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COAL RESOURCE OCCURRENCE MAPS AND COAL DEVELOPMENT POTENTIAL OF THE KAPPES CANYON QUADRANGLE, SWEETWATER COUNTY, WYOMING

[Report includes 3 plates]

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GEOLOGICAL SURVEY

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INTRODUCTION

Purpose

This text is to be used in conjunction with Coal Resource Occurrence (CRO) Maps of the Kappes Canyon quadrangle, Sweetwater County, 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 Published and unpublished public information available through June, 1978, was used as the data base for this study.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 Kappes Canyon quadrangle is located in southwestern Sweetwater County, approximately 5 airline miles (8 km) south of the city of Rock Springs, Wyoming. The area is unpopulated.

Accessibility

An improved light-duty road crosses the eastern half of the Kappes Canyon quadrangle from north to southeast, connecting Rock Springs and Interstate Highway 80 to the north with the South Baxter Basin gas field to the southeast. This road branches to the west in the north-central part of the quadrangle, following Barney Canyon and Cedar Creek to the west and connecting with an improved light-duty road along Little Bitter Creek. The road along Little Bitter Creek crosses the southwestern corner of the quadrangle and connects Rock Springs to the north with Wyoming Highway 373 to the southwest. The remainder of the quadrangle is served by several unimproved dirt roads and trails.

The main east-west line of the Union Pacific Railroad passes approximately 6 miles (10 km) north of the quadrangle. This line provides railway service across southern Wyoming connecting Odgen, Utah to the west with Omaha, Nebraska to the east.

A gas pipeline crosses the quadrangle from southeast to northwest.

Physiography

The Kappes Canyon quadrangle lies in the western part of the Rock Springs uplift and on the western edge of the South Baxter Basin gas field. The landscape in the southeastern part of the quadrangle is characterized by several relatively flat-topped buttes separated by the deeply incised Kappes Canyon. The remainder of the quadrangle is characterized by a rugged terrain of hills and canyons. Altitudes in the quadrangle range from 8,667 feet (2,642 m) on Quaking Asp Mountain on the east-central edge of the quadrangle to approximately 6,420 feet (1,957 m) along Rock Canyon in the northwestern corner of the quadrangle. Cedar Creek has cut Kappes Canyon approximately 500 to 900 feet (152 to 274 m) below the surrounding buttes.

Little Bitter Creek crosses the southwestern corner of the quadrangle and flows northerly just west of the quadrangle boundary to join Bitter Creek, a tributary of the Green River, west of Rock Springs. Cedar Creek and its tributaries, which drain the southern half of the quadrangle, and Rock Canyon which drains the northwestern quarter of the quadrangle, flow northwesterly and are tributaries of Little Bitter Creek. The northeastern quarter of the quadrangle is drained by Sweetwater Creek that flows northerly into Bitter Creek at Rock Springs. All streams in the quadrangle are intermittent and flow mainly in response to snowmelt in the spring.

Climate and Vegetation

The climate of southwestern Wyoming is semiarid and is characterized by low precipitation, rapid evaporation, and large daily temperature changes. Summers are usually dry and mild, and winters are cold. The

annual precipitation averages 9 inches (23 cm), with approximately two thirds falling during the spring and early summer months.

The average annual temperature is 42°F (6°C). The temperature during January averages 18°F (-8°C), with temperatures ranging from 8°F (-13°C) to 28°F (-2°C). During July temperatures range from 54°F (12°C) to 84°F (29°C), with an average of 69°F (21°C) (U.S. Bureau of Land Management, 1978, and Wyoming Natural Resources Board, 1966).

Winds are usually from the west-southwest and southwest with an average velocity of 11 miles per hour (18 km per hr) (U.S. Bureau of Land Management, 1978).

Principal types of vegetation in the area include sagebrush, saltbush, greasewood, rabbitbrush, mountain mahogany, juniper, serviceberry and grasses (U.S. Bureau of Land Management, 1978).

Land Status

The Kappes Canyon quadrangle lies in the western part of the Rock Springs Known Recoverable Coal Resource Area (KRCRA). Approximately 30 percent of the quadrangle's total area lies within the KRCRA boundary. The Federal government owns the coal rights for less than half of this area. One active coal lease is present within the KRCRA boundary as shown on plate 2.

GENERAL GEOLOGY

Previous Work

Schultz described and mapped the geology and coal resources of the southern part of the Rock Springs coal field in 1910. Hale (1950, 1955), Smith (1961, 1965), Bradley (1964), Keith (1965), Burger (1965), Gosar and Hopkins (1969), and Roehler (1961, 1965, 1973, 1976, 1977, and 1978), have discussed the lithology and depositional environment of the various formations exposed in the Rock Springs uplift area. The Rocky Mountain Energy Company (RMEC) has drilled several coal test holes in the quadrangle.

Stratigraphy

The formations cropping out in the Kappes Canyon quadrangle range in age from Upper Cretaceous to Oligocene. Of these, only the Rock Springs Formation is known to contain coal in this quadrangle.

The Baxter Shale of Upper Cretaceous age crops out along the northeastern side of the quadrangle (Roehler, 1977). It is composed primarily of dark gray gypsiferous marine shale with occasional lenses of very fine grained sandstone (Hale, 1950, 1955, Smith, 1961, 1965, and Keith, 1965). The Baxter Shale is approximately 2,350 feet (716 m) thick where drilled in the Mountain Fuel Supply Company Firehole Unit No. 1 well located in sec. 12, T. 16 N., R. 106 W. in the Firehole Basin 15-minute quadrangle to the west (Gosar and Hopkins (1969). The formation was deposited during the influx of the Baxter sea during Montanan (Upper Cretaceous) time (Hale, 1955).

The Mesaverde Group of Upper Cretaceous age is subdivided into four formations which are, in ascending order, the Blair Formation, the Rock Springs Formation, the Ericson Sandstone, and the Almond Formation.

The Blair Formation conformably overlies the Baxter Shale and crops out in the northeastern part of the quadrangle (Roehler, 1977). It consists of a basal brown to buff, fine- to medium-grained sandstone overlain by a thick sequence of sandy shale and thin argillaceous sandstone (Smith, 1961). The total thickness of the formation is approximately 1,560 feet (475 m) where measured in the Davis Oil Company Rock Canyon No. 1 well located in sec. 1, T. 17 N., R. 105 W. in this quadrangle. The Blair Formation represents a shallow marine sequence deposited as the Baxter sea regressed to the east (Gosar and Hopkins, 1969).

The Rock Springs Formation conformably overlies the Blair Formation and crops out through the central part of the Kappes Canyon quadrangle (Roehler, 1977). It contains thick fossiliferous sandstone, thin coal, and carbonaceous shale (Hale, 1950, 1955, Smith, 1961, 1965, and Keith,

1965). The formation consists of six marine tongues that are equivalent to the thick coal-bearing facies found to the north near Rock Springs. In ascending order, these units are the Chimney Rock Tongue, a gray very fine grained basal sandstone; the Black Butte Tongue, a dark-gray silty to sandy shale; the Brooks Tongue, a gray very fine grained sandstone interbedded with shale at the base of the tongue; the Coulson Tongue, a dark-gray silty shale; the McCourt Tongue, a light-gray very fine to fine-grained sandstone; and the Gottsche Tongue, a very dark-gray carbonaceous shale, comprise the Rock Springs Formation in this area (Hale, 1950, Smith, 1961, 1965, and Roehler, 1973). The formation is approximately 1,270 feet (387 m) thick where measured in the Cities Service Oil Company No. 1 Rock Springs unit well located in sec. 7, T. 17 N., R. 105 W., in the Firehole Basin 15-minute quadrangle to the west.

The Ericson Sandstone conformably overlies the Rock Springs Formation and crops out along the western part of the quadrangle (Roehler, 1977). It is approximately 750 feet (229 m) thick where measured in the Cities Service Oil Company No. 1 Rock Springs unit well located in sec. 7, T. 17 N., R. 105 W., to the west in the Firehole Basin 15-minute quadrangle. It consists of an upper and lower massive, light-gray to gray, very fine to coarse-grained cross-bedded sandstone separated by an intervening unit of dark-gray shale, thin coal, and rusty-weathering sandstone (Smith, 1961, and Roehler, 1973). The formation is fluvial in origin (Roehler, 1978).

The eroded remnants of the Almond Formation crop out in the southwestern corner of the quadrangle (Roehler, 1973) where it conformably overlies the Ericson Sandstone. Post-Cretaceous erosion has stripped away much of the Almond Formation in this quadrangle. A thickness of approximately 240 feet (73 m) of the Almond Formation was measured in the Cities Service Oil Company No. 1 Rock Springs unit well located in sec. 7, T. 17 N., R. 105 W., in the Firehole Basin 15-minute quadrangle approximately 3 miles (4.8 km) to the west of the quadrangle. The Almond Formation generally consists of gray sandstone, gray shale, carbonaceous shale, thin coal beds and minor thin beds of gray siltstone

and dolomite (Roehler, 1976). The Almond Formation reflects deposition in coastal swamp, brackish-water lagoon and barrier beach environments (Hale, 1950, Roehler, 1976).

The Paleocene-age Fort Union Formation unconformably overlies the Almond Formation within the western part of the quadrangle (Roehler, 1977). Roehler's (1961) measured section in the northeast quarter of the Firehole Basin 15-minute quadrangle to the west of the Kappes canyon quadrangle indicates that the formation is composed of a sequence of interbedded carbonaceous shale, siltstone, thin coal beds and sandstone deposited in a paludal environment. Owing to the unconformable contact between the Fort Union Formation and the overlying Bishop Conglomerate, only an unknown thickness of the lower portion of the formation crops out in the southwestern corner of the quadrangle.

The Bishop Conglomerate of Oligocene age (Roehler, 1977) forms a resistant cap over much of the southeastern part of the quadrangle. It is composed of cobbles and pebbles of quartzite, quartz, hornblende gneiss, granite, and chert derived from the ancestral Uinta Mountains to the south (Bradley, 1964, and Roehler, 1973).

Recent deposits of alluvium cover the stream valleys of Little Bitter Creek, Cedar Creek, Rock Canyon and Sweetwater Creek.

Structure

The Kappes Canyon quadrangle is located along the western flank of the Rock Springs uplift, a doubly plunging asymmetric anticline having a north-south axis. Throughout most of the quadrangle, the beds strike northwesterly and dip 5° to 6° to the southwest. The fault traces shown on plate 1 are after Roehler (1977).

COAL GEOLOGY

Because the Rock Springs Formation becomes progressively more marine in character as it is traced south along the western flank of the uplift, the coal beds thin southward and eventually pinch out altogether. Coal

beds of Reserve Base thickness (5 feet or 1.5 meters) or greater were not identified in the Rock Springs Formation in the Kappes Canyon quadrangle. The maximum thickness of a Rock Springs Formation coal bed measured in the quadrangle was 4 feet (1.2 m).

The Almond Formation is known to contain lagoonal coals in many of its exposures on the Rock Springs uplift. Roehler's (1978, section no. 2777) measured section just outside the quadrangle boundary indicates that the formation consists of only carbonaceous shale, shale, and sandstone. If coal beds are present, they are probably very thin.

Only the lower portion of the Fort Union Formation is exposed within the quadrangle and it is not known to contain coal.

COAL DEVELOPMENT POTENTIAL

Areas where coal beds of Reserve Base thickness (5 feet or 1.5 meters) or greater are overlain by 3,000 feet (914 m) or less of overburden are considered to have development potential for either surface or subsurface mining methods. Coal beds of Reserve Base thickness are not known to be present in this quadrangle. Therefore, all Federal lands within the KRCRA boundary have been classified as having an unknown development potential for surface and subsurface mining methods.

The source of each indexed data point shown on plate 1 is listed in table 1.

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

Plate 1 Index Number	Source	Data Base
1	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
2	↓	Drill hole No. 2AS
3	↓	Drill hole No. 3AS
4	↓	Drill hole No. 2AS
5	Champlin Oil and Refining Co.	Oil/gas well No. 1 Husky-State
6	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
7	↓	Drill hole No. 1AD
8	↓	Drill hole No. 2AD
9	↓	Drill hole No. 3AD
10	↓	Drill hole No. 4AD
11	↓	Drill hole No. 5AD
12	↓	Drill hole No. 6AD
13	↓	Drill hole No. 1AS
14	Davis Oil Co.	Oil/gas well No. 1 Rock Canyon
15	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AS
16	↓	Drill hole No. 2AS
17	↓	Drill hole No. 3AS

Table 1. -- Continued

Plate 1 Index Number	Source	Data Base
18	Rocky Mountain Energy Co., (no date), unpublished data	Drill hole No. 1AD
19		Drill hole No. 2AD
20		Drill hole No. 3AD
21		Drill hole No. 4AD
22		Drill hole No. 5AD
23		Drill hole No. 2AS
24		Drill hole No. 1AS
25		Drill hole No. 1AS
26		Drill hole No. 2AS
27		Drill hole No. 5AD
28		Drill hole No. 6AD

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