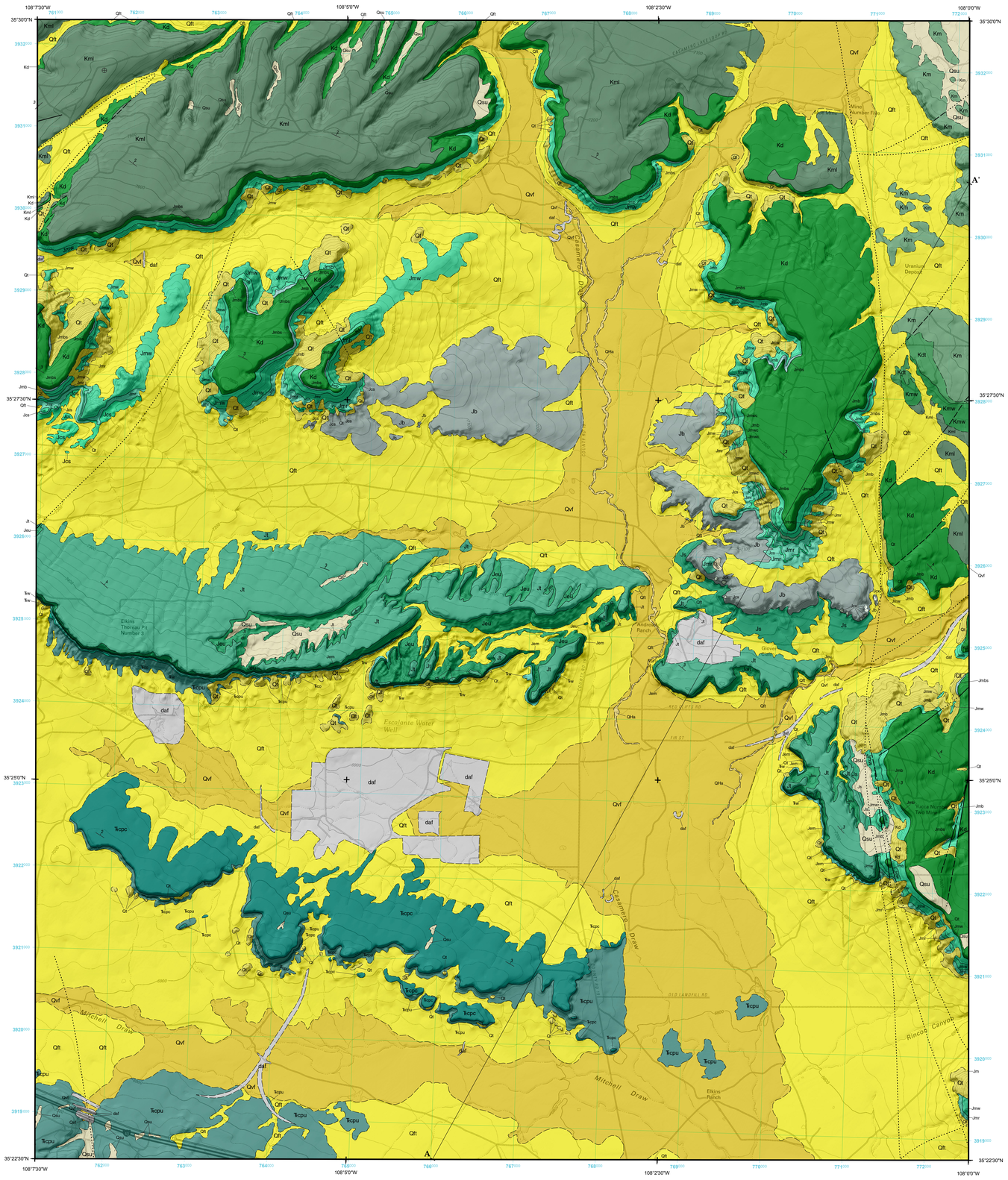
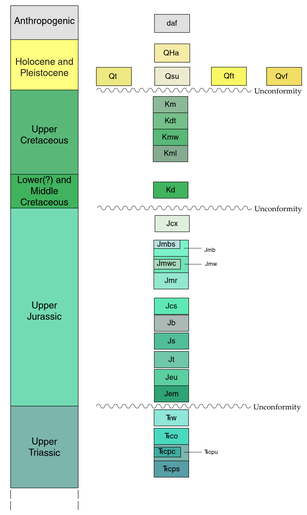


Correlation of Map Units



Explanation of Map Symbols

- Contact—Identity and existence certain. Location: accurate where solid, approximate where dashed.
- Fault—Identity and existence certain. Location: accurate where solid, approximate where dashed, and dotted where concealed
- Horizontal bedding
- Inclined bedding
- A A' Cross section line

Mapping Responsibilities

Rawling, Geoffrey C.

Green, Morris W. and Pierson, Charles T.

Description of Map Units

Disturbed\Artificial\Antropogenic

daf—**Disturbed ground/artificial fill**—Anthropogenic fill for highway and railroad embankments and earthen dams, and disturbed ground at industrial and mine sites where underlying geology is obscured.

Quaternary

QHa—**Recent Alluvium**—Unlithified gravel, sand, silt, and clay in incised active drainages.

Qsu—**Upland Deposits**—Unlithified to poorly lithified sand, silt, and clay forming low-relief sheets and thin (< 5 feet) valley fills on upland surfaces. Generally unincised by modern drainages.

Qft—**Fan and Hillslope Toe Deposits**—Unlithified to poorly lithified gravel, sand, silt, and clay. Forms coalesced, low-gradient alluvial fans and the toes of slopes. Generally undissected by modern drainages.

Qvf—**Valley Fill**—Unlithified to poorly lithified gravel, sand, silt, and clay beneath very low gradient valley floors and alluvial slopes. Undissected by modern drainages. Composition probably becomes progressively finer-grained with increasing distance from bedrock slopes.

Qt—**Talus**—Unlithified talus, landslide blocks, and colluvium.

Cretaceous

Km—**Main body of Mancos Shale**—Dark-olive-gray, friable, silty shale, locally interbedded with minor very thin-bedded to laminated, yellowish-brown, sandy siltstone. Incompletely exposed.

Kdt—**Twowells Tongue of Dakota Sandstone**—Yellowish-brown, fine-grained, silty sandstone and sandy siltstone with light-gray, lenticular beds of fossiliferous limestone. 4–6 feet thick.

Kmw—**Whitewater Arroyo Tongue of Mancos Shale**—Yellowish-brown to yellowish-gray, fossiliferous shale. 90–110 feet thick.

Kml—**Lower part of Mancos Shale**—Olive-gray to pale-grayish-yellow shale with interbeds of yellowish-brown, sandy siltstone and silty sandstone containing dark-gray, fossiliferous, lenticular limestone bodies. 100–150 feet thick.

Kd—**Dakota Sandstone**—Yellowish-brown to buff, medium- to fine-grained, well-sorted, siliceous sand-stone, with thin beds of black to gray, carbonaceous shale, interbedded locally. 80–140 feet thick.

Jurasic

Jcx—**Collapse features/breccia pipes**—Collapse features/breccia pipes.

Jmb—**Brushy Basin Member of Morrison Formation**—Greenish-gray to purplish-gray, claystone and sandy siltstone. 80–120 feet thick.

Jmbs—**Sandstone lenses within the Brushy Basin Member of Morrison Formation**—Yellowish-brown, pink, and white, medium- to coarse-grained, poorly sorted sandstone.

Jmw—**Westwater Canyon Member of Morrison Formation**—Yellowish-gray to reddish-brown, medium- to coarse-grained, poorly sorted fluvially cross-bedded sandstone. Intertongues with the Recapture Member. 150–200 feet thick.

Jmwc—**Claystone and siltstone lenses within the Westwater Canyon Member of the Morrison Formation**—Local lenses of dusky-reddish- to purplish-gray claystone and siltstone.

Jmr—**Recapture Member of the Morrison Formation**—Purplish- and greenish-gray to white siltstone and claystone containing lenses of greenish-white, fine- to medium-grained, moderately well-sorted sandstone. Intertongues with Westwater Canyon Member and Cow Springs Sandstone. 110–140 feet thick.

Jcs—**Cow Springs Sandstone**—Light- to greenish-gray, medium- to fine-grained, moderately well-sorted sandstone with high-angle aeolian crossbedding. Intertongues with the Morrison Formation and Bluff Sandstone. 0–65 feet thick.

Jb—**Bluff Sandstone**—Very light-reddish-brown, pale-orange, and greenish-gray, fine- to medium-grained sandstone and silty sandstone; contains alternately cross-bedded and parallel-bedded units, separated locally by thin claystone and siltstone partings. 100–150 feet thick.

Js—**Summerville Formation**—Parallel-bedded, reddish-brown to light-orange, fine-grained silty sandstone and thin-bedded, reddish-brown claystone and siltstone. 95–140 feet thick.

Jt—**Todilto Limestone**—Light- to dark-gray, thin-bedded limestone, locally containing small secondary calcite crystals. Lower third is laminated sandy limestone. 20–30 feet thick.

Jeu—**Upper sandy member of the Entrada Sandstone**—Reddish-orange to reddish-brown, medium- to fine-grained, well-sorted, aeolian cross-bedded sandstone. 130–150 feet thick.

Jem—**Medial silty member of the Entrada Sandstone**—Dark-reddish-purple, clayey siltstone and very fine-grained silty sandstone. 45–50 feet thick.

Triassic

Trw—**Wingate Sandstone**—Reddish-orange, medium- to fine-grained, well-sorted, aeolian cross-bedded sandstone containing randomly oriented calcite-filled joints. Commonly contains fine- to medium-grained, angular, white chert grains that tend to be concentrated along cross-bed laminations. Angular, pebble-sized and smaller, white chert grains occur locally in a zone approximately 6 inches thick at the base of the unit. 35–45 feet thick.

Trco—**Owl Rock member of the Chinle Formation**—White, light-green, and purplish-gray, limestone-pebble conglomerate, interbedded with reddish-purple siltstone. 15–20 feet thick.

Trcpc—**Correo Sandstone Bed of the Petrified Forest member of the Chinle Formation**—Light- to medium-dark-purplish-gray, medium- to fine-grained, fluvially cross-bedded siliceous sandstone. Locally contains grayish-brown, limestone-pebble conglomerate. 20–35 feet thick.

Trcpu—**Upper part of the Petrified Forest member of the Chinle Formation**—Dark- to light-purplish-gray, clayey siltstone. About 680 feet thick.

Trcps—**Sonsela Sandstone Bed of the Petrified Forest Member of the Chinle Formation**—Yellowish-brown to white, medium- to coarse-grained sandstone containing fluvial cross-beds. Locally conglomeratic and contains micaceous minerals that tend to be concentrated along cross-bed laminations; also locally contains lenses of reddish- to purplish-gray claystone and siltstone. Base not exposed (bed separates upper and lower parts of Petrified Forest Member). Cross section only.

pTrcps—**Pre-Sonsela Sandstone** (units undivided)—Cross section only.

Comments to Map Users

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes may not be shown due to recent development.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The New Mexico Bureau of Geology and Mineral Resources created the Open-file Geologic Map Series to expedite dissemination of these geologic maps and map data to the public as rapidly as possible while allowing for map revision as geologists continued to work in map areas. Each map sheet carries the original date of publication below the map as well as the latest revision date in the upper right corner. In most cases, the original date of publication coincides with the date of the map product delivered to the National Cooperative Geologic Mapping Program (NCGMP) as part of New Mexico's STATEMAP agreement. While maps are produced, maintained, and updated in an ArcGIS geodatabase, at the time of the STATEMAP deliverable, each map goes through cartographic production and internal review prior to uploading to the Internet. Even if additional updates are carried out on the ArcGIS map data files, citations to these maps should reflect this original publication date and the original authors listed. The views and conclusions contained in these map documents are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

Base map from U.S. Geological Survey 2010.
North American Datum of 1983 (NAD83) World Geodetic System of 1984 (WGS84).
Projection and 1000-meter grid: Universal Transverse Mercator, Zone 12S
10 000-foot ticks: New Mexico Coordinate System of 1983(west zone), shown in blue.

Roads.....©2006-2010 Tele Atlas
Names.....GNIS, 2008
Hydrography.....National Hydrography Dataset, 2005
Contours.....National Elevation Dataset, 2000

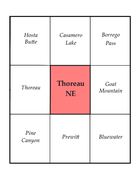
1:24,000

1 0.5 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 0.5 0 1 Kilometer

Contour Interval 20 Feet
National Geodetic Vertical Datum of 1988



Quadrangle Location

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 148

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act (Fund Number: G14AS00006), administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (L. Greer Price, *Director and State Geologist*, Dr. J. Michael Timmons, *Assoc. Director for Mapping Programs*).

Geologic Map of the Thoreau NE 7.5-Minute Quadrangle, McKinley County, New Mexico

June, 2015

by
Rawling, Geoffrey C.; [1]
(Surficial geology for the entire quadrangle interpreted from aerial photography)

Green, Morris W.; [2] and Pierson, Charles T. [2]
(Bedrock geology, bedrock unit descriptions, and subsurface interpretation for the entire quadrangle)

[1] *New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801*
[2] *United States Geological Survey, Reston, VA 20192*

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
801 Leroy Place
Socorro, New Mexico
87801-4796

[575] 835-5490

This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

Geologic Cross Section