QUALITY OF GROUND WATER IN HARRISON COUNTY, MISSISSIPPI, JUNE - JULY 1993

By Larry J. Slack, William T. Oakley, Charles G. O'Hara, and Lance M. Cooper

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CONVERSION FACTORS AND WATER-QUALITY INFORMATION

<u>Multiply</u>	<u>By</u>	<u>To obtain</u>
foot	0.3048	meter

To convert degrees Celsius (°C) to Fahrenheit (°F), use the following:

$$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

Specific conductance is reported in microsiemens per centimeter at 25 °C ($\mu\text{S}/\text{cm}$); pH, in standard units. Chemical concentrations are given in milligrams per liter (mg/L) or micrograms per liter ($\mu\text{g}/\text{L}$). Milligrams and micrograms per liter are units expressing the weight of solute per volume (liter) of water. One thousand micrograms per liter is equivalent to 1 mg/L. For concentrations less than 7,000 mg/L, milligrams per liter are equivalent to parts per million. Color is reported in platinum-cobalt units.

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ABSTRACT

During June and July 1993, the U.S. Geological Survey analyzed water from 145 wells in Harrison County, southeastern Mississippi. The wells are completed in five major geologic units: the Citronelle, Graham Ferry, Pascagoula, and Hattiesburg Formations and the Catahoula Sandstone. The wells ranged from 74 to 2,410 feet in depth. Specific conductance (lab), ranged from 15 to 2,020 microsiemens per centimeter; pH (lab), from 5.9 to 9.0; color, from less than 5 to 120 platinum-cobalt units; dissolved-solids concentrations (residue on evaporation), from 20 to 1,120 milligrams per liter; chloride concentrations, from 1.9 to 470 milligrams per liter; and nitrite plus nitrate as nitrogen concentrations, from less than 0.02 to 0.85 milligram per liter. Most of the larger values of specific conductance, pH, dissolved-solids concentrations, and chloride concentrations were from wells in the southern one-half of the county.

INTRODUCTION

As part of the Federal-State Cooperative Program, the U.S. Geological Survey (USGS) collects, on a systematic basis, data needed for the continuing determination and evaluation of the quantity, quality, and use of water resources in the United States and appraises the availability of ground and surface water through analytical and interpretive investigations. The resulting information forms the foundation for many of the nation's water-resources management and planning activities and allows for the detection of water problems.

During June and July 1993, in cooperation with the Harrison County Board of Supervisors, the USGS analyzed water from 145 wells to determine current water quality of the ground water in the southeastern Mississippi county. This report summarizes the site selection criteria and site information, the methods of sampling and analysis, and the results of the water-quality data for these wells.

SITE SELECTION CRITERIA AND SITE INFORMATION

Sites were selected to represent the major geologic units and depths at which wells have been completed in Harrison County. First preference in site selection was given to wells included in the USGS ground-water sampling network in the county in 1988. Other selection criteria included wells that were currently (1993) in use or had been in use recently.

Two of the 145 wells are completed in the Citronelle Formation, 55 in the Graham Ferry Formation, 72 in the Pascagoula Formation, 14 in the Hattiesburg Formation, and 2 in the Catahoula Sandstone (table 1, fig. 1). Water from 64 wells (44 percent) is used for public supply; 54 wells (37 percent) for domestic purposes; 13 wells (9 percent) for industrial purposes; and 7 wells (5 percent) for institutional purposes. Water from the remainder of the wells is used for aquaculture, fire protection, irrigation, power generation, or recreation purposes.

METHODS OF SAMPLING AND ANALYSIS

To obtain samples that closely represent ground water from the water-bearing unit, most of the wells were pumped long enough prior to sampling to withdraw at least twice the volume of water standing in the casing. The samples were shipped to the USGS Water Resources Division Water-Quality Service Unit in Ocala, Florida, where the samples were analyzed using standard USGS procedures.

RESULTS

Water-quality data collected from the 145 wells during the 1993 sampling are listed in table 2. These data include specific conductance (field and lab), pH (field and lab), color, dissolved-solids concentration (residue on evaporation at 180 °C), chloride, and nitrite plus nitrate-nitrogen concentrations. The values for these constituents or properties are similar to those reported by Slack and others (1993) for ground-water samples collected from March to June 1993 in Jackson County, immediately east of Harrison County.

Additional water-quality data collected from 27 wells selected from the the 145 wells are listed in table 3. These data include nutrients (ammonia and orthophosphorus), major ions (calcium, magnesium, sodium, potassium, sulfate, fluoride, and silica), iron, manganese, and alkalinity.

For the convenience of the reader, the water-quality data collected from the 145 wells in Harrison County during the 1993 sampling are summarized in table 4. The data are presented individually for each of the major geologic units and then aggregated for all geologic units.

Also for the convenience of the reader, the areal distribution of specific conductance (lab), pH (lab), color, dissolved-solids concentration, and chloride concentration in ground water is mapped in figures 2-6. The relation of depth and specific conductance (lab), pH (lab), color, dissolved-solids concentration, and chloride concentration in ground water is shown in figures 7-11.

The wells ranged from 74 to 2,410 feet in depth and had a median depth of 746 feet (table 4). Well depths generally were smallest for those completed in the Citronelle Formation and greatest for wells completed in the Catahoula Sandstone. Median depth was 115 feet for wells completed in the Citronelle Formation; 420 feet for wells completed in the Graham Ferry Formation; 842 feet for wells completed in the Pascagoula Formation; 1,675 feet for wells completed in the Hattiesburg Formation; and 2,405 feet for wells completed in the Catahoula Sandstone (table 4).

Specific conductance (lab) ranged from 15 to 2,020 microsiemens per centimeter; the median was 273 microsiemens (table 4). Most of the larger values of specific conductance (exceeding 500 microsiemens) were from wells in the southern one-half of the county (fig. 2). Specific conductance generally increased with depth in water from the Graham Ferry and Pascagoula Formations; however, the relation showed considerable variation (fig. 7).

The pH (lab) ranged from 5.9 to 9.0; the median was 8.4 (table 4). Most of the larger values of pH (exceeding 8.0 units) were from wells in the southern one-half of the county (fig. 3). The pH generally increased with depth in water from the Graham Ferry and Pascagoula Formations and decreased with depth in water from the Hattiesburg Formation; however, the relation showed considerable variation (fig. 8).

Color ranged from less than 5 to 120 platinum-cobalt units; the median was less than 5 platinum-cobalt units (table 4). Color was less than 5 platinum-cobalt units in two-thirds of the samples. Color exceeded 15 platinum-cobalt units in only 14 of 145 samples (less than 10 percent). Furthermore, color exceeded 75 units in only one sample (less than 1 percent). Most of the larger values of color (exceeding 35 units) were from wells in the northern one-half of the county (fig. 4). Color generally increased with depth in water from the Pascagoula Formation and decreased with depth in water from the Graham Ferry and Hattiesburg Formations; however, the relation showed considerable variation (fig. 9).

The determination of color represents an evaluation of a physical property. The color of natural water usually results from leaching of organic debris (Hem, 1985). The recommended limit of 15 platinum-cobalt units for color in public water supplies is based principally on aesthetic reasons (U.S. Environmental Protection Agency, 1986). Water consistently can be treated using standard coagulation, sedimentation, and filtration processes to decrease color to substantially less than 15 platinum-cobalt units when the source water does not exceed 75 platinum-cobalt units.

Dissolved-solids concentrations (residue on evaporation) ranged from 20 to 1,120 milligrams per liter; the median was 199 milligrams per liter (table 4). Dissolved solids exceeded 500 milligrams per liter in only 6 of 145 samples (4 percent). Furthermore, dissolved solids exceeded 1,000 milligrams per liter in only two samples (about 1 percent). Most of the larger values of dissolved-solids concentrations (exceeding 250 milligrams per liter) were from wells in the southern one-half of the county (fig. 5). Dissolved-solids concentrations generally increased with depth in water from the Graham Ferry and Pascagoula Formations; however, the relation showed considerable variation (fig. 10).

High dissolved-solids concentrations are objectionable because of possible physiological effects, mineral taste, and economic consequences of additional water treatment. The recommended limit of 500 milligrams per liter for dissolved solids in public water supplies is based largely on aesthetic reasons (U.S. Environmental Protection Agency, 1986). One concern is that drinking water containing a high concentration of dissolved solids is likely to contain an excessive concentration of some specific substance that would be objectionable. Nationally, a considerable number of water supplies with dissolved solids in excess of the 500-milligram per liter limit are used without any obvious ill effects. On the basis of practicality, a dissolved-solids concentration of 1,000 milligrams per liter generally is recommended as an upper limit for potable waters.

Chloride concentrations ranged from 1.9 to 470 milligrams per liter; the median was 3.7 milligrams per liter (table 4). Chloride concentrations exceeded 250 milligrams per liter in only 3 of 145 samples (about 2 percent) and did not exceed 500 milligrams per liter in any samples. Most of the larger values of chloride concentrations (exceeding 25 milligrams per liter) were from wells in the southern one-half of the county (fig. 6). Chloride concentrations generally increased with depth in water from the Graham Ferry and Pascagoula Formations; however, the relation showed considerable variation (fig. 11).

The recommended limit of 250 milligrams per liter for chloride in public water supplies is based largely on aesthetic reasons (U.S. Environmental Protection Agency, 1986). On the basis of taste, there may be a large difference between detectable and objectionable chloride concentrations; acclimatization is thought to be an important factor.

Nitrite plus nitrate as nitrogen concentrations ranged from less than 0.02 to 0.85 milligram per liter; the median was less than 0.02 milligram per liter (table 4). Nitrite plus nitrate as nitrogen concentrations were 0.14 milligram per liter or less in 141 of 143 samples (almost 99 percent). The primary maximum contaminant level for nitrate-nitrogen is 10 milligrams per liter (U.S. Environmental Protection Agency, 1986). Nitrite plus nitrate as nitrogen concentrations were small and showed no pattern of distribution areally or with depth.

SUMMARY

During June and July 1993, the U.S. Geological Survey analyzed water from 145 wells in Harrison County, southeastern Mississippi. The wells are completed in five major geologic units: the Citronelle, Graham Ferry, Pascagoula, and Hattiesburg Formations and the Catahoula Sandstone.

The wells ranged from 74 to 2,410 feet in depth. Specific conductance (lab) ranged from 15 to 2,020 microsiemens per centimeter. The pH (lab) ranged from 5.9 to 9.0. Color ranged from less than 5 to 120 platinum-cobalt units. Dissolved-solids concentrations (residue on evaporation) ranged from 20 to 1,120 milligrams per liter. Chloride concentrations ranged from 1.9 to 470 milligrams per liter. Nitrite plus nitrate as nitrogen concentrations ranged from less than 0.02 to 0.85 milligram per liter. Most of the larger values of specific conductance, pH, dissolved-solids concentrations, and chloride concentrations were from wells in the southern one-half of the county. Most of the larger values of color were from wells in the northern one-half of the county. Specific conductance, pH, color, dissolved-solids concentrations, and chloride concentrations showed considerable variation with depth.

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Figure 2.--Specific conductance (lab) of ground water in Harrison County, Mississippi, during 1993.

Figure 3.—pH (lab) of ground water in Harrison County, Mississippi, during 1993.

Figure 4.—Color of ground water in Harrison County, Mississippi, during 1993.

Figure 5.—Dissolved-solids concentration in ground water in Harrison County, Mississippi, during 1993.

Figure 6.—Chloride concentration in ground water in Harrison County, Mississippi, during 1993.

Figure 7.--Relation of depth and specific conductance of ground water in Harrison County, Mississippi, during 1993.

Figure 8.--Relation of depth and pH of ground water in Harrison County, Mississippi, during 1993.

Figure 9.--Relation of depth and color of ground water in Harrison County, Mississippi, during 1993.

Figure 10.--Relation of depth and dissolved-solids concentration in ground water in Harrison County, Mississippi, during 1993.

Figure 11.—Relation of depth and chloride concentration in ground water in Harrison County, Mississippi, during 1993.

Table 1. Summary of site information for wells in Harrison County, Mississippi

[Formations: CRNL, Citronelle; GRMF, Graham Ferry; PCGL, Pascagoula; HBRG, Hattiesburg; CTHL, Catahoula Sandstone; --, no data]

Site number	Local number and owner or operator	Station number	Depth of well (feet)	Top of open interval (feet)	Geologic unit code
1	A22 Virgil Shows	303726089160001	310	--	GRMF
2	A42 John Biskey	303457089152701	120	110	GRMF
3	B4 Oscar Ladner	303439089130901	227	--	GRMF
4	B5 Niron Ladner	303513089122401	330	--	GRMF
5	B9 William Dickens	303632089103701	257	--	GRMF
6	B10 F Ladner	303610089103601	200	--	GRMF
7	B12 Mary House	303911089090801	230	--	GRMF
8	B85 Louis Simmons	303809089110001	74	69	GRMF
9	B87 Richard Ladner	300610089103601	322	317	GRMF
10	B126 Clarence Hall	303919089095301	180	170	GRMF
11	B129 Bryan Wallace	303736089095501	310	295	GRMF
12	B161 Billy Hickman	303822089120101	210	200	GRMF
13	B166 Gene Breland	303827089102902	140	--	GRMF
14	C018 U S Forest Service	303732089032201	638	588	PCGL
15	C19 U S Forest Service	303732089032101	230	--	GRMF
16	C27 John Alliston	303527089075001	678	668	PCGL
17	C81 Saucier Utility	303809089081101	776	746	PCGL
18	C120 Viola Mason	303651089054801	1,510	1,480	HBRG
19	C134 Paul Roberts	303532089071802	300	290	GRMF
20	C146 Clifford Vogle	303540089024801	476	466	PCGL
21	C183 Buddy Conway	303730089060001	189	179	GRMF
22	C219 Church of Christ	303841089074801	237	227	GRMF
23	C274 Saucier Utility	303806089080301	1,410	1,350	HBRG
24	C286 Larry Haley	303851089043301	730	710	PCGL
25	C287 U S Forest Service	303405089074601	875	850	PCGL
26	C288 U S Forest Service	303736089032701	645	620	PCGL
27	D11 Eldon Mallett	303858088542001	80	--	CRNL
28	D19 Preston Fayard	303530088595201	326	316	GRMF
29	D26 L W Parker	303335088593001	705	675	PCGL
30	D34 E E Fayard	303548088593201	215	210	GRMF

**Table 1. Summary of site information for wells in Harrison County,
Mississippi--Continued**

Site number	Local number and owner or operator		Station number	Depth of well (feet)	Top of open interval (feet)	Geologic unit code
31	D36	Kenneth L Gates	303832089013201	252	242	GRMF
32	D42	Sydney Mallett	303957088580201	366	356	GRMF
33	D43	Jerry Lepoma	303348089000801	900	--	PCGL
34	E91	Jim Usery	303308089170101	1,320	1,300	PCGL
35	E93	S S Fazzio	303318089154301	315	305	GRMF
36	E95	D Drake	303130089153401	420	410	GRMF
37	E99	Kenny Fazzio	303354089161801	420	400	GRMF
38	E100	Lonnie Necaie	302751089185101	410	400	GRMF
39	F081	Foley Lindsey	303124089110801	325	320	GRMF
40	F148	Riverline Utility	303328089101401	358	319	GRMF
41	F287	Kevin Morris	303110089094201	635	625	GRMF
42	F333	Michael Memorial	302946089094201	520	500	GRMF
43	F335	Lizana Fire Dept	303155089140101	560	540	GRMF
44	F336	Bill Stephens	302838089122201	980	960	PCGL
45	F338	International Paper	302650089115101	202	192	GRMF
46	G024	MS Fish Hatchery	303115089070904	785	725	PCGL
47	G146	MS Fish Hatchery	303054089070101	420	400	GRMF
48	G239	B L S Inc	302908089064301	520	460	GRMF
49	G425	Orange Grove	302825089042001	700	650	PCGL
50	G428	Johnson	303048089071701	1,800	--	HBRG
51	G429	Orange Grove	302934089053501	690	610	PCGL
52	G430	W Ladner	303046089052301	1,780	1,760	HBRG
53	H48	R H Ladner	303009088540601	840	830	PCGL
54	H265	C M Plummer	303114089582202	794	754	PCGL
55	H270	Doug Young	303025088542001	836	816	PCGL
56	J192	Highland Baptist	302540089143601	540	525	GRMF
57	J211	G W Byrne	302447089165201	2,410	2,350	CTHL
58	J212	DuPont	302306089182801	1,760	1,660	HBRG
59	J213	DuPont	302308089183101	1,770	1,640	HBRG
60	J216	Waste Management	302536089162601	546	506	GRMF
61	K4	MS Housing	302305089082401	785	765	PCGL
62	K325	Ricky Lee	302741089113401	1,400	1,390	HBRG
63	K326	Deep South Trucking	302450089112701	640	620	PCGL
64	L2	Gulfport	302220089055401	815	755	PCGL
65	L14	Gulfport	302330089053001	763	703	PCGL

**Table 1. Summary of site information for wells in Harrison County,
Mississippi--Continued**

Site number	Local number and owner or operator		Station number	Depth of well (feet)	Top of open interval (feet)	Geologic unit code
66	L15	Gulfport	302230089034202	752	689	PCGL
67	L17	Gulfport	302206089074505	848	768	PCGL
68	L18	Orange Grove	302712089052401	765	715	PCGL
69	L34	Harrison County	302602089051301	584	514	GRMF
70	L35	Dedeaux Utility	302645089032701	730	680	PCGL
71	L160	U S Navy	302252089062001	1,200	1,130	PCGL
72	L161	U S Navy	302748089074501	850	--	PCGL
73	L231	Orange Grove	302810089060002	697	647	PCGL
74	L330	Dedeaux Utility	302700089030801	742	678	PCGL
75	L405	Gulfport	302357089064201	795	715	PCGL
76	L411	Harrison County	302603089050201	711	661	PCGL
77	L426	Gulfport	302252089053301	926	886	PCGL
78	L430	U S Navy	302251089062901	746	686	PCGL
79	L433	U S Navy	302249089073701	720	649	PCGL
80	L454	Carl McGill	302403089141801	2,400	2,380	CTHL
81	L654	Dolan Trailer Park	302410089082201	1,690	1,670	HBRG
82	L660	Dedeaux Utility	302659089030801	741	690	PCGL
83	L663	Sterling Drug	302331089053401	1,180	1,120	PCGL
84	L667	Gulfport	302152089064901	952	772	PCGL
85	L669	Fore Concrete	302656089054901	1,660	1,600	HBRG
86	L670	Orange Grove	302646089053001	750	670	PCGL
87	M4	Biloxi	302342088563003	1,200	1,120	PCGL
88	M6	Biloxi	302410088533607	463	384	GRMF
89	M23	MS Power	302611089014801	755	695	PCGL
90	M24	MS Power	302615089011503	845	785	PCGL
91	M26	Harrison County	302440089014501	752	679	PCGL
92	M31	Oakleigh Manor	302702089011401	510	486	GRMF
93	M33	Biloxi	302455088584001	700	660	GRMF
94	M40	Biloxi	302454088580001	654	604	GRMF
95	M75	U S Air Force	302451088550501	610	570	GRMF
96	M76	U S Air Force	302432088541601	630	590	GRMF
97	M79	U S Air Force	302354088555101	640	600	GRMF
98	M196	Biloxi	302624089000001	850	840	PCGL
99	M266	James Talley	302557088530301	1,236	1,210	PCGL
100	M300	Oakleigh Utility	302712089012001	508	488	GRMF

**Table 1. Summary of site information for wells in Harrison County,
Mississippi--Continued**

Site number	Local number and owner or operator	Station number	Depth of well (feet)	Top of open interval (feet)	Geologic unit code
101	M351 Biloxi	302350088570501	846	796	PCGL
102	M380 Gulfport	302457089014501	786	736	PCGL
103	M397 Gulfport	302346089001501	830	770	PCGL
104	M428 Imperial Estate	302632088565001	593	563	GRMF
105	M519 Biloxi	302554088580401	546	486	GRMF
106	M550 Biloxi	302456088541304	634	564	GRMF
107	M576 Biloxi	302404088590301	848	788	PCGL
108	M643 D'Iberville	302410088531501	840	747	PCGL
109	M644 Gulfport	302352089015701	820	740	PCGL
110	M648 Gulfport	302409089002101	845	745	PCGL
111	M657 Gulfport	302304089020301	900	820	PCGL
112	M661 Biloxi	302555088555401	550	500	GRMF
113	M674 Biloxi	302552088580401	593	533	GRMF
114	M696 Biloxi	302428088531501	915	855	PCGL
115	M698 Biloxi	302356088595701	819	758	PCGL
116	M703 Biloxi	302610088580201	845	755	PCGL
117	M704 Biloxi	302540088565001	593	533	GRMF
118	M709 MS Coast Coliseum	302340088582601	150	120	CRNL
119	M710 Gulf Orleans	302810088545201	332	282	GRMF
120	M711 John Sherman	302812088592101	1,472	1,457	HBRG
121	M714 Galion Utility	302645088540301	810	750	PCGL
122	M722 Dels Seaway	302439088531301	1,240	--	PCGL
123	M727 Biloxi	302430088574901	649	588	GRMF
124	M729 Biloxi	302359088522001	895	825	PCGL
125	M730 Biloxi	302348088560501	845	785	PCGL
126	M734 Dels Seaway	302438088531001	1,160	1,110	PCGL
127	M739 Citanovitch Packing	302443088525001	1,100	1,050	PCGL
128	M741 Rolling Hills	302627088545201	1,000	--	PCGL
129	M744 Cedar Lake Trailer Park	302623088554801	846	806	PCGL
130	N102 Pass Christian	301838089163201	966	906	PCGL
131	N104 DuPont	302258089183101	1,750	1,600	HBRG
132	N166 DuPont	302233089191501	684	644	GRMF
133	N291 DuPont	302300089180601	1,760	1,620	HBRG
134	N313 Pass Christian	301832089171301	982	912	PCGL
135	N327 Pass Christian	301917089153101	858	823	PCGL

**Table 1. Summary of site information for wells in Harrison County,
Mississippi--Continued**

Site number	Local number and owner or operator		Station number	Depth of well (feet)	Top of open interval (feet)	Geologic unit code
136	O6	Pass Christian	301936089142403	891	841	PCGL
137	O8	Long Beach	302200089100601	611	571	GRMF
138	O11	Long Beach	302215089102001	590	550	GRMF
139	O123	Long Beach	302020089110001	873	803	PCGL
140	O125	Margot Gack	302134089141501	1,580	1,550	HBRG
141	O251	Long Beach	302207089100501	850	790	PCGL
142	O268	Long Beach	302059089090601	876	816	PCGL
143	O296	Long Beach	302139089084401	862	778	PCGL
144	O307	Long Beach	302204089102701	1,640	1,560	HBRG
145	O309	Coast Water Works	302023089135101	1,050	1,010	PCGL

Table 2. Water-quality data collected from wells in Harrison County, Mississippi, during 1993

[Formations: CRNL, Citronelle; GRMF, Graham Ferry; PCGL, Pascagoula; HBRG, Hattiesburg; CTHL, Catahoula Sandstone; $\mu\text{S}/\text{cm}$, microsiemens per centimeter at 25 degrees Celsius; ROE, residue on evaporation at 180 degrees Celsius; mg/L, milligrams per liter; N, nitrogen; <, less than; --, no data]

Site number	Local number	Geologic unit code	Date	Specific conductance ($\mu\text{S}/\text{cm}$)		pH		Color (platinum-cobalt units)	ROE (mg/L)	Chloride (mg/L)	Nitrite plus nitrate, as N (mg/L)
				field	lab	field	lab				
1	A22	GRMF	July 19	--	127	6.8	6.9	<5	125	3.7	<0.02
2	A42	GRMF	July 19	78	75	6.7	7.3	<5	111	3.4	<.02
3	B4	GRMF	July 7	23	27	5.6	6.2	<5	30	3.6	.02
4	B5	GRMF	July 7	13	15	5.5	5.9	<5	20	2.7	.02
5	B9	GRMF	July 7	119	124	6.8	7.3	50	129	3.5	<.02
6	B10	GRMF	July 7	154	155	7.2	7.6	<5	151	3.6	<.02
7	B12	GRMF	July 7	118	107	6.6	7.0	120	121	2.9	<.02
8	B85	GRMF	July 2	54	53	5.2	6.6	<5	91	4.1	.05
9	B87	GRMF	July 7	108	122	6.8	7.1	<5	130	3.5	<.02
10	B126	GRMF	July 7	121	120	6.7	7.2	<5	128	3.1	<.02
11	B129	GRMF	July 2	185	192	7.1	7.9	<5	163	4.0	<.02
12	B161	GRMF	July 7	158	157	6.8	7.4	<5	142	3.8	<.02
13	B166	GRMF	July 2	30	34	5.5	5.9	<5	48	4.8	.59
14	C18	PCGL	June 30	268	270	8.3	8.1	<5	193	2.4	<.02
15	C19	GRMF	June 30	179	170	6.9	7.2	<5	160	2.8	.04
16	C27	PCGL	June 30	243	262	9.0	8.8	<5	172	2.3	<.02
17	C81	PCGL	June 30	238	227	8.7	8.6	<5	176	2.7	<.02
18	C120	HBRG	June 30	230	225	8.6	8.2	<5	150	1.9	<.02
19	C134	GRMF	July 1	113	108	6.5	6.9	<5	120	3.1	<.02
20	C146	PCGL	July 1	111	112	6.5	7.1	60	129	2.9	<.02
21	C183	GRMF	July 2	167	170	6.7	7.6	<5	145	3.3	<.02
22	C219	GRMF	June 30	99	102	6.7	7.0	<5	120	3.0	<.02
23	C274	HBRG	June 30	253	250	8.6	8.6	<5	180	3.0	<.02
24	C286	PCGL	July 1	303	309	8.9	8.7	<5	196	2.4	<.02
25	C287	PCGL	July 1	280	283	9.0	8.9	<5	186	2.4	<.02
26	C288	PCGL	June 30	292	288	8.5	8.3	<5	199	2.3	<.02
27	D11	CRNL	July 1	23	21	5.5	6.1	<5	37	3.1	<.02
28	D19	GRMF	July 1	141	130	7.0	7.1	30	149	3.0	<.02
29	D26	PCGL	July 1	173	176	6.9	7.5	<5	172	2.7	<.02
30	D34	GRMF	July 1	177	173	7.2	7.6	<5	155	3.2	<.02

**Table 2. Water-quality data collected from wells in Harrison County,
Mississippi, during 1993--Continued**

Site number	Local number	Geologic unit code	Date	Specific conductance ($\mu\text{S}/\text{cm}$)		pH		Color (platinum- cobalt units)	ROE (mg/L)	Chloride (mg/L)	Nitrite plus nitrate, as N (mg/L)
				field	lab	field	lab				
31	D36	GRMF	July 1	114	111	6.6	6.8	10	128	3.4	<0.02
32	D42	GRMF	July 1	339	338	7.5	7.7	<5	233	2.5	<.02
33	D43	PCGL	July 1	600	595	8.9	8.6	25	382	3.1	<.02
34	E91	PCGL	July 19	322	345	9.3	9.0	5	215	2.3	<.02
35	E93	GRMF	July 19	163	198	7.5	7.6	<5	157	4.0	.08
36	E95	GRMF	July 19	227	223	8.4	8.3	<5	142	4.0	<.02
37	E99	GRMF	July 19	170	156	6.9	7.6	50	143	3.4	<.02
38	E100	GRMF	July 21	190	189	7.3	7.5	20	154	3.4	<.02
39	F81	GRMF	July 20	244	246	8.1	8.1	<5	164	5.4	<.02
40	F148	GRMF	July 21	166	163	7.4	7.8	<5	141	3.7	<.02
41	F287	GRMF	July 20	147	145	6.7	7.0	5	140	3.5	<.02
42	F333	GRMF	July 20	198	194	7.6	7.8	<5	149	3.7	<.02
43	F335	GRMF	July 20	196	193	7.5	7.6	<5	159	3.4	<.02
44	F336	PCGL	July 20	384	387	9.3	8.9	10	237	2.4	.06
45	F338	GRMF	July 20	118	113	6.5	7.0	10	141	6.8	<.02
46	G24	PCGL	July 8	186	184	8.6	8.4	<5	165	3.4	.03
47	G146	GRMF	July 8	169	169	7.3	7.3	<5	140	3.6	<.02
48	G239	GRMF	July 6	180	180	7.5	7.6	<5	152	3.7	<.02
49	G425	PCGL	July 6	291	295	8.9	8.7	<5	200	2.7	<.02
50	G428	HBRG	July 19	--	280	9.0	8.5	5	182	2.4	<.02
51	G429	PCGL	July 6	268	265	9.0	8.6	<5	182	3.0	.03
52	G430	HBRG	June 29	292	298	8.8	8.7	5	194	2.3	<.02
53	H48	PCGL	July 20	918	919	8.8	8.6	10	539	150	<.02
54	H265	PCGL	July 20	444	434	9.1	8.5	<5	278	30	.03
55	H270	PCGL	July 20	657	667	8.9	8.7	10	421	86	<.02
56	J192	GRMF	July 20	207	206	7.1	7.5	<5	164	3.3	<.02
57	J211	CTHL	July 21	590	592	8.9	8.5	10	339	73	<.02
58	J212	HBRG	July 7	844	823	8.7	8.1	<5	456	150	<.02
59	J213	HBRG	July 7	770	763	9.1	8.5	<5	422	140	<.02
60	J216	GRMF	July 9	202	202	7.4	7.5	<5	165	3.3	<.02
61	K4	PCGL	July 20	234	233	8.2	8.0	<5	168	3.9	<.02
62	K325	HBRG	July 19	369	369	9.2	9.0	5	254	2.3	<.02
63	K326	PCGL	July 7	207	206	8.1	7.8	<5	170	3.4	<.02
64	L2	PCGL	July 7	307	297	8.2	8.8	<5	202	4.3	<.02
65	L14	PCGL	July 7	247	244	8.0	8.8	<5	194	3.3	<.02

**Table 2. Water-quality data collected from wells in Harrison County,
Mississippi, during 1993--Continued**

Site number	Local number	Geologic unit code	Date	Specific conductance (μ S/cm)		pH		Color (platinum- cobalt units)	ROE (mg/L)	Chloride (mg/L)	Nitrite plus nitrate, as N (mg/L)
				field	lab	field	lab				
66	L15	PCGL	July 7	268	273	8.6	8.5	<5	190	3.8	<0.02
67	L17	PCGL	July 7	252	253	8.0	8.0	<5	184	3.9	<.02
68	L18	PCGL	July 6	240	236	8.7	8.4	<5	174	3.6	<.02
69	L34	GRMF	July 20	434	429	9.1	8.8	5	296	2.6	<.02
70	L35	PCGL	July 21	316	315	9.1	8.9	<5	217	2.6	<.02
71	L160	PCGL	July 7	246	247	7.7	8.0	<5	189	6.6	<.02
72	L161	PCGL	July 7	290	290	8.9	8.7	<5	206	4.0	<.02
73	L231	PCGL	July 6	280	228	8.6	8.2	<5	172	3.7	<.02
74	L330	PCGL	July 21	381	384	9.2	8.9	<5	255	2.6	<.02
75	L405	PCGL	July 7	294	299	8.8	8.6	<5	206	2.9	<.02
76	L411	PCGL	July 20	254	251	8.9	8.4	<5	213	3.6	<.02
77	L426	PCGL	July 7	343	346	9.1	8.9	<5	224	3.3	<.02
78	L430	PCGL	July 7	217	243	8.3	8.4	<5	183	4.6	<.02
79	L433	PCGL	July 7	241	237	7.4	7.8	<5	188	4.2	<.02
80	L454	CTHL	July 6	1,130	1,110	9.0	8.7	10	638	220	<.02
81	L654	HBRG	June 30	357	355	8.8	8.8	<5	231	5.9	<.02
82	L660	PCGL	July 21	345	342	9.0	8.8	<5	234	2.8	<.02
83	L663	PCGL	July 19	452	454	9.1	8.9	15	280	2.6	<.02
84	L667	PCGL	July 7	277	281	8.7	8.5	<5	200	4.0	<.02
85	L669	HBRG	July 19	--	248	8.1	8.1	<5	196	5.8	.03
86	L670	PCGL	July 6	253	239	8.6	8.2	<5	186	3.5	<.02
87	M4	PCGL	July 8	560	554	8.9	8.7	10	331	48	<.02
88	M6	GRMF	July 8	311	314	8.7	8.5	<5	208	4.0	<.02
89	M23	PCGL	July 8	359	354	8.9	8.8	<5	234	2.8	<.02
90	M24	PCGL	July 8	491	491	8.9	8.8	10	305	13	--
91	M26	PCGL	July 20	207	207	8.5	8.0	<5	189	5.9	<.02
92	M31	GRMF	July 8	317	316	8.5	8.2	<5	228	3.1	<.02
93	M33	GRMF	July 8	327	324	8.6	8.5	<5	221	4.2	<.02
94	M40	GRMF	July 9	279	271	7.6	7.8	<5	208	3.5	<.02
95	M75	GRMF	July 8	263	260	7.9	7.7	<5	199	4.5	.85
96	M76	GRMF	July 8	226	237	7.9	8.0	<5	186	4.1	<.02
97	M79	GRMF	July 8	318	317	8.7	8.6	<5	216	5.0	<.02
98	M196	PCGL	July 8	316	310	--	8.8	5	197	8.8	.14
99	M266	PCGL	July 20	1,830	1,880	8.9	8.7	10	1,020	440	<.02
100	M300	GRMF	July 8	347	345	9.2	8.9	<5	234	2.5	<.02

**Table 2. Water-quality data collected from wells in Harrison County,
Mississippi, during 1993--Continued**

Site number	Local number	Geologic unit code	Date	Specific conductance ($\mu\text{S}/\text{cm}$)		pH		Color (platinum- cobalt units)	ROE (mg/L)	Chloride (mg/L)	Nitrite plus nitrate, as N (mg/L)
				field	lab	field	lab				
101	M351	PCGL	July 8	405	399	9.0	8.8	10	250	7.4	<0.02
102	M380	PCGL	July 8	440	451	8.8	8.4	20	289	13	<.02
103	M397	PCGL	July 8	369	373	9.2	8.8	5	243	4.2	<.02
104	M428	GRMF	July 21	271	266	7.7	7.7	<5	202	2.9	<.02
105	M519	GRMF	July 8	--	236	8.5	8.2	<5	171	2.9	<.02
106	M550	GRMF	July 8	280	277	8.0	8.1	<5	210	4.2	<.02
107	M576	PCGL	July 8	389	391	9.0	8.9	10	249	6.8	<.02
108	M643	PCGL	July 20	569	562	9.0	8.7	10	371	6.6	<.02
109	M644	PCGL	July 8	431	438	9.2	8.7	5	281	10	<.02
110	M648	PCGL	July 8	430	433	9.2	8.8	10	284	10	<.02
111	M657	PCGL	July 8	425	430	9.1	8.7	5	281	9.8	<.02
112	M661	GRMF	July 9	242	190	7.5	7.6	<5	168	3.3	<.02
113	M674	GRMF	July 8	330	312	9.0	8.7	5	204	12	<.02
114	M696	PCGL	July 8	532	534	8.9	8.7	10	325	38	<.02
115	M698	PCGL	July 8	398	396	8.9	8.8	<5	261	6.6	<.02
116	M703	PCGL	July 8	340	328	9.0	8.7	<5	209	12	<.02
117	M704	GRMF	July 9	370	327	8.3	8.1	<5	229	3.5	<.02
118	M709	CRNL	July 8	360	354	8.5	8.5	<5	236	9.8	--
119	M710	GRMF	July 21	275	273	8.5	8.2	<5	220	3.8	<.02
120	M711	HBRG	July 20	1,240	1,260	8.7	8.5	20	711	230	<.02
121	M714	PCGL	July 20	543	539	9.1	8.8	10	325	34	<.02
122	M722	PCGL	July 8	636	643	9.0	8.4	10	387	74	<.02
123	M727	GRMF	July 9	230	223	8.2	8.1	<5	182	3.1	<.02
124	M729	PCGL	July 8	538	533	9.0	8.7	10	336	39	<.02
125	M730	PCGL	July 8	400	394	9.0	8.8	<5	251	8.1	<.02
126	M734	PCGL	July 8	1,640	1,690	8.7	8.5	20	921	380	<.02
127	M739	PCGL	July 21	2,000	2,020	8.6	8.4	50	1,120	470	<.02
128	M741	PCGL	July 21	717	759	9.0	8.6	10	434	96	<.02
129	M744	PCGL	July 21	430	432	9.0	8.7	5	272	24	.05
130	N102	PCGL	June 30	621	622	8.7	8.6	20	384	32	<.02
131	N104	HBRG	July 7	569	564	8.8	8.2	<5	319	73	<.02
132	N166	GRMF	July 7	246	241	7.8	7.8	10	191	5.2	<.02
133	N291	HBRG	July 7	638	622	8.7	8.2	<5	357	96	<.02
134	N313	PCGL	June 30	557	560	8.7	8.6	15	343	35	<.02
135	N327	PCGL	June 30	636	637	8.7	8.7	20	389	48	<.02

**Table 2. Water-quality data collected from wells in Harrison County,
Mississippi, during 1993--Continued**

Site number	Local number	Geologic unit code	Date	Specific conductance (μ S/cm)		pH		Color (platinum- cobalt units)	ROE (mg/L)	Chloride (mg/L)	Nitrite plus nitrate, as N (mg/L)
				field	lab	field	lab				
136	O6	PCGL	June 30	433	449	8.4	8.6	<5	284	19	0.03
137	O8	GRMF	June 29	195	198	8.1	7.9	<5	168	3.0	<.02
138	O11	GRMF	June 29	189	190	7.9	7.7	<5	163	3.0	<.02
139	O123	PCGL	June 29	271	272	7.4	7.8	20	202	3.1	<.02
140	O125	HBRG	July 7	375	374	9.0	8.7	<5	238	17	<.02
141	O251	PCGL	June 29	239	242	8.4	8.4	<5	184	3.3	<.02
142	O268	PCGL	June 29	257	260	8.1	8.0	<5	196	4.1	<.02
143	O296	PCGL	June 29	247	249	8.3	8.0	<5	183	3.4	<.02
144	O307	HBRG	June 29	426	434	8.6	8.8	<5	265	34	<.02
145	O309	PCGL	July 8	531	525	9.0	8.7	10	333	21	<.02

Table 3. Water-quality data collected from selected wells in Harrison County, Mississippi, during 1993

[N, nitrogen; P, phosphorus; mg/L, milligrams per liter; µg/L, micrograms per liter;
CaCO₃, calcium carbonate. All constituents dissolved]

Site number	Local number	Date	Ammonia, as N	Phosphorus, ortho, as P	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Sulfate (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Iron (µg/L)	Manganese (µg/L)	Alkalinity, as CaCO ₃
17	C81	06-30	0.10	0.53	0.3	<0.10	52	0.14	9.3	0.2	27	25	4	103
23	C274	06-30	.04	.48	.4	<.10	58	.60	11	.2	22	10	6	113
34	E91	07-19	.28	.37	.2	<.10	78	.29	11	.4	22	4	7	162
36	E95	07-19	.04	.11	1.3	.24	49	.52	7.7	.1	16	<3	12	102
40	F148	07-21	.11	.17	3.0	.71	31	1.0	6.9	.1	56	190	110	71
42	F333	07-20	.10	.21	1.8	.22	43	.70	7.5	.2	46	140	34	85
44	F336	07-20	.22	.36	.2	<.10	91	.23	10	.3	19	3	4	186
53	H48	07-20	.18	.28	3.4	.32	190	1.3	2.9	.4	21	<3	27	227
55	H270	07-20	.07	.30	2.1	.18	140	1.1	4.4	.4	19	<3	12	195
61	K4	07-20	.09	.24	.3	<.10	55	.40	7.6	.2	42	91	23	108
62	K325	07-19	.36	.33	.2	<.10	86	.24	10	.3	20	6	1	177
87	M4	07-08	.39	.33	1.0	<.10	120	.75	6.4	.4	20	<3	2	200
98	M196	07-08	.33	.33	.9	<.10	69	.45	11	.3	21	<3	6	130
99	M266	07-20	.57	.17	4.4	1.0	400	2.4	<.2	.5	11	4	18	265
104	M428	07-21	.31	.18	1.2	.35	61	1.0	7.7	.1	56	370	210	127
112	M661	07-09	.03	.01	1.4	.42	42	1.1	6.6	.1	60	630	250	83
114	M696	07-08	.16	.28	.9	<.10	120	.68	6.4	.4	20	<3	5	205
116	M703	07-08	.08	.27	.8	<.10	74	.45	10	.3	23	<3	4	136
119	M710	07-21	.11	.28	.4	<.10	63	.31	8.6	.3	31	14	4	127
120	M711	07-20	.24	.30	2.6	.35	270	1.6	.3	.6	17	6	26	286
123	M727	07-09	.16	.25	.6	.10	52	.45	8.7	.1	50	23	21	102
124	M729	07-08	.17	.29	.6	<.10	120	.77	6.7	.4	24	<3	3	209
127	M739	07-21	.94	.14	4.6	.87	400	2.2	1.0	.6	14	--	--	274
128	M741	07-21	.04	.25	3.1	.33	170	1.0	3.5	.4	20	11	19	232
135	N327	06-30	.11	.35	.9	.13	150	.64	1.4	.4	19	8	10	255
136	O6	06-30	.22	.32	--	--	--	--	5.5	.4	--	--	--	200
144	O307	06-29	.05	.21	2.2	<.10	93	.74	8.6	.2	16	21	16	160

Table 4. Summary of water-quality data collected from wells in Harrison County, Mississippi, during 1993

[$\mu\text{S}/\text{cm}$, microsiemens per centimeter at 25 degrees Celsius; ROE, residue on evaporation at 180 degrees Celsius; mg/L, milligrams per liter; N, nitrogen; <, less than.
All constituents dissolved]

Citronelle Formation (2 samples)			
	Minimum	Median	Maximum
Depth, in feet	80	115	150
Specific conductance, field ($\mu\text{S}/\text{cm}$)	23	192	360
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	21	188	354
pH, field	5.5	7.0	8.5
pH, lab	6.1	7.3	8.5
Color (platinum-cobalt units)	<5	<5	<5
ROE (mg/L)	37	136	236
Chloride (mg/L)	3.1	6.4	9.8
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	<0.02
Graham Ferry Formation (55 samples)			
	Minimum	Median	Maximum
Depth, in feet	74	420	700
Specific conductance, field ($\mu\text{S}/\text{cm}$)	13	189	434
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	15	190	429
pH, field	5.2	7.4	9.2
pH, lab	5.9	7.6	8.9
Color (platinum-cobalt units)	<5	<5	120
ROE (mg/L)	20	157	296
Chloride (mg/L)	2.5	3.5	12
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	0.85
Pascagoula Formation (72 samples)			
	Minimum	Median	Maximum
Depth, in feet	476	842	1,320
Specific conductance, field ($\mu\text{S}/\text{cm}$)	111	342	2,000
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	112	344	2,020
pH, field	6.5	8.9	9.3
pH, lab	7.1	8.6	9.0
Color (platinum-cobalt units)	<5	<5	60
ROE (mg/L)	129	220	1,120
Chloride (mg/L)	2.3	4.2	470
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	0.14

Table 4. Summary of water-quality data collected from wells in Harrison County, Mississippi, during 1993--Continued

Hattiesburg Formation			
(14 samples)			
	Minimum	Median	Maximum
Depth, in feet	1,400	1,675	1,800
Specific conductance, field ($\mu\text{S}/\text{cm}$)	230	400	1,240
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	225	372	1,260
pH, field	8.1	8.8	9.2
pH, lab	8.1	8.5	9.0
Color (platinum-cobalt units)	<5	<5	20
ROE (mg/L)	150	246	711
Chloride (mg/L)	1.9	11	230
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	0.03
Catahoula Sandstone			
(2 samples)			
	Minimum	Median	Maximum
Depth, in feet	2,400	2,405	2,410
Specific conductance, field ($\mu\text{S}/\text{cm}$)	590	860	1,130
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	592	851	1,110
pH, field	8.9	8.9	9.0
pH, lab	8.5	8.6	8.7
Color (platinum-cobalt units)	10	10	10
ROE (mg/L)	339	488	638
Chloride (mg/L)	73	146	220
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	<0.02
All geologic units			
(145 samples)			
	Minimum	Median	Maximum
Depth, in feet	74	746	2,410
Specific conductance, field ($\mu\text{S}/\text{cm}$)	13	280	2,000
Specific conductance, lab ($\mu\text{S}/\text{cm}$)	15	273	2,020
pH, field	5.2	8.6	9.3
pH, lab	5.9	8.4	9.0
Color (platinum-cobalt units)	<5	<5	120
ROE (mg/L)	20	199	1,120
Chloride (mg/L)	1.9	3.7	470
Nitrite plus nitrate, as N (mg/L)	<0.02	<0.02	0.85