EXPLORATION OF THE LIGHTNING DOCK KGRA, ANIMAS VALLEY AND PYRAMID MOUNTAINS, HIDALGO COUNTY, NEW MEXICO, 1975-78

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Exploration of the Lightning Dock KGRA, funded by USGS and NM Energy & Minerals Dept., involved geologic mapping (E. G. Deal, Eastern Kentucky Univ., W. E. Elston, UNM); hydrogeochemical and isotopic models (C. Swanberg, NMSU; G. P. Landis, M. J. Logsdon, UNM) and geophysical surveys (G. R. Jiracek, UNM). A summary (Elston et al., 1983, NMBM&MR Circ. 177, 44 p., geologic map) concluded that geothermal waters are structurally controlled by an intersection of 3 geologic features, ~ 9 km SW of the present hot wells: (1) The moat and ring-fracture zone of the late Eocene Muir ignimbrite cauldron, projected westward from the Pyramid Mtns to the Animas Valley. Ground was prepared by fractures related to caldera collapse and resurgence. Base exchange reactions by zeolitized pyroclastic rhyolites of precursor and moat stages may account for purity of geothermal waters. (2) A NE-trending alignment of Plio-Pleistocene basalt volcanoes, from the San Bernadino field (SE Arizona) to Lordsburg. Resistivity and gravity highs and isotherms of KGRA waters follow this trend. An electrically conductive body, detected by magnetotelluric soundings 7 km below the geophysical highs, has been interpreted as mafic (mantle?) rock near the basalt solidus and ultimate heat source. (3) A recently-active N-S fault system. From northern Mexico to the Gila River (200 km), it controls numerous shallow epithermal Mn oxide-fluorite veins. Inclusions in fluorite from the Doubtful (Animas) mine, 3.5 km SE of the hot wells, indicate former boiling fluids (apparent temp. 137-345°C). The KGRA seems to be a relict of a much larger fault-controlled hydrothermal system.

Geothermal waters were interpreted as mixtures from two sources, both meteoric: (1) 25%, 10^4-yr old 250°C water from a deep source, possibly condensed from a vapor phase after boiling, and collected in a reservoir of fractured rocks at ~1.5 km depth. (2) 75%, ground water in fractured volcanic rocks. Mixing at ~0.5 km results in a 150-170°C reservoir, from which a rising structurally controlled plume mixes with a cool shallow aquifer (Gila Cg?), and disperses NE.

Today, wells 135-180 m deep produce up to 1,200 gpm of water ≤119°C. Annually, 25 million roses are shipped from the largest (32 acres) geothermal greenhouse complex in the US and millions of tilapia fingerlings are raised in geothermal tanks.


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