EDWARDS AQUIFER
AUTHORITY

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EDWARDS AQUIFER AUTHORITY HYDROGEOLOGIC DATA REPORT FOR 1999

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1.0 INTRODUCTION

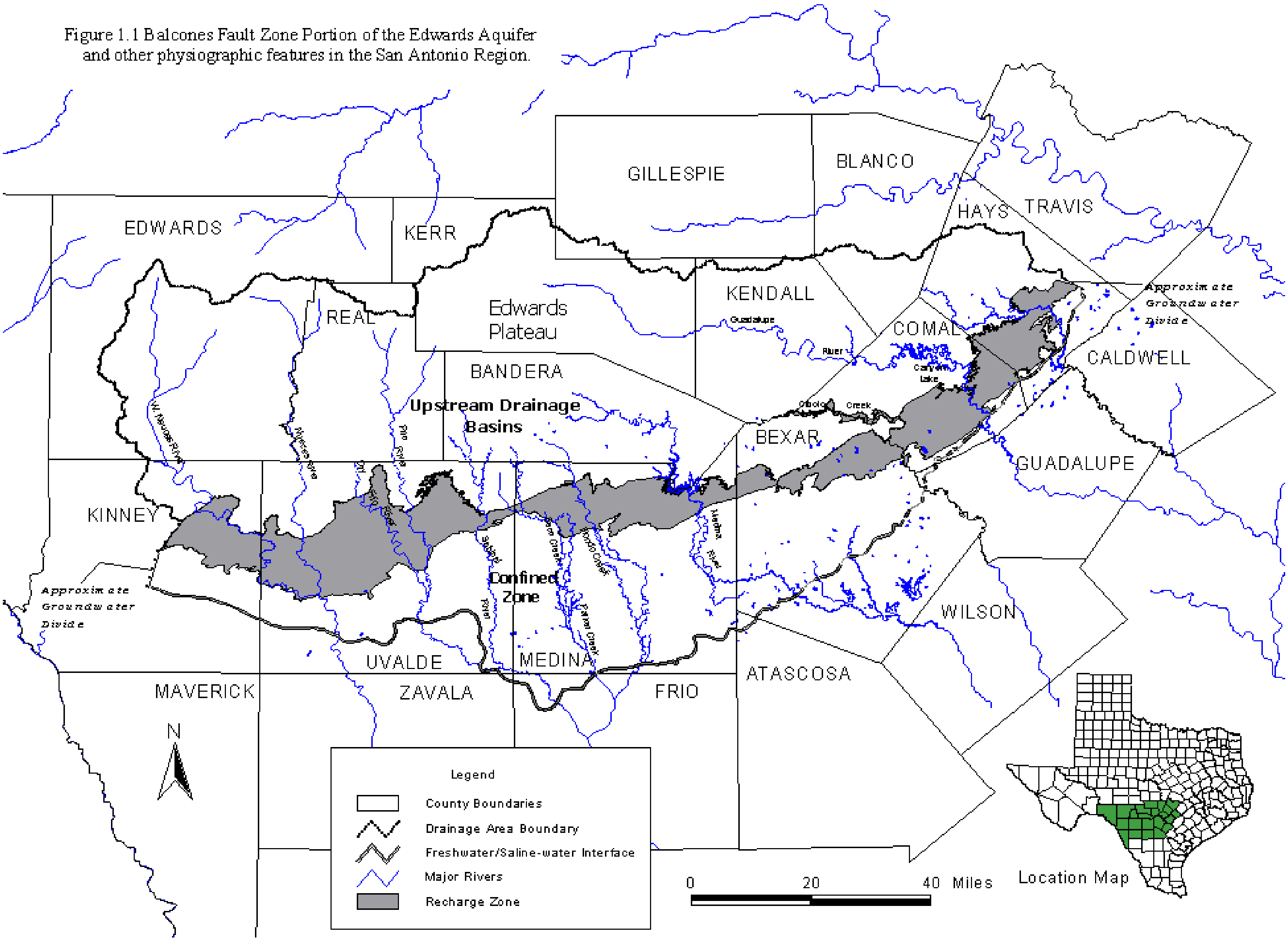
Located in south central Texas, the Edwards Aquifer is one of the most permeable and productive aquifers in the United States. The Balcones Fault Zone portion of the aquifer in the San Antonio region extends from the groundwater divide near Brackettville in Kinney County – east to the city of San Antonio and Bexar County – then northeast to the groundwater divide near Kyle in Hays County – a distance of approximately 180 miles **(Figure 1.1).** The aquifer is the water source for approximately 1.7 million people in the region and is also a major source of water for agriculture and industry. In addition, the aquifer discharges through a series of large springs that provide the aquatic habitat for a number of endangered species. Springflow also provides a significant portion of water for down stream interests in the Guadalupe River basin.

The Edwards Aquifer Authority (the Authority) was created by the Texas Legislature in 1993 to replace the Edwards Underground Water District (EUWD) and was mandated to manage, preserve, and protect the Edwards Aquifer. The Authority encompasses all or parts of an eight-county area including Uvalde, Medina, Atascosa, Bexar, Comal, Guadalupe, Hays, and Caldwell counties. 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, domestic, 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 being 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."

The Edwards Aquifer discussed in this data report refers to the Balcones Fault Zone portion of the Edwards Aquifer in the San Antonio region that extends from a groundwater divide near Brackettville in Kinney County to a groundwater divide near Kyle in Hays County as indicated on Figure 1.1. The report presents quantitative and qualitative data collected in 1999, as well as an historical perspective by providing annual data for the period of record (1934-1999). Information concerning water levels and water quality are provided in this report.

Figure 1.1 Balcones Fault Zone Portion of the Edwards Aquifer and other physiographic features in the San Antonio Region.



2.0 HYDROGEOLOGY OF THE EDWARDS AQUIFER

The Edwards Aquifer is contained within the Cretaceous age Edwards Group limestone (Edwards Limestone) and associated units. The aquifer is generally capped by the Del Rio Clay and overlays the Glen Rose Formation (upper unit of the Trinity Aquifer).

The Edwards Aquifer is one of the largest and most important karst aquifer systems in the United States. Historically, the aquifer has been protected by its great depth below population centers and undeveloped land in the recharge and contributing zones. Generally, the water quality in the aquifer is among the best in the United States. However; threats to the aquifer are many and occur from various sources including the transport and use of hazardous materials across the recharge zone, abandoned water wells, urban non-point runoff, etc.

The Edwards Aquifer is one of the most productive karst groundwater systems in the United States. The aquifer extends through parts of Kinney, Uvalde, Medina, Frio, Atascosa, Bexar, Comal, Guadalupe, and Hays County in south central Texas – covering an area approximately 180 miles long and 5 to 40 miles wide. The Edwards is the predominant water source for much of this area including the City of San Antonio, the eighth largest city in the United States. Historically, the cities of San Marcos, New Braunfels, and San Antonio were founded around large springs that flow from the aquifer. As the region grew, wells were drilled into the Edwards to supplement the water supplied by the springs. In addition, the aquifer has become an important water source for agriculture and industry in the region.

The Edwards Aquifer is named after and contained in the Edwards Limestone of Cretaceous age. The Edwards Limestone and associated units range from 450 to over 600 feet thick in the region. A series of faults in the Balcones fault zone has exposed the Edwards Limestone at the surface along the southern boundary of the Texas Hill Country. Down faulting has dropped the Edwards Limestone to great depth below the surface along the aquifer's southern boundary. In some areas, fresh water can be found in the Edwards Limestone as much as 4,000 feet below the surface.

Water in the Edwards Aquifer is part of the hydrologic cycle and is constantly being recharged and discharged from the aquifer. Surface streams forming on the contributing zone (the Texas Hill Country), flow south and cross the Edwards Limestone outcrop (recharge zone) and during low flow conditions, most surface water is captured by the aquifer. In addition, rainfall that occurs directly on the recharge zone may also enter the aquifer. Groundwater moves through the aquifer and ultimately discharges from a number of locations such as Leona Springs in Uvalde County; San Pedro and San Antonio Springs in Bexar County; Hueco and Comal Springs in Comal County; San Marcos Springs in Hays County; and through domestic, municipal, agricultural, and industrial wells throughout the region. Residence time in the aquifer ranges from a few hours or days to many years depending upon depth of circulation, location, and other aquifer parameters.

The Edwards Aquifer is a karst aquifer that is characterized by the presence of sinkholes, sinking streams, caves, springs, and a well-integrated subsurface drainage system. The aquifer contains extremely high (cavernous) porosity and permeability that is characteristic of many karst aquifers. In contrast, aquifers that occur in sand and gravel or in bedrock such as sandstone, have a much lower permeability. The high porosity and permeability of the Edwards creates the conditions to allow extremely productive water wells, the rapid infiltration of surface water, and the quick response of groundwater levels to rainfall (recharge) events. While the Edwards Aquifer transmits very large volumes of water, the cavernous porosity provides rapid recharge and limited filtration of surface water.

3.0 GROUNDWATER LEVELS

In the San Antonio region of the Edwards Aquifer, periodic water level measurements have been compiled from a variety of wells since 1929. 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 level monitoring network from eastern Kinney County to central Hays County. **Plate 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).

In 1999, the Authority's water level data collection program consisted of 25 digital recorder-equipped observation wells and monthly measurements from 16 periodic observation wells. 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 16 observation wells on a monthly basis during normal aquifer conditions, and approximately 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. In many places, the Edwards and Trinity aquifers are hydraulically connected, allowing the interchange of groundwater, depending on hydraulic gradient. 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 used to make projections on future aquifer levels and spring discharge rates. 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, springflows increase as groundwater levels increase. Likewise, during drought or high-demand conditions, water levels and springflows generally decline, reflecting greater groundwater discharge than groundwater recharge. **Table 3.1** lists the annual records of high and low water levels measured in five selected Edwards Aquifer observation wells.

In 1999, discharge was generally greater than recharge as demonstrated by periods of decreasing water levels from January to March, April to June, and July to October **(Appendix A: Tables A-1 – A-6)**. The net decrease in water levels at the Bexar County index well (AY-68-37-203, or "J-17") between January 1^{st} and December 31^{st} was 22.6 feet (686.3 feet above MSL in January to 663.7 feet above MSL in December).

Table 3.1 Highest and lowest recorded water levels for selected observation wells in the San Antonio Region of the Edwards Aquifer, 1934-1999 (measured in feet above Mean Sea Level).

Year	City of Uvalde Uvalde County YP-69-50-302a (J-27)		Castroville Medina County TD-68-41-301b		San Antonio Bexar County AY-68-37-203c (J-17)		New Braunfels Comal County DX-68-23-302d		Kyle Well Hays County LR-67-01-304e	
	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

(Table 3.1 continued)

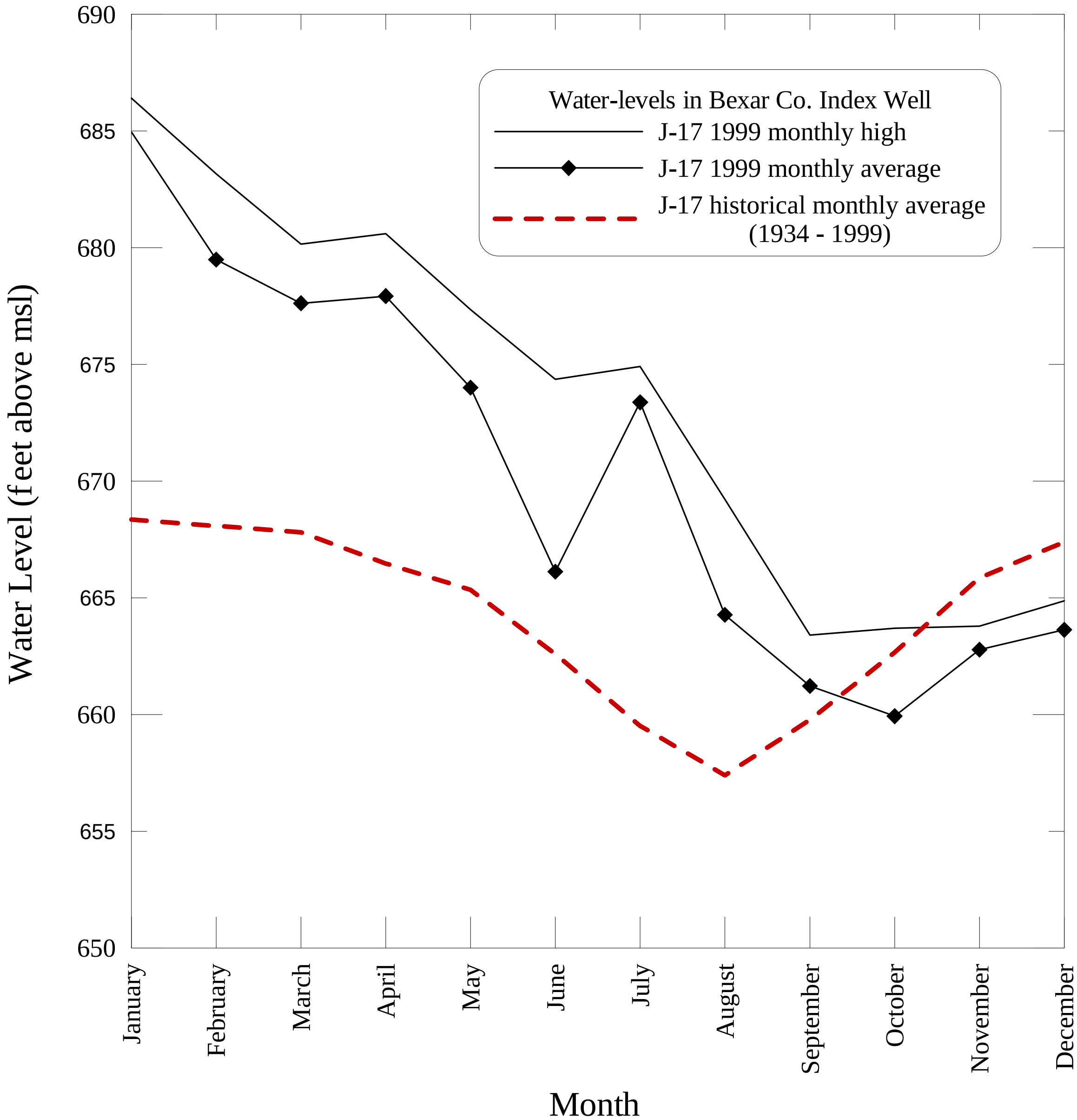
Year	City of Uvalde Uvalde County YP-69-50-302[a]		Castroville Medina County TD-68-41-301[b]		San Antonio Bexar County AY-68-37-203[c]		New Braunfels Comal County DX-68-23-302[d]		Kyle Well Hays County LR-67-01-304[e]	
	High	Low	High	Low	High	Low	High	Low	High	Low
1990	872.9	861.6	679.5	640.8	658.1	622.7	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
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
1999	880.7	876.8	716.4	682.9	686.4	656.9	628.7	624.9	588.6	537.9
Average	High	Low	High	Low	High	Low	High	Low	High	Low
	872.4	863.4	701.4	672.4	675.5	652.0	626.6	623.4	583.1	566.6
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, 2000.
"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).

Overall, the water levels in the Edwards Aquifer were higher during seven out of 12 months in 1999 relative to water levels recorded in 1998. The high water levels at the beginning of 1999 were due to above average precipitation in late 1998. The average annual water level for 1999 (670.4 feet above MSL) at J-17 was higher than the average annual water level at J-17 for 1998 (667.7 feet above MSL). The Edwards Aquifer water levels never reached the Authority's Critical Period Management Plan trigger level at J-17 for Stage I (i.e., at or below 650 feet MSL). The Critical Period Management Plan became effective in April 1998 (Rick Illgner, personal communication, 1998). **Figure 3.1** compares the J-17 monthly average water level for the period of record and water levels for the year 1999. **Tables A-1** through **A-6** in **Appendix A** show 1999 water levels for selected observation wells.

Appendix B contains the 1999 hydrographs, with precipitation information, for the index wells in Bexar, Medina and Uvalde counties. **Appendix B** also contains the 1999 hydrographs, with precipitation information, for Comal and San Marcos Springs in Comal and Hays counties respectively. The hydrographs indicate the periods of relatively lower and higher water levels and how water levels in the Edwards Aquifer rapidly reacts to rainfall events.

Figure 3.1 Water level comparison between the monthly average for the period of record (1934-1999), the monthly highs for 1999, and the monthly average at the Bexar County index well, AY-68-37-203 (J-17).



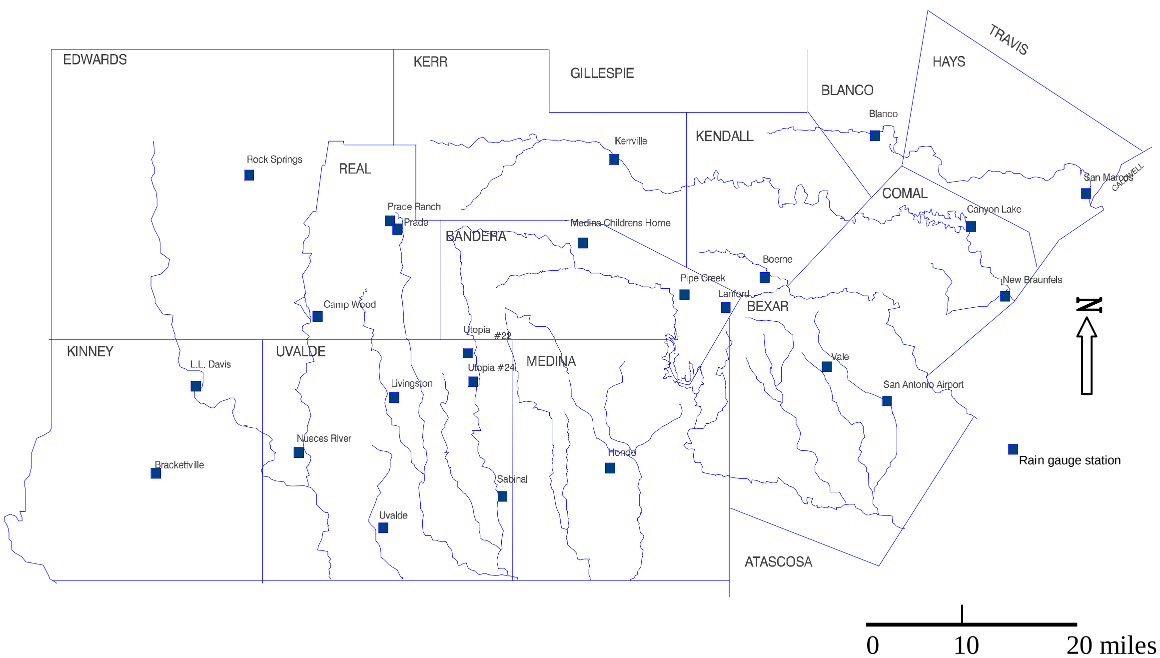
4.0 PRECIPITATION

4.1 Precipitation in the Edwards Aquifer Region

Precipitation is the principal 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 recharged 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 4.1** is a map showing the locations of precipitation gauging stations used by the Authority and other agencies to calculate recharge to the aquifer in 1999.

Figure 4.1 Sites used by the Edwards Aquifer Authority and other agencies to monitor precipitation in 1999.



Precipitation data for San Antonio has been collected by various agencies since 1871. 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 1999 was approximately 45% below average. Average precipitation in San Antonio for the period between 1934 and 1999 is 30.02 inches. In 1999, total precipitation measured at the San Antonio International Airport was 16.63 inches.

Figure 4.2 is a graph of precipitation data for San Antonio from 1934 to 1999. **Table 4.1** lists annual precipitation for selected rain gauges in the region. **Table 4.2** shows monthly measurements for 1999 at selected rain gauge stations across the region.

Figure 4.2 Annual precipitation and average precipitation for San Antonio, 1934-1999.

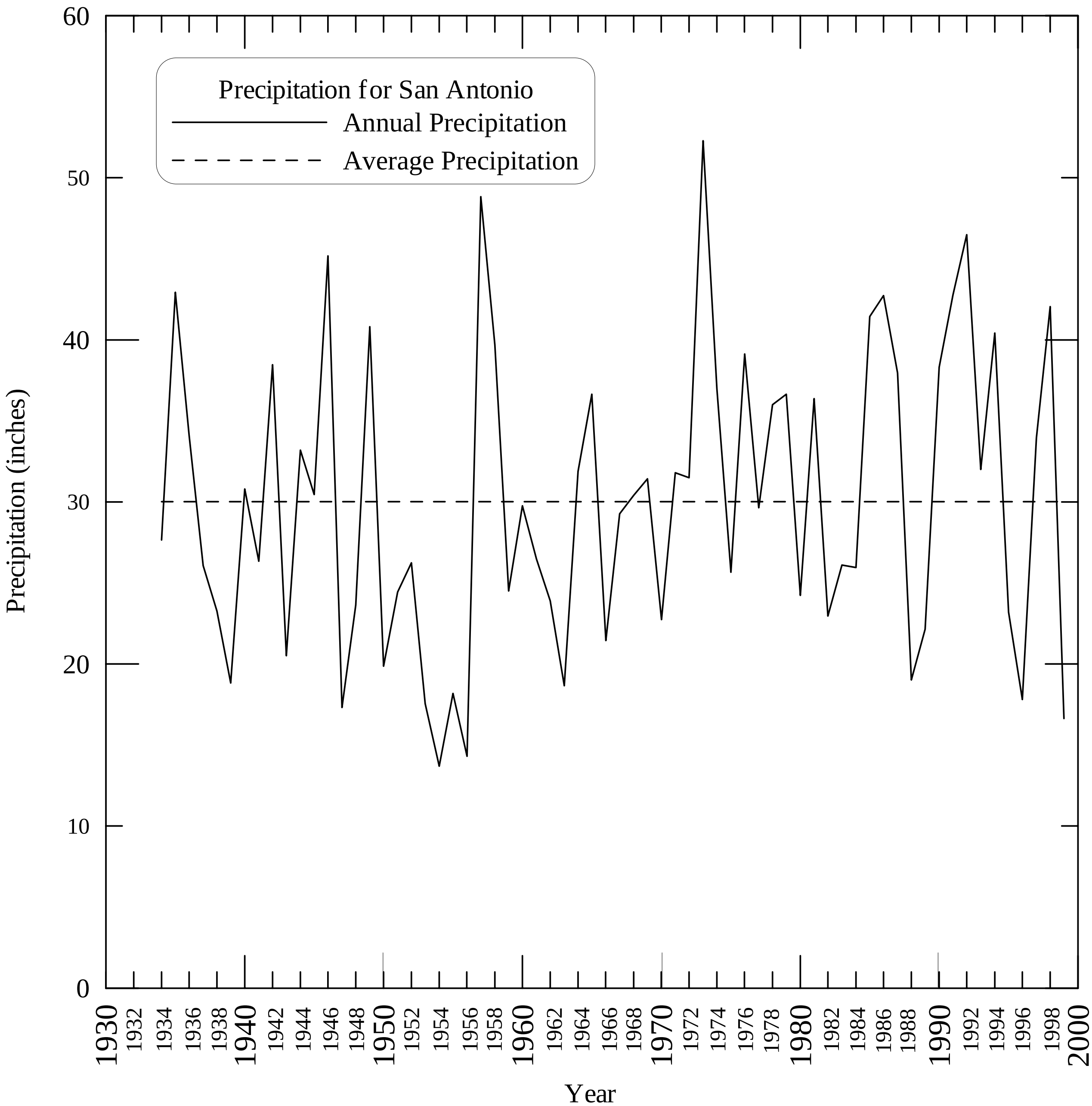


Table 4.1 Annual precipitation for selected rain gauges in the Edwards Aquifer Region, 1934-1999 (measured in inches).

Year	Brackettville	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	41.43	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 4.1 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
1999	19.88	19.08	2.55b	16.94	16.63	18.67	21.07	19.38
Years of Record	97	96	81	95	115	95	100	96
Yearly Average	21.68	23.68	24.01b	28.26	30.02	33.66	33.10	34.24

Data source: US Department of Commerce (2000), NOAA (1934-1999).
"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 4.2 Monthly precipitation data from selected Edwards Aquifer Authority and National Oceanic and Atmospheric Administration precipitation-gauging stations, 1999 (measured in inches).

Gauge	County	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
San Antonio Intl. Airport	Bexar	0.08	0.01	3.48	0.91	2.78	3.37	1.97	2.11	0.06	1.29	0.05	0.52	16.63
Vanderpool 10N	Bandera	---	0.0	2.76	1.98	6.60	4.30	0.0	0.38	0.69	1.65	---	0.200	18.56
Children's Home	Bandera	0.0	0.0	3.50	1.19	3.05	4.40	1.50	0.38	0.32	1.32	0.0	0.0	15.66
Landford	Bandera	0.15	0.0	3.58	1.83	1.77	4.52	6.02	2.03	0.70	2.48	0.0	0.30	23.38
New Braunfels	Comal	0.17	0.0	3.03	1.99	3.58	6.43	3.28	0.20	0.0	1.74	0.17	0.48	21.07
San Marcos	Hays	0.84	0.02	2.12	1.79	3.46	5.81	3.05	0.04	0.44	1.30	0.10	0.41	19.38
Kerrville	Kerr	0.05	0.03	3.19	1.36	3.23	2.98	2.96	0.24	0.97	2.33	---	0.42	17.76
Hondo	Medina	0.07	0.11	3.44	1.79	1.80	5.19	0.44	070	0.29	0.28	0.04	0.29	16.94
Prade Ranch	Real	0.15	0.0	3.86	6.27	0.0	4.6	1.85	0.0	0.0	1.60	0.0	0.0	18.33
Uvalde	Uvalde	0.0	0.0	3.16	1.34	1.46	6.61	3.35	1.38	0.36	1.30	0.0	0.12	19.08
Utopia 22	Uvalde	0.10	0.0	2.01	2.25	1.31	7.97	0.0	0.25	2.45	0.15	0.0	0.0	16.49
Utopia 24	Uvalde	0.0	0.0	1.90	3.39	3.60	2.99	2.70	0.45	1.60	0.15	0.0	0.0	16.78
Sabinal	Uvalde	---	---	---	---	---	---	---	---	0.09	2.38	0.0	0.08	2.55

Table 4.2, continued

Gauge	County	Average	Deviation from Avregae
San Antonio Intl. Airport	Bexar	30.02	-13.39
New Braunfels	Comal	33.10	-12.03
San Marcos	Hays	34.24	-14.86
Hondo	Medina	28.26	-11.32
Uvalde	Uvalde	23.68	-4.60

Data source: Edwards Aquifer Authority and US Department of Commerce (NOAA), 2000.
"---" indicates missing or incomplete data for the month.

The San Antonio region is situated between the semi-arid Chihuahuan Desert area to the west and a wetter more humid Coastal Plain 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 approximately 13 to 52 inches (NOAA, 1999).

In 1999, total rainfall across the region was below average. The western area of the Edwards Aquifer and contributing zone was approximately 4 inches below normal; however, San Antonio/Bexar County was 13.39 inches below normal and San Marcos/Hays County was 14.86 inches below normal. The months of September, November, and December were exceptionally dry. Decreased rainfall and subsequent low recharge was reflected in lower than average water levels and spring flow in the last quarter of the year.

4.2 Precipitation Enhancement Program (PEP)

The Edwards Aquifer Authority Board of Directors voted in the Fall of 1997 to pursue 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 to the Authority's precipitation enhancement contractor (Weather Modification, Inc.) and is valid for four years beginning in January 1999 and ending in December 2002. The permit allows the Authority, through its contractor, to conduct precipitation enhancement anytime during the year, including the traditional period of April through September. The goals of the PEP are:

- To enhance rainfall in a targeted area by using state-of-the-art cloud seeding technology and procedures to seed suitable convective clouds (Weather Modification, Inc., 2000);
- To increase the average annual quantity of water that may be withdrawn from the aquifer;
- To reduce the periods of low water levels and resulting threatened springflows;
- To reduced and delay potentially large expenditures to import surface water for aquifer recharge; and
- To develop and demonstrate weather modification management techniques that will improve reliability and efficiency of water supply at desired locations.

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. The project area consists of over six million acres across south Texas, covering all or parts of 12 counties including Real, Uvalde, Kerr, Bandera, Medina, Bexar, Blanco, Comal, hays, Guadalupe, and Caldwell (Weather Modification, Inc., 2000). Additional benefits may be realized even 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. The year 1999 was characterized as one with many low intensity thunderstorms and a few days with severe, long-lived, high intensity storms. Although there were numerous cumulus type clouds on most days, they were of the fair weather variety and had no potential to produced precipitation (Weather Modification, Inc., 2000). Weekly reports are posted at the Authority' web page at http://www.e-aquifer.com/Weathermod/weathermod.htm.

Weather Modification, Inc. reported that PEP operations were very successful in 1999. During the 5-month project, the aircraft completed 59 seeding and reconnaissance missions. These flights totaled 174.9 hours, and took place on 38 days. Approximately 37.5 kg of silver iodide was dispersed as seeding agent during the flights. A detailed assessment of the seeding effectiveness is beyond the scope of the present contract of Weather Modification, Inc. but some preliminary analyses of the TITAN radar storm tracking data support the hypotheses of promotion of additional rainfall from seeded storms (Weather Modification, Inc., 2000). The Texas Water Development Board (TWDB) and TNRCC are currently working to evaluate the effectiveness of weather modification as a water resources management tool.

5.0 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 5.1** identifies the major drainage basins that cross the EARZ. These basins are also listed below in **Table 5.1**.

Table 5.1 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

Estimates of the contribution from adjacent hydraulically connected aquifers ranges from 5,000 to 60,000 acre feet per year. However, 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 5.2** lists estimated annual recharge by river basin from 1934 through 1999, based on USGS calculations. The USGS estimates that annual recharge for the period of record (1934 to 1999) ranged from 43,700 acre-feet at the height of the drought of record in 1956, to 2,486,000 acre-feet in 1992. In 1999, estimated recharge was 473,400 acre-feet. Average annual recharge from 1934 to 1999 was 680,000 acre-feet. However, since 1990, the ten-year average annual recharge has been estimated to be approximately 970,900 acre-feet. **Figure 5.2** 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 1999.

Recharge directly affects groundwater levels in the aquifer. Water levels rise during periods 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. Below normal rainfall conditions in 1999 resulted in a noticeable decrease of recharge to the Edwards Aquifer relative to the 1998 recharge estimate.

The Authority operates four recharge dams across the EARZ. The locations of the recharge structures are shown in **Figure 5.1**. A linear regression analysis of historical rainfall and recharge indicates that no recharge occurred at the dams in 1999. However, one recharge event was observed at Seco Creek Sinkhole in June 1999. **Table 5.3** shows the annual historical recharge recorded, or estimated for each site since construction.

Figure 5.1 Major drainage basins and Edwards Aquifer Authority recharge structures in the San Antonio region of the Edwards Aquifer.

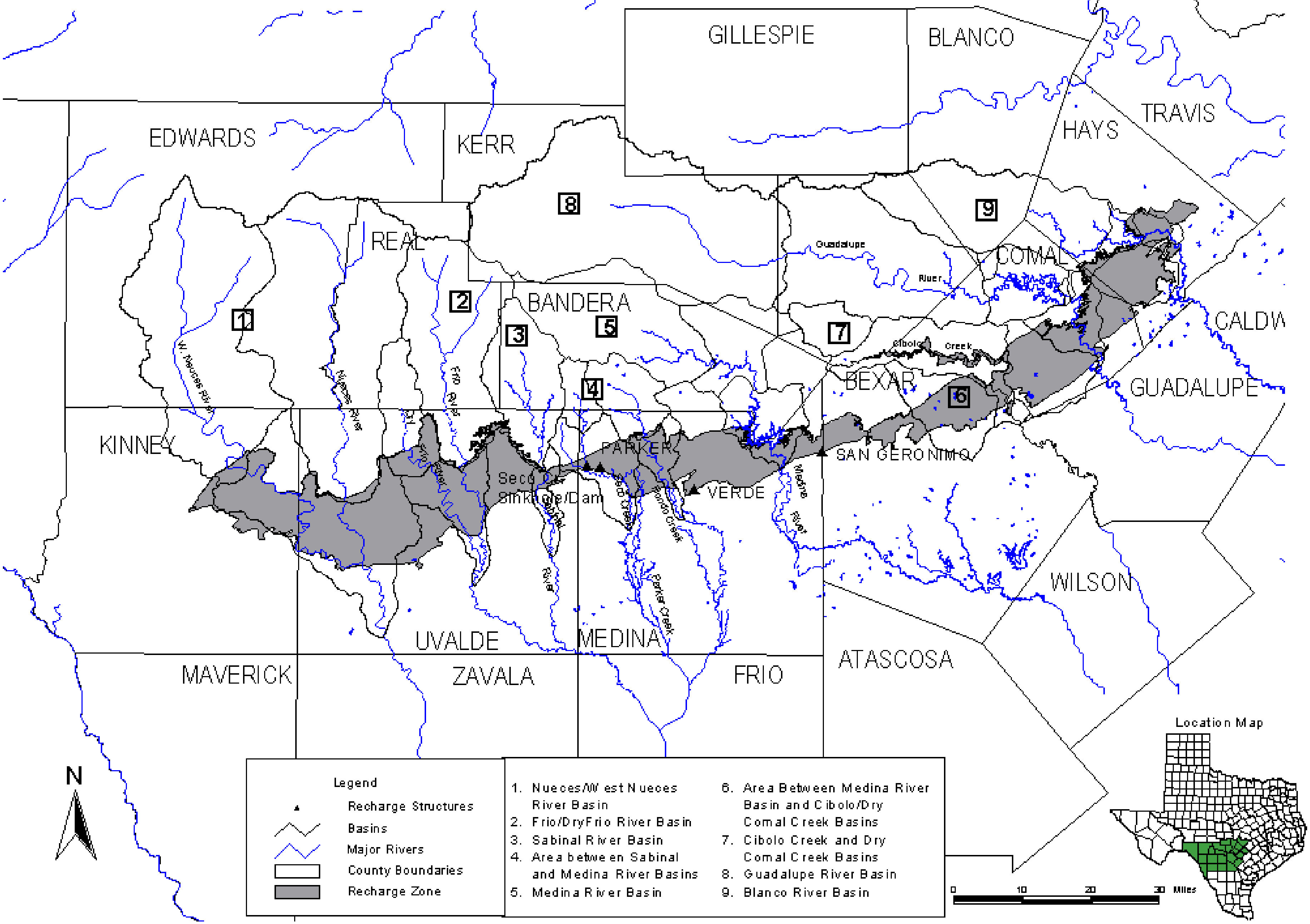


Table 5.2 Estimated annual groundwater recharge to the Edwards Aquifer by drainage basin, 1934-1999 (measured in thousands of acre-feet).

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	17.0	33.1	42.4	9.3	9.6	11.1	399.0
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	139.0	54.1	116.3	191.2	57.8	850.7
1942	103.5	95.1	34.0	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	76.0	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	52.0	51.4	105.1	155.3	40.7	556.1
1947	72.4	77.7	16.7	45.2	44.0	55.5	79.5	31.6	422.6
1948	41.1	25.6	26.0	20.2	14.8	17.5	19.9	13.2	178.3
1949	166.0	86.1	31.5	70.3	33.0	41.8	55.9	23.5	508.1
1950	41.5	35.5	13.3	27.0	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	10.0	10.7	162.1
1955	128.0	22.1	0.6	7.7	16.5	4.3	3.3	9.5	192.0
1956	15.6	4.2	1.6	3.6	6.3	2.0	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	300.0	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	127.0	104.0	89.7	160.0	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	27.0	5.0	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	83.0	23.2	104.0	54.6	78.8	115.3	66.7	623.5
1966	169.2	134.0	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	19.0	466.5
1968	130.8	176.0	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	68.0	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	49.0	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	973.0
1976	150.7	238.6	68.2	182.0	94.5	47.9	54.3	57.9	894.1
1977	102.9	193.0	62.7	159.5	77.7	97.9	191.6	66.7	952.0
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	205.0	365.2	105.6	252.1	91.3	165.0	196.8	67.3	1448.3
1982	19.4	123.4	21.0	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	17.0	24.9	69.9	12.6	28.5	25.5	355.5

(Table 5.2 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 Cibolo Creek/ Dry Comal Creek basin	Cibolo 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	255.0	54.6	131.2	54.0	35.9	71.8	41.3	1123.1
1991	325.2	421.0	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	2486.0
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	57.0	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
1999	101.4	136.8	30.8	57.2	77.1	21.2	27.9	21.0	473.4
For the period of record 1934-1999:									
Average	116.7	134.4	42.0	107.8	61.6	70.1	104.9	42.5	680.0
Median	99.7	120.7	30.9	78.4	60.5	49.9	77.4	34.1	547.1
For the period of record 1990-1999:									
Average	185.3	229.3	62.4	165.7	66.3	83.2	109.3	69.2	970.9
Median	135.8	180.3	44.7	96.8	62.5	37.6	81.4	39.6	830.6

Data source: USGS, 2000.
*Total may not be equal to sum of basin values due to rounding.

Figure 5.2 Estimated annual recharge and ten-year floating average recharge for the San Antonio area of the Edwards Aquifer (1934-1999).

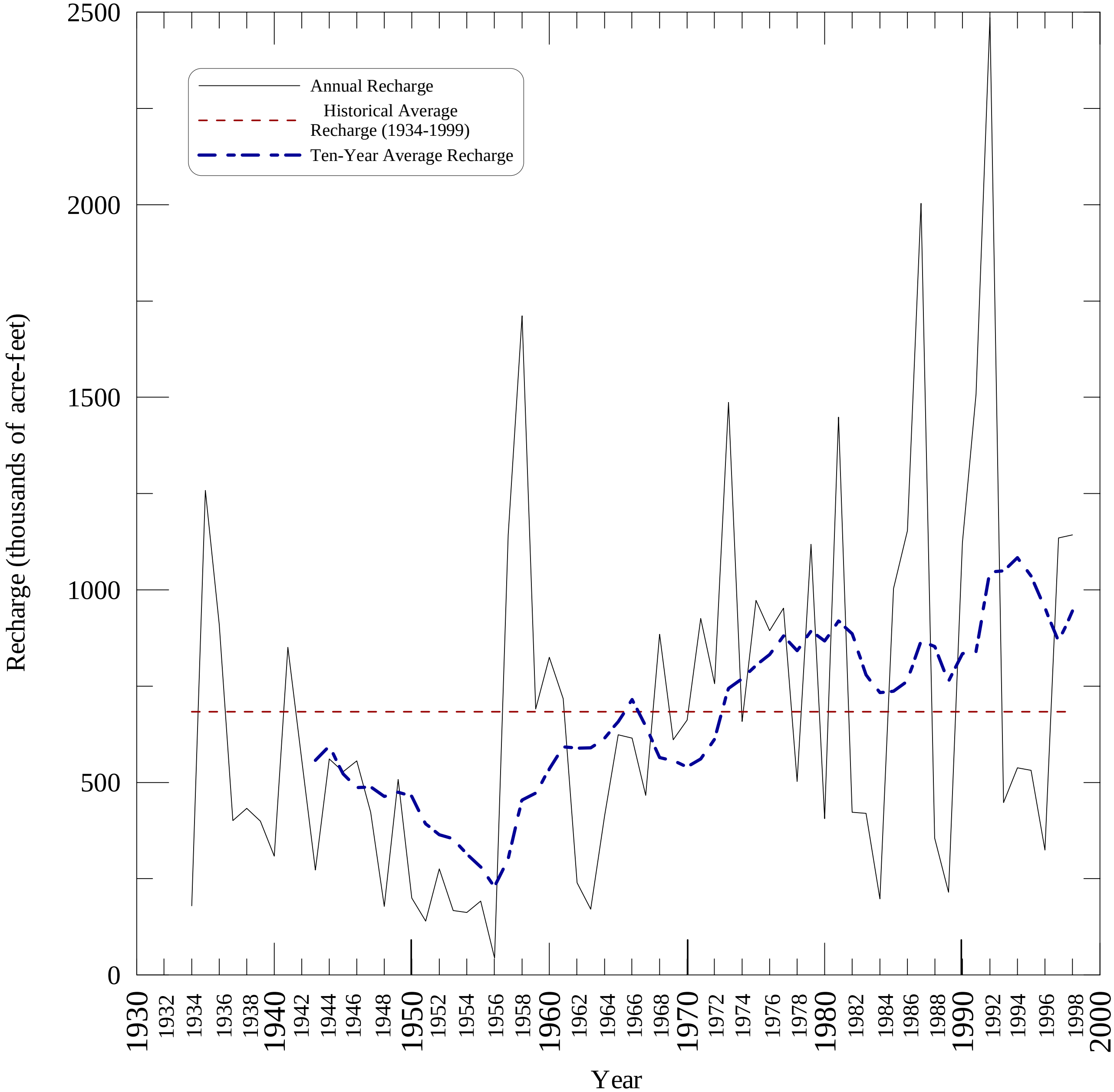


Table 5.3 Estimated annual Edwards Aquifer recharge from Edwards Aquifer Authority recharge projects (measured in acre-feet).

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	1469a\b	1160b	872b	3796b	7297
1999	0b	0b	0b	50c	50b/c
Total	**14,802**	**16,314**	**12,839**	**37,790**	**81,745**
Average	569	742	563	2,223	3,144
Median	160	250	91	479	794

Data source: USGS and Edwards Aquifer Authority, 2000.
"a" Provisional data.
"b" Determined by linear regression analysis.
"c" Linear regression analysis indicates zero recharge; however, one recharge event was observed that was estimated to have recharged 50 acre feet.
"---" indicates no data available.

The 1999 recharge estimates shown in **Table 5.3** for Parker Creek, Verde Creek, San Geronimo, and Seco Creek dams were determined by a linear regression analysis, using the "least squares" method. 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 1999. The historical average annual recharge contributed by the combined structures is 3,142 acre-feet.

6.0 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 is the primary basis of 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 currently calculated by measuring downstream flows from springs, or by measuring water levels in observation wells near the springs, and then making the necessary corrections from these values. **Figure 6.1** indicates the location of the major springs of the Edwards Aquifer. The groundwater discharge resulting from pumping is calculated by tabulating reported water use data from municipal, irrigation, and industrial wells. Discharge from domestic and livestock wells is estimated.

Estimates of annual groundwater discharge from springflow and pumping for the San Antonio area of the Edwards Aquifer are available from 1934 to 1999 (**Table 6.1**). 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 1999, total groundwater discharge from the Edwards Aquifer from wells and springs was estimated at 898,800 acre-feet.

Springflow from 1934 to 1999 has varied from a low of 69,800 acre-feet in 1956 to a high of 802,800 acre-feet in 1992 (**Table 6.1**). **Table 6.2** lists the monthly estimated discharge in 1999 for six primary Edwards Aquifer springs. Spring discharge from the Edwards Aquifer for 1999 was calculated at 456,100 acre-feet. Spring discharge accounted for 51 percent of total discharge from the Edwards Aquifer in 1999 (**Tables 61 and 6.2**).

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 6.2** 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 442,700 acre-feet in 1999, or an increase of approximately 300 percent. Average annual well production was estimated to be 300,600 acre-feet per year for the period of record from 1934 to 1999, while the estimated 10-year average for pumping from 1990 through 1999 was 424,900 acre-feet (**Table 6.1**). Reported groundwater pumping accounted for 442,700 acre-feet of water discharged from the Edwards Aquifer in 1999.

Table 6.3 shows the 1999 discharge data by use for the counties in the region. The discharge estimates were compiled from pumpage data reported by municipal, industrial, and agricultural users to the Authority. Pumpage from domestic supply, stock, and miscellaneous use were estimated by the Authority. **Table 6.4** shows annual estimated Edwards Aquifer groundwater discharge by use from 1955 to 1999.

Figure 6.1 Major Springs in the San Antonio Region of the Edwards Aquifer.

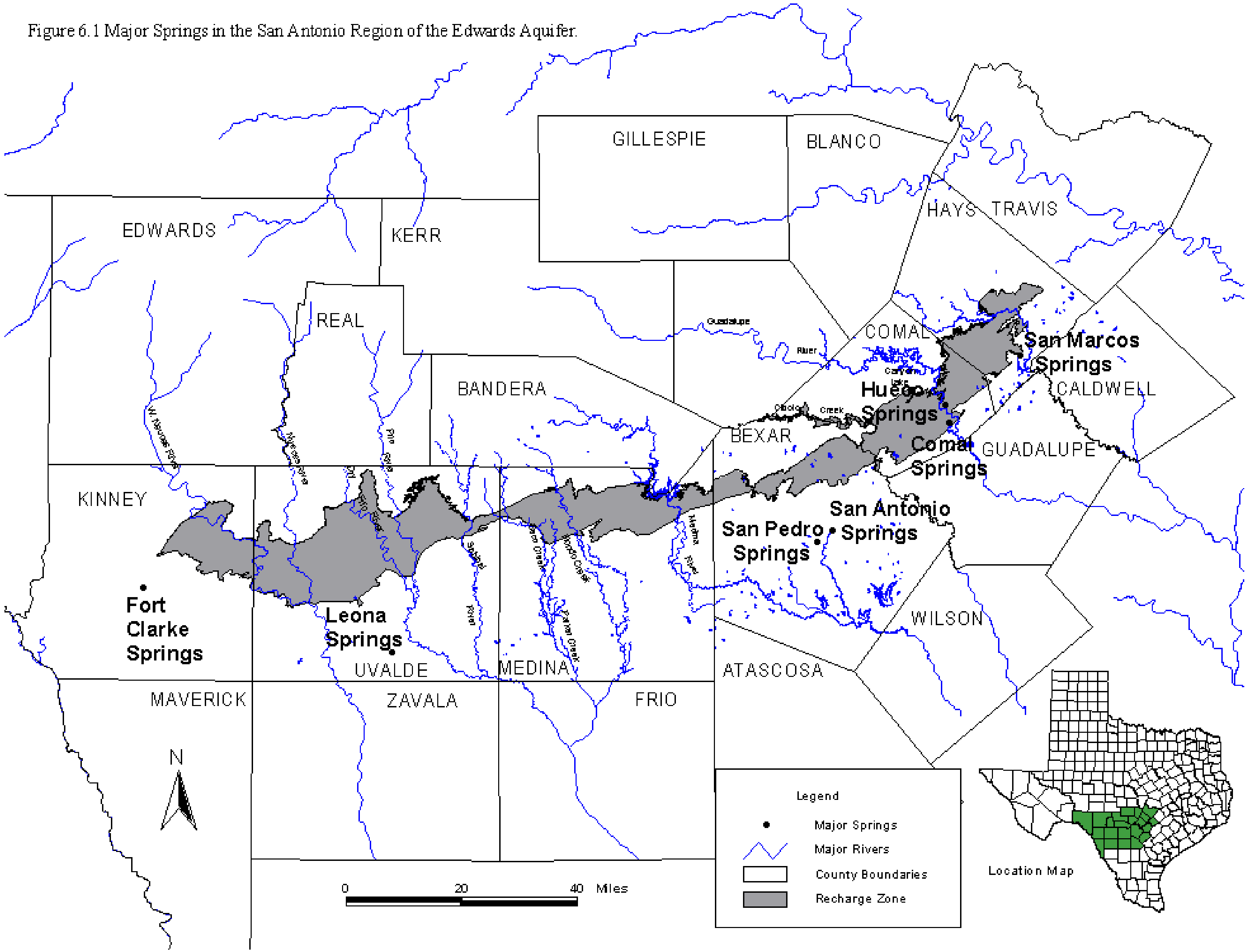


Table 6.1 Annual estimated groundwater discharge data by county for the Edwards Aquifer, 1934-1999 (measured in thousands of acre-feet).

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
1994	95.5	41.1	297.7	269.8	110.6	814.8	424.6	390.2

(**Table 6.1 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	271.8c	168.8	917.6	453.5	464.1
1999	104.0	49.2	307.1b	295.5c	143.0	898.8	442.7	456.1
For period of record 1934-1999:								
Average	71.1	19.6	236.2	220.2	118.9	667.4	300.6	366.7
Median	62.1	11.5	218.8	231.8	116.2	657.1	292.0	375.7
For period of record 1990-1999 (10 years):								
Average	97.7	39.7	314.0	262.0	144.2	850.4	424.9	425.5
Median	99.8	38.2	310.0	256.6	146.1	802.7	430.3	387.1

Data source: USGS and Edwards Aquifer Authority, 2000.
"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 subsequent years.
*Note: **Table 6.1** was updated on February 9, 2001.*

Table 6.2 Estimated spring discharge from the Edwards Aquifer, 1999 (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.	25,517	19,154	4,826	4,733	893	3,108	58,231
Feb.	22,159	15,277	3,999	2,305	594	2,762	47,096
March	23,702	14,025	3,817	1,913	583	2,931	46,971
April	22,191	11,562	3,093	1,957	576	2,919	42,298
May	22,106	11,052	2,628	973	456	3,066	40,281
June	19,809	10,742	2,056	224	235	2,921	35,987
July	21,421	10,933	1,843	793	433	3,052	38,475
Aug.	19,523	9,041	1,564	0	185	2,968	33,281
Sept.	17,687	7,656	1,188	0	117	2,612	29,260
Oct.	17,514	7,011	988	0	100	2,171	27,784
Nov.	17,712	6,770	830	0	145	2,072	27,529
Dec.	18,361	7,089	729	0	168	2,555	28,902
Total	**247,702**	**130,312**	**27,561**	**12,898**	**4,485**	**33,137**	**456,095**

Data source: USGS, 2000.
Differences may occur due to rounding procedures.

Figure 6.2 Groundwater pumping compared to springflow in the Edwards Aquifer, 1934-1999 (measured in thousands of acre-feet).

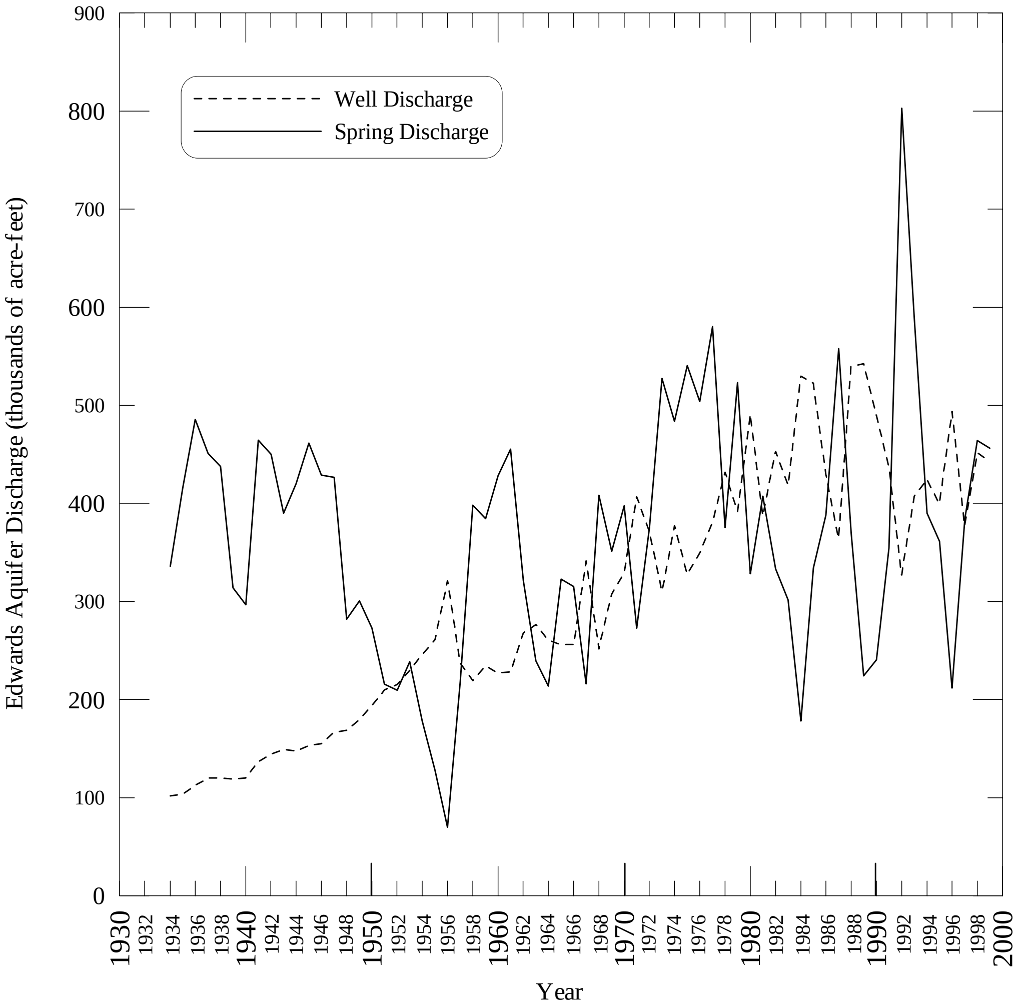


Table 6.3 Total groundwater discharge from the Edwards Aquifer, 1999 (measured in thousands of acre-feet).

County	Irrigation	Municipal /Military	Domestic /Stock	Industrial	Total Wells	Springs (est'd by USGS)	Total Well & Springs
Bexar	14.4 a,b	241.4	8.8	25.1	289.7	17.4	**307.1**
Comal	0.1 b	7.4	0.3	12.4 d	20.2	275.3	**295.5**
Hays	0.02 b	10.2	0.8	1.7	12.7	130.3	**143.0**
Medina	40.0 b	7.2	0.9	1.1	49.2	0.0	**49.2**
Uvalde	58.5 b	6.1	2.3	2.1	69.0	33.1	**102.1**
Kinney	0.6	1.0	0.3	0.0	1.9c	0.0	**1.9**
Total	**113.6**	**273.3**	**13.4**	**42.4**	**442.7**	**456.1**	**898.8**

Differences may occur due to rounding procedures.
Data source: Edwards Aquifer Authority, and USGS 2000.
"a" Includes Atascosa County.
"b" Estimated from reports of Edwards Aquifer irrigators.
"c" Estimated by USGS, and Edwards Aquifer Authority.
"d" Includes Guadalupe County.

Table 6.4 Annual estimated Edwards Aquifer groundwater discharge by use, 1955-1999 (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 6.4 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
1999	113.6	273.3	13.4	42.4	456.1
Average 1955-99	108.8	203.2	31.8	23.7	371.7
Median 1955-99	104.2	205.3	32.3	22.3	375.5
Average 1988-99	106.2	254.0	25.9	39.0	425.3
Median 1988-99	100.1	254.0	23.7	38.1	387.1

Data source: USGS and Edwards Aquifer Authority, 2000.
"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 1999. Prior to 1997, 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 Authority initiated the Edwards Aquifer Well Metering Program in 1997. This program requires that all municipal, industrial, and irrigation Edwards Aquifer wells be metered. Since 1998, the Authority has 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.

7.0 GROUNDWATER QUALITY

7.1 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.

In 1999, the Authority in cooperation with the USGS, San Antonio Water System, and TWDB collected water quality samples from 57 wells, two springs, and eight surface streams. The locations of these sites are shown in **Plate 2.** 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. All water samples were analyzed in the laboratory for common major ions, minor elements (metals, including heavy metals), total dissolved solids (TDS), hardness and nutrients. Water samples collected from twelve wells, two springs and eight stream locations were also analyzed for pesticides and herbicides. Water samples collected from eight wells and one spring were also analyzed for volatile organic compounds (VOCs). The parameters analyzed, drinking water standards and their typical concentrations in the Edwards Aquifer are listed in **Table 7.1**.

In 1999, water samples from 57 wells in the Edwards Aquifer were analyzed for minor element metals. Laboratory analyses indicated that several wells, primarily the saline zone transect wells, in San Antonio, New Braunfels, San Marcos, Uvalde ("Knippa Gap"), and the South Medina County observation well (TD-69-63-103), contained minor element metal concentrations above the method detection limit (MDL). None of the detected metal concentrations exceeded published maximum contaminant levels (MCLs) for drinking water. Also laboratory analyses indicated that several wells located across the region, in Comal, Medina and Uvalde counties, contained nitrate concentrations above the MDL. However, none of the nitrates concentrations exceeded the MCL. None of the groundwater samples analyzed for pesticides, herbicides and VOCs indicated detectable concentrations of these compounds.

In 1999, water samples collected from eight stream and two spring locations were analyzed for pesticides and herbicides. No pesticides or herbicides were detected in the samples. One Edwards Aquifer spring (Comal Springs) was sampled for VOC analysis in 1999. No VOCs were detected in the sample from Comal Springs.

Table 7.1 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
Alkalinity (mg/L)	--	200-250
Conductivity (μS/cm)	--	300-500
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	BMDL-0.1
Total Nitrite Nitrogen (mg/L)	1.0	BMDL-0.1
Total Ammonia Nitrogen (mg/L)	--	BMDL-0.1
Total Phosphorus (mg/L)	--	BMDL-0.1
Microbiological Parameters:	--	
Biochemical Oxygen Demand (mg/L)	--	BMDL-1
Total Organic Carbon (mg/L)	--	1-5
Detergents (MBAS)	--	BMDL-0.1
Total Coliform (cols/100ml)	10,000 (raw water for drinking-water supplies)	BMDL-5,000
Fecal Coliform (cols/100ml)	2,000 (raw water for drinking-water supplies)	BMDL-150
Fecal Streptococci (cols/100ml)	--	BMDL-100
Minor Elements (Metals):		
Arsenic (As) (μg/L)	50	BMDL-2
Barium (Ba) (μg/L)	2000	BMDL-100
Cadmium (Cd) (μg/L)	5	BMDL-1
Chromium (Cr) (μg/L)	100	BMDL-15
Copper (Cu) (μg/L)	1300**	BMDL-40
Iron (Fe) (μg/L)	300*	BMDL-500
Lead (Pb) (μg/L)	15**	BMDL-10
Manganese (Mn) (μg/L)	50*	BMDL-50
Mercury (Hg) (μg/L)	2	BMDL-1.5
Selenium (Se) (μg/L)	50	BMDL
Silver (Ag) (μg/L)	183a	BMDL
Zinc (Zn) (μg/L)	5000*	BMDL-2000
Nickel (Ni) (μg/L)	100	BMDL-4
Pesticides:		
Aldrin (μg/L)	0.005a	BMDL
Atrazine (μg/L)	3	BMDL
Chlordane (μg/L)	2	BMDL
DDD (μg/L)	0.355a	BMDL
DDE (μg/L)	0.25a	BMDL
DDT (μg/L)	0.25a	BMDL
Endrin (μg/L)	2	BMDL
Halowax (μg/L)	--	BMDL
Heptachlor (μg/L)	0.4	BMDL
Heptachlor epoxide (μg/L)	0.2	BMDL
Lindane (μg/L)	0.2	BMDL
Mirex (μg/L)	--	BMDL
Diazinon (μg/L)	--	BMDL
Ethion (μg/L)	--	BMDL

(Table 7.1 continued)

Parameter	Current Maximum or Secondary Contaminant Levels	Edwards Aquifer Typical Range of Results
Pesticides (cont'd):		
Malathion (µg/L)	--	BMDL
Methyl Parathion (µg/L)	--	BMDL
Methyl Trithion (µg/L)	--	BMDL
Parathion (µg/L)	--	BMDL
Trithion (µg/L)	--	BMDL
PCB (µg/L)	0.5	BMDL
Endosulfan (µg/L)	1.8a	BMDL
Ethyl Trithion (µg/L)	--	BMDL
Perthane (µg/L)	--	BMDL
Toxaphene (µg/L)	3	BMDL
Herbicides:		
2, 4-D (µg/L)	70	BMDL
2, 4, 5-T (µg/L)	--	BMDL
2, 4, 5-TP (Silvex) (µg/L)	50	BMDL
Volatile organic compound:		
Acetone (µg/L)	3650a	BMDL
Acrolein (µg/L)	730a	BMDL
Acrylonitrite (µg/L)	0.158a	BMDL
Bromoform (µg/L)	100a	BMDL
2-Butanone (µg/L)	--	BMDL
Carbon disulfide (µg/L)	3650a	BMDL
Chlorobenzene (µg/L)	100	BMDL
Chloroform (µg/L)	100a	BMDL
Chloromethane (µg/L)	--	BMDL
1,2 Dichlorobenzene (µg/L)	600	BMDL
1,3 Dichlorobenzene (µg/L)	75	BMDL
1,2 Dichloroethane (µg/L)	5	BMDL
2-Hexanone (µg/L)	--	BMDL
Methylene Chloride (µg/L)	5	BMDL
4-Methyl-2-pentanone (µg/L)	--	BMDL
1,1,1-Trichloroethane (µg/L)	200	BMDL
1,1,2-Trichloroethane (µg/L)	5	BMDL
1,2-Dichloroethane (µg/L)	5	BMDL
1,2-Dichloropropane (µg/L)	5	BMDL
1,1-Dichloroethylene (µg/L)	7	BMDL
1,2,4-Trichlorobenzene (µg/L)	70	BMDL
Benzene (µg/L)	5	BMDL
Carbon Tetrachloride (µg/L)	5	BMDL
cis-1,2-Dichloroethylene (µg/L)	70	BMDL
Dichloromethane (µg/L)	5	BMDL
Ethylbenzene (µg/L)	700	BMDL
o-Dichlorobenzene (µg/L)	600	BMDL
Para-Dichlorobenzene (µg/L)	75	BMDL
Styrene (µg/L)	100	BMDL
Tetrachloroethane (µg/L)	5	BMDL
Tetrachloroethylene (µg/L)	5	BMDL

(Table 7.1 continued)

Parameter	Current Maximum or Secondary Contaminant Levels	Edwards Aquifer Typical Range of Results
Volatile organic compound: (cont'd):		
Toluene (µg/L)	1000	BMDL
trans-1,2-Dichloroethylene (µg/L)	100	BMDL
Trichloroethylene (µg/L)	5	BMDL
Vinyl Chloride (µg/L)	2	BMDL
Xylenes, total (mg/L)	10	BMDL

Data source: EPA maximum contaminant levels, 40 CFR , Part 141, 1999.
"a" Risk-based maximum contaminant level listed in 30 TAC Chapter 335, Subchapter S dated 7-20-2000.
"--" indicates no applicable maximum or secondary contaminant level.
"*" Secondary maximum contaminant level (40 CFR, Part 143, 1999).
"**" Copper and Lead are 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, which is 1300 µg/L for Copper, and for Lead 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 (MCL) or primary drinking water standards. The MCL for a contaminant is the maximum permissible level in water that is delivered to any user of a public water system. 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 7.1**.

None of the water quality data (**Appendix C**) collected in 1999 indicated concentrations of any contaminant above an MCL.

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 7.2** is a list of the current secondary standards. Concentrations of the secondary standards listed on **Table 7.2** 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 in the saline water zone. On occasions when concentrations exceed a secondary standard, the exceedance can generally be attributed to naturally occurring conditions.

Table 7.2 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, 1999.

The Authority will continue to monitor the Edwards Aquifer for contaminants in order to detect and investigate possible impacts to the aquifer. The Authority continues its programs to protect the generally excellent water quality of the aquifer through investigating groundwater contamination, and identifying and analyzing anomalous data from the Authority's aquifer-wide sampling program.

7.2 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 7.3**.

Table 7.3 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 1** and **2**. 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 1999, the Authority, working in cooperation with SAWS and TWDB, provided funding to complete a transect of five wells in the Bexar-Comal-Guadalupe "Tri-County" area, to study and monitor the freshwater/saline-water interface in the Edwards Aquifer. Three of the five proposed wells were completed in 1999, the remaining two wells were proposed to be completed in the year 2000. 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.

7.3 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 2**. Laboratory analyses of the samples collected in 1999 (**Appendix C**) indicate no detectable concentrations of pesticides, herbicides, or other direct evidence of surface water contamination.

8.0 SUMMARY

In 1999, discharge from the Edwards Aquifer was greater than recharge as demonstrated by periods of decreasing water levels. The net decrease in water levels in the Bexar County index well was 22.6 feet for the year. The amount of rain received in the San Antonio region in 1999 was approximately 45% below normal.

The average estimated annual groundwater recharge to the Edwards Aquifer in the San Antonio region from 1934 through 1999 is approximately 680,000 acre-feet. Recharge in 1999 was approximately 473,400 acre-feet. 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 1999 was 898,800 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 1999 was calculated at 456,100 acre-feet or 51 percent of the total discharge. Groundwater pumping accounted for 442,700 acre-feet of water discharged from the Edwards Aquifer in 1999. In general, water level data during 1999 reflected a decrease in water recharging the aquifer, although there was a decrease in pumping relative to 1998.

In 1999, the Authority collected water quality samples from 57 wells, two springs and eight stream basins. The water samples were analyzed for major ions, minor element metals, TDS, hardness and nutrients. Water samples from 12 wells, two springs and eight surface water locations were also analyzed for pesticides and herbicides. Water samples from eight wells and one spring were also analyzed for VOCs. None of the constituents analyzed were detected above published MCLs. No pesticides, herbicides, or VOC's were detected in the water samples analyzed for these compounds.

9.0 DEFINITIONS

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

Acre-foot (ac-ft) 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).

Aquifer 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.

Artesian well 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.

Artesian zone An area where the water level from a confined aquifer stands above the top of the strata in which the aquifer is located.

Bacteria 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).

Conductivity 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.

Confined aquifer An artesian aquifer or an aquifer bound above and below by impermeable strata, or by strata with lower permeability than the aquifer itself.

Discharge The volume of water that passes a given point within a given period of time.

Drainage basin 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.

<u>Edwards Underground Water District</u>	The regional governmental entity that preceded the Edwards Aquifer Authority.
<u>Edwards Aquifer Authority</u>	The regional governmental entity established by the Texas Legislature in 1993 to "manage, preserve, and protect the Edwards Aquifer."
<u>Freshwater/saline-water interface</u>	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."
<u>Gauging station</u>	A particular site that systematically collects hydrologic data such as streamflow, springflow or precipitation.
<u>Groundwater divide</u>	A ridge, or mound in the water table or potentiometric surface from which the groundwater moves away in both directions.
<u>Micrograms per liter (μg/L)</u>	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.
<u>Milligrams per liter (mg/L)</u>	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.
<u>Potentiometric surface</u>	An imaginary surface representing the total head of groundwater and defined by the level that water will rise in a well. Under confined conditions. Under confined conditions, the water table is the potentiometric surface.
<u>Real time data</u>	Instantaneous or near-instantaneous information used to monitor a current condition such as precipitation, stream flow, spring discharge, etc.
<u>Recharge</u>	The process involved in absorption and addition of water to the zone of saturation.
<u>Recharge zone</u>	The area in which water infiltrates into the ground and eventually reaches the zone of saturation in one or more aquifers.
<u>Specific conductance</u>	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^{o}C. Expressed in microsiemens per centimeter (μS/cm). See also Conductivity.
<u>Ten-year floating average</u>	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, usually expressed in units of milligrams per liter (mg/L).
Transect wells	A group of water quality monitoring wells positioned in a site to monitor water quality changes, such as across the freshwater/saline-water interface.
Unconfined aquifer	An aquifer, or a portion of an aquifer, with a water table and containing groundwater that is not under pressure beneath relatively impermeable rocks.
Underflow	The movement of water flowing beneath the land surface within the bed or alluvial plain of a surface stream.
Water table	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.
Water level observation well	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.
Zone of aeration	The subsurface zone where the voids and pore spaces are filled with water under less pressure than that of the atmosphere and air.
Zone of saturation	The subsurface zone in which all voids and pore spaces are filled with water under pressure greater than that of the atmosphere.

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APPENDIX A – Water Level Data for Selected Wells

Table A-1 City of Kyle well (LR 67-01-809) daily high water levels (in feet above MSL), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	N/D	581.2	579.6	578.4	577.5	N/D	N/D	N/D	N/D	575.2	574.9	574.7
2	N/D	581.1	579.6	578.3	577.5	N/D	N/D	N/D	N/D	575.1	574.9	574.7
3	N/D	581.0	579.5	578.3	577.4	N/D	N/D	N/D	N/D	575.1	574.9	574.7
4	N/D	581.0	579.4	578.3	577.4	N/D	N/D	N/D	N/D	575.1	574.9	574.7
5	N/D	580.9	579.4	578.3	577.4	N/D	N/D	N/D	N/D	575.1	574.9	574.7
6	N/D	580.8	579.3	578.2	577.3	N/D	N/D	N/D	N/D	575.1	574.9	574.7
7	N/D	580.8	579.3	578.2	577.3	N/D	N/D	N/D	N/D	575.1	574.8	574.7
8	N/D	580.8	579.3	578.2	577.3	N/D	N/D	N/D	N/D	575.1	574.9	574.7
9	N/D	580.7	579.2	578.1	577.3	N/D	N/D	N/D	N/D	575.0	574.9	574.7
10	N/D	580.6	579.2	578.1	577.3	N/D	N/D	N/D	N/D	575.0	574.9	574.7
11	N/D	580.6	579.1	578.1	577.3	N/D	N/D	N/D	N/D	575.0	574.9	574.7
12	N/D	580.5	579.1	578.0	577.2	N/D	N/D	N/D	N/D	575.0	574.8	574.7
13	N/D	580.4	579.0	578.0	577.2	N/D	576.6	N/D	N/D	575.0	574.8	574.7
14	N/D	580.4	579.0	578.0	577.2	N/D	N/D	N/D	N/D	575.0	574.9	574.7
15	N/D	580.4	578.9	577.9	577.2	N/D	N/D	N/D	575.3	575.0	574.9	574.7
16	N/D	580.3	578.9	577.9	577.2	N/D	N/D	N/D	N/D	575.0	574.8	574.7
17	N/D	580.3	578.9	577.8	577.1	N/D	N/D	N/D	N/D	575.0	574.8	574.7
18	N/D	580.2	578.8	577.8	577.1	N/D	N/D	N/D	N/D	575.0	574.8	574.7
19	582.1	580.2	578.8	577.8	577.1	N/D	N/D	N/D	N/D	574.9	574.8	574.7
20	582.0	580.1	578.7	577.8	577.1	N/D	N/D	N/D	575.3	574.9	574.8	574.7
21	582.0	580.0	578.7	577.8	577.1	N/D	N/D	N/D	575.3	574.9	574.8	574.7
22	582.0	580.0	578.7	577.7	577.0	N/D	N/D	N/D	575.3	574.9	574.8	574.7
23	581.8	579.9	578.6	577.7	577.0	576.8	N/D	N/D	575.3	574.8	574.8	574.7
24	581.7	579.8	578.6	577.7	577.0	N/D	N/D	575.7	575.3	574.8	574.7	574.7
25	581.6	579.8	578.6	577.6	577.0	N/D	N/D	N/D	575.3	574.8	574.8	574.7
26	581.6	579.8	578.5	577.6	N/D	N/D	N/D	N/D	575.3	574.8	574.8	574.7
27	581.5	579.7	578.5	577.6	N/D	N/D	N/D	N/D	575.2	574.8	574.8	574.7
28	581.5	579.6	578.5	577.6	N/D	N/D	N/D	N/D	575.2	574.8	574.7	574.7
29	581.4		578.4	577.6	N/D	N/D	N/D	N/D	575.2	574.9	574.7	574.7
30	581.3		578.4	577.5	N/D	N/D	N/D	N/D	575.2	574.9	574.7	574.7
31	581.2		578.4		N/D		N/D	N/D		574.9		574.7

Table A-2 Landa Park well (DX-68-23-302) daily high water levels (in feet above MSL), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	628.7	628.3	627.7	627.7	627.3	626.8	626.7	626.5	625.7	625.2	625.3	625.3
2	628.7	628.3	627.7	627.7	627.3	626.7	626.7	626.5	625.7	625.1	625.3	625.3
3	628.7	628.3	627.7	627.7	627.3	626.6	626.7	626.4	625.6	625.1	625.3	625.3
4	628.7	628.3	627.7	627.7	627.4	626.6	626.7	626.4	625.6	625.1	625.3	625.3
5	628.7	628.2	627.6	627.7	627.3	626.5	626.7	626.3	625.6	625.1	625.3	625.3
6	628.6	628.2	627.6	627.6	627.3	626.4	626.7	626.3	625.6	625.1	625.3	625.3
7	628.6	628.2	627.6	627.6	627.3	626.3	626.7	626.3	625.6	625.0	625.3	625.3
8	628.6	628.2	627.6	627.6	627.3	626.2	626.7	626.2	625.6	625.0	625.3	625.3
9	628.6	628.2	627.6	627.6	627.2	626.2	626.7	626.2	625.6	625.0	625.3	625.3
10	628.6	628.1	627.6	627.6	627.3	626.1	626.9	626.1	625.6	625.0	625.3	625.3
11	628.6	628.1	627.6	627.5	627.3	626.0	626.8	626.1	625.6	625.0	625.3	625.3
12	628.6	628.1	627.6	627.5	627.3	625.9	626.8	626.1	625.6	625.0	625.3	625.3
13	628.6	628.1	627.6	627.5	627.3	625.9	626.8	626.0	625.5	624.9	625.3	625.3
14	628.5	628.0	627.6	627.5	627.3	626.3	626.8	625.9	625.5	624.9	625.3	625.3
15	628.5	628.0	627.6	627.5	627.3	626.0	626.8	625.9	625.5	624.9	625.3	625.3
16	628.5	628.0	627.5	627.5	627.2	626.0	626.8	625.8	625.4	624.9	625.3	625.3
17	628.5	628.0	627.5	627.5	627.2	626.0	626.8	625.8	625.4	625.0	625.2	625.3
18	628.5	628.0	627.5	627.4	627.4	626.1	626.8	625.7	625.4	625.1	625.2	625.3
19	628.5	627.9	627.6	627.4	627.2	626.1	626.8	625.7	625.4	625.1	625.2	625.3
20	628.5	627.9	627.6	627.4	627.1	626.6	626.8	625.7	625.3	625.1	625.2	625.3
21	628.5	627.9	627.6	627.4	627.1	626.9	626.8	625.6	625.3	625.2	625.3	625.3
22	628.5	627.8	627.6	627.4	627.1	626.5	626.8	625.6	625.3	625.2	625.3	625.3
23	628.5	627.8	627.6	627.3	627.1	626.6	626.8	625.6	625.3	625.2	625.3	625.3
24	628.4	627.8	627.6	627.3	627.1	626.6	626.8	625.7	625.2	625.2	625.2	625.3
25	628.4	627.8	627.6	627.3	627.0	626.6	626.8	625.7	625.2	625.2	625.3	625.3
26	628.4	627.7	627.6	627.3	627.2	626.6	626.8	625.7	625.2	625.2	625.3	625.4
27	628.4	627.7	627.8	627.3	627.0	626.7	626.7	625.7	625.2	625.2	625.3	625.4
28	628.4	627.7	627.8	627.3	626.9	626.7	626.7	625.7	625.2	625.2	625.3	625.3
29	628.4		627.7	627.3	626.9	626.7	626.6	625.7	625.2	625.2	625.3	625.3
30	628.4		627.6	627.3	626.9	626.7	626.6	625.7	625.2	625.2	625.3	625.3
31	628.3		627.6		626.9		626.6	625.7		625.3		625.3

“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), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	716.4	712.3	704.2	708.5	706.2	693.0	702.0	700.6	694.6	690.7	693.4	692.7
2	716.2	712.1	704.1	708.7	706.4	691.9	702.0	700.1	694.5	690.6	693.4	692.9
3	715.8	711.7	703.7	708.8	706.7	690.7	702.0	699.6	694.4	690.3	693.4	692.8
4	715.7	711.2	703.9	708.9	706.8	689.7	701.9	699.2	694.2	690.1	693.4	N/D
5	715.8	710.6	704.1	708.9	706.8	689.0	702.0	698.8	694.1	690.1	693.3	N/D
6	715.8	710.2	704.1	708.7	706.4	688.2	702.1	698.5	695.0	690.2	693.0	N/D
7	715.8	709.9	704.4	708.6	705.7	687.8	702.2	698.3	694.3	690.2	693.0	N/D
8	715.8	709.5	704.6	708.7	704.9	686.8	702.3	698.0	694.4	690.1	693.1	N/D
9	715.6	708.8	704.5	708.7	704.0	685.8	702.1	697.7	694.3	689.9	693.1	N/D
10	715.4	708.1	704.4	708.7	703.5	684.9	701.8	697.3	694.3	689.7	693.0	N/D
11	715.4	707.6	704.4	708.3	703.3	684.1	701.8	697.0	694.2	689.6	692.9	N/D
12	715.5	705.8	705.7	708.0	703.4	683.1	702.2	696.5	694.1	689.3	692.7	N/D
13	715.4	705.3	705.0	708.0	702.7	682.9	702.7	696.1	694.3	689.2	692.6	N/D
14	715.1	705.3	704.7	708.1	701.9	684.2	703.0	695.6	693.8	689.2	692.5	N/D
15	715.1	705.4	704.9	707.8	701.0	687.2	703.1	695.3	693.6	689.2	692.5	N/D
16	715.1	705.2	705.1	707.4	700.1	689.0	703.1	694.9	693.4	689.2	692.4	N/D
17	715.0	704.8	705.3	707.2	699.5	690.4	703.2	694.5	693.1	689.5	692.4	N/D
18	714.8	704.5	705.9	707.0	699.7	691.5	703.2	694.1	692.8	690.1	692.3	N/D
19	714.6	704.1	705.5	706.8	700.2	692.6	703.4	694.0	692.6	690.5	692.2	N/D
20	714.6	704.1	705.4	706.6	700.3	698.5	703.4	693.8	692.4	691.1	692.3	N/D
21	714.6	703.7	705.7	706.3	700.1	N/D	703.5	693.6	692.0	691.6	692.6	N/D
22	714.6	703.8	706.0	706.1	699.6	N/D	703.6	693.5	691.7	692.0	692.6	N/D
23	714.0	703.7	706.0	705.7	699.1	N/D	703.5	694.4	691.6	692.2	692.5	N/D
24	713.7	703.7	706.5	705.0	698.8	698.9	703.4	694.1	691.5	692.4	692.3	N/D
25	713.6	703.7	706.6	704.8	698.1	699.8	703.2	694.6	691.4	692.6	692.4	N/D
26	713.4	704.0	706.7	705.0	697.2	700.5	703.0	695.0	691.4	692.6	692.6	N/D
27	713.3	704.0	708.1	705.3	696.3	701.1	702.7	695.0	691.3	692.7	692.8	N/D
28	713.2	703.9	707.3	705.8	695.6	701.5	702.3	695.0	691.1	692.8	692.8	N/D
29	713.1		707.4	706.0	694.6	701.9	701.8	695.2	690.9	693.0	692.7	N/D
30	712.8		707.8	706.1	694.2	702.0	701.5	694.7	690.7	693.1	692.6	N/D
31	712.5		708.2		693.8		701.1	694.7		693.2		N/D

Table A-4 City of Hondo index well (TD-69-47-306) daily high water levels (in feet above MSL), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	742.6	737.3	726.4	734.3	731.3	709.8	726.8	724.6	719.3	715.1	718.6	716.7
2	742.5	736.4	708.5	734.5	731.5	707.9	726.8	724.1	719.3	714.6	718.4	716.4
3	742.2	735.3	726.4	734.6	731.8	706.5	726.6	723.9	719.2	714.6	718.4	716.4
4	742.1	734.3	726.4	734.6	732.0	705.9	726.6	723.5	718.8	714.7	718.2	716.5
5	742.3	733.4	727.1	734.6	732.0	704.6	726.5	722.7	718.9	714.7	717.9	716.2
6	742.3	733.0	726.8	734.2	731.3	704.2	726.2	723.1	719.2	714.6	717.5	716.4
7	741.9	732.2	727.9	734.0	729.8	704.3	726.0	722.6	719.7	714.5	717.6	716.6
8	741.8	731.8	728.4	734.1	727.8	702.8	726.0	722.2	719.8	714.3	717.8	716.4
9	741.4	730.4	727.8	734.1	726.0	701.6	725.7	722.0	719.6	714.2	718.0	716.2
10	741.6	728.4	727.4	733.9	725.8	701.0	725.6	721.4	719.1	714.5	717.4	715.7
11	741.7	727.3	727.3	733.5	726.2	699.8	725.7	721.3	719.2	714.4	717.0	716.0
12	741.7	726.2	727.4	733.0	726.3	699.1	726.5	720.5	719.2	713.8	717.1	716.3
13	741.7	726.1	727.9	733.1	724.0	702.6	727.2	719.9	718.5	714.0	716.6	716.4
14	741.4	726.6	728.2	733.2	721.7	705.0	728.0	719.4	718.5	713.8	716.4	716.5
15	741.1	726.9	728.4	732.5	720.9	708.9	727.9	719.4	718.3	713.6	716.6	715.9
16	741.1	726.6	728.3	732.1	719.7	711.8	728.2	719.0	718.0	713.3	716.0	715.7
17	741.0	725.7	728.7	731.8	719.4	713.4	728.2	718.5	717.9	714.4	716.3	715.8
18	740.9	725.1	729.4	731.4	722.3	714.7	728.2	718.2	717.5	715.4	716.1	715.6
19	740.6	725.2	730.3	730.8	723.1	715.7	728.3	718.2	717.3	716.1	715.9	715.7
20	740.4	725.5	730.7	730.4	723.4	717.2	728.3	718.0	716.9	716.7	716.2	715.7
21	740.1	726.2	730.9	730.3	722.9	719.0	728.1	717.6	716.7	717.2	716.7	715.7
22	739.8	725.9	731.1	729.8	721.8	720.8	728.4	718.2	716.4	717.7	716.8	715.8
23	739.2	725.8	731.1	729.4	721.5	722.2	728.3	718.8	716.1	717.7	716.9	715.9
24	739.1	725.7	731.3	728.2	720.7	723.3	727.7	719.8	716.3	717.8	716.7	716.0
25	739.1	725.4	731.6	728.5	718.4	724.3	727.7	720.3	715.9	718.0	716.8	716.1
26	738.4	725.1	731.7	729.4	716.0	725.2	727.6	720.5	716.3	718.0	717.1	716.5
27	738.2	725.2	732.3	730.1	716.0	725.9	727.3	720.6	716.1	718.0	717.2	716.7
28	738.0	725.8	732.8	730.6	713.4	726.3	726.6	720.3	715.8	718.0	717.0	716.2
29	738.3		733.0	730.8	712.5	726.7	726.1	720.1	715.4	718.2	717.0	715.8
30	737.5		733.6	731.1	712.5	726.8	725.8	719.7	715.3	718.2	716.8	715.3
31	737.3		734.0		712.3		724.8	719.6		718.5		715.0

“N/D” indicates no data available.

Table A-5 Bexar County index well (AY-68-37-203 (J-17)) daily high water levels (in feet above MSL), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	686.3	683.2	676.8	680.3	676.7	668.0	673.5	669.2	663.4	658.9	663.8	662.7
2	686.4	682.8	676.6	680.4	677.0	666.0	673.1	668.6	663.2	659.1	663.5	663.0
3	686.2	682.5	676.5	680.6	677.1	665.4	672.8	667.9	662.9	659.0	663.5	662.8
4	686.0	682.2	676.4	680.4	677.3	664.4	673.3	667.2	662.8	658.5	663.6	662.9
5	685.9	681.8	676.6	680.4	677.2	664.0	673.8	667.9	662.7	658.7	663.2	663.1
6	685.8	681.7	676.6	679.8	676.5	663.1	673.9	667.7	663.1	658.5	663.1	662.8
7	685.7	681.5	676.6	679.6	675.7	662.0	673.7	667.4	662.7	658.4	663.1	662.8
8	685.8	680.9	676.9	679.4	675.2	660.6	673.6	666.8	662.9	658.5	662.6	663.0
9	685.7	680.4	676.7	679.1	674.7	660.3	673.3	665.7	663.1	658.7	662.9	662.8
10	685.7	680.1	676.5	678.8	675.1	659.4	672.9	665.5	662.8	658.3	662.7	662.9
11	685.4	679.9	676.4	678.5	675.7	658.2	673.4	665.0	662.7	657.8	662.7	663.3
12	685.4	679.6	676.3	678.0	676.1	658.1	674.1	664.3	662.3	657.3	662.4	664.0
13	685.3	679.6	676.9	678.0	675.9	658.3	674.7	663.5	661.7	657.3	662.6	663.9
14	685.1	679.4	677.3	678.2	675.3	659.1	674.9	663.3	661.8	657.3	662.6	664.0
15	685.1	679.2	677.4	678.1	674.7	660.2	674.6	662.7	661.6	656.9	662.3	663.8
16	685.3	678.8	677.2	678.0	674.0	663.4	674.3	661.6	661.3	657.5	662.2	663.4
17	685.1	678.7	677.3	678.0	673.4	664.4	674.0	661.1	660.8	658.9	662.0	663.6
18	684.8	678.4	677.4	677.6	673.3	665.1	674.3	661.3	660.7	660.1	662.1	663.7
19	684.5	678.0	677.8	677.1	674.1	666.0	674.4	661.1	660.5	660.9	661.9	663.9
20	684.5	677.9	678.3	676.6	674.1	668.0	674.5	660.5	660.1	661.5	662.1	663.7
21	684.5	677.7	678.5	676.3	673.9	669.9	674.4	660.7	659.4	662.0	662.4	663.7
22	684.4	677.4	678.3	676.1	673.7	671.2	674.4	660.7	659.6	662.1	662.3	663.9
23	684.2	677.4	678.3	675.6	673.2	672.1	674.2	661.8	659.7	662.5	662.4	664.1
24	684.2	677.4	678.3	675.1	672.5	672.8	673.8	663.6	659.4	662.4	662.4	664.2
25	683.8	677.3	678.4	675.3	671.6	673.2	673.3	664.4	659.5	661.9	662.9	664.3
26	683.6	677.3	678.3	676.0	670.8	673.9	672.7	664.3	659.8	662.1	663.4	664.8
27	683.7	677.5	678.5	676.5	670.4	674.4	672.1	664.0	659.0	662.1	663.5	664.9
28	683.6	677.2	679.3	676.6	670.2	674.3	671.6	663.9	659.0	662.0	663.5	664.3
29	683.6		679.8	676.7	669.6	673.9	670.9	663.4	658.9	662.1	662.8	664.3
30	683.6		680.0	676.6	669.8	673.8	670.4	663.8	659.3	662.7	662.7	664.1
31	683.5		680.2		669.3		669.9	663.7		663.7		663.7

Table A-6 City of Uvalde index well (YP-69-50-302) daily high water levels (in feet above MSL), 1999.

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	880.6	880.3	879.4	879.8	879.6	878.2	878.2	879.5	879.6	879.4	879.2	878.7
2	880.6	880.2	879.4	879.8	879.6	878.1	878.2	879.5	879.6	879.5	879.1	878.7
3	880.6	880.1	879.3	879.8	879.7	877.9	878.3	879.5	879.6	879.4	879.1	878.7
4	880.6	880.0	879.3	879.8	879.8	877.8	878.4	879.5	879.6	879.4	879.2	878.7
5	880.6	879.9	879.3	879.9	879.7	877.6	878.5	879.5	879.6	879.4	879.1	878.6
6	880.6	879.9	879.3	879.9	879.5	877.5	878.5	879.4	879.6	879.3	879.0	878.6
7	880.6	879.8	879.3	879.9	879.4	877.4	878.5	879.5	879.7	879.3	879.0	878.6
8	880.7	879.8	879.4	880.0	879.2	877.3	878.6	879.5	879.7	879.2	879.0	878.6
9	880.7	879.8	879.3	880.0	879.2	877.1	878.6	879.5	879.6	879.2	879.0	878.6
10	880.6	879.7	879.3	880.0	879.2	877.0	878.6	879.5	879.6	879.2	879.0	878.6
11	880.7	879.7	879.3	880.0	879.1	876.8	878.8	879.4	879.6	879.2	878.9	878.6
12	880.7	879.7	879.3	880.0	879.1	876.8	878.9	879.4	879.6	879.1	878.9	878.6
13	880.7	879.6	879.3	880.0	879.2	876.8	879.0	879.4	879.6	879.1	878.9	878.5
14	880.7	879.6	879.3	880.1	879.2	876.9	879.0	879.5	879.6	879.1	878.9	878.6
15	880.7	879.6	879.3	880.0	879.2	877.0	879.1	879.5	879.6	879.1	878.8	878.5
16	880.7	879.6	879.3	880.0	879.3	877.0	879.1	879.4	879.6	879.1	878.9	878.5
17	880.7	879.5	879.4	879.9	879.3	877.0	879.2	879.4	879.5	879.2	878.9	878.5
18	880.7	879.5	879.3	879.9	879.3	877.0	879.3	879.4	879.5	879.2	878.9	878.5
19	880.6	879.5	879.3	879.9	879.3	877.1	879.3	879.4	879.5	879.2	878.8	878.4
20	880.6	879.5	879.4	879.8	879.3	877.3	879.4	879.4	879.5	879.2	878.8	878.4
21	880.7	879.4	879.3	879.8	879.1	877.5	879.4	879.5	879.5	879.3	878.8	878.4
22	880.7	879.4	879.4	879.7	879.0	877.6	879.4	879.5	879.4	879.3	878.7	878.4
23	880.6	879.4	879.4	879.6	878.9	877.7	879.5	879.6	879.4	879.2	878.7	878.4
24	880.6	879.4	879.4	879.4	878.9	877.8	879.5	879.7	879.4	879.2	878.7	878.4
25	880.6	879.4	879.4	879.4	878.8	877.9	879.5	879.7	879.5	879.2	878.7	878.4
26	880.5	879.4	879.4	879.5	878.7	877.9	879.5	879.7	879.5	879.2	878.7	878.4
27	880.5	879.4	879.6	879.5	878.6	877.9	879.5	879.7	879.4	879.2	878.6	878.4
28	880.5	879.4	879.6	879.5	878.5	878.0	879.5	879.7	879.4	879.2	878.6	878.4
29	880.5		879.6	879.5	878.4	878.1	879.5	879.7	879.4	879.2	878.6	878.4
30	880.3		879.7	879.5	878.4	878.2	879.5	879.7	879.4	879.2	878.6	878.4
31	880.3		879.7		878.4		879.5	879.7		879.2		878.4

APPENDIX B – 1999 Hydrographs for Index Wells and Springs

Figure B-1. Bexar County Index Well (AY-68-37-203 (J-17))
Hydrograph of Water Elevation vs. Precipitation at San Antonio Intl. Airport

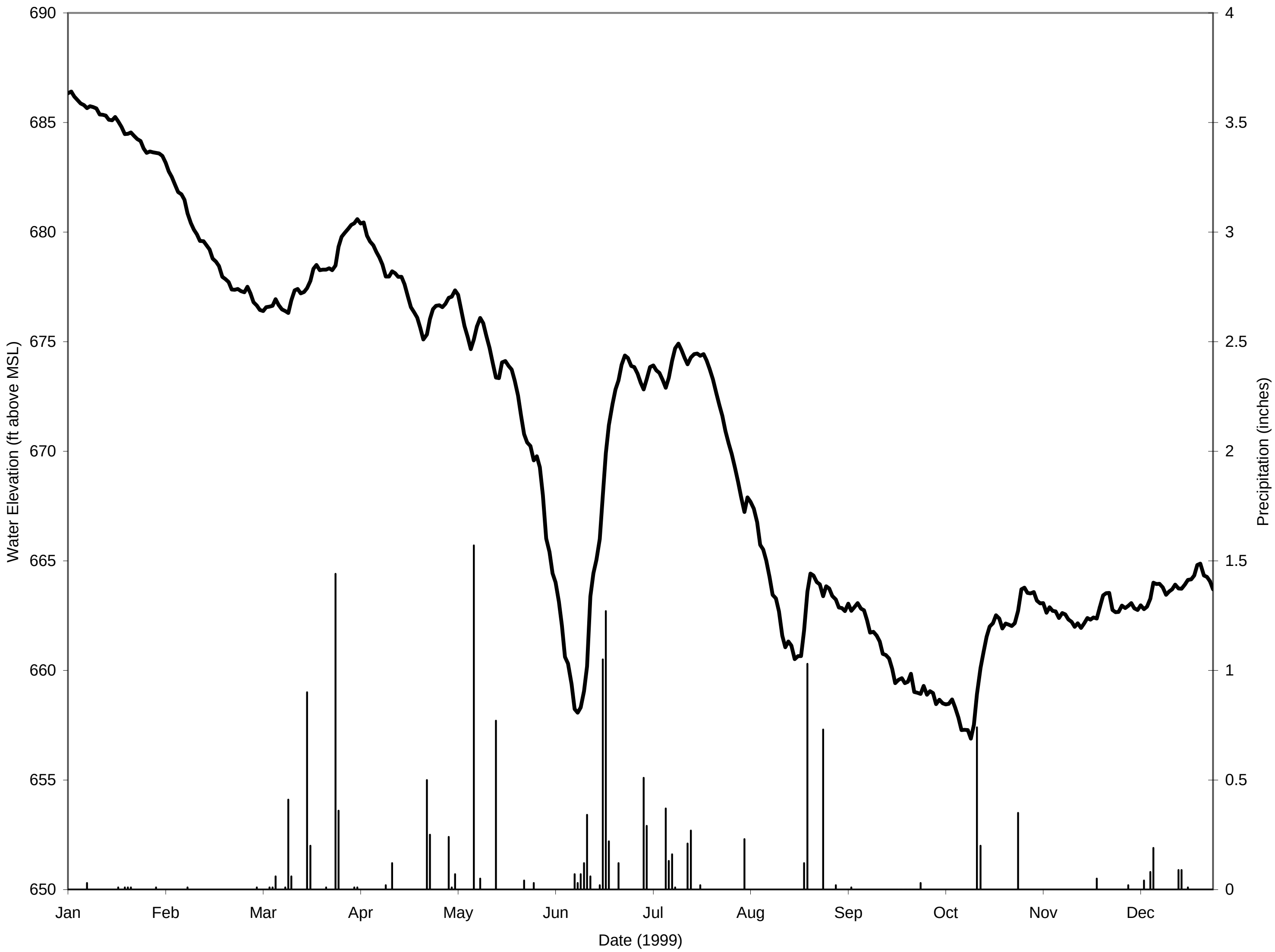


Figure B-2. City of Hondo Index Well (TD-69-47-306)
Hydrograph of Water Level Elevation vs. Precipitation at Hondo

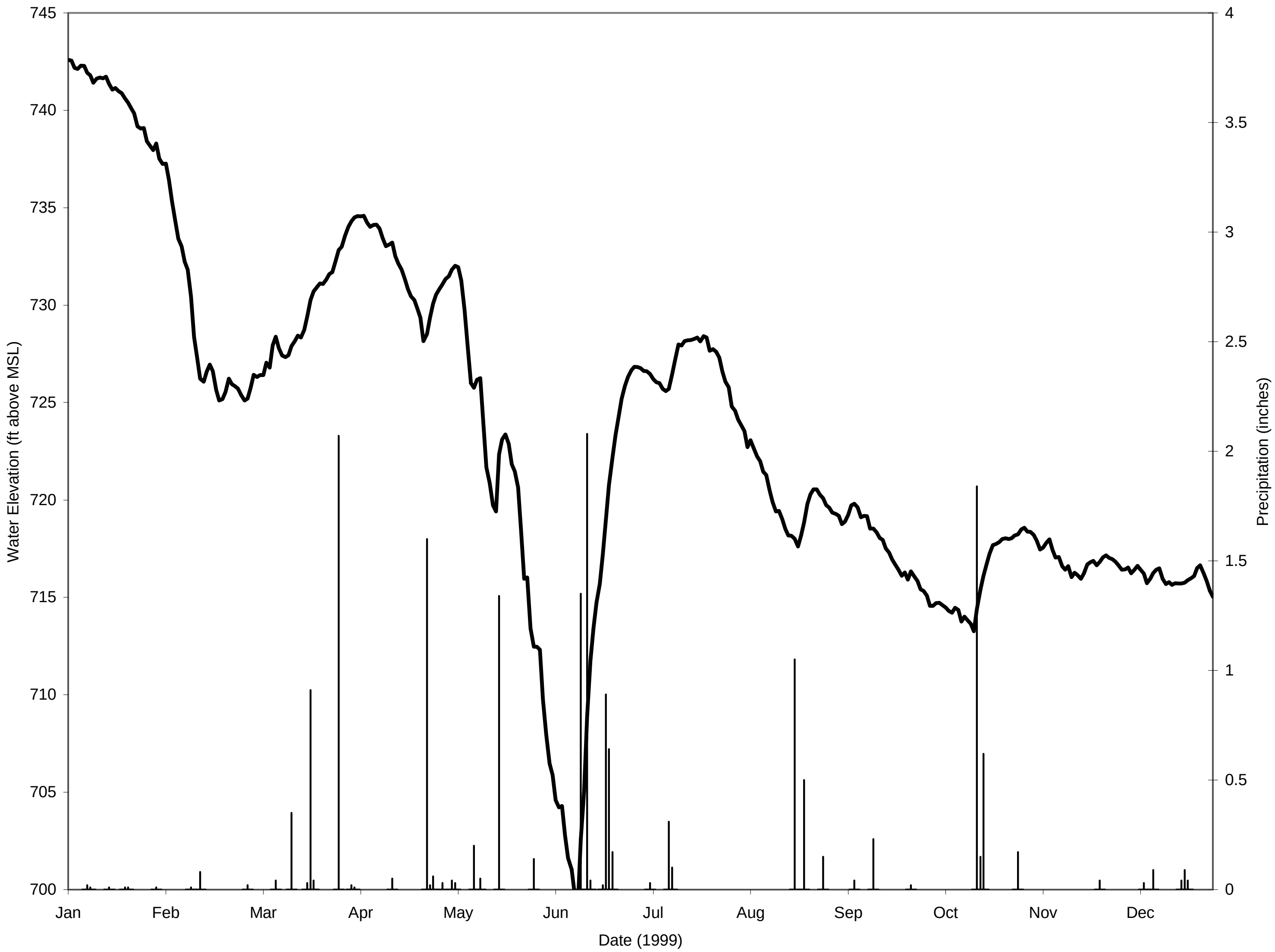


Figure B-3. City of Uvalde Index Well (YP-69-50-302 (J-27))
Hydrograph of Water Level Elevation vs. Precipitation at Uvalde

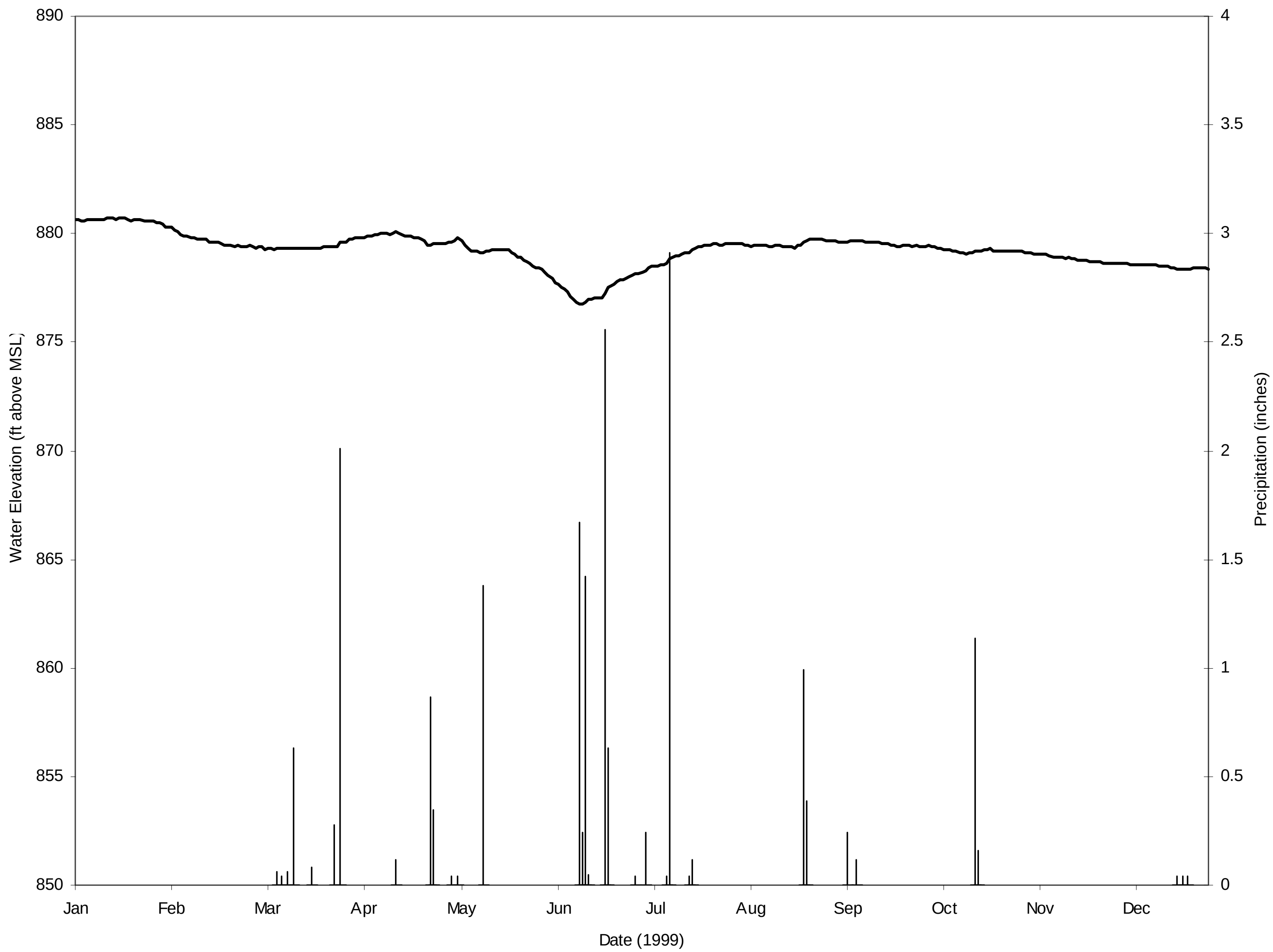


Figure B-4. Comal Springflow (DX-68-23-301)
Hydrograph of Springflow vs. Precipitation at San Antonio Intl. Airport

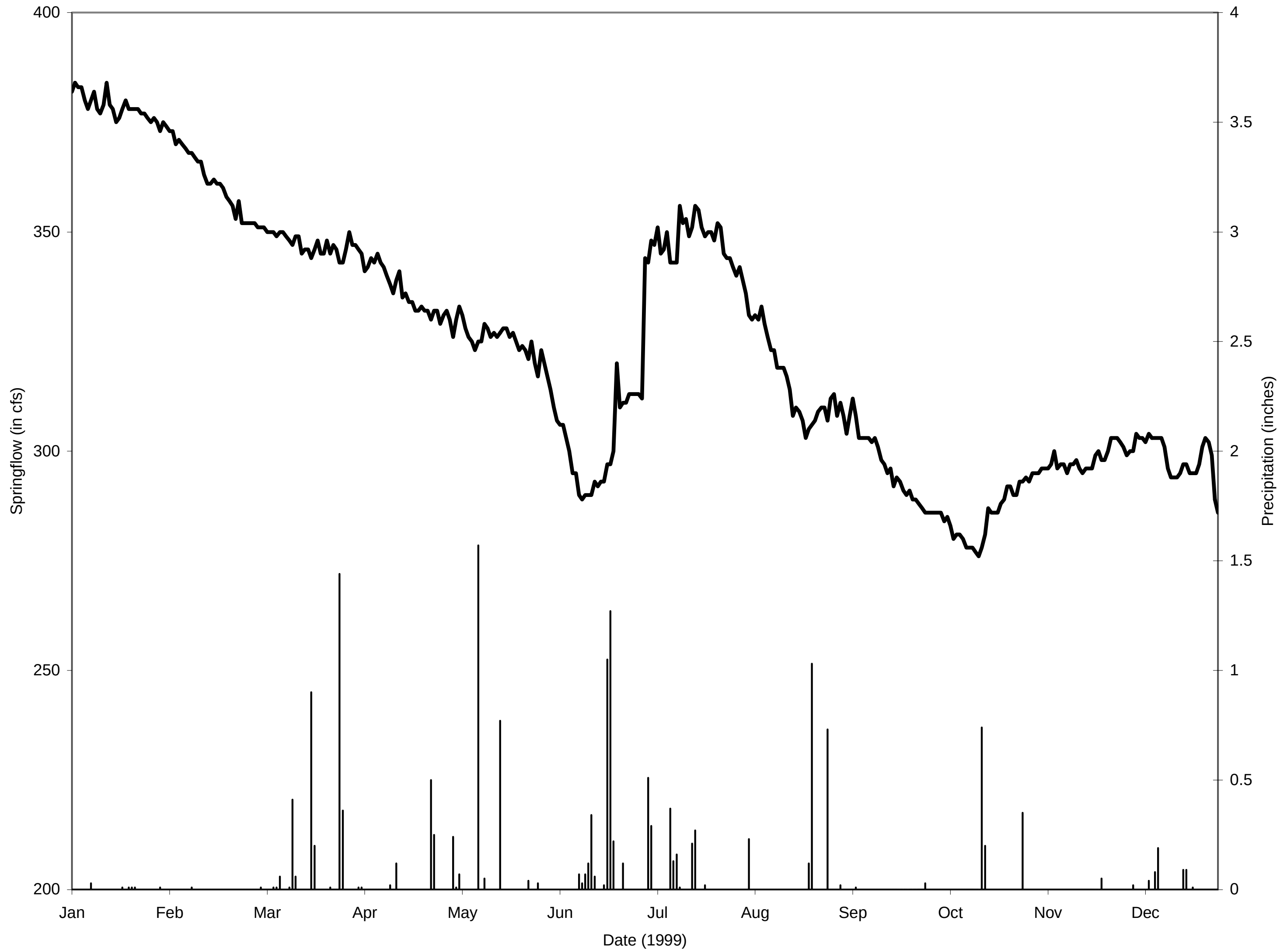
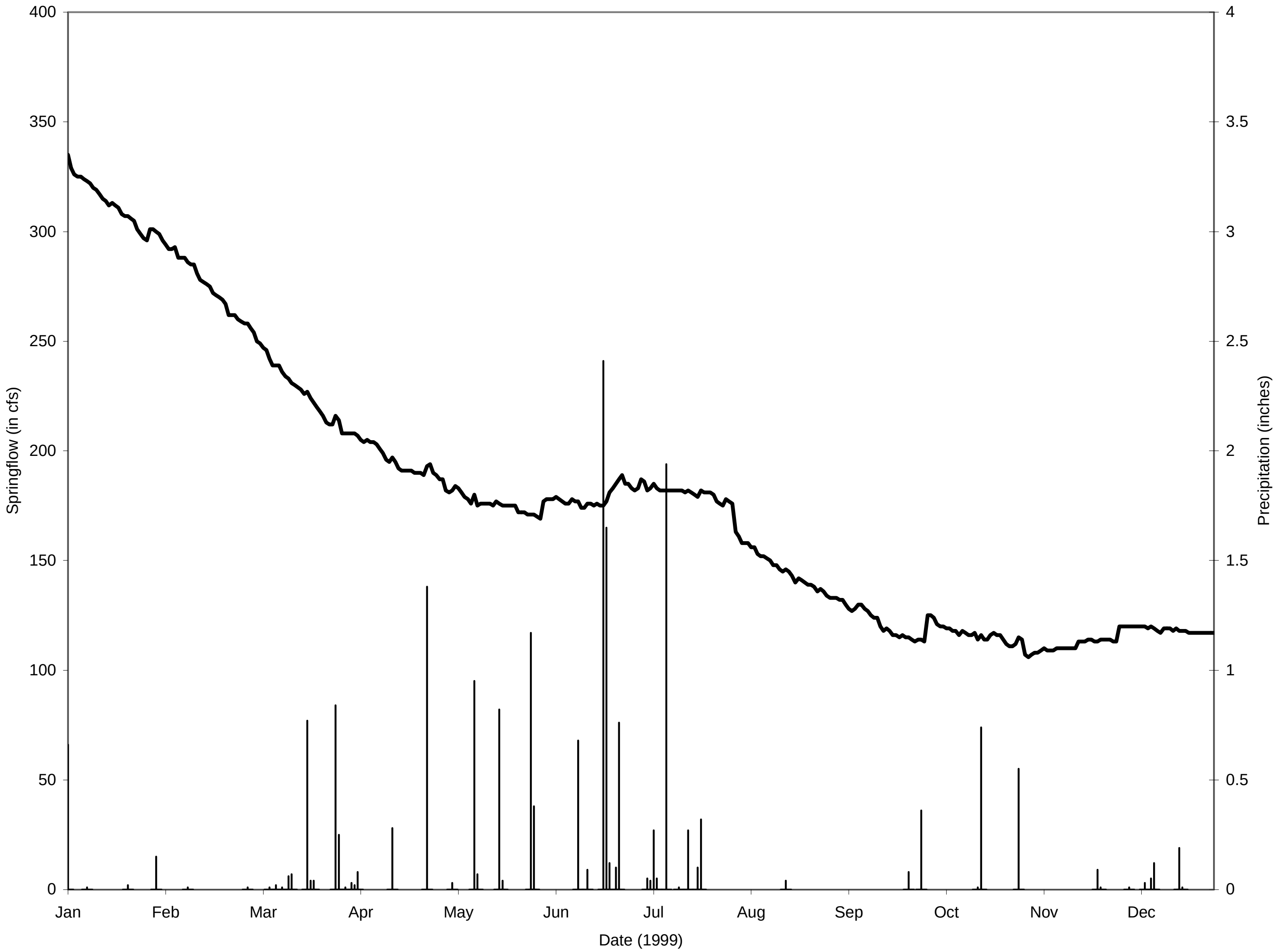


Figure B-5. San Marcos Springflow
Hydrograph of Springflow vs. Precipitation at San Marcos



APPENDIX C – Water Quality Data

Analytical data for selected properties and common inorganic constituents in water from wells completed in the Edwards Aquifer, 1999.

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	Hard-ness, total (mg/L)
Bexar													
	AY-68-37-521	1/20/99	13:23	1275	278	23	32	5430	5000	230	230	7.1	2300
		2/24/99	12:11	1275	246	18.7	31.5	5430	5000	244	220	6.9	2325
		3/24/99	12:03	1275	243	21.5	32	5420	5000	250	220	6.8	2250
		4/28/99	13:21	1275	351	20	32.5	5420	5000	224	237	6.8	2250
		5/26/99	12:47	1275	262	20	32.5	5420	4900	248	242	6.9	2150
		6/29/99	16:34	1275	469	23	32.5	5410	5000	230	238	6.8	2150
		8/31/99	14:16	1275	596	20	32.5	5410	5000	224	224	6.8	2300
		9/30/99	14:05	1275	585	20	32	5410	5000	220	184	6.7	2220
	*	10/19/99	14:05	1275	NR	NR	32	5450	5000	240	211	6.9	2250
	AY-68-37-522	1/20/99	13:37	1075	292	30	31.5	3970	3750	216	210	7.3	1650
		2/24/99	12:23	1075	222	25	31	3970	3780	216	216	7.1	1550
		3/24/99	12:13	1075	253	27.3	31	3960	3730	212	212	6.8	1500
		4/28/99	13:25	1075	355	27.3	31.5	3960	3730	206	216	6.8	1650
		5/26/99	13:28	1075	303	25	31.5	3950	3700	222	220	7.1	1550
		6/29/99	16:29	1075	464	33	31.5	3970	3910	216	217	7	1550
		8/31/99	14:16	1075	632	23	31.5	3950	3400	202	204	7	1500
		9/30/99	14:00	1075	580	25	31.5	3930	3800	202	180	6.8	1550
	*	10/19/99	14:40	1075	NR	NR	31	3970	3700	219	218	7	1800
	AY-68-37-523	1/20/99	13:27	1175	282	20	31	5560	5100	244	232	7.2	2300
		2/24/99	12:17	1175	228	16.7	31	5570	5100	232	232	6.9	2250
		3/24/99	12:07	1175	247	18.7	31	5550	5000	242	234	6.8	2250
		4/28/99	13:15	1175	345	16.7	32	5530	5000	226	238	6.9	2100
		5/26/99	13:11	1175	286	15.8	31.5	5550	5100	248	236	7	2200
		6/29/99	16:22	1175	457	18.7	31.5	5510	5000	234	236	7	2250
		8/31/99	14:30	1175	610	15.8	31.5	5530	5000	224	228	6.9	2200
		9/30/99	14:14	1175	594	14.3	31.5	5540	5100	222	206	6.7	2200
	*	10/19/99	13:45	1175	NR	NR	30.5	5580	5000	197	238	6.9	2400
	AY-68-37-524	1/20/99	16:30	881	450	NR	29	780	630	220	194	7.6	330
		2/24/99	14:09	881	339	NR	28.5	789	760	200	204	7.3	340
		3/24/99	13:33	881	323	23.1	28.5	795	750	212	196	7.3	320
		4/28/99	14:54	881	459	NR	29	811	780	190	200	7.2	330

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Bexar	AY-68-37-524	5/26/99	15:13	881	413	NR	28.5	823	800	203	196	7.3	290
		6/29/99	14:41	881	341	NR	29	832	820	194	196	7.3	340
		8/31/99	12:47	881	437	NR	28.5	861	810	190	204	7.3	330
		9/30/99	12:45	881	435	NR	29	904	880	192	170	7.2	350
	*	10/19/99	15:50	881	NR	NR	29	917	850	197	210	7.2	360
	AY-68-37-525	1/20/99	16:26	1150	446	NR	29.5	6370	5700	244	244	7.4	2675
		2/24/99	14:02	1150	332	NR	29	6380	5600	252	250	7	2575
		3/24/99	13:39	1150	329	20	29.5	6370	5800	254	246	6.9	2450
		4/28/99	15:00	1150	465	21.5	30	6370	5600	242	252	6.8	2500
		5/26/99	14:38	1150	378	20	30	6370	5900	264	248	6.9	2550
		6/29/99	14:30	1150	330	23	29.5	6360	6000	248	252	6.9	2400
		8/31/99	12:47	1150	437	15	29.5	6370	5900	246	242	7	2500
		9/30/99	12:45	1150	435	17.7	29.5	6360	6000	236	228	6.8	2600
	*	10/19/99	16:15	1150	NR	NR	28.5	6440	6000	257	256	6.7	2700
	AY-68-37-526	1/20/99	15:35	1223	305	NR	27	914	880	194	196	7.6	376
		2/24/99	15:21	1223	396	18.7	26.5	913	900	194	200	7.4	370
		3/24/99	14:38	1223	368	21.5	26	913	870	208	192	7.4	380
		4/28/99	12:10	1223	310	17.7	26.5	895	850	188	208	7.2	364
		5/26/99	10:48	1223	153	15.8	26.5	901	870	205	200	7.4	330
		6/29/99	12:05	1223	210	NR	26.5	869	850	222	208	7.4	355
		8/31/99	11:11	1223	300	15	26.5	869	820	196	210	7.5	320
		9/30/99	11:10	1223	310	12	26.5	865	820	184	180	7.3	350
	*	10/19/99	12:10	1223	NR	NR	25.5	858	800	189	210	7.4	350
	AY-68-37-527	1/20/99	15:07	926	277	NR	26.5	509	487	184	194	7.7	228
		2/24/99	15:14	926	389	100	26.5	512	495	194	194	7.5	232
		3/24/99	14:40	926	370	100	26.5	511	480	196	186	7	232
		4/28/99	12:19	926	319	~100	26.5	518	490	190	202	7.4	228
		5/26/99	11:16	926	181	~100	26.5	523	490	205	200	7.4	192
		6/29/99	12:09	926	214	~100	26.5	510	495	198	202	7.3	240
		8/31/99	11:17	926	300	~100	27	528	500	188	204	7.5	216
		9/30/99	11:20	926	320	80	26.5	527	500	184	174	7.3	224
	*	10/19/99	11:27	926	NR	NR	26	531	500	186	206	7.3	240

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Comal													
	DX-68-22-901*	6/2/99	10:19	255	NR	NR	22.7	509	NA	248	NA	NA	251
	DX-68-22-902*	6/2/99	9:24	240	NR	NR	22.2	525	NA	250	NA	NA	221
	DX-68-23-304	12/28/99	14:30	965	210	NR	24	545	500	242	240	7.1	237
	DX-68-23-602*	5/27/99	10:21	790	NR	NR	22.9	518	NA	240	NA	NA	255
	DX-68-23-616A	1/19/99	13:41	576	51	10	25	2900	2800	278	246	7.1	810
		2/16/99	13:56	576	45	10.5	25	2920	2800	280	271	7.1	830
		3/16/99	14:22	576	47	12	25.5	2930	2770	284	250	7.3	810
		4/27/99	13:51	576	41	10	25.5	2940	2800	266	273	7	810
	*	5/18/99	14:43	576	NR	NR	25.3	2910	NA	289	NA	NA	792
		6/22/99	15:26	576	46	10	25.5	2970	2930	262	282	7.2	830
		7/22/99	15:27	576	57	10	25.5	2890	2750	266	278	7.1	810
		8/31/99	13:17	576	82	10.7	25.5	2970	2800	164	263	7.2	830
		9/28/99	14:54	576	49	10	25.5	2960	2900	256	258	7.2	820
		12/27/99	16:20	576	50	9.4	25.3	2870	2800	274	255	7.2	760
	DX-68-23-616B	1/19/99	12:45	738	55	10	26	1710	1670	228	212	7.1	530
		2/16/99	14:04	738	53	10.5	26	1700	1660	236	212	7.3	540
		3/16/99	14:22	738	47	12	26	1700	1620	228	212	7.3	540
		4/27/99	13:58	738	48	10	26	1700	1620	220	232	7.2	530
	*	5/18/99	14:52	738	NR	NR	26.1	1700	NA	232	NA	NA	519
		6/22/99	15:20	738	40	12.5	26	1700	1670	212	226	7.3	530
		7/22/99	15:36	738	66	15	26	1700	1670	222	236	7.3	540
		8/30/99	13:17	738	82	13.6	26.5	1690	1600	214	230	7.3	560
		9/28/99	15:02	738	97	13.1	26.5	1700	1650	220	226	7.2	530
		12/27/99	16:15	738	45	NR	26.1	1688	1650	222	231	7.3	480
	DX-68-23-617	1/19/99	9:58	917	41	11.1	25.5	569	530	222	212	7.3	310
		2/16/99	10:04	917	49	10.7	26	567	530	220	220	7.4	290
		3/16/99	10:21	917	41	12.5	26	567	530	214	214	7.3	280
		4/27/99	10:19	917	49	12	26.5	567	520	218	214	7.3	290
	*	5/18/99	10:32	917	NR	NR	26	568	NA	220	NA	NA	268
		6/22/99	10:20	917	45	12.5	26.5	566	520	214	220	7.4	270
		7/22/99	10:32	917	57	13.6	26.5	566	520	208	224	7.5	280
		8/30/99	10:12	917	87	13.6	26.5	566	510	202	224	7.4	280

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Comal	DX-68-23-617	9/28/99	10:22	917	82	13.1	26.5	564	520	198	230	7.4	270
		12/27/99	11:10	917	65	13.6	26.1	562	500	218	210	7.5	200
	DX-68-23-618	1/19/99	10:04	660	47	11.1	25	633	600	206	190	7.4	270
		2/16/99	10:09	660	54	11.1	25.5	633	620	190	202	7.4	270
		3/16/99	10:29	660	49	12.5	25.5	633	580	202	200	7.3	280
		4/27/99	10:11	660	41	12	25.5	633	600	198	210	7.4	270
	*	5/18/99	10:25	660	NR	NR	25.4	634	NA	202	NA	NA	262
		6/22/99	10:28	660	53	13.1	25.5	632	600	196	200	7.5	270
		7/22/99	10:41	660	66	14.3	25.5	632	600	196	206	7.5	270
		8/30/99	10:19	660	94	13.6	25.5	633	600	190	212	7.4	260
		9/28/99	10:24	660	84	13.1	25.5	634	600	196	212	7.4	280
		12/27/99	11:00	660	55	13.6	25.5	633	510	196	232	7.5	210
	DX-68-23-619A	1/19/99	11:56	652	52	7.3	25.5	535	500	220	194	7.4	260
		2/16/99	12:02	652	49	9.7	25.5	535	510	190	202	7.3	260
		3/16/99	12:24	652	42	10.4	25.5	535	500	198	198	7.6	250
		4/27/99	12:03	652	43	10	26	535	500	212	212	7.4	240
	*	5/18/99	12:41	652	NR	NR	26	535	NA	202	NA	NA	242
		6/22/99	11:52	652	47	11.5	26	536	500	196	202	7.4	260
		7/22/99	12:59	652	54	12	26	535	500	196	204	7.5	260
		8/30/99	11:40	652	35	11.5	26	537	500	184	202	7.5	270
		9/28/99	12:15	652	80	11.1	26	536	500	194	212	7.4	250
		12/27/99	14:15	652	65	7.5	25.4	536	520	216	234	7.4	220
	DX-68-23-619B	1/19/99	11:50	787	46	7	26	560	520	238	212	7.4	265
		2/16/99	12:07	787	54	8.6	26	557	530	208	222	7.4	270
		3/16/99	12:24	787	42	10.4	26.5	558	510	214	212	7.6	280
		4/27/99	12:09	787	49	10	26.5	558	510	214	214	7.4	270
	*	5/18/99	12:47	787	NR	NR	26.2	558	NA	221	NA	NA	260
		6/22/99	11:45	787	40	9.4	26.5	557	510	216	220	7.4	270
		7/22/99	13:05	787	60	12	26.5	557	500	216	224	7.4	260
		8/30/99	11:40	787	35	11.5	26.5	558	510	204	228	7.5	280
		9/28/99	16:35	787	84	13.1	26.5	558	530	190	231	7.4	290
		12/27/99	14:10	787	60	12.5	26.2	558	650	216	220	7.5	210
	DX-68-30-208*	6/17/99	13:21	29*2	NR	NR	23.7	658	NA	253	NA	NA	293

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Guadalupe													
	Tri-County #1	9/14/99	11:30	920	330	60	26	821	780	214	220	7.4	304
	Tri-County #2	10/13/99	12:00	1050	367	60	27	523	5000	230	256	7	1420
	Tri-County #3	12/14/99	11:10	1222	160	60	27.7	7940	7800	220	277	6.7	2030
Hays													
	LR-67-01-812	1/7/99	14:39	543	39	10.4	24	14760	13500	360	357	6.8	4100
		2/17/99	17:04	543	59	9.7	24.5	14750	13800	354	380	6.8	4200
		5/20/99	15:47	543	51	15	24.5	14740	12800	360	382	6.8	4300
		8/9/99	16:12	543	62	18	25	14740	13500	350	388	6.8	4150
		11/23/99	14:45	543	101	17.7	25	14740	14000	310	297	6.7	3350
	LR-67-01-813A	1/7/99	14:49	564	74	9.7	24.5	14740	13300	402	356	6.7	4100
		2/17/99	15:11	564	51	12	24.5	14730	13700	380	376	6.8	3750
		5/20/99	13:59	564	64	15	25	14740	12800	386	382	6.7	4200
		8/9/99	12:46	564	61	18	25	14720	14000	356	388	6.7	3650
		11/23/99	12:45	564	50	16.7	25	14720	13500	322	218	6.8	3500
	LR-67-01-813B	1/7/99	14:55	699	80	10.4	25	14700	13800	366	348	6.8	4000
		2/17/99	15:18	699	58	9.7	25	14700	13900	364	372	6.9	3800
		5/20/99	14:07	699	72	15	25.5	14710	12600	374	376	6.7	4200
		8/9/99	13:03	699	78	18	25.5	14680	14000	346	382	6.7	3900
		11/23/99	12:45	699	50	18.7	26	14670	13500	332	250	7	3500
	LR-67-01-814A	1/7/99	11:14	556	84	10	24.5	14720	13800	388	352	6.7	4000
		2/17/99	12:05	556	55	9.4	25	14710	14000	438	370	6.9	3900
		5/20/99	11:02	556	72	15	25	14760	12900	402	378	6.8	4200
		8/9/99	11:04	556	54	18	25.5	14700	13800	354	380	6.8	3600
		11/23/99	9:35	556	NR	17.7	25	14700	14000	340	288	6.8	3500
	LR-67-01-814B	1/7/99	11:21	726	91	10	25.5	14670	13700	368	352	6.7	4000
		2/17/99	12:13	726	63	13.6	26	14640	13900	366	368	6.9	4100
		5/20/99	11:07	726	77	15	26	14710	13100	370	378	6.7	4200
		8/9/99	11:11	726	61	18	26	14660	14000	348	380	6.8	3900
		11/23/99	9:35	726	NR	17.7	26	14650	14000	336	294	6.8	3500

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Medina													
	TD-68-25-703*	4/19/99	13:50	425	NR	NR	22	437	NA	182	NA	NA	219
	TD-68-33-202*	4/19/99	11:42	279	NR	NR	22.6	454	NA	191	NA	NA	227
	TD-68-41-102*	5/6/99	12:13	1431	NR	NR	24.7	491	NA	206	NA	NA	230
	TD-68-41-303*	4/19/99	10:10	717	NR	NR	23.9	495	NA	201	NA	NA	239
	TD-68-41-901*	5/6/99	11:05	1855	NR	NR	26.7	486	NA	200	NA	NA	222
	TD-68-42-506*	5/3/99	10:49	1445	NR	NR	25.6	494	NA	196	NA	NA	225
	TD-68-42-806*	4/26/99	11:14	2044	NR	NR	31.3	479	NA	192	NA	NA	232
	TD-68-49-301*	4/26/99	16:01	2550	NR	NR	32.4	471	NA	192	NA	NA	232
	TD-68-49-501*	4/26/99	14:07	2716	NR	NR	28.2	505	NA	200	NA	NA	240
	TD-69-37-302*	5/5/99	10:25	410	NR	NR	22.6	485	NA	212	NA	NA	233
	TD-69-38-906*	4/22/99	9:46	940	NR	NR	24	509	NA	230	NA	NA	248
	TD-69-39-601*	4/22/99	14:49	360	NR	NR	23.7	475	NA	221	NA	NA	237
	TD-69-46-601*	4/22/99	11:03	360	NR	NR	23.6	474	NA	209	NA	NA	235
	TD-69-47-301*	4/22/99	12:27	1510	NR	NR	24.4	471	NA	208	NA	NA	233
	TD-69-63-103*	5/6/99	16:08	3406	NR	NR	43.8	558	NA	185	NA	NA	257
Uvalde													
	YP-69-35-401*	5/17/99	12:17		NR	NR	23	491	NA	224	NA	NA	235
	YP-69-35-602*	6/23/99	13:05	237	NR	NR	23.4	445	NA	208	NA	NA	217
	YP-69-42-709*	6/30/99	14:11	721	NR	NR	26.3	485	NA	196	NA	NA	222
	YP-69-43-606*	5/10/99	14:51	698	NR	NR	23.3	508	NA	204	NA	NA	228
	YP-69-44-902	2/22/99	14:40	1560	250	75	23.2	513	495	206	174	7.6	208
	YP-69-45-404*	7/15/99	13:55	1493	NR	NR	23.3	533	NA	214	NA	NA	248
	YP-69-45-405*	5/5/99	12:04	1211	NR	NR	23.2	475	NA	212	NA	NA	227
	YP-69-50-203*	5/10/99	11:28	525	NR	NR	23.2	555	NA	214	NA	NA	241
	YP-69-50-207*	7/15/99	10:50	265	NR	NR	25	516	NA	208	NA	NA	233
	YP-69-50-501*	5/10/99	10:33	600	NR	NR	22.7	1177	NA	230	NA	NA	437
	YP-69-50-506*	7/15/99	11:48	525	NR	NR	23.8	597	NA	216	NA	NA	261
	YP-69-51-120*	5/10/99	13:34	400	NR	NR	24.7	1045	NA	246	NA	NA	387
	YP-69-51-606	4/11/99	14:30	1400	297	60	31.4	3080	2980	NA	268	7.1	960
	YP-69-52-102	1/26/99	14:00	1494	25	1950	33.5	2130	2130	254	265	7.1	650
	YP-69-52-202	4/21/99	11:13	1500	295	60	30.1	638	560	199	187	7.6	212
	YP-69-52-404	7/29/99	13:30	1466	270	60	35	2760	2680	NA	278	7.1	300

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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-68-37-521	1/20/99	575	204	462	29.9	880	1660	4.3	9.6	4420
		2/24/99	535	201	498	31	870	1646	4.15	9.3	4360
		3/24/99	572	208	480	30.7	890	1520	4.4	9.2	4996
		4/28/99	549	185	498	33.3	880	1735	4.2	8.6	4554
		5/26/99	563	193	404	31	880	1722	4.5	9.1	4344
		6/29/99	547	196	527	29.6	930	1650	4.5	9.4	4188
		8/31/99	556	203	450	30.9	900	1450	4.24	8.66	4948
		9/30/99	560	202	442	29.2	920	1770	4.78	9.13	4552
		10/19/99	566	204	485	29.4	910	1790	4.28	9.18	4296
	AY-68-37-522	1/20/99	385	142	341	21.5	580	1182	3.7	7.9	3180
		2/24/99	390	139	364	22.6	580	1120	3.25	8.2	3244
		3/24/99	413	139	346	22.3	580	1035	3.75	8.2	3580
		4/28/99	393	133	350	24.6	590	1251	3.6	7.9	3188
		5/26/99	415	139	306	21.1	570	1240	3.6	8.1	3212
		6/29/99	394	137	349	21.6	610	1211	3.5	7.1	3316
		8/31/99	367	135	317	21.2	600	1060	3.57	8.06	3440
		9/30/99	395	139	296	15.6	630	1300	4.39	8.24	3276
		10/19/99	418	145	342	20.8	620	1280	3.96	8.08	3168
	AY-68-37-523	1/20/99	557	216	520	30.2	910	1660	4.3	8.9	4540
		2/24/99	561	210	554	31.8	890	1726	4	8.7	4516
		3/24/99	553	217	526	31.7	910	1430	4.3	8.9	5100
		4/28/99	550	197	520	34.4	900	1692	4.1	8.6	4604
		5/26/99	560	206	428	29.7	900	1688	4.1	8.2	4616
		6/29/99	544	207	517	30.8	880	1630	4.3	8.5	4576
		8/31/99	524	202	605	27.9	925	1400	4.07	8.24	976
		9/30/99	539	206	488	28.2	950	1740	4.92	8.54	4600
		10/19/99	564	220	530	29.3	970	1750	4.33	9.04	4440
	AY-68-37-524	1/20/99	87	27	37.2	2.5	65	105	0.9	6.4	664
		2/24/99	80	26	42.1	2.7	65	104	1	6.2	522
		3/24/99	88	27	38.2	2.8	65	102	1.08	6.4	600
		4/28/99	87	26	43.2	3.6	70	129	1.08	6	616
		5/26/99	91	27	37.9	3	70	114	1.06	6.4	564

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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-68-37-524	6/29/99	87	27	42.8	3.1	80	119	1.16	6	956
		8/31/99	90	29	51.1	2.04	75	111	1.26	6.29	508
		9/30/99	97	31	51.2	1.14	100	177	1.4	6.54	684
		10/19/99	99	32	49.3	3.45	80	167	1.34	6.84	672
	AY-68-37-525	1/20/99	593	258	572	35.3	1150	1915	4.5	8.7	5348
		2/24/99	601	251	654	34.3	1200	1770	4	8.6	5040
		3/24/99	618	258	628	36.3	1200	1835	4.4	8.8	5968
		4/28/99	587	239	528	39.3	1000	2025	4.4	8	5344
		5/26/99	619	250	431	32.3	1100	1936	4.5	8.2	5204
		6/29/99	594	254	619	34.8	1050	1904	4.5	8.3	4920
		8/31/99	603	258	630	30.7	1200	1740	4.36	8.38	5968
		9/30/99	614	258	556	32.8	1300	2050	5.26	8.54	5436
		10/19/99	623	262	647	34.4	1200	2040	4.64	8.48	5038
	AY-68-37-526	1/20/99	95	32	43.8	2.1	80	156	0.77	5.8	820
		2/24/99	90	32	48.7	2.4	76	145	0.67	5.6	624
		3/24/99	95	33	44.6	2.5	78	145	0.7	5.9	653
		4/28/99	94	30	45	2.9	78	146	0.75	4.5	636
		5/26/99	94	31	39.3	2.3	76	145	0.74	5.6	644
		6/29/99	91	31	41.4	2.4	72	133	0.73	4.1	630
		8/31/99	89	31	47.4	<1.0	86	127	0.80	5.5	644
		9/30/99	93	31	40.7	<1	86	154	0.85	5.48	568
		10/19/99	89	31	39.7	2.2	72	134	0.75	5.66	632
	AY-68-37-527	1/20/99	65	17	9.1	<1	26	26	0.32	5.7	352
		2/24/99	59	17	11.9	1.1	28	23	0.29	5.7	308
		3/24/99	67	18	11.4	<1	26	25	0.3	5.7	328
		4/28/99	57	16	12.1	1.2	28	30	0.32	5.4	336
		5/26/99	67	17	12.7	<1	28	32	0.29	5	312
		6/29/99	65	17	10.6	1.1	28	27	0.37	5.6	308
		8/31/99	66	18	13.2	<1	30	33.3	0.38	5.56	324
		9/30/99	68	17	10.2	<1	34	33.3	0.39	5.62	248
		10/19/99	69	18	11.8	1.22	32	32.3	0.33	5.82	168

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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)
Comal											
	DX-68-22-901*	6/2/99	82	11	6	1	9	9	0.1	12	273
	DX-68-22-902*	6/2/99	70	11	7	0.9	10	11	0.1	12	255
	DX-68-23-304	12/28/99	78	17	12	1	20	26	0.25	5.2	256
	DX-68-23-602*	5/27/99	79	14	9	1.4	14	19	0.2	13	297
	DX-68-23-616A	1/19/99	163	104	299	21.7	490	508	3.45	6.8	2040
		2/16/99	164	101	288	21.5	500	490	3.34	6.6	1904
		3/16/99	155	100	279	22.5	490	509	3.45	6.6	2004
		4/27/99	167	95	329	21.2	510	558	3.35	6.6	2024
	*	5/18/99	149	99	318	21.1	534	535	3	15	1844
		6/22/99	167	100	314	22.3	520	570	3.15	6.7	2080
	DX-68-23-616A	7/22/99	160	93	296	20.6	510	567	3.25	6.6	1980
		8/31/99	166	101	331	19.9	530	556	3.22	6.71	2008
		9/28/99	154	103	304	21.6	550	554	3.4	6.76	1992
		12/27/99	162	99	330	20	533	520	3.38	6.4	1732
	DX-68-23-616B	1/19/99	99	63	140	10.7	260	283	3.25	5.7	1172
		2/16/99	101	62	127	10.5	260	279	3.35	6.4	1140
		3/16/99	100	62	125	10	270	276	3.35	6.4	1172
		4/27/99	98	57	159	10.4	260	276	3.3	6	1200
	*	5/18/99	93	62	151	11	265	284	3.1	15	1038
		6/22/99	100	62	136	10.8	250	293	3.25	6.4	1280
		7/22/99	96	57	131	9.9	270	272	3.2	5.8	1156
		8/30/99	99	60	156	9.55	270	281	3.39	6.22	1104
		9/28/99	96	61	130	9.43	290	288	3.35	7.08	1160
		12/27/99	100	63	160	9	288	281	3.36	6	1012
	DX-68-23-617	1/19/99	60	27	7.3	1.1	17	53	1.22	6	400
		2/16/99	58	27	7.6	1.2	18	52	1.22	5.8	368
		3/16/99	58	26	7.9	1.5	18	54	1.28	5.8	392
		4/27/99	58	25	10.2	1.4	18	52	1.26	5.7	416
	*	5/18/99	56	27	11	1.5	17	54	1.3	14	327
		6/22/99	59	26	9.5	1.6	18	55	1.18	5.8	456
		7/22/99	59	25	9.6	1.3	18	53	1.22	5.8	364
		8/30/99	60	26	12	<1	18	53.8	1.28	5.78	352

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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)
Comal	DX-68-23-617	9/28/99	58	27	7.92	<1	21	54.6	1.26	5.74	340
		12/27/99	49	29	15	1	23	41	2.36	5.7	168
	DX-68-23-618	1/19/99	52	33	25.1	2.1	44	63	2.4	6.2	412
		2/16/99	53	32	24.1	2.3	42	60	2.45	6.3	352
		3/16/99	49	32	23.6	2.7	40	58	2.25	6.2	408
		4/27/99	53	30	29.1	2.4	21	61	2.5	6	444
	*	5/18/99	51	32	26	2.6	45	63	2.6	15	347
		6/22/99	53	31	26.4	2.5	42	63	2.45	6.2	328
		7/22/99	54	31	26	2.2	44	64	2.2	6.1	400
		8/30/99	54	32	29.5	<1	44	64	2.5	6.12	384
		9/28/99	54	33	28.5	<1	48	63	2.65	5.92	372
		12/27/99	60	25	12	<1.0	19	46	1.42	5	260
	DX-68-23-619A	1/19/99	51	29	11.6	1.2	22	43	2.4	6.2	352
		2/16/99	51	30	13.4	1.3	22	40	2.35	6.2	284
		3/16/99	49	30	10.6	1.9	21	41	2.25	6.1	344
		4/27/99	50	28	13.9	1.5	23	43	2.4	5.9	364
	DX-68-23-619A*	5/18/99	47	30	14	1.7	23	44	2.4	15	304
		6/22/99	50	29	12.4	1.6	22	46	2.3	6	352
		7/22/99	51	28	13	1.4	23	44	2.1	6.1	328
		8/30/99	51	29	16	<1	24	44.6	2.41	6.06	272
		9/28/99	49	30	13	<1	25	43	2.4	5.88	304
		12/27/99	60	27	11	1	18	48	1.22	5.3	332
	DX-68-23-619B	1/19/99	62	26	8.8	1	18	50	1.52	5.8	376
		2/16/99	60	25	9.8	1.2	19	44	1.42	5.9	336
		3/16/99	56	25	8	1.7	18	45	1.54	5.8	368
		4/27/99	59	24	11	1.4	20	48	1.52	5.6	376
	*	5/18/99	55	25	11	1.4	18	49	1.5	14	316
		6/22/99	59	25	9.8	1.1	19	47	1.4	5.7	336
		7/22/99	59	23	10	1.3	20	48	1.36	5.8	356
		8/30/99	62	25	12.2	<1	19	47.7	1.47	5.78	296
		9/28/99	59	25	9.08	<1	21	46.6	1.46	5.58	328
		12/27/99	54	32	28	2	46	59	2.62	5.7	300
	DX-68-30-208*	6/17/99	94	14	12	2.6	13	47	0.2	16	382

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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Guadalupe											
	Tri-County #1	9/14/99	57	34	56.6	1.29	67	80.9	2.33	5.59	480
	Tri-County #2	10/13/99	294	164	626	35.6	1100	934	3.83	6.02	3584
	Tri-County #3	12/14/99	496	228	1040	61	2098	1850	5.18	6.8	5668
Hays											
	LR-67-01-812	1/7/99	900	449	1997	93.2	4050	2625	5.63	7.2	11136
		2/17/99	883	439	2124	95.4	3950	2674	5.25	6.8	11196
		5/20/99	916	446	2064	99.5	4150	2800	5.9	7	10980
		8/9/99	928	448	2272	94.6	3900	2670	5.38	7.3	11868
		11/23/99	897	436	1906	97	4023	3085	5.82	6.8	11872
	LR-67-01-813A	1/7/99	914	451	2020	93.6	3600	2680	5.75	6.9	11184
		2/17/99	926	461	2108	94.6	3950	2824	6.25	6.8	11360
		5/20/99	923	449	2072	97.8	4200	2758	4.9	7	11568
		8/9/99	921	452	2292	93.6	3950	2511	5.5	6.9	11680
		11/23/99	889	433	1984	98	3948	3130	6.45	6.7	11940
	LR-67-01-813B	1/7/99	902	438	2050	92.5	3900	2542	4.88	6.8	11140
		2/17/99	892	451	2152	92.6	3900	2758	6	6.9	11388
		5/20/99	857	418	2032	97.3	4150	2745	4.7	6.8	12032
		8/9/99	914	443	2048	88	3950	2525	5.38	6.8	11816
		11/23/99	856	433	2052	97	4084	3080	7.22	6.7	11868
	LR-67-01-814A	1/7/99	892	450	1997	92	3950	2580	5	7.1	11196
		2/17/99	879	433	2140	84.8	3925	2650	6	7.1	11208
		5/20/99	881	434	2064	95.4	4150	2683	4.8	7.6	11796
		8/9/99	889	454	2108	74.3	4000	2736	4.08	7	11640
		11/23/99	884	448	1998	100	4084	3060	6.48	6.9	11720
	LR-67-01-814B	1/7/99	891	453	1980	91.2	3500	2584	5	6.8	10808
		2/17/99	863	431	2048	98.4	3900	2730	7	6.8	11228
		5/20/99	886	428	1992	97.1	4150	2800	4.7	7	11796
		8/9/99	913	450	2108	54.1	4000	2614	7.5	6.4	11828
		11/23/99	873	435	1936	99	4098	3040	6.52	6.5	11976
Medina											
	TD-68-25-703*	4/19/99	73	9	6	1	10	34	0.1	11	252
	TD-68-33-202*	4/19/99	74	11	6	1.1	11	29	0.1	13	261

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Analytical data for major ions in water from wells completed in the Edwards Aquifer, 1999.

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Medina	TD-68-41-102	5/6/99	67	15	9	1.1	22	16	0.2	13	268
	TD-68-41-303*	4/19/99	70	16	10	1.1	23	17	0.2	14	276
	TD-68-41-901*	5/6/99	63	16	9	1.1	24	15	0.2	13	262
	TD-68-42-506*	5/3/99	65	15	10	1.1	25	14	0.2	12	266
	TD-68-42-806*	4/26/99	65	17	9	1.1	22	18	1.6	15	266
	TD-68-49-301*	4/26/99	57	20	9	1	19	24	0.6	15	269
	TD-68-49-501*	4/26/99	68	16	11	1.2	27	20	0.2	14	283
	TD-69-37-302*	5/5/99	76	11	6	1.2	11	24	0.2	13	270
	TD-69-38-906*	4/22/99	77	14	9	1.2	13	12	0.2	15	286
	TD-69-39-601*	4/22/99	78	10	7	0.9	12	11	0.1	14	268
	TD-69-46-601*	4/22/99	70	15	8	1.1	14	18	0.2	14	265
	TD-69-47-301*	4/22/99	68	15	8	1.1	14	17	0.2	14	263
	TD-69-63-103*	5/6/99	57	22	10	1.3	15	87	1.1	21	333
Uvalde											
	YP-69-35-401*	5/17/99	68	16	7	0.9	12	10	0.1	13	259
	YP-69-35-602*	6/23/99	57	19	7	1.1	12	12	0.1	14	243
	YP-69-42-709*	6/30/99	72	10	14	1.1	25	12	0.1	13	274
	YP-69-43-606*	5/10/99	75	10	11	1.1	26	14	0.1	14	275
	YP-69-44-902	2/22/99	46	15	22.9	2.3	38	26	0.62	4.6	252
	YP-69-45-404*	7/15/99	73	16	12	1.4	17	37	0.2	13	298
	YP-69-45-405*	5/5/99	69	14	7	1.1	13	19	0.2	13	260
	YP-69-50-203*	5/10/99	80	10	15	1	34	17	0.1	14	297
	YP-69-50-207*	7/15/99	77	10	13	1	25	14	0.1	14	284
	YP-69-50-501*	5/10/99	148	17	55	1.4	183	79	0.2	18	654
	YP-69-50-506*	7/15/99	89	9	17	1.1	37	23	0.1	13	328
	YP-69-51-120*	5/10/99	128	16	49	1.5	114	67	1.3	18	563
	YP-69-51-606	4/11/99	245	87	330	19	370	851	3.2	7.5	2256
	YP-69-52-102	1/26/99	164	59	222	10.3	260	411	3.1	6.9	1392
	YP-69-52-202	4/21/99	54	16	34.4	4.2	42	80	0.99	6.5	320
	YP-69-52-404	7/29/99	150	44	378	13	400	550	2.75	8.7	1784

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Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1999.

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-68-37-521	2/24/99	<0.002	0.01	<0.001	<0.001	<0.001	0.019	<0.002	0.008	<0.002	<0.003	<0.001	<0.01
		5/26/99	0.002	0.01	<0.001	0.001	<0.001	0.034	<0.002	0.009	<0.002	0.005	<0.001	<0.01
		8/31/99	<0.002	<0.01	<0.001	<0.001	0.019	0.018	<0.002	0.008	<0.002	0.009	<0.001	<0.01
	AY-68-37-522	2/24/99	<0.002	<0.01	<0.001	0.001	<0.001	0.095	0.003	0.009	<0.002	<0.003	<0.001	<0.01
		5/26/99	<0.002	0.01	<0.001	<0.001	<0.001	0.111	<0.002	0.01	<0.002	<0.003	<0.001	<0.01
		8/31/99	<0.002	<0.01	<0.001	<0.001	0.002	0.048	<0.002	0.005	<0.002	0.008	<0.001	<0.01
	AY-68-37-523	2/24/99	<0.002	<0.01	<0.001	<0.001	<0.001	0.03	<0.002	0.009	<0.002	<0.003	<0.001	<0.01
		5/26/99	0.003	0.01	<0.001	<0.001	<0.001	0.039	<0.002	0.009	<0.002	<0.003	<0.001	<0.01
		8/31/99	<0.002	<0.01	<0.001	<0.001	<0.001	0.028	<0.002	0.004	<0.002	0.009	<0.001	<0.01
	AY-68-37-524	2/24/99	<0.002	0.07	<0.001	<0.001	<0.001	0.6	<0.002	0.005	<0.002	<0.003	<0.001	<0.01
		5/26/99	0.006	0.06	<0.001	<0.001	<0.001	0.798	<0.002	0.006	<0.002	<0.003	<0.001	<0.01
		8/31/99	0.006	0.06	<0.001	<0.001	<0.001	1.14	<0.002	0.005	<0.002	0.005	<0.001	<0.01
	AY-68-37-525	2/24/99	<0.002	0.01	<0.001	<0.001	<0.001	0.02	<0.002	0.01	<0.002	<0.003	<0.001	<0.01
		5/26/99	0.002	0.01	<0.001	<0.001	<0.001	0.054	<0.002	0.012	<0.002	<0.003	<0.001	<0.01
		8/31/99	<0.002	<0.01	<0.001	<0.001	<0.001	0.034	<0.002	0.008	<0.002	0.006	<0.001	<0.01
	AY-68-37-526	2/24/99	<0.002	0.11	<0.001	<0.001	<0.001	0.71	<0.002	0.014	<0.002	<0.003	<0.001	<0.01
		5/26/99	0.002	0.1	<0.001	<0.001	<0.001	1.535	<0.002	0.022	<0.002	<0.003	<0.001	<0.01
		8/31/99	<0.002	0.1	<0.001	<0.001	0.002	0.599	<0.002	0.01	<0.002	0.003	<0.001	<0.01
	AY-68-37-527	2/24/99	<0.002	0.11	<0.001	<0.001	<0.001	0.003	<0.002	0.003	<0.002	<0.003	<0.001	<0.01
		5/26/99	<0.002	0.11	<0.001	<0.001	0.002	0.013	0.005	0.003	<0.002	<0.003	<0.001	<0.01
		8/31/99	<0.002	0.11	<0.001	<0.001	0.002	0.012	<0.002	<0.002	<0.002	0.003	<0.001	<0.01
Comal														
	DX-68-22-901*	6/2/99	<0.002	0.0296	<0.001	0.0054	<0.002	<0.05	0.0026	<0.001	NA	<0.004	NA	0.0093
	DX-68-22-902*	6/2/99	<0.002	0.0298	<0.001	0.0053	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	<0.002
	DX-68-23-304	12/28/99	<0.002	0.06	<0.001	0.005	0.002	0.019	<0.002	<0.002	<0.002	<0.003	<0.001	0.03
	DX-68-23-602*	5/27/99	<0.002	0.0379	<0.001	0.0056	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	0.004
	DX-68-23-616A	2/16/99	0.002	0.03	<0.001	<0.002	0.003	0.031	0.012	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.0239	<0.001	<0.001	<0.002	0.134	<0.001	0.0016	NA	0.0134	NA	<0.002
		7/22/99	<0.002	0.03	<0.001	<0.002	<0.001	0.022	<0.002	0.003	<0.002	<0.003	<0.001	<0.01
		12/27/99	<0.002	0.03	<0.001	<0.001	0.001	0.062	<0.002	0.004	<0.002	<0.003	<0.001	<0.01
	DX-68-23-616B	2/16/99	<0.002	0.03	<0.001	<0.002	0.006	0.006	0.005	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.0208	<0.001	<0.001	<0.002	0.087	<0.001	<0.001	NA	0.0054	NA	<0.002
		7/22/99	<0.002	0.02	<0.001	<0.002	<0.001	0.007	<0.002	<0.002	<0.002	0.003	<0.001	<0.01
		12/27/99	<0.002	0.03	<0.001	<0.001	<0.001	0.013	<0.002	0.003	<0.002	<0.003	<0.001	0.01

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NA = not analyzed

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1999.

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)
Comal	DX-68-23-617	2/16/99	<0.002	0.11	<0.001	<0.002	0/014	0.007	0.003	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.1115	<0.001	<0.001	<0.002	0.057	<0.001	<0.001	NA	<0.004	NA	0.0044
		7/22/99	<0.002	0.11	<0.001	<0.002	<0.001	0.009	<0.002	<0.002	<0.002	<0.003	<0.001	0.01
		12/27/99	<0.002	0.05	<0.001	0.002	0.026	0.06	<0.002	<0.002	<0.002	<0.003	<0.001	0.01
	DX-68-23-618	2/16/99	<0.002	0.04	<0.001	<0.002	0.002	0.008	0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.0301	<0.001	<0.001	<0.002	0.06	<0.001	<0.001	NA	<0.004	NA	<0.002
		7/22/99	<0.002	0.03	<0.001	<0.002	<0.001	0.014	<0.002	<0.002	<0.002	<0.003	<0.001	0.01
		12/27/99	<0.002	0.13	<0.001	<0.001	0.002	0.024	<0.002	<0.002	<0.002	<0.003	<0.001	0.02
	DX-68-23-619A	2/16/99	<0.002	0.05	<0.001	<0.002	0.001	0.036	0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.1216	<0.001	<0.001	<0.002	0.102	<0.001	<0.001	NA	<0.004	NA	0.0026
		7/22/99	<0.002	0.04	<0.001	<0.002	<0.001	0.055	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		12/27/99	<0.002	0.12	<0.001	<0.001	0.002	0.007	<0.002	<0.002	<0.002	<0.003	<0.001	0.01
	DX-68-23-619B	2/16/99	<0.002	0.12	<0.001	<0.002	0.001	0.021	0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		5/18/99	<0.002	0.0401	<0.001	<0.001	<0.002	0.091	<0.001	<0.001	NA	<0.004	NA	<0.002
		7/22/99	<0.002	0.12	<0.001	<0.002	<0.001	0.024	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		12/27/99	<0.002	0.04	<0.001	0.004	<0.001	0.019	<0.002	<0.002	<0.002	<0.003	<0.001	0.01
	DX-68-30-208	6/17/99	<0.002	0.0512	<0.001	0.003	<0.002	0.061	<0.001	0.0052	NA	<0.004	NA	<0.002
Guadalupe														
	Tri-County #1	9/14/99	<0.002	0.09	<0.001	<0.001	<0.001	0.186	<0.002	0.003	<0.002	NA	<0.001	0.05
	Tri-County #2	10/13/99	0.007	0.06	<0.002	<0.002	0.002	0.063	<0.002	0.022	<0.002	0.007	<0.001	0.01
	Tri-County #3	12/14/99	0.002	0.03	<0.001	<0.002	0.001	0.163	<0.002	0.007	<0.002	NA	<0.001	<0.01
Hays														
	LR-67-01-812	1/7/99	0.002	<0.01	<0.001	<0.001	0.003	0.008	0.002	0.003	<0.002	0.006	<0.001	<0.01
		2/17/99	<0.002	<0.01	<0.001	<0.001	0.005	0.01	<0.002	0.002	<0.002	<0.003	<0.001	<0.01
		5/20/99	<0.002	<0.01	<0.001	<0.001	<0.001	<0.003	<0.002	0.002	<0.002	0.006	<0.001	<0.01
		8/9/99	0.004	<0.01	<0.001	<0.002	0.001	0.006	<0.002	0.003	<0.002	0.015	<0.001	<0.01
		11/23/99	0.006	<0.01	<0.001	<0.001	<0.001	0.004	0.002	0.004	<0.002	0.008	<0.001	0.03
	LR-67-01-813A	1/7/99	<0.002	<0.01	<0.001	<0.001	0.003	0.042	<0.002	0.005	<0.002	0.007	<0.001	<0.01
		2/17/99	<0.002	<0.01	0.001	<0.001	<0.001	0.005	<0.002	0.002	<0.002	<0.003	<0.001	0.01
		5/20/99	0.002	<0.01	<0.001	0.002	<0.001	<0.003	<0.002	0.004	<0.002	0.006	<0.001	<0.01
		8/9/99	0.004	<0.01	<0.001	<0.002	0.001	0.008	<0.002	0.005	<0.002	0.015	<0.001	<0.01
		11/23/99	0.005	<0.01	<0.001	<0.001	<0.001	0.004	<0.002	0.006	<0.002	0.009	<0.001	<0.01

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NA = not analyzed

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1999.

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-67-01-813B	1/7/99	0.002	<0.01	<0.001	0.001	0.004	0.009	<0.002	0.003	<0.002	0.007	<0.001	<0.01
		2/17/99	<0.002	<0.01	<0.001	<0.001	0.002	0.015	<0.002	<0.002	<0.002	0.004	<0.001	<0.01
		5/20/99	0.002	<0.01	<0.001	<0.001	<0.001	<0.003	<0.002	0.002	<0.002	0.012	<0.001	<0.01
		8/9/99	0.003	<0.01	<0.001	<0.002	<0.001	0.004	<0.002	0.003	<0.002	0.016	<0.001	<0.01
		11/23/99	0.005	<0.01	<0.001	<0.001	<0.001	0.016	<0.002	0.003	<0.002	0.008	<0.001	<0.01
	LR-67-01-814A	1/7/99	<0.002	<0.01	<0.001	<0.001	0.003	0.008	<0.002	0.003	<0.002	0.005	<0.001	<0.01
		2/17/99	<0.002	<0.01	<0.001	<0.001	0.002	0.014	<0.002	<0.002	<0.002	0.004	<0.001	<0.01
		5/20/99	<0.002	<0.01	<0.001	<0.001	<0.001	<0.003	<0.002	0.002	<0.002	0.014	<0.001	<0.01
		8/9/99	0.003	<0.01	<0.001	<0.002	<0.001	0.008	<0.002	0.003	<0.002	0.01	<0.001	<0.01
		11/23/99	0.006	<0.01	<0.001	<0.001	<0.001	0.003	<0.002	0.003	<0.002	0.007	<0.001	<0.01
	LR-67-01-814B	1/7/99	<0.002	<0.01	<0.001	<0.001	0.003	0.006	<0.002	0.003	<0.002	0.006	<0.001	<0.01
		2/17/99	<0.002	<0.01	<0.001	<0.001	0.002	0.011	<0.002	<0.002	<0.002	<0.003	<0.001	<0.01
		5/20/99	<0.002	<0.01	<0.001	0.001	<0.001	<0.003	<0.002	0.002	<0.002	0.012	<0.001	<0.01
		8/9/99	0.002	<0.01	<0.001	<0.002	<0.001	0.011	<0.002	0.003	<0.002	0.012	<0.001	<0.01
		11/23/99	0.006	<0.01	<0.001	<0.001	<0.001	0.005	<0.002	0.003	<0.002	0.01	<0.001	<0.01
Medina														
	TD-68-25-703*	4/19/99	<0.002	0.0294	<0.001	0.0088	0.0028	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0307
	TD-68-33-202*	4/19/99	<0.002	0.0317	<0.001	0.0101	0.0031	<0.05	0.0013	<0.001	NA	<0.004	NA	0.16
	TD-68-41-102*	5/6/99	<0.002	0.0487	<0.001	0.0141	0.003	<0.05	0.0052	<0.001	NA	<0.004	NA	0.0103
	TD-68-41-303*	4/19/99	<0.002	0.047	<0.001	0.0109	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	<0.004
	TD-68-41-901*	5/6/99	<0.002	0.0853	<0.001	0.0133	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0065
	TD-68-42-506*	5/3/99	<0.002	0.0704	<0.001	0.0139	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0046
	TD-68-42-806*	4/26/99	<0.002	0.101	<0.001	0.019	0.0042	<0.05	0.0097	<0.001	NA	<0.004	NA	0.0312
	TD-68-49-301*	4/26/99	<0.002	0.181	<0.001	0.0197	0.0043	<0.05	<0.001	<0.001	NA	<0.004	NA	<0.004
	TD-68-49-501*	4/26/99	<0.002	0.129	<0.001	0.0197	0.0035	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0062
	TD-69-37-302*	5/5/99	<0.002	0.033	<0.001	0.0147	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0111
	TD-69-38-906*	4/22/99	<0.002	0.0423	<0.001	0.0112	0.0035	<0.05	<0.001	<0.001	NA	<0.004	NA	0.005
	TD-69-39-601*	4/22/99	<0.002	0.0304	<0.001	0.0102	0.0022	<0.05	0.0025	<0.001	NA	<0.004	NA	0.434
	TD-69-46-601*	4/22/99	<0.002	0.0363	<0.001	0.0098	0.0038	<0.05	<0.001	<0.001	NA	<0.004	NA	0.006
	TD-69-47-301*	4/22/99	<0.002	0.0379	<0.001	0.0098	0.0031	<0.05	0.0011	<0.001	NA	<0.004	NA	0.0218
	TD-69-63-103*	5/6/99	<0.002	0.116	<0.001	0.0119	<0.002	0.93	<0.001	0.0221	NA	<0.004	NA	<0.004

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NA = not analyzed

Analytical data for minor elements in water from wells completed in the Edwards Aquifer, 1999.

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)
Uvalde														
	YP-69-35-401*	5/17/99	<0.002	0.0458	<0.001	<0.001	<0.002	0.053	<0.001	<0.001	NA	<0.004	NA	0.0085
	YP-69-35-602*	6/23/99	<0.002	0.038	<0.001	0.004	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	<0.002
	YP-69-42-709*	6/30/99	<0.002	0.048	<0.001	0.0011	<0.002	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0072
	YP-69-43-606*	5/10/99	<0.002	0.0476	<0.001	0.007	0.0023	0.058	<0.001	<0.001	NA	<0.004	NA	0.0026
	YP-69-44-902	2/22/99	<0.002	0.09	<0.001	<0.001	<0.001	0.319	<0.002	0.009	<0.002	<0.003	<0.001	0.01
	YP-69-45-404*	7/15/99	<0.002	0.0406	<0.001	0.0024	0.0035	0.058	0.002	0.0037	NA	<0.004	NA	0.0088
	YP-69-45-405*	5/5/99	<0.002	0.035	<0.001	0.0133	0.0024	<0.05	<0.001	<0.001	NA	<0.004	NA	0.0139
	YP-69-50-203*	5/10/99	<0.002	0.0497	<0.001	0.0017	0.0078	<0.05	<0.001	<0.001	NA	<0.004	NA	0.006
	YP-69-50-207*	7/15/99	<0.002	0.0516	<0.001	0.0019	0.0021	0.081	0.0037	<0.001	NA	NA	NA	0.0112
	YP-69-50-501*	5/10/99	<0.002	0.0902	<0.001	0.0022	0.0051	0.056	0.0065	<0.001	NA	NA	NA	0.0151
	YP-69-50-506*	7/15/99	<0.002	0.0662	<0.001	0.0026	0.0063	0.08	0.0017	<0.001	NA	NA	NA	0.0077
	YP-69-51-120*	5/10/99	<0.002	0.0919	<0.001	0.002	0.0026	<0.05	<0.001	<0.001	NA	NA	NA	0.0055
	YP-69-51-606	4/11/99	<0.002	0.02	<0.001	<0.001	0.001	0.037	<0.002	0.01	<0.002	NA	<0.001	<0.01
	YP-69-52-102	1/26/99	<0.002	0.02	<0.001	0.003	<0.001	0.1	<0.002	0.009	<0.002	NA	<0.001	<0.01
	YP-69-52-202	4/21/99	<0.002	0.06	<0.001	0.002	0.001	0.018	<0.002	0.006	<0.002	NA	<0.001	<0.01
	YP-69-52-404	7/29/99	0.008	0.03	<0.001	<0.002	<0.001	2.005	<0.002	0.012	<0.002	NA	<0.001	0.27

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NA = not analyzed

Analytical data for nutrients in water from wells completed in the Edwards Aquifer, 1999.

County	Station name	Date sampled	Nitrogen, Kjeldahl (mg/L)	Nitrogen, nitrate (mg/L)	Nitrogen, nitrite (mg/L)	Phosphorus, total (mg/L)	Total Organic Carbon (mg/L)
Comal							
	DX-68-15-901*	6/2/99	<0.04	0.935		0.041	
	DX-68-22-901*	6/2/99	<0.04	1.27		<0.04	
	DX-68-22-902*	6/2/99	<0.04	1.2		0.046	
	DX-68-23-301*	6/2/99	<0.04	1.46		0.045	
	DX-68-23-602*	5/27/99	0.041	1.8		<0.04	
	DX-68-23-616A*	5/18/99	1.02	<0.02		<0.04	
	DX-68-23-616B*	5/18/99	0.493	<0.02		0.06	
	DX-68-23-617*	5/18/99	<0.04	0.402		0.073	
	DX-68-23-618*	5/18/99	0.15	<0.02		<0.04	
	DX-68-23-619A*	5/18/99	<0.04	<0.02		<0.04	
	DX-68-23-619B*	5/18/99	<0.04	<0.02		<0.04	
	DX-68-30-208*	6/17/99	<0.04	7.94		<0.04	
Medina							
	TD-68-25-703*	4/19/99	0.058	0.48		<0.04	
	TD-68-33-202*	4/19/99	<0.04	0.8		<0.04	
	TD-68-41-102*	5/6/99	0.09	1.6		<0.04	
	TD-68-41-303*	4/19/99	0.041	2.2		<0.04	
	TD-68-41-901*	5/6/99	0.061	1.63		<0.04	
	TD-68-42-506*	5/3/99	0.04	1.72		<0.04	
	TD-68-42-806*	4/26/99	<0.04	1.22		<0.04	
	TD-68-49-301*	4/26/99	<0.04	1.3		<0.04	
	TD-68-49-501*	4/26/99	<0.04	2.12		<0.04	
	TD-69-37-302*	5/5/99	0.101	1.58		<0.04	
	TD-69-38-906*	4/22/99	0.081	3.36		<0.04	
	TD-69-39-601*	4/22/99	0.065	1.55		<0.04	
	TD-69-46-601*	4/22/99	0.172	1.53		<0.04	
	TD-69-47-301*	4/22/99	<0.04	1.63		<0.04	
	TD-69-63-103*	5/6/99	0.073	<0.02		<0.04	
Guadalupe							
	Tri-County #1	9/14/99	0.46	0.54	0.062	<0.01	<1.0
	Tri-County #2	10/13/99	2.23	0.314	0.033	<0.01	
	Tri-County #3	12/14/99	4.46	0.4	0.012	<0.01	<1.0
Uvalde							
	YP-69-35-401*	5/17/99	<0.04	1.88		<0.04	
	YP-69-35-602*	6/23/99	<0.04	1.51		<0.04	
	YP-69-42-709*	6/30/99	<0.04	2.54		<0.04	
	YP-69-43-606*	5/10/99	<0.04	1.94		<0.04	
	YP-69-44-902	2/22/99	1.4	2.48	0.015	<0.01	<1.0
	YP-69-45-404*	7/15/99	<0.04	1.5		<0.04	
	YP-69-45-405*	5/5/99	0.067	1.16		<0.04	
	YP-69-50-203*	5/10/99	0.108	1.9		0.04	
	YP-69-50-207*	7/15/99	<0.04	2.39		<0.04	
	YP-69-50-501*	5/10/99	0.076	5.92		0.041	
	YP-69-50-506*	7/15/99	<0.04	3.07		<0.04	
	YP-69-51-120*	5/10/99	0.051	6.74		<0.04	
	YP-69-51-606	4/11/99	1.4	<0.02	0.005	<0.01	1
	YP-69-52-202	4/21/99	0.37	1.33	0.006	<0.01	<1.0
	YP-69-52-404	7/29/99	1.4	<0.05	<0.005	<0.01	<1.0

Note: This table was updated on February 5, 2001.

Analytical data for pesticides and herbicides in water from wells completed in the Edwards Aquifer, 1999.

County	State Well Number	Date Sampled	Aldrin (mg/L)	Gamma BHC (Lindane) (mg/L)	Chlordane (mg/L)	DDD (mg/L)	DDE (mg/L)	DDT (mg/L)	Dieldrin (mg/L)	Endosulfan I, Alpha (mg/L)	Endosulfan II, Beta (mg/L)	Endrin (mg/L)
Comal												
	DX-68-22-902	6/2/1999	<0.0002	<0.0005	<0.05	NA	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Medina												
	TD-68-33-202	4/19/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-68-42-806	4/26/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-68-49-501	4/26/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-69-37-302	5/5/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-69-38-906	4/22/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-69-47-301	4/22/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	TD-69-63-103	5/6/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
Uvalde												
	YP-69-35-602	6/23/1999	<0.0002	<0.0005	<0.05	NA	NA	NA	<0.0002	<0.001	<0.001	<0.0005
	YP-69-42-709	6/30/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	YP-69-45-405	5/5/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005
	YP-69-51-120	5/10/1999	<0.0002	<0.0005	<0.05	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0005

NA = not analyzed

Analytical data for pesticides and herbicides in water from wells completed in the Edwards Aquifer, 1999.

State Well Number	Heptachlor (mg/L)	Heptachlor Epoxide (mg/L)	Mirex (mg/L)	Perthane (mg/L)	Toxaphene (mg/L)	PCB-Total (mg/L)	Diazinon (mg/L)	Ethion (mg/L)	Malathion (mg/L)	Methyl Parathion (mg/L)	Parathion (mg/L)	Trithion (mg/L)
DX-68-22-902	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-68-33-202	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-68-42-806	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-68-49-501	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-69-37-302	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-69-38-906	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-69-47-301	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
TD-69-63-103	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
YP-69-35-602	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
YP-69-42-709	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
YP-69-45-405	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002
YP-69-51-120	<0.0005	<0.005	<0.005	<0.01	<0.2	<0.05	<0.005	<0.01	<0.005	<0.05	<0.01	<0.002

NA = not analyzed

Analytical data for pesticides and herbicides in water from wells completed in the Edwards Aquifer, 1999.

State Well Number	2,4-D (μg/L)	2,4,5-T (μg/L)	2,4,5-TP (Silvex) (μg/L)	Atrazine (μg/L)	Hexachlorobenzene (μg/L)	Hexachlorocyclopentadiene (μg/L)	Methoxychlor (μg/L)	Pentachlorophenol (μg/L)
DX-68-22-902	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-68-33-202	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-68-42-806	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-68-49-501	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-69-37-302	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-69-38-906	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-69-47-301	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
TD-69-63-103	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
YP-69-35-602	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
YP-69-42-709	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
YP-69-45-405	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05
YP-69-51-120	<0.001	<0.002	<0.001	<0.001	<0.005	<0.005	<0.05	<0.05

NA = not analyzed

Analytical data for pesticides and herbicides in water from wells completed in the Edwards Aquifer, 1999.

State Well Number	Pichloram (μg/L)	Polychlorinated Napthalenes (μg/L)	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)
DX-68-22-902	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-68-33-202	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-68-42-806	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-68-49-501	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-69-37-302	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-69-38-906	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-69-47-301	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
TD-69-63-103	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
YP-69-35-602	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
YP-69-42-709	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
YP-69-45-405	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01
YP-69-51-120	<0.01	<0.01	<0.01	<0.005	<0.05	<0.02	<0.01	<0.05	<0.05	<0.01

NA = not analyzed

Analytical data for volatile organic compound in water from springs discharging from the Edwards Aquifer, 1999.

State Well Number	Date Sampled	Acetone (mg/L)	Acetonitrile (mg/L)	Acrolein (mg/L)	Acrylonitrile (mg/L)	Allyl alcohol (mg/L)	Allyl chloride (mg/L)	Benzene (mg/L)
Comal								
Comal Springs (DX-68-23-301)	6/2/1999	<4	NA	<4	<2	NA	NA	<0.2

State Well Number	Date Sampled	Benzyl chloride (mg/L)	Bromoacetone (mg/L)	Bromodichloromethane (mg/L)	Bromoform (mg/L)	Bromomethane (mg/L)	2-Butanone (mg/L)	Carbon disulfide (mg/L)
Comal								
Comal Springs (DX-68-23-301)	6/2/1999	NA	NA	<0.2	<0.2	<0.4	<4	<0.2

State Well Number	Date Sampled	Carbon tetrachloride (mg/L)	Chloro-benzene (mg/L)	Chloroethane (mg/L)	2-Chloroethanol (mg/L)	2-Chloroethylvinylether (mg/L)	Chloroform (mg/L)	Chloromethane (mg/L)
Comal								
Comal Springs (DX-68-23-301)	6/2/1999	<0.2	<0.2	<0.4	NA	NA	<0.2	<0.4

State Well Number	Date Sampled	Chloroprene (mg/L)	Dibromochlorobenzene (mg/L)	Dibromochloromethane (mg/L)	1,2-Dibromo-3-chloropropane (mg/L)	1,2-Dibromoethane (mg/L)	Dibromomethane (mg/L)	1,2-Dichlorobenzene (mg/L)
Comal								
Comal Springs (DX-68-23-301)	6/2/1999	NA	NA	<0.2	NA	<0.2	<0.4	<0.2

State Well Number	Date Sampled	1,3-Dichloro-benzene (mg/L)	1,4-Dichloro-benzene (mg/L)	1,4-Dichlor-2-butene (mg/L)	Dichlorodifluoromethane (mg/L)	1,1-Dichloroethane (mg/L)	1,2-Dichloroethane (mg/L)	1,1-Dichloroethene (mg/L)
Comal								
Comal Springs (DX-68-23-301)	6/2/1999	<0.2	<0.2	NA	<0.4	<0.2	<0.2	<0.2

NA = not analyzed

Analytical data for volatile organic compound in water from springs discharging from the Edwards Aquifer, 1999.

State Well Number	Date Sampled	Cis-1,2-Dichloroethene (mg/L)	Trans-1,2-Dichloroethene (mg/L)	1,2-Dichloropropane (mg/L)	Cis-1,3-Dichloropropane (mg/L)	1,3-Dichloro-2-propanol (mg/L)	1,3-Dichloropropene (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	<0.2	<0.2	<0.2	NA	NA	NA

State Well Number	Date Sampled	Cis-1,2-Dichloropropene (mg/L)	Trans-1,2-Dichloropropene (mg/L)	Cis-1,3-Dichloropropene (mg/L)	Trans-1,3-Dichloropropene (mg/L)	1,4-Dioxane (mg/L)	Ethyl benzene (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	<0.2	<0.2	NA	NA	NA	<0.2

State Well Number	Date Sampled	Ethyl methacrylate (mg/L)	Ethylene oxide (mg/L)	2-Hexanone (mg/L)	Isobutyl alcohol (mg/L)	Methacrylonitrile (mg/L)	Methylene chloride (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	NA	NA	<0.4	NA	NA	<0.4

State Well Number	Date Sampled	Methyl bromide (mg/L)	Methyl chloride (mg/L)	Methyl iodide (mg/L)	Methyl methacrylate (mg/L)	4-Methyl-2-pentanone (mg/L)	Pentachloroethane (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	NA	NA	NA	NA	<0.4	NA

State Well Number	Date Sampled	Propargyl alcohol (mg/L)	Propionitrile (mg/L)	Styrene (mg/L)	1,1,1,2-Tetrachloroethane (mg/L)	1,1,2,2-Tetrachloroethane (mg/L)	Tetrachloroethene (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	NA	NA	<0.2	<0.2	<0.2	<0.2

NA = not analyzed

Analytical data for volatile organic compound in water from springs discharging from the Edwards Aquifer, 1999.

State Well Number	Date Sampled	Toluene (mg/L)	1,1,1-Trichloroethane (mg/L)	1,1,2-Trichloroethane (mg/L)	Trichloroethene (mg/L)	Trichlorofluoromethane (mg/L)	1,2,3-Trichloropropane (mg/L)
Comal							
Comal Springs (DX-68-23-301)	6/2/1999	<0.2	<0.2	<0.2	<0.2	<0.4	<0.2

State Well Number	Date Sampled	Vinyl acetate (mg/L)	Vinyl chloride (mg/L)	Xylene (mg/L)	o-Xylene (mg/L)	m,p-Xylenes (mg/L)
Comal						
Comal Springs (DX-68-23-301)	6/2/1999	NA	<0.4	NA	<0.2	<0.2

NA = not analyzed