UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
5563 De Zavala Rd., Suite 290
San Antonio, TX 78249

MEMORANDUM

April 1st, 2016

To: Jim Winterle, Director Data Management and Modeling, Edwards Aquifer Authority

From: Richard Slattery, Hydrologic Technician, USGS, San Antonio, TX

Thru: J. Ryan Banta, South Texas Program Office Studies Chief, USGS, San Antonio, TX

Subject: Estimated annual recharge to, and spring discharge from the Edwards aquifer, 2015

Attached are two tables, the first table contains the estimated annual total recharge in thousands of acre-feet by river basin to the Edwards aquifer in the San Antonio area for the period 1934 through 2015. The second table contains the monthly total spring discharge discharging from the Edwards aquifer in acre-feet per month by spring for 2015.

Total recharge in 2015 was estimated to be 1.36 million acre-feet; well above the annual average of 700 thousand acre-feet (table 1).

The total spring discharge from the Edwards aquifer in 2015 was estimated to be 404.5 thousand acre-feet (table 2).

To view the complete USGS recharge information sheet, see the web page titled, *Estimated Recharge to the Edwards Aquifer in the San Antonio Area, Texas, 1934-2014,* at: http://tx.usgs.gov/projects/aquifer_springs/estimatedrecharge.htm

U.S. GEOLOGICAL SURVEY
SOUTH TEXAS WATER SCIENCE CENTER
5563 De Zavala Rd., Suite 290
San Antonio, TX 78249

Table 1. Estimated annual recharge to the Edwards aquifer in the San Antonio area, by stream basin or ungaged area, 1934–2015. [thousands of acre-feet]

Calendar Year	Nueces-West Nueces River Basin	Frio-Dry Frio River Basin [1]	Sabinal River Basin [1]	Area Between Sabinal River and Medina River Basin [1]	Medina River Basin[2]	Area between Medina River Basin and Cibolo-Dry Comal Creek Basins[1]	Cibolo Creek and Dry Comal Creek Basin	Blanco River Basin[1]	Total[3]
1934	8.6	27.9	7.5	19.9	46.5	21	28.4	19.8	179.6
1935	411.3	192.3	56.6	166.2	71.1	138.2	182.7	39.8	1258.2
1936	176.5	157.4	43.5	142.9	91.6	108.9	146.1	42.7	909.6
1937	28.8	75.7	21.5	61.3	80.5	47.8	63.9	21.2	400.7
1938	63.5	69.3	20.9	54.1	65.5	46.2	76.8	36.4	432.7
1939	227	49.5	17	33.1	42.4	9.3	9.6	11.1	399
1940	50.4	60.3	23.8	56.6	38.8	29.3	30.8	18.8	308.8
1941	89.9	151.8	50.6	139	54.1	116.3	191.2	57.8	850.7
1942	103.5	95.1	34	84.4	51.7	66.9	93.6	28.6	557.8
1943	36.5	42.3	11.1	33.8	41.5	29.5	58.3	20.1	273.1
1944	64.1	76	24.8	74.3	50.5	72.5	152.5	46.2	560.9
1945	47.3	71.1	30.8	78.6	54.8	79.6	129.9	35.7	527.8
1946	80.9	54.2	16.5	52	51.4	105.1	155.3	40.7	556.1
1947	72.4	77.7	16.7	45.2	44	55.5	79.5	31.6	422.6
1948	41.1	25.6	26	20.2	14.8	17.5	19.9	13.2	178.3
1949	166	86.1	31.5	70.3	33	41.8	55.9	23.5	508.1
1950	41.5	35.5	13.3	27	23.6	17.3	24.6	17.4	200.2
1951	18.3	28.4	7.3	26.4	21.1	15.3	12.5	10.6	139.9
1952	27.9	15.7	3.2	30.2	25.4	50.1	102.3	20.7	275.5
1953	21.4	15.1	3.2	4.4	36.2	20.1	42.3	24.9	167.6
1954	61.3	31.6	7.1	11.9	25.3	4.2	10	10.7	162.1
1955	128	22.1	0.6	7.7	16.5	4.3	3.3	9.5	192
1956	15.6	4.2	1.6	3.6	6.3	2	2.2	8.2	43.7
1957	108.6	133.6	65.4	129.5	55.6	175.6	397.9	76.4	1142.6
1958	266.7	300	223.8	294.9	95.5	190.9	268.7	70.7	1711.2
1959	109.6	158.9	61.6	96.7	94.7	57.4	77.9	33.6	690.4
1960	88.7	128.1	64.9	127	104	89.7	160	62.4	824.8
1961	85.2	151.3	57.4	105.4	88.3	69.3	110.8	49.4	717.1
1962	47.4	46.6	4.3	23.5	57.3	16.7	24.7	18.9	239.4
1963	39.7	27	5	10.3	41.9	9.3	21.3	16.2	170.7
1964	126.1	57.1	16.3	61.3	43.3	35.8	51.1	22.2	413.2
1965	97.9	83	23.2	104	54.6	78.8	115.3	66.7	623.5
1966	169.2	134	37.7	78.2	50.5	44.5	66.5	34.6	615.2
1967	82.2	137.9	30.4	64.8	44.7	30.2	57.3	19	466.5
1968	130.8	176	66.4	198.7	59.9	83.1	120.5	49.3	884.7
1969	119.7	113.8	30.7	84.2	55.4	60.2	99.9	46.6	610.5
1970	112.6	141.9	35.4	81.6	68	68.8	113.8	39.5	661.6
1971	263.4	212.4	39.2	155.6	68.7	81.4	82.4	22.2	925.3
1972	108.4	144.6	49	154.6	87.9	74.3	104.2	33.4	756.4
1973	190.6	256.9	123.9	286.4	97.6	237.2	211.7	82.2	1486.5
1974	91.1	135.7	36.1	115.3	96.2	68.1	76.9	39.1	658.5
1975	71.8	143.6	47.9	195.9	93.4	138.8	195.7	85.9	973
1976	150.7	238.6	68.2	182	94.5	47.9	54.3	57.9	894.1
1977	102.9	193	62.7	159.5	77.7	97.9	191.6	66.7	952
1978	69.8	73.1	30.9	103.7	76.7	49.6	72.4	26.3	502.5
1979	128.4	201.4	68.6	203.1	89.4	85.4	266.3	75.2	1117.8
1980	58.6	85.6	42.6	25.3	88.3	18.8	55.4	31.8	406.4
1981	205	365.2	105.6	252.1	91.3	165	196.8	67.3	1448.4
1982	19.4	123.4	21	90.9	76.8	22.6	44.8	23.5	422.4
1983	79.2	85.9	20.1	42.9	74.4	31.9	62.5	23.2	420.1
1984	32.4	40.4	8.8	18.1	43.9	11.3	16.9	25.9	197.9
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	1153.7
1987	308.5	473.3	110.7	405.5	90.4	229.3	270.9	114.9	2003.6

U.S. GEOLOGICAL SURVEY
SOUTH TEXAS WATER SCIENCE CENTER
5563 De Zavala Rd., Suite 290
San Antonio, TX 78249

Calendar Year	Nueces-West Nueces River Basin	Frio-Dry Frio River Basin [1]	Sabinal River Basin [1]	Area Between Sabinal River and Medina River Basin [1]	Medina River Basin[2]	Area between Medina River Basin and Cibolo-Dry Comal Creek Basins[1]	Cibolo Creek and Dry Comal Creek Basin	Blanco River Basin[1]	Total[3]
1988	59.2	117.9	17	24.9	69.9	12.6	28.5	25.5	355.5
1989	52.6	52.6	8.4	13.5	46.9	4.6	12.3	23.6	214.4
1990	479.3	255	54.6	131.2	54	35.9	71.8	41.3	1123.2
1991	325.2	421	103.1	315.2	52.8	84.5	109.7	96.9	1508.4
1992	234.1	586.9	201.1	566.1	91.4	290.6	286.6	228.9	2485.7
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	92	11.4	9.4	42.3	10.6	14.7	13.9	324.3
1997	176.9	209.1	57	208.4	63.3	193.4	144.2	82.3	1134.6
1998	141.5	214.8	72.5	201.4	80.3	86.2	240.9	104.7	1142.3
1999	101.4	136.8	30.8	57.2	77.1	21.2	27.9	21	473.5
2000	238.4	123	33.1	55.2	53.4	28.6	48.6	34.1	614.5
2001	297.5	126.7	66.2	124.1	90	101.5	173.7	89.7	1069.4
2002	83.6	207.3	70.6	345.2	93.7	175.5	[4]447.8	150	[4]1573.7
2003	149.8	112.2	31.7	67.4	86.8	56.2	105.0	59.9	669.0
2004	481.9	424.5	116.0	343.9	95.5	213.4	315.0	185.8	2,176.1
2005	105.5	147.2	50.1	79.1	82.8	84.8	140.4	74.1	764.0
2006	45.5	60.2	9.0	5.0	47.7	5.1	11.2	17.9	201.6
2007	471.8	474.4	104.0	406.4	75.2	227.6	306.1	96.9	2,162.3
2008	48.2	44.5	5.9	9.8	53.6	9.6	22.8	18.5	212.9
2009	58.5	30.3	1.8	13.5	45.6	7.3	26.4	27.5	211.0
2010	135.4	104.9	31.5	186.3	68.2	81.4	148.2	57.5	813.5
2011	15.3	13.7	1.0	2.0	43.3	3.0	15.3	18.3	112.0
2012	78.3	82.6	8.9	14.4	41.6	3.9	32.2	51.6	313.5
2013	67.7	26.7	.5	2.8	10.8	3.3	28.7	42.1	182.7
2014	19.8	32.8	4.9	14.4	8.9	.4	9.5	16.5	107.2
2015	**343.8**	**281.9**	**42.2**	**218.4**	**54.6**	**131.6**	**177.3**	**108.3**	**1,358.1**
Average	**126.2**	**136.1**	**40.8**	**109.8**	**61.2**	**70.2**	**108.9**	**47.0**	**701.3**

[1] Includes recharge from ungaged areas
[2] Recharge to Edwards aquifer from Medina River Basin consists entirely of losses from Medina Lake (Puente, 1978, p. 23).
[3] Totals might not equal sum of basin values due to rounding.
[4] Revised in 2005 for error in computation.

Table 2. Summary of spring discharge in acre-feet per month, January–December 2015.

	Leona Springs and Underflow nr Uvalde, Tx (08204000)	San Pedro Springs at San Antonio, Tx (08178090)	San Antonio Springs at San Antonio, Tx (08177818)	Comal Springs at New Braunfels, Tx (08168710)	Hueco Springs nr New Braunfels Tx (08168000)	San Marcos Springs at San Marcos, Tx (08170000)	Total Discharge[1]
Jan	0	0	0	8,950	2,560	7,700	19,210
Feb	0	0	0	10,340	2,970	8,660	21,970
Mar	0	0	0	11,960	2,850	10,140	24,950
Apr	0	2.60	0	11,820	3,670	10,440	25,930
May	0	48.0	0	15,220	6,460	12,790	34,520
Jun	44.5	246	183	19,260	6,130	20,250	46,110
Jul	135	183	43.0	20,560	5,140	19,560	45,620
Aug	144	3.8	0	16,500	4,380	17,330	38,360
Sep	187	0	0	12,840	2,920	14,310	30,260
Oct	345	3.1	0	12,880	3,180	12,660	29,070
Nov	378	114	0	17,600	5,910	19,350	43,350
Dec	470	188	0	18,940	5,500	20,020	45,120
Total Annual Discharge in acre-feet per year[1]:							
	1,700	788	226	176,900	51,670	173,200	404,500

[1] Totals might not equal sum of discharge values due to rounding.

U.S. GEOLOGICAL SURVEY
SOUTH TEXAS WATER SCIENCE CENTER
5563 De Zavala Rd., Suite 290
San Antonio, TX 78249