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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE BURLEY DRAW QUADRANGLE, SWEETWATER COUNTY, WYOMING

(Report includes 15 plates)

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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 Burley Draw quadrangle, Sweetwater County, Wyoming (15 plates). This report was compiled to support the land planning work of the Bureau of Land Management 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 Burley Draw 7 1/2-minute quadrangle is in southern Sweetwater County, Wyoming, 31 mi (9.45 km) southeast of the city of Rock Springs.

Accessibility

Wyoming Highway 430 enters the western part of the quadrangle 31 mi (9.45 km) southeast of Rock Springs, Wyoming, and crosses the western part of the quadrangle. Most parts of the quadrangle are accessible by unimproved gravel roads and trails.

Physiography

The Burley Draw quadrangle is situated in the southern part of the Rock Springs coal field in the southern part of the Rock Spring 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 and pinon trees along high ridges. Topographic elevations range from 7,650 ft (2,332 m) along the southeastern part of the quadrangle to 6,800 ft (2,073 m) in the west-central part of the quadrangle. The major drainage is Alkali wash, an intermittent stream which flows west and its principal tributaries: Burley Draw and East Salt Wells Creek.

Industries in the quadrangle are sheep and cattle ranching, and in the northeastern part of the quadrangle, oil and gas production. Beds of minable coal, more than 5 ft (1.5 m) thick and beneath less than 1,000 ft (305 m) of overburden, are present, as indicated on plate 1.

Climate

The climate in the Burley Draw quadrangle is arid and windy. Mean annual precipitation, mostly in the form of snow, is about 7 in (18 cm) (Root, Glass, and Lane, 1973). Temperatures annually range between -30°F (-34°C) and +100°F (+38°C). Strong westerly winds occur almost daily.

Land Status

The Burley Draw quadrangle is 8.6 mi (13.8 km) long, 6.5 mi (10.5km) wide, and encompasses 55.9 mi^2 (145 km^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 beneath 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 two years later (Schultz, 1910, pl. 14). A detailed geologic map of the quadrangle, on a topographic base, was published in 1974 by H. W. Roehler.

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 beneath less than 1,000 ft (305 m) overburden are restricted to the Fort Union and Almond Formations in the northwestern part of the quadrangle. The Fort Union Formation has been mapped in the quadrangle and is about 1,100 ft (335 m) thick and is composed of gray, very fine grained sandstone; gray siltstone; gray shale; brown and black carbonaceous shale; coal; conglomerate lenses; gray dolomite; and gray mudstone. The Almond Formation is exposed in the northeastern part of the quadrangle and has been interpolated from data in the Mud Springs Ranch Quadrangle and drill holes in the Burley Draw quadrangle; it is composed of gray shale, siltstone, sandstone, carbonaceous shale, and coal (pl. 3). Beds of minable coal in the Fort Union Formation are the Upper Little Valley, the Big Burn, and the Robin coal beds.

Coal beds in the Fort Union Formation were deposited in the intermontane Green River Basin area in a subtropical climate in extensive freshwater swamps. Elevations above sea level were probably less than 1,000 ft (305 m).

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. The erratic lenticular-shaped characteristics of the Almond coal beds reflect the deposition along the length of the back-barrier areas.

Coal beds in the Fort Union Formation were deposited in extensive freshwater swamps of the intermontane Green River Basin area. The freshwater peat swamps were developed in delta plain environments (Romeo Flores, oral communication). In contrast to the Almond coal beds, the Fort Union coal beds are laterally extensive, typical of peat deposits formed in deltaic environments.

Structure

The quadrangle is on the southeastern flank of the Rock Springs uplift, a few miles east of the southward plunge of the major anticlinal axis of the uplift. The northern half of the quadrangle has strata that strike N20°E and dip 3° to 5° southeast. Crossing the northeastern corner of the quadrangle is the northwest-southeast-trending axis of the Jackknife Spring anticline, which is plunging to the southeast; crossing the southern part of the quadrangle and trending east to west is the Pine Butte syncline which plunges to the southeast.

COAL GEOLOGY

Coal outcrops have been mapped in the Burley Draw quadrangle by Roehler (1974). The Upper Little Valley was mapped but the Big Burn was not. The trace of the Big Burn was projected into the quadrangle from the Cooper Ridge NE quadrangle, where it is thickest, by using unpublished data (Roehler) and drill-hole data. The Robin coal bed isopachs and structure contours have also been projected into the quadrangle using outcrops in the Mud Springs Ranch and Camel Rock quadrangles and drill-hole data. The three coal beds identified in this report, the Upper Little Valley coal bed, Big Burn coal bed, and Robin coal bed, are more than 5 ft (1.5 m) thick and are beneath less than 1,000 ft (305 m) of overburden.

There are no chemical analyses of coal beds in the Burley Draw 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 values range 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).

Big Burn Coal Bed

The Big Burn coal bed is 6 ft (1.8 m) thick in the Chandler and Simpson #1 Government-Robinson Well in sec. 18, T. 16 N., R. 101 W. (pl. 4). In other oil-and-gas wells, it is 5 ft (1.5 m) thick and thins out toward the south, where it is only 1.7 ft (.5 m) thick in sec. 35, T. 16 N., R. 102 W. Overburden ranges from less than 100 ft (30 m) to more than 1,000 ft (305 m) on the Big Burn coal bed where it is of minable thickness (pl. 6).

Upper Little Valley Coal Bed

The Upper Little Valley coal bed in the Burley Draw quadrangle has an average thickness at outcrop of 5 ft (1.5 m); the coal thickens toward the southwest in the Mud Springs Ranch quadrangle. This coal bed is named Upper Little Valley in the Mud Springs Ranch quadrangle but was not named in the Burley Draw quadrangle by Roehler (1974). Further north in the Cooper Ridge NE quadrangle, however, it is named the Lower Little Valley coal bed. This coal bed is here referred to as the Upper Little Valley coal bed in the Burley Draw quadrangle. Overburden ranges from less than 100 ft (30 m) to more than 1,000 ft (305 m) on the Upper Little Valley coal bed where it is of minable thickness (pl. 11).

Robin Coal Bed

The Robin coal bed has not been mapped in the Burley Draw quadrangle, however, it outcrops in the Mud Springs Ranch and Camel Rock quadrangles and on the basis of drill-hole data, it is found to extend to a depth of 1,000 ft (305 m) in the Burley Draw quadrangle. The coal bed is 14.6 ft (4.5 m) to 9.3 ft (3 m) thick in the southeastern part of the Camel Rock quadrangle (Roehler, unpublished data) and 4 ft (1.2 m) thick in the Chandler and Simpson #1 Government-Robinson Well in sec. 18, T. 16 N., R. 101 W., Burley Draw quadrangle (pl. 4).

Overburden on the Robin coal bed ranges from less than 400 ft (122 m) to more than 1,000 ft (305 m) in sec. 14, T. 16 N., R. 102 W.

COAL RESOURCES AND RESERVES

Coal resources and reserves were calculated from data obtained from isopach maps, plates 4 and 9, mining ratio and overburden maps, plates 6 and 11, and areal distribution and identified resource maps, plates 7, 8, 12, and 13. Resources and reserves were calculated for all coal beds that are more than 5 ft (1.5 m) thick, that dip less than 15°, and that lie beneath less than 1,000 ft (305 m) of overburden. The coal-bed tonnages were calculated with a computing planimeter which is programmed to measure acreage, multiply it by the average isopached thickness of the coal bed, and multiply it times 1,770 (short tons of coal per acre-foot — 13,018 metric tons per hectare-meter) for subbituminous coal. This 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 (to convert to cubic meters per metric ton, multiply by 0.842). 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

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, respectively, as shown on plate 14. 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 Big Burn has high potential for surface mining in sec. 18, T. 16 N., R. 101 W. (pl. 14). The coal bed is 5 ft (1.5 m) to 6 ft (1.8 m) thick, has less than 200 ft (61 m) of overburden, and dips 3° to 12°.

The Upper Little Valley coal bed has high potential for surface mining in secs. 14, 26, 34, T. 16 N., R. 101 W. (pl. 14). The coal bed is 5 ft (1.5 m) to 8 ft (2.4 m) thick, has less than 200 ft (61 m) of overburden, and dips 3° to 12°.

COAL DEVELOPMENT POTENTIAL FOR UNDERGROUND MINING

The Big Burn, Upper Little Valley, and Robin 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) overburden, are considered to have high potential for underground mining (pl. 15). 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 Burley Draw quadrangle, Sweetwater County, Wyoming

(Development potentials are based on mining ratios (cubic yards of overburden/ton of underlying coal)

To convert tons to metric tons, multiply by 0.9072; to convert mining ratios in yd^3/ton coal to m^3/t, multiply by 0.842)

	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
Big Burn	300,000	200,000	900,000	1,400,000
Upper Little Valley	200,000	200,000	1,800,000	2,200,000
TOTAL	500,000	400,000	2,700,000	3,600,000

Table 2.--Coal Reserve Base data (in short tons) for underground mining methods for Federal coal lands in the Burley Draw 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)
Big Burn	7,000,000
Upper Little Valley	27,000,000
Robin	2,800,000
TOTAL	36,800,000

REFERENCES

Roehler, H. W., 1974, Geologic map of the Burley Draw quadrangle, Sweetwater County,Wyoming: U.S. Geol. Survey Geol. Quad. Map GQ-1200.

_____1976, Geology and mineral resources of the Cooper Ridge NE quadrangle, Sweetwater County, Wyoming: U.S. Geol. Survey Open-File Report 76-494, scale 1:24,000.

_____1977, Lagoonal origin of coals in the Almond Formation in the Rock Springs uplift, Wyoming, in Murray, D. K., editor, Geology of Rocky Mountain Coal, Proc. of the 1976 Symposium: Colorado Geol. Survey, Resource Series 1, p. 85-89.

_____1977, Coal resources in the Mud Springs Ranch quadrangle, Sweetwater County, Wyoming: U.S. Geol. Survey Open-File Report 77-77, 53 p., 3 pls.

Root, F. K., Glass, G. B., and Lane, D. W., 1973, Sweetwater County, Wyoming: Geologic Map Atlas and Summary of Economic Mineral Resources: Wyoming Geol. Survey, County Resource Series, no. 2, 9 pls.

Schultz, A. R., 1910, The southern part of the Rock Springs coal field, Sweetwater County, Wyoming: U.S. Geol. Survey Bull. 381-B, p. 214-281.