

INTRODUCTION

In 1978 the U.S. Geological Survey began a 4-year study of aquifers in the northern Great Plains. The purpose of this map, which is a product of that study, is to show the total thickness of the "Dakota sandstone" (drillers' term). Other maps show the altitude of the top (Feltis, 1982a) and the cumulative thickness of sandstone (Feltis, 1982b) in the "Dakota sandstone." These maps are part of a series that describes the geology and potentiometric surface of selected rock units of Jurassic or younger age in the plains area of Montana.

SOURCE OF DATA

Most geologic data used to compile the map have been obtained from records of oil and gas exploration wells on file in offices of the Montana Department of Natural Resources and Conservation and the U.S. Geological Survey. The data were derived from interpretation of geophysical logs of oil or gas test wells. One site per township was the optimum density of data selected for map compilation; however, geophysical logs were not available for all townships.

"DAKOTA SANDSTONE"

The Lower Cretaceous "Dakota sandstone" in this report is a drillers' term for the basal sandstone of the 1,500- to 2,200-foot-thick "Colorado group" of drillers' usage in Montana. The "Dakota" includes the Fall River Sandstone in southeastern Montana, South Dakota, and Wyoming and the First Cat Creek sandstone (of informal subsurface usage) in central Montana. In the northwestern part of the study area, the "Dakota" includes a thin sandstone at the base of the Flood Member of the Blackleaf Formation. The "Dakota" unconformably overlies the continental deposits of the Kootenai Formation, or its equivalent, and is conformably overlain by the Skull Creek Shale. The source material for the "Dakota sandstone" was from the north-trending cordilleran highland in Idaho and Utah and from the lowlands that extended westward from the middle part of the continent. The sandstone was deposited in a slowly transgressive Skull Creek sea that produced a variety of deltaic and littoral deposits including channel sands, offshore bars, and beach deposits interbedded with fine-grained shallow marine deposits.

TOTAL THICKNESS

As shown on the map, the thickness of the "Dakota" ranges from about 25 feet in the northwest part of the study area to about 200 feet at locations in the southeast corner of Montana where the Fall River Sandstone extends into the State. The thick sequence of sandstone in the southeast corner of the State is related to a complex of deltas that formed in parts of South Dakota, Wyoming, and Montana. A description of this depositional sequence is given by Dondanville (1963) and Miller (1963). In the southwest part of the area, thicknesses of about 200 feet include the sandstone equivalent to the Greybull Sandstone Member of the Cloverly Formation as used in the Big Horn basin in Wyoming; it is described by Knappan and Moulton (1930) and by Shelton (1972).

The difference between the "Dakota" thickness and the cumulative thickness of sandstone is small, because the "Dakota" is commonly a continuous sequence of sandstone. However, shale beds are common and the cumulative thickness of sandstone may be a few tens of feet less than the "Dakota" thickness.

REFERENCES CITED

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Dondanville, R. F., 1963, The Fall River Formation, northwestern Black Hills: lithology and geologic history. Wyoming Geological Association and Billings Geological Association Guidebook, First Joint Field Conference, northern Powder River basin, Wyoming and Montana, August 8-10, 1963, p. 87-99.

Feltis, R. D., 1982a, Map showing altitude of the top of the "Dakota sandstone," Montana. U.S. Geological Survey Water-Resources Investigations 82-4036, scale 1:1,000,000.

1982b, Map showing cumulative thickness of sandstone in the "Dakota sandstone," Montana. U.S. Geological Survey Water-Resources Investigations 82-4035, scale 1:1,000,000.

Knappan, R. S., and Moulton, G. F., 1930, Geology and mineral resources of parts of Carbon, Big Horn, Yellowstone, and Stillwater Counties, Montana. U.S. Geological Survey Bulletin 822-A, 70 p.

Miller, D. N., Jr., 1963, Subsurface aspects of the Fall River Sandstone, northern Black Hills: Wyoming Geological Association and Billings Geological Association Guidebook, First Joint Field Conference, northern Powder River basin, Wyoming and Montana, August 8-10, 1963, p. 100-103.

Ross, C. P., and Andrews, D. A., and Witkind, I. J., 1955, Geologic map of Montana. U.S. Geological Survey, scale 1:500,000, 2 sheets.

Shelton, J. W., 1972, Trend and depositional environment of Greybull Sandstone, northern part of the Pryor uplift: Montana Geological Society Guidebook, 21st Annual Geological Conference, Crazy Mountains basin, September 22-24, 1972, p. 75-80.

METRIC CONVERSION TABLE

The following factors can be used to convert inch-pound units in this report to the International System of units (SI):

Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer

CRETACEOUS

EXPLANATION

"COLORADO GROUP"--Pattern shows general area of outcrop. The "Dakota sandstone" is the basal sandstone of the "Colorado group" of drillers' usage

CONTACT--Dashed where concealed by alluvium or terrace deposits

THRUST FAULT--Sawtooth on upper plate

NORMAL FAULT--Approximately located. U, upthrown side; D, downthrown side

FAULT ZONE, LINEAMENT, OR TREND--Arrows, where shown, indicate relative horizontal movement

GENERALIZED RANGE IN TOTAL THICKNESS OF THE "DAKOTA SANDSTONE," IN FEET

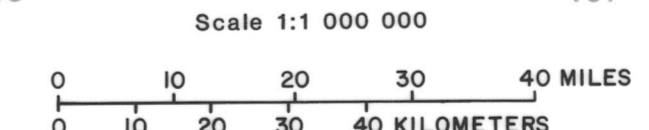
	0 to 25		100 to 125
	25 to 50		125 to 150
	50 to 75		150 to 175
	75 to 100		175 to 200

CONTROL POINT--Location of oil or gas test well. A control point within a circle indicates an anomalously large or small total thickness. Where a control point occurs within several circles, the range in thickness of the innermost circle is indicated numerically

115-150



Base from U.S. Geological Survey State base map, 1968



Geologic contacts from Ross, Andrews, and Witkind (1955). Structural features from Dobbin and Erdmann (1955)

MAP SHOWING TOTAL THICKNESS OF THE "DAKOTA SANDSTONE," MONTANA

by
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