

**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 from 0 feet to about 30 feet.

**Qts** TERRACE SANDS (Holocene, (?)Pleistocene) - Mapped as the Gurtie sand by Morgan (1924). Consists of unconsolidated, locally and distally(?) derived, light-colored, very fine- to fine-grained sand, mixed with some silt-sized material. Basal 5 to 10 feet composed of a medium- to coarse-grained pebbly sand; granule-, pebble-, to rarely cobble-sized gravel makes up about 10-15% of basal part; composition of gravel is medium dark gray chert and limestone; pink granite; white vein quartz also present but rare. Thickness from 0 feet to as much as 50 feet.

**PPst** STRATFORD FORMATION (Upper Pennsylvanian - Lower Permian, Gzhelian - Asselian) - Consists of limestone-clast paraconglomerate and orthoconglomerate intercalated with red clay shale and local quartz arenite. The contact with other Pennsylvanian and Permian units to the north is somewhat arbitrary and based on where the majority of limestone-clast conglomerates occur relative to marine and non-marine sandstones and shales. The limestone paraconglomerate and orthoconglomerate are both heterogeneous and poorly sorted; clasts are primarily pebble- to cobble-sized, olate in shape, and composed almost exclusively of limestones originating from the Arbuckle highlands, with rare clasts of granite and chert. Paraconglomerate matrix is variable, ranging from a fine-grained sandstone composed of well-rounded quartz grains in a white calcareous cement, to a coarse-grained, pebbly sandstone matrix; more commonly found interfingering with Permian- and Pennsylvanian-aged sandstones and shales in the middle and northern parts of the quad. Orthoconglomerates are more common in the southern part of the quad, proximal to the Arbuckle Mountains proper. Intercalated red clayshales and sandstones represent southward directed interfingering of Vanoss through Seminole lithology with northward directed tongues of conglomerate. Total thickness unknown, at least 300 feet based on cross section.

**PPvn** VANOSS FORMATION (Upper Pennsylvanian - Lower Permian, Gzhelian - Asselian) - Composed of indurated to moderately indurated calcareous arkoses, pebbly lithic arkoses, and arkosic orthoconglomerates, interbedded with friable clayshales and mudshales; thin carbonate mudstone beds observed locally, and more common in the lower third of unit. In the southern part of quad, arkoses are locally intercalated with lenses of limestone-clast orthoconglomerate, representing northward directed tongues of the Stratford Formation. Color of coarse-grained arkoses range from very pale orange (10YR 8/2) and grayish orange (10YR 7/4) to yellowish gray (5Y 7/2), dark yellowish orange (10YR 6/6), and dusky yellow (5Y 6/4); fine- to medium-grained arkoses tend to be gray and less red in hue, varying from yellowish gray (5Y 6/1, 5Y 7/2) and very light gray (N5) to pale olive (10Y 6/2); overall, arkoses are poorly sorted, with grains ranging in size from very fine- to coarse-grained and from subrounded to subangular in shape; arkoses are locally pebbly, with clasts consisting of 55% to 75% gray quartz and 25% to 35% pink orthoquartz. Orthoconglomerate clasts are subrounded to rounded, pebbles to cobble-sized, and include lithic compositions ranging from orthoquartz, milky quartz, granite, white to gray chert, and gray limestone. Overall, bedding is wavy to discontinuous and laminated to medium-bedded as intervals alternate between fine- and coarse-grained material; ripple marks and internal trough cross-bedding are common in the finer grained arkoses. Shales are gray to yellow-gray to orange-brown in color. Colors include dusky yellow (5Y 6/4); light yellowish orange (10YR 6/6); moderate yellowish brown (10YR 5/4); yellowish gray (5Y 7/2); light olive gray (5Y 5/2); pale olive (10Y 6/2); olive gray (5Y 4/1); light olive brown (5Y 5/6); and moderate olive brown (5Y 7). Shale is mostly claystone texturally, and calcareous, although it may be silty and/or non-calcareous as well. Shale is blocky which sometimes results in bulbous weathering. White carbonate nodules are common within the shale. Limestones are generally thin, yellow-weathering mudstones with no or very few fossils. Colors include yellowish gray (5Y 7/2), dark yellowish orange (10YR 6/6), light olive gray (5Y 6/1), moderate yellowish brown (10YR 5/4), dusky yellow (5Y 6/4), and pale yellowish brown (10YR 6/2). Sometimes the limestones weather in shades of gray such as medium gray (N5). The limestones are moderately to well-indurated. They are commonly thin (3-4 cm thick) and nodular. They may exhibit popcorn-like texture or be ragged-looking. Some limestones are up to 10 cm thick. Limestones may contain sand- to pebble-sized clastic grains. Calcite vugs and/or stringers are common in the limestones. Thickness is at least 400 feet, but incomplete, as top is not exposed in quad.

**Pad** ADA FORMATION (Upper Pennsylvanian - Gzhelian?) - Consists of interbedded quartz arenite, pebbly quartz arenite, siltstone, shale, and limestone. As is observed in the Vanoss Formation, Stratford Formation orthoconglomerates locally interfinger with the Ada Formation in the southern part of the quadrangle. Arenites are grayish yellow (5Y 8/4), yellowish gray (5Y 7/2), pale yellowish brown (10YR 6/2), or moderate yellowish brown (10YR 5/4); some sandstones are asphaltic, and these are usually olive gray (5Y 3/2) in color; they are friable to very well-indurated, and internal cross-lamination is present generally calcareous and fine- to very fine-grained; medium- to coarse-grained arenite present, but less common. Mineralogically, arenites are composed predominantly of quartz, but white plagioclase, brown biotite, and pink K-feldspar are also present in very small amounts; however, locally, plagioclase and biotite are appreciable, amounting to about 3% of grain constituents; quartz grains are rounded to subrounded; plagioclase grains are angular to subangular. Conglomeratic sandstones occur locally; clasts consist of subrounded pebbles, but may range up to cobble-sized. Pebbles are variable in color and composition and commonly include chert and quartz. Shale is light olive gray (5Y 5/2), pale olive (10Y 6/2), dusky yellow (5Y 6/4), and moderate yellowish brown (10YR 5/4); it is usually calcareous and texturally consists of claystone to mudstone, based on sand and silt content. Limestone is grayish orange (10YR 7/4), very pale orange (10YR 8/2), or dark yellowish orange (10YR 6/6) when fresh; weathered surfaces are typically medium light gray (N6), normally thin-bedded (1-2 ft thick), unfossiliferous, carbonate mudstone. Karst brecciation is common, with fractures and vugs filled with a calcite spar; in one area, vugs were filled with black asphalt. Total thickness of the Ada Formation ranges from 0 to 100 feet due to truncation by the upper Vanoss Formation.

**Pfr** FRANCIS FORMATION (Upper Pennsylvanian - Kasimovian) - Consists primarily of very fossiliferous, calcareous clayshales with an intervening, thin- to medium-bedded quartz arenite interval in the middle, locally exposed in the quad. Francis clayshales range from medium dark gray (N4) to medium light gray (N6), weathered and fresh; they are normally slightly silty, laminated to well laminated, highly calcareous and fossiliferous, containing a diverse, Pennsylvanian-age benthic fauna. The basal clay shale is approximately 20 feet thick, based on cross sections, and represents the main shale exposed in the Ada Brick quarry located about three miles to the northeast of Roff, and is separated from the upper Francis clay shale zone by an intervening sandstone interval. The upper Francis clay shale zone is similar to the lower clay shale. Maximum thickness of this upper shale zone is about 75 feet thick. The middle sandstone interval is dark yellowish orange (10YR 6/6) to grayish orange (10YR 7/4) weathered; it is normally a light gray (N7) fresh, thin-bedded, fine- to very fine-grained, slightly argillaceous and calcareous. Bedding is typically planar, ranging from 0.5 to 2 feet thick. Horizontal burrows are common in the upper half of unit, as are dark gray clay shale partings between individual sandstone beds. Maximum thickness of sandstone interval is about 20 feet. Thickness of Francis Formation varies from 0 to 125 feet, due to truncation by the Ada Formation.

**Psm** SEMINOLE FORMATION (Pennsylvanian, Kasimovian) - Consists of alternating sandstone, shale, and limestone. The top of the DeHay Limestone marks the top of the formation; it is a fairly persistent, indurated, 1 foot thick, crinoid wackestone, packstone to rarely a grainstone. Sandstones of the Seminole are normally grayish orange (10YR 7/4), indurated- to well-indurated, fine- to very fine-grained, calcareous quartz arenites; in some areas, calcareous sandstones may grade laterally into sandy limestone; unfossiliferous, sedimentary structures are common; in one location that had well developed asymmetric ripple marks, as well as abundant brachiopod molds. Intercalated para- and orthoconglomerates are common in some areas; most represent the Stratford Formation as it interfingers with time-equivalent Pennsylvanian units to the north. Clasts are composed mostly of limestone derived from the Arbuckle Mountains, are rounded to well-rounded, are obtain in shape, and range from pebble to cobble size. Shales within the Seminole formation are olive gray (5Y 4/1), pale olive (10Y 6/2), light olive gray (5Y 5/2), and dusky yellow (5Y 6/4); blocky-bedded, calcareous mudstones. Limestones observed in the Seminole Formation range in color from yellowish gray (5Y 7/2) to light olive gray (5Y 6/1), are thin, well-indurated, non-fossiliferous, carbonate mudstones; locally, they may contain calcite stringers and become highly argillaceous to the point they laterally grade into limy sandstones. Thickness 75 feet; incomplete, as base is not exposed in quad.

**Ovsf** SYLVAN SHALE (Upper Ordovician, Ashgillian) - Blocky, sometimes laminated, mudstones and mudshales, interbedded with thin, poorly-indurated, argillaceous sandstones and siltstones. Observed only in the subsurface, covered either by Stratford Formation or by reclamation efforts in the Roff North quad.

**Ovsf** VIOLA SPRINGS AND FERNVALE LIMESTONES (Upper Ordovician, Ashgillian?) - Caradocian - Both are medium gray (N5), dense, wavy, medium- to thick-bedded limestones. The Fernvale Limestone tends to be darker in color overall; locally it is a crinoidal wackestone, to rarely a packstone. Only observed in the uppermost 50 feet of this unit. The Viola Springs Limestone is predominantly a cherty, poorly fossiliferous, carbonate mudstone, although thin intervals of crinoidal packstone textures may occur locally. Total thickness of combined interval about 500 feet.

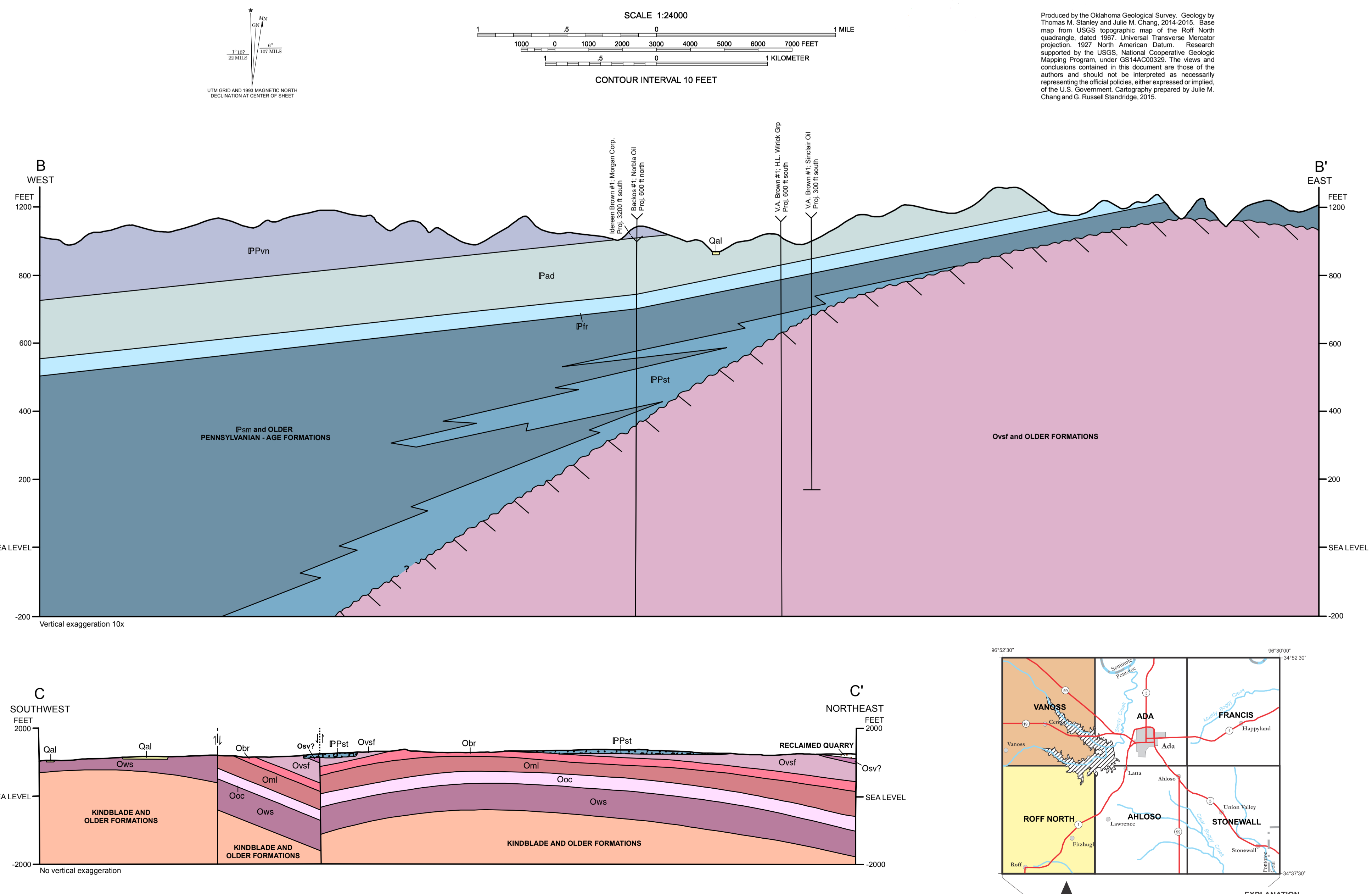
**Obr** BROMIDE FORMATION (Middle to Upper Ordovician, Caradocian to Llandellian) - Consists of an upper limestone and a lower, predominantly clastic interval (interbedded sandstone, shale, and argillaceous limestone). Upper limestone interval typically medium light gray (N6), medium gray (N5), or medium bluish gray (5B 5/1) fresh; grayish orange (10YR 7/4) to dark yellowish orange (10YR 6/6) weathered; texturally it is wavy, medium- to rarely, planar thick-bedded, highly fossiliferous, whole fossil to skeletal wackestone and packstone, some grainstone textures occur locally in the uppermost part. Main difference between Bromide carbonates and overlying Viola Springs types is the absence of chert in the Bromide. Lower clastic interval very poorly exposed. Sandstones typically are pinkish gray (5YR 8/1) to very light gray (N8), poorly-indurated to friable, mostly thin-bedded, although some thicker (massive?) intervals do occur, and texturally consist of fine- to medium-grained quartz arenites. Interspersed shale intervals consist of greenish gray (5GY 6/1) to grayish yellow green (5GY 7/2) fresh, moderate yellow (5Y 7/6) weathered clayshale. Thin, very argillaceous to sandy limestone beds occur within shales and sandstones, although they tend to be more common in the lower third of this basal clastic interval. Total thickness of the Bromide about 450 to 500 feet.

**Omi** McLISH FORMATION (Middle Ordovician, Llandellian) - Similar to the overlying Bromide Formation, consisting of an upper carbonate-dominated interval (having some sandstone and shale interbeds), and a lower clastic-dominated interval; clastic interval of the McLish has fewer shale and sandy limestone interbeds than Bromide. Limestones of the upper interval consist of medium light gray (N6) to greenish gray (5GY 6/1) weathered and fresh, locally argillaceous, fossiliferous (usually skeletal), but some whole fossils occur; carbonate mudstones and wackestones, with local packstone beds. Birdseye texture, clear calcite spar filling fractures, are commonly found in mudstones in the upper half of this interval. Clayshale partings may occur, but are rarely seen in outcrop. Sandstones of the lower McLish interval consist of very light gray (N8) to white (N9) fresh; grayish yellow green (5GY 7/2) to pale yellowish green (10GY 7/2) weathered, very friable, fine-grained, slightly argillaceous, quartz arenites; bedding unknown given the friable nature of the sandstone lithology. Total thickness about 400 feet.

**Ooc** OIL CREEK FORMATION (Middle Ordovician, Llandellian) - Similar to the Bromide and McLish Formations, the Oil Creek consists of an upper carbonate-dominated interval having a varying amount of shale interbeds, overlying a lower, clastic-dominated interval. Limestones in upper Oil Creek interval consist of medium gray (N5) to medium bluish gray (5B 5/1) fresh; pale yellowish orange (10YR 8/6) weathered, thin- to locally medium-bedded, slightly argillaceous, very fossiliferous packstones, with some wackestones; chert pebbles may be present in lower basal packstone beds of this interval (Ham, 1945). Interspersed shales are pale yellowish brown (10YR 6/2), light olive gray (5Y 5/2), and pale olive (10Y 6/2) weathered and fresh, laminated, clayshale; shale intervals vary from a few inches thick to as much as tens of feet, with thicker shale intervals (and subsequent more frequent and thinner limestone beds) becoming more common toward the top of this upper Oil Creek interval. Lower Oil Creek clastic interval dominated by a very light gray (N8) to white (N9) friable, well-sorted, fine-grained quartz arenite; bedding difficult to observe due to friable nature of sandstone, but some geologic reports suggest medium- to thick-bedded (Ham, 1945; Harris, 1957). Total thickness of formation about 250 feet.

**Ows** WEST SPRING CREEK FORMATION (Lower Ordovician, Arenigian) - Almost consistently a medium light gray (N6), thin- to rarely, medium-bedded, fossiliferous, dolomitic carbonate mudstone, with minor wackestone texture occurring at a few stratigraphic horizons; shale and argillaceous intervals occur toward the top of the formation. Total thickness approximately 800 feet based on cross section.

**Oki** KINDBLADE FORMATION and older Arbuckle Group strata - Lithologically and texturally similar to West Spring Creek Formation. Observed only in the subsurface.



**GEOLOGIC MAP OF THE ROFF NORTH 7.5' QUADRANGLE, PONTOTOC COUNTY, OKLAHOMA**

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