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COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE SOUTHEAST QUARTER OF THE SOLDIER SUMMIT 15-MINUTE QUADRANGLE, CARBON AND UTAH COUNTIES, UTAH

(Report includes 8 plates)

By

AAA Engineering And Drafting, Inc.

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

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INTRODUCTION

Purpose

This report was compiled to support the land planning work of the Bureau of Land Management and to provide a systematic coal resource inventory of Federal coal lands in Known Recoverable Coal Resource Areas (KRCRA's) in the Western United States. It supplements the land planning requirements of the Federal Coal Leasing Amendments Act of 1976 (Public Law 94-377) sec. (3)(B) which states, in part, that "Each land-use plan prepared by the Secretary [of the Interior] (or in the case of lands within the National Forest System, the Secretary of Agriculture pursuant to subparagraph (A)(i)) shall include an assessment of the amount of coal deposits in such land, identifying the amount of such coal which is recoverable by deep mining operations and the amount of such coal which is recoverable by surface mining operations."

This text is to be used in conjunction with the Coal Resource Occurrence (CRO) Maps (7 plates) and the Coal Development Potential (CDP) Map (1 plate) of the Southeast Quarter of the Soldier Summit 15-minute quadrangle, Carbon and Utah Counties, Utah (U.S. Geological Survey Open-File Report 79-482).

Published and unpublished public information were used as data sources for this study. No new drilling nor field mapping were done to supplement this study. No confidential nor proprietary data were used.

Location

The Southeast Quarter of the Soldier Summit 15-minute quadrangle is located at the north end of the Wasatch Plateau coal field in central Utah. The north half of the quadrangle lies in Utah County and the

south half in Carbon County. The southeast corner of the quadrangle is a little over 14 mi (22.5 km) northwest of Price, Utah which is the county seat of Carbon County.

Accessibility

U.S. Highway 50-6 and the main line of the Denver and Rio Grande Western Railroad pass through the northeast quarter of the quadrangle. A branch line of the railroad extends south and west from its junction with the main line at Colton through the upper Price River Canyon to Scofield dam at the west edge of the quadrangle. The branch line continues south about 10 mi (16 km) to the town of Clear Creek. U.S. Highway 50-6 connects with Interstate Highway 15 near Spanish Fork, Utah some 42 mi (68 km) to the west. Utah Highway 96 begins at U.S. Highway 50-6 in the northeast corner of the quadrangle and then passes up Spring Canyon to provide access to the towns of Scofield and Clear Creek southwest of the quadrangle. Numerous dirt roads provide access for ranchers to the mountainous areas.

Physiography

The Wasatch Plateau is a high and deeply dissected tableland, the eastern side of which forms a sweeping stretch of barren sandstone cliffs nearly 80 miles (129 km) long. The parallel rock strata dip at low angles and the resistant sandstone beds form nearly horizontal lines of cliffs and ledges on the steep canyon walls.

The area within the quadrangle is rugged and mountainous with altitudes ranging from 7,200 ft (2,195 m) where Price River leaves the quadrangle to over 9,250 ft (2,819 m) on a peak in the southeast corner of the quadrangle. The mountainous area in the northwestern part is underlain by soft Tertiary beds which erode to rounded, soil covered hills

and ridges. The steep-walled canyons carved by Price River and Beaver Creek on the south side of the quadrangle are rocky and precipitous. Price River canyon is over 2,000 ft (610 m) deep at the western side of the quadrangle. The canyon walls are steep rock-covered slopes with cliffs and ledges but little vegetation. The flatter upland areas, however, support an abundant vegetation of grasses, brush, and trees. The northeast part of the quadrangle is a gently sloping upland valley drained by White River which flows into Price River at Colton.

Climate

The climate on the Wasatch Plateau varies with altitude from alpine to semiarid. The normal annual precipitation on the Southeast Quarter of the Soldier Summit 15-minute quadrangle ranges from 18 inches (46 cm) at the lower elevations to over 25 inches (64 cm) in the higher areas (U.S. Department of Commerce, (1964)). Much of the precipitation falls during the winter months. Occasional late summer cloudburst storms may produce flash floods which could damage roads and bridges.

Temperatures on the Wasatch Plateau in the area of the quadrangle are cool in summer and cold in winter. The annual mean temperature at the Scofield Dam is 37.7 degrees F (3.2 degrees C) with temperature extremes of 89 degrees F (31.7 degrees C) in the summer and -42 degrees F (-41 degrees C) in the winter (U.S. Department of Commerce, 1957).

Land Status

The KRCRA area in the quadrangle covers approximately 3,900 acres. This area includes 2,000 acres of unleased Federal coal land and 1,900 acres of non-Federal land. The distribution of Federal and non-Federal coal lands and the KRCRA boundary are shown on plate 2. Unleased Federal coal lands constitute approximately 51 percent of the KRCRA and 49 percent of the lands are non-Federal.

GENERAL GEOLOGY

Previous Work

Spieker (1931) mapped the geology and coal deposits of the Wasatch Plateau and his map is the most detailed work presently available. The stratigraphy of the area is further described by Spieker and Reeside (1925), Katich (1954), and Moussa (1965). Doelling (1972) has summarized the geology and updated the coal data for the Wasatch Plateau area.

Stratigraphy

The formations which crop out in the quadrangle area include the Blackhawk Formation, Castlegate Sandstone, and Price River Formation which comprise the Mesaverde Group of Upper Cretaceous age; the North Horn Formation of Upper Cretaceous and Tertiary age; the Flagstaff Limestone of Paleocene age; and the Colton and Green River Formations of Eocene age.

The oldest formation exposed in the quadrangle is the Upper Cretaceous Blackhawk Formation which contains the important coal beds. The Blackhawk is from 1,500 to 1,600 ft (456 to 488 m) thick and is composed of yellow to gray fine- to medium-grained sandstone interbedded with subordinate gray carbonceous shale and coal beds.

The overlying Castlegate Sandstone ranges from 200 to 500 ft (51 to 153 m) thick, and is composed of white to gray, coarse-grained, conglomeratic sandstone which forms prominant cliffs and weathers to shades of brown. The Price River Formation overlies the Castlegate Sandstone and consists of about 550 ft (168 m) of gray, sandstone interbedded with minor shales and conglomerate.

The overlying North Horn Formation marks the transition from the Cretaceous to the Tertiary, and is the lowest member of the Wasatch Group.

It is nearly 600 ft (183 m) thick and consists of variegated shale and lesser amounts of sandstone, conglomerate, and freshwater limestone.

Although the lower contact of the Flagstaff Limestone with the underlying North Horn Formation is not sharp, the Flagstaff is more resistant and easily recognized. It consists of about 500 ft (153 m) of evenly-bedded yellowish-gray or cream-colored lacustrine limestone interbedded with subordinate amounts of sandstone, shale, and volcanic ash. The overlying Colton Formation is about 1,500 ft (458 m) thick and consists of variegated shale with subordinate lenticular sandstone and limestone beds similar to those in the North Horn Formation. The youngest Tertiary formation exposed in the quadrangle is the Green River Formation which consists mainly of greenish-gray lacustrine shale and siltstone. This formation is present in the northeast corner of the quadrangle.

Structure

Doelling (1972) describes the geologic structure in the area and states that the principal structural feature of the quadrangle is the northeastward-dipping flank of the Clear Creek anticline. The inclination is as much as 15 degrees in places. Several faults along the western edge of the quadrangle represent the north end of the Pleasant Valley fault zone. The easternmost fault of the North Gordon Creek fault zone extends into the area along the east edge of the quadrangle. This fault, called the Forge Mountain fault, may continue as far north as Colton and marks the east edge of the Wasatch Plateau coal field. There is plenty of room between faults for mining; the difficult problem is the moderate to steep dip and resultant increase in cover to the north and east.

COAL GEOLOGY

The coal-bearing Blackhawk Formation is only exposed in the southwest part of the quadrangle in the steep-walled Price River Canyon. The Haley coal bed crops out approximately 900 ft (272 m) below the Castlegate Sandstone and possibly 700 ft (212 m) above the unexposed Hiawatha bed which is the basal coal in the Blackhawk Formation.

No non-proprietary drill-hole information was available for the quadrangle area. The principal coal beds in other parts of the northern Wasatch Plateau are the Hiawatha and the Castlegate "A" beds which would be quite deep in this quadrangle. The only area with less than 1,000 ft (305 m) of cover above those beds is in the bottom of the western part of Price River Canyon.

Haley Coal Bed

The only exposed coal bed of potential value found in the quadrangle is the Haley bed which crops out in Price River Canyon in the southwest part of the quadrangle. Measurements of the coal range from 3.0 to 6.0^{+} ft (0.9 to 1.8^{+} m) thick, but the coal becomes thin and dirty westward toward Scofield Reservoir. Only five coal thickness measurements are known and four of those are less than 5 ft (1.5 m). The coal isopach lines shown on plate 4 suggest that the coal bed thickens in a southward direction. The bed is over 6 ft (1.8 m) thick in section 14, T. 12 S., R. 7 E., but the exact thickness is unknown. The lateral extent and commercial value of the Haley bed in this quadrangle have not been determined. No chemical analyses are available for the Haley coal.

Information concerning the general character of the coal mined from this quadrangle is not available. However, the Haley bed is present in the Pleasant Valley area to the southwest and coal was mined at the Haley mine where it was found to be unprofitable for mining (Spieker, 1931, p. 89).

Mining Operations

There are a total of two mines which operated on the Haley coal bed in this quadrangle; The People's Coal and Coke mine in section 11, T. 12 S., R. 7 E. and the Carbon Dale mine in section 13, T. 12 S., R. 7 E. The estimated total production from both mines is 6,000 tons (Doelling, 1972). At the time of this report (1979) there were no active mines in the quadrangle.

COAL RESOURCES

The principle source of data used in the construction of the coal isopach, structure contour, and coal-data maps was Doelling (1972).

Coal resource tonnages were calculated for measured and indicated categories in the unleased areas of Federal coal land within the KRCRA boundary where the coal is 5 ft (1.5 m) or more thick. Data obtained from the coal isopach map (plate 4) was used to calculate the Reserve Base values. The coal-bed acreage (measured by planimeter) multiplied by the average isopached thickness of the coal bed times a conversion factor of 1,800 short tons of coal per acre-foot of bituminous coal yields the coal resources in short tons of coal for the isopached coal bed. Reserve Base and Reserve values for the Haley Bed are shown on plate 7 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.

"Measured resources are computed from dimensions revealed in outcrops, and mine workings. 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 the 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 for which there is geologic evidence. The points of observation are 1½ (2.4 km) to 6 miles (9.6 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 or points of observation or measurement." (U.S. Bureau of Mines and U.S. Geological Survey, 1976).

Coal Reserve Base tonnages per Federal section are shown on plate 2 and total approximately 0.103 million short tons (0.09 million metric tons) for the unleased Federal coal lands within the KRCRA boundary in the quadrangle.

Table 1: Coal Reserve Base data for subsurface mining methods for Federal coal lands (in short tons) in the Southeast Quarter of the Soldier Summit 15-minute quadrangle, Carbon and Utah Counties, Utah.

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

Coal Bed Name	High development potential	Moderate development potential	Low development potential	Total
Haley	103,000	-0-	-0-	103,000

COAL DEVELOPMENT POTENTIAL

Development Potential for Surface Mining Methods

No development potential for surface mining methods exists in the area of this quadrangle because of the rugged topography, steep-sided canyons, extreme relief, and thick overburden. There may be very small areas where some rim stripping could be done, but in general the area is not conducive to surface mining methods.

Development Potential for Subsurface Mining and In Situ Gasification

The coal development potential for the underground mining of coal is shown on plate 8. In this quadrangle the areas where coal beds 5 ft (1.5 m) or more in thickness are overlain by less than 1,000 ft (305 m) of overburden are considered to have a high development potential for underground mining.

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 a moderate and a low development potential respectively. Areas that contain no known coal in beds 5 ft (1.5 m) or more thick, but coal-bearing units are present

at depths of less than 3,000 ft (914 m) are classified as areas of unknown coal development potential. Areas where no coal beds are known to occur or where coal beds are present at depths greater than 3,000 ft (914 m) have no coal-development potential. The areas of unleased Federal coal land within the KRCRA in the Southeast Quarter of the Soldier Summit 15-minute quadrangle fall within the "high" and "unknown" development potential classifications.

The designation of a coal development potential classification is based on the occurrence of the highest-rated coal-bearing area that may occur within any fractional part of a 40-acre BLM land grid area or lot area of unleased Federal coal land. For example, a certain 40-acre area is totally underlain by a coal bed with a "moderate" development potential. If a small corner of the same 40-acre area is also underlain by another coal bed with a "high" development potential, the entire 40-acre area is given a "high" development potential rating even though most of the area is rated "moderate" by the lower coal bed. Another possibility is a 40-acre area devoid of any coal except a small corner where a 5-ft (1.5 m) coal bed crops out. In this case the 40-acre area will have a "high" development potential rating.

In this quadrangle, approximately 120 acres of unleased Federal land within the KRCRA have a high development potential rating and 1,750 acres have an unknown development potential.

The in situ coal gasification methods of development potential classification are based on the dip and depth of coal beds having a minimum thickness of 5 ft (1.5 m). There are only two development potential classifications--moderate and low. The criteria for in situ classification include coal bed dips of 15 to 90 degrees and coal bed depth of 200-3,000 ft (61-914 m).

Inasmuch as the coal beds dip less than 15 degrees in the Southeast Quarter of the Soldier Summit 15-minute quadrangle, the in situ coal gasification methods of development potential classification do not apply.

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

The following table shows the source reference and page number for the data shown on plate 1.

Table 2. Source of data used on plate 1.

Source	Plate 1 Index Number	Data Base Measured Section No.	Page No.
Doelling, H. H., 1972	1	1	242
	2	2	242
	3	3	242
	4	4	242
	5	5	242

REFERENCES

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