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GEOLOGY OF THE SANTA ROSA AREA

by

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PHYSICAL SETTING

Santa Rosa is situated on the Pecos River and is the seat of government for Guadalupe County. Interstate Route 40 and U.S. Highway 66 junction at Santa Rosa with U.S. 54 leading to Vaughn and U.S. 84 to Fort Sumner. Established in 1865 it became the rail center with the coming of the Rock Island and El Paso Northwestern in 1901. After the railroad building period the town became a general trading center and finally the county seat. With the development of the transcontinental highways the town gradually became a tourist attraction, and its full recreational potential is probably just beginning. It has one of the most unusual physiographic and geologic settings of any city in New Mexico.

The physiography is a huge sink caused by underground water dissolving spongy holes and caverns in limestone and other soluble rocks to the extent that the surface has gradually subsided in a large roughly circular area. The Santa Rosa sink is about 6 miles in diameter and up to 400 feet deep. An inward-sloping drape of sandstone beds surrounds the sink. Santa Rosa is at the northeast edge of the sink floor and spreads onto the adjacent rim along U.S. 66. The sink appears to have grown by expanding outward as is suggested by the several convex outward bights separated by inward "points" or noses of uncollapsed boundaries (Fig. 1).

Good views of the sink are seen coming east on I-40 about 3 miles west of town and in coming north on U.S. 54 about 6 miles southwest of town. The Pecos River enters the sink through a narrow gorge about 1 mile north of the center of town and flows across the eastern floor of the sink to an exit through the southern drape wall of the sink.

Collapse of the sink probably began in early Pleistocene or several hundred million years ago and may be going on locally and sporadically at present. From the beginning, the Pecos and its tributaries brought gravel and sand into the sink and this material appears to have accumulated to as much as 250 to 400 feet in thickness. Subsequently regional uplift caused the Pecos River to incise its course into the canyon that is so prominent north and south of the sink around Santa Rosa. During the canyon cutting much of the gravel within the sink has been eroded. However, large hills of the dissected gravel lie south and southwest of town. Except for small bluffs at river level and in a few places around the town the floor of the large sink is sand and gravel and this material contrasts with the hard strong sandstone that armors the sides and rim of the sink.

In addition to the peripheral drape of sandstone beds into the sink there are numerous sharply collapsed sink holes and some smoothly sloped swales without broken walls that have sagged into underlying caverns. These range from about 50 to 1,500 feet in diameter. About 190 of these occur in and marginal to the large sink and with few exceptions are concentrated along the northern and western sides. Those near the Pecos River if low enough have permanent water in them. There are 16 such small natural lakes near Santa Rosa.

WATER RESOURCES

Thanks to the Pecos River Santa Rosa is blessed with more potential water of nonminable type than most southwestern cities of its size. Even though Santa Rosa is referred to as "The City of Lakes," until 1926 drinking water was brought in by railroad tank car and sold at 50 cents per barrel (Larsen, 1969). However, the Rock Island Railway (Southern Pacific) had developed three surface water reservoirs, Tres Lagunas, near the head of El Rito Creek 2 to 3 miles east of town. In 1954 the Railway gave these and their filtering and pumping plant to the City. In 1956 the City took over the public water system from Southwestern Public Service Company which pumped water from the Pecos River. Recently (1966) the City established a well field 12 miles to the northwest on the road to Colonias. Three wells have been drilled and, presently, two of these supply the needs. The wells have been drilled to about 600 feet. Water was encountered first at about 420 feet but after completion the water rose about 360 feet. Pumping potential is reported to be 1,000 gpm. Withdrawals are considerably lower and ample water appears assured for considerable growth.

MINERAL RESOURCES

Gravel is the only local mineral resource that is currently important to the urbanization of Santa Rosa. Ample supplies exist in and near the city. Additional good gravel deposits are widespread on the pediments a few miles away. The Santa Rosa sandstone is, of course, abundant and could be used for both ornamental and dimension building stone. A considerable number of stone houses in the older part of town have been built of Santa Rosa sandstone. Additionally some of the more indurated Permian sandstone which occurs south of town along the Pecos Canyon could be used. However, the stone quarry operations appear to have given way competitively to fabricated building blocks.

In the 1930's the natural asphalt occurring in the Santa Rosa Sandstone 6 miles to the north was used to pave roads in the city. This source is no longer competitive which manufactured petroleum asphalt.

BEDROCK AND FOUNDATIONS

Buildings, roads, and highways have been constructed on all the outcropping rocks in the Santa Rosa area. Types of foundation material include sandstone and shale, sand and gravel, river terrace gravel, some lacustrine or swamp clays and silts, and dune sand. Sand and gravel of the sink appear stable and are easily excavated for burial of pipes or other installations such as septic tanks. The river terrace gravel benches as along

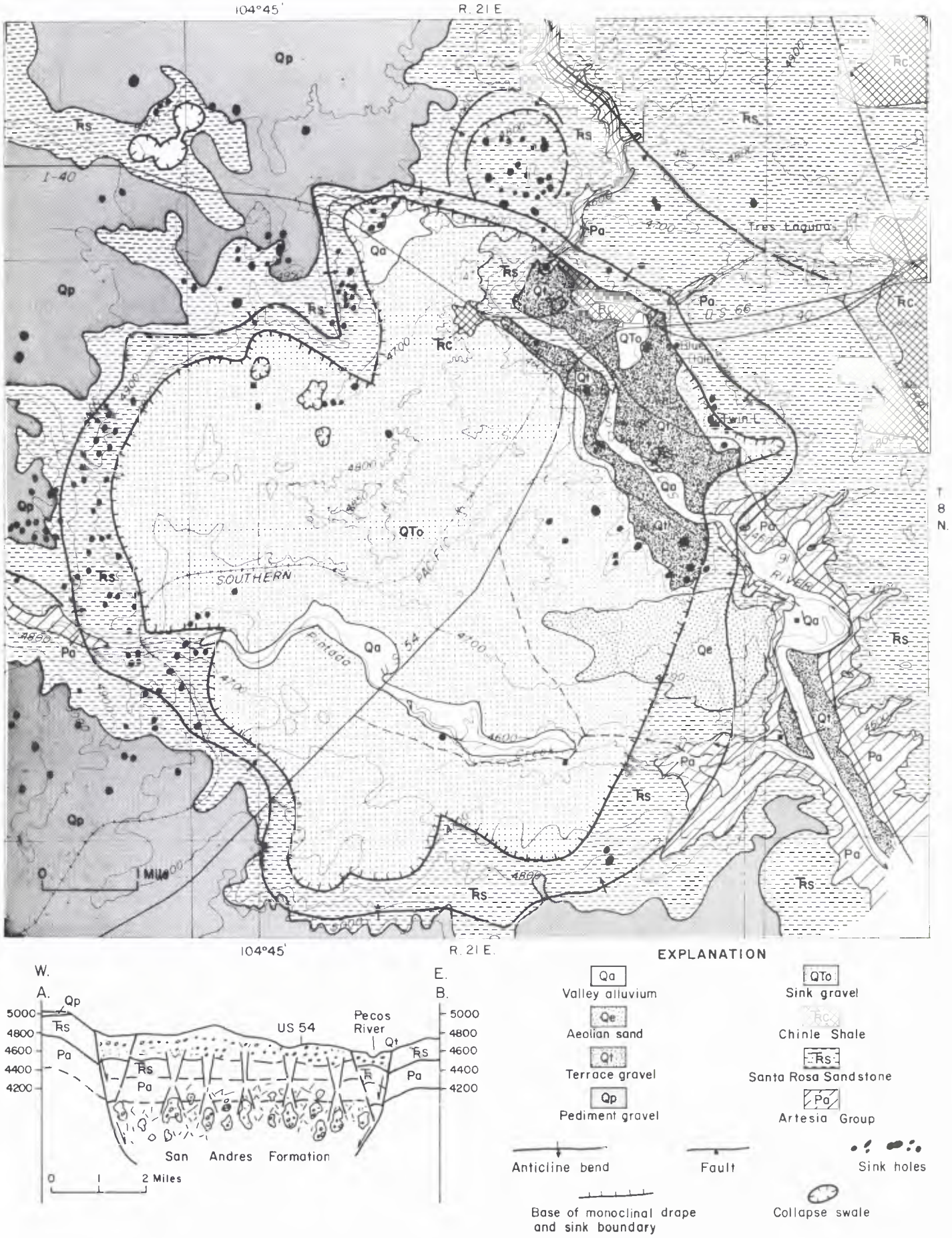

Figure 1. Geologic map of Santa Rosa and the Santa Rosa sink.

El Rito Creek east of the Pecos and south of Bass Lake are boggy and present drainage problems for some foundations. In such places the terraces may be underlain by impervious Triassic shale.

The indurated Santa Rosa sandstone presents excavation problems in the eastern and northern parts of town. For additional bridges across the river, foundations near town might be in Santa Rosa, however, local areas of broken rock, mud, and gravel, which have collapsed into the more stable sandstone, could pose some foundation support problems. The greatest foundation and stability problem lies in the possibility of local sagging or collapse. Future building of any massive structures should be preceded by careful geologic examination and possible drilling to ascertain the existence or likelihood of weak cavernous ground below the surface.

GEOLOGIC HAZARDS

Urban geologic hazards may include landsliding, mudflows, flooding, earthquakes, volcanic eruptions, subsidence. Some cities, as in California and other mountainous parts of the world, exist with several or all these hazards. For Santa Rosa, only subsidence is a hazard as evidenced by the numerous sinks some of which show marks of recency. The likelihood of damage or destruction because of this natural hazard is rather small. There is little that can be done to avoid the possibility except for careful geologic and engineering examination of all future sites of large construction projects. No landslides exist in the area and none is likely; little or no mud is present; and the region is one of no volcanic history. Earthquakes that have occurred in this part of the state are discussed elsewhere in this guidebook. Although the possibility of earthquake effects at Santa Rosa is quite minor, should one occur it could trigger sinking and local modification of lake levels.

The Pecos River is entrenched in its channel some 20 to 50 feet through the city so that even very large storms on the river would not flood the city. The surrounding slopes and gradients of arroyos and creeks are such as to pose little flooding hazard. The following peaks, recorded by the U.S. Weather Bureau, are indicative of the potential: June 9, 1903, 21.1 ft; September 30, 1904, 24.7 ft; and June 2, 1937, 25.7 ft. However, the main part of town is 40 to 60 ft. above the river.

The city has been using a sink hole on the hill about one-half mile north of town as a dump and this could result in some pollution to domestic wells near town that may not be tied into the city system. It is reported that dumping in this sink is to be discontinued.

REFERENCE

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