

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geophysical Logs and Sample Analysis for 10 Holes Drilled during 1981 in
the Western Part of the Yampa Coal Field, Moffat County, Colorado

By

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Open-File Report 85-37

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

¹USGS, Denver, Colo.

²Bureau of Land Management

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INTRODUCTION

During the summer of 1981, 10 drill holes (six rotary holes with diameters of approximately 5 inches and four 3-inch core holes) were drilled in the western part of the Yampa coal field southwest of Craig, Colo. (figs. 1-3, table 1). All of the 16,200 cumulative feet were drilled with truck-mounted drill rigs. The core holes were drilled by personnel and equipment of the Branch of Coal Resources of the U.S. Geological Survey and the rotary holes were drilled under U.S. Geological Survey Contract No. 14-08-0001-18814 awarded to A. E. Bennett.

The purpose of the drilling was to obtain information on the depth, thickness, continuity, and quality of the Federal coal in the Williams Fork Formation of Late Cretaceous age (fig. 4) as described by Hancock (1925) in this area of the Yampa coal field. Drill-hole sites were positioned within areas known to be of interest to industry for future leasing, and drilling operations were limited to areas adjacent to existing roads. For stratigraphic control, wells were drilled to reach either the Twentymile Sandstone Member of the Williams Fork Formation or the Trout Creek Sandstone Member of the Upper Cretaceous Iles Formation. However, in several instances the target unit was not reached or could not be identified with certainty.

Permission for access and to drill on private surface was obtained by Janet Hook, who also coordinated the drilling, geophysical logging, and coring operations and was present during some of the Bureau of Land Management's drill-site inspections. Other U.S. Geological Survey geologists who assisted with various phases of the drilling program were Bill Bowers, Cletus King, and Tom Piccirilli.

Geophysical logs were run in each of the 10 drill holes. Those run in the rotary holes were by Savage Scientific, Craig, Colo., under contract to A. E. Bennett, and those run in the core holes were by the U.S. Geological Survey. Natural-gamma (NG), density (gamma-gamma) (D), and single-point resistance (R) logs were run in all 10 holes. Coal is represented on the natural-gamma log by a sharp reduction in the radioactivity (deflection to the left) and on the density log by a sharp reduction in the density (deflection to the left except on log R-2-81c). Using the density log, coal thickness can be estimated as the vertical distance between the halfway point on the upper deflection and the halfway point on the lower deflection. In addition to these logs, caliper (C) and spontaneous potential (SP) logs were run in the core holes. Owing to various lost circulation problems, liquid (drilling mud or water) could not always be maintained in the upper parts of some drill holes during logging. Because the electric logs (SP and R) require a liquid in the hole, the logging operation was halted and an attempt was made to fill the holes to the top. This procedure was not always successful and, thus,

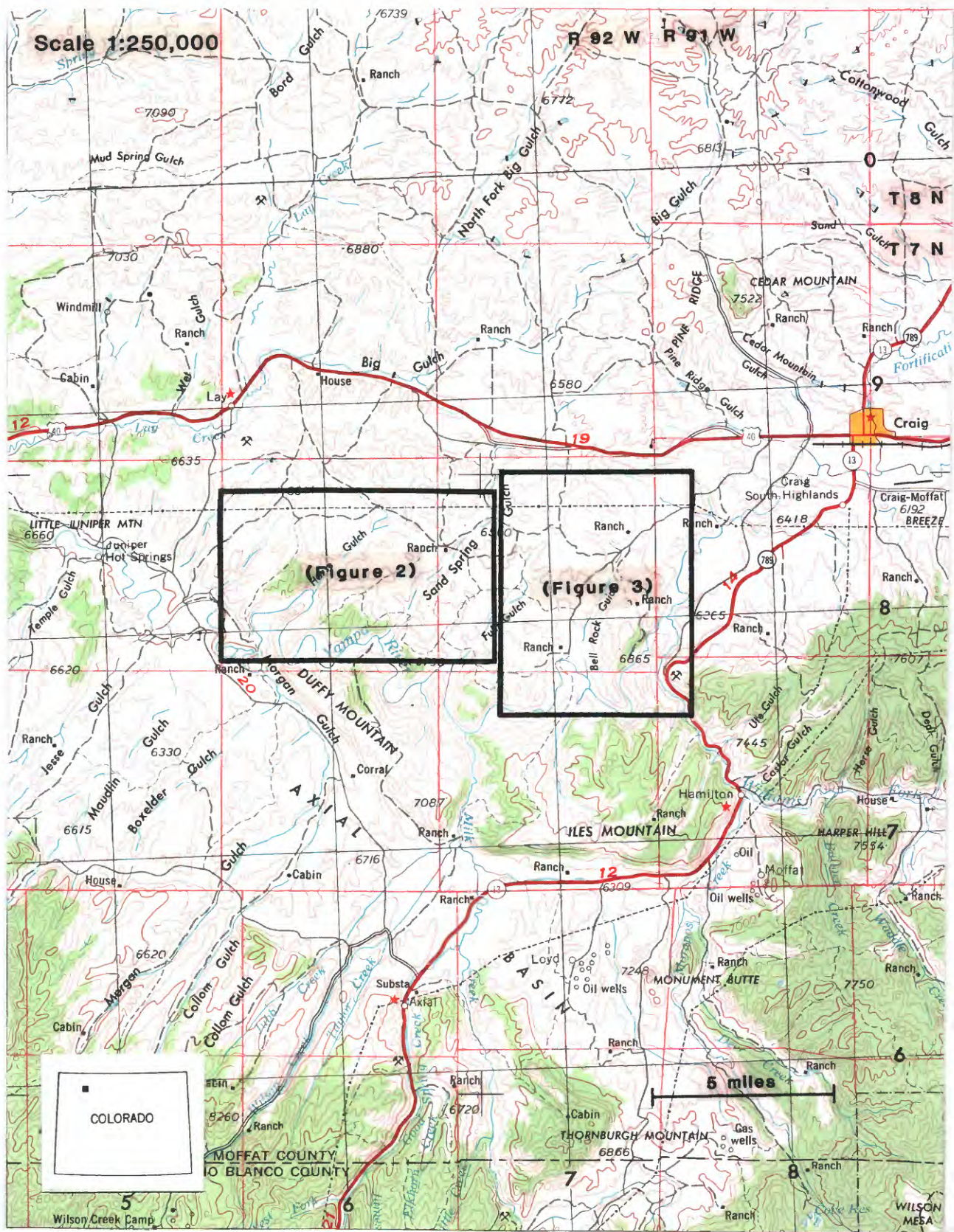


Figure 1.--General location map showing the boundaries of figures 2 and 3.

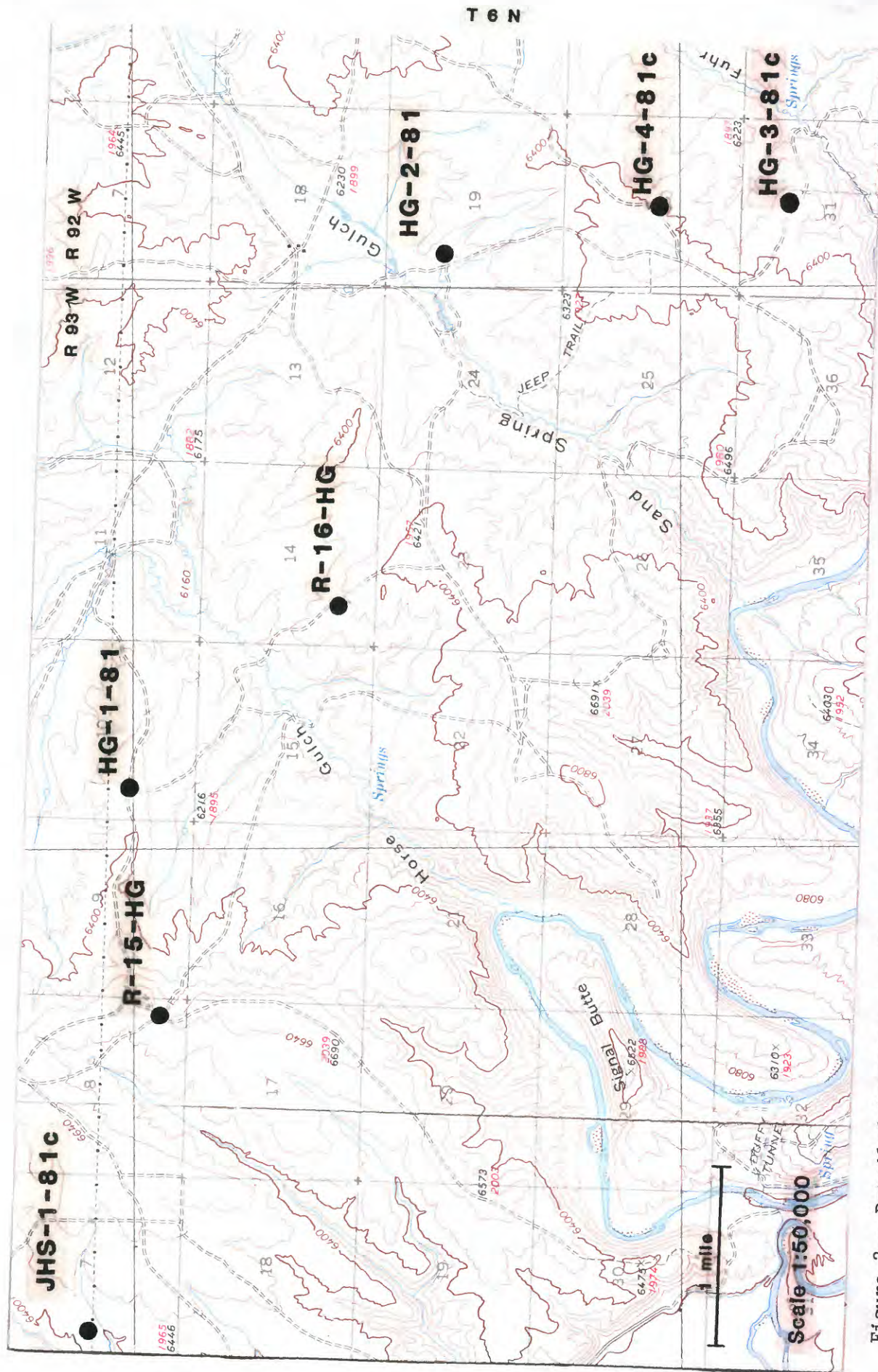


Figure 2.--Detailed location map of drill-holes JHS-1-81c, R-15-HG, R-16-HG, HG-1-81, HG-2-81, HG-4-81c, and HG-3-81c.

Table 1.--Drill-hole locations, ground elevations, and drilled and logged total depths

[Locations shown on figures 2 and 3. All depths are in feet; to convert to meters, multiply by 0.3048]

Hole No.	Location	Ground elevation	Total depth drilled	Depth logged
Figure 2				
JHS-1-81c ¹	T. 6 N., R. 93 W., sec. 7 600 ft FWL, 2,600 ft FNL	6,450	635	632
R-15-HG	T. 6 N., R. 93 W., sec. 8 550 ft FEL, 750 ft FSL	6,630	1,525	1,520.5
R-16-HG	T. 6 N., R. 93 W., sec. 14 1,150 ft FWL, 1,150 ft FSL	6,300	1,947	1,947
HG-1-81	T. 6 N., R. 93 W., sec. 10 925 ft FWL, 1,900 ft FSL	6,371	2,300	2,296
HG-2-81	T. 6 N., R. 92 W., sec. 19 950 ft FWL, 1,750 ft FNL	6,195	2,247	2,247
HG-3-81c ¹	T. 6 N., R. 92 W., sec. 31 2,700 ft FWL, 1,550 ft FNL	6,355	1,217	1,200
HG-4-81c ¹	T. 6 N., R. 92 W., sec. 30 2,600 ft FWL, 2,800 ft FNL	6,410	460	459
Figure 3				
RB-1-81	T. 6 N., R. 92 W., sec. 13 2,550 ft FWL, 1,400 ft FNL	6,382	2,070	2,070
RB-2-81c ¹	T. 6 N., R. 92 W., sec. 25 2,000 ft FWL, 700 ft FNL	6,600	1,485	1,480
RB-3-81	T. 6 N., R. 92 W., sec. 21 1,750 ft FWL, 575 ft FSL	6,190	2,318	2,300

¹The letter c indicates a core hole. All of the core holes were selectively sampled for coal and the analyses are listed in this report.

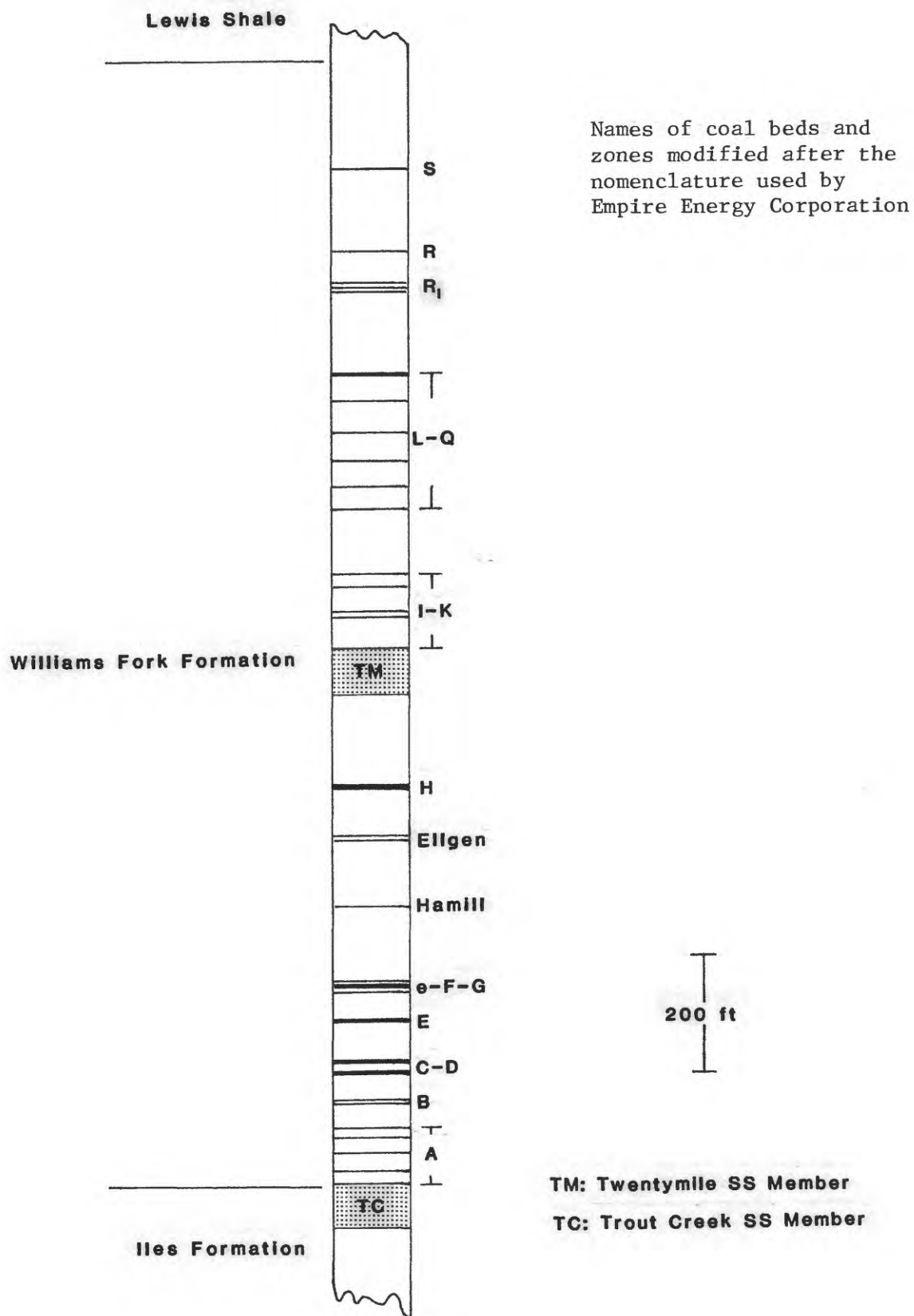


Figure 4.--Generalized columnar section of the Williams Fork Formation in the western Yampa coal field showing coal beds and zones. Most of these beds and zones were sampled in one or more of the core holes.

electric logs were not recorded in the top portion of some drill holes. The logs were originally run at a vertical scale of 1 inch equal to 10 feet, but for convenience of reproducing this report, the logs were reduced in scale to 1 inch equal to 50 feet. To convert feet to meters, multiply by 0.3048. All of the log scales listed in this report on the individual log headings are the values reported by the logger in reference to the original scale of 1 inch equal to 10 feet.

A total of 806 feet of core was recovered from holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c of which 256 feet of the core were coal. Each core hole was a twin of a rotary hole previously drilled at the same location. From the cored coal, 40 samples (one sample, D239537 from JHS-1-81c, was later lost) were ground and put in plastic bags by the U.S. Geological Survey during the fall of 1981 and placed in storage. The noncoal part of the core was later placed in the U.S. Geological Survey core library. In the spring of 1984, the Bureau of Land Management contracted the Denver office of Commercial Testing and Engineering Company (C.T.&E.) to conduct proximate analysis on the 39 available samples and the results are given in tables 3 and 4 and summarized in table 2.¹

REFERENCES CITED

- American Society for Testing and Materials, 1978, 1978 annual book for ASTM standards, pt. 26: Philadelphia, Pa., 906 p.
- Hancock, E. T., 1925, Geology and coal resources of the Axial and Monument Butte quadrangles, Moffat County, Colorado: U.S. Geological Survey Bulletin 757, 134 p.
- Johnson, E. A., 1978, Geophysical logs for 18 holes drilled during 1977 in the Round Bottom area, Yampa coal field, Moffat County, Colorado: U.S. Geological Survey Open-File Report 78-229, 48 p.
- Meyer, R. F., 1978, Geophysical logs of 20 holes drilled in 1977 in the Yampa coal field, Hamilton, Horse Gulch, and Pagoda quadrangles, Moffat County, Colorado: U.S. Geological Survey Open-File Report 78-366, 51 p.

¹These samples were in storage for 2 1/2 years. Thus, the values obtained by proximate analysis may not be truly representative of the coal as originally sampled.

Table 2.--Arithmetic mean, observed range, geometric mean, and geometric deviation of proximate analysis, sulfur, and heat-of-combustion of 39 coal samples from the Williams Fork Formation, Yampa coal field, Moffat County, Colorado

[All values are in percent except Kcal/kg, Btu/lb, and geometric deviation and are reported on an as-received basis. Kcal/kg = 0.556 (Btu/lb)]

	Arithmetic mean	Observed range		Geometric mean	Geometric deviation
		Minimum	Maximum		
Proximate analysis					
Moisture	11.2	6.82	16.07	10.91	1.3
Ash	7.8	2.53	22.89	6.87	1.6
Volatile matter	33.5	28.93	36.54	33.51	1.1
Fixed carbon	47.5	38.84	51.79	47.42	1.1
Sulfur					
Sulfur	0.59	0.26	1.31	0.55	1.5
Heat-of-combustion					
Btu/lb	10,690	9,073	11,475	10,672	1.1
Kcal/kg	5,944	5,045	6,380	5,934	1.1

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c,
Moffat County, Colorado

[The first line of entry for each analysis represents as-received values, the second line represents moisture-free values and the third line represents moisture- and ash-free values. All analyses were conducted in accordance with ASTM D-3172 and, except Btu/lb, are reported in percent.
NC = not calculated by C.T.&E. Leaders (---) indicate no data]

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
JHS-1-81c								
D239531	H	143.70- 151.80	10.4 --- ---	5.8 6.4 ---	35.1 39.2 41.9	48.7 54.3 58.1	11,042 12,329 13,176	0.84 .94 NC
D239532	Ellgen zone	234.20- 239.00	13.1 --- ---	5.8 6.7 ---	32.9 37.9 40.6	48.2 55.4 59.4	10,645 12,245 13,124	1.31 1.51 NC
D239533	Ellgen zone	244.40- 248.00	12.1 --- ---	6.9 7.9 ---	34.6 39.3 42.7	46.4 52.8 57.3	10,678 12,146 13,188	1.10 1.25 NC
D239534	E	380.00- 392.00	11.9 --- ---	5.5 6.2 ---	34.6 39.3 41.9	48.0 54.5 58.1	11,024 12,519 13,351	.77 .87 NC
D239535	B	520.20- 524.00	8.8 --- ---	12.7 13.9 ---	34.1 37.4 43.4	44.4 48.8 56.6	10,451 11,462 13,309	.91 1.00 NC
D239536	A zone	557.50- 566.70	10.3 --- ---	5.7 6.3 ---	33.4 37.2 39.8	50.6 56.4 60.3	11,202 12,483 13,325	.75 .84 NC
D239537	A zone							

-----Sample lost-----

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c,
Moffat County, Colorado--Continued

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
JHS-1-81c--Continued								
D239538	A zone	596.45- 602.70	11.1 ---	8.1 9.1	34.5 38.9 42.8	46.2 52.0 57.2	10,811 12,166 13,382	0.64 .72 NC
D239539	A zone	621.10- 624.70	9.3 ---	15.8 17.4 ---	32.5 35.8 43.3	42.5 46.8 56.7	9,919 10,938 13,239	.73 .80 NC
HG-3-81c								
D239540	R	95.20- 99.20	15.8 ---	6.6 7.9 ---	31.4 37.3 40.4	46.2 54.9 59.6	9,987 11,860 12,876	0.59 .70 NC
D239541	Q	168.80- 177.00	16.1 ---	3.9 4.7 ---	32.1 38.3 40.2	47.9 57.0 59.8	10,411 12,404 13,009	.40 .48 NC
D239542	L	411.50- 418.60	13.8 ---	5.0 5.8 ---	32.4 37.6 40.0	48.7 56.6 60.1	10,532 12,225 12,976	.34 .40 NC
D239543	K	516.00- 520.50	13.2 ---	3.8 4.4 ---	33.2 38.2 40.0	49.8 57.4 60.0	10,891 12,544 13,120	.26 .30 NC
D239544	K	522.40- 528.60	11.8 ---	17.6 20.0 ---	28.9 32.8 41.0	41.6 47.2 59.0	9,073 10,292 12,860	.34 .38 NC

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c,
Moffat County, Colorado--Continued

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
HG-3-81c--Continued								
D239545	I-K zone	542.40- 546.00	12.9 ---	13.3 15.2 ---	30.1 34.5 40.7	43.8 50.3 59.3	9,617 11,038 13,020	0.51 .58 NC
D239546	I-K zone	585.70- 590.00	12.3 ---	8.1 9.3 ---	32.6 37.1 40.9	47.0 53.6 59.1	10,471 11,936 13,158	.35 .40 NC
D239547	I-K zone	632.90- 636.40	12.8 ---	5.1 5.8 ---	33.9 38.9 41.3	48.2 55.3 58.7	10,806 12,394 13,161	1.17 1.34 NC
D239548	?	808.50- 813.10	10.7 ---	13.5 15.1 ---	32.5 36.4 42.9	43.3 48.5 57.1	9,897 11,085 13,061	.57 .64 NC
D239549	Ellgen zone	872.00- 879.00	11.8 ---	3.7 4.1 ---	34.3 38.9 40.5	50.3 57.0 59.5	11,247 12,746 13,296	.40 .45 NC
D239550	Ellgen zone	886.00- 889.50	9.3 ---	13.4 14.7 ---	31.8 35.0 41.1	45.6 50.2 58.9	10,186 11,229 13,172	.40 .44 NC
D239551	Ellgen zone	898.60- 907.17	10.2 ---	5.6 6.3 ---	35.2 39.2 41.8	49.0 54.6 58.2	11,218 12,491 13,325	.40 .44 NC
D239552	F	1,105.60- 1,110.00	9.8 ---	7.4 8.2 ---	34.0 37.7 41.1	48.8 54.1 58.9	10,976 12,164 13,253	.55 .61 NC

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c,
Moffat County, Colorado--Continued

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
HG-3-81c--Continued								
D239553	F	1,111.30- 1,117.50	7.2 ---	10.3 11.1 ---	36.5 39.4 44.3	46.0 49.5 55.7	10,690 11,514 12,953	0.40 .43 NC
D239554	E	1,169.10- 1,179.50	9.4 ---	6.7 7.4 ---	35.0 38.7 41.7	48.9 54.0 58.3	11,229 12,391 13,375	.50 .55 NC
D239555	CD zone?	1,209.40- 1,213.60	6.8 ---	22.9 24.6 ---	31.4 33.8 44.7	38.8 41.7 55.3	9,278 9,957 13,199	.76 .82 NC
HG-4-81c								
D239528	S	123.00- 127.80	15.0 ---	7.8 9.2 ---	33.1 38.9 42.9	44.1 51.9 57.1	9,939 11,691 12,873	1.04 1.22 NC
D239529	R	296.00- 306.00	14.8 ---	5.7 6.6 ---	32.4 38.0 40.8	47.1 55.3 59.2	10,331 12,123 12,985	.45 .53 NC
D239530	Q	431.50- 438.25	12.4 ---	4.6 5.2 ---	32.7 37.4 39.5	50.2 57.4 60.5	10,725 12,247 12,926	.51 .58 NC

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c, Moffat County, Colorado--Continued

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
RB-2-81c								
D239516	Mu(?)	249.00- 252.00	13.1 ---	7.1 8.2 ---	32.9 38.0 41.2	46.9 54.0 58.8	10,411 11,986 13,055	0.63 .72 NC
D239517	L	293.00- 297.20	13.4 ---	4.9 5.7 ---	33.0 38.0 40.4	48.7 56.3 59.6	10,680 12,333 13,078	.28 .32 NC
D239518	K	394.00- 398.00	13.5 ---	4.6 5.3 ---	32.4 37.5 39.6	49.4 57.2 60.4	10,694 12,366 13,061	1.08 1.25 NC
D239519	J	462.00- 466.00	12.2 ---	2.5 2.9 ---	33.8 38.5 39.6	51.5 58.6 60.4	11,310 12,879 13,261	.43 .49 NC
D239520	H	718.00- 723.80	10.8 ---	4.2 4.6 ---	35.5 39.8 41.8	49.6 55.5 58.3	11,288 12,650 13,267	.41 .46 NC
D239521	F	1,141.80- 1,158.65	8.7 ---	4.2 4.6 ---	36.4 39.8 41.7	50.8 55.6 58.3	11,455 12,542 13,147	.44 .48 NC
D239522	e	1,165.45- 1,170.10	10.3 ---	4.2 4.7 ---	34.2 38.1 40.0	51.3 57.2 60.0	11,223 12,509 13,125	.53 .59 NC

Table 3.--Proximate analysis of coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c,
Moffat County, Colorado--Continued

Sample No.	Bed name	Interval (ft)	Moisture	Ash	Volatile matter	Fixed carbon	Btu/lb	Sulfur
RB-2-81c--Continued								
D239523	E	1,203.00- 1,216.00	9.3 ---	8.4 9.2 ---	35.5 39.2 43.2	46.8 51.6 56.8	10,895 12,017 13,237	0.37 .41 NC
D239524	C-D zone	1,309.50- 1,318.40	7.6 ---	10.2 11.0 ---	34.5 37.4 42.0	47.7 51.6 58.0	11,113 12,026 13,514	.50 .54 NC
D239525	C-D zone	1,320.00- 1,325.45	7.5 ---	7.8 8.5 ---	34.5 37.3 40.7	50.2 54.2 59.3	11,475 12,403 13,549	.57 .62 NC
D239526	C-D zone	1,329.75- 1,347.10	7.7 ---	8.9 9.7 ---	35.7 38.7 42.8	47.7 51.7 57.2	11,275 12,220 13,531	.42 .46 NC
D239527	A(?)	1,446.00- 1,451.45	8.6 ---	4.9 5.4 ---	34.6 37.9 40.1	51.8 56.7 59.9	11,810 12,926 13,664	.54 .59 NC

Table 4. Calculated values based on proximate analysis results for coal samples from drill holes
JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c, Moffat County, Colorado

[Volatile matter and fixed carbon values are in percent]

Sample No.	Dry mineral ¹ matter free volatile matter	Dry mineral ¹ matter free fixed carbon	Moist mineral ¹ matter free Btu	Lbs sulfur ² million Btu	Lbs sulfur dioxide ³ million Btu
JHS-1-81c					
D239531	41.4	58.6	11,788	0.76	1.52
D239532	40.0	60.0	11,377	1.24	2.47
D239533	42.1	57.9	11,559	1.03	2.06
D239534	41.4	58.6	11,731	.70	1.39
D239535	42.5	57.5	12,124	.87	1.74
D239536	39.3	60.7	11,945	.68	1.35
D239538	42.2	57.8	11,855	.59	1.18
D239539	42.2	57.8	11,968	.73	1.46
HG-3-81c					
D239540	39.9	60.1	10,764	0.59	1.18
D239541	39.8	60.2	10,873	.39	.77
D239542	39.6	60.4	11,136	.33	.65
D239543	39.7	60.3	11,362	.24	.48
D239544	39.7	60.3	11,209	.37	.74
D239545	39.7	60.3	11,231	.53	1.05
D239546	40.4	59.6	11,487	.34	.67
D239547	40.7	59.3	11,449	1.08	2.16
D239548	41.9	58.1	11,597	.58	1.15
D239549	40.3	59.7	11,715	.36	.71
D239550	40.2	59.8	11,914	.39	.78
D239551	41.4	58.6	11,950	.35	.70
D239552	40.5	59.5	11,942	.50	1.00
D239553	43.6	56.4	10,237	.38	.75
D239554	41.2	58.8	12,110	.45	.89
D239555	43.1	56.9	12,343	.83	1.65

Table 4. Calculated values based on proximate analysis results for coal samples from drill holes JHS-1-81c, HG-3-81c, HG-4-81c, and RB-2-81c, Moffat County, Colorado--Continued

Sample No.	Dry mineral ¹ matter free volatile matter	Dry mineral ¹ matter free fixed carbon	Moist mineral ¹ matter free Btu	Lbs sulfur ² million Btu	Lbs sulfur dioxide ³ million Btu
HG-4-81c					
D239528	42.2	57.8	10,864	1.05	2.09
D239529	40.3	59.7	11,009	.44	.87
D239530	39.1	60.9	11,292	.48	.95
RB-2-81c					
D239516	40.6	59.4	11,285	0.60	1.20
D239517	40.0	60.0	11,285	.26	.52
D239518	39.1	60.9	11,267	1.01	2.02
D239519	39.4	60.6	11,634	.38	.76
D239520	41.4	58.6	11,824	.37	.73
D239521	41.4	58.6	12,007	.39	.77
D239522	39.6	60.4	11,766	.47	.94
D239523	42.6	57.4	11,983	.34	.68
D239524	41.3	58.7	12,495	.45	.90
D239525	40.2	59.8	12,547	.50	1.00
D239526	40.2	57.8	12,489	.38	.75
D239527	39.7	60.3	12,485	.46	.91

¹ Calculated according to ASTM D-388 Parr Formula.

²
$$\frac{1,000,000}{\text{Btu (as-received)}} \times \text{percent sulfur (as-received)} = \text{lbs sulfur/million Btu.}$$

³
$$\frac{1,000,000}{\text{Btu (as-received)}} \times \text{percent sulfur (as-received)} \times 2 = \text{lbs sulfur dioxide/million Btu.}$$

U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. JHS-1-81c Date logged 7/22/81¹ Ground elevation 6450 ft

T. 6 N., R. 93 W., Sec. 7 : 600 ft f W. 1, 2600 ft f N. 1

Drilling medium mud² Drilled depth 635 ft Fluid level 39 ft

Logging company USGS Logging speed 20 ft/min. Logged depth 632 ft

Natural gamma (NG) Scale 13.26 CPS/in. T.C. 4

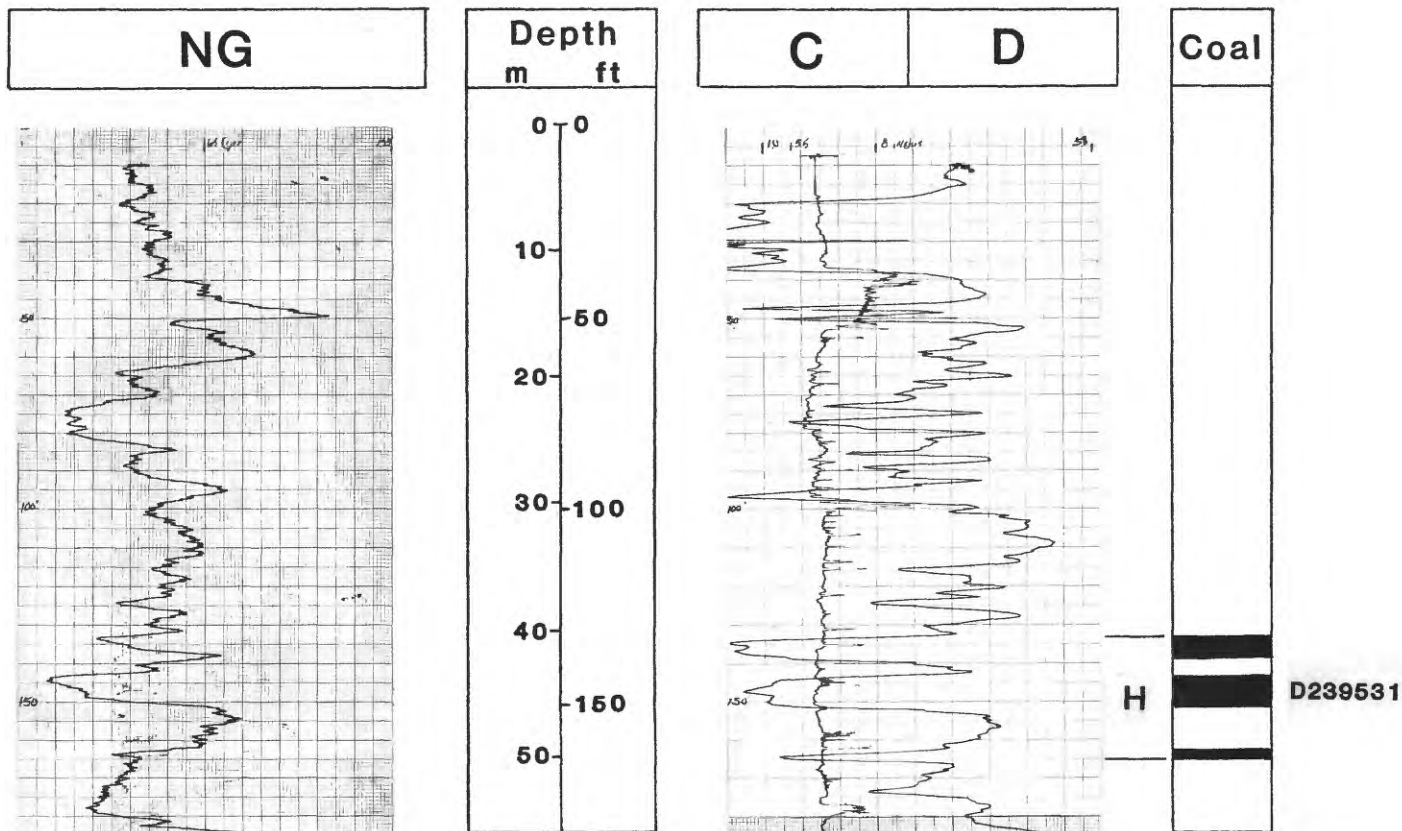
Caliper (C) Scale ?

Density (gamma-gamma) (D) Scale ? T.C. 3

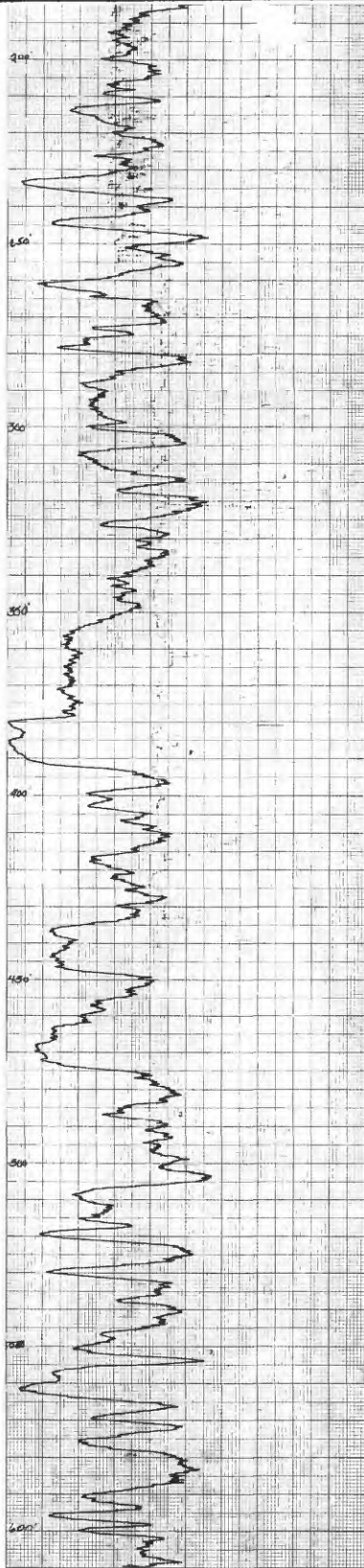
Spontaneous potential (SP) Scale 40 mv/log div.

Single point resistance (R) Scale variable

Remarks: ¹Density and caliper log run on 7/23/81. ²Hole filled with fresh water at time of logging. Note: This hole cored coal intervals and was a twin of R-1-JHS drilled in 1980.



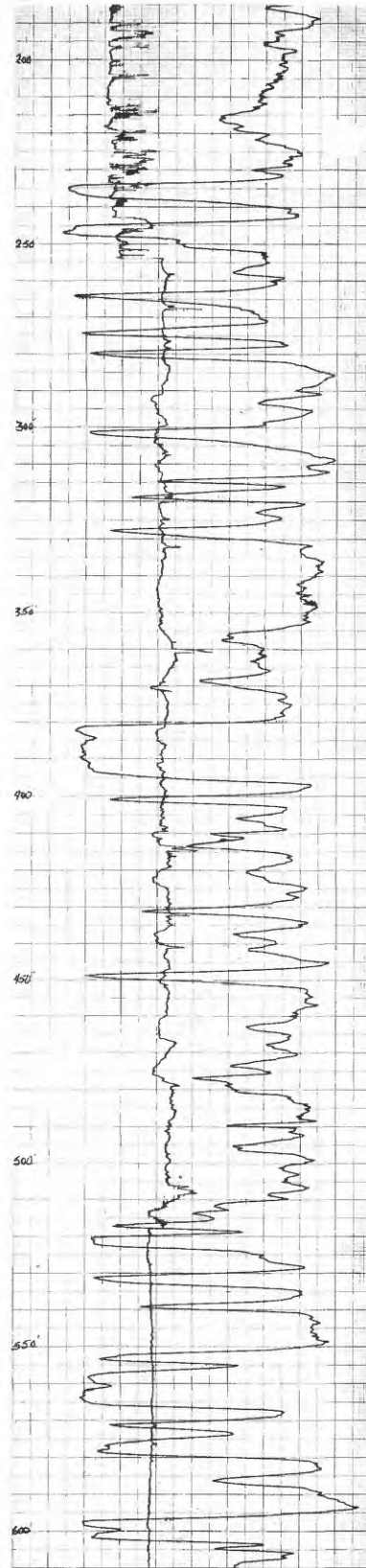
NG



Depth
m ft

60 200
70 250
80 300
90 350
100 400
110 450
120 500
130 550
140 600
150 650
160 700
170 750
180 800

C



D

ELLGEN

e-F-G

E

C-D

B

A

Coal

D239532
D239533

D239534

D239535

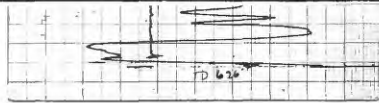
D239536

D239537

D239538

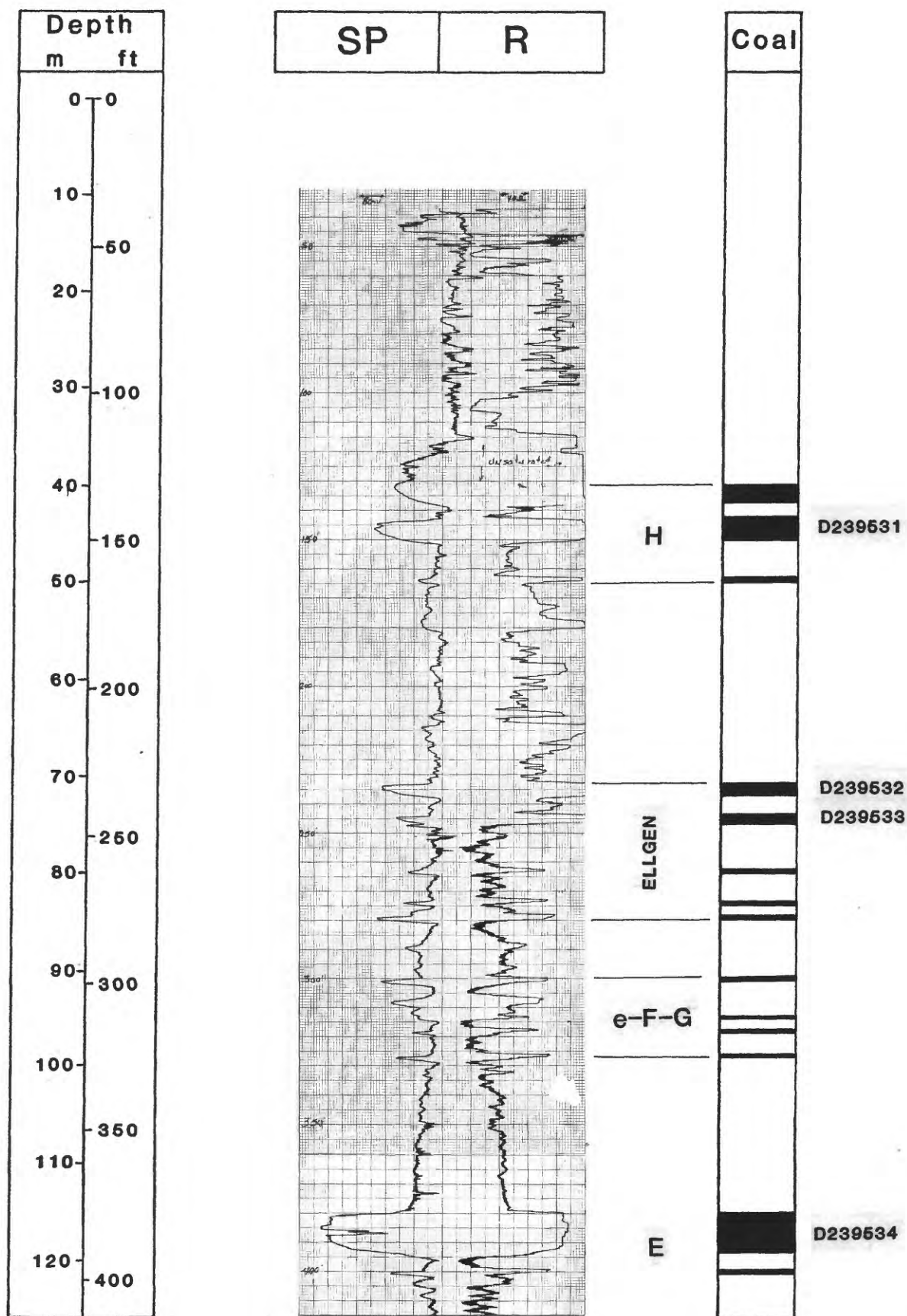


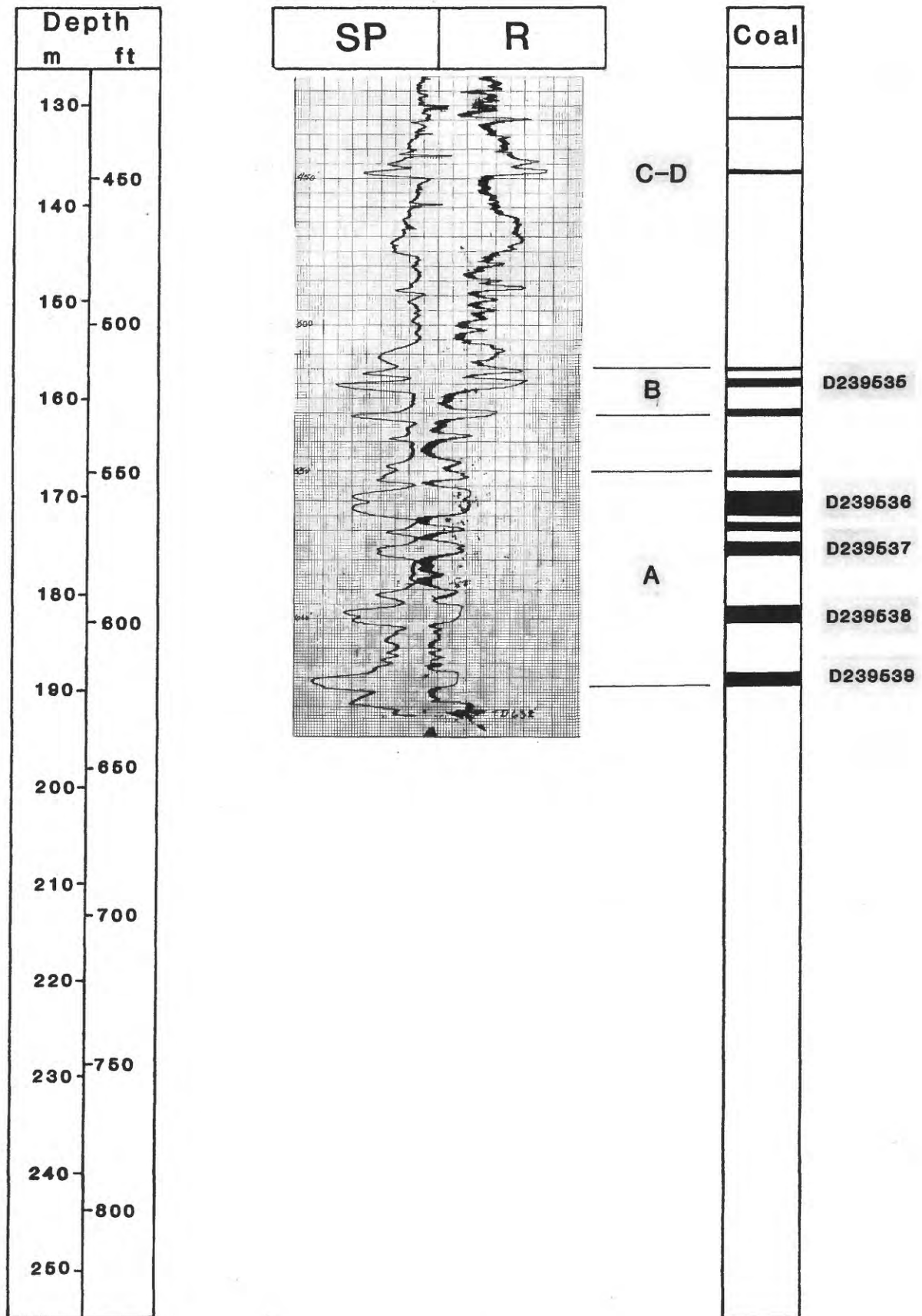
Depth	
m	ft
190	
200	650
210	
220	700
230	
240	750
250	
260	800
270	
280	850
290	
300	900
310	
	950
	1000



Coal

D239539





U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. R-15-HG Date logged 6/8/81 Ground elevation 6630 ft

T. 6 N., R. 93 W., Sec. 8 : 550 ft f E. 1, 750 ft f S. 1

Drilling medium mud Drilled depth 1525 ft Fluid level 322 ft

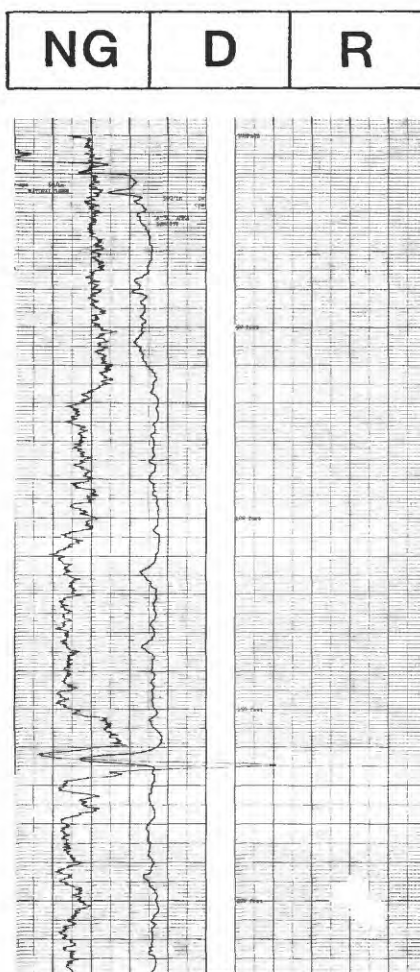
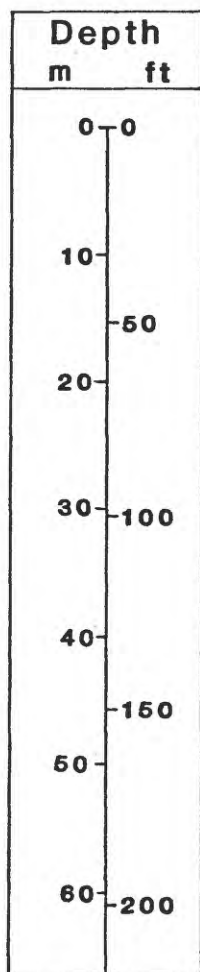
Logging company 1 Logging speed 25 ft/min. Logged depth 1520.5 ft

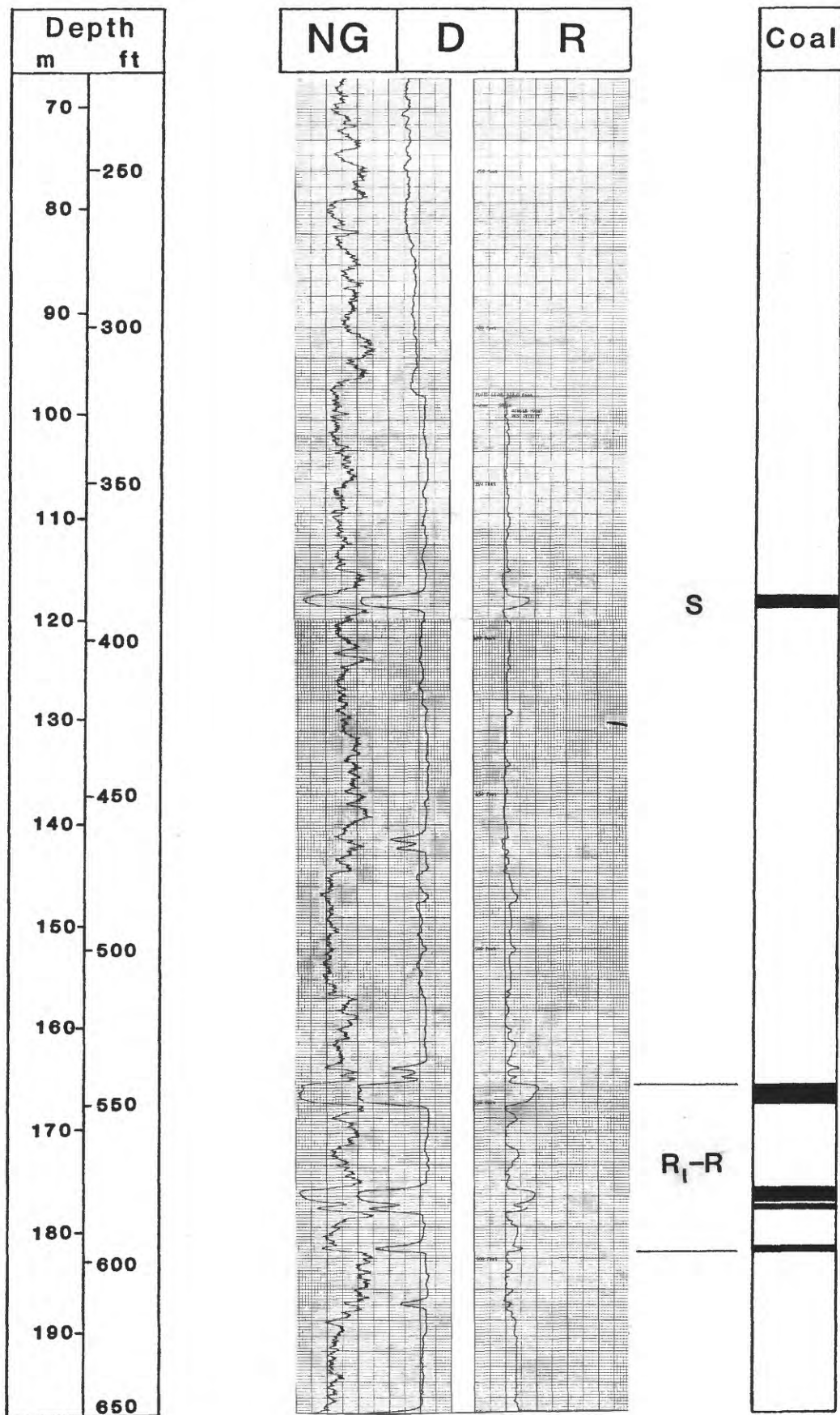
Natural gamma (NG) Scale 50 CPS/in. T.C. 1

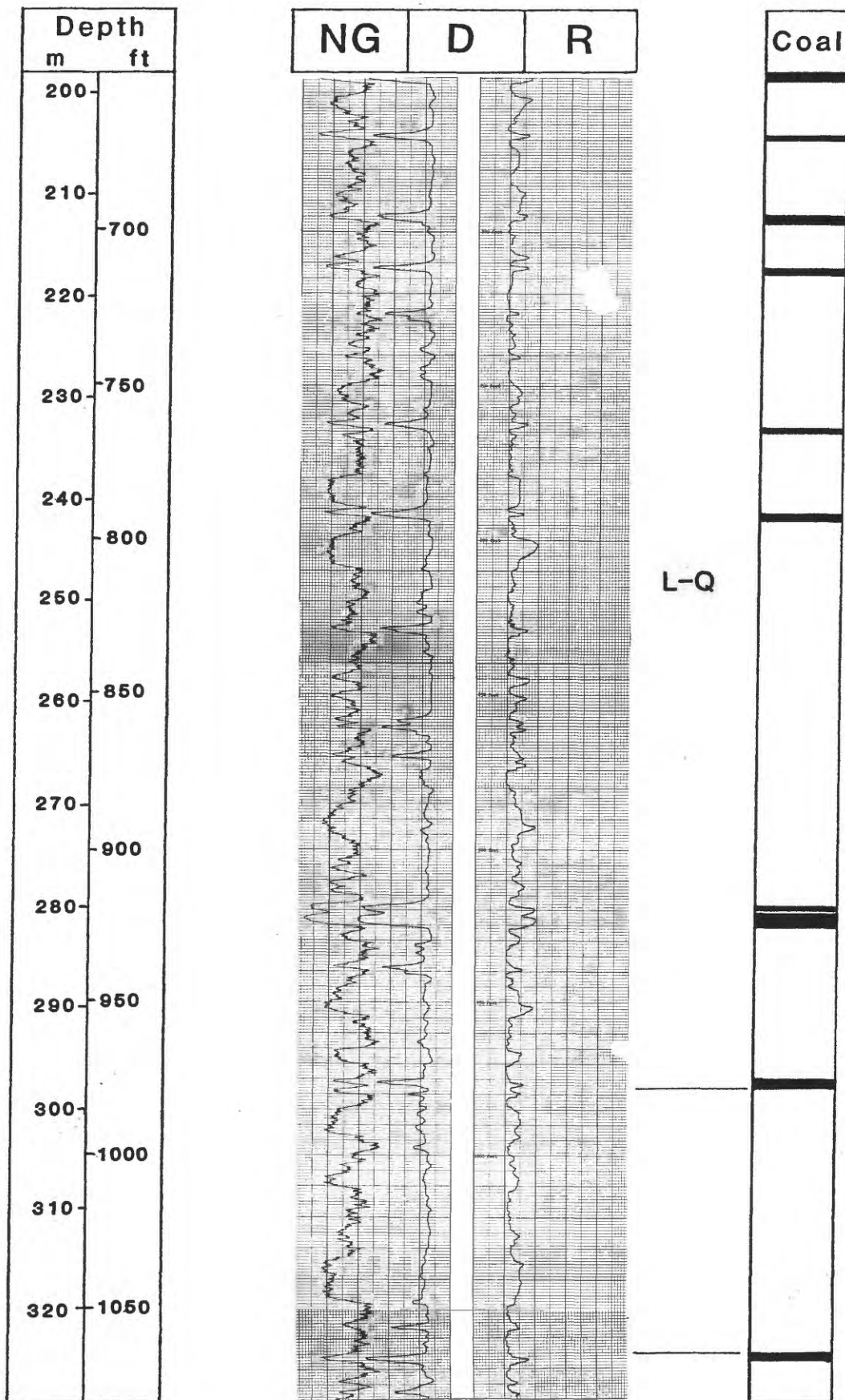
Density (gamma-gamma) (D) Scale 500 CPS/in. T.C. 1

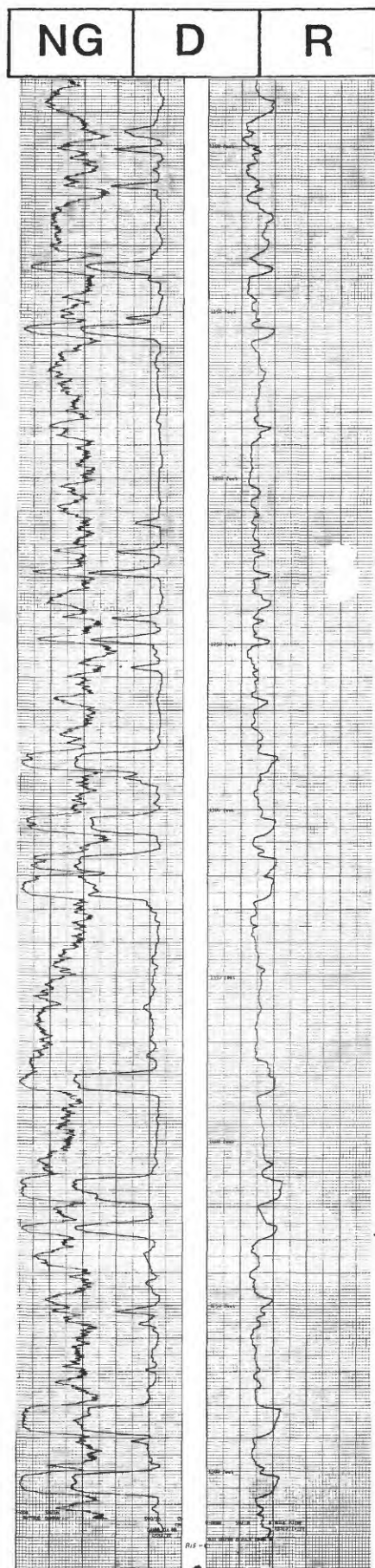
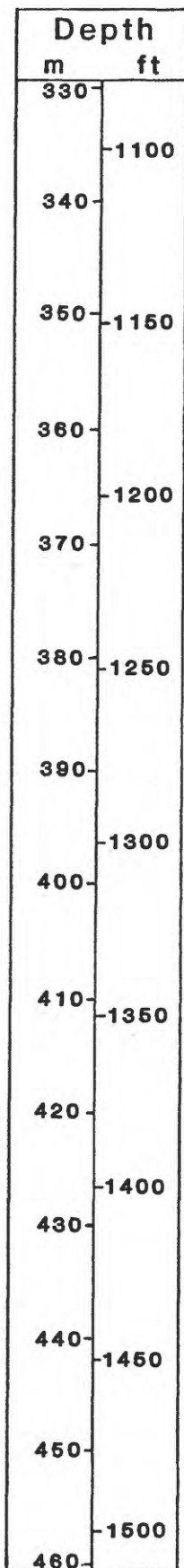
Single point resistance (R) Scale variable

Remarks: 1 Savage Scientific. Lost circulation associated with clinker and fractured rock prevented the Trout Creek Sandstone target horizon from being reached.









I-K

H

ELLGEN

G

Coal

Top TM

U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. R-16-HG Date logged 6/12/81 Ground elevation 6300 ft

T. 6 N., R. 93 W., Sec. 14 : 1150 ft f W. 1, 1150 ft f S. 1

Drilling medium mud Drilled depth 1947 ft Fluid level 156 ft

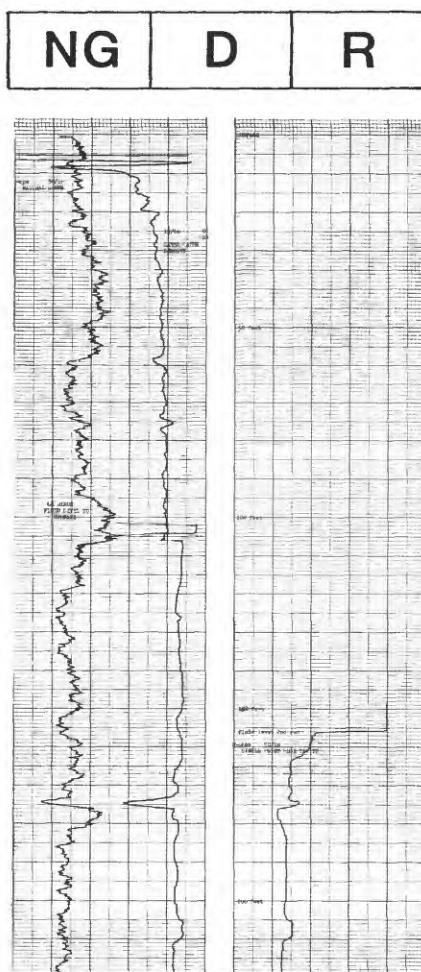
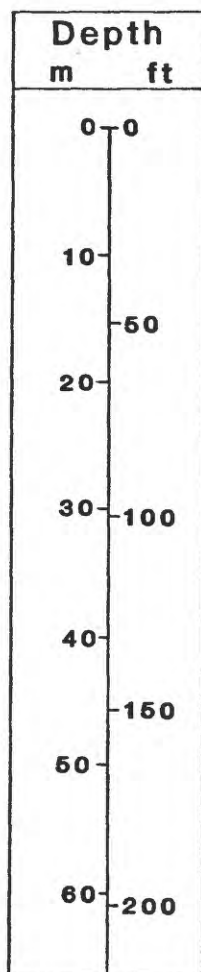
Logging company 1 Logging speed 25 ft/min. Logged depth 1947 ft

Natural gamma (NG) Scale 50 CPS/in. T.C. 1

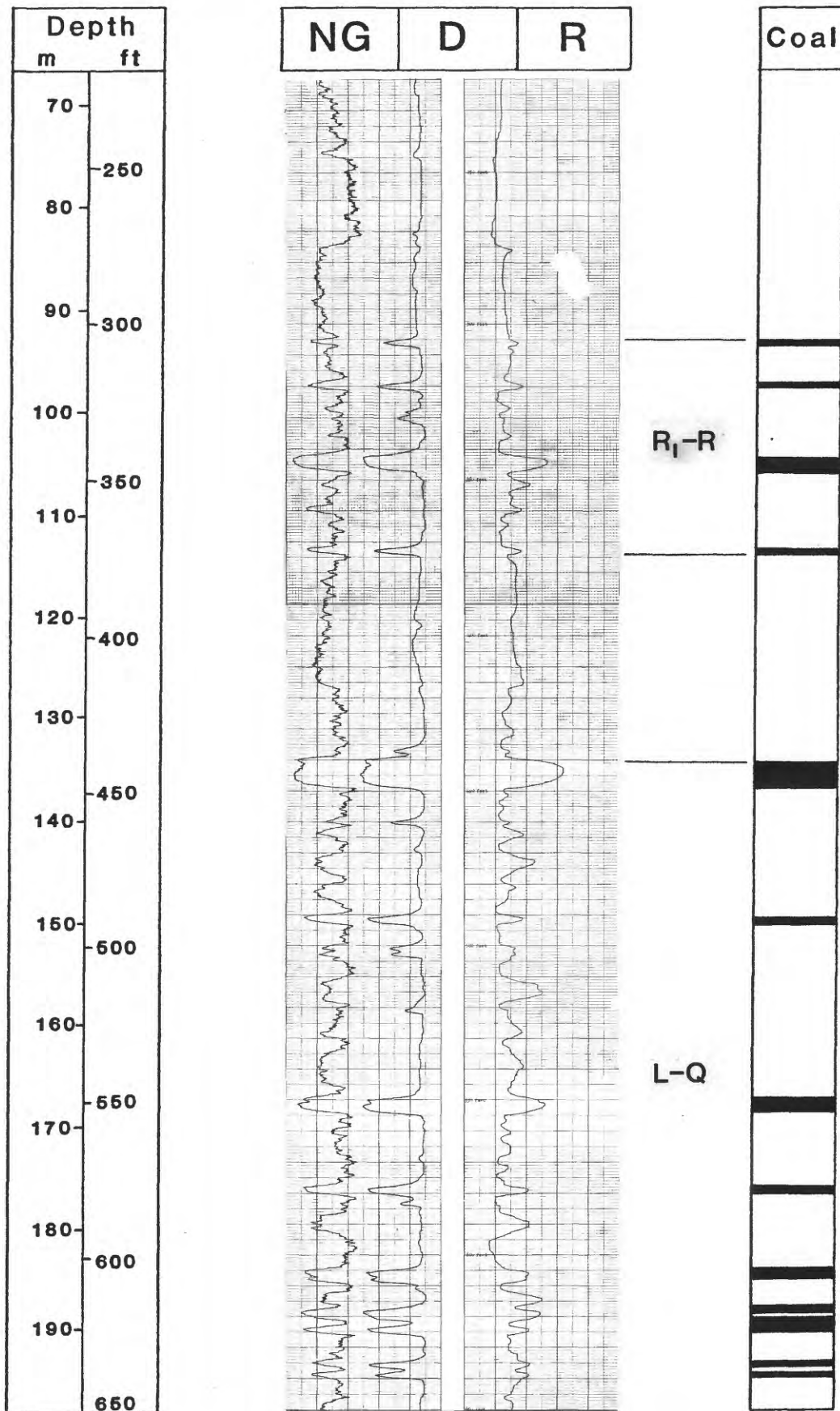
Density (gamma-gamma) (D) Scale 1000 CPS/in. T.C. 1

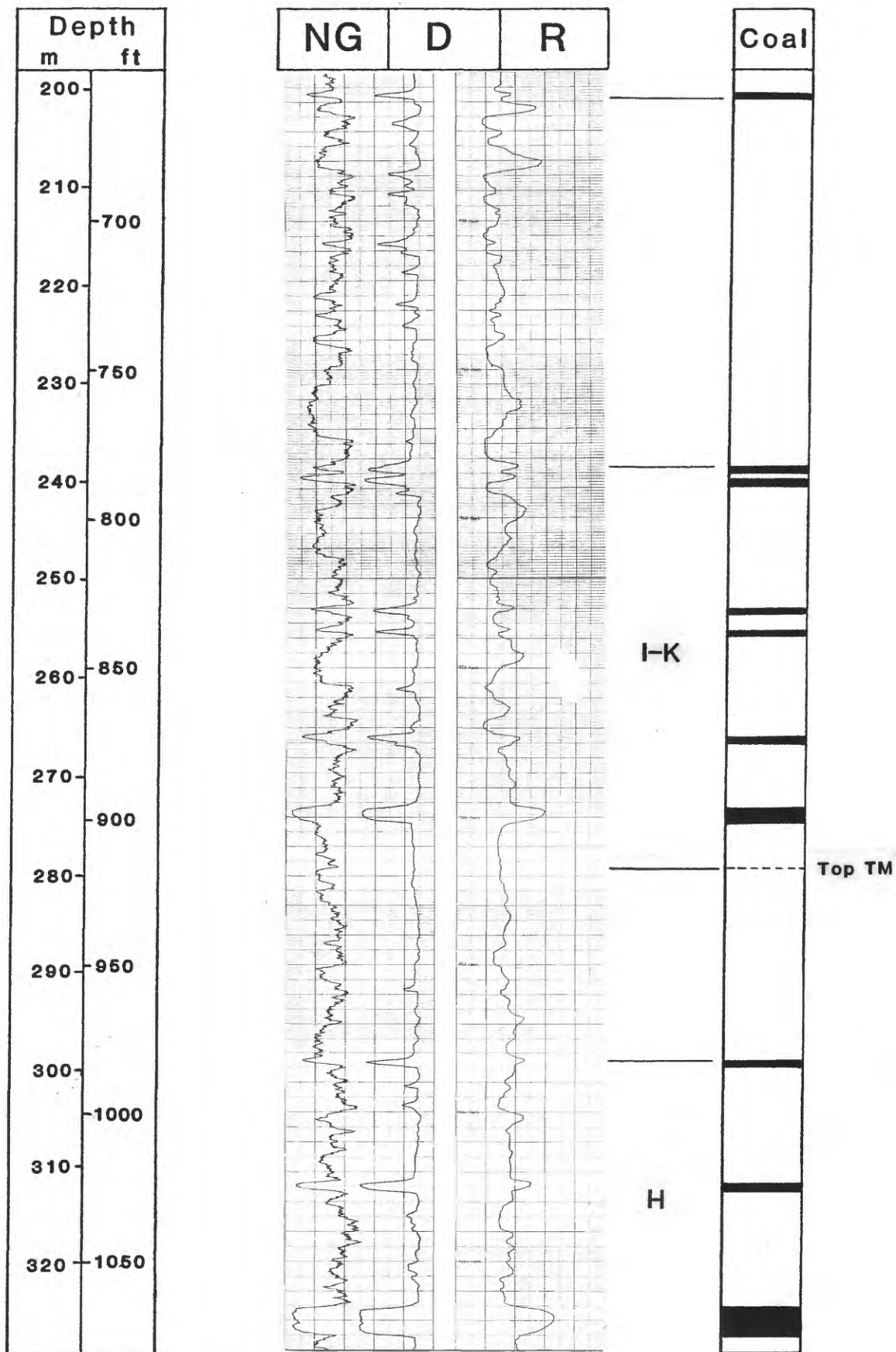
Single point resistance (R) Scale variable

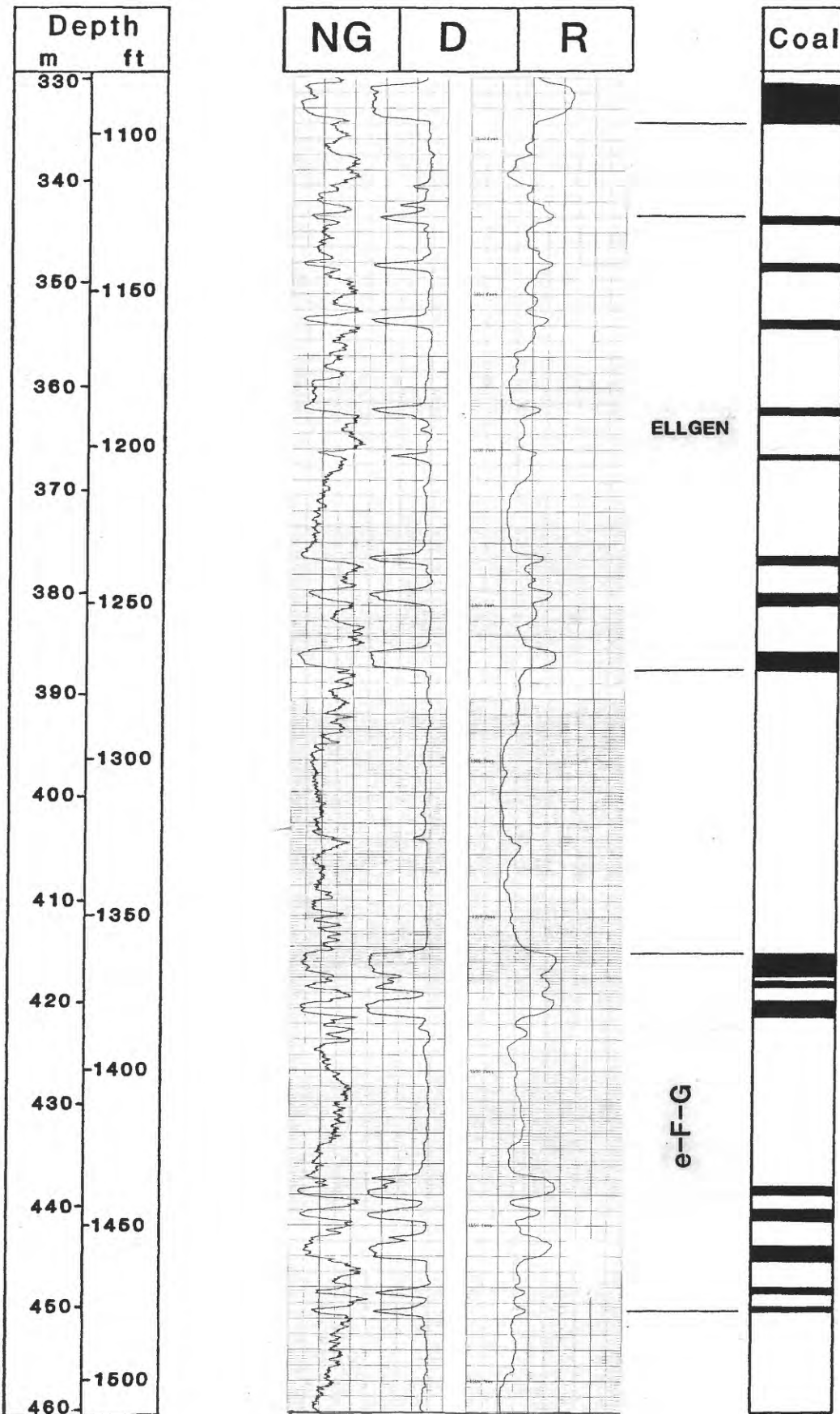
Remarks: 1 Savage Scientific

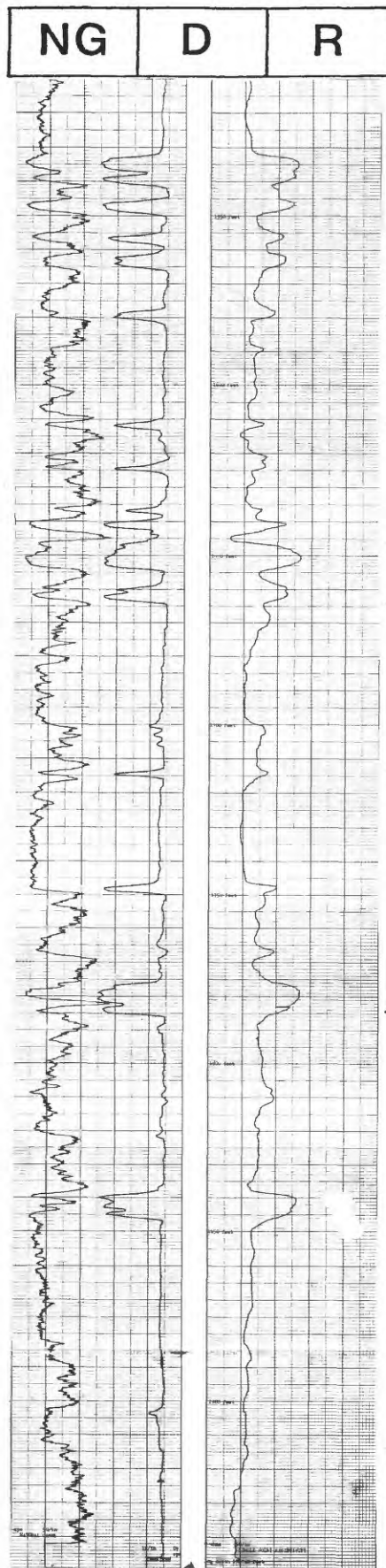
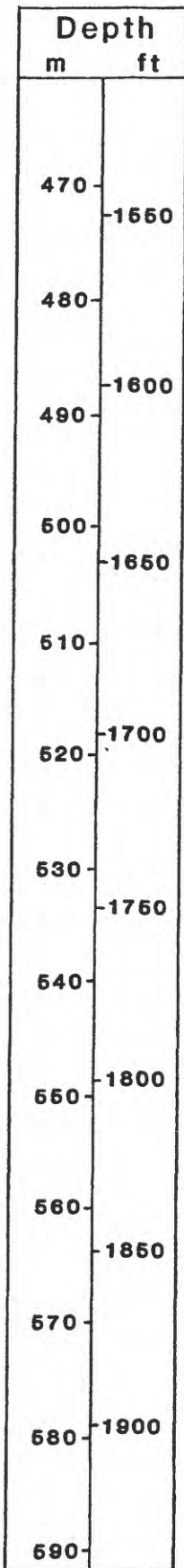


S







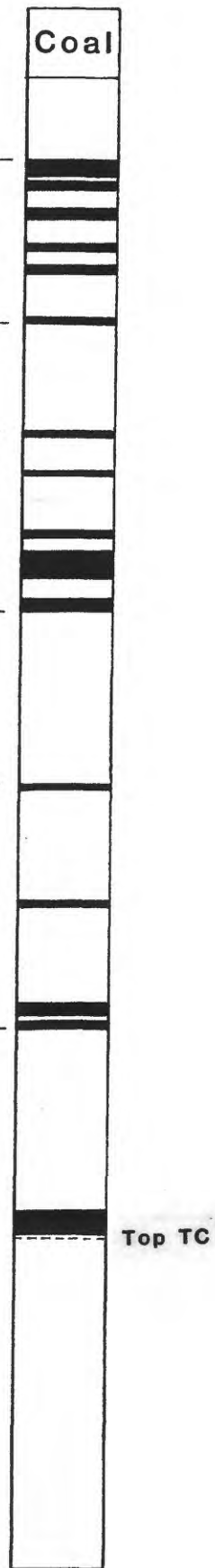


E

C-D

B

A



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. HG-1-81 Date logged 6/4/81 Ground elevation 6371 ft

T. 6 N., R. 93 W., Sec. 10 : 925 ft f W. 1, 1900 ft f S. 1

Drilling medium mud Drilled depth 2300 ft Fluid level 18 ft

Logging company 1 Logging speed 25 ft/min. Logged depth 2296 ft

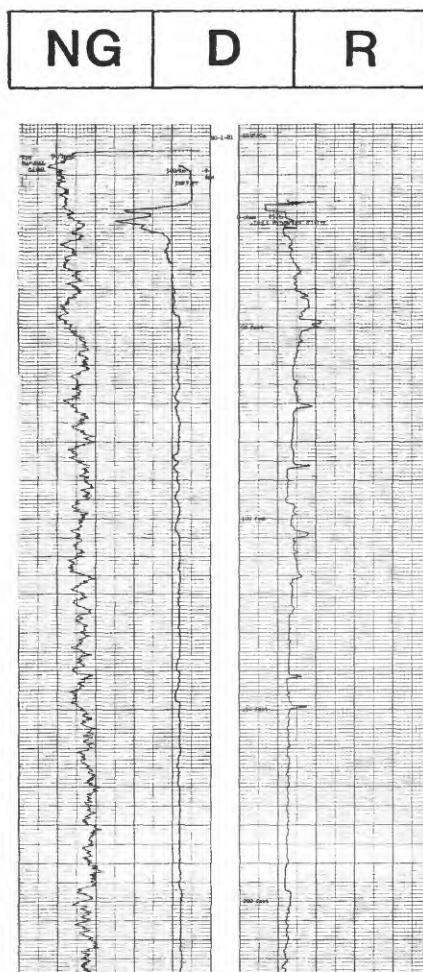
Natural gamma (NG) Scale 50 CPS/in. T.C. 1

Density (gamma-gamma) (D) Scale 500 CPS/in. T.C. 1

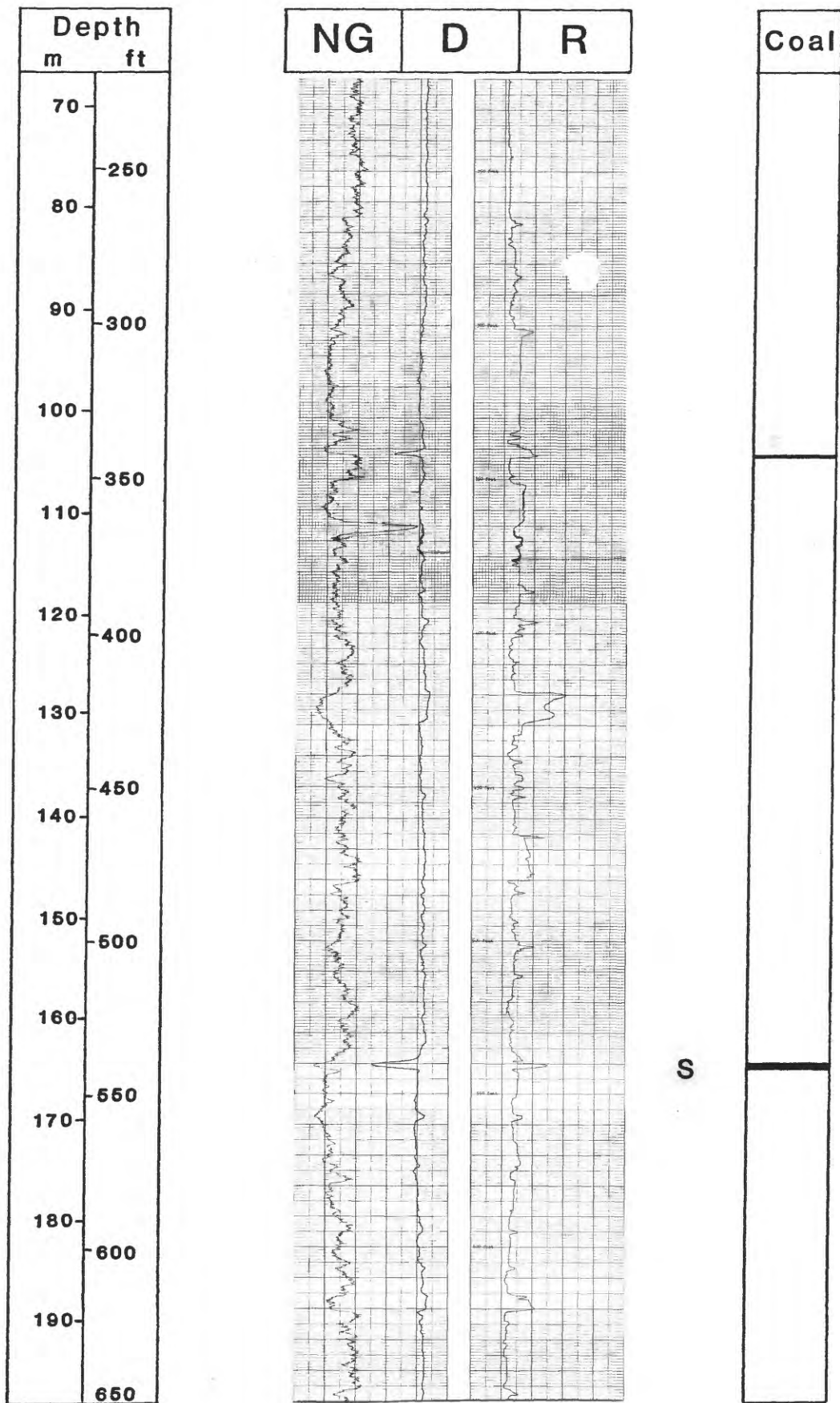
Single point resistance (R) Scale variable

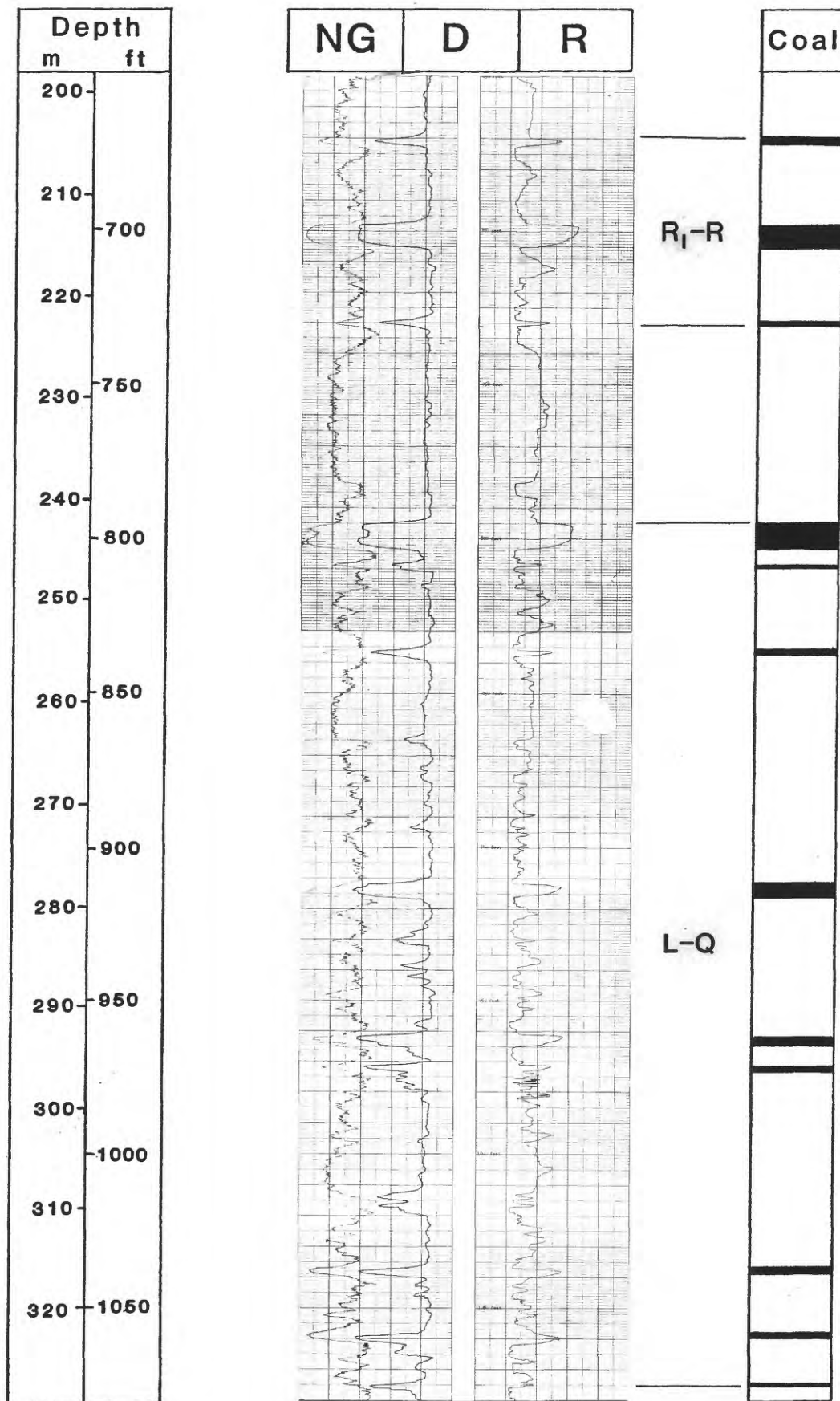
Remarks: 1 Savage Scientific. This hole penetrated the entire Williams Fork
Formation. Coal beds and zones between the Twentymile Trout Creek Sandstones
could not be identified by name.

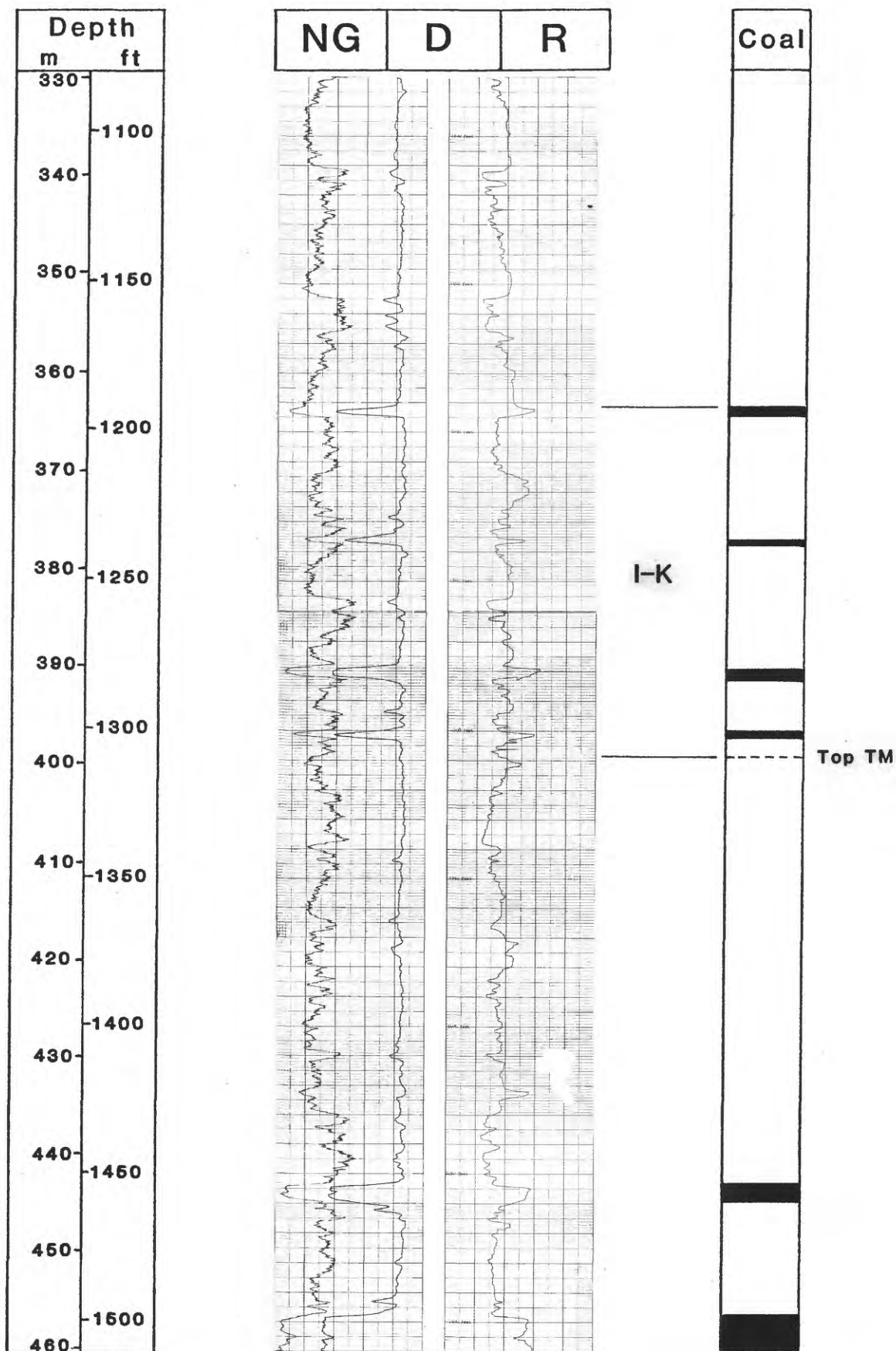
Depth	
m	ft
0	0
10	
50	
20	
30	100
40	
150	
50	
200	



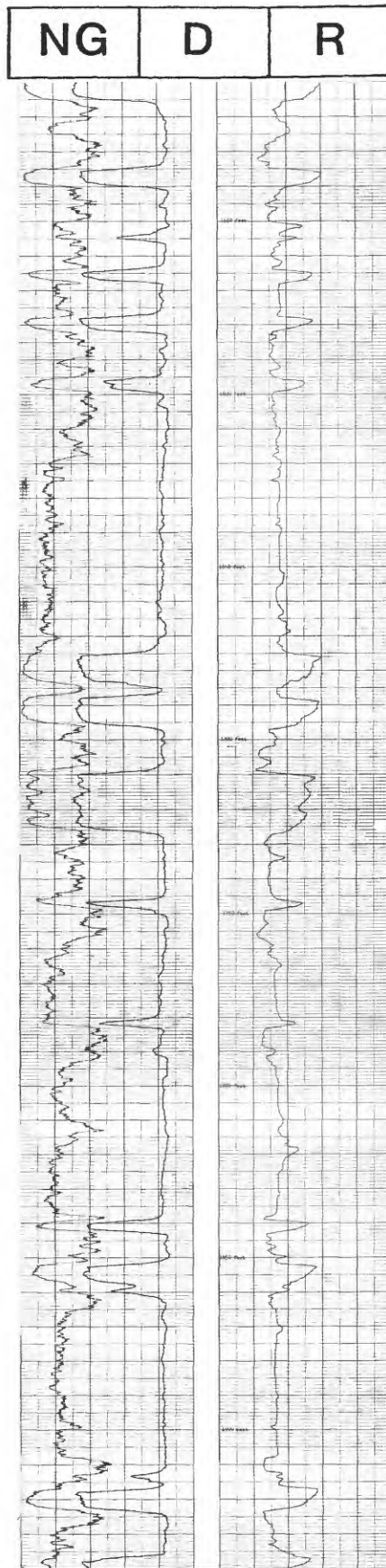
Coal



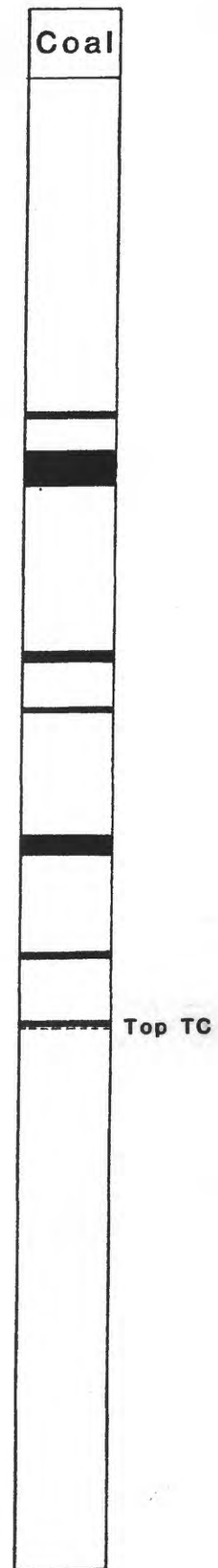
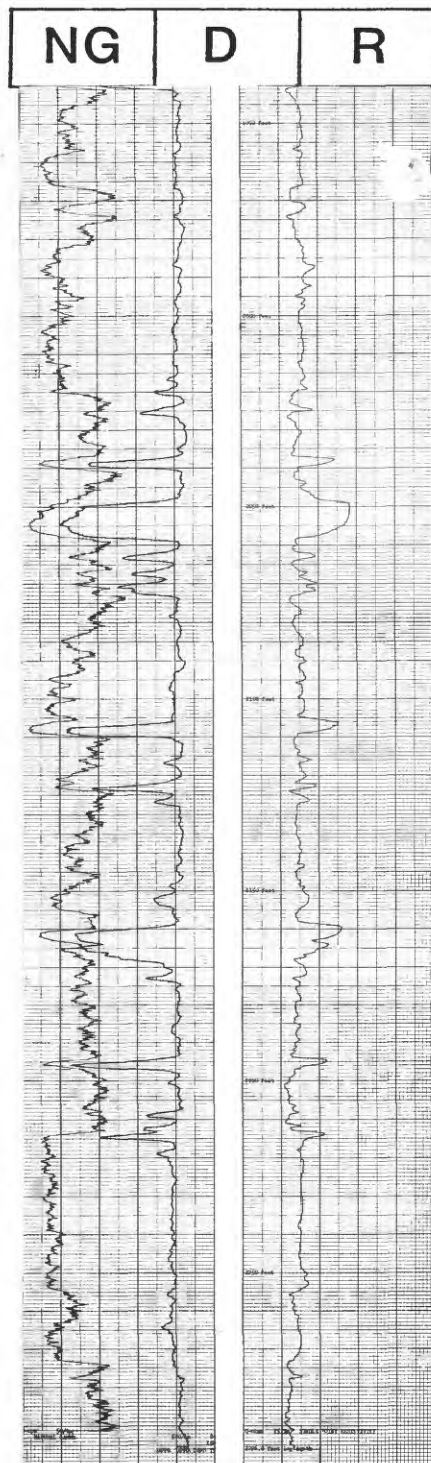




Depth	
m	ft
470	1550
480	
	1600
490	
500	1650
510	
	1700
520	
	1750
530	
	1800
550	
	1850
560	
	1900
570	
580	
590	



Depth	
m	ft
	1950
600	
	2000
610	
	2050
620	
	2100
630	
	2150
640	
	2200
650	
	2250
660	
	2300
670	
	2350
680	
690	
700	
710	
720	



U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. HG-2-81 Date logged 6/17/81 Ground elevation 6195 ft

T. 6 N., R. 92 W., Sec. 19 : 950 ft f W. 1, 1750 ft f N. 1

Drilling medium mud Drilled depth ? Fluid level 16 ft

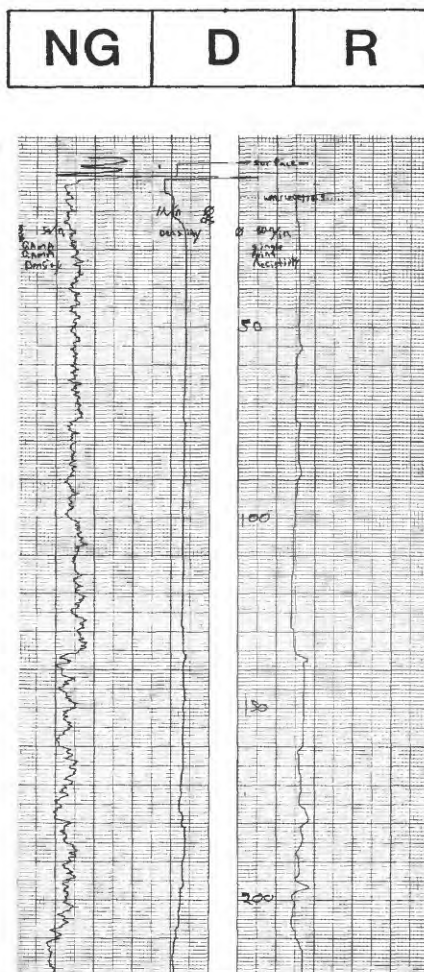
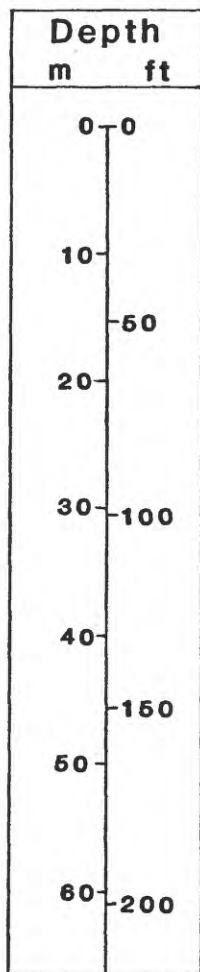
Logging company 1 Logging speed 25 ft/min. Logged depth 2247 ft

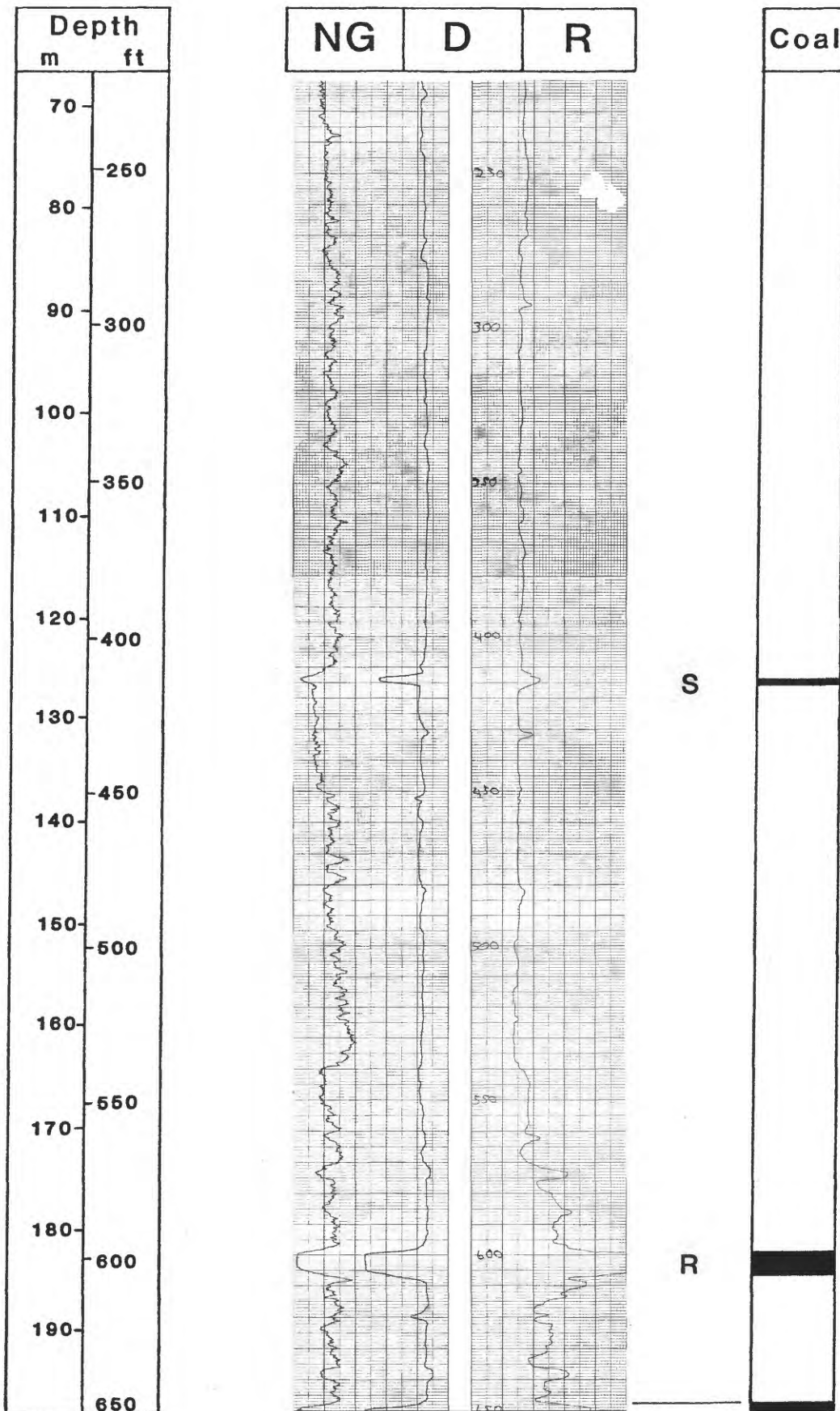
Natural gamma (NG) Scale 50 CPS/in. T.C. 1

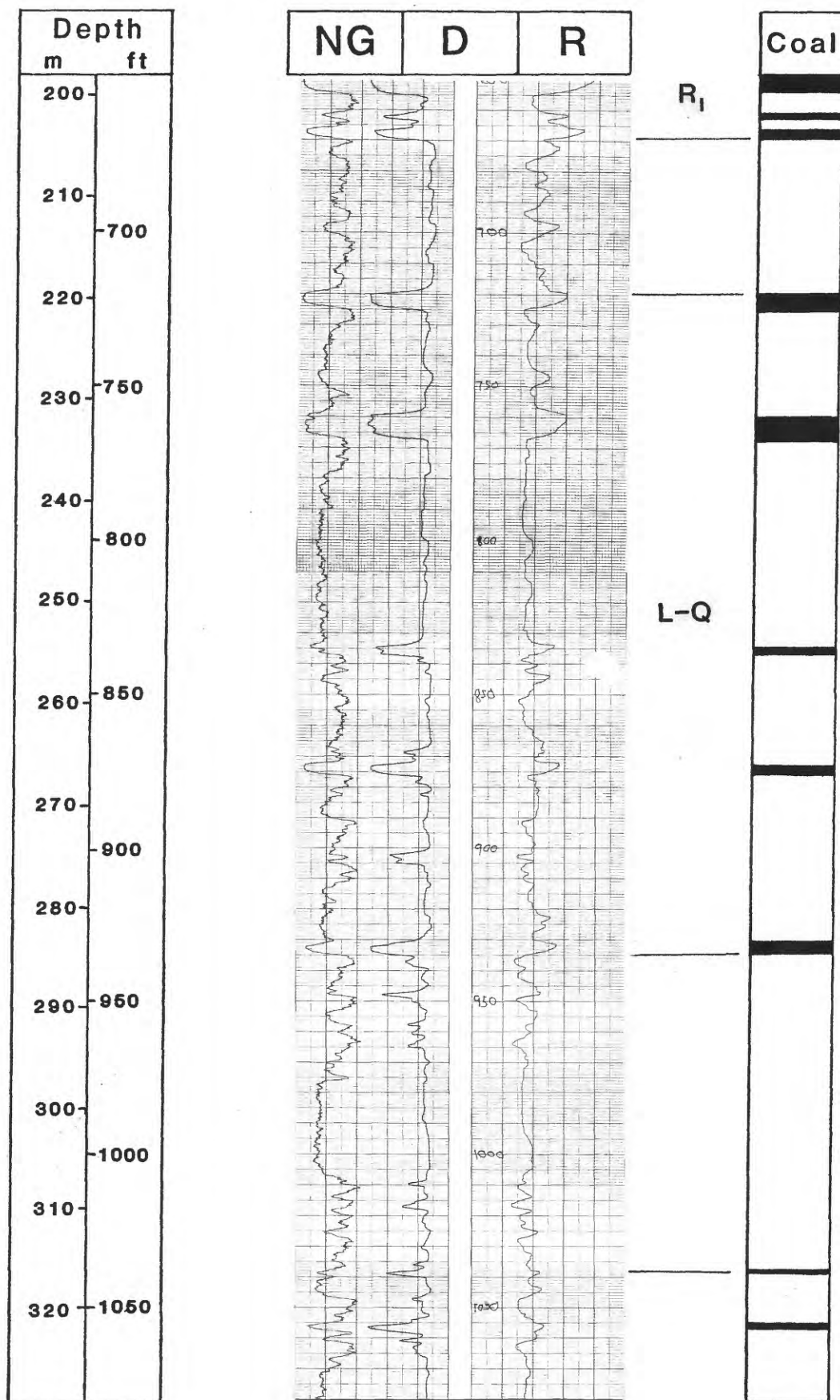
Density (gamma-gamma) (D) Scale 1000 CPS/in. T.C. 1

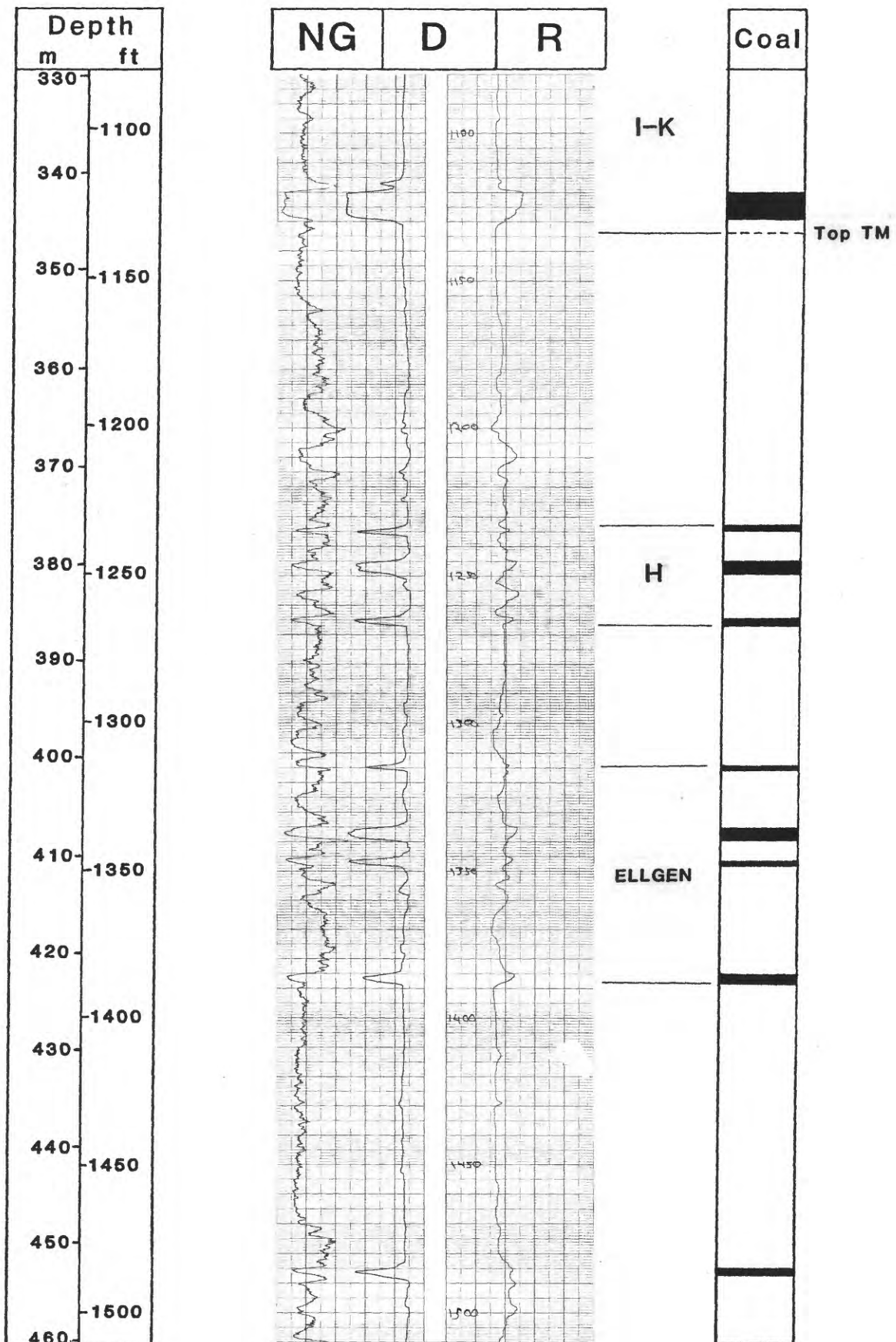
Single point resistance (R) Scale variable

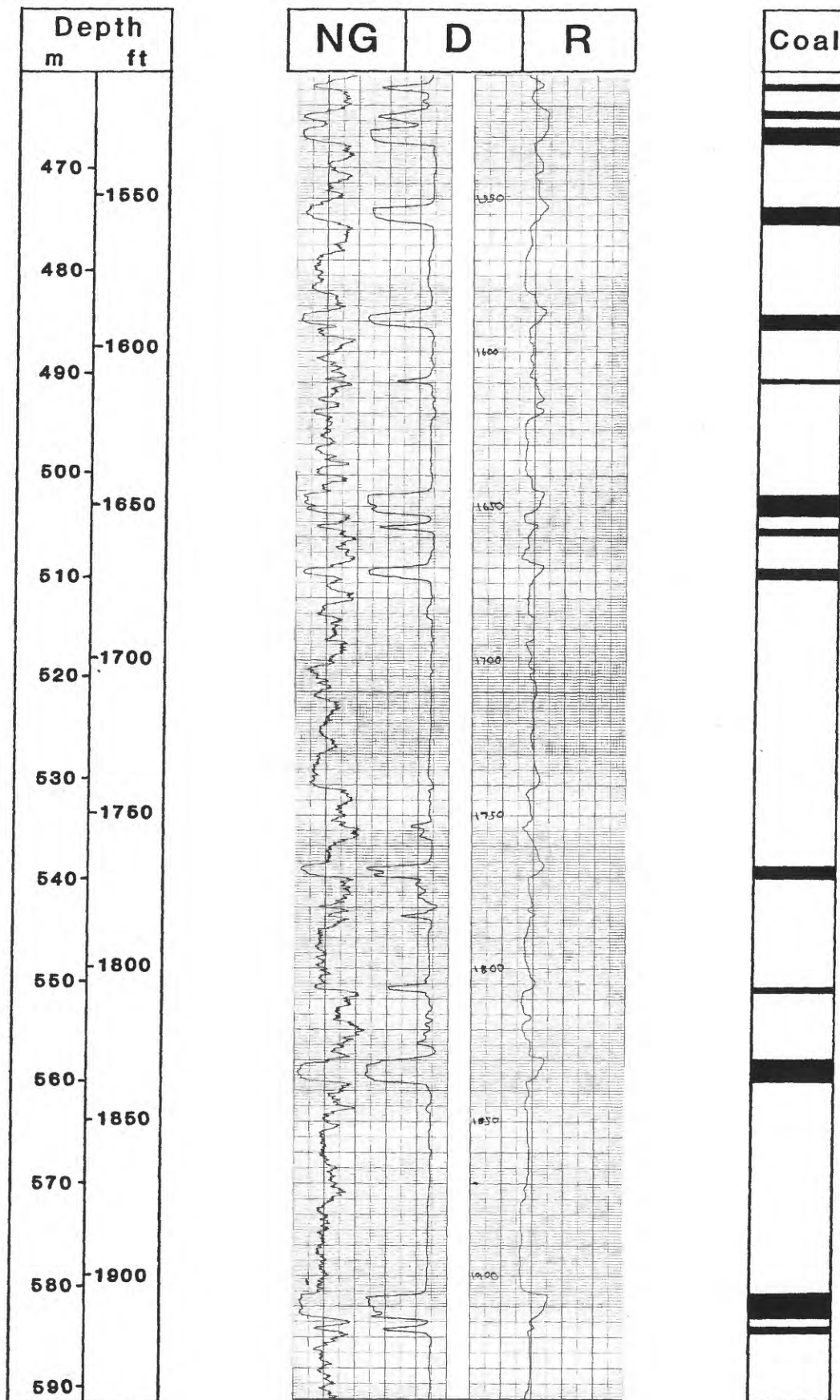
Remarks: 1 Savage Scientific. Some of the coal beds and zones between the
Twentymile and Trout Creek Sandstones could not be identified by name.

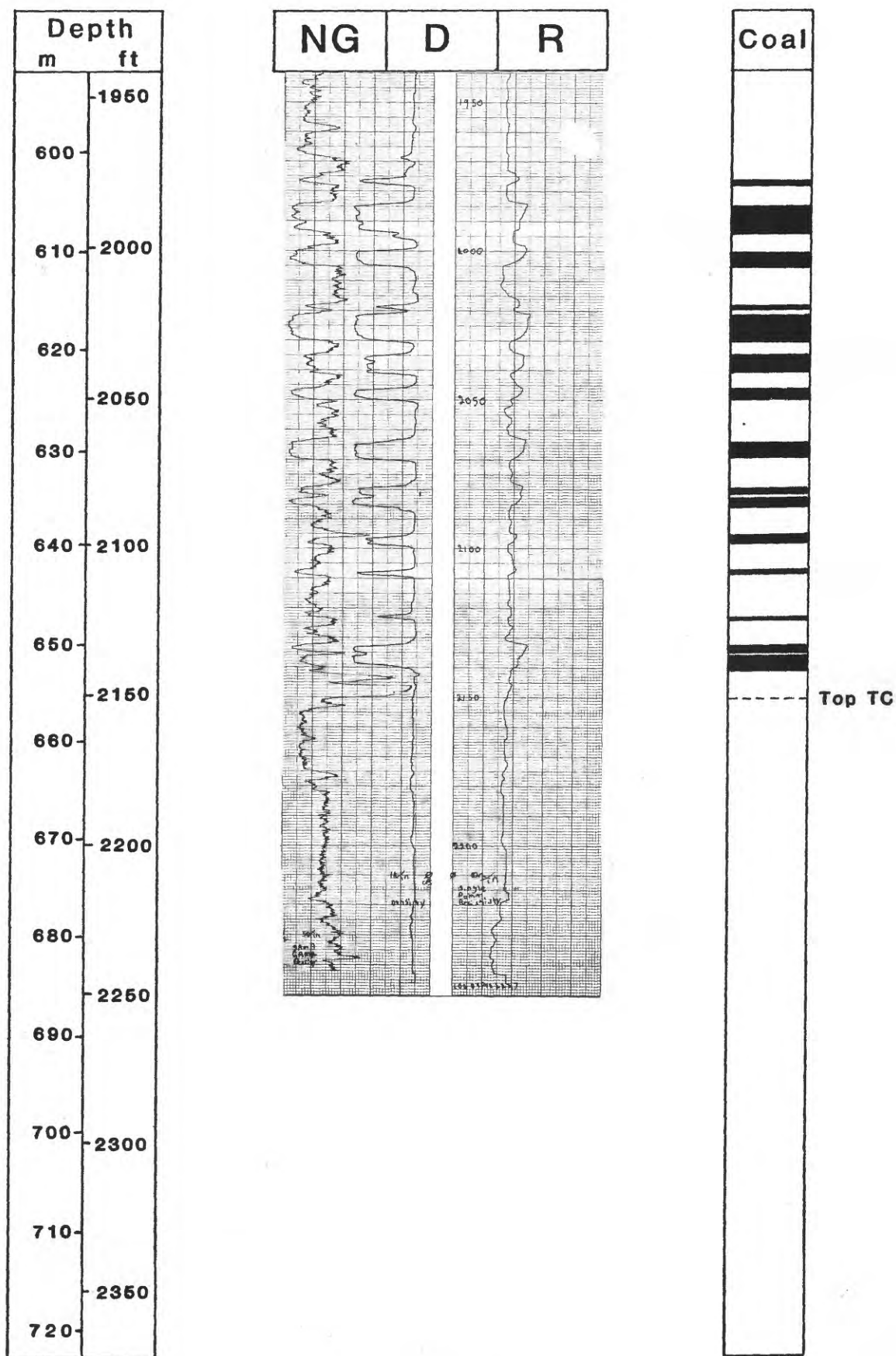












U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. HG-3-81c Date logged 8/1/81 Ground elevation 6355 ft

T. 6 N., R. 92 W., Sec. 31 : 2700 ft f W. 1, 1550 ft f N. 1

Drilling medium mud¹ Drilled depth 1217 ft Fluid level 10 ft

Logging company USGS Logging speed 20 ft/min. Logged depth 1200 ft

Natural gamma (NG) Scale 9.39 CPS/in. T.C. 4

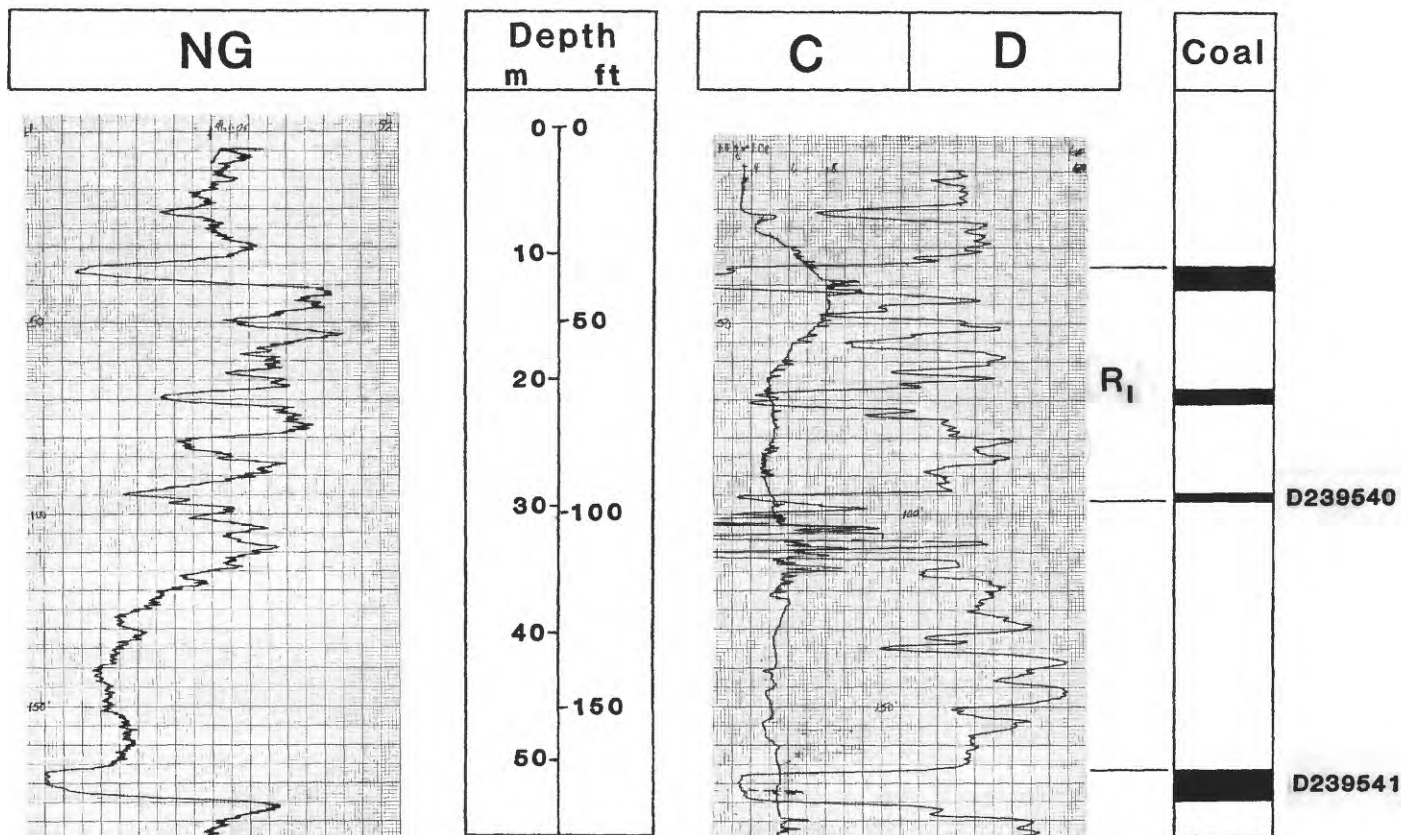
Caliper (C) Scale 1 in./log div.

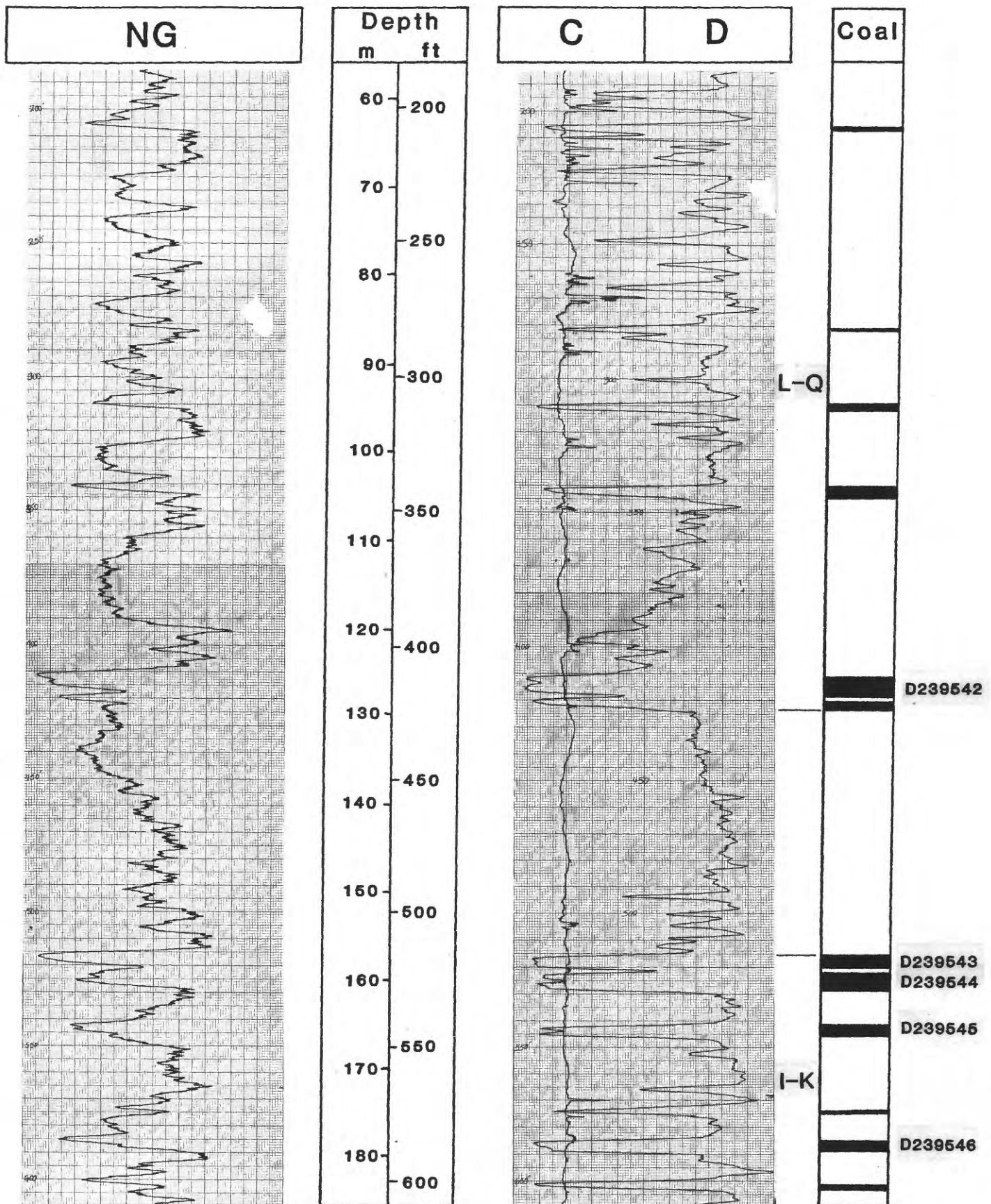
Density (gamma-gamma) (D) Scale ? T.C. 3

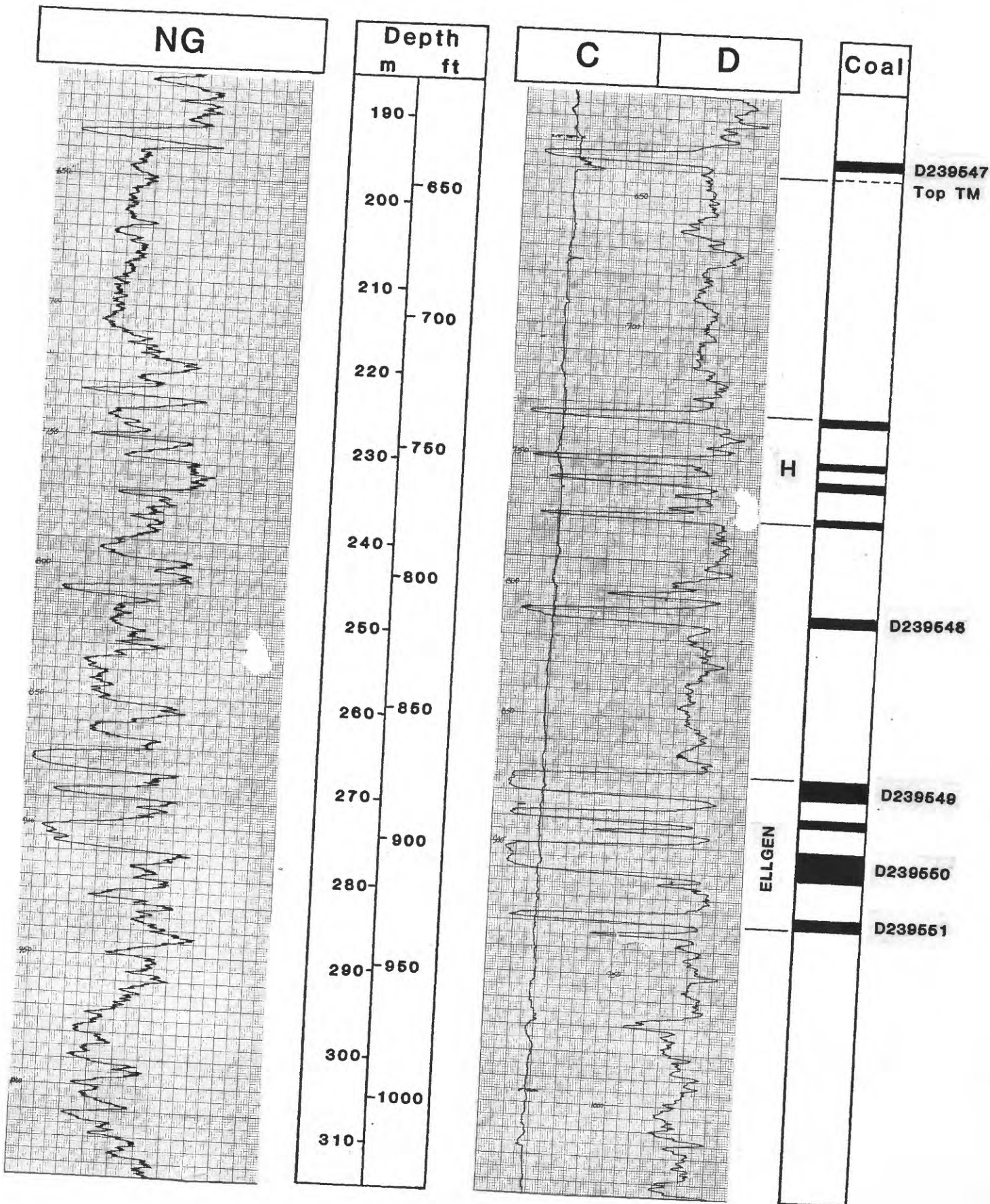
Spontaneous potential (SP) Scale 2

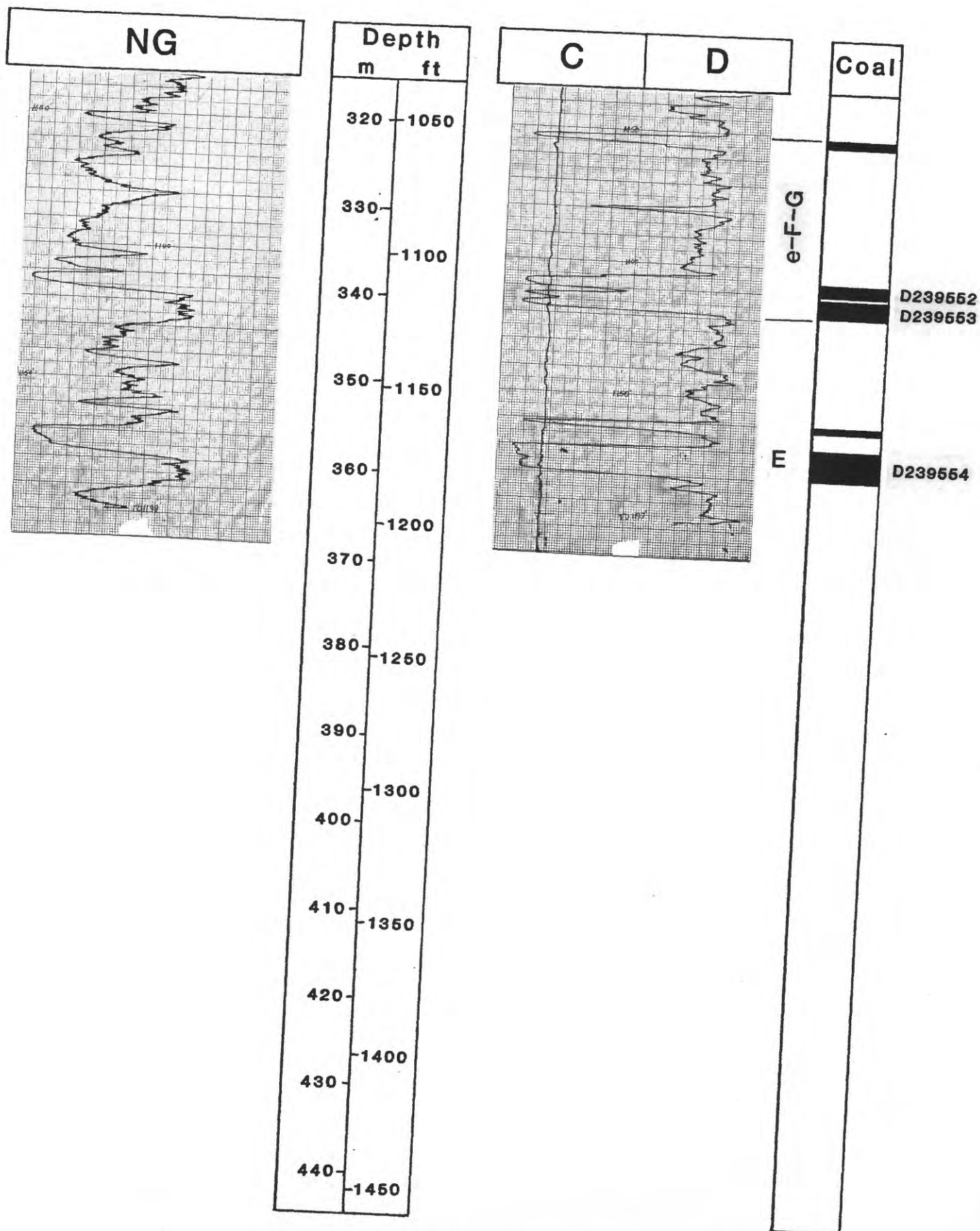
Single point resistance (R) Scale variable

Remarks: ¹Hole filled with fresh water when logged. ²100 mv/log div. from 1200 ft to 180 ft; 200 mv/log div. from 180 ft to 0 ft. Note: This hole cored coal intervals and was a twin of R-11-HG drilled in 1977 (Meyer, 1978).

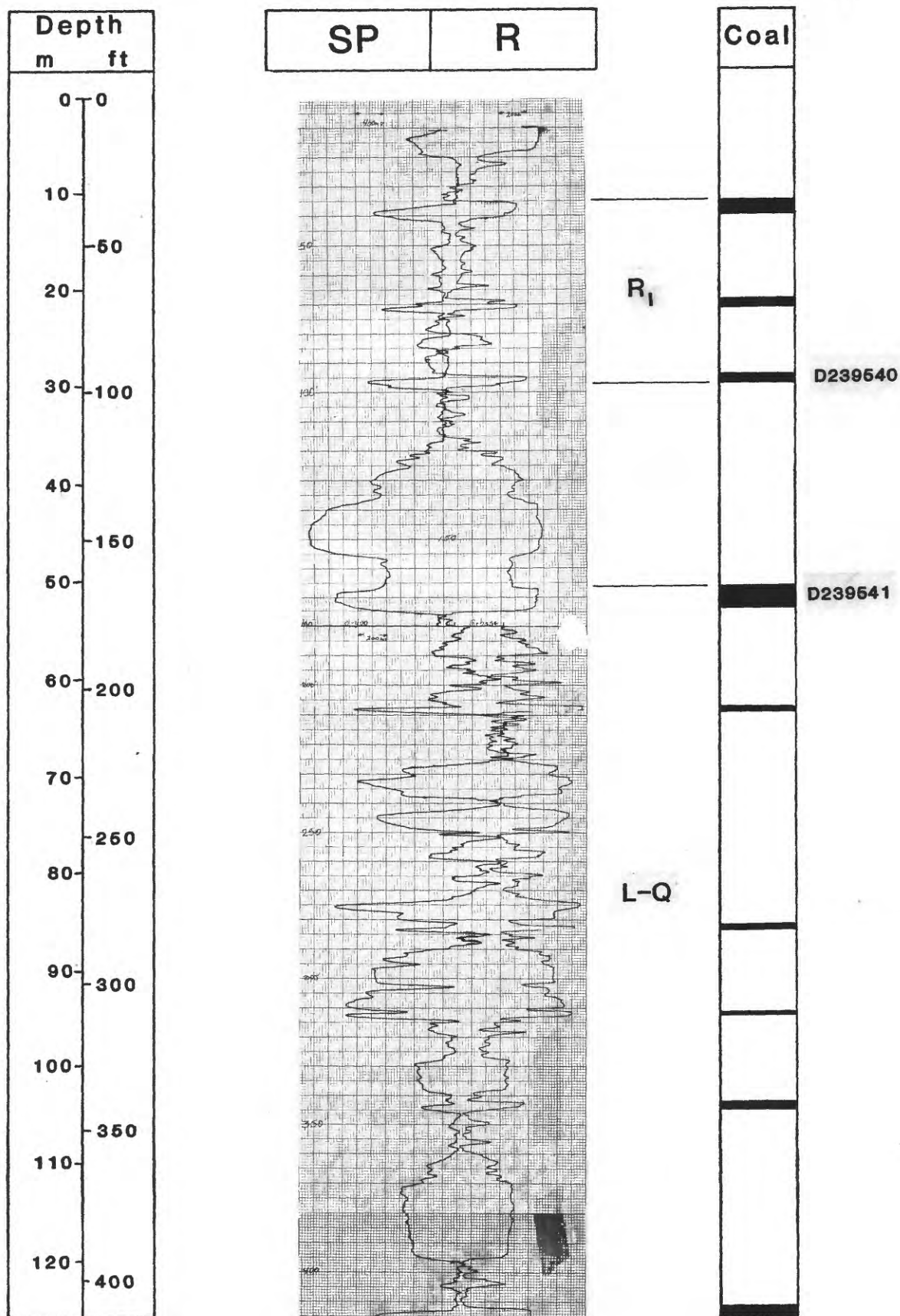


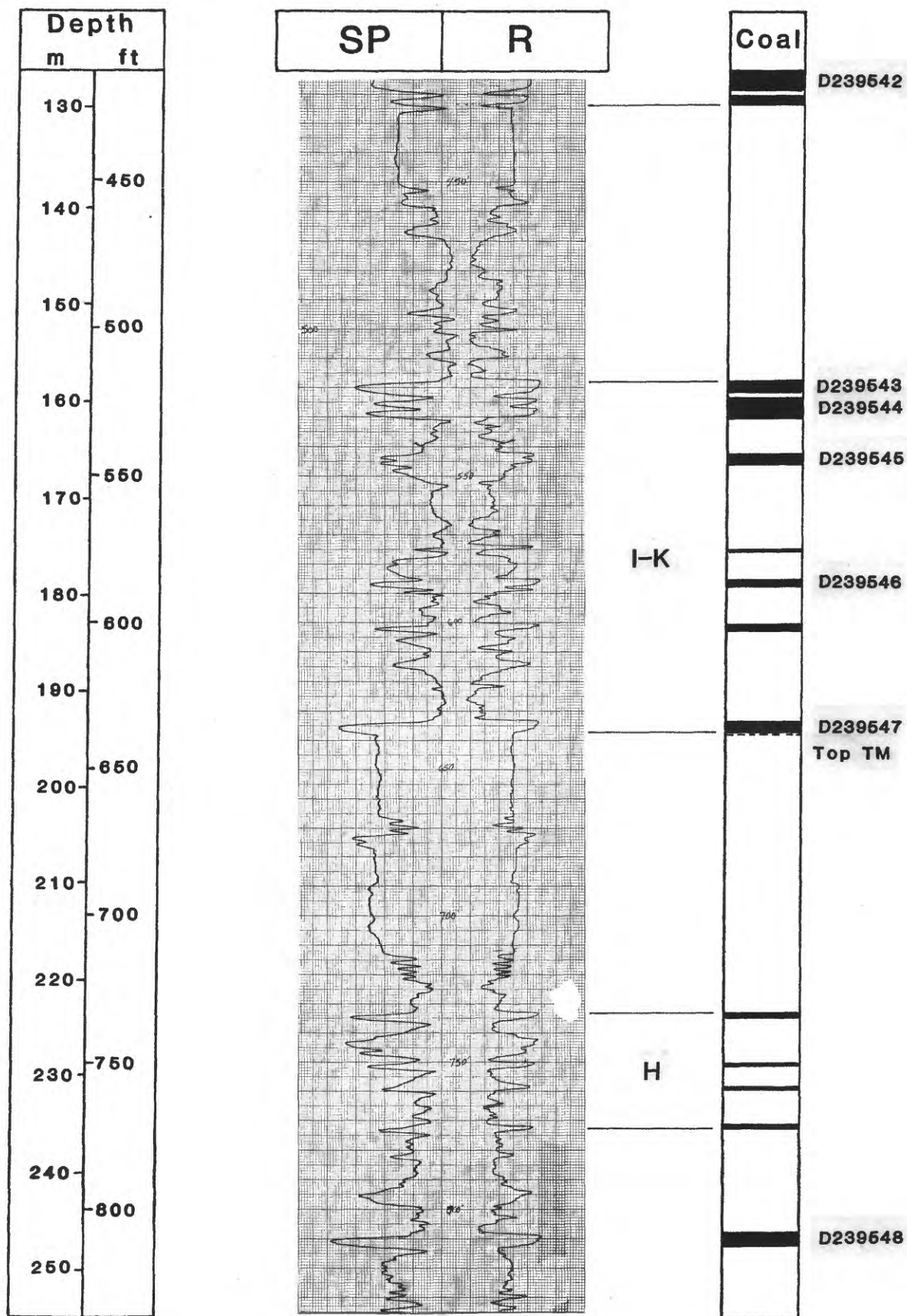


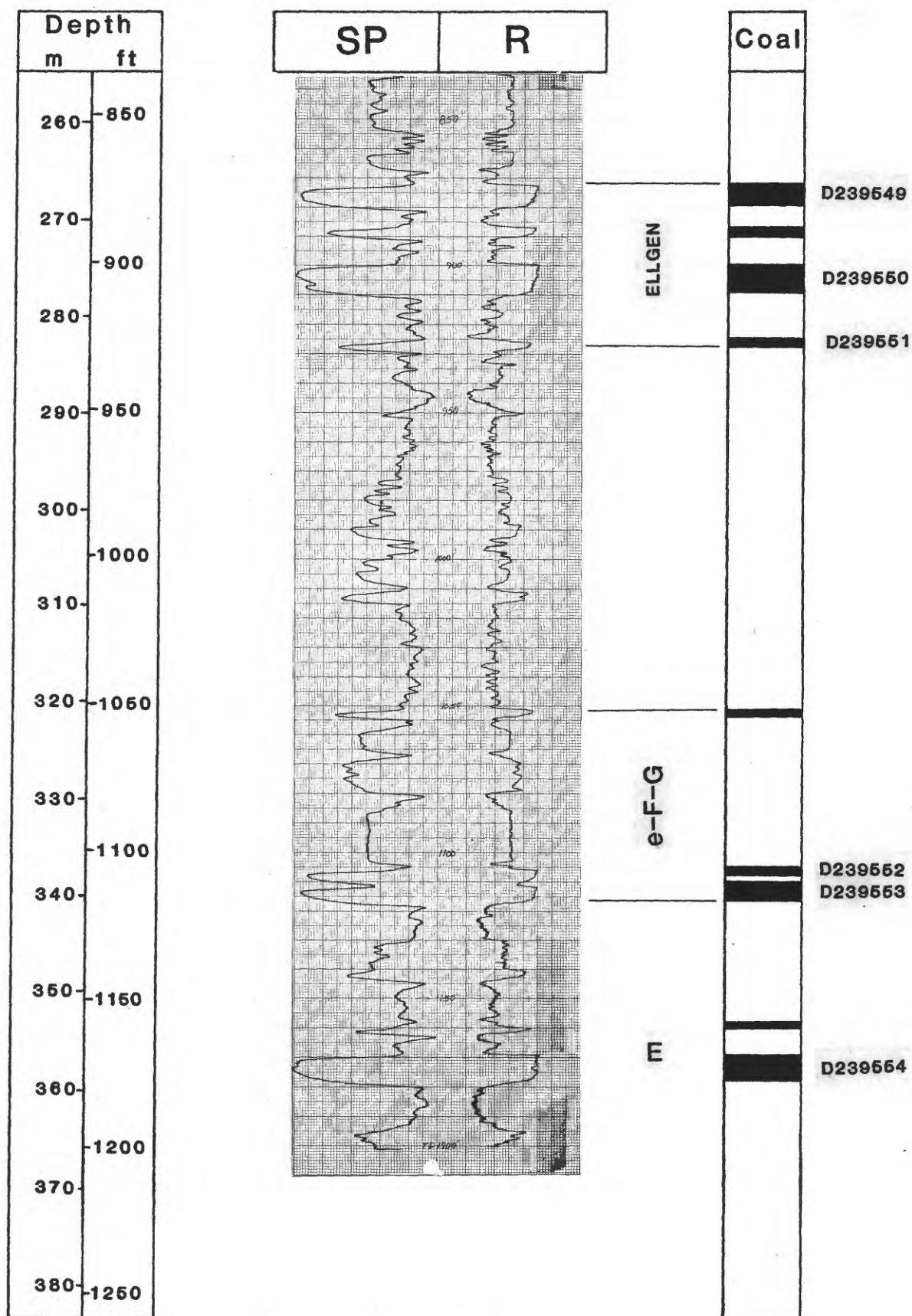




Hole no. HG-3-81c (continued)







U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. HC-4-81c Date logged 8/18/81¹ Ground elevation 6410 ft

T. 6 N., R. 92 W., Sec. 30 : 2600 ft f W. 1, 2800 ft f N. 1

Drilling medium mud² Drilled depth 460 ft Fluid level 19 ft

Logging company USGS Logging speed 20 ft/min. Logged depth 459 ft

Natural gamma (NG) Scale 8.16 CPS/in. T.C. 4

Caliper (C) Scale .7 in./log div.

Density (gamma-gamma) (D) Scale ? T.C. 3

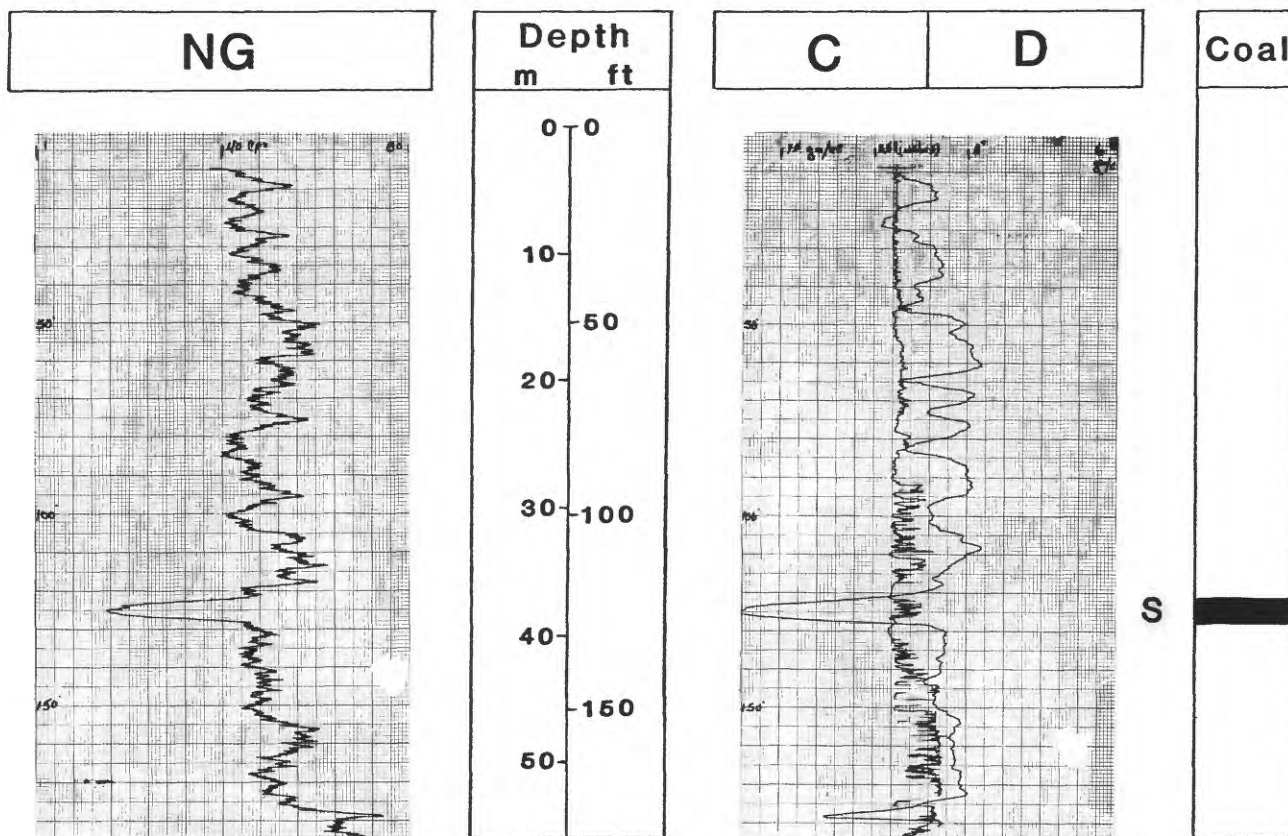
Spontaneous potential (SP) Scale 20 mv/log div.

Single point resistance (R) Scale variable

Remarks: ¹Natural gamma run 8/17/81. ²Hole filled with fresh water when logged.

Note: This hole cored coal intervals and was a twin of R-10-HG drilled in 1977

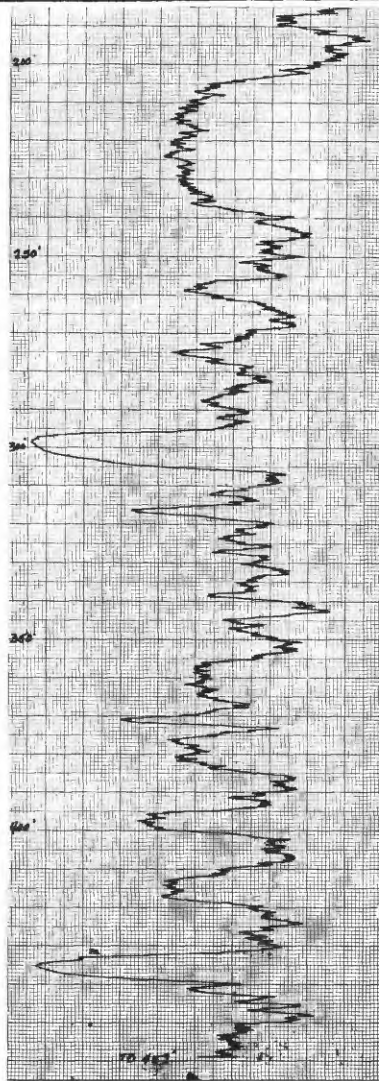
(Meyer, 1978).



S

D239528

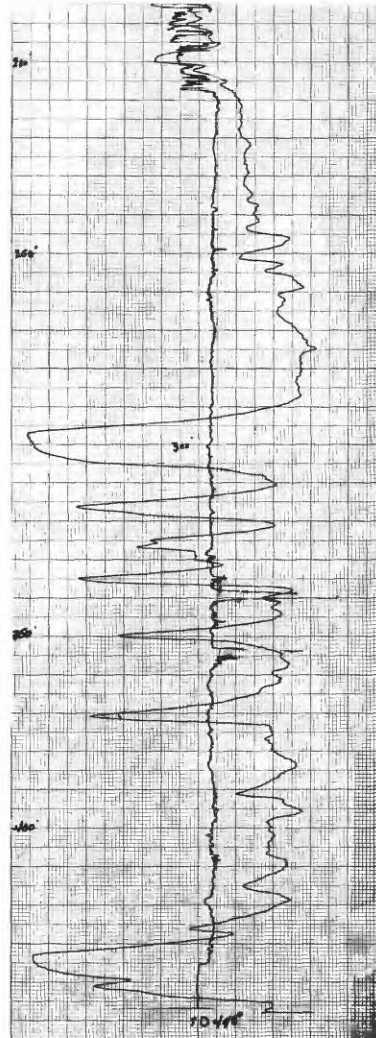
NG



Depth
m ft

60	200
70	250
80	300
90	350
100	400
110	450
120	500
130	550
140	600
150	
160	
170	
180	

C D



Coal

R

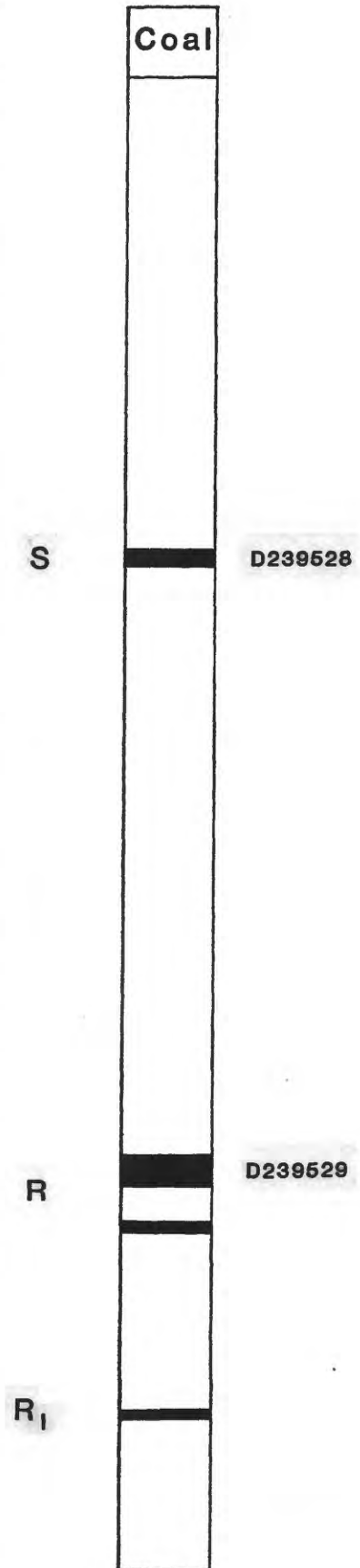
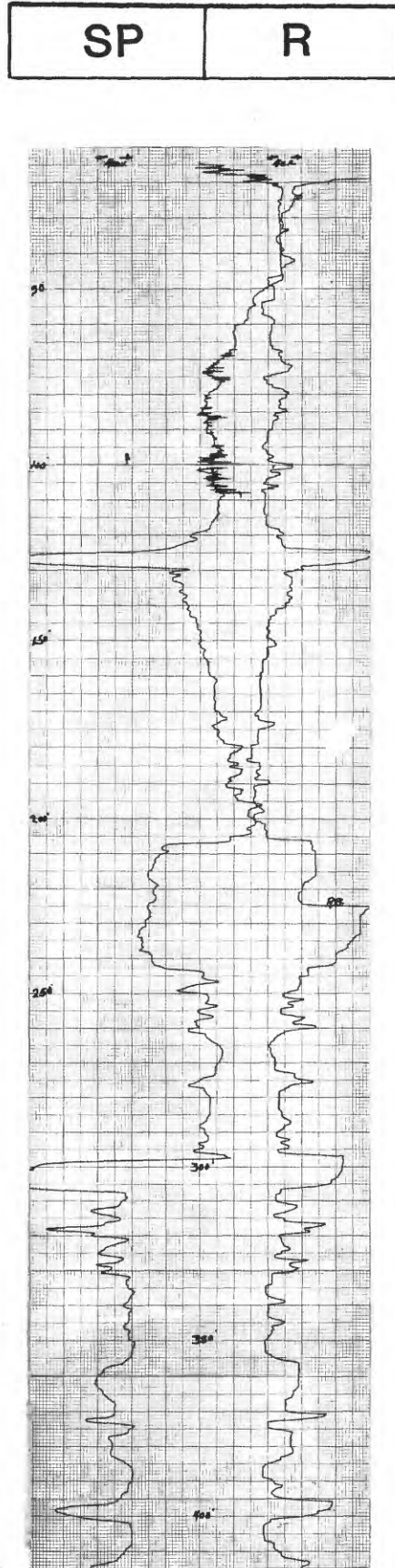
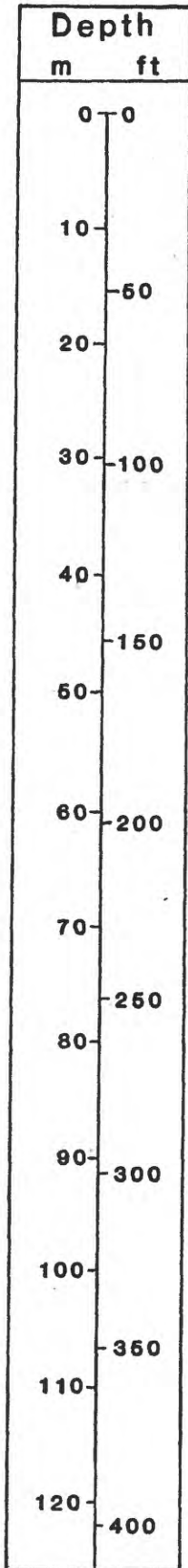
D239529

R₁

Q

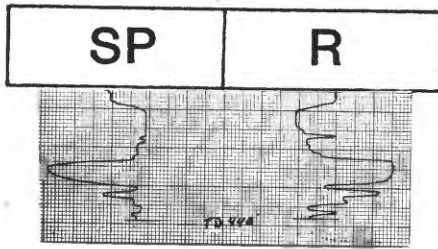
D239530

Hole no. HG-4-81c (continued)



Hole no. HG-4-81c (continued)

Depth	
m	ft
130	
	450
140	
150	500
160	
	550
170	
180	600
190	
	650
200	
210	700
220	
	750
230	
240	800
250	



Q

Coal

D239530

U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. RB-1-81 Date logged 6/29/81 Ground elevation 6382 ft

T. 6 N., R. 92 W., Sec. 13 : 2550 ft f W. 1, 1400 ft f N. 1

Drilling medium mud Drilled depth 2070 ft(?) Fluid level 81 ft

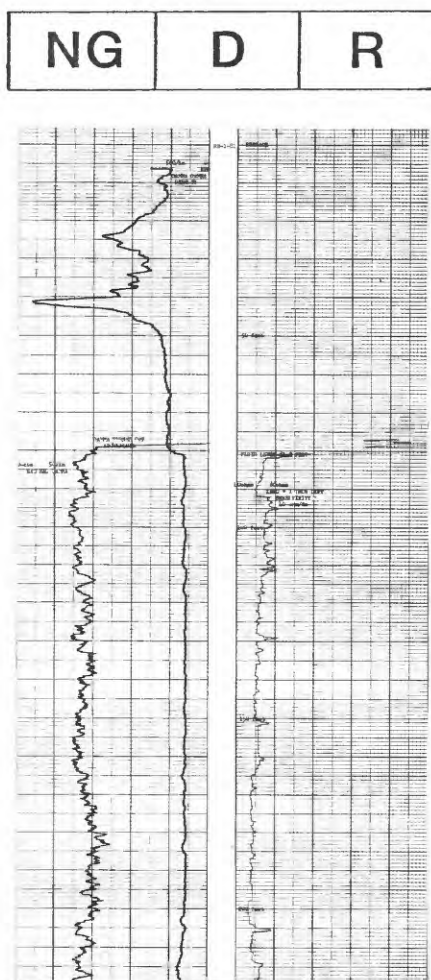
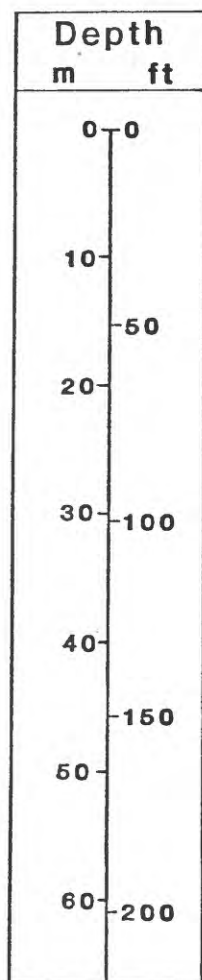
Logging company ¹ Logging speed 25 ft/min. Logged depth 2070 ft

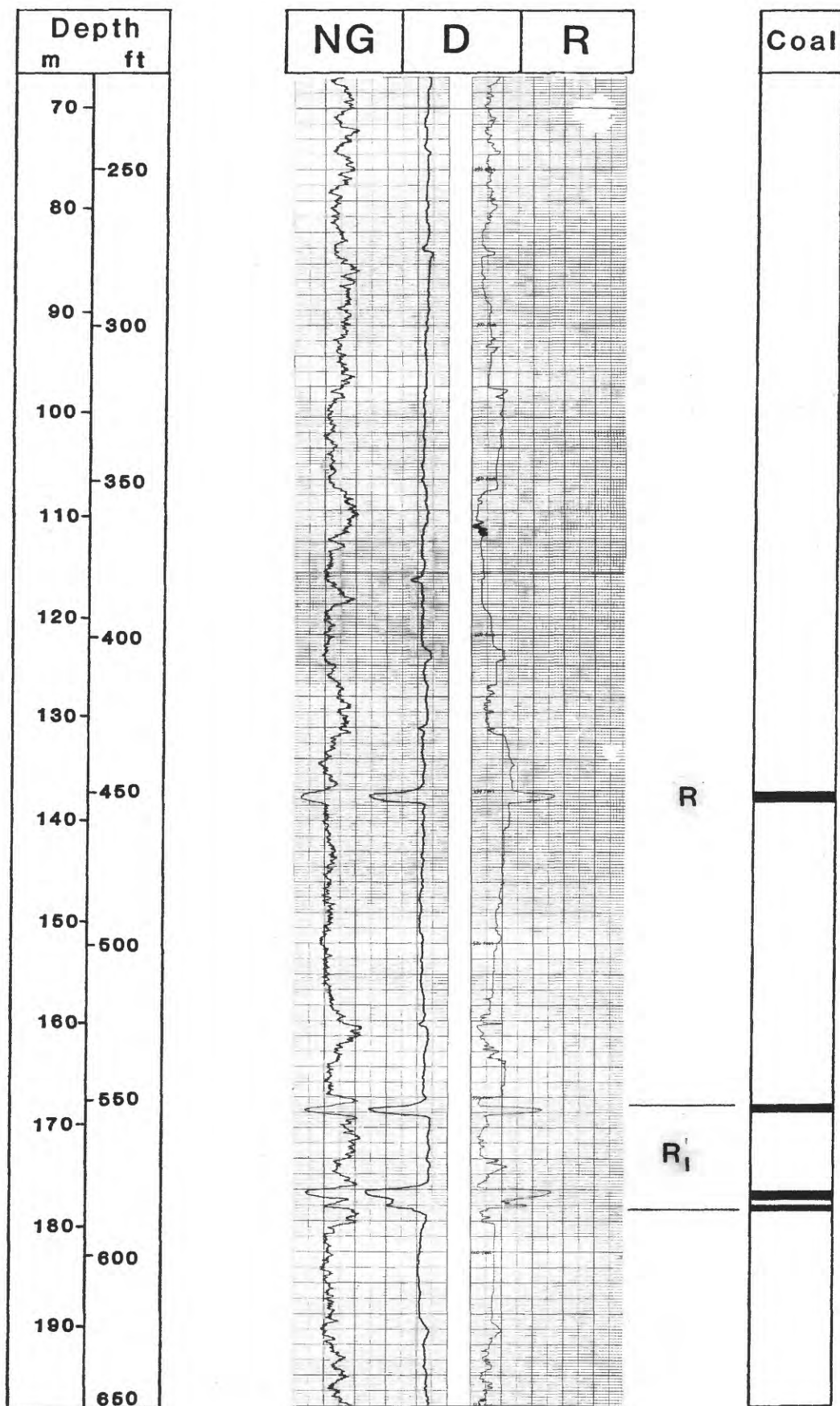
Natural gamma (NG) Scale 50 CPS/in. T.C. 1

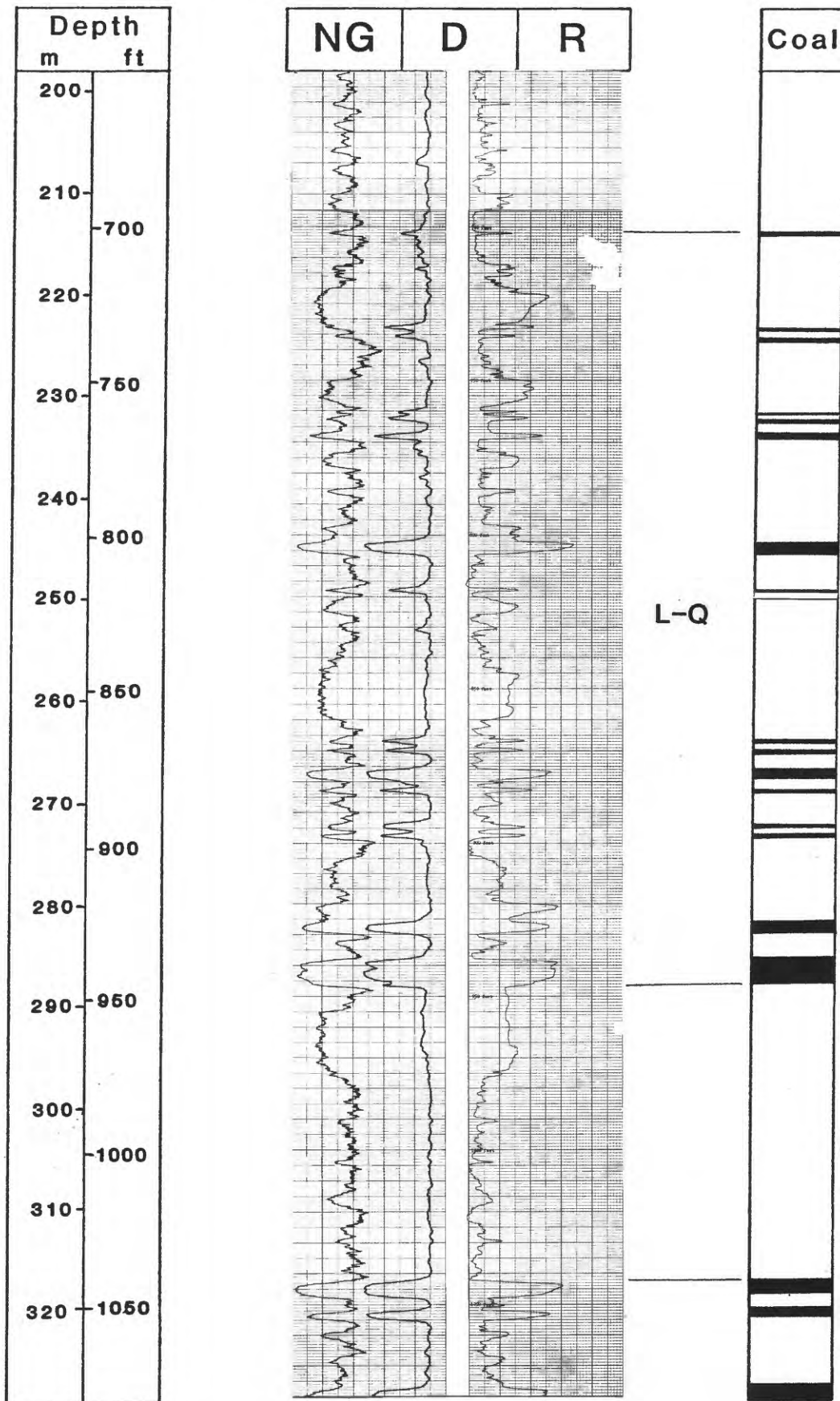
Density (gamma-gamma) (D) Scale 500 CPS/in. T.C. 1

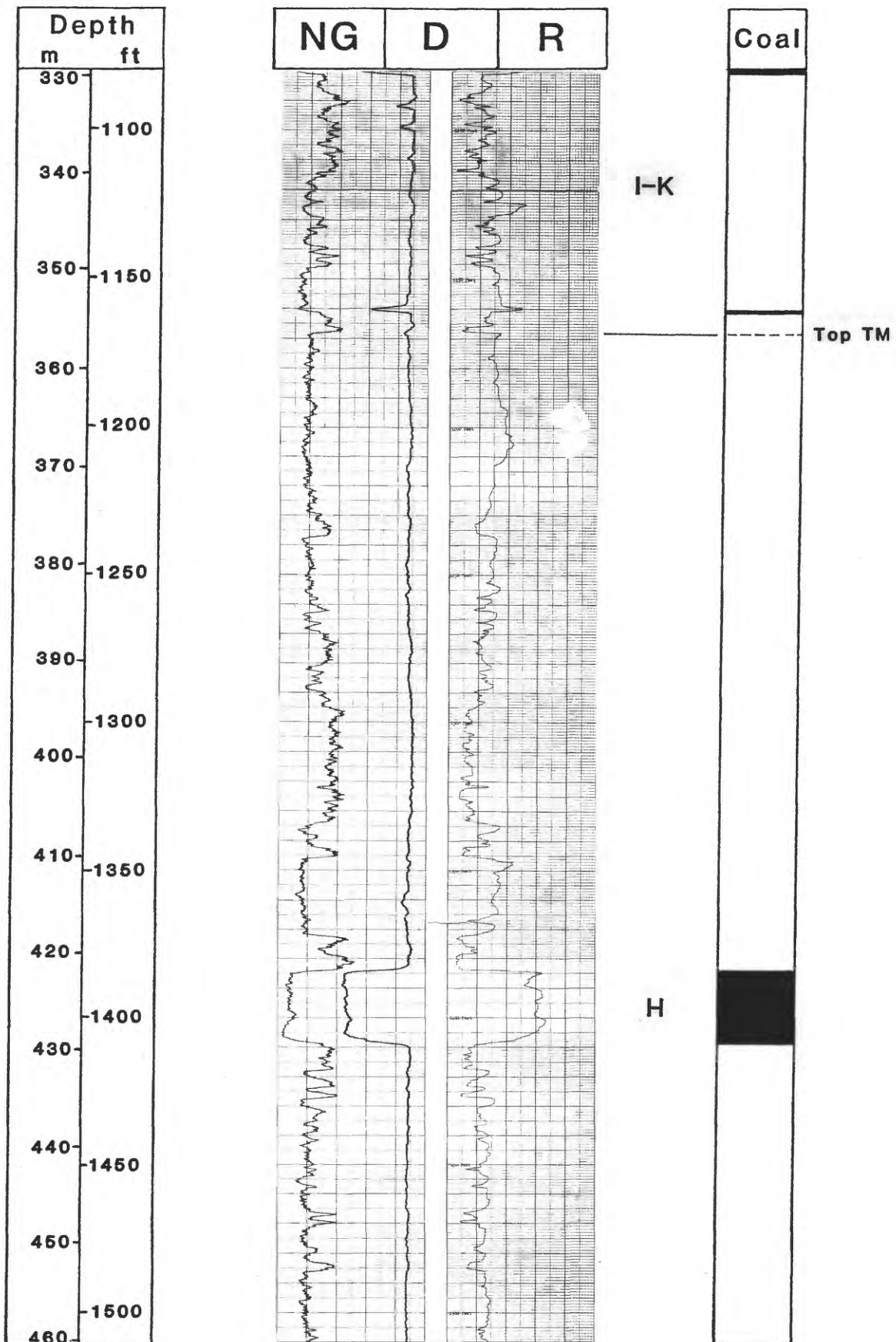
Single point resistance (R) Scale variable

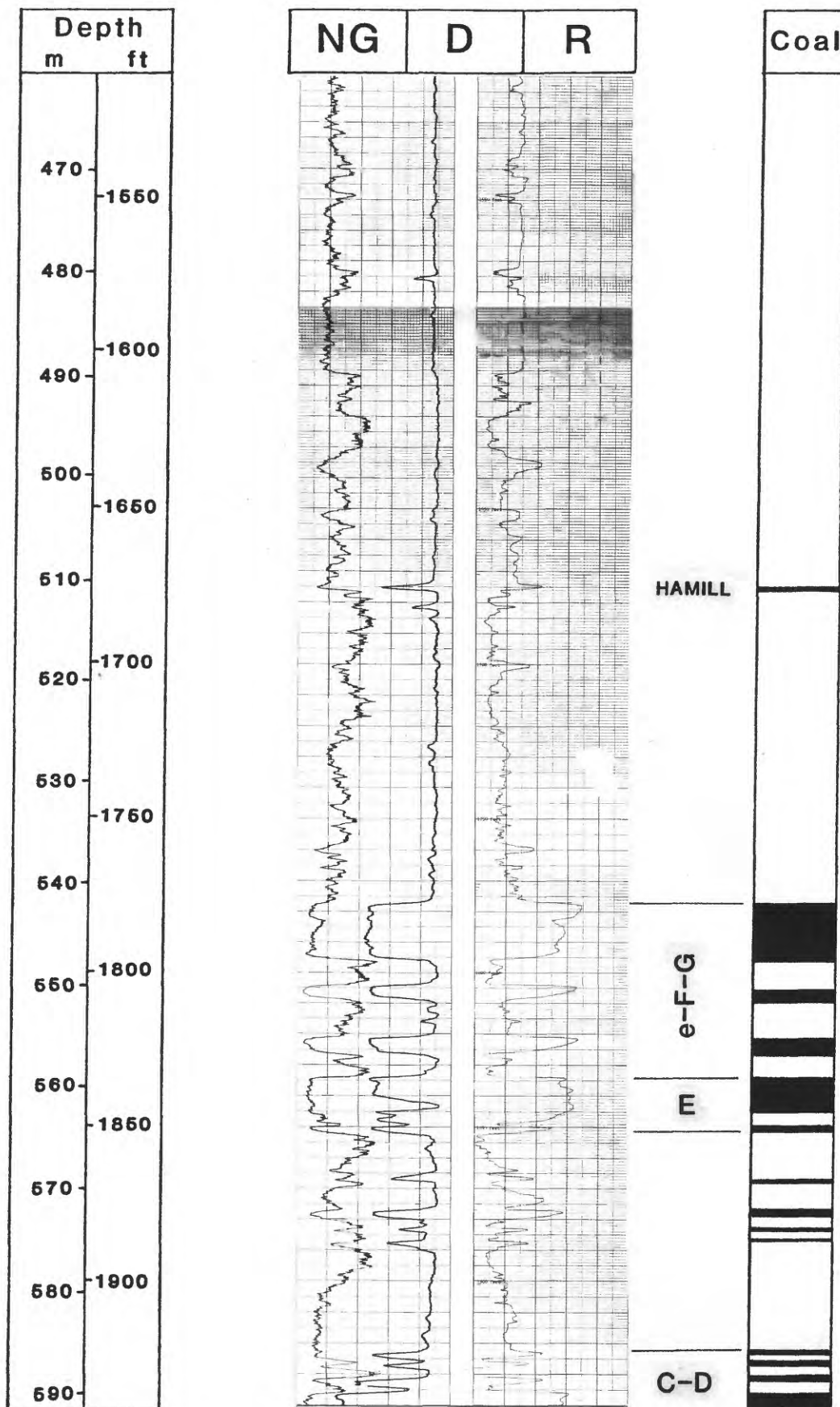
Remarks: ¹Savage Scientific.











U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. RB-3-81 Date logged 6/24/81 Ground elevation 6190 ft

T. 6 N., R. 92 W., Sec. 21 : 1750 ft f W. 1, 575 ft f S. 1

Drilling medium mud¹ Drilled depth 2318 ft Fluid level 1 ft

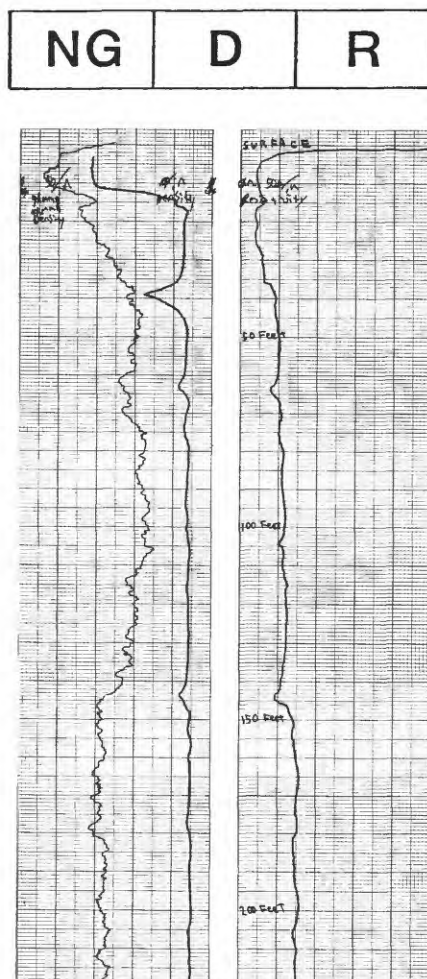
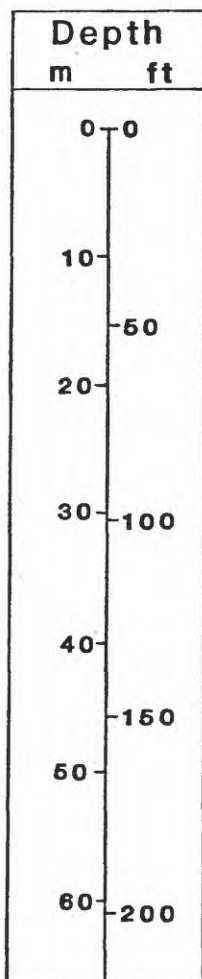
Logging company ² Logging speed 15 ft/min. Logged depth 2300 ft

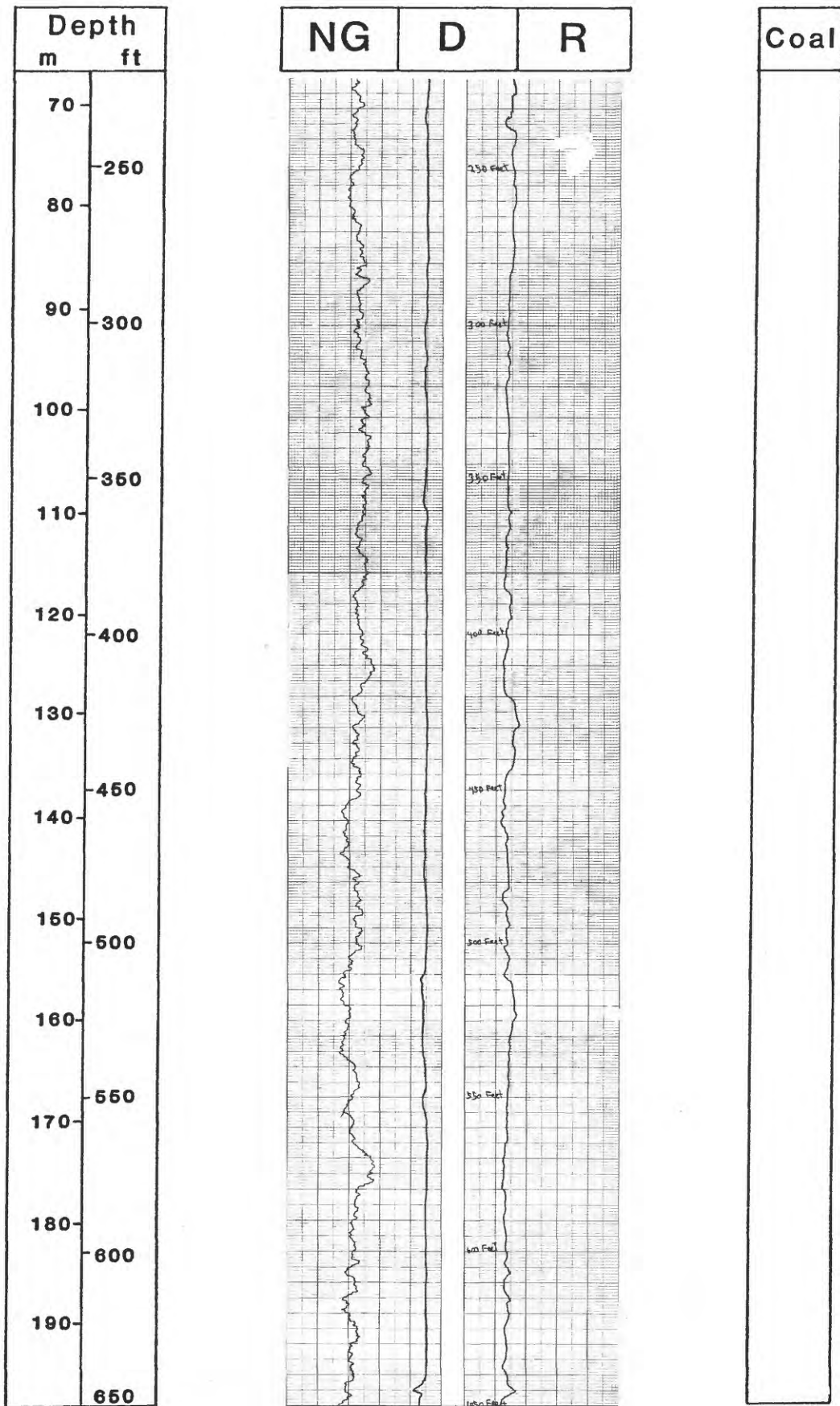
Natural gamma (NG) Scale 30 CPS/in. T.C. 2

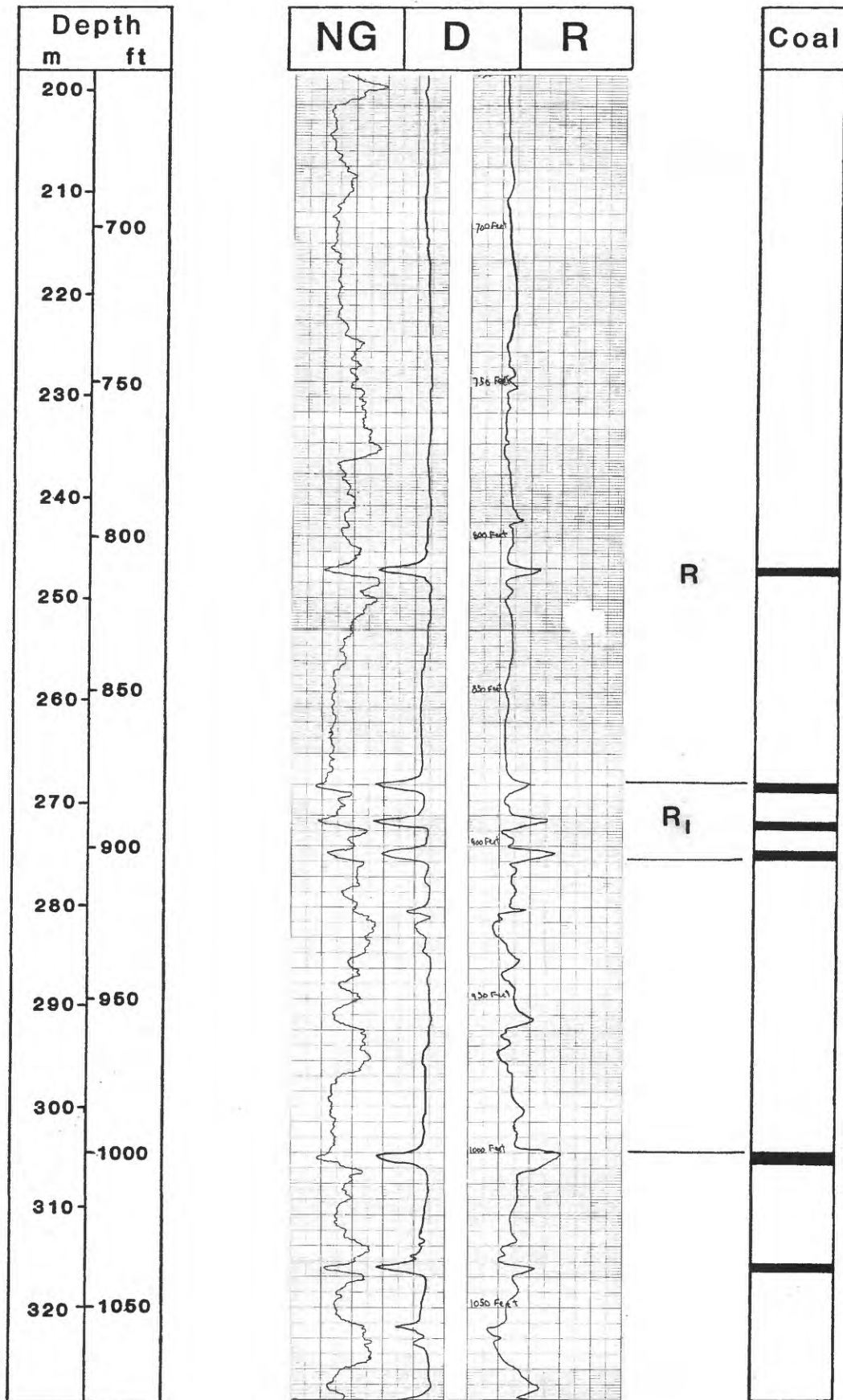
Density (gamma-gamma) (D) Scale 100 CPS/in. T.C. 1

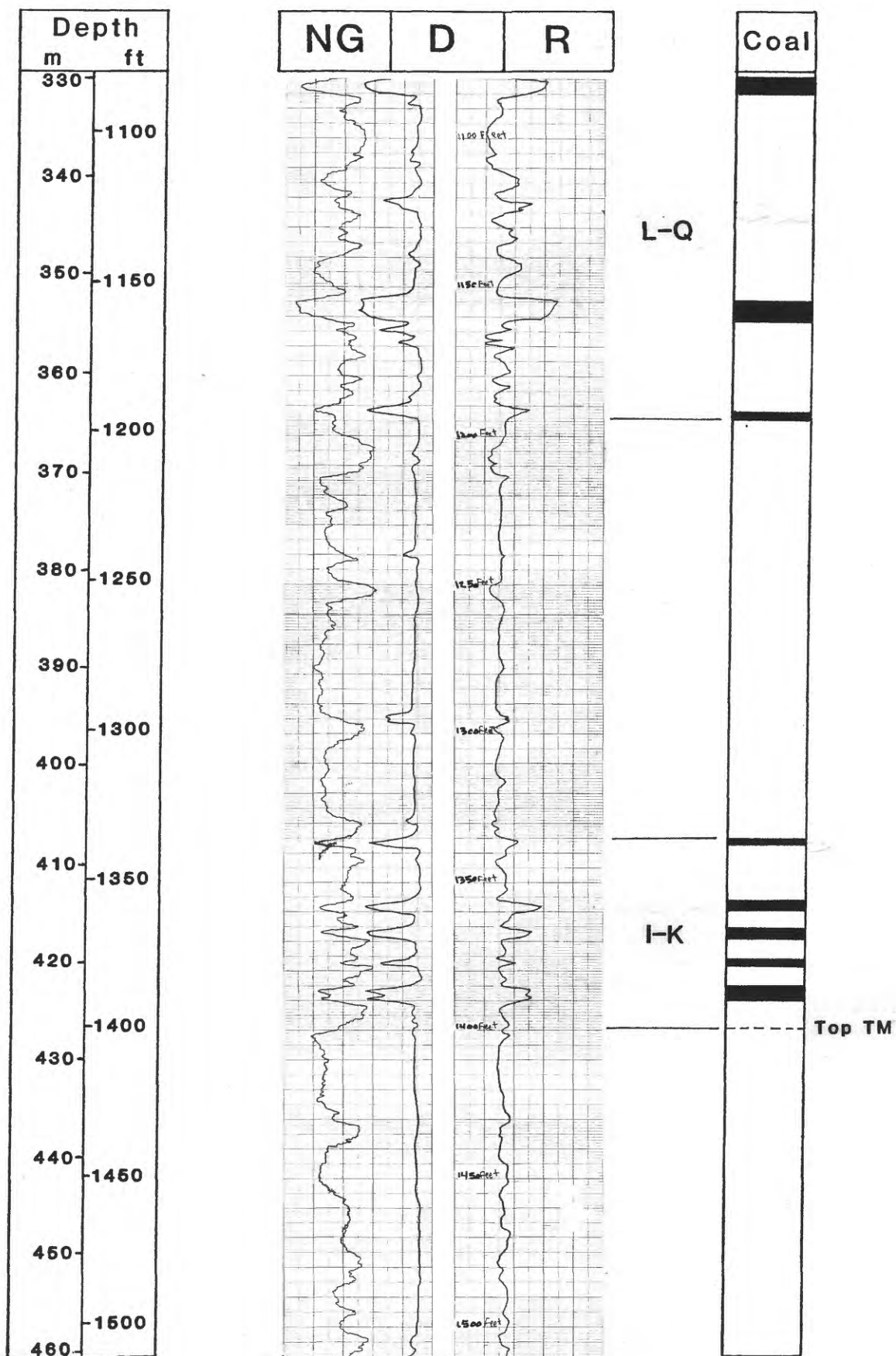
Single point resistance (R) Scale variable

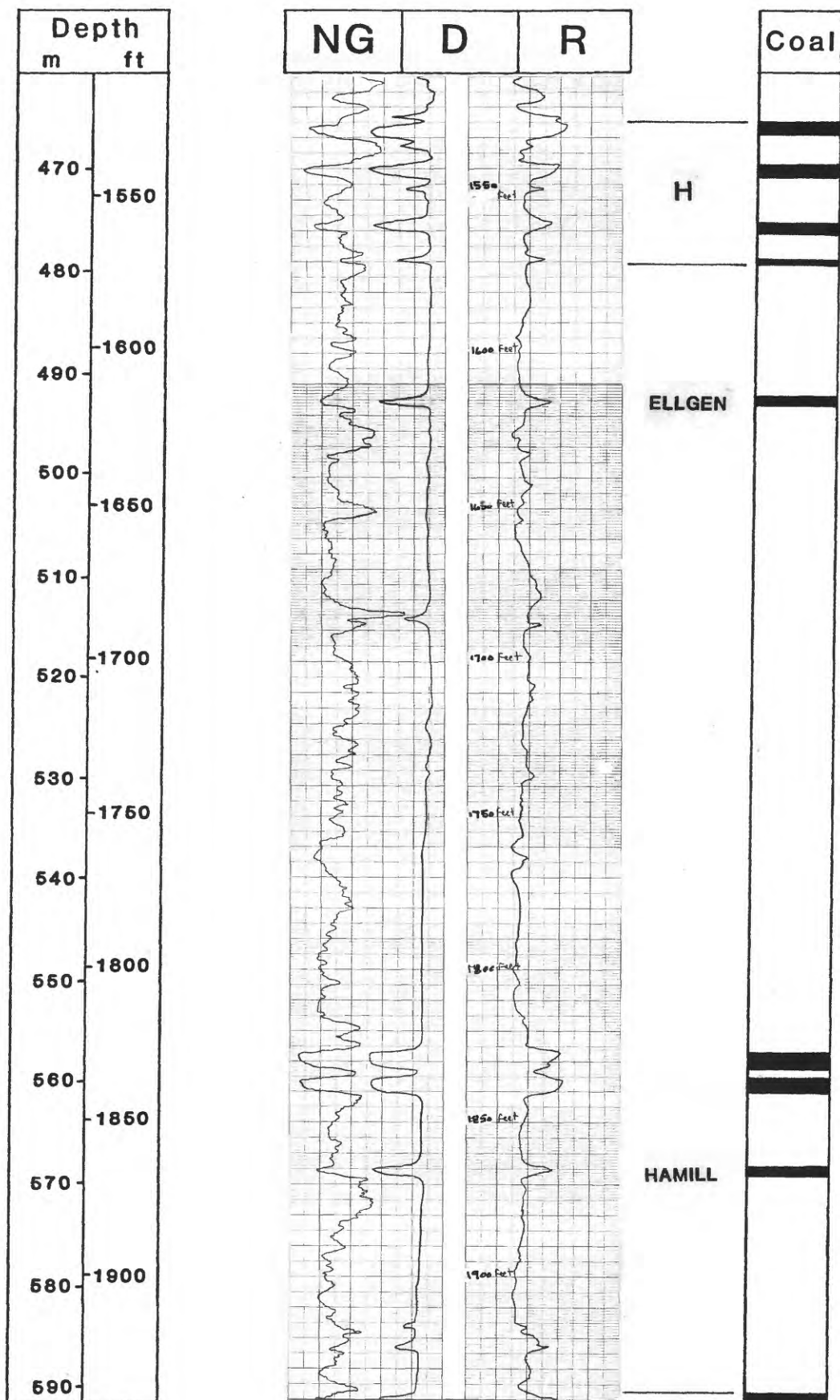
Remarks: ¹Hole filled with fresh water when logged. ²Savage Scientific.

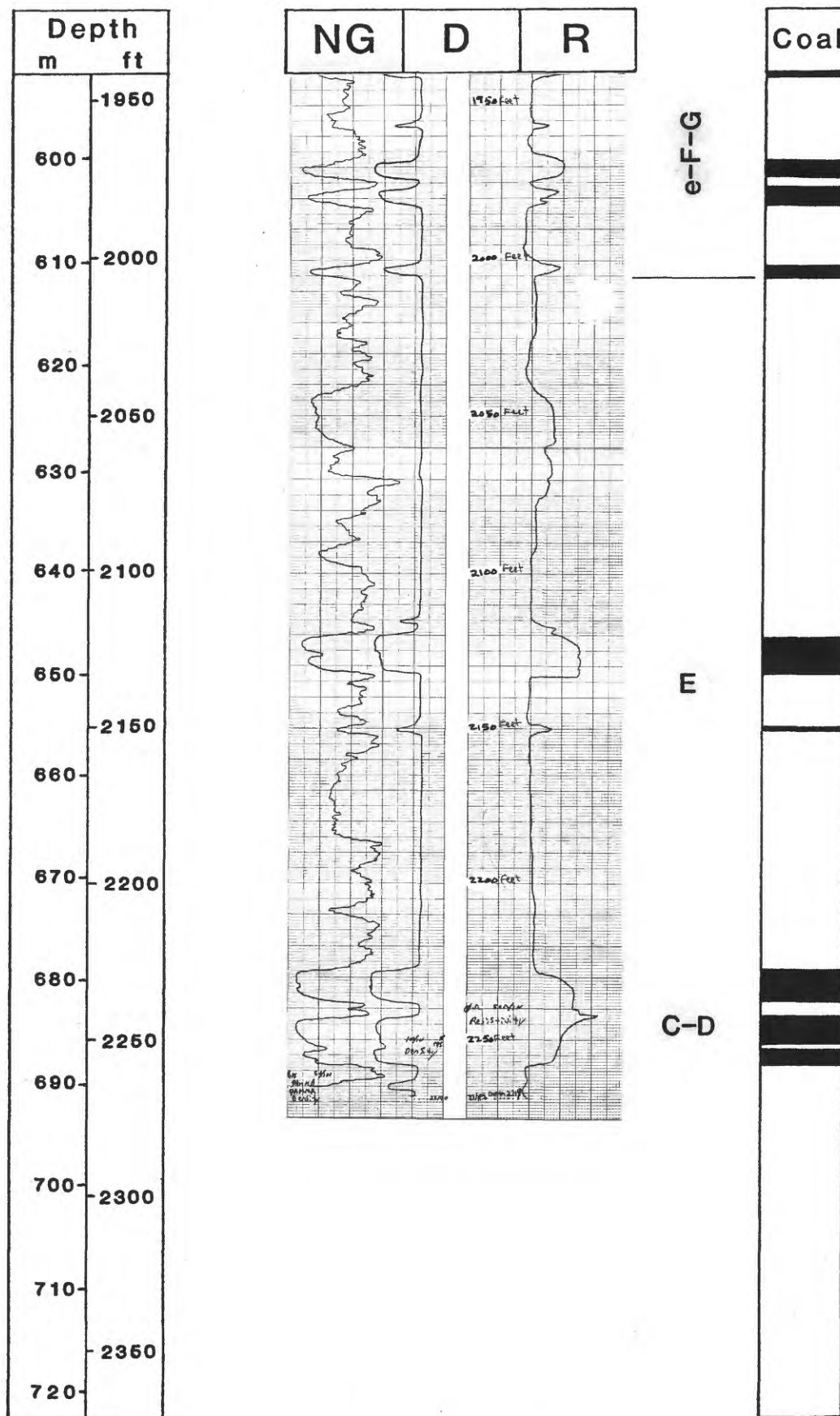




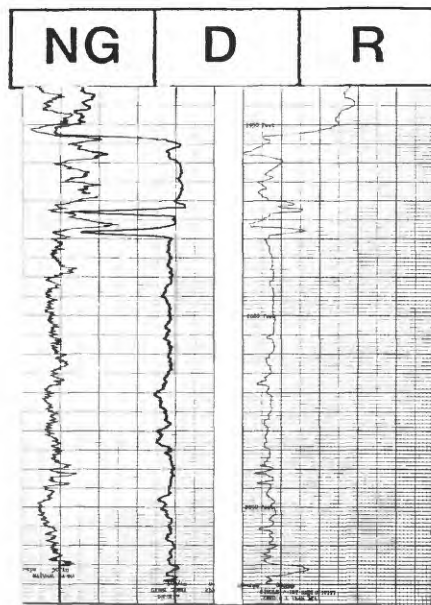








Depth	
m	ft
	1950
600	
610	2000
620	
	2050
630	
640	2100
650	
	2150
660	
670	2200
680	
	2250
690	
700	2300
710	
	2350
720	



fault ?

TC ?

U.S. GEOLOGICAL SURVEY
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. RB-2-81c Date logged 8/16/81¹ Ground elevation 6600 ft

T. 6 N., R. 92 W., Sec. 25 : 2000 ft f W. 1, 700 ft f N. 1

Drilling medium mud² Drilled depth 1485 ft Fluid level 170 ft

Logging company USGS Logging speed 25 ft/min.³ Logged depth 1480 ft

Spontaneous potential (SP) Scale 20 mv/log div.

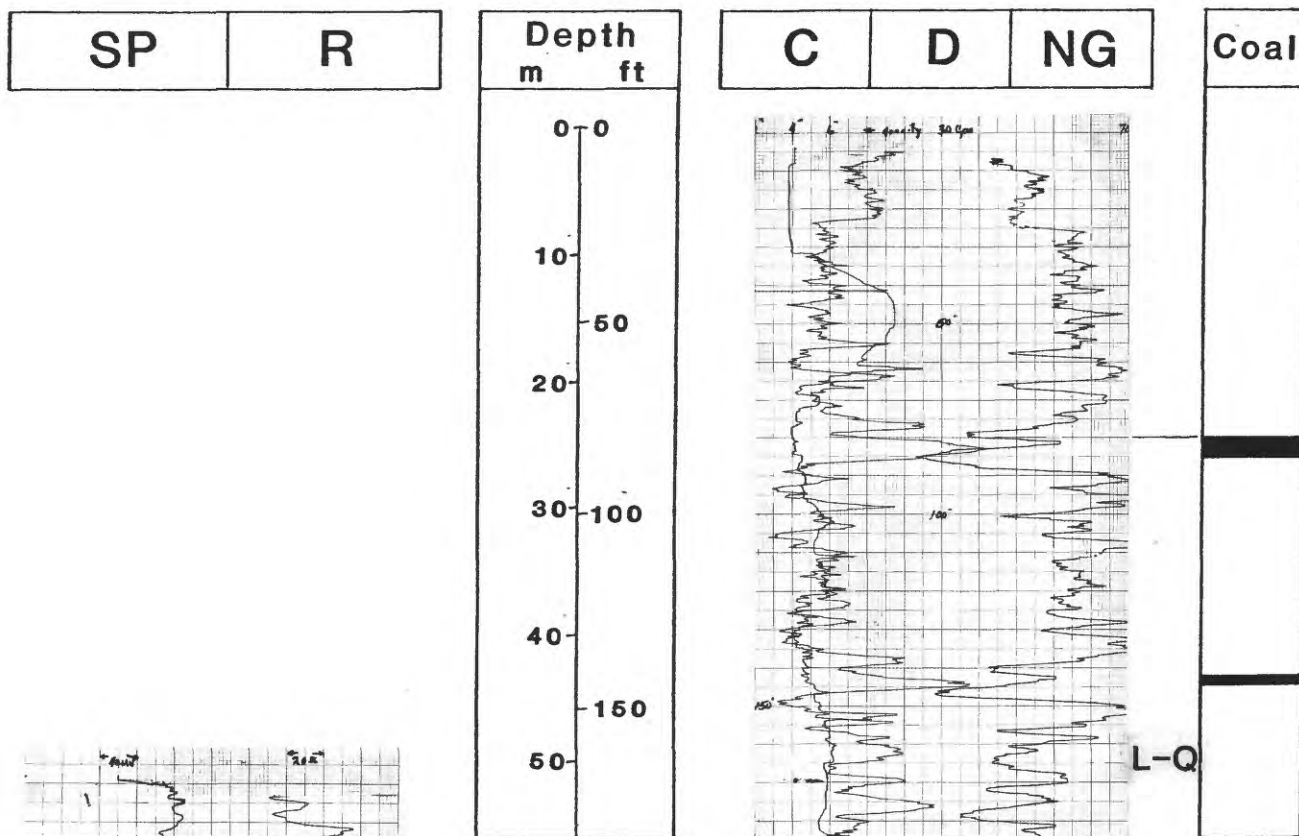
Single point resistance (R) Scale variable

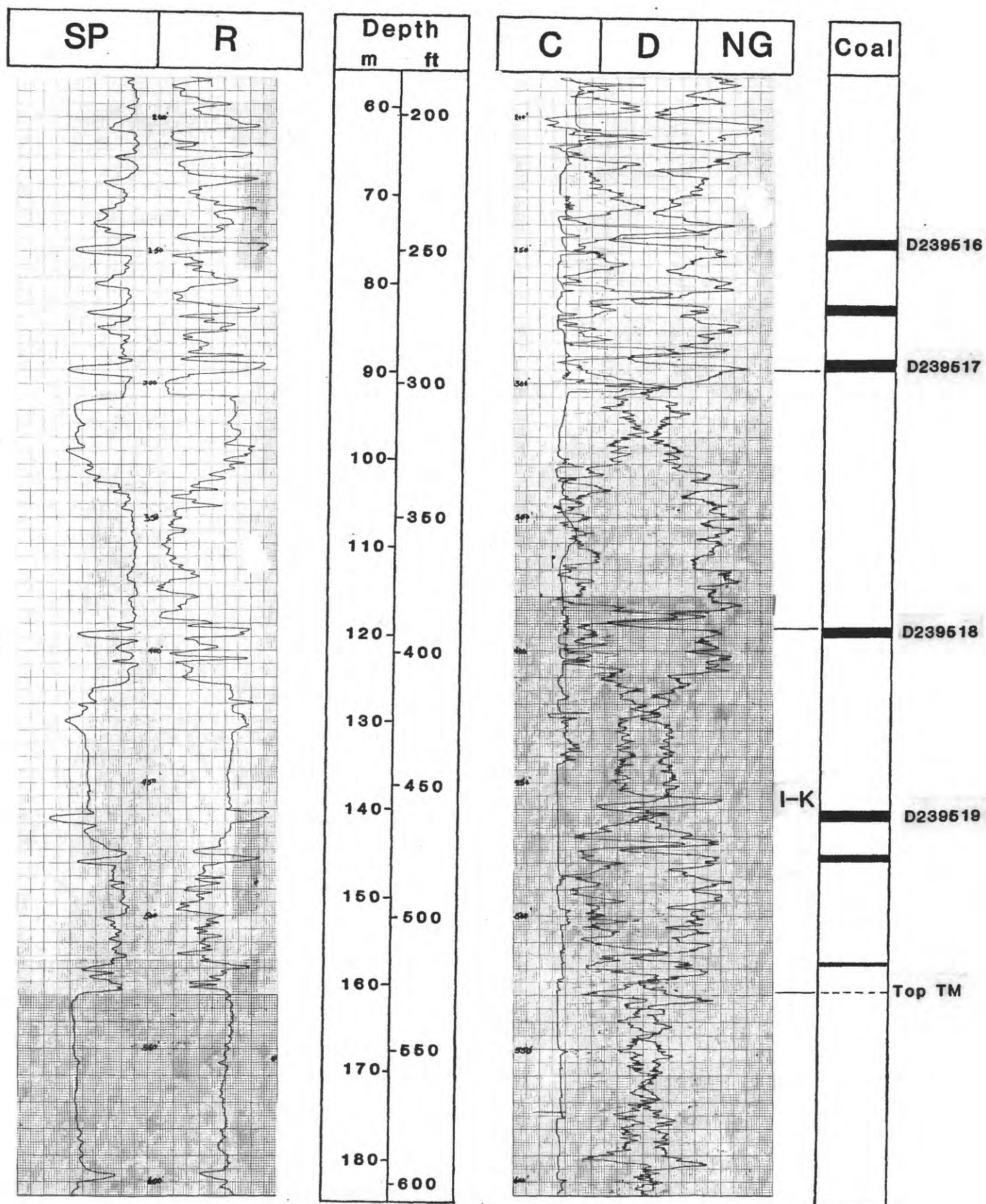
Caliper (C) Scale 1 in./log div.

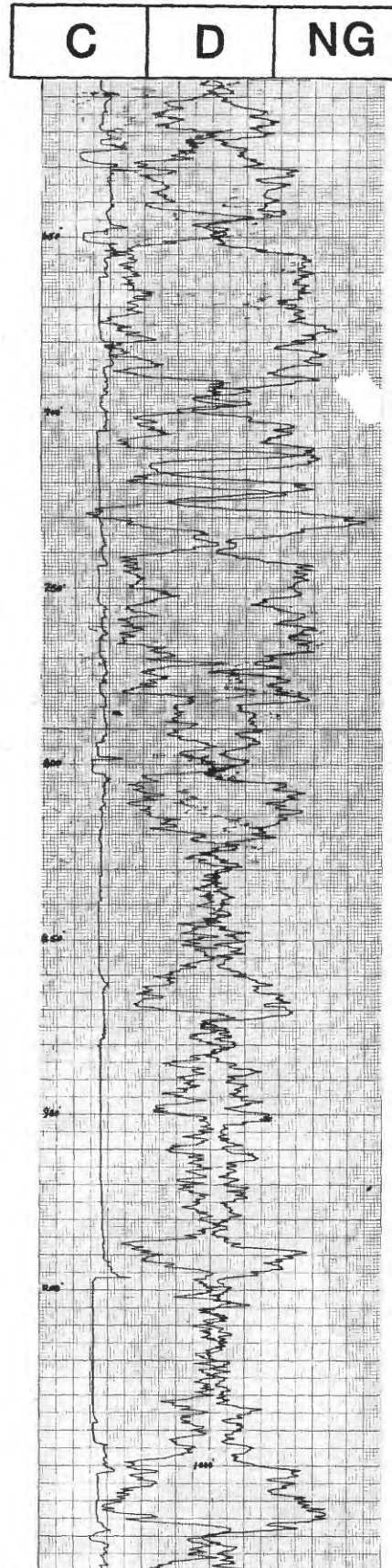
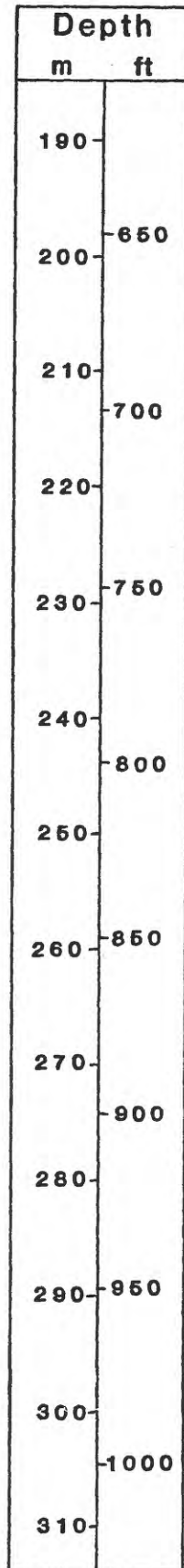
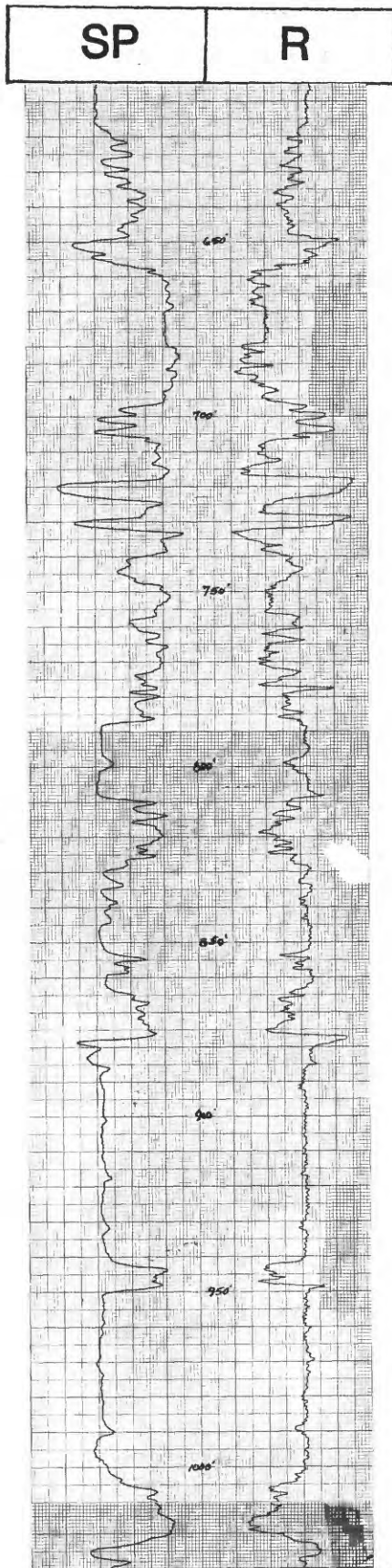
Density (gamma-gamma) (D) Scale ? T.C. ?

Natural gamma (NG) Scale ? T.C. ?

Remarks: ¹Electric log run on 8/17/81. ²Some fresh water added. ³Caliper-density-natural gamma log run at 17 ft/min. Note: This hole cored coal intervals and was a twin of E-12-RdB drilled in 1977 (Johnson, 1978).



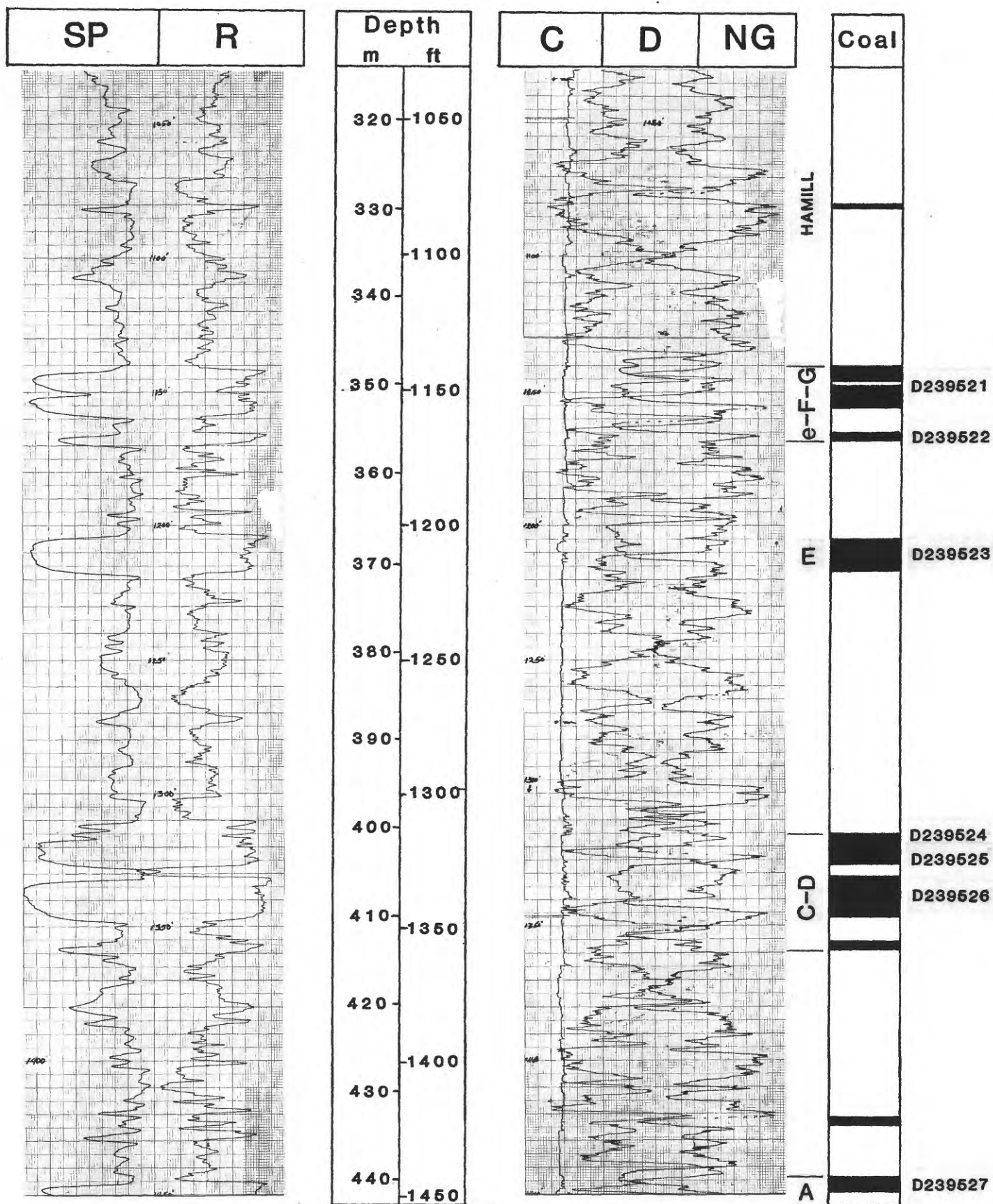




H

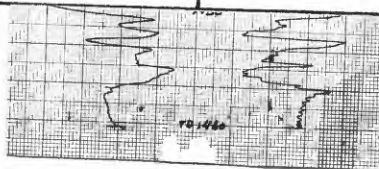
D239520

ELLGEN



Hole no. RB-2-81c (continued)

SP	R
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Depth	
m	ft
450	
	1500
460	
	1550
470	
	1600
480	
	1650
490	
	1700
500	
	1750
510	
	1800
520	
	1850
530	
540	
550	
560	
570	

C	D	NG
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Coal

TC