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1. Review of geophysical activities by the U. S. Geological Survey in Saudi Arabia, July 1965 to June 1966, by W. E. Davis and R. V. Allen. 4 p.

2. Geophysical investigations of the Bahran gossan and Shaihab mine, Saudi Arabia, by W. E. Davis and R. V. Allen. 2 p., 1 fig.

3. Phosphate deposits in the Jawf-Sakakah basin, Kingdom of Saudi Arabia, Part II: Thaniyat Turayf and Quraymiz, by James W. Mytton. 20 p., 3 figs., 3 tables.

4. Progress report on analyses of pyritic core from diamond drill holes under gossan at Wadi Wassat, Saudi Arabia, by W. C. Overstreet, Louis Gonzales, C. E. Thompson, Mohammed A. Fourati, Ali Sharah, and Jamal Sumbul. 17 p., including 7 tables.

5. Progress Report II: Assays and analyses of pyritic core from Wadi Wassat gossan, Saudi Arabia, by W. C. Overstreet, Sayyad Matouq Bahijra, Mohammed A. Fourati, and Louis Gonzales. 8 p., including 2 tables.

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6. Preliminary geologic map of Nevada, compiled by Kathleen M. Montgomery and others. 1 map, explanation, and index to sources (3 sheets), scale 1:1,000,000. Material from which copies can be made at private expense is available in the Reno, Salt Lake City, Los Angeles, and San Francisco offices, above.

7. Preliminary geologic map of southern Nye County, Nevada, by Henry R. Cornwall. 1 map and explanation, 1 fig., 6 p. source data; scale 1:250,000. Material from which copies can be made at private expense is available in the Reno, Salt Lake City, and Los Angeles offices, above.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
US GEOLOGICAL SURVEY

REVIEW OF GEOPHYSICAL ACTIVITIES BY THE U. S. GEOLOGICAL SURVEY IN SAUDI ARABIA JULY 1965 to JUNE 1966

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

U. S. Geological Survey
Open file report
1967

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REVIEW OF GEOPHYSICAL ACTIVITIES BY THE U. S. GEOLOGICAL SURVEY IN SAUDI ARABIA JULY 1965 TO JUNE 1966

by

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

Geophysical support of the mineral exploration program in Saudi Arabia has consisted mostly of exploratory field investigations. This effort has been coordinated with studies of the geologic mapping and mineral prospecting program conducted by the Division of Mineral Resources of the Ministry of Petroleum and Mineral Resources. In addition, direction and advice concerning geophysical work and contracts has been given to the Ministry; and several target areas selected by geologists of the U. S. Geological Survey have been investigated.

Initially the Ministry's geophysical prospecting program was reviewed and the results of field investigations were studied. Requests by geologists for geophysical support in new areas were also studied and evaluated. The geophysical instruments and auxiliary equipment of the Ministry were examined and tested. Brief experimental magnetic and electromagnetic surveys were then made in the Al Mahawiyah and Jabal Idsas areas. During the course of this preliminary work, personnel were trained, and suitable field techniques and instrumentation procedures were developed for reconnaissance and detailed exploratory investigations of iron and sulphide deposits. Upon subsequent arrival of new instruments the geophysical prospecting program was started. Surveys were made of prospects. Results of the work are presented in technical letters as follows:

Geophysical exploration in the Jabal Samran Area, Saudi Arabia (22°18'N, 39°32'E).

Electro-magnetic surveys were made of five localities near the mountain. The data depict four subsurface conductive zones whose inferred traces correspond to the general trends of mineralized vein systems found in geologic mapping. Drill holes were located for determining the conductive sources.

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

Geophysical exploration in the Mahad Adh Dhahab District, [illegible]. Saudi Arabia, (23°30'N, 40°50'E).

Electromagnetic exploration work done near the Mahd Adh Dhahab and Lahuf mines indicate that no deposits of massive sulphides lie at depths less than 150 feet within the areas studied.

Magnetometer survey in the Jebel Idsas Area, Saudi Arabia, (23°18'N, 45°12'E).

Results of the investigation indicate that a zone of magnetite more than 1700 meters in length lies beneath southward protruding ridges and the adjoining margin of a wadi in the central part of the area; and that a small zone of less economic importance occurs beneath a low ridge to the east. The main zone is inferred to be the source of a total-intensity magnetic anomaly found in airborne work. This zone averages about 75 meters in width and may contain as much as 50 percent magnetite. Completion of an important drill hole is recommended.

Geophysical exploration in the Southern Hijaz, Saudi Arabia, (20°00-28'N, 41°20-30'E).

Surveys were made over 16 ancient mines and prospects found in geologic reconnaissance. The surveys were made with the electromagnetic dip-angle method supplemented by electromagnetic horizontal-coil and magnetometer techniques. Results of the work indicate that no commercial deposits of massive sulphides occur near the mines. A hidden zone of moderate conductivity that may contain massive sulphides occur near the mines. A hidden zone of moderate conductivity that may contain massive sulphides was found in the Wadi Fig area. No magnetite deposits were discovered in the magnetometer surveys.

Magnetometer survey of the Methgal iron deposit, Saudi Arabia, (22°42'N, 39°51'E).

Results of the investigation suggest that the deposit contains pods and lenses of magnetite and hematite, which are not much larger than the outcrops; and which probably do not represent a sufficient quantity to be of commercial interest. Test-drilling is not recommended.

Geophysical investigations in the Bi'r Idimah-Wadi Wassat area Saudi Arabia, (18°30'N, 44°10'E). Part one

An electromagnetic survey over the northern part of an extensive gossan indicates that massive sulphides (pyrite) underlie the outcrop zone as found

in a drill hole. A strong electromagnetic response in the central part of the surveyed area may represent a richer part of the pyrite-bearing zone or may be caused by a more conductive source, such as chalcopyrite. Test-drilling in this part of the gossan is recommended.

Geophysical investigations in the Bi'r Idimah-Wadi Wassat area, Saudi Arabia (18°30'N, 44°10'E). Part two.

Results of electromagnetic surveys over four parts of the gossan to the south indicate that deposits of massive sulphides occur intermittently along the gossan. The deposits vary in width and depth of burial, and can be detected by close-spaced electromagnetic measurements. Recommended that geologic mapping be done in conjunction with additional geophysical surveying to obtain sufficient information for planning and undertaking a systematic exploratory drilling program.

Geophysical investigation of the Bahran Gossan and Shaihab Mine, Saudi Arabia (22°31-36'N, 39°45'E).

Reconnaissance electromagnetic surveys were made over the gossan and mine workings. The data indicate that a mineralized zone lies beneath the west edge of the gossan and extends southeasterly beneath the wadi sediments; and that a hidden conductor is associated with the marble bed worked in ancient mining operations. Additional geophysical surveys should be made to explore other mines in the district.

Request for tender for airborne geophysical surveys, the Kingdom of Saudi Arabia, Ministry of Petroleum and Mineral Resources.

This request was prepared for an airborne magnetometer-scintillation counter survey of the Precambrian shield, approximately 540,000 square kilometers; and for airborne electromagnetic surveys of about 24,000 square kilometers. Because of B.R.G.M. requirements and insufficient funds the request was not submitted to bidders.

Results of the exploratory investigations indicate that geophysical prospecting techniques can be applied successfully throughout most of the shield area. Application, however, seems to be somewhat limited in parts of the southern Hijaz, where we suspect that the mineralization is more disseminated or that the zone of oxidation extends to great depths. The interpretation of geologic data obtained during

the past two years will aid materially in determining exploration criteria and feasible geophysical methods for particular districts. We may expect that the results of current test-drilling will give valuable information for interpreting data and guiding exploratory work in other parts of the shield.

The geophysical work of the U. S. Geological Survey in Saudi Arabia has been undertaken as part of a cooperative agreement for mineral exploration in the Arabian Shield reached in 1963 between officials of the Ministry of Petroleum and Mineral Resources, Kingdom of Saudi Arabia, and the United States Geological Survey.