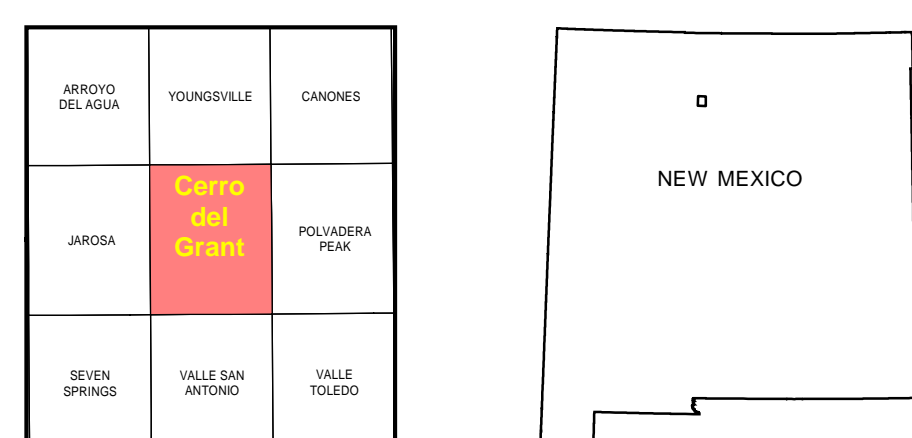


Base from U.S. Geological Survey 1953, photorevised 1977.
1927 North American datum, Universal Transverse Mercator Projection.
1000-meter UTM grid cells, zone 13, shown in red.

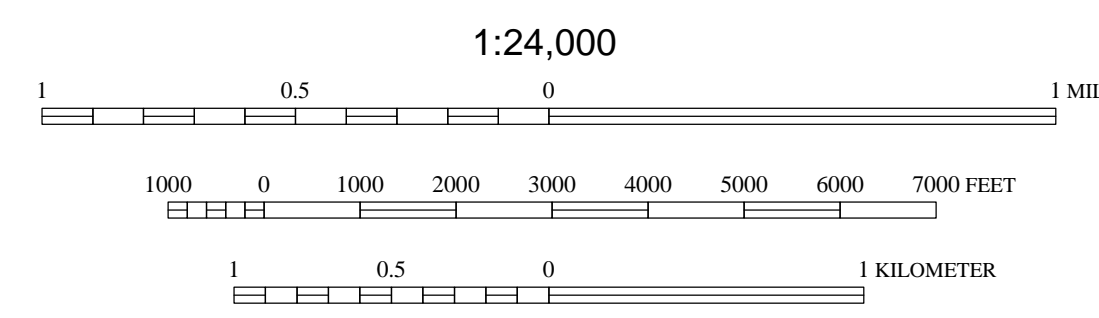


QUADRANGLE LOCATION

This draft geologic map is preliminary and will undergo revision. It was produced from either scans of hand-drafted originals or from digitally drafted original maps and figures using a wide variety of software, and is currently in cartographic production. It is being distributed in this draft form as part of the bureau's Open-File map series (OFGM), due to high demand for current geologic map data in those areas where STATEMAP quadrangles are located, and it is the bureau's policy to disseminate geologic data to the public as soon as possible.

After this map has undergone scientific peer review, editing, and final cartographic production adhering to bureau map standards, it will be released in our Geologic Map (GM) series. This final version will receive a new GM number and will supersede this preliminary open-file geologic map.

DRAFT



OFGM 87

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This and other STATEMAP quadrangles are (or soon will be) available for free download in both PDF and ArcGIS formats at:

<http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html>

Geologic map of the Cerro Del Grant quadrangle, Rio Arriba and Sandoval Counties, New Mexico.

May 2004

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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map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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 geologists. 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 associated with recent development may not be shown.

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 map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. 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 State of New Mexico, or the U.S. Government.

Explanation of Map Units

- Qal **Alluvium (Quaternary)** – unconsolidated, clay, silt, sand, and gravel deposits up to 5 m thick; includes locally organic-rich sediments.
- Qc **Colluvium (Quaternary)** – unconsolidated fine to coarse debris derived from local volcanic and sedimentary rocks; up to 35 m thick.
- Ql **Landslide deposits (Quaternary)** – unconsolidated, sorted, fine to coarse volcanic and sedimentary debris with morphology suggestive of a landslide; up to 35 m thick.
- Qb **Bandler Tuff (1.6 Ma to 1.4 Ma)** – pumiceous air-fall tephra, welded rhyolitic ash-flow tuff, and local volcanoclastic sediments; divided into two members, from younger to older:
- Qbt **Tshirege Member** – primarily light pinkish gray, crystal tuff, weakly to moderately welded with phenocrysts of quartz, sanidine, and pyroxene and pumice fragments in a fine-grained matrix of vitric ash up to 70 m thick; includes basal white pumiceous tephra deposits (1–2 m thick) of the Tsankawi Pumice Bed. Cerro Toledo tuffaceous and volcanoclastic sediments not observed.
- Qbo **Owoli Member** – tan-colored, crystal- and lithic-bearing tuff, weakly to partly welded, locally with up to 30% xenoliths of dacite and other intermediate to mafic volcanic rocks; 0–100 m thick. Basal pumiceous tephra deposits of the basal Guaje Pumice Bed not observed.
- Tr **Tschicoma Formation (3 Ma to 7 Ma)** – includes andesites and local dacites occurring as massive lavas, domes, vents, and shallow intrusives on La Grulla Plateau; informally divided into two members:
- Ttd **Tschicoma dacites (7.35 Ma)** – includes hornblende- and hornblende-biotite porphyritic rocks of diverse texture and lithology that overlie Tschicoma andesites and are concentrated in domes and lavas of limited areal extent along the east edge of La Grulla Plateau; 0–150 m thick. Both coarsely porphyritic and fine-grained, flow-banded, weakly porphyritic dacites are present.
- Tta **Tschicoma andesite (Pliocene)** – mainly coarsely porphyritic, 2-pyroxene andesites that occur as massive flows, domes and shallow intrusives on the west-central parts of La Grulla Plateau; 70 to 150 m thick. Includes local dark gray, fine-grained, weakly porphyritic andesite containing pyroxene and minor olivine.
- Tl **Lobato Formation (7 Ma to 14 Ma)** – includes andesites and local dacite occurring as lavas, domes, and vents exposed in the escarpment of Encino Lookout, on Banco Largo, and on the north end of La Grulla Plateau; informally divided into two members:
- Tld **Lobato Dacite (Pliocene, <7.85 Ma)** – weakly porphyritic, plagioclase-augite-hypersthene + biotite dacite exposed as an endogenous dome at Encino Escarpment and dike on Banco Largo; up to 100 m thick.
- Tba **Tschicoma andesite (Pliocene)** – dark gray, weakly porphyritic, fine-grained, plagioclase-pyroxene-olivine basaltic-andesite and andesite exposed in a series of flows with pyroclastic interlayers associated with a shield cone at Encino escarpment; includes remnant andesite lavas and pyroclastic debris on Banco Largo; at least 70 m thick.
- Tpa **Paliza Canyon andesite (8 Ma)** – dark gray, coarsely porphyritic, pyroxene andesite; locally strongly altered; exposed in limited outcrop on the northern Valles caldera rim; thickness undetermined.
- Tb **Basalt (unassigned) (late Miocene to Pliocene)** – weakly porphyritic, fine-grained olivine-phyric basalt exposed in thin flows within Santa Fe Group sandstone on Canones Creek. Also observed in boulder subcrop where deposited on lower Abiquiu Formation conglomerate in the Four Hills area.
- Td **Ojo Caliente Formation of the Santa Fe Group (late Miocene to Pliocene)** – pink to tan-colored, well-sorted, fine-grained feldspathic and quartz-feldspathic sandstone of eolian origin; up to 100 m thick.
- Ta **Abiquiu Formation (early Miocene)** – informally divided into three subunits including, from younger to older:
- Tau **Upper sandstone member** – white, light gray, and buff-colored fine- to medium-grained, tuffaceous and volcanoclastic sandstone and mudstone, locally conglomeratic, estimated 100 to 130 m thick. The upper sandstone is a slope-forming unit comprised of moderately sorted, moderately indurated volcanic detritus representing diverse lithologies including pumice, basalt, and welded tuff.

- Tfp **Federal Chert member** – varicolored, white, blue to gray, black, cryptocrystalline, massive chert, limy chert, and limestone containing nodular chert, conspicuous ledge former, 2 to 8 m thick. The chert is locally interlayered with thin beds of arkosic sandstone and conglomerate and is typically more limy at its base.
- Tal **Lower conglomerate member** – pinkish tan to gray, generally coarse arkosic conglomerate and fine- to medium-grained sandstone, slope forming, 300 to 400 ft (100 to 130 m) thick. The lower conglomerate member is poorly sorted, weakly to moderately indurated, calcareous, and characterized by well rounded pebbles to boulder-size (up to 50 cm) clasts composed of Precambrian quartzite, granite, pegmatite, gneiss and schist, as well as fine-grained limestone and mudstone.
- Ter **El Rito Formation (Eocene)** – orange-red, hematitic, micaceous mudstone and siltstone and lenses of fine- to medium-grained arkosic sandstone, slope forming, estimated 50 to 140 m thick. The El Rito Formation locally possesses a 2-to 10-m-thick basal conglomerate section made up of very well rounded Precambrian schist, gneiss, and hematitic quartzite cobbles and boulders (up to 1 m) in a weakly indurated matrix of coarse sand.
- Km **Mancos Shale (Late Cretaceous)** – dark gray and brown, weakly consolidated, calcareous, carbonaceous shale and interlayered thin beds of fossiliferous limestone, slope forming, 0 to 65 m thick. Lowermost part of the section only is locally present; upper contact is an erosional unconformity of moderate relief.
- Kd **Dakota Sandstone (Late Cretaceous)** – white, gray, and tan, fine-grained quartzose sandstone, well sorted, locally kaolinitic, conspicuous as a cliff former, 60 to 67 m thick. The Dakota Sandstone is well sorted, thick bedded to massive, and locally contains thin interbeds of black, carbonaceous shale. The basal contact with the underlying Morrison Formation was arbitrarily determined as the lowest occurrence of carbonaceous matter observed in the rock, whether sandstone or shale.
- Jm **Morrison Formation (Late Jurassic)** – shown on the map as an undivided unit, three members are recognized in the map area with combined total thickness of 220 to 250 m as measured in sec. 27 and 34, T. 23 N. R. 4 E. and sec. 3, T. 21 N. R. 3 E. (Lawrence, 1979). From younger to older, the subunits are:
- Jackpile Sandstone Member – white to tan, fine-grained, kaolinitic, quartzose sandstone, well indurated, conspicuous cliff-forming unit, thick bedded to massive, 57 to 67 m thick. Contains abundant thin beds of quartz pebble conglomerate and locally exhibits medium-scale cross bedding.
- Brushy Basin Member – banded, dark reddish brown and light tan to ochre-colored, interlayered dark-colored sandy to silty shale and light-colored very fine grained subarkosic to feldspathic sandstone, slope forming, 110 m thick.
- Recapture Shale Member – conspicuously banded, gray and maroon, white to gray very fine grained quartzose to subarkosic sandstone and interlayered maroon-colored sandy to silty shale, slope forming, 72 m thick. The basal 12 m of this unit consists of white to light gray, fine- to very fine grained quartzose sandstone, thin-bedded, fissile, containing small-scale ripple marks.
- Jt **Todilto Formation (Late Jurassic)** – white to gray, dominantly fine-grained, massive gypsum, sloping-forming unit; with a 2- to 3-m-thick basal section of gray, laminated, fissile limestone; total unit thickness 15 to 27 m. A gray, crusty "popcorn" texture typically develops on erosional surfaces of Todilto gypsum.
- Je **Entrada Sandstone (Late Jurassic)** – white, pink, and yellowish tan, fine- to very fine-grained quartzose sandstone, well sorted, moderately indurated, exhibits large-scale eolian dunal cross-bedding, cliff former, 60 to 67 m thick.
- Tc **Chinle Formation (Late Triassic)** – two members occur in the map area, from younger to older:
- Tu **Upper Shale Member (also known as the Petrified Forest Member)** – maroon and gray-green, micaceous shale, minimum 100 m thick.
- Tj **Poleo Sandstone** – yellow-brown to maroon-gray, medium- to fine-grained, micaceous, quartzose sandstone and interbedded reddish brown shaly sandstone, locally cross bedded; minimum 50 m thick.

Correlation of Map Units

