



## **GEOLOGIC MAP OF SETON VILLAGE QUADRANGLE, SANTA FE COUNTY, NEW MEXICO**

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Open-file Geologic Map OF-GM 023,  
scale 1: 24,000  
(mapped at 1:12,000)

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## COMMENTS TO MAP USERS

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This quadrangle map has been Open-Filed in order to make it available as soon as possible. The map has not been reviewed according to NMBMMR standards, and due to the ongoing nature of work in the area, revision of this map is likely. As such, dates of revision are listed in the upper right corner of the map and on the accompanying report.

***The contents of the report and map should not be considered final and complete until it is published by the NMBMMR.***

A geologic map graphically displays information on the distribution, nature, orientation, and age relationships of rock and surficial units and the occurrence of structural features such as faults and folds. Geologic contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic map are based on field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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. Significant portions of the study area may have been mapped at scales smaller than the final map; therefore, the user should be aware of potentially significant variations in map detail. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown everywhere.

Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. The information provided on this map cannot be substituted for site-specific geologic, hydrogeologic, or geotechnical investigations. The use of this map to precisely locate buildings relative to the geological substrate is not recommended without site-specific studies conducted by qualified earth-science professionals.

The cross-sections in this report are constructed based on surficial geology, and where available, subsurface and geophysical data. The cross sections are interpretive and should be used as an aid to understand the geologic framework and not used as the sole source of data in locating or designing wells, buildings, roads, or other structures.

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.

## Description of Map Units

### *Anthropogenic Deposits*

- af** **Artificial fill (Historical)** -- Silt, sand, and gravel. Sediment is poorly sorted and lacks bedding. Sediment is loose and of variable thickness.
- afdg** **Artificial fill and disturbed group (historical)** – Artificial fill (see description for unit **af**) and disturbed ground.

### *Cenozoic Rocks*

- Qam** **Alluvium confined to modern drainages (Holocene)** – Sand and gravel of modern channel. May include low terraces.
- Qc** **Colluvium (Uppermost Pleistocene to Holocene)** – Deposited on steeper slopes than Qvf with generally angular heterolithic clasts. Hillslope processes appear to dominate. Possible intertongues of alluvium.
- Qvf** **Valley fill (Uppermost Pleistocene to Holocene)** – Locally derived, unconsolidated, matrix-supported, alluvium and colluvium along margins of active drainages between Ancha ridges/interfluves. Includes low terraces/terrace deposits. Primarily consists of reworked Ancha material moving downslope.
- Qf** **Alluvial fans (uppermost Pleistocene to Holocene)** – Locally derived, unconsolidated gravel, sand, silt, and clay deposited at the mouths of steep minor tributary drainages of Arroyo Hondo.
- Qth** **Quaternary fluvial terrace deposits of Arroyo Hondo (Pleistocene to Holocene)** –
- Qth5** – **Terrace Gravel (upper Holocene?)** Fill terrace gravel with treads approximately 10 feet above the modern grade of Arroyo Hondo
- Qth4** – **Terrace Gravel (middle to upper Holocene?)** Fill terrace gravel with treads approximately 20 feet above modern grade.
- Qth3** – **Terrace Gravel (middle to upper Holocene?)** Fill terrace gravel with treads approximately 35 feet above modern grade.
- Qth2** – **Terrace Gravel (upper Pleistocene to lower Holocene?)** Strath terrace gravel with treads approximately 60 feet above modern grade.
- Qth1** – **Terrace Gravel (middle to upper Pleistocene?)** Strath terrace gravel with treads approximately 80 feet above modern grade.
- Qao** **Older alluvium (Pleistocene)** – Sandy gravel east of Eldorado similar in composition and texture to the Ancha Formation in that area but occupying a lower geomorphic position. 1-10? m thick.
- Qbt** **Lower Bandelier Tuff (Pleistocene, 1.66 ± 0.030 Ma—Jeff Winick, 1999 NMGR L unpublished report)** – Outcrops of this pumice/ash layer are covered by ~1 m of Ancha Formation along Arroyo Hondo

- QTa Ancha Formation (lower Pliocene(?) to lower Pleistocene)** – Sand, muddy sand, gravel, silt, and clay that collectively represent a relatively thick, extensive, aggradational sediment fill in the Santa Fe Embayment south of the Santa Fe River. These unconsolidated to poorly consolidated sediments are locally derived (shed from the foothills and the Sangre de Cristo Mountains), and are of alluvial origin (predominately fan material). The Ancha formation is generally more than 10 m thick, and has a gentle south-westward dip of ~ 5 degrees. Contacts with underlying units are generally poorly exposed, but typically form a distinct angular unconformity with the more steeply dipping Tesuque formation. The Ancha Formation is generally a beige-colored unit that becomes lighter in color near the upper surface from calcium carbonate-rich soils. The underlying Tesuque Formation is reddish which helps to distinguish it from the lithologically similar Ancha Formation. The Ancha formation contains Qlbt in upper 1-2 meters in places along Arroyo Hondo which places a minimum age of  $1.66 \pm 0.030$  Ma on most of the unit and an approximate age for the formation of the Ancha constructional before net incision of the region occurred in the early Pleistocene. Aggradation appears to have continued into the middle to late Pleistocene in some canyons along the mountain front (Koning, Connell, Pazzaglia, and McIntosh, 2002).
- Ttaml Lower tongue of lithosome A, Nambé Member, Tesuque Formation (upper Oligocene to lower Miocene)** – Tannish pebbly sandstone with an estimated 3-5% silt-clay. Beds are medium to thick and tabular, with local internal beds that are very thin to thin and lenticular. Most beds are matrix-supported. Gravel includes minor cobbles (up to 8x8 cm; a and b axes) and is poorly sorted, subrounded to subangular, and composed of granite with 1-7% quartzite, 1-6% Paleozoic sandstone and siltstone, 1-4% vein quartz, and 0-3% dark chert. Sand is very fine- to very coarse-grained (mostly very fine- to medium-grained), subangular to subrounded, poorly to very poorly sorted, and arkosic. This unit is well-consolidated and underlies fine-grained lithosome S. It grades northward into coarser-grained sandy pebble-cobble conglomerate. Thickness of 75-120 m. Description is from Read et al. (2000, rev. 2010).
- Tts Lithosome S of the Tesuque Formation – (lower to middle Miocene)** – Pebbly sand channel-fill deposits and fine sandstone, siltstone, and mudstone floodplain deposits associated with a large drainage exiting the Sangre de Cristo Mountains near the modern Santa Fe River. Unit is recognized by its clast composition (35-65% granite, 3-40% Paleozoic clasts, 5-30% quartzite, including a distinctive black quartzite, and 1-8% chert), reddish color (particularly compared to the tan deposits of unit **Ttal**), and high-energy-flow deposits in very broad, thick channel complexes that possess very thin to medium, planar to lenticular internal bedding. Lithosome S is coarser-grained near the axis of its associated alluvial fan and near the mountain-front, and becomes finer-grained to the south, southwest, northwest, and north. Coarse-grained strata include pebbly sandstone (most common), sandy conglomerate, and sandstone. The coarse strata exhibit stacked channel-fill complexes. There is relatively high connectivity of the channel-fills and channel-fills may fine-upwards. Gravel consists of pebbles with subordinate cobbles. Channel-fill gravel is clast-supported, poorly to moderately sorted, and mostly subrounded (but granitic clasts may be subangular). The sand fraction is an arkose composed of quartz, 10-30% potassium feldspar, trace to 7% yellowish Paleozoic siltstone, sandstone, or limestone grains, and trace to 5% chert and dark quartzite grains. Channel-fill sand is commonly light brown (7.5YR 6/3), fine- to very coarse-grained, poorly to well sorted, and subrounded to subangular. Well consolidated, pink to very pale brown, silty-clayey very fine- to fine-grained sand beds like that seen in lithosome A are uncommon. Cementation of channel-fills is variable. Channel-fills are weakly to moderately consolidated and weakly to non-cemented in overall coarser strata but 10-50% of the channel-fill complexes may be moderately to strongly cemented by calcium carbonate in overall finer strata. Finer-grained strata of lithosome S are in very thin to medium, tabular beds with internal horizontal-planar to wavy laminations; locally, this sediment is massive. Overbank sediment consists of light brown to reddish yellow and pink to very pale brown siltstone, very fine- to coarse-grained (generally fine-grained) sandstone, and silty to clayey sandstone. Within the fine sediment are local very thin to medium, lenticular channel-fills. There are also variable amounts of reddish brown to yellowish red to light reddish brown mudstone and sandy mudstone. Maximum thickness of ~11000 m on this quadrangle. Description is from Read et al. (2000, rev. 2010).

- Tbl** **Bishops Lodge member of the Espinaso Formation (upper Oligocene?)** – White tuffaceous mudstone, gray pebbly volcanoclastic sandstone and pebble to cobble conglomerate. Clasts of light to dark gray pyroxene ( $\pm$  biotite) latite as large as 50 cm but typically 5-20 cm.
- Tla** **Latite/Andesite (Oligocene)** – Lava flows exposed in Arroyo Hondo and in scattered outcrops along I-25 and near Seton Village contain hornblende and plagioclase phenocrysts in an aphanitic dark-brown matrix. K-Ar date of  $29.3 \pm 0.6$  Ma (Baldrige et al., 1980).
- Te** **Espinaso Formation (Oligocene)** – Distinctly red volcanoclastic unit exposed in Arroyo Hondo. A  $^{40}\text{Ar}/^{39}\text{Ar}$  date of  $31.48 \pm 0.33$  Ma (Peters, 1999, NMGRU unpublished report) was obtained from an ash layer found near the base of the Espinaso Formation exposed on the flanks of the Sunlit hills. This middle-Espinaso age date indicates that the lower Espinaso did not reach the mountain front.
- Tg** **Galisteo Formation (Eocene?)** – Brick red sandstone and conglomerate unconformably overlies Proterozoic basement in the vicinity of Arroyo Hondo and I-25. No volcanic clasts are present in this section overlain by the Espinaso Formation. These rocks may not be Eocene and could represent younger sediments consisting of reworked Galisteo Formation (Cather, 1992)

### *Paleozoic Rocks*

- IPlp** **La Posada Formation (Pennsylvanian)** – Grey limestone exposed in scattered small outcrops near Seton Village. Appears to overlie or be inter-bedded with arkosic sandstone. In the type section at Dalton Bluff (Kues, 2001), the lower portion of the unit is dominantly clastic.
- IPlps** **La Posada Formation, sandstone (Pennsylvanian)** – Coarse arkosic sandstone in a small lone outcrop near Seton Village. All Paleozoic outcrops on the quadrangle are close proximity to the Proterozoic basement and this sandstone is similar to basal Sandia Fm. outcrops in other ranges. However, that nomenclature is not appropriate for the Southern Sangre de Cristo Mountains (Kues, 2001). This unit is identified separately only because of the limited exposure and to highlight the exposed contact between the overlying limestone.

### *Proterozoic Rocks*

- Ymg** **Megacrystic granitoid (Mesoproterozoic?)** – Coarse unfoliated granite contains quartz, biotite, and large (up to 10cm) K-spar megacrysts. Looks quite similar to the Sandia Granite. High magnetic susceptibility suggests that this rock may be responsible for the pronounced magnetic high in this area (Mark Hudson, personal communication, 2003).
- Ypeg** **Pegmatite (Mesoproterozoic?)** – Simple pegmatite veins and pods, unfoliated
- Xd** **Granodiorite to Diorite (Paleoproterozoic?)** – Generally medium-grained dark, weakly foliated-to-unfoliated massive diorite. Forms pod-like bodies within surrounding gneisses suggesting late emplacement. Cut by Ypeg.
- Xpg** **Pink Granitic Gneiss (Paleoproterozoic)** – Fine-grained quartz-Kspar mylonitic gneiss is distinctly pink in outcrop. This rock appears to be more resistant to weathering than the coarser biotite-bearing gneisses and forms the bulk of the Sunlit Hills.
- Xbg** **Biotite-rich granitic gneiss (Paleoproterozoic)** – Coarse grained strongly foliated biotite-bearing gneiss often contains microcline augen and appears to be less resistant to weathering than Xpg. Forms much of the broad valley east of the Sunlit hills that I-25 travels along. Unit is broadly generalized due to poor exposure.

**Xa Strongly foliated amphibolite and mafic schist (Paleoproterozoic)** -- may include Xd in places. Mafic units tend to weather poorly and are often mantled by Yg and Xbg float. Consequently, Xa and other mafic units are probably vastly under-represented on the map.

## References

- Baldrige, W.S., Damon, P.E., Shafiqullah, M., and Bridwell, R.J., 1980, Evolution of the central Rio Grande rift, New Mexico - new Potassium-Argon ages: *Earth and Planetary Science Letters*, v. 51, p. 309-321.
- Cather, S.M., 1992, Suggested revisions to the Tertiary tectonic history of north-central New Mexico: *New Mexico Geological Society Guidebook, 43<sup>rd</sup> Field Conference, San Juan Basin IV*, p. 109-122.
- Koning, D.J., Connell, S.D., Pazzaglia, F.J., and McIntosh, W.C., 2002, Redefinition of the Ancha Formation and Pliocene-Pleistocene deposition in the Santa Fe embayment, north-central New Mexico: *New Mexico Geology*, v. 24, no. 3, p. 75-87.
- Koning, D.J., and Hallett, R.B., 2002, rev. 2013, Geologic map of the Turquoise Hill quadrangle, Santa Fe County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM 41, scale 1:24,000.
- Kues, B.S., 2001, The Pennsylvanian System in New Mexico – overview with suggestions for revision of stratigraphic nomenclature: *New Mexico Geology*, v. 23, no. 4, p. 103-122.
- Read, A.S., Koning, D.J., Smith, G.A., Ralser, S., Rogers, J., and Bauer, P.W., 2000 (last revised 9-21-2010), Geologic map of the Santa Fe 7.5-minute quadrangle: New Mexico Bureau of Mines and Mineral Resources, Open-file Geologic Map OF-GM-32, scale 1:12,000.
- Read, A.S., and Koning, D.J., 2010, Geologic map of the southern Espanola Basin: New Mexico Bureau of Geology and Mineral Resources, Open-file Report OF-531, scale 1:48,000.