DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

WATER-RESOURCES INVESTIGATIONS 82-4036

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 altitude of the top of the "Dakota sandstone" (drillers' term). Other maps show the total thickness (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" is 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. The Dakota appears as a tabular rock unit; however, individual beds of sandstone are discontinuous and interbedded with siltstone and shale.

STRUCTURAL FEATURES

The map shows the range in altitude and the configuration of several structural features. The Williston basin is separated from the Powder River basin by the Miles City arch and the Cedar Creek anticline in eastern Montana. In the northern part of the State the map shows the Sweetgrass arch, Sweet Grass Hills, Bearpaw and Little Rocky Mountains, Hogeland basin, Blood Creek syncline, and the Bowdoin dome. In the center of the State is the Big Snowy anticlinorium with the Big Snowy, Judith, and North and South Moccasin Mountains at the west end and Porcupine dome on the east. In south-central Montana the map shows the Bull Mountains and Wheatland basins, Big Coulee-Hailstone dome, anticlinal noses of the Big Horn and Pryor Mountains, and north end of the Big Horn basin and the east side of Crazy Mountains basin connected by the Reed Point syncline. The Black Hills uplift is shown in the southeast corner of the State. These and other structural features are shown on the map by Dobbin and Erdmann (1955), which used the base of the "Dakota sandstone" as the contoured horizon.

REFERENCES CITED

Dobbin, C. E., and Erdmann, C. E., 1955, Structure contour map of the Montana Plains: U.S. Geological Survey Oil and Gas Investigations Map OM-178B, scale 1:1,000,000.

Feltis, R. D., 1982a, Map showing total thickness of the "Dakota sandstone," Montana: U.S. Geological Survey Water-Resources Investigations 82-4037, 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.

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.

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

National Geodetic Vertical Datum of 1929: A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.

EXPLANATION

CRETACEOUS

"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

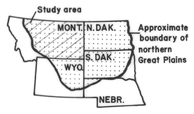
THRUST FAULT--Sawteeth on upper plate

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

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

STRUCTURE CONTOUR--Shows altitude of the top of the "Dakota sandstone." Hachures indicate depression contour. Contour intervals 500 and 1000 feet. National Geodetic Vertical Datum of 1929

CONTROL POINT--Location of oil or gas test well



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

Scale 1:1 000 000

0 10 20 30 40 MILES
0 10 20 30 40 KILOMETERS

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

INTERIOR--GEOLOGICAL SURVEY, RESTON, VIRGINIA--1983

MAP SHOWING ALTITUDE OF THE TOP OF THE "DAKOTA SANDSTONE," MONTANA

by
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Helena, Montana