UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Saudi Arabia Investigation Report
(IR) SA-41

PRELIMINARY REPORT ON A FIELD TRIP

SEPTEMBER 29-DECEMBER 12, 1964

TO THE AQABA AREA, SAUDI ARABIA

by

Virgil A. Trent and Robert F. Johnson

1968

68-274

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 Also on open file in that office is a large amount of material, in the form of unpublished manuscripts, maps, field notes, drill logs, annotated aerial photographs, etc., that has resulted from other previous geologic work by Saudi Arabian government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.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Saudi Arabian Mineral
Exploration - 41

PRELIMINARY REPORT ON A FIELD TRIP SEPTEMBER 29-DECEMBER 12, 1964 TO THE AQABA AREA, SAUDI ARABIA

by

Virgil A. Trent and Robert F. Johnson

Introduction

During the period September 29-December 12, 1964, field investigations were made in the northern Hijaz as a part of the joint Saudi Arabia - U. S. Geological Survey project to search for mineral deposits in the Precambrian rocks of Saudi Arabia. The area investigated (fig. 1) lies east of the Gulf of Aqaba in the Wadi As Sirhan quadrangle, sheet I-200A (Bramkamp and others, 1963) and in the northwest corner of sheet I-204A, the Northwestern Hijaz quadrangle (Brown and others, 1963).

The procedure followed in field work was to attempt to reach predetermined areas that had been noted on aerial photographs as being anomalous, such as bleached areas, areas of dark rocks, fault zones, and veins or dikes. Close attention was paid to the contact zones of intrusive rocks. Soil samples screened to minus 30 and plus 80 mesh were taken below or adjoining areas showing alteration, from veins showing some evidence of sulfide minerals, and from wadis that drain intrusive contacts where there was some evidence of alteration or veining. Spot tests were made for radioactivity and for the presence of fluorescent minerals. No systematic geologic mapping was attempted, but checks were made on rocks exposed on or near the route traveled for the purpose of confirming the geology shown on the published geologic maps of the quadrangles. The major modifications of sheet I-200A are shown on figure 2.

The field examination alone did not disclose any mineralized areas that seemed worthy of more detailed work but it is hoped that the samples taken will show more

favorable results. Sparse showings of copper minerals southwest of Jabal Lawz, and a few gossan-bearing veins in serpentine east of the mountain were the best "finds." Some cross-fiber chrysotile with fibers as much as 1 centimeter long was noted in a serpentinized dike south of Jabal Rawa but the quantity seemed too small to be of interest. Inron formation occurs in thin beds and lenticular bodies about as shown on plate 2 of Kahr and Agoc's report (1962). However, their plate 3 does not show iron formation that crops out along the northwest-trending fault that crosses Wadi Ghawjah, and other small lenses that occur east of Jabal Shar. A point of geologic interest is that banded iron ores are not confined to the Silasia formation but also occur in the metavolcanic rocks mapped as gd. The beds in the metavolcanic rocks are tl thin, lenticular, and do not contain red chert.

Geologic notes

The following paragraphs will describe the areas that we were requested to examine by Dr. G. F. Brown and will also point out some of the discrepancies we noted on the geologic maps I-200A and I-204A. In general the contacts on the geologic maps are well located but more field checking should have been done to identify the rocks. Some errors may be drafting errors as the labels seem to be reversed in some areas. Our field determinations of the rocks are useful for our work but any revision of the map should be based on more detailed petrographic work.

We had been requested to look at the following areas in some detail in order to check the photogeologic interpretation:

1) The area mapped as Tlc in Wadi Shurays near the Jordan border.

The rocks in this area are pebble conglomerate and arkosic sandstone so are probably not Tlc which is described as being dominantly calcareous. A sedimentary section of low dipping beds about 15 meters thick is exposed. The lower 10 meters are largely pebble conglomerate and coarse arkosic sandstone. The upper 5 meters are finer-grained sandstone. The sandstone is cross bedded and in places cemented by limonite. The beds are yellow, buff, brown, and reddish in color. They lie on dark granitic rocks that are cut by many dikes. Similar sandstone crops out about 4 kilometers to the west on the edge of the coastal plain.

Kahr mapped these rocks as Cambrian sandstone and arkose.[1/] Our opinion is that these rocks are not as consolidated as the Paleozoic rocks and may be younger, possibly even Tertiary, but we would be hard put to prove it.

2) The area mapped as gb north of Jabal Lawz.

We were not able to reach the central portion of this area but examined the east, south, and west margins. Some gabbroic float was found in a wadi draining the central area but the bulk of the rock is granite slightly darker in color than the adjacent granite. The lobe projecting southeast from the main gb mass is a coarse-grained biotite granite with numerous inclusions of hornblende-biotite-quartz hornfels. On the west side of the mass the rocks mapped as gr are gray granite whereas those mapped as gb are red granite; no gabbro float was seen in the wadis that drain the western part of the mass.

3) The area mapped as sp southwest of Jabal Lawz and sp (?) north of Jabal Marshah in the central part of the area we examined.

The rocks mapped as sp southwest of Jabal Lawz are dark metavolcanic rock and hornfels. We think that the rocks shown as sp should be labeled gd and that the rocks to the south that are labeled gd are actually Hadian formation (h). These latter rocks are light-colored and greenish argillite and conglomerate. Rocks mapped as east of the fault shown on the map are of higher metamorphic grade, phyllite, schist, and conglomerate with stretched pebbles. These rocks could be si as shown or could be the more metamorphosed equivalent of the argillite and conglomerate that we call Hadiyah.

The other area shown as sp (?), north of Jabal Marshah is hornblende granite.

4) The area mapped as gb west of Tayyib al Ism.

This area was mapped as gb on the basis of float found by Von Gaertner and Shurenberg at the mouth of the main wadi.[2/] We followed the gorge cut by the wadi from Tayyib al Ism to the coast and found the rocks to be largely granite. The gorge tends to follow a more mafic intrusive, not very dark but with calcic plagioclase. We called it a diorite in the field but a thin section may show it to be gabbro. In any event

1/ Kahr, V. P., 1:50,000 compilation map of the Aqaba-Haql area: unpublished map in files of Directorate General for Mineral Resources, Jiddah.

2/ Transcript of field notes by Glen Brown.

this rock formed only a minor part of the area mapped as gb, and can probably not be shown on the scale of the map.

5) The area mapped as Є q? north of Al Bad'.

These beds are probably part of the Raghama formation. They contain calcareous beds as well as sandstone and conglomerate.

6) The area mapped as QTb? north of Aynunah.

This area is a dissected pediment with a thin veneer of boulders lying on silty material that is bedded but scarcely lithified. One bed of tough mud had an astringent taste and looked like sabkah material. Plant remains are abundant on some beds. The beds dip about 10 degrees to the northeast toward the mountains. The overlying boulder gravels slope gently seaward. These rocks do not resemble the Raghama formation but could correspond to the Tsm unit described in the legend of sheet I-200A.

7) Area northeast of Ash Sharmah.

On the west side of this basin are outcrops of the Raghama formation, occurring either in tilted blocks or in a small syncline. Some beds are fossiliferous buff limestone. Dips as steep as 50 degrees were noted but generally the beds are flatter.

The northeast side of the basin is underlain by southwest-dipping unmetamorphosed andesite flows, conglomerate, rhyolite tuff, and red and green shale. The section is volcanic and conglomeratic at the base and at the top with the shaly beds between. The rocks lie on coarse-grained granitic rock. The section resembles the unmetamorphosed volcanic and sedimentary rocks that lie unconformably beneath the Cambrian sandstone north of Wadi Sawawin. These latter rocks have been called the Shammar formation.

In the northwest corner of sheet I-204A the area mapped as sc east of Al Muwaylih is actually largely metavolcanic rock, gd, with some Silasia formation in Wadi Ghawjah. Farther east between 36° and 36°30'E. the area shown as sr is actually granite with rhyolite dikes. In the same area the presence of the Hadiyah formation (h) south of the gp intrusive was confirmed.

Mineral deposits

A discussion of mineral potential will have to be deferred until the analytical results of the sampling are completed. Nothing was seen in the field that indicated areas of economic interest.

A manganese prospect on the Jordan border had been reported by Dr. Kahr and was re-examined by us. A pit about 15 meters long, 2 meters wide, and as much as 2 meters deep has been blasted out. The country rock is granite and aplite. Manganese oxides coat fracture surfaces in the country rock and fill fractures a few centimeters wide. The veinlets thus formed are irregular and die out within a few meters. The protore was not seen. The deposit is too small to be of interest.

Secondary copper minerals occur in small amounts in widely scattered areas. The best showing consisted of chrysocolla and minor chalcocite in conglomerate and volcanic rocks about 30 kilometers east of Al Bad'. The host rock is thought to be Hadiyah formation in part. Another small occurrence of copper minerals east of Wadi Qaraqir in sheet I-204A is also in the Hadiyah formation.

We were unable to locate the galena-bearing quartz vein reported by Wendel, Minerals Attache, Ankara (letter to Brown dated August 12, 1964). Some quartz veins in the same general area contain specularite. Analyses of Wendel's samples would be of interest.

A vast tonnage of gypsum is available in the Raghama formation west of Al Bad'. Much of the gypsum is mixed with shale but fairly pure beds of gypsum as much as 1 meter thick occur in many places.

Inquiries were made regarding a reported oil seep south of Maqna but no one that we asked had heard of it.

Iron formation occurs in scattered deposits from Wadi Rawa in sheet I-200A to Wadi Qaraqir in sheet I-204A. Nothing was seen that is remotely comparable to the Sawawin deposits in size, but some deposits seem to be of better quality. Iron formation occurs in the Silasia formation and also in the underlying metavolcanic rocks. The deposits in the metavolcanic rocks are thin and lenticular and the iron

is largely magnetite; red chert is not common and epidote and garnet are accessory minerals. Considerable iron formation occurs along the large northwest-trending fault that corsses Wadi Ghawjah in sheet I-204A. Lenses as much as 10 meters thick occur along or near the fault over a distance of several hundred meters.

Observations made on this field trip confirmed those made previously regarding the lack of sulfide minerals in the area. This is remarkable in view of the abundant and varied intrusive rocks that occur throughout the region.

References cited

Bramkamp, R. A., Brown, G. F., Holm, D. F., and Layne, N. M., Jr., 1963, Geology of Wadi As Sirhan quadrangle, Kingdom of Saudi Arabia: U. S. Geol. Survey Misc. Geol. Inv. Map I-200A.

Brown, G. F., Jackson, R. O., Bogue, R. G., and Elberg, E. L., Jr., 1963, Geology of the Northwestern Hijaz quadrangle, Kingdom of Saudi Arabia: U. S. Geol. Survey Misc. Geol. Inv. Map I-204A.

Kahr, V. P., and Agoc's, William, 1962, Geologic and magnetic reconnaissance survey of iron-bearing area of Wadi Sawawin: Directorate General for Mineral Resources, unpublished rept; Jiddah, Saudi Arabia

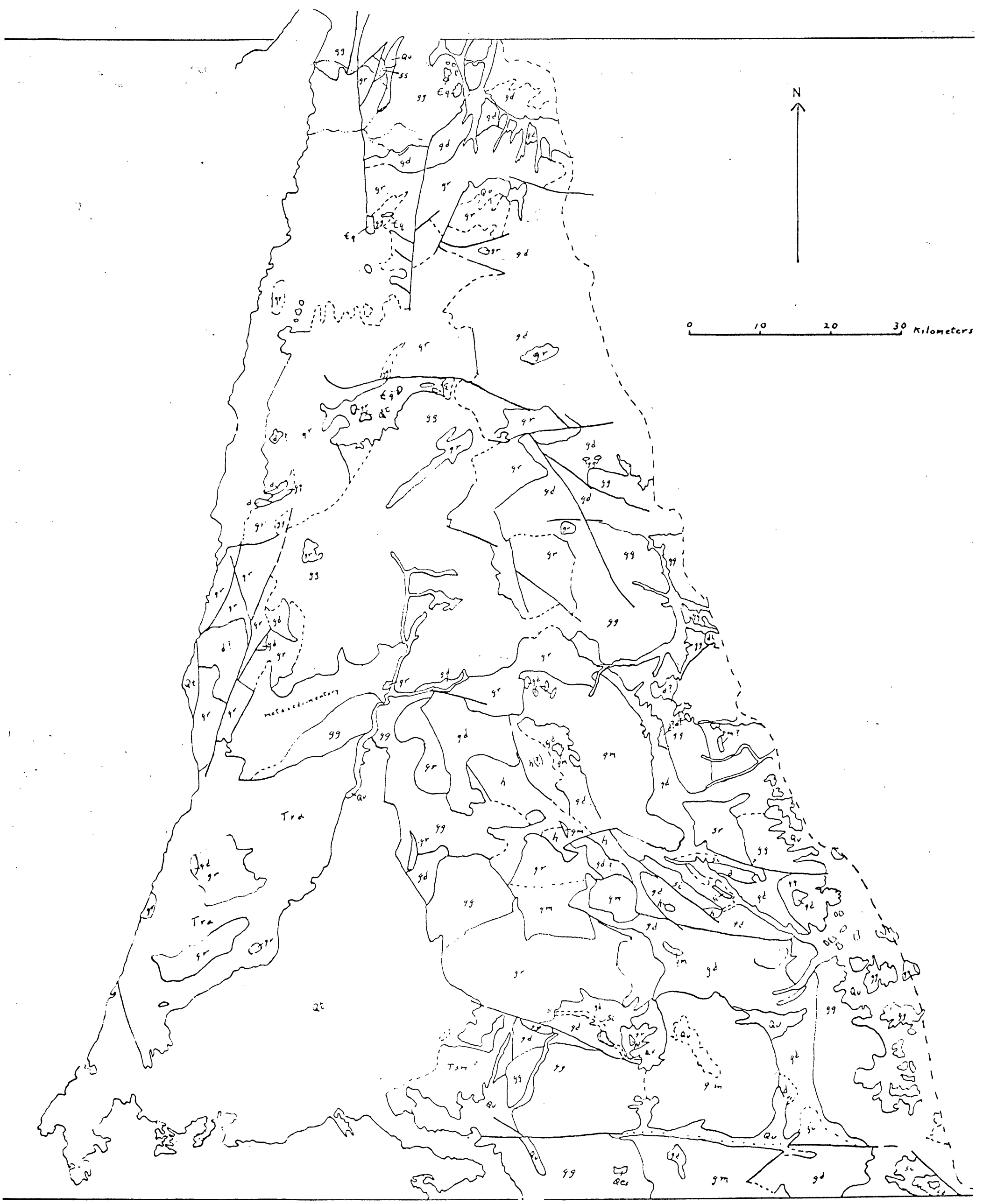

Figure 2. Map showing tentative revision of major map units, sheet I-200-A

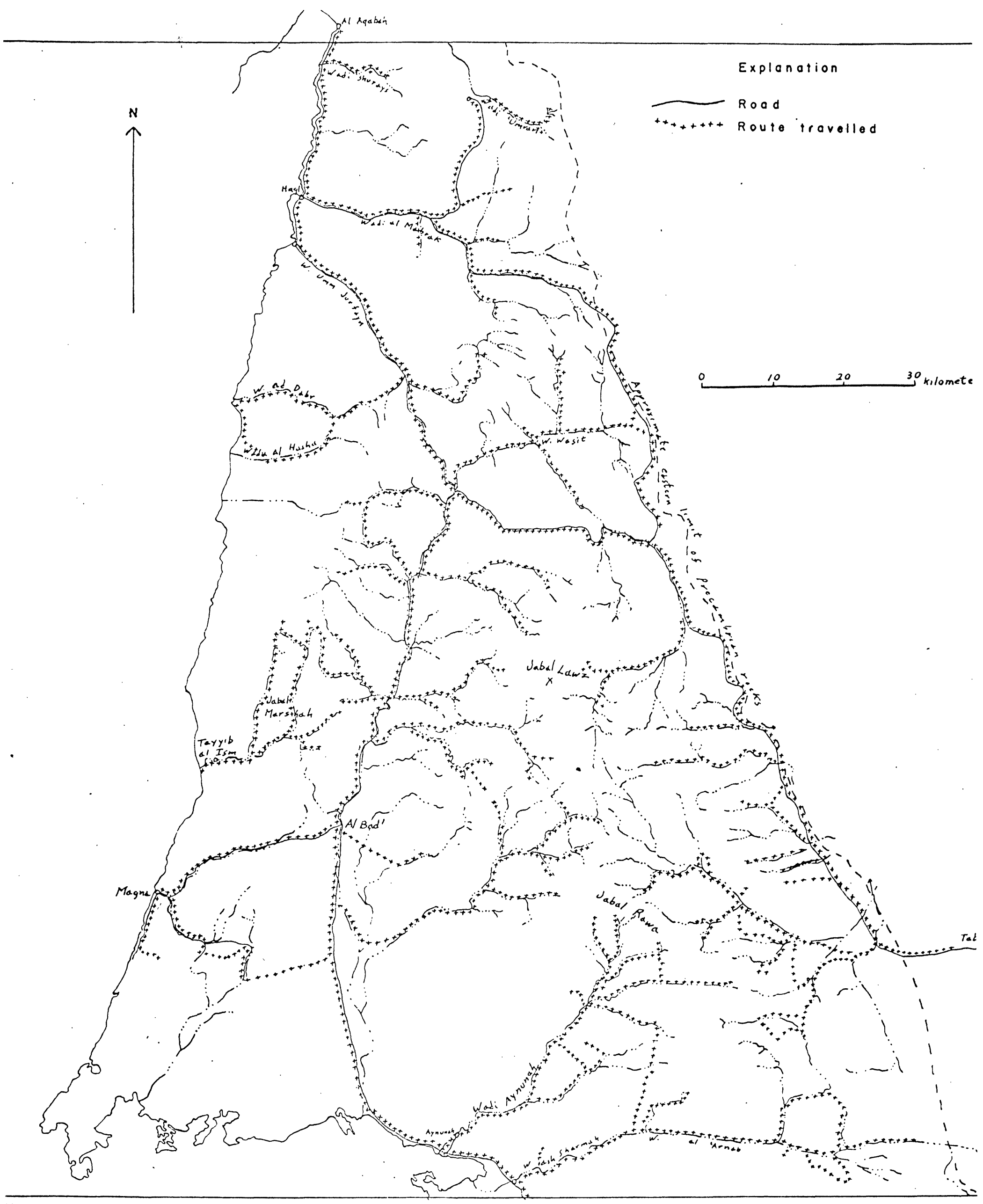

Figure 1. Map of southwest corner of sheet I-200 showing route travelled in 1964.