HYDROGEOLOGIC DATA FOR THE CANAL CREEK AREA, ABERDEEN PROVING GROUND, MARYLAND, APRIL 1986-MARCH 1988

By James P. Oliveros and Patrice Gernhardt

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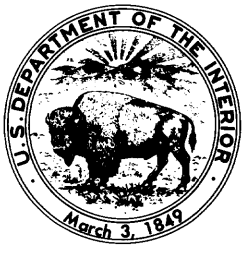
ABERDEEN PROVING GROUND, MARYLAND



Towson, Maryland

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CONVERSION FACTORS AND ABBREVIATIONS

For the convenience of readers who may prefer to use metric (International System) units rather than the inch-pound units used in this report, values may be converted by using the following factors:

Multiply inch-pound unit	by	To obtain metric units
inch (in.)	25.4	millimeter (mm)
	25,400.	micron
foot (ft)	0.3048	meter (m)

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 "Sea Level Datum of 1929."

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ABSTRACT

This report is a compilation of hydrologic and geologic data collected for the period April 1986 through March 1988 for the Canal Creek area of Aberdeen Proving Ground, Maryland. Geologic data include lithologic logs for 73 sites and geophysical logs for 71 sites. Hydrologic data consist of hydrographs and synoptic water-level measurements. The hydrographs were taken from eight wells that were equipped with continuous water-level recorders, and the synoptic water-level measurements were made four times during the study. Well-construction data also are included for 149 observation wells.

INTRODUCTION

Description of Study Area

The Canal Creek study area is located in the Edgewood area of Aberdeen Proving Ground (APG), Harford County, Maryland (fig. 1). The study area lies within the Coastal Plain physiographic province and is underlain by unconsolidated sediments which thicken to as much as 400 ft (feet). The sediments are primarily of the Potomac Group of Cretaceous-age, but a thin veneer of sediments of the Talbot Formation of Pleistocene-age overlie the Potomac Group sediments for most of the study area.

The sediments are divided into discrete aquifers and confining units that from the surface downward, are called the (1) surficial aquifer, (2) upper confining unit, (3) Canal Creek aquifer, (4) lower confining unit, and (5) lower confined aquifer (Don Vroblesky, U.S. Geological Survey, written commun., 1988). The Canal Creek and lower confined aquifers were pumped heavily between 1950 and 1968 to supply water for manufacturing activities. From 1968 until 1984, wells screened in the aquifers were used only as standby water-supply wells. In 1984, the Maryland Department of Health detected volatile organic contaminants in the ground water and the standby water-supply wells were no longer used for drinking water purposes. The U.S. Geological Survey (USGS) and the U.S. Department of Defense, Office of Environmental Management, began investigating the effects of ground-water contamination within the Canal Creek area in 1985.

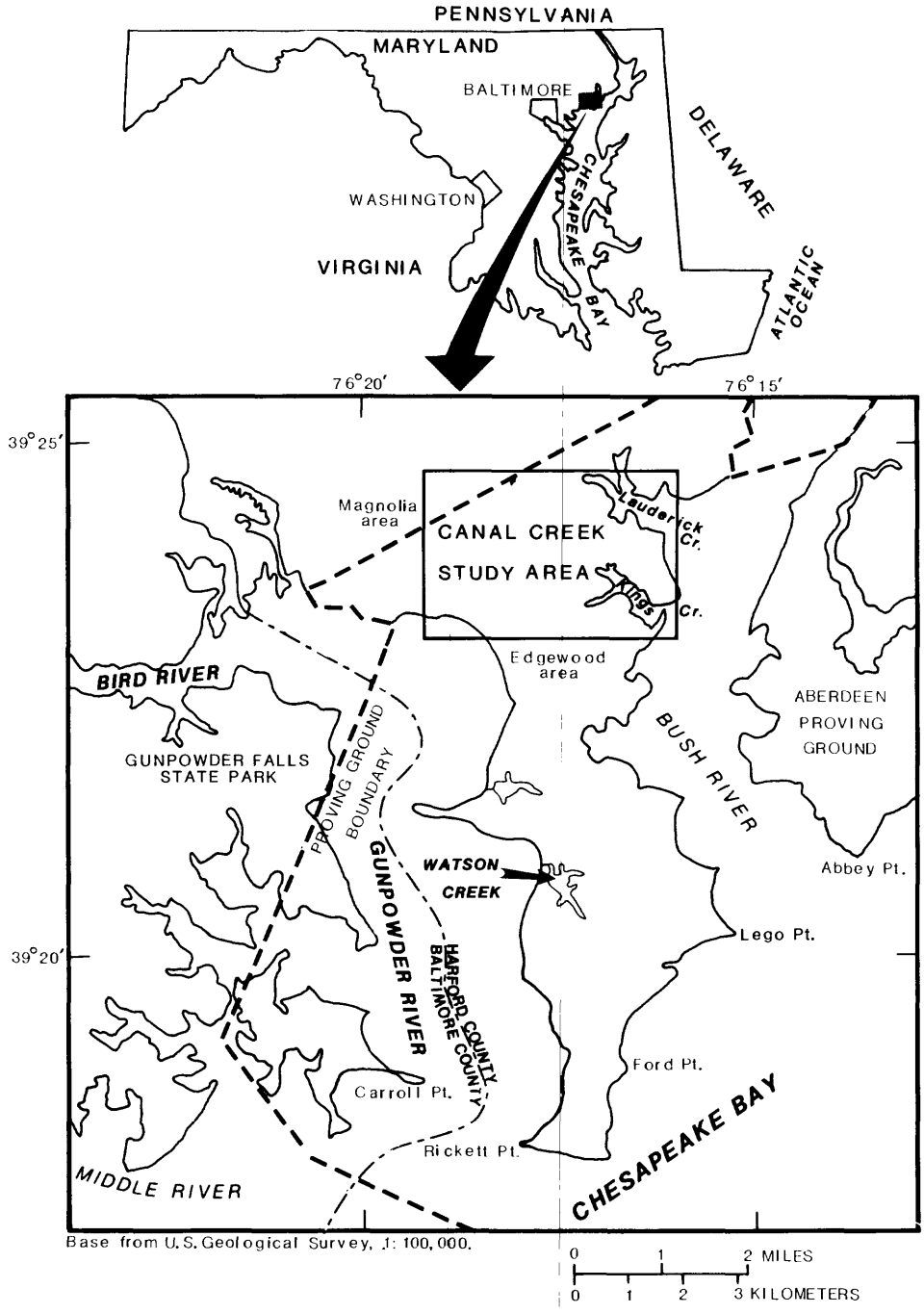

Figure 1.--Location of the Canal Creek study area.

Previous Studies

Previous geologic data from the study area were limited to drillers' logs of the water-supply wells and lithologic logs from shallow (less than 35 ft) monitoring wells installed by the U.S. Army Toxic and Hazardous Materials Agency (THAMA). Geologic data as well as some hydrologic data are presented in a report published by THAMA (Nemeth and others, 1983). The USGS has collected water-level data from one of the standby water-supply wells since 1949.

Numbering System

Each test-boring and well-cluster site was assigned a sequential number based on the order in which the site was originally chosen for investigation. A distinction was made between first- and second-phase well-cluster sites. The first-phase sites were given a one- or two-digit number, with the first site being assigned number 1 and the last site being assigned number 44. The second-phase sites were given a three-digit number, with the first site being assigned number 101 and the last site mentioned in this report being assigned number 138. Some sites were eliminated after numbers were assigned; consequently, some numbers are missing from the sequences.

Three sites were chosen specifically as test-boring sites where only geophysical data were collected and no wells were installed. The sites were numbered TH1, TH2, and TH3. The borings were logged and then sealed with cement without emplacement of well casing.

Each well-cluster site contains one or more observation well. Individual wells are assigned a site number followed by a letter, with the letter corresponding to the relative depth of each well. For example, site 1 contains six wells--1A, 1B, 1C, 1D, 1E, and 1F--with well 1A being the shallowest and well 1F being the deepest. Two exceptions to this rule are wells 7A.1 and 12A.1. In both these cases, four wells were drilled in phase 1--7A, 7B, 12A, and 12B. A shallower well was added at each site in phase 2--7A.1 and 12A.1. Preceding each well number are the letters "CC" for Canal Creek. These letters are used in order to distinguish wells in the Canal Creek study area from wells in other study areas. Each well is also assigned a county well-permit number, but because the permits were obtained after the local numbers were assigned, the local numbers were retained. The permit numbers are listed in table 3; however, not all the wells were assigned a permit number by the time this report was written (November 1988).

Acknowledgments

Many people outside the U.S. Geological Survey facilitated the collection of lithologic and geophysical data during drilling operations. Thanks are given to Cynthia L. Couch of the Office of Environmental Management (OEM), Aberdeen Proving Ground, and David Parks, formerly of OEM, for their support of the study. Thanks are also given to the Technical Escort Unit for providing support during drilling operations, and to the U.S. Army Corps of Engineers for collecting core samples and providing geophysical logging equipment. Special thanks are given to John Bush, William Krynor, James Stefano, and Samuel Pastor of the U.S. Army Corps of Engineers for assisting in the collection of geophysical data.

WELL CONSTRUCTION

Detailed well-construction records (table 1) were kept for all monitoring wells, and uniform well-construction procedures were followed for the majority of the wells. All wells consist of a 4-in.-outside-diameter polyvinyl chloride (pvc) casing, and most contain a 4-in.-outside-diameter pvc screen that is 5 ft in length. A sand pack was installed around the screened interval up to 1 ft above the top of the screen (fig. 2). Bentonite pellets were placed above the sand pack 12 to 24 in. thick; a grout seal was placed around the outside of the casing from the top of the bentonite plug up to the land surface.

DATA COLLECTION

Data collection began in April 1986 with drilling of the observation wells. From April 1986 through March 1988, 149 observation wells were installed at 75 sites (fig. 3) in two phases of drilling. Detailed geologic data (table 2) were collected at each site during drilling except at sites 12 and 121. Synoptic water-level measurements (table 3) were made four times and water-level recorders were installed on selected wells for recording water levels at 15-minute intervals (figs. 4-11). Additionally, geophysical logs were run at 71 sites (figs. 12-29).

There was a total of 78 sites where borings were made in conjunction with the study. Wells were only installed at 75 of the sites. The other three sites were only used for test borings. At 37 of the well sites, test borings were drilled prior to the installation of wells. Geologic and geophysical data were generally collected from the test borings; therefore, the depths of the geologic data and geophysical logs in table 2 do not necessarily correspond with the well depths in table 1. In other cases, core samples were not taken to the total depth of the boring.

The hydrogeologic data presented in this report are only part of the overall data base from the study. Chemical data from the sampling of the first-phase wells also were collected (Michelle M. Lorah and Don A. Vroblesky, U.S. Geological Survey, written commun., 1988) and the collection of hydrologic data is ongoing.

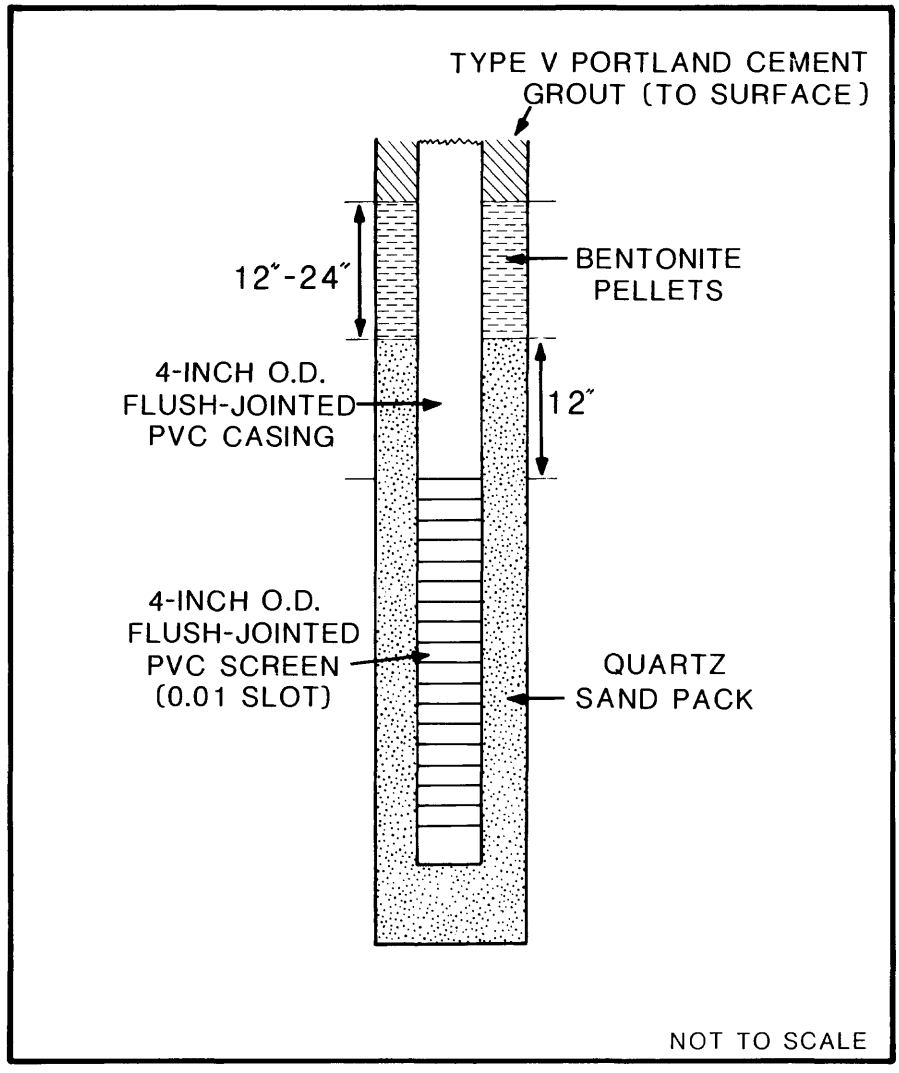

Figure 2.--Typical well construction.

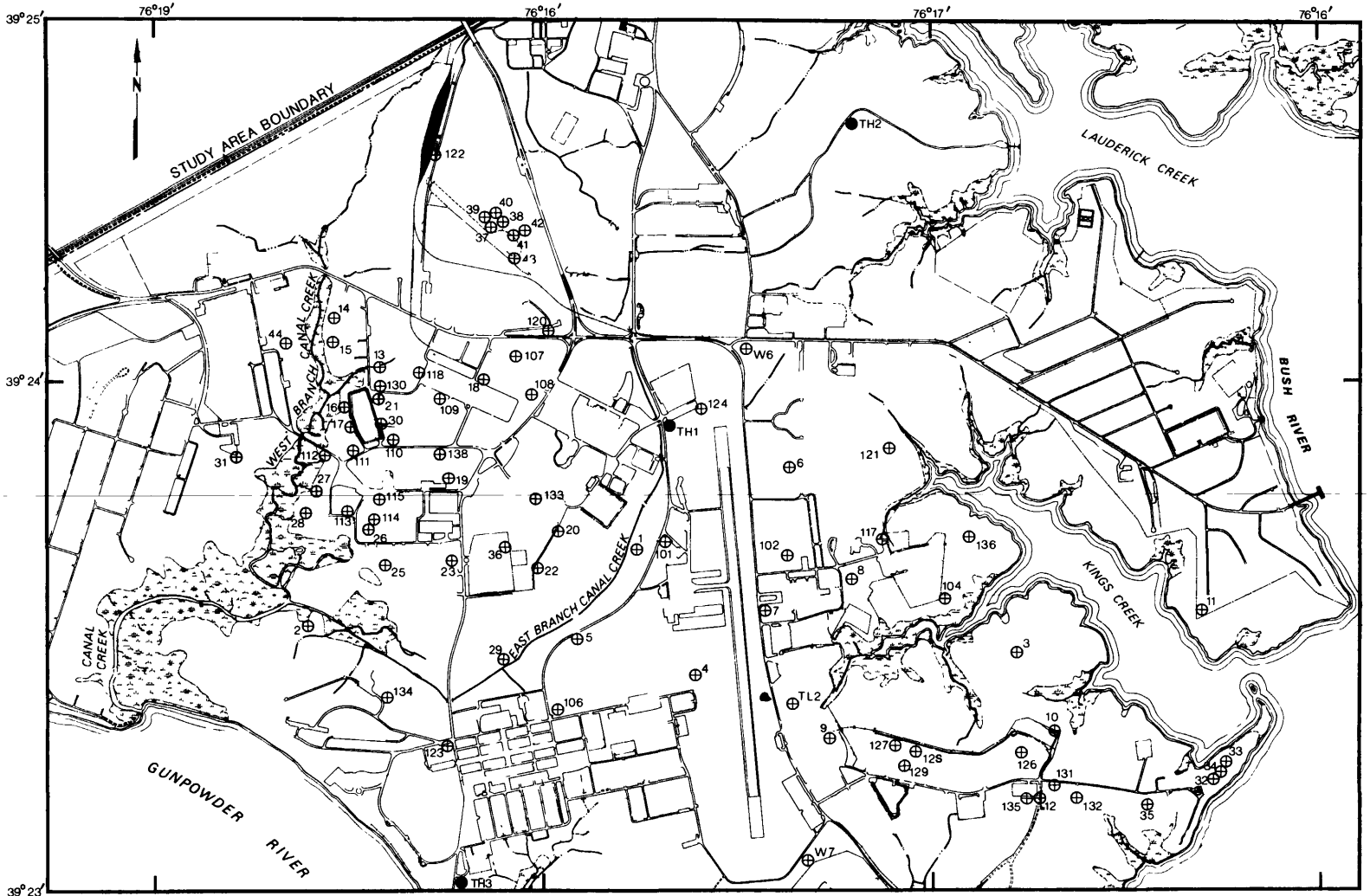

Figure 3.--Site locations.

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Dingman, R.J., Ferguson, H.F., and Martin, R.O.R., 1956, The water resources of Baltimore and Harford Counties: Maryland Department of Geology, Mines and Water Resources[1], Bulletin 17, 231 p.

Munsell Color, 1975, The Munsell soil color charts: Macbeth a division of Kollmorgen Corporation, Baltmore, Maryland.

Nemeth, Gary, Murphy, J.M., and Zarzycki, J.H., 1983, Environmental survey of the Edgewood area of Aberdeen Proving Ground, Maryland: Report no. DRXTH-AS-FR-82185, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland, 276 p.

Southwick, D.L., Owens, J.P., and Edwards, Jonathan, Jr., 1969, The geology of Harford County, Maryland: Maryland Geological Survey, 133 p.

[1] The name of this agency was changed to the Maryland Geological Survey in June 1964.

 (p. 9 follows)

TABLES 1 THROUGH 3

Table 1.--Well-construction data

[--, data not available]

Site identification number: Latitude and longitude plus a 2-digit sequence number.

Altitude: In feet above sea level.

Drilling method: Auger--Well installed using hollow-stem auger.
Mud rotary--Well installed using mud rotary with bentonite mud.

Aquifer: S Surficial aquifer
CC Canal Creek aquifer
LC Lower confined aquifer
I Unidentified isolated sand lense

Local number	Site identification number	Permit number	Altitude of land surface	Drilling method	Depth of boring (in feet)	Screened interval (depth in feet)	Aquifer
CC-1A	392335076172201	HA-81-2983	8.1	Auger	27	22.0 - 27.0	S
CC-1B	392335076172202	HA-81-2984	7.8	Auger	52	47.0 - 52.0	CC
CC-1C	392335076172203	HA-81-2985	8.0	Auger	72	67.0 - 72.0	CC
CC-1D	392335076172204	HA-81-2986	8.3	Mud rotary	154	149.0 -154.0	LC
CC-1E	392335076172205	HA-81-2987	8.4	Mud rotary	173	168.0 -173.0	LC
CC-1F	392335076172206	--	8.1	Mud rotary	198	183.0 -188.0	LC
CC-2A	392328076182701	HA-81-2988	8.8	Auger	36	31.0 - 36.0	CC
CC-2B	392328076182702	HA-81-2989	8.6	Mud rotary	145	140.0 -145.0	LC
CC-2C	392328076182703	HA-81-2990	7.5	Mud rotary	187	175.0 -180.0	LC
CC-3A	392323076165001	HA-81-2993	18.8	Mud rotary	140	135.0 -140.0	CC
CC-3B	392323076165002	HA-81-2994	19.2	Mud rotary	165	160.0 -165.0	CC
CC-4A	392323076173601	HA-81-2996	23.6	Auger	83	78.0 - 83.0	CC
CC-4B	392323076173602	HA-81-2997	24.2	Mud rotary	99	88.0 - 90.0	CC
						95.0 - 99.0	CC
CC-5A	392327076175501	HA-81-2999	17.5	Auger	20	15.0 - 20.0	S
CC-5B	392327076175502	HA-81-3000	16.8	Auger	59	54.0 - 59.0	CC
CC-5C	392327076175503	HA-81-3001	17.8	Auger	85	73.5 - 75.5	CC
						80.5 - 82.5	
						83.0 - 85	
CC-6A	392344076172101	HA-81-3003	26.0	Auger	63	58.0 - 63.0	CC
CC-6B	392344076172102	HA-81-3004	26.4	Auger	86	81.0 - 86.0	CC
CC-6C	392344076172103	--	25.9	Auger	123	115.0 -120	LC
CC-7A.1	392332076172403	HA-81-4050	28.0	Auger	73	56.0 - 63.0	CC
CC-7A	392332076172401	HA-81-3005	28.3	Auger	90	85.0 - 90.0	CC
CC-7B	392332076172402	HA-81-3006	28.0	Auger	107	102.0 -107.0	CC
CC-8A	392334076171301	HA-81-3007	18.5	Auger	52	46.0 - 52.0	S
CC-8B	392334076171302	HA-81-3008	18.4	Auger	80	75.0 - 80.0	I
CC-8C	392334076171303	HA-81-3009	18.1	Auger	95	89.5 - 94.5	CC
CC-8D	392334076171304	HA-81-3010	21.6	Auger	115	110.0 -115.0	CC
CC-8E	392334076171305	HA-81-3011	20.2	Mud rotary	202	196.5 -201.5	LC
CC-9A	392316076171201	HA-81-3012	19.9	Auger	13	8.0 - 13.0	S
CC-9B	392316076171202	HA-81-3013	19.9	Mud rotary	123	118.0 -123.0	CC
CC-10A	392317076164001	HA-81-3015	18.4	Auger	17	12.0 - 17.0	S
CC-11A	392332076161901	HA-81-3017	13.8	Mud rotary	138	133.0 -138.0	CC
CC-11B	392332076161902	HA-81-3018	13.5	Mud rotary	161	156.0 -161.0	CC
CC-12A.1	392308076164303	--	16.7	Auger	24	14.0 - 19.0	S
CC-12A	392308076164301	HA-81-3019	17.4	Mud rotary	145	132.0 -137.0	CC
CC-12B	392308076164302	HA-81-3020	16.5	Mud rotary	170	160.0 -165.0	CC
CC-13A	392401076182401	HA-81-3021	8.3	Auger	29	24.0 - 29.0	CC
CC-13B	392401076182402	HA-81-3022	8.3	Auger	56	51.0 - 56.0	CC
CC-14A	392407076183001	HA-81-3023	7.5	Auger	30	25.0 - 30.0	CC
CC-14B	392407076183002	HA-81-3024	7.4	Auger	55	50.0 - 55.0	CC
CC-15A	392404076183001	HA-81-3025	5.7	Auger	24	19.0 - 24.0	CC
CC-16A	392357076185201	HA-81-3027	11.7	Auger	23	18.0 - 23.0	CC
CC-16B	392357076185202	HA-81-3028	12.0	Auger	38	33.0 - 38.0	CC
CC-16C	392357076185203	HA-81-3029	11.8	Auger	88	83.0 - 88.0	LC
CC-16D	392357076185204	HA-81-3030	12.1	Mud rotary	120	115.0 -120.0	LC
CC-17A	392354076185201	HA-81-3031	10.1	Auger	24	19.0 - 24.0	CC
CC-17B	392354076185202	HA-81-3032	10.2	Auger	35	30.0 - 35.0	CC
CC-17C	392354076185203	HA-81-3033	10.3	Auger	103	98.0 -103.0	LC
CC-18A	392400076180601	HA-81-3034	19.8	Auger	52	47.5 - 52.0	CC
CC-18B	392400076180602	HA-81-3035	19.9	Auger	70	65.0 - 70.0	CC
CC-19A	392348076181401	HA-81-3036	28.4	Auger	11	6.0 - 11.0	I

Table 1.--Well-construction data--Continued

[--, data not available]

Site identification number: Latitude and longitude plus a 2-digit sequence number.

Altitude: In feet above sea level.

Drilling method: Auger--Well installed using hollow-stem auger.
Mud rotary--Well installed using mud rotary with bentonite mud.

Aquifer: S Surficial aquifer
CC Canal Creek aquifer
LC Lower confined aquifer
I Unidentified isolated sand lense

Local number	Site identification number	Permit number	Altitude of land surface	Drilling method	Depth of boring (in feet)	Screened interval (depth in feet)	Aquifer
CC-19B	392348076181402	HA-81-3037	28.4	Auger	58	53.0 - 58.0	CC
CC-20A	392341076175401	HA-81-3038	11.2	Auger	16	11.0 - 16.0	S
CC-20B	392341076175402	HA-81-3039	10.9	Auger	34	25.0 - 30.0	S
CC-20C	392341076175403	HA-81-3040	10.4	Auger	59	54.0 - 59.0	CC
CC-20D	392341076175404	HA-81-3041	10.8	Auger	74	68.0 - 73.0	CC
CC-21A	392358076182401	HA-81-3043	14.2	Auger	35	30.0 - 35.0	CC
CC-22A	392337076175701	HA-81-3048	11.7	Auger	27	22.0 - 27.0	S
CC-22B	392337076175702	HA-81-3049	11.9	Auger	50	45.0 - 50.0	CC
CC-22C	392337076175703	HA-81-3050	12.3	Auger	70	65.0 - 70.0	CC
CC-23A	392339076181301	HA-81-3051	20.4	Auger	21	16.0 - 21.0	S
CC-23B	392339076181302	HA-81-3052	20.4	Auger	57	52.0 - 57.0	CC
CC-25A	392338076182301	HA-81-3056	12.1	Auger	27	22.0 - 27.0	CC
CC-25B	392338076182302	HA-81-3057	12.1	Auger	45	40.0 - 45.0	CC
CC-26A	392342076182601	HA-81-3058	12.9	Auger	20	15.0 - 20.0	CC
CC-26B	392342076182602	HA-81-3059	13.0	Auger	40	35.0 - 40.0	CC
CC-26C	392342076182603	HA-81-3060	13.6	Mud rotary	149	144.0 -149.0	LC
CC-27A	392343076183301	HA-81-3061	11.4	Auger	23	18.0 - 23.0	CC
CC-27B	392343076183302	HA-81-3062	11.2	Auger	40	35.0 - 40.0	CC
CC-28A	392340076183401	HA-81-3063	10.9	Auger	21	16.0 - 21.0	CC
CC-28B	392340076183402	HA-81-3064	10.8	Auger	50	45.0 - 50.0	CC
CC-28C	392340076183403	--	10.3	Auger	137	120.0 -125.0	LC
CC-29A	392328076180201	HA-81-3065	6.5	Auger	15	7.7 - 9.7	S
						12.5 - 15.0	S
CC-29B	392328076180202	HA-81-3066	6.6	Auger	47	42.0 - 47.0	CC
CC-30A	392355076182201	HA-81-3067	21.4	Auger	42	36.0 - 41.0	CC
CC-31A	392350076184301	HA-81-4076	9.1	Auger	37	25.0 - 30.0	CC
CC-32A	392311076161601	HA-81-4046	13.3	Auger	19	10.5 - 15.5	S
CC-32B	392311076161602	HA-81-4047	14.1	Auger	43	21.0 - 26.0	S
CC-33A	392314076161401	HA-81-4048	14.3	Auger	19	11.0 - 16.0	S
CC-33B	392314076161402	HA-81-4049	14.2	Auger	70	62.0 - 67.0	S
CC-34A	392312076161501	HA-81-4045	14.6	Auger	22	14.0 - 19.0	S
CC-35A	392307076162801	HA-81-4044	14.2	Auger	50	24.0 - 29.0	S
CC-36A	392340076180201	HA-81-4075	14.5	Auger	26	10.0 - 15.0	S
CC-36B	392340076180202	--	14.3	Auger	44	39.0 - 44.0	CC
CC-36C	392340076180203	--	14.2	Auger	62	56.0 - 61.0	CC
CC-36D	392340076180204	--	14.2	Auger	93	88.0 - 93.0	CC
CC-37A	392415076180001	HA-81-4043	32.1	Auger	43	23.0 - 28.0	CC
CC-38A	392416076175001	HA-81-4042	31.6	Auger	48	34.0 - 39.0	CC
CC-39A	392416076180301	HA-81-4041	31.4	Auger	29	20.0 - 25.0	CC
CC-39B	392416076180302	HA-81-4040	31.5	Auger	63	35.0 - 40.0	CC
CC-40A	392417076180101	HA-81-4039	31.2	Auger	34	26.0 - 31.0	CC
CC-41A	392417076180201	HA-81-4038	34.6	Auger	57	39.0 - 44.0	CC
CC-42A	392415076175701	HA-81-4037	33.8	Auger	49	22.0 - 38.0	CC
CC-43A	392414076175801	--	30.0	Auger	57	33.0 - 38.0	CC
CC-44A	392405076183701	HA-81-4077	11.9	Auger	37	16.0 - 21.0	CC
CC-101A	392341076174001	--	12.3	Auger	14	5.0 - 10.0	S
CC-101B	392341076174002	--	12.3	Auger	28	17.0 - 22.0	CC
CC-101C	392341076174003	--	11.6	Auger	56	45.0 - 50.0	CC
CC-102A	392339076172201	--	23.4	Auger	74	65.0 - 70.0	CC
CC-102B	392339076172202	--	23.0	Auger	89	81.0 - 86.0	CC
CC-102C	392339076172203	--	25.8	Auger	118	100.0 -105.0	CC
CC-104A	392333076170201	--	12.4	Auger	87	76.0 - 81.0	CC
CC-104B	392333076170202	--	12.7	Auger	99	91.0 - 96.0	CC
CC-104C	392333076170203	--	13.0	Auger	129	99.0 -129.0	CC

Table 1.--Well-construction data--Continued

[--, data not available]

Site identification number: Latitude and longitude plus a 2-digit sequence number.

Altitude: In feet above sea level.

Drilling method: Auger--Well installed using hollow-stem auger.
Mud rotary--Well installed using mud rotary with bentonite mud.

Aquifer: S Surficial aquifer
CC Canal Creek aquifer
LC Lower confined aquifer
I Unidentified isolated sand lense

Local number	Site identification number	Permit number	Altitude of land surface	Drilling method	Depth of boring (in feet)	Screened interval (depth in feet)	Aquifer
CC-106A	392320076175601	--	22.8	Auger	96	90.0 - 95.0	CC
CC-107A	392404076180301	--	29.7	Auger	58	51.0 - 56.0	CC
CC-107B	392404076180302	--	29.3	Auger	88	66.0 - 71.0	CC
CC-108A	392358076180001	--	29.6	Auger	60	55.0 - 60.0	CC
CC-108B	392358076180002	--	29.4	Auger	74	68.0 - 73.0	CC
CC-109A	392357076181401	--	17.0	Auger	47	36.0 - 41.0	CC
CC-109B	392357076181402	--	17.2	Auger	69	59.0 - 64.0	CC
CC-110A	392353076182001	--	22.8	Auger	53	40.0 - 45.0	CC
CC-111A	392352076182601	--	15.1	Auger	32	25.0 - 30.0	CC
CC-111B	392352076182602	--	16.2	Auger	43	31.0 - 36.0	CC
CC-112A	392351076183101	--	9.8	Auger	39	29.0 - 34.0	CC
CC-113A	392345076182701	--	15.3	Auger	40	30.0 - 35.0	CC
CC-113B	392345076182702	--	15.1	Auger	64	51.0 - 56.0	CC
CC-114A	392344076182401	--	18.2	Auger	20	12.0 - 17.0	S
CC-114B	392344076182402	--	17.0	Auger	44	36.0 - 41.0	CC
CC-114C	392344076182403	--	17.8	Auger	64	53.0 - 58.0	CC
CC-115A	392346076182401	--	27.4	Auger	60	43.0 - 48.0	CC
CC-117A	392343076170201	--	9.1	Auger	83	78.0 - 83.0	CC
CC-117B	392343076170202	--	9.1	Auger	103	95.0 -100.0	CC
CC-118A	392401076181601	--	14.7	Auger	39	32.0 - 37.0	CC
CC-118B	392401076181602	--	15.0	Auger	59	51.0 - 56.0	CC
CC-120A	392406076175701	--	32.0	Auger	64	55.0 - 60.0	CC
CC-120B	392406076175702	--	32.1	Auger	74	65.0 - 70.0	CC
CC-121A	392348076170401	--	10.4	Auger	93	68.0 - 93.0	CC
CC-121B	392348076170402	--	10.1	Auger	105	91.0 - 96.0	CC
CC-122A	392425076181501	--	28.9	Auger	43	22.0 - 27.0	CC
CC-123A	392316076181501	--	27.9	Auger	91	77.0 - 82.0	CC
CC-123B	392316076181502	--	27.7	Auger	109	101.0 -106.0	CC
CC-124A	392355076173401	--	17.4	Auger	19	13.0 - 18.0	S
CC-124B	392355076173402	--	17.3	Auger	74	67.0 - 72.0	CC
CC-126A	392314076164601	--	24.0	Auger	24	13.0 - 18.0	S
CC-127A	392316076170401	--	24.4	Auger	18	6.0 - 11.0	S
CC-128A	392314076165901	--	22.3	Auger	14	6.0 - 11.0	S
CC-129A	392312076170301	--	27.5	Auger	33	17.5 - 22.5	S
CC-130A	392359076182301	--	14.8	Auger	41	32.0 - 37.0	CC
CC-130B	392359076182302	--	14.2	Auger	54	47.0 - 52.0	CC
CC-131A	392310076164101	--	12.8	Auger	18	11.5 - 16.5	S
CC-132A	392309076163901	--	16.7	Auger	18	11.0 - 16.0	S
CC-133A	392343076175401	--	23.6	Auger	24	15.0 - 20.0	S
CC-133B	392343076175402	--	23.3	Auger	74	60.0 - 65.0	CC
CC-134A	392323076182401	--	21.0	Auger	79	70.0 - 75.0	CC
CC-134B	392323076182402	--	20.6	Auger	99	93.0 - 98.0	CC
CC-135A	392309076164501	--	20.4	Auger	33	14.0 - 19.0	S
CC-136A	392340076165101	--	23.0	Auger	104	98.0 -103.0	CC
CC-136B	392340076165102	--	23.5	Auger	144	133.0 -138.0	CC
CC-138A	392351076181401	--	32.5	Auger	12	5.0 - 10.0	I

Table 2.--Lithologic logs for well-cluster sites

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 1		
Fill material, sand and gravel	2.3	2.3
Crystalline material, black; with black nodular crystals	2.9	0.6
Sand, clayey, brown, (mL)	5.0	2.1
Sand, brown-gray, wet; brown mU near top and gray (fU) near bottom, sorting moderate to good	15.3	10.3
Clay, gray, plastic; with patches of maroon sandy clay	16.0	0.7
Sand, gray to brown, well-sorted (mL-mU)	35.0	19.0
Sand, same as above with maroon irregular banding and small lenses of light gray clay and purple nodules	40.0	5.0
Sand, tan, well-sorted (mU-cL), wet	57.0	17.0
Sand and gravel, white, poorly sorted (mL-vcU to 2 in.), lignitic; with isolated maroon staining	61.0	4.0
No sample	63.0	2.0
Clay, gray to light pink, friable	65.0	2.0
No sample	67.0	2.0
Sand and gravel, white to tan, poorly sorted	69.0	2.0
No sample	71.0	2.0
Sand, white, poorly sorted (vfL-vcU); with patches of purple	72.4	1.4
Sand, clayey	73.0	0.6
No sample	75.0	2.0
Sand, light brown, well-sorted (mL-mU)	79.6	4.6
Clay, gray to light pink; with floating gravel and black nodules	80.0	0.4
Sand, tan, well-sorted (mU); alternating with darker clayey sand and gravel	84.4	4.4
Clay, dark gray to silver, friable; with sand and gravel lenses	86.0	1.6
Clay, brown, friable	87.5	1.5
Clay, black, friable, lignitic	90.0	2.5
Clay, dark gray, plastic	93.1	3.1
Clay, light gray and brick red mottled, friable; with dark green blotches at borders between gray and red	99.0	5.9
Clay, silty, green to gray, friable	100.0	1.0
Sand, gray, poorly sorted (vfL-mL), micaceous	106.2	6.2
Clay, sandy, dark gray, lignitic	107.5	1.3
Lignite, massive; with well preserved plant fragments	108.9	1.4
Clay, multicolored (gray, green, brown, red), plastic	130.0	21.1
No sample	170.6	40.6
Sand, gray (fu-mL), clean, micaceous	170.9	0.3
No sample	181.5	10.6
Sand, light gray, clean, well-sorted (mU), micaceous	182.0	0.5
No sample	186.4	4.4
Sand, grayish tan, well-sorted (mU), micaceous	186.8	0.4

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 2		
Soil zone, brown	2.0	2.0
Sand, clayey, orange and gray-brown mottled, poorly sorted	4.0	2.0
Clay, sandy, brown, wet	6.2	2.2
Sand, clayey, light gray, poorly sorted (vfU-mL)	10.0	3.8
Clay, gray; with thin sand lenses	12.0	2.0
Sand and gravel, white, orange-stained	36.9	24.9
Sand, light gray, black-stained	40.0	3.1
Sand and gravel, white, coarse	48.0	8.0
Clay, silty, brick-red and gray mottling, friable	58.0	10.0
Sand, silty, light gray, well-sorted (fL-fU), micaceous	67.7	9.7
Clay, sandy, red, brown, yellow, and gray mottled; friable	68.0	0.3
Sand, silty, light gray, poorly sorted (fL-fU)	68.7	0.7
Clay, silty, mottled as before, friable, lignitic, dense	82.2	13.5
Sand, clayey, light gray, poorly sorted	83.0	.8
Clay, silty, mottled as before, friable, micaceous; with thin gray sand lenses	92.0	9.0
No sample	96.0	4.0
Clay, silty, mottled as before, friable, micaceous; with thin gray sand lenses	98.0	2.0
No sample	110.0	12.0
Sand, silty, light gray (fU-mL); with thin gray clay lenses	138.0	28.0
Sand, light gray, clean, well-sorted (mL-cL), lignitic; with small gravel	151.1	13.1
No sample	164.0	12.9
Clay, sandy, dark brown, maroon and gray, friable	165.2	1.2
No sample	176.0	10.8
Clay, silty, dark gray, friable, micaceous	176.5	0.5
Sand, silty, silver-gray (fL) micaceous	179.9	3.4
Sand, light gray, clean, well-sorted (mU)	181.2	1.3

Note: Beginning at 16 ft, sample cores were taken every other 2 ft; therefore, the data were interpolated unless more than 2 ft of sample were missing.

Description	Depth (ft)	Thickness (ft)
SITE 3		
No sample	56.0	56.0
Clay, silty, light gray and red, micaceous	57.0	1.0
Silt, clayey, light gray, micaceous	60.0	3.0
No sample	86.0	26.0
Silt, clayey, red and olive mottled	90.0	4.0
No sample	120.0	30.0
Clay, silty, dark gray, friable, lignitic, micaceous	129.0	9.0
Sand and gravel, white, clean, coarse	145.0	16.0
Clay, white, plastic	148.0	3.0
Sand and gravel, buff to white, coarse	176.0	28.0
Clay, white; with iron concretions at sharp upper contact	177.0	1.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 4		
Soil, silty, gray-brown to orange	4.0	4.0
Silt, clayey, gray	9.7	5.7
Sand, silty, gray to orange	12.9	3.2
Silt, clayey, gray	19.0	6.1
Clay, red-brown and light gray mottled, plastic	45.5	26.5
Silt, sandy, gray, micaceous; sand up to (fU)	45.8	0.3
Clay, silty, brown, friable	46.4	0.6
Silt, sandy, gray, micaceous; sand up to (mU)	48.6	2.2
Clay, silty, red-brown, friable	49.9	1.3
Clay, silty, gray-brown, friable, finely laminated	50.7	0.8
Sand, silty, gray, finely laminated; interbedded with lignitic, micaceous layers of clayey silt	77.4	26.7
Sand, tan, clean, well-sorted (mU)	78.4	1.0
Sand, white to yellow; with ochre and lavender banding	79.3	0.9
Sand, yellow-brown, well-sorted (mL-mU)	85.0	5.7
Sand, silty, red-brown; with lenses of gray clay	85.5	0.5
Silt, multicolored, clayey	86.0	0.5
Sand and gravel, yellow-orange; with multicolored bands	105.9	19.9
Clay, white; with orange-rust lenses and hard iron concretions at sharp upper contact	107.5	1.6
No sample	118.0	10.5
Clay, dark gray, lignitic	120.0	2.0

Description	Depth (ft)	Thickness (ft)
SITE 5		
Soil, clayey, brown	0.7	0.7
Sand, clayey, brown, micaceous, lignitic	10.4	9.7
Sand, light brown, well-sorted (mL)	12.4	2.0
Silt, clayey, gray and brown mottled	14.8	2.4
Sand, tan to orange, well-sorted (mU)	18.6	3.8
Sand, pink to gray, well-sorted (mL-cU)	27.2	8.6
Clay, gray, plastic	31.5	4.3
Clay, red and gray mottled, plastic	47.0	15.5
Sand, silty, pink-gray, poorly sorted (fU-clay)	49.0	2.0
Sand, light gray, well-sorted (mL-mU), loose, wet	50.3	1.3
Clay, gray; with fine laminae of lignitic sand	53.0	2.7
Sand, gray; with fine laminae of lignite-rich sand	55.1	2.1
Clay, gray	55.4	0.3
Sand, gray; with fine laminae of lignitic sand	60.2	4.8
Sand, silty, gray, poorly sorted (mL-silt), micaceous, lignitic	67.3	7.1
Clay, sandy, yellow-ochre, micaceous; with multicolored banding	69.2	1.9
Sand, wet (poor recovery)	75.0	5.8
Sand and gravel, clean, white to pink, well-sorted (mU-gravel)	85.6	10.6
Sand and gravel, silty, orange, poorly sorted with black coatings at lower contact	86.9	1.3
Clay, dark gray to brown, friable, thinly laminated; with sharp upper contact	93.0	6.1
Clay, brown to red, plastic; (no core, based on cuttings)	120.0	27.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 6		
Soil, silty	1.0	1.0
Silt, clayey, orange and gray mottled	5.0	4.0
Sand, orange and tan, well-sorted (mL)	5.5	0.5
Clay, gray and lavender mottled, friable	7.5	2.0
Silt, clayey, gray and lavender mottled; with lenses of orange and gray silty sand	14.0	6.5
Clay, red, yellow and gray mottled; with silty lenses	18.7	4.7
Silt, sandy, orange and gray mottled	24.0	5.3
Silt, clayey, white and orange-stained	25.8	1.8
Clay, red, plastic; with irregular white silt lenses	26.8	1.0
Silt, clayey, white, orange-stained	31.0	4.2
Silt, sandy, light blue-gray, micaceous	32.7	1.7
Sand, silty, white, orange-stained, micaceous	44.0	11.3
Clay, dark gray, micaceous, lignitic; with lenses of light gray clayey sand	56.1	12.1
Sand, tan and orange, well-sorted (mL)	58.7	2.6
Sand, white and multicolored, well-sorted (mL)	65.3	6.6
Silt, clayey, multicolored; with thin lignitic laminae	66.3	1.0
Sand, white to tan and multicolored, well-sorted (mL)	77.1	10.8
Sand, silty, poorly sorted	77.3	0.2
Clay, silty, pink-brown, friable	77.6	0.3
Sand, white to tan and multicolored, well-sorted (mL-cU)	82.5	4.9
Sand and gravel, tan to white, coarse, well-sorted (cU-gravel); with occasional white clay lenses	92.1	9.6
Sand, silty, white to brown, lignitic	92.4	0.3
Clay, pink-gray, plastic; with floating gravel	97.0	4.6
Sand, brown, well-sorted (mU); with floating gravel	100.6	3.6
Clay, pink-gray, plastic	105.3	4.7
Sand, white, well-sorted (mL-cL)	113.0	7.7
Clay, pink-gray, plastic	113.4	0.4
Sand, silty, white	114.5	1.1
No sample	116.5	2.0
Sand, multicolored (white, pink, brown, tan)	118.5	2.0

Description	Depth (ft)	Thickness (ft)
SITE 7		
Fill material	19.0	19.0
Clay, chocolate-brown, plastic	19.8	0.8
Sand, clayey, gray	22.3	2.5
Clay, gray-brown, friable	23.0	.7
Sand, clayey, gray-brown; with lenses of dark gray clay	29.0	6.0
Clay, red, brown, gray, and white marbled, friable	34.9	5.9
Clay, sandy, light gray; with lithified sandstone fragments	36.2	1.3
Clay, red and gray mottled	39.0	2.8
Clay, sandy, light gray	45.6	6.6
Clay, gray, plastic, massive	46.2	0.6
Clay, sandy, light gray	54.0	7.8
No sample	60.0	6.0
Sand, silty, gray, poorly sorted (fU-mL), micaceous, lignitic, pyritic; with some clay layers	82.0	22.0
Sand, dark gray-brown, well-sorted (mU)	84.6	2.6
Sand and gravel, reddish-brown to yellow-brown	86.6	2.0
Sand, light gray, clean, well-sorted (mL-mU)	87.1	0.5
Sand and gravel, yellow-brown; with black coatings on sandstone gravel	98.0	10.9
Clay, sandy, light gray, friable	98.5	0.5
Sand and gravel, white and orange-stained	114.0	15.5

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 8		
Silty soil	3.0	3.0
Clay, red, yellow and gray mottled, plastic, dense	19.0	16.0
Clay, red, plastic, dense; with irregular white, silty zones	40.1	21.1
Clay, gray, friable, micaceous; mixed with red clay as above	42.7	2.6
Clay, red, plastic, dense; with irregular, white silty zones and an olive green, mineralized front at the contacts	48.4	5.7
Sand, silty, light gray, poorly sorted, micaceous	52.5	4.1
Clay, red, plastic, dense; with irregular white zones, and green mineralization as above	54.0	1.5
Sand, gray, well-sorted (fU-mL); with alternating lenses of dark gray, plastic clay	64.0	10.0
Sand, gray to tan, well-sorted (mU)	66.7	2.7
Sand, silty, gray, lignitic	67.1	0.4
Sand, gray, well-sorted (mL)	69.0	1.9
Sand, silty, wet, brown; with red-black concretions	71.4	2.4
Sand, clayey, white, (fU); with yellow and lavender laminae	72.0	0.6
Sand, silty, multicolored, micaceous	74.7	2.7
Sand, brown, clean, well-sorted (mU); with multicolored laminae and gravel (1-4 in.)	89.0	14.3
No sample	168.4	79.4
Sand, gray (mL) clean	168.7	0.3
Clay, gray and tan mottled, plastic, dense, micaceous	170.7	2.0
No sample	188.1	17.4
Clay, sandy, dark gray, lignitic	190.1	2.0
No sample	199.1	9.0
Clay, gray, micaceous, lignitic; with some floating gravel up to 0.5 in.	199.8	0.7

Description	Depth (ft)	Thickness (ft)
SITE 9		
Soil, brown	0.4	0.4
Sand, silty, gray and orange mottled, poorly sorted (fL-mU); with thin clay lenses	9.7	9.3
Clay, brown, red and gray marbled, plastic; with thin sand lenses	12.4	2.7
Clay, sandy, light gray; becoming more sandy with depth	29.0	16.6
Clay, sandy, chocolate-brown, friable; with thin sand lenses	35.0	6.0
Clay, marbled (gray, red, brown, yellow), hard, plastic; with sand lenses and less distinct marbling near bottom	83.7	48.7
Clay and sand, thinly laminated, interbedded; with clayey, poorly sorted sand and friable, sandy clay	94.0	10.3
No sample*	100.0	6.0
Sand, clayey, light gray, micaceous; becoming more sandy with depth	102.8	2.8
No sample	108.0	5.2
Sand, silty, light gray, micaceous	108.9	0.9
No sample	114.0	5.1
Sand, pink to orange, clean, well-sorted (vfU-fL)	115.0	1.0
No sample	120.0	5.0
Sand and gravel, tan to orange, clean (fU-mL to gravel)	121.0	1.0
No sample	128.0	7.0
Sand and gravel as before	128.8	0.8

* Moved boring location where land surface was at a slightly different altitude.

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 10		
Soil, silty, brown	0.4	0.4
Silt, clayey, grayish-brown; with gravel and hard, black concretions	1.2	0.8
Silt, clayey, orange-brown and gray mottled; with sand lenses	4.2	3.0
Sand and gravel, tan to orange; clean, well-sorted sand (mL-mU), and angular gravel (0.5-4.0 in.)	14.0	9.8
Sand, clayey, dark to light gray, orange-stained, poorly sorted, wet	29.9	15.9
Clay, red, plastic; with irregular, white, silty lenses	34.0	4.1
Clay, red, lavender and yellow mottled, plastic; with irregular, white, silty lenses	39.0	5.0
Clay, gray, green and pink mottled, plastic; with some floating gravel	42.0	3.0
Clay, dark brown, red and gray mottled, plastic; with small iron concretions	60.0	18.0
Clay, red, plastic; with irregular white silty lenses and olive mineralized fronts at contacts	68.0	8.0
Clay, dark gray, plastic, lignitic	71.0	3.0
Clay, red and gray mottled, plastic	84.0	13.0
Clay, red and olive, plastic, tight	87.4	3.4
Silt and clay, interbedded; white micaceous clayey silt with red, tight, plastic clay	97.2	9.8
Silt, sandy, wet, white	101.0	3.8
Clay, dark gray, friable	104.0	3.0

Description	Depth (ft)	Thickness (ft)
SITE 11		
No sample	134.0	134.0
Sand, white, orange-stained, clean, well-sorted (mL-mU)	135.6	1.6
No sample	156.0	20.4
Clay, silty, white, friable, micaceous	156.2	0.2
Sand, multicolor-banded, white, clean, poorly sorted (fL-cL)	157.3	1.1

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 13		
Soil, sandy, grayish-brown	0.6	0.6
Sandy silt and clay, gray to grayish-brown, orange-mottled, lignitic; wet below 1.4 ft	4.0	3.4
Sand, clayey, light gray and orange mottling	5.0	1.0
Sand, gravelly, tan, well-sorted (mU); with thin, orange, clay lenses	1.5	6.5
Sand, gray and orange mottled, well-sorted (mU); with lenses of clayey sand	8.2	1.7
Clay, pinkish-gray to dark gray, friable, hard, micaceous; with white and orange mottling, and lenses of sandy clay	13.5	5.3
Sand and gravel, white, well-sorted (mU-cL); with purple and orange bands, and thin layers of white, clayey sand	19.0	5.5
Sand and gravel, white, coarse (cL-cU to gravel)	20.7	1.7
Sand and gravel, tan to white, poorly sorted	29.0	8.3
No sample	39.0	10.0
Silt, sandy, light gray to tan, micaceous; having less sand with depth	42.7	3.7
Clay, silty, dark gray, friable	44.0	1.3
Sand, silty, orange, poorly sorted	44.9	0.9
Silt and sand, pink, lavender and tan mottled; grading from sandy silt to clayey silt with depth	46.3	1.4
Clay, pink, lavender and tan mottled, friable	47.7	1.4
Sand, clayey, pink and tan mottled, poorly sorted	48.6	0.9
Sand, silty, orange to tan, well-sorted (mL)	50.3	1.7
Clay, pink and tan mottled, friable	50.7	0.4
Sand, silty, pale-orange, well-sorted (mL)	54.0	3.3
Sand, tan to orange, well-sorted (mU-cU)	58.2	4.2
Clay, light gray, plastic; with small purple blotches	59.0	0.8
Clay, light gray, brown, red and yellow-green marbled, friable	66.4	7.4
Sand, clayey, light gray, (vfU)	74.9	8.5
Clay, silty, reddish-brown, friable, hard, micaceous; with small specks of lignite	79.0	4.1

Description	Depth (ft)	Thickness (ft)
SITE 14		
Soil, silty	1.2	1.2
Silt, clayey, light brown	2.9	1.7
Sand, silty, orange-brown, well-sorted (fU-mL)	3.6	0.7
Sand and gravel, orange-brown to tan, poorly sorted (mU-gravel); with gravel up to 5 in.	10.0	6.4
Sand, clayey, and gravel, orange-brown and gray	11.4	1.4
Sand, silty, white to tan, well-sorted (fU-mL)	12.6	1.2
Sand and gravel, orange, poorly sorted (silt to gravel); with gravel up to 4 in., and iron-cemented gravel	16.4	3.8
Silt, sandy, light gray,micaceous; with thin lenses of red to lavender clay	17.7	1.3
Silt, orange-tan, clayey; with small iron concretions	19.0	1.3
Sand, tan, clean, well-sorted (mL-cU)	20.2	1.2
Sand and gravel, lavender to yellow-orange; with large cobbles, and white clay lenses containing floating sand and gravel	24.0	3.8
No sample	33.5	9.5
Silt, sandy, tan-orange; with small maroon blotches	35.5	2.0
No sample	38.5	3.0
Sand and gravel, tan to white	40.5	2.0
No sample	43.5	3.0
Sand and gravel, gray, poorly sorted (fL-gravel), lignitic	45.5	2.0
No sample	48.5	3.0
Sand and gravel, clean, coarse*	50.5	2.0
No sample	53.5	3.0
Sand and gravel, clean, coarse*	55.5	2.0
No sample	58.5	3.0
Sand and gravel, clean, coarse*	60.5	2.0

* Hole was washed prior to spoon drive and clay- to silt-sized particles probably were washed from the sample.

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 15		
Sand, silty, brown, orange-stained	4.0	2.0
Sand, clayey, gray, orange-stained	4.3	0.3
Sand, gray-brown, orange-stained, clean, well-sorted (mU)	6.4	2.1
Sand, gray, orange-stained, well-sorted (mU); with thin layers of clayey sand	7.5	1.1
Sand and gravel, orange; with quartz sand (mL-mU) and gravel (0.5-3.0 in.) mixed with reddish-black, iron-cemented sandstone fragments up to 4 in.	10.0	2.5
No sample	12.0	2.0
Clay and sand, interbedded; with mostly gray clay containing (mL) orange sand lenses and floating gravel	14.7	2.7
Sand and gravel, multicolored (mL-cU); with some sandstone	24.6	9.9
Clay, white; with sand and gravel lenses and some red staining	24.9	0.3
Sand and gravel, white, coarse (mU-vcL to gravel)	28.0	3.1
Sand and gravel, maroon, coarse (mL-mU to gravel); with thin lenses of white clay	28.6	0.6
Sand and gravel, silty, orange-brown	30.3	1.7
Sand and clay, interbedded; with dark gray clayey to silty sand (vfU-mL) and thin, micaceous, lignitic clay layers containing floating gravel	53.0	22.7
Clay, multicolored (gray, brown, red, yellow, ochre), variegated	64.0	11.0

Description	Depth (ft)	Thickness (ft)
SITE 16		
Fill material, multicolored; mixture of clay, sand and gravel	9.0	9.0
Clay and sand, interbedded; with thin layers of orange, micaceous sand (fL-fU) in light gray clay	10.9	1.9
Sand, orange (mL-mU); interbedded with gray-brown sandy clay containing gravel and iron concretions	14.0	3.1
Clay, sandy, gray and orange mottled, friable; with gravel	17.8	3.8
Sand and gravel, wet, multicolored; with well-sorted (mU) sand, and consolidated sand lenses	23.8	6.0
Sand, clayey, white and orange mottled	24.0	0.2
Sand and gravel, silty, light brown to yellow, poorly sorted (mL-vcU); with small (0.1-0.2 in.) gravel	38.0	14.0
Sand and gravel, pink, maroon and orange; with (cL-cU) sand, and yellow clay coatings on grains	40.7	2.7
Sand, clayey, multicolored, thinly laminated (fU)	44.3	3.6
Sand and clay, interbedded; with gray, fine (fU-mL) sand and dark gray, plastic, lignitic, micaceous clay	48.1	3.8
Sand and clay, interbedded; with orange and pink fine clayey sand, and pink-gray, lignitic clay	51.2	3.1
Sand, multicolored, clean, well-sorted (mU-cL)	60.0	8.8
No sample	75.0	15.0
Sand and clay, pink-gray, finely laminated; with fine sand (vfU) and friable, dense, lignitic and micaceous clay	81.0	6.0
Sand, clayey, brown-gray, poorly sorted (fU-mL), micaceous	84.5	3.5
Sand, light brown, clean, well-sorted (mL)	91.0	6.5
No sample	100.0	9.0
Sand, gray-brown, clean, well-sorted (mL); with thin layers of lignitic, micaceous, sandy clay	105.3	5.3
No sample	120.1	14.8
Sand and clay, gray-brown; mixed in indistinct lenses	124.8	4.7
Sand, gray-brown, clean, well-sorted (fU-mL); with lenses of clay	136.5	11.7
Clay, dark gray, friable, hard, micaceous	146.8	10.3
Sand, clayey, gray (fU-mL) micaceous	147.3	0.5

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 17		
Soil, silty, brown	5.0	5.0
Sand, clayey and silty, orange and gray mottled (vfU-fL); with sand becoming coarser at depth	9.0	4.0
Sand, multicolored, well-sorted (mU); with thin laminae of light gray clay	12.9	3.9
Clay, sandy gray, maroon and orange mottled	16.0	3.1
Sand, clayey, white and orange to purple mottled; with small purple concretions	19.0	3.0
Sand and gravel, white and multicolor banded; with well-sorted sand (mU), and gravel becoming gravel becoming more abundant with depth	29.0	10.0
No sample	34.0	5.0
Sand and gravel, wet, clean, coarse	35.8	1.8
No sample	39.0	3.2
Sand and gravel, wet, clean, coarse	40.6	1.6
Clay, dark gray, plastic, micaceous; with gradational upper contact	41.0	0.4
Clay, brick-red and silver-gray mottled, friable, hard, micaceous; with red clay becoming dominant with depth	77.0	36.0
Sand, gray, medium to fine (fU-mL); with dark gray clay lenses	99.0	22.0
Sand, dark gray, clean well-sorted (mL-mU), wet	106.9	7.9
Clay, dark gray	107.0	0.1
No sample	109.0	2.0
Clay, dark gray, micaceous; with some small sand lenses	115.0	6.0

Description	Depth (ft)	Thickness (ft)
SITE 18		
Soil, brown; with orange mottling	1.9	1.9
Clay, silty, orange and gray mottled	17.0	15.1
Sand, clayey, light gray and orange mottled, (fL-fU)	18.8	1.8
Clay, sandy, red-brown, friable, micaceous	34.0	15.2
Sandy clay, dark gray to brown, thinly laminated; with thin laminations of (vfU-fL), yellow sand	39.0	5.0
Clay, gray-brown; with orange streaks	39.9	0.9
Sand, multicolored, well-sorted (mL-mU), wet; with black-purple concretions	44.0	4.1
Sand, white, clean, coarse (mU-cL); with small pebbles	54.2	10.2
No sample	57.0	2.8
Clay, multicolored, mottled, friable	58.0	1.0
No sample	67.0	9.0
Sand, silty, white, orange and red banded	69.0	2.0
No sample	71.0	2.0
Sand, silty, multicolor banded, medium	73.0	2.0
No sample	75.0	2.0
Sand and clay, laminated; with coarse (cL-cU) gray sand in dark gray lignitic clay	77.0	2.0
No sample	83.0	6.0
Clay, red-brown and gray marbled, hard, plastic	85.0	2.0
No sample	87.0	2.0
Clay, red-brown and gray mottled, hard, friable; with some gray, silty zones	89.0	2.0
No sample	97.0	8.0
Clay, red-brown and gray mottled, hard, plastic	99.0	2.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 19		
Fill material; containing sand, asphalt and concrete	2.3	2.3
Soil zone (prior to filling); with gray loamy soil and roots	4.0	1.7
Sand, silty, light gray, poorly sorted (silt-mL)	4.9	0.9
Clay, silty, blue-gray, slightly plastic	6.0	1.1
Sand, silty, light gray, poorly sorted (silt-cL); with thin clay lenses	20.8	14.8
Clay, silty, dark gray and brown-pink banded, lignitic	29.0	8.2
Sand and clay, interbedded; with multicolored silty sand and silty, multicolored clay	53.0	24.0
Sand, multicolored,(mL-mU); with abundant gravel near base	59.0	6.0
Sand and clay, interbedded; with multicolored silty sand and clay	64.0	5.0

Description	Depth (ft)	Thickness (ft)
SITE 20		
Soil, sandy; with some clay	1.3	1.3
Sand, white (fL-fU) clean; with large iron concretions (up to 2 in.), and sand becoming orange near bottom	14.0	12.7
No sample	21.5	7.5
Clay, sandy, white	22.0	0.5
Sand, silty; with some clay	23.5	1.5
No sample	30.0	6.5
Silt, clayey, and sand, white and orange	31.2	1.2
Sand, orange-stained, coarse (cU)	31.7	0.5
No sample	60.5	28.8
Sand, gray-brown, coarse (cU)	65.0	4.5
Clay, white, hard, plastic	65.3	0.3
Sand and gravel, dry, poorly sorted (vfU sand to 0.5 in. gravel); with lenses of hard, plastic, white clay	66.4	1.1
Sand, white, wet, well-sorted (fU-mL); with small purple concretions, becoming coarser, gravelly, and multicolored with depth	74.5	8.1
Sand and clay, interbedded; with numerous thin, alternating beds of poorly sorted, multicolored sand and gravel; with friable, silty clay	89.7	15.2

Description	Depth (ft)	Thickness (ft)
SITE 21		
Soil	0.8	0.8
Clay, silty, gray-brown to orange mottled, friable	10.2	9.4
Clay, silty, multicolored (brown, red, purple, yellow, pink), mottled, hard, friable; with dark brown concretions	18.4	8.2
Clay, silty, light gray to white; mixed with (vcL) sand near bottom	20.8	2.4
Clay, silty, white; with purple lenses	23.4	2.6
Sand, silty, multicolored, fine; with purple lenses bordered by yellow	26.6	3.2
Silt, clayey, white; with yellow mottling	29.0	2.4

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 22		
Soil, light gray to brown	1.3	1.3
Sand, clayey, dark brown,(mL-mU)	5.9	4.6
Sand, tan to buff,(mU), fairly clean	18.5	12.6
Clay, white, plastic	19.0	0.5
Sand, white,(fL-fU), clean	20.5	1.5
No sample	23.0	2.5
Sand, tan,(mL),clean	25.0	2.0
No sample	27.5	2.5
Sand, tan,(mL), clean,; with some pebbles up to 0.3 in.	32.5	5.0
No sample	37.5	5.0
Sand, tan,(mL), clean	39.5	2.0
No sample	41.5	2.0
Sand, tan to gray,(mL-cU)	45.9	4.4
No sample	49.2	3.3
Sand, tan to gray,(mL-cU)	51.2	2.0
No sample	54.5	3.3
Sand, tan to gray,(vcU)	56.5	2.0
No sample	59.6	3.1
Sand and gravel, tan to gray; with medium sand and gravel up to 0.3 in.	61.6	2.0
No sample	64.7	3.1
Sand and gravel, tan to gray, coarse	66.7	2.0
No sample	70.0	3.3
Sand and gravel, tan; coarse with cobbles up to 5 in., and iron-cemented gravel near bottom, coated with dark gray, plastic clay	73.0	3.0
No sample	90.0	17.0
Clay, silver, soft, plastic; stuck to bottom of auger	90.0	

Description	Depth (ft)	Thickness (ft)
SITE 23		
Soil, brown; with roots	0.4	0.4
Clayey fill material, orange-brown; with asphalt and wood	7.8	7.4
Sand, clayey, orange to tan,(mL)	10.3	2.5
Clay, silty, white, friable, micaceous; with abundant small red-purple concretions	11.1	0.8
Sand, silty, multicolored,(mL-mU); with small lenses of white clay and small purple concretions	14.0	2.9
Sand, tan, wet, clean,(mL); with some orange staining and lenses of clayey silt near bottom	29.3	15.3
Sand, clayey, light gray to orange,(fL-fU); with small, pink, silty clay lenses and purple concretions	34.0	4.7
Sand, pinkish-brown, poorly sorted (fU-mU); with green and ochre bands, and thin lenses of white silty clay	39.0	5.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 25		
Soil, brown	0.6	0.6
Fill material, brown to gray; with clay, sand and gravel	4.0	3.4
Silt, clayey, orange-brown and gray mottled	11.5	7.5
Sand, clayey, light gray and orange mottled,(mL); with red-black concretions	14.0	2.5
Sand, white to gray and orange, clean, well-sorted (mL-mU); with red-black concretions, and thin clay lenses	17.3	3.3
Sand, clayey, light gray,(mU); with small red-black concretions and some clay coatings on grains	19.0	1.7
Sand, tan, wet, clean, well-sorted (mU); with small, white clay lenses, and sand turning gray near bottom	29.0	10.0

Description	Depth (ft)	Thickness (ft)
SITE 26		
Soil, dark brown; with roots	0.3	0.3
Fill material containing silt, quartz pebbles, and brick fragments	2.0	1.7
Silt, clayey, orange	3.7	1.7
Clay, silty, brown, sltly plastic	5.5	1.8
Sand, orange to tan,(mL-cL)	9.9	4.4
No sample	35.0	25.1
Sand, pink, clean, well-sorted, micaceous; with small iron concretions, and gravel near bottom	49.3	14.3
No sample	63.0	13.7
Silt, clayey, white	69.0	6.0
No sample	114.0	45.0
Clay, silty, dark gray, lignitic	125.2	11.2
Sand, gray, coarse; with some pebbles	125.5	0.3
Clay, dark gray, lignitic	126.3	0.8

Description	Depth (ft)	Thickness (ft)
SITE 27		
Fill material containing rock and industrial slag material	4.0	4.0
Silt, gray to orange-brown, dry, clayey	7.6	3.6
Silt, gray, sandy, micaceous	10.4	2.8
Sand, light gray, medium to coarse (mL-cL)	11.3	0.9
Sand, light gray to orange-brown, poorly sorted (silt-vfU)	14.0	2.7
Clay, gray, very plastic	15.0	1.0
Silt, gray to orange-brown, clayey; with some sand	18.3	3.3
Sand, tan to orange, clean, medium (mL-mU); with some gravel	22.4	4.1
Sand, gray to orange-brown, silty; with upper contact marked by iron concretion	23.8	1.4
Clay, dark gray, plastic	26.9	3.1
Sand and silt, gray to orange, clayey	30.6	3.7
Sand, orange to tan, fine to medium (fU-mU); with some large cobbles	34.0	3.4

Table 2.--Lithologic logs for well-cluster sites--Continued

Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 28		
Sand, brown, loamy; with cobbles and roots	3.8	3.8
Sand, brown, clean, well-sorted (cL); clayey near bottom	8.0	4.2
Clay, white to pink-brown, friable	15.3	7.3
Sand, gray and brown; with irregular purple banding, and purple concretions	15.6	0.3
Sand, tan to white, clean,(fU-mL), micaceous	23.8	8.2
No sample	28.8	5.0
Sand, tan, clean; becoming coarser with depth	38.8	10.0

Description	Depth (ft)	Thickness (ft)
SITE 29		
Soil, brown, loamy	3.7	3.7
Fill material; containing rock fragments, glass, and brick	9.1	5.4
Clay, gray, plastic	10.7	1.6
Sand, clayey, brown and gray, poorly sorted	13.7	3.0
Sand, wet, clean, well-sorted (mL)	15.2	1.5
Sand, clayey, brown and gray, poorly sorted	16.9	1.7
Clay, purple to black, plastic	18.1	1.2
Sand, brown, wet, clean, well-sorted (mU)	19.7	1.6
Clay, sandy, lavender-gray, plastic, lignitic	40.0	20.3
Sand, multicolored; with lenses of lavender gray clay	43.7	3.7
Sand, brown-orange, wet, clean, well-sorted (mU)	59.2	15.5
Sand, reddish-brown, poorly sorted (mU); containing pebbles	60.2	1.0
No sample	73.7	13.5
Clay, multicolored, hard; containing some sand lenses and gravel	75.7	2.0

Description	Depth (ft)	Thickness (ft)
SITE 30		
Soil	0.1	0.1
Fill material; containing rock fragments, sand, and clay	5.1	5.0
Sand, clayey, pink, brown and orange,(mL-mU); with purple nodules	5.8	0.7
Clay, silty, gray-brown, hard, friable; with orange and pink mottling	17.6	11.8
Sand and clay, gray and orange mottled; with layers of mixed sand and clay	25.2	7.6
Clay, multicolored, marbled, plastic, micaceous	26.2	1.0
Silt, clayey, orange and maroon mottled, laminated, micaceous	31.7	5.5
Sand, multicolored, wet,(mU-vcU)	41.0	9.3
Sand, multicolored, wet,(mL); with thin layers of white clay	42.5	1.5

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 31		
Soil	2.8	2.8
Sand, brown to tan, clean, poorly sorted (cL-vcU); with some gravel and cobbles	5.0	2.2
Clay, gray-brown, lignitic; with some brown,(cL-vcU)sand lenses	9.0	4.0
Clay, brown-gray, plastic, lignitic	16.5	7.5
Sand, clayey, gray-tan, poorly sorted (mL-cL); with gravel and a sharp upper contact	18.5	2.0
Sand, gray and orange-stained, well-sorted (mL-mU)	19.0	0.5
Sand and gravel, gray to tan; well-sorted in zones of different coarseness, coarser with depth	29.0	10.0

Description	Depth (ft)	Thickness (ft)
SITE 32		
Soil, clayey	0.4	0.4
Clay, sandy, orange-brown and gray mottled	3.5	3.1
Sand, gray and orange-brown mottled,(mL); with some small clay lenses and some lignite	14.0	10.5
Sand and gravel, red-brown, poorly sorted,(cL)to cobbles	15.6	1.6
Sand and clay, lavender; with plastic clay, and(fL)sand	17.5	1.9
Sand, lavender to tan,(fU-mL), well-sorted	22.0	4.5
Sand and clay, interbedded, lavender; with plastic clay and fine sand	34.2	12.2
Clay, silty, gray-brown, dense	44.0	9.8

Description	Depth (ft)	Thickness (ft)
SITE 33		
Soil	0.6	0.6
Clay, sandy, gray and orange-brown mottled sandy	5.0	4.4
Sand, clayey, gray and orange-stained,(fU), clayey	9.0	4.0
Sand, tan to orange, well-sorted	11.5	2.5
Clay, sandy, gray and orange-brown mottled	12.1	0.6
Sand, tan to orange, well-sorted	13.0	0.9
Sand, clayey, gray and orange-brown mottled	18.6	5.6
Sand and clay, lavender; with some gravel and lignite	19.0	0.4
Sand, tan to orange,(mU); with some large cobbles	22.2	3.2
Clay, sandy, lavender and orange-tan mottled	24.0	1.8
Sand, tan to orange,(mU), well-sorted, lignitic	25.2	1.2
Clay, lavender, dense, lignitic; with small sand layers	28.0	2.8
Sand, orange and lavender,(mU), well-sorted, lignitic; with some distinct clay layers near bottom	59.0	31.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 34		
Soil	0.2	0.2
Silt, clayey, yellow-brown and orange mottled, with lenses of dark red-brown, hard, friable clay	7.0	6.8
Sand, gray and orange-brown mottled,(fU-mL), clean, well-sorted; wet near bottom	15.4	8.4
Sand and gravel, reddish-black; with large cobbles (up to 6 in.)	16.4	1.0
Sand, white, wet, clean, well-sorted (mL)	17.9	1.5
Sand, clayey, white and orange laminated,(mL)	20.6	2.7
Clay, lavender, hard, plastic	22.1	1.5
Sand and clay, interbedded; with gray,(fU-mL)sand, and lavender clay	23.6	1.5
Sand, orange, clean, well-sorted (mL)	24.0	0.4

Description	Depth (ft)	Thickness (ft)
SITE 35		
Soil	0.2	0.2
Fill material; containing clay, sand, gravel, and fragments of ceramic material	2.2	2.0
Sand, clayey, and silt, light gray and orange-stained, micaceous; with hard iron concretions and wet near bottom	16.6	14.4
Sand, gray and orange-brown mottled, well-sorted (mL-mU), wet; with a few lenses of clayey sand	19.5	2.9
Clay, sandy, lavender and orange-stained, micaceous	22.2	2.7
Sand, light pink to tan, well-sorted (mL-mU), wet	28.6	6.4
Sand, bright-orange,(mL); with red-black iron concretions	29.0	0.4

Description	Depth (ft)	Thickness (ft)
SITE 36		
Soil	0.5	0.5
Clay, brown	2.5	2.0
Sand, clayey, orange-brown, well-sorted (mL); becoming more sandy toward bottom	3.5	1.0
Sand, tan, poorly sorted (fU-mU); with gravel and cobbles and some red-purple nodules	12.0	8.5
Sand, gray,(mL), micaceous	17.0	5.0
Sand and clay, interbedded, lavender and orange-stained; with (mL) sand and plastic clay	22.0	5.0
Sand, tan, well-sorted (cU); with orange staining	29.0	7.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 37		
Fill material	0.5	0.5
Soil	1.0	0.5
Sand, silty, tan and gray mottled,(mU)	6.0	5.0
Clay, sandy, lavender; containing thin sand lenses and becoming red, white and gray near bottom	19.0	13.0
Sand, tan to gray, poorly sorted (mL-cU); with some clay lenses and iron oxide layers	34.0	15.0
Sand, silty, tan to gray,(fU-mU)	36.7	2.7
Sand and clay, interbedded; with white to lavender sandy clay lenses	39.0	2.3
Sand, pinkish-tan, poorly sorted (fU-mU)	42.0	3.0
Sand and clay, interbedded; with tan sand and white, plastic, micaceous clay	43.0	1.0

Description	Depth (ft)	Thickness (ft)
SITE 38		
Fill material and soil	2.0	2.0
Clay, brown to gray, plastic, lignitic	6.0	4.0
Clay, sandy, lavender, gray and white; with distinct thin sand lenses	11.0	5.0
Clay, dark gray, dense, plastic	18.5	7.5
Sand and clay, interbedded; with lavender and orange sand, and dark gray, plastic clay	19.5	1.0
Clay, dark gray, dense, plastic	32.5	13.0
Clay and sand, interbedded; with lavender sand and dark gray-green, plastic clay	37.0	4.5
Sand, tan and orange-stained, poorly sorted (mL-cU)	45.0	8.0
Clay and sand, interbedded; with lavender and white, lignitic clay, and lavender, gray and white	48.0	3.0
Sand, clayey, gray to white and orange-stained, well-sorted (mU)	49.0	1.0

Description	Depth (ft)	Thickness (ft)
SITE 39		
Fill material	1.0	1.0
Soil	2.0	1.0
Sand, tan and orange-stained, (mU-cL); with brown-gray clay	6.0	4.0
Clay and sand, interbedded; with lavender, friable, thinly laminated clay and lavender to gray, fine to medium sand	14.0	8.0
Clay, lavender and white-streaked, massive	18.5	4.5
Sand, tan and orange-stained, wet, well-sorted (mL-mU), micaceous and lignitic; sparse clay lenses	49.0	30.5

Description	Depth (ft)	Thickness (ft)
SITE 40		
Fill material	1.0	1.0
Clay, gray, plastic	2.1	1.1
Clay, sandy, gray and orange mottled	4.0	1.9
Clay, blue-gray to lavender, friable; with sand lenses	8.2	4.2
Clay, sandy, lavender and orange mottled	19.0	10.8
Clay, dark gray; with interbedded sand lenses	24.0	5.0
Sand, tan to lavender and orange-stained, well-sorted (mL-mU)	33.0	9.0
Clay, lavender and orange mottled, dense; with sand lenses	34.0	1.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 41		
Soil	0.5	0.5
Clay, brown, gray, and orange mottled, lignitic; with sand lenses and cobbles	7.5	7.0
Sand, tan,(cL-cU), well-sorted	9.5	2.0
Sand, silty, orange, lignitic	10.1	0.6
Sand and clay, interbedded; with tan to orange (mL-mU) sand and lavender to white sandy clay	17.5	7.4
Clay, lavender, gray and orange mottled, dense; with iron nodules and iron-cemented gravel	23.1	5.6
Sand, tan and lavender, orange-stained, poorly sorted (vfU-fU); with thin clay lenses near bottom	32.6	9.5
Sand, tan to lavender, well-sorted (fU-mL), micaceous, lignitic; with thin clay lenses near bottom	51.0	18.4
Clay and sand, interbedded; with lavender sandy clay, and orange-stained, lavender (mL-mU)sand	53.0	2.0
Sand, lavender, orange-stained L-mU)	59.0	6.0

Description	Depth (ft)	Thickness (ft)
SITE 42		
Soil	0.5	0.5
Clay, brown; with some cobbles	2.5	2.0
Sand, clayey, tan to brown,(mL-mU)	7.0	4.5
Sand, tan and brown-stained, fairly well-sorted (mU-cL)	17.0	10.0
Clay, lavender and orange mottled; with some lenses of red-gray plastic clay	24.0	7.0
Clay, sandy, lavender and orange mottled; with thin sand lenses	26.5	2.5
Sand, lavender to tan,(mL-mU); with thin clay lenses	30.0	3.5
Sand and clay, interbedded; with tan to lavender,(mL-mU)sand, and lavender and orange mottled clay	34.0	4.0

Description	Depth (ft)	Thickness (ft)
SITE 43		
Fill material	2.0	2.0
Sand and clay, interbedded; with tan, (fU-mL) sand and tan silty clay	5.5	3.5
Sand, tan, orange-stained, well-sorted (mU-cL); with clay lenses that increase in frequency and thickness with depth, also gravel and cobbles near bottom	20.5	15.0
Sand and gravel, yellow-orange, coarse; with cobbles up to 2 in. common	29.0	8.5
Sand, tan and orange-stained,(cL-vcU); coarsening upwards	34.0	5.0

Description	Depth (ft)	Thickness (ft)
SITE 44		
Soil	0.5	0.5
Sand and clay, interbedded with tan to orange clayey sand, and brown, micaceous sandy clay	7.0	6.5
Clay, gray and orange mottled	9.5	2.5
Sand, tan, orange, and purple mottled, (cL-cU); with thin clay lenses	10.5	1.0
Sand and gravel, tan and orange mottled, poorly sorted; with numerous large cobbles	13.5	3.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 101		
Silt, sandy, brown	0.3	0.3
Fill material, sand and silt with large fragments of rock and smaller gravel, orange-brown, roots	4.0	3.7
Silt, clayey, dark red-brown and brown mottling, with lenses of fine sand, roots, and orange staining, moist	6.3	2.3
Sand, dark red to orange-brown,(fU-mU), wet; with sparse gravel (<0.2 in.)	10.5	4.3
Sand, dark red to orange-brown,(fU-mU), interbedded with sandy, light gray clay	11.5	1.0
Clay, sandy, dark gray, soft, friable, micaceous; with streaks of light gray fine (fL) sand, grades to pinkish gray color in places	14.0	2.5
Silt, clayey, light gray to pink, hard; with fine (fL), micaceous, clayey sand lenses, and orange silt lenses	14.9	0.9
Sand, dark brown-orange, micaceous, wet; with dark mineral grains and a fragment of red sandstone at 16 ft	16.0	1.1
Silt, clayey, pink, orange-streaked, soft, micaceous	16.2	0.2
Sand, dark brown-orange, poorly sorted,(fU-mU) (mainly mL)	18.2	2.0
Sandstone, maroon, orange and red, fine-grained	18.3	0.1
Sand, dark brown-orange, poorly sorted,(fU-mu)(mainly mL)	19.0	0.8
Sand, multicolored, poorly sorted(fU-mU)(mainly mU), wet; with red to black sandstone, and light gray, micaceous clay	22.8	3.8
No sample	24.0	1.2

Description	Depth (ft)	Thickness (ft)
SITE 102		
Soil zone, silty, brown-orange-tan	1.5	1.5
Clay, silty, orange-brown-tan mottled	4.0	2.5
Clay, silty, gray-green-orange mottled	5.7	1.7
Clay, silty, orange-tan mottled; with brick-red clay lenses	9.0	3.3
Clay, red, dense	11.5	2.5
No sample	14.0	2.5
Clay, red, dense	19.0	5.0
Clay, red, dense; with white silt lenses, increasing with depth	27.0	8.0
Silt, sandy, white	29.0	2.0
Silt, sandy, white, micaceous; wet near bottom	34.0	5.0
Sand, clayey, light gray, yellow-orange stained, [10YR 7/1] (fL-fU), fairly tight, micaceous	39.5	5.5
Sand, silty, light gray, light yellow, and red mottled, [10YR 7/1] (fL-mL) (mostly fU), micaceous, wet	42.3	2.8
No sample	44.0	1.7
Sand, silty, light gray,(fU-mL)(mostly fU); with clayey sand lenses, and purple and orange banding	49.0	5.0
Sand, dark gray,(fU-mL)(mostly mL), micaceous; with black staining and yellow mottling; top 1.4 ft wet; lignite specks in thin bands near bottom	51.4	2.4
Clay, dark gray, friable; with light gray and orange,(fU-mL), micaceous, sand lenses, [10YR 3/]	51.9	0.5
Sand, light gray and orange mottled,(fU-mL), moist	52.4	0.5
Clay, dark gray, friable; with orange and light gray,(fU-mL), sand lenses	53.0	0.6
No sample	54.0	1.0
Sand, silty, multicolored,(fL-mU), micaceous, wet; with well-rounded quartz grains, dark mineral grains, and iron concretions	57.7	3.7
No sample	59.0	1.3
Sand, multicolored,(fL-mU), wet	63.7	4.7

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 104		
Clay, brick-red, hard, friable; with silty mottling of brown, ochre-yellow and light gray	58.7	9.7
Sand, clayey, light gray,(fL-fU), micaceous	59.5	0.8
Clay, dark gray-orange mottled	61.5	2.0
Sand, clayey, light gray, micaceous	64.0	2.5
Sand, silty, dark brown	64.5	0.5
Clay, dark gray and orange mottled	67.5	3.0
Sand, silty, light gray, micaceous	68.7	1.2
Clay, dark gray and orange mottled	70.3	1.6
Sand, silty, light gray, micaceous	71.0	0.7
Sand, clayey, light gray-orange mottled	74.0	3.0
Sand, silty, light gray; with some orange bands	89.0	15.0
Sand, silty, pink-tan, fine- to medium-grained	91.0	2.0
Sand, white-buff, fine- to medium-grained	94.0	3.0
Sand, orange-red, fine- to medium-grained	94.7	0.7
Sand, white-buff, fine- to medium-grained	97.0	2.3
Sand and gravel, red-orange, coarse (to 2 in.)	99.0	2.0
Sand and gravel, red-orange, coarse (to 2 in.); sharp lower contact bounded by rusty iron concretion	100.2	1.2
Clay, gray-orange mottled; with sharp lower contact	103.0	2.8
Sand and gravel, coarse, rust-stained	104.0	1.0
No sample	106.0	2.0
Clay, gray-orange mottled	109.0	3.0
No sample, (probably sand)	114.0	5.0
Sand, red-brown, medium- to coarse-grained; with some gravel	118.4	4.5
Clay, gray	119.0	0.5
Clay, light gray, plastic	124.0	5.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 106		
Soil zone; with roots	0.8	0.8
Sand, clayey and silty, light gray, tan and, brown-orange (iron stain) mottled,(mL-mU)	4.6	3.8
Silt, light tan-gray,(fL), micaceous; with subrounded, quartz pebbles up to 2 in.	5.4	0.8
Sand, clayey and silty, light gray, iron-stained,(fU-mL); with pebbles	5.6	0.2
Sand, silty, gray,(fU-mL), micaceous	7.2	1.6
Sand, silty, brown-orange and light gray layered,(fU-mL), micaceous; with some pebbles	7.8	0.6
Silt, clayey, light tan-gray, micaceous	8.5	0.7
Sand, clayey, orange, poorly sorted, wet; with some pebbles	9.0	0.5
Clay, silty, orange, wet	9.3	0.3
Silt, clayey, medium gray, wet; coarsening downward	10.9	1.6
Sand, silty, light gray and iron-stained, well-sorted; with thin, fine-grained gray, clayey sand layers	12.5	1.6
Silt, clayey, dark gray, micaceous	13.2	0.7
Sand, silty, dark gray,(mL-fU), wet	16.9	3.7
Sand, clayey, dark gray,(mL-mU), wet; coarsening down	17.7	0.8
Sand, light to dark gray, (mU), clean well-sorted	19.0	1.3
Sand, silty, gray, micaceous,(mL), wet; with dark mineral grains	20.8	1.8
Sand, silty and clayey, gray, hard, friable	21.7	0.9
Sand, dark gray,(mU-cL), poorly sorted; with pebbles, a large cobble, and clayey sand lenses	23.5	1.8
Silt, clayey, tan-gray, micaceous; with some pebbles and lignite fragments	24.0	0.5
Clay, light tan-gray, plastic, micaceous; with lignite specks	25.8	1.8
Clay, dark gray; with abundant lignitized twigs and branches, some layers composed entirely of lignitized wood	31.8	6.0
Sand, clayey, tan-gray,(fU), wet; with sparce lignite fragments	34.0	2.2
No sample	44.0	10.0
Sand, light olive-gray [5Y 5/2], (mU-cL), wet; light gray {5Y 6/6} sand nodule found at base, with light olive-brown center, 0.1 ft diameter	46.4	2.4
Clay, moderate brown [5YR 4/4], hard; with medium light gray silt stringer	47.3	1.3
No sample	49.0	1.7
Silt, clayey and sandy, red-brown and olive-gray, mottled; with some lignite, and with a cobble at base	54.0	5.0
Clay, silty, gray-brown [5YR 3/2], moist; with moisture diminishing downward; sparsely scattered lignite 1.2 ft to base, up to 0.2 in. fragments	57.5	3.5
Silt, light gray; with dark gray chert-like nodule	57.8	0.3
Siltstone, light gray	58.0	0.2
Silt, gray-brown, with gravel, rock fragments, and lignite	58.3	0.3
No sample	59.0	0.7
Sand, clayey and silty, light gray,(fU-fL); interbedded with dark gray clay and silt containing lignite fragments, some pebbles and gray siltstone cobbles	63.0	4.0
Clay, silty, dark gray; with occasional lignite fragments, and abundant sandy (vfL) silt stringers	64.0	1.0
Silt, clayey, dark brown-gray, micaceous, hard, friable; with one rock fragment at top	69.0	5.0
Silt, clayey, dark brown-gray, tight, micaceous; with irregular silt layers	74.0	5.0
Silt, clayey, dark brown-gray, hard, friable, micaceous; with some tiny lignite fragments, interbedded with fine laminae of tan-gray,(fL-mU), silty sand	77.5	3.5
No sample	78.1	0.6
Silt, clayey, dark brown-gray, hard, micaceous; interbedded with sandy, light tan-gray silt	80.2	2.1
Sand, silty, light tan-gray,(fU); with tiny, sparse lignite fragments	81.5	1.3
Silt, clayey, dark brown-gray, micaceous	82.2	0.7
Silt, clayey, dark brown-gray, hard, micaceous; mixed with light tan-gray, (mL-mU) silty sand	84.0	1.8
Sand, silty, dark gray-brown,(mU-cL); with sub-rounded quartzite pebbles	84.5	0.5
Sand, yellow to gray [5Y 7/6-7/2], mU; with occasional quartz pebbles	88.5	3.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 107		
Soil zone, loamy, dark brown; with roots, organic material, recent debris, glass, and a 4-in.-long piece of steel	0.5	0.5
Silt, yellow-brown, hard; with roots, sporadic white mineralized zones, and fine sand near bottom	7.0	6.5
Sand, gray-brown, orange-stained,(mL-mU), micaceous; with plant roots	8.5	1.5
Sand, dark brown,(mL); with black staining of unknown origin, and silt lense at base	9.0	0.5
Clay, pink-red, hard; with brown-red laminae that include black staining; stringers of reduced light gray clay, and gray to mustard,(fL-fU), sand lenses	17.2	8.2
Clay, dark red, dense, plastic	19.0	1.8
Clay, brick-red, dense, tight; with some lignite, black staining, and white mottled mineralized zones	25.0	6.0
Sand, silty, pink-gray, yellow-brown stained,(fL-fU) (mostly fL), quartzose, micaceous	28.3	3.3
Clay, brick-red, micaceous; with some white mottling	29.0	0.7
Clay, silty, red-brown, hard, dense, micaceous; with white reduced zones, and hard, brown semiconsolidated inclusions	41.8	12.8
Silt, sandy, dark gray, laminated, fissile, micaceous; becoming more consolidated with depth	45.0	3.2
Sand, medium gray,(mL-mU), micaceous; with lignite and silt lenses	45.8	0.8
Silt, sandy, gray, lignitic, micaceous; with gray,(fU fL), semiconsolidated sand lenses	46.0	0.2
Sand, silty, red-orange to buff,(mU-cL), quartzose; with iron-cemented sandstone-siltstone rock fragments, (0.2-3.0 in.), and clay inclusions	47.3	1.3
Clay, silty, light gray to white, highly plastic, micaceous, homogeneous	48.3	1.0
No sample	49.0	0.7
Sand, buff to orange,(cU), quartzose; with gravel as subrounded quartz fragments (1.0-1.5 in.), and sparse iron-cemented conglomeratic sandstone	52.5	3.5
No sample	87.0	34.5
Silt, clayey, orange and light buff, friable; with sparse quartz gravel, and interfingered with gray clay, sand lenses, and thick layers of lignite	89.0	2.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 108		
Soil, silty, zone, light gray; with roots	0.5	0.5
Sand, light orange,(mL-mU); becoming moist at 3 ft, with quartz pebbles (<0.2 in.), and small clay lenses	7.3	6.8
Sand, clayey, orange and light gray,(mL-mU), micaceous; with irregular color bands, maroon iron concretions, and quartz pebbles	9.0	1.7
Silt, clayey, multicolored; with tight, micaceous,(mL-mU), multicolored, sand in irregular lenses, and some clay; also with small maroon nodules	13.5	4.5
Sand, dark orange, red-stained,(fU-mL), clean, wet	14.0	0.5
Sand, silty, orange to red-orange,(fU-mL); with iron-cemented red sandstone	15.9	1.9
Sand, yellow to red-orange,(mU-cL); with 0.3 in. pebbles mixed with soft, micaceous, light gray and pink silty clay	18.0	2.1
No sample	19.0	1.0
Sand, light tan to orange,(mL-cU) (mostly mU), quartzose, micaceous; with some dark mineral grains	22.0	3.0
No sample	24.0	2.0
Clay, silty, multicolored; with small, hard, friable, micaceous, white stringers	29.0	5.0
Clay, silty, multicolored; with small lenses of fine-grained light gray sand	37.3	8.3
Clay, sandy, light gray to pink,(fL-fU), micaceous; with a gradational contact with yellow to orange, red-stained,(fU-mL)sand in thin lenses	39.0	1.7
Clay, sandy, purple and light gray; mixed with micaceous,(fU-fL), brown-green mottled clayey sand; sand diminished at bottom 2 ft	44.0	5.0
Silt, clayey, mustard, red, brown and light gray mottled, micaceous	48.0	4.0
Clay, silty, dark gray, dense, micaceous	49.0	1.0
Silt, sandy, olive gray and mustard, micaceous; with medium-grained sand layers	52.5	3.5
Sand, multicolored,(mU-vcU), conglomeratic, micaceous; with semiconsolidated maroon sandstone nodules, sparse clay lenses, and quartz pebbles up to 1.5 in. long	54.0	1.5

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 109		
Soil zone, medium brown	0.5	0.5
Fill material, light orange-brown; containing large pebbles, cobbles, and organic-rich, orange-brown, clayey silt hard pack	2.0	1.5
No sample	4.0	2.0
Clay, red-brown and light gray mottled (light gray possibly due to reducing conditions); gray increasing near base, and containing plant fragments	14.0	10.0
Clay, silt, and silty sands, multicolored, mottled, hard, tight; gradationally coarsening downward, with sand lenses up to(fU-mL)	24.8	10.8
Silt, mustard, gray-brown, and light olive-gray, soft, plastic	27.3	2.5
Sand, gray,(fU-mL), organic-rich, finely laminated; with fairly tight mustard to red clay stringers	29.0	1.7
Sand, silty, gray, mustard, and purple, finely laminated, wet; with wet, lignitic, micaceous clay stringers	30.5	1.5
Silt, dark olive-gray, micaceous, hard, friable; with sparse orange staining and lignite	31.7	1.2
Sand, multicolored, mottled,(mL), quartzose; with black grains throughout (possibly lignite or mineral grains), maroon stringers, and consolidated silt fragments	34.0	2.3
Silt, clayey, brown	34.5	0.5
Sand, maroon, tan, mustard,(mU-cU)(coarsening downward), micaceous; with pebbles at base, abundant small black fragments throughout, and consolidated silt fragments	39.0	4.5
No sample	54.0	15.0
Clay, silty, dark gray, plastic; with lignite fragments up to 0.4 in.	57.0	3.0
No sample	59.0	2.0
Sand	65.0	6.0
Clay, dark gray to purple-gray, hard, plastic; with lignite up to 1.2 in. long	69.0	4.0

Description	Depth (ft)	Thickness (ft)
SITE 110		
Soil, silty, zone, dark brown to yellow-brown, orange-mottled; with abundant roots	1.0	1.0
Sand, silty and clayey, light gray, orange-mottled,(fU-mU)(coarsening downward); with dark gray clay lenses	3.4	2.4
Silt, clayey, pink-gray, dark gray, and orange mottled; with small,(fU-mL), friable, bright-orange sand lenses	4.0	0.6
Clay, multicolored (hues darkening with depth), lignitic; with hard, friable, micaceous, fine-grained sand lenses	14.0	10.0
Clay, sandy, mottled,(fL-fU); with irregular bands and thin layers of sand, and some large lignite fragments	19.0	5.0
Clay, sandy, gray-red mottled,(fL-fU), lignitic, micaceous; becoming more sandy and fairly clean with depth	31.1	12.1
Sand, light gray-tan,(fU-mL), micaceous, moist; with some light brown clay lenses	32.0	0.9
Silt, clayey, and sand, yellow-orange, micaceous; with (fU-mL) sand	32.9	0.9
Sand, white,(mL), wet, with sparse pebbles (0.2 in.), small balls of clayey sand, and orange staining in thin bands	33.7	0.8
Clay, white, micaceous, plastic; interlayered with white sand containing small red-maroon nodules	34.0	0.3
Sand, white, (mU), micaceous, wet; with patches of black staining, and thin layers of micaceous, clayey sand	36.2	2.2
Sand, clayey, white, (mU), tight, micaceous	36.7	0.5
Sand, multicolored, (mU-cU), loose	37.5	0.8
Sand, silty, multicolored, (mL-mU), micaceous; with some thin clay layers, and irregular multicolored banding	39.0	1.5

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 111		
Sandy soil zone, medium brown, with grass roots	0.3	0.3
Sand, silty, orange-brown, (fU-mL); with numerous small (0.4 in.), mU, white sand lenses, red to gray discontinuous clay lenses, and abundant quartzite pebbles	2.1	1.8
Sand, orange-brown, (mU); with fragments of concrete (0.8-4.0 in.), and fill material	2.7	0.6
Clay, silty, light gray, tight; with abundant maroon, orange-brown, discontinuous clay stringers	4.0	1.3
Clay, silty, multicolored, mottled, tight, friable; generally coarsening downward	6.3	2.3
Silt, sandy, light gray; generally coarsening downward, with sand (fL-mL), and abundant yellow-brown staining	9.0	2.7
Sand, silty, light gray, yellow-brown stained, (fL-mL); generally coarsening downward	14.0	5.0
Sand, light gray, (mU-cL)	15.0	1.0
Sand, silty, light gray, (fU-mU); with abundant orange-brown and maroon staining, and some clay content	24.7	9.7
Sand, light gray and maroon mottled, (mU)	26.5	1.8
Sand, multicolored, mottled, (cL-vcL)	29.0	2.5

Description	Depth (ft)	Thickness (ft)
SITE 112		
Soil zone, dark brown	0.2	0.2
Silt, clayey, orange-brown; with medium-grained sand lenses, sparse pebbles, and small roots	1.4	1.2
Sand, pale orange, (mL-mU), dry; with thin, white-pink silt lenses	3.7	2.3
Silt, clayey, dark black and brown, organic-rich; with sharp upper contact; orange to brown medium-grained sand stringers common, also some light gray silt	14.0	10.3
Clay and silt, dark gray, micaceous, friable; with fine-grained, light gray sand lenses, and becoming more clayey near bottom	23.0	9.0
No sample	24.0	1.0
Silt, sandy, orange and gray, finely laminated, lignitic, micaceous; with some clay	29.0	5.0
Sand and gravel, white to pink, orange-stained, coarse	31.5	2.5
Clay, white, plastic; bounded by hard, red iron concretions	32.0	0.5

Description	Depth (ft)	Thickness (ft)
SITE 113		
Soil zone, brown; with roots	0.2	0.2
Fill material; with rock fragments, pebbles, (fL-mU) sand, and orange-brown mottled silt	2.3	2.1
Sand, clayey, mottled orange-brown and gray-brown,(fL-mU), micaceous, odd smell	4.0	1.7
Sand, bright orange, (fU-cL), moist; with red, maroon, and black iron concretions, quartz cobbles	9.3	5.3
Silt, clayey, tight; interbedded with thin layers of (fU-cL) sand, and clay decreasing with depth	12.2	2.9
Sand, silty, brown-orange, poorly sorted; with gravel lenses held together by clayey silt, and fragments of red-black sandstone	14.3	2.1
Sand, clayey, pink-tan, (fL-fU), micaceous; with thin orange banding	16.8	2.5
Sand, gray-tan; interbedded with dark gray clayey silt	18.2	1.4
Silt, clayey, pink-tan, micaceous; interbedded with tan clay and fine-grained, light gray sand; contains some orange staining	21.6	3.4
Sand, silty, bleached white, wet; with some thin purple, yellow, and orange banding in upper 0.5 ft; sharp upper contact and iron concretions at base	29.0	7.4

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 114		
Soil zone, brown	0.1	0.1
Fill material; with brown, (mL-cL) sand, gravel, rock fragments, sandstone, asphalt, and metal	7.7	7.6
Sand, light brown-gray, (fL-mU), with thin, black layer at top, and clayey, brown silt lense	9.0	1.3
Sand, multicolored, (fU-mU), wet; with irregular bsnding; and gray, clayey sand lenses	10.8	1.8
Sand, light yellow-tan, (fU-cL), clean; with sparse light gray clay lenses	17.0	6.2
No sample	19.0	2.0
Sand and gravel, purple, orange, and tan, (mU-cU); with white to light gray, silty, micaceous clay	24.0	5.0
Silt, clayey, and sand, pink and orange-mottled, micaceous; sand (fL-fU), coarsening downward	29.0	5.0

Description	Depth (ft)	Thickness (ft)
SITE 115		
Sandy soil zone, medium brown, (mU), hard; with some silt and fill material	2.0	2.0
No sample	4.0	2.0
Silt, sandy, light tan-brown, with large slag pebbles	5.0	1.0
Sand, light yellow-gray, (mU-cL); with some clayey and silty zones	13.2	8.2
No sample	14.0	0.8
Sand, quartzose, light orange-tan, (mU-cL), moist; with maroon silty stringers, and consolidated claystone pebbles at base	18.4	4.4
No sample	19.0	0.6
Sand, quartzose, orange-tan, (mU-cL); maroon mottling near base	22.1	3.1
Sand, silty, light yellow-tan, (mU-cL); with some maroon silt layers, and consolidated siltstone fragments	28.3	6.2
No sample	29.0	0.7
Sand, silty, light tan to orange and gray, (mL-cL), micaceous, wet; with some silt layers	41.2	12.2
No sample	44.0	2.8
Sand, light gray and tan, (mL-cL); with maroon staining, and clayey silt stringers	48.0	4.0

Description	Depth (ft)	Thickness (ft)
SITE 117		
No sample	34.0	34.0
Clay, yellow-red mottled [5YR 4/6], hard, friable; with thin, light gray silt lenses, and thin, fine-grained partings of (mL), yellow-red sand, also some thin lenses of wet, light gray, clayey sand	44.0	10.0
No sample	79.0	35.0
Sand and gravel, light red-brown [5YR 6/4], (mL-vcU); sand has black staining and contains red-yellow bands [7.5YR 6/8]	83.8	5.0
No sample	98.8	15.0
Sand and gravel, light red-brown [5YR 6/4], (mL-vcU); sand has black staining, and gravel disappears with depth	103.8	5.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 118		
Sandy soil zone, light tan-gray; with pebbles and fill material	1.0	1.0
No sample	4.0	3.0
Sandy soil zone, light tan-gray; with pebbles and fill material	4.4	0.4
Silt, clayey, olive-gray, lignitic; with light gray reduced zones	9.0	4.6
Silt and clay, red, yellow, and brown, lignitic, micaceous, dense; with maroon nodules	21.3	12.3
Sand, silty, gray to brown, (fU-mL); with finely laminated light and dark gray layers	25.3	4.0
Sand, yellow, brown, and purple, (mL-cU) (coarsening downward), micaceous, quartzose; with clayey lenses near top, and iron-cemented sandstone and siltstone layer at upper contact; bottom 0.5 ft wet	29.0	3.7

Description	Depth (ft)	Thickness (ft)
SITE 120		
Soil zone, tan, dry; with roots	0.5	0.5
Sand, silty, tan to cream, (mU); with olive, silty clay lenses	4.3	3.8
Silt, clayey, white, dense, hard; with red, dense clay that contains orange mottling near base	25.7	21.4
Sand, silty, white, (fU-mL), damp	29.0	3.3
Clay, dark red and olive mottling; with white silt in alternating bands with clay	42.3	13.3
Clay, dark brown, layered with sand, silty, light gray	46.0	3.7
Clay, dark gray, dense, hard; containing silt and sand that increases with depth	54.0	8.0
Iron concretion, hard, followed by running sands	54.1	0.1

Description	Depth (ft)	Thickness (ft)
SITE 122		
Fill material, loose; with black gravelly debris	0.7	0.7
Silt, clayey, light gray and orange mottled, micaceous; with thin, (fL-mU), sand lenses	5.0	4.3
Sand, and gravel, orange to light gray	6.6	1.6
Silt, clayey, light pink-gray and orange mottled, hard, friable	7.5	0.9
No sample	9.0	1.5
Silt, clayey, light pink, hard, friable; with some imbedded quartz gravel, and pale-orange, (mL) sand lenses	9.8	0.8
Sand, silty, white, (fU-mL), wet; with some clay	11.7	1.9
Clay, silty, pink-gray [7.5YR 7/2], hard, friable; with orange-white mottling	13.9	2.2
Sand and gravel, red-yellow, orange-stained, micaceous, wet; with (mU-vcU) sand, and white, sandy clay	29.0	15.1

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 123		
Soil, silty, zone, gray-brown; somewhat clayey	0.8	0.8
Silt, sandy, orange-brown [10YR 6/6], gray, and rust [2.5YR 4/7], dry; with sparse clay lenses	18.2	17.4
Sand, orange-brown [10YR 6/3], fine-grained, wet	23.7	5.5
Silt, mottled, dense, dry, sharp contact with sand above, iron concretions with pebbles at contact	26.1	2.4
Sand, silty, gray, (vfL-mL), poorly sorted, micaceous, wet; intermixed with clay near base	43.5	17.4
Clay, silty, red [2.5YR 3/4], ochre, and light gray marbled, soft, plastic, micaceous	46.9	3.4
Sand, clayey, light gray, (vfU-fU), micaceous	48.0	1.1
Clay, silty, multicolored marbled, soft, plastic	49.0	1.0
Clay, yellow-ochre, light gray, and red marbled, hard; with silt and sand lenses, and iron concretions	64.0	15.0
Sand, clayey, light gray, (vfU-fL), micaceous; intermixed with hard, olive-green to gray, silty clay; with thin partings of clean, fU, orange-red sand	71.8	7.8
No sample	74.0	2.2
Sand and gravel, multicolored, poorly sorted, micaceous; with iron-cemented sandstone, small nodules of white silty clay	79.0	5.0
Sand, multicolored, (fU-mL), micaceous, wet; color banded; includes silty fine-grained layers, and dark mineral grains	85.0	6.0
No sample	89.0	4.0
Sand, silty, white, (fU-mL), micaceous; multicolored at top, becoming predominantly white towards bottom	99.0	10.0
Silt, clayey, white, micaceous, banded; with small purple nodules and poorly sorted, clean, micaceous, (fL-mL), white and orange sand	99.6	0.6
Sand, white, purple, and orange-brown, banded, (mL-mU), micaceous, wet; with some dark mineral grains	102.7	3.1

Description	Depth (ft)	Thickness (ft)
SITE 124		
No sample	4.0	4.0
Sand, silty, orange-brown, (fL-mL), micaceous; coarsening downward	7.0	3.0
Silt, sandy, gray, quartzose, micaceous	8.0	1.0
Sand and silt, orange, brown, tan, and maroon mottled, (mL), micaceous, poorly sorted; with iron-cemented nodules at upper contact	9.0	1.0
Sand, orange and brown, (mL-mU), quartzose, wet; coarsening downward, iron-cemented nodules, and small black mineral grains present	14.0	5.0
Sand, orange-brown, (mU-cL), quartzose, wet	17.3	3.3
No sample	19.0	1.7
Sand, orange-brown, (cL), quartzose	21.5	2.5
Silt, buff to brown, dense; with orange-brown sandy partings	23.7	2.2
Sand, silty, buff and mustard, micaceous; with iron-cemented sand nodules	24.0	0.3
Silt, sandy, mustard and brown, (fL-mL), finely laminated, lignitic, micaceous; with purple, semi-consolidated silt nodules	33.2	9.2
Silt, sandy, dark gray, (fL), micaceous, lignitic; with top marked by abundant medium-grained, orange-brown sand laminae	34.0	0.8
Silt, sandy, dark gray, dense, medium grained, micaceous	37.8	3.8
Sand, silty, dark gray, (mL), micaceous; dark gray silt laminae in lower 0.3 ft	40.0	2.2
Sand, light gray to multicolored, (mL-mU), micaceous; with clayey lenses near top, and semi-consolidated siltstone nodules in maroon zones	49.0	9.0
Sand, multicolored, (mU); with silt lenses, (0.3 ft thick)	54.0	5.0
Sand, light gray, light tan, and orange-brown, (mL-cU), micaceous; coarsening downward, iron-cemented sandstone nodules, and occasional clay lenses	64.0	0.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 126		
Soil, clayey, brown; with roots	0.7	0.7
Sand, clayey, dark brown-orange [10YR 4/6], (fU), moist	3.3	2.6
Silt, orange [10YR 4/6] and gray (5Y 6/1) mottled, hard, dry	4.0	0.7
Silt, clayey, green, brown, and orange mottled, (fU); with thin sand lenses	6.1	2.1
Sand, white, yellow, and orange [10YR 7/8] mottled, dry	9.0	2.9
Sand, white to pink, (mL-mU), orange-streaked, micaceous; increasing wetness with depth	13.1	4.1
Sand, light orange [10YR 7/6], (mL-mU), wet	14.0	0.9
Sand, orange [10YR 6/8], (mL-mU), micaceous, wet	17.5	3.5
No sample	19.0	1.5
Sand, orange [10YR 6/8], (mL); with thin, gray clayey sand lenses	19.6	0.6
Sand, gray [2.5YR 4/0], (mL), lignitic, clayey sand lenses	20.0	0.4
Sand, clayey, dark gray [2.5YR 3/0], micaceous, lignitic, soft, wet	24.0	4.0

Description	Depth (ft)	Thickness (ft)
SITE 127		
Soil zone	0.7	0.7
Sand, silty, orange-brown [7.5 YR 5/8], (mL-mU); moist near base	7.0	6.3
Sand, pale brown [10YR 7/3] and orange mottled, (mU), well-sorted, subrounded; with large cobbles and sandstone fragments	8.8	1.8
Sand, silty, light gray and orange mottled, (fU-fL), micaceous, lignitic; with gradational color change to mottled pink-gray and pink-orange bottom 1.3 ft	10.3	1.5
Sand, light red-brown [5YR 6/3], (cU-mU)	11.5	1.2
Silt, sandy, orange and light gray mottled, (fU-fL), micaceous	13.3	1.8
Silt, clayey, and sand, dark gray, (fU-fL), micaceous	14.5	1.2
Clay, brown and light gray to mottled pink-gray, red, yellow and dark gray	19.0	4.5

Description	Depth (ft)	Thickness (ft)
SITE 128		
Sand, silty, light olive-brown [2.5Y 5/4], subrounded, quartzose	1.6	1.6
Sand, clayey, yellow-brown [10YR 5/4] (mU), quartzose	2.6	1.0
Sand, brown-yellow [10YR 6/6], (mL-fL), subrounded, quartzose	3.8	1.2
Sand light gray [10YR 7/1] and brown-yellow [10YR 6/6] mottled, (cL), subangular, quartzose, clean	6.0	2.2
Sand, yellow-red [5YR 5/8], (mL-fL), quartzose; with abrupt upper contact	6.2	0.2
Sand, silty, yellow-red [5YR 5/8] and light gray [10YR 7/1] banded, quartzose	6.8	0.6
Sand, dark gray [5YR 4/1], (fU), quartzose, micaceous; with abrupt upper contact	11.0	4.2
Clay, silty, light gray [10YR 8/1], red [10R 4/8], and olive-green, tight; with abrupt upper boundary, and thin sand lenses	19.0	8.0

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Dept (ft)	Thickness (ft)
SITE 129		
Sand, silty, dark yellow-brown [10YR 4/4], (fU), subrounded, quartzose	1.0	1.0
Sand, clayey, brown [7.5YR 4/6], (mU), subrounded	3.0	2.0
Sand, yellow-brown [10YR 5/8] to pink-white [7.5YR 8/2], (mL-mU), quartzose	8.5	5.5
Clay, silty, light gray [10YR 7/1], brown-yellow [10YR 6/8], (fU), quartzose	9.0	0.5
Sand, brown-yellow [10YR 6/6], (mL), subangular, quartzose	12.0	3.0
Sand, silty, brown-gray [10Y/R 6/2] and brown [7.5YR 5/6] banded, (fU), quartzose	13.6	1.6
Clay, sandy, dark gray [5Y 3/1], (fU), quartzose	14.0	0.4
Sand, silty, dark gray, (fU-mU), quartzose	17.0	3.0
Sand, dark gray, (cU-vcU), rounded, quartzose; with trace feldspar, and organic odor	19.0	2.0
No sample	21.0	2.0
Clay, sandy, light gray [5Y 6/1], (fU), quartzose; distinct upper contact	34.0	13.0

Description	Depth (ft)	Thickness (ft)
SITE 130		
Soil zone, dark gray; with fill material containing large rock fragments	0.7	0.7
Silt, light orange and white, (fU-fL), hard, dry	3.1	2.4
Silt, clayey, red, orange, light gray, and white marbled, (fL-fU); with small maroon nodules, and thin sand lenses	6.3	3.2
Sand, white to light gray, orange-mottled, (fU-fL), micaceous; with sparse clayey sand lenses	9.9	3.6
Clay, sandy, orange, brown, white, and gray marbled, (fL-fU), hard; with patches of maroon sand	22.9	13.0
Sand, light gray-tan, (fL-fU), micaceous, moist; with thin, dark gray clay layers	28.2	5.3
Sand, clayey, light pink-tan, orange-stained, (fL-fU), micaceous, lignitic	29.3	1.1
Sand, white, yellow, purple, orange banded, (fU-mU), wet; with small sandstone nodules	34.0	4.7

Description	Depth (ft)	Thickness (ft)
SITE 131		
Clayey and silty soil zone, dark brown [10YR 3/3]	0.4	0.4
Sand, light brown-gray [10YR 7/1] and orange [10YR 6/8] mottled, (fU-mL); interbedded with clayey sand	1.8	1.4
No sample	4.0	2.2
Sand, clayey, and silt, interbedded, orange and gray mottled; with some banding	8.2	4.2
Silt, clayey, orange [.5YR 5/8], micaceous	9.0	0.8
Sand, clayey, dark grayish-brown [7.5 YR 4/0], wet	12.3	3.3
Sand, light gray, (mL), clean, micaceous	12.8	0.5
Sand, clayey, dark gray, (vfU-mL), micaceous; with some thin, brown laminae	19.0	6.2

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 132		
Soil	0.1	0.1
Sand, silty, brown [7.5YR 4/4], (fU)	1.8	1.7
Sand, yellow [10YR 7/4], (fU-mL), dry; with some iron concretions	8.6	6.8
Silt, clayey, and sand, light gray to orange, interfingered	14.0	5.4
Sand, dark gray, (mU-mL), soupy	15.7	1.7
Sand, clayey, and gravel, dark gray, interfingered with dark gray silty clay	16.3	0.6
Clay, silty, dark gray, micaceous, soft	19.0	2.7

Description	Depth (ft)	Thickness (ft)
SITE 133		
Soil	0.2	0.2
Sand and gravel, brownish-orange,(fU-mU); with fill material	4.6	4.4
Sand, yellow [10YR 7/6], (fU-cL), well-sorted; coarsening downward	24.0	19.4
No sample	34.0	10.0
Clay, silty, pinkish-white [2.5YR 6/0]; with small red concretions	40.1	6.1
Sand, tan [7.5 YR 8/2], (fL-cL), poorly sorted	44.0	3.9

Description	Depth (ft)	Thickness (ft)
SITE 134		
Soil, clayey, dark brown, plastic, organic-rich	1.2	1.2
Silt, clayey, orange-brown, plastic; with some sand	4.3	3.1
Silt, sandy, gray-orange-mottled	9.0	4.7
Sand, tan to gray, (fU-cU), clean	11.0	2.0
Sand, silty, orange to tan; with sand up to (cL)	14.0	3.0
Clay, silty, dark gray, dense and plastic	25.7	11.7
Sand and clay, orange-gray to light gray, interfingered	26.6	0.9
Sand, multicolored, (fU-mL); with large iron concretions	32.2	5.6
Clay, pink	32.6	0.4
Sand, white multicolored-banded, (fU-mL), wet	39.8	7.2
No sample	44.0	4.2
Clay, silty, dark gray [5YR 4/1] to reddish-brown [5YR 3/3], lignitic, hard; with some fine sand	51.5	7.5
Sand, light gray, (mL-mU), well-sorted	53.2	1.7
Sand, clayey, white to light gray, multicolor-banded, micaceous, hard	62.4	9.2
Clay, sandy, white, hard	62.8	0.4
Sand, multicolored, (mU), clean, soupy	67.2	4.4
Sand, clayey, white, purple, and yellow, micaceous	67.5	0.3

Description	Depth (ft)	Thickness (ft)
SITE 135		
Soil, gray-brown [10YR 3/2], organic-rich	0.4	0.4
Sand, silty and clayey, brown [7.5YR 5/8], (mU)	2.5	2.1
Clay, sandy, light yellow-brown [10YR 5/6], (mL)	3.8	1.3
Sand, yellow-brown [10YR 6/8], (fU-mU), micaceous	17.7	13.9
Sand, dark gray [5Y 4/1], (mU), micaceous	21.3	3.6
Sand, clayey and silty, dark gray, (fL-fU)	34.0	12.7

Table 2.--Lithologic logs for well-cluster sites--Continued

[Alphanumeric codes enclosed in brackets, at selected horizons, refer to color designations as specified in the Munsell Soil Color Charts (1975)]

Sand grade scale

Grain size (in microns)	Term
1,410-2,000	vcU
1,000-1,410	vcL
710-1,000	cU
500- 710	cL
350- 500	mU
250- 350	mL
177- 250	fU
125- 177	fL
88- 125	vfU
62- 88	vfL

Description	Depth (ft)	Thickness (ft)
SITE 136		
No sample	125.0	125.0
Sand, gravelly, multicolor-banded, (mL-cL), soupy	140.5	15.5
Clay, silver-gray, micaceous, hard, plastic	145.0	4.5

Description	Depth (ft)	Thickness (ft)
SITE 138		
Soil, dark brown	0.7	0.7
Sand, silty, orange to orange-brown, (mU)	4.0	3.3
Sand, buff, (fU-mU), clean	9.3	5.3
Sandy silt and clay, orange and gray	19.0	9.7
Clay, silty, dark gray; with large lignite fragments	57.5	38.5
Silt, clayey, light gray, micaceous; with some sand	62.0	4.5

Table 3.--Synoptic water-level measurements

[--, data not collected]

Local number	Water levels, in feet above sea level			
	11/18/86	02/17/87	08/25/87	03/18/88
CC-1A	5.01	6.29	4.12	5.89
CC-1B	5.41	6.70	5.31	6.43
CC-1C	5.46	6.90	5.56	6.61
CC-1D	7.35	7.68	7.24	7.72
CC-1E	7.08	7.71	7.38	7.84
CC-1F	8.47	8.79	8.32	8.84
CC-2A	1.49	1.49	1.16	1.81
CC-2B	7.13	6.13	7.18	7.67
CC-2C	5.07	6.46	4.55	5.19
CC-3A	3.84	3.70	3.33	4.01
CC-3B	4.23	4.83	4.56	5.00
CC-4A	4.69	5.44	4.71	5.40
CC-4B	4.72	5.49	4.73	5.41
CC-5A	7.42	11.01	7.86	10.60
CC-5B	4.74	5.65	4.72	5.53
CC-5C	4.77	5.66	4.75	5.56
CC-6A	5.11	6.04	5.10	5.95
CC-6B	--	--	--	6.04
CC-6C	--	--	--	6.18
CC-7A	4.80	5.59	4.81	6.04
CC-7B	4.81	5.61	4.82	5.55
CC-7C	--	--	5.15	5.88
CC-8A	4.78	5.56	4.29	5.51
CC-8B	4.79	5.53	4.84	5.52
CC-8C	4.81	5.58	4.84	5.55
CC-8D	4.83	5.63	4.88	5.60
CC-8E	5.88	6.10	5.92	6.18
CC-9A	13.41	14.48	12.99	14.27
CC-9B	4.82	12.12	4.88	5.45
CC-10A	3.82	12.71	11.56	12.82
CC-11A	0.08	.32	3.22	3.56
CC-11B	2.73	3.39	3.23	3.56
CC-12A.1	--	--	--	9.73
CC-12A	--	4.26	3.90	4.30
CC-12B	--	4.31	3.93	4.34
CC-13A	6.40	7.44	6.34	7.41
CC-13B	6.52	7.59	6.43	7.56
CC-14A	5.68	6.50	5.23	6.43
CC-14B	5.55	6.59	6.28	7.51
CC-15A	5.40	6.10	5.23	6.17
CC-16A	2.55	3.98	3.22	3.67
CC-16B	2.52	2.64	2.87	2.93
CC-16C	10.48	10.87	10.09	10.91
CC-16D	10.50	11.89	10.09	10.93
CC-17A	2.64	2.80	2.99	3.01
CC-17B	2.69	2.75	2.75	2.94
CC-17C	10.31	10.70	9.94	10.74
CC-18A	7.15	7.38	7.08	8.31
CC-18B	7.16	8.41	7.11	8.34
CC-19A	20.45	25.90	20.85	25.45
CC-19B	5.85	8.14	6.47	7.72
CC-20A	5.87	7.20	5.66	6.80
CC-20B	6.39	7.99	6.49	7.62
CC-20C	6.50	8.47	6.74	7.89
CC-20D	6.63	8.51	6.78	8.38
CC-21A	2.99	3.22	3.33	3.41
CC-22A	5.46	7.99	5.46	6.81
CC-22B	6.33	8.38	6.49	7.95
CC-22C	6.33	8.38	6.51	7.97
CC-23A	6.67	9.51	7.11	9.14
CC-23B	5.74	7.47	5.79	7.26
CC-25A	4.97	6.04	4.89	5.92
CC-25B	4.94	6.01	4.86	5.89
CC-26A	5.48	6.41	5.41	6.29
CC-26B	4.91	5.92	4.75	5.81

Table 3.--Synoptic water-level measurements--Continued

[--, data not collected]

Local number	Water levels, in feet above sea level			
	11/18/86	02/17/87	08/25/87	03/18/88
CC-26C	9.32	9.71	9.04	9.78
CC-27A	3.62	4.17	3.49	4.18
CC-27B	4.27	4.98	4.18	4.96
CC-28A	4.09	4.76	4.24	4.71
CC-28B	4.11	4.81	3.96	4.76
CC-28C	--	--	--	10.05
CC-29A	2.84	3.67	2.44	3.45
CC-29B	4.70	5.60	4.66	5.50
CC-30A	3.00	3.29	3.34	3.46
CC-31A	8.22	9.34	8.54	9.46
CC-32A	0.98	.69	1.06	.79
CC-32B	1.00	.70	1.31	.86
CC-33A	.11	.65	.97	.69
CC-33B	.78	.29	1.41	.67
CC-34A	.93	.76	1.12	.73
CC-35A	-4.07	-3.38	-3.81	-3.48
CC-36A	--	9.30	6.71	8.73
CC-36B	--	--	--	8.50
CC-36C	--	--	--	7.96
CC-36D	--	--	--	7.87
CC-37A	12.70	13.57	13.79	14.76
CC-38A	12.90	14.73	13.97	14.82
CC-39A	12.74	14.54	13.78	14.72
CC-39B	12.81	14.61	13.86	14.79
CC-40A	12.86	14.59	13.94	14.79
CC-41A	13.56	15.60	14.64	15.79
CC-42A	13.71	15.79	14.82	15.98
CC-43A	12.96	15.02	13.95	15.24
CC-44A	9.26	10.56	9.49	10.35
CC-101A	--	--	--	7.11
CC-101B	--	--	--	6.77
CC-101C	--	--	--	6.32
CC-102A	--	--	--	5.88
CC-102B	--	--	--	8.39
CC-102C	--	--	--	9.00
CC-104A	--	--	--	3.62
CC-104B	--	--	--	5.17
CC-104C	--	--	--	5.16
CC-106A	--	--	4.17	4.98
CC-107A	--	--	--	8.41
CC-107B	--	--	--	8.43
CC-108A	--	--	--	8.54
CC-108B	--	--	--	8.48
CC-109A	--	--	6.71	7.87
CC-109B	--	--	6.17	7.19
CC-110A	--	--	5.06	3.98
CC-111A	--	--	3.00	3.03
CC-111B	--	--	3.05	3.03
CC-112A	--	--	2.81	2.67
CC-113A	--	--	4.54	5.60
CC-113B	--	--	4.56	5.59
CC-114A	--	--	9.01	10.89
CC-114B	--	--	4.78	5.93
CC-114C	--	--	4.81	5.90
CC-115A	--	--	5.03	6.16
CC-117A	--	--	--	5.57
CC-117B	--	--	--	5.57
CC-118A	--	--	6.62	7.70
CC-118B	--	--	6.65	7.76
CC-120A	--	--	--	10.89
CC-120B	--	--	--	10.88
CC-121A	--	--	--	5.57
CC-121B	--	--	--	5.58
CC-122A	--	--	--	21.15
CC-123A	--	--	--	3.83

Table 3.--Synoptic water-level measurements--Continued

[--, data not collected]

Local number	Water levels, in feet above sea level			
	11/18/86	02/17/87	08/25/87	03/18/88
CC-123B	--	--	--	5.76
CC-124A	--	--	--	12.59
CC-124B	--	--	--	7.34
CC-126A	--	--	--	14.29
CC-127A	--	--	--	18.71
CC-128A	--	--	--	18.53
CC-129A	--	--	--	17.06
CC-130A	--	--	6.28	7.35
CC-130B	--	--	12.00	7.26
CC-131A	--	--	--	7.70
CC-132A	--	--	--	8.24
CC-133A	--	--	--	9.64
CC-133B	--	--	--	9.72
CC-134A	--	--	--	3.77
CC-134B	--	--	--	3.76
CC-135A	--	--	--	10.56
CC-136A	--	--	--	5.14
CC-136B	--	--	--	5.14
CC-138A	--	--	--	dry

HYDROGRAPHS

(figures 4 through 11)

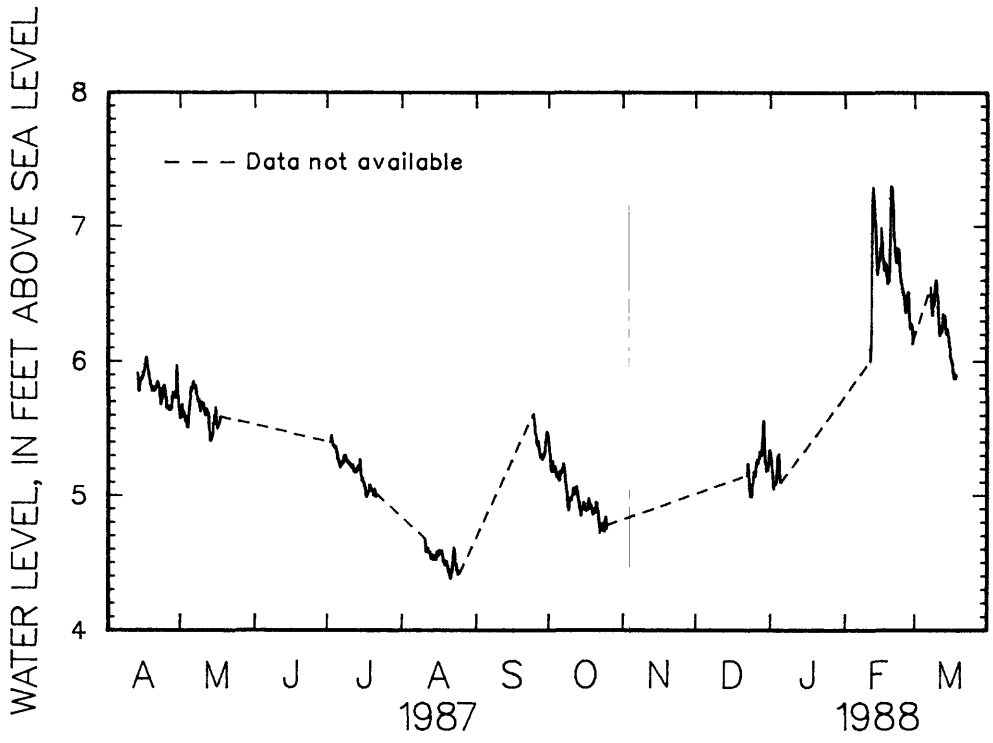

Figure 4.--Water levels for well 1A, April 1987 through March 1988.

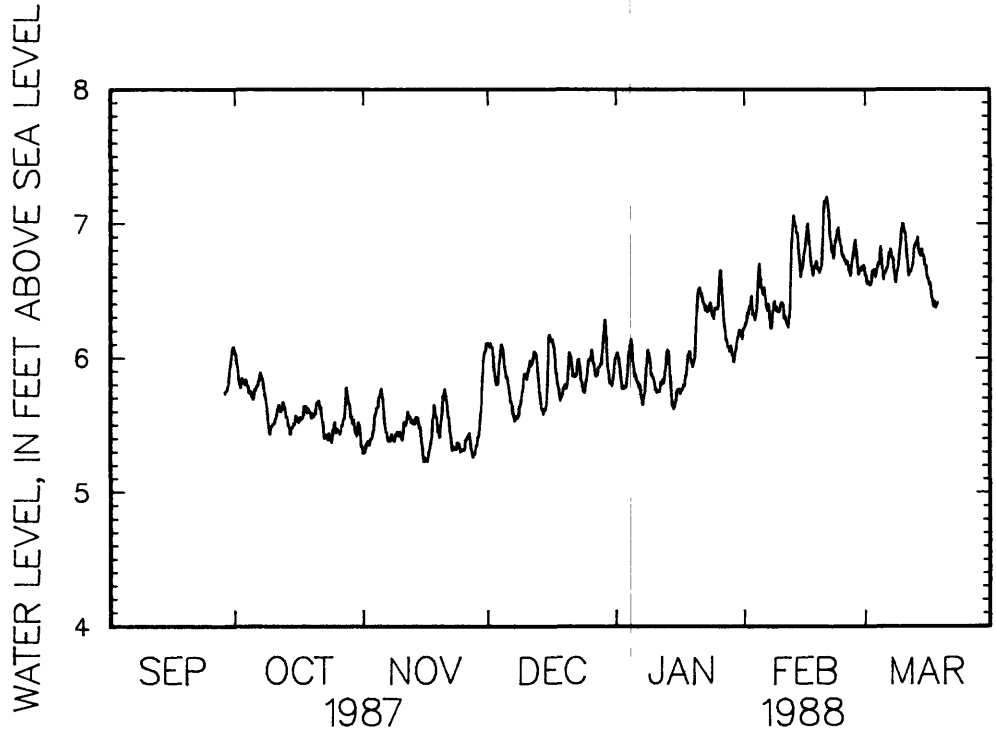

Figure 5.--Water levels for well 1B, September 1987 through March 1988.

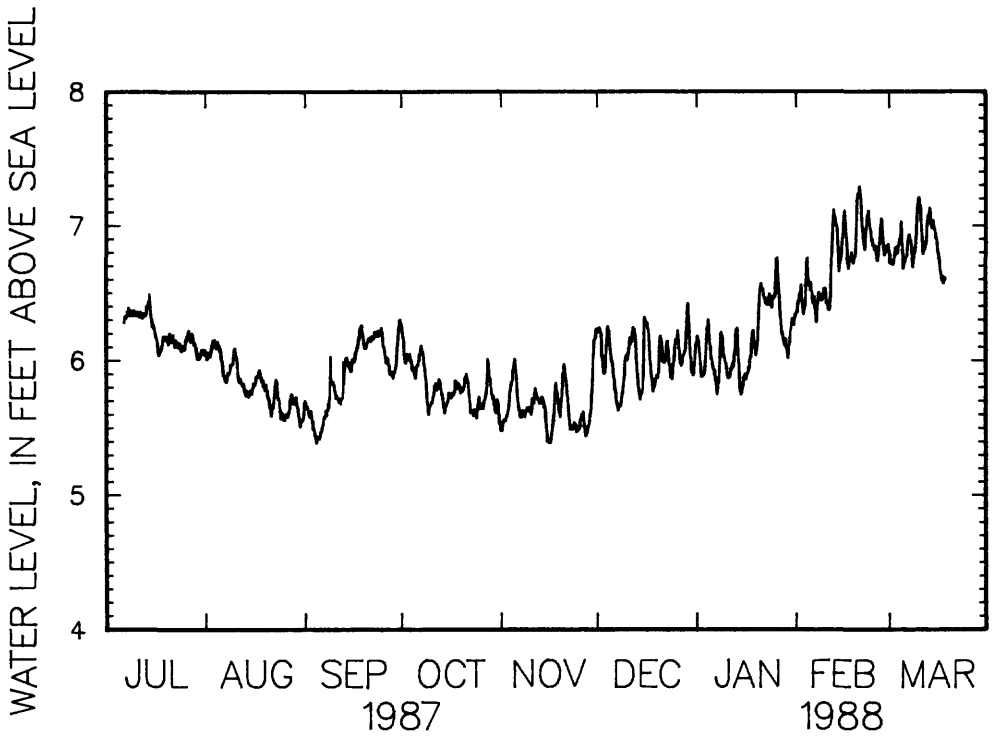

Figure 6.--Water levels for well 1C, July 1987 through March 1988.

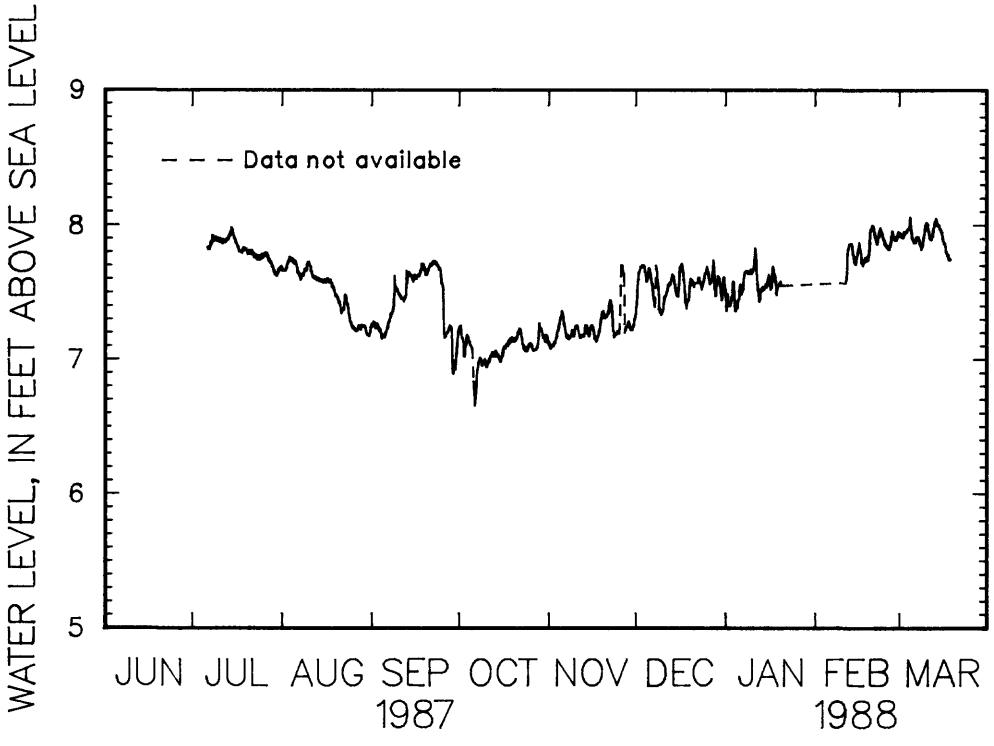

Figure 7.--Water levels for well 1D, June 1987 through March 1988.

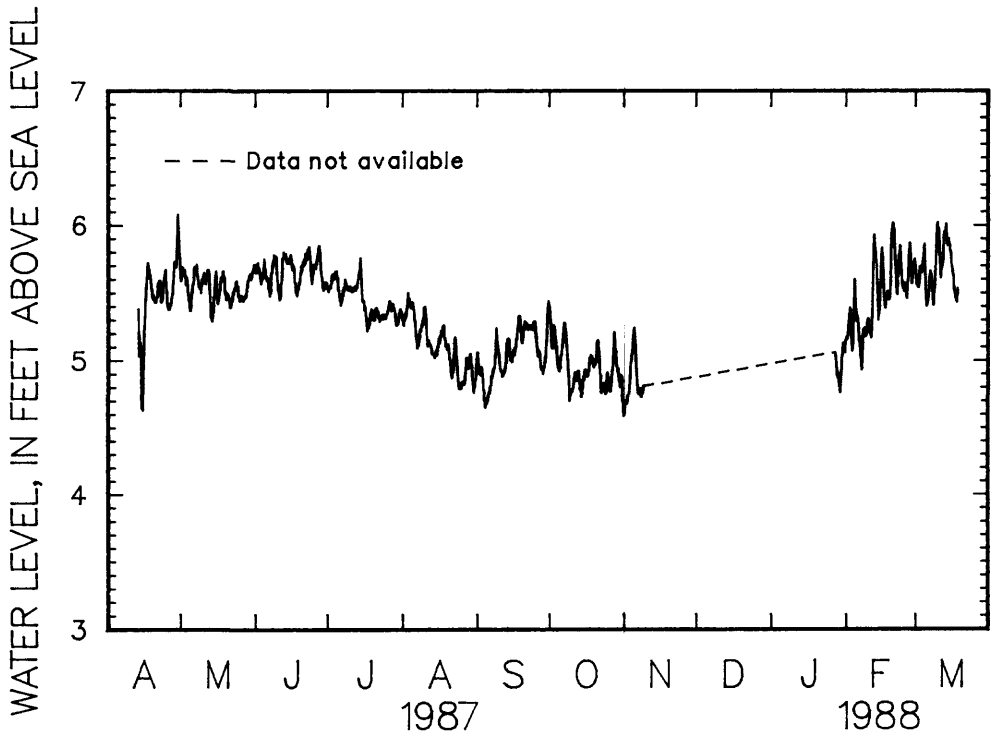

Figure 8.--Water levels for well 7A, April 1987 through March 1988.

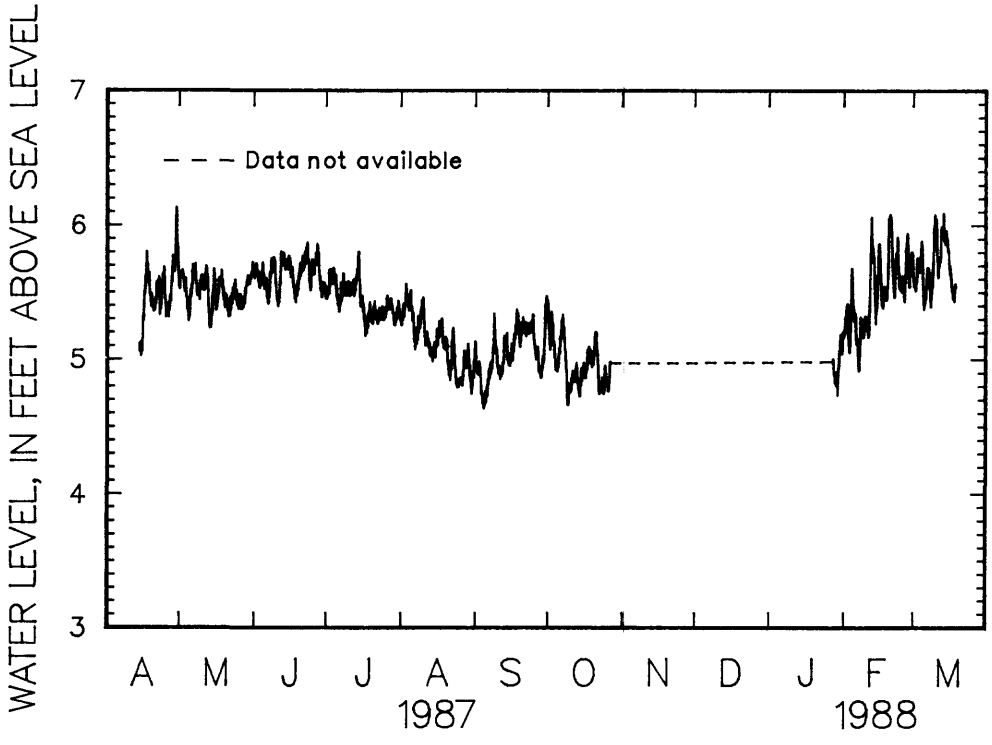

Figure 9.--Water levels for well 8C, April 1987 through March 1988.

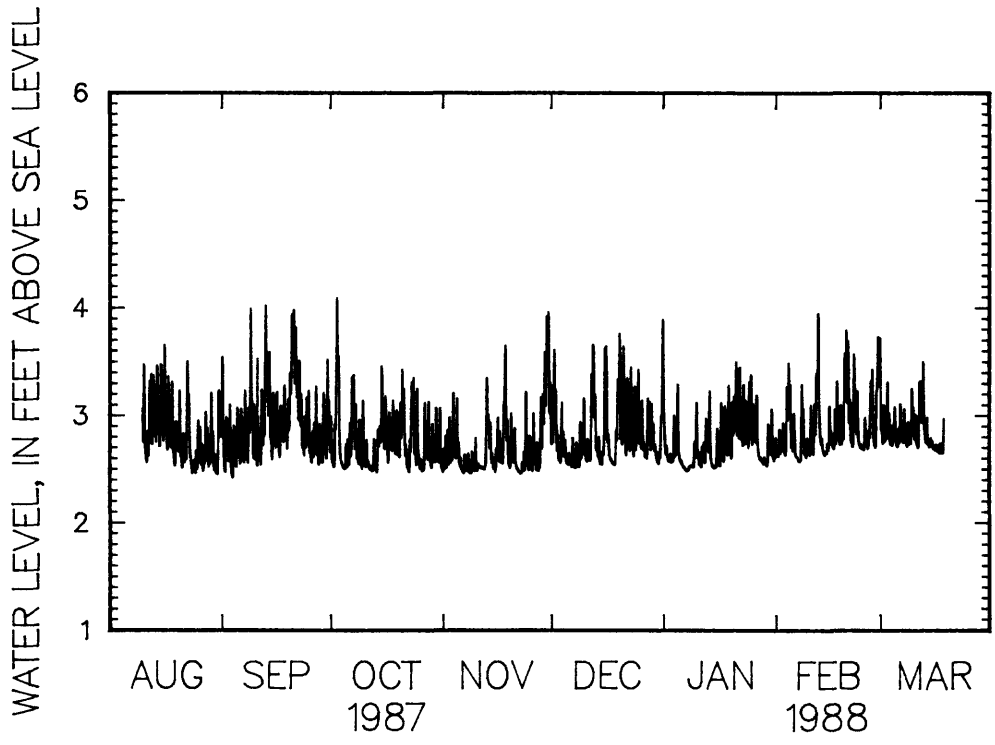

Figure 10.--Water levels for well 16B, August 1987 through March 1988.

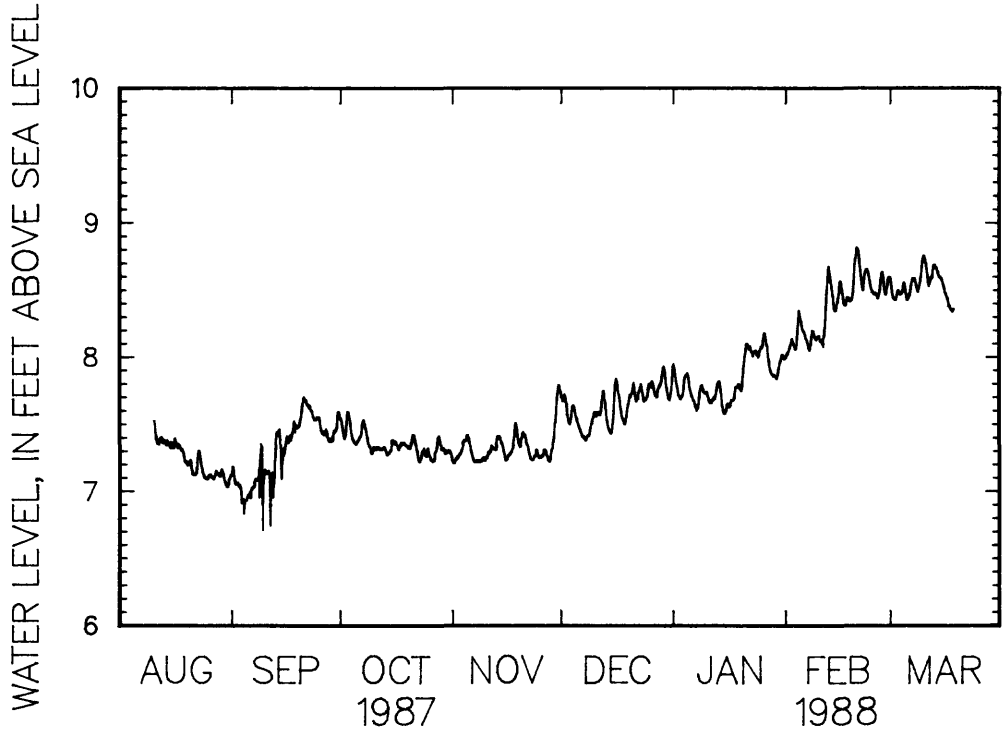

Figure 11.--Water levels for well 18B, August 1987 through March 1988.

 (p. 53 follows)

GEOPHYSICAL LOGS

(figures 12-29)

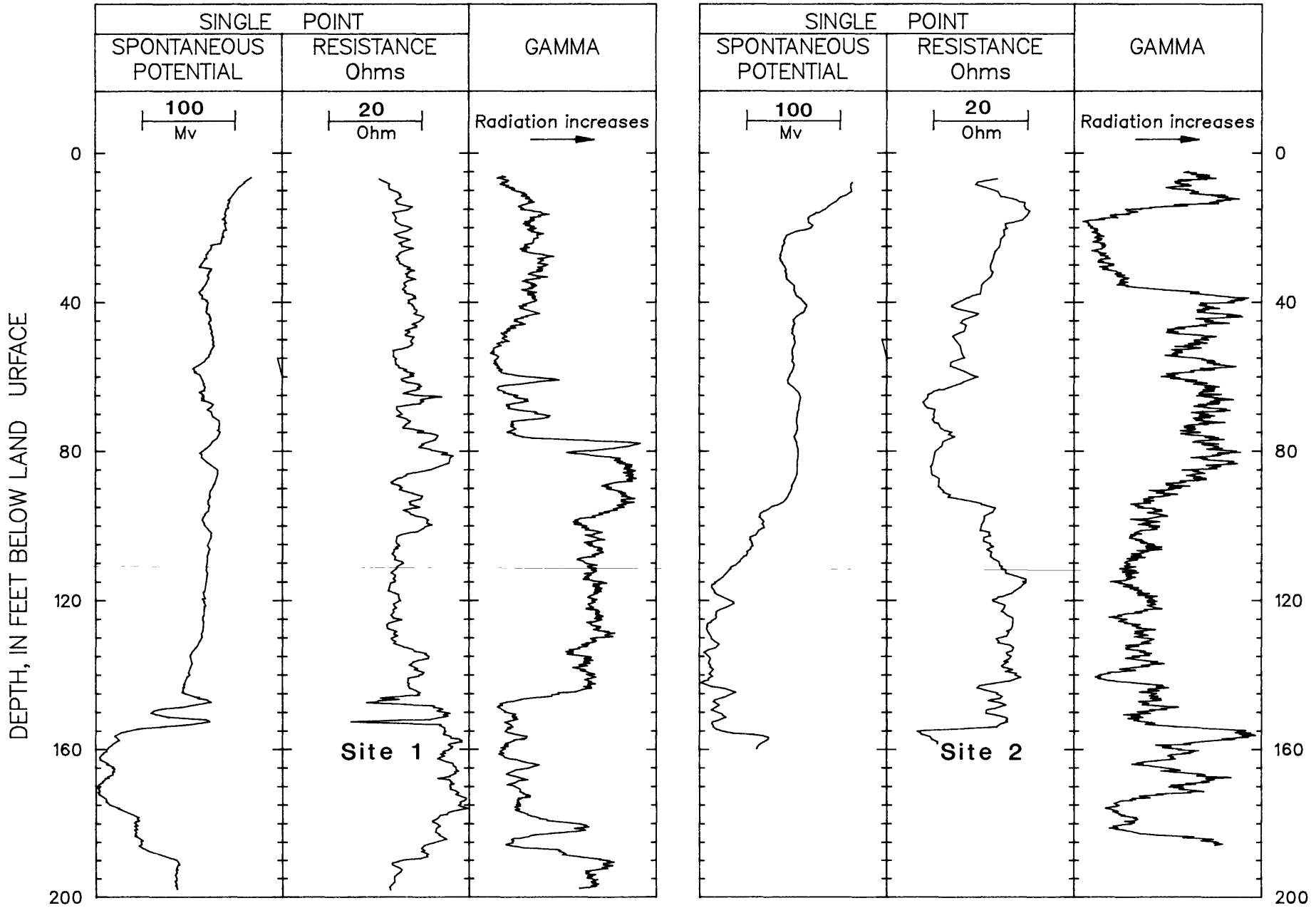

Figure 12.--Electric and gamma logs from borings drilled using the mud rotary method for sites 1 and 2.

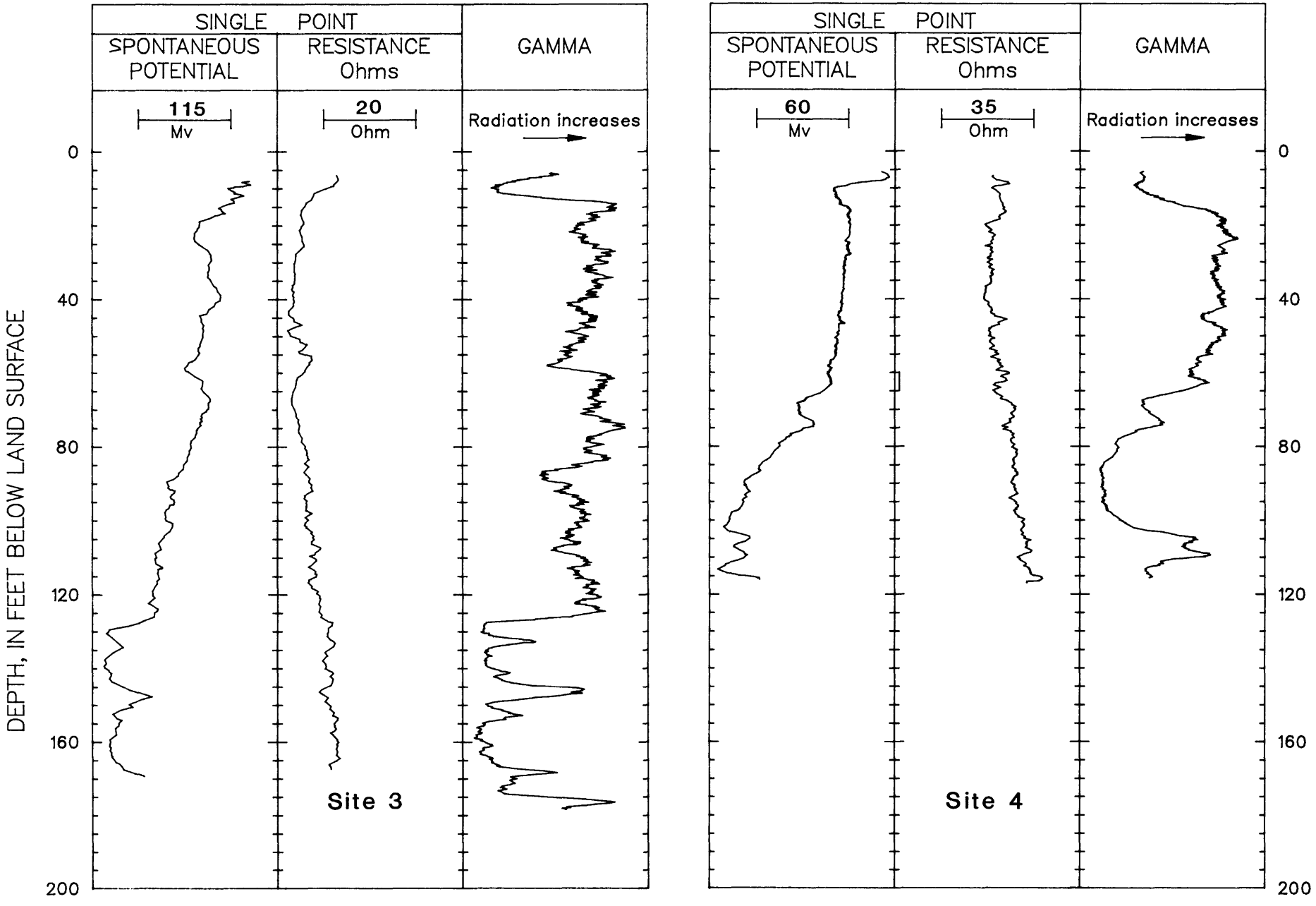

Figure 13.--Electric and gamma logs from borings drilled using the mud rotary method for sites 3 and 4.

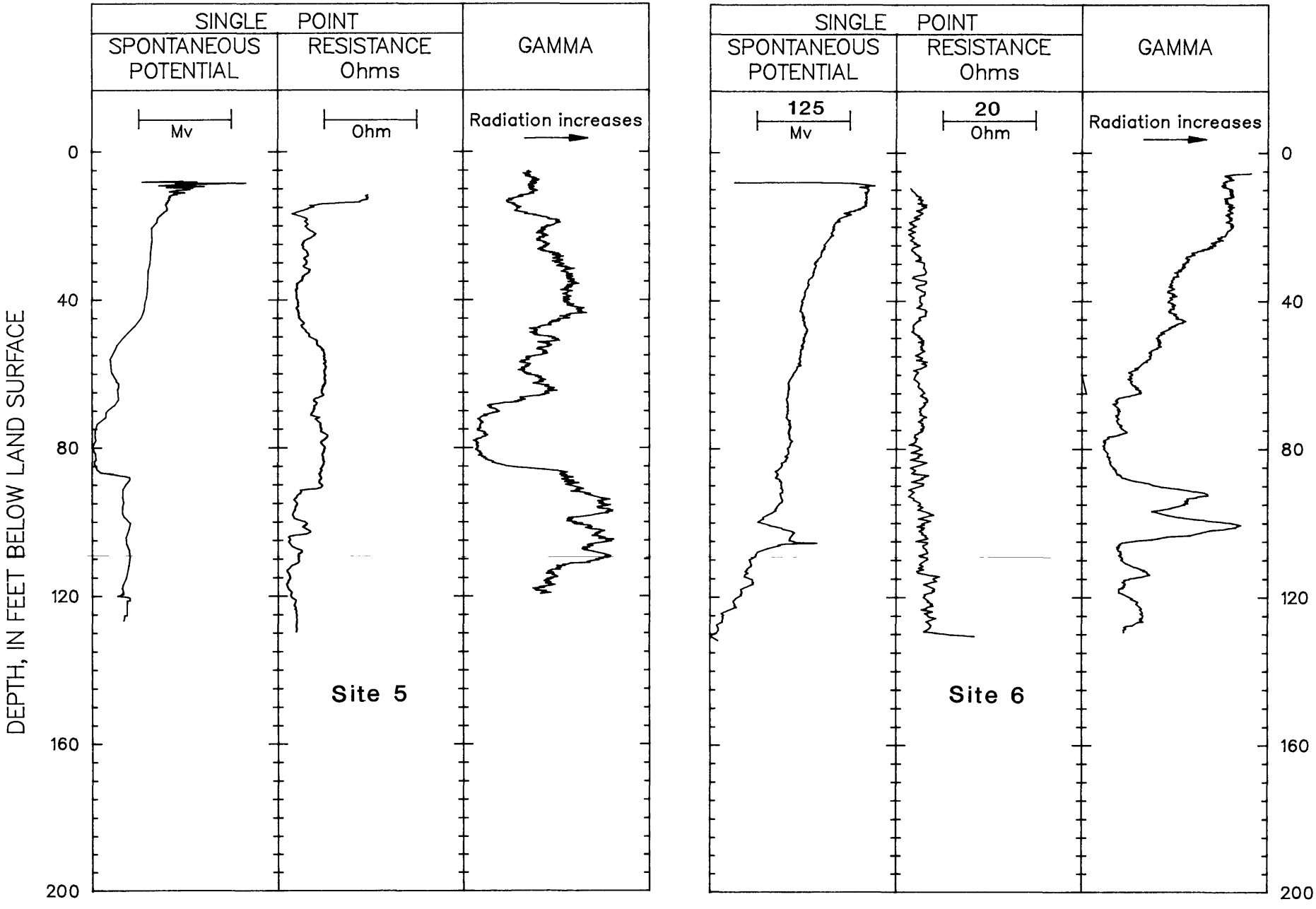

Figure 14.--Electric and gamma logs from borings drilled using the mud rotary method for sites 5 and 6.

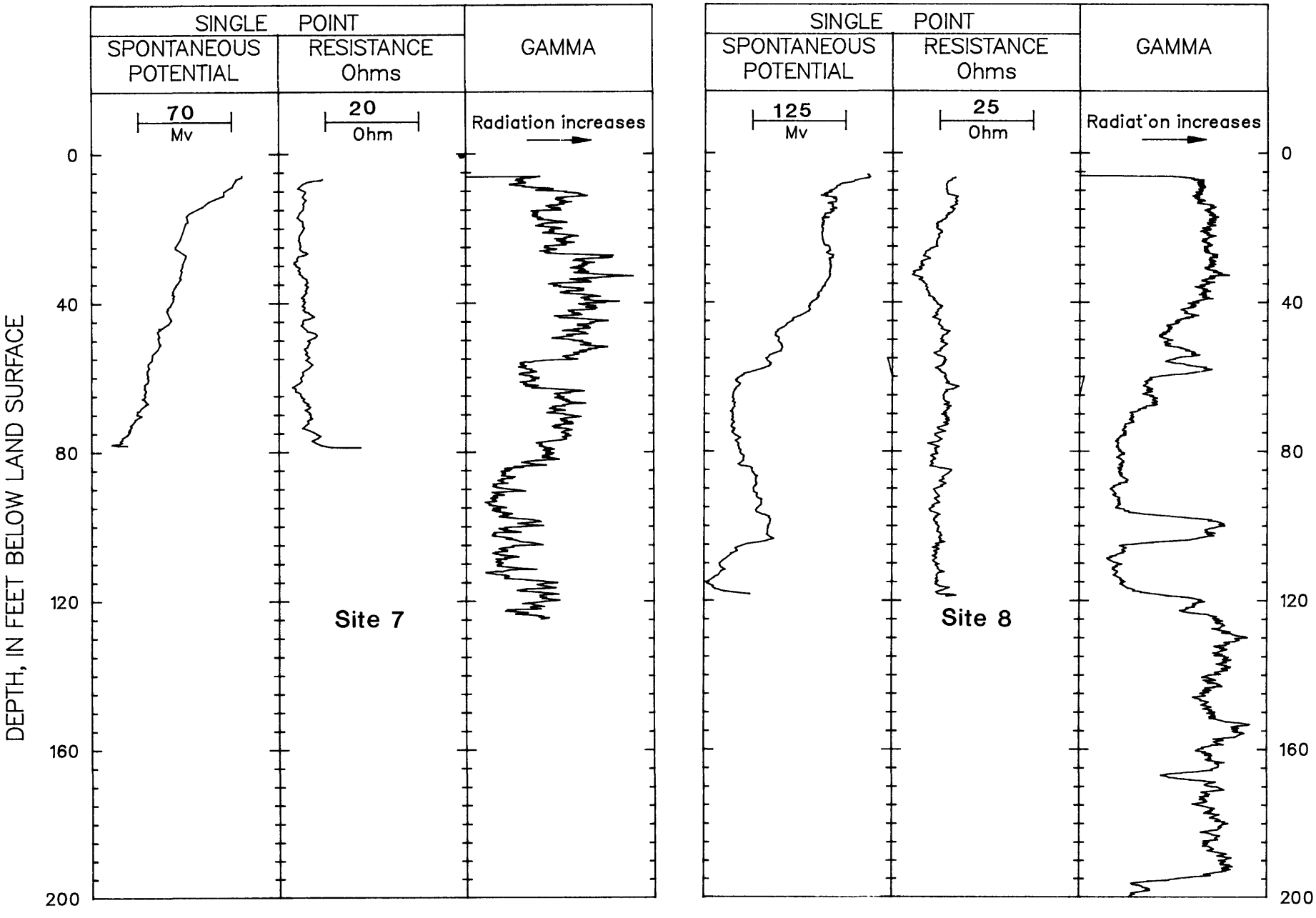

Figure 15.--Electric and gamma logs from borings drilled using the mud rotary method for sites 7 and 8.

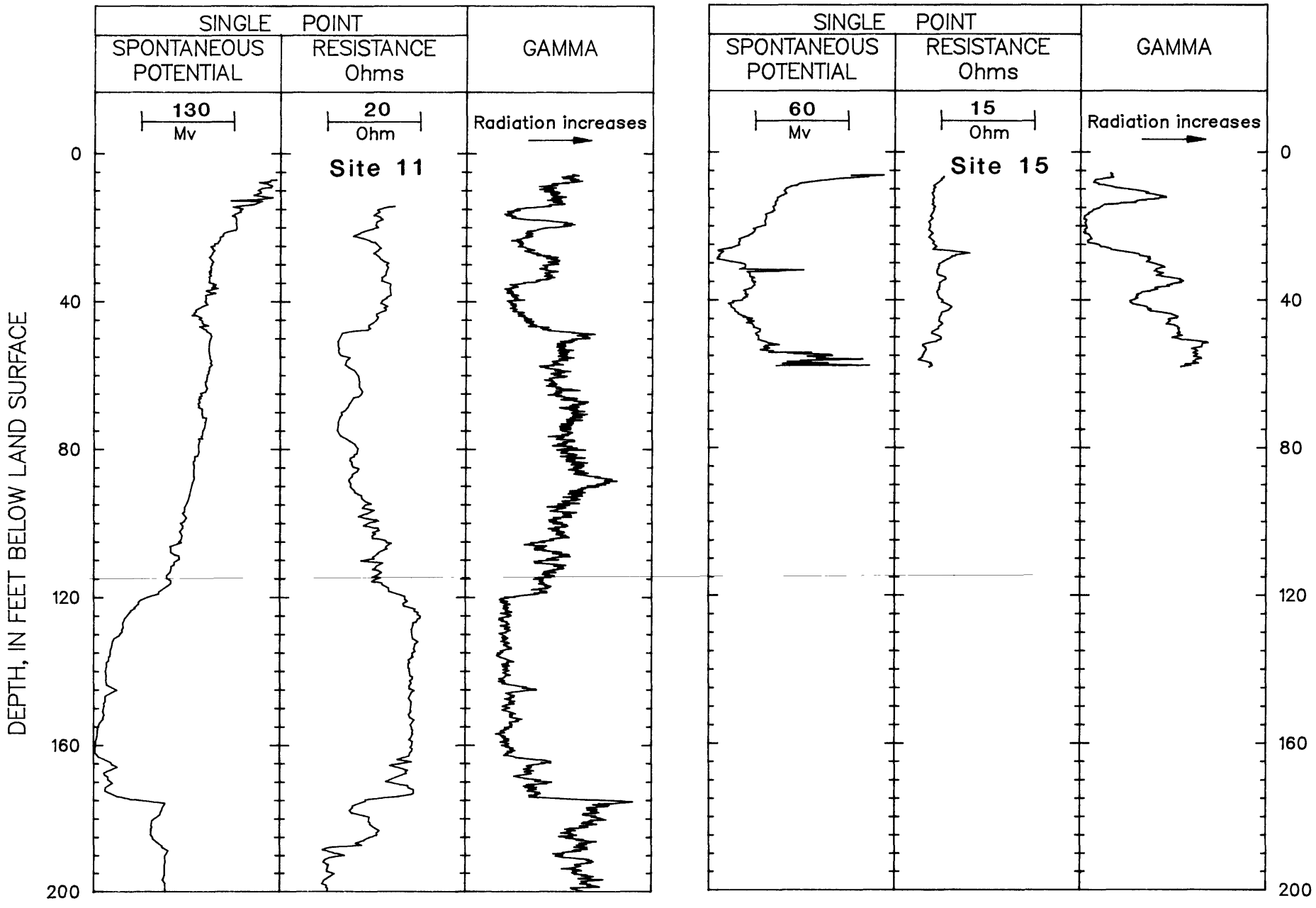

Figure 16.--Electric and gamma logs from borings drilled using the mud rotary method for sites 11 and 15.

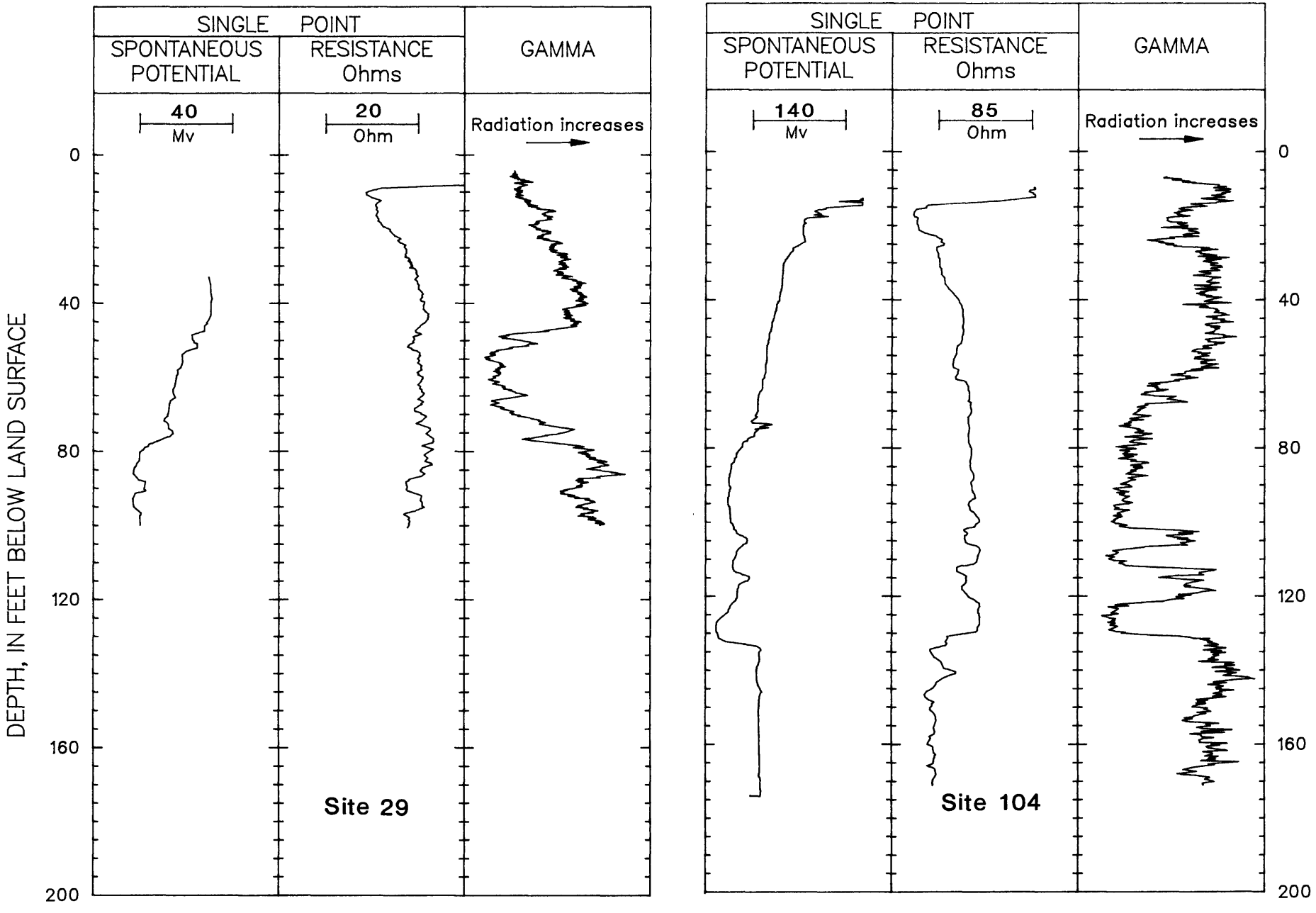

Figure 17.--Electric and gamma logs from borings drilled using the mud rotary method for sites 29 and 104.

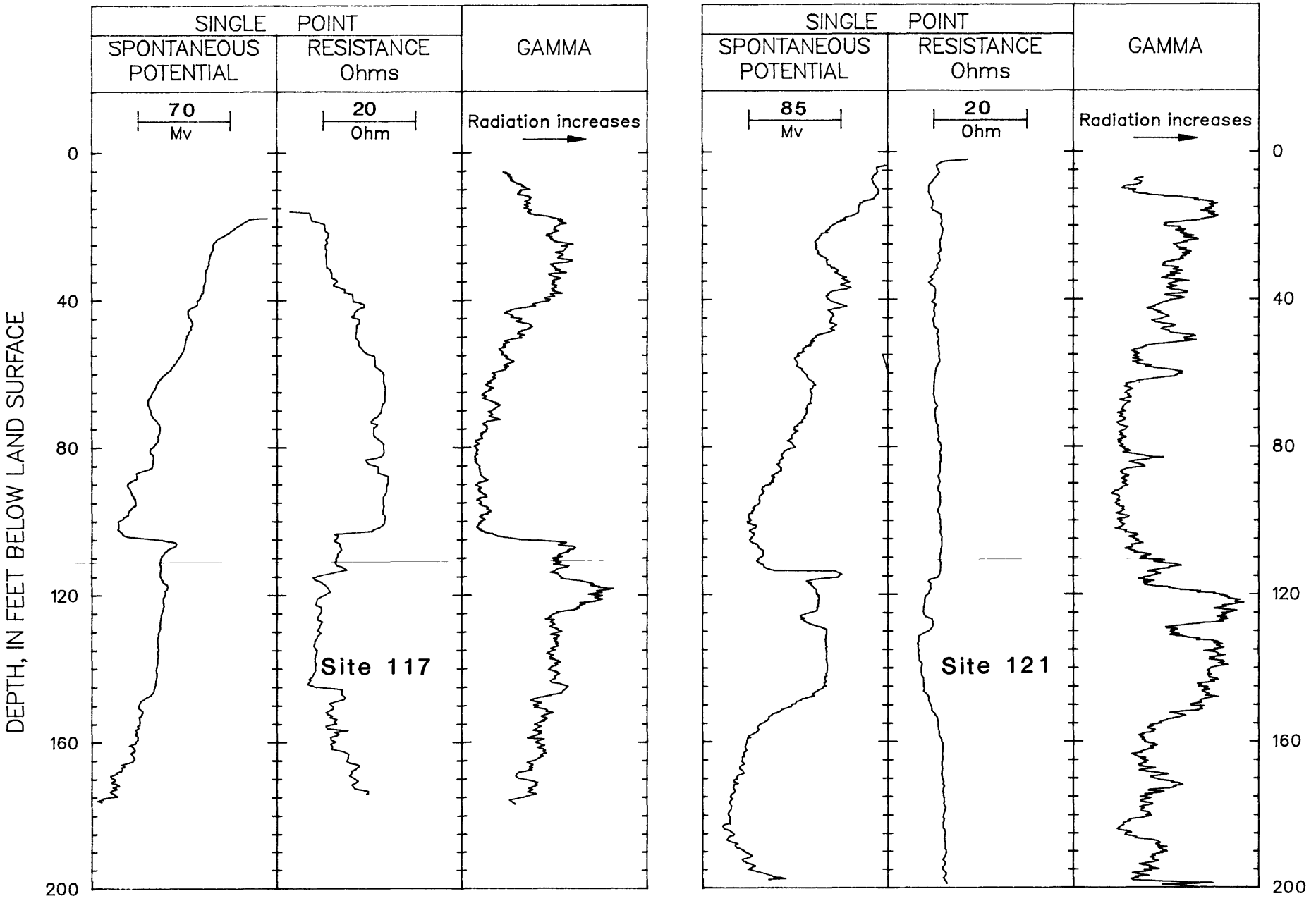

Figure 18.--Electric and gamma logs from borings drilled using the mud rotary method for sites 117 and 121.

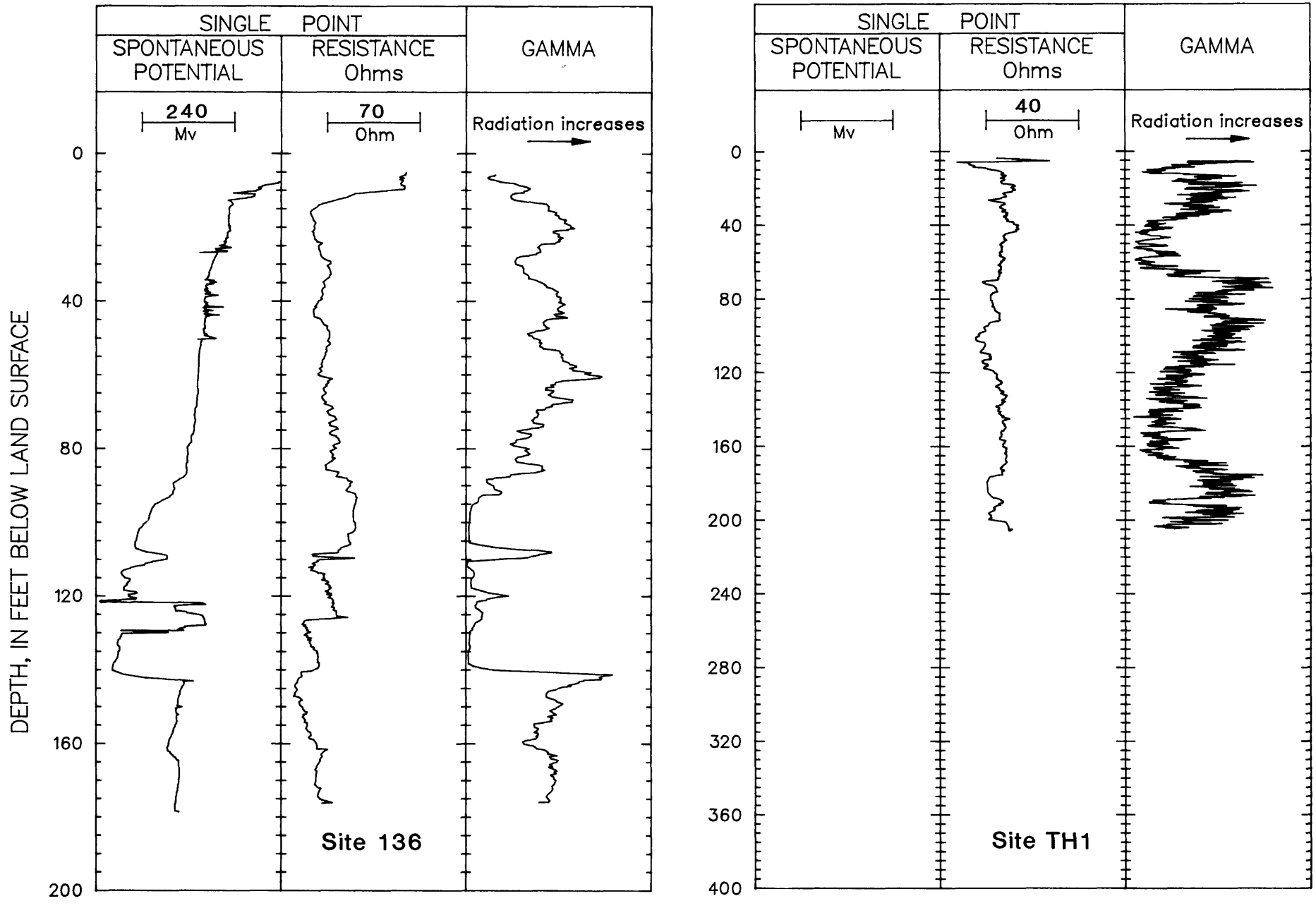

Figure 19.--Electric and gamma logs from borings drilled using the mud rotary method for sites 136 and TH1.

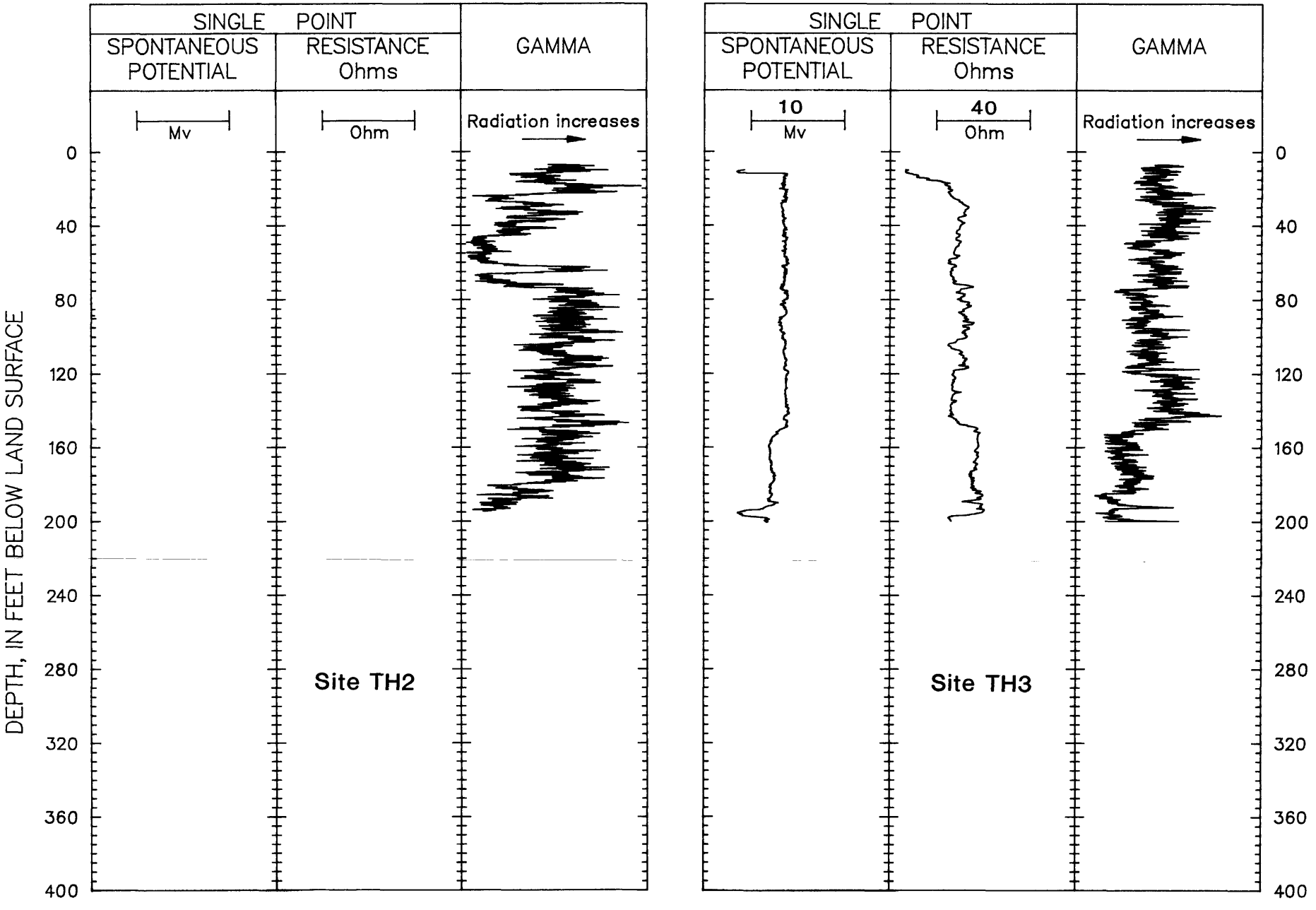

Figure 20.--Electric and gamma logs from borings drilled using the mud rotary method for sites TH2 and TH3.

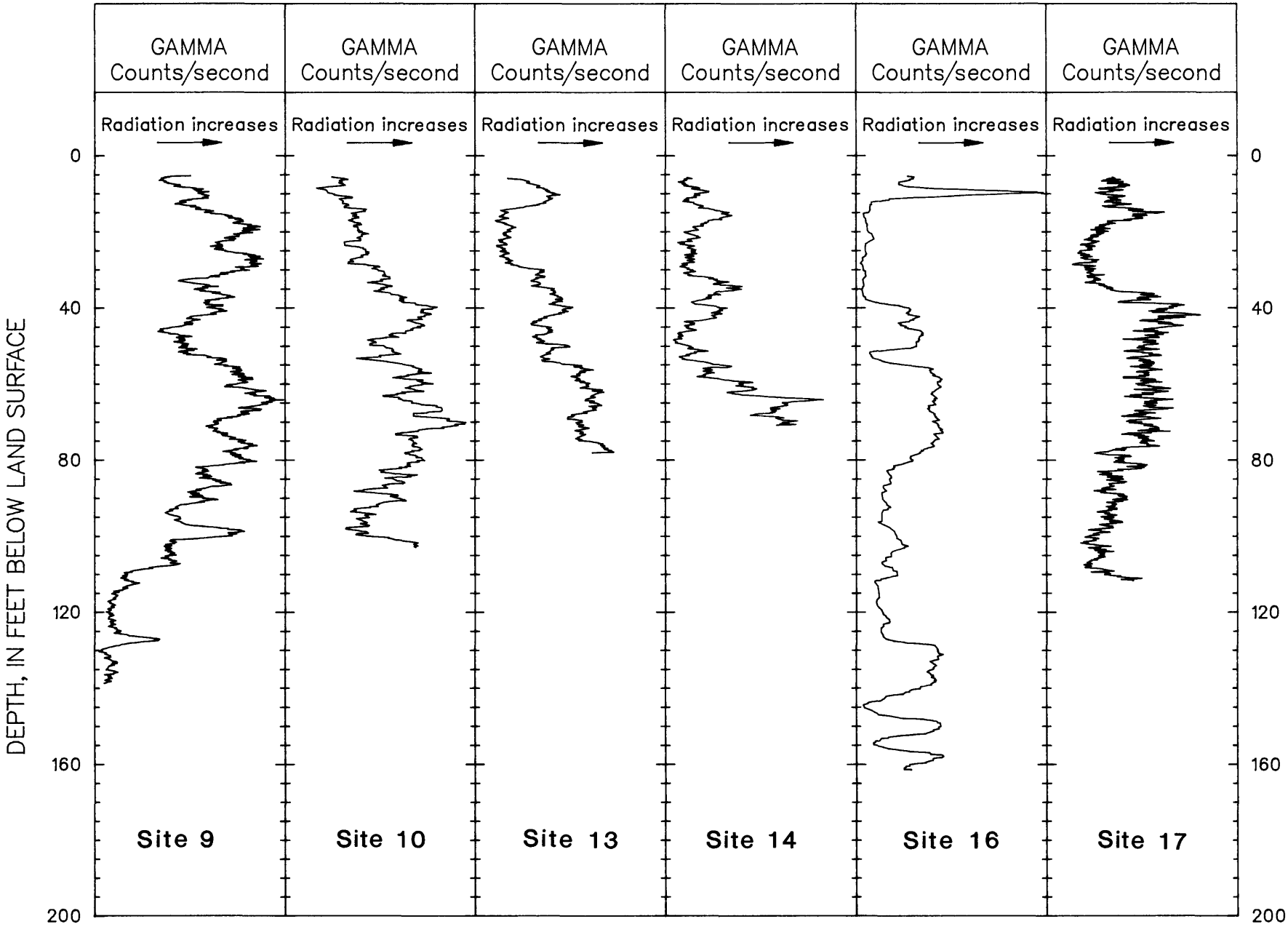

Figure 21.—Gamma logs from borings drilled using the hollow-stem auger method for sites 9, 10, 13, 14, 16 and 17.

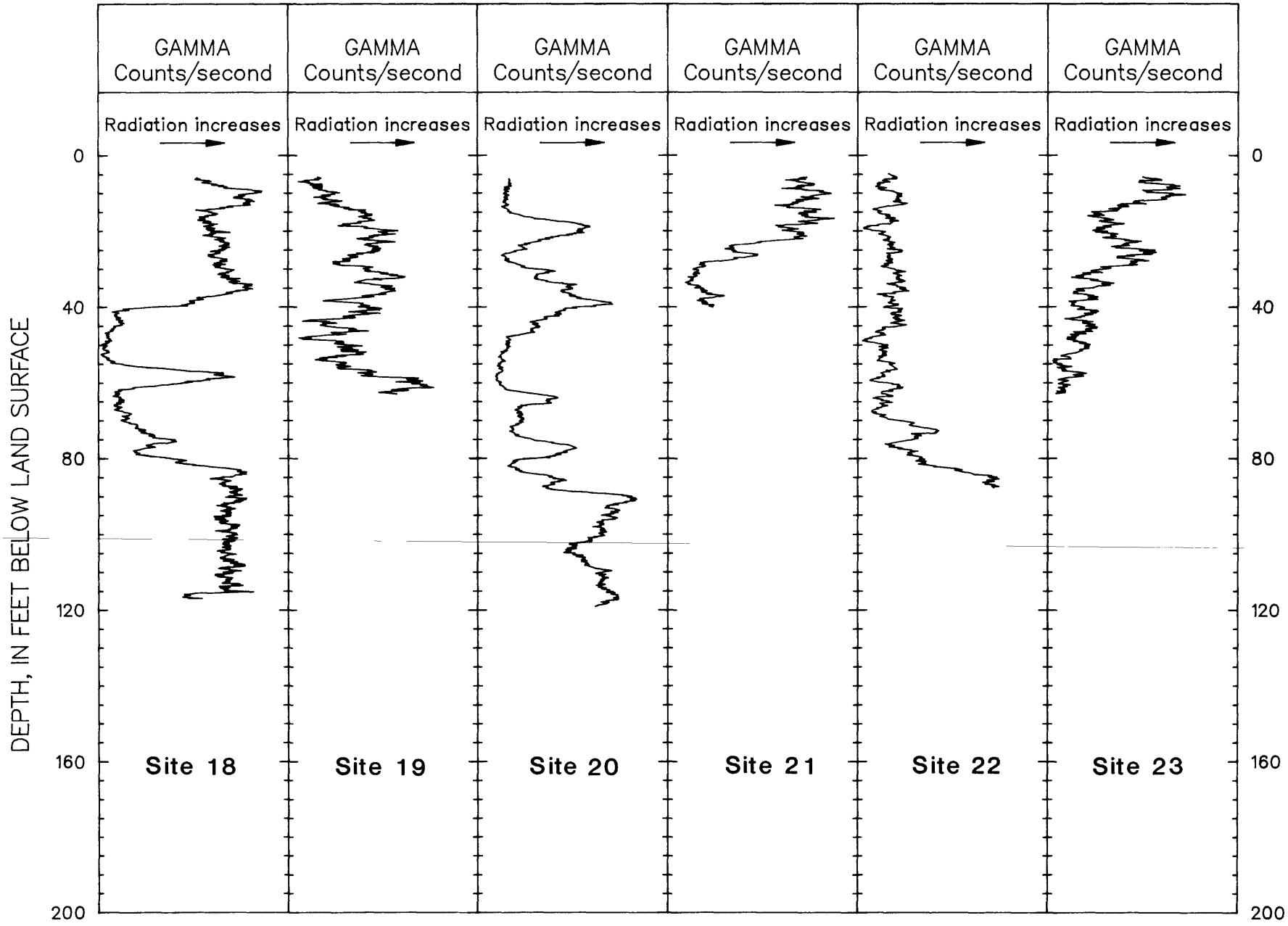

Figure 22.--Gamma logs from borings drilled using the hollow-stem auger method for sites 18, 19, 20, 21, 22 and 23.

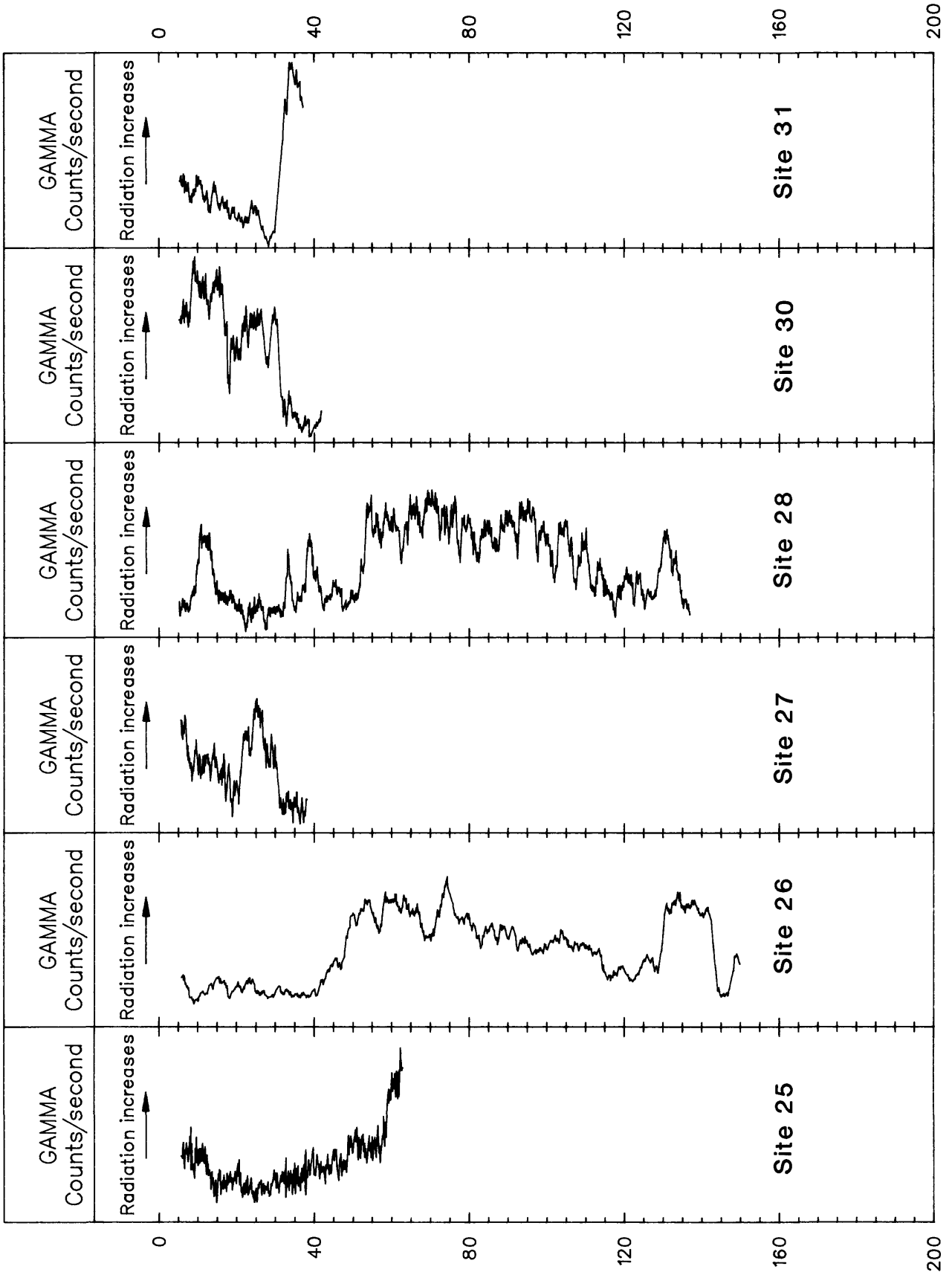

Figure 23.—Gamma logs from borings drilled using the hollow-stem auger for sites 25, 26, 27, 28, 30 and 31.

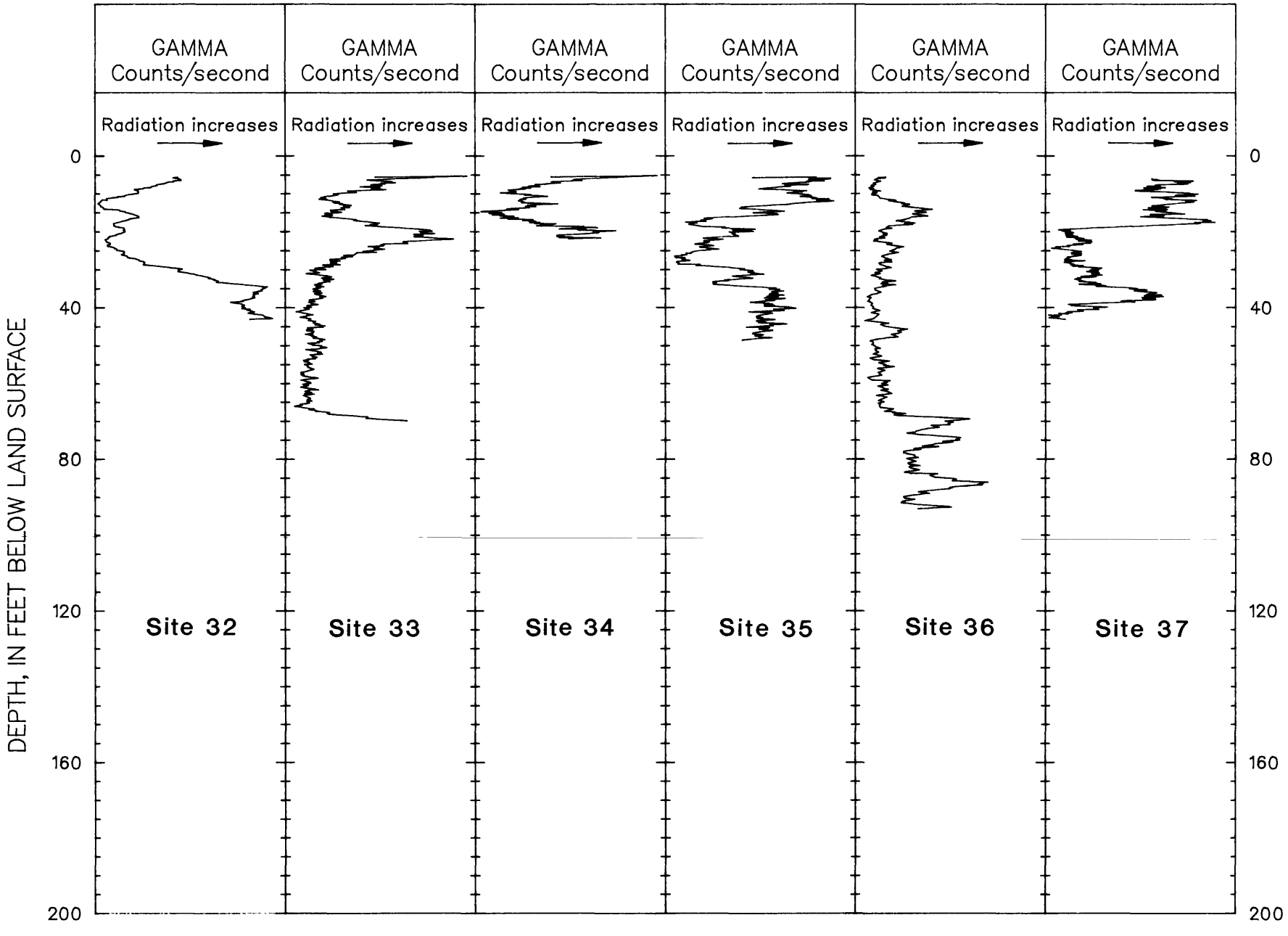

Figure 24.--Gamma logs from borings drilled using the hollow-stem auger method for sites 32. 33. 34. 35. 36 and 37.

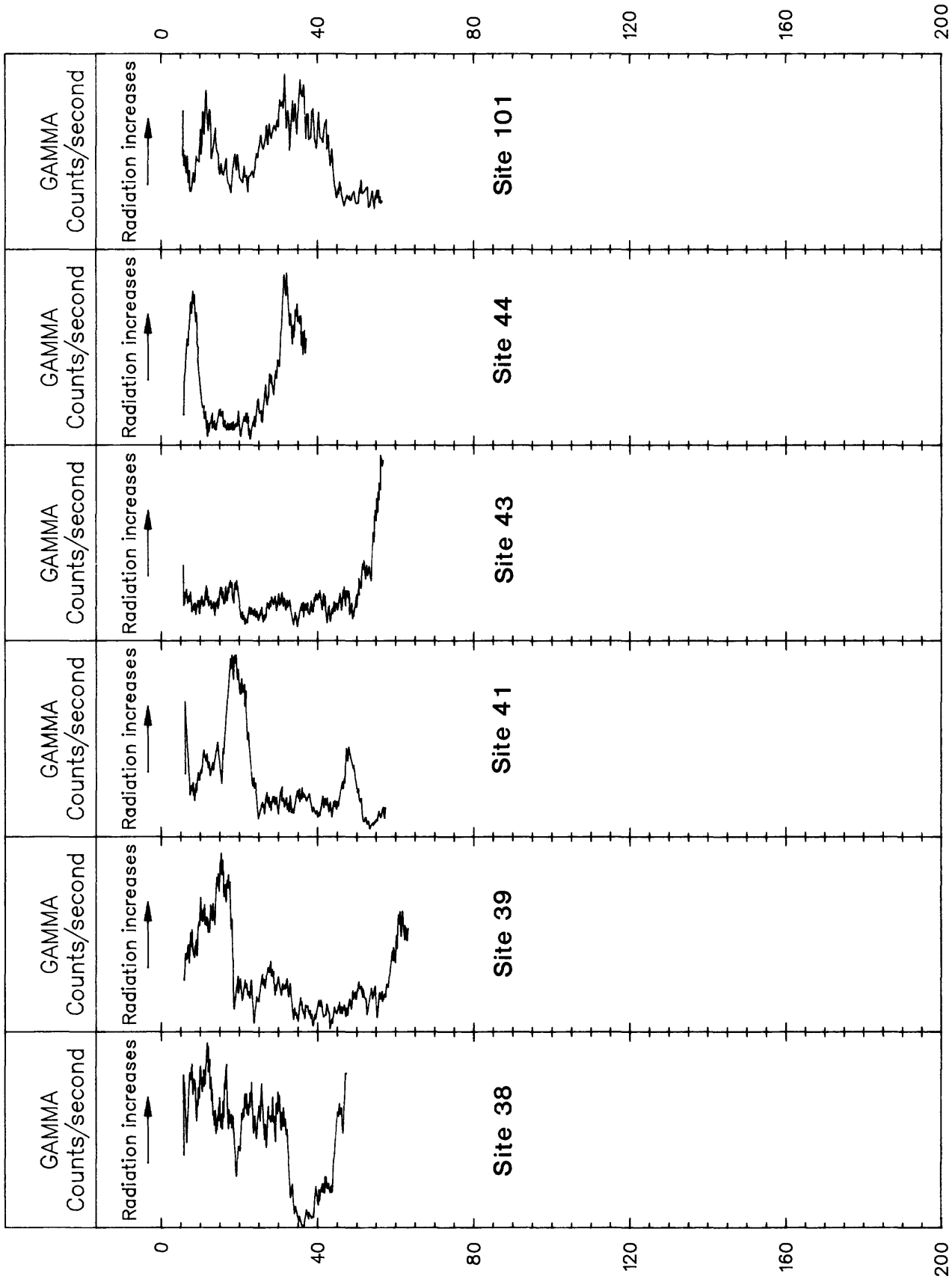

Figure 25.--Gamma logs from borings drilled using the hollow-stem auger method for sites 38, 39, 41, 43, 44 and 101.

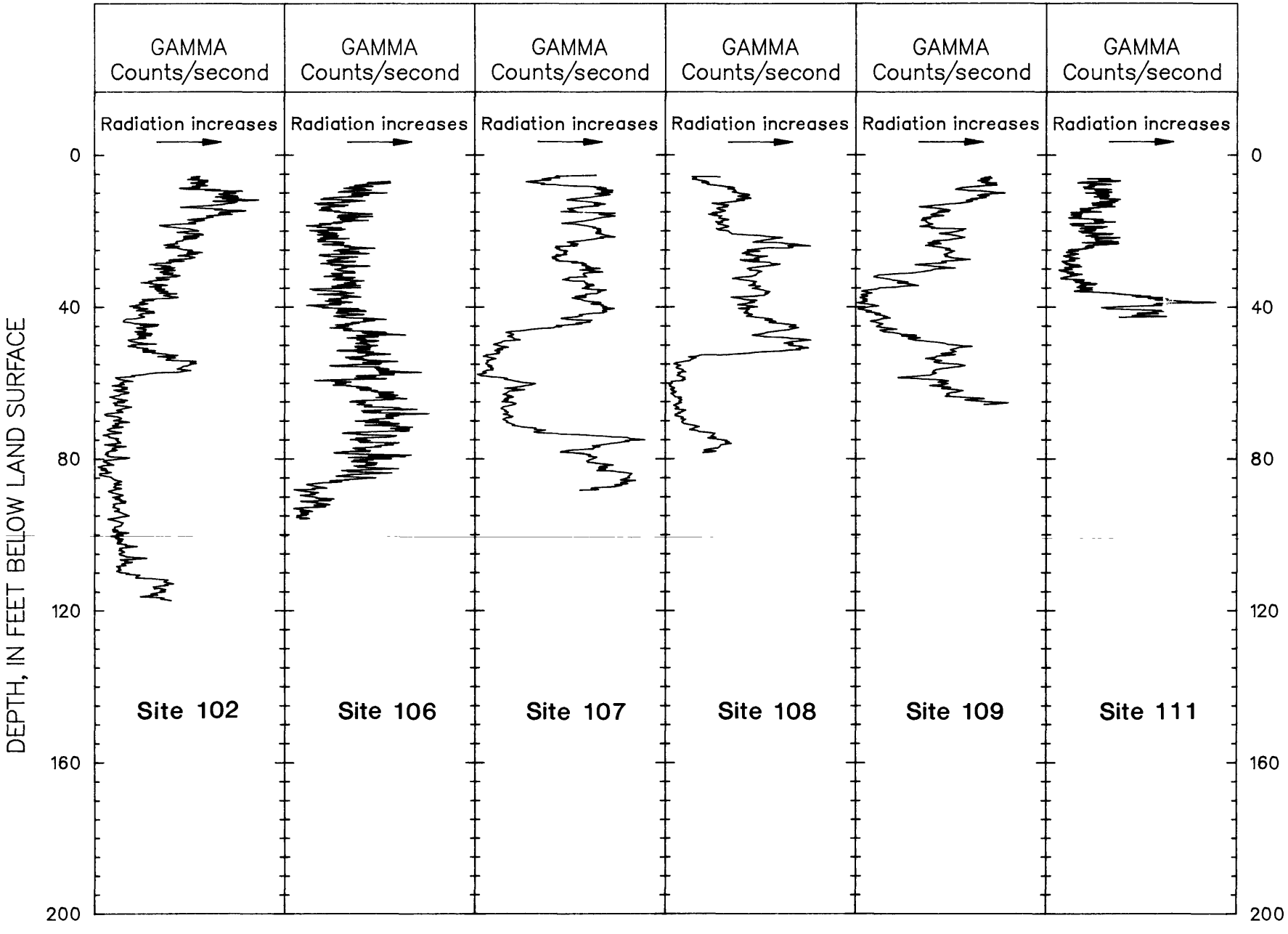

Figure 26.--Gamma logs from borings drilled using the hollow-stem auger method for sites 102, 106, 107, 108, 109 and 111.

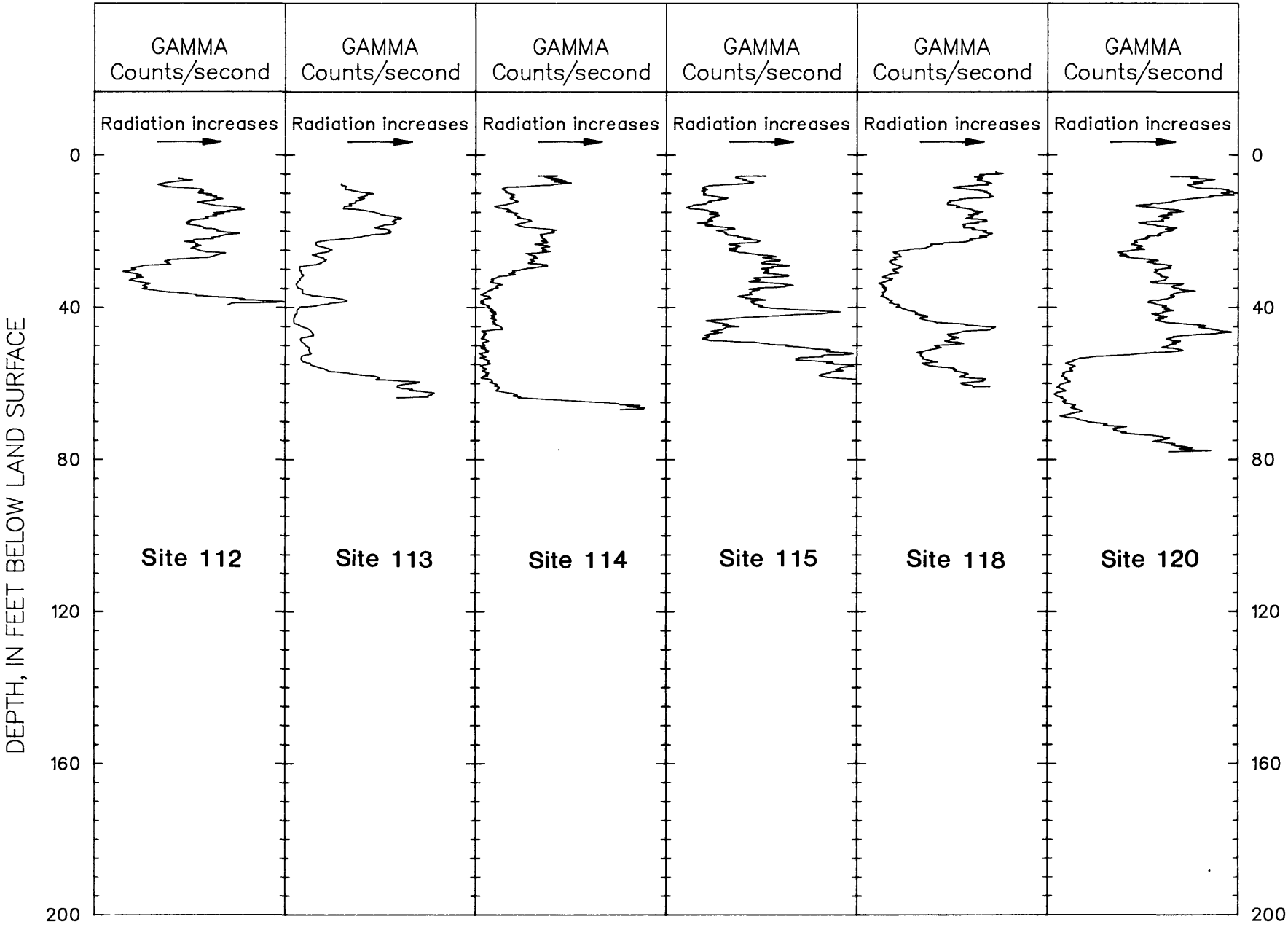

Figure 27.--Gamma logs from borings drilled using the hollow-stem auger method for sites 112, 113, 114, 115, 118 and 120.

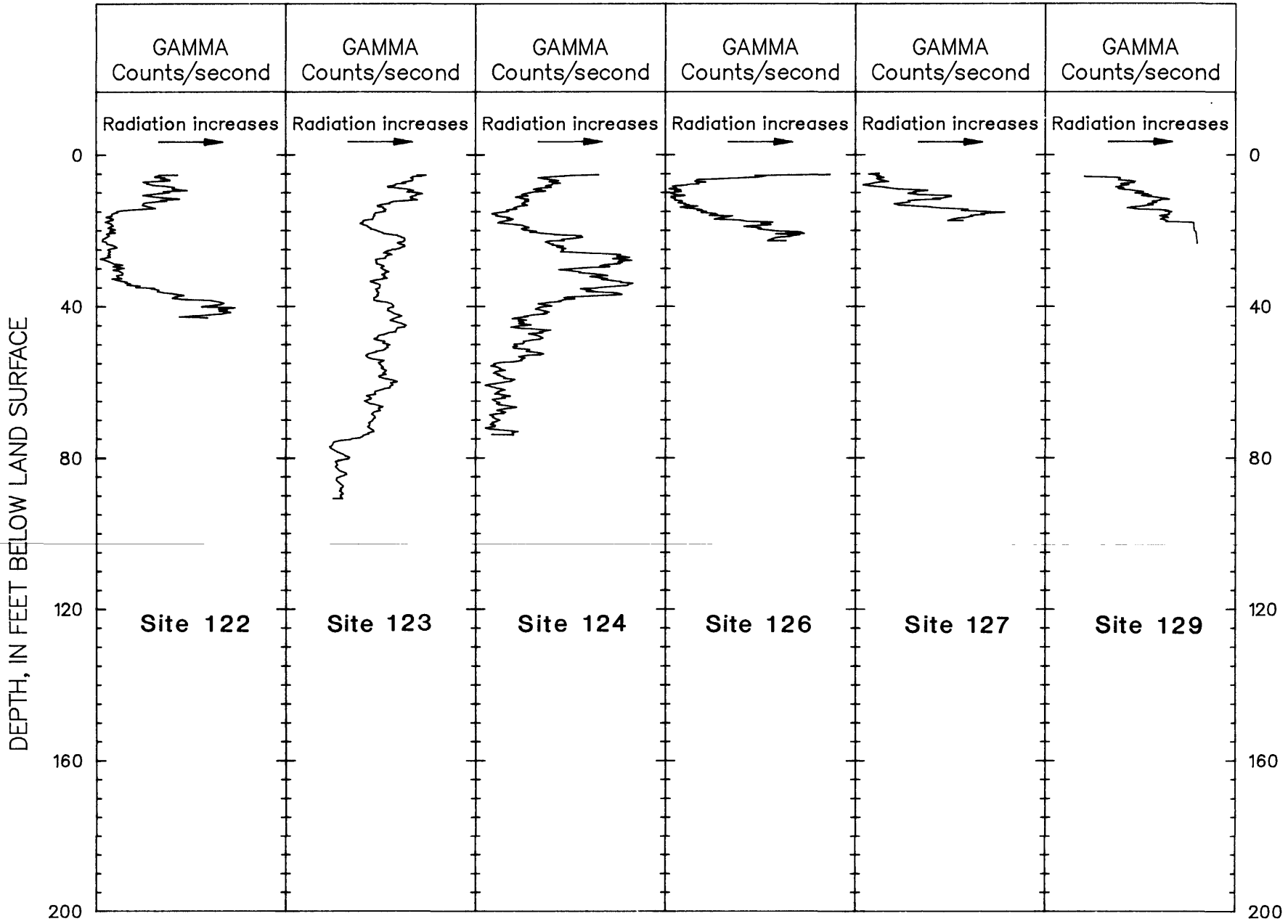

Figure 28.--Gamma logs from borings drilled using the hollow-stem auger method for sites 122, 123, 124, 126 127 and 129.

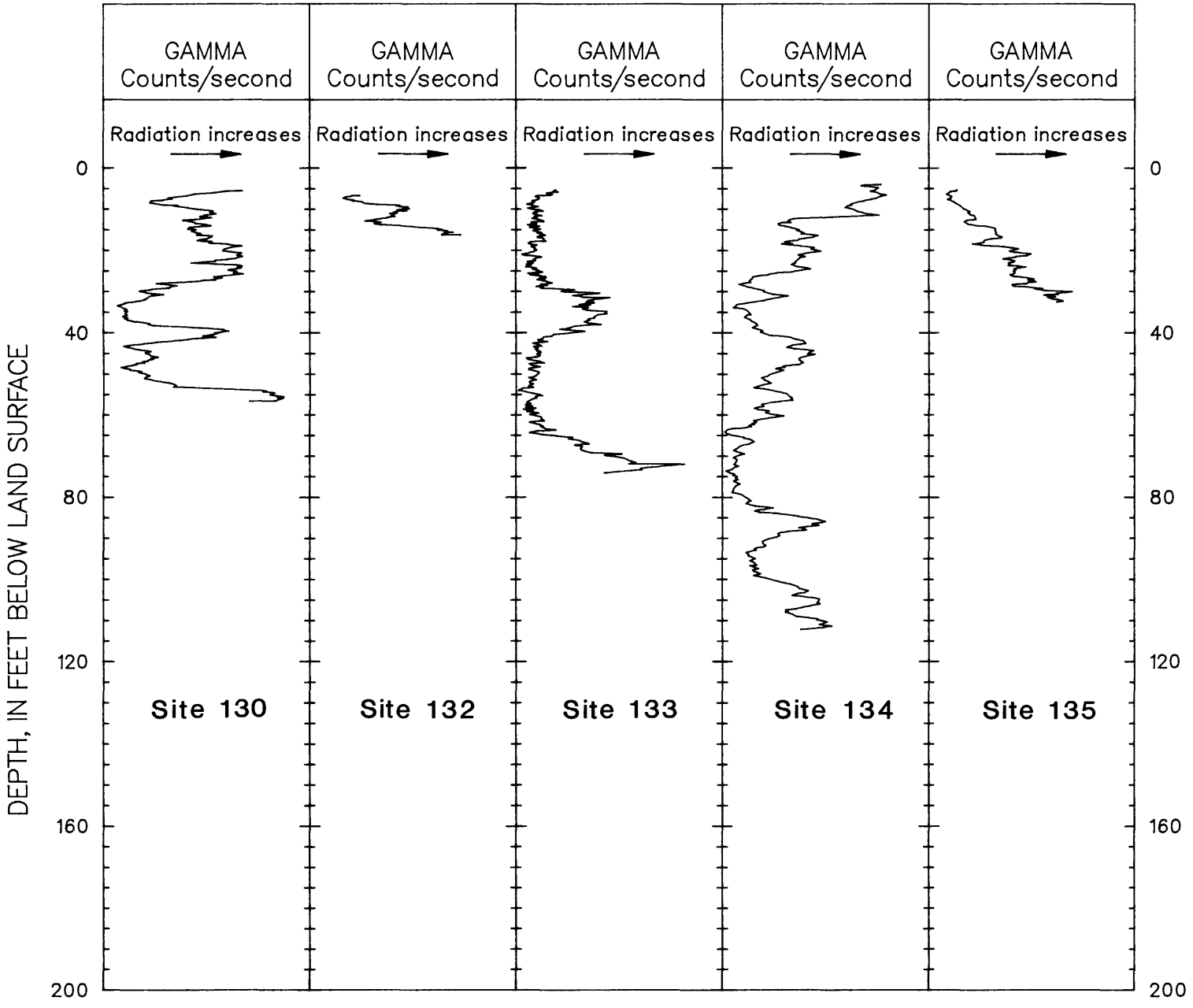

Figure 29.--Gamma logs from borings drilled using the hollow-stem auger method for sites 130, 132, 133, 134 and 135.

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