PRELIMINARY SURFICIAL GEOLOGY OF THE LANCASTER QUADRANGLE, ATCHISON COUNTY, KANSAS

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2014

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KANSAS GEOLOGICAL SURVEY
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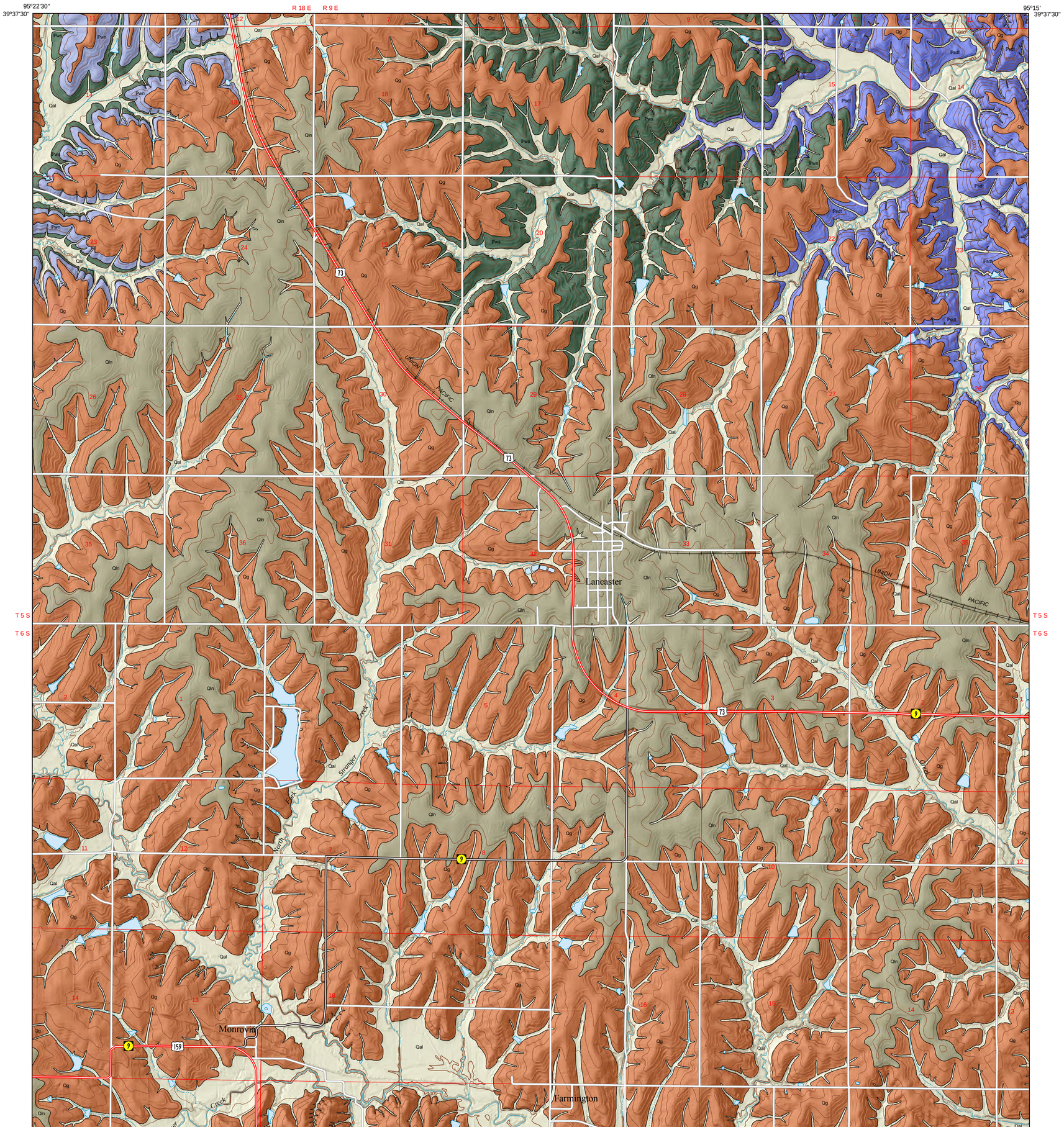


GEOLOGIC UNITS

Units and descriptions from Ward (1973) and field notes

CENOZOIC

Quaternary System
Pleistocene–Holocene

Qal

Alluvium and Terraces — Pleistocene terraces are composed of discontinuous deposits of brown sandy clay on stream-valley walls. They may also contain reddish-brown silt resembling loess. The thickness of terraces ranges from 0-70 feet (~ 0-21 m). Holocene alluvium is composed of brown to bluish-gray, sandy, pebbly clay. Thin beds of gravel composed of limestone, chert, and glacial material may be interspersed throughout the alluvium or rest directly on bedrock. Alluvium may also contain reddish-brown silt resembling loess. The thickness of alluvium ranges from 0-105 feet (~ 0-32 m).

Pleistocene

Qln

Loess and Nortonville Clay—The Nortonville clay is a light-gray, compact clay that may be slightly sandy and contain sparse pebbles. The Nortonville clay is lacustrine in origin and thought to have been deposited in a lake marginal to glaciers to the north. Reddish-brown weathered streaks may be present throughout the clay and additions of brown to reddish-brown, non-calcareous, slightly sandy loess have been incorporated into these upland deposits. The thickness of loess and Nortonville clay ranges from 0-45 feet (~ 0-14 m).

Qg

Glacial Till—The Cedar Bluffs till is a heterogeneous mixture of clay, silt, and gravel with colors of brown to reddish-brown, yellowish-brown, or light gray. It also contains erratics and lenses of gravel. Thickness of the Cedar Bluffs till ranges from 0-100 feet (~ 0-30 m). The Nickerson till is composed of a heterogeneous mixture of clay, silt, sand, and gravel with colors of dark-gray to bluish-gray with some reddish-brown streaks. It contains lenses of gravel and fewer erratics than the Cedar Bluffs till. Thickness of the Nickerson till ranges from 0-90 feet (~ 0-27 m).

PALEOZOIC

Carboniferous System – Pennsylvanian Subsystem

Wabaunsee Group

Nemaha Subgroup

IPwn

Bern Limestone, Auburn Shale, Emporia Limestone, and **Willard Shale** – At the base of the Bern Limestone the **Burlingame Limestone Member** is a gray to brown, fossiliferous, medium-hard limestone. The middle **Soldier Creek Shale Member** is a gray to greenish-gray shale. The upper **Wakarusa Limestone Member** is a bluish-gray to brown, fossiliferous, hard, dense limestone. Thickness of the Bern Limestone ranges from 20-30 feet (~ 6-9 m). The **Auburn Shale** is a gray to light-gray shale, limy in the lower part, silty and sandy in the middle part, and very limy in the upper part. A thin, black, platy shale is present near the middle part. Its thickness ranges from 30-40 feet (~ 9-12 m). At the base of the **Emporia Limestone**, the **Reading Limestone Member** is two to three beds of bluish-gray to brown, slightly fossiliferous, hard, dense limestone. The middle **Harveyville Shale Member** is gray to greenish-gray, calcareous, and blocky. The upper **Elmont Limestone Member** is bluish-gray to brown, hard, and fossiliferous. The thickness of the Emporia Limestone is 20-30 feet (~ 6-9 m). The **Willard Shale** is a gray to brownish-gray, non-calcareous, micaceous, sandy shale that locally contains an impure sandstone in the upper part. Its thickness ranges from 30-40 feet (~ 9-12 m).

Sacfox Subgroup

IPws

Severy Shale, Howard Limestone, and **Scranton Shale** -- The **Severy Shale** is a gray to tan, sandy shale. This shale is silty and calcareous in the lower part and clayey and non-calcareous in the upper part. Thickness ranges from 30-45 feet (~ 9-14 m). From the base to the uppermost part of the **Howard Limestone**, members include the **Bachelor Creek Limestone Member, Aarde Shale Member**, **Church Limestone Member**, **Winzeler Shale Member**, and the **Utopia Limestone Member**. The Bachelor Creek limestone is not present in Atchison County. The Howard Limestone consists of alternating beds of bluish-gray to brown, fossiliferous, hard, dense limestone members and dark-gray to tannish-gray, calcareous, silty shale members. The Nodaway coal bed is present in the Aarde Shale Member. Thickness of the Howard Limestone ranges from 10-20 feet (~ 3-6 m). From the base to the uppermost part of the **Scranton Shale**, members include the **White Cloud Shale Member**, **Happy Hollow Limestone Member**, **Cedar Vale Shale Member**, **Rulo Limestone Member**, and the **Silver Lake Shale Member**. Shale members are composed of tan to bluish-gray, silty, sandy shale. Limestone members are 1 to 3 feet (~ 0.3-1 m) thick, gray, fossiliferous, and silty. A thin coal bed is present just below the Rulo limestone. Thickness of the Scranton Shale ranges from 50-80 feet (~ 15-24 m).

Shawnee Group

IPsdt

Deer Creek Limestone, Calhoun Shale, and Topeka Limestone — From the base to the uppermost part of the **Deer Creek Limestone**, members include the **Ozawkie Limestone Member**, **Oskaloosa Shale Member**, **Rock Bluff Limestone Member**, **Larsh and Burroak Shale Member**, and the **Ervine Creek Limestone Member**. The Deer Creek Limestone consists of alternating beds of gray to white weathering to brown, fossiliferous, dense, and hard limestone members and gray to black, blocky to fissile, and clayey to silty shale members. The Ozawkie and Rock Bluff Limestone Members are single-bedded to massive. Thickness of the Deer Creek Limestone ranges from 30-40 feet (~ 9-12 m). The **Calhoun Shale** is a bluish-gray, platy to blocky, silty, sandy shale. Its thickness ranges from 15-25 feet (~ 4-8 m). From the base to the uppermost part of the **Topeka Limestone**, members include the **Hartford Limestone Member**, **Iowa Point Shale Member**, **Curzon Limestone Member**, **Jones Point Shale Member**, **Sheldon Limestone Member**, **Turner Creek Shale Member**, **Du Bois Limestone Member**, **Holt Shale Member**, and **Coal Creek Limestone Member**. The **Topeka Limestone** consists of alternating beds of bluish-gray to gray and brown, fossiliferous, hard to medium-hard limestone members and bluish-gray to black, fossiliferous, calcareous, silty shale members. Locally, thin coal beds occur in some of the shale members. Thickness ranges from 20-30 feet (~ 6-9 m).

Reference

Ward, J. R., 1973, Geohydrology of Atchison County, northeastern Kansas: U.S. Geological Survey, Hydrologic Investigations Atlas HA-467, 2 sheets, scale: 1:62,500; http://pubs.er.usgs.gov/ publication/ha467.

EXPLANATION

Boundaries and Locations

- Township/range line
- Section line

Transportation

- U.S. highway
- State highway
- Local road
- Railroad

Geologic Unit Boundaries

- Observed contact

Hydrology and Topography

- Perennial stream
- Intermittent stream
- Water body
- Water body - manmade shoreline
- Elevation contour (100-meter interval)
- Elevation contour (20-meter interval)

Elevation contours are presented for general reference. Used in the U.S. Geological Survey's current US Topo 1:24,000-scale topographic map series, they were generated from hydrographically-improved 1/3 arc-second National Elevation Dataset (NED) data, and smoothed during processing for use at 1:24,000 scale. In some places the contours may be more generalized than the base data used for compilation of geologic outcrop patterns. Outcrop patterns on the map will typically reflect topographic variation more accurately than the associated contour lines. Repeated fluctuation of an outcrop line across a contour line should be interpreted as an indication that the mapped rock unit is maintaining a relatively constant elevation along a generalized contour.

1-m LiDAR hillshades and 1-m 2010 and 2012 U.S. Department of Agriculture – Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) digital imagery were used as references in the digital mapping. USGS 7.5-min 1:24,000-scale topographic maps, USDA Natural Resources Conservation Service (NRCS) soil surveys, and other geologic maps and bulletins were used to supplement the mapping. Roads and highways are shown on the base map as represented by data from the Kansas Department of Transportation (KDOT), U.S. Census Bureau, and other sources. U.S. Department of Agriculture – Farm Services Agency (USDA-FSA) National Agriculture Imagery Program (NAIP) imagery also was used to check road locations.

Shaded relief is based on 1-meter hydroflattened bare-earth DEMs from the State of Kansas LiDAR Database. The DEM images, in ERDAS IMAGINE format, were mosaicked into a single output DEM, downsampled to 5-meter resolution, and reprojected to decimal degrees. The output DEM was then converted to a hillshade, a multidirectional shaded-relief image using angles of illumination from 0°, 225°, 270°, and 315° azimuths, each 45° above the horizon, with a 4x vertical exaggeration.

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, award number G13AC00168 (FY2013).

This map was produced using the ArcGIS system developed by Esri (Environmental Systems Research Institute, Inc.).

This map is a preliminary product and has had less scientific and cartographic review than the Kansas Geological Survey's M-series geologic maps. KGS does not guarantee this map to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations made from the map or decisions based thereon.

SUGGESTED REFERENCE TO THE MAP

Koop, A. N., and Johnson, W. C., 2014, Preliminary surficial geology of the Lancaster quadrangle, Atchison County, Kansas: Kansas Geological Survey, Open-file Report 2014-6, scale 1:24,000, unpublished.

SCALE 1:24 000

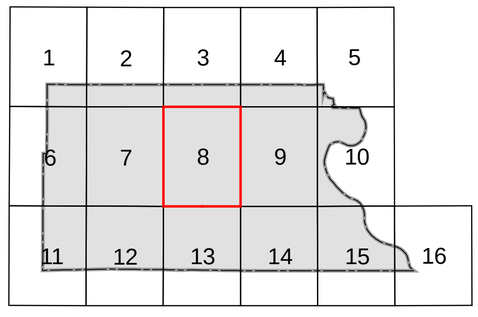
1 0.5 0 1 MILE

1 0.5 0 1 2 KILOMETERS

UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 15
NORTH AMERICAN DATUM OF 1983

APPROXIMATE MEAN DECLINATION, 2014

QUADRANGLE LOCATION



ATCHISON COUNTY QUADRANGLES

1 Horton
2 Everest
3 Denton
4 Bendena
5 Atchison NE KS-MO
6 Whiting
7 Effingham
8 Lancaster
9 Atchison West
10 Atchison East KS-MO
11 Arrington
12 Half Mound
13 Nortonville
14 Potter
15 Oak Mills KS-MO
16 Weston MO-KS