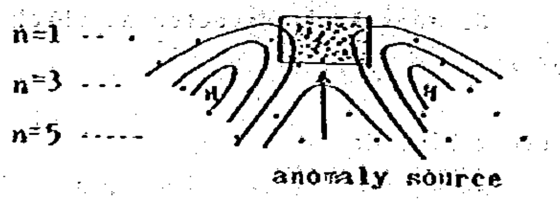
4-1-5 Resistivity and FE Plans

For this survey, high FE zone possessing mineralization shows good coincidence with low resistivity zone with value of less than 100 Ω-m. It is understood as that it is the bed with rich porosity widely effected by alteration around zone of mineralization. In order to examine the correlation, plane map is made by every electrode separation factor of (n). Plane map of apparent resistivity is shown in Fig. III-9-1, and the one of FE is in Fig. III-9-2.



In addition, it is apt to lead misunderstanding about deep anomaly, then, interpretation must be done with great care. This means, with anomaly setting by dipole-dipole electrode arrangement showing inverse V shape anomaly, fake anomaly appears on plane map cutting at n=3, 4 and 5. This is the reason why it is called as pseudo-section.

For this survey, anomaly of plane map shows the trend of spreading toward north since real anomaly source is south dipping.

For low resistivity plane map, low resistivity zone against distribution of sedimentary rocks is detected at the area range from center toward north of the survey area. This distribution is widely recognized under the capping of andesite on survey line F.

Low resistivity pattern of deeper than n=3 is distributing toward north and east-west of measuring point No. 5.

Meanwhile, anomaly is detected at northern end of each survey line of B, D, E, H and I as shallow indication in n=1 for FE plane map. It is consider- to be caused by disseminated sulfide widely spread at boundary surface of granodiorite and mudstone - sandstone and is indicating that granodiorite is successive at the depth.

At No. 5 ~ 6 of survey line C, there is another isolated anomaly at n=2, 3 caused by massive sulfide examined by its spectral form. At No. 5 ~ 6 of survey lines D and E, weak spread of anomaly towards east is perceived with small texture.

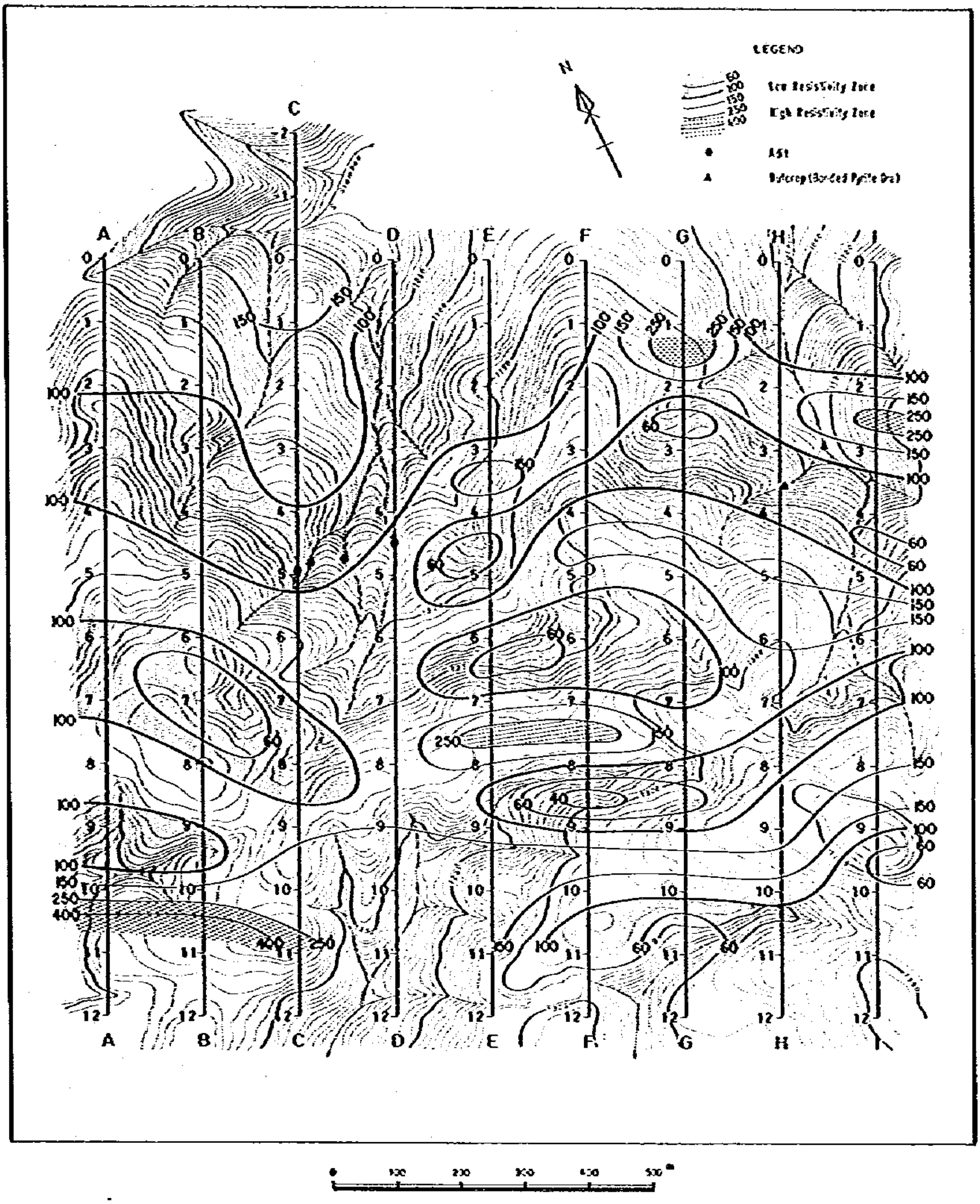


Fig. III-9-1.1 Plan Map of Apparent Resistivity (N = 1)

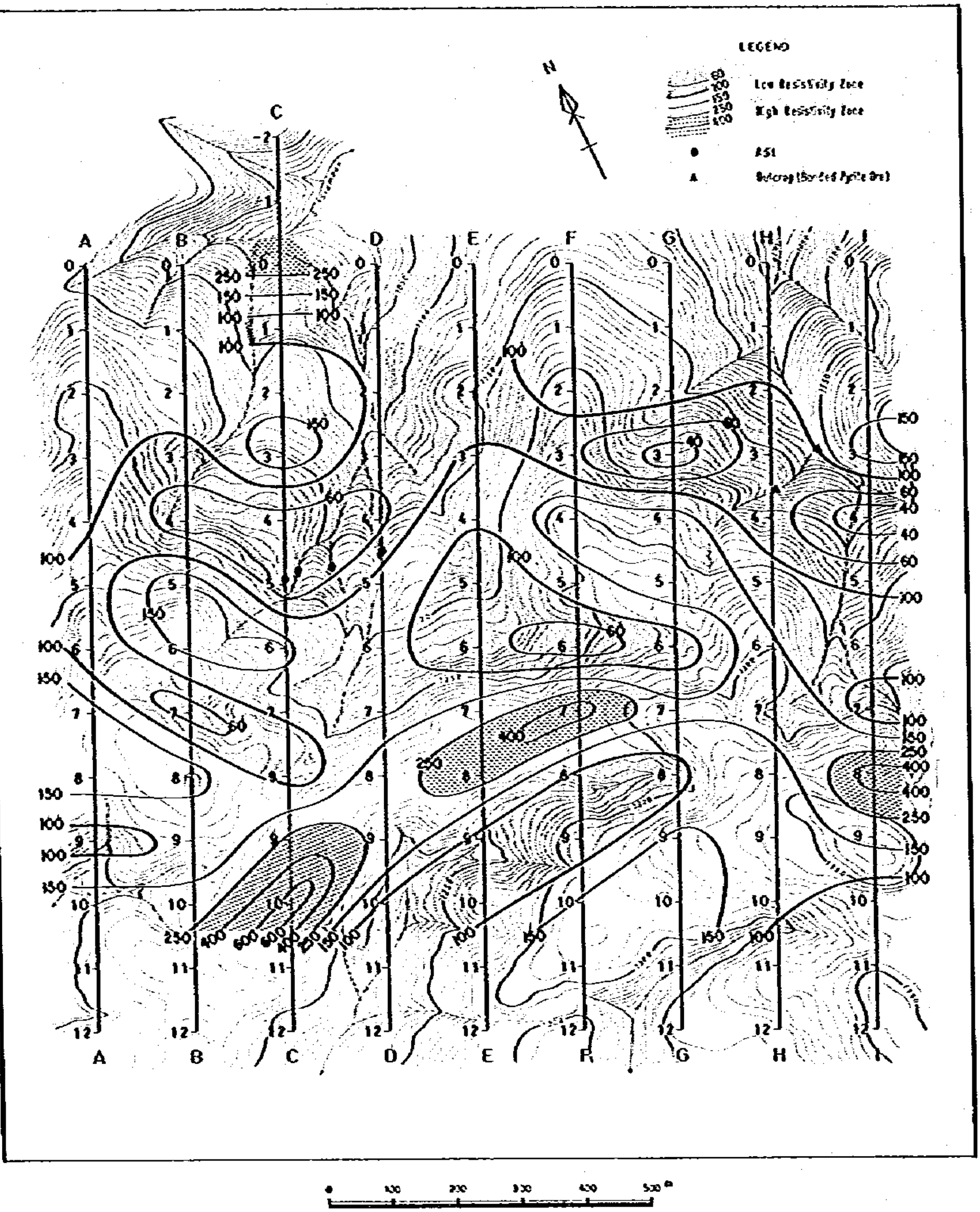


Fig. III-9-1.2 Plan Map of Apparent Resistivity (N = 2)

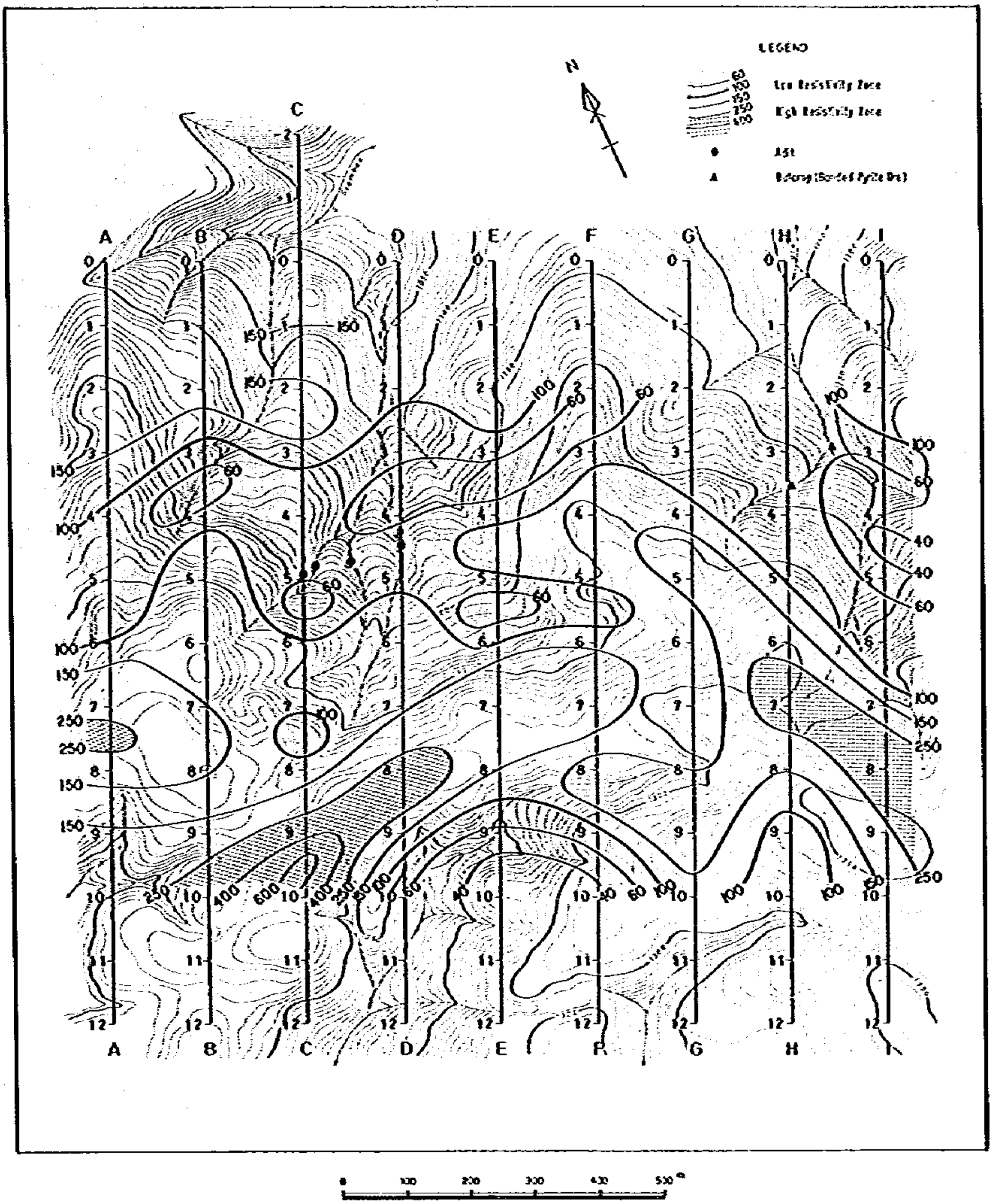


Fig. III-9-1.3 Plan Map of Apparent Resistivity [N = 3]

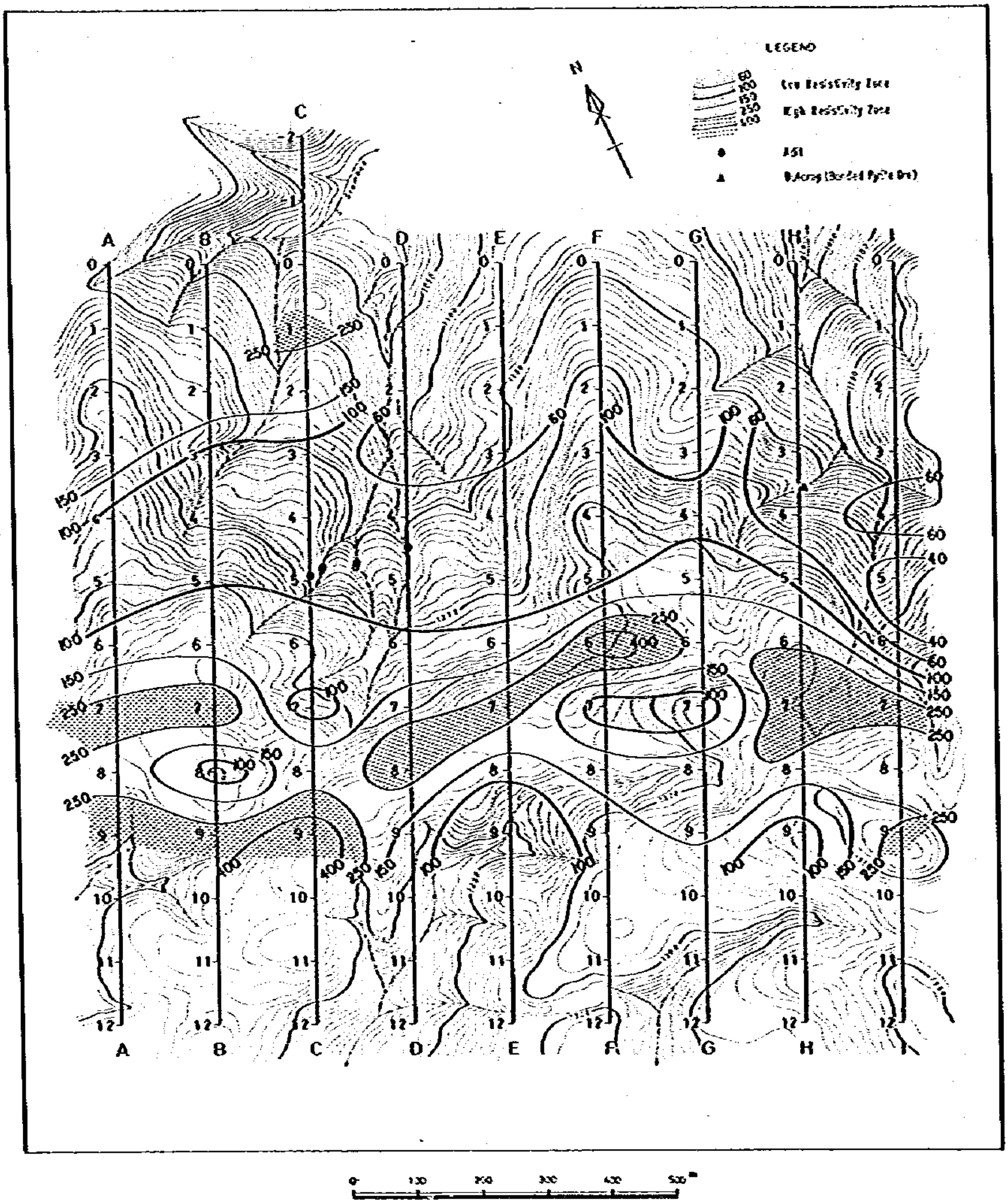


Fig. III-9-1.4 Plan Map of Apparent Resistivity (N = 4)

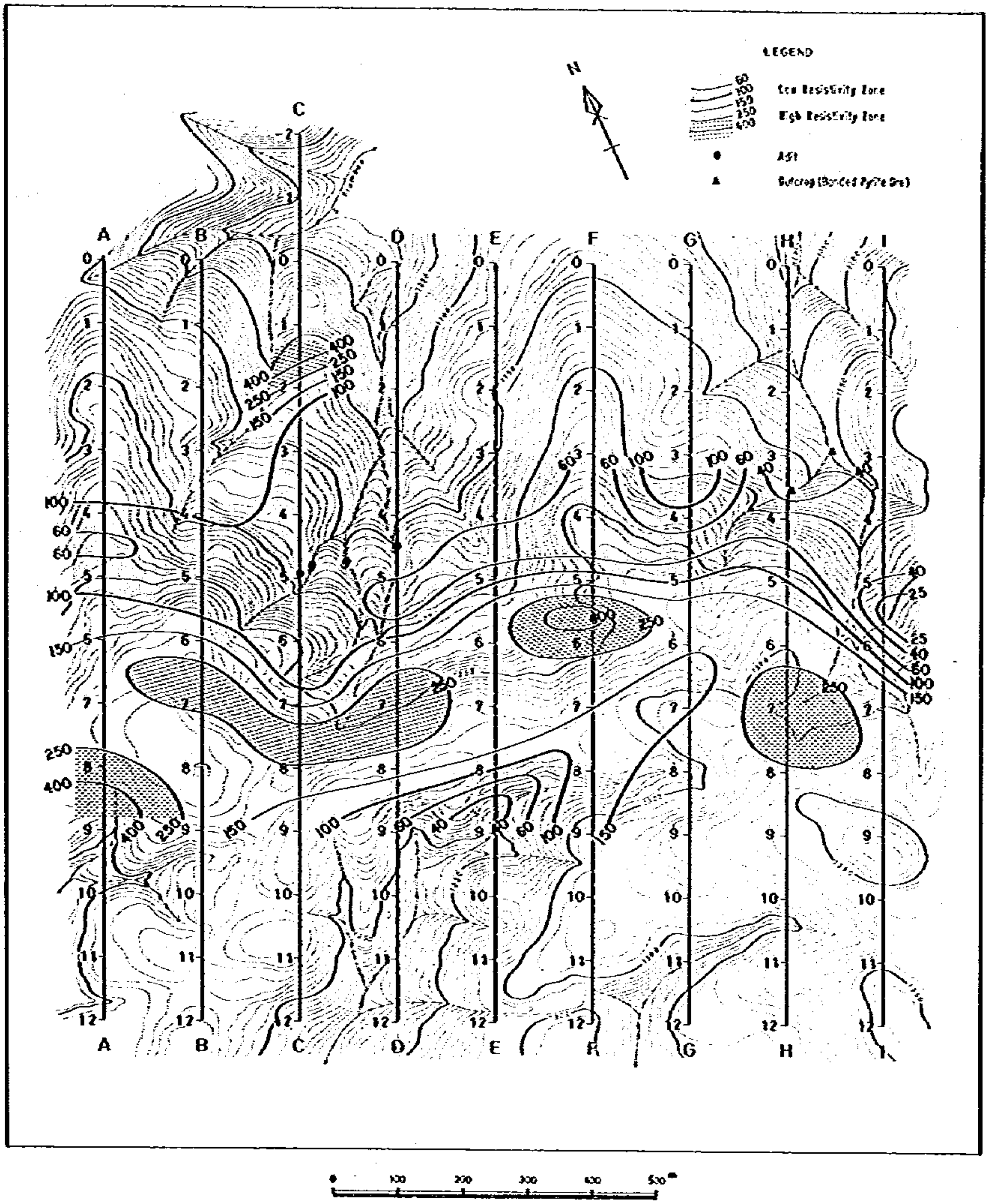


Fig. III-9-1.5 Plan Map of Apparent Resistivity (N = 5)

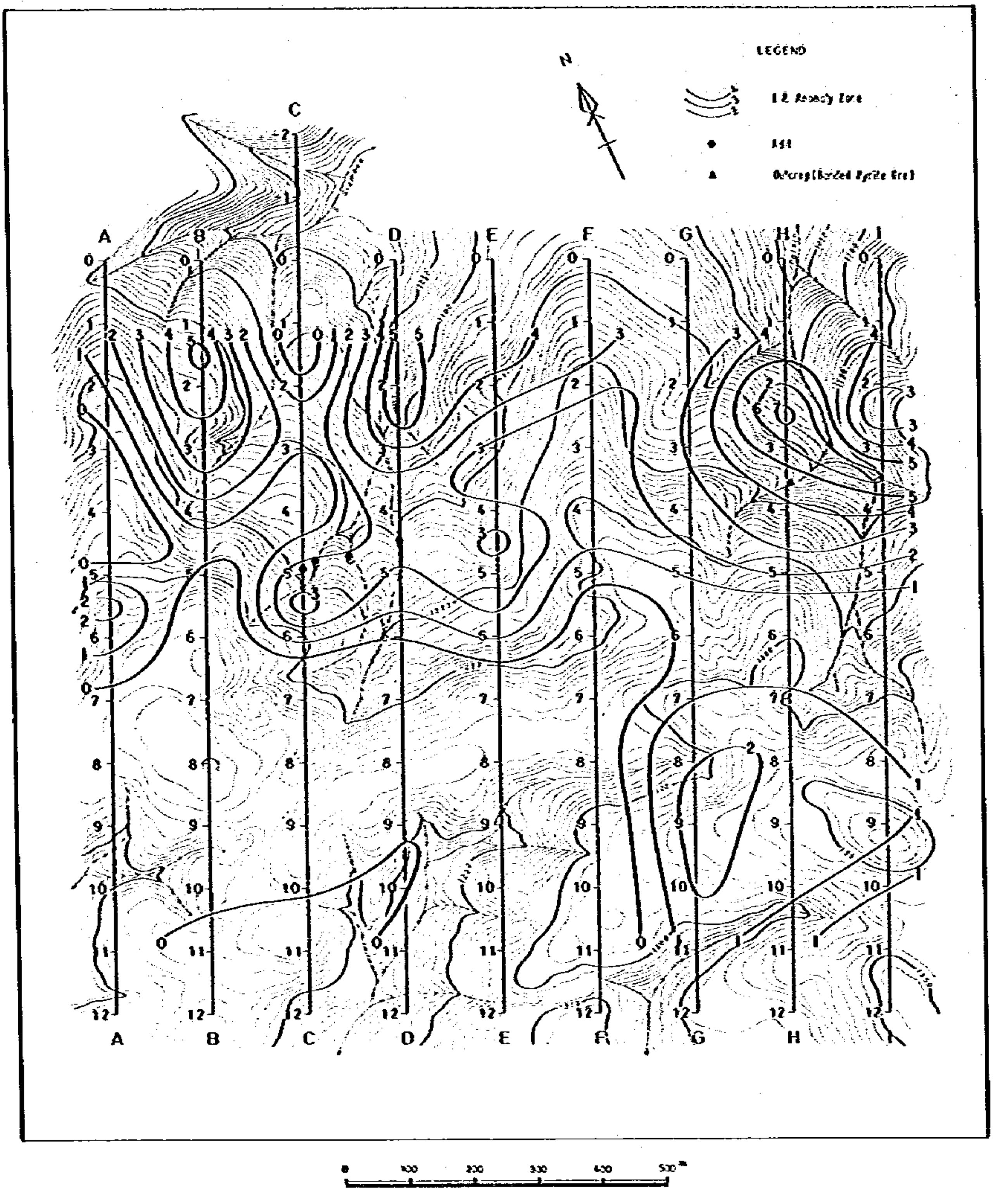


Fig. III-9-2.1 Plan Map of Percent Frequency Effect (N = 1)

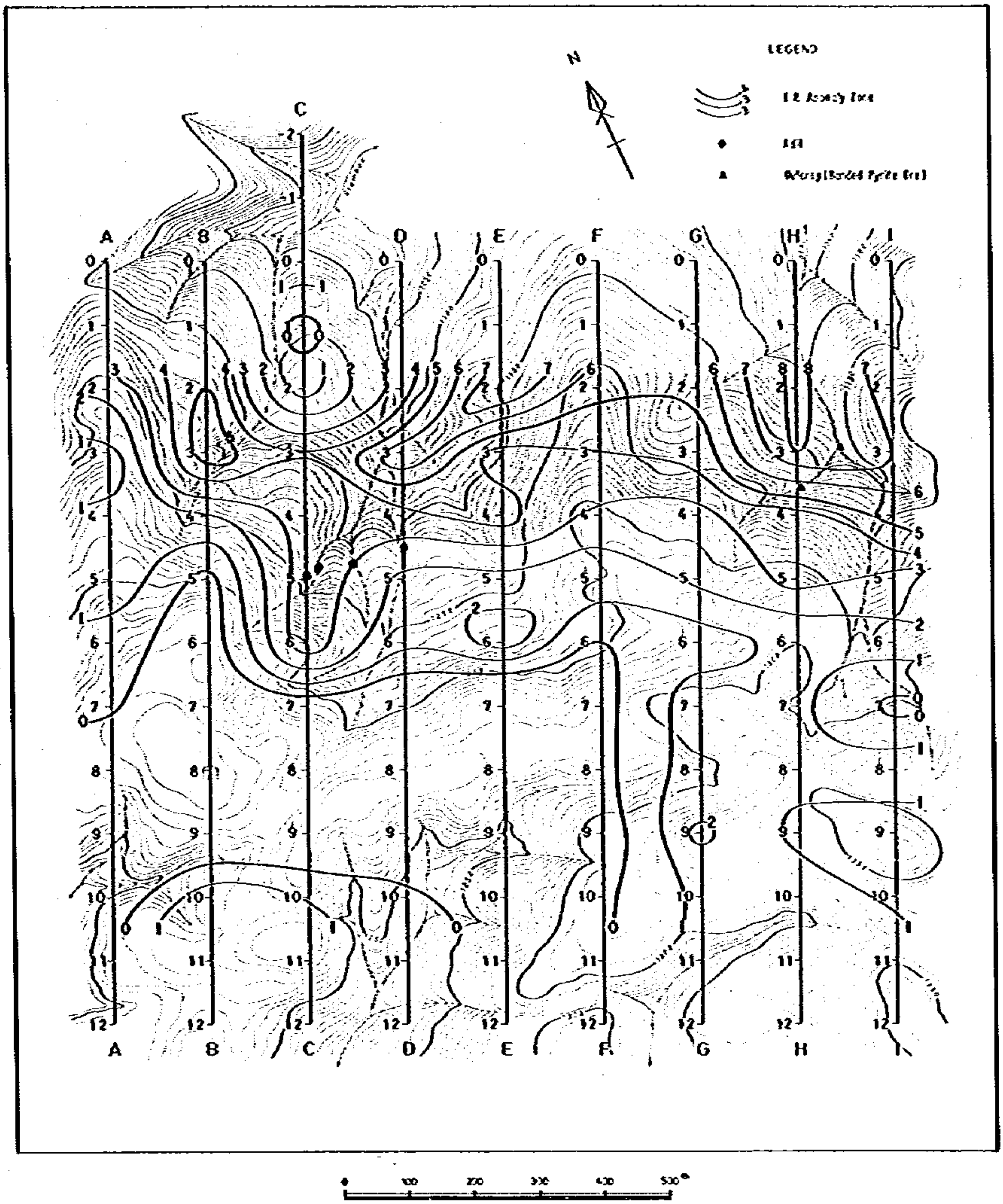


Fig. III-9-2.2 Plan Map of Percent Frequency Effect [N = 2]

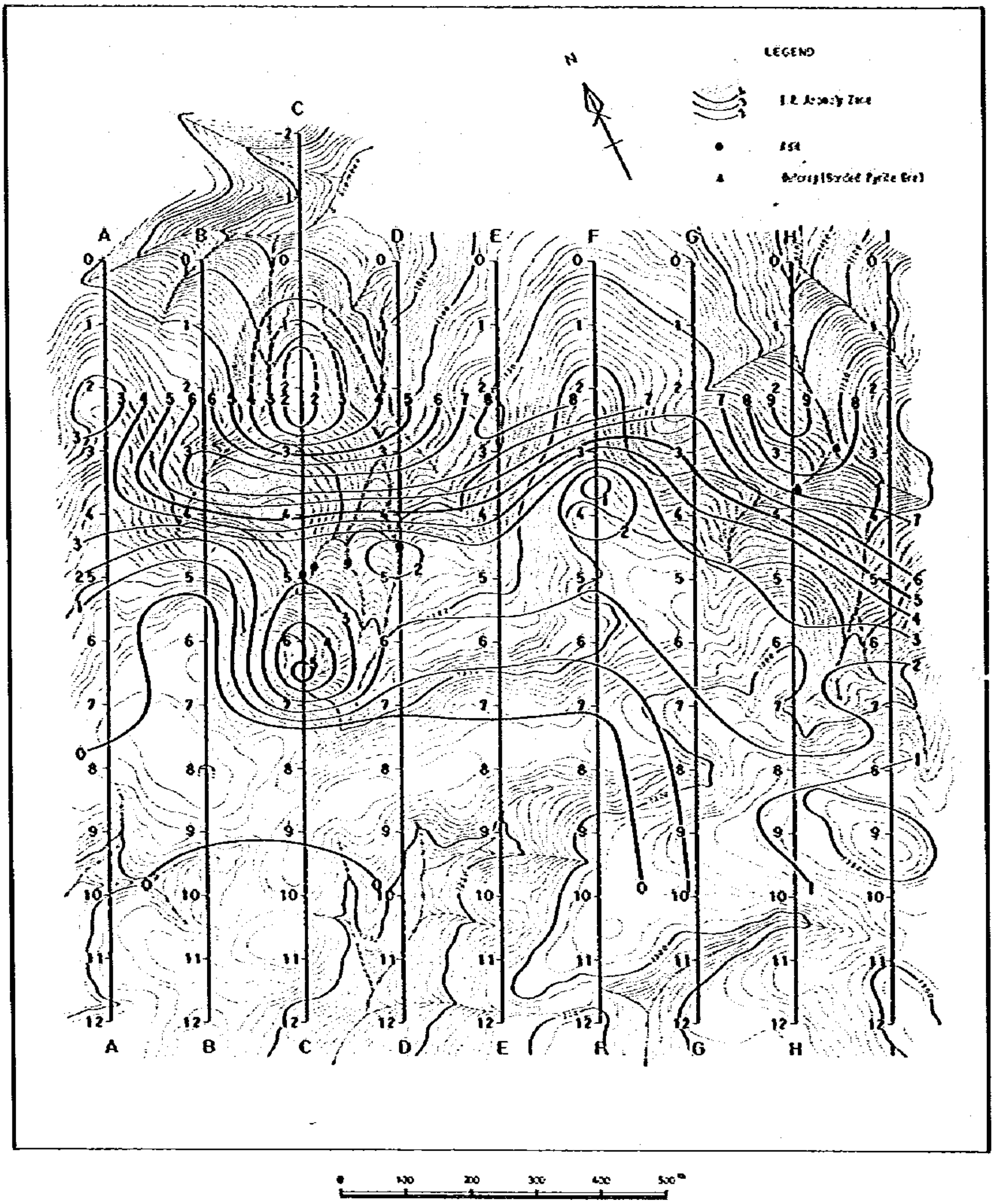


Fig. III-9-2.3 Plan Map of Percent Frequency Effect [N = 3]

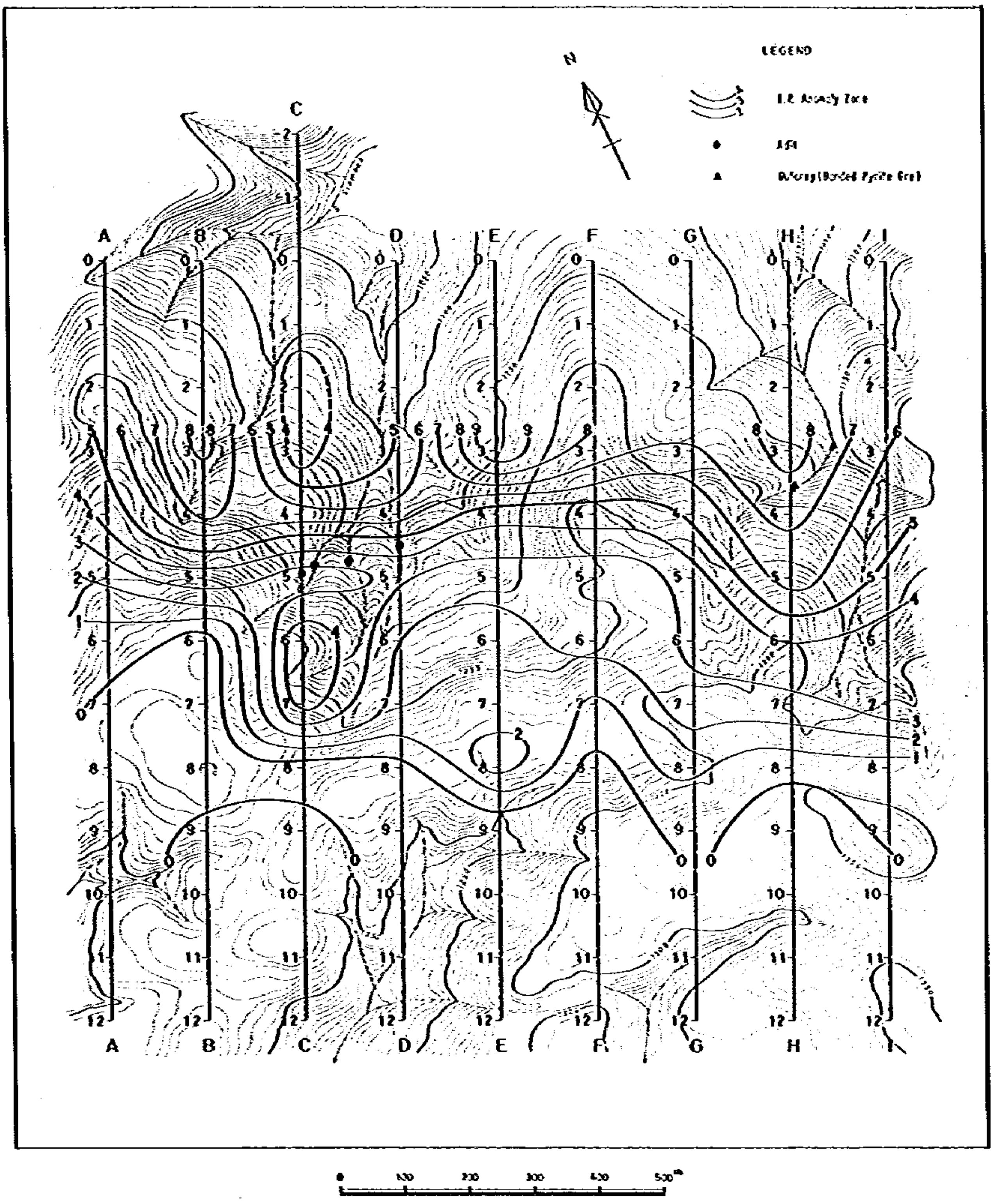


Fig. III-9-2.4 Plan Map of Percent Frequency Effect (N = 4)

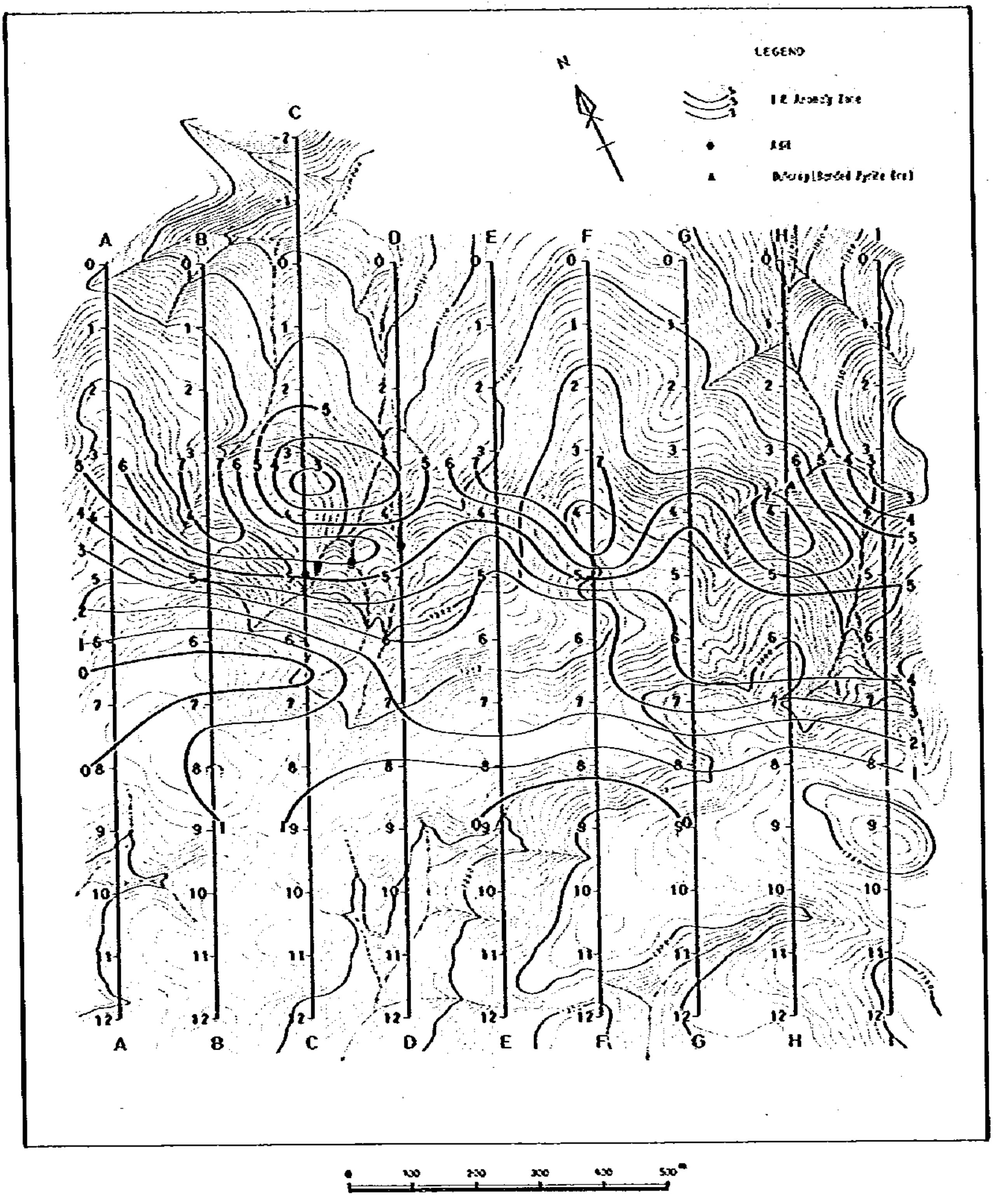


Fig. III-9-2.5 Plan Map of Percent Frequency Effect [N = 5]

For pseudo-section caused by disseminated sulfide zone spreading from the shallow, careful interpretation is needed since real anomalous source is shallow and is small scale even though anomaly spreads widely at the depth.

4-2 OTHER GEOPHYSICAL DATA

In the past in Muara Sipongi area, geophysical surveys such as self potential method, magnetic survey and IP method were conducted by the Directorate of Mineral Resources, and some data were taken and mapped in the present survey area.

Those surveys cover the northeastern part of line C and the line spacing is 400 m as they are the reconnaissance surveys.

Comparison of the present SIP survey with the former one are as follows:

Self Potential Method (SP)

Negative anomalies are usually observed above the ore deposit and the mineralized zone. In this area, background of SP survey seems to be -10 mV, so that SP anomalies are separated into a weak anomaly of -30 ~ -50 mV and a strong anomaly of less than -50 mV to delineate the anomalous zone.

In the northern part of this area, NW-SE trending anomalous belt was confirmed with less -70 mV negative anomaly around No. 1 ~ 2 of line D as its center.

Anomaly of less than -50 mV extend to No. 1 of lines E and F, and the weaker anomaly extend to line I. Another weak anomaly are seen around No. 4 of lines E and F.

Meanwhile, at No. 5 of line C near the outcrops of the ore deposit, potential gradient is small within a weak anomaly zone of -20 mV. This -20 mV contour, showing closed circle towards east where limestone is distributed may extend towards west.

SP anomaly belt in the north correspond with the southern boundary of granodiorite, which agree with the northern anomaly of this SIP survey caused by pyrite mineralization.

Weak anomalies around No. 4 on lines E and F locate in the eastern extension zone of the outcrops, but negative anomaly is weak and source can not be identified from the geological features.

Magnetic Method

Magnetic anomaly is characterized by three anomalous zones: comparatively strong anomaly belt running in the middle of survey area in NW-SE direction, nothern part of lines C and D, and the eastern part of the area. Magnetic anomaly detected in the center of the area is the strongest around No. 5 of line H, with a tendency to expand to the east. However, no magnetic body are found on the surface, and basic rock is assumed to exist at the depth.

Anomaly on lines C and D are attributed to the Tertiary andesite dikes found on the surface at No. 1 of line C and No. 3 of line D.

In the south of No. 6 of lines C and D, a weak anomaly was detected, which is interpreted as being due to andesitic tuff on basic volcanic rocks.

Around No. 5 of line C and No. 4 of line D near the outcrop, a pair of high and low weak magnetic anomalies are detected matching on limestone surrounded by mudstone and sandstone. This anomaly is considered to be mainly due to pyrrhotite in the contact ore deposit.

It is interpreted as that anomaly is limited in the limestone, so that the distribution of limestone is limited within the surface distribution, or as that content of magnetic mineral decrease outside of the limestone.

IP Method

As the results of IP survey, five IP pseudo-sections for lines A, II, III, IV and V were obtained. This IP method is a conventional one using 0.3 and 3.0 Hz with an electrode spacing being 50 m. Electrode separation factor is n=1 ~ 4, so that this method was a shallow survey.

Judging from each pseudo-sections, more than 5% is interpreted as "anomaly" and the anomalous zone is shown on Fig. III-10-1.

Strong IP anomalies are detected in the northern part of the area at the southern boundary of granodiorite, continuous anomaly of No. 2 and No. 3 of lines G, H and I, and a weak shallow anomaly at No. 4 ~ 5 of lines F ~ I. The former two coincide with FE anomaly detected in this SIP survey. The latter one is the shallow anomaly source at the depth of 75 m and in the west of this shallow anomaly, outcrops of lines C and D are seen, so that this anomaly must be related with this mineralization. The reason why SIP anomaly was not detected here is believed to be due to the wider electrode spacing of 100 m.

4-3 MODEL SIMULATION FOR SIP ANOMALY

Among the several eminent SIP anomalies detected in this survey, one detected around No. 5 of line C (West ore deposit) and one around No. 4 of line H (East ore deposit) are interpreted as the most promissing anomalies in this area.

Then, model simulations were applied for those anomalies by assuming PFE and resistivity model based on the physical property measurement. In order to get the closest calculated value to the observed value, more than ten times of calculations have been tried and their results are shown on Fig. III-9-3.1, 3.2.

Line C (Fig. III-9-3.1)

There are three massive anomalies detected on this line; between No. 5 and No. 6, between No. 3 and No. 4, and north of No. 2, for which three kind of codes, "8" (resistivity of 50 Ω-m, PFE of 10%), "5" (resistivity of 1,000 Ω-m, PFE of 10%) and "4" (resistivity of 1,000 Ω-m, PFE of 10%) correspond to them respectively.

Resistivity and PFE of other non-anomalous area are assumed by rock sample measurement and the model structure by geological section attached.

Results of Simulation

As for apparent resistivity distribution, low resistivity zone around No. 5 is generally fit well with the observed value, except north of No. 2 and south of No. 10 because of the end-effect of the line, where the correlation with the observed value are not sufficient, but general tendency of the calculated value look like that of the observed value.

As for PFE, a pants leg shape under No. 5 and high PE pattern under No. 3 can be calculated close to the observed value with a slight change in their shapes. It may be due to the high resistivity andesite dikes seen between No. 0 and No. 3 which affect considerably to the calculation of FE, and due to the end-effect of the line.

Line H (Fig. III-9-3.2)

On this line, strong PFE anomaly was detected at the northern part of No. 4 at the depths. There are high resistivity zone between No. 6 and No. 8 at the middle to deep zone, with comparatively high PFE values. For those sources, code number 5, 6 and 7 correspond to PFE of 10 ~ 25%, resistivity of 50 ~ 100 Ω-m model between No. 3 - No. 5.5.

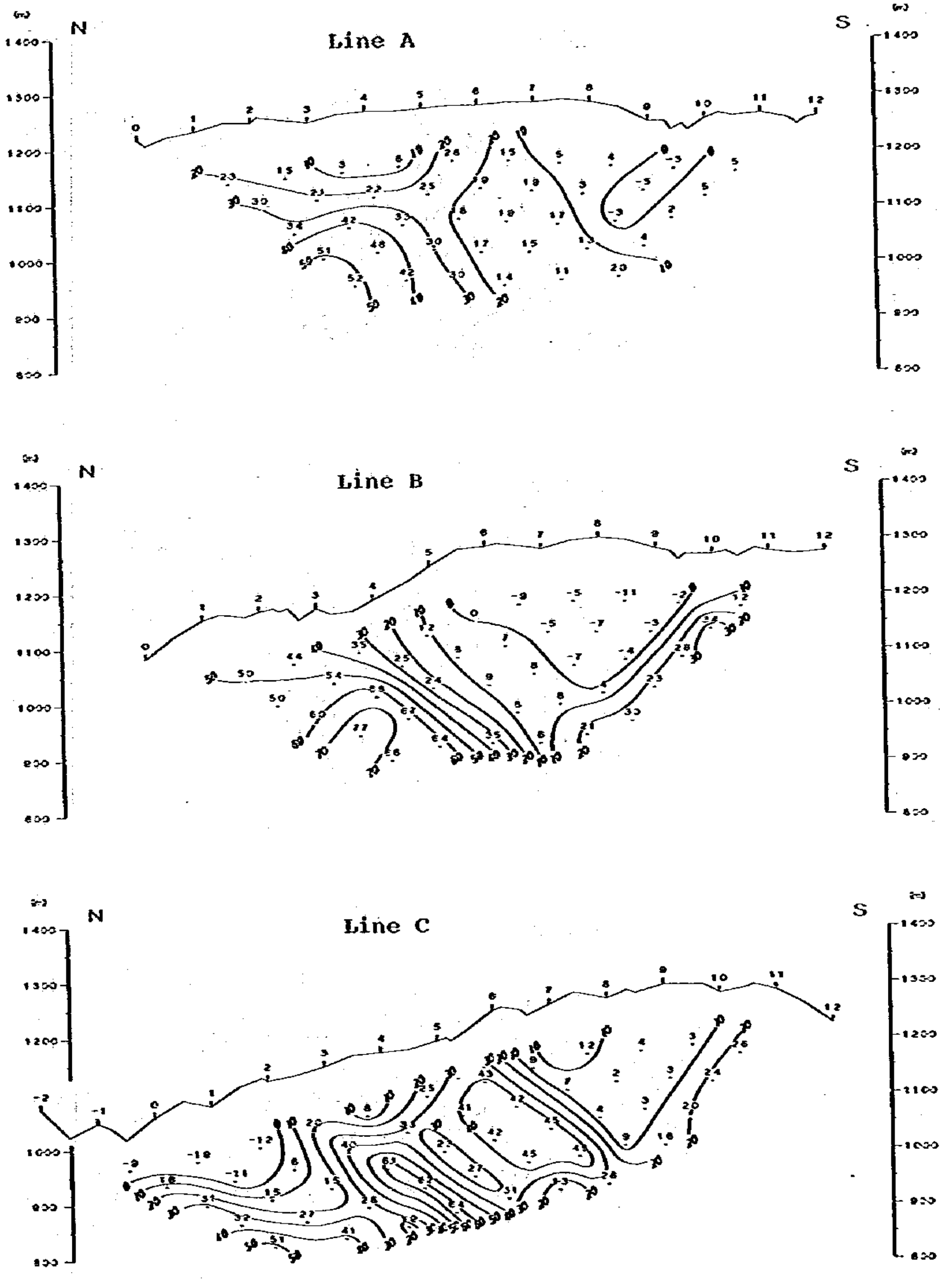


Fig. III-8-1.1 Three-Point Decoupled Phase (Line A, B, C)

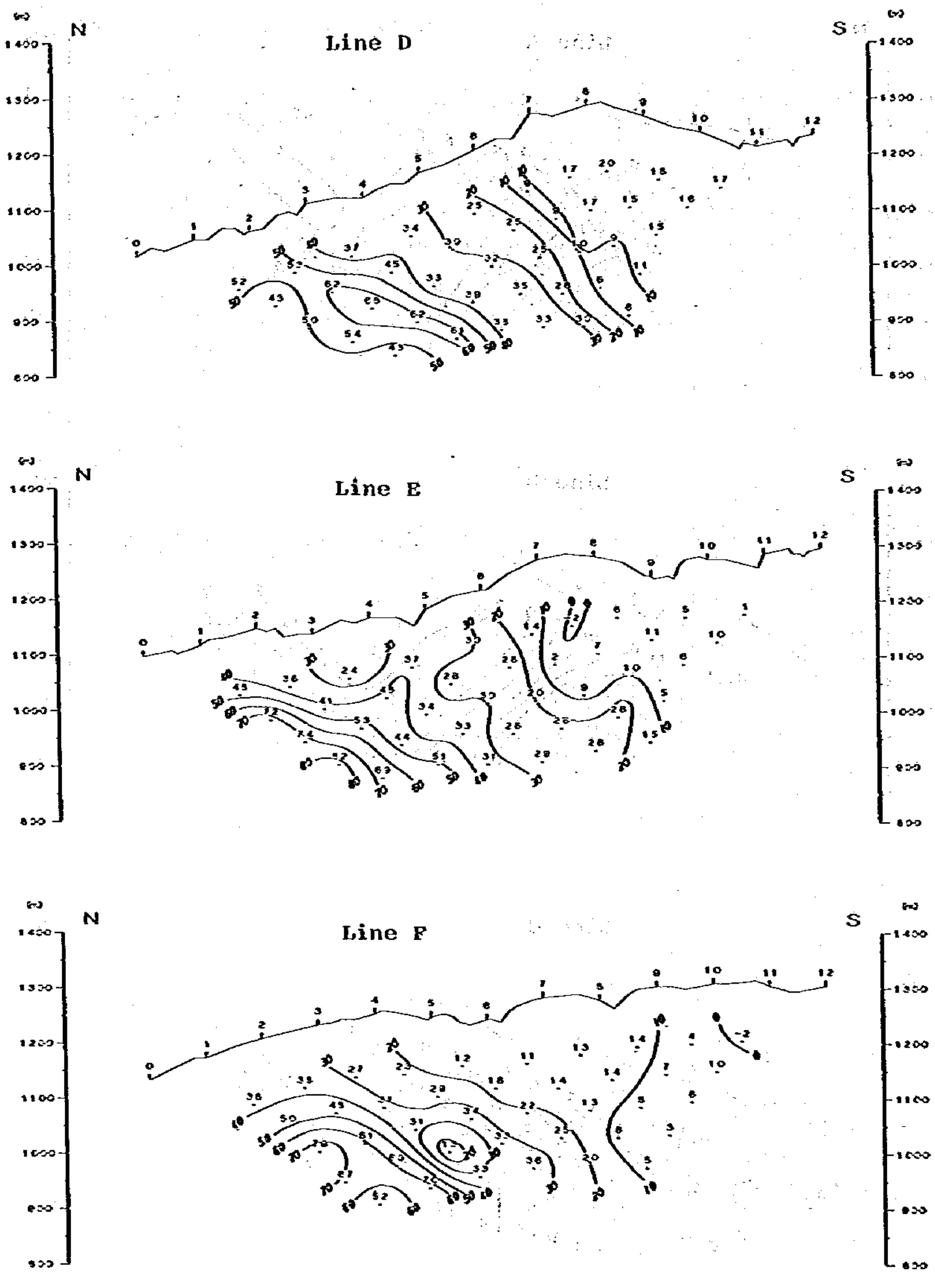


Fig. III-8-1.2 Three-Point Decoupled Phase (Line D, E, F)

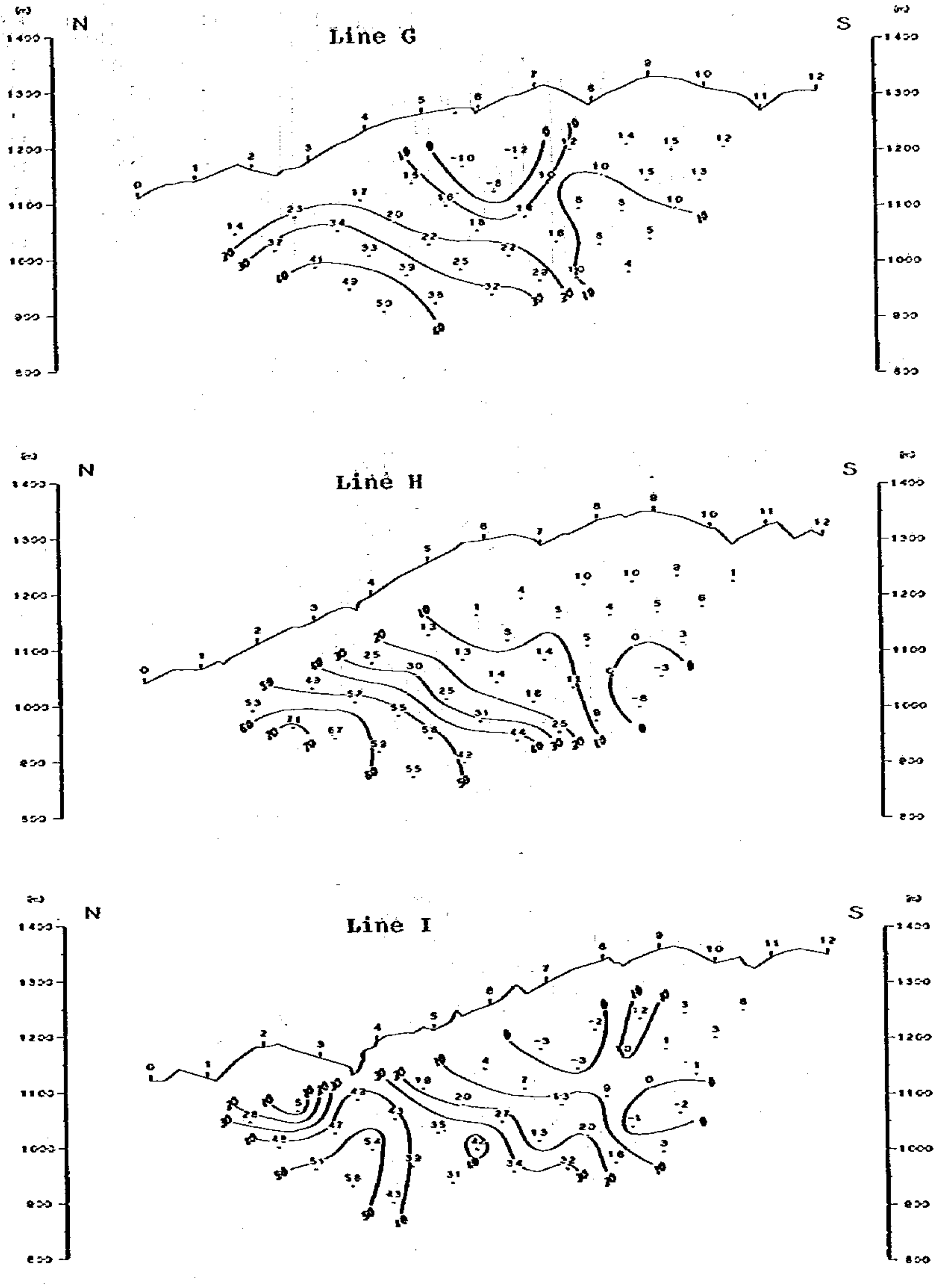
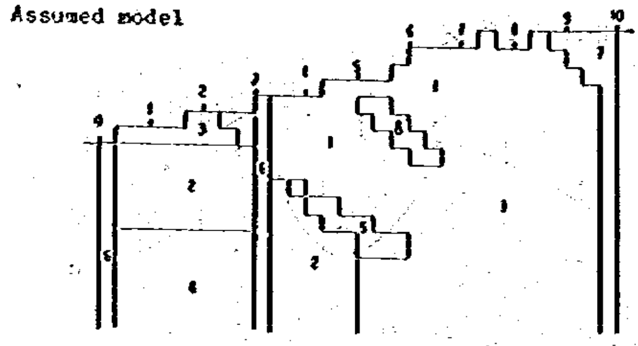


Fig. III-8-1.3 Three-Point Decoupled Phase (Line G, H, I)



CODE	RESISTIVITY (Ω-m)	PFE (%)
1	150	1
2	1000	2
3	500	1
4	1000	10
5	1000	15
6	2500	1
7	5000	1
8	50	10

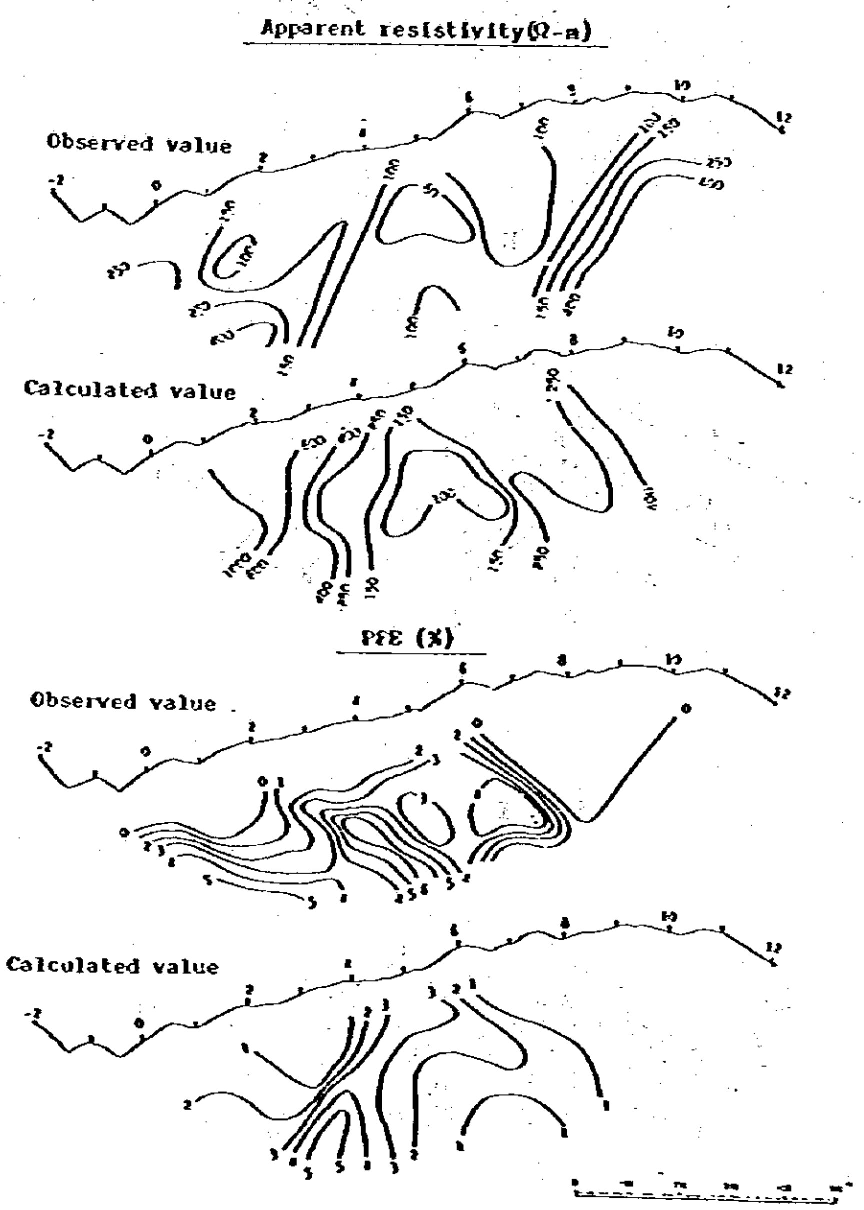
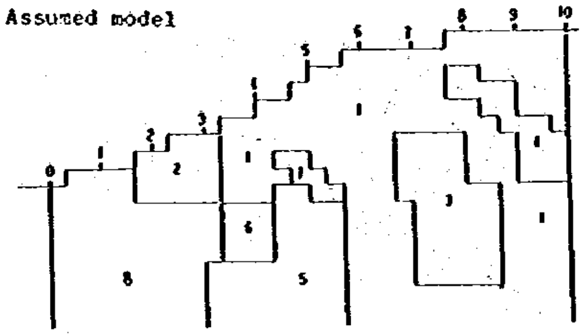


Fig.III-9-3.1 Model simulation for Line C



CODE	RESISTIVITY (Ω-m)	PFE (%)
1	100	1
2	150	1
3	1000	2
4	100	2
5	50	10
6	50	25
7	150	10
8	1000	1

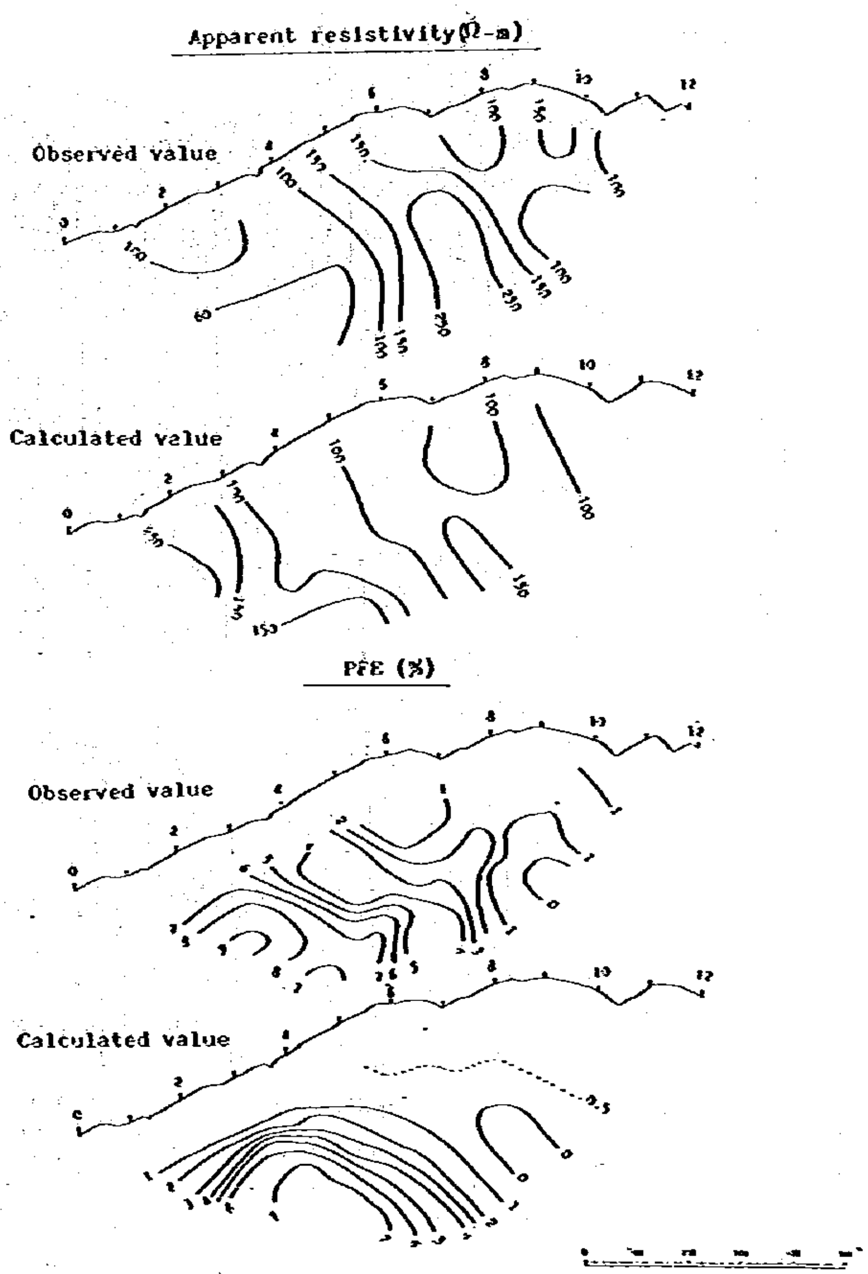


Fig.III-9-3.2 Model simulation for Line H

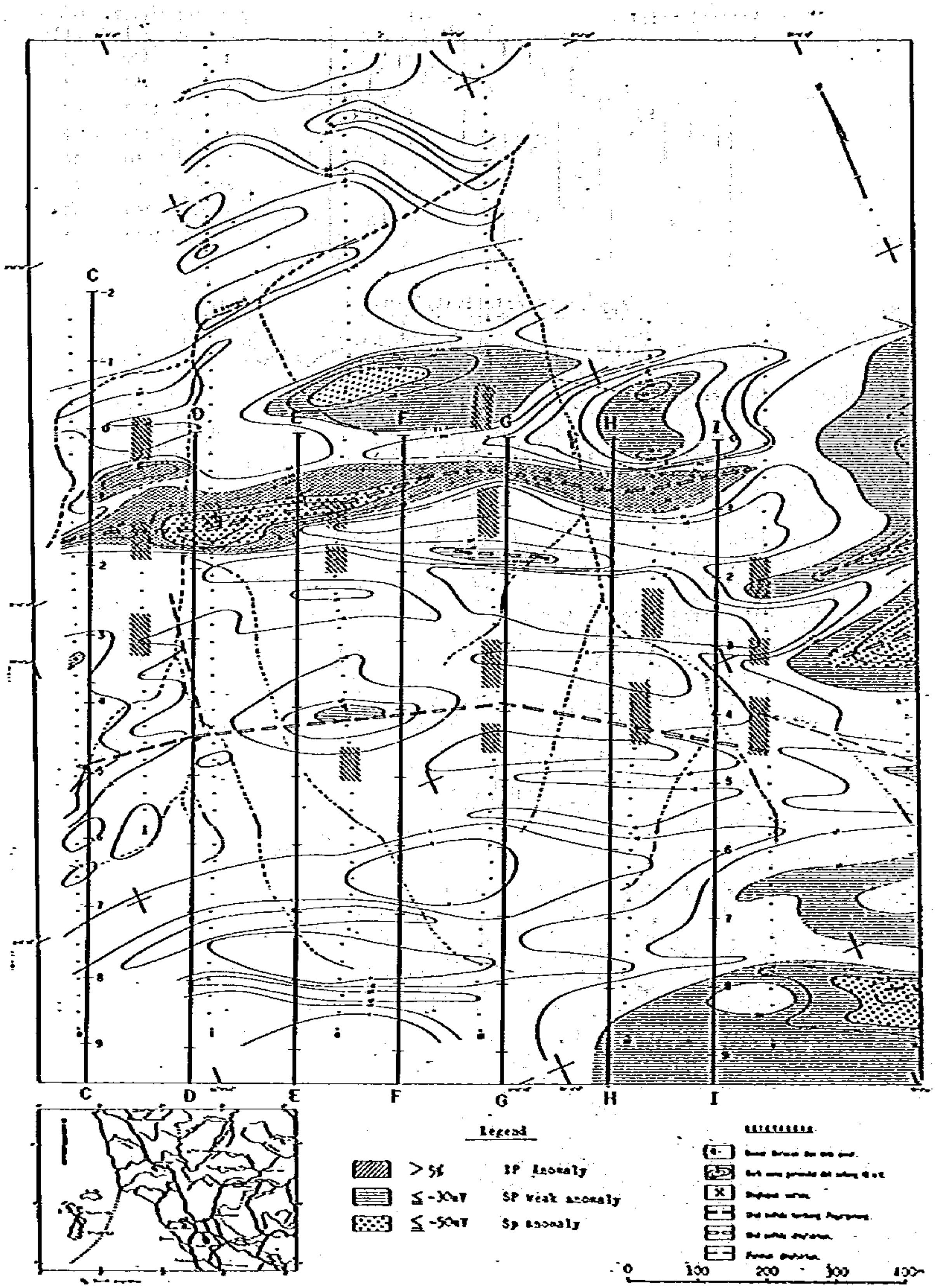


Fig. III-10-1 SP & IP Anomaly Map

(From R.Marloen 1981,courtesy of D.M.R.)

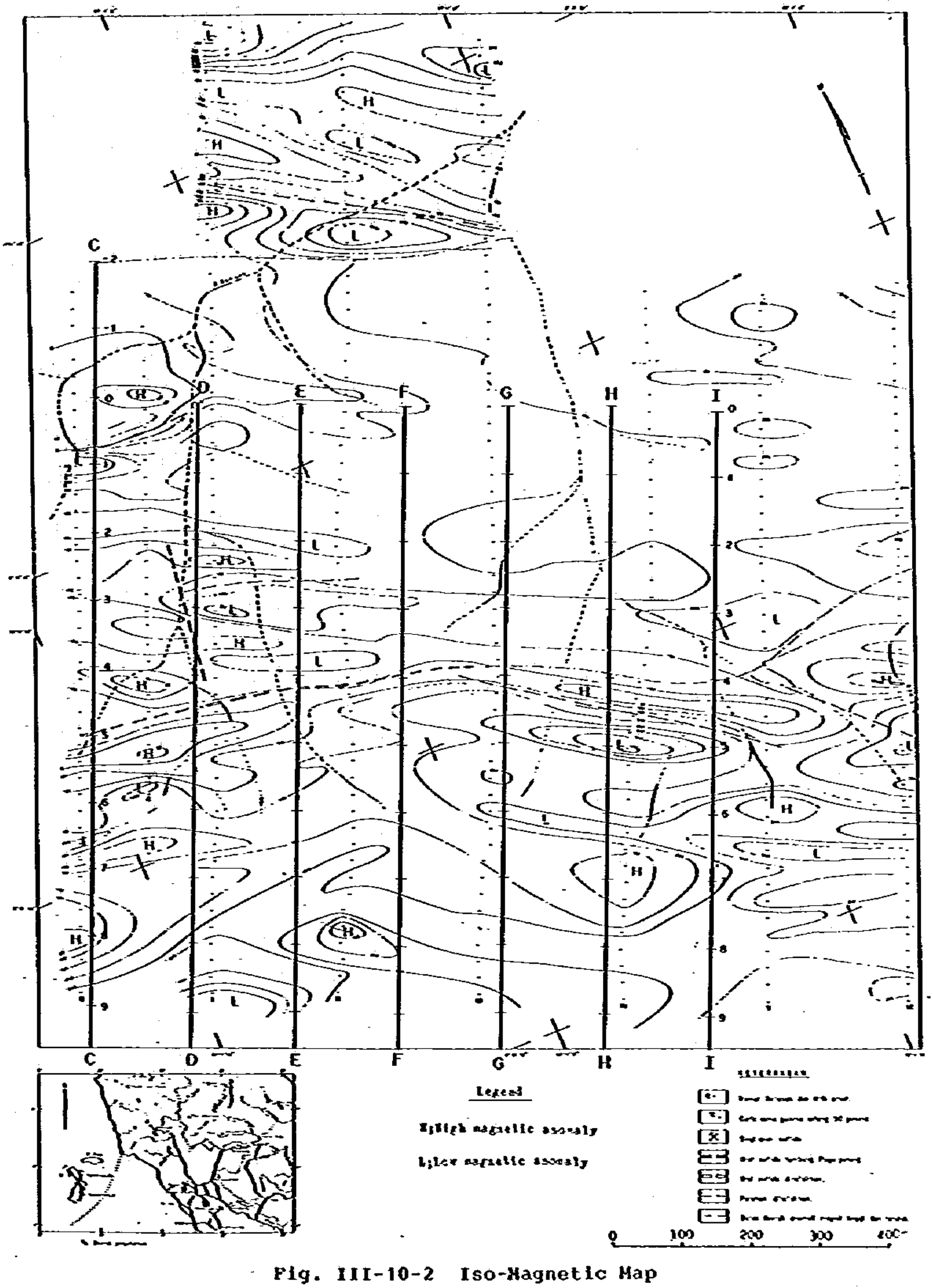


Fig. III-10-2 Iso-Magnetic Map

(From E.Ruswandi 1981,courtesty of D.M.R.)

Then, for the high resistivity zone at the middle depth of No. 6 ~ No. 8, code number 3 correspond to the model of 2% of FE and 1,000 Ω-m of resistivity.

Results of Simulation

General pattern of calculated resistivity roughly fit well with the observed value, which suggest us that the assumed resistivity model is close to the real structure.

On the other hand, for PFE model, only good correlation was obtained for the anomaly north of No. 3, but for the south dipping anomaly from No. 4 ~ No. 8, no response was found in the simulation. Some anomalous source might exist in the depth of No. 5 ~ No. 8.

4-4 CONSIDERATION OF SURVEY RESULTS

By investigating the relationship between the geology - mineralization and IP anomaly detected by each survey line, it is understood as follows:

A) IP anomaly seen in north of every survey line is mainly detected at the contact between sedimentary rocks (such as mudstone and sandstone) and granodiorite. It is considered to be caused by wide disseminated or bedded sulfide ore.

Some of the survey lines show different shape of anomaly source, and it is believed as that they indicate the form of granodiorite at the depth.

B) Shape of the spectral of weak anomaly detected at the depth at No. 5 ~ 6 of survey line C forms different shape of anomaly from one of A's and indicates decreasing trend of phase at low resistivity range. The anomaly is considered to be effected by massive sulfide with small texture.

C) At andesitic tuff seen at No. 3 ~ 4 of survey lines C and D, there is strong dissemination of pyrite with south dipping anomaly.

D) Sedimentary rocks generally show low resistivity such as value of 100 ~ 200 Ω-m, but some of the parts which have effected by mineralization construct lower resistivity zone with value of 50 ~ 100 Ω-m. Hence, IP anomaly is detected in low resistivity zone.

E) Fine grained limestone and pyroxene andesite show high resistivity. There is no IP anomaly caused by mineralization.

By above-mentioned results, anomaly of each survey line was plotted on the plane map and is shown on Fig. III-3-1, called spectral IP Anomaly Map.

Anomaly zone spreading toward east-west in northern part of each survey line differs in its depth and pattern: however, it is stretching to dominant strike direction caused by mineralization around the contact between sedimentary rocks and granodiorite.

At survey lines F ~ I, they move their center toward north a little but they are still successive to anomaly of survey lines A ~ E at the depth.

At the creek in northeast at No. 3 ~ 4 of survey line H, strong IP anomaly can be detected. It is supposed to be due to dissemination of Py, Pb and Zn in dacitic tuff.

Meanwhile, about anomaly detected at No. 5 ~ 6 of survey line C, no anomaly was detected at adjacent survey line 150 m apart from this survey line C because of small scaled massive sulfide.

However, there is weak indication between No. 5 ~ 6 of survey lines D and E. It is possible that it stretches toward east along the structure from survey line C.

Consequently, it is needed to confirm the spread of the anomaly towards survey line D with prospecting by drilling for IP anomaly at most promissing area of No. 4 ~ 6 of survey line C.

Moreover, drilling around No. 3 ~ 4 at survey line H is recommended to certify the anomaly in northern part of the line.

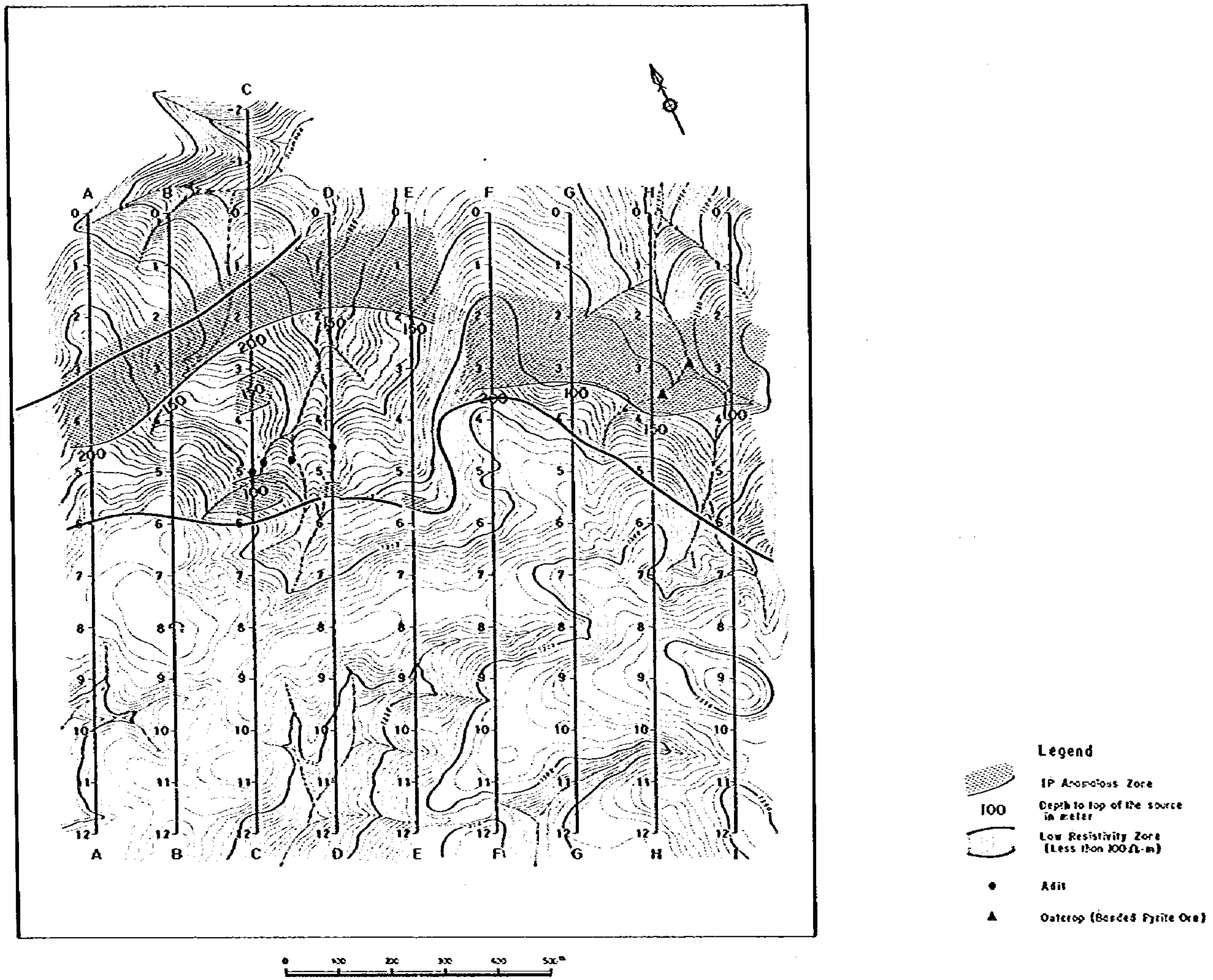


Fig. III-10-3   Spectral IP Anomaly Map

CHAPTER 5 SUMMARY

Based on the geological and geochemical survey of the first phase mineral exploration, outcrops of contact metasomatic ore deposit are confirmed in Pagar Gunung area.

In the second phase survey, as one of the geophysical survey, a spectral IP was adopted to investigate the lower extension of the ore body and the distribution of mineralization.

Nine survey lines of 1.2 km length with each 150 m apart were run and the total line length is 11,000 m. Electrode configuration is Dipole-Dipole and the spacing (a) is 100 m.

Survey instruments are made by Zonge Engineering Research & Organization, and the receiver is GDP-12/2G, whose frequency range is from 0.125 to 80 Hz to measure phase and magnitude.

The field survey was commenced on 11 June 1983 and completed on 18 July 1983.

Data processing and interpretation works were done in Japan; after conducting calibration and topographic correction, phase spectrum, Cole-Cole diagram, magnitude diagram, pseudo-section and plane map of PFE and 3-point decoupled phase are made.

Rock samples collected for physical properly measurement are 29 pieces. Physical property measurement are done by the same system as used in the field by showing phase and magnitude spectrum for each sample.

For the interpretation of the results, above mentioned data and maps together with geological informations are synthetically taken into consideration in order to know the horizontal distribution of IP anomaly and vertical extension to the depths.

The following conclusions are derived from the survey:

1) Judging from Cole-Cole diagram, monotonous left up tendency are generally seen in the higher frequency range. Especially in the southern part of survey lines G to I, out-of-phase component is small, while in the southern end of line A to F, vertical pattern are recognized. In the

northern part of each line, left side up pattern which suggest SIP anomaly are dominant.

2) From phase spectral map, three kinds of typical pattern which may reflect the characteristic of anomaly source are separated: The first one detected in the northern end of survey line A, B, D and E at the depth of n=3 ~ 5 are almost flat at 0.125 Hz harmonics with phase anomaly of more than -50 milliradian. The second one is a V shaped spectral seen in the central part of line C where 0.125 harmonics decreases with frequency increases, and this pattern is also found on lines B and D. The third pattern are seen in the southernmost part of line A showing monotonously increasing spectrum mainly due to electromagnetic coupling.

3) Magnitude spectrum map showing decrease to the right in the northern end of the line suggest big IP effect, which are concordant with Cole-Cole and phase spectrum in the same zone.

4) Apparent resistivity of this area vary from 40 ~ 250 Ω-m and low resistivity zone less than 100 Ω-m correspond with sedimentary rocks of mudstone and sandstone, while high resistivity zone more than 250 Ω-m with non-altered andesite dikes or limestone.

5) More than 3% of PFE are defined as anomaly, which overlap with phase anomaly zone of bigger than -30 milliradian.

Three major SIP anomalous zones are selected by synthetic interpretation:

(1) Anomalous zone between No. 5 ~ 6 on lines C, D and E
(2) Anomalous zone between No. 2 ~ 4 on line A to line E
(3) Anomalous zone north part of line F to line I

(1) is the anomaly related with Pagar Gunung West ore deposit showing V shaped phase spectrum. This spectral is characteristic around the outcrops of line C, No. 5 and also seen on both lines D and E. This anomalous source is supposed to lie by southerly dipping at the depth of 100 m.

Phase anomaly in (2) zone have more than -30 milliradian and the spectral type is almost flat in low frequency range and increasing in higher range than 8 Hz. This anomalous zone may be attributed to the pyrite mineralization at the contact zone of granodiorite with mudstone and sandstone. This anomalous zone continuing well to the adjoining line are interpreted to be due to disseminated sulfide.

(3) anomaly is related with Pagar Gunung East ore deposit and resembles with (2) anomaly by their phase spectrum and PFE, however, apparent resistivity of the anomalous zone is less than 100 Ω-m. As the maximum PFE detected at the depth of No. 3 of line H is 9.3% and typical PFE pattern is observed on the easternmost line I, this anomalous zone must be extending further to eastwards.

PART IV

DRILLING SURVEY

CHAPTER 1 SURVEY OUTLINE

1-1 PURPOSE OF THE SURVEY

As a result of geological, geochemical and geophysical (SIP method) surveys on Pagar Gunung ore deposit of Muara Sipongi area B carried out in the first stage of second phase, Pagar Gunung ore deposit would be expected to be promissing target for further exploration.

Five drills (total hole length : 1,200 m) were successively planned and were carried out in the later stage of the phase in order to explore dawnward extention of Pagar Gunung West ore deposit and SIP anomaly distributing at north zone of the deposit.

1-2 SPECIFICATIONS AND LOCATION OF THE SURVEY

The survey method and quantity are shown in Table IV-1-1

Table IV-1-1 Specification of the drilling survey

	Drilling Survey	Ore Deposit Survey
Survey Method	Wire-line Drilling method (Drilling capacity 300 m in BQ size)	Survey by measure tape and compass
Survey quantity	Drilling Hole length 250 m x 4 holes 1,000 m 200 m x 1 hole 200 m 5 holes 1,200 m Core survey Geological column of drilling core 1/200 Thin section 10 pcs Polish section 20 pcs Chemical assay of ores (Au,Ag,Cu,Pb,Zn) x 30 pcs	Detail survey of Ore Deposit Pagar Gunung East (Outcrop A & B) Pagar Gunung West (Adit 1 - 6) Geological and ore deposit map 1/100, 1/1,000

Drilling sites are shown in Fig. IV-1-1 and Table IV-1-2.

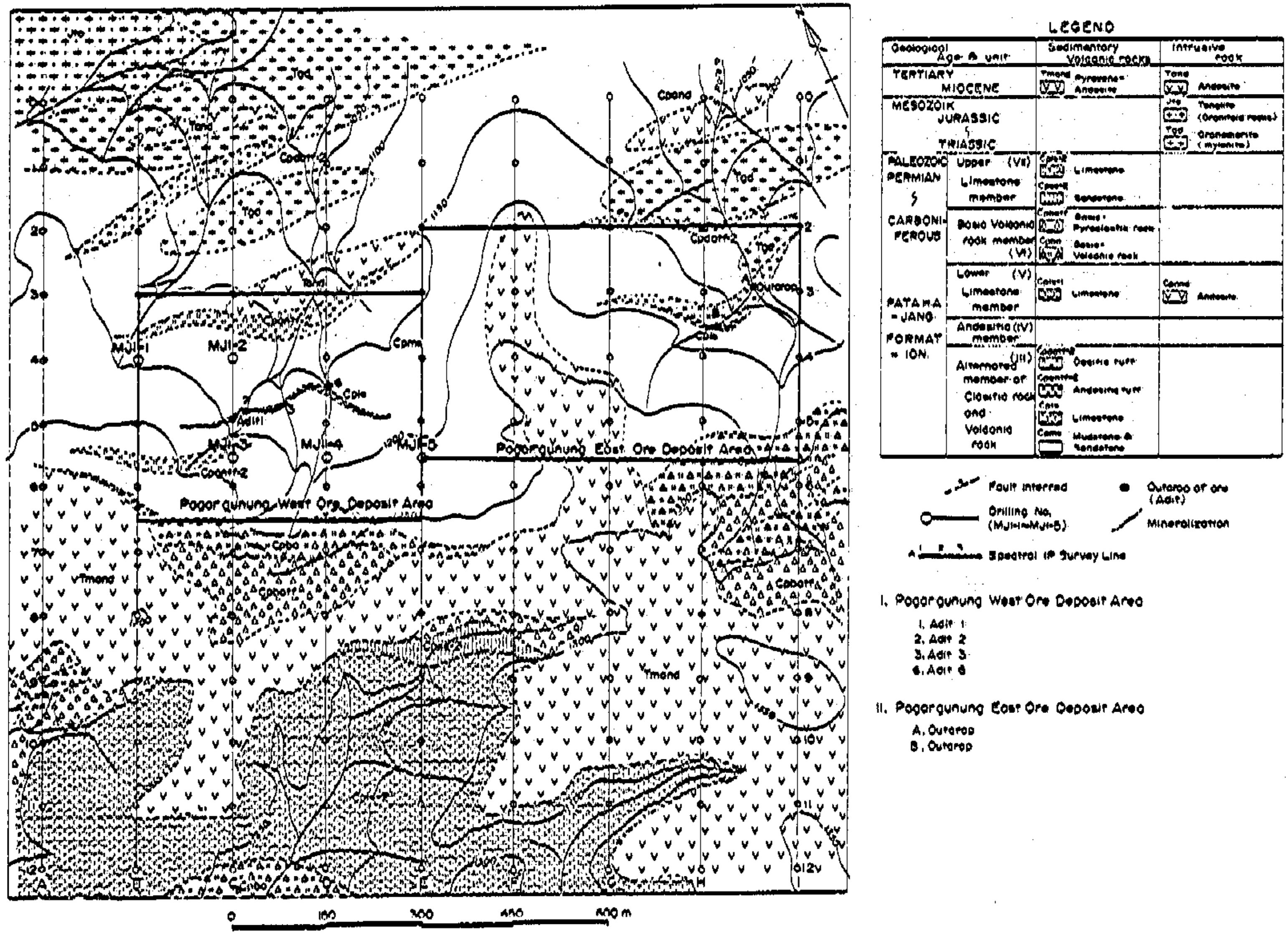


Fig. IV-1-1 Location Map of Drill Hole

Table IV-1-2 Location and Purpose of Drill Hole

Drilling hole No.	Location	Hole length planed(m)	Dip	Survey Purpose
MJI-1	B line-4.0 (MSL)	200	90°	Survey of SIP anomaly located at north parallel zone along Pagar Gunung West ore deposit
MJI-2	C line-4.0 (1,175 MCL)	250	90°	Survey of SIP anomaly located at north parallel zone along Pagar Gunung West ore deposit
MJI-3	C line-5.5 (1,215 MSL)	250	90°	Dawnward extention of Adit No. 1 & 2 out crop of Pagar Gunung ore deposit
MJI-4	D line-5.5 (1,185 MSL)	250	90°	Dawnward extention of Adit No. 6 outcrop of Pagar Gunung West ore deposit
MJI-5	E line-5.5 (1,210 MSL)	250	90°	East extention of Pagar Gunung West ore deposit shown by SIP anomaly
Total		1,200		

The locations are shown by point of SIP survey line, and these altitudes are obtained through topographycal map of 1/5,000 compiled by DMR member for SIP survey.

1.3 DRILLING HOLES LENGTH PERFORMED

Hole length, dip, core recovery and drilling period of each hole are shown in Table IV-1-3.

Table IV-1-3 Drill Hole Length and Drilling Period Performed

Drill hole Number	Planed Hole Length (m)	Actual Hole Length (m)	Dip	Surface Soil (m)	Core Length (m)	C. R. (%)	Drilling started	Drilling completed
MJI-1	200	200.50	-90°	10.00	177.80	93.3	'84-4-10	'84-4-27
MJI-2	250	250.20	-90°	9.00	195.65	81.1	'84-3-13	'84-4-4
MJI-3	250	250.30	-90°	17.00	210.70	90.3	'83-12-15	'84-1-10
MJI-4	250	250.20	-90°	7.00	185.95	76.5	'84-1-16	'84-2-14
MJI-5	250	250.10	-90°	12.00	212.00	89.0	'84-2-19	'84-3-7
Total	1,200	1,201.30						

$$\text{C.R. : Core recovery} = \frac{\text{Core length}}{\text{hole length} - \text{Surface soil part length}} \times 100\ \%$$

CHAPTER 2 DRILLING OPERATION

2-1 DRILLING METHOD

The drilling operation was performed by means of wire line method using oversized diamond bits of NQ (79.0 mm diameter) and BQ (62.0 mm diameter) size, besides non core drilling using tri-cone bit through soil and unconsolidated part of surface.

Bentonite was used for material of mud water, but libonite-mixed bentonite mud water used to use to keep good hole condition while the drilling work passed fault brecciated and fractured zone, because libonite is useful to protect collapsed or swelled wall of hole. It was also very effective to add suitably cutting oil in the mud water in order to decrease torque resistance caused by wall collapse.

Geology in the drilling holes consists of sedimentary rock (shale, limestone, slate and sandstone), volcanic rock (andesite, dacite and their pyroclastic rock) and igneous rock which are mostly silicified and occur many joints, schistositys and fractures. They form sometimes with the fracture and were frequently pluged up in core barrel. Material, namely telstop, saw dust and chaff, were mixed in circulating water to prevent running out water through crack and fracture.

2-2 DRILLING MACHINE AND EQUIPMENT USED

Table IV-2-1 shows drilling machine, used in the survey. Consumables of the survey is also listed in Table IV-2-2.

2-3 OPERATION MEMBER AND SHIFT

Operation of moving-in, moving-out and preparation in drilling site was done by one shift per one day system, while drilling operation was carried out by three shifts per one day, eight hours per one shift. One shift of drilling work consists of a Japanese engineer, a Indonesian counterpart (DMR) and two Indonesian workers.

Table IV-2-1 Drilling Machine and Equipment Used

Drilling Machine Model "OE-8BL"	1set
Specifications :	
Capacity	300 m (BQ WL)
Dimensions L x W x H	1,550mm x 700mm x 1,260mm
Hoisting capacity	2,000 kg
Spindle speed	Forward 100, 190, 320, 530, rpm
Engine Model NS-130CG	13 HP / 2,200 rpm
Drilling pump Model "MG-10"	1set
Specifications :	
Piston diameter	68 mm
Stroke	100 mm
Capacity	Discharge capacity 120 ℓ/min Max pressure 70 kg/cm²
Dimensions L x W x H	1,690 mm x 580 mm x 930 mm
Engine Model NS-110C	11 HP / 2,200 rpm
Water supply pump Model "TA500"	1set
Specifications :	
Capacity	Discbrge capacity 40 ℓ/min Max pressure 30 kg/cm²
Engine Model NS-50C	6 HP / 2,400 rpm
Wire line hoist Model "WLH-4"	1set
Specifications :	
Rope capacity	500 m
Hoisting speed	8~105 m/min
Engine Model NS-40C	5 HP / 2,400 rpm
Mud mixer Model "MCE-100"	1set
Capacity	100 ℓ / 600 rpm
Engine Model NS-40C	5 HP / 2,400 rpm
Generater Model "NDY-3.2S"	1set
Generater Model "YSG-2S"	1set
Drilling tools	
Drilling rod	NQ WL 3 m 70 pcs BQ WL 3 m 110 pcs
Casing pipe	HX 0.5 m 2 pcs HX 1 m 6 pcs NW 1 m 3 pcs NW 3 m 20 pcs BW 1 m 3 pcs BW 3 m 70 pcs
Derrick	1set
Specifications :	
Height	9.5 m
Max load capacity	6,000 kg

Table IV-2-2 Consumables Used

Description	Specifications	Unit	Quantity MJI 1	MJI 2	MJI 3	MJI 4	MJI 5	Total
Light oil		ℓ	1,505	1,750	1,840	1,850	1,815	8,760
Engine oil		ℓ	46	57	57	50	55	265
Hydraulic oil		ℓ	10	11	50	17	10	98
Gear oil		ℓ						18
Grease		kg						35
Bentonite		kg	3,510	6,050	6,780	7,180	4,150	27,670
Libonite		kg			80	735	185	1,000
C M C		kg	56	83	71	66	62	341
Caustic soda		kg			1	8	3	12
Tel - stop		kg		63	107	30		200
Cutting oil		ℓ	120	155		40	140	455
Calcium chloride		kg	8	20		35	25	88
Cement		kg	760	1,410	1,400	3,800	960	8,350
Diamond bit	HQ WL	pc	5	6	5	5	4	25
"	BQ WL	pc	3	5	6	5	5	24
Diamond reamer	HQ WL	pc	1	2	2	2	2	9
"	BQ WL	pc	1	2	2	2	2	9
Casing metal shoe	HX	pc	1	1	1	1	1	5
"	NX	pc	1	1	1	1	1	5
"	BX	pc	1	1	1	1	1	5
Tricone bit	3 7/8"	pc	2	2	2	1	1	8
Core barrel Ass'y	HQ WL	set						2
"	BQ WL	set						2
Inner tube	HQ WL	pc						4
"	BQ WL	pc						4
Core lifter case	HQ WL	pc	4	4	6	4	2	20
"	BQ WL	pc	2	4	4	4	4	18
Core lifter	HQ WL	pc	3	4	6	6	6	25
"	BQ WL	pc	4	4	7	6	4	25
Thrust ball bearing	HQ WL	pc	4	4	6	4	4	22
"	BQ WL	pc	2	4	4	2	4	16
Innertube stabilizer	HQ WL	pc	1	2	2	2	1	8
"	BQ WL	pc	1	1	2	1	1	6
Chuck piece	HQ WL	set						2
"	BQ WL	set						2
Cylinder liner	68 mm	pc						2
Piston rod		pc						4
Piston rubber	68 mm	pc						16
Wire rope	6φ 200 m	roll						2
Manila rope	16φ 100 m	roll						1
Wire		kg						100
Nail		kg						36
Core box	HQ WL	pc	24	22	25	25	27	123
"	BQ WL	pc	13	18	18	15	16	80

2-4 TRANSPORTATION

Drilling machine and equipment shipped from Japan were landed at Harbor Belawan (Medan), and were transported by large truck (capacity 6 tons) to Kotanopan through Sumatra Travers High Way, and by truck (capacity 2 tons) from Kotanopan to Simpang Tolang. There are about 650 km from Belawan to Kotanopan and 6 km from Kotanopan to Simpang Tolang.

Through mountain road of 9 km, the machine and equipment were conveyed from Simpang Tolang to Pagar Gunung base camp by human power.

Local transportation between drilling sites in Pagar Gunung Area was done by human power, after access road was constructed.

2-5 WATER SUPPLY

Circulation water of drilling operation was supplied by pumping directly up from river or via water storing pond constructed between river and drilling site while river is very far distance.

CHAPTER 3 RESULTS OF THE SURVEY

3-1 DRILLING

3-1-1 Site MJI-1

We used 3 7/8" tricone bit and concentrated bentonite drilling mud for drilling through the soil and talus deposits. HX casing pipe was inserted at 4.00m depth, we continued drilling to 10.00m depth where NW casing pipe was inserted.

Below 10.00m, NQ wireline method, bentonite drilling mud and cutting oil were used for the operation. The major rocks were andesite, calcareous rocks, shale and siliceous rocks. Silicification was generally strong and the rocks were easily fractured because of the well-developed joints. They became partly crushed and often clogged the core. Collapse and lost circulation were frequent. Thus the hole between 10.00m-37.10m depth was expanded by 3 7/8" tricone bit and NW casing was extended, but the insertion of the casing by mechanical rotation became increasingly difficult. Therefore the NW casing was inserted at 33.00m depth. Partial collapse and loss of circulation occurred frequently below 33.00m and operation was often jammed by the total loss of circulation and the sludge caused by the collapse of the upper parts. We continued drilling to 123.00m by cementing each time the operation was jammed. BW casing pipe was inserted at 123.00m, and below that depth we drilled by BQ wireline method with bentonite mud and cutting oil. The rocks were mainly siliceous in mature and some tuff, shale, sandstone and others were observed. The rocks were quite strongly silicified. Preventive measured were taken for loss of circulation and the drilling went smoothly down to 200.50m where the objective was accomplished and the work completed.

3-1-2 Site MJI-2

The 3 7/8" tricone bit and concentrated bentonite mud were used for drilling through the soil and talus deposits. HX casing pipe was inserted at 4.00m depth and we continued drilling to 9.00m depth where the bedrock was reached and NW casing pipe inserted.

Then, we drilled to 141.00m depth by NQ wireline method with bentonite drilling mud and cutting oil and inserted the BW casing pipe. The major rock units were andesite, slate, sandstone and shale.

There were argillized fractured zones where the hole collapsed. Also, the well-developed joints caused frequent jamming and loss of circulation. The hole was expanded between 9.00m-21.00m by 3 7/8" tricone bit and extended the NW casing pipe. But the lithology below that depth was still unfavourable and collapse and loss of drilling mud occurred frequently. These were stopped each time by cementation and pumping concentrated drilling mud containing straw, saw dust and cement milk. When we reached the depth of 98.00m, the cemented portion - near 30m-40m depth - collapsed and the operation became difficult. Therefore, the hole between 21.00m-45.00m was expanded by 3 7/8" tricone bit and extension of NW casing pipe was inserted. Total circulation was lost at depths 67.20m, 97.10m, 97.70m and 133.00m. Also loss of circulation at the rate of 10ℓ/min-50ℓ/min occurred frequently (pumping rate 60ℓ/min) and preventive measures were taken each time (a total of 32 times). The total loss of circulation at 133.00m could not be stopped after four attempts and subsequent operation was done by cutting oil. But the vibration caused by the drilling without circulation resulted in partial collapse and the operation became difficult. Thus BW casing pipe was inserted at 141.00m depth.

Below 141.00m, we drilled by BQ wireline method with bentonite drilling mud and cutting oil. The rocks were generally strongly silicified with well-developed joints. The core was jammed particularly between the depth of 141.00m to 206.00m. There were six points where circulation was lost at the rate of 10ℓ/min-30ℓ/min including a total loss (pumping rate 40ℓ/min) at 235.85m. The loss was stopped by normal measures each time and the objective of the drilling was achieved at the depth of 250.20m.

3-1-3 Site HJI-3

The 3 7/8" tricone bit and concentrated bentonite mud were used for drilling through the soil and talus deposits. HX casing pipe was inserted at 3.60m depth, continued drilling with 3 7/8" tricone bit to the depth of 19.00m and NW casing pipe was inserted.

Then we drilled by NQ wireline method with bentonite and libonite drilling muds. The major rocks were andesite, shale, sandstone and limestone. The lithology was unfabourable to the depth of 30.00m and the operation became difficult due to the loss of circulation and the collapse of the hole. Thus the zone between 19.00m to 31.00m was expanded by 3 7/8" tricone bit and NW casing pipe was extended to that zone. The rocks were generally silicified strongly with well-developed joints. They were easily fractured and jammed the core frequently.

The circulation was totally lost at depths of 27.80m, 28.60m, 32.30m, 44.10m and 79.80m. Also small loss of 10ℓ/min-20ℓ/min circulation occurred frequently. At every loss of circulation, concentrated drilling mud containing Tel-stop was pumped in to stop the loss. The soft argillaceous layers collapsed by the drilling mud flow and frequently jammed the operation. BW casing pipe was inserted at the depth of 150.00m.

Below 150.00m, BQ wireline method with bentonite drilling mud was used. The rocks were mainly siliceous. The circulation was totally lost at 182.20m and here we recovered semi-spherical core of approximately 25cm which we believe to be a vug. We made several attempts to stop the loss by pumping in Tel-stop and cement milk. Each attempt stopped the loss temporarily, but we lost the circulation completely when we resumed drilling. Therefore, we subsequently drilled without circulation to 206.60m, but the vibration was intense. And the wear of the bits lowered the efficiency of the operation so much that we halted the operation in order to stop the loss completely. We threw in cement lumps containing Tel-stop, waited to harden and cut through the cement. We repeated this operation for four days and succeeded in maintaining approximately 2/3 of the circulation. We drilled to the depth of 250.30m with stopping minor circulation losses and attained our objective.

3-1-4 Site MJI-4

We drilled through the soil and talus deposits to 3.50m using 3 7/8" tricone bit and concentrated bentonite drilling mud. NW casing pipe was inserted at that depth.

We further drilled to 7.00m by 3 7/8" tricone bit and inserted NW casing pipe. Subsequent work was conducted by NQ wireline method with bentonite and Libonite drilling muds. The major rocks were andesite, volcanic tuff breccia, black shale and siliceous rocks. In general, the physical nature of the rocks was not stable and the hole collapsed frequently. Therefore, the 7.00m-32.80m and 32.80m-42.00m zones were expanded by 3 7/8" tricone bit and the NW casing pipe was extended into the above zones. The lithology below 42.00m was also not favourable, particularly the 50.00m-114.80m zone was intensely argillized with some fractured zones and the hole collapsed very frequently.

At 56.50m depth, groundwater flowed in at the rate of 32ℓ/min which further aggravated the collapse and frequently caused jamming. At 64.60m cement grouting was done four times with a total of 2,600 litres of cement milk in order to stop the water. This lowered the water flow to 3-5ℓ/min and we resumed drilling. The subsequent drilling was conducted continuously through fractured zones and the operation was greatly hindered by frequent collapse, partial jamming by clay and various other problems. Thus, we were forced to use time for cementation for preventing collapse and the efficiency was very low during this zone. We drilled to 150.00m with repeated cementation and inserted BW casing pipe.

Below 150.00m, we proceeded by BQ wireline method using libonite drilling mud. The rocks were siliceous rocks, sandstone, hard shale and slate. They were partially argillized. The rocks were well-jointed and fragile, frequently causing core jamming. The objective of drilling in this site was accomplished at 250.20m.

3-1-5 Site MJI-5

We drilled through the soil and talus deposits to 7.00m using 3 7/8" tricone bit and concentrated bentonite drilling mud. HX casing pipe was inserted at that depth.

We further drilled by NQ wireline method with bentonite and Libonite drilling muds. The rocks were andesite, hard shale, sandstone, tuff breccia and slate. Argillized zones and fault zones were found. The lithology of the upper parts were unfavourable, resulting in frequent collapse. Therefore, we expanded the hole between 12.00m-18.00m by 3 7/8" tricone bit and extended the NW casing pipe into that zone. Below this depth, we encountered partial collapse which forced us to carry out cementation three times to the depth of 90.50m. We continued drilling to 150.00m and inserted BW casing pipe. Below this, we operated by BQ wireline method with Libonite drilling mud. The main rocks were calcareous rocks, coarse-grained tuff, sandstone, slate and granite, and the drilling in this zone progressed smoothly. We attained or objective at 250.10m depth and completed our operation.

3-1-6 Drilling Record

(1) Drilling Operation Data

Drilling operation data on each hole are summarised in Table IV-3-1 ∿ IV-3-5. Average drilling length per drilling-day was 10.36 m.

(2) Core Recovery

Average core recovery of five holes was 86.6 percent, as it is shown in Table IV-1-3.

(3) Drilling Progress

Progress of drilling operation on each hole are shown in Table IV-3-6 ∿ IV-3-10, and working time analysis of the drilling is shown in Table IV-3-11. Table IV-3-12 and IV-3-13 show record of consumed diamond bits.

(4) Drilling Progress Figures

Drilling progress of each hole are figured in Fig. IV-3-1 ∿ IV-3-5.

Table IV-3-1 Summary of the Drilling Operation on MJI-1

		Survey period				Total man	
		Period	days	work day	off day	Engieer	worker
Operation	Prepara-tion	6. 4.1984~ 9. 4.1984	3.5	3.5 days	0 days	14 man	115 man
	Drilling	10. 4.1984~27. 4.1984	18	drilling 16	0	64	260
				recovering 2	0	8	57
	Removing	28. 4.1984~ 5. 5.1984	8	8	0	32	153
	Total	6. 4.1984~ 5. 5.1984	29.5	29.5	0	118	585

Drilling length		m		m
	length planed	200.00	Surface soil Overburden Quaternary	10.00
	Increase or Decrease in length	—	Core length	177.80
	Length drilled	200.50	Core recovery	93.3 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	91.6	
100 ~ 20).5	95.4	93.3

Woking hours		h	%	%
	Drilling	200°50'	49.0	39.5
	Other working	174°00'	42.4	34.3
	Recovering	35°10'	8.6	6.9
	Total	410°00'	100	80.7
	Reassemblage	31°00'		6.1
	Dismantlement	17°00'		3.3
	Water transportation	—		
	Road construction and others	50°00'		9.9
	G. Total	508°00'		100

Efficiency of Drilling

Total m/work period (m/day)	200.50m/18 days (11.14m/day)
Toxal m/Total shift (m/shift)	200.50m/51 shift (3.93m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8"	N Q	B Q
Drilled length	10.00 m	113.00 m	77.50 m
Core length	—	104.95	72.85

Casing pipe inserted	Size	meterage (m)	meterage/drilling length × 100 (%)	Recovery (%)
	B X	4.00	2.0	100
	N W	33.00	16.5	100
	B W	123.00	61.3	100

Table IV-3-2 Summary of the Drilling Operation on MJI-2

Operation

	Survey period: Period	days	work day	off day	Total man: Engieer	Total man: worker
Preparation	9. 3.1984~12. 3.1984	3.5	3.5 days	0 days	14 man	131 man
Drilling	13. 3.1984~ 4. 4.1984	23	drilling 19	0	79	482
			recovering 3	1	11	105
Removing	4. 5.1984~ 6. 4.1984	1.5	1.5	0	6	41
Total	9. 3.1984~ 6. 4.1984	28	27	1	110	759

Drilling length

length planed	250.00 m	Surface soil Overburden Quaternary	9.00 m
Increase or Decrease in length	— m	Core length	195.65 m
Length drilled	250.20	Core recovery	81.1 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	59.4	
100 ~ 200	91.4	76.2
200 ~ 250.2	100	81.1

Woking hours

		%	%
Drilling	231°00' h	44.4	40.9
Other working	233°20'	44.8	41.2
Recovering	56°10'	10.8	9.9
Total	520°30'	100	
Reassemblage	30°00'		5.3
Dismantlement	15°30'		2.7
Water transportation	—		
Road construction and others	—		
G. Total	566°00'		100

Efficiency of Drilling

Total m/work period (m/day)	250.20m/23 days (10.88m/day)
Total m/Total shift (m/shift)	250.20m/64 shift (3.91m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8"	N Q	B Q
Drilled length	9.00 m	132.00 m	109.20 m
Core length	—	91.05	104.60

Casing pipe inserted

Size	meterage (m)	meterage / drilling length × 100 (%)	Recovery (%)
H X	4.00	1.6	100
N W	45.00	18.0	100
B W	141.00	56.3	100

Table IV-3-3 Summary of the Drilling Operation on MJI-3

		Survey period				Total man	
		Period	days	work day	off day	Engieer	worker
Operation	Preparation	4.12.1983~14.12.1983	11	11 days	0 days	44 man	1,102 man
	Drilling	15.12.1983~10. 1.1984	27	drilling 20	0	80	242
				recovering 6	1	24	64
	Removing	11. 1.1984~12. 1.1984	2	2	0	8	23
	Total	4.12.1983~12. 1.1984	40	39	1	156	1,436

Drilling length				
length planed	250.00 m	Surface soil Overburden Quaternary	17.00 m
Increase or Decrease in length	— m	Core length	210.70 m
Length drilled	250.30	Core recovery	90.3 %

Core recovery of 100 m hole		
Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	76.9	
100 ~ 200	96.7	87.7
200 ~ 250.3	99.6	90.3

Woking hours				
Drilling		181°00′ h	30.4 %	25.6 %
Other working		253°40′	42.5	35.8
Recovering		161°50′	27.1	22.9
Total		596°30′	100	84.3
	Reassemblage	63°00′		8.9
	Dismantlement	5°00′		0.7
Water transportation		—		
Road construction and others		43°00′		6.1
G. Total		707°30′		100

Efficiency of Drilling	
Total m/work period (m/day)	250.30m/27 days (9.27m/day)
Total m/Total shift (m/shift)	250.30m/72 shift (3.48m/shift)

Drilling length/bit (each sized bit)			
Bit size	3 7/8"	N Q	B Q
Drilled length	19.00 m	131.00 m	100.30 m
Core length	—	110.70	100.00

Casing pipe inserted			
Size	meterage (m)	meterage/drilling length × 100 (%)	Recovery (%)
H X	3.60	1.4	100
N W	31.00	12.4	100
B W	150.00	60.0	100

Table IV-3-4 Summary of the Drilling Operation on MJI-4

		Survey period				Total man	
		Period	days	work day	off day	Engieer	worker
Operation	Preparation	13. 1.1984~15. 1.1984	3	3 days	0 days	12 man	109 man
	Drilling	16. 1.1984~14. 2.1984	30	drilling 21	0	82	337
				recovery 8	1	36	235
	Removing	15. 2.1984~16. 2.1984	1.5	1.5	0	6	41
	Total	13. 1.1984~16. 2.1984	34.5	33.5	1	136	722

Drilling length				
	length planed	250.00 m	Surface soil Overburden Quaternary	12.00 m
	Increase or Decrease in length	— m	Core length	185.95 m
	Length drilled	250.20	Core recovery	76.5 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	67.5	
100 ~ 200	81.1	74.5
200 ~ 250.2	83.9	76.5

Woking hours				
	Drilling	200°50' h	29.1 %	27.5 %
	Other working	351°20'	50.8	48.0
	Recovering	138°50'	20.1	19.0
	Total	691°00	100	94.5
	Reassemblage	26°00		3.5
	Dismantlement	14°30		2.0
	Water transportation	—		
	Road construction and others	—		
	G. Total	731°30'		100

Efficiency of Drilling

Total m/work period (m/day)	250.20m/30 days (8.34m/day)
Total m/Total shift (m/shift)	250.20m/86 shift (2.91m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8"	N Q	B Q
Drilled length	7.00m	143.00m	100.20m
Core length	—	102.35	83.60

Casing pipe inserted	Size	meterage (m)	meterage/drilling length × 100 (%)	Recovery (%)
	B X	3.50	2.3	100
	N W	42.00	16.8	100
	B W	150.00	60.0	100

Table IV-3-5 Summary of the Drilling Operation on MJI-5

		Survey period				Total man	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	16. 2.1984 ~ 18. 2.1984	2.5	2.5 days	0 days	10 man	75 man
	Drilling	19. 2.1984 ~ 7. 3.1984	18	drilling 16	0	62	359
				recovery 1	1	8	57
	Removing	8. 3.1984 ~ 9. 3.1984	1.5	1.5	0	6	36
	Total	16. 2.1984 ~ 9. 3.1984	22	21	1	86	527

Drilling length	length planed	250.00 m	Surface soil Overburden Quaternary	12.00 m
	Increase or Decrease in length	— m	Core length	212.00 m
	Length drilled	250.10	Core recovery	89.0 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	78.9	
100 ~ 200	96.8	88.4
200 ~ 250.10	91.5	89.0

				%	%
Woking hours	Drilling		182°20' h	46.5	41.8
	Other working		184°50'	47.1	42.3
	Recovering		25°20'	6.4	5.8
	Total		392°30'	100	89.9
		Reassemblage	23°00'		5.3
		Dismantlement	21°00'		4.8
	Water transportation		—		
	Road construction and others		—		
	G. Total		436°30'		100

Efficiency of Drilling

Total m/work period (m/day)	250.10m/18 days (13.89m/day)
Total m/Total shift (m/shift)	250.10m/49 shift (5.10m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8"	N Q	B Q
Drilled length	12.00 m	138.00 m	100.10 m
Core length	—	118.95	93.05

Casing pipe inserted	Size	meterage (m)	meterage/drilling length × 100 (%)	Recovery (%)
	H X	7.00	2.8	100
	N W	18.00	7.2	100
	B W	150.00	60.0	100

Table IV-3-6 Record of the Drilling Operation on HJI-1

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
April	m	m	m	m	m	shift	shift	man	man
6	Reassemb								
7	Reassemb						1.5	6	45
8	Reassemb								
9	Reassemb								
10	10.00			10.00	—				
11	4.10	4.70	5.90	14.70	11.80				
12	5.60	3.80	6.10	15.50	14.15				
13	Reaming	Reaming	Reaming						
14	Ins-C.P	3.30	3.00	6.30	6.60	9	15	28	209
15	3.10	4.50	4.40	12.00	11.00				
16	4.20	4.00	5.00	13.20	13.20				
17	3.10	4.40	5.80	13.30	11.50				
18	4.90	Off day	Cem,	4.90	4.90				
19	Sol-cem	Cem-cut	2.00	2.00	1.80				
20	3.30	3.10	3.30	9.70	9.60				
21	2.90	3.10	4.50	10.30	10.40	17	20	28	81
22	2.50	4.20	3.70	10.40	10.00				
23	2.10	3.60	5.30	11.00	8.30				
24	5.00	5.70	5.00	15.70	15.70				
25	7.50	7.20	6.90	21.60	21.60				
26	7.60	6.40	5.30	19.30	18.15				
27	4.70	5.20	Out C.P	9.90	9.10				
28	Dismant					17	19	28	127
29	Transpor								
30	Transpor								
May 1	Transpor								
2	Transpor								
3	Transpor								
4	Transpor								
5	Transpor						7	28	123
Total	70.60	63.70	66.20	200.50	177.80	43	62.5	118	585

Abbreviation:
- Reassemb, Reassemblage
- Dismant, Dismantlement
- Transpor, Transportation
- Ins-C.P, Inserting Casing pipe
- Out-C.P, Taking out Casingpipe
- Cem, Cementing work
- Cem-Cut, Cutting cementing part
- Sol-cem, Solidification of cement
- Stop-wat, Stoping for water leakage

Table IV-3-7 Record of the Drilling Opetation on MJI-2

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
March	m	m	m	m	m	shift	shift	man	man
9	Reassemb								
10	Reassemb						1.5	6	53
11	Reassemb								
12	Reassemb								
13	10.50			10.50	1.00				
14	5.40	2.10		7.50	2.00				
15	4.50	3.20	6.40	14.10	8.45				
16	6.10	2.10	3.60	11.80	3.60				
17	Sol-cem	Cem-Cut	5.50	5.50	2.70	10	14	28	208
18	8.00	5.30	5.30	18.60	12.10				
19	3.40	off day	Cem-Cut	3.40	1.75				
20	2.50	4.20	5.40	12.10	8.15				
21	3.60	4.10	2.00	9.70	7.95				
22	4.50	1.10	off day	5.60	5.35				
23	Reaming	Reaming	Ins-C.P						
24	Cem-Cut	Cem-Cut	3.00	3.00	2.80	13	19	26	202
25	6.50	5.40	4.50	16.40	15.60				
26	3.40	5.60	6.00	15.00	14.20				
27	2.30	2.70	2.80	7.80	5.40				
28	Ins-C.P	4.60	4.90	9.50	9.20				
29	5.10	5.20	4.60	14.90	14.00				
30	6.20	3.60	4.40	14.20	13.20				
31	5.20	4.40	4.40	14.00	12.55	20	21	28	174
April 1	4.60	3.60	5.10	13.30	12.35				
2	5.90	5.60	6.40	17.90	17.90				
3	2.70	4.80	5.80	13.30	13.30				
4	6.80	5.30	Out-C.P	12.10	12.10				
5	Dismant	Dismant							
6	Transpor					11	14.5	22	122
Total	97.20	72.90	80.10	250.20	195.65	54	70	110	759

Table IV-3-8 Record of the Drilling Operation on MJI-3

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
December	m	m	m	m	m	shift	shift	man	man
4	Transpor								
5	Transpor								
6	Transpor								
7	Transpor								
8	Transpor								
9	Reassemb								
10	Reassemb						7	28	669
11	Reassemb								
12	Reassemb								
13	Reassemb								
14	Reassemb								
15	4.00			4.00	—				
16	15.00			15.00	—				
17	5.70	4.50	Cem	10.20	10.05	4	9	28	467
18	1.50	0.80	Cem	2.30	1.60				
19	Cem-Cut	Reaming	Ins-C.P						
20	1.20	3.20	7.80	12.20	8.50				
21	2.70	5.00	5.20	12.90	8.15				
22	6.30	6.20	8.20	20.70	15.80				
23	6.10	6.50	7.60	20.20	17.30				
24	2.00	6.50	5.70	14.20	14.00	17	21	28	69
25	3.30	6.10	2.60	12.00	11.90				
26	4.70	4.70	5.20	14.60	13.00				
27	6.20	5.20	0.30	11.70	10.40				
28	3.30	5.00	5.00	13.30	13.20				
29	6.00	7.00	6.00	19.00	19.00				
30	Stop-wat	Cem	off day						
31	Cem-Cut	Cem	off day			15	19	28	90
January 1	off day								
2	4.60	4.80	3.10	12.50	12.50				
3	2.50	3.60	3.60	9.70	9.60				
4	2.10	Cem Cut	Cem	2.10	2.10				
5	Cem-Cut	Cem-Cut	Cem						
6	Cem-Cut	Cem	Sol-cem						
7	Cem-Cut	Cem	Cem-Cut			7	18	24	75
8	1.50	6.10	7.90	15.50	15.40				
9	6.60	5.40	5.70	17.70	17.70				
10	2.50	7.40	0.60	10.50	10.50				
11	Out-C.P	Out-C.P							
12	Dismant					9	12	20	66
Total	87.80	88.00	74.50	250.30	210.70	52	86	156	1,436

Table IV-3-9 Record of the Drilling Opetation on MJI-4

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
January	m	m	m	m	m	shift	shift	man	man
13	Reassemb								
14	Reassemb						2	8	73
15	Reassemb								
16	8.40			8.40	1.30				
17	5.10	8.00	8.30	21.40	21.00				
18	3.00	Reaming	Reaming	3.00	1.10				
19	Ins-C.P	3.60	5.70	9.30	3.70				
20	Reaming	4.50	7.30	11.80	4.40				
21	5.00	3.00	2.70	10.70	6.85	12	17	28	109
22	Cem	off day	off day						
23	Cem-Cut	Cem-Cut	Cem-Cut						
24	Cem	Cem-Cut	0.40	0.40	0.15				
25	2.00	Cem	2.90	2.90	1.20				
26	Sol-cem	Cem-Cut	5.80	5.80	2.90				
27	Cem	Cem-Cut	4.20	4.20	3.60				
28	Sol-cem	Cem-Cut	5.90	5.90	5.20	6	19	26	200
29	6.00	5.70	6.60	18.30	15.90				
30	7.20	6.60	6.40	20.20	15.70				
31	0.50	Cem	Cem	0.50	0.30				
February									
1	Sol-cem	Cem-Cut	Cem						
2	Sol-cem	Cem-Cut	Cem						
3	Sol-cem	Cem-Cut	Cem						
4	Sol-cem	Cem-Cut	1.60	1.60	1.00	8	21	28	161
5	5.50	4.20	5.00	14.70	11.85				
6	5.50	3.40	1.90	10.80	7.50				
7	5.50	6.50	4.70	16.70	12.20				
8	7.30	7.00	6.10	20.40	18.00				
9	5.60	5.00	6.00	16.60	14.10				
10	2.60	1.20	2.60	6.40	4.55				
11	2.30	1.60	4.80	8.70	7.00	21	21	23	99
12	4.50	4.20	5.30	14.00	12.05				
13	1.80	3.90	2.40	8.10	7.25				
14	3.60	3.80	Out-C.P	7.40	7.15				
15	Dismant	Dismant							
16	Transpor					8	11.5	18	80
Total	81.40	72.20	96.60	250.20	185.95	55	91.5	136	722

Table IV-3-10 Record of the Drilling Opetation on MJI-5

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
February	m	m	m	m	m	shift	shift	man	man
16	Reassemb								
17	Reassemb								
18	Reassemb						2.5	10	75
19	13.50			13.50	0.65				
20	6.50	3.10	0.50	10.10	7.05				
21	1.70	6.20	off day	7.90	4.10				
22	Sol-cem	5.40	6.10	11.50	8.25				
23	2.40	8.60	3.20	14.20	10.80				
24	Cem	off day	Cem-Cut						
25	6.00	7.70	5.80	19.50	18.05	14	17	27	223
26	9.60	4.20	off day	13.80	12.60				
27	Cem-Cut	9.00	7.30	16.30	14.50				
28	9.80	5.60	8.70	24.10	23.85				
29	9.30	7.00	2.80	19.10	19.10				
March 1	2.80	5.70	5.10	13.60	13.60				
2	6.20	5.80	5.50	17.50	17.00				
3	5.80	6.10	5.90	17.80	16.50	19	20	27	119
4	6.10	5.60	5.60	17.30	16.90				
5	5.80	5.90	5.60	17.30	15.40				
6	4.90	4.20	0.80	9.90	8.60				
7	3.50	3.20	Out-C.P	6.70	5.05				
8	Dismant	Dismant							
9	Transpor					11	14.5	22	110
Total	93.90	93.30	62.90	250.10	212.00	44	54	86	527

Table IV-3-11 Working Time Analysis of the Drilling Operation

Hole NO.	Drilling			Shift		Working man		Working time						
	Bit size	Drilling	Core length	Drilling	Total	Engineer	Worker	Drilling	Other Working	Recovering	Total	Removing	Road construction and others	G. Total
		m	m	shift	shift	man	man	h	h	h	h	h	h	h
MJI—1	3 7/8"	10.00	—	1	4.5	18	130	3°40'	4°50'		8°30'	31°00'		39°30'
	N Q	113.00	104.95	28	35	48	218	126°30'	121°00'	34°00'	281.30'			281°30'
	B Q	77.50	72.85	14	23	52	237	70°40'	48°10'	1°10'	120°00'	17°00'	50°00'	187°00'
	total	200.50	177.80	43	62.5	118	585	200°50'	174°00'	35°10'	410°00'	48°00'	50°00'	508°00'
MJI—2	3 7/8"	9.00	—	1	4.5	18	174	3°30'	5°00'		8°30'	30°00'		38°30'
	N Q	132.00	91.05	31	39	54	343	125°50'	136°00'	16°30'	279°00'			279°00'
	B Q	109.20	104.60	22	26.5	38	242	101°40'	91°40'	39°40'	233°00'	15°30'		248°30'
	total	250.20	195.65	54	74	110	759	231°00'	233°20'	56°10'	520°30'	45°30'		566°00'
MJI—3	3 7/8"	10.00	—	2	13	52	1,126	5°20'	11°40'		17°00'	63°00'	43°00'	123°00'
	N Q	131.00	110.70	28	33	44	115	86°50'	139°50'	37°20'	264°00'			264°00'
	B Q	100.30	100.00	22	40	60	195	88°50'	102°10'	124°30'	315°30'	5°00'		320°30'
	total	250.30	210.70	52	86	156	1,436	181°00'	253°40'	161°50'	596°30'	68°00'	43°00'	707°30'
MJI—4	3 7/8"	7.00	—	0.5	3.5	14	118	2°10'	1°50'		4°00'	26°00'		30°00'
	N Q	143.00	102.35	30.5	60.5	83	445	108°20'	240°30'	132°40'	481°30'			481°30'
	B Q	100.20	83.60	24	27.5	39	159	90°20'	109°00'	6°10'	205°30'	14°30'		220°00'
	total	250.20	185.95	55	91.5	136	722	200°50'	351°20'	138°50'	691°00'	40°30'		731°30'
MJI—5	3 7/8"	12.00	—	1	3.5	14	110	4°30'	4°00'		8°30'	23°00'		31°30'
	N Q	138.00	118.95	23	27	38	261	100°30'	92°10'	24°20'	217°00'			217°00'
	B Q	100.10	93.05	20	23.5	34	156	77°20'	88°40'	1°00'	167°00'	21°00'		188°00'
	total	250.10	212.00	44	54	86	527	182°20'	184°50'	25°20'	392°30'	44°00'		436°30'
Grand Total		1,201.30	982.10	248	364	606	4,029	996°00'	1,197°10'	417°20'	2,610°30'	246°00'	93°00'	2,949°30'

Table IV-3-12 Specification of Diamond Bit Used

Item	Size of bit	Type of bit	Carats per bit	Matrix	Stones per carat	Waterway	Total bit Used
Diamond Bit	75.6 mm	NQ - WL	28 ct	E	25 pcs	4	9 pcs
	79.0 mm	NQ - WL	30	Z	25	4	6
		NQ - WL	30	C	40	4	4
		NQ - WL	30	CE	25	4	4
		NQ - WL	25	IHI8	60 ~ 80	6	2
	60.0 mm	BQ - WL	19	E	25	4	9
	62.0 mm	BQ - WL	20	Z	25	4	10
		BQ - WL	22	C	40	4	4
		BQ - WL	22	CE	25	4	1
Total			※ 1,203				49

E : for ordinary rock   C : for hard rock

Z : for ordinary rock   IHI8 : for Imprignate bit

※ : total amount of diamnd carat

Table IV-3-13 Drilling Meterage of Diamond Bit Used

Item	Size	Bit No.	Drilling meterage by hole Unit : Meter					Total
			MJI-1	MJI-2	MJI-3	MJI-4	MJI-5	
Diamond bit	N Q	P 2217			34.80			34.80
		P 2218			17.50	10.70		28.20
		P 2219			25.20	2.70		27.90
		P 2220				42.80		42.80
		P 2221			27.40		5.00	32.40
		P 2222			26.10			26.10
		38300				27.60		27.60
		38301				18.10		18.10
		38302				21.50		21.50
		38303				19.60		19.60
		40493					27.60	27.60
		40494					30.20	30.20
		40495					29.00	29.00
		40496		15.30				15.30
		40497		12.50				12.50
		181752					46.20	46.20
		181753		26.20				26.20
		181754		29.60				29.60
		181766		27.00				27.00
		181767	30.70					30.70
		181768	17.90					17.90
		181769	26.70					26.70
		181770	21.30					21.30
		28738		21.40				21.40
		28740	16.40					16.40
		Drilling length/bit (657.00/25)						(26.28)
Diamond bit	B Q	N 979			32.30			32.30
		N 980			12.50	7.80		20.30
		N 7189			11.80			11.80
		N 7190			10.50	9.20		19.70
		N 7191			18.70			18.70
		41103			14.50			14.50
		0954				18.10		18.10
		0955				16.70		16.70
		1210				12.10		12.10
		1211				17.50		17.50
		1212				18.80		18.80
		1213					11.30	11.30
		1214					18.20	18.20
		1215					16.50	16.50
		P 6317					28.60	28.60
		P 6318					25.50	25.50
		P 6319		21.00				21.00
		P 6320		19.20				19.20
		P 6321		24.80				24.80
		172685		27.60				27.60
		172686		16.60				16.60
		172687	24.60					24.60
		172688	28.10					28.10
		172689	24.80					24.80
		Drilled length/bit (487.30/24)						(20.30)
Total		Drilled length						1,144.30
		Drilled length/bit (1,144.30/49)						23.35

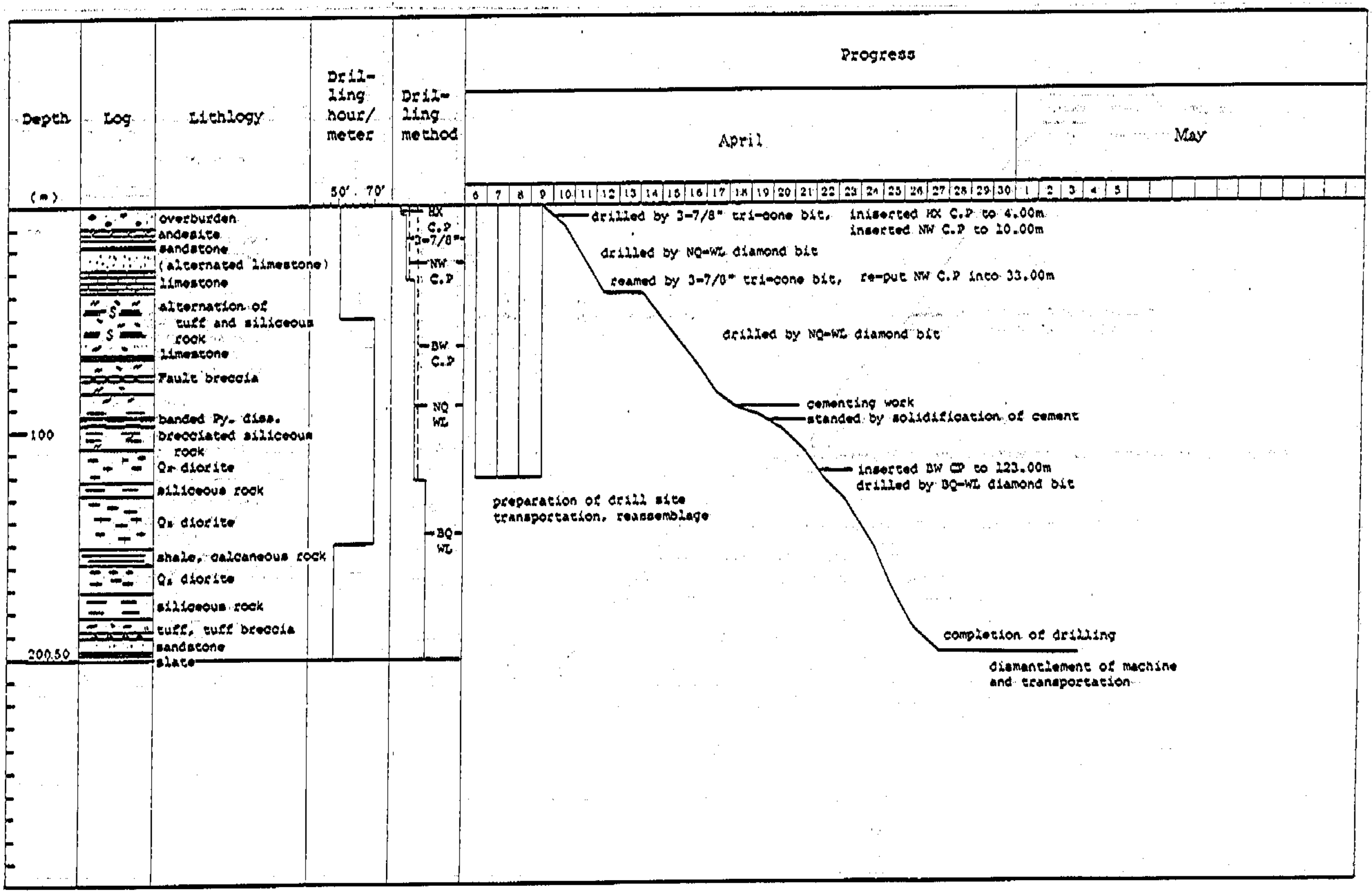


Fig. IV-3-1 Drilling Progress on MJI-1

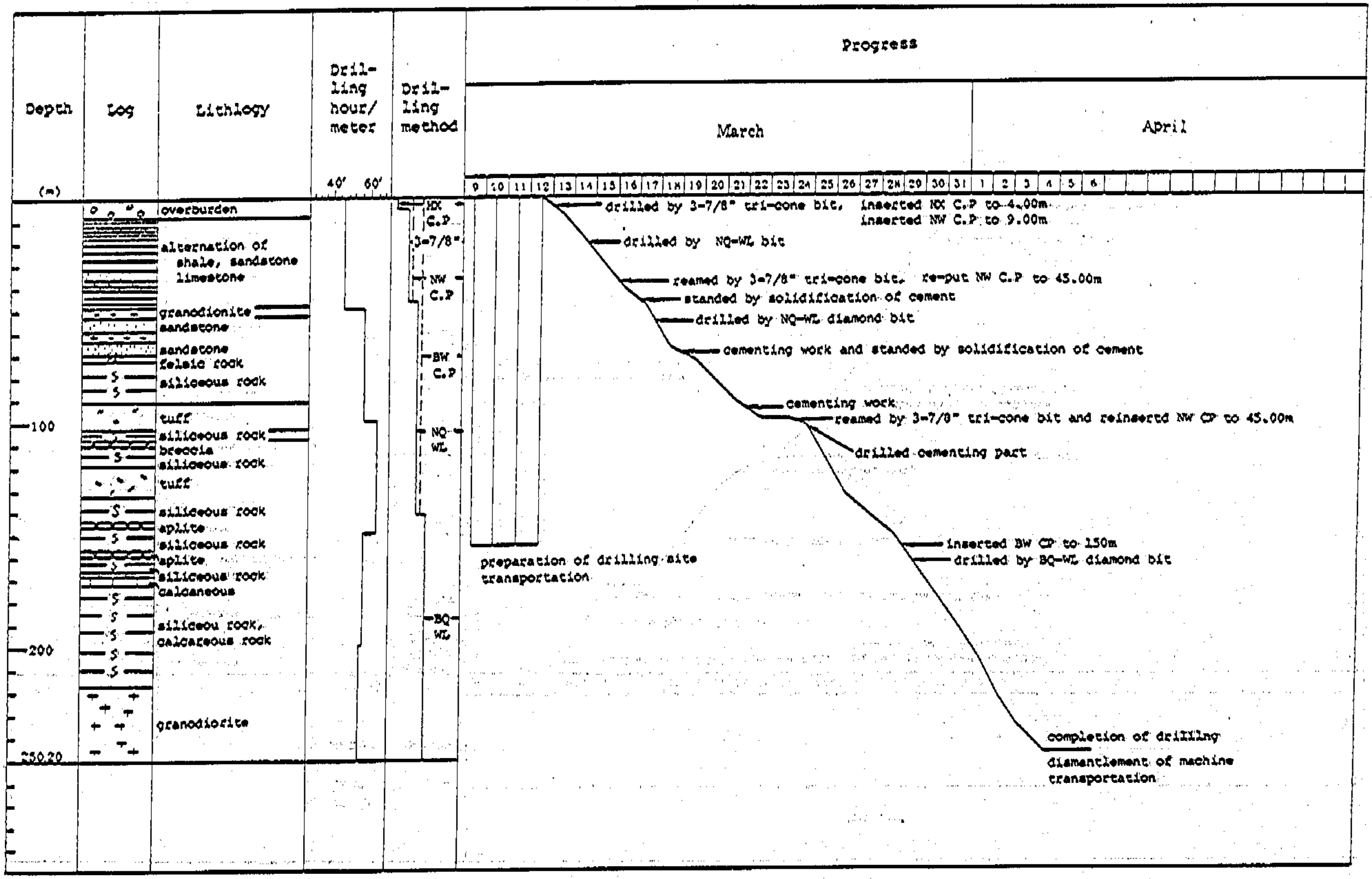


Fig. IV-3-2 Drilling Progress on MJI-2

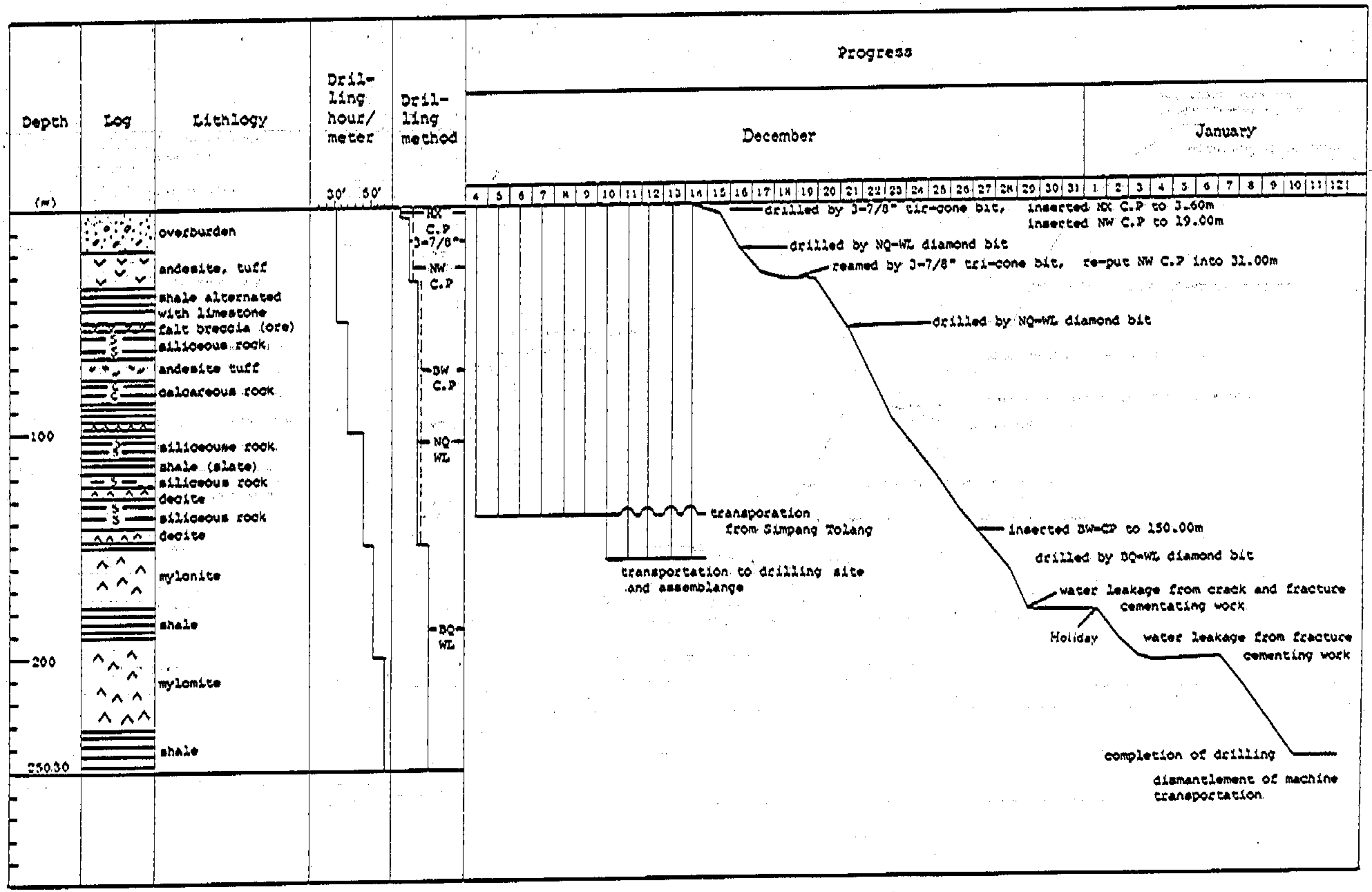


Fig. IV-3-3 Drilling Progress on MJI-3

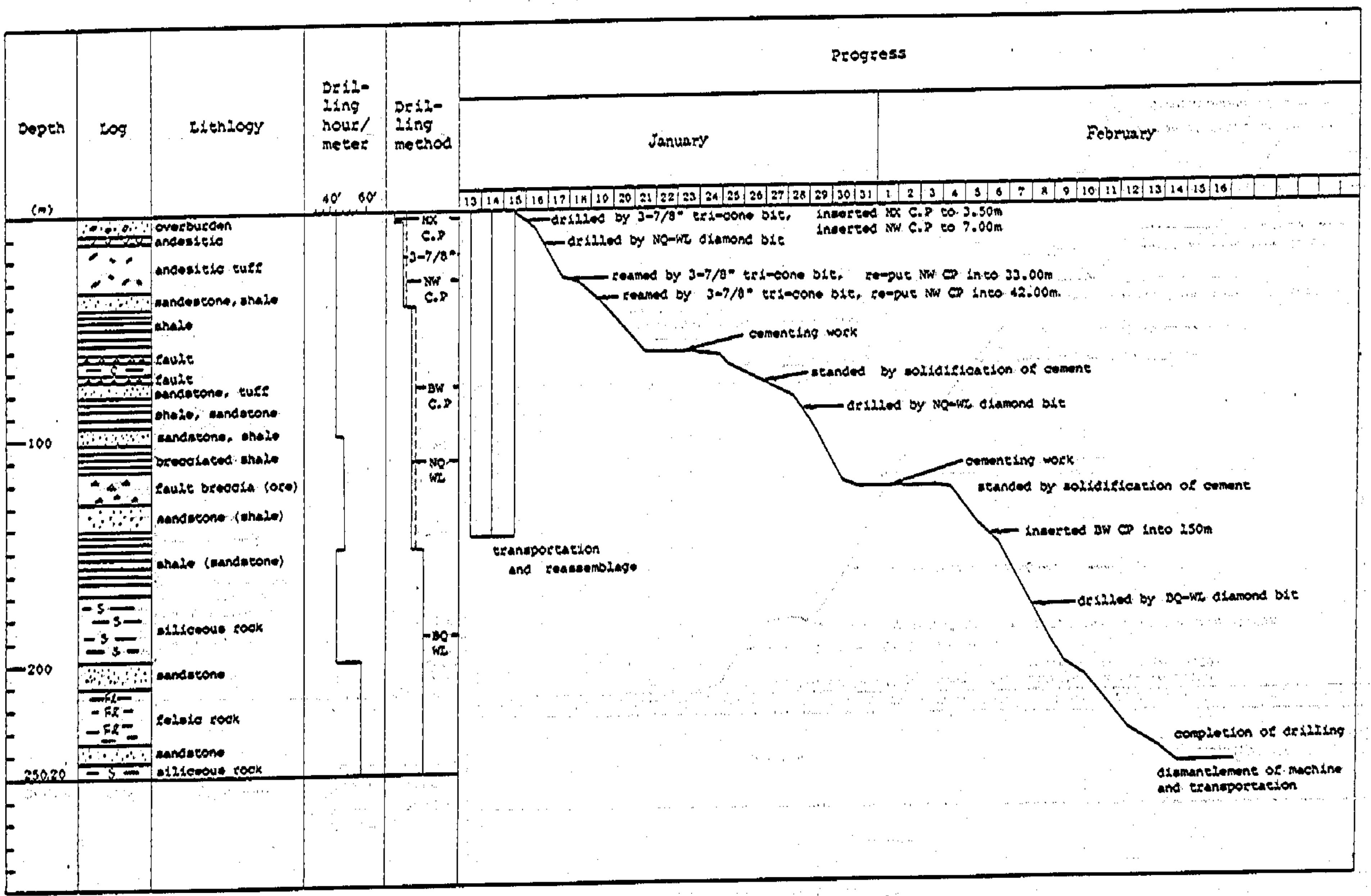


Fig. IV-3-4 Drilling Progress on MJI-4

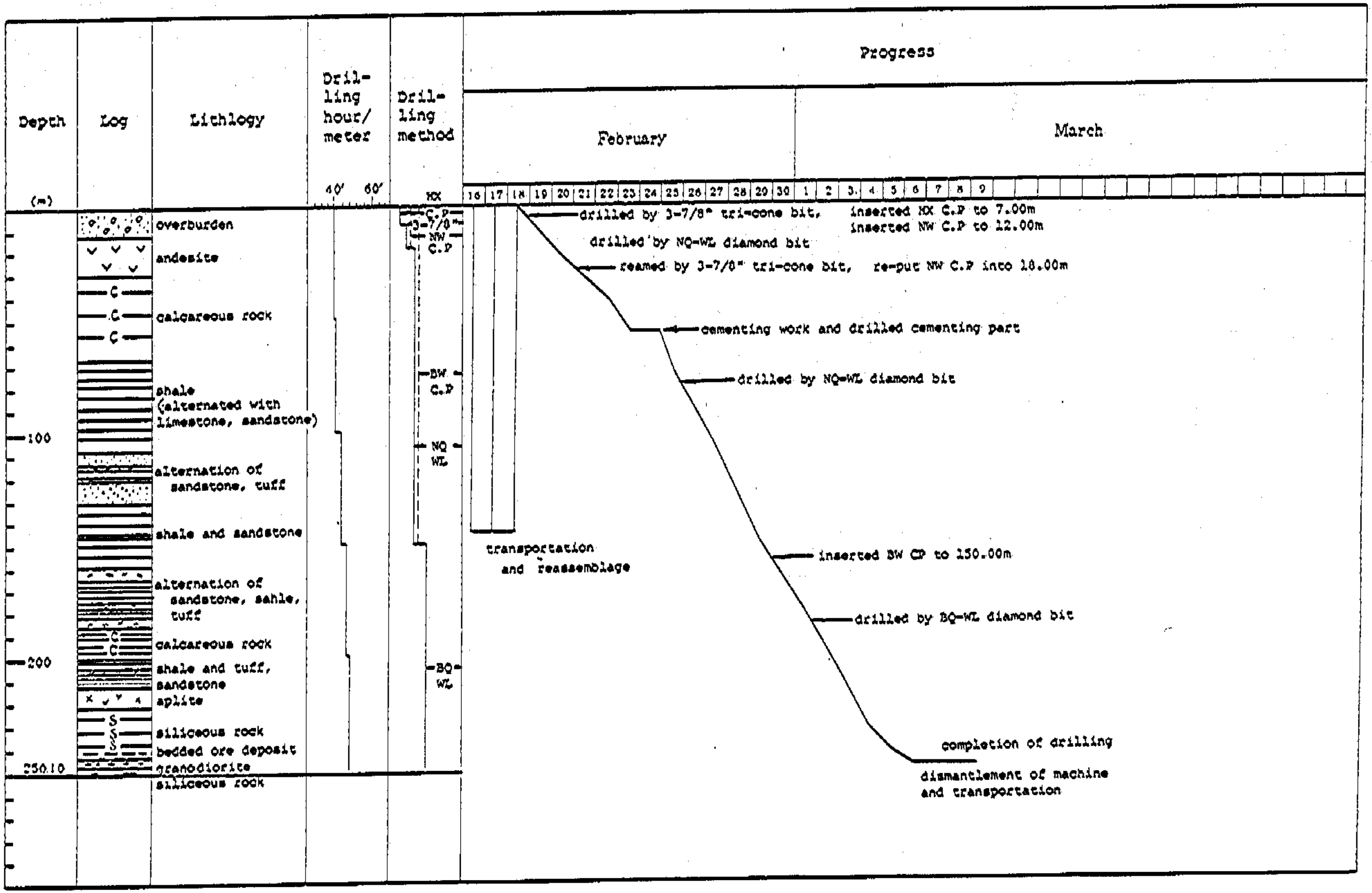


Fig. IV-3-5 Drilling Progress on MJI-5

3-2 GEOLOGY AND THE RESULTS OF MICROSCOPIC OBSERVATION

3-2-1 Site MJI-1

The columnar section of the drill core is shown in Fig. IV-3-1. The lithology of the section is as follows.

0-10m depth: Top soil and andesite boulders.

10m-40m depth: Mainly sandstone, calcareous rocks and shale. Green skarn observed in limestone at 31.80m-34.30m.

40m-99m depth: Mainly acidic rocks (quartz diorite, aplite, granodiorite), siliceous rocks and hybrid rocks. Alternation of tuff, calcareous rocks and shale is observed in places. Microfolding of calcareous rocks is observed at 67m-68m. There is a fault breccia zone at 76m-78m. Weak pyrite dissemination is observed throughout and fine-grained magnetite is observed near 92m.

99m-183m depth: Mainly acidic rocks (quartz diorite, granodiorite) and siliceous rocks. Pyrite dissemination is observed throughout. Quartz veins (0.10m-0.05m) and quartz vein network is observed in some parts of the acidic rocks. Green skarn is observed in calcareous rocks at 153m-158m and in siliceous rocks at 171m-183m.

183m-200.50m depth: Mainly tuff (tuff breccia, sandy tuff, fine-grained tuff), shale and sandstone. Parts of the shale is phyllitic.

Microscopic observation of rocks

S12 (93.00m depth) is somewhat pelitic fine-grained tuff consisting of fine quartz, plagioclase, calcite fragments and clay minerals. It has unclear foliation.

Microscopic observation of ores

D26 (91.10m depth) is an ore consisting mainly of massive pyrite. Some chalcopyrite and pyrrhotite are observed under the microscope. D25 (93.10m depth) is a disseminated ore in silicified epidote skarn. Pyrite, sphalerite and minor amounts of chalcopyrite, galena and pyrrhotite are observed.

3-2-2 Site MJI-2

The columnar section of the drill core is shown in Fig. IV-3-2. The lithology of the core is as follows.

0-9m depth: Top soil.

9m-49m depth: Mainly sandstone, shale and calcareous rocks, partly slate and phyllite.

49m-62.70m depth: Mainly acidic and hybrid rocks. The origin of the hybrid rocks is difficult to determine because it is intruded by acidic rocks. Schistose structure and microfolds are observed in parts of there rocks.

62.70m-90m depth: Mainly sandstone, felsic rocks and siliceous rocks.

90m-110m depth: Mainly acidic, hybrid and siliceous rocks. Between 106m and 110m is a fractured zone and the hard shale is brecciated and argillized.

110m-170m depth: Mainly acidic rocks, green siliceous rocks and calcareous rocks. The calcareous rocks (partly siliceous) is significantly green-skarnized. The mineralization is mainly pyrite dissemination and occurs accompanying quartz veins (111.30m-111.80m, 160.90m-161.05m) and also as banded ore in the skarn zone (136.20m-136.80m, 139.50m-140.20m, 142.50m-143.30m, 146.00m-146.80m, 148,00m-149.50m, 155.60m-157.00m). In both types of mineralization, pyrite and pyrrhotite are the only ore minerals which can be identified by the unaided eyes.

170m-218.50m depth: Mainly siliceous and calcareous rocks. Parts of these rocks have suffered strong silicification and have altered to chert. Also skarnization is observed in parts of calcareous rocks. Quartz veins (width 0.25m-0.05m) are observed particularly between 204m and 218m.

218.50m-250.20m depth: Mainly hybrid, siliceous and acidic (quartz diorite) rocks.

Microscopic observation of rocks

S11 (126.00m) is dacitic tuff. Quartz, plagioclase and clay forms the matrix and dacite and pumic fragments, plagioclase and mafic minerals are observed.

Microscopic observation of ores

P20 (53.70m), P21 (112.50m) and P22 (139.00m) are all disseminated ores. The major mineral is pyrite with some pyrrhotite and minor amounts of chalcopyrite and sphalerite.

S24 (226.00m) is a disseminated ore from silicified epidote skarn. Pyrite, pyrrhotite and small amount of chalcopyrite are observed microscopically.

3-2-3 Site MJI-3

The columnar section of the drill core is shown in Fig. IV-3-3. The lithology of the section is as follows.

0-17.00m depth: Mainly soil and andesitic pyroclastic rocks.

17.00-34.00m depth: Dark brown to dark green andesite with quartz veinlets and quartz network transecting through-out the rock. Severely fractured.

34.00m-65.00m depth: Mainly sedimentary rocks (shale, sandstone, limestone, tuff). Mineralized zones were confirmed at 34.50m-38.40m, 53.70m-54.30m and 58.90m-60.00m.

Fine-grained ore minerals are disseminated in the mineralized zone at 34.50m-38.40m. The host rock of this zone is argillized and fractured mudstone (partly sandstone, limestone). It is difficult to identify the ore minerals by the unaided eyes.

The mineralized zones at 53.70m-54.30m and 58.90m-60.00m occur in the fault breccia zone and massive ores rich in lead and zinc are observed. Brecciated ores with 5cm of fault dray are found in the cores.

65.00m-75.60m depth: Andesite with well-developed joints. Chloritization is intense along the joint planes.

75.60m-109.40m depth: Mainly calcareous rocks (partly silicified), limestone, hard shale with minor amount of phyllitic rocks. Fractured and argillized zones are observed in some places.

109.40m-149.00m depth: Mainly siliceous rocks accompanied in some places by quartz veins (width 0.30m-0.10m). Also andesite sills and dacite dykes occur occasionally. Weak dissemination of pyrite and magnetite are observed at 120.00m-145.00m.

149.00m-190.00m depth: Mainly siliceous rocks with quartz vein network in some places. Also semi-spherical core of 0.25m width was obtained at 182.25m. This is interpreted as being the result of drilling through the outer part of a vug. The inner side of the vug is covered by fire (1-2mm) comby crystals of quartz. Weak pyrite mineralization is observed at 149.00m-152.50m and 162.00m-186.00m.

190.00m-250.30m depth: Mainly siliceous rocks (massive, schists), hard shale, hybrid rocks with some intrusion of granitic rocks (aplite, granodiorite). Contact metasomatism is conspicuous near the granitic intrusion and the lithology becomes complex making identification of the rocks by unaided eyes difficult.

As for mineralization, weak pyrite (magnetite, pyrrhotite etc.) dissemination and veinlet network is observed at 200.00m-210.00m and 218.00m-231.60m.

Microscopic observation of rocks

S1 (66.50m) is dacitic sandy tuff. Quartz, clay and mafic minerals form the matrix and siliceous fragments, quartz, mafic minerals and minor amounts of plagioclase are observed. S2 (139.60m) is dacitic tuff. Quartz, clay and iron minerals form the matrix and quartz, plagioclase, iron mineral fragments and some mafic minerals are observed. Both S1 and S2 contain chlorite, sericite and epidote as secondary minerals. S3 (166.50m), S4 (191.50m) and S5 (217.50m) are all mylonitic rocks with cataclastic structure the constituent minerals are quartz, plagioclase and mafic minerals. They are fractured and some quartz are recrystallized.

As for original rocks, S5 retains some coarse-grained plagioclase and quartz with banded structure and it is tonalite or granodioritic rock, while S3 and S4 is finer-grained and it is most probably dacitic tuff. S6 (248.50m) is slate and contains muscovite, quartz, carbonates and minor amount of plagioclase in banded arrangement.

Microscopic observation of ores

P7 (35.50m), P8 (71.80m), P9 (144.60m) and P10 (225.70m) are all pyrite and pyrrhotite dissemination ores and contain minor amount of galena, sphalerite and chalcopyrite.

S23 (54.00m) is a massive ore consisting mainly of pyrite and arsenopyrite with minor content of chalcopyrite, shalerite and galena. The chalcopyrite occurs as small exsolution dots or lamellae in sphalerite.

3-2-4 Site MJI-4

The columnar section of the MJI-4 drill core is shown in Fig. IV-3-4. The lithology of the section is as follows.

0-7.00m depth: Soil and andesite boulders.

7.00m-24.80m depth: Brown andesite to andesitic tuff with quartz veins, veinlets and network dissecting throughout the core. Andesit is well-jointed.

24.80m-29.80m depth: Tuff breccia and brecciated andesite.

29.80m-50.10m depth: Sedimentary rocks consisting mainly of black shale. Mineralization is almost non-existant between 7.00m and 50.10m.

50.10m-114.80m depth: Siliceous rocks, calcareous rocks, hard shale, siliceous and sandy tuff. Fractured and argillized throughout the zone. Fracturing and argillization are particularly strong at 50.10m-53.90m, 61.00m-72.80m and 106.30m-111.00m. Slickenside was observed in the fault zones at 61.00m-61.50m, near 65.00m, 71.00m and others. Quartz vein network is particularly developed at 80.50m-105.00m.

Pyritization is the major mineralization and finegrained pyrite is disseminated in most of the fractured and argillized zones. The pyritization is relatively strong at 50.10m-51.90m and the zone 71.00m-72.80m consists of galena and pyrite dissemination.

114.80m-127.60m depth: Hit ore deposits. It is dissemination of fine-grained ore minerals including brecciated massive ore (Zn, Pb rich) dragged by fault. The host rock is siliceous at 114.80m-121.60m, shale at 121.60m-123.90m and calcareous rocks at 123.90m-127.60m. Fig. IV-3-5 is the sketch of the boundary of the deposit as seen in the core (116.20m-131.90m).

127.60m-191.20m depth: Green siliceous rocks, sandstone, hard shale and slate. Quartz veinlets occur along the microfolds of the hard shale. Also quartz network is observed in places at 152.40m-170.00m. As for mineralization, weak dissemination of pyrite and magnetite is observed.

191.20m-250.20m depth: Siliceous rocks, felsic rocks, sandstone, hybrid rocks and aplite. Chloritization is strong in siliceous and hybrid rocks. Mineralization of this part is weak pyrite mineralization.

Microscopic observation of rocks

S7 (49.00m) is slate with banded arrangement of biotite, muscovite and minor amounts of plagioclase and quartz. Some chlorite is also present. S8 (118.50m) is green skarn with epidote, pyroxene, calcite and sericite. Minor amounts of sphalerite and pyrite is associated.

Microscopic observation of ores

P11 (122.30m) and P12 (124.10m) are the lower I mineralized zone of the Pagar Gunung Deposit consisting of chalcopyrite, pyrite, sphalerite and galena. Chalcopyrite occurs as small exsolution dots and lamellae in sphalerites.

3-2-5 Site MJI-5

The columnar section of drill core MJI-5 is shown in Fig. IV-3-6. The lithology of the section is as follows.

0-12m depth: Soil and andesite boulders.

12m-29.20m depth: Dark green andesite, generally massive.

29.20m-84.50m depth: Mainly sedimentary rocks (calcareous rocks, hard shale, sandstone and tuff breccia). Skarnization is observed through the core and the mineralization is weak pyrite dissemination.

84.50m-108.00m depth: Mainly shale and limestone. There are local microfolds (96.50m-98.70m); fault breccia zone (near 84m and 87m) and argillized zones. Relatively large mineralization occurs at 84.50m-85.10m, 88.50m-89.40m and 106.00m-106.80m. The mineralization consists of dissemination of fine-grained pyrite and galena (?) which is difficult to identify by the unaided eyes. The host rocks are sandstone and calcareous rocks.

108m-129.70m depth: Mainly coarse-grained tuff, fine-grained tuff and sandstone.

129.70m-159.00m depth: Mainly calcareous rocks and slate. Quartz vein network is developed throughout the core. Zone of fault fractures and microfaults are observed near 130m and 140m respectively. Mineralization is weak dissemination of pyrite.

159.00m-194.70m depth: Mainly calcareous rocks, coarse-grained tuff, sandstone and slate. Quartz veins are observed near 176m and quartz network near 180m. Microfolds are observed near 189m. The larger mineralized zones in this core are as follows.

Depth (m)	Width (m)	Host rock	Mineralization
170.60-170.80	0.20	Slate	Dissemination (Pb, Zn, cp, py) accompanied by veinlets
175.50-176.00	0.50	Sandstone	Dissemination (py) accompanied by quartz vein network
190.40-191.40	1.00	calcareous rocks	Dissemination (Zn, Pb, cp, py)
191.40-192.60	1.20	calcareous rocks	Dissemination (Zn, Pb, cp, py)

194.70m-250.20m depth: The upper part consists mainly of sedimentary rocks and the lower part of acidic rocks (granodiorite, aplite etc.). The sedimentary rocks near the contact with the acidic rocks is hybridized and the identification of the original rocks is difficult because of silification and microfolding. Also chloritization is generally observed. There is a mineralized zone at 241.40m-242.20m which consists of banded ore. The major ore mineral is pyrite accompanied by sphalerite and galena. The host rock is green siliceous rocks.

Microscopic observation of rocks

S9 (186.00m), S10 (196.00m) are both dacitic sandy tuff. The matrix consists of quartz, plagioclase, calcite and clay. Dacite fragments, quartz, plagioclase, calcite and other mineral fragments are observed.

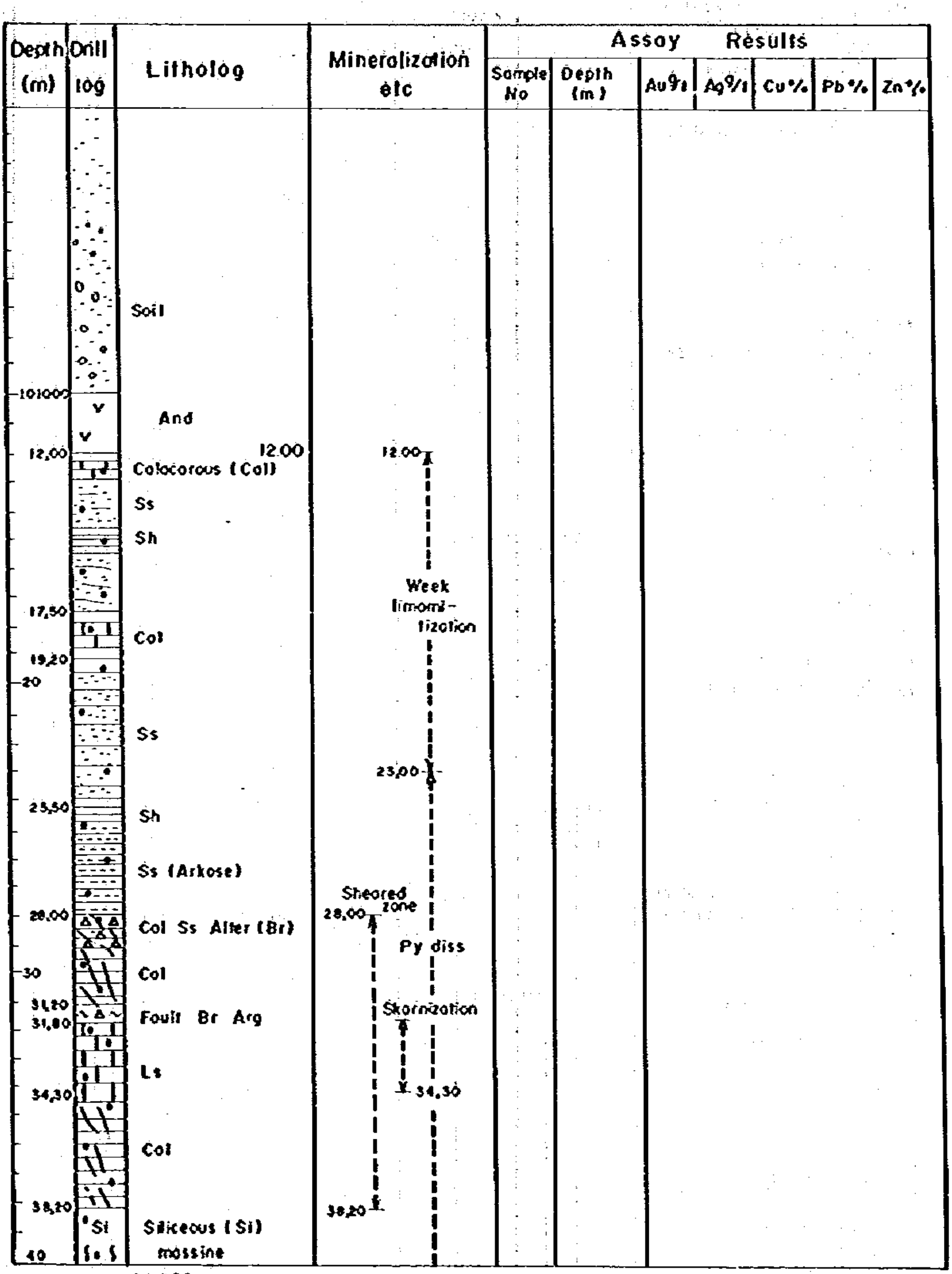
Microscopic observation of ores

I. P17 (190.60m) and P18 (241.60m) are massive ores which will be described later. They consist of sphalerite, pyrrhotite, pyrite, chalcopyrite and galena. Chalcopyrite occurs as exsolution dots and lamellae in sphalerite.

II. P19 (24.00m) is a banded ore which will be described later. It consists mainly of pyrite accompanied by minor amount of sphalerite. These minerals are arranged in banded structure.

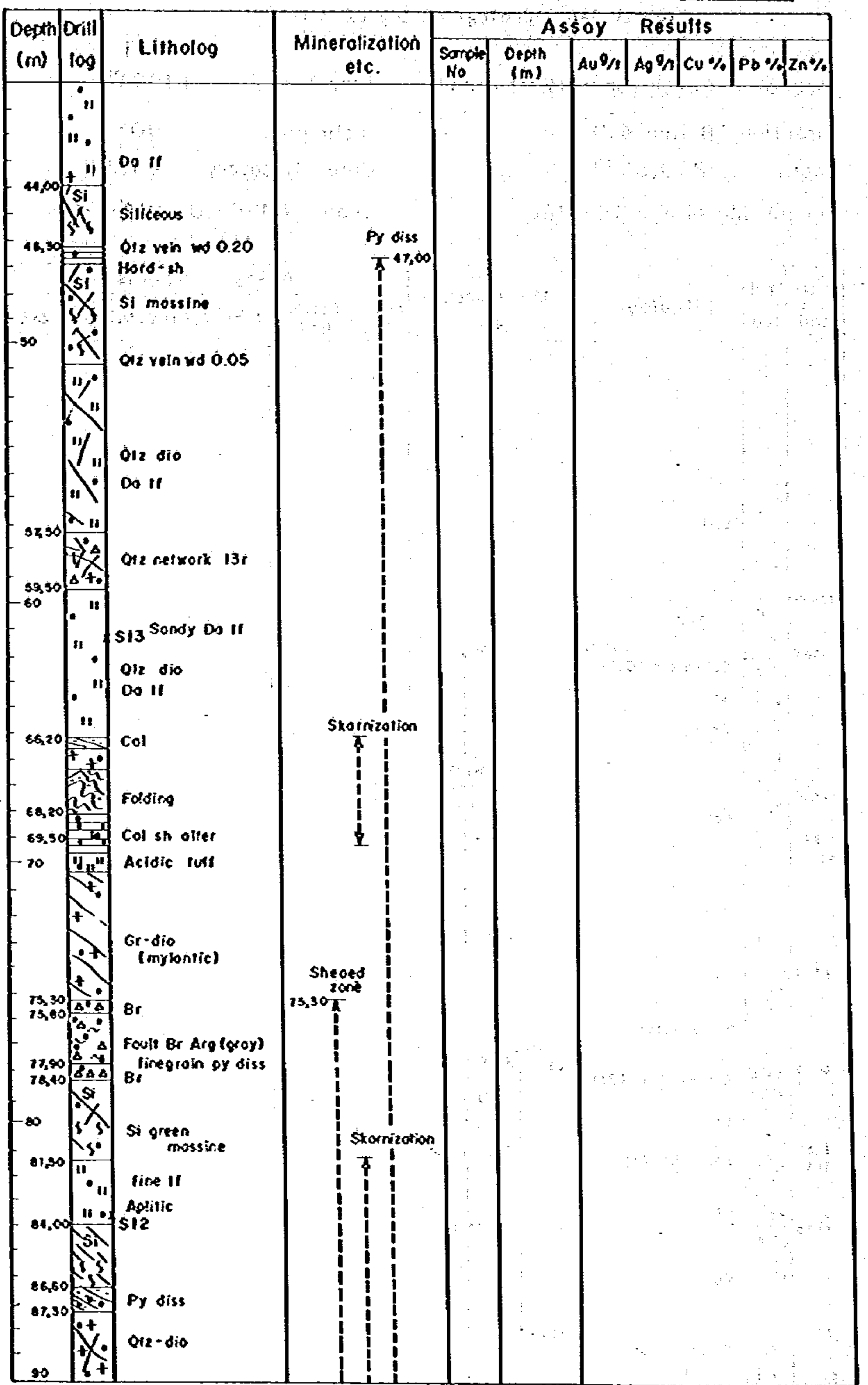
Fig. IV-3-6 . Geological Log of MJI-1

Location	: Pogor gunung (West Area)	Elevation	: 1190 m
Direction	: B line 4,0	Inclination	: 90°
Depth	: 200,50 m	Core Recovery	: 93,3%
Boring Machine	: OE-8BL	Team	: 84'-4-10 ~84'-4-27



1:200

MJ 1-1


Depth (m)
Drill log
Litholog
Mineralization etc.
Assay Results
Sample No
Depth (m)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
44,00
46,30
50
57,50
59,50
60
66,20
68,20
69,50
70
75,30
75,60
77,90
78,40
80
81,50
84,00
86,60
87,30
90
Si
Do tf
Siliceous
Qtz vein wd 0.20
Hard-sh
Si massive
Qtz vein wd 0.05
Qtz dio
Do tf
Qtz network 13r
S13
Sandy Do tf
Qtz dio
Do tf
Cal
Folding
Cal sh alter
Acidic tuff
Gr-dio
(mylontic)
Br
Fault Br Arg (gray)
finegrain py diss
Br
Si green
massive
fine tf
Aplitic
S12
Py diss
Qtz-dio
Py diss
47,00
Skarnization
Sheared zone
75,30
Skarnization
1: 200

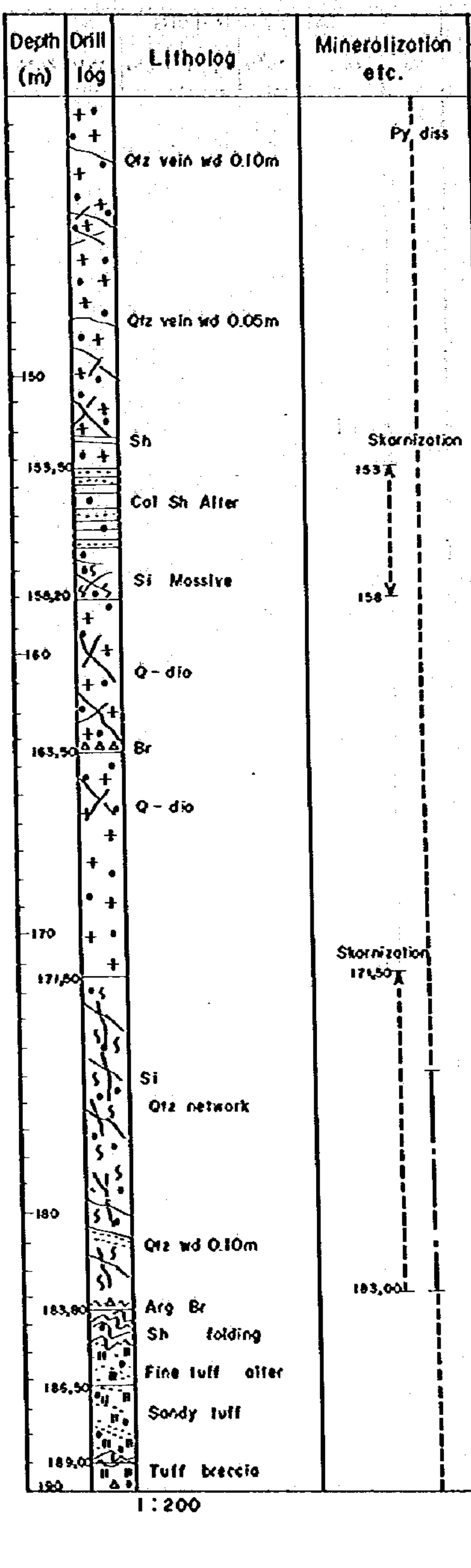
M J I - I

Depth (m)	Drill log	Litholog
		P26 Skarne
91,10		Col Banded Py diss
91,70		Complex
92,50		P25 Py magnetite
		Si . Br
95,00		Col
	Si	
		Si Shloritezation massive
99,30		
100		Gra - dio (Mylonitic)
103,60		Si Br
106,00		Si massive
109,00		Br Arg goma (Calcite crystal)
110		Qtz network
		Qtz - dio
		Qtz filinvein
120		
122,00	Si	Si Br
123,00		Fault? Ss (Silem)
125,00	Si	Si Br
127,30		Si massive
128,90		Py diss
130		Aplitic — Fine grain Py diss
		Qtz vein wd 0.05m
		Qtz vein wd 0.05m
		Qtz network
		Q - dio
140		

Mineralization etc.	
Sheared zone (to 127,00)	Py diss
Skarnization	

Assay Results						
Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %

1 : 200



1 : 200

Assay Results						
Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A33	181,70 ~182,30	<0.1	0.2	0.03	tr	0.01

Depth (m)	Drill log	Litholog	Mineralization etc.	Assay Results: Sample No	Depth (m)	Au g/t	Ag g/t	Cu%	Pb%	Zn%
		Ss Massive	Py diss							
194,00		Sh (Phyllitic)								
194,80		Ss								
197,70		Tuff Breccia								
199,40		Qtz vein ¥d 0.10m	199,40							
200		Sh (Phyllite)								
		200,50m								

INDEX

Symbol	Name	Symbol	Name
	Soil	Q-dio	Quartz-Diorite (Granitoid rock)
Ss	Sandstone	gr-dio	Granodiorit (Mylonite)
Ls	Limestone	Comp	Complex rock
Sh	Shale	Br	Breccia
Sl	Slate	Arg	Argillization
Fl	Felsic rock	Sili	Silicification
Cal	Calcarous rock	Qtz	Quartz Vein & network
Si	Siliceous rock		Massive Ore
Tf	Tuffaceous rock	diss	Dissemination
Da	Dacitic rock		Thin Section (Sample No.)
And	Andesitic rock		Polished Section (Sample No.)
Ap	Aplitic rock		Assay (Sample No.)

1:200

Fig. IV-3-7 Geological Log of MJI-2

1

Location : Pagar gunung (West Area)

Elevation : 1175 m

Direction : C line 4,0

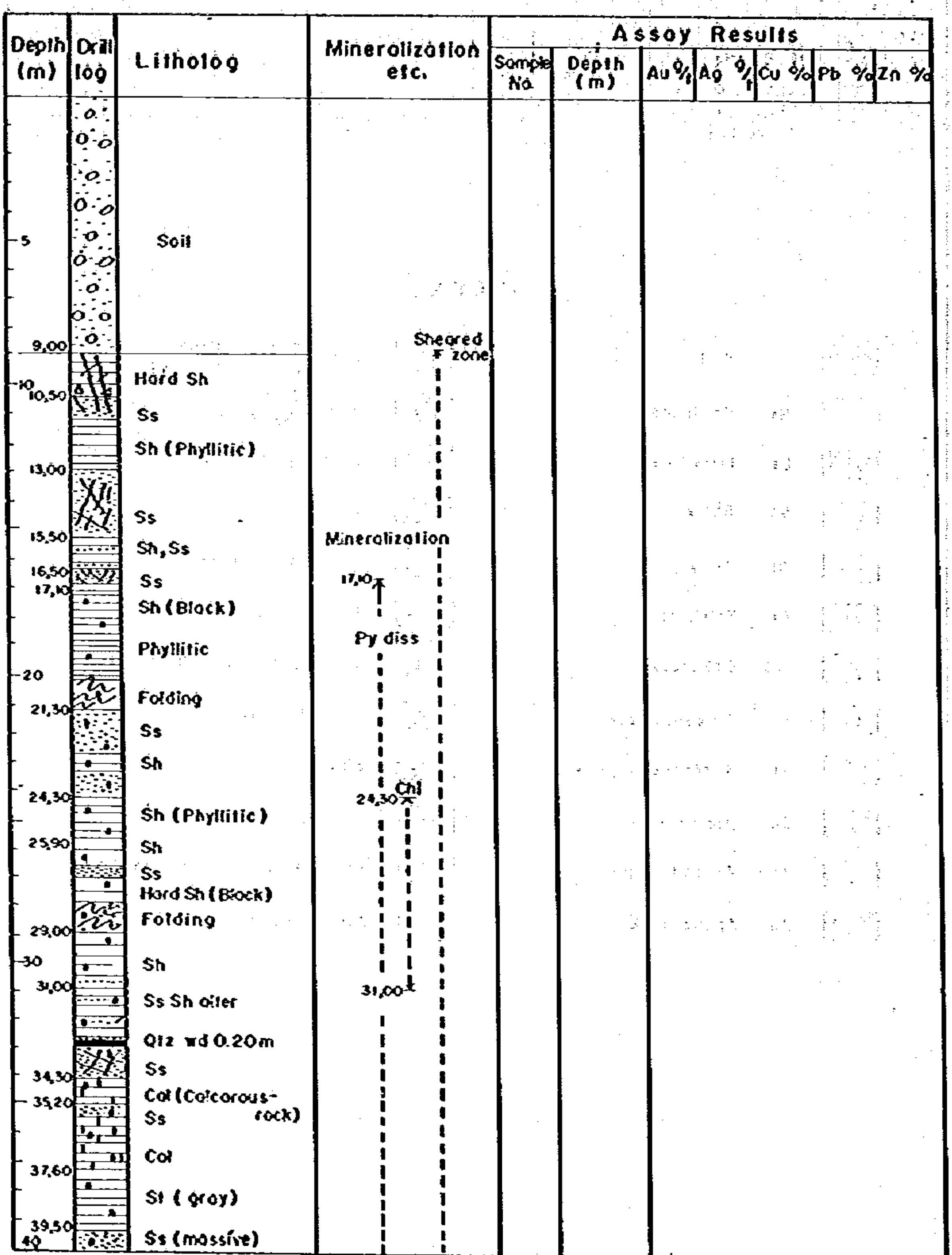
Inclination : 90°

Depth : 250,20 m

Core Recovery : 81,1 %

Boring Machine : OE-8 BL

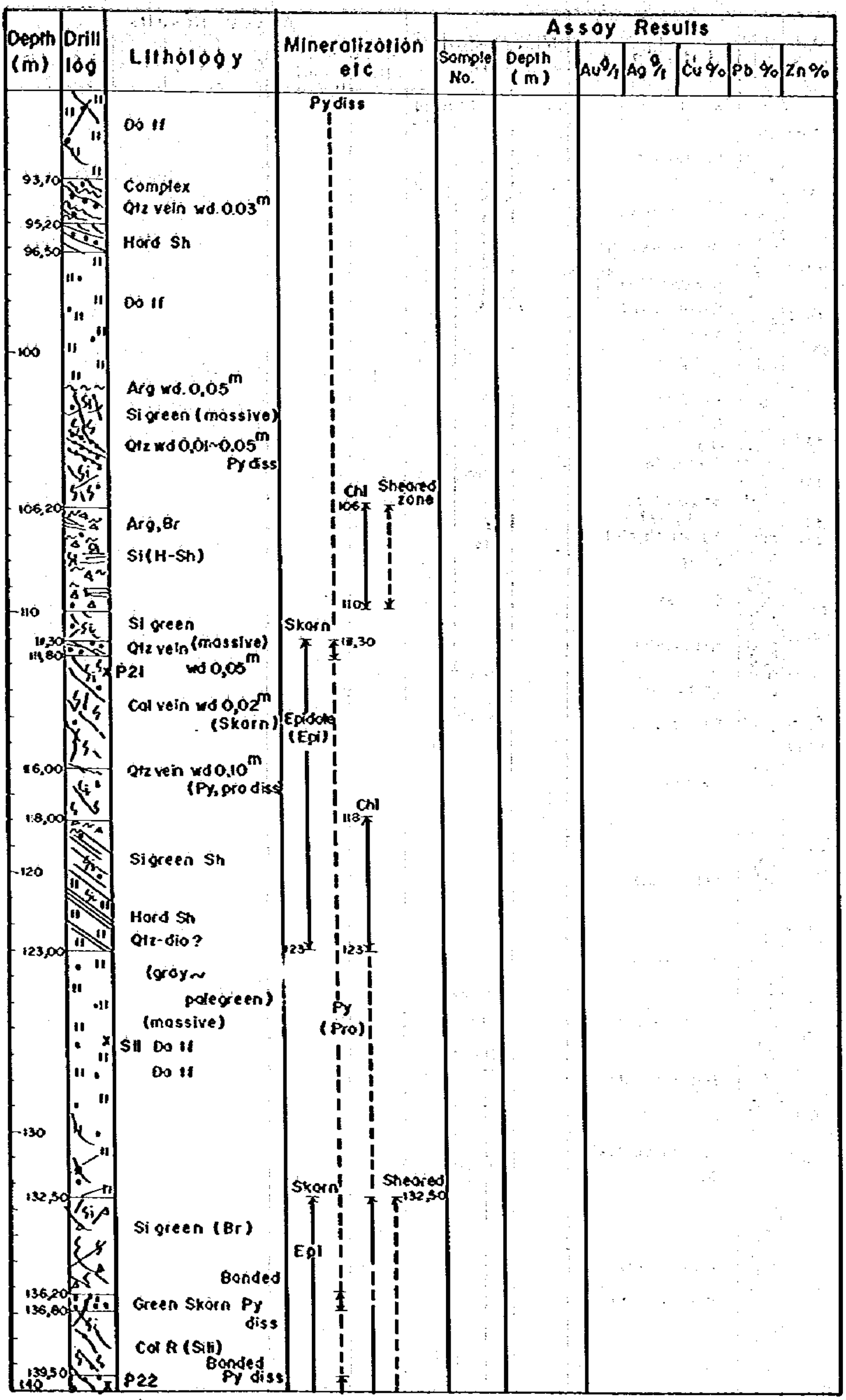
Term : 84'-3-13~84'-4-4



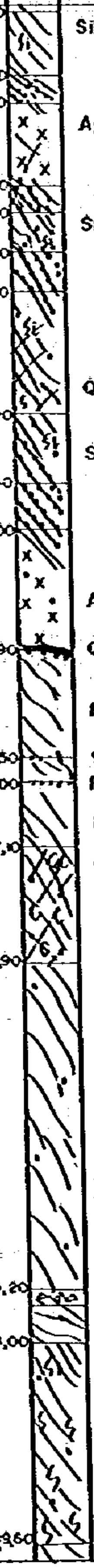
1:200

Depth (m)	Drill log	Lithology	Mineralization etc	Assay Results: Sample No.	Depth (m)	Au %	Ag %	Cu %	Pb %	Zn %
		Ss, Sl alter	Sheared zone							
41,50		Ss massive								
44,00		Col Folding	Chloritization; 44,50							
		Sl (dark gray)								
47,00		Qtz Vein (0,05^m)								
48,90		Ss, Sl altered	48,90							
		Ss								
50		Do ff								
		Complex								
		Gr my								
53,60		P20 Arkose Ss								
55,00		Ss (Br, Arg) (gray)	55,00							
56,70		Ss Qtz Veinlet	Py diss							
57,40		Do ff								
60		Complex								
61,00		Qtz Veinlet								
62,70		Sh, Ss alter	62,70							
64,30		Ss massive	65,00							
65,20		Ss, Sili								
69,20 / 70		Felsic rock								
72,00		Si massive								
75,00		Ss (Br, Arg)	75,00							
76,20		Si green (Chl)	76,20; Chl							
79,50 / 80		Ss								
81,10		Hard Sh (Black)								
		Do ff	81,50							
		Si (massive) (Granitic rock)								
90			89,00; 90,00							

1:200


Depth (m)
Drill log
Lithology
Mineralization etc
Assay Results
Sample No.
Depth (m)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
Py diss
Do !!
93,70
Complex
Qtz vein wd 0.03m
95,20
Hard Sh
96,50
Do !!
100
Arg wd 0,05m
Si green (massive)
Qtz wd 0,01~0,05m
Py diss
Chl
Sheared zone
106
106,20
Arg, Br
Si (H-Sh)
110
110
Si green
Skarn
Qtz vein (massive)
111,30
111,80
wd 0,05m
P21
Cal vein wd 0,02m
(Skarn)
Epidote
(Epi)
116,00
Qtz vein wd 0,10m
(Py, pro diss)
Chl
118,00
118
120
Si green Sh
Hard Sh
Qtz-dio ?
123,00
123
123
(gray~
palegreen)
(massive)
Py
(Pro)
Sil Do !!
Do !!
130
Skarn
Sheared
132,50
132,50
Si green (Br)
Epi
Banded
136,20
136,80
Green Skarn Py diss
Cal R (Sili)
Banded
139,50
140
P22
Py diss

1:200



Depth (m)	Lithology	Mineralization etc	Sample No.	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
140,20	Siliceous Rock (Felsic)	Skarn, Col, Py diss							
142,50									
143,30	Aplitic R								
146,00	Banded Py diss		A31	146,00 ~146,80	<0.1	0.2	0.01	tr	0.01
146,80	Si(Col)								
148,00	Banded Py diss (massive)								
149,50									
150	Qtz vein wd 0,05 ~0,02 m								
153,20	Si(Col)								
155,60	Banded Py (Pro) diss	Sheared zone							
157,00		157							
	Aplitic								
160									
160,90	Qtz Vein wd 0,15m Py rich								
	Felsic (Cherty)								
164,50	gono								
165,00	Py diss (Skarn)	165							
	Felsic								
167,10	Col (Sili) massive	167 Epi							
170		170							
170,90	Col (Sili) (Cherty) (gray ~ pale green) (Cherty)								
180									
181,20	Qtz Vein wd 0,10m Py diss								
183,00	Si (Cherty R) (gray)								
189,60		Skarn 189,60							
190									

1:200

Depth (m)	Lithology	Mineralization etc
	Siliceous green rock	Pydiss
195,70	Cal (Sili)	Skarn
197,60		Sheared Zone 198,00
198,20	Si (Br, Arg)	
200		
202,00	Cal (Sili) (massive)	202,00
	Qtz vein wd 0,05m	
	Qtz vein wd 0,10m	
207,00	Cal, Ss alter	
	Si (massive)	
210		
210,70	Cal	
211,20	Fault Br wd 0,10m	
	Qtz vein wd 0,25m	
	Qtz vein wd 0,10m	
217,00	Cal Qtz veinlet	
218,50		
220	Complex rock (Sili) (massive)	
	P24	
229,00		
230	Siliceous rock (Banded)	
231,50	Qtz film vein	
	Siliceous (massive)	
239,00	Granodiorit	
240		

1:200

Sample No.	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A32	210,70 ~ 211,20	<0.1	0.5	0.02	0.02	0.52

Depth (m)	Drill log	Lithology	Mineralization etc	Assay Results						
				Sample No	Depth (m)	Au g/t	Ag g/t	Cu%	Pb%	Zn%
		Granodiorite								
		Qtz Vein wd 0,20 m								
		Qtz Vein wd 0,20 m								
250		250,20 m								

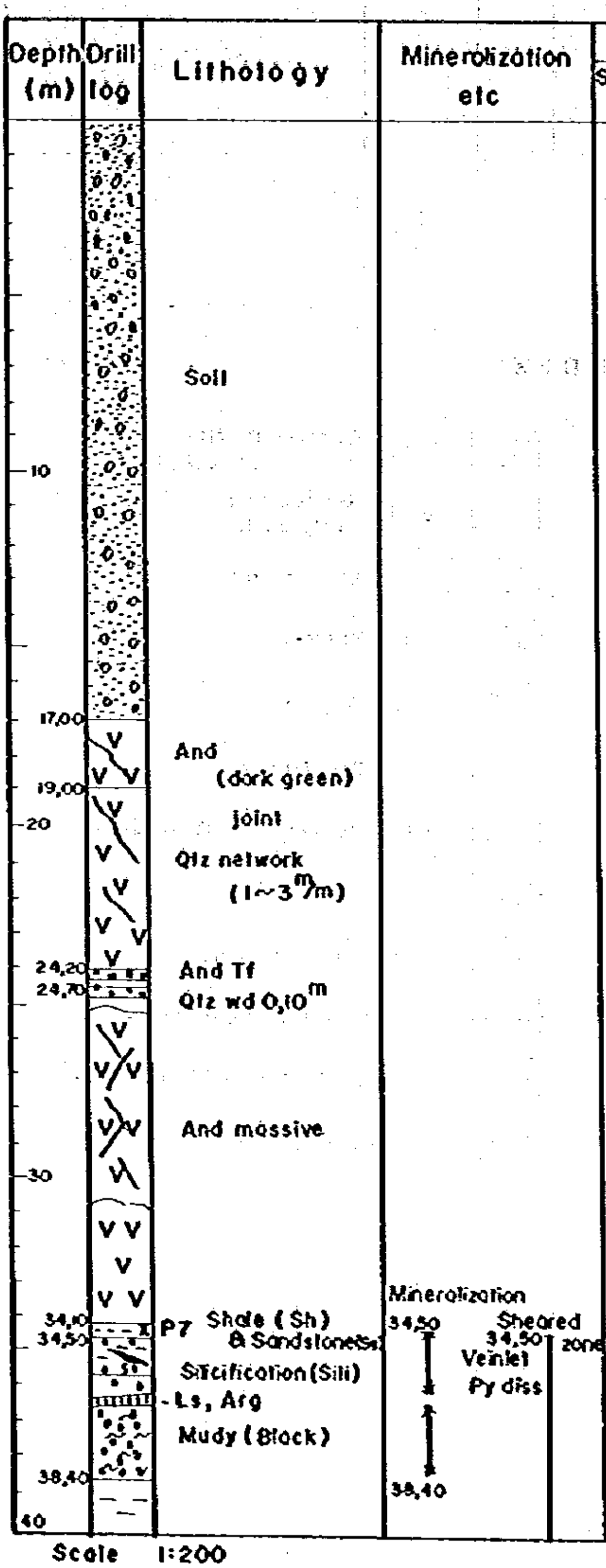
INDEX

		Soil
	Ss	Sandstone
	Ls	Limestone
	Sh	Shale
	Sl	Slate
	Fl	Felsic rock
	Cal	Calcarous rock
	Si	Siliceous rock
	Tf	Tuffaceous rock
	Da	Dacitic rock
	And	Andesitic rock
	Ap	Aplitic rock
	Q-dio	Quartz - Diorite (Granitoid rock)
	gr-dio	Granodiorit (Mylonite)
	Comp	Complex rock
	Br	Breccia
	Arg	Argillization
	Sili	Silicification
	Qtz	Quartz Vein & network
		Massive Ore
	diss	Dissemination
Si ~		Thin Section (Sample No
Pl ~		Polished Section (Sample No)
Al ~		Assay (Sample No)

Fig. IV-3-8 Geological Log of MJI-3

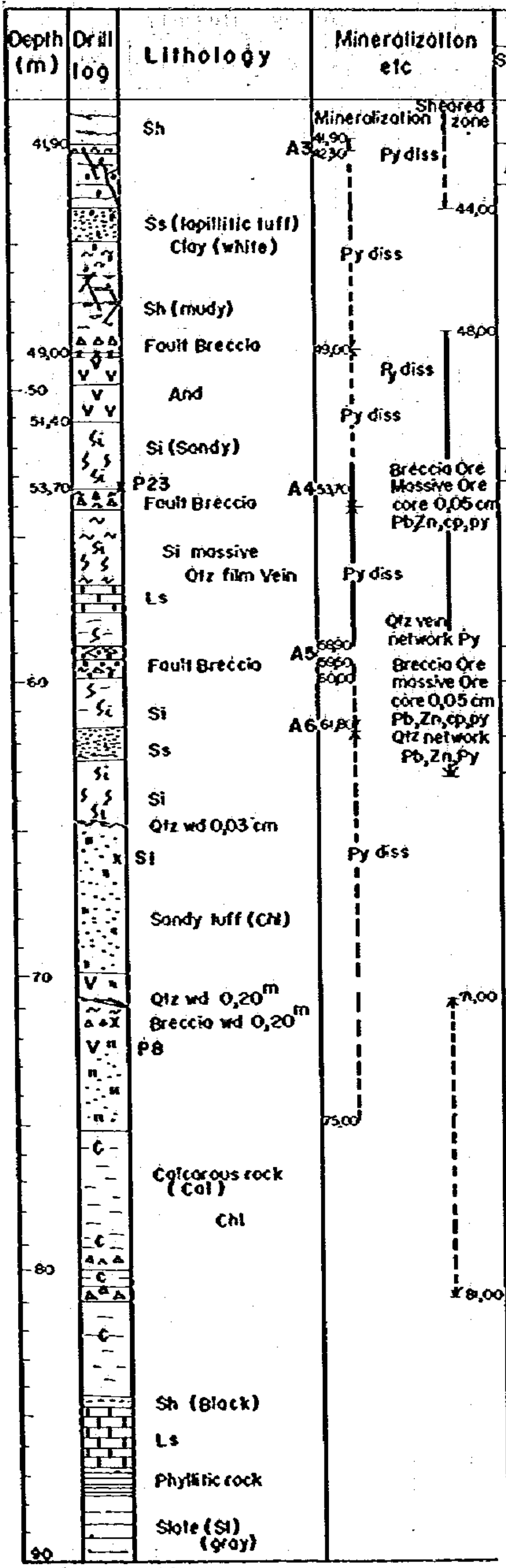
Location : Pagar gunung
Direction : Cline 5,5
Depth : 250,30 m
Boring Machine : OE-8 BL

Elevation : 1215 m
Inclination : 90°
Core Recovery : 90,3 %
Term : 83-12-15 84-1-10



Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 1	34,30 ~ 36,30	<0.1	1.9	0.01	0.05	0.08
A 2	36,30 ~ 38,40	<0.1	1.9	0.01	0.02	0.02

Scale 1:200



Assay Results						
Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
A 3	41,90 ~ 42,30	<0.1	3.2	tr	0.01	0.01
A 4	53,70~54,30	<0.1	62.0	0.14	3.44	1.29
A 5	59,50 ~ 60,00	<0.1	34.0	0.29	0.90	0.85
A 6	61,80 ~ 61,90	<0.1	56.0	0.14	2.93	4.18

Scale 1:200

MJI-3

Depth (m)	Lithology	Mineralization etc
	Si (Phyllite)	Sheared zone
93,60		
94,50		94,50
	Do (White~gray) massive	
98,00	Hard Sh (gray) massive	
100		
	Si	
104,00		
	Si	
108,50	Sh (Black)	
109,40		
110	Do	
	Qtz wd 0,20m	
111,70	Qtz wd 0,25m	
	Sh	
116,00	Qtz wd 0,15m	
117,50	Qtz wd 0,10m	
	Si green rock	Mineralization
120	Sh (Black)	120,00
121,00	Qtz wd 0,30m	
	Qtz wd 0,15m	
123,00		
	Do	
	Qtz wd 0,30m	126,00
126,00		
	Black clay wd 0,25m	
129,50		
	Si (Breccied	
130		
132,00	Siliceous green rock	Py diss (magnetite mineral)
134,50	Br	
135,50	Qtz network	
136,70	Hard Sh	
138,30	Qtz network	
140	Si massive S2	

1:200

Depth (m)	Lithology	Mineralization etc
142,00	Qtz wd 0,10^m	Mineralization Py diss; Sheared zone
143,50	And (Brown)	
145,20	P9	A7 144,50 network Py 145,00
	And massive Chloritization	
148,20	Br and Arg	149,00
149,00	Qtz wd 0,08	Py diss
150		
152,00	Si (massive)	152,50
	Si	
160		
162,00	Qtz network	162,00
	Qtz network	
	S3 Mylonitic	Py diss (fine grain)
170	Si	
176,00	Qtz network	
177,30	Silicification	177,30
	Sh (Hard)	Py diss
180		
182,50	Qtz crystal wd 0,25^m (gama)	
	Sh (Hard)	
185,00	Aplitic wd 0,20^m	186,00
	Sh (Hard) Schistosity	
189,50 / 190	Aplitic (Xenolith shale)	189,50 Py diss

Assay Results

Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
A7	144,50 ~ 145,00	<0.1	1.5	tr	0.01	0.02

1:200

MJI-3

Depth (m)	Lithology	Mineralization etc	Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
191,50	S4 Granodioritic rock (mylonitic)	Mineralization Py diss							
194,40	Qtz wd 0,30m	194,10							
	Granitic gness?								
197,00	Gr								
200	Si. (massive)	200,00 Py diss							
204,70	Qtz wd 0,20m								
206,00	Qtz network (epidote)	Py network							
	Qtz network	Py network							
210	Aplitic roc	210,00							
	Si								
212,90	Sh (Hard)								
214,00	Aplitic								
215,00	Qtz wd 0,10m								
216,00	Sh (Hard)								
	S5 Complex rock (massive)	218,00 Py diss							
220	Silicificatio Mylonitic	223,50							
225,50	P10 Qtz Veinlet	225,50							
	Si massive	Py diss and veinlet magnetic mineral							
228,50	Qtz Veinlet								
230	Qtz wd 0,10m (epidote)	230,80 Py veinlet							
231,60	Qtz wd 0,25m	A8 231,60	A 8	230,80 ~ 231,60	<0.1	1.7	0.01	0.05	0.06
234,50	Qtz wd 0,10m	234,50 Py diss							
	Sh (Hard)								
240	Miner folding Qtz film vein	Veinlet Py							

Depth (m)	Drill log	Lithology	Mineralization etc	Assay Results						
				Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
		Gr.(mylonitic)								
242,00		Sh (Hard)								
245,00			245,00							
			Py diss							
		Qtz Veinlet								
	S6									
250		Aplitic rocks								
250,30			250,30							

1:200

INDEX

Abbr.	Name	Abbr.	Name
	Soil	Q-dio	Quartz – Diorit (Granitoid rock)
Ss	Sandstone	Gr-dio	Granodiorit (mylonite)
Ls	Limestone	Comp	Complex rock
Sh	Shale	Br	Breccia
Sl	Slate	Arg	Argillization
Fl	Felsic rock	Sili	Silicification
Cal	Calcarous rock	Qtz	Quartz vein & network
Si	Siliceous rock		Massive Ore
Tf	Tuffaceous rock	diss	Dissemination
Da	Dacitic rock	S1~	Thin Section (Sample No)
And	Andesitic rock	P1~	Polished Section (Sample No)
Ap	Aplitic rock	A1~	Assay (Sample No)

Fig. IV-3-9 Geological Log of MJI-4

Location : Pagor gunung	Elevation : 1185 m
Direction : D line 5,5	Inclination : 90°
Depth : 250,20 m	Core Recovery : 76,5 %
Boring Machine : OE-8 BL	Term : 84-1-16 84-2-14

Depth (m)	Drill log	Lithology	Mineralization etc	Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
0 – 7,00		Soil								
7,00 – 12,30 (10)		And (Brown) Joint Qtz film vein								
12,30 – 24,80 (20)		Andesiti tuff With Qtz wd 1~3 m/m	Sheared zone 20,0 ~							
24,80 – 25,50		Arg w 0,05 m								
25,50 – 26,80		Lapilli tuff								
26,80 – 29,80		Andesitic tuff (green patch)								
29,80 – 33,70 (30)		And Breccia > Arg								
33,70 – 37,20		Sh Ss Sh Qtz wd 0,10 m								
37,20 – 39,00		Ss								
39,00 – 40		Fault zone								

Scale 1:200

MJI-4

Depth (m)	Lithology	Mineralization etc	Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
40.50	Sh, Ss alter	Sheared zone							
	Black Shale (Sh)								
	S7								
49.00	Fault								
	Sh (Black)	Mineralization							
50.10	Sh	50.10 Py diss fine grain A9 51.90 (zone 50.10)	A 9	50.10 ~ 51.90	<0.1	1.6	tr	tr	0.01
51.90	Sh (Black) Arg alter								
53.90	Ss Silicification	53.90 (zone 53.90)							
	32 l/min								
56.50		56.50							
57.20	Siliceous rock (Si) Sandy massive	Py diss fine green							
60									
61.00	Fault	61.00 (zone 61.00)							
61.50									
63.00	Si (Sandy)	63.10 Py diss fine green 64.60							
65.00	Fault Br zone								
	Calcorous rock (Cal)								
70									
71.00	Fault Br zone	71.00 Pb, Py diss A10 72.80 (zone 71.00–72.80)	A10	71.00 ~ 72.80	<0.1	4.3	0.02	0.11	0.15
72.80	Hard Sh (Black)	72.80 Py diss 75.70 (zone 72.80–75.70)							
74.20	SS Sili massive								
75.70	Tuffaceous Ss massive								
77.30									
78.30	Hard Sh								
79.00	Tf	79.00 Sheared zone 80.00							
80	Ss								
80.50	Sh (Black) Qtz network	Py diss							
85.00		fine grain							
86.50	Sh (Black) Qtz network	88.00							
89.00	Ss (gray)								
89.70		89.70							

Scale 1:200

Depth (m) / Drill log

Depth marks: 94,50 · 95,00 · 96,50 · 97,50 · 98,30 · 100 · 101,00 · 101,80 · 103,00 · 105,00 · 106,30 · 110 · 111,00 · 113,00 · 114,80 · 116,50 · 118,40 · 120 · 120,70 · 122,00 · 122,60 · 123,30 · 123,90 · 124,80 · 125,90 · 127,60 · 129,70 · 130 · 133,30 · 136,00 · 140

Lithology

- Sh
- Qtz network
- Chloritization
- Ss (Pale blue) massive
- Sh
- Qtz wd 0,20^m
- Ss massive
- Qtz network
- Sh Br and Qtz network
- Ss massive
- Sh (Black)
- Qtz network
- Sh (Black)
- Br and Arg
- Sh (Black)
- Sh
- Sh, Ss alter Arg
- Fault zone (116,50–127,60): Br Ore; Ss Arg (grey) (S8); Qtz Sh; Br Ore (P11); Sh; Arg Black (P12); LS
- Ss
- Folding
- Calcite vein
- Hard Sh (Black)
- Qtz wd 0,02^m
- Ss massive
- Sh
- Ss
- Qtz film Vein
- Qtz wd 0,10^m
- Ss massive

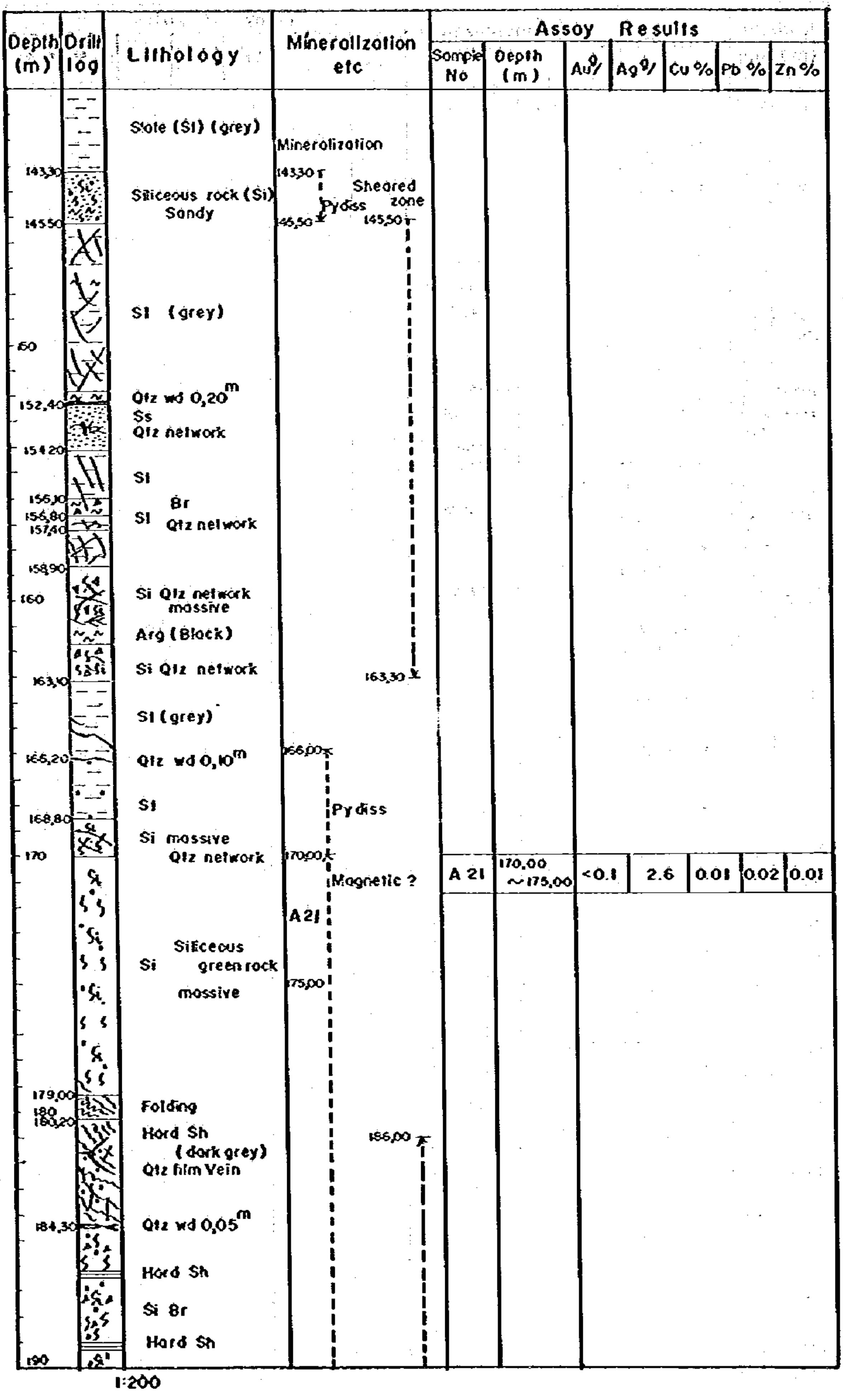
Mineralization etc

- Mineralization (to 110,00); Py diss
- Sheared zone (to 94,50)
- Sheared zone 100,00 – 114,80
- 114,80–116,50 A11: massive ore wd 0,20^m
- 116,50–118,40 A12: wd 0,05^m, wd 0,05^m
- 118,40–120,70 A13: Ore zone
- 120,70–122,00 A14
- 122,00–122,60 A15 wd 0,20^m
- 122,60–123,30 A16
- 123,30–123,90 wd 0,25^m
- 123,90–124,80 A17 wd 0,20^m
- 124,80–125,90 A18 wd 0,06^m
- 125,90–127,60 A19 wd 0,04^m
- 127,60: Br massive ore, Pb, Zn rich (to 129,70)
- 129,70 – 140: A20 Py diss

Assay Results

Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
A11	114,80 ~ 116,50	<0.1	6.7	0.02	0.04	0.08
A12	116,50 ~ 118,40	<0.1	4.5	0.93	0.71	1.50
A13	118,40 ~ 120,70	<0.1	19.0	0.43	0.24	0.64
A14	120,70 ~ 122,00	<0.1	6.9	0.06	0.11	0.24
A15	122,00 ~ 122,60	<0.1	42.0	0.30	2.50	4.48
A16	122,60 ~ 123,90	<0.1	7.7	0.03	0.22	0.29
A17	123,90 ~ 124,30, 124,30 ~ 124,80	<0.1	47.0	0.21	0.80	1.53
A18	124,80 ~ 125,40, 125,40 ~ 125,90	<0.1	29.0	0.08	1.05	0.70
A19	125,90 ~ 127,60	<0.1	5.7	0.03	0.23	0.80
A20	129,70 ~ 140,10	<0.1	0.9	0.01	0.01	0.01

1:200



Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 21	170,00 ~175,00	<0.1	2.6	0.01	0.02	0.01

Depth (m)	Drill log	Lithology	Mineralization etc	Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
191,20		Si green rock	Py diss (to 191,20)							
		Felsic rock (Fl) (grey)								
194,50		Si massive								
		Fl	Mineralization Sheared zone							
199,50		Ss Silicification massive	199,50 – Py diss; 199,50 – Sheared zone							
200										
202,20		Arg (grey), Br								
203,40		Si green rock Chloritization	203,40 – Chloritization							
207,10		Aplitic rock	– 207,10 (Sheared zone)							
		Si green rock Sandy								
210,40		Fl (grey) bedding	– 210,40 (Py diss); – 210,40 (Chloritization)							
214,30		Qtz wd 0,05^{m}								
215,80		Fl, Ss alter (grey dark grey)	215,80 – Py diss							
220										
221,40		Qtz wd 0,10^{m}	– 221,50 (Py diss)							
		Fl								
223,00		Br	223,00 – Py diss; 223,00 – Chloritization; 223,00 –							
224,30		Complex rock Calcite network Chloritization								
228,00		Fl								
		Br, Arg								
230			– 230,50 (Chloritization)							
		Fl massive (Blue)								
232,70		Arg (grey), Br								
233,70		Fl (joint)	– 233,70							
237,70		Ss								
240			(Py diss continues)							

Scale 1:200

Depth (m)	Drill log	Lithology	Mineralization etc	Assay Results						
				Sample No	Depth (m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %
		Ss massive								
242,00		Fl (dark grey)	Py diss							
244,80		Si (Sandy) massive								
248,50		Qtz wd 0,05^{m}	248,50							
250		250,20								

1:200

INDEX

Abbr.	Name	Abbr.	Name
	Soil	Q-dio	Quartz – Diorit (Granitoid rock)
Ss	Sandstone	Gr dio	Granodiorit (mylonite)
Ls	Limestone	Comp	Complex rock
Sh	Shale	Br	Breccia
Sl	Slate	Arg	Argillization
Fl	Felsic rock	Sili	Silicification
Cal	Calcarous rock	Qtz	Quartz vein & network
Si	Siliceous rock		Massive Ore
Tf	Tuffaceous rock	diss	Dissemination
Da	Dacitic rock	SI~	Thin Section (Sample No)
And	Andesitic rock	PI~	Polished Section (Sample No)
Ap	Aplitic rock	AI~	Assay (Sample No)

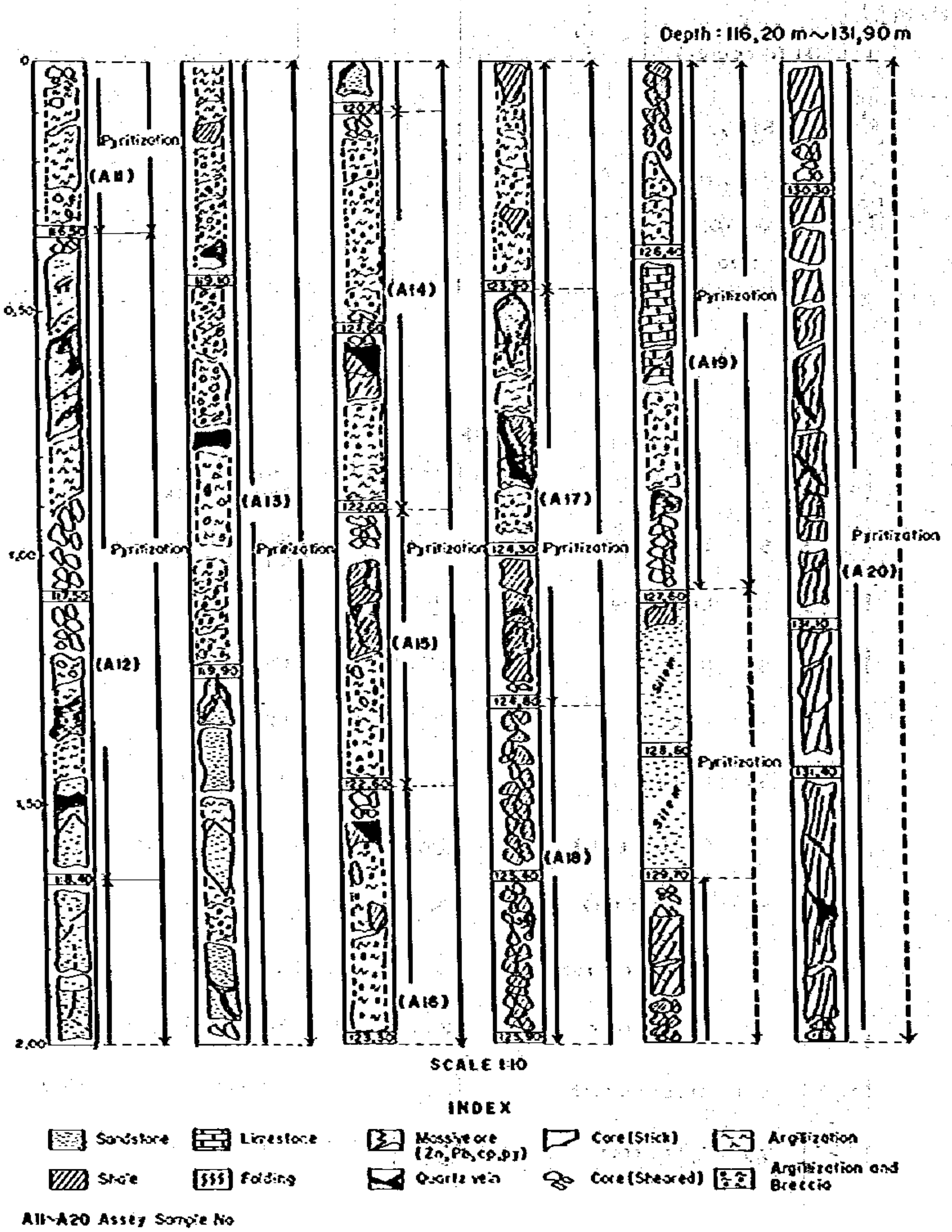


Fig. IV-3-10 Sketch of Mineralization zone between 116.20 m to 131.90 m of MJI-4

Fig. IV-3-11 Geological Log of MJI-5

1

Location : Pagar gunung (West Area)

Elevation : 1 210 m

Direction : E line 5.5

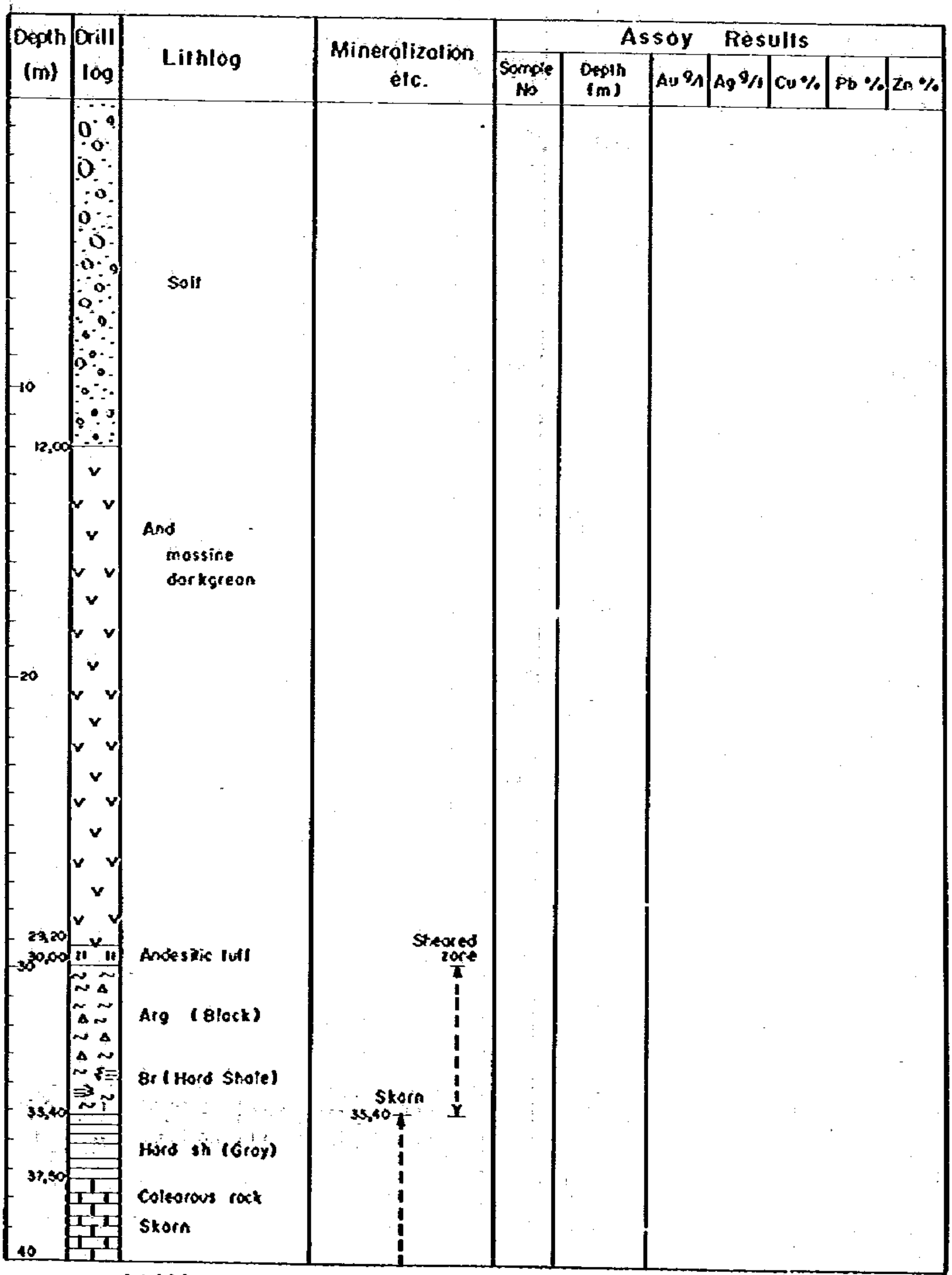
Inclination : 90°

Depth : 250,10 m

Core Recovery : 89 %

Boring Machine : OE-8BL

Team : 84'-2-19 ~ 84'-3-7



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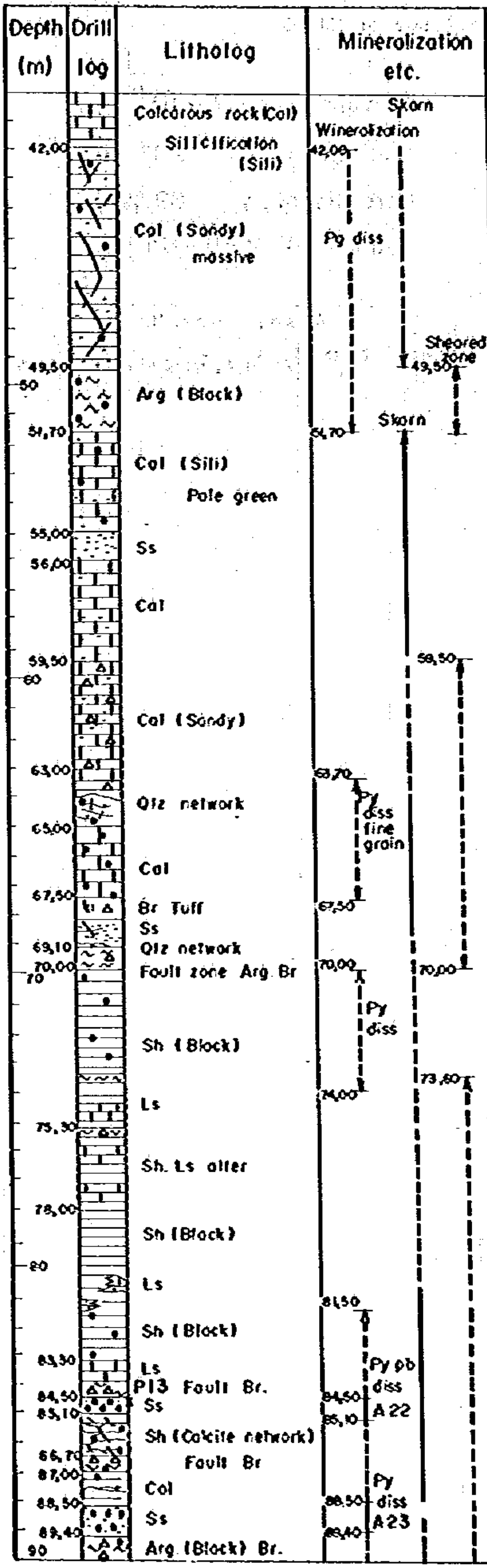


1 : 200

Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 22	84,50 ~ 85,10	<0.1	1.5	0.02	tr	0.01
A 23	88,50 ~ 89,40	<0.1	1.4	tr	tr	tr

MJ 1-5

Depth (m)	Litholog	Mineralization etc
90,50	S.S Arg(Block)	Py diss
91,60	Sh	
92,40	Ls Arg(Block)	92,40 A24
93,50	Sh (Block)	93,60 Py pb diss; Sheared zone
95,50	Sh. Ls alter	Skarn
96,50	Sh.Ls alter (Folding zone)	
98,70	Sh. Ls alter	Py diss
100		
100,70	Fault Bc Arg(Block)	
101,20	Ls Arg (Block)	
102,40	Ls	
103,60	Arg. Br	
104,60	Ls	
105,40	Arg (Block)	106,00
106,00	Pt4	106,00 Py pb diss A25
	Col	106,80 Py diss
108,00	Coarse tuff	
	Ss massive	
110		
112,00	Coarse tuff	112,00
	Finetf	
114,30	Coarse tuff	
	Ls	Py diss fine gain
116,00	Ss	116,50
117,00	Col	
	Coarse tuff	
	Ss	
119,30	Coarse tuff	119,30
120	Col	
	Arg (Block) Br.	Py diss
	Ss	
123,00	Hand Sh	123,00
	Col Ss alter	124,00
124,60	Tuffaceous sandstone (fine tuff)	
129,00	Qtz wd 0.03m	129,0
129,7	Coarse tuff	
130		
130,5	Fault. Br. Arg	
	Sl (grey)	Py diss
	Arg (grey)	
	Sl	
	Calcitee > Qtz network	
	Sl. Ss. alter	
	Qtz network	
	Sl. Ss alter	
140	Qtz network	

Assay Results

Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 24	92,40 ~93,60	<0.1	0.8	tr	tr	0.01
A 25	106,00 ~106,80	<0.1	1.2	tr	tr	tr

1: 200

M J I-5

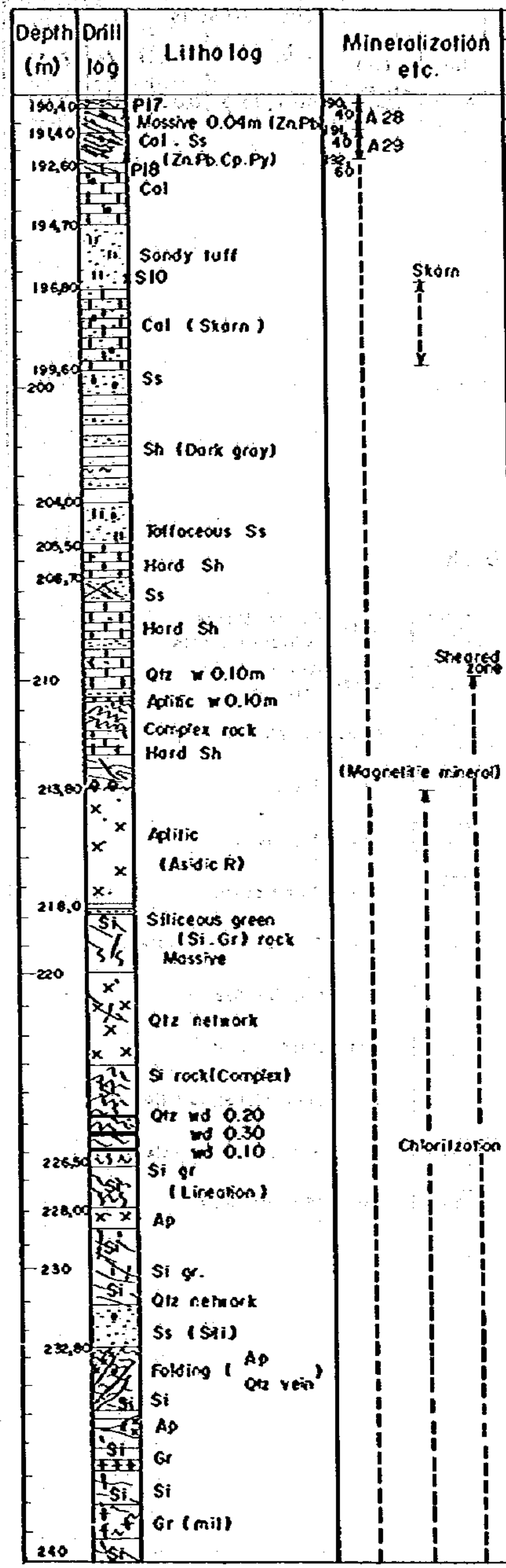
Depth (m)	Litholog	Mineralization etc
141,60	Sl Br.	Sheared zone (to 160,0)
	Qtz network	
	Sl (Darkgray)	Py diss (to 147,00)
146,40	Folding	
147,00	Calcite wd 0.30m	147,00
	Sl	
150	Qtz network	
151,00	Ss	150,5 Py diss
	Sl (Dark gray ~ Black)	154,5 Py diss
156,70	Ss massive	156,20
157,50	Cal	157,50
	Ss	
159,00	Coarse tuff (Dark green)	
160	Fine tuff	160,0
	Sl (Dark gray)	
	Fine tuff	Py diss
	Sl (Gray) Felsic	
164,00		
165,00	Fine tuff	
	Ss massive	
167,20	Qtz wd 0.10m	
	Qtz wd 0.05m	
	Coarse tuff	
170	Sl	Veinlet 170,0
170,60	Ss Veinlet P 15	170,6 Zm pb
	Sl (Gray)	A26 Cp
172,40	Ss Massive	
173,50	Sl Ss Alter	
	Qtz network	175,50 A 27 Py diss
176,00	P16 Coarse tuff (Dark green)	176,00
178,30	Sl	179,0 Py diss
180	Qtz film	179,5 fine grain
180,20	Sl network Qtz	
183,50	Coarse tuff (Dark grey) (1~0.5 m/m)	183,5
185,00	Ss	185,0
	Coarse tuff	Py diss
	Calcarios R folding	
189,00		
190		190

1:200

Assay Results

Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 26	170,60 ~170,80	<0.1	54.0	0.53	0.45	2.53
A 27	175,50 ~176,00	<0.1	1.6	0.01	0.01	0.04

MJI-5



Assay Results						
Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 28	190,40 ~191,40	<0.1	13.0	0.09	0.09	3.39
A 29	191,40 ~192,60	<0.1	40.0	0.44	0.24	4.02

1: 200

Depth (m)	Drill log	Litholog	Mineralization etc.	Sample No	Depth (m)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
240	Si	Ap	A 30	A 30	241,40 ~242,20	<0.1	13.0	0.05	0.60	2.03
241,40	Si	P19	241,40 massive ore							
242,20		Banded ore	242,20							
	Si	Py rich Zn Pu Cp-								
243,3	+		Py diss Chloritization							
	+	Gr								
247,0		Hard Sh								
247,70	+	Gr								
248,50		Sl								
250	Si									

250,10 m

INDEX

Symbol	Abbr.	Name
		Soil
	Ss	Sandstone
	Ls	Limestone
	Sh	Shale
	Sl	Slate
Fl	Fl	Felsic rock
C	Cal	Calcarous rock
Si	Si	Siliceous rock
	Tf	Tuffaceous rock
	Da	Dacitic rock
	And	Andesitic rock
	Ap	Aplitic rock
	Q-dio	Quartz-Diorite (Granitoid rock)
	gr-dio	Granodiorit (Mylonite)
	Comp	Complex rock
	Br	Breccia
	Arg	Argillization
	Sili	Silicification
	Qtz	Quartz Vein & network
		Massive Ore
	diss	Dissemination
Sl		Thin Section (Sample No.)
Pl		Polished Section (Sample No.)
A l		Assay (Sample No.)

1:200

3-3 GEOLOGY AND ORE DEPOSITS

The outline of the geology, ore deposits and microscopic observation of the Pagar Gunung West Deposit is described in II-4-2-1 (Fig. II-3-9 and 10) and those of the Pagar Gunung East Deposit in II-4-2-2 (Fig. II-3-11 to 14).

The objective of the present survey was to clarify the surface geology of the area in the vicinity of both East and West Deposits. Thus during this survey, the geology and ore deposits of relatively large area were investigated, sampling for chemical analysis was not conducted, and the analytical results reported in Part II are quoted here.

3-3-1 Pagar Gunung West Deposit

There are old Tunnels 1, 2, 3, and 6 at the Pagar Gunung West Deposit. It shows that small scale prospecting and mining were conducted in the olden days. It is now almost impossible to confirm the old prospecting and mining dump. The present work was concentrated near the 2, 3 and 6 tunnels where high grade massive ores are exposed.(Fig. IV-3-12, Fig. IV-3-13)

(1) Adit 2

The massive ore body is exposed continuously for approximately 5m along the strike at Adit 2. This tunnel was dug along the bonanza. The entrance has collapsed and it is not possible to enter.

The ore body extends in N45°W direction with a dip of 35°W. The length of the exposure is more than 8m. The massive part is high grade PbZn body with an average width of 1.80m and composition of Au 0.3g/t, Ag 127.2g/t, Cu 0.61%, Pb 14.02% and Zn 14.63%. The northern end of the ore body is cut by a fault the extension to the north is not clear. The southern end is brecciated by a fault which is approximately 2m wide and then continues southward to the footwall side of Tunnel 1.

The host rock is shale on the hangingwall side and andesite lava on the footwall. Argillization is particularly strong on the footwall side.

(2) Adit 3

This is located approximately 40m east of Tunnel 2 and is dug along the massive ore body. The direction of the tunnel is S25°W and the slope is 30°S. The roof of the tunnel has collapsed at 2m from the entrance. The ore body has a strike of N80°W and a dip of 30°S and the extension of the outcrop is more than 20m. The ore body consists of 0.10m-0.40m wide veinlets and disseminated ores for a distance of 10m westward from the tunnel entrance. It is altered and the major minerals are limonite and oxidized. Near the entrance, the ore body is massive (0.30m-0.50m wide) with veinlets and disseminated ores (0.10m-0.30m wide) on the hangingwall side. They are both limonized with dissemination of galena, zinc ore and chalcocite. The ore body between the tunnel entrance and 8m eastward is veinlets (0.10m-0.30m wide) and dissemination ores. The eastern end is dragged and brecciated by a fault (over 3m in width) and the extension cannot be confirmed due to the lack of exposures. The host rocks are black shale with partly calcareous rocks on the hangingwall side while the footwall side consists of phyllitic rocks and shale. They are altered, particularly the footwall is strongly argillized.

(3) Adit 6

This tunnel is located approximately 160m east of Tunnel 1. This is a cross cut for prospecting the high grade massive ore body. The trend of the tunnel is S20°W and the roof has collapsed at 3m from the entrance. The strike of the ore body is approximately E-W and the dip 30°S. The length of the exposure is over 11m. The grade deteriorates to the west of the entrance. The ore body near the entrance is the bonanza of the massive body with a width of more than 2.90m and the average grade of Au 1.6g/t, Ag 85.6g/t, Cu 0.14%, Pb 5.97%, Zn 5.56% (Part II 4-2-1). The length of the bonanza, however, is approximately 3m and is generally small. The ore body to the east of the entrance is in a fault zone (2m wide) and is dragged with decreasing width (1.00m-0.50m). It is completely cut by the easternmost fault (strike N40°W, dip 75°E) and its extension cannot be confirmed.

The host rock on the western side is sandstone rich in quartz. The

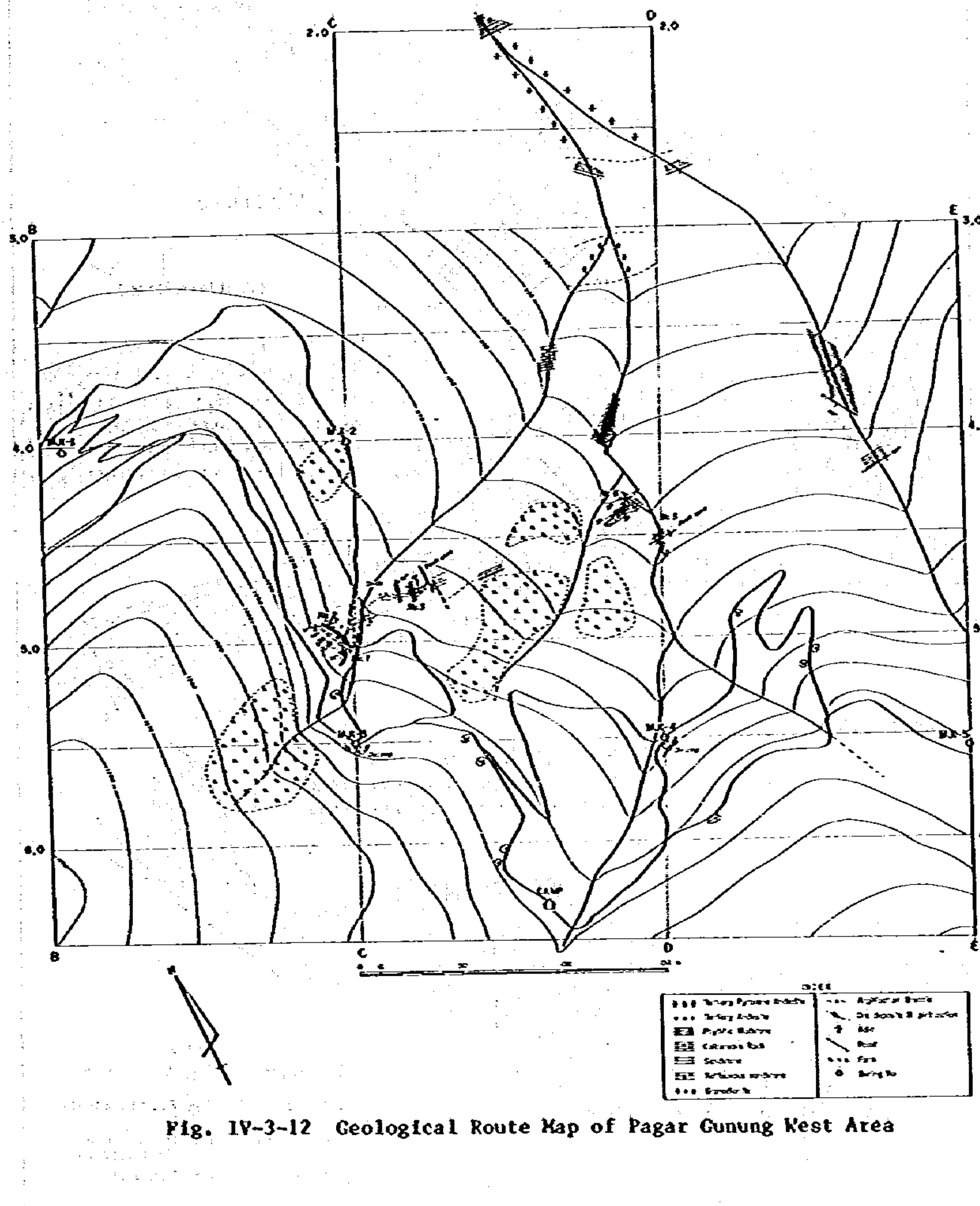
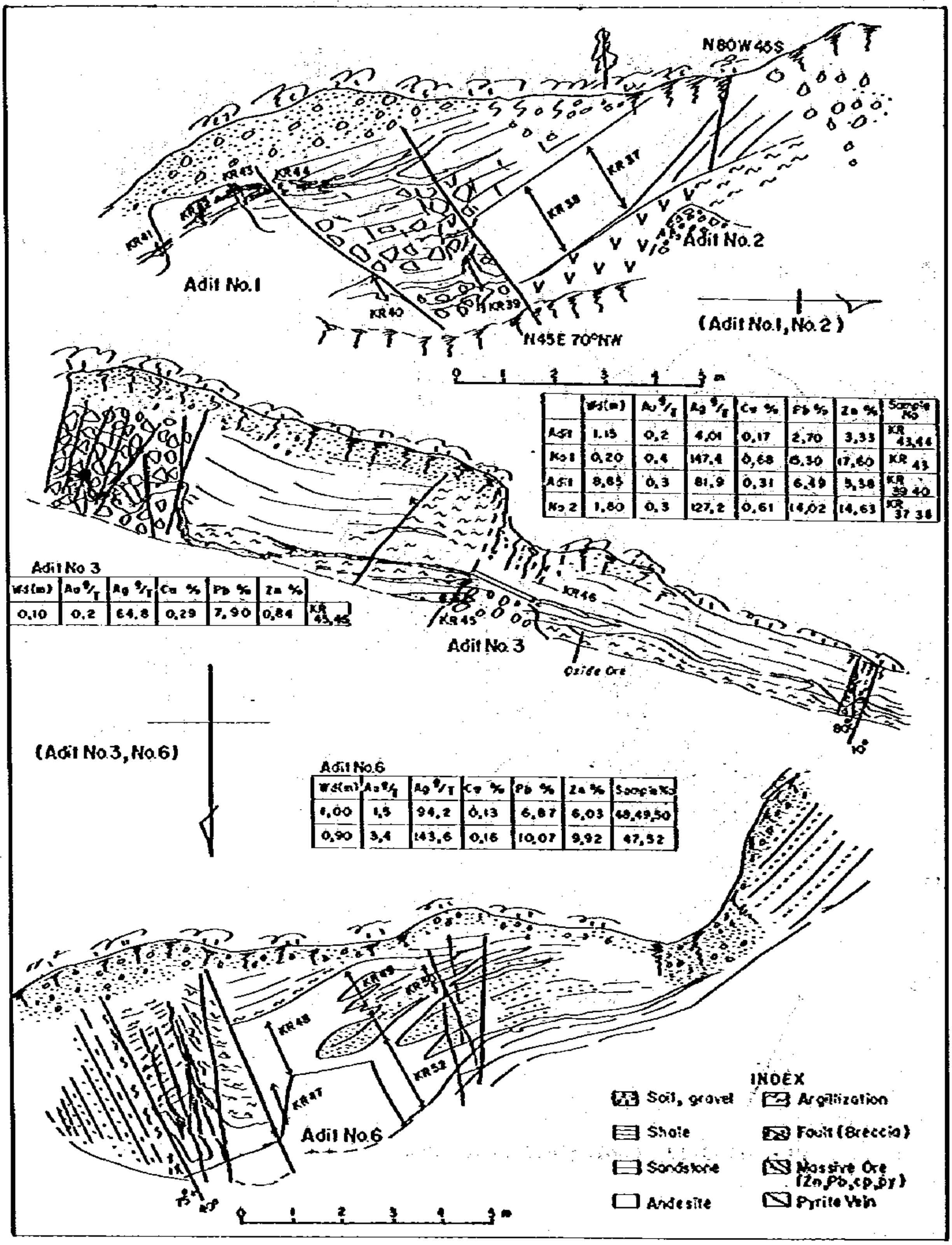


Fig. IV-3-12 Geological Route Map of Pagar Gunung West Area



	Wd(m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %	Sample No
Adit	1.15	0,2	4,01	0,17	2,70	3,33	KR 43,44
No.1	0,20	0,4	147,4	0,68	6,30	17,60	KR 43
Adit	8,65	0,3	81,9	0,31	6,49	5,38	KR 39 40
No.2	1,80	0,3	127,2	0,61	14,02	14,63	KR 37 38

Adit No 3

Wd(m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %	
0,10	0,2	64,8	0,29	7,90	0,84	KR 45,46

Adit No.6

Wd(m)	Au g/T	Ag g/T	Cu %	Pb %	Zn %	Sample No
1,00	1,5	94,2	0,13	6,87	6,03	48,49,50
0,90	3,4	143,6	0,16	10,07	9,92	47,52

Fig. IV-3-13 Sketch of Ore Deposit, Pagar Gunung West Ore Deposit