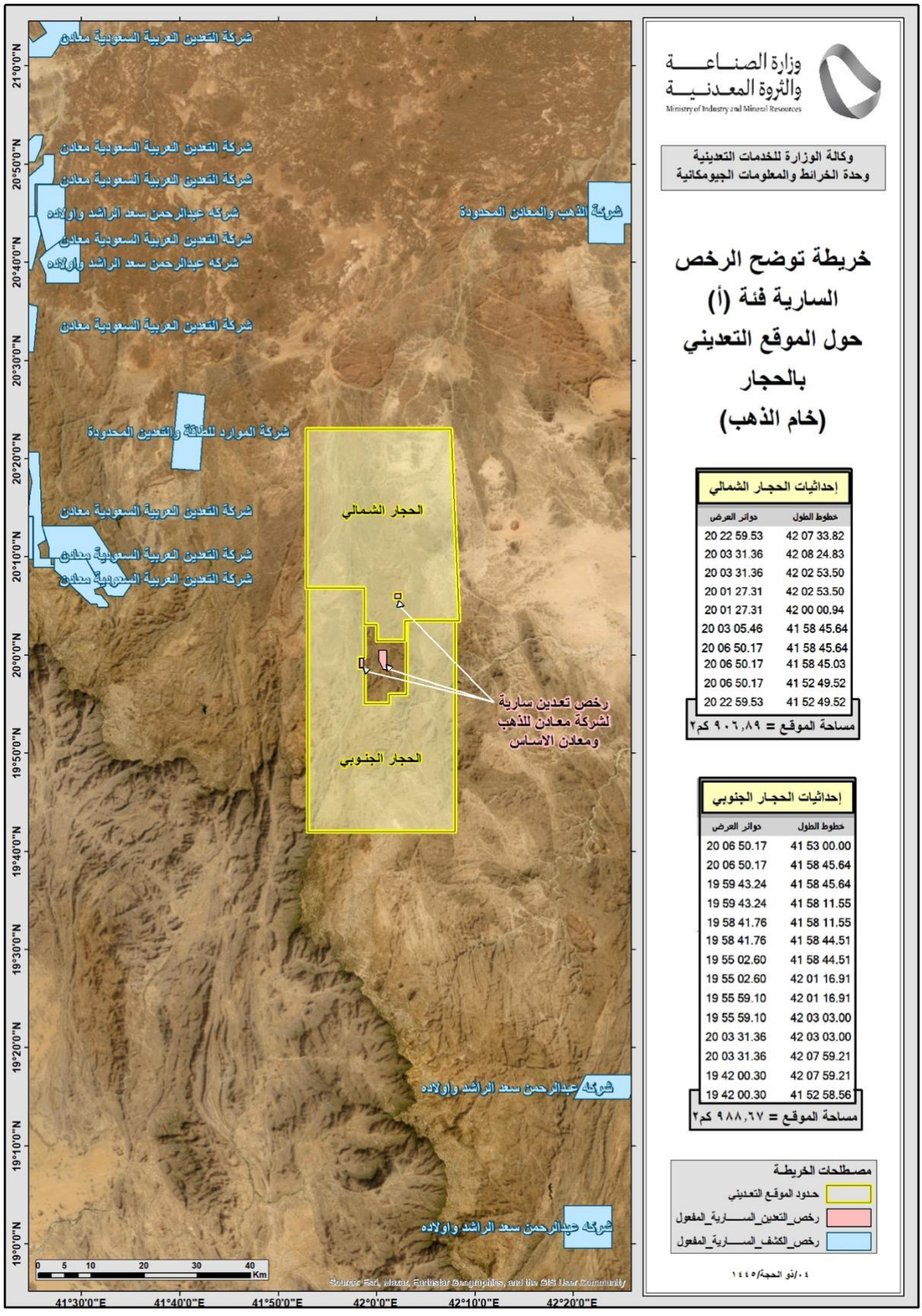
وزارة الصناعة
والثروة المعدنية
Ministry of Industry and Mineral Resources

Al Hajar Site

This document provides the technical information for Al Hajar site. The information provided covers Site location, Geology and Mineral occurrences map of the belt, Previous exploration details, Regional & Local geology details, and Exploration recommendations.

Contents

1. Site location and Map



The Al Hajar site is located within the Wadi Shwas VMS Belt, which occupies an area of about 3,893 km² in the Asir Terrane. The Al Hajar site is divided into two distinct license areas:

- **Al Hajar North:** 906.89 km²
- **Al Hajar South:** 988.67 km²

The above map illustrates the precise boundaries and coordinates of these two license areas. It also shows the active mining and exploration licences around these two areas.

2. Site detail

The Wadi Shwas VMS Belt occupies an area of about 3,893 km² in the Asir Terrane and it is located east of and mostly parallel to the adjacent Wadi Bidah Belt. The belt underlain by Khutnah Formation sedimentary rocks and Quirshah Formation mafic to intermediate volcanic and volcaniclastic rocks that have been metamorphosed to the greenschist facies. The Quirshah Formation hosts most of the known VMS deposits.

The Wadi Shwas belt contains two main VMS deposits, Al Hajar and Jadmah, the second of which is currently known as Al Qadmah – both are associated with a large number of lesser prospects (Table 1). Al Hajar is significant in that it contains a significant amount of gold associated with gossan structure.

Table 1:Summary of Occurrences in the Wadi Shwas VMS Belt

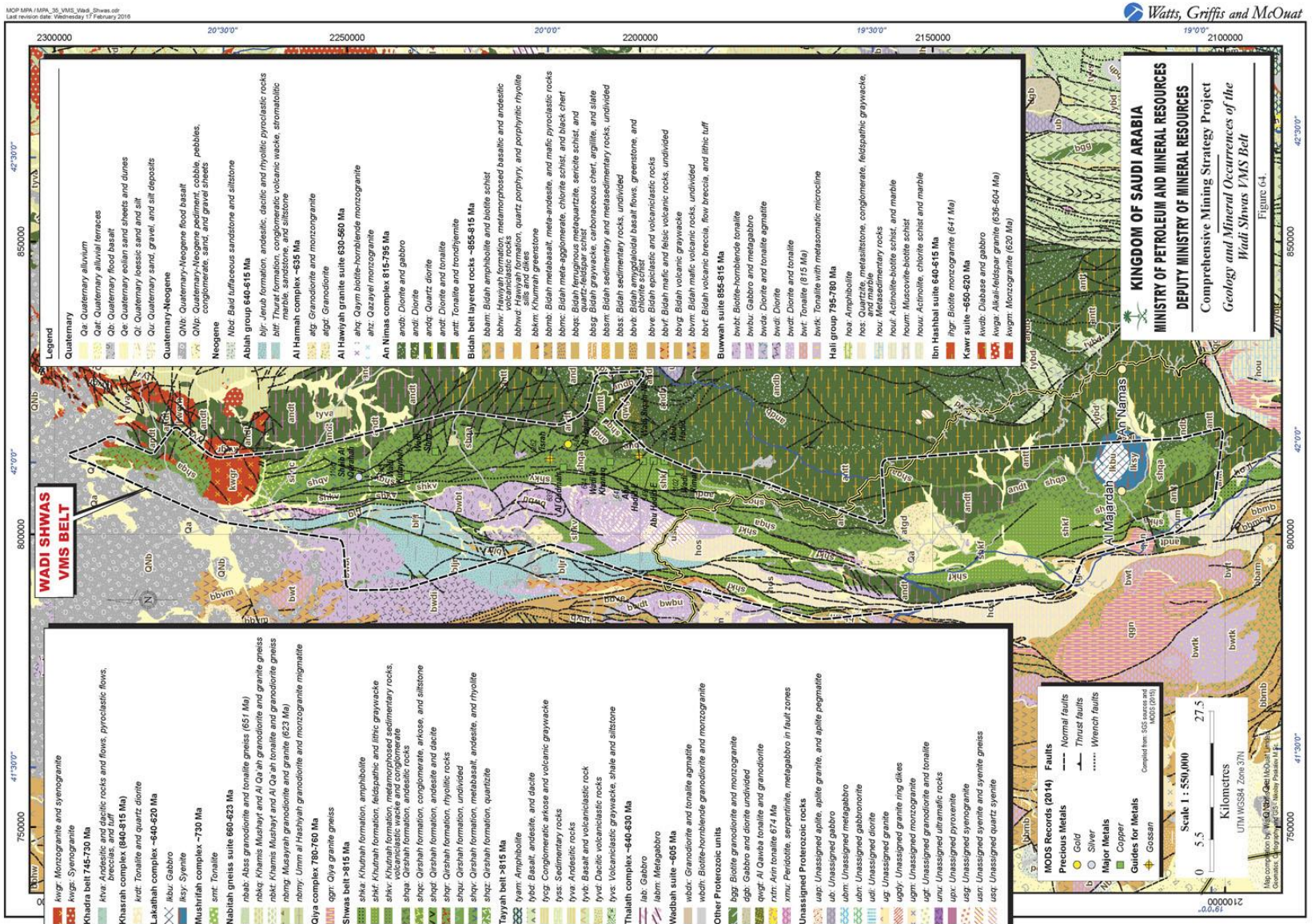
MODS	Name New	Name Old	Main Commodity	Longitude	Latitude	Nearest Town	Potential Ranking	Geometry
1106	Shaib Al Qurahah	Abu Sydra	Ag	41.9656110	20.3048610	Al 'Aqiq	Low	undetermined
0645	Wadi Kutaynah	Iktinah	Cu	41.9650560	20.2300560	Bishah	Medium	dd, sm / ms
0641	Wadi Shirs	Shmaytah	Cu	42.0055560	20.1861110	Bishah	Low	dd, v
1262	Yisrah	Ysrah	G	41.9902780	20.0094440	Balqarn	Undefined	undetermined
0639	Al Qadmah	Jadmah	Cu	41.9754720	19.9888890	Balqarn	Very high	sm / ms, lenses, stringers
0649	Al Hajar	Al Hajar	Cu-Au	42.0136110	19.9810560	Balqarn	Very high	dd, sm / ms, stockwork v
0644	Wadi Al Khanaq	Al Wakaban	Cu	41.9833330	19.9166670	Balqarn	Very low	dd
1263	Wadi Siqam-NE	Al Hashiyah	G	41.9930560	19.8725000	Balqarn	Very low	veins
0647	Abu Hadid-E	Siqam As Sawan	Cu	41.9833330	19.8666670	Balqarn	Medium	dd, stratiform
0648	Abu Hadid-E	Shabat As Suqah	Cu	41.9833330	19.8500000	Balqarn	Medium	dd, stratiform
0646	Abu Hadid	Abu Hadid	Cu	41.9833330	19.8333330	Balqarn	Medium	dd, stratiform
1102	Wadi Rimah	Al Mahtriq	Cu	41.9638890	19.8222220	Balqarn	Medium	dd, stratiform

NOTES: 1) * Ranking according to MODS 2) v=veins, dd = disseminated; sm = sub-massive; ms = massive classified as VMS based on limited descriptions – no resource estimates available

3. Location

The Wadi Shwas VMS belt lies east of and mostly parallel to the adjacent Wadi Bidah Mineral Belt and it occupies an area of about 3893 sq. km in the Asir Terrane (Figure 3).

Figure 3: Geology and Mineral Occurrences of the Wadi Shwas VMS Belt



4. Previous Exploration

The first visit of the ancient workings at Al Hajar occurred during 1965 by the USGS when an attempt was made to find the sources of airborne EM conductors on the ground (Trent, 1965). In 1973, the first systematic exploration by the DGMR consisted of a 20 m x 40 m SP survey and a small amount of Turam (EM) surveying. A long SP anomaly was found to be coincident with the gossans. IP and/or more Turam-EM were recommended in advance of drill-testing the conductors (Gazzaz, 1974). The Japanese Geological Mission ("**JGM**") carried out 1:2,000-scale geological mapping using aerial photographs for control purposes. The gossans were extensively sampled, and three diamond drill holes totalling 562 m were completed. The logs and sections of drill holes HAJ-1 to HAJ-3 are missing from the Fujii and others (1978) report. The log of HAJ-3, revised sections of all drill holes, and selected analytical data are reproduced in Cheeseman and Poloni (1980). The work by the JGM defined several types of gossan, including an opaline variety, in four zones. Fifty-three samples contained between 0.01% and 1.33% Cu, nil to 1.25% Pb, and 0.01% to 0.27% Zn. The JGM reported that 19 of the samples contained between 0.12 to 7.70 ppm Au and 0.8 to 19.5 ppm Ag, the first report of gold at the site. Drill hole HAJ-1 intersected copper mineralization grading 3.01% Cu over 1.2 m, and 2.07% Cu over 3.1 m due to supergene enrichment (chrysocolla and native copper). Elsewhere, only disseminated pyrite and minor chalcopyrite were intersected (Fujii and others). Further sampling of the gossans by the JGM totalling 13 one-metre samples returned 210 to 5,470 ppm Cu and 140 to 1,450 ppm Zn.

During 1975-1976, the DGMR undertook geophysical surveys on a 20 m x 40 m and 20 m x 80 m grid for a total of 8 line-kilometers of surveying, including a magnetic survey (352 stations), gradient array IP survey (286 measurements), three-array IP survey on four lines, and a dipole-dipole IP survey on one line (ARGAS, 1978). The work outlined a N-striking, 400-500 m long anomaly comprising a weak SP response, high chargeability and low resistivity (Gazzaz, 1974). The IP response is characteristic of a weathering or oxidized horizon near surface and may reflect the base of the oxidized zone. A second anomaly to the north was associated with an area of gossan and underlying disseminated sulfide mineralization tested by drill holes HAJ-1 and HAJ-2 (Cheeseman and Poloni). During 1975-1980, the DGMR remapped the prospect and undertook a small drainage geochemical program, with a sampling program to test gossan and other bedrock types. Drill hole HAJ-3 was deepened and drill hole HAJ-4 was drilled for a total of 406.35 m. Other work included petrographic studies of drill core and gossans. Seventeen chip samples were taken from or across the base of the weathered profile in gossan zones. Samples averaged 0.82 g Au/t, but one 5.5 m interval gave average gold values of 3.9 g/t and 51 g Ag/t. Mineralization in the extension of drill hole HAJ-3 consisted of 1-3% pyrite to a depth of 320 m, with minor base-metal concentrations (1.98% Cu, 0.14% Zn and 12.1 g Ag/t over 1.5 m). Zones up to 56 m in width of chloritized rhyolite in hole HAJ-4 contained 2-5% pyrite but only minor base-metal concentrations. The best assays were obtained from two 1.5 m intervals containing 1.58% and 0.08% Cu, and 0.07% and 1.71% Zn. The DGMR felt that the sulfide mineralization of drill holes HAJ-3 and HAJ-4 and the overlying gossans explained the principal geophysical anomaly. Initial geochemical studies at Al Hajar by BRGM in 1979 and 1980 showed that the chlorite-rich, chalcopyrite-bearing rocks

are the product of magnesian alteration of felsic tuffs, and thus represent alteration pipes up to 100 m thick. Barbier and others (1983) noted that drill holes HAJ-1 and HAJ-2 were sited outside surface areas of high copper content and that the grades encountered may therefore be relatively low.

Between 1987 and 1989, BRGM undertook a major exploration program to evaluate the gold potential of the near-surface oxidized zone at Al Hajar. Surface work included 1:500-scale geological mapping, "reconnaissance" rock chip sampling (900 samples), sampling in forty 25-m spaced trenches (4,637 samples) and geophysical surveying (SP, mise-a-la-masse, magnetic, resistivity and IP). Both gossans had been adequately diamond drilled with 44 holes totalling 3,850 m at a 25 m x 25 m spacing at Al Hajar North *a*nd 37 holes totalling 2,308 m on a 50 m x 50 m grid a Al Hajar South. About 6,000 drill core samples were analyzed. Other work included petrographic studies, density measurements, more than 1,000 spot cyanidation tests on drill core and trench samples, bottle and column cyanidation tests (mostly on samples from Al Hajar North) and an in-situ heap-leaching test of 1,500 t of material from Al Hajar North which yielded 6,224.48 g gold and 2,634.5 g silver. A water availability study involving a VLF-EM survey was completed and nine additional holes totalling 447 m were drilled for pumping tests. A feasibility study was also completed at that time by the BRGM. The Al Hajar North deposit was demonstrated to be shaped like a 300 m x 130 m ellipse, with an average depth of 45 m. Its total geological reserves were estimated to be 2.37 Mt grading 2.5 g Au/t, with estimated recoverable reserves of 1.54 Mt grading 3.45 g Au/t using a 1 g/t cut-off. It was estimated that 80-92% of the gold would be recoverable. The Al Hajar South deposit is also an elliptical zone 410 m long and 220 m wide, with an average thickness of 37 m. It was estimated to contain total geological reserves of 5.73 Mt grading 1.44 g Au/t and estimated recoverable reserves of 2.69 Mt grading 2.6 g Au/t with 70-85% of the gold recoverable. The BRGM's preliminary feasibility study was favorable at a throughput of 400,000 t per year grading 2.88 g Au/t and 500,000 t per year at 2.53 g Au/t. The BRGM envisaged additional drilling at both deposits (3,500 m), further metallurgical work, completion of the hydrogeological studies, and a final feasibility study (BRGM, 1989). A resource of 300,000 t grading 6.82% Cu was estimated for sulfate-enriched rock at the base of the gold-rich gossan. Below this, a resource of primary (hypogene) massive sulphides for Al Hajar North and South was estimated to total 1.85 Mt grading 2.13% Zn in primary massive sulfides and 904,500 t grading 1.30% Cu in vein stockwork sulfides (BRGM, 1989).

5. Regional Geology

The Wadi Shwas VMS belt is underlain by Shwas belt metasedimentary rocks and volcanic rocks (>815 Ma) belonging to the Khutnah and Qirshah Formations respectively that have been metamorphosed to the greenschist facies. The Quishah Formation is made up of mafic to intermediate volcanic and volcaniclastic rocks and it hosts most of the known VMS deposits.

6. Local Geology

The Al Hajar Au-Ag-Cu-Zn deposit (MODS 0649), is the most advanced and prospective prospect in the Wadi Shwas VMS belt. It is hosted by steeply dipping, moderately folded volcanic rocks of the Qirshah

Formation, including dacitic to rhyodacitic pyroclastic rocks and flows, rhyolite, and mafic flows and dikes (Fujii and others, 1978). The Al Hajar deposit is also part of the Wadi Shwas Gold Belt and a figure showing the geological setting is presented in that section of this report.

7. Mineralization

Disseminated, veinlet and massive sulfide mineralization is mainly hosted within chloritized (hydrothermally altered) rhyodacite. At Al Hajar North, a massive sulfide body, 160 m long and 40 to 90 m thick occurs within a talcose and chloritic zone. The massive body as well as the altered rocks enclosing it are cut by a stockwork sulfide zone. Massive sulfides at Al Hajar South are less well defined. Pyrite and pyrrhotite predominate with minor chalcopyrite, sphalerite, arsenopyrite and magnetite, as well as a number of minor sulfide minerals and sulphosalts.

8. Nearby occurrences

The Al Qadmah (0639) and Wadi Al Khanaq (0644) sites are close by. Based on previous exploration results, Wadi Al Khanaq is thought to be low priority however Al Qadmah is a high-priority volcanogenic massive sulphide target. It was explored by the Japanese Geological Mission and the Bureau de Recherches Geologique et Miniere ("BRGM") during the 1970s and 1980s resulting in 2,881 m of diamond drilling and nearly 300 m of trenching. At the time, the gold-enriched gossan was estimated to contain a resource of 257,500 t averaging 5.58 g Au/t and 56.5 g Ag/t. The underlying Cu-Zn sulphide body was estimated to contain a resource in the range of 696,000 t averaging 3.11% Cu, 1.76% Zn and 21 g Ag/t; or, 1,393,000 t averaging 2.08% Cu, 1.54% Zn and 19.4 g Ag/t.

9. Prospectivity

The Wadi Shwas mineral belt is an excellent VMS belt with considerable potential for additional discoveries. The weathered zone at Al Hajar and possibly Jadmah has been mined, but the unoxidized sulphides have not. Details of any recent work in this area are unavailable so our recommendations are made without recourse to this work.

10. Similar deposit

Deposits having geology similar to Al Hajar are well known in the Arabian Shield and elsewhere in the world. The Hawiyah deposit, a relatively recent discovery by Kefi Minerals and its joint venture partner ARTAR, is of the same class of deposit but located in the adjacent Wadi Bidah belt. Hawiyah is the largest and most advanced project in the Wadi Bidah mineral belt (MODS 1304). The project was acquired in 2014 based on analytical results generated by the BRGM in 1989 from samples taken of the ancient mine dumps and gossans which returned gold values of up to 9 g/t.

Mineralization is hosted by a series of lithological units comprised of chert, banded ironstones and intermediate breccias all belonging to the Hawiyah formation. The mineralized zone exhibits a weathering profile consisting of a near surface oxide zone, variably enriched in gold, a transitional zone enriched in copper and a fresh domain of pyritic, stratiform massive sulphides.

Since the start of the recent project, Kefi has completed 70 drill holes and excavated 53 trenches along a 4.5 km long mineralized zone 1-15 m in thickness. The outlined zone encloses three significant mineralized lodes. Based on this work and subsequent additional work the initial resource was recently upgraded to 29 Mt grading 0.89 % Cu, 0.94 % Zn, 0.7 g/t Au and 10 g/t AG (Kefi, 2023). This estimate is JORC compliant. A prefeasibility study was released in 2020 showing a positive economic outlook and additional work is planned to achieve an estimated production date of 2027. The success of this project serves to validate the potential of the Wadi Bidah Mineral belt and that patient and quality exploration will be rewarded. This lesson can apply to other belts such as the Wadi Shwas belt that hosts Al Hajar.