Coal Exploratory Drilling in the Datil Mountain Coal Field

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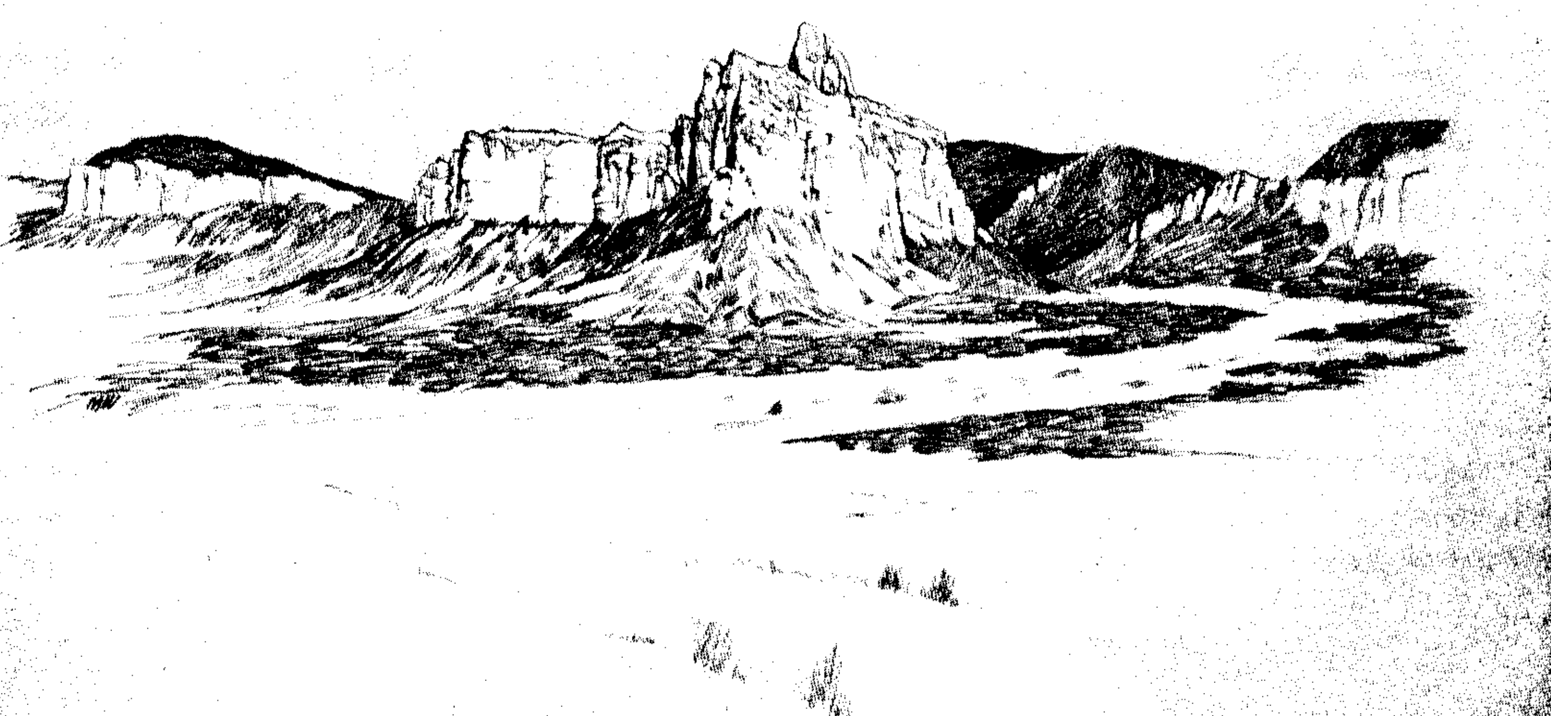

Open-File Report 111

New Mexico Bureau of Mines and Mineral Resources

1979

This report is the result of a cooperative project funded in part by the Geological Division of the U.S. Geological Survey under grant 14-08-0001-6-525

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ABSTRACT

Coal resources of the Datil Mountain coal field are poorly known. Small mines in Coal Canyon, near Riley, and at the Hot Spots mine have produced about 900 tons of coal. Five twinned holes were drilled by the NMBM&MR drill rig as directed by the authors, in the Riley, Bonnie Canyon, Pueblo Viejo Mesa, Wild Horse Canyon, and Pasture Canyon quadrangles to evaluate the coal beds on a regional basis.

The coals penetrated are in the Dilco Coal Member of the Crevasse Canyon Formation. Most of the coal beds encountered were 1 to 2.5 ft thick but one 4.0 and 4.3 ft thick seams were penetrated. The coals analyzed are high-volatile A bituminous coal with 11,725 to 12,646 Btu/lb, ash of 8.85 to 16.36 percent, fixed carbon of 42.30 to 47.58 percent, and sulfur of 0.51 to 2.75 percent.

This preliminary survey indicates there is mineable coal in the Crevasse Canyon Formation in the Datil Mountain coal field. Much more geologic mapping and more drilling is required to properly assess the coal resources.

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INTRODUCTION

Purpose and Scope

The purpose of this project was twofold: first, to obtain preliminary information about the stratigraphy of the Mesaverde Group at five specific sites; second, to obtain an indication of the quality and quantity of coal in the Datil Mountain field. In the spring of 1979, the New Mexico Bureau of Mines and Mineral Resources drilled 5 twinned holes in the Datil Mountain coal field. A total of 915 ft of rotary and 93 ft of core drilling was completed in this preliminary phase of the study. The drill sites were widely spaced; some reconnaissance geological mapping was done to select site locations. Following the mapping and drilling, proximate and ultimate analyses were performed on coal samples taken from the cored intervals by Hazen Laboratories of Denver, Colorado. This report presents,in detail,the information gained in this preliminary study. Additional work needs to be done in the Datil Mountain coal field to give a more complete picture of the regional stratigraphy and the coal potential.

Only four of these holes penetrated enough coal to warrant their being cored. Cuttings from all five rotary holes were collected at 5 ft intervals and described (Appendix III). Only the thicker coals were cored, however, recovery on these was somewhat poor, due to breakup of the coal in the core barrel. All five holes were geophysically logged, and coal thicknesses were picked from the logs.

ACKNOWLEDGMENTS

The authors wish to thank B.W. Cox, W.C. Cox, T. Kelley, and B. Lee, ranchers in the Datil Mountain region, for their cooperation. We wish to thank C.F. Richard, Socorro District Archaeologist with the Bureau of Land Management, for her help with archaeological clearances. Appreciation is expressed to S.C. Hook, paleontologist with the Bureau of Mines and Mineral Resources, for his helpful discussions concerning the Late Cretaceous marine stratigraphy of this region. Thanks are extended to S.L. Moore of the U.S Geological Survey for providing information from his field studies in the area.

PREVIOUS INVESTIGATIONS

G.K. Gilbert (1875), a member of the Wheeler Survey, visited this region in 1873 and published a report dividing the rocks in the area into Cretaceous and overlying red clay and trachyte. He noted coals in the Cretaceous sequence (fig. 1).

In 1899, C.L. Herrick (1900) made a journey through the Datil Mountain region noting the existence of "lignites" in this region and questioning their age. He correlated the lignites in the northern portion of the field with the Fox Hills formation. He also noted the presence of red Tertiary units overlying the Cretaceous units.

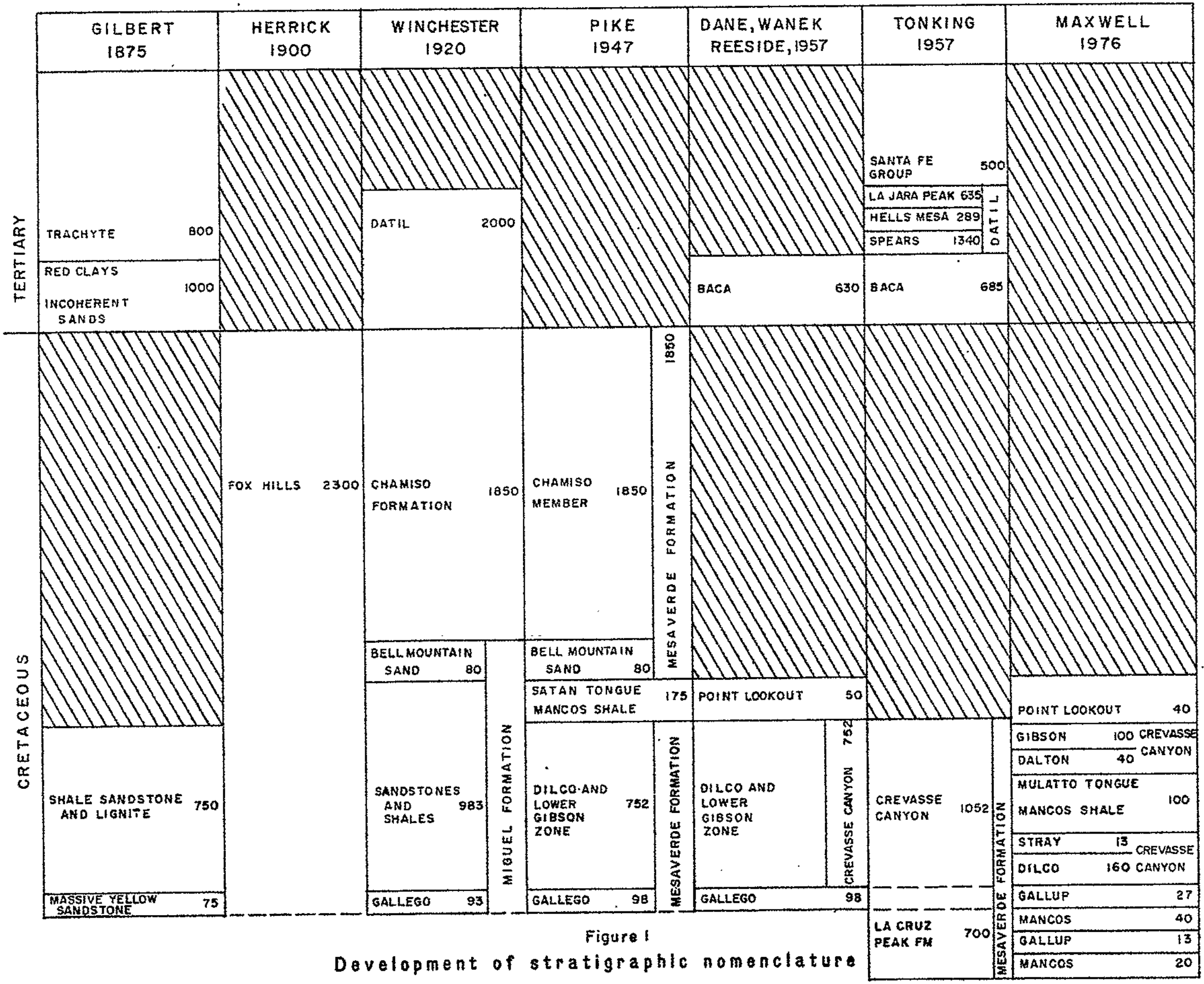


Figure I

Development of stratigraphic nomenclature in the Datil Mountain coal field

D.E. Winchester (1920) made a detailed study of the coal resources of northern Socorro County in 1913 and 1914. He divided the Cretaceous into the following units (in ascending order): the Dakota Sandstone, the Miguel formation, and the overlying Chamiso formation. He described two sandstones in the Miguel, a lower sand which he named the Gallego sandstone and an upper sand he named the Bell Mountain sandstone. He also named the overlying Tertiary Datil Formation which consists of conglomerates, sandstone, tuffs, and rhyolites.

Reconnaissance reports on the structure and red beds in New Mexico by N.H. Darton (1922, 1928) covered part of the Datil Mountain region. Darton reviewed Winchester's work on the Triassic and Cretaceous units that crop out along the upper Rio Salado.

W.S. Pike (1947) correlated the Mancos Formation and the lower Mesaverde Formation units of the southern San Juan Basin with those of the Datil area, and he discarded Herrick's "Fox Hills lignite" and "Yellow sands of the Upper Fox Hills" terminology. He also dropped Winchester's Miguel formation and reduced the Chamiso formation to a member of the Mesaverde Formation.

The Puertecito 15' quadrangle was mapped by W.H. Tonking (1957). This work deals with the general geology of this quadrangle and introduced a new formational name, the La Cruz Peak Formation for the sequence of shales and sands above the Tres Hermanos Member of the Mancos Shale. He assigned the coals in the area to the Crevasse Canyon Formation.

D.B. Givens (1957) mapped the Dog Springs 15' quadrangle immediately to the west of the Puertecito quadrangle. His measured sections show some coals in the Crevasse Canyon and La Cruz Peak Formations. Willard and Givens (1958) mapped the Datil 30' quadrangle but did not prepare a report on the stratigraphy.

Dane, Wanek, and Reeside (1957) reinterpreted Winchester's Bell Mountain sandstone and Chamiso formation as an upfaulted repetition of the Gallego sandstone and the upper part of the Miguel formation. They raised the Gallup from a member to a formation and restricted the Gallego to the upper sandstone of the Gallup. They also proposed the name D-Cross tongue of the Mancos for the 175-ft shale unit below the Gallup Sandstone.

R.W. Foster (1964) reviewed the subsurface data of the Catron County portion of this region and pointed out the most favorable stratigraphic horizons for oil. He noted the presence of some coal in the Spanel and Heinze #1-9609 Wells (sec. 19, T.4N., R.9W., NMPM); however, accurate thicknesses were not given.

C.H. Maxwell and S.L. Moore, U.S. Geological Survey, have mapped the northern portion of this field. Only part of their work has been published at this time (Maxwell, 1976a,b).

C.E. Chapin and his students (1979) have done considerable work in the eastern portion of the field. Their work includes detailed mapping of a number of quadrangles. Chapin is continuing his work westward in this area.

S.C. Hook, NMBM&MR, is currently working on Late Cretaceous marine stratigraphy and paleontology of this region with W.A. Cobban of the U.S. Geological Survey.

Location and Accessibility

The Datil Mountain coal field is located in west-central New Mexico covering more than 765 sq mi in Socorro, Catron, and Valencia Counties. The field is bounded on the east by the Lucero uplift and Ladron Mountains, on the west by the North Plains-Malpais area, on the north by erosion from the main part of the San Juan Basin, and on the south by the thick Tertiary volcanic blanket that forms the Datil and Gallinas Mountains (fig. 2).

The area can be reached by various unpaved county and ranch roads leading from I-40 on the north and US-60 on the south. Inclement weather hinders access considerably. A paved road from Magdalena to the Alamo Reservation is scheduled for completion in the near future and would provide good access to the center of the field.

Geography

The field lies on the southern edge of the Colorado Plateau physiographic province. Cenozoic deformation, erosion, and volcanism have produced starkly beautiful landscapes. The region is one of canyons, mesas, and mountains.

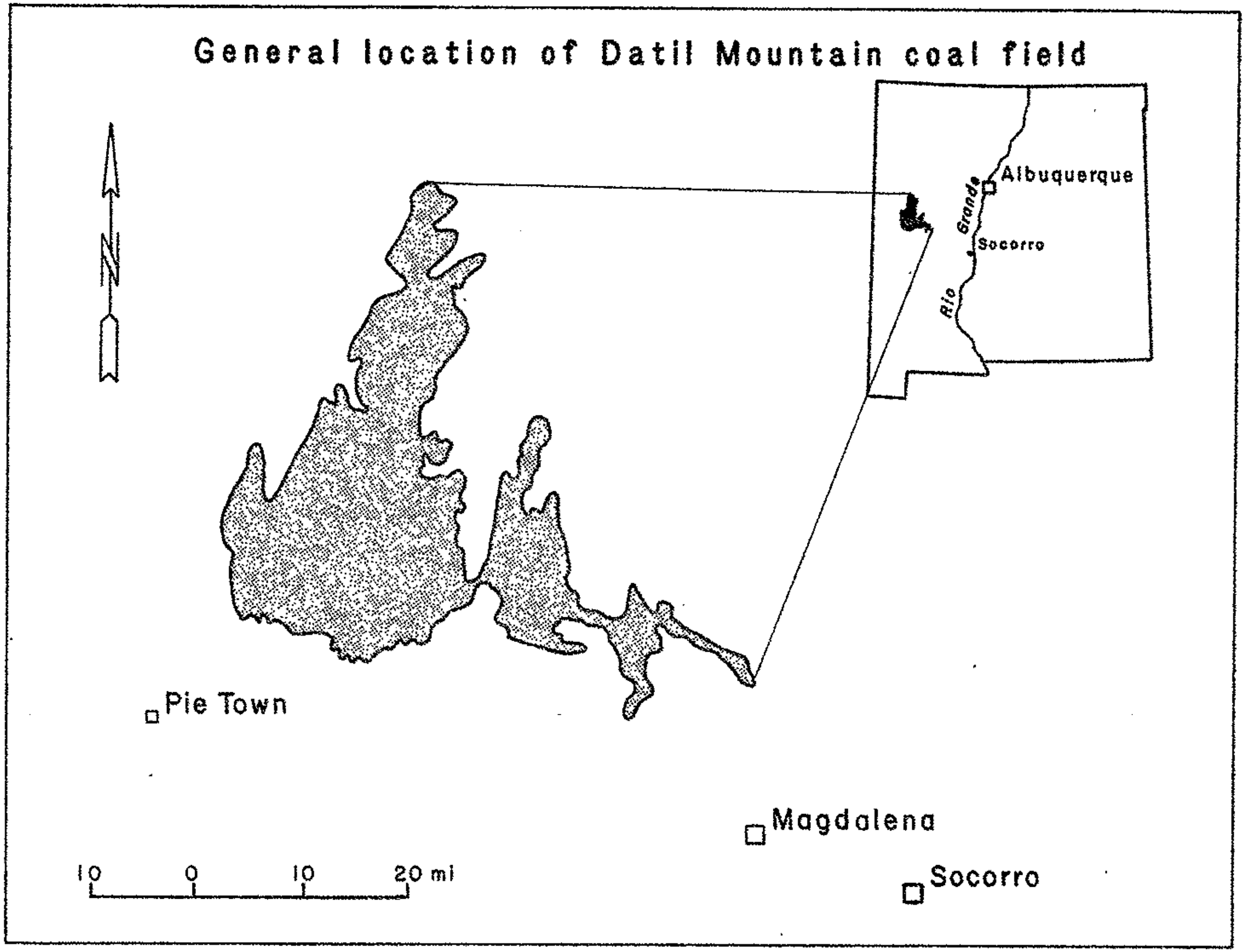

General location of Datil Mountain coal field
Albuquerque
Rio Grande
Socorro
Pie Town
Magdalena
Socorro
10 0 10 20 mi
N

Figure 2

Elevations range from 5,530 ft (1,691 m) near Riley on the east end of the field to 9,555 ft (2,922 m) in the Datil Mountains in the central portion of the field. Much of the Cretaceous rocks of the region are obscured by the Tertiary volcanics. The combination of Cretaceous sandstones, shales, and siltstones with the Tertiary volcanics produces a rapidly changing topography.

The Continental Divide, at an average elevation of 7,990 ft (2,443 m), runs through the field separating the surface drainage between the Rio Salado to the east and the Little Colorado to the west. No perennial streams occur in this area.

Most of the field is in the upper Sonoran floral life zone, which at this latitude is between 4,000 ft (1,223 m) and 7,000 ft (2,140 m) in altitude, and receives an average annual precipitation of between 12 and 18 inches (30.5 and 45.7 cm). That portion above 7,000 ft (2,140 m) is in the Transition zone. The Sonoran zone is characterized by piñon pine, ponderosa pine, juniper, scrub oak, and sagebrush. Piñon pine, ponderosa pine, and juniper are the only large trees growing in west-central New Mexico, and they grow mainly in well-drained rocky or sandy places on the north-facing slopes. Sagebrush plains and grasslands cover large areas where there is insufficient soil moisture to support piñon and juniper.

DESCRIPTION OF UNITS PENETRATED IN DRILLING

Crevasse Canyon Formation

The Crevasse Canyon was defined by Allen and Balk (1954) as a 420-700 ft interval of sedimentary rocks between the top of the Gallup Sandstone and the base of the Point Lookout Sandstone. The formation was divided by Allen and Balk into three members (in ascending order): the Dilco Coal Member, the Dalton Sandstone Member, and the Gibson Coal Member. There is a fourth unit, if the continental Bartlett Barren Member (which occurs near Gallup) is included (Sears, 1925). Parts of Allen and Balk's descriptions of the different members are given in the following paragraphs. Both the Dilco and Gibson Members are composed of continental-type deposits. Mineable quantities of coal are found in these units in coal fields near Gallup, New Mexico.

The Dilco Coal Member (Sears, 1925) consists of 240-300 ft of silty shales, laminated siltstone, coals, and thin- to medium-bedded, medium- to fine-grained sandstones. Colors are homogeneous in individual beds but range from white to pale olive brown. Texture ranges from coarse sand to clay, with fine sand and siltstone the most abundant. Sorting is fair to poor, and cementation is fair to good. Other than petrified wood, no fossils have been reported.

The Dalton Sandstone Member (Sears, 1934) at the type locality consists of 20-45 ft of sand within an interval of

40-70 ft, which is divided into a lower transgressive sandstone and an upper regressive sandstone. Colors range from white to grayish orange. Texture in the lower sandstone is a fine- to coarse-grained quartz sandstone. The upper sandstone consists of a medium- to coarse-grained, well-sorted quartz sand. The matrix of both sandstones is clay.

The Gibson Coal Member (Sears, 1925) consists of 135-550 ft of silty shales, coals, and sandstone. This member thickens southward as it replaces the Point Lookout Sandstone. Rock colors range from yellow through gray to black (Allen and Balk, 1954).

Geologic Structure

The Datil Mountain coal field lies along the southeastern edge of the Colorado Plateau province in a low area between the Zuni uplift to the northwest and the Lucero-Ladron uplift on the east. The coal field area is structurally complex, especially along the southern end of the field which coincides with the southern boundary of the Colorado Plateau. The northern part of the field is a synclinal extension off of the San Juan Basin. This portion of the field consists of the north plunging McCarty's syncline (Maxwell, 1976a). Erosion has separated the coal-bearing rocks of the Datil coal field from similar rocks in the San Juan Basin to the north.

The bedding in the southern end of the field generally dips to the south off the edge of the Colorado Plateau. To the south the coal-bearing rocks are overlain by a thick sequence of Tertiary sedimentary and volcanic rocks. Gentle north-trending Laramide folds cause deviations in the general southerly dip directions (Chapin and others, 1979). Further complicating the structure in the southeastern part of the field, particularly from Riley to Puertecito, are a series of north-trending normal faults and related mafic dikes which developed during formation of the Rio Grande rift (Chapin and others, 1979). Dips in the highly disturbed southeastern part of the field range from 3° to 45° to the south, with an average of about 15°. In the southwest, across the Red Lake fault, dips are generally less, reaching a maximum of 20° but with most dips less than 5° to the south. Dips in the northern part of the field are related to the gentle north-plunging McCarty's syncline and for the most part are less than 10° (fig. 3).

COAL GEOLOGY

Three quadrangle maps covering parts of the Datil field have been published: Dog Springs 15' quadrangle (Givens, 1957), Puertecito 15' quadrangle (Tonking, 1957), and the Datil 30' quadrangle (Willard and Givens, 1958), however, none emphasize coal geology. Several other quadrangles covering much of the eastern portion of the Datil coal field are being or have been mapped by graduate students, under the guidance of C.E. Chapin, NMBM&MR (fig. 4). To date no comprehensive study of the Datil Mountain coal field has been done.

In the eastern Datil Mountain field, the area east of the Red Lake fault, coals are most evident southwest of

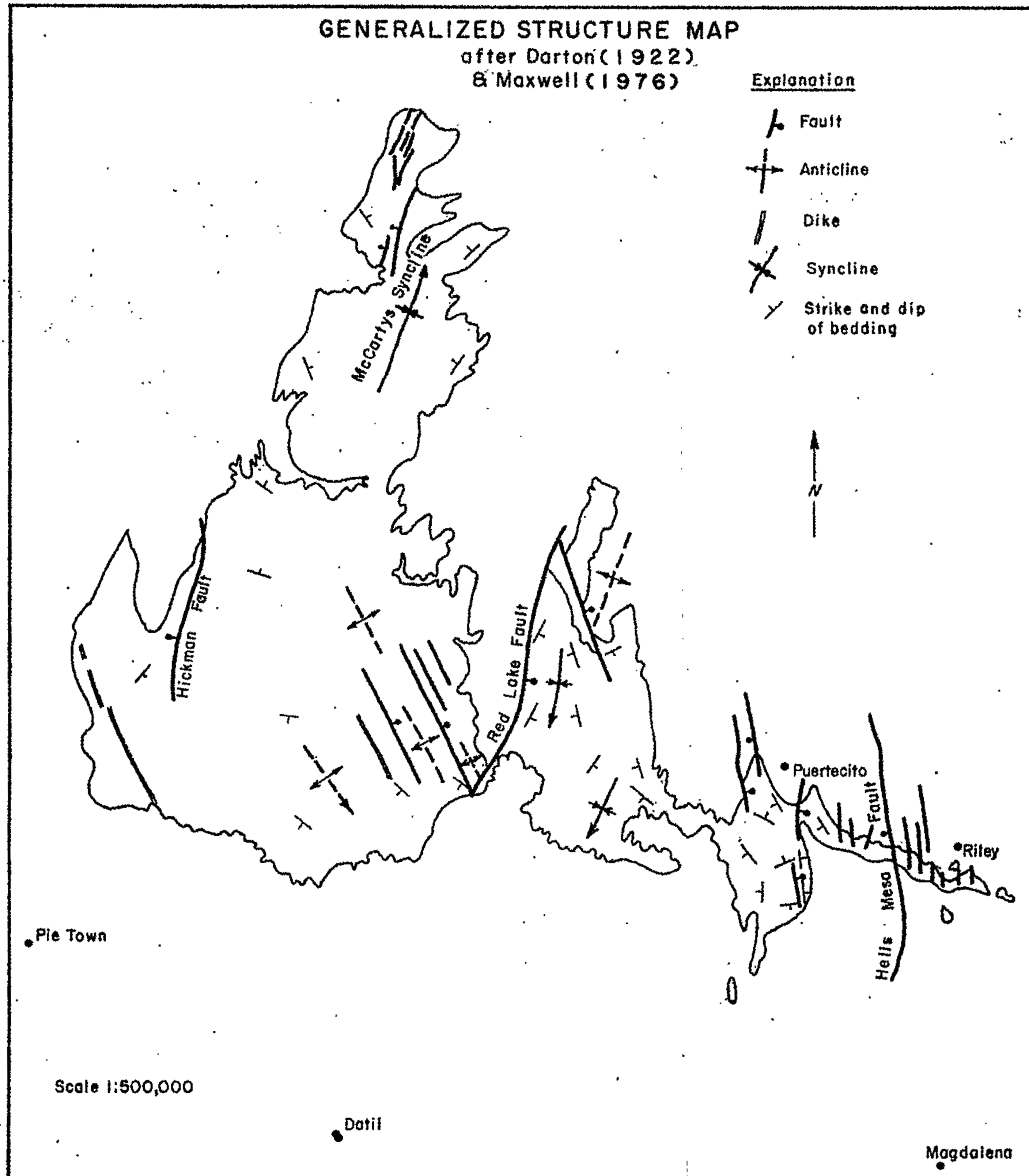

GENERALIZED STRUCTURE MAP
after Darton (1922)
& Maxwell (1976)
Explanation
Fault
Anticline
Dike
Syncline
Strike and dip of bedding
N
McCartys Syncline
Hickman Fault
Red Lake Fault
Puertecito
Hells Mesa Fault
Riley
Pie Town
Scale 1:500,000
Datil
Magdalena

Figure 3

Quadrangles of Datil Mountain Coal Field

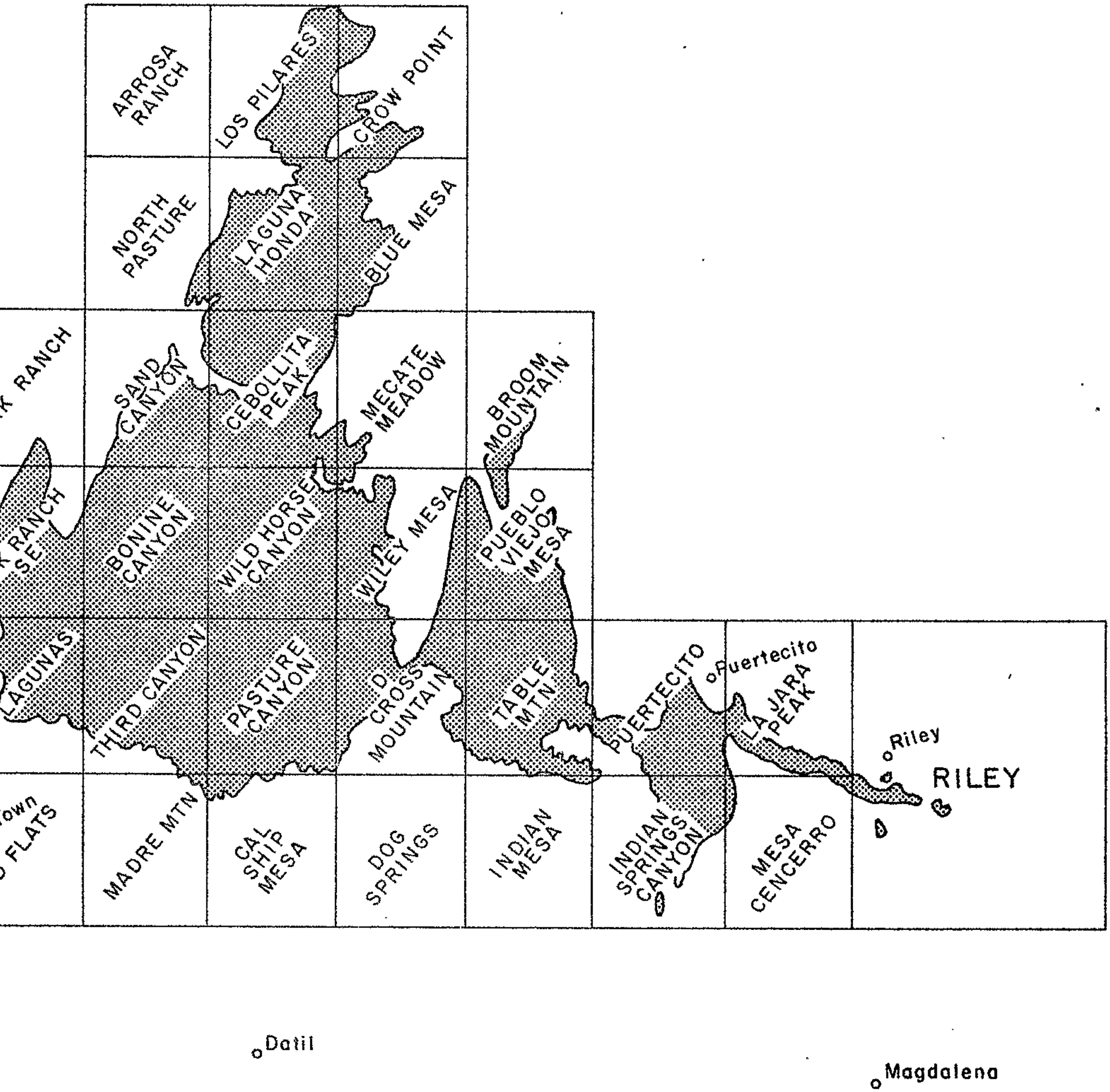


FIGURE 4

Riley, south of Puertecito, and in the Indian Springs Canyon area. These coal beds range in thickness on the outcrop from a few inches to 5 ft and occur in the Dilco Coal Member of the Crevasse Canyon. The beds are not laterally continuous and change in thickness abruptly (Chapin and others, 1979). Two holes were drilled by the Bureau in this area, D-1 and D-3 (fig. 5). D-1 contains 7.9 ft of coal and bottoms in the Gallup Sandstone at 99.5 ft. Within an 11-ft interval, 4.4 ft of coal is distributed in 3 thin seams, the lowest of which is 11.8 ft above the top of the Gallup. The average seam thickness in D-1 is 1.3 ft, with a range of 0.9 to 2.2 ft. In D-3, 8.7 ft of coal is found in drilling 73 ft from the surface to the Gallup. Within an interval of 21 ft, 13 to 34 ft above the Gallup, 6.9 ft of coal occurs as 3 seams. These beds have an average thickness of 2.3 ft and a range of 1.6-4 ft.

Coal in the west-central part of the field, west of the Red Lake fault, is best exposed in the Onion Springs area on the Wild Horse Canyon quadrangle (Winchester, unpublished field notes). In this area coal beds 2-5 ft thick can be traced at least 2 mi along the canyon sides. Holes D-4 and D-5 were drilled near this area. In D-4 the coal is all within 66 ft of the surface and consists of a total of 6.5 ft of coal, which occurs as 2 seams ranging from 2.2 to 4.3 ft. D-5 did not penetrate any coal beds in drilling 196 ft of Crevasse Canyon strata to the top of the Gallup sandstone.

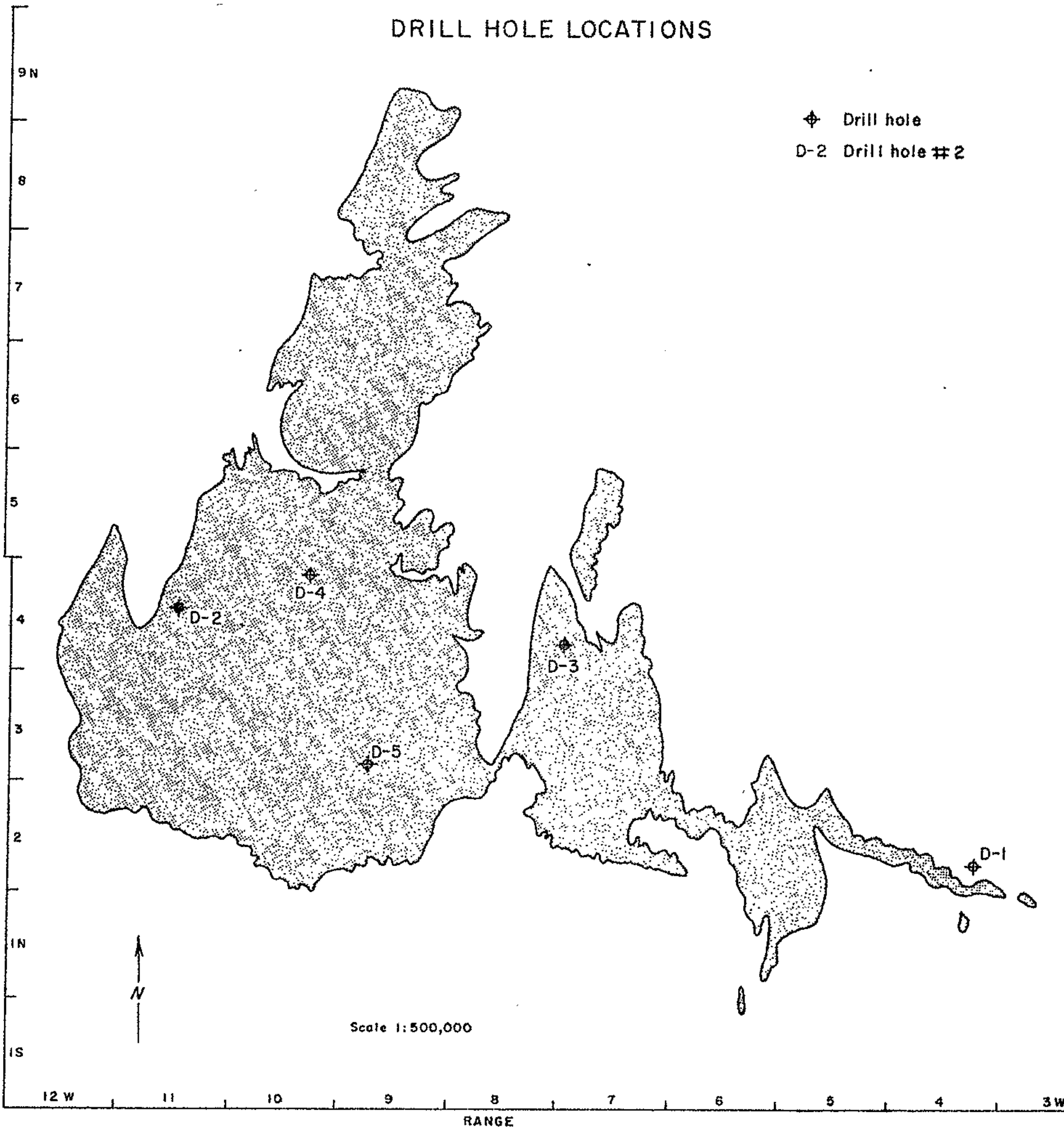

DRILL HOLE LOCATIONS
Drill hole
D-2 Drill hole #2
D-1
D-2
D-3
D-4
D-5
N
Scale 1:500,000
TOWNSHIP
9 N
8
7
6
5
4
3
2
1 N
1 S
12 W
11
10
9
8
7
6
5
4
3 W
RANGE

Figure 5

The coal in the far western part of the field is generally not exposed. Drill hole D-2 is the only hole drilled in this area. This hole contains 3.1 ft of coal distributed over a 19 ft interval. The 2 seams are 1.0 and 2.1 ft thick. The lowest coal is 71 ft above the top of the Gallup.

Maxwell (1976a) reported thin coals (less than 2 ft) outcropping in the northern part of the field. The upper member of the Crevasse Canyon Formation, the Gibson Member, is covered by landslide or talus deposits, from the basalt capping Cebolleta Mesa and is not believed to contain thick coals. No drilling has been reported in this portion of the Datil Mountain field.

Our preliminary program indicates that mineable coals do occur in the Dilco Member of the Crevasse Canyon Formation. More detailed mapping and drilling is needed to define coal occurrences throughout the field. The areas mentioned above would serve as good target areas for further resource evaluation.

COAL PROSPECTS AND MINES

A number of small underground coal mines have operated in this field. The coal produced was probably used for local heating and may have been used by the smelters in Magdalena. A description of what is known about mines and prospects in the coal field follows.

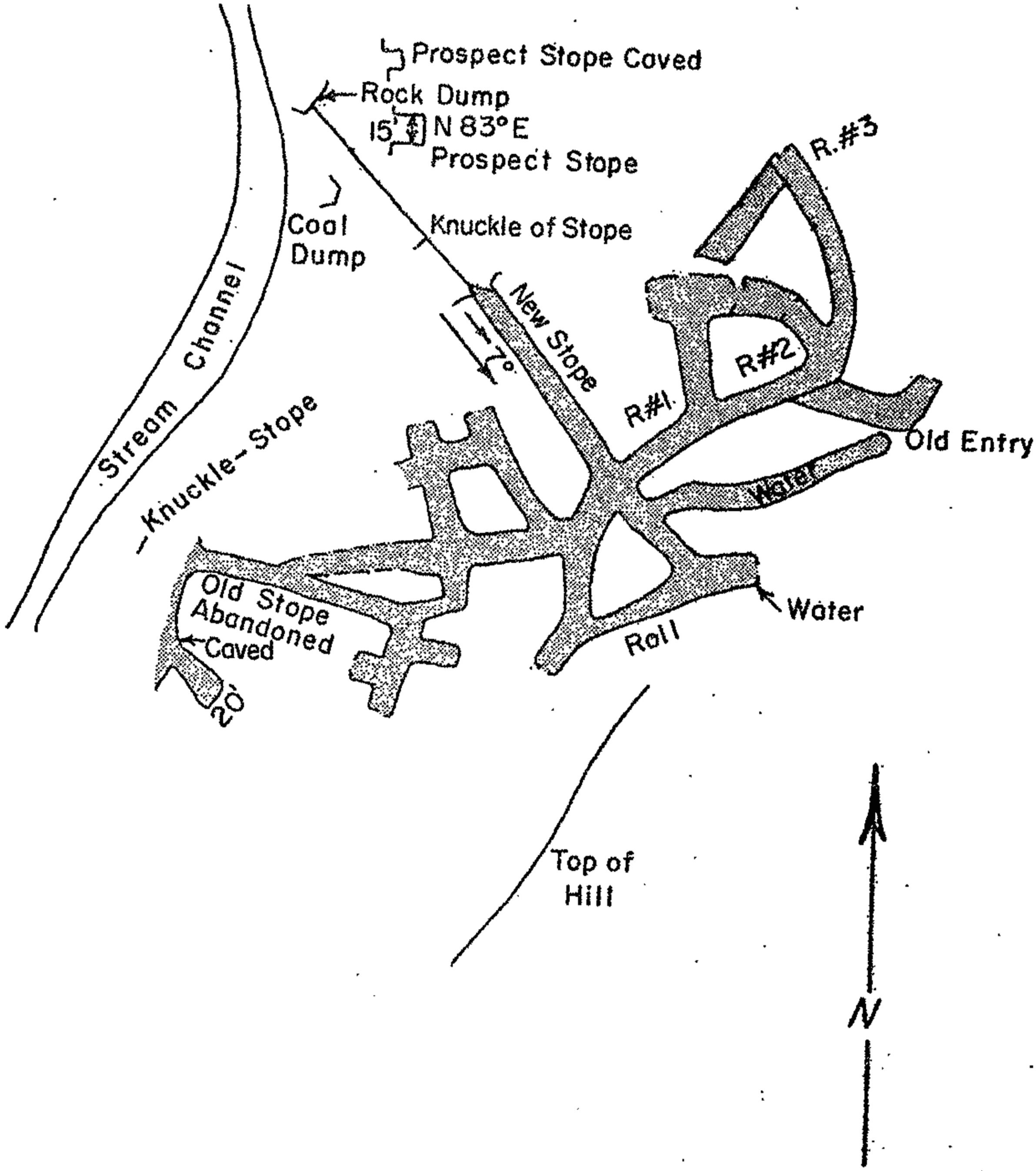
A mine was reported by D.E. Winchester in the Puertecito quadrangle. The prospect was located in sec. 8, T.2 N., R.6 W. on a 4-5-ft bed of coal. Recent field work has failed to locate this prospect.

The Raney Prospect is located in Coal Canyon, sec. 18, T.4 N., R.1 W. in the Wild Horse quadrangle. This mine was reported to be on a 5-ft bed of hard, bright coal. The mine was in trespass on federal coal land and was closed by the U.S.G.S. in 1946 (Nickelson and Frost, in preparation). Field work has located the collapsed portal of this mine. Production records indicate 43 tons of coal were mined.

A small unnamed mine operated in sec. 26 and 27, T.2 N., R.4 W., southwest of Riley. The largest part of the workings is an adit in sec. 26 on a 4-ft, 8-inch seam. No records are available on this mine.

The El Cerro mine, southwest of Riley (S½, sec. 33, T.2 N., R.4 W.) operated intermittently from 1917 to 1940. The coal mined was from 21 to 27 inches thick. This property produced 788 tons, according to federal records (Nickelson and Frost, in preparation). Fig. 6 shows the works of this mine.

The Hot Spots mine (NW¼, sec. 18, T.1 N., R.5 W.) produced 85 tons of coal between 1927 and 1931 (Nickelson and Frost, in preparation). The coal seam was 46 inches thick. The coals here grade laterally into silty shale and sandstone (Mayerson, 1979).



EL CERRO MINE

Figure 6

COAL ANALYSES

The analyses given in this report are from core samples. Moisture ranges from 0.61 to 4.09 percent, with an average of 2.17 percent. This low moisture is probably due to drying during the delay between sample collection and analysis. The rank of the coal based on heating value is high-volatile A bituminous (ASTM, 1967). The range of heating value for these coals is 11,725 to 12,646 Btu per pound, with an average of 12,157 Btu per pound.

The ash content is present as discrete partings or material intimately mingled with the coal itself. The samples contain 8.85 to 16.36 percent ash, averaging 12.75 percent.

Sulfur content ranges between 0.51 and 2.75 percent and averages 1.19 percent. The high value is due to a visible pyrite content in D-1. Volatile matter ranges between 35.78 and 41.29 percent and averages 38.50 percent; fixed carbon ranges between 42.30 and 47.58 percent with an average of 45.61 percent. Table 1 lists the results of the analyses on samples from the project.

Table 1. Analyses of coal drill cores

Core Footage	Proximate Analysis*				Ultimate Analysis*				
	Moisture	Ash	Volatile Matter	Fixed Carbon	Carbon	Hydrogen	Nitrogen	Sulfur	BTU
D1 - 8082 + 8385	0.61	16.03	35.78	47.58	66.85	4.95	1.24	2.75	12,238
D2 - 4447	1.44	16.36	39.90	42.30	65.54	5.07	1.34	0.81	11,725
D3 - 6267	2.52	9.65	41.03	46.80	70.14	5.39	1.30	0.60	12,646
D4 - 810 + 6669	4.09	8.85	41.29	45.77	68.47	4.99	1.35	0.51	12,017

Forms of Sulfur*

	Total	Pyritic	Organic	Sulfate
D1	2.75	2.02	0.72	0.01
D2	0.91	0.28	0.58	0.01
D3	0.69	0.05	0.64	0.00
D4	0.51	0.04	0.45	0.02

*as received basis; values in percent except for Btu

Example: D1 - 8082 + 8385 Drill hole #1 - 80 ft to 82 ft + 83 ft to 85 ft

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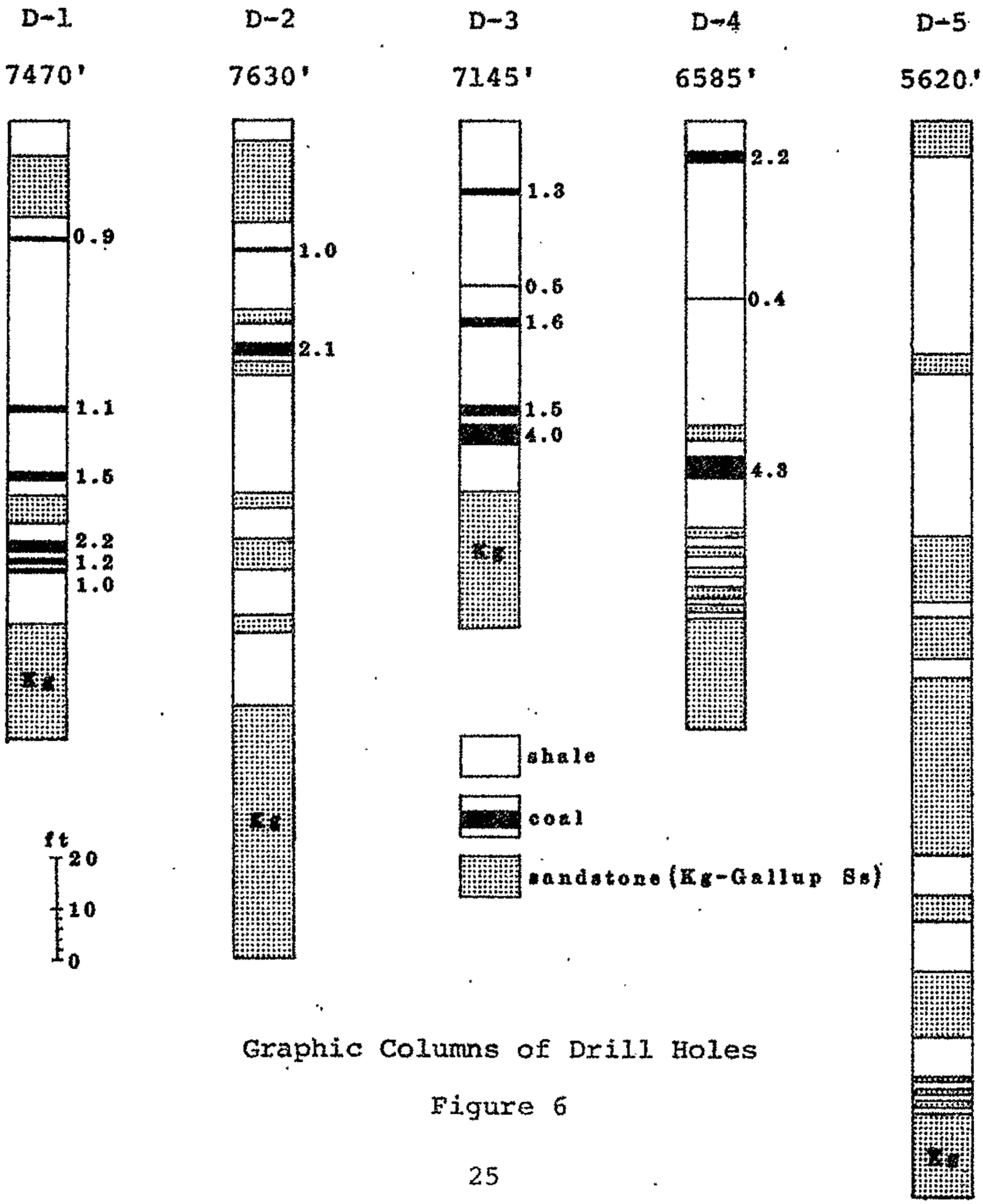
APPENDIX I

Location and Graphic Columns of Drill Holes

Location of Drill Holes

Hole Number		Ground Level
D-1	NE¼SW¼ sec. 26, T. 2 N., R. 4 W.	5620
D-2	SW¼SW¼ sec. 15, T. 4 N., R. 11 W.	7470
D-3	NE¼NE¼ sec. 30, T. 4 N., R. 7 W.	6585
D-4	NE¼NW¼ sec. 2, T. 4 N., R. 10 W.	7630
D-5	NW¼SE¼ sec. 29, T. 3 N., R. 9 W.	7145

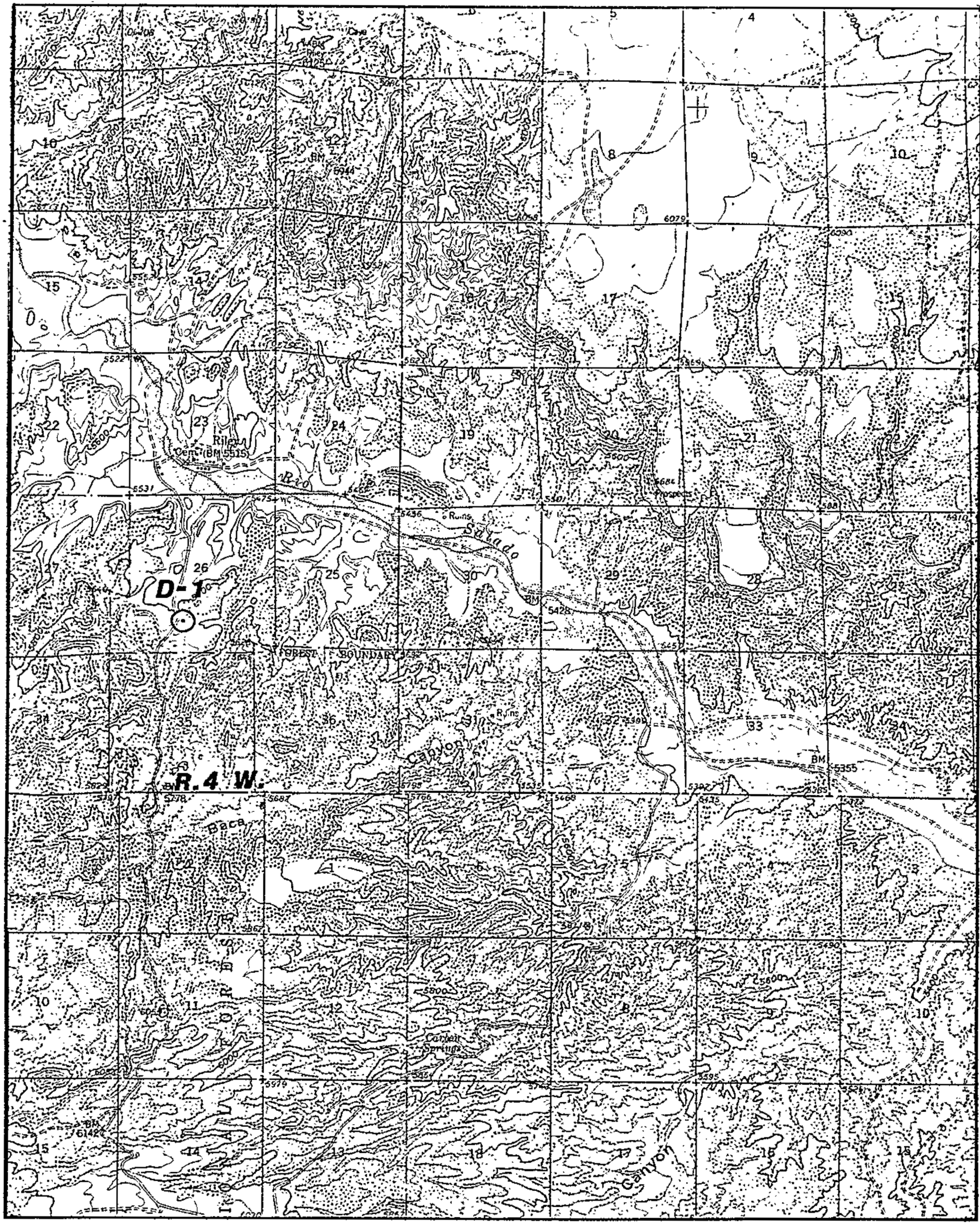


Graphic Columns of Drill Holes

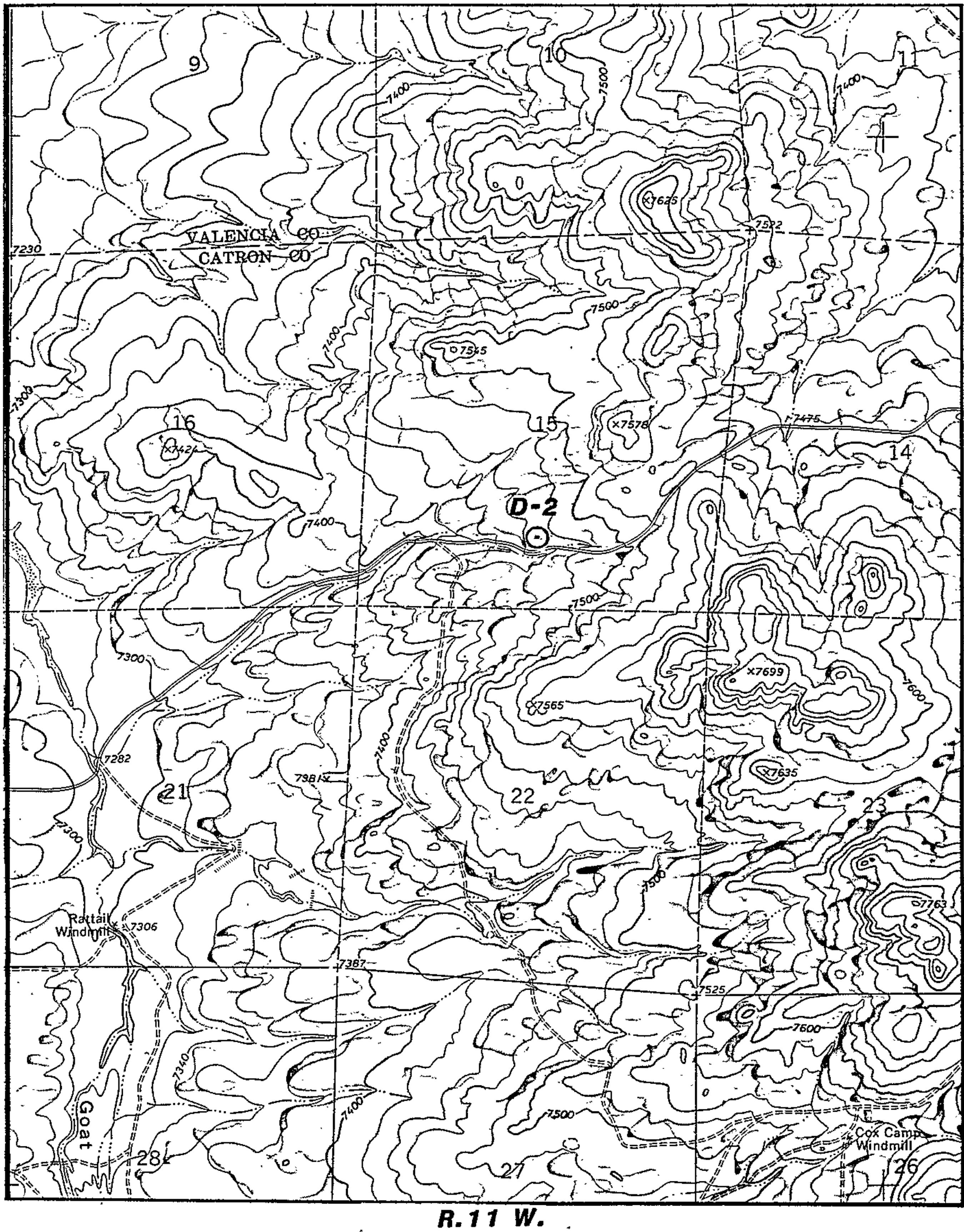
Figure 6

APPENDIX II

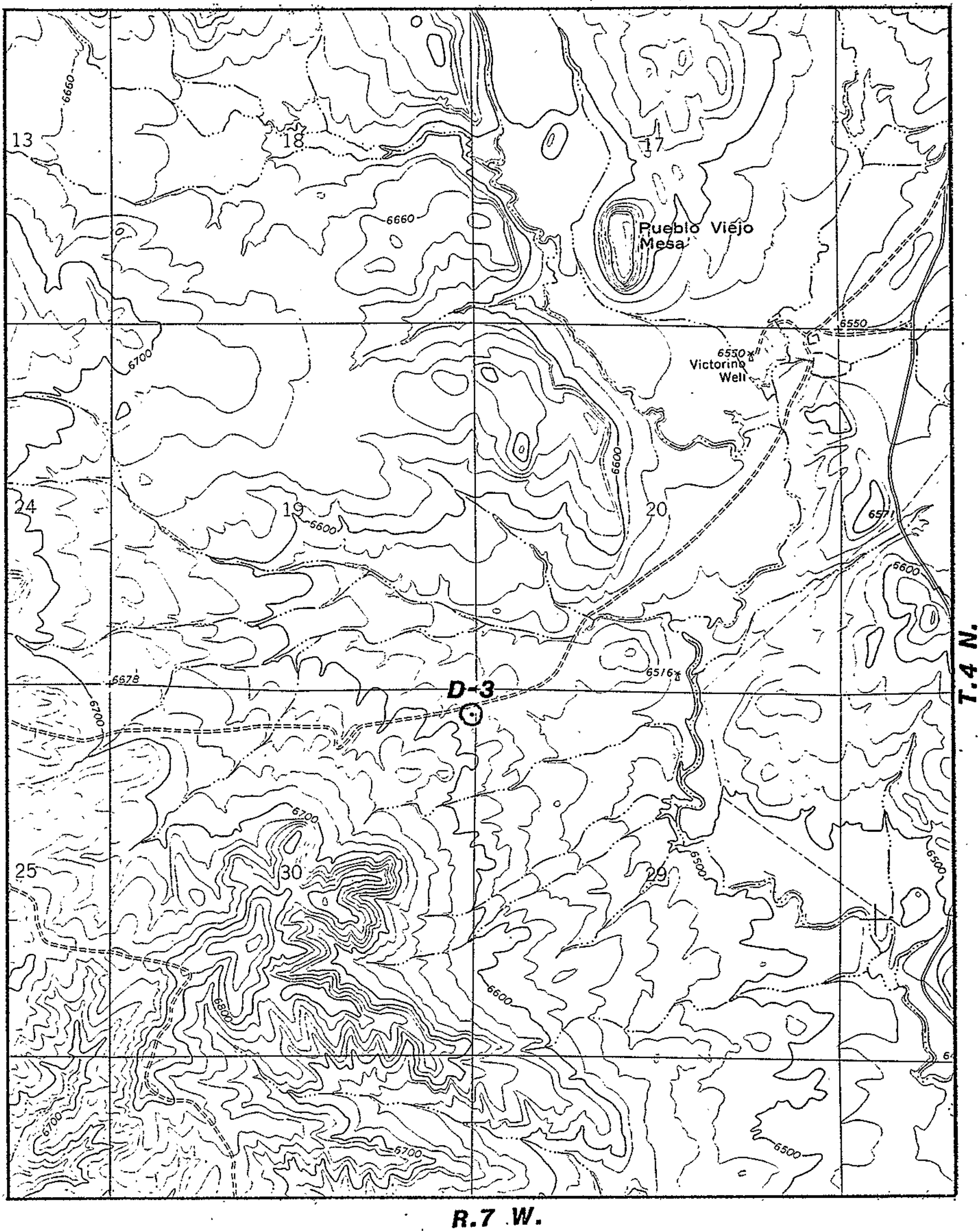
Maps of Drill Hole Locations



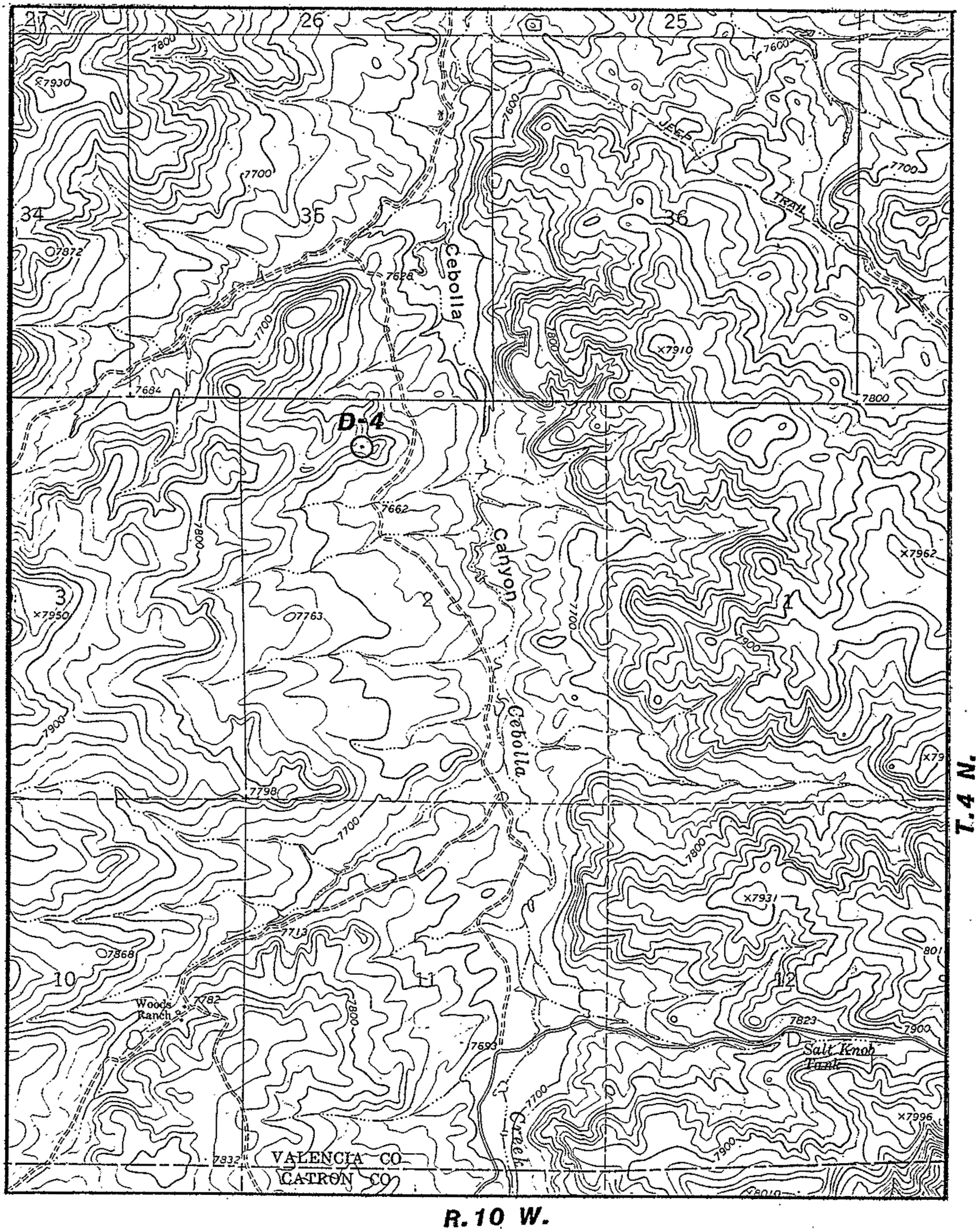
RILEY QUADRANGLE



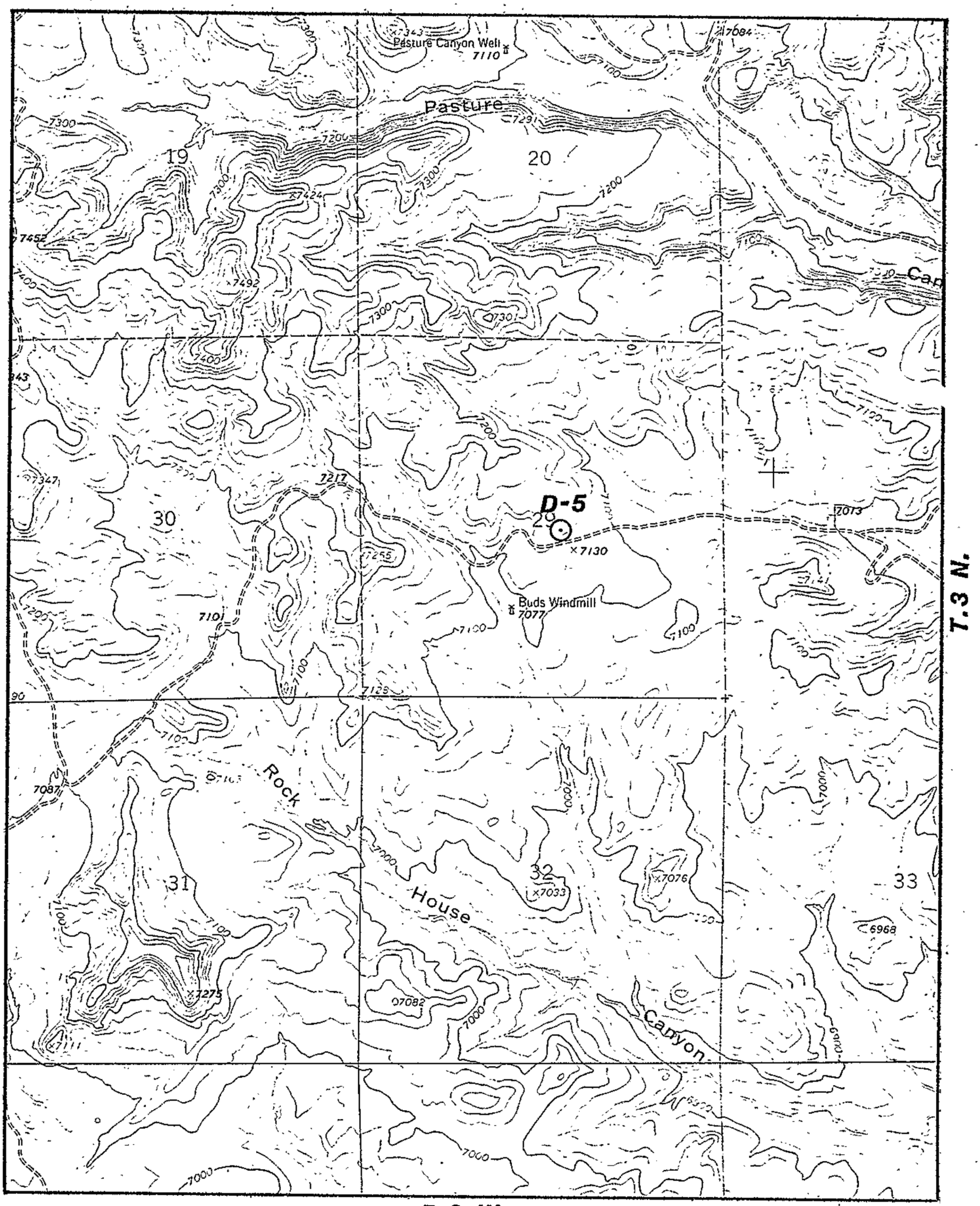
BONINE CANYON QUADRANGLE



PUEBLO VIEJO MESA QUADRANGLE



WILD HORSE CANYON QUADRANGLE



R.9 W.

PASTURE CANYON QUADRANGLE

APPENDIX III

Description of Cuttings and Cores

Drilling Sample Log D-1

NE¼SW¼ sec. 26, T. 2 N., R. 4 W.

Footage	Rock Type	Coal Thickness
0'-6'	Shale, gray-brown to dark gray	
6'-9'	Siltstone, reddish-brown, clayey, well-cemented	
9'-10'	Sandstone, fossiliferous, calcareous	
10'-16'	Sandstone, yellow, fine-grained	
16'-20'	Shale, grayish-brown, carbonaceous	
20'-20.3'	COAL	0.3'
20.3'-22.5'	Shale, brown, carbonaceous	
22.5'-25'	Sandstone, yellow, very fine to fine-grained	
25'-26'	Shale, brown, carbonaceous, sandy, contains gypsum	
26'-27'	Sandstone, brown shaly	
27'-31'	Shale, gray-brown, carbonaceous	
31'-33'	Shale, dark-brown, coaly	
33'-34'	Sandstone, yellow, fine-grained, carbonaceous at top	
34'-40.5'	Shale, gray, sandy at base, contains gypsum	
40.5'-41'	Sandstone, yellow, fine-grained	
41'-42'	Shale, gray	
42'-44'	Sandstone, gray, fine-grained, well-cemented	
44'-45'	Shale, dark-brown, coaly	
45'-47'	Shale, gray, silty	
47'-47.5'	Shale, brown, coaly	
47.5'-54'	Shale, gray, silty	
54'-54.5'	COAL	0.5'
54.5'-57'	Shale, brown, carbonaceous	
57'-61.5'	Shale, gray, carbonaceous	

Footage	Rock Type	Coal Thickness
61.5'-66.5'	Sandstone, gray, silty	
66.5'-68.5'	COAL	2.0'
68.5'-69'	Shale, dark gray-black, carbonaceous	
69'-71.5'	Sandstone, gray, fine-grained, contains clay chips	
71.5'-72'	Shale, gray, sandy	
72'-73'	Siltstone, dark-gray	
73'-75'	Sandstone, light-gray, fine-grained, well-cemented	
75'-77'	Siltstone, gray, carbonaceous, shaly	
77'-81'	Shale, dark gray, silty	
81'-83.5'	COAL	2.5', damp
83.5'-84	Shale, dark, brown, coaly	
84'-85.5'	COAL	1.5'
85.5'-86'	Shale, brown, coaly	
86'-87'	COAL, shaly	1.0'
87'-88'	Shale, brown, coaly, silty	
88'-92'	Shale, dark-gray-black, carbonaceous	
92'-92.5'	Shale, black, coaly	
92.5'-94	COAL, shaly	1.5'
94'-96.5'	Shale, dark gray-black, coaly	
96.5'-119'	Sandstone, gray, well-cemented, making water	
119'-122'	Sandstone, gray, softer, shaly	

T. D.

Drill Sample Log D-2

SE¼SW¼ sec. 15, T. 4 N., R. 11 W.

Footage	Rock Type	Coal Thickness
0'-4'	Alluvium, gray to brown	
4'-9'	Sandstone, yellow-gray, weathered	
9'-18'	Sandstone, white-gray, well-sorted, fine-grained, thin-bedded, mica	
18'-24.5'	Shale, yellow-gray, mica	
24.5'-24.6'	COAL, black, bright	0.1
24.6'-36'	Shale, black-brown, less carbonaceous towards base	
36'-41.5'	Sandstone, white-gray, fine-grained, poor sorting, interbedded clay	
41.5'-43'	Shale, black-gray	
43'-44'	Sandstone, gray-brown, thin bedded, poorly sorted	
44'-46.1'	COAL, black, shale partings	2.1
46.1'-46.7'	Sandstone, gray, poor sorting	
46.7'-47'	Shale, brown-black	
47'-50'	Sandstone, gray, thin-bedded, fine-grained	
50'-54'	Shale, gray	
54'-58'	Sandstone, gray-black, thin-bedded, fine-grained, pyrite	
58'-74'	Shale, gray-black, banded	
74'-77'	Sandstone, gray-black, calcite	
77'-82'	Shale, gray-black, thin , 1", coal interbedded	
82'-89'	Sandstone, black, interbedded shale	
89'-92'	Sandstone, white-gray, thin-bedded, shale, gray, interbedded	

Footage	Rock Type	Coal Thickness
92'-94'	Shale, gray-black, thin coal, block	
94'-98'	Sandstone, white-gray, thin-bedded, fine-grained, thin coal ¼"-2"	
98'-113'	Shale, gray, thin coal ¼"	
113'-113.5'	COAL, black	0.5
113.5'-115'	Sandstone, white-gray, fine-grained, well-sorted	
115'-118'	Shale, black, carbonaceous -thin coals ½"-1"	
118'-126'	Sandstone, gray-black, fine-grained, poorly sorted	
126'-139'	Sandstone, gray, fine-grained, well-sorted	
139'-150'	Sandstone, gray, H_2O - 5-10 gal per min.	
150'-165'	Sandstone, gray, vuggy, lost circulation	
T. D.		

Drill Sample Log D-3

NE¼NE¼ sec. 30, T. 7 N., R. 4 W.

Footage	Rock Type	Coal Thickness
0'-5'	Alluvium, shale, gray-black, carbonaceous	
5'-10'	Shale, gray-black	
10'-13½'	Shale, black, carbonaceous	
13½'-15'	COAL, black, bright, good cleavage	1.5
15'-33'	Shale, gray-brown	
33'-33½'	Siltstone interbedded sandstone, yellow-brown, thin-bedded	
33½'-41½'	Sandstone, white-brown, fine-grained, well-sorted	
41½'-43'	COAL, black, bright	1.5
43'-57'	Shale, gray-black	
57'-58.5'	COAL, black	1.5
58.5'-60.6'	Shale, gray-black	
60.5'-64.5'	COAL, black	4.5
64.5'-75'	Shale, gray-black	
75'-79'	Sandstone, brown-white, fine-grained	
79'-100'	Sandstone interbedded shale, yellow-brown, fine-grained	

T. D.

Drill Sample Log D-4

NE¼SW¼ sec. 2, T. 4 N., R. 10 W.

Footage	Rock Type	Coal Thickness
0-4	Shale, gray	
4-6.5	Sandstone	
6.5-7.5	Sandstone, tan, coal fragments	
7.5-8.5	COAL	1.0
8.5-20	Shale, gray	
20-25	Shale, gray	
25-30	Shale, gray-green	
30-33.5	Shale, carbonaceous	
33.5-37	Shale, platy, dark-gray	
37-37.5	COAL	0.5
37.5-40	Shale, carbonaceous	
40-54	Shale, dark green, 2'3" sandstone partings, clay partings	
54-60	Shale, dark-gray	
60-63	Sandstone, light-gray	
63-64.5	Sandstone, very hard	
64.5-67	Sandstone, very hard with shale partings	
67-69	Shale, dark gray with stringers sandstone and coal	
69-73.5	COAL	4.5
73.5-74	Shale, dark-brown	
74-75	Sandstone, tan	
75-80	Sandstone, light-gray, some shale partings	

Footage	Rock Type	Coal Thickness
80-91	Shale, dark-gray, sandstone, siltstone	
91-97	Sandstone, thin, gray, and shale beds	
97-108	Sandstone, light gray, fine-grained	
108-111	Shale, dark gray-green, well-indurated	
111-120	Sandstone, light-gray marine	
T. D.		

Drill Sample Log D-5

NW¼SE¼ sec. 29, T. 3 N., R. 9 W.

Footage	Rock Type	Coal Thickness
0-7	Sandstone, greenish-tan, fine-grained, cementation increases with depth	
7-7.5	Shale, brown	
7.5-11	Sandstone, fine-grained, gray, well-indurated, shale partings	
11-16.5	Shale, tan yellow	
16.5-18.5	COAL and carbonaceous shale (moist)	2.0
18.5-25	Shale, soft, yellow green	
25-31.5	Shale, soft, dark-green (moist)	
31.5-33	Shale, light-brown, organic fragments	
33-34	Yellow-brown silt	
34-34.5	Shale, carbonaceous	
34.5-36	COAL	1.5
36-38	Shale, carbonaceous	
38-44	Shale, dark-gray, with organics	
44-45	COAL	1.0
45-47	Shale, carbonaceous	
47-50.5	Sandstone, well-indurated, very fine-grained, light-gray	
50.5-51.5	Shale, dark-gray	
51.5-52	Shale, carbonaceous	
52-53	COAL	1.0
53-57	Shale, gray	
57-61	Shale, carbonaceous	
61-65	Shale, dark-gray, soft	

Footage	Rock Type	Coal Thickness
65.-66.5	Shale, gray	
66.5-67.5	COAL	1.0
67.5-68.5	Shale, gray	
68.5-83	Shale, dark-gray	
83-86	Siltstone, gray	
86-87	Sandstone, light-gray	
87-90	Siltstone, dark-gray, alternating with sandstone	
90-91	Sandstone	
91-92	Sandstone, medium-grained, brown	
92-93	Siltstone, gray	
93-94	Sandstone, gray, fine-grained, pyrite	
94-94.5	Siltstone, dark-gray	
94.5-98	Sandstone, laminated, gray-green, fine-grained, moist	
98-100	Shale, dark-gray	
100-107	Sandstone, gray-green, fine-grained, moist, weakly laminated	
107-108	Shale, carbonaceous	
108-114	Shale, gray	
114-115	Sandstone, gray-green, fine-grained, moist	
115-120	Shale, gray	
120-122	Sandstone, gray-green	
122-123	Sandstone, coarse, wet	
123-145	Sandstone, gray, water 129.5	
145-147	Sandstone, gray, with coal fragments	
147-148	Sandstone, dark-gray, fine-grained	
148-155	Shale, dark-gray	

Footage	Rock Type	Coal Thickness
155-160	Siltstone, gray	
160-171	Shale, dark-gray	
171-185	Sandstone, gray-green, fine-grained, coal fragments	
184-190	Shale, dark-gray	
190-196.5	Shale, dark-gray, sandstone lenses	
196.5-212	Sandstone, gray-green, fine-grained	

T. D.

Core Description, Drill Hole D1

sec. 26, T.2N., R.4W.
(interval cored 79.5' - 97')

Footage	Rock Type
79.5 - 80.3	Siltstone, medium dark gray (N4), carbonaceous, with sandy flaser bedding, coaly and pyritic at base
80.3 - 81.8	COAL, black (N1), thin to medium moderate banding
81.8 - 81.9	Shale, yellowish gray (5Y 7/2), coaly, very pyritic
81.9 - 82.0	COAL, black (N1), medium, moderate banding
82.0 - 82.1	COAL, black (N1), bony; nodules of pyrite
82.1 - 82.3	COAL, black (N1), pyritic at base
82.3 - 83.3	Shale, dark gray (N3), carbonaceous, poorly laminated, bioturbated
83.3 - 84.5	COAL, black (N1), thin sparse to moderate banding, pyrite grains along bedding planes
84.5 - 85.6	Shale, dark gray (N3), carbonaceous, coaly, shows root tubes or bioturbation
85.6 - 86.0	COAL, black (N1), thin banded
86.0 - 88.0	Shale, olive gray (5Y 4/1)
88.0 - 91.7	Shale, dark gray (N3) to medium dark gray (N4), silty, upper part shows bioturbation, lower part has carbonaceous trash and leaf impressions
91.7 - 92.4	Shale, grayish black (N2), very carbonaceous, with abundant carbonaceous trash and leaf impressions
92.4 - 92.5	COAL, black (N1), thin banding, with sparse pyrite cubes
92.5 - 94.9	Shale, olive black (5Y 2/1), poorly laminated, bioturbated, carbonaceous and pyritic
94.9 - 95.6	Sandstone, light gray (N7), very fine to fine grained, interlaminated with siltstone, medium dark gray (N4)

Footage	Rock Type
95.6 - 96.6	Sandstone, light gray (N7), fine to very fine grained, non-calcareous, with a few carbonaceous laminae
96.6 - 97.0	Siltstone, medium light gray (N6), with interlaminated sand

Core Description, Drill Hole D2

sec. 15, T.4N., R.11W.
(interval cored 40' - 49')

Footage	Rock Type
40 - 41.7	Shale, medium gray (N5), carbonaceous, silty
41.7 - 43.0	Siltstone, light gray (N7), with carbonaceous laminae and thin calcite filled fractures
43.0 - 44.2	Shale, brownish-black (5YR 2/1), very carbonaceous, biotrubated - shows slickensides
44.2 - 44.5	COAL, black (N1), shaly, contains small pyrite crystals on bedding planes
44.5 - 46.5	COAL, black (N1), bright, thin to medium moderate banding, contains a few pyrite crystals
46.5 - 46.8	Shale, brownish-black (5YR 2/1), very carbonaceous, coaly
46.8 - 47.2	COAL, black (N1), bright, banded
47.2 - 47.8	Shale, brownish-black (5YR 2/1), very carbonaceous, coaly, bioturbated; contains abundant pyrite
47.8 - 48.7	Shale, medium gray (N5), silty, slightly carbonaceous
48.7 - 49.0	Core lost

Core Description, Drill Hole D3

sec. 30, T.4N., R.7W.
(interval cored 12' - 67')

Footage	Rock Type
0-12	Not cored
12-21.5	Shale, light gray, silty shale (5Y 6/1), light tan, micaceous, carbonaceous, coaly root tubes with iron staining on edge: carbonaceous shale, (N5), medium gray, near base: entire sequence broken up during retrieval, approximately 65% recovered
21.5-23.6	Silt (5Y 5/6), micaeous, well indurated
23.6-24.0	Shale (5Y 4/1), olive gray, calcite inclusions, possible pelecypod impression
24.0-26.6	Shale (N5), medium gray, carbonaceous
26.6-29.1	Shale, silty, light olive brown (5Y 5/6), micaeous
29.1-31.6	Shale (N4), light gray, clay clasts, interval 21.5 - 31.6 (90% complete)
32.0-40.5	Sandstone, silty (5Y 6/1), light olive gray, coal fragments, micaeous, iron staining along fractures, coarsening downward, carbonaceous shale partings
40.5-41.6	Shale (N5), light gray, coaly inclusions, iron staining along fractures, well indurated, CaC03 inclusions
41.6-47.7	Carbonaceous shale
41.7-41.8	Shale (N3), carbonized plant remains
41.8-42.4	COAL, black, crumbled, pyrite along cleats
42.4-44.0	Shale, brownish-black (5YR 2/1), very carbonaceous, coaly at top, bioturbated (coaly root tubes, and slickensides)
44.0-49.7	Shale, medium dark gray (N4-5), carbonaceous, bioturbated (coaly rootlets)
49.7-50.4	Siltstone, light gray (N7) with interlaminated shale
50.4-52	Shale, medium gray (N5), carbonaceous

Footage	Rock Type
52-61	Shale (N5), medium gray, only 3' present, mostly crumbled high clay content: 30% recovered
61-62	Shale, gray (N6), silty, carbonized plant material, laminations of carbonaceous shale, frequency of carbonized plant material increases towards bottom
62-66.9	COAL: all sampled
66.9-67.0	Sandstone (N3), carbonaceous stringers

Core Description, Drill Hole D4

sec. 2, T.4N., R.10W.
(intervals cored 8.5' - 10' and 66.5' - 75.5')

Footage	Rock Type
8.5 - 9.8	COAL, black (N1), bright, highly fractured
9.8 - 10.0	Shale, brownish-gray(5YR 4/1) to brownish-black (5YR 2/1), very carbonaceous
END RUN I	
START RUN II	
66.5 - 70.5	COAL, black(N1), bright, banded, highly fractured; recovery not very good (66%)
70.5 - 73.0	Shale, medium light gray (N6) to dark gray (N3), darker where more carbonaceous; poor recovery (25%)
73.0 - 75.5	Siltstone, greenish gray (5G 6/1), shaley with some very fine sand and dark carbonaceous laminae
END RUN II	

APPENDIX V

Geophysical Logs

CENTURY GEOPHYSICAL CORP
6650 EAST APACHE
TULSA, OKLAHOMA 74115

C-366-E SP 11748B

DATE 2/8/79

COMPANY	N MEX. BUREAU of MINES
BORE HOLE	D-1
AREA	DATIL-RILEY
COUNTY	SOCORRO
STATE	N. Mex.
SECTION	
TOWNSHIP	
RANGE	
LOG MEASURED FROM	Ground Level

HOLE NO	D-1
SEC	26
TWP	2N
RANGE	4W
AREA	DATIL-RILEY
COUNTY	SOCORRO
STATE	N. Mex.
COMPANY	N.M. BUREAU
DATE	2/8/78
TOTAL FOOTAGE LOGGED	122'

T D DRILLED	122'
BIT SIZE	4.5 In
CASING	YES
BORE HOLE FLUID	H_2O
DENSITY	
VISCOSITY	
RESISTIVITY	
OPERATOR	D.R. BUSCH
UNIT NO	7727
LOCATION	Grants
DRIVE	8.0 Hrs
TIME IN	1300
STAND BY	0 Hrs
TIME OUT	1412
LOGGING	1.2 Hrs
TOTAL	9.2 Hrs
ROUNDTRIP MILEAGE	282 Mile
CHARGEABLE STANDBY	0 Hrs

INITIAL RUN	
T D LOGGED	122'
GAMMA SCALE	500 - 50 Cps Per In
TIME CONSTANT	1
LOGGING SPEED	20 Ft/Min
CALIBRATION & PROBE DATA	
SOURCE NO	VL-95
SOURCE VALUE	25 mCi
PROBE NO	8030A-308
PROBE SIZE	1 7/8 In
DETECTOR	NaI Xtal
TYPE & SIZE	1/8 x 1 1/4"
DEAD TIME	2 μs
K FACTOR	1.59×10^{-5}
WATER FACTOR	1.13
AIR FACTOR	1.0
RES SCALE	25 ohms per 5 inches
SP	Mv/In

DENSITY ~~GAMMA RERUNS~~ (Initial run offscale)

SCALE	250K=25K Per In	500K=50K Cps Per In	= Cps Per In
T C	1 Sec	1 Sec	Sec
LOGGING SPEED	20 Ft/Min	20 Ft/Min	Ft/Min
FROM	122 Ft	75 Ft	Ft
TO	75 Ft	0 Ft	Ft
TOTAL	47'	75'	

P.O. # 18724

SELF POTENTIAL

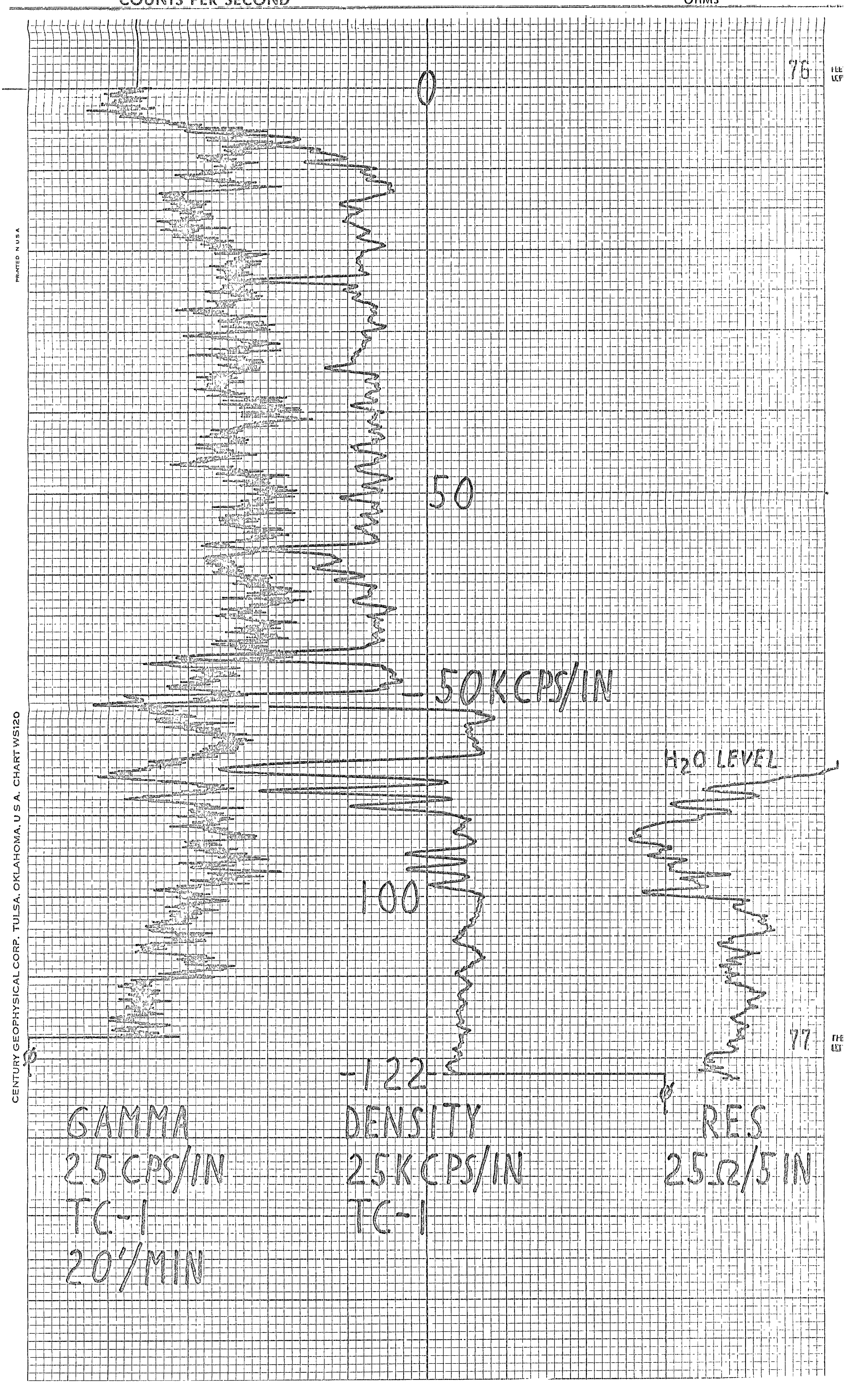
\- MV +

NATURAL GAMMA RAY COUNTS PER SECOND

DENSITY

RESISTANCE OHMS

CT-112



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CENTURY GEOPHYSICAL CORP. TULSA, OKLAHOMA, U.S.A. CHART WS120

CENTURY GEOPHYSICAL CORP.
6650 EAST APACHE
TULSA, OKLAHOMA 74115

C-366-E SP 117488

DATE	3/9/79
COMPANY	NEW MEXICO BUREAU OF MINES
BORE HOLE	D-2
AREA	KING RANCH
COUNTY	CATRON
STATE	NEW MEXICO
SECTION	15
TOWNSHIP	4N
RANGE	11W
LOG MEASURED FROM	G.L.

HOLE NO	D-2
SEC	15
TWP	4N
RANGE	11W
AREA	KING RANCH
COUNTY	CATRON
STATE	NEW MEXICO
COMPANY	N.M.B. OF MINES
DATE	3/9/79
TOTAL FOOTAGE LOGGED	163'
T D DRILLED	165' Ft
BIT SIZE	4 1/2 In
CASING	
BORE HOLE FLUID	H2O @ 119'
DENSITY	
VISCOSITY	
RESISTIVITY	
OPERATOR	TROTTER
UNIT NO	7727
LOCATION	GRANTS
DRIVE	3.5 Hrs
TIME IN	1045
STAND BY	— Hrs
TIME OUT	1130
LOGGING	0.75 Hrs
TOTAL	4.25 Hrs
ROUNDTRIP MILEAGE	112 Miles
CHARGEABLE STANDBY	Hrs

INITIAL RUN

T D LOGGED	163'
GAMMA SCALE	500 - 50 Cps Per In
TIME CONSTANT	2
LOGGING SPEED	20 Ft/Min
CALIBRATION & PROBE DATA	
SOURCE NO	VL-95
SOURCE VALUE	25mCy Ce137
PROBE NO	8030-108
PROBE SIZE	1 7/8 In
DETECTOR	SCIN XTAL
TYPE & SIZE	7/8 x 1 1/4
DEAD TIME	<1μSEC.
K FACTOR	1.59 x 10⁻⁵
WATER FACTOR	1.12
AIR FACTOR	1.00
RES SCALE	50 ohms per 5 inches
S P	— Mv/In

GAMMA RERUNS (Initial run offscale)

SCALE	SCALE	SCALE
Cps Per In	Cps Per In	Cps Per In
T C Sec / LOGGING SPEED Ft/Min	T C Sec / LOGGING SPEED Ft/Min	T C Sec. / LOGGING SPEED Ft/Min
FROM Ft	FROM Ft	FROM Ft
TO Ft	TO Ft	TO Ft
TOTAL	TOTAL	TOTAL

ANALOG — GAMMA, DENSITY, RES.

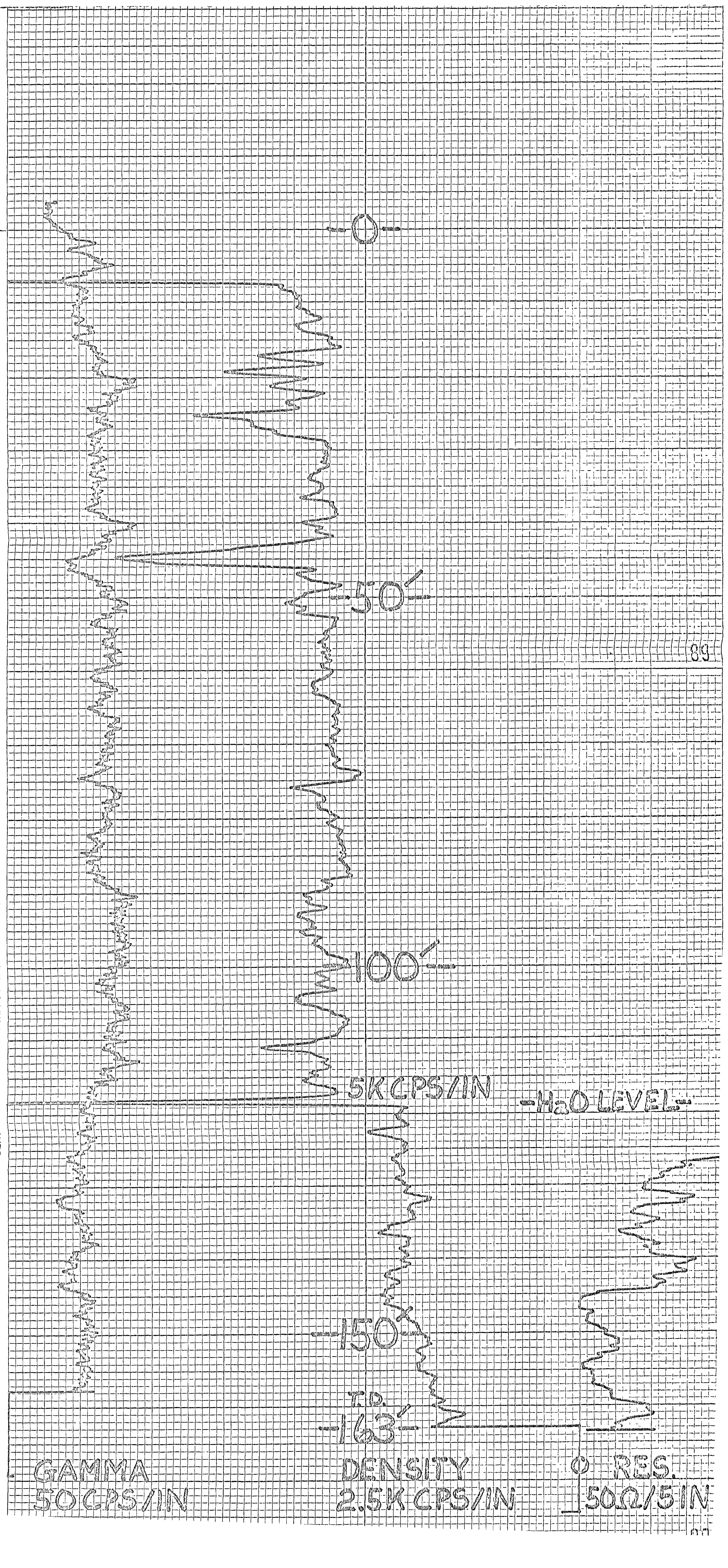
SELF POTENTIAL — MV +

NATURAL GAMMA RAY COUNTS PER SECOND

DENSITY

RESISTANCE OHMS

CT-112



CENTURY GEOPHYSICAL CORP. TULSA, OKLAHOMA, U.S.A. CHART WS120

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CENTURY GEOPHYSICAL CORPORATION
Tulsa, Oklahoma

OPERATOR: R. FIFIELD
DATE: 4-17-79
UNIT NO. 7665
FIELD OFFICE: GRANTS

COMPANY: NEW MEXICO BUREAU OF MINES
BOREHOLE: D-3
AREA: RED LAKE RANCH
ELEVATION: 6600
COUNTY: SOCORRO
STATE: NEW MEXICO
SECTION: 30
TOWNSHIP: 4N
RANGE: 7W

HOLE DATA

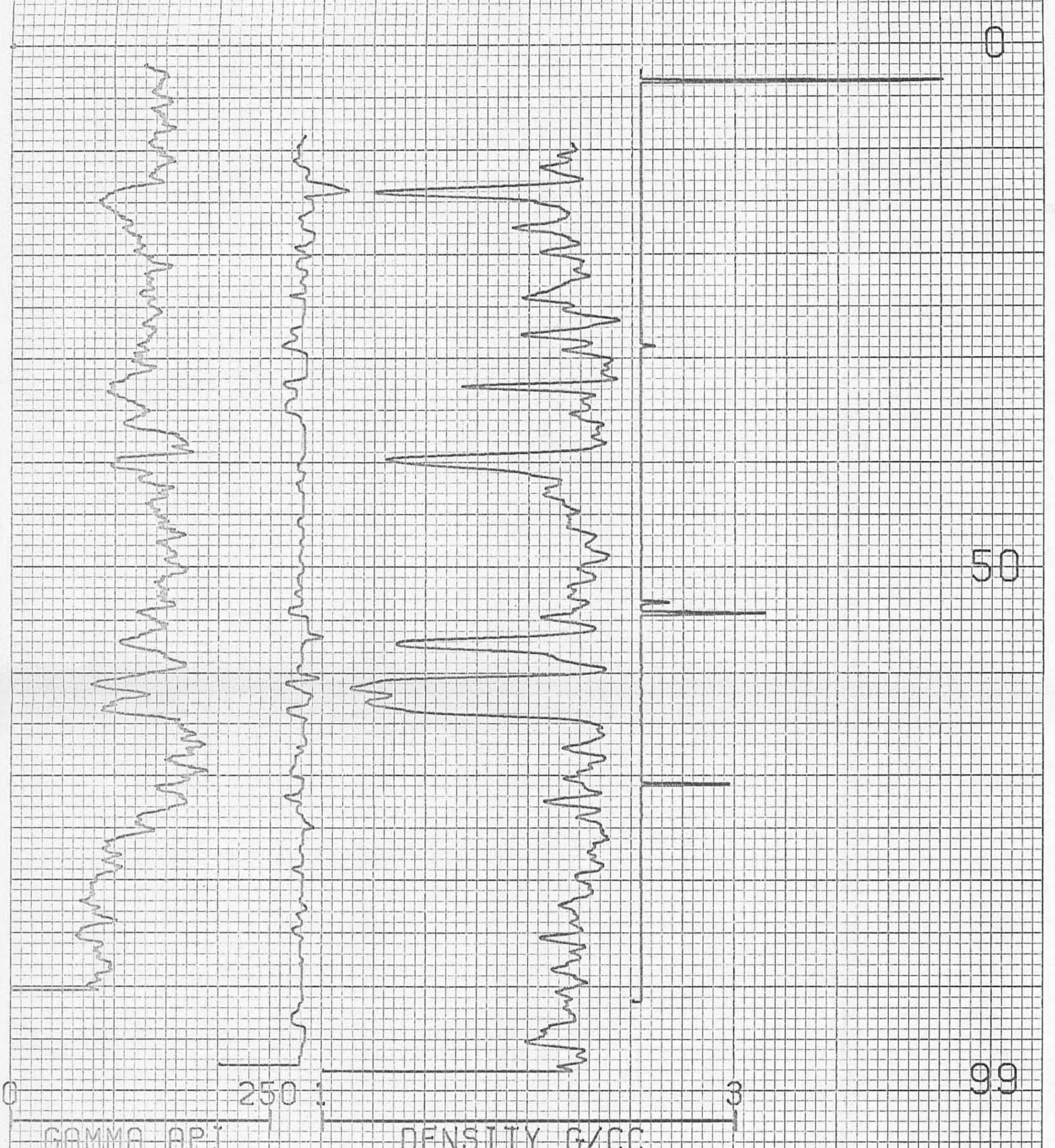
TOTAL DEPTH — DRILLER	100	BIT SIZE	4.5
TOTAL DEPTH — LOGGER	100	CASING — TYPE & SIZE	NONE
TOTAL FOOTAGE LOGGED	100	CASING DEPTH	—
LOGGING SPEED	25 FT/MIN	BOREHOLE FLUID	—
REFERENCE LEVEL	GRD LEVEL	FLUID RESISTIVITY	— @ — °F
PROBE NO.	9030A-177	SOFTWARE LEVEL	V3L4*A

REMARKS: DRY HOLE

EQUIPMENT DATA

		9010	9030	9050/55	9060	
PROBE MODEL		9010	9030	9050/55	9060	
PROBE DIAMETER		1.87"	2.0"	1.87"	1.4"	
NATURAL GAMMA	DETECTOR TYPE	NaI	NaI	NaI	NaI	
	DETECTOR SIZE	.875" x 1.25"	1.25" x 4.5"	.875" x 4.0"	.5" x 3.0"	
	STD. K-FACTOR	1.59×10^{-5}	—	$.558 \times 10^{-5}$	1.62×10^{-5}	
	STD. DEADTIME	1 μsec	—	1.18 μsec	1 μsec	
	CALIB. MODEL LOC.		—			
	CALIB DATE		—			
	K-FACTOR		—			
	DEADTIME		—			
	TEST READING		—			
	WATER FACTOR		—			
	CASING FACTOR		—			
DENSITY	DETECTOR TYPE	—	NaI	—	NaI	
	DETECTOR SIZE	—	.5" x 1.5"	—	.5" x 3.0"	
	SOURCE TYPE	—	Cs^{137}	—	Cs^{137}	
	SOURCE NO.	—	VL193	—		
	SOURCE STRENGTH	—	125 mc	—		
	SOURCE SPACING	—	—	—		
NEUTRON	DETECTOR TYPE	—	—	He^3	—	
	DETECTOR SIZE	—	—	1.0" x 6.0"	—	
	SOURCE TYPE	—	—	AmBe	—	
	SOURCE NO.	—	—		—	
	SOURCE STRENGTH	—	—		—	
	SOURCE SPACING	—	—		—	
SNGL. PT RESISTANCE		1.4"D x 2.5"L	—	1.4"D x 2.5"L	1.1"D x 2.5"L	
RESISTIVITY		—	6" FOCUSED	—	—	
SELF POTENTIAL		YES	—	YES	YES	
TEMPERATURE		—	—	YES	—	
DEVIATION		—	—	NO / YES	—	
CALIPER		—	YES	—	—	

CT-112 REV. 11-78



COMPU-LOG V3L4 04-17-79

D-3

NM BUREAU OF MINES

PUEBLO VIEJO

HOLE DIAMETER : 04.5

CAL STD CPS = 5575 CAL RUN CPS = 5643

PROBE # 9030A -177 PROBE CAL BIAS = +00036

TRUCK # 7665

R. FIFIELD

30

CENTURY GEOPHYSICAL CORPORATION

Tulsa, Oklahoma

OPERATOR	G VENHUIZEN
DATE	30 MAY 79
UNIT NO.	7727
FIELD OFFICE	GRANTS
COMPANY	NMBM + MR
BOREHOLE	D-4
AREA	DATIL COAL FIELD
ELEVATION	
COUNTY	~~&~~ VALENCIA
STATE	NEW MEXICO
SECTION	2
TOWNSHIP	4N
RANGE	10W

HOLE DATA

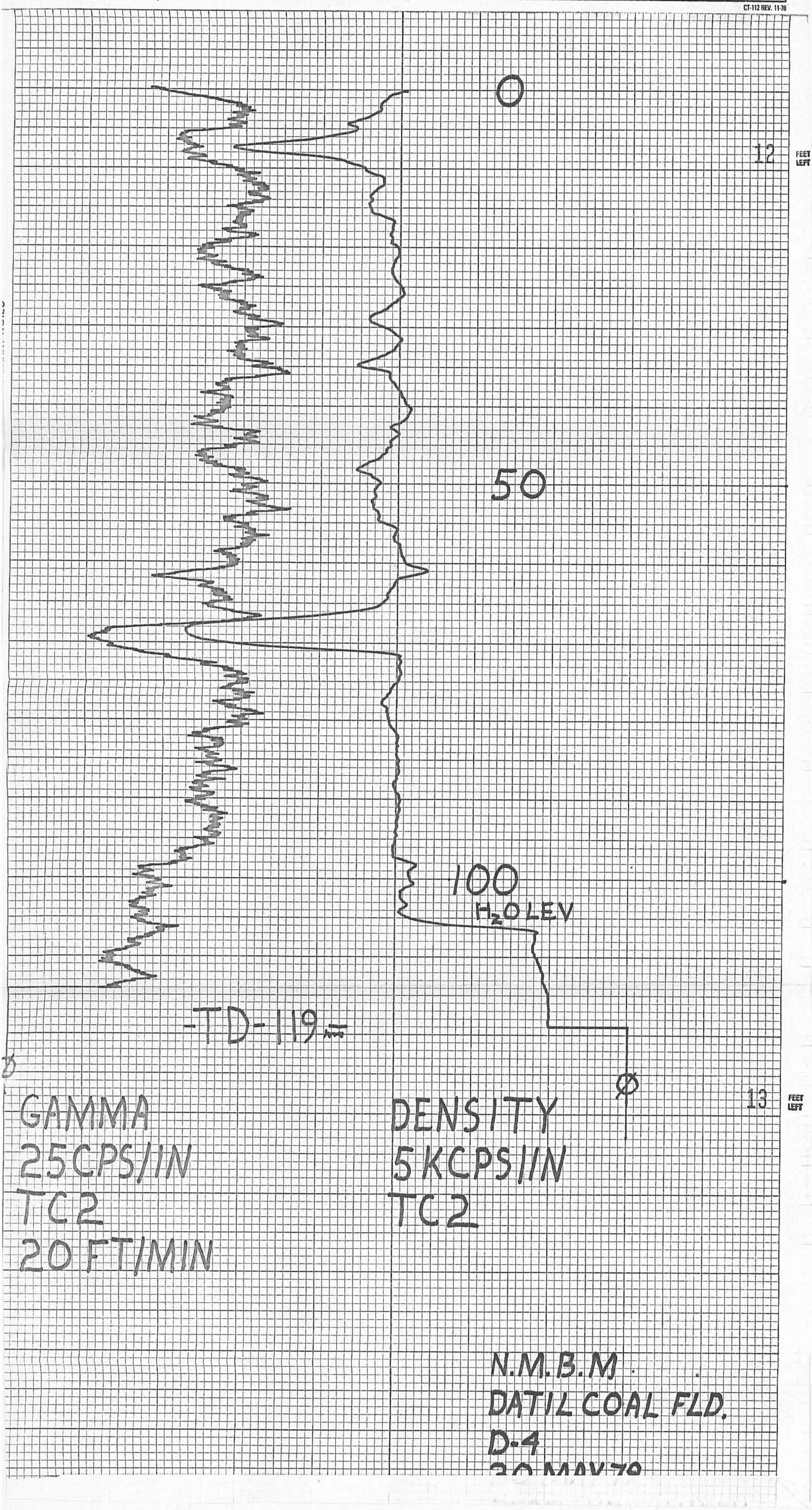
TOTAL DEPTH — DRILLER	125'	BIT SIZE	4.5"
TOTAL DEPTH — LOGGER	119'	CASING — TYPE & SIZE	NONE
TOTAL FOOTAGE LOGGED	119'	CASING DEPTH	N/A
LOGGING SPEED	20 FT/MIN	BOREHOLE FLUID	H_2O
REFERENCE LEVEL	GRD LEV	FLUID RESISTIVITY	N/A @ °F
PROBE NO.	8030A-308	SOFTWARE LEVEL	ANALOG

REMARKS: GAMMA
25 CPS/IN
TC 2
DENSITY
5 KCPS/IN
TC 2
NO RESISTANCE (H_2O LEV 106')

EQUIPMENT DATA

		9010	9030	9050/55	9060	
PROBE MODEL		9010	9030	9050/55	9060	8030
PROBE DIAMETER		1.87"	2.0"	1.87"	1.4"	1.87
NATURAL GAMMA	DETECTOR TYPE	NaI	NaI	NaI	NaI	NaI
	DETECTOR SIZE	.875" x 1.25"	1.25" x 4.5"	.875" x 4.0"	.5" x 3.0"	7/8 x 1¼
	STD. K-FACTOR	1.59×10^{-5}	—	$.550 \times 10^{-5}$	1.62×10^{-5}	1.57×10^{-5}
	STD. DEADTIME	1 μsec	—	1.18 μsec	1 μsec	1 μsec
	CALIB. MODEL LOC.		—			
	CALIB DATE		—			
	K-FACTOR		—			
	DEADTIME		—			
	TEST READING		—			
	WATER FACTOR		—			1.124
	CASING FACTOR		—			N/A
DENSITY	DETECTOR TYPE	—	NaI	—	NaI	NaI
	DETECTOR SIZE	—	.5" x 1.5"	—	.5" x 3.0"	1/8 x 1¼
	SOURCE TYPE	—	Cs^{137}	—	Cs^{137}	Cs^{137}
	SOURCE NO.	—		—		
	SOURCE STRENGTH	—		—		
	SOURCE SPACING	—		—		
NEUTRON	DETECTOR TYPE	—	—	He^3	—	
	DETECTOR SIZE	—	—	1.0" x 6.0"	—	
	SOURCE TYPE	—	—	AmBe	—	
	SOURCE NO.	—	—		—	
	SOURCE STRENGTH	—	—		—	
	SOURCE SPACING	—	—		—	
SNGL. PT RESISTANCE		1.4"D x 2.5"L	—	1.4"D x 2.5"L	1.1"D x 2.5"L	
RESISTIVITY		—	6" FOCUSED	—	—	
SELF POTENTIAL		YES	—	YES	YES	
TEMPERATURE		—	—	YES	—	
DEVIATION		—	—	NO / YES	—	
CALIPER		—	YES	—	—	

CT-112 REV. 11-78



CENTURY GEOPHYSICAL CORPORATION

Tulsa, Oklahoma

OPERATOR: G VEN HUIZEN	DATE: 30 MAY 79
UNIT NO: 7727	FIELD OFFICE: GRANTS

COMPANY: NEW MEX BUREAU OF MINES	
BOREHOLE: D-5	
AREA: DATIL COAL FLD.	ELEVATION:
COUNTY: CATRON	STATE: NEW MEX
SECTION: 29 TOWNSHIP: 3N	RANGE: 9W

HOLE DATA

TOTAL DEPTH — DRILLER	212'	BIT SIZE	4.5"
TOTAL DEPTH — LOGGER	205'	CASING — TYPE & SIZE	STEEL
TOTAL FOOTAGE LOGGED	205'	CASING DEPTH	2'-3'
LOGGING SPEED	20 FT/MIN	BOREHOLE FLUID	GRD WATER
REFERENCE LEVEL	GRD LEV	FLUID RESISTIVITY	N/A @ °F
PROBE NO	8030A-308	SOFTWARE LEVEL	ANALOG

REMARKS
GAMMA
25 CPS/IN
TC 2
DEN
1K CPS/IN 112-205
5K CPS/IN 0-112
RES
50 Ω/5IN

EQUIPMENT DATA

		9010	9030	9050/55	9060	8030A
PROBE MODEL		9010	9030	9050/55	9060	8030A
PROBE DIAMETER		1.87"	2.0"	1.87"	1.4"	1.87"
NATURAL GAMMA	DETECTOR TYPE	NaI	NaI	NaI	NaI	NaI
	DETECTOR SIZE	.875 x 1.25"	1.25" x 4.5"	.875" x 4.0"	.5" x 3.0"	.875x1 1/4
	STD K FACTOR	1.59 x 10^{-5}	—	5.58 x 10^{-5}	1.62 x 10^{-5}	1.59x10^{-5}
	STD DEADTIME	1 μsec	—	1.18 μsec	1 μsec	1 μsec
	CALIB MODEL LOC		—			
	CALIB DATE		—			
	K FACTOR		—			
	DEADTIME		—			
	TEST READING		—			
	WATER FACTOR		—			1.124
	CASING FACTOR		—			
DENSITY	DETECTOR TYPE	—	NaI	—	NaI	NaI
	DETECTOR SIZE	—	.5" x 1.5"	—	.5" x 3.0"	7/8x1 1/4
	SOURCE TYPE	—	Cs^{137}	—	Cs^{137}	Cs^{137}
	SOURCE NO	—		—		
	SOURCE STRENGTH	—		—		
	SOURCE SPACING	—		—		
NEUTRON	DETECTOR TYPE	—	—	He^3	—	N/A
	DETECTOR SIZE	—	—	1.0" x 6.0"	—	
	SOURCE TYPE	—	—	AmBe	—	
	SOURCE NO	—	—		—	
	SOURCE STRENGTH	—	—		—	
	SOURCE SPACING	—	—		—	
SNGL. PT RESISTANCE		1.4"D x 2.5"L	—	1.4"D x 2.5"L	1.1"D x 2.5"L	
RESISTIVITY		—	6" FOCUSED	—	—	
SELF POTENTIAL		YES	—	YES	YES	
TEMPERATURE		—	—	YES	—	
DEVIATION		—	—	NO / YES	—	
CALIPER		—	YES	—	—	

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