Text to Accompany:

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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE THE CRESTON JUNCTION QUADRANGLE, CARBON AND SWEETWATER COUNTIES, WYOMING

[Report includes 43 plates]

Prepared for

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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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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INTRODUCTION

Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) and Coal Development Potential (CDP) Maps of the Creston Junction quadrangle, Carbon and Sweetwater Counties, Wyoming. This report was compiled to support the land planning work of the Bureau of Land Management (BLM) to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States. This investigation was undertaken by Dames & Moore, Denver, Colorado, at the request of the U.S. Geological Survey under contract number 14-08-0001-17104. The resource information gathered for this report is in response to the Federal Coal Leasing Amendments Act of 1976 (P. L. 94-377). Published and unpublished public information was used as the data base for this study. No new drilling or field mapping was performed, nor was any confidential data used.

Location

The Creston Junction quadrangle is located in south-central Wyoming on the county line between western Carbon County and eastern Sweetwater County, approximately 20 miles (32 km) west of Rawlins and 12 miles (19 km) east of Wamsutter, Wyoming. With the exception of a few houses at Creston Junction and the 44 Ranch located in the northwestern portion of the quadrangle, the area is relatively unpopulated. Cherokee, a former loading station for the Union Pacific Railroad, has been abandoned.

Accessibility

The main east-west line of the Union Pacific Railroad, providing railway service across southern Wyoming, passes through the northern one third of the quadrangle. The railway connects Ogden, Utah to the west, and Omaha, Nebraska to the east.

Interstate Highway 80 passes east-west across the northern edge of the quadrangle, and Wyoming Highway 789, connecting Baggs and Creston Junction, crosses the western edge of the quadrangle. The remainder of the quadrangle is served by a network of unimproved dirt roads and trails.

Physiography

The Creston Junction quadrangle is located in the Red Desert region on the southern edge of the Great Divide Basin. The landscape within the quadrangle is characterized by broad gravel-capped terraces and gentle cuestas. Cherokee Hill, in the northeastern corner of the quadrangle, rises about 150 feet (46 m) above the surrounding area. Altitudes in the quadrangle vary from 6,780 feet (2,067 m) on Fillmore Creek on the northeastern edge of the quadrangle to 7,295 feet (2,224 m) in the southeastern corner of the quadrangle.

Fillmore Creek, cutting across the central portion of the quadrangle, flows into Separation Creek northeast of the quadrangle boundary. All streams in the area are intermittent, flowing mainly in response to snowmelt in the spring. Some terminate locally in broad undrained depressions or playas, and may form shallow alkaline lakes which fluctuate in size with the seasons.

Climate and Vegetation

The climate of south-central Wyoming is semi-arid, characterized by low precipitation, rapid evaporation, and large daily temperature variations. Summers are usually dry and mild, and winters are cold. The annual precipitation in the area averages 10.4 inches (26.4 cm). Approximately two thirds of the precipitation falls in the spring and summer during a seven-month period from April through October.

The average annual temperature in the area is 43°F (6°C). The temperature during January averages 21°F (-6°C) and ranges from 12°F (-11°C) to 31°F (-0.6°C). During July the average temperature is 68°F (20°C), and the temperature ranges from 51°F (11°C) to 84°F (29°C) (U.S. Bureau of Land Management, 1978, and Wyoming Natural Resources Board, 1966).

The winds are usually from the southwest and the west-southwest with an average velocity of 12 miles per hour (19 km per hr) (U.S. Bureau of Land Management).

The principal types of vegetation in the quadrangle include grasses, sagebrush, greasewood, saltbush, rabbitbrush, and other desert shrubs.

Land Status

The Creston Junction quadrangle lies along the northern edge of the Rawlins Known Recoverable Coal Resource Area. The southern nine tenths of the quadrangle lie within the KRCRA boundary. The Federal government owns the coal rights for less than one half of this area. Four active coal leases are present within the KRCRA boundary, as shown on plate 2.

GENERAL GEOLOGY

Previous Work

Ball (1909) described the coal-bearing Fort Union and Wasatch Formations present in the Creston Junction quadrangle in his study of the western part of the Little Snake River coal field. Smith (1909) covered a small area in the northern part of the quadrangle in an investigation of the eastern part of the Great Divide Basin coal field. A detailed report on the geology and ground-water resources of the Rawlins area, to the northeast of the quadrangle, was made by Berry (1960). Masursky (1962) described the Tertiary-age formations present in the quadrangle. Welder and McGreevy (1966) included the Creston Junction quadrangle in a report published on the geology and ground-water resources of the Great Divide Basin. Gill, Merewether, and Cobban (1970) described the stratigraphy of the Upper Cretaceous-age rocks in the Bridger Pass area east of the quadrangle. Smith and others (1972) described the strippable coals and the coal reserves present in the Cherokee deposit in the southwestern corner of the quadrangle. Sanders made a detailed investigation of the geology and coal resources of the adjacent Riner quadrangle in 1974 and of the Creston Junction quadrangle in 1975. Recent unpublished data from the Rocky Mountain Energy Company (RMEC) and from geologic mapping by Back (1976) and Edson (in press, b, and 1977) provided the location of coal outcrops and coal thickness information.

Stratigraphy

The formations exposed in the Creston Junction quadrangle range in age from Paleocene to Recent. Only the Fort Union Formation of Paleocene age contains coal in the quadrangle.

The Fort Union Formation, cropping out over the southeastern two thirds of the Creston Junction quadrangle, is approximately 3,400 feet (1,036 m) thick with only the upper one half of the formation exposed in the quadrangle. The subsurface portion of the formation consists of approximately 500 feet (152 m) of light-gray, thick-bedded to massive, medium- to coarse-grained, generally cross-bedded basal sandstones. These are overlain by approximately 1,500 feet (457 m) of alternating beds of light-brown to orange argillaceous siltstone, light-gray fine- to medium-grained sandstone, light- to dark-gray shale, and thin lenticular coal beds. Above these are approximately 700 feet (213 m) of poorly exposed beds of arenaceous siltstone and carbonaceous shale. The upper 600 to 700 feet (183 to 213 m) of the Fort Union Formation consist of gray-brown argillaceous siltstone, brown micaceous sandstone, shale, thick coals, and lignite (Sanders, 1974 and 1975).

Unconformably overlying the Fort Union Formation and cropping out over the northwestern one third of the quadrangle are approximately 350 feet (107 m) of Eocene-age Wasatch Formation sediments. These consist of intertonguing white to yellowish-white massive beds of arkose, or brown ferruginous lenses of coarse-grained to granulitic arkose, and dark-gray, gray-green, or black shale which locally contains numerous plant fragments. The base of the formation is placed at the lowest occurrence of ferruginous lenses or massive arkose beds. These sediments are lithologically equivalent to the Battle Springs Formation cropping out north of the quadrangle (Sanders, 1974 and 1975).

Recent deposits of alluvium cover the stream valley of Fillmore Creek. Pleistocene-age terrace remnants of unconsolidated gravel cap Cherokee Hill and much of the northwestern portion of the quadrangle. Windblown sand and several large areas of playa-lake clays also occur in the quadrangle (Sanders, 1975).

Thick sections of detrital material, eroded from older deposits, formed the coarse sandstones of the Fort Union Formation.

The siltstones, shales and coals were deposited in stream, lake, and swamp environments.

The coarse-grained arkose of the Wasatch Formation is probably a fluvial facies of the main Wasatch Formation, formed in a piedmont environment adjacent to the sediment source (Masursky, 1962).

Structure

The Creston Junction quadrangle lies on the southeastern edge of the Wamsutter arch, a low, broad, indistinct structure which separates the Great Divide and Washakie structural basins.

Throughout most of the quadrangle, the strata strike approximately N 60° E and dip gently to the northwest toward the Great Divide Basin. In the southwestern portion of the quadrangle, the rocks strike nearly north and dip westerly into the Washakie Basin. Sanders (1975) indicates that due to depositional attitudes of the Fort Union Formation beds in the upper 600 feet (183 m) of the formation, dips measured at sandstone outcrops are 2° to 5° higher than dips measured on shale and coal outcrops or as interpreted from drill hole data. The steeply dipping strata in secs. 19 and 20, T. 20 N., R. 91 W., where surface dips are 25° to 45° steeper than those of underlying strata, are believed to represent sedimentary structures such as foreset beds.

The two small faults indicated by Sanders (1975) in the southwestern portion of the quadrangle are hypothetical structures based primarily on drill hole data. They could be the result of monoclinal folding or differential compaction.

COAL GEOLOGY

Beds of the Upper and Lower Fort Union Coal Zones have been identified in this quadrangle as shown on plate 3. Approximately 1,000 feet (305 m) of the Lower Fort Union Coal Zone is encountered in deep wells drilled in the southern part of the quadrangle. An estimated 1,500 feet (457 m) of shale and siltstone separate the Lower Fort Union Coal Zone and the Upper Fort Union Coal Zone. The Upper Fort Union Coal Zone is approximately 500 feet (152 m) thick and is approximately 200 feet (61 m) below the base of the Wasatch Formation.

Rocky Mountain Energy Company has drilled extensively in the Rawlins area and has named many of the Fort Union coal beds using an alphanumeric designation (e.g., F2). Generic names (e.g., Red Rim) have been used by Edson (in press, a) and Back (1976) to designate some of the same beds. Both names are used in this report and on CRO maps where applicable.

Chemical analyses of coal.--Representative chemical analyses of samples from the Upper Fort Union Coal Zone are included in table 1 (Sanders, 1975). No known analyses of coal in the Lower Fort Union Coal Zone were available for this quadrangle, however, analyses for the Red Rim (F2) and undifferentiated Fort Union Formation coal beds from the Riner quadrangle to the east are included in table 1 (RMEC, no date).

In general the coals in this area rank as subbituminous B or C on a moist, mineral-matter-free basis according to ASTM Standard Specification D 388-77 (ASTM, 1977).

Lower Fort Union Coal Zone

Coal beds of the Lower Fort Union Coal Zone exist at depth but do not crop out in the quadrangle. Numerous undifferentiated Fort Union beds were mapped in the southern half of this quadrangle. These beds, stratigraphically, are located in the Lower Fort Union Coal Zone, but do not appear to correlate with named beds to the east in the Fillmore Ranch and Riner quadrangles. Bracketed numbers were used for identification purposes in this quadrangle only. The FU[2], FU[3], FU[4], FU[5], FU[6], FU[7], FU[8], FU[9], and FU[10] coal beds were treated as isopachable beds and the remaining undifferentiated coal beds greater than 5 feet (1.5 m) in thickness were treated as isolated data points. (see Isolated Data Points section of this report). The dotted line shown on plate 7 represents a limit of confidence beyond which isopach and structure contours for the FU[3] coal bed are not prepared due to insufficient data. With further information this coal bed might be correlated with the Red Rim (F2) coal bed in the Lower Fort Union Coal Zone. It is believed, however, that the bed continues to be of Reserve Base thickness (greater than 5 feet or 1.5 meters) in areas beyond this line.

In the Creston Junction quadrangle, dips measured at the surface by Sanders (1974) average 5° in a northwesterly direction. Overburden thickness increases in the same direction.

Red Rim (F2) Coal Bed

The Red Rim (F2) coal bed is the only identified coal bed in the Lower Fort Union Coal Zone in this quadrangle. The name Red Rim, as used by Edson (in press, a), refers to a correlatable coal bed which crops out near Red Rim ridge located in T. 20 N., R. 90 W., in the northwest quarter of the Bridger Pass 15-minute quadrangle. The thickness of the bed is 27 feet (8.2 m) in sec. 18, T. 19 N., R. 90 W., (in the Riner quadrangle), and in sec. 22, T. 19 N., R. 91 W., in the Fillmore Ranch quadrangle. This bed is continuous through broad areas of the Riner, Fillmore Ranch, and Seaverson Reservoir quadrangles and is, therefore, believed to be persistant at depth, down-dip, into the southeastern corner of this quadrangle. Isopach and structure contour maps were prepared for the Red Rim (F2) coal bed using data projected from the quadrangles to the east. The dotted line shown on plates 29, 30, and 31 represents a limit of confidence beyond which isopach and structure contours are not drawn due to insufficient data although the bed is believed to be of Reserve Base thickness in the area beyond this line. The average dip, as calculated from plate 29, is less than 5° in a northwesterly direction.

Upper Fort Union Coal Zone

The coal beds of the Upper Fort Union Coal Zone crop out extensively in this quadrangle as shown on plate 1. The average dip measured in the coal-bearing area (Sanders, 1974) is 5° in a northwesterly direction.

Horse Butte (E) Coal Bed

The Horse Butte (E) coal bed is, stratigraphically, the lowest identified bed in the Upper Fort Union Coal Zone. This bed, designated the E coal bed by RMEC, was named for Horse Butte located in sec. 5, T. 19 N., R. 91 W. The Horse Butte coal bed is found only in the southwest corner of the quadrangle where it reaches a maximum thickness of 11 feet (3.4 m) in sec. 12, T. 19 N., R. 92 W. In the Creston quadrangle to the west, the bed is found in one drill hole located in sec. 3, T. 19 N., R. 92 W., and measures 10.5 feet (3.2 m) in thickness. The dip derived from plate 26 dips 2° in a northwesterly direction.

Cow Butte (D) Coal Bed

The Cow Butte (D) coal bed is 85 feet (25.9 m) above the Horse Butte bed where encountered in a drill hole located in sec. 11, T. 19 N., R. 92 W. The coal bed is named for Cow Butte located in sec. 5, T. 19 N., R. 91 W. (Back, 1976). Maximum thickness of this bed was measured in sec. 1, T. 19 N., R. 92 W. is 26.6 feet (8.1 m) excluding 12.7 feet (3.9 m) of partings. To the east, in the Riner quadrangle, the bed averages 8 feet (2.4 m) in thickness and to the south, in the Seaverson Reservoir quadrangle, the bed averages 10 feet (3.0 m) in thickness. In general, the Cow Butte (D) coal bed contains a significant amount of partings and in some areas of the Creston Junction quadrangle the bed is split by as much as 100 feet (30 m) of carbonaceous shale. The average dip calculated from plate 29 is less than 5° in a northwesterly direction.

Lower Cherokee (C) Coal Bed

The Lower Cherokee (C) coal bed is the lower split of the Cherokee coal bed and was named for the abandoned Cherokee loading station on the Union Pacific Railroad located in sec. 10, T. 20 N., R. 91 W. In this quadrangle, the upper and lower splits are separated by interburden ranging in thickness from 1 to 100 feet (0.3 to 30.5 m). The interburden thins to the south where the splits join to form the Cherokee bed in the Seaverson Reservoir quadrangle.

The Lower Cherokee (C) coal bed is approximately 75 to 200 feet (22.9 to 61 m) above the Cow Butte (D) coal bed of the Upper Fort Union Coal Zone. The Lower Cherokee (C) coal bed reaches a maximum thickness of 30.5 feet (9.3 m) in sec. 35, T. 20 N., R. 92 W. Partings are numerous, attaining a combined thickness of 7 feet (2.1 m) in secs. 17 and 19, T. 20 N., R. 91 W. To the south, in the Seaverson Reservoir quadrangle, the bed combines with the Upper Cherokee (B) coal bed where a maximum combined thickness of 49 feet (14.9 m) was reported in sec. 15, T. 19 N., R. 92 W. In the Riner quadrangle to the east, the Lower Cherokee (C) bed thins, averaging 10 feet (3.0 m) excluding partings. The dip of the bed is less than 5° to the northwest as calculated from plate 32.

Upper Cherokee (B) Coal Bed

The maximum thickness recorded for the Upper Cherokee (B) coal bed was 19.6 feet (6.0 m) with a 1.1-foot (0.3-m) parting, found in sec. 11, T. 19 N., R. 92 W. Partings in the Upper Cherokee coal bed reach a maximum thickness of 11 feet (3.4 m) in sec. 24, T. 20 N., R. 92 W. This bed runs discontinuously to the northeast averaging 7 feet (2.1 m) in thickness. The dip derived from plate 36 is 5° or less in a northwesterly direction.

High Point (A) Coal Bed

The High Point (A) coal bed is, stratigraphically, the uppermost identified bed in the Upper Fort Union Coal Zone, lying approximately 80 feet (24.4 m) above the Upper Cherokee (B) coal bed. The bed is named for the High Point ridge located in sec. 17, T. 19 N., R. 92 W. The bed reaches a maximum recorded thickness of 12.5 feet (3.8 m) in an outcrop measured section in sec. 17, T. 20 N., R. 91 W., in the Creston quadrangle to the west. This bed is discontinuous in the quadrangle, occurring only in the northeast and southwest corners. In the Riner quadrangle to the east, the maximum thickness of the High Point bed is 3.5 feet (1.1 m), well below the minimum Reserve Base thickness of 5 feet (1.5 m). To the south, in the Seaverson Reservoir quadrangle, the bed reaches 8 feet (2.4 m) in thickness in secs. 15 and 22, T. 19 N., R. 92

W. From plate 39, the average calculated dip is less than 5° in a northwesterly direction.

Isolated Data Points

In instances where isolated measurements of coal beds thicker than 5 feet (1.5 m) are encountered, the standard criteria for construction of isopach, structure contour, mining ratio, and overburden isopach maps are not applicable. The lack of data concerning 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 this reason, isolated data points are included on a separate sheet (in U.S. Geological Survey files) for non-isopachable coal beds. The isolated data points used in this quadrangle are listed below. The coal beds identified by bracketed numbers are not formally named but are numbered for identification purposes in this quadrangle only.

Source	Location	Coal Bed or Zone	Thickness
Amoco Production Co.	sec. 27, T. 20 N., R. 91 W.	FU[1]	9.0 ft (2.7 m)
Back (1976)	sec. 17, T. 20 N., R. 91 W.	FU[11]	6.0 ft (1.8 m)
Back (1976)	sec. 20 T. 20 N., R. 91 W.	FU[12]	8.5 ft (2.6 m)

COAL RESOURCES

Information from oil and gas wells, from coal test holes drilled by RMEC, and coal data from Edson (in press, b, and 1977), as well as surface mapping by Sanders (1974), was used to construct outcrop, isopach, and structure contour maps of the coal beds in this quadrangle.

Coal resources were calculated using data obtained from the coal isopach maps (plates 4, 7, 10, 13, 16, 19, 21, 24, 26, 29, 32, 35, and 39). The coal bed acreage (measured by planimeter) multiplied by the average isopached thickness of the coal bed and by a conversion factor of 1,770 short tons of coal per acre-foot (13,018 metric tons per hectare-meter) for subbituminous coal yields the coal resources in short tons for each isopached coal bed. Reserve Base and Reserve tonnages for the isopached beds are shown on plates 6, 9, 12, 15, 18, 23, 28, 31, 34, 38, and 41, and are rounded to the nearest 10,000 short tons (9,072 metric tons). Coal beds thicker than 5 feet (1.5 m) that lie less than 3,000 feet (914 m) below the ground surface are included, although this criteria differs somewhat from that used in calculating Reserve Base and Reserve tonnages as stated in U.S. Geological Survey Bulletin 1450-B which calls for a maximum depth of 1,000 feet (305 m) for subbituminous coal. Only Reserve Base tonnages (designated as inferred resources) are calculated for areas influenced by the isolated data points in this quadrangle. Coal Reserve Base tonnages per Federal section are shown on plate 2 and total approximately 332.51 million short tons (301.65 million metric tons) for the entire quadrangle. Reserve Base tonnages in the various development potential categories for surface and subsurface mining methods are shown in tables 2 and 3.

Dames & Moore has not made any determination of economic recoverability for any of the coal beds described in this report.

COAL DEVELOPMENT POTENTIAL

Coal development potential areas are drawn to coincide with the boundaries of the smallest legal land subdivisions shown on plate 2. In sections or portions of sections where no land subdivisions have been surveyed by the BLM, approximate 40-acre (16-ha) parcels have been used to show the limits of the high, moderate, or low development potentials. A constraint imposed by the BLM specifies that the highest development potential affecting any portion of a 40-acre (16-ha) lot, tract, or parcel be applied to that entire lot, tract, or parcel. For example, if 5 acres (2 ha) within a parcel meet criteria for a high development potential, 25 acres (10 ha) a moderate development potential, and 10 acres (4 ha) a low development potential, then the entire 40 acres (16 ha) are assigned a high development potential.

Development Potential for Surface Mining Methods

Areas where the coal beds are overlain by 200 feet (61 m) or less of overburden are considered to have potential for surface mining and were assigned a high, moderate, or low development potential based on the mining ratio (cubic yards of overburden per ton of recoverable coal). The formula used to calculate mining ratios is as follows:

$$MR = \frac{t_o \, (0.911)}{t_c \, (rf)}$$

where MR = mining ratio
t_o = thickness of overburden
t_c = thickness of coal
rf = recovery factor

Note: 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 defined as areas underlain by coal beds having respective mining ratio values of 0 to 10, 10 to 15, and greater than 15, as shown on plates 27, 30, 33, 37, and 40. 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.

Unknown development potentials have been assigned to those areas where coal data is absent or extremely limited, including areas influenced by isolated data points. Even though these areas contain coal thicker than 5 feet (1.5 m), limited knowledge of the areal distribution of the coal prevents accurate evaluation of development potential. Tonnages in the unknown potential category for isolated data points total 2,650,000 short tons (2,404,000 metric tons).

The coal development potential for surface mining methods (<200 feet or 61 meters of overburden) is shown on plate 42.

Of those Federal land areas having known development potential for surface mining, 74 percent are rated high, 17 percent are rated moderate, and 9 percent are rated low. The remaining Federal land is classified as having unknown development potential implying that no known coal beds 5 feet (1.5 m) or more thick, not including isolated data points, occur within 200 feet (61 m) below the ground surface but that coal-bearing units are present.

Development Potential for Subsurface and In-Situ Mining Methods

The coal development potential for subsurface mining is shown on plate 43. Areas of high, moderate, and low development potential are defined as areas underlain by coal beds of Reserve Base thickness at depths ranging from 200 to 1,000 feet (61 to 305 m), 1,000 to 2,000 feet (305 to 610 m), and 2,000 to 3,000 feet (610 to 914 m), respectively.

Of those Federal land areas having known development potential for conventional subsurface mining methods, 53 percent are rated high, 15 percent are rated moderate, and 32 percent are rated low. The remaining Federal lands are classified as having unknown development potential implying that no known coal beds 5 feet (1.5 m) or more thick, not including isolated data points, occur between 200 feet (61 m) and 3,000 feet (914 m) below the ground surface but that coal-bearing units are present. Tonnages for the unknown (subsurface) development potential for isolated data points total 4,040,000 short tons (3,665,000 metric tons).

Because the coal beds in the quadrangle possess relatively gentle dips (less than 15°), development potential for in-situ mining methods is rated as unknown.

Table 1. Chemical analyses of coals in the Creston Junction quadrangle, Carbon and Sweetwater Counties, Wyoming.

Location	COAL BED NAME	Form of Analysis	Proximate				Ultimate					Heating Value	
			Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	Btu/Lb
Sec. 27, T. 19 N., R. 92 W. (Sanders, 1975)	High Point (A)	A	15.87	34.76	29.01	20.36	3.33	-	-	-	-	-	7,782
Cherokee coal district, southwestern part of quadrangle (Sanders, 1975)	Upper Cherokee (B)	A	22.65	31.62	30.30	14.59	1.82	-	-	-	-	-	7,714
Cherokee coal district, southwestern part of quadrangle (Sanders 1975)	Lower Cherokee (C)	A	22.37	34.85	30.42	12.80	1.66	-	-	-	-	-	8,293
Cherokee coal district, southwestern part of quadrangle (Sanders, 1975)	Cow Butte (D)	A	17.64	35.01	25.80	21.83	3.26	-	-	-	-	-	7,417
Cherokee coal district, southwestern part of quadrangle (Sanders, 1975)	Horse Butte (E)	A	18.86	33.08	28.25	19.80	2.25	-	-	-	-	-	7,613
NW¼, NW¼, NW¼, sec. 35, T. 20 N., R. 90W. (RR-75 - RMEC Red Rim)	FU, Undifferentiated	A C	25.42 0.0	29.15 39.09	37.16 49.82	8.27 11.09	0.46 0.62	- -	- -	- -	- -	- -	8,109 10,873
SE¼, SE¼, sec. 7, T. 20 N., R. 90 W. (RR-102 - RMEC Red Rim)	Red Rim (F2)	A C	24.72 0.0	29.19 38.78	35.43 47.06	10.66 14.16	0.25 0.33	- -	- -	- -	- -	- -	8,065 10,713

Form of Analysis: A, as received
C, moisture free

Note: To convert Btu/pound to kilojoules/kilogram, multiply by 2.326

Table 2. Strippable coal Reserve Base data for Federal coal lands (in short tons) in the Creston Junction quadrangle, Carbon and Sweetwater Counties, Wyoming.

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Total
High Point (A)	940,000	540,000	1,100,000	2,580,000
Upper Cherokee (B)	2,190,000	2,900,000	5,060,000	10,150,000
Lower Cherokee (C)	21,510,000	3,170,000	1,970,000	26,650,000
Cow Butte (D)	18,920,000	5,550,000	2,080,000	26,550,000
TOTAL	43,560,000	12,160,000	10,210,000	65,930,000

Note: To convert short tons to metric tons, multiply by 0.9072.

Table 3. Coal Reserve Base data for subsurface mining methods for Federal coal lands (in short tons) in the Creston Junction quadrangle, Carbon and Sweetwater Counties, Wyoming.

Coal Bed	High Development Potential	Moderate Development Potential	Low Development Potential	Total
High Point (A)	4,110,000	--	--	4,110,000
Upper Cherokee (B)	10,100,000	--	130,000	10,230,000
Lower Cherokee (C)	52,980,000	--	--	52,980,000
Cow Butte (D)	54,260,000	--	--	54,260,000
Horse Butte (E)	140,000	--	--	140,000
FU {9}	--	7,660,000	--	7,660,000
FU {7}	--	--	770,000	770,000
FU {6}	--	4,310,000	--	4,310,000
FU {5}	--	--	4,870,000	4,870,000
FU {4}	--	--	840,000	840,000
FU {3}	--	--	83,690,000	83,690,000
FU {2}	--	--	18,280,000	18,280,000
Red Rim (F2)	--	7,410,000	10,340,000	17,750,000
TOTAL	121,590,000	19,380,000	118,920,000	259,890,000

Note: To convert short tons to metric tons, multiply by 0.9072

Table 4. -- Sources of data used on plate 1

Plate 1 Index Number	Source	Data Base
1	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 58 (RME Drill hole No. 1AS)
2	↓	Drill hole No. 59 (RME Drill hole No. 2AS)
3	↓	Drill hole No. 60 (RME Drill hole No. 3AS)
4	Amoco Production Co.	Oil/gas well No. 1 Fillmore Creek, WI Unit
5	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 61 (RME Drill hole No. 4AS)
6	↓	Drill hole No. 64 (PP & L Drill hole No. 51)
7	↓	Drill hole No. 63 (PP & L drill hole No. 50)
8	↓	Drill hole No. 62 (PP & L drill hole No. 49)
9	↓	Drill hole No. 67 (PP & L Drill No. 2-SW)
10	↓	Drill hole No. 66 (PP & L Drill hole No. 46)

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
11	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 65 (PP & L Drill No. 45)
12	Edson, 1977, U.S. Geological Survey, unpublished map	Coal test hole
13	↓	Coal test hole
14	Pacific Power & Light Co.	Oil/gas well No. 1 Cherokee
15	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 69 (PP & L Drill hole No. 43)
16	↓	Drill hole No. 68 (PP & L Drill hole No. 42)
17	↓	Drill hole No. 70 (PP & L Drill hole No. 53)
18	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. 52
19	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 72 (PP & L Drill hole No. 48)
20	↓	Drill hole No. 71 (PP & L Drill hole No. 47)
21	↓	Drill hole No. 74 (PP & L Drill hole No. 64)

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Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
22	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 75 (PP & L Drill hole No. 81)
23	↓	Drill hole No. 73 (PP & L Drill hole No. 48)
24	↓	Drill hole No. 77 (PP & L Drill hole No. 41)
25	↓	Drill hole No. 76 (PP & L Drill hole No. 40)
26	↓	Drill hole No. 78 (PP & L Drill hole No. 3-W)
27	↓	Drill hole No. 79 (PP & L Drill hole No. 37)
28	↓	Drill hole No. 80 (PP & L Drill hole No. 34)
29	↓	Drill hole No. 81 (PP & L Drill hole No. 4NW)
30	↓	Drill hole No. 84 (RME Drill hole No. 1AS)
31	↓	Drill hole No. 83 (PP & L Drill hole No. 38)
32	Edson, 1977, U.S. Geological Survey, unpublished map	Drill hole No. T-2

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
33	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 82 (PP & L Drill hole No. 73)
34		Drill hole No. 85 (PP & L Drill hole No. 3)
35		Drill hole No. 87 (PP & L Drill hole No. 36)
36		Drill hole No. 86 (PP & L Drill hole No. 35)
37		Drill hole No. 90 (PP & L Drill hole No. 33)
38		Drill hole No. 89 (PP & L Drill hole No. 32)
39		Drill hole No. 88 (PP & L Drill hole No. 31)
40		Drill hole No. 92 (PP & L Drill hole No. 29)
41		Drill hole No. 91 (PP & L Drill hole No. 28)
42		Drill hole No. 94 (PP & L Drill hole No. 4)

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
43	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 93 (PP & L Drill hole No. 66-7)
44	↓	Drill hole No. 96 (PP & L Drill hole No. 65)
45	↓	Drill hole No. 95 (PP & L Drill hole No. 27)
46	↓	Drill hole No. 2 (RME Drill hole No. 41)
47	↓	Drill hole No. 1 (RME Drill hole No. 45-III)
48	Rocky Mountain Energy Co., (no date), unpublished map	Drill hole No. 3AS
49	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 3 (RME Drill hole No. 45)
50	Rocky Mountain Energy Co., (no date), unpublished map	Drill hole No. 2AS
51	Back, 1976, U.S.Geological Survey, unpublished map	Drill hole No. 6 (RME Drill hole No. 24)
52	Rocky Mountain Energy Co., (no date), unpublished map	Drill hole No. 1AS
53	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 8 (RME Drill hole No. 2AS)

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
54	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 10 (RME Drill hole No. 1AS)
55	↓	Drill hole No. 9 (RME Drill hole No. 3AS)
56	↓	Drill hole No. 11 (PP & L Drill hole No. 10)
57	↓	Drill hole No. 13 (RME Drill hole No. 4AS)
58	↓	Drill hole No. 12 (RME Drill hole No. 1AS)
59	↓	Drill hole No. 15 (RME Drill hole No. 3AS)
60	↓	Drill hole No. 14 (RME Drill hole No. 2AS)
61	↓	Drill hole No. 16 (PP & L Drill hole No. 8-N)
62	↓	Drill hole No. 19 (RME Drill hole No. 2AS)
63	↓	Drill hole No. 18 (PP & L Drill hole No. 7-NE)
64	↓	Drill hole No. 17 (PP & L Drill No. 8-N)
65	↓	Drill hole No. 21 (RME Drill hole No. 1AS)

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
66	Back, 1976, U.S. Geological Survey unpublished map	Drill hole No. 20 (PP & L Drill hole No. 84)
67	↓	Drill hole No. 22 (PP & L Drill hole No. 75)
68	↓	Drill hole No. 23 (PP & L Drill hole No. 85)
69	↓	Drill hole No. 24 (RME Drill hole No. 1AS)
70	↓	Drill hole No. 27 (RME Drill hole No. 192)
71	↓	Drill hole No. 26 (PP & L Drill hole No. 9)
72	Rocky Mountain Energy Co., (no date), unpublished map	Drill hole No. 4AS
73	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 25 (RME Drill hole No. 4AS)
74	↓	Drill hole No. 29 (RME Drill hole No. 3AS)
75	↓	Drill hole No. 28 (RME Drill hole No. 2AS)
76	↓	Drill hole No. 31 (RME Drill hole No. 130)
77	↓	Drill hole No. 30 (RME Drill hole No. 128)
78	Amoco Production Co.	Oil/gas well #1 Amoco "A" Champlin 252

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Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
79	Back, 1976, U.S.Geological Survey, unpublished map	Drill hole No. 33 (RME Drill hole No. 131)
80	↓	Drill hole No. 32 (RME Drill hole No. 1AS)
81	↓	Drill hole No. 34 (RME Drill hole No. 132)
82	↓	Drill hole No. 35 (RME Drill hole No. 2AS)
83	Rocky Mountain Energy Co., (no date) unpublished map	Drill hole No. 3AS
84	↓	Drill hole No. 2AS
85	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 36 (PP & L Drill hole No. 74)
86	Sanders, 1974, U.S. Geological Survey, Coal Investigations Map C-68	Coal test hole
87	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 38 (RME Drill
88	↓	Drill hole No. 37 (RME Drill hole No. 133)
89	Rocky Mountain Energy Co., (no date), unpublished map	Drill hole No. 1AS
90	Masursky, 1962, U.S. Geological Survey Bulletin 1099-B	Coal test hole Auger No. 220
91	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 41 (PP & L Drill hole No. 7)

Table 4. -- Continued.

Plate 1 Index Number	Source	Data Base
92	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 42 (PP & L Drill hole No. 75)
93	↓	Drill hole No. 43 (PP & L Drill hole No. 7-SW)
94	↓	Drill hole No. 44 (PP & L Drill hole No. 63)
95	↓	Drill hole No. 45 (PP & L Drill hole No. 1-NE)
96	↓	Drill hole No. 46 (PP & L Drill hole No. 62)
97	↓	Drill hole No. 47 (PP & L Drill hole No.1
98	↓	Drill hole No. 48 (PP & L Drill hole No. 89)
99	↓	Drill hole No. 49 (PP & L Drill hole No. 61)
100	Smith and others, 1972, U.S. Bureau of Mines Information Circular 8538, fig. 12	Coal test hole
101	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 51 (PP & L Drill hole No. 59)

Table 4. -- Concluded.

Plate 1 Index Number	Source	Data Base
102	Back, 1976, U.S. Geological Survey unpublished map	Drill hole No. 50 (PP & L Drill hole No. 60)
103	↓	Drill hole No. 53 (PP & L Drill hole No. 57)
104	↓	Drill hole No. 52 (PP & L Drill hole No. 58)
105	↓	Drill hole No. 57 (PP & L Drill hole No. 56)
106	Amoco Production Co.	Oil/gas well No. 1 Amoco "A" - Champlin 345)
107	Back, 1976, U.S. Geological Survey, unpublished map	Drill hole No. 56 (PP & L Drill hole No. 55)
108	↓	Drill hole No. 55 (PP & L Drill hole No. 2)
109	Smith and others, 1972, U.S. Bureau of Mines Information Circular 8538, fig. 12	Coal test hole
110	Edson, 1977, U.S. Geological Survey, unpublished map	Coal test hole

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