

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geophysical Log Suite from Drill Hole No. 4
Mariano Lake-Lake Valley Drilling Project, McKinley County,
New Mexico

by

U.S. Geological Survey

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This report is preliminary and has not been reviewed
for conformity with U.S. Geological Survey editorial standards
and stratigraphic nomenclature.

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INTRODUCTION

In the fall of 1980, the U.S. Geological Survey contracted with Longman Drilling Company of Albuquerque, New Mexico to rotary drill and core twelve holes along a north-south line from Mariano Lake to the vicinity of Lake Valley, New Mexico. This report incorporates the logs from drill hole no. 4. Similar reports on holes no. 1, 2, and 3 were released by the U.S. Geological Survey (1981a, b).

The drilling project is funded under a reimbursable interagency agreement between the U.S. Bureau of Indian Affairs (BIA) and the U.S. Geological Survey (USGS). The program was designed by representatives of the BIA, USGS, and the Minerals Department of the Navajo Tribe.

PURPOSE

The principal objective of this project was to provide core samples and geophysical logs for petrologic, sedimentologic, geophysical, and geochemical studies of the Upper Jurassic Morrison Formation. Other objectives included the following: stratigraphic and coal studies of Upper Cretaceous rocks; hydrologic and water monitoring of well no. 2; control for a proposed seismic study of the same geographic area; and development of water wells by the Navajo Tribal Water and Sanitation Department.

GENERAL DRILLING PLAN

The locations of all twelve drill holes are shown on figure 1, which is a portion of the Gallup 1⁰ x 2⁰ Quadrangle. The general drilling plan called for most holes to be rotary drilled into the Upper Cretaceous Dakota Sandstone

and then cored into or through the Recapture Member of the Morrison Formation. The interval to be cored in each hole was be about 600 ft.

Exceptions to the general drilling were as follows: Hole No. 2, rotary drilled, surface to Jurassic Entrada Sandstone; Hole No. 4A, cored 21-218 feet, to test an observed near-surface I. P. anomaly; Hole No. 6, deepened after coring by rotary drilling into the Jurassic Entrada Sandstone; Hole No. 7A, cored only the Westwater Canyon Member of the Morrison Formation; Hole No. 8, abandoned in lower part of Westwater Canyon Member of the Morrison Formation; and Holes No. 9 and 10, abandoned in Upper Cretaceous rocks.

Chip samples were collected at 10-ft or 20-ft intervals throughout each hole and sludge samples collected at 20-ft intervals throughout the cored interval.

The following suite of geophysical logs were included in the general drilling project: Natural gamma, self potential, neutron-neutron porosity, resistance, resistivity, temperature, deviation, gamma-gamma density, caliper, magnetic susceptibility, gamma ray spectrometer (KUT), sonic, induced polarization, conductivity and high resolution 4-arm digital dipmeter.

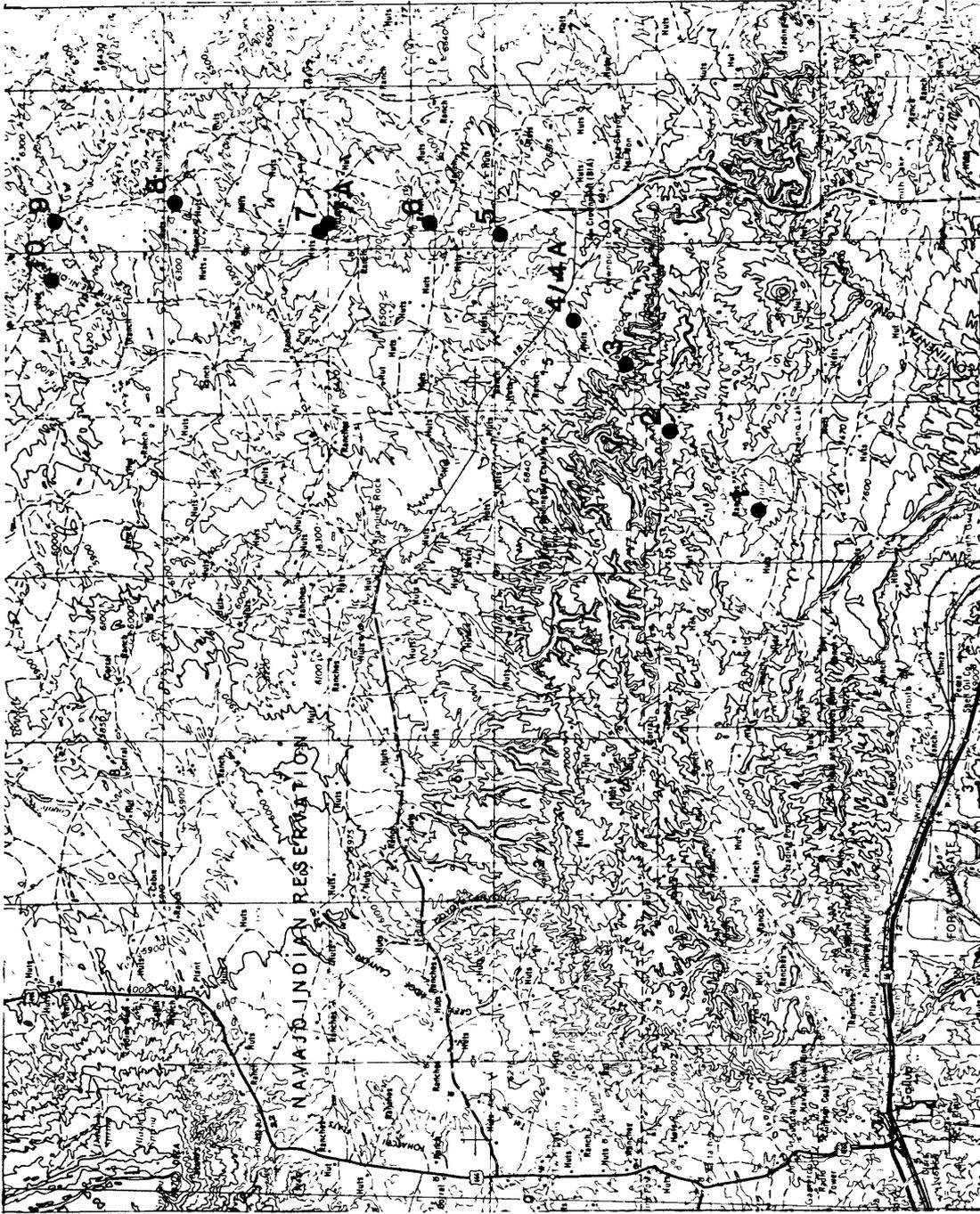


Figure 1. - Location of USGS Drill Holes, Gallup 1° x 2° Quadrangle.

DRILL HOLE NO. S-4

The location of this well is shown on figure 2.

The vital statistics on this well are:

Spud date: Nov. 18, 1980.

Location: T. 17 N., R. 13 W., SE 1/4 sec. 15.

Lat. 35°41'55' Long. 108°12'00"

Collar Elevation:	6810 feet	Gibson Coal Member Crevasse Canyon Formation (Cretaceous)
Core Point Top:	1722 feet depth)	Dakota Sandstone (Cretaceous)
Bottom Cored Interval:	2310 feet depth)	Recapture Member Morrison Formation (Jurassic)
Total Depth:	2310 feet (depth)	Recapture Member Morrison Formation (Jurassic)

Completion of well: Abandoned, Dec. 11, 1980.

The following suite of geophysical logs were run on this hole and accompany this report: Natural gamma, self potential, resistance, neutron-neutron porosity, deviation, caliper, gamma-gamma density, resistivity, KUT, prompt fission neutron, magnetic susceptibility, induced polarization, spontaneous potential and sonic (pls. 1-8).

The self potential, resistance, and resistivity logs are of poor quality due to a high-salt-based mud used to maximize hole stability and core recovery. Salt concentration at the time of logging was greater than 40,000 ppm and possibly as high as 80,000 ppm.

Uranium mineral concentrations were encountered from 1914 feet to 1937 feet, with ore-grade ($>.05\% \text{U}_3\text{O}_8$) intercepts at 1914 feet and 1934 feet.

A coal and carbonaceous shale interval of 60 feet was penetrated at 615 feet, and 15 feet of coal with an interbedded 3-foot sandstone unit was encountered at 1730 feet.

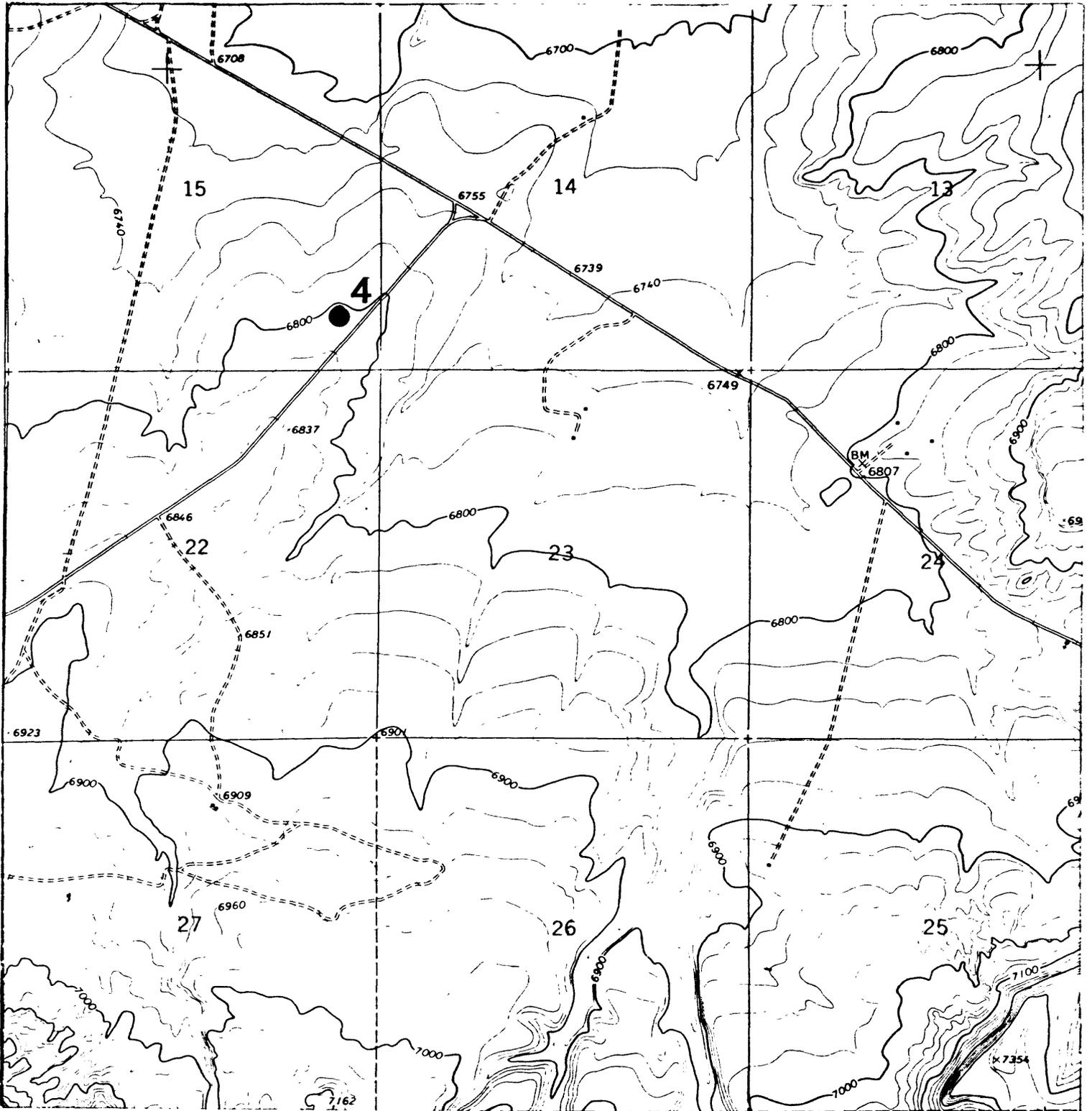


Figure 2.--Locations of USGS Drill Hole No. 4, Crownpoint 7 1/2' Quadrangle, T17N R13W.

References

- U.S. Geological Survey, 1981a, Geophysical Log Suite from Drill Hole Nos. 1 and 2, Mariano Lake - Lake Valley Drilling Project, McKinley County, New Mexico: U.S. geological Survey Open-File Report 81-172.
- U.S. Geological Survey, 1981b, Geophysical Log Suite from Drill Hole No. 3, Mariano Lake - Lake Valley Drilling Project, McKinley County, New Mexico: U.S. Geological Survey Open-File Report 81-439.