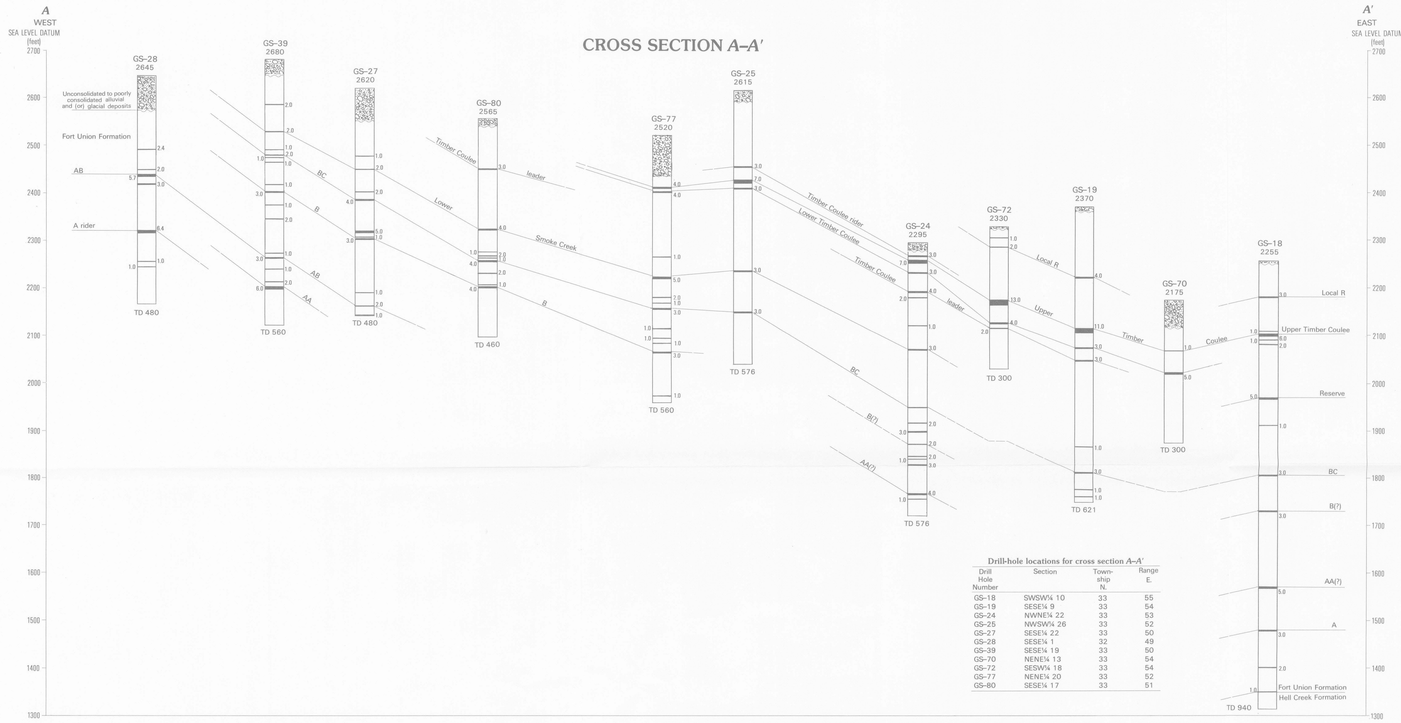
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
U.S. BUREAU OF INDIAN AFFAIRS

COAL INVESTIGATIONS
MAP C-122-C

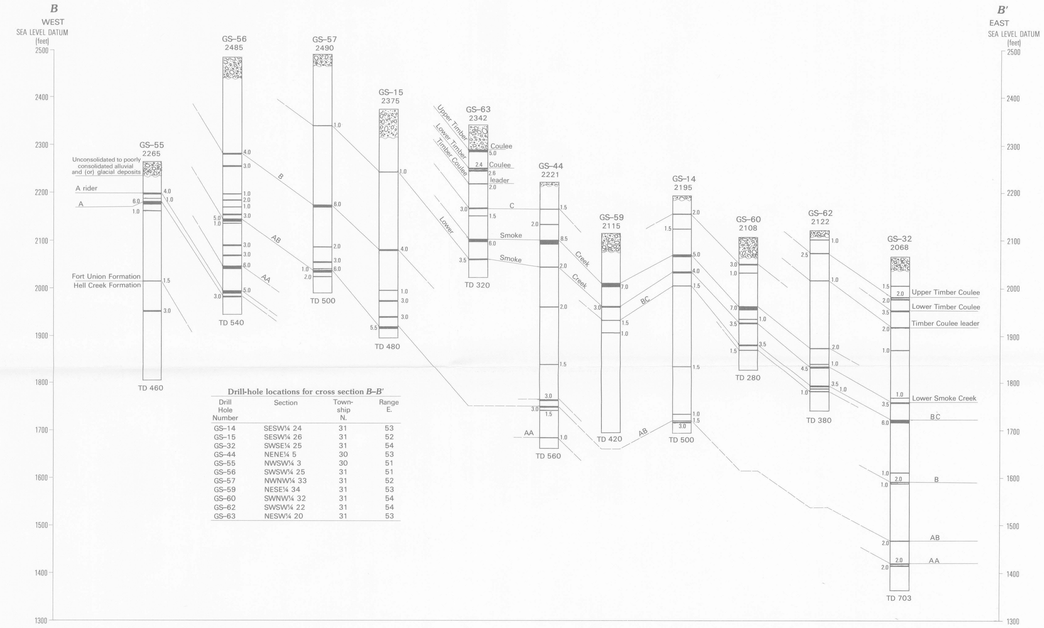
CROSS SECTION *A–A′*



Drill-hole locations for cross section *A–A′*

Drill Hole Number	Section	Township N.	Range E.
GS-18	SWSW¼ 10	33	55
GS-19	SESE¼ 9	33	54
GS-24	NWNE¼ 22	33	53
GS-25	NWSW¼ 26	33	52
GS-27	SESE¼ 22	33	50
GS-28	SESE¼ 1	32	49
GS-39	SESE¼ 19	33	50
GS-70	NENE¼ 13	33	54
GS-72	SESW¼ 18	33	54
GS-77	NENE¼ 20	33	52
GS-80	SESE¼ 17	33	51

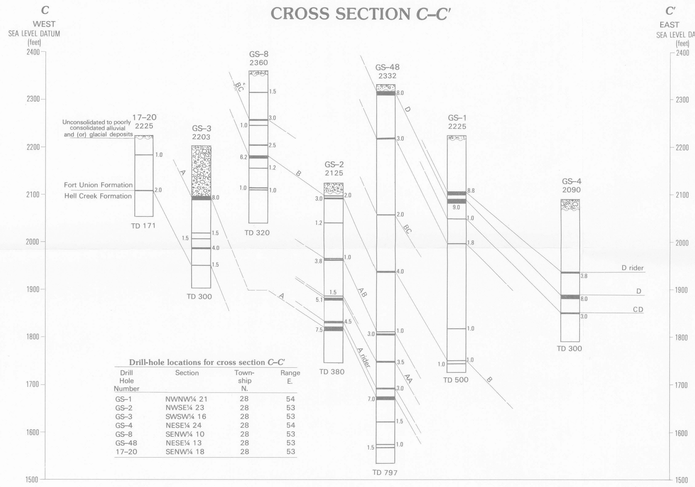
CROSS SECTION *B–B′*



Drill-hole locations for cross section *B–B′*

Drill Hole Number	Section	Township N.	Range E.
GS-14	SESW¼ 24	31	53
GS-15	SESW¼ 26	31	52
GS-32	SWSE¼ 25	31	54
GS-44	NENE¼ 5	30	53
GS-55	NWSW¼ 3	30	51
GS-56	SWSW¼ 25	31	51
GS-57	NWNW¼ 33	31	52
GS-59	NESE¼ 34	31	53
GS-60	SWNW¼ 32	31	54
GS-62	SWSW¼ 22	31	54
GS-63	NESW¼ 20	31	53

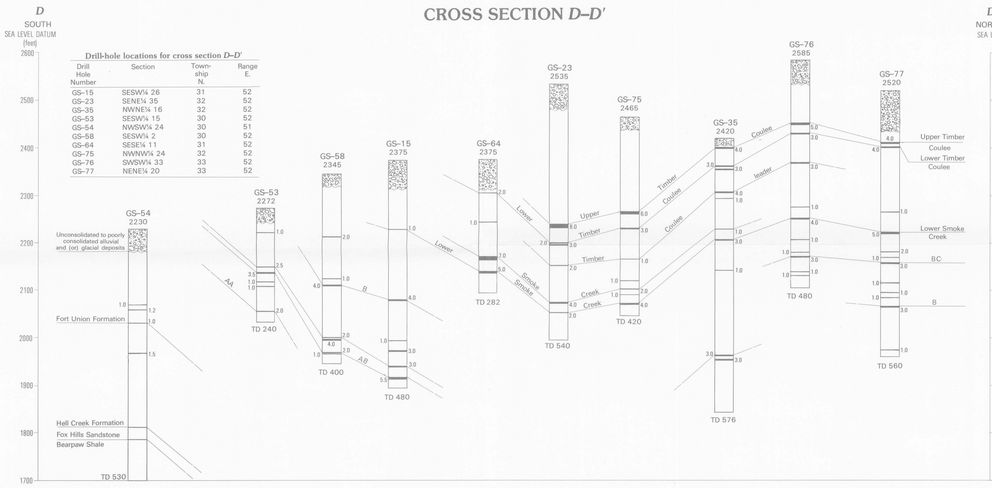
CROSS SECTION *C–C′*



Drill-hole locations for cross section *C–C′*

Drill Hole Number	Section	Township N.	Range E.
GS-1	NWNW¼ 21	28	54
GS-2	NWSE¼ 23	28	53
GS-3	SWSW¼ 16	28	53
GS-4	NESE¼ 24	28	54
GS-8	SENW¼ 10	28	53
GS-48	NESE¼ 13	28	53
17–20	SENW¼ 18	28	53

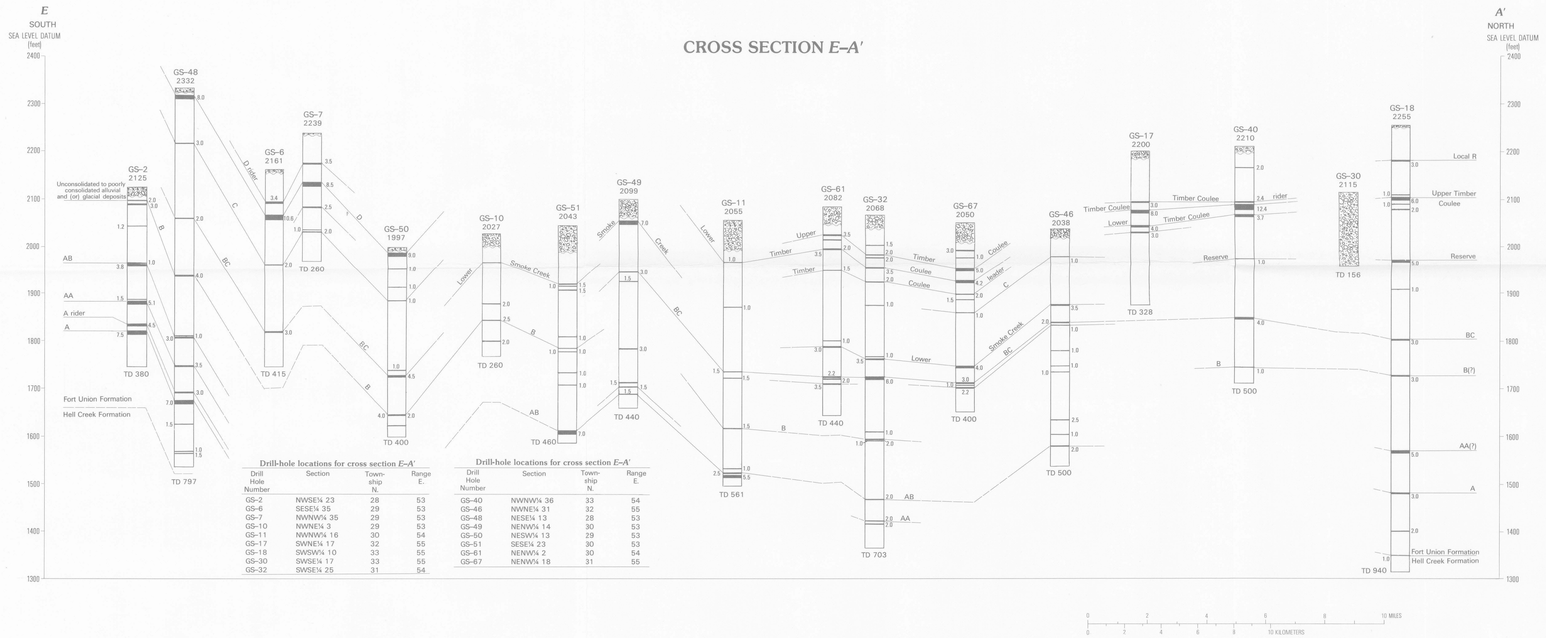
CROSS SECTION *D–D′*



Drill-hole locations for cross section *D–D′*

Drill Hole Number	Section	Township N.	Range E.
GS-15	SESW¼ 26	31	52
GS-23	SENE¼ 35	32	52
GS-35	NWNE¼ 16	32	52
GS-53	SESW¼ 15	30	52
GS-54	NWSW¼ 24	30	51
GS-58	SESW¼ 2	30	52
GS-64	SESE¼ 11	31	52
GS-75	NWNW¼ 24	32	52
GS-76	SWSW¼ 33	33	52
GS-77	NENE¼ 20	33	52

CROSS SECTION *E–A′*

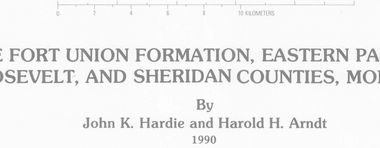


Drill-hole locations for cross section *E–A′*

Drill Hole Number	Section	Township N.	Range E.
GS-2	NWSE¼ 23	28	53
GS-6	SESE¼ 35	29	53
GS-7	NWNW¼ 35	29	53
GS-10	NWNE¼ 3	29	53
GS-11	NWNW¼ 16	30	54
GS-17	SWNE¼ 17	32	55
GS-18	SWSW¼ 10	33	55
GS-30	SWSE¼ 17	33	55
GS-32	SWSE¼ 25	31	54

Drill-hole locations for cross section *E–A′*

Drill Hole Number	Section	Township N.	Range E.
GS-40	NWNW¼ 36	33	54
GS-46	NWNE¼ 31	32	55
GS-48	NESE¼ 13	28	53
GS-49	NENW¼ 14	30	53
GS-50	NESW¼ 13	29	53
GS-51	SESE¼ 23	30	53
GS-61	NENW¼ 2	30	54
GS-67	NENW¼ 18	31	55



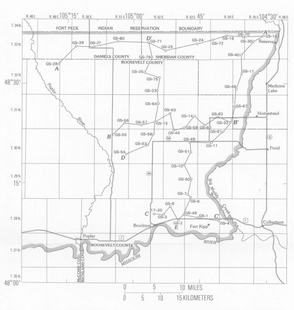
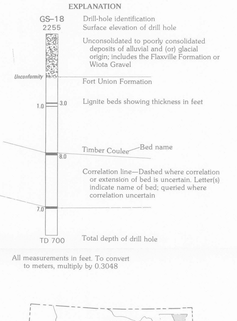
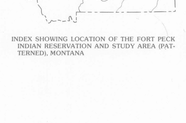


Figure 1.—Map showing locations of selected drill holes and cross sections, eastern part of the Fort Peck Indian Reservation, Montana.





INDEX SHOWING LOCATION OF THE FORT PECK INDIAN RESERVATION AND STUDY AREA (PATTERNED), MONTANA

STRATIGRAPHIC FRAMEWORK OF COAL BEDS IN THE FORT UNION FORMATION, EASTERN PART OF THE FORT PECK INDIAN RESERVATION, DANIELS, ROOSEVELT, AND SHERIDAN COUNTIES, MONTANA

By
John K. Hardie and Harold H. Arndt

1990

INTRODUCTION

The Fort Peck Indian Reservation occupies about 3,000 square miles in parts of Daniels, Roosevelt, Sheridan, and Valley Counties, northeast Montana. This report covers the easternmost part of the reservation, an area containing about 1,000 square miles underlain by the coal-bearing Paleocene Fort Union Formation, the focus of this study. The study area is bound on the west by the Poplar River, on the south by the Missouri River, on the east by Big Muddy Creek, and on the north by the reservation boundary. The physiographic character of the area is flat to rolling with scattered glacial surface features. Grasslands, cultivated fields, and glaciofluvial surficial deposits all but conceal much of the bedrock exposures which are at best few and poor.

Eighty-three coal exploratory holes were drilled by the U.S. Geological Survey between 1978 and 1980 (Hardie and Arndt, 1981; Arndt and others, 1982a, b) as part of the data collection phase of a comprehensive coal resource assessment project which was completed in 1985 (Biewick and others, in press; Hardie and Arndt, 1987). An additional 622 supplemental data points consisting of measured sections, logged water wells, and logged seismograph shot holes were used to support correlation of the coal exploratory holes. Fifty of the coal exploratory holes are included in this report which is one of a series of reports that resulted from that investigation. Other reports in this series include U.S. Geological Survey Coal Investigations Maps C–122–A and C–122–B showing the geology and structure of the Fort Union Formation (Hardie and Arndt, 1988), and stratigraphic profiles showing the stratigraphy of the Fort Union Formation (Hardie and Arndt, in press).

GEOLOGIC SETTING

The study area is located on the western flank of the Williston Basin where gentle easterly dips of less than 1° are present. Surface exposures of bedrock range from Upper Cretaceous marine shales and deltaic rocks to Tertiary and Quaternary continental deposits (table 1). Upper Cretaceous rocks are exposed in the extreme western part of the study area in a narrow margin along the Poplar River and in the south, between the communities of Brockton and Poplar (fig. 1). The remainder of the study area is underlain by rocks of the Fort Union Formation which are mantled by poorly consolidated surficial deposits.

The Fort Union Formation is gradational and conformable with the underlying Upper Cretaceous Hell Creek Formation; the contact between the two units is arbitrarily placed at the base of the lowest mappable coal bed, above which thick extensive coal beds are common (Colton and Bateman, 1956). Fort Union strata are more than 1,300 feet thick in the northeast part of the study area, thinning to a feather edge along the western margin. The formation consists of bright-yellow, thick- to thinly interbedded sandstone, siltstone, claystone, mudstone, and lignite. Much of the Fort Union is buried under upper Tertiary and Quaternary surficial deposits. The oldest of these, the Flaxville Formation (upper Miocene or Pliocene), lies unconformably on Fort Union Formation strata and locally consists of poorly consolidated fluvial deposits of clay, sand, silt, and quartzitic gravel. The Flaxville, a reddish-brown gravel-supported unit, caps the highland areas, where it commonly exceeds thicknesses of 100 feet. The overlying Pleistocene Wiota Gravel is gradational with the Flaxville Formation and the two units are similar in lithology, mode of transport, and area of occurrence. The Wiota Gravel, however, lacks the thickness and lateral extent of the gravel in the Flaxville Formation and has a larger mean clast size. Unconsolidated to poorly consolidated glacial deposits of mostly Wisconsin age are commonly present along slopes and bottoms of lowland areas. Delineation of surficial deposits was not part of this study.

COAL BEDS

Coal beds in the study area were first described and named by Smith (1910). From scattered exposures, he constructed a generalized section with coal beds designated alphabetically. Subsequent investigations (this report; Arndt and Hardie, 1985; Hardie and Arndt, 1987,1988, in press; Hardie and Van Gosen, 1986) significantly modified Smith's generalized section and coal-bed nomenclature to that shown in figure 2. Smith's coal bed designations were retained where possible.

Twenty-one coal samples were collected from different core hole localities in the study area from 1978 to 1980 during the coal exploratory drilling phase to show the range of coal quality. Arithmatic means computed on proximate analysis and total sulfur content on an as-recieved basis yielded heat-of-combustion of 6,540 Btu/lb, 34.7 percent moisture, 10.8 percent ash, and 1 percent total sulfur. The apparent ranks for all samples were calculated as lignite A using the formulas established by the American Society for Testing and Materials (1978).

According to depositional environment studies conducted by Flores and Lepp (1983), Fort Union coal beds in the study area were deposited in two different environmental settings. Coal beds in the lower part of the interval, below the Reserve and Smoke Creek coal bed were probably deposited in an upper delta-plain environment. Coal beds in the upper part of the interval, were believed to have been backswamp coals, deposited on broad abandoned meander belts of an alluvial-plain and on crevasse-splay deposits of an adjacent flood plain.

Locally, coal beds are laterally persistant, with some beds only a few feet thick extending over wide areas. Coal bed thicknesses range from a few inches to 13 feet (cross section *A–A′*, drill hole GS-72). The thickest of the more continuous coal beds are in the D coal zone in the southern part of the study area, and in the Timber Coulee coal zone in the northern part. Both coal zones occupy the same stratigraphic position but the exact relation of the two zones is unclear because of the presence of an elongated east-west trending, till-covered, erosional lowland, that roughly parallels cross section ***B–B′***. Coal beds belonging to the D coal zone can be correlated northward to the southern margin of this lowland, where they have been eroded and buried beneath a thick veneer of till. Coal beds of the Timber Coulee coal zone can be correlated southward, to the northern margin of the lowland where they are also eroded and buried beneath a till cover. The authors have chosen to treat these as two distinct coal zones in this report and have queried their correlation in the generalized section shown in figure 2. However, it is possible that these two coal zones are equivalent separated by an erosional hiatus (cross section ***E–A′***, drill holes GS–10, GS–51, and GS–49).

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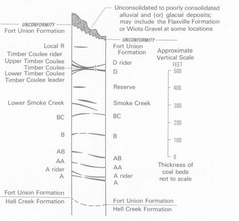

Figure 2.—Generalized columnar section showing lignite beds of economic importance in the eastern part of the Fort Peck Indian Reservation, Montana.

PATENTS—GEOLOGICAL SURVEY, RESTON, VA—1990
Manuscript approved for publication, March 15, 1988

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