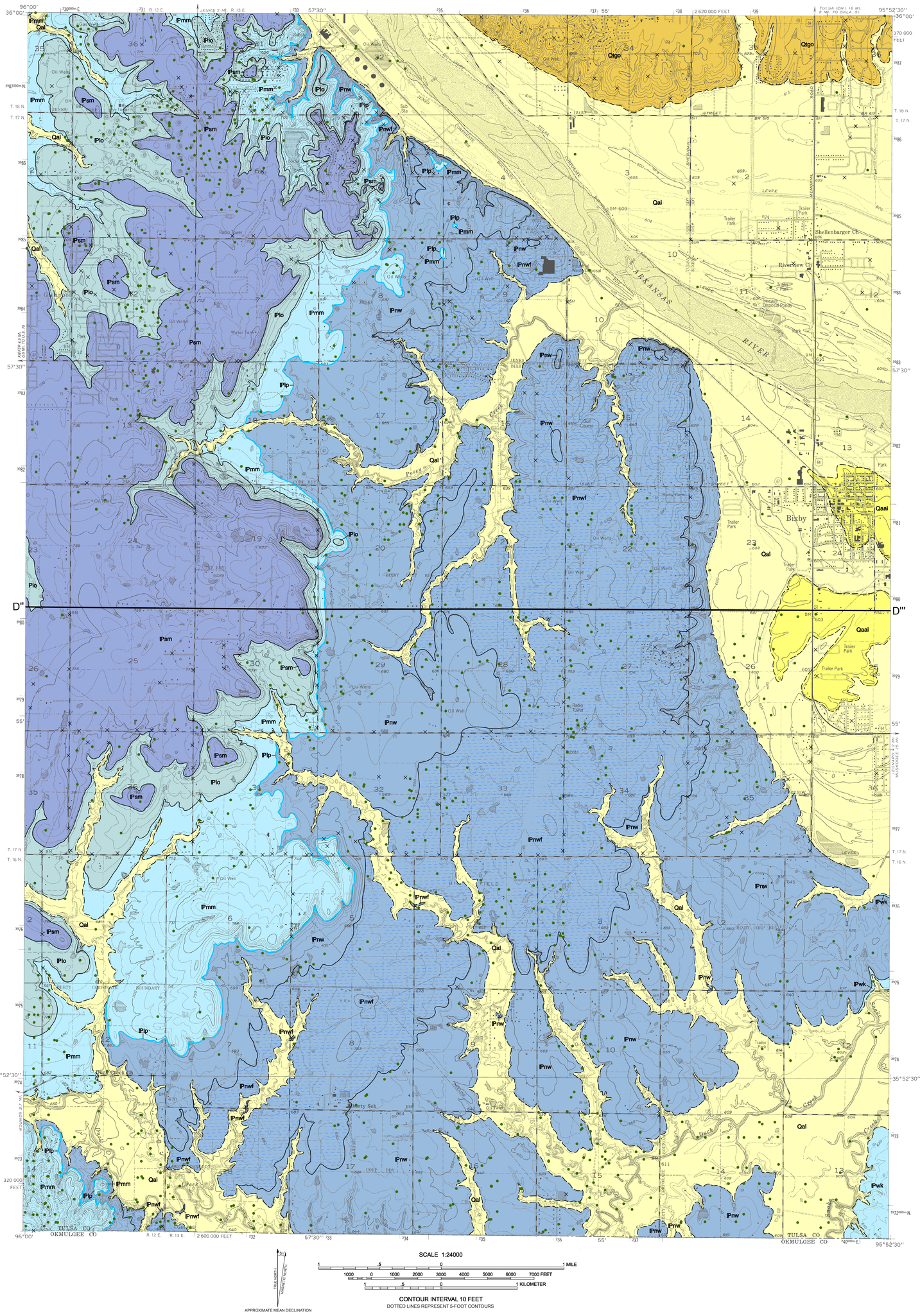
OKLAHOMA GEOLOGICAL SURVEY
G. Randy Keller, *Director*

USGS science for a changing world

Oklahoma Geologic Quadrangle **OGQ-75**
Geologic Map of the Bixby 7.5′ Quadrangle

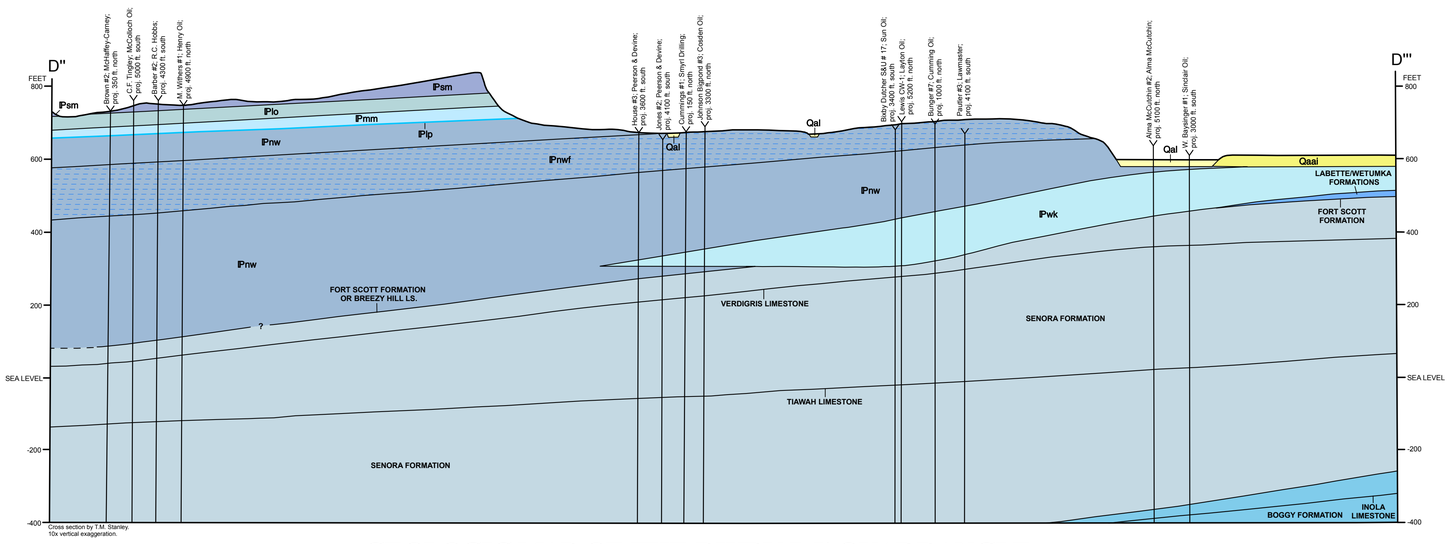


SCALE 1:24000

1 0 .5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS

APPROXIMATE MEAN DECLINATION



Cross section by T.M. Stanley.
10x vertical exaggeration.

GEOLOGIC MAP OF THE BIXBY 7.5′ QUADRANGLE, TULSA COUNTY, OKLAHOMA

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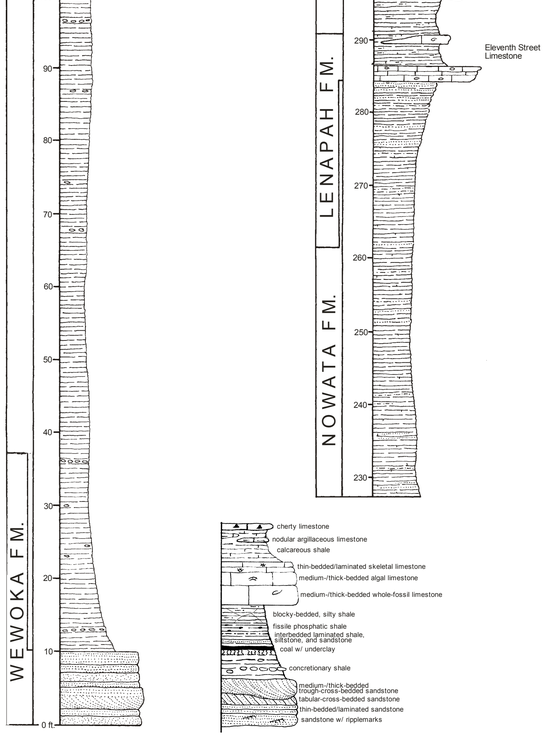
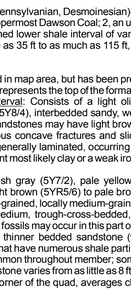
STANDARD REFERENCE SECTION

Main stratotype section for the Bixby 7.5-minute quadrangle showing principal formations, members , and beds, their relative stratigraphic positions, general lithologic textures, and average thicknesses. Formal member and bed names are indicated by capitalization (i.e., Tulsa Sandstone), while informal names are given in lowercase (i.e., Nowata flagstone). Unit names followed by a '?' indicate that the member or bed was not observed in the field area, but has been reported in adjacent areas or in the subsurface.



CORRELATION OF MAP UNITS



DESCRIPTION OF UNITS*

Qal ALLUVIUM (Holocene)—Clay, silt, sand, and gravel in channels and on flood plains of modern streams. Includes terrace deposits of similar composition located directly above and adjacent to modern channels and flood plains. Thickness: 0 to about 30 ft.

Qaai ALLUVIUM OF ARKANSAS RIVER OF INTERMEDIATE AGE (Holocene and Pleistocene(?))—Clay, silt, sand, and minor gravel on, adjacent to, and 10 to 20 ft above, modern flood plains of the Arkansas River. Area rarely subject to flooding. Thickness: unknown, most likely between 20 to 50 ft.

Qtgo REMNANTS OF OLDER TERRACE DEPOSITS (Pleistocene)—Clay, silt, sand, and gravel adjacent to the flood plain of the Arkansas River. Sand commonly is medium- to rarely coarse-grained and very light colored; when present, gravel locally consists of concentrations of local and distally derived, subrounded pebble and cobble-sized clasts of limestone and dolomite composition. The upper third to half of the deposit exhibits signs of aeolian reworking and modification that suggests a prevailing northeast wind direction throughout the Holocene. Thickness: 0 to as much as 100 ft.

Psm SEMINOLE FORMATION (Pennsylvanian, Missourian)—Formation consists of a lower sandstone interval, called the Tulsa Sandstone, and a basal and upper suite of interlaminated, concretionary, silty clayshales, mudshales and siltstones. The Tulsa coal also occurs within the uppermost shale interval, just above the top of the Tulsa Sandstone.

The Tulsa Sandstone starts anywhere from 6 to 15 ft above the base of the formation, and consists of a pale yellowish orange (10YR8/6) to light brown (5YR5/6) color, and with distinct dark yellowish orange (10YR6/6) weathering spots, weak to moderately indurated, thin to medium bedded, very fine- to fine-grained argillaceous and micaceous sandstone; sandstone mostly siliceous, but may have a weak calcite cement within some bedding intervals. Unit appears as a series of stacked channels sequences, where an individual sequence may vary between 2 to 4 ft thick, and which are separated by a 6-12" thick interval of interlaminated calcareous, silty clayshale and siltstone; bedding at base of each sequence is thicker (varying from 12-24") and has channel-form lower surfaces, which grade up into thinner (3-5" thick) and planar bedded sandstone sequences. Horizontal burrows and tool marks common along the base of beds, while tabular cross bedding evident within bed interiors. Beds often appear pitted due to the weathering out of horizontal burrows. Thickness of the member varies from 30 ft in the northern part of the quad, and thinning to as little as 8 ft in the southwest part of the quad.

A dark yellowish orange (10YR6/6), pale yellowish orange (10YR8/6), to light olive gray (5Y6/1), laminated, slightly silty, concretionary clayshales interlaminated with mudshales and siltstones occur above and below the Tulsa Sandstone. Siltstone intervals are ripple-marked, and also have abundant horizontal trace fossils. Concretionary material occurring as discontinuous lenses and beds within clayshales that vary from 1-6" thick.

Float chips of the Tulsa coal have been observed in a shallow drainage located in the SE1/4, SE1/4, Sec. 35, T.17N., R.12E.

Only the lower 63 ft of the formation is exposed in the quad.

Plo LOST BRANCH FORMATION (Pennsylvanian, Desmoinesian)—Poorly exposed, except for the Glenpool Limestone bed. Overall, a light brown (5YR6/4) to pale yellowish brown (10YR6/2), locally medium light gray (N6), laminated, slightly calcareous, micaceous, silty clayshale. Basal 3 ft of formation, just above the Dawson Coal, consists of a medium dark gray (N4) to dark gray (N3), well-laminated to fissile, phosphatic mudshale to clayshale called the Nuyaka Creek shale bed. The top of the formation is marked at the top the Glenpool Limestone, which is a dusky yellow (5Y6/4) to pale olive (10Y6/2), 1-1.5 ft thick, laminated, wavy-bedded packstone to whole fossil wackestone in upper half, grading down into an argillaceous unfossiliferous carbonate mudstone in lower part of bed; brachiopods, gastropods, and crinoid debris the most common fossils. Thickness of the Lost Branch ranges from 1 to 40 ft thick, averages closer to 35 ft thick across the map area.

Pmm MEMORIAL FORMATION (Pennsylvanian, Desmoinesian)—May consist of four members, these are in descending order: 1, the uppermost Dawson Coal; 2, an unnamed upper shale interval; 3, the Jenks Sandstone; and 4, an unnamed lower shale interval of variable thickness. Overall thickness of the formation varies from as little as 35 ft to as much as 115 ft, dependant on the thickness of the Jenks Sandstone.

Dawson Coal: Unobserved in map area, but has been previously reported by Bennison and others (1972), and Oakes (1952). It represents the top of the formation.

unnamed upper shale interval: Consists of a light olive brown (5Y5/6), grayish orange pink (5YR7/2), to grayish yellow (5Y8/4), interbedded sandy, weakly calcareous mudstones, and friable, fine-grained sandstones. Sandstones may have light brown (5YR6/4) oxide spots. Mudstones are blocky bedded, with numerous concave fractures and slickensides that are indicative of paleosol development. Sandstones generally laminated, occurring as discontinuous beds and lenses within mudstones; sandstone cement most likely clay or a weak iron-oxide. Thickness of interval varies from 2 to 8 ft thick.

Jenks Sandstone: Yellowish gray (5Y7/2), pale yellowish brown (10YR6/2), to dark yellowish orange (10YR6/2), locally light brown (5YR5/6) to pale brown (5YR5/2), friable to weakly indurated, thin- to medium-bedded, fine-grained, locally medium-grained at base, micaceous sandstone. Lower third of sandstone thin to medium, trough-cross-bedded, with bedding varying from 3"-16" thick; horizontal burrrows and plant fossils may occur in this part of the member. The upper two-thirds of the Jenks Sanstone consists of thinner bedded sandstone (with beds ranging from 0.5" to 4" thick, averaging closer to 2" thick) that have numerous shale partings and interbeds (flaser bedding). Clay-ball clasts and flute casts common throughout member; some tabular cross-bedding in middle of unit. Thickness of the Jenks Sandstone varies from as little as 8 ft in the middle of the quad to as much as 90 ft thick in the far southwest corner of the quad, averages closer to 25 ft thick throughout rest of map area.

unnamed lower shale interval: Overall, a light olive gray (5Y6/1) to greenish gray (5GY6/1), poorly laminated, calcareous, slightly silty clayshale; thickness of interval varies from 2 to 8 ft.

Plp LENAPAH LIMESTONE (Pennsylvanian, Desmoinesian)—In the Bixby quad, represented by the Eleventh Street Limestone, which consists of a dark yellowish brown (10YR4/2) to dark yellowish orange (10YR6/6), skeletal to whole fossil wackestone to packstone, to locally a grainstone texture; grainstone and packstone textures may be associated with abundant ooids; crinoid columns and plates are the most dominant fossil, while bryozoans, brachiopods, and bivales also occur. In the northern part of the quad, where the limestone is thickest, the Eleventh Street consists of two limestone beds separated by a 2 to 3 ft thick clayshale interval. In the central and southern part of the quad, the uppermost limestone bed of the Eleventh Street was not observed. Thickness of the Eleventh Street Limestone varies from 6 to 7 ft in the northern part of the quad, to as little as 2 ft thick in the southern part.

Pnw NOWATA FORMATION (Pennsylvanian, Desmoinesian)—Formation can be segregated into three informal units, an upper and lower shale, and an intervening, interbedded limestone and shale interval termed the Nowata flagstones (Pnwf).

Upper and lower shale intervals consist of medium gray (N5), light gray (N7), and light brown (5YR5/6), well laminated to locally fissile, slightly silty, concretionary clayshales, with rare siltstone and very fine-grained sandstone interbeds; coarser-grained terrigenous material and calcite cement more common in upper shale interval, while concretions, usually nodules, are more common in lower shale interval.

The Nowata flagstone interval is 100 to 130 ft of interbedded shale and limestone that normally occurs about 65 ft below the top of the formation. Limestones are a light olive gray (5Y 5/2 to 5Y 6/1) to light brown (5YR6/4), laminated to thin-bedded, argillaceous, carbonate mudstones; bedding is even and planar, with most beds having an uniform thickness of between 0.5-3.0 inches; some limestones beds exhibit internal parallel lamination to possibly a very low-angle cross-lamination; in some exposures, the carbonate mudstones display a prominent rectangular fracture pattern, with fractures sometimes being curved. The interbedded shales are usually a light olive gray (5Y5/2), laminated to well-laminated, calcareous clayshale; shale intervals range between 4-12" thick, except toward the base of the unit where shale intervals may attain a thickness of 10 ft or more.

The flagstone facies is capped by a 12 to 14 ft thick interval consisting of indurated to well-indurated, wavy thin-bedded to laminated, bioturbated, very sandy limestone to very calcareous sandstone; bedding varies from 1-3" thick, with thicker beds more common toward the top; limestone beds usually separated by 1-2" thick intervals of calcareous, silty clayshale; shale intervals becoming more common and thicker toward base of this capping unit.

Further to west, in the subsurface, and to the south, the shales of the Nowata Formation grade into shale and sandstone suites of the Wewoka Formation.

Overall, the thickness of the formation is about 400 ft.

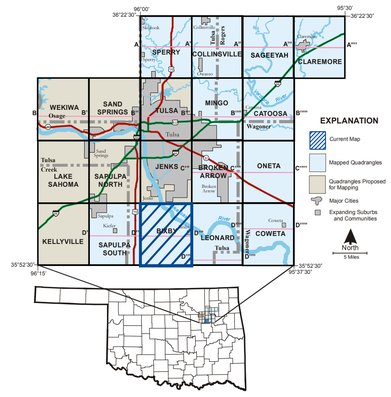
Pwk WEWOKA FORMATION (Pennsylvanian, Desmoinesian)—Poorly exposed in quad, and consists of the more sandstone-dominated facies of the Wewoka Formation of southern Oklahoma. Sandstones are friable, fine-grained, and produce a characteristic sandy soil in contrast to the clay loam formed from the overlying Nowata shales. Only the upper 15 ft is exposed in the quad.

REFERENCES CITED:

Bennison, A.P.; Chenoweth, P.A.; Desjardins, L.A.; and Ferris, C., 1972, Surface geology and Bouguer gravity of Tulsa County, Oklahoma, *in* Bennison, A.P. (ed.), Tulsa's Physical Environment: Tulsa Geological Society Digest, 37, 1 sheet, scale 1:63,360.

Oakes, M.C., 1952, Geology and mineral resources of Tulsa County, Oklahoma (includes parts of adjacent counties): Oklahoma Geological Survey Bulletin, 69, 234 p.

*Detailed descriptions only include mappable units observed in the field. Formal member and bed names are indicated by capitalization (i.e., Glenpool Limestone), while informal names are given in lowercase (i.e., Nowata flagstone). Color of units based on fresh surfaces, unless stated otherwise.



SYMBOLS

— — — Unit contact; dashed where approximate

× Outcrop, geologic observation

• Petroleum well. Includes oil, gas, oil and gas, dry service (water supply or injection), junked and abandoned, unknown. Modified from Natural Resources Information System database

Map Credits

Base map from a USGS topographic map of the Bixby quadrangle, dated 1957 and photorevised 1993. Universal Transverse Mercator projection. 1927 North American Datum. National Geodetic Vertical Datum of 1929. Geology by Thomas M. Stanley and Julie M. Chang, 2008-2009. Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under 08HQAG0020. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government. Cartography and layout prepared by G. Russell Standridge, 2009.