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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE RANGELY QUADRANGLE RIO BLANCO COUNTY, COLORADO

BY

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This report has not been edited for conformity with U.S. Geological Survey editorial Standards or stratigraphic nomenclature.

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Purpose

These maps were compiled to support the land-use planning work of the Bureau of Land Management and to provide a systematic coal resource inventory of Federal coal lands in the Lower White Known Recoverable Coal Resource Area (KRCRA) in response to the land-use planning requirements of the Federal Coal Leasing Amendments Act of 1976.

Published and unpublished non-proprietary data sources were used for this study. No new drilling or field mapping was done to supplement this study. No confidential or proprietary data were used.

Location

The Rangely quadrangle is located in Rio Blanco County in northwestern Colorado. The city of Craig, the county seat of Moffat County, is 72 miles (115 km) northeast of the quadrangle and the city of Meeker, the county seat of Rio Blanco County, is approximately 45 miles (72 km) to the east. The town of Rangely is located in the north-central part of the quadrangle and the Colorado-Utah State line is 13 miles (21 km) west of Rangely. The Colorado-Wyoming State line is 61 miles (98 km) north and the city of Vernal, Utah is 41 miles (66 km) northwest of the quadrangle.

Accessibility

Colorado State Highway 64 crosses the northern part of the quadrangle and passes through the town of Rangely. The highway continues eastward to Meeker and northwestward to Dinosaur, Colorado. A paved medium-duty county road leaves Colorado State Highway 64 approximately 2.5 miles (4.0 km) west of Rangely and runs north to Blue Mountain, Colorado. Colorado State Highway 139 runs southward from Rangely in Douglas Creek canyon along the east side of the quadrangle. The Dragon-Rangely Road, a light duty gravel road, runs south from

Rangely along the drainage divide between Johnson Draw and Trail Draw. A number of light duty oil well service roads occur in the northern part of the quadrangle in the Rangely oil field. Several unimproved dirt roads and jeep trails provide access to the more rugged areas of the quadrangle.

The nearest railhead is at Craig. This is the western terminus of a branch line of the Denver and Rio Grande Western Railroad; from Craig rail connections can be made to Denver, Colorado. The Rangely airport is about 1.5 miles (2.4 km) east of the town.

Physiography

The topography of the Rangely quadrangle includes flat lowlands along the flood plain of the White River, moderately hilly areas in the Coal Oil Basin in the northern part of the quadrangle, and low mountainous terrain in the southern part. The relief is approximately 1,050 ft. (320 m) with the highest point in the quadrangle being slightly less than 6,200 ft. (1,890 m) above sea level on a mountain in the southeast corner of the quadrangle. The elevation of the low point is about 5,150 ft. (1,570 m) where the White River leaves the west-central, part of the quadrangle.

The northern part of the quadrangle lies in an area of low hills and shallow washes called the Coal Oil Basin. This area drains southward toward the White River. The southern half of the quadrangle is higher and more rugged than the northern part. Douglas Creek, the main drainage in the southern half of the quadrangle flows northward into the White River.

The White River forms the major drainage in the area and crosses the north central part of the quadrangle in an east-west direction. The river meanders across its flood plain westward to its confluence with the Green River in Utah.

Climate

The Rangely quadrangle has a mid-latitude steppe climate and semiarid conditions prevail in the area. The normal annual precipitation ranges from 9 inches (23 cm) in the central area of the quadrangle to 11 inches (28 cm) on the southern edge of the quadrangle (U.S. Department of Commerce, (1964)).

A weather station at Rangely has recorded an all-time high temperature of 104^{0} F (40^{0} C) and an all-time, low temperature of -37^{0} F (-38^{0} C) (National Weather Service Forecast Office, personal communication). The mean annual temperature at Rangely is 45.6^{0} F (7.6^{0} C). A flood hazard exists along the flood plain of the White River.

Land Status

The Rangely quadrangle lies in the southwest part of the Lower White River Known Recoverable Coal Resource Area (KRCRA). The KRCRA covers approximately 20,950 acres (8,478 ha) of the quadrangle. Plate 2 shows areas of non-Federal land and the KRCRA boundary. There were no existing Federal coal leases or preference right lease applications in this quadrangle when the land check for this report was made on the date shown on plate 2. A comparison of the area of Federal coal ownership and the non-Federal lands in the quadrangle area is shown in table 1.

Table 1.-- Comparison of Federal and non-Federal land areas in the Rangely quadrangle, Rio Blanco County, Colorado

Category	Approximate area (acres)[1]	Percent of quadrangle area
Non-Federal land	7,590	21
Unleased Federal coal ownership	29,070[2]	79
Total	36,660	100

[1]To convert acres to hectares, multiply acres by 0.4047
[2]Coal is known to be present in only part of this area.

Previous Work

Gale (1910) described the coal fields of northwestern Colorado and northeastern Utah including the Lower White River field. Cullins (1971) mapped the geology and coal exposures of the Rangely quadrangle.

Barnum and Garrigues (1980) made a study of the coal deposits and geology of the adjoining Cactus Reservoir quadrangle to the northeast. Gaskill and Horn (1961) mapped the surface exposures of coal beds in the northeast Rangely area. Garrigues (1976) and Barnum and others (1977) reported on a series of coal test holes drilled in the Lower White River coal field. Cullins (1968) mapped the geology and coal outcrops in the adjoining Banty Point quadrangle to the west, and in the Mellen Hill quadrangle to the northwest (Cullins, 1969).

GENERAL GEOLOGY

Stratigraphy

Sedimentary rocks exposed in the Rangely quadrangle are Late Cretaceous in age. These rocks include the following formations in ascending order: Mancos Shale, Castlegate Sandstone, Buck Tongue of the Mancos Shale, and Mesaverde Group. The Mesaverde Group has been subdivided into the following units in ascending order: Sego Sandstone, minor coal unit, main coal unit, and upper unit (Cullins, 1971, modified by Barnum and Garrigues, 1980.

The main body of the Mancos Shale is about 4,500 ft (1,372 m) thick and is composed of brownish- to dark-gray marine shale interbedded with siltstone, very fine-grained sandstone, and thin beds of bentonite.

The Castlegate Sandstone consists of light-gray, fine- to medium-grained sandstone the top of which weathers into pedestals and monuments. The Castlegate Sandstone ranges from 35-50 ft (11-15 m) thick.

The Buck Tongue of the Mancos Shale ranges from 250-300 ft (76-91 m) thick and consists of gray to brownish-gray marine shale and contains orange-weathering dolomite concretions. Locally abundant gypsum crystals occur in the top 85 ft (26 m).

The Sego Sandstone is approximately 210 ft (64 m) thick and consists primarily of yellowish-gray to grayish-orange fine-grained sandstone at the base; brownish-gray sandy shale in the middle; and very light-gray, fine-grained, massive sandstone at the top.

The minor coal unit of the Mesaverde Group contains interbedded light-brown and yellowish-gray fine- to very fine-grained sandstone, gray to light-brownish-gray shale, brown carbonaceous shale, and thin coal beds as much 2.5 ft (0.8 m) thick. The minor coal unit is approximately 700 ft (213 m) thick.

The main coal unit of the Mesaverde Group consists primarily of interbedded grayish-orange, very fine-grained, lenticular sandstone, gray shale, brown carbonaceous shale, and coal. The thickest coal beds are found in the lower part of this unit which is designated as the main coal zone (Barnum and Garrigues, 1980). The main coal unit ranges from 540-680 ft(165-207 m) thick.

The upper unit of the Mesaverde Group is approximately 1,100 ft (335 m) thick and consists of interbedded brown to yellowish-gray, massive lenticular sandstone and yellowish-gray shale. The top of this unit is not exposed within the quadrangle.

In the small area of the Rangely quadrangle east of Douglas Creek the Mesaverde Group has been divided, in ascending order, into the Sego Sandstone, the Iles Formation, including the Trout Creek Sandstone Member at the top, and the Williams Fork Formation by Cullins (1971).

Structure

The east-west trending axial trace of the Rangely anticline lies approximately ½ mile (0.8 km) north of the town of Rangely. This anticline is asymmetrical, the south flank dipping more steeply than the north. Approximately 3 3/4 miles (6 km) south of and subparallel to the Rangely anticline lies the westward plunging Johnson Draw syncline and the eastward plunging South Rangely syncline (Cullins, 1971). The dips are more than 30° on the south flank of the Rangely anticline at the west edge of the quadrangle and decreases eastward to about 10°. The coal-bearing formations crop out along the northern flanks of the Johnson Draw and South Rangely synclines where the dips range west to east, from about 30° to less than 5°. South of the synclinal axes the rocks dip from 1° to 3° north and northwestward. The rocks rise very gently southeastward from the synclinal area to the Douglas Creek Arch south of the quadrangle.

A series of northeast-southwest trending normal faults occur in the south half of the quadrangle (pl. 1). The faults have displacements from 5 to 120 ft (1.5 to 37 m) (Cullins, 1971) and may be significant in coal-mining operations. The faults are spaced from several hundred feet to almost 2 miles (3 km) apart.

COAL GEOLOGY

The important coal beds in the Rangely quadrangle occur in the main coal unit of the Mesaverde Group (pl. 3). Most coal beds in this unit are lenticular and cannot be correlated for any great distance. Generally, the coal beds are concentrated in the main coal zone of Barnum and Garrigues (1980). The coal zone contains several coal beds 5 ft (1 m) or more thick with the thicker coal beds concentrated near the base of the zone. The thickest coal beds in the main coal unit are in the west-central part of the quadrangle (pl. 1) and apparently thin to the northwest and the southeast (Cullins, 1971). The minor coal unit of the Mesaverde Group contains very thin discontinuous coal beds less than 3 ft (1 m) thick.

The datum shown on plate 3 is the base of the main coal zone of Barnum and Garrigues (1980). Because of the lenticular nature of the coal beds and the uncertainty of continuity, the correlation lines shown between some of the columns on plate 3 are dashed. The vertical positions of isolated coal beds shown on plate 3 are relative. The spatial relationships of the coal beds (pl. 3) were plotted using the best information available, and may not be accurate.

In this report the coal beds of the main coal zone have been named MCZ (main coal zone) 1 to 4. These numbered coal beds have been correlated over small areas, generally within the quadrangle, and the sequential numbering does not necessarily reflect the true stratagraphic position of one coal bed with respect to the other. Thin local coal beds of limited extent in the main coal zone are named MCZ L (local bed, main coal zone) on plates 1 and 3. The local coal beds which occur below the main coal zone have been labeled "L" (local).

Coal beds 5 ft (1.5 m) or more thick that lie less than 3,000 ft (914 m) below the ground surface are Reserve Base coals and are used in calculating Reserve Base and Reserve tonnages discussed below under Coal Resources.

Main Coal Zone

Coal Bed 1

Coal bed 1 (MCZ 1) of the main coal zone is 5 ft (1.5 m) or more thick in the central part of the quadrangle (pl. 4). The MCZ 1 coal bed ranges from 1.2 to 6.3 ft (0.4 to 1.9 m) in thickness along the east-west trending outcrop line shown on plate 1. The absence of thickness data behind the outcrop makes it difficult to project coal thickness trends in a southward direction. Therefore, an insufficient data line was drawn approximately one-quarter mile (0.4 km) from the outcrop trace on the coal isopach and the areal distribution and identified resources maps (pl. 4 and 6). The MCZ 1 coal bed dips southwestward from 5^{o} to 12^{o} in the area of its outcrop.

Coal Bed 2

Coal bed (MCZ 2) of the main coal zone is 5 ft (1.5 m) or more thick in an indeterminate area in the central part of the quadrangle (pl. 5). An insufficient data line has been drawn one-quarter mile (0.4 km) from the outcrop trace on the coal isopach map (pl. 5) because of a lack of non-proprietary data. The MCZ 2 coal bed ranges from 2.5 to 7.9 ft (0.8 to 2.4 km) in thickness along the east-west trending outcrop line shown on plate 1. The MCZ 2 coal bed dips from 4^{o} to 12^{o} to the southwest in the outcrop area.

Table 2.--Isolated data points, Rangely quadrangle, Rio Blanco County, Colorado

Index No. (pl. 1)	Location	Coal Occurrence	Coal Bed Name	Coal Thickness (ft)[1]	Measured Area (acres)[2]	Resource tonnage (s.t.)[3]
1	SW¼SE¼ sec. 8, T. 1 N., R. 102 W.	Outcrop	MCZ L	15.0	64	1,700,000
9	SW¼NW¼ sec. 15, T. 1 N., R. 102 W.	Outcrop	MCZ L	6.5	29	300,000
12	NW¼SE¼ sec. 14, T. 1 N. R. 102 W.	Mine	MCZ L	12.0	26	600,000
28	SE¼NW¼ sec. 17, T. 1 N., R. 101 W.	Outcrop	MCZ L	7.9	3	*
50	NW¼NW¼ sec. 30 T. 1 N., R. 101 W.	Outcrop	MCZ L	5.0	19	200,000
			Total resource tonnage			2,800,000

* Resource tonnage is less than 50,000 short tons and is not added into the total resource tonnage figure.

[1]To convert feet to meters, multiply feet by 0.3048

[2]To convert acres to hectares, multiply acres by 0.4047

[3]To convert short tons to metric tons, multiply short tons by 0.9072

Isolated Data Points

The standard criteria for construction of isopach, structure contour, and overburden isopach maps cannot be applied to some coal beds of Reserve Base thickness because thickness measurements are few and isolated. The lack of data for these beds limits the extent to which they can be reasonably projected in any direction and usually precludes correlations with other better-known beds. For these reasons, maps of isolated data points are not included in this report but are in U.S. Geological Survey files. Reserve Base tonnages were calculated for these non-isopached coal beds and are shown in table 2.

CHEMICAL ANALYSES OF THE COAL

Analyses of coal samples taken from an 11.9 ft (3.6 m) thick coal bed in the abandoned J. W. Rector mine in the Rangely quadrangle were reported by Cullins, (1971) and are shown in the following table.

Table 3.--Proximate and ultimate analyses of coal from the J. W. Rector mine. NW¼SE¼ sec. 14, T. 1 N., R. 102 W., Rio Blanco County, Colorado (Cullins 1971)

Sample Number	5519	5520
Proximate Analyses		
Moisture	8.55 percent	9.77 percent
Volatile matter	33.40 Do.	33.43 Do.
Fixed carbon	49.99 Do.	51.27 Do.
Ash	8.06 Do.	5.53 Do.
Ultimate Analyses		
Hydrogen	5.30 percent	5.38 percent
Carbon	64.64 Do.	65.28 Do.
Nitrogen	1.18 Do.	1.11 Do.
Oxygen	20.36 Do.	22.30 Do.
Sulphur	0.46 Do.	0.40 Do.
Heating value	11,080 Bty/lb[1]	11,490 Btu/lb[1]

[1]To convert Btu/lb to Kj/kg, multiply by 2.326

On the basis of the above analyses, the coal is ranked as high-volatile C bituminous coal (American Society for Testing and materials, 1977).

MINING OPERATIONS

Gale (1910) described the workings in the abandoned coal mine located in the NW¼SE¼ sec. 14, T. 1 N., R. 102 W. referred to as the J. W. Rector mine. "The entry is cut on the middle portion of the large bed of coal, leaving coal both above and below. The coal bed measures 11 feet 11 inches at the face of one of the slopes that turns down, 90 feet in from the entrance. At that place a seam of bone about 2 inches thick was noted 4 feet 3 inches below the roof. This bone forms the roof of the main entry. . . . . The strike of the beds is N. 68° W. and they dip 9° SW. The roof is composed of 12 to 15 feet of compact clay shale underlying a rusty colored sandstone ledge. The floor is smooth and composed of brown or bony shale for a depth of a few inches."

The coal bed in the J. W. Rector mine is apparently a local bed that has not been correlated with other coal occurrences in the quadrangle. The mine opened 1898 and produced at least 100 short tons (91 metric tons). The total production for the mine is unknown.

COAL RESOURCES

The principle source of data used in the construction of the coal isopach, structure contour, and coal-data maps was Cullins (1971).

The coal isopach maps were constructed using a point-data net derived from coal-thickness measurements of an individual coal bed obtained from surface exposures within the quadrangle boundary and a 3-mile (4.8 km) -wide zone around the quadrangle. Measured coal-thickness values were used directly in the point-data net. The principle of uniform variation in thickness between data points was used to establish the position of isopach lines.

Structure contour maps were constructed by using a point-data net derived from surface exposures. The elevation of the top of each contoured coal bed was based on surface altitude referenced to mean sea level.

Each overburden isopach map was based on a point-data net derived from stratigraphic-interval thicknesses measured from the ground surface to the top of the isopached coal bed. This was accomplished by laying a structure contour map over, and in registration with, a topographic contour map and then calculating apparent overburden thickness values at the intersections of structure contour lines and surface topographic contour lines.

Coal thickness data was obtained from the coal isopach maps (pl. 4 and 5) for resource calculations. The coal-bed acreage (measured by planimeter) multiplied by the average isopach thickness of the coal bed multiplied by a conversion factor of 1,800 short tons of coal per acre-foot (13,238 metric tons of coal per hectare-meter) for bituminous coal yeilds coal resources in short tons. Reserve Base and Reserve values for the MCZ 1 and MCZ 2 coal beds are shown on pl. 6 and are rounded to the nearest tenth of a million short tons. The Reserve values are based on a subsurface mining recoverability factor of 50 percent and a surface mining recoverability factor of 85 percent (specified by the U.S. Geological Survey, unpublished data, 1979).

The following criteria for coal resource determinations are given in U.S. Geological Survey Bulletin 1450-B: "Measured.--Resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent of true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coal beds, the points of observation are no greater than ½ mile (0.8 km) apart. Measured coal is projected to extend as a ¼ mile (0.4 km) wide belt from the outcrop or points of observation or measurement.

"Indicated.--Resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on basis of geologic evidence. The points of observation are ½ (0.8 km) to 1½ miles (2.4 km) apart. Indicated coal is projected to extend as a ½ mile (0.8 km) wide belt that lies more than ¼ mile (0.4 km) from the outcrop or points of observation or measurement.

"Inferred.--Quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are available. The estimates are based primarily on an assumed continuation from Demonstrated coal [a collective term for the sum of coal in both Measured and Indicated Resources and Reserves] for which there is geologic evidence. The points of observation are 1½ (2.4 km) to 6 miles (9.5 km) apart. Inferred coal is projected to extend as a 2¼-mile (3.6 km) wide belt that lies more than 3/4 mile (1.2 km) from the outcrop of points of observation or measurement." (U.S. Bureau of Mines and U.S. Geological Survey, 1976, p. B6 and B7).

Coal resource tonnages were calculated for measured, indicated, and inferred categories in the unleased areas of Federal coal land where the coal is 5 ft (1.5 m) or more thick and lies within 3,000 ft (9.4 m) of the surface. The criteria cited above were used in calculating Reserve Base and Reserve data in this report and differ from those stated in U.S. Geological Survey Bulletin 1450-B, which calls for a minimum thickness of 28 in (70 cm) for bituminous coal and a maximum depth of 1,000 ft (300 m).

In this study, coal 5 ft (1.5 m) or more thick lying between the ground surface and a depth of 200 ft (61 m) is considered amenable to surface mining methods; coal 5 ft (1.5 m) or more thick lying between 200 ft (61 m) and 3,000 ft (914 m) below ground level in beds having dips of less than 15° is considered minable by conventional subsurface methods. Coal of Reserve Base thickness lying between 200 ft (61 m) and 3,000 ft (914 m) below ground level with dips greater than 15° is assumed to be suitable for in situ coal gasification methods.

Reserve Base tonnages of Federal coal per section for all isopached coal beds are shown on plate 2 and total approximately 1.7 million short tons (1.5 million metric tons) for the unleased Federal coal lands within the quadrangle. Reserve Base (in short tons) in the various development potential categories for surface and subsurface mining methods are shown in tables 4 and 5.

Resource tonnages calculated for isolated data points (non-isopached coal beds) are classified as inferred coal and placed in the unknown development potential category. The coal resources for the isolated data points are shown in table 2 and total 2.8 million short tons (2.5 million metric tons). In this quadrangle the unknown development potential resource coal is projected to extend as a ¼ mile (0.4 km) wide belt from points of measurement at the isolated data points.

AAA Engineering & Drafting, Inc. has not made any determination of economic recovery for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn (pl. 7 and 8) to coincide with the boundaries of the smallest legal land subdivisions shown on plate 2. In sections or parts of sections where no land subdivisions have been surveyed by the BLM (U.S. Bureau of Land Management), approximate 40-acre (16-ha) parcels have been used to show the limits of high-, moderate-, or low-development-potential areas.

The designation of a coal development potential classification is based on the occurence of the highest rated coal-bearing area that may occur within any fractional part of a 40-acre (16-ha) BLM land-grid area, lot, or tract of unleased Federal coal land. For example, a certain 40-acre (16-ha) parcel is totally underlain by a coal bed of moderate-development-potential. If a small corner of the same 40-acre (16-ha) area is also underlain by another coal bed of high-development-potential, the entire 40-acre (16-ha) area is given a high-development-potential rating even though most of the area is rated "moderate".

Development Potential Using Surface Mining Methods

Areas where the coal beds 5 ft (1.5 m) or more in thickness are overlain by 200 ft (61 m) or less of overburden are considered to have a surface mining potential and were assigned a high-, moderate-, or low-development-potential on the basis of the mining ratio (cubic yards of overburden per ton of recoverable coal). The following formula is used to calculate mining ratios:

$$MR \; \frac{t_o \,(0.896)}{t_c \;\; (rf)}$$

Where MR = mining ratio (cubic yards of overburden per ton of recoverable coal)

t_o = thickness of overburden (in feet)

t_c = thickness of coal (in feet)

rf = recovery factor

0.896 = factor for bituminous coal

To convert mining ratio to cubic meters of overburden per metric ton of recoverable coal, multiply MR by 0.8428.

Areas of high-, moderate-, and low-development-potential for surface mining methods are here defined as areas underlain by coal beds having respective mining-ratio values of 0 to 10, 10 to 15, and greater than 15. These mining ratio values for each development-potential category are based on economic and technological criteria and were provided by the U.S. Geological Survey (1979, unpublished data).

The coal development potential using surface mining methods is shown on plate 7. Approximately 3 percent of the unleased Federal land area in this quadrangle is classified as having a high-development-potential; less than 1 percent has a moderate-development-potential; and 1 percent has a low-development-potential using surface mining methods. The remaining Federal land in the quadrangle is classified as having an unknown surface mining development potential or no development potential. Areas of unknown surface mining development potential are those not known to contain coal beds 5 ft (1.5 m) or more thick that are within 200 ft (61.0 m) of the surfaces: however, coal beds 5 ft (1.5 m) or more thick could be present in the area. Lands where it is known that no coal beds occur within 200 ft (61.0 m) of the surface have no surface-mining potential.

Development Potential Using Subsurface Mining and In Situ Coal Gasification

The coal development potential for areas in which subsurface development of coal is assumed possible is shown on plate 5. In this quadrangle, areas where coal beds dip 15^{o} or less, are 5 ft (1.5 m) or more thick and are overlain by 200 to 1,000 ft (61 to 305 m) of overburden are considered to have a high-development-potential for conventional subsurface mining methods.

Approximately 2 percent of the unleased Federal land in this quadrangle has a high classification. Areas where such beds are overlain by 1,000 to 2,000 ft (305 to 610 m) and 2,000 to 3,000 ft (610 to 914 m) of overburden are rated as having moderate- and low-development-potentials respectively. In this quadrangle there are no areas classified with a moderate- or low-development-potential using subsurface mining methods. Areas that contain no known coal beds 5 ft (1.5 m) or more thick but do contain coal-bearing units at depths between 200 to 3,000 ft (61 to 914 m) are classified as areas of unknown coal development potential. Areas where it is known that no coal beds occur or where coal beds are present at depths greater than 3,000 ft (914 m) have no coal-development potential.

Reserve Base tonnages have been calculated for all areas where the beds are 5 ft (1.5 m) or more thick. Reserves are based on a recoverability factor of 50 percent (specified by the U.S. Geological Survey, unpublished data, 1979) and have been calculated for only that part of the Reserve Base considered to be suitable for conventional subsurface mining methods.

Areas that contain coal beds overlain by 200 to 3,000 ft (61 to 914 m) of overburden and having dips in excess of 15^{o} are considered to have potential for development only by in situ coal gasification methods. Inasmuch as no coal beds 5 ft (1.5 m) or more thick are known to occur in this quadrangle where the dip is more than 15^{o}, no lands are rated for using in situ coal gasification methods.

Table 4.--Coal Reserve Base data for surface mining methods for Federal coal lands in the Rangely quadrangle, Rio Blanco County, Colorado

(In short tons)[1]

Coal Bed Name	High development potential (0-10 mining ratio)	Moderate development potential (10-15 mining ratio)	Low development potential (>15 mining ratio)	Total
MCZ 1 coal bed	2,100,000	100,000	100,000	2,300,000
MCZ 2 coal bed	1,000,000	-0-	-0-	1,000,000
TOTALS	3,100,000	100,000	100,000	3,300,000

[1]To convert short tons to metric tons, multiply by 0.9072

Table 5.--Coal Reserve Base data for subsurface mining methods for Federal coal lands in the Rangely quadrangle, Rio Blanco County, Colorado.
(In short tons)[1]

Coal Bed Name	High development potential	Moderate development potential	Low development potential	Total
MCZ 1 coal bed	600,000	-0-	-0-	600,000
MCZ 2 coal bed	500,000	-0-	-0-	500,000
TOTAL	1,100,000	-0-	-0-	1,100,000

[1]To convert short tons to metric tons, multiply by 0.9072

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