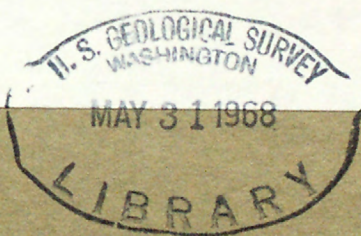


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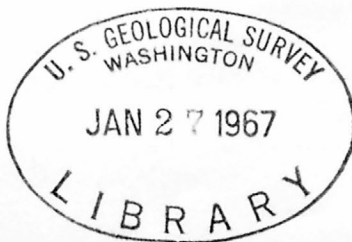
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GEOPHYSICAL INVESTIGATIONS OF THE BAHRAN GOSSAN

AND SHAIHAB MINE, SAUDI ARABIA

By W. E. Davis and R. V. Allen



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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOPHYSICAL INVESTIGATIONS
OF THE
BAHRAN GOSSAN AND SHAIHAB MINE
SAUDI ARABIA

by

W.E. Davis* and R.V. Allen*

Introduction

Reconnaissance geophysical investigations were made of the Bahran gossan and Shaihab mine in the Fatima-Rabigh Area. This work was requested by C. W. Smith, geologist, as part of a geologic mapping and exploratory program undertaken by the Division of Mineral Resources of the Ministry of Petroleum and Mineral Resources. The United States Geological Survey is assisting in this program under a contractual agreement with the Ministry of Petroleum and Mineral Resources, Kingdom of Saudi Arabia. Electro-magnetic measurements were made to detect subsurface electrical conductors that may represent deposits of massive sulphides indicated by mineralized veins exposed in the walls of ancient mine workings.

Vertical-coil electromagnetic dip-angle equipment having a 500-watt generator and operating frequency of 1100 cps (Sharpe, Model SE 100) was used in the investigations. Observations were made at intervals of 12.5 meters along traverses crossing the general trend of the gossan and mine workings. The effective depth of penetration of the measurements was between 200 and 400 feet. Field work was done by the authors during March 1966.

Bahran Gossan

The Bahran gossan is near lat. $22^{\circ}31'N$. and long. $39^{\circ}45'E$, approximately 35 kilometers east of Jebel Farasan. Gossan is exposed intermittently for a distance of several kilometers along the western slope of a tributary to Wadi Marakh. The country

* U.S. Geological Survey, Jiddah, Saudi Arabia

rock consists mostly of metamorphosed flow rocks which form steep hills east and west of the ^{tributary} ~~gossan wadi~~. Shallow excavations in several places indicate that parts of the gossan have been mined. The transmitting unit was placed over a gossan ^{outcrop} near one of these workings and dip-angle measurements were made along lines 150 and 250 meters to the north and south.

The data (Fig. 1) reveal that a hidden conductive zone lies beneath the west side of the gossan north of the transmitter station. The zone continues southeastward to underlie alluvium east of the altered zone. Analysis of the data indicates that the conductive source dips steeply to the west and its top lies at depths less than 50 meters. The source is inferred to have moderate conductivity that may be caused by massive sulphides. The richest part of the zone probably occurs beneath the eastern part of traverse 250S.

Shaihab Mine

The Shaihab mine is near lat. $22^{\circ}36'N$. long. $39^{\circ}45'W$. on Wadi ~~Sitarah~~ ^{Hawarah} about 10 kilometers north of the Bahran gossan. In the surrounding area, especially, to the south across Wadi ~~Sitarah~~ ^{Hawarah} are several ancient mine workings. In the Shaihab mine copper carbonate occurs in marble near the crest of a small sharp ridge that extends northward from the north side of the wadi into high limestone hills. The ridge and bordering hills are underlain by metamorphic rocks. Talus on the east side of the ridge shows considerable copper staining.

The transmitter was set up on the ridge crest about 8 meters above the mine working. Dip-angle measurements were made across the apparent trend of the marble. Relatively weak but definite indications of a concealed conductor were found along the marble bed.

Recommendations

Results of the investigations indicate that deposits of massive sulphides may occur beneath the gossan and in the vicinity of the Shaihab mine. We recommend that detailed geologic mapping and additional geophysical work be done to delineate such deposits and to explore other ancient mines in the district.



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