UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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OPEN-FILE REPORT 79-623

1985

FEDERAL COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE CUBA 7 1/2-MINUTE QUADRANGLE, SANDOVAL COUNTY, NEW MEXICO

[Report includes 4 plates]

Prepared by Berge Exploration, Inc.

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INTRODUCTION

Purpose

This text complements the Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) maps of the Cuba 7½ minute quadrangle, Sandoval and Rio Arriba Counties, New Mexico. These maps and report are part of an evaluation of fifty-six 7½ minute quadrangles in northwestern New Mexico which were completed under U. S. Geological Survey Contract No. 14-08-0001-17459 (see figs. 1 and 2).

The purpose of this Coal Resource Occurrence-Coal Development Potential program, which was conceived by Congress as part of its Federal Coal Leasing Amendments Act of 1976, is to obtain coal resource information and to determine the geographical extent of Federal coal deposits. In addition, the program is intended to provide information on the amount of coal recoverable by various mining methods and to serve as a guide for land-use planning.

The U. S. Geological Survey initiated the program by identifying areas underlain by coal resources. These areas were designated Known Recoverable Coal Resource Areas based on the presence of minable coal thicknesses, adequate areal extent of these coal deposits, and the potential for developing commercial quantities of coal at minable depths.

This report is limited to coal resources which are 3,000 ft (914 m) or less below ground surface. Published and unpublished public information was used as the data base for this study. No new drilling or field mapping was performed as part of this study, nor were any confidential data used.

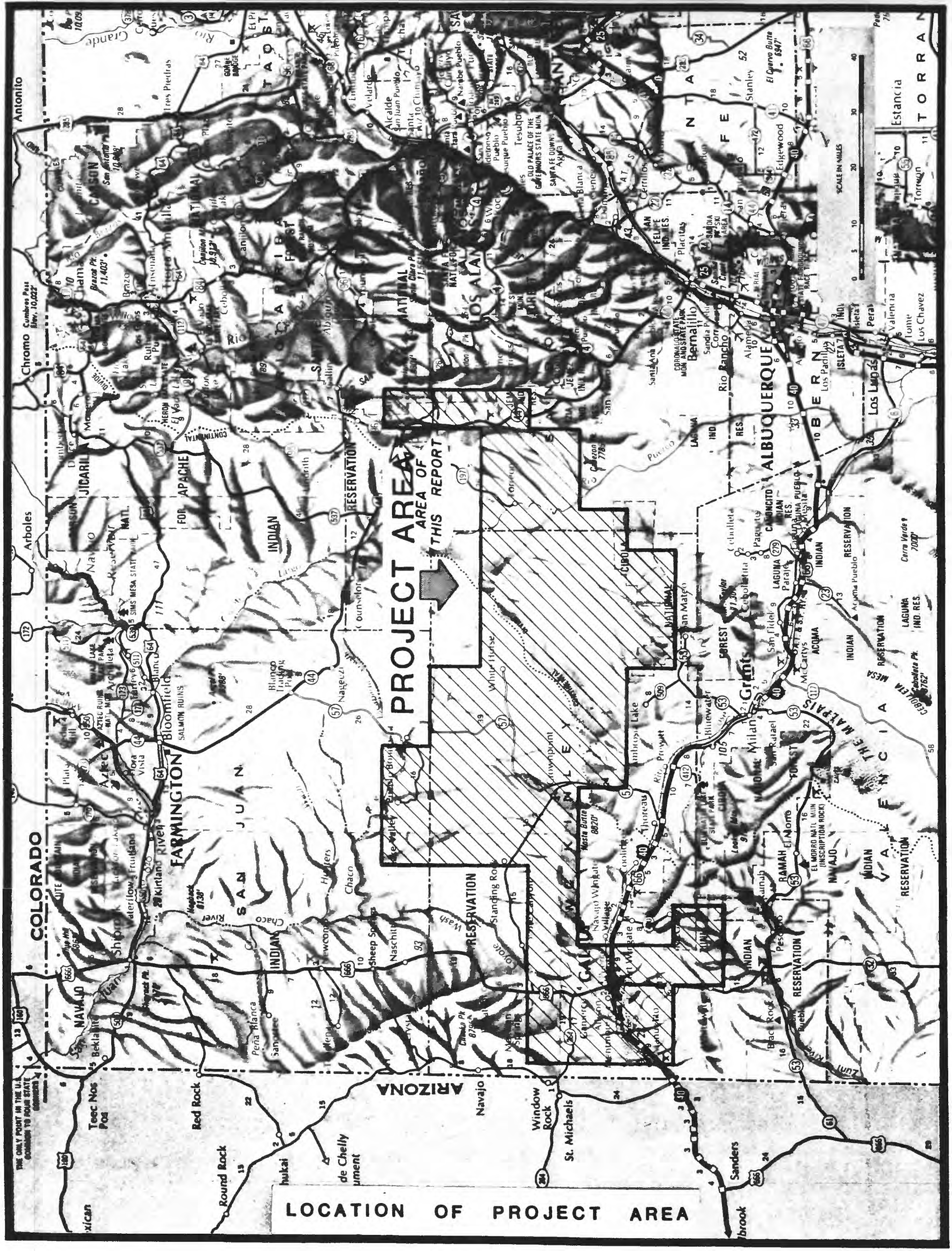
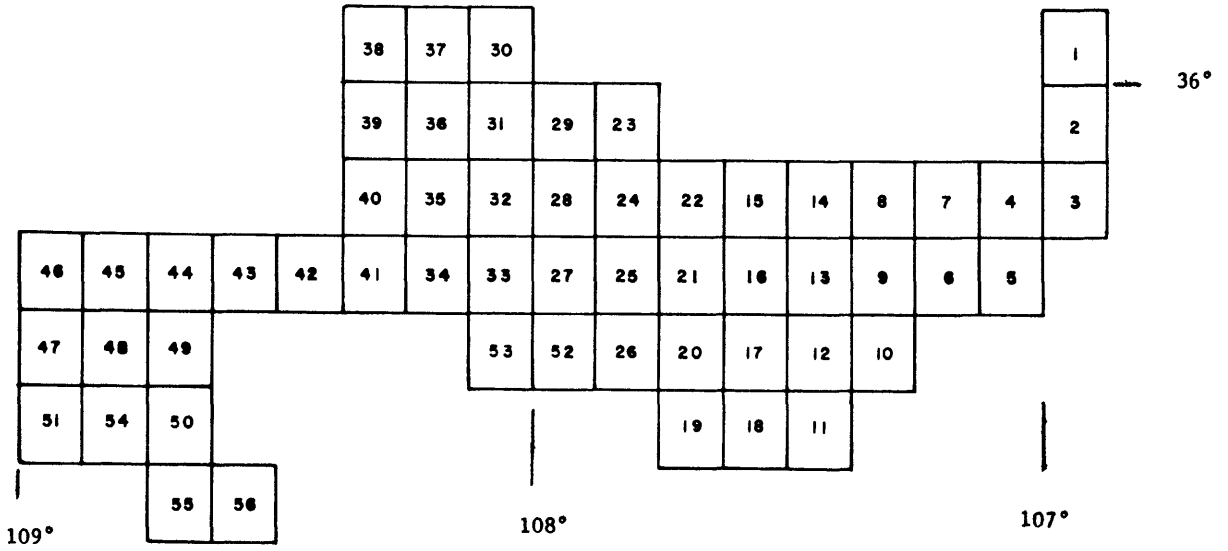

LOCATION OF PROJECT AREA
PROJECT AREA
AREA OF THIS REPORT
COLORADO
ARIZONA
FARMINGTON
ALBUQUERQUE
Grants
Bloomfield
Aztec
Shiprock
Window Rock
St. Michaels
Sanders
Red Rock
Round Rock
Teec Nos Pos
Bernalillo
Rio Rancho
Los Lunas
Estancia
Chromo
Arboles
Antonito
San Mateo
Milan
Thoreau
Crownpoint
Standing Rock
Counselor
Nageezi
Cuba
Laguna
Acoma
Ramah
El Morro
Zuni
JICARILLA APACHE INDIAN RESERVATION
NAVAJO INDIAN RESERVATION
SAN JUAN
McKINLEY
VALENCIA
BERNALILLO
SANDOVAL
SANTA FE
TORRANCE
Rio Grande
Chaco River
Rio Puerco
Los Alamos
SCALE IN MILES

FIGURE 1

FIGURE 2.--Index to USGS 7 1/2-minute quadrangles and coal resource occurrence/ coal development potential maps for the southern San Juan Basin area, New Mexico

Map No.	Quadrangle	Open-file report
1	Cuba	79- 623
2	San Pablo	79- 624
3	La Ventana	79-1038
4	Headcut Reservoir	79-1043
5	San Luis	79-1044
6	Arroyo Empedrado	79-1045
7	Wolf Stand	79-1046
8	Tinian	79- 625
9	Canada Calladita	79- 626
10	Cerro Parido	79- 627
11	El Dado Mesa	79- 628
12	Mesa Cortada	79- 629
13	Mesita del Gavilan	79- 630
14	Rincon Marquez	79- 631
15	Whitehorse Rincon	79- 632
16	Mesita Americana	79- 633
17	El Dado	79- 634
18	Cerro Alesna	79- 635
19	San Lucas Dam	79- 636
20	Piedra de la Aguila	79-1039
21	Hospah	79- 637
22	Whitehorse	79-1040
23	Seven Lakes NE	79- 638
24	Kin Nahzin Ruins	79- 639
25	Orphan Annie Rock	79-1041
26	Mesa de los Toros	79-1122
27	Laguna Castillo	79- 640
28	Seven Lakes	79-1042
29	Seven Lakes NW	79-1123
30	Kin Klizhin Ruins	79-1047
31	Nose Rock	79- 641
32	Becenti Lake	79-1124
33	Heart Rock	79- 642
34	Crownpoint	79-1125
35	Antelope Lookout Mesa	79-1376
36	Milk Lake	79-1377
37	La Vida Mission	79-1378
38	The Pillar 3 SE	79-1379
39	Red Lake Well	79-1380
40	Standing Rock	79-1381
41	Dalton Pass	80- 026
42	Oak Spring	80- 027
43	Hard Ground Flats	80- 028
44	Big Rock Hill	80- 029
45	Twin Lakes	80- 030
46	Tse Bonita School	80- 031
47	Samson Lake	80- 032
48	Gallup West	80- 033
49	Gallup East	80- 034
50	Bread Springs	80- 035
51	Manuelito	80- 036
52	Borrego Pass	80- 037
53	Casamero Lake	80- 038
54	Twin Buttes	80- 039
55	Pinehaven	80- 040
56	Upper Nutria	80- 041



Location

The Cuba 7½ minute quadrangle includes acreage in Tps. 21 and 22 N., Rs. 1 E., 1 W., and 2 W. of the New Mexico Principal Meridian, Sandoval and Rio Arriba Counties, northwestern New Mexico. The town of Cuba is located in the southern part of the quadrangle (see figs. 1 and 2).

Accessibility

Access to the quadrangle is by two-lane paved State Highways 96 from the north, 126 from the east, 197 from the southwest, and 44 from both the south and west. Dirt roads and jeep trails traverse all but the steepest portions of the quadrangle. The Atchison, Topeka, and Santa Fe Railroad passes about 44 mi (71 km) southeast of the quadrangle (see fig. 1). An abandoned railroad which served coal mines in the La Ventana area during the 1920's and early 1930's is about 13 mi (21 km) south of the Cuba quadrangle.

Physiography

The Cuba quadrangle is in the San Pedro Foothills and Penistaja Cuestas sectors (Baltz, 1967) of the Navajo section of the southernmost part of the Colorado Plateau physiographic province (U. S. Geological Survey, 1965). The Nacimiento Mountains cover the eastern one-fourth of the quadrangle. The remainder of the area is characterized by alluvial valley floors and mesas.

The Rio Puerco and Arroyo San Jose are the major drainages in the area. Elevations within the quadrangle range from less than 6,820 ft (2,079 m) along the Rio Puerco in the southwest to over 10,200 ft (3,109 m) in the Nacimiento Mountains in the northeast.

Climate

The climate of this area is semiarid to arid. The following temperature and precipitation data were reported by the National Oceanic and Atmospheric Administration for the Cuba Station. Average total annual precipitation for thirteen of the previous fifteen years is 13.57 in. (34.47 cm). Intense thunderstorms in July, August, and September account for the majority of precipitation. The area is susceptible to flash flooding associated with these thunderstorms. Mean annual temperature for seven of the previous fifteen years is 46.2°F (7.9°C). The average daily temperatures in January and July are 25.5°F (-3.6°C) and 68.8°F (20.4°C), respectively.

Land status

The Federal Government holds coal rights to about 60 percent of the Cuba quadrangle. For the specific coal ownership boundaries, see plate 2. It is not within the scope of this report to provide detailed land-surface ownership. Most of the eastern one-third of the quadrangle is Federal land within the Santa Fe National Forest. The Jicarilla Apache Indian Reservation occupies about 800 acres (324 ha) in the northwestern part of the quadrangle. The quadrangle is not within any Known Recoverable Coal Resource Area. As of October 26, 1978 there were no Federal coal leases, coal preference right lease applications or coal exploration licenses within the Cuba quadrangle.

GENERAL GEOLOGY

Previous work

Early reports on the area include that of Gardner (1910) who noted coal outcrops in the area. Dane (1936) reported several coal outcrop measurements south of the Cuba quadrangle. Shomaker, Beaumont, and Kottlowski (1971) noted that surface mining would be unsuitable in the area because of the steeply dipping coal beds. Fassett and Hinds (1971) reported no Fruitland Formation coal occurrences in the Cuba quadrangle. Woodward, and others (1972) mapped the geology of the quadrangle but did not report coals.

Stratigraphy

Rock units which crop out in the Cuba quadrangle range in age from Precambrian to Quaternary. Precambrian rocks are exposed along the Nacimiento fault zone in the eastern part of the quadrangle. Quaternary deposits include alluvium and terrace gravels from the Rio Puerco and its tributaries. All known coal beds occur in the Upper Cretaceous Allison Member of the Menefee Formation in the Cuba quadrangle.

The Menefee Formation consists of dark gray to brown carbonaceous to noncarbonaceous shales, light gray sandstones, and coal beds, and is divisible into the basal Cleary Coal Member and upper Allison Member. The Menefee Formation is about 250 ft (76 m) thick locally. A massive

channel sandstone sequence defines the boundary between the two members. The Allison Member was defined as the Allison Barren Member by Sears (1925) as containing thin, noncommercial coal beds. However, the upper part of the Allison Member contains at least one relatively thick coal bed in the Cuba quadrangle.

Although the Fruitland Formation crops out in the area and is the major coal-bearing formation in the San Juan Basin, no Fruitland Formation coals have been reported in the Cuba quadrangle. Coal occurrences within the Cleary Coal Member of the Menefee Formation and Dakota Sandstone have been reported in areas nearby, but were not mapped in the Cuba quadrangle because of insufficient data.

Depositional environments

The Cretaceous System sedimentary units in the quadrangle represent transgressive and regressive depositional conditions. There were innumerable minor cycles of widely varying duration and extent within the major sedimentary sequences. The paucity of data in this quadrangle and the intended scope of this report permit only general interpretations of the depositional environments.

The Cretaceous coal deposits of the San Juan Basin are products of former coastal swamps and marshes. These swamps and marshes were supported by heavy precipitation and a climate conducive to rapid vegetal growth in moderately fresh water. Due to the relatively low sulfur contents of the San Juan Basin coals, Shomaker and Whyte (1977) suggest the coals formed in fresh water environments.

Most of the coal-bearing units were deposited in coastal plain environments. The majority of the peat deposits formed in a transition zone

between lower and upper deltaic sediments during periods of relative shoreline stability. Coals also formed in lake margin swamps inland from the coastal area. Shoreline oscillations and the subsequent influx of continental or marine debris upon the peat accumulations produced the vertical buildup or "stacking" of peat deposits. This sediment debris represents variable ash contents, rock partings, and splits within the coal seams. The peat often accumulated in lenses or pods which were generally parallel to the ancient shorelines (Sears, Hunt, and Hendricks, 1941).

Structure

The Cuba quadrangle is in the Central Basin and Nacimiento Uplift structural divisions in the extreme eastern portion of the structural depression known as the San Juan Basin (Kelley, 1950). The major structural features in the quadrangle are the Nacimiento Uplift and associated thrust faults. Precambrian crystalline rocks were brought into contact with basinal strata by a thrust block which moved westward (Woodward and others, 1972). Several high angle faults are present which formed in response to the Nacimiento Uplift. Most Cretaceous strata are overturned and dip from 60° to 85° east at outcrop in the eastern part of the quadrangle.

COAL GEOLOGY

One coal bed which occurs in the upper portion of the Allison Member was identified in this quadrangle by Dane (1936). The coal bed is here

informally called the Menefee Allison No. 1 coal bed. The bed is inferred to be continuous, although it may consist of several different beds that are stratigraphically equivalent.

Because the coal bed occurs in only a small portion of the Cuba quadrangle, the isopach, structure contour, and overburden maps are included in this report (figs. 3, 4, and 5). The zone of overturned beds shown on the figures is based on mapping by Dane (1936) and Woodward and others, (1972). The insufficient data line (figs. 3, 4, and 5) represents the boundary between areas with adequate data for inferring coal thickness and structure, and areas of little or no coal information.

There are no published coal quality analyses of the coal bed from the Cuba quadrangle. Analyses of Allison Member coal samples from the abandoned Rio Puerco mine (sample 1) and the abandoned Anderson mine (sample 2) which are 9 and 11.5 mi (14.5 and 18.5 km), respectively, south and southwest of the quadrangle have been reported by the U. S. Bureau of Mines (1936) and are shown in table 1. The Allison Member beds analyzed are probably similar in quality to the Allison Member bed in this quadrangle. Rank of the Allison Member seam is probably subbituminous A to high volatile C bituminous in this area.

Menefee Allison No. 1 coal bed

The Menefee Allison No. 1 coal bed is a persistent coal bed near the top of the Allison Member of the Menefee Formation. Dane (1936) inferred the outcrop trace along the southern quadrangle boundary in parts of secs. 35 and 26, T. 21 N., R. 1 W. There are no outcrop

Figure 3

ISOPACH MAP OF THE MENEFEE ALLISON NO.1 BED

(see explanation on page 13)

Figure 4

STRUCTURE CONTOUR MAP OF THE MENEFEE ALLISON NO. 1 BED

(see explanation on page 13)

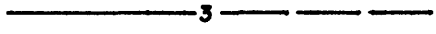
Figure 5

ISOPACH MAP OF THE OVERBURDEN OF THE MENEFEE ALLISON NO.1 BED

(see explanation on page 14)

Figure 3

EXPLANATION



ISOPACHS OF THE MENEFEE ALLISON NO. 1 COAL BED-Showing thickness in feet.

TRACE OF COAL BED OUTCROP-Arrow points toward the coal-bearing area. Dashed line indicates inferred outcrop.

FAULT-Dashed where approximately located.

THRUST FAULT-Teeth on upthrown block, dashed where approximately located.

Indicates overturned beds.

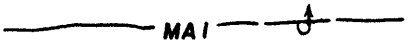
Shaded area indicates zone of overturned beds.

To convert feet to meters, multiply feet by 0.3048.

Figure 4

EXPLANATION

STRUCTURE CONTOURS-Drawn on top of the Menefee Allison No. 1 coal bed. Contour interval 200 feet (61 meters). Datum is mean sea level. Contours dashed where inferred and not shown in zone of overturned beds.



TRACE OF COAL BED OUTCROP-Arrow points toward the coal-bearing area. Dashed line indicates inferred outcrop.

FAULT-Dashed where approximately located.

THRUST FAULT-Teeth on upthrown block, dashed where approximately located.

Indicates overturned beds.

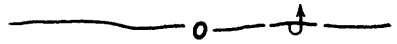
Shaded area indicates zone of overturned beds.

To convert feet to meters, multiply feet by 0.3048.

Figure 5

EXPLANATION

OVERBURDEN ISOPACHS-Showing thickness of overburden, in feet, from the surface to the top of the Menefee Allison No. 1 coal bed. Isopach interval 100 feet (30.5 meters). Isopachs dashed where inferred and not shown in zone of overturned beds. Stripping limit is 200 feet (61 meters).



TRACE OF COAL BED OUTCROP-Arrow points toward the coal-bearing area. Dashed line indicates inferred outcrop.

Mining ratios for the Menefee Allison No. 1 exceed 15 and are therefore not shown.

FAULT-Dashed where approximately located.

THRUST FAULT-Teeth on upthrown block, dashed where approximately located.

Indicates overturned beds.

Shaded area indicates zone of overturned beds.

To convert feet to meters, multiply feet by 0.3048.

Table 1.- Analyses of coal samples from the Allison Member of the Menefee Formation.

[Form of analysis: A, as received; B, moisture free; C, moisture and ash free]

from U. S. Bureau of Mines, 1936

Sample	Type of Sample	Location			Form of analysis	Proximate analysis (percent)				Sulfur	Heating value (Btu/lb)
		Sec.	T. N.	R. W.		Mois-ture	Volatile matter	Fixed carbon	Ash		
1	Mine sample (Rio Puerco Mine)	SE¼			A	12.1	35.8	44.5	7.6	2.8	10,940
		19	19	1	B	--	40.7	50.6	8.7	3.2	12,460
					C	--	44.6	55.4	--	3.5	13,640
2	Mine sample (Anderson Mine)	NE¼NW¼ SE¼									
		35	19	2	A	20.0	32.5	42.6	4.9	0.7	10,240
					B	--	40.7	53.2	6.1	0.8	12,790
					C	--	43.3	56.7	--	0.9	13,630

Remarks:

A moist, mineral-matter-free (MMMF) calculation, using the Parr Formula (American Society for Testing and Materials, 1973), yields heating values of 11,966 Btu/lb (27,833 kJ/kg; sample 1) and 10,819 Btu/lb (25,165 kJ/kg; sample 2). No agglomerating characteristics are available for these samples.

measurement data for the coal bed in the quadrangle. Dane (1936) reported 4.3 ft (1.3 m) of total coal with a 1.0 ft (0.3 m) rock parting, in SW¼ SW¼ SE¼ sec 35, T. 21 N., R. 1 W., which is within the adjacent San Pablo quadrangle. The 3.0 ft (0.9 m) isopach line (fig. 3) is inferred from this data point.

Structure contours (fig. 4) are based on coal data from the San Pablo quadrangle. At outcrop, the coal bed strikes N. 14° E. and is overturned, dipping from 60° to 85° E. The coal bed overburden (fig. 5) was derived from structure contour and topographic maps. The fault traces are from Woodward, and others (1972).

COAL RESOURCES

Because there are no identified correlative coal beds on Federal coal land with thicknesses of 3.0 ft (0.9 m) or greater, no reserve base or reserves have been calculated for the Cuba quadrangle. The U. S. Geological Survey specified that only coal beds 3.0 ft (0.9 m) or greater in thickness be included in reserve base and reserve data, rather than the 28 in. (71 cm) minimum prescribed in U. S. Geological Survey Bulletin 1450-B.

COAL DEVELOPMENT POTENTIAL

The factors used to determine the development potential are the presence of a potentially coal-bearing formation, and the thickness and overburden of correlative coal beds. The U. S. Geological Survey supplied the criteria to evaluate the coal development potential for Federal lands

in this quadrangle. These criteria are based on current industry practice, U. S. Geological Survey Bulletin 1450-B, and anticipated technological advances. All available data were utilized for the surface and subsurface coal development potential evaluations.

Any area underlain by a potentially coal-bearing formation with 200 ft (61 m) or less of overburden has potential for surface mining. The U. S. Geological Survey designated the 200 ft (61 m) maximum depth as the stripping limit. Areas where a potentially coal-bearing formation is overlain by more than 200 ft (61 m) of overburden have no potential for surface mining. Areas with no correlative coal bed or a correlative coal bed less than 3.0 ft (0.9 m) in thickness and overlain by 200 ft (61 m) or less of overburden have unknown surface mining potential.

Any area underlain by a potentially coal-bearing formation with 200 to 3,000 ft (61 to 914 m) of overburden has potential for subsurface mining. Areas where a potentially coal-bearing formation is overlain by more than 3,000 ft (914 m) of overburden have no subsurface mining potential. Development potential for subsurface mining is unknown where a potentially coal-bearing formation within 200 to 3,000 ft (61 to 914 m) of the surface contains no identified correlative coal bed or a correlative coal bed less than 3.0 ft (0.9 m) thick.

The no and unknown development potential boundaries for surface mining methods (plate 3) are defined at the contacts of the coal-bearing Fruitland Formation with the underlying noncoal-bearing Pictured Cliffs Sandstone and overlying noncoal-bearing Kirtland Shale. There is unknown development potential for surface mining methods within the Menefee Formation, but because these unknown areas occupy less than 50 percent of the legal 40 acre land

subdivisions, the unknown development potential was not shown on plate 3. The no and unknown development potential boundaries for subsurface mining methods (plate 4) are defined at the coal-bearing Menefee Formation contact and noncoal-bearing Point Lookout Sandstone. The above contacts are approximated due to the inaccuracies of adjusting old geologic maps to modern topographic bases.

The coal development potential of this quadrangle is subject to revision. As further coal information becomes available, it is possible that correlative coal beds with sufficient thicknesses may be identified. These coal data will likely define areas of Federal coal lands with development potentials other than no or unknown.

Development potential for surface mining methods

The coal development potential for surface mining methods in the Cuba quadrangle is shown on plate 3. Based on all presently available data, the Menefee Allison No. 1 coal bed does not underlie Federal coal lands at depths of 200 ft (61 m) or less with thicknesses of 3.0 ft (0.9 m) or greater. The Fruitland and Menefee Formations are potentially coal-bearing in this quadrangle. Based on development potential criteria, all Federal coal lands in the Cuba quadrangle have either no or unknown development potential for surface mining methods.

Development potential for subsurface mining methods and in situ gasification

The coal development potential for subsurface mining methods in the Cuba quadrangle is shown on plate 4. Based on all presently available data, the Menefee Allison No. 1 coal bed does not underlie Federal coal lands at depths of 200 to 3,000 ft (61 to 914 m) with thicknesses of 3.0 ft (0.9 m) or greater. The Fruitland and Menefee Formations are potentially coal-bearing in this quadrangle. Based on development potential criteria, all Federal coal lands in the Cuba quadrangle have either no or unknown development potential for subsurface mining methods.

In situ gasification of coal has not been done on a commercial scale in the United States and criteria for rating the development potential of this method are unknown.

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Woodward, L. A., and others, 1972, Geologic map of the Cuba quadrangle, New Mexico: New Mexico Bureau of Mines and Mineral Resources Geologic Map 25.

coal bed--A stratified sequence of coal, composed of relatively homogeneous material, exhibiting some degree of lithologic unity and separated from the rocks above and below by physically rather well defined boundary planes.

coal bed separation line--A line on a map plate separating areas where different coal beds or zones are mapped.

coal bench--One of two or more divisions of a coal bed separated by rock.

coal conversion factor--A factor used to convert acre-feet of coal into short tons of coal; bituminous coal is 1800 tons/acre-ft; subbituminous coal is 1770 tons/acre-ft.

coal development potential--A subjective determination of the comparative potential of Federal coal lands for development of a commercially viable coal mining operation.

coal exploration license--An area of Federal coal lands in which the licensee is granted the right, after outlining the area and the probable methods of exploration, to investigate the coal resources. An exploration license has a term not to exceed 2 years and does not confer rights to a lease.

coal lease--An area of Federal coal lands in which the Federal Government has entered into a contractual agreement for development of the coal deposits.

coal split--A coal bed resulting from the occurrence of a noncoal parting within the parent coal bed which divides the single coal bed into two or more coal beds.

coal zone--A distinctive stratigraphic interval containing a sequence of alternating coal and noncoal layers in which the coal beds may so lack lateral persistence that correlating individual beds in the zone is not feasible.

Federal coal land--Land for which the Federal Government holds title to the coal mineral rights, without regard to surface ownership.

hypothetical resources--Undiscovered coal resources in beds that may reasonably be expected to exist in known mining districts under known geologic conditions. In general, hypothetical resources are in broad areas of coal fields where points of observation are absent and evidence is from distant outcrops, drill holes or wells. Exploration that confirms their presence and reveals quantity and quality will permit their reclassification as a Reserve or Identified Subeconomic Resource.

identified resources--Specific bodies of coal whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements.

indicated--Coal for which estimates for the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections.

inferred--Coal in unexplored extensions of demonstrated resources for which estimates of the quality and quantity are based on geologic evidence and projections.

isopach--A line joining points of equal bed thickness.

Known Recoverable Coal Resource Area (KRCRA)--Formerly called Known Coal Leasing Area (KCLA). Area in which the Federal coal land is classified (1) as subject to the coal leasing provisions of the Mineral Leasing Act of 1920, as amended, and (2) by virtue of the available data being sufficient to permit evaluation as to extent, location, and potential for developing commercial quantities of coal.

measured--Coal for which estimates for rank, quality, and quantity can be computed, within a margin of error of less than 20 percent, from sample analyses and measurements from closely spaced and geologically well known sample sites.

mining ratio--A numerical ratio equating the in-place volumes, in cubic yards, of rocks that must be removed in order to recover 1 short ton of coal by surface mining.

overburden--A stratigraphic interval (composed of noncoal beds and coal beds) lying between the ground surface and the top of a coal bed. For coal zones, overburden is the stratigraphic interval lying between the ground surface and the structural datum used to map the zone.

parting--A noncoal layer occurring along a bedding plane within a coal bed.

Preference Right Lease Application (PRLA)--An area of Federal coal lands for which an application for a noncompetitive coal lease has been made as a result of exploration done under a coal prospecting permit. PRLA's are no longer obtainable.

quality or grade--Refers to measurements such as heat value; fixed carbon; moisture; ash; sulfur; phosphorus; major, minor, and trace elements; coking properties; petrologic properties; and particular organic constituents.

rank--The classification of coal relative to other coals, according to degree of metamorphism, or progressive alteration, in the natural series from lignite to anthracite (Classification of coals by rank, 1973, American Society for Testing and Materials, ASTM Designation D-388-66).

recovery factor--The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the Reserve Base in the ground.

reserve--That part of identified coal resource that can be economically mined at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the reserve base.

reserve base--That part of identified coal resource from which Reserves are calculated.

stripping limit--A vertical depth, in feet, measured from the surface, reflecting the probable maximum, practical depth to which surface mining may be technologically feasible in the forseeable future. The rock interval, expressed in feet, above the stripping limit is the "strippable interval."

structure contour--A line joining points of equal elevation on a stratum or bed.