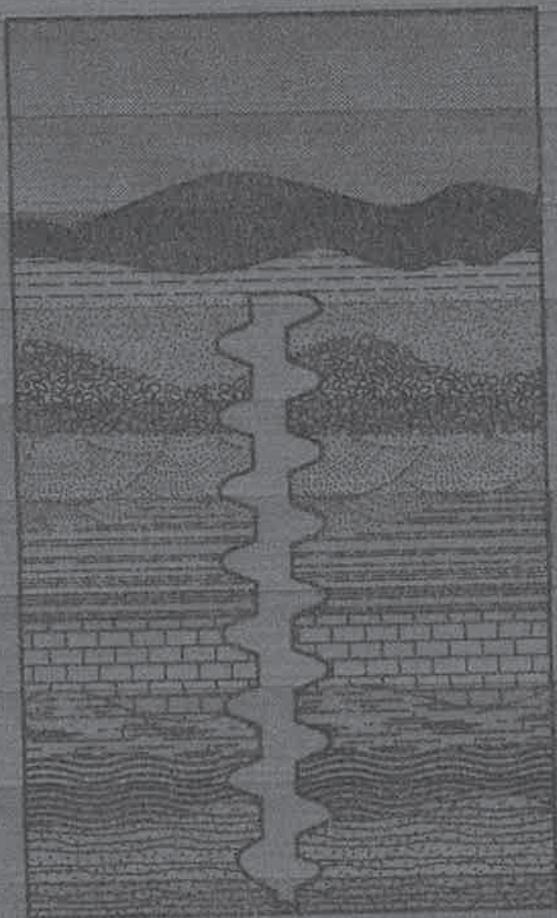


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GEOTHERMAL
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INVESTIGATIONS OF GROUND WATER FLOW DIRECTIONS
IN THE SOUTHWESTERN EXTENSION OF THE
INDIAN WELLS VALLEY, CALIFORNIA

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INTRODUCTION

In December 1985, the Eastern Kern County Resources Conservation District commissioned Geothermal Surveys, Inc. (GSI) to perform a geohydrological investigation of the southwest extension of Indian Wells Valley, Kern County, California (Figure 1).

The objective of this project is to help define the ground water flow divide between water flowing northeast towards Inyokern and water flowing southwest towards Red Rock Canyon. This will provide planners with a greater understanding of the ground water recharge in the Ridgecrest-Inyokern area.

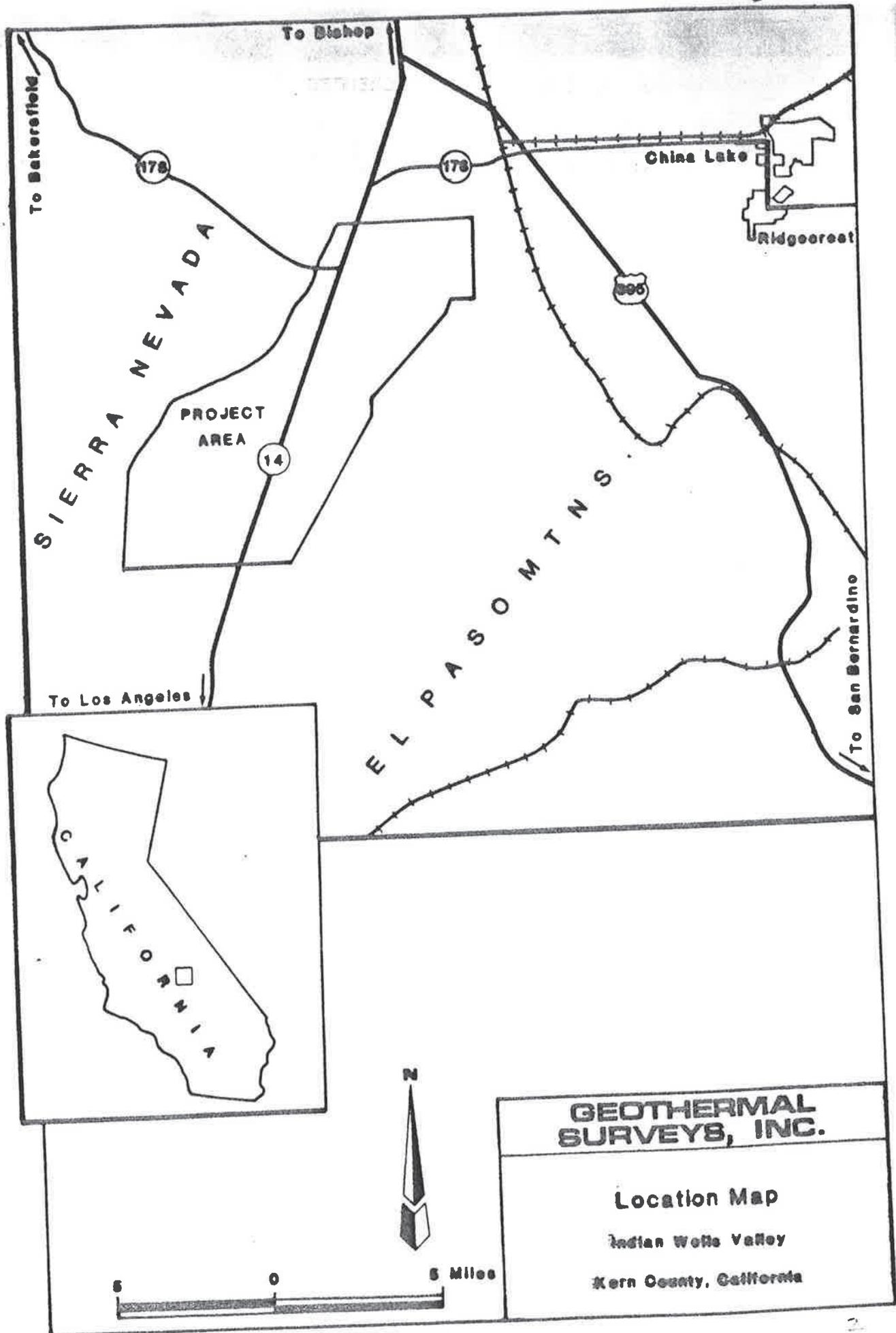
All surface drainage is to the northeast towards Inyokern. Analysis of water levels in wells suggests that a ground water flow divide is located near Sage Canyon (Dutcher and Moyle, 1973, Plate 2). However, this analysis was based on data from only 4 wells and was considered tenuous.

Research for this project consisted of the installation of a network of 57 ground temperature monitoring stations, 2 temperature surveys, and an analysis of the results supplemented with information derived from the pertinent geologic and geohydrologic literature.

Field work for this study was accomplished in December 1985 and January 1986. An initial reconnaissance of the project area and a field review with a Bureau of Land Management archaeologist to obtain approval of sites in environmentally or archaeologically sensitive areas were performed on December 30-31, 1985. Installation of the temperature monitoring stations was begun on January 7, 1986 and completed on January 12. All drilling was performed by Permanent Dead Man Company of Bakersfield, California. Temperature surveys were conducted on January 13-14 and January 22-24.

We gratefully acknowledge the assistance and cooperation of Mr. L. Marquardt and Mr. R. Dodge of the Eastern Kern County Resource Conservation District. Mr. G. Thomsen of the Ridgecrest office of the Bureau of Land Management was very helpful in working with us to obtain the necessary permits.

Figure 1



**GEO THERMAL
SURVEYS, INC.**

Location Map
Indian Wells Valley
Kern County, California

REFERENCES

- Austin, C.F. and Durbin, W.F., 1985, Coso: Example of a complex geothermal reservoir: Naval Weapons Center Technical Publication 6658, 96 p.
- Dibblee, T.W., Jr., 1967, Areal geology of the Western Mojave Desert, California: U.S. Geological Survey Professional Paper 522, 153 p.
- Dutcher, L.C. and Moyle, W.R., 1973, Geologic and hydrologic features of Indian Wells Valley, California: U.S. Geological Survey, Water Supply Paper 2007, U.S. Government Printing Office, Washington D.C., 30 p.
- Hulin, C.D., 1925, Geology and ore deposits of the Randsburg Quadrangle, California: California Mining Bureau Bulletin 95, 152 p.
- Jennings, C.W., Burnett, J.L., and Troxel, B.W., compilers, 1962, Geologic map of California: Olaf P. Jenkins Edition, California Division of Mines and Geology, Trona and Bakersfield Sheets; scale 1:250,000.
- Kunkle, F. and Chase, G.F., 1969, Geology and ground water in Indian Wells Valley, California: U.S. Geological Survey, Water Resources Division, Open File Report, Menlo Park, California, 84 p.
- Lipinski, P., 1980, Map of Indian Wells Valley, California, showing change in water level, 1963-73, and hydrographs of selected wells: U.S. Geological Survey, Open File Map 80-342.
- Moyle, W.R., Jr., 1963, Data on water wells in Indian Wells Valley area: Inyo, Kern and San Bernardino Counties, California: State of California, Department of Water Resources, Bulletin No. 91-9, 243 p.
- Olivér, H.W., Chapman, R.H., Biehler, S., Robbin, S.L., Hanna, W.F., Grisлом, A. Beyer, L.A., and Silver, E.A., 1980, Gravity map of California and its continental margin: California Division of Mines and Geology; scale 1:750,000.
- Oliver, H.W., (ed.), 1980, Interpretation of the gravity map of California and its continental margin: California Division of Mines and Geology Bulletin 205, 52 p.
- Roquemore, G.R. and Zellmer, J.T., 1983, Ground cracking associated with 1982 magnitude 5.2 Indian Wells Valley Earthquake: California Geology, pages 197-200.

St. Amand, P., 1985, Water supply of the Indian Wells Valley, California: Naval Weapons Center Technical Publication 6404, 71 p.

U.S. Geological Survey, 1961, Topographic Map of Western United States; Bakersfield sheet; Trona Sheet; scale 1:250,000.

U.S. Geological Survey, 15 minute Topographic Quadrangles (California) Cross Mountain; Inyokern; Onyx; and Saltdale; scale 1:62,500.

Zbur, R.T., 1963, A geophysical investigation of Indian Wells Valley, California: U.S. Naval Ordnance Test Station, China Lake, Naval Weapons Center Technical Publication 2795, 98 p.

TOPOGRAPHIC SETTING

The project area is in a southwest trending extension of Indian Wells Valley. This extension is approximately 15 miles long and 7 miles wide at its maximum and has an average elevation of about 3,100 ft. It is bounded to the north by the Sierra Nevada, which rise along a steep front to elevations greater than 6,000 ft. To the south, the El Paso Mountains rise to an elevation of 5,244 ft. (Black Mountain).

Streams in the area are intermittent. Most drain to the northeast towards China Lake, but those in the extreme southwest part of the valley drain south through Red Rock Canyon into Fremont Valley.

Topographic coverage of the project area is provided by the following USGS Topographic Quadrangles.

Name	Size	Contour Interval	Date
Dove Spring, CA	7 1/2 min.	40 ft.	1972
Freeman Junction, CA	7 1/2 min.	20 ft.	1972
Inyokern SE, CA	7 1/2 min	20 ft	1972
Horse Canyon, CA	7 1/2 min	40 ft.	1972
Saltdale NW, Ca.	7 1/2 min	40 ft.	1967

Included on this map are the location of a ground water flow divide and the directions of ground water flow inferred by Dutcher and Moyle (1973, Plate 2) based on water level data from wells.