Thickness

The thickness of the upper aquifer unit in the Western Interior Plains is depicted in geohydrologic section *B-B'* (fig. 5) and on the accompanying thickness map (fig. 6). The thickness of the upper aquifer unit ranges from a few feet near the edges of the Nemaha Anticline, the Cambridge Arch, the Central Kansas Uplift, and the Pratt Anticline to about 1,500 feet in the Hugoton Embayment in Clark County (fig. 6). The Forest City and the Cherokee Basins are located east of the Nemaha Anticline and are separated by the Bourbon Arch (fig. 2). North of the Bourbon Arch, the unit generally thickens to the northeast into the Forest City Basin to a maximum of about 300 to 400 feet, except where it is interrupted by an area about 100 feet thick that trends northeastward from Linn County to Pottawatomie County. South of the Bourbon Arch, the unit thickens to the south and southwest into the Cherokee Basin, with the thickest area (about 400 feet) near the Nemaha Anticline (compare figs. 2 and 6).

West of the Nemaha Anticline are the Sedgwick and the Salina Basins. In the Salina Basin, the area of greatest thickness (400–500 feet) of the upper aquifer unit is adjacent to the Central Kansas Uplift in the southwestern part of the basin. At the center of the Sedgwick Basin in Harvey and Sedgwick Counties, the thickness of the upper aquifer unit ranges from about 200 to 400 feet and thins gradually east and west toward the Nemaha and the Pratt Anticlines.

In the northern area of the Hugoton Embayment west of the Cambridge Arch, the upper aquifer unit is rather thin with a somewhat constant thickness of 100 to 500 feet as indicated by rather widely spaced contours (fig. 6). From this broad, thin area in northwestern Kansas and from the flanks of the Central Kansas Uplift and the Pratt Anticline, the upper aquifer unit thickens abruptly to about 1,500 feet into the deeper part of the Hugoton Embayment near the Kansas-Oklahoma State line. This abrupt thickening is indicated by more closely spaced contours in this area than the area to the north.

Well Yields

The upper aquifer unit in the Western Interior Plains aquifer system is used as a source of water in and adjacent to the outcrop area in southeastern Kansas, except where contact with former mining sites has degraded the water (Sprull, 1987). Well yields in this upper aquifer unit generally range from 25 to 100 gallons per minute (Macfarlane and others, 1981) but may exceed 1,000 gallons per minute where the rocks are fractured (Abernathy, 1941). The upper aquifer unit is not used as a source of water in the rest of the State because the water is saline.

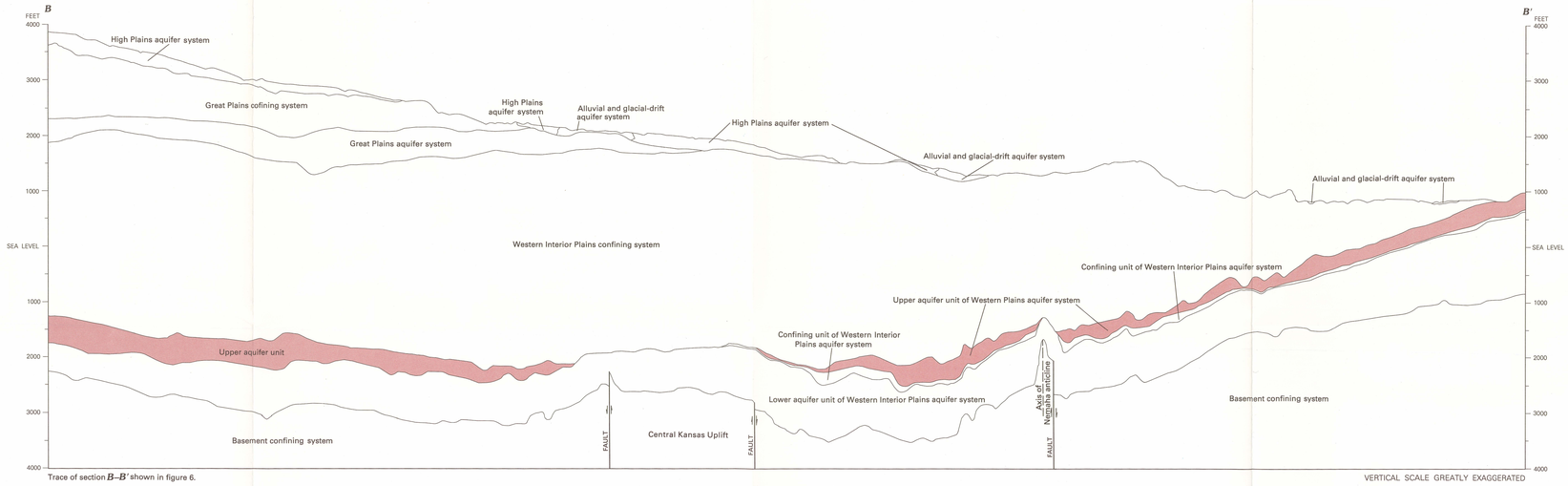
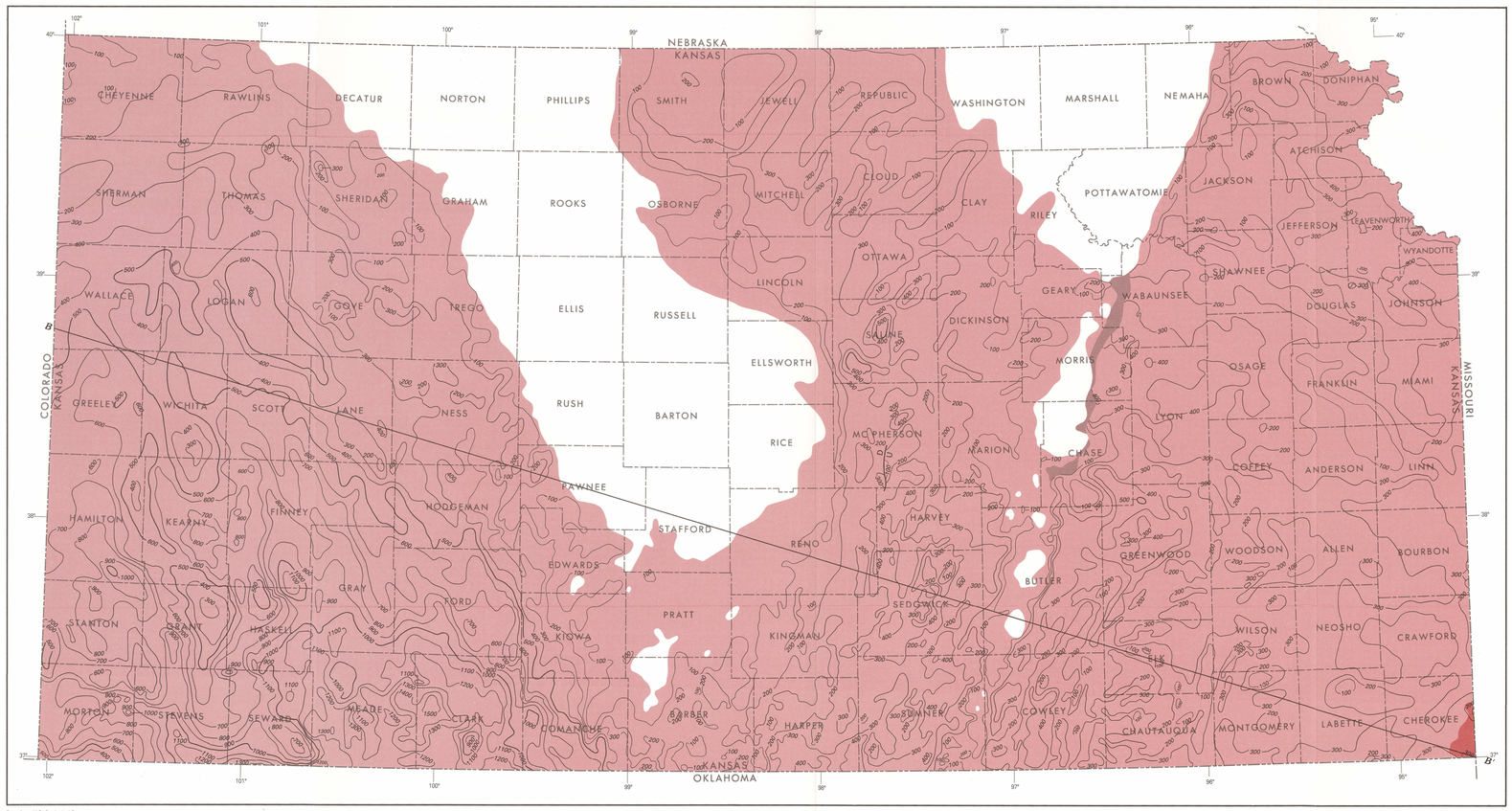


FIGURE 5.—Geohydrologic section showing relative thickness of upper aquifer unit.



Base from U.S. Geological Survey
State base map, 1:500,000, 1984

SCALE 1:1,000,000
0 10 20 30 40 MILES
0 20 40 KILOMETERS

FIGURE 6.—Geohydrologic map showing thickness of upper aquifer unit.

EXPLANATION

- AREA OF UPPER AQUIFER UNIT
- AREA WHERE UPPER AQUIFER UNIT IS EXPOSED
- AREA WHERE UPPER AQUIFER UNIT IS ABSENT
- AREA OF ABRUPTLY CHANGING THICKNESS
- 100 — LINE OF EQUAL THICKNESS OF UPPER AQUIFER UNIT—Interval 100 feet
- U/D — FAULT—U, upthrown side; D, downthrown side
- B — B' TRACE OF SECTION

SELECTED REFERENCES

Abernathy, G.E., 1941, Ground-water resources of Mississippian and older rocks in Bourbon, Crawford, Cherokee, and Labette Counties, southeastern Kansas: Kansas Geological Survey Bulletin 38, pt. 8, p. 221–236.

Adkison, W.L., editor, 1966, Stratigraphic cross section of Paleozoic rocks—Colorado to New York: American Association of Petroleum Geologists Cross Section Publication 4, 58 p.

Goebel, E.D., and Stewart, G.F., 1979, Kansas, *in* Craig, L.C., and Connor, C.W., coords., Introduction and regional analyses of the Mississippian System, pt. 1 of Paleotectonic investigations of the Mississippian System in the United States: U.S. Geological Survey Professional Paper 1010-G, G113-G122.

Imes, J.L., 1990, Major geohydrologic units in and adjacent to the Ozark Plateaus province, Missouri, Arkansas, Kansas, and Oklahoma: U.S. Geological Survey Hydrologic Investigations Atlas HA-711-A, scale 1:750,000, 1 sheet.

Jorgensen, D.G., and Signor, D.C., 1981, Plan of study for the Central Midwest Regional Aquifer-System Analysis in parts of Arkansas, Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, South Dakota, and Texas: U.S. Geological Survey Water-Resources Investigations Open-File Report 81–206, 28 p.

Macfarlane, P.A., Whittemore, D.O., and Hathaway, L.R., 1981, The hydrogeology and chemical quality in the lower Paleozoic aquifers in southeast Kansas and adjoining areas of Missouri and Oklahoma: Kansas Geological Survey Open-File Report 81–16, 48 p.

Merriam, D.F., 1960, Preliminary regional structural contour map on top of Mississippian rocks in Kansas: Kansas Geological Survey Oil and Gas Investigation No. 22, scale 1:633,600, 1 sheet.

_____1963, The geologic history of Kansas: Kansas Geological Survey Bulletin 162, 317 p.

Spinazola, J.M., Wolf, R.J., and McGovern, H.E., in press, Geohydrologic systems in Kansas—Physical framework of the Great Plains Aquifer system: U.S. Geological Survey Hydrologic Investigations Atlas HA-722-B, scale 1:1,000,000, 2 sheets.

Sprull, T.B., 1987, Assessment of water resources in lead-zinc mined areas in Cherokee County, Kansas, and adjacent areas: U.S. Geological Survey Water-Supply Paper 2268, 68 p.

Wolf, R.J., Hansen, C.V., McGovern, H.E., and Spinazola, J.M., 1990, Geohydrologic units in Kansas with emphasis on systems in Upper Cambrian through Lower Cretaceous rocks: U.S. Geological Survey Hydrologic Investigations Atlas HA-722-A, scales 1:1,500,000 and 1:2,000,000, 2 sheets.

Wolf, R.J., McGovern, H.E., and Spinazola, J.M., in press, Geohydrologic systems in Kansas—Physical framework of the Western Interior Plains confining system: U.S. Geological Survey Hydrologic Investigations Atlas HA-722-C, scale 1:1,000,000, 2 sheets.

Zeller, D.E., editor, 1968, The stratigraphic succession in Kansas: Kansas Geological Survey Bulletin 189, 81 p.

GEOHYDROLOGIC SYSTEMS IN KANSAS—PHYSICAL FRAMEWORK OF THE UPPER AQUIFER UNIT IN THE WESTERN INTERIOR PLAINS AQUIFER SYSTEM

By
C. V. Hansen, E. J. Underwood, R. J. Wolf, and J. M. Spinazola

1992

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1992