

CHAPTER 4 DRILLING SURVEY

4-1 Background and Objectives

Drilling survey was carried out in order to clarify the mineralization on geophysical anomaly zones detected by the TDIP and TEM surveys conducted during the Phase I and Phase II of this project.

4-2 Survey Areas and Amounts

Drilling survey was conducted in Rakah, Quron Al-Akhabab, Tawi Rakah, Hayl as Safil and Najaid areas. Fig. II -4-1 shows the location of the boreholes. The total amount of survey consisted of 27 boreholes with a total drilling length of 4,762.85m.

4-3 Survey Method

4-3-1 Drilling operation

During drilling operations two types of rigs were used as mentioned in Appendix 1. The wire line method was utilized. Table II -4-1 and Appendix 2 shows the progress records of the drillings.

4-3-2 Core logging

Description of the drill cores was conducted at the drilling site during drilling operations and compiled in a 1:200 log sheet. Core sampling was carried out concurrent to core logging activities. Amount of laboratory works are indicated in Table I -1-2.

4-4 Survey Results

Drilling logs are shown in Appendix 3A. The results of chemical analysis are shown in Appendix 4A. The results of drilling survey are described for each area as follows:

4-4-1 Rakah area

Drilling survey carried out two boreholes in this area.

During Phase I, a high chargeability and low resistivity anomaly zone was detected to the southeast of Rakah open pit by TDIP survey. TEM survey was also conducted on this anomaly zone. Drilling survey carried out one borehole (MJOY-1) to clarify the nature of the high TEM response anomaly detected from the middle to deep part.

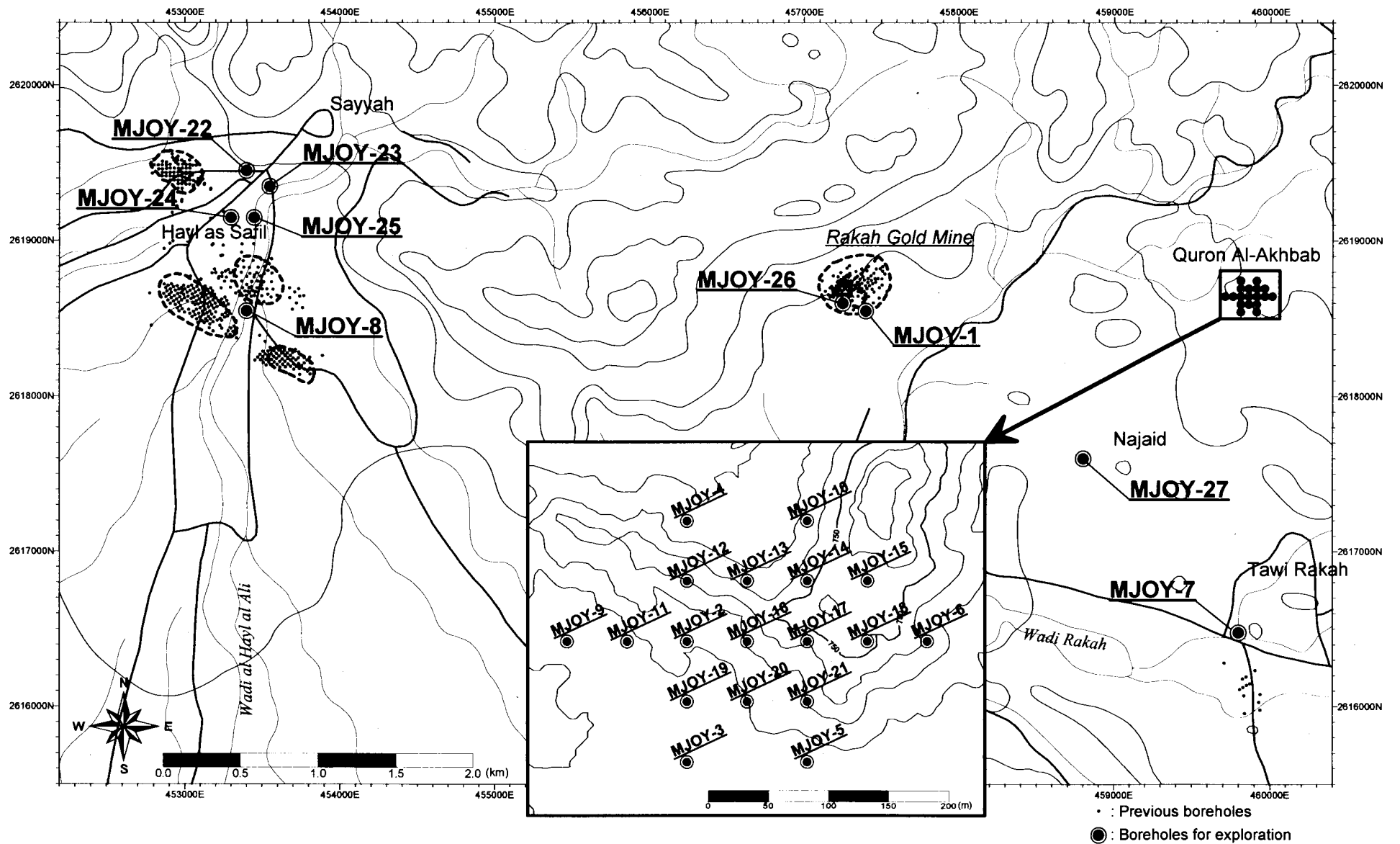


Fig. II -4-1 Location map of boreholes for exploration

Table II-4-1 Drilling survey for exploration

Area Name	Holes	Coordinate		Elevation (m)	Length planned (m)	Length excuted (m)	Inclination (deg.)	Direction (deg.)	
		N (km)	E (km)						
(1) Rakah area	MJOY-1	2,618.587	457.422	660.8	250	251.10	-90	-	
	MJOY-26	2,618.648	457.279	671.4	150	150.35	-90	-	
	Total length				400	401.45			
(2) Quron Al-Akhabab area	MJOY-2	2,618.681	459.832	696.4	200	200.35	-90	-	
	MJOY-3	2,618.580	459.836	685.1	250	251.10	-90	-	
	MJOY-4	2,618.797	459.836	690.8	200	200.10	-90	-	
	MJOY-5	2,618.576	459.939	686.8	250	250.10	-90	-	
	MJOY-6	2,618.693	460.041	710.8	250	250.65	-90	-	
	MJOY-9	2,618.687	459.730	684.2	150	150.00	-90	-	
	MJOY-10	2,618.777	459.920	700.8	150	150.35	-90	-	
	MJOY-11	2,618.689	459.782	687.8	150	150.30	-90	-	
	MJOY-12	2,618.725	459.819	710.2	150	150.35	-80	45	
	MJOY-13	2,618.729	459.875	709.1	150	150.05	-90	-	
	MJOY-14	2,618.740	459.916	718.1	150	150.20	-80	90	
	MJOY-15	2,618.731	459.980	727.1	150	150.35	-90	-	
	MJOY-16	2,618.690	459.875	701.4	150	150.40	-90	-	
	MJOY-17	2,618.686	459.932	717.1	150	150.35	-90	-	
	MJOY-18	2,618.685	459.981	721.8	150	150.35	-90	-	
	MJOY-19	2,618.639	459.829	685.1	150	150.35	-90	-	
	MJOY-20	2,618.635	459.875	692.1	150	150.35	-90	-	
	MJOY-21	2,618.639	459.929	702.1	150	150.05	-90	-	
	Total length				3,100	3,105.75			
	(3) Tawi Rakah area	MJOY-7	2,616.471	459.882	657.2	250	250.60	-90	-
		Total length				250	250.60		
(4) Hayl as Safil area	MJOY-8	2,618.558	453.449	672.6	250	250.25	-90	-	
	MJOY-22	2,619.451	453.411	687.3	150	150.35	-90	-	
	MJOY-23	2,619.363	453.531	684.9	150	150.35	-70	270	
	MJOY-24	2,619.166	453.360	688.3	150	150.35	-70	90	
	MJOY-25	2,619.164	453.513	685.4	150	153.40	-70	270	
Total length				850	854.70				
(5) Najaid area	MJOY-27	2,617.664	458.828	651.8	150	150.35	-90	-	
	Total length				150	150.35			
Grand total length					4,750	4,762.85			

During Phase II, a high chargeability and low resistivity anomaly zone was detected to the southwest of Rakah open pit by a detailed TDIP survey. Drilling survey was carried out at one borehole site (MJOY-26) in this anomaly zone.

(1) MJOY-1 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

- 0.00m ~ -7.15m Lasail Unit. Slightly gossanized and weathered part.
- 7.15m ~ -171.35m Lasail Unit. Consisting mainly of basaltic massive lava accompanied by basaltic pillow lava and hyaloclastite. Two sheets of metalliferous sediments of 15-20cm thick are intercalated between -77.80m and -78.35m.
- 171.35m Fault.
- 171.35m ~ -251.10m(end of hole) Lasail Unit. Consisting of basaltic pillow lava and massive lava. Many basaltic dikes are intruded.

Mineralization: Only pyrite dissemination and veinlets are recognized at the part above -171.35m. Below -171.35m, pyrite dissemination is well developed in the whole part and quartz veinlets with pyrite are also recognized. Pyrite-quartz veins with chalcopyrite are recognized partly below -191.10m.

Alteration: Silicification is recognized in the whole part. The strength of silicification is relatively weak above -171.35m and intense below -171.35m.

(2) MJOY-26 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

- 0.00m ~ -5.40m Filling materials for site preparations
- 5.40m ~ -124.85m Lasail Unit. Consisting only basaltic pillow lava. Variole texture is recognized partly in pillow lava.
- 124.85m Fault.
- 124.85m ~ -150.35m(end of hole) Lasail Unit. Consisting of basaltic pillow lava and massive lava. Massive lava looks like peperite.

Mineralization: Stockwork ore are intersected from -22.45m to -27.15m and from -38.15m to -59.65m. Pyrite dissemination is well developed between -22.45m and -124.85m. Dark gray quartz veinlets network with large amount of fine-grained pyrite are developed at -74.00m. Below -124.85m, mineralization is not recognized.

Alteration: Silicification of moderate intensity is recognized in the whole part.

4-4-2 Quron Al-Akhabab area

During Phase I, TEM survey was conducted on a remarkable high chargeability and low resistivity anomaly zone detected by TDIP survey. Drilling of the borehole MJOY-3 was carried out in the high TEM response zone, becoming clear that the mineralization zone presents a good correlation with the high chargeability zone. To further confirm these results, 4 more boreholes were carried out in the high chargeability zone.

During Phase II, the distribution and shape of high chargeability zone was clarified in detail by a detailed TDIP survey. Drilling survey conducted the drilling of 13 boreholes on this high chargeability zone.

(1) MJOY-2 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -200.35m (end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava. Accompanied by a few massive lava at the lowest part. Variole texture is recognized partly in pillow lava.

Mineralization: The part between 0.00m and -160.75m forms stockwork ore in which pyrite-quartz veins accompanied by chalcopyrite are well developed. Almost all sulphide is oxidized between 0.00m and -17.70m. Weak pyrite dissemination is recognized at the whole part. Very weak chalcopyrite dissemination is recognized from -17.70m to -130.50m. Below -160.75m, copper mineralization is not recognized. Average grade of copper is 0.83% between -17.70m and -89.70m, indicating a relatively high grade.

Alteration: Silicification is recognized in the whole part. Epidote dissemination is partly recognized below -104.00m.

(2) MJOY-3 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -159.40m Lasail Unit. Consisting mainly of basaltic pillow lava accompanied by basaltic massive lava. Variole texture is partly recognized in pillow lava below -87.15m.

-159.40m Fault.

-159.40m ~ -251.10m(end of hole) Lasail Unit. Consisting of basaltic pillow lava, and partially accompanied by hyaloclastite. Variole texture is partly recognized in pillow lava.

Mineralization: Above -106.70m Weak pyrite dissemination is partly recognized. Between -106.70m and -159.40m, middle to strong pyrite dissemination accompanied by many pyrite veinlets are recognized all over. Copper mineralization is recognized below -166.00m. Below -170.10m, the formed stockwork ore consists mainly of chalcopyrite and quartz vein with pyrite. Pyrite dissemination and veinlets are also recognized in this part. Chalcopyrite dissemination is partly recognized.

Alteration: Silicification is recognized in the whole part. Relatively weak silicification above -103.20m but intense below -103.20m

(3) MJOY-4 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -200.10m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, accompanied

by basaltic massive lava from the middle to deep part. Basaltic dikes intrude partly.

Mineralization: Weak pyrite dissemination and pyrite-quartz veinlets are recognized in the whole part. Chalcopyrite veinlets with quartz and pyrite are sparsely recognized in the whole part.

Alteration: Silicification is recognized in the whole part. Especially, the interval between -171.00m and -191.75m shows intense silicification.

(4) MJOY-5 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -119.40m Lasail Unit. Consisting mainly of basaltic pillow lava accompanied by basaltic massive lava.

-119.40m ~ -119.80m Fault accompanied by intensely silicified fracture zone.

-119.80m ~ -250.10m(end of hole) Consisting of basaltic pillow lava. Intercalated doleritic sheetflow accompanied by basaltic dikes between -150.10m and -167.20m.

Mineralization: Mineralization is not recognized above the fault of -119.40m. Below the fault, weak pyrite dissemination with pyrite-quartz veinlets is recognized at the whole part. Chalcopyrite veinlets with little quartz and pyrite are also observed sparsely in the whole interval.

Alteration: Alteration is not recognized above the fault. Below the fault, silicification is recognized in the whole part. Epidote veinlets are observed between -122.15m and -142.90m.

(5) MJOY-6 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -250.65m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava accompanied by basaltic massive lava. Basaltic dikes intrude below -195.95m.

Mineralization: Chalcopyrite-quartz vein with little pyrite recognized continuously between -23.35m and -165.05m. Average grade of copper is 0.75% between -114.15m and -165.05m. Below -165.05m, copper mineralization is also recognized, but chalcopyrite-quartz vein are sparsely recognized. Pyrite dissemination and veinlets are observed in the whole interval, but with a very weak intensity.

Alteration: Silicification is recognized in the whole part.

(6) MJOY-9 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -250.65m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava with partly intercalations of basaltic massive lava.

Mineralization: Low-grade stockwork ore is formed from 0.00m to -140.40m. Veinlets with chalcopyrite are distributed scarcely. Weak pyrite dissemination is recognized in the whole part.

Alteration: Silicification is observed in the whole part.

(7) MJOY-10 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting of alternation of basaltic pillow lava and massive lava. Basaltic dikes intrude partly.

Mineralization: Very low grade mineralization of copper are recognized below -20.35m. Distribution of quartz veinlets with chalcopyrite and pyrite are scarce.

Alteration: Silicification is observed in the whole part. Epidote veinlets are recognized scarcely between -38.05m and -85.10m.

(8) MJOY-11 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.30m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, partly intercalated by basaltic massive lava above -100.00m. Variole texture is partly recognized in pillow lava.

Mineralization: Low grade stockwork ore is intersected between -9.20m and -116.90m. The parts from -71.55m to -77.00m and from -112.40m to -113.85m show slightly high grade.

Alteration: Silicification is observed at the whole part. Epidote veinlets are recognized between -93.25m and -102.35m.

(9) MJOY-12 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, with frequent intercalations of basaltic massive lava. Basaltic dikes intrude. Variole texture is partly recognized in pillow lava below -68.85m.

Mineralization: Stockwork ore is intersected intermittently below -28.15m. Wide chalcopyrite veinlets are recognized between -32.95m and -34.45m. Other part scarcely shows veinlets.

Alteration: Silicification is observed in the whole part. Epidote veinlets are scarcely recognized between -70.25m and -119.45m.

(10) MJOY-13 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -73.95m Lasail Unit. Consisting mainly of basaltic pillow lava, intercalating basaltic massive lava frequently. Basaltic dikes intrude below -38.70m.

-73.95m ~ -150.05m(end of hole) Lasail Unit. Consisting mainly of basaltic massive lava, partly intercalations of basaltic pillow lava. Many basaltic dikes intrude.

Mineralization: Copper mineralization is recognized from -28.15m to end of hole. Stockwork ore is formed below -51.85m. Wide chalcopyrite veinlets are developed between -81.40m and -103.80m.

Alteration: Silicification is observed in the whole part. Epidote veinlets are scarcely recognized between -126.80m and the end of the hole.

(11) MJOY-14 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.20m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, with frequent intercalations of basaltic massive lava. Basaltic dikes intrude.

Mineralization: Stockwork ore is intersected at -36.55m. Chalcopyrite veinlets are scarcely distributed. The grade is low as a whole. Stockwork ore is recognized intermittently through end of the hole.
Alteration: Silicification is observed in the whole part.

(12) MJOY-15 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -9.25m Wasted rocks by ancient mining activities.

-9.25m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, intercalating basaltic massive lava frequently. Many basaltic dikes intrude below -47.80m.

Mineralization: Stockwork ore is formed from -19.90m to the end of the hole. This stockwork ore contains more pyrite than chalcopyrite, and the grade of copper is low as a whole.

Alteration: Silicification is observed in the whole part.

(13) MJOY-16 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.40m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, with frequent intercalations of basaltic massive lava. Many basaltic dikes intrude below -44.15m. Variole texture is partly recognized in pillow lava.

Mineralization: Stockwork ore is formed from -19.35m to the end of the hole. The part between -86.35m and the end of the hole shows relatively high grade.

Alteration: Silicification is observed in the whole part.

(14) MJOY-17 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava with frequent intercalations of basaltic massive lava. Many basaltic dikes intrude below -61.60m.

Mineralization: Copper mineralization is recognized below -37.25m. Stockwork ore is formed from -48.10m to the end of the hole. The parts from -68.85m to -86.50m and from -98.65m to -119.55m are relatively high grade zone with dense and relatively wide chalcopyrite veinlets.

Alteration: Silicification is observed in the whole part.

(15) MJOY-18 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava with frequent intercalations of basaltic massive lava. Many basaltic dikes intrude.

Mineralization: Copper mineralization of copper is recognized below -36.25m. Stockwork ore is formed from -47.30m to the end of the hole. Chalcopyrite veinlets are distributed densely. Average Cu grade of the part between -47.30m and -79.30m is 0.6% and that of the part between -119.30m and -141.30m is 0.8%.

Alteration: Silicification is observed in the whole part.

(16) MJOY-19 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting of alternation of basaltic pillow lava and massive lava. Many basaltic dikes intrude. Variole texture is partly recognized in pillow lava.

Mineralization: Low grade copper mineralization is recognized below -11.00m. Distribution of quartz veinlets with scarce chalcopyrite and pyrite.

Alteration: Silicification is observed in the whole part. Strong silicification is recognized at a part. Epidote veinlets are recognized between -79.60m and -93.50m.

(17) MJOY-20 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava, intercalating basaltic massive lava partly.

Mineralization: Stockwork ore is formed from -12.10m to the end of the hole. Chalcopyrite veinlets are distributed densely above -47.60m. Below -47.60m, mineralization becomes weak. Below -82.80m, stockwork ore is distributed intermittently.

Alteration: Silicification is observed at the whole part. Epidote veinlets are recognized between -113.75m and -117.90m.

(18) MJOY-21 borehole

Geology: Consisting of Lasail Unit of Samail Volcanic Rocks.

0.00m ~ -63.15m Lasail Unit. Consisting mainly of basaltic pillow lava, partly intercalating basaltic massive lava.

-63.15m ~ -150.05m(end of hole) Lasail Unit. Consisting mainly of basaltic massive lava, intercalating basaltic pillow lava. Many basaltic dikes intrude.

Mineralization: Stockwork ore is formed from -22.80m to the end of the hole. The parts from -22.85m to -103.35m and from -140.30m to the end of the hole presents relatively high grade.

Alteration: Silicification is observed in the whole part.

4-4-3 Tawi Rakah area

In this area, remarkable chargeability anomaly is detected around and to the north of the existing mineral showing. Drilling survey carried out one borehole in high chargeability zone to the north of the known mineral showing.

(1) MJOY-7 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -3.50m Unconsolidated Quaternary sediments.

-3.50m ~ -250.60m(end of hole) Lasail Unit. Consisting of basaltic pillow lava and massive lava. Pillow lava is dominant at the part above -139.20m. Basaltic dikes intrude sparsely.

Mineralization: Mineralization is observed above -135.85m. Pyrite dissemination and veinlets are continuously recognized between -14.90m and -135.85m. Chalcopyrite-quartz veinlets with epidote and pyrite are partly recognized between -16.35m and -135.85m. Chalcopyrite dissemination is also partly found.

Alteration: Weak silicification is observed in the whole part. Epidote-quartz veins are recognized below -113.95m.

4-4-4 Hayl as Safil area

Remarkable high chargeability zone was detected around gossan during Phase I. The south edge of this high chargeability zone shows low resistivity, and forming high metal factor zone. Drilling survey carried out one borehole (MJOY-8) in this high metal factor anomaly zone where no drilling survey has been previously done. Small but clear high metal factor anomaly zone was also detected 300m to the north of gossan. In Phase II, drilling survey carried out one borehole(MJOY-22) in this anomaly zone.

Remarkable high chargeability zone and small-scale anomaly zone were detected to the north of gossan and 200m to the northeast of gossan respectively during Phase II. Drilling survey carried out 2 boreholes (MJOY-24 and MJOY-25) in the former anomaly zone and at one borehole (MJOY-23) in the latter anomaly zone.

(1) MJOY-8 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit and Geotimes Unit of the Samail Volcanic Rocks.

0.00m ~ -17.40m	Unconsolidated Quaternary sediments.
-17.40m ~ -146.30m	Lasail Unit. Consisting of basaltic pillow lava and massive lava. Variole texture is partly recognized in pillow lava. Many small cracks and hematite filling up interpillow are also observed.
-146.30m ~ -183.60m	Lasail Unit. Consisting of reddish brown metalliferous sediments and peperite (consisting of breccia of basaltic lava and metalliferous sediments, and formed by intruding lava into unconsolidated metalliferous sediments)
-183.60m ~ -225.60m	Geotimes Unit. Consisting of basaltic pillow lava accompanied by thick interpillow with hematite.
-225.60m ~ -250.25m(end of hole)	Geotimes Unit. Consisting of slumped sediments in which gray - dark gray pyroclastic rocks and reddish brown metalliferous sediments show schistose-like banded structure.

Mineralization: Mineralization is not recognized. Small chalcopyrite crystals are recognized in silicified breccia within slumped sediments.

Alteration: Silicification is thoroughly observed. Quarts veinlets are recognized in many parts.

(2) MJOY-22 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit of the Samail Volcanic Rocks.

- 0.00m ~ -17.20m Quaternary sediments consisting of calcrete.
-17.20m ~ -23.15m Lasail Unit. Consisting of basaltic pillow lava and massive lava.
-23.15m ~ -26.80m Lasail Unit. Consisting of slump bed showing schistosity like banded structure of gray-dark gray pyroclastic rocks and reddish brown metalliferous sediments.
-26.80m ~ -150.35m(end of hole) Lasail Unit. Consisting mainly of basaltic pillow lava partly intercalated by basaltic massive lava or hyaloclastite.

Mineralization: Mineralization is not recognized.

Alteration: Silicification accompanied by quartz veinlets are observed from -17.40m to -23.15m and from -72.80m to the end of the hole.

(3) MJOY-23 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit and Geotimes Unit of the Samail Volcanic Rocks.

- 0.00m ~ -4.35m Unconsolidated wadi sediments.
-4.35m ~ -24.60m Quaternary sediments consisting of calcrete.
-24.60m ~ -124.65m Lasail Unit. Consisting of basaltic pillow lava and massive lava. Variole texture is partly recognized in pillow lava.
-124.65m Fault. Fractured along fault.
-124.65m ~ -150.35m(end of hole) Geotimes Unit. Consisting of basaltic pillow lava accompanied by thick interpillow with hematite.

Mineralization: Mineralization is not recognized.

Alteration: Weak to middle silicification is observed in both Lasail and Geotimes Unit. Lasail Unit is accompanied by many quartz veinlets and Geotimes Unit by quartz-calcite-hematite veinlets.

(4) MJOY-24 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit and Geotimes Unit of the Samail Volcanic Rocks.

- 0.00m ~ -3.70m Quaternary sediments consisting of calcrete.
-3.70m ~ -33.70m Geotimes Unit. Consisting of basaltic pillow lava.
-33.70m Thrust faults
-33.70m ~ -118.80m Lasail Unit. Consisting mainly of basaltic pillow lava intercalating hyaloclastite. Variole texture is partly recognized in pillow lava and basaltic rocks in hyaloclastite.
-118.80m ~ -150.35m(end of hole) Lasail Unit. Consisting of alternation of basaltic pillow lava and massive lava. Variole texture is partly recognized in pillow lava.

Mineralization: Low grade stockwork ore is intersected between -80.30m and -133.70m. This

stockwork ore consists of quartz veinlets accompanied by chalcopyrite, pyrite and specularite. Pyrite dissemination and veinlets are more widely distributed from -49.90m to -159.10m and from -71.55m to the end of the hole.

Alteration: Silicification is observed in both Lasail and Geotimes Unit. Strong silicification is recognized between -90.00m and -118.80m.

(5) MJOY-25 borehole

Geology: Consisting of Quaternary sediments and Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -3.45m	Unconsolidated wadi sediments.
-3.45m ~ -16.45m	Quaternary sediments consisting of calcrete.
-16.45m ~ -88.00m	Lasail Unit. Consisting of basaltic pillow lava.
-88.00m ~ -88.35m	Fracture zone.
-88.35m ~ -150.40m(end of hole)	Lasail Unit. Consisting of basaltic pillow lava. Variole texture is partly recognized.

Mineralization: Low grade stockwork ore is intersected between -138.80m and the end of the hole. This stockwork ore consists of quartz veinlets accompanied by chalcopyrite, pyrite and specularite as well as MJOY-24. Quartz veinlets accompanied by large amount of specularite are developed between -94.60m and the end of the hole.

Alteration: Silicification is observed in the whole part.

4-4-5 Najaid area

Remarkable high chargeability zone was detected at the shallow part as well as Quron Al Akhbab area. Drilling survey drilled one borehole in this anomaly zone.

(1) MJOY-27 borehole

Geology: Consisting of Lasail Unit of the Samail Volcanic Rocks.

0.00m ~ -150.35m(end of hole) Lasail Unit. Consisting of alternation of basaltic pillow lava and massive lava. Pillow lava is dominant. Basaltic dikes intrude.

Mineralization: Between 0.00m and -52.60m, pyrite weak dissemination and veinlets and scarce chalcopyrite veinlets are observed. Below -52.60m, chalcopyrite veinlets of the width of 1 to 4 mm are observed every 1 or 2m.

Alteration: Weak silicification is observed in the whole part. Epidote-quartz veinlets are recognized in the whole part.

4-5 Further Considerations

4-5-1 Rakah area

High chargeability zone was detected to the southeast of Rakah open pit by TDIP survey during

Phase I. Drilling survey was carried out on the high TEM response zone detected by the TEM survey conducted on the above mentioned high chargeability zone. As a result of the drilling survey, low grade stockwork zone accompanied partly by chalcopyrite veinlets was intersected below -171.35m. In previous survey, stockwork ore was intersected to the northeast of the Rakah open pit, while IP anomaly zone was detected to the south of the open pit during Phase I. According to this result, there was open the possibility of finding another ore body to the south of existing ore, and for that reason, a detailed TDIP survey was carried out during Phase II. As a result of this survey, remarkable chargeability zone was detected to the southwest of the open pit(Fig. II -4-2). Drilling survey carried out one hole in this anomaly zone intersecting stockwork ore consisting of chalcopyrite with gold mineralization in 2 shallow parts. Total ore length was 18.20m with an average grade of 0.48%Cu and 0.46g/tAu. Therefore, there is a good possibility of finding another stockwork ore zone to the southwest of the open pit.

4-5-2 Quron Al-Akhabab area

Drilling survey carried out five boreholes on the remarkable chargeability anomaly zone detected by TDIP survey during Phase I. Stockwork ore was intersected in all boreholes. At MJOY-2 borehole, stockwork ore was intersected at -17.70m with an average grade of 0.83%Cu and of 0.35g/tAu between -17.70 and -89.70m. In order to clarify the mineralization distribution in detail, a more precise TDIP survey was carried out during Phase II, and drilling survey conducted 13 boreholes in detected chargeability anomaly zone. The drilling survey intersected stockwork ore of more than 10m length with 0.5%Cu grade in 6 boreholes, indicating that the distribution of high chargeability anomaly corresponds to the distribution of mineralized zone and that the mineralized zone extends about 300m along the EW direction and about 150m along the NS direction(Fig. II -4-3). The area of the mineralized zone is rather wide but with a low average copper grade because the high grade part is not continuous. Gold mineralization of gold is scarcely distributed. An approximate ore reserve in this area is 2 million tons with an average grade of 0.71%Cu and less than 0.1g/tAu.

4-5-3 Tawi Rakah area

Remarkable chargeability anomaly similar to that in Quron Al-Akhabab area was detected around and to the north of existing mineral showing. Drilling survey conducted one borehole in the northern anomaly intersected low-grade stockwork between -14.90m and -107.00m consisting of chalcopyrite accompanied by intense pyrite dissemination. Weak copper mineralization was recognized continuously to -140m. The detailed TDIP survey carried out during Phase II clarified that it is meaningless to pursue further exploration works in this area.

4-5-4 Hayl as Safil area

Remarkable high chargeability zone was detected around gossan during Phase I. The south edge of this high chargeability zone shows low resistivity which is interpreted as a high metal factor zone. No drilling survey was yet conducted in this high metal factor zone and to clarify this IP anomaly the

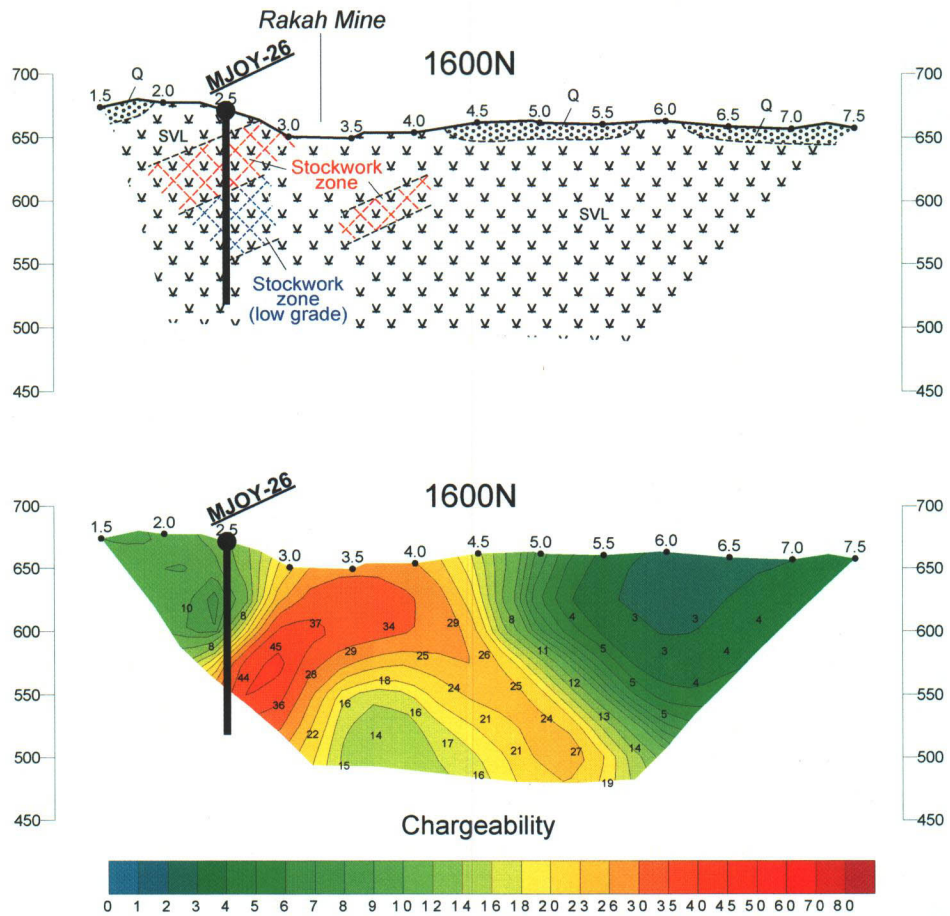


Fig. II -4-2 Cross section of borehole site in Rakah area; comparison with IP pseudo-section

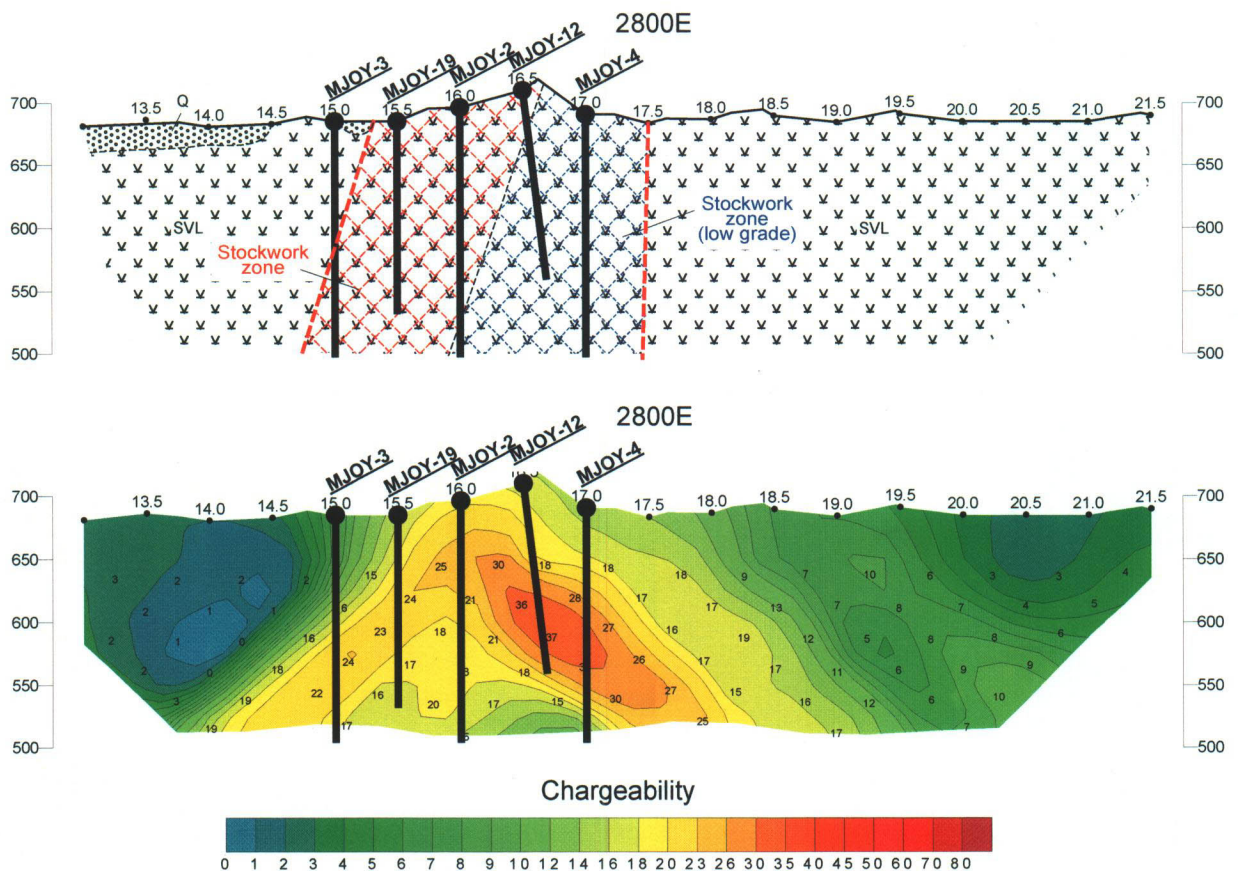


Fig. II -4-3 Cross section of borehole site in Quron Al-Akhabab area; comparison with IP pseudo-section

Table II -4-2 Summary of results on drilling survey

Area Name	Bore Hole NO.	Type of Ore	Depth (m)		Thickness (m)	Average Grade	
			from	to		Cu(%)	Au(g/t)
Quron Al-Akhabab	MJOY-9	stockwork	8.30	42.30	34.00	0.53	0.05
		stockwork	42.30	140.40	98.10	0.27	0.03
	MJOY-11	stockwork	9.20	75.20	66.00	0.28	0.04
		stockwork	75.20	116.90	41.70	0.18	0.02
	MJOY-12	stockwork	28.15	37.80	9.65	0.80	0.17
		stockwork	37.80	64.40	26.60	0.09	0.02
	MJOY-13	stockwork	51.85	81.30	29.45	0.20	0.05
		stockwork	81.30	115.15	33.85	0.51	0.07
		stockwork	115.15	150.05	34.90	0.22	0.01
	MJOY-14	stockwork	66.20	108.20	42.00	0.25	0.06
		stockwork	108.20	139.60	31.40	0.20	0.06
	MJOY-15	stockwork	19.90	67.90	48.00	0.28	0.02
		stockwork	67.90	138.50	70.60	0.13	0.03
	MJOY-16	stockwork	19.35	41.35	22.00	0.66	0.05
		stockwork	41.35	93.35	52.00	0.41	0.05
		stockwork	93.35	150.40	57.05	0.49	0.03
	MJOY-17	stockwork	48.10	98.10	50.00	0.24	0.03
		stockwork	98.10	116.10	18.00	0.58	0.04
		stockwork	116.10	150.35	34.25	0.13	0.04
	MJOY-18	stockwork	47.30	79.30	32.00	0.60	0.03
		stockwork	79.30	119.30	40.00	0.18	0.03
		stockwork	119.30	141.30	22.00	0.80	0.05
	MJOY-19	stockwork	11.00	121.00	110.00	0.16	0.03
		stockwork	121.00	150.35	29.35	0.27	0.04
MJOY-20	stockwork	21.55	45.55	24.00	0.49	0.17	
	stockwork	45.55	77.55	32.00	0.24	0.05	
MJOY-21	stockwork	22.85	56.85	34.00	0.43	0.03	
	stockwork	56.85	98.85	42.00	0.74	0.04	
	stockwork	98.85	150.05	51.20	0.27	0.03	
*MJOY-2	stockwork	17.70	89.70	72.00	0.83	0.35	
	stockwork	89.70	127.70	38.00	0.37	0.34	
	stockwork	127.70	160.75	33.05	0.29	0.36	
*MJOY-6	stockwork	23.35	98.15	74.80	0.30	0.07	
	stockwork	98.15	114.15	16.00	0.46	0.07	
	stockwork	114.15	165.05	50.90	0.76	0.04	
Hayl as Safil	MJOY-24	stockwork	80.30	96.30	16.00	0.11	0.03
			96.30	133.70	37.40	0.03	0.01
	MJOY-25	stockwork	138.80	153.40	14.60	0.07	0.01
Rakah	MJOY-26	stockwork	22.45	27.15	4.70	0.32	0.59
		stockwork	46.15	59.65	13.50	0.54	0.42

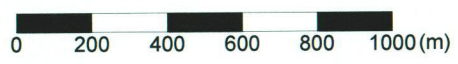
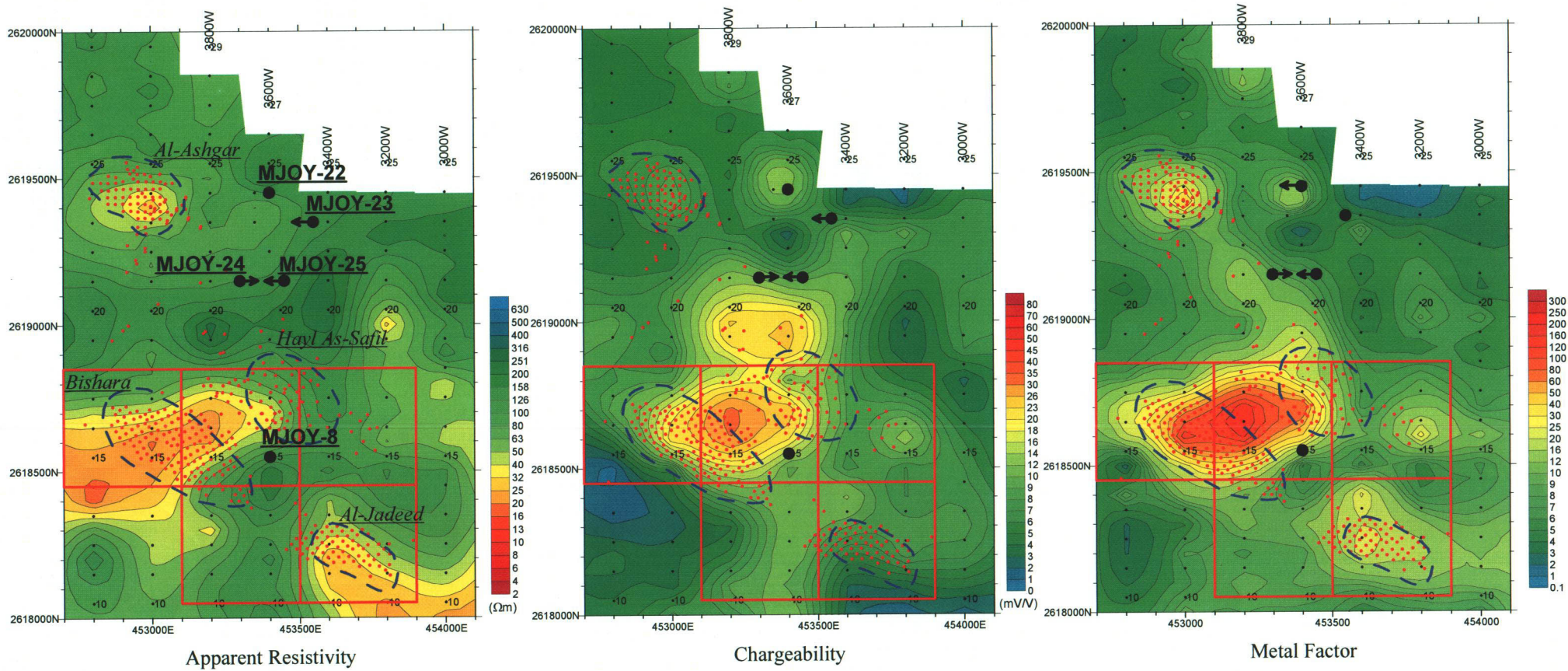
* carried out in Phase I.

borehole (MJOY-8) drilled during the present survey, detected, strong silicification but mineralization was rarely recognized. Another drilling survey (borehole MJOY-22) was carried out in one small but remarkable IP anomaly detected 300m to the north of gossan, but mineralization was not recognized.

The geophysical survey of Phase I clarified also that the distribution range of high metal factor anomaly at the shallow level (N=1) presents good correspondence with the locations of the known ore bodies(Fig. II -4-4). TEM high response anomaly zone was detected in places where massive sulphide ore bodies are found. During Phase II, the detailed TDIP survey carried out around gossan clarified in more detail the distribution of high chargeabilities. With this result in mind, the drilling survey conducted 2 boreholes in a high chargeability zone detected to the north of gossan, finding low grade stockwork ore containing hematite (specularite) and pyrite(Fig. II -4-5). Although drilling survey was not carried out at the center of the high chargeability anomaly zone because of steep topography and date tree plantation, it is inferred that copper mineralization recognized at the edge of the anomaly zone suggests that stockwork ore exists at the high chargeability anomaly zone.

4-5-5 Najaid area

Remarkable high chargeability zone was detected at shallow part, and to investigate this result, the drilling survey carried out one hole (MJOY-27) in this anomaly zone(Fig. II -4-6). The drilling recognized copper mineralization (chalcopyrite veinlets of 1 to 4 mm width) but scarcely distributed. It is inferred weak mineralization in this area.



- : TEM survey area
- : Boreholes in this project
- : Previous boreholes
- : Outline of existing ore

Fig. II -4-4 TDIP plane maps for N=1 in Hayl as Safil area

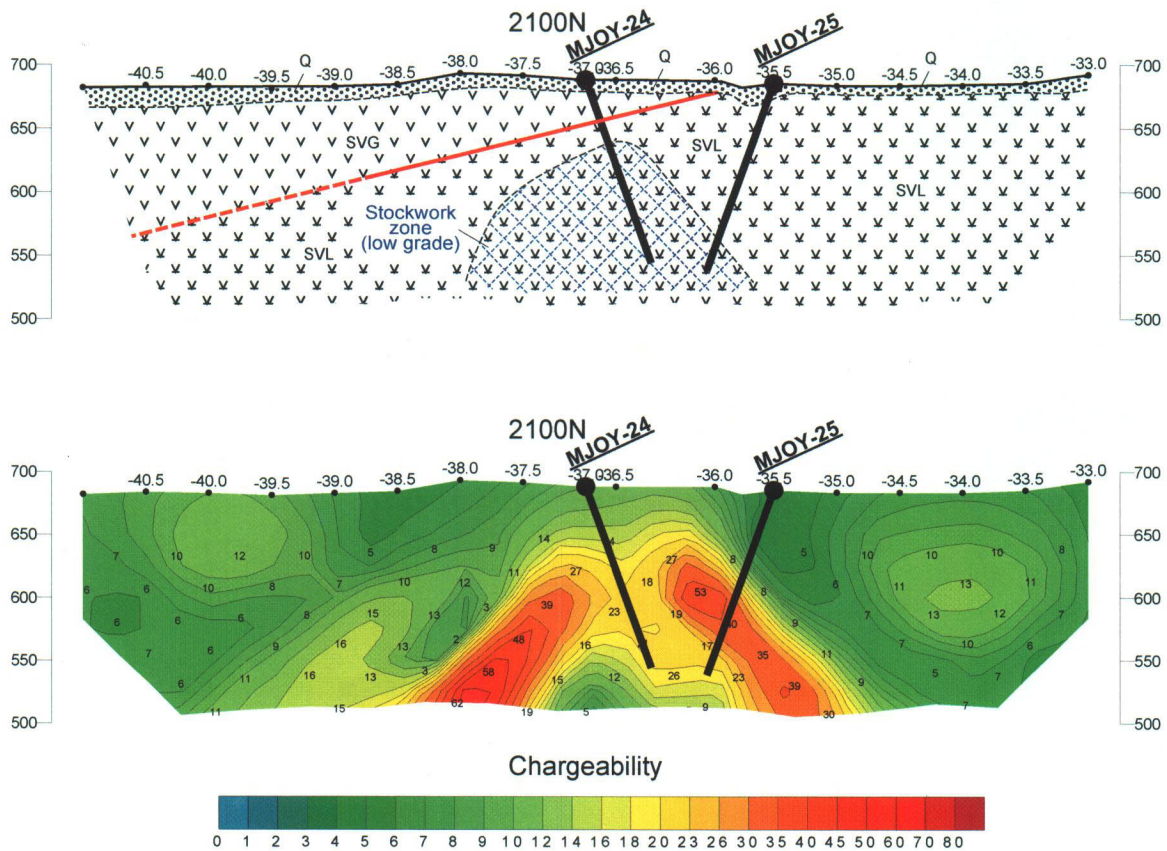


Fig. II-4-5 Cross section of borehole site in Hayl as Safil area; comparison with IP pseudo-section

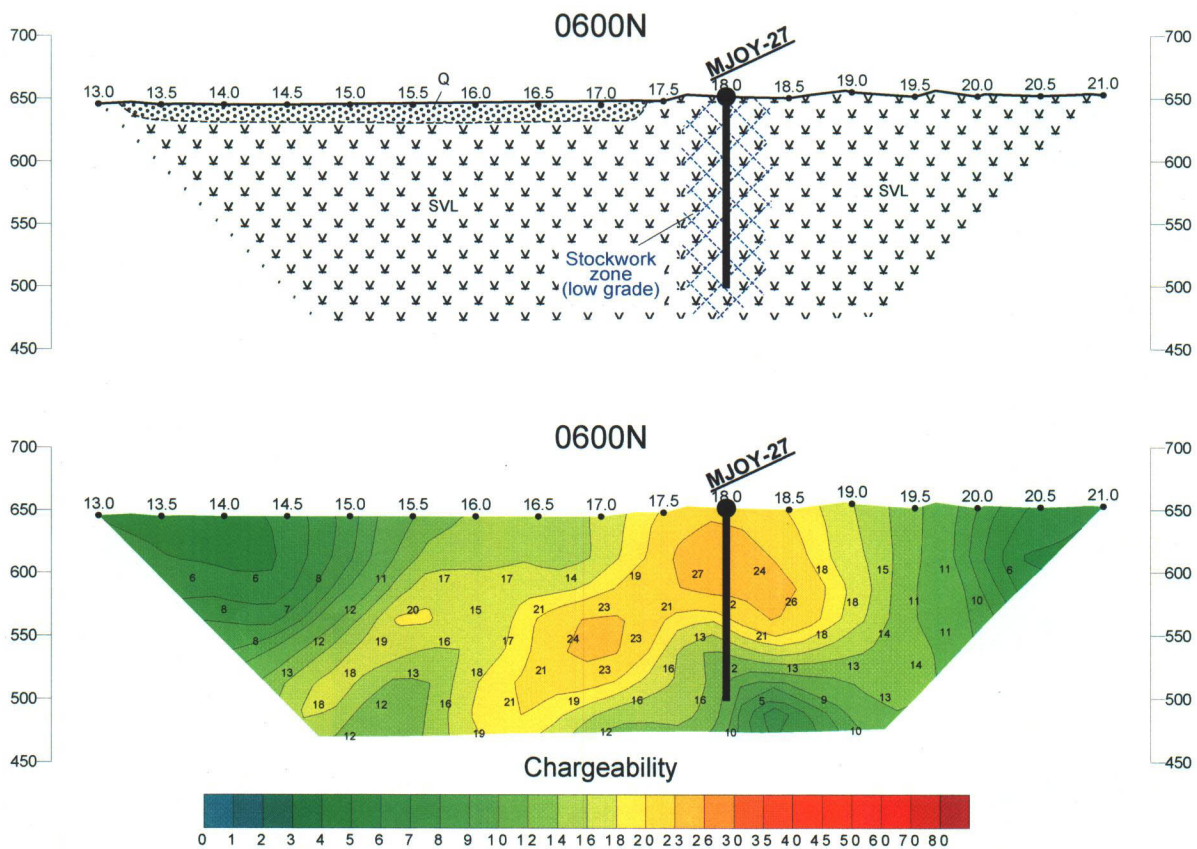


Fig. II-4-6 Cross section of borehole site in Najaid area; comparison with IP pseudo-section