OKLAHOMA GEOLOGICAL SURVEY
Charles J. Mankin, *Director*

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Oklahoma Geologic Quadrangle **OGQ-57**

# Geologic Map of the Claremore 7.5′ Quadrangle

## INTRODUCTION

This geologic map of the Claremore 7.5′ Quadrangle was compiled from detailed field mapping and field investigations by the authors through the USGS STATEMAP program, assistance award number 03HQAG0014. The STATEMAP program is a cooperative effort between the U.S. Geological Survey and State Geological Surveys, the primary goal of which is to develop a geologic framework in areas determined to be of important economic, social, or scientific interest to individual States.

The geology was manually compiled onto a modern 7.5′ topographic quadrangle and subsequently digitized for ultimate publication at a scale of 1:24,000. Additional data such as the location of petroleum wells were collected from the Natural Resources Information System (NRIS) database and complied onto the 7.5′ quadrangle. The geologic map of the Claremore Quadrangle was originally published as an Oklahoma Geological Survey open-file report, number 3-2005. This map has subsequently been transferred from open-file to the Oklahoma Geologic Quadrangle Map series.

The geologic map is based on detailed field mapping and interpretation of additional data by the authors. Most of the contacts bordering Quaternary units are gradational. The locations, character, and distribution of all map units were verified in the field prior to them being compiled onto the current base map. The locations of the petroleum wells are based on data available in the Natural Resources Information System database; these records, in turn, are based on forms submitted by individual operators to the Oklahoma Corporation Commission. The locations of petroleum wells were not verified in the field. The records maintained in the NRIS database may be incorrect and/or incomplete; thus, the well locations shown on the map may be incomplete and/or incorrect.

The Claremore map, or any of its parts, can be printed at a variety of scales and be used in many ways by homeowners, landowners, civil engineers, land-use planners, government agencies, businesses, etc; however, this map and relevant database is not meant to be used or displayed at any scale larger than 1:24,000 (e.g., 1:20,000 or 1:12,000).

## PROCEDURES

Previously published, and unpublished, reports and maps (Bennison and others, 1972; Govett, 1959; Gruman, 1954; Hemish, 1989; Hemish and Chaplin, 1999; Marcher and Bingham, 1971; Oakes, 1952; Sparks, 1955; Stringer, 1959; Tillman, 1952) were read in order to establish the stratigraphic framework and general geologic relations of the area. These reports, however, served only as a general guide. A 7.5′ topographic map of the area was taken into the field and used as the base map for compiling the geology of the quadrangle. Because much of the area is urban, virtually all the roads in the area were driven and any outcrops were located and described; subsequently, these outcrops and points of geologic observation were noted on the map. In most cases walking traverses were made to look for additional outcrops, or to better define formatio n contacts and/or formation distributions and their contained lithofacies types. The geologic cross section was interpreted using a combination of the recently mapped surface geology, coupled with stratigraphic interpretations of oil and gas electric logs (on file at the Oklahoma Geological Survey's log library) that fell within 1 mile north or south of the section line. In sections where drill holes were scarce, the search area away from the cross section line was expanded to 2 miles north and south.

The geology and cross section were digitized with wells, geologic observations, individual map units, or other mappable features as separate layers in an ESRI shapefile format. All shapefiles are then assembled together and overlain by a USGS 1:24,000-scale topographic base map. Symbology and labels were designated for a final map layout at 1:24,000 scale. The geologic symbols conform closely, but not exact in every case, to the FGDC Digital Cartographic Standard for Geologic Map Symbolization. The data files were originally used as a cartographic tool for constructing a printable map. Therefore, errors may exist from digitization done at 1:24,000 scale, and the construction of each map on a quadrangle-by-quadrangle basis when aligning this map with adjacent maps. Finally, the attribute table for each geologic feature layer may not contain detailed information except when used for categorizing some feature objects. Specific information about each geologic unit can be found in the Description of Units on the published PDF map.

## GEOLOGIC SETTING AND STRUCTURAL GEOLOGY

The Claremore quadrangle is located within the Claremore Cuesta Plains Geomorphic Province at the northeast edge of the Northern Shelf Geologic Province. Surface rocks consist of gently westward dipping Middle Pennsylvanian (Desmoinesian) units, which include in ascending order: 1) the uppermost part Savanna Formation, 2) Boggy Formation, 3) Senora Formation, and 3) the lower part of the Fort Scott Formation. Resistant sandstones (and some limestone es) of the Senora Formation typically form cuestas above broad plains principally composed of shales of the Senora and Boggy Formations. Coal beds are common within many of the shale units of the Senora Formation and in the past have been extensively mined locally in the northwestern part of the quad (the Croweburg coal for example, see Standard Reference Section). All mapped units represent non-marine to marginal-marine deltaic-type sandstones and shales interbedded with more typically marine, fossiliferous limestone beds and shale intervals.

Some stratigraphic intervals have been re-defined since Marcher and Bingham (1971), which was the most recent published map of the area. These changes are illustrated on the Standard Reference Section of the area, which was assembled from detailed descriptions of outcrop, and shows the essential lithostratigraphic character and average thicknesses of the various mapped units. The most prominent change is the placement of the upper boundary of the Boggy Formation at the top of the Weir-Pittsburg coal. Previous reports placed this contact ambiguously at the base of either the Chelsea Sandstone, or at the base of the Tiawah Limestone. However, the original type designation of this part of the Desmoinesian section clearly shows the top of the Weir-Pittsburg coal as the contact between the Boggy and Senora Formations (Branson, 1954). The Weir-Pittsburg has a greater regional stratigraphic significance, as it pertains to correlation between northeast Oklahoma, southeast Kansas, and western Missouri, than either the Chelsea or the Tiawah.

Consequently, in the Claremore area the Boggy Formation is bounded by the Bluejacket Sandstone at base and the Weir-Pittsburg coal at top, and includes the Lower Taft Sandstone and Inola Limestone. In the Claremore quad the Lower Taft is a fairly prominent sandstone interval, the basal contact of which (designated by "it") is shown on the geologic map. The Inola Limestone can best be described as an interval consisting of several thin limestone beds each separated by thin intervals of fissile shale, rather than an individual carbonate bed. The member was poorly exposed in the map area, and although it has been described from a number of drill holes in Rogers County (see Hemish, 1989), was not mapped as a separate unit of the Boggy.

The Senora Formation includes all lithology falling within the interval bounded at the base by the top of the Weir-Pittsburg coal, up through to the base of the Fort Scott Formation. Various mappable units occur within the Senora, and are illustrated on the map and in the Standard Reference Section. The most prominent is the Chelsea Sandstone, which caps many of the small hills near the town of Claremore. The base of the Chelsea is well-defined and easily mapped, although it does fluctuate up and down the section due to its erosional nature. Normally the base occurs between 20 to 30 feet above the Tiawah Limestone, but locally it may be found resting directly on top of the limestone. The upper contact of the Chelsea is far more ambiguous to discern in the field, and is based mostly on surrounding soil textures that formed from the weathering of whatever the prevailing bedrock lithology was, becoming more of the clay loam rather than a sandy loam as one traverses up section. Other well-defined and mappable members belonging to the Senora Formation, and which are included on the map, are: Verdigris Limestone, the Lagonda Sandstone, and the Breezy hill Limestone.

Structurally, the Desmoinesian section exposed in the Claremore quadrangle has a general strike of N15°E to N20°E and an average dip of 40 feet/mile. These observations are based primarily on mapped outcrop patterns and subsurface correlation between drill holes. Other structural elements include two broad fold features, a northwest trending anticlinal fold located in the middle of the study area, and a northeast trending synclinal fold located in the northwest part of the quadrangle. These interpretations are based on the outcrop patterns of prominent units and subsurface correlations between dill holes. A northeast trending normal fault with an apparent displacement of 15 feet is also well-exposed, and can be observed along the center of south line Sec. 14, and at the SW1/4, SW1/4, SW1/4 Sec.12, T. 21 N., R. 16 E.

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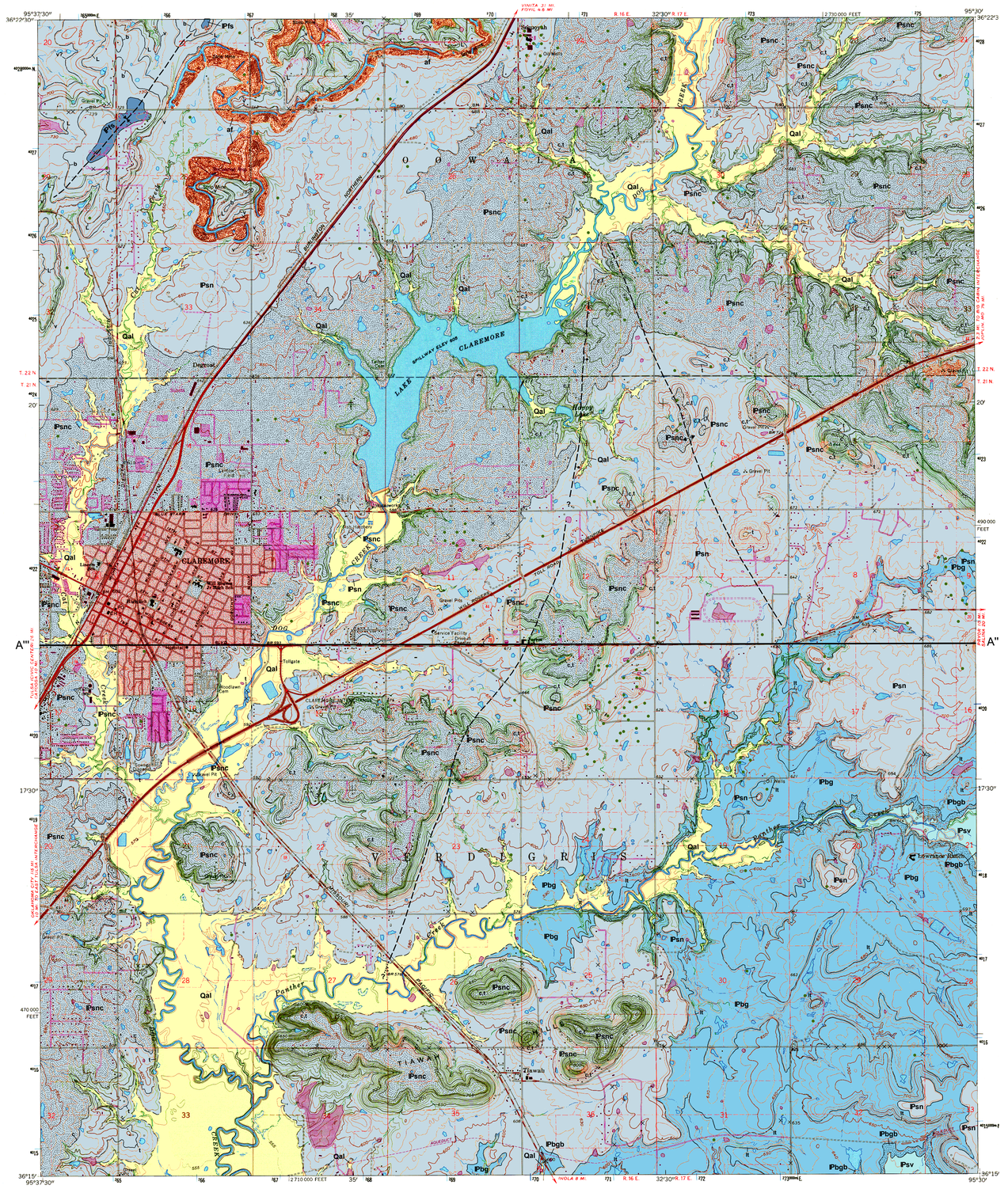



### Base Map Credits

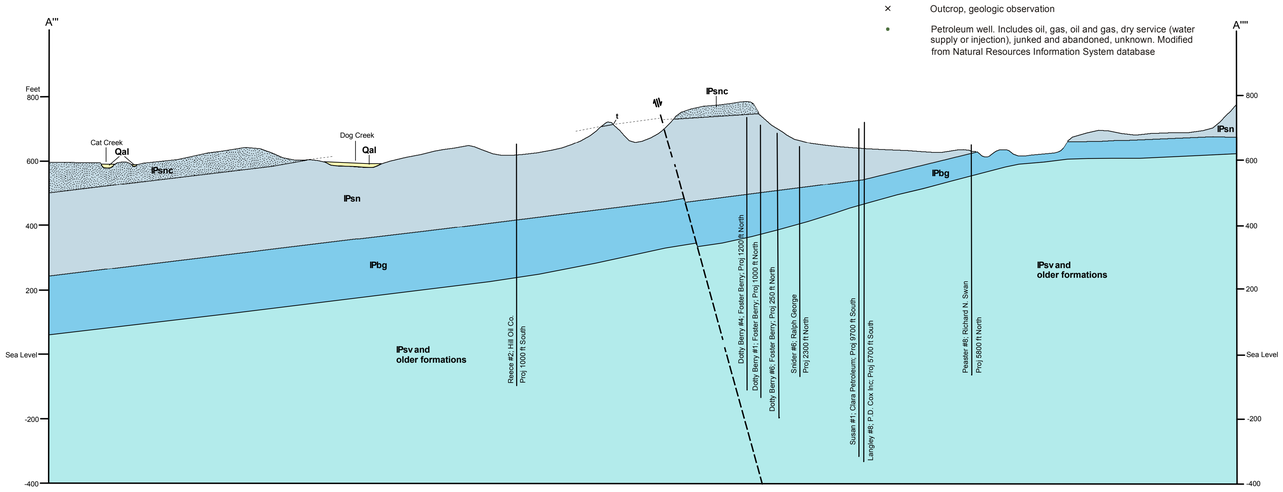
The base map was compiled by the U.S. Geological Survey. Topography by photogrammetric methods from aerial photographs taken 1962. Field checked 1963. Universal Transverse Mercator grid, zone 15. 1927 North American Datum. 10,000-foot ticks based on Oklahoma coordinate system, north zone. 1,000-meter Universal Transverse Mercator grid ticks, zone 15

### Geologic Map Credits

Geology by Thomas M. Stanley and Galen W. Miller, 2003-2004. Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under Assistance Award Number 03HQAG0014. 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. Published originally as Open-File Report OF3-2005. Map revised and published as OGQ- 57. Cartography and layout prepared by G. Russell Standridge, 2004.

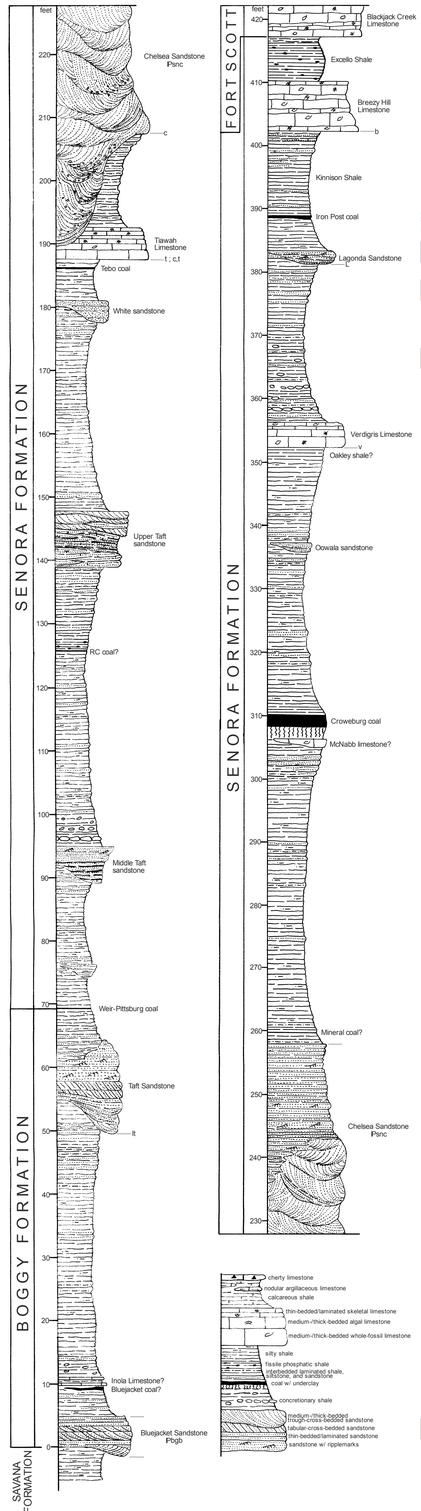
## SYMBOLS

- Unit contact; dashed where approximate
- Axial trace of antiformal structure
- Axial trace of synformal structure
- Fault, dotted where covered; ball and spike on downthrown side.
- 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




## STANDARD REFERENCE SECTION

Main stratotype section for the Claremore 7.5-minute quadrangle showing principal formations, members , and beds, and their relative stratigraphic positions, general lithologic textures, and average thicknesses. Formal member and bed names are indicated by capitalization (i.e., Chelsea Sandstone), while informal names are given in lowercase (i.e., White sandstone). 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

QUATERNARY — HOLOCENE: af, Qal

UNCONFORMITY

PENNSYLVANIAN — DESMOINESIAN: Pfs, Psn, Pbg, Psv

## DESCRIPTION OF UNITS*

af — ARTIFICIAL FILL (Holocene) - Natural or artificial talus, slumps, and tailings covering formally exposed areas around active and inactive mining operations.

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.

Pfs — FORT SCOTT FORMATION (Pennsylvanian, Desmoinesian) - Light gray (N7) to medium light gray (N6), thin to medium, wavy bedded whole-fossil wackestones and mudstones. Bedding varies from 2" to as much as 16" thick with thicker bedding more frequent toward top of exposure; wavy bedding contacts due (in part) to stromatolitic bedding. Fossils dominated by spirifer and productid brachiopods, and crinoid debris; algae and fusulinids common in some intervals. Only basal 5-7 ft of the Blackjack Creek Limestone Member exposed in map area.

Psn — SENORA FORMATION (Pennsylvanian, Desmoinesian) - Complex sequence of silty and concretionary clayshale interbedded with a number of mappable limestone and sandstone members (including: b, Breezy Hill Limestone; L, Lagonda Sandstone; v, Verdigris Limestone; IPsnc, Chelsea Sandstone; t, Tiawah Limestone); and various minor sandstone intervals and coal beds (including: Oowala sandstone; White sandstone; Upper and Middle Taft sandstones; and the Iron Post, Croweburg, Mineral, Tebo, RC, and Weir-Pittsburg coal beds).

A silty to sandy clayshale, interlaminated with 0.25-1" thick, very fine-grained sandstone and siltstone beds is the predominant lithology of the formation, silt and sand content increasing adjacent to significant sandstone intervals (such as the Chelsea or Upper Taft sandstones); clayshale bedding laminated, becoming blocky where deeply weathered; color variable, ranging, from the most frequent to infrequent: medium light gray (N6), brownish gray (5YR4/1), grayish orange (10YR7/4), very pale orange (10YR8/2), dark yellowish orange (10YR6/2), pale brown (5YR5/2), light brown (5YR5/6), grayish yellow (5Y8/4), and yellowish gray (5Y7/2); typically, shale associated with concretionary zones tend to be more orange or brown, instead of gray in hue, while those shales associated with coal seams tend to be harder, more evenly laminated, and have a medium dark gray (N4) color; clay is predominant cement, calcite rare.

Clayshales immediately above coal seams tends to be harder, silt-free, slightly phosphatic, with slightly thicker laminated bedding, and are weakly calcareous; color usually a medium dark gray (N4).

The interlaminated sandstones and siltstones are friable to poorly indurated, usually a very pale orange (10YR8/2), pale orange (10YR8/2), or dark yellowish orange (10YR6/2); sandstone more common than siltstone, typically fine- to very fine-grained; predominant cement is clay, with a possible weak silica.

Ironstone concretions occur sporadically throughout the shale section, but concentrations may occur just above the Verdigris Limestone and the Middle Taft sandstone; concretions composed predominately of hematite, sometimes siderite; may occur as 0.5-2" thick, dense discontinuous beds in the concentrated horizons, but normally occur as small (between 1-2") individual, hollow, ovoid-shaped clasts; color a light red (5R6/6) to moderate red (5R5/4).

A number of prominent stratigraphic horizons occur in the Senora Formation, these are in descending order:

Excello Shale: Predominantly a medium dark gray (N4) to dark gray (N3), well-laminated to fissile, phosphatic clayshale; however, upper 2-5" a light brownish gray (5YR6/1) to pale brown (5YR5/2), laminated, slightly silty, calcareous, fossiliferous clayshale. Phosphate nodules throughout lower part of member, occurring as 0.25-0.5", ovoid-shaped clasts. Thickness from 3-6 ft, averaging 4 ft.

Breezy Hill Limestone (b): Grayish orange (10YR7/4) to medium light gray (N6), with local dark yellowish orange (10YR6/6) streaks along bedding contacts and fractures, alternating thin- to medium-, wavy bedded, whole-fossil and skeletal wackestone and mudstone. Bedding varies from 3-16" thick, with thinner bedding characterized by skeletal textures, and medium bedding a characteristically whole-fossil texture. Fossils dominated by small productids and mesolobids, along with large crinoid stems; chaetetid sponges present. Thickness about 7 ft.

Kinnison Shale: Medium light gray (N6) in lower half, becoming moderate yellowish brown (10YR5/4) in upper half, fissile to well-laminated, silty clayshale with very fine-grained sandstone and siltstone partings. Silt and sand increasing toward top of member. Base occurs at the Iron Post coal; clayshale just above coal tends to be a medium dark gray (N4), hard, thickly laminated clayshale. Thickness of member about 13 ft.

Iron Post coal: Poorly exposed; where observed, however, is mostly characterized by a black (N1) carbon smear 1-1.5" thick; locally it may become a 3-6" coal seam.

Lagonda Sandstone (L): Grayish orange (10YR7/4), dark yellowish orange (10YR6/6), to very pale orange (10YR8/2), friable, planar to sometimes wavy laminated, infrequently thin-bedded, fine- to very fine-grained, slightly siliceous sandstone; calcite cement rare. Bedding usually no more than 0.16-0.25" thick, but may reach 3" thick in some outcrops; ripplemark bedding surfaces with internal tabular cross-lamination common. Thickness ranges from 6" to 2.2 ft.

Verdigris Limestone (v): medium dark gray (N4) skeletal mudstone; but may weather to a medium light gray (N6), grayish red (5R4/2), or grayish orange (10YR7/4) color. Represented either by a single massive bed, or by a couple of 9-12" thick planar skeletal mudstone beds; top 3-4" becoming a wavy laminated whole-fossil mudstone to wackestone, with large productid brachiopods and large crinoid stems. Thickness about 3-3.5 ft.

Croweburg coal: Poorly exposed in map area; where observed in old mine workings represented by a black (N1) to grayish black (N2), 2' thick coal bed overlying a 2' thick very light gray (N8) to light bluish gray (5B7/1) underclay. Locally a 12-16" whole-fossil mudstone, informally named the McNabb limestone in some reports, occurs immediately below the underclay.

Chelsea Sandstone (IPsnc; c; c.t): Variable sandstone unit that can be loosely segregated into two zones. Lower zone well exposed, consisting of a pale reddish brown (10YR4/2), dark yellowish brown (10YR7/4), grayish orange (10YR8/2), to locally moderate yellow (5Y7/6), pale greenish yellow (10Y8/2), or pale olive (10Y6/2), moderately indurated, medium- to thin-bedded, fine- to medium-grained, calcareous trough-cross-bedded sandstone. Trough cross-bed sets vary from 0.5" to 3' thick, average 5" thick; locally graded, with siltstone, sandstone, and limestone pebble conglomerate set within a medium-grained sand matrix at base, that grades upward into a fine-grained sandstone. Thickness of basal Chelsea varies from 25-40 ft, but averages closer to 35 ft. Upper zone of the Chelsea poorly exposed, evidenced often times only by the presence of a sandy loam soil, as opposed to a clay loam; where exposed consists of a pale yellowish brown (10YR6/2) to light brown (5YR6/4), friable, thin-bedded to often planar laminated, weakly calcareous, micaceous, fine-grained sandstone. Thickness varying from 15-25 ft thick, averaging closer to 17 ft. Typically, base of the Chelsea resides 5-10 ft above the Tiawah Limestone; locally it may be as high as 20 ft. above, or channeled down in contact with the Tiawah. Average thickness of the Chelsea Sandstone is 52 ft.

Tiawah Limestone (t; c.t): Similar to the Verdigris Limestone in texture and thickness, usually a grayish orange pink (5YR7/2) to very pale orange (10YR7/2), locally light brownish gray (5YR6/1) to pale yellowish brown (10YR6/2), with dark yellowish orange (10YR6/6) splotches; generally a massive bed of whole-fossil mudstone in lower half, grading into a wavy laminated skeletal wackestone in upper half. Fossils usually large crinoid stems with large productid and spiriferid brachiopods. Thickness varies from 2-5 ft thick, but averaging about 3 ft thick; member thins due to upper part of limestone being truncated by channeling from the Chelsea Sandstone. Where the Tiawah was mapped in close proximity to the Chelsea, base of the limestone labeled with a 'c.t'.

Tebo coal: Rarely observed; black (N1) to grayish black (N2), 1-2" thick coal seam, with a 2-3" thick underclay immediately below.

White sandstone: Normally a yellowish gray (5Y7/2) to pale greenish yellow (10Y8/2) color, but can be a very pale orange (10YR8/2) to pale yellowish orange (10YR8/6) in deeply weathered exposures; moderately indurated, fine-grained, slightly micaceous, siliceous sandstone. Bedding planar, medium, varying from 11-16" thick; some tabular cross-bedding observed at the base of unit in some exposures. Thickness from 2-4 ft thick.

Upper Taft sandstone: Overall, a grayish orange (10YR7/4), becoming dark yellowish orange (10YR6/6) in upper third, moderately indurated, medium- to thin-bedded, fine- to very fine-grained, micaceous, calcareous sandstone, with shale interbeds and partings. Interval can be segregated into 3 general lithologic zones: basal zone usually 23" thick, consists of medium to thin planar bedding, with bedding ranging from 0.5-4" thick, shale partings common, sandstone is slightly calcareous; middle zone consists of about 3.2' of alternating beds of sandstone and shale, each about 3-4" thick, sandstone slightly calcareous and indurated; the upper sandstone zone is moderately indurated, siliceous, and thin- to medium-trough-cross-bedded. Upper Taft sandstone about 7.8 ft thick.

Middle Taft sandstone: moderate yellowish brown (10YR5/4) to moderately greenish yellow (10Y7/4) in upper half, very pale orange (10YR8/2) to pale yellowish orange (10YR8/6) in lower part, weak to moderately indurated, very fine-grained, micaceous sandstone. Lower half poorly exposed, laminated (bedding from 0.32-0.5" thick), slightly calcareous with some shale partings (giving interval a flaser bedded appearance); upper half better exposed, thin-bedded (bedding from 1-6" thick), siliceous, with internal tabular cross-bedding and ripplemark bedding surfaces. Unit from 3-6 ft thick.

Weir-Pittsburg coal: Poorly exposed interval of dark gray (N3) to medium dark gray (N4), hard, thickly laminated slightly silty clayshale above a 1-2" thick carbon smear.

Basal contact of the Senora Formation placed at the stratigraphic horizon of the Weir-Pittsburg coal, which usually occurs between 17-20 ft below the base of the Middle Taft sandstone. Total thickness of the formation about 350 ft, thickening to the west and northwest based on cross section.




Pbg — BOGGY FORMATION (Pennsylvanian, Desmoinesian) - Generally a very silty to sandy, laminated clayshale, with two intervening sandstone members (lt, Taft Sandstone [also known as the Lower Taft Sandstone in some reports]; IPbgb, Bluejacket Sandstone); and a limestone and coal (Inola Limestone and Bluejacket coal), both of which were not observed in the map area.

Clayshales variable in color, ranging from medium light gray (N6), grayish orange pink (5YR7/2), to light brown (5YR5/6), sometimes moderate red (5R5/4) to pale red (10R6/2) near prominent sandstones; laminated to blocky bedded, very silty to even sandy, with siltstone and very fine-grained sandstone interbeds and partings; sand and silt content increasing proximal to significant sandstone intervals; a medium gray (N5) concretionary, calcareous clayshale occurs near base, possibly associated with the Inola Limestone(?), or Bluejacket coal(?).

Mappable stratigraphic horizons within the Boggy Formation include, in descending order the:

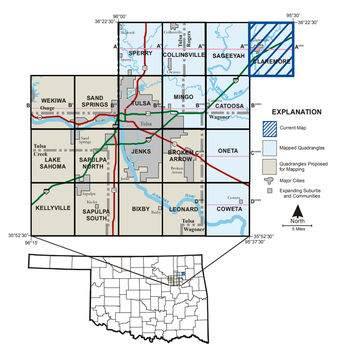
Taft Sandstone (lt): Texture and color similar to Middle and Upper Taft sandstones of the Senora Formation; color a moderate yellow (5Y7/6), dusky yellow (5Y6/4) or dark greenish yellow (10Y6/6), grading toward top to a light brown (5YR5/6) and pale reddish brown (10R5/4); moderate brown (5YR4/4) oxide spots common, giving sandstone an overall mottled appearance; texturally, sandstone is moderately indurated, locally indurated, thin - to medium-bedded, very fine- to fine-grained, and slightly siliceous. Basal third with trough-cross-bedding, middle third with tabular cross-bedding, and upper third having thin, planar bedding with ripplemark surfaces. Basal contact may be gradational with underlying shale lithology. Member thickness from 5 ft to as much as 15 ft, averaging about 8 ft thick.

Bluejacket Sandstone (IPbgb): Grayish orange (10YR7/4) to dark yellowish orange (10YR6/6), well-indurated, sucrosic-looking, thin-bedded, fine-grained, siliceous sandstone. Bedding planar, ranging from 1-4" thick, with internal tabular cross-bedding. Thickness about 5.3 ft, but may attain 7 ft in some areas.

Base of the Boggy Formation mapped at base of the Bluejacket Sandstone. Thickness about 69 ft, becoming thicker to west and northwest based on cross section.

Psv — SAVANNA FORMATION (Pennsylvanian, Desmoinesian) - Poorly exposed, mapped in quad only where base of Bluejacket Sandstone was observed; typically forms a yellowish gray (5Y7/2) silty clay-loam soil along some drainages and low-lying areas, which probably formed from weathering of a silty clayshale. Only about the upper 5-7 ft occurs in map area.

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




# GEOLOGIC MAP OF THE CLAREMORE 7.5′ QUADRANGLE, ROGERS COUNTY, OKLAHOMA

Thomas M. Stanley and Galen W. Miller

2004