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PRELIMINARY REPORT ON THE LITTLE SUSITNA DISTRICT, MATANUSKA COAL FIELD, ALASKA

By F. F. Barnes

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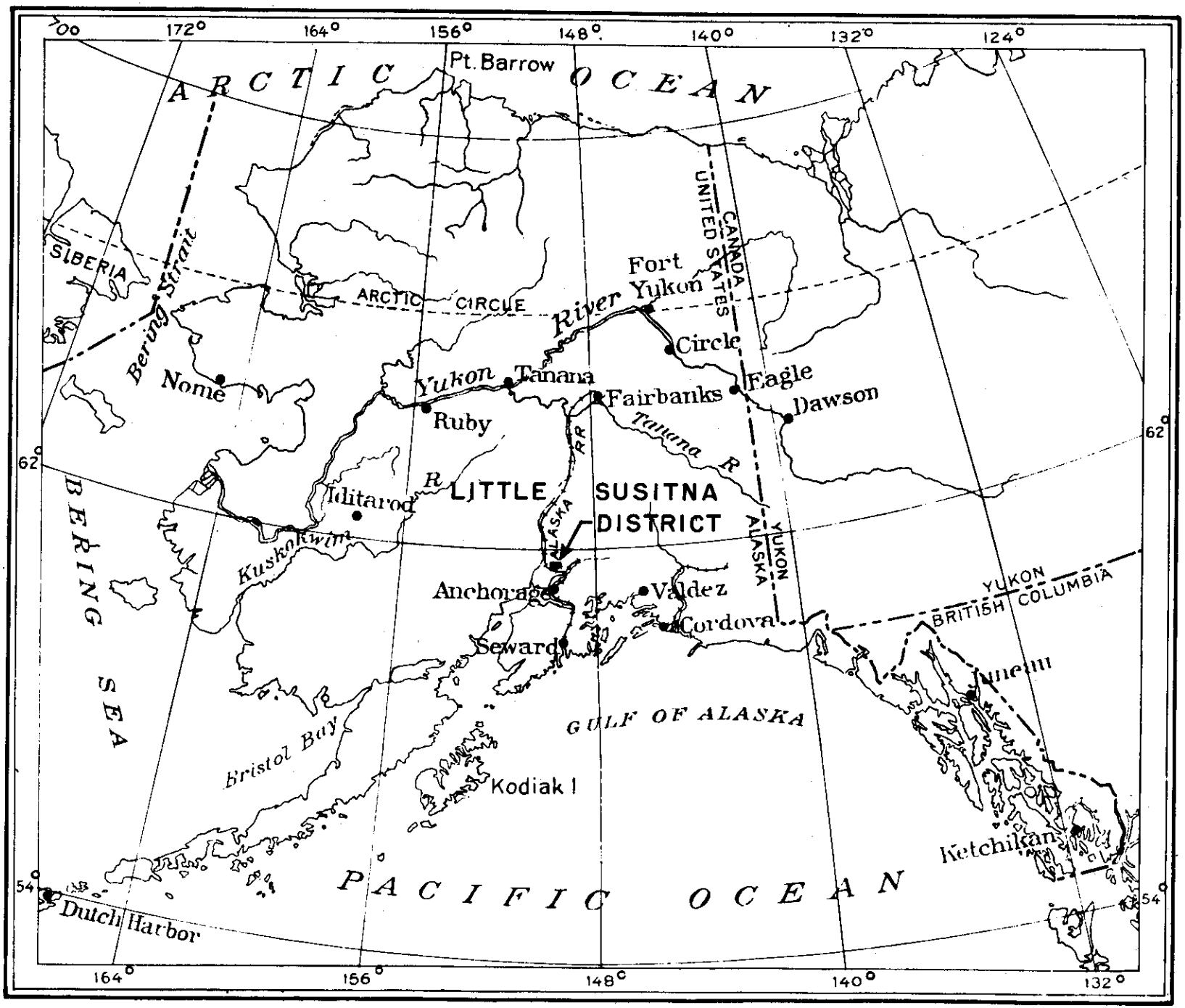

Figure 1: Map of Alaska, showing location of Little Susitna district.

PRELIMINARY REPORT ON THE LITTLE SUSITNA DISTRICT, MATANUSKA COAL FIELD, ALASKA

By F. F. Barnes

Introduction

The Little Susitna district, as defined in this report, occupies an area roughly 25 miles long and 3 miles wide on the north side of the lower (western) extremity of the Matanuska Valley in south-central Alaska (fig. 1). The district is bounded on the north by the Talkeetna Mountains, on the south and east by the Little Susitna River, and on the west by the broad lowland of the Susitna River. (See pl. 1)

This report is based on field work done in the summer of 1952, in which the writer was assisted by Alfred Oestreich, Lewis Ladwig, and Richard Pack. Prior to the present investigation very little was known geologically of the district, except that it was largely covered with alluvial and glacial deposits and that coal-bearing rocks were exposed at three widely separated localities. The purpose of the investigation was to determine, if possible from scattered outcrops and shallow test pits, whether any parts of the district offered sufficient promise of containing minable coal deposits to warrant a more detailed investigation using subsurface methods.

As a result of this preliminary investigation, plans are being made to explore more thoroughly, by trenching and drilling, some of the more promising parts of the district.

General description of the district

Topographically the Little Susitna district consists of a series of gently southward sloping benches or terraces that extend from the foot of the Talkeetna Mountains to the Little Susitna River. The lowest bench is a flat gravel terrace about 30 feet above the level of the river flood plain, from which it is separated by a steep escarpment. The higher benches to the north are less well defined, and although locally covered with a thin veneer of gravel they apparently consist mainly of bedrock. All these benches are dissected by more than a dozen small tributaries of the Little Susitna, all of which head on the southern slope of the Talkeetna Mountains and are incised to depths of 50 to 100 feet. The Little Susitna, below the canyon through which it issues from the mountains, meanders widely over a flood plain averaging about half a mile in width, and locally divides into two or more channels. Despite its meandering course the river has a rather steep gradient, flowing over an almost continuous succession of rapids and shoals.

The district has a maximum relief of about 850 feet, ranging in altitude from 250 feet at the western end to 1,100 feet at the foot of the mountains at the eastern end.

Most of the district is covered with a thick stand of trees, consisting mainly of birch and poplar on the well-drained benches, black spruce on poorly drained upland areas, and cottonwood and some spruce along the larger tributaries and on the river flood plain. West of Bench Lake trees are present only in scattered clumps, the cover consisting mainly of low shrubs and grasses.

Although the lower Matanuska Valley is close to tidewater, it is so far from the open ocean that its climate is more typical of interior Alaska than of the coast. The summers are mild, and the winters are severe, low temperatures often being accompanied by strong down-valley winds. The temperature may rise well above 80° F. in summer and drop below -30° F. in winter, but these extremes are exceptional. The average annual precipitation is about 16 inches, and August and September are the wettest months, each averaging nearly 3 inches.

The southern border of the Little Susitna district is accessible at the east end by graveled roads from Palmer and Wasilla, each about 10 miles distant, and at the west end by the Alaska Railroad. A graveled road extends within 2 miles of the district at a point north of Wasilla, from which point a truck road extends to a coal prospect half a mile north of the river. Another graveled road extends westward from Wasilla to Pittman, from which point a dirt road extends several miles farther along the railroad. With the exception of the railroad at the west end and the truck road to the coal prospect there are no roads within the district; however, the terrain is such that little difficulty should be encountered in building access roads to any part of the district.

Stratigraphy

On the basis of rather scarce and widely scattered outcrops, two bedrock formations have been mapped in the Little Susitna district. The older formation, which probably underlies the mountain slopes that form the northern boundary of the district, consists of well-indurated conglomerate, arkosic sandstone, and shale that have been considerably metamorphosed.

These rocks are evidently a westward extension of a succession of arkose, shale, and conglomerate that is typically exposed in Arkose Ridge east of the Little Susitna canyon. Although these rocks were originally assigned an Eocene age on the basis of a few plant fossils, later evidence strongly suggests that they are probably Cretaceous in age.

South of the mountain front the Little Susitna district is believed to be entirely underlain by poorly to moderately indurated sediments consisting mainly of fine to coarse pebbly sandstone, siltstone, claystone, and an unknown number of coal beds ranging from a few inches to at least eight feet in thickness. On the basis of general similarity, in lithology and degree of induration, to Tertiary rocks in neighboring areas, these rocks are believed to be of Tertiary age. A 600-foot sequence of moderately indurated pebble conglomerate and sandstone beds, through which the southern part of the Little Susitna canyon is carved, is probably also Tertiary in age, but its relation to the coal-bearing rocks has not been definitely established. Structurally, it appears to dip beneath the nearest coal-bearing rocks about a mile downstream, but lithologically it appears to be identical with the Eska conglomerate, which overlies the coal-bearing Chickaloon formation in the Wishbone Hill district, a few miles to the east. More information is needed to determine the relations of the conglomerate of the Little Susitna canyon to the Eska conglomerate, and of the coal-bearing rocks of the Little Susitna district to the Chickaloon formation. Although all the coal-bearing rocks of the Matanuska Valley have been assumed to be of essentially the same age, the similarity of the conglomerates in the Little

Susitna canyon and on Wishbone Hill, plus the fact that the conglomerate in the canyon apparently underlies the coal-bearing rocks to the south, suggest the possibility that the Little Susitna coal is younger, separated from the Chickaloon formation by the Eska conglomerate.

The contact between Tertiary and older rocks was not found at any point in the district. In the Little Susitna canyon, conglomerate of Tertiary age is exposed within a few hundred feet of the highly disturbed Cretaceous strata in Arkose Ridge, but the structural and topographic relations of the two formations strongly suggest that they are separated by a major fault. Farther west the contact could be located only approximately between widely spaced exposures of these Cretaceous(?) rocks on the north and Tertiary rocks to the south.

Three general types of unconsolidated deposits of Quaternary age are shown on the accompanying geologic map. Glacial deposits, including both moraine and outwash gravels, cover the lowland south of the river. Terrace gravels are shown covering the lowest terrace of the Little Susitna River. This terrace was traced more or less continuously along the north side of the river; south of the river it is not distinguishable east of the township line between Rs. 1 and 2W. Alluvial deposits are shown only on the flood plain of the Little Susitna River. Although no unconsolidated deposits are shown on the map in the area mapped as Tertiary rocks, the bedrock in this area is entirely covered, except on a few steep slopes and cut banks along the streams, by a mantle of variable thickness consisting of alluvium, glacial deposits, and soil.

Structure

Based on the rather scanty evidence of widely scattered outcrops, the dominant structure of the Tertiary rocks of the Little Susitna district appears to be a moderate to gentle southerly dip, modified by only slight folding. The steepest dips, of 30°- 35° S., were measured in the conglomerate at the mouth of the Little Susitna canyon and in coal-bearing rocks at locality 3 (see pl, 1). Horizontal beds were noted at two points in sec. 4, T. 18 N., R. 1 E. A gentle synclinal fold is visible in coal-bearing rocks in the west bank of the Little Susitna River on unsurveyed land just west of sec. 35, T. 19 N., R. 1 E. Coal beds at the Houston strip mine, at the west end of the district, dip about 4° NW. Elsewhere, with few exceptions, the observed dips are to the south or southeast at low angles.

Although no faults were observed in the coal-bearing rocks, this fact may be due more to the scarcity of outcrops than to a lack of faulting.

Coal

Character and distribution

The known occurrences of coal in the Little Susitna district are shown on the accompanying geologic map, which also shows the probable extent of the coal-bearing formation as inferred from outcrops and the presence of float in stream beds. Although coal was observed in place at only six widely scattered localities it is probable, in view of the general scarcity of outcrops and the more widespread occurrence of coal float, that coal beds are more numerous and extensive than the few exposures would seem to indicate. Additional field work, including subsurface exploration, will be required to determine more accurately the total number and extent of coal beds in the district.

The coal at all the outcrops appears to be of about the same general character. Each bed includes both bright and dull coal, and all the beds examined include one or more claystone partings or bony layers. The following analyses indicate that the coal of this district is subbituminous B in rank, according to current standards of classification. Samples D-51894 and D-51895 were collected by R. R. May and the writer in September 1950; sample D-92673 was collected by the writer in July 1952.

Analyses of coal from the Little Susitna district, Matanuska coal field, Alaska

Condition of sample: A, as received; B, air-dried; C, moisture-free; D, moisture- and ash-free.

/Analyses by U. S. Bureau of Mines, Pittsburgh, Pa./

Lab. No.	Location	Bed.	Condition	Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Heating value, Btu.
D-51894	Houston strip mine, 1,200 ft. northeast of old tunnel	Upper Houston	A	20.3	31.6	38.9	9.2	0.4	9,210
			B	13.7	34.2	42.1	10.0	.5	9,970
			C	----	39.6	48.9	11.5	.5	11,550
			D	----	44.8	55.2	----	.6	13,060
D-51895	-----do---------	Lower Houston	A	17.4	32.5	36.6	13.5	.4	9,160
			B	11.5	34.8	39.3	14.4	.5	9,820
			C	----	39.3	44.4	16.3	.5	11,090
			D	----	47.0	53.0	----	.6	13,250
D-92673	Outcrop at locality 4, near N.W. corner sec. 13, T.18 N., R.2 W. (unsurveyed)	Unnamed	A	14.1	31.3	34.1	20.5	.4	8,460
			C	----	36.4	39.8	23.8	.4	9,850
			D	----	47.8	52.2	----	.5	12,920

Description of Coal Localities

Locality 1, Houston strip mine.-- The Houston strip mine, at the western end of the district, is the only producing coal mine in the area. Strip mining is in progress on two thin beds that have a general dip of about 4°NW. The following section, measured in the strip pit in 1950, is representative:

Section in Houston strip mine, 1,200 ft. northeast of old tunnel

	Feet
Shale, gray, coaly at base	10+
Coal, dull glossy[1]	.8
Bone, with bright coal streaks	.6
Coal, bright[1]	1.0
Coaly shale	1.3
Coaly shale and bone	2.3
Coal[2]	1.0
Coaly shale[2]	.3
Coal, with clay slips[2]	.5
Bone	.2
Coaly shale.	

[1]Included in analysis D-51894
[2]Included in analysis D-51895

Diamond-drilling at Houston by the Bureau of Mines in 1952 revealed that the coal-bearing formation at this locality is at least 1,400 feet thick and includes several thin coal beds and coaly zones.

Locality 2, NW¼ sec. 16, T.18 N., R.2 W. (unsurveyed).-- At locality 2 the following section, including a thin coal zone, was measured in the east wall of the second tributary east of Bench Lake.

Section at locality 2

	Feet
Sandstone, coarse yellow-weathering, 2-ft concretionary zone at base	6+
Claystone, dark gray carbonaceous	.9
Sandstone, medium to coarse, iron-stained	1.5
Claystone, silty, dark gray carbonaceous	.9
Claystone, coaly, interbedded with coal	.6
Coal, clean brittle	.5
Claystone, light-gray massive	6+

Strike N. 55°E.; dip, 14°SE.

Locality 3, NE¼ sec. 15, T. 18 N., R.2 W. (unsurveyed).-- A 10-foot section of coal-bearing rocks was uncovered in the east wall of a small gully at locality 3 after its presence was revealed by abundant coal float in the creek bed. The following section was measured at this point:

Section at locality 3

	Feet
Claystone (slumped)	2+
Coaly wash	.5
Rusty weathered clay zone	.1
Claystone, coaly	1.0
Coal, platy	.7
Claystone, coaly, interbedded with bone	.6
Claystone, coaly	.5
Coal, upper part bright brittle, lower part dull platy	1.3
Claystone, coaly, and bone	.2
Coal, bright brittle	1.8
Claystone, coaly (lense)	.3
Coal, bright brittle	.7
Claystone, coaly	.3
Coal, slightly bony	.4
Coal, bright brittle	1.0
Sandstone, shaly.	

Strike, N. 70°E; dip, 32° SE.

Locality 4, NW¼ sec. 13, T. 18 N., R.2 W. (unsurveyed). -- The most promising coal bed seen in the district was found at locality 4. This bed is exposed continuously for about 100 feet in the west bank of one of the larger tributaries of the Little Susitna River. The total thickness of the bed is not known, as its base lies below creek level. The following section was measured at this locality:

Section at locality 4

	Feet
Claystone	1.5
Claystone, carbonaceous	.8
Coal	.1
Coal, interbedded with bone and coaly claystone	.8
Claystone, with coal lenses, grading downward into bone	.4
Coal, bright brittle[1]	4.3
Shale, coaly (lense)	.2
Coal, somewhat bony at base	.2
Claystone, coaly	.2
Coal, bright brittle	.2
Coal, bright, interlensing with coaly claystone	.7
Claystone, coaly, with numerous coal lenses	.6
Bone	.4
Coal, bright, tough	.8
(Base not exposed)	

[1]Included in analysis D-92673

Strike, N. 80°E.; dip, 6°S.

The coal at this point is about 70 feet below the general upland level into which the creek valley is incised. As this surface is nearly flat, the thickness of overburden should remain fairly uniform over a considerable area, and may even decrease northward, up the dip of the bed. The analysis of a sample from this bed given in the preceding table shows a rather high ash content. The writer believes that a sample taken farther

in from the outcrop would show a much smaller percentage of ash.

An unusually thick section of Tertiary rocks was exposed in the west wall of the same creek valley about a quarter of a mile farther downstream. The following section was measured at this point:

Section ½ mile downstream from locality 4

	Feet
Sandstone, medium, light-yellow	4+
Conglomerate, fine-pebble, sandy	1
Sandstone, medium, light-yellow	1
Conglomerate, fine-pebble, with sandstone lenses	5
Sandstone (largely covered)	20+
Coaly gouge and slump material	1.3
Coal, bright	.5
Claystone, coaly	1.2
Coal, dull, grading into bone	.5
Claystone, coaly, and bone	1.1
Coal, bright brittle	.2
Bone (base below creek level, not exposed)	1.2+

Strike, N. 40° - 60°E; dip, 12° SW.

Locality 5, S½ sec. 9, T. 18N., R. 1 W. -- Locality 5 is at the Stadler-Harris coal prospect, on a small tributary stream known locally as Coal Creek. The presance of coal on this creek has been known for many years, and short exploratory tunnels were driven on coal beds at locality 5 and near the mouth of the creek, but only a few tons of coal were ever produced. In 1952 Emil Stadler and James Harris built a truck road to locality 5 and began stripping on the south side of the creek in an attempt to uncover the coal bed that is exposed in the creek bottom and in the tunnel in the north wall of the creek valley. The following section was measured in the tunnel:

Section of coal bed in tunnel at locality 5

	Feet
Coal (top not exposed)	0.8+
Claystone, coaly	.8
Coal, with few bony streaks	2.7
Claystone, coaly	.3
Coal	.3
Claystone, coaly	

Strike, east; dip, 20°S.

A coal bed that apparently lies about 25 feet higher in the section than the one at locality 5 was uncovered in the east wall of Coal Creek about 100 yards farther downstream. The following section was measured at this point:

Section 100 yards downstream from locality 5

	Feet
Claystone, coaly, with numerous thin coal lenses	4+
Coal, bright friable	.4
Claystone, coaly	1.1
Coal, bright friable	.7
Iron-carbonate concretions	.6
Coal, bright friable	.2
Claystone, coaly, and bone	.3
Coal, platy, including a few thin bony lenses (lower 0.5 ft crushed and sheared)	3.1
Claystone, rusty yellow	

Strike, N. 85°E; dip, 10°S.

A coaly section including 4 feet of coal was measured in the creek bed about a quarter of a mile downstream from locality 5.

Section on Coal Creek ¼ mile below locality 5

	Feet
Claystone, brownish gray	0.2
Coal, shaly	.3
Bone and coaly claystone	.8
Coal, shaly, including several claystone lenses	.6
Coal, shaly	.1
Claystone, coaly	.1
Coal, bright	2.4
Coal, shaly, with several thin partings	
Claystone, coaly.	

Strike, N. 70° W.; dip, 13° SW.

The original discovery of coal on Coal Creek was made in 1917 by John Bartholf, who drove a short tunnel on a coal bed near the mouth of the creek and produced some coal for use at gold mines in the Willow Creek district. The following section was measured in the tunnel in 1950:

Section in tunnel near mouth of Coal Creek

	Feet
Coal, thin-bedded, and claystone, coaly	1.8
Bone and coal, interbedded	.7
Shale, carbonaceous, and iron carbonate nodules	.2
Coal, in part bony, including numerous large masses of coaly iron carbonate	4.6
Coal, blocky, with lenses of bone and coaly claystone. (base not exposed)	2.3+

Strike, N. 40°W.; dip, 10°SW

Locality 6, E½ sec. 34 (unsurveyed), T.19 N., R.1 E. -- The only known coal exposure near the eastern end of the Little Susitna district is at locality 6, in the west bank of the Little Susitna River. The following section was measured in 1952:

Section at locality 6

	Feet
Sandstone, medium, gray	4+
Coal, platy	1.5
Claystone, coaly	.2
Coal, platy	1.3
Claystone, coaly, lower part gougy	.8+

Strike, N. 45°E.; dip, 10°NW.

The base of the above section was at river level, so it was not possible to determine whether more coal is present below the gougy zone. A short distance upstream from this locality the Tertiary strata flatten and then rise gradually northward to form a gentle synclinal fold, but not far enough to reexpose the coal bed. The attitude of the coal and enclosing beds indicates that the coal may underlie at relatively shallow depth a low bench that extends westward from locality 6. Trenching or drilling is needed to determine whether the coal is minable by stripping.