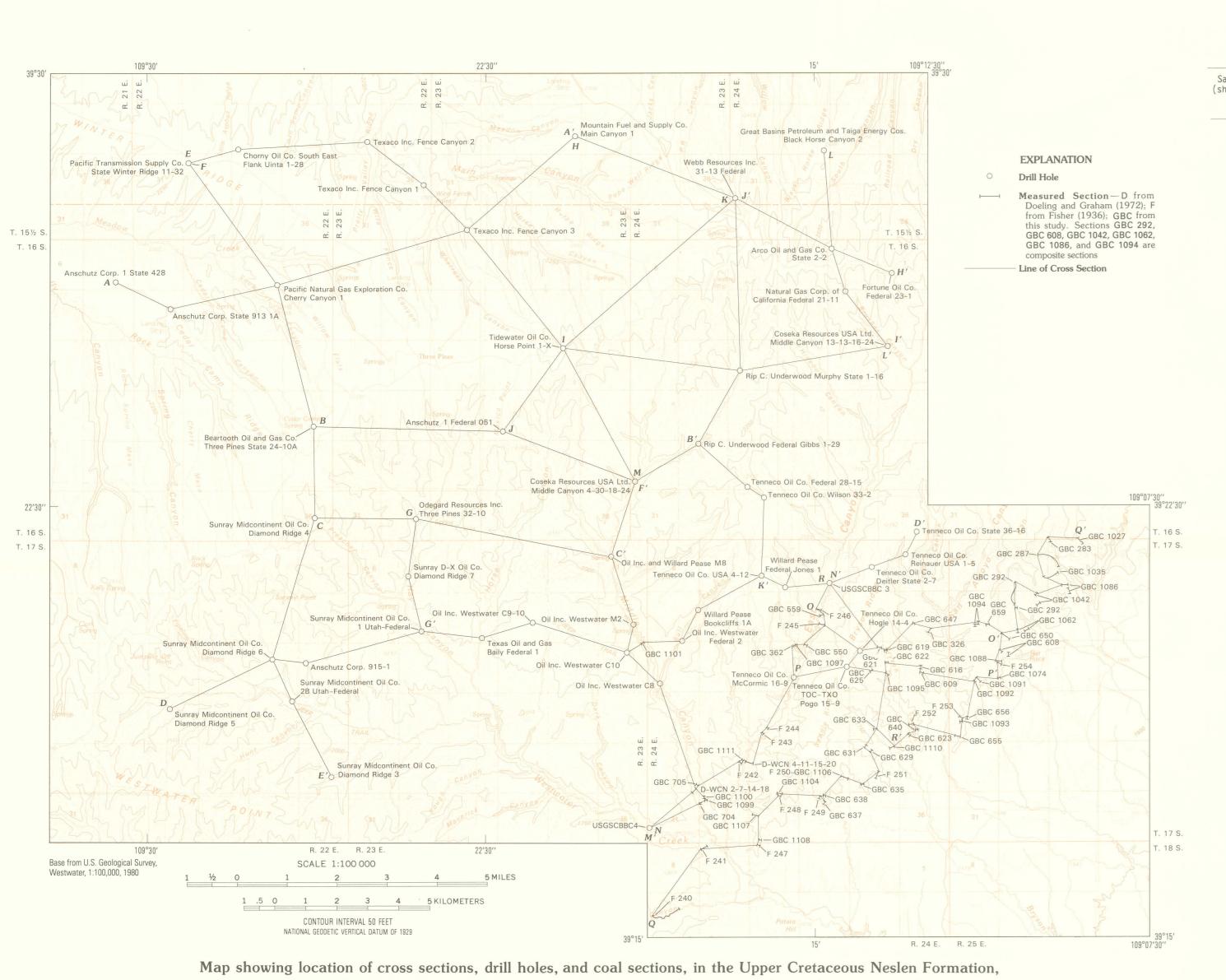


Map showing contact between the Sego Sandstone and Neslen formation, related faults, and outcrops of coal zones in the Neslen Formation, north-central part of the Westwater 30' × 60' quadrangle, Utah

CONTOUR INTERVAL 40 FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929



north-central part of the Westwater 30' × 60' quadrangle, Utah

DEPARTMENT OF THE INTERIOR

Table 1. Proximate and ultimate analyses, Btu/lb, moisture free, ash free Btu/lb, and apparent rank for selected coal samples from drill hole USGSCBBC 3 [Analyses for sample numbers 4, 5, and 14 by Geochemical Testing; all others by U.S. Department of Energy. As rec'd, as received; daf, dry, ash free; leaders (- --) indicate no datal Proximate analyses
Moisture Volatile Fixed Ash Thickness Analysis Carbon Hydrogen Nitrogen Oxygen Sulfur (calculated by Parr's (shown on N-N') (ft) (in.) (ft) (in.) (ft) (in.) third formula, 1928, matter carbon p. 7-23) 1 107 9.5 108 8.5 0 11 As rec'd 6.7 33.0 34.6 25.7 9,362 53.1 12,677 High-volatile C bituminous 37.2 27.5 10,030 56.9 4.5 51.3 --- 13,843 78.6 6.2 Moisture free --- 35.3 daf --- 48.7 45.1 10.8 11,578 65.0 48.9 11.8 12,559 70.5 High-volatile C bituminous 36.3 39.4 Moisture free ---44.6 (analyzed as one sample) High-volatile B bituminous 13,057 117 9 118 5 0 8 53.8 3.2 13,903 78.1 43.0 5.6 Moisture free ---44.4 55.6 High-volatile B bituminous 13,379 176 8.5 178 3.5 1 7 47.5 14.36 12,372 69.4 5.0 1.6 Moisture free ---44.5 55.5 --- 14,444 81.0 47.1 11.8 11,519 64.9 5.3 50.6 12.7 12,377 69.7 4.9 58.0 --- 14,170 79.9 5.6 High-volatile B bituminous 36.7 1.6 Moisture free ---High-volatile C bituminous 31.4 34.0 42.8 18.3 10,463 58.7 46.3 19.7 11,297 63.4 186 8.5 188 1 1 4.5 As rec'd 5.2 4.7 1.4 42.3 High-volatile B bituminous 13,029 188 1 189 5.5 1 4.5 As rec'd 7.1 32.6 43.1 17.2 10,657 60.1 35.1 46.4 18.5 11,471 64.7 43.1 56.9 --- 14,083 79.5 5.2 1.3 4.7 1.4 5.8 1.8 Moisture free ---32.0 34.8 43.1 16.9 10,587 60.5 46.8 18.4 11,507 65.7 12,862 High-volatile C bituminous 189 5.5 190 10 1 4.5 As rec'd 4.5 Moisture free ---42.6 54.4 --- 14,093 80.5 3.2 12,919 72.4 3.5 13,979 78.4 49.3 53.3 5.9 5.5 High-volatile B bituminous Moisture free ---High-volatile C bituminous 45.5 21.3 10,890 62.2 57.7 --- 13,840 79.1 4.6 Moisture free ---32.9 40.4 19.1 10,398 58.1 5.2 35.6 43.8 20.6 11,247 62.8 4.7 High-volatile B bituminous Moisture free ---44.9 196 10 197 6.5 0 8.5 As rec'd 6.6 As rec'd 6.6 38.6 Moisture free --- 41.3 47.8 7.0 12,481 69.6 51.2 7.5 13,360 74.5 5.9 5.6 High-volatile B bituminous 13,024 197 6.5 198 4.5 0 10 High-volatile B bituminous Moisture free --- 31.6 44.4 24.0 10,598 60.9 4.3 daf --- 41.6 58.4 --- 13,952 80.1 5.7 41.6 58.4 --- 13,952 80.1 52.0 6.4 12,466 70.9 55.6 6.8 13,332 75.8 13,319 High-volatile B bituminous 37.6 Moisture free ---253 3 253 6 0 3 As rec'd 6.8 36.3 41.6 15.3 11,118 61.7 254 2 254 3.25 0 1.25 Moisture free --- 39.0 44.6 16.4 11,933 66.2 High-volatile B bituminous 4.9 (analyzed as one sample) High-volatile B bituminous 253 6 254 2 0 8 As rec'd As rec'd 4.5 35.7 39.5 20.3 10,581 60.1 5.1 Moisture free --- 37.4 41.3 21.3 11,084 62.9 4.8 8.8 36.1 44.5 12.7 11,627 64.8 5.4 1.7 14.6 .9 38.7 47.7 13.6 12,458 69.5 4.9 1.8 9.3 1.0 370 4 370 11 0 7 As rec'd 13,346 High-volatile B bituminous 35.1 43.9 13.8 11,385 64.9 37.8 47.3 14.9 12,270 70.0 370 11 371 1.5 0 2.50 As rec'd 13,278 High-volatile B bituminous 4.3 1.8 8.2 Moisture free ---44.4 55.6 --- 14,417 82.2 High-volatile B bituminous 406 3.5 408 .5 1 9 As rec'd 51.2 12.7 12,608 70.1 58.7 --- 14,442 80.3 36.1 41.3 Moisture free ---High-volatile B bituminous Moisture free --- 39.0 53.8 7.2 13,441 74.6 --- 42.0 58.0 --- 14,481 80.4 408 8 410 1.25 1 5.25 As rec'd 5.9 30.1 37.1 26.9 9,657 53.6 4.8 1.3 11.8 1.4 Moisture free --- 32.0 39.4 28.6 10,265 57.0 4.5 1.4 7.0 1.5 daf --- 44.8 55.2 --- 14,381 79.9 6.2 2.0 9.8 2.0 High-volatile B bituminous

DISCUSSION

The Book Cliffs coal field extends diagonally across the Westwater $30' \times 60'$ quadrangle from the southwest to the northeast. The coal field is named for the Book Cliffs, a prominent, generally southward-facing escarpment that is underlain by Cretaceous and Tertiary rocks. The study area covered by this report is the north-central part of the Westwater $30' \times 60'$ quadrangle and includes all of the Bryson Canyon, Cedar Camp Canyon, Dry Canyon, and P R Spring 7 1/2-minute quadrangles, part of the Preacher Canyon and San Arroyo Ridge 7 1/2-minute quadrangles, and part of the Tenmile Canyon 15-minute quadrangle.

STRATIGRAPHY OF COAL-BEARING ROCKS AND ADJACENT STRATA

Most coal in the north-central part of the Westwater 30′ × 60′ quadrangle occurs in the Upper Cretaceous Neslen Formation; only a few coal beds occur in the formations adjacent to the Neslen. According to H.W. Roehler (oral commun., 1980), the Neslen and the underlying and overlying formations constitute an example of near-classical strand-plain sedimentation. In ascending order the formations and the depositional environments are the following: the Sego Sandstone, lower, middle, and upper strand-plain environment; the Neslen Formation, swamp and stream environment; the Farrer Formation, coastal-plain environment; and the Tuscher Formation, alluvial-plain environment. All of these formations were defined by Fisher (1936, p. 15–20) and the stratigraphic nomenclature in the study area is shown on figure 1.

UTAH	COLORADO
TUSCHER FORMATION	HUNTER CANYON FORMATION
FARRAR FORMATION	UPPER PART OF THE MOUNT GARFIELD FORMATION
NESLEN FORMATION SULPHUR CANYON SANDSTONE MEMBER	LOWER PART OF THE MOUNT GARFIELD FORMATION
SEGO SANDS	STONE
ANCHOR MINE TONGUE OF	THE MANCOS SHALE
SEGO SANDS	STONE

Figure 1. Diagram showing part of the Upper Cretaceous stratigraphic nomenclature used in the north-central and northeastern parts of the

Westwater $30' \times 60'$ quadrangle, Colorado and Utah.

The Sego Sandstone is composed of several persistent littoral sandstone tongues which are interstratified with silty-sandy shale. In the study area, the sandstone tongues commonly crop out as two distinct cliffs and the Anchor Mine Tongue of the Mancos Shale occurs between the two sandstone tongues but is not a distinct unit. The Sego Sandstone is crossbedded or cross laminated and is composed of very fine to medium-grained quartz, minor kaolinized feldspar, and very sparse opaque mineral grains. The sandstone ranges in color from brown or brownish gray to very light gray. Sparse coal in thin, nonpersistent beds occurs locally in the Sego. The Sego Sandstone is gradational with the underlying Buck Tongue of the Mancos Shale; the thickness of the gradational zone differs from place to place. The thickness of the Sego Sandstone is about

200 ft (61 m) in the study area.

The Neslen Formation is composed of shale, silty-sandy shale, siltstone, and sandstone. The shale is mostly carbonaceous; only a minor amount of it is greenish gray and noncarbonaceous. Although coal beds occur throughout the formation, they are more numerous and thicker in the upper middle and lower upper parts. Sandstone constitutes slightly more than half of the stratigraphic thickness of the Neslen Formation; the proportion of sandstone to finer clastic rocks differs from place to place. Most of the sandstone is very fine grained, commonly cross laminated, and brown to very light gray. In outcrop, the sandstone bodies range from pod-shaped lenticular to blanket lenticular. The pod-shaped lenticular bodies have small ratios of outcrop length to thickness (10:1 to 30:1) and appear to be channel scour-and-fill deposits. The blanket-lenticular bodies, in contrast, have high ratios of outcrop length to thickness (100:1 or greater) and are considered to be products of low-energy fluvial deposition. The Sulphur Canyon Sandstone Member of the Neslen Formation (Fisher, 1936, p. 18) is unique in that it forms a persistent outcrop throughout the study area and is continuous many miles to the southwest. It is a clean, very light gray quartzose sandstone that may be reworked sandy sediment deposited in a bay-shore environment (H.W. Roehler, oral commun., 1980). The contact of the Neslen with the underlying Sego Sandstone appears generally distinct; however, in some places the exact contact could not be located closer than 10-20 ft (3-6 m). The thickness of the Neslen Formation is roughly 300-400 ft (91-122 m); the top is placed where dominantly carbonaceous shale grades into

dominantly green shale.

The Farrer Formation overlies the Neslen and in turn is overlain by the Tuscher Formation. Rocks of the Farrer and Tuscher were deposited in dominantly fluvial environments as is evidenced by the occurrence of more numerous, coarser-grained, and thicker sandstone units than those in the Neslen. The thickness of the sandstone units increases progressively upward through the Farrer and into the Tuscher where they may be as much as 100 ft (30 m) thick. Almost all of the shale in both formations is grayish green and noncarbonaceous in contrast to the dominantly carbonaceous character of shale in the Neslen Formation. Although thin nonpersistent coal beds are reported in the Farrer Formation, none are known to occur in the study area. Because the contact between the Neslen and the Farrer is gradational, there is some question to which formation the highest coals mapped in this study belong.

METHODS OF INVESTIGATION AND CORRELATION

Cross sections A-A' through R-R' showing coal zone correlations are plotted on the location map as are the location and numbers of measured coal sections and drill holes. Most cross sections are aligned roughly north-south or east-west with intersecting points. Cross section Q-Q' roughly follows the escarpment in which the Neslen Formation is exposed.

The correlation of the coal zones is primarily based on position of coal beds above the top of the Sego Sandstone and above or below the Sulphur Canyon Sandstone Member of the Neslen Formation although it is somewhat arbitrary because the top of the Sego Sandstone is not so distinct that it consistently constitutes the same horizon from section to section. Correlation is also based on the character of the coal beds thickness, number, and grouping; for example, in

of this work.

A diligent search was made for all coal occurrences in the measured sections by close examination including digging trenches where necessary. Most of the measured sections extend no higher than the highest coal occurrence although the strata above the highest coal occurrence were examined to verify that the occurrence was the highest.

Several coal sections that are shown in the cross sections were not measured to datum as

the case of the Chesterfield coal zone, the Sulphur Canyon Sandstone Member that closely underlies

the zone serves as an excellent marker. Miscorrelation may result from errors inherent in the use of either hand level or altimeter, the methods used to measure coal sections in the course

part of this study or part of Fisher's (1936) study. Most of these sections were correlated using the top of the Sulphur Canyon Sandstone Member of the Neslen Formation as datum.

The position of the top of the Sulphur Canyon relative to the top of the Sego Sandstone was derived from the nearest completely measured section or drill hole. Correlation of some adjacent measured sections was made using a distinctive sandstone unit other than the Sulphur Canyon or coal beds that could be traced from section to section. On the basis of new data, coal zone correlations made by previous workers were revised in this report.

Subsurface information is from holes drilled to obtain coal quality data (USGSCBBC 3 and USGSCBBC 4) as well as from holes drilled to test for natural gas (identified by name on cross sections A-A' through M-M', and O-O' and P-P'). Although the natural gas drill holes were drilled deeper than the Sego Sandstone, only data to the top or the upper part of the Sego are

Several different kinds of geophysical logs were run in the natural gas drill holes, including density, gamma ray, laterolog, neutron, spontaneous potential, and resistivity. The geophysical logs are only marginally useful for distinguishing coal and are subject to misinterpretation. The coal beds interpreted from geophysical logs are generally thicker than those in adjacent measured sections, and partings of sandstone, shale, siltstone, and tonstein, or the occurrence of impure coal, common in or associated with coal beds in measured and described sections, are not differentiated.

COAL ZONES AND COAL BEDS

Four coal zones are identified in the north-central part of the study area. In ascending order the coal zones are the lower, Ballard, Chesterfield, and Carbonera.

Lower is an informal name given to a zone of coal beds extending from the top of the Sego Sandstone to about 50 ft (15 m) above it. The zone contains 1-8 coal beds ranging in thickness from 1 in. to 4 ft (2.5-120 cm). The lower zone is persistent throughout most of the study area except in the west and northwest where it cannot be identified in drill holes. The zone includes the Palisade zone as used by Fisher (1936, p. 9) in this area, but the name Palisade is not used here because Young (1955, p. 190) observed that the zone is not correlative with the Palisade

in type area near Palisade, Colo. The Ballard coal zone (Fisher, 1936, p. 18-19) in the study area consists of 1-3 coal beds ranging in thickness from 1 1/2 in. to 4 ft (4-120 cm). The thickness of the zone ranges from 3 in. to about 27 ft (8 cm to 8 m). The base of the zone ranges from about 113 ft to about 207 ft (34-63 m) above the top of the Sego Sandstone. The Ballard is generally present throughout the eastern part of the study area and is only locally present in the western part. The Ballard coal zone was defined by Fisher (1936, p. 13-14) as occurring directly or a short distance beneath and approximately coextensive with the Thompson Canyon Sandstone Member of the Neslen Formation. If Fisher's definition is strictly adhered to, the eastward extent of the Ballard coal zone would be limited to about where long 109°25′ W. intersects the lower Book Cliffs or near the pinchout of the Thompson Canyon Sandstone Member. Doelling (1972) subsequently extended the Ballard coal zone eastward to near the Utah-Colorado border. In this report, the Thompson Canyon Sandstone and Sulphur Canyon Sandstone Members are considered to be genetically related; the similarity of their respective lithologies, their persistent character, and their occurrence at about the same stratigraphic position in the Neslen Formation strongly suggests this. The two members are viewed as being part of a once continuous deposit that was later bisected by erosion that sculpted the Book Cliffs. The gap between the outcrop of the sandstones (between long 109°20'30" W. and 109°25' W.) is about 5 mi (8 km). The coal zone beneath the Sulphur Canyon Sandstone Member is therefore correlated with the Ballard coal zone west of long 109°25′ W. It should be noted, however, that whereas the Ballard west of long 109°25′ W. occurs directly or a short distance beneath the Thompson Canyon Sandstone Member, in the study area it occurs 30-50 ft (9-15 m) below the Sulphur Canyon Sandstone Member. The Chesterfield coal zone (Fisher, 1936, p. 19) consists of 1-5 coal beds ranging in thickness from 2 in. to 7 ft (5-210 cm). The thickness of the zone ranges from 1 ft to as much as 36 ft (0.3-11 m). The base of the zone ranges from 182 ft to 291 ft (56-89 m) above the top of the Sego Sandstone and usually occurs just above the top of the Sulphur Canyon Sandstone Member which in most places serves as an excellent marker for the zone. The Chesterfield coal zone, however, is distinguishable by the number, thickness, and grouping of the coal beds that constitute it and although the Sulphur Canyon Sandstone Member is a handy marker, it need not be referred to. The Chesterfield coal zone is generally present in the southeastern part of the study area and occurs only locally in the northern and western parts. The Carbonera coal zone (Erdmann, 1934, p. 86) consists of 1-3 coal beds ranging in thickness from 3 in. to about 6 ft (7.5-180 cm). The thickness of the zone ranges from 3 in.

thickness from 3 in. to about 6 ft (7.5-180 cm). The thickness of the zone ranges from 3 in. to as much as 15 ft (8 cm to 4.5 m). The base of the zone ranges from about 240 ft to about 325 ft (73-99 m) above the top of the Sego Sandstone and from 25 ft to about 60 ft (7.5-18 m) above the top of the Chesterfield coal zone. Coal beds are assigned to the Carbonera zone largely on the basis of their stratigraphic position relative to the Chesterfield coal zone. The Carbonera coal zone is the least persistent of the four coal zones and only occurs locally in the study area.

In addition to the coal beds included in designated zones, other coal beds occur above, below, and between these four zones. The other beds, with few exceptions, are so discontinuous that

they are not regarded as zones.

Coal beds in the western and northwestern parts of the study area occur much more randomly than those in the southeastern part and appear to have formed in a different depositional environment. The general aspect of the coal beds in the western and northwestern parts of the study area is similar to that of the coal beds in the Mesaverde Formation described on the northern flank of the Uinta Basin (Doelling and Graham, 1972, p. 31-36).

COAL RESOURCES

The U.S. Geological Survey normally generates coal resource calculations using the computer-based National Coal Resources Data System (NCRDS). The system can effectively compute coal resources of individual, noncomplex, persistent coal beds; however, due to the highly lenticular nature of the coal beds in the study area, their general thinness, and the abundance of interbed-ded noncoal materials, resource estimates were not calculated using NCRDS. Data on coal beds as well as strata above, between, and below coal beds examined in measured sections and drill holes as part of this study were entered into the NCRDS.

Fisher (1936, p. 94, 97) indicated that the Book Cliffs coal field east of R. 22 E. or about long 109°32′W. contains no minable coal, a visual judgement of what he regarded as poor quality coal. However, the analyses of 29 coal samples from drill holes USGSCBBC 3 and USGSCBBC 4 show that only three of the samples have an ash content greater than 25 weight percent on a moisture free basis, and one greater than 33 weight percent (tables 1, 3). Coal has not been mined commercially in the study area. Most of the surface and mineral rights are federally owned, although some are state owned and few are privately owned.

COAL ANALYSES

Analyses of coal samples from drill holes USGSCBBC 3 and USGSCBBC 4 are presented in tables 1-5. Analytical data are keyed by number to coal sections derived from these drill holes; the coal sections and numbers are shown on cross section N-N'.

Coal rank is high-volatile B and high-volatile C bituminous and increases irregularly with depth. It is assumed that coal rank increases with increasing depth northward into the Uinta Basin. Sulfur content averages about 0.7 percent and ash, on a moisture free basis, averages about 15 percent. The analytical data are probably a general reflection of coal quality in the study area. Coal and impure coal indicated in coal sections were visually determined. Identification of impure coal is probably correct; however, some cored coal described as coal is actually impure coal on the basis of analytical data.

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Table 2. Methane gas emmission analyses for selected coal intervals in drill hole USGSCBBC 3 [Analyses by Utah Geological and Mineral Survey]

Sample number	From		То		Thickness		Period of	Lost	Desorbed	Residual	Sample	cm^3/g	ft^3 in	Predicted
(shown on $\underline{N}-\underline{N}^{T}$)	(ft)	(in.)	(ft)	(in.)	(ft)	(in.)	desorption (days)	gas (cm ³)	gas (cm ³)	gas (cm ³)	mass (g)		place	emission (ft ³ /ton/da
1	107	9.5	108	8.5	0	11	17	0	0	30	1,701.0	0.02	0.7	4.2
3	117	9	118	5	0	8	17	0	26	0	1,077.3	.02	.8	4.6
9	190	10	191	8.5	0	10.5	16	0	2	20	1,474.2	.02	.5	3.2
12	196	10	197	6.5	0	8.5	16	0	0	0	1,169.4	.00	.0	.0
16	253	6	254	2	0	8	15	31	141	150	1,183.6	.31	9.8	58.6
17	370	4	370	11	0	7	14	0	0	150	1,034.8	.16	5.1	30.3
20	408	.5	408	8	0	7.5	14	0	0	0	1,119.8	.0	.0	.0

Table 3. Proximate and ultimate analyses, Btu/lb, moisture free, ash free Btu/lb, and apparent rank for selected coal samples from drill hole USGSCBBC 4

[Analyses for sample nos. 1, 3, and 4 by U.S. Department of Energy; sample nos. 2, 5-7 by Geochemical Testing: sample no. 8 by Commercial Testing and

Sample number	From		To		Thickness		Analysis	Proximate analyses				Btu/1b
(shown on $N-N'$)	(ft)	(in.)	(ft)	(in.)		(in.)	basis	Moisture	Volatile matter	Fixed carbon	Ash	
1	193	2.5	193	8.5	0	6	As rec'd Moisture free daf	4.7	33.0 34.6 47.7	36.2 38.0 52.3	26.1 27.4	9,760 10,241 14,112
2	233 235 238 (anal	11 11 9 yzed as	234 238 239 one sa	7 1.5 11.5 ample)	0 2 1	8 2.5 2.5	As rec'd Moisture free daf	4.5	35.2 36.8 44.1	44.6 46.7 55.9	15.68 16.43	11,272 11,804 14,124
3	238	1.5	238	9	0	7.5	As rec'd Moisture free daf	5.6	42.0 44.4 47.5	46.2 49.1 52.5	6.2	12,738 13,494 14,434
4	277	9	278	6	0	9	As rec'd Moisture free daf	5.9	39.0 41.5 42.7	52.4 55.7 57.3	2.6	13,236 14,073 14,473
5	344	0	345	11.5	1	11.5	As rec'd Moisture free daf	4.1	37.1 38.6 44.3	46.5 48.5 55.7	12.3 12.8	12,012 12,525 14,370
6	362 363 (anal	2 2 yzed as	362 364 one sa	10 3 umple)	0 1	8	As rec'd Moisture free daf	5.3	35.7 37.7 40.3	52.9 55.8 59.7	6.1 6.4	12,791 13,512 14,438
7	403	6.5	405	1	1	6.5	As rec'd Moisture free daf	4.7	26.1 27.4 43.4	34.0 35.7 56.6	35.2 37.0	8,507 8,927 14,159
8	430 431 431 (anal	1.25 1.25 11.75 yzed as	430 431 432	5.25 5.25 2.50	0 0 0	4 4 2.75	As rec'd Moisture free daf	6.8	35.9 38.5	45.4 48.7	12.0 12.9	11,847 12,707

				Table 3.	Continue	ed			
Sample number		Ultin	mate analys	es	Moist ash free	Apparent rank			
(shown on <u>N-N</u> ')	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	Btu/lb (calculated by Parr's third formula, 1928, p. 7-23)			
1	54.3 57.0 78.5	4.7 4.4 6.0	1.3 1.3 1.8	12.9 9.2 12.6	0.7 .7 1.0	13,470	High-volatile B bituminous		
2	63.9 66.9 80.0	5.0 4.7 5.6	1.4 1.4 1.7	13.3 9.7 11.6	.8 .8 1.0	13,451	High-volatile B bituminou		
3	72.1 76.4 81.7	5.8 5.4 5.8	1.8 1.9 2.0	13.7 9.2 9.9	.5 .5	13,569	High-volatile B bituminou		
4	71.1 75.6 77.8	5.9 5.6 5.8	1.8 1.9 2.0	18.0 13.5 13.9	.6 .6	13,542	High-volatile B bituminous		
5	66.9 69.7 80.0	5.3 5.1 5.8	1.5 1.6 1.8	13.5 10.3 11.8	.5 .5	13,781	High-volatile B bituminous		
6	72.2 76.3 81.5	5.4 5.0 5.4	1.6 1.7 1.8	14.2 10.0 10.6	.6 .6	13,615	High-volatile B bituminous		
7	47.5 49.8 79.1	4.0 3.6 5.7	1.2 1.3 2.0	11.6 7.8 12.4	.5 .5	13,629	High-volatile B bituminous		
8	66.3	4.6	1.6	8.1	.5	13,527	High-volatile B bituminous		

Table 4. Methane gas emission analyses for selected coal samples from drill hole USGSCBBC 4
[Analyses by Utah Geological and Mineral Survey]

71.1 5.0 1.8 8.7 .6

Sample number From To Thickness Period of Lost Desorbed Residual Sample cm $^3/g$ ft 3 in Predicted (shown on N-N') (ft) (in.) (ft) (in.) (ft) (in.) desorption gas gas gas mass place emission (days) (cm 3) (cm 3) (g) (ft 3 /ton/day 193 2.5 193 8.5 0 6 7 0 765 155 1,275.7 0.80 25.6 153.6 3 238 1.5 238 9 0 7.5 6 0 1,567 500 1,516.7 1.4 45.8 274.6

Table 5. Apparent specific gravity and Hardgrove Grindability Index for selected samples from drill hole USGSCBBC 4

[Analyses by Camp Dresser and McKee, Inc. Leaders (---) indicate no data]

Sample number (shown on $N-N$)		om (in.)		(in.)		kness (in.)	Analysis basis	Percent moisture	Apparent specific gravity	Hardgrove Grindability Index
9	361	9	362	2	0	5	As received Equilibrium moisture basis Air-dried basis	15.10 9.56 4.44	1.29 1.29 1.29	 48
10	362	10	363	2	0	4	As received Equilibrium moisture basis Air-dried basis	18.14 8.54 2.58	1.27 1.26 1.24	38
11	431	5.25	431	11.75	0	6.5	As received Equilibrium moisture basis Air-dried basis	5.83 6.4 3.35	1.35 1.32 1.29	 47