PROPOSED EXPANSION OF THE CITY OF ALBUQUERQUE/U.S. GEOLOGICAL SURVEY GROUND-WATER-LEVEL MONITORING NETWORK FOR THE MIDDLE RIO GRANDE BASIN, NEW MEXICO

By Laura M. Bexfield

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Denver, CO 80225-0286

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
foot	0.3048	meter
acre-foot	1,233	cubic meter
mile	1.609	kilometer
square mile	2.590	square kilometer
acre	4,047	square meter

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

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ABSTRACT

The Middle Rio Grande Basin in central New Mexico, extending from Cochiti Lake on the north to San Acacia on the south, covers an area of about 3,060 square miles. Ground-water withdrawals in the basin are concentrated in and around the city of Albuquerque. Because of rapid increases in population and associated ground-water pumpage, a network of wells was established cooperatively by the City of Albuquerque and the U.S. Geological Survey between April 1982 and September 1983 to monitor changes in ground-water levels throughout the basin. Expansion of this network has been identified as an essential element in plans to study the relation between surface water and ground water in the basin. An inventory of existing wells in the Albuquerque metropolitan area has brought together information on about 400 wells that either are being monitored for water levels or would be good candidates for monitoring. About 115 wells or well sites are proposed as additions to the current 128-well ground-water-level monitoring network for the Middle Rio Grande Basin. Despite the extensive network that would be created by the addition of the proposed existing wells, however, certain parts of the Albuquerque metropolitan area would remain without adequate coverage areally and/or with depth in the Santa Fe Group aquifer until the installation of the proposed new monitoring wells.

INTRODUCTION

The Middle Rio Grande Basin (also known as the Albuquerque Basin) of central New Mexico extends from Cochiti Lake on the north to San Acacia on the south (fig. 1). The basin, commonly defined as the extent of Cenozoic deposits in the region, is about 25 to 40 miles wide and covers an area of about 3,060 square miles. Within the basin, the only perennial stream is the Rio Grande, to which the Jemez River and the Rio Puerco are the main tributaries. The aquifer system in the basin is composed of the Tertiary and Quaternary Santa Fe Group and Holocene inner-valley alluvium. The Santa Fe Group aquifer system is hydraulically connected to the Rio Grande and to a system of canals and drains through the alluvium in the Rio Grande inner valley (McAda, 1996) (fig. 1).

The major population center in the Middle Rio Grande Basin is the city of Albuquerque, which had a population of about 385,000 people in 1990 (U.S. Department of Commerce, 1993). The 1990 census reported that about 520,000 people live in the entire Albuquerque metropolitan area. The City of Albuquerque is the largest user of ground water in the basin. About 92 percent (157,000 acre-feet) of the estimated 171,000 acre-feet of ground water withdrawn from the basin for the year ending in March 1994 (Kernodle and others, 1995) was withdrawn in the Albuquerque area; about 72 percent (123,000 acre-feet) was withdrawn by the City of Albuquerque (McAda, 1996). As McAda (1996) stated, that volume is a dramatic increase from about 2,000 acre-feet pumped by the City in 1933 (Bjorklund and Maxwell, 1961) and about 59,000 acre-feet pumped in 1970 (files of the City of Albuquerque).

As a result of rapid increases in population and associated ground-water pumpage in the Middle Rio Grande Basin, a network of wells was established cooperatively by the City of Albuquerque and the U.S.

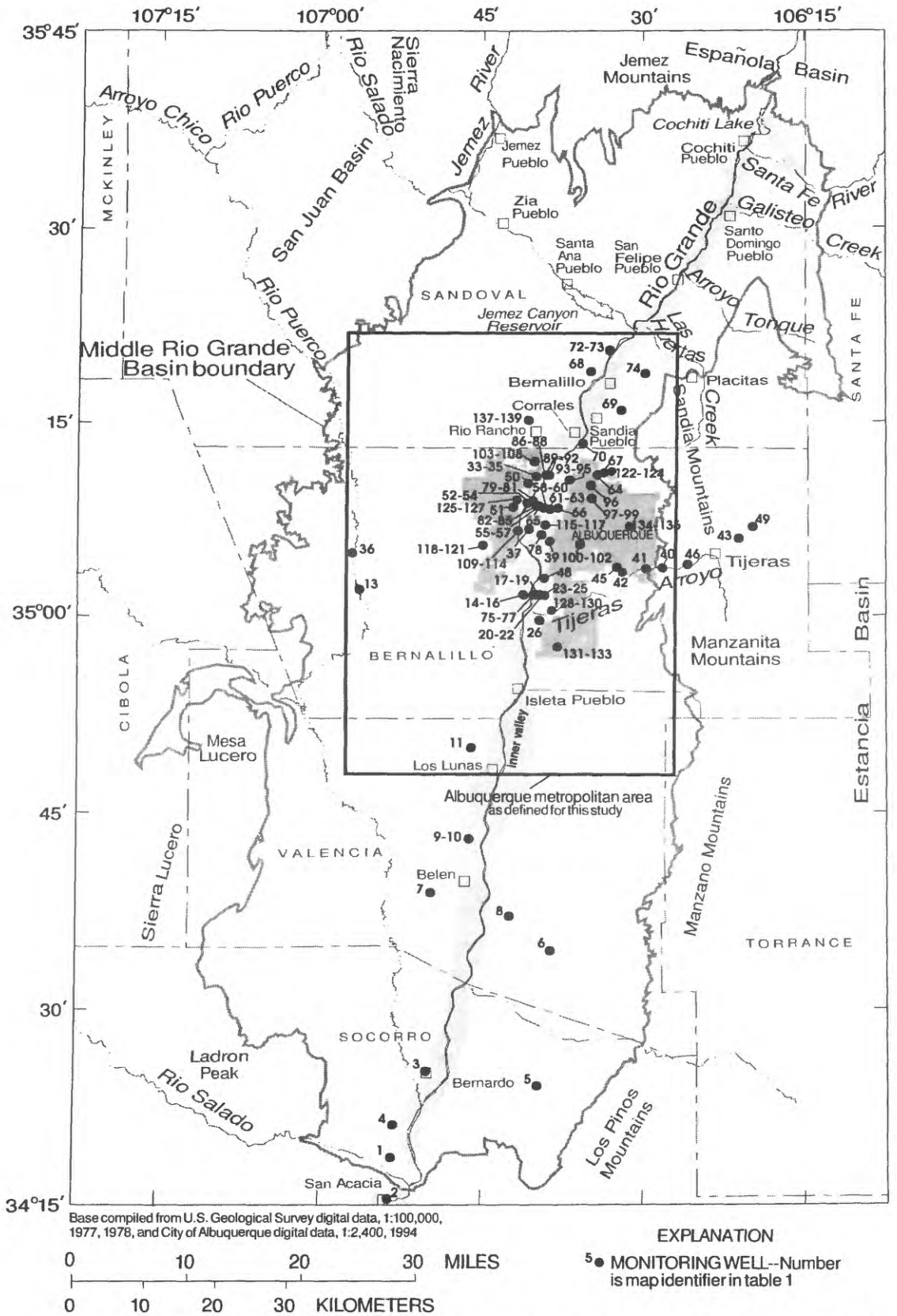

Figure 1.--Location of the Middle Rio Grande Basin and wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network (modified from McAda, 1996).

Geological Survey (USGS) between April 1982 and September 1983 to monitor changes in ground-water levels throughout the basin (Rankin, 1994). This network, hereafter called the City of Albuquerque/ USGS ground-water-level monitoring network, currently (September 1997) includes 128 wells (fig. 1 and table 1). Water levels collected by USGS personnel in association with this network are entered into the National Water Information System (NWIS) data base maintained by the USGS. In his plan of study to improve understanding of and quantify hydrologic relations between the Rio Grande and the Santa Fe Group aquifer system, McAda (1996) listed expansion of the City of Albuquerque/USGS ground-water-level monitoring network as an essential study element. This report was prepared in cooperation with the City of Albuquerque.

Purpose and Scope

This report describes the process used to inventory existing wells for possible inclusion in the City of Albuquerque/USGS ground-water-level monitoring network for the Middle Rio Grande Basin. The wells inventoried and the final wells proposed for inclusion in the network are listed. To focus the expansion effort on the area of the basin most likely to be affected by ground-water withdrawals in Albuquerque, the well search was limited to the Albuquerque metropolitan area, as defined for this study (fig. 1). This area extends north to south generally from the southern part of Santa Ana Pueblo to the southern boundary of Isleta Pueblo, and east to west from the Rio Puerco to the eastern edge of the basin boundary.

For this effort, emphasis was placed on obtaining information for those existing wells that were best suited for use as monitoring wells. Wells most appropriate for use as monitoring wells meet the following criteria: (1) the total depth and perforated interval are known, (2) the perforated interval is short, (3) the well is not being used to produce water, (4) the owner is willing to allow access either to the well for measurement or to water-level information already collected for the well, and (5) the total depth/perforated interval corresponds as closely as possible to the production zone for City of Albuquerque wells. Therefore, information was obtained first for those wells that were drilled for the purpose of monitoring water levels and water quality, regardless of whether the wells currently are monitored. Such wells may be referred to as piezometers in this report if they are part of a group of wells situated in the same general location (often referred to collectively as a piezometer nest), and each well has a short screen open to a different depth of the aquifer. Location information also was obtained for various sites where at least one well was drilled in connection with a past or current investigation for possible ground-water contamination (ground-water investigation sites). However, information on individual monitoring wells at each of these sites generally was not obtained because of the large number of wells. In addition to wells drilled strictly for monitoring purposes, information was obtained for any well (domestic, irrigation, or production) that is included in an existing water-level monitoring network.

The information obtained for wells to be considered for inclusion in the network was compiled in tables and posted on maps to facilitate selection of the most desirable wells. Plate 1 (all plates are located in the back of this report) shows all wells that currently (September 1997) are monitored through various programs by either the USGS or the City of Albuquerque. All wells that were considered as potential additions to the City of Albuquerque/USGS network also are shown on plate 1. The wells that are proposed for inclusion are indicated on plate 2, which includes identifiers corresponding to the map identifiers (ID's) in tables 1-3. Table 1 lists location, well construction, and monitoring data for wells in the current network; also included is information on geophysical logs available through the USGS for these wells (Wilkins, 1995). Table 2 lists similar information for wells proposed as additions to the network. Table 3 lists locations of proposed ground-water investigation sites. The wells or ground-water investigation sites selected as final proposed additions to the network were chosen largely to provide the best possible distribution of wells both areally and with depth in the Albuquerque metropolitan area.

Well-Numbering System

The New Mexico system of numbering wells is based on the common subdivision of public lands into sections (fig. 2). The well number, in addition to designating the well, locates its position to the nearest 10-acre tract in the land network. The number is divided by periods into four segments. The first segment denotes the township north (N.) or south (S.)

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network

[Map ID: map identification number shown in figure 1. Well name: D, deep; M, middepth; S, shallow; ANN, annulus. Geophysical log: CA, caliper; GA, natural gamma; LL, lateralog; LN, long-normal resistivity; SN, short-normal resistivity; SP, spontaneous potential; SPR, single-point resistivity; NU, neutron; GG, gamma gamma; RST, resistance; TM, temperature; INRS, induction resistivity;MFRS, micro-focused resistivity; MNRS, micro-normal resistivity; CMR, combinable magnetic resonance; SO, sonic. Monitoring frequency: SE, semiannually; A, annually; Q, quarterly; MO, monthly; R, recorder. --, no data]

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construc-tion	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophys-ical logs avail-able[1]	Monitor-ing fre-quency
1	REST AREA	01N.01W.13.244	341839	1065316	4,900.00	08-23-76	212	164.08	10-31-95	173.00	212.00	--	SE
2	HERKENHOFF	01S.01W.01.213	341528	1065333	4,660.00	--	38.0	13.11	10-31-95	--	--	--	SE
3	SALAS	02N.01E.04.444	342513	1065003	4,739.00	11-11-77	107	12.07	10-31-95	99.00	106.00	--	SE
4	SEVILLETA	02N.01E.31.313	342107	1065304	4,860.00	07-02-75	223	136.64	10-31-95	210.00	220.00	--	SE
5	BLACK BUTTE	02N.03E.18.232	342407	1063952	5,139.00	01-01-40	346	308.16	10-31-95	--	--	--	SE
6	MCLAUGHLIN	04N.02E.17.244	343428	1063833	5,052.00	01-10-78	355	253.02	10-31-95	335.00	355.00	--	SE
7	BELEN AIRPORT	05N.01E.22.141	343853	1064941	5,175.00	03-14-83	620	371.84	10-31-95	453.00 570.00	483.00 610.00	--	SE
8	FAUST	05N.01E.35.143	343706	1064223	4,980.00	03-15-83	375	188.13	10-31-95	353.00	373.00	--	SE
9	ESTES 1	06N.02E.30.412A	344258	1064609	4,815.00	01-01-78	135	6.32	10-31-95	125.00	130.00	--	SE
10	ESTES 5	06N.02E.30.412B	344258	1064609	4,815.00	10-01-83	300	7.60	10-31-95	265.00	270.00	--	SE
11	WEBB	07N.02E.18.422	345000	1064555	4,990.00	06-12-58	407	140.38	01-20-95	150.00 250.00	230.00 390.00	--	A
13	COLLIER-RPTP	09N.01W.04.424	350204	1065623	5,280.00	- -57	150	75.25	10-30-95	--	--	--	Q
14	RIO BRAVO 1-D	09N.02E.12.214A	350137	1064105	4,930.88	--	148.50	10.69	11-01-95	138.5	143.5	CA,GA,LL, LN,SN,SP,SPR	Q
15	RIO BRAVO 1-M	09N.02E.12.214B	350137	1064105	4,930.81	--	103.80	10.62	11-01-95	94	99	--	Q
16	RIO BRAVO 1-S	09N.02E.12.214C	350137	1064105	4,930.58	--	38.40	10.50	04-04-95	28	33	--	Q
17	RIO BRAVO 2-D	09N.03E.07.131A	350138	1063955	4,928.71	--	153.53	9.90	11-01-95	143.53	148.53	GA,LL,LN, SN,SP,SPR	Q
18	RIO BRAVO 2-M	09N.03E.07.131B	350138	1063955	4,928.84	--	91.16	9.58	11-01-95	81	86	--	Q
19	RIO BRAVO 2-S	09N.03E.07.131C	350138	1063955	4,928.91	--	48.60	9.41	11-01-95	38.6	43.6	--	Q
20	RIO BRAVO 3-D	09N.03E.07.241A	350138	1063932	4,927.14	--	148.00	10.51	07-03-95	138	143	CA,GA,LL, LN,SN,SP,SPR	Q
21	RIO BRAVO 3-M	09N.03E.07.241B	350138	1063932	4,927.40	--	101.00	10.10	11-01-95	91	96	--	Q
22	RIO BRAVO 3-S	09N.03E.07.241C	350138	1063932	4,927.48	--	49.33	10.06	11-01-95	39.33	44.33	--	Q
23	RIO BRAVO 4-D	09N.03E.08.144A	350135	1063906	4,932.65	--	149.40	21.80	11-01-95	139.4	144.4	CA,GA,LL,LN, NU,SN,SP,SPR	Q
24	RIO BRAVO 4-M	09N.03E.08.144B	350135	1063906	4,932.75	--	124.23	23.20	11-01-95	114.23	119.23	--	Q
25	RIO BRAVO 4-S	09N.03E.08.144C	350135	1063906	4,932.81	--	49.33	23.53	11-01-95	39.3	44.3	--	Q
26	CHAVA	09N.03E.19.243	345940	1063934	4,976.00	01-01-81	125	71.74	10-26-95	113.00	123.00	--	Q

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophysical logs available[1]	Monitoring frequency
33	WEST MESA 3-ANN	11N.03E.18.411B	351051	1063953	4,995.00	03-25-83 --	660	31.69	11-28-95	350.00 490.00	390.00 590.00	GA,GG,NU, RST,TM	MO
34	WEST MESA 3-S	11N.03E.18.411C	351051	1063953	4,995.00	03-25-83	840	39.51	11-28-95	710.00	790.00	--	MO
35	WEST MESA 3-D	11N.03E.18.411D	351051	1063953	4,995.00	03-25-83 --	1,050	41.17	11-28-95	870.00 1,010.00	990.00 1,050.00	--	MO
36	C-1	10N.01W.21.134	350454	1065704	5,320.00	--	117	54.96	10-30-95	--	--	--	Q
37	CITY OBS 4	10N.02E.12.241	350646	1064036	4,959.00	- -55	150	33.44	11-01-95	140.00	150.00	GA,NU	Q
39	CITY OBS 1	10N.03E.17.232	350548	1063839	4,960.00	01-01-55	149	50.38	12-29-94	138.60	148.60	GA,NU	Q
40	GRANITE HILL	10N.04E.25.324	350343	1062809	5,680	11-01-75	89	32.23	10-26-95	--	--	--	Q
41	FOUR HILLS	10N.04E.26.331	350339	1062940	5,668.67	--	--	54.79	10-26-95	--	--	--	Q
42	EUBANK-1	10N.04E.32.422	350259	1063158	5,457.00	--	615.0	566.33	05-10-94	550.0	610.0	CA,GA,LN, NU,SN	A
43	HOME OIL	10N.05E.12.434	350602	1062104	6,620.00	--	54.30	26.17	10-26-95	--	--	--	Q
45	KAFB 5	10N.04E.29.413	350346	1063223	5,433.70	07-29-52	1,004	558.65	01-06-89	504.00	1,004.00	--	R
46	DEAD MANS CURVE	10N.05E.29.114	350359	1062547	5,980	--	--	39.88	06-06-88	--	--	--	R
48	SAN JOSE 9	10N.03E.32.314	350256	1063908	4,941.00	01-01-63	765	36.04	02- -94	188.50	764.50	CA,GA,INRS, MFRS,MNRS, NU,SN,SP,TM	R
49	JUNCTION	10N.06E.05.332	350655	1061945	6,750	--	84.00	69.42	10-26-95	--	--	--	Q
50	NELSON	11N.02E.24.223	351019	1064040	5,064.00	01-18-83	275	103.05	10-30-95	258.50	273.50	--	Q
51	LA LUZ DEL SOL	11N.02E.35.142	350829	1064204	5,110.00	09-28-78	250	152.34	10-30-95	230.00	245.00	--	Q
52	MONTAÑO 1-D	11N.02E.25.341A	350854	1064037	4,975.52	--	152.00	10.93	10-30-95	140	145	CA,GA,LL, LN,SN,SP,SPR	Q
53	MONTAÑO 1-M	11N.02E.25.341B	350854	1064037	4,975.58	--	93.40	10.83	10-30-95	83.4	88.4	--	Q
54	MONTAÑO 1-S	11N.02E.25.341C	350854	1064037	4,975.08	--	48.41	8.71	10-30-95	40	45	--	Q
55	MONTAÑO 2-D	ELENA GALLEGOS[2]	350836	1063956	4,970.17	--	147.40	21.53	11-01-95	138	143	CA,GA,LL, LN,SN,SP,SPR	Q
56	MONTAÑO 2-M	ELENA GALLEGOS[2]	350836	1063956	4,970.07	--	99.00	16.77	11-01-95	90	95	--	Q
57	MONTAÑO 2-S	ELENA GALLEGOS[2]	350836	1063956	4,969.84	--	39.70	12.65	11-01-95	30	35	--	Q
58	MONTAÑO 3-D	ELENA GALLEGOS[2]	350827	1063913	4,972.33	--	149.80	32.68	11-01-95	140	145	CA,GA,SP,SPR	Q
59	MONTAÑO 3-M	ELENA GALLEGOS[2]	350827	1063913	4,972.33	--	99.0	32.23	11-01-95	90	95	--	Q
60	MONTAÑO 3-S	ELENA GALLEGOS[2]	350827	1063913	4,972.32	--	49.80	28.07	11-01-95	40	45	--	Q

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophysical logs available[1]	Monitoring frequency
61	MONTAÑO 4-D	11N.03E.32.234A	350821	1063837	4,975.01	--	131.50	45.17	11-01-95	122.5	127.5	CA,GA,LL, LN,SN,SP,SPR	Q
62	MONTAÑO 4-M	11N.03E.32.234B	350821	1063837	4,974.00	--	93.50	42.10	11-01-95	84.5	89.5	--	Q
63	MONTAÑO 4-S	11N.03E.32.234C	350821	1063837	4,974.68	- -88	50.20	42.32	11-01-95	40.2	45.2	--	Q
64	SHOEMAKER	11N.03E.13.244	351059	1063410	5,292	--	--	361.64	11-01-95	--	--	--	Q
65	CITY OBS 3	11N.03E.31.214	350836	1063938	4,973.00	01-01-55	152	26.40	11-01-95	142.00	152.00	--	Q
66	CITY OBS 2	11N.03E.33.143	350824	1063753	4,980.00	01-01-55	150	57.20	11-01-95	140.30	150.30	GA,NU	Q
67	SPANISH ASSEMBLY OF GOD	11N.04E.18.124	351108	1063336	5,385.00	05-01-85	575	472.39	04-20-95	--	--	--	S
68	SAN MIGUEL	13N.03E.36.132A	351852	1063449	5,162.00	04-01-85	206	151.78	11-28-95	--	--	--	M
69	SANDIA 2[3]	12N.04E.17.424	351556	1063159	5,357.00	- -56	305	297.80	01-20-93	--	--	--	Q
70	NORTH BOSQUE[3]	12N.03E.35.414	351322	1063532	4,995	--	--	6.16	12-29-93	--	--	--	Q
72	SANTA ANA 1	13N.04E.19.421	352029	1063306	5,075.00	01-01-68	108	32.87	10-30-95	--	--	--	Q
73	SANTA ANA 2	13N.04E.19.243	352032	1063306	5,075.00	03-05-84	200	31.77	10-30-95	180.00	200.00	--	Q
74	DEAVER	13N.04E.34.422	351843	1062945	5,484.00	11-19-82	703	432.07	10-30-95	693.00	703.00	--	SE
75	RIO BRAVO 5-D	09N.03E.07.114B	350138	1064011	4,930	09-24-92	515.0	12.10	12-02-92	500.0	510.0	CA,GA,GG, LN,NU,SN	Q
76	RIO BRAVO 5-M	09N.03E.07.114	350138	1064011	4,930	01-08-92	150.0	7.30	01-09-92	135.0	145.0	--	Q
77	RIO BRAVO 5-S	09N.03E.07.114A	350138	1064011	4,930	01-09-92	22.0	8.0	01-09-92	7.0	17.0	--	Q
78	BIA WINDMILL	10N.03E.07.434B	350618	1063918	4,960	06-01-95	75.00	35.76	05-09-96	--	--	--	Q
79	MONTAÑO 5-D	11N.03E.30.313B	350859	1064016	4,977.14	09-14-92	150.0	9.79	12-17-92	135.0	145.0	CA,GA,GG, LN,NU,SN	Q
80	MONTAÑO 5-M	11N.03E.30.313A	350859	1064016	4,977.31	09-12-92	75.0	7.39	12-17-92	60.0	70.0	--	Q
81	MONTAÑO 5-S	11N.03E.30.313	350859	1064016	4,977.28	09-13-92	25.0	7.46	12-17-92	10.0	20.0	--	Q
82	MONTAÑO 6-D	11N.03E.31.213A	350836	1063954	4,970	11-01-94	983.00	31.00	11-10-94	972.00	978.00	--	Q
83	MONTAÑO 6-M-D	11N.03E.31.213B	350836	1063954	4,970	11-02-94	836.00	30.01	11-10-94	826.0	831.0	--	Q
84	MONTAÑO 6-M-S	11N.03E.31.213C	350836	1063954	4,970	11-03-94	568.0	28.25	11-10-94	558.0	563.0	--	Q
85	MONTAÑO 6-S	11N.03E.31.213D	350836	1063954	4,970	11-04-94	182.0	20.62	11-10-94	172.00	177.00	--	Q
86	PASEO 1-D	11N.03E.17.141B	351059	1063859	4,991.18	09-19-92	600.0	37.71	12-03-92	545.0	555.0	CA,GA,GG, LN,NU,SN	Q

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophysical logs available[1]	Monitoring frequency
87	PASEO 1-M	11N.03E.17.141	351059	1063859	4,889.53	01-11-92	150	19.56	02-14-92	135	145	--	Q
88	PASEO 1-S	11N.03E.17.141A	351059	1063859	4,990.80	01-12-92	25	6.76	12-03-92	10.0	20.0	--	Q
89	PASEO 2-D	11N.03E.17.233	351057	1063842	4,989.07	09-27-92	150.0	16.42	12-17-92	135.0	145.0	--	Q
90	PASEO 2-M-D	11N.03E.17.233A	351057	1063842	4,988.60	09-28-92	95.0	11.63	12-17-92	80.0	90.0	CA,GG,LN, NU,SN	Q
91	PASEO 2-M-S	11N.03E.17.233B	351057	1063842	4,988.58	09-29-92	45.0	11.81	12-17-92	30.0	40.0	--	Q
92	PASEO 2-S	11N.03E.17.233D	351057	1063842	4,990	06-19-93	23.35	10.60	08-02-93	13	23	--	Q
93	PASEO 3-D	11N.03E.15.344C	351035	1063647	5,006	08-13-93	543.9	69.95	08-24-93	538.9	543.9	--	Q
94	PASEO 3-M	11N.03E.15.344B	351035	1063647	5,006	08-13-93	143.5	53.20	08-24-93	138.5	143.5	--	Q
95	PASEO 3-S	11N.03E.15.344A	351035	1063647	5,006	07-24-93	68.7	51.29	08-24-93	63.7	68.7	--	Q
96	PINO-1	11N.03E.24.142	351009	1063447	5,232	- -92	360	318	06-18-92	320	360	--	Q
97	SISTER CITIES-D[4]	11N.03E.25.322	350908	1063444	5,240	03-31-96	1,308	348.09	10-24-96	1,298	1,303	CA,GA,GG, LN,NU,SN	R
98	SISTER CITIES-M[4]	11N.03E.25.322A	350908	1063444	5,240	03-31-96	799	348.34	10-24-96	789	794	--	R
99	SISTER CITIES-S[4]	11N.03E.25.322B	350908	1063444	5,240	03-31-96	460	339.89	10-24-96	350	450	--	R
100	DEL SOL-D[4]	10N.03E.14.324	350534	1063547	5,210	05-07-96	1,567	336.69	10-24-96	1,557	1,562	CA,GA,GG, LN,NU,SN	R
101	DEL SOL-M[4]	10N.03E.14.324A	350534	1063547	5,210	05-07-96	842	345.61	10-24-96	832	837	--	R
102	DEL SOL-S[4]	10N.03E.14.324B	350534	1063547	5,210	05-07-96	425	348.66	10-24-96	315	415	--	R
103	HUNTER RIDGE 1-D[4]	11N.03E.07.141	351201	1064005	5,105	06-14-96	1,518	162.73	10-24-96	1,508	1,513	CA,GA,GG, LN,NU,SN	R
104	HUNTER RIDGE 1-M[4]	11N.03E.07.141A	351201	1064005	5,105	06-14-96	855	158.61	10-24-96	845	850	--	R
105	HUNTER RIDGE 1-S[4]	11N.03E.07.141B	351201	1064005	5,105	06-14-96	238	146.11	10-24-96	148	228	--	R
106	HUNTER RIDGE 2-D[4]	11N.03E.07.141C	351201	1064005	5,105	06-23-96	359	150.65	10-24-96	349	354	CA,GA,GG, LN,NU,SN	R

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophysical logs available[1]	Monitoring frequency
107	HUNTER RIDGE 2-M[4]	11N.03E.07.141D	351201	1064005	5,105	06-23-96	305	147.95	10-24-96	295	300	--	R
108	HUNTER RIDGE 2-S[4]	11N.03E.07.141E	351201	1064005	5,105	06-23-96	268	147.39	10-24-96	238	258	--	R
109	WEST BLUFF 1-D[4]	10N.02E.11.244	350638	1064137	5,100	07-18-96	1,095	173.11	10-24-96	1,085	1,090	CA,GA,GG, LN,NU,SN	R
110	WEST BLUFF 1-M[4]	10N.02E.11.244A	350638	1064137	5,100	07-18-96	689	161.91	10-24-96	679	684	--	R
111	WEST BLUFF 1-S[4]	10N.02E.11.244B	350638	1064137	5,100	07-18-96	437	155.32	10-24-96	422	427	--	R
112	WEST BLUFF 2-D[4]	10N.02E.11.244C	350638	1064137	5,100	08-18-96	328	155.25	10-24-96	318	323	CA,GA,GG, LN,NU,SN	R
113	WEST BLUFF 2-M[4]	10N.02E.11.244D	350638	1064137	5,100	08-18-96	254	155.57	10-24-96	244	249	--	R
114	WEST BLUFF 2-S[4]	10N.02E.11.244E	350638	1064137	5,100	08-18-96	173	155.51	10-24-96	143	163	--	R
115	GARFIELD-D[4]	10N.03E.05.341	350706	1063903	4,964	09-11-96	1,020	49.44	10-24-96	995	1,010	CA,GA,GG, LN,NU,SN	R
116	GARFIELD-M[4]	10N.03E.05.341A	350706	1063903	4,964	09-11-96	582	48.28	10-24-96	552	572	--	R
117	GARFIELD-S[4]	10N.03E.05.341B	350706	1063903	4,964	09-11-96	93	43.51	10-24-96	43	83	--	R
118	98TH ST-D[4]	10N.02E.17.44	350530	1064452	5,320	02-15-97	1,544	421.46	04-21-97	1,534	1,539	CA,CMR,GA,GG, LN,NU,SN,SO[5]	R
119	98TH ST-M-D[4]	10N.02E.17.44A	350530	1064452	5,320	02-15-97	1,112	422.69	04-21-97	1,102	1,107	--	R
120	98TH ST-M-S[4]	10N.02E.17.44B	350530	1064452	5,320	02-15-97	749	416	04-21-97	739	744	--	R
121	98TH ST-S[4]	10N.02E.17.44C	350530	1064452	5,320	02-15-97	438	391.30	04-21-97	388	433	--	R
122	NOR ESTE-D[4]	11N.04E.18.222	351114	1063306	5,460	06-03-97	1,525	538.48	06-06-97	1,515	1,520	CA,GA,INRS,LL, LN,NU,SN,SO,SP	R
123	NOR ESTE-M[4]	11N.04E.18.222A	351114	1063306	5,460	06-03-97	1,193	540.22	06-06-97	1,183	1,188	--	R
124	NOR ESTE-S[4]	11N.04E.18.222B	351114	1063306	5,460	06-03-97	608	540.73	06-06-97	538	598	--	R
125	SIERRA VISTA-D[4]	11N.03E.26.243	350910	1064148	5,110	07-20-97	1,644	178.75	08-08-97	1,634	1,639	CA,GA,NU	R
126	SIERRA VISTA-M[4]	11N.03E.26.243A	350910	1064148	5,110	07-20-97	928	153.04	08-08-97	918	923	--	R

Table 1.-- Location, construction, and monitoring data for wells in the current City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Concluded

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Geophysical logs available[1]	Monitoring frequency
127	SIERRA VISTA-S[4]	11N.03E.26.243B	350910	1064148	5,110	07-20-97	210	148.79	08-08-97	140	200	--	R
128	MONTESA-D[4]	09N.03E.10.342	350056	1063701	5,100	09-10-97	1,633	211.00	10-02-97	1,618	1,623	CA,GA,INRS,LL, LN,NU,SN,SO,SP	R
129	MONTESA-M[4]	09N.03E.10.342	350056	1063701	5,100	09-10-97	708	216.06	10-02-97	698	703		R
130	MONTESA-S[4]	09N.03E.10.342	350056	1063701	5,100	09-10-97	325	211.22	10-02-97	260	320		R
131	MESA DEL SOL-D[6]	09N.03E.34.231	345758	1063642	5,300	06-06-97	1,630	400.56	06-20-97	1,580	1,620	CA,GA,LN,NU, RST,SN,SO,SP	R
132	MESA DEL SOL-M[6]	09N.03E.34.231A	345758	1063642	5,300	06-06-97	1,015	412.48	06-20-97	990	1,010	--	R
133	MESA DEL SOL-S[6]	09N.03E.34.231B	345758	1063642	5,300	06-06-97	525	406.76	06-20-97	420	520	--	R
134	MATHESON-D[6]	10N.04E.09.214	350653	1063116	5,565	07-16-97	1,520	727.44	07-18-97	1,460	1,500	CA,GA,LN,NU, RST,SN,SO,SP	R
135	MATHESON-M[6]	10N.04E.09.214A	350653	1063116	5,565	07-16-97	1,045	720.38	07-18-97	1,020	1,040	--	R
136	MATHESON-S[6]	10N.04E.09.214B	350653	1063116	5,565	07-16-97	705	582.64	07-18-97	600	700	--	R
137	LINCOLN-D[6]	12N.02E.24.312	351515	1064115	5,450	09-02-97	1,260	495.5	09-02-97	1,200	1,240	CA,GA,LN,NU, RST,SN,SO,SP	R
138	LINCOLN-M[6]	12N.02E.24.312	351515	1064115	5,450	09-02-97	835	494.3	09-02-97	810	830	--	R
139	LINCOLN-S[6]	12N.02E.24.312	351515	1064115	5,450	09-02-97	595	485.65	08-28-97	490	590	--	R

[1]Logs listed generally are available through a geophysical-log data base at the U.S. Geological Survey. Logs for Rio Bravo 1-4 and Montaño 1-4 also are available in Anderholm and Bullard (1987).
[2]Name of land grant is given; no well number is available.
[3]Permission to continue measurements is uncertain.
[4]Nested monitoring wells installed in 1996 or 1997 as part of a cooperative program between the City of Albuquerque and the U.S. Geological Survey. Detailed geologic logs are available from the New Mexico Bureau of Mines and Mineral Resources.
[5]Continuous core was collected at the 98th Street site in a separate drill hole about 60 feet from this monitoring well.
[6]Nested monitoring wells installed in 1997 by the Office of the State Engineer.

Table 2.--Location, construction, and monitoring data for wells proposed as additions to the City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network

[Map ID: map identification number shown on plate 2. Well name: S, shallow; D, deep; ANN, annulus; M, mid-depth. Monitoring frequency: A, annual; Q, quarterly; MO, monthly; F, once every 5 years; R, recorder. BIA, Bureau of Indian Affairs; KAFB, Kirtland Air Force Base; SNL/NM, Sandia National Laboratories; USGS, U.S. Geological Survey; Shomaker, John Shomaker & Associates, Inc. --, no data]

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Monitored by	Monitoring frequency
28	WEST MESA 1A-S[1]	10N.01E.22.322B	350449	1064931	5,796	06-25-81	1,121	886.80	04-12-94	980	1,121	--	--
29	WEST MESA 1A-D[1]	10N.01E.22.322C	350449	1064931	5,796	06-25-81	1,179	884.95	04-12-94	1,139	1,179	--	--
30	WEST MESA 2-ANN[1]	11N.02E.18.313B	351046	1064647	5,730	11-01-81	1,250	769.17	04-12-94	800 925	830 955	--	--
31	WEST MESA 2-M[1]	11N.02E.18.313C	351046	1064647	5,730	11-01-81	1,410	794.82	04-12-94	1,275 1,390	1,345 1,410	--	--
32	WEST MESA 2-D[1]	11N.02E.18.313D	351046	1064647	5,730	11-01-81	1,805	796.97	04-12-94	1,525 1,630 1,735	1,545 1,695 1,795	--	--
140	RWP002	07N.04E.23.122	344934	1062921	5,745.00	04- -52	340	249.30	01-28-93	([2])	([2])	BIA	A
141	RWP001	07N.03E.13.434	344939	1063426	5,295.00	04- -39	496	450.70	01-28-93	([2])	([2])	BIA	A
142	SOLAR	07N.02E.07.114	345111	1064641	5,030.00	--	--	189.20	01-27-93	--	--	BIA	A
143	ECW001	08N.03E.32.412	345235	1063844	4,977.00	11-01-34	123	115.10	01-28-93	([2])	([2])	BIA	A
144	ECW557	08N.02E.27.432	345314	1064255	4,880.00	- -33	44	13.60	01-07-93	([2])	([2])	BIA	A
145	RWP540	08N.02E.29.213	345346	1064512	5,016.00	02-01-16	167	150.10	01-26-93	([2])	([2])	BIA	A
146	ECW861	08N.01W.24.312	345421	1065358	5,504.00	- -32	744	654.90	01-27-93	--	--	BIA	A
147	RWP026	08N.02E.10.211	345629	1064304	5,070.00	04- -68	261	184.00	01-27-93	([2])	([2])	BIA	A
148	RWP009	08N.01E.01.342	345643	1064723	5,260.00	08-01-56	430.00	387.10	01-27-93	([2])	([2])	BIA	A
149	CHICAL	--	345160	1063937	4,905	- -	--	37.10	01-28-93	--	--	BIA	A
150	ECW002	--	345055	1062929	5,715.00	11- -34	239	191.80	01-28-93	([2])	([2])	BIA	A
151	ECW006	--	345134	1065450	5,423.00	11- -34	700	580.20	01-25-93	([2])	([2])	BIA	A
152	ECW007	--	345207	1063535	5,260.00	12- -34	445	426.80	01-28-93	([2])	([2])	BIA	A
153	RWP003	--	344952	1063722	5,145.00	03- -58	440	312.90	01-28-93	([2])	([2])	BIA	A
154	RWP005	--	345046	1064945	5,263.00	- -34	437	420.10	01-26-93	--	--	BIA	A
155	RWP008	--	345406	1065030	5,470.00	05- -64	620	599.00	01-27-93	([2])	([2])	BIA	A
156	RWP011	--	345427	1065505	5,665.00	05- -57	780	688.60	01-25-93	([2])	([2])	BIA	A
157	RWP014	--	345542	1062837	5,800.00	06- -58	415	178.10	01-28-93	([2])	([2])	BIA	A
158	RWP015	--	345225	1065558	5,570.00	10- -60	720	600.80	01-25-93	([2])	([2])	BIA	A
159	RWP016	--	345556	1063834	5,260.00	03- -61	442	381.40	01-27-93	([2])	([2])	BIA	A

Table 2.--Location, construction, and monitoring data for wells proposed as additions to the City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Monitored by	Monitoring frequency
160	RWP019	--	345433	1063854	5,235.00	11- -66	457	356.30	01-27-93	432	456	BIA	A
161	RWP020	--	345111	1063707	5,160.00	02- -67	355	317.80	01-28-93	340	350	BIA	A
162	RWP021	--	345115	1063242	5,450.00	01-28-93	120	99.10	01-28-93	107	117	BIA	A
163	RWP024	--	345335	1062939	5,720.00	01-28-93	295	201.60	01-28-93	(2)	(2)	BIA	A
164	RWP028	--	345458	1063308	5,365.00	08- -69	44	23.10	01-27-93	(2)	(2)	BIA	A
165	RWP031	--	345158	1064819	5,230.00	01- -72	401	351.80	01-26-93	(2)	(2)	BIA	A
166	RWP032	--	345610	1064513	5,260.00	03- -72	378	338.70	01-27-93	--	--	BIA	A
167	KAFB-1001	08N.03E.01.412	345650	1063422	5,253	04-20-92	377.0	361.67	10-30-95	342.0	367.0	KAFB	Q
168	KAFB-1002	08N.03E.01.312	345651	1063455	5,250	03-31-92	377.0	356.34	10-30-95	342.0	367.0	KAFB	Q
169	KAFB-1005	09N.03E.36.412	345745	1063428	5,285	05-27-92	398.0	379.68	10-30-95	363.0	388.0	KAFB	Q
170	SFR-1D	--	345651	1063219	5,395	08-06-92	378.0	139.62	11-03-95	348.0	368.0	SNL/NM	Q
171	SFR-4T	--	345650	1063054	5,570	09-30-93	380	293.5	09-30-93	340	360	SNL/NM	Q
172	TRE-1	--	345731	1063122	5,492.48	07-31-95	305	176.5	07-31-95	255	295	SNL/NM	Q
173	TRN-1	--	345740	1062924	5,730.90	10-12-94	350	82	10-12-94	320	340	SNL/NM	Q
174	TRS-1S	--	345732	1062905	5,774.81	09-06-95	214.75	123	09-06-95	164.75	204.75	SNL/NM	MO
175	TRS-1D	--	345732	1062905	5,774.806	09-06-95	316.4	117.91	11-03-95	266.4	306.4	SNL/NM	MO
176	CWL-MW5U	--	345815	1063213	5,414.02	04-19-94	502.0	--	--	477.0	497.0	SNL/NM	Q
177	CWL-MW5L	--	345815	1063213	5,414.02	04-19-94	558.0	--	--	533.0	553.0	SNL/NM	Q
178	SWTA-3	--	345816	1063333	5,320.57	09-06-89	432.2	426.15	10-30-95	407.2	427.2	SNL/NM	Q
179	MRN-1	--	345848	1063357	5,303.683	01-22-95	606.7	417.79	10-11-95	546.7	586.7	SNL/NM	Q
180	LMF-1	--	345844	1063023	5,623.77	08-11-95	360	345.7	08-11-95	310	350	SNL/NM	Q
181	EOD	--	345848	1062942	5,806	--	204.0	143.59	10-30-95	204.0	212.0	SNL/NM	MO
182	SCHOOL HOUSE	--	345919	1062840	5,794.41	--	103.0	95.58	10-31-95	83.0	103.0	SNL/NM	MO
183	MWL-MW1	--	345933	1063242	5,381.54	10-01-88	478.0	458.18	- -88	456.0	476.0	SNL/NM	MO
184	AVN-2	--	350001	1063157	5,438.19	06-05-95	520	506.5	06-05-95	195	515	SNL/NM	MO
185	NWTA-3	--	345959	1063334	5,333.81	09-20-89	460.4	450.42	10-30-95	434.9	454.9	SNL/NM	Q
186	PL-3	--	350042	1063351	5,329.90	12-04-94	475	453.4	12-04-94	445	465	SNL/NM	Q
187	KAFB-0602[3]	09N.04E.09.134	350121	1063143	5,361.49	03-20-90	467.0	312.38	10-31-95	437.0	457.0	SNL/NM	MO
188	KAFB-0215	09N.04E.07.234	350126	1063319	--	10-12-91	405.0	384.37	02- -96	370.0	395.0	SNL/NM	MO
189	MVMWK	--	350128	1063509	--	--	300.0	291.29	08- -95	275.0	295.0	SNL/NM	Q

Table 2.--Location, construction, and monitoring data for wells proposed as additions to the City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Continued

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Monitored by	Monitoring frequency
190	KAFB-0902[3]	09N.03E.02.432	350157	1063531	5,227.3	02-02-90	367.0	352.03	10-31-95	337.0	357.0	SNL/NM	MO
191	KAFB-0417	09N.03E.02.131	350220	1063610	5,313	06-06-92	465.0	438.85	10-31-95	430.0	455.0	SNL/NM	MO
192	KAFB-0114	09N.03E.02.224	350230	1063509	5,318	08-17-92	469	448.63	10-30-95	434.0	459.0	KAFB	Q
193	KAFB-0502[3]	09N.04E.06.141	350221	1063342	5,361.21	12-06-89	506.0	494.38	10-31-95	476.0	496.0	SNL/NM	MO
194	WYO-1	--	350225	1063303	5,387.72	08-27-95	570.0	507.88	11-03-95	510.0	560.0	SNL/NM	MO
195	WYO-2	--	350225	1063303	5,387.72	08-27-95	295	272.9	08-27-95	265	285	SNL/NM	MO
196	TA2-NW1-325	--	350232	1063228	5,417.31	04-01-93	330.3	306.5	04-01-93	295	325	SNL/NM	MO
197	TA2-NW1-595	--	350232	1063228	5,417.28	07-27-93	598	--	--	585	595	SNL/NM	MO
198	TJA-2	--	350211	1063158	5,348.58	07-12-94	305	274	07-12-94	275	295	KAFB	Q
199	KAFB-0310	09N.04E.04.341	350153	1063139	5,420	08-27-91	455.0	367.01	10-30-95	400.0	445.0	KAFB	Q
200	KAFB-0309	09N.04E.04.141	350218	1063145	5,409.95	07-20-91	535	375.0	07-17-92	500	525	KAFB	Q
201	PGS-2	--	350318	1063257	5,405.19	09-22-95	655	546.3	09-22-95	535	565	SNL/NM	MO
										585	595		
										625	645		
202	SADRUDIN	09N.02E.03.421	350213	1064249	4,960	09-12-85	150	31	01-12-95	135	150	USGS	F
203	BAKER	09N.02E.03.142	350225	1064316	5,004	02-23-73	203	89.67	01-17-95	--	--	USGS	F
204	TOTTER	11N.03E.13.242	351100	1063412	5,292.00	10-15-76	460	359.19	11-01-95	380.00	400.00	USGS	F
										420.00	440.00		
										440.00	460.00		
205	KING	12N.02E.35.112	351224	1064245	5,385	07-12-93	675	451.65	02-14-95	655	670	USGS	F
206	IMWB1	12N.03E.32.443A	351305	1063831	5,007	02-14-95	60	12.17	05-31-96	30	50	Shomaker	R[4]
207	IMWB2	12N.03E.32.443B	351305	1063831	5,007	02-14-95	240	33.24	05-31-96	190	230	Shomaker	R[4]
208	IMWB3	12N.03E.32.443C	351305	1063831	5,007	02-14-95	800	54.44	05-31-96	710	790	Shomaker	R[4]
209	IMWA1	12N.03E.32.321D	351330	1063908	5,200	01-28-95	250	212.77	05-31-96	220	240	Shomaker	R[4]
210	IMWA3	12N.03E.32.321E	351330	1063908	5,200	01-28-95	440	239.32	05-31-96	390	430.0	Shomaker	R[4]
211	IMWA4	12N.03E.32.321F	351330	1063908	5,200	01-28-95	660	234.71	05-31-96	610	660	Shomaker	R[4]
212	IMWA2	12N.03E.32.321A	351331	1063908	5,200	01-28-95	305	227.24	05-31-96	275	295	Shomaker	R[4]
213	IMWA5	12N.03E.32.321B	351331	1063908	5,200	01-28-95	1,015	247.24	05-31-96	925	1,005	Shomaker	R[4]
214	IMWA6	12N.03E.32.321C	351331	1063908	5,200	01-28-95	1,715	258.11	05-31-96	1,605	1,705	Shomaker	R[3]

Table 2.--Location, construction, and monitoring data for wells proposed as additions to the City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network--Concluded

Map ID	Well name	Well number	Latitude	Longitude	Altitude of land surface (feet above sea level)	Date of construction	Depth of well (feet)	Water level (feet)	Date water level measured	Top of open interval (feet)	Bottom of open interval (feet)	Monitored by	Monitoring frequency
215	IMWC1	--	351319	1063735	5,003	--	--	9.31	05-31-96	30	50	Shomaker	R
216	IMWC2	--	351319	1063735	5,003	--	--	26.61	05-31-96	220	260	Shomaker	R
217	IMWC3	--	351319	1063735	5,003	--	--	13.30	05-31-96	90	110	Shomaker	R
218	IMWC4	--	351319	1063735	5,003	--	--	35.93	05-31-96	350	390	Shomaker	R
219	IMWC5	--	351319	1063735	5,003	--	--	55.10	05-31-96	710	790	Shomaker	R
220	IMWC6	--	351319	1063735	5,003	--	--	59.75	05-31-96	1,360	1,460	Shomaker	R
221	STANBROUGH	13N.04E.34.142	351739	1063047	--	--	--	286.45	02-16-95	--	--	USGS	F
222	RIO RANCHO 18	13N.03E.21.312	352032	1063759	5,523	06-17-94	2,070	370.83	01-17-95	542	2,050	USGS	F
223	SANTA ANA (#3)	13N.04E.18.311	352003	1063431	5,265.00	--	230	207.50	02-09-95	--	--	USGS	F
224	BOWERS[5]	13N.04E.12.112	352121	1062855	5,130.00	--	50	26.67	07-30-96	--	--	USGS	F
225	MOORE[5]	11N.02E.22.4	--	--	--	--	326	--	--	--	--	--	--
226	GOERING	12N.03E.29.422	--	--	5,225	06-01-82	315	--	--	300	315	Shomaker	MO
227	ECW001	12N.04E.32.242	351336	1063159	5,565	02- -33	657	606.10	01-20-93	--	--	BIA	A
228	RACE	11N.04E.06.424	351226	1063303	5,435	02- -77	560	504.50	01-07-93	--	--	BIA	A
229	RWP003	12N.04E.30.124	351440	1063343	5,190	- -56	202	154.53	03-29-56	--	--	BIA	A
230	ISLETA EAST 2	08N.02E.01.423B	--	--	4,898	08-25-93	165.9	1.6	08-27-93	150.5	155.5	BIA	R
231	ISLETA EAST 4	08N.02E.01.423A	--	--	4,898	07-31-93	75	2	07-31-93	65	70	BIA	R

[1]Well formerly in network in which measurements could be resumed. The following logs are available through a USGS geophysical-log data base for this site: natural gamma, gamma gamma, neutron, resistance, spontaneous potential, and temperature.
[2]Assume 20 feet of perforations at bottom.
[3]The following logs are available through a USGS geophysical-log data base for this site: caliper, natural gamma, gamma gamma, long-normal resistivity, neutron, short-normal resistivity, and spontaneous potential.
[4]Well also monitored by the USGS once every 5 years.
[5]Construction data reported by owner; Office of the State Engineer well record not yet obtained.

Table 3.--Location information for ground-water investigation sites proposed as additions to the City of Albuquerque/U.S. Geological Survey ground-water-level monitoring network

[Map ID: map identification number shown on plate 2]

Map ID	Location
	Leaking underground storage tank (LUST) sites
A	Yale Auto Sales
B	U-Pump-It
C	Pump N Save
D	Coronado Air Center
	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites and State enforcement sites
E	Oil Sludge Disposal Trenches
F	Rek Chem Industries
G	Van Waters & Rogers-Dale
H	Mesa Oil Company
I	Mountainview Subdivision
J	Van Waters & Rogers-Edmonds
K	South Valley
L	Proto Service B & B Auto Sales
M	Old Gulton Industries
N	Siemens
O	Sunbell
P	Fox & Associates, Inc.
Q	Rinchem Company, Inc.
R	Digital
S	Sparton Technology, Inc.

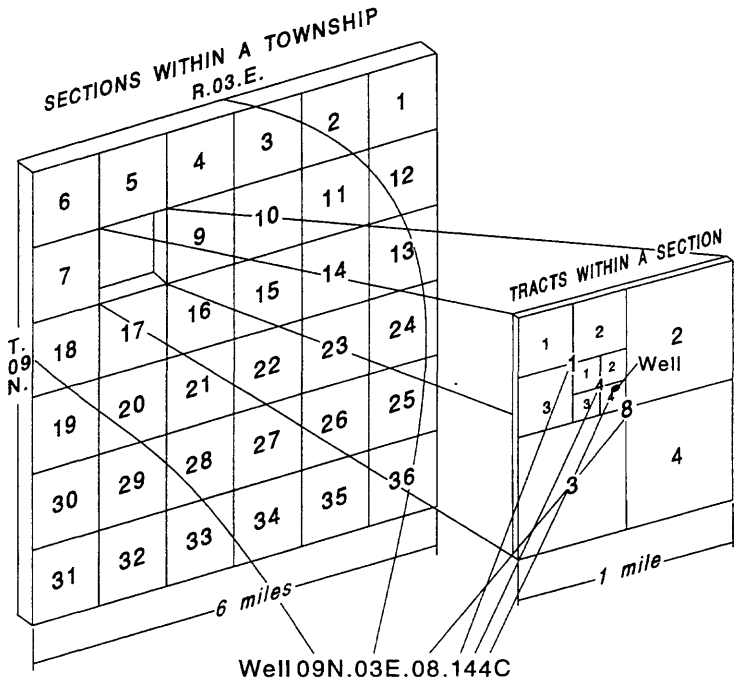

Figure 2.--Well-numbering system in New Mexico.

of the New Mexico Base Line; the second segment denotes the range east (E.) or west (W.) of the New Mexico Principal Meridian; and the third segment denotes the section (sec.) within the township. The fourth segment consists of three digits that denote the 160-, 40-, or 10-acre tract, respectively, in which the well is located. The section is divided into four quarters, numbered 1, 2, 3, and 4, for the northwest, northeast, southwest, and southeast quarters, respectively. The first digit of the fourth segment denotes the quarter section, which is a tract of 160 acres. Similarly, the 160-acre tract is divided into four 40-acre tracts denoted by the second digit and numbered in the same manner. Finally, the 40-acre tract is divided into four 10-acre tracts that are denoted by the third digit. If a well cannot be located accurately within a particular section or tract, a zero is used for that part of the location number. If more than one well is located within a certain 10-acre tract, the wells are distinguished from one another by the addition of a letter at the end of the well number.

Acknowledgments

The author thanks the numerous individuals who shared detailed information on various monitoring wells. These individuals include Doug Earp and Gloria Cruz with the City of Albuquerque Environmental Health Department, Anthony Pino and Terry Nelson with the City of Albuquerque Solid Waste Department, Grace Haggerty with Gram, Inc., Bill White with the Bureau of Indian Affairs, Blaine Sanchez with Isleta Pueblo, Melanie McKinley with Philips Semiconductors, Steve Hansen with the Bureau of Reclamation, and Jane Cramer and Thomas Leck with the Underground Storage Tank Bureau of the New Mexico Environment Department. Others who contributed to this effort include Oscar Simpson with the Drinking Water Bureau of the New Mexico Environment Department, Baird Swanson and Sheri Sinclair with the Ground-Water Quality Bureau of the New Mexico Environment Department, Paul Romero with ECO Resources, Linda Logan with the Office of the State Engineer in Santa Fe, Charles Walenberg and Wayne Canon with the Office of the State Engineer in Albuquerque, Ted Moore with the New Mexico Engineering Research Institute, and Tim Georing with Sandia National Laboratories.

In addition, the author recognizes other members of the USGS who contributed their time and advice. This report builds upon information that had been compiled by the past efforts of Doug McAda, Mike

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EXISTING MONITORING NETWORKS AND WELLS

Several ground-water-level and/or ground-water-quality monitoring networks currently operate in the Albuquerque metropolitan area. These networks are associated with Federal, State, tribal, or local governments or with private corporations. Those monitoring wells that already are monitored by the USGS or the City of Albuquerque or that have been proposed to be installed for this purpose are shown on plate 1. Also shown are selected high-capacity production wells, which represent the locations of the largest known ground-water withdrawals in the area. All monitoring wells associated with organizations other than the USGS or the City of Albuquerque appear on plate 1 in blue. These existing wells constitute all wells that were considered as potential additions to the City of Albuquerque/USGS network. Inclusion of these wells in the network could merely involve the transfer of data already collected by other organizations into the NWIS data base of the USGS (after review for quality) rather than the collection of data by USGS personnel.

U.S. Geological Survey Monitoring-Well Networks

Through various programs, the USGS currently monitors water levels at about 85 different locations in the Albuquerque metropolitan area. In addition to the City of Albuquerque/USGS network, the USGS maintains one ground-water-level monitoring network with the Office of the State Engineer (OSE) and another associated with the Federally funded National Water-Quality Assessment (NAWQA) Program. Water levels measured in the wells associated with each program generally are entered into the USGS NWIS data base.

The City of Albuquerque/USGS network consists of wells (including various individual piezometers) across the entire Middle Rio Grande Basin; currently (September 1997) water levels are measured in 128 wells (fig. 1 and table 1). Of the 128 wells monitored for this network, 115 are located in the Albuquerque metropolitan area (as defined for this report). Forty-eight of these wells are known to have a total depth at least 150 feet below the water table, so they reflect hydraulic heads in parts of the aquifer below the area of the water table (pl. 1). Sixteen of these deeper wells (including two unused production wells) are known to extend to near the bottom of the production zone, as defined by the screened intervals of the closest municipal wells. As indicated in table 1, water levels generally are measured in the wells on a monthly, quarterly, semiannual, or annual basis, depending on various factors such as the amount of change observed in the depth to water. Three of the wells are equipped with recorders. Piezometer nests located along Rio Bravo Boulevard (Rio Bravo 1-5), Montaño Road (Montaño 1-6), and Paseo del Norte (Paseo 1-3) are monitored as part of the network (Rankin, 1996); Rio Bravo 5, Montaño 5 and 6, and Paseo 1-3 were only recently (October 1996) added. Some of these piezometer nests occasionally are equipped with recorders in association with other projects.

The City of Albuquerque, in cooperation with the USGS, began a drilling program in 1996 to install nested monitoring wells in the Albuquerque metropolitan area. The locations and construction of these additional monitoring wells are designed to provide meaningful hydraulic-head and water-quality data for specific depths in geographical areas where these data are lacking (Thorn, 1996). All piezometer nests recently drilled in association with this program (currently numbering 34 completions at nine different sites around the city) are considered part of the City of Albuquerque/USGS network and are being equipped with data recorders. Each site at which one of these new monitoring wells is drilled includes at least one piezometer completion screened near the water table, one screened at about the middle of the production zone of the closest municipal wells, and one screened near the bottom of the production zone.

In addition to the monitoring wells installed under the cooperative program between the City of Albuquerque and the USGS, monitoring wells of similar construction were installed by the OSE at three other sites during 1997 (table 1). These wells have been added to the City of Albuquerque/USGS ground-water-level monitoring network. The installation of monitoring wells at additional sites around the Albuquerque metropolitan area through a cooperative

program between Bernalillo County and the USGS has been proposed (pl. 1). Once installed, all these monitoring wells also are proposed to be added to the City of Albuquerque/USGS network.

Through a separate and continuous cooperative program between the USGS and the OSE, water levels are measured once every 5 years in 19 wells around the Albuquerque metropolitan area. Of these wells, nine are piezometer completions in monitoring wells associated with Intel Corporation in Rio Rancho, which are discussed in a separate section below. Another well in this network is an unused production well for the City of Rio Rancho that has about 1,500 feet of screen.

Through another cooperative program between the USGS and the OSE, 20 piezometers were installed during 1997 at five sites in the inner valley near the Interstate 40 bridge over the Rio Grande. The deepest hole drilled extends 130 feet below land surface. All these piezometers have been equipped with data recorders in association with an aquifer test planned by the OSE. There are currently no plans to incorporate these wells into any continuous ground-water-level monitoring network.

Twenty-four wells in the Albuquerque metropolitan area are monitored by the USGS through the Federally funded NAWQA Program. One of these wells is a piezometer completion associated with Montaño 4; another is a completion associated with Paseo 2. Four others are part of the City of Albuquerque network maintained by the Environmental Health Department, discussed in a separate section below. Because all 24 wells were drilled or selected from existing wells to study land-use effects on the quality of shallow ground water, they are completed very close to the water table. Water levels in these wells are measured periodically through the NAWQA Program.

City of Albuquerque Monitoring-Well Networks

The City of Albuquerque maintains two monitoring-well networks that have a total of 57 wells. The City of Albuquerque Environmental Health Department currently maintains 46 wells to monitor water levels and water quality. Several new monitoring wells were installed in late 1996 and in 1997 as additions to this network. Water levels were measured monthly in 28 wells in the network as of 1996 (Earp, 1996); with the addition of new wells, this number should increase to about 35 during 1997. None of the wells in the network extend more than 150 feet below the water table.

The City of Albuquerque Solid Waste Department maintains 11 monitoring wells at the South Broadway and Cerro Colorado Landfills. Currently, water levels are measured by a consultant annually at the South Broadway Landfill and semiannually at the Cerro Colorado Landfill (Anthony Pino, City of Albuquerque Solid Waste Department, oral commun., 1996). Two of the wells at the Cerro Colorado Landfill extend more than 150 feet below the water table.

Intel Monitoring Wells

Fifteen piezometers in three general locations are associated with the Intel Corporation in Rio Rancho. Each location is equipped with pressure transducers and automatic data recorders, which are maintained by John Shomaker & Associates, Inc. The OSE required Intel to support this ground-water-level monitoring program for at least 3 years, after which water-level monitoring might be performed on a less frequent basis (Office of the State Engineer, written commun., 1994). Currently, water-level data in these wells are compiled in monthly reports to the OSE in Albuquerque. At least eight of the piezometer completions at Intel have well depths more than 150 feet below the water table. John Shomaker & Associates, Inc. also monitors and reports water levels in nine domestic wells for Intel on a monthly basis (John Shomaker & Associates, Inc., 1996). Exact locations of these nine wells have not been obtained and, therefore, are not shown on plate 1.

Monitoring Wells on Sandia Pueblo and Isleta Pueblo

The Bureau of Indian Affairs (BIA) operates a water-level network of mostly windmills on the lands of several pueblos in the region, including Sandia and Isleta. Four wells on Sandia Pueblo, none of which extends more than 150 feet below the water table, currently are included in this network. The BIA network also includes 32 wells on Isleta Pueblo, 27 of which are within the Albuquerque metropolitan area (fig. 1). One of these wells extends more than 150 feet below the water table (Bill White, Bureau of Indian

Affairs, written commun., 1995). The BIA generally measures water levels for the network about once a year (Bill White, oral commun., 1996). Authorities for each pueblo having wells in the network may choose whether to release their data to the general public; during 1995, authorities for Isleta Pueblo agreed to release data to the USGS. Permission to have access to the data for each pueblo in the network must be obtained from authorities at each pueblo with each change of administration (Bill White, oral commun., 1996). The City of Albuquerque/USGS network currently includes two wells on Sandia Pueblo, but permission to access these wells also is subject to changes in authority on the pueblo. One well on Isleta Pueblo recently was dropped from the City of Albuquerque/USGS network because the hole is now dry.

Monitoring Wells Associated with Kirtland Air Force Base

More than 135 observation and monitoring wells are located on or near Kirtland Air Force Base. These wells generally are associated with four different organizations that operate on the base: Kirtland's Environmental Management group, Sandia National Laboratories' (SNL/NM) Environmental Restoration Project and Groundwater Protection Program, and Lovelace's Inhalation Toxicology Research Institute. Each of these organizations has a monitoring program that is either subject to regulatory requirements or voluntary. The Groundwater Protection Program is in the process of assembling a data base that will incorporate all water-level data collected on Kirtland Air Force Base through the SNL/NM (Grace Haggerty, Gram, Inc., oral commun., 1997). This data base should include water levels in approximately 65 wells, measured on either a monthly or quarterly basis (table 2) (Grace Haggerty, written commun., 1997). Water-level data for approximately 25 additional wells measured quarterly by Kirtland Air Force Base personnel also are likely to be available through the Groundwater Protection Program.

Philips Semiconductors Monitoring Wells

Four monitoring wells have been drilled by Philips Semiconductors on their property, located northwest of the intersection of Interstate 25 and Alameda Boulevard. These monitoring wells, which are all screened across the water table, were drilled as part of a voluntary monitoring program begun because the Philips facility is located on the site of a former landfill (Melanie McKinley, Philips Semiconductors, oral commun., 1996). Employees of the company measure water levels in the wells on a quarterly basis and report the water levels to the State. Philips Semiconductors has offered to send these data to the USGS or allow the USGS direct access to measure water levels.

Bureau of Reclamation Monitoring Wells

The Bureau of Reclamation (BOR) has installed several monitoring wells in the Albuquerque metropolitan area. These wells include the nest at Paseo 3, which is now monitored by the USGS. In addition, the BOR has drilled at least 16 shallow wells (generally less than 20 feet deep) on five cross sections east of the Rio Grande, between Sandia Pueblo and Rio Bravo Boulevard (Steven Hansen, Bureau of Reclamation, written commun., 1996). Exact locations were not readily available for these wells; therefore, they are not shown on plate 1.

The BOR also drilled at least four monitoring wells near the northern boundary of Isleta Pueblo. The BIA maintains recorders on the two monitoring wells on the east side of the Rio Grande. Although these wells are located in the inner-valley alluvium, one extends more than 150 feet below the water table (Steve Hansen, written commun., 1996). In addition, the presence of the shallower well allows information to be gathered on vertical head differences in the aquifer. The two monitoring wells on the west side of the Rio Grande are located just north of Isleta Pueblo and are not currently being monitored (Bill White, oral commun., 1996). The BOR has indicated that the USGS could monitor these wells, if desired (Steve Hansen, oral commun., 1996).

Monitoring Wells Associated with Ground-Water Investigation Sites

The New Mexico Environment Department (NMED) investigates various sites of potential ground-water contamination to determine whether ground-water remediation under specific Federal or State regulations may be necessary. Investigation of the

possibility of ground-water contamination can result in the installation of one or more monitoring wells at some sites. Specific types of sites at which ground-water investigations and remediation may take place include sites associated with a leaking underground storage tank (LUST), sites that are under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and sites that are under the authority of New Mexico's State Water Quality Control Commission regulations (State enforcement sites).

The NMED generally requires that monitoring wells be drilled at the site of a LUST if the distance between the bottom of the contaminated soil and the water table is less than 50 feet. As a result, most of these monitoring wells in the Albuquerque metropolitan area are in the inner-valley alluvium (pl. 1 shows only those LUST sites where monitoring wells were required). Typically, these wells are screened very close to the water table. Water levels in the monitoring wells generally are measured and reported by consultants on a quarterly basis. Currently, these data are not entered into any centralized data base. These data could be obtained on a regular basis, however, from the agency or persons overseeing those particular sites (Jane Cramer, New Mexico Environment Department, oral commun., 1996). One major limitation is that sites generally are considered "active" by the NMED for only a few years, after which the monitoring wells are ordered to be plugged. Any attempt to allow a well to remain open once a site becomes "inactive" so that the USGS could measure water levels directly would require the approval of both the State and the property owners involved.

The NMED also requires that wells be installed at some CERCLA and State enforcement sites in the Albuquerque metropolitan area. As with the LUST sites, most CERCLA and State enforcement sites having monitoring wells are located in the inner-valley alluvium (pl. 1 shows only those CERCLA and State enforcement sites where monitoring wells are known to exist), and water-level data collected by the State or by consultants from monitoring wells at these sites are not entered into a data base. In several cases, water levels are not collected on a continuous basis but only for the period of time that the site is under investigation for potential ground-water contamination. More information is likely to exist for those sites where ground-water remediation was required. Unlike LUST sites, however, monitoring wells associated with CERCLA and State enforcement sites are likely to be in existence for several years. Some wells associated with State enforcement sites may be plugged once cleanup activities are completed, whereas others may remain open, with control passed to other government entities such as the City of Albuquerque. Direct access by the USGS to a selected number of CERCLA or State enforcement sites for water-level measurements may be possible, with permission from the property owners and the State.

PROPOSED EXPANSION OF THE CITY OF ALBUQUERQUE/U.S. GEOLOGICAL SURVEY GROUND-WATER-LEVEL MONITORING NETWORK

The USGS proposes the addition of as many as about 115 wells to the current City of Albuquerque/ USGS network for the Middle Rio Grande Basin. These additions were chosen to provide greater areal coverage of the Albuquerque metropolitan area, which generally is needed outside the inner-valley area. Where several choices of wells are available for a given geographical area, the proposed additions were selected because they provide a good distribution of hydraulic heads with depth in the aquifer and/or because water-level data already are collected for those wells by an organization willing to provide the data to the City of Albuquerque and the USGS. All proposed additions to the network are shown on plate 2, which includes map ID's corresponding to those in tables 1 through 3. The numerical map ID's in table 1 do not include all numbers in sequential order because the ID's correspond with the site numbers listed in the most recent data report for the network (Rankin, 1996), which includes some wells recently dropped from the network. Wells in the current network have map ID's through 139; the monitoring wells recently installed in the cooperative effort between the City of Albuquerque and the USGS have map ID's 97 through 130. Those installed by the OSE during 1997 have map ID's 131 through 139.

The USGS proposes resuming quarterly or semiannual water-level measurements in five piezometer completions drilled by the USGS in 1981 in two locations west of Albuquerque (map ID's 28 through 32). All five completions extend at least 150 feet below the water table. Water-level measurements in these wells have been cut back or stopped in recent years because of budget constraints. The USGS also

proposes adding eight of the wells that are monitored solely through the cooperative program between the USGS and the OSE to the current City of Albuquerque/ USGS network so that water levels in those wells would be measured more frequently than once every 5 years. The wells suggested (map ID's 202 through 205 and 221 through 224) generally are those located outside the inner valley. The USGS does not propose adding the piezometers drilled for the OSE at the Interstate 40 bridge over the Rio Grande because these wells are located in an area of the inner valley for which a large amount of ground-water-level data already exist. The USGS also does not propose adding any wells monitored through the NAWQA Program to the City of Albuquerque/USGS network because these wells are completed in the inner valley at very shallow depths.

At this time, the USGS does not propose entering the construction and water-level data for the various wells monitored by the City of Albuquerque Environmental Health and Solid Waste Departments into the USGS NWIS data base because this information already is maintained by the City of Albuquerque. Future data requirements, however, may result in an effort to create one comprehensive data base maintained by either the USGS or the City.

The USGS proposes that water levels for the monitoring wells owned by Intel Corporation (map ID's 206 through 220) be obtained from John Shomaker & Associates, Inc. on a regular basis for entry into the NWIS data base. The data collected by John Shomaker & Associates, Inc., are presumed to meet USGS quality-control standards and should provide important information on differences in hydraulic head with depth in the aquifer. The owner of one of the nine domestic wells monitored by John Shomaker & Associates, Inc. for Intel Corporation (map ID 226) offered to allow the USGS to also monitor his well, if desired.

The USGS proposes obtaining permission from authorities at Sandia Pueblo and Isleta Pueblo, if possible, for the USGS to measure water levels in several wells to be included in the City of Albuquerque/USGS network (map ID's 140 through 166 and 227 through 231). If permission were granted, water levels probably would be measured quarterly or semiannually, thereby allowing for the collection of a greater quantity of data in these areas than is currently available. The USGS proposes that USGS personnel be involved in direct measurements for a period of time sufficient to allow quality-control activities and training of pueblo personnel.

The USGS proposes that water levels be obtained from sources at Sandia National Laboratories and Gram, Inc. on a regular basis for incorporation into NWIS and the City of Albuquerque/USGS network. The specific wells proposed as additions to the network are 35 wells currently in the networks maintained by Sandia National Laboratories and Kirtland Air Force Base (map ID's 167 through 201). These wells provide good areal coverage of Kirtland Air Force Base. The data obtained by Sandia National Laboratories and Kirtland Air Force Base are presumed to meet USGS quality-control standards. If certain wells are dropped from these programs in the future, however, the USGS likely could have access to the wells to make measurements firsthand.

The USGS does not propose measuring water levels in any of the monitoring wells at Philips Semiconductors because the Albuquerque Environmental Health Department installed monitoring wells on the property of Philips Semiconductors in 1996 and 1997 as additions to that network. Therefore, water-level measurements in this area already are monitored monthly by the City of Albuquerque.

The USGS does not propose adding those BOR wells located along five cross sections east of the Rio Grande or those just north of Isleta Pueblo on the west side of the Rio Grande to the City of Albuquerque/ USGS network. These wells are all of shallow depths and are located in the inner-valley alluvium, which is not an area of high priority for additional wells in the current network. However, the USGS does propose obtaining information from the BIA periodically, subject to permission from authorities at Isleta Pueblo, for the two wells located near Isleta Lakes (map ID's 230 and 231) because these wells can provide information on vertical head differences in the aquifer.

The USGS proposes obtaining water-level information from the NMED for those LUST sites located outside the inner-valley alluvium. Four such sites (map ID's A through D) were known as of 1994. Water levels measured by consultants reporting to the NMED are presumed to meet USGS quality-control standards. Once the sites become inactive, the USGS proposes preserving a well at each site, where possible, for continued water-level measurements by USGS personnel.

The USGS proposes obtaining water-level information either from the NMED or, if possible, through direct measurement for a limited number of CERCLA and State enforcement sites (possibly about 10) selected from the 15 sites known to have wells that could contribute important information either spatially or with depth to the water-level monitoring network (map ID's E through S). Detailed information on monitoring wells associated with these sites has not yet been obtained but once acquired would be used to determine the specific wells best suited for monitoring.

The USGS also proposes monitoring one domestic well located in the western part of Albuquerque (map ID 225). The owner has offered access to this well.

CONCLUSION

Expansion of the City of Albuquerque/USGS ground-water-level monitoring network has been identified as an essential element in plans to study the relation between surface water and ground water in the Middle Rio Grande Basin. The effort to expand this network has brought together information on about 400 wells in the Albuquerque metropolitan area that are either being monitored for water levels or would be good candidates for monitoring. This number does not include the numerous individual wells associated with ground-water remediation sites in the region. The USGS proposes adding as many as about 115 wells or ground-water remediation sites in the Albuquerque metropolitan area to the current network of 128 located in the Middle Rio Grande Basin. Of the proposed additions, about 65 already are being monitored by organizations from which data could be obtained without USGS measurements. Despite the extensive network that would be created by the addition of the proposed existing wells, however, certain parts of the metropolitan area would remain without adequate areal coverage. Also, because only about 24 of the existing wells suggested as additions are known to extend more than 150 feet below the water table, the construction of the proposed deep monitoring wells is important to adequately monitor the effects on the aquifer from ground-water withdrawals in the Albuquerque metropolitan area.

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