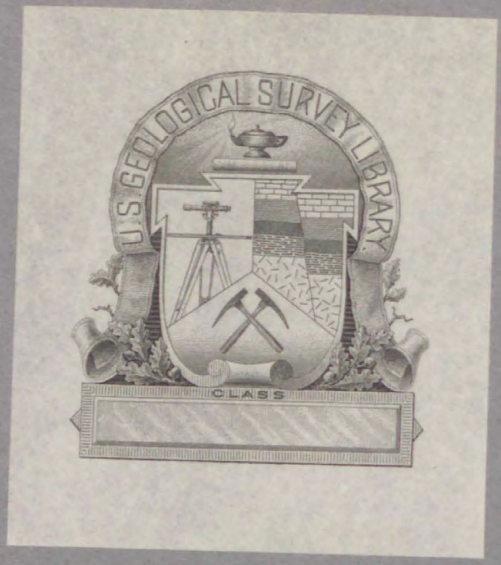
U. S. Geological Survey.

[REPORTS-OPEN FILE SERIES], no. 1494: 1970.


U.S. GEOLOGICAL SURVEY LIBRARY
CLASS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

[U.S. ... file series]

Saudi Arabia Investigation Report
(IR)SA-104

RECOMMENDED GEOPHYSICAL INVESTIGATIONS OF MINERAL OCCURRENCES AT JABAL SAMRAN, AL MARASIA, AND WUTAILEH

by

D. H. Hase and V. J. Flanigan
U. S. Geological Survey

and

M. N. Akhrass
Ministry of Petroleum and Mineral Resources

U. S. Geological Survey
OPEN FILE REPORT
This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards or nomenclature.

1970

U.S. GEOLOGICAL SURVEY
WASHINGTON, D.C.
20242
[Reports - Open file series]

For release NOVEMBER 6, 1970

The U.S. Geological Survey is releasing in open files the following reports. Copies are available for inspection in the Geological Survey Libraries, 1033 GSA Bldg., Washington, D. C. 20242; Bldg. 25, Federal Center, Denver, Colo. 80225; and 345 Middlefield Rd., Menlo Park, Calif. 94025:

1. Schmidt hammer test method for field determination of physical properties of zeolitized tuff, by John R. Ege, Danny R. Miller, and Walter Danilchik. 37 p., including 19 figs., 1 table. (*)

2. A geochemical evaluation of the Ash Sha'ib mineral prospect, Asir quadrangle, Kingdom of Saudi Arabia, by Glenn H. Allcott. 38 p., 6 pl., 3 figs., 6 tables.

3. Preliminary geophysical investigation of the Esh Qay'ib (Esh Sha'ib) mine area, Saudi Arabia, by Willard E. Davis and Hisham Kazzaz. 10 p., 6 figs.

4. Recommended geophysical investigations of mineral occurrences at Jabal Samran, Al Marasia, and Wutaileh, by D. H. Hase, V. J. Flanigan, and M. N. Akhrass. 5 p., 1 map, scale 1:500,000.

5. Qualitative analysis of airborne magnetometer data: The Arabian Shield, Kingdom of Saudi Arabia, by Donald H. Hase. 44 p., 1 pl.

6. Preliminary investigation of cement materials in the Taif area, Saudi Arabia, by Conrad Martin. 18 p., 1 fig., 1 table.

7. An appraisal of the Jabal Idsas magnetite mineralization based on diamond drill hole N40A, by Conrad Martin. 29 p., 4 figs., 1 table.

8. Geological reconnaissance of the western part of the Wadi Ar Rimah quadrangle, Saudi Arabia, by James W. Mytton. 3 p.

9. Reconnaissance for mineral deposits in the Precambrian rocks of the Wadi Ar Rimah quadrangle, Kingdom of Saudi Arabia, by James W. Mytton. 76 p., 1 pl., 3 figs., 3 tables.

10. Preliminary report on the Dawadami district, Saudi Arabia, by Paul K. Theobald, Jr. 4 p.

(*) Note: Item 1, above, is also available for inspection at 504 Custom House, San Francisco, Calif. 94111; 7638 Federal Bldg., Los Angeles, Calif. 90012; 1012 Federal Bldg., Denver, Colo. 80202; 8102 Federal Office Bldg., Salt Lake City, Utah; and in the Library, Mackay School of Mines, University of Nevada, Reno, Nev. 89507.

RECOMMENDED GEOPHYSICAL INVESTIGATIONS OF MINERAL OCCURRENCES AT JABAL SAMRAN, AL MARASIA, AND WUTAILEH

by

D. H. Hase, V. J. Flanigan, M. N. Akhrass

PREFACE

In 1963, in response to a request from the Ministry of Petroleum and Mineral Resources, the Saudi Arabian Government and the U. S. Geological Survey, U. S. Department of the Interior, with the approval of the U. S. Department of State, undertook a joint and cooperative effort to map and evaluate the mineral potential of central and western Saudi Arabia. The results of this program are being released in USGS open files in the United States and are also available in the Library of the Ministry of Petroleum and Mineral Resources. Also on open file in that office is a large amount of material, in the form of unpublished manuscripts, maps, field notes, drill logs, annotated aerial photographs, etc., that has resulted from other previous geologic work by Saudi Arabian government agencies. The Government of Saudi Arabia makes this information available to interested persons, and has set up a liberal mining code which is included in "Mineral Resources of Saudi Arabia, a Guide for Investment and Development," published in 1965 as Bulletin 1 of the Ministry of Petroleum and Mineral Resources, Directorate General of Mineral Resources, Jiddah, Saudi Arabia.

INTRODUCTION

A familiarization and reconnaissance trip was made in the vicinity of Jabal Samran during 7-8 April 1968. The trip was suggested by E. Meaton and W. Liddicoat, Ministry of Petroleum and Mineral Resources, for the purpose of inspecting the mineral occurrences at Jabal Samran, Al Marasia, and Wutaileh, and recommending feasible geophysical methods which should be applied to the study of these occurrences.

PRIORITY

The suggested priority for undertaking these geophysical investigations is based upon the apparent indications of mineralization at each site, the geologic and topographic setting, and the feasibility of using geophysical techniques. The following priority is recommended:

1. Jabal Samran
2. Al Marasia
3. Wutaileh

RECOMMENDED GEOPHYSICAL INVESTIGATIONS

Jabal Samran

On the north zone, the Turam electromagnetic method should be used to locate the mineralized portions of the quartz-filled shear zone and to obtain approximation of the widths. Profiles perpendicular to the strike of the vein should be made to locate the more highly mineralized portions. Terrain effects will have to be considered.

Induced polarization profiles should be made along the strike of the vein outcrop to detect any conductors which may not have been located by electromagnetic methods or drilling.

At those sites where there is evidence of higher concentration of sulfides, induced polarization profiles should be made perpendicular to the strike of the vein. An expanding electrode configuration will provide data which can be used to interpret the width, depth, and attitude of the conductor.

An induced polarization profile with an expanding-electrode configuration should be made along the sample trench above Drill Hole 22 to provide data which can be correlated with assay results.

An in-hole, induced polarization survey should be made in Drill Hole 22, if the hole is open, to provide data which can be correlated with assay results. Some modification of the available induced polarization apparatus will be required.

On the south zone located in the wadi near the airstrip, induced polarization profiles with an expanding-electrode configuration should be made perpendicular to the trace of the conductors which were previously detected by dip angle electromagnetic techniques. The data can be used to interpret the width, depth, and attitude of the conductors.

Several refraction seismic profiles perpendicular to the strike of the conductors should be made to determine the depth to the bedrock.

Several gravity and magnetic profiles perpendicular to the strike of the conductors should be made to determine the applicability of these methods to locating mineralized conductors because of differences in density and magnetic susceptibility.

It is estimated that this program of geophysical investigations will require four to five weeks of field work.

Al Marasia Gossan

The Turam electromagnetic method should be used to locate the mineralized conductor, to determine the extent of on-strike continuations southward along the talus-covered hillside and northward into the wadi, and to obtain an approximation of the width of the conductor. Inasmuch as the sulfide mineralization intersected in the drill holes is highly disseminated, the Turam method may not detect the conductor.

Induced polarization profiles with an expanding-electrode configuration should be made perpendicular to the located conductor at those sites where the electromagnetic data suggest higher concentrations of sulfides, or if the conductor is not located, the induced polarization profiles should be made perpendicular to the inferred northerly strike of the greenschist. These data can be used to interpret the width, depth, and attitude of the conductor.

In-hole, induced polarization surveys should be made in the two drill holes, if these holes are open, to provide data which can be correlated with assay results.

Several refraction seismic profiles should be made in the wadi north of the gossan to determine the depth to the bedrock.

It is estimated that this program of geophysical investigations will require two weeks of field work.

Wataileh Gossans

The Turam electromagnetic method should be used to locate the conductor, to determine the extent of on-strike continuations from the gossan sites, and to obtain an approximation of the width. Profiles should be made perpendicular to the inferred strike of the gossan.

The distribution of the gossans suggests that greater concentrations of sulfides occur as lenses or pods within the greenschist. The pyritization in the altered greenschist and the disseminated copper (sulfide?) reported in the schist will produce anomalies which will distort the anomalies caused by the lenses or pods of more sulfide-rich greenschist from which the gossans developed. The greater the difference in sulfide concentration, the more likely is the possibility that electrical geophysical methods can be used successfully to detect the more mineralized portions of the rock.

It is estimated that this program of geophysical investigations will require one week of field work.

A subsequent phase of this investigation would involve making induced polarization profiles with an expanding-electrode configuration at those sites of highest conductivity as suggested from the Turam data. Should the Turam method not be successful in locating the conductor, the induced polarization method would have to be depended upon entirely. This is, however, subject to the same limitation although not to the same degree that is imposed on the Turam method by the high background conductivity resulting from the widespread disseminated sulfides.

PERSONNEL REQUIREMENTS

To accomplish the recommended programs of geophysical investigations, the following personnel will be required:

1-3 Geophysicists (Ministry of Petroleum and Mineral Resources and U.S. Geological Survey)

1 Surveyor

2 Drivers

1 Cook

4 Workers (recommend hire locally)

EQUIPMENT REQUIREMENTS

To accomplish the recommended programs of geophysical investigations, the following equipment will be required:

Appropriate geophysical apparatus

Camp equipment

2 Land rovers

1 Truck.

POCKET CONTAINS
_____ ITEM'S.