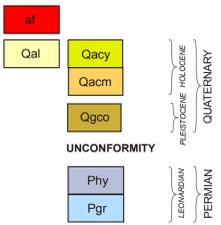


CORRELATION OF MAP UNITS

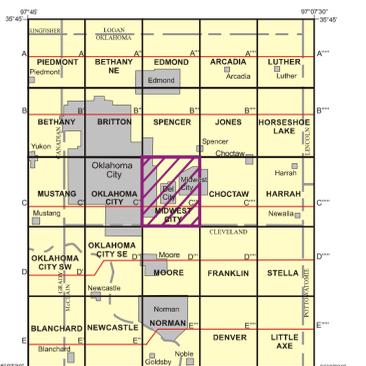


DESCRIPTION OF UNITS

- af** ARTIFICIAL FILL—Natural or artificial slumps, cavings, talus or active fill around extensive areas of architectural development or landfills that cover formerly exposed areas. Thickness variable
- 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
- Qacy** ALLUVIUM OF NORTH CANADIAN RIVER (Holocene)—Clay, silt, sand, and gravel in channels and on flood plain of North Canadian River. Area probably subject to frequent flooding. Thickness: generally 0 to 40 ft; rarely more than 40 ft
- Qacm** ALLUVIUM OF NORTH CANADIAN RIVER (Holocene)—Clay, silt, sand, and gravel on Recent flood plain of North Canadian River about 5 to 10 ft above Qacy. Area rarely subject to flooding. Thickness: unknown, possibly as much as 50 ft
- Qgco** REMNANTS OF OLDER TERRACE DEPOSITS (Pleistocene)—Clay, silt, sand, and gravel adjacent to the flood plain of the North Canadian River. Sand commonly is medium- to coarse-grained and very light colored; gravel locally consists of concentrations of distally derived pebbles and cobbles, mostly subrounded quartz and quartzite. Base of unit varies from 20 to 50 ft above the modern flood plain and ranges in elevation from 1190 ft to 1220 ft above sea level. The top of the unit is as much as 70 ft above the modern flood plain and is as high as 1225 ft above sea level. The majority of these deposits occur along the south side of the North Canadian River. Thickness: 0 to 15 ft
- Phy** HENNESSEY FORMATION (Permian)—Shale and siltstone, poorly exposed, mostly moderate reddish brown (10R4/6), moderate red (5R4/6), to moderate reddish orange (10R6/6) with conspicuous light greenish gray (5GY8/1) iron-reduction spots. The lower 20-30 ft is predominantly a blocky-weathering silty shale and claystone that exhibits good paleosol development; locally with faintly tabular siltstone and fine- to very fine grained sandstone. A dusky yellow (5Y6/4) to moderate orange pink (10R8/2) dolomitic siltstone bed, 3-5 in. thick, may be found locally near contact with the Garber Formation. Above the lower part, thin-bedded to laminated siltstones and very fine grained sandstones are common. Occurs on tops of hills and ridges, generally expressed as highly weathered, muddy soil. Thickness: 0-100 ft, top eroded
- Pgr** GARBER FORMATION (Permian)—Sandstone, mostly fine-grained to less commonly very fine to medium-fine-grained, appears to be very fine grained near base, moderate reddish brown (10R4/6), moderate reddish orange (10R6/6), moderate red (5R5/4), light brown (5YR5/6), and dark yellowish orange (10YR6/6); minor siltstone, shale, and siltstone-pebble conglomerate. Sandstone typically porous and friable. Commonly weathers to smooth, rounded outcrops; locally with platy to flaggy to rarely shaly appearance. Locally weathers to hard, dark-colored (grayish black (N2)) beds completely cemented with hematite, calcite, and/or silica. Dark-colored sandstone blocks locally form lag deposit over weathered outcrops. Large- and small-scale crossbeds, trough crossbeds common; many outcrops characterized by inclined beds and channelform deposits, although plane-parallel stratification also present. Shale and/or siltstone rip-up clasts uncommon; burrows extremely rare. Sandstone locally color-banded (e.g. moderate reddish brown (10R4/6), grayish red purple (5R4/2), and grayish yellow green (5GY7/2)) or with mottled appearance. Small calcareous and iron-oxide spheres occur locally on weathered surfaces. Circular iron-reduction spots very rare. Siltstone and shale sandy, colored-banded (e.g. moderate reddish brown (10R4/6) and yellowish gray (5Y7/2)), stratified to unstratified, and with uncommon iron-reduction spots as large as 2 in. in diameter. Typically soft, weather to "badlands"-type topography. Siltstone and shale common near base and top of formation. In places, siltstone and shale contain evidence of paleosol development such as blocky weathering, fractures with fracture surfaces marked by small slickensides, through-going curved fractures, and calcareous concretions. Barite roses (Oklahoma rose rock) common on west side of area. Thickness: about 650 ft, based on cross section

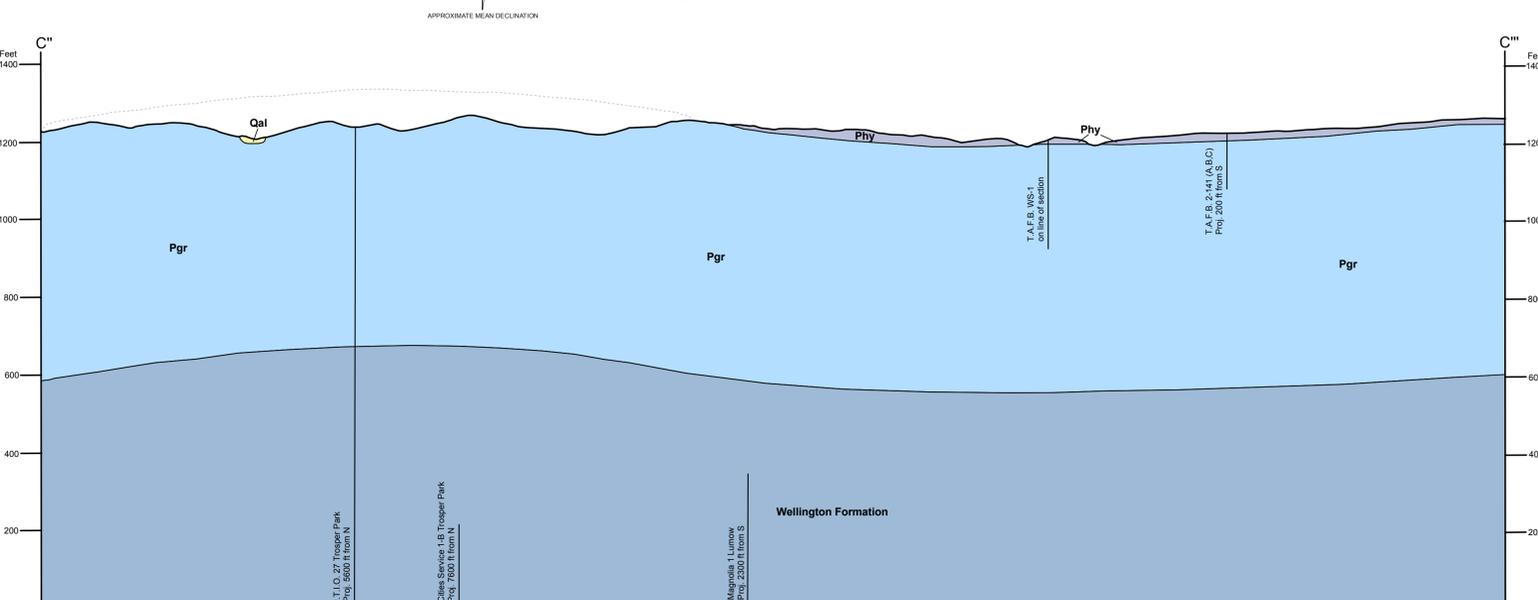
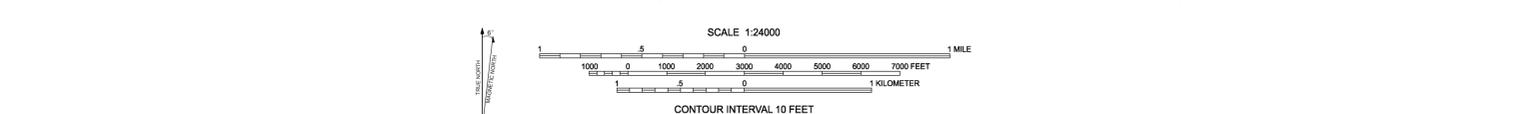
SYMBOLS

- Unit contact; dashed where approximate
- ⊕ Dome; position inferred
- × 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
- Municipal water well
- Exotic (quartz, quartzite) pebbles and cobbles



Base Map Credits  
The base map was compiled by the U.S. Geological Survey. Topography compiled 1956. Planimetry derived from imagery taken 1995 and other sources. Universal Transverse Mercator (UTM) projection. 1883 North American datum. 10,000-foot grid lines based on Oklahoma coordinate system, north and south zones. 1,000-meter UTM grid, zone 14.

Geologic Map Credits  
Geology by Thomas M. Stanley and Neil H. Suneson, 1999-2000. Assisted by W. Aaron Barnes, 1998. Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under Assistance Award Number 5903G0137. The views and opinions 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 2-2003 as an author-prepared, black-and-white paper map. Digitally reproduced in color as Open-File Report OF2-2004. Map rechecked and published as OQG-46. Cartography and layout prepared by G. Russel Blanksidge, 2002.



10x vertical exaggeration  
Formation contacts based on wireline-log interpretations by N.H. Suneson and surface mapping by the authors. Vertical lines show logs used in the interpretations. Special thanks to C. Scott Bowen, Geologist - Project Manager - Environmental Restoration Division, for drillhole data at Tinker Air Force Base.

**GEOLOGIC MAP OF THE MIDWEST CITY 7.5' QUADRANGLE, OKLAHOMA AND CLEVELAND COUNTIES, OKLAHOMA**  
Thomas M. Stanley and Neil H. Suneson  
2000