747.1	371.3	375.8
1973	96.5	14.9	273.0	289.3	164.3	838.0	310.4	527.6
1974	133.3	28.6	272.1	286.1	141.1	861.2	377.4	483.8
1975	112.0	22.6	259.0	296.0	178.6	868.2	327.8	540.4
1976	136.4	19.4	253.2	279.7	164.7	853.4	349.5	503.9
1977	156.5	19.9	317.5	295.0	172.0	960.9	380.6	580.3
1978	154.3	38.7	269.5	245.7	99.1	807.3	431.8	375.5
1979	130.1	32.9	294.5	300.0	157.0	914.5	391.5	523.0
1980	151.0	39.9	300.3	220.3	107.9	819.4	491.1	328.3
1981	104.2	26.1	280.7	241.8	141.6	794.4	387.1	407.3
1982	129.2	33.4	305.1	213.2	105.5	786.4	453.1	333.3
1983	107.7	29.7	277.6	186.6	118.5	720.1	418.5	301.6
1984	156.9	46.9	309.7	108.9	85.7	708.1	529.8	178.3
1985	156.9	59.2	295.5	200.0	144.9	856.5	522.5	334.0
1986	91.7	41.9	294.0	229.3	160.4	817.3	429.3	388.0
1987	94.9	15.9	326.6	286.2	198.4	922.0	364.1	557.9
1988	156.7	82.2	317.4	236.5	116.9	909.7	540.0	369.7
1989	156.9	70.5	305.6	147.9	85.6	766.5	542.4	224.1
1990	118.1	69.7	276.8	171.3	94.1	730.0	489.4	240.6
1991	76.6	25.6	315.5	221.9	151.0	790.6	436.0	354.6
1992	76.5	9.3	370.5	412.4	261.3	1130.0	327.2	802.8
1993	107.5	17.8	371.0	349.5	151.0	996.7	407.3	589.4

(Table 5.1 continued)

Year	Kinney, Uvalde	Medina	Bexar	Comal	Hays	Total	Total Wells	Total Springs
1995	90.8	35.2	*272.1	235.0	127.8	761.0	399.6	361.3
1996	117.6	66.3	*286.8	150.2	84.7	705.6	493.6	212.0
1997	77.0	31.4	260.2	243.3	149.2	761.1	377.1	383.9
1998	113.1a	51.3	312.4b	271.4	169.6c	917.6	453.5	464.1
For period of record 1934-1998:								
Average	70.6	19.2	236.4	219.1	118.6	663.9	298.5	365.4
Median	59.6	11.1	220	231.7	115.4	655.4	276.4	375.5
For period of record 1989-1998 (10 years):								
Average	103.0	41.8	306.9	247.3	138.5	837.4	435.1	402.3
Median	101.5	38.2	301.7	239.2	138.5	778.6	430.3	372.7

Data source: USGS and Edwards Aquifer Authority, 1999.

"a" USGS estimated Kinney County irrigation discharge.

"b" Estimated from Atascosa County reports of Edwards Aquifer irrigators.

"c" Estimated from Guadalupe County reports of Edwards Aquifer industrial users.

Differences may occur due to rounding procedures.

*In 1995, the USGS has revised the method of calculating domestic/livestock pumping, which significantly decreased the estimate for 1996.

Table 5.2 Estimated spring discharge from the Edwards Aquifer, 1998 (measured in acre-feet).

Month	Comal Springs	San Marcos Springs	Hueco Springs	San Antonio Springs	San Pedro Springs	Leona Springs and Leona River Underflow	Total monthly discharge combining all springs
Jan.	18,988	10,445	3,435	1,043	410	2,187	36,508
Feb.	17,907	10,264	3,979	1,492	443	1,810	35,895
March	20,450	12,752	4,694	2,856	637	2,197	43,586
April	19,256	12,260	4,570	1,660	491	2,195	40,432
May	16,546	10,887	4,029	0	66	1,602	33,130
June	12,724	9,763	3,119	0	0	1,114	26,720
July	12,012	9,663	2,301	0	0	981	24,957
Aug.	12,795	9,513	1,975	0	47	1,211	25,541
Sept.	15,330	11,246	2,085	0	178	1,996	30,835
Oct.	20,316	16,879	2,854	2,192	502	2,707	45,450
Nov.	23,457	22,130	3,981	6,407	1,018	3,012	60,005
Dec.	23,802	21,840	5,053	6,145	1,002	3,257	61,099
Total	213,580	157,556	42,075	21,796	4,795	24,269	464,100

Data source: USGS, 1999.

Differences may occur due to rounding procedures.

Note: divide Total by 1,000 to get thousands of acre-feet as in Table 5.1

Figure 5.2 Groundwater pumping compared to springflow in the Edwards Aquifer, 1934-1998 (measured in thousands of acre-feet).

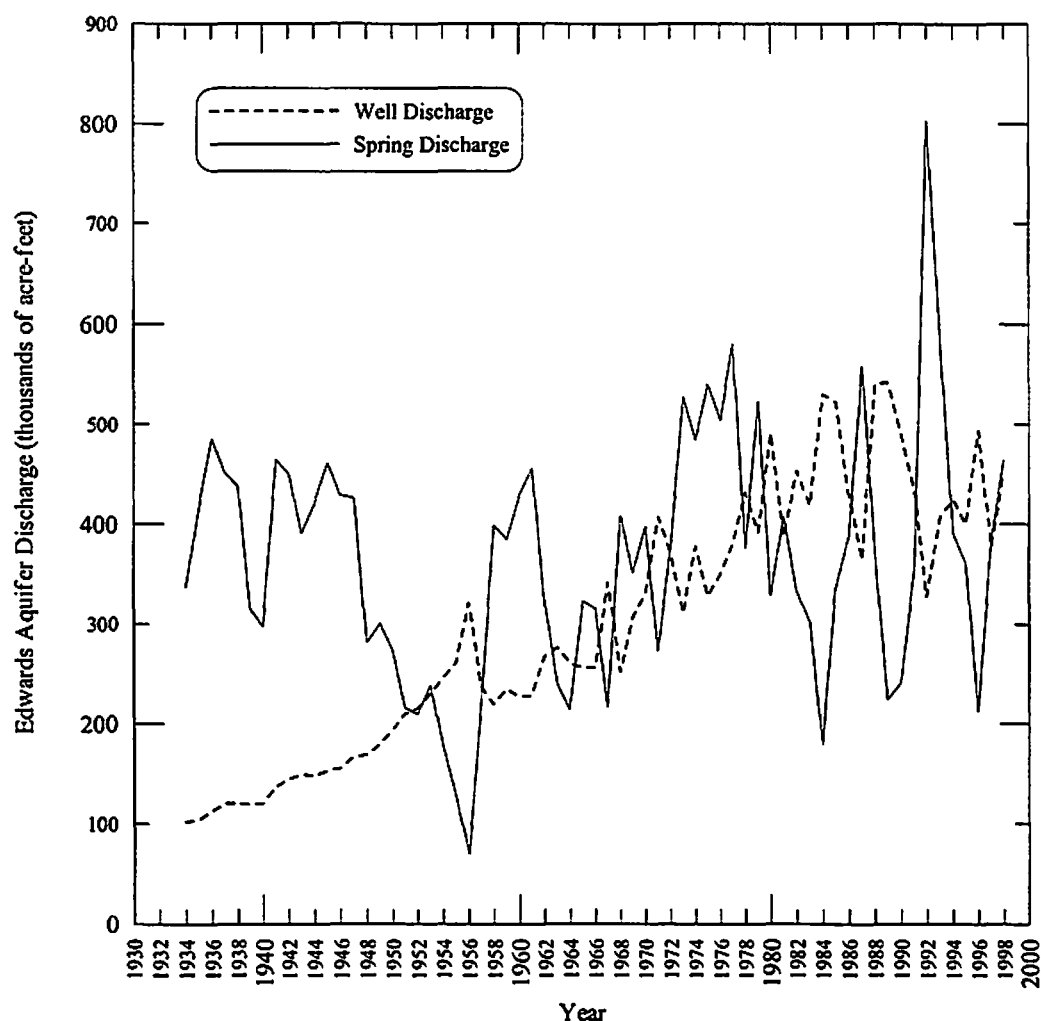


Table 5.3 Total groundwater discharge from the Edwards Aquifer, 1998 (measured in thousands of acre-feet).

County	Irrigation	Municipal /Military	Domestic /Stock	Industrial	Total Wells	Springs (est'd by USGS)	Total Well & Springs
Bexar	12.5 a,b	240	8.8	24.4	285.7	26.7	312.3
Comal	0.2 b	3.5	0.3	11.7	15.7	255.7	271.4
Hays	0.02 b	9.3	0.8	1.9 d	12.0	157.6	169.6
Medina	43.0 b	6.6	0.9	0.8	51.3	0.0	51.3
Uvalde	75.6 b	6.1	2.3	2.9	86.9	24.3	111.2
Kinney	0.6 c	1.0	0.3	0.0	1.9	0.0	1.9
Total	131.9	266.5	13.4	41.7	453.5	464.3	917.7

Differences may occur due to rounding procedures.

Data source: Edwards Aquifer Authority, and USGS 1999.

"a" Includes Atascosa County.

"b" Estimated from reports of Edwards Aquifer irrigators.

"c" Estimated by USGS.

"d" Includes Guadalupe County.

Table 5.4 Annual estimated Edwards Aquifer groundwater discharge by use, 1955-1998
(measured in thousands of acre-feet).

Year	Irrigation	Municipal	Domestic/ Stock	Industrial/ Commercial	Springs
1955	85.2	120.5	30.1	25.1	127.8
1956	127.2	138.3	28.9	22.4	69.8
1957	68.8	116.1	29.8	22.6	219.2
1958	47.2	113.7	33.4	25.1	398.2
1959	60.0	118.9	31.5	24.2	384.5
1960	54.9	121.1	29.1	23.3	428.3
1961	52.1	124.5	29.6	22.2	455.3
1962	72.7	143.7	28.8	22.8	321.1
1963	75.4	151.8	27.8	21.8	239.6
1964	72.6	140.2	26.3	21.7	213.8
1965	68.0	138.8	27.0	22.3	322.8
1966	68.2	141.8	23.3	22.6	315.3
1967	119.4	171.0	25.1	25.8	216.1
1968	59.3	146.9	25.5	20.0	408.3
1969	95.2	162.0	29.2	21.1	351.2
1970	110.1	167.5	29.3	22.5	397.7
1971	159.4	196.2	28.6	22.6	272.7
1972	128.8	190.5	30.8	21.1	375.8
1973	82.2	177.1	32.3	18.8	527.6
1974	140.4	174.6	33.5	15.1	483.3
1975	96.4	182.5	33.6	15.3	540.4
1976	118.2	182.1	34.6	14.7	503.9
1977	124.2	205.3	38.1	13.0	580.3
1978	165.8	214.2	40.3	11.5	375.5
1979	126.8	208.9	40.7	15.2	523.0
1980	177.9	256.2	43.3	13.7	328.3
1981	101.8	231.8	40.9	12.6	407.3
1982	130.0	268.6	39.5	15.0	333.3
1983	115.9	249.2	38.8	14.7	301.5
1984	191.2	287.2	36.2	15.2	178.3
1985	203.1	263.7	39.2	16.5	334.0
1986	104.2	266.3	42.0	16.8	388.0
1987	40.9	260.9	43.5	18.7	557.9
1988	193.1	286.2	41.9	18.8	369.7
1989	196.2	285.2	38.2	22.9	224.1
1990	172.9	254.9	37.9	23.7	240.6
1991	88.5	240.5	39.5	67.5	354.6
1992	27.1	236.5	34.8	29.0	802.8
1993	69.3	252.0	49.9	36.1	589.4
1994	104.5	247.0	33.9	39.3	390.2

(Table 5.4 continued)

Year	Irrigation	Municipal	Domestic/ Stock	Industrial/ Commercial	Springs
1995	95.6	255.0	*11.6	37.3	361.3
1996	181.3	261.3	*12.3	38.8	212.0
1997	77.4 a/b	253.0	12.3	34.4	383.9
1998	131.9 a	266.5	13.4	41.7 b	464.1
Average 1955-98	108.7	201.6	32.2	23.3	369.8
Median 1955-98	103	200.7	32.9	22.2	372.6
Average 1988-98	114.5	255.2	28.4	37.1	402.1
Median 1988-98	100.1	254.0	34.4	36.7	372.6

Data source: USGS and Edwards Aquifer Authority, 1999.

a Includes estimates from Atascosa County discharge by Edwards Aquifer users.

b Includes estimates from Guadalupe County discharge by Edwards Aquifer users.
Differences may occur due to rounding procedures.

*In 1995 the USGS revised the method of calculating domestic/livestock pumpage, which significantly decreased the estimate for 1995 and 1996.

The Authority and the USGS estimated discharge from the Edwards Aquifer in 1998. In previous years, the USGS determined the total amount of irrigated acreage from county tax rolls, which have remained relatively constant over recent years. County soil and water conservation districts provided estimates of irrigation "duties" for selected crop types. The USGS multiplied these duties by amounts of irrigated acreage by crop type as provided by the U.S. Department of Agriculture (USDA), thereby determining an estimate of irrigation uses from the Edwards Aquifer. The USDA no longer provides this data making this method of estimation impossible to use.

The Authority initiated the Edwards Aquifer Well Metering Program in 1997. This program requires that all municipal, industrial, and irrigation Edwards Aquifer wells be metered. The Authority utilized well pumpage data from the Well Metering Program to estimate well discharge. Use of direct pumpage data has significantly improved the discharge estimating process.

6.0 GROUNDWATER QUALITY

6.1 Water Quality in the Edwards Aquifer

The Authority, in cooperation with the USGS and TWDB, has conducted a systematic program of water quality data collection since 1968. Through this cooperative effort, the Authority has maintained a network of groundwater and surface water sites for gathering water quality data across the entire area of the Edwards Aquifer. Analyses of these data have been used by the Authority to monitor changes in aquifer water quality. The Authority's Water Quality Protection Program is to ensure long-term protection of groundwater quality in the Edwards Aquifer and the streams crossing over the Edwards Aquifer Recharge Zone.

In 1998, the Authority in cooperation with the USGS and San Antonio Water System (SAWS) collected water quality samples from 63 wells, 4 springs, and 8 streams. The locations of these sites are shown in **Plate 6.1**. These samples were analyzed in the field for selected water quality parameters and in the laboratory for inorganic and organic chemical constituents. The field analysis included temperature, pH, conductivity, and alkalinity. The laboratory analyses included common major ions, minor elements (metals, including heavy metals), Total Dissolved Solids (TDS), nutrients, pesticides, herbicides, volatile organic compounds and other selected analytes. The parameters analyzed and their typical concentrations in groundwater are listed in **Table 6.1**.

In 1998, 63 wells in the Edwards Aquifer were sampled and analyzed for the occurrence of minor element metals. Laboratory analyses indicated that several wells, such as the saline zone transect wells, in San Antonio, New Braunfels, and San Marcos, and private wells in Medina County and in Uvalde County, contained some minor element metal concentrations above the method detection limit (MDL). The analytical values in the subject wells were extremely low with all but one well containing no more than 20 percent of the maximum contaminant level (MCL). The one exception, well TD-68-42-806, indicated a lead concentration above the MCL. In general, these analytical values correspond to typical aquifer results for minor element metal content, as seen in **Table 6.1**.

In 1998, water samples were collected for Volatile Organic Compounds (VOC) analysis at 8 stream and 4 spring locations distributed across the aquifer region. The samples indicated no detectable levels of any of the VOC's analyzed. The 8 stream and 4 spring locations were also sampled and analyzed for pesticides and herbicides. The samples indicated no detectable levels of any of the pesticides and herbicides compounds analyzed.

The Authority participated with the USGS in the National Water Quality Assessment (NAWQA) Program to establish a 30-well monitoring network on the EARZ. The objective of the study is to correlate the quality of recently recharged groundwater with different types of urban land use. Drilling of the 30 wells was completed in the summer of 1998, and water quality samples were collected by the USGS in the last quarter of 1998. The NAWQA study results will be presented by the USGS at a later date. The results of this study will assist the Authority in developing strategies for monitoring land development activities over the EARZ.

Table 6.1 Groundwater quality standards.

Parameter	Current Maximum or Secondary Contaminant Levels	Edwards Aquifer Typical Range of Results
Laboratory Parameters:		
pH	6.5-8.5*	6.5-8.0
Hardness (mg/L)	--	250-300
Non-carbonate Hardness (mg/L)	--	20-50
Dissolved Solids (mg/L)	500*	250-450
Major Ions:		
Calcium (Ca) (mg/L)	--	80-120
Magnesium (Mg) (mg/L)	--	10-20
Sodium (Na) (mg/L)	--	3-10
Potassium (K) (mg/L)	--	1-2
Bicarbonate (CO ₃) (mg/L)	--	250-400
Carbonate (CO ₃) (mg/L)	--	0
Sulfate (SO ₄) (mg/L)	250*	10-30
Chloride (Cl) (mg/L)	250*	10-30
Fluoride (F) (mg/L)	4	0.1-0.5
Silica (SiO ₂) (mg/L)	--	10-20
Nutrients:		
Total Nitrate Nitrogen (mg/L)	10	BMLD-0.1
Total Nitrite Nitrogen (mg/L)	1.0	BMLD-0.1
Total Ammonia Nitrogen (mg/L)	--	BMLD-0.1
Total Phosphorus (mg/L)	--	BMLD-0.1
Microbiological Parameters:		
Biochemical Oxygen Demand (mg/L)	--	BMLD-1
Total Organic Carbon (mg/L)	--	1-5
Detergents (MBAS)	--	BMLD-0.1
Total Coliform (cols/100ml)	10,000 (raw water for drinking-water supplies)	BMLD-5,000
Fecal Coliform (cols/100ml)	2,000 (raw water for drinking-water supplies)	BMLD-150
Fecal Streptococci (cols/100ml)	--	BMLD-100
Minor Elements (Metals):		
Arsenic (As) (µg/L)	50	BMLD-2
Cadmium (Cd) (µg/L)	5	BMLD-1
Chromium (Cr) (µg/L)	100	BMLD-15
Copper (Cu) (µg/L)	1000*	BMLD-40
Iron (Fe) (µg/L)	300*	BMLD-500
Lead (Pb) (µg/L)	15**	BMLD-10
Manganese (Mn) (µg/L)	50*	BMLD-50
Mercury (Hg) (µg/L)	2	BMLD-1.5
Zinc (Zn) (µg/L)	5000*	BMLD-2000
Nickel (Ni) (µg/L)	100	BMLD-4
Pesticides:		
Aldrin (µg/L)	0.005a	BMLD
Chlordane (µg/L)	2	BMLD
DDD (µg/L)	0.355a	BMLD
DDE (µg/L)	0.25a	BMLD
DDT (µg/L)	0.25a	BMLD
Heptachlor (µg/L)	0.4	BMLD
Heptachlor epoxide (µg/L)	0.2	BMLD
Lindane (µg/L)	0.2	BMLD
Mirex (µg/L)	--	BMLD
Diazinon (µg/L)	--	BMLD
Ethion (µg/L)	--	BMLD
Malathion (µg/L)	--	BMLD
Methyl Parathion (µg/L)	--	BMLD
Methyl Trithion (µg/L)	--	BMLD
Parathion (µg/L)	--	BMLD
Trithion (µg/L)	--	BMLD

(Table 6.1 continued)

Parameter	Current Maximum or Secondary Contaminant Levels	Edwards Aquifer Typical Range of Results
Pesticides (cont'd):		
PCB (µg/L)	0.5	BMLD
Endosulfan (µg/L)	1.8a	BMLD
Ethyl Trithion (µg/L)	--	BMLD
Perthane (µg/L)	--	BMLD
Toxaphene (µg/L)	3	BMLD
Herbicides:		
2, 4-D (µg/L)	70	BMLD
2, 4, 5-T (µg/L)	--	BMLD
2, 4, 5-TP (Silvex) (µg/L)	50	BMLD
Volatile organic compound:		
1,1,1-Trichloroethane (µg/L)	200	BMLD
1,1,2-Trichloroethane (µg/L)	5	BMLD
1,2-Dichloroethane (µg/L)	5	BMLD
1,2-Dichloropropane (µg/L)	5	BMLD
1,1-Dichloroethylene (µg/L)	7	BMLD
1,2,4-Trichlorobenzene (µg/L)	70	BMLD
Benzene (µg/L)	5	BMLD
Carbon Tetrachloride (µg/L)	5	BMLD
cis-1,2-Dichloroethylene	70	BMLD
Dichloromethane (µg/L)	5	BMLD
Ethylbenzene (µg/L)	700	BMLD
o-Dichlorobenzene (µg/L)	600	BMLD
Para-Dichlorobenzene (µg/L)	75	BMLD
Styrene (µg/L)	100	BMLD
Tetrachloroethylene (µg/L)	5	BMLD
Toluene (µg/L)	1000	BMLD
trans-1,2-Dichloroethylene (µg/L)	100	BMLD
Trichloroethylene (µg/L)	5	BMLD
Vinyl Chloride (µg/L)	2	BMLD
Xylenes, total (mg/L)	10	BMLD

Data source: EPA maximum contaminant levels, 40 CFR, Part 141, 1995.

"a" Risk-based maximum contaminant level listed in 30 TAC Chapter 335, Subchapter S dated 10-24-99.

"—" indicates no applicable maximum or secondary contaminant level.

*** Secondary maximum contaminant level (40 CFR, Part 143, 1995).

**** Lead is regulated by a Treatment Technique action level. The action level, which triggers public water systems into taking treatment steps if exceeded in more than 10% of tap samples, is 15µg/L.

"BMDL" = below method detection limits.

Primary Drinking Water Standards – These standards are enforceable and are often referred to as the maximum contaminant level or MCL. The MCL for a contaminant is the maximum permissible level in water that is delivered to any user of a public water system. Primary standards (MCLs) protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in public water systems. The primary standards are indicated on Table 6.1.

No MCLs were exceeded in the groundwater quality data collected for 1998. The action level for lead (not an MCL) was exceeded in one well (TD 68-42-806). The lead concentration in a water sample from well TD 68-42-806 was 28.7 µg/L., the action level is 15 µg/L. Lead concentrations above the action level are commonly associated with the corrosion of pumping equipment. As of 1998, no significant reoccurring instances of lead concentrations exceeding the action level have been detected in the Edwards Aquifer in the San Antonio region.

Secondary Drinking Water Standards – These standards are non-enforceable and are set for contaminants that may affect the aesthetic qualities of drinking water, such as odor or appearance. Table 6.2 is a list of the current secondary standards. Concentrations of the secondary standards listed on Table 6.2 are generally not exceeded in the freshwater portion of the Edwards Aquifer; however, concentrations of total dissolved solids (TDS), fluoride, and iron occasionally exceed the secondary standard. On occasions when concentrations exceed a secondary standard, the exceedance can be attributed to naturally occurring conditions.

Table 6.2 Secondary drinking-water standards.

Contaminant	Secondary Maximum Contaminant Level (SMCL)(mg/L)
Aluminum	0.05-0.2
Chloride	250
Color	15 color units
Copper	1.0
Corrosivity	Non-corrosive
Fluoride	2.0
Iron	0.3
Manganese	0.05
pH	6.5-8.5
Silver	0.10
Sulfate	250
Total Dissolved Solids (TDS)	500
Zinc	5

Data source: EPA, 40 CFR, Part 143, 1995.

The Authority will continue to monitor for these contaminants as well as many others in order to detect and investigate any occurrences of possible contamination to the aquifer. The Authority continues its programs to protect the excellent water quality of the aquifer through investigating groundwater contamination, and identifying and analyzing anomalous data from the Authority's aquifer-wide sampling program.

6.2 Freshwater/Saline-water Interface Study

The freshwater/saline-water interface of the Edwards Aquifer is a regional boundary between the fresh and saline portion of the aquifer and is defined by a mapped iso-concentration line representing 1,000 mg/l of total dissolved solids (TDS). Groundwater is commonly classified according to TDS concentrations, as shown in Table 6.3.

Table 6.3 Classification of groundwater quality based on total dissolved solids.

Description	TDS Concentration (mg/L)
Fresh	Less than 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Brine	More than 35,000

Source: Winslow and Kister, 1956.

The interface varies both laterally and vertically in portions of the aquifer. Locally this line is referred to as the freshwater/saline-water interface, or "bad-water line," which defines the farthest downdip extent of potable water (Pavilicek and others, 1987). The freshwater/saline-water interface is shown in Plates 2.1, 3.1 and 6.1. Water quality concerns related to the position and stability of the freshwater/saline-water interface have been expressed for years. The limited water quality data collected during and since the drought of record in the 1950's is inconclusive as to whether encroachment of saline water is likely.

South and southeast of the interface, water from the aquifer is slightly to moderately saline and contains moderate to large concentrations of dissolved chloride and sulfate. The interface varies both laterally and vertically, as determined in several wells near the boundary. Water from some wells north of the interface, and from all wells south of the interface contains dissolved hydrogen sulfide gas. In most wells along the interface, freshwater has been encountered in the upper portion and saline water in the lower portion of the Edwards Aquifer (Groschen, 1993; Reeves, 1971). Other wells along the interface have encountered the opposite vertical distribution, with saline-water zones overlying freshwater zones, particularly in the southern area of Medina County (J.R. Waugh, oral communication, 1997).

In 1985, a research study of the freshwater/saline-water interface was initiated by the former EUWD in cooperation with the USGS, TWDB and SAWS. A series of seven wells were drilled in the San Antonio area that transects the freshwater/saline-water interface to detect changes in water quality as the hydraulic head in the aquifer changes. This program was implemented in response to the concern that increased aquifer withdrawals might result in encroachment of saline-water into the aquifer freshwater zone. As part of the Authority's ongoing water quality program, monthly and other periodic samples have been collected and analyzed. Other samples are collected when certain spring-discharge criteria are met.

The possibility of saline-water encroachment and subsequent deterioration of water quality in the aquifer led to the construction of two additional water quality monitor well transects across the freshwater/saline-water interface. The monitor wells were drilled and tested by the Authority and USGS with the cooperation of local entities. These transects are located in the New Braunfels and San Marcos areas (Poteet and others, 1992). These transect wells have maintained relatively constant values of water quality with no significant changes. In 1998, the Authority, working in cooperation with SAWS and TWDB, provided funding to complete a transect of four wells in southeastern Uvalde County to study a structure known as the "Knippa

Gap” and the freshwater/saline-water interface in the Edwards Aquifer. During the studies conducted to date (1986 to present), the data indicate that normal changes in the aquifer water levels have little effect on the water quality in wells that are directly adjacent to the freshwater/saline-water interface.

6.3 Surface Water Quality Data

Surface water quality data is collected within the catchment area at stations upstream of the EARZ. The surface water data collection sites are located within eight major stream basins that flow across and contribute significant groundwater recharge to the Edwards Aquifer within the EARZ in the San Antonio Region. These include from west to east, the Nueces River, Dry Frio River, Frio River, Sabinal River, Seco Creek, Hondo Creek, Medina River, and Blanco River. Data from this network of data collection sites can be used as a base level to evaluate the quality of water recharging the aquifer and the sensitivity of water quality to land use changes in various areas of the Edwards Aquifer region. Locations of data collection sites are illustrated in **Plate 6.1**. Laboratory analyses of the samples collected in 1998 (**Appendix B**) indicate no detectable concentrations of pesticides, herbicides, or volatile organic compounds.

7.0 SUMMARY

The average estimated annual groundwater recharge to the Edwards Aquifer in the San Antonio region from 1934 through 1998 was approximately 683,100 acre-feet. Recharge in 1998 was approximately 1,142,300 acre-feet, which was well above the regional average. The lowest annual recharge of 43,700 acre-feet occurred in 1956, and the highest annual recharge of 2,486,000 acre-feet occurred in 1992.

Estimated annual discharge from the Edwards Aquifer through wells and springs in 1998 was 917,600 acre-feet. The lowest annual discharge through wells and springs was 388,800 acre-feet, which occurred in 1955. Spring discharge from the Edwards Aquifer for 1998 was calculated at 464,100 acre-feet or 51 percent of the total discharge. Groundwater pumping accounted for 453,500 acre-feet of water discharged from the Edwards Aquifer in 1998. In general, water level data during 1998 reflected a slight increase in water recharging the aquifer, as well as an increase in pumping relative to 1997.

Results of the Authority's 1998 water quality monitoring program illustrate the continued excellent quality of water in the Edwards Aquifer. In 1998, the Authority collected water quality samples from wells, springs and stream basins, which were analyzed for major ions, nutrients, minor element metals, pesticides, herbicides, and VOC's. Laboratory analyses of samples from several wells contained minor element metal concentrations slightly above the MDL. No compounds were detected in 1998 above MCL concentrations. Laboratory analyses of the surface water samples collected in 1998 indicated no detectable concentrations of pesticides, herbicides, or VOC's. Overall, results of the 1998 water quality sampling and analysis program illustrate the continued excellent quality of water in the Edwards Aquifer.

8.0 DEFINITIONS

Technical terms and abbreviations used in this report are defined as follows:

<u>Acre-foot (ac-ft)</u>	The quantity of water required to cover one acre to a depth of one foot, equivalent to 43,560 ft ³ (cubic feet), about 325,851 gal (gallons), or 1,233 m ³ (cubic meters).
<u>Aquifer</u>	A body of rock that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.
<u>Artesian well</u>	A well tapping confined groundwater. Water in the well rises above the level of the confined water-bearing strata under artesian pressure but does not necessarily reach the land surface.
<u>Artesian zone</u>	An area where the water level from a confined aquifer stands above the top of the strata in which the aquifer is located.
<u>Bacteria</u>	Microscopic unicellular organisms, typically spherical, rod-like, or spiral and threadlike in shape, often clumped in colonies. Some bacteria are pathogenic (causing disease), while others perform an essential role in nature in the recycling of materials (measured in colonies/100 ml).
<u>Conductivity</u>	A measure of the ease with which an electrical current can be caused to flow through an aqueous solution under the influence of an applied electric field. Expressed as the algebraic reciprocal of electrical resistance (measured in microSiemens per centimeter (μS/cm) at ambient temperature). Generally, in water the greater the total dissolved solids content, the greater the value of conductivity. See also Specific conductance.
<u>Confined aquifer</u>	An artesian aquifer or an aquifer bound above and below by impermeable strata, or by strata with lower permeability than the aquifer itself.
<u>Discharge</u>	The volume of water that passes a given point within a given period of time.
<u>Drainage basin</u>	An area bounded by a divide and occupied by a drainage system. It consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

**Edwards
Underground
Water District**

The regional governmental entity that preceded the Edwards Aquifer Authority.

**Freshwater/saline-
water interface**

The interface or area that separates total dissolved solids (TDS) values less than 1,000 mg/L (freshwater) from TDS values greater than 1,000 mg/L (saline-water). Commonly referred to as the "bad water line."

Gauging station

A particular site that systematically collects hydrologic data such as streamflow, springflow or precipitation.

**Groundwater
divide**

A ridge, or mound in the water table or other potentiometric surface from which the groundwater moves away in both directions.

**Micrograms per
liter
($\mu\text{g/L}$)**

A unit for expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. 1,000 micrograms per liter are equal to 1 milligram per liter.

**Milligrams per liter
(mg/L)**

A unit for expressing the concentration of chemical constituents in solution as mass (milligrams) of solute per unit volume (liter) of water. 1,000 milligrams per liter are equal to 1 gram per liter.

**Potentiometric
surface**

An imaginary surface representing the total head of groundwater and defined by the level that water will rise in a well.

Real time data

Instantaneous or near-instantaneous information used to monitor a current condition such as precipitation, stream flow, spring discharge, etc.

Recharge

The process involved in absorption and addition of water to the zone of saturation.

Recharge zone

The area in which water infiltrates into the ground and eventually reaches the zone of saturation in one or more aquifers.

**Specific
conductance**

A measure of the ability of an aqueous solution to conduct an electrical current. Specific conductance is the given value of conductivity adjusted to a standard temperature of 25°C. Expressed in microsiemens per centimeter ($\mu\text{S/cm}$). See also Conductivity.

**Ten-year floating
average**

The calculated mean of the current year plus the previous nine years in a graph.

**Total dissolved
solids (TDS)**

The concentration of dissolved minerals in water, expressed in units of milligrams per liter (mg/L).

<u>Transect wells</u>	A group of water quality monitoring wells positioned in a site to monitor water quality changes, such as across the freshwater/saline-water interface.
<u>Unconfined aquifer</u>	An aquifer, or a portion of an aquifer, with a water table and containing groundwater that is not under pressure beneath relatively impermeable rocks.
<u>Underflow</u>	The movement of water flowing beneath the land surface within the bed or alluvial plain of a surface stream.
<u>Water table</u>	The interface between the zone of saturation and the zone of aeration, where the surface pressure of unconfined groundwater is equal to the atmospheric pressure.
<u>Water level observation well</u>	A water well used to measure the water level or potentiometric surface of water-bearing strata such as the Edwards Aquifer, Leona Gravel Aquifer, and Lower Glen Rose (Trinity) Aquifer.
<u>Zone of aeration</u>	The subsurface zone where the voids and pore spaces are filled with water under less pressure than that of the atmosphere and air.
<u>Zone of saturation</u>	The subsurface zone in which all voids and pore spaces are filled with water under pressure greater than that of the atmosphere.

9.0 REFERENCES

- Bader, R.W., Walthour, S.D., and Waugh, J.R., 1993, Edwards Aquifer hydrogeologic status report for 1992: Edwards Underground Water District Report 93-05, 71 p.
- Department of Commerce, 1999, Climatological Data Annual Data Summary, Texas 1998, National Oceanic and Atmospheric Administration (NOAA), Volume 103, #13, 70 p.
- Edwards Aquifer Authority, 1999 Open Data Files.
- Edwards Underground Water District, 1995, Division of Field Operations Open Data Files.
- Pavilicek, D.J., Small, T.A., and Rettmann, P.L., 1987, Hydrogeologic data from a study of the freshwater zone/saline-water zone interface in the Edwards Aquifer, San Antonio Region, Texas: U.S. Geological Survey Open-File Report 87-389, 108 p.
- Poteet, Diane, Collier, Hughbert, and Maclay, R.W., 1992, Investigation of the fresh/saline-water interface in the Edwards Aquifer in New Braunfels and San Marcos, Texas: San Antonio, Tex., Edwards Underground Water District Report 92-02 [variously paged].
- Puente, Celso, 1978, Method of estimating natural recharge to the Edwards Aquifer in the San Antonio area, Texas: U.S. Geological Survey Water-Resources Investigations Report 78-10, 38 p.
- Reeves, R.D., 1971 Results of test drilling at the San Marcos Fish Hatchery, Texas: U.S. Geological Survey Open-File Report, 11 p.
- Schultz, A.L., 1992, Using geophysical logs in the Edwards Aquifer to estimate water quality along the freshwater/saline-water interface (Uvalde to San Antonio, Texas): Edwards Underground Water District Report 92-03, 47 p.
- Schultz, A.L., 1993, Defining the Edwards Aquifer freshwater/saline-water interface with geophysical logs and measured data (San Antonio to Kyle, Texas): Edwards Underground Water District Report 93-06, 81 p.
- Schultz, A.L., 1994, 1994 Review and update of the position of the Edwards Aquifer freshwater/saline-water interface from Uvalde to Kyle, Texas: Edwards Underground Water District Report 94-05, 31 p.
- Texas Natural Resources Conservation Commission (TNRCC), 1999, 30 TAC Chapter 335, Subchapter S - Industrial Solid Waste and Municipal Hazardous Waste, , October 1999.
- United States Department of Commerce, 1970-1994, Climatological data, Texas, annual summaries: National Oceanic and Atmospheric Administration, v 75-97, no. 13.
- United States Environmental Protection Agency, 1995, Maximum contaminant levels (subpart of part 141, National primary drinking water regulations): U.S. Code of Federal Regulations, Title 40, parts 100-149.

- United States Environmental Protection Agency, 1995, National primary and secondary drinking water regulations; synthetic organic compounds and inorganic chemicals (sections 141.11, 141.12, 141.32, 141.50, 141.51, 141.61, and 141.62 of part 143): U.S. Code of Federal Regulations, Title 40 parts 100-149.
- United States Environmental Protection Agency, 1995, Secondary maximum contaminant levels (section 141.3 of part 143, National secondary drinking water regulations): U.S. Code of Federal Regulations, Title 40, parts 100-149.
- United States Geological Survey, 1996, Basic data collection joint funding agreement with Edwards Aquifer Authority for Fiscal Year 1995-1996: Authority open files.
- United States Geological Survey, 1998, Recharge to and discharge from the Edwards Aquifer in the San Antonio Area, Texas, 1997, In cooperation with Edwards Aquifer Authority, 4 p.
- Walthour, S.D., Waugh, J.R., and Sutton, C.M., 1994, Edwards Aquifer hydrogeologic report for 1993: Edwards Underground Water District Report 94-04, 178 p.
- Walthour, S.D., Waugh, J.R., and O'Connor, Jim, 1995, Edwards Aquifer hydrogeologic report for 1994: Edwards Underground Water District Report 95-07, 124 p.
- Waugh, J.R., 1993, South Medina County observation well report: Edwards Underground Water District Report 93-11, 10 p.
- Winslow, A.G., and Kister, L.R., 1956, Saline-water resources of Texas: U.S. Geological Survey Water-Supply Paper 1365, 105 p.

APPENDIX A – Water Level Data

Table A-1 City of Kyle well (LR 67-01-809) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	N/D	N/D	N/D	N/D	N/D	N/D	577.29	575.98	576.61	577.88	585.27	N/D
2	N/D	N/D	N/D	N/D	N/D	N/D	577.28	575.97	576.59	577.85	585.27	N/D
3	N/D	N/D	N/D	N/D	N/D	N/D	577.29	575.95	576.55	577.83	585.25	N/D
4	N/D	N/D	N/D	N/D	N/D	N/D	577.37	575.94	576.51	577.79	585.22	N/D
5	N/D	N/D	N/D	N/D	N/D	N/D	577.45	575.92	576.49	577.77	585.18	N/D
6	N/D	N/D	N/D	N/D	N/D	N/D	577.48	575.92	576.46	577.83	585.16	N/D
7	N/D	N/D	N/D	N/D	N/D	N/D	577.49	575.92	576.43	577.83	585.21	N/D
8	N/D	N/D	N/D	N/D	N/D	N/D	577.48	575.91	576.41	577.83	585.23	N/D
9	N/D	N/D	N/D	N/D	N/D	N/D	577.44	575.89	576.38	577.82	585.3	N/D
10	N/D	N/D	N/D	N/D	N/D	N/D	577.41	575.88	576.35	577.81	585.28	N/D
11	N/D	N/D	N/D	N/D	N/D	N/D	577.4	575.86	576.38	577.79	585.18	N/D
12	N/D	N/D	N/D	N/D	N/D	N/D	577.39	575.84	576.39	577.75	585.2	N/D
13	N/D	N/D	N/D	N/D	N/D	N/D	577.38	575.82	576.39	577.71	585.23	N/D
14	N/D	N/D	N/D	N/D	N/D	N/D	577.37	575.82	576.39	577.68	585.4	N/D
15	N/D	N/D	N/D	N/D	N/D	577.63	577.34	575.82	576.37	577.66	585.5	N/D
16	N/D	N/D	N/D	N/D	N/D	577.59	577.33	575.82	577.04	577.64	585.55	N/D
17	N/D	N/D	N/D	N/D	N/D	577.55	577.31	575.81	577.68	582.98	585.55	N/D
18	N/D	N/D	N/D	N/D	N/D	577.52	577.3	575.83	577.94	583.97	585.56	N/D
19	N/D	N/D	N/D	N/D	N/D	577.5	577.28	575.83	578.06	584.96	585.56	N/D
20	N/D	N/D	N/D	N/D	N/D	577.48	577.25	575.83	578.09	585.28	585.55	N/D
21	N/D	N/D	N/D	N/D	N/D	577.44	577.25	575.79	578.08	585.41	585.51	N/D
22	N/D	N/D	N/D	N/D	N/D	577.42	577.21	575.88	578.08	585.5	585.5	N/D
23	N/D	N/D	N/D	N/D	N/D	577.4	577.21	576.25	578.06	585.58	585.48	N/D
24	N/D	N/D	N/D	N/D	N/D	577.38	577.18	576.55	578.02	585.62	585.46	N/D
25	N/D	N/D	N/D	N/D	N/D	577.37	576.11	576.71	578.02	585.62	585.46	N/D
26	N/D	N/D	N/D	N/D	N/D	577.36	576.09	576.72	578	585.54	585.42	N/D
27	N/D	N/D	N/D	N/D	N/D	577.36	576.07	576.72	577.99	585.47	585.4	N/D
28	N/D	N/D	N/D	N/D	N/D	577.34	576.07	576.7	577.96	585.44	585.41	N/D
29	N/D	N/D	N/D	N/D	N/D	577.33	576.05	576.69	577.94	585.38	585.42	N/D
30	N/D	N/D	N/D	N/D	N/D	577.32	576.01	576.65	577.91	585.32	585.39	N/D
31	N/D	N/D	N/D	N/D	N/D		576	576.63		585.28		N/D

Table A-2 Landa Park well (DX-68-23-302) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	M/F	626.4	626.8	627.0	626.2	M/F	623.5	623.1	624.7	625.1	628.6	628.9
2	M/F	626.4	626.8	627.0	626.2	M/F	623.5	623.0	624.7	625.1	628.6	628.8
3	M/F	626.4	626.8	627.0	626.1	M/F	623.8	623.0	624.7	625.1	628.6	628.9
4	M/F	626.4	626.8	627.0	626.0	M/F	624.1	623.0	624.7	625.1	628.6	628.9
5	M/F	626.4	626.8	627.0	625.9	M/F	623.8	622.9	624.7	625.1	628.7	628.8
6	M/F	626.4	626.8	627.0	625.8	M/F	623.8	623.1	624.7	625.1	628.7	628.8
7	M/F	626.5	626.9	626.9	625.8	M/F	623.8	623.3	624.8	625.2	628.7	628.8
8	M/F	626.5	626.9	626.9	625.7	M/F	623.8	623.4	624.8	625.2	628.7	628.8
9	M/F	626.5	626.9	626.8	625.6	M/F	623.8	623.4	624.7	625.2	628.7	628.8
10	M/F	626.5	626.7	626.8	625.6	M/F	623.7	623.5	624.8	625.3	628.7	628.8
11	M/F	626.5	626.7	626.8	625.5	M/F	623.7	623.5	624.8	625.3	628.7	628.8
12	M/F	626.5	626.6	626.8	625.4	M/F	623.6	623.4	624.9	625.3	628.7	628.8
13	M/F	626.5	626.6	626.8	625.4	M/F	623.6	623.4	624.9	625.3	628.7	628.8
14	M/F	626.6	626.7	626.7	625.4	M/F	623.6	623.5	625.2	625.3	628.9	628.8
15	M/F	626.6	626.7	626.7	625.4	624.1	623.6	623.6	625.0	625.3	628.8	628.8
16	626.4	626.6	627.1	626.8	625.3	624.1	623.6	623.6	625.2	625.3	628.8	628.8
17	626.4	626.6	626.9	626.8	625.3	624.0	623.6	623.7	625.2	629.3	628.8	628.8
18	626.4	626.6	626.9	626.8	625.3	624.0	623.5	623.8	625.2	628.6	628.9	629.6
19	626.4	626.6	626.9	626.8	625.2	623.9	623.5	623.8	625.2	628.2	628.9	628.8
20	626.4	626.6	627.0	626.7	625.1	623.9	623.4	623.9	625.2	628.1	628.8	628.8
21	626.4	626.7	627.0	626.7	625.1	623.8	623.4	623.9	625.2	628.1	628.8	628.8
22	626.4	626.7	627.1	626.7	625.0	623.8	623.3	624.0	625.2	628.2	628.9	628.8
23	626.3	626.7	627.1	626.6	624.9	623.7	623.3	624.4	625.2	628.2	628.9	628.8
24	626.3	626.7	627.0	626.6	624.9	623.6	623.3	624.3	625.2	628.3	628.9	628.7
25	626.4	626.8	627.0	626.6	624.8	623.5	623.3	624.4	625.2	628.4	628.9	628.7
26	626.4	626.8	627.0	626.6	624.8	623.5	623.2	624.5	625.2	628.4	628.8	628.7
27	626.3	626.8	627.0	626.6	b/d	623.5	623.2	624.6	625.2	628.5	628.9	628.7
28	626.3	626.8	627.0	626.5	b/d	623.4	623.2	624.6	625.2	628.5	628.9	628.7
29	626.3		627.0	626.4	b/d	623.4	623.2	624.7	625.2	628.5	628.9	628.7
30	626.3		627.0	626.3	b/d	623.5	623.1	624.7	625.1	628.5	628.9	628.7
31	626.5		626.9		b/d		623.1	624.7		628.6		628.7

"M/F" indicates mechanical failure.

"N/D" indicates no data available.

Table A-3 City of Castroville well (TD-68-41-301) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	699.34	N/D	703.5	708.2	691.0	M/F	M/F	669.8	681.7	690.1	710.0	N/D
2	699.47	N/D	703.6	708.0	690.0	M/F	M/F	669.6	682.1	690.1	708.6	717.0
3	699.58	N/D	703.8	707.9	689.1	669.4	M/F	669.5	682.2	690.1	N/D	717.1
4	699.68	N/D	704.0	707.5	688.2	M/F	M/F	669.3	682.2	690.1	N/D	717.1
5	699.74	N/D	704.1	707.4	687.2	M/F	M/F	669.1	682.2	690.1	N/D	717.1
6	702.08	N/D	704.1	707.2	686.5	M/F	M/F	670.2	682.1	690.3	N/D	717.1
7	697.25	N/D	704.4	707.1	M/F	M/F	M/F	671.3	682.2	686.6	N/D	717.0
8	697.53	N/D	704.2	706.9	M/F	M/F	M/F	672.2	682.2	687.2	N/D	716.8
9	697.72	N/D	703.9	706.5	M/F	M/F	M/F	672.7	688.8	687.7	N/D	716.7
10	697.76	N/D	703.7	706.0	M/F	M/F	M/F	673.1	689.0	688.1	N/D	716.8
11	698	698.92	703.6	705.6	M/F	M/F	M/F	673.3	689.4	688.3	N/D	716.7
12	698.1	698.91	703.8	705.5	M/F	M/F	M/F	673.4	689.8	688.3	N/D	716.8
13	698.06	698.88	703.9	705.5	M/F	M/F	M/F	673.5	690.1	688.4	N/D	716.7
14	698.09	699.82	704.1	705.3	M/F	M/F	M/F	674.8	690.2	688.5	N/D	716.7
15	N/D	699.53	704.1	705.3	M/F	M/F	M/F	674.8	690.4	688.6	N/D	716.7
16	N/D	701.17	705.7	704.7	M/F	M/F	M/F	674.8	691.0	688.6	N/D	716.7
17	N/D	699.48	705.7	704.2	M/F	M/F	M/F	674.8	690.9	691.0	N/D	716.7
18	N/D	699.61	706.4	703.8	M/F	M/F	M/F	674.8	691.2	693.3	N/D	717.0
19	N/D	701.48	706.7	703.7	M/F	M/F	M/F	674.8	691.4	696.8	N/D	716.9
20	N/D	701.57	707.1	703.3	M/F	M/F	M/F	678.6	691.4	699.4	N/D	716.8
21	N/D	704.39	707.5	702.8	M/F	M/F	M/F	679.0	691.4	701.3	N/D	716.8
22	N/D	704.39	707.8	701.7	M/F	M/F	M/F	681.9	691.3	702.9	N/D	716.5
23	N/D	704.39	708.1	700.7	M/F	M/F	671.5	680.5	691.1	704.0	N/D	716.5
24	N/D	704.39	708.2	699.5	M/F	M/F	671.4	680.5	691.0	704.9	N/D	716.4
25	N/D	704.39	708.3	698.1	M/F	M/F	671.1	680.5	690.9	705.7	N/D	716.4
26	N/D	703.26	708.4	696.6	M/F	M/F	670.9	680.5	690.8	706.1	N/D	716.6
27	N/D	703.21	708.5	695.4	M/F	M/F	670.6	680.5	690.8	706.6	N/D	716.7
28	N/D	703.3	708.5	694.2	M/F	M/F	670.3	680.5	690.7	707.0	N/D	716.7
29	N/D		708.5	693.0	M/F	M/F	670.2	680.5	690.5	707.3	N/D	716.6
30	N/D		708.6	691.8	M/F	M/F	670.1	681.0	690.4	707.5	N/D	716.3
31	N/D		708.4		M/F		670.1	681.4		707.9		716.3

Table A-4 City of Hondo index well (TD-69-47-306) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	722.2	720.8	725.7	731.4	705.3	685.7	685.5	689.1	712.3	713.6	738.0	743.2
2	722.3	721.4	725.8	731.1	704.3	683.3	686.3	689.0	712.5	713.8	738.2	743.3
3	722.4	722.2	725.9	730.6	702.7	681.6	688.3	688.9	712.6	714.1	738.3	743.4
4	722.4	722.7	726.1	730.2	702.3	680.2	690.5	688.5	712.4	714.0	738.6	743.4
5	722.4	723.0	726.2	730.0	700.6	679.7	692.1	688.9	712.3	714.2	738.8	743.5
6	722.3	722.9	726.1	729.9	699.4	680.1	692.5	691.0	712.2	714.5	739.2	743.5
7	722.5	723.0	726.4	729.7	699.5	681.0	692.6	692.6	712.2	715.3	739.6	743.4
8	722.8	723.0	726.1	729.1	699.0	681.6	692.3	693.4	712.3	716.0	739.8	743.1
9	723.0	723.2	725.8	728.4	698.5	679.6	691.8	694.0	712.3	716.5	740.3	743.2
10	723.1	722.9	725.4	727.6	697.2	678.0	691.9	694.4	712.4	716.8	740.3	743.2
11	723.5	722.6	725.4	727.2	697.4	684.6	691.6	694.5	712.9	716.9	740.2	743.3
12	723.5	722.4	725.3	727.4	695.0	688.6	691.6	694.5	713.4	716.9	740.5	743.2
13	723.5	722.3	725.4	727.6	693.4	690.5	691.1	694.5	713.5	716.9	740.7	743.2
14	723.5	722.5	725.7	726.8	693.2	692.5	691.3	695.0	713.6	717.0	741.0	743.4
15	723.3	723.1	726.3	726.6	693.0	692.9	691.5	696.3	714.0	717.0	741.4	743.4
16	723.2	723.4	727.9	726.0	692.3	693.0	691.6	697.0	714.2	717.0	741.8	743.5
17	723.1	723.5	729.2	725.3	692.4	692.1	691.6	697.8	714.5	717.8	742.0	743.5
18	723.1	723.7	730.1	725.2	692.7	690.2	691.4	698.7	714.7	723.0	742.3	743.8
19	722.8	723.8	730.7	724.9	691.0	687.6	691.9	699.4	714.8	726.6	742.4	743.7
20	722.9	723.8	731.2	724.0	690.0	684.8	691.8	700.0	714.9	729.2	742.5	743.5
21	722.9	724.1	731.5	722.6	689.3	682.9	691.2	700.1	715.0	731.1	742.6	743.6
22	722.7	724.4	731.8	720.7	688.0	681.8	691.0	701.1	714.7	732.6	742.8	743.1
23	722.2	724.4	732.1	717.9	687.5	679.7	690.4	704.2	714.3	733.8	742.8	743.3
24	722.0	724.6	732.3	715.5	686.7	678.5	689.7	706.4	714.3	734.8	742.9	743.1
25	722.1	724.9	732.2	713.8	687.3	678.5	689.5	708.3	714.2	735.5	743.0	743.3
26	721.9	725.1	732.3	712.1	687.4	678.1	689.5	709.3	714.4	736.0	743.0	743.3
27	721.1	725.5	732.3	710.9	687.3	678.5	689.2	710.2	714.4	736.4	743.2	743.4
28	720.5	725.6	732.2	709.5	687.2	680.1	689.3	710.8	714.2	736.9	743.3	743.1
29	719.9		732.1	707.9	686.5	681.7	689.7	711.3	713.9	737.2	743.5	743.1
30	719.2		732.1	706.3	685.9	684.7	689.8	711.5	713.6	737.4	743.4	742.8
31	719.9		731.6		686.0		689.6	711.8		737.7		742.7

"M/F" indicates mechanical failure.

"N/D" indicates no data available.

Table A-5 J-17, Bexar County index well (AY-68-37-203) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	671.9	673.4	677.5	680.0	665.9	649.2	644.8	641.1	662.0	661.1	687.1	687.9
2	672.0	673.9	677.6	679.8	665.2	648.5	645.7	640.0	662.2	660.8	687.5	687.9
3	672.2	674.1	677.9	679.5	663.8	647.4	646.6	640.0	662.1	661.2	687.5	687.9
4	672.2	674.2	677.9	679.2	662.6	646.9	647.9	640.4	661.6	660.9	687.6	687.8
5	672.2	674.5	677.9	678.8	662.3	646.1	648.9	641.7	661.2	660.4	687.8	687.9
6	672.4	674.5	677.8	678.5	661.8	646.8	648.6	644.9	660.8	662.3	687.8	687.9
7	673.4	674.5	677.6	678.4	661.2	646.4	648.6	646.4	660.8	663.5	688.3	687.6
8	674.0	674.5	677.4	677.9	660.0	646.9	647.4	646.9	660.3	664.2	688.3	687.4
9	674.1	674.5	677.2	677.6	660.1	646.0	646.6	647.4	660.8	664.5	688.3	687.4
10	674.2	674.8	677.5	677.2	659.1	645.0	646.1	646.8	660.9	664.7	688.2	687.4
11	674.4	674.6	677.5	677.0	658.5	646.6	646.7	646.6	661.9	664.9	688.1	687.2
12	674.1	674.1	676.9	676.8	657.8	648.2	645.5	646.3	662.8	664.7	688.0	687.6
13	673.8	674.4	677.0	677.0	657.1	648.9	645.2	646.6	663.5	664.5	688.2	687.6
14	673.9	674.5	676.8	676.5	656.7	649.7	645.8	648.6	663.3	664.5	688.4	687.4
15	673.7	675.1	676.4	676.0	656.4	649.4	646.4	649.6	663.4	664.4	688.7	687.3
16	673.6	675.3	678.5	675.7	655.7	648.4	646.6	650.8	663.6	664.2	688.7	687.3
17	673.4	675.3	680.0	675.1	655.8	647.7	644.9	651.6	664.2	669.5	688.6	687.1
18	673.5	675.6	680.6	675.5	655.2	647.1	645.4	652.9	664.5	676.2	688.8	687.2
19	673.2	675.6	681.1	675.6	645.5	646.2	644.2	653.7	664.7	679.8	688.7	687.3
20	673.0	675.5	681.3	674.9	653.8	645.7	643.7	654.1	664.7	681.9	688.6	687.3
21	673.0	675.9	681.3	674.2	653.1	645.0	643.8	653.8	664.2	682.9	688.9	687.2
22	672.7	676.6	681.3	673.6	652.1	644.5	643.3	656.2	663.9	683.6	688.9	686.9
23	672.5	676.6	681.3	672.2	652.0	642.7	643.7	659.3	663.3	684.4	688.6	686.9
24	672.4	676.6	681.5	671.6	651.5	642.2	642.3	660.6	663.1	685.1	688.4	686.8
25	672.5	676.9	680.8	670.9	651.1	641.9	642.3	661.4	662.6	685.7	688.4	687.0
26	672.4	677.1	680.9	670.5	650.8	641.5	642.4	662.1	662.6	685.9	688.2	687.1
27	672.1	677.4	681.2	669.9	651.2	641.9	641.3	662.3	662.6	686.2	688.3	687.1
28	671.8	677.5	680.9	669.2	652.0	641.2	641.9	662.3	661.9	686.6	688.3	686.9
29	671.5		680.8	668.0	651.8	643.1	642.0	662.3	661.7	686.7	688.4	686.5
30	671.5		680.5	667.1	651.0	644.4	641.9	662.2	661.5	686.7	688.1	686.3
31	672.6		680.2		650.2		640.8	661.8		686.8		686.3

Table A-6 City of Uvalde index well (YP-69-50-302) daily high water levels (in feet above MSL), 1998.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	877.5	876.7	876.3	876.8	874.6	870.8	869.3	868.7	873.8	876.5	878.4	879.8
2	877.6	876.7	876.3	876.8	874.5	870.6	869.4	868.7	873.9	876.6	878.4	879.8
3	877.6	876.6	876.4	876.8	874.4	870.5	869.4	868.7	874.1	876.7	878.5	879.9
4	877.6	876.5	876.4	876.8	874.3	870.4	869.5	868.7	874.2	876.7	878.4	879.9
5	877.6	876.5	876.4	876.8	874.2	870.3	869.5	868.7	874.4	876.8	878.5	880.0
6	877.6	876.4	876.4	876.8	874.1	870.1	869.5	868.8	874.5	876.9	878.5	880.0
7	877.6	876.4	876.4	876.9	873.9	870.0	869.5	868.9	874.6	877.0	878.6	880.1
8	877.6	876.4	876.4	876.8	873.7	870.0	869.5	868.9	874.7	877.0	878.7	880.0
9	877.6	876.3	876.3	876.8	873.6	869.9	869.5	868.9	874.8	877.1	878.8	880.1
10	877.6	876.2	876.3	876.7	873.5	869.9	869.5	868.9	874.9	877.1	878.8	880.1
11	877.5	876.2	876.3	876.7	873.4	870.0	869.4	868.9	875.1	877.2	878.8	880.1
12	877.6	876.2	876.3	876.7	873.2	870.0	869.4	868.8	875.2	877.2	878.9	880.2
13	877.6	876.1	876.4	876.7	873.1	870.1	869.3	868.8	875.3	877.2	879.0	880.2
14	877.6	876.1	876.4	876.7	872.9	870.1	869.4	869.0	875.3	877.3	879.1	880.2
15	877.6	876.1	876.5	876.6	872.8	870.1	869.4	869.1	875.4	877.3	879.1	880.3
16	877.5	876.2	876.6	876.5	872.6	870.1	869.3	869.2	875.5	877.4	879.2	880.3
17	877.5	876.2	876.6	876.3	872.5	870.1	869.2	869.3	875.7	877.4	879.2	880.3
18	877.5	876.2	876.6	876.3	872.4	870.1	869.2	869.5	875.8	877.6	879.2	880.4
19	877.5	876.2	876.6	876.1	872.2	870.1	869.2	869.8	875.8	877.6	879.3	880.4
20	877.5	876.2	876.6	876.0	872.1	870.0	869.1	870.0	875.9	877.7	879.4	880.4
21	877.5	876.2	876.6	875.8	872.0	870.0	869.1	870.3	876.0	877.7	879.4	880.4
22	877.4	876.3	876.6	875.7	871.9	869.9	869.1	870.5	876.0	877.8	879.5	880.4
23	877.3	876.3	876.6	875.6	871.8	869.8	869.0	871.1	876.1	877.8	879.5	880.4
24	877.2	876.3	876.6	875.4	871.7	869.7	869.0	871.7	876.1	877.9	879.5	880.4
25	877.2	876.4	876.7	875.4	871.7	869.6	869.0	872.1	876.2	878.0	879.6	880.5
26	877.1	876.4	876.7	875.2	871.6	869.4	869.0	872.2	876.3	878.0	879.6	880.5
27	877.0	876.4	876.7	875.2	871.5	869.3	868.9	872.2	876.3	878.1	879.6	880.6
28	876.9	876.4	876.7	875.1	871.3	869.2	868.9	872.2	876.4	878.2	879.7	880.6
29	876.8		876.8	874.9	871.1	869.2	868.8	872.2	876.4	878.2	879.8	880.6
30	876.7		876.9	874.8	871.0	869.3	868.8	F/S	876.5	878.3	879.8	880.6
31	876.7		876.8		870.9		868.7	F/S		878.3		880.6

APPENDIX B – Water Quality Data

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
Bexar	AY-68-29-405	8/14/98	8:56				23	667		316	303	6.89	308
	AY-68-30-211	11/19/98	15:38	777	98	10	22	650	620	218	226	7.3	310
	AY-68-28-806*	8/28/98		860			25		568	256		7.1	280
	AY-68-34-601*	9/15/98		395			24.1		536	256.3		7.3	267
	AY-68-35-505*	9/1/98		900			26		487	206		7.3	240
	AY-68-36-512*	8/26/98		1190			25		483	217		7.3	231
	AY-68-43-208*	9/8/98		1242			26.9		503	196		7.3	235
	AY-68-44-218*	7/28/98		1326			28.5		509	200		7.3	235
	AY-68-37-521	1/28/98	13:20	1275	330	20	32	5410	5100	234	221	6.6	2100
		2/26/98	13:40	1275	295		31.5	5450	5100	202	234	6.8	2250
		4/16/98	13:05	1275	290		32.5	5410	5100	260	237	6.8	2275
		4/30/98	13:20	1275	310		32	5450	5100	252	243	6.7	2225
		5/27/98	13:15	1275	275	20	32	5420	5100	262	236	6.6	2250
		6/24/98	13:47	1275	322	11.5	31	5420	4800	218	236	6.7	2250
		7/22/98	13:23	1275	267	12	32	5410	4900	236	232	6.6	2225
		8/26/98	12:52	1275	302	20	32.5	5420	4900	216	238	6.6	2225
		9/29/98	12:18	1275	238	17.7	32	5420	5000	198	237	6.5	2200
		10/28/98	12:14	1275	264	21.5	32.5	5430	5100	228	234	6.6	2250
		11/23/98	12:05	1275	270	23	32	5440	5000	232	216	6.6	2200
		12/30/98	12:17	1275	287	23	31.5	5430	5000	236	220	6.7	2250
	AY-68-37-522	1/28/98	13:20	1075	330	30	31	4020	4030	218	210	6.8	1250
		2/26/98	13:10	1075	265		30	4030	3900	184	218	6.9	1650
		4/16/98	13:05	1075	290		31.5	4000	3900	214	214	6.9	1700
		4/30/98	13:20	1075	310		31	4030	3930	220	218	6.8	1650
		5/27/98	13:15	1075	275	30	31	4020	3960	214	212	6.7	1625
		6/24/98	13:47	1075	322	13.6	31	4010	3830	234	208	6.7	1450
		7/22/98	13:30	1075	275	13.6	31	3990	3900	224	210	6.7	1600
		8/26/98	13:05	1075	315	20	31.5	4000	3890	196	212	6.6	1450
		9/29/98	12:24	1075	244	20	31.5	3980	3900	202	214	6.6	1650
		10/28/98	12:19	1075	269	25	31.5	3980	3750	210	212	6.7	1500
		11/23/98	12:09	1075	274	30	31	3990	3800	216	206	6.7	1500

* Data provided by the USGS and/or the TWDB

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
	AY-68-37-523	12/30/98	12:23	1075	293	27	31	3980	3860	220	208	6.7	1600
		1/28/98	13:20	1175	330	14.1	31	5540	5200	242	234	6.7	2000
		2/26/98	13:30	1175	285		31	5590	5100	204	242	6.8	2150
		4/16/98	13:05	1175	290		31.5	5550	5200	240	232	6.8	2250
		4/30/98	13:20	1175	310		31	5560	5100	232	238	6.7	2050
		5/27/98	13:15	1175	275	14.3	31	5600	5100	236	232	6.6	2150
		6/24/98	13:47	1175	322	7.5	30	5590	5000	234	234	6.7	2200
		7/22/98	13:35	1175	279	7.5	31	5580	5100	232	234	6.6	2150
		8/26/98	12:58	1175	308	13.6	31.5	5560	5000	218	232	6.6	2200
		9/29/98	12:31	1175	251	13.6	31.5	5570	5000	218	214	6.5	2100
		10/28/98	12:16	1175	266	17.7	31.5	5550	5000	234	238	6.6	2200
		11/23/98	12:11	1175	276	20	31	5560	5100	236	226	6.6	2150
	AY-68-37-524	12/30/98	12:20	1175	290	20	31	5560	5100	230	224	6.7	2250
		1/28/98	14:50	881	410	38	28	923	900	198	200	7.1	340
		2/26/98	14:40	881	350		28	925	900	186	198	7.4	380
		4/16/98	13:55	881	335		29	916	900	190	194	7.3	370
		4/30/98	14:55	881	395		29	921	910	192	202	7	370
		5/27/98	14:45	881	355	38	29	939	900	196	194	7.1	370
		6/24/98	15:06	881	391	20	29	918	890	188	196	7.2	370
		7/22/98	14:47	881	341	21.5	29	910	880	188	194	7.1	360
		8/26/98	14:53	881	413		29	912	900	180	196	7.1	360
		9/29/98	13:54	881	324	60	29	912	900	180	196	7	370
		10/28/98	13:43	881	343	40	29	904	850	186	200	7	360
		11/23/98	15:13	881	448		28.5	820	810		192	7.1	340
	AY-68-37-525	12/30/98	14:03	881	383		28	777	750	216	196	7.2	340
		1/28/98	14:50	1150	410	17.5	29.5	6330	6000	254	254	6.8	2500
		2/26/98	15:10	1150	380		29	6370	6000	216	262	6.8	2600
		4/16/98	13:55	1150	335		30	6350	6000	256	252	6.8	2650
		4/30/98	14:55	1150	395		29.5	6380	6100	248	252	6.7	2625
		5/27/98	14:45	1150	355	17.6	29.5	6350	5900	252	258	6.6	2625
		6/24/98	15:06	1150	391	7.5	29	6350	5800	242	252	6.7	2550
		7/22/98	14:39	1150	333	8.1	29.5	6350	5900	230	248	6.6	2575

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
		8/26/98	14:37	1150	397	13.6	29.5	6370	5900	230	252	6.6	2350
		9/29/98	13:50	1150	320	15	29.5	6360	5800	220	254	6.6	2575
		10/28/98	13:40	1150	340	23	30	6380	5800	244	248	6.6	2550
		11/23/98	15:07	1150	450		29.5	6370	5900		232	6.6	2600
		12/30/98	14:00	1150	380		29.5	6380	5900	250	236	6.7	2600
	AY-68-37-526	2/26/98	16:10	1223	430		25.5	901	880	166	202	7.4	364
		4/16/98	15:00	1223	345		27.5	894	920	204	196	7.5	376
		4/30/98	16:10	1223	460		27	880	860	194	200	7.3	368
		5/27/98	16:03	1223	423	14.3	27	820	780	192	190	7.2	344
		6/25/98	14:14	1223	168	10.9	27	893	850	166	194	7.3	364
		7/22/98	15:48	1223	433	12	27.5	861	820	188	194	7.2	348
		8/26/98	15:39	1223	429	10.7	27.5	840	810	178	196	7.1	348
		9/29/98	15:01	1223	381	15	26.5	841	790	170	200	7.1	350
		10/28/98	15:07	1223	422	21.5	26.5	886	900	194	198	7.1	370
		11/23/98	14:16	1223	381	21.5	26.5	918	880		196	7.2	370
	AY-68-37-527	1/28/98	15:50	927	460	>100	26.5	512	490	192	196	7	232
		2/26/98	15:55	927	415		26.5	510	490	168	200	7.4	248
		4/16/98	15:00	927	345		26	513	500	196	196	7.5	242
		4/30/98	15:40	927	430		27	512	500	192	194	7.2	244
		5/27/98	16:03	927	423	>100	27	540	510	182	192	7.1	248
		6/25/98	16:52	927	435	12	27	545	510	174	194	7.2	240
		7/22/98	16:20	927	471	12	27	530	500	186	196	7.2	240
		8/26/98	15:52	927	442		27	513	500	176	194	7.1	240
		9/29/98	14:52	927	372	>100	27.5	516	490	180	196	7.1	244
		10/28/98	14:58	927	413	>50	27	508	520	180	194	7.2	236
		11/23/98	14:02	927	367		26.5	508	490		194	7.3	236

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
Comal	DX-68-30-2XX	11/9/98	10:20		50	20	22.5	592	560	234	238	7.1	280
	DX-68-23-304	11/18/98	12:47	965	137	420	23.9	539	510	222	224	7.3	250
	DX-68-23-302	11/6/98	11:05	230	80	12	23	534	510		230	7.2	248
	DX-68-23-616A	1/30/98	13:25	576	55	10	25.5	2860	2800	276	275	6.9	840
		2/27/98	14:00	576	55		25	2860	2860	258	270	7.2	815
		4/8/98	11:20	576	52	10	25.5	2900	2800	260	270	7.1	810
		4/29/98	15:30	576	70		25.5	2920	2830	278	250	7	805
		5/26/98	15:21	576	66	10	25.5	3010	2960	272	270	7	850
		6/23/98	13:08	576	68	10	25.5	3020	2910	266	256	7.1	850
		7/21/98	12:47	576	41	10	25.5	3000	2920	298	244	7	835
		8/25/98	14:15	576	58	10.4	25.5	2880	2780	242	269	7.1	323
		9/28/98	14:17	576	41	9.7	25.5	2840	2700	260	268	7.1	820
		10/27/98	14:03	576	53	9.4	25.5	2800	2700	238	272	6.9	780
		11/17/98	14:14	576	44	10	25	2520	2800	272	262	7.2	785
		12/21/98	13:22	576	42		25	2860	2700	278	273	6.9	800
	DX-68-23-616B	1/30/98	13:25	738	55	10	26	1700	1680	208	230	7	510
		2/27/98	14:00	738	55		26	1718	1680	216	228	7.3	540
		4/8/98	11:20	738	52	10	26	1706	1670	218	228	7.3	540
		4/29/98	15:30	738	70		26	1722	1670	224	216	7.2	540
		5/26/98	15:21	738	66	10	26.5	1716	1660	228	226	7.1	550
		6/23/98	13:08	738	68	10	26.5	1705	1660	210	222	7.2	520
		7/21/98	12:47	738	41	10	26.5	1700	1660	214	210	7.1	550
		8/25/98	14:08	738	51		26	1710	1670	156	224	7.3	212
		9/28/98	14:17	738	41	9.7	26	1710	1600	202	222	7.3	530
		10/27/98	14:03	738	53	10.4	26	1720	1680	202	222	7.1	530
		11/17/98	14:14	738	44	10.7	26	2600	1640	224	234	7.3	520
		12/21/98	13:22	738	42		25	1720	1680	238	228	7.1	530
	DX-68-23-617	1/30/98	10:30	917	65	11.5	26	564	540	210	222	7.2	220
		2/27/98	10:45	917	55		26	567	530	210	222	7.5	300
		4/8/98	10:00	917	50	11.5	26	557	530	202	219	7.4	276
		4/29/98	10:58	917	76		26	560	530	246	220	7.3	275

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
	DX-68-23-618	5/26/98	10:15	917	60	11.5	26.5	568	510	216	216	7.3	290
		6/23/98	10:39	917	74	9	26.5	561	520	198	212	7.3	280
		7/21/98	10:52	917	59	11.1	26.5	564	530	206	214	7.3	280
		8/25/98	10:29	917	47	11.1	26.5	563	510	202	220	7.3	108
		9/28/98	10:25	917	41	11.1	26.5	561	510	198	224	7.4	280
		10/27/98	10:09	917	35	11.1	26	566	580	206	222	7.2	280
		11/17/98	10:33	917	48	10.7	26.5	568	530	196	216	7.5	280
		12/21/98	10:05	917	40	11.5	26	568	540	254	216	7.2	280
		1/30/98	10:30	660	65	11.5	25	6200	600	196	204	7.2	210
		2/27/98	10:45	660	55		25	624	610	184	204	7.5	260
		4/8/98	10:00	660	50	11.5	25	616	600	190	200	7.5	280
		4/29/98	10:58	660	76		25	621	600	206	196	7.5	270
		5/26/98	10:31	660	76	11.5	26	628	600	192	200	7.3	280
		6/23/98	10:39	660	74	9	26	631	600	192	202	7.4	270
		7/21/98	10:52	660	59	10.7	25.5	629	600	194	197	7.3	270
		8/25/98	10:44	660	62	11.1	25.5	625	600	184	200	7.4	104
	DX-68-23-619A	9/28/98	10:35	660	51	11.1	25.5	624	590	178	204	7.4	260
		10/27/98	10:20	660	46	10.7	25.5	629	650	172	200	7.3	270
		11/17/98	10:46	660	61	10.7	25.5	631	600	208	196	7.5	260
		12/21/98	10:09	660	44	11.5	25.5	632	600	206	200	7.2	270
		1/30/98	12:05	652	60	8.5	25.5	533	500	190	202	7.1	210
		2/27/98	12:35	652	68		25.5	535	510	188	203	7.5	255
		4/8/98	13:00	652	55	8.5	25.5	529	500	188	204	7.5	250
		4/29/98	12:50	652	66		25.5	527	510	200	200	7.4	255
		5/26/98	12:40	652	40	8.5	26	541	500	186	198	7.4	270
		6/23/98	8:38	652	58	5	25.5	534	500	184	200	7.5	260
		7/21/98	8:28	652	45	8.3	25.5	535	500	188	196	7.4	260
		8/25/98	12:34	652	56	9.4	26	535	500	190	200	7.5	98
		9/28/98	12:23	652	46	8.3	26	534	500	184	204	7.4	260
		10/27/98	11:55	652	40	8.6	25.5	535	540	188	200	7.2	240
		11/17/98	12:24	652	44	8.1	25.5	535	500	198	198	7.5	250
		12/21/98	11:49	652	39	9.1	25.5	535	510	220	200	7.2	270

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
	DX-68-23-619B	1/30/98	12:05	787	60		26	554	530	204	222	7	220
		2/27/98	12:35	787	68		26	554	530	208	218	7.5	265
		4/8/98	13:00	787	55	12.6	26.5	552	520	186	220	7.4	276
		4/29/98	12:50	787	66		26.5	547	520	218	218	7.3	275
		5/26/98	12:51	787	51	12	26.5	557	520	218	214	7.3	290
		6/23/98	8:38	787	58	5	26.5	562	510	214	220	7.4	280
		7/21/98	8:28	787	45	8.3	26	559	520	202	218	7.3	270
		8/25/98	12:34	787	56	9.4	26.5	558	520	196	218	7.4	108
		9/28/98	12:23	787	46	8.3	26.5	558	500	192	216	7.4	270
		10/27/98	11:55	787	40	8.6	26	559	530	190	216	7.2	270
		11/17/98	12:24	787	44	8.1	26	559	510	220	218	7.5	260
		12/21/98	11:49	787	39	9.1	26	558	520	230	216	7.2	270
Hays	LR-58-57-311*	4/21/98	11:30	315	10		21.5		587		300	7.1	330
	LR-58-58-403	4/22/98	8:30	390	10		21.5		565		270	7.1	300
	LR-67-01-812	4/10/98	14:40	543	53	12	24.5	14710	13900	358	375	6.6	4250
		7/2/98	12:13	543	49	12	25	14730	13000	372	355	6.5	4150
		9/30/98	16:21	543	39	7.1	25	14720	13300	318	378	6.4	4100
	LR-67-01-813A	4/10/98	13:00	564	53	12	24.5	14690	13700	236	370	6.6	3900
		7/2/98	9:52	564	51	12	24.5	14750	13200	370	356	6.5	4000
		9/30/98	14:33	564	52	7.1	25	14730	13400	348	368	6.4	4100
	LR-67-01-813B	4/10/98	13:00	699	53	12	25	14660	13800	358	370	6.6	4000
		7/2/98	10:11	699	70	12	25.5	14700	13200	362	356	6.5	3900
		9/30/98	14:21	699	56	10	25.5	14710	13400	318	366	6.3	4100
	LR-67-01-814A	4/10/98	11:05	556	65	12	24.5	14710	13800	354	372	6.6	4100
		6/30/98	10:38	556	84	12	25	14670	14000	374	368	6.5	4025
		9/30/98	11:39	556	42	7.1	25.5	14680	13500	340	374	6.4	4100
	LR-67-01-814B	4/10/98	11:05	726	65	12	25.5	14660	13800	324	376	6.6	4000
		6/30/98	11:54	726	69	12	26	14350	14000	366	366	6.4	4000
		9/30/98	11:17	726	67	9.4	26	14660	13300	334	370	6.3	4100

* Data provided by the USGS and/or the TWDB

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (µS/cm)	Specific conductance lab @25 °C (µS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
Medina													
	TD-69-47-303	8/4/98	9:34			1500	24.4	473		202	202	7.31	220
	TD-69-47-301	8/4/98	10:45				25.5	468		206	204	7.26	219
	TD-69-46-601	8/5/98	15:49				24.3	475		204	207	7.31	214
	TD-69-29-902	8/11/98	10:16				23.4	535		247	242	7.02	246
	TD-69-29-901	8/11/98	11:47				22.7	446		211	208	7.26	207
	TD-69-37-302	8/11/98	13:20				24.1	485		215	217	7.23	225
	TD-68-41-303	8/11/98	15:17				24.3	494		206	200	7.39	220
	TD-69-56-507	8/12/98	10:39				34.5	485		194	193	7.28	218
	TD-69-56-508	8/12/98	11:46				31.9	506		202	201	7.28	224
	TD-68-42-806	8/18/98	10:30				31.8	475		196	189	7.23	228
	TD-68-49-301	8/18/98	12:07				32.9	472		194	189	7.26	228
	TD-68-49-501	8/18/98	14:06				28.3	505		202	198	7.26	239
	TD-68-33-502	8/20/98	9:21				23.3	486		192	190	7.31	243
	TD-68-25-703	8/20/98	10:51			10	22.01	431		180	176	7.31	215
	TD-69-37-601	8/20/98	12:45				24.9	477		225	218	7.13	240
	TD-69-38-906	8/27/98	9:40				24.6	498		227	223	7.19	235
	TD-69-47-307	8/27/98	11:27				24.3	474		208	204	7.3	230
	TD-68-33-202	8/31/98	10:04				22.8	454		192	189	7.26	230
	TD-68-41-102	8/31/98	14:48				24.6	490		208	199	7.28	237
	TD-68-41-901	8/31/98	15:59				26.6	486		196	193	7.22	240
	TD-69-47-8X1	2/11/98	13:35		315	60	23.4	480	498	174	207	7.3	264
	TD-69-47-8X2	2/11/98	14:45		370	850	23.2	514	494	172	202	7.4	272
	TD-69-47-8X3	2/11/98	14:05		335	100	24.1	510	496	174	205	7.2	264
	TD-69-47-7X1	2/11/98	15:20		410	700	23.3	525	498	176	205	7.4	264

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Time sampled	Depth of well (ft)	Pump or flow period prior to sampling (min)	Flow rate (gpm)	Water temperature (°C)	Conductivity, field (μS/cm)	Specific conductance lab @25 °C (μS/cm)	Alkalinity field (mg/L)	Alkalinity lab (mg/L)	pH	Hardness, total (mg/L)
Uvalde													
	YP-69-50-207	7/23/98	12:28				24	542		209	206	7.15	251
	YP-69-50-506	7/23/98	10:15				24	570		223	214	7.14	261
	YP-69-50-203	7/23/98	11:18				24	552		212	211	7.15	251
	YP-69-45-405	8/5/98	9:25				23.2	475		210	206	7.31	220
	YP-69-45-404	8/5/98	11:27			1000	23.5	551		208	204	7.22	242
	YP-69-50-501	8/5/98	13:56				23.4	1075		232	224	6.99	387
	YP-69-43-606	8/19/98	9:32				23.3	497		205	202	7.18	235
	YP-69-51-120	8/19/98	12:37				25.1	932		242	241	6.94	390

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
Bexar	AY-68-29-405	8/14/98	107	10.1	10.4	2.64	18	15.8	0.09	14.6	369
	AY-68-30-211	11/19/98	88	18	12.6	2.1	11	47	0.25	6.2	532
	AY-68-28-806*	8/28/98	89	14	9	1	15	20	0.2	13	319
	AY-68-34-601*	9/15/98	70	23	8	1	14	49	0.2	14	311
	AY-68-35-505*	9/1/98	71	15	9	1	14	19	0.1	16	275
	AY-68-36-512*	8/26/98	68	15	9	1	18	17	0.1	13	271
	AY-68-43-208*	9/8/98	68	16	10	1	22	17	0.1	14	275
	AY-68-44-218*	7/28/98	65	17	11	1	24	25	0.2	13	282
	AY-68-37-521	1/28/98	528	195	680	38.7	920	1861	4.75	9.3	4652
		2/26/98	574	208	487	29	890	1912	4.4	9.4	4964
		4/16/98	577	202	498	25.9	910	1557	5	10	4424
		4/30/98	542	198	427	30.4	910	1853	4.9	9.4	4308
		5/27/98	573	198	441	29.1	910	1630	4.8	7.9	4266
		6/24/98	552	199	454	30.9	920	1591	4.4	8.1	4864
		7/22/98	550	195	412	29.5	890	1806	4.8	9.3	4320
		8/26/98	534	192	382	28.5	920	1674	5.2	9.3	4416
		9/29/98	530	193	502	30.6	890	1838	4.4	8.6	4600
		10/28/98	518	191	426	28.3	890	1829	4.3	8.6	4696
		11/23/98	530	197	478	31.8	840	1984	4.2	9.1	4632
		12/30/98	586	205	486	31	880	1782	4	9	4456
	AY-68-37-522	1/28/98	379	138	393	30.1	750	1271	3.75	8.3	3272
		2/26/98	403	142	320	23	620	1217	3.5	8.2	3356
		4/16/98	409	139	354	18.8	620	1156	3.65	8.5	3400
		4/30/98	377	143	311	22.2	630	1283	4	8.3	3296
		5/27/98	411	138	314	21.6	620	1115	4	8.4	3220
		6/24/98	394	143	310	23.1	620	1085	3.9	7.7	3604
		7/22/98	380	138	268	21.4	600	1284	4.1	8.3	3156
		8/26/98	403	140	272	21.2	620	1209	4	8.1	3112
		9/29/98	363	134	347	22.3	580	1278	4	7.7	3228
		10/28/98	365	136	297	21.1	580	1174	3.5	7.8	3336
		11/23/98	371	140	339	23.4	550	1154	3.3	8	3304
		12/30/98	445	145	342	22.2	590	1336	3.3	7.9	3108

* Data provided by the USGS and/or the TWDB

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
Bexar	AY-68-37-523	1/28/98	517	199	552	39	950	1638	4.75	8.8	4792
		2/26/98	540	212	462	29	940	1724	4.4	8.7	4904
		4/16/98	556	211	512	24.9	930	1603	4.8	9.2	4652
		4/30/98	554	212	452	30.9	910	1790	4.4	8.7	4544
		5/27/98	563	209	483	30	930	1638	4.4	8.9	4420
		6/24/98	553	210	432	32.3	940	1620	4.4	8.5	5044
		7/22/98	544	204	410	30	920	1771	4.8	8.8	4776
		8/26/98	505	199	395	29.3	940	1609	4.5	8.7	4476
		9/29/98	520	207	518	31.4	910	1680	4.4	8.3	4728
		10/28/98	509	204	442	28.1	910	1573	3.8	8.3	4780
		11/23/98	511	208	523	32.5	840	1813	3.8	8.5	4684
		12/30/98	579	220	525	30.6	920	1727	4	8.4	4836
	AY-68-37-524	1/28/98	90	31	60.7	<1	90	172	1.44	6.8	636
		2/26/98	81	32	47.8	5	85	176	1.4	6.6	704
		4/16/98	97	33	54.2	2.9	85	144	1.35	7.2	820
		4/30/98	80	32	48.2	3.7	85	167	1.38	6.8	964
		5/27/98	98	32	48	3.4	90	140	1.44	6.9	812
		6/24/98	95	32	45.2	3.2	90	151	1.37	6.8	636
		7/22/98	88	30	42.4	3.3	90	159	1.48	6.7	632
		8/26/98	90	30	42	3.7	85	144	1.36	6.5	556
		9/29/98	89	30	49.8	3.3	80	151	1.34	6.9	568
		10/28/98	86	30	39.4	3.4	80	129	0.71	6.3	608
		11/23/98	80	28	42	3.4	60	132	1.02	6.5	572
		12/30/98	92	28	39.9	2.75	70	120	0.99	6.3	560
	AY-68-37-525	1/28/98	560	246	817	44.3	1300	2070	4.65	8.7	5448
		2/26/98	596	255	576	33.5	1200	2426	4.9	8.7	5422
		4/16/98	618	254	868	28.8	1300	1888	4.8	9.1	5184
		4/30/98	608	256	550	36	1200	2080	4.7	8.6	5168
		5/27/98	619	253	536	33.7	1250	2042	4.9	9	5028
		6/24/98	603	254	555	37.6	1250	1974	4.6	9.2	5864
		7/22/98	585	250	510	33.8	1175	2028	5.2	8.8	5368
		8/26/98	568	247	567	32.7	1250	2018	4.8	8.4	5216
		9/29/98	566	242	596	35.6	1200	2054	4.75	8.8	5332

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
	AY-68-37-526	10/28/98	577	250	502	31.4	1100	1881	5.3	8.3	5464
		11/23/98	575	257	598	37.3	1100	2206	4.5	8.9	5524
		12/30/98	633	264	592	34	1150	2220	4.1	8.6	5140
		2/26/98	79	31	41.8	3.5	78	164	0.81	5.7	604
		4/16/98	92	32	50	2	78	145	0.74	6	872
		4/30/98	96	31	38.1	2.4	78	145	0.79	5.7	840
		5/27/98	89	29	32.2	1.7	68	120	0.72	5.6	772
		6/25/98	87	32	40.6	1.9	78	141	0.68	5.8	576
		7/22/98	89	30	34.9	2.1	76	140	0.73	5.4	636
		8/26/98	80	29	32	2.3	70	134	0.75	5.4	536
		9/29/98	83	27	38.6	2	75	124	0.72	5.8	476
		10/28/98	86	30	33.8	2	80	130	0.82	5.6	568
		11/23/98	87	31	44.2	2.8	74	174	0.7	4.4	612
	AY-68-37-527	1/28/98	64	18	21.3	<1	34	29	0.34	5.9	324
		2/26/98	66	17	11.8	1.5	26	25	0.36	5.7	264
		4/16/98	66	17	18.9	<1	30	27	0.31	6	318
		4/30/98	66	18	11.3	1.1	30	31	0.34	5.7	326
		5/27/98	68	18	11.4	<1	32	37	0.42	6	320
		6/25/98	63	18	14.1	<1	32	38	0.38	5.8	276
		7/22/98	66	17	11.3	<1	32	36	0.45	5.8	300
		8/26/98	63	17	8.6	1.1	28	28	0.32	5.6	268
		9/29/98	64	17	11.9	<1	28	31	0.36	5.7	284
		10/28/98	62	17	9.9	<1	28	21	0.31	5.4	300
		11/23/98	60	17	10.4	1.4	24	26	0.34	3.4	316
Comal	DX-68-30-2XX	11/9/98	96	8	9.6	1.3	14	25	0.24	5.9	396
	DX-68-23-304	11/18/98	71	16	9.1	1.3	19	24	0.22	6	424
	DX-68-23-302	11/6/98	70	15	8.2	1	17	19	0.32	5.8	284
	DX-68-23-616A	1/30/98	145	97	421	26.8	530	566	3.4	6.5	2048
		2/27/98	156	98	298	21	530	520	4.05	6.2	2104
		4/8/98	159	100	304.4	20.4	520	634	3.9	6.9	1696
		4/29/98	165	95	304	20.4	470	552	4	6.5	1964

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
	DX-68-23-616B	5/26/98	165	100	324	21	550	526	4.1	6.3	2024
		6/23/98	148	105	310	21.3	560	531	3.6	6.8	2088
		7/21/98	153	99	294	21.1	550	574	4.4	6.8	2008
		8/25/98	142	96	260	20.1	520	495	3.3	6.7	1792
		9/28/98	143	93	310	20.1	515	485	3.25	6.3	1932
		10/27/98	144	95	273	18.8	500	402	3.6	6.6	1800
		11/17/98	157	96	275	21.3	500	529	3.4	6.5	2124
		12/21/98	168	99	295	20.7	490	644	3.5	6.6	1830
		1/30/98	92	61	206	12.2	280	296	3.3	6.3	1148
		2/27/98	98	64	171	11	280	304	3.65	5	1156
		4/8/98	93	62	145	10.5	270	284	3.6	7.2	1000
		4/29/98	101	59	143	9.8	260	284	3.6	6	1076
		5/26/98	97	62	146	9.9	280	281	3.55	5.8	1164
		6/23/98	93	63	134	9.8	280	278	3.15	6.3	1152
		7/21/98	98	61	130	9.7	270	293	3.7	6	1136
		8/25/98	99	59	127	10	280	268	3.25	6.2	976
		9/28/98	95	58	144	9.9	270	258	6.8	6.3	1168
		10/27/98	93	60	138	8.7	260	246	3.3	6.3	1032
		11/17/98	93	61	139	10.5	260	305	3.55	6.4	1300
		12/21/98	104	63	139	10.6	250	308	3.4	6.4	1024
	DX-68-23-617	1/30/98	57	27	15.8	<1	19	54	1.25	5.8	356
		2/27/98	60	28	10.8	2	19	53	1.36	5.6	344
		4/8/98	59	27	10.8	1.3	20	61	1.48	6.9	324
		4/29/98	61	26	10	1.1	22	52	1.32	5.6	312
		5/26/98	59	26	8.3	<1	19	48	1.28	4.3	304
		6/23/98	57	27	10.7	<1	20	49	1.3	5.8	314
		7/21/98	57	26	9.4	1.2	20	54	1.38	5.7	296
		8/25/98	56	26	8.2	1.4	18	48	1.25	5.7	284
		9/28/98	54	25	10.7	1.4	22	51	1.28	5.7	348
		10/27/98	54	26	10.2	<1	18	44	1.28	5.1	320
		11/17/98	55	26	9.3	<1	19	55	1.4	5.8	396
		12/21/98	63	28	9.9	1.1	18	55	1.16	5.8	300

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
	DX-68-23-618	1/30/98	49	32	37.3	<1	46	62	2.35	6.6	380
		2/27/98	54	33	25.8	3	44	60	2.7	5.7	348
		4/8/98	53	33	26.1	2.1	44	69	2.9	6.8	248
		4/29/98	55	32	26.2	1.9	44	60	2.7	6.1	336
		5/26/98	54	33	24.6	1.7	44	63	2.75	6.1	316
		6/23/98	51	33	26.1	1.3	48	59	2.3	6	324
		7/21/98	51	32	24.4	1.9	44	61	2.8	6	312
		8/25/98	49	31	22	2.1	44	62	2.48	6	260
		9/28/98	50	31	27.1	1.9	42	57	2.65	6	374
		10/27/98	52	31	24.1	1.3	42	58	2.4	6.4	364
		11/17/98	50	32	25.9	1.8	40	66	2.8	6.4	412
		12/21/98	57	34	25.3	2	42	69	2.4	6.1	332
	DX-68-23-619A	1/30/98	48	29	21.5	<1	25	45	2.3	3	320
		2/27/98	51	31	14.3	2	24	43	2.55	5.5	280
		4/8/98	49	29	13.8	1.3	24	50	2.65	7	220
		4/29/98	52	29	13.4	1.2	26	42	2.5	6	272
		5/26/98	51	29	12.5	<1	25	43	2.55	5.9	312
		6/23/98	49	30	14.1	<1	25	41	2.15	5.3	240
		7/21/98	44	29	12.1	1.2	24	44	2.5	5.9	264
		8/25/98	49	28	11	1.3	24	40	2.1	6.1	240
		9/28/98	49	29	14	1.2	26	41	2.35	5.9	308
		10/27/98	46	29	12.3	<1	23	36	2.15	6.2	304
		11/17/98	44	29	12.7	<1	23	45	2.6	6.2	356
		12/21/98	52	30	13.1	1.3	22	47	2.4	6	280
	DX-68-23-619B	1/30/98	54	26	16.7	<1	20	47	1.48	4.6	328
		2/27/98	51	26	11.5	1.8	20	48	1.52	5.1	268
		4/8/98	60	25	11.1	1	20	54	1.64	6.5	296
		4/29/98	61	25	10.6	1	22	46	1.54	5.8	308
		5/26/98	59	25	8.7	<1	21	46	1.52	5	312
		6/23/98	56	25	11.1	<1	21	43	1.52	5.6	280
		7/21/98	56	24	9.4	<1	21	47	1.54	5.7	296
		8/25/98	56	25	8.1	1.1	20	47	1.5	5.7	260
		9/28/98	56	24	10.8	<1	20	42	1.48	5.7	332

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
		10/27/98	57	25	9.9	<1	20	42	1.34	5.7	308
		11/17/98	56	25	9.4	<1	19	48	1.48	5.9	372
		12/21/98	57	22	10.4	1.2	18	49	1.52	5.8	308
Hays											
	LR-58-57-311*	4/21/98	80	31	5.9	0.77	10	7.2	0.2	12	336
	LR-58-58-403	4/22/98	80	23	5.9	1.1	10	24	0.49	11	324
	LR-67-01-812	4/10/98	893	440	2088	92.7	4100	2610	6	7.6	11956
		7/2/98	903	443	2152	93.8	3900	2572	5	6.5	11684
		9/30/98	853	448	2040	98.2	3950	2766	6	6.9	12014
	LR-67-01-813A	4/10/98	905	444	2140	91.6	4000	2478	6	7.7	11864
		7/2/98	891	443	2064	92.8	3650	2550	5	6	11800
		9/30/98	834	436	2072	94.7	3800	2861	6	7.1	12044
	LR-67-01-813B	4/10/98	904	442	2064	87.8	4050	2530	6.25	7.5	11860
		7/2/98	895	435	2068	92.8	4050	2614	4.8	6.8	11780
		9/30/98	852	448	2036	96.9	3900	2740	5.5	7	12260
	LR-67-01-814A	4/10/98	899	451	2416	85.6	3950	2552	6.5	7.9	11604
		6/30/98	891	444	2168	100	4100	2640	5.1	7	11768
		9/30/98	826	435	2052	96.5	4000	2759	6.5	7.1	12200
	LR-67-01-814B	4/10/98	899	448	2304	83.9	3950	2580	6.25	8.1	11920
		6/30/98	893	438	2112	93.2	3500	2570	5.2	6.4	11696
		9/30/98	837	440	2008	93.9	3350	2806	5.75	6.8	12268
Medina											
	TD-69-47-303	8/4/98	61.9	15.9	8.48	2.36	15.6	17.2	0.13	13.6	262
	TD-69-47-301	8/4/98	63.1	14.9	8.08	2.33	13.6	17.1	0.14	13.5	261
	TD-69-46-601	8/5/98	62.4	14.2	7.82	2.2	14.5	18	0.12	13.3	263
	TD-69-29-902	8/11/98	87.9	6.62	7.69	2.1	13.5	14	0.09	14.2	296
	TD-69-29-901	8/11/98	71.1	7.29	5.33	2.1	7.6	12.3	0.09	12.9	247
	TD-69-37-302	8/11/98	68.1	13.3	6.61	2.23	9.9	19.8	0.13	13	269
	TD-68-41-303	8/11/98	62.5	15	9.99	2.24	21.2	16.3	0.12	12.9	269
	TD-69-56-507	8/12/98	48.9	20.4	10.3	2.25	18.1	32.5	0.59	14.9	277
	TD-69-56-508	8/12/98	51.4	21.3	12	2.42	22.4	27.3	0.81	14.5	284

* Data provided by the USGS and/or the TWDB

Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids (mg/L)
Medina	TD-68-42-806	8/18/98	64	16.2	8.97	<1	20.2	17.9	1.39	13.4	263
	TD-68-49-301	8/18/98	56.7	19.3	8.61	<1	18.3	23.4	0.51	13.4	266
	TD-68-49-501	8/18/98	68.5	15.9	11	1.09	25.2	19.6	0.18	12.4	283
	TD-68-33-502	8/20/98	69.8	16.6	7.09	1.28	12.2	45.5	0.14	12.1	282
	TD-68-25-703	8/20/98	70.4	9.61	5.81	1.09	9.6	33.3	0.08	10.4	247
	TD-69-37-601	8/20/98	79.5	10.1	6.36	<1	12.2	10.2	0.09	12.4	268
	TD-69-38-906	8/27/98	73.3	12.8	7.88	1.1	11.9	11.8	0.14	13.5	279
	TD-69-47-307	8/27/98	67.5	14.9	7.64	<1	14.6	17.4	0.14	12.9	265
	TD-68-33-202	8/31/98	75.2	10.3	6.15	1.03	10.8	29.4	0.08	12	262
	TD-68-41-102	8/31/98	70.3	15	9.31	1.03	20.8	16.4	0.11	12.9	274
	TD-68-41-901	8/31/98	68.8	16.4	9.47	1.04	23.5	15.1	0.15	12.7	272
	TD-69-47-8X1	2/11/98	65	15	16.7	<1	26	18	0.18	3.8	310
	TD-69-47-8X2	2/11/98	67	14	15.4	<1	27	17	0.17	3.7	296
	TD-69-47-8X3	2/11/98	66	15	14.8	<1	27	15	0.18	3	296
	TD-69-47-7X1	2/11/98	69	15	16.7	<1	27	17	0.17	2.8	344
Uvalde	YP-69-50-207	7/23/98	83.8	10.2	14.3	1.22	33.1	15.3	0.06	13.4	307
	YP-69-50-506	7/23/98	90.1	8.74	14.9	1.25	34	22.7	0.08	13.6	328
	YP-69-50-203	7/23/98	83.8	10.3	15.5	1.19	34.1	17.1	0.06	13.5	315
	YP-69-45-405	8/5/98	65.6	13.8	7.73	2.25	12.8	18.9	0.12	13.7	269
	YP-69-45-404	8/5/98	69.8	16.4	12.3	2.72	19	48.9	0.15	13.6	312
	YP-69-50-501	8/5/98	129	15.8	42.9	2.44	150	73.1	<0.05	16.8	570
	YP-69-43-606	8/19/98	77.9	9.97	10.8	1.11	21.5	13.1	0.08	12.8	279
	YP-69-51-120	8/19/98	128	15.8	40.6	1.53	106	62.9	1.04	15.6	538

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Bexar	AY-68-29-405	8/14/98	<0.002	0.0488	<0.001	0.0241	0.0062	<0.01	<0.001	<0.001		0.0047		<0.004
	AY-68-30-211	11/19/98	<0.002	0.07	<0.001	<0.002	0.001	0.031	0.003	0.007	<0.002	<0.003	<0.001	<0.01
	AY-68-28-806*	8/28/98	<0.002	0.0333	<0.001	0.0079	<0.002	0.015	<0.001	<0.001		<0.004		0.0045
	AY-68-34-601*	9/15/98	<0.002	0.0346	<0.001	0.0016	<0.002	0.015	<0.001	0.0015		<0.004		0.0087
	AY-68-35-505*	9/1/98	<0.002	0.0397	<0.001	0.0255	0.0095	0.016	0.0027	<0.001		<0.004		0.0072
	AY-68-36-512*	8/26/98	<0.002	0.046	<0.001	0.0084	<0.002	0.012	<0.001	<0.001		<0.004		0.0082
	AY-68-43-208*	9/8/98	<0.002	0.0552	<0.001	0.0016	0.0034	0.017	0.0027	0.0018		<0.004		0.0923
	AY-68-44-218*	7/28/98	<0.002	0.106	<0.001	0.0044	<0.002	0.012	<0.001	<0.001		<0.004		<0.004
	AY-68-37-521	1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	0.003	0.02	<0.001	<0.002	<0.001	0.021	<0.002	0.009	<0.002	<0.003	<0.001	0.03
		5/27/98												
		6/24/98												
		7/22/98												
		8/26/98	<0.002	<0.01	<0.001	<0.001	<0.001	0.022	<0.002	0.007	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												
		11/23/98	<0.002	<0.01	<0.001	<0.001	0.002	0.023	0.003	0.008	<0.002	<0.003	<0.001	<0.03
		12/30/98												
	AY-68-37-522	1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	0.003	0.01	<0.001	<0.002	<0.001	0.04	<0.002	0.013	<0.002	<0.003	<0.001	0.02
		5/27/98												
		6/24/98												
		7/22/98												
		8/26/98	<0.002	<0.01	<0.001	<0.001	0.001	0.047	<0.002	0.008	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												
		11/23/98	<0.002	<0.01	<0.001	<0.001	0.002	0.059	<0.002	0.01	<0.002	<0.003	<0.001	<0.03
		12/30/98												

* Data provided by the USGS and/or the TWDB

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Bexar	AY-68-37-523	1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	0.004	0.01	<0.001	<0.002	<0.001	0.025	<0.002	0.009	<0.002	<0.003	<0.001	<0.01
		5/27/98												
		6/24/98												
		7/22/98												
		8/26/98	<0.002	<0.01	<0.001	<0.001	<0.001	0.038	0.007	0.009	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												
		11/23/98	<0.002	<0.01	<0.001	<0.001	0.002	0.029	<0.002	0.009	<0.002	<0.003	<0.001	<0.03
		12/30/98												
	AY-68-37-524	1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	0.004	0.06	<0.001	<0.002	<0.001	1.032	0.004	0.006	<0.002	<0.003	<0.001	<0.01
		5/27/98												
		6/24/98												
		7/22/98												
		8/26/98	0.004	0.05	<0.001	<0.001	<0.001	1.014	<0.002	0.006	<0.002	<0.003	<0.001	0.01
		9/29/98												
		10/28/98												
		11/23/98	0.003	0.08	<0.001	<0.001	0.002	1.48	<0.002	0.005	<0.002	<0.003	<0.001	<0.03
		12/30/98												
	AY-68-37-525	1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	<0.002	0.02	<0.001	<0.002	<0.001	0.029	<0.002	0.012	<0.002	0.003	<0.001	<0.01
		5/27/98												
		6/24/98												
		7/22/98												
		8/26/98	<0.002	<0.01	<0.001	<0.001	0.002	0.035	<0.002	0.012	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												

* Data provided by the USGS and/or the TWDB

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Bexar	AY-68-37-526	11/23/98	<0.002	0.01	<0.001	0.007	<0.001	0.054	<0.002	0.011	<0.002	<0.003	<0.001	<0.03
		12/30/98												
		2/26/98												
		4/16/98												
		4/30/98	<0.002	0.11	<0.001	<0.002	<0.001	0.614	<0.002	0.011	<0.002	<0.003	<0.001	<0.01
		5/27/98												
		6/25/98												
		7/22/98												
		8/26/98	<0.002	0.1	<0.001	<0.001	0.001	0.605	<0.002	0.008	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												
	AY-68-37-527	11/23/98	<0.002	0.11	<0.001	<0.001	0.003	1.48	<0.002	0.012	<0.002	<0.003	<0.001	<0.03
		1/28/98												
		2/26/98												
		4/16/98												
		4/30/98	<0.002	0.11	<0.001	<0.002	<0.001	0.008	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		5/27/98												
		6/25/98												
		7/22/98												
		8/26/98	<0.002	0.1	<0.001	<0.001	<0.001	0.007	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		9/29/98												
		10/28/98												
		11/23/98	<0.002	0.17	<0.001	<0.001	0.006	0.018	<0.002	0.006	<0.002	<0.003	<0.001	<0.03
Comal	DX-68-30-2XX	11/9/98	<0.002	0.06	<0.001	<0.001	0.013	0.006	0.002	<0.002	<0.002	<0.003	<0.001	0.04
	DX-68-23-304	11/18/98	<0.002	0.08	<0.001	<0.002	0.001	0.025	0.003	0.002	<0.002	<0.003	<0.001	0.02
	DX-68-23-302	11/6/98	<0.002	0.06	<0.001	<0.001	0.006	0.006	0.003	<0.002	<0.002	<0.003	<0.001	<0.01
	DX-68-23-616A	1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.03	<0.001	0.002	<0.001	0.013	0.003	0.003	<0.002	<0.003	<0.001	<0.01
		5/26/98												
		6/23/98												

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Denton	DX-68-23-616B	7/21/98												
		8/25/98	<0.002	0.02	<0.001	<0.001	<0.001	0.016	<0.002	0.002	<0.002	<0.003	<0.001	0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.05	<0.001	<0.002	0.001	0.015	<0.002	0.003	<0.002	<0.003	<0.001	<0.01
		12/21/98												
		1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.03	<0.001	0.002	<0.001	0.006	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		5/26/98												
		6/23/98												
	DX-68-23-617	7/21/98												
		8/25/98	<0.002	0.02	<0.001	<0.001	<0.001	0.004	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.04	<0.001	<0.002	0.003	0.007	0.006	0.003	<0.002	<0.003	<0.001	<0.01
		12/21/98												
		1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.11	<0.001	<0.002	<0.001	0.005	<0.002	<0.001	<0.002	<0.003	<0.001	<0.01
		5/26/98												
		6/23/98												
	DX-68-23-618	7/21/98												
		8/25/98	<0.002	0.11	<0.001	<0.001	<0.001	0.005	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.13	<0.001	<0.002	<0.001	0.006	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		12/21/98												
		1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.03	<0.001	0.002	0.032	0.012	0.002	<0.001	<0.002	<0.003	<0.001	<0.01

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Denton	DX-68-23-619A	5/26/98												
		6/23/98												
		7/21/98												
		8/25/98	<0.002	0.03	<0.001	<0.001	<0.001	0.025	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.05	<0.001	<0.002	0.001	0.012	0.004	<0.002	<0.002	<0.003	<0.001	<0.01
		12/21/98												
		1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.04	<0.001	0.002	<0.001	0.038	0.003	<0.001	<0.002	<0.003	<0.001	<0.01
	DX-68-23-619B	5/26/98												
		6/23/98												
		7/21/98												
		8/25/98	<0.002	0.04	<0.001	<0.001	<0.001	0.07	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.06	<0.001	<0.002	0.001	0.034	0.006	<0.002	<0.002	<0.003	<0.001	<0.01
		12/21/98												
		1/30/98												
		2/27/98												
		4/8/98												
		4/29/98	<0.002	0.12	<0.001	<0.002	<0.001	0.027	<0.002	<0.001	<0.002	<0.003	<0.001	<0.01
		5/26/98												
		6/23/98												
		7/21/98												
		8/25/98	<0.002	0.11	<0.001	<0.001	<0.001	0.027	0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		9/28/98												
		10/27/98												
		11/17/98	<0.002	0.14	<0.001	<0.002	0.001	0.029	0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		12/21/98												

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Hays														
	LR-58-57-311*	4/21/98												
	LR-58-58-403	4/22/98												
	LR-67-01-812	4/10/98												
		7/2/98	<0.002	0.01	<0.001	0.003	0.004	0.01	0.006	0.004	<0.002	0.005	<0.001	0.03
		9/30/98	<0.002	<0.01	<0.001	0.002	0.002	0.004	<0.002	0.005	<0.002	<0.003	<0.001	<0.01
	LR-67-01-813A	4/10/98												
		7/2/98	<0.002	<0.01	<0.001	<0.002	0.005	0.01	0.002	0.008	<0.002	0.015	<0.001	0.03
		9/30/98	<0.002	0.01	<0.001	<0.002	0.003	0.012	<0.002	0.003	<0.002	0.006	<0.001	<0.01
	LR-67-01-813B	4/10/98												
		7/2/98	<0.002	0.01	<0.001	<0.002	0.005	0.013	0.006	0.01	<0.002	0.011	<0.001	0.03
		9/30/98	<0.002	<0.01	<0.001	<0.002	0.004	0.015	<0.002	0.005	<0.002	0.004	<0.001	<0.01
	LR-67-01-814A	4/10/98												
		6/30/98	0.002	0.01	<0.001	0.005	0.004	0.012	0.003	0.006	<0.002	0.017	<0.001	0.03
		9/30/98	<0.002	<0.01	<0.001	0.002	0.002	0.007	<0.002	0.003	<0.002	0.006	<0.001	<0.01
	LR-67-01-814B	4/10/98												
		6/30/98	<0.002	0.01	<0.001	<0.002	0.005	0.009	0.002	0.005	<0.002	0.015	<0.001	0.03
		9/30/98	<0.002	0.01	<0.001	<0.002	<0.001	0.011	<0.002	0.002	<0.002	<0.003	<0.001	0.01
Medina														
	TD-69-47-303	8/4/98	<0.002	0.0416	<0.001	0.0043	0.0114	0.015	0.0068	<0.001		<0.004		<0.004
	TD-69-47-301	8/4/98	<0.002	0.0373	<0.001	0.0048	0.0079	0.01	0.0016	<0.001		<0.004		0.0226
	TD-69-46-601	8/5/98	<0.002	0.0352	<0.001	0.0042	0.0069	0.01	<0.001	<0.001		<0.004		0.0106
	TD-69-29-902	8/11/98	<0.002	0.0392	<0.001	0.0204	<0.002	<0.01	<0.001	<0.001		<0.004		0.264
	TD-69-29-901	8/11/98	<0.002	0.0301	<0.001	0.0182	<0.002	<0.01	<0.001	0.0085		0.005		0.283
	TD-69-37-302	8/11/98	<0.002	0.0337	<0.001	0.0178	0.0022	<0.01	<0.001	<0.001		<0.004		0.0137
	TD-68-41-303	8/11/98	<0.002	0.0495	<0.001	0.0143	<0.002	<0.01	<0.001	<0.001		0.0044		<0.004
	TD-69-56-507	8/12/98	<0.002	0.207	<0.001	0.0141	<0.002	0.015	<0.001	<0.001		0.0056		<0.004
	TD-69-56-508	8/12/98	<0.002	0.201	<0.001	0.015	<0.002	0.019	<0.001	0.001		0.0055		<0.004
	TD-68-42-806	8/18/98	<0.002	0.0974	<0.001	<0.001	0.0074	0.016	0.0287	<0.001		<0.004		0.124
	TD-68-49-301	8/18/98	<0.002	0.173	<0.001	<0.001	0.0124	0.012	0.0025	<0.001		<0.004		0.0102
	TD-68-49-501	8/18/98	<0.002	0.122	<0.001	<0.001	0.0038	0.011	<0.001	<0.001		<0.004		0.0052
	TD-68-33-502	8/20/98	<0.002	0.0332	<0.001	<0.001	<0.002	0.012	<0.001	<0.001		<0.004		<0.004
	TD-68-25-703	8/20/98	<0.002	0.0308	<0.001	<0.001	0.003	<0.01	<0.001	<0.001		<0.004		0.0243

* Data provided by the USGS and/or the TWDB

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1998.

County	State well number	Date sampled	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, dissolved (mg/L)	Mercury, dissolved (mg/L)	Selenium, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)
Medina	TD-69-37-601	8/20/98	<0.002	0.0333	<0.001	<0.001	0.003	0.011	0.0039	<0.001		<0.004		0.906
	TD-69-38-906	8/27/98	<0.002	0.0396	<0.001	0.0138	0.0062	<0.01	<0.001	<0.001		<0.004		0.0086
	TD-69-47-307	8/27/98	<0.002	0.0403	<0.001	0.0111	<0.002	<0.01	<0.001	<0.001		<0.004		<0.004
	TD-68-33-202	8/31/98	<0.002	0.036	<0.001	0.0186	0.0055	0.018	0.0014	<0.001		<0.004		0.181
	TD-68-41-102	8/31/98	<0.002	0.0517	<0.001	0.0212	0.0046	0.014	0.0059	<0.001		<0.004		0.0179
	TD-68-41-901	8/31/98	<0.002	0.0942	<0.001	0.0176	<0.002	0.011	<0.001	<0.001		<0.004		<0.004
	TD-69-47-8X1	2/11/98	<0.002	0.05	<0.001	<0.001	0.006	<0.003	<0.002	<0.001	<0.002	<0.003	<0.001	0.01
	TD-69-47-8X2	2/11/98	<0.002	0.05	<0.001	<0.001	0.007	<0.003	<0.002	<0.001	<0.002	<0.003	<0.001	0.01
	TD-69-47-8X3	2/11/98	<0.002	0.06	<0.001	<0.001	0.004	<0.003	<0.002	<0.001	<0.002	<0.003	<0.001	<0.01
	TD-69-47-7X1	2/11/98	<0.002	0.05	<0.001	<0.001	0.01	<0.003	<0.002	<0.001	<0.002	<0.003	<0.001	0.01
Uvalde	YP-69-50-207	7/23/98	<0.002	0.0515	<0.001	0.0033	0.0027	0.014	<0.001	<0.001		<0.004		<0.004
	YP-69-50-506	7/23/98	<0.002	0.0629	<0.001	0.0033	0.0028	0.651	0.001	<0.001		<0.004		<0.004
	YP-69-50-203	7/23/98	<0.002	0.0506	<0.001	0.0029	0.0062	0.014	<0.001	<0.001		<0.004		<0.004
	YP-69-45-405	8/5/98	<0.002	0.0336	<0.001	0.0042	0.0056	<0.01	<0.001	<0.001		<0.004		0.0111
	YP-69-45-404	8/5/98	<0.002	0.0345	<0.001	0.0027	0.006	0.001	0.002	<0.001		<0.004		0.0068
	YP-69-50-501	8/5/98	<0.002	0.0879	<0.001	0.0053	0.0058	0.012	0.0018	<0.001		0.007		0.0067
	YP-69-43-606	8/19/98	<0.002	0.0551	<0.001	<0.001	0.0048	0.01	<0.001	<0.001		<0.004		0.0061
	YP-69-51-120	8/19/98	0.0023	0.0975	<0.001	<0.001	0.003	0.015	<0.001	<0.001		<0.004		0.008

Analytical data for inorganic constituents in water from streams crossing the Edwards Aquifer Recharge Zone,
and springs discharging from the Edwards Aquifer 1998.

Station Name	Date sampled	Time sampled	Water temp (°C)	Conductivity, field (µS/cm)	Alkalinity, field (mg/L)	pH	Oxygen, dissolved (mg/L)	Hardness, total (mg/L)
Comal Springs (DX-68-23-301)	11/6/98	10:30	23.4	532		7.4		246
Hueco Springs (DX-68-15-901)	11/9/98	13:30	21.5	568	252	7		278
SanPedroSprings	11/23/98	10:23	24	524	204	7.3		250
SanAntonioSprings	11/24/98	14:30	24	477		7.4	5.7	230
Blanco River @ Wimberley	10/22/98	15:50	20	501	202	8.4	9.1	234
Blanco River @ Wimberley	12/15/98	10:10	13	515	232	8.3	11.5	202
Medina River @ Bandera	4/1/98	13:15	17.4	533	126	8.2	10.9	260
Medina River @ Bandera	10/22/98	15:50	18.5	504	170	8.4	9.2	228
Medina River @ Bandera	12/8/98	11:32	15.5	553	222	8.3	10.1	256
Hondo Creek @ Tarpley	3/18/98	10:40	16.5	422	166	8.36	11.9	202
Hondo Creek @ Tarpley	10/15/98	14:25	24.5	414	166	8.3	8.4	184
Seco Creek @ Miller Ranch	3/18/98	14:15	20.3	438	144	8.26	11.3	202
Seco Creek @ Miller Ranch	10/15/98	10:30	20.5	428	144	8.2	8.4	188
Seco Creek @ Miller Ranch	12/18/98	10:50	13	465	198	8.2	9.91	196
Sabinal River @ Sabinal	10/14/98	16:40	23.5	455	210	8.3	8.3	200
Frio River @ Concan	10/14/98	11:30	22.5	434	178	8.2	8.4	208
Dry Frio River @ Reagan Wells	3/17/98	13:10	18.2	387	160	7.92	9.9	185
Dry Frio River @ Reagan Wells	10/14/98	8:30	22.5	411	186	8	6.8	200
Nueces River @ Laguna	3/17/98	9:40	16.4	397	166	8.11	9.7	188
Nueces River @ Laguna	10/13/98	12:30	24.5	426	174	8.1		200

Analytical data for selected properties and common inorganic constituents in water from streams crossing the Edwards Aquifer Recharge Zone and springs discharging from the Edwards Aquifer 1998.

Station name	Date sampled	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Total dissolved solids
Comal Springs (DX-68-23-301)	11/6/98	70	15	8.5	<1	18	19	0.26	5.5	216
Hueco Springs (DX-68-15-901)	11/9/98	93	10	5.7	<1	13	14	0.2	4.8	340
San Pedro Springs	11/23/98	67	15	9.9	1.3	22	24	0.19	6.1	340
San Antonio Springs	11/24/98	61	15	7.8	1.2	18	16	0.21	5.8	300
Blanco River @ Wimberley	10/22/98	74	12	4.2	<1	10	24	0.3	4.5	248
Blanco River @ Wimberley	12/15/98	62	16	6	<1	12	25	0.23	4.4	296
Medina River @ Bandera	4/1/98	86	17	6.1	1.1	16	70	0.29	5.1	320
Medina River @ Bandera	10/22/98	65	16	4.6	<1	10	48	0.44	6	276
Medina River @ Bandera	12/8/98	67	19	3.9	1.4	14	79	0.3	3.9	348
Hondo Creek @ Tarpley	3/18/98	59	8	4.3	1.2	11	26	0.22	4.8	220
Hondo Creek @ Tarpley	10/15/98	53	9	4.6	1.1	10	23	0.18	5.1	188
Seco Creek @ Miller Ranch	3/18/98	59	10	4.5	<1	12	29	0.25	5.4	232
Seco Creek @ Miller Ranch	10/15/98	51	10	5.3	1	11	26	0.25	5.6	208
Seco Creek @ Miller Ranch	12/18/98	66	11	5.8	<1	12	36	0.25	5.7	356
Sabinal River @ Sabinal	10/14/98	54	12	6.5	1.2	12	20	0.24	6.1	236
Frio River @ Concan	10/14/98	60	14	6.5	1	13	14	0.13	5.9	196
Dry Frio River @ Reagan Wells	3/17/98	61	11	4.9	0.5	12	33	0.13	3.5	196
Dry Frio River @ Reagan Wells	10/14/98	59	12	5.2	<1	11	12	0.13	4.9	180
Nueces River @ Laguna	3/17/98	56	13	8.6	1.2	17	33	0.19	5.5	212
Nueces River @ Laguna	10/13/98	58	13	7.1	1	13	144	0.18	5.9	196

Analytical data for minor elements in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.

Station name	Date sampled	As, disld* (mg/L)	Ba, disld* (mg/L)	Cd, disld* (mg/L)	Cr, disld* (mg/L)	Cu, disld* (mg/L)	Fe, disld* (mg/L)	Pb, disld* (mg/L)	Mn, disld* (mg/L)	Hg, disld* (mg/L)	Se, disld* (mg/L)	Ag, disld* (mg/L)	Zn, disld* (mg/L)	BOD 5	Nitrogen, Kjeldahl (mg/L)	Nitrogen, nitrate (mg/L)	Nitrogen, nitrite (mg/L)	Phosphorus, total (mg/L)	Total organic carbon (mg/L)	Total suspended solids (mg/L)
Comal Springs (DX-68-23-301)	11/6/98	<0.002	0.06	<0.001	<0.001	0.002	<0.003	0.003	<0.002	<0.002	<0.003	<0.001	<0.01	<1	<0.1	1.54	<0.005	0.03		
Hueco Springs (DX-68-15-901)	11/9/98	<0.002	0.05	<0.001	<0.001	0.136	<0.003	0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	<0.1	1.38	0.006	<0.01		3
SanPedro Springs	11/23/98	<0.002	0.06	<0.001	<0.001	0.003	0.01	<0.002	<0.002	<0.002	<0.003	<0.001	<0.03		0.46	2.43	<0.005	<0.01		
SanAntonio Springs	11/24/98	<0.002	0.06	<0.001	<0.001	0.042	0.131	<0.002	<0.002	<0.002	<0.003	<0.001	<0.03		<0.1	1.95	<0.005	<0.01		
Blanco River @ Wimberley	10/22/98	<0.002	0.03	<0.001	0.011	<0.001	0.003	<0.002	0.005	<0.002	0.003	<0.001	<0.01	<1	0.56	0.44	<0.005	<0.01	5	3
	12/15/98	<0.002	0.03	<0.001	<0.001	<0.001	0.003	<0.002	0.002	<0.002	<0.003	<0.001	<0.01	<1	<0.1	0.86	<0.005	<0.01	<1	3
Medina River @ Bandera	4/1/98	0.049	0.03	<0.001	<0.002	0.003	<0.003	<0.002	0.002	<0.002	<0.003	<0.001	0.02	<1	0.19	0.42	<0.005	<0.01	3.2	2
	10/22/98	0.003	0.03	<0.001	<0.001	<0.001	<0.003	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.28	0.43	<0.005	<0.01	10	6
	12/8/98	<0.002	0.03	<0.001	<0.001	0.001	0.006	0.004	0.002	<0.002	<0.003	<0.001	<0.01	<1	<0.1	0.53	<0.005	<0.01	<1	<1
Hondo Creek @ Tarpley	3/18/98	<0.002	0.02	<0.001	<0.002	<0.001	<0.003	<0.002	0.001	<0.002	0.003	<0.001	<0.01	<1	0.46	0.42	0.003	0.006	3.4	2
	10/15/98	<0.002	0.03	<0.001	<0.001	<0.001	0.004	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.19	0.2	<0.005	<0.01	3	1
Seco Creek @ Miller Ranch	3/18/98	<0.002	0.02	<0.001	<0.002	<0.001	<0.003	<0.002	0.001	<0.002	<0.003	<0.001	<0.01	<1	0.37	0.55	0.003	0.025	3	<1
	10/15/98	<0.002	0.03	<0.001	<0.001	<0.001	0.004	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.19	0.51	<0.005	<0.01	4	<1
	12/18/98	<0.002	0.03	<0.001	<0.001	<0.001	<0.003	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.1	0.59	<0.005	<0.01	<1	3
Sabinal River @ Sabinal	10/14/98	<0.002	0.04	<0.001	<0.001	<0.001	<0.003	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.28	0.63	<0.005	0.02	4	<1
Frio River @ Concan	10/14/98	<0.002	0.04	<0.001	<0.001	<0.001	0.004	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.19	0.85	<0.005	<0.01	18	3
Dry Frio River @ Reagan Wells	3/17/98	<0.002	0.03	<0.001	<0.002	<0.001	<0.003	<0.002	<0.001	<0.002	>0.003	<0.001	<0.01	<1	0.37	1.07	0.002	0.002	2.5	<1
	10/14/98	<0.002	0.04	<0.001	0.001	0.012	<0.003	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.28	1	<0.005	<0.01	13	2
Nueces River @ Laguna	3/17/98	<0.002	0.03	<0.001	<0.002	<0.001	<0.003	<0.002	<0.001	<0.002	<0.003	<0.001	<0.001	<1	0.65	1.28	0.002	0.008	4.5	<1
	10/13/98	<0.002	0.05	<0.001	0.001	0.005	0.004	0.005	<0.002	<0.002	<0.003	<0.001	<0.01	<1	0.46	1.4	<0.005	<0.01	8	4

disld* = dissolved

Analytical data for pesticides and herbicides in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.

Station name	Date Sampled	Aldrin (µg/L)	Gamma BHC (Lindane) (µg/L)	Chlordane (µg/L)	4,4' - DDD (µg/L)	4,4' - DDE (µg/L)	4,4' - DDT (µg/L)	Dieldrin (µg/L)	Endosulfan I (Alpha) (µg/L)	Endosulfan II (Beta) (µg/L)	Endrin (µg/L)
Cornal Springs (DX-68-23-301)	11/6/98										
Hueco Springs (DX-68-15-901)	11/9/98	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SanPedroSprings	11/23/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
SanAntonioSprings	11/24/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Blanco River @ Wimberley	10/22/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	12/15/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Medina River @ Bandera	4/1/98	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10/22/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	12/8/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Hondo Creek @ Tarpley	3/18/98	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10/15/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Seco Creek @ Miller Ranch	3/18/98	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10/15/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	12/18/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Sabinal River @ Sabinal	10/14/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Frio River @ Concan	10/14/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Dry Frio River @ Reagan Wells	3/17/98	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10/14/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Nueces River @ Laguna	3/17/98	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10/13/98	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005

**Analytical data for pesticides and herbicides in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.**

Station name	Heptachlor (µg/L)	Heptachlor Epoxide (µg/L)	Mirex (µg/L)	Perthane (µg/L)	Toxaphene (µg/L)	PCB- 1016 (µg/L)	PCB- 1221 (µg/L)	PCB- 1232 (µg/L)	PCB- 1242 (µg/L)	PCB- 1248 (µg/L)	PCB- 1254 (µg/L)	PCB- 1260 (µg/L)	PCB- Total (µg/L)
Comal Springs (DX-68-23-301)													
Hueco Springs (DX-68-15-901)	<0.01	<0.01	<0.01	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
SanPedroSprings	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
SanAntonioSprings	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Blanco River @ Wimberley	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Medina River @ Bandera	<0.01	<0.01	<0.01	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Hondo Creek @ Tarpley	<0.01	<0.01	<0.01	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Seco Creek @ Miller Ranch	<0.01	<0.01	<0.01	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Sabinal River @ Sabinal	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Frio River @ Concan	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Dry Frio River @ Reagan Wells	<0.01	<0.01	<0.01	<0.01	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05
Nueces River @ Laguna	<0.01	<0.01	<0.01	<0.01	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	
	<0.0005	<0.005	<0.005	<0.01	<0.2								<0.05

**Analytical data for pesticides and herbicides in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.**

Station name	Halowax 1000 (µg/L)	Halowax 1001 (µg/L)	Halowax 1013 (µg/L)	Halowax 1014 (µg/L)	Halowax 1051 (µg/L)	Halowax 1099 (µg/L)	Diazinon (µg/L)	Ethion (µg/L)	Malathion (µg/L)	Methyl Parathion (µg/L)	Parathion (µg/L)	Trithion (µg/L)
Comal Springs (DX-68-23-301)												
Hueco Springs (DX-68-15-901)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SanPedroSprings							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
SanAntonioSprings							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Blanco River @ Wimberley							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Medina River @ Bandera	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Hondo Creek @ Tarpley	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Seco Creek @ Miller Ranch	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Sabinal River @ Sabinal							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Frio River @ Concan							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Dry Frio River @ Reagan Wells	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
Nueces River @ Laguna	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
							<0.005	<0.01	<0.005	<0.05	<0.01	<0.002

**Analytical data for pesticides and herbicides in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.**

Station name	2,4-D (µg/L)	2,4,5-T (µg/L)	2,4,5-TP (Silvex) (µg/L)	Atrazine (µg/L)	Hexachloro- benzene (µg/L)	Hexachloro- cyclopentadiene (µg/L)	Methoxychlor (µg/L)	Pentachloro- phenol (µg/L)	Picloram (µg/L)	Polychlorinated Naphthalenes (µg/L)
Comal Springs (DX-68-23-301)										
Hueco Springs (DX-68-15-901)	<0.01	<0.01	<0.01							
SanPedroSprings	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
SanAntonioSprings	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Blanco River @ Wimberley	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
				<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Medina River @ Bandera	<0.01	<0.01	<0.01							
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Hondo Creek @ Tarpley	<0.01	<0.01	<0.01							
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Seco Creek @ Miller Ranch	<0.01	<0.01	<0.01							
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Sabinal River @ Sabinal	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Frio River @ Concan	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Dry Frio River @ Reagan Wells	<0.01	<0.01	<0.01							
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01
Nueces River @ Laguna	<0.01	<0.01	<0.01							
	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05	<0.01	<0.01

**Analytical data for pesticides and herbicides in water from streams crossing the Edwards Aquifer Recharge Zone
and springs discharging from the Edwards Aquifer, 1998.**

Station name	Simazine (µg/L)	Alachlor (µg/L)	Aldicarb (µg/L)	Aldicarb Sulfoxide (µg/L)	Carbofuran (µg/L)	Dalapon (µg/L)	Dinoseb (µg/L)	Oxymyl (µg/L)
Comal Springs (DX-68-23-301)								
Hueco Springs (DX-68-15-901)								
SanPedroSprings	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
SanAntonioSprings	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Blanco River @ Wimberley	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Medina River @ Bandera	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Hondo Creek @ Tarpley	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Seco Creek @ Miller Ranch	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Sabinal River @ Sabinal	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Frio River @ Concan	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Dry Frio River @ Reagan Wells	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
Nueces River @ Laguna	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01