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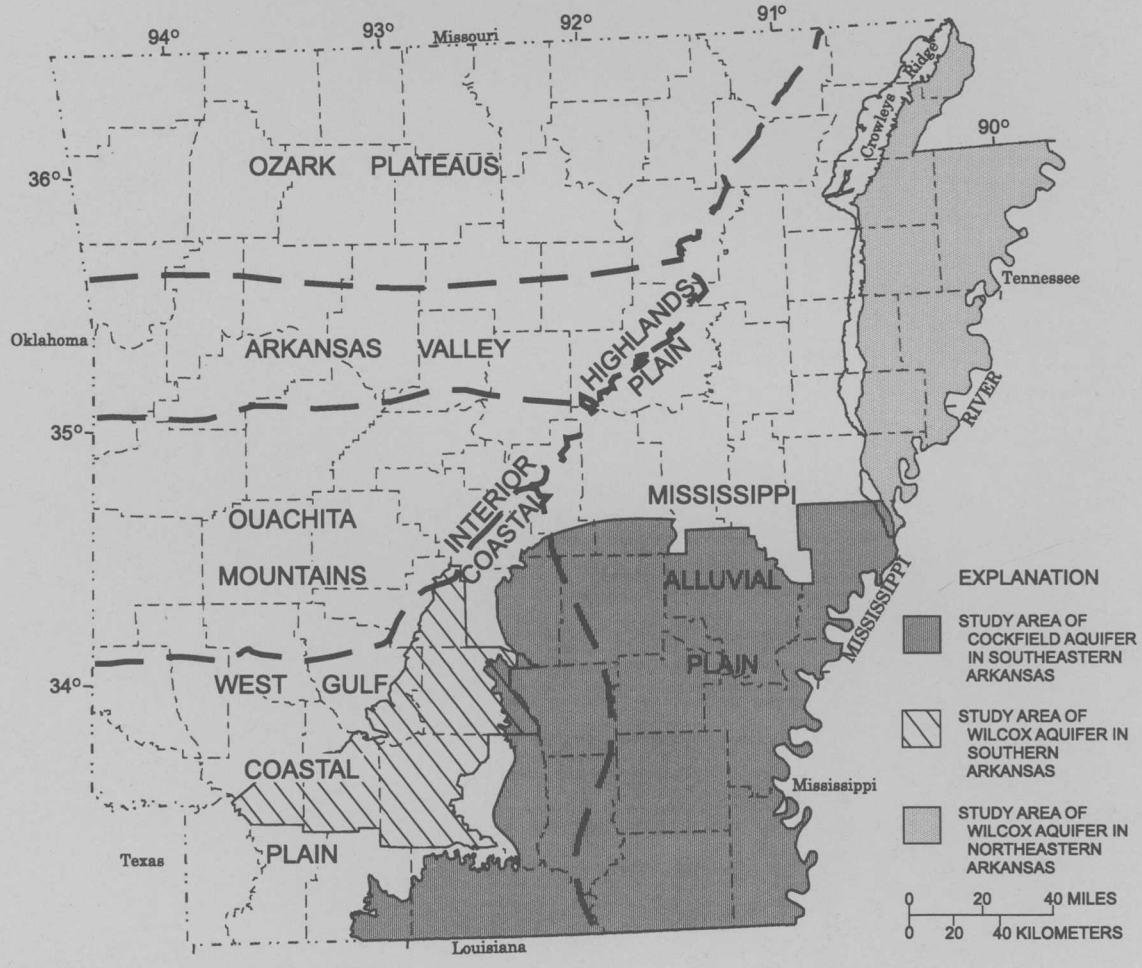
POTENTIOMETRIC SURFACES OF AQUIFERS IN THE COCKFIELD FORMATION IN SOUTHEASTERN ARKANSAS AND THE WILCOX GROUP IN SOUTHERN AND NORTHEASTERN ARKANSAS, 2000

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 00-4206



U.S. Department of the Interior
U.S. Geological Survey

POTENTIOMETRIC SURFACES OF AQUIFERS IN THE COCKFIELD FORMATION IN SOUTHEASTERN ARKANSAS AND THE WILCOX GROUP IN SOUTHERN AND NORTHEASTERN ARKANSAS, 2000

By T.P. Schrader and Robert L. Joseph

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Little Rock, Arkansas
2000

U.S. DEPARTMENT OF THE INTERIOR
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By T.P. Schrader and Robert L. Joseph

ABSTRACT

The Cockfield and lower Wilcox aquifers are sources of water for local use in southern and northeastern Arkansas, where in 1995 more than 51 million gallons per day of water was withdrawn. During January through April 2000, 54 water-level measurements were made in wells completed in the Cockfield aquifer, 13 water-level measurements were made in wells completed in the lower Wilcox aquifer in southern Arkansas, and 43 water-level measurements were made in wells completed in the lower Wilcox aquifer in northeastern Arkansas. The potentiometric surface data reveal spatial trends in both aquifers across the study areas.

The regional direction of ground-water flow of the Cockfield aquifer is generally toward the east and south, away from the outcrop area, except in areas of intense ground-water withdrawals. The configuration of the potentiometric surface indicates that heavy pumpage has probably altered or reversed the natural direction of flow in these areas. A potentiometric low caused by the pumpage near Greenville, Mississippi, extends into Chicot, Desha, and Drew Counties. Water levels in five wells showed average declines between 0.5 and 0.8 foot per year.

The regional direction of ground-water flow in the lower Wilcox aquifers is generally east and south, away from the outcrop, except in areas of intense ground-water withdrawals. Potentiometric depressions, where flow is toward centers of pumping, indicate that heavy pumpage has probably altered or reversed the natural direction of flow. Two potentiometric depressions are centered in the vicinity of Paragould and West Memphis, Arkansas, where ground-water withdrawals probably have altered the natural direction of flow. Long-term hydrographs of seven wells show water-level declines in the lower Wilcox aquifer in northeastern Arkansas. The average water-level decline in two wells was between 0.8 and 1.0 foot per year and in five wells was between 1.2 and 1.8 foot per year.

INTRODUCTION

The Cockfield Formation and Wilcox Group are sources of water for local use in southern and northeastern Arkansas, where in 1995 about 51 million gallons per day (Mgal/d) of water was withdrawn from these aquifers (Holland, 1999). Major withdrawals are made from the aquifers for industrial and public supplies, with lesser but locally significant withdrawals for domestic and livestock uses.

A study was conducted in cooperation with the Arkansas Soil and Water Conservation Commission and the Arkansas Geological Commission to provide potentiometric surfaces and water-level hydrographs associated with aquifers in the Cockfield Formation and the Wilcox Group (herein after referred to as the Cockfield aquifer and the lower Wilcox aquifer) in southern and northeastern Arkansas. During January through April 2000, 54 water-level measurements were made in wells completed in the Cockfield aquifer, 13 water-level measurements were made in wells completed in the lower Wilcox aquifer in southwestern Arkansas, and 43 water-level measurements were made in wells completed in the lower Wilcox aquifer in northeastern Arkansas. These water levels were mea-

sured in public water supply, industrial, commercial, domestic, and observation wells. This report presents the results as potentiometric-surface maps and as long-term water-level hydrographs.

The areas of water-level measurements (study areas) as shown in figure 1 and plates 1-3 include much of the West Gulf Coastal Plain and the Mississippi Alluvial Plain physiographic sections in Arkansas. The study area of the Cockfield aquifer in southeastern Arkansas is bounded on the east by the Mississippi River and on the south by the Louisiana State line. The western and northern boundaries are defined by the western and northern extent of the outcrop and subcrop (Hosman, 1982) of the Cockfield Formation. The study area of the lower Wilcox aquifer in southern Arkansas is defined by the outcrop of the Wilcox Group and the locations of monitoring wells in Clark, Dallas, Hempstead, Hot Spring, Nevada, and Ouachita Counties. The study area of the lower Wilcox aquifer in northeastern Arkansas is bounded on the north by the Missouri State line and on the east by the Mississippi River. The western boundary of the study area is defined by the locations of monitoring wells that fully penetrate the lower Wilcox aquifer.

A previous report (Joseph, 1998) describing the potentiometric surfaces of the Cockfield and lower Wilcox aquifers showed data measured during October 1996 through July 1997. For that report, 53 and 51 water-level measurements were made in wells completed in the Cockfield and lower Wilcox aquifers, respectively.

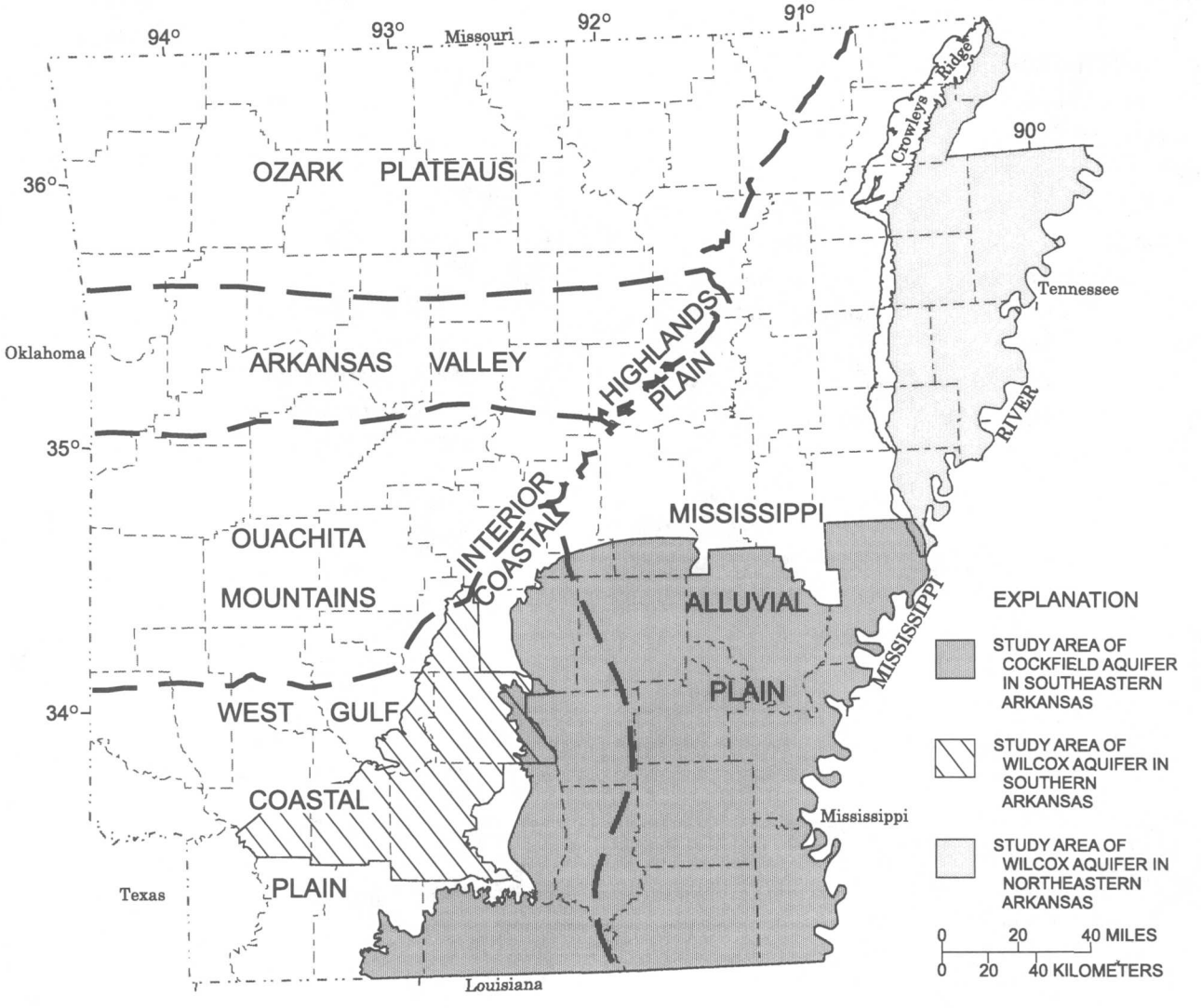


Figure 1. Location of study areas.

The well-numbering system used in this report is based upon the location of the wells according to the Federal land survey used in Arkansas. The component parts of a well number are the township number; the range number; the section number; three letters which indicate, respectively, the quarter section, the quarter-quarter section, and the quarter-quarter-quarter section in which the well is located; and a sequence number of the well in the quarter-quarter-quarter section. The letters are assigned counterclockwise, beginning with "A" in the northeast quarter or quarter-quarter or quarter-quarter-quarter section in which the well is located. For example, well 01S03W04BBD16 (fig. 2) is located in Township 1 South, Range 3 West, and in the southeast quarter of the northwest quarter of the northwest quarter of section 4. This well is the 16th well in this quarter-quarter-quarter section of section 4 from which data were collected.

COCKFIELD FORMATION

Hydrogeologic Setting

The Cockfield aquifer comprises the Cockfield Formation of Eocene age, which generally consists of discontinuous fine- to medium-grained sand interbedded with silt, clay, and lignite, all of nonmarine origin. Most of the sand beds, which constitute the aquifer media, are found near the base of the Cockfield Formation. The Cockfield Formation generally ranges from 100 to 400 feet (ft) in thickness near the outcrop area but thickens downdip of the outcrop area and reaches 625 ft in thickness in northeastern Chicot County (Onellion and Criner, 1955). Total sand thickness in the Cockfield Formation generally ranges from 20 to 150 ft. The nonmarine sediments of the Cockfield Formation are underlain and, for much of the area, overlain by fine-grained sediments of marine origin. The Cockfield Formation is underlain throughout the area by calcareous and sandy marl, limestone, or carbonaceous clay of the Cook Mountain Formation. Throughout much of southeastern Arkansas, the Cockfield Formation is overlain by the silty clays of the Jackson Group. Sand beds at the base of the overlying Jackson Group in parts of southeastern Arkansas may be in hydraulic connection with the Cockfield aquifer.

The Cockfield Formation crops out over much of southeastern Arkansas and yields relatively minor quantities of water in this area. In the subcrop area, the Cockfield Formation is overlain by terrace deposits and alluvium of Quaternary age. The terrace deposits may attain a thickness of 40 ft, and as much as 60 ft of alluvium overlies the Cockfield Formation in some of the larger river valleys. The Cockfield Formation dips southeastward from the outcrop area and is confined by the Jackson Group in much of the area. In the outcrop of the Cockfield Formation, water table conditions commonly occur at shallow depth. In the confined part of the aquifer, the potentiometric surface can be near, or above, land surface. Yields of most wells in the outcrop areas are small, less than 30 gallons per minute (gal/min), but in other areas, properly constructed wells screened the full thickness of the aquifer often yield 100 to 500 gal/min (Westerfield, 1994).

The Cockfield aquifer is recharged in the outcrop area and may discharge water to other units as water moves downdip. Most recharge to the Cockfield aquifer occurs by infiltration of rainfall on the upland outcrop areas and by inflow from the overlying alluvium (Ackerman, 1987). The direction of regional water movement generally is southeastward. Most discharge is to rivers in outcrop areas, to vertically adjacent units where the Cockfield aquifer is confined, and to wells (Ackerman, 1987).

Withdrawals from the Cockfield aquifer in Arkansas increased 21 percent between 1990 and 1995. Withdrawals from the Cockfield aquifer in Arkansas totaled 9.8 Mgal/d in 1995 (Holland, 1999), an increase of 1.7 Mgal/d from 1990 (Holland, 1993). An estimated 18 Mgal/d was pumped from the Cockfield aquifer in Mississippi in 1995. In the vicinity of Greenville, Mississippi, immediately across the State line, pumpage from the Cockfield aquifer totaled about 8.2 Mgal/d in 1995 (D.E. Burt, U.S. Geological Survey, written commun., 1997). Most wells completed in the Cockfield aquifer in the study area provide small volumes of water for domestic and livestock use. In some locations, the Cockfield aquifer yields volumes large enough to supply industrial, municipal, and public supply systems.

Potentiometric Surface

The potentiometric-surface map shows the altitude to which water would have stood in tightly cased wells screened in the Cockfield aquifer (plate 1). The map is based upon water-level data collected at 54 wells in the Cockfield aquifer during January and April 2000, in southeastern Arkansas (table 1). The potentio-

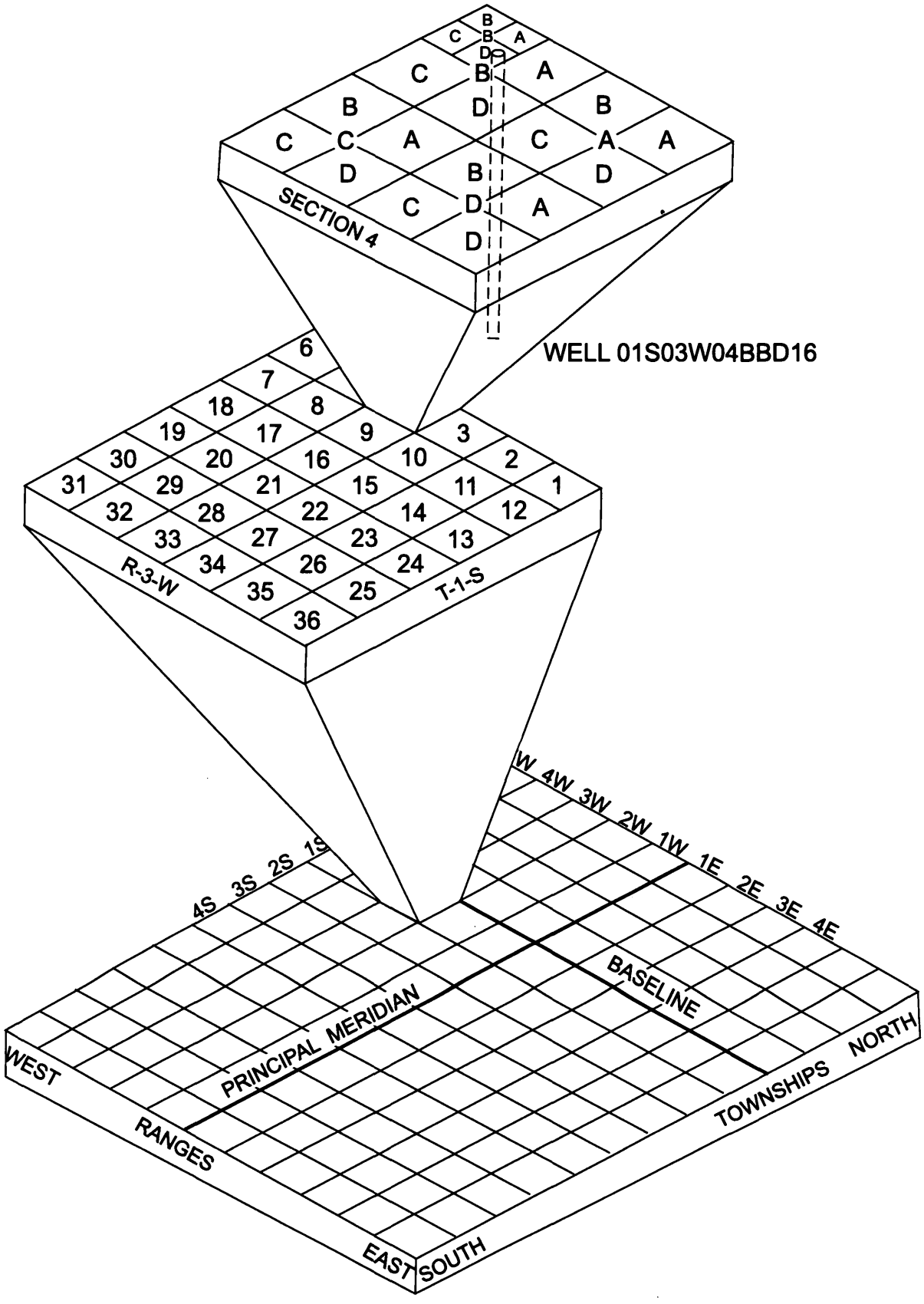


Figure 2. Well-numbering system.

Table 1. Information pertaining to measured wells completed in the Cockfield aquifer in southeastern Arkansas, 2000

[In this report, the well latitudes and longitudes were measured using a PPS system referenced to the North American Datum of 1983. The decimal accuracy is referred to hundreths of seconds of a degree; --, no data]

Latitude	Longitude	Local well number	Well depth (feet)	Water level altitude (feet above sea level)	Depth to water (feet below land-surface datum)	Land-surface datum altitude (feet above sea level)	Date of measure-ment
			Ashley County				
332144.16	912932.04	15S04W26CBC1	409	89	39.02	128	1/12/2000
331417.16	913029.96	17S04W10BCD2	340	87	37.54	125	1/12/2000
331405.59	913032.52	17S04W10CBA1	360	88	36.93	125	1/12/2000
331441.73	914510.26	17S06W07ADA1	426	93	81.20	174	1/12/2000
330710.14	913247.20	18S04W19DAA2	356	91	25.11	116	1/12/2000
331037.97	915627.09	18S08W04BBC1	314	67	81.79	149	1/12/2000
330629.64	915629.28	18S08W29DDD2	--	68	71.62	140	4/27/2000
330336.04	913424.80	19S05W12CAC1	320	86	29.44	115	1/12/2000
			Bradley County				
333138.81	920521.74	14S10W01BAD1	540	86	145.07	231	1/24/2000
332657.77	921025.45	14S10W31DBA1	349	100	93.28	193	1/14/2000
332656.05	921250.79	14S11W35CAB1	320	115	75.41	190	1/24/2000
332649.91	921232.92	14S11W35DAC1	345	111	63.31	174	1/24/2000
332536.20	921858.24	15S12W11CAB1	225	132	23.09	155	1/14/2000
331950.80	920618.92	16S10W11DCB1	152	107	44.65	152	1/14/2000
332027.06	921223.16	16S11W11ACA1	140	108	33.02	141	1/14/2000
			Calhoun County				
334559.50	922534.29	11S13W15BBC1	70	257	52.95	310	4/24/2000
333555.01	922637.58	13S13W09CBD1	147	196	35.72	232	4/24/2000
333524.29	922934.83	13S14W13ACC1	145	184	31.02	215	1/14/2000
332829.40	922721.84	14S13W29ADA1	81	133	26.72	160	1/14/2000
333212.52	923222.86	14S14W04ADA1	149	164	12.07	176	4/13/2000
332931.23	923249.30	14S14W21ACB1	160	115	16.86	132	4/25/2000
			Chicot County				
333246.81	912301.06	13S03W26BBB1	422	72	67.07	139	1/11/2000
333106.11	912601.62	14S03W05BBA1	510	63	75.98	139	1/12/2000
332314.42	912437.93	15S03W21ABA1	400	75	46.65	122	1/11/2000
332027.37	911857.43	16S02W04BAC1	330	83	41.86	125	1/12/2000
330651.76	911546.75	18S02W24CDB1	364	83	45.66	129	1/12/2000
330640.40	911541.03	18S02W25ABB3	332	89	46.02	135	1/12/2000
330731.03	912319.49	18S03W14CCC1	320	84	14.13	98	1/12/2000

Table 1. Information pertaining to measured wells completed in the Cockfield aquifer in southeastern Arkansas, 2000--Continued

[In this report, the well latitudes and longitudes were measured using a PPS system referenced to the North American Datum of 1983. The decimal accuracy is referred to hundreths of seconds of a degree; --, no data]

Latitude	Longitude	Local well number	Well depth (feet)	Water level altitude (feet above sea level)	Depth to water (feet below land-surface datum)	Land-surface datum altitude (feet above sea level)	Date of measure-ment
			Cleveland County				
340334.31	921152.27	08S11W02BCB1	395	94	147.12	241	1/18/2000
335901.60	922443.58	08S13W34BDA1	181	161	86.92	248	1/18/2000
334449.24	921257.50	11S11W23BBD1	148	232	43.08	275	1/18/2000
			Columbia County				
331312.79	930914.27	17S20W35BBD1	--	346	15.13	361	1/19/2000
330233.23	930958.13	19S20W34ADC1	39.8	290	22.62	313	1/19/2000
330519.87	931856.93	19S21W17CBB1	54.8	262	44.13	306	1/19/2000
330247.49	931512.71	19S21W35ADC1	30.1	253	3.42	256	1/19/2000
330244.94	932033.94	19S22W36DBB1	68.6	310	40.56	351	1/19/2000
			Dallas County				
340535.31	922432.33	07S13W22CAC1	136	162	27.80	190	1/18/2000
			Desha County				
333627.61	911244.74	12S01W32DCA1	495	72	63.86	136	1/11/2000
333747.19	912611.12	12S03W30ADC1	280	79	73.79	153	1/11/2000
333503.88	911920.57	13S02W08CAA1	515	84	63.02	147	1/11/2000
			Drew County				
334216.06	913438.36	11S05W35DDB1	500	83	97.48	180	1/11/2000
333749.57	915550.67	12S08W33AAB1	543	78	95.19	173	1/11/2000
332846.37	914338.98	14S06W21BDC1	--	95	116.66	212	1/11/2000
332754.08	914744.45	14S07W26BAB1	440	109	120.96	230	1/11/2000
			Lincoln County				
335203.84	913917.74	10S05W06CAC1	550	69	101.43	170	1/10/2000
			Union County				
331914.61	925017.57	16S17W23BCC1	21	202	18.34	220	1/13/2000
331219.26	921928.98	17S12W27DCA1	24	158	12.31	170	1/13/2000
331402.11	922745.81	17S13W17DDC1	156	153	39.59	193	1/13/2000
331405.93	923037.12	17S14W14DDD1	19.5	126	8.51	135	1/13/2000
331144.14	924116.35	17S15W31DCA2	110	216	52.68	269	1/13/2000
331229.04	924600.84	17S16W33BBA2	31	230	24.86	255	1/13/2000
331453.24	925722.95	17S18W15CDA1	35	262	28.36	290	1/13/2000
330823.80	923909.29	18S15W21DAC1	40	174	26.29	200	1/13/2000
330207.08	922109.30	19S12W28CBA1	25	189	10.53	200	1/13/2000

metric surface is mapped by determining the altitude of the water levels measured in wells and is represented on the map by contours that connect points of equal value. The direction of ground-water flow is perpendicular to the contours in the direction of downward gradient. The potentiometric surface data reveal spatial trends in the study area.

The regional direction of ground-water flow is generally toward the east and south, away from the outcrop, except in areas of intense ground-water withdrawals. The lowest water-level altitude measured was 63 ft above sea level[1] in Chicot County; the highest water-level altitude measured was 346 ft above sea level in Columbia County in the outcrop area. The configuration of the potentiometric surface indicates that heavy pumpage has probably altered or reversed the natural direction of ground-water flow in these areas. A potentiometric low area near heavy pumpage at Greenville, Mississippi (Wasson, 1981), extends into Chicot, Desha, and Drew Counties in southeastern Arkansas. A cone of depression might be forming in an area of intense pumpage near Crossett in Ashley County.

Long-Term Hydrographs

Water-level data from each of six selected wells (wells A-F, plate 1) completed in the Cockfield aquifer were plotted to illustrate historical water levels in selected areas of southeastern Arkansas (fig. 3). During the period 1975-2000, water levels at locations in Ashley, Bradley, Chicot, Cleveland, and Drew Counties (hydrographs A, B, C, D, and E) showed average declines between 0.5 and 0.8 feet per year (ft/yr). The hydrograph from a well located in Union County (hydrograph F) illustrates that the water level in that area has remained relatively constant since 1966.

[1]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.

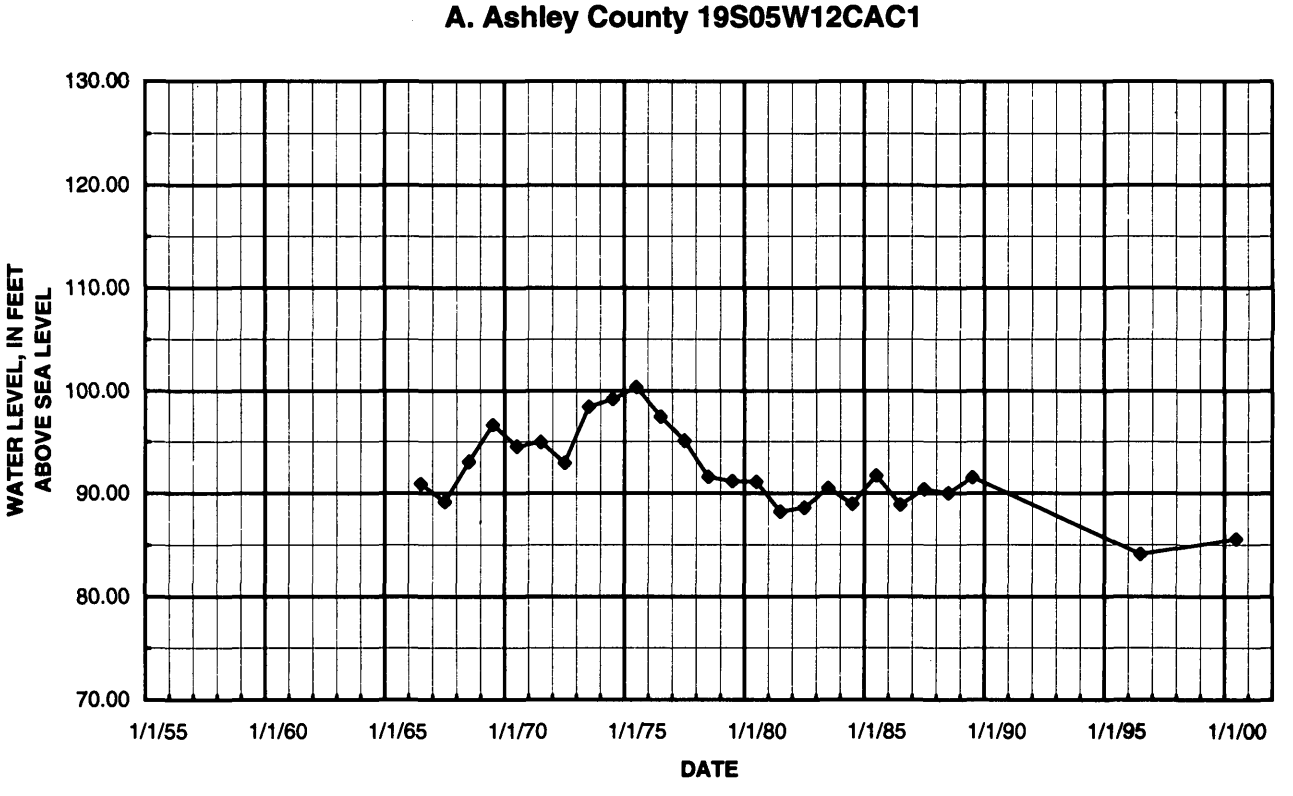
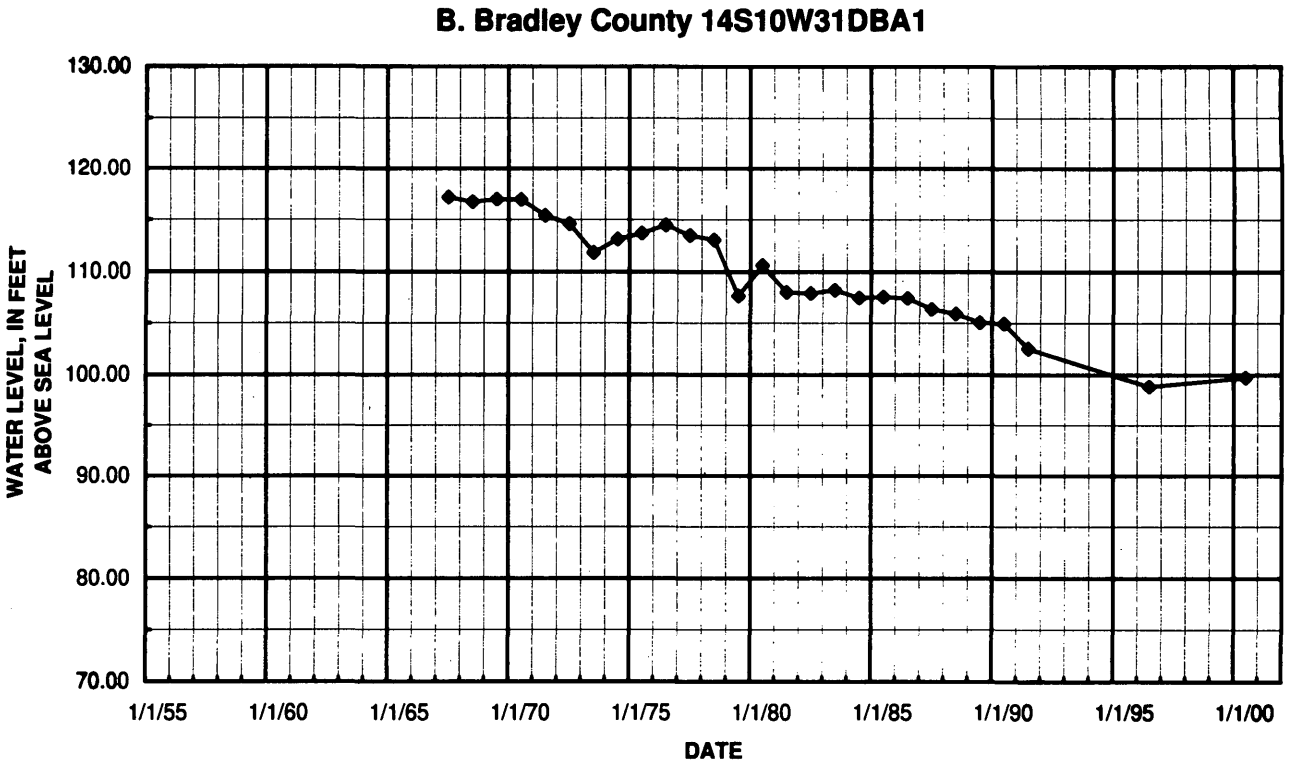


Figure 3. Water-level hydrographs for selected wells completed in the Cockfield aquifer in southeastern Arkansas (page 1 of 4).



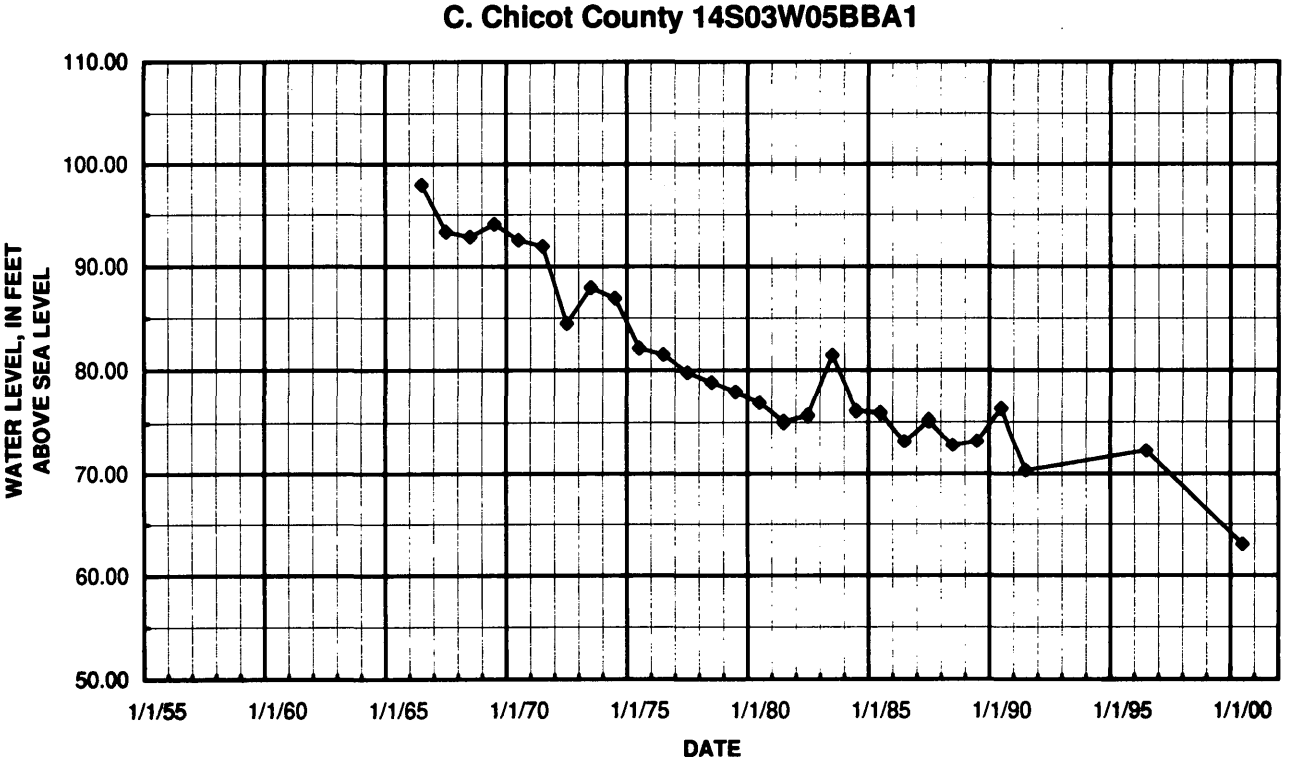
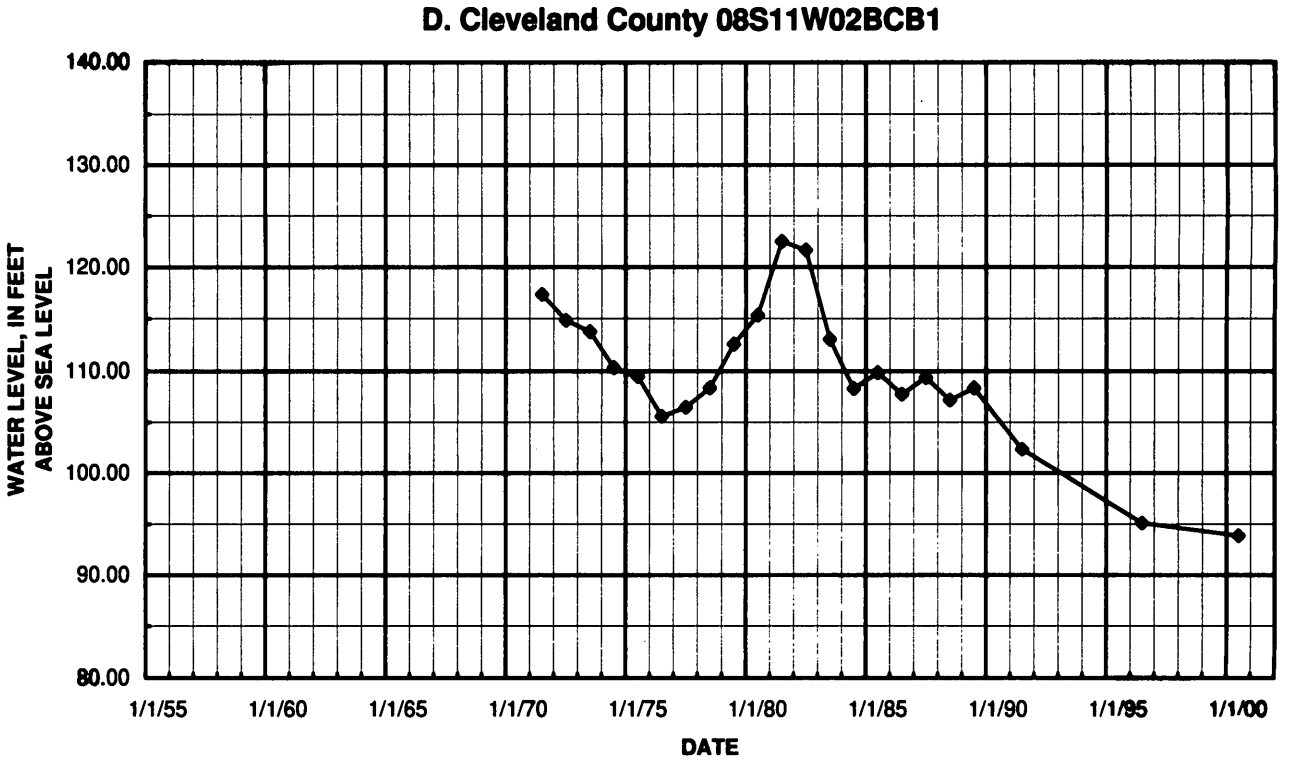


Figure 3. Water-level hydrographs for selected wells completed in the Cockfield aquifer in southeastern Arkansas (page 2 of 4).



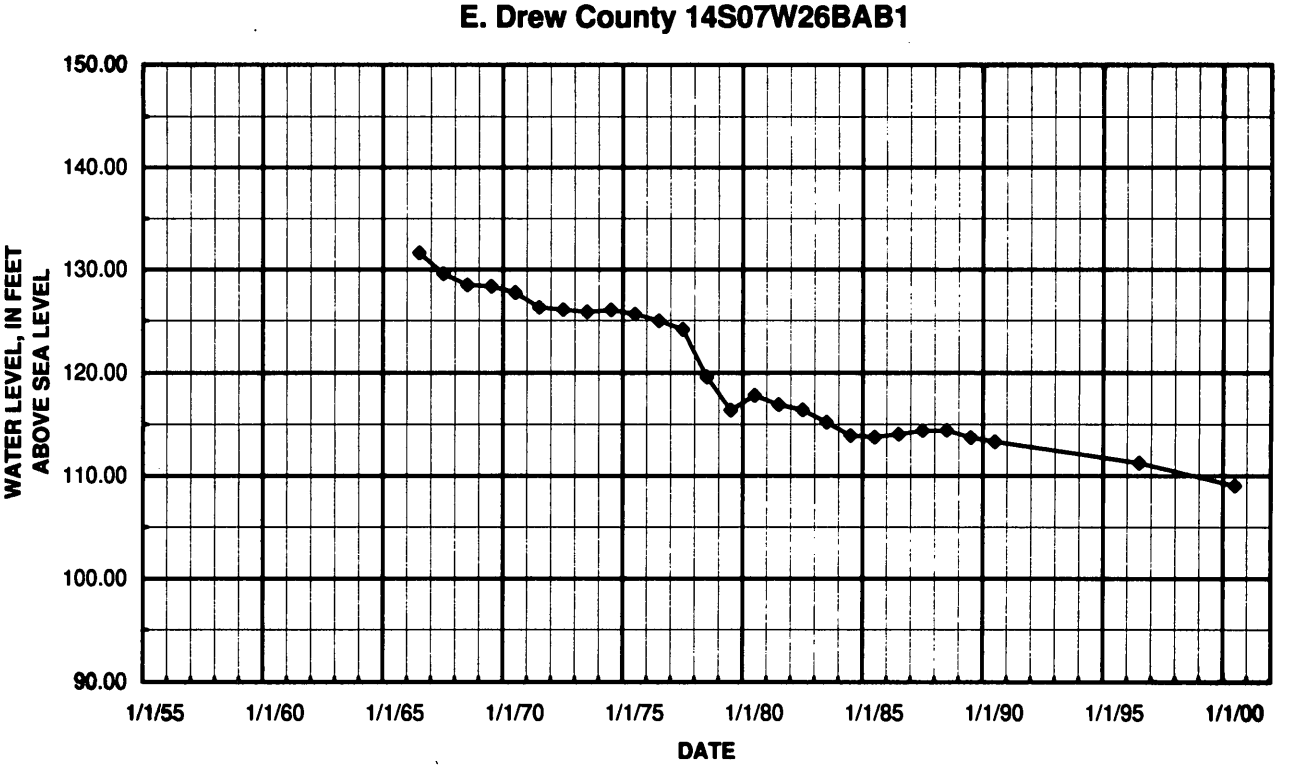


Figure 3. Water-level hydrographs for selected wells completed in the Cockfield aquifer in southeastern Arkansas (page 3 of 4).

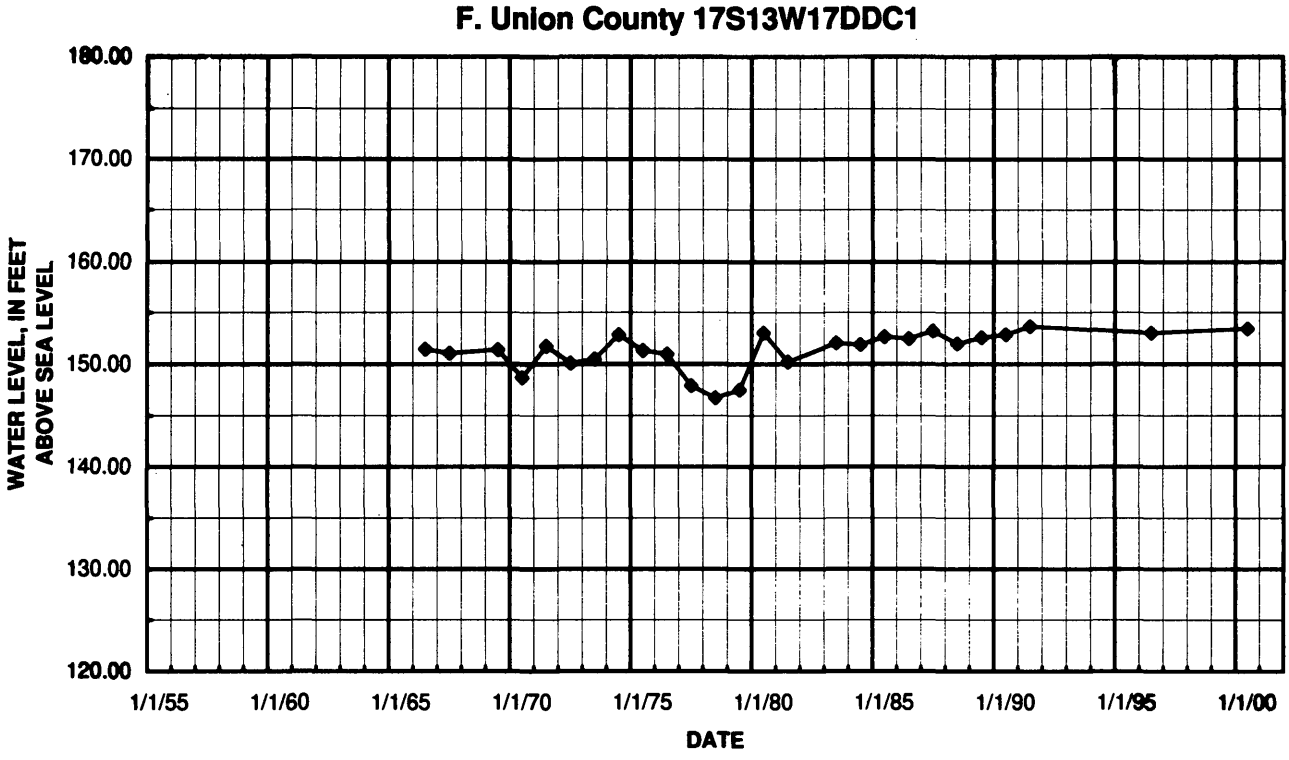


Figure 3. Water-level hydrographs for selected wells completed in the Cockfield aquifer in southeastern Arkansas (page 4 of 4).

WILCOX GROUP

Hydrogeologic Setting

The lower Wilcox aquifer comprises part of the Wilcox Group of Eocene age, which extends throughout most of eastern and southern Arkansas. The Wilcox Group contains discontinuous sands in the outcrop area of southern Arkansas. The Wilcox Group, in most of the area where present in southern Arkansas, overlies the Midway Group, is overlain by terrace deposits and alluvium of Quaternary age, and crops out in a discontinuous band 1 to 3 miles wide in many places. The Wilcox Group becomes progressively thicker downdip (southeast) from the outcrop, ranging in thickness from a few feet in the outcrop to about 750 ft in northeastern Bradley County (Albin, 1964). The Wilcox Group in southern Arkansas consists of complexly interbedded layers of clay, sandy clay, sand, and lignite. Sand beds generally are thin and are not continuous over large areas. Water wells typically are drilled on or near the outcrop areas because of small yields to wells in other areas. The Wilcox Group does not extend northwest of its outcrop and subcrop area in southern Arkansas.

In northeastern Arkansas, sand beds of the middle to lower part of the Wilcox Group have been referred to as the "1,400-foot sand" (Ryling, 1960; Plebuch, 1961) and the "lower Wilcox aquifer" (Hosman and others, 1968). The Wilcox Group throughout most of northeastern Arkansas is composed of thin interbedded layers of lignitic sand and clays. The lower Wilcox aquifer is confined by an overlying clay bed of the Wilcox Group and an underlying clay bed of the Wilcox Group or the Midway Group. The Wilcox Group outcrops at or near Crowleys Ridge in Clay, Greene, and Craighead Counties (Broom and Lyford, 1981). East of Crowleys Ridge in northeastern Arkansas, the Wilcox Group contains a sand bed 200 ft or more in thickness (Petersen and others, 1985).

The potential yield of water to wells penetrating the lower Wilcox aquifer varies between two areas where water-level measurements were collected. In the northeastern area, the lower Wilcox aquifer yields sufficient water for industrial and public supplies in wells with depths greater than 1,000 ft. Wells in this area yield quantities of water that range from 100 to 2,000 gal/min. Wells in the vicinity of Blytheville, Arkansas, yield quantities of water that range from 200 to 1,800

gal/min (Halberg and Reed, 1964). Wells in the southern area produced quantities in the range of 10 to 100 gal/min.

The lower Wilcox aquifer is recharged in the outcrop and subcrop areas and water moves southeastward (downdip). In the confined part of the lower Wilcox aquifer in northeastern Arkansas, the potentiometric surface can be close to, or above, land surface. Discharge from the aquifer is largely to wells (Westerfield, 1994).

Withdrawals from the lower Wilcox aquifer increased nearly 33 percent between 1990 and 1995. Withdrawals totaled about 41 Mgal/d in 1995 (Holland, 1999), an increase of more than 10 Mgal/d from 1990 (Holland, 1993). In southern Arkansas, the primary use of water from the aquifer is for domestic supplies, usually from wells on or near the outcrop areas. In northeastern Arkansas, the primary use of water from the aquifer is for public supplies, but the aquifer is also a source of water for some commercial, domestic, and industrial users.

Potentiometric Surface

The potentiometric-surface maps show the altitude to which water would have stood in tightly cased wells screened in the lower Wilcox aquifer (plates 2 and 3). The maps are based upon water-level data collected during January through March 2000, at 13 wells in the lower Wilcox aquifer in southern Arkansas and at 43 wells in the lower Wilcox aquifer in northeastern Arkansas (tables 2 and 3). The potentiometric surface is mapped by determining the altitude of the water levels measured in wells and is represented on the map by contours that connect points of equal value. The direction of ground-water flow is perpendicular to the contours in the direction of downward gradient. The potentiometric surface data reveal spatial trends in the study areas.

The regional direction of ground-water flow is generally east and south, away from the outcrop, except in areas of intense ground-water withdrawals. The lowest water-level altitude measured in southern Arkansas was 148 ft above sea level in Clark County; the highest water-level altitude measured was 398 ft above sea level in Hempstead County in the outcrop area. The lowest water-level altitude measured in northeastern Arkansas was 124 ft above sea level in Crittenden County; the highest water-level altitude measured was 368 ft above sea level in Clay County. Water levels collected from wells located on Crowleys Ridge may exhibit higher water levels because of irregular topography on the ridge (Hines and others, 1972). Potentiometric depressions, where flow is toward centers of pumping, indicate that heavy pumpage has probably altered or reversed the natural direction of flow. In northeastern Arkansas, two potentiometric depressions are centered in the vicinity of Paragould and West Memphis, Arkansas, where ground-water withdrawals probably have altered the natural direction of flow. A cone of depression appears to be forming near Dyess in Mississippi County.

A comparison of potentiometric surfaces in 1996-97 (Joseph, 1998) and 2000 indicates different trends in the two areas of the lower Wilcox aquifer. The southern area shows only minor differences between the 1996-97 and 2000 potentiometric surfaces. Over most of the extent of the northeastern area, the potentiometric surface declined 10 to 20 ft between 1996-97 and 2000.

Comparison of Water-Level Changes in Potentiometric Depressions from 1996-97 to 2000

Analysis of 1996-97 and 2000 water-level data reveals that water levels continued to decline in two potentiometric depressions in northeastern Arkansas. In Greene County in December 1996, the lowest water-level altitude measured was 177 ft above sea level near Paragould (Joseph, 1998). In 2000, the lowest water-level altitude measured was 157 ft above sea level about 3 miles southwest of Paragould. The average water-level decline, from December 1996 to January 2000, in the well at Paragould and the well 3 miles southwest of Paragould was about 2.3 and 9.3 ft/yr, respectively. Since 1996-97 the area enclosed by the 180 ft above sea level contour has expanded eastward and southward to include the city of New Hope (fig. 4). The center of the potentiometric depression has shifted southwest and decreased about 20 ft in altitude.

In Crittenden County in December 1996, the lowest water-level measured was 140 ft above sea level near West Memphis. In January 2000, the lowest water level measured was 124 ft above sea level at the same location—a decrease of 16 ft in altitude. The area enclosed by the 140 ft contour has expanded westward and southward (fig. 5). In Crittenden County, water levels in eight wells were measured in both December 1996 and January 2000. The average decline of water levels in these wells ranged from 2.0 to 5.5 ft/yr.

Table 2. Information pertaining to measured wells completed in the lower Wilcox aquifer in southern Arkansas, 2000

[In this report, the well latitudes and longitudes were measured using a PPS system referenced to the North American Datum of 1983. The decimal accuracy is referred to hundreths of seconds of a degree]

Latitude	Longitude	Local well number	Well depth (feet)	Water level altitude (feet above sea level)	Depth to water (feet below land-surface datum)	Land-surface datum altitude (feet above sea level)	Date of measure-ment
			Clark County				
340916.58	925603.50	07S18W03BBD1	47	256	13.73	270	1/20/2000
340651.92	925756.59	07S18W20ABB2	18.5	229	13.05	242	1/20/2000
335610.94	925905.46	09S18W20CBB1	25.5	208	22.03	230	1/20/2000
335215.53	925613.20	10S18W10DDB1	215	148	47.42	195	1/20/2000
335402.68	930612.28	10S20W01BAC1	53	263	32.44	295	1/20/2000
			Hempstead County				
333841.73	932911.40	13S23W04BDD1	14.2	346	4.46	350	1/19/2000
333829.33	933311.35	13S24W02DCA2	63	398	47.98	446	1/19/2000
333523.99	933635.22	13S24W29ACC1	60.2	338	32.91	371	1/19/2000
			Hot Spring County				
342144.24	924532.49	04S16W20CBB1	18.2	340	4.92	345	1/20/2000
341835.92	924853.18	05S17W10AAC1	26	391	19.07	410	1/20/2000
			Nevada County				
334045.77	931940.51	12S22W24CDA1	41.2	313	31.14	344	1/19/2000
333753.62	931425.80	13S21W02DCC1	240	252	62.84	315	1/19/2000
			Ouachita County				
334045.77	931940.51	12S19W11DCD1	533	282	5.73	288	1/19/2000

Table 3. Information pertaining to measured wells completed in the lower Wilcox aquifer in northeastern Arkansas, 2000

[In this report, the well latitudes and longitudes were measured using a PPS system referenced to the North American Datum of 1983. The decimal accuracy is referred to hundreths of seconds of a degree; --, no data]

Latitude	Longitude	Local well number	Well depth (feet)	Water level altitude (feet above sea level)	Depth to water (feet below land-surface datum)	Land-surface datum altitude (feet above sea level)	Date of measure-ment
			Clay County				
362347.39	901702.65	20N07E01CBB1	200	368	91.95	460	1/25/2000
362715.82	901126.15	21N08E14CBB1	157	291	88.99	380	1/25/2000
			Craighead County				
354525.74	901911.04	13N07E14BBA2	1,028	182	38.66	221	1/25/2000
354842.50	903028.78	14N05E25DCB1	890	190	43.35	233	3/2/2000
354802.66	903208.26	14N05E34DAA1	865	187	43.15	230	3/2/2000
354737.24	903208.74	14N05E34DDD1	874	186	43.20	229	3/2/2000
354858.06	902612.88	14N06E27ACB2	999	191	36.44	227	1/25/2000
355008.10	902202.27	14N07E17DCB1	1,070	195	36.96	232	1/26/2000
355314.65	902107.49	15N07E33BAD1	1,034	200	32.13	232	1/26/2000
			Crittenden County				
355448.57	901827.90	04N07E36ADB1	1,638	146	54.88	201	1/27/2000
350128.89	902224.94	05N07E29ACC1	1,700	144	56.47	200	1/27/2000
350520.04	901807.36	05N07E01ABB1	1,541	146	60.93	207	1/27/2000
350906.93	901041.83	06N09E07CAC1	1,470	124	85.72	210	1/27/2000
351317.99	901930.17	07N07E14CCC1	1,584	153	69.81	223	2/2/2000
351238.43	901147.62	07N08E24CAB1	1,540	154	66.68	221	1/27/2000
351614.48	902752.47	08N06E33CBD1	1,750	161	54.04	215	1/27/2000
352225.08	901515.82	09N08E29ADD1	1,564	170	55.20	225	1/27/2000
			Greene County				
360123.25	903026.27	16N05E13BAB1	545	157	133.04	290	1/25/2000
360348.44	903658.17	17N04E36BCA1	311	347	158.21	505	1/25/2000
360327.82	902902.22	17N06E31DCB1	507	170	115.17	285	1/25/2000
361209.33	902519.91	18N06E10DCD1	120	294	25.66	320	1/25/2000
			Mississippi County				
352923.16	901504.93	10N08E17ADD1	1,521	175	50.42	225	1/27/2000
353538.10	901300.85	11N08E10AAC1	1,400	169	51.28	220	1/27/2000

Table 3. Information pertaining to measured wells completed in the lower Wilcox aquifer in northeastern Arkansas, 2000--Continued

[In this report, the well latitudes and longitudes were measured using a PPS system referenced to the North American Datum of 1983. The decimal accuracy is referred to hundreths of seconds of a degree; --, no data]

Latitude	Longitude	Local well number	Well depth (feet)	Water level altitude (feet above sea level)	Depth to water (feet below land-surface datum)	Land-surface datum altitude (feet above sea level)	Date of measure-ment
353214.43	900739.30	11N09E33AAB1	1,560	183	54.27	237	1/27/2000
353348.86	900213.03	11N10E20ADA1	--	188	47.28	235	1/27/2000
354032.78	900548.31	12N09E11DBB1	1,420	195	35.38	230	1/26/2000
353916.85	895617.97	12N11E17CDD1	1,500	173	72.46	245	1/26/2000
353911.44	895627.71	12N11E20BAA1	1,610	172	70.00	242	1/26/2000
354528.38	895546.91	13N11E08DDA1	1,445	183	62.22	245	1/26/2000
354220.74	895806.80	13N11E31CCCC1	1,500	192	49.48	241	1/26/2000
354859.29	895625.66	14N11E20CCA1	1,518	204	36.11	240	1/26/2000
355606.85	901526.57	15N08E08DBC3	1,060	209	28.65	238	1/26/2000
355305.56	900951.56	15N09E31ACD1	1,158	201	39.39	240	1/26/2000
355712.28	895806.44	15N10E01ADC1	1,350	210	38.06	248	1/26/2000
355426.05	894701.36	15N12E23DBC1	1,491	181	56.86	238	1/26/2000
			Poinsett County				
352924.65	902128.92	10N07E16CBB2	1,500	174	43.87	218	2/2/2000
353621.64	903617.76	11N05E06CCD1	992	173	41.19	214	3/3/2000
353233.66	903009.40	11N05E36AAA1	1,175	176	38.21	214	3/2/2000
353152.33	902519.67	11N06E35CDA3	1,301	176	38.68	215	2/2/2000
353628.66	901954.89	11N07E03BDD1	1,456	170	46.42	216	2/2/2000
344037.95	903059.05	12N05E13BBB1	1,071	175	46.87	222	2/2/2000
			St. Francis County				
345711.72	902829.76	04N06E16CCB1	1,091	145	57.46	202	1/21/2000
345649.00	902814.83	04N06E21BAD2	1,740	145	55.92	201	1/21/2000

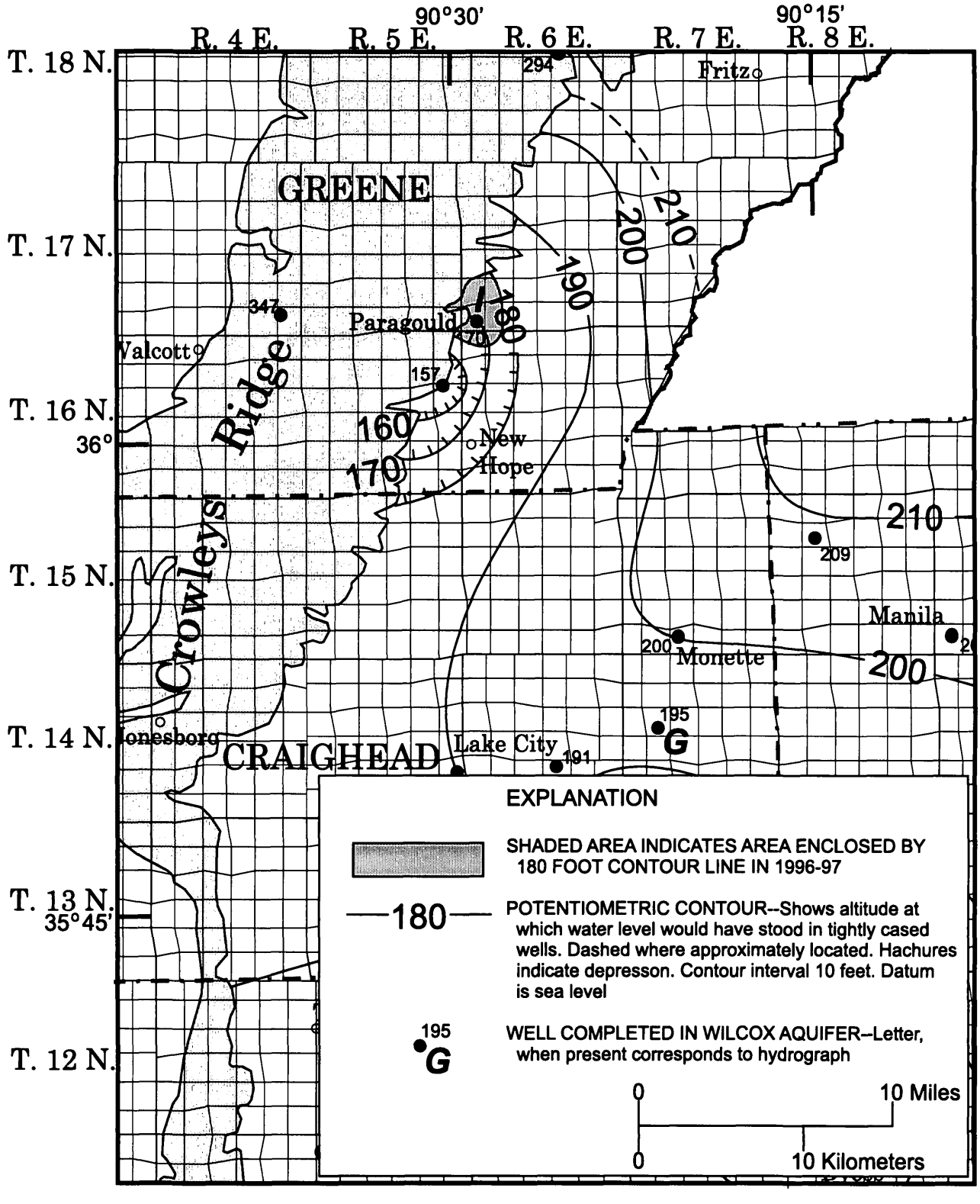


Figure 4. Comparison of Paragould, Greene County, potentiometric depression, 1996-97 to 2000.

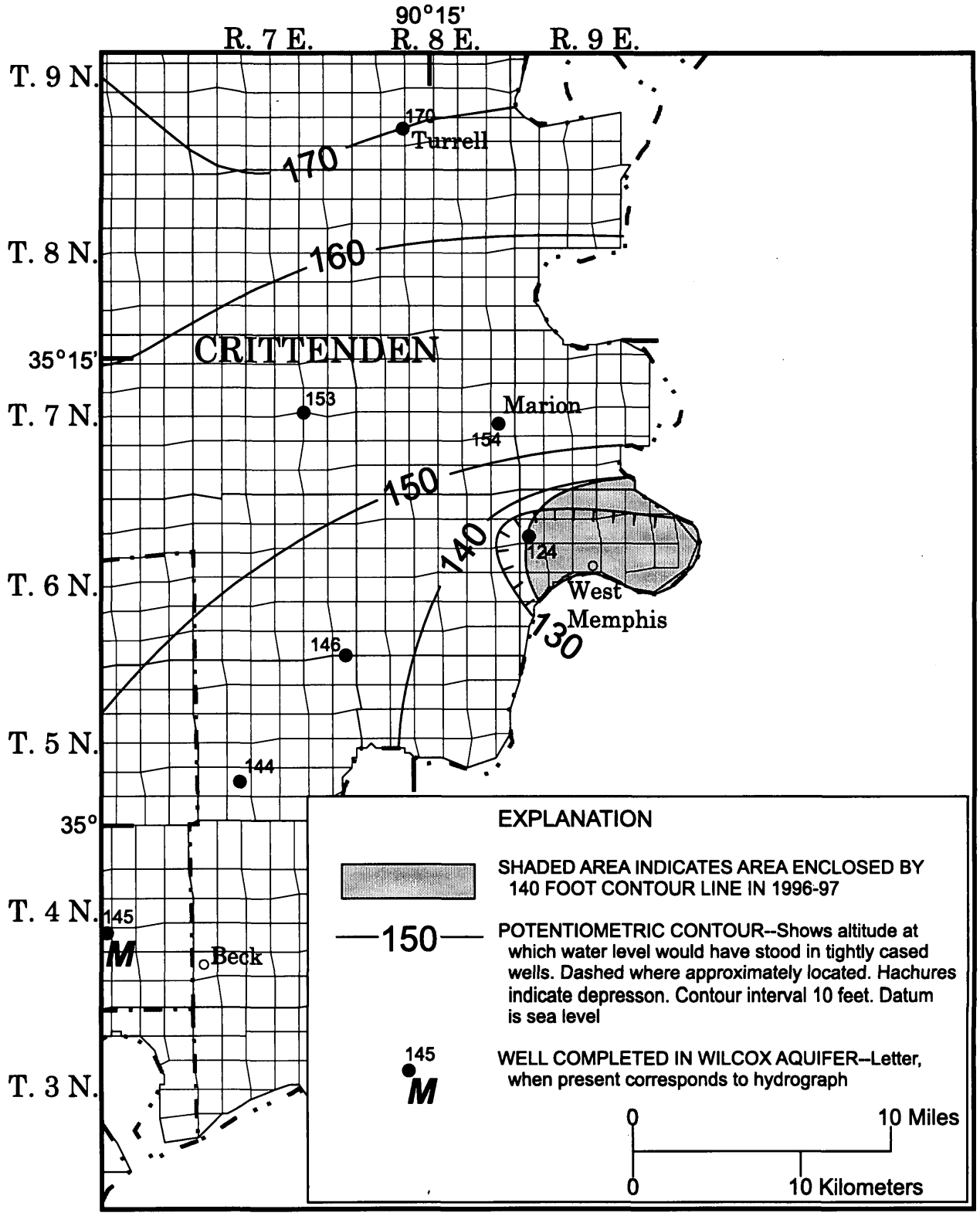


Figure 5. Comparison of West Memphis, Crittenden County, potentiometric depression, 1996-97 to 2000.

Long-Term Hydrographs

Water-level data from each of seven selected wells (wells G-M, plate 3) completed in the lower Wilcox aquifer were plotted to illustrate historical water levels in northeastern Arkansas (fig. 6). During the period 1975-2000, water levels showed an average decline between 0.8 and 1.0 ft/yr at locations in Craighead and Mississippi Counties (hydrographs G and K) and between 1.2 and 1.8 ft/yr at locations in Crittenden, Greene, Lee, Poinsett, and St. Francis Counties (hydrographs H, I, J, L, and M).

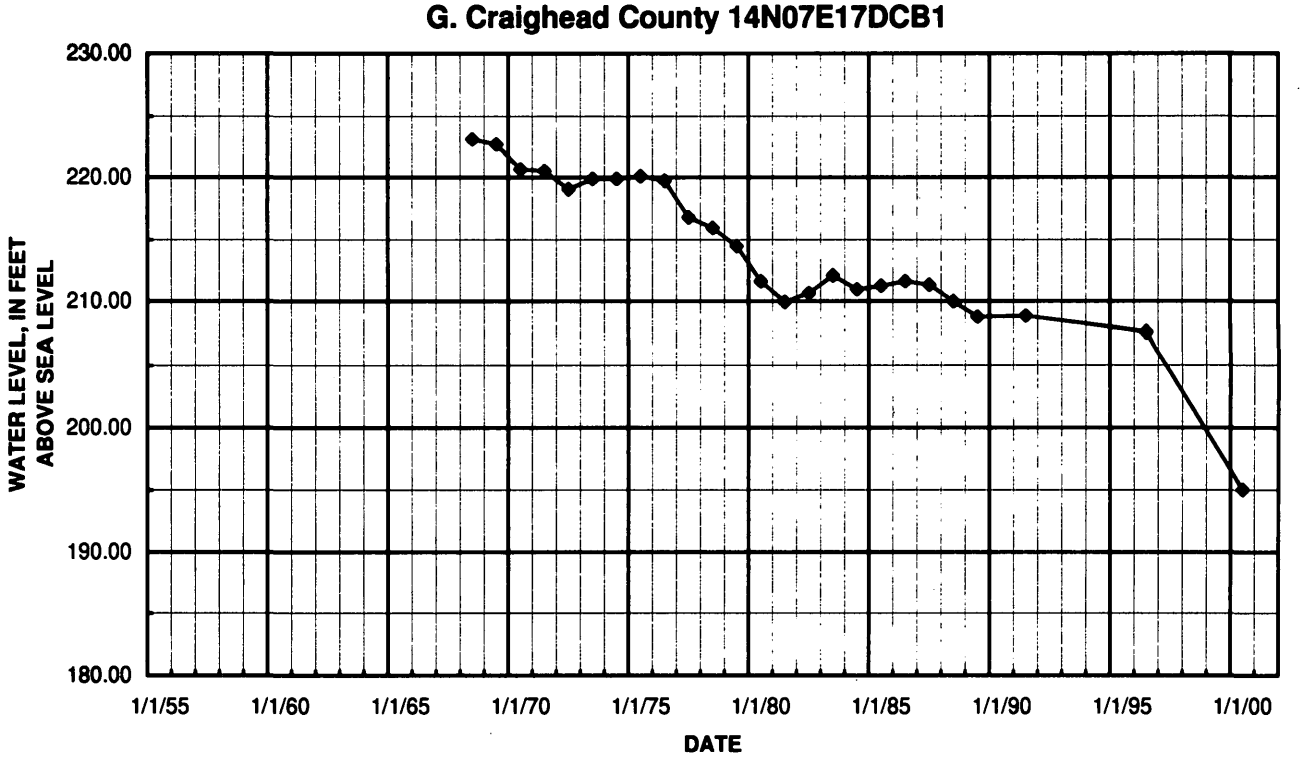
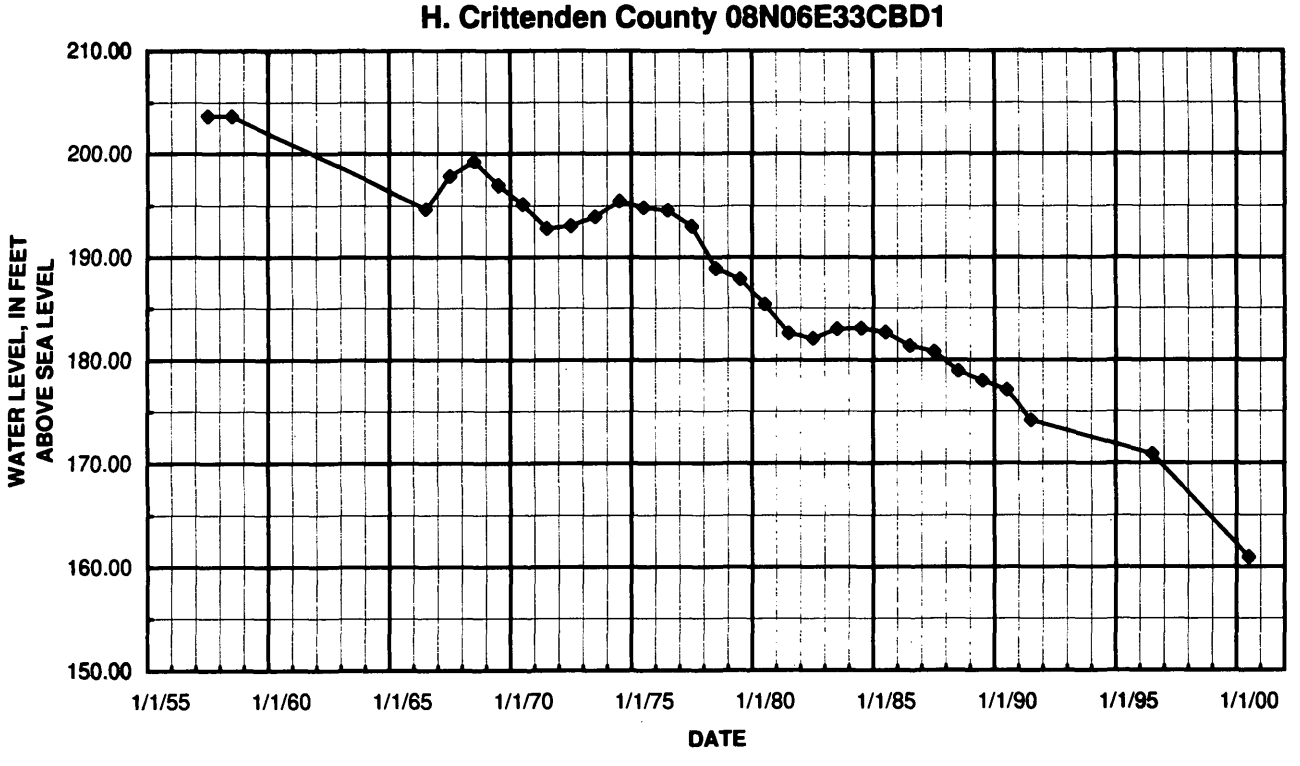


Figure 6. Water-level hydrographs for selected wells completed in the lower Wilcox aquifer in northeastern Arkansas (page 1 of 4).



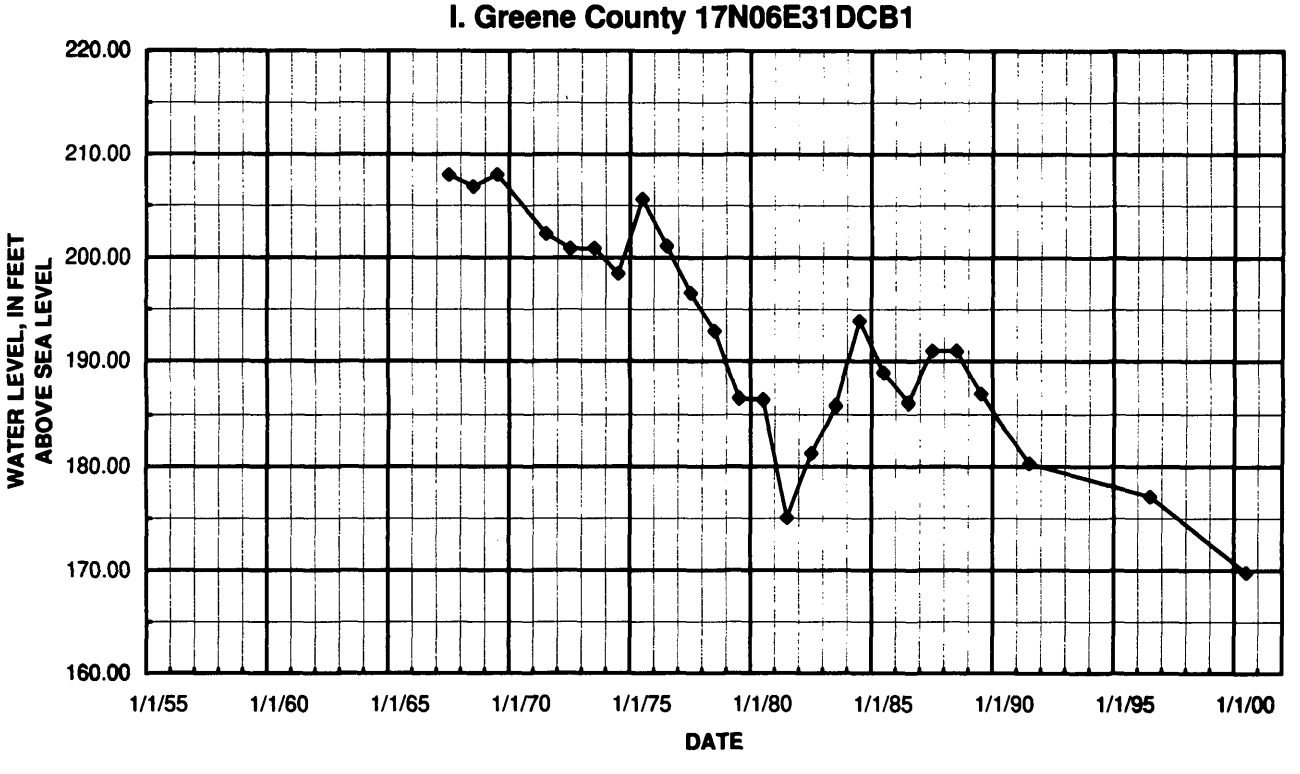
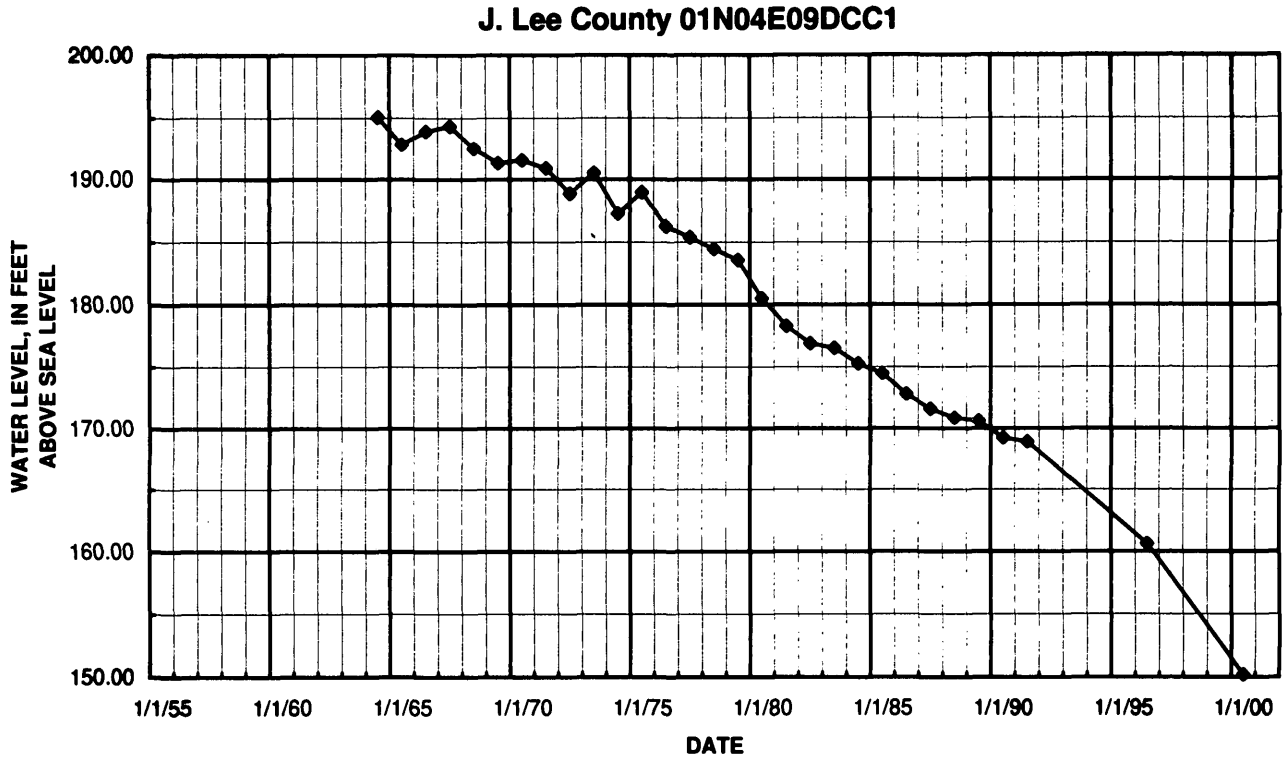


Figure 6. Water-level hydrographs for selected wells completed in the lower Wilcox aquifer in northeastern Arkansas (page 2 of 4).



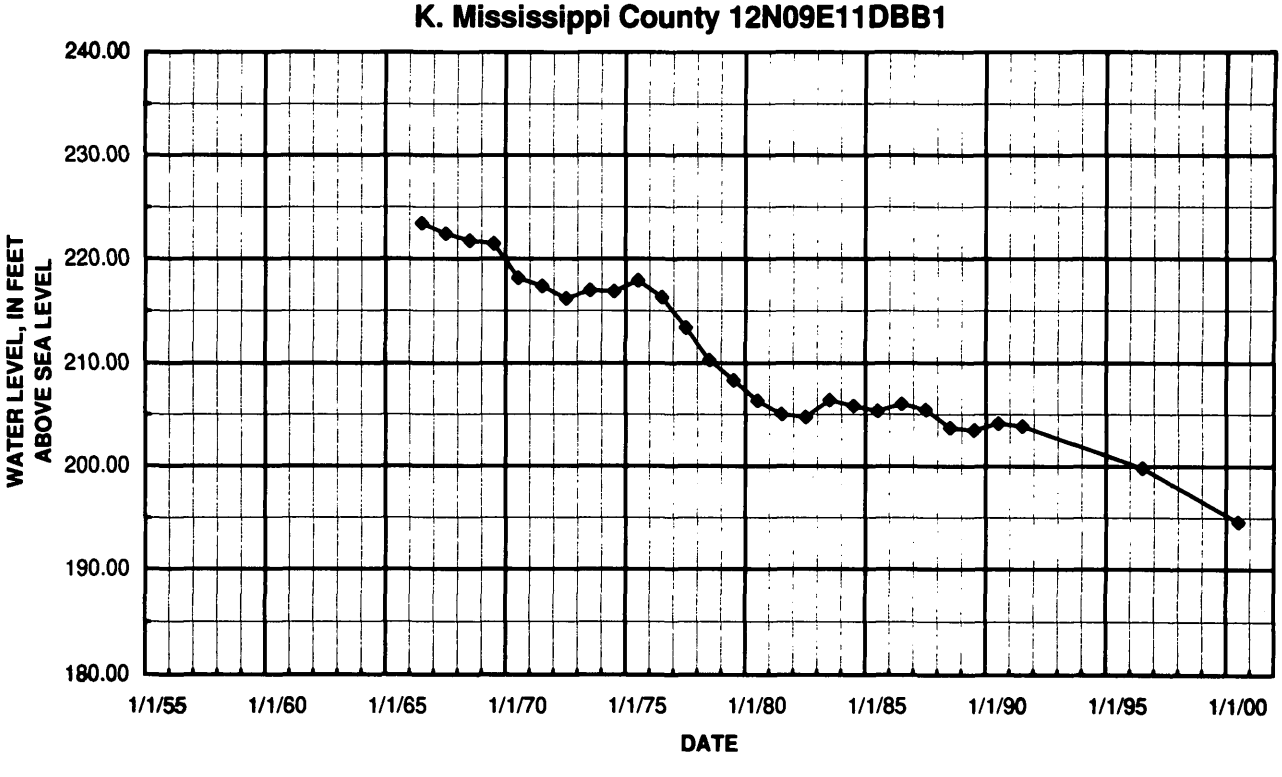
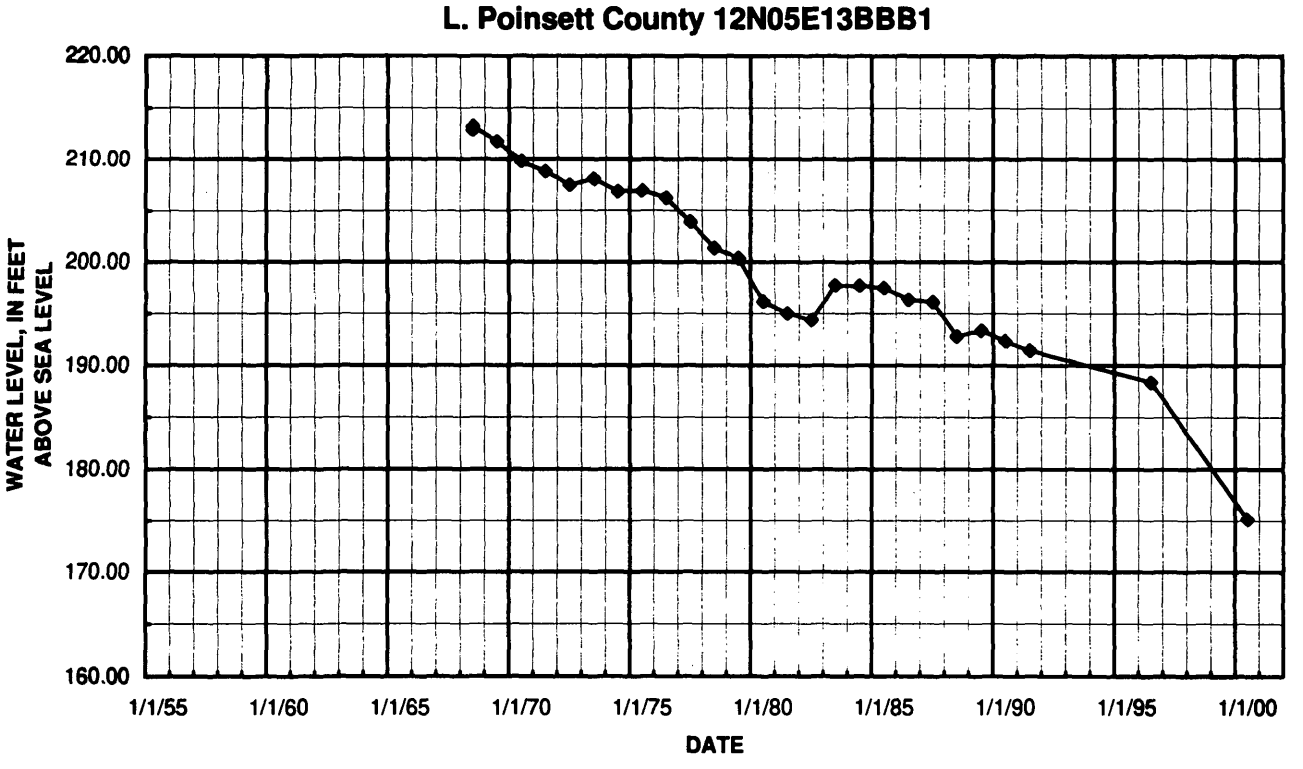


Figure 6. Water-level hydrographs for selected wells completed in the lower Wilcox aquifer in northeastern Arkansas (page 3 of 4).



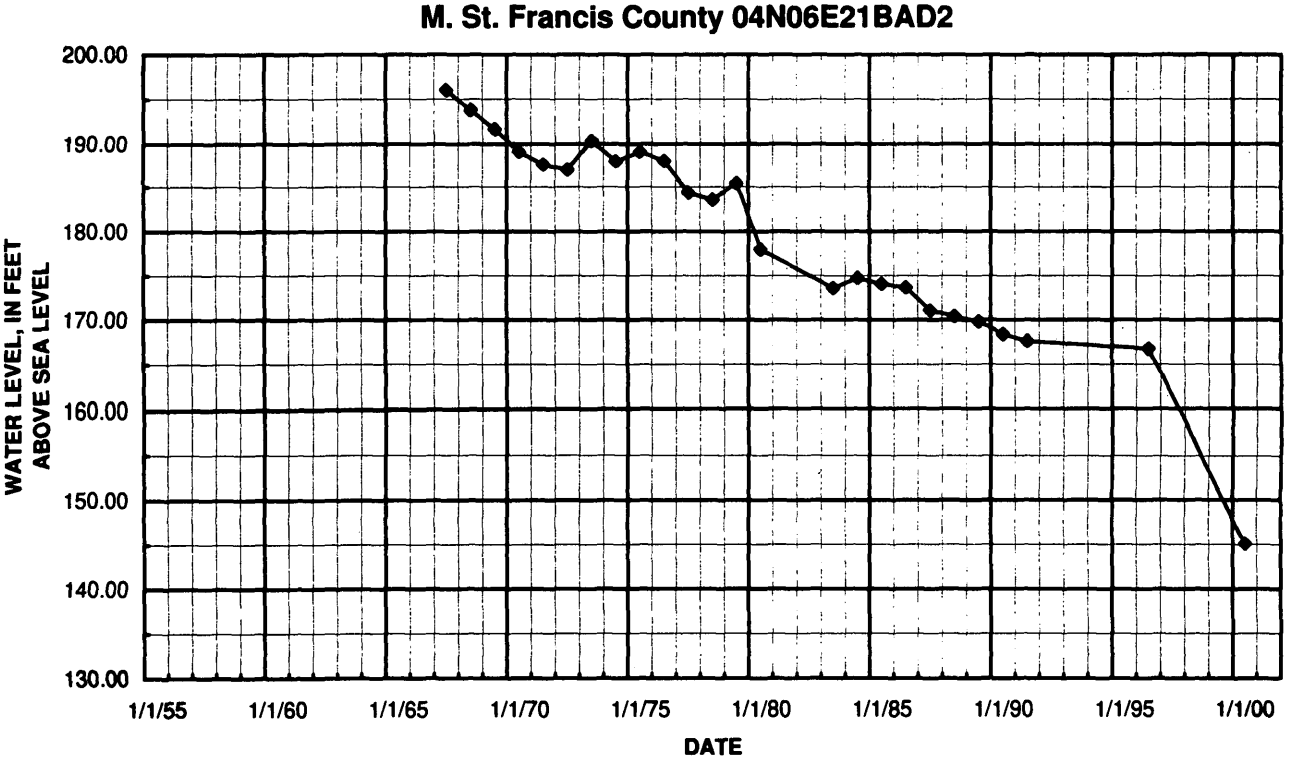


Figure 6. Water-level hydrographs for selected wells completed in the lower Wilcox aquifer in northeastern Arkansas (page 4 of 4).

SUMMARY

During January through April 2000, 54 water-level measurements were made in wells completed in the Cockfield aquifer, 13 water-level measurements were made in wells completed in the lower Wilcox aquifer in southwestern Arkansas, and 43 water-level measurements were made in wells completed in the lower Wilcox aquifer in northeastern Arkansas. The Cockfield and lower Wilcox aquifers are sources of water for local use. Major withdrawals are made from the aquifers for industrial and public supply, with lesser but locally significant withdrawals for domestic and livestock uses. Approximately 51 Mgal/d was withdrawn from these aquifers in 1995. The potentiometric surface data reveal spatial trends in both aquifers across the study areas.

Water-level measurements at wells completed in the Cockfield aquifer ranged in altitude from 63 to 346 feet above sea level. The regional direction of ground-water flow in the Cockfield aquifer is generally toward the east and south, away from the outcrop area, except in areas of intense ground-water withdrawals. The configuration of the potentiometric surface indicates that heavy pumpage has probably altered or reversed the natural direction of ground-water flow in these areas. A potentiometric low caused by the pumpage near Greenville, Mississippi, extends into Chicot, Desha, and Drew Counties. Water levels in five wells showed average declines between 0.5 and 0.8 ft/yr at locations in Ashley, Bradley, Chicot, Cleveland, and Drew Counties. The hydrograph from a well located in Union County showed relatively constant water levels since 1966.

Water-level measurements at wells completed in the lower Wilcox aquifer in southern Arkansas ranged from 148 to 398 feet above sea level. Water-level measurements at wells completed in the lower Wilcox aquifer in northeastern Arkansas ranged from 124 to 368 feet above sea level. The regional direction of ground-water flow in the lower Wilcox aquifers is generally toward the east and south, away from the outcrop area, except in areas of intense ground-water withdrawals. Potentiometric depressions, where flow is toward centers of pumping, indicate that heavy pumpage has probably altered or reversed the natural direction of flow. Two potentiometric depressions are centered in the vicinity of Paragould and West Memphis, Arkansas, where ground-water withdrawals have altered the natural direction of flow. Comparisons of cones of depression from 1996-97 to 2000 indicate expansion and deepening at Paragould, Greene County and West Memphis, Crittenden County. Long-term hydrographs of seven wells showed an average decline in the lower Wilcox aquifer in northeastern Arkansas between 0.8 and 1.0 ft/yr at locations in Craighead and Mississippi Counties, and between 1.2 and 1.8 ft/yr at locations in Crittenden, Greene, Lee, Poinsett, and St. Francis Counties.

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