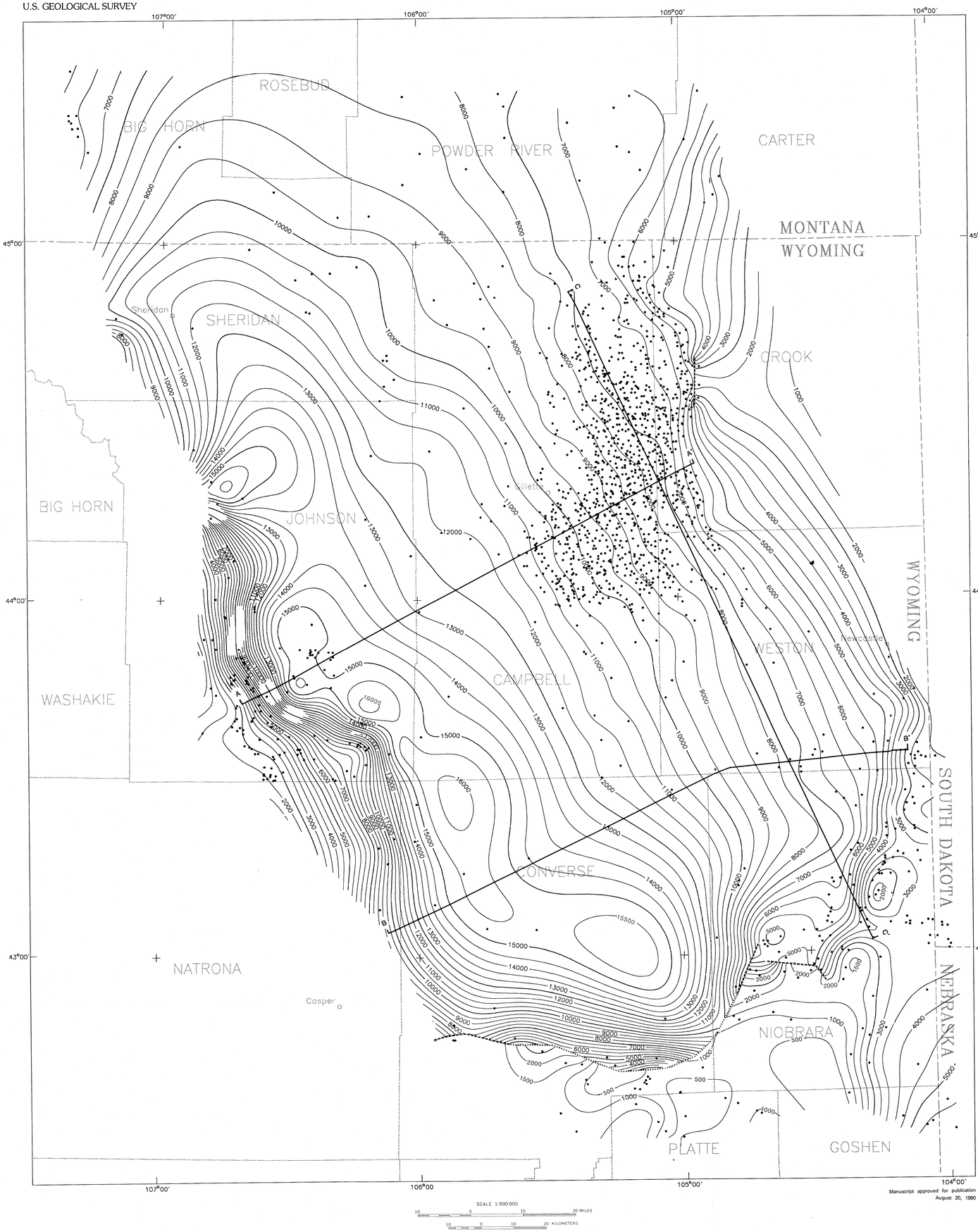
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-2140-A
FOLIO OF THE POWDER RIVER BASIN,
WYOMING AND MONTANA



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EXPLANATION

Fault--Dashed where approximately located; dotted where concealed (see explanation of faults in text)

Isopach--Showing thickness of the interval between ground surface and top of the Pennsylvanian and Permian Minnelusa Formation (equivalent in part to the Hartville Formation on outcrop in the central and eastern parts of the basin, the Tensleep Sandstone to the west, and the Casper Formation to the south). Mapped thickness not corrected to true stratigraphic thickness in wells having inclined or faulted beds, or in deviated boreholes. Contour lines not shown in areas where line spacing is very congested. Datum is mean sea level. Contour interval 500 feet

Borehole--Penetrating top of the Minnelusa Formation and equivalents

DISCUSSION

This map is one in a series of U.S. Geological Survey Miscellaneous Field Studies (MF) maps showing computer-generated structure contours, isopachs, and cross sections of selected formations in the Powder River basin, Wyoming and Montana. The map and cross sections were constructed from information stored in a U.S. Geological Survey Evolution of Sedimentary Basins data base. This data base contains picks of geologic formation and (or) unit tops and bases determined from electric resistivity and gamma-ray logs of 8,592 wells penetrating Tertiary and older rocks in the Powder River basin. Well completion cards (scout tickets) were reviewed and compared with copies of all logs, and formation or unit contacts determined by N.M. Denson, D.L. Macke, R.R. Schumann and others. This isopach map is based on information from 1,480 of these wells that penetrate the Minnelusa Formation and equivalents.

The map and cross sections were generated using Dynamic Graphics Corporation Interactive Surface Modeling (ISM) mapping program, on a VAX 11-780 computer. A mathematical grid representative of the top or thickness of each formation or unit was first created from the scattered data set. An elevation value relative to sea level (for the formation top) or an isopach value (for the formation or unit thickness) was then calculated at each grid node. The isopach map and cross sections were produced from these gridded data. The grids are based on minimum tension surface values rather than individual well data; consequently, contour lines may be drawn differently than if they were hand-contoured, and the cross sections are not tied to specific wells.

At the present time, ISM software is not capable of handling reverse faults in its mapping programs, so faults are shown on the map as vertical normal only. Where these normal faults do not approximate the reverse faults they are intended to represent, or in structurally complex areas of the basin, fault traces are omitted from the map.

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ACKNOWLEDGEMENTS

Debra Higley and Calae Runge of the U.S. Geological Survey transferred the Powder River basin data base to the VAX 11-780 computer, where it could be utilized for data retrievals. Dave Macke provided helpful comments on how the file was originally created, and thoughtful insights on stratigraphy and structure in the Powder River basin.

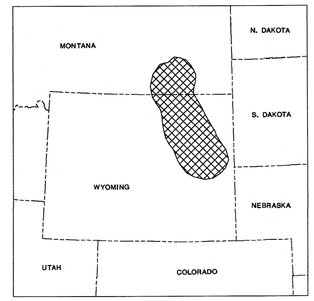
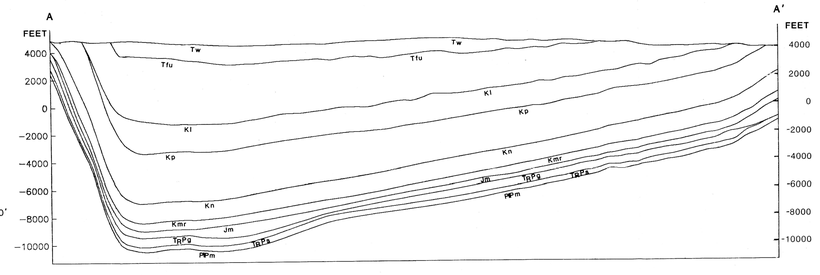
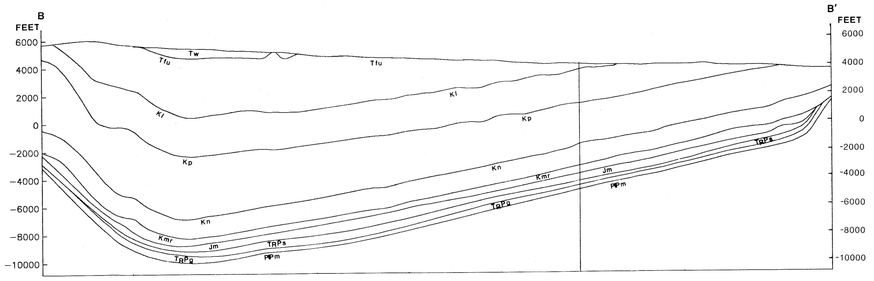
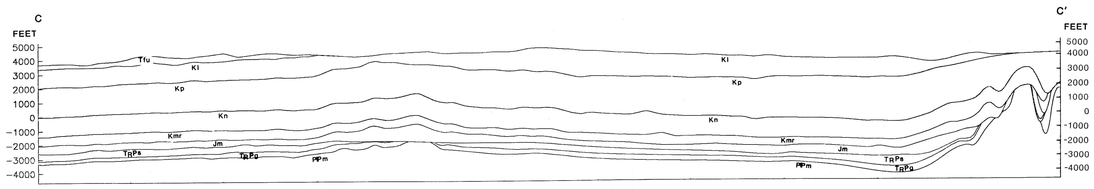
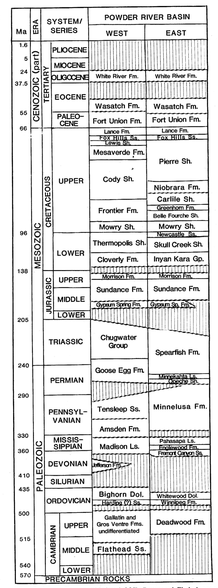


Figure 1.--Index showing location of Powder River basin, Wyoming and Montana









Modified from Fox and Higley (1987); Love and Christiansen (1985); Hose (1955); Mapel (1959); Lochman-Balk (1972); Sando and Sandberg (1987); Lageson and others (1979)

Figure 2.--Generalized stratigraphic column of sedimentary units in the Powder River basin

Geologic units shown on cross sections: Tw, Tertiary Wasatch Formation; Tfu, Tertiary Fort Union Formation; Kl, Cretaceous Lance Formation; Kp, Cretaceous Pierre Shale and equivalents; Kn, Cretaceous Niobrara Formation and equivalents; Kmr, Cretaceous Mowry Shale; Jm, Jurassic Morrison Formation; TrPs, Triassic and Permian Spearfish Formation and Equivalents; TrPg, Triassic and Permian Goose Egg Formation and equivalents; PPm, Permian and Pennsylvanian Minnelusa Formation and equivalents. For description of map units, see Love and Christiansen (1985). Datum is mean sea level. Vertical exaggeration for all cross sections, x10.