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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS
OF THE ERICKSON-KENT RANCH QUADRANGLE,
SWEETWATER COUNTY, WYOMING

(Report includes 14 plates)

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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 report was compiled to support the land planning work of the Bureau of Land Management's Energy Minerals Activities Recommendation System (EMARS) program, and to provide a systematic coal resource inventory of federally owned coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the western United States.

Location

The Erickson-Kent Ranch 7½-minute quadrangle is in southern Sweetwater County, Wyoming, 30 mi (48 km) south-southeast of the city of Rock Springs.

Accessibility

Wyoming Highway 430 enters the northwest part of the quadrangle 36 mi (58 km) southeast of Rock Springs, Wyoming, and crosses the quadrangles from north to south. Most parts of the quadrangle are accessible by unimproved gravel roads and trails that branch laterally from Highway 430.

Physiography

The Erickson-Kent Ranch quadrangles is situated in the southern part of the Rock Springs coal field in the southern part of the Rock Springs uplift. The desert landscape in the area consists of barren rock ridges and alluvium-filled valleys. The vegetation is mostly sparse grass and patches of sage at lower elevations and juniper trees along high ridges. Topographic elevations range from 6,910 ft (2,106 m) along East Salt Wells Creek in the northwest part of the quadrangle to 7,831 ft (2,387 m) on Rife Rim on the southeast part of the quadrangle. The major drainage is East Salt Wells Creek, which flows northward, and its intermittent tributaries, Brooks Draw, West Draw, East Draw, and Scheggs Draw.

Industries in the quadrangle are sheep and cattle ranching and some natural gas production from the Brooks Draw area in the northwest part of the quadrangle. Beds of minable coal, more than 5 ft (1.5 m) thick and under less than 1,000 ft (305 m) of overburden, are present, as indicated on plate 1.

Climate

The climate in the Erickson-Kent Ranch quadrangle is arid and windy. Mean annual precipitation, mostly in the form of snow, is about 8 in. (20 cm) (Root, Glass, and Lane, 1973). Temperature annually ranges between -30°F (-34°C) and +100°F (+38°C). Strong westerly winds occur almost daily.

Land Status

The Erickson-Kent Ranch quadrangle is 8.6 mi (13.8 km) long, 6.5 mi (10.5 km) wide, and encompasses 55.9 mi² (145 km²). Approximately 94 percent of the coal in the quadrangle is owned by the Federal Government (pl. 2). The Federal Government owns coal rights to some lands where the coal beds are known to be more than 5 ft (1.5 m) thick and under less than 1,000 ft (305 m) of overburden.

GENERAL GEOLOGY

Previous Work

The southern part of the Rock Springs coal field, including the quadrangle area, was mapped in 1908, by A. R. Schultz of the U.S. Geological Survey. A geologic map showing coal outcrops at the scale of 1:250,000, on a planimetric base, was published 2 years later (Schultz, 1910, pl. 14). A detailed geologic map of the quadrangle, on a topographic base, was published by the author (Roehler, 1973).

Stratigraphy

Rocks exposed in the quadrangle are of Quaternary, Tertiary, and Cretaceous ages. They are assigned to surficial deposits of alluvium that occupy narrow stream valleys, and to the underlying Green River, Wasatch, Fort Union, Lewis Shale, and Almond Formations (Roehler, 1973).

Beds of coal 5 ft (1.5 m) or more thick and under less than 1,000 ft (305 m) of overburden are restricted to the Almond Formation in the northwestern part of the quadrangle. The formation there is about 800 ft (244 m) thick and is composed of gray shale, siltstone, sandstone, carbonaceous shale, and coal (pl. 3). Beds of minable coal in the formation are the Waxwing bed, about 420 ft (128 m) below the top of the formation; the Upper Gull bed, about 490 ft (149 m) below the top of the formation; and the Lower Gull bed, about 505 ft (154 m) below the top of the formation.

The Almond coal beds were deposited in a tropical climate in brackish-water lagoons that formed on the landward sides of barrier bars that developed along the western coastlines of the Late Cretaceous Lewis Sea (Roehler, 1977). During early stages of development the lagoons had large areas of open water; in late stages they were choked with thick mats of vegetation.

Structure

The quadrangle is on the southeast flank of the Rock Springs uplift, a few miles east of the regional southward-plunging, anticlinal axis of the uplift. The southern one-half of the quadrangle has strata that strike N60°E and dip 3° to 5° southeast. Crossing the quadrangle in an east-southeast direction, slightly north of the center of the quadrangle, is the east-plunging Salt Wells anticline (Roehler, 1973). Rocks along the axis of Salt Wells anticline plunge 2° to 3° east; dips on the limbs vary from 3° to 5° southeast and from 4° to 9° northeast. High-angle reverse faults, with displacements of as much as 100 ft (30 m) are situated on the north and south limbs of Salt Wells anticline, parallel to the anticlinal axis. Crossing the north-central part of the quadrangle in an east-west direction, north of Salt Wells anticline, is an unnamed syncline.

COAL GEOLOGY

No coal outcrops have been mapped in the Erickson-Kent Ranch quadrangle, but more than 12 coal beds have been identified on geophysical logs of oil-and-gas test holes (pls. 1, 3). Three of these coal beds, identified in this report as the Waxwing, Upper Gull, and Lower Gull, are 5 ft (1.5 m) or more thick and are beneath less than 1,000 ft (305 m) of overburden.

There are no chemical analyses of coal from the Erickson-Kent Ranch quadrangle. However, analyses from other places in the Rock Springs coal field indicate that the Almond coal beds are subbituminous C to subbituminous A in rank. They contain less than 1 percent sulfur and average about 50 percent fixed carbon and 4 percent ash. The heating value ranges from 8,800 to 10,850 Btu/lb (20,469 to 25,237 kJ/kg) on a moist, mineral-matter-free basis (Schultz, 1910, p. 243).

Waxwing Coal Bed

The Waxwing coal bed is 6 ft (1.8 m) thick in the Jerry Chambers, Champlin Fed. 1-14 Well in sec. 14, T. 14 N., R. 102 W. (pl. 4). In other oil-and-gas test wells surrounding the Fed. 1014 Well, it is consistently 4 ft (1.2 m) or less thick. Overburden on the Waxwing coal bed varies from less than 500 ft (152 m) to more than 1,000 ft (305 m) in a small area in secs. 14 and 15, T. 14 N., R. 102 W., where it is of minable thickness (pl. 4).

Upper Gull Coal Bed

Although the Upper Gull coal bed has not been mapped in the Erickson-Kent Ranch quadrangle, it is believed to crop out in a small area in sec. 10, T. 14 N., R. 102 W. The evidence for this is based on extrapolation of structural and topographic data. The Upper Gull coal bed is 4.2 to 7.3 ft (1.3 to 2.2 m) thick in outcrops a few miles west of the northwest boundary of the quadrangle, and in oil-and-gas drill holes in the northwest part of the quadrangle it is 2 to 7 ft (0.6 to 2.1 m) thick.

Lower Gull Coal Bed

The Lower Gull coal bed is 2 to 10 ft (0.6 to 3 m) thick in the northwestern part of the quadrangle, where its occurrence is known only from the correlations of geophysical logs of oil-and-gas test wells (pl. 10). The bed is 7.3 ft (2.2 m) thick in outcrops in the SE $\frac{1}{4}$ sec. 31, T. 15 N., R. 103 W., 3 mi (4.8 km) west of the northwestern boundary of the quadrangle, and 10 ft (3 m) thick in the Chandler and Assoc., Fed. 5-1 Well in NW $\frac{1}{4}$ sec. 1, T. 14 N., R. 102 W. The bed is believed to be thickest along an east-west trend that connects these surface and subsurface measurements.

COAL RESOURCES AND RESERVES

Coal resources and reserves were calculated from data obtained from isopach maps, plates 4, 7, and 10; overburden and mining-ratio maps, plates 5, 8, and 11; and areal distribution and identified resource maps, plates 6, 9, and 12. Resources and reserves were calculated for all coal beds that are more than 5 ft (1.5 m) thick, that dip less than 15⁰, and that are under less than 1,000 ft (305 m) of overburden. The coal-bed acreage (measured by planimeter) multiplied by the average isopached thickness of the coal bed, times 1,770 short tons of coal per acre-foot (13,028 metric tons per hectare-meter) for subbituminous coal, yielded the Reserve Base tonnage for each coal bed in each reporting category (measured, indicated, and inferred, less than 200 ft (61 m) of overburden; measured, indicated, and inferred, more than 200 ft (61 m) of overburden). Recovery factors applied were 0.85 for surface mining methods (outcrop to 200 ft (61 m) of overburden), and 0.50 for underground mining methods 200 to 1,000 ft (61 to 305 m) of overburden). Reserves were determined for each reporting category by multiplying the Reserve Base times the recovery factor.

COAL DEVELOPMENT POTENTIAL FOR SURFACE MINING

Areas where the coal beds are overlain by 200 ft (61 m) or less of overburden are considered to have potential for strip mining and were assigned to 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

0.911 = Factor for subbituminous coal (yd³ overburden/ton coal) To convert yd³/ton to m³/metric ton, multiply by 0.842.

Areas of high, moderate, and low development potential for surface mining have mining-ratio values of 0 to 10:1, 10:1 to 15:1, and >15:1 to 200 ft (61 m) of overburden, respectively, as shown on plate 13. The areas of high, moderate, and low development potential are based on present-day economic and technological criteria and are applicable only to this quadrangle. They were derived in consultation with J. Paul Storrs, Area Mining Supervisor, U.S. Geological Survey.

The Upper and Lower Gull coal beds have low potential for surface mining in secs. 10 and 11, T. 14 N., R. 102 W. (pl. 13). The beds there are 5 to 7 ft (1.5 to 2.1 m) thick, are under less than 200 ft (61 m) of overburden, and dip 3° to 12° northeast and southeast. Interburden between the two beds ranges from 7 to 21 ft (2.1 to 6.4 m).

COAL DEVELOPMENT POTENTIAL FOR UNDERGROUND MINING

The Waxwing, Upper Gull, and Lower Gull coal beds, where they 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 high potential for underground mining (pl. 14). These coal beds are probably everywhere less than 10 ft (3 m) thick and dip in southeasterly and northeasterly directions from 3° to 15°.

Table 1.--Strippable-coal Reserve Base data (in short tons) for Federal coal lands in the Erickson-Kent Ranch quadrangle, Sweetwater County, Wyoming

(Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying recoverable coal). To convert tons to metric tons, multiply by 0.9072; to convert mining ratios in yd³/ton coal to m³/t, multiply by 0.842)

Coal bed	High development potential (0 to 10:1 mining ratio)	Moderate development potential (10:1 to 15:1 mining ratio)	Low development potential (>15:1 mining ratio)	Total
Upper Gull	473,000	352,000	770,000	1,595,000
Lower Gull	- 0 -	- 0 -	310,000	310,000
TOTAL	473,000	352,000	1,080,000	1,905,000

Table 2.--Coal Reserve Base data for underground mining methods
for Federal coal lands (in short tons) in the
Erickson-Kent Ranch quadrangle, Sweetwater County,
Wyoming

(To convert short tons to metric tons, multiply
by 0.9072)

Coal bed name	High development potential (200 to 1,000 ft)
Waxwing	2,500,000
Upper Gull	5,100,000
Lower Gull	11,600,000
TOTAL	19,200,000

REFERENCES

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