

# New Mexico



## Using Geologic Maps to Find Groundwater

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### Defining the Problem

The **population** of the historic village of Placitas, New Mexico, in the picturesque and geologically complex Sandia foothills north of Albuquerque, has **tripled** since 1970. Increased domestic well development, combined with persistent **droughts**, have culminated in dry and depleted wells (Fig. 1), reduced discharge from perennial springs, reduced property values, and a growing awareness of the potential for aquifer **depletion**.

### The Geologic Map

The Placitas area straddles the geologic boundary between the Sandia Mountains and the Albuquerque Basin of the Rio Grande rift (Fig. 2). The availability of potable groundwater is highly variable and controlled entirely by the complicated geology of the region. The geologic map (Fig. 3) enables us to better understand these controls and the **complexity** of this tectonically dynamic region. The geologic units exposed in Placitas vary from Precambrian granite and gneiss to Paleozoic limestone and sandstone, a variety of fine-grained Mesozoic sedimentary rocks, and Cenozoic alluvium composed of 23.7-million- to 700,000-year-old Santa Fe Group basin fill. Major **faults** in the region, including the complex Placitas fault zone, dissect the Paleozoic and Mesozoic strata (Fig. 4).

### Applying the Geologic Map

In this region, faults and stratigraphic barriers compartmentalize groundwater into small isolated bedrock aquifers, control the movement of mountain recharge, and affect water potability and availability. Digital geologic maps provided the geologic framework for a three-year **hydrogeologic** study of this maze of aquifers and aquitards (confining beds). When combined with subsurface geologic information from water well records, the maps provided a basis for locating water-level monitoring and water-quality sampling networks. By synthesizing these data, the **study** was able to delineate the locations of aquifers, aquitards, hydrologic boundaries, and preferential flow pathways (Figs. 5).

### Conclusion

The geologic and groundwater mapping products support county land use and planning decisions in this rapidly developing area. State water agencies, planners, developers, home owners, home buyers, real estate agents, and county officials **use** the maps to support an array of decisions regarding water rights, lot size, well placement, water system design, and other land use decisions. Similar applications of geologic **maps** are being used throughout New Mexico.

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Example

Fig. 1.

A groundwater hydrograph from a domestic well completed in an isolated sandstone of the Cretaceous lower Mancos Shale. The water level dropped about 70 ft in one year and the well subsequently went dry.

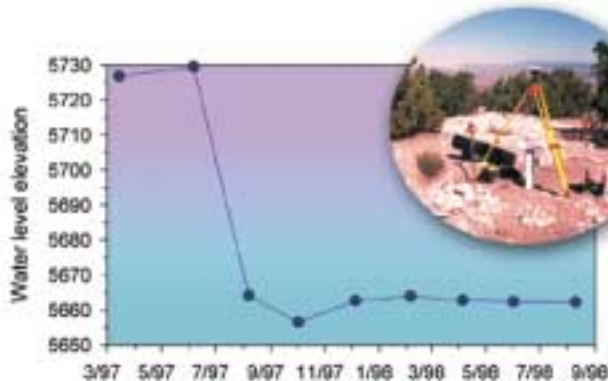


Fig. 2. The Sandia Mountains, looking north along the crest into the Albuquerque Basin.



Ranchos Fault

Mancos Formation

# geologic map

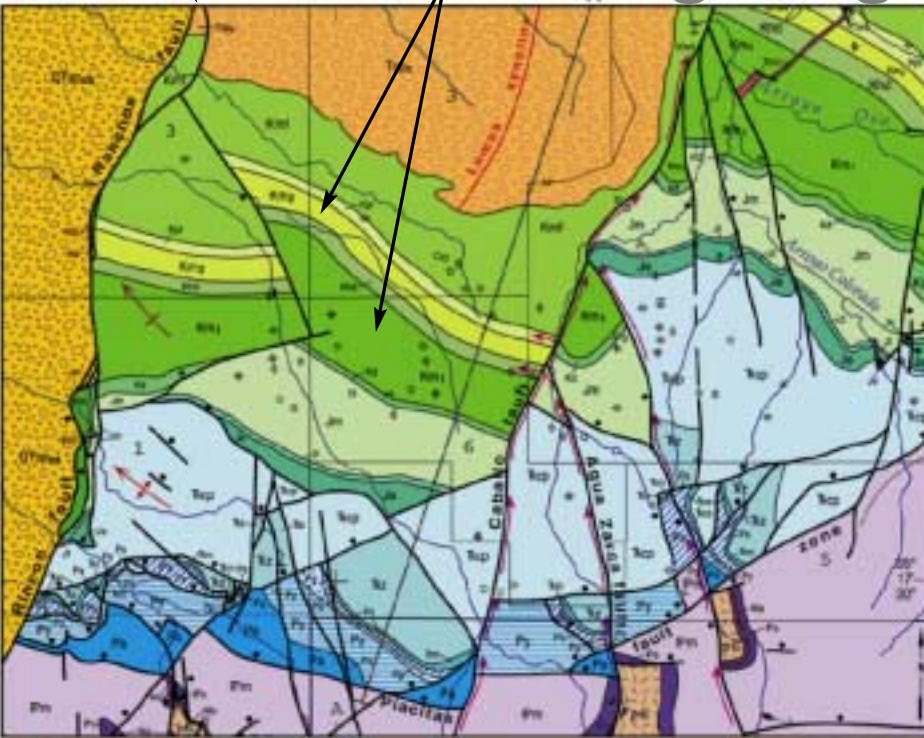


Fig. 3. A portion of the geologic map of the Placitas area shows that major faults and structures have disrupted the largely sedimentary formations. Red arrows mark the preferential groundwater flow pathways.

## References

A downloadable PDF version of the Placitas 7.5-minute geologic map and a CD-ROM describing the report Hydrogeology & Water Resources of the Placitas Area, Sandoval County, New Mexico (NMBGMR Open File Report 469) are available at <http://geoinfo.nmt.edu/publications/home.html>.

Fig. 4. This road cut shows the Ranchos fault zone west of Placitas, where older Mesozoic strata (Mancos and Morrison formations) are faulted against younger Santa Fe Group basin fill. This rift-margin fault is associated with a major hydrologic discontinuity.

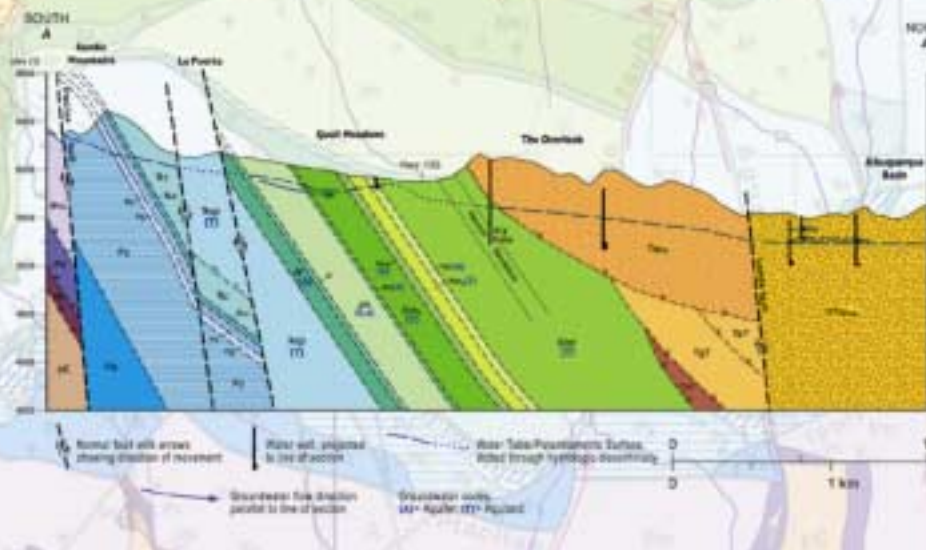
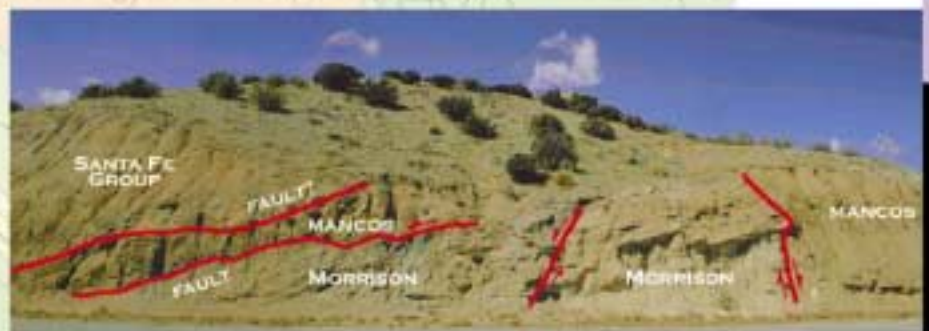


Fig. 5. This geologic cross section through the Paleozoic and Mesozoic strata in Placitas, NM, shows sub-vertical strip aquifers (A) layered between aquitards (T). Aquitards are the less-permeable rock layers confining the aquifers.