TRUTH OR CONSEQUENCE, NEW MEXICO
- A SPA CITY -

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INTRODUCTION

Truth or Consequences (TorC), named after the popular 40s and 50s radio quiz show on NBC, is located in south-central New Mexico on the banks of the Rio Grande. It is known for its "hot springs" and spas that use 100 to 110°F temperature water for hot baths, swimming pools and space heating. The original 19th century name for the town site area was Las Palomas Hot Springs, but the area had no permanent residents. Las Palomas, meaning place of doves, actually refers to a town site several miles south of TorC; where, hot spring visitors were forced to stay. The TorC town site grew into the small village of Hot Springs in the early 20th century and until March 1950, it was just one of hundreds of other small "hot spring" resort areas that was dependent on the tourist trade. In early 1950, Ralph Edwards, the moderator of the NBC radio program "Truth or Consequences" announced a nationwide contest for the program to annually visit a small city, if the city changed its name to that of the radio program. Hot Springs, New Mexico voted to changed its name by a four-to-one margin and won the Ralph Edwards' contest. Thus, the city no longer needed to be confused with other "hot spring" communities, but had its own unique name, Truth or Consequences or TorC as the town is commonly called in New Mexico today. Every year since 1950, Ralph Edwards has been coming back to celebrate the anniversary of the name change with a parade and other activities.

It is said that Indians in the region used the springs as "neutral grounds" long before Europeans settled the area. Indian tribes no doubt gathered here without conflict for the trading, religious purposes, to bathe, and to alleviate ailments. During the latter half of the 1800s, several large ranches were established across the area, and cowboys from one of these ranches, the John Cross Ranch, built the first adobe bathhouse over Geronimo Springs (Photo 1 and 2). The town of Hot Springs (TorC) proper really began with the construction of Elephant Butte Dam and Reservoir in 1912. Elephant Butte Dam was completed in 1916, as a part of the Rio Grande Project, one of the first large-scale irrigation projects in the west under the Reclamation Act of 1902. The town was incorporated in 1916 as Hot Springs and became the county seat of Sierra County in 1937. From the early 1900s, the hot mineral springs baths and hotels started developing into popular and permanent business (Photos 3 and 4).

Photo 1. ***The earliest known photo of people enjoying the health benefits of the hot mineral springs–thought to be from 1860s or 70s (Courtesy of Geronimo Springs Museum Archives).***

Photo 2. ***This old structure, one of the first to be built in the downtown, was a bathhouse built by the John Cross Cattle Co., for use by its cowboys–dated around 1882 (Courtesy of Geronimo Springs Museum Archives).***

Photo 3. ***One of the first bathhouses and hotels built in Hot Springs (Courtesy of Geronimo Springs Museum Archives).***

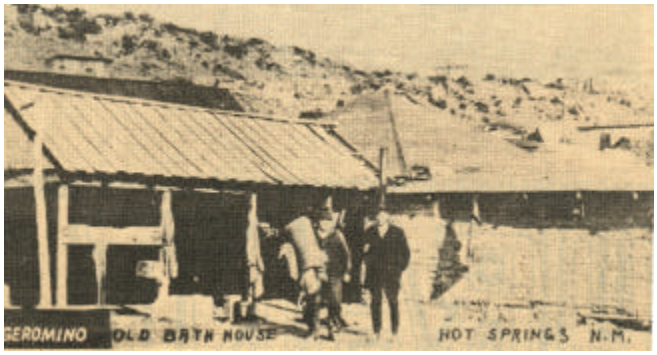

Photo 4. ***From the early-1900s showing one of the hot mineral springs baths and hotels that had developed (Courtesy of Geronimo Springs Museum Archives).***

GEOLOGY AND HYDROGEOLOGY

TorC overlies a bedrock constriction along the Rio Grande between the upstream Engle basin to the north and the Palomas basin to the south. The Engle and Palomas basins are major half grabens within the southern Rio Grande rift. The intersection of a northwest-trending horst block, the Mud Springs Mountains uplift, and the north-trending Caballo Mountains horst forms a bedrock constriction for surface and groundwater flow between the basins (Figure 1). The bedrock geology in the area of the TorC geothermal system is complex and shows compressional structures of Laramide (Late Cretaceous to Eocene) internal to the Later Tertiary rift Mud Springs Mountains horst block (Kelley and Silver, 1952). Thermal water discharges into Rio Grande fluvial terrace deposits of Latest Pleistocene to Holocene age from overturned, but steeply dipping Pennsylvanian limestone at or near the contact with the Devonian Percha Shale (Figure 2). Other unconfirmed flows may originate from the buried

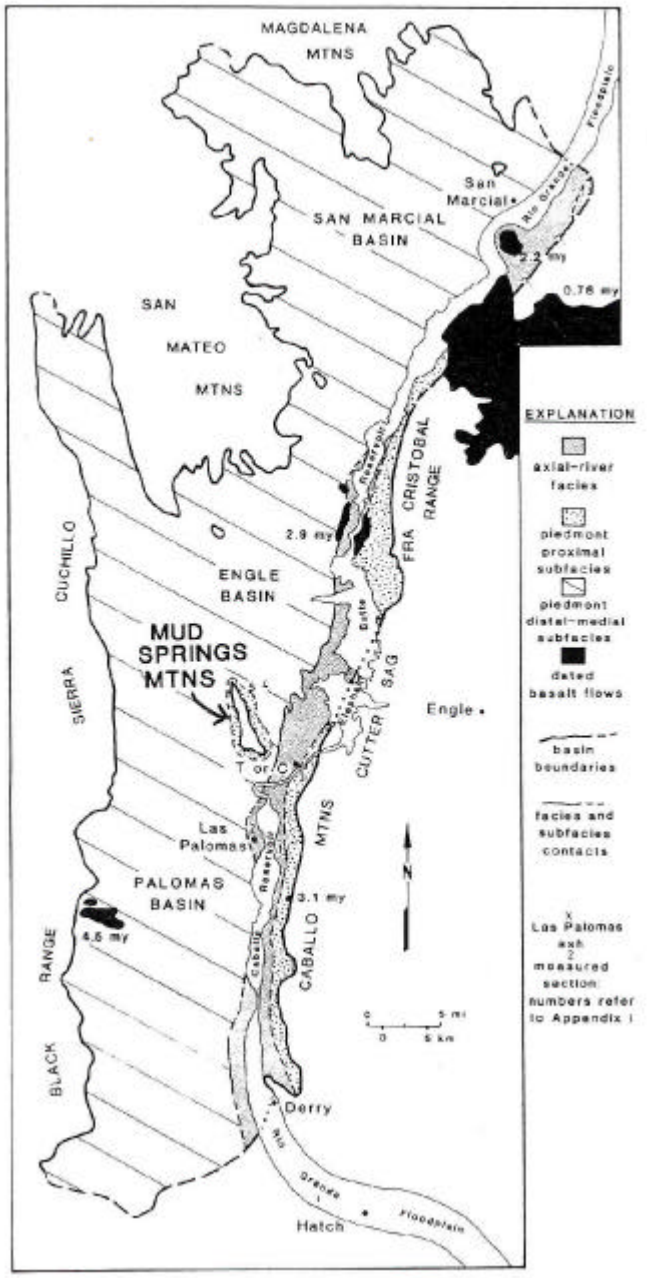

Figure 1. ***Structural geologic settling of the Truth or Consequence area.***

shallow pediment built on vertically-oriented Ordovician limestone, dolomite and sandstone and fractured Precambrian granite. However, the Precambrian granite appears to act as a aquitard as no thermal flows are noted on the south bank of the Rio Grande or in the vicinity of Carrie Tingley Hospital where granite is exposed. Other possible bedrock control is indicated by a small Pleistocene reverse fault (?) that displaces Paleozoic Limestone over early Pleistocene axial fluvial ancestral Rio Grande deposits or Palomas Formation, an upper Santa Fe Group basin fill unit of the Palomas basin (Wells and Granzow, 1981).

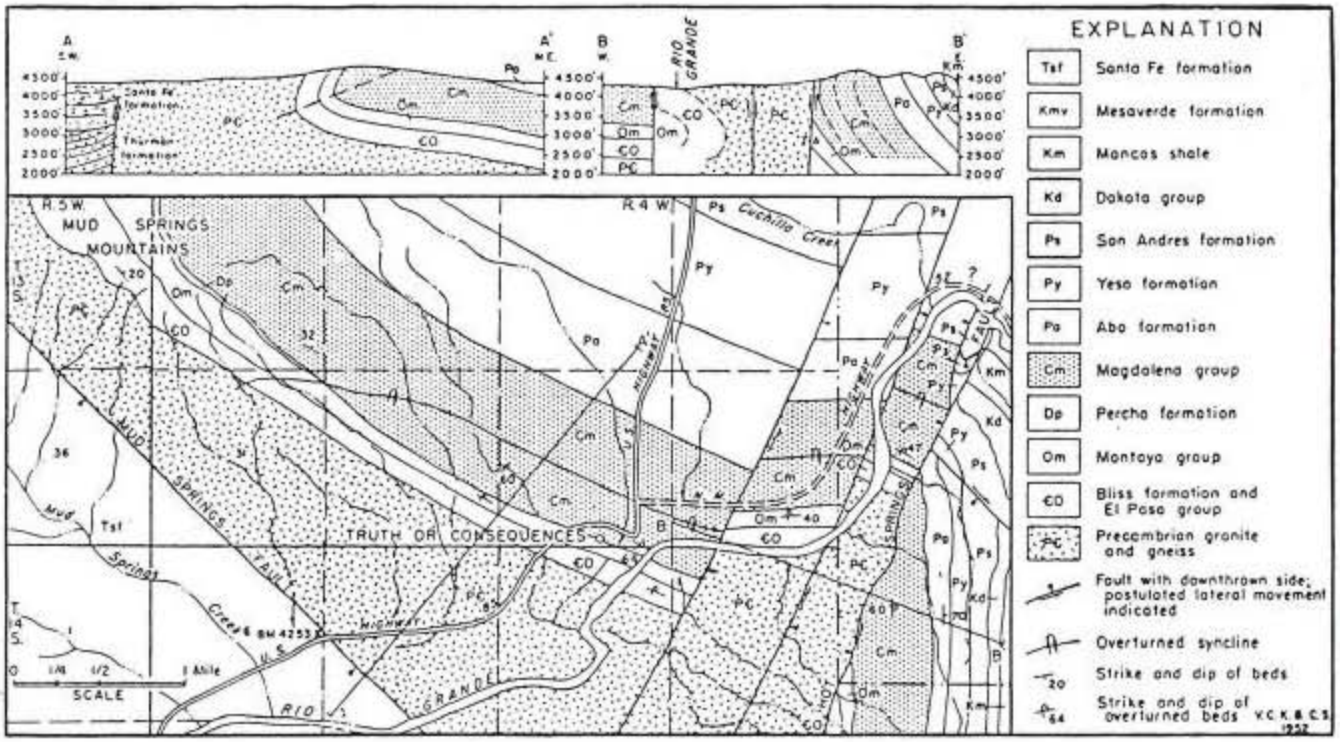

Figure 2. Geology and cross sections of the Truth or Consequence area (from Kelley and Silver, 1952).

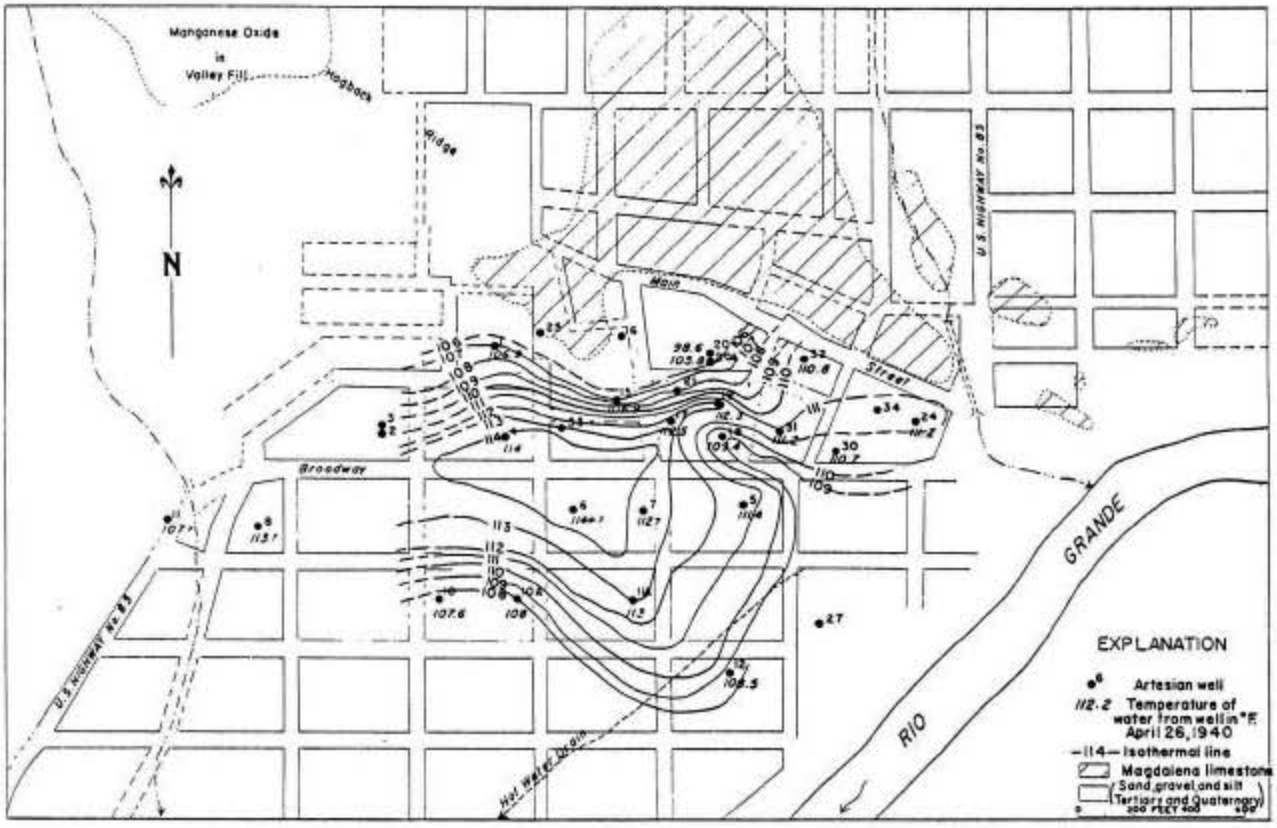

Figure 3. Map of Truth of Consequence showing distribution of temperatures of thermal water from artesian wells, April 26, 1940 (after: Theis, Taylor and Murray, 1942).

Hot springs and thermal wells are found only in the center of TorC in a small area about a quarter of a mile radius in sec 33, T 13 S, R 4 W (Figure 3). The thermal waters at TorC range from 36 to 45.6 °C and they are sodium chloride type with total dissolved solids generally between 2600 and 2700 mg/L (Summers, 1976; Witcher, 1995). End member thermal waters have chloride concentrations exceeding 1350 mg/L and silica concentrations between 41and 45 mg/L. Shallow near surface mixing with non-thermal groundwater is indicated by generally lower chloride concentration and lower temperature. The ultimate discharge of the thermal water is to the Rio Grande directly or indirectly via subsurface flow and mixing with non-thermal water. Theis and others (1941) estimated the total discharge of the geothermal system to be about 3.5 cfs or about 2,260,000 gpd based upon flow measurements in the Rio Grande downstream. Theis and others (1941) estimated the natural heat loss of the system at 180,000 calories per minute (42,850 Btu/hr).

In 1935, the New Mexico State Engineer declared a 38 mi^2 area around TorC as the "Hot Springs Underground Water Basin." On July 1, 1937 the Hot Springs Underground Water Basin was closed to additional appropriation of thermal water and the basin was closed to further non-thermal appropriation in 1945. Almost all production of thermal water at TorC comes from drilled or shallow dug wells ranging from a few feet depth to 258 feet depth. Artesian surface flow of several tens of gallons per minute is common. Theis and others (1941) reported the results of short-term pump test of several wells with specific capacities of 10 to 34 gpm/ft, transmissivities of 34,000 to 52,000 ft^2/min, and storage coefficients of $1.2x10^{-3}$ to $1.8x10^{-8}$

Fluctuations occur in artesian head of spring and well discharges, and are related to diurnal and seasonal use of the water and level of the Rio Grande. Several years ago, the Rio Grande was dredged as a requirement to remove sediment build up allowing greater channel capacity to prevent flash flooding and flooding if the upstream Elephant Butte Dam has large spill way and controlled releases. As a result of this, the artesian head dropped at several spas and temperature drops were noted, especially when no release of water from the Dam to the Rio Grande was occurring. In order to remedy the problem, the U. S. Bureau of Reclamation bulldozerd an earthen dam below the thermal area to bring the level of the Rio Grande up during low flow periods. This approach has successfully resolved the artesian head and temperature drops.

GEOTHERMAL USE

Two early demonstration projects using geothermal energy were the Carrie Tingley Hospital and the Senior Citizens' Center. Both projects were funded by the New Mexico Energy and Minerals Department and constructed in the early-1980s. At the hospital, geothermal waters at 105EF were supplied to heat a swimming pool which was used for physical therapy treatments for crippled children. The hospital has since been located to Albuquerque; however, the geothermal system remains intact at the physical plant. A low-temperature space heating system demonstration project was constructed at the Senior Citizens' Center. The geothermal water is provided from a sump, run through heat exchangers, and the extracted heat is circulated through a forced-air heating system.

The Geronimo Springs Museum, site of the original hot springs used by the early cowboys and later the Old State Bathhouse location, is heated by 108 °F geothermal water piped through forced-air heaters in the rooms. A shallow well in front of the building supplies water to the heating system and cascaded over sculptures in front of the buildings (Photo 5). Unfortunately, the well has sanding problems, and cannot supply sufficient heat to the building in the winter. A life-size wax statue of the famous Apache leader along with the history of his exploits, stands in the lobby of the museum.

Photo 5. ***Geronimo Springs Museum showing the sculpture with cascaded geothermal water.***

A series of eight hot spring pools and spas are located throughout the community. Some provide lodging and massages, and are frequent by many return customers. Both indoor and outdoor soaking tubs are available using the geothermal water direct (Photos. 6, 7, 8 and 9).

Photo 6. ***Hot Springs Association sign showing the location of the pools and spas.***

Photo 7. ***River Bend Hot Springs consisting of two soaking pools.***

Photo 8. ***Itay-Yo-Kay Hot Springs channel with effluent water.***

Photo 9. ***Marshall Hot Springs Spa and Resort.***

REFERENCES

Kelley, V. C. and C. Silver, 1952. "Geology of the Caballo Mountains," University of New Mexico, Publications in Geology 4, 286 p.

Lozinsky, R. P. and J. W. Hawley, 1986. "Upper Cenozoic Palomas Formation of South-Central New Mexico: Truth or Consequences." *New Mexico Geological Society 37th Annual Field Conference Guidebook*, p. 239-247

Summers, W. K., 1976. "Catalog of Thermal Waters in New Mexico," New Mexico Bureau of Mines and Minerals Resources Hydrologic Report 4, 80 p.

Theis, C. V.; Taylor, G. C. and C. R. Murray, 1942. "Thermal Waters of the Hot Springs Artesian Basin Sierra County, New Mexico," New Mexico State Engineers 14th and 15th Biennial Reports, 1938-1942, p. 419-492.

Wells, S. G. and H. Granzow, 1981. "Hydrogeology of the Thermal Aquifer near Truth or Consequences, New Mexico in State-Coupled Low-Temperature Geothermal Resource Assessment Program, Fiscal Year 1980," p. 3-5 to 3-51.

Witcher, J. C., 1995. "New Mexico Geothermal Resources Database," New Mexico State University, Southwest Technology Development Institute Report prepared for Geo-Heat Center, Oregon Institute of Technology, 32 p.