GROUND-WATER RESOURCES OF JONES COUNTY, MISSISSIPPI

By E.H. Boswell, Daphne Darden, and Gene A. Bednar

U.S. GEOLOGICAL SURVEY

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CONVERSION FACTORS AND ABBREVIATIONS

This report uses inch-pound units. The equivalent International System (SI) units may be obtained using the following factors:

Multiply	by	To obtain
inch (in.)	25.4	millimeter (mm)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
foot per day (ft/d)	0.3048	meter per day (m/d)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
million gallons per day (Mgal/d)	0.04381	cubic meters per second (m^3/s)
cubic foot per day per foot $(ft^3/d)/ft$ or ft^2/d	0.0929	cubic meters per day per meter $(m^3/d)/m$

Abbreviations

Milligrams per liter (mg/L)

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

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ABSTRACT

Jones County, Mississippi, is supplied by ground water from aquifers in strata of Eocene and younger age. The largest ground-water withdrawals are from aquifers in the Catahoula Sandstone of the Miocene aquifer system that occur at depths of 200 and 400 feet in the Laurel area, but several public and industrial water-supply wells obtain water from deeper Eocene strata that occur at depths of more than 900 feet. Some small water supplies in the northern part of the county are obtained from wells less than 200 feet deep that tap Oligocene sediments.

Pumpage from all aquifers in Jones County for all uses increased from less than 1 million gallons per day in 1925 to a maximum of 21.6 million gallons per day in 1975. The city of Laurel used about 6.2 million gallons per day in 1984 and total water use for the county was about 14.1 million gallons per day.

Some wells in the Laurel area produce over 700 gallons per minute from the Catahoula aquifers. The highest yields, more than 1,500 gallons per minute, are produced by wells made in the upper Catahoula aquifer in the southwestern part of the county.

The extreme irregularity of the sand beds that form the aquifers is reflected in the wide range in hydraulic characteristics. Transmissivity values range from 600 to 10,000 square feet per day and average about 6,000 square feet per day. The average hydraulic conductivity is about 90 feet per day.

Water levels in key observation wells in the lower Catahoula aquifer at Laurel have declined from about 150 feet above sea level in 1945 to about 80 feet above sea level in 1985. Since 1975, water levels in the Catahoula aquifers in the Laurel area have declined at a slower rate, but the cone of depression has enlarged because of areal changes in pumping.

Water in the major aquifers is usable for most purposes and concentrations of most common constituents do not exceed water-quality criteria for drinking-water supplies; however, there is a distinct difference in water types between the Catahoula and Vicksburg aquifers and the deeper Eocene aquifers.

Iron concentrations are highest in the Catahoula and Vicksburg aquifers, exceeding 0.30 milligrams per liter in water from 33 percent of the wells for which data are available. Color is highest in the Eocene Cockfield aquifer, exceeding 50 units in water from 60 percent of the wells. Dissolved-solids concentrations range from 487 to 840 milligrams per liter in water from wells in the Cockfield and Sparta aquifers. Silica concentrations exceed 50 milligrams per liter in water from several wells in the Catahoula and Vicksburg aquifers but concentrations generally are equal to or less than 15 milligrams per liter in water from wells in the Cockfield and Sparta aquifers. The pH values generally are less than 7.0 units in water from wells in the Catahoula and Vicksburg aquifers and greater than 8.4 units in water from wells in the Cockfield and Sparta aquifers. Hardness of water from all aquifers rarely exceeds 50 milligrams per liter.

INTRODUCTION

In 1982, the city of Laurel, Miss., requested that the U.S. Geological Survey appraise present and potential ground-water supplies in the Laurel area. Ground-water data were needed for efficient development of the city's water resources as well as a coordinated development of water supply throughout Jones County.

Purpose and Scope

This report describes the ground-water resources of Jones County, Miss. The emphasis of the report is on delineation of aquifers, analysis of areal variations in hydraulic characteristics of the aquifers, water-level changes, water quality, and identification of the effects of long-term withdrawals.

Work for this study included analysis of water-use trends and water-level declines, determination of the interrelation of water-bearing zones, and identification of ground-water-quality problem areas. Contamination of ground water by oil-field brine, known to occur in the area, has been investigated as part of another study.

Description of the Area

The study area includes about 696 mi^2 in Jones County, Miss. The principal municipalities are Laurel, Ellisville, Sandersville, and Soso (fig. 1).

Jones County is in the Southern Pine Hills district of the Gulf Coastal Plain. Most of the surface of the county is underlain by the Catahoula Sandstone, which passes beneath the Hattiesburg Formation in the south and overlies the Vicksburg Group in the northeast (fig. 2). Drainage is southward by streams that flow through wide, flat valleys that are characterized by broad meanders and oxbow lakes. The principal streams are the Leaf River and its larger tributaries--Tallahala Creek, Tallahoma Creek, and the Bogue Homa. The alluvial plains of the major streams are subject to flooding.

Previous Investigations

The earliest detailed description of the ground-water resources of Jones County was included in a report by Stephenson and others (1928). In 1940 the U.S. Geological Survey was requested to make an investigation of ground-water conditions in the Laurel area as a result of severe water-level declines in the middle Catahoula aquifer. Shows and others (1966) included a description of Jones County water resources in a multi-county report on the availability of water for industry.

WATER DEVELOPMENT AND USE

Virtually all water used for public and industrial water systems in Jones County is obtained from underground sources. Most of the extensive freshwater aquifers occur in water-bearing sand beds in geologic units of Miocene and younger age. Aquifers of Eocene age underlie the county at greater depth. However, these aquifers contain freshwater only in the northern part of the county. The geologic units and their water-bearing characteristics are described in table 1. Descriptions of typical wells in the study area are presented in table 2 and locations of selected wells are shown in figures 3 and 4.

The municipal water system at Laurel was established about 1901 when the first of two wells was drilled for a water plant located at 6th Street and 9th Avenue (fig. 4). A third well was drilled in 1904. The original wells at the plant have been replaced and supplemented by wells drilled at the plant and at other locations in the city. In 1970-71, a new field of seven wells was drilled in the southern part of the city near the municipal airport. During the period 1982-84, two new wells were drilled in the northern part of the city to improve distribution and allow a reduction in pumping in the south. As of 1985, the municipal water supply is obtained from 13 wells (fig. 4). Other public water supplies in Jones County include 15 rural community water systems that have been organized since 1964.

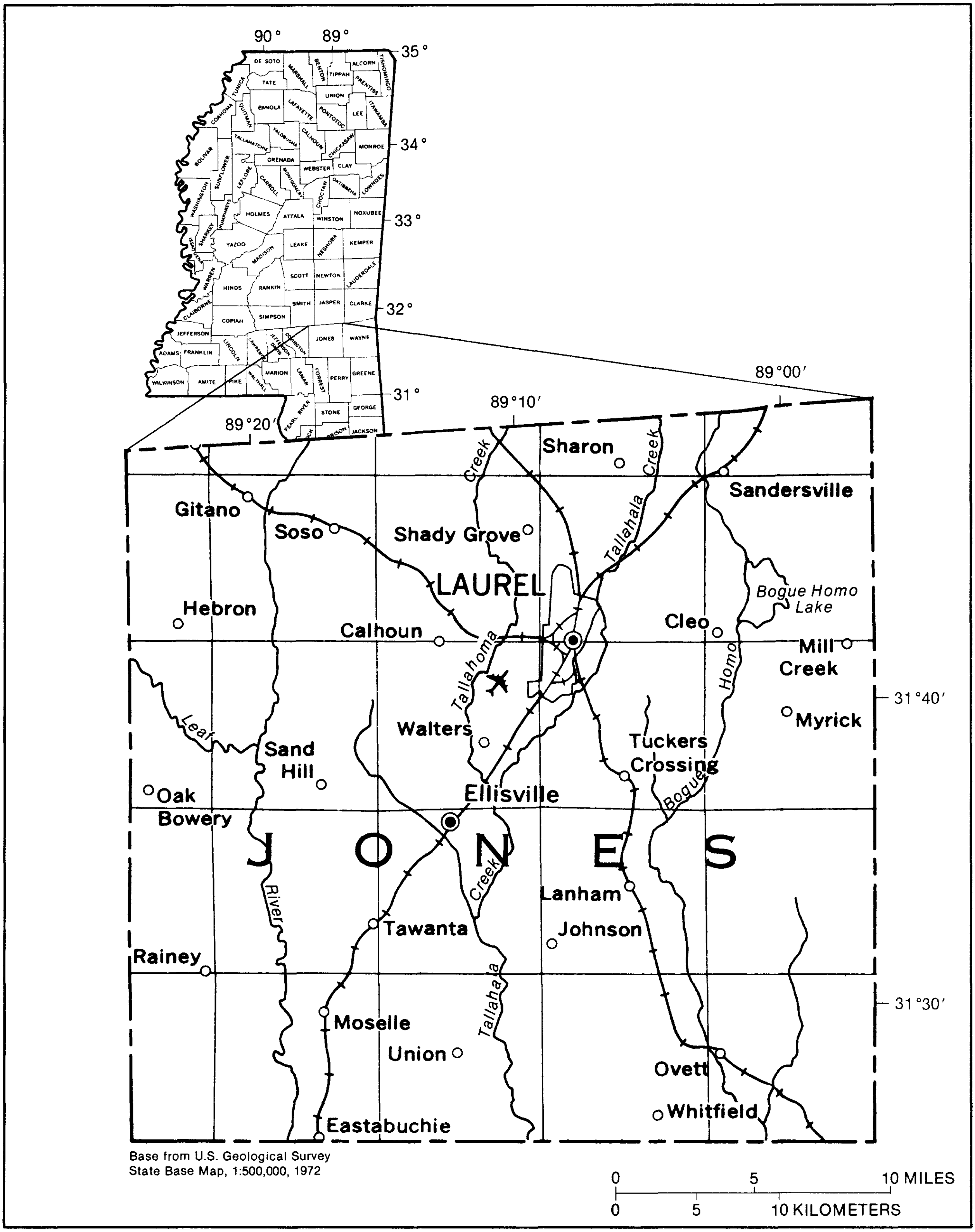

Figure 1.--Location of Jones County in Mississippi.

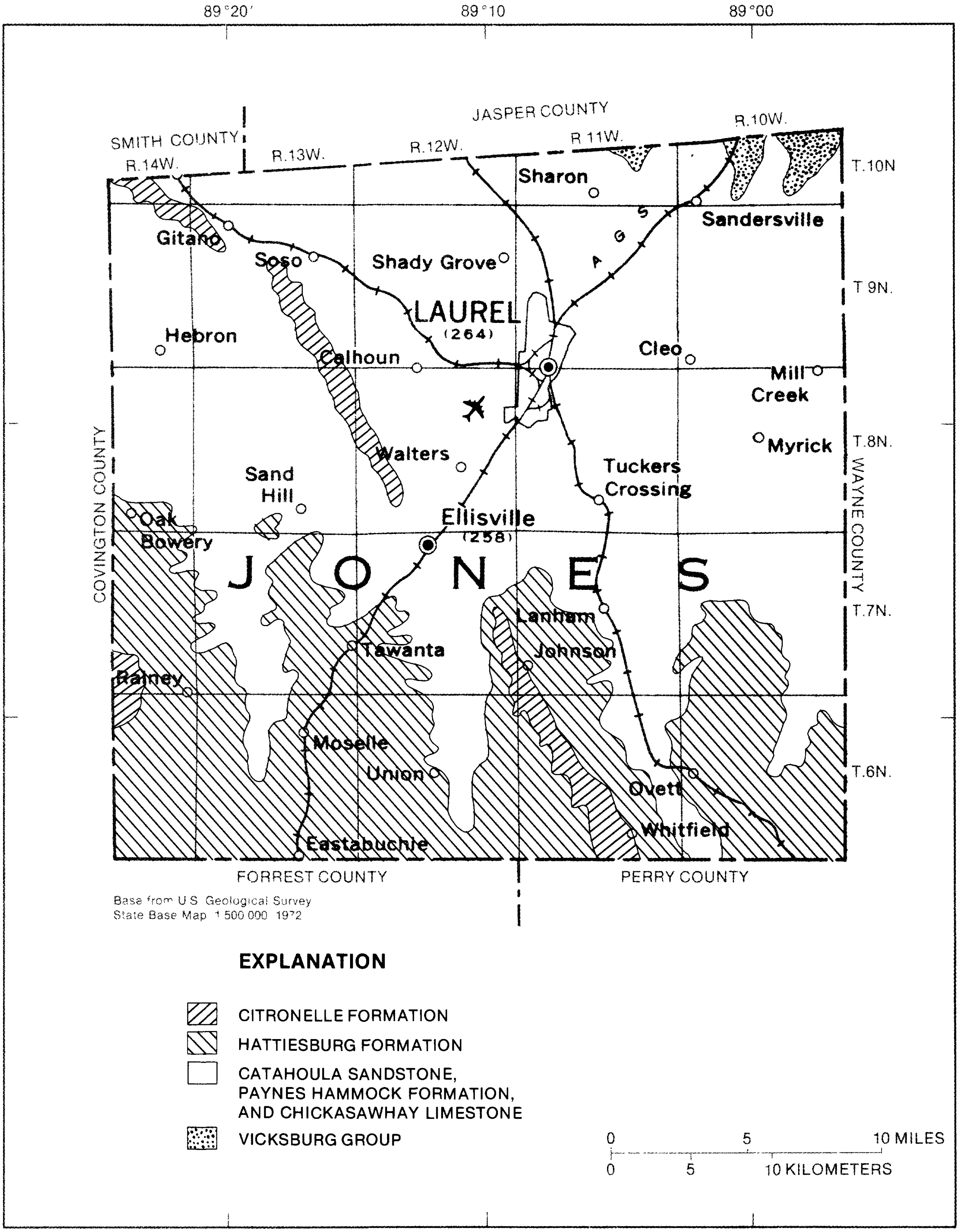

Figure 2.--Geologic map of Jones County. (Geology modified from Bicker, 1969.)

Table 1.--Geologic units and major aquifers in Jones County

ERA	System	Series	Group	Geologic unit (N — SE)	Major aquifer
CENOZOIC	QUATERNARY			Alluvium and terrace deposits	
		Pliocene		Citronelle Formation	Citronelle aquifers
	TERTIARY	Miocene		Hattiesburg Formation Catahoula Sandstone	Miocene aquifer system
				? —— ? —— ?	
		Oligocene		Paynes Hammock Formation Chickasawhay Limestone	Miocene aquifer system
			Vicksburg	Bucatunna Formation	
				Byram Formation	
				Glendon Formation	Oligocene aquifer system
				Marianna Formation	
				Mint Spring Formation	
				Forest Hill Formation (N) / Red Bluff Formation (SE)	
		Eocene	Jackson	Yazoo Formation	
				Moodys Branch Formation	
			Claiborne	Cockfield Formation	Cockfield Formation
				Cook Mountain Formation	Sparta aquifer system
				Sparta Sand	
				Zilpha Clay	
				Winona Sand	Winona-Tallahatta aquifer
				Tallahatta Formation Neshoba Sand Member Basic City Shale Member Meridian Sand Member	
			Wilcox	Bashi Formation (N) / Hatchetiqbee Formation (SE)	Meridian-upper Wilcox aquifer
		Paleocene		Tuscahoma Formation	
				Nanafalia Formation	Lower Wilcox aquifer
			Midway	Naheola Formation	
				Porters Creek Clay	
				Clayton Formation	

Table 2.--Records of selected wells in Jones County, Mississippi

Water-bearing units: HBRG, Hattiesburg Formation; CTHL, Catahoula Sandstone, undifferentiated; CTHLU, upper Catahoula aquifer; CTHLM, Middle Catahoula aquifer; CTHLL, lower Catahoula aquifer; VKBG, Vicksburg Group; CCKF, Cockfield Formation; SPRT, Sparta Sand; MUWX, Meridian-upper Wilcox squifer

Water Use: H, Domestic; N, Industrial; P, Public; S, Stock, I, Institutional; U, Unused; Z, Other or Destroyed.

Well No.	Location: Section	Location: Township	Location: Range	Owner	Date Drilled	Altitude (ft)	Well Depth (ft)	Casing Diam. (ft)	Screen Length (ft)	Aquifer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Analysis	Electric log
A1	11	09N	13W	A J Green Jr	1955	300	46	2	5	CTHLM	21	05-55		H	X	
A2	25	10N	13W	Gulf Oil Corp	1945	380	350	4		CTHLL	100	01-65		D	X	
A3	13	09N	13W	Soso W A	1965	325	470	6	30	CTHLL	108	09-84	162	P	X	
A20	14	09N	13W	Soso W A	1968	330	405	6	30	CTHLL	112	09-84	180	P	X	
A64	14	09N	14W	Hatten W A	1972	320	480	6	40	CTHLL	77	07-72	150	P		255
A91	36	10N	14W	Tri-County W A	1984	378	305	5	40	CTHLL	104	07-84	65	Z		304
B11	13	09N	12W	J N Altmyer	1955	270	120	3		CTHLM	40	07-55		H	X	
B15	13	09N	12W	Shady Grove W A	1965	290	384	6	36	CTHLL	193	09-84	150	P	X	
B23	32	09N	12W	Hollingworth W A	1965	315	90	2		CTHLM				H		
B24	13	09N	12W	Shady Grove W A	1965	318	370	6	30	CTHLL	211	12-81	162	P	X	116
B25	13	09N	12W	Shady Grove W A	1965	290	360	6	30	CTHLL	193	09-84	166	P		
B29	05	09N	12W	Matthews Moss W A	1966	340	336	6	30	CTHLL	121	12-66	225	P	X	
B56	05	09N	12W	Matthews Moss W A	1969	320	340	4	30	CTHLL	137	09-84	85	P		
B69	05	09N	12W	Matthews Moss W A	1974	320	340	6	50	CTHLL	119	04-84	250	P		
B73	13	09N	12W	Shady Grove W A	1976	300	370	6	30	CTHLL	185	02-76	170	P		
B74	24	09N	12W	Dairy Fresh	1978	270	196	4	20	CTHLM	75	02-78	75	N		
B75	05	09N	12W	Matthews Moss W A	1980	305	314	8	45	CTHLL	99	06-80	263	M	X	274
B79	21	09N	12W	Calhoun W A	1981	350	392	10	50	CTHLL	171	09-84	300	P	X	284
B82	13	09N	12W	Shady Grove W A	1984	275	348	8	47	CTHLL	74	08-84	212	P		302
C2	24	10N	11W	Trans Con Gas	1950	345	235	6	20	VKBG	54	01-50	35	Z	X	
C3	32	09N	11W	Atlantic Ice Co	1950	270	193	8	40	CTHLM	102	01-50		U		
C4	29	09N	11W	Donald & Thrssh Lbr	1942	247	298	10	50	CTHLL	118	08-42	400	U		
C5	24	10N	11W	Trans Con Gas	1950	310	173	6	20	VKBG	61	09-50	45	N		
C7	22	09N	11W	Henry B Tate	1955	295	158	2	11	CTHLM	85	01-55		H	X	
C27	05	09N	11W	R M Foster	1947	300	78	2	4	CTHL	40	07-55		H	X	
C31	29	09N	11W	Laurel No 1A (24th St)	1954	243	318	24	50	CTHLL	137	09-70	668	P	X	
C33	31	09N	11W	Laurel No 2A (13th St)	1949	290	340	24	60	CTHLL	112	03-49		U		
C34	31	09N	11W	Laurel No 5 (Park)	1945	276	383	18	45	CTHLL	200	09-84		U	X	
C35	32	09N	11W	Laurel No 6 (14th St)	1949	242	483	18	60	CTHLL	160	12-84	407	P		
C37	29	09N	11W	Laurel No 8 (1st Ave)	1954	277	343	18	60	CTHLL	130	08-54	608	P	X	

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location: Section	Location: Township	Location: Range	Owner	Date Drilled	Altitude (ft)	Well Depth (ft)	Casing Diam. (ft)	Screen Length (ft)	Aquifer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Analysis	Electric log
C38	32	09N	11W	Sou United Ice	1946	271	346	10	50	CTHLL	142	01-64		U		
C41	18	09N	11W	Mar-Ree Subdiv	1958	290	335	4		CTHLL	153	01-58	80	U		
C42	18	09N	11W	Mar-Ree Subdiv	1965	290	335	4	20	CTHLL	168	05-65	28	U		
C43	17	09N	11W	Sharon W A	1965	250	228	8	10	CTHLL	103	07-65	200	P	X	
C44	33	09N	11W	Powers W A	1965	292	385	6	45	CTHLL	162	07-65	225	P	X	
C45	12	09N	11W	C M Sauls	1963	295	143	2	12	CTHLL	115	05-63		H	X	
C46	33	09N	11W	Powers W A	1966	292	385	6	35	CTHLL	177	12-81	204	P		
C53	29	09N	11W	Laurel No 1 (Old)	1926	248	314	10	25	CTHLL	85	12-47		U	X	
C55	31	09N	11W	Laurel No 2 (Old)	1930	257	350	26	60	CTHLL	95	12-41	900	Z		
C67	20	09N	11W	Laurel No 7 (Northview)	1980	274	322	24	63	CTHLL	198	04-84	632	P	X	
C76	15	09N	11W	T L James Const	1966	300	632	6	61	CCKF	97	07-66		Z		
C80	11	09N	11W	Errata W A	1967	325	260	2	10	CTHLL	159	10-67	6	U	X	
C85	12	09N	11W	Errata W A	1968	323	295	6	30	CTHLL	174	09-84	175	P		
C96	31	09N	11W	Laurel No 1 (12th St)	1970	320	410	18	52	CTHLL	233	09-84	548	P		143
C101A	33	10N	11W	Sharon W A (Test)	1970	305	247	2	5	CTHLL	100	09-70		Z		202
C101B	33	10N	11W	Sharon W A (Test)	1970	305	176	2	5	CTHLL	115	09-70		Z	X	202
C103	18	09N	11W	Univ Util (Test)	1971	300	522			CTHL				Z		235
C110	18	09N	11W	Laurel (Univ)	1971	300	326	8	51	CTHLL	216	07-81	350	P		
C111	33	10N	11W	Sharon W A	1972	305	248	6	35	CTHLL	152	04-84	175	U		
C112	27	09N	11W	C P Clark	1972	280	328	2	5	CTHLL	180	03-72	4	U		
C113	34	10N	11W	Sharon W A	1972	305	248	6	35	CTHLL	116	04-84	130	P		
C127	12	09N	11W	Errata W A	1974	310	255	6	35	CTHLL	167	12-81	130	P		
C128	12	09N	11W	Sandersville Lmbr	1974	260	210	2	37	VKBG	3	07-74	5	H		
C134	08	09N	11W	Christian Ind Pk	1977	270	227	6	35	CTHLL	150	05-81	30	N		264
C135	34	09N	11W	Powers W A	1978	290	370	8	30	CTHLL	150	09-78	300	P		
C138	27	09N	11W	C P Clark	1978	350	328	4	10	CTHLL	200	07-78	25	H		265
C141	29	09N	11W	Masonite Corp	1981	244	270	8	40	CTHLL	150	05-81	400	N		
C143	09	09N	11W	Chevon U S A Inc	1981	256	168	3	42	CTHLL	65	12-81	35	Z		
C144	33	10N	11W	Sharon W A (Test)	1982	305	768	4	30	CCKF	98	06-82	18	Z	X	291
C145	33	10N	11W	Sharon W A	1982	305	248	10	30	CTHLL	155	04-84	259	P	X	294
C146	28	10N	11W	Sharon W A (Test)	1982	330	730	4	65	CCKF	117	08-82	44	Z	X	295
C153	31	09N	11W	Laurel No 5A (Park)	1983	268	374	12	50	CTHLL	196	09-84	556	P		299
C155	28	10N	11W	Sharon W A	1984	320	731	6	84	CCKF	110	05-84	260	P		303
C160	09	09N	11W	Sharon W A (Test)	1985	265	817	4	15	CCKF	68	04-85	37	Z	X	326
D3	21	10N	10W	Southland Ref	1946	293	640	10	20	CCKF	60	04-55	175	U	X	

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location: Sec-tion	Location: Town-ship	Location: Range	Owner	Date Dril-led	Alti-tude (ft)	Well Depth (ft)	Cas-ing Diam. (ft)	Screen Length (ft)	Aqui-fer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Anal-ysis	Elec-tric log
D4	32	10N	10W	C W Mckenzie	1945	285	70	2		CTHLL			3	H	X	
D5	31	10N	10W	Dolly Perkins	1953	295	126	2		CTHLL			10	H	X	
D6	31	09N	10W	R R Mayo	1955	235	76	2	5	CTHLL	30	03-55		H	X	
D7	32	10N	10W	C W Mckenzie	1946	260	210	4		VKBG	5	05-55		H	X	
D23	06	09N	10W	Phillips Serv	1954	280	41	2		CTHLL	18	01-54	10	H		
D28	31	09N	10W	R R Mayo	1955	235	226	4	4	CTHLL	30	03-55	3	H	X	
D34	33	10N	10W	Bill McDonald	1963	315	620	2	20	CCKF	80	11-63		H		
D35	06	09N	10W	Sandersville	1963	268	130	10	40	CTHLL	68	12-81	150	U	X	
D37	23	09N	10W	Sinclair Oil Co	1962	322	826	4	52	CCKF	123	08-62	40	U		
D39	23	10N	10W	Humble Oil Co	1962	330	634	2	20	CCKF	160	12-62				
D40	23	10N	10W	Calvin McDonald	1963	373	518	2	20	CCKF	110	12-63		H		
D41	23	10N	10W	Humble Oil Co	1962	360	562	2	24	CCKF	105	12-62		H		
D42	25	10N	10W	Humble Oil Co	1962	285	484	2	22	CCKF	85	12-62		U		
D45	31	10N	10W	Sandersville	1962	283	710	8	40	CCKF	14	09-62	134	Z	X	
D72	32	09N	10W	Myrick-Mill Ck W A	1966	310	347	6	30	CTHLL	128	09-84	165	P	X	
D73	32	09N	10W	Myrick-Mill Ck W A	1966	315	352	6	30	CTHLL	129	09-84	170	P		
D77	25	10N	10W	Humble Oil Co	1962	310	602	2	25	CCKF	110	12-62		U		
D107	05	09N	10W	Sandersville	1970	268	160	4	10	CTHLL	74	12-81	60	P		
D117	27	10N	10W	Beaver Meadow W A	1971	372	612	6	35	CCKF	185	10-80	100	P	X	242
D121	27	10N	10W	Beaver Meadow W A	1971	380	600	6	35	CCKF	168	07-71	114	P		247
D124	06	09N	10W	Sandersville (Test)	1971	280	709							Z		253
D125	30	10N	10W	Sandersville	1971	315	184	8	58	CTHLL	59	09-84	200	P	X	254
D127	21	10N	10W	Southland Ref	1972	305	600	6	60	CCKF	105	05-72	273	N	X	256
D140	05	09N	10W	Sandersville	1979	268	155	6	20	CTHLL	85	10-79	100	P		
D142	27	10N	10W	Beaver Meadow W A	1979	382	651	6	65	CCKF	197	12-79	162	P		270
D143	21	09N	10W	Poineer Production	1980	245	714	3	42	CCKF	60	08-80	80	Z		
D147	21	10N	10W	Southland Ref (Test)	1981	303	70							Z		279
D148	06	09N	10W	Sandersville	1967	290	181	6	61	CTHLL	75	12-67	110	P	X	
D149	25	10N	10W	Calvin McDonald	1963	330	518	2	20	CCKF	110	12-63	10	H	X	
D154	04	09N	10W	David New Drlng	1983	290	720	3	63	CCKF	100	06-83	100	Z		
D155	04	09N	10W	Trans Continental	1984	305	630	3	42	CCKF	150	05-84	70	Z		
D156	26	10N	10W	Endrex Explr	1985	290	567	3	105	CCKF	90	02-85	75	Z		
D157	29	10N	10W	Sandersville	1985	270	592	4	10	CCKF	99	03-85	20	U	X	
D158	30	09N	10W	Roy West	1970	235	750	2	10	CCKF	50	09-70	65	H	X	
D160	36	10N	10W	Endrex Explr	1985	290	525	3	63	CCKF	150	03-85	50	Z		

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location Sec-tion	Town-ship	Range	Owner	Date Dril-led	Alti-tude (ft)	Well Depth (ft)	Cas-ing Diam. (ft)	Screen Length (ft)	Aqui-fer	Water Level Depth (ft)	Date	Pump. Gal/min	Water Use	Anal-ysis	Elec-tric log
E43	01	08N	13W	Pleasant Rdg W A (Test)	1981	440	398	4	10	CTHLM	196	09-84	12	Z		289
E44	01	08N	13W	Pleasant Rdg W A	1982	440	398	10	40	CTHLM	203	09-84	360	P		292
F2	14	08N	12W	Laurel No 1 Airfield	1942	223	466	16	30	CTHLL	23	08-42	200	U		
F3	14	08N	12W	Laurel No 2 Airfield	1942	215	471	16	40	CTHLL	16	09-42		U	X	
F4	12	08N	12W	Laurel (Test)	1964	265	430			CTHL				Z		
F6	01	08N	12W	Laurel C C	1920	300	250	4		CTHLM	134	03-64		Z		
F7	01	08N	12W	Laurel C C	1964	305	246	8	30	CTHLM	122	12-81	290	I	X	
F18	23	08N	12W	Laurel (Test)	1965	218	532	4		CTHL				Z		
F19	14	08N	12W	Laurel (Test)	1965	219	471	2	14	CTHLL	44	07-65	20	Z	X	
F20	14	08N	12W	Laurel No 10 (Airfield)	1965	220	466	20	60	CTHLL	162	09-84		U		
F21	04	08N	12W	Calhoun W A	1965	318	498	6	30	CTHL	205	10-82	100	U	X	126
F22	04	08N	12W	Calhoun W A Rdg	1966	315	482	6	30	CTHL	205	09-84	112	P	X	
F23	07	08N	12W	Pleasant Rdg W A 1	1966	412	413	10	63	CTHLM	207	09-84	300	P	X	131
F24	07	08N	12W	Pleasant Rdg W A 2	1967	405	394	10	20	CTHL	200	04-67	300	P	X	134
F37	11	08N	12W	Laurel (Test)	1970	230	511			CTHL				Z		144
F38	13	08N	12W	Laurel (Test)	1970	214	510			CTHL				Z		145
F39	14	08N	12W	Laurel (Test)	1970	230	532			CTHL				Z		146
F40	14	08N	12W	Laurel (Test)	1970	230	508			CTHL				Z		147
F41	14	08N	12W	Laurel (Test)	1970	230	503			CTHL				Z		148
F42	15	08N	12W	Laurel (Test)	1970	223	502			CTHL				Z		149
F43	15	08N	12W	Laurel (Test)	1970	226	505			CTHL				Z		150
F44	14	08N	12W	Laurel No 2 (Airport)	1970	225	500	18	100	CTHLL	174	09-84	686	P	X	151
F45	10	08N	12W	Laurel (Test)	1970	215	480			CTHL				Z		153
F46	14	08N	12W	Laurel (Test)	1970	230	503			CTHL				Z		154
F47	15	08N	12W	Laurel (Test)	1970	210	503			CTHL				Z		155
F48	15	08N	12W	Laurel (Test)	1970	205	503			CTHL				Z		156
F49	15	08N	12W	Laurel (Test)	1970	207	505			CTHL				Z		157
F50	14	08N	12W	Laurel (Test)	1970	215	503			CTHL				Z		158
F59	14	08N	12W	Laurel No 9 (A St)	1971	215	466	18	60	CTHLL	159	09-84	758	P	X	243
F60	13	08N	12W	Laurel No 11 (11 South)	1971	215	474	18	60	CTHLL	168	09-84	732	P		245
F61	15	08N	12W	Laurel No 14 (Pendorff)	1971	227	480	18	60	CTHLL	175	09-84	720	P		246
F62	15	08N	12W	Laurel No 13 (Pendorff)	1971	225	480	18	80	CTHLL	174	04-84	641	P	X	248
F63	14	08N	12W	Laurel No 12 (Airport)	1971	227	449	18	60	CTHLL	183	09-84	709	P	X	251
F65	07	08N	12W	Pleasant Rdg W A	1972	400	385	8	45	CTHLL	196	12-81	200	P		
F71	04	08N	12W	Calhoun W A	1974	295	460	6	30	CTHLL	172	09-84	151	P		

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location: Section	Location: Township	Location: Range	Owner	Date Drilled	Altitude (ft)	Well Depth (ft)	Casing Diam. (ft)	Screen Length (ft)	Aquifer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Analysis	Electric log
F72	26	08N	12W	American Quasar	1979	195	485	3	42	CTHLL	141	09-84	128	P		
F74	04	08N	12W	Calhoun W A	1982	380	491	10	50	CTHLL	197	09-84	300	P		297
G1	04	08N	11W	C P Clark	1963	235	318	5	12	CTHLL	116	11-81	120	H	X	
G4	06	08N	11W	Miss America Foods	1946	263	408	8	40	CTHLL	131	01-6	300	U		
G5	03	08N	11W	Powers W A (Old GLU)	1959	265	368	6	40	CTHLL	141	09-84	128	P		
G7	05	08N	11W	Valley Farms In	1959	225	400	4						U		
G8	02	08N	11W	Powers School	1962	264	309	4	10	CTHLL	115	06-62		U		
G9	02	08N	11W	Powers School	1954	264	300	3		CTHLL				U		
G10	06	08N	11W	Laurel (#10 WSP 576)	1920	278	1316	8	80	SPRT	25	01-64		Z	X	
G17	04	08N	11W	Glade W A	1965	275	475	6	30	CTHLL	181	09-84	135	P		119
G18	15	08N	11W	Glade W A	1965	230	529	6	29	CTHLL	56	07-65	140	P	X	120
G19	15	08N	11W	Glade W A	1960	275	452	6	20	CTHLL	68	09-65	75	U		
G52	06	08N	11W	Laurel	1920	269	220	6	40	CTHLM	+1	01-20		Z		
G53	06	08N	11W	Laurel	1933	269	397	12	40	CTHLL	109	02-40	850	Z		
G54	06	08N	11W	Laurel	1924	264	400	10	40	CTHLL	109	09-24	150	U		
G55	06	08N	11W	Laurel No 4 (Prentiss)	1950	279	405	24	60	CTHLL	196	04-84	662	P	X	
G56	27	08N	11W	Schlumberger	1962	225	471	4	20	CTHLL	42	10-62		H		
G57	07	08N	11W	Masonite Corp No 14A	1968	235	225	18	55	CTHLM	170	04-68	400	N		
G58	08	08N	11W	East Miss Ice	1925	271	390	8	60	CTHLL			200	U		
G60	08	08N	11W	Masonite Corp No 11	1946	220	210	16	41	CTHLM	148	11-63	280	U		
G61	08	08N	11W	Masonite Corp No 12	1948	230	222	12	54	CTHLM	145	09-61	297	N		
G62	07	08N	11W	Masonite Corp No 14	1958	235	220	38	50	CTHLM	133	05-58	225	U		
G63	07	08N	11W	Masonite Corp No 15	1958	225	230	12	50	CTHLM	96	06-85	465	N	X	
G64	07	08N	11W	Masonite Corp No 16	1960	235	1068	12	60	CCKF	78	06-85	495	N	X	
G65	08	08N	11W	Masonite Corp No 17	1964	230	209	24	60	CTHLM	137	07-64	536	N		
G66	08	08N	11W	Masonite Corp No 18	1964	234	413	24	60	CTHLL	154	06-85	596	N		
G67	08	08N	11W	Masonite Corp No 19	1964	231	1236	24	212	CCKF	89	06-85	217	N		
G68	05	08N	11W	Masonite Corp No 20	1964	230	409	16	60	CTHLL	103	12-64	145	N		
G70	06	08N	11W	Laurel Oil	1900	292	210	6		CTHLM	150	12-41		U		
G72	06	08N	11W	Miss America Foods	1936	255	205	8	20	CTHLL	130	01-64		U		
G75	06	08N	11W	Laurel Mills	1920	292	244	4		CTHLM	117	01-39		Z		
G76	06	08N	11W	Laurel Mills	1926	290	285	8		CTHLM				Z		
G77	05	08N	11W	East Miss Ice	1925	240	189	8	20	CTHLM	112	01-64		U		
G79	08	08N	11W	Masonite Corp No 3	1928	232	247	12	60	CTHLM	44	08-28		U		
G80	08	08N	11W	Masonite Corp No 2	1926	229	243	12	63	CTHLM	43	11-26	653	U		

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location Sec-tion	Town-ship	Range	Owner	Date Dril-led	Alti-tude (ft)	Well Depth (ft)	Cas-ing Diam. (ft)	Screen Length (ft)	Aqui-fer	Water Level Depth (ft)	Date	Pump. Gal/min	Water Use	Anal-ysis	Elec-tric log
G81	08	08N	11W	Masonite Corp No 1	1925	230	260	10	60	CTHLM	38	10-25		U		
G82	08	08N	11W	Masonite Corp No 4	1931	231	2287	10		MUWX	1	02-31	300	U	X	
G83	08	08N	11W	Masonite Corp No 5	1938	219	198	12	60	CTHLM	84	02-38	485	U		
G84	07	08N	11W	Masonite Corp No 7	1937	234	224	12	60	CTHLM	114	10-39	800	U		
G85	07	08N	11W	Masonite Corp No 6	1936	229	243	12	60	CTHLM	72	12-38	500	U		
G88	08	08N	11W	Masonite Corp No 8	1939	222	189	12	40	CTHLM	84	11-39	280	U		
G89	08	08N	11W	Masonite Corp No 9	1940	222	198	14	40	CTHLM	118	09-54		U		
G92	06	08N	11W	Masonite Corp No 10	1941	225	188	12	40	CTHLM	116	09-54		U		
G93	06	08N	11W	Masonite Corp No 4A	1944	231	1065	10	50	CCKF	71	10-63	225	N		
G94	07	08N	11W	Masonite Corp No 6A	1955	228	195	36	60	CTHLM	96	11-55	392	N		
G95	07	08N	11W	Masonite Corp No 7A	1963	234	226	36	40	CTHLM	154	10-62	708	N		
G104	06	08N	11W	Laurel No 3A (Plant 1)	1945	273	396	24	45	CTHLL	185	12-83	428	P	X	
G109	15	08N	11W	Glade W A	1971	270	498	6	20	CTHLL	167	09-84	110	U		249
G111	16	08N	11W	Glade W A	1972	250	490	6	20	CTHLL	165	07-81	205	P		258
G113	02	08N	11W	Powers W A (Gtr Laurel)	1973	260	355	4	26	CTHLL	140	02-73	60	P		260
G119	07	08N	11W	Masonite Corp No 6B	1974	230	228	18	60	CTHLM	120	08-74	500	N		
G127	13	08N	11W	Glade W A (Test)	1981	265	591			CTHL				Z		280
G128	14	08N	11W	Glade W A (Test)	1981	255	595			CTHL				Z		281
G129	27	08N	11W	Glade W A (Test)	1981	240	360	4	20	CTHL	66	09-81	20	Z		285
G130	27	08N	11W	Glade W A	1982	240	361	8	35	CTHL	79	09-84	212	P	X	
G131	19	08N	11W	R E Paul	1984	330	609	4	10	CTHL	236	08-84	12	H		
G132	32	08N	11W	David New Drlg	1984	285	620	3	40	CTHL	150	06-84	75	Z		
G133	06	08N	11W	Laurel	1913	274	400	6		CTHL				U		
G134	06	08N	11W	Laurel (#7 WSP 576)	1901	272	400	8	20	CTHL	72	02-12	250	U		
G135	06	08N	11W	Laurel (#8 WSP 576)	1904	272	412	6		CTHL	72	02-12	200	Z		
G136	06	08N	11W	Laurel (#9 WSP 576)	1914	272	1000	12	40	CCKF	+14	03-14				
H4	02	08N	10W	M&M W A (Test)	1966	323	196	2	10	CTHL	147	09-84		U	X	
H35	34	08N	10W	M&M W A	1976	345	540	6	35	CTHLL	140	01-77	150	P		263
J16	33	07N	13W	Sou Miss Power (Test)	1968	210	626	8		CTHL				Z		138
J17	33	07N	13W	Sou Miss Power (Test)	1966	205	230	6	20	CTHL	36	05-66	100	Z		139
J19	33	07N	13W	Sou Miss Power (Test)	1968	205	268			CTHL				Z		141
J35	33	07N	13W	Sou Miss Power	1969	205	278	20	93	CTHLU	35	06-69	1580	E		
J36	33	07N	13W	Sou Miss Power	1969	205	264	20	90	CTHLU	30	05-69	1600	E		
J37	33	07N	13W	Sou Miss Power	1969	205	263	20	88	CTHLU	44	12-81	1520	E		
J43	11	07N	13W	Pine W A (Test)	1971	349	675	2	10	CTHLL	178	02-71	6	Z	X	237

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location: Section	Location: Township	Range	Owner	Date Drilled	Altitude (ft)	Well Depth (ft)	Casing Diam. (ft)	Screen Length (ft)	Aquifer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Analysis	Electric log
J50	11	07N	13W	Pine W A	1971	350	674	8	50	CTHLL	178	04-84	125	P		244
J51	24	07N	13W	Oak Grove W A (Test)	1971	345	683	2	10	CTHLM	172	08-71	5	Z	X	250
J61	24	07N	13W	Oak Grove W A	1973	345	672	8	42	CTHLM	194	12-81	171	P		
J64	11	07N	13W	Pine W A	1973	350	677	6	35	CTHLU	140	06-79	5	H		268
J66	15	07N	13W	Ray Wood	1979	305	388	2	10	CTHLU	140	06-79	5	H		268
J68	14	07N	13W	American Quasar	1980	341	336	3	42	CTHLU	60	12-80	75	Z		
J69	14	07N	13W	American Quasar	1981	332	315	3	42	CTHLU	70	01-81	70	Z		
J70	24	07N	13W	Oak Grove W A	1981	350	688	6	40	CTHLM	199	07-81	212	P	X	283
K1	04	07N	12W	Ellisville	1931	248	542	12	60	CTHLL	42	01-31	400	U	X	
K2	04	07N	12W	Ellisville	1937	252	549	12	60	CTHLL	68	01-37	375	U	X	
K3	04	07N	12W	Ellisville	1948	250	552	12	65	CTHLL	126	12-81	600	U		
K4	08	07N	12W	Ellisville State Sch	1939	212	552	6		CTHLL	36	09-60		U		
K6	08	07N	12W	Ellisville State Sch	1956	230	552	8	40	CTHLL	99	12-81	300	T	X	
K7	08	07N	12W	Ellisville State Sch	1962	220	100	2	6	CTHLU				Z		
K8	08	07N	12W	Ellisville State Sch	1963	220	548	12	40	CTHLL	95	12-81	400	T	X	
K11	04	07N	12W	Ellisville	1964	245	550	12	50	CTHLL	65	07-64	569	P		
K13	13	07N	12W	Ellisville AFB	1960	365	450	6		CTHLM	195	08-80		U	X	
K31	05	07N	12W	Ellisville	1969	240	548	12	86	CTHLL	100	09-84	600	P	X	
K40	10	07N	12W	Hunt Oil Co	1981	210	546	3	42	CTHLL	70	12-81	75	Z		
K41	03	07N	12W	Ellisville	1982	250	562	12	45	CTHLL	163	09-84	350	P		293
K102	08	07N	12W	Ellisville State Sch	1929	212	552	8		CTHLL	56	01-49	260	U		
L38	31	07N	11W	J&P W A	1970	390	760	4	42	CTHLL	258	09-84	240	P	X	232
L39	31	07N	11W	J&P W A	1970	390	585	2	5	CTHLM	227	11-70	5			232
L42	31	07N	11W	J&P W A	1971	370	772	6	41	CTHLL	238	12-81	197	P		239
L45	09	07N	11W	Lifeway Farms	1983	200	290	4	15	CTHLM	120	11-73	90	U		
L50	18	07N	11W	Tideway Oil	1977	275	398	3	21	CTHLM	80	12-77	65	Z		
L51	31	07N	11W	J&P W A	1979	360	813	8	40	CTHLL	237	04-84	278	P	X	269
L52	08	07N	11W	American Quasar	1980	252	420	3	42	CTHLM	110	11-80	80	Z		
M1	06	07N	10W	U S Forest Serv	1964	280	111	2	20	CTHLU	65	06-64		R		
M2	06	07N	10W	U S Forest Serv	1965	280	640	4	30	CTHLL	100	11-65		R		

Table 2.--Records of selected wells in Jones County, Mississippi--Continued

Well No.	Location: Section	Location: Township	Location: Range	Owner	Date Drilled	Altitude (ft)	Well Depth (ft)	Casing Diam. (ft)	Screen Length (ft)	Aquifer	Water Level: Depth (ft)	Water Level: Date	Pump. Gal/min	Water Use	Analysis	Electric log
N12	11	06N	13W	Moselle W A	1968	300	754	8	54	CTHLL	154	04-84	150	P	X	137
N54	19	06N	13W	Pine Belt Airport	1972	290	165	4	20	HBRG	65	04-72	100	C		257
N63	11	06N	13W	Moselle W A (Test)	1972	280	807							U		252
N64	11	06N	13W	Moselle W A	1972	250	722	8	46	CTHLL	106	04-84	150	P		259
N69	20	06N	13W	Pine Belt Airport	1980	310	886	12	45	CTHLM	150	09-85	548	C		275
N70	08	06N	13W	Inexco Oil	1981	220	294	3	42	CTHLU	60	02-81	70	Z		
N107	14	06N	13W	P M Ikeler (#19 WSP576)	1916	225	525	4	80	CTHLM	28	08-19		Z	X	
O24	31	06N	12W	Masonite Corp	1970	312	167	2	5	HBRG	70	08-70	8	H		
P38	09	06N	11W	Conoco Oil	1979	201	500	4	42	CTHLM	100	08-79	70	Z		
P39	09	06N	11W	Continential Oil	1981	320	357	3	42	CTHLU	70	02-81	70	Z		
P40	27	06N	11W	B G Fortenberry	1984	325	420	3	42	CTHLU	125	01-84	60	Z		
Q4	18	06N	10W	J F Sumrall	1955	212	242	2		CTHLU	29	01-55		H	X	
Q108	18	06N	10W	Ovett	1929	175	212	2		CTHLU	+5	03-40	14	U	X	

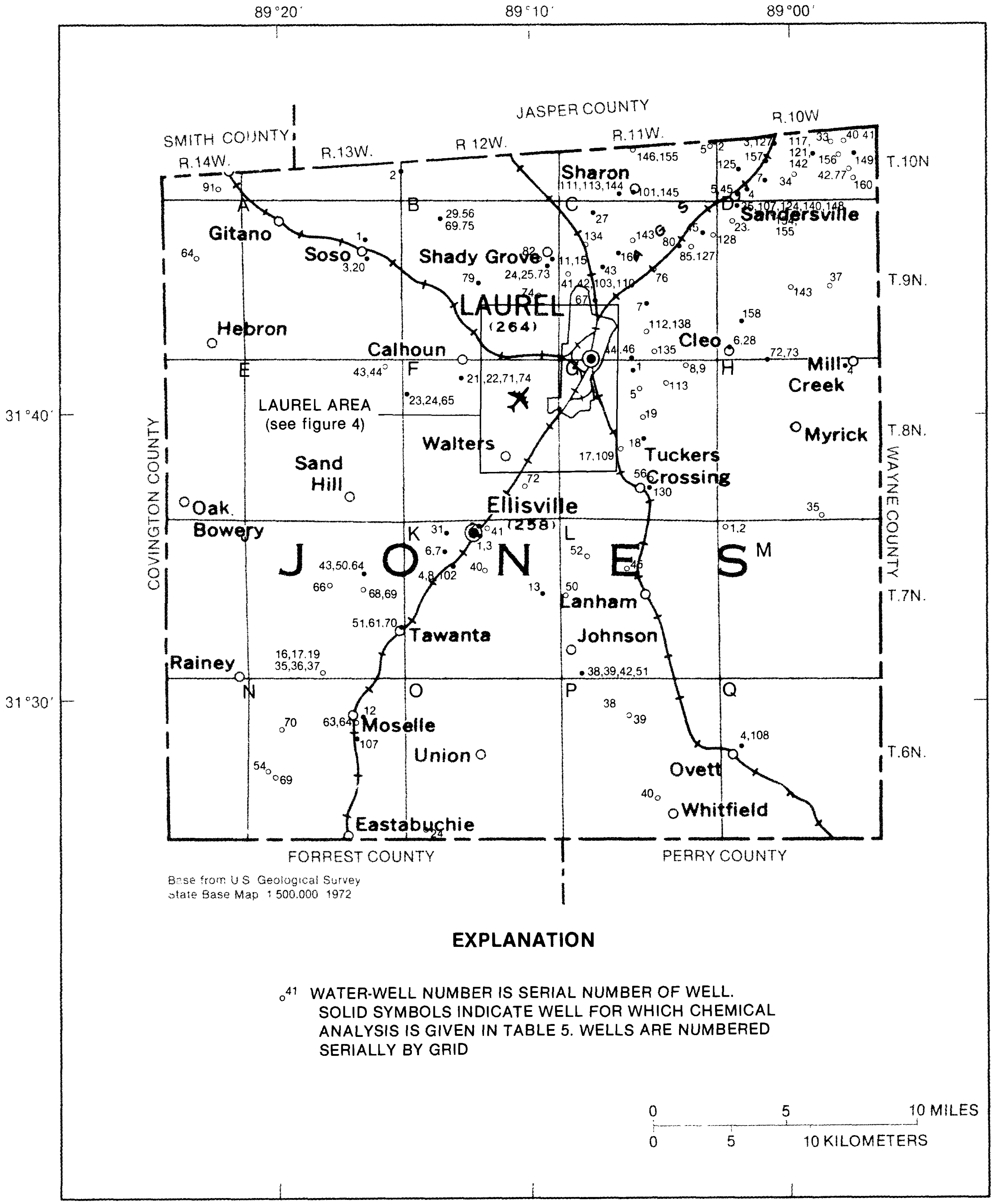

Figure 3.--Locations of selected water wells in Jones County.

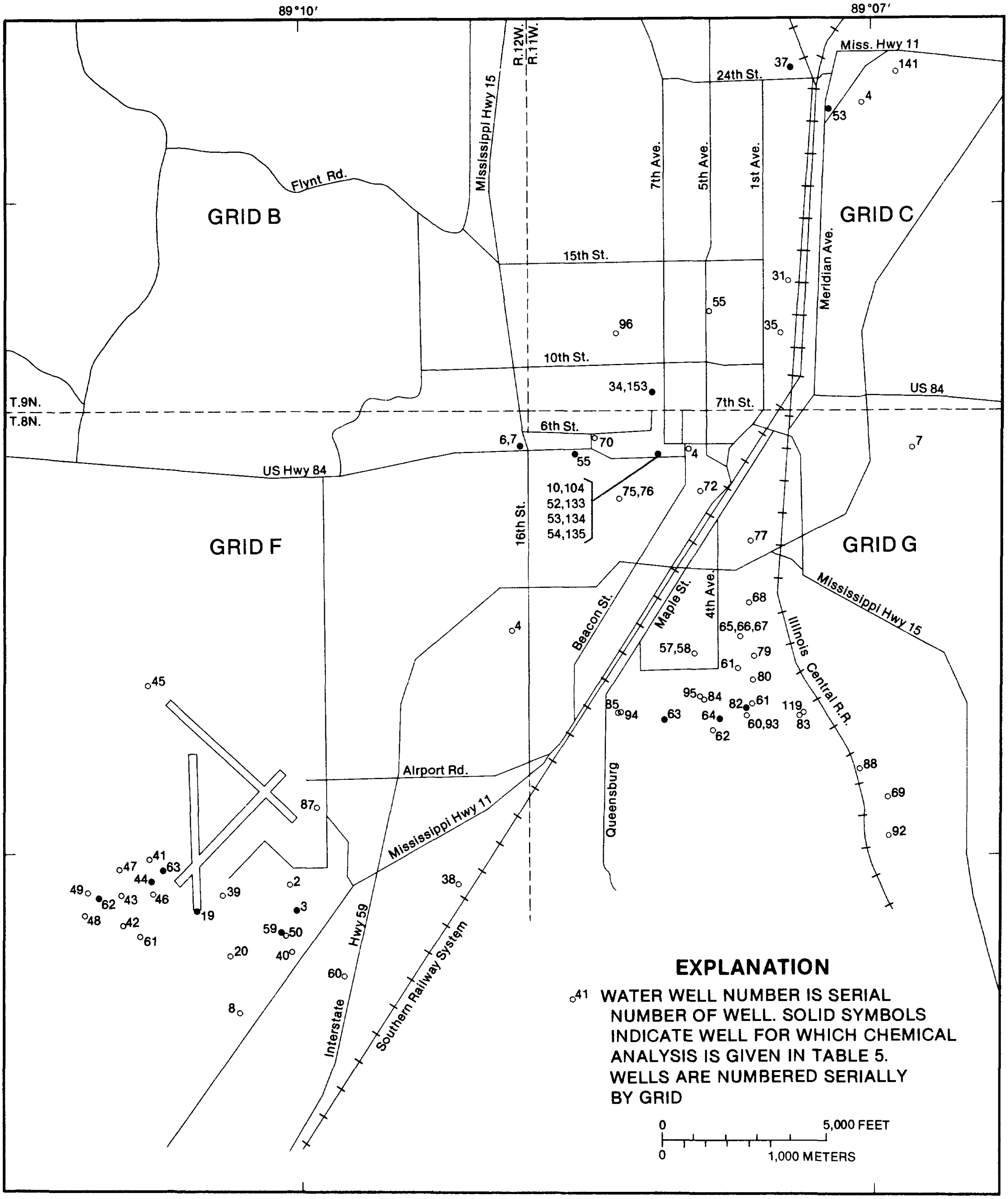

Figure 4.--Locations of selected water wells in the Laurel area.

The first industrial well reported was drilled in 1910; however, industrial water use was negligible until after 1926 when the first of several large industries began operations in the area.

Ground-water withdrawals were less than 1 Mgal/d until 1926 when industrial development began. G.F. Brown stated in an unpublished report that "in 1941 the city of Laurel pumped an average of 2,730,000 gallons per day throughout the year, the Masonite Corporation pumped an average of 4,520,000 gallons per day, and other industries pumped an average of 3,185,000 gallons per day. The Masonite Corporation continued pumping at the rate of 4.5 Mgal/d throughout 1942 and 1943 (E.G. Grady, written commun., 1943). The upper or "200 foot" (the middle Catahoula aquifer as used in this report) sand produced 7,590,000 gallons per day, and the lower Catahoula sand (aquifer) produced 2,845,000 gallons per day."

In 1955, about 7.8 Mgal/d was being produced (Mississippi Water Resources Policy Commission, 1955) and in 1966, about 12.5 Mgal/d was pumped (Shows and others, 1966).

According to Callahan (1976), total pumpage in Jones County in 1975 was about 21.6 Mgal/d, including 7.9 Mgal/d by municipalities (mostly by the city of Laurel) and 7.6 Mgal/d by self-supplied industries. Rural water systems produced 1.6 Mgal/d, and 2.1 Mgal/d was produced for thermoelectric power. About 2.4 Mgal/d was pumped for domestic, stock, and other uses.

Pumpage in the county declined by 1980 to about 14.8 Mgal/d of which 8.6 Mgal/d was for public supplies including 2.0 Mgal/d produced by rural water systems. Self-supplied industrial withdrawals decreased to 3.6 Mgal/d owing to operational changes (Callahan, 1983). In 1983, the city of Laurel produced an average of 5.5 Mgal/d, and in 1984, about 6.2 Mgal/d. In 1984 rural water systems in Jones County used about 2.9 Mgal/d. Table 3 summarizes ground-water use for Jones County in 1984.

GEOHYDROLOGY

Sediments exposed in Jones County are Oligocene to Holocene (Recent) in age. However, most of the exposed units in the county are Miocene deposits that are blanketed in a few places by the Citronelle Formation of Pliocene age or by much younger terrace or alluvial deposits. Units of hydrologic significance in the county that occur only in the subsurface are of Eocene and Paleocene age and comprise, in descending order, the Jackson, Claiborne, and Wilcox Groups (table 1).

Ground-water conditions in Jones County were described about 60 years ago by L.W. Stephenson and others (1928) as follows:

> The Catahoula sandstone, which increases in thickness from less than 100 feet in the northeast to perhaps 500 feet in the south, is the principal developed source of ground water. Large quantities of water are obtainable in places in the formation. The static level of the waters of the Catahouls is high enough in the southern part of the county to produce flowing wells in the lowlands that border some of the larger streams, such as Leaf River and Bogue Homo. Throughout the area of its outcrop the Catahoula is the source of small to medium-sized springs, most of which yield water of excellent quality for ordinary uses. The Hattiesburg clay, which overlaps the Catahoula in the south, is not regarded as a probable source of large quantities of water because of the impervious nature of the clay of which it is chiefly composed; but the formation contains some sandy layers and may be the source of some domestic water supplies in the area of its outcrop. The sand and gravel deposits that cap many of the hills of the area, and likewise the coarser sand and

Table 3.--Ground-water use in Jones County, 1984

(Average daily pumpage, in million gallons; A, areation; F, filtration; C, chlorination; Fl, fluoridation; CTHLL, lower Catahoula aquifer; CTHL, Catahoula Sandstone; CTHLM, Middle Catahoula aquifer; CCKF, Cockfield Formation; VKBG, Vicksburg Group; CTHLU, upper Catahoula aquifer)

	Ground Water			Treatment				
Owner	Domestic	Industrial	Total	A	F	C	Fl	Aquifer
			Municipalities and Institutions					
Ellisville	0.280	0.132	0.412			x		CTHLL
Ellisville State School		.263	.263			x	x	CTHLL
Laurel	3.923	2.258	6.181	x		x	x	CTHLL
Sandersville	.074	.013	.087			x		CTHL
			Water Associations and Companies					
Calhoun WA	.294	--	.294	x	x	x		CTHLL
Errata WA	.062		.062					CTHLL
Glade WA	.275	--	.275			x	x	CTHLL
Greater-Laurel	.004	--	.004			x		CTHLL
Hatten WA	.051	--	.051					CTHLL
J & P Utility	.378	--	.378			x		CTHLL, CTHLM
Matthews-Moss	.050	--	.050	x	x	x		CTHLL
Moselle WA	.135	--	.135			x		CTHLL
Myrick-Mill Cr	.191	--	.191			x		CTHLL
Oak Grove	.037	--	.037					CTHLM
Pendorf	.145	--	.145					CTHL
Pine WA	.031	--	.031					CTHLL
Pleasant Ridge	.347	--	.347	x	x	x		CTHLL
Powers WA	.168	--	.168			x		CTHLL
Shady Grove	.223	--	.223			x		CTHLL
Sharon WA	.181	--	.181			x	x	CTHLL, CCKF
Soso	.109	--	.109			x		CTHLL
Southwest Jones	.185	--	.185[a]					CTHLL
			Self-supplied Industrial					
Masonite Co.	--	2.530	2.530			x		CCKF, CTHLM
Southland Oil	--	.150	.150					CCKF
Trans-continental	--	.002	.002					VKBG
South Miss. Power Electric	--	1.620	1.620					CTHLU
Total	7.143	6.968	14.111					

a Wells are in Covington County

gravel that form the base of the terrace deposits which border the streams, are doubtless the source of springs and of the water obtained in some of the shallow dug and bored wells."

The description remains valid although water-level declines have reduced the areas of artesian flow and modern data show the Catahoula Sandstone to be somewhat more than 500 feet thick.

The southward-dipping Miocene sediments contain freshwater throughout Jones County. The deepest freshwater (water containing less than 1,000 mg/L of dissolved solids) occurs at depths ranging from about 700 feet below sea level in the Sparta aquifer system in extreme northeastern Jones County to about 600 feet below sea level in the Catahoula Sandstone in the southwestern part. In the southern one-half of the county, the average depth to the base of freshwater is about 500 feet below sea level. Ground water also occurs in shallow water-table aquifers in most places; however, the deeper confined (artesian) aquifers are the source of ground water for all public and industrial water supplies.

Recharge to the confined aquifers occurs throughout Jones County where the permeable sand outcrops are exposed at the surface to precipitation or are hydraulically connected to overlying younger water-bearing strata. Water from the uppermost unconfined (water table) aquifers is discharged into the larger streams or moves into the confined aquifers. The lower and middle Catahoula aquifers, principal sources of water at Laurel, are recharged in the area extending from the northern part of the city to about 8 miles north of the city.

The direction of ground-water movement in the confined aquifers originally was southward, coinciding with the dip of the strata. However, ground-water movement in Jones County is now from all directions into the cone of depression caused by long-term pumping for public and industrial water supplies in the Laurel area.

The most extensive aquifers in the Jones County area are sand beds in the Miocene deposits, primarily the Catahoula Sandstone. The Catahoula aquifers form the lower part of the Miocene aquifer system (Newcome, 1975). The Paynes Hammock Formation and the Chickasawhay Limestone, of Oligocene age, underlie the Catahoula and do not include significant water-bearing beds. Of minor importance as an aquifer is the Glendon Formation of the Vicksburg Group, a part of the Oligocene aquifer system. Aquifers in the Cockfield Formation and Sparta Sand underlie and are separated from the Oligocene aquifer system by several hundred feet of relatively impermeable strata that are mostly clay. Water-bearing strata also occur below the Sparta Sand; however, in Jones County these strata contain freshwater only in the extreme northeast.

The rate of dip of the Glendon Formation is southwesterly at about 40 feet per mile (fig. 5). Assuming that the Miocene and Eocene beds have about the same dip, a specific stratum or aquifer in these beds will be about 100 feet deeper for each 2½ miles of site displacement southwestward (assuming that site altitudes are the same).

Miocene Aquifer System

Freshwater in the Catahoula Sandstone in Jones County extends to depths ranging from about 100 feet above sea level in the northeastern part of the county to more than 600 feet below sea level in the southwest. The water-bearing Hattiesburg Formation overlies the Catahoula in the southern part of Jones County and extends southward. All water-bearing strata in both formations are included in the extensive Miocene aquifer system.

The principal Miocene aquifers tapped by public and industrial water-supply wells in the Laurel area occur in the Catahoula Sandstone at depths of about 200 and 400 feet. In this study these strata are referred to as the middle and lower Catahoula aquifers, respectively. The upper Catahoula aquifer crops out south of the Laurel area and extends farther southward in the subsurface.

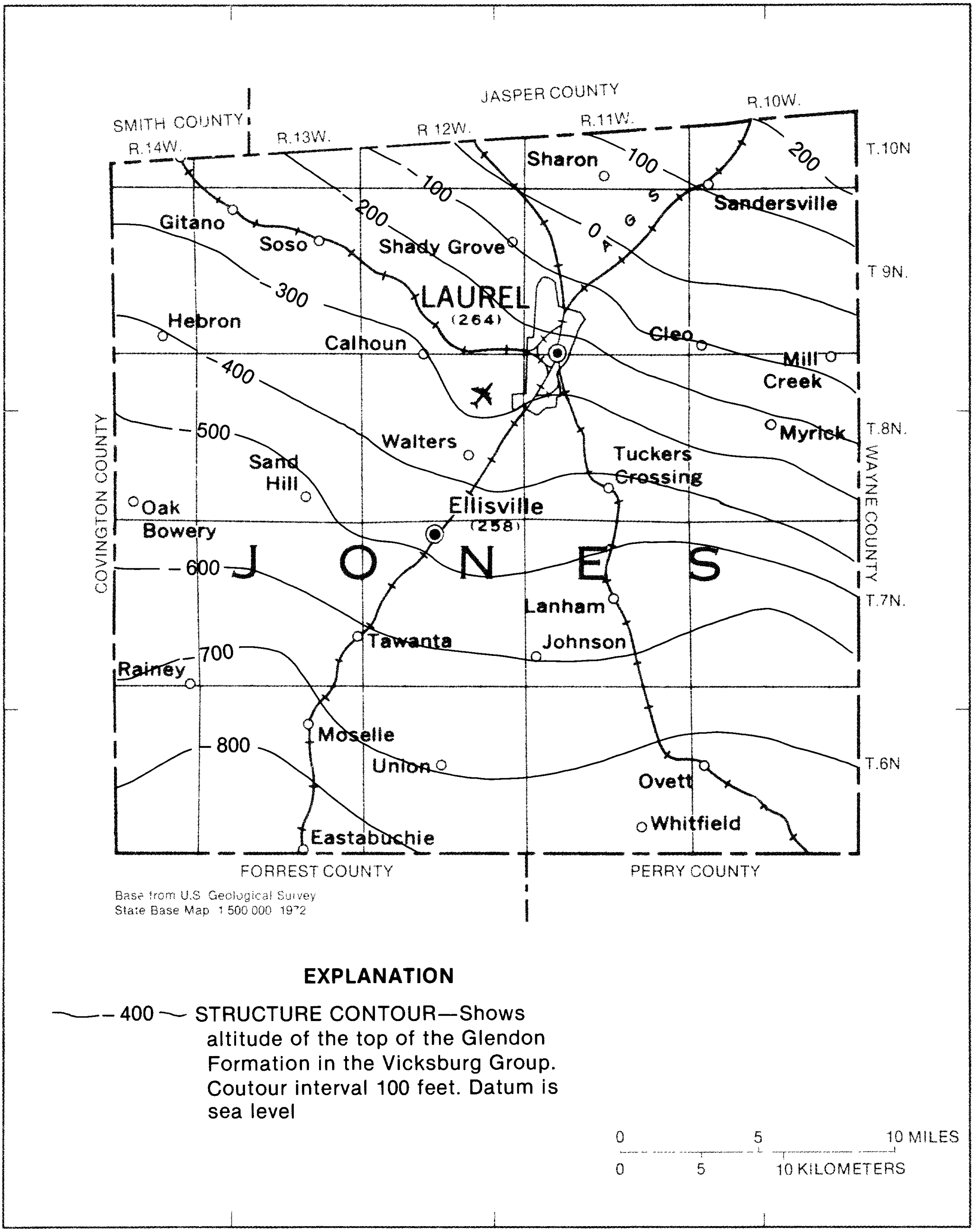

Figure 5.--Configuration of the top of the Glendon Formation in Jones County.

A typical geophysical log (fig. 6) shows the base of the sand that forms the middle Catahoula aquifer (200-foot sand) at about 250 feet and the base of the lower Catahoula aquifer (400-foot sand) at about 480 feet. Although the formation was named the Catahoula Sandstone, it commonly contains as much as 50 percent clay (fig. 6) and the aquifers differ in thickness and lithology throughout the area (figs. 7, 8, and 9). The two zones constitute two separate Catahoula aquifers in the Laurel area and the upper Catahoula forms a third aquifer to the south. The base of the upper Catahoula aquifer, which crops out at and south of Laurel, is 400 to 500 feet above the top of Glendon Formation.

Because the Catahoula sand strata in the Laurel area vary considerably in thickness and hydraulic characteristics, the probability of making a large-capacity water well in any zone at a specific site cannot be accurately predicted. In the lower Catahoula aquifer for example, test drilling in the Laurel airport area for a new municipal well field resulted in 19 test holes for seven successful well sites. Test drilling at the Masonite Corporation in the southeastern part of Laurel found the lower Catahoula aquifer to be poorly developed in that area. In the southern part of the county the Tatum Limestone Member occurs in the Catahoula Sandstone and apparently makes a transition northward into sand and clay (fig. 9). The transition from marine to fluvial and deltaic sediments may be a factor in the extremely variable character of the lower Catahoula aquifer. Drillers logs and geophysical logs for wells outside the Laurel area indicate that all zones may be locally hydraulically connected and ultimately merge into the regional Miocene aquifer system.

Maps depicting configuration and altitude of the bases of the sand zones are impractical owing to the extreme differences in the thickness and position of sand beds throughout the formation. Complete penetration of the water-bearing zones during test drilling can be ensured by estimating test hole depths based on the altitude of the Glendon Formation (fig. 5). The base of the lower Catahoula aquifer zone averages about 100 feet above the top of the Glendon; the base of the middle Catahoula aquifer and the base of the upper Catahoula are about 250 feet and about 400-500 feet above the top of the Glendon, respectively.

The results of aquifer tests indicate that aquifers in the Miocene aquifer system that underlie the southern part of Mississippi are among the most permeable in the State (Newcome, 1971, p. 6). The average hydraulic conductivity for 21 aquifer tests made using wells in Jones County was 90 ft/d [680 (gal/d)/ft^2] -- near the average for Miocene aquifers in Mississippi (Newcome, 1971, p. 17). Transmissivity (T) values, a function of aquifer thickness and hydraulic conductivity, range from 600 ft^2/d [4,500 (gal/d)/ft] to 10,000 ft^2/d [75,000 (gal/d)/ft], averaging about 6,000 ft^2/d [45,000 (gal/d)/ft]. In the Laurel area, average hydraulic conductivity values are 85 ft/d [640 (gal/d)/ft^2], slightly lower than average (table 4).

The highest yielding wells screened in the Catahoula aquifers each produce about 1,600 gal/min (fig. 3, wells J35, J36, and J37). The wells, located in the southwestern part of the county, are screened in the upper Catahoula aquifer whereas large wells in the central and northern parts of the county are screened in the middle and lower Catahoula aquifers (figs. 8 and 9). Wells in the Laurel area commonly produce 400 to 800 gal/min.

By 1940, water levels in the middle Catahoula aquifer had declined to about 100 feet above sea level in the industrial area in the southeastern part of the city (fig. 10). Mr. E.G. Grady, formerly with the Masonite Corporation, reported to the Industrial Water Conference in 1955 that "the static level of the aquifer dropped from minus 38 feet (181 feet above sea level) in 1926 to minus 130 feet (89 feet above sea level) during 1941 and 1942. Since then it has varied from 116 to 124 feet (103 to 95 feet above sea level). We feel that equilibrium has occurred due to the fact that our usage has dropped from 5.8 to 3.7 million gallons per day * * *." Water levels in the Masonite well field have in fact continued to

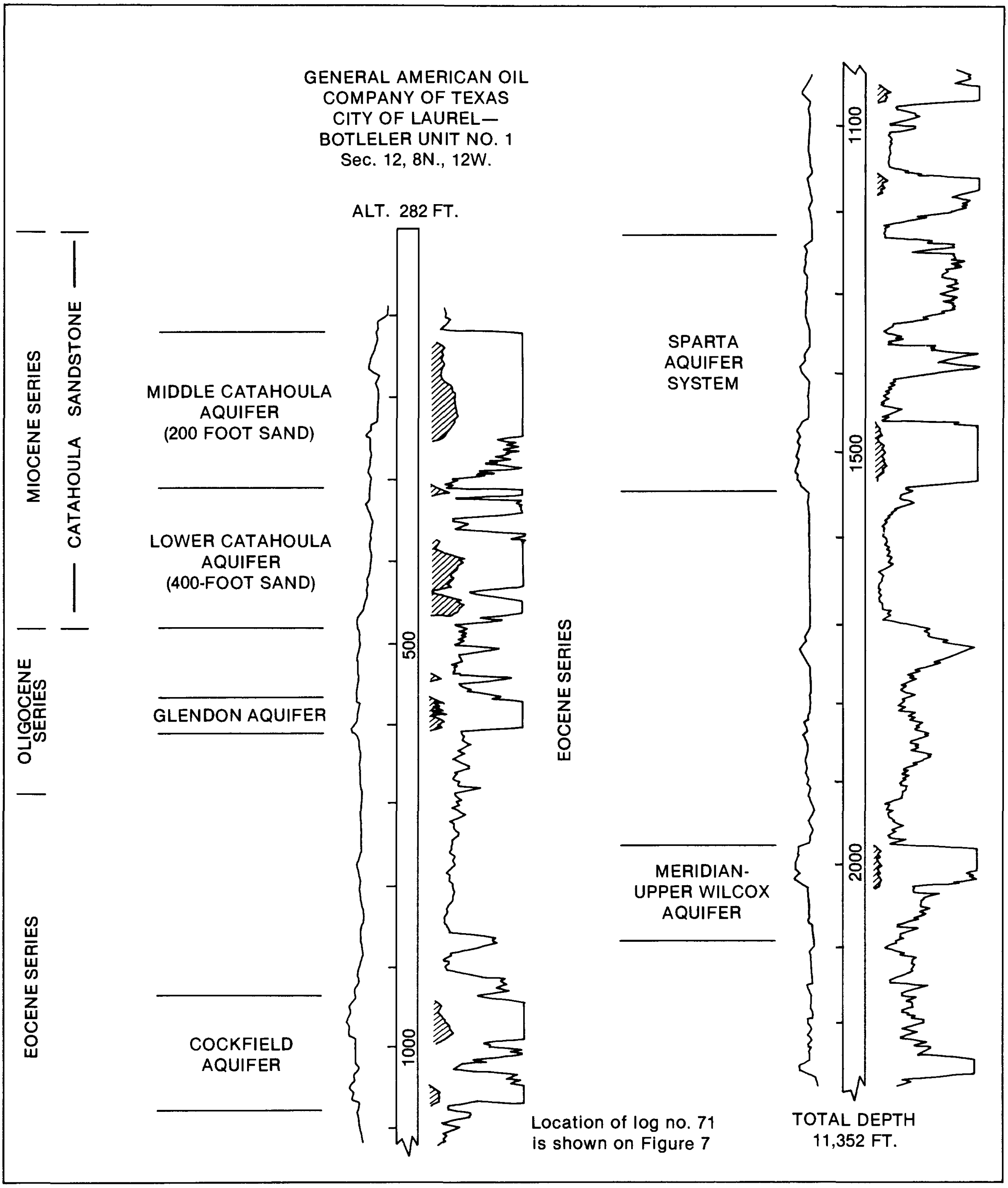

Figure 6.--Geophysical log showing stratographic units and aquifers in the Laurel area.

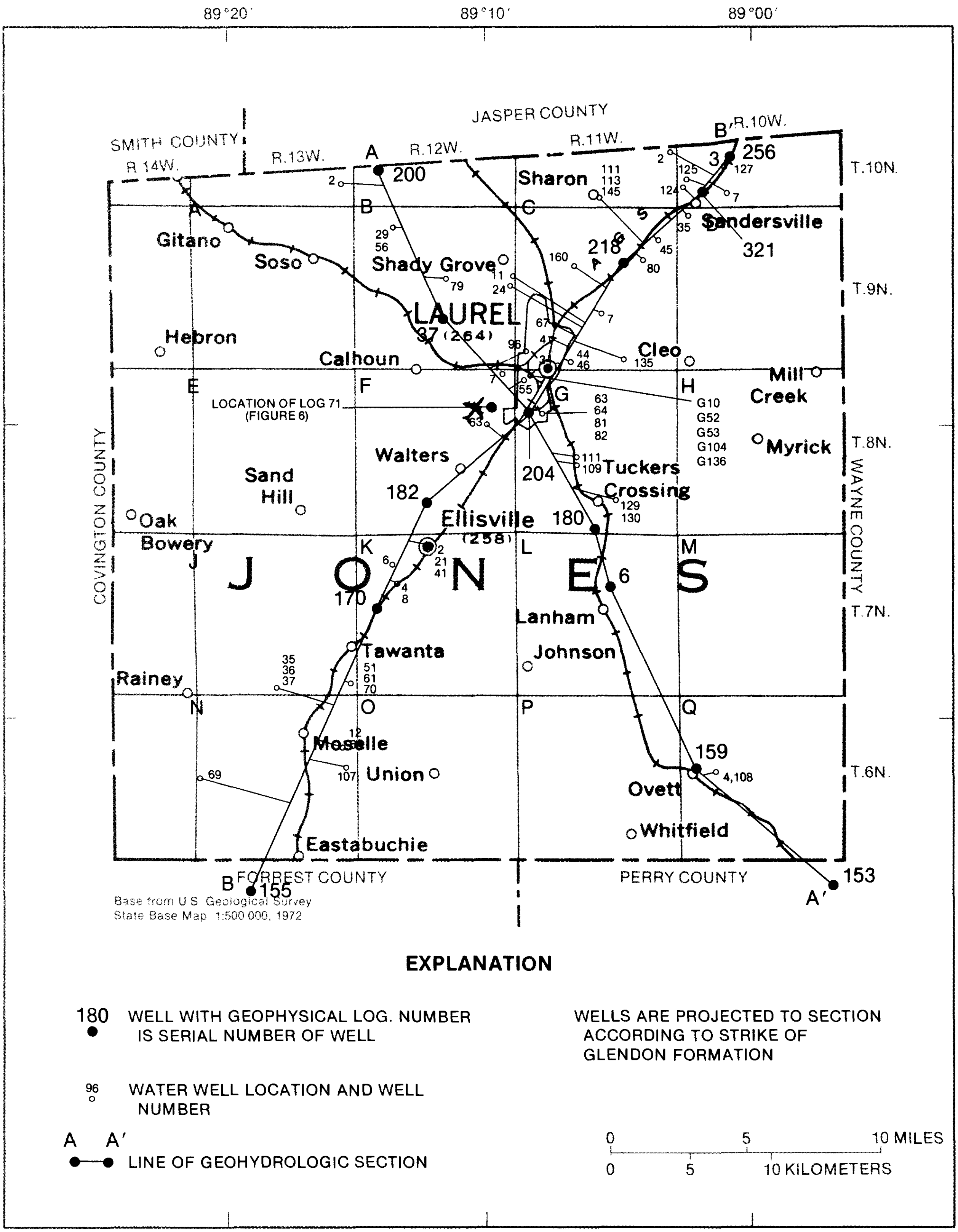

Figure 7.--Locations of geohydrologic sections A-A' and B-B'.

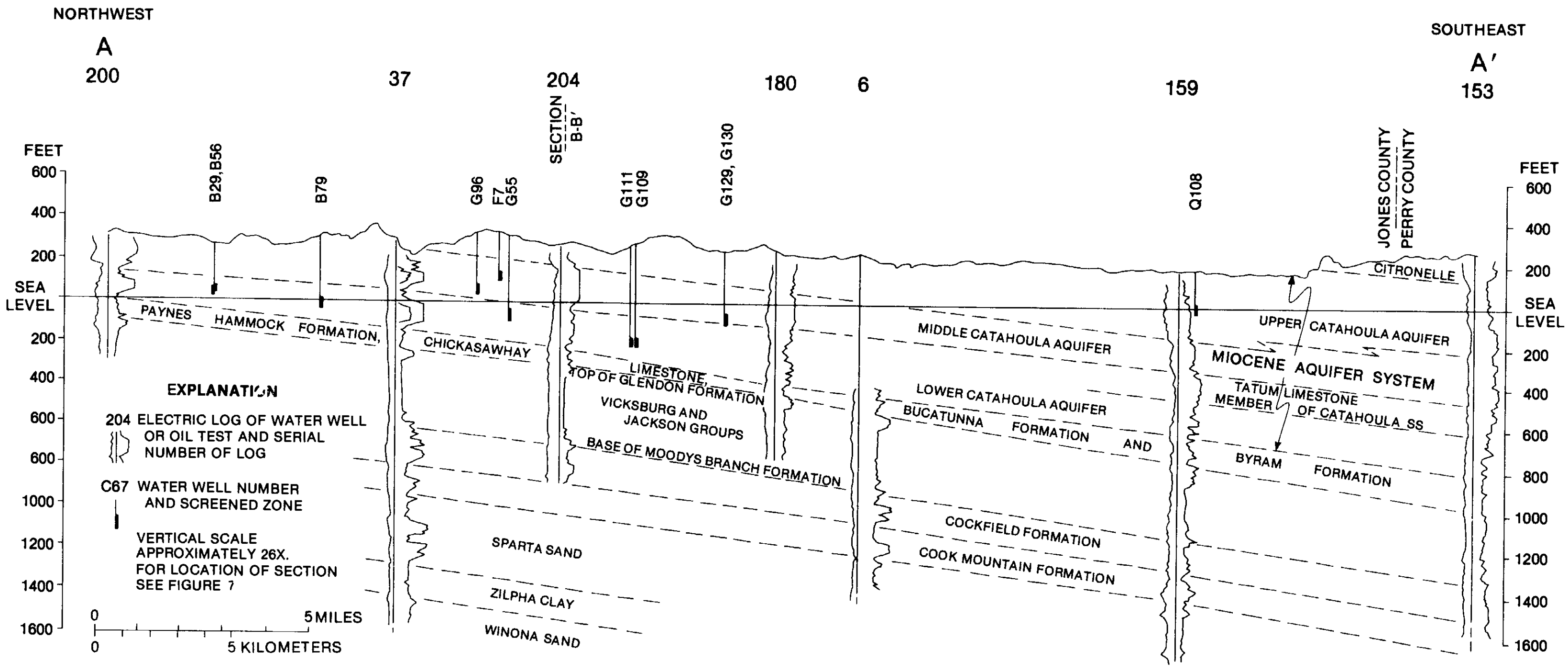

Figure 8.--Geohydrologic section A-A′.

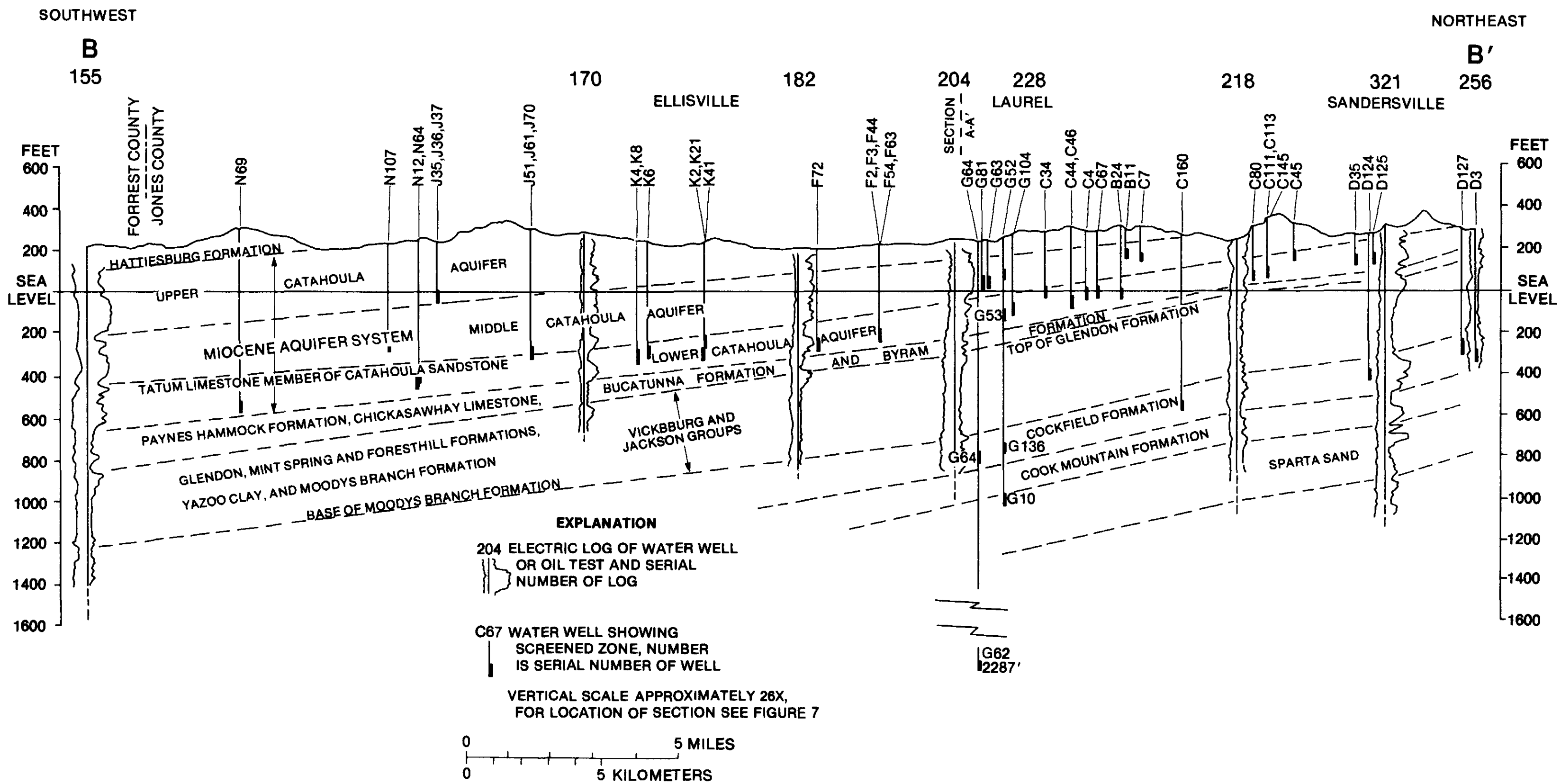

Figure 9.--Geohydrologic section B-B′.

Table 4.--Summary of aquifer tests in Jones County

(Modified from Newcome, 1971; CTHLL, lower Catahoula squifer; CCKF, Cockfield Formation; CTHLM, middle Catahoula aquifer; CTHLU, upper Catahoula aquifer; ft, feet; hrs, hours; gal/min, gallons per minute; (gal/min)/ft, gallons per minute per foot; ft^2/d, feet squared per day; ft/d, feet per day)

Well no.	Owner	Date	Depth (ft)	Aquifer	Aquifer thickness (ft)	Screen length (ft)	Pumping period (hrs)	Test yield (gal/min)	Specific capacity (gal/min)/ft (1 day)	Stor. coefficient	Transmissivity (ft^2/d)	Hydr. conductivity (ft/d)
A3	Soso Community	8-65	470	CTHLL	120	--	8	162	6.8	--	10,000	84
B24	Shady Grove W A	8-65	370	CTHLL	50	30	8	162	5.5	0.0002	9,300	180
B25	Shady Grove W A	8-65	360	CTHLL	50	30	8	166	12	.0002	9,300	180
C44	Powers W A	7-65	385	CTHLL	50	45	8	225	12	--	8,000	160
C46	Powers W A	4-66	365	CTHLL	63	35	1	204	4.3	--	7,300	110
C67	Laurel	8-65	322	CTHLL	70		4	950	29.3	--	9,600	130
D72	Myrick-Mill Cr	11-66	347	CTHLL	84	30	2	165	5.8	.0003	3,600	42
D73	Myrick-Mill Cr	11-66	352	CTHLL	84	30	1	170	7.8	.0003	3,600	42
D117	Beaver Meadow	5-71	612	CCKF	60	35	1	100	1.6	--	1,000	17
D125	Sandersville	1-72	182	CTHLL	44	40	5	250	8.2	--	4,600	100
F7	Laurel C C	10-64	246	CTHLM	40	30	6	290	7.4	.001	5,800	140
F20	Laurel Airport	10-65	466	CTHLL	54	60	7	832	15	.0003	4,200	79
F21	Calhoun W A	4-66	498	CTHLL	54	30	1	137	11	.0002	7,300	130
G17	Glade W A	7-65	475	CTHLL	30	20	2	120	.8	--	640	21
G18	Glade W A	7-65	529	CTHLL	40	30	505	120	1.0	--	600	14
G68	Masonite Corp	12-64	409	CTHLL	59	60	24	361	6.5	--	2,200	38
G55	Laurel	2-64	405	CTHLL	70	60		480	14	--	4,500	64
G104	Laurel	2-64	396	CTHLL	100	45	5	860	8.6	.0003	5,800	58
J17	Sou Miss Power	6-68	230	CTHLU	100	20	4	100	4.5	--	8,800	88
J50	Pine W A	8-71	675	CTHLL	44	40	5	250	8.2	--	4,600	100
K11	Ellisville	12-64	550	CTHLL	80	50	2	400	12	.0002	5,300	66

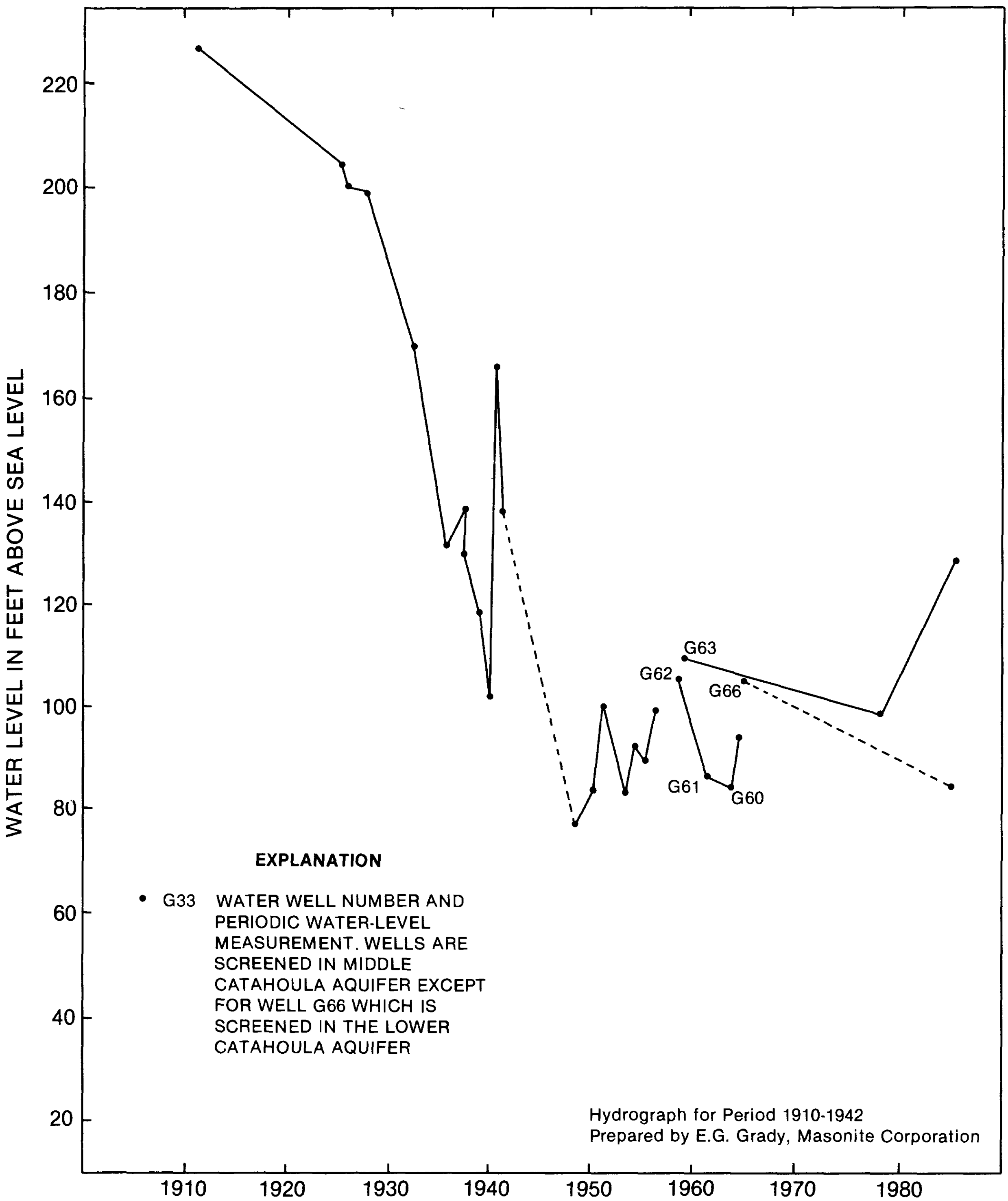

Figure 10.--Water-level trends in the middle Catahoula aquifer, 1910-85.

fluctuate in the 80 to 100 feet above sea level range, indicating that the aquifer is capable of yielding about 4 Mgal/d in the area and confirming Mr. Grady's opinion.

Water-level declines in the lower Catahoula aquifer, the source of the municipal water supply, were not severe by 1940 but were sufficient to cause concern. As a result, the U.S. Geological Survey was asked in 1940 to investigate ground-water conditions in the area.

Water-level measurements made in 1941 showed a well-developed cone of depression in the middle Catahoula aquifer in the southeastern part of the Laurel area and a shallower cone in the lower Catahoula aquifer centered at the Laurel water plant (fig. 11), reflecting the effects of withdrawals of nearly 6 Mgal/d and 3.5 Mgal/d, respectively.

Water levels in the Laurel city water-plant area in the lower Catahoula aquifer declined from about 200 feet above sea level in 1920 to about 70 feet above sea level in 1985. The water level in well G104, near the old downtown water plant declined from about 135 feet above sea level when drilled in 1938 to a low of about 78 feet in 1941, and ranged from 80 to 105 feet above sea level until 1956. The shape of the 1972 cone of depression (fig. 12) in the lower Catahoula aquifer was altered by pumping from a new well field in the airport area south of the city. In 1984 the shape of the cone changed owing to a resumption of pumping in the central and northern part of the city (fig. 13). Figure 14 presents hydrographs for observation wells in the Catahoula aquifers as well as other aquifers in Jones County.

The lowest water levels measured in 1984 were in wells in the Laurel Airport well field. A well in the lower Catahoula aquifer (F20) at the airport well field, an area where the static level was 200 feet above sea level in 1942 (well F2, table 2), showed a declining trend from about 177 feet above sea level when drilled in 1965 to about 50 feet above sea level in 1984 (fig. 14), an average decline of nearly 7 feet per year. The decline since 1975 has been small, and recent measurements indicate some recovery due to a change in pumping distribution. The deepest recorded water level in the Laurel area (198.4 feet below land surface in August 1981 in the lower Catahoula aquifer in well F20) shows the pronounced effect of pumped well interference in the airport well field.

Water levels in industrial wells screened in the middle Catahoula aquifer in the southeastern part of the city remained virtually stable until about 1979 (fig. 10). Because of recent changes in operation that included more efficient use of water, extensive recycling of water, and a reduction in withdrawals to about 1.5 Mgal/d, water levels had recovered to about 130 feet above sea level (well G63) in July 1985--about 45 feet higher than the level in the lower Catahoula aquifer (fig. 10, well G66).

Water levels in the lower Catahoula aquifer have continued to decline at a rate of about 3.7 feet per year in the Laurel area and the cone of depression has expanded areally (figs. 12 and 13). The expansion is attributed to changes in the distribution of withdrawals and to a continuing adjustment of the potentiometric surfaces. If withdrawals continue in the same pattern and at about the same rate, the cone of depression will expand at a slow rate and this decline will persist. The principal expansion of the cone has been to the southwest because (1) the source of recharge is to the north, (2) the water-bearing sand beds are thicker to the west, and (3) water-levels in the southwest have declined as a result of withdrawals in the airport well field since 1973.

Oligocene Aquifer System

The Oligocene aquifer system (Gandl, 1979) is the source of water for low-yielding (less than 50 gal/min) wells in the northeastern part of Jones County. The water-bearing stratum is the Glendon Formation of the Vicksburg Group (fig. 5). In adjoining Wayne County, the Glendon is composed of "Hard ledges of limestone interbedded with gray to greenish-gray marl" that exhibits "horsebone" weathering (May, 1974, p. 77). The stratum, locally referred to as "honeycomb rock" (Shows and others, 1966), is water bearing as a result of weathering and dissolution by ground water. Although the

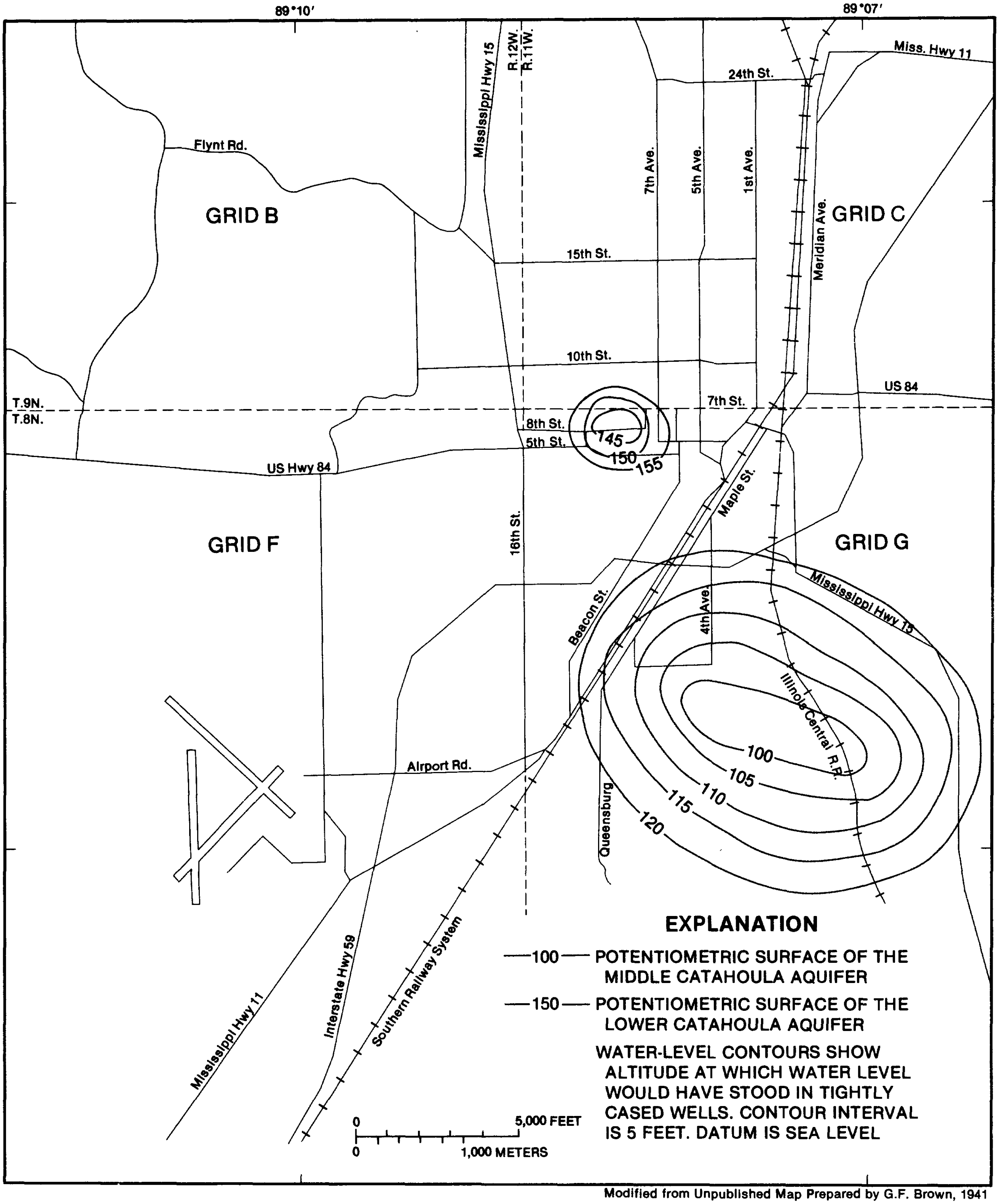

Figure 11.--Potentiometric surface in pumping centers in the middle and lower Catahoula aquifers in Laurel, 1941.

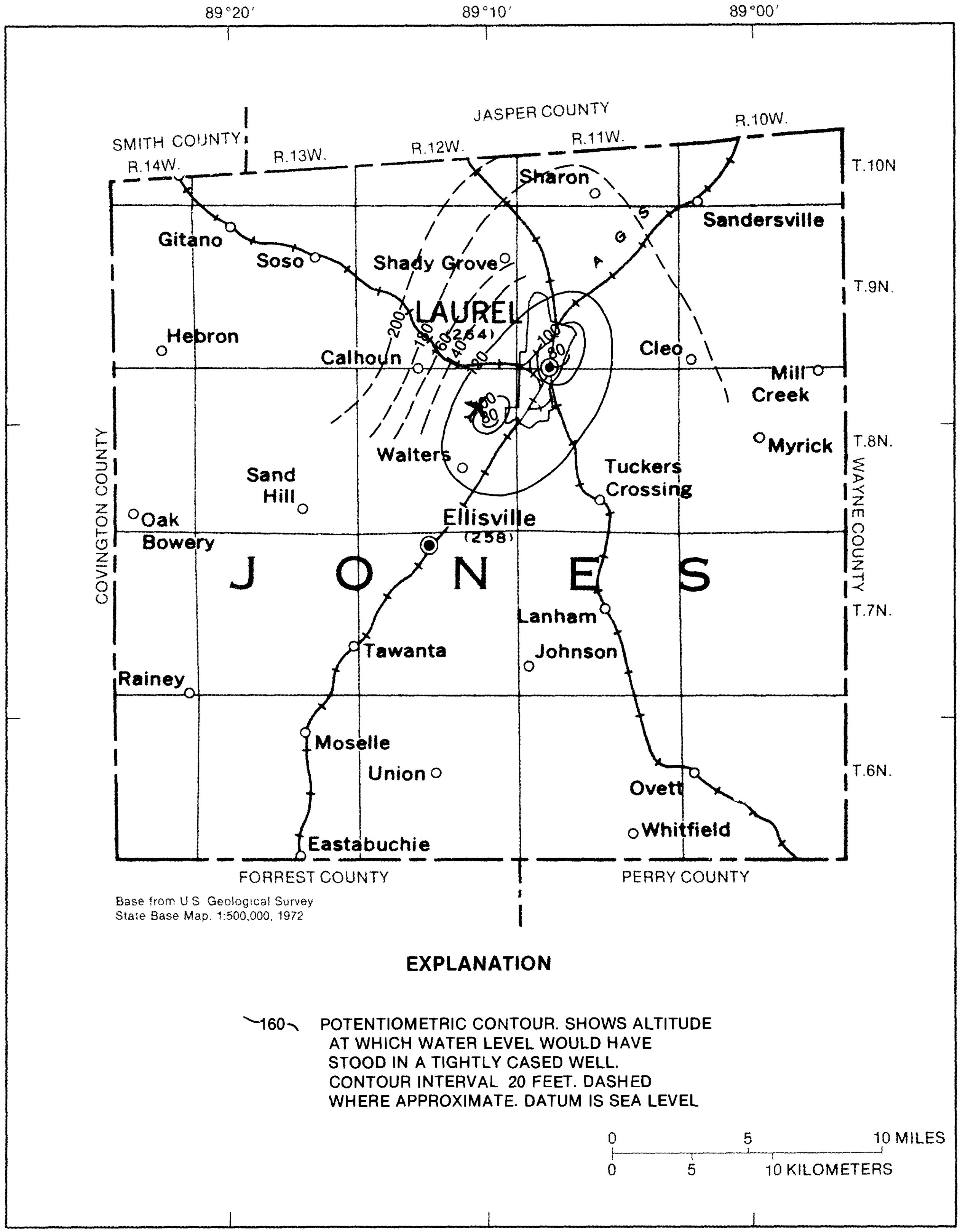

Figure 12.--Potentiometric surface in pumping centers in the lower Catahoula aquifer in the Laurel area, 1972.

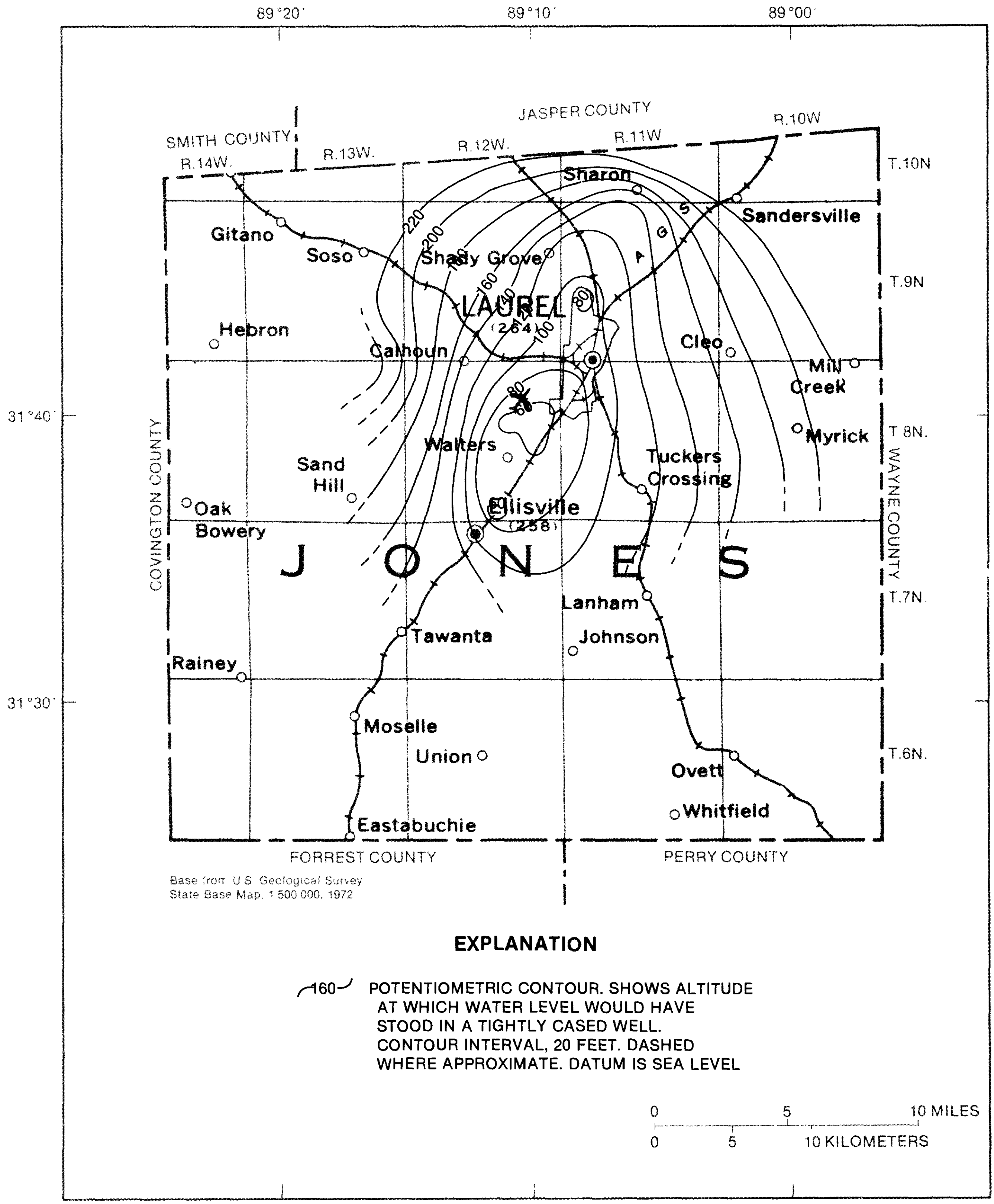

Figure 13.--Potentiometric surface in a pumping center in the lower Catahoula aquifer in the Laurel area, April 1984.

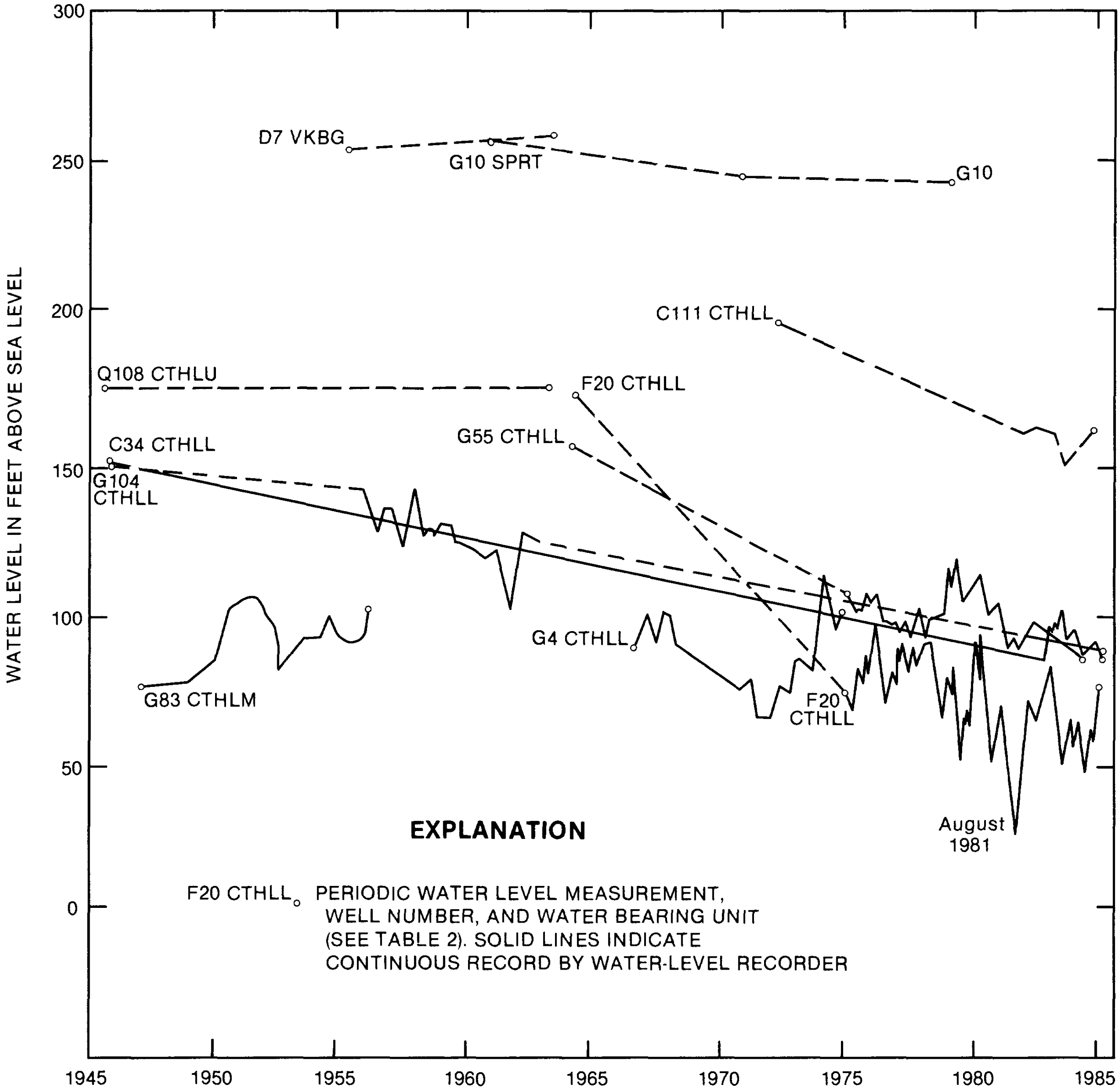

Figure 14.--Water-level trends in Jones County, 1945–85.

aquifer is characterized by low yields to wells, the acceptable quality of the water contributes to the utilization of the water by small users.

The Vicksburg Group is exposed at the surface in very small areas in extreme northeast Jones County. The Glendon averages about 25 feet in thickness and occurs at depths of about 100 feet above sea level at Sandersville and about 200 feet below sea level along a line trending northwest-southeast through Laurel.

Pumping has not noticeably affected water levels in the aquifer in Jones County. Water-bearing strata, known as the Vicksburg aquifer, that occur locally in the upper part of the Vicksburg Group above the Glendon Formation in Wayne County (May, 1974) have not been recognized in the subsurface in Jones County. The Chickasawhay Limestone and the Paynes Hammock Formation are not recognized as aquifers.

Eocene Aquifers

The Sparta aquifer system (Newcome, 1976) and the Cockfield aquifer (Spiers, 1977a) contain freshwater in the northern part of Jones County, slightly saline water in the central part, and moderately saline water in the southern part (figs. 15 and 16). Both aquifers are capable of yielding several hundred gallons per minute to wells; however, the use of water is limited because of high dissolved-solids concentrations and color. The Cockfield is the source for three industrial water wells in Laurel and for several rural water system wells in the northeastern part of the county. The Sparta, at present, is a potential source of supplemental water.

The water level in the Cockfield aquifer at Laurel was about 165 feet above sea level in well G64 in 1985. The reported level in a nearby well (G93) indicates that water levels have not changed significantly since 1963. Stephenson and others (1928, p. 253) reported the water level in a 1,000-foot well (F136) at the old water plant to be 14 feet above land surface (286 feet above sea level) in 1914. This measurement indicates a very large water-level change by 1945.

The water level in well G10 in the Sparta aquifer system was 4 feet below land surface in 1920. Periodic measurements since 1962 show that the level declined about 35 feet (2.4 ft/yr) during the period 1963-78 (fig. 14). Because water from the Sparta is not used in Jones County, the water-level decline in the Sparta is the result of regional withdrawals.

The Meridian-Tallahatta aquifer (Spiers, 1977b) is not a significant aquifer in Jones County. The Meridian-upper Wilcox aquifer (Boswell, 1976) contains slightly saline water in the extreme northern part of the county (Gandl, 1982), but it is not capable of large yields to wells. The lower Wilcox aquifer of Paleocene age (Boswell, 1975), which would be capable of large yields to wells, contains slightly saline to moderately saline water in the same area (Gandl, 1982).

WATER QUALITY

Freshwater Aquifers

The aasessment of water-quality conditions of major aquifers in Jones County is based on the results of water-quality data from 61 wells screened in the lower, middle, and upper Catahoula aquifers, and from 15 wells in the Vicksburg, Cockfield, and Sparta aquifers (table 5). Data are not available to describe adequately the water quality of the Citronelle and Hattiesburg aquifers in Jones County; however, these aquifers are not extensively used as sources of water supplies in the county.

Water in the major aquifers is usable for most purposes. Concentrations of most common constituents and properties of water do not exceed criteria established by the Environmental Protection Agency (U.S. Environmental Protection Agency, 1986b, 1986c). A summary of selected water-quality data is given in table 6.

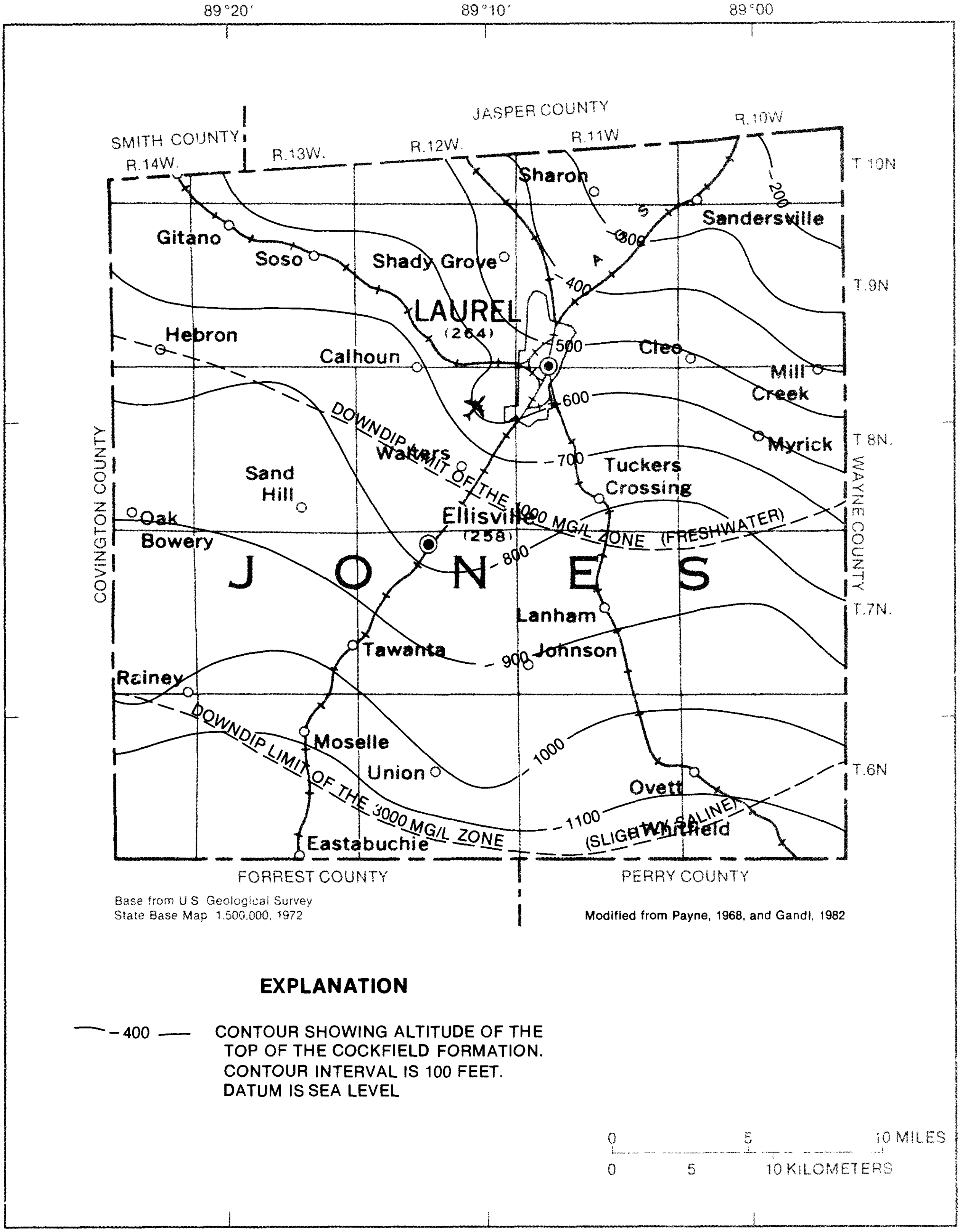

Figure 15.--Configuration of the top and the distribution of salinity in the water-bearing zones of the Cockfield Formation.

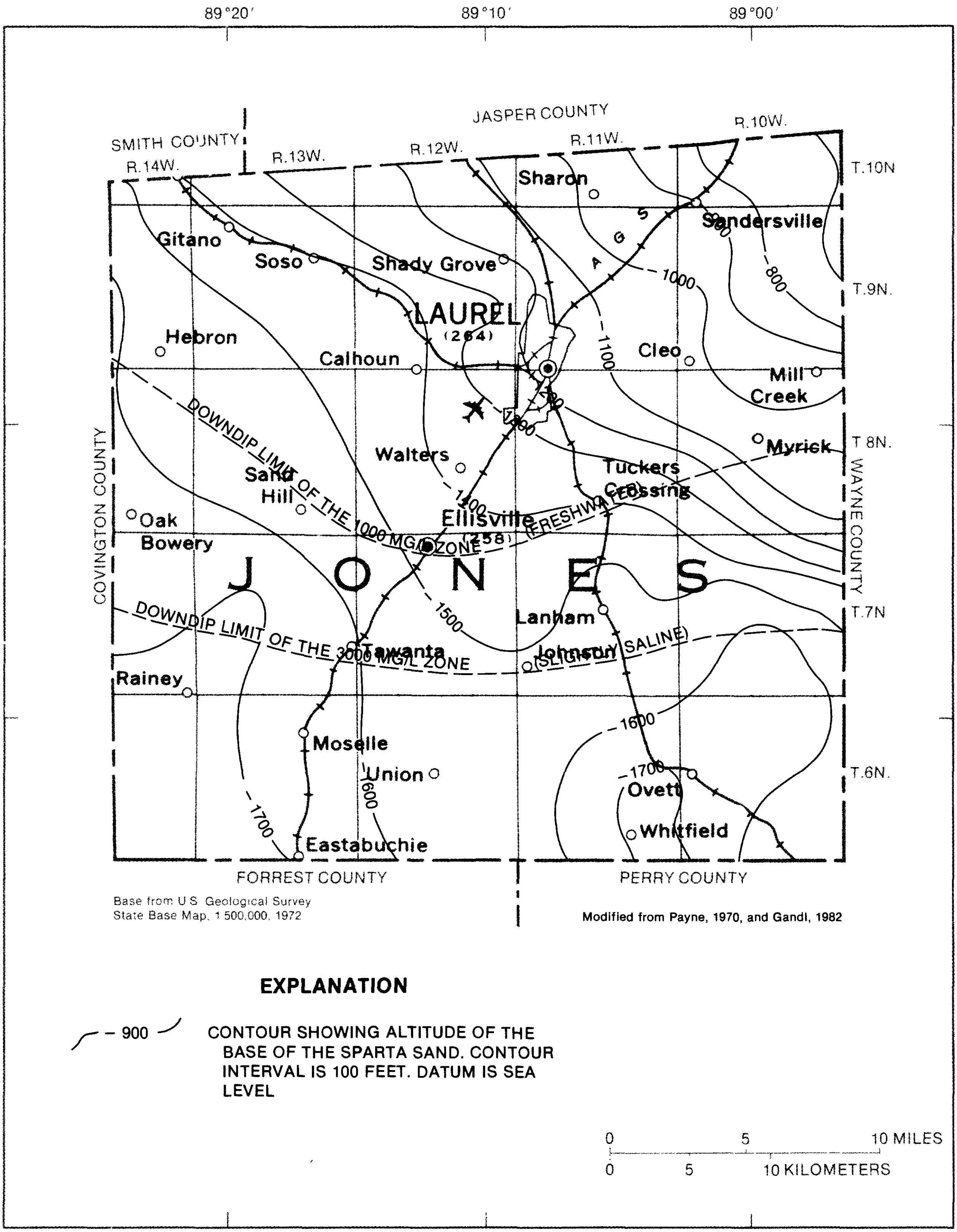

Figure 16.--Configuration of the base and distribution of salinity in the water-bearing zones of the Sparta Sand.

Table 5.--Water-quality data for selected wells in Jones County
(milligrams per liter except as indicated)

Well no.	Well depth (ft)	Date	Silica (SiO_2)	Total iron[a] (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Alkalinity (as $CaCO_3$)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness (as $CaCO_3$)	Specific conductance (microseimens at 25°C)	pH (standard units)	Color (platinum-cobalt units)
A001	46	5/55	--	1.20	4.4	2.0	2.1	0.8	18	0.6	4.0	--	50	19	56	6.8	20
A002	350	11/67	11	.03	2.9	.7	4.2	.7	2	.2	4.9	0.0	43	10	49	5.3	--
A003	470	8/65	56	.10	1.6	.0	19	1.5	30	12	1.8	.0	115	4	104	6.3	0
A020[b]	405	3/70	--	1.00	1.2	1.0	12	4.5	20	11	7.0	.0	53	7	--	5.9	--
B011	120	7/55	--	2.10	1.9	1.7	2.8	--	10	3.0	2.5	--	35	12	31	5.9	1
B015[b]	384	12/80	--	<.10	--	--	104	--	177	19	38	.9	280	8	--	--	5
B024	370	8/65	21	.03	3.5	1.5	85	3.0	185	11	1.8	.7	246	15	383	7.5	0
B029	336	11/67	47	5.10	7.1	4.2	14	3.6	53	9.8	2.2	.2	117	35	132	6.6	5
B075[b]	314	1/81	--	.45	8.0	2.9	14	--	22	30	11	.1	82	32	--	5.8	--
B079[b]	392	3/82	--	.40	4.0	2.4	23	2.4	42	2.1	18	.1	76	20	--	--	--
C002	235	5/55	17	.67	8.9	3.6	12	3.0	51	11	3.2	--	112	37	138	6.9	20
C007	158	5/55	--	2.40	7.9	2.0	2.0	.3	28	1.0	3.0	--	46	28	69	6.4	4
C027	78	7/55	--	1.90	2.9	2.5	4.3	--	14	8.0	3.5	--	47	18	57	6.0	4
C034	383	6/51	64	.12	4.1	1.2	25	1.0	54	12	3.5	.0	154	15	139	6.4	5
C037	343	2/64	41	.16	1.0	.6	67	1.6	135	9.8	3.2	.3	206	5	270	7.6	5
C043[b]	228	7/65	--	.10	--	--	--	--	115	--	7.0	--	--	7	--	7.2	0
C044[b]	385	5/82	--	.10	--	--	41	2.8	90	6.7	12	.1	124	23	--	--	--
C045	143	9/65	46	1.80	7.0	2.6	9.7	1.8	34	6.0	6.2	.0	107	28	115	5.9	20
C053	314	6/51	35	.07	1.8	1.1	66	3.2	134	9.4	4.0	.3	207	9	280	7.6	8
C067	322	6/51	29	.10	3.4	2.1	79	5.3	174	8.2	3.8	.5	243	17	337	7.9	10
C080[b]	260	3/82	--	.90	6.4	3.4	12	1.8	44	7.2	16	.1	74	30	--	5.8	--
C101[b]	176	9/70	--	<.10	--	--	--	--	102	--	6.0	--	--	54	--	7.5	--
C144	768	6/82	12	.05[d]	1.9	.7	210	3.2	389	35	17	.8	532	8	865	8.5	17
C145[b]	248	7/82	--	<.10	8.8	3.9	25	2.9	99	5.1	9.0	.1	114	38	--	6.9	--
C160	817	4/85	13	.66[d]	1.6	.6	210	3.0	398	47	21	.6	487	6	890	8.5	80
D003	640	4/55	--	.32	2.7	1.1	218	5.6	376	49	28	2.0	556	11	880	8.6	70
D004	70	5/55	27	4.00	3.3	1.7	21	2.0	53	10	2.8	--	134	15	133	7.0	5
D005	126	5/55	--	.32	9.9	4.5	64	4.8	159	12	4.2	--	236	43	341	8.4	8
D006	76	5/55	--	.41	12	4.0	6.2	2.0	52	6.2	4.0	--	86	46	133	7.9	3
D007	210	5/55	--	.17	3.3	1.3	110	3.8	222	19	4.2	--	296	14	467	8.5	23
D028	226	5/55	35	.25	7.9	3.6	18	3.6	64	8.2	4.0	--	141	35	135	7.0	4
D035	130	6/65	37	.16	3.9	2.2	48	2.7	109	7.2	3.6	.2	171	19	246	6.7	10
D045[b]	710	10/62	15	.10	1.0	.0	--	--		50	27	.2	489	2	--	8.4	65
D072[b]	347	4/70	--	.00	.0	.0	53	1.2	102	8.6	4.0	.0	131	0	--	8.0	5
D117	612	2/85	12	.07[d]	2.1	.9	210	3.0	368	48	25	.8	490	9	840	8.6	50
D125[b]	184	10/81	--	.85	--	--	9.0	.3	33	8.2	17	.1	69	--	--	--	--
D127	600	2/85	13	.03[d]	1.4	.5	200	3.1	366	46	25	.8	507	6	840	8.8	40
D148[b]	181	12/67	--	.10	--	--	--	--	180	--	5.0	--	--	23	--	7.9	--
D149	518	2/85	12	.02[d]	2.0	.8	200	3.4	358	39	28	.6	513	8	810	8.8	50
D157	592	3/85	12	.07[d]	1.6	.6	210	2.5	367	50	25	.6	498	6	850	8.7	95

Table 5.--Water-quality data from selected wells in Jones County--Continued
(milligrams per liter except as indicated)

Well no.	Well depth (ft)	Date	Silica (SiO_2)	Total iron[a] (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Alkalinity (as $CaCO_3$)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Dissolved solids (residue at 180°C)	Hardness (as $CaCO_3$)	Specific conductance (microseimens at 25°C)	pH (standard units)	Color (platinum-cobalt units)
D158	750	3/85	13	.03[d]	1.3	.6	310	2.9	579	49	25	1.2	743	6	1280	8.8	150
F003[b]	471	12/66	--	.20	1.6	.7	--	--	49	17	5.0	.2	87	7	--	6.4	--
F007	246	10/64	20	.52	3.8	1.1	6.2	1.2	17	7.8	2.7	.1	59	14	66	5.8	5
F019[b]	471	7/65	--	.10	--	--	--	--	45	--	7.0	--	--	8	--	6.8	--
F021[b]	498	3/70	--	.50	2.0	1.2	15	4.5	30	13	3.0	.1	56	10	--	5.9	--
F022[b]	482	3/70	--	0.40	2.0	1.2	17	2.5	34	12	3.0	0.1	60	10	--	5.9	--
F023[b]	413	4/70	--	.00	1.4	.0	9.0	.0	16	2.6	3.0	.0	27	3	--	5.4	--
F044[b]	500	4/71	--	<.10	--	--	--	--	55	--	5.0	--	--	16	--	6.1	--
F059[b]	466	4/71	--	<.10	--	--	--	--	45	--	5.0	--	--	9	--	6.1	--
F062[b]	480	3/82	--	.12	3.2	2.4	19	2.6	44	10	9.0	.2	73	18	--	6.0	--
F063[b]	449	3/82	--	.30	4.0	2.4	19	3.1	50	10	10	.2	79	20	--	6.1	--
G001	318	2/64	39	.04	.5	.2	59	1.2	115	9.6	2.7	.3	183	2	237	7.7	5
G010	1316	12/20	17	.22	2.0	1.6	348[e]	--	752	4.8	7.0	--	862	12	--	--	--
G018	529	6/65	18	.07	3.4	.9	153	2.5	335	.0	3.2	1.1	421	12	644	7.6	50
G055	405	2/64	58	.24	1.3	1.9	27	2.5	58	9.2	2.4	.2	139	11	142	6.3	5
G063	230	6/85	21	1.70[d]	6.7	2.6	11	1.9	41	13	3.0	<.1	82	27	122	6.2	5
G064	1068	6/72	16	--	2.4	1.0	330	4.2	655	46	22	1.5	840	10	1320	8.5	180
G082[c]	2287	3/60	--	.15	2.4	.0	328[e]	--	767	47	20	--	788	6	--	8.4	--
G104	396	6/51	60	.09	4.4	2.2	30	2.6	75	11	3.5	.0	165	20	171	6.9	12
G130[b]	361	2/83	--	.30	8.0	2.4	65	2.4	135	11	11	.3	181	30	--	7.3	--
H004[b]	196	4/66	--	.20	--	--	--	--	6	--	5.0	--	--	10	--	5.3	--
J043[b]	675	2/71	--	.10	--	--	--	--	115	--	7.0	--	--	8	--	8.1	5
J051[b]	683	9/71	--	.00	.0	.0	76	.0	118	30	5.0	.2	190	0	--	8.4	0
J070[b]	688	11/81	--	.15	1.6	1.5	61	1.0	122	14	23	.1	207	10	--	8.2	5
K001[b]	542	6/59	36	.00	3.5	1.4	--	--	--	13	2.0	.0	158	15	--	7.8	--
K002	549	2/64	59	.07	2.7	.5	46	1.6	92	12	2.3	.1	174	9	197	7.6	15
K006[b]	552	5/82	--	<.10	2.8	1.7	54	1.5	116	8.4	9.0	.3	147	14	--	7.6	--
K008[b]	548	10/63	--	.00	3.8	2.0	--	--	--	--	5.9	--	--	18	--	--	--
K013[b]	450	5/64	16	--	15	3.1	20	2.6	80	13	3.1	.1	121	50	--	--	5
K031[b]	548	6/72	42	--	2.5	.2	50	1.6	100	11	2.0	.2	191	7	--	--	0
L038	760	12/78	45	.02[d]	3.7	.6	48	1.9	107	13	2.2	.2	181	12	210	8.1	5
L051	813	11/79	53	.03[d]	1.4	.2	54	1.3	115	13	2.4	.2	193	4	235	8.0	5
N012	754	6/72	37	--	1.4	.1	55	1.3	115	9.2	2.7	.3	180	4	250	7.9	5
N107	525	8/19	20	4.30	11	3.6	47[e]	--	127	12	3.5	.0	179	42	--	--	--
Q004	242	9/64	16	.17	13	3.8	27	2.6	93	.8	8.4	.3	134	48	220	6.9	15
Q108	212	7/43	17	.65	15	4.8	20[e]	--	84	9.1	4.4	.0	120	57	--	7.3	--

[a] USGS samples filtered and acidified on-site after 1978
[b] Analysis by Mississippi State Board of Health
[d] Dissolved iron
[e] Sodium plus potassium

Table 6.--Summary of selected water-quality data

Parameter	Value[1]	Percent equal to or less than value shown	Range[1]	Number of analyses
		Catahoula and Vicksburg aquifers		
Dissolved solids	100	35	27-421	55
	200	84		
	300	98		
Hardness (as $CaCO_3$)	10	37	0-54	62
	20	71		
	50	97		
Total Iron[2]	.30	67	0.00-5.10	61
	.60	79		
Color	15	87	0-50	38
Silica	25	30	11-64	30
	50	80		
Fluoride	.3	91	0.0-1.1	44
pH	7.0	58	5.3-8.5	57
	8.0	89		
		Cockfield and Sparta aquifers		
Dissolved Solids	600	67	487-840	12
	800	83		
Hardness (as $CaCO_3$)	10	83	2-12	12
Total Iron[2]	.30	82	0.02-0.66	11
Color	50	40	17-180	10
	100	80		
Silica	15	80	12-16	9
Fluoride	.8	70	0.6-2.0	10
pH	8.6	64	8.4-8.8	11

[1] in milligrams per liter except pH and color which are expressed in "units"
[2] includes dissolved iron

These data show that the dissolved-solids concentrations in water in the Catahoula and Vicksburg aquifers range from 27 to 421 mg/L and that the concentrations are significantly lower than those in the deeper Cockfield and Sparta aquifers. Dissolved-solids concentrations in water in the deeper aquifers often exceed EPA criteria (500 mg/L). In general, dissolved-solids concentrations of water in the Catahoula aquifers are lowest near recharge areas and increase down the dip from recharge areas (figs. 17 and 18). In the middle Catahoula aquifer along geohydrologic section B-B' (fig. 18), the dissolved-solids concentrations increase from 35 mg/L at well B11 to 179 mg/L at well N107. In the lower Catahoula aquifer, the dissolved-solids concentrations increase from 69 mg/L at well D125 to 180 mg/L at well N12. Although dissolved-solids concentrations tend to increase down the dip from recharge areas, local conditions may cause an increase in the concentrations; for example, lowered water levels caused by prolonged heavy pumping may result in the mixing of ambient water with more mineralized water from a hydraulically connected, confined aquifer. The dissolved-solids concentration was 421 mg/L in water from well G18, screened at the base of the lower Catahoula aquifer (table 5). This suggests that water near the base of the lower Catahoula aquifer in some parts of the county has higher dissolved-solids concentrations than water in shallower parts of the aquifer. Dissolved-solids concentrations in the water from wells B24 (246 mg/L) and C67 (243 mg/L) are significantly higher than those in water from wells located downgradient. These higher dissolved-solids concentrations probably are the result of mixing with more mineralized water from deeper in the lower Catahoula aquifer.

Dissolved-solids concentrations of water in the Cockfield aquifer increased from 507 mg/L at well D127 to 840 mg/L at well site G64 (fig. 18). Water from well G10 in the Sparta aquifer had about the same dissolved-solids concentrations as water from nearby well G64 in the Cockfield aquifer.

Variations in chemical characteristics of water in major aquifers along hydrologic sections A-A' and B-B' also are shown in figures 17 and 18. Modified Stiff (1951) diagrams are used to represent major chemical constituents, in milliequivalents per liter, for selected data given in table 5. The diagrams shown in the hydrologic sections indicate that the water undergoes a natural change in quality as it moves down the dip from recharge areas. The diagrams demonstrate similarity of chemical characteristics of the water from wells screened at shallow depths near recharge areas of the Catahoula and Vicksburg aquifers. Water from these shallow wells has low dissolved-solids concentrations (less than 100 mg/L) and nearly equal concentrations (expressed in milliequivalents per liter) of the four groups of major constituents. The primary water-quality change as water moves down the dip in an aquifer is an increase in alkalinity and in the concentrations of sodium and dissolved solids. These changes are shown at wells B11 and N107 in the middle Catahoula aquifer and at wells D125 and N12 in the lower Catahoula aquifer (fig. 18). Even though well Q4 is the only well shown in the upper Catahoula aquifer (fig. 17), the shape of the diagram suggests that a water-quality change has occurred also in this aquifer as the water moved down the dip from its recharge area.

A large increase in alkalinity and in sodium concentrations occurs from well D127 to G64 in the Cockfield aquifer (fig. 18). Although records show that well G82 was screened at a depth below the Cockfield aquifer, the type is similar to that of water in the Cockfield aquifer and it is assumed that the water from well G82 was actually from the Cockfield aquifer. The depth of screen or screens in well G82 could not be verified because the well had been destroyed.

Iron in water from some parts of the Catahoula and Vicksburg aquifers and color of some water from the Cockfield and Sparta

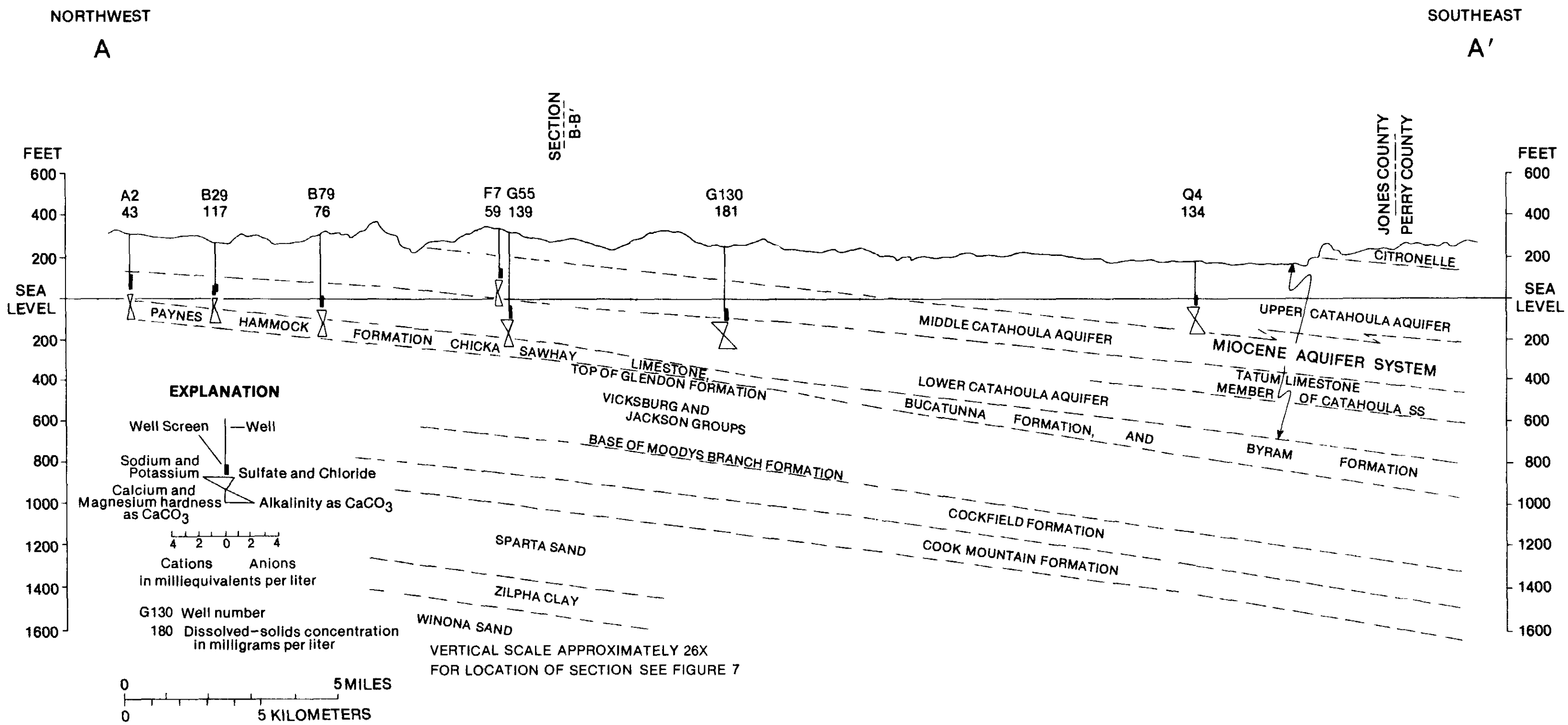

Figure 17.--Geohydrologic section A-A′: variations in chemical characteristics of ground water in Jones County.

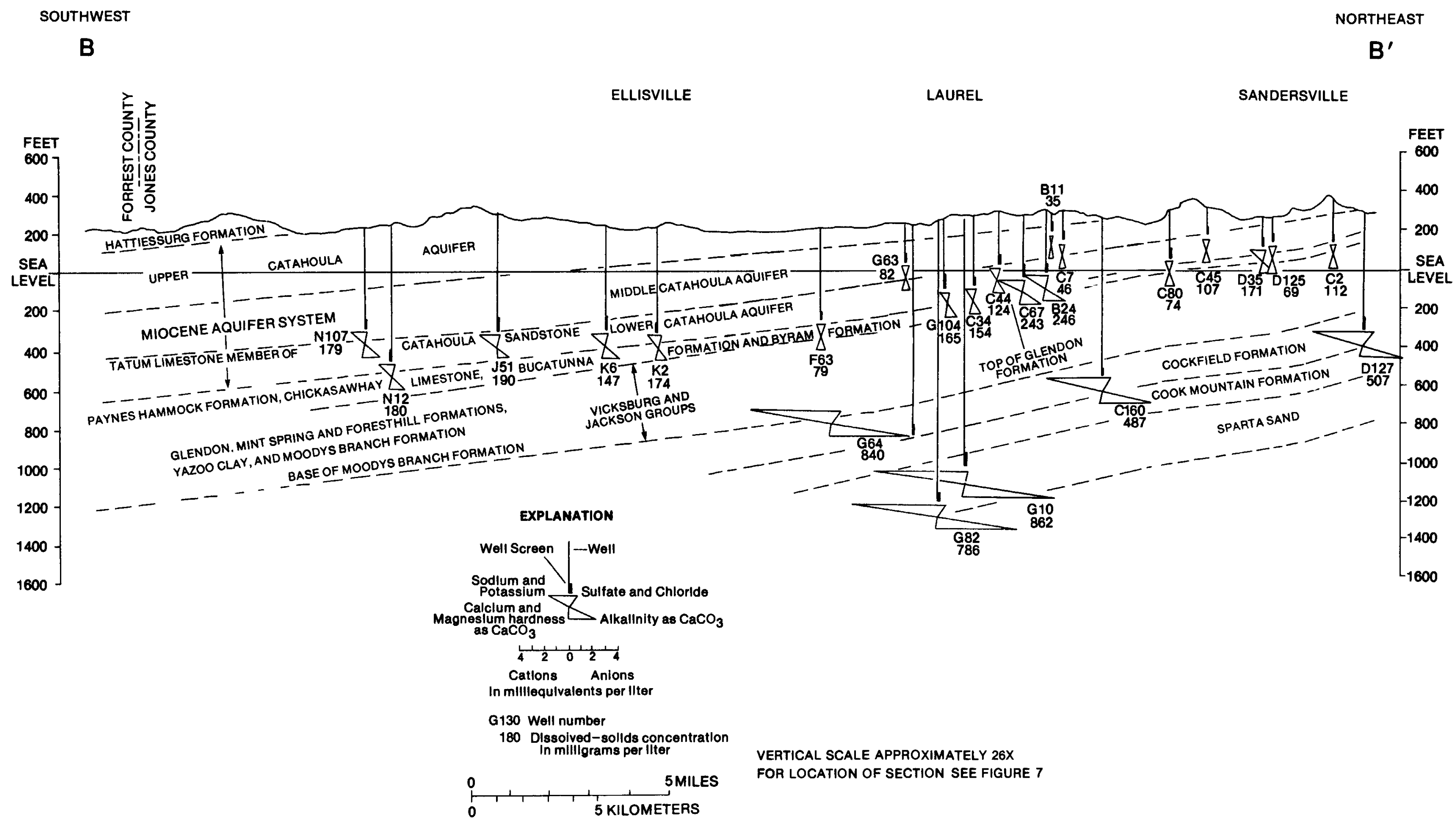

Figure 18.--Geohydrologic section B-B′: variations in chemical characteristics of ground water in Jones County.

aquifers equal or exceed EPA criteria of 0.3 mg/L and 15 units for iron and color, respectively. Iron concentrations in water from the Catahoula and Vicksburg aquifers ranged from 0.00 to 5.10 mg/L and exceeded 0.30 mg/L in 33 percent of the wells. Data also indicate that fewer iron problems will occur in wells screened in the Cockfield and Sparta aquifers than wells screened in the Catahoula and Vicksburg aquifers.

Wells screened in the Catahoula and Vicksburg aquifers generally produce water that is low in color (less than 15 units). In the Catahoula aquifers, the highest color observed (50 units) was in the water from well G18. In addition to higher dissolved-solids concentrations and color, the water had other characteristics that were dissimilar to water from wells in the lower Catahoula aquifer at other locations. Except for lower concentrations of sulfate (0.0 mg/L) and chloride (3.2 mg/L), the water is more similar to water in the Cockfield aquifer. The color of water in all wells screened in the Cockfield aquifer exceeded 15 units; 80 percent of the values ranged from 17 to 100 units (table 6).

Data show that the water in all aquifers is soft (less than 60 mg/L). The hardness was less than 50 mg/L in water from 97 percent of the wells in the Catahoula and Vicksburg aquifers and was less than 10 mg/L in water from 83 percent of the wells in the Cockfield and Sparta aquifers. Silica concentrations ranged from 11 to 64 mg/L in the water from the Catahoula and Vicksburg aquifers and from 12 to 16 mg/L in the Cockfield aquifer. Based on an annual average of maximum daily air temperature of 73.5°F at Laurel, the EPA criteria for a optimum fluoride concentration (0.8 mg/L) was exceeded in 30 percent of analyses of water from the Cockfield aquifer. Fluoride concentrations in 91 percent of the analyses of water from the Catahoula and Vicksburg aquifers were equal to or less than 0.3 mg/L (table 6).

The median pH value of water from wells in the Catahoula and Vicksburg aquifers was 6.9 units. In these aquifers, pH values of water ranged from 5.3 to 8.5 units and in 58 percent of the analyses was equal to or less than 7.0 units. In the Cockfield aquifer, the median pH of water was 8.6 units. The pH ranged from 8.4 to 8.8 units and in 64 percent of the analyses was equal to or less than 8.6 units (table 6).

Saline Water

Freshwater is defined by the Geological Survey as water in which dissolved-solids concentrations are less than 1,000 mg/L. In Jones County, the base of the 1,000 mg/L zone is at the base of the Sparta aquifer system in the northern part of the county (fig. 16), and at the base of the Oligocene and Miocene aquifers farther to the south. The base of the slightly saline zone is in the lower Wilcox aquifer in the extreme northeastern part of the county and occurs in progressively shallower aquifers southward. The base of the moderately saline zone is at the base of the lower Wilcox aquifer in the northeast part of the county and in the upper Wilcox aquifer in most of the remainder of the county. Maps developed in a statewide study by Gandl (1982) show the altitude of the fresh, slightly saline, and moderately saline ground-water zones. The maps may be useful in planning the injection depths for fluid wastes such as oil-field brine. Underground injection wells are required to inject fluid wastes below the moderately saline zone.

Aquifer and Stream Contamination

The injection of wastes (including oil-field brines and other drilling wastes) into freshwater aquifers is now prohibited by State and Federal law; however, the past use of earthen pits and improper waste-injection methods has resulted in local contamination of freshwater aquifers in Jones County.

Although streams in Jones County generally are "gaining streams", there is a possibility of infiltration of surface water (recharge) into aquifers in areas of heavy pumping. Saltwater contamination can be expected in wells drilled in areas in or near oil fields. "Slugs" of saltwater from long-abandoned pits or wells may appear unexpectedly in the subsurface of Jones County in and near areas where petroleum has been produced. A short-term, intensive study of

Tallahala Creek in the Laurel area in August 1977 (Arthur, 1978) showed the stream at that time was not significantly contaminated upstream of the city but was affected by municipal and industrial waste from the Laurel area. The quality of water in Tallahala Creek improved substantially below the confluence with Tallahoma Creek. Studies during the period 1982-83 showed pronounced contamination of Tallahatta Creek (a tributary of Tallahala Creek) near Waldrup in Jasper County. A study made in 1982 indicated some contamination in Old Julie Branch north of Sandersville and in Reedy Creek west of Sandersville (Kalkhoff, 1985).

POTENTIAL FOR GROUND-WATER DEVELOPMENT

Ground-water development in the Jones County area can proceed by continued development of the Miocene aquifer system and, to the north and east of Laurel, use of the Cockfield and Sparta aquifers. The Miocene aquifers available in many areas are capable of large yields to wells. The Oligocene aquifer system is not a major factor for future planning, but it too can be used in some places as a source for small supplies.

The Miocene aquifer system (Newcome, 1975) comprises a series of interconnected sand bodies that over large areas act as integral parts of the system but locally function as separate hydraulic units. The capability to transmit and store ground water is directly related to the hydraulic characteristics and thickness of the sand zones that form aquifers. The Catahoula Sandstone (the lower part of the Miocene aquifer system) in Jones County thickens from less than 1 foot in the northeast to a maximum of nearly 800 feet in the southwest and the cumulative sand thickness (the aggregate of all sand beds) increases in proportion. The cumulative sand thickness ranges from about 200 feet in the Laurel area to more than 400 feet in the southwest; therefore, the potential for ground-water development from the Catahoula is much greater in the southern part of the county. The opportunity for development is further enhanced by the following factors:

- Multiple aquifers.--North of Laurel only the lower Catahoula aquifer occurs, but both the lower and middle Catahoula aquifers underlie Laurel. In the Ellisville area and southward, both occur, and the overlying upper Catahoula aquifer also is available. Although these aquifers are interconnected regionally, well fields at some sites in the county could produce water from several zones with minimal pumping drawdown interference. Conversely, owing to irregularity of the sand beds, one or more of the aquifers may not be present at a site.

- Recharge.--Wells in the southern part of the county benefit from recharge throughout the area where the Catahoula Sandstone is exposed. Recharge to the lower Catahoula aquifer occurs generally north of Laurel; recharge to the middle Catahoula aquifer occurs in a northwest-southeast trending belt several miles wide through the Laurel area, and the upper Catahoula aquifer is recharged in a parallel belt trending through and south of Ellisville.

- Water levels.--Withdrawals in the Laurel area have had a pronounced effect on water levels (figs. 10-14); however, water levels south of the present cone of depression have been less affected, reflecting mostly regional declines. Wells outside the affected area will benefit from much smaller pumping lifts and significantly lower energy costs for pumping water.

- Competition for water.--The largest withdrawals of ground water outside the Laurel area and proximate to Jones County are made in the Hattiesburg area and the influence of this pumping will affect water levels in southwestern Jones County.

Most of the interference effects of large ground-water withdrawals can be minimized by siting well fields in southeastern and west-central Jones County and as far as practical from the present cone of depression (fig. 13).

The lower Catahoula aquifer is tapped by 13 city-owned wells, 6 at the airport well field and 7 at other locations. The aquifer is the source for several other public and industrial water-supply wells. The potential for increased production from the lower Catahoula is limited in the city and at the airport well field because of low static levels that result in a limitation on pumping drawdown space in wells and because of well interference. Production from wells in the airport well field is extremely limited because of lowered water levels and excessive well interference. Production of water from the middle Catahoula aquifer is subject to the same limitations as the lower Catahoula but, being about 200 feet shallower, is severely restricted in the Laurel area by lack of pumping drawdown space.

The lower Catahoula aquifers can sustain present (1985) withdrawals if appropriate well spacing is observed. An analysis of water-level declines, static levels, and projected static and pumping levels indicate that locations to the southeast, south, southwest and west of Laurel offer advantages. The Miocene aquifer system thickens southward, the number of water-bearing strata increases, and individual aquifers become deeper. Water levels are higher with increasing distance from concentrated pumping.

A 1,000-foot well (G133), drilled by the city in 1914 to the Cockfield aquifer, produced highly colored water having relatively high dissolved-solids concentrations. A 1,316-foot well (G10), drilled in 1914 into the Sparta Sand produced similar water. These aquifers have little potential as drinking-water sources south and west of the Laurel and in most of Jones County, owing to the quality of the water (fig. 18). In the Laurel area and to the north and northeast, however, the water can be used in emergencies and for many purposes. Several industrial wells that tap the Cockfield aquifer in the Laurel area produce water that is used for non-consumptive purposes. The quality of water in the aquifers improves substantially to the north and northeast of Laurel where the aquifer is the source of water for several rural water-system wells (for example, C155, D117, D121, and D142). Pumping for municipal or industrial water supplies from these aquifers does not affect the Oligocene or Miocene aquifer system through well interference.

The Oligocene aquifer system is capable of sustaining small yields to wells in some places. Two wells (C2 and C5) were reported to pump 35 and 45 gal/min, respectively. A well at Sandersville (C66) produced 75 gal/min and similar production could be expected at some other sites.

The approximate quantity of ground water moving through an aquifer may be calculated by using known or estimated values for the hydraulic characteristics of an aquifer or more precisely by more complex procedures using computer digital models. Assuming an average cumulative sand thickness of 300 feet in the central part of the county and using the average hydraulic conductivity for Miocene sand of 94 ft/d or 700 [(gal/d)/ft^2] (Newcome, 1971, p. 6 and 17), the Miocene aquifer system in Jones County can have an average transmissivity of 28,000 ft^2/d or 210,000 (gal/d)/ft. Assuming a 27-mile line trending east to west across the central part of the county at the latitude of Ellisville and a hydraulic gradient to the south of 5 feet per mile, about 28 Mgal/d would flow southward under natural (pre-development) conditions.

Aquifer tests show that aquifers in the Jones County area exhibit a wide range in hydraulic characteristics (table 4); however, for general planning, these average values can be used to make reasonable estimates of yields to wells and to approximate the effects of well interference. Graphical solutions can be made by using figure 19 in conjunction with well spacing, pumping

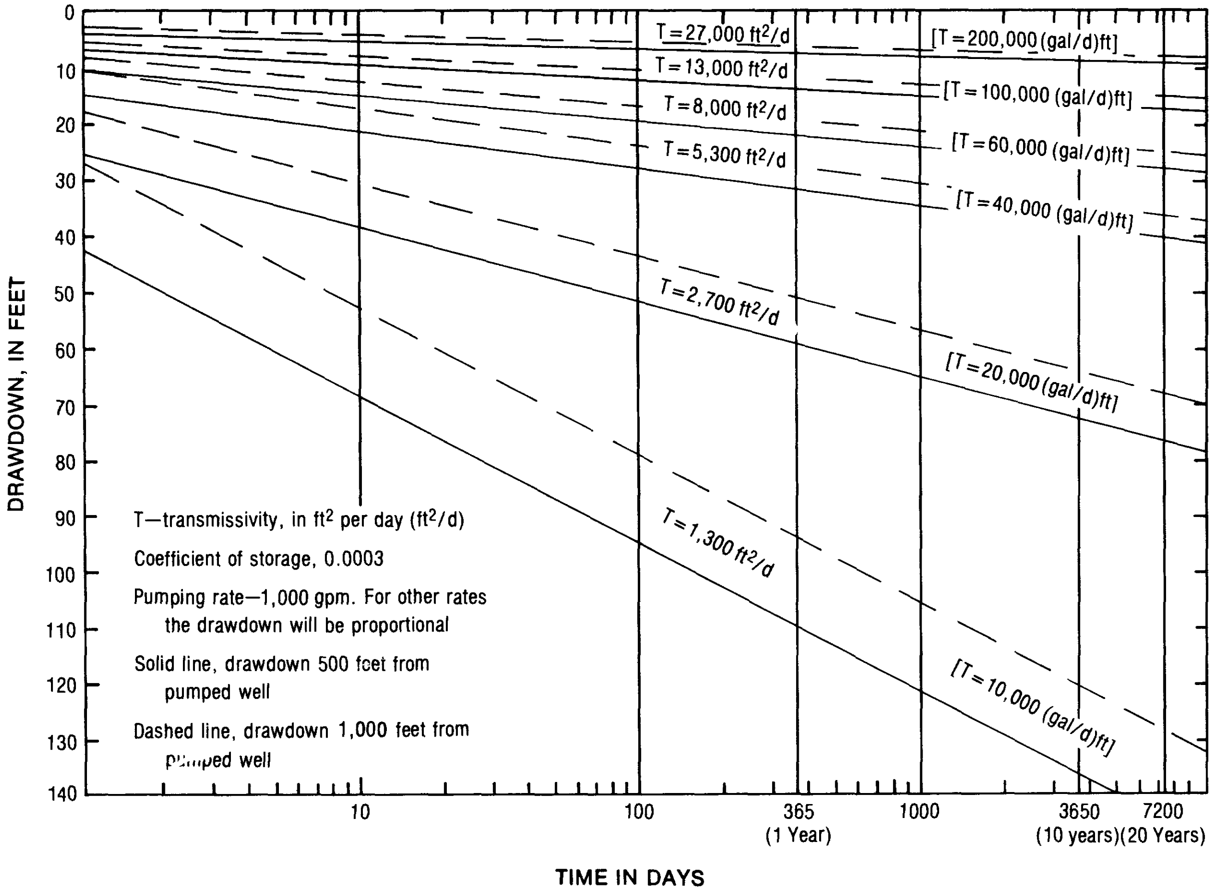

Figure 19.--Theoretical time-distance relations for pumping from the Miocene aquifer system.

rate, and pumping duration. Following is an explanation of the use of the graph for a well pumping 750 gal/min from an aquifer having a transmissivity of 5,300 ft^2/d [40,000 (gal/d)/ft].

The average hydraulic conductivity for the Miocene sand in Jones County is near the average of 94 ft/d [700 (gal/d)/ft^2] as determined by Newcome (1971, p. 6 and 17). An aquifer that is 60 feet thick can have an estimated transmissivity (hydraulic conductivity multiplied by aquifer thickness) of about 5,600 ft^2/d [42,000 (gal/d)/ft]. The specific capacity of a 100-percent efficient well in the area can be estimated by dividing the transmissivity in ft^2/d by a factor of 270 -- a modification of a method method described by Newcome (1965). A typical well in a 60-foot thick aquifer in Jones County could be expected, assuming about 80-percent efficiency, to have a specific capacity of about 17 gal/min for each foot of pumping drawdown ($94 \times 60 \div 270 \times 0.80 = 16.7$). The pumping drawdown for 750 gal/min for this well would be about 44 feet; however, a fully efficient well would have a drawdown of about 37 feet.

From the graph (fig. 19) the interference at 1,000 feet after pumping 1,000 gal/min for 1 year would be about 28 feet and correcting for 750 gal/min gives 21 feet of interference. After 20 years, the interference will have increased to about 28 feet (fig. 19, drawdown of 37 feet, corrected for 750 gal/min).

Estimates for future pumping levels for a specific well can be made by adding the interference effects of other wells to the self-induced drawdown (pumping drawdown) in the subject well and including the additional effects of regional water-level declines. For example, three 750-gal/min wells spaced in a triangle that is 1,000 feet on each side will have a pumping level about 93 feet lower than the static level after 20 years continuous pumping (see fig. 19; 28 ft x 2 = 56 ft + 37 ft of pumping drawdown), assuming 100-percent efficiency. These estimates are based on assumptions that the aquifer is infinite in extent and has uniform transmissivity.

Although most of the ground-water withdrawals in Jones County are made in the Laurel area, the proliferation of rural community water systems adds to the complexity of interpreting the effects of withdrawals and to the problems of water-resource management. Withdrawals in several industrial areas in Jones County and pumping in the Hattiesburg area are other factors that affect the ground-water resource in the county. Accurate projections for future pumping levels, interference effects between well fields or pumping centers, and water-level declines would require much additional geohydrologic data and computer modeling.

SUMMARY

Ground-water withdrawals from the Miocene aquifer system in the Jones County area increased from less than 1 Mgal/d before 1925 to about 14.1 Mgal/d in 1984; about 9.9 Mgal/d was pumped for public-water supplies.

Most of the water used from the Miocene aquifer system in Jones County is produced from the lower and middle Catahoula aquifers; however, the largest well yields are obtained from the upper Catahoula aquifer in the southwestern part of the county.

Although water levels in the aquifers at Laurel have declined more than 100 feet since 1920, most of the decline had occurred by 1941. In the last decade only moderate declines have been observed.

Hydraulic characteristics of the aquifers vary considerably from place to place. Transmissivity values range from 600 to 10,000 ft^2/d. Hydraulic conductivity average about 90 ft/d.

Available data indicate that with appropriate well spacing and a redistribution of pumping, some increases in pumping withdrawals from the lower Catahoula aquifer in the Laurel area can be made while maintaining pumping levels within acceptable limits; however, large increases in pumping within the present cone of depression will result in excessive declines. The middle Catahoula aquifer can continue to sustain a yield of about 4 Mgal/d under the same conditions.

Large ground-water withdrawals can be made in southeastern and western Jones County where the Catahoula Sandstone increases in thickness, multiple aquifers occur, and interference due to other centers of heavy pumping is minimal. The water-supply potential is especially good in the upper Catahoula aquifer in the southwestern part of the county where the aquifer is capable of large yields to wells. Withdrawals in the Hattiesburg area, mostly from the middle and lower Catahoula aquifers, may have little effect on the upper Catahoula aquifer in Jones County.

Alkalinity and concentrations of sodium and dissolved solids increase as water moves down the dip from recharge areas. Dissolved-solids concentrations were 200 mg/L or less in water from 84 percent of the wells in the Catahoula and Vicksburg aquifers. In the Cockfield and Sparta aquifers, the dissolved-solids concentrations were significantly higher, ranging from 487 to 840 mg/L. Hardness was 50 mg/L or less in water from 97 percent of the wells in the Catahoula and Vicksburg aquifers and was 10 mg/L or less in water from 83 percent of the wells in the Cockfield and Sparta aquifers.

Water from wells in the Catahoula and Vicksburg aquifers commonly contained higher iron concentrations and was lower in color than water in the Cockfield and Sparta aquifers. Iron concentrations in water from wells in the Catahoula and Vicksburg aquifers ranged from 0.00 to 5.10 mg/L and exceeded 0.30 mg/L in 33 percent of the analyses. Iron concentrations were 0.30 mg/L or less in water from 82 percent of the wells in the Cockfield and Sparta aquifers. Color ranged from 0 to 50 units in water from wells in the Catahoula and Vicksburg aquifers and from 17 to 180 units in water from wells in the Cockfield and Sparta aquifers.

Fluoride concentrations generally were 0.3 mg/L or less in water from wells in the Catahoula and Vicksburg aquifers and exceeded 0.8 mg/L in water from 30 percent of the wells in the Cockfield and Sparta aquifers. Silica concentrations ranged from 11 to 64 mg/L and were greater than 50 mg/L in water from 20 percent of the wells in the Catahoula and Vicksburg aquifers. Silica concentrations ranged from 12 to 16 mg/L in water from wells in the Cockfield and Sparta aquifers. The pH of water from wells in the Catahoula and Vicksburg aquifers ranged from 5.3 and 8.5 units and was 7.0 units or less in 58 percent of the wells. The pH of water from wells in the Cockfield aquifer ranged from 8.4 to 8.8 units.

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