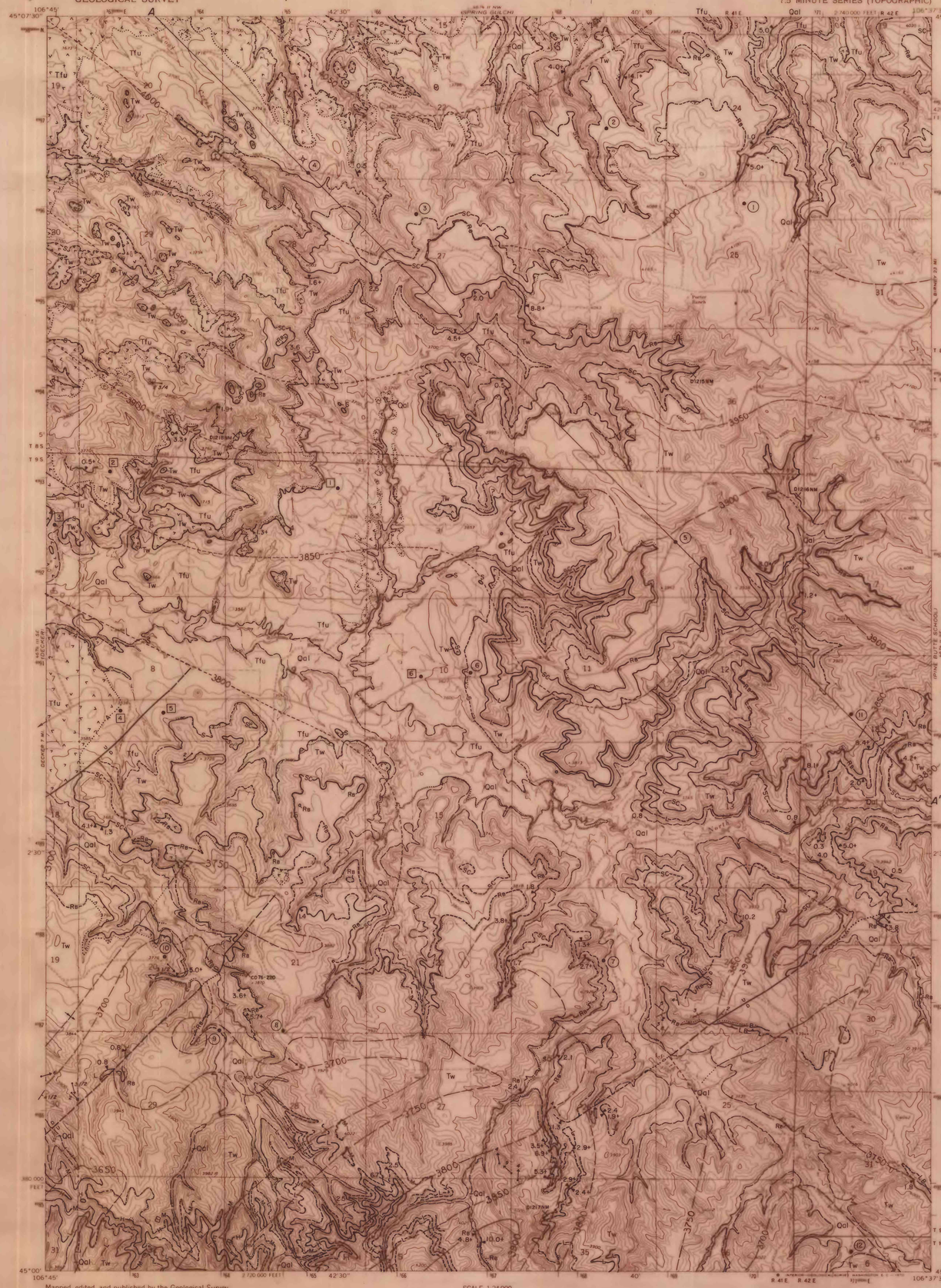
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HOLMES RANCH QUADRANGLE
MONTANA-BIG HORN CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1966. Field checked 1967

Polyconic projection. 1927 North American datum
10,000-foot grid based on Montana coordinate system, south zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Fine red dashed lines indicate selected fence lines

SCALE 1:24000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Geology mapped in 1975

ROAD CLASSIFICATION

Light duty road, all weather — Unimproved road, fair or dry weather

MONTANA
QUADRANGLE LOCATION

HOLMES RANCH, MONT.
N4500—W10637.5/7.5

PRELIMINARY GEOLOGIC MAP AND COAL RESOURCES OF THE HOLMES RANCH QUADRANGLE, BIG HORN COUNTY, MONTANA

By
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1980

OPEN-FILE REPORT

This report has not been edited for conformity with Geological Survey editorial standards or stratigraphic nomenclature

CORRELATION OF MAP UNITS

Qal	Holocene	QUATERNARY
Unconformity		
Tw	Eocene	TERTIARY
Tfu	Paleocene	TERTIARY

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Valley fill consisting mostly of unconsolidated sand, silt, and clay

Tw WASATCH FORMATION (EOCENE)--Interbedded claystone, shale, siltstone, sandstone, and coal. Numerous thin coal beds and carbonaceous shale beds occur in upper half of formation. Petrified logs and stumps (often in place) are common in upper half; wood fragments occur throughout formation. A fairly extensive fossil bed consisting of well-preserved gastropods and pelecypods occurs in lower half, 40-70 feet (12.2-21.3m) above the Roland (Baker) coal bed (see Coal Index on sheet 2). Thin lenticular gastropod and pelecypod beds are scattered throughout formation. Baked and fused rock (clinker) is rare in upper half of formation but common near base of formation along the Roland (Baker) coal bed. Maximum exposed thickness is about 700 feet (213m)

Tfu FORT UNION FORMATION (PALEOCENE)--Interbedded claystone, shale, siltstone, sandstone, and coal. Sandstone is more common than in Wasatch Formation; shale less common. Several thick coal beds are present in the subsurface, but are usually represented by widespread baked and fused rock (clinker) at the surface. Coal beds are usually exposed only in relatively fresh cuts along streams. The top of the Smith coal bed is the top of the Fort Union Formation. Exposed thickness is approximately 250 feet (76m)

SC 4.2 ..... COAL BED--Drawn on base of coal bed or zone. Dashed where approximately located; short dashed where indefinite; dotted where concealed by alluvium; queried where location and extent of bed are unknown. Thickness of coal, in feet,[1] measured at triangle; calculated by method of Smith and others (1913, p. 72-73), and Bass and others (1970, p. 6). Letters denote specific coal beds as follows:

B--Badger	SC--Squirrel Creek
LB--Local below Badger	S--Smith
H--Holmes	A1, A2--Anderson
M--Munson	L--Locals
RB--Roland of Baker	D1--Dietz 1

BAKED AND FUSED ROCK--Trace of burned coal bed; dashed where approximately located; dotted boundary indicates inferred extent of burn; letter identifies coal bed

CONTACT--Approximately located

FAULT--Dashed where approximately located; dotted where concealed. U, upthrown side; D, downthrown side

MONOCLINE--Showing trace of axis. Dashed where approximately located; dotted where concealed

BEDDING
Strike and dip of beds
Component of dip. Dot marks point of observation

3750 STRUCTURE CONTOURS--Drawn on base of Roland (Baker) coal bed or clinker; long dashed where approximately located; short dashed where projected above land surface. Contour interval 50 ft (15.2 m). Datum is mean sea level

DRILL HOLES--Index numbers refer to coal sections shown on sheet 2
Coal test hole drilled by U.S. Geological Survey-Montana Bureau of Mines and Geology
Coal test hole drilled by Decker Coal Company
Abandoned oil and gas test hole

CO76-220, D1218NM USGS FOSSIL LOCALITIES

[1] To convert feet to meters, multiply by 0.3048

REFERENCES

Bass, N.W., Smith, H.L., and Horn, G.H., 1970, Standards for the classification of the public coal lands: U.S. Geol. Survey Circ. 633, 10p.

Smith, G.O., and others, 1913, The classification of the public lands: U.S. Geol. Survey Bull. 537, 197p.

Introduction

In 1975, the Holmes Ranch quadrangle was mapped as part of the U.S. Geological Survey's program of classifying and evaluating the coal resources of the Powder River basin.

Previous geologic work in the area includes mapping in parts of Big Horn and Rosebud Counties, Montana (Baker, 1929), and a study of strippable coal resources of southeastern Montana by the Montana Bureau of Mines and Geology (Matson and Blumer, 1973).

Subsurface information was obtained from the 1973 Montana Bureau of Mines and Geology publication (Matson and Blumer), and from test holes drilled under a U.S. Geological Survey grant (U.S. Geological Survey and Montana Bureau of Mines and Geology, (1976 and 1977). Mr. Tom Wollenzien of Peter Kiewit Sons' Company (Decker Coal Company) was helpful in providing company test-hole data.

Stratigraphy

Rocks exposed in the Holmes Ranch quadrangle are the Tongue River Member of the Fort Union Formation (Paleocene) and the Wasatch Formation (Eocene). The top of the Smith coal bed has been designated as the contact between the two formations in this area.

Holocene alluvial and colluvial materials fill the major stream valleys.

Fort Union Formation

Approximately 250 ft (76 m) of the upper part of the Tongue River Member of the Fort Union Formation is exposed in the Holmes Ranch quadrangle. The Tongue River is approximately 1,800 ft (549 m) thick in this area and contains most of the economically significant coal. It consists of interbedded sandstone, siltstone, sandy shale, shale, carbonaceous shale, and coal. The rocks are typically poorly consolidated and the resulting outcrops are badly weathered and poorly exposed. Scattered resistant sandstone and siltstone beds can be traced locally on the surface.

Subsurface information on the upper part of the Tongue River Member was published by Matson and Blumer (1973) and the U.S. Geological Survey and Montana Bureau of Mines and Geology (1976 and 1977). Subsurface information on the lower part of the Tongue River, as well as on the underlying Lebo and Tullock Members of the Fort Union, was obtained from logs of the one oil and gas test located within the quadrangle and from logs of oil and gas tests in adjoining quadrangles.

Wasatch Formation

Approximately 700 ft (213 m) of interbedded sandstone, siltstone, shale, carbonaceous shale, and coal represent the Wasatch Formation in the Holmes Ranch quadrangle.

A thin, consistent, well-consolidated coquina bed was found in the lower half of the formation, 40 to 70 ft (12.2 to 21.3 m) above the Roland coal bed of Baker. It consists principally of gastropod shells, with some pelecypod shells. Other coquina zones of limited extent were also found higher up in the section. At one locality crocodile scutes were found weathered out at the surface (G. E. Lewis, written commun., 1976).

Silicified wood fragments are very common in the Wasatch Formation, particularly in the carbonaceous shale and coal intervals. Entire silicified logs and upright tree-stumps were found in several locations.

Subsurface information on the lowermost Wasatch Formation was presented by Matson and Blumer (1973) and the U.S. Geological Survey and Montana Bureau of Mines and Geology (1976 and 1977).

Structure

Northeast-trending subparallel folding and faulting occur in the southern part of the Holmes Ranch quadrangle. The two faults and the fold mapped in the southwestern part are continuations of faults mapped in the Decker quadrangle where they are described as high-angle normal faults (Law and Grazis, 1976). The northern fault and the monocline are downthrown on the south. The southern fault is downthrown on the north. Relative displacements of these structures are unknown in the Holmes Ranch quadrangle, but probably range from 5 to 70 ft (1.5 to 21.3 m).

Faulting and folding are also expcsed on a northwest-trending ridge in the southeastern part of the quadrangle. Principal movement in this area was along a fault normal to the strike of the ridge. Rocks on the southeast side are downthrown, with estimated relative displacements of as much as 300 ft (91.4 m). A small, similarly trending fault exhibiting similar movement, but on a much smaller scale, was mapped just north of the major fault. A monoclinal flexure, downthrown to the north, parallels the faults on the southeast. Evidence of the lateral extent of the major fault is masked by alluvial materials and covered slopes, particularly southwest of the ridge.

There are no major structures elsewhere in the quadrangle. Small-scale variations in surface elevation of some of the beds are probably due to collapse of the sediments above burning coal beds and/or surface slumping. Regional dip is to the south.

Economic Geology

Coal is the most important resource in the Holmes Ranch quadrangle at this time. Of potential importance are oil and gas and sand and gravel.

Coal.--Coal beds of economic thickness occur mainly in the Tongue River Member of the Fort Union Formation. Thin coal beds have been identified in the Lebo Shale and Tullock Members of the Fort Union but there are insufficient data to establish the presence or absence of these members in this quadrangle. Several of the Wasatch Formation coal beds are extensive enough to be of possible economic importance, but most are thin and discontinuous.

As-received analyses of samples from six holes in and around the quadrangle are shown in table 1. Ranks of the coal determined from calculated moist, mineral-matter-free Btu values, range from lignite A to subbituminous A.

Demonstrated and inferred coal resources are shown in table 2 for the Roland of Baker, Smith, Anderson, Dietz 1 and Dietz 2 coal beds. Coal beds below the Dietz 2, mainly the Canyon, Cook, and Wall coal beds of Baker, were not considered in this report because a complete subsurface section of the interval is not available. In this general area these beds have tentatively been correlated with the Monarch, Carney, and "A" coal beds of Taff (1909), respectively.

The Dietz 2 coal bed underlies the entire quadrangle; subsurface data from one coal test-hole indicated that its two beds total 13 ft (3.9 m) in thickness.

The Dietz 1 coal bed underlies 99 percent of the quadrangle. It crops out in one stream valley along the northern boundary of the quadrangle and is burned in this outcrop. It ranges in thickness from 10 to 16 ft (3 to 4.9 m) in test-hole locations.

The Anderson coal bed underlies approximately 90 percent of the quadrangle. It crops out in the northwestern quarter and is typically extensively burned. At one outcrop, the thickness was 15.8 ft (4.8 m). In the subsurface, the thickness varied from 17 to 26 ft (5.2 to 7.9 m).

There is surface and subsurface evidence that the Anderson is split in parts of the northwestern quarter of the quadrangle. According to subsurface data, the split lies from 5 to 90 ft (1.5 to 27.4 m) below the main bed, and varies in thickness from 4 to 17 ft (1.2 to 5.2 m) where it is present.

The Smith coal bed lies from 150 to 200 ft (45.7 to 61.0 m) above the Anderson, and underlies approximately 75 percent of the quadrangle. It varies in thickness from 3.3 to 14.1 ft (1.0 to 4.3 m) of exposed coal at the surface and from 12 to 16 ft (3.7 to 4.9 m) in the subsurface. It is commonly burned in outcrop, particularly in the northeastern corner of the quadrangle.

The Squirrel Creek coal bed (Law and Grazis, 1972) occurs locally, approximately 80-120 ft (24.4-36.6 m) above the Smith bed. It underlies 70 percent of the quadrangle, and is 0 to 4.1 ft (0 to 1.2 m) thick in outcrop and 0 to 5 ft (0 to 1.5 m) thick in the subsurface.

The Roland coal bed of Baker is the most consistent coal bed in the Wasatch Formation in this area. It underlies approximately 50 percent of the quadrangle, and ranges in thickness from 2.4 to 10.1 ft (0.7 to 3.1 m) in outcrop and from 7 to 11 ft (2.1 to 3.4 m) in the subsurface.

The uppermost coal beds (Badger, Holmes, Munson, and local beds) in the Wasatch Formation were not considered in this report because they occur only in very small areas.

Oil and gas.--One unsuccessful oil and gas test has been drilled within the Holmes Ranch quadrangle and additional unsuccessful tests have been drilled in adjoining quadrangles. Despite the limited potential for oil and gas development, exploration will probably continue, and oil and gas may yet prove to be an economic resource in the area.

Sand and gravel.--Sand and gravel deposits are present in the alluvial valleys and are of potential, if small, economic importance. Clinker from burned coal outcrops is used as road-surface material.

References

Baker, A. A., 1929, The northward extension of the Sheridan coal field, Big Horn and Rosebud Counties, Montana: U.S. Geol. Survey Bull. 806-B, pt. 2, p. 15-67.

Law, B. E., and Grazis, S.L., 1972, Geologic map and coal resources of the Decker quadrangle, Big Horn County, Montana: U.S. Geol. Survey open-file report.

Matson, R. E., and Blumer, J.W., 1973, Quality and reserves of strippable coal, selected deposits, southeastern Montana: Montana Bur. Mines and Geology Bull. 91, 135 p.

Taff, J.A., 1909, The Sheridan coal field, Wyoming: U.S. Geol. Survey Bull. 341-B, p. 123-150.

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_____ 1977, Preliminary report on 1976 drilling of coals in Campbell and Sheridan Counties, Wyoming; and Big Horn, Dawson, McCone, Richland, Roosevelt, Rosebud, Sheridan and Wibaux Counties, Montana: U.S. Geol. Survey Open-File Report 77-283.