

# Geologic Map of the Ojito Spring Quadrangle, Sandoval County, New Mexico

By

**Formento-Trigilio, M. L.; Toya, C.; Pazzaglia, F. J.**

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*Open-file Digital Geologic Map OF-GM 046***

**Scale 1:24,000**

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

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# Ojito Spring, New Mexico 7.5-min. Quadrangle

## EDMAP PROJECT Year 2 Final Deliverables

University of New Mexico, 1996-98  
Ms. Merri Lisa Formento-Trigilio, Mr. Karl Wegmann (student mappers)  
and  
Dr. Frank J. Pazzaglia (P.I.)

### MAP UNIT DESCRIPTIONS

#### Quaternary

- Qal Alluvium undivided (Holocene to late Pleistocene(?)).** Predominantly stratified sand and silt with local gravelly, clay-rich, and silt-rich eolian beds. Locally composed of several aggradational packages separated by soils. Deposits underlie floodplains and reflect the bedrock composition in adjacent hillslopes. From < 1 m to 10 m thick.
- Qls Landslide deposits (Holocene).** Poorly stratified hillslope deposits that consists predominantly of large blocks derived from vertical cliffs of Cretaceous Dakota sandstone. Deposits mantle shale slopes that underlie the cliff-forming sandstone. From 1 m to 5 m thick.
- Qt4 Fluvial terraces (Holocene).** Red and tan (color reflects adjacent hillslope bedrock source), well-sorted, sand, silt and clay with lesser amounts of rounded fluvial gravels. Straths (terrace bases) are cut into the modern floodplain and are adjacent to deeply incised drainages. The “.P” denotes an Arroyo Peñasco deposit. Charcoal samples taken from 1 m below the terrace tread yields dates of  $960\pm 60$  to  $2290\pm 70$  radiocarbon years BP (Formento-Trigilio, 1997). Upward-fining packages of sand and silt are separated by buried soils along the Rio Salado. From 3 m to 20 m thick.
- Qt3 Fluvial terraces (late Pleistocene).** Red, well-sorted, well-stratified, rounded fluvial gravels and sand with lesser amounts of silt and clay. Gravels consist predominantly of granite derived from Sierra Nacimiento. The “.P” denotes an Arroyo Peñasco deposit.
- Qt3a** The “a” and “b” denotes local complex response terraces that are correlative with Qt3. Straths typically 5 m to 6 m above grade. Treads are significantly reworked, with no soils preserved. From 2 m to 6 m thick.
- Qt3b**
- Qt3.P**
- Qt2 Fluvial terraces (middle Pleistocene).** Red, well-sorted, well-stratified, rounded fluvial gravels and sand and are commonly interbedded with travertine. Gravels consist predominantly of granite derived from Sierra Nacimiento. Straths are 13 m to 35 m above grade. Treads are reworked, with no soils preserved. The “.P” denotes an Arroyo Peñasco deposit, where U-series dating of travertine yields an approximate age of 300 ka
- Qt2.P**

at the base and approximately 60 ka of travertine overlying the terrace tread (USGS geochronology lab; Formento-Trigilio, 1997). Terrace deposits thicken toward the basin center, particularly along Arroyo Cuchilla. From 3 m to 25 m thick.

**Qt1 Fluvial terraces (Pleistocene).** Gray, well sorted, rounded, travertine-cemented fluvial gravels and gypsiferous sand. Gravels consist predominantly of granite derived from Sierra Nacimiento. Straths are approximately 50m to 60 m above grade. Treads are significantly reworked. Found only along the Rio Salado. From 3 m to 10 m thick.

**Qtb Fluvial terraces (Pleistocene?).** Sub-rounded, poorly-stratified, gravel lags that mantle low-relief, poorly-expressed terrace risers. Gravels consist of vesicular basalt and granite, likely derived from Mesa Prieta to the west. Straths range from grade to 12 m above grade. Treads are significantly reworked. Found only in the western half of the quadrangle. Less than 1 m thick.

**QTug Upland gravels (Pleistocene to Pliocene?).** Well-rounded, poorly-stratified, gravel lags that mantle low-relief upland surfaces (1800 m in elevation) approximately 100 m above grade. Found mantling the Jurassic Todilto ridge that flanks the east side of the Rio Salado. Less than 1 m thick.

### Cretaceous

#### **Mancos Shale.**

Dark-gray, calcareous marine shale and siltstone with zones of calcareous concretions, few thin limestone beds. Shale facies occurring between mappable sand and limestone bodies.

**Kmn Niobrara Sandstones** - Undivided gray, coarse-grained sandstones stratigraphically above the Gallup Sandstone that fine-upward. First sandstone unit stratigraphically above the Gallup Sandstone, maybe equivalent to Tocito Sandstone. 5 m to 10 m thick.

**Kmg Gallup Sandstone.** Gray to white, bioturbated, coarse-grained and cross-bedded quartz arenite sandstone with a horizontally bedded, tan to yellow siltstone base. Thickness varies, approximately 10 m thick.

**Kmjl Juana Lopez Member.** Orange-brown and olive to purplish gray, fossiliferous calcarenite interbedded with fissile, medium to dark-gray noncalcarenitic clay shale with local, abundant calcareous concretions. Fossils consist mostly of abraded fish bones, pelecypods, and ammonites. The ribbed oyster (*Lopha lugubris*) is a distinctive and abundant marker fossil. Thickness ranges from 5 m to 7 m.

**Kms Semilla Sandstone Member.** Dark-gray shale and tan to yellow, planar laminated siltstone overlain by well-sorted, well-rounded, fine-grained and horizontally bedded sandstone. Locally, planar cross-beds and bioturbated with abundant worm traces. Well-exposed as a ridge-former in the southwestern quarter of the quadrangle. In the northwestern portion of the quadrangle, the Semilla Sandstone is poorly exposed and

outcrops as a low hill held up by discontinuous sandstone and pervasive concretions. From 15 m to 20 m thick.

**Kmgr Graneros Shale Member.** Dark-gray, marine shale with local, thin limy sandstone beds and thin limestone beds. A pervasive zone of calcareous concretions that underlies low hills may be equivalent to the Greenhorn Limestone Member. From 1 m to 3 m thick.

**Km Mancos Shale.** Dark-gray, marine shale facies mapped between major sandstone bodies.

**Kmu Mancos Shale (undivided).** Dark-gray, marine shale and intercalated sandstones.

### **Dakota Formation.**

In the map area the Dakota Formation consists of intertonguing sandstones and shales. Following from Landis et al., (1973) and Dane et al., (1971), from oldest to youngest these units are an unnamed carbonaceous basal sandstone (mapped as the top of the Jackpile Sandstone), the Oak Canyon Member of the Mancos Shale, and the Cubero Tongue of the Dakota Formation, both of which comprise **Kd1**; the Clay Mesa Tongue of the Mancos Shale, and the Pagate Tongue of the Dakota Formation, both of which comprise **Kd2**; the Whitewater Arroyo Shale Tongue of the Mancos Shale and the Two Wells Sandstone Tongue of the Dakota Formation comprise **Kd3**. The **Kd3** sandstone/shale couplet is poorly exposed and only occurs a narrow belt in the northwestern portion of the map area.

**Kd3 Two Wells Sandstone Tongue of the Dakota Sandstone.** Light gray, to yellow-gray, fine-grained, distinctly fine-bedded sandstone. Forms dip slope on back of cuesta ridges. Distinguished from lower Mancos Shale (Graneros Shale Member and local Greenhorn Limestone Member) in the map area by the last occurrence of slightly calcareous to non-calcareous sandstone. Thickness unknown.

**Whitewater Arroyo Shale Member of the Mancos Shale.** Dark-gray to olive-gray, shale. Thickness unknown.

**Kd2 Pagate Tongue of Dakota Formation.** Tan to yellow siltstone capped by sugary, calcareous, feldspathic sandstone. Planar bedded with local cross-beds and concretions. Thickness ranges from 5 m to 10 m.

**Clay Mesa Member of the Mancos Shale.** Dark-gray, carbonaceous shale. It is the first shale unit overlying resistant Cubero sandstone. Thickness ranges from 10 m to 18 m thick.

**Kd1 Cubero Member of Dakota Formation.** Gray, platy, bioturbated, calcareous, moderately well to poorly indurated, fine-grained feldspathic sandstone intercalated with thin shale and siltstone beds. Ridge-former of variable thickness, ranges from 5 m to 10 m thick.

**Oak Canyon Member of Dakota Formation.** Dark-gray, carbonaceous shale that increases in silt and fine-grained sand up section. It is the first shale unit that lies unconformably upon the Jackpile Sandstone. Thickness varies throughout map area but typically ranges from 10 m to 20 m thick.

## Jurassic

*Morrison Formation (Anderson and Lucas, 1995):*

- Jmj Jackpile Sandstone.** Yellow to white-gray subarkosic arenites, with minor conglomerate seams, clay galls and iron nodules, interbedded with gray-green claystone (Flesch, 1974). Medium to large scale, moderately dipping trough cross-beds, planar cross-beds, and scour and fill structures. This map unit includes a local, 0-5 m thick, distinctive, white, carbonaceous sandstone at its base. The basal sandstone is tentatively correlated with the Burro Canyon or Cedar Mesa Formations (Cretaceous). The Jackpile Sandstone ranges from 6 m to 25 m thick.
- Jmbb Brushy Basin Shale Member.** Variegated gray-green and red-brown, montmorillonitic claystone, yellow to tan, iron oxide stained, well-indurated arkosic arenites with conglomeratic seams and clay galls (Flesch, 1974). Discontinuous, resistant sandstone units typically cap mesas and the shale is topographically expressed as a broad slope. From 60 m to 90 m thick.
- Jmsw Salt Wash Member (formerly mapped as Westwater Canyon, Flesch, 1974).** Light gray, yellowish to tan, iron oxide stained, fine- to medium-grained, well-sorted, well-rounded, arkosic to subarkosic arenites, interbedded with grayish-red, silty mudstones. Sandstone interbeds vary in thickness with a main continuous, lower unit and a main, upper, discontinuous unit in the northern half of the map area. Occasionally, highly discontinuous sandstone units are present in the main lower unit in the northern half of the map area. Medium and large scale trough cross-bedding and wedge sets, with local scour and fill, ripples and parting lineations. From 35 m to 50 m thick.

*San Rafael Group (Anderson and Lucas, 1996):*

- Js Summerville Formation (includes previously differentiated Recapture member).** Variegated maroon and gray, thinly bedded sandstone interbedded with gypsiferous siltstone, sandy siltstone, or mudstone (Anderson and Lucas, 1992). Generally a slope former, but can occur as a steep cliff with well-indurated horizontal bedding. Sandstone beds are lenticular and as thick as 15 m. A 0.1 to 0.2-m thick, grayish pink carbonate bed with vertical striations occurs at the top of the formation. The carbonate bed is interpreted to be a pedogenic carbonate, and therefore, marks a diastem or unconformity at the top of the San Rafael Group sequence (Anderson and Lucas, 1996). Maximum of 80 m thick.
- Jt Todiltio Formation.** Gray, thinly laminated kerogenic limestone interbedded with organic-rich silt (< 3 m thick) conformably overlies the Entrada Sandstone. The limestone unit grades upward to nodular, “chicken-wire” gypsum. The nodular gypsum gradually fines upward to a poorly-laminated, more massive texture. A breccia zone of variable thickness forms a hummocky topography that caps local ridges (Kirkland, et al., 1995). The quadrangle lacks a complete section, but the formation ranges from 60m to 70 m thick in the map area.

**Je** **Entrada Sandstone.** Light orange to pale-yellow or white, very fine to medium-grained, subrounded to subangular, quartz sandstone with trough and festoon crossbed sets. Found in the northeastern portion of the quadrangle as cliff-forming units. The quadrangle lacks a complete section, but the formation ranges from 30 m to 60 m thick in the map area.

### **Triassic**

**TRc** **Chinle Group** (undifferentiated). Reddish-brown shale with minor amounts of green and maroon shale and red siltstone and sandstone. Thin to medium-bedded, fine to coarse-grained, argillaceous and feldspathic quartzose sandstone interbedded with siltstone and silty claystone. This interval grades upward to claystone and sandstone lentils (Woodward, 1987). Found in the northeastern portion of the quadrangle as valley and slope-forming units. The quadrangle lacks a complete section, but the formation ranges from 2 m to 40 m thick in the map area.

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