UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOPHYSICAL AND LITHOLOGIC LOGS OF NINE TEST HOLES DRILLED DURING 1980 IN THE COMO WEST, ELMO, AND T. E. RANCH QUADRANGLES, CARBON COUNTY, WYOMING

By

Dan E. Hansen, Frank D. Spencer, and Courteney Williamson

Open-File Report 81-1347
1981

CONTENTS

ILLUSTRATIONS

Table

GEOPHYSICAL AND LITHOLOGIC LOGS OF NINE TEST HOLES DRILLED DURING 1980 IN THE COMO WEST, ELMO, AND T. E. RANCH QUADRANGLES, CARBON COUNTY, WYOMING

by Dan E. Hansen, Frank D. Spencer, and Courteney Williamson

Introduction

During 1980 the U. S. Geological Survey drilled and logged nine test holes in the Hanna coal field, Carbon County, Wyoming as part of the Coal Exploratory Program. The holes were drilled on Federal lands in the Como West, Elmo, and T. E. Ranch quadrangles, T. 23-24N., R. 80-81W (see fig. 1). Data from these holes are summarized in table 1 and more precise drill hole locations are shown by individual maps (figures 2,3,4, and 5). The holes were drilled to confirm the presence of normal faults and to confirm coal bed correlations that were in doubt. This report on 1980 drilling, supplements reports on 1978 and 1979 drilling in the Como West and Elmo quadrangles (see Hansen and Schugg, 1979; Hansen and others, 1980).

Rotary holes were drilled by a U.S. Geological Survey truck-mounted rig using 5 1/8-inch cone bits. Drilling fluids were air and air-water biodegradable foam. The holes were filled with heavy mud upon completion and a surface plug of cement placed therein. Drill sites were then reclaimed.

A general suite of logs consisting of natural gamma ray, gamma gamma (density), and resistivity were run. Two holes that could not be logged were abandoned and offset drilled. One hole (49 CW) collapsed at bottom depths prior to logging and a shortened geophysical log was run. The coal section was logged, however. The geophysical logging contractor was Frontier Logging Corporation, Broomfield, Colorado.

The geophysical logs in this report were photographically reduced to 20 per cent of their original size. The reduced scale is about 1 inch to 50

feet. All measurements on the geophysical logs are in feet, but depth in meters and feet is shown with the logs.

Lithologic logs are based on field examinatin of drill-hole cuttings collected at 5-foot intervals. Lithologic interpretations are adjusted to geophysical logs.

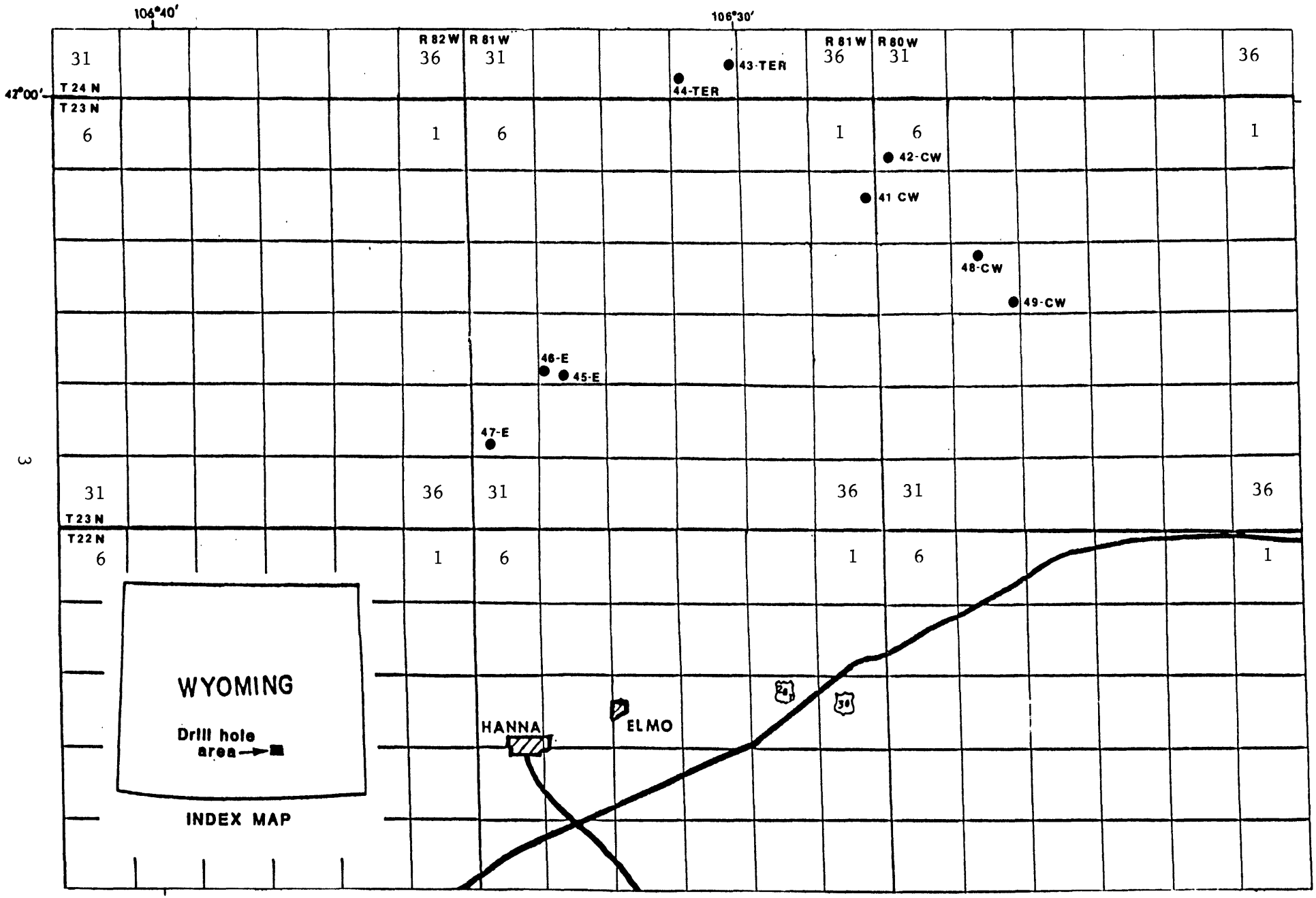


Figure 1.---Index map showing approximate locations of drill holes, Hanna coal field, Wyoming

Table 1.----Summary of information for nine drill holes in the Como West, Elmo, and T. E. Ranch quadrangles, Carbon County, Wyoming.

Drill hole	Location	Quadrangle	Depth drilled (ft)	Depth logged (ft)
41-CW	SE NE NE Sec. 12, T. 23 N., R. 81 W.	Como West	710	710
42-CW-B	NW NW SW Sec. 6, T. 23 N., R. 80 W.	Como West	655	655
43-TER	NE NE SE Sec. 34 T. 24 N., R. 81 W.	T. E. Ranch	825	810
44-TER	NE NW SW Sec. 34 T. 24 N., R. 81 W.	T. E. Ranch	675	675
45-E	SE SE SW Sec. 20, T. 23 N., R. 81 W	Elmo	515	515
46-E	NW SW SW Sec. 20, T. 23 N., R. 81 W.	Elmo	515	515
47-E	NW SE SW Sec. 30 T. 23 N., R. 81 W	Elmo	515	510
48-CW	SE NE NW Sec. 20, T. 23 N., R. 80 W	Como West	415	401
49-CW-B	SE SE SE Sec. 20, T. 23 N., R. 80 W.	Como West	655	535

COMO WEST QUADRANGLE, WYOMING–CARBON CO.

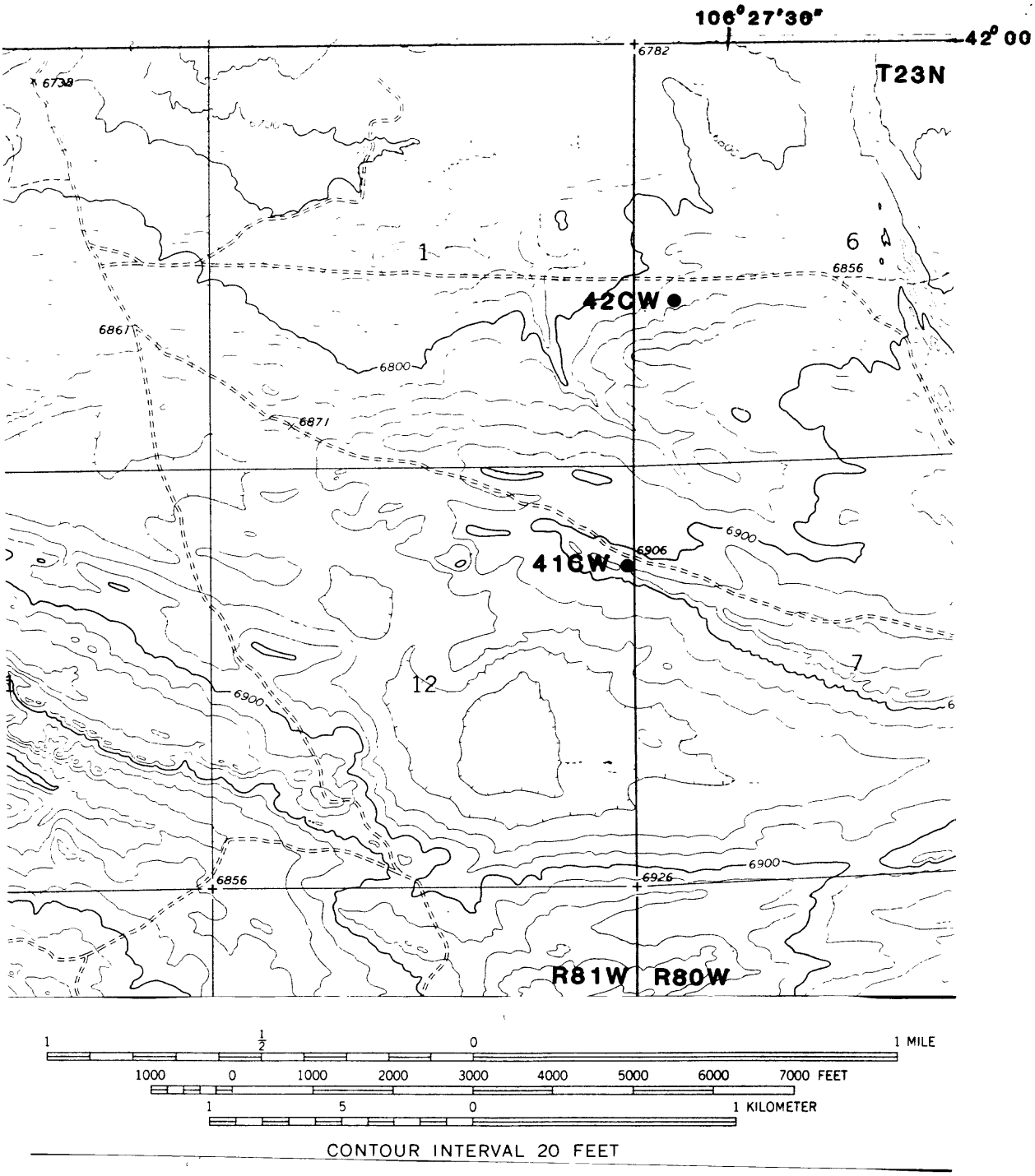


Figure 2.--Drill-hole location map, northeast part of Como West quadrangle, Carbon County, Wyoming.

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 41-CW DATE 7/31/80 SURFACE ELEVATION(ft) 6915

LOCATION SE NE NE Sec. 12 T. 23N R. 81W Quad. Como West

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 710

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

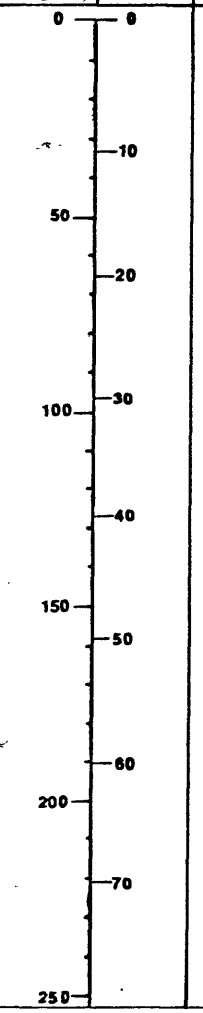
GEOPHYSICAL LOGS:

Natural Gamma	; Scale	20 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	16 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

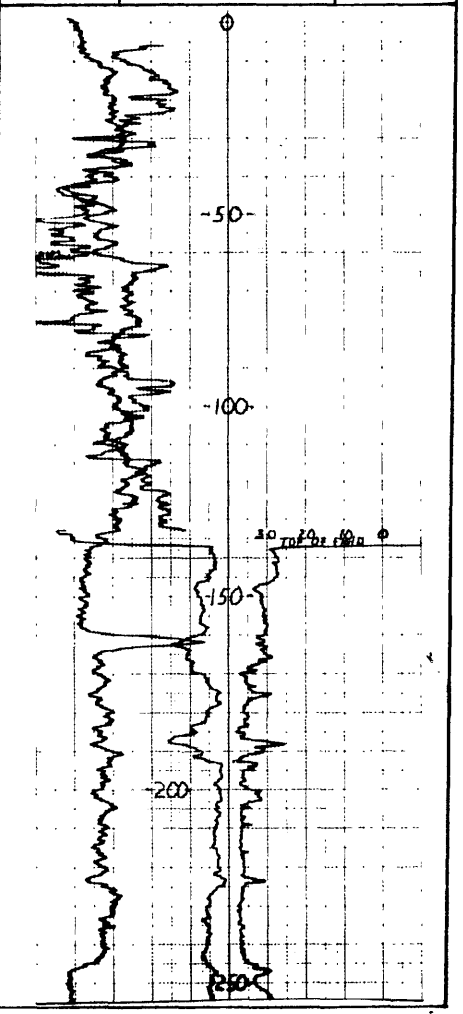
Interval in feet		Lithology
0.0	9.0	Sandstone, very light-gray, fine-grained, calcareous. Black chert fragments. Iron stains
9.0	20.0	Siltstone and claystone, laminated, light yellowish-gray and yellowish-brown
20.0	26.0	Siltstone and claystone, laminated, light greenish-gray
26.0	29.0	Shale, light brownish-gray
29.0	33.0	Shale, black, carbonaceous
33.0	35.0	Coal
35.0	38.0	Shale, black, carbonaceous, some boney coal fragments
38.0	39.0	Coal
39.0	41.5	Shale, black, carbonaceous, coaly
41.5	45.0	Coal
45.0	50.0	Shale, black, carbonaceous, coaly
50.0	52.0	Coal
52.0	54.0	Shale, black, carbonaceous, coaly
54.0	57.0	Coal, shaly
57.0	59.0	Shale, black, carbonaceous, coaly
59.0	61.5	Coal, shaly
61.5	65.0	Claystone, dark-gray
65.0	79.0	Claystone, light- to medium-gray, silty

Strip Log

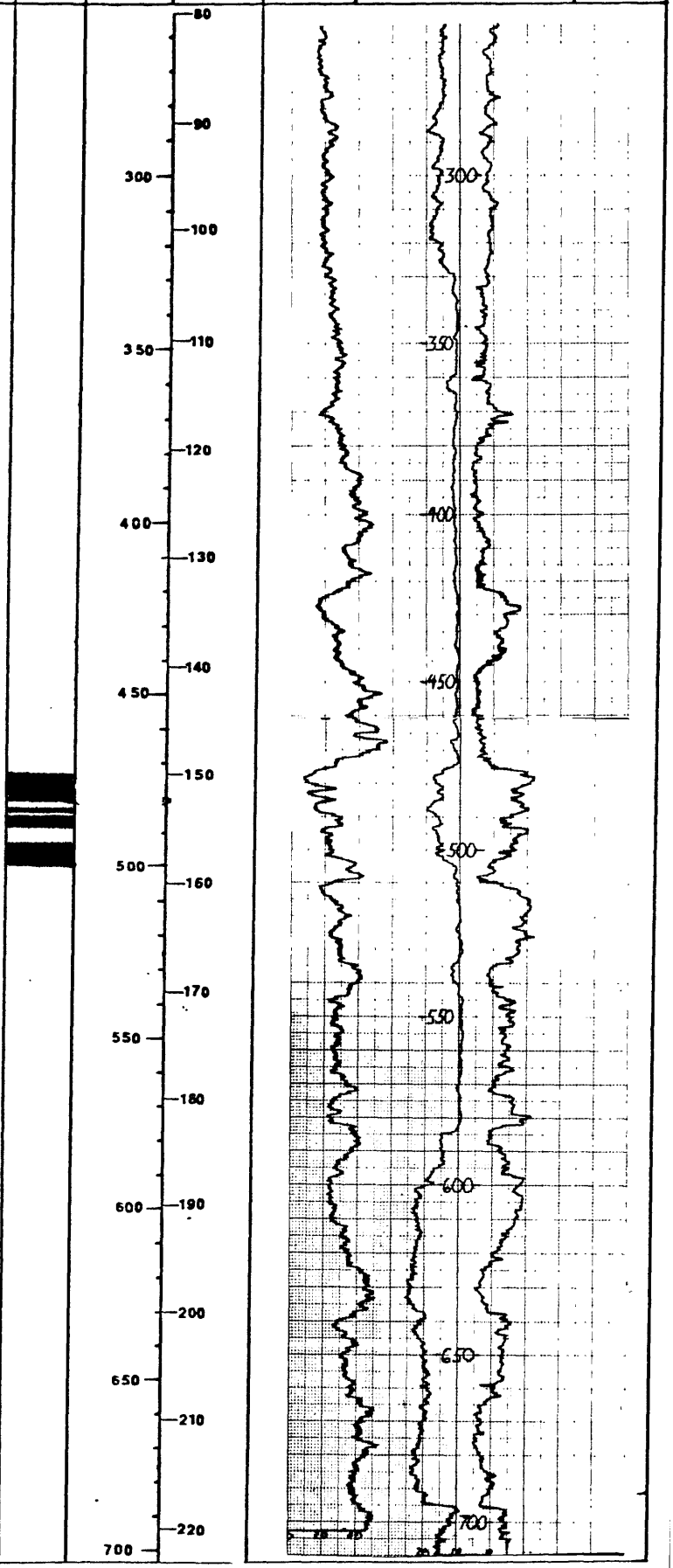
Depth (ft / m)



Geophysical Logs: Gamma | Den | Res



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs: Gamma / Den / Res
79.0	92.0	Siltstone, light-gray, clayey				
92.0	101.0	Siltstone, light-gray, sandy				
101.0	108.0	Claystone, medium-gray				
108.0	110.0	Siltstone, medium-gray				
110.0	119.0	Claystone, medium-gray, silty				
119.0	127.0	Claystone and siltstone, medium-gray				
127.0	133.5	Siltstone, light-gray				
133.5	137.0	Sandstone and siltstone, light gray. Sandstone is light-gray				
137.0	160.0	Sandstone, light-gray, fine-grained, silty				
160.0	163.0	Coal, shaly and shale, dark brown, carbonaceous				
163.0	179.0	Siltstone, medium-gray, shaly				
179.0	183.0	Shale, dark-gray, carbonaceous laminations				
183.0	186.0	Shale, black, carbonaceous				
186.0	189.0	Coal, shaly				
189.0	194.0	Claystone, medium-gray, silty				
194.0	225.0	Siltstone, medium-gray, clayey and sandy				
225.0	233.0	Claystone, medium-gray, silty				
233.0	246.0	Siltstone, medium-gray, clayey				
246.0	248.0	Sandstone, light-gray, fine-grained, calcareous				
248.0	270.0	Sandstone, light- to medium-gray, fine- to medium-grained. Clay and coal fragments				
270.0	284.5	Sandstone, light- to medium-gray, medium- to coarse-grained, some pyrite				
284.5	288.0	Sandstone, light- to medium-gray, some laminations of gray and dark brown shale, carbonaceous				
288.0	330.0	Sandstone, light gray, medium- to coarse-grained. Some laminations of medium gray siltstone and shale				
330.0	349.0	Sandstone, medium-gray, fine-grained, silty				
349.0	368.0	Siltstone, medium-gray, very sandy				
368.0	371.0	Sandstone, light gray, fine-grained, calcareous				
371.0	375.0	Sandstone, light gray, fine-grained, grades downward into siltstone				
375.0	387.0	Siltstone, medium gray				
387.0	409.0	Shale, medium- to dark-brown. A few laminations of black, carbonaceous shale				



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
409.0	416.0	Siltstone, medium gray						
416.0-	419.0	Shale, dark gray, silty						
419.0	423.0	Siltstone, medium gray, sandy						
423.0	434.0	Sandstone, light-gray, fine- to medium-grained						
434.0	446.0	Siltstone, medium-gray, very sandy						
446.0	449.0	Shale, medium gray, silty						
449.0	475.0	Shale, dark brown and black, carbonaceous, partly coaly						
475.0	481.0	Coal						
481.0	482.0	Shale, black, carbonaceous						
482.0	484.0	Coal						
484.0	485.5	Shale, black, carbonaceous						
485.5	489.0	Coal						
489.0	493.0	Shale, dark brown, carbonaceous						
493.0	495.0	Coal						
495.0	502.5	Coal and shale, interbedded. Shale is black, carbonaceous						
502.5	509.0	Shale, black, carbonaceous, traces of coal						
509.0	516.0	Sandstone, light-gray, fine-grained; pyrite						
516.0	523.0	Siltstone, medium gray, sandy and clayey						
523.0	527.0	Sandstone, light-gray, fine-grained, silty						
527.0	534.0	Siltstone, medium-gray						
534.0	540.0	Shale, dark brown, carbonaceous						
540.0	544.0	Shale, dark gray, silty						
544.0	546.0	Sandstone, light-gray, fine-grained, calcareous						
546.0	567.0	Siltstone, medium gray, very sandy						
567.0	570.5	Siltstone, medium gray						
570.5	572.5	Shale, gray						
572.5	578.0	Sandstone and siltstone, medium-gray. Sandstone is very fine-grained						
578.0	579.0	Siltstone, medium gray						
579.0	582.0	Sandstone, light gray, fine-grained, silty						
582.0	592.5	Shale, dark gray, silty, sandy						
592.5	598.0	Siltstone, dark gray, sandy						
598.0	612.0	Sandstone, light gray, very fine-grained, calcareous, silty						
612.0	624.0	Siltstone, dark gray						
624.0	637.0	Shale, dark gray, carbonaceous						

Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
637.0	639.0	Siltstone, light- to medium-gray, sandy						
639.0	645.0	Sandstone, light gray, fine-grained						
645.0	649.0	Siltstone, light- to medium-gray						
649.0	658.0	Sandstone, light-gray, fine-grained, silty						
658.0	663.0	Siltstone, medium-gray, sandy						
663.0	666.0	Siltstone, medium gray						
666.0	669.0	Shale, medium gray						
669.0	676.0	Siltstone, medium gray						
676.0	678.0	Shale, light gray						
678.0	681.0	Shale, light gray and dark gray, carbonaceous						
681.0	695.0	Siltstone, medium and dark gray. Laminations and thin beds of dark gray carbonaceous shale and coal						
695.0	697.0	Siltstone, dark gray, sandy						
697.0	710.0	Shale, light-greenish-gray, silty, slight carbonaceous						

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 42-CW DATE 8/2/80 SURFACE ELEVATION(ft) 6835

LOCATION NW NW SW Sec. 6 T. 23N R. 80W Quad. Como West

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 655

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

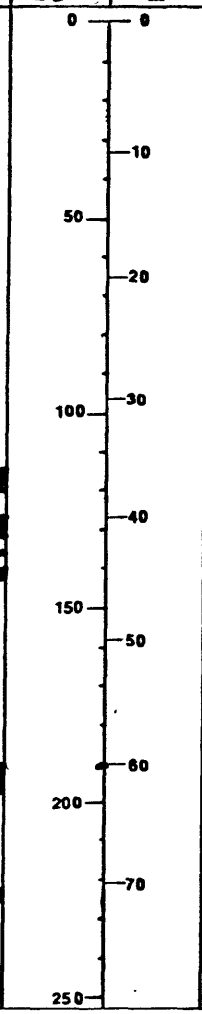
GEOPHYSICAL LOGS:

Natural Gamma	; Scale	20 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	16 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

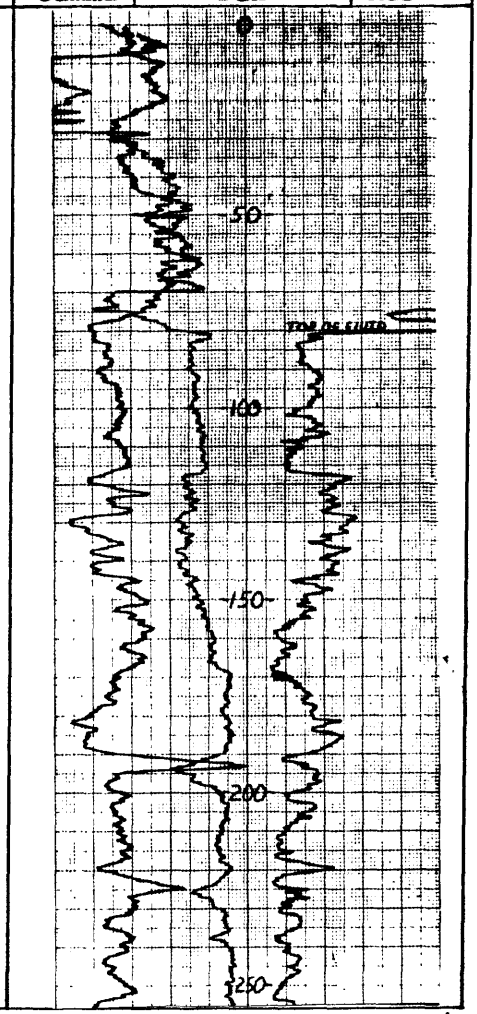
Interval in feet		Lithology
0.0	10.0	Shale, olive-gray, shell fragments
10.0	20.0	Shale, light-brown, shell fragments
20.0	25.0	Siltstone, medium-brown, gypsiferous
25.0	27.0	Sandstone and siltstone, medium-gray, very-fine-grained, calcareous
27.0	31.0	Sandstone, light-gray, very-fine-grained, silty, calcareous
31.0	45.0	Siltstone, medium-gray
45.0	50.0	Shale, dark greenish-brown, carbonaceous. Shell fragments, gypsiferous
50.0	53.0	Shale, light-gray. Streaks of very fine-grained sandstone, light-gray, calcareous
53.0	60.0	Shale, light-gray, shell fragments
60.0	62.0	Shale, light olive-gray
62.0	67.0	Shale, medium brownish-gray, carbonaceous, silty, gypsiferous
67.0	70.0	Shale, light brownish-gray
70.0	78.0	Shale, light-greenish-gray. Laminations of light gray, very fine grained, calcareous sandstone

Strip Log

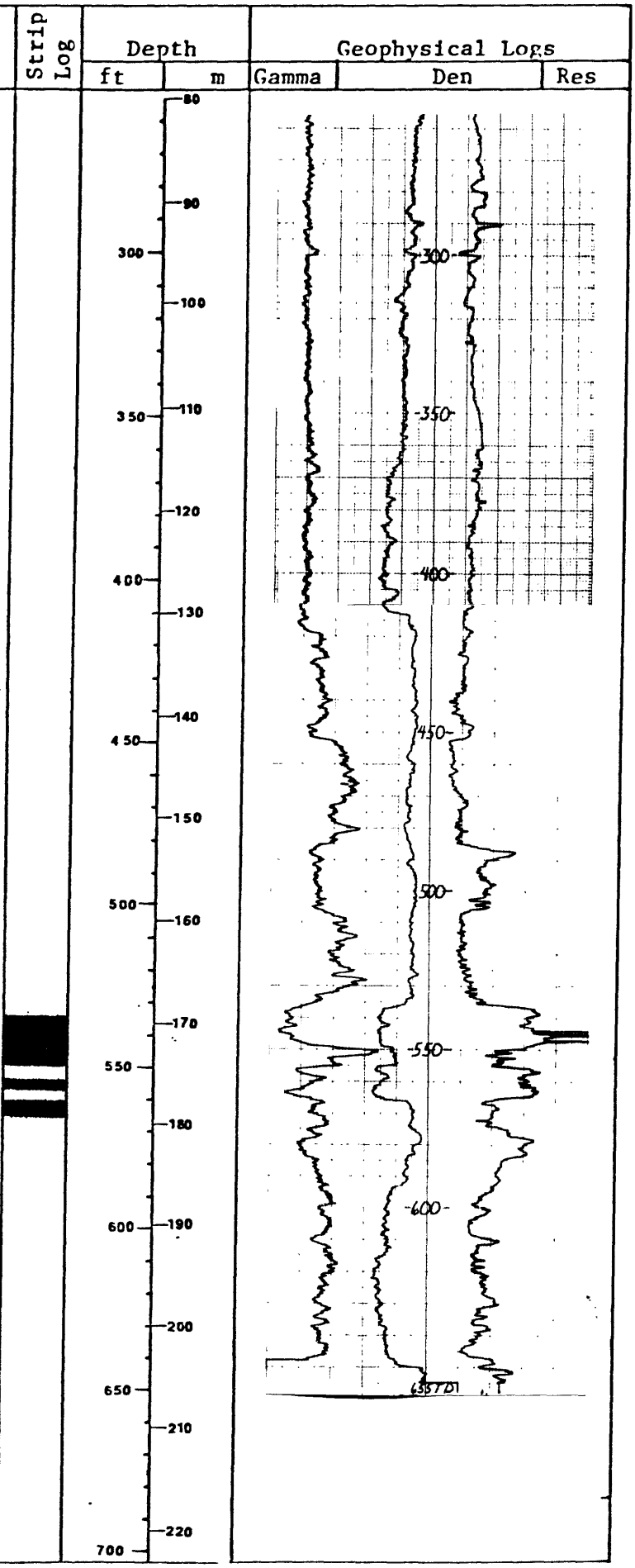
Depth



Geophysical Logs



		Lithology
78.0	83.0	Sandstone, light-gray, very fine-grained
83.0	89.0	Siltstone, light-gray, sandy
89.0	93.5	Sandstone, light-gray, very fine-grained, silty
93.5	100.0	Siltstone, medium-gray
100.0	102.0	Shale, medium-gray, silty
102.0	110.5	Siltstone, medium-gray, sandy
110.5	117.0	Shale, dark brown, carbonaceous
117.0	121.0	Coal
121.0	128.0	Shale, black, carbonaceous, coaly
128.0	133.0	Coal
133.0	137.0	Shale, black, carbonaceous, coaly
137.0	138.5	Coal, shaly
138.5	140.0	Shale, black, carbonaceous, coaly
140.0	144.0	Coal, shaly
144.0	168.5	Shale, black, carbonaceous, coaly
168.5	177.0	Siltstone, light-gray, sandy
177.0	191.0	Sandstone, light-gray, very fine-grained
191.0	198.0	Coal
198.0	202.5	Shale, dark brown, carbonaceous
202.5	207.0	Siltstone, light-gray, sandy
207.0	213.5	Siltstone, light-gray
213.5	218.0	Shale, dark-gray, carbonaceous; trace of coal fragments
218.0	221.0	Sandstone, light-gray, very fine-grained, cross bedded; coal and shale fragments
221.0	224.0	Shale, dark-brown, carbonaceous
224.0	227.0	Coal, shaly
227.0	232.0	Shale, dark-brown, carbonaceous, partly coaly
232.0	236.0	Sandstone and siltstone, light gray. Sandstone is very fine-grained
236.0	242.0	Siltstone, light-gray, clayey
242.0	247.0	Sandstone and siltstone, light-gray, very fine-grained
247.0	254.0	Siltstone, light-gray, clayey
254.0	255.0	Sandstone, light-gray, very fine-grained, silty, cross bedded, some pyrite
255.0	276.0	Sandstone, light-gray, fine- to coarse-grained, pyritic



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
276.0	280.0	Sandstone, conglomeratic, medium-gray. Interbeds of siltstone with coal fragments						
280.0	285.0	Sandstone, white, fine- to medium-grained. Black chert grains						
285.0	316.0	Sandstone, white, medium- to coarse-grained						
316.0	419.0	Sandstone, very light-gray, medium- to coarse-grained. Well sorted from 360 to 419.0						
419.0	448.0	Siltstone, medium-gray, sandy						
448.0	452.5	Sandstone, medium-gray, very fine-grained, silty						
452.5	485.0	Shale, dark-brown, carbonaceous						
485.0	489.0	Sandstone, light brownish-gray, very fine-grained, calcareous						
489.0	507.0	Siltstone, medium-gray, sandy						
507.0	536.0	Shale, dark-brown, carbonaceous						
536.0	544.0	Coal, bright and some dull						
544.0	550.0	Coal, bright						
550.0	555.0	Shale, black, carbonaceous, coaly						
555.0	558.5	Coal, bright						
558.5	561.5	Shale, black, carbonaceous, coaly						
561.5	566.0	Coal, bright						
566.0	574.0	Shale, black, carbonaceous						
574.0	584.0	Sandstone, light- to medium-gray, fine-grained, silty						
584.0	593.0	Siltstone, medium-gray, sandy						
593.0	605.0	Siltstone, medium-gray. Some interbeds of gray, very fine-grained, calcareous sandstone						
605.0	650.0	Siltstone, medium-gray. Some very thin interbeds of gray, very fine-grained sandstone						
650.0	655.0	Sandstone, medium gray, very fine-grained, partly silty						

COMO WEST QUADRANGLE, WYOMING--CARBON CO.

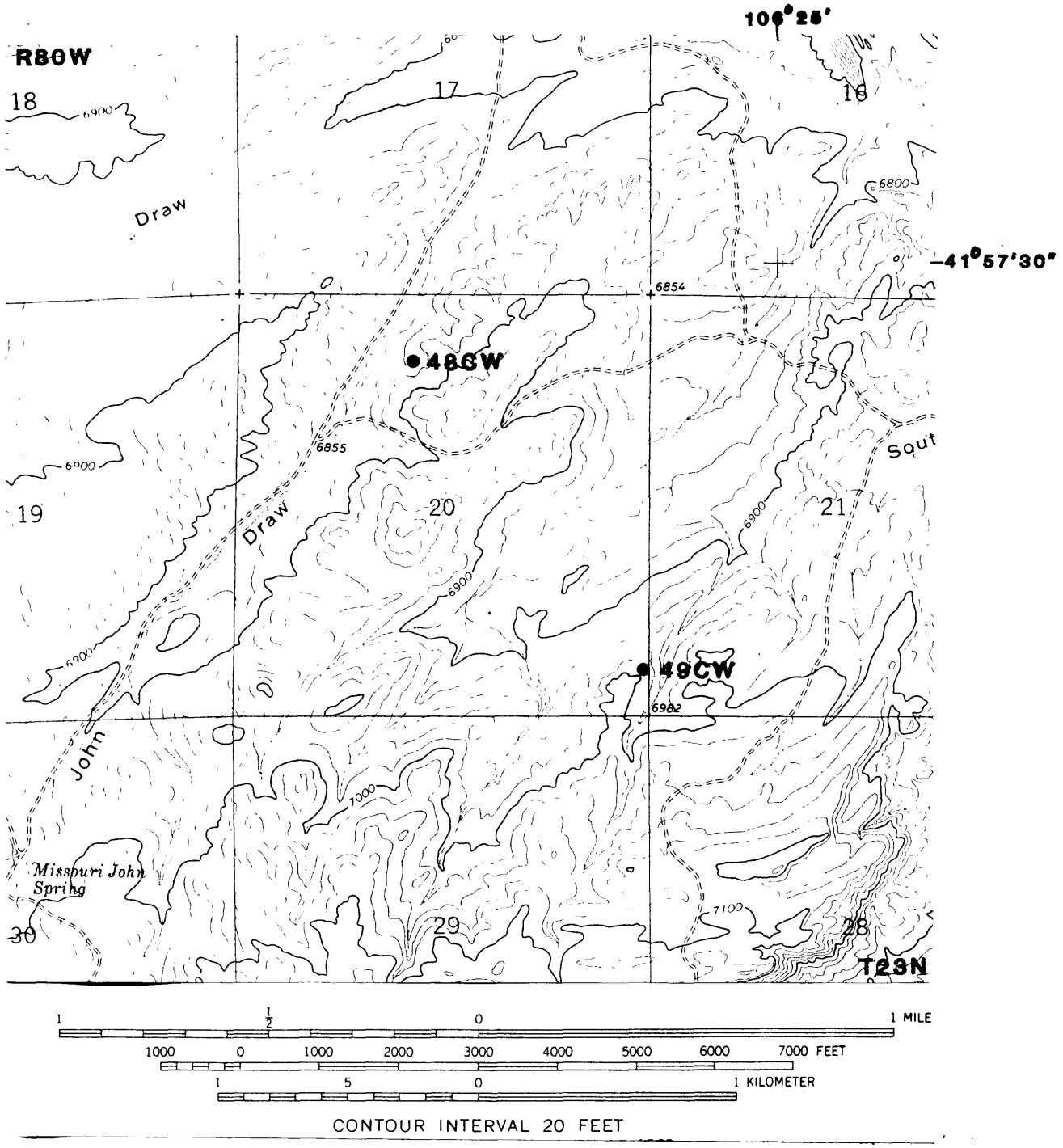


Figure 3.-- Drill-hole location map, southeast part of T.E. Ranch quadrangle, Carbon County, Wyoming.

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 43-TER DATE 8/3/80 SURFACE ELEVATION(ft) 6550

LOCATION NE NE SE Sec. 34 T. 24N R. 81W Quad. T E Ranch

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 825

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

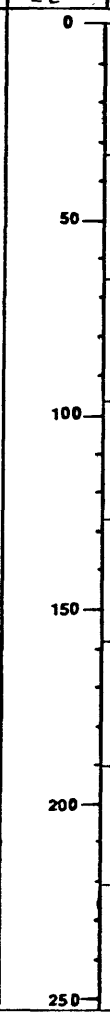
GEOPHYSICAL LOGS:

Natural Gamma	;	Scale 50 cps/in	Logging Speed 15	fpm
Gamma Gamma	;	Scale 10 cps/in	Logging Speed 15	fpm
Resistivity	;	Scale 16 cps/in	Logging Speed 15	fpm
Caliper	;	Scale _____	Logging Speed _____	fpm

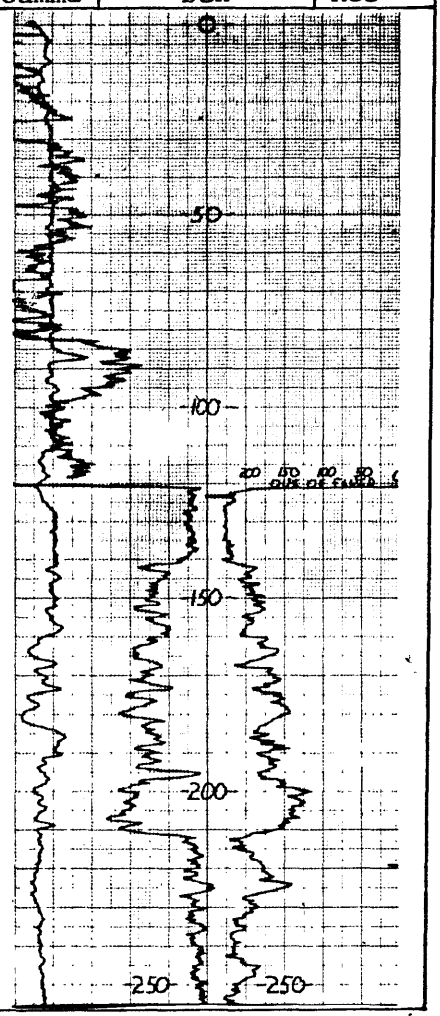
Interval in feet		Lithology
0.0	10.0	Surface sandstone and claystone, brown. Sandstone is fine-grained
10.0	20.3	Sandstone, light-brown, fine-grained
20.3	31.0	Shale, gray, silty, oxidized to brownish-gray
31.0	44.0	Claystone, medium-gray, silty; claystone oxidized to brown
44.0	48.0	Claystone, medium-dark gray, carbonaceous; claystone oxidized to dark-brown
48.0	53.5	Claystone, olive gray, silty
53.5	95.0	Claystone, medium-gray, silty
95.0	98.3	Shale, dark-gray and black, carbonaceous, clayey
98.3	106.0	Shale, medium-dark-gray
106.0	111.0	Siltstone and shale, medium-dark-gray
111.0	125.5	Sandstone, gray, fine-grained
125.5	127.5	Shale and siltstone, medium-dark-gray
127.5	142.0	Shale, dark-gray
142.0	160.0	Shale and coal, interbedded. Shale is dark-gray and black, carbonaceous
160.0	166.0	Coal
166.0	168.0	Shale, dark-gray
168.0	173.0	Coal, shaly
173.0	174.0	Shale, dark-gray

Strip Log

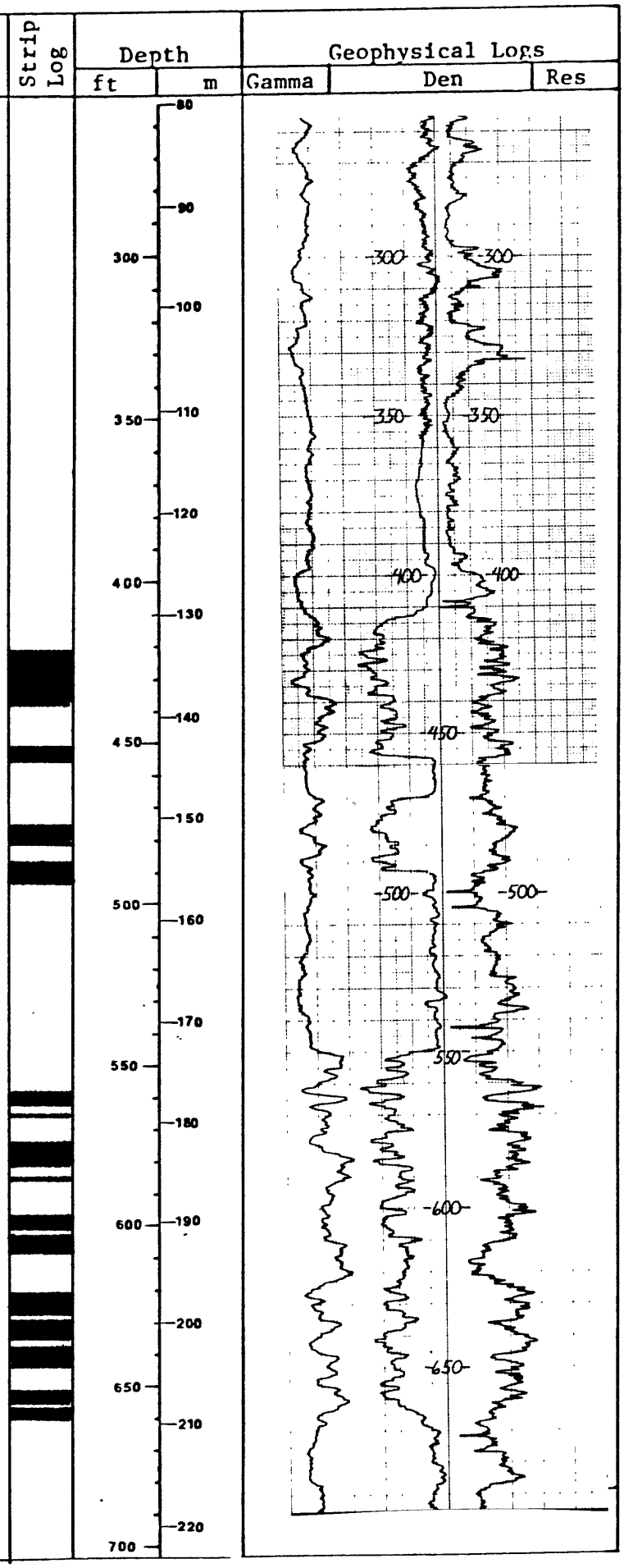
Depth (ft / m)



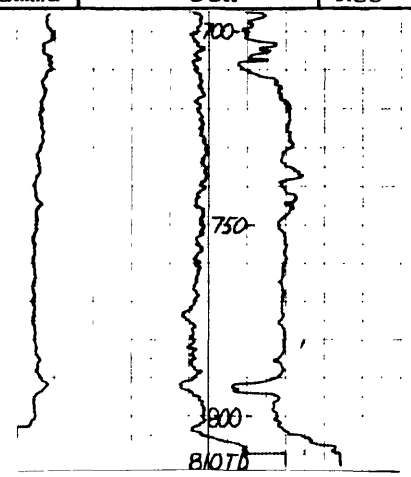
Geophysical Logs: Gamma | Den | Res



		Lithology
174.0	177.0	Coal
177.0	179.0	Shale, black, carbonaceous
179.0	183.0	Coal
183.0	197.0	Shale and coal, interbedded. Shale is black, carbonaceous
197.0	211.0	Coal
211.0	221.0	Sandstone, gray, fine-grained, silty
221.0	228.0	Sandstone, light-gray, fine-grained, calcareous (hard)
228.0	240.0	Siltstone, medium-gray, sandy
240.0	249.0	Sandstone, light-gray, very fine-grained
249.0	262.0	Siltstone, medium-gray, sandy
262.0	270.0	Sandstone, light- to medium-gray, silty
270.0	275.0	Siltstone, medium-dark-gray, shaly
275.0	277.0	Shale, medium-dark-gray
277.0	282.5	Siltstone, medium-dark-gray
282.5	285.0	Shale, medium-dark-gray, silty
285.0	297.0	Siltstone, medium-dark-gray, shaly
297.0	301.0	Sandstone, light-gray, fine-grained
301.0	308.0	Sandstone, light-gray, fine- to medium-grained
308.0	311.0	Siltstone, medium-gray
311.0	313.5	Shale, medium-gray
313.5	321.0	Siltstone, medium-gray
321.0	327.0	Sandstone, light-gray, silty and shaly
327.0	334.0	Sandstone, light-gray fine-grained
334.0	344.0	Siltstone, medium-to medium dark-gray
344.0	398.0	Shale and siltstone, dark gray
398.0	413.0	Sandstone, medium-gray, fine-grained
413.0	422.0	Shale, black, carbonaceous, coal bands and lenses
422.0	432.0	Coal, shaly
432.0	435.0	Coal
435.0	438.0	Coal, shaly
438.0	452.0	Shale, black, carbonaceous, coaly
452.0	457.0	Coal
457.0	470.0	Siltstone, medium dark-gray, sandy
470.0	477.0	Shale, black, carbonaceous, coaly
477.0	481.0	Coal
481.0	488.0	Shale, black, carbonaceous
488.0	493.0	Coal



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs: Gamma / Den / Res
493.0	519.0	Siltstone and sandstone, medium-gray. Sandstone is very fine-grained				
519.0	538.0	Sandstone, light- to medium-gray, very fine-grained, very silty				
538.0	550.0	Siltstone, medium-gray, sandy				
550.0	559.0	Shale, black, carbonaceous				
559.0	563.0	Coal				
563.0	566.0	Shale, black, carbonaceous				
566.0	568.0	Coal				
568.0	575.0	Shale, black, carbonaceous				
575.0	579.0	Coal				
579.0	581.5	Coal, shaly				
581.5	584.0	Shale, black, carbonaceous				
584.0	586.0	Coal, shaly				
586.0	599.0	Shale, black, carbonaceous, coaly				
599.0	602.0	Coal, shaly				
602.0	603.0	Shale, black, carbonaceous				
603.0	609.0	Coal, shaly				
609.0	621.0	Shale, black, carbonaceous				
621.0	628.0	Coal				
628.0	629.5	Shale, black, carbonaceous				
629.5	635.0	Coal, shaly				
635.0	638.5	Shale, black, carbonaceous				
638.5	645.5	Coal				
645.5	653.0	Shale, black, carbonaceous, coaly				
653.0	656.0	Coal				
656.0	657.0	Shale, black, carbonaceous				
657.0	660.0	Coal, shaly				
660.0	663.0	Shale, black, carbonaceous				
663.0	675.0	Siltstone, dark-gray, sandy				
675.0	687.0	Sandstone, light- to medium-gray, fine-grained, silty				
687.0	710.0	Siltstone, medium-gray, shaly and sandy				
710.0	730.0	Sandstone, light-gray, fine-grained, silty, calcareous, hard				
730.0	753.0	Sandstone, light-gray, coarse-grained, loose grains				
753.0	791.0	Sandstone, light-gray, fine- to medium-grained, loose grains				
791.0	794.0	Claystone, medium-gray				
794.0	825.0	Sandstone, light-gray, fine- to coarse-grained, chiefly fine to medium-grained				



LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 44-TER DATE 8/13/80 SURFACE ELEVATION(ft) 6543

LOCATION NE NW SW Sec. 34 T. 24N R. 81W Quad. T E Ranch

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 675

CORED YES [ ] NO [X] INTERVAL(s) _____

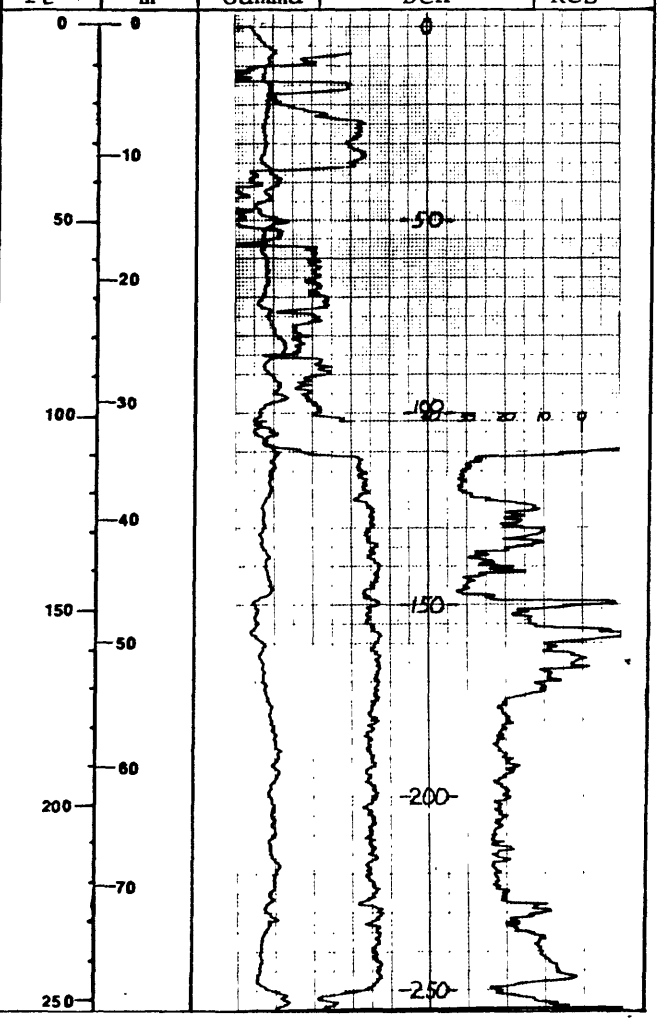
DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

GEOPHYSICAL LOGS:

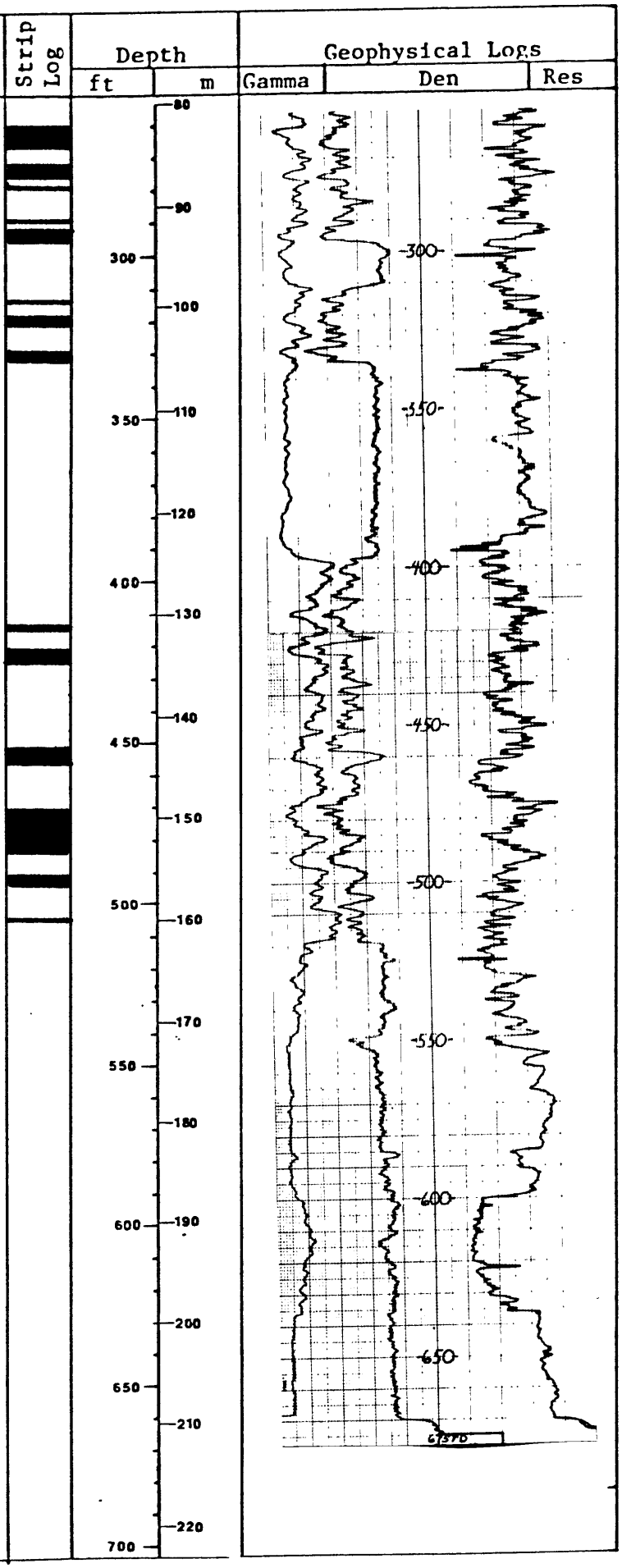
Natural Gamma	; Scale	50 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	15 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

Interval in feet		Lithology
0.0	15.0	Sandstone, brown, fine-grained
15.0	24.0	Sandstone, light-brown, fine- to medium-grained
24.0	36.0	Sandstone and claystone, brown and reddish-brown. Sandstone is fine-grained
36.0	41.0	Shale, black and brownish-black, carbonaceous
41.0	43.0	Coal
43.0	44.5	Shale, black, carbonaceous
44.5	49.0	Coal
49.0	51.5	Shale, medium-gray
51.5	73.0	Sandstone and siltstone, light-gray to medium-gray. Sandstone is fine-grained.
73.0	79.5	Siltstone, medium-gray, sandy
79.5	86.0	Shale, olive gray
86.0	90.5	Siltstone, medium-gray, sandy
90.5	97.0	Shale, olive gray, silty
97.0	108.5	Sandstone, light-gray, fine-grained, silty
108.5	114.5	Shale, medium-gray, silty and clayey
114.5	115.5	Shale, dark-gray
115.5	122.0	Shale-[illegible]stone, medium-gray, silty
122.0	135.5	Siltstone, medium- to medium-dark-gray, sandy
135.5	148.0	Siltstone, medium- to medium-dark-gray, clayey

Strip Log



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs: Gamma / Den / Res
148.0	159.0	Sandstone, light-gray, fine-grained calcareous (hard)				
159.0	167.0	Sandstone, light-gray, fine-grained, silty				
167.0	174.0	Siltstone, medium-gray, sandy				
174.0	196.0	Shale, olive-gray and medium dark-gray, silty				
196.0	228.0	Shale, olive-gray and dark-gray, carbonaceous				
228.0	232.0	Shale, dark-gray, carbonaceous				
232.0	251.0	Sandstone, light- to medium-gray, fine-grained, silty				
251.0	260.0	Shale, dark-gray and black, carbonaceous				
260.0	267.0	Coal, shaly				
267.0	273.5	Shale, black, carbonaceous				
273.5	277.0	Coal				
277.0	279.0	Shale, dark-gray and black, carbonaceous				
279.0	280.0	Coal				
280.0	289.0	Shale, black and dark-gray, carbonaceous				
289.0	290.0	Coal				
290.0	292.0	Shale, black, carbonaceous				
292.0	296.0	Coal				
296.0	311.0	Sandstone and siltstone, medium-gray. Sandstone is fine-grained				
311.0	314.5	Shale, black, carbonaceous				
314.5	315.5	Coal				
315.5	319.0	Shale, black, carbonaceous				
319.0	322.0	Coal				
322.0	330.0	Shale, black, carbonaceous, coaly				
330.0	333.0	Coal				
333.0	335.0	Shale, dark gray,carbonaceous				
335.0	370.0	Sandstone, light-gray, fine-grained; siltstone, medium-gray				
370.0	397.0	Sandstone, light-gray, fine- to medium-grained, partly silty				
397.0	413.0	Shale, black, carbonaceous, coaly				
413.0	415.0	Coal				
415.0	423.0	Shale, black, carbonaceous, coaly				
423.0	427.0	Coal				
427.0	453.0	Shale, black, carbonaceous, coaly				
453.0	458.0	Coal				
458.0	462.0	Siltstone, medium- to medium dark-gray, sandy				
462.0	472.0	Shale, black, carbonaceous				
472.0	485.0	Coal, shaly				



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
485.0	491.0	Shale, dark-gray						
491.0	495.0	Coal						
495.0	507.0	shale, black, carbonaceous, coaly						
507.0	508.0	Coal						
508.0	518.0	Shale-claystone, medium-gray						
518.0	529.0	Sandstone and claystone, silty. Sandstone is light gray, fine grained, calcareous (hard). Claystone is medium gray						
529.0	549.0	Sandstone, light-gray, fine-grained, calcareous (hard), very silty						
549.0	552.0	Claystone, dark-gray, sandy						
552.0	566.0	Sandstone, light-gray, fine-grained, loose grains						
566.0	580.0	Sandstone, light-gray, fine-to medium-grained, loose grains						
580.0	585.0	Sandstone, light-gray, fine-to coarse grained, loose grains						
585.0	590.0	Sandstone, light-gray, fine-grained. loose grains						
590.0	600.0	Sandstone, fine- to coarse-grained, loose grains						
600.0	630.0	Siltstone and claystone, medium-gray, sandy						
630.0	636.0	Siltstone and sandstone. Siltstone is medium-dark-gray, shaly. Sandstone is light-gray, fine-grained, calcareous (hard)						
636.0	651.0	Sandstone, gray, fine- to medium-grained						
651.0	675.0	Sandstone, light-gray, fine-to coarse-grained (chiefly coarse- grained)						

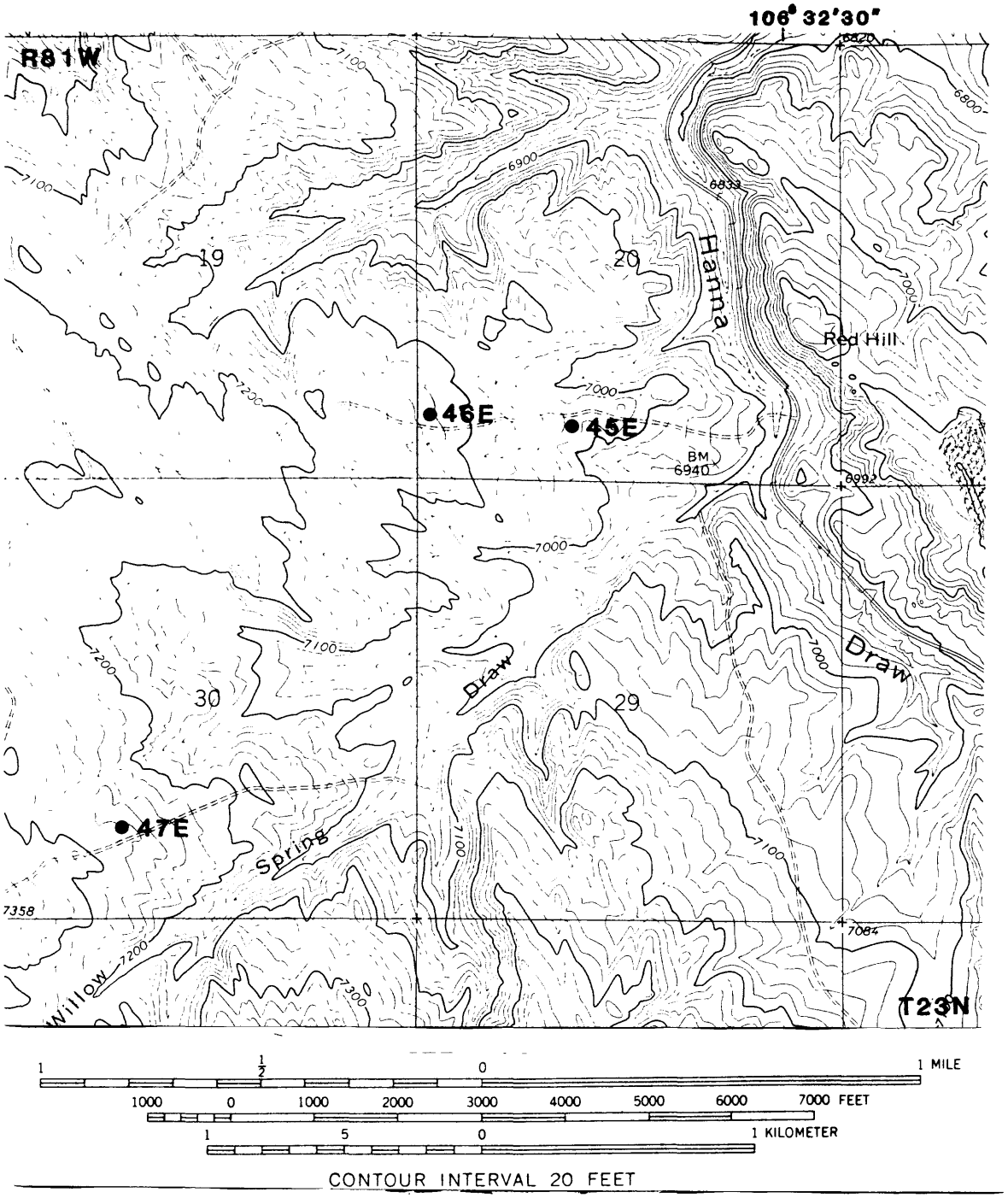


Figure 4.--Drill-hole location map, central part of Elmo quadrangle, Carbon County, Wyoming.

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 45-E DATE 8/4/80 SURFACE ELEVATION(ft) 7037

LOCATION NE SE SW Sec. 20 T.23N R. 81W Quad. Elmo

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 515

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

GEOPHYSICAL LOGS:

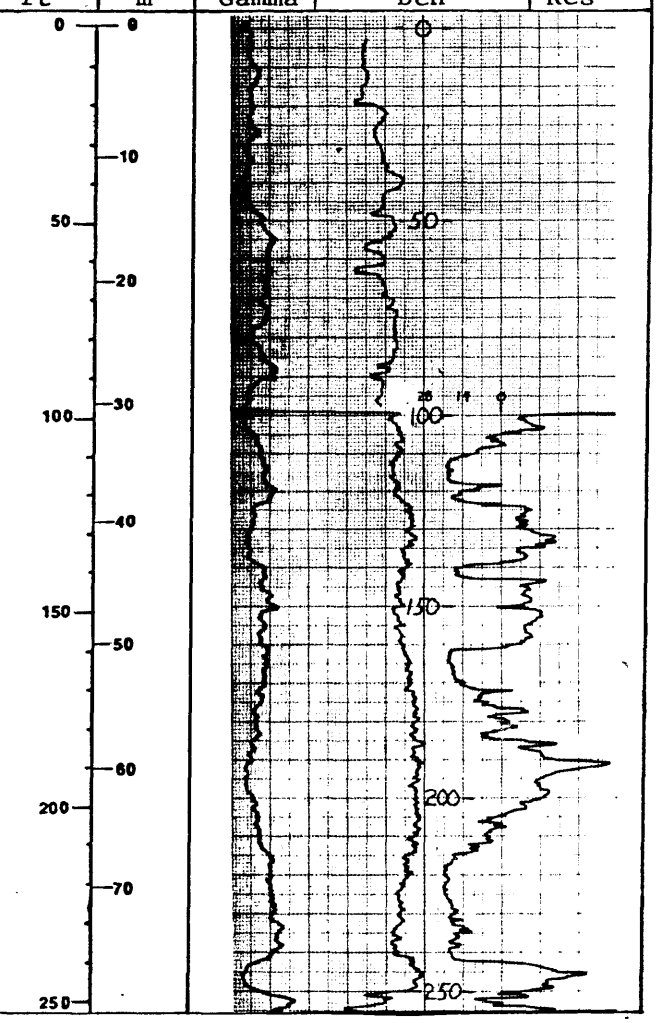
Natural Gamma	; Scale	50 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	15 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

Interval in feet		Lithology
0.0	10.0	Sandstone, light-brown, fine- to medium-grained
10.0	14.5	Sandstone and shale, interbedded, light-brownish-gray, brown, and olive-gray. Sandstone is fine- to medium-grained.
14.5	37.0	Sandstone, light-yellowish-brown, fine- to coarse-grained
37.0	42.0	Sandstone, light-gray, fine- to medium-grained, calcareous
42.0	49.0	Sandstone, light-brown, fine- to very coarse-grained
49.0	54.0	Sandstone, light-gray, fine-grained, silty
54.0	58.0	Shale, dark-gray and black, carbonaceous, traces of coal
58.0	62.0	Siltstone, medium-dark-gray
62.0	64.0	Shale, dark gray, silty
64.0	77.0	Siltstone, medium-gray, sandy
77.0	82.0	Sandstone, light-gray, fine-grained
82.0	86.0	Siltstone, medium-gray, sandy
86.0	90.5	Claystone, medium-dark-gray, silty
90.5	105.0	Sandstone, gray, fine-grained
105.0	111.0	Siltstone, medium-dark-gray
111.0	123.0	Shale, dark-gray, carbonaceous, clayey

Strip Log

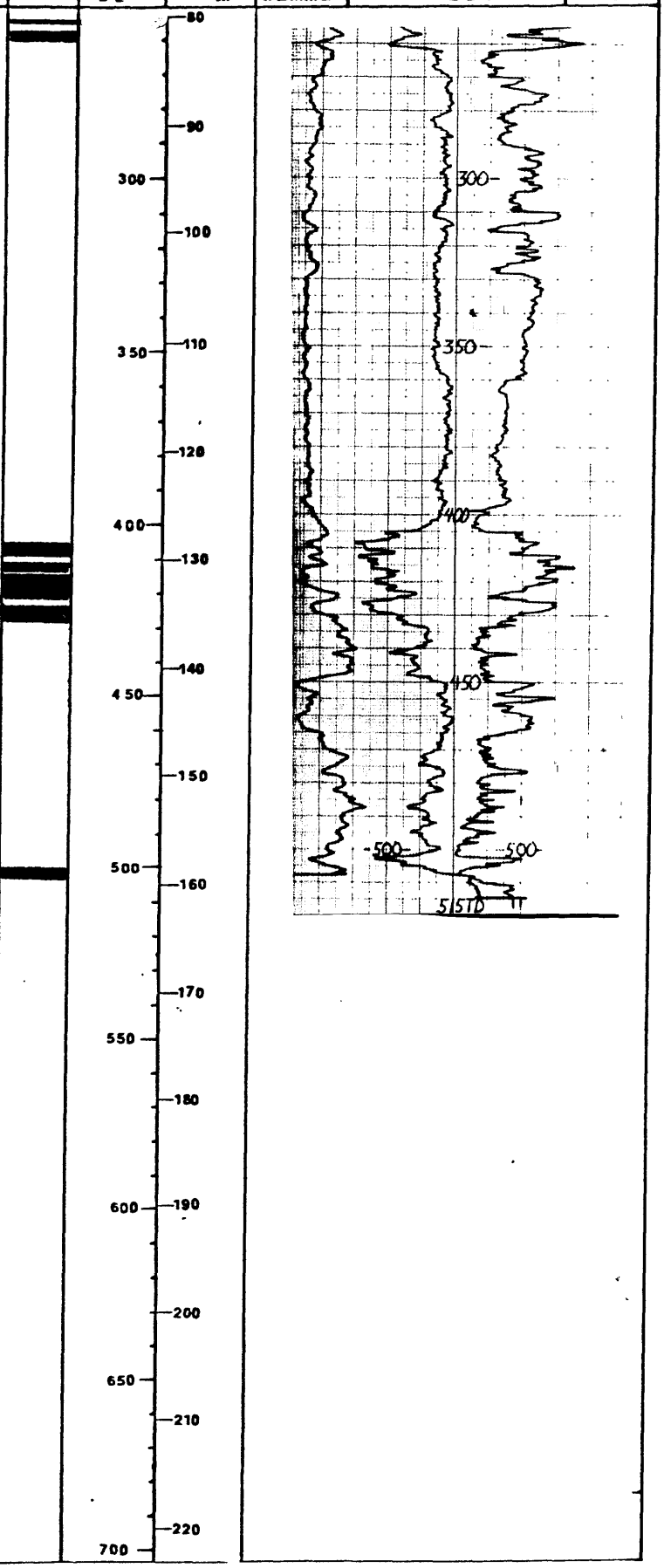
Depth (ft / m)

Geophysical Logs: Gamma | Den | Res



45-E

Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs
123.0	130.0	Sandstone, gray, fine-grained				
130.0	139.0	Sandstone, light-gray, fine- to medium-grained				
139.0	143.0	Claystone, dark-gray				
143.0	150.0	Sandstone, light-gray, fine-grained, silty				
150.0	155.0	Sandstone, gray, fine- to coarse-grained, clayey				
155.0	161.0	Sandstone, medium-gray, fine-grained, silty				
161.0	176.5	Shale, black, carbonaceous, silty				
176.5	185.0	Siltstone and shale, dark-gray, carbonaceous				
185.0	201.0	Sandstone, light-gray, fine- to medium-grained				
201.0	205.0	Sandstone, medium-gray, very fine-grained, silty				
205.0	210.0	Siltstone, medium-gray				
210.0	214.0	Siltstone, medium-dark-gray, clayey				
214.0	242.0	Shale, dark brownish-gray and black, carbonaceous				
242.0	251.0	Sandstone, light-gray, fine- to medium-grained				
251.0	254.0	Shale, black, carbonaceous				
254.0	255.0	Coal, shaly				
255.0	258.0	Shale, black, carbonaceous				
258.0	261.0	Coal				
261.0	270.0	Shale, dark-brown and black, carbonaceous				
270.0	281.0	Siltstone, medium-gray, sandy				
281.0	291.0	Shale, black, carbonaceous, silty				
291.0	304.0	Sandstone and siltstone, interbedded, light- to medium-gray. Sandstone is fine-grained				
304.0	310.0	Siltstone, dark-gray				
310.0	314.0	Sandstone, light-gray, fine- to medium-grained				
314.0	316.0	Shale, dark-gray, silty				
316.0	325.0	Sand, light-gray, fine- to medium-grained, silty				
325.0	328.0	Shale, dark-gray, silty				
328.0	360.0	Sandstone, light- to medium-gray, fine- to medium-grained, silty				
360.0	398.0	Sandstone and siltstone, light- to medium-gray, interlaminated. Sandstone is fine- to medium-grained				
398.0	405.0	Shale, dark-gray, hard				
405.0	407.5	Shale, black, carbonaceous				
407.5	410.0	Coal				



45-E

Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
410.0	412.0	Shale, black, carbonaceous						
412.0	414.0	Coal, shaly						
414.0	415.5	Shale, black, carbonaceus						
415.5	423.0	Coal, shaly						
423.0	426.0	Shale, black, carbonaceous						
426.0	429.3	Coal						
429.3	448.0	Shale and claystone, dark brownish-gray to black						
448.0	453.0	Sandstone, dark brownish-gray, fine grained, hard, calcareous						
453.0	459.0	Siltstone, dark brownish-gray, hard, calcareous						
459.0	464.5	Sandstone, light-gray and brownish-gray, fine- to medium-grained, hard, calcareous						
464.5	470.0	Shale, dark-gray, silty						
470.0	475.0	Shale, dark brownish-gray and black, carbonaceous						
475.0	478.0	Shale, dark gray and black, silty and sandy						
478.0	502.0	Shale, dark-gray to black, carbonaceous						
502.0	505.0	Coal						
505.0	511.0	Shale, black, carbonaceous						
511.0	515.0	Sandstone, brownish-gray, fine-grained, hard, calcareous						

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 46-E DATE 8/5/80 SURFACE ELEVATION(ft) 7130

LOCATION NW SW SW Sec. 20 T. 23N R. 81W Quad. Elmo

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 515

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

GEOPHYSICAL LOGS:

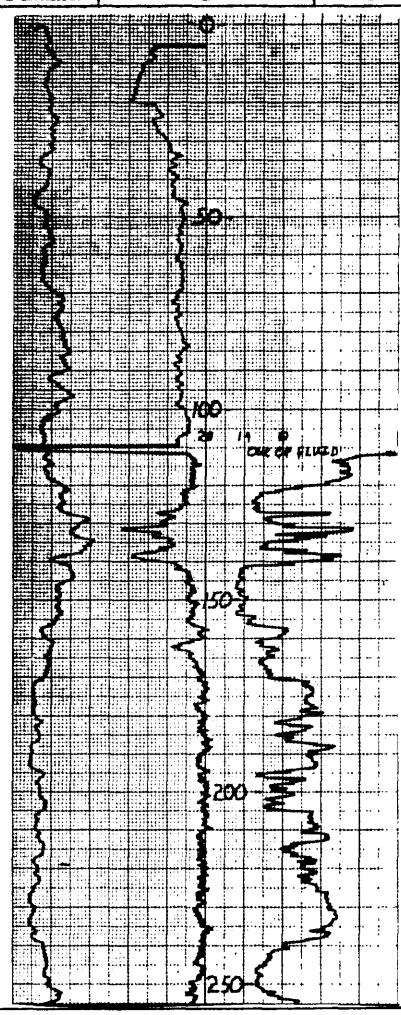
Natural Gamma	; Scale	50 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	15 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

Interval in feet		Lithology
0.0	10.5	Claystone-shale, brown, carbonaceous
10.5	15.5	Sandstone-conglomerate, light-brown. Sandstone is fine- to very coarse-grained. Conglomerate consists chiefly of granules and small pebbles of feldspar
15.5	24.0	Sandstone, light-brown, fine- to coarse-grained, slightly conglomeratic
24.0	33.0	Shale-claystone, dark-brown, carbonaceous
33.0	37.0	Siltstone and sandstone, interlaminated, medium and olive gray. Sandstone is very fine-grained
37.0	43.0	Siltstone, medium-gray, clayey
43.0	47.5	Sandstone, gray, fine-grained, silty
47.5	69.5	Siltstone, medium-gray, clayey
69.5	83.0	Shale, medium- to medium-dark-gray. A few very thin beds of very fine-grained sandstone, light gray
83.0	90.5	Shale, dark-gray, carbonaceus, clayey
90.5	94.0	Sandstone, white to light-gray, fine-grained (loose), very silty
94.0	98.0	Siltstone, light-gray, sandy

Strip Log

Depth (ft / m)

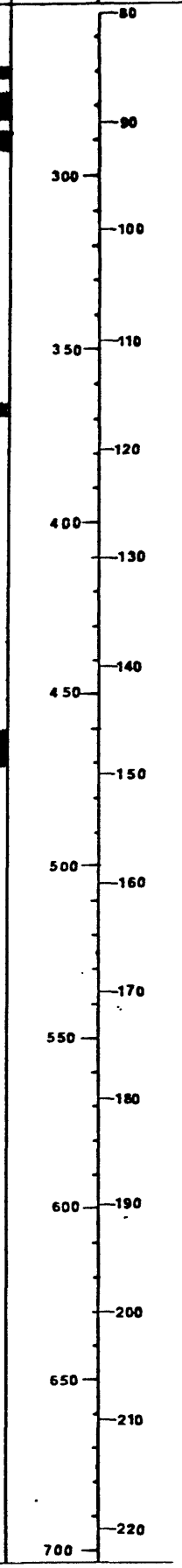
Geophysical Logs: Gamma | Den | Res



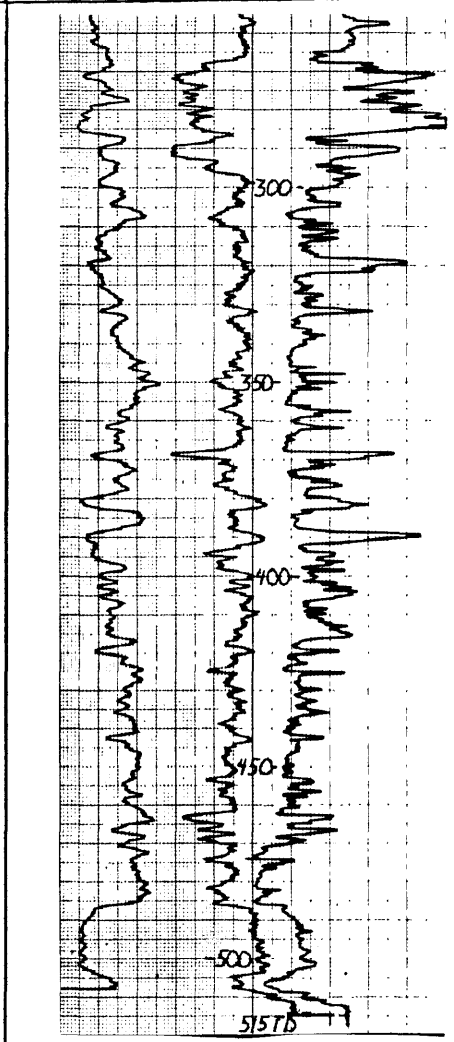
		Lithology
98.0	111.0	Sandstone, light-brownish-gray, fine- to very coarse-grained. Slightly conglomeratic, a few granules and small pebbles of feldspar
111.0	121.5	Sandstone, light-brown, very fine-grained
121.5	127.0	Shale, dark-gray
127.0	131.0	Shale, black, coaly
131.0	132.0	Coal
132.0	138.0	Shale, black, coaly
138.0	140.0	Coal
140.0	156.5	Claystone, medium-gray, partly silty
156.5	160.5	Siltstone, medium-gray
160.5	166.5	Shale, dark-gray, carbonaceous
166.5	170.0	Siltstone, medium-gray, clayey
170.0	181.0	Sandstone, light-gray, fine-grained
181.0	187.0	Sandstone, light-gray, fine-grained, silty
187.0	194.5	Sandstone, light-gray, fine-grained
194.5	205.0	Siltstone-sandstone, medium-gray
205.0	213.0	Sandstone, light-gray, fine-grained, silty
213.0	224.0	Siltstone, medium-gray, sandy
224.0	239.0	Sandstone, light-gray, fine-grained
239.0	251.0	Siltstone, medium-dark-gray, clayey
251.0	254.5	Shale, brownish-gray
254.5	265.0	Sandstone, light-gray, fine- to very coarse-grained
265.0	267.0	Shale, dark-gray, carbonaceous
267.0	270.0	Shale, black, carbonaceous
270.0	273.5	Coal
273.5	278.5	Shale, black, coaly
278.5	286.0	Coal, shaly
286.0	289.0	Shale, dark-gray, carbonaceous
289.0	293.0	Coal
293.0	297.0	Shale, black, carbonaceous
297.0	311.0	Siltstone and shale, dark-gray to black
311.0	327.0	Sandstone and siltstone, brownish-gray, shaly
327.0	330.5	Shale, dark-gray
330.5	332.0	Siltstone, dark-gray, clayey
332.0	342.0	Shale, dark-gray, silty
342.0	368.0	Shale, dark-gray to black, carbonaceous, sandy and silty
368.0	370.0	Coal

Strip Log

Depth



Geophysical Logs



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
370.0	379.0	Shale, black, carbonaceous						
379.0	383.0	Sandstone, light-gray and brownish-gray						
383.0	388.0	Shale, dark gray, clayey						
388.0	391.5	Sandstone, light gray to brownish-gray						
391.5	399.0	Shale, black, carbonaceous						
399.0	406.0	Sandstone and siltstone, interbedded, gray to dark-gray and brownish-gray. Sandstone is fine- to coarse-grained						
406.0	418.0	Siltstone, dark-gray, sandy						
418.0	421.0	Sandstone, medium-gray, silty, fine grained						
421.0	452.0	Claystone, black, carbonaceous, silty						
452.0	462.5	Shale, black, carbonaceous. Very thin interbeds of dark brown, very fine-grained sandstone						
462.5	465.0	Coal, shaly						
465.0	471.0	Shale and coal. Shale is black, carbonaceous						
471.0	486.0	Shale, black, carbonaceous, silty						
486.0	495.0	Sandstone, medium-gray and dark-brown, very fine-grained, calcareous						
495.0	505.0	Sandstone, light-brownish-gray and medium-gray. medium-grained						
505.0	509.0	Shale, black, carbonaceus						
509.0	515.0	Siltstone, dark gray, sandy, hard.						

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 47-E DATE 8/12/80 SURFACE ELEVATION(ft) 7285

LOCATION NW SE SW Sec. 30 T. 23N R. 81W Quad. Elmo

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 515

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

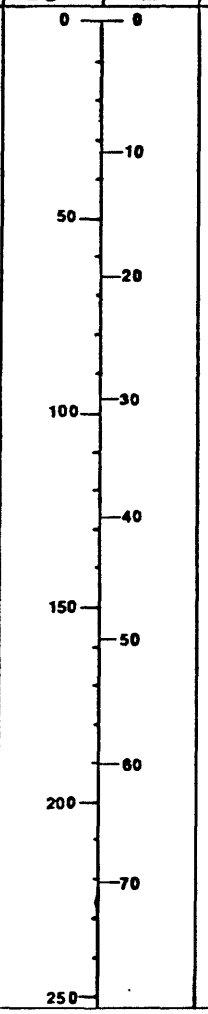
GEOPHYSICAL LOGS:

Natural Gamma	; Scale	50 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	15 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

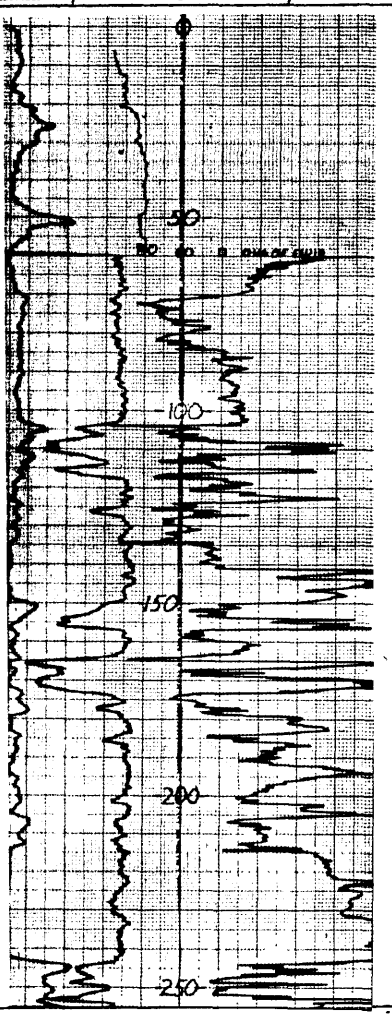
Interval in feet		Lithology
0	12.0	Shale-claystone, light brownish-gray, very silty
12.0	17.0	Sandstone, light-gray, very fine-grained
17.0	18.7	Shale, dark brownish-gray
18.7	20.0	Siltstone, brownish-gray
20.0	24.5	Claystone, dark brownish-gray, partly carbonaceous, partly silty
24.5	31.0	Shale, clayey, dark-gray, carbonaceous
31.0	35.0	Siltstone, medium-gray, clayey
35.0	38.0	Siltstone, yellowish-gray, sandy
38.0	45.0	Sandstone, yellowish-gray, fine-grained
45.0	47.0	Siltstone, medium-gray
47.0	49.0	Claystone, medium-gray, silty
49.0	55.0	Shale-claystone, dark brownish-gray, carbonaceous
55.0	57.0	Siltstone, light-yellowish-gray, sandy
57.0	71.0	Sandstone, light-yellowish-gray, fine-grained
71.0	103.3	Siltstone-shale, dark-gray, fossiliferous (shell fragments).
103.3	108.0	Shale, black, carbonaceous
108.0	111.0	Coal, bright, shale parting
111.0	115.0	Shale, black, carbonaceous
115.0	116.0	Coal, bright

Strip Log

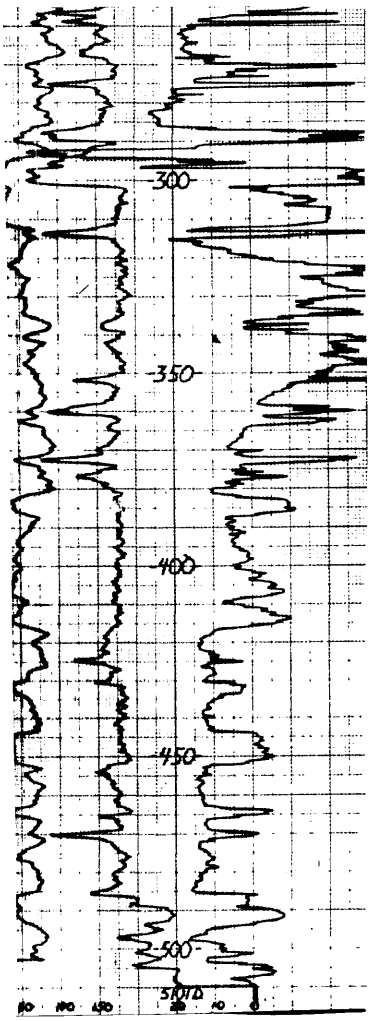
Depth



Geophysical Logs



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs: Gamma / Den / Res
116.0	117.0	Shale, black, carbonaceous				
117.0	124.0	Sandstone, light-gray, very-fine-grained, silty, calcareous, (hard)				
124.0	125.3	Shale, black, carbonaceous				
125.3	127.0	Coal, shaly				
127.0	129.0	Claystone, medium-gray, silty				
129.0	134.0	Siltstone-claystone, medium-gray				
134.0	150.0	Sandstone, light- to medium-gray, fine-grained, silty				
150.0	153.8	Shale, dark-gray, carbonaceous				
153.8	157.0	Coal, shaly				
157.0	159.5	Shale and siltstone, dark-gray and medium-gray				
159.5	164.0	Siltstone, medium-gray				
164.0	165.0	Claystone, medium-gray				
165.0	167.0	Coal				
167.0	169.0	Shale, black, carbonaceous				
169.0	173.2	Coal				
173.2	175.0	Shale, black, carbonaceous				
175.0	176.5	Siltstone, medium-gray				
176.5	179.0	Claystone, dark gray, carbonaceous				
179.0	184.0	Sandstone, medium-gray, silty				
184.0	186.0	Shale, medium-gray, silty				
186.0	192.0	Siltstone, medium-gray				
192.0	195.0	Sandstone, medium-gray, silty, shaly				
195.0	200.0	Siltstone, medium-gray, shaly				
200.0	202.0	Shale, dark-gray, carbonaceous				
202.0	206.0	Sandstone-siltstone, medium-gray				
206.0	208.2	Shale, dark-gray, carbonaceous				
208.2	212.5	Siltstone, medium-gray				
212.5	213.5	Shale, dark-gray, carbonaceous				
213.5	239.0	Sandstone, light-gray, fine-grained				
239.0	244.0	Sandstone, light-gray, fine-to medium grained				
244.0	253.0	Shale, black, carbonaceous, coal streaks				
253.0	254.5	Coal				
254.5	256.0	Shale, black, carbonaceous				
256.0	257.0	Coal				
257.0	258.5	Shale, black, carbonaceous				
258.5	259.5	Coal				
259.5	269.5	Shale, dark gray, carbonaceous				
269.5	273.5	Claystone-siltstone, medium- to medium-dark-gray				
273.5	275.0	Claystone, medium-gray				
275.0	276.0	Coal				
276.0	278.5	Claystone, medium-gray				
278.5	286.0	Shale-claystone, dark-gray to black, carbonaceous				



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
286.0	290.0	Coal						
290.0	294.0	Claystone, dark gray, carbonaceous						
294.0	296.0	Coal						
296.0	297.0	Claystone, dark gray, carbonaceous						
297.0	302.0	Coal						
302.0	312.0	Sandstone, light-gray, fine- to medium-grained						
312.0	313.0	Shale, dark gray, carbonaceous						
313.0	314.5	Coal						
314.5	320.0	Shale, dark gray, carbonaceous						
320.0	336.0	Sandstone, light-gray, fine- to coarse-grained, very silty and clayey						
336.0	339.0	Claystone, dark-gray, sandy						
339.0	351.0	Sandstone, light-gray, very clayey						
351.0	352.5	Claystone, dark-gray, coaly						
352.5	358.0	Claystone, medium-dark-gray						
358.0	361.0	Coal, shaly						
361.0	364.0	Shale, dark-gray, carbonaceous						
364.0	372.0	Claystone, dark gray, carbonaceous						
372.0	373.4	Coal						
373.4	381.0	Claystone, dark-gray, carbonaceous						
381.0	386.0	Sandstone, gray, fine- to coarse-grained, silty						
386.0	392.0	Siltstone, medium-gray, clayey						
392.0	401.0	Siltstone, medium-gray, sandy						
401.0	408.0	Sandstone, light-gray, fine-grained, silty						
408.0	410.0	Siltstone, medium-gray, clayey						
410.0	416.0	Sandstone, gray, fine- to coarse-grained, clayey						
416.0	430.0	Claystone, medium- to dark-gray, carbonaceous. Coal streak at 424.5 to 425.0						
430.0	434.0	Siltstone, medium-gray						
434.0	443.5	Claystone, medium- to dark-gray, partly carbonaceous						
443.5	452.0	Sandstone, gray, fine- to coarse-grained, silty						
452.0	463.0	Claystone, dark gray, partly carbonaceous, silty						
463.0	466.0	Siltstone, dark-gray, sandy						
466.0	469.5	Claystone, dark-gray, partly carbonaceous						
469.5	471.0	Coal, shaly						
471.0	486.0	Claystone, dark-gray, silty, carbonaceous						
486.0	494.0	Siltstone-sandstone, gray. Sandstone is fine-grained						

Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
494.0	504.0	Shale, black, carbonaceous, traces of coal						
504.0	515.0	Siltstone, medium-gray						

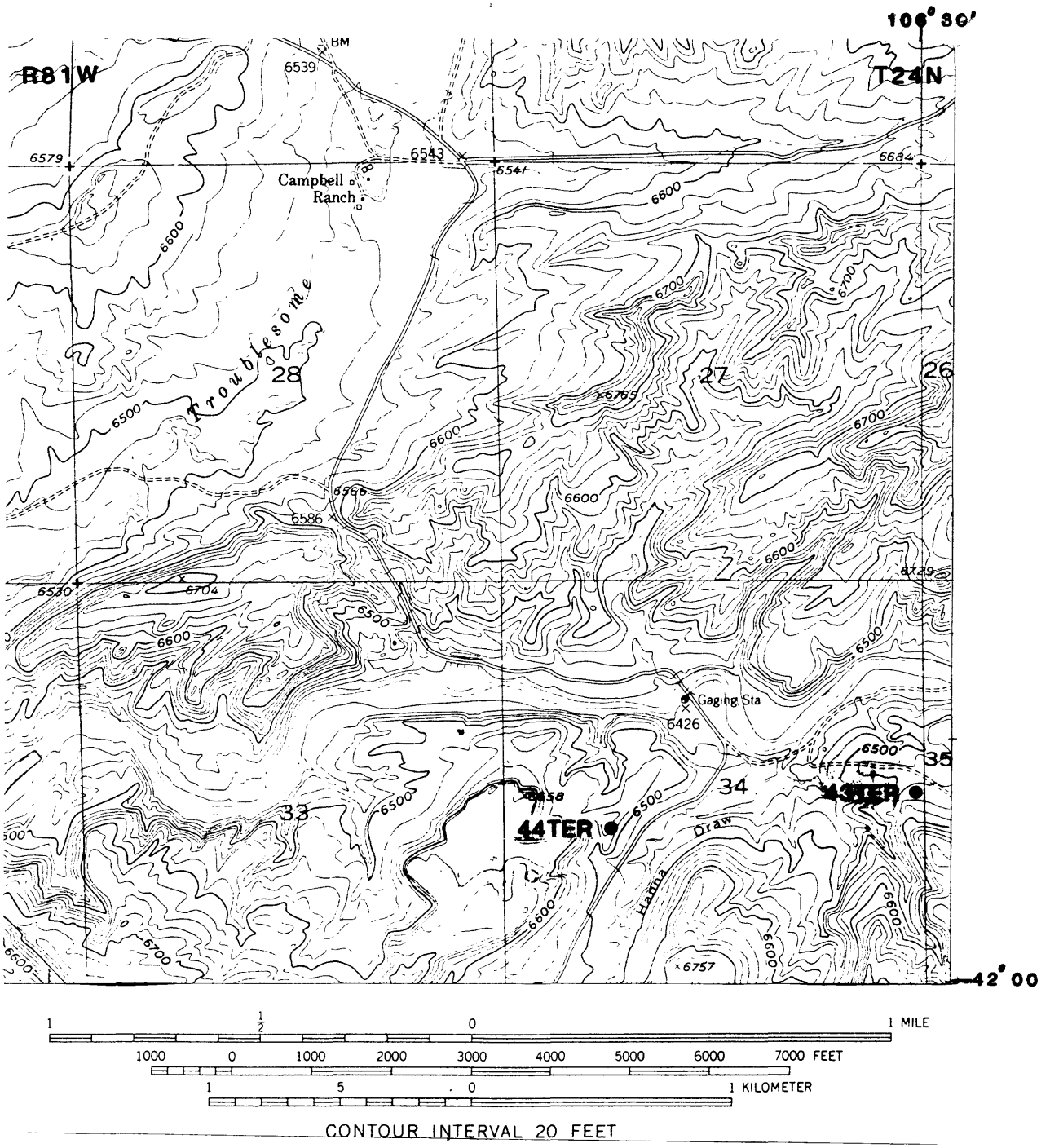


Figure 5.--Drill-hole location map, central part of Como West quadrangle, Carbon County, Wyoming.

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 48-CW DATE 7/30/80 SURFACE ELEVATION(ft) 6865

LOCATION SE NE NW Sec. 20 T. 23N R. 80W Quad. Como West

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 415

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

GEOPHYSICAL LOGS:

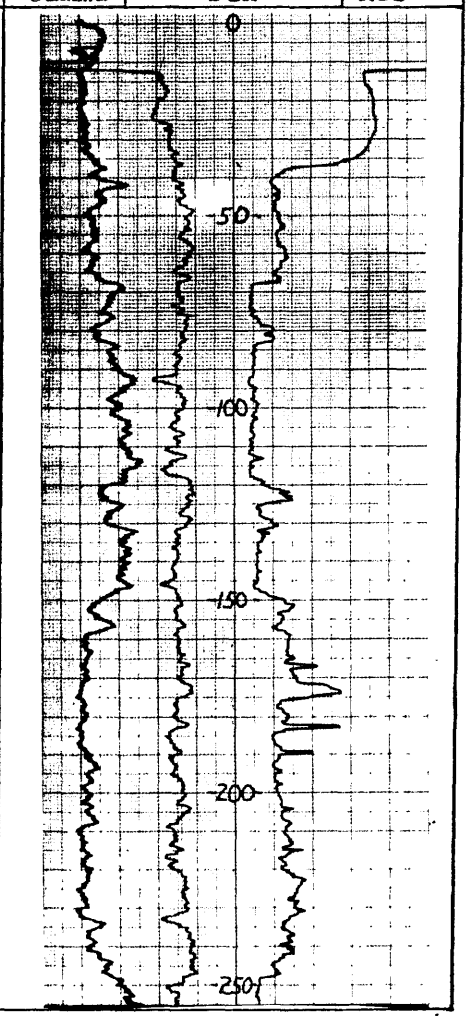
Natural Gamma	; Scale	20 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	16 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

Interval in feet		Lithology
0.0	12.0	Clay, medium-brown, sandy. Sand, fine to medium-grained. Alluvium
12.0	25.0	Sandstone, medium-yellowish-brown, fine-grained, silty
25.0	33.0	Sandstone, light-yellowish-brown, fine-grained, silty
33.0	40.0	Siltstone, light-yellowish-brown, sandy. Sandstone is very fine to fine-grained
40.0	43.0	Claystone, gray
43.0	48.0	Siltstone, light-gray, sandy
48.0		Sandstone, light-gray, fine-grained; quartz and feldspar grains, silty, clayey
57.0	67.5	Sandstone, medium- to coarse-grained, clayey and silty. Pyrite at 65-68 feet
67.5	78.0	Shale, medium-gray, mostly silty
78.0	83.0	Siltstone, medium-gray
83.0	92.0	Shale, medium- to dark-gray, clayey
92.0	94.0	Shale, medium-gray
94.0	103.0	Shale, dark-gray, carbonaceous
103.0	110.0	Shale, medium-gray
110.0	116.0	Shale, light- to medium-gray
116.0	120.0	Shale, medium-gray
120.0	124.0	Siltstone, light- to medium-gray

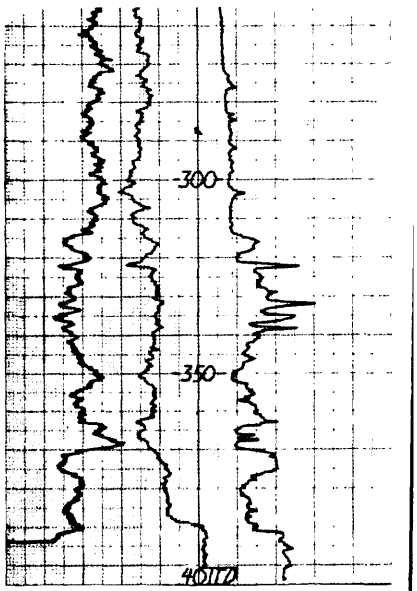
Strip Log

Depth

Geophysical Logs



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs
124.0	126.5	Shale, medium-gray				
126.5	128.0	Shale, medium- to dark-brown, carbonaceous				
128.0	131.0	Shale, medium- to dark-brown, silty, carbonaceous				
131.0	147.0	Shale, medium- to dark-gray				
147.0	150.5	Siltstone, medium-gray				
150.5	155.0	Sandstone, medium-gray, medium- to coarse-grained, silty				
155.0	158.0	Shale, medium-gray, silty				
158.0	166.0	Sandstone, light- to medium-gray, medium- to coarse-grained, clayey				
166.0	208.0	Sandstone, light-to medium-gray, fine- to medium-grained, silty				
208.0	215.0	Sandstone, light-gray, fine- to medium-grained. Coarse black chert.				
215.0	220.5	Sandstone, light- to medium-gray, medium- to coarse-grained; coarse black chert grains and black, carbonaceous shale				
220.5	230.0	Sandstone, light- to medium-gray, medium- to coarse-grained. Thin stringers of coaly material				
230.0	232.0	Sandstone, light- to medium-gray, medium- to coarse-grained. Thin interbeds of gray shale and coal				
232.0	235.5	Shale, gray and coal, sandy				
235.5	241.0	Sandstone, light- to medium-gray, fine- to medium-grained, silty				
241.0	248.0	Siltstone, medium-gray				
248.0	253.0	Shale, medium-gray				
253.0	255.0	Sandstone, light-gray, medium- to coarse-grained, pyrite, clayey				
255.0	272.0	Shale, light- to medium-gray, clayey, pyritic				
272.0	314.0	Shale, medium-gray, a few very thin coal bands				
314.0	318.5	Siltstone, medium-gray				
318.5	321.5	Shale, medium-gray				
321.5	323.0	Coal				
323.0	327.0	Shale, medium-gray, silty				



48-CW

Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
327.0	342.0	Siltstone and shale, interbedded, medium-gray						
342.0	348.0	Shale, medium-gray, silty						
348.0	354.0	Shale, medium-gray						
354.0	363.0	Siltstone, medium-gray, clayey						
363.0	370.0	Shale, light- to medium-brown, partly carbonaceous						
370.0	376.0	Siltstone, medium-gray						
376.0	391.0	Shale, medium-gray, silty						
391.0	415.0	Sandstone, light- to medium-gray, fine- to medium-grained, silty						

LITHOLOGIC AND GEOPHYSICAL LOGS

LOCATION NUMBER 49-CW DATE 7/22/80 SURFACE ELEVATION(ft) 6995

LOCATION SE SE SE Sec.20 T.23N R.80W Quad. Como West

COUNTY Carbon STATE Wyoming TOTAL DEPTH(ft) 655

CORED YES [ ] NO [X] INTERVAL(s) _____

DRILLING MEDIUM: [X] AIR [X] FOAM [ ] MUD [ ] WATER OBSERVATION WELL

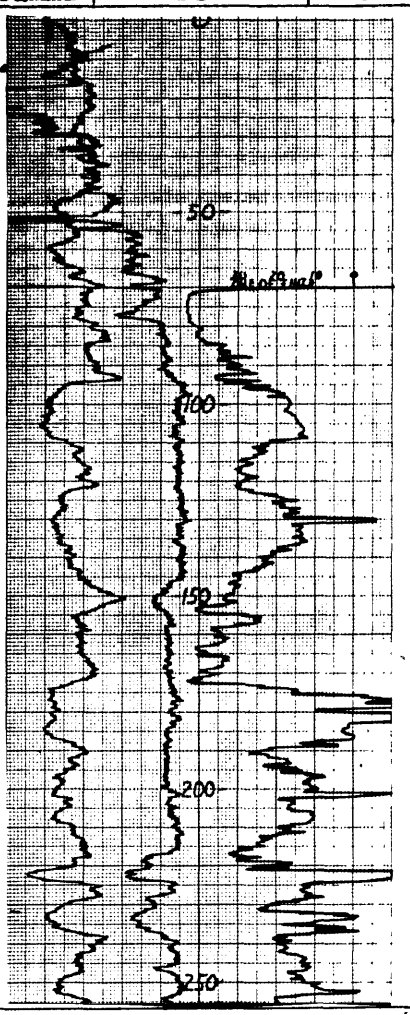
GEOPHYSICAL LOGS:

Natural Gamma	; Scale	20 cps/in	Logging Speed	15	fpm
Gamma Gamma	; Scale	10 cps/in	Logging Speed	15	fpm
Resistivity	; Scale	16 ohms/in	Logging Speed	15	fpm
Caliper	; Scale		Logging Speed		fpm

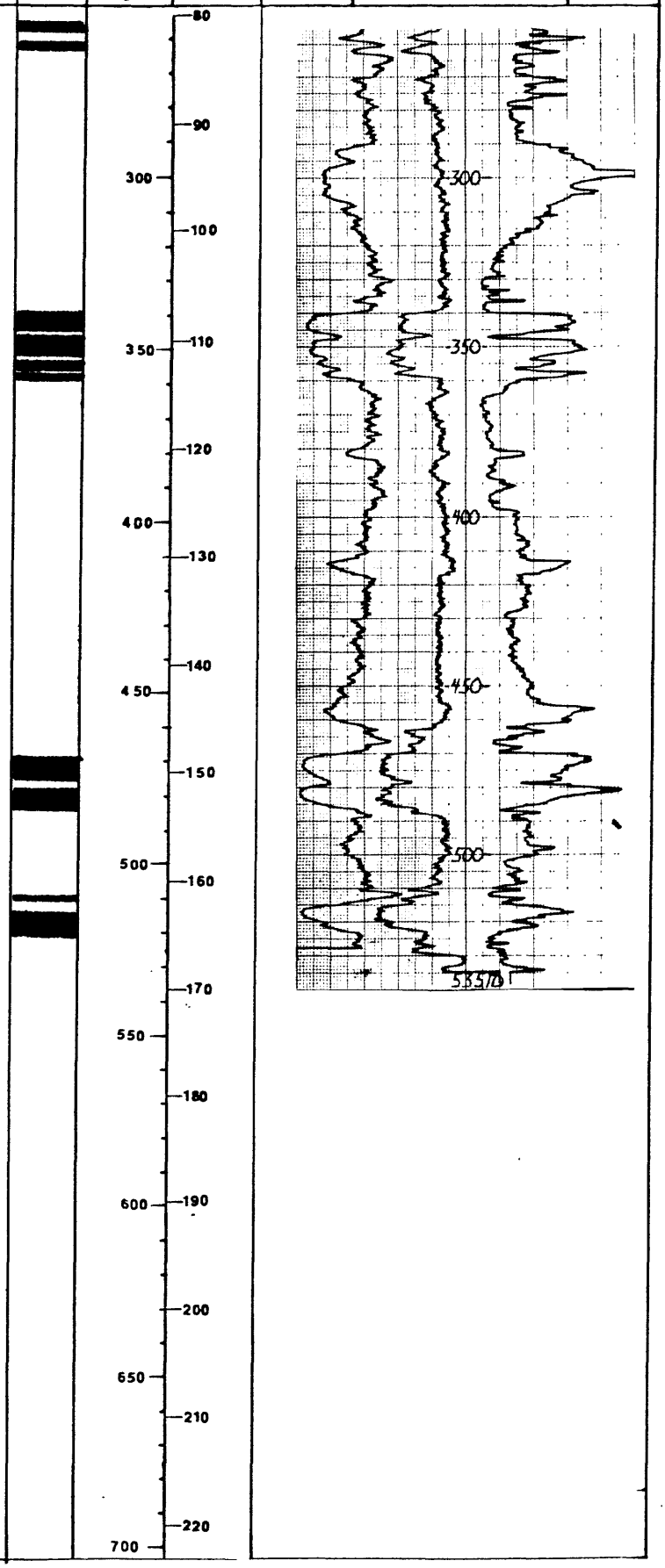
Interval in feet		Lithology
0.0	5.0	Clay, brown; sandstone, brown, fine-grained; surface material
5.0	11.0	Clay, light gray and brownish gray, sandy and silty
11.0	15.0	Sandstone, light-brownish-gray, fine- to medium-grained, silty
15.0	32.0	Claystone, brownish-gray, partly brown, carbonaceous
32.0	35.0	Claystone and siltstone, olive gray and light-brown
35.0	46.0	Shale, brownish-gray and gray
46.0	50.5	Sandstone, light-brown, fine- to coarse-grained, silty. Mostly medium-grained
50.5	54.0	Siltstone, medium-dark-gray
54,0	58.0	Claystone, medium-gray, silty
58.0	64.5	Sandstone, light-gray, fine-grained
64.5	68.0	Siltstone, medium-gray, clayey and sandy
68.0	79.0	Claystone, medium-dark-gray, partly carbonaceous near base
79.0	84.0	Shale, dark-gray
84.0	92.0	Shale, brownish-black and black, carbonaceous, coaly
92.0	94.0	Shale, black, carbonaceous
94.0	109.0	Sandstone, light-gray, fine-grained

Strip Log

Depth (ft / m)



Lithology			Strip Log	Depth ft	Depth m	Geophysical Logs: Gamma / Den / Res
109.0	121.5	Shale, medium-dark-gray, silty and sandy				
121.5	143.0	Siltstone, medium dark gray, very sandy				
143.0	151.0	Shale, medium-dark-gray, silty				
151.0	172.5	Shale, dark-gray to black, carbonaceous. Coaly and silty				
172.5	181.0	Sandstone, medium-gray, fine- to medium-grained				
181.0	187.0	Sandstone, light-gray, fine- to coarse-grained				
187.0	194.5	Shale, medium-gray, silty				
194.5	200.0	Siltstone, medium-dark-gray, very sandy				
200.0	202.0	Sandstone, medium-gray, fine-grained, silty				
202.0	206.0	Siltstone, medium gray				
206.0	209.0	Sandstone, medium-gray, fine-grained, silty				
209.0	215.0	Shale, medium-dark-gray, gradational upward into sandstone				
215.0	218.0	Claystone, dark-greenish-gray, fractured				
218.0	221.0	Shale, black, carbonaceous				
221.0	224.0	Coal				
224.0	231.0	Shale, black, carbonaceous				
231.0	237.0	Coal				
237.0	248.0	Shale, black, carbonaceous, partly coaly				
248.0	253.0	Siltstone, medium-gray				
253.0	257.0	Shale, black, carbonaceous				
257.0	259.0	Coal				
259.0	261.0	Shale, black, carbonaceous				
261.0	263.0	Coal				
263.0	270.0	Shale, black, carbonaceous				
270.0	280.0	Shale, black, carbonaceous; coal lenses and very thin beds				
280.0	291.0	Shale, medium-dark-gray				
291.0	294.0	Sandstone, gray, fine-grained, laminations of siltstone and carbonaceous material				
294.0	297.0	Siltstone, medium-gray				
297.0	307.0	Sandstone, medium-gray, fine-grained				
307.0	320.0	Siltstone and shale, medium-gray. Grades downward into shale				



Lithology			Strip Log	Depth		Geophysical Logs		
				ft	m	Gamma	Den	Res
320.0	340.0	Shale, dark-gray to black, carbonaceous						
340.0	346.0	Coal						
346.0	348.0	Shale, black, carbonaceous						
348.0	353.0	Coal						
353.0	354.0	Shale, medium-gray						
354.0	356.0	Coal						
356.0	357.0	Shale, dark-gray, carbonaceous						
357.0	359.0	Coal						
359.0	380.0	Shale, medium- to medium-dark-gray						
380.0	383.0	Siltstone, medium-gray						
383.0	397.0	Shale, medium-dark-gray, clayey, partly fractured						
397.0	412.0	Claystone, medium-dark-gray. Laminations of siltstone						
412.0	417.0	Sandstone, light-gray, fine-grained						
417.0	430.0	Claystone, medium gray, fractured						
430.0	446.0	Shale, dark-gray, silty. Grades downward into siltstone						
446.0	453.5	Siltstone, medium-gray. Grades downward into sandstone						
453.5	461.0	Sandstone, light-gray, fine-grained						
461.0	470.0	Shale, dark-gray to black, carbonaceous						
470.0	476.5	Coal						
476.5	479.5	Shale, black, carbonaceous						
479.5	486.0	Coal						
486.0	493.0	Shale, medium-dark-gray, silty						
493.0	501.0	Siltstone, medium-dark-gray						
501.0	504.0	Shale, dark-gray						
504.0	510.0	Shale, dark-gray to black, carbonaceous						
510.0	511.0	Coal						
511.0	513.0	Shale, gray						
513.0	515.0	Shale, black, carbonaceous						
515.0	522.0	Coal						
522.0	530.0	Shale, dark-gray to black, carbonaceous						
530.0	533.0	Claystone, medium-gray, silty						
533.0	535.0	Shale, black, carbonaceous, coaly						

References

Hansen, D. E., and Schugg, D. L., 1979, Geophysical and lithologic logs of 39 coal test holes drilled during 1978 in the Como West and Elmo quadrangles, Carbon County, Wyoming: U.S. Geological Survey Open-File Report 79-1701, 112 p.

Hansen, D. E., Spencer, F. D., and Stamm, M. E., 1980, Geophysical and lithologic logs of six test holes drilled during 1979 in the Como West and Elmo quadrangles, Carbon County, Wyoming: U.S. Geological Survey Open-File Report 80-899, 25 p.