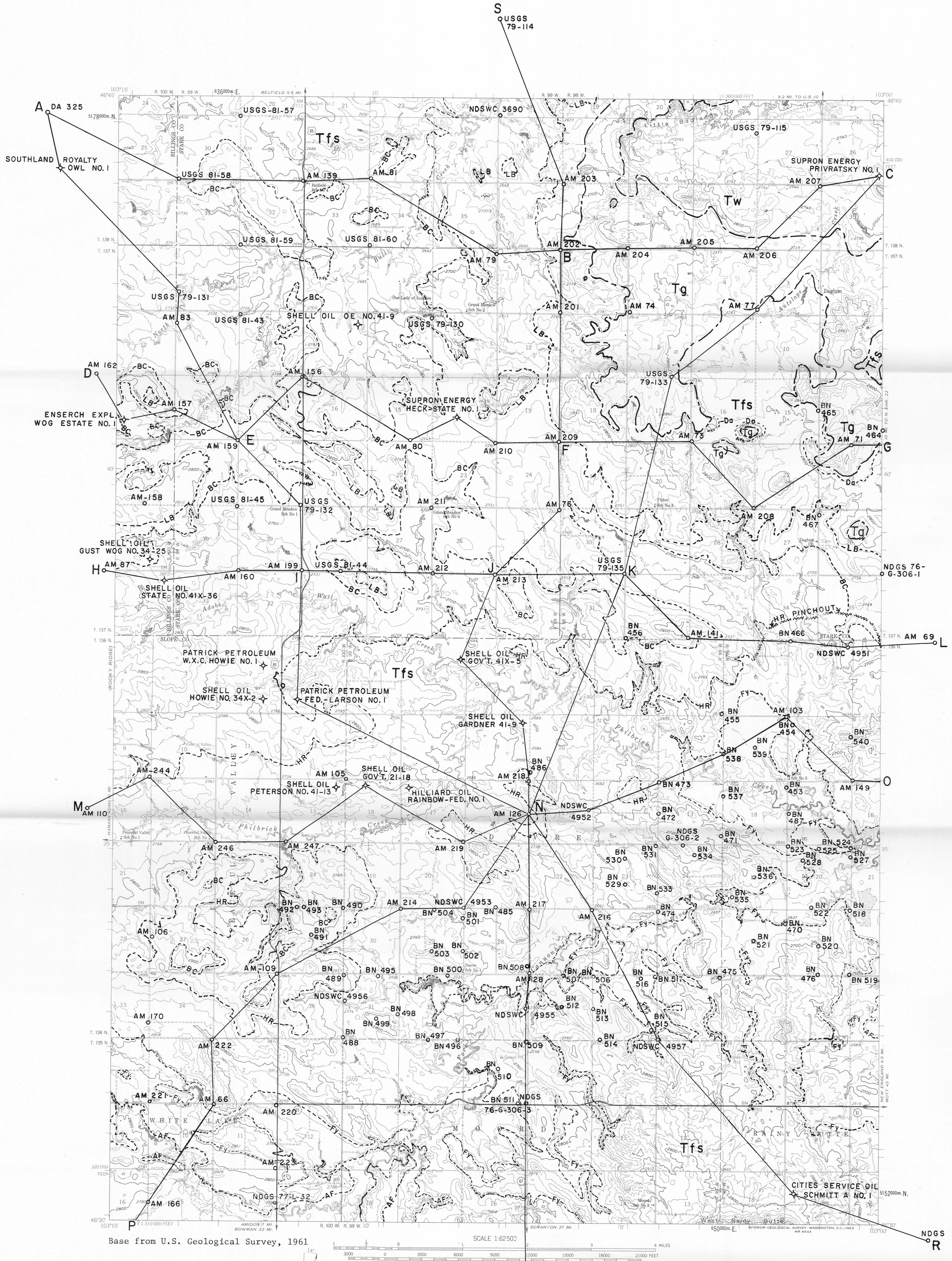
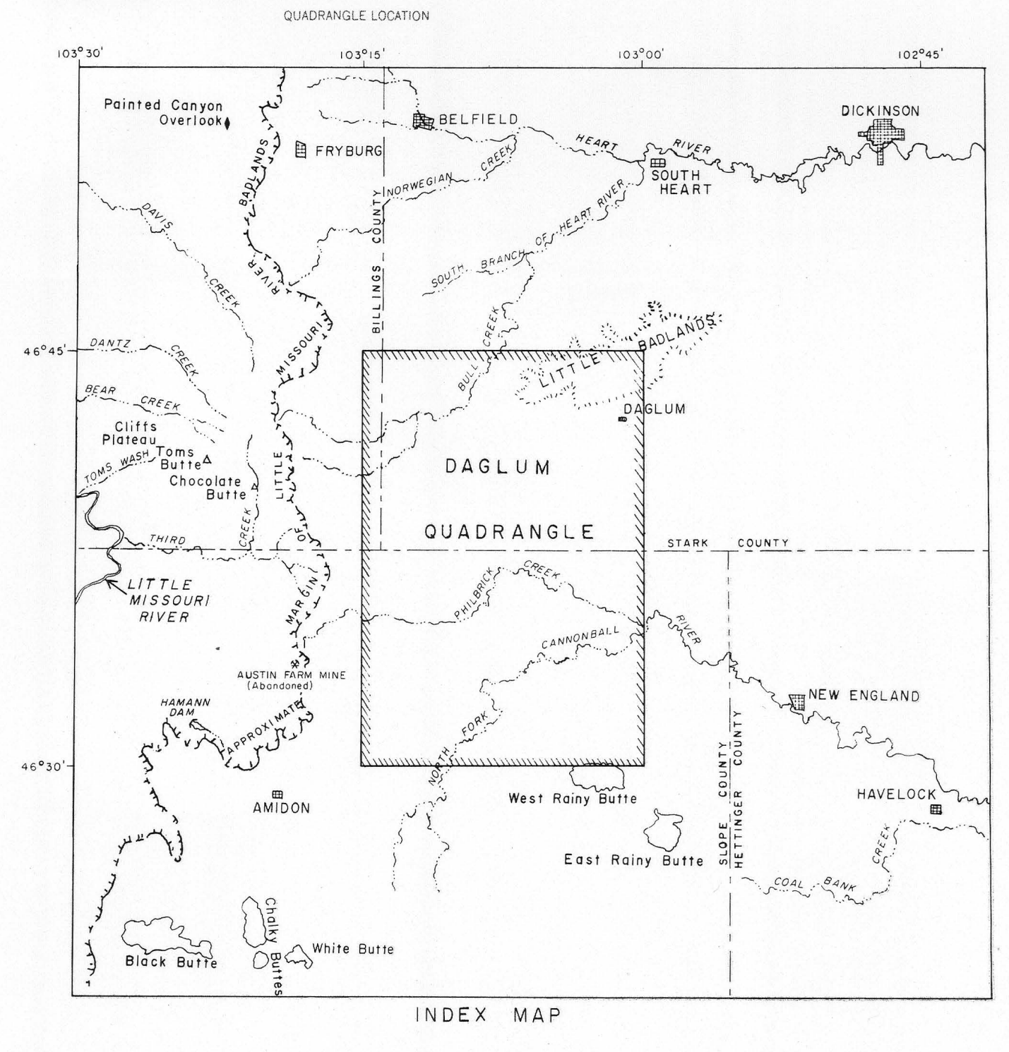
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1345-A
SHEET 1 OF 3



Base from U.S. Geological Survey, 1961



INDEX MAP

EXPLANATION OF MAP UNITS

Tw	WHITE RIVER GROUP (OLIGOCENE)--White or pinkish-white to light-tan claystone and siltstone; conglomeratic sandstone at base; unconformably overlies Golden Valley Formation
Tg	GOLDEN VALLEY FORMATION (EOCENE AND PALEOCENE)--White kaolinitic sandstone; yellowish-gray silty claystone; thin carbonaceous to lignitic shales; and yellow calcareous sandstone concretions. Carbonaceous zones are locally radioactive. Drill-hole logs show truncation of upper Sentinel Butte beds by Golden Valley sandstones, indicating an unconformable contact in this area
Tfs	SENTINEL BUTTE MEMBER, FORT UNION FORMATION (PALEOCENE)--Predominantly dark- to light-gray shale and siltstone; gray to tan very fine grained sandstone; gray, grayish-brown, to tan claystone; and numerous lignite beds
— — —	CONTACT--Approximately located
Fy	LIGNITE OUTCROP--Solid where exposed; dashed where projected to surface from structure contour maps Da--Daglum bed LB--Little Badlands bed BC--Bull Creek bed HR--Heart River bed Fy--Fryburg bed AF--Austin Farm bed
	SUBSURFACE PINCHOUT LINE OF HR BED
	CLINKER--Rocks baked and (or) fused by the in-place burning of an underlying coal bed. Outcrop trace of the coal bed, prior to burning, shown by chevrons
A—B—C	TRACE OF COAL CORRELATION CROSS SECTION
SHELL OIL GARDNER 41-9	OIL AND GAS TEST HOLE WITH GAMMA-RAY LOG THROUGH COAL-BEARING INTERVAL--Showing names of operator and lease and well number; producing wells not differentiated
○ BN 488	COAL TEST HOLE--Showing operator and number BN--Baukol-Noonan, Inc. AM--North American Coal Corp. DA--(NACCO) USGS--United States Geological Survey NDGS--North Dakota Geological Survey NDSWC--North Dakota State Water Commission water observation well

Note: Numbers for Baukol-Noonan test holes are those used in U.S. Geological Survey Open-File Report 79-564 (Owen, 1979). Numbers of North American Coal Corp. holes are company designated numbers. The first two digits of USGS and NDGS hole numbers indicate the year of drilling and the remaining digits identify the holes.

INTRODUCTION

The Daglum quadrangle of southwestern North Dakota (see index map) is underlain by 11 lignite beds that exceed 5 ft in thickness within the Sentinel Butte and Tongue River Members of the Fort Union Formation. Six of these beds crop out within the quadrangle. This report illustrates the stratigraphic position, correlation, extent, and structural attitude of the lignite beds.

SOURCES OF DRILL-HOLE DATA

Most of the drill-hole data used in this report were furnished by the North American Coal Corp. and Baukol-Noonan, Inc. The Baukol-Noonan data were previously published in a report by Hal Owen (1979). The unpublished data from North American Coal Corp. were released to the U.S. Geological Survey for unrestricted use in August 1980. Correlations shown in this report include some changes from previous interpretations in the area that are largely due to the data furnished by the two named coal companies. Geophysical logs supplied by North American Coal Corp. were particularly useful in the resolution of stratigraphic problems in the area.

In addition to coal company data, the gamma-ray logs of 16 oil test holes provided information, particularly for the deeper lignite beds. Logs of seven holes came from the North Dakota State Water Commission County Ground Water Studies (Trapp, 1971; Anna, 1980). The remaining data points are coal test holes drilled by the North Dakota and U.S. Geological Surveys between 1975 and 1981 as part of continuing coal resource evaluation studies in North Dakota. Logs of those holes have been published in several open-file reports or released through the Rocky Mountain Well Log Service of Petroleum Information Corp.

TOPOGRAPHY

The surface of the Daglum quadrangle is a predominantly gently rolling terrain. The principal exceptions are the western end of the bluffs of the Little Badlands in the northeast and the north slope of West Rainy Butte in the southeast. Total topographic relief within the quadrangle is only 400 ft, with elevations ranging from about 2,620 ft near the junction of Philbrick Creek and the Cannonball River in secs. 16 and 21, T. 136 N., R. 98 W. and along Bull Creek in sec. 23, T. 138 N., R. 99 W., to about 3,040 ft on the north slope of West Rainy Butte in sec. 18, T. 135 N., R. 98 W.

STRATIGRAPHY

The Sentinel Butte Member of the Fort Union Formation (Paleocene), the Golden Valley Formation (Eocene and Paleocene), and the White River Group (Oligocene) constitute the land surface of the Daglum quadrangle. Bedrock exposures are poor and scarce and most of the surface consists of cultivated fields, wheat being the principal crop. Uncultivated areas are covered with vegetation, primarily range grasses, with particularly dense growth of grass and shrubs along the drainages of Philbrick Creek and the North Fork of the Cannonball River. Most of the lignite beds are especially well hidden by cultivated fields, vegetation, and soil cover except where exposed in roadcuts along U.S. Route 85; a few isolated patches of clinker and lignite "bloom" occur in other parts of the quadrangle. Because the lignite beds rarely crop out, the traces of the lignite bed outcrops shown on the geologic map have been projected to the surface from structure contour maps of the individual coal beds; these traces incorporate the few surface exposures found in the field.

The Golden Valley Formation and White River Group are partially exposed in the northeast part of the quadrangle, along the bluffs of the Little Badlands. The formation contacts, however, are not well exposed. The contact of Golden Valley with the Sentinel Butte Member of the Fort Union Formation, only approximately located, was mapped in this area on the basis of the color change in the soil of cultivated fields from the dark gray characteristic of Sentinel Butte shales to the white of the kaolinitic sandstones in the lower Golden Valley. In the subsurface the contact is picked at the base of a sharp and distinctive change in the character of the resistivity log; the Golden Valley beds exhibit high resistivity relative to the shales and siltstones of the Sentinel Butte Member. The Golden Valley Formation is also characterized in this area by thin intervals of unusually high radioactivity on the gamma-ray log. These intervals consist of uranium-enriched carbonaceous or lignitic shales. With the exception of a 2.5-ft-thick lignite bed just below the Golden Valley-Sentinel Butte contact in hole number AM-207 (cross section ABC) and a radioactive zone at a depth of 155-170 ft in hole number AM-203 (cross section SBFJNQ), all of the radioactive beds within the Daglum quadrangle are restricted to the Golden Valley Formation. The radioactive interval in hole number AM-203 probably represents a slightly mineralized fault zone.

Previous reports (Benson, 1952; Hickey, 1977) indicate that the Golden Valley is conformable with, and in most places gradational into, the Sentinel Butte beds. Caldwell (1954) described one area of local unconformity near Hebron, N. Dak., where Golden Valley strata truncate the Harnisch lignite bed of Fort Union age. Hickey (1977, p. 16) described several areas of local unconformity and stated: "The most common type of unconformable contact involves Bear Den Member channel fills composed of light gray to white kaolinitic sandstone. These range from channels at the base of the member cut less than 1 m into the Fort Union Formation,***to channels incised more than 10 m into the underlying formation in addition to occupying almost the entire thickness of the Bear Den Member. Good examples of these large channel fills are found at the head of Big Muddy Creek, 8 km northeast of Hebron***and north of the Fairy Dells area in southern Dunn County." In the subsurface of the Daglum area the Golden Valley Formation appears to lie unconformably on Sentinel Butte strata. The interval betweem the base of the Golden Valley Formation and the underlying Little Badlands lignite bed of this report ranges from less than 30 to more than 100 ft, and several thin lignites overlying the Little Badlands bed appear to be truncated by Golden Valley beds. The 7.5-ft-thick Daglum lignite bed in hole number AM-71 (cross section DEFG) lies 100 ft above the Little Badlands bed and is present only in that hole and at location number BN-464 (northeast of AM-71) within the quadrangle. The Daglum bed has apparently been truncated to the north by an unconformable relationship with the overlying Golden Valley beds.

The White River Group unconformably overlies the Golden Valley Formation. The contact between these units was not mapped in the field for this report. The contact as shown on the geologic map is a combination of projected subsurface data and the contact as shown by Caldwell (1954); it is generalized and approximate.

Units of the Fort Union Formation that underlie, but do not crop out within, the Daglum quadrangle include the lower part of the Sentinel Butte Member and the underlying Tongue River and Ludlow Members. These units consist of fine-grained fluvial plain deposits of shale, siltstone, fine-grained sandstone, claystone, and lignite. They are differentiated in outcrop primarily by color--the Tongue River beds are generally lighter hued and yellowish in contrast with the drab gray and brown hues of the Sentinel Butte and Ludlow Members. In the subsurface the HT Butte lignite marks the Sentinel Butte-Tongue River contact and the thick sandstone unit below the Harmon bed (and Hansen bed where present) identifies the basal part of the Tongue River Member. The Ludlow Member contains a zone of several thin (2-5 ft) lignite beds in its lower part, but discussion of these is beyond the scope of this report. The Ludlow intertongues with marine sandstones of the Cannonball Member of the Fort Union Formation in southwestern North Dakota.

STRUCTURE

The dominant structural feature of the Daglum quadrangle is a gentle regional northeasterly dip of the strata toward a synclinal axis near the northeast corner of the quadrangle. Dips average about 40 ft per mile and are as much as 100 ft per mile (about 1/2° to 1°) near the synclinal axis. The vertical exaggeration of the coal-correlation cross sections necessary for clear illustration of the coal bed correlations grossly amplifies and exaggerates the structural attitude of the beds as well as the gentle surface topography.

LIGNITE BEDS

Daglum lignite bed

The Daglum lignite bed, named for the proximity of its occurrence to the village of Daglum, is the stratigraphically highest lignite of the Fort Union Formation preserved within the Daglum quadrangle. It was penetrated by only two of the drill holes shown on the map. In hole AM-71 (cross section DEFG) the Daglum bed is 7.5 ft thick and lies only 3 ft below the Golden Valley Formation. At this location the Daglum bed is 100 ft above the next significant lignite in the Sentinel Butte Member, the Little Badlands bed. In hole BN-464 (northeast of AM-71, but not on cross section DEFG) the Daglum bed is 8.5 ft thick and lies 110 ft above the Little Badlands bed. The contact with the base of the Golden Valley Formation is indeterminable from the lithologic log of this hole but cannot lie far above the Daglum bed.

The Daglum bed is absent in drill holes north of the AM-71 and BN-464 locations, apparently truncated by overlying Golden Valley beds. In the S½ sec. 16 and the NE¼ sec. 22, T. 137 N., R. 98 W., several small areas of clinker near the 2,800-ft-elevation contour are interpreted to represent the burned outcrop of the Daglum lignite.

The Daglum bed is not correlated with any previously named lignite bed of regional extent in the Sentinel Butte Member. The bed is stratigraphically very high in the Sentinel Butte, and it is likely that there are few areas where this part of the Sentinel Butte Member has been preserved. Neither of the drill holes penetrating the Daglum bed was deep enough to also penetrate the HT Butte bed, the basal unit of the Sentinel Butte Member. Nearby drill hole AM-73 (cross section DEFG) did penetrate the HT Butte bed, however, as well as 105 ft of Sentinel Butte strata above the Little Badlands bed. At this location a total of 587 ft of the Sentinel Butte Member was penetrated, which is the thickest preserved section of the member penetrated within the quadrangle. This hole was located at an elevation of 2,790 ft, about 10 ft below the level of the clinker of the Daglum bed in the SW¼ sec. 16, T. 137 N., R. 98 W. Therefore, the total thickness for the Sentinel Butte Member at this location measured from the base of the HT Butte lignite bed to the top of the Daglum bed is about 600 ft. An unknown but probably very minor thickness of Sentinel Butte strata above the Daglum bed may have been eroded in this area prior to deposition of the Golden Valley Formation.

Little Badlands lignite bed

The Little Badlands bed underlies most of the northeast quadrant of the Daglum quadrangle. It is the uppermost bed underlying the Little Badlands geographic area that reaches a thickness of 5 ft or more with the exception of the areally restricted Daglum bed described previously. The Little Badlands bed is not correlated with any previously named, regionally extensive lignite bed. It occupies a similar stratigraphic position to the Dickinson lignite bed (Menge, 1977), but efforts to establish a definitive correlation have so far been frustrated, and it is not likely that the Little Badlands and Dickinson are the same, continuous, bed. Within the Daglum quadrangle the Little Badlands lignite bed ranges from a single discrete 5- to 7-ft bed to a zone consisting of two to four beds of various thickness aggregating as much as 11 ft. The Little Badlands bed is exposed at the common corner of secs. 16, 17, 20 and 21, T. 137 N., R. 99 W. where it consists of two thin splits separated by an 8-ft parting. It is present at a depth of 21 ft in hole AM-158 at the west edge of the area but retains a thickness there of only 2 ft.

Bull Creek lignite bed

Named for its surface occurrence along the valley of Bull Creek in the northwest quadrant of the Daglum quadrangle, this bed is not correlated with any previously named, regionally recognized beds. The Bull Creek bed is 25-75 ft below the Little Badlands zone and ranges from 1 to 12 ft in thickness. The bed is exposed along U.S. Route 85 in secs. 16 and 17, T. 137 N., R. 99 W. A thin clinker and ash zone exposed in the road ditches between secs. 20 and 21 of the same township represents this bed. In addition, small outcrops of clinker from the burning of this bed are present in sec. 34, T. 138 N., R. 99 W., and sec. 4, T. 137 N., R. 99 W.

Heart River lignite bed

The Heart River bed was described and named by A. G. Leonard (Leonard and others, 1925, p. 140-144). The bed crops out north of the Daglum quadrangle along the valley of the Heart River between Fryburg and South Heart, in most places being represented by a conspicuous red clinker. Menge (1977) extended subsurface correlations of the Heart River bed eastward beyond Dickinson to Tps. 139-140 N., R. 95 W. Owen (1979) correctly identified the Heart River bed in the area of the large outlying remnant in the southwest part of the Daglum quadrangle, but east of the Daglum quadrangle he apparently mistook the higher Little Badlands or Bull Creek lignites for the Heart River bed, owing to a lack of deep tests for control on the lower beds. Banet (1980) identified the Heart River bed in the subsurface in the northwest part of the area.

West of the Daglum quadrangle the Heart River lignite bed crops out near the top of the bluffs east of Third Creek and below the crests of the divides between Dantz Creek, Davis Creek, and Third Creek. It is also the highest lignite bed exposed near the top of Toms Butte in sec. 14, T. 137 N., R. 101 W., 6 miles west of the Daglum quadrangle. The Heart River bed splits and thins eastward from the Daglum quadrangle and pinches out to the east within 4-6 miles from the edge of the quadrangle. The bed pinches out locally within the quadrangle and is absent because of nondeposition in holes BN-466 and NDSWC-4951 (cross section HIJKL). The bed is also missing in hole USGS-79-133 (cross section PNKC), where its interval appears to be occupied by a contemporaneous channel sandstone.

The Heart River bed is thickest in the northwest quadrant of the quadrangle and is thinnest toward the east and southeast, ranging from 0 (a pinch-out) in places to 9.5 ft in thickness at hole USGS-81-59.

Fryburg lignite bed

Leonard (Leonard and others, 1925, p. 140-144) named and described the Fryburg lignite bed for its occurrence along the edge of the Little Missouri River badlands and Norwegian Creek near the town of Fryburg, northwest of the Daglum quadrangle. Menge (1977) extended subsurface correlations of the Fryburg bed eastward to a line of pinchout a few miles west of Dickinson. Owen (1979) and Banet (1980) correlated the Fryburg bed into the area of the Daglum quadrangle and the vicinity of the North Fork of the Cannonball River in T. 136 N., Rs. 98-99 W. Lewis (1979) identified the Fryburg in an area north of Amidon to the west of the Daglum quadrangle. There the bed crops out high along the bluffs east of Third Creek.

The Fryburg bed underlies most of the Daglum quadrangle in thicknesses from 5 to 13 ft. The bed splits and thins toward the south and southeast and is only 2-3 ft thick along the south edge of the quadrangle. The interval between the Fryburg and overlying Heart River bed ranges from 20 to 110 ft and is greatest in the southern part of the area.

Austin Farm lignite bed

From 40 to 120 ft below the Fryburg bed in the Daglum quadrangle lies another locally significant bed which does not correlate readily with previously described beds of the region. This bed was once mined from an adit in the SE¼ sec. 25, T. 136 N., R. 101 W., about 3 miles west of the Daglum quadrangle, on a farm that now belongs to a Mr. William Austin. For this location I have here named this unit the Austin Farm lignite bed.

In the Daglum quadrangle the Austin Farm bed ranges in thickness from 0 (a pinch-out) to 11.5 ft. At several locations it lies within 1 ft or less of the underlying Coal Bank Creek lignite bed, and at hole number AM-81 (cross section ABC) the two beds are merged into a single 12-ft-thick lignite. This bed is thickest in the southwest part of the quadrangle where it exceeds 8 ft in thickness over a broad area; it is thinnest in the northwest and southeast corners of the quadrangle and is locally missing by nondeposition. Northwest of the Daglum quadrangle this bed maintains a thickness of less than 2 ft, but it has been traced in the subsurface to the vicinity of Fryburg where it is 1.5 ft thick and lies 89 ft below the Fryburg lignite bed.

The Austin Farm bed was erroneously correlated by Owen (1979) as the HT Butte bed, but with the excellent drill-hole logs released by North American Coal Corp. after Owen's report was written the bed can be convincingly traced to outcrops in the Little Missouri River badlands west of the Daglum quadrangle where it is demonstrably well above the Tongue River-Sentinel Butte contact and the HT Butte lignite bed. Banet (1980) followed Owen's nomenclature and mapped this bed as the HT Butte bed in his report.

Eastward from the Daglum quadrangle the Austin Farm bed has been tentatively correlated in drill holes for 16 miles to sec. 34, T. 138 N., R. 95 W. The Austin Farm bed is the lowest thick lignite cropping out in the Daglum quadrangle.

Coal Bank Creek lignite bed

From a merger with to more than 90 ft below the Austin Farm bed lies an extensive lignite which was correlated into the Daglum area by Owen (1979) as the extension of the Coal Bank Creek bed from the Havelock area along Coal Bank Creek in T. 139 N., R. 96 W. Data from more recent drill holes indicate that this correlation is probably correct. Banet (1980) used Owen's nomenclature.

The Coal Bank Creek bed does not crop out within the Daglum quadrangle, but underlies the entire area of the quadrangle in thicknesses ranging from 3 to 12 ft.

The Coal Bank Creek bed thins to the northwest of the Daglum quadrangle. It is only 1 ft thick in a drill hole in the SW cor. sec. 21, T. 139 N., R. 100 W. To the west the bed crops out along the bluffs of Third Creek and near the top of Cliffs Plateau a few tens of feet below the Austin Farm bed. A measurement of 3.75 ft was taken on the Coal Bank Creek bed in the SW¼ sec. 9, T. 137 N., R. 101 W. on Cliffs Plateau. Like the overlying Austin Farm bed, the Coal Bank Creek bed has been tentatively traced in the subsurface east of the Daglum quadrangle to sec. 34, T. 138 N., R. 95 W.

HT Butte lignite bed

The regionally extensive HT Butte lignite bed is from 75 to 165 ft below the Coal Bank Creek bed in the Daglum area. This bed was named by Hares (1928) but was described earlier by Leonard (1908, p. 52) and Leonard and Smith (1909) as the basal lignite of the sequence later designated the Sentinel Butte Member of the Fort Union Formation. Royce (1967) considered the HT Butte bed to be the top unit of the underlying Tongue River Member. This placement creates problems in the N½ T. 138 N., R. 100 W. where the HT Butte bed divides from a single 12-ft bed into two 6-ft splits, the upper of which pinches out abruptly between drill holes 1 mile apart. A remnant of this upper split is present in USGS drill hole number 79-114 (cross section SBFJNQ) 12 ft below the Coal Bank Creek bed. To the northwest, toward Fryburg, this split thickens and becomes the dominant split of the HT Butte bed. I have designated this split as the Painted Canyon lobe of the HT Butte bed for its occurrence below the Painted Canyon Overlook in the South Unit of Theodore Roosevelt National Memorial Park west of Fryburg (work in progress). At surface exposures where the HT Butte consists of two or more splits, as it does near the head of Toms Wash in T. 137 N., R. 101 W., the intervening shales are typical of the dark-gray Sentinel Butte strata. The color change from light-gray, yellow, or tan beds of the Tongue River to dark-gray or brown beds characteristic of the Sentinel Butte is primal in the definition of the contact in surface exposures, and I therefore retain the older usage (Leonard, 1908, p. 52; Leonard and Smith, 1909) and include the HT Butte bed as the basal unit of the Sentinel Butte Member.

The HT Butte bed underlies the entire Daglum quadrangle in thicknesses ranging from 4 to 14 ft. It thins and splits toward the southern and eastern edges of the area. In the vicinity of Havelock it is represented by two thin 1- to 2-ft splits 40-60 ft below the Coal Bank Creek bed. The bed is missing in a drill hole in sec. 14, T. 134 N., R. 99 W., 5 miles south of the Daglum quadrangle.

The HT Butte bed of this report was correlated as the "Garner Creek" bed by Owen (1979) and Banet (1980).

Garner Creek lignite bed

Between the HT Butte and Harmon beds of the Daglum quadrangle there is only one regionally extensive lignite. This bed has been tentatively traced in the subsurface to the vicinity of the Little Missouri River badlands along Bear Creek and is correlated with the Garner Creek lignite bed as mapped by Hares (1928) in sec. 36, T. 138 N., R. 102 W. The higher "Meyer" bed mapped by Hares is probably a split of the HT Butte bed in that area and does not extend to the Daglum quadrangle.

The Garner Creek bed is from 2 to 12 ft thick within the quadrangle and lies from 40 to 130 ft below the HT Butte bed. In the northern part of the area the Garner Creek bed is generally 140-180 ft above the Harmon bed, but this interval thins southward. In the southwest corner of the quadrangle (cross section PNKC) splits of the Garner Creek bed are only 40 ft above the main Harmon bed and rest within a few feet of a split of the Harmon bed which I have designated as the Hamann Dam lobe of the Harmon bed for its outcrop a few feet below the lake level at Hamann Dam in sec. 6, T. 135 N., R. 101 W., 7.5 miles west of the Daglum quadrangle (work in progress). The Garner Creek bed splits into thin remnants and pinches out southwest of the Daglum quadrangle and is not present in the vicinity of Amidon or at Hamann Dam.

The Garner Creek bed of this report was described as the "Nomad" bed by Owen (1979) and Banet (1980) in this area.

Harmon lignite bed

The Harmon lignite bed, mapped by Hares (1928) from the vicinity of Bowman, N. Dak., along the Little Missouri River badlands to the S½ T. 139 N., R. 102 W., has been correlated in the subsurface throughout much of southwestern North Dakota. It underlies the Daglum quadrangle at depths ranging from 300 ft in the southwest corner to 1,100 ft in the northeast. It ranges from 4 to 22 ft in thickness.

Hansen lignite bed

From 20 to 80 ft below the Harmon bed is the Hansen bed. The Hansen is as much as 16 ft thick in the central part of the quadrangle. It is not present in the southeast and northeast corners of the area, where its interval is occupied by thick sandstone. Where present, the Hansen bed is separated by a few feet of shale from the massive basal sandstone unit of the Tongue River Member. Because of its depth, only the oil tests and a few of the coal tests in the southern part of the area penetrated the interval. The data is not sufficient to delineate the extent of the Hansen bed with accuracy.

Miscellaneous lignite beds

Numerous thin lenticular lignite beds of 1-3 ft in thickness occur between the major beds described above throughout the Daglum quadrangle. Only the intervals between the Fryburg and Austin Farm beds and the Harmon and Hansen beds seem to be almost totally lacking in these thin, local lignites. They are particularly common in the zones above the Fryburg bed. One thin bed of relatively wide extent is a 1- to 2.5-ft-thick bed which is present from about 20 to 50 ft above the HT Butte bed in the southern half of the quadrangle. At some places there is a 2- to 5-ft-thick lignite bed a few feet below the basal Tongue River sandstone in the upper part of the Ludlow Member (cross sections MNO, SBFJNQ, AEINR). Other thin lignites, not shown or considered in this report, occur in the lower part of the Ludlow Member and in the underlying Hell Creek Formation (Cretaceous) throughout the Daglum area.

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STRUCTURAL-STRATIGRAPHIC FRAMEWORK AND CORRELATION OF COAL BEDS IN THE TONGUE RIVER AND SENTINEL BUTTE MEMBERS OF THE FORT UNION FORMATION, DAGLUM 15-MINUTE QUADRANGLE, BILLINGS, STARK, AND SLOPE COUNTIES, NORTH DAKOTA

By

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