UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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1979

COAL RESOURCE OCCURRENCE AND COAL DEVELOPMENT POTENTIAL MAPS OF THE JOHNS PEAK QUADRANGLE SEVIER COUNTY, UTAH

(Report includes 8 plates)

By

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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 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 Johns Peak quadrangle, Sevier County, Utah (U.S. Geological Survey Open-File Report 79-1015).

Published and unpublished public information were used as data sources for this study.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 Johns Peak 7½-minute quadrangle is located at the south end of the Wasatch Plateau coal field in Central Utah. The quadrangle lies in the eastern part of Sevier County. The city of Richfield, the county seat of Sevier County, is 32 miles (51 km) west of the quadrangle. The city of Salina is 24 miles (39 km) northwest and the town of Emery is 14 miles (23 km) northeast of the quadrangle.

Accessibility

Johns Peak quadrangle is in a rugged mountainous area and no paved roads cross the quadrangle. However, U.S. Interstate Highway 70 lies about 0.5 mile (0.8 km) north of the quadrangle boundary. Utah Highway 72 is a light-duty gravel road which runs south from Fremont Junction on U.S. Interstate 70 0.5 mile (0.8 km) north of the northeast corner of the quadrangle. Utah Highway 72 crosses the quadrangle from north to south and continues southward to the town of Fremont approximately 15 miles (24 km) southwest of the quadrangle. Several dirt roads and jeep trails provide access to other parts of the quadrangle.

The nearest railhead is at the city of Salina approximately 24 miles (39 km) northwest of the quadrangle and is reached via U.S. Interstate Highway 70.

Physiography

The Wasatch Plateau is a high and deeply dissected tableland. The eastern margin of the plateau forms a sweeping stretch of barren sandstone cliffs some 80 miles (129 km) long. Johns Peak quadrangle lies at the southern end of the Wasatch Plateau and the sandstone cliffs which are characteristic of the eastern edge of the plateau are present only in the northeast part of the quadrangle. Altitudes range from 6,680 ft (2,036 m) where Last Chance Creek leaves the quadrangle on the east side to more than 10,000 ft (3,048 m) in the southwest corner. The total relief in the quadrangle is more than 3,300 ft (1,006 m). Coal bed outcrops in the quadrangle occur at elevations between 6,800 and 9,200 ft (2,073 and 2,804 m) above sea level.

The quadrangle covers parts of two coal fields. The Emery field lies on the east side of the Paradise fault in the eastern third of the quadrangle, and the Wasatch Plateau field lies on the west side of the fault.

The two major drainage systems in the area of the quadrangle are those of Ivie Creek and Last Chance Creek. The south half of the quadrangle drains into Last Chance Creek which flows eastward and southeastward into the lower part of Muddy Creek. Ivie Creek lies just north of the north boundary of the quadrangle and carries runoff from the north half of the quadrangle eastward and northeastward until it enters the middle section of Muddy Creek.

Climate

The Wasatch Plateau is located in a mid-latitude steppe climate. The normal annual precipitation ranges from 10 inches (25 cm) in the northeast corner of the quadrangle to 25 inches (64 cm) on the high area in the southwest corner of the quadrangle (U.S. Department of Commerce, (1964)). Practically all of the quadrangle area is over 7,000 ft (2,134 m) in elevation above sea level. The temperatures are generally cool in the summer and cold in the winter. Maximum summer temperatures are around 85 degrees F (29 degrees C) and the minimum winter temperatures are near -20 degrees F (-26 degrees C).

Land Status

Johns Peak quadrangle lies at the south end of the Wasatch Plateau Known Recoverable Coal Resource Area (KRCRA). Approximately 18,600 acres (7,527 ha) of the quadrangle area lies within the KRCRA and plate 2 shows the distribution, and table 1 lists the acres of Federal and non-Federal lands in that area at the date shown on plate 2.

Table 1. Approximate distribution of coal lands within the KRCRA in the Johns Peak quadrangle, Sevier County, Utah.

Category	Approximate Area (acres)*	Percent of KRCRA (%)
Non-Federal land	800	4
Unleased Federal coal land	17,800	96
Total	18,600	100

*To convert acres to hectares, multiply acres by 0.4047

GENERAL GEOLOGY

Previous Work

Spieker (1931) mapped the geology and coal outcrops of the Wasatch Plateau in detail. The stratigraphy of the area has also been described by Spieker and Reeside (1925), Katich (1954), and Hayes and others (1977). In 1972 Doelling summarized the geology and assembled the available coal data for the coal field. More recent work done in some of the nearby quadrangles is discussed under Coal Geology below.

Stratigraphy

The coal beds of economic importance in the Wasatch Plateau coal field are Upper Cretaceous in age and are confined to the Blackhawk Formation of the Mesaverde Group. The Mesaverde includes the following four formations in ascending order: the Star Point Sandstone, Blackhawk Formation, Castlegate Sandstone, and the Price River Formation. The Upper Cretaceous Mancos Shale underlies the Mesaverde Group and includes coal beds of economic importance in the Emery coal field, part of which lies in the southeast quarter of Johns Peak quadrangle. The Tertiary strata overlying the Mesaverde Group consist of small patches of the North Horn Formation (Upper Cretaceous and Paleocene) in several small fault blocks on the west side of the quadrangle.

The oldest unit exposed in the quadrangle is the Tununk Shale Member of the Mancos Shale which crops out in the southeast corner of the quadrangle. The Tununk Shale is a black- to brown-black silty shale and is overlain by the Ferron Sandstone Member of the Mancos Shale which consists of 800 ft (244 m) of alternating sandstone, shale, and coal beds. The basal unit of the Ferron is a 180 ft (55 in) resistant sandstone bed. The Blue Gate Shale member of the Mancos Shale overlies the Ferron Sandstone and is composed of at least 2,000 ft (610 m) of blue-gray silty shale. Doelling (1972) estimates that about 1,000 ft (305 m) of the Blue Gate are exposed in the quadrangle on the east side of the Paradise fault. On the west side of the fault the Emery Sandstone Member of the Mancos Shale forms a series of step-like sandstone cliffs and ledges with some thin shale beds. The Emery is more than 800 ft (244 m) thick and one or more coal beds have questionably been reported in the unit which is normally barren of coal (Doelling, 1972). The Masuk Shale Member of the Mancos Shale overlies the Emery Sandstone and is similar to the blue-gray silty shale of the Blue Gate Shale Member but is sandier. The Masuk is the youngest member of the Mancos Shale and is about 600 ft (183 m) thick in the quadrangle.

The Star Point Sandstone overlies the Masuk Shale and generally forms a cliff along the east side of the Wasatch Plateau. It is about 200 ft (61 m) thick and thickens slightly northward (Doelling, 1972). It is composed of yellowish-gray fine- to medium-grained sandstone.

The Blackhawk Formation is approximately 750 ft (229 m) thick (Doelling, 1972) and is exposed over a large area in the north-central part of the quadrangle. The formation consists of very fine- to medium-grained sandstone, siltstone, shale, and coal; sandstone is the dominant rock type. Marley and Flores (1977, p. ii and iii) report in a study north of Johns Peak quadrangle that "the Blackhawk Formation interfingers laterally with and locally unconformably overlies the Star Point Sandstone. . . The characteristics of the rock types of the Blackhawk Formation suggest that they represent delta-plain deposits, which grade (seaward) into the underlying delta-front and prodelta deposits of the Star Point Sandstone."

The Castlegate Sandstone overlies the Blackhawk Formation and is a massive, cliff-forming, yellow to gray sandstone unit. The overlying Price River Formation is similar to the Castlegate but the bedding is less massive and is composed of fine- to medium-grained sandstone with some interbedded shale. The total thickness of the Castlegate-Price River sequence is approximately 800 ft (244 m) (Doelling, 1972). The Price River Formation is less resistant to erosion than the Castlegate Sandstone and forms step-like ledges in its outcrop pattern.

The North Horn Formation is Upper Cretaceous and Paleocene in age. It consists of variegated shale and subordinate conglomerate, sandstone, and limestone. The North Horn Formation only crops out in a small faulted area on the west side of the quadrangle in sections 19 and 20, T. 24 S., R. 4 E.

The Bullion Canyon volcanics of Tertiary age crop out in the extreme southwest corner of the quadrangle. The volcanics cover a large area south of the quadrangle and effectively terminate the Wasatch Plateau coal field.

A large area of the central and west central parts of the quadrangle are covered with Quaternary gravels which shield an extensive area underlain by Upper Cretaceous formations. The high-level gravel is composed of volcanics, quartzites, chert, and limestone. These gravels occur at elevations exceeding 9,000 ft (2,743 m) and cap Johns Peak which is 9,540 ft (2,908 m) above sea level.

Structure

The major fault in the area cuts diagonally across the eastern half of the quadrangle from north northeast to south southwest. This fault passes through Paradise Valley and is called the Paradise fault in this area. Spieker (1931) interprets this fault as a southward extension of the Joes Valley fault zone which is the most extensive of three fault zones in the Wasatch Plateau coal field. In Johns Peak quadrangle the Paradise fault occurs in the Mancos Shale and is downthrown on the west side.

Several clusters of shorter faults 1 to 3 miles (1.6 to 4.8 km) in length occur in the western half of the quadrangle. Most of these faults have less than 100 ft (30 m) of displacement although one of the north-south faults near the west edge of the quadrangle has placed the Price River Formation against the Masuk Shale with a displacement of at least 1,500 ft (457 m) (Doelling, 1972).

The structure contour map of the Hiawatha coal bed (plate 5) indicates that the coal beds in the Blackhawk Formation dip from 1 to 5 degrees to the north and northwest in the north half of the quadrangle.

COAL GEOLOGY

The chief coal beds in the southern part of the Wasatch Plateau coal field occur in the lower section of the Blackhawk Formation. In the area of this quadrangle Spieker (1931) and Doelling (1972) list the following coal beds in ascending order: the Hiawatha, Upper Hiawatha, Ivie, Upper Ivie, and some thin local coal beds.

Spieker (1931, p. 196) reports that, "The country adjacent to Ivie Creek consists largely of rounded slopes, and natural exposures of coal are rare... South of Ivie Creek exposures of coal diminish sharply, and apparently no important beds are present between Ivie Creek and Last Chance Creek. Near the head of Last Chance Creek exposures of coal return for a short space, but farther south the rocks in general are very poorly exposed. In most of the area the coal is not exposed." Within the last several years at least eight non-proprietary coal test holes have been drilled in the Wasatch Plateau section of the quadrangle as shown on plate 1. Other holes have been drilled eastward in the Emery field which is outside the Wasatch Plateau KRCRA.

Hayes and Sanchez (1977) mapped the geology of the Emery West quadrangle and the geology of the Flagstaff Peak quadrangle (Sanchez and Hayes, 1977). These two quadrangles are respectively 9 and 18 miles (14 and 29 km) north of Johns Peak quadrangle. While Hayes and Sanchez were mapping those two quadrangles Marley and Flores (1977) made detailed measurements and descriptions of closely-spaced stratigraphic sections of the upper part of the Star Point Sandstone and the lower part of the Blackhawk Formation. During the course of this work a zone of intertonguing between these two formations was observed at several localities within a 6 mile (10 km) long and 0.6 mile (1 km) wide belt extending south-southeastward from the north wall of Muddy Creek Canyon in the Flagstaff Peak quadrangle to a point near the town of Emery in the Emery West quadrangle. See figure 1. "As a result of this intertonguing, the contact between the two formations is about 20 m higher to the east than it is to the west and the coal-bed correlations of Spieker (1931) must be modified." (Flores and others, 1978)

As a consequence of the recognition of the intertonguing, a revision of the correlations of the lower Blackhawk Formation coal beds between the two sides of the intertonguing zone was suggested by Flores and other (1978). They pointed out, for example, that "the upper bed in the abandoned mine of Muddy Canyon and referred to as Muddy No. 2 coal bed by Spieker (1931) is

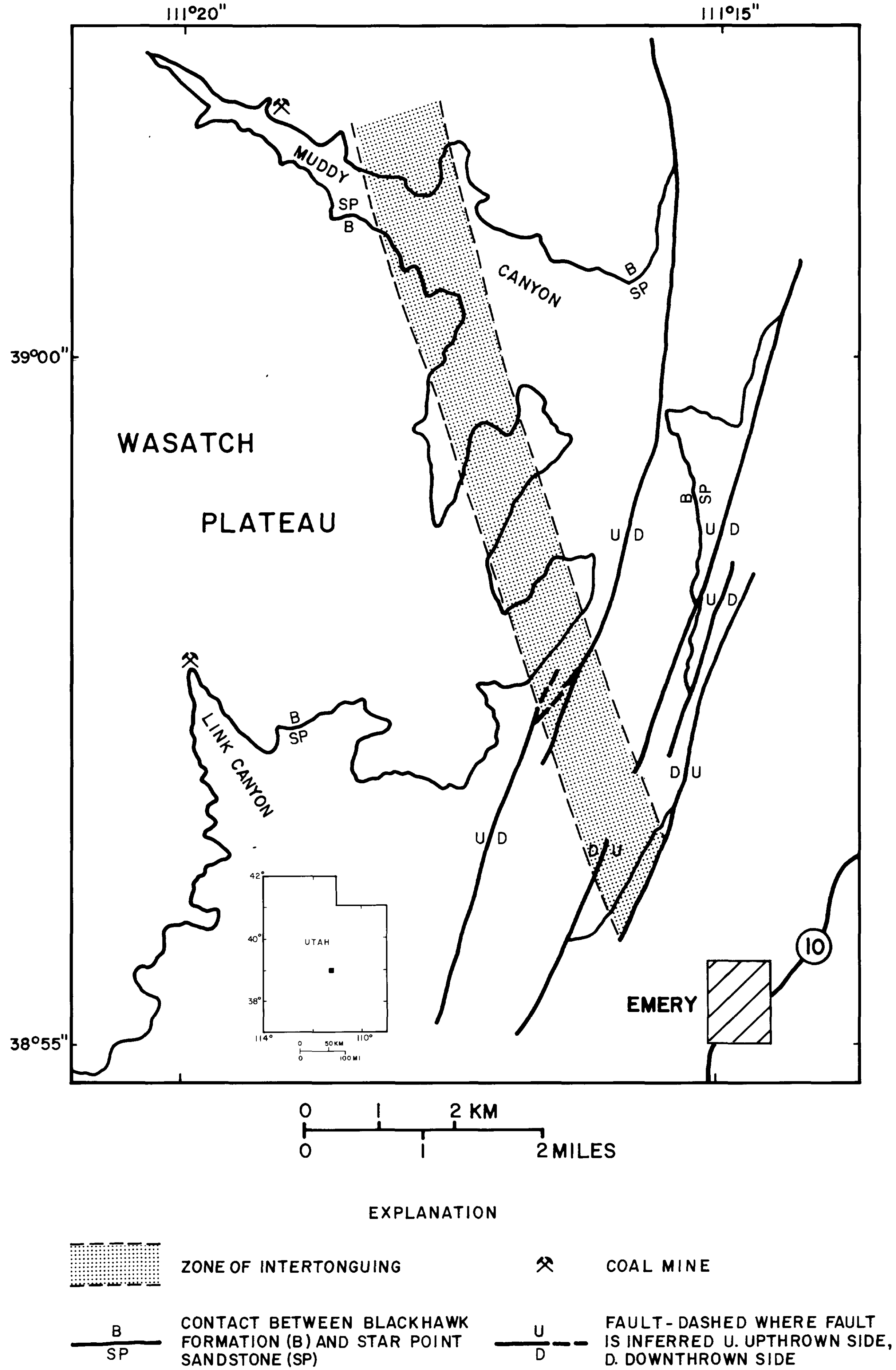

FIGURE 1. Map showing zone of intertonguing (after Flores and others, 1978).

apparently the Hiawatha coal bed. . ." and that, "The coal bed mined in the abandoned Link Canyon mine. . .and identified by Doelling (1972) as the Upper Hiawatha coal bed merges laterally eastward into the Star Point Sandstone and must be about 20 m below the stratigraphic position of the Upper Hiawatha coal bed of areas to the east of the zone of intertonguing" (Flores and others, 1978). Generalized cross sections through the zone of intertonguing are shown in figure 2.

The Johns Peak quadrangle lies south and west of the zone of intertonguing and the coal-bed names used here reflect the stratigraphic correlations suggested by Flores and others (1978) in the Emery West and Flagstaff Peak quadrangles.

Based on the revised correlations of coal beds to the west and south of the zone of intertonguing observed by Marley and Flores (1977) the coal-bed names used by earlier workers are revised to coincide more closely to the correlations used in the quadrangle to the north including the Old Woman Plateau, Acord Lakes, Emery West, and Flagstaff Peak quadrangles. The names "A" Bed and "B" Bed are tentatively used here by the present authors for lack of other names. "A" Bed is the name used for the coal bed formerly called the Hiawatha bed by Spieker (1931) and other earlier writers. "B" Bed is the name used for the coal bed formerly called the Upper Hiawatha. "Hiawatha" is herein used for the coal bed called the "Ivie" bed of Spieker (1931) and Doelling (1972). Spieker (1931) generally used local names for coal beds other than the Hiawatha and Upper Hiawatha which he used almost throughout the Wasatch Plateau coal field. However, he stated (p. 180) that, "If names were to be extended, with our present knowledge, Ivie would be preferable for the Muddy No. 2." and that mining in certain areas may prove their equivalency. The Muddy No. 2 bed on the west side of the zone

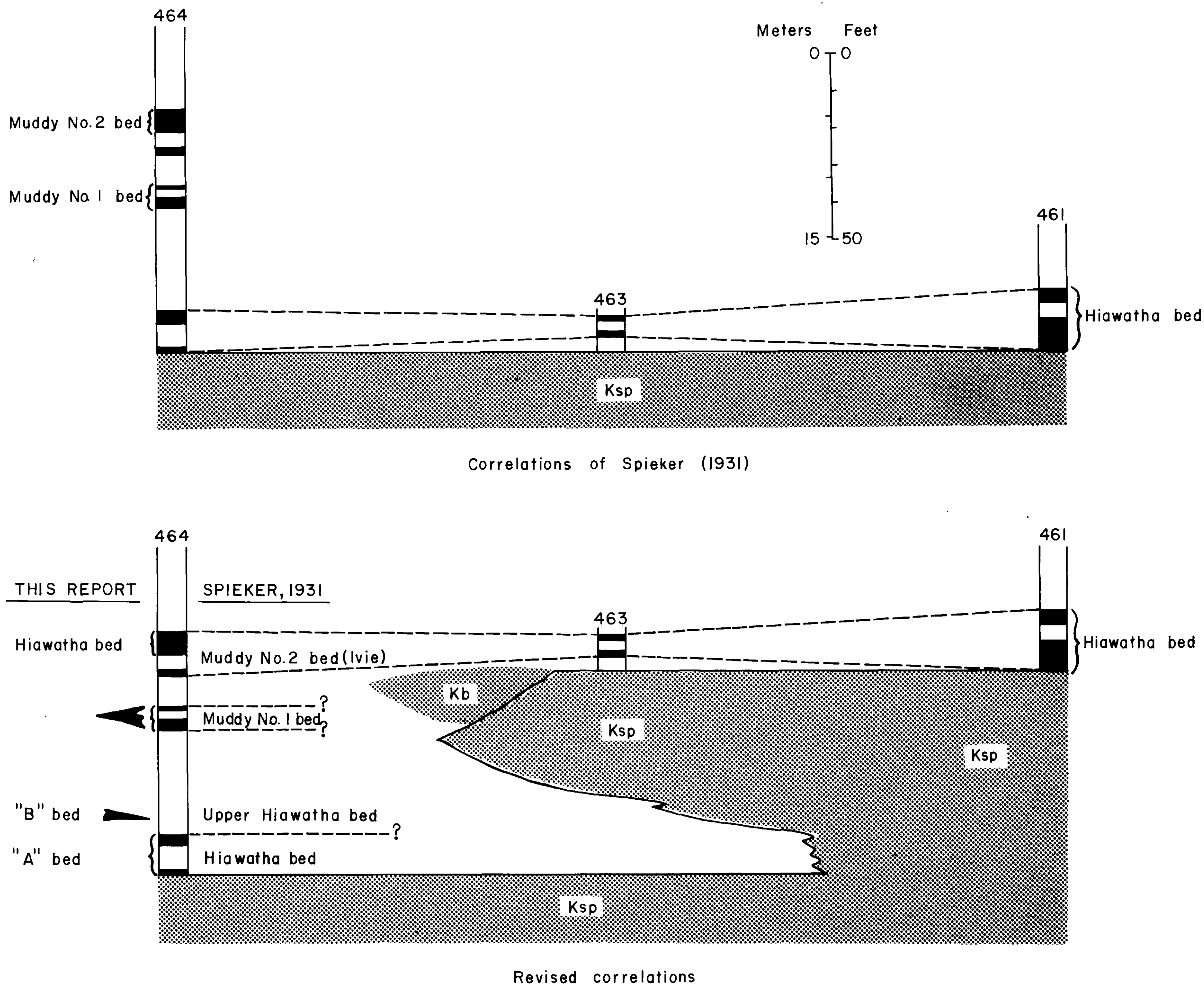

FIGURE 2. Generalized cross sections showing former and revised coal-bed correlations (after Flores and others, 1978).

of intertonguing is correlated to the Hiawatha bed on the east side of the intertonguing as shown in figure 2. Table 2 below shows the coal bed correlations used in this report and in the Emery West quadrangle.

Table 2. Correlations of coal beds on the east and west sides of the zone of intertonguing, Johns Peak and Emery West quadrangles, Sevier and Emery Counties, Utah.

West Side of Zone Intertonguing			East Side of Zone of Intertonguing
New Correlations Johns Peak Quadrangle	New Correlations Emery West Quadrangle	Spieker (1931) and Doelling (1972)	Spieker (1931) and Doelling (1972)
			Upper Ivie
			Muddy No. 2
			Muddy No. 1
	Upper Hiawatha	Upper Ivie	Upper Hiawatha
Hiawatha	Hiawatha	Muddy No. 2 (Ivie)	Hiawatha
(absent)	"C" Bed	Muddy No. 1	
"B" Bed	"B" Bed	Upper Hiawatha	
"A" Bed	"A" Bed	Hiawatha	

Intervals reported as "bony coal," "shaly coal," or other similar terms in the data sources are shown as "rock" intervals in this report on plates 1 and 3. These intervals were not included in the coal thicknesses used to contruct the coal isopach map.

"A" Coal Bed

The "A" coal bed occurs on the west side of the zone of intertonguing and the name is tentatively used here by the present authors because of the lack of another name. The bed in this area is the one formely called the "Hiawatha" coal bed by Spieker (1931) and Doelling (1972). Based on findings interpreted by Flores and others (1978) the bed merges laterally into the Star Point Sandstone about 15 miles (24 km) northeast of the quadrangle in the zone of intertonguing and is approximately 65 ft (20 m) stratigraphically below the Hiawatha coal bed on the east side of the zone. The "A" bed occurs on or near the top of the Star Point Sandstone and is thin and lenticular in this quadrangle. It is absent in some of the holes drilled in the quadrangle, but where encountered the bed ranges in thickness from 0.4 to 4.5 ft (0.1 to 1.4 m).

"B" Coal Bed

The "B" coal bed occurs on the west side of the zone of intertonguing and was formerly called the Upper Hiawatha coal bed by Spieker (1931) and Doelling (1972). The bed is well developed along the north side of the North Fork of Last Chance Creek (index numbers 10 to 13 on plate 1) where the bed reaches a thickness of 7.8 ft (2.4 m). The bed was also encountered in holes drilled in the northwest quarter of the quadrangle where the bed was generally less than 5 ft (1.5 m) thick except in the hole at index number 20 where it was 6.5 ft (2.0 m) thick. The "B" bed is approximately 20 ft (6.1 m) above the base of the Blackhawk Formation. Because of the limited number of widely-spaced points of measurement where the bed is over 5.0 ft (1.5 m) thick, a coal isopach map of the bed was not drawn. For this reason isolated data-point maps (in U.S. Geological Survey files) were made on separate sheets for the non-isopachable coal beds which occur on unleased Federal coal land. The index numbers for which the isolated data maps were made for the "B" bed include index numbers 10, 12, and 20.

Hiawatha Coal Bed

Based on findings interpreted by Flores and others (1978) the Hiawatha coal bed on the east side of the zone of intertonguing correlates with the coal bed formerly called the Muddy No. 2 coal bed on the west side of the zone by Spieker (1931) and Doelling (1972). In the Ivie Creek area Spieker

(1931, p. 180) suggests the equivalency of the Muddy No. 2 and the Ivie coal beds. In this report the coal bed called "Hiawatha" is the one formerly called the Ivie coal bed by Spieker (1931). The points of measurement for this coal bed all occur in the north half of the quadrangle where the bed reaches a thickness of 9.0 ft (2.7 m) in Clear Creek Canyon. See the coal isopach map, plate 4. The area where the coal bed is Reserve Base thickness, over 5.0 ft (1.5 m), appears to be limited to the Clear Creek area and the bed thins eastward and southward. Westward the bed apparently pinches out and is missing in the drill holes at index numbers 15, 18, and 20 on plate 1.

Ferron Coal Zone

The southeast quarter of the quadrangle covers part of the Emery coal field which contains coal beds in the Ferron Sandstone Member of the Mancos Shale. Several measured sections and drill holes in that area are shown on plate 1 along with their respective coal and rock intervals. Inasmuch as this area is outside the Wasatch Plateau KRCRA and is not included in the present study, the measured sections and drill holes have not been given index numbers and are not shown on the coal data sheet, plate 3. However, two measurements of Ferron coal beds occur in the KRCRA. An oil test well drilled by Pacific Natural Gas Company in Section 8, T. 25 S., R. 4 E. encountered two coal beds 9.0 and 13.0 ft (2.7 and 4.0 m) thick at depths below 2,320 ft (707 m). A 12 ft (3.7 m) thick coal bed was measured at an abandoned mine or prospect west of Paradise Valley in Section 22, T. 25 S., R. 4 E. Doelling (1972, p. 480) assigned this coal bed to the Ferron Sandstone.

Isolated data maps (in U.S. Geological Survey files) were made for the two occurrences of Ferron Sandstone coal in the KRCRA and the Reserve Base tonnages for the immediate 0.25 mile (0.4 km) area around these two points are shown on plate 2. It is possible that the Ferron coal beds underlie the Blackhawk Formation to the northwest, but the overburden thickness above the Ferron beds would probably exceed 3,000 ft (914 m).

Chemical Analyses of the Coal

Three coal analyses are available for the quadrangle area. These are listed by Doelling (1972, table 5) and are summarized below. Two analyses are of Hiawatha (Ivie) coal and one is an analysis of Ferron coal.

Table 3. Average proximate analysis of coal samples from the Hiawatha coal bed (formerly Ivie bed of Spieker, 1931), Johns Peak quadrangle, Sevier County, Utah.*

	No. Analyses	As Received (percent) Average	Range
Moisture	2	13.4	12.9-13.9
Volatile matter	2	36.2	35.2-37.2
Fixed carbon	2	43.8	43.6-43.9
Ash	2	6.7	6.0-7.3
Sulfur	2	.6	.6
Btu/lb**	2	10,570	10,540-10,600

*After Doelling (1972, p. 96)
**To convert Btu/lb to Kj/kg multiply by 2.326

Based on the ASTM system of classification and the average analysis shown in table 2, the Hiawatha coal is ranked as high volatile C bituminous (if it is agglomerating) (American Society for Testing and Materials, 1977).

The following is an analysis of an outcrop sample of the lower zone of Ferron coal (Doelling, 1972, p. 96).

	As received (percent)	Moisture free (percent)
Moisture	11.9	--
Volatile matter	36.4	41.3
Fixed carbon	42.7	48.5
Ash	9.0	10.2
Sulfur	0.53	0.60
Btu/lb	--	9,830

Mining Operations

Very little coal has been removed from the quadrangle and most of the known prospects and abandoned small coal mines are quite old and are mentioned by Spieker (1931). Several short adits have been driven in Clear Creek Canyon, Red Creek Canyon, Last Chance Canyon, and on the West side of Paradise Valley (Doelling, 1972). The workings in Red Creek and Clear Creek Canyons are in the Hiawatha bed; those in Last Chance Canyon are in the upper zone of the Ferron coals; and a prospect on the west side of Paradise Valley is in a coal bed in the Emery Sandstone. At the time of this writing (1979) there were no active coal mines within the KRCRA area in the quadrangle.

COAL RESOURCES

The principal sources of data used in the construction of the coal isopach, structure contour, and coal-data maps were Doelling (1972), Spieker (1931), Davis and Doelling (1979), and unpublished logs of holes drilled by the U.S. Geological Survey (1977).

Coal resource tonnages were calculated for measured, indicated, and inferred categories in unleased areas of Federal coal land within the KRCRA boundary. Data obtained from the coal isopach map (plate 4) and isolated data maps were 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 (13, 238 metric tons per hectare-meter) for bituminous coal yields the coal resources in short tons of coal for each isopached coal bed. Reserve Base and Reserve values for the Hiawatha 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. Coal beds thicker than 5 ft (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 minimum thickness of 28 inches (70 cm) for bituminous coal and a maximum depth of 1,000 ft (305 m) for both bituminous and subbituminous coal. Reserve Base tonnages only (designated as inferred resources) are calculated for areas in this quadrangle that are influenced by isolated data points at the locations of index numbers 10, 12, 14, 20, and 22 on plate 1.

Coal Reserve Base tonnages per Federal section are shown on plate 2 and total approximately 12.2 million short tons (11.1 million metric tons) for the Hiawatha coal bed and 9.1 million short tons (8.3 million metric tons) for the non-isopached coal beds in the unleased Federal coal lands within the KRCRA boundary in Johns Peak quadrangle. These data are shown in table 4.

"Measured resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. 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) 1½ miles (2.4 km) apart. Indicated coal is projected to extend 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 a 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).

Table 4. Coal Reserve Base data for subsurface mining methods for Federal coal lands (in short tons) in the Johns Peak quadrangle, Sevier County, Utah.

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

Coal Bed Name	High development potential	Low and Moderate development potential	Unknown development potential	Total
Hiawatha	12,200,000	-0-	-0-	12,200,000
Non-isopached coal beds	-0-	-0-	9,100,000	9,100,000
Total	12,200,000	-0-	9,100,000	21,300,000

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

COAL DEVELOPMENT POTENTIAL

Development Potential for Surface Mining Methods

No development potential for surface mining methods exist in the KRCRA 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 Coal Gasification Methods

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

Areas where coal beds of Reserve Base thickness 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 (9914 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. In Johns Peak quadrangle there are no known areas in the KRCRA with a moderate or low development potential based on the available data. The areas where non-isopached coal beds are Reserve Base thickness at isolated data points are rated with an unknown development potential.

The designation of a coal development potential classification is based on the occurence of the highest-rated coal-bearing area that may occur within any fractional part of a 40-acre (16-ha) BLM land grid area or lot area of unleased Federal coal land. For example, a certain 40-acre (16-ha) area is totally underlain by a coal bed with a "moderate" development potential. If a small corner of the same 40-acre (16-ha) area is also underlain by another coal bed with a "high" development potential, the entire 40-acre (16-ha) 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 (16-ha) 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 (16-ha) area will have a "high" development potential rating.

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 5.0 ft (1.5 m). There are only two development potential classifications--moderate and low. The criteria for in situ coal gasification include coal bed dips of 15 to 90 degrees and coal bed depths of 200 to 3,000 ft (61 to 914 m).

Inasmuch as the coal beds generally dip less than 15 degrees in Johns Peak quadrangle, the criteria for the classification of in situ coal gasification methods of development potential do not apply.

Table 5. Sources of data used on plate 1

Source	Plate 1 Index Number	Data Base: Drill Hole or Measured Section No.	Data Base: Page or Plate No.
Doelling, 1972	1	2	p. 166
	2	3	p. 166
	3	4	p. 166
	4	5	p. 166
	5	6	p. 166
	6	7	p. 166
	7	8	p. 166
	8	9	p. 166
	10	11	p. 166
	11	12	p. 166
	12	13	p. 166
	13	14	p. 166
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Davis and Doelling (1977)	9	Apdx. II	p. 90
and Spieker (1931)		600	p. 197
U.S. Geol. Survey, 1977	15	d.h. W-LCC-4-JP	
unpublished geophysical logs	16	d.h. W-LCC-6-JP	
	18	d.h. W-LCC-5-JP	
	20	d.h. W-LCC-3-JP	
	21	d.h. W-LCC-7-JP	
Davis and Doelling, 1977	17	d.h. 7	
	19	d.h. 8	

REFERENCES

American Society for Testing and Materials, 1977, Standard Specification for classification of coals by rank, in Gaseous fuels, coal, and coke; atmospheric analysis: ASTM Publication D 388-77.

Doelling, H. H., 1972, Wasatch Plateau coal field, in Doelling, H. H., Central Utah coal fields: Utah Geol. and Min. Survey Mon. Ser. no. 3.

Flores, R. M., and others, 1978, Newly delineated intertonguing between the Star Point Sandstone and the coal-bearing Blackhawk Formation requires revision of some coal-bed correlations in southern part of Wasatch Plateau, Utah: U.S. Geol. Survey unpublished report.

Hayes, P. T., and others, 1977, Summary of the geology, mineral resources, engineering geology characteristics, and environmental geochemistry of east-central Utah: U.S. Geol. Survey Open-File Report 77-513.

Katich, P. J., Jr., 1954, Cretaceous and early Tertiary stratigraphy of central and south-central Utah with emphasis on the Wasatch Plateau area: Intermtn. Association of Petroleum Geologists Guidebook, 5th Ann. Field Conf.

Marley, W. E., III, 1978, Lithostratigraphy of portions of the Upper Cretaceous Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau, Utah: Unpublished M. S. thesis, North Carolina State Univ.

Marley, W. E., III, and Flores, R. M., 1977, Descriptions of stratigraphic sections, Upper Cretaceous Blackhawk Formation and Star Point Sandstone in the Emery West and Flagstaff Peak quadrangles, Utah: U.S. Geol. Survey Open-File Report 77-833.

Marley, W. E., Flores, R. M., and Cavaroc, V. V., 1978, Lithogenetic variations of the Upper Cretaceous Blackhawk Formation and Star Point Sandstone in the Wasatch Plateau, Utah: Geol. Soc. America Abstracts with Programs Rocky Mountain Sec. 31st Annual Mtg.

Sanchez, J. D., and Hayes, P. T., 1977, Preliminary geologic map of the Flagstaff Peak quadrangle, Emery, Sanpete, and Sevier Counties, Utah: U.S. Geol. Survey Open-File Report 77-823.

Spieker, E. M., 1931, The Wasatch Plateau coal field, Utah: U.S. Geol. Survey Bull. 819.

Spieker, E. M., and Reeside, J. B., Jr., 1925, Cretaceous and Tertiary formations of the Wasatch Plateau, Utah: Geol. Soc. of America Bull., v. 36.

U.S. Bureau of Mines and U.S. Geological Survey, 1976, Coal resource classification system of the U.S. Bureau of Mines and U.S. Geological Survey: U.S. Geol. Survey Bull. 1450-B.

U.S. Department of Commerce, (1964), Normal annual precipitation in inches, 1931-1960, State of Utah: U.S. Dept. of Commerce Weather Bureau Map WR-1210-A.