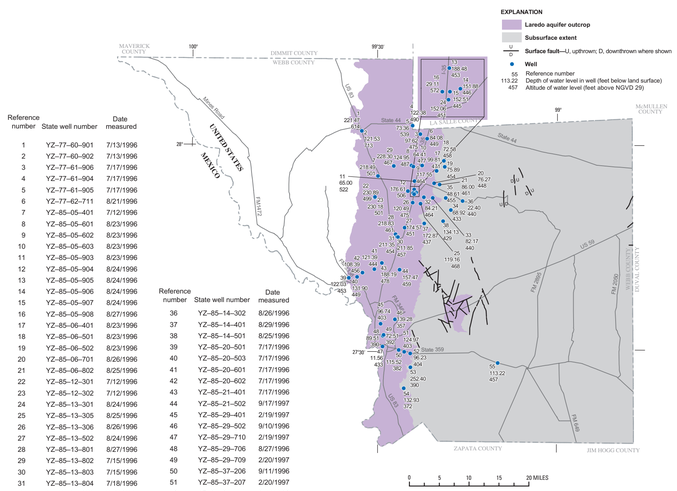

Reference number	State well number	Date measured
1	YZ–77–60–901	7/13/1996
2	YZ–77–60–902	7/13/1996
3	YZ–77–61–906	7/17/1996
4	YZ–77–61–904	7/17/1996
5	YZ–77–61–905	7/17/1996
6	YZ–77–62–711	8/21/1996
7	YZ–85–05–401	7/12/1996
8	YZ–85–05–601	8/23/1996
9	YZ–85–05–602	8/23/1996
10	YZ–85–05–603	8/23/1996
11	YZ–85–05–903	8/23/1996
12	YZ–85–05–904	8/24/1996
13	YZ–85–05–905	8/24/1996
14	YZ–85–05–906	8/24/1996
15	YZ–85–05–907	8/24/1996
16	YZ–85–05–908	8/27/1996
17	YZ–85–06–401	8/23/1996
18	YZ–85–06–501	8/23/1996
19	YZ–85–06–502	8/23/1996
20	YZ–85–06–701	8/26/1996
21	YZ–85–06–802	8/25/1996
22	YZ–85–12–301	7/12/1996
23	YZ–85–12–302	7/12/1996
24	YZ–85–13–301	8/24/1996
25	YZ–85–13–305	8/25/1996
26	YZ–85–13–306	8/26/1996
27	YZ–85–13–502	8/24/1996
28	YZ–85–13–801	8/27/1996
29	YZ–85–13–802	7/15/1996
30	YZ–85–13–803	7/15/1996
31	YZ–85–13–804	7/18/1996
32	YZ–85–14–101	8/26/1996
33	YZ–85–14–102	8/26/1996
34	YZ–85–14–201	8/29/1996
35	YZ–85–14–202	8/29/1996
36	YZ–85–14–302	8/26/1996
37	YZ–85–14–401	8/29/1996
38	YZ–85–14–501	8/25/1996
39	YZ–85–20–501	7/17/1996
40	YZ–85–20–503	7/17/1996
41	YZ–85–20–601	7/17/1996
42	YZ–85–20–602	7/17/1996
43	YZ–85–21–401	7/17/1996
44	YZ–85–21–502	9/17/1997
45	YZ–85–29–401	2/19/1997
46	YZ–85–29–502	9/10/1996
47	YZ–85–29–710	2/19/1997
48	YZ–85–29–706	8/27/1996
49	YZ–85–29–709	2/20/1997
50	YZ–85–37–206	9/11/1996
51	YZ–85–37–207	2/20/1997
52	YZ–85–37–301	9/11/1996
53	YZ–85–37–603	9/11/1996
54	YZ–85–37–801	9/9/1996
55	YZ–85–39–201	4/1/1997

Figure 26. Extent of the Laredo aquifer outcrop, subsurface extent of the aquifer, and depth of water level in wells, 1996–97.

Figure 30. Specific capacity and estimated transmissivity of the Laredo aquifer.

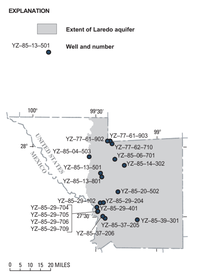

Figure 29. Net sand thickness of the Laredo aquifer.

Table 5. Water quality of the Laredo aquifer

[ft, feet; gal/min, gallons per minute; µS/cm, microsiemens per centimeter at 25 °C; °C, degrees Celsius; mg/L, milligrams per liter; NTU, nephelometric turbidity units; -- not available; <, less than; µg/L, micrograms per liter]

Sampled well number (fig. 2)	USGS station number	State well number	Aquifer	Sample date	Depth of well (ft)	Flow rate (gal/min)	Specific conductance (field) (µS/cm)	pH (field) (standard units)	Water temperature (°C)	Dissolved solids, residue at 180 °C (mg/L)	Turbidity (NTU)	Hardness, total (mg/L as $CaCO_3$)
2	280152090340901	YZ–77–61–902	Laredo	01/16/1998	520	50	1,160	7.1	26.9	740	3.5	350
3	280034095220101	YZ–77–62–710	Laredo	01/16/1998	600	10	1,270	7.4	28.5	856	2.0	270
7	275157090930801	YZ–85–12–301	Laredo	09/18/1997	301	12	1,590	7.1	29.0	1,040	.74	350
8	275223090235301	YZ–85–13–301	Laredo	01/29/1998	502	20	2,613	8.3	27.9	1,470	1.0	180
9	275305091942201	YZ–85–06–802	Laredo	03/04/1998	468	5	3,753	8.5	25.5	2,400	.28	43
10	275332090132001	YZ–85–07–701	Laredo	03/04/1998	1,200	5	3,230	8.6	27.0	2,000	.22	9.0
11	275125090155601	YZ–85–14–302	Laredo	02/04/1998	1,200	15	2,940	8.7	29.0	1,740	.30	8.0
12	274759090273201	YZ–85–13–501	Laredo	03/04/1998	520	15	3,600	7.0	28.5	2,610	7.1	890
13	274633090265401	YZ–85–13–801	Laredo	01/28/1998	550	15	3,350	7.0	27.5	2,400	.60	660
14	274808090221301	YZ–85–14–401	Laredo	01/29/1998	--	20	4,820	8.1	27.5	2,910	.45	60
15	274839090203401	YZ–85–14–402	Laredo	02/04/1998	--	1.5	3,860	8.4	28.0	2,380	.40	22
16	274828090190601	YZ–85–14–501	Laredo	01/29/1998	500	20	3,630	8.7	29.5	2,260	.15	15
18	274012090343101	YZ–85–20–502	Laredo	03/18/1998	240	7	3,169	7.5	27.5	2,190	1.2	240
20	274122090263301	YZ–85–21–502	Laredo	09/17/1997	452	30	4,230	8.2	29.5	2,520	.30	47
21	273521090274101	YZ–85–29–102	Laredo	09/03/1997	800	--	3,204	8.8	30.0	2,010	.14	14
22	273153090260401	YZ–85–29–204	Laredo	03/03/1998	710	15	1,840	8.9	28.7	1,130	.12	7.0
23	273331090291701	YZ–85–29–401	Laredo	03/03/1998	300	30	2,200	8.9	27.1	1,310	.16	7.0
24	273145090285401	YZ–85–29–706	Laredo	09/17/1997	235	20	2,120	8.7	28.0	1,280	.14	9.0
25	273154090284801	YZ–85–29–709	Laredo	01/14/1998	440	167	1,970	8.8	27.5	1,260	.15	8.0
26	272942090262001	YZ–85–37–206	Laredo	09/11/1997	370	<10	3,230	8.5	28.5	1,970	.60	11
27	272902090251601	YZ–85–37–205	Laredo	03/02/1998	290	8	3,668	7.6	27.2	2,430	.18	240
28	273455090175901	YZ–85–30–501	Laredo	11/12/1997	500	20	5,450	8.1	29.5	4,090	2.0	100
29	272749090190701	YZ–85–39–201	Laredo	03/02/1998	860	2	4,170	8.5	37.5	2,570	.14	9.0
30	272813090903901	YZ–85–39–301	Laredo	11/13/1997	1,230	40	4,435	8.4	39.0	2,840	.16	7.0

Sampled well number (fig. 2)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium-adsorption ratio	Sodium percentage	Potassium, dissolved (mg/L as K)	Alkalinity (field, total) (mg/L as $CaCO_3$)	Bicarbonate, dissolved (mg/L as HCO_3)	Sulfate, dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)
2	90	29	130	3.0	45	6.0	253	308	192	121	0.60
3	58	30	174	5.0	58	6.7	227	277	296	100	.62
7	91	30	210	5.0	57	5.4	276	336	345	140	.90
8	44	16	422	14	83	6.0	89	108	412	441	.25
9	13	2.4	819	55	97	2.5	213	260	900	461	.38
10	3.0	.37	691	100	99	1.3	295	360	527	510	.72
11	2.8	.19	630	98	99	1.4	240	294	363	530	.50
12	194	96	494	7	55	11	180	222	1,080	442	.24
13	170	55	510	9	62	11	237	290	924	430	.70
14	17	3.9	970	55	97	3.0	230	283	569	1,030	.40
15	6.9	1.1	850	80	99	1.7	300	367	607	670	.60
16	5.0	.48	750	86	99	1.5	163	199	842	490	.30
18	47	28	699	20	86	5.1	417	508	965	180	1.1
20	13	3.6	830	53	97	2.8	280	341	672	730	1.2
21	4.3	.62	670	79	99	1.4	241	294	601	490	.70
22	2.1	.35	401	68	99	.99	305	372	306	184	.57
23	2.3	.30	476	79	99	.99	265	323	338	294	.50
24	2.4	.77	450	65	99	1.3	306	373	350	280	.60
25	2.3	.55	450	69	99	1.3	304	371	349	240	.65
26	2.2	1.1	730	99	99	1.8	694	846	303	440	1.9
27	58	22	769	22	87	6.6	192	234	740	702	.28
28	21	12	1,300	56	96	5.6	294	358	1,680	750	.20
29	2.4	.72	982	140	99	1.9	710	865	512	580	2.0
30	1.5	.69	1,000	170	100	2.1	1,006	1,226	354	710	2.1

Sampled well number (fig. 2)	Silica, dissolved (mg/L as Si)	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, nitrite+nitrate, dissolved (mg/L as N)	Nitrogen, ammonia, dissolved (mg/L as NH_4)	Nitrogen, ammonia, dissolved (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)	Nitrogen, organic, dissolved (mg/L as N)	Phosphorus, dissolved (mg/L as P)	Phosphorus, ortho, dissolved (mg/L as P)	Phosphate, ortho, dissolved (mg/L as PO_4)	Aluminum, dissolved (µg/L as Al)
2	21	--	--	--	--	--	--	--	--	--	4.4
3	19	<0.01	0.08	0.10	0.08	<0.1	--	<0.01	0.01	0.04	4.5
7	22	<.01	<.05	.08	.06	<.2	--	<.01	.01	.03	4.0
8	11	<.01	<.05	.55	.43	.43	--	.02	<.01	--	5.2
9	11	<.01	<.05	.27	.21	.16	--	<.01	.02	.05	4.9
10	15	.01	<.05	.46	.36	.35	--	<.01	.04	.13	8.1
11	15	<.01	<.05	.40	.31	.40	0.08	.04	.07	.21	12
12	18	<.01	<.05	.28	.21	.20	--	<.01	.01	.04	4.7
13	20	<.01	<.05	.33	.25	.20	--	.02	.01	.05	3.4
14	12	<.01	<.05	.37	.29	.30	--	<.01	.01	.05	5.0
15	13	<.01	<.05	.14	.11	.10	.03	<.01	.03	.1	6.0
16	13	<.01	<.05	.35	.27	.30	.01	<.01	.04	.13	12
18	18	<.01	<.05	.28	.22	.28	.06	<.01	.03	.08	3.9
20	12	<.01	<.05	.41	.32	.30	--	.02	.01	.05	6.2
21	13	<.01	<.05	.35	.27	.30	.01	.03	.02	.07	13
22	14	<.01	<.05	.24	.18	.20	--	.02	.06	.17	9.5
23	13	<.01	<.05	.26	.20	.20	--	<.01	.04	.13	7.9
24	12	.01	<.05	.21	.16	<.2	--	.01	.03	.08	8.5
25	12	<.01	.09	.20	.15	.1	--	.03	.04	.12	8.0
26	12	<.01	<.05	.31	.24	.2	--	.03	.04	.14	6.5
27	16	<.01	.25	.22	.17	.2	--	<.01	.01	.04	5.1
28	15	<.01	<.05	1.4	1.1	1.3	.22	.03	.03	.09	5.0
29	17	<.01	<.05	.65	.51	.5	.01	.05	.09	.29	10
30	17	<.01	<.05	.85	.66	.8	.12	.06	.12	.37	18

Sampled well number (fig. 2)	Antimony, dissolved, (ug/L as Sb)	Arsenic, dissolved (ug/L as As)	Barium, dissolved (ug/L as Ba)	Beryllium, dissolved (ug/L as Be)	Boron, dissolved (ug/L as B)	Cadmium, dissolved (ug/L as Cd)	Chromium, dissolved (ug/L as Cr)	Cobalt, dissolved (ug/L as Co)	Copper, dissolved (ug/L as Cu)	Iron, dissolved (ug/L as Fe)	Lead, dissolved (ug/L as Pb)
2	<1	<1	28	<1	681	<1	5.6	<1	<1	364	<1
3	<1	<1	27	<1	776	<1	4.1	<1	<1	248	<1
7	<1	<1	20	<1	671	<1	1.5	<1	3.3	180	9.5
8	<2	<1	24	<2	2,067	<2	<2.0	<2	<2	302	<2
9	<2	<1	13	<2	1,420	<2	2.8	<2	<2	231	<2
10	<2	<1	23	<2	1,608	<2	3.3	<2	<2	43	<2
11	<2	<1	39	<2	1,170	<2	3.3	<2	<2	<30	<2
12	<2	<1	12	<2	1,516	<2	2.5	<2	2.0	791	<2
13	<2	<1	15	<2	1,510	<2	<2.0	<2	<2	130	<2
14	<2	<1	18	<2	1,480	<2	<2.0	<2	<2	230	<2
15	<2	<1	12	<2	1,880	<2	4.5	<2	<2	31	<2
16	<2	<1	13	<2	1,500	<2	<2.0	<2	<2	<30	<2
18	<2	<1	13	<2	4,203	<2	<2.0	<2	<2	396	<2
20	<2	<1	19	<2	3,740	<2	2.3	<2	2.1	140	<2
21	<2	<1	16	<2	1,960	<2	2.9	<2	<2	21	<2
22	<1	<1	21	<1	1,206	<1	5.9	<1	<1	<10	<1
23	<1	<1	16	<1	1,430	<1	3.6	<1	<1	<30	<1
24	<1	<1	15	<1	1,350	<1	<1.0	<1	<1	<9	<1
25	<1	<1	17	<1	1,300	<1	5.3	<1	<1	<30	<1
26	<2	<1	20	<2	2,820	<2	6.2	<2	2.1	130	<2
27	<2	<1	23	<2	1,569	<2	2.9	<2	2.1	<30	<2
28	<3	<1	14	<3	2,450	<3	<3.0	<3	<3	960	<3
29	<2	<1	30	<2	2,885	<2	9.3	<2	<2	32	<2
30	<2	<1	44	<2	3,929	<2	4.7	<2	<2	21	<2

Sampled well number (fig. 2)	Lithium, dissolved (ug/L as Li)	Manganese, dissolved (ug/L as Mn)	Mercury, dissolved (ug/L as Hg)	Molybdenum, dissolved (ug/L as Mo)	Nickel, dissolved (ug/L as Ni)	Selenium, dissolved (ug/L as Se)	Silver, dissolved (ug/L as Ag)	Strontium, dissolved (ug/L as Sr)	Uranium, dissolved (ug/L as U)	Vanadium, dissolved (ug/L as V)	Zinc, dissolved (ug/L as Zn)
2	143	11	--	<1	<1	<1	<1	706	<1	<10	1.0
3	142	13	<0.1	<1	<1	<1	<1	1,404	<1	<10	20
7	130	19	<.1	1.1	<1	<1	<1	854	<1	<6	23
8	156	30	<.1	<2	<2	<1	<2	1,993	<2	<30	<2
9	278	29	<.1	<2	<2	<1	--	464	<2	<30	<2
10	106	4.3	<.1	6.1	<2	<1	<2	162	<2	<30	583
11	68	2.1	<.1	<2	<2	<1	<2	135	<2	<30	3.2
12	252	102	<.1	<2	<2	<1	<2	6,889	<2	<30	9.1
13	202	53	<.1	11	<2	<1	<2	4,860	<2	<30	6.2
14	280	8.0	<.1	6.2	<2	<1	<2	510	<2	<30	<2
15	210	5.5	<.1	8.1	<2	<1	--	222	<2	<30	4.3
16	180	<2	<.1	<2	<2	<1	<2	184	<2	<30	<2
18	391	30	<.1	5.7	<2	<1	<2	2,774	<2	<30	152
20	159	21	.60	3.7	<2	<1	<2	632	<2	<18	<2
21	82	3.3	<.1	<2	<2	<1	<2	313	<2	<18	5.1
22	48	2.5	<.1	1.3	<1	<1	<1	105	<1	<10	8.0
23	62	1.1	<.1	1.8	<1	<1	<1	148	<1	<30	1.5
24	60	2.1	<.1	1.8	<1	<1	<1	164	<1	<18	2.0
25	56	2.2	<.1	1.2	<1	<1	<1	153	<1	<30	15
26	92	8.5	<.1	2.2	<2	<1	<2	230	<2	<18	5.1
27	260	27	<.1	<2	<2	<1	<2	2,136	<2	<30	70
28	430	64	<.1	8.0	<3	<1	<3	1,590	<3	<30	3.1
29	177	4.0	.35	4.4	<2	<1	--	201	<2	<30	<2
30	130	7.6	<.1	<2	<2	<1	--	245	<2	<24	3.7

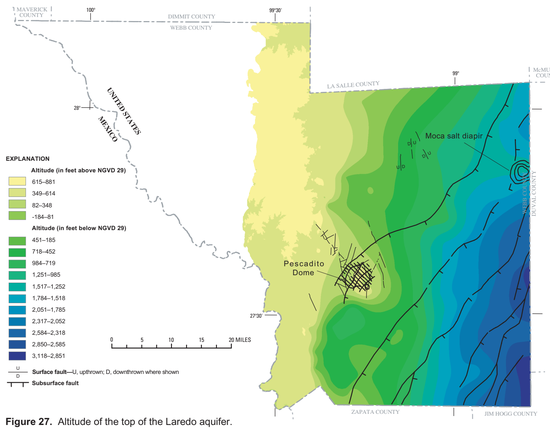

Figure 27. Altitude of the top of the Laredo aquifer.

Laredo Aquifer

The Laredo aquifer crops out in the middle of Webb County in a north-south trend (fig. 26). The Laredo aquifer consists primarily of interbedded sandstones and glauconitic sandstones at the base and top of the aquifer. The sandstones are separated by thinned sequences of shale with glauconitic marl, clay, and in the middle part of the aquifer some fossiliferous limestone (Eargle, 1968). Generally, the sandiest parts of the aquifer are at the base of the aquifer, and the percentage of shale in the section increases toward the top of the aquifer. The outcrop of the Laredo aquifer in Webb County covers about 620 mi^2, and the average dip of the Laredo aquifer is to the southeast at about 72 ft/mi. The altitude of the top of the Laredo aquifer ranges from about 880 ft above NGVD 29 along the western edge of the aquifer to nearly 3,120 ft below NGVD 29 in the southeastern part of the county (fig. 27). The Laredo aquifer in Webb County ranges in thickness from about 1 ft along the western edge of the outcrop to about 1,510 ft in the central part of the county (fig. 28). The thickest sections of the aquifer are along a north-south trend beneath the eastern edge of the outcrop. The thickest sections of net sand in the Laredo aquifer are in the central and eastern parts of the county (fig. 29). The net sand thickness of the Laredo aquifer ranges from about 1 to 570 ft. Although not shown in figure 29, some of the thickest sands are concentrated in channels, and borehole geophysical logs show that the sands have a fining-upward character.

Recharge to the Laredo aquifer occurs mainly by infiltration of precipitation. The Laredo aquifer is bounded by the overlying Yegua aquifer and the underlying El Pico confining unit (table 1), both of which have a greater shale content than the Laredo aquifer. The Laredo aquifer receives an estimated 33,000 acre-ft/yr of recharge on the outcrop (assuming an effective recharge rate of 5 percent of annual average precipitation of 20.1 in.). The regional flow direction of water in the Laredo aquifer generally is downdip to the east. The depth to water in the Laredo aquifer from water-level measurements ranged from about 12 to 252 ft below land surface (fig. 26). Ground-water flow through the Laredo aquifer is partly dependent on the interconnection between the interbedded sand units within the aquifer. Wells completed in the Laredo aquifer yield small to large (5 to 170 gal/min) amounts of fresh to moderately saline water (Lonsdale and Day, 1937; Winslow and Kister, 1956). Specific capacities computed from 20 tests in the Laredo aquifer were highly variable, ranging from 4.0 to 711 ft^2/d, and estimated transmissivities ranged from 85 to 2,735 ft^2/d (fig. 30, table 2). The locations of the largest specific capacities and estimated transmissivities generally coincided with the locations of greatest net sand thicknesses.

Water is withdrawn from the Laredo aquifer for domestic, stock, irrigation, commercial, institutional, and public-supply uses. Analytical results from 24 sampled wells open to the Laredo aquifer (fig. 2, nos. 2, 3, 7–16, 18, 20–30) are shown in table 5. The dissolved solids concentrations ranged from 740 to 4,090 mg/L, all greater than the SDWR of 500 mg/L. Analyses of samples from the Laredo aquifer generally indicate that the principal dissolved constituents in the water are sodium and chloride, with lesser amounts of sulfates and bicarbonates (fig. 31). The sodium percentage of cations in the water ranged from 45 to 100. Of the 24 samples, chloride concentrations in 18 samples and sulfate concentrations in 23 samples exceeded the SDWRs of 250 mg/L. The larger sulfate concentrations are in the northern part of the county. The fluoride concentration in one sample (2.1 mg/L, well 30) exceeded the SDWR of 2.0 mg/L. Water samples from the Laredo aquifer generally have some metals and trace elements. Iron concentrations in five of the 24 samples exceeded the SDWR of 300 µg/L. The largest iron concentrations in wells sampled in the county were in the Laredo aquifer. Manganese concentrations in three of the 24 samples exceeded the SDWR of 50 µg/L, and the zinc concentration in one well exceeded the SDWR of 500 µg/L. Strontium concentrations in one-half the samples exceeded the lifetime HA of 400 µg/L; and, as with all wells sampled in the other aquifers, all boron concentrations exceeded the lifetime HA of 600 µg/L.

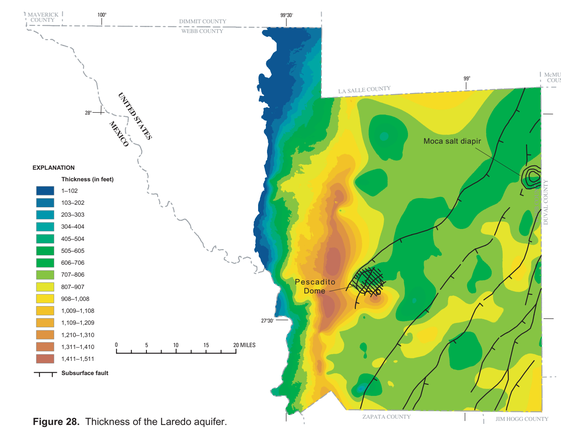

Figure 28. Thickness of the Laredo aquifer.

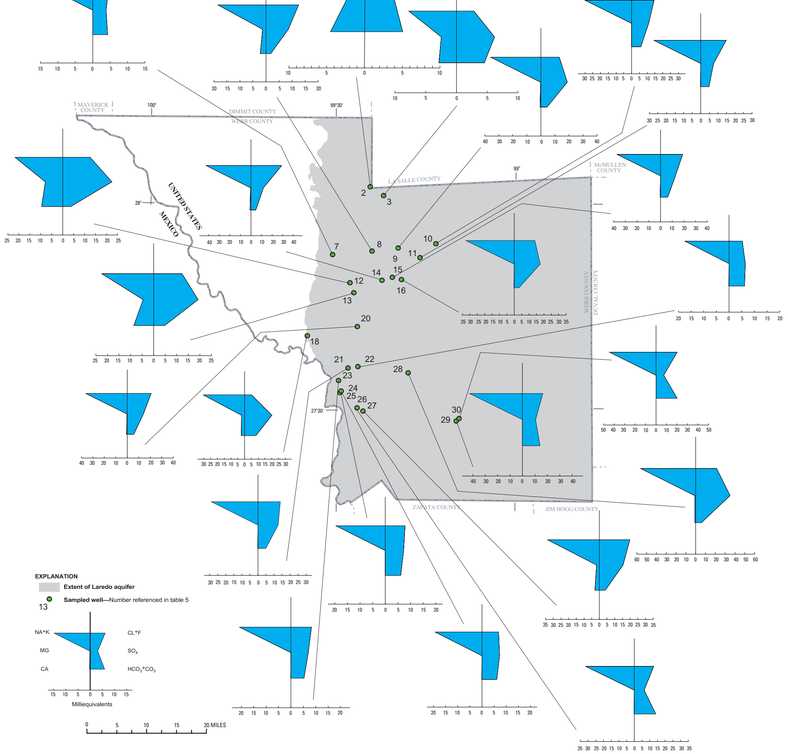

Figure 31. Chemical characteristics of water from the Laredo aquifer.

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