GEOLOGY OF SAN YSIDRO QUADRANGLE, NEW MEXICO

by Lee A. Woodward and Richard L. Ruetschilling

1976

SCALE 1:24,000

0 1 MILE

0 1 KILOMETER

Base from U.S. Geological Survey

Geology by Lee A. Woodward and Richard L. Ruetschilling, 1974

PREVIOUS WORK

The San Ysidro quadrangle was included in reconnaissance maps of larger areas by Renick (1931) and Wood and Northrop (1946). A map by Smith and others (1970) at a scale of 1:125,000 includes the northeastern part of the quadrangle; their map concerns mainly the Cenozoic volcanic rocks of the Jemez Mountains and is generalized for the earlier rocks. The distribution of the Zia Sand Formation (Tz) in the southeastern part of the quadrangle is shown on a generalized map by Galusha (1966).

ROCK UNITS

Schistose, fine-grained granodioritic to quartz monzonitic rocks (p€s) of Precambrian age are the oldest rocks exposed in this quadrangle and occur as inclusions up to 100 ft across in the gneiss (p€gn), the next oldest unit. Regional metamorphism of the schist occurred prior to intrusion of the igneous parent of the gneiss, which was later regionally metamorphosed. Pink, coarse-grained granite (p€g) is intrusive into the gneiss; local foliation of the granite (p€g) is probably primary flow structure developed during intrusion.

Leucogranite (p€lg) is exposed near Mesa Cuchilla in the northeast part of the quadrangle and its structural relationship to the other Precambrian units is not known. The leucogranite was emplaced after the last episode of regional metamorphism and may be broadly of the same age as the pink, coarse-grained granite (p€g) exposed in the northwest part of the quadrangle.

The Madera Formation (IPm) varies in thickness and lithology as the northern part of this quadrangle was a positive area during Pennsylvanian time. Proximity to the crystalline Precambrian source terrane is the principal factor in the varying facies of the Madera. The Abo Formation (Pa) locally rests directly on the Precambrian rocks and also varies in thickness, indicating that the positive tendencies continued into Permian time.

All the strata above the Todilto Formation (Jt) and below the Dakota Formation (Kd) are assigned to the Morrison Formation (Jm). The lowest member may contain strata equivalent to the Summerville Formation (Ruetschilling, 1973). The upper unnamed member is probably correlative with the Jackpile ore-bearing horizon of the Laguna area (Woodward and Schumacher, 1973).

Sandstone beds in the upper part of the Dakota Formation (Cretaceous) intertongue northward with marine shales assigned to the Mancos Shale (Km). Thus, the contact of the Dakota with the overlying Mancos Shale is stratigraphically higher in this quadrangle than in quadrangles to the north (Woodward and Martinez, 1974).

Terrace and pediment deposits (QTtp) and travertine (QTtr) were deposited throughout the same time interval and in some cases at the same place; this has resulted in gradations. In the northwestern part of the quadrangle the terrace and pediment gravels locally occur at the base of the travertine but are too limited to be shown on the map. North of NM-44, immediately west of San Ysidro, travertine occurs at the base of the terrace and pediment gravel but is also too limited to show on the map. At a few other localities the terrace and pediment gravels are cemented by interstitial travertine, forming conglomerate.

STRUCTURE

Precambrian Deformation

Regional synkinematic metamorphism of the gneiss (p€gn) imparted a northeast-trending foliation on the gneiss. The mechanism of emplacement of the pink, coarse-grained granite (p€g) is not certain but may have occurred by dilation.

Paleozoic Deformation

Isopach maps by Wood and Northrop (1946) show that the Nacimiento area was a positive structural element during Pennsylvanian time and continued to show positive tendencies during Permian time. At most localities in this quadrangle the Precambrian is overlain by the Madera Formation (IPm) except near Arroyo Penasco (sec. 17 T. 16 N., R. 1 E.) where the Abo Formation rests directly on the Precambrian.

Cenozoic Deformation

The principal tectonic features that extend into this quadrangle are the Nacimiento uplift, the San Juan Basin, and the Rio Grande rift (fig. 1). The Nacimiento uplift and San Juan Basin began to form during the early Cenozoic, whereas the Rio Grande rift formed during the late Cenozoic. The Nacimiento uplift is bounded mainly by the Pajarito fault on the west and the San Ysidro and Jemez fault-zones on the east. The last episode of movement of the Nacimiento uplift was probably synchronous with late Cenozoic rifting.

The Pajarito is a high-angle, reverse fault, dipping to the east and having up to 1,500 ft of stratigraphic separation in the northern part of the quadrangle. West of the Pajarito fault and about 1 mile north of where the fault is crossed by NM-44 there are thin slices of the Petrified Forest Member (Rpf) and Agua Zarca Sandstone Member (Raz) of the Chinle Formation, Entrada Sandstone (Je), and Todilto Formation (Jt) that are dragged along the fault and tectonically thinned; these formations are mapped as one unit there.

The Jemez is a normal fault and dips steeply to the east; stratigraphic separation cannot be determined but may be several thousand ft. Most other faults are high-angle and normal with stratigraphic separations ranging up to a few hundred ft.

The northerly trending folds in the southwestern part of the quadrangle appear to be related to development of the Nacimiento uplift whereas the folds in the southeastern part are related to formation of the Rio Grande rift. The doubly plunging anticline west of Cañada de las Milpas is used for gas storage by Southern Union Gas Company.

MINERAL AND ENERGY RESOURCES

Gypsum is mined at White Mesa in the central-southern part of the quadrangle where large tonnages of gypsum are exposed on a dip-slope. West of NM-44 in the central-western part of the quadrangle on the Zia Indian Reservation another area has large amounts of gypsum exposed at the surface.

Small copper prospects are located in sec. 13 T. 16 N., R. 1 E. where carbonaceous fossil plant remains and minor copper sulfides are surrounded by halos of malachite and chrysocolla in arkoses of the Abo Formation (Pa).

In the Brushy Basin Member of the Morrison Formation there are several small pits and bulldozer trenches that were excavated in search of uranium (Chenoweth, 1974). Although no uranium-bearing minerals were observed at the workings, Chenoweth (1974) reported that radioactivity is concentrated around mudstone galls, sandstone-mudstone interfaces, and in limonite-stained sandstone lenses.

Bulldozer trenches in black, carbonaceous shale in the lower part of the Dakota Formation in secs. 22, 26, and 27 T. 15 N., R. 1 E., were excavated in exploration for gold by Mr. F. E. Gossett of Albuquerque. A single specimen of the carbonaceous shale from the easternmost excavation in sec. 26 contains about 0.2 parts per million (0.006 oz/ton) gold as analyzed by J. W. Husler of the Department of Geology at the University of New Mexico by atomic absorption spectrophotometry.

Terrace and pediment deposits (QTtp) composed of pebbles and larger clasts of Precambrian crystalline rocks and volcanic rocks are excellent sources of aggregate. These deposits are mostly thin, about 10 ft, but locally are up to 30 ft in thickness. Some have been used for pit-run sub-base and for road surfacing.

The presence of thermal springs along Arroyo Peñasco and travertine deposits along the margins of the Nacimiento uplift suggest that this area may merit detailed investigation for possible geothermal energy. Tierra Amarilla anticline and the northwestern corner of the quadrangle in particular are areas having abundant surface evidence of thermal waters.

ACKNOWLEDGMENT

S. A. Northrop critically reviewed the map and accompanying text.

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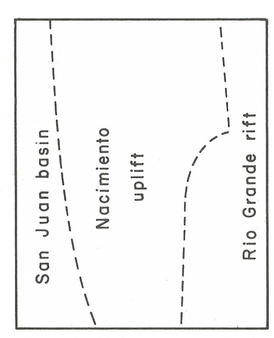
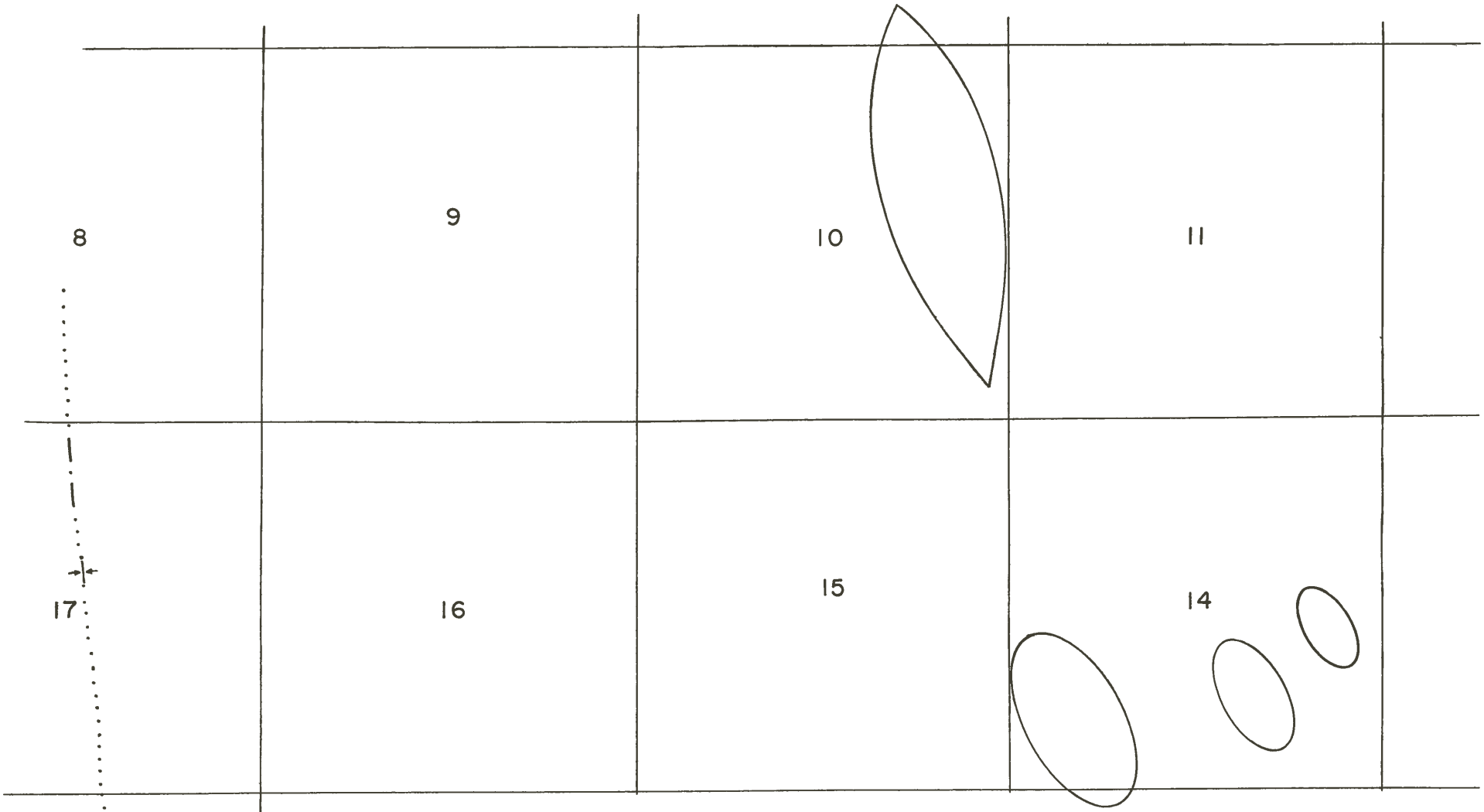


Figure 1. Major tectonic features of San Ysidro quadrangle



ERRATA SHEET — GEOLOGIC MAP 37

In the lower left corner of GM-37, in sections 17 and 20, please reverse the arrows on the dotted line so that they identify the dotted line as a *syncline* (not an anticline, as printed).

Also, please disregard the inadvertent color streaks printed in sections 10 and 14, as shown above.

New Mexico Bureau of Mines and Mineral Resources August 3, 1976