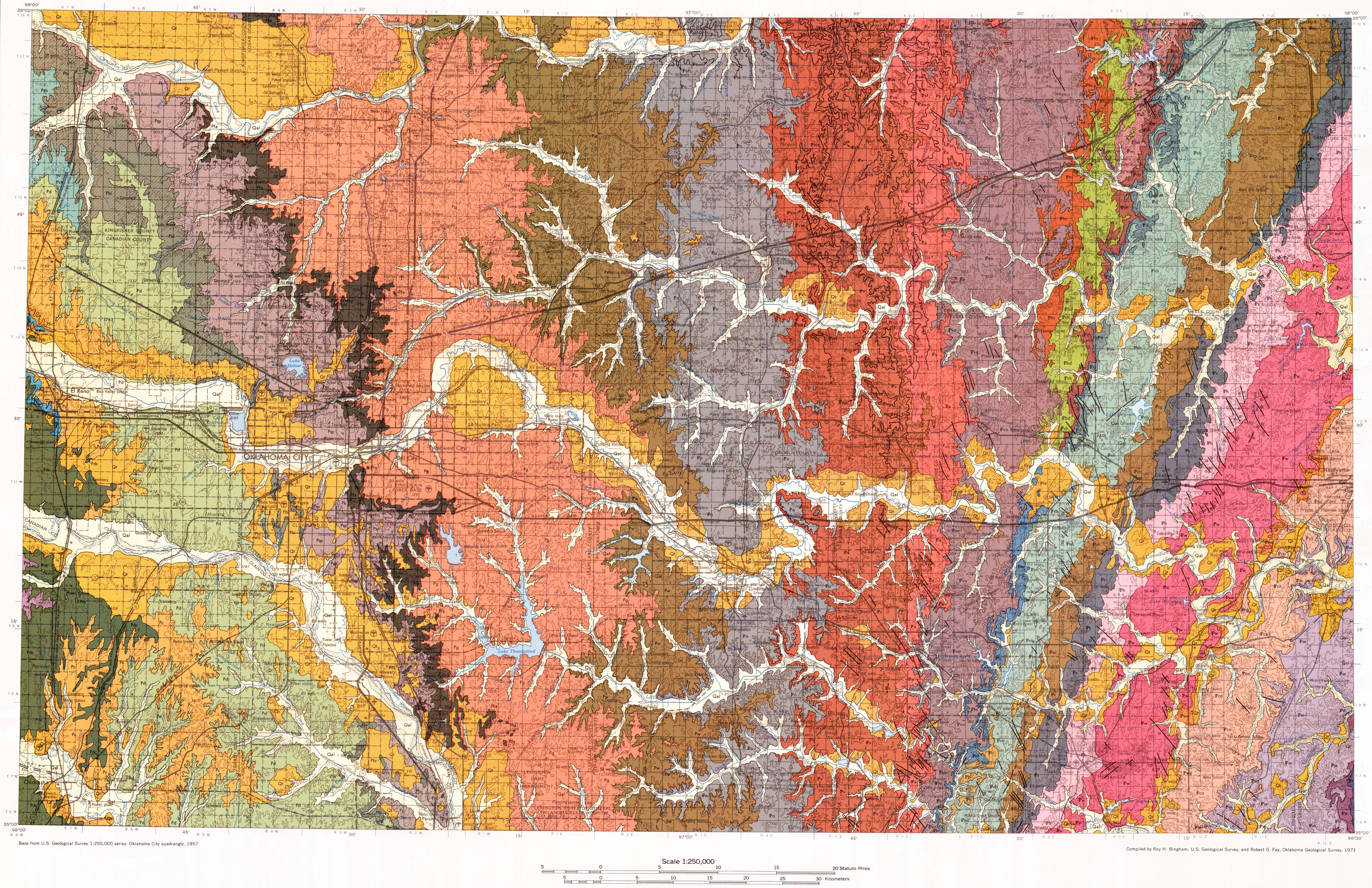

Base from U.S. Geological Survey 1:250,000 series: Oklahoma City quadrangle, 1957

Compiled by Roy H. Bingham, U.S. Geological Survey, and Robert O. Fay, Oklahoma Geological Survey, 1973

Figure 2. Geologic map.

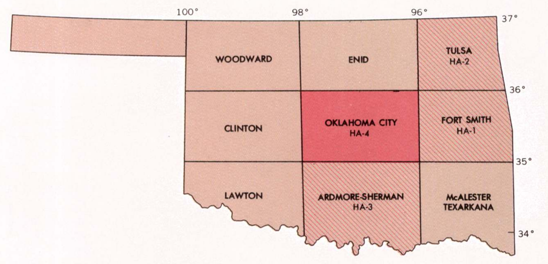

Figure 1. Location of Oklahoma City quadrangle.

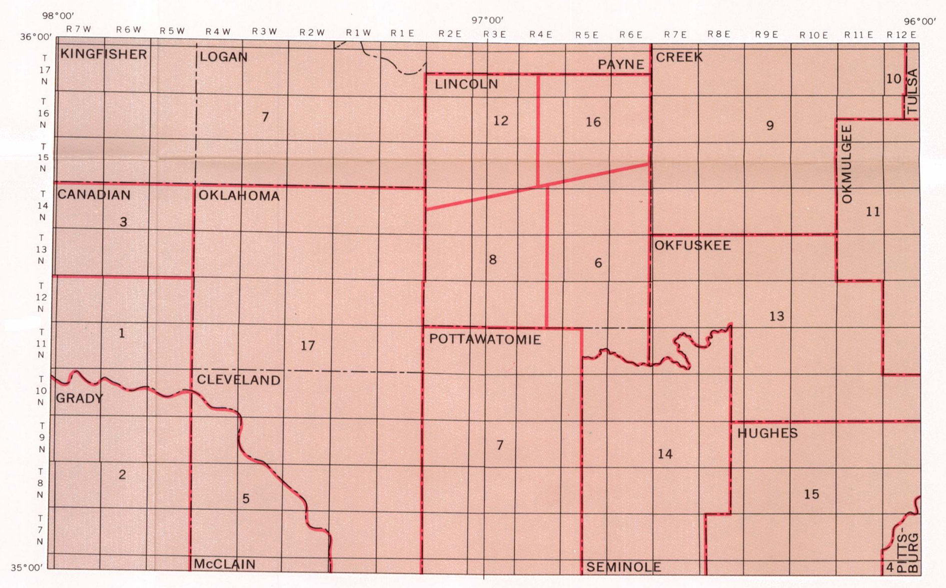

Figure 3. Index to geologic mapping.

EXPLANATION

The stratigraphic nomenclature and age determinations used herein are those accepted by the Oklahoma Geological Survey and do not necessarily agree with those of the U.S. Geological Survey.

QUATERNARY — Holocene

Qal — ALLUVIUM

Sand, silt, clay, and lenticular beds of gravel. Thickness ranges from about 30 to 100 feet and probably averages about 50 feet along major streams. Along minor streams, thickness ranges from a few feet to about 50 feet and probably averages about 25 feet. Alluvium is a major aquifer in parts of quadrangle.

QUATERNARY — Pleistocene

Qt — TERRACE DEPOSITS

Lenticular beds of sand, silt, clay, and gravel. Thickness ranges from a few feet to about 100 feet and probably averages about 50 feet along major streams. These deposits are major aquifers along Cimarron, Canadian, and North Canadian Rivers.

UNCONFORMITY

PERMIAN — Custerian — Whitehorse Group

Pm — MARLOW FORMATION

Mostly orange-brown fine-grained gypsiferous sandstone, with some red-brown shale. Contains 10 feet of calcitic sandstone lenses near middle and 2 thin dolomites (or gypsums) at top. Exposed thickness, about 50 feet (top 50 to 75 feet eroded).

PERMIAN — Cimarronian — El Reno Group

Pdc — DOG CREEK SHALE

Mostly red-brown silty shale and some fine-grained sandstone. Contains one or two layers of thin dolomite (or gypsum) in lower part; basal part grades southward into Chickasha Formation. Thickness averages about 200 feet near Minco and 130 feet near Chickasha.

Pb — BLAINE FORMATION

Mostly thin gypsums with thin dolomites below each gypsum, interbedded with red-brown shale; grades southward into Chickasha Formation. Thickness, 50 to 75 feet.

Pf — FLOWERPOT SHALE

Mostly red-brown silty clay shale with stringers of gypsum (satin spar and selenite); grades southward into Chickasha Formation. Thickness, 20 to 40 feet.

Pc — CHICKASHA FORMATION

Variegated mudstone conglomerate and red-brown to orange-brown silty shale and siltstone, with minor amounts of orange-brown fine-grained sandstone; upper part grades northward into Dog Creek Shale, Blaine Formation, Flowerpot Shale, and upper part of Cedar Hills Sandstone; lower part grades into Duncan Sandstone. Thickness, about 100 feet near Chickasha and 300 feet near Okarche.

Pd — DUNCAN SANDSTONE

Mainly red-brown to orange-brown fine-grained sandstone, with some mudstone conglomerate and shale; grades northward into Cedar Hills Sandstone and Chickasha Formation. Thickness, 450 feet near Chickasha, 300 feet near Oklahoma City, and 100 feet or more near Okarche.

Pch — CEDAR HILLS SANDSTONE

Lenticular beds of orange-brown fine-grained sandstone and red-brown shale; lower part grades southward into Duncan Sandstone. *Piedmont Sandstone Bed* at base. Thickness, 180 feet (only lower 80 feet exposed in mapped area).

PERMIAN — Cimarronian — Hennessey Group

Pbi — BISON FORMATION

Mostly red-brown shale; grades northward into many thin greenish-gray calcitic siltstones and some orange-brown fine-grained sandstones and siltstones. *Reeding Sandstone Bed* at base. Thickness ranges from 95 feet in south to 120 feet in north.

Psp — SALT PLAINS FORMATION

Red-brown blocky shale and orange-brown siltstone, grades southward into Purcell Sandstone in Norman area. Thickness, 200 feet.

Pk — KINGMAN SILTSTONE

Orange-brown to greenish-gray, even-bedded siltstones, with some fine-grained sandstone and red-brown shale; grades southward into Purcell Sandstone. Thickness, 30 feet.

Pp — PURCELL SANDSTONE

Red-brown to maroon fine- to coarse-grained sandstone, mudstone conglomerate, and red-brown shale. Thickness, 150 feet.

Pfa — FAIRMONT SHALE

Red-brown blocky shale; grades into Garber Sandstone at base. Thickness, 30 feet at Oklahoma City, 110 feet near Purcell, and 120 feet near Kingfisher.

PERMIAN — Cimarronian — Sumner Group

Pg — GARBER SANDSTONE

Mostly orange-brown to red-brown fine-grained sandstone, irregularly bedded with red-brown shale and some chert and mudstone conglomerate. Thickness ranges from 150 feet in south to 400 feet or more in north. The Garber and underlying Wellington are major aquifers in Cleveland and Oklahoma Counties.

Pw — WELLINGTON FORMATION

Red-brown shale and orange-brown fine-grained sandstone, containing much maroon mudstone conglomerate and chert conglomerate to south. Thickness ranges from about 150 feet in south to 500 feet in north.

PENNSYLVANIAN — Gearyan

IPowi, IPofr, IPowr, IPo, IPoc — OSCAR GROUP

Red-brown to gray shale and orange-brown fine-grained, crossbedded sandstone; grades southward into arkosic sandstone and conglomerate. Includes *Herington Limestone* at top in Payne County, *Neva Limestone* (0.2 to 1.2 feet thick) at base in Lincoln County, and *Hart Limestone* (4 to 10 feet thick) at base in Pottawatomie County. In Payne County, includes thin stringers of *Winfield Limestone,* IPowi (75 feet below top), *Fort Riley Limestone,* IPofr (245 feet below top), *Wreford Limestone,* IPowr (345 feet below top), and *Cottonwood Limestone,* IPoc (525 feet below top). Thickness ranges from 300 feet in south to 600 feet in north.

IPvre, IPvlc, IPva, IPv, IPvb, IPvg, IPve — VANOSS GROUP

Red-brown to gray shale and orange-brown fine-grained, crossbedded sandstone; grades southward into arkosic sandstone and conglomerate. Includes many thin limestone beds and shale units north of North Canadian River (descending): *Roca Shale* (75 feet thick), *Red Eagle Limestone,* IPvre (3 to 8 feet thick), *Johnson Shale* (60 feet thick), *Long Creek Limestone,* IPvlc (9 to 12 feet thick), *Hughes Creek Shale* (52 feet thick), *Americus Limestone,* IPva (1.0 to 2.5 feet thick), *Admire Shale* (70 feet thick), *Brownville Limestone,* IPvb (1 to 3 feet thick), *Pony Creek Shale* (75 feet thick), *Grayhorse Limestone,* IPvg (1 foot thick), unnamed shale (70 feet thick), *Elmont Limestone,* IPve (1.2 to 7.8 feet thick), *Stonebreaker Shale* (60 feet thick), and *Reading Limestone* (1.5 feet thick), at base. Total thickness of group ranges from 250 feet in south to 490 feet in north.

PENNSYLVANIAN — Virgilian

IPaw, IPab, IPa, IPat — ADA GROUP

Mostly orange-brown fine-grained sandstone and red-brown to gray shale; grades southward into chert conglomerates. Includes the following thin limestone beds and shale units north of North Canadian River (descending): *Auburn Shale* (80 feet thick), *Wakarusa Limestone,* IPaw (1 to 6 feet thick), unnamed shale (95 feet thick), *Bird Creek Limestone,* IPab (1 to 9 feet thick), *Severy-Aarde Shale* (45 feet thick), *Turkey Run Limestone,* IPat (1 foot thick), unnamed shale (45 feet thick), and *Lecompton Limestone* (1.5 to 10 feet thick), at base. Total thickness of group ranges from 100 feet in south to 280 feet in north.

IPva — VAMOOSA FORMATION

Alternating thin to massive layers of fine- to coarse-grained sandstone and sandy, silty shale containing some chert conglomerate in middle and lower parts of formation. Thickness ranges from about 200 to about 690 feet.

UNCONFORMITY

PENNSYLVANIAN — Missourian

IPht — HILLTOP FORMATION

Mainly shale, grading upward into massive siltstone and fine-grained sandstone; grades northward into Barnsdall Formation, Chanute Formation, and Dewey Limestone. Thickness ranges from 0 to 200 feet.

IPb — BELLE CITY LIMESTONE

Consists of two fossiliferous limestone units with an intervening fossiliferous shale. Thickness ranges from 12 to 20 feet; present in southern part of area only, where it is below Hilltop Formation.

IPta — TALLANT FORMATION

Mostly fine- to medium-grained sandstone 10 to 60 feet thick overlain by shale 25 to 65 feet thick. Cut out by Vamoosa Formation in central part of area. Total thickness ranges from 0 to 100 feet.

IPbd — BARNSDALL FORMATION

Mostly fine-grained sandstone overlain by shale; may grade northward into Wann Formation. Thickness ranges from about 80 to about 200 feet.

IPwi — WANN FORMATION and IOLA LIMESTONE

Wann Formation, shale and fine- to medium-grained sandstone; thickness, 40 to 180 feet. Underlying *Iola Limestone,* mainly fine-grained calcareous sandstone and limestone with some shale; thickness, 15 to 20 feet.

IPch — CHANUTE FORMATION

Mainly fine- to medium-grained sandstone 3 to 20 feet thick, overlain by shale 20 to 80 feet thick. Total thickness ranges from about 25 to 90 feet.

IPd — DEWEY LIMESTONE

Mainly sandy limestone or calcareous sandstone containing limestone lenses 1.5 to 20 feet thick, overlain by shale 5 to 50 feet thick. Total thickness ranges from 20 to 60 feet.

IPnh — NELLIE BLY FORMATION and HOGSHOOTER LIMESTONE

Nellie Bly Formation, mainly shale with many fine-grained sandstone beds and limestone beds locally in upper part; thickness, about 250 to about 550 feet. Underlying *Hogshooter Limestone,* massive crinoidal limestone 1 to 15 feet thick.

IPcc — COFFEYVILLE FORMATION and CHECKERBOARD LIMESTONE

Coffeyville Formation, mainly shale interbedded with fine- to medium-grained sandstone locally containing chert and limestone conglomerate and thin coal seams; thickness, 150 to 470 feet. Underlying *Checkerboard Limestone,* crystalline limestone 2.5 to 5 feet thick.

IPs — SEMINOLE FORMATION

Chert conglomerate, shale, and fine-grained sandstone containing coal seams in upper part locally. Thickness ranges from 100 to 375 feet.

PENNSYLVANIAN — Desmoinesian

IPh — HOLDENVILLE SHALE

Mainly clay shale with some interbedded fine-grained calcareous sandstone locally containing beds of crystalline limestone. Thickness ranges from 100 to 280 feet.

IPw — WEWOKA FORMATION

Interbedded fine- to medium-grained sandstone and calcareous shale. Thickness ranges from 400 to 750 feet.

IPwe — WETUMKA SHALE

Mainly sandy, silty, laminated shale 100 to 200 feet thick.

IPca — CALVIN SANDSTONE

Medium-grained, thin-bedded to massive sandstone and silty shale. Thickness ranges from 230 to about 440 feet.

IPse — SENORA FORMATION

Mainly fine-grained micaceous sandstone and shale locally containing coal beds. Thickness ranges from about 500 to 950 feet.

IPst — STUART SHALE

Mostly laminated clay shale and minor amounts of silty sandstone. Thickness ranges from 80 to 180 feet.

IPt — THURMAN SANDSTONE

Mainly medium-grained, silty sandstone with cherty conglomerate at base. Only a few feet exposed in quadrangle.

Contact

U / D

Fault, approximately located; dotted where concealed; U, upthrown side; D, downthrown side.

INTRODUCTION

Urbanization, economic growth, and improved standards of living in rural areas of Oklahoma have resulted in requirements for ever-increasing amounts of water. Basic information on the availability and usability of water is needed in many parts of the State by planners and individual water users for development of this vital resource. To provide this information on a regional basis, the U.S. Geological Survey in cooperation with the Oklahoma Geological Survey is making reconnaissance appraisals of the water resources, with special emphasis on ground water, throughout the State. The Oklahoma City quadrangle, which includes about 7,800 square miles in central Oklahoma (fig. 1), was selected for appraisal because of the need for information on the distribution and hydrologic characteristics of the various aquifers and on the chemical quality of ground water, and the need for summaries of available data on the chemical quality and availability of surface water. The Oklahoma City quadrangle is the fourth area in the State to receive such an appraisal study.

Information used to appraise the water resources of the Oklahoma City quadrangle was obtained in the field, taken from U.S. Geological Survey reports and files, or obtained from published and unpublished records of State and Federal agencies. Special acknowledgment for providing useful information is due the U.S. Army Corps of Engineers, the U.S. Public Health Service, the Farmers Home Administration, the U.S. Soil Conservation Service, the Oklahoma Water Resources Board, and city officials. The cooperation and assistance of many individuals who provided useful information are also acknowledged.

Additional studies are needed to determine the potential of alluvium and terrace deposits along the tributaries to Deep Fork, Cimarron, North Canadian, and Canadian Rivers as a source of industrial and municipal water supplies.

Expansion of the large-capacity well fields in the Garber Sandstone and Wellington Formation, particularly in Norman, Oklahoma City, and Edmond, will expand the cone of depression in water levels. The effects of such expansion will reduce the amount of water available and will probably cause deterioration of water quality. The areal extent and intensity of those effects need to be determined.

GEOLOGIC SETTING

Most of the Oklahoma City quadrangle is underlain by rocks of Pennsylvanian and Permian age (fig. 2). The regional dip, which averages about 40 feet per mile, is toward the northwest at the east edge of the area and toward the southwest at the west edge. The rocks dip toward the west near the center of the area where the formations of Pennsylvanian age pass beneath the rocks of Permian age. Erosion has formed a gently rolling surface interrupted by east-facing escarpments and isolated buttes capped by resistant sandstone except in parts of Hughes and Okfuskee Counties, where deep valleys have been formed in shale.

In the eastern third of the quadrangle, many northwest-striking faults form a generally northeastward trend. Most of the faults are parallel and apparently were formed during Late Pennsylvanian time as a result of uplift of the Nemaha ridge.

SOURCES OF GEOLOGIC INFORMATION

The sources of information used to compile the geologic map in the Oklahoma City quadrangle are listed below; the area included in each source is shown in figure 3.

1. ARMSTRONG, B. D., 1958, Areal geology of southeastern Canadian County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 64 p. (Geologic map revised by R. O. Fay, 1969.)
2. DAVIS, L. V., 1955, Geology and ground-water resources of Grady and northern Stephens Counties, Oklahoma: Oklahoma Geological Survey Bulletin 73, 184 p. (Geologic map revised by R. O. Fay, 1969.)
3. GILLUM, C. C., 1958, Areal geology of northeast Canadian County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 70 p. (Geologic map revised by R. O. Fay, 1969.)
4. GOVETT, RAY, 1957, The geology of the Cabaniss-Arpelar area, Pittsburg County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 60 p.
5. MARKAS, J. M., 1965, Geology of northern McClain County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 128 p. (Geologic map revised by R. O. Fay, 1970.)
6. MASTERS, K. E., 1955, Geology of the Prague area, Lincoln and Pottawatomie Counties, Oklahoma: University of Oklahoma unpublished M.S. thesis, 37 p. (Geologic map revised by R. O. Fay, 1970.)
7. MISER, H. D., and others, 1954, Geologic map of Oklahoma: U.S. Geological Survey and Oklahoma Geological Survey, scale 1:500,000. (Revisions made by R. O. Fay, 1970–71.)
8. MORGAN, B. R., 1958, Geology of southwestern Lincoln County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 129 p. (Geologic map revised by R. O. Fay, 1970.)
9. OAKES, M. C., 1959, Geology and mineral resources of Creek County, Oklahoma: Oklahoma Geological Survey Bulletin 81, 60 p.
10. OAKES, M. C., DILLE, G. S., and WARREN, J. H., 1952, Geology and mineral resources of Tulsa County, Oklahoma: Oklahoma Geological Survey Bulletin 69, 234 p.
11. OAKES, M. C., and MOTTS, W. S., 1963, Geology and water resources of Okmulgee County, Oklahoma: Oklahoma Geological Survey Bulletin 91, 164 p.
12. POWNELL, L. D., 1957, Surface geology of northwestern Lincoln County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 65 p. (Geologic map revised by R. O. Fay, 1970.)
13. RIES, E. R., 1954, Geology and mineral resources of Okfuskee County, Oklahoma: Oklahoma Geological Survey Bulletin 71, 120 p.
14. TANNER, W. F., 1956, Geology of Seminole County, Oklahoma: Oklahoma Geological Survey Bulletin 74, 175 p.
15. WEAVER, O. D., JR., 1954, Geology and mineral resources of Hughes County, Oklahoma: Oklahoma Geological Survey Bulletin 70, 150 p.
16. WEST, A. E., 1955, Surface geology of northeastern Lincoln County, Oklahoma: University of Oklahoma unpublished M.S. thesis, 53 p. (Geologic map revised by R. O. Fay, 1970.)
17. WOOD, P. R., and BURTON, L. C., 1968, Ground-water resources in Cleveland and Oklahoma Counties, Oklahoma: Oklahoma Geological Survey Circular 71, 75 p. (Geologic map revised by R. O. Fay, 1970.)

FIGURE B-18

RECONNAISSANCE OF THE WATER RESOURCES OF THE OKLAHOMA CITY QUADRANGLE, CENTRAL OKLAHOMA

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