

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Geophysical Logs for 34 Holes Drilled during 1980 in the  
Yampa Coal Field, Moffat and Routt Counties, Colorado

By

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Open-File Report 85-43

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

<sup>1</sup>USGS, Denver, Colo.

<sup>2</sup>Bureau of Land Management

1985

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INTRODUCTION

During the summer of 1980, 34 holes, with diameters of approximately 5 inches and with a cumulative depth of 36,593 feet, were drilled in the Yampa coal field located in Moffat and Routt Counties, Colorado (figs. 1-6, table 1). The holes were drilled with truck-mounted rotary drill rigs partly under U.S. Geological Survey contract No. 14-08-0001-18814, awarded to A. E. Bennett and partly under an intra-bureau agreement utilizing U.S. Geological Survey personnel and equipment.

The purpose of the drilling was to obtain information on the depth, thickness, and continuity of the Federal coal known to exist in the Williams Fork Formation of Late Cretaceous age (Hancock, 1925; Bass and others, 1955). 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 (fig. 7). 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 the authors. Janet Hook and Steve Roberts coordinated the drilling and geophysical logging operations and participated in the Bureau of Land Management's pre- and post-drilling site inspections. Other U.S. Geological Survey personnel who assisted in various phases of the drilling program were Robert Brown, Alex Donatich, Toby Manzanares, Richard Meyer, Tom Piccirilli, and C. E. Timmons.

Under contracts and agreements the holes were logged by geophysical methods by one of the following logging organizations: (1) Strata Surveys, Steamboat Springs, Colo.; (2) Conservation Division, U.S. Geological Survey, Lakewood, Colo.; and (3) Savage Scientific, Craig, Colo.

Three geophysical logs were recorded simultaneously during a single logging run. Natural-gamma (NG) and density (gamma-gamma) (D) are the logs used to identify coal. 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 where logged by the U.S. Geological Survey). 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. Single-point resistance (R) logs used in conjunction with natural-gamma logs



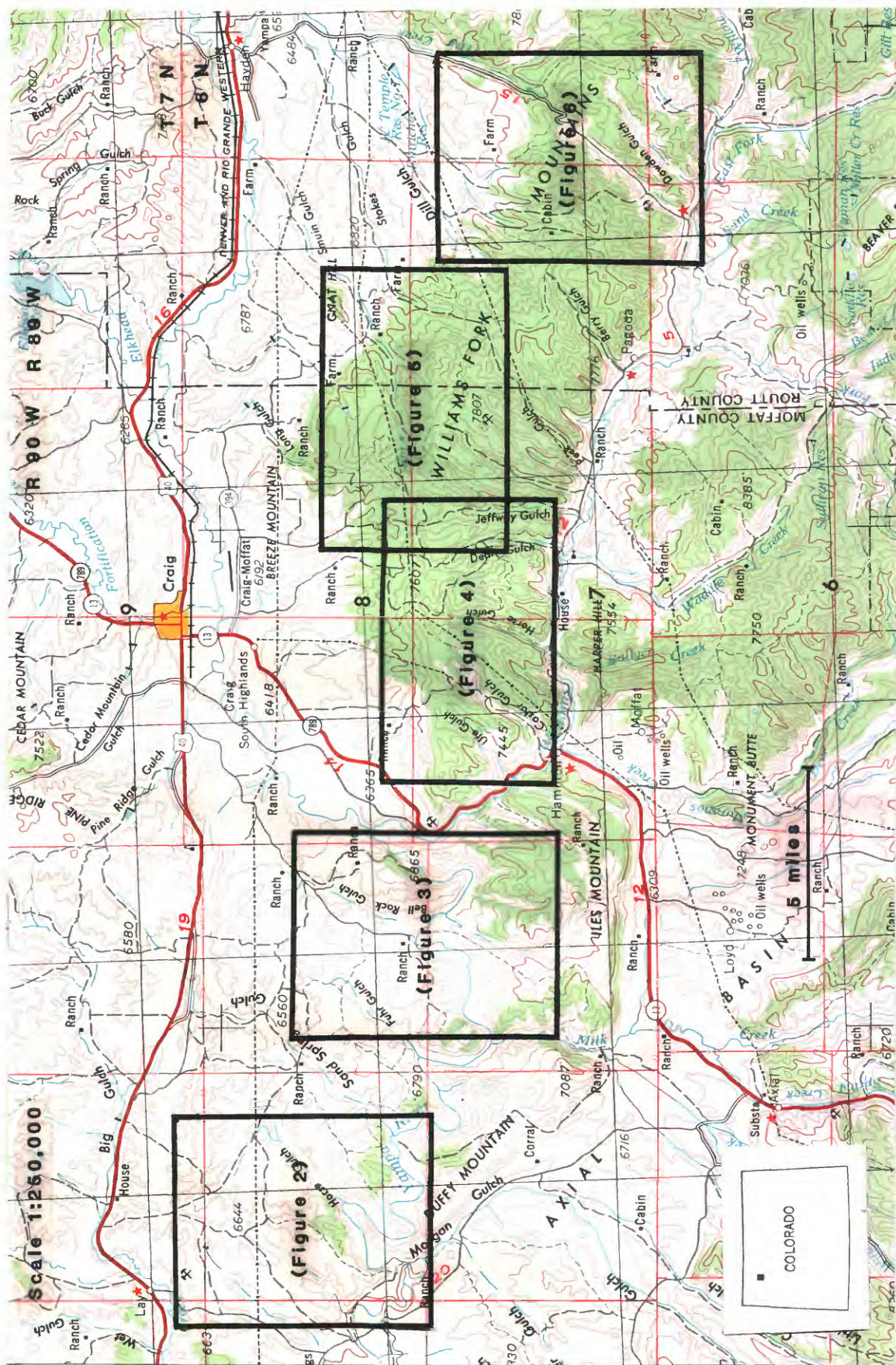


Figure 1.--General location map showing the boundaries of figures 2 through 6.



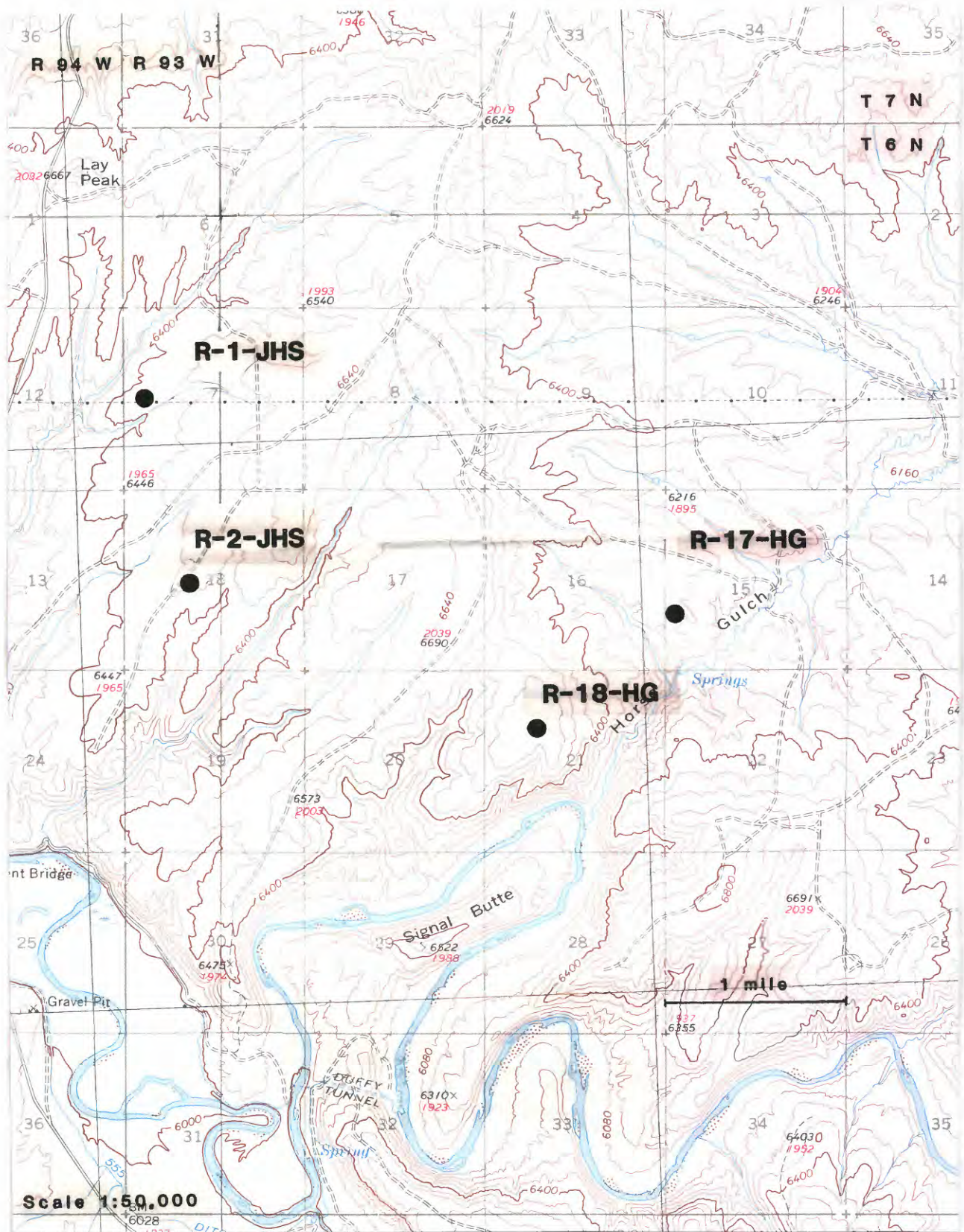


Figure 2.--Detailed location map of drill-holes R-1-JHS, R-2-JHS, R-17-HG, and R-18-HG.



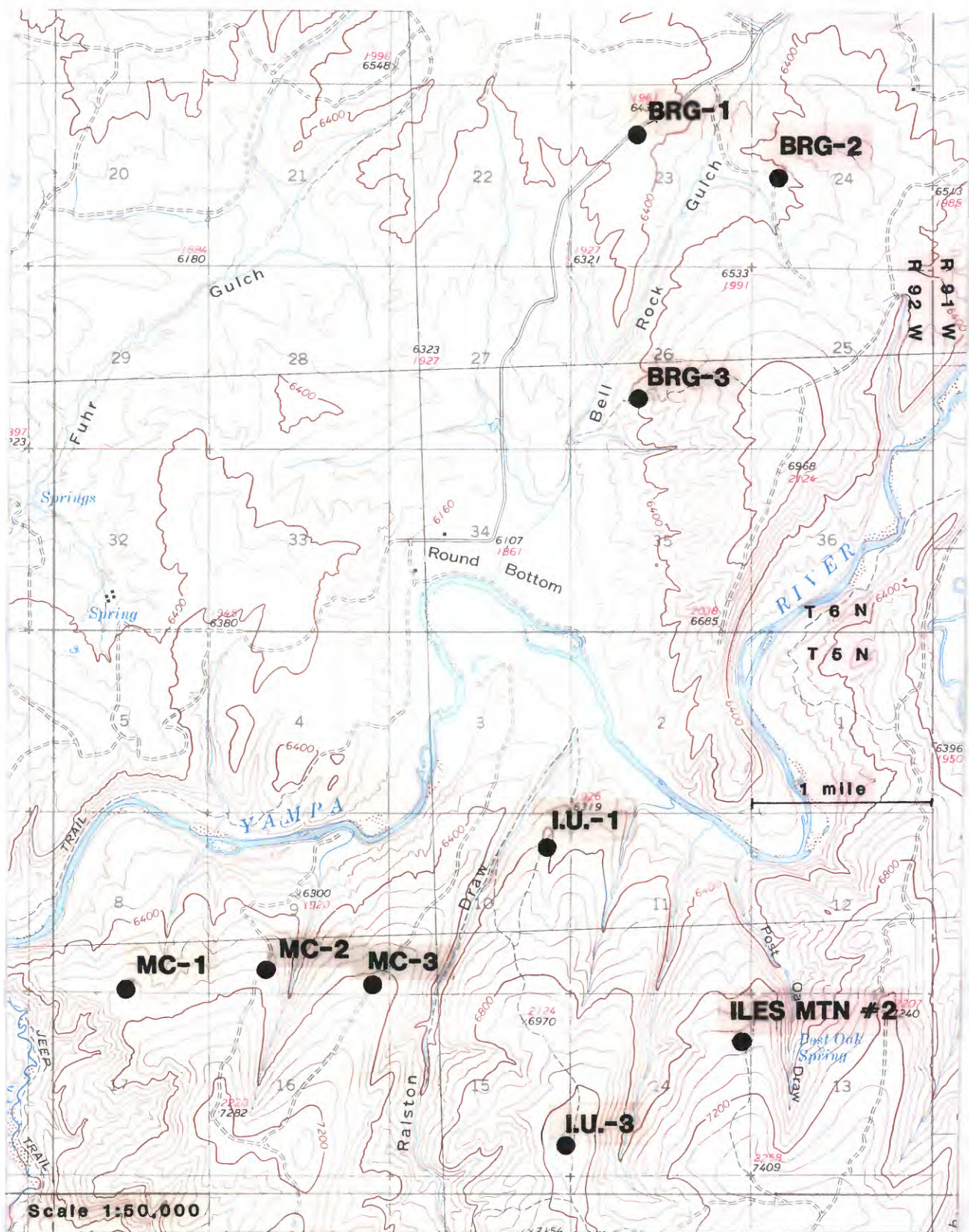


Figure 3.--Detailed location map of drill-holes BRG-1, BRG-2, BRG-3, I.U.-1, Iles Mtn. #2, I.U.-3, MC-1, MC-2, and MC-3.



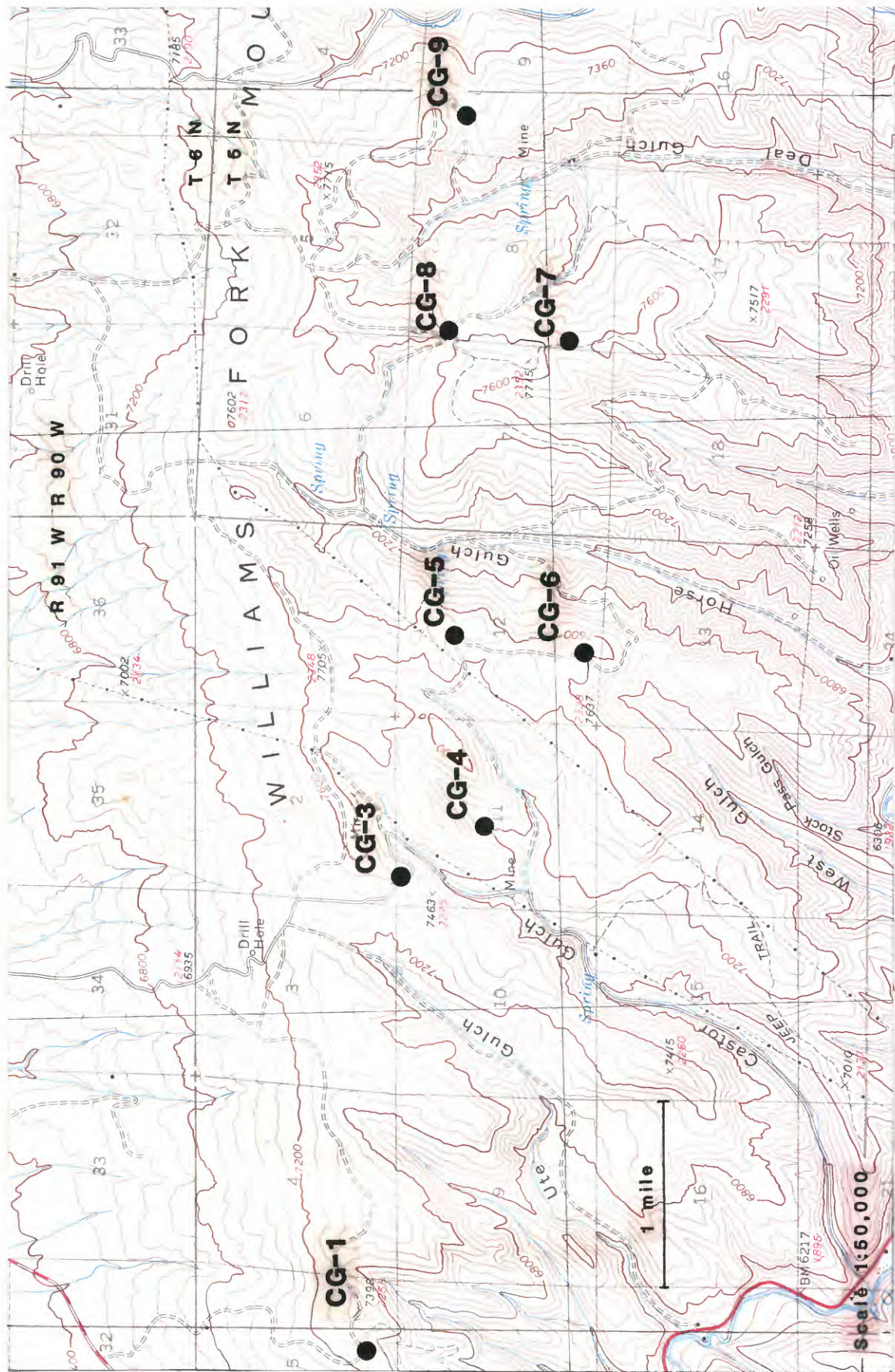


Figure 4.--Detailed location map of drill-holes CG-1, CG-3, CG-4, CG-5, CG-6, CG-7, CG-8, and CG-9.



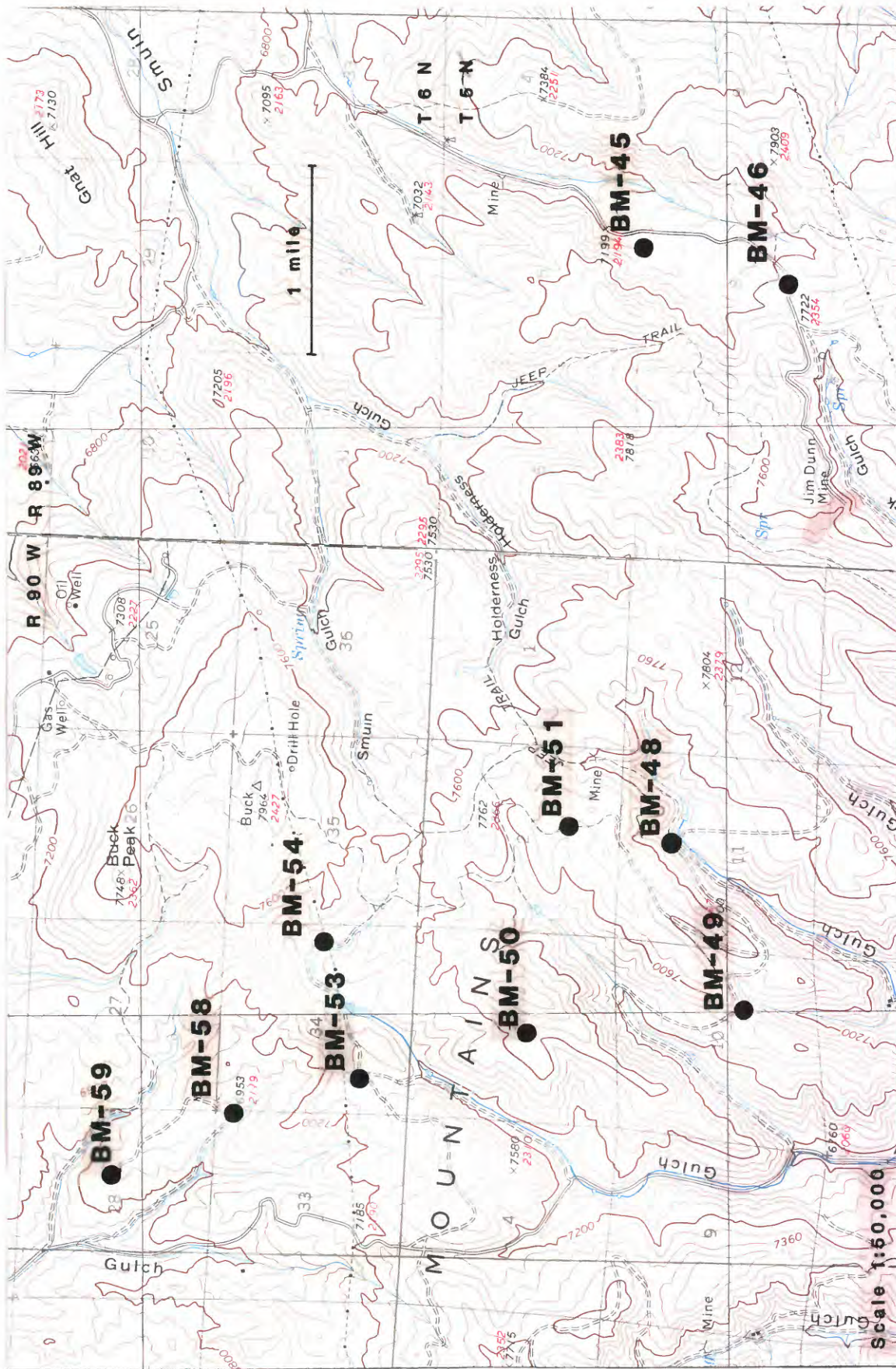


Figure 5.--Detailed location map of drill-holes BM-45, BM-46, BM-48, BM-49, BM-50, BM-51, BM-53, BM-54, BM-58, and BM-59.



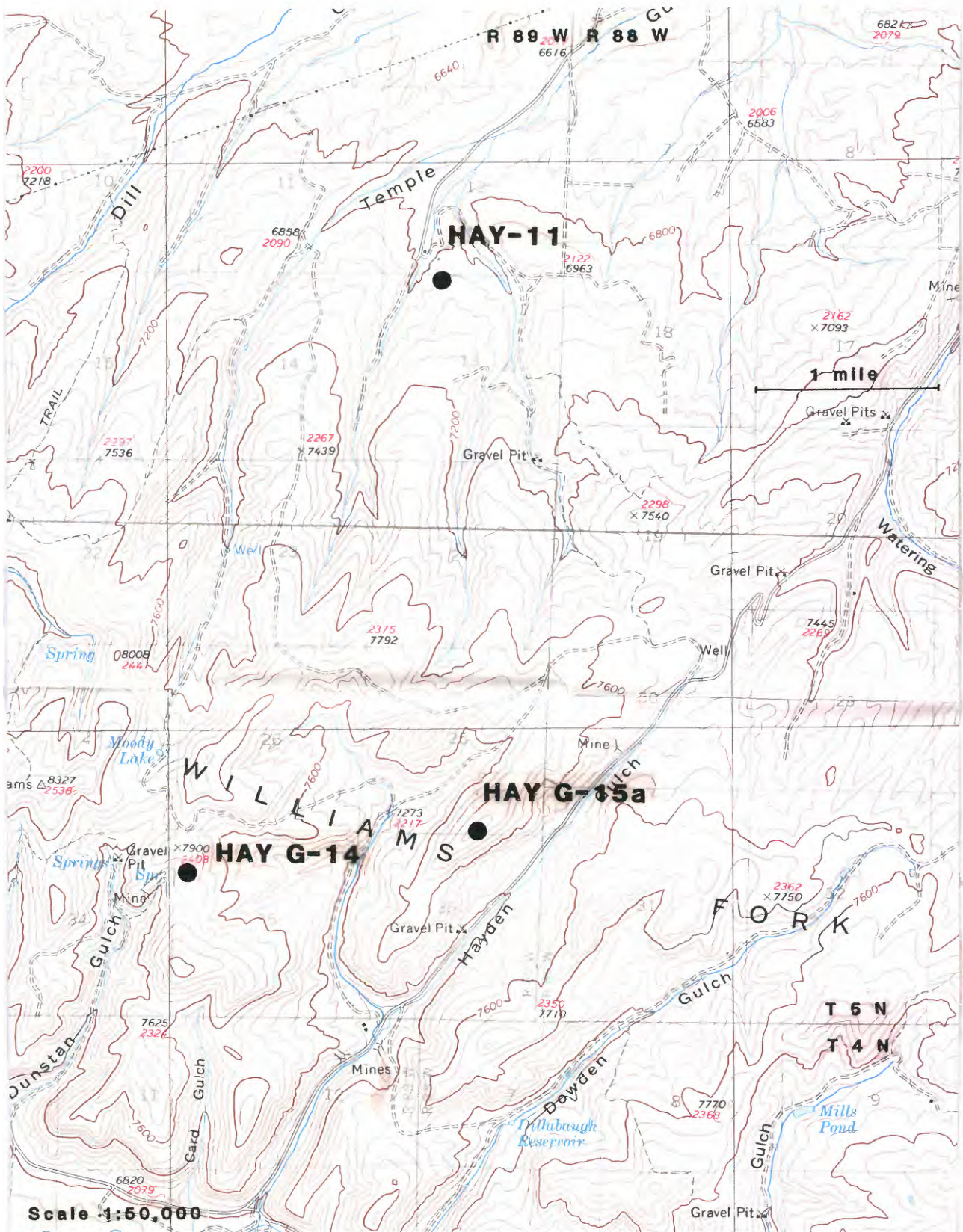


Figure 6.--Detailed location map of drill-holes HAY-11, HAY G-14, and HAY G-15a.

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

[All elevations and depths stated herein are in feet;  
to convert to meters, multiply by 0.3048]

Hole No.	Location	Ground elevation	Total depth drilled	Depth logged
Figure 2				
R-1-JHS	T. 6 N., R. 93 W., sec. 7 2,600' FNL, 600' FWL	6,440	742	742
R-2-JHS	T. 6 N., R. 93 W., sec. 18 2,550' FSL, 1,850' FWL	6,494	961	961
R-17-HG	T. 6 N., R. 93 W., sec. 15 1,700' FSL, 200' FWL	6,270	1,500	1,494
R-18-HG	T. 6 N., R. 93 W., sec. 21 1,750' FNL, 1,450' FWL	6,720	1,420	1,379
Figure 3				
BRG-1	T. 6 N., R. 92 W., sec. 23 1,400' FNL, 1,800' FWL	6,440	1,763	1,763
BRG-2	T. 6 N., R. 92 W., sec. 24 2,700' FNL, 700' FWL	6,360	1,840	1,810
BRG-3	T. 6 N., R. 92 W., sec. 26 1,450' FSL, 2,000' FWL	6,445	1,500	1,496
I.U.-1	T. 5 N., R. 92 W., sec. 10 800' FEL, 1,000' FNL	6,410	1,360	1,359
Iles Mtn. #2	T. 5 N., R. 92 W., sec. 14 1,550' FNL, 350' FEL	7,020	995(?)	995
I.U.-3	T. 5 N., R. 92 W., sec. 15 200' FEL, 1,000' FSL	7,300	900	900
MC-1	T. 5 N., R. 92 W., sec. 8 100' FSL, 2,400' FEL	6,760	1,002	1,001
MC-2	T. 5 N., R. 92 W., sec. 9 1,650' FWL, 700' FSL	6,710	1,300	1,292
MC-3	T. 5 N., R. 92 W., sec. 9 250' FSL, 500' FEL	6,840	1,380	1,350



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

Hole No.	Location	Ground elevation	Total depth drilled	Depth logged
Figure 4				
CG-1	T. 5 N., R. 91 W., sec. 5 900' FSL, 2,050' FEL	7,270	1,105(?)	1,105
CG-3	T. 5 N., R. 91 W., sec. 11 100' FNL, 850' FWL	7,460	1,035(?)	1,035
CG-4	T. 5 N., R. 91 W., sec. 11 2,500' FNL, 2,250' FWL	7,240	500	489
CG-5	T. 5 N., R. 91 W., sec. 12 1,650' FNL, 2,250' FWL	7,680	895(?)	895
CG-6	T. 5 N., R. 91 W., sec. 12 400' FSL, 2,000' FWL	7,610	800	800
CG-7	T. 5 N., R. 90 W., sec. 8 1,250' FSL, 100' FWL	7,565	920	920
CG-8	T. 5 N., R. 90 W., sec. 8 1,150' FNL, 100' FWL	7,565	1,000	1,000
CG-9	T. 5 N., R. 90 W., sec. 9 1,400' FNL, 900' FWL	7,445	940	937

Figure 5				
BM-45	T. 5 N., R. 89 W., sec. 8 200' FNL, 2,000' FEL	7,300	1,005	1,004
BM-46	T. 5 N., R. 89 W., sec. 8 1,200' FSL, 2,550' FWL	7,640	1,000	986
BM-48	T. 5 N., R. 90 W., sec. 11 1,500' FNL, 2,500' FEL	7,360	1,180	1,180
BM-49	T. 5 N., R. 90 W., sec. 10 2,050' FSL, 1,700' FEL	7,485	960	957
BM-50	T. 5 N., R. 90 W., sec. 3 2,500' FSL, 2,400' FWL	7,640	715	715
BM-51	T. 5 N., R. 90 W., sec. 2 1,550' FSL, 2,250' FEL	7,730	515(?)	515

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

Hole No.	Location	Ground elevation	Total depth drilled	Depth logged
Figure 5--Continued				
BM-53	T. 6 N., R. 90 W., sec. 34 1,350' FSL, 1,050' FWL	7,340	1,500	1,500
BM-54	T. 6 N., R. 90 W., sec. 34 2,600' FSL, 650' FEL	7,330	1,040	1,040
BM-58	T. 6 N., R. 90 W., sec. 33 500' FNL, 100' FEL	6,945	1,000	905
BM-59	T. 6 N., R. 90 W., sec. 28 2,600' FNL, 1,800' FEL	6,895	1,000	996
Figure 6				
HAY-11	T. 5 N., R. 89 W., sec. 13 200' FNL, 1,700' FWL	6,890	760	753
HAY-G-14	T. 5 N., R. 89 W., sec. 35 1,300' FNL, 300' FWL	7,705	600	570
HAY-G-15a	T. 5 N., R. 89 W., sec. 25 200' FSL, 1,800' FEL	7,920	1,460	1,455

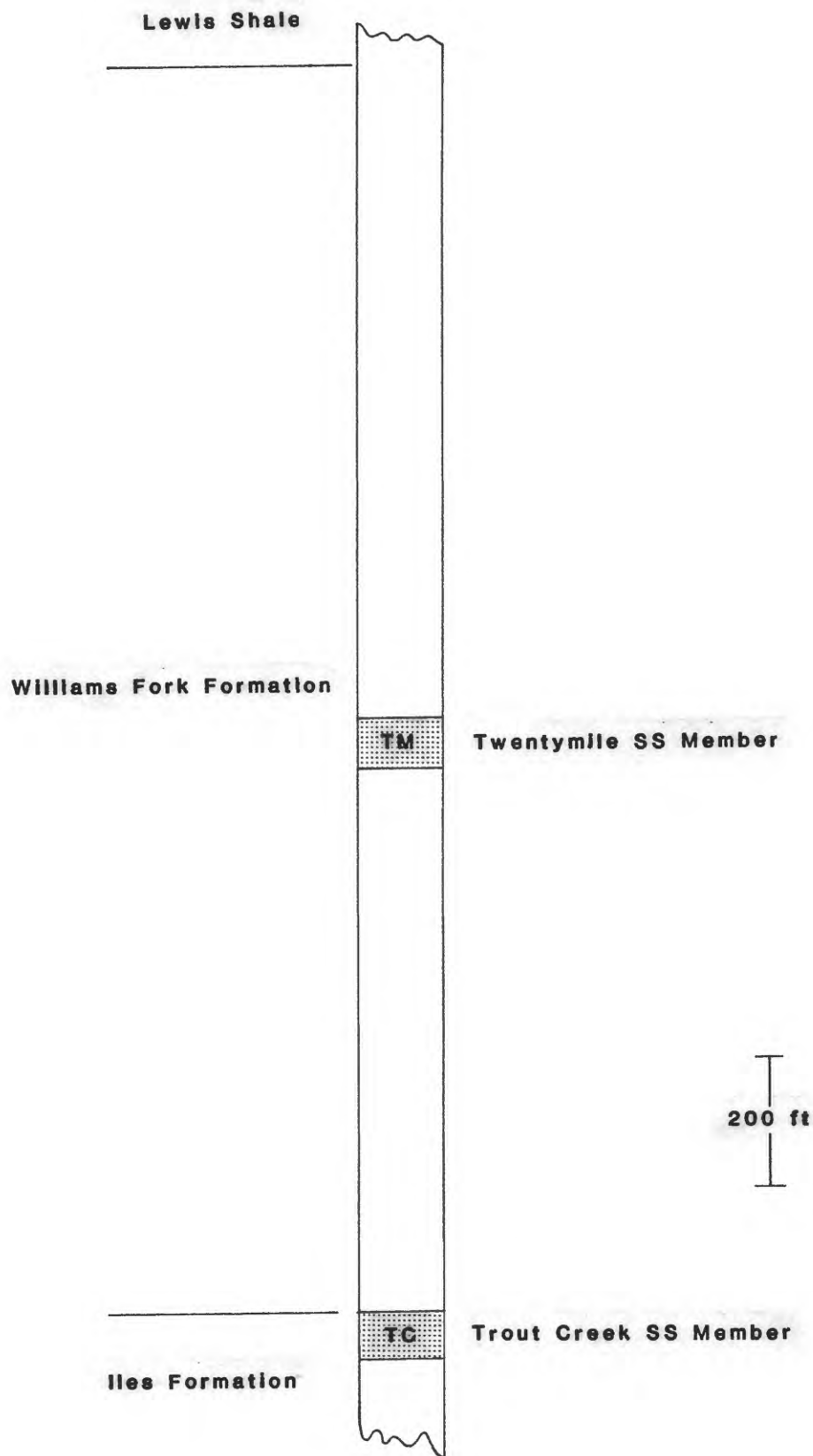


Figure 7.--Generalized columnar section of the Williams Fork Formation in the Yampa coal field.



are used primarily to distinguish between rock types (e.g., sandstone from shale). A caliper log was also run in several holes to measure hole diameter in an effort to identify washouts.

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 log (single-point resistance) requires liquid in the hole, the logging operation was halted and an attempt was made to fill the holes to the top with drilling mud or water. This procedure was not always successful, and some of these logs are absent.

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.

#### REFERENCES CITED

- Bass, N. W., Eby, J. B., and Campbell, M. R., 1955, Geology and mineral fuels of part of Routt and Moffat Counties, Colorado: U.S. Geological Survey Bulletin 1027-D, p. 143-250.
- 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.

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

Hole no. R-1-JHS Date logged 9/27/80 Ground elevation 6440 ft

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

Drilling medium mud Drilled depth 742 ft Fluid level 38 ft

Logging company <sup>1</sup> Logging speed 20 ft/min.<sup>2</sup> Logged depth 742 ft

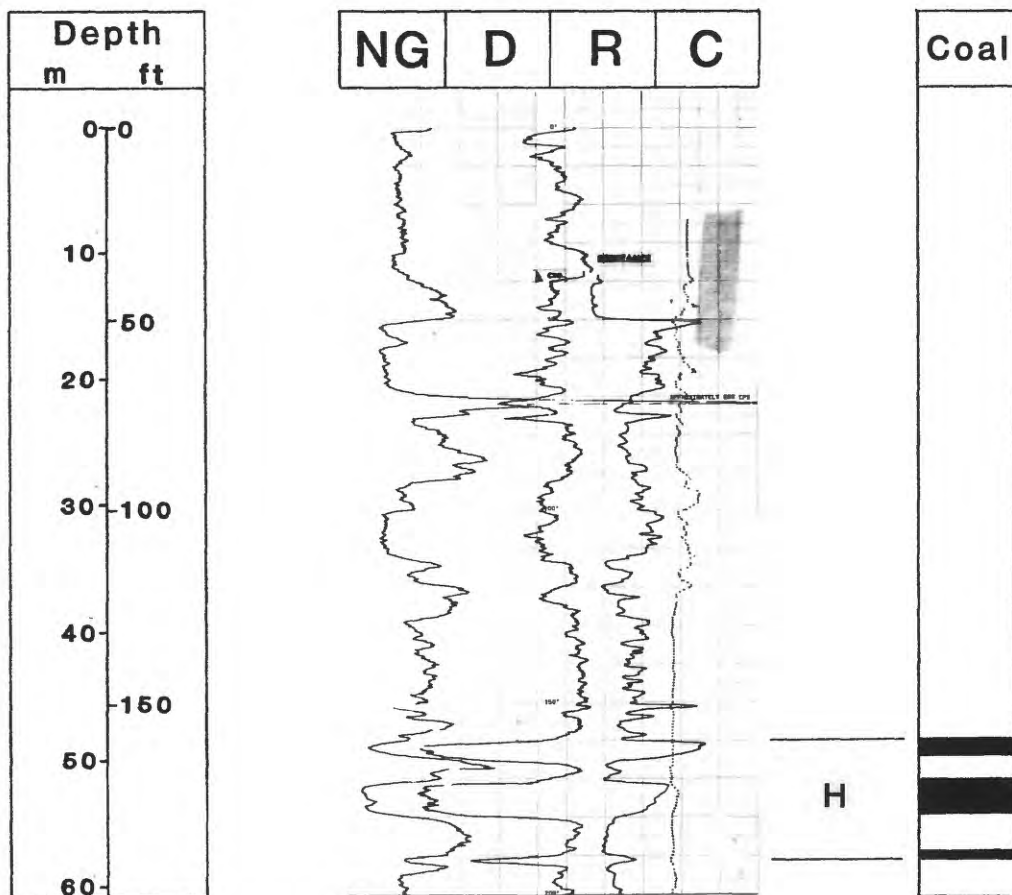
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

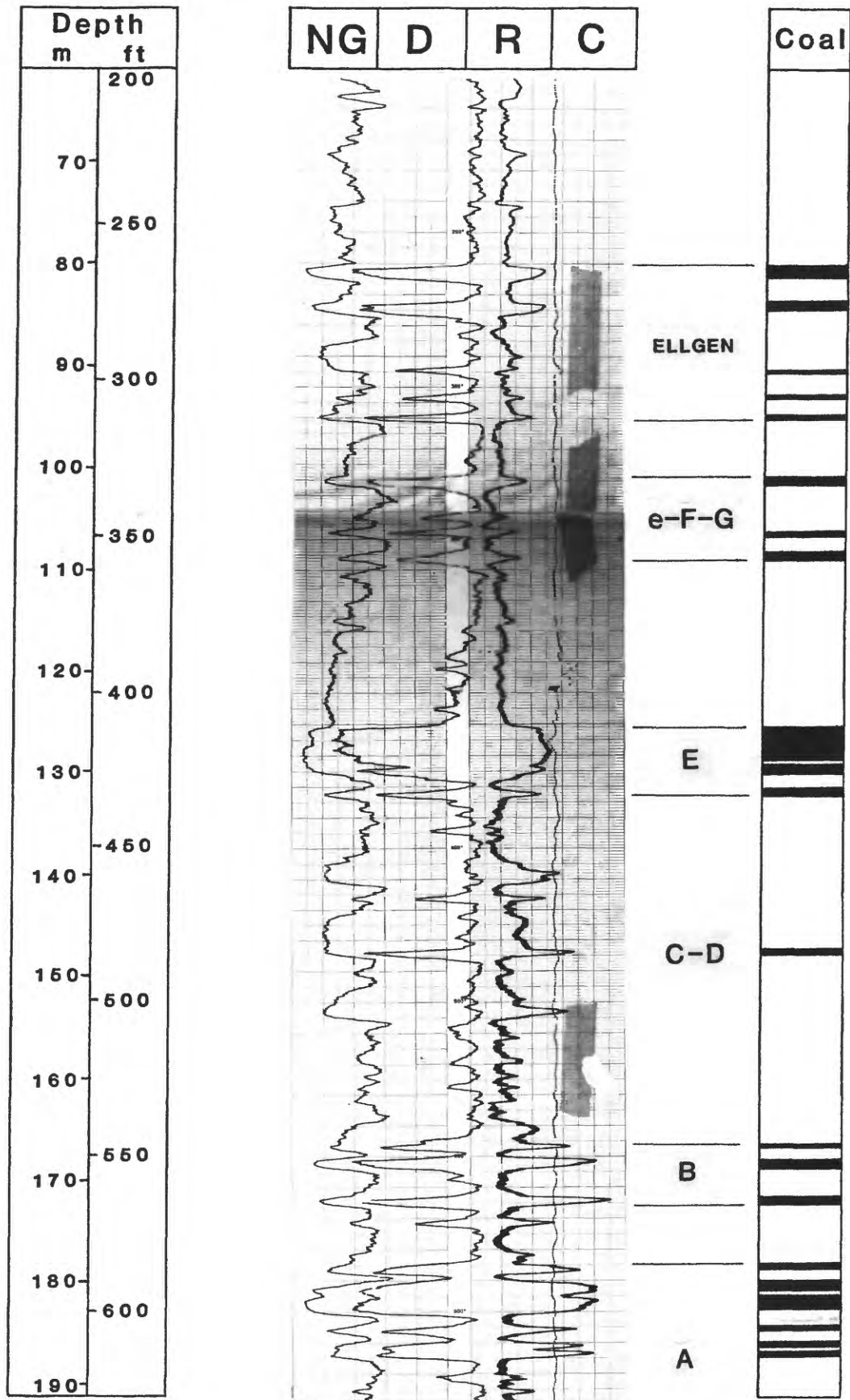
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

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

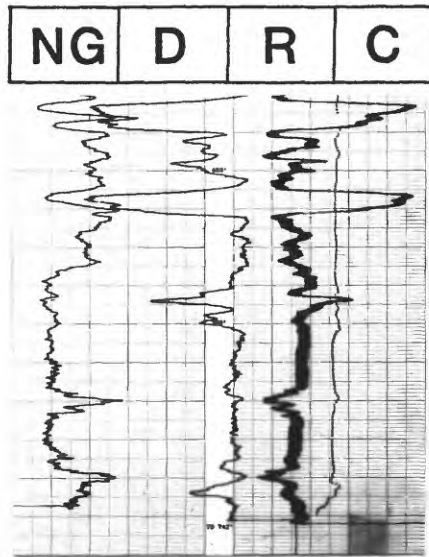
Remarks: <sup>1</sup>Strata Surveys. <sup>2</sup>Caliper run at 30 ft/min. Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation.







Depth	
m	ft
200	650
210	
	700
220	
230	750
240	
	800
250	
260	850
270	
	900
280	
290	950
300	
	1000
310	
320	1050



Coal

Top TC

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

Hole no. R-2-JHS Date logged 9/28/80 Ground elevation 6494 ft

T. 6 N., R. 93 W., Sec. 18 : 2550 ft f S. 1,1850 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 961 ft Fluid level 5 ft

Logging company 2 Logging speed 20 ft/min.<sup>3</sup> Logged depth 961 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

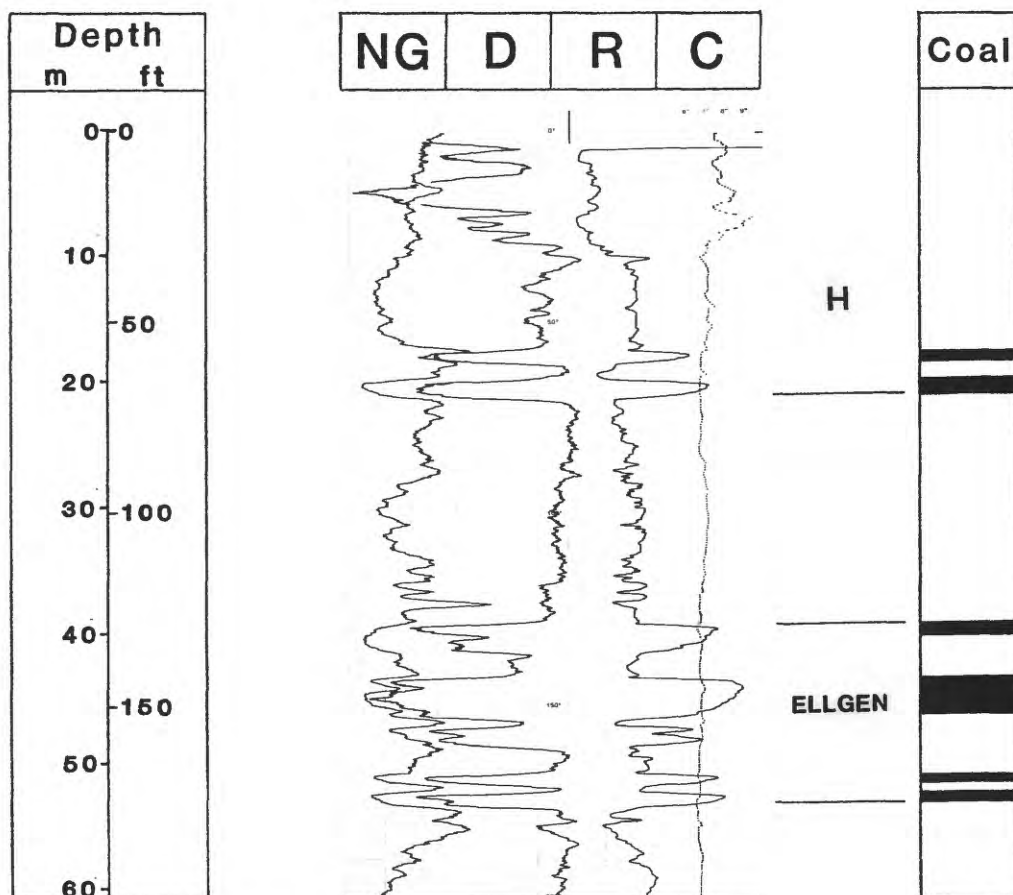
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

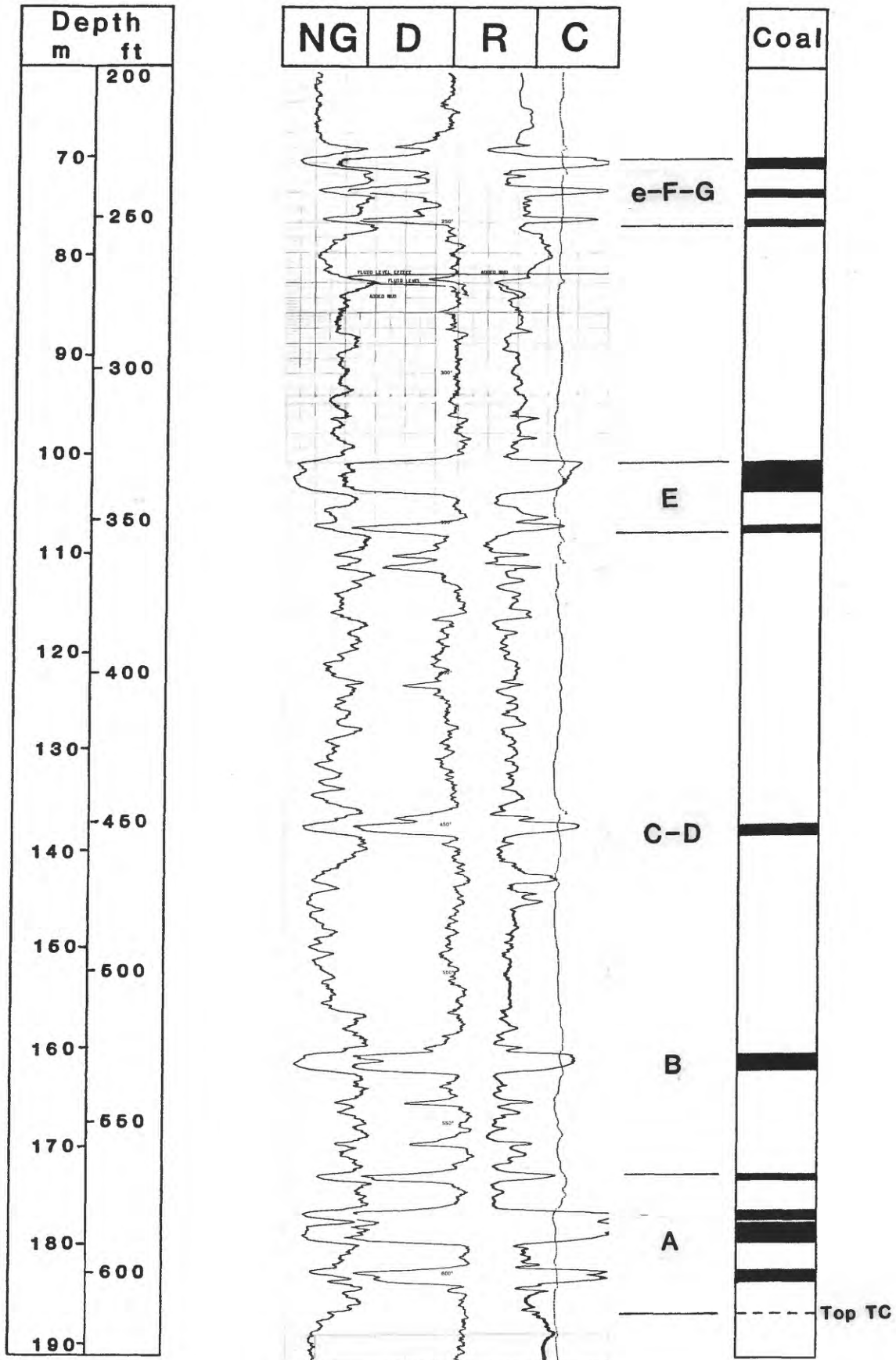
Single point resistance (R) Scale variable

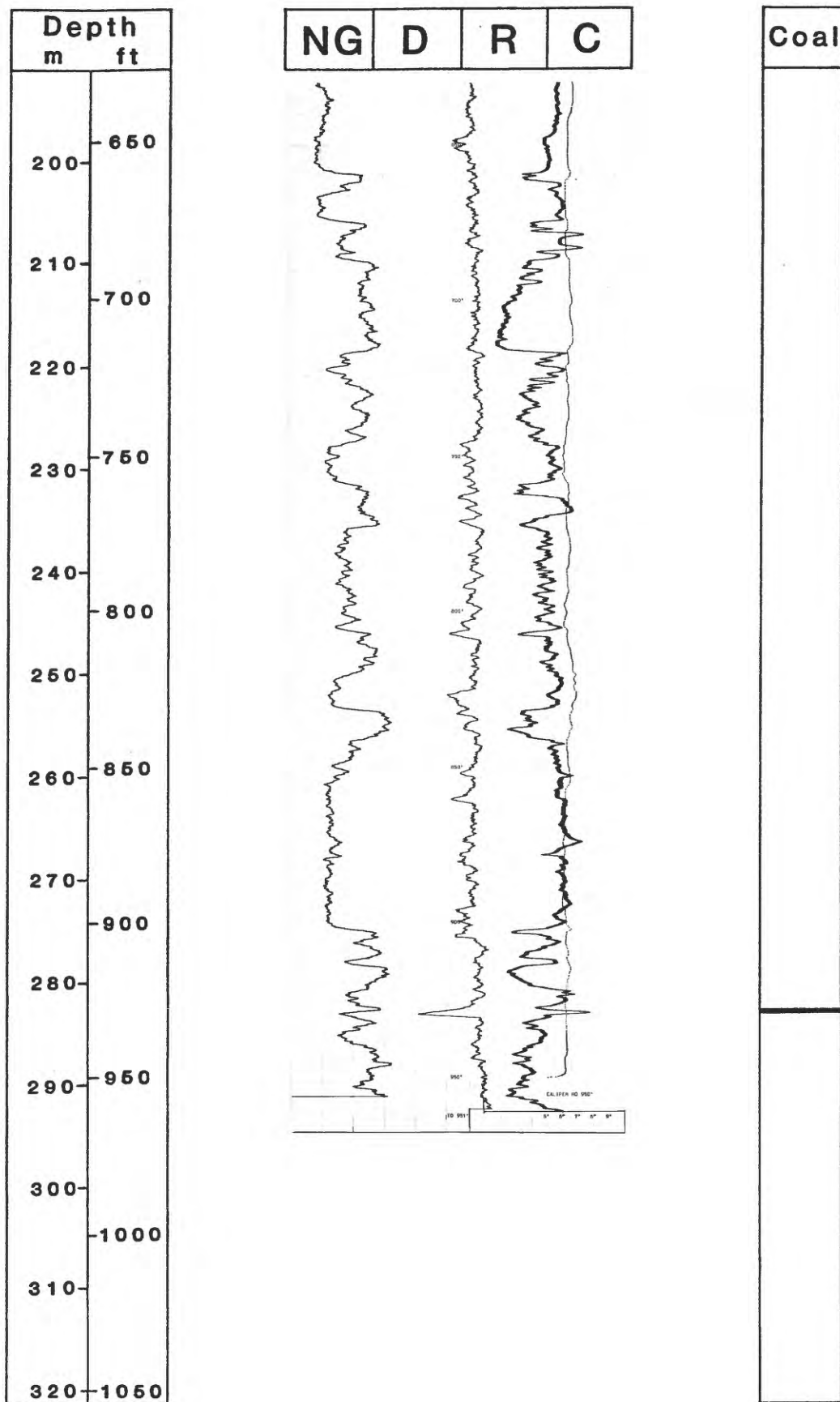
Caliper (C) Scale 1 in./log div.

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. <sup>3</sup>Caliper run at 30 ft/min.

Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation.







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

Hole no. R-17-HG Date logged 9/25/80 Ground elevation 6270 ft

T. 6 N., R. 93 W., Sec. 15 : 1700 ft f S. 1, 200 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 1500 ft Fluid level surface

Logging company <sup>2</sup> Logging speed 20 ft/min.<sup>3</sup> Logged depth 1494 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

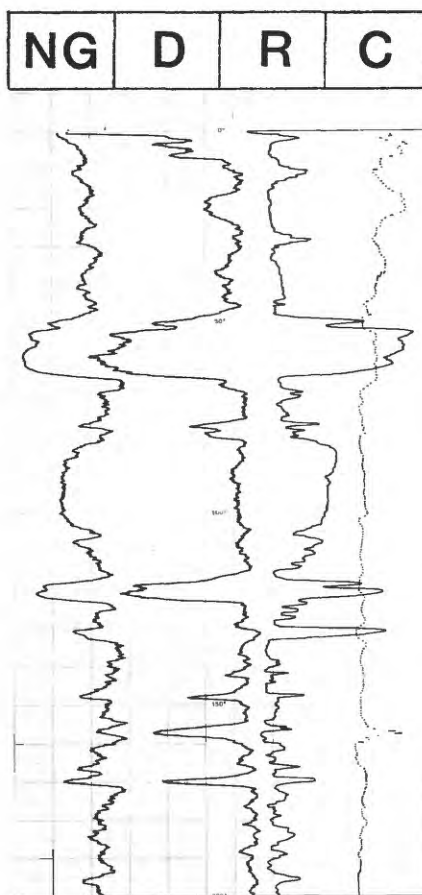
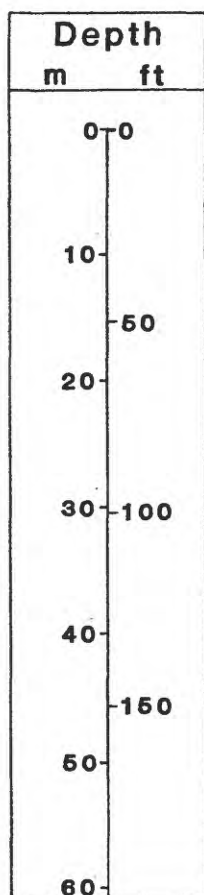
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

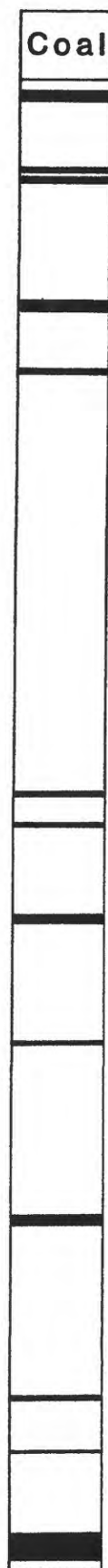
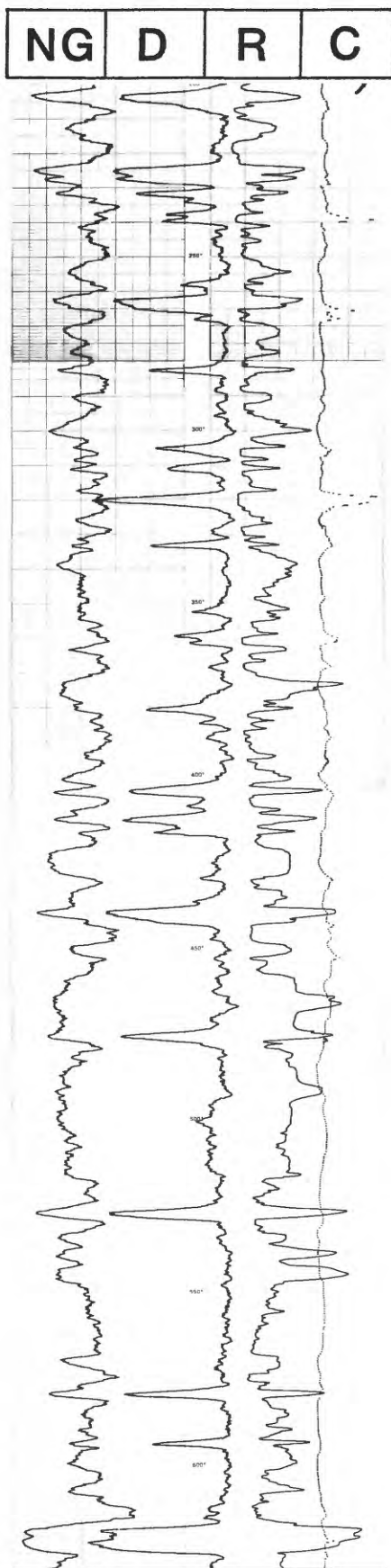
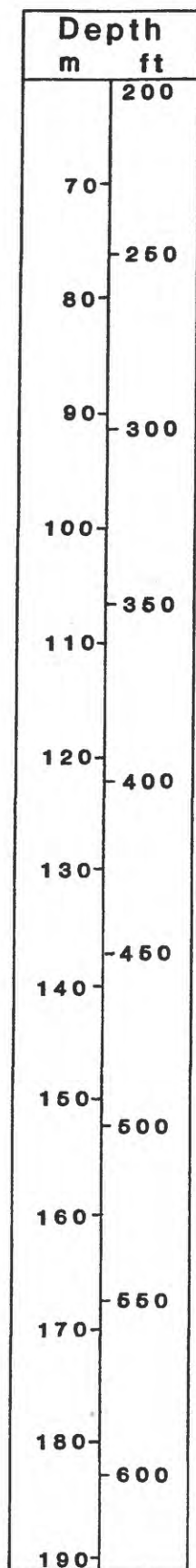
Caliper (C) Scale 1 in./log div.

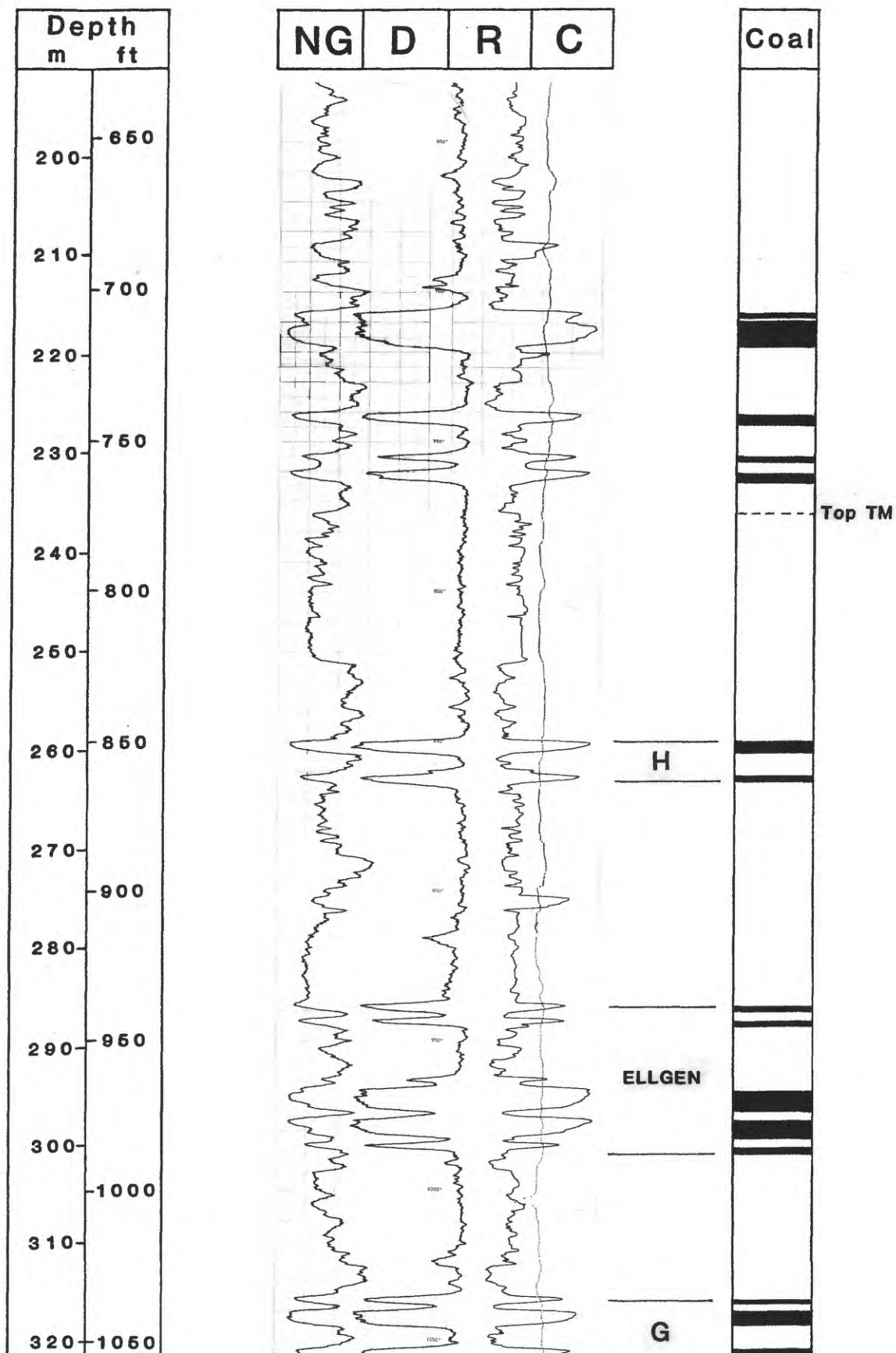
Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. <sup>3</sup>Caliper run at 40 ft/min.

Names of coal beds and zones modified after the nomenclature used by Empire  
Energy Corporation. Coal above the TM could not be correlated.

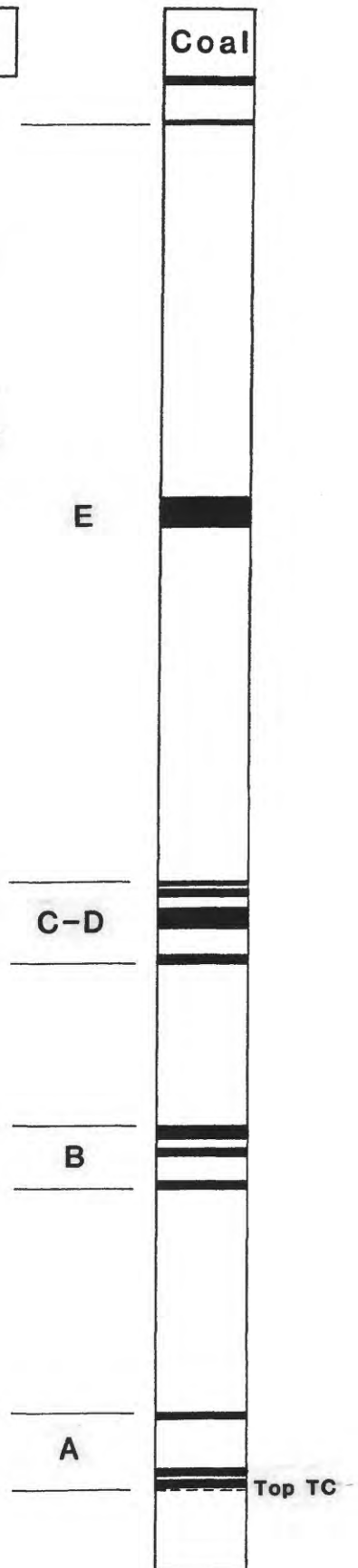
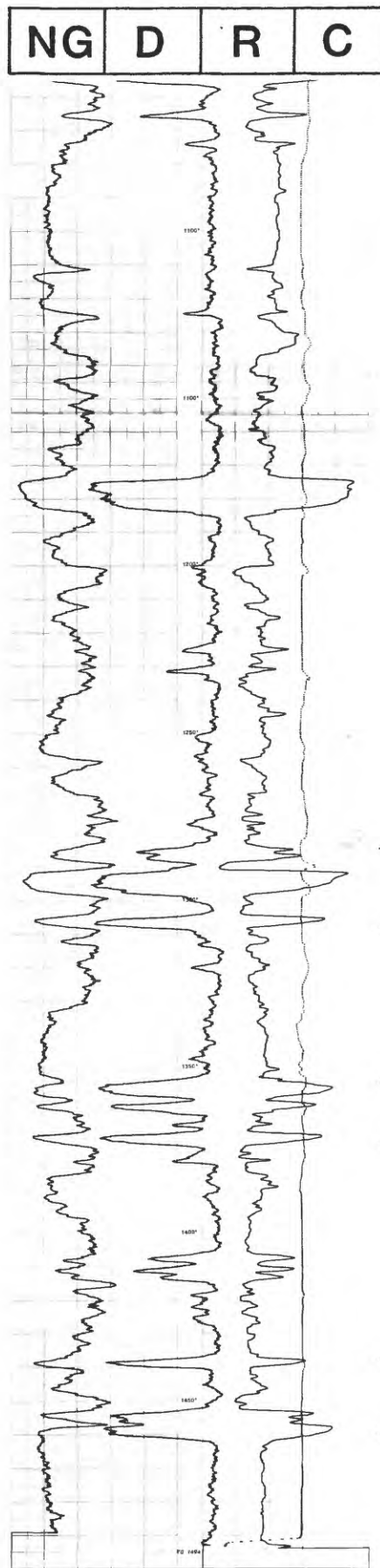








Depth	
m	ft
330	1100
340	
350	1150
360	
370	1200
380	1250
390	
400	1300
410	1350
420	
430	1400
440	1450
450	



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

Hole no. R-18-HG Date logged 10/4/80 Ground elevation 6720 ft

T. 6 N., R. 93 W., Sec. 21 : 1750 ft f N. 1, 1450 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 1420 ft Fluid level 335 ft

Logging company <sup>2</sup> Logging speed 20 ft/min.<sup>3</sup> Logged depth 1379 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 4 T.C. 2

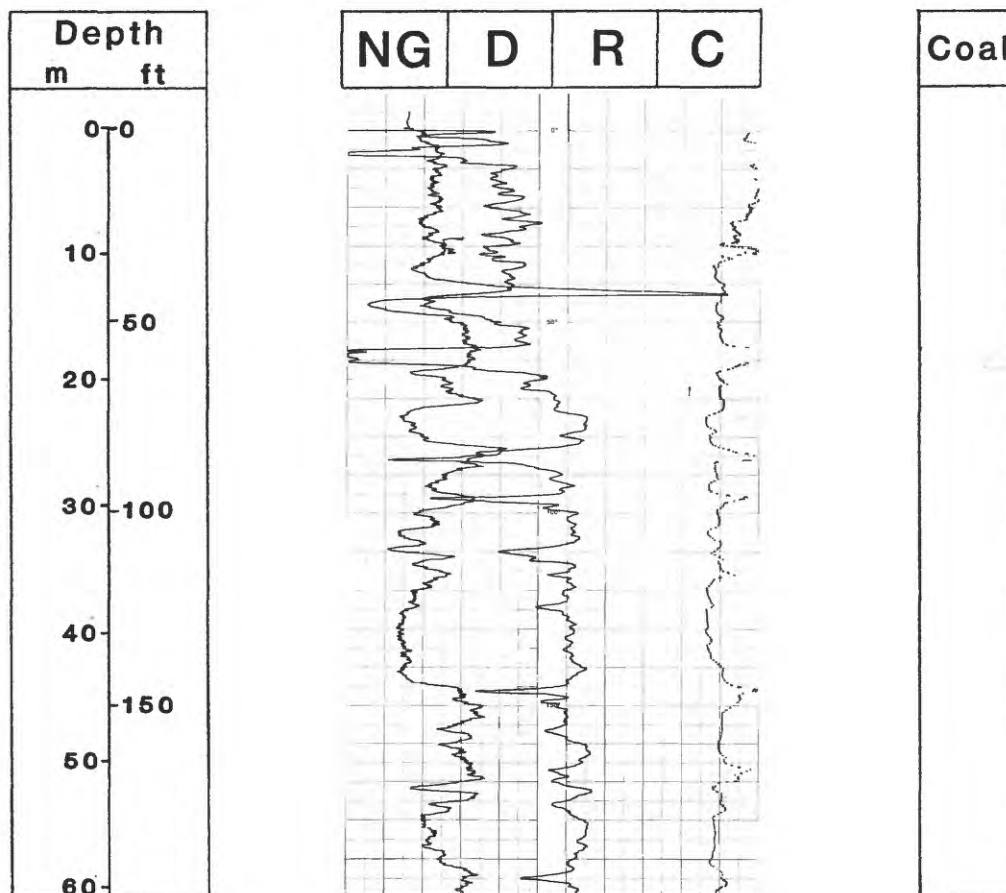
Single point resistance (R) Scale variable

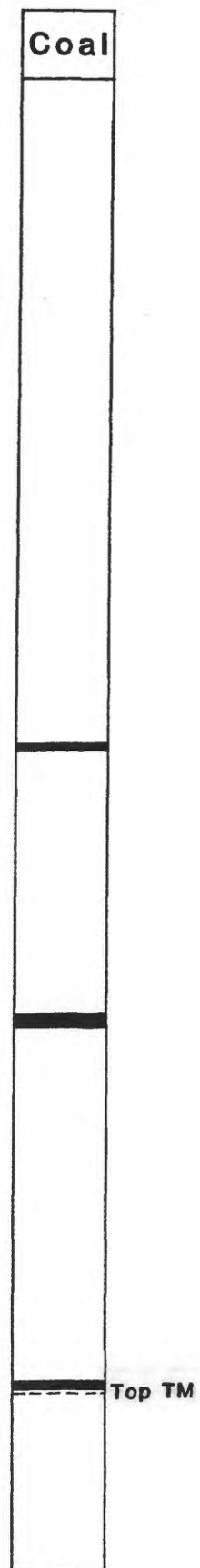
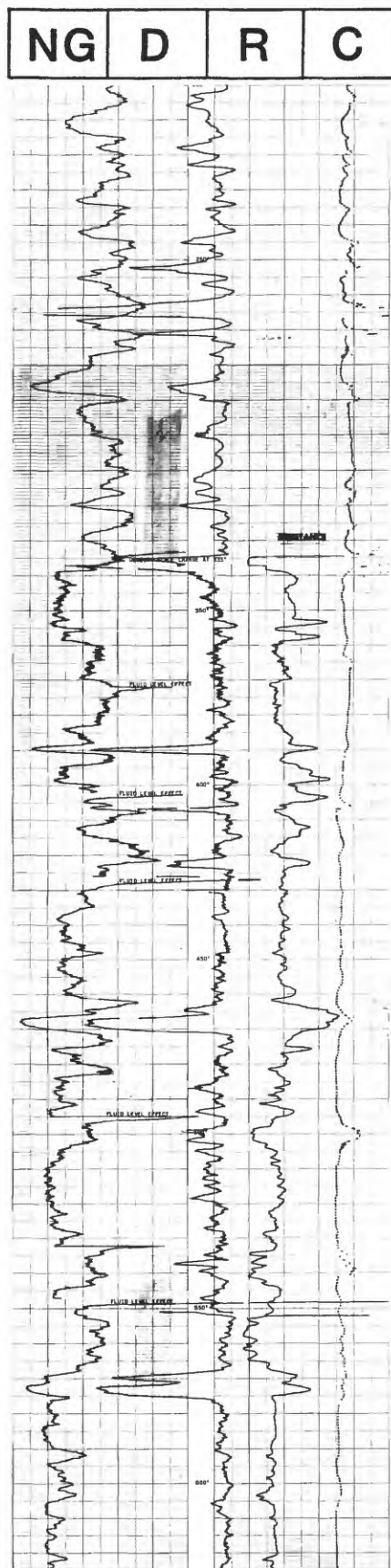
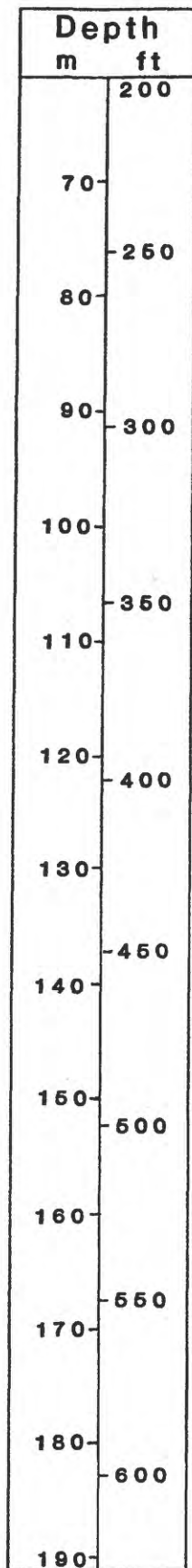
Caliper (C) Scale 1 in./log div.

Remarks: <sup>1</sup>Hole filled with fresh water at time of logging. <sup>2</sup>Strata Surveys.

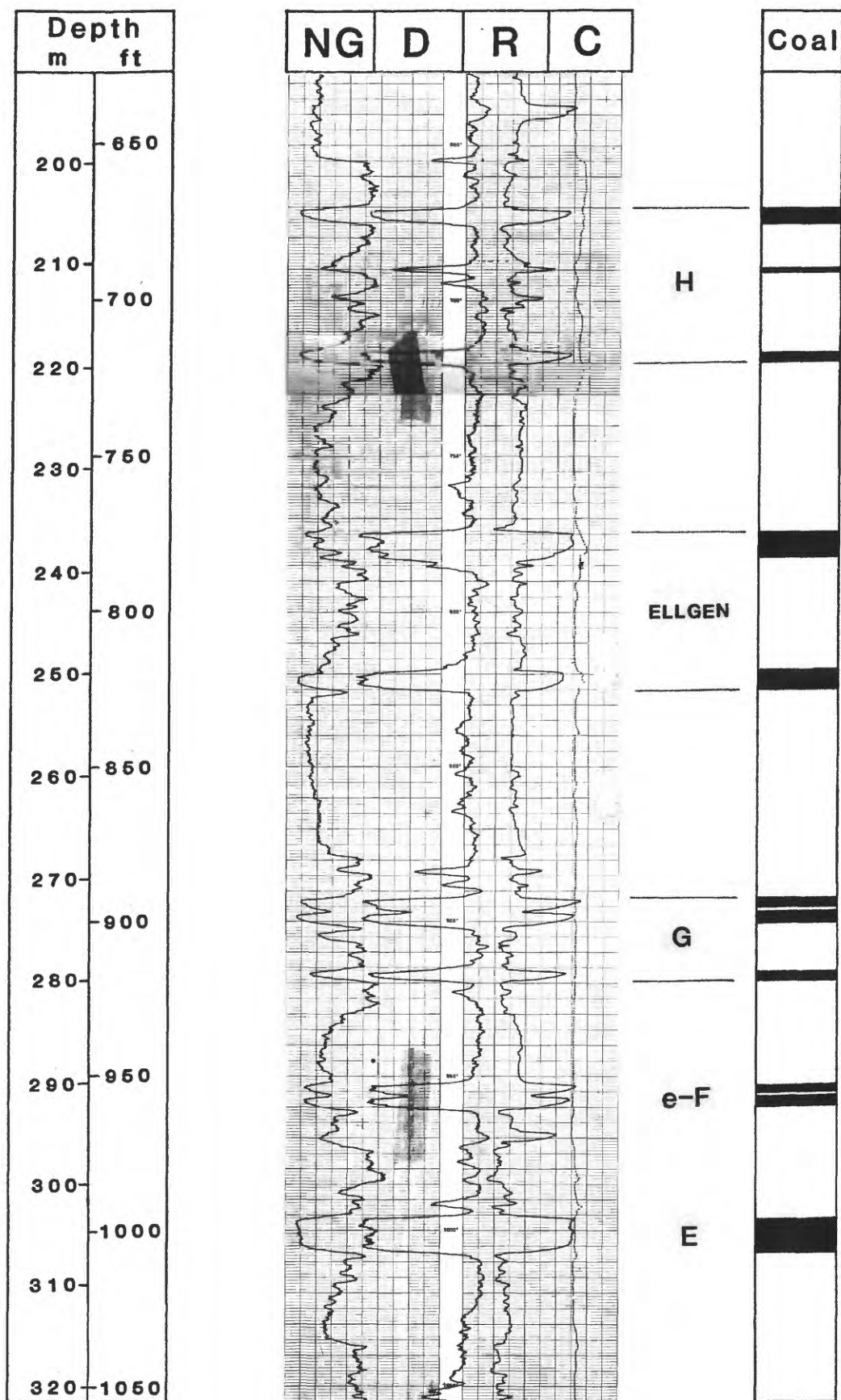
<sup>3</sup>Caliper run at 30 ft/min. <sup>4</sup>1379 ft to 335 ft 48 CPS/log div.; 335 ft to 0 ft

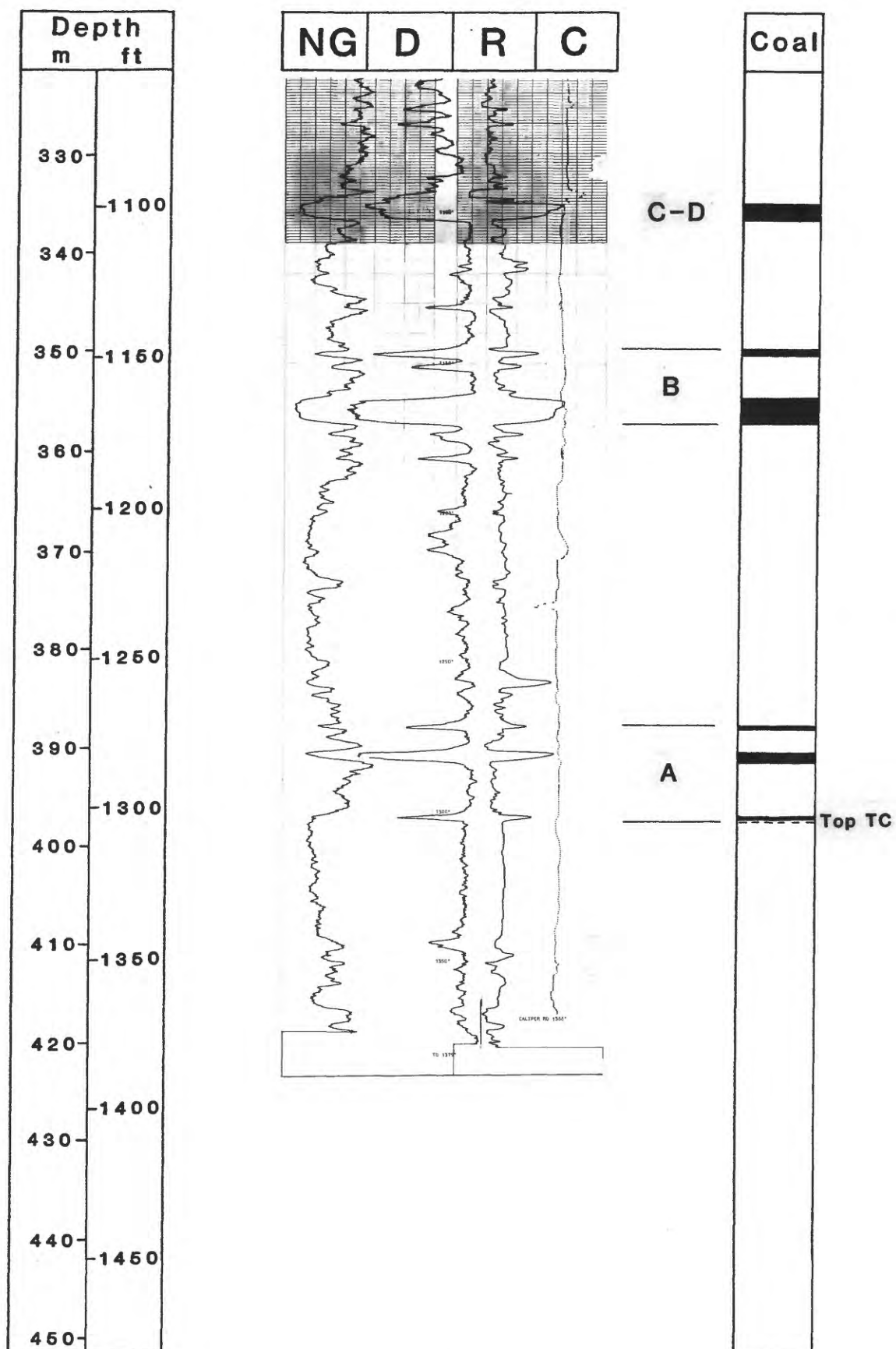
96 CPS/log div. Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation. Coal above the TM could not be correlated.













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

Hole no. BRG-1 Date logged 9/12/80 Ground elevation 6440 ft

T. 6 N., R. 92 W., Sec. 23 : 1400 ft f N. 1, 1800 ft f W. 1

Drilling medium 1 Drilled depth 1763 ft Fluid level 116 ft

Logging company 2 Logging speed 20 ft/min. Logged depth 1763 ft

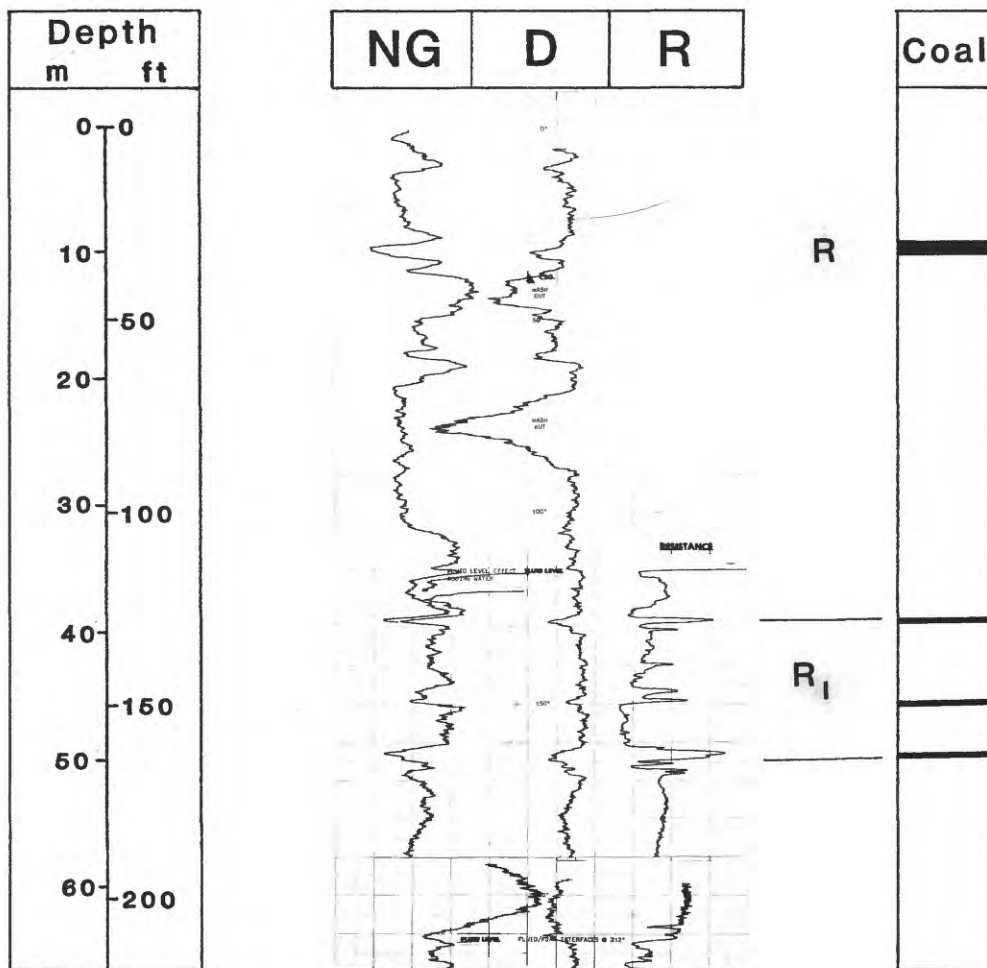
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

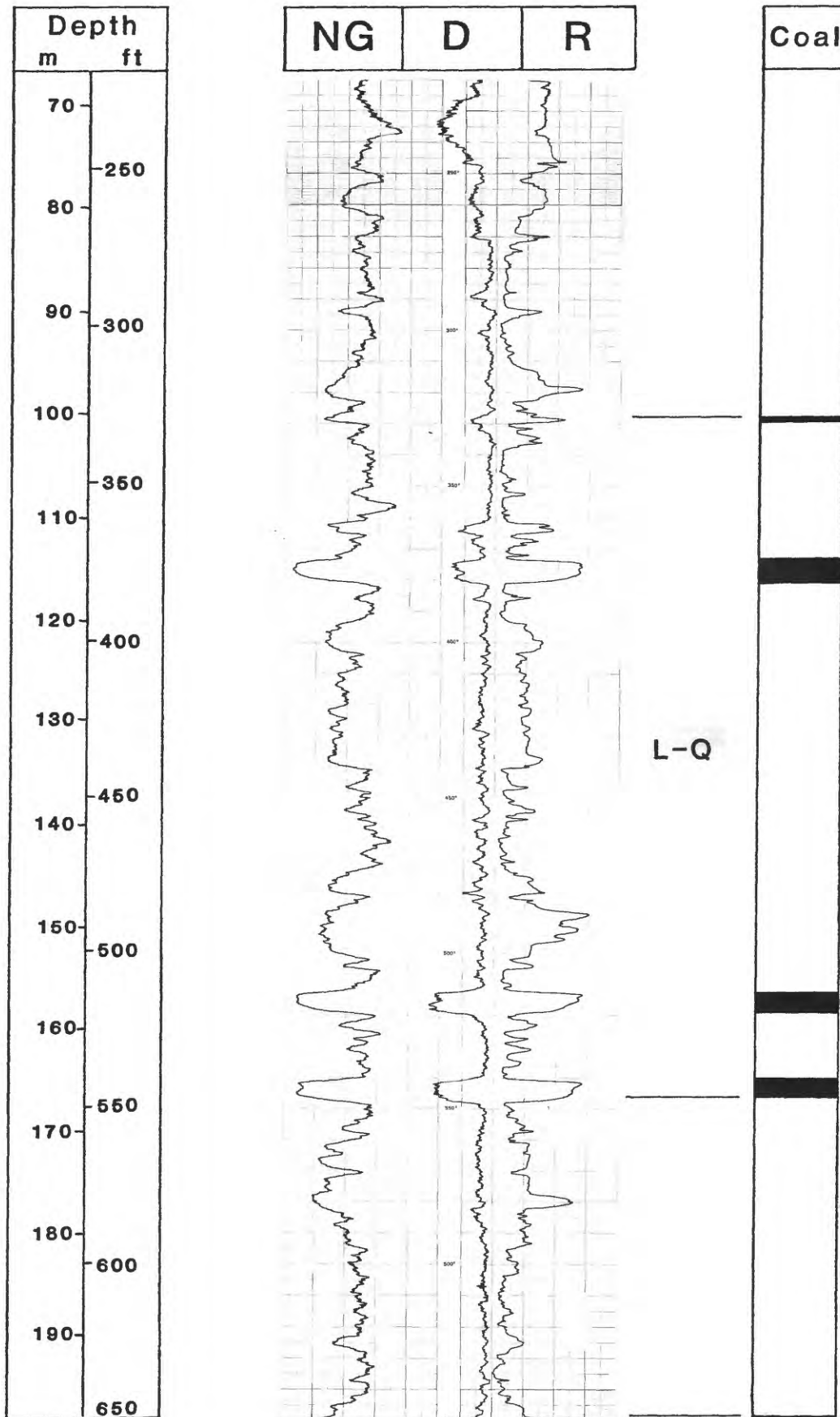
Density (gamma-gamma) (D) Scale 20 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: 1 Hole filled with fresh water and foam at time of logging.

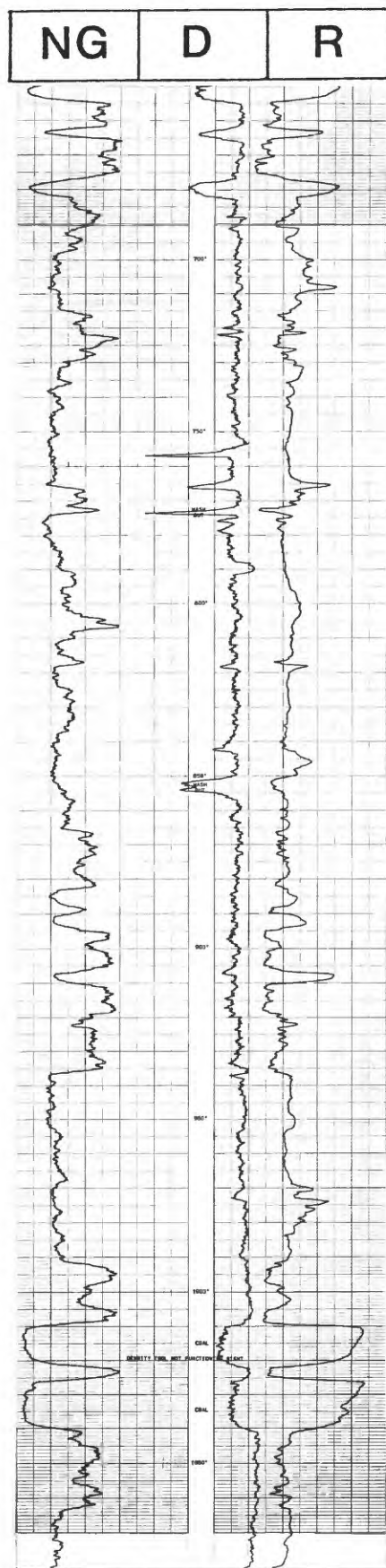
2 Strata Surveys. Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation.

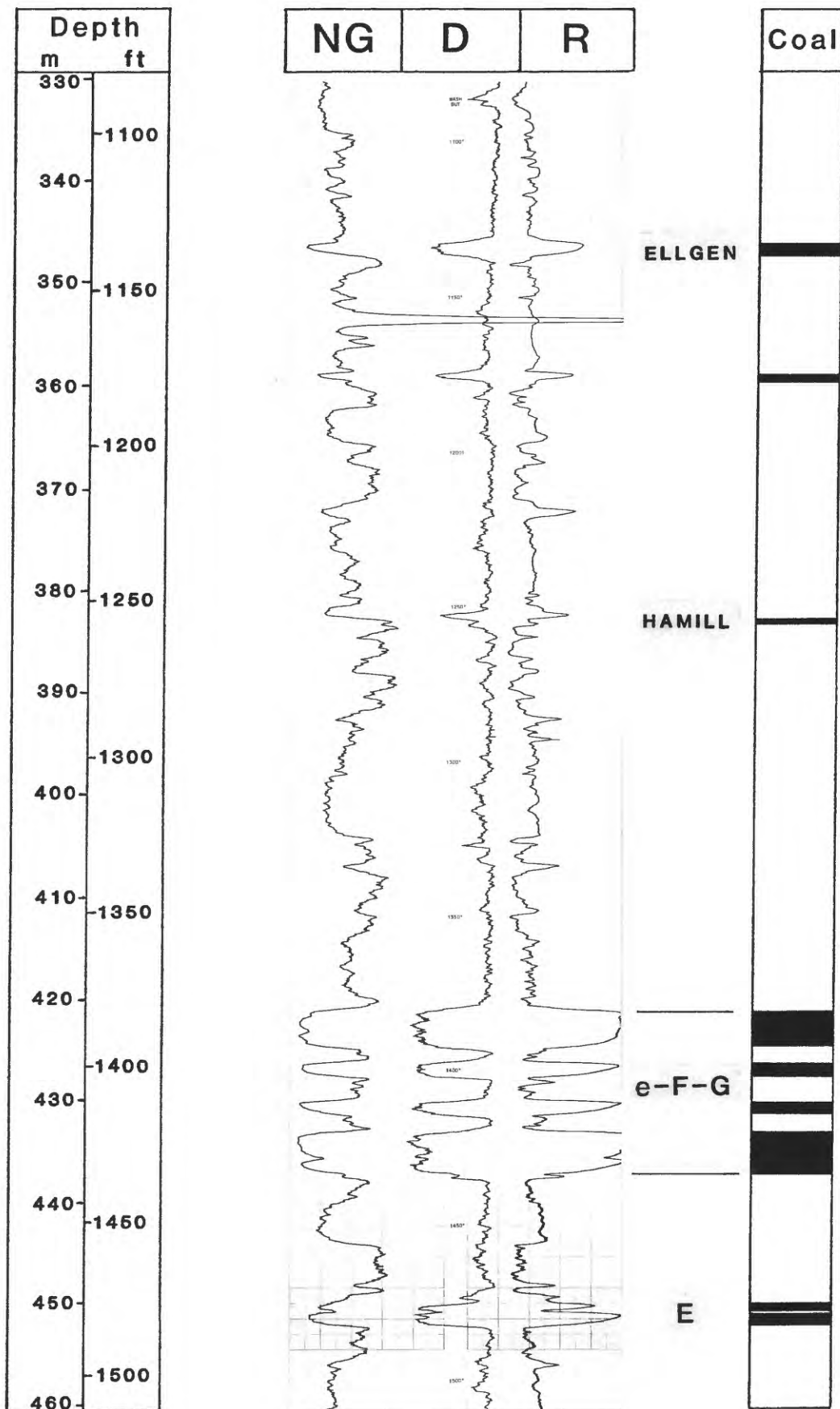


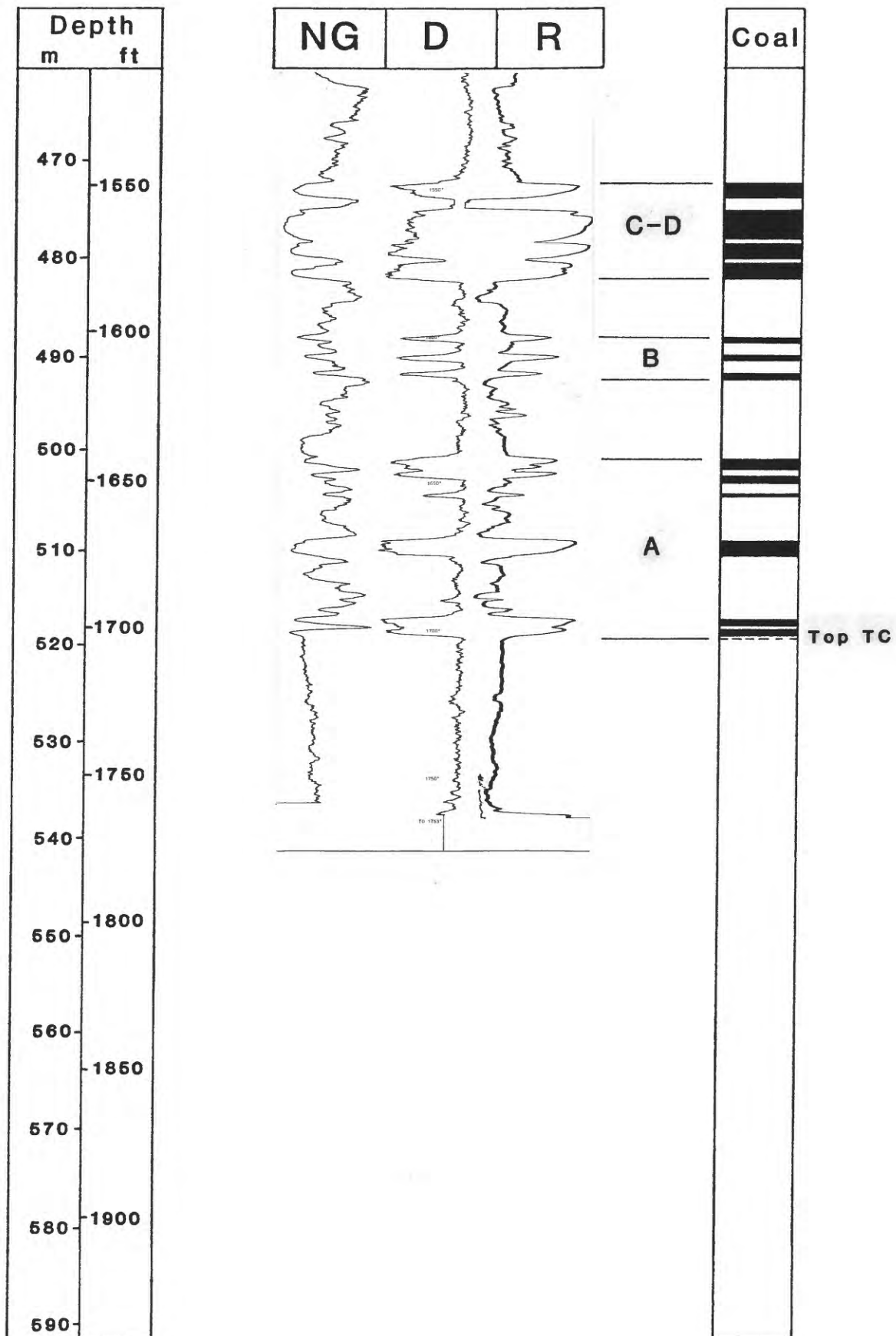




Depth	
m	ft
200	
210	
	700
220	
230	
	750
240	
	800
250	
260	
	850
270	
	900
280	
290	
	950
300	
	1000
310	
	1050
320	









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

Hole no. BRG-2 Date logged 9/18/80 Ground elevation 6360 ft

T. 6 N., R. 92 W., Sec. 24 : 2700 ft f N. 1, 700 ft f W. 1

Drilling medium mud/foam Drilled depth 1840 ft Fluid level 60 ft

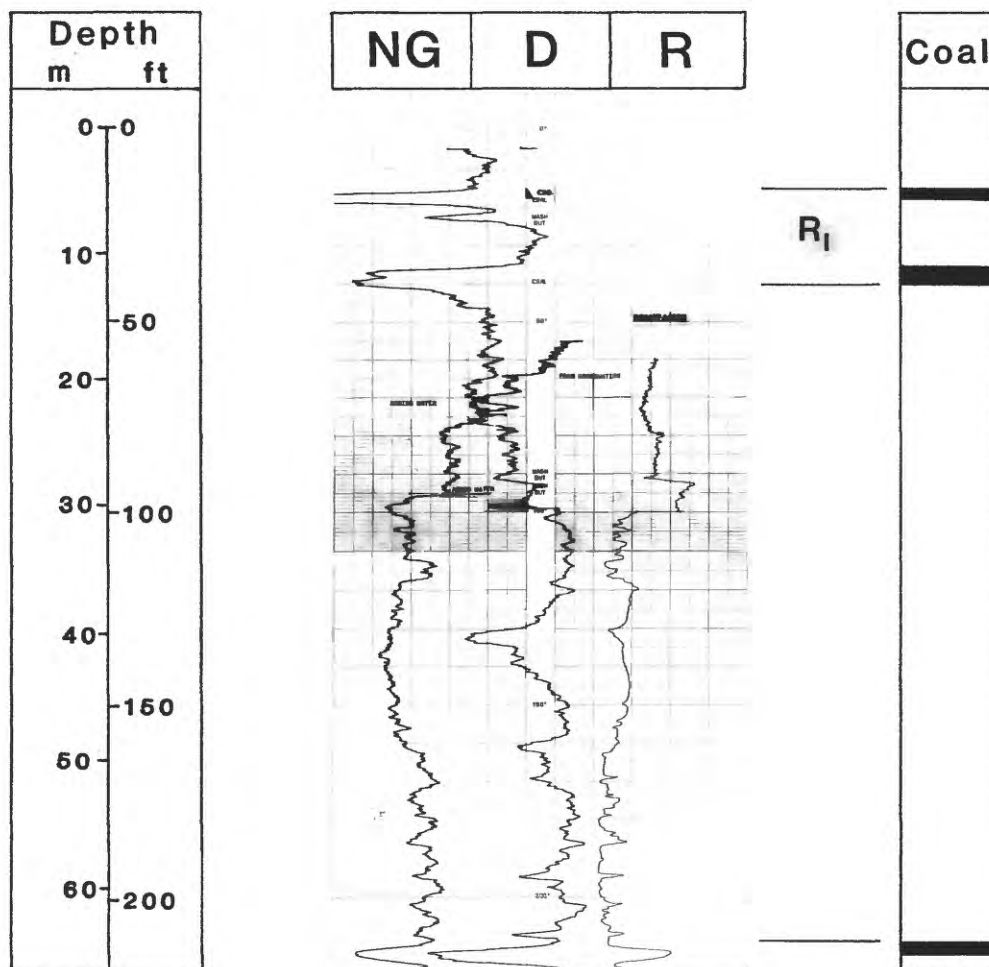
Logging company <sup>1</sup> Logging speed 20 ft/min. Logged depth 1810 ft

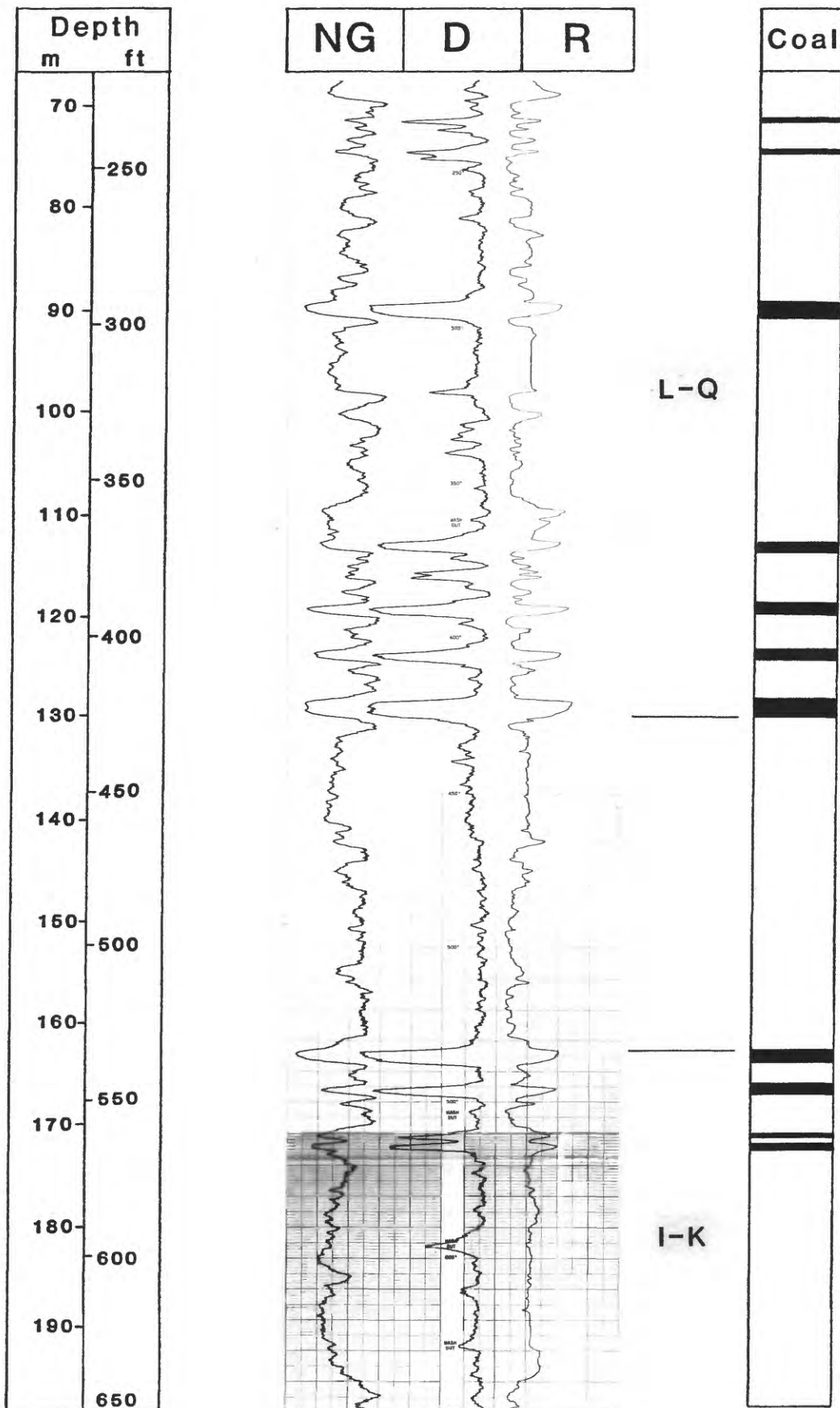
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

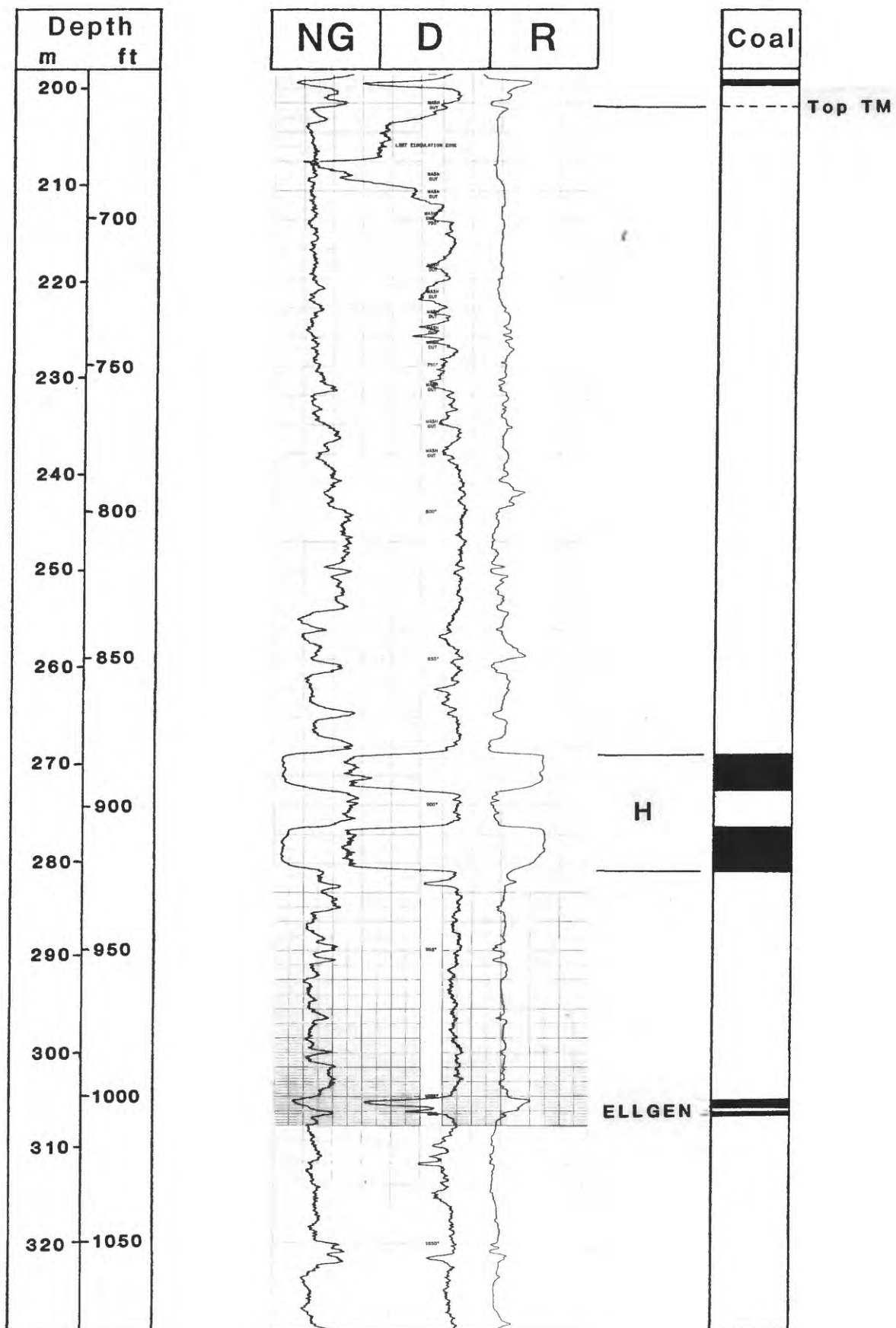
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

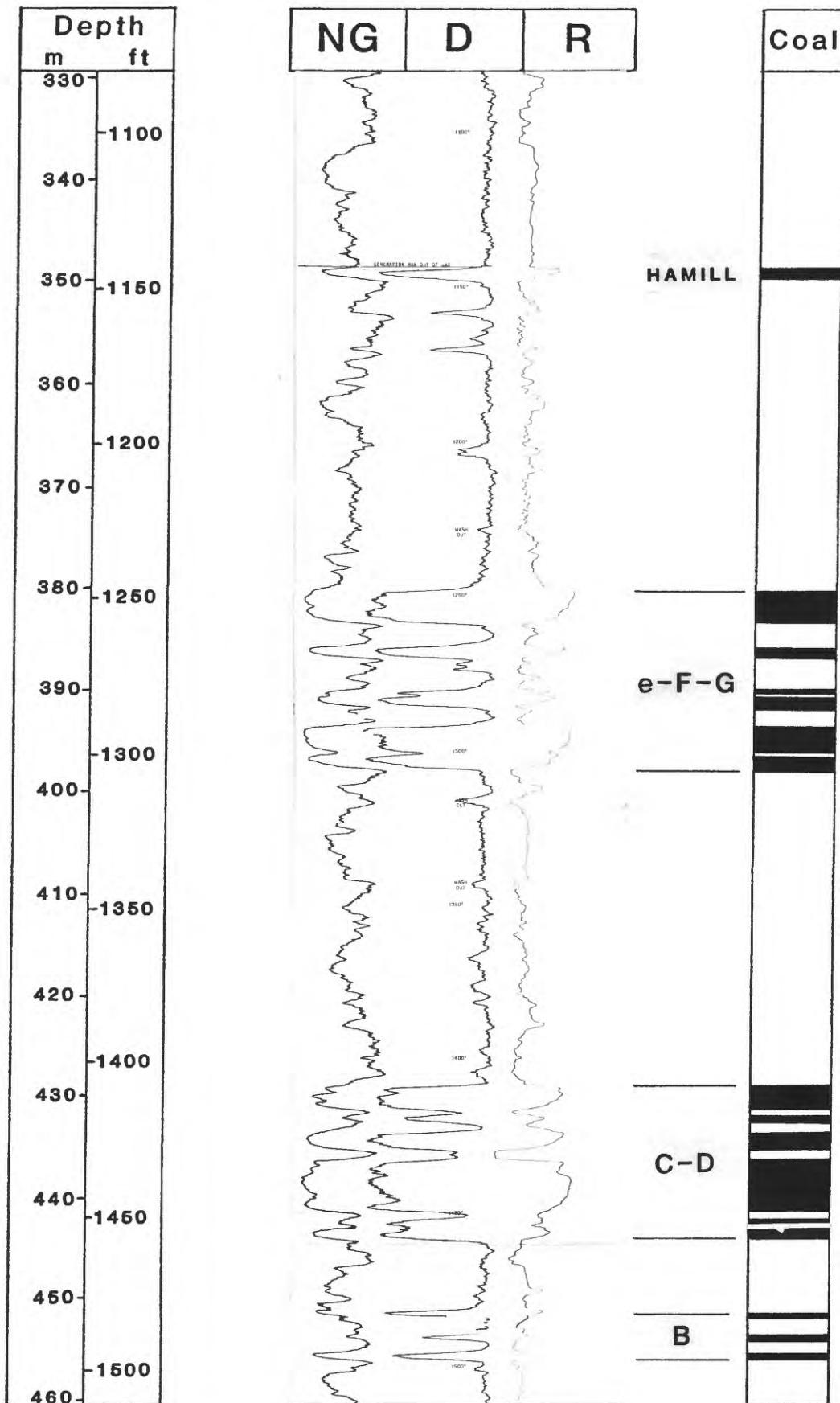
Remarks: <sup>1</sup>Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Empire Energy Corporation.

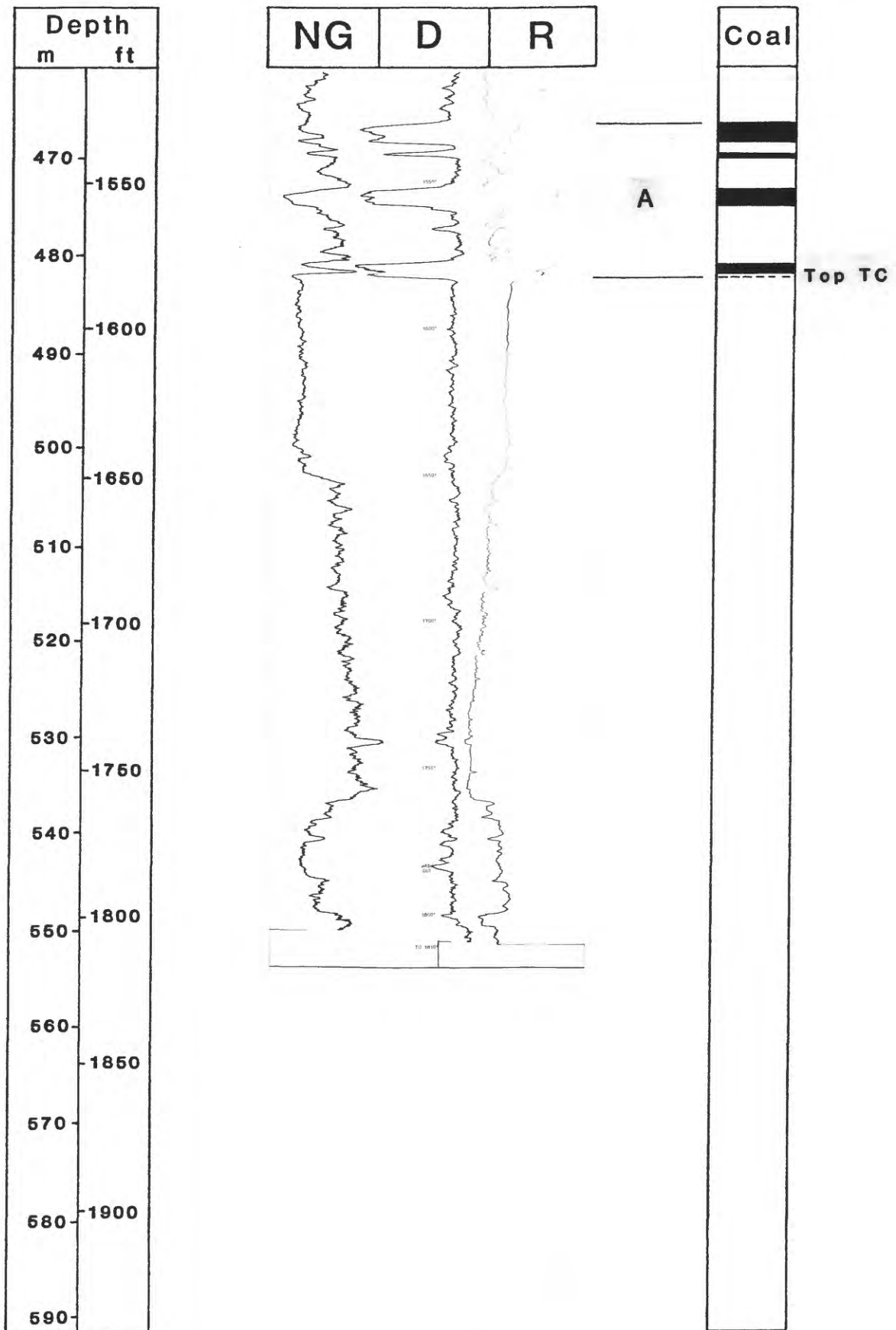












U.S. GEOLOGICAL SURVEY  
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. BRG-3 Date logged 9/27/80 Ground elevation 6445 ft

T. 6 N., R. 92 W., Sec. 26 : 1450 ft f S. 1, 2000 ft f W. 1

Drilling medium mud Drilled depth 1500 ft Fluid level \_\_\_\_\_

Logging company <sup>1</sup> Logging speed 20 ft/min.<sup>2</sup> Logged depth 1496 ft

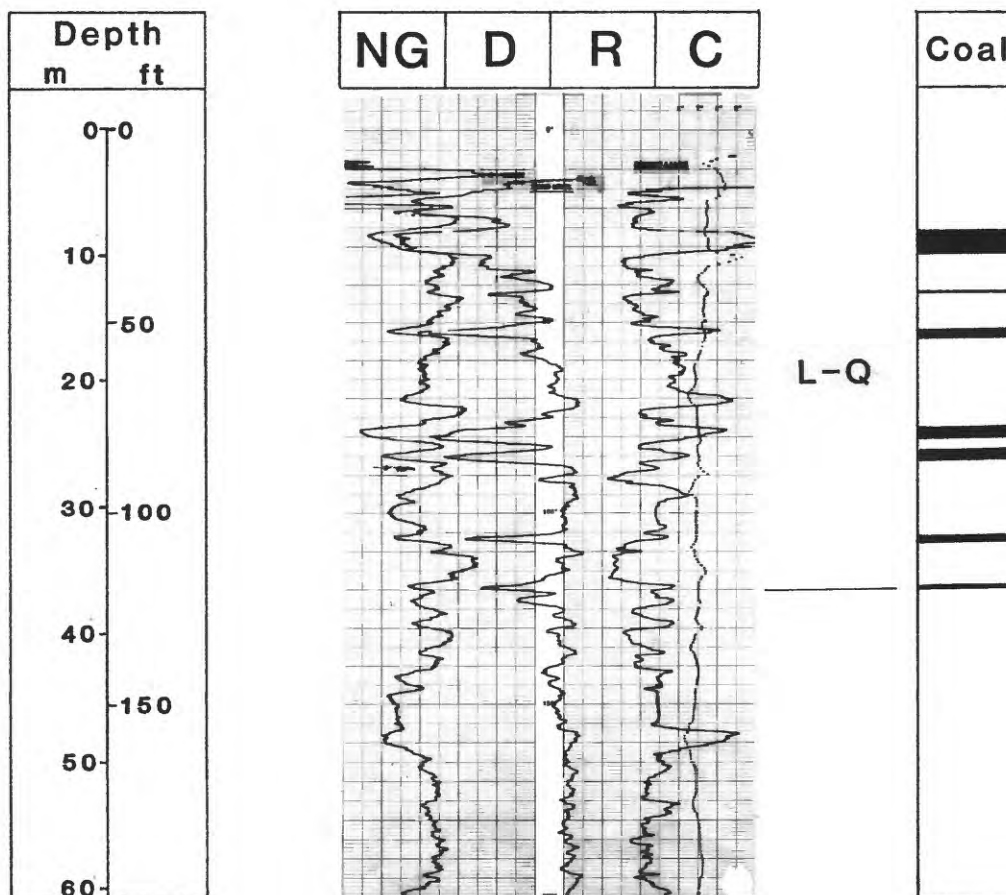
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

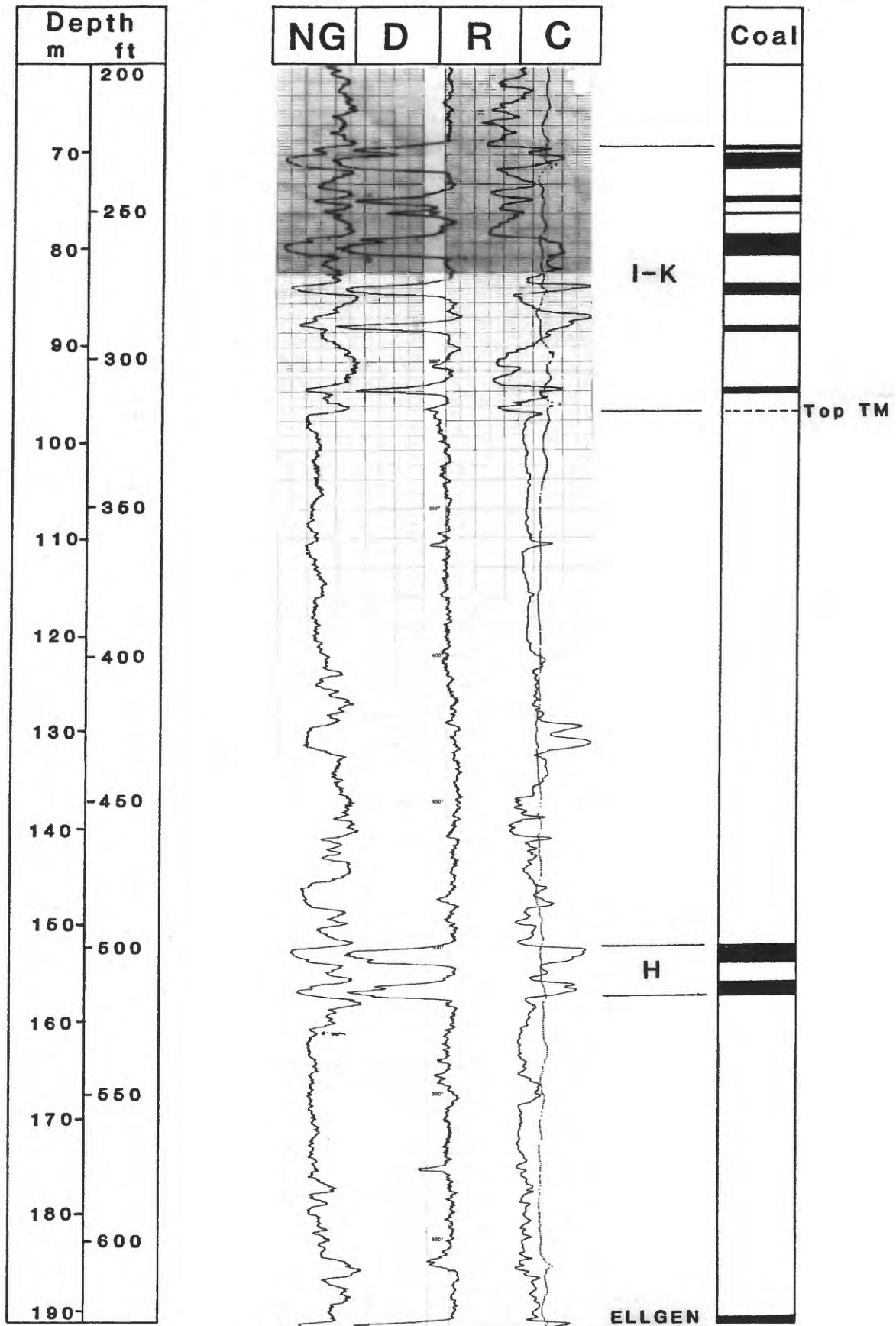
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

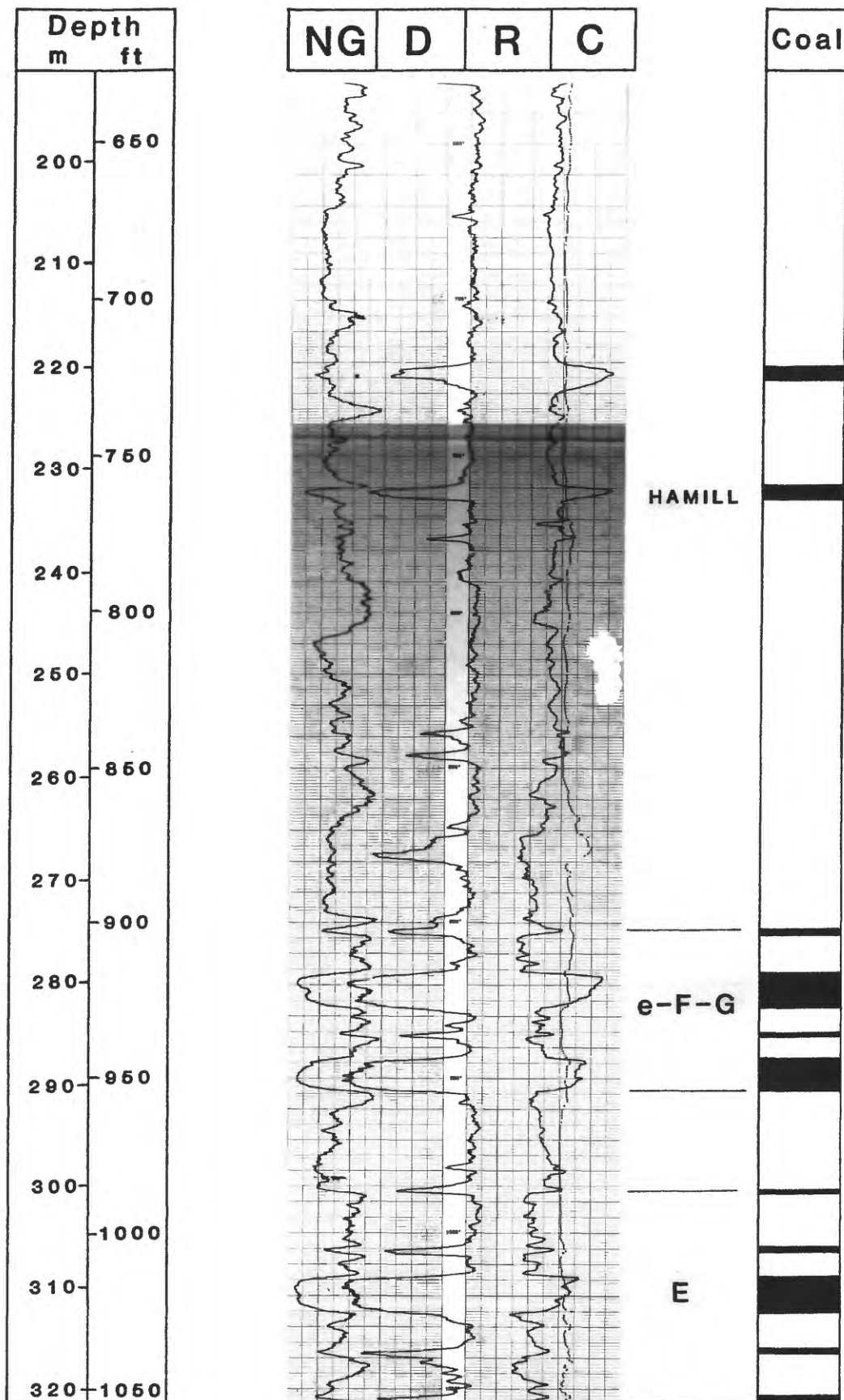
Caliper (C) Scale 1 in./log div.

Remarks: <sup>1</sup>Strata Surveys. <sup>2</sup>Caliper run at 30 ft/min. Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation.

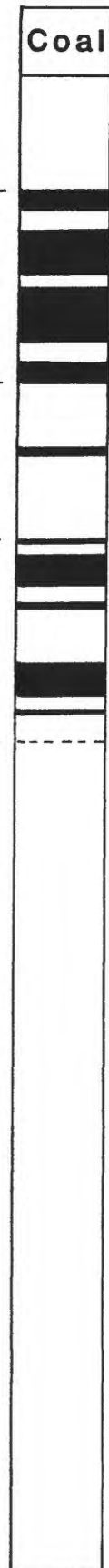
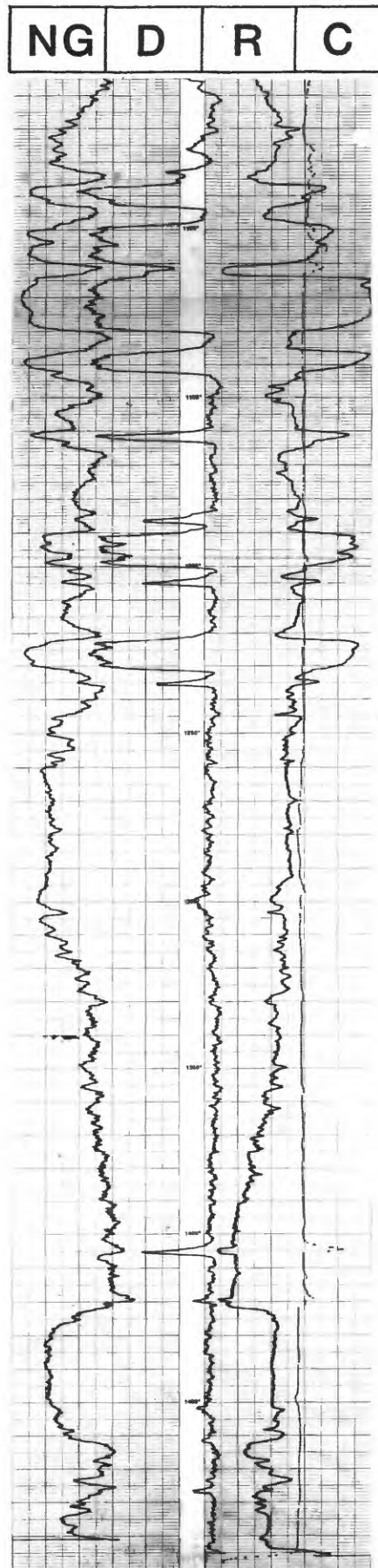








Depth	
m	ft
330	1100
340	
350	1150
360	
370	1200
380	1250
390	
400	1300
410	1350
420	
430	1400
440	1450
450	



C-D

B

A

Top TC

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

Hole no. I.U.-1 Date logged 9/15/80 Ground elevation 6410 ft

T. 5 N., R. 92 W., Sec. 10 : 800 ft f E. 1, 1000 ft f N. 1

Drilling medium mud<sup>1</sup> Drilled depth 1360 ft Fluid level surface

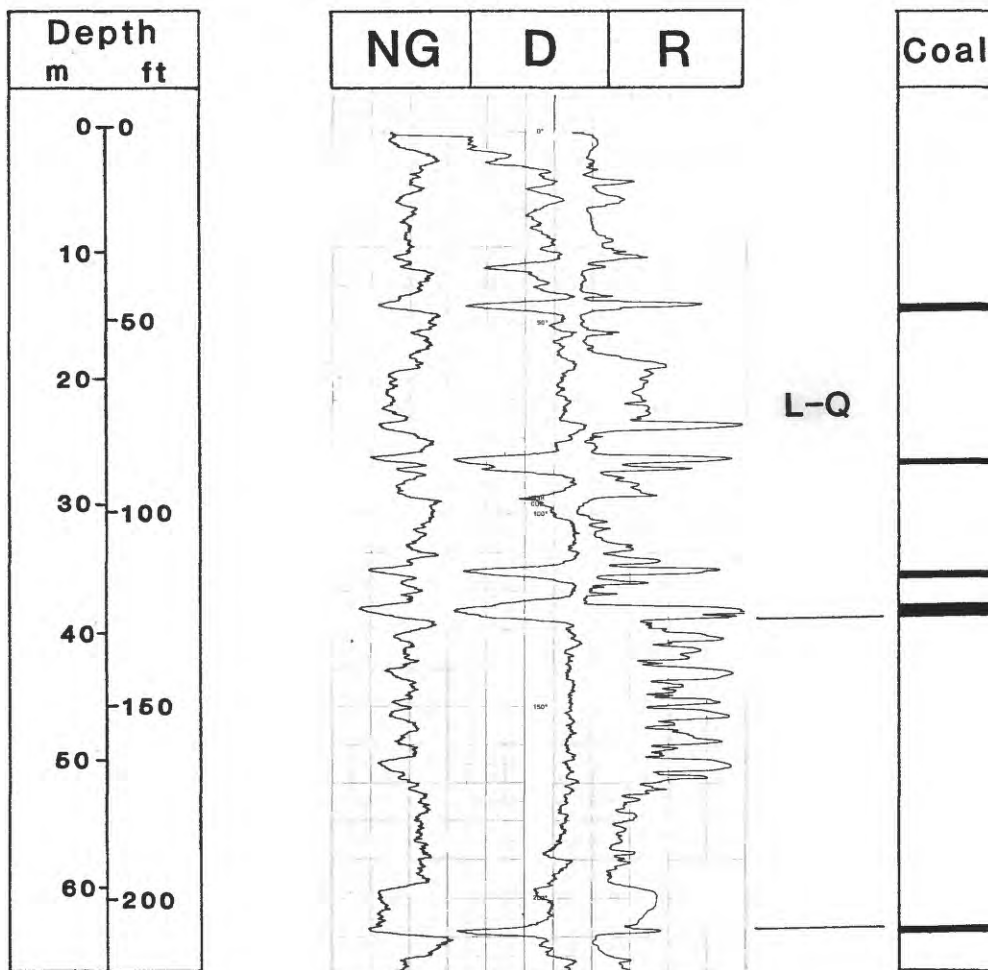
Logging company <sup>2</sup> Logging speed 20 ft/min. Logged depth 1359 ft

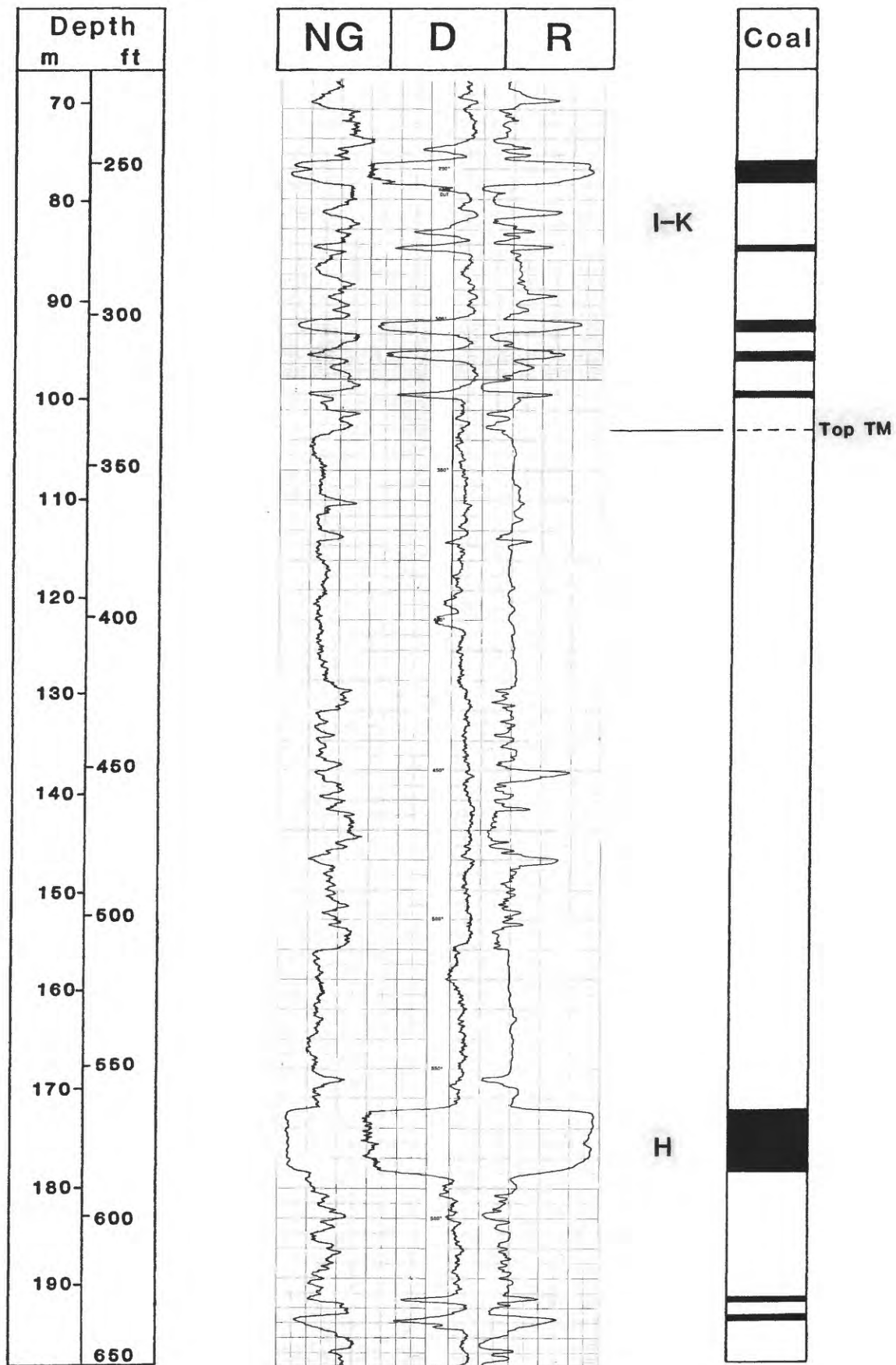
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 40 CPS/log div. T.C. 2

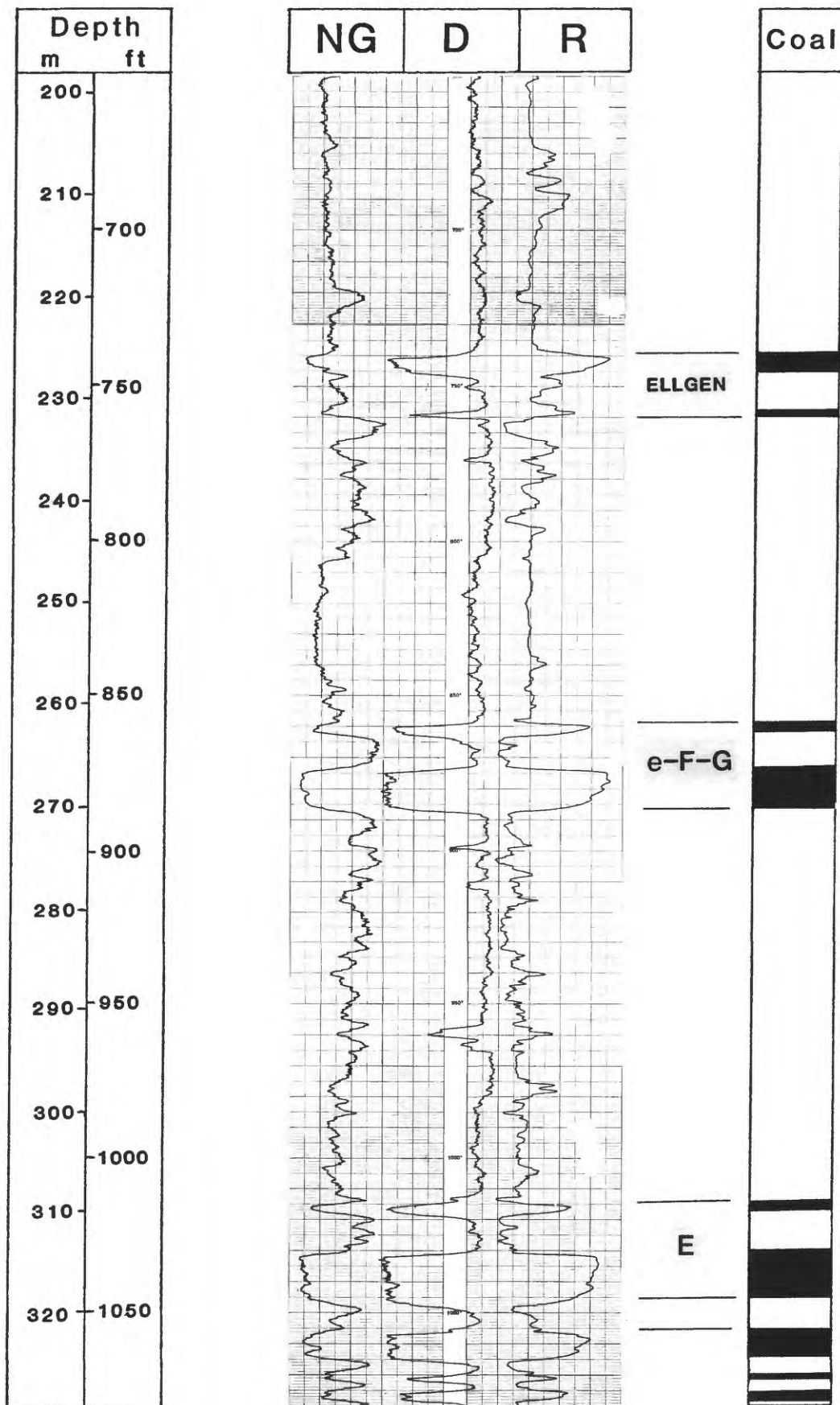
Single point resistance (R) Scale variable

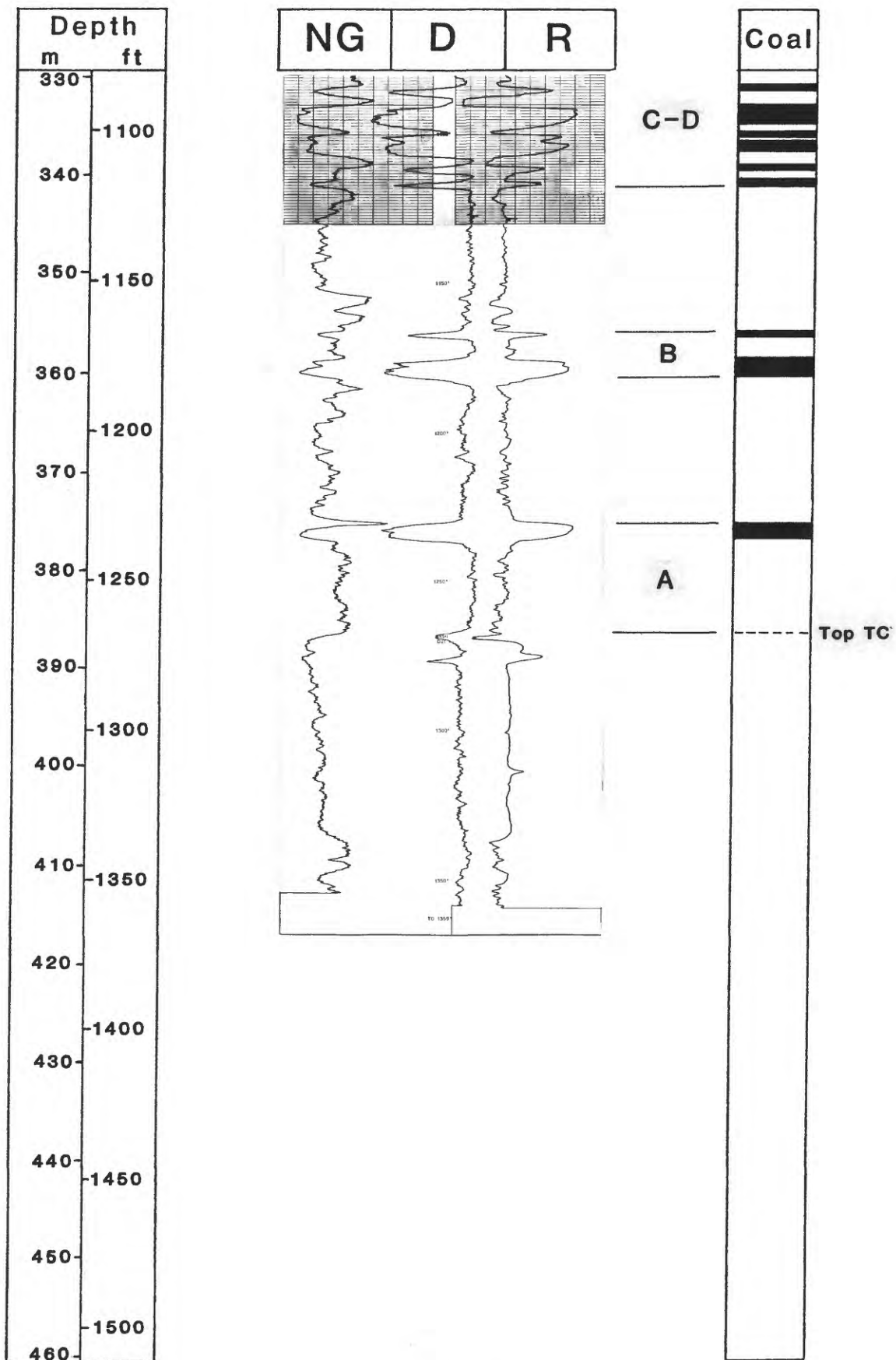
Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. Names of coal beds and  
zones modified after the nomenclature used by Empire Energy Corporation.







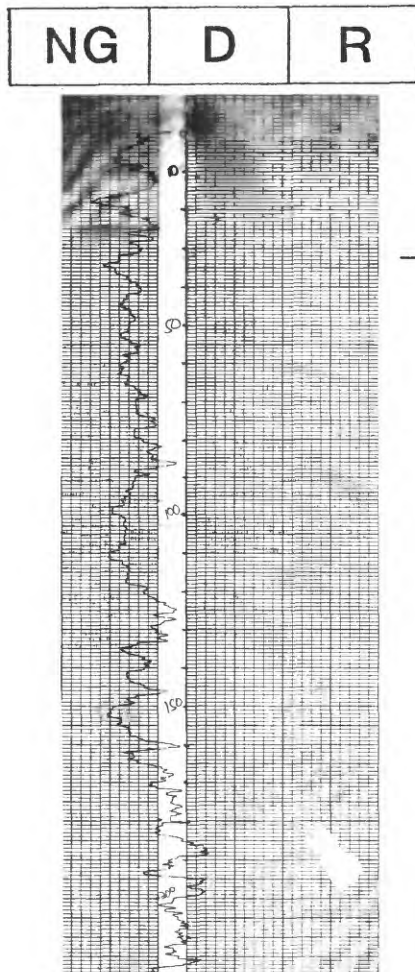
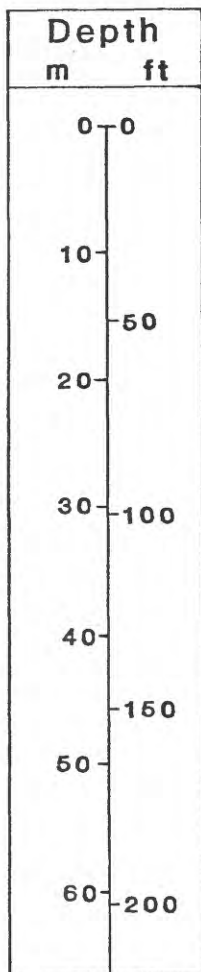




U.S. GEOLOGICAL SURVEY  
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. Iles Mtn. # 2 Date logged 7/3/80 Ground elevation 7020 ft<sup>1</sup>  
T. 5 N., R. 92 W., Sec. 14 : 1550 ft f N. 1, 350 ft f E. 1  
Drilling medium 2 Drilled depth 995 ft(?) Fluid level 250 ft  
Logging company USGS Logging speed 20 ft/min. Logged depth 995 ft  
Natural gamma (NG) Scale 3 T.C. 2  
Density (gamma-gamma) (D) Scale 120 CPS/in. T.C. 2  
Single point resistance (R) Scale variable

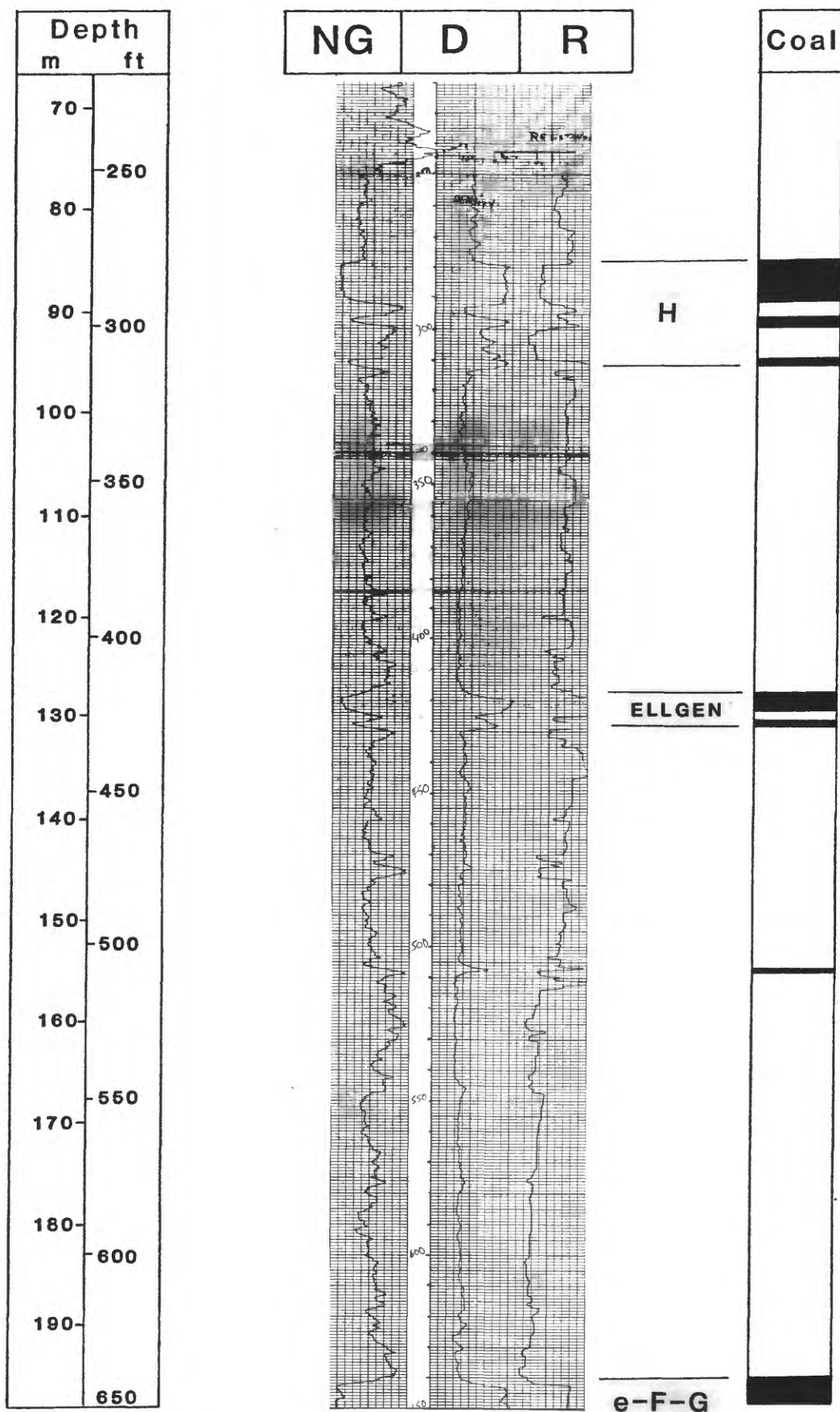
Remarks: <sup>1</sup>Map shows 7000 ft. <sup>2</sup>Hole filled with fresh water at time of logging.  
<sup>3</sup>20 CPS/in. from 995 ft to 250 ft; 9 CPS/in. from 250 ft to 0 ft. Names of coal  
beds and zones modified after the nomenclature used by Empire Energy Corporation.



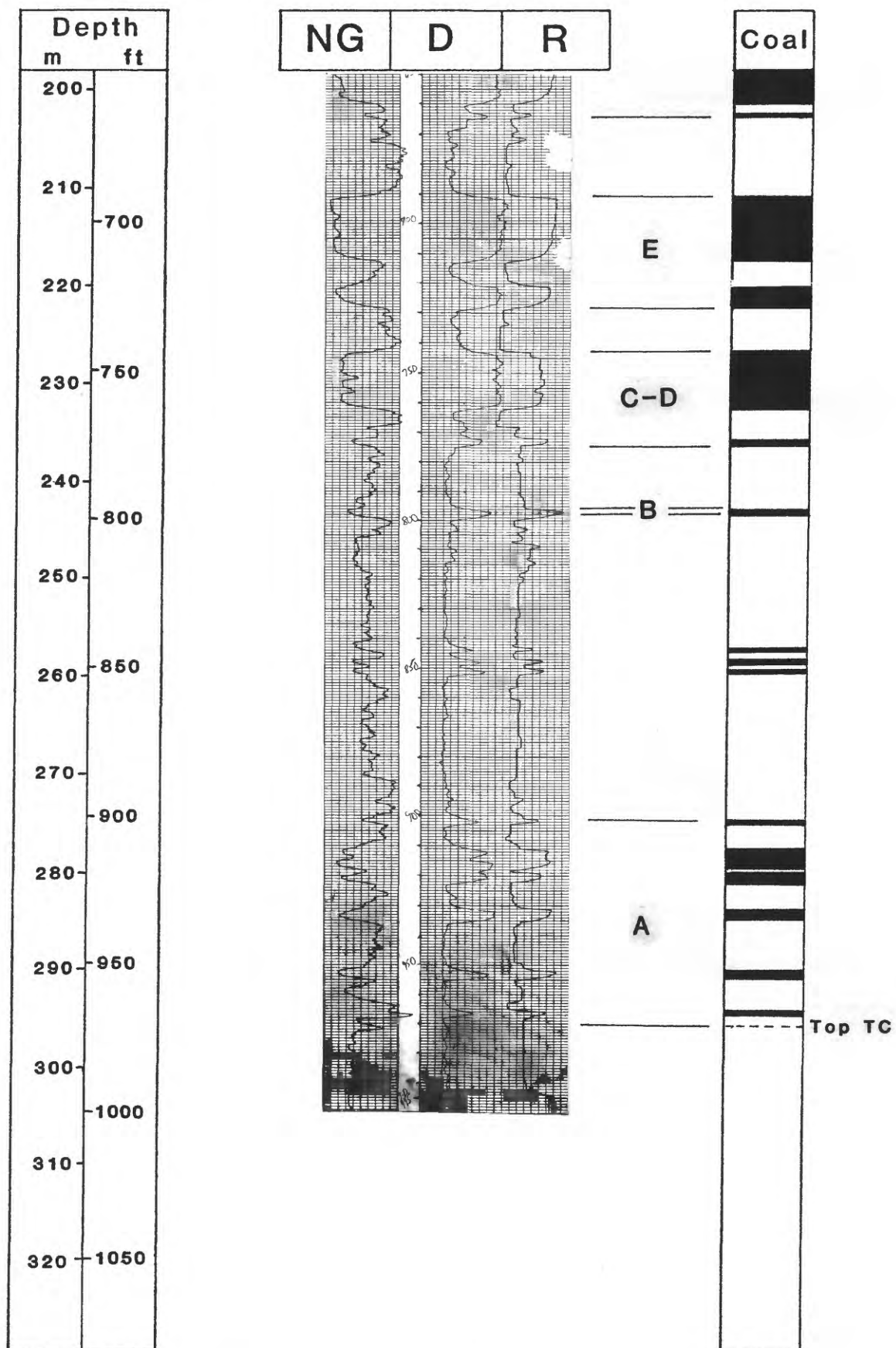
I-K



Top TM







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

Hole no. I.U.-3 Date logged 9/17/80 Ground elevation 7300 ft

T. 5 N., R. 92 W., Sec. 15 : 200 ft f E. 1, 1000 ft f S. 1

Drilling medium mud Drilled depth 900 ft Fluid level 259 ft

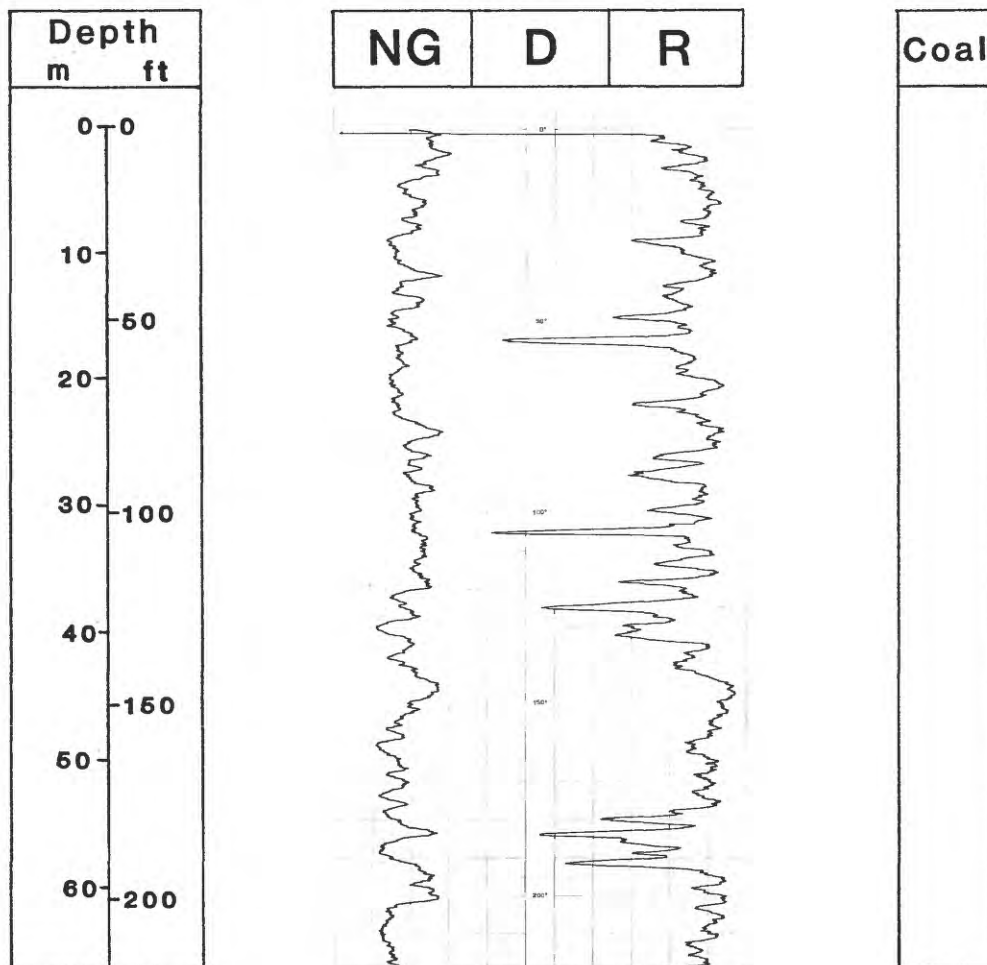
Logging company <sup>1</sup> Logging speed 20 ft/min. Logged depth 900 ft

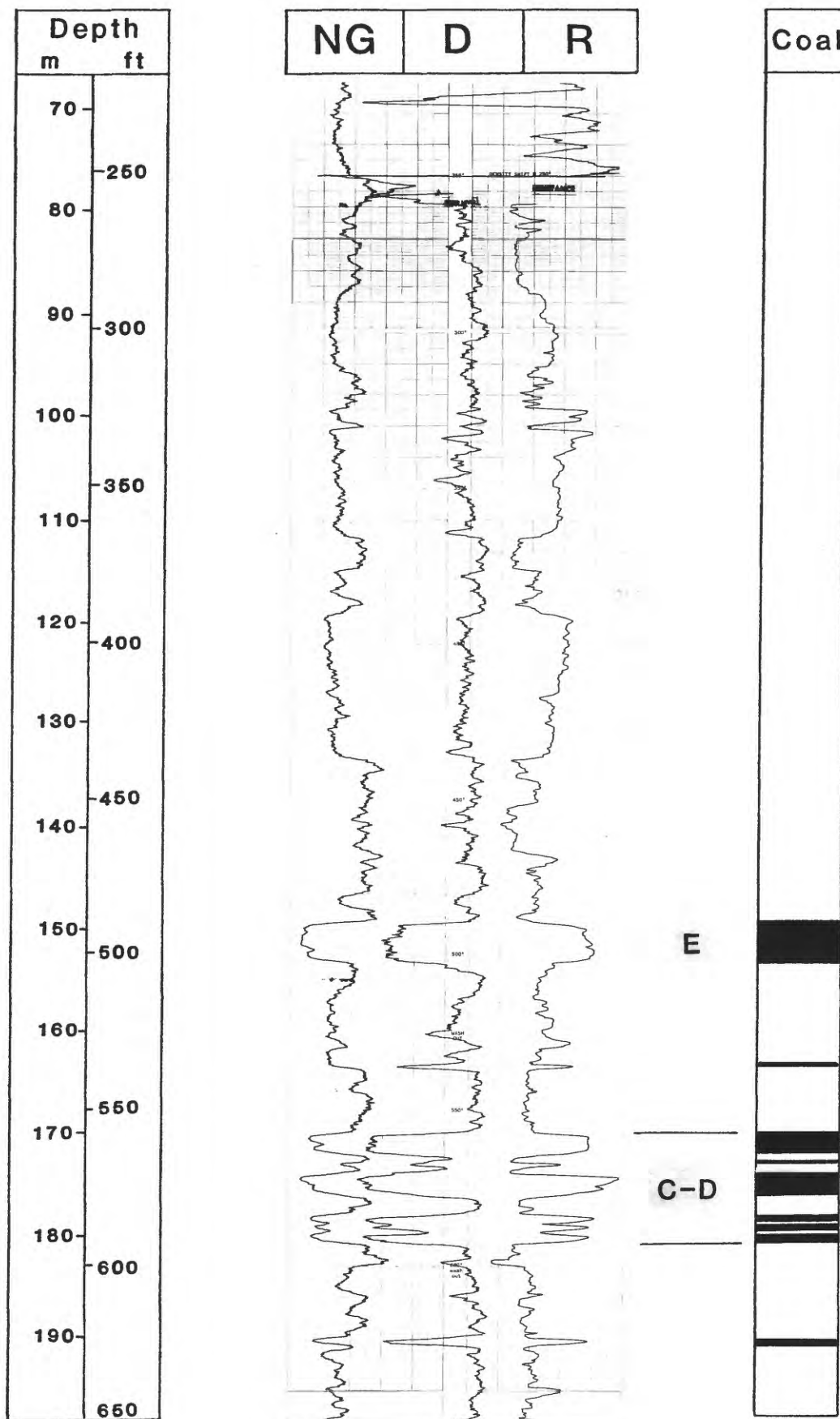
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

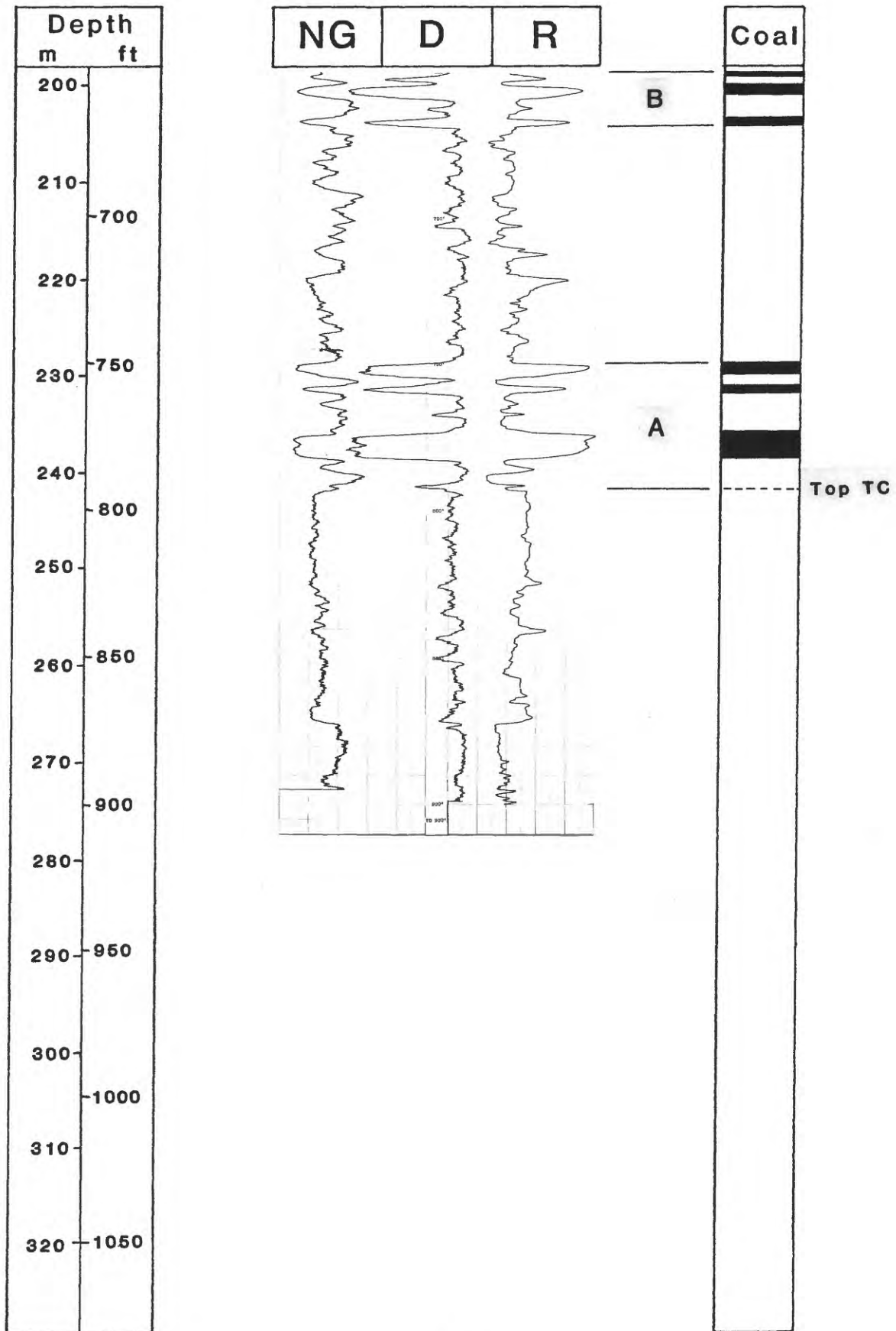
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Empire Energy Corporation.









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

Hole no. MC-1 Date logged 9/25/80 Ground elevation 6760 ft

T. 5 N., R. 92 W., Sec. 8 : 100 ft f S. 1, 2400 ft f E. 1

Drilling medium mud<sup>1</sup> Drilled depth 1002 ft Fluid level 73 ft

Logging company <sup>2</sup> Logging speed 20 ft/min.<sup>3</sup> Logged depth 1001 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

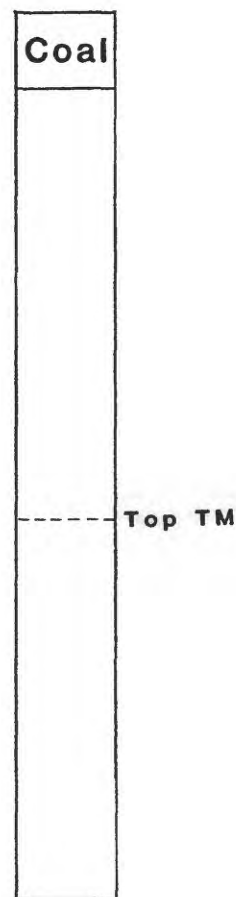
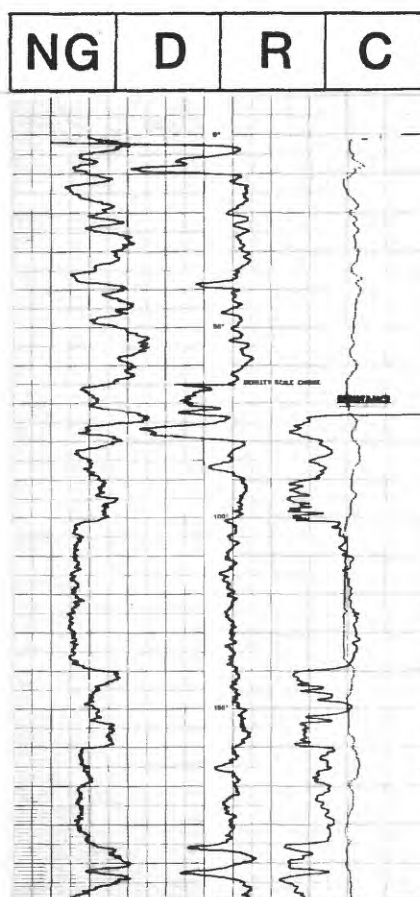
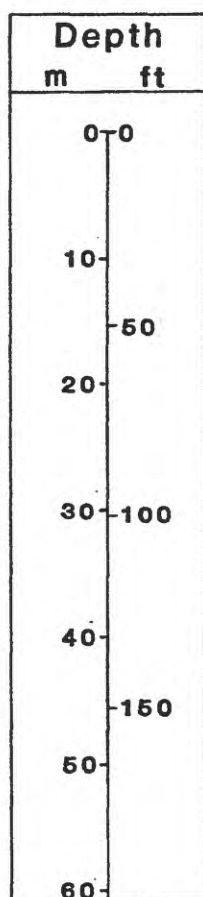
Density (gamma-gamma) (D) Scale (4) T.C. 2

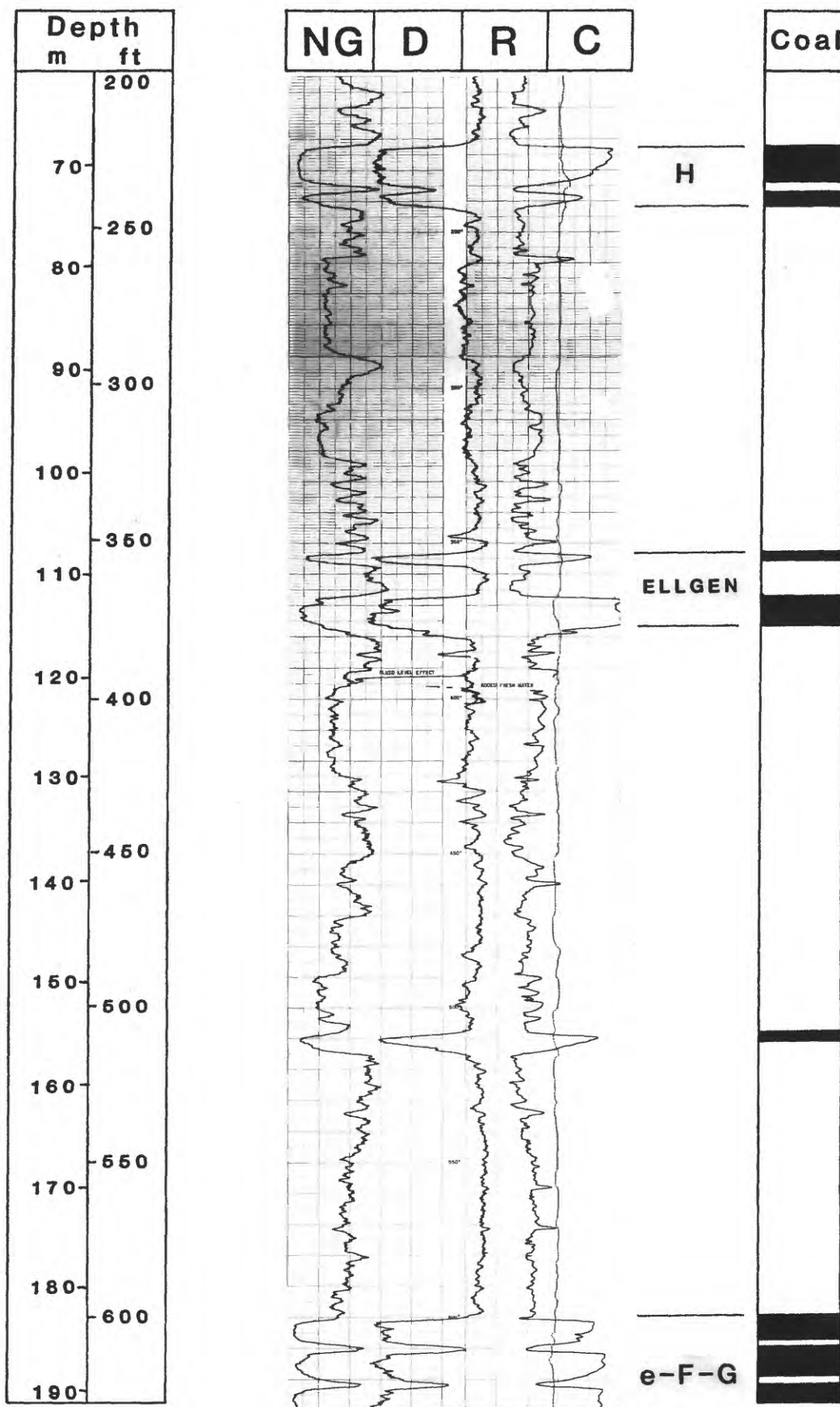
Single point resistance (R) Scale variable

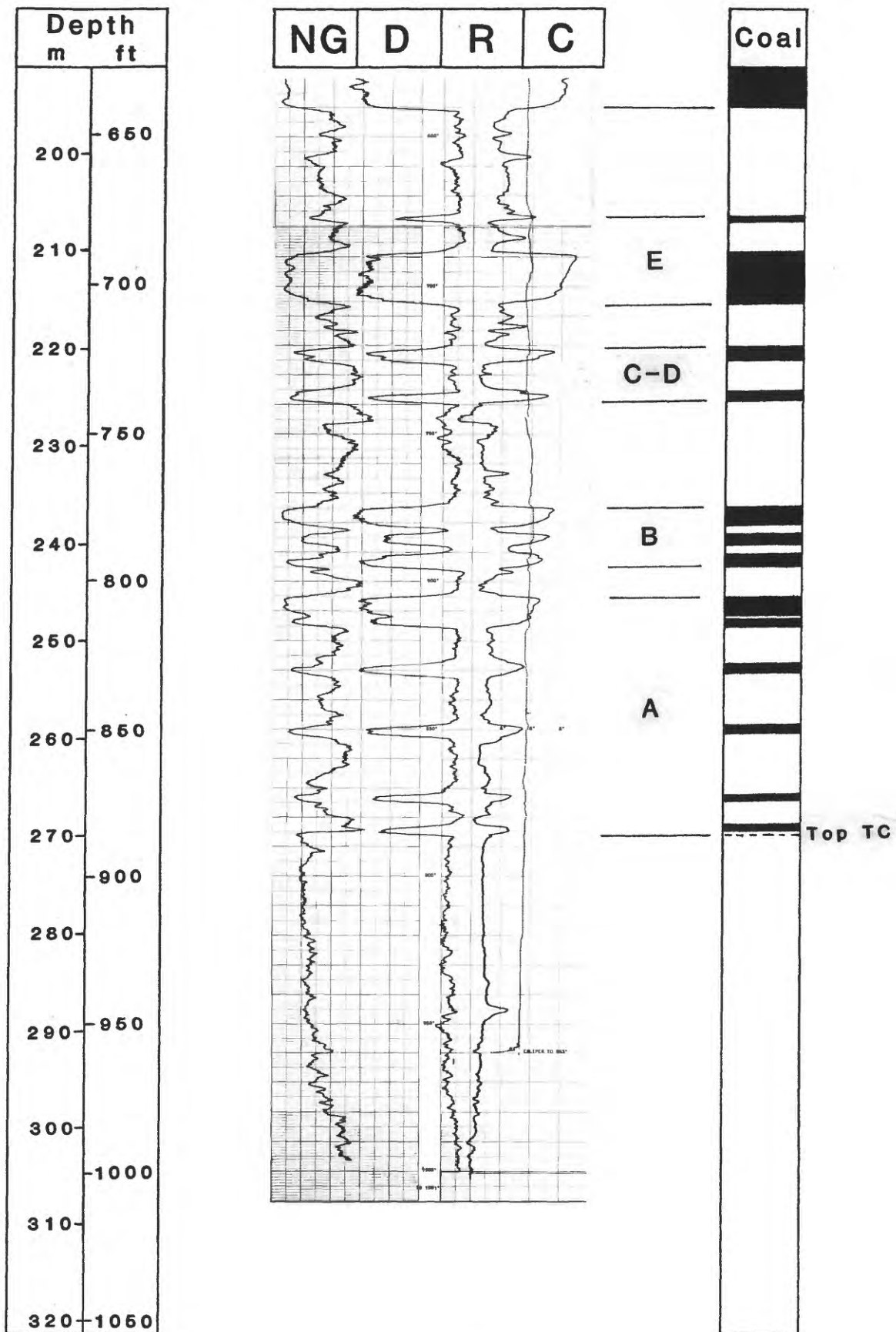
Caliper (C) Scale 1 in./log div.

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. <sup>3</sup>Caliper run at 30 ft/min.

<sup>4</sup>1001 ft to 65 ft at 200 CPS/log div.; 65 ft to 0 ft at 400 CPS/log div. Names of coal beds and zones modified after the nomenclature used by Empire Energy Corporation.







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

Hole no. MC-2 Date logged 9/20/80 Ground elevation 6710 ft

T. 5 N., R. 92 W., Sec. 9 : 1650 ft f W. 1, 700 ft f S. 1

Drilling medium 1 Drilled depth 1300 ft Fluid level 542 ft

Logging company 2 Logging speed 20 ft/min.<sup>3</sup> Logged depth 1292 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

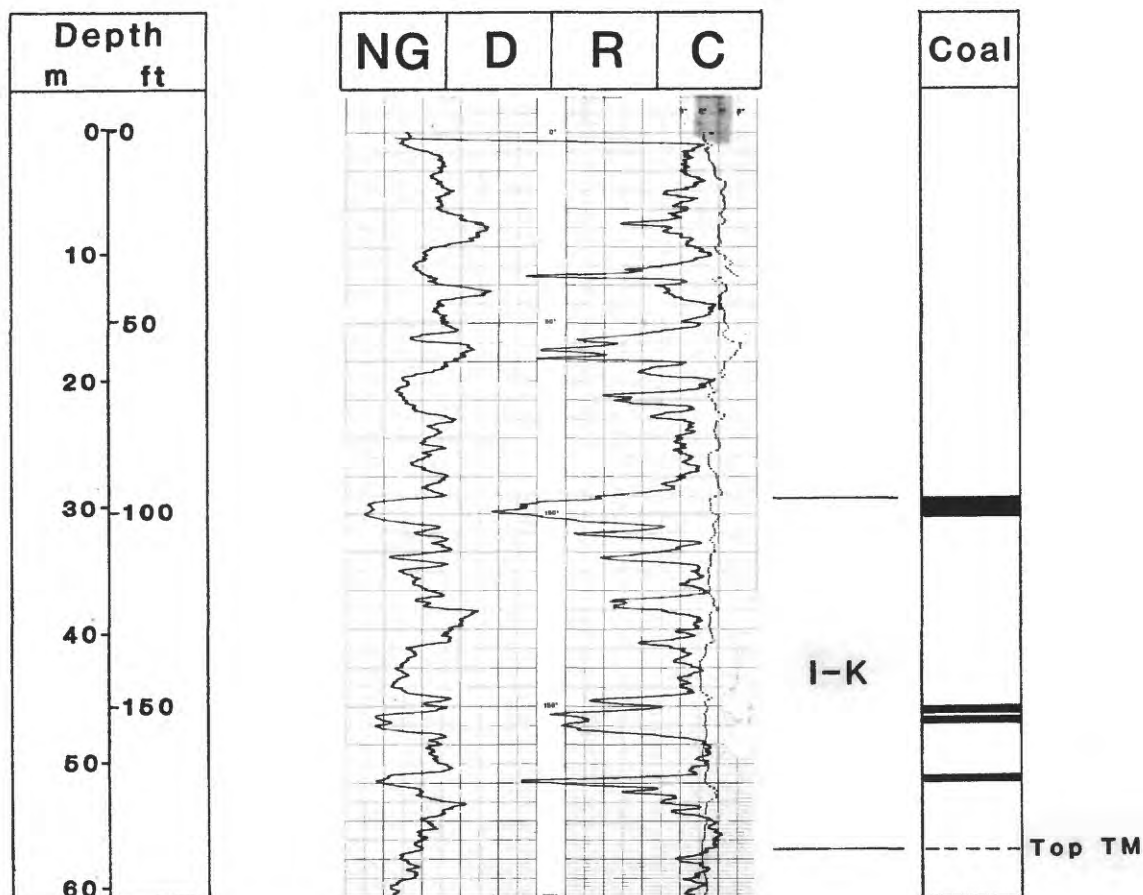
Density (gamma-gamma) (D) Scale 40 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

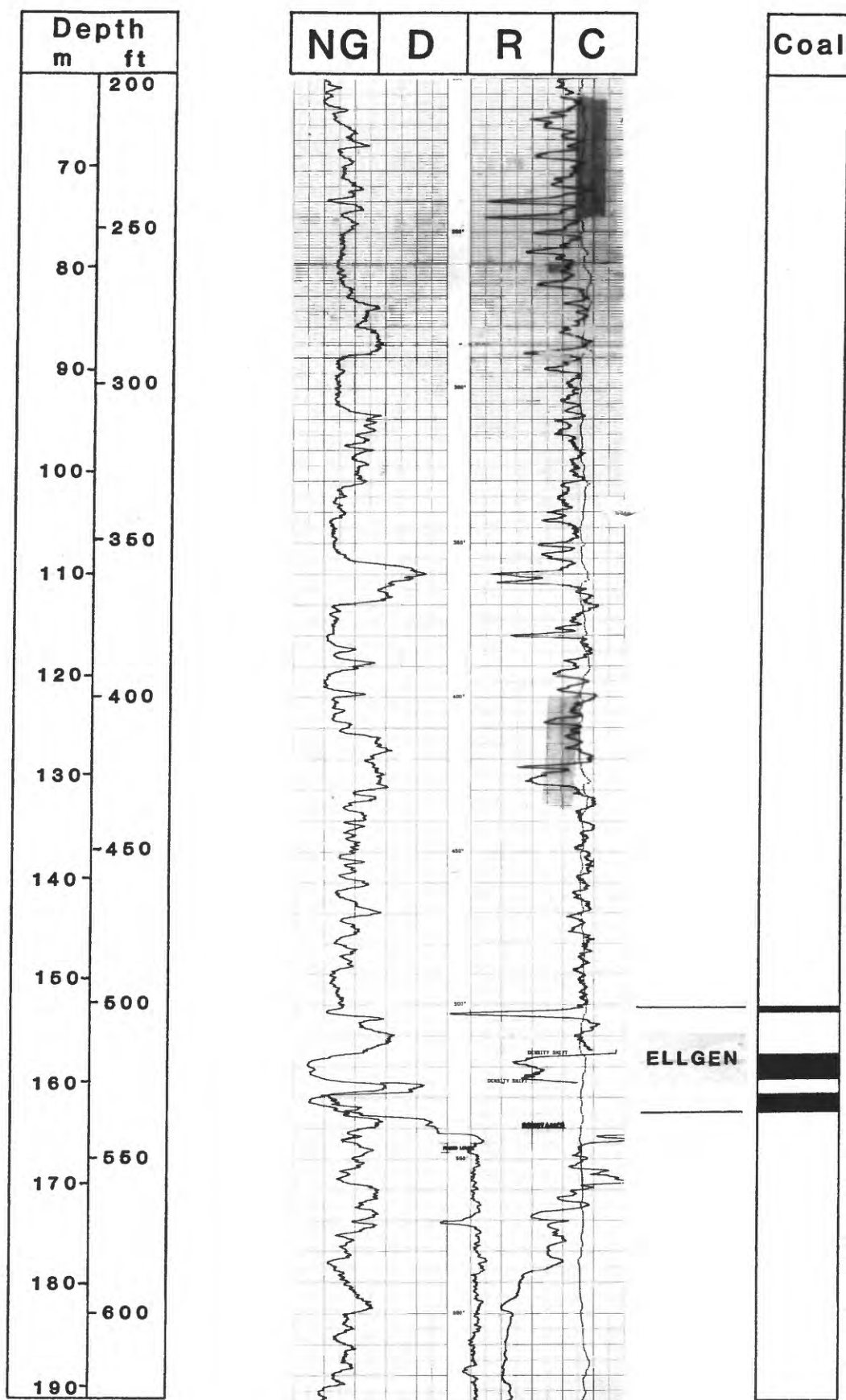
Caliper (C) Scale 1 in./log div.

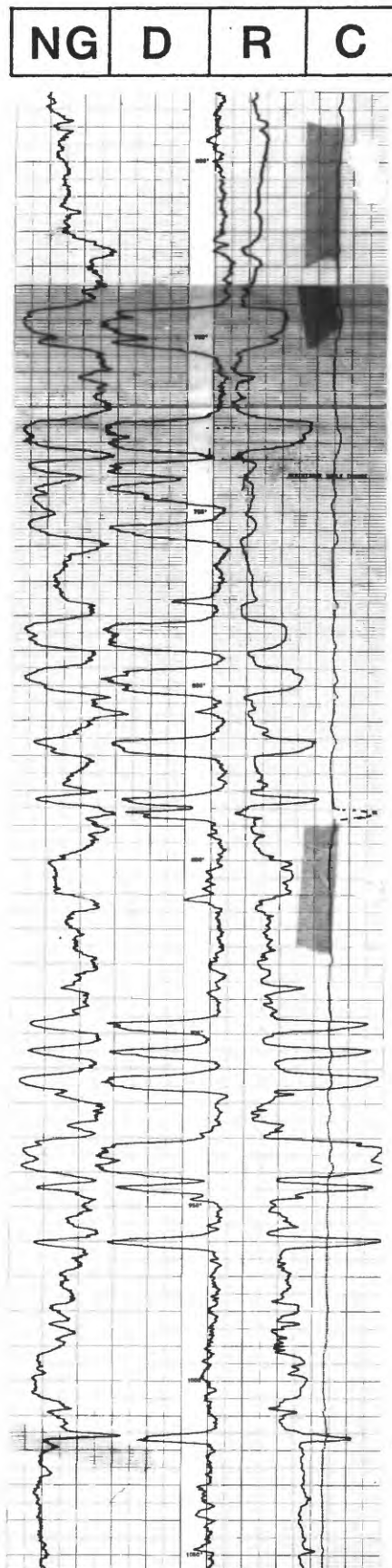
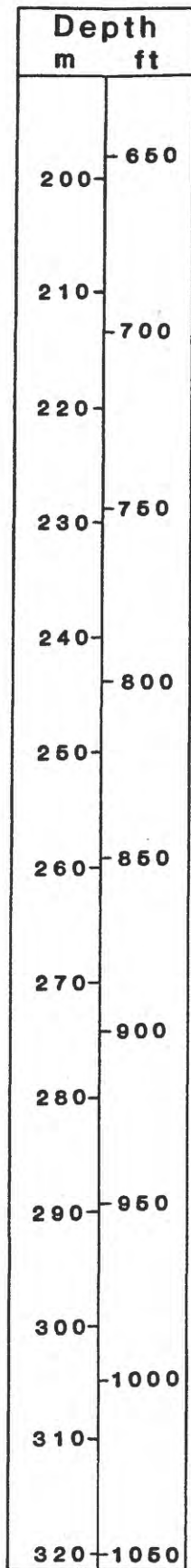
Remarks: <sup>1</sup>Hole filled with fresh water at time of logging. <sup>2</sup>Strata Surveys.

<sup>3</sup>Caliper run at 30 ft/min. Names of coal beds and zones modified after the  
nomenclature used by Empire Energy Corporation.









e-F-G

E

C-D

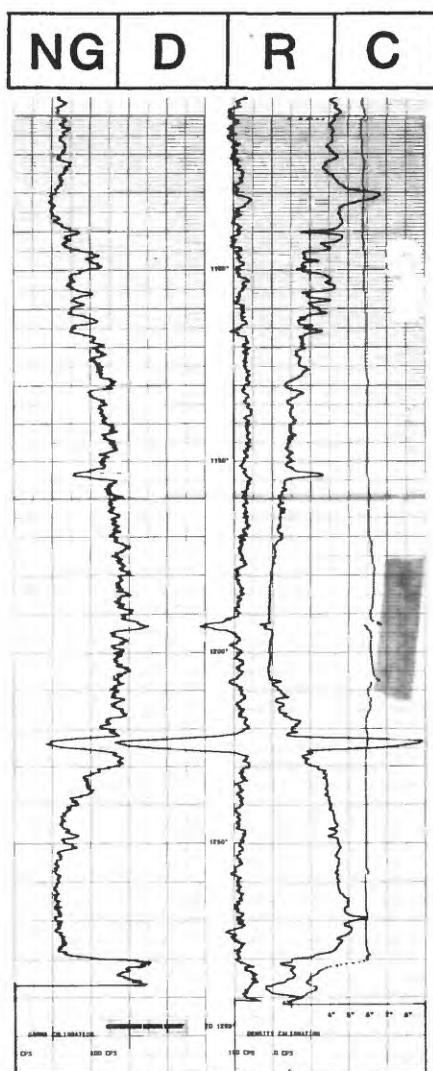
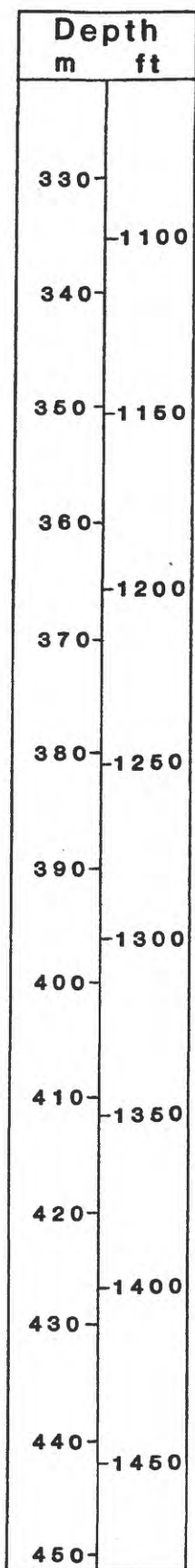
B

A

Coal

Top TC

Hole no. MC-2 (continued)



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

Hole no. MC-3 Date logged 9/14/80 Ground elevation 6840 ft

T. 5 N., R. 92 W., Sec. 9 : 250 ft f S. 1, 500 ft f E. 1

Drilling medium mud<sup>1</sup> Drilled depth 1380 ft Fluid level surface

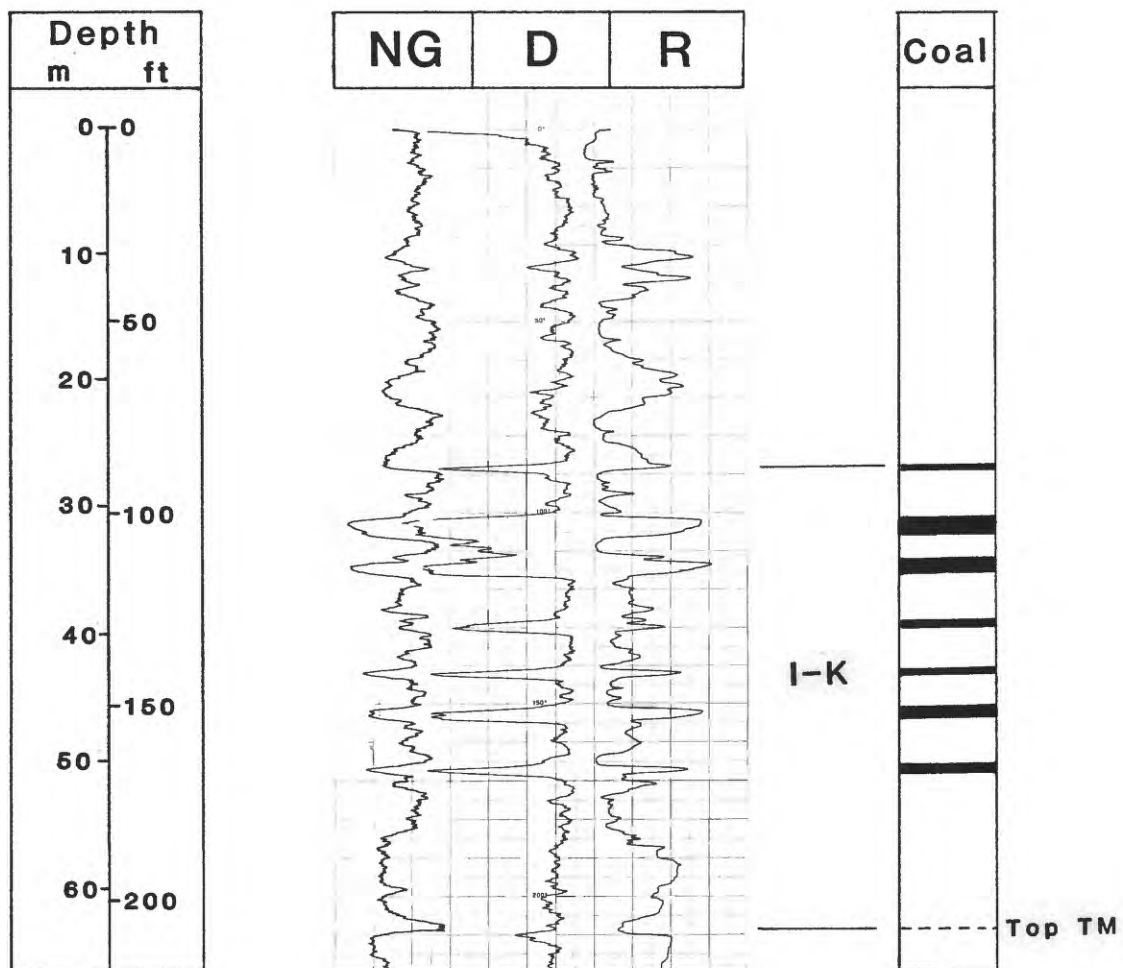
Logging company <sup>2</sup> Logging speed 15 ft/min. Logged depth 1350 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

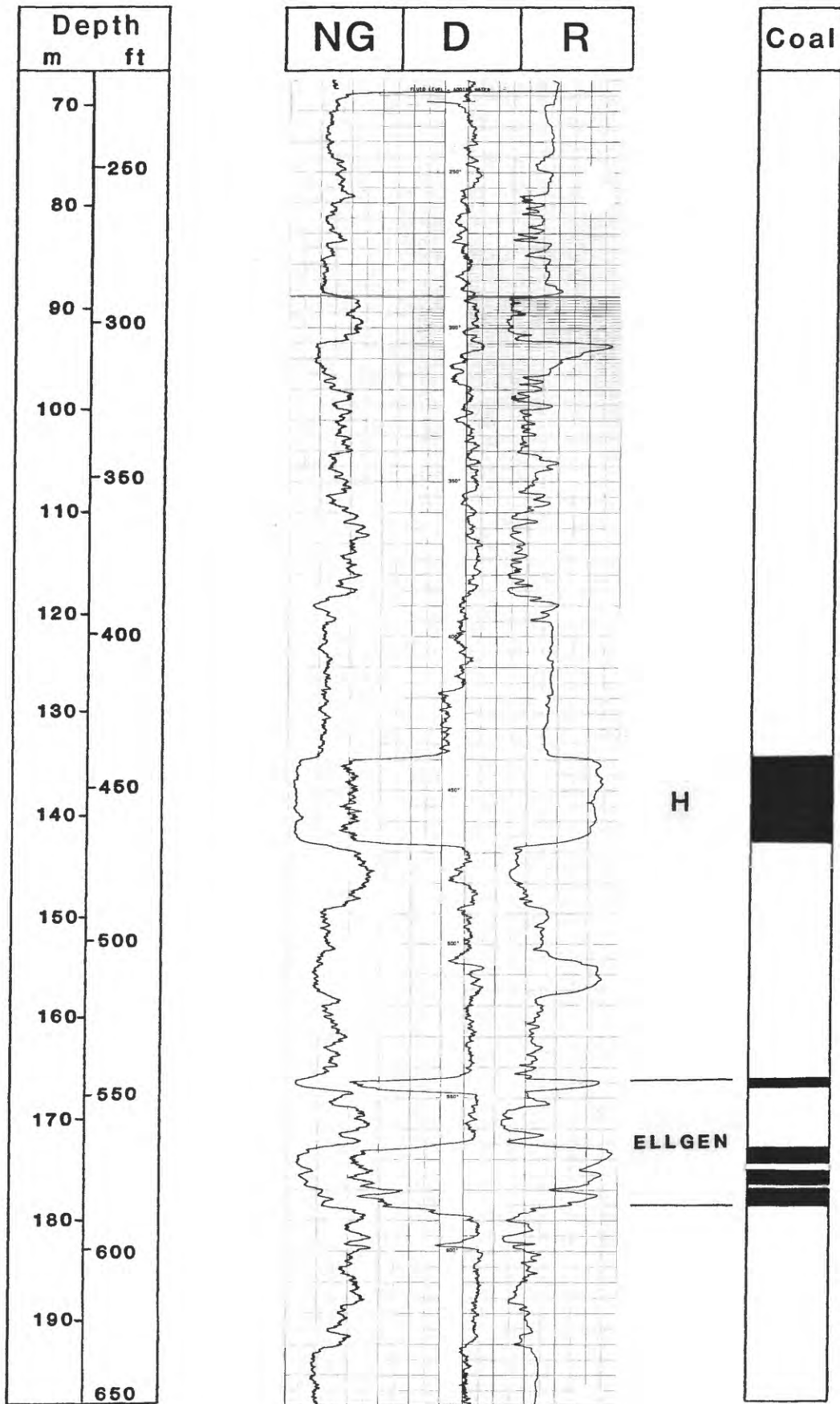
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

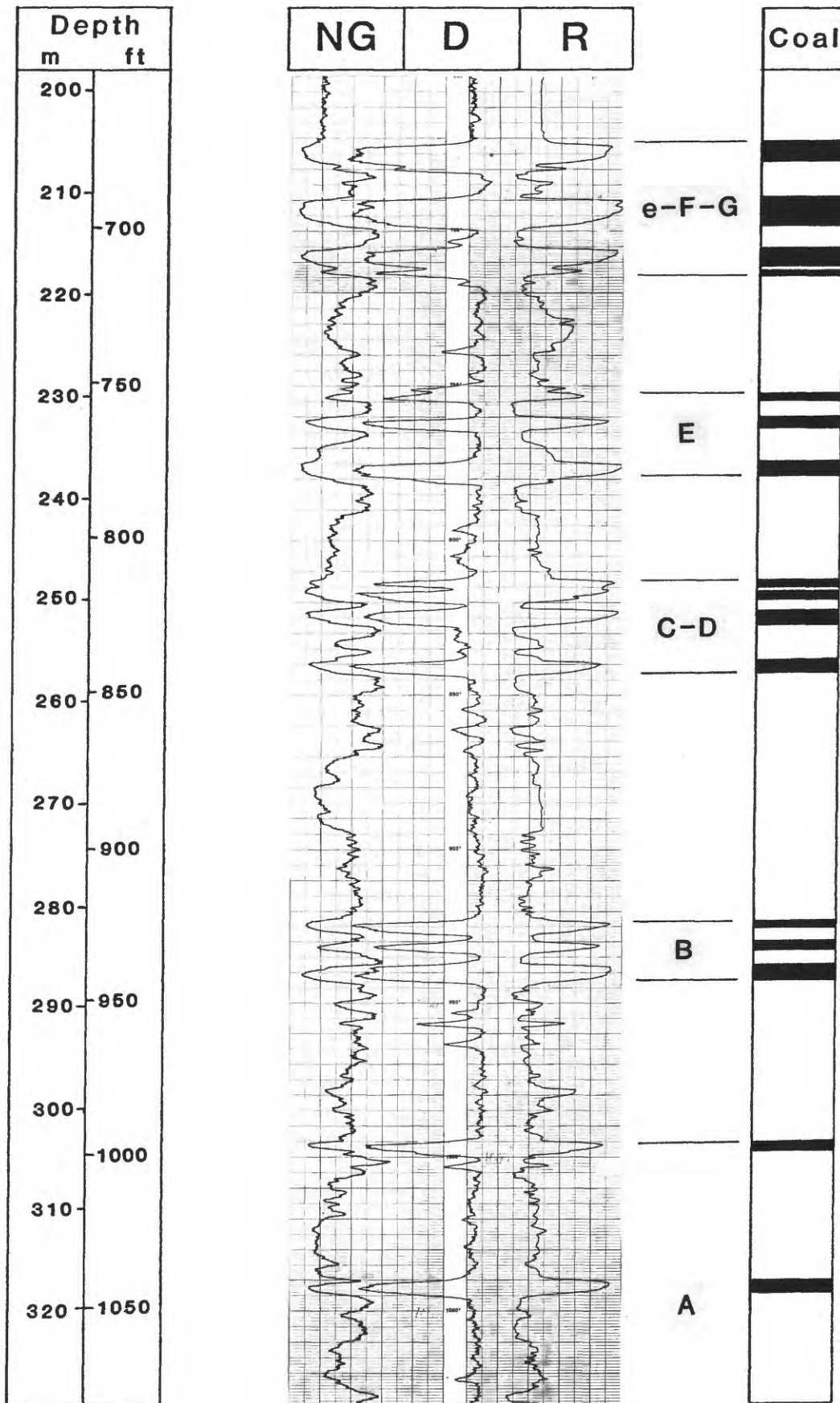
Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. Names of coal beds and  
zones modified after the nomenclature used by Empire Energy Corporation.

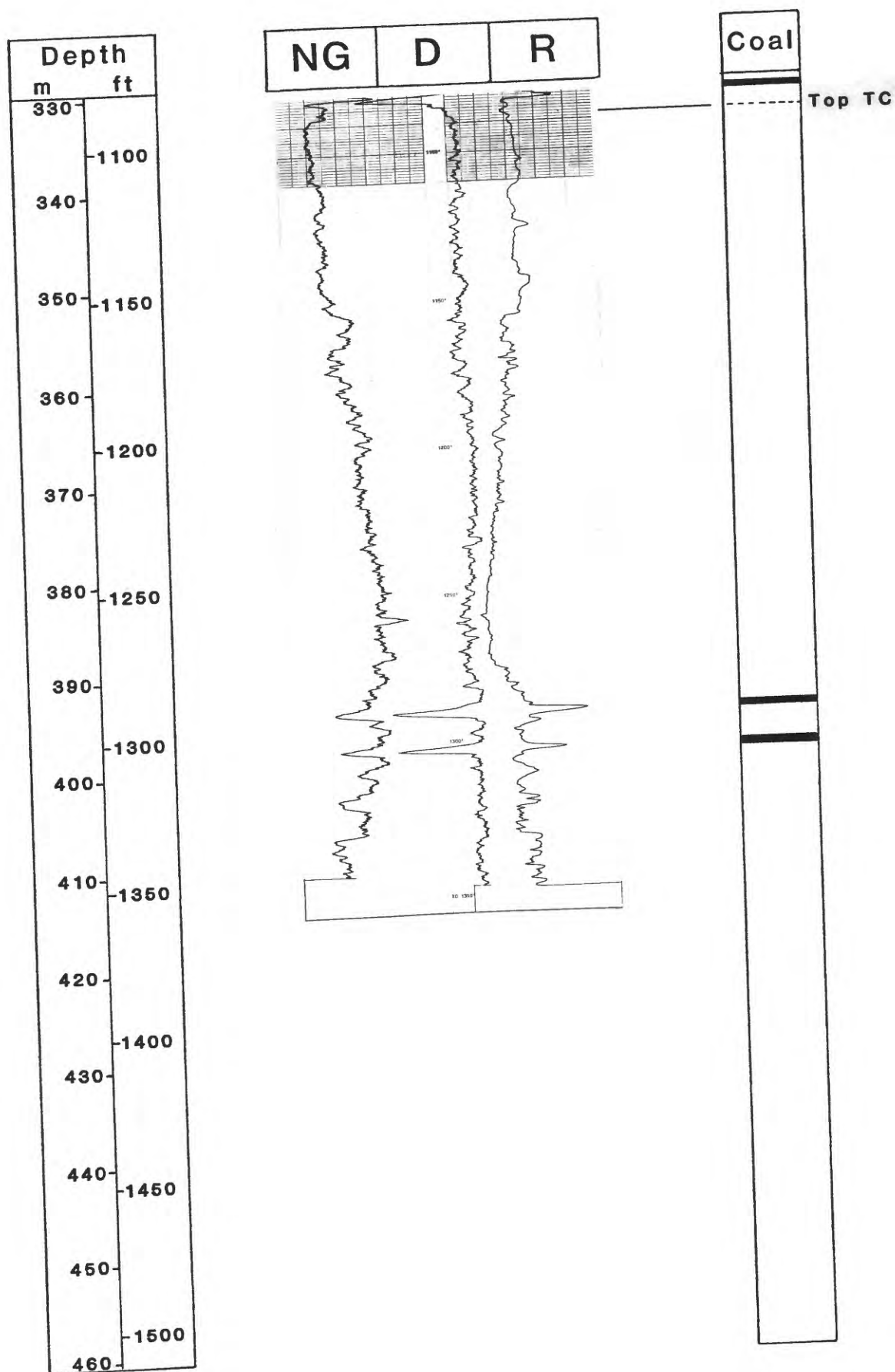




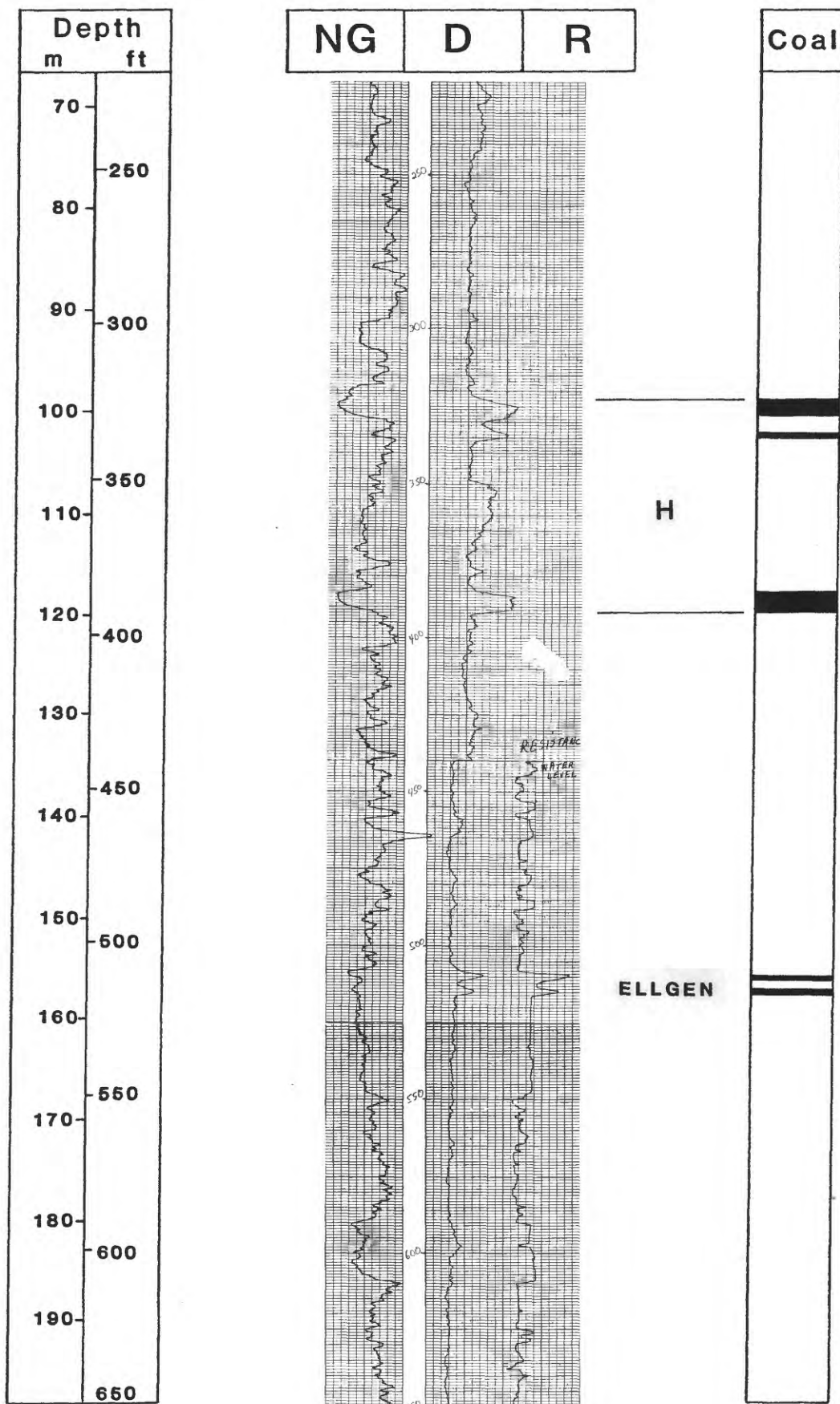




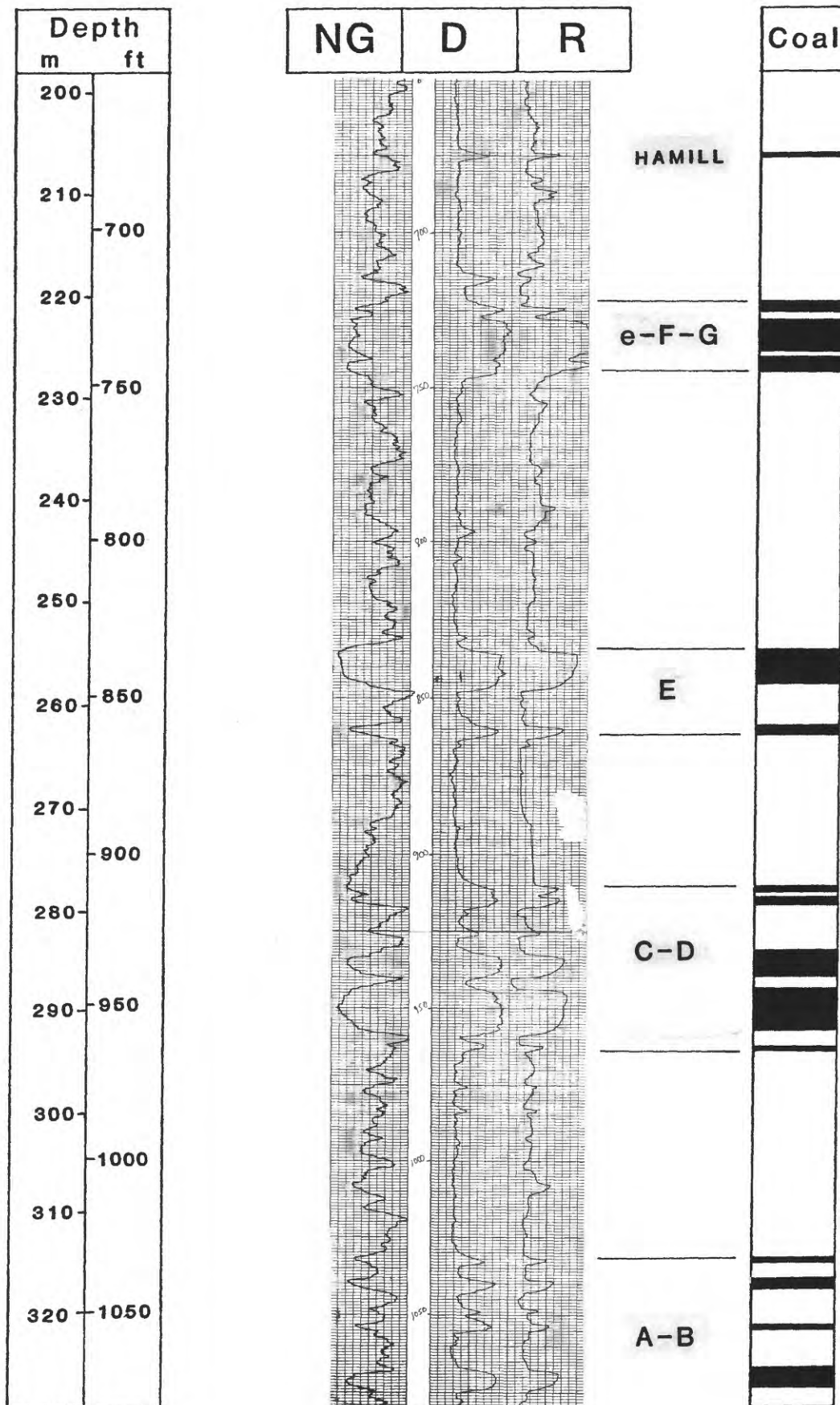
Hole no. MC-3 (continued)











Depth	
m	ft
330	
	1100
340	
350	1150
360	
	1200
370	
380	1250
390	
	1300
400	
410	1350
420	
	1400
430	
440	1450
450	
	1500
460	

NG	D	R
----	---	---



Coal

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

Hole no. CG-3 Date logged 8/14/80 Ground elevation 7460 ft

T. 5 N., R. 91 W., Sec. 11 : 100 ft f N. 1, 850 ft f W. 1

Drilling medium 1 Drilled depth 1035 ft (?) Fluid level 467 ft

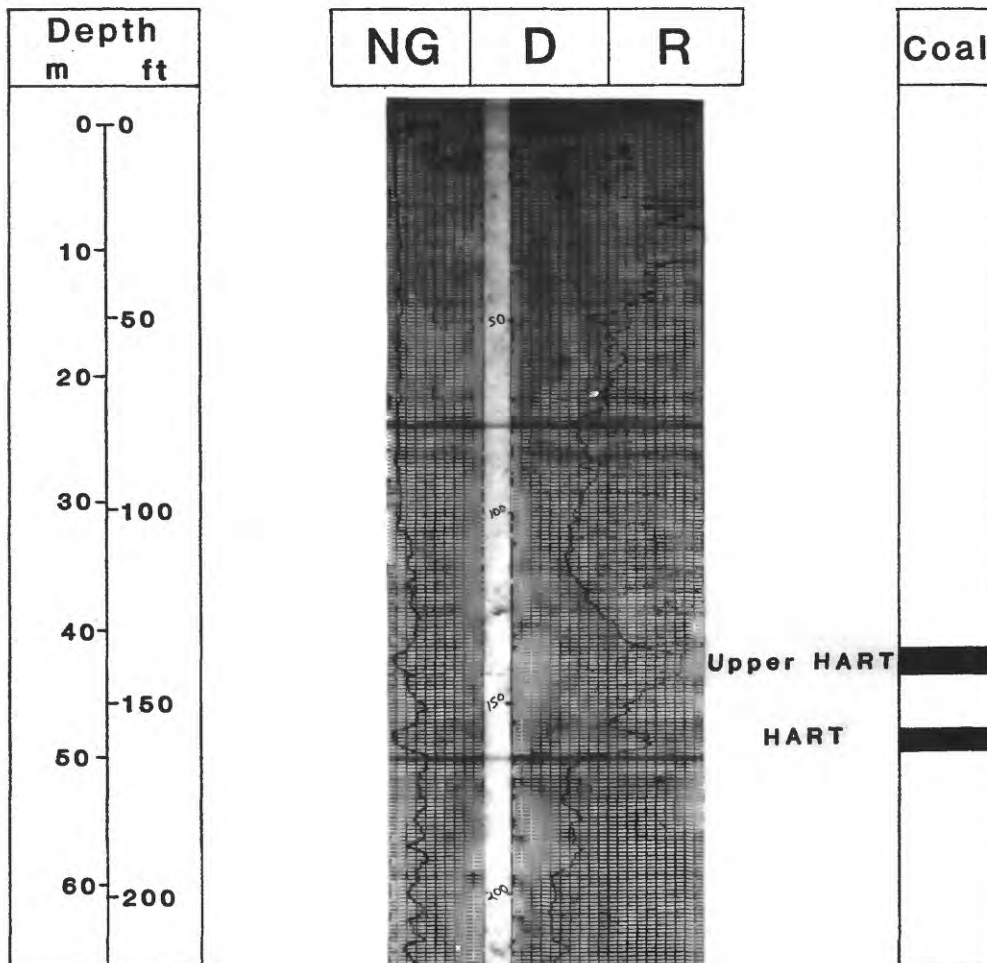
Logging company USGS Logging speed 20 ft/min. Logged depth 1035 ft

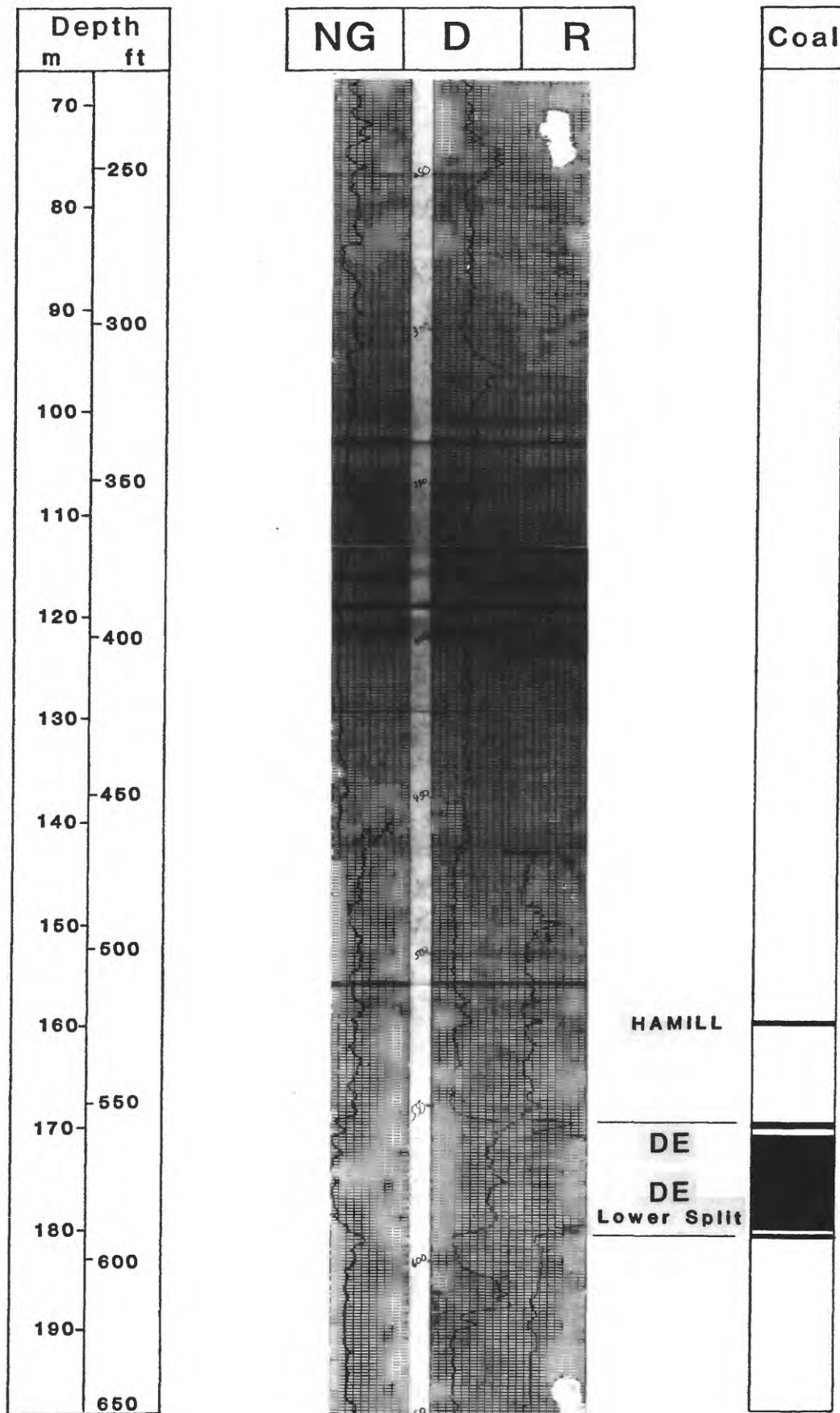
Natural gamma (NG) Scale 2 T.C. 4

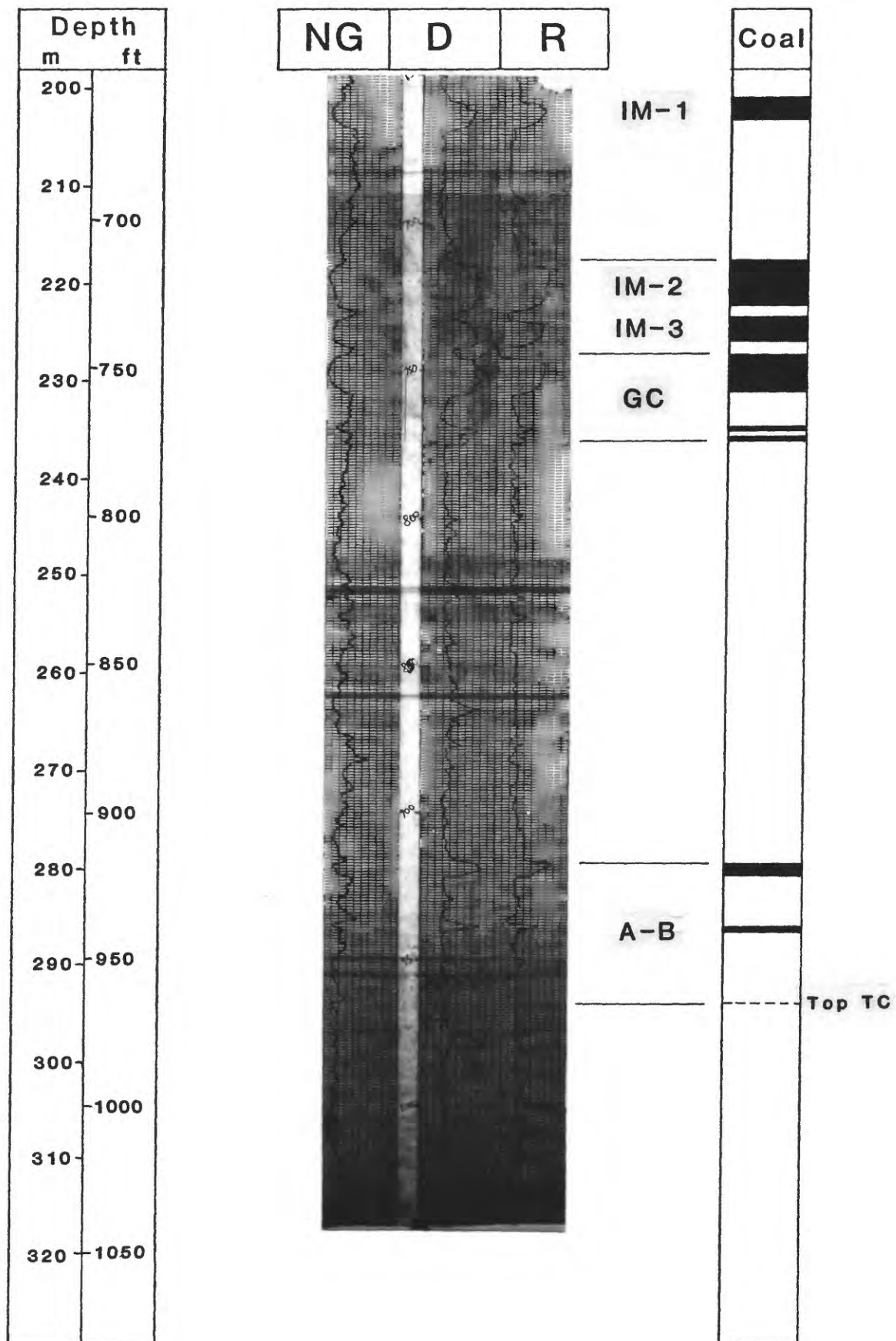
Density (gamma-gamma) (D) Scale 79 CPS/in. T.C. 4

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Hole filled with fresh water at time of logging. <sup>2</sup>? CPS/in. from 1035 ft to 466 ft; 100 CPS/in. from 466 ft to 0 ft. Names of coal beds and zones modified after the nomenclature used by Trapper Mining, Incorporated.









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

Hole no. CG-4 Date logged 9/16/80 Ground elevation 7240 ft

T. 5 N., R. 91 W., Sec. 11 : 2500 ft f N. 1, 2250 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 500 ft Fluid level 1 ft

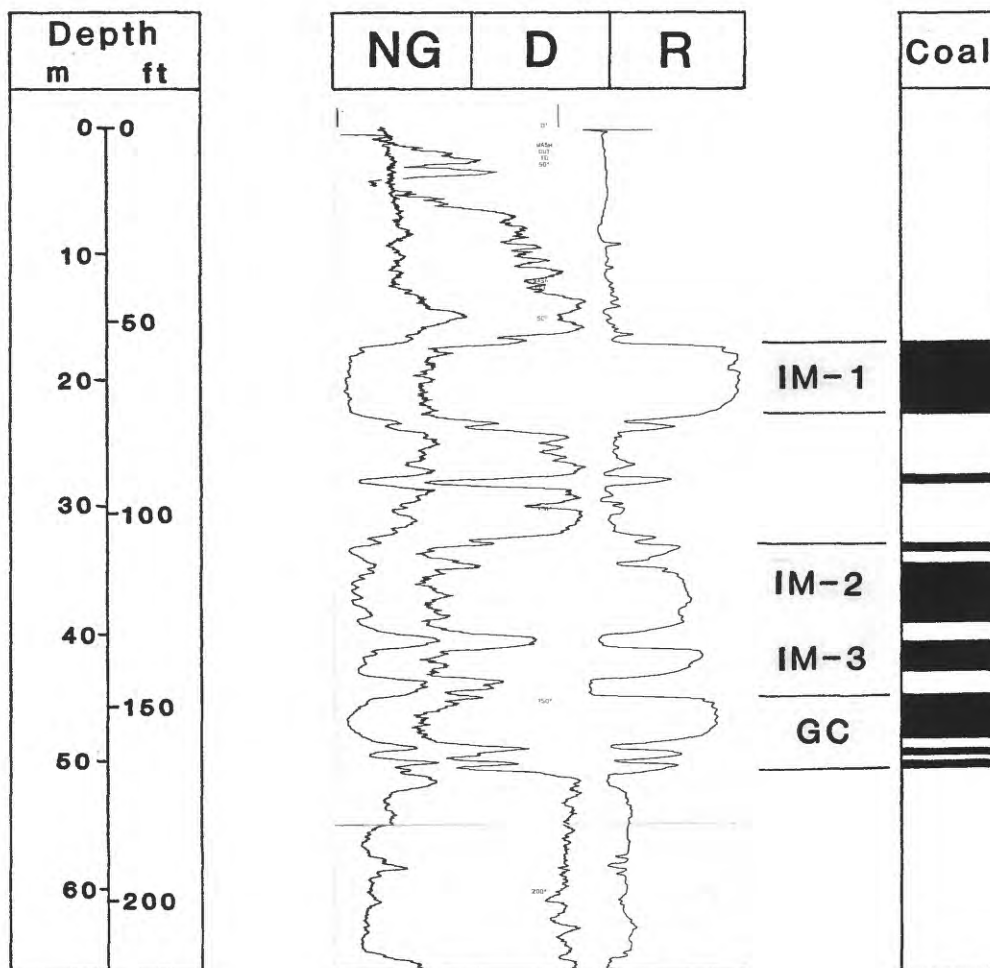
Logging company ~<sup>2</sup> Logging speed 18 ft/min. Logged depth 489 ft

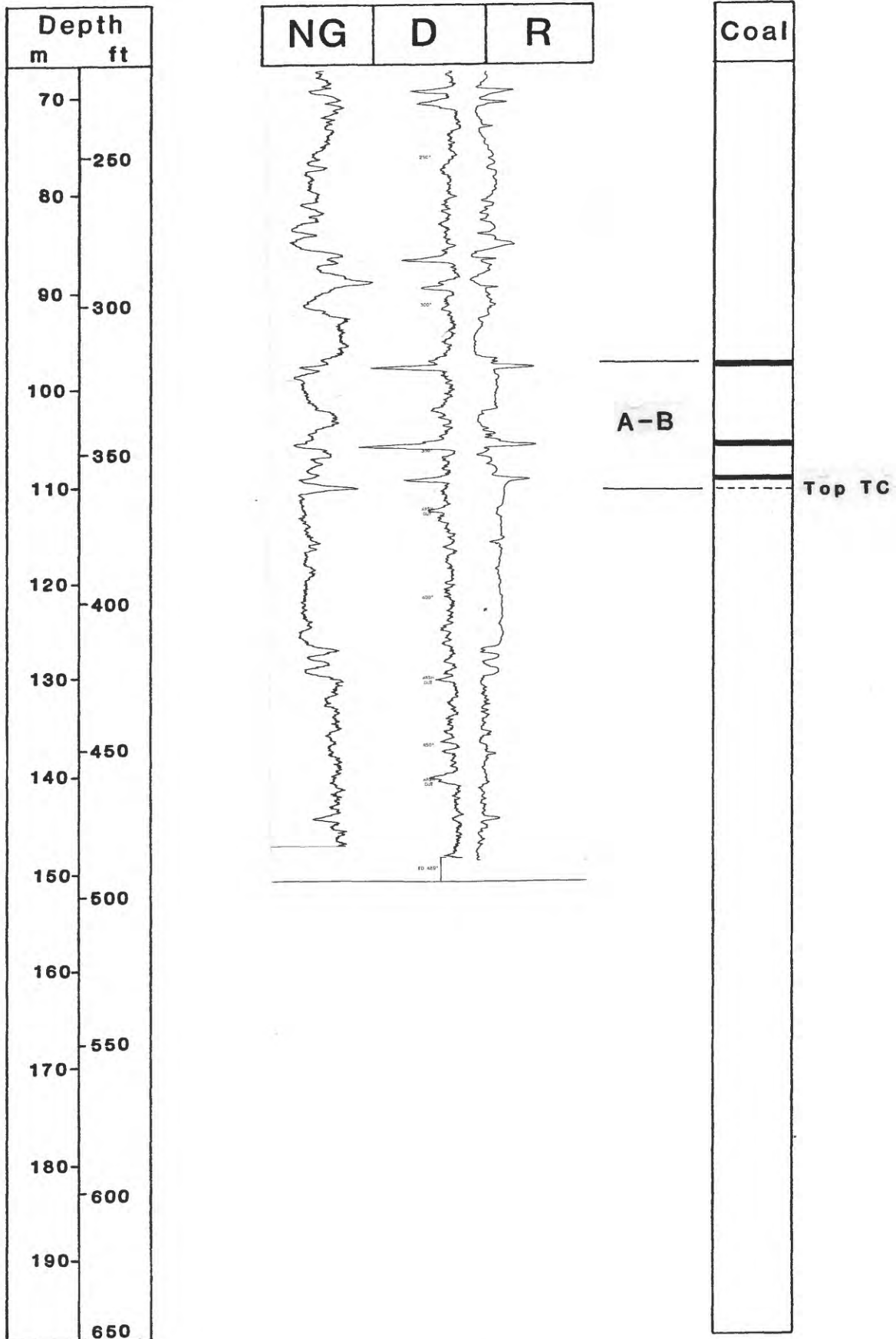
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. Names of coal beds and zones modified after the nomenclature used by Trapper Mining, Incorporated.





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

Hole no. CG-5 Date logged 8/19/80 Ground elevation 7680 ft

T. 5 N., R. 91 W., Sec. 12 : 1650 ft f N. 1, 2250 ft f W. 1

Drilling medium 1 Drilled depth 895 ft (?) Fluid level 128 ft

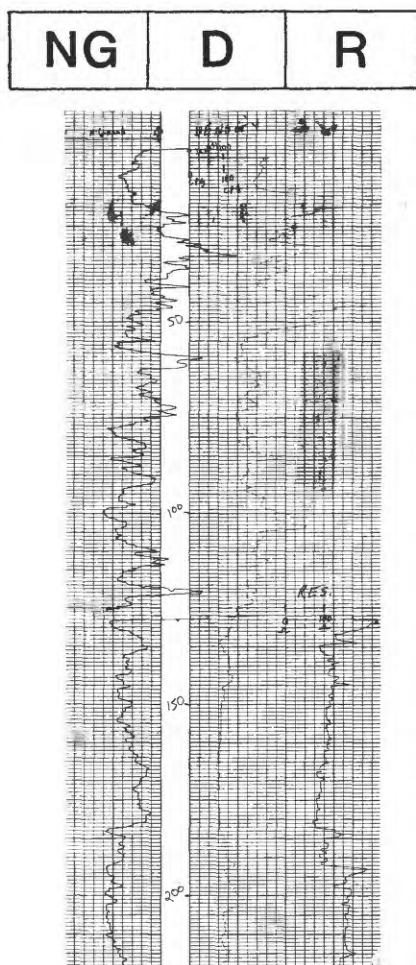
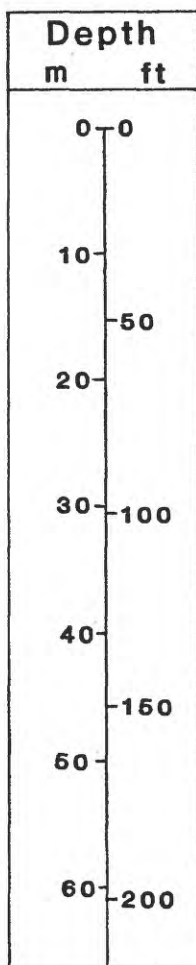
Logging company USGS Logging speed 20 ft/min. Logged depth 895 ft

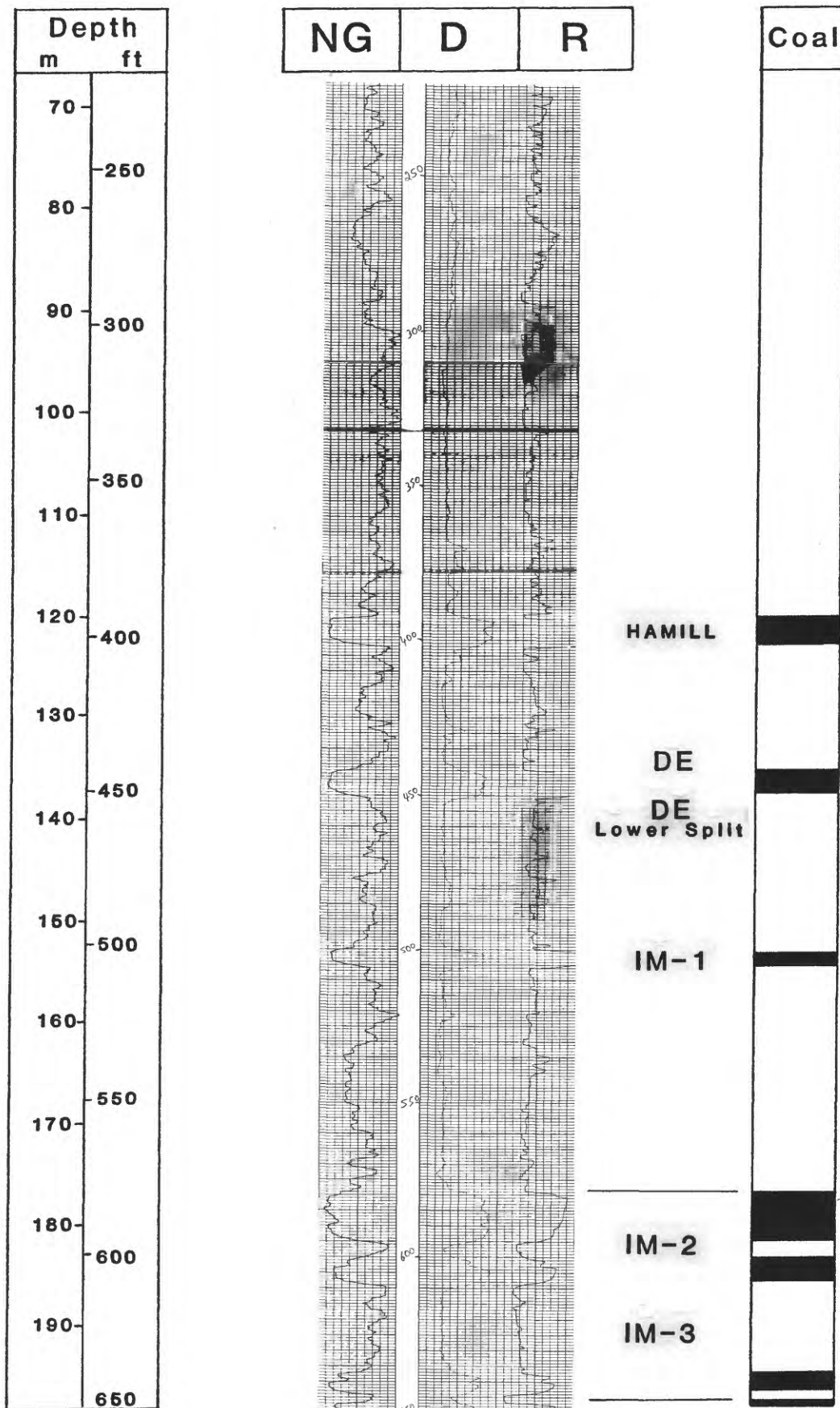
Natural gamma (NG) Scale 20 CPS/in. T.C. 2

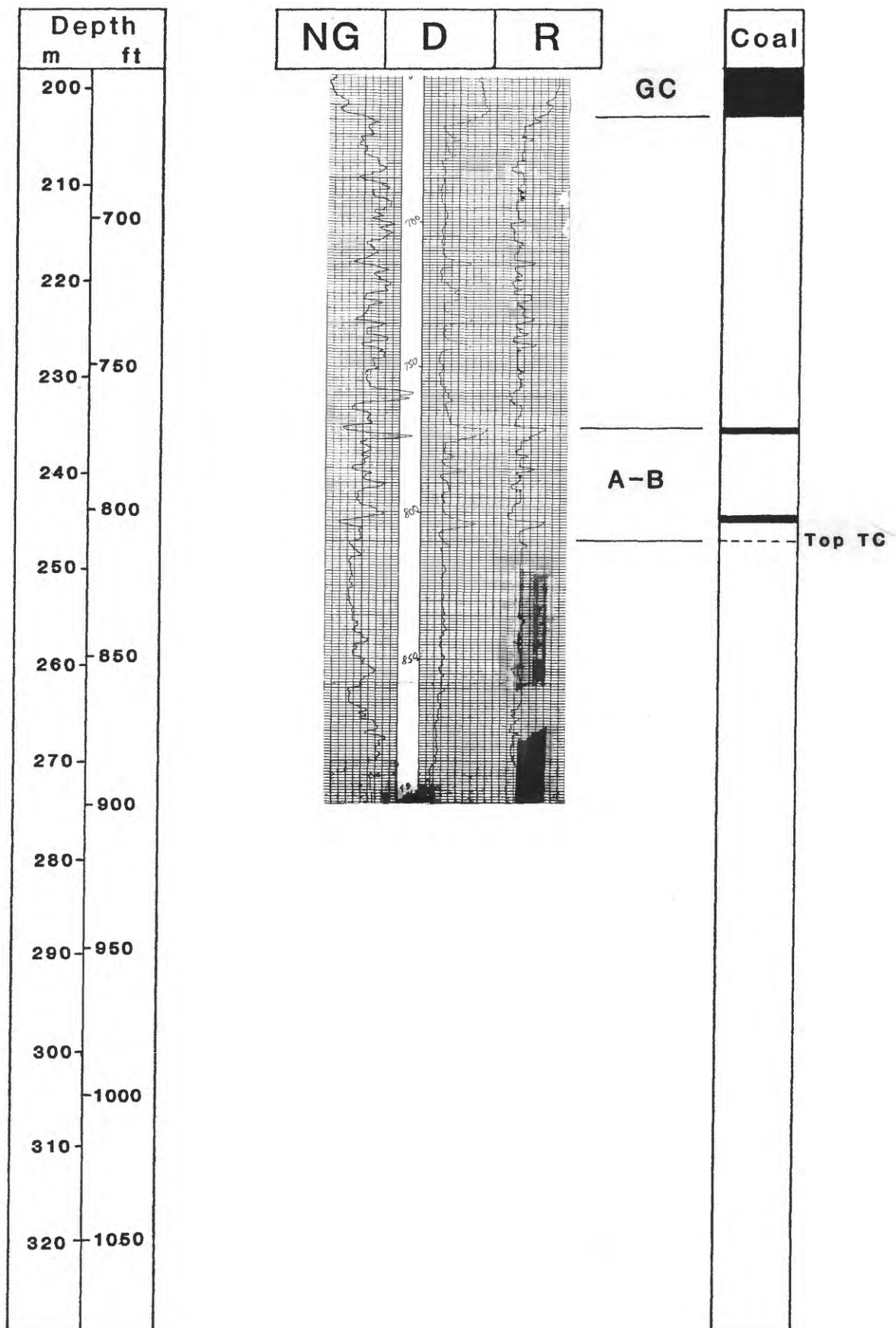
Density (gamma-gamma) (D) Scale 79 CPS/in. T.C. 2

Single point resistance (R) Scale variable

Remarks: 1 Hole was filled with fresh water at time of logging. Names of coal  
beds and zones modified after the nomenclature used by Trapper Mining,  
Incorporated.









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

Hole no. CG-6 Date logged 8/31/80 Ground elevation 7610 ft

T. 5 N., R. 91 W., Sec. 12 : 400 ft f S. 1, 2000 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 800 ft Fluid level 11 ft

Logging company <sup>2</sup> Logging speed 18 ft/min. Logged depth 800 ft

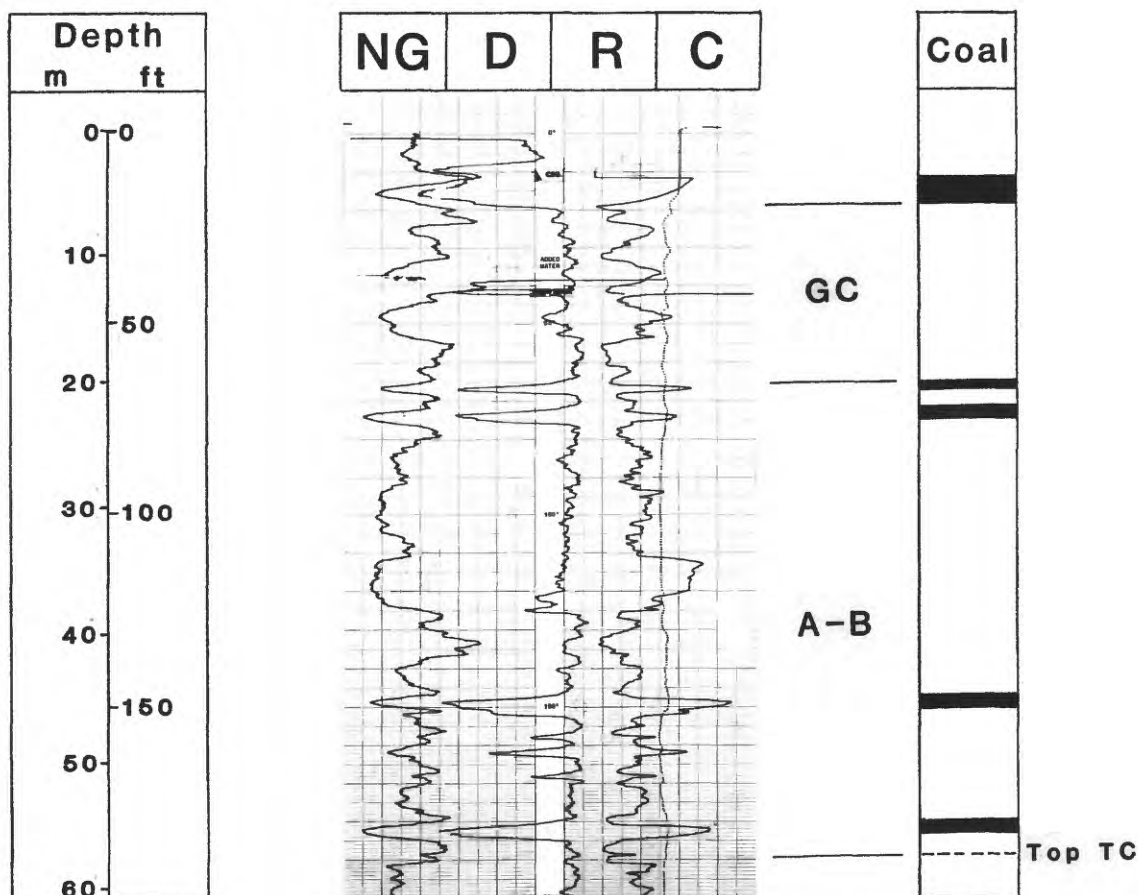
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

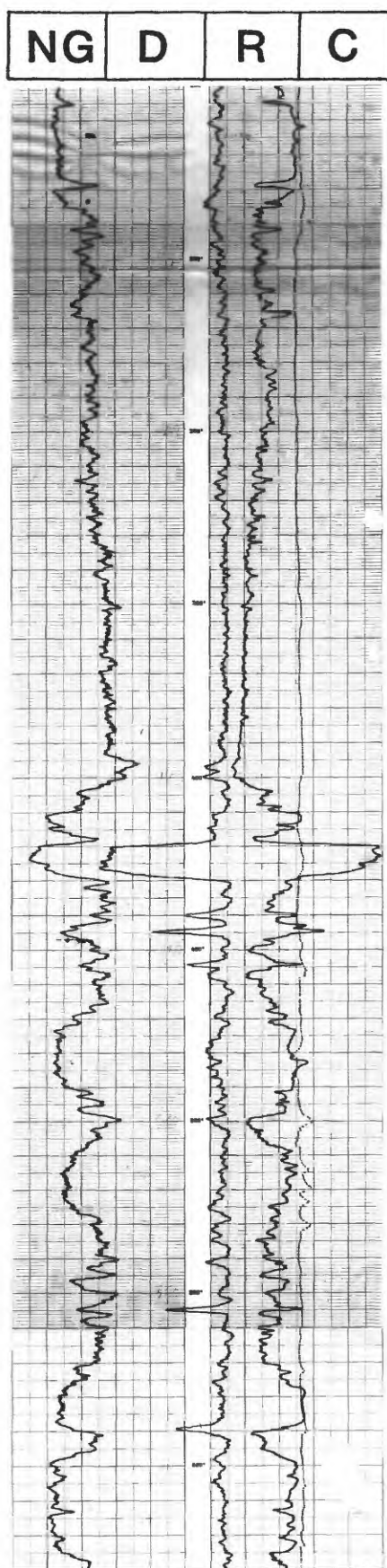
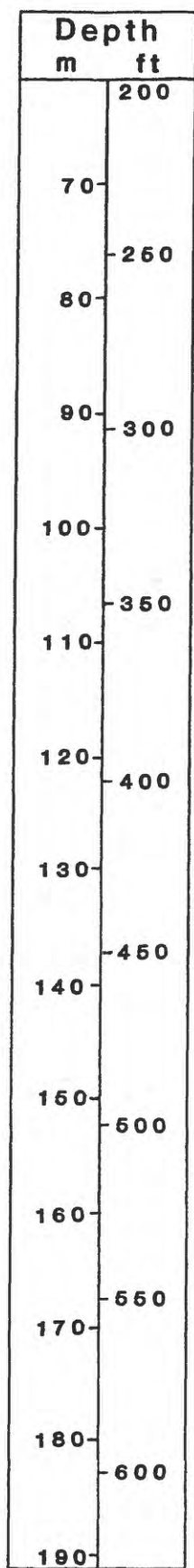
Density (gamma-gamma) (D) Scale 41 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

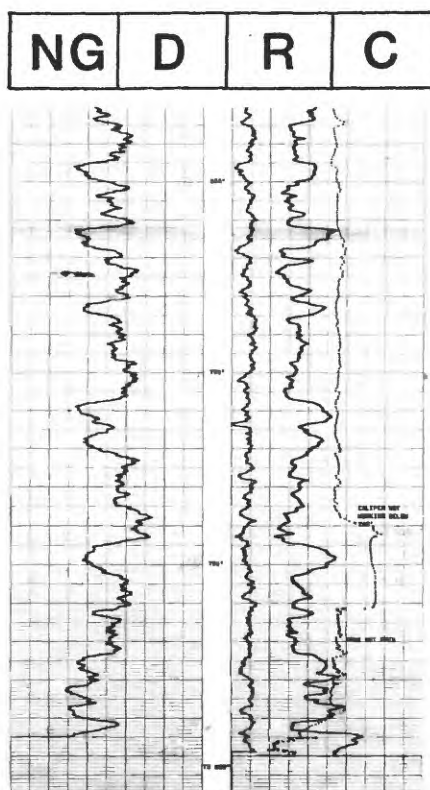
Caliper (C) Scale 1 in./log div.

Remarks: 1Some fresh water added. 2Strata Surveys. Names of coal beds and zones modified after the nomenclature used by Trapper Mining, Incorporated.





Depth m ft	
200	660
210	
	700
220	
230	750
240	
	800
250	
260	850
270	
	900
280	
290	950
300	
	1000
310	
320	1050



Coal

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

Hole no. CG-7 Date logged 9/8/80 Ground elevation 7565 ft

T. 5 N., R. 90 W., Sec. 8 : 1250 ft f S. 1, 100 ft f W. 1

Drilling medium 1 Drilled depth 920 ft Fluid level 675 ft

Logging company 2 Logging speed 15 ft/min. Logged depth 920 ft

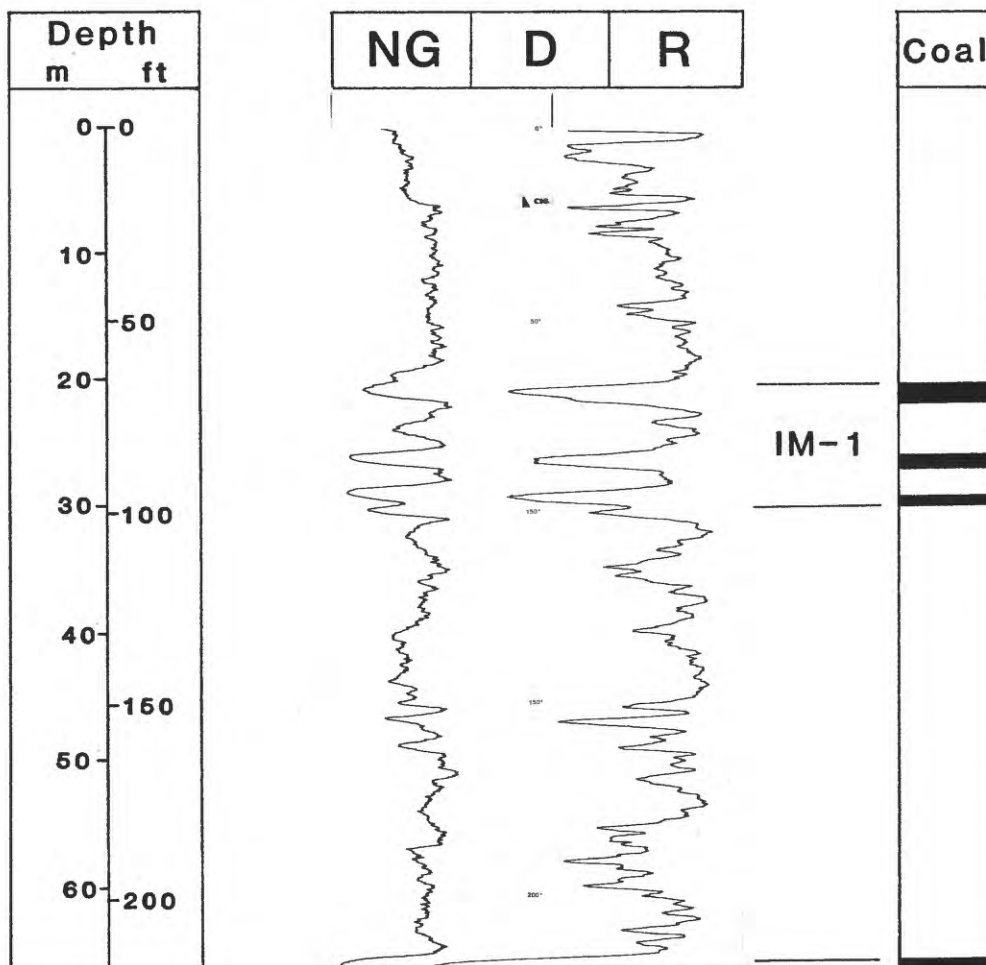
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

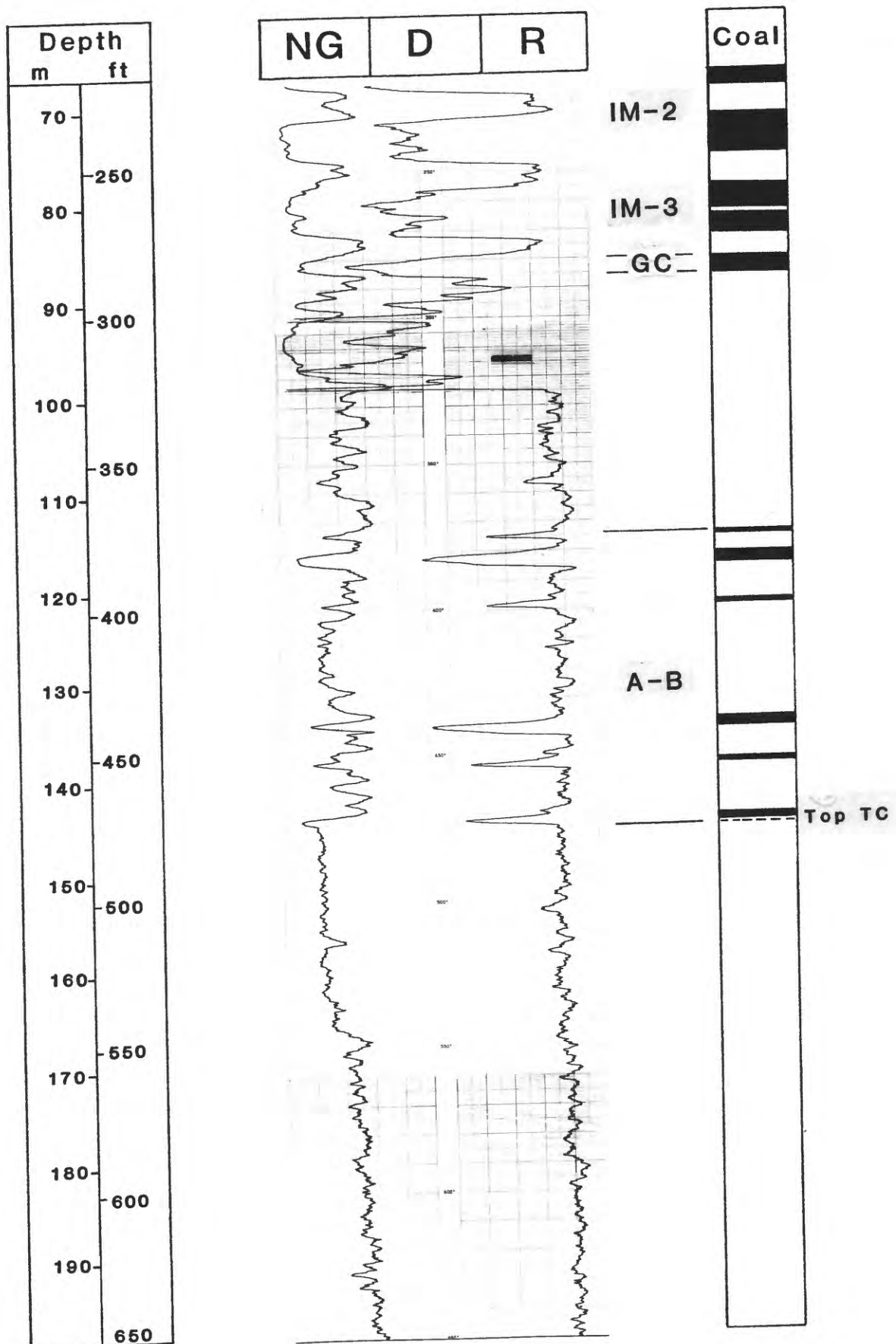
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Hole was filled with fresh water at the time of logging.

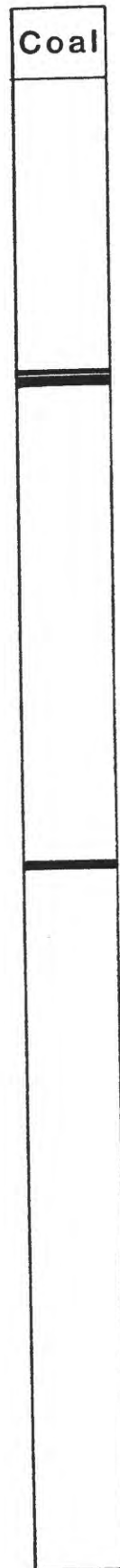
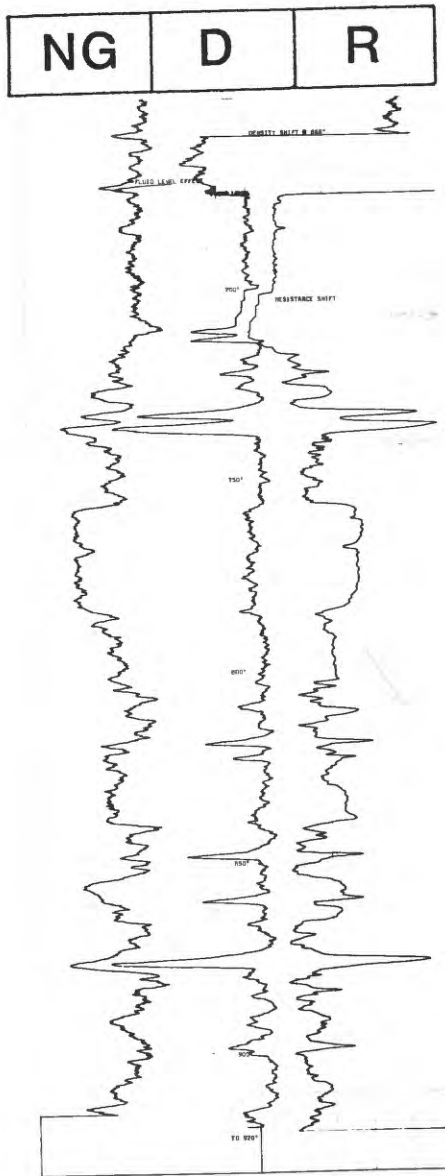
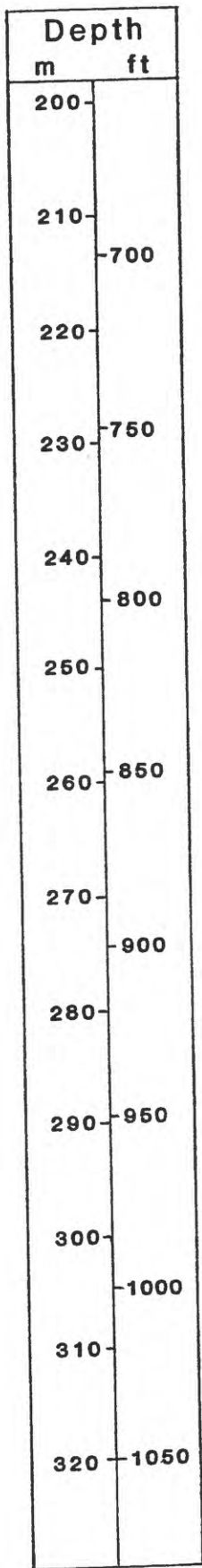
<sup>2</sup>Strata Surveys. Names of coal beds and zones modified after the nomenclature used by Trapper Mining, Incorporated.







Hole no. CG-7 (continued)



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

Hole no. CG-8 Date logged 9/3/80 Ground elevation 7565 ft

T. 5 N., R. 90 W., Sec. 8 : 1150 ft f N. 1, 100 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 1000 ft Fluid level 20 ft

Logging company <sup>2</sup> Logging speed 18 ft/min.<sup>3</sup> Logged depth 1000 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

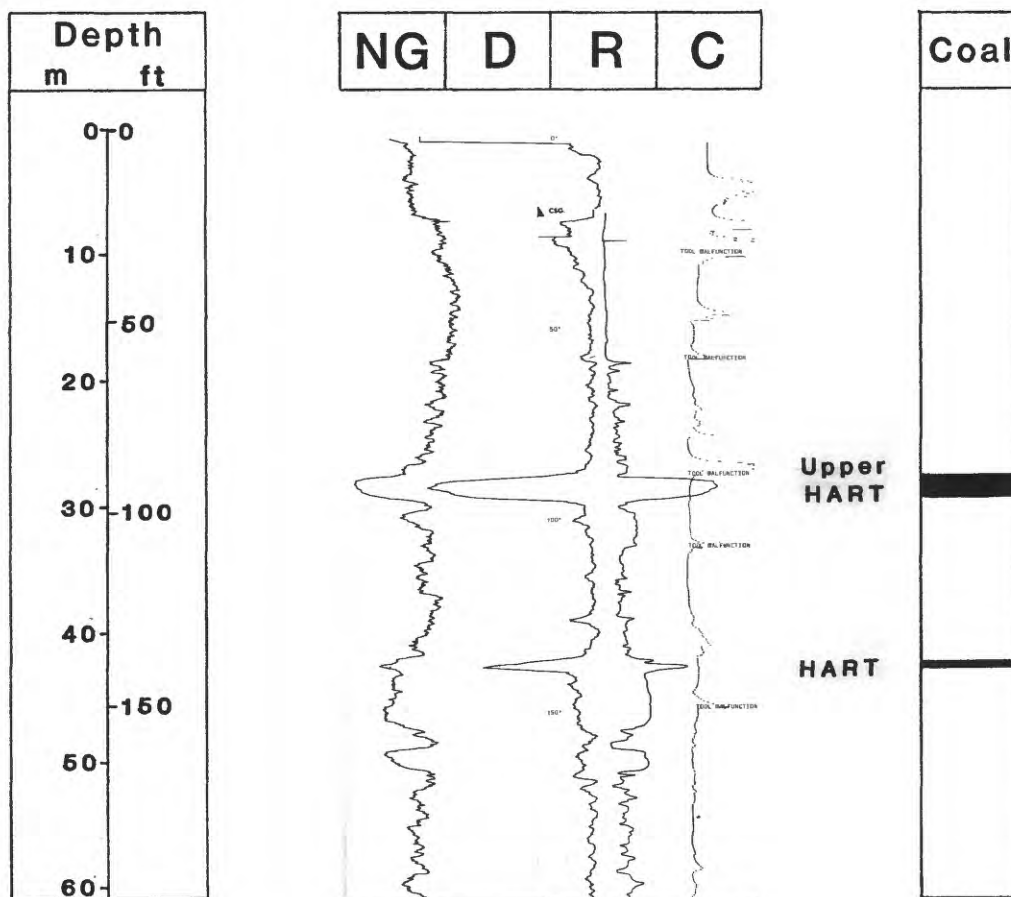
Density (gamma-gamma) (D) Scale 66.6 CPS/log div. T.C. 2

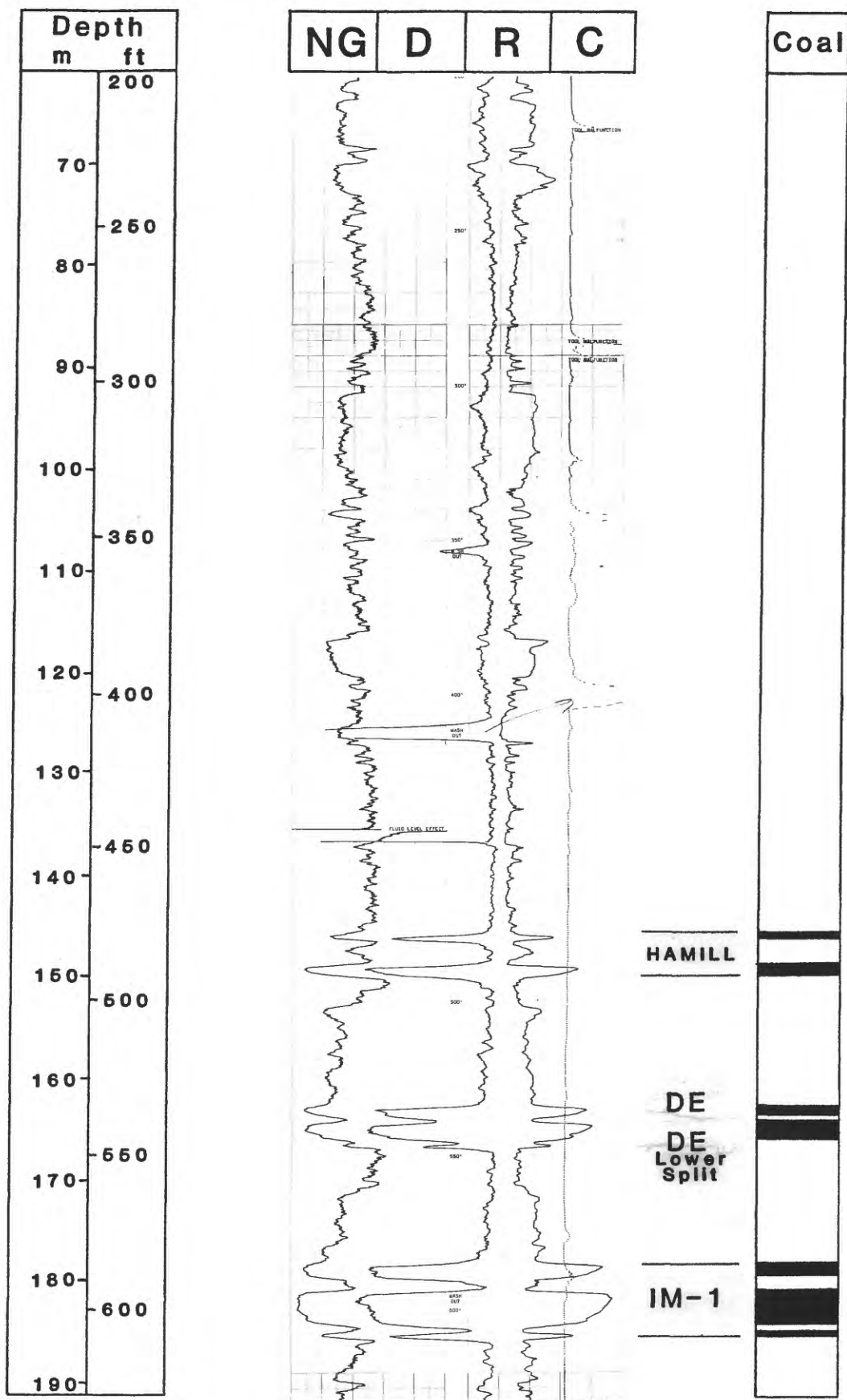
Single point resistance (R) Scale variable

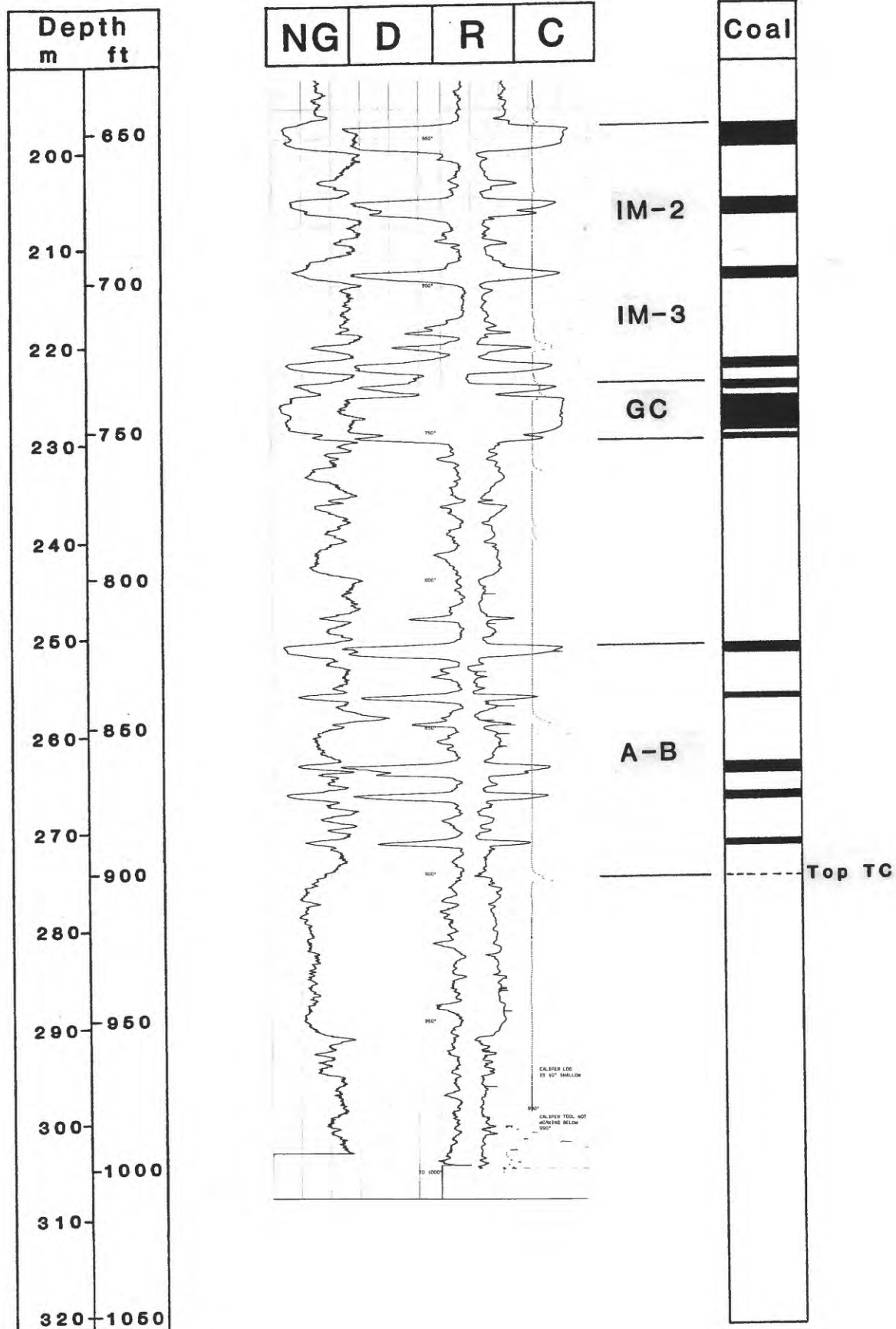
Caliper (C) Scale 1 in./log div.

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. <sup>3</sup>Caliper run at 40 ft/min.

Names of coal beds and zones modified after the nomenclature used by Trapper  
Mining, Incorporated.







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

Hole no. CG-9 Date logged 9/13/80 Ground elevation 7445 ft

T. 5 N., R. 90 W., Sec. 9 : 1400 ft f N. 1, 900 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 940 ft Fluid level 18 ft

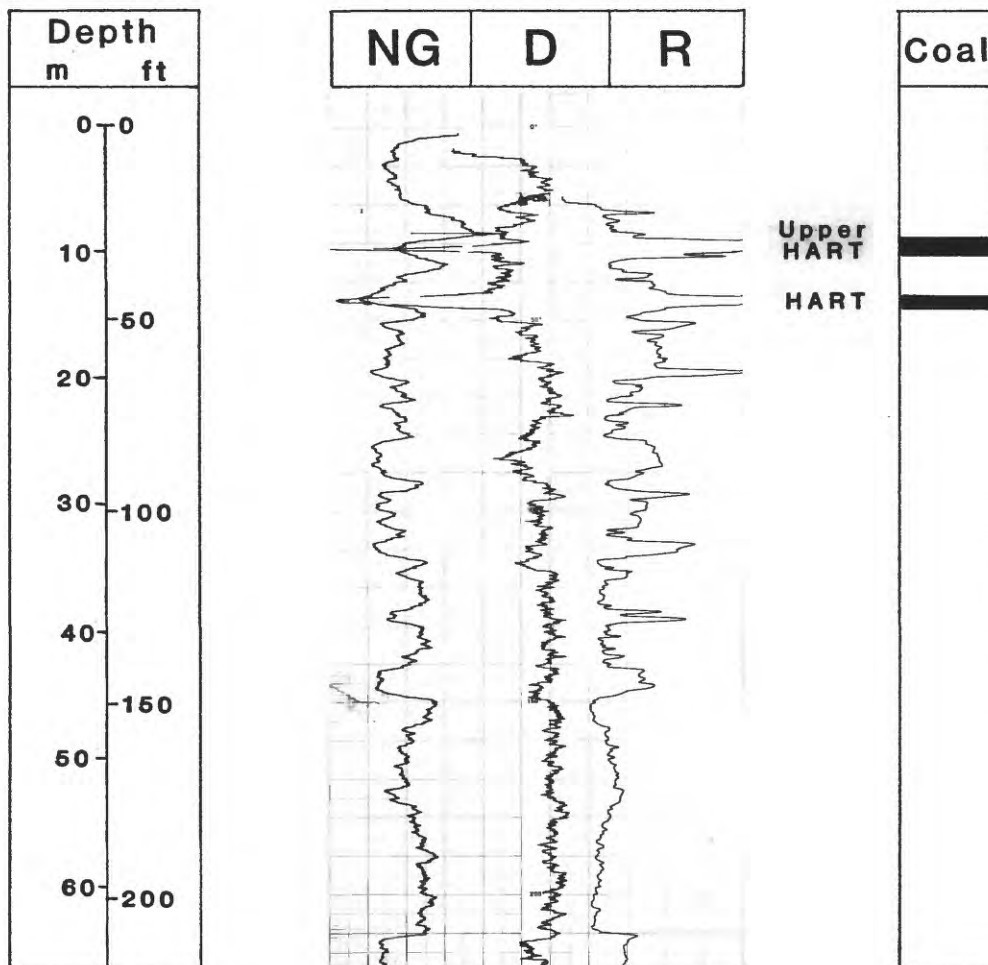
Logging company <sup>2</sup> Logging speed 18 ft/min. Logged depth 937 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

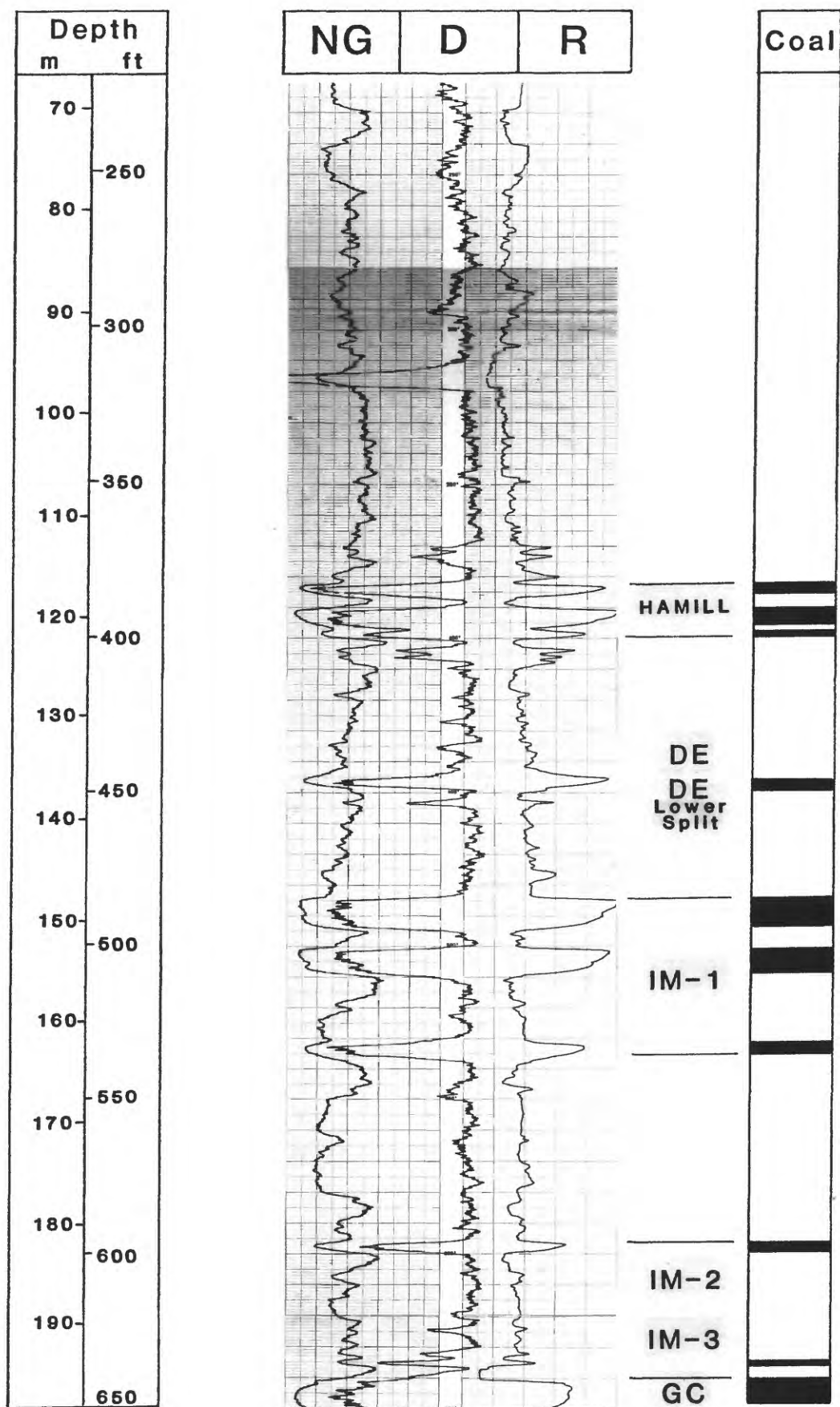
Density (gamma-gamma) (D) Scale 10.5 CPS/log div. T.C. 2

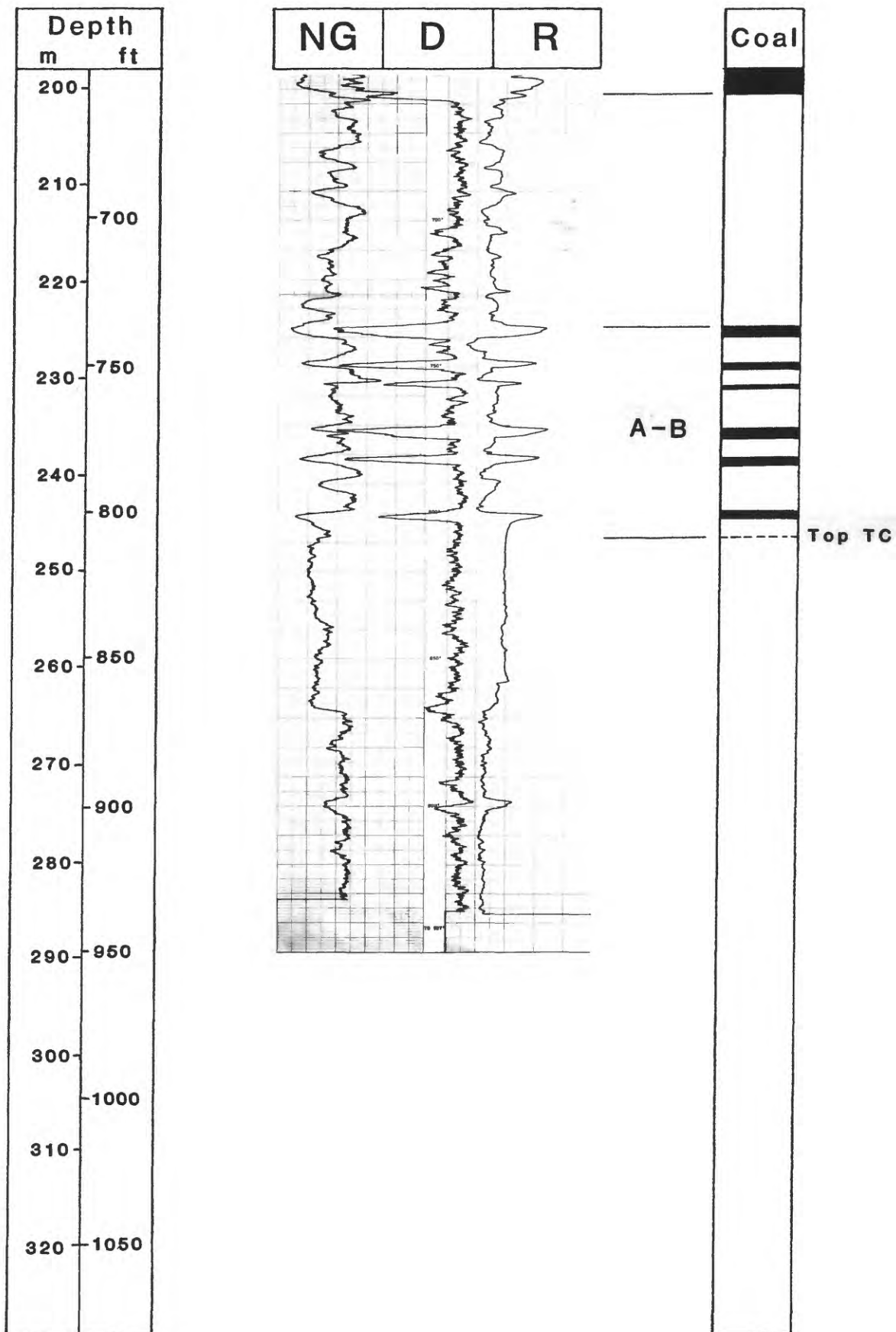
Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. Names of coal beds and  
zones modified after the nomenclature used by Trapper Mining, Incorporated.









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

Hole no. BM-45 Date logged 8/31/80 Ground elevation 7300 ft

T. 5 N., R. 89 W., Sec. 8 : 200 ft f N. 1, 2000 ft f E. 1

Drilling medium mud Drilled depth 1005 ft Fluid level 13 ft

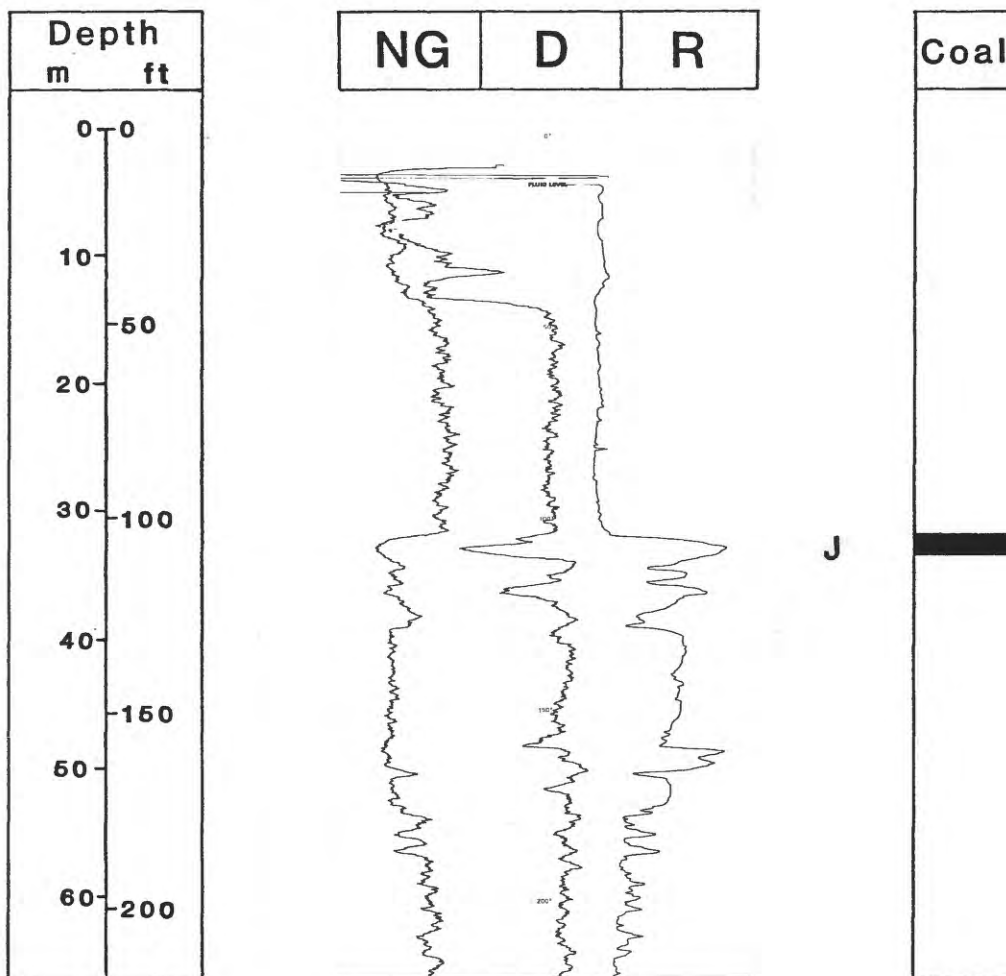
Logging company 1 Logging speed 18 ft/min. Logged depth 1004 ft

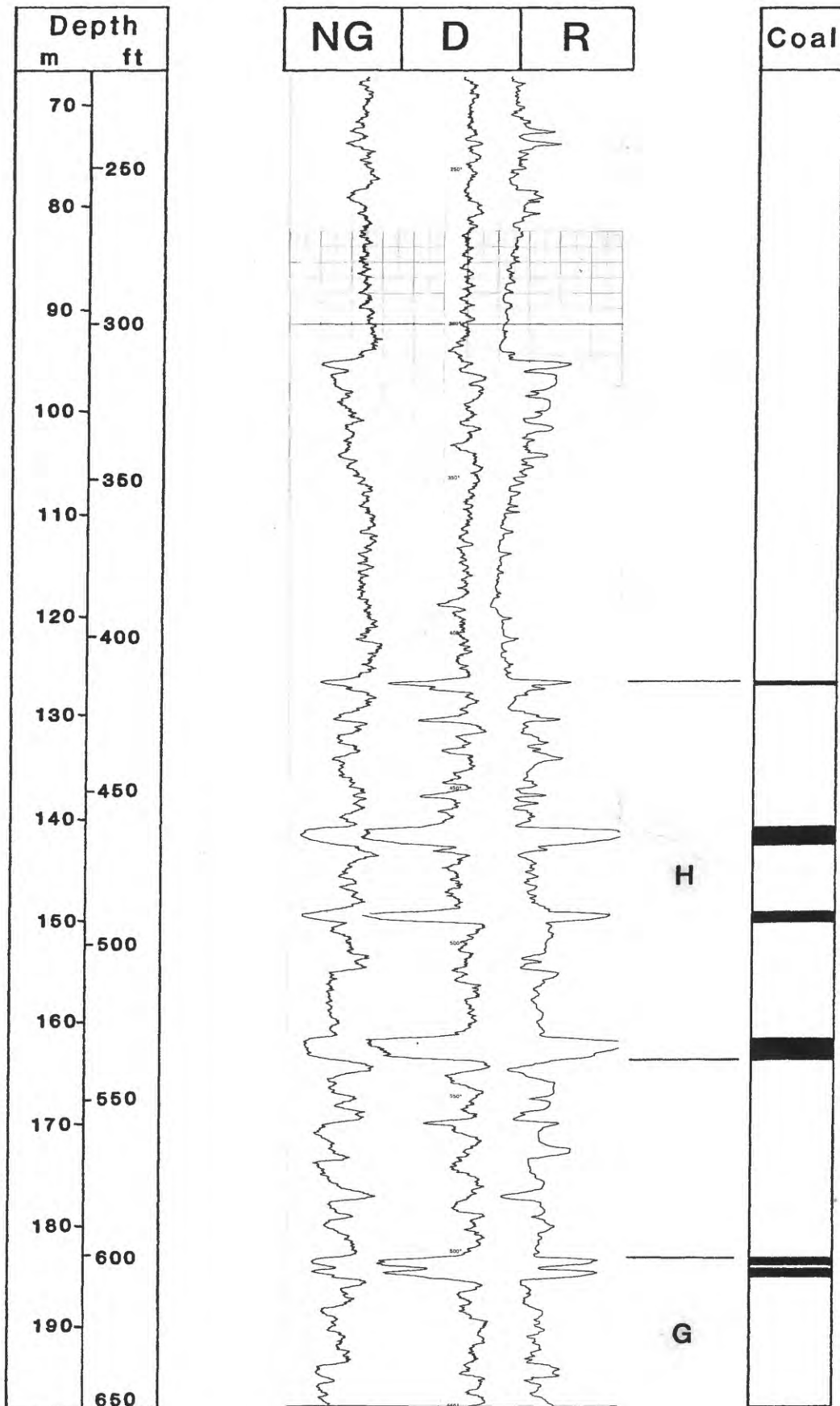
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

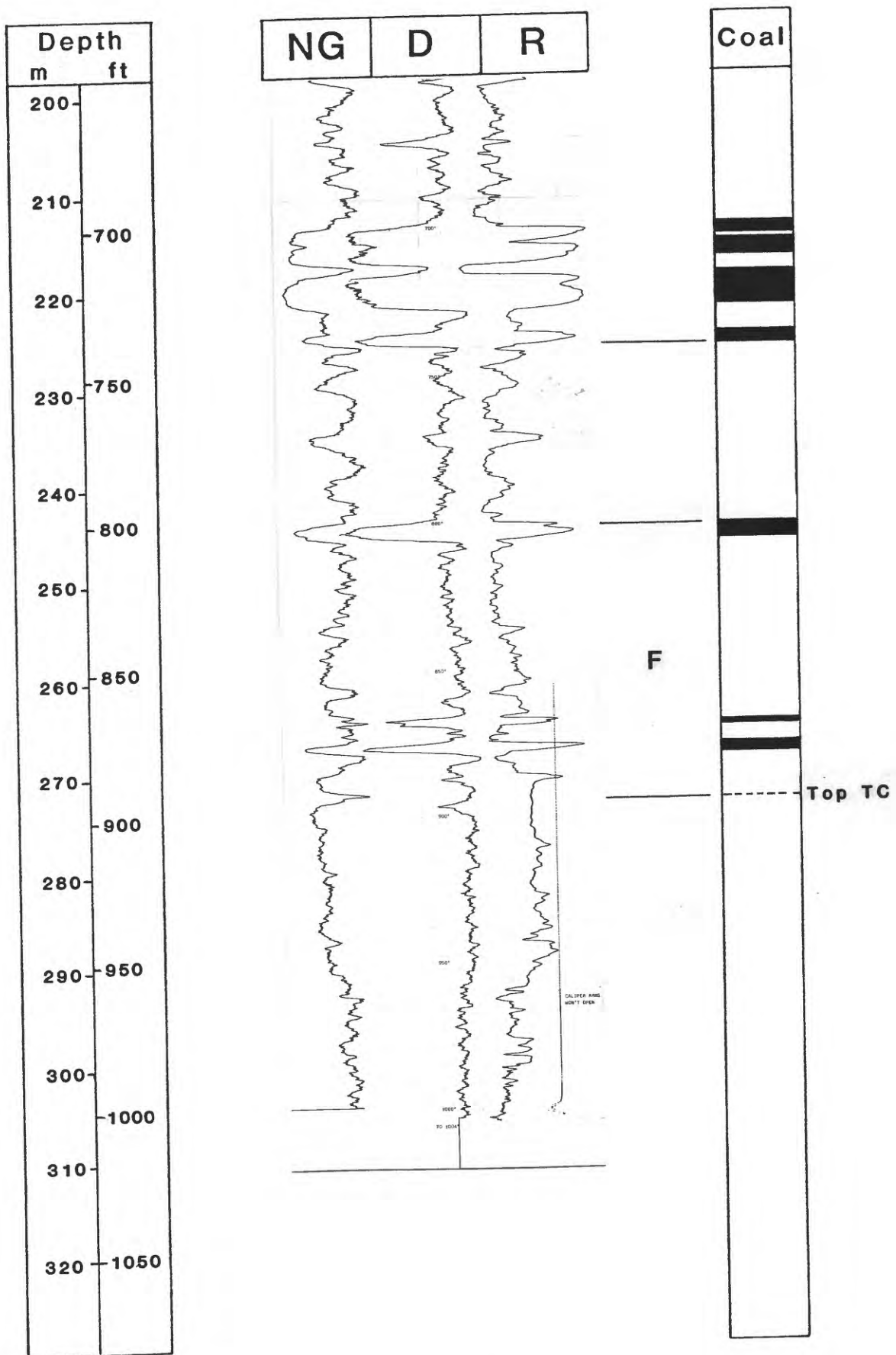
Density (gamma-gamma) (D) Scale 40 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: 1 Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Bass and others, 1955.









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

Hole no. BM-46 Date logged 8-31-80 Ground elevation 7640 ft

T. 5 N., R. 89 W., Sec. 8 : 1200 ft f S. 1, 2550 ft f W. 1

Drilling medium 1 Drilled depth 1000 ft Fluid level Surface

Logging company 2 Logging speed 18 ft/min. Logged depth 986 ft.

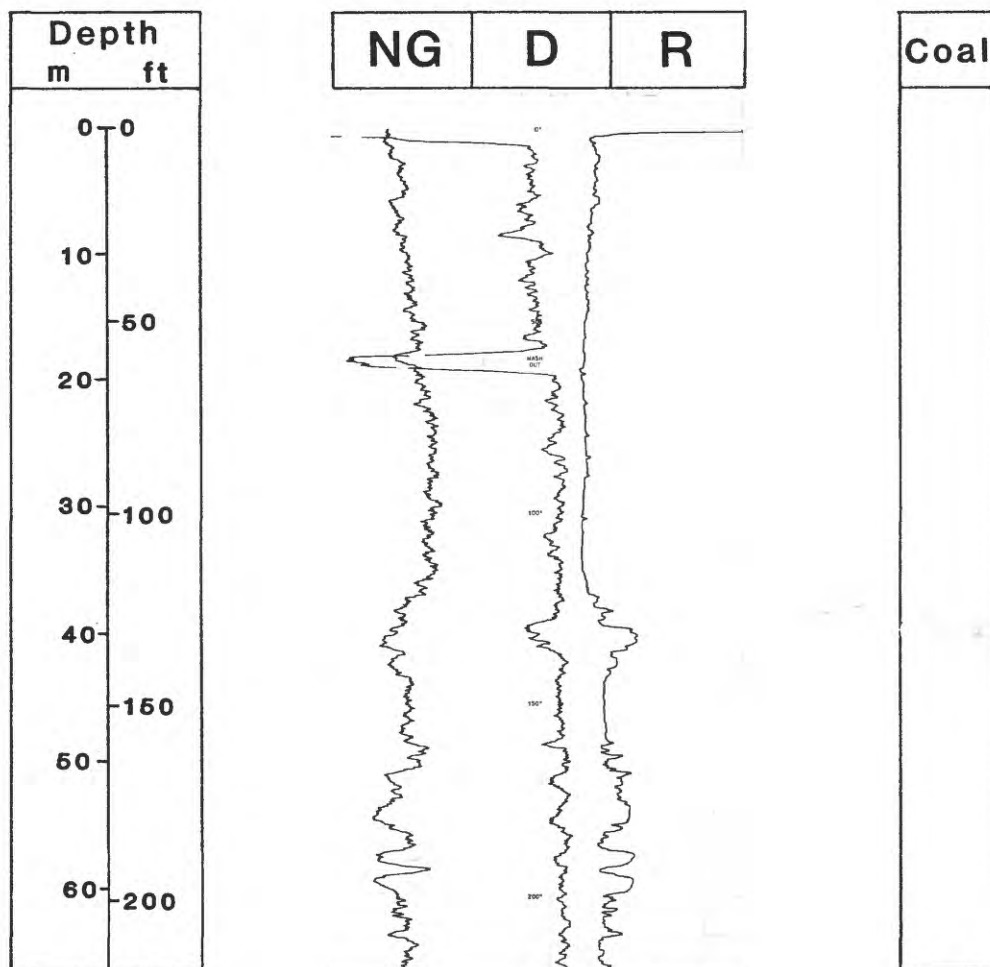
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

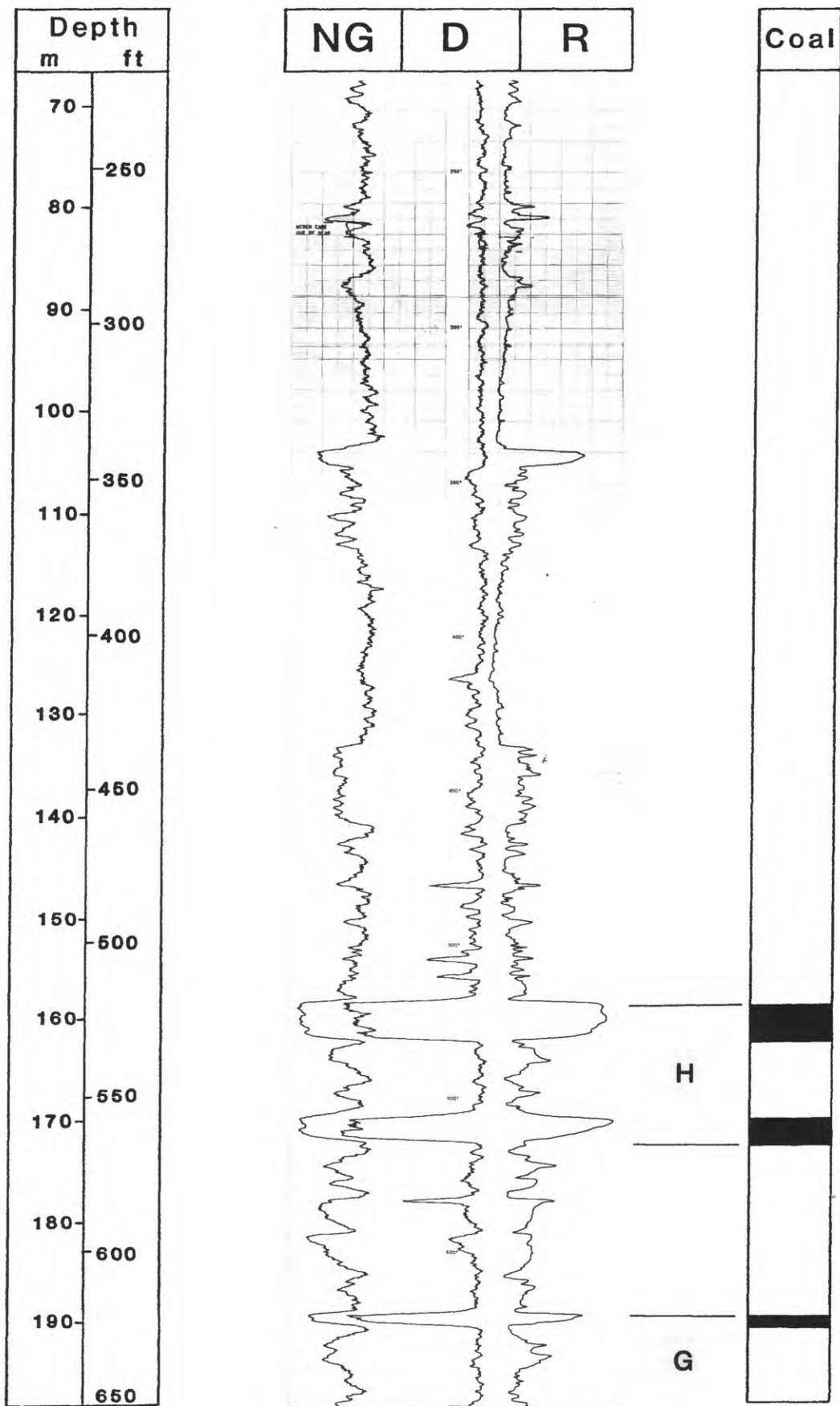
Density (gamma-gamma) (D) Scale 33.3 CPS/log div. T.C. 2

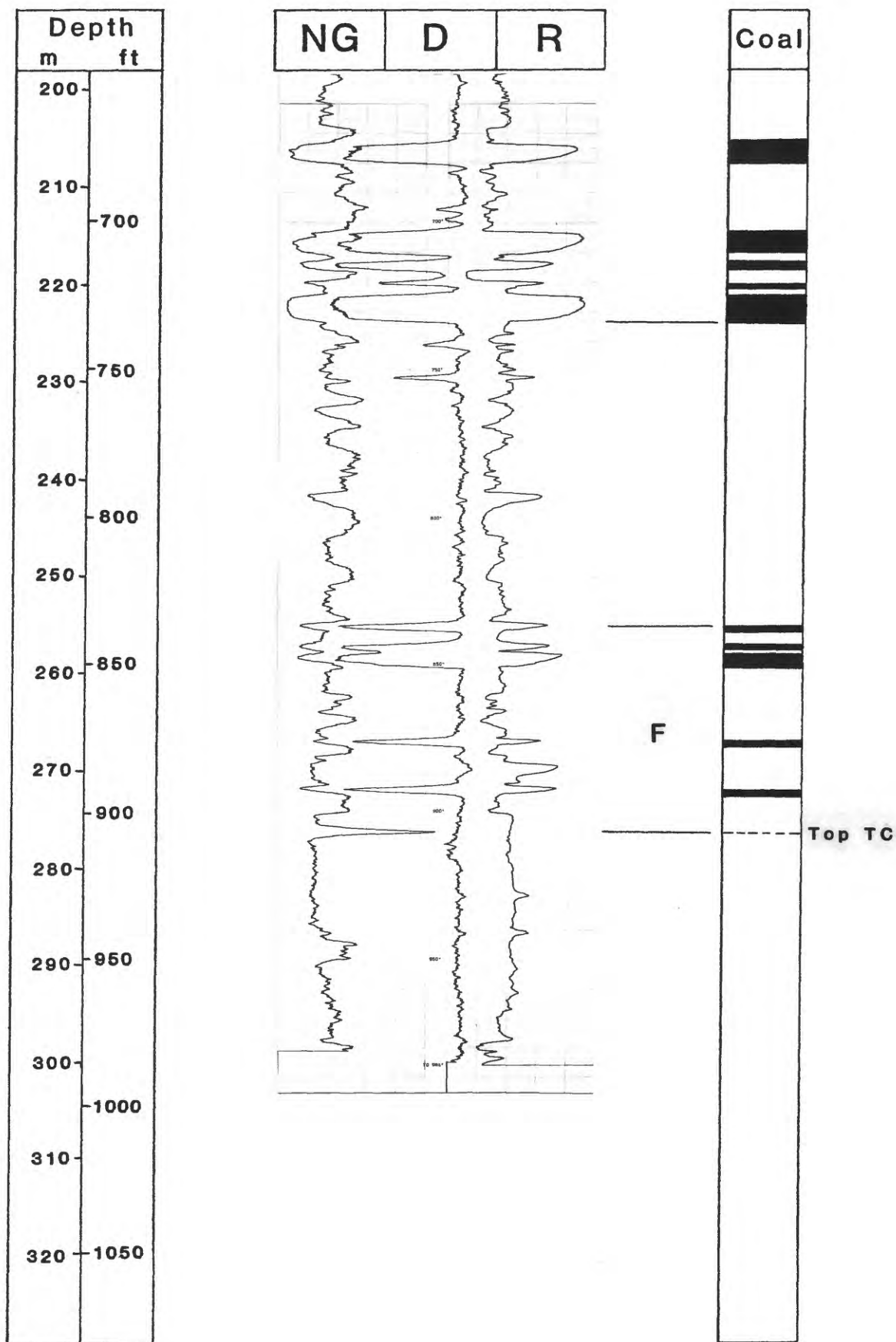
Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Hole fill with fresh water at time of logging. <sup>2</sup>Strata Surveys.

Names of coal beds and zones modified after the nomenclature used by Bass and others, 1955.







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

Hole no. BM-48 Date logged 8/28/80 Ground elevation 7360 ft

T. 5 N., R. 90 W., Sec. 11 : 1500 ft f N. 1, 2500 ft f E. 1

Drilling medium mud Drilled depth 1180 ft Fluid level 13 ft

Logging company 1 Logging speed 18 ft/min.<sup>2</sup> Logged depth 1180 ft

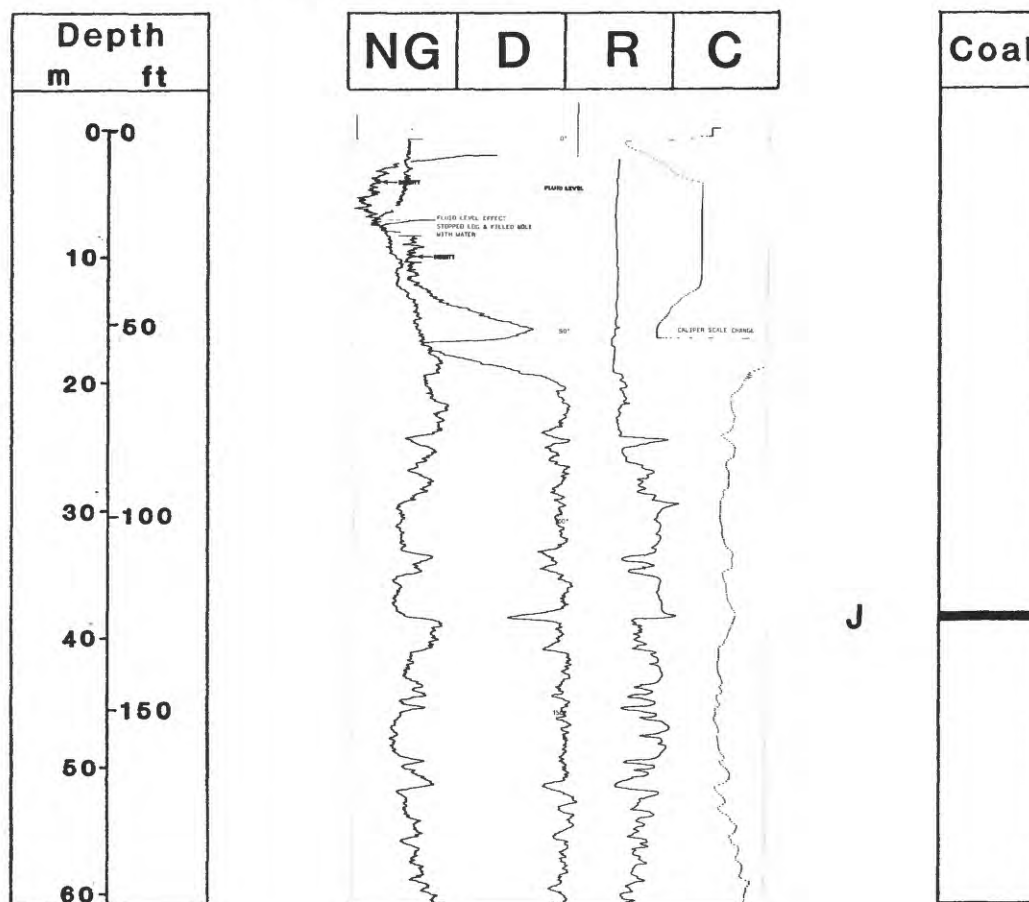
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

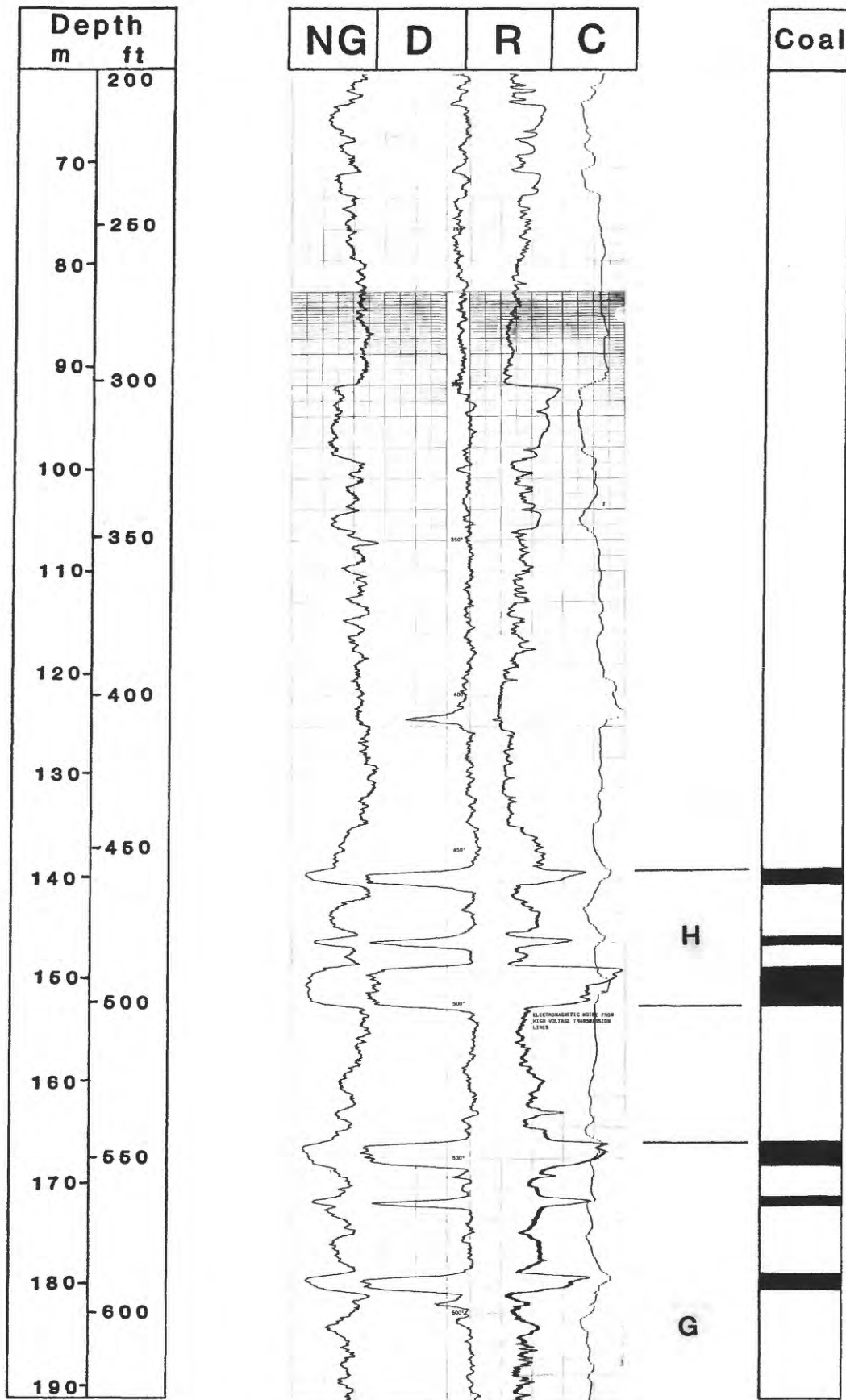
Density (gamma-gamma) (D) Scale 50 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Caliper (C) Scale 3

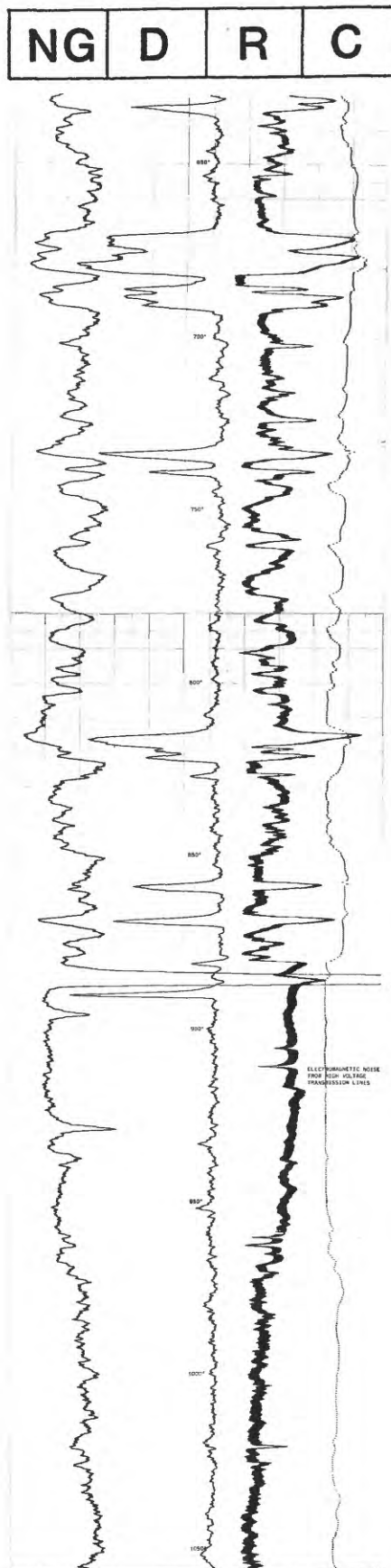
Remarks: <sup>1</sup>Strata Surveys <sup>2</sup>Caliper ran at 40 ft/min. from 1179 ft to 53 ft and 20 ft/min. from 53 ft to 0 ft <sup>3</sup>1 in./log div. from 1179 ft to 53 ft and 2 in./log div. from 53 ft to 0 ft. Names of coal beds and zones modified after the nomenclature used by Bass and others, 1955.







Depth	
m	ft
200	650
210	
	700
220	
230	750
240	
	800
250	
260	850
270	
	900
280	
290	950
300	
	1000
310	
320	1050



Depth m ft	
330	1100
340	
350	1150
360	
	1200
370	
380	1250
390	
	1300
400	
410	1350
420	
	1400
430	
440	1450
450	



Coal

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

Hole no. BM-49 Date logged 8/26/80 Ground elevation 7485 ft

T. 5 N., R. 90 W., Sec. 10 : 2050 ft S. 1, 1700 ft E. 1

Drilling medium 1 Drilled depth 960 ft Fluid level 174 ft

Logging company 2 Logging speed 15 ft/min. Logged depth 957 ft

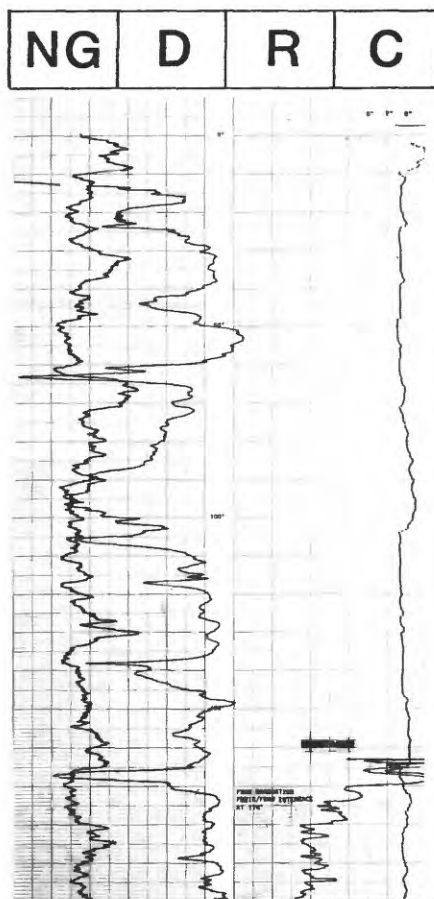
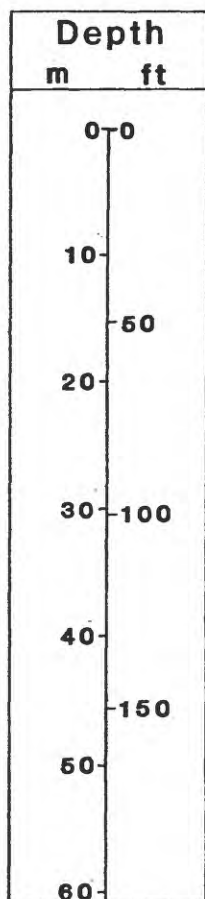
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

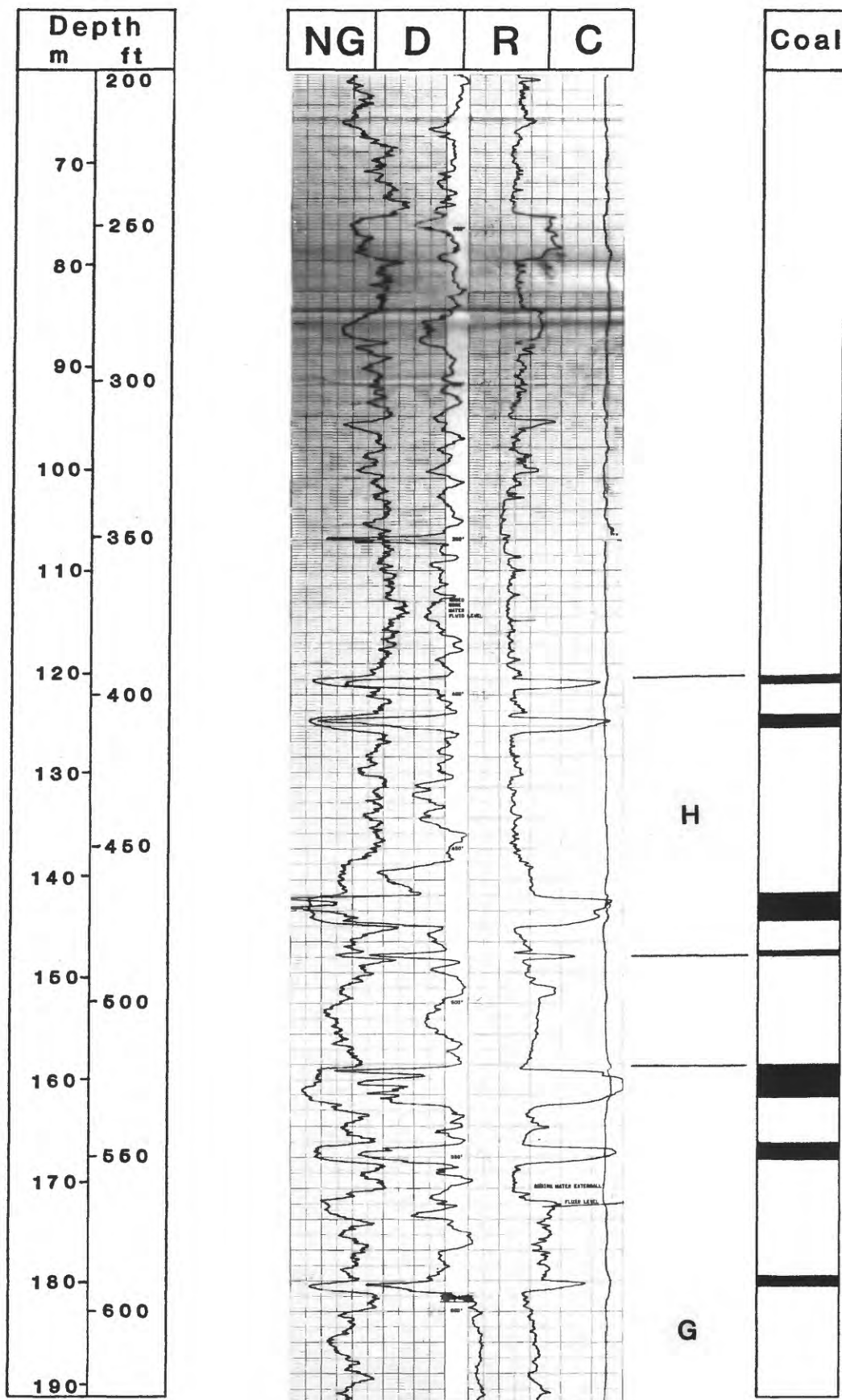
Density (gamma-gamma) (D) Scale 19.9 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

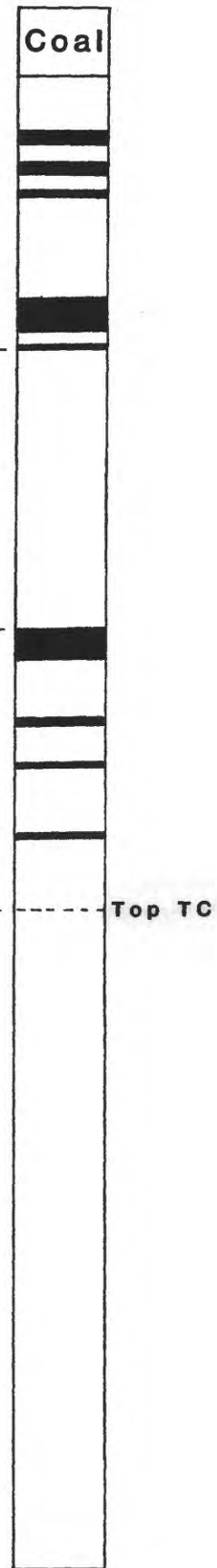
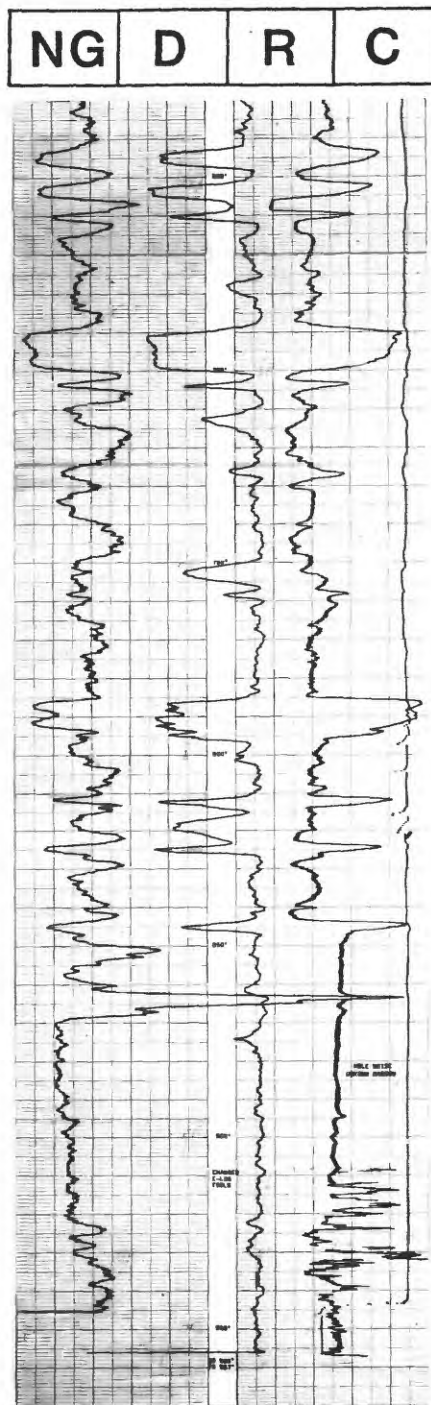
Caliper (C) Scale 1 in. log div.

Remarks: <sup>1</sup>Hole filled with water at time of logging <sup>2</sup>Strata Surveys Names of  
coal beds and zones modified after the nomenclature used by Bass and others, 1955.



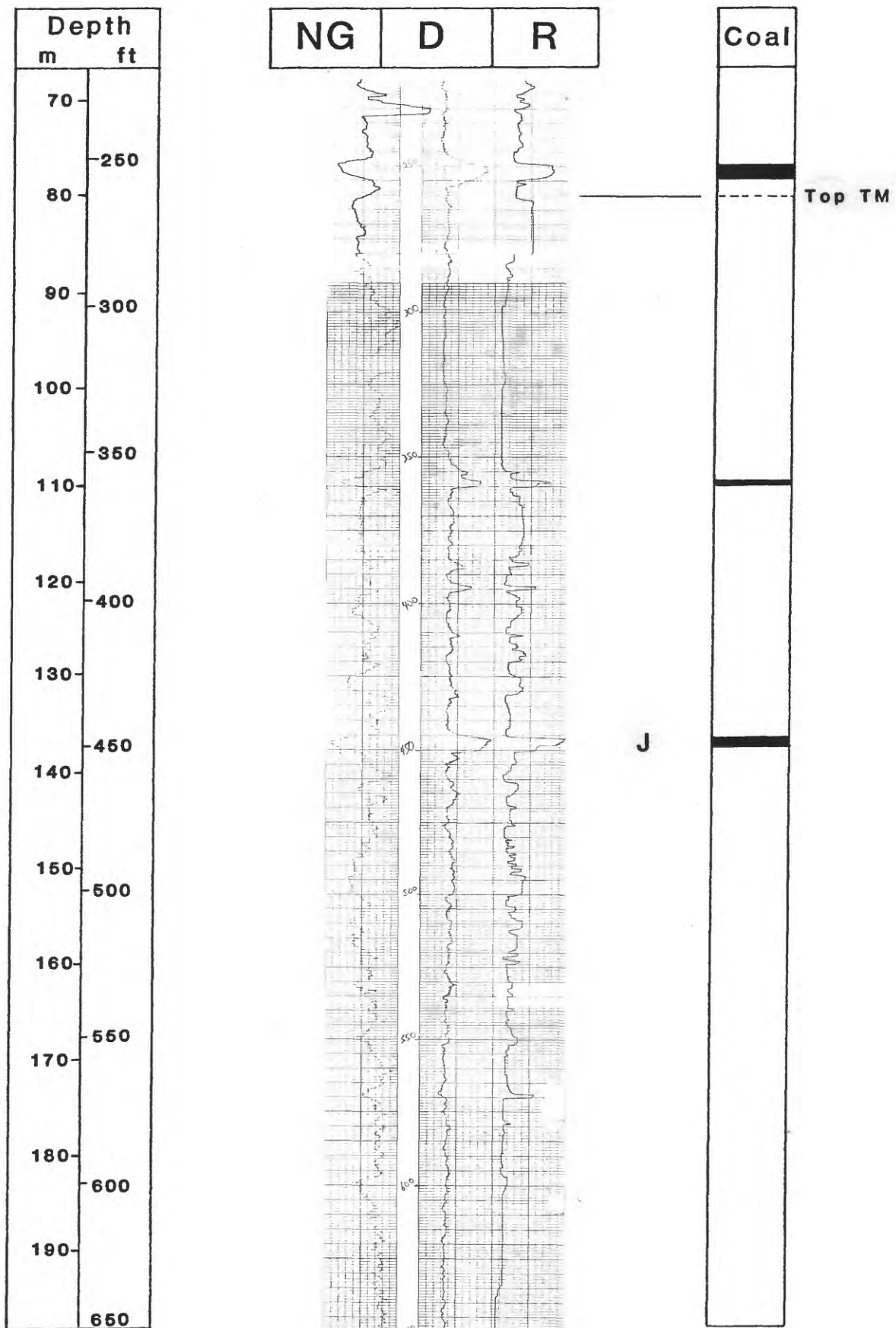


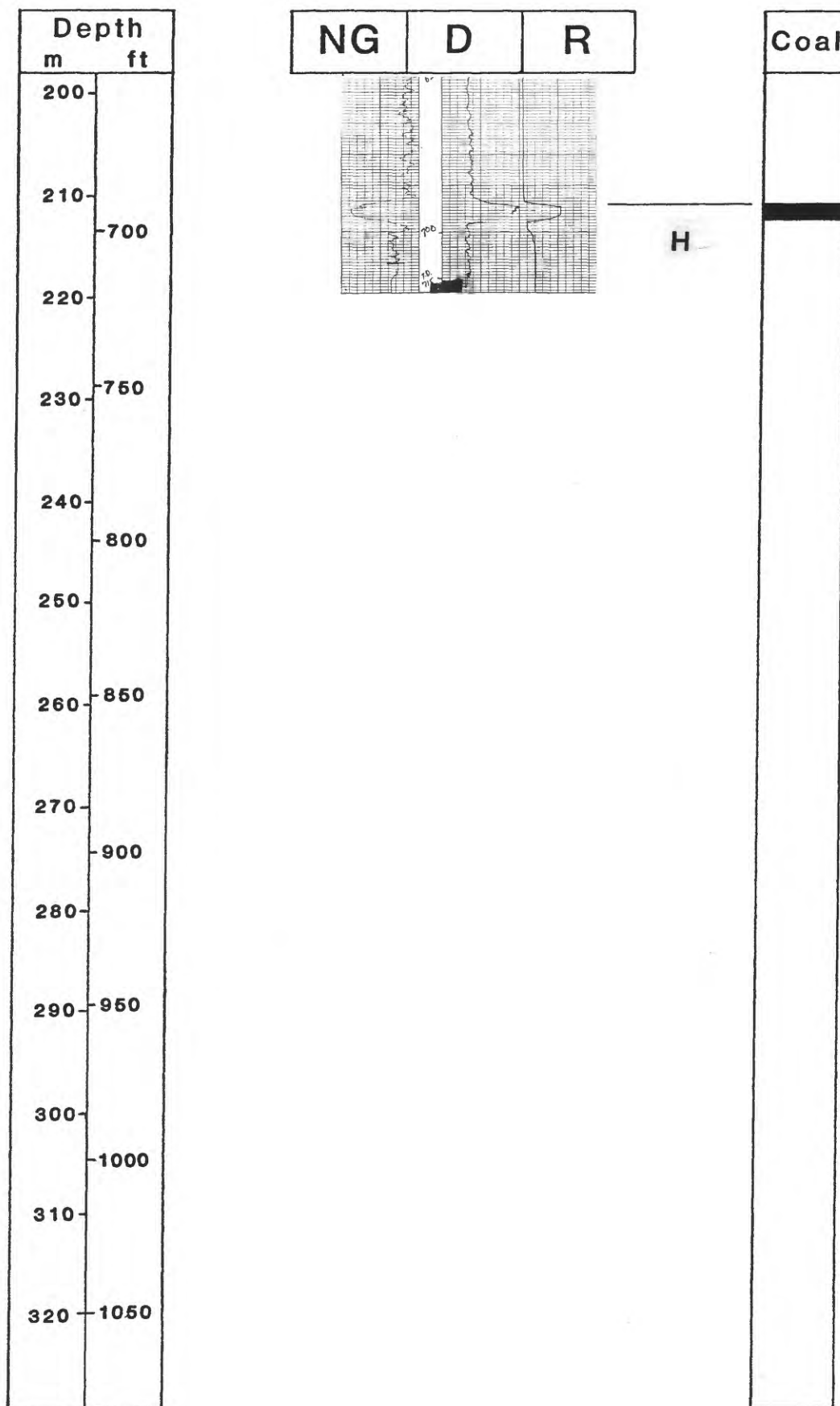
Depth	
m	ft
200	660
210	
	700
220	
230	750
240	
	800
250	
260	850
270	
	900
280	
290	950
300	
	1000
310	
320	1050



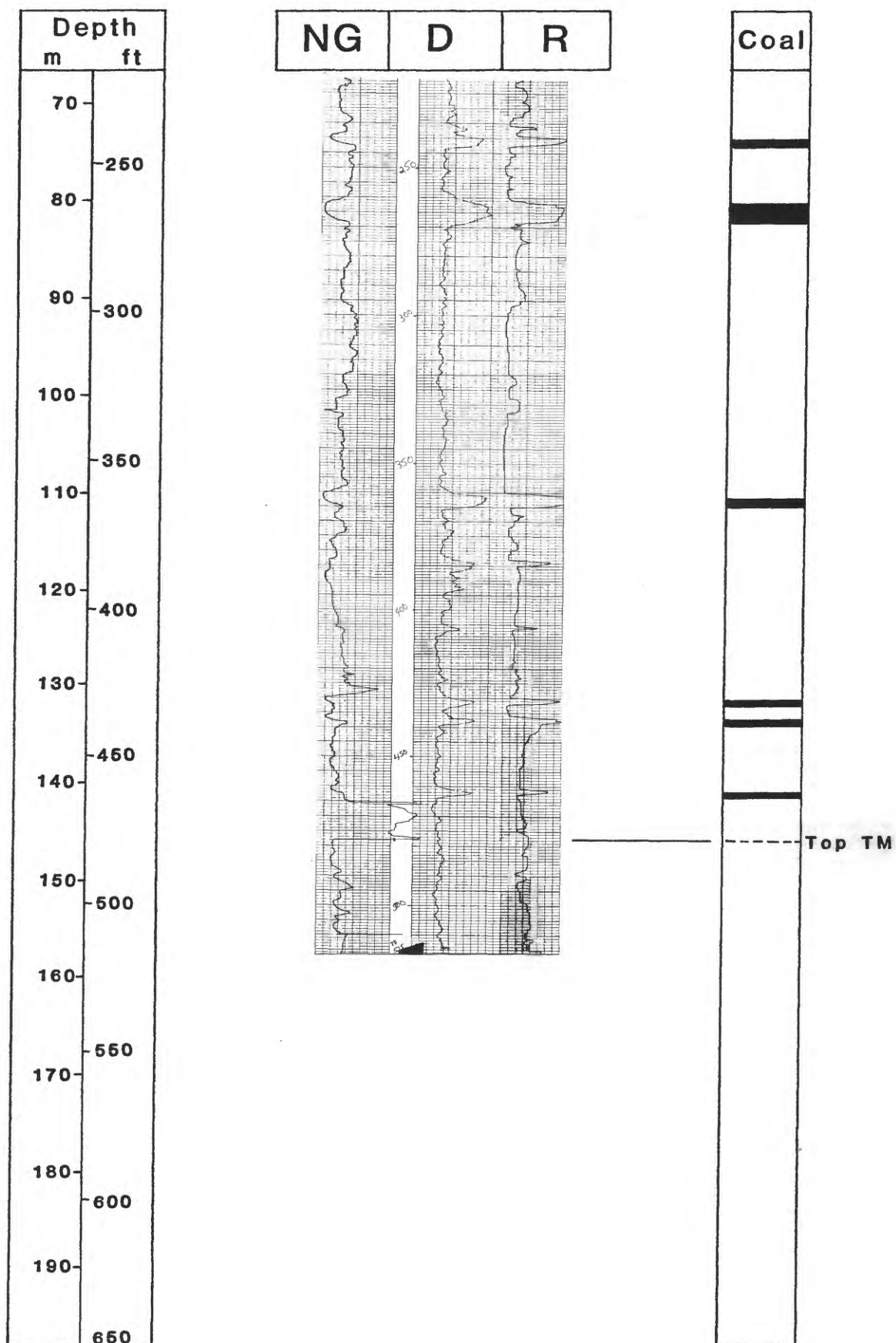












U.S. GEOLOGICAL SURVEY  
GEOPHYSICAL LOG, MOFFAT COUNTY, COLORADO

Hole no. BM-53 Date logged 9/5/80 Ground elevation 7340 ft

T. 6 N., R. 90 W., Sec. 34 : 1350 ft f S. 1,1050 ft f W. 1

Drilling medium mud Drilled depth 1500 ft Fluid level 7 ft

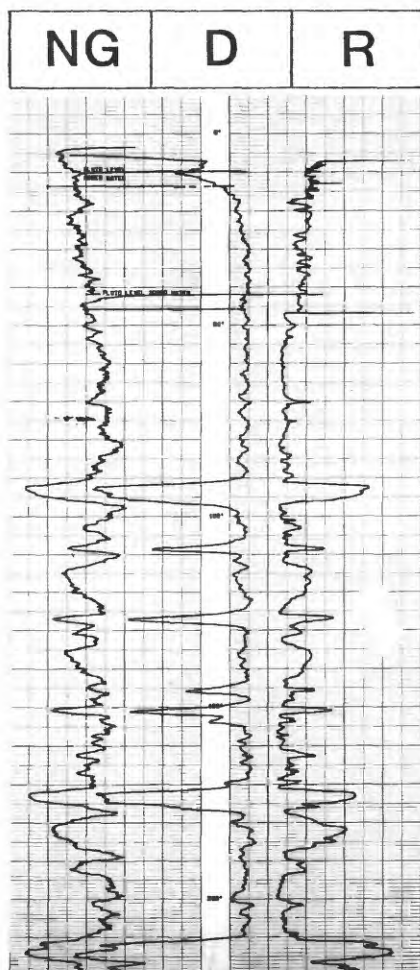
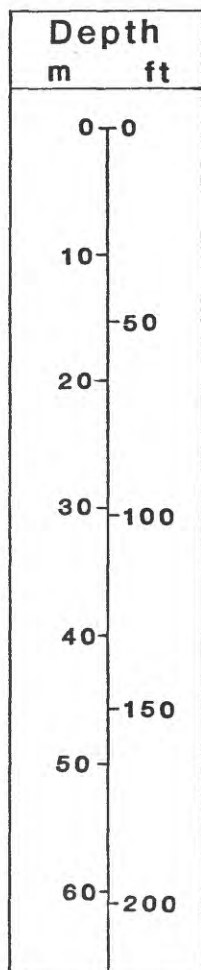
Logging company 1 Logging speed 18 ft/min. Logged depth 1500 ft

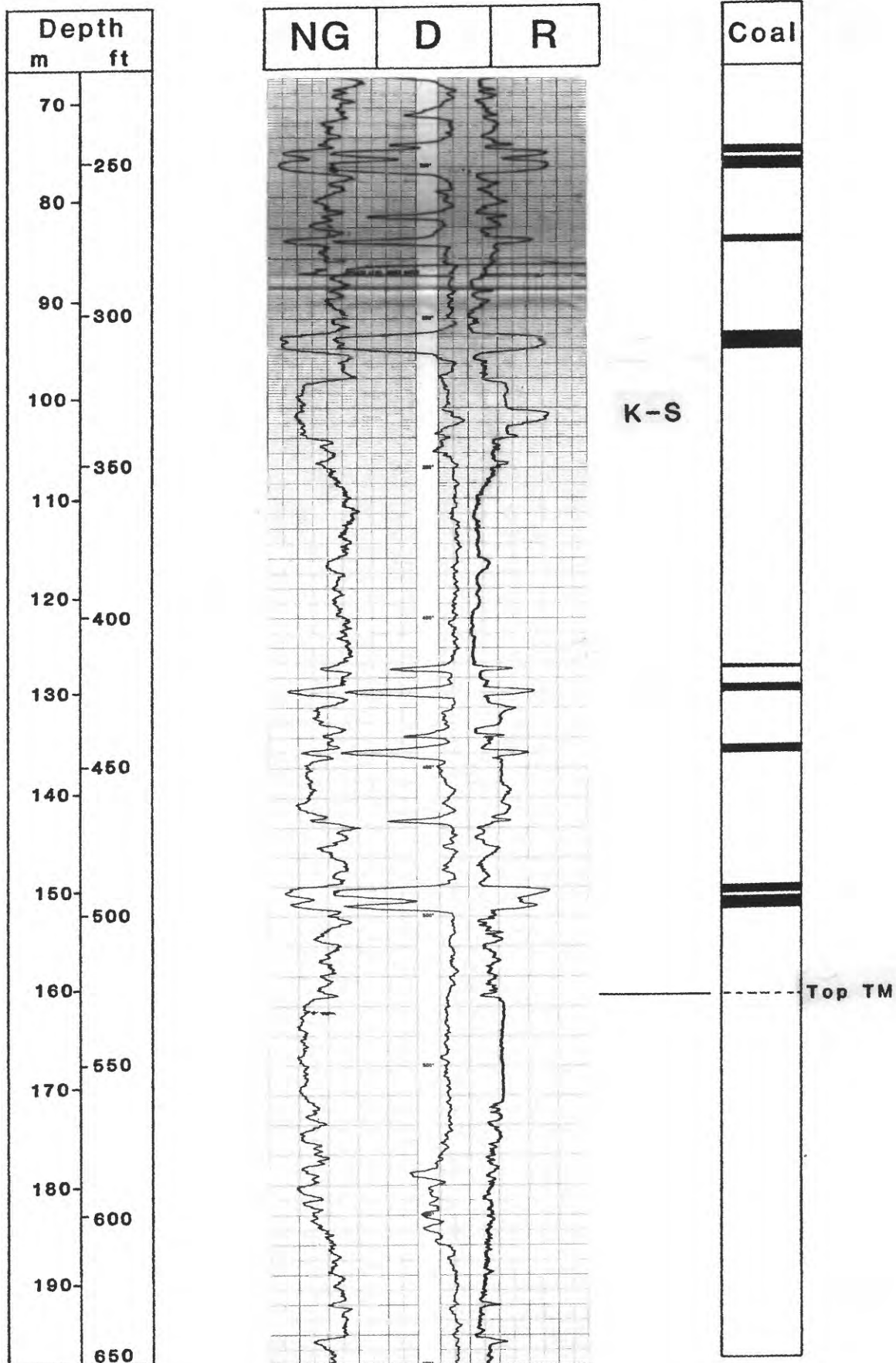
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 66.6 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

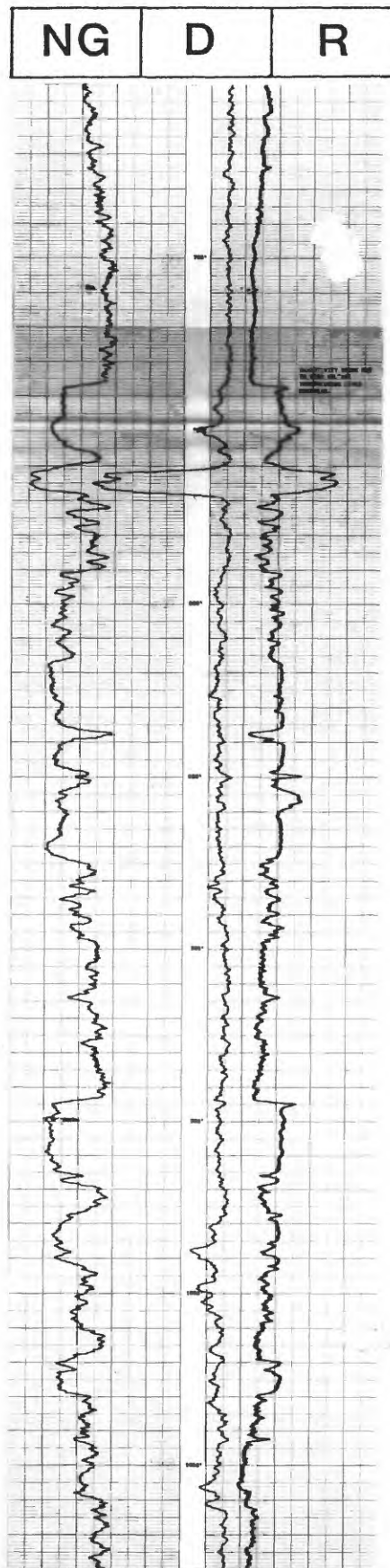
Remarks: 1 Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Bass and others, 1955.





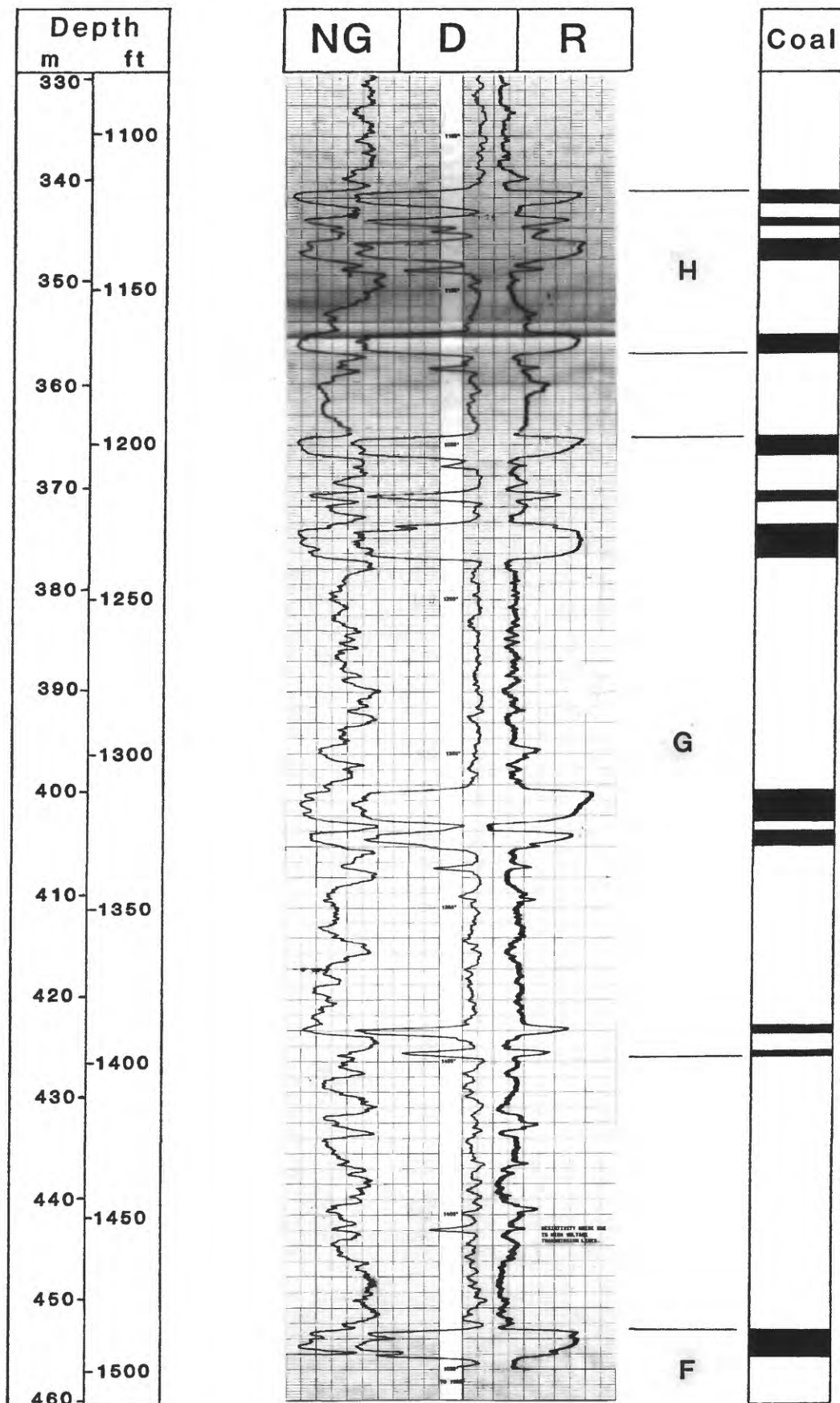


Depth	
m	ft
200	
210	
	700
220	
230	
	750
240	
	800
250	
260	
	850
270	
	900
280	
290	
	950
300	
	1000
310	
320	
	1050



J

Coal



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

Hole no. BM-54 Date logged 9/7/80 Ground elevation 7330 ft

T. 6 N., R. 90 W., Sec. 34 : 2600 ft f S. 1,650 ft f E. 1

Drilling medium mud Drilled depth 1040 ft Fluid level 9 ft

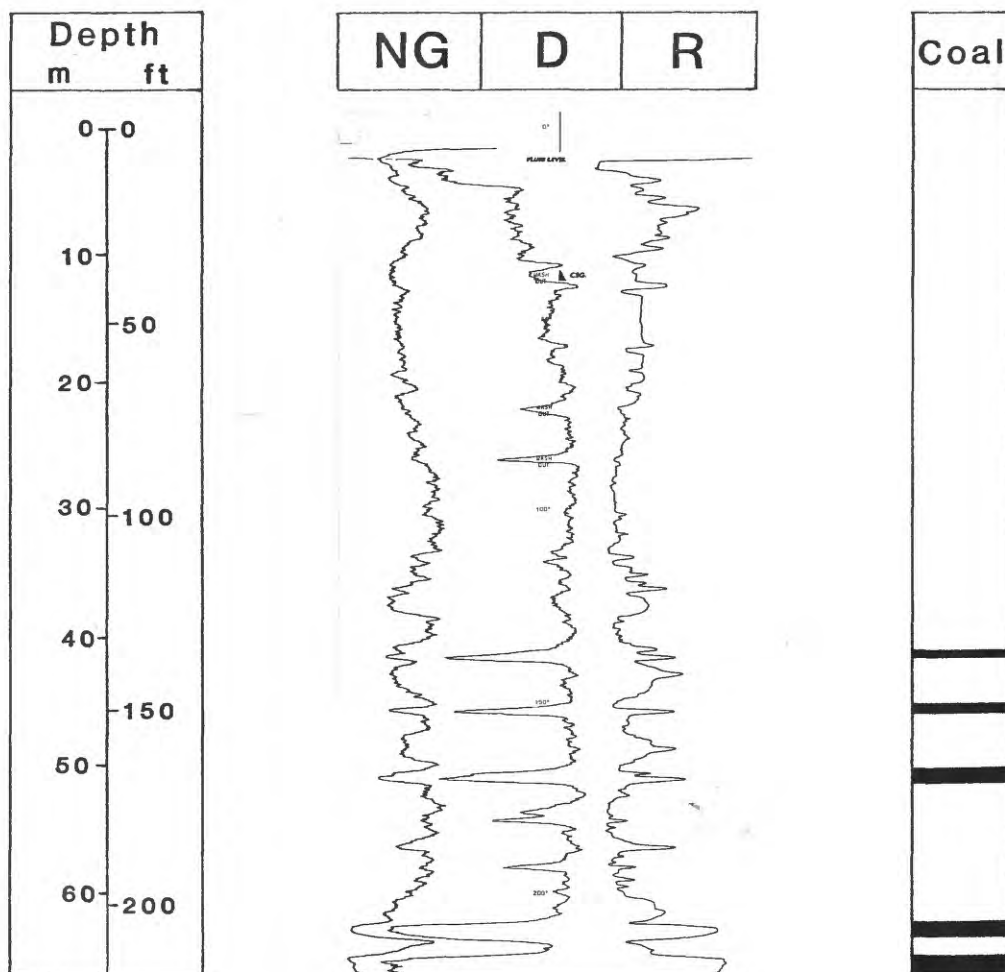
Logging company 1 Logging speed 18 ft/min. Logged depth 1040 ft

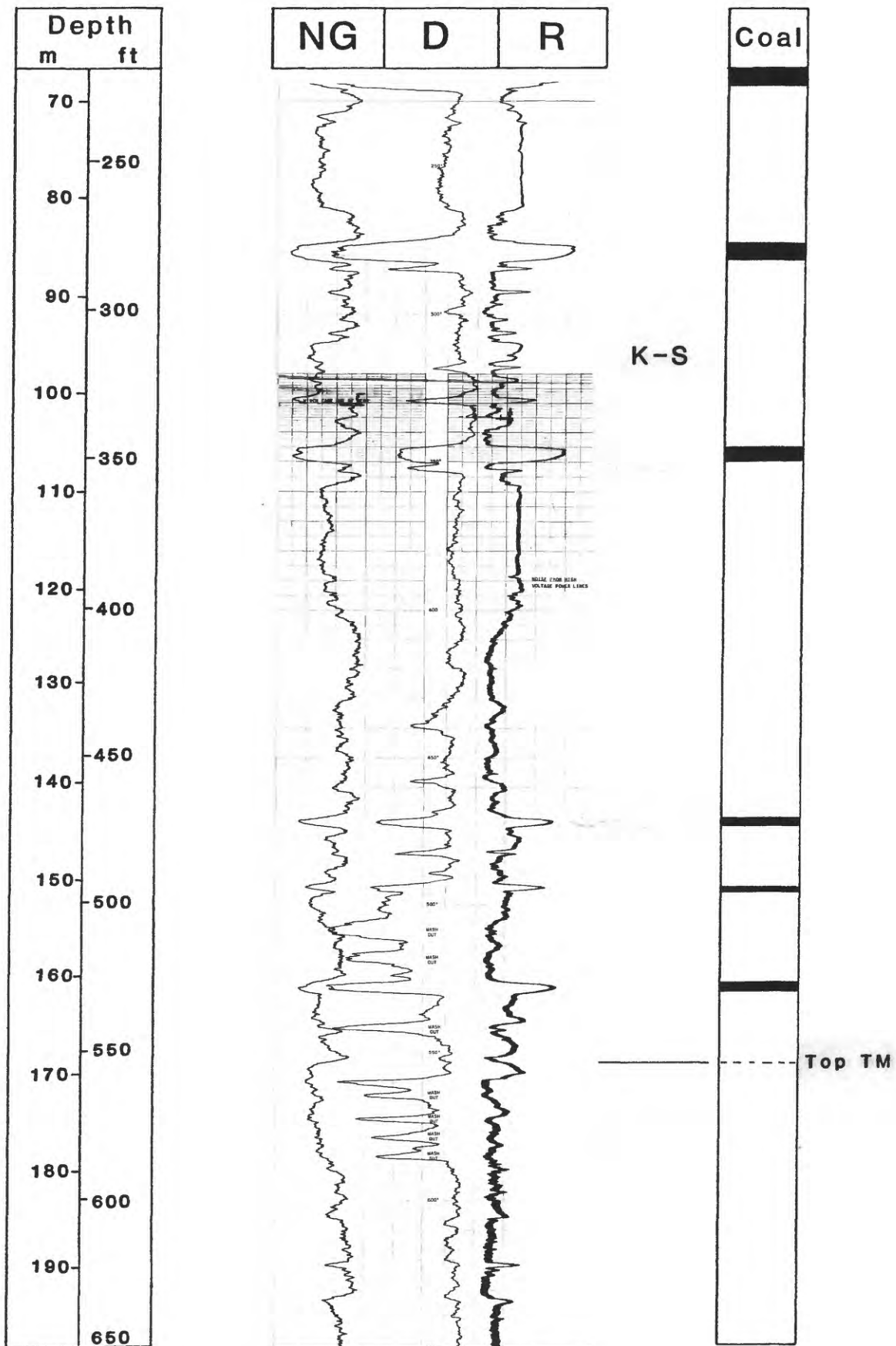
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

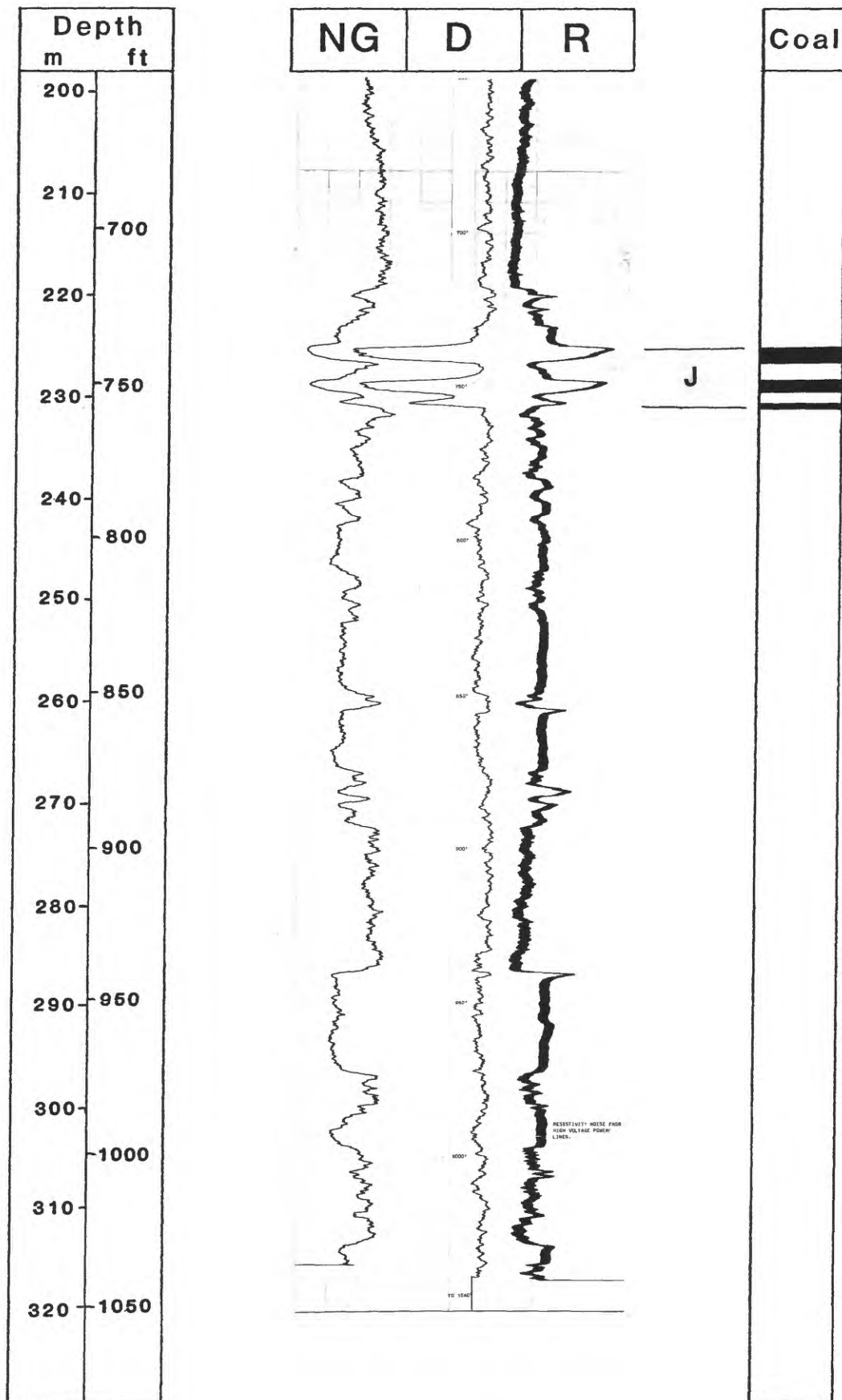
Density (gamma-gamma) (D) Scale 33 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Bass and others, 1955.







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

Hole no. BM-58 Date logged 9/8/80 Ground elevation 6945 ft

T. 6 N., R. 90 W., Sec. 33 : 500 ft f N. 1, 100 ft f E. 1

Drilling medium mud<sup>1</sup> Drilled depth 1000 ft Fluid level 5 ft

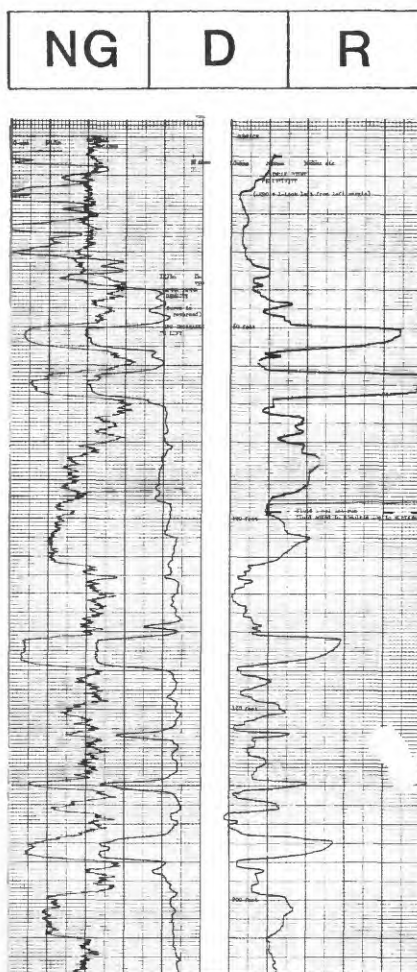
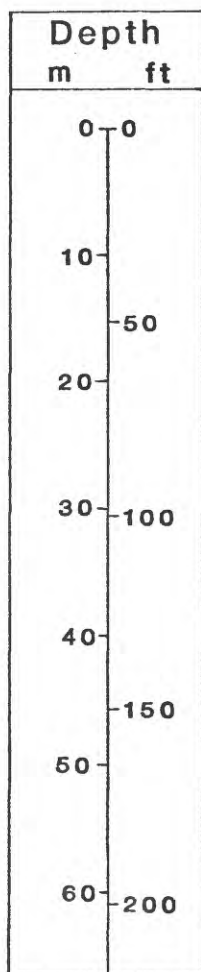
Logging company 2 Logging speed 25 ft/min. Logged depth 905 ft

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

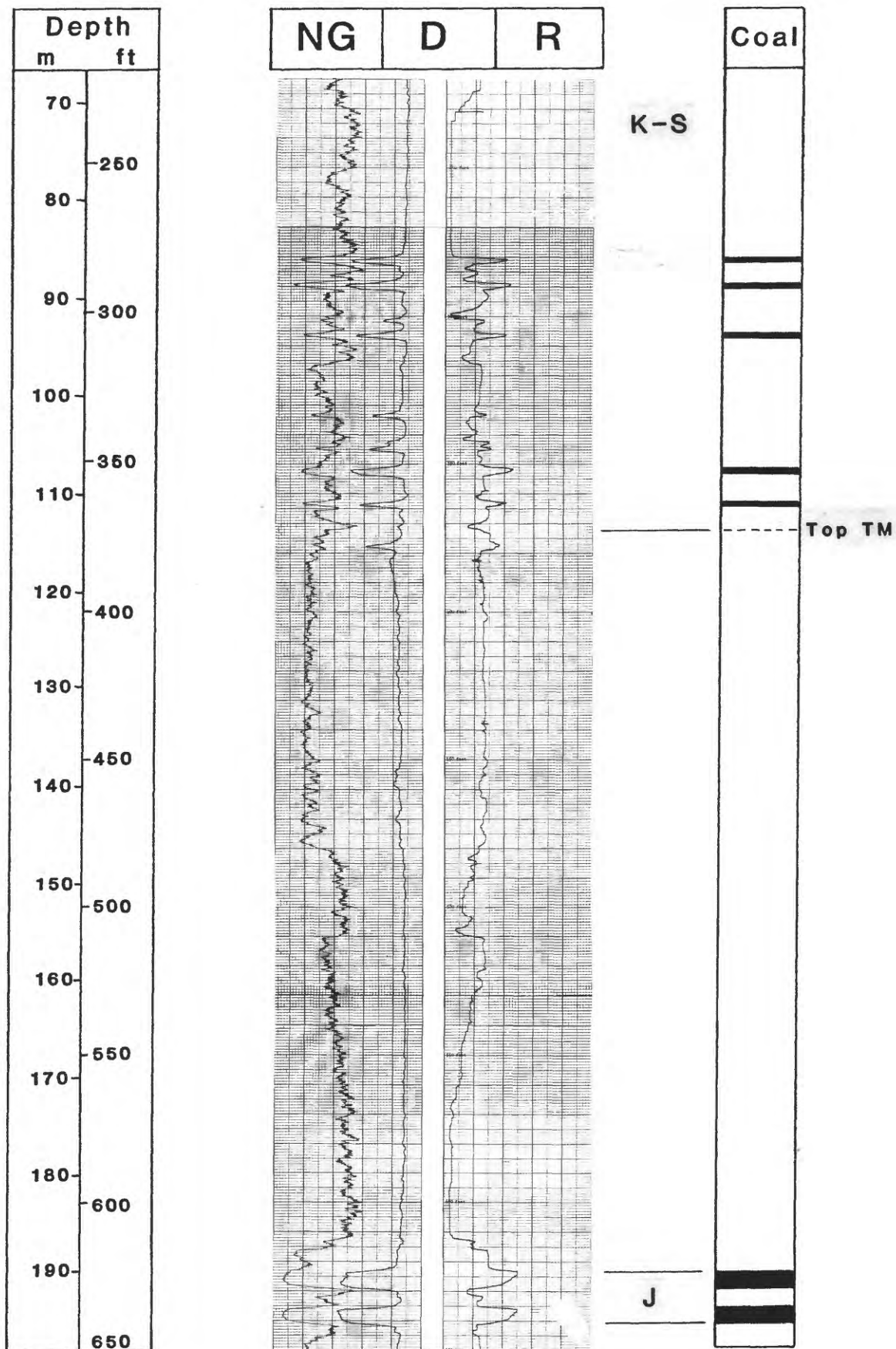
Density (gamma-gamma) (D) Scale 500 CPS/in. T.C. 1

Single point resistance (R) Scale variable

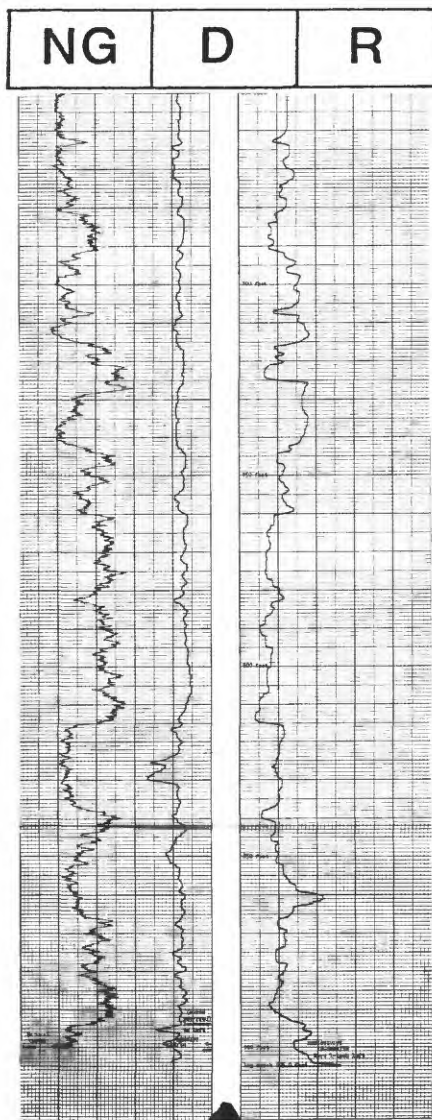
Remarks: <sup>1</sup>Some fresh water added <sup>2</sup>Savage Scientific. Names of coal beds and zones  
modified after the nomenclature used by Bass and others, 1955.







Depth	
m	ft
200	
210	700
220	
230	750
240	
250	800
260	850
270	
280	900
290	950
300	
310	1000
320	1050



Coal

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

Hole no. BM-59 Date logged 9/6/80 Ground elevation 6895 ft

T. 6 N., R. 90 W., Sec. 28 : 2600 ft f N. 1, 1800 ft f E. 1

Drilling medium mud<sup>1</sup> Drilled depth 1000 ft Fluid level 2 ft

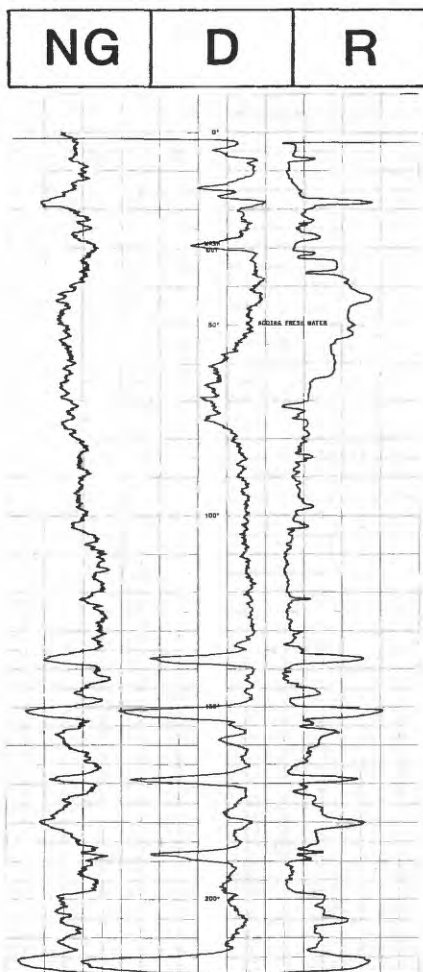
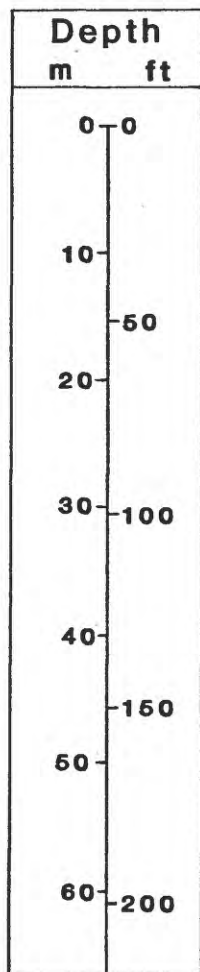
Logging company <sup>2</sup> Logging speed 18 ft/min. Logged depth 996 ft

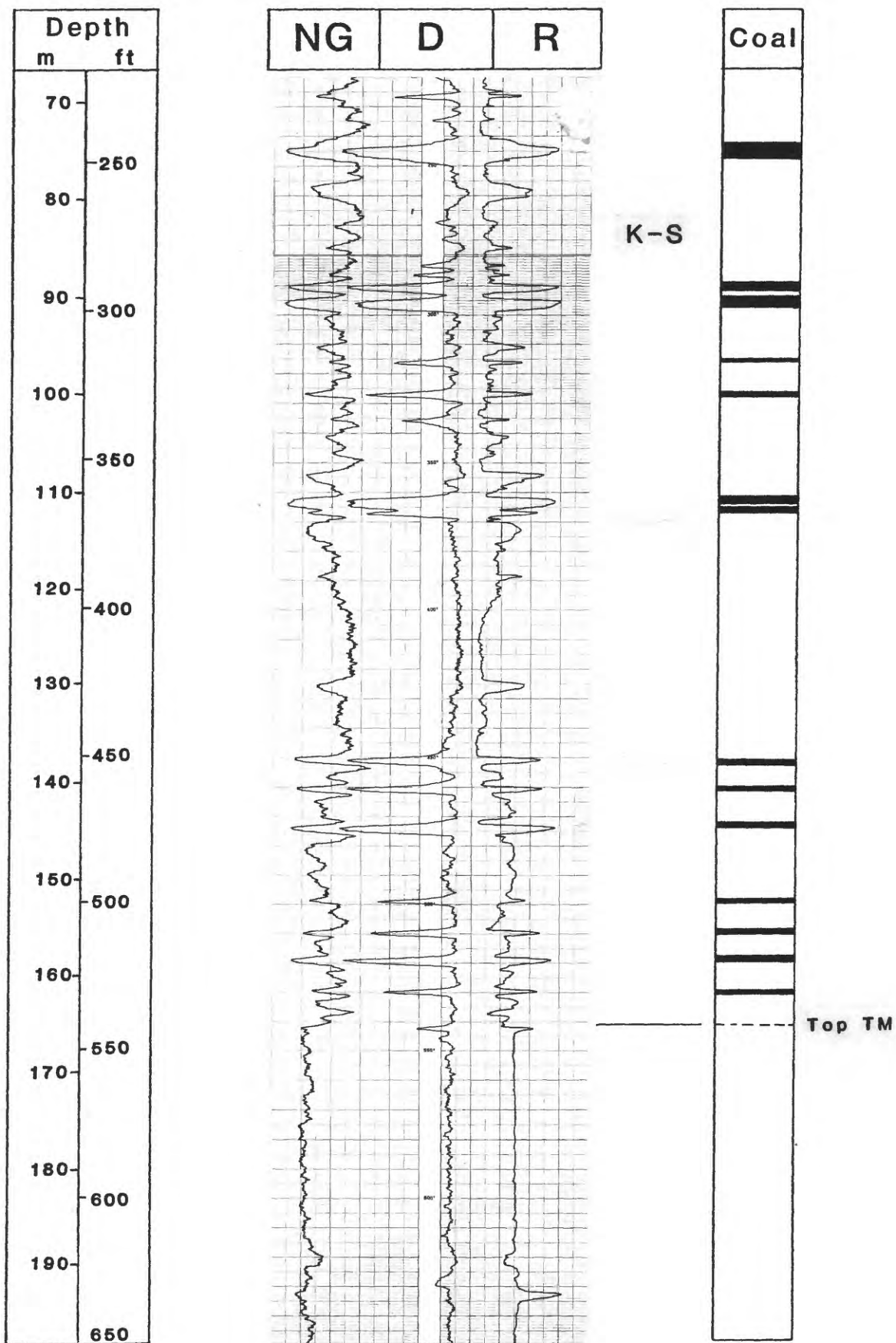
Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

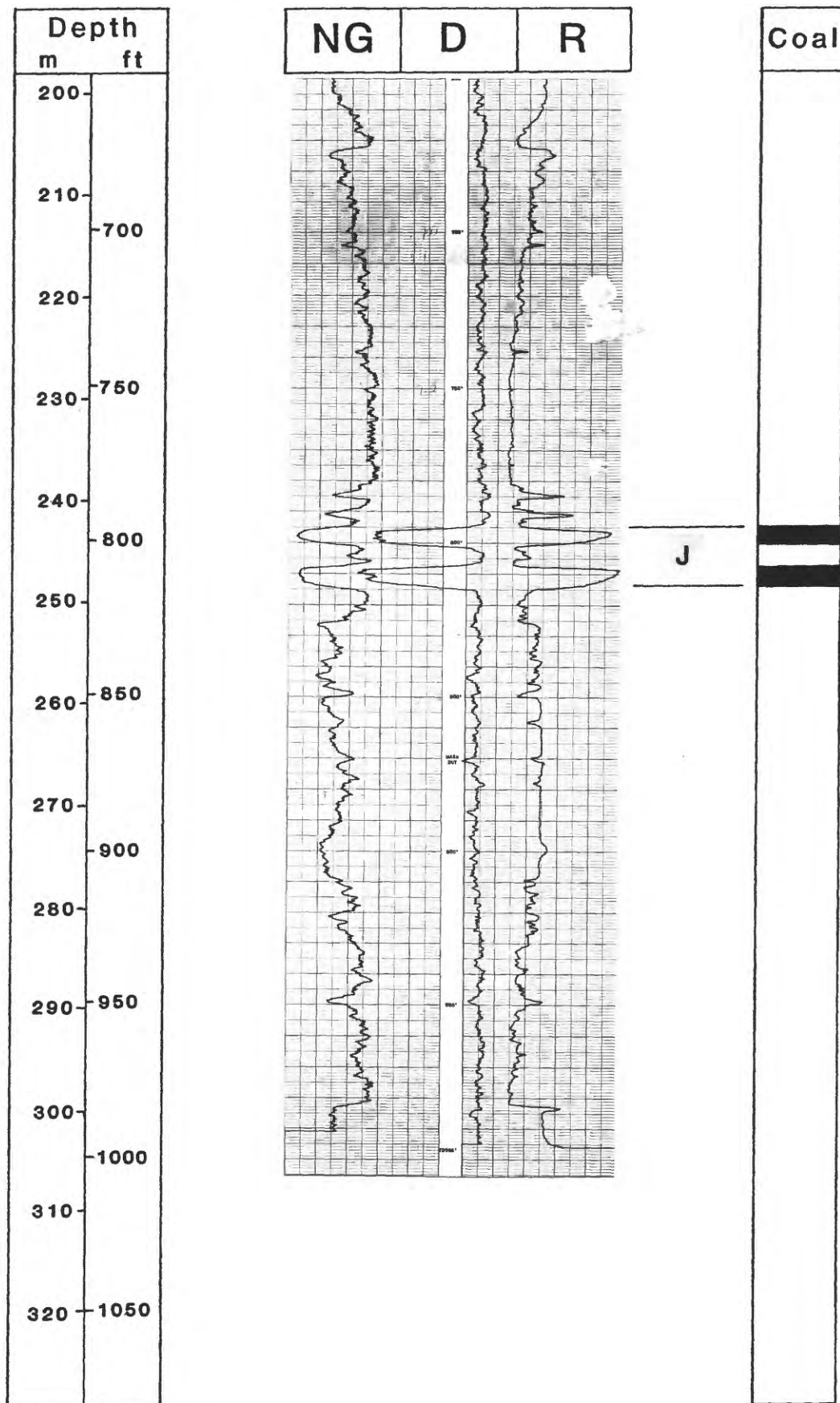
Density (gamma-gamma) (D) Scale 40 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. Names of coal beds and zones modified after the nomenclature used by Bass and others, 1955.







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

Hole no. HAY-11 Date logged 9/19/80 Ground elevation 6890 ft

T. 5 N., R. 89 W., Sec. 13 : 200 ft f N. 1, 1700 ft f W. 1

Drilling medium mud<sup>1</sup> Drilled depth 760 ft Fluid level 59 ft

Logging company <sup>2</sup> Logging speed 20 ft/min.<sup>3</sup> Logged depth 753 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 30 CPS/log div. T.C. 2

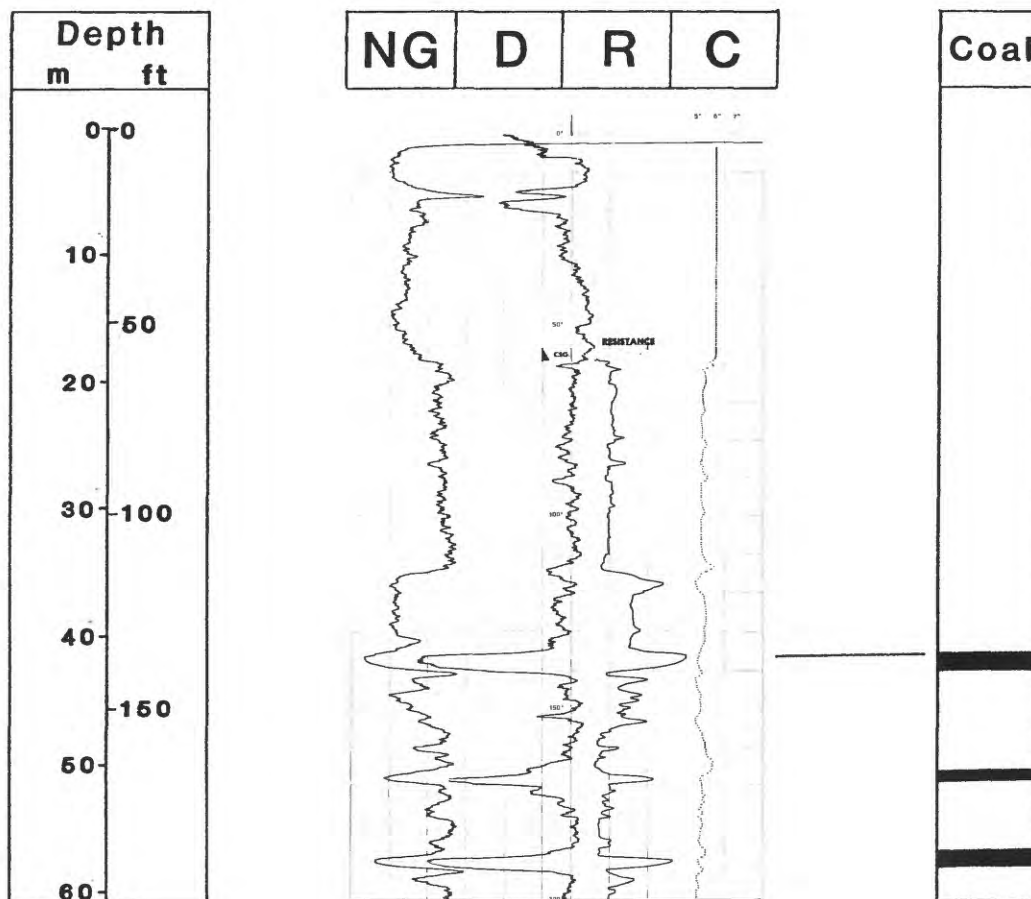
Single point resistance (R) Scale variable

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

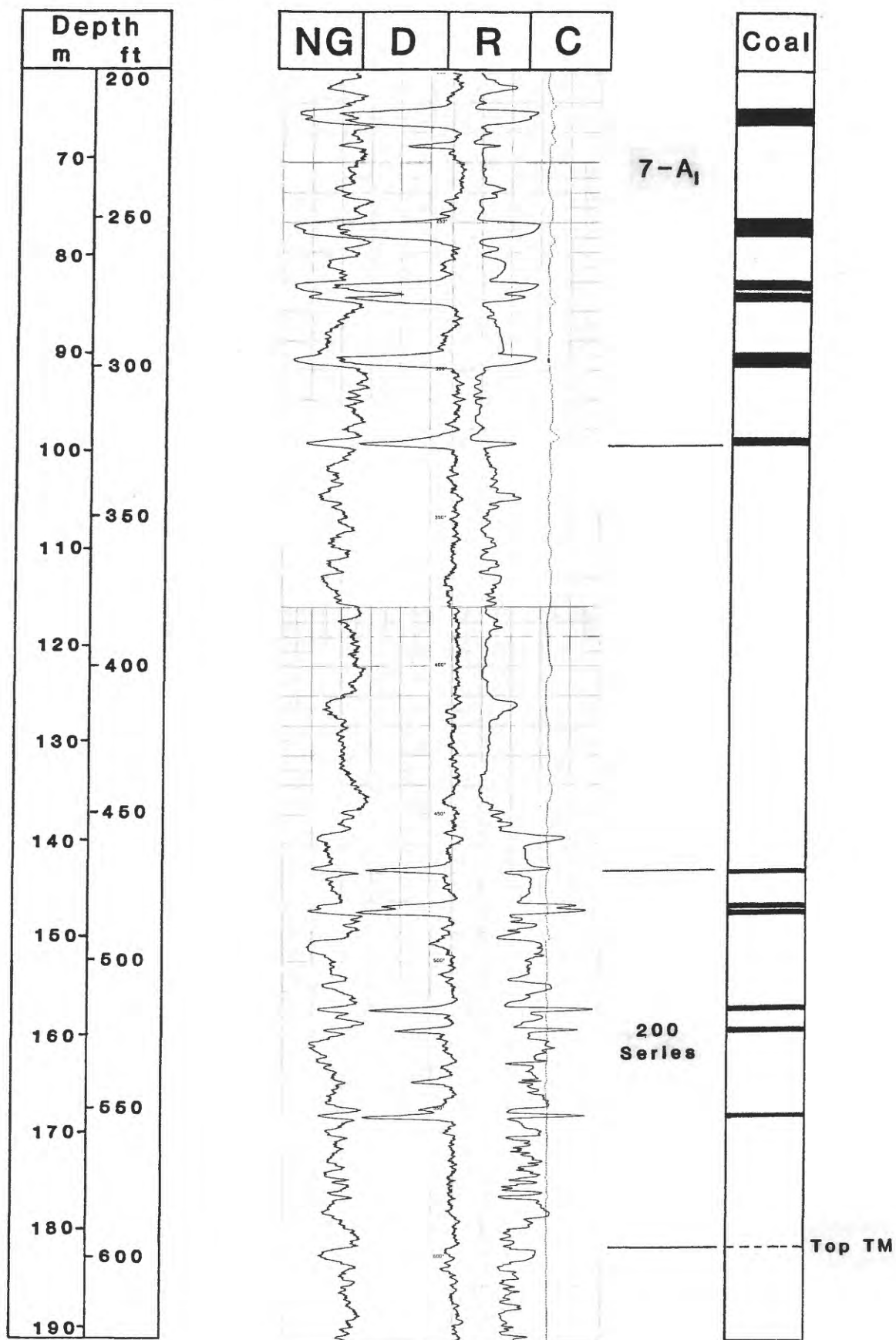
Remarks: <sup>1</sup>Some fresh water added. <sup>2</sup>Strata Surveys. <sup>3</sup>Caliper, run at 30 ft/min.

Names of coal beds and zones modified after the nomenclature used by Colowyo

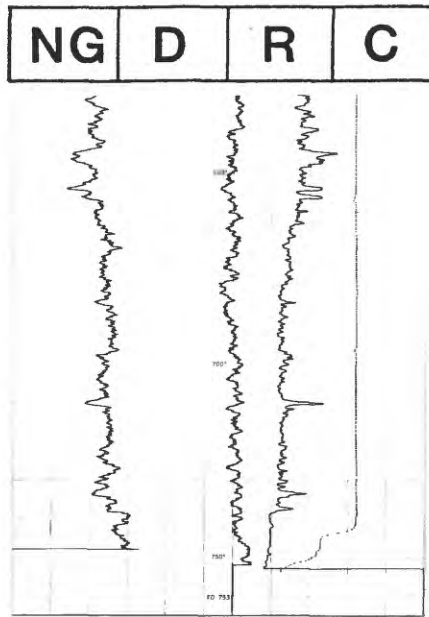
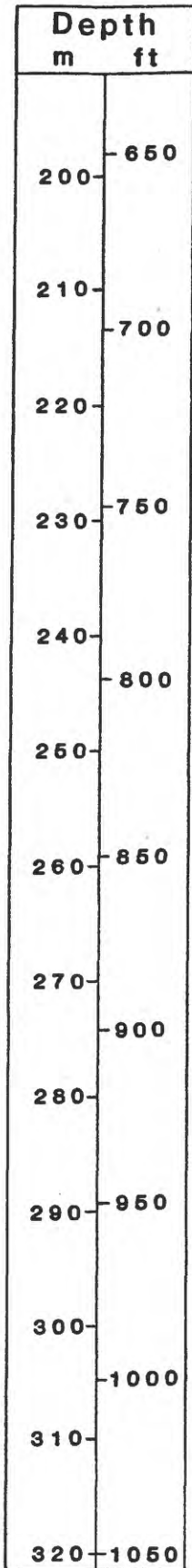
Coal Company.



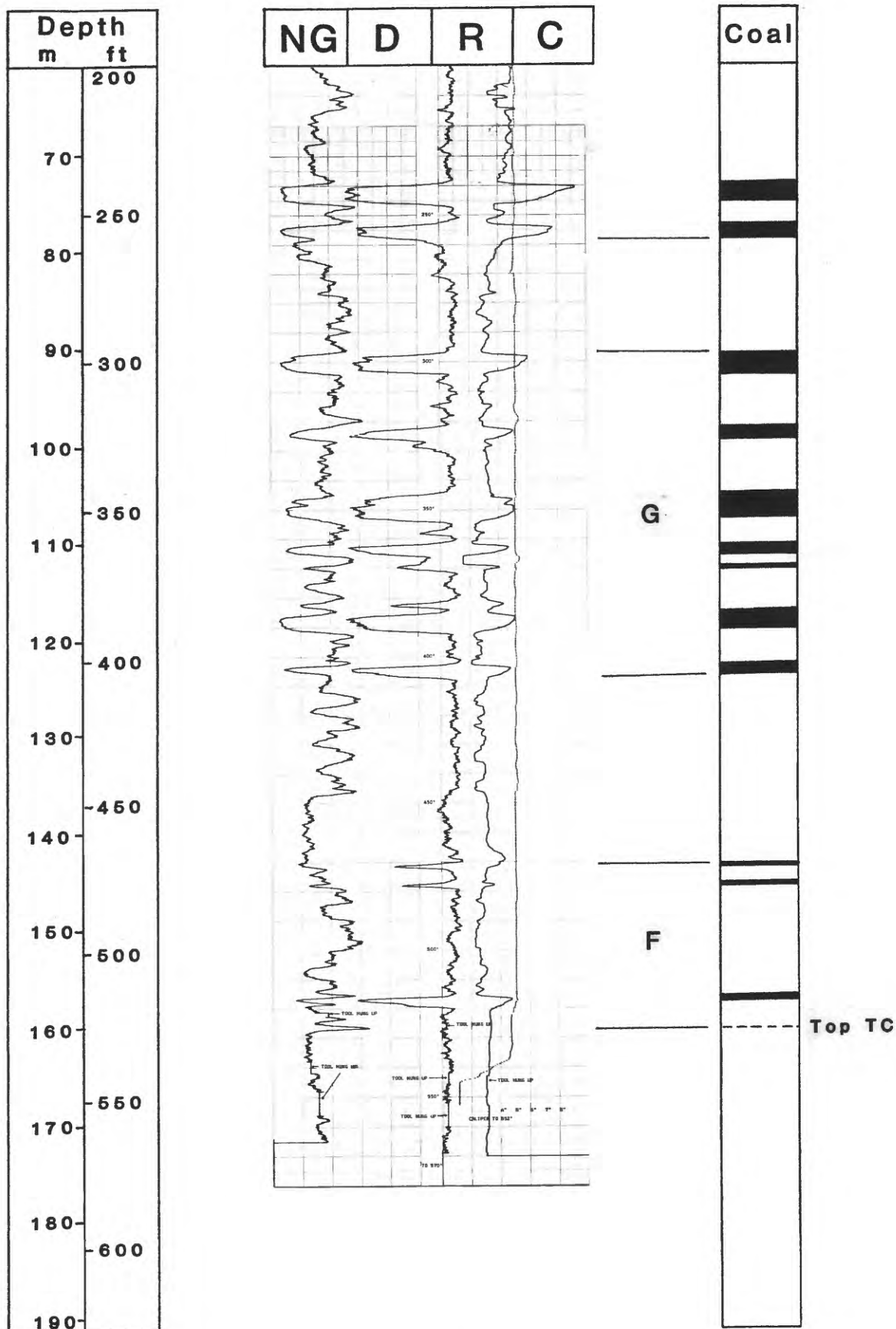




Hole no. HAY-11 (continued)







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

Hole no. HAY G-15a Date logged 9/6/80 Ground elevation 7920 ft

T. 5 N., R. 89 W., Sec. 25 : 200 ft f S. 1, 1800 ft f E. 1

Drilling medium mud Drilled depth 1460 ft Fluid level 291 ft

Logging company 1 Logging speed 18 ft/min. Logged depth 1455 ft

Natural gamma (NG) Scale 25 CPS/log div. T.C. 2

Density (gamma-gamma) (D) Scale 66.6 CPS/log div. T.C. 2

Single point resistance (R) Scale variable

Remarks: <sup>1</sup>Strata Surveys. Names of coal beds and zones modified after the  
nomenclature used by Colowyo Coal Company (above the Twentymile Sandstone) and  
by Bass and others, 1955 (below the Twentymile Sandstone).

