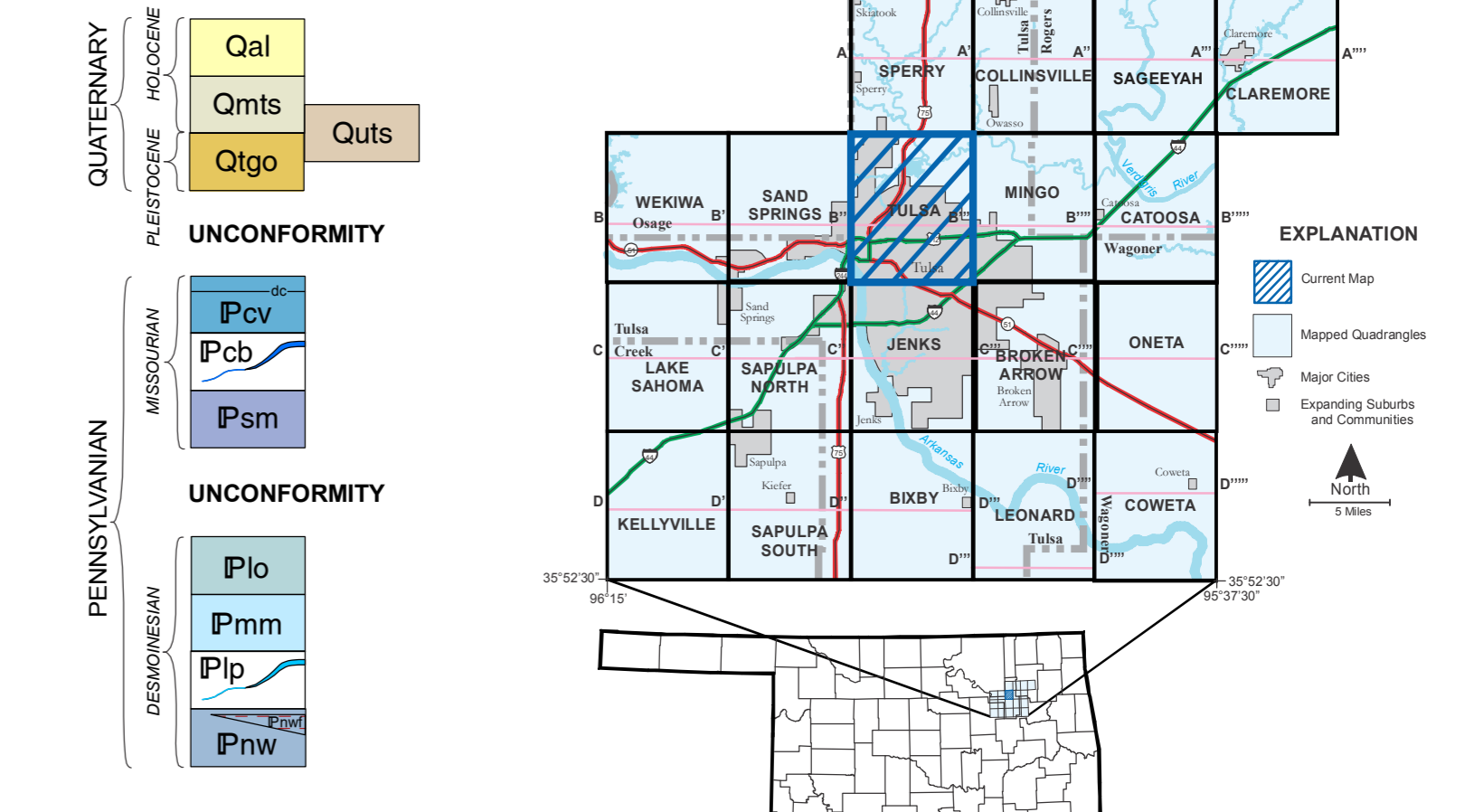
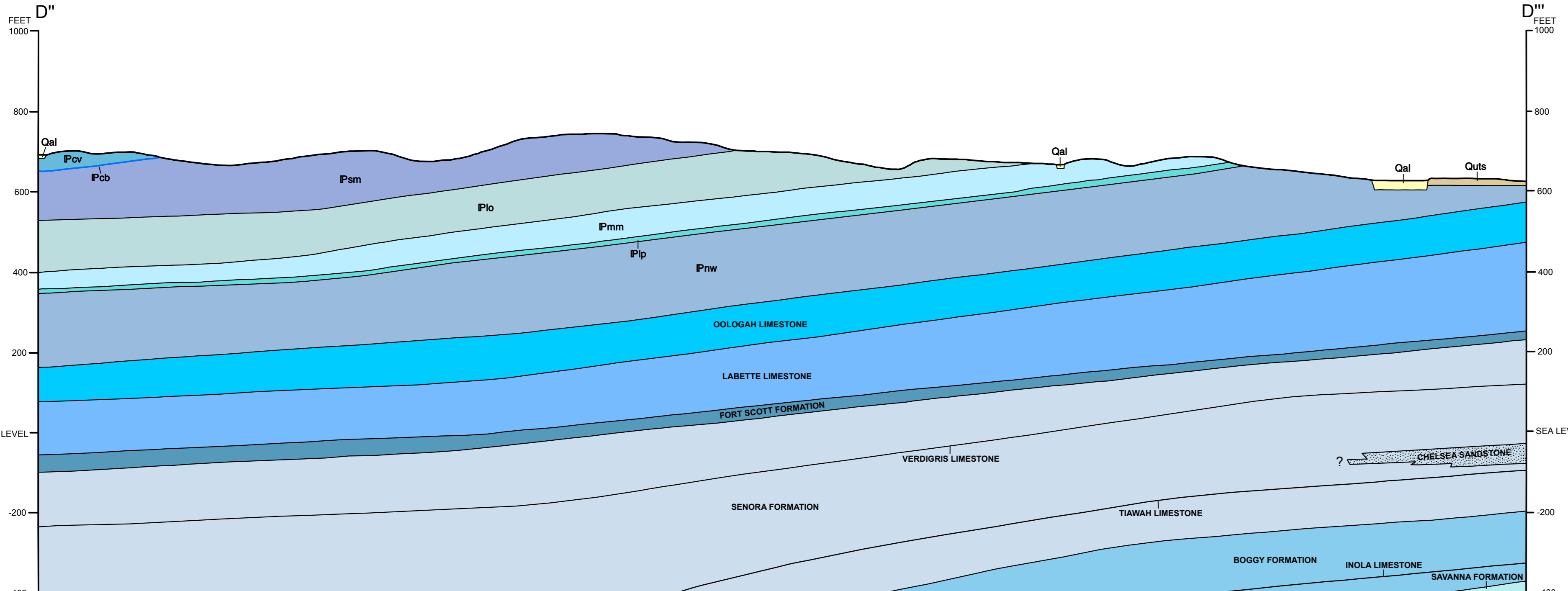
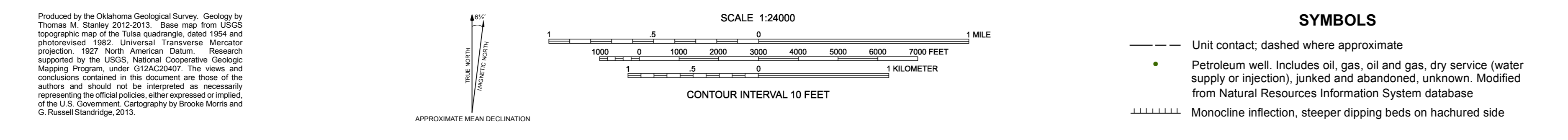


CORRELATION OF MAP UNITS



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.
- Qmts** MIDDLE TERRACE SANDS (Holocene)—Unconsolidated unit composed of locally and distally(?) derived sediment consisting exclusively of fine to medium-grained quartz sand, clay, and some silt. Top of unit is about 40 ft to 60 ft above modern flood plain deposits; are rarely subject to flooding. Thickness: 0 to over 60 ft.
- Quts** UPPER TERRACE SANDS (Holocene / Pleistocene(?))—Unconsolidated unit composed of locally and distally derived sediment; consisting of fine- to medium-grained quartz sand, clay, silt, and with a lag conglomerate locally at base. Base of unit is anywhere between 50 ft to 150 ft above modern flood plains. Thickness: 0 ft to at least 40 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 pebbles and cobble-sized clasts of limestone and dolomite composition. The upper third to half of the deposit exhibits signs of aeolian reworking and modification, suggesting a prevailing northeast wind direction throughout the Holocene. Thickness: 0 ft to as much as 140 ft.
- Pcvc** COFFEYVILLE FORMATION (Pennsylvanian, Missourian)—Formation composed of a number of sandstone and shale intervals, the most prominent being the Dodds Creek Sandstone situated in the upper part of the unit. In ascending order these informal intervals include:  
A basal 3-10 ft thick interval immediately above the Checkerboard Limestone of well-laminated, medium dark gray (N4), phosphatic clayshale; this dark gray shale grades upward into a wavy laminated, grayish orange (10YR7/4) to yellowish gray (5Y7/2), slightly silty, non-calcareous clayshale, with interlamination of very fine-grained sandstone and some siltstone. Overall, this first shale interval varies between 15 ft to 30 ft thick, averaging about 21 ft. It is a dusky yellow (5Y6/4). Next is a 5-10 ft interval of moderate greenish yellow (10Y7/4) to dusky yellow (5Y6/4), weakly indurated, thin-bedded, slightly silty, very fine-grained sandstone; parting lineations and ripple-marked bedding surfaces common.  
This is followed by a thick sequence (about 47 ft thick) of interbedded shale and sandstone, with shale as dominant lithology. Shales are pale yellowish orange (10YR8/6) to grayish orange (10YR7/4), friable, laminated, slightly silty and micaceous, non-calcareous clayshale, which becomes weakly indurated and well-laminated in the upper 10-13 ft of interval; interbedded sandstones are yellowish gray (5Y6/1) to grayish orange (10YR7/4), moderately indurated, silty, and very fine-grained, typically 2'-3' thick with some internal shale partings; some thin siltstone beds occur, but are more common in upper third of interval. Wavy, ripple bedding common in sandstone and siltstone interbeds.  
Dodds Creek Sandstone ('dc' marks base of interval): about 20 ft of grayish orange (10YR7/4), dark yellowish orange (10YR6/6), to a very pale orange (10YR8/2), but locally weathers to a distinct moderate yellowish brown (10YR5/4), weakly to moderately indurated, thin wavy-bedded to locally wavy-laminated, weakly calcareous, micaceous, fine-grained sandstone; bedding from 0.5'-4" thick, but basal beds may be 12" thick; typically, tops of beds ripple-marked, while base of beds are planar, with each bed separated by a shale parting.  
The uppermost 5-20 ft of Coffeyville composed of laminated, slightly silty clayshale similar to shale interval occurring below the Dodds Creek Sandstone.  
Overall, the thickness of the Coffeyville Formation is about 120-130 ft thick, top is not exposed in quad.
- Pcb** CHECKERBOARD LIMESTONE (Pennsylvanian, Missourian)—The Checkerboard Limestone is medium gray (N6), greenish gray (5GY6/1) to dark greenish gray (5GY4/1), but weathers to a distinct moderate yellowish brown (10YR5/4) to dark yellowish orange (10YR6/6) color. Texturally, it is a skeletal to whole-fossil carbonate mudstone to wackestone; bedding is commonly absent in the formation at most exposures, although thin, planar to wavy beds of about 2' to 3" thick have been observed locally, occurring above the main, basal bed. Fossils include crinoid stems, corals, and bivalves. Thin calcite veins (~1 cm wide), are present in some exposures. Thickness a consistent 3 ft.
- Psm** SEMINOLE FORMATION (Pennsylvanian, Missourian)—Formation consists of a lower sandstone interval, called the Tulsa Sandstone, and a basal and upper suite of interbedded, laminated, concretionary, silty clayshales, mudshales and siltstones.  
The base of the Tulsa Sandstone occurs between 6 to 15 ft above the base of the formation. The sandstone consists of a pale yellowish orange (10YR8/6), light brown (5YR5/6), grayish red (5R4/2), very pale orange (10YR8/2), to yellowish gray (5Y7/2), with dark yellowish orange (10YR8/6) weathering spots, is weakly to moderately indurated, thin- to medium-bedded, very fine- to fine-grained argillaceous and micaceous sandstone; sandstone mostly silty, and may have a weak calcite cement within some bedding intervals. Unit appears as a series of stacked channel sections, where an individual sequence may vary between 2 ft to 4 ft thick, 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" to 24") and has channel-form lower surfaces, which grade up to a thinner (3'-5" thick), 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 burrow filling.  
Dark yellowish orange (10YR8/6), pale yellowish orange (10YR8/6), to light olive gray (5Y 6/1), laminated, slightly silty, concretionary clayshales interlaminated with mudshales and siltstones occur above and below the Tulsa Sandstone; concretionary material occurring as discontinuous lenses and beds within clayshales that vary from 1'-6" thick. Siltstone intervals are ripple-marked, and also have abundant horizontal track fossils.  
Total thickness of the Seminole Formation about 130 ft.
- 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 ft to 1.5 ft thick, laminated, wavy-bedded packstone, grading upward into a whole fossil, carbonate mudstone wackestone; brachiopods, gastropods, and crinoid debris the most common fossils. Thickness of the Lost Branch about 110 ft.
- 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 Jenkins Sandstone; and 4, an unnamed lower shale interval of variable thickness. Thickness of the formation about 70 ft.  
Dawson Coal: unobserved in map area, but has been reported in the area by Bennison and others (1972), and Oakes (1952). Extensive workings into the Dawson occur throughout the center of the quad. 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 (5Y8/6), interbedded sandy, weakly calcareous mudstone, and friable, fine-grained sandstone. Sandstones may have light brown (5YR6/4) oxide spots. Mudstone 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 about 50 ft thick.  
Jenkins Sandstone: yellowish gray (5Y7/2), pale yellowish brown (10YR6/2), 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-tough cross-bedded, with bedding varying from 3'-16" thick; rest of interval thinner bedded (with beds ranging from 0.5' to 4" thick, averaging closer to 2" thick), and having numerous shale partings and interbeds (flaser bedding). Clay-ball clasts, and flake casts common throughout member; some tabular cross-bedding in middle of unit. Thickness of the Jenkins Sandstone about 8-10 ft.  
unnamed lower shale interval: consists of a light olive gray (5Y6/1) to greenish gray (5GY6/1), poorly laminated, calcareous slightly silty clayshale; poorly exposed. Thickness of interval varies from 2 to 8 ft, depending on thickness of overlying Jenkins Sandstone.
- Plp** LENAPAH LIMESTONE (Pennsylvanian, Desmoinesian)—Represented by the Eleventh Street Limestone, and 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; crinoid columns and plates are the most dominant fossil, bryozoans, brachiopods, and bivalves also occur. Thickness of the Eleventh Street Limestone no more than 3 ft, and usually less than a foot thick.
- Pnw** NOWATA FORMATION (Pennsylvanian, Desmoinesian)—Can be segregated into two informal units, a lower shale interval, and an upper, interbedded limestone and shale interval termed the Nowata flagstones (Pnw).  
Lower shale interval consists 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; nodular, hematite concretions common.  
The Nowata Flagstone interval is less than 55 ft of interbedded shale and limestone, and pinches out completely to the north; the top of which stratigraphically occurs between 5 ft and 15 ft below the top of the formation. Limestones are a light olive gray (5Y2 to 5Y6/1) to light brown (5YR5/4), laminated to thin-bedded, argillaceous, carbonate mudstones; bedding is even and planar with most beds having uniform thickness of between 0.5'-3.0'; some limestone 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 fracture surfaces sometimes being concoidal. 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 between individual limestone beds. Only the uppermost 150 ft of the formation is exposed in the Jenkins quad.



**GEOLOGIC MAP OF THE TULSA 7.5' QUADRANGLE, TULSA COUNTY, OKLAHOMA**  
Thomas M. Stanley  
2013

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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.