THE REPUBLIC OF INDONESIA

REPORT ON THE COOPERATIVE MINERAL EXPLORATION

OF

NOTHERN SUMATRA

PHASE III

APRIL 1985

JAPAN INTERNATIONAL COOPERATION AGENCY
METAL MINING AGENCY OF JAPAN

Errata

page and line	error	correct
1 up 4	at the zinc mineraization, Muara Sipongi B	zinc mineralization at the Muara Sipongi B
2 up 8	each hole is shown	each hole are shown
Fig 1-3	∘ Third phase	• Third phase
Table 1-2	— survey Result	— Survey Result
6 up 8	Pentonite	Bentonite
8 dawn 1	epidote skarn	epidote skarn | pyrite dissemination
12 up 5	as follows	as shows at 11 page
14 dawn 2	catacracized cleavage	cataclastic cleavage
Table 3-1	∘ rare	• rare
17 dawn 18	argiraceous	argillaceous
17 dawn 6	(fault clay part	(fault clay part)
20 up 17	mineralization zoned	mineralized zones
22 dawn 6	banded ore disse-	banded or disse-
23 up 23	mineralized Zones	mineralized zones
23 dawn 18	p.85 %	9.85 %
23 dawn 14	C.82 % of Cu	0.82 %
24 up 8	Mineralized zones	mineralized zone
25 up 7	1,000 m s,l.	1,000 m s.l.
22 Fig 4-8	MJI-15	MJI-5

PREFACE

The Government of Japan, in response to a request extended by the Government of the Republic of Indonesia, agreed to conduct a metallic mineral exploration survey in Northern Sumatra, and commissioned its implementation to the Japan International Cooperation Agency.

The Agency, taking into consideration the importance of the technical nature of this survey, sought the cooperation of the Metal Mining Agency of Japan in order to accomplish the contemplated task.

The Government of the Republic of Indonesia appointed the Directorate of Mineral Resources to execute the survey as counterpart to the Japanese team.

The survey is being carried out jointly by experts from both Governments.

The third phase of the collaboration survey consists of drilling exploration for metallic minerals.

This report summarizes the results of the third phase of the survey and will later form a portion of the final report on the results obtained throughout the survey.

We wish to take this opportunity to express our gratitude to all sides concerned in the execution of the survey.

April 30, 1985

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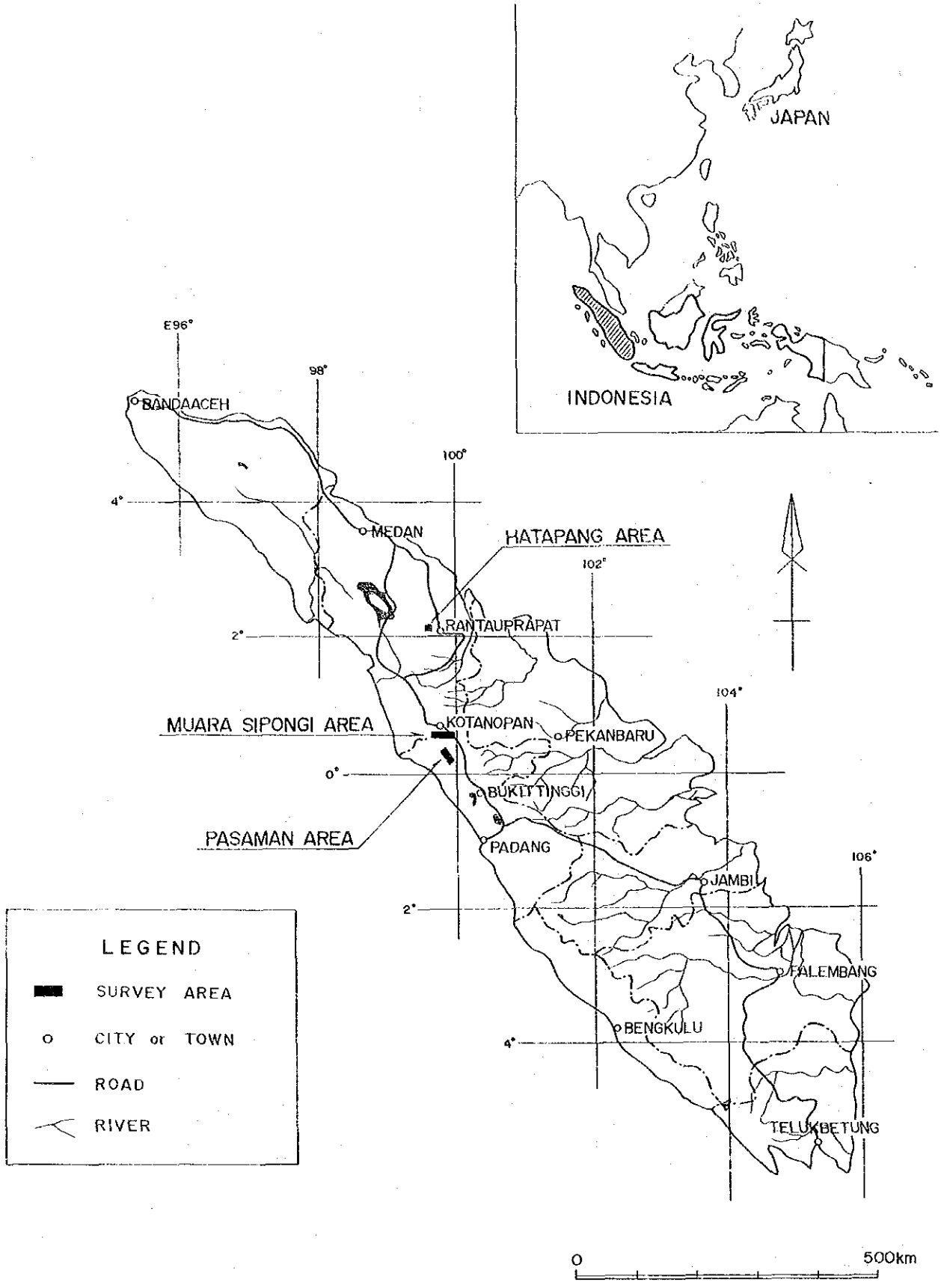

Fig. 1-1 Location Map of Survey Areas in Northern Sumatra

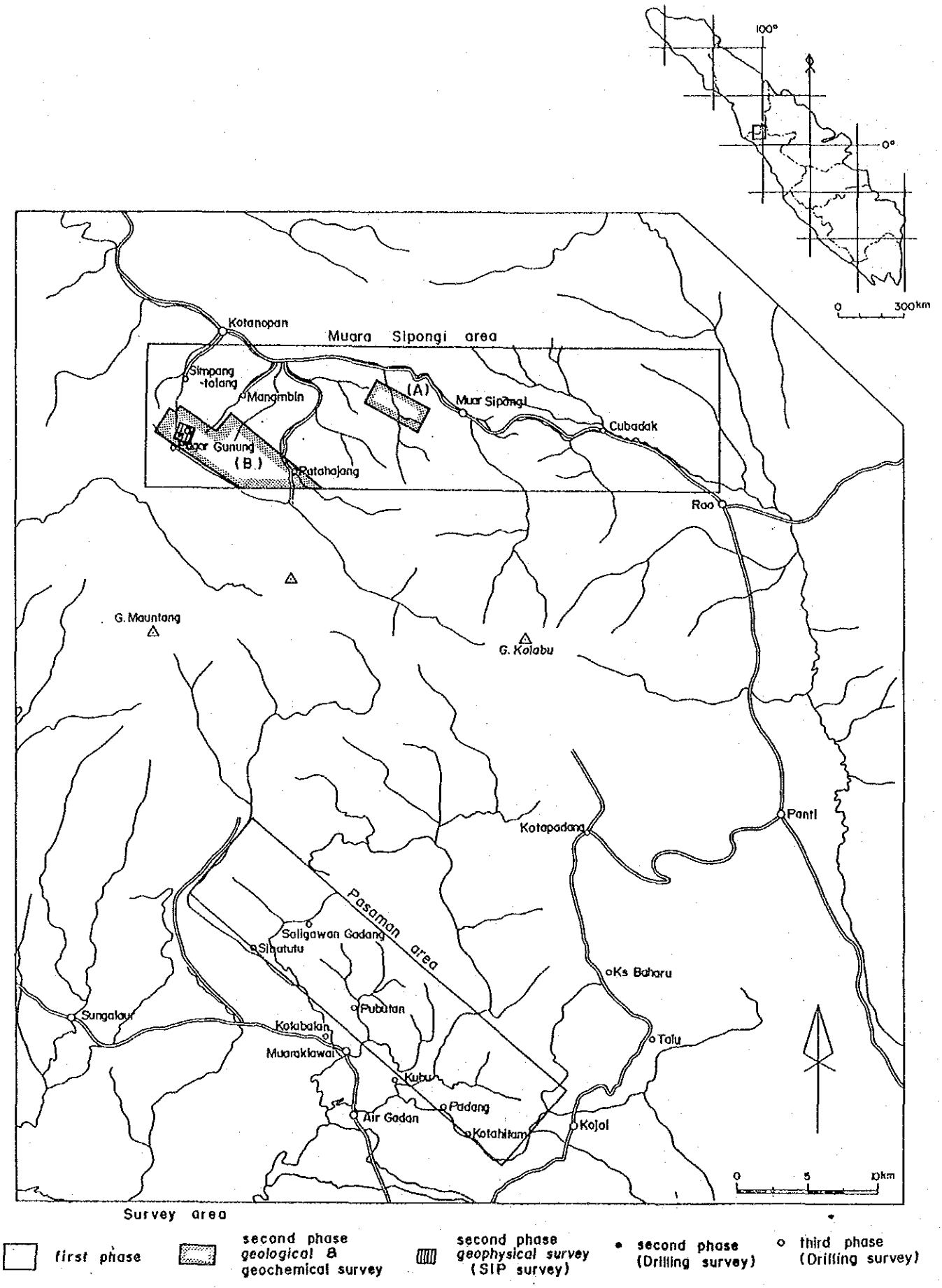

Fig. 1-2 Location Map of Muara Sipongi Area

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SUMMARY

Within the frame work of the Cooperative Mineral Exploration Survey in Northern Sumatra, a drilling survey was successively conducted to explore Pagar Gunung East Mineralized Zone in third phase. Nine holes (total drilling length: 2,103.90 m) were carried out. As the result of the survey, emplacement condition, relation with geology, igneous activity, scale and grade on the Pagar Gunung Mineralized zone were elucidated.

The Pagar Gunung Area consists of Sedimentary Rock and Pyroclastic Rock Member and Basic Volcanic Rock Member, Patahajang Formation, the Permian – the Carboniferous. Both Members made contact with the thrust fault, and it is inferred that the Basic Volcanic Rock Member is an allochthonous rock body.

The Sedimentary Rock and Pyroclastic Rock Member, emplacing Pagar Gunung Mineralized Zones, in divided into Argillaceous Rock Predominance Facies at the upper part and Siliceous Rock-Pyroclastic Rock Predominance Facies at the lower part. At the northern part of the survey area, mylonite (granodiorite) and quartz diorite have intruded into the Member.

The Drilling survey found many mineralized zones, and based on the stratigraphycal position of their emplacement, they are grouped into four mineralized zones, namely Mineralized Zone I', Mineralized Zone I, Mineralized Zone II and Mineralized Zone III.

The Mineralized Zone I', and I embeding in Argillaceous Rock Predominance Facies have replaced intercalated calcareous shale, and consist of chalcopyrite, galena, sphalerite accompany by epidote-clinopyroxene skarn. Mineralized Zone I extends to east-west direction with 1,200 m extention, having alternately a rich part and a poor part. Mineralized Zone I' is located at 70 m upper horizone of Mineralized Zone I, and was newly found by the drilling survey. It has the same ore composition of the zone I, but its gold content ranging from 0.4–1.6 g/t is higher than the Zone I.

The Mineralized Zone II, emplacing into Siliceous Rock-Pyroclastic Rock Predominance Facies, consists of several sub-zones, especially at the east part of the Pagar Gunung area. The Zone II is divided into six sub-Zones, correlating with their stratigraphycal situation. They consist mainly of pyrrhotite and pyrite associating with epidote-garnet skarn. Upper sub-Zones contain small amounts of sphalerite, but the Mineralized Zone is generally low grade of silver, cooper· lead and zinc.

The possible ore reserve, calculating Mineralized Zone I' and I, is expected 800,000t, mean thickness 0.88 m, silver 68 g/t, copper 0.45, lead 1.20% and zinc 4.60%.

Silver bearing lead-zinc mineralized zones of Pagar Gunung are skarn type ore deposit replaced selectively calcareous shale intercalating in Argillaceous Rock Predominance Facies, but have stratabound control. As a result of the above fact, it is very effectively on an exploration survey of silver bearing copper-lead -zinc ore deposit at Pagar Gunung area to trace calcareous shale intercalation in Argillaceous Rock Predominance Facies of Patahajang Formation.

CHAPTER 1 OUTLINE OF SURVEY

1-1 INTRODUCTION

Within the frame work of the third phase of the Cooperative Mineral Exploration Survey in Northern Sumatra of the Republic of Indonesia a drilling survey was conducted at Pagar Gunung lead and at the zinc mineralization area, Muara Sipongi Area B, continuing through the second phase.

In the second survey, geological, geochemical and geophysical surveys (SIP method) were carried out to shed more light on the Pagar Gunung mineralized area. As a result of the survey, emplacement and continuity of Pagar Gunung mineralized zone it was found to extend about one kilometer in an east-west direction, and to be divided into two mineralized zones, namely east and west mineralized zones. Drilling survey (five holes, total length 1,200 m) was successively performed in the phase to determine the West Mineralized Zone.

In the third phase, a drilling survey was continued to explore East Mineralized zone and the part between the West and East Mineralized zone. (nine holes, total length 2,100 m).

1-2 SURVEY SCHEDULE AND SURVEY TEAM MEMBERS

The third survey was conducted from June 25, 1984 to March 23, 1985. The survey was carried out under the cooperation survey with the Japanese survey team of the Metal Mining Agency of Japan and its Indonesian counterpart of the Directorate of Mineral Resources, Directorate General of Geology and Mineral Resources, Ministry of Mines and Energy.

(1) Period of Field Survey

From June 25, 1984 to March 23, 1985
(actual drilling operation period)
From July 20, 1984 to February 18, 1985

(2) Survey Members

	Japanese Members	Indonesian Members
(a)	Survey programing and negotiation	
	Makoto Ishida (MMAJ)	Salman Padmanagara (Director DMR)
	Ken Nakayama (MMAJ)	P.H.Silitonga (DMR)
	Takashi Kamiki (MMAJ)	
(b)	Members of the survey team	
	Sakae Ichihara (MMAJ)	Yaya Sunarya (DMR)
	(Leader and Economic Geology)	(Coordinator)
		Deddy T.Sutisna (DMR)
		(Economic Geology)
	(Drilling)	(Drilling)
	Yukio Kawamura (MMAJ)	Madtuhi (DMR)
	Mitsuo Sasaki (MMAJ)	Supratono (DMR)
	Masazo Haga (MMAJ)	Tono Hardian (DMR)
		Ruhiat (DMR)
		Kisman (DMR)
		Bany Johan (DMR)
		(Assistant)
		M.Mamat (DMR)

MMAJ : Metal Mining Agency of Japan
DMR : Directorate of Mineral Resources

1-3 Purpose of the Drilling Survey

The purpose of the third phase survey (drilling survey) was to explore and make clear an emplacement condition, scale, grade of the deep extention, east extention of the East Mineralized Zone and part between the West and East zones of Pagar Gunung silver bearing lead-zinc mineralized zone.

1-4 Location and Programme of the Drilling Survey

Location of the drill holes (nine holes, total length planned 2,100 m) and drill length, purpose of each hole is shown in Table 1-1, Fig. 1-3.

Table 1-1 Programme and Purpose of Drilling Survey

Hole No.	Location	Length Drilled	Dip	Purpose
MJI-6	east of MJI-12 (1,207.26 m)	250 (m)	-90°	east extention of Pagar Gunung east mineralized zone
MJI-7	Between MJI-11, 12 (1,218.19 m)	200	-90°	deep extention of Pagar Gung east mineralized zone
MJI-8	F line 4.0 (1,257.00 m)	250	-90°	part between Pagar Gunung east and west mineralized zone
MJI-9	G line 4.0 (1,235.65 m)	250	-90°	ditto
MJI-10	H line 4.5 (1,156.32)	200	-90°	SIP anomaly located at north parallel zone of Pagar Gunung Mineralized zone
MJI-11	H line 4.5 (1,235.89 m)	250	-90°	deep extention of Pagar Gunung East Mineralized zone
MJI-12	I line 4.0 (1191.73 m)	250	-90°	ditto
MJI-13	80 m sw of MJI-6 (1,234.00 m)	250	-90°	Deep and east extention of Pagar Gunung East Mineralized Zone
MJI-14	130 m east of MJI-6 (1, 268.00 m)	250	-90°	East extention of Pagar Gunung mineralized zone
	Total	2,100		

1-5 Drilling Holes Performed

Hole length, core recovery, drilling period of each hole are shown in Table 1-2.

Table 1-2 Drilling survey Result

Drilling No.	Drill Length Planed	Drill Length Performed	Dip	Surface Soil	Core Length	Core Recovery	Period	
							Start	Finish
	(m)	(m)		(m)	(m)	%		
MJI-6	250	250.30	-90°	9.00	221.90	92.0	Nov. 25 '84	Dec. 12 '84
MJI-7	200	200.40	-90°	12.00	169.20	89.8	Dec. 17 '84	Dec. 30 '84
MJI-8	250	250.50	-90°	16.00	215.50	91.9	Oct. 28 '84	Nov. 13 '84
MJI-9	250	250.50	-90°	8.00	219.45	90.5	Oct. 10 '84	Oct. 20 '84
MJI-10	200	200.50	-90°	7.00	167.45	86.5	Sep. 12 '84	Sep. 23 '84
MJI-11	250	250.20	-90°	13.30	183.50	77.5	July 20 '84	Aug. 12 '84
MJI-12	200	200.30	-90°	5.00	168.60	86.3	Aug. 20 '84	Sep. 4 '84
MJI-13	250	250.50	-90°	9.00	208.40	86.3	Jan. 29 '85	Feb. 18 '85
MJI-14	250	250.70	-90°	21.00	202.60	88.2	Jan. 10 '85	Jan 23 '85
Total	2,100	(2,103.90)		(100.30)	1,756.60	87.7		

$$\text{Core Recovery} = \frac{\text{Core length}}{\text{Hole length} - \text{Surface soil}} \times 100\ (\%)$$

1-6 Laboratory Work and Core Logging Work

The lithology, alteration and mineralization of the drilling core area observed at the Pagar Gunung drilling base camp, and compiled in the core logging chart (1/200 scale). 1/4 part of the ore samples were splited by a diamond cutter, and collected for chemical assay. Laboratory work is shown as follows:

(1) Microscopic observation of rock thin section ..... 46 pieces
(2) Microscopic observation of ore sample ..... 43 pieces
(3) Chemical assay of ore sample
(Au, Ag, Cu, Pb, Zn) ..... 21 pieces
(4) Chemical assay of ore sample
(Ag, Cu, Pb, Zn) ..... 103 pieces

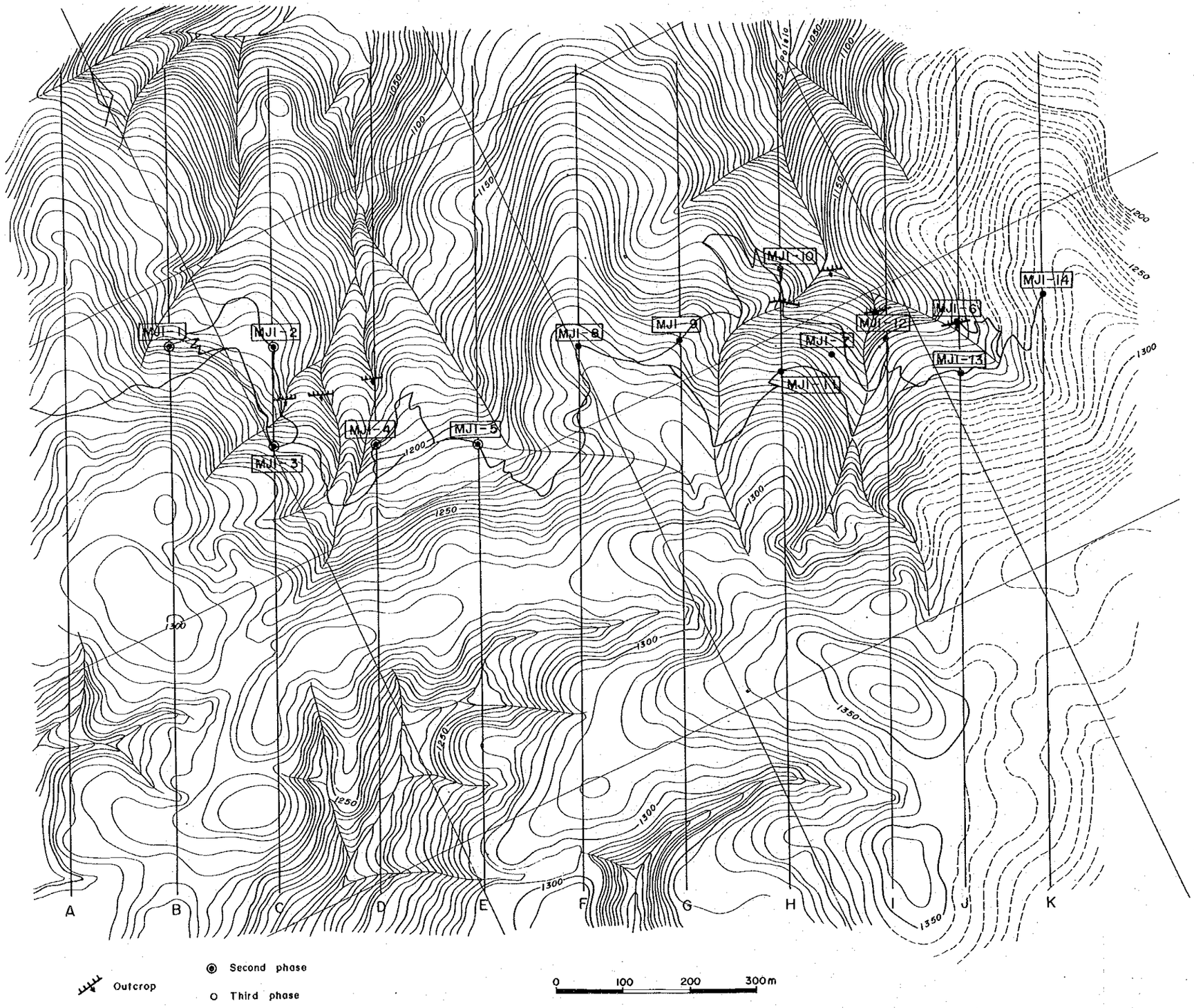


Fig. 1-3 Location Map of Drill Holes in Pagar Gunung Area

CHAPTER 2 DRILLING OPERATION

2-1 DRILLING METHOD

The drilling operation was performed by means of a wire line method using an oversized diamond bit of NQ (79 mm diameter) and BQ (62 mm diameter), while non core drilling using tri-cone bit (98.4 mm) through surface soil and weather rock was performed.
Bentonite was used for material of mud water. When drilling through the fault part and fractured part, libonite mixed bentonite water was circulated to keep a good hole condition. It was very effective to add suitably mud oil (lubricant) in mud water to reduce torque resistance caused by wall collapse.

Circulating water often leaked out through a crack or a fracture in ground. Telstop (cotton residual), Seaclay (asbestos fraction) and Telseal (vermiculite fraction) were mixed in circulating mud water to stop leakage of water through the crack and fractured of rock. When circulating water severely leaked, cementing work was done, and when no way to stop leakage of circulating water the drilling operation was done supplying continuously clean water.

Drilling programme is shown in Fig. 2-1.

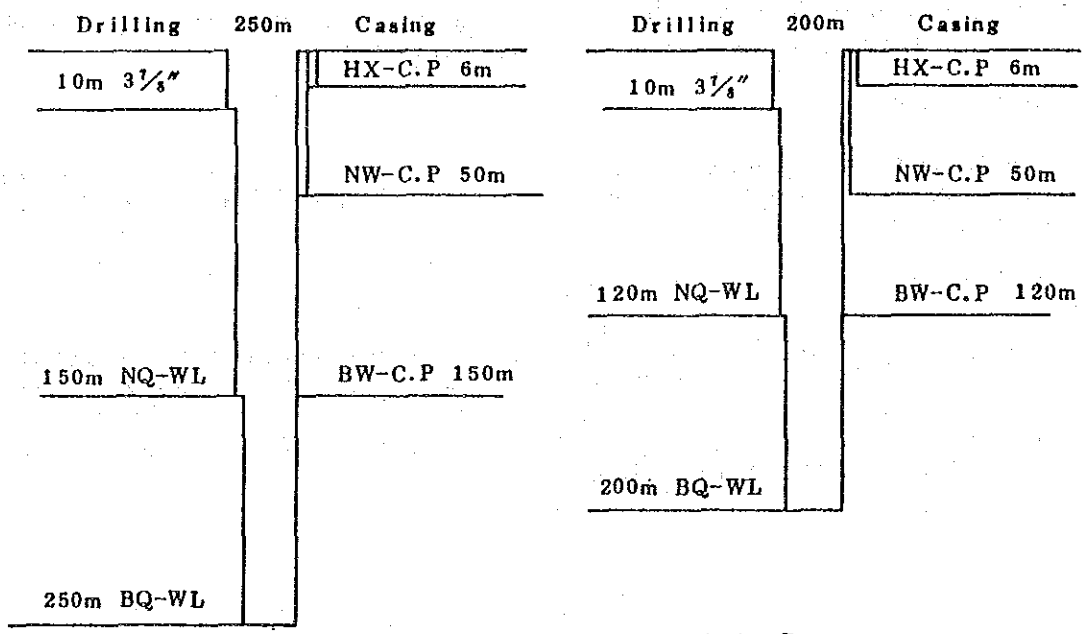


Fig. 2-1 Drilling and Casing Programme

In this survey, the inner tube of the core barrel which was plated with chrome metal inside of its tube was used. The Usage of the core barrel promoted a better core recovery, namely the average core recovery reached 90% and especially mineralized part was 100%.

2-2 Drilling Machine and Consumables Used

Koken OE-8BL (drilling capacity 300 m) was used. Table 2-1 shows specification of drilling machine, pump, engine and so on. Consumables including bit, drilling mud-oil, cement etc is shown in Table 2-2–2-5. Drilling muds were brought from Japan, but bentonite and mud oil were used up and then a certain amount of the materials were purchased at Medan. Light oil and cement were purchased at Kotanopan, the nearest town from the drilling place.

2-3 Operation Member, Shift and Drilling Record

The Operation of the move-in and move-out from site to site and preparation in the drilling site were done on a 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 was organised by a Japanese engineer, an Indonesian counterpart (DMR) and two Indonesian workers.

Record of operations are shown in Table 2-6–Table 2-24 and Fig. 2-2–Fig. 2-10.

2-4 Transportation and Road Construction

Pentonite, spare parts etc shipped from Japan were unloaded at Harbour Belawan (Medan), and were transported to Kotanopan through Sumatra Travers Road by large truck (capacity 6 tons), and from Kotanopan to Simpang Tolang by small truck (capacity 2 tons). There are about 650 km from Medan to Kotanopan, and 6 km from Kotanopan to Simpang Tolang.

Via a mountain road of 9 km, these materials were conveyed from Simpang Tolang to Pagar Gunung base camp by human power.

These materials arrived at Belawan on July 13, 1984 and customs clearance of the materials were processed until August 18, 1984.

There was no access from drilling site to drilling site, and the transportation road was constructed. The total distance of constructed road reached 3,500 m.

2-5 Water Supply

The Water for the drilling operation was supplied by natural running through piping from a neighbouring river. But water was supplied by pump to MJI-8, because the site was situated at the top of the ridge.

2-6 Withdrawal

After completion of the survey, all drilling machine and equipment were transported to Pagar Gunung base Camp, and only the machines and engine pumps, derrick were taken out from Pagar Gunung.

The cores were stored at the core house of the Pagar Gunung base camp, and they were delivered to the Directorate of Mineral Resources.

Table 2-1 Drilling Machine and Equipment used

Drilling Machine Model "OE – 8BL"		1 set	
Specifications:			
Capacity		300 mm (BQ WL)	
Dimensions L x W x H		1,550 mm x 700 mm x 1,260 mm	
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"		1 set	
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 980 mm	
Engine	Model NS – 110C	11 HP/2,200 rpm	
Water supply pump Model "MG – 5h"		1 set	
Specifications:			
Capacity		Discharge capacity	60 ℓ/min
		Max pressure	30 kg/cm²
Engine	Model NS – 50C	6 HP/2,400 rpm	
Wire line hoist Model "WLH – 4"		1 set	
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"		1 set	
Capacity		100 ℓ/600 rpm	
Engine	Model NS – 40C	5 HP/2,400 rpm	
Generator	Model "NDY – 3.2S"	1 set	
Generator	Model "YSG – 2S"	1 set	
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		1 set	
Specifications:			
Height		9.5 m	
Max load capacity		6,000 kg	

Table 2-2 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	79.0 mm	NQ – WL	30 Ct	E	25	4	10
		NQ – WL	30	CE	25	4	12
		NQ – WL	30	C	25	4	13
		NQ – WL	25	HH8	60 ~ 80	6	5
	62.0 mm	BQ – WL	22	E	25	4	6
		BQ – WL	22	CE	25	4	16
		BQ – WL	22	C	25	4	10
Total			*1,879				72

E : for ordinary rock
CE : for ordinary rock
C : for hard rock
HH8 : for Imprignate bit
* : total amount of diamnd carat

Table 2-3 Drilling Meterage of Diamond Bit (NQ) Used

Item	Size	Bit No.	Drilling Meterage by hole Unit: Meter									Total (m)
			MJI-6	MJI-7	MJI-8	MJI-9	MJI-10	MJI-11	MJI-12	MJI-13	MJI-14	
Dia-mond bit	NQ	184459						21.40				21.40
		184460						31.20				31.20
		184461							22.30			22.30
		184462							39.20			39.20
		184463					12.80					12.80
		184464				38.80						38.80
		184465				31.90						31.90
		184466				20.60						20.60
		184467			52.40							52.40
		184468			20.10							20.10
		184469	10.30	8.90								19.20
		184470			30.90							30.90
		184471									23.20	23.20
		184472						27.15				27.15
		184473						23.30				23.30
		184474							14.20			14.20
		184475							41.90			41.90
		184476					32.60					32.60
		184477					33.50					33.50
		184478									28.10	28.10
		184479				28.30						28.30
		184480	14.40									14.40
		184481	53.00									53.00
		184482		43.20								43.20
		184483		22.90								22.90
		184484						37.95				37.95
		184485				23.40						23.40
		184486			30.60							30.60
		184487	26.00									26.00
		184488	37.30									37.30
		284147							19.50			19.50
		284148		14.50								14.50
		284149		18.50								18.50
		284150					28.15					28.15
		284151								34.00		34.00
		1841531								29.60		29.60
		1841532									22.90	22.90
		401-7									54.80	54.80
		403-7								44.70		44.70
		404-3								32.70		32.70
	Total		141.00	108.00	134.00	143.00	107.05	141.00	137.10	141.00	129.00	1,181.15
Total			Drilled length/bit (1,181.15/40)									29.53

Table 2-4 Drilling Meterage of Diamond Bit (BQ) Used

Item	Size	Bit No.	Drilling Meterage by hole Unit: Meter									Total (m)
			MJI-6	MJI-7	MJI-8	MJI-9	MJI-10	MJI-11	MJI-12	MJI-13	MJI-14	
Dia-mond bit	BQ	172685						14.40				14.40
		172686						15.40				15.40
		172687						18.75				18.75
		172688						22.80				22.80
		172689						17.65				17.65
		172690						11.20	8.10			19.30
		174504					54.40					54.40
		174505					32.05					32.05
		174506				20.80						20.80
		174507				29.30						29.30
		174508	13.60									13.60
		174509		26.20								26.20
		174510	4.10		35.10							39.20
		174511			40.00							40.00
		174512									31.10	31.10
		174513								21.50		21.50
		174514							42.10			42.10
		174515				37.60						37.60
		174516				12.80						12.80
		174517	52.00									52.00
		174518	19.90									19.90
		174519	10.70	18.10								28.80
		174520			25.40							25.40
		174521		36.10								36.10
		174522									39.70	39.70
		174523									8.50	8.50
		NS301									21.40	21.40
		NS304								16.60		16.60
		NS307								19.40		19.40
		NS309								15.70		15.70
		NS310								17.60		17.60
		NS312								9.70		9.70
	Total		100.30	80.40	100.50	100.50	86.45	100.20	50.20	100.50	100.70	819.75
Total			Drilled length/bit (819.75/32)									25.62
Grand Total			Drilled length/bit (NQ and BQ) (2,000.90/72)									27.79

Table 2-5 List of Consumables Used

Description	Specifications	Unit	Quantity									Total
			MJI-6	MJI-7	MJI-8	MJI-9	MJI-10	MJI-11	MJI-12	MJI-13	MJI-14	
Light oil		ℓ	1,105	975	1,110	1,125	710	1,695	930	1,350	943	9,943
Engine oil		ℓ	29	28	20	20	18	20	20	36	32	223
Hydraulic oil		ℓ	5	12	4	8	18	12	6	6	24	85
Gear oil		ℓ		4		8		10				22
Grease		Kg	6	8	5	6	5	8	6	20	10	74
Bentonite		Kg	4,575	2,075	2,975	3,275	1,975	4,500	2,450	3,300	3,400	28,525
Libonite		Kg			820						400	1,220
C.M.C		Kg	92	46	121	56	22	181	27	80	42	667
Caustic soda		Kg			12						8	20
Tel – stop		Kg	28	47	120	185	15		18	79	65	557
Sea Clay		Kg	70	25	210	160	65		60		10	600
Tel – seal		Kg	40	30	40	30	10		10	20	20	200
Cutting oil		ℓ	126	140	115	170	41	200	60	118	68	1,038
Calcium chloride		Kg	18	8	25	28	5	16	6	12	10	128
Cement		Kg	1,560	640	1,520	1,880	480	1,840	600	880	560	9,960
Diamong bit	NQ – WL	pc	5	4	4	5	4	5	5	4	4	40
Diamond bit	BQ – WL	pc	4	2	3	4	2	6	1	6	4	32
Diamond reamer	NQ – WL	pc	2	2	1	2	2	2	1	2	2	16
Diamond reamer	BQ – WL	pc	2	1	1	2	1	2	1	2	1	13
Casing bit	NX – NW	pc	1	1			1	2		2		7
Casing metal shoe	HX	pc	2	1	1	1	1	1	1	1	1	10
Casing metal shoe	BX – BW	pc	1	1	1	1	1	1	1	1	1	9
Tri cone bit	3 7/8"	pc	1	1	1	1	1	1	1	1	1	9
Core barrel Assy	NQ – WL	set			1			1	1		1	4
Core barrel Assy	BQ – WL	set	1			1		1		1		4
Inner tube	NQ – WL	pc		2		1		1	1		2	7
Inner tube	BQ – WL	pc	1			2		1	1		1	6
Core lifter case	NQ – WL	pc	4	4	5	6	4	5	4	6	4	42
Core lifter case	BQ – WL	pc	4	2	4	4	3	4	2	4	3	30
Core lifter	NQ – WL	pc	5	4	6	6	4	6	4	6	4	45
Core lifter	BQ – WL	pc	4	3	4	4	2	4	2	4	3	30
Thrust ball bearing	NQ – WL	pc	4	4	4	4	4	4	4	4	4	36
Thrust ball bearing	BQ – WL	pc	4	4	4	4	4	4	4	4	4	36
Innertube stabilizer	NQ – WL	pc	2	2	1	2	2	2	1	2	2	16
Innertube stabilizer	BQ – WL	pc	2	1	1	2	1	2	1	2	1	13
Chack piece	NQ – WL	set	1			1		1			1	4
Chack piece	BQ – WL	set		1		1		1				3
Cylinder liner	68 mm	pc	2		1	2		2			2	9
Piston rod		pc	2		1	2		2			2	9
Piston rubber	68 mm	pc	4	4	8	4	4	4	4	4	4	40
Wire rope	6 m/m 300 m	roll			1			1				2
Core Box	NQ – WL	pc	27	20	26	27	19	22	28	28	25	222
Core Box	BQ – WL	pc	17	13	17	17	15	16	8	14	16	133

Table 2-6 Working Time Analysis of the Drilling Operation

Hole No.	Drilling			Shift		Working man		Working time						G. Total
	Bit size	Drilling	Core length	Drilling	Total	Engineer	Worker	Drilling	Other Working	Recovering	Total	Removing	Road construction and others	
		m	m	shift	shift	man	man	h	h	h	h	h	h	h
MJI-6	3 7/8"	9.00	–	1	10	40	274	5°20′	2°40′		8°00′	72°00′		80°00′
	NQ	141.00	123.90	27	28	47	281	161°30′	107°10′	11°20′	280°00′			280°00′
	BQ	100.30	98.00	19	21	21	84	66°20′	36°50′	50′	104°00′	8°00′		112°00′
	Total	250.30	221.90	47	59	108	639	233°10′	146°40′	12°10′	392°00′	80°00′	(137°00′)	472°00′
MJI-7	3 7/8"	12.00	–	1	5	20	134	5°30′	2°30′		8°00′	32°00′		40°00′
	NQ	108.00	91.30	21	22	30	212	82°50′	73°50′	19°20′	176°00′			176°00′
	BQ	80.40	77.90	16	18	26	154	75°10′	45°40′	15°10′	136°00′	8°00′		144°00′
	total	200.40	169.20	38	45	76	500	163°30′	122°00′	34°30′	320°00′	40°00′		360°00′
MJI-8	3 7/8"	16.00	–	2	7	23	152	7°00′	5°40′	3°20′	16°00′	40°00′		56°00′
	NQ	134.00	118.65	22	23	43	223	123°50′	80°00′	52°10′	256°00′			256°00′
	BQ	100.50	96.85	22	28	28	212	56°50′	42°20′	36°30′	136°00′	16°00′		152°00′
	total	250.50	215.50	46	58	93	587	187°40′	128°20′	92°00′	408°00′	56°00′		464°00′
MJI-9	3 7/8"	7.00	–	1	8	30	194	4°20′	3°00′	40′	8°00′	59°30′		67°30′
	NQ	143.00	124.25	16	20	32	145	102°50′	68°20′	12°50′	184°00′			184°00′
	BQ	100.50	95.20	27	38	46	265	56°10′	79°20′	136°30′	272°00′	8°00′		280°00′
	total	250.50	219.45	44	66	108	604	163°20′	150°40′	150°00′	464°00′	67°30′		531°30′
MJI-10	3 7/8"	7.00	–	1	5	20	137	2°30′	4°30′		8°00′	34°00′		42°00′
	NQ	107.05	81.80	18	18	26	99	85°50′	54°20′	3°50′	144°00′			144°00′
	BQ	86.45	85.65	12	14	22	119	67°50′	36°10′		104°00′	8°00′		112°00′
	total	200.50	167.45	31	37	68	355	157°10′	95°00′	3°50′	256°00′	42°00′		298°00′
MJI-11	3 7/8"	9.00	–	2	10	40	265	6°00′	11°00′		17°00′	70°30′		89°30′
	NQ	141.00	94.70	24	30	40	279	83°40′	131°30′	25°00′	240°10′			240°10′
	BQ	100.20	88.80	28	37	56	245	96°50′	135°40′	63°20′	295°50′	8°00′		303°50′
	total	250.20	283.50	54	77	136	789	186°30′	278°10′	88°20′	553°00′	78°30′		631°30′
MJI-12	3 7/8"	13.00	–	1	5	19	116	2°30′	5°30′		8°00′	34°00′		42°00′
	NQ	137.10	121.95	27	27	56	397	157°30′	101°00′	13°30′	272°00′			272°00′
	BQ	50.20	46.65	10	14	16	57	19°10′	24°20′		43°30′	20°30′		64°00′
	total	200.30	168.60	38	46	91	570	179°10′	130°50′	13°30′	323°30′	54°30′		378°00′
MJI-13	3 7/8"	9.00	–	1	4	16	153	3°30′	4°30′		8°00′	27°00′		35°00′
	NQ	141.00	126.90	30	34	46	228	135°20′	106°50′	26°50′	269°00′			269°00′
	BQ	100.50	81.50	24	28	42	205	101°50′	97°10′	9°00′	208°00′	16°00′		224°00′
	total	250.50	208.40	55	66	104	586	240°40′	208°30′	35°50′	485°00′	43°00′	(248°00′)	528°00′
MJI-14	3 7/8"	21.00	–	2	11	39	286	6°30′	17°30′		24°00′	64°00′		88°00′
	NQ	129.00	112.45	17	25	25	163	79°20′	76°40′	13°20′	169°20′			169°20′
	BQ	100.70	90.15	18	20	31	220	82°20′	40°10′	8°40′	131°10′	11°30′		142°40′
	total	250.70	202.60	37	56	95	669	168°10′	134°20′	22°00′	324°30′	75°30′		400°00′
Grand Total		2,103.90	1,756.60	390	510	879	5,299	1,679°20′	1,394°30′	452°10′	3,526°00′	537°00′	(385°00′)	4,063°00′

( ) Outer hour

Table 2-7 Record of the Drilling Operation on MJI-6

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
November	m	m	m	m	m	shift	shift	man	man
16	Reassemb								
17	Reassemb						2	8	55
18	Reassemb								
19	Reassemb								
20	Reassemb								
21	Reassemb								
22	Reassemb								
23	Reassemb								
24	Reassemb						7	28	184
25	12.00			12.00	1.50				
26	2.90	Reaming	1.90	4.80	2.00				
27	1.20	1.70	5.30	8.20	3.90				
28	4.30	6.10	6.20	16.60	13.70				
29	7.10	4.50	5.10	16.70	15.20				
30	5.30	8.40	8.60	22.30	22.30				
December									
1	8.00	4.00	5.40	17.40	17.40	18	19	28	197
2	5.90	6.20	5.30	17.40	16.30				
3	4.00	4.60	4.50	13.10	11.00				
4	5.70	5.00	7.00	17.70	16.80				
5	3.80	1.10	6.00	10.90	10.90				
6	5.20	2.20	3.20	10.60	9.90				
7	3.40	6.50	6.90	16.80	16.80				
8	4.70	6.10	5.80	16.60	15.20	21	21	28	134
9	6.70	6.60	6.00	19.30	19.30				
10	5.70	6.00	7.90	19.60	19.60				
11	7.30	3.00	Out-C.P	10.30	10.10				
12	Dismant					8	10	16	69
Total	93.20	72.00	85.10	250.30	221.90	47	59	108	639

Abbreviation

Pds,	Preparation for drilling site	Cem,	Cementing work
Transpor,	Transportation	Cem-Cut,	Cutting cementing part
Reassemb,	Reassemblage	Stop-wat,	Stoping for water leakage
Dismant,	Dismantlement	Pws,	Preparation for drilling site
Ins-C.P,	Inserting casing pipe	Rsdg,	Repair work for sink of drilling graund
Out-C.P,	Taking out casing pipe		

Table 2-8 Record of the Drilling Operation on MJI-7

	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
13	Reassemb								
14	Reassemb								
15	Reassemb						3	12	110
16	Reassemb								
17	13.40			13.40	0.90				
18	5.40	7.10	1.10	13.60	8.45				
19	2.30	8.00	0.70	11.00	10.00				
20	Cem-Cut	5.90	0.60	6.50	5.80				
21	2.10	7.20	7.50	16.80	11.90				
22	5.60	9.70	8.00	23.30	22.45	15	17	28	142
23	6.50	6.90	6.20	19.60	19.00				
24	6.80	4.20	3.20	14.20	11.30				
25	2.30	6.00	6.10	14.40	14.20				
26	6.00	6.60	3.40	16.00	16.00				
27	4.40	5.70	5.30	15.40	15.30				
28	3.50	5.40	5.00	13.90	13.90				
29	5.50	4.60	4.30	14.40	13.70	21	21	28	152
30	5.20	2.70	Out-C.P	7.90	6.30				
31	Dismant					2	4	8	96
Total	69.00	80.00	51.40	200.40	169.20	38	45	76	500

Table 2-9 Record of the Drilling Operation on MJI-8

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
October	m	m	m	m	m	shift	shift	man	man
22	Off day								
23	Reassemb								
24	Reassemb								
25	Reassemb								
26	Reassemb								
27	Reassemb						5	20	143
28	7.70	9.20	7.90	24.80	6.40				
29	5.10	5.90	6.70	17.70	12.05				
30	4.40	1.10	8.20	13.70	13.00				
31	6.00	6.10	9.50	21.60	19.55				
November									
1	2.40	Cem-Cut	1.60	4.00	3.60				
2	7.80	10.40	8.80	27.00	25.55				
3	8.80	6.40	6.30	21.50	19.40	20	21	28	136
4	5.20	5.10	5.40	15.70	15.70				
5	4.00	3.80	7.20	15.00	14.20				
6	7.00	2.40	1.90	11.30	11.25				
7	Stop-wat	0.90	4.50	5.40	5.40				
8	3.40	4.00	7.70	15.10	15.10				
9	4.20	6.10	Stop-wat	10.30	10.20				
10	Stop-wat	7.50	4.10	11.60	11.50	18	21	28	186
11	2.40	4.30	3.70	10.40	9.60				
12	3.40	3.50	4.70	11.60	10.20				
13	7.40	6.40	Out-C.P	13.80	12.80				
14	Dismant								
15	Dismant					8	10	17	122
Total	79.20	83.10	88.20	250.50	215.50	46	57	93	587

Table 2-10 Record of the Drilling Operation on MJI-9

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
September	m	m	m	m	m	shift	shift	man	man
25	Reassemb								
26	Reassemb								
27	Reassemb								
28	Reassemb								
29	Reassemb						5	20	126
30	Reassemb								
October									
1	Reassemb								
2	13.00	10.70	10.00	33.70	17.45				
3	5.30	Reaming	8.80	14.10	11.85				
4	8.00	9.30	Cem	17.30	14.20				
5	Cem-Cut	9.20	9.20	18.40	16.75				
6	8.30	8.00	9.60	25.90	23.80	12	17	28	171
7	7.30	10.70	9.50	27.50	27.10				
8	6.10	7.00	Ins-C.P	13.10	13.10				
9	8.30	8.90	7.30	24.50	24.50				
10	5.40	7.70	1.20	14.30	14.30				
11	4.10	6.50	5.50	16.10	15.00				
12	2.40	Stop-wat	Stop-wat	2.40	2.10				
13	1.10	Stop-wat	0.10	1.20	1.15	17	21	28	147
14	2.50	Stop-wat	Stop-wat	2.50	2.45				
15	Stop-wat	0.45	0.60	1.05	0.95				
16	0.15	1.55	1.50	3.20	2.35				
17	1.85	Stop-wat	Stop-wat	1.85	1.85				
18	Stop-wat	3.85	7.45	11.30	9.70				
19	1.80	2.90	2.90	7.60	6.65				
20	5.30	6.90	2.30	14.50	14.20	15	21	28	148
21	Out-C.P	Dismant					1	4	12
Total	80.90	93.65	75.95	250.50	219.45	44	65	108	604

Table 2-11 Record of the Drilling Operation on MJI-10

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
September	m	m	m	m	m	shift	shift	man	man
8	Transpor						1	4	32
9	Reassemb								
10	Reassemb								
11	Reassemb								
12	7.80			7.80	0.80				
13	5.20	6.10		11.30	5.20				
14	5.80	5.80	6.40	18.00	8.80				
15	2.50	7.00	4.50	14.00	11.70	9	12	28	148
16	8.20	8.10	5.70	22.00	19.20				
17	8.50	4.30	8.40	21.20	16.50				
18	5.30	6.10	5.60	17.00	16.85				
19	2.75	3.25	7.20	13.20	13.20				
20	6.70	6.70	7.10	20.50	20.50				
21	8.40	9.10	5.90	23.40	22.60				
22	7.20	8.00	8.60	23.80	23.80	21	21	28	123
23	8.30	Out-C.P		8.30	8.30				
24	Dismant					1	3	8	52
Total	76.65	64.45	59.40	200.50	167.45	31	37	68	355

Table 2-12 Record of the Drilling Operation on MJI-11

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
July	m	m	m	m	m	shift	shift	man	man
12	Pds								
13	Pds								
14	Reassemb						3	12	70
15	Reassemb								
16	Reassemb								
17	Reassemb								
18	Reassemb								
19	Reassemb								
20	5.00			5.00	–				
21	4.00			4.00	–	2	7	28	195
22	6.00	8.10	6.90	21.00	12.90				
23	Reaming	6.80	7.30	14.10	10.85				
24	0.30	Reaming	Reaming	0.30	0.20				
25	1.40	5.75	4.85	12.00	6.75				
26	1.90	Cem	Cem-Cut	1.90	1.00				
27	6.20	6.70	7.40	20.30	14.10				
28	7.10	7.75	8.55	23.40	18.90	16	21	28	202
29	8.50	7.75	7.45	23.70	18.10				
30	7.40	4.20	8.50	20.10	9.60				
31	3.70	0.50	Ins-C.P	4.20	2.30				
August									
1	3.10	5.30	3.20	11.60	8.50				
2	4.00	4.60	4.80	13.40	12.10				
3	3.70	2.80	6.70	13.20	12.90				
4	5.50	3.45	Cem	8.95	8.95	19	21	28	161
5	Cem-Cut	1.40	Cem	1.40	1.30				
6	Cem-Cut	0.15	Cem	0.15	0.15				
7	4.30	3.80	Stop-wat	8.10	8.10				
8	2.20	0.70	3.50	6.40	5.15				
9	5.10	3.05	3.45	11.60	9.90				
10	5.00	3.35	3.15	11.50	9.70				
11	2.70	2.60	4.60	9.90	8.80	16	21	28	116
12	4.00	Out-C.P		4.00	3.25				
13	Out-C.P	Out-C.P							
14	Dismant					1	5	12	45
Total	91.10	78.75	80.35	250.20	183.50	54	78	136	789

Table 2-13 Record of the Drilling Operation on MJI-12

	Drilling length			Total		Shift		Working man	
	Shift. 1	Shift. 2	Shift. 3	Drilling	Core length	Drilling	Total	Engineer	Worker
August	m	m	m	m	m	shift	shift	man	man
15	Reassemb								
16	Reassemb								
17	Off day								
18	Reassemb						3	12	76
19	Reassemb								
20	13.00	5.00		18.00	3.40				
21	3.00	6.20		9.20	8.10				
22	4.00	4.10		8.10	6.05				
23	6.30	4.00		10.30	8.40				
24	4.50	6.00		10.50	10.50				
25	7.65	7.25		14.90	14.90	12	13	28	245
26	5.60	3.10		8.70	7.65				
27	2.80	3.70		6.50	4.05				
28	5.00	4.10		9.10	5.95				
29	6.20	4.50	4.60	15.30	14.80				
30	4.70	3.80	6.00	14.50	13.75				
31	5.50	3.10	7.70	16.30	16.30				
September									
1	7.60	1.10	4.30	13.00	12.00	18	18	28	143
2	5.00	4.90	8.30	18.20	17.30				
3	4.80	5.30	6.10	16.20	14.90				
4	5.60	4.00	1.90	11.50	10.55				
5	Out-C.P	Dismant							
6	Dismant								
7	Dismant					9	13	23	106
Total	91.25	70.15	38.90	200.30	168.60	39	47	91	570

Table 2-14 Record of the Drilling Operation on MJI-13

	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
26	Reassemb						1	4	38
27	Reassemb								
28	Reassemb								
29	8.00			8.00	–				
30	6.10	6.00	8.00	20.10	15.80				
31	2.30	2.90	Reaming	5.20	2.95				
February									
1	3.50	3.70	4.00	11.20	8.45				
2	5.00	6.00	7.10	18.10	13.40	12	15	28	194
3	0.30	Cem-Cut	5.10	5.40	5.10				
4	1.10	2.60	Cem	3.70	3.20				
5	Cem-Cut	3.30	6.00	9.30	9.30				
6	6.00	2.60	6.00	14.60	14.60				
7	6.30	6.10	6.10	18.50	18.50				
8	6.10	5.00	6.30	17.40	17.40				
9	5.20	5.00	4.50	14.70	14.40	18	21	28	143
10	3.80	3.20	5.50	12.50	11.95				
11	4.30	5.10	3.40	12.80	10.85				
12	3.30	5.70	4.60	13.60	9.80				
13	4.50	3.30	3.20	11.00	7.15				
14	Rsdg	5.70	6.60	12.30	9.85				
15	3.50	3.80	4.60	11.90	10.70				
16	4.90	3.70	3.70	12.30	10.80	20	21	28	113
17	4.00	3.80	4.20	12.00	9.10				
18	3.50	2.40	Out-C.P	5.90	5.10				
19	Dismant								
20	Dismant					5	8	16	98
Total	81.70	79.90	88.80	250.50	208.40	55	66	104	586

Table 2-15 Record of the Drilling Operation on MJI-14

	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
1	Off day								
2	Pds								
3	Reassemb								
4	Reassemb								
5	Reassemb						4	16	119
6	Reassemb								
7	Reassemb								
8	Reassemb								
9	Reassemb								
10	8.00			8.00	—				
11	Pws	13.00	9.30	22.30	6.50				
12	10.00	1.70	7.00	18.70	11.65	6	11	28	241
13	3.50	9.80	7.30	20.60	17.50				
14	3.00	Cem	Cem-Cut	3.00	2.70				
15	9.60	10.30	11.50	31.40	28.70				
16	9.70	11.00	9.20	29.90	29.50				
17	6.30	7.40	2.40	16.10	15.90				
18	4.60	4.70	8.10	17.40	13.90				
19	6.20	5.40	6.60	18.20	17.75	19	21	28	122
20	5.20	6.30	6.60	18.10	18.10				
21	7.30	6.40	7.00	20.70	20.30				
22	6.60	4.60	6.20	17.40	12.20				
23	1.80	2.70	4.40	8.90	7.90				
24	Out-C.P Dismant								
25	Dismant					12	14	23	187
Total	81.80	83.30	85.60	250.70	202.60	37	50	95	669

Table 2-16 Summary of the Drilling Operation on MJI-6

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	16.11.1984 ~ 24.11.1984	9	days 9	days 0	man 36	man 239
	Drilling	25.11.1984 ~ 11.12.1984	17	drilling 17	0	68	385
				recovering 0	0	0	0
	Removing	12.12.1984 ~ 12.12.1984	1	1	0	4	15
	Total	16.11.1984 ~ 12.12.1984	27	27	0	108	639

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 9.00
	Increase or Decrease in length	m –	Core length	m 221.90
	Length drilled	250.30	Core recovery	92.0 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	85.7	
100 ~ 200	93.8	89.9
200 ~ 250.3	99.6	92.0

Working hours	Drilling	h 233°10′	% 59.5	% 49.4
	Other working	146°40′	37.4	31.1
	Recovering	12°10′	3.1	2.6
	Total	392°00′	100	83.1
	Reassemblage	72°00′		15.2
	Dismantlement	8°00′		1.7
	Water transportation			
	Road construction and others			
	G. Total	472°00′		100

Efficiency of Drilling

Total m/work period (m/day)	250.3 m/17 days (14.72 m/day)
Total m/total shift (m/shift)	250.3 m/49 shift (5.11 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	9.00	141.00	100.30
Core length	0	123.90	98.00

Casing pipe inserted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	6.50	2.6	100
	NW	18.00	7.2	100
	BW	150.00	60.0	100

Table 2-17 Summary of the Drilling Operation on MJI-7

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	13.12.1984 ~ 16.12.1984	4	days 4	days 0	man 16	man 125
	Drilling	17.12.1984 ~ 30.12.1984	14	drilling 14	0	56	330
				recovering 0	0	0	0
	Removing	31.12.1984 ~ 31.12.1984	1	1	0	4	45
	Total	13.12.1984 ~ 31.12.1984	19	19	0	76	500

Drilling length	Length planed	m 200.00	Surface soil Overburden Quaternary	m 12.00
	Increase or Decrease in length	m –	Core length	m 169.20
	Length drilled	200.40	Core recovery	89.8 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	85.1	
100 ~ 200.4	93.9	89.9

working hours	Drilling	h 163°10′	% 51.1	% 45.4
	Other working	122°00′	38.1	33.9
	Recovering	34°30′	10.8	9.6
	Total	320°00′	100	88.9
	Reassemblage	32°00′		8.9
	Dismantlement	8°00′		2.2
	Water transportation			
	Road construction and others			
	G. Total	360°00′		100

Efficiency of Drilling

Total m/work period (m/day)	200.40 m/14 days (14.31 m/day)
Total m/total shift (m/shift)	200.40 m/40 shift (5.01 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	12.00	108.00	80.40
Core length	0	91.30	77.90

Casing pipe inserted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	5.00	2.5	100
	NW	27.00	13.5	100
	BW	120.00	60.0	100

Table 2-18 Summary of the Drilling Operation on MJI-8

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	22.10.1984 ~ 27.10.1984	6	days 5	days 1	man 20	man 143
	Drilling	28.10.1984 ~ 13.11.1984	17	drilling 16	0	63	325
				recovering 1	0	3	54
	Removing	14.11.1984 ~ 15.11.1984	2	2	0	7	65
	Total	22.10.1984 ~ 15.11.1984	25	24	1	93	587

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 16.00
	Increase or Decrease in length	m –	Core length	m 215.50
	Length drilled	250.50	Core recovery	91.9 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	86.6	
100 ~ 200	95.6	91.5
200 ~ 250.5	93.5	91.9

working hours	Drilling	h 187°40′	% 46.0	% 40.4
	Other working	128°20′	31.5	27.7
	Recovering	92°00′	22.5	19.8
	Total	408°00′	100	87.9
	Reassemblage	40°00′		8.6
	Dismantlement	16°00′		3.5
	Water transportation			
	Road construction and others			
	G. Total	464°00′		100

Efficiency of Drilling

Total m/work period (m/day)	250.5 m/17 days (14.73 m/day)
Total m/total shift (m/shift)	250.5 m/51 shift (4.91 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	16.00	134.00	100.50
Core length	0	118.65	96.85

Casing pipe inscerted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	5.00	2.0	100
	NW	48.00	19.2	100
	BW	150.00	60.0	100

Table 2-19 Summary of the Drilling Operation on MJI-9

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	25.9.1984 ~ 1.10.1984	7	days 7	days 0	man 28	man 176
	Drilling	2.10.1984 ~ 20.10.1984	19	drilling 15	0	61	348
				recovering 4	0	15	74
	Removing	21.10.1984 ~ 21.10.1984	1	1	0	4	6
	Total	25.9.1984 ~ 21.10.1984	27	27	0	108	604

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 8.00
	Increase or Decrease in length	m –	Core length	m 219.45
	Length drilled	250.50	Core recovery	90.5 %

Core recovery of 100 m hole		
Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	81.7	
100 ~ 200	99.0	90.7
200 ~ 250.5	89.7	90.5

working hours	h	%	%
Drilling	163°20′	35.2	30.7
Other working	150°40′	32.5	28.4
Recovering	150°00′	32.3	28.2
Total	464°00′	100	87.3
Reassemblage	59°30′		11.2
Dismantlement	8°00′		1.5
Water transportation			
Road construction and others			
G. Total	531°30′		100

Efficiency of Drilling	
Total m/work period (m/day)	250.5 m/19 days (13.18 m/day)
Total m/total shift (m/shift)	250.5 m/57 shift (4.39 m/shift)

Drilling length/bit (each sized bit)			
Bit size	3 7/8	N Q	B Q
Drilled length	7.00	143.00	100.50
Core length	0	124.25	95.20

Casing pipe inserted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	4.00	1.6	100
	NW	39.00	15.6	100
	BW	150.00	60.0	100

Table 2-20 Summary of the Drilling Operation on MJI-10

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	8.9.1984 ~ 11.9.1984	4	days 4	days 0	man 16	man 137
	Drilling	12.9.1984 ~ 23.9.1984	12	drilling 12	0	48	193
				recovering 0	0	0	0
	Removing	24.9.1984 ~ 24.9.1984	1	1	0	4	25
	Total	8.9.1984 ~ 24.9.1984	17	17	0	68	355

Drilling length	Length planed	m 200.00	Surface soil Overburden Quaternary	m 7.00
	Increase or Decrease in length	m —	Core length	m 167.45
	Length drilled	200.50	Core recovery	86.5 %

Core recovery of 100 m hole		
Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	73.0	
100 ~ 200.5	99.1	86.5

Woking hours				
Drilling	h 157°10′	% 61.4	% 52.7	
Other working	95°00′	37.1	31.9	
Recovering	3°50′	1.5	1.3	
Total	256°00′	100	85.9	
Reassemblage	34°00′		11.4	
Dismantlement	8°00′		2.7	
Water transportation				
Road construction and others				
G. Total	298°00′		100	

Efficiency of Drilling	
Total m/work period (m/day)	200.5 m/12 days (16.7 m/day)
Total m/total shift (m/shift)	200.5 m/32 shift (6.27 m/shift)

Drilling length/bit (each sized bit)			
Bit size	3 7/8	N Q	B Q
Drilled length	7.00	107.05	86.45
Core length	0	81.80	85.65

Casing pipe inscerted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	5.00	2.5	100
	NW	42.00	20.9	100
	BW	114.05	56.9	100

Table 2-21 Summary of the Drilling Operation on MJI-11

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	12.7.1984 ~ 19.7.1984	8	days 8	days 0	man 32	man 225
	Drilling	20.7.1984 ~ 13.8.1984	25	drilling 21	0	87	503
				recovering 4	0	13	43
	Removing	14.8.1984 ~ 14.8.1984	1	1	0	4	18
	Total	12.7.1984 ~ 14.8.1984	34	34	0	136	789

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 13.30
	Increase or Decrease in length	m –	Core length	m 183.50
	Length drilled	250.20	Core recovery	77.5 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	72.5	
100 ~ 200	80.0	76.5
200 ~ 250.2	80.9	77.5

Woking hours	Drilling	h 186°30′	% 33.7	% 29.5
	Other working	278°10′	50.3	44.0
	Recovering	88°20′	16.0	14.0
	Total	553°00′	100	87.5
	Reassemblage	70°30′		11.2
	Dismantlement	8°00′		1.3
	Water transportation			
	Road construction and others			
	G. Total	631°30′		100

Efficiency of Drilling

Total m/work period (m/day)	250.20 m/25 days (10.01 m/day)
Total m/total shift (m/shift)	250.20 m/69 shift (3.63 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	9.00	141.00	100.20
Core length	0	94.70	88.80

Casing pipe inserted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	5.00	2.0	100
	NW	45.80	18.3	100
	BW	150.00	60.0	100

Table 2-22 Summary of the Drilling Operation on MJI-12

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	15.8.1984 ~ 19.8.1984	5	days 4	days 1	man 16	man 91
	Drilling	20.8.1984 ~ 4.9.1984	16	drilling 16	0	64	446
				recovering 0	0	0	0
	Removing	5.9.1984 ~ 7.9.1984	3	3	0	11	33
	Total	15.8.1984 ~ 7.9.1984	24	23	1	91	570

Drilling length	Length planed	m 200.00	Surface soil Overburden Quaternary	m 5.00
	Increase or Decrease in length	m –	Core length	m 168.60
	Length drilled	200.30	Core recovery	86.3 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	77.6	
100 ~ 200.3	94.9	86.3

working hours	Drilling	h 179°10′	% 55.4	% 47.4
	Other working	130°50′	40.4	34.6
	Recovering	13°30′	4.2	3.6
	Total	323°30′	100	85.6
	Reassemblage	34°00′		9.0
	Dismantlement	20°30′		5.4
	Water transportation			
	Road construction and others			
	G. Total	378°00′		100

Efficiency of Drilling

Total m/work period (m/day)	200.30 m/16 days (12.52 m/day)
Total m/total shift (m/shift)	(200.30 m/39 shift (5.14 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	13.00	137.10	50.20
Core length	0	121.95	46.65

Casing pipe inserted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	5.00	2.5	100
	NW	30.00	15.0	100
	BW	150.10	74.9	100

Table 2-23 Summary of the Drilling Operation on MJI-13

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	1.1.1985 ~ 9.1.1985	9	days 8	days 1	man 32	man 250
	Drilling	10.1.1985 ~ 23.1.1985	14	drilling 13	0	52	358
				recovering 1	0	4	9
	Removing	24.1.1985 ~ 25.1.1985	2	2	0	7	52
	Total	1.1.1985 ~ 25.1.1985	25	24	1	95	669

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 21.00
	Increase or Decrease in length	m –	Core length	m 202.60
	Length drilled	250.70	Core recovery	88.0 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	80.4	
100 ~ 200	95.0	88.5
200 ~ 250.7	87.0	88.2

working hours	Drilling	h 168°10′	% 51.8	% 42.0
	Other working	134°20′	41.4	33.6
	Recovering	22°00′	6.8	5.5
	Total	324°30′	100	81.1
	Reassemblage	64°00′		16.0
	Dismantlement	11°30′		2.9
	Water transportation			
	Road construction and others			
	G. Total	400°00′		100

Efficiency of Drilling

Total m/work period (m/day)	250.70 m/14 days (17.91 m/day)
Total m/total shift (m/shift)	250.70 m/40 shift (6.27 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	21.00	129.00	100.70
Core length	0	112.45	90.15

	Size	meterage (m)	meterage drilling length × 100 (%)	Recovery (%)
Casing pipe inserted	HX	5.00	2.0	100
	NW	50.00	19.9	100
	BW	150.00	60.0	100

Table 2-24 Summary of the Drilling Operation on MJI-14

		Sarvey Period				Total man day	
		Period	days	work day	off day	Engineer	worker
Operation	Preparation	26.1.1985 ~ 28.1.1985	3	days 3	days 0	man 12	man 113
	Drilling	29.1.1985 ~ 18.2.1985	21	drilling 20	0	80	400
				recovering 1	0	4	9
	Removing	19.2.1985 ~ 20.2.1985	2	2	0	8	64
	Total	26.1.1985 ~ 20.2.1985	26	26	0	104	586

Drilling length	Length planed	m 250.00	Surface soil Overburden Quaternary	m 9.00
	Increase or Decrease in length	m –	Core length	m 208.40
	Length drilled	250.50	Core recovery	86.3 %

Core recovery of 100 m hole

Depth of hole (m)	core recovery (%)	core recovery cumulated (%)
0 ~ 100	84.8	
100 ~ 200	87.5	86.2
200 ~ 250.5	86.5	86.3

working hours	Drilling	h 240°40′	% 49.6	% 45.6
	Other working	208°30′	43.0	39.5
	Recovering	35°50′	7.4	6.8
	Total	485°00′	100	91.9
	Reassemblage	27°00′		5.1
	Dismantlement	16°00′		3.0
	Water transportation			
	Road construction and others			
	G. Total	528°00′		100

Efficiency of Drilling

Total m/work period (m/day)	250.50 m/21 days (11.93 m/day)
Total m/total shift (m/shift)	250.50 m/61 shift (4.11 m/shift)

Drilling length/bit (each sized bit)

Bit size	3 7/8	N Q	B Q
Drilled length	9.00	141.00	100.50
Core length	–	126.90	81.50

Casing pipe inscerted	Size	meterage (m)	meterage drilling length x 100 (%)	Recovery (%)
	HX	6.00	2.4	100
	NW	39.00	15.6	100
	BW	150.00	60.0	100

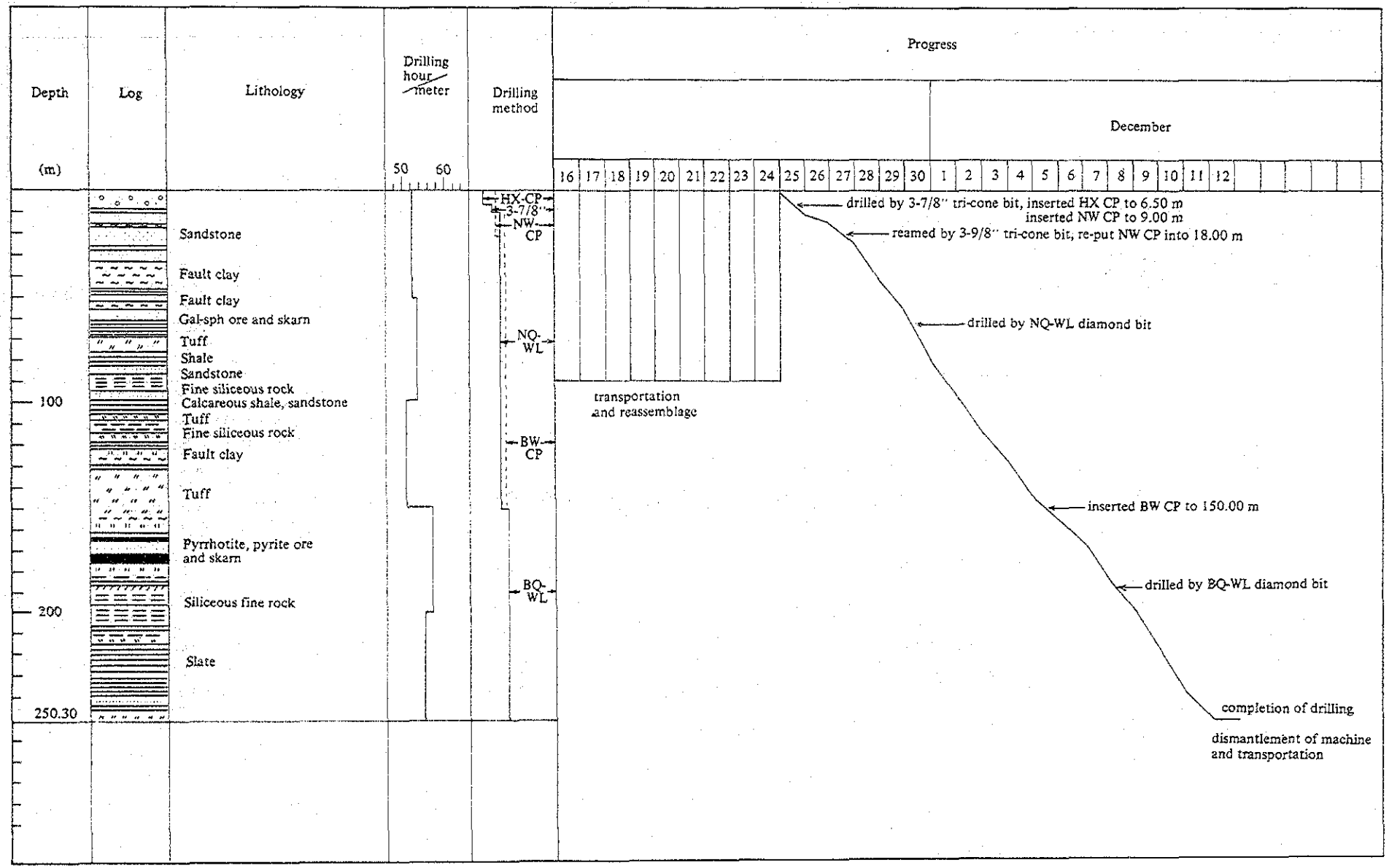


Fig. 2-2 Drilling Progress on MJI-6

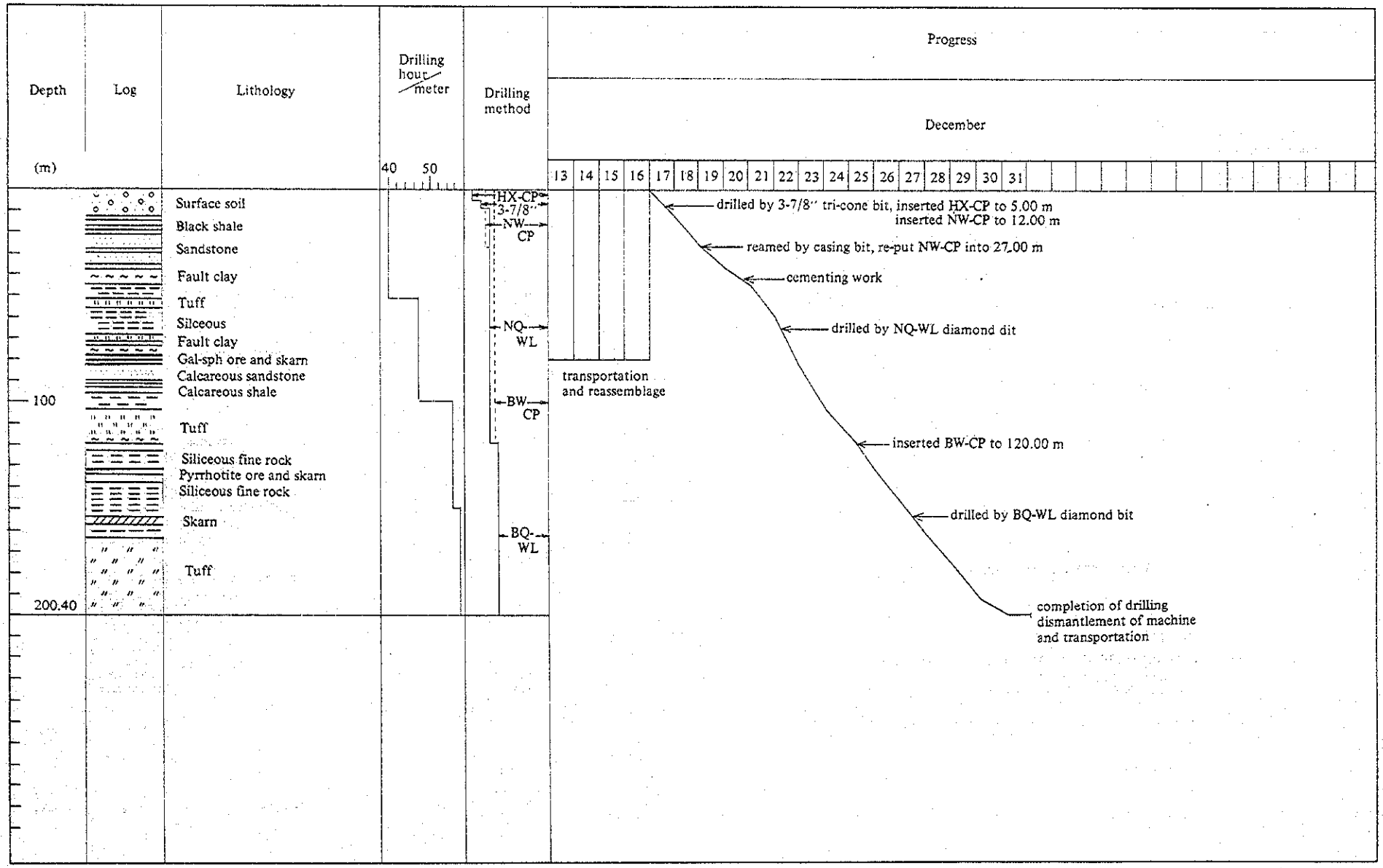


Fig. 2-3 Drilling Progress on MJI-7

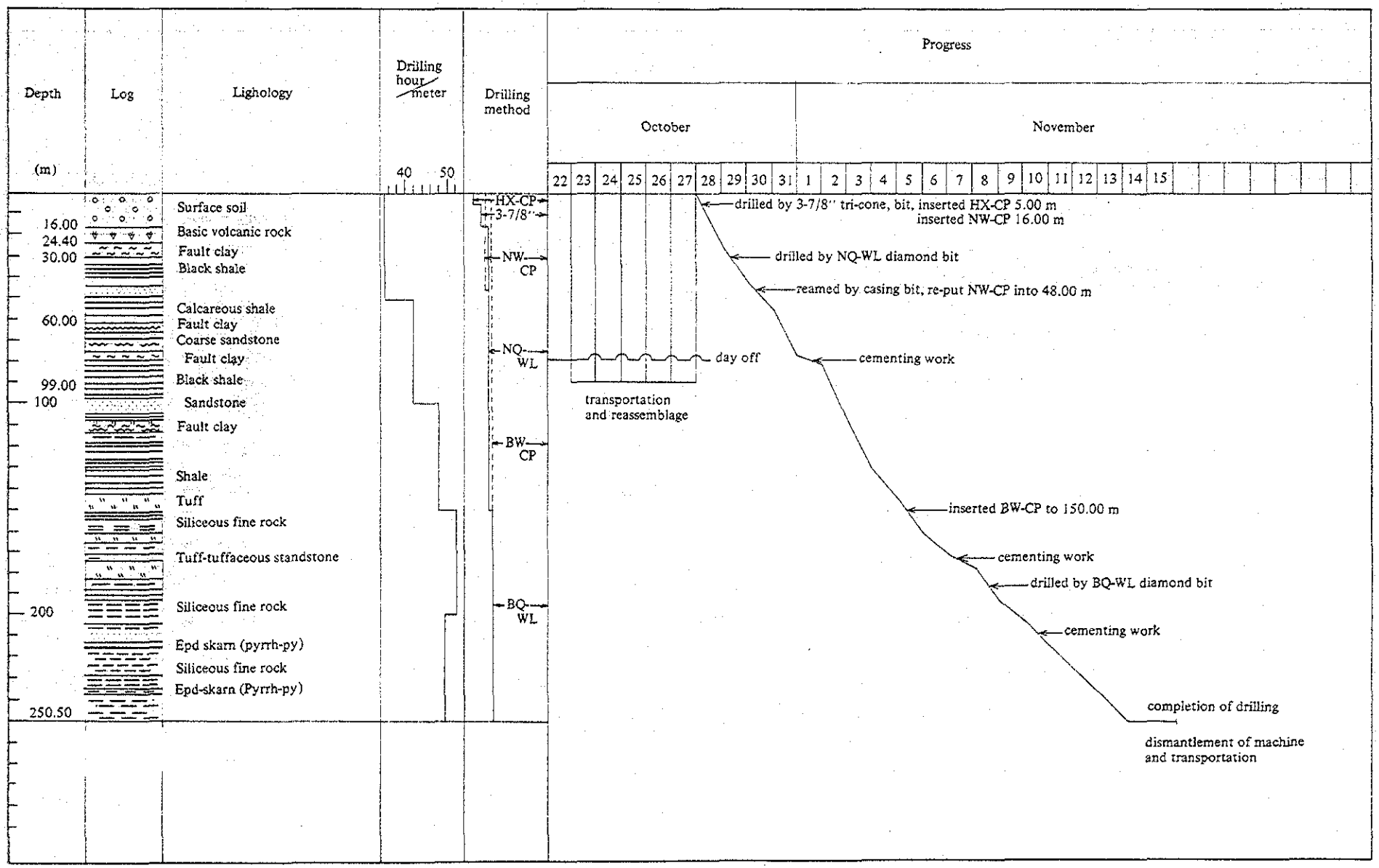


Fig. 2-4 Drilling Progress on MJI-8

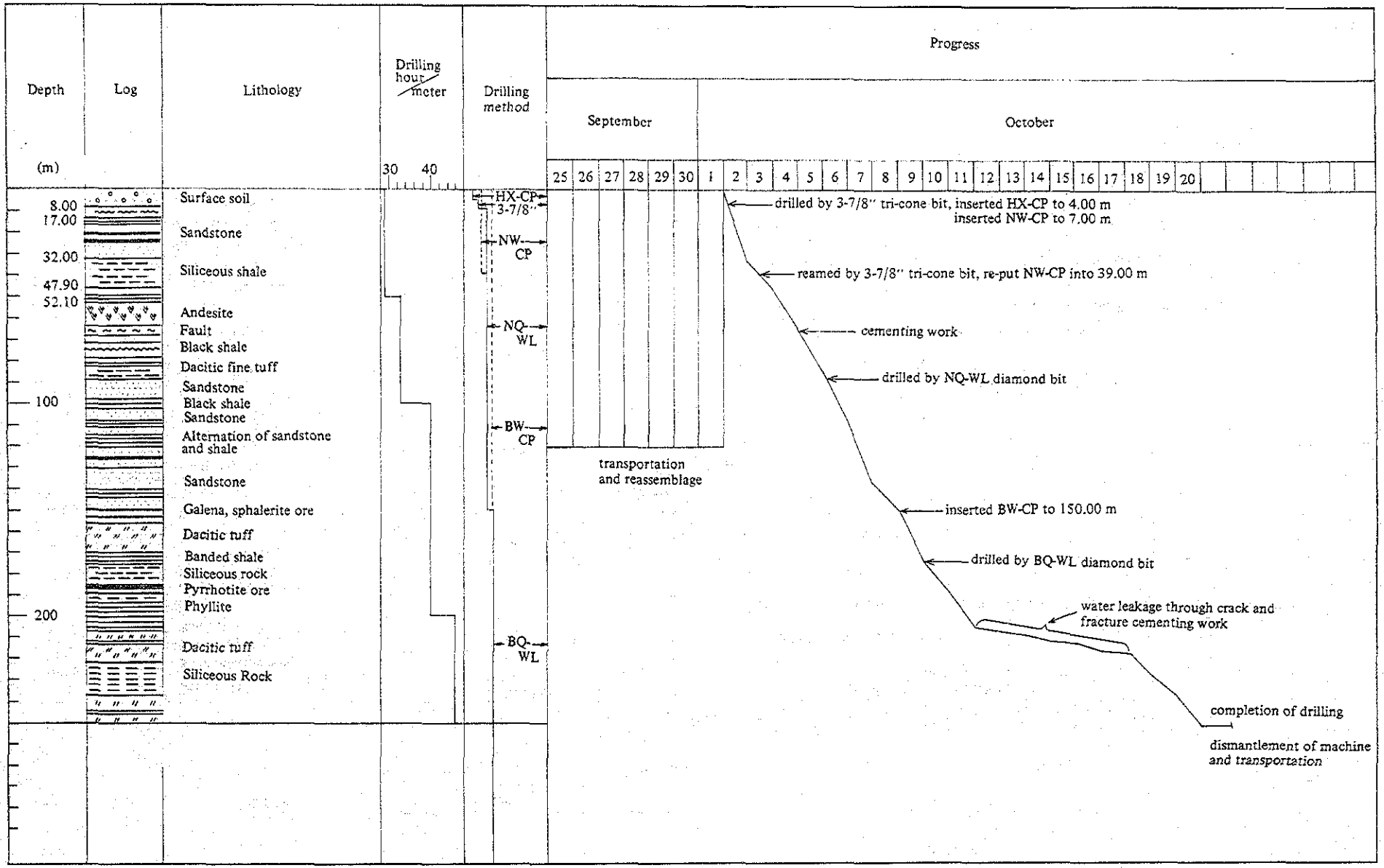


Fig. 2-5 Drilling Progress on MJI-9

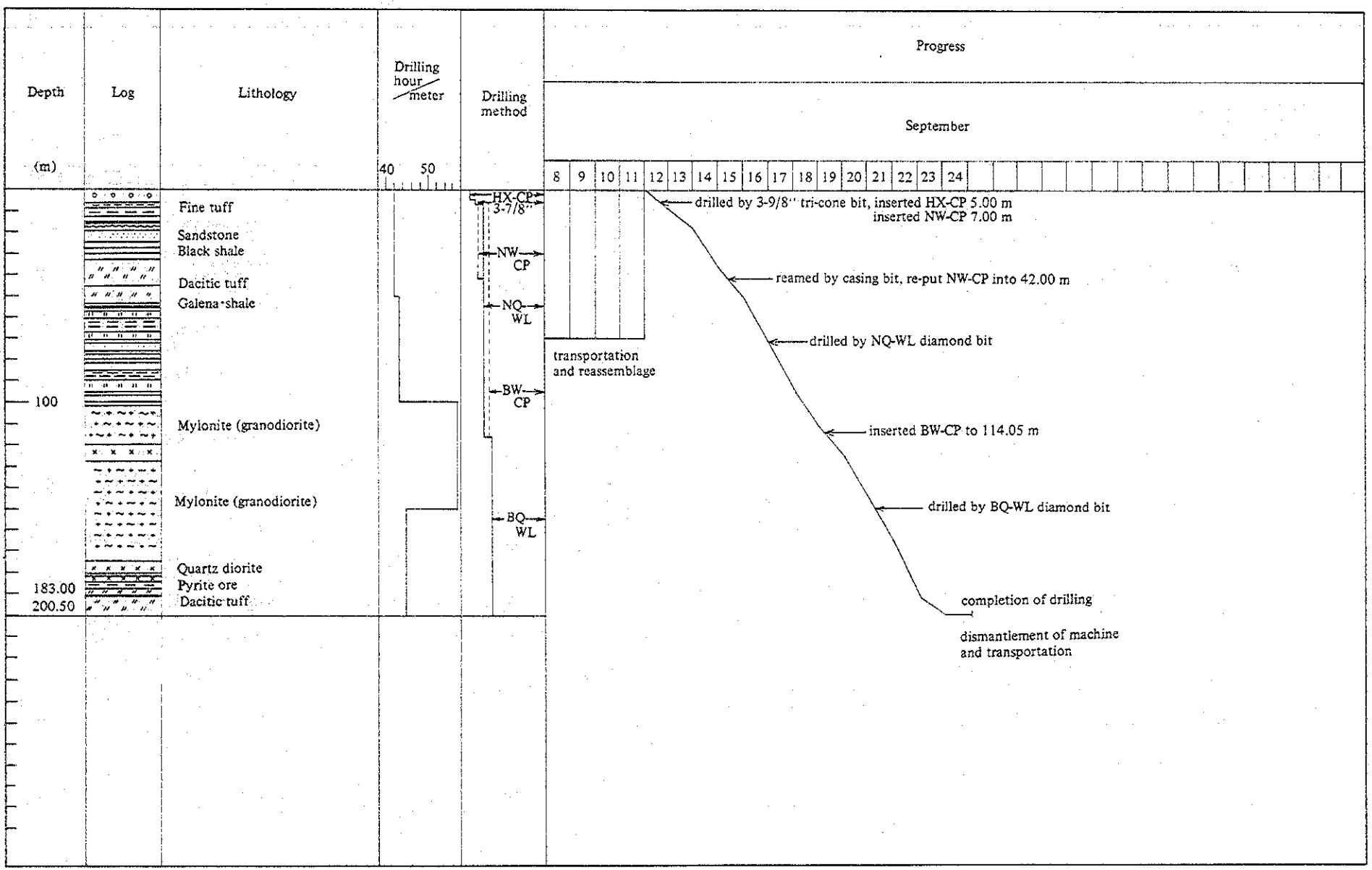


Fig. 2-6 Drilling Progress on MJI-10

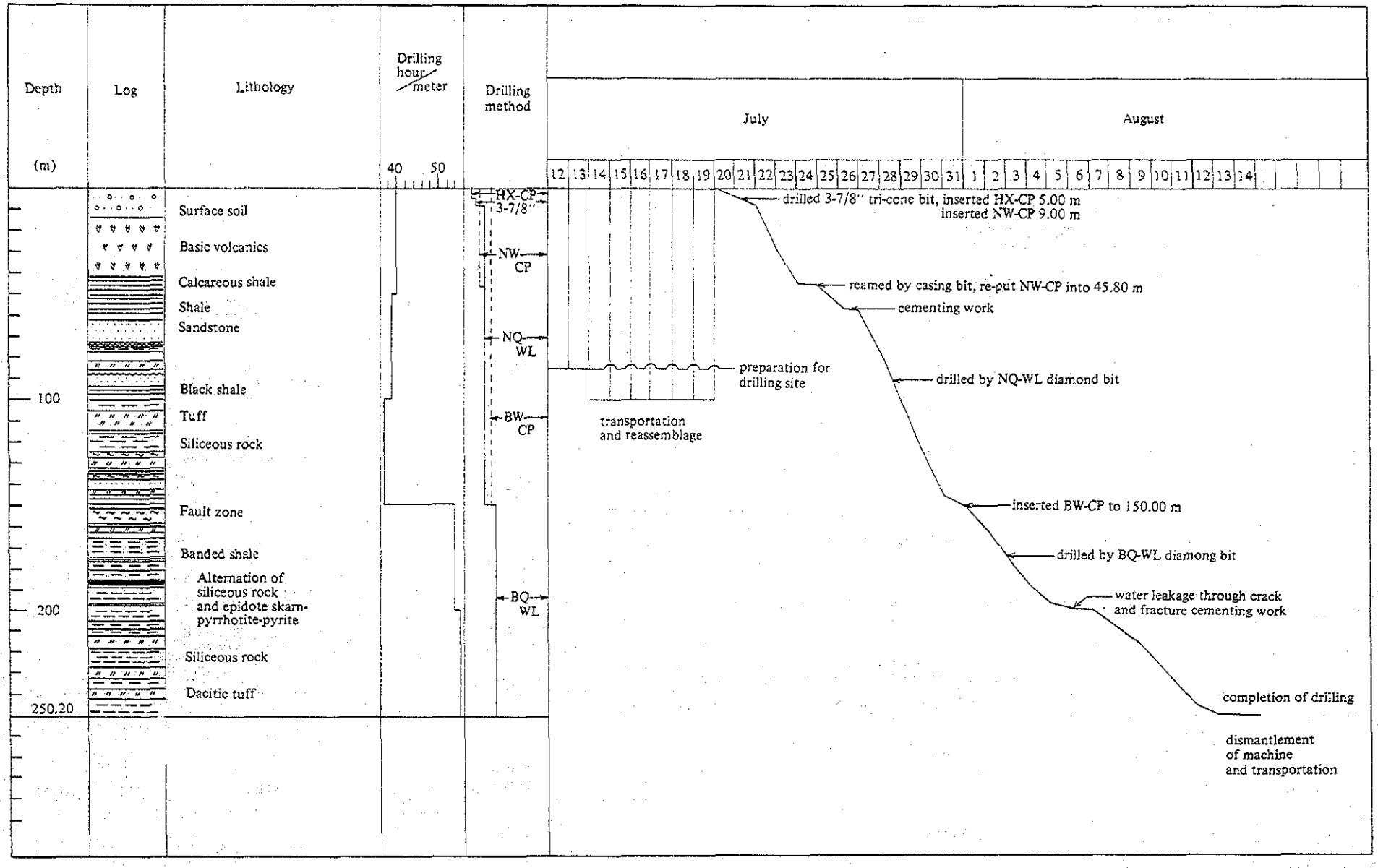


Fig. 2-7 Drilling Progress on MJI-11

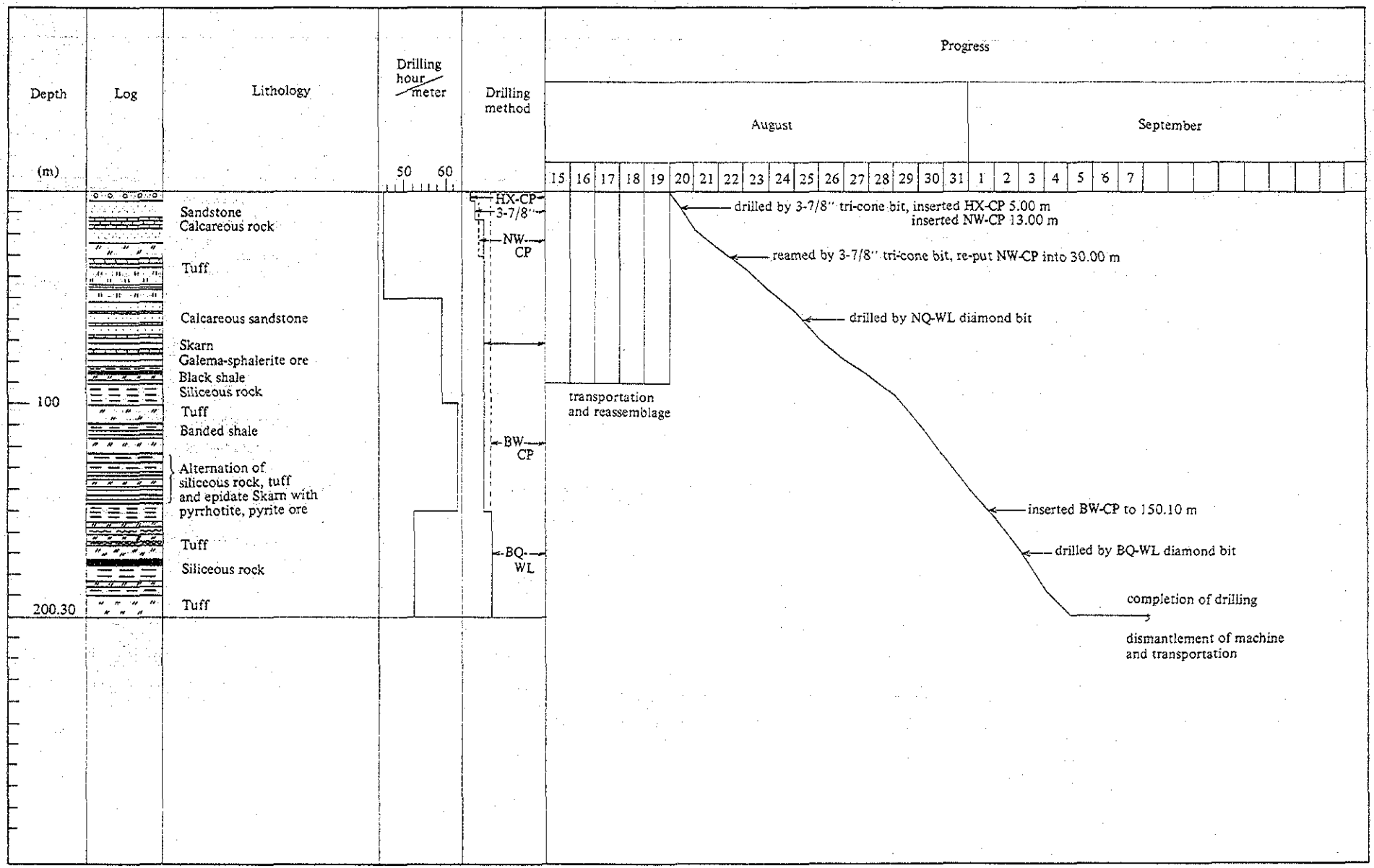


Fig. 2-8 Drilling Progress on MJI-12

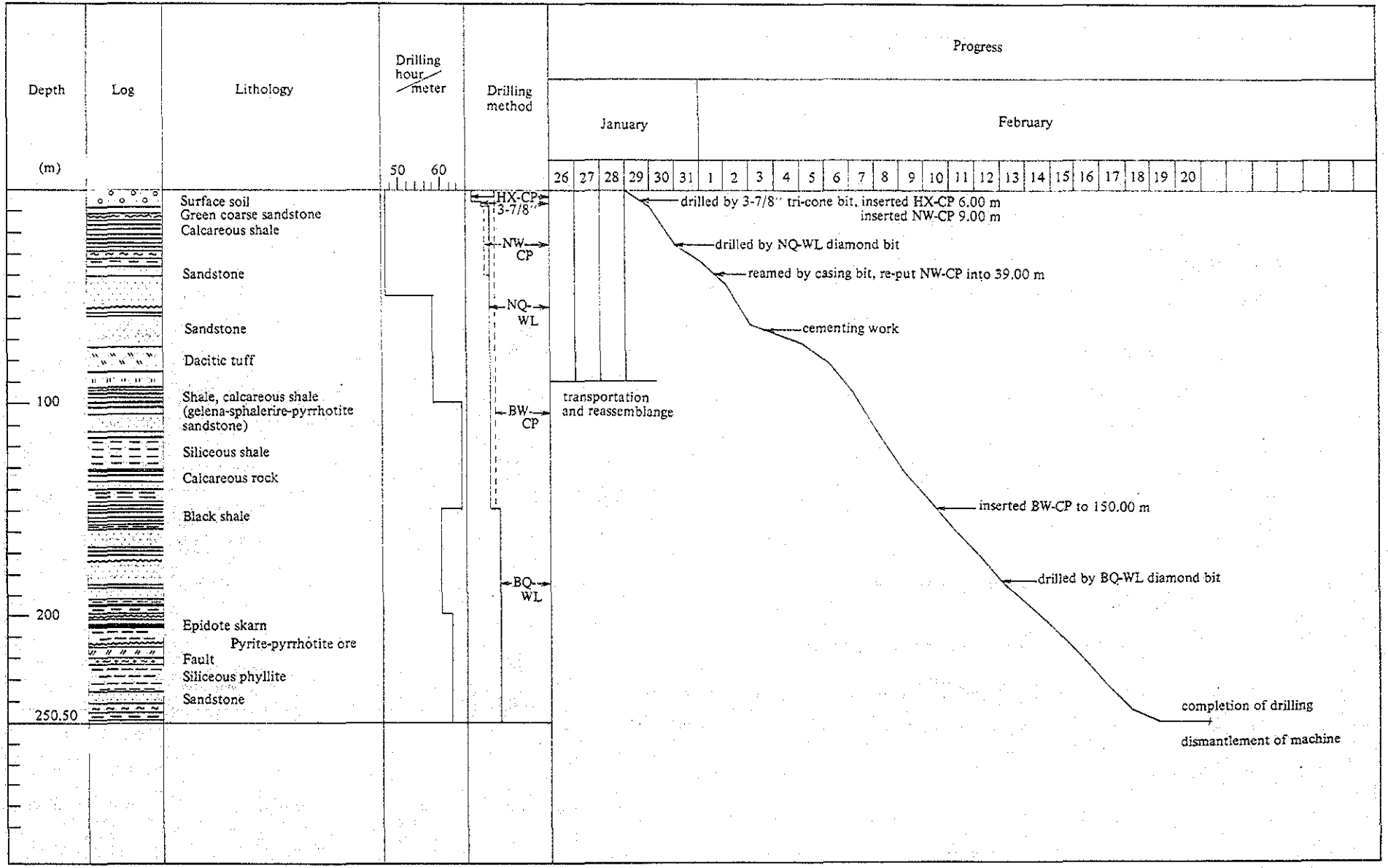


Fig. 2-9 Drilling Progress on MJI-13

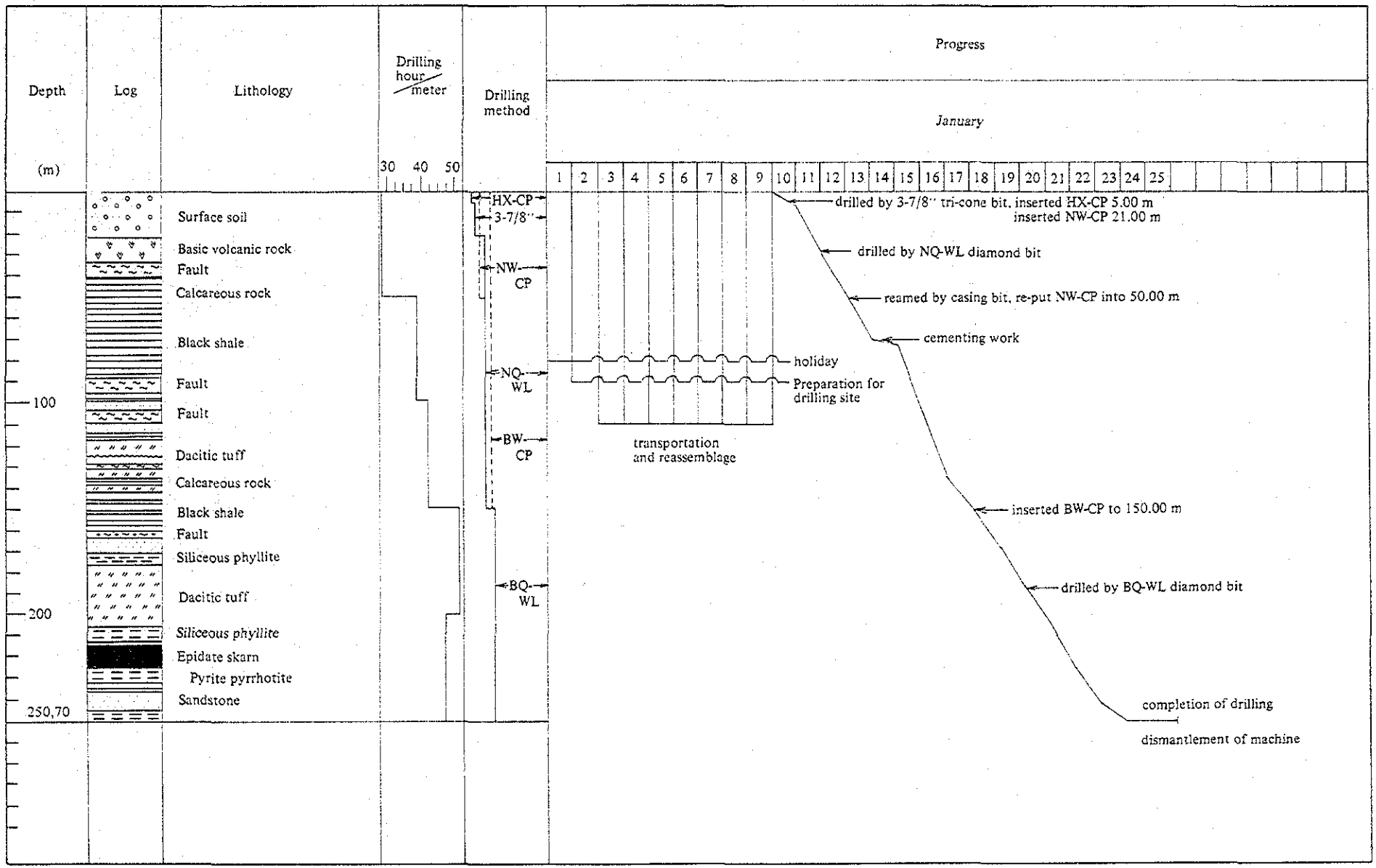


Fig. 2-10 Drilling Progress on MJI-14

CHAPTER 3 The Geology and Mineralization by Drilling Survey

Geological and ore log of drill holes are shown in Fig. 3-1 – Fig. 3.10. Chemical assay results of the ore samples are summarized in Table 3-3 and Table 3-4, Fig. 3-11. Observation data of thin sections and ore polished specimens are compiled in Table 3-1, Table 3-2 and Fig. 3-12.

3-1 MJI-6

0 m – 9.00 m: Surface soil and weathered rock
9.00 m – 34.40 m: Alternation stratum of sandstone, siliceous shale, black shale. Sandstone is coarse grained arkosic sandstone, consisting of plagioclase, quartz and rock fragment, and has a clear grade bedding. Pyrite dissemination is observed at 20 m – 32 m
32.40 m – 50.50 m: Fault clay zone. There are breccias of acidic tuff and lappili tuff with fault clay. Galena, sphalerite and pyrrhotite bearing ore and disseminated ore breccias occur at 38.60 m – 38.90 m.
50.50 m – 67.50 m: Mainly sandstone and shale. Intercalation of acidic tuff is observed in some place. Sandstone and shale is calcareous. Calcareous congromerate is observed at around 55 m, and pebble shale with flat-shaped siliceous rock pebble and calcareous rock pebble are distributed at around 66 m. In the calcareous shale horizone, following mineralizations are embedded:

Depth (m)	Width (m)	Host rock	Mineralization
61.70 – 62.80	1.10	calcareous sandstone and shale	banded and disseminated galena sphalerite and pyrrhotite
64.15 – 64.35	0.20	calcareous shale	veinlet and dissemination ore consisting of chalcopyrite, sphalerite and pyrrhotite

67.50 m – 99.00 m: Mainly acidic tuff, shale and fine grained siliceous rock. Disseminated Pyrite is embeded in a epidote skarn at 77.00 m – 78.30 m. Banded pyrite ore at 82.95 m – 83.00 m and veinlets constituting of galena and sphalerite at 83.60 m – 83.80 m. They are embeded in epidotized calcareous shale and sandstone (epidote skarn) at 82.00 m – 84.00 m. At the boundary part of this strata and banded shale green skarn associating with banded pyrite ore including small amount of galena and sphalerite from 98.15 m to 98.95 m.
99.00 m – 102.00 m: The part consists of banded shale with alternation of thin mud and sand layers (1 mm in thickness). The rock is slaty with schistose texture.
102.00 m – 250.30 m: Mainly alternation of fine siliceous rock, coarse grained siliceous rock and shale (slate). Hard massive siliceous rock was catacrastised with catacrastic cleavage: and is called catacrasite like rock. It is very difficult to identify the siliceous rock, because of its strong silicification, but sometimes the coarse siliceous rock is recognized as a pyroclastic texture, and

Depth (m)	Width (m)	Host rock	Mineralization
127.20 – 127.80	0.60	epidote skarn	banded pyrite-pyrrhotite ore with small amount of galena and sphalerite
163.80 – 166.85	3.05	epidote skarn	banded pyrite – pyrrhotite
169.70 – 175.70	6.00	epidote skarn	ditto

under microscopic observation, tuffaceous sandstone, andesitic tuff are observable; therefor, their original rock composition could be tuffaceous rock.

In the horizone, following mineralizations were caught through drilling:

3-2 MJI-7

0.00 m – 12.00 m: Surface soil and weathered rock
12.00 m – 21.00 m: Sedimentary rock consisting of limestone (associated with congromeratic limestone) and black shale.
21.00 m – 37.30 m: Alternation of sandstone and shale. The sandstone is arkosic having a beautiful graded bedding.
37.30 m – 70.60 m: Acidic tuff, fine grained siliceous rock black shale. Segregated quarts veins occur in the black shale.
70.60 m – 76.60 m: Fault breccia and fault clay. Fault breccia of pyrite ore was observed at 76.00 m.
76.60 m – 103.00 m: Alternation bed of calcareous rock, calcareous shale. Following mineralizations were caught in the horizon:

Depth (m)	Depth (m)	Host rock	Mineralization
77.10 – 77.30	0.70	calcareous shale	banded – disseminated galena-sphalerite ore
78.60 – 78.85	0.25	clacareous shale	pyrite veinlets
79.80 – 80.65	0.85	calcareous shale	pyrite veinlets
88.70 – 88.80	0.10	epidote skarn	galena-sphalerite veinlets
94.50 – 94.65	0.15	epidote skarn	pyrite veinlets
101.80 – 101.90	0.10	epidote skarn	pyrite veinlets

In the horizone, epidotization is common.
103.00 m – 119.40 m: Fine siliceous rock, acidic tuff and shale. Epidote siliceous skarn is observed at contact part between the strata and banded shale distributed under horizon.
119.40 m – 120.40 m: Mainly silicified rock. The original rock could be fine siliceous rock, siliceous sandstone or acidic tuff. Siliceous massive rock is catacrastized, and has clear catacrastic cleavage. Many epidote skarn layer are interbeded in the horizon and mineralizations associated with pyrite and pyrrhotite are embeded in the skarn layers, as follows.:

Depth (m)	Width (m)	Host rock	Mineralization
124.80 – 124.65	0.85	epidote skarn	pyrite dissemination
127.80 – 127.45	0.15	epidote skarn	pyrite dissemination
131.50 – 132.00	0.50	epidote skarn	pyrite dissemination
132.45 – 132.85	0.40	epidote skarn	banded pyrrotite ore
140.70 – 140.70	0.65	epidote skarn	ditto
157.55 – 158.90	1.35	epidote skarn	

3-1 MJI-8

0.00 m – 16.00 m: Surface soil
16.00 m – 24.00 m: massive green basic volcanic rock. The rock is partly brecciated.
24.00 m – 29.70 m: Fault clay zone (black shale)
29.70 m – 98.60 m: Calcareous bleck shale (at 35.00 m – 39.00 m, 46.00 m – 60.00 m) and black shale with intercaration of sandstone. The horizon is correlative with mineralizazed zone I' horizone which embeds lead-spharerite ore as newly found ore, but there is no indication of mineralization.
98.60 m – 104.70 m: Alternation bed of shale and sandstone. The sandstone has very distinct grade bedding.
104.70 m – 153.50 m: Mainly calcareous rocks consists of calcareous sandstone, calcareous shale. Pebble limestone, and calcareous flat pebble shale occur characteristically in the formation. The calcareous pebble shale which is distributed at 136.00 m – 141.50 m is correlative with Mineralized Zone I (Pagar Gunung lead-zinc mineralized zone), but the hole failed to catch the ore.
153.50 m – 186.50 m: Alternation bed with fine siliceous rock, dacitic tuff, sandstone and shale. Massive siliceous rock is catacrastized, and became catacrasite like rock with clear catacrastic cleavage. Adjacent boundary with banded shale underly the formation, a pyritization part is recognized.
186.50 m – 193.00 m: Banded shale which is alternated with very fine sandy part and mud part. The rock is semi-schist with weak schistosity.
193.00 m – 250.50 m: The zone consists of fine siliceous rock, siliceous sandstone, dacitic tuff and shale. Fine siliceous and shale were metemorphosed slightly, and show as semi-schist (slate). Dactitic tuff was catacrastized. Spots or banded epidote is observable, and pyrite is disseminated at adjacent part of epidotization.

The following mineralization is embeded in the stratum:

Depth (m)	Width (m)	Host rock	Mineralization
213.08 – 213.15	0.07	Epidote skarn	Banded pyrite
215.05 – 215.30	0.25	Epidote skarn	Banded pyrrhotite (sphalerite)
237.20 – 237.40	0.20	Epidote skarn	ditto

Weakly mineralized epidote skarn layers are embeded at 215.50 m – 216.40 m, and – 241.85 m.

3-4 MJI-9

0.00 m – 8.00 m: Surface soil and weathered rock.
8.00 m – 57.50 m: Shale (calcareous shale in some part), sandstone and sericitized white siliceous rock. These rocks have schistosity, and kink band texture showing sharp bending of schistsity occurs characteristically in some part.
57.50 m – 64.10 m: Dark green andesite. The rock is composed of plagioclase and a little maffic mineral (altered pyroxene) and biotite of phenocryst in ground mass of quartz and plagioclase, and has undergone chloritization and epidotization. It is regarded as a member of the basic volcanic rock distributed at the top ridge of the Pagar Gunung mountain. Shear zone (fault zone) is commonly observable between the Basic Vokanic Rock Member and lower member.
64.10 m – 109.00 m: Alternation with black shale, fine siliceous rock and fine grained ~ coarse grained sandstone. The sandstone shows good graded bedding, and sedimentary cycle of coarce sandstone and fine grained sandstone to shale is observed. Between 64.10 m and 83.00 m, rocks are fractured very much, supposing an effect of a shear zone at just the contact part of Basic

Volcanic Rock Member.
109.00 m – 132.00 m: Alternated strata with dacitic tuff, black shale and sandstone.
132.00 m – 152.00 m: Alternation with black shale and sandstone. At 138.00 m – 140.00, dacitic sandy tuff is intercalated in the strata. Calcareous sandstone and shale have undergone skarnization containning epidote, wollastonite and a few clinopyroxene at 149.00 m – 152.00 m. Following mineralization is embeded in the skarn:

Depth (m)	Width (m)	Host rock	Mineralization
149.40 – 149.60	0.20	wollastonite, calcareous rock	network veinlets of sphalerite
150.40 – 151.40	1.00	green skarn, calcareous shale	Banded chalcopyrite-galena-sphalerite ore

The ore at 150.40 m – 151.40 m contains epidote and clinopyroxene as skarn mineral.
152.00 m – 169.70 m: Massive cataclastized coarse siliceous rock. The rock is catacrasite like rock having a clear cataclastic cleavage. But the rock remains pyroclastic texture in some part, supposing dacitic pyroclastic rock (tuff and lapilli tuff) as the original rock. Below 165 m, spoted epidote occurs, increasing downward.
169.70 m – 175.00 m: Banded shale, a semi-schist with schistosity.
175.00 m – 250.00 m: Alternation with fine siliceous rock, massive siliceous rock (dacitic tuff) and siliceous shale. They became semi-schist and cataclastite, showing schistosity and cataclastic cleavage. Below 203.00 m, epidote occurs. Spotted, vein of epidote are common at the part, and banded epidote skarn layers are distributed at many parts, a skarn layer (for example, at around 191.80 m) contains garnet (grandite). The Main mineralization is as follows:

Depth (m)	Width (m)	Host rock	Mineralization
191.50 – 192.05	0.55	epidote skarn	banded pyrrhotite ore
220.80 – 220.90	0.10	quartz vein	brecciated pyrite ore
231.60 – 131.80	0.20	epidote skarn	banded pyrrhotite ore
235.60	0.05	siliceous shale	galena-sphalerite-pyrite vein

The ore at 235.60 m is fissure filling vein, filled with a fine crack intercrossing with 80 degree in the drilling core.

3-5 MJI-10

0.00 m – 7.00 m: Surface soil weathered rock
7.00 m – 7.10 m: Breccia tuffaceous shale. The rock is correlative with stratum of most lower part distributing at horizon of mineralized zone I.
7.10 m – 23.40 m: Alternation with sandstone, fine siliceous rock and shale. Sandstone distributed at 20 m – 23.40 m is calcareous rock.
23.40 m – 29.00 m: Banded shale
29.00 m – 101.00 m: Alternation with dacitic tuff and tuffaceous sandstone. Spotted epidotes occur in tuffaceous rock. At 40 m – 47 m and 70 m – 72 m, dacites having quartz phenocryst are distributed. Massive siliceous rocks are strongly catacrastized. Pyrite ore associating with epidote skarn in embeded at the rock.

101.00 m – 183.00 m: Light-coloured massive rock, containing muscovite. Through microscopic observation, felspar is strongly sericitized, and quartz shows oscillatory extinction. The rock can be identified as granodiorite, though it is strongly mylonized. At 175.00 m – 182.00 m, quartz diorite consisting of plagioclase, quartz and altered mafic mineral has intruded into the granodiorite.
183.00 m – 200.50 m: Fine siliceous rock and coarse tuffaceous rock. The rock has undergone sericitization and kaolinization at 195 m and its neighbour. Massive pyrite ore is embeded at 189.00 m – 190.40 m, but its gangue mineral is mostly quartz, not epidote or calcite skarn minerals.

3-6 MJI-11

00.00 m – 13.30 m: Surface soil and weathered rock
13.30 m – 40.60 m: Massive green-coloured basic volcanic rock (basaltic tuff and basalt), partly brecciated rock. At 16.00 m – 40.60 m, the rock has been fractured by shearing.
40.60 m – 61.50 m: Sandstone, black shale. Sandstone at just below of basic volcanic rock (at 40.60 m – 41.80 m), fault zone at 41.80 m – 42.40 m, calcareous rock at 42.40 m – 42.20 m, fault clay at 48.20 m – 51.00 m and black shale at 51.00 m – 61.50 m. From 40,60 m to 51.00 m, there are many fault clay parts and brecciation of rock, showing shear zone.
61.50 m – 71.90 m: Coarse to fine grained graywacke sandstone having good grade bedding.
71.90 m – 145.80 m: Alternation bed with sandy tuff, sandstone, fine siliceous rock and shale. Pyrite dissemination is partly observed.
145.80 m – 154.80 m: Shale is predominantly distributed throughout. The shale is mostly calcareous rock, and at lower horizon, there is pebble shale with siliceous rock and calcareous breccia, sub-brescia from 153.80 m to 154.80 m. The horizon is correlative with emplacement part of mineralized zone I (silver bearing lead-zinc ore zone), but the hole did not succeed in locating the ore, because there are many faults.
154.80 m – 173.40 m: Fine siliceous rock and dacitic tuff.
173.40 m – 175.00 m: Banded shale alternated with very thin mud material and sand-silt material. It is semi-schist having weak schistosity. The bed is very extensively continued to an east and west extention from MJI-3 to MJI-14, though it has very thin thickness (about 10 m – 2°m), and is useful to use for a kie bed. Many pyrrhotite-pyrite bearing epidote skarn layers occur below the bed.

Depth (m)	Width (m)	Host rock	Mineralization
184.00 – 184.10	0.10	Epidote skarn	banded sphalerite, pyrrhotite
185.20 – 186.70	1.50	Epidote skarn	banded pyrrhotite
192.55 – 192.95	0.40	Epidote skarn	ditto
194.60 – 194.75	0.15	Epidote skarn	banded (sphalerite) pyrrhotite
195.15 – 195.40	0.25	Epidote skarn	ditto
195.70 – 195.80	0.10	Epidote skarn	banded skarn
203.70 – 204.00	0.30	Epidote skarn	ditto
205.35 – 206.55	1.20	Epidote skarn	ditto
207.50 – 208.60	1.10	Epidote skarn	ditto
209.90 – 210.30	0.40	Epidote skarn	banded pyrrhotite-pyrite

175.60 m – 250.30 m: Mainly siliceous shale, shale, siliceous sandstone and dacitic tuff, and they are semi-schist and catacrasite like rock, forming schistosity and catacrastic cleavages. The rocks have extensively undergone silicification and epidotization, especially calcareous parts alter to epidote-garnet skarn. Banded pyrrhotite-pyrite ores are embeded in the skarn layer as follows:

The mineralization can be grouped into three sub zones as indicated in the above chart, namely from 184.00 to 186.70 m, 192.55 m – 195.80 m and 203.70 m – 210.30 m. Pyrrhotite content decreases and pyrite content increases toward a deep zone, and sphalerite increases toward an upper horizone. The mineralization, it is infered, was formed by skarnization of calcareous part of siliceous slate (or clacareous siliceous sandstone).

3-7 MJI-12

0.00 m – 5.00 m: Surface soil and weathered rock
5.00 m – 26.10 m: Mainly sandstone, but intercalated bed of shale at 14.30 m – 16.90 m and limestone at 16.90 m – 17.40 m. Grade bedding is observable in the sandstone, but not a clear comparing case of MJI-11.
26.10 m – 43.90 m: Tuffaceous rock. Slightly greenish andesitic tuff and tuff breccia, containing epidote and chlorite.
43.90 m – 80.95 m: Alternation of sandstone and shale, mostly calcareous rock. There is clinopyroxene-chlorite bearing wollastonite-epidote skarn, and within the skarn zone, three mineralizations were detected by the drilling as follows:

Depth (m)	Width (m)	Host rock	Mineralization
49.60 – 49.90	0.30	green skarn (calcareous sandstone)	sphalerite veinlets
51.60 – 51.80	0.20	ditto	sphalerite dissemination
52.60 – 52.60	0.60	ditto	ditto

Mineralization at 49.60 – 49.90 is network ore which sphalerite fills small fissures in wollastnite skarn. From 72.30 to 73.30 m, there is calcite epidote skarn associated with sphalerite-pyrite-chalcopyrite dissemination. Banded chalcopyrite-galena-sphalerite bearing skarn consisting of epidote and clinopyroxene was found by drilling. The mineralization is deep extention of Pagar Gunung East Mineralized zone (Outcrop B). According to a mineralogical test by an electron probe micro analyser on skarn minerals of the outcrop by second phase survey, clinopyroxene is identified to composition of ($Di_{55.6}$·$Hd_{34.9}$·$Jo_{9.0}$) – ($Di_{58.0}$·$Hd_{30.5}$·$Jo_{11.5}$), and epidote is pistacite contaning much iron.
80.95 m – 111.20 m: Alternation of dacite tuff, fine grained siliceous slate, and slate. Much epidote occurs at 105.00 m – 109.00 m. Sphalerite dissemination is embeded within the epidote skarn from 108.35 to 108.75 m.
112.20 m – 115.30 m: Banded shale (slaty) with alternation of thin mud part and silt part.
115.30 m – 200.30 m: Alternation with fine siliceous rock, sandstone, dacitic tuff and slate. Massive siliceous rocks are catacratized. Whole rocks have been undergone epidotization, and spoted epidote and epidote veins are observable at any part. Much mineralization, showing in the next table, is embeded:

Depth (m)	Width (m)	Host rock	Mineralization
120.50 – 120.80	0.35	Epidote skarn	banded galena-sphalerite-pyrite
126.85 – 127.25	0.40	ditto	ditto
130.05 – 130.55	0.50	ditto	banded galena-sphalerite-pyrite
136.30 – 136.80	0.50	ditto	banded pyrrhotite
138.60 – 138.75	0.15	ditto	disseminated (sphalerite) pyrite
139.20 – 140.90	1.70	ditto	banded pyrite and pyrrhotite
141.35 – 143.00	1.65	ditto	banded-dissemination of pyrite and pyrrhotite
143.50 – 145.00	1.50	ditto	banded (pyrrhotite) pyrite
172.35 – 175.65	3.20	ditto	(chalcopyrite) – Pyrite-pyrrhtite

The mineralized (Mineralized zone II) zones of the hole is counted mostly in many sub-zones, compared with other drillings, therefore, based on the hole's result, the mineralization is grouped in the following chart:

Mineralization Group	Depth	Mineralization
Mineralized Sub-zone II-1	108.35 – 108.75	(Sphalerite) pyrrhotite
Mineralized Sub-zone II-2	120.50 – 120.85	ditto
Mineralized Sub-zone II-3	126.85 – 127.25	mainly pyrrhotite
Mineralized Sub-zone II-4	130.05 – 130.55	ditto
Mineralized Sub-zone II-5	136.30 – 145.00	ditto
Mineralized Sub-zone II-6	172.05 – 175.65	pyrrhotite-pyrite

It is a general tendency that the lower zone, especially Mineralized sub-Zone II-6, contains only pyrrhotite and pyrite, and a very little amount of lead, zinc and copper.

3-8 MJI-13

0.00 m – 9.00 m: Surface soil and weathered rock.
9.00 m – 11.50 m: Massive green sandstone containing chlorite, epidote and quartz fragment. There are many calcite veinlets.
11.50 m – 13.40 m: Fault clay.
13.40 m – 46.00 m: Alternation of limestone, clacareous shale, shale. Limestone, calcareous pebble shale and calcareous shale are predominant and distributed at 13.40 m – 26.00 m. Chalcopyrite-galena-sphalerite ore was detected at 23.10 m – 24.20 m within the calcareous rock horizon.
The mineralization is located at 70 m upper from Mineralized zone I, and also is a deep extention

of the newly found outcrop at drilling site MJI-9. Host rock of the mineralization is calcreous pebbel shale, being similar to Mineralized Zone I. But in comparison with Mineralized Zone I, skarnization of the mineralization is weaker. (The mineralization is named mineralized zone I'). A chemical assay result of the ore shows that the ore is of good quality of grade, especially silver and gold comparing with other ores, namely Au: 0.4 g/t, silver: 195 g/t, Cu: 1.25%, Pb: 1.31%, and Zn: 9.85%.

46.00 m – 74.00 m: Fine grained siliceous rock, shale and sandstone. Sandstone have not crear grade bedding. Massive pyrite ore is embeded at 66.80 m – 67.00 m.

74.00 m – 84.00 m: Tuffaceous sandstone. It has undergone silicification and is a very hard rock.

84.00 m – 104.50 m: Alternation with calcareous sandstone, epidote bearing tuffaceous sandstone, and calcareous shale. Also calcareous pebble shale is distributed, and has undergone mineralization, similar to other drilling.

Following ores were caught through drilling:

Depth (m)	Width (m)	Host rock	Minaralization
95.10 – 95.30	0.20	epidote calcareous shale	pyrite veinlets
95.75 – 95.80	0.05	ditto	galena-sphalerite-pyrite banded ore
96.35 – 97.20	0.85	ditto	galena-sphalerite-veinlet-disseminated ore
100.10 – 100.45	0.35	ditto	chalcopyrite-sphalerite-pyrrhotite banded ore

The ores are correlative with Meneralized Zone I, and result of the MJI-6 drilling as following chart.

MJI-13	MJI-6	Mineralization
95.10 – 95.30 95.75 – 95.80 96.35 – 97.20	61.70 – 62.80	banded – disseminated galena-sphalerite-pyrrhotite
100.10 – 100.45 102.20 – 102.40	64.15 – 64.35	chalcopyrite-sphalerite-pyrrhotite

104.50 m – 146.50 m: Tuffaceous sandstone, fine grained siliceous rock and slate. Banded pyrite pyrrhotite ore is observed at 114.10 m – 114.40 m, and clacareous siliceous rock is recognized at 133.00 m and around.

14650 m – 150.50 m: Mainly black slate. It is correlated with banded shale.

150.50 m – 250.50 m: The rock distributed in this range has undergone strong silicification; therefore it is very difficult to indentify the rock originally at times, but there could be alternation beds with fine grained siliceous rock, tuffaceous sandy tuff and tuff. They are cataclasite like rock or semi-schist, judging existense of weak schistosity and catacracized cleavage. Following mineralizations were detected by the drilling:

Depth (m)	Width (m)	Host rock	Mineralization
184.60 – 184.70	0.10	shale, fine grained siliceous rock	massive pyrite
195.40 – 196.70	1.30	fine siliceous rock epidote-garnet skarn	banded pyrite-pyrrhotite
803.00 – 205.50	2.05	ditto	massive – disseminated pyrite ore
248.80 – 249.50	0.70	epidote skarn	hassive – disseminated pyrite ore

Toward deep part, the mineralization increases amount of pyrite, while pyrrhotite decreases.

3-9 MJI-14

0 m– 21.00 m: Surface soil and weathered rock.
21.00 m – 33.00 m: Massive green basic volcanic rock. The rock was brecciated.
33.00 m – 40.00 m: Fault clay part. (fault). In the fault, following ores are accomanied as follows:

Depth (m)	Width (m)	Mineralization
36.40 – 36.45	0.05	galena-sphalerite – pyrite
38.30 – 38.50	0.20	ditto
39.10 – 39.80	0.70	ditto (sludge)

The ore is in the same group of Mineralized Zone I' which crops out at MJI-6 drilling site and was detected at 23.10 m – 24.20 m of MJI-13 drilling, but the ore occurs as drag ore in the fault.
40.00 m – 85.50 m: Limestone at 40.00 m – 43.00 m, calcareous shale at 43.00 m – 52.50 m and balck shale at 52.50 m – 85.50 m. Black shale contains intercalated thin sandstone layers. Altered andesite at 65.90 m – 69.60 m contained sericite and pyrite dissemination.
85.50 m – 96.30 m: Fault clay zone. In the fault, fault breccias of coarse sandstone are included.
96.50 m – 101.70 m: Fault clay.
107.20 m – 116.20 m: Grade bedded sandstone and black shale.
116.20 m – 134.30 m: Dacitic sandstone. Small faults appear at 123.00 m – 124.00 m, at 127.00 m –129.00 m.
134.30 m – 161.90 m: Alternated bed with calcareous rock, sandstone and shale. Dissemination and filmy ore consisting of galena, sphalerite, pyrite are embeded along the bedding of calcareous pebble shale at 141.65 m – 142.35 m. The mineralized part has undergone sericitization with ores, but no skarn mineral occur such as epidote and clinopyroxene. This part could be the poor mineralized part of the Mineralized Zone I.
164.70 m – 167.70 m: Fault clay zone.
167.70 m – 250.70 m: The part consists of coarse-fine grained sandstone, fine sandstone, dacitic tuff, sandy dacitic tuff and so on. Most rock has undergone silicification, especially very strong silicification at 197.00 m – 212.50 m. Mineralizations are distributed at the following depths:

Depth (m)	Width (m)	Host rock	Mineralization
192.10 – 192.15	0.05	silicified sandstone	coarse galena-sphalerite-pyrite ore (vein type)
215.50 – 224.50	9.00	Epidote·garnet skarn	banded pyrrhotite-pyrite ore
236.70 – 236.74	0.05	Epidote skarn	banded pyrite ore
239.20 – 239.40	0.20	Epidote skarn	pyrite dissemination

Garnet (grandite)-epidote skarn is embeded at 215.50 m – 224.50 m.

LEGEND

		Surface soil		Q-Dio	Quartz Diorite
	Sh	Shale (Mudstone)		Ap	Aplitic rock
	Sl	Slate		Tn	Tonalite
	Ss	Sandstone		Q-dio	Quartz diorite
	Css	Coorse sandstone		Gr-dio	Granodiorite
	Cong	Conglomerate		Myl	Mylonite
	Ls	Limestone		Hyb Rk	Hybrid rock
C	Cal	Calcareous rock		Br	Breccia
Fl	Fl	Felsic rock		Argn	Argillization
Si	Si	Siliceous rock		Siln	Silicification
	Ftf	Fine tuff		Sk	Skarn
	Tf	Tuff	Qtz V Qtz Nw		Quartz Vein & Network
	Stf	Sandy tuff	Mass Ore Ban Ore		Massive & Banded Ore
	Laptf	Lapilli tuff		Diss Ore	Dissemination
	Brtf	Breccia tuff	S-15		Thin section
	Da	Dacite	P-30		Polished section
	And	Andesite	A-60		Assay sample
	Bvk	Basic Volcanic rock		Flt	Fault
				Slime	Slime

Abbreviation

Da	Dacite	Py	Pyrite	Qtz	Quartz
And	Andesite	Pyr	Pyrhotite	Cal	Calcite
Brk	Basic igneous rock	Cp	Chalcopyrite	Chl	Chlorite
Ap	Aplitic rock	Sph	Sphalerite	Se	Sericite
Q-dio	Quartz diorite	Gal	Galena	Vnt	Veinlet
G-dio	Granodiorite	Epd	Epidote	Netw	Network
		Px	Pyroxene	Altn	Alternation
		Cly	Clay	Flt intm	Fault
		( )	Containing		
		Lith	Lithic		

Fig. 3-1 Regent of Geological Log

Drill Hole No : MJI-6 6-1

Location : Pagar Gunung East Elevation : 1,207.26 m.s.l

Coordinate point : from MJI-12 Inclination : -90°

Depth : 250.30 m Core Recovery : 92.0 %

Drilling Machine : OE-8BL Term : Nov. 25, 1984 ~ Dec. 12, 1984

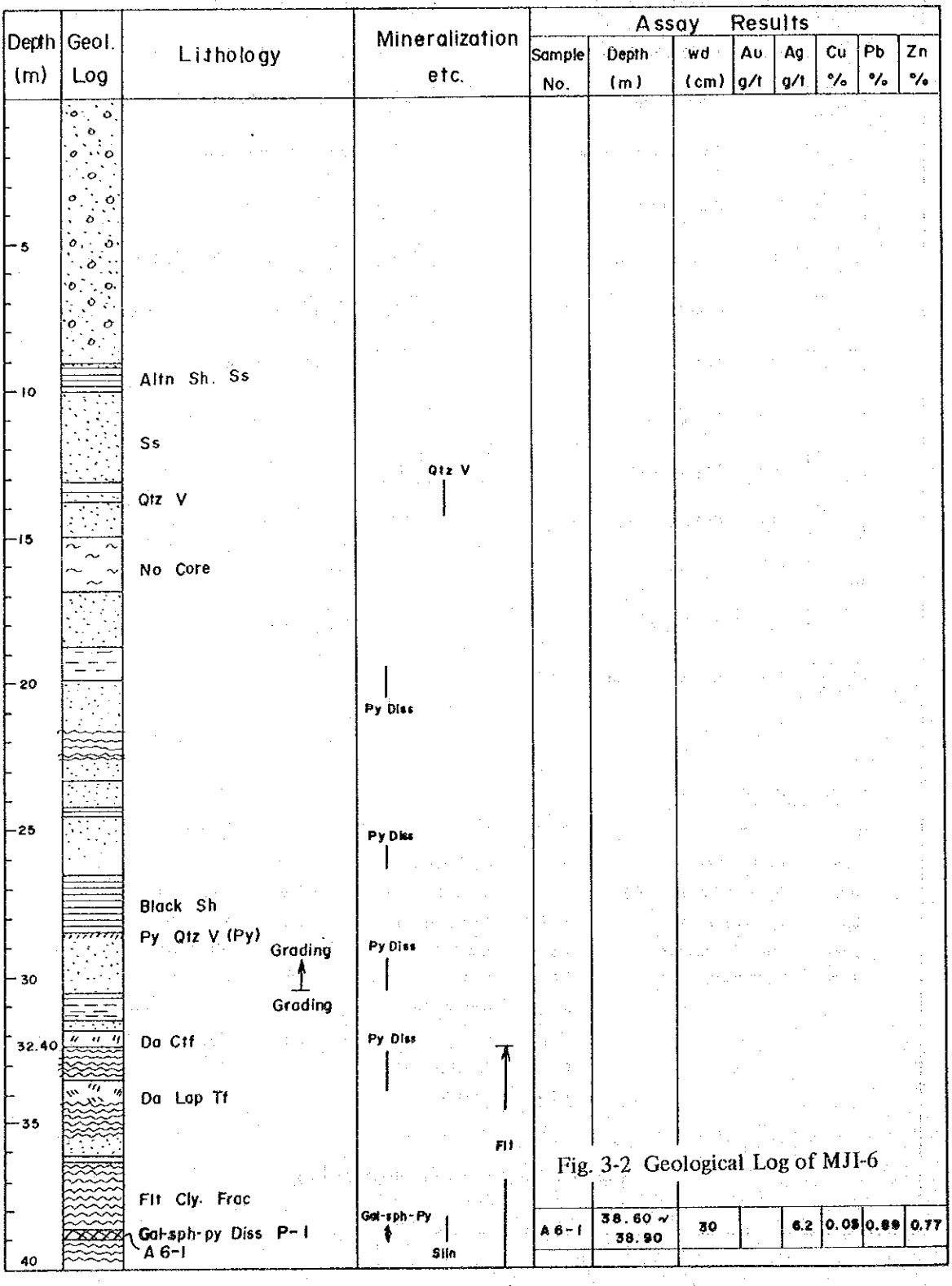
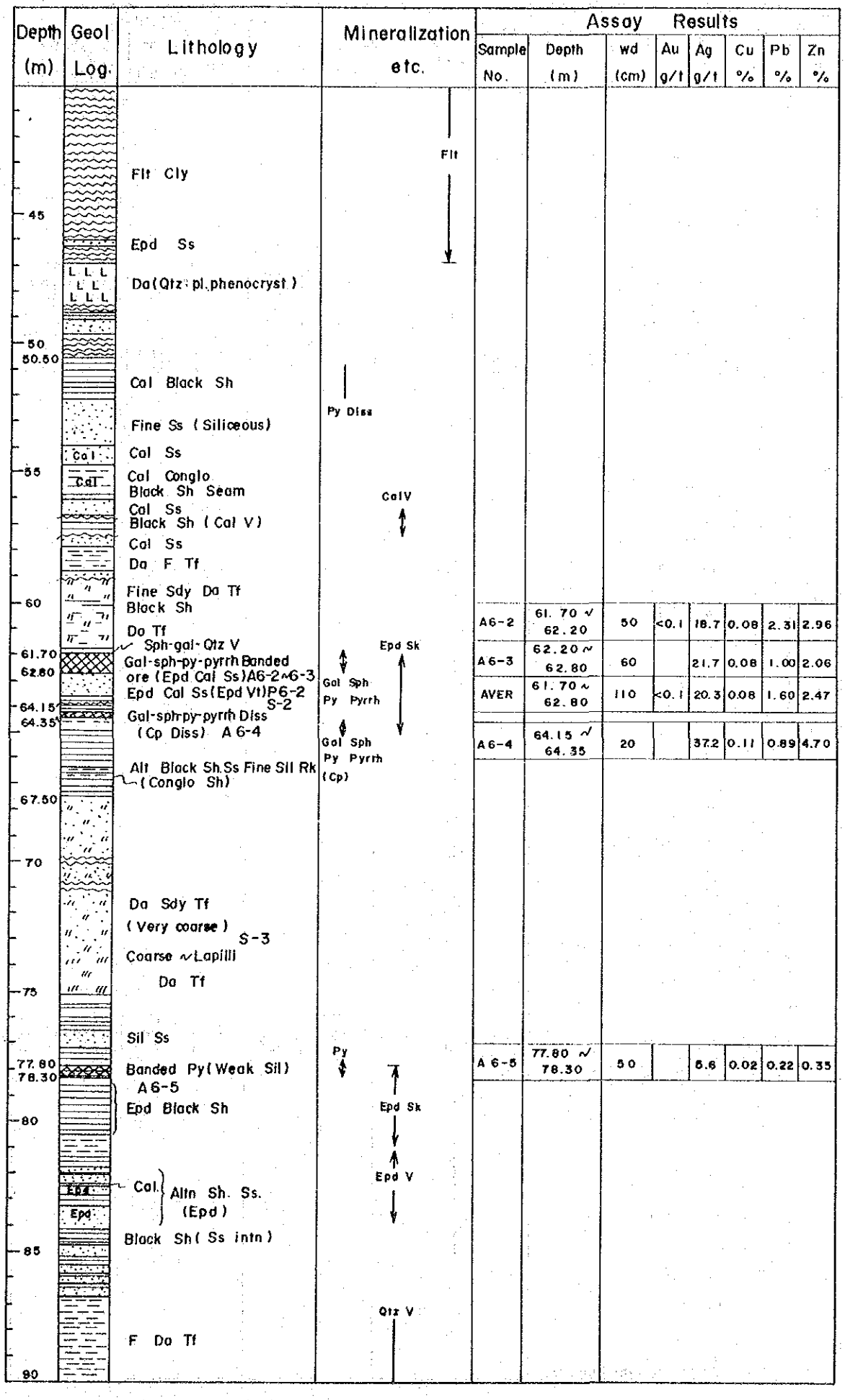
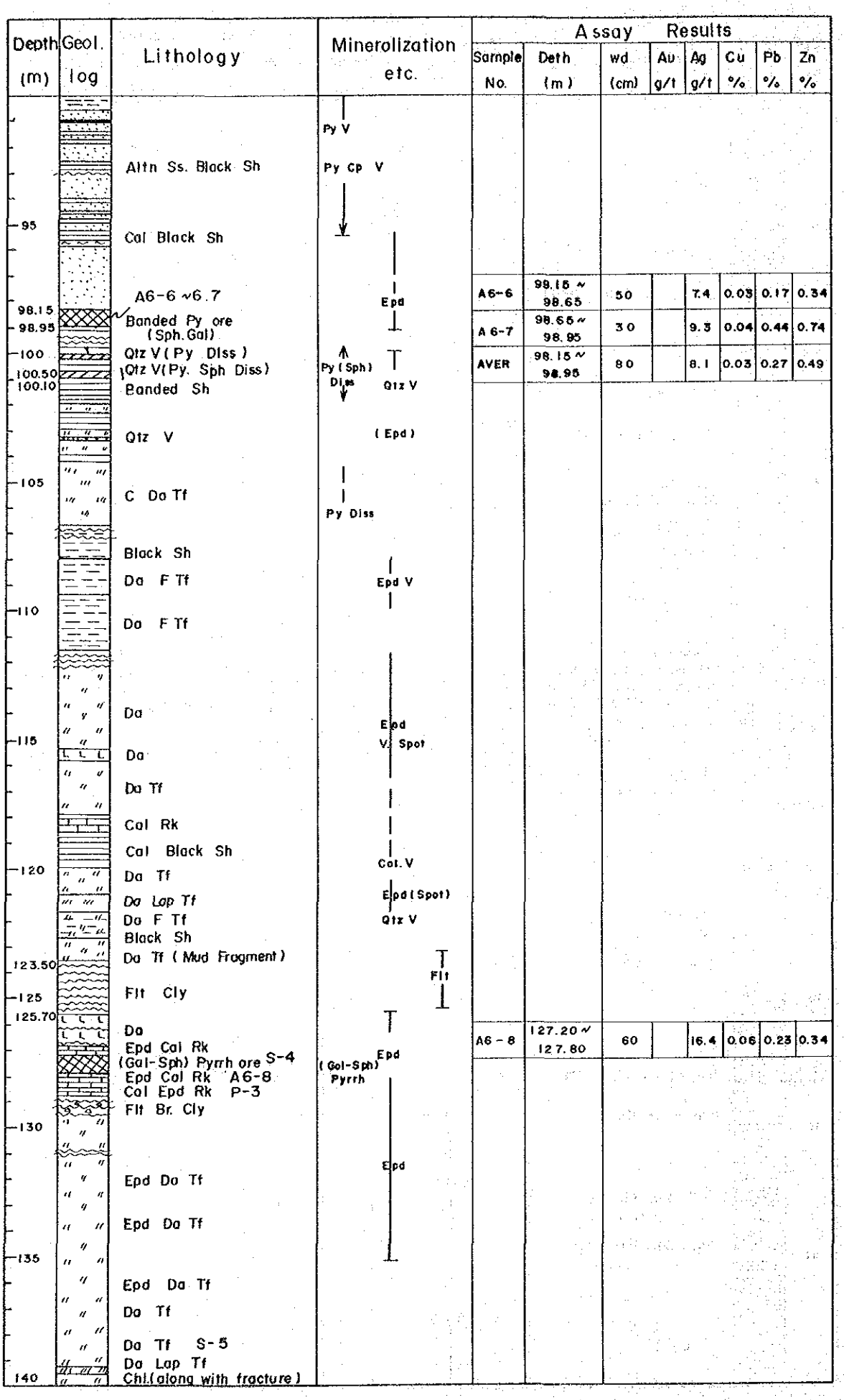


Fig. 3-2 Geological Log of MJI-6



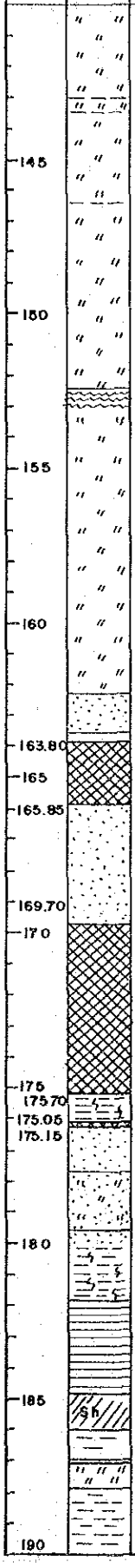
Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A6-2	61.70 ~ 62.20	50	<0.1	18.7	0.08	2.31	2.96
A6-3	62.20 ~ 62.80	60		21.7	0.08	1.00	2.06
AVER	61.70 ~ 62.80	110	<0.1	20.3	0.08	1.60	2.47
A6-4	64.15 ~ 64.35	20		37.2	0.11	0.89	4.70
A6-5	77.80 ~ 78.30	50		6.6	0.02	0.22	0.35

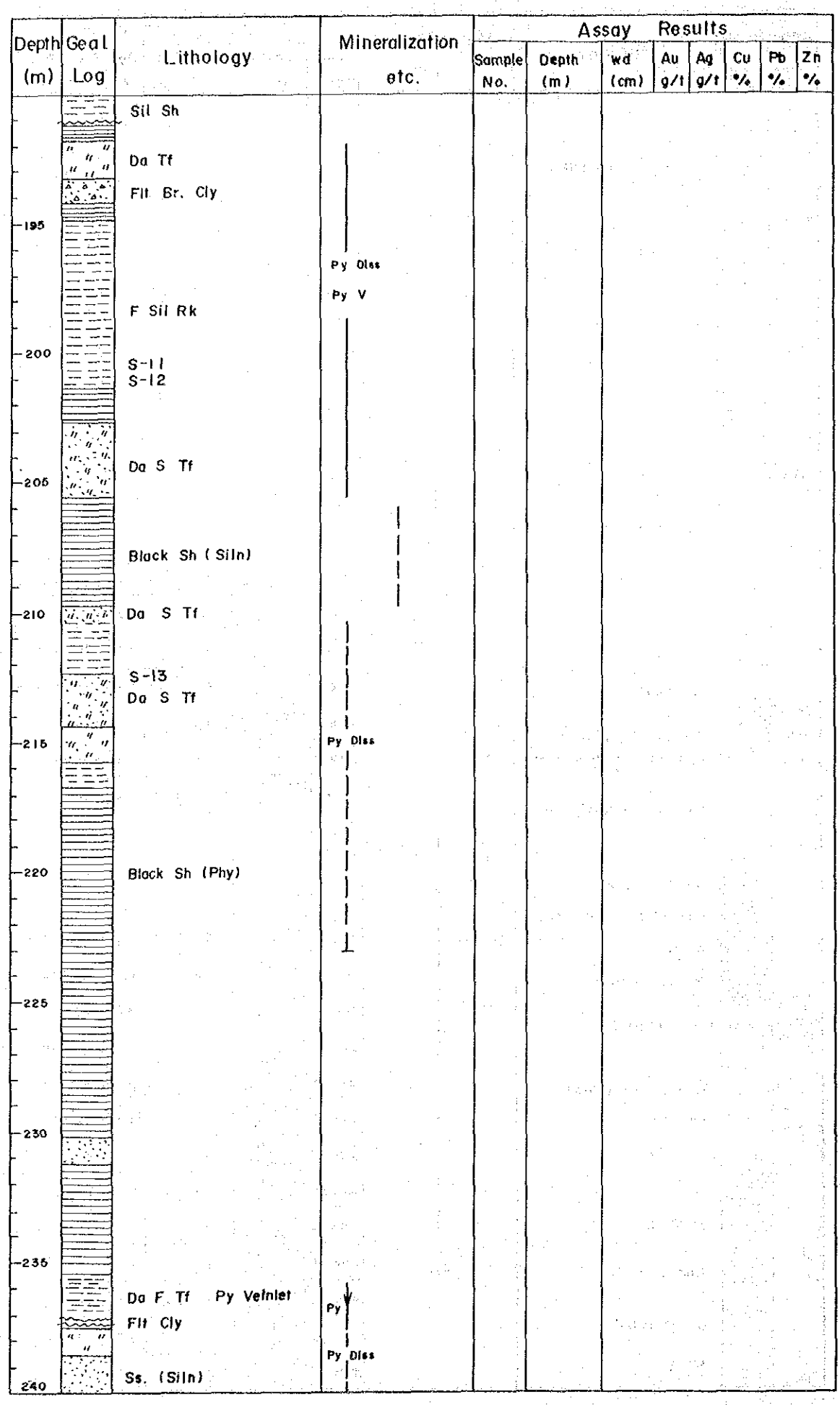


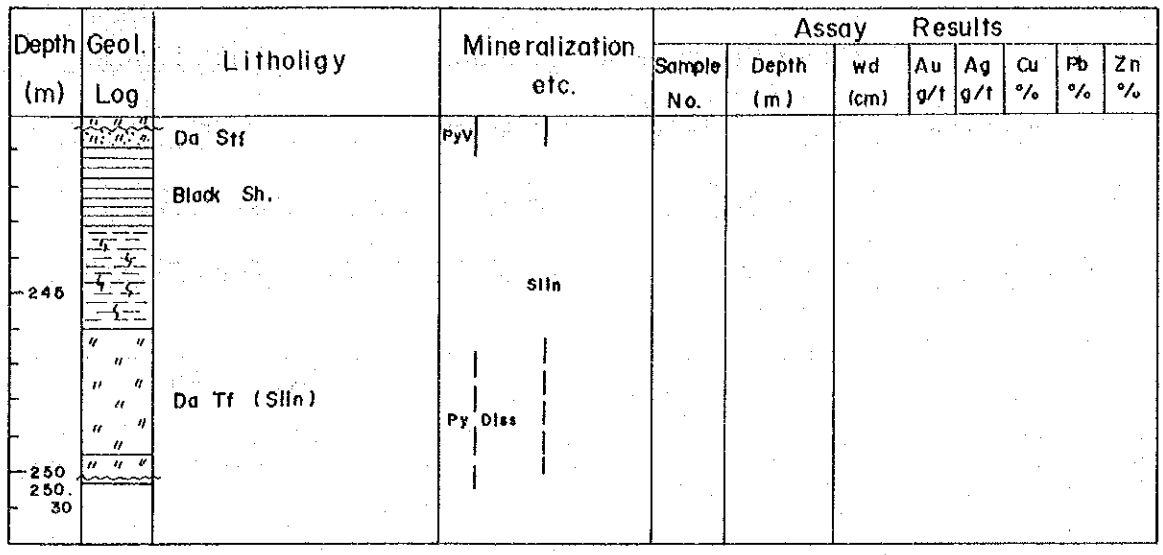
Assay Results

Sample No.	Deth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A6-6	99.15 ~ 98.65	50		7.4	0.03	0.17	0.34
A 6-7	98.65 ~ 98.95	30		9.3	0.04	0.44	0.74
AVER	98.15 ~ 98.95	80		8.1	0.03	0.27	0.49
A6 - 8	127.20 ~ 127.80	60		16.4	0.06	0.23	0.34



Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
			Assay Results				
AS6-9	163.80 ~ 164.30	50		0.60	0.08	0.02	0.03
AS6-10	164.30 ~ 164.80	50		1.6	0.04	<0.01	<0.01
AS6-11	164.80 ~ 165.30	50		2.5	0.08	<0.01	<0.01
AS6-12	165.30 ~ 165.80	50	<0.1	1.9	0.11	<0.01	0.01
AS6-13	165.80 ~ 166.30	50		1.2	0.11	<0.01	0.01
AS6-14	166.30 ~ 166.85	55		1.9	0.16	<0.01	0.01
AVER	163.80 ~ 166.85	(305)	<0.1	1.6	0.10	<0.01	0.01
AS6-15	168.70 ~ 170.20	50		1.9	0.10	<0.01	<0.01
AS6-16	170.20 ~ 170.70	50		0.6	0.12	<0.01	<0.01
AS6-17	170.70 ~ 171.20	50		3.1	0.13	<0.01	<0.01
AS6-18	171.20 ~ 172.70	50		1.2	0.09	<0.01	<0.01
AS6-19	172.70 ~ 173.20	50		0.6	0.09	<0.01	<0.01
AS6-20	173.20 ~ 173.70	50		1.2	0.11	<0.01	<0.01
AS6-21	173.70 ~ 174.20	50	<0.1	1.2	0.08	<0.01	0.06
AS6-22	174.20 ~ 174.70	50		0.6	0.16	<0.01	0.01
AS6-23	174.70 ~ 175.20	50		0.9	0.13	<0.01	0.01
AS6-24	175.20 ~ 175.70	50		1.2	0.15	<0.01	0.01
AS6-25	175.70 ~ 176.20	50	<0.1	1.2	0.13	<0.01	0.01
AS6-26	176.20 ~ 175.70	50		2.5	0.11	<0.01	0.02
AVER	168.70 ~ 175.70	(600)		1.4	0.12	<0.01	0.02


Depth (m)
Geal Log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
Sil Sh
Da Tf
Flt Br. Cly
195
Py Diss
Py V
F Sil Rk
200
S-11
S-12
Da S Tf
205
Black Sh (Siln)
Da S Tf
210
S-13
Da S Tf
215
Py Diss
Black Sh (Phy)
220
225
230
235
Da F Tf Py Veinlet
Py
Flt Cly
Py Diss
Ss. (Siln)
240



Sh : Almost phyllitic (Semischist)

Drill Hole No. : MJI-7

Location : Pagar Gunung East

Coordinate Point : middle point of MJI-11 & MJI-12

Depth : 200.40 m

Drilling Machine : OE-8BL

Elevation : 1,218.19 m.s.l

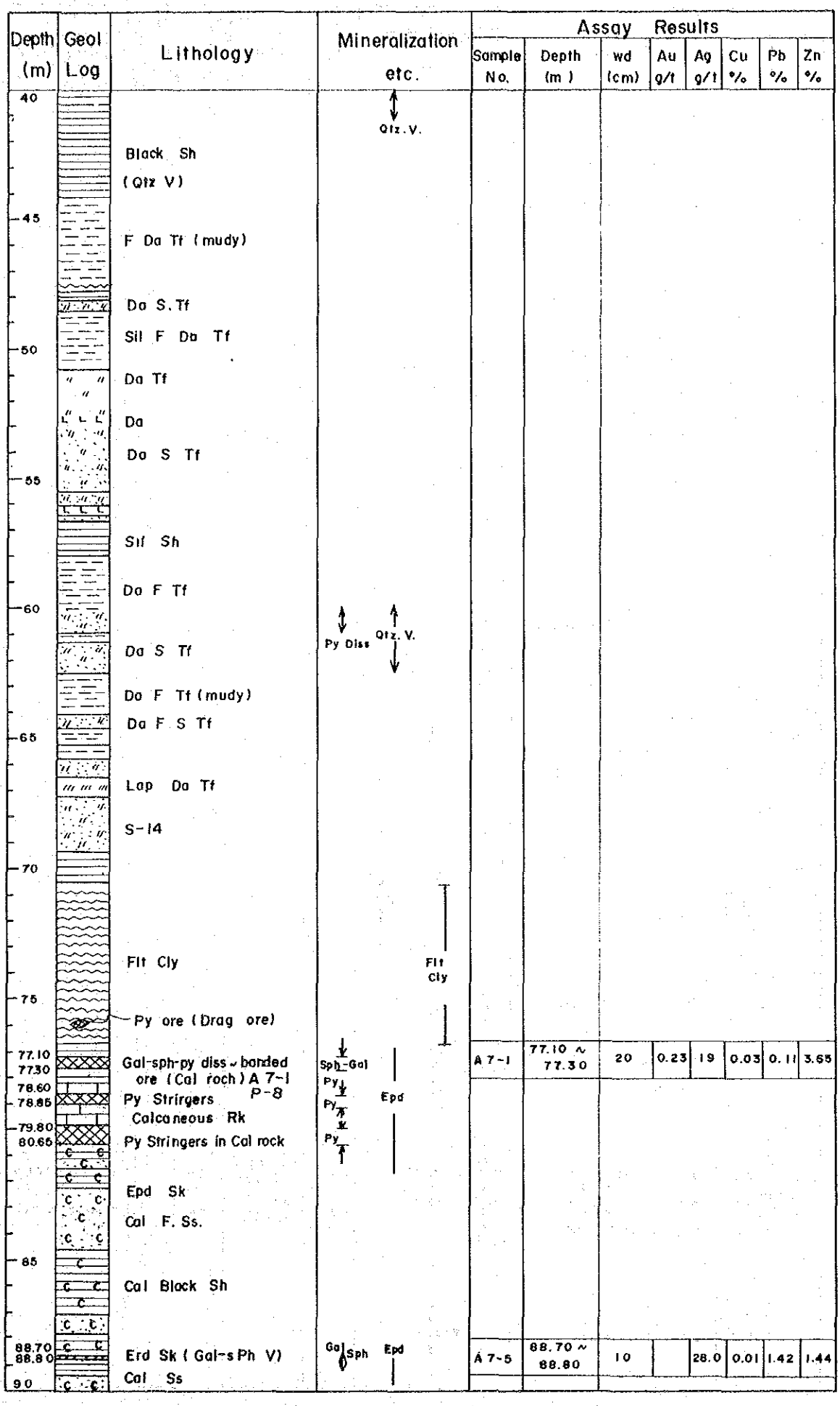
Inclination : -90°

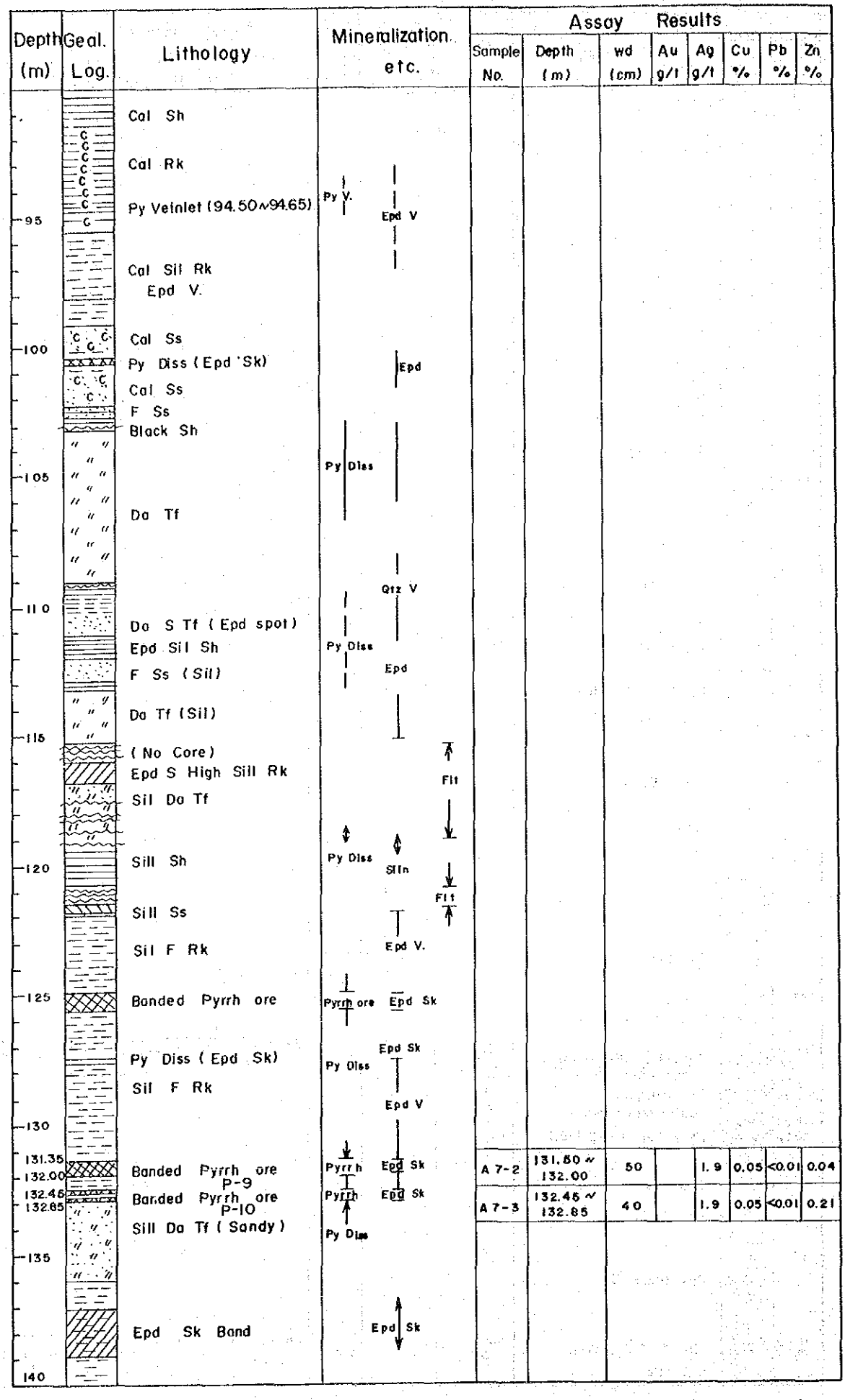
Core Recovery : 89.8 %

Term : Dec.17,1984 ~ Dec.30.1984

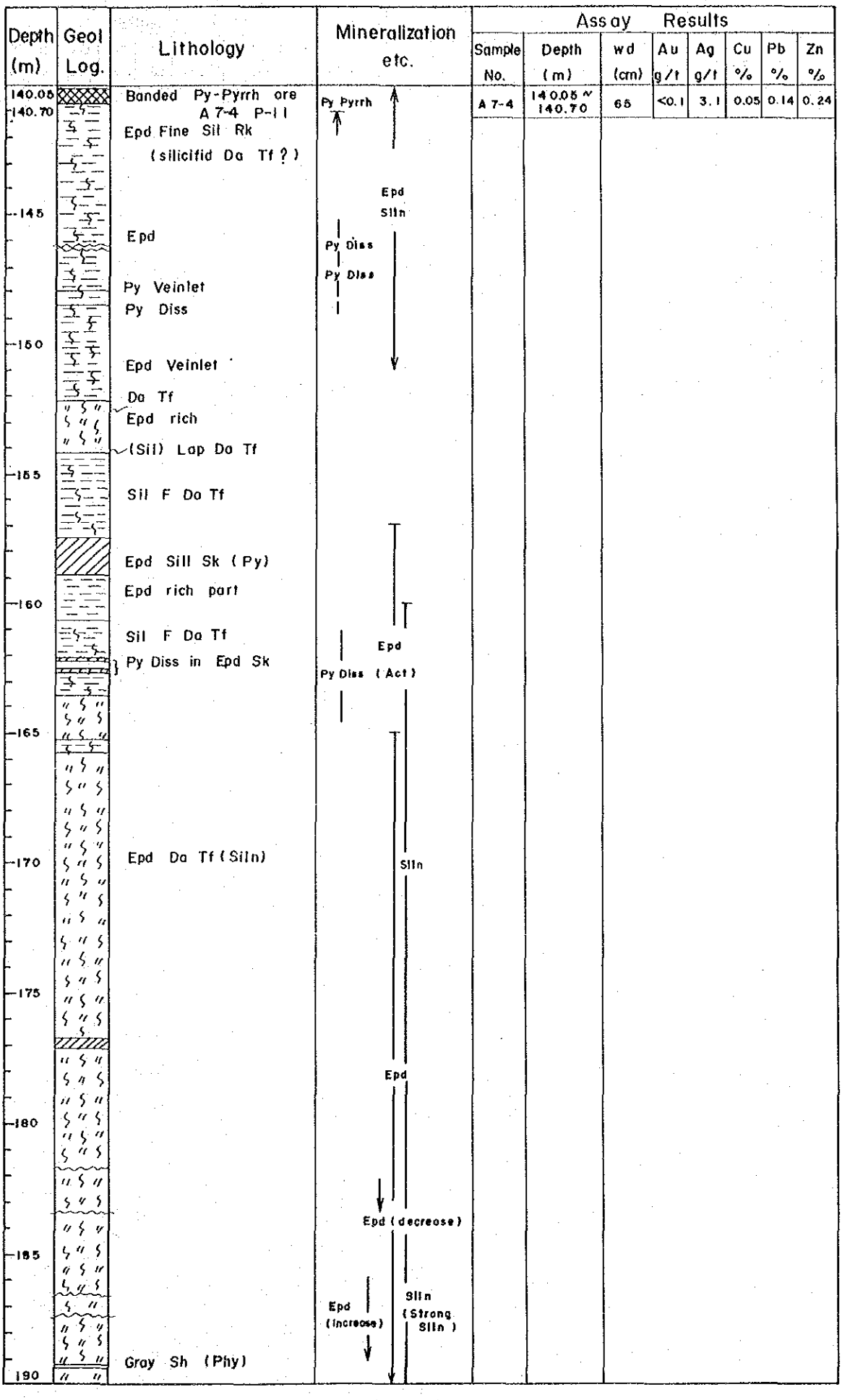
Depth (m)	Geol Log	Lithology	Mineralization etc.	Assay Results
5				
10				
12.00		Ls (Partly Cong Ls)		
15		Qtz		
		Pebbly Sh		
		Cal. Black Sh		
20				
		Ss		
		Grading		
25		C Ss		
		Ss		
		Cal Sh.		
30		F Ss		
		Grading		
		Ss		
		C Ss.		
35		C Ss.		
		Black Sh (Seg Qtz V)		
40		No Core (Flt)		

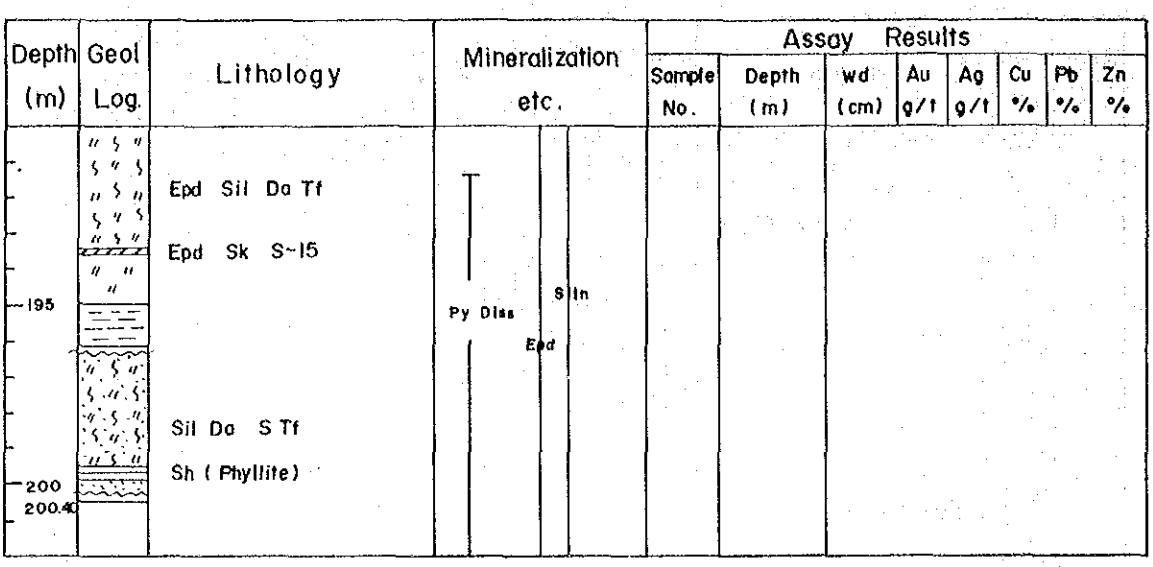
Fig. 3-3 Geological Log of MJI-7


Depth (m)
Geol Log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
40
45
50
55
60
65
70
75
77.10
77.30
78.60
78.85
79.80
80.65
88.70
88.80
90
Black Sh
(Qtz V)
F Da Tf (mudy)
Da S. Tf
Sil F Da Tf
Da Tf
Da
Da S Tf
Slf Sh
Da F Tf
Da S Tf
Da F Tf (mudy)
Da F S Tf
Lap Da Tf
S-14
Flt Cly
Py ore (Drag ore)
Gal-sph-py diss ~ banded ore (Cal rock) A 7-1
P-8
Py Stringers
Calcaneous Rk
Py Stringers in Cal rock
Epd Sk
Cal F. Ss.
Cal Block Sh
Erd Sk (Gal-sPh V)
Cal Ss
Qtz. V.
Py Diss
Qtz. V.
Flt Cly
Sph-Gal
Py
Py
Py
Epd
Gal
Sph
Epd
A 7-1
77.10 ~ 77.30
20
0.23
19
0.03
0.11
3.65
A 7-5
88.70 ~ 88.80
10
28.0
0.01
1.42
1.44



Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 7-2	131.80 ~ 132.00	50		1.9	0.05	<0.01	0.04
A 7-3	132.45 ~ 132.85	40		1.9	0.05	<0.01	0.21


Depth (m)
Geol Log.
Lithology
Mineralization etc.
140.05
140.70
Banded Py-Pyrrh ore
A 7-4 P-11
Epd Fine Sil Rk
(silicified Da Tf ?)
Epd
Py Veinlet
Py Diss
Epd Veinlet
Da Tf
Epd rich
(Sil) Lap Da Tf
Sil F Da Tf
Epd Sill Sk (Py)
Epd rich part
Sil F Da Tf
Py Diss in Epd Sk
Epd Da Tf (Silin)
Gray Sh (Phy)
145
150
155
160
165
170
175
180
185
190
Py Pyrrh
Epd
Silin
Py Diss
Py Diss
Epd
Py Diss (Act)
Silin
Epd
Epd (decreose)
Epd (increase)
Silin (Strong Silin)
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
A 7-4
140.05 ~ 140.70
65
<0.1
3.1
0.05
0.14
0.24


Depth (m)
Geol Log.
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu %
Pb %
Zn %
Epd Sil Da Tf
Epd Sk S~15
195
Py Diss
Sln
Epd
Sil Da S Tf
Sh (Phyllite)
200
200.4

Drill Hole No. : MJI - 8 8 - 1

Location : Pagar Gunung East Elevation : 1,257.00 m.s.l

Coordinate Point : F line 4.0 Inclination : - 90°

Depth : 250.50m Core Recovery : 91.9 %

Drilling Machine : OE 8BL Term : Oct. 28,1984 ~ Nov. 13,1984

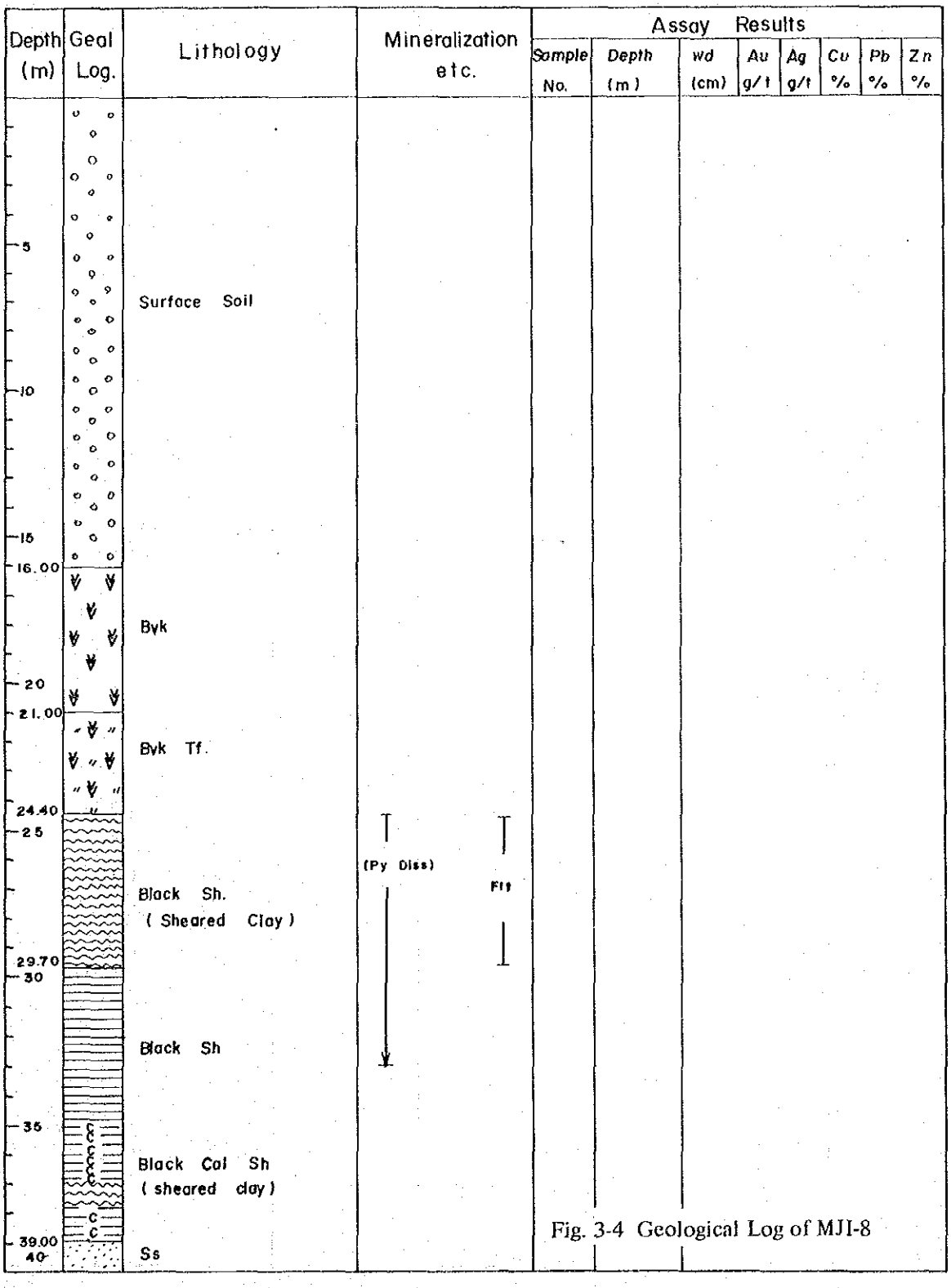
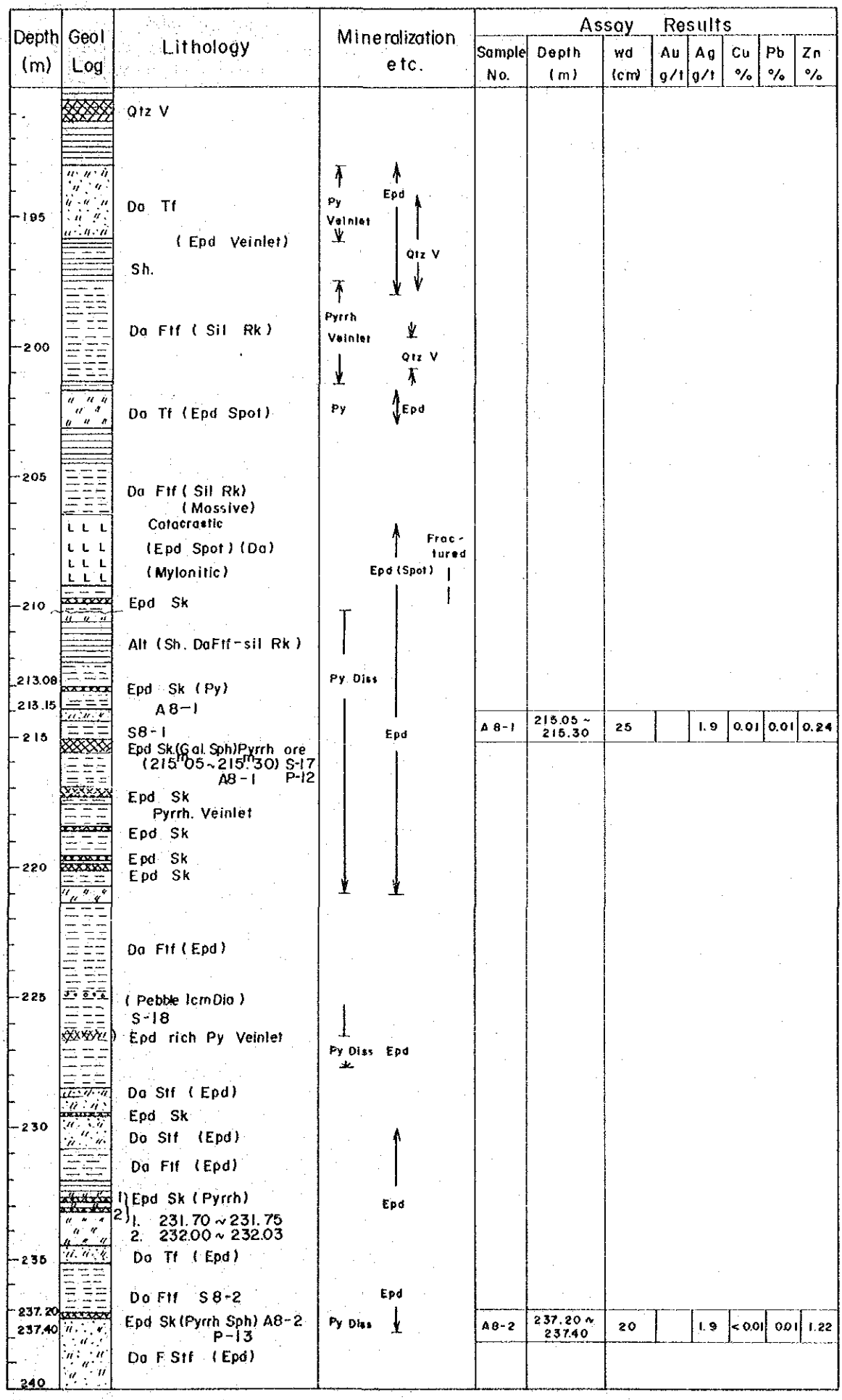


Fig. 3-4 Geological Log of MJI-8

Depth (m)	Geol Log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
		Ss									
		Ss									
45		Ss									
		Cal Sh (Marl)									
		Black Sh									
50											
		Cal Sh (Marl)									
55											
		Black Sh									
		Ls									
60		Sheared Black Sh									
61.10		Black Sh									
		Fine Si (Datf ?)									
65		Black Sh									
66.60		Css									
		Css									
70		Black Sh									
75											
		Black Sh									
80											
85											
90											

Depth (m)	Geol Log.	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
95		Black Sh									
100		F Ss ↑ (grading) Css									
		Sil Sh									
		Fss ↑ (grading)									
104.70		Css									
105		Black Sh									
		Cal Ss									
110		Sh (Silty) Cal Cong									
		Ss (Tuffaceous)									
		Br + Cly Br + Cly } Flt									
115		Cal Ss									
		Altn of Cal Ss. Sh									
		Cal Css Br (Flt)									
118.50											
119.40		Cal Cong									
120		Black Sh									
		Cal Ss									
		Cal Ss									
125		Black Sh									
		F Sl (grading) M Ss									
130		Ss (CSc ~ Fss)									
		Da Tf									
135		Da S Tf									
		Sh (heterogeneous)									
		Qtz V									
140		Sh (Alt mud. Silt)									

Depth (m)	Geol. Log.	Lithology	Mineralization etc.	Assay Results: Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
141.50											
145		Da Tf (Coarse) (Lithic Tf)									
150		Ss (Mud Seam)									
		Alt Sh Ss									
		Sh (beterogenous)									
155		Da Ftf (Sil Rk)	Epd								
160											
		Da Tf (Sil Rk)									
165											
		Da Ftf (Sil Rk)	Py Diss								
170											
		Ss (Fine)									
		Altn Ss. Sh									
175											
		Da Tf (Sil Rk)	Py V, Epd								
180		S-16									
		Da F tf (Sil Rk)	Epd V								
185											
		Banded Sh (Alt Banding Sh. Ss)									
190											



Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A 8-1	215.05 ~ 215.30	25		1.9	0.01	0.01	0.24
A8-2	237.20 ~ 237.40	20		1.9	< 0.01	0.01	1.22

Depth (m)	Geol Log.	Lithology	Mineralization etc.	Assay Results						
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
		Epd Sk Py Diss 241.80~241.85 Epd Qtz	Py Mp Epd								
245		Do Ftf Py Diss 246.60~246.65 Py Diss 247.70~247.75									
250		Do Ftf									
250.60											

Drilling No. : MJI - 9

Location : Pagar Gunung East

Coordinate Point : G line 4.0

Depth : 250.50 m

Drilling Machine : OE-88L

Elevation : 1235.65 m.s.l

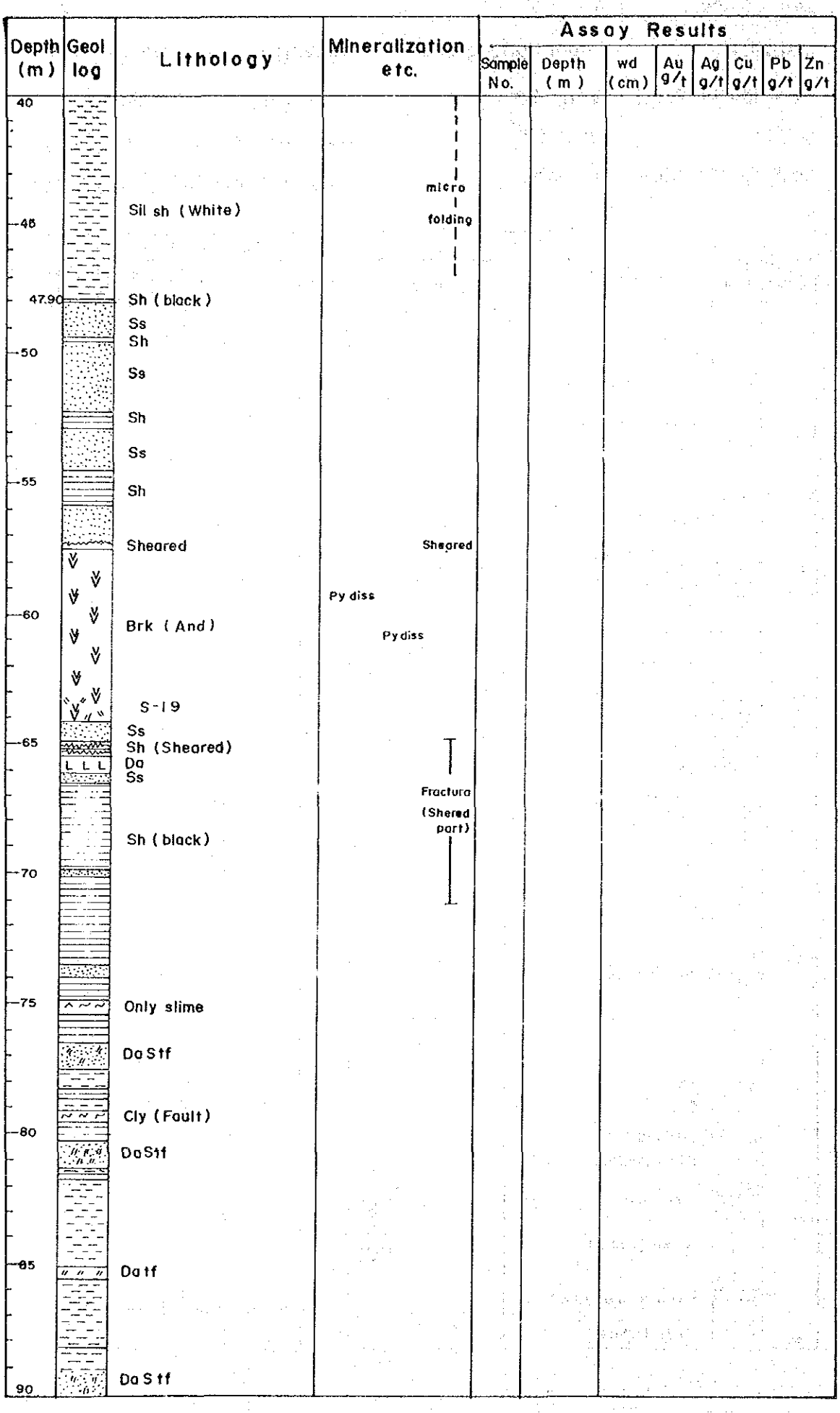
Inclination : 90°

Core Recovery : 90.5 %

Term : Oct. 2, 1984 - Oct. 20, 1984

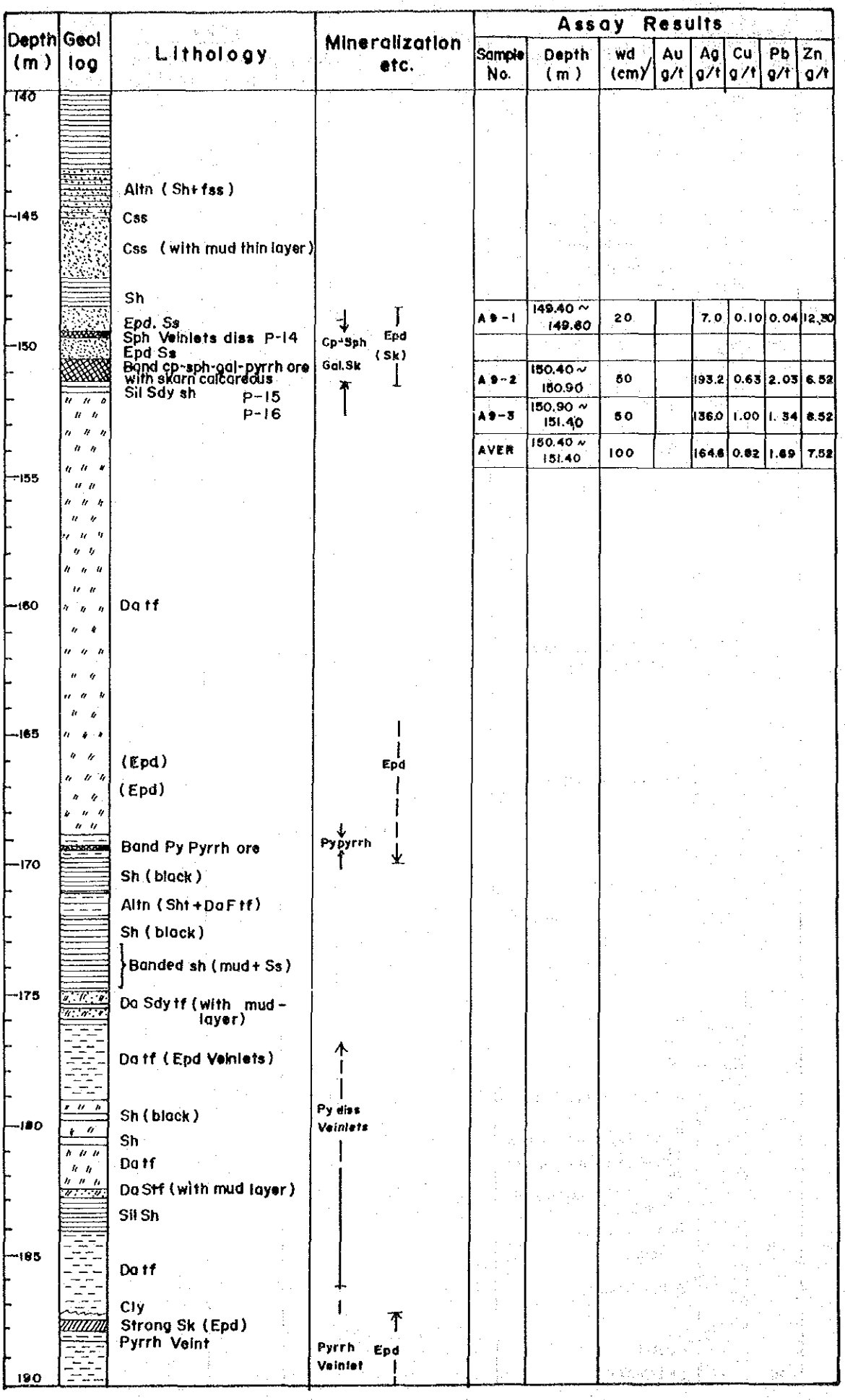
Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
5		Surface Soil									
8.00		Css									
		Sh (black)									
		Sh (wheathered)									
10		Flt Br only slime									
		Cal sh									
		Silty Sh (black)									
15		Cal sh									
		Css									
		Fss (silty)									
		Da									
20		Ss									
25		Sh (Sandy)									
		Ss									
30		Sh									
		Css									
		Sh (black)									
		Sil sh (white)									
		Kirk band	Kirk band								
35		Sil sh (white)	Micro folding								
		Ss (with mud film)									
40		Sil sh (white)									

Fig. 3-5 Geological Log of MJI-9


Depth (m)
Geol log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu g/t
Pb g/t
Zn g/t
40
48
47.90
50
55
60
65
70
75
80
85
90
Sil sh (White)
Sh (black)
Ss
Sh
Ss
Sh
Ss
Sh
Sheared
Brk (And)
S-19
Ss
Sh (Sheared)
Da
Ss
Sh (black)
Only slime
Da Stf
Cly (Fault)
Da Stf
Da tf
Da S tf
micro folding
Sheared
Py diss
Py diss
Fractura (Shered part)

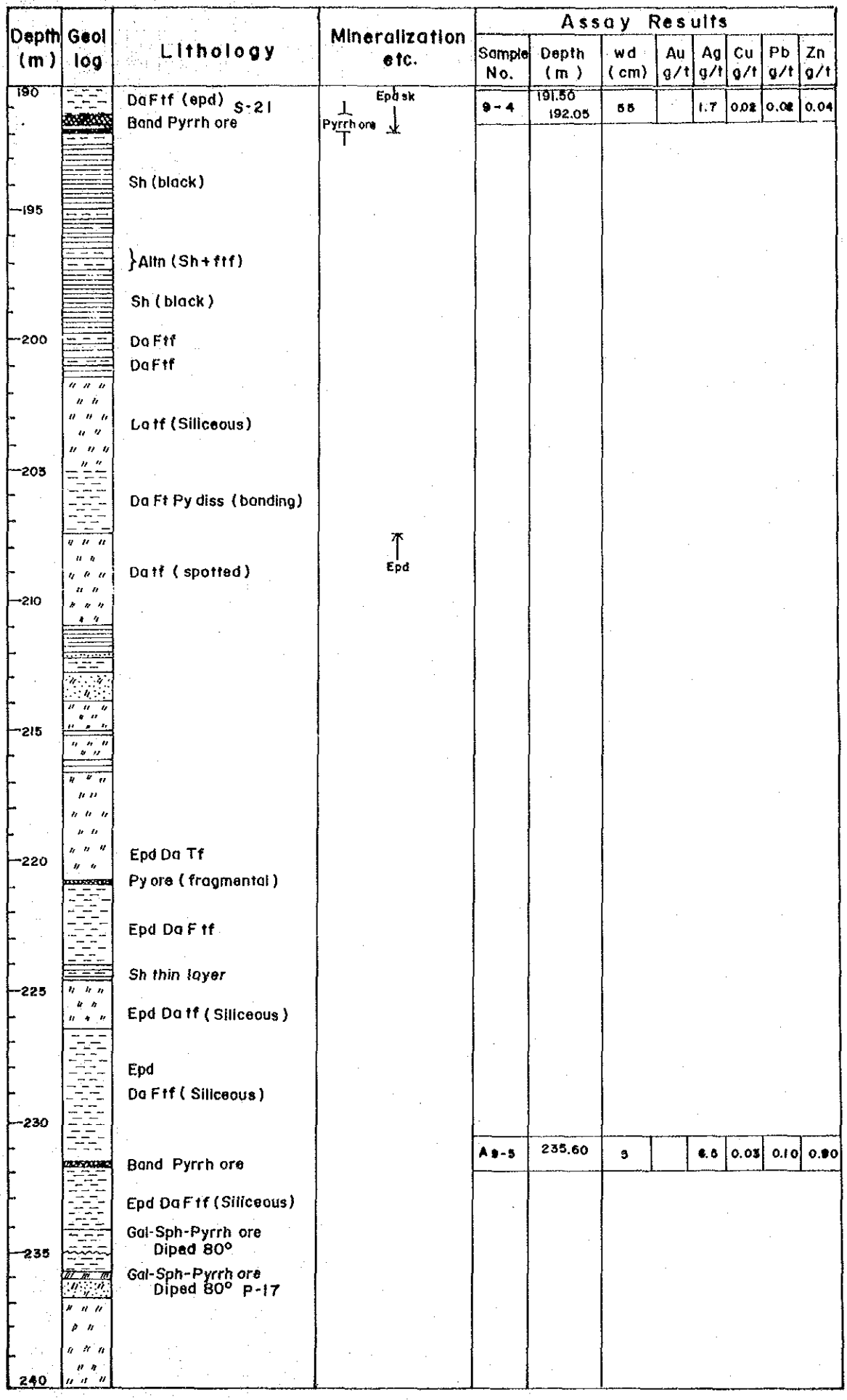
Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
		↑ fine									
		coarse									
95		Css (include with Sh fragment)									
		Sh (black)									
		Css									
		Css									
100											
		Ss									
105											
		Sh									
		Css									
110		Sh (gray silt)									
		(flattened Qz peble)									
		Sil Sh (DaFtf)									
115											
		Sh (massive silty)									
120											
		F Ss (Silty)									
		Da st (with mud fragment)									
		Da tf									
125											
		Sh									
		Da Stf									
		Sh									
		Da Tf (with mud fragment)									
130		Sh									
		Da Stf (with mud layer)									
		sh S-20									
		Da Stf (with mud layer)									
		css									
		Ss (with mud layer)									
		folding									
		Altn (Sh + ss)									
135		folding									
		Altn (Sh + Ss)									
		Da Stf									
140		Sh (black)									

85



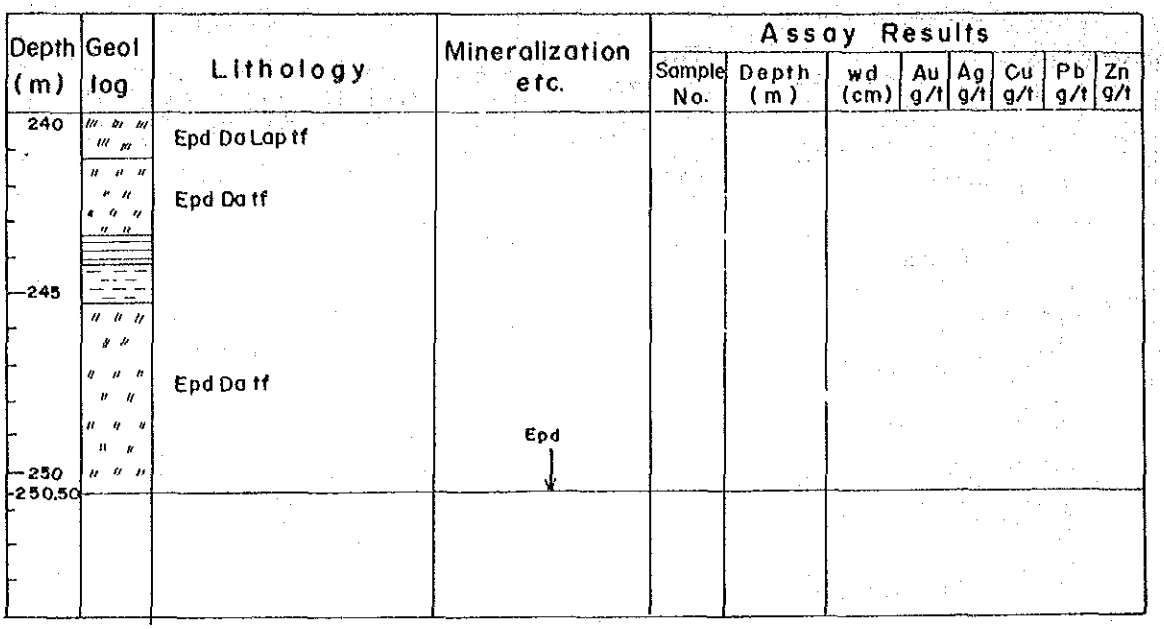
Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A 9-1	149.40 ~ 149.60	20		7.0	0.10	0.04	12.30
A 9-2	150.40 ~ 150.90	50		193.2	0.63	2.03	6.52
A 9-3	150.90 ~ 151.40	50		136.0	1.00	1.34	8.52
AVER	150.40 ~ 151.40	100		164.6	0.82	1.69	7.52

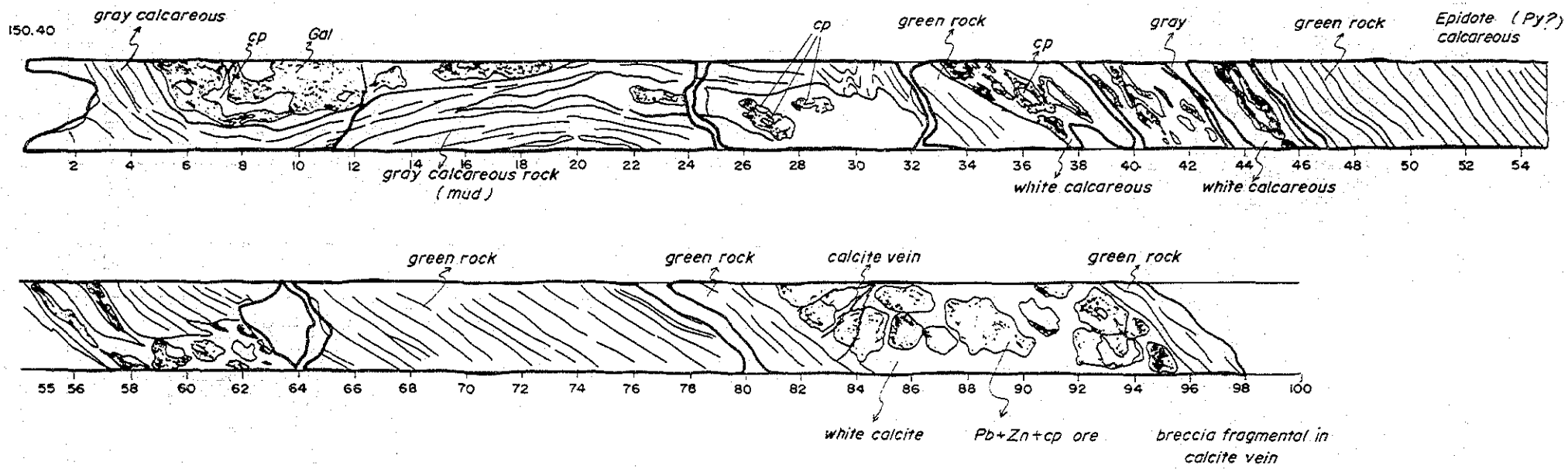


Assay Results

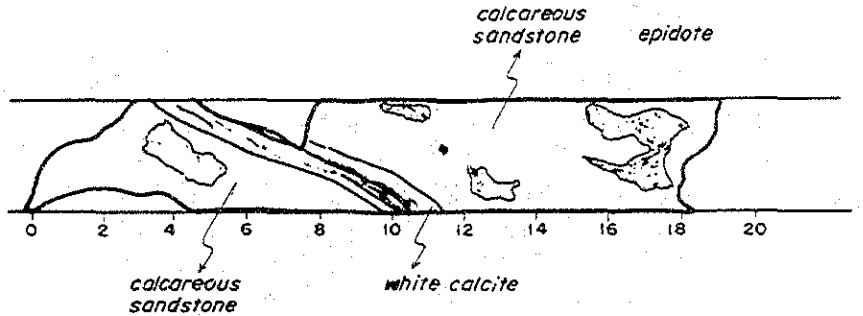
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
9-4	191.50 192.05	55		1.7	0.02	0.02	0.04
A 9-5	235.60	3		6.6	0.03	0.10	0.80


Depth (m)
Geol log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu g/t
Pb g/t
Zn g/t
240
245
250
250.50
Epd Da Lap tf
Epd Da tf
Epd Da tf
Epd

MJI-9 150.40 ~ 151.40



MJI-9



Drilling No. : MJI-10

Location : Pagar Gunung East

Coordinate Point : I line 3.0

Depth : 200.50 m

Drilling Machine : OE-8BL

Elevation : 1156.32 m.s.l.

Inclination : 90°

Core Recovery : 86.5 %

Term : Sept.12,1984-Sept.23,1984

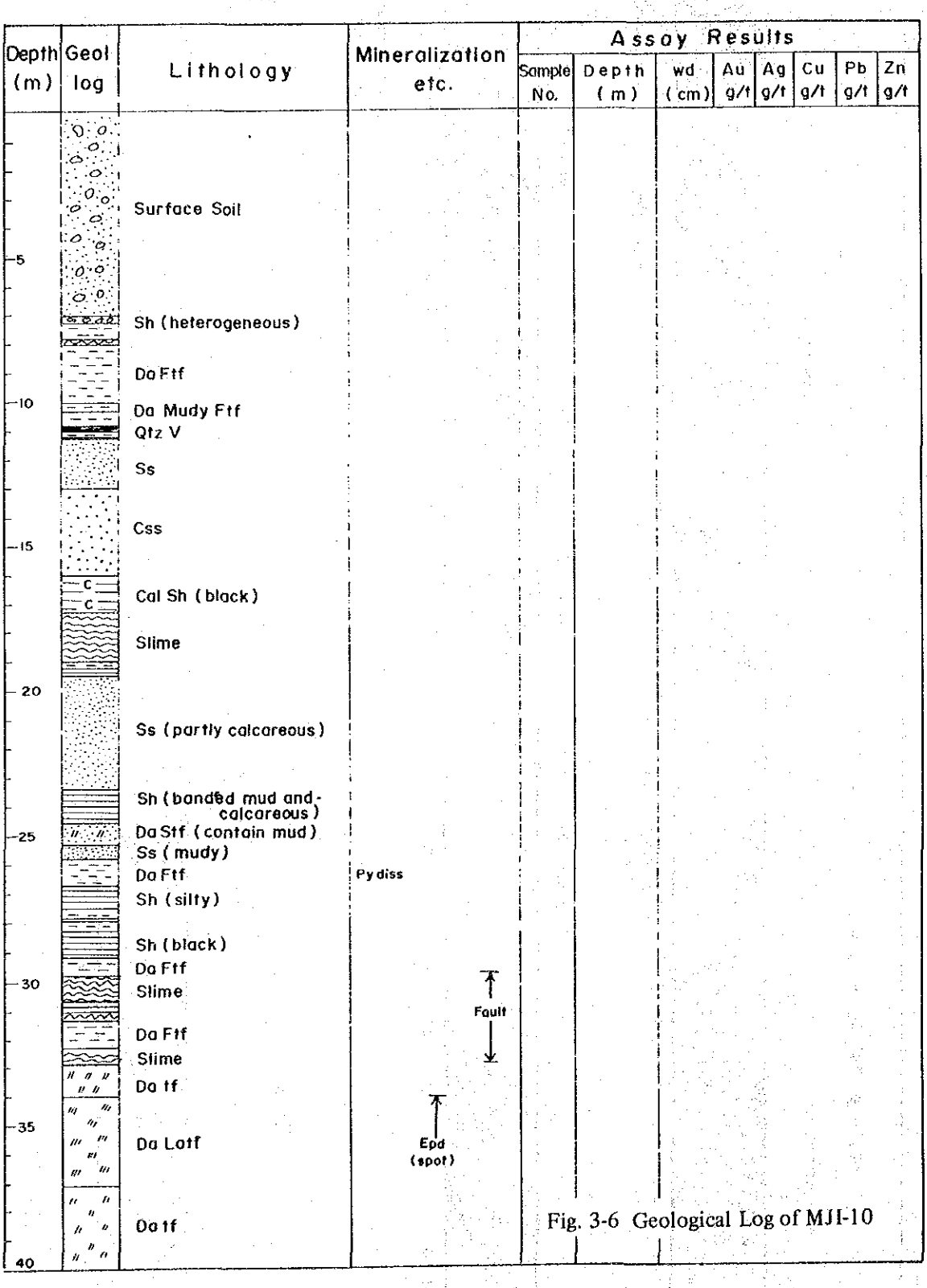
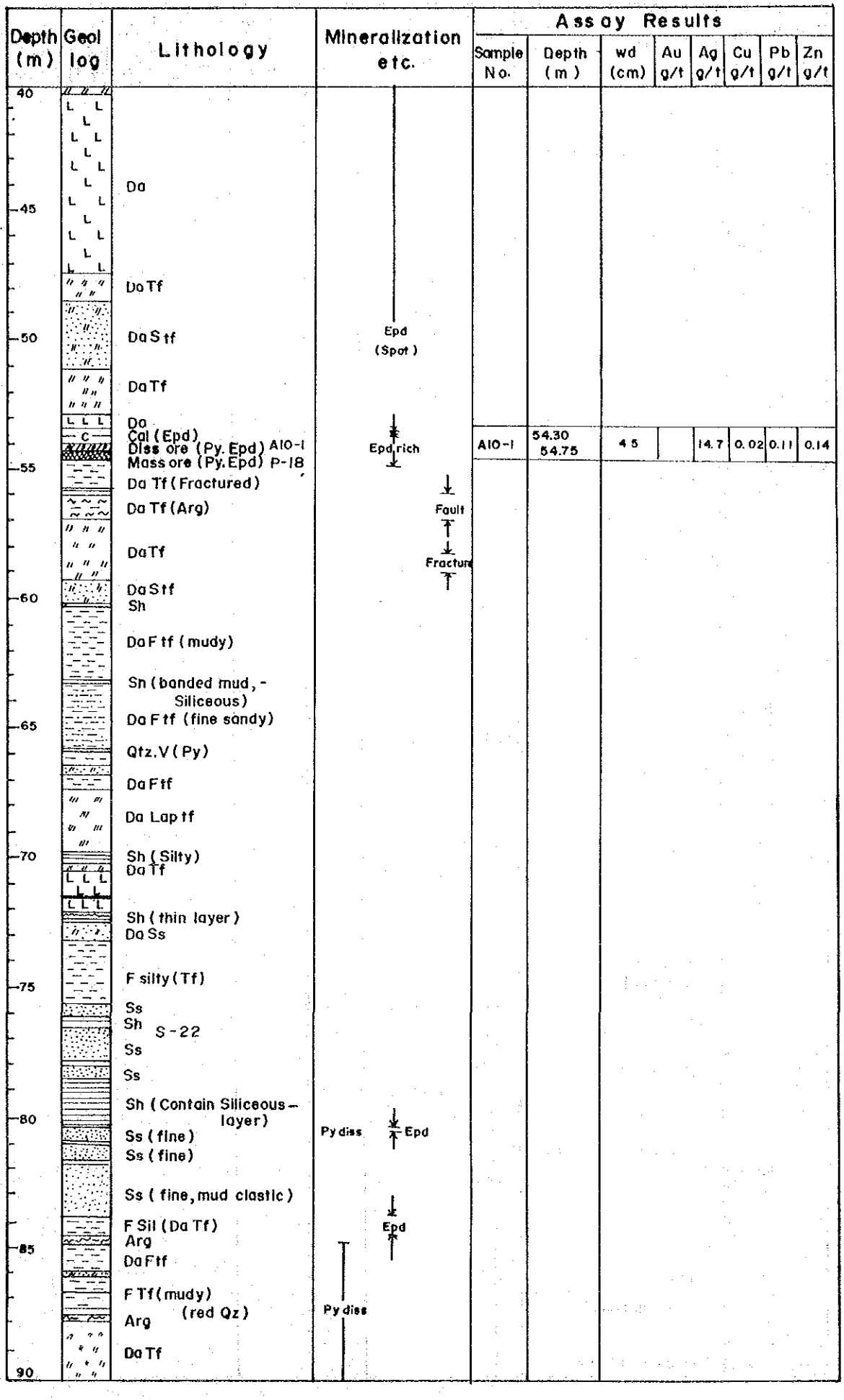


Fig. 3-6 Geological Log of MJI-10


Depth (m)
Geol log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu g/t
Pb g/t
Zn g/t
40
45
50
55
60
65
70
75
80
85
90
Da
Da Tf
Da S tf
Da Tf
Da
Cal (Epd)
Diss ore (Py. Epd) A10-1
Mass ore (Py. Epd) P-18
Da Tf (Fractured)
Da Tf (Arg)
Da Tf
Da S tf
Sh
Da F tf (mudy)
Sh (banded mud, - Siliceous)
Da F tf (fine sandy)
Qtz. V (Py)
Da F tf
Da Lap tf
Sh (Silty)
Da Tf
Sh (thin layer)
Da Ss
F silty (Tf)
Ss
Sh
S-22
Ss
Ss
Sh (Contain Siliceous - layer)
Ss (fine)
Ss (fine)
Ss (fine, mud clastic)
F Sil (Da Tf)
Arg
Da F tf
F Tf (mudy)
Arg
(red Qz)
Da Tf
Epd (Spot)
Epd rich
Fault
Fracture
Py diss
Epd
Epd
Py diss
A10-1
54.30
54.75
4 5
14.7
0. 02
0.11
0.14

91

Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results: Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
90		Da Stf									
		Da Stf (Coarse grain)									
95		Sh									
		Q – Dio	Py diss								
		Da Tf	Epd								
100		Da Tf (Sdy)	Epd Veinlet								
105		Myl (Gr~Dio)									
110											
115			Py diss Epd (Spot)								
120		Tn P									
		Da Ftf S-23 Brecciated									
125		Tn P									
		S-24	Epd (Spot)								
130		Banded Pyrite (5 cm)	Py diss								
135		Da Tf (Very Siliceous)									
140		Py banded (10 cm)									

Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
140		Py banded ore (5cm)									
145											
150		Py diss Qtz (10cm)	Epd (Spot)								
		Da									
155											
		Myl. (Gr.-Dio)									
160											
165											
170			Py diss								
175		S-25									
		Hyb Rk									
		Tn (bio. hb Tn)									
		Q-Dio S-26									
180											
		Q-Dio									
185		Da Ftf									
		Da Tf (coarse Tf)									
190		Mass-Diss Py P-19									

Depth (m)	Geol log	Lithology	Mineralization etc.
190		Mass ore (Py,Qtz)	Py mass ore
		Da tf (coarse tf)	Py imp
195		Arg	
		Sln	Arg n
		Da tf (coarse tf)	
200		Da	
200.50			

Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A10-2	189.80 190.40	60		0.5	<0.01	0.01	0.03

Drilling No. : MJI-11 11-1

Location : Pagar Gunung East Elevation : 1,235.89 m.s.l.

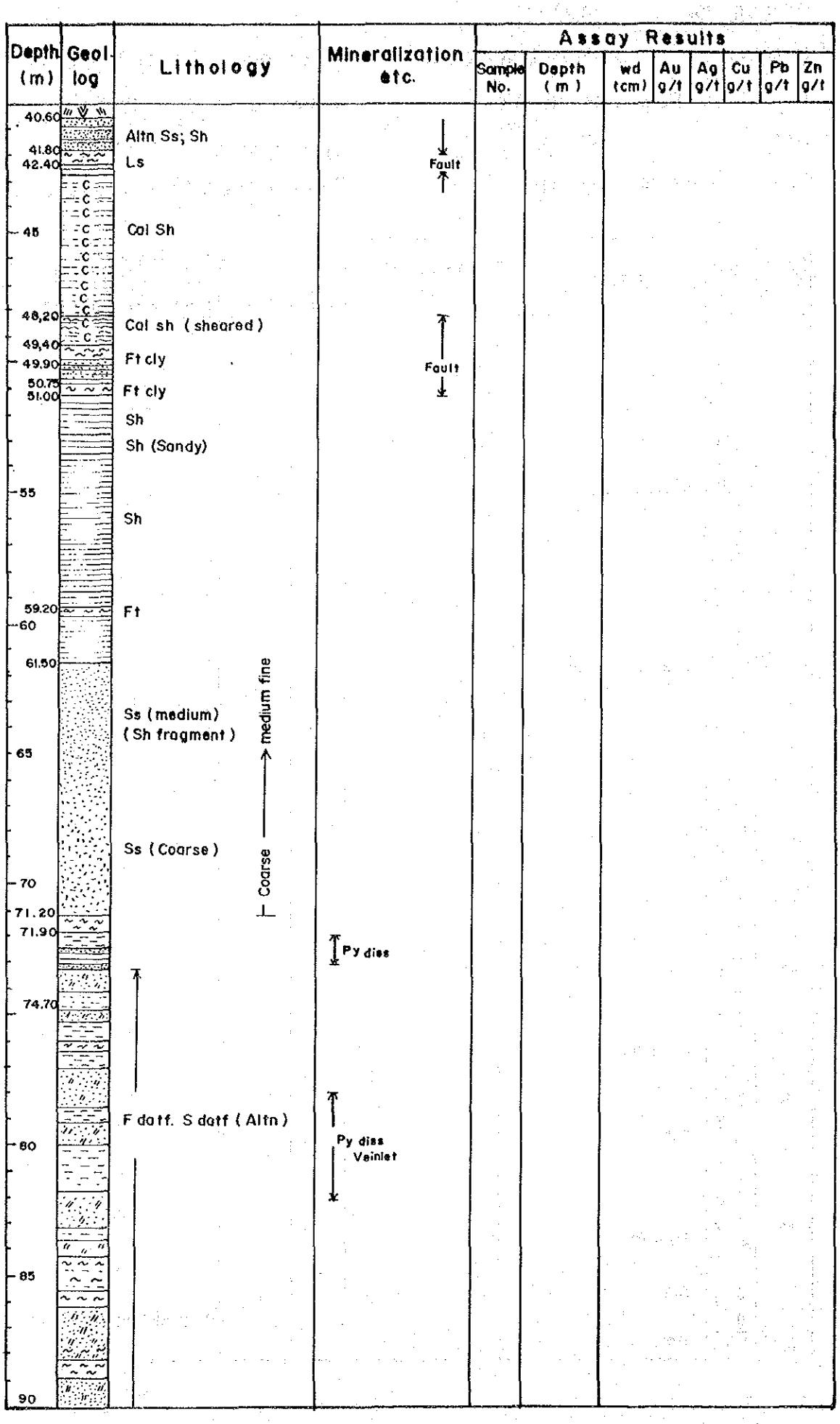
Coordinate Point : H line 4.5 Inclination : -90°

Depth : 250.20 m Core Recovery : 77.5 %

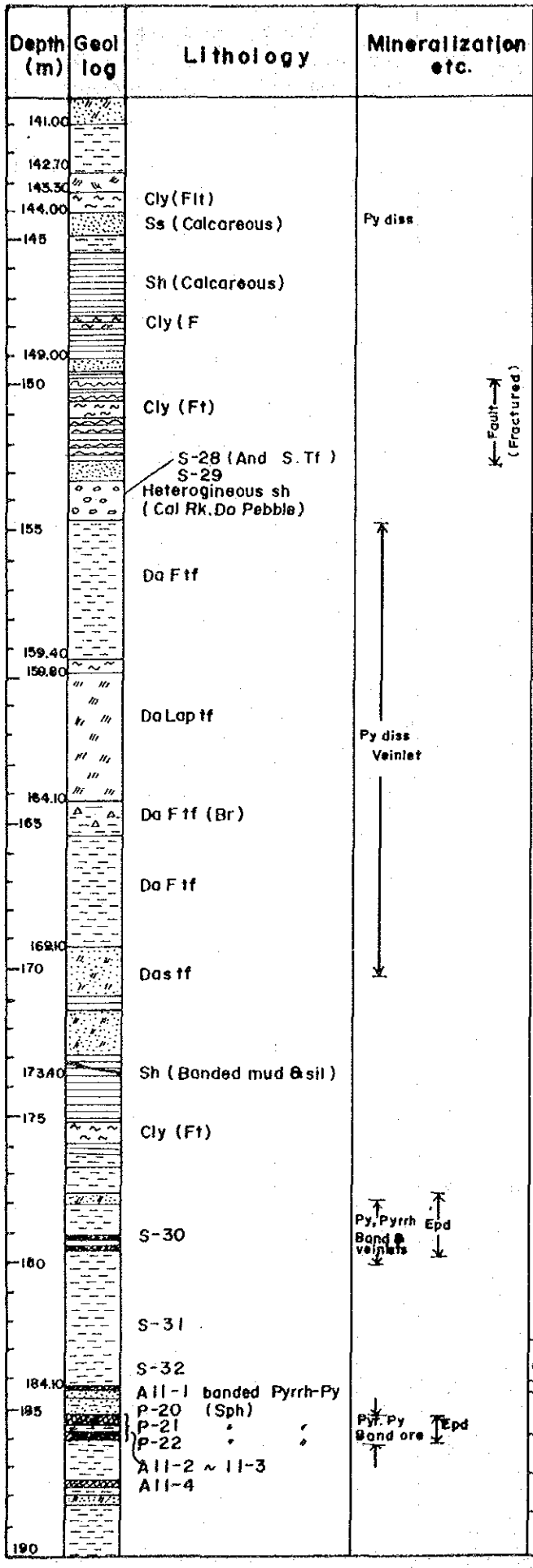
Drilling Machine : OE-8BL Term: July.20,1984-Aug.12,1984

Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
5		Surface Soil									
10											
13.30		Brk (Weathered)									
15											
20		Bvk									
25											
27.80		Bvk (Tf)									
30		Bvk									
35		Bvk (Br)									
		Bvk									
40		Bvk (Tf)									

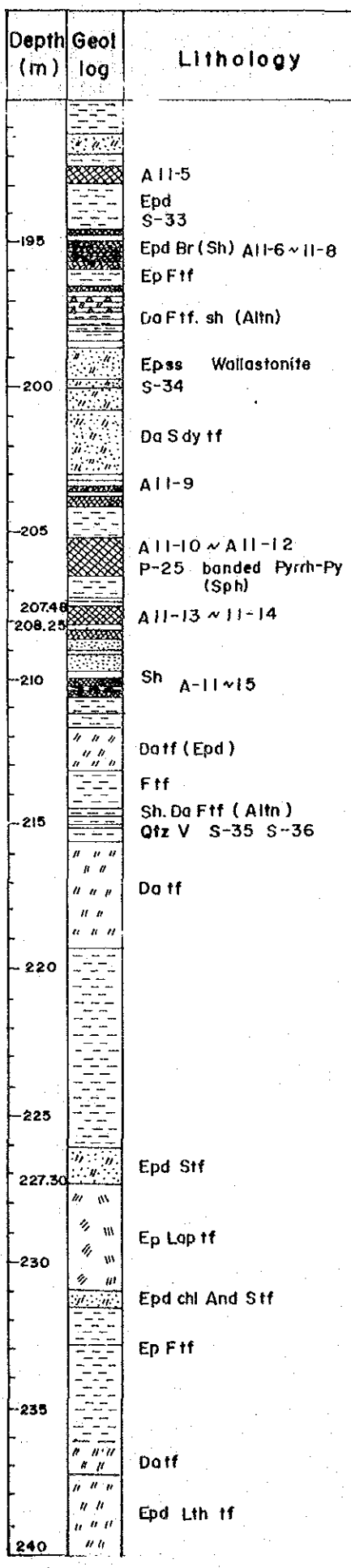
Fig. 3-7 Geological Log of MJI-11


Depth (m)
Geol log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu g/t
Pb g/t
Zn g/t
40.60
41.80
42.40
45
48.20
49.40
49.90
50.75
51.00
55
59.20
60
61.50
65
70
71.20
71.90
74.70
80
85
90
Altn Ss; Sh
Ls
Col Sh
Col sh (sheared)
Ft cly
Ft cly
Sh
Sh (Sandy)
Sh
Ft
Ss (medium)
(Sh fragment)
Ss (Coarse)
medium fine
Coarse
F datf. S datf (Altn)
Fault
Fault
Py dies
Py diss
Veinlet

Depth m	Geol log	Lithology	Mineralization etc.	Assay Results: Sample No.	Depth (m)	wd (m)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
93.05		Sh									
95		Sh (gray Sil Sh)									
96.20		Ss									
		Sh	Py diss								
		Sh Ss									
100		Sil (gray)									
		Da F tf									
105		Ss									
		Da Stf									
110		S-27									
111.15											
112.45		CSs (tf)									
115		Sh									
115.50											
120		da Stf (sh)									
122.70											
125		Cly (Flt)	Fault								
			Py Veinlet								
		Da	Py diss								
130		Da Stf									
		Da Cs tf									
		Stf	Py diss								
		Fine Stf									
135		Cly (Ft)	Fault								
		CSs									
		Cly (Flt)									
140		Da F tf									

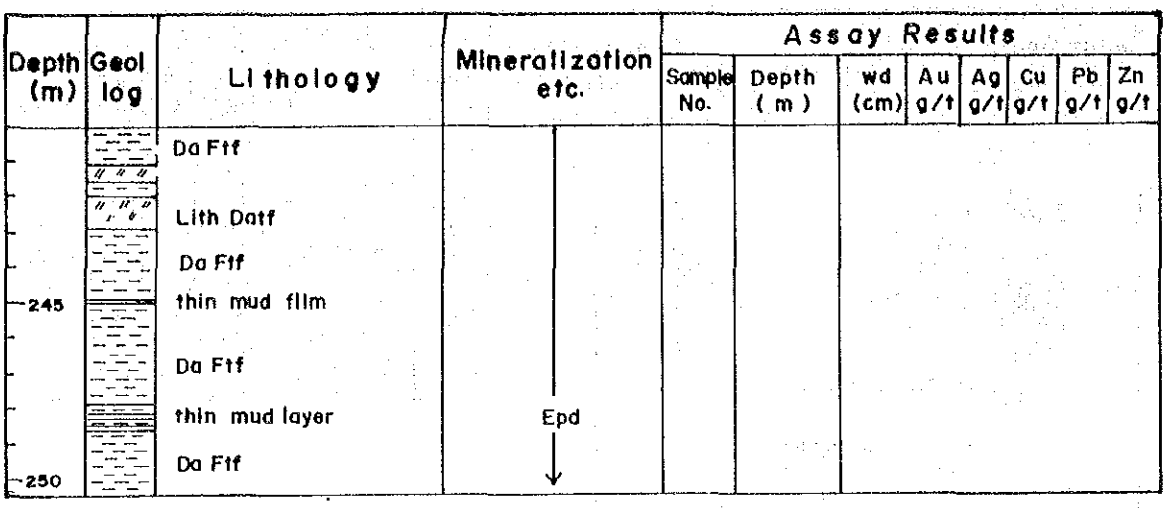


Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
All-1	184.00 ~ 184.10	10	<0.1	12.5	0.07	0.11	1.39
All-2	185.20 ~ 185.70	50		0.9	0.05	0.01	0.35
All-3	185.70 ~ 186.20	50		0.9	0.04	0.01	0.33
All-4	186.20 ~ 186.70	50		0.4	0.02	<0.01	0.02
AVER	(186.20 ~ 186.70)	150		0.7	0.04	<0.01	0.23

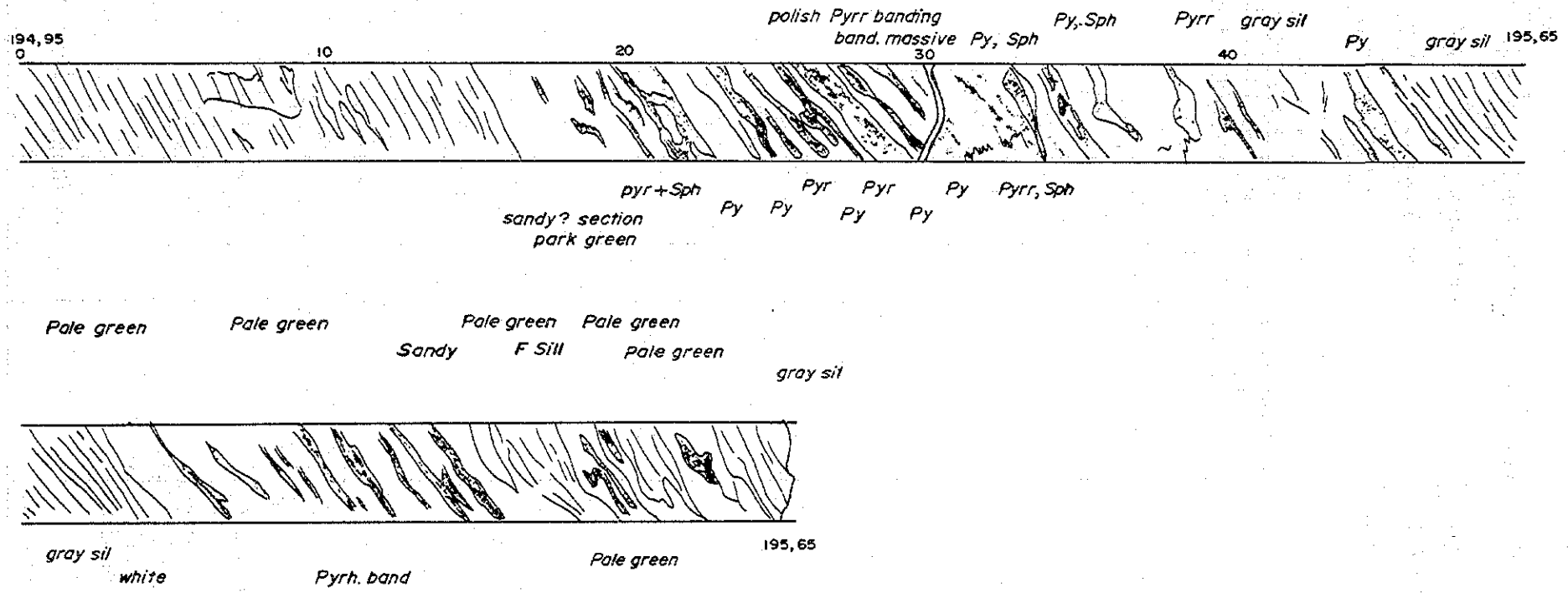


Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A11-5	192.55 ~ 192.95	50		1.9	0.05	0.01	0.05
A11-6	194.60 ~ 194.75	20		1.2	0.08	<0.01	0.06
A11-7	195.15 ~ 195.40	20	<0.1	0.9	0.05	<0.01	6.94
A11-8	195.70 ~ 195.80	40		1.1	0.05	0.01	0.02
A11-9	203.70 ~ 204.00	30		0.9	0.04	<0.01	0.06
A11-10	205.35 ~ 205.85	50		5.8	0.04	0.05	0.14
A11-11	205.85 ~ 206.35	50		3.2	0.04	0.03	0.04
A11-12	206.35 ~ 206.55	20		4.0	0.05	0.04	0.11
AVER	205.35 ~ 206.55	120		4.4	0.04	0.04	0.09
A11-13	207.50 ~ 208.00	50		1.5	0.03	0.04	0.06
A11-14	208.00 ~ 208.60	60		0.8	0.02	0.01	0.01
AVER	207.50 ~ 208.60	110		1.1	0.03	0.03	0.03
A11-15	209.90 ~ 210.30	40		0.7	0.03	<0.01	0.01


Depth (m)
Geol log
Lithology
Mineralization etc.
Assay Results
Sample No.
Depth (m)
wd (cm)
Au g/t
Ag g/t
Cu g/t
Pb g/t
Zn g/t
Da Ftf
Lith Datf
Da Ftf
thin mud film
Da Ftf
thin mud layer
Da Ftf
245
250
Epd

MJI-11 194.95 ~ 195.65



Drilling No. : MJI-12 12-1

Location : Pagar Gunung East Elevation : 1191.73 m.s.l.

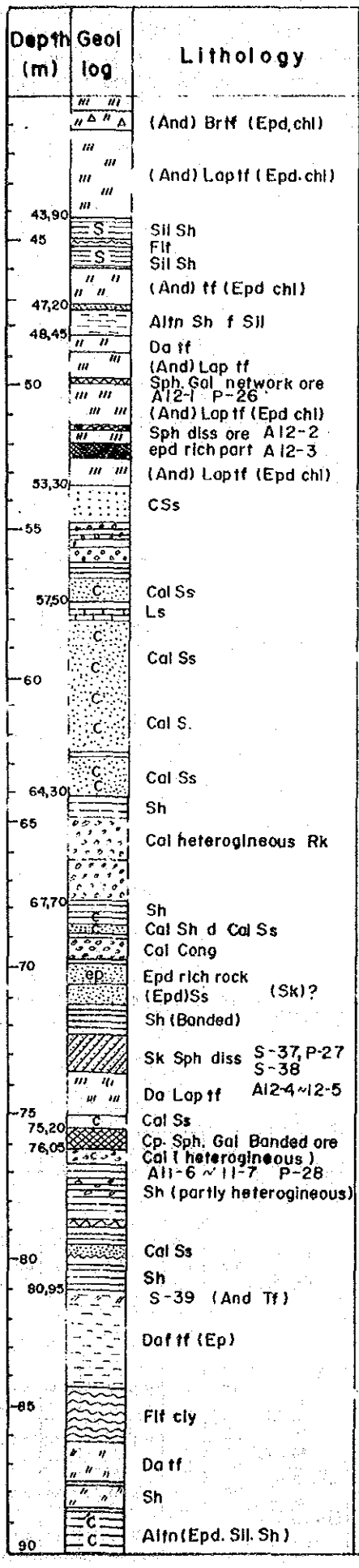
Coordinate Point : I line 4.0 Inclination : -90°

Depth : 200.30 m Core Recovery : 86.3 %

Drilling Machine : OE-8BL Term : Aug. 20, 1984 - Sep. 4, 1984

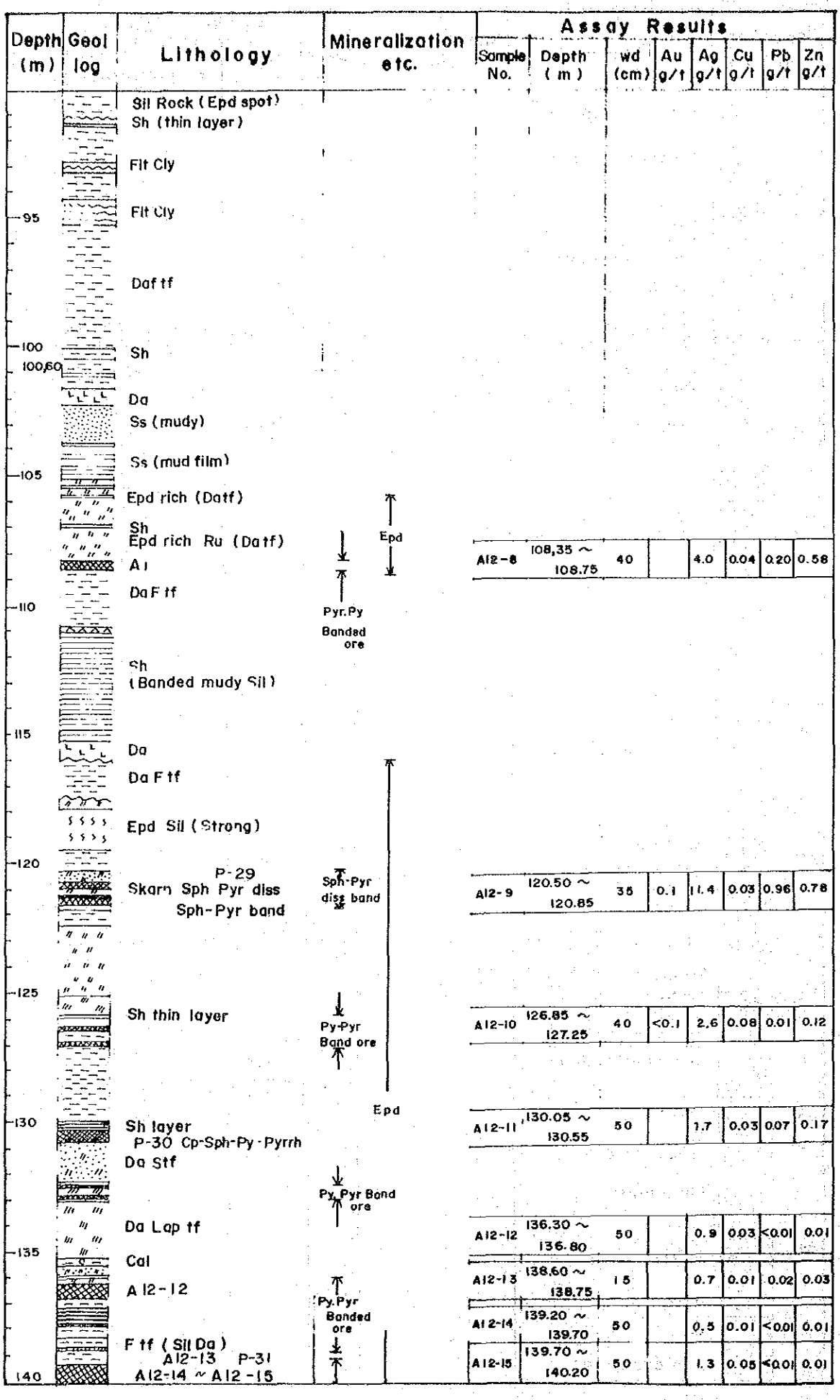
Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
		Surface Soil									
5		Ss (Weathered)									
10											
13.00		CSs									
14.30		Sh (hard Sil)									
16.90		Cal									
20		Ss									
		Fss									
		Coarse Ss									
		Sh									
25		Da Lap tf									
		Da sd tf									
		Da Lap tf									
29.90		Fss (da tf)									
30.15		Cal									
		Ls (banded mud. Ls)									
32.90		Sh									
34.00		Sh (Hard)									
35		Ss									
		(And) Brtf (Epd chl)									
		Qtz V									
38.40		(And) Lap tf (Epd chl)									
40											

Fig. 3-8 Geological Log of MJI-12

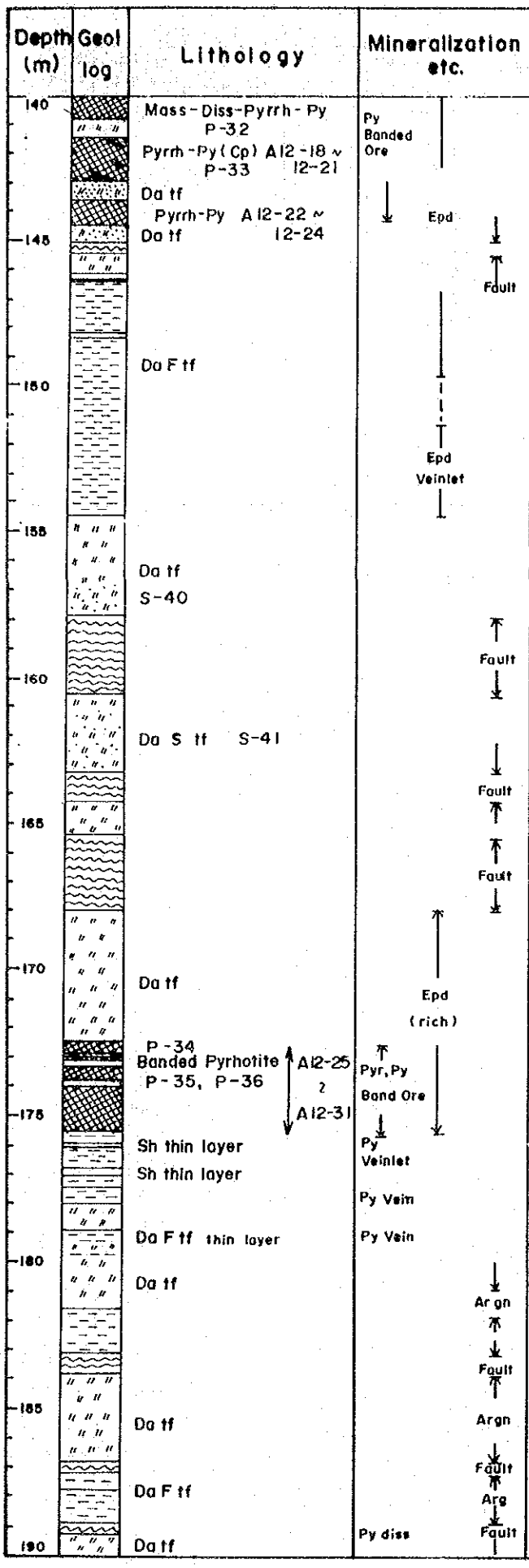


Assay Results

Sample No.	Depth (m)	wd (m)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A12-1	49,60 ~ 49,90	30		34.0	0.13	3.02	3.97
A12-2	51,60 ~ 51,80	20		20.0	0.06	0.90	1.43
A12-3	52,10 ~ 52,60	50		27.0	0.09	1.20	2.22
A12-4	72,30 ~ 72,80	50		1.8	0.04	0.01	0.95
A12-5	72,80 ~ 73,30	50		0.6	0.01	<0.01	0.10
AVER	72.30 ~ 73.30	100		1.2	0.04	<0.01	0.53
A12-6	75,10 ~ 75,60	50	0.1	19.8	0.31	0.03	7.68
A12-7	75,60 ~ 76,10	50		28.0	0.65	0.02	7.44
AVER	(75.10 ~ 76.10)	100		23.9	0.48	0.03	7.56

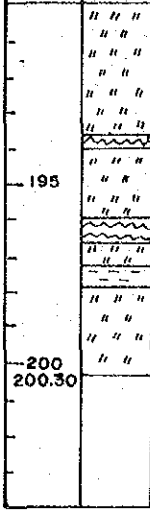


Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A12-8	108.35 ~ 108.75	40		4.0	0.04	0.20	0.58
A12-9	120.50 ~ 120.85	35	0.1	11.4	0.03	0.96	0.78
A12-10	126.85 ~ 127.25	40	<0.1	2.6	0.08	0.01	0.12
A12-11	130.05 ~ 130.55	50		1.7	0.03	0.07	0.17
A12-12	136.30 ~ 136.80	50		0.9	0.03	<0.01	0.01
A12-13	138.60 ~ 138.75	15		0.7	0.01	0.02	0.03
A12-14	139.20 ~ 139.70	50		0.5	0.01	<0.01	0.01
A12-15	139.70 ~ 140.20	50		1.3	0.05	<0.01	0.01



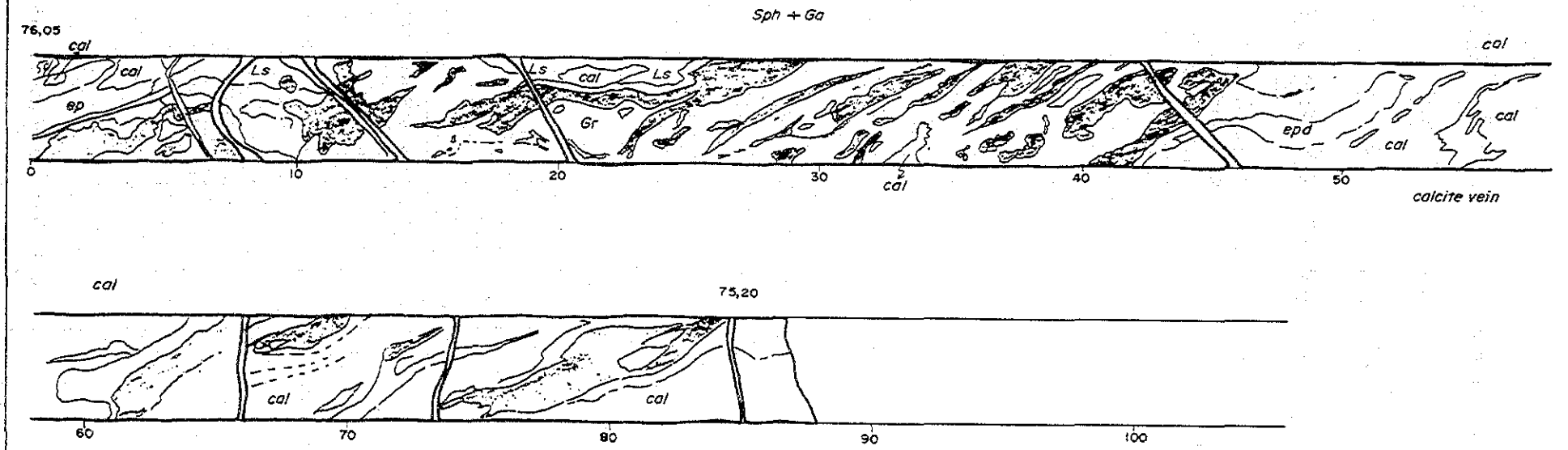
Assay Results

Sample No.	Depth (m)	wd (m)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
A12-16	140,20 ~ 140,70	50		1.6	0.05	0.01	0.01
A12-17	140,70 ~ 140,90	20		1.2	0.01	0.01	0.03
AVER	(39.20 ~ 140.90)	170		1.1	0.03	<0.01	0.01
A12-18	141,35 ~ 141,85	50		2.7	0.02	0.02	0.03
A12-19	141,85 ~ 142,35	50		3.4	0.04	0.01	0.06
A12-20	142,35 ~ 142,85	50		3.3	0.06	0.01	0.02
A12-21	142,85 ~ 143,00	15		3.0	0.02	0.02	0.03
AVER	(141.35 ~ 143.00)	165		3.1	0.04	0.01	0.04
A12-22	143,50 ~ 144,00	50		2.8	0.01	0.02	0.04
A12-23	144,00 ~ 144,50	50		3.7	0.01	0.02	0.02
A12-24	144,50 ~ 145,00	50		10.0	0.08	0.17	0.47
AVER	143.50 ~ 145.00	150		5.5	0.03	0.07	0.18
A12-25	172,35 ~ 172,85	50		1.2	0.08	<0.01	<0.01
A12-26	172,85 ~ 173,35	50		1.4	0.19	<0.01	0.01
A12-27	173,35 ~ 173,85	50		1.0	0.17	<0.01	<0.01
A12-28	173,85 ~ 174,35	50		0.8	0.12	<0.01	<0.01
A12-29	174,35 ~ 174,85	50		1.2	0.18	<0.01	0.01
A12-30	174,85 ~ 175,35	50		2.0	0.14	<0.01	0.01
A12-31	175,35 ~ 175,65	30		0.8	0.07	<0.01	<0.01
AVER	172.35 ~ 178.65	330		1.2	0.14	<0.01	<0.01



Depth (m)	Geol log	Lithology	Mineralization etc.	Assay Results							
				Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu g/t	Pb g/t	Zn g/t
		DaTf(Sil)	Fractured								
			Fault								
			Fault								
		S-42	Fractured								
		DaTf(Sil)									

MJ1-12



Gr Green part

cal Calcareous

Drill Hole : MJI - 13 13 - 1

Location : Pagar Gunung East Elevation : 1,234 m.s.l

Coordinate Point : 80^{m}S25W of MJI-6 Inclination : -90°

Depth : 250.50 ^{m} Core Recovery : 86.3 %

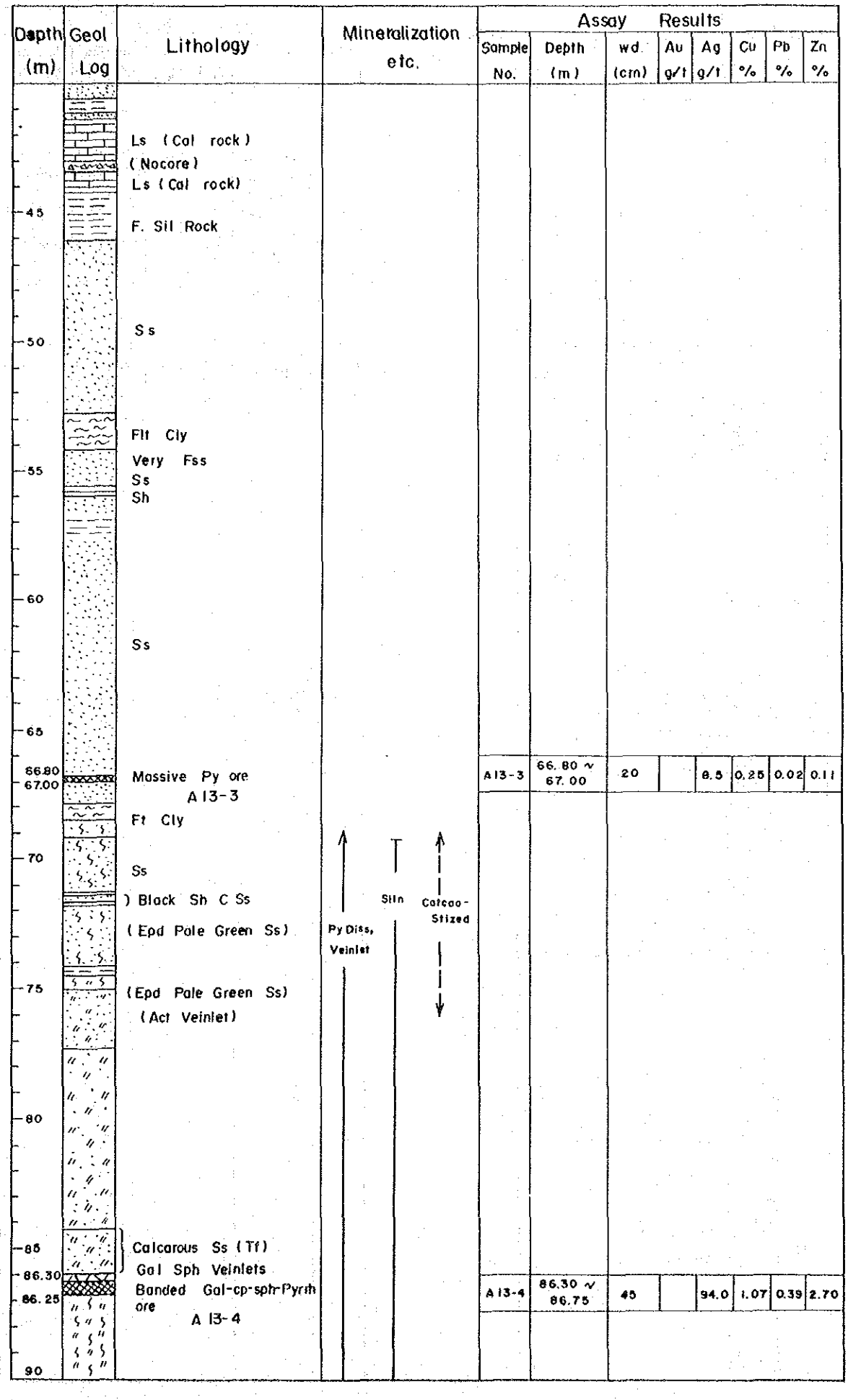
Drilling Machine : OE - 8BL Term : JAN. 29, 1985 ~ FEB. 18, 1985

Depth (m)	Geol Log	Lithology	Mineralization etc.
5			
10		Green Css	
		Green Css	
		Flt Cly - Br	
		Ls	
15		Cal Sh	
		Br Ss	
20		F Ss	
		Cal Pebble Sh	
23.10		Gal - Sph - Py (Cp) ore	
24.20		A 13-1, 2 P-37	
25		Cal Pebble Sh	
		Ss	
		(Black) Sh	
30			
		(No Core) Flt?	
35		F Sil rock	
		F Ss	
40		Ss	

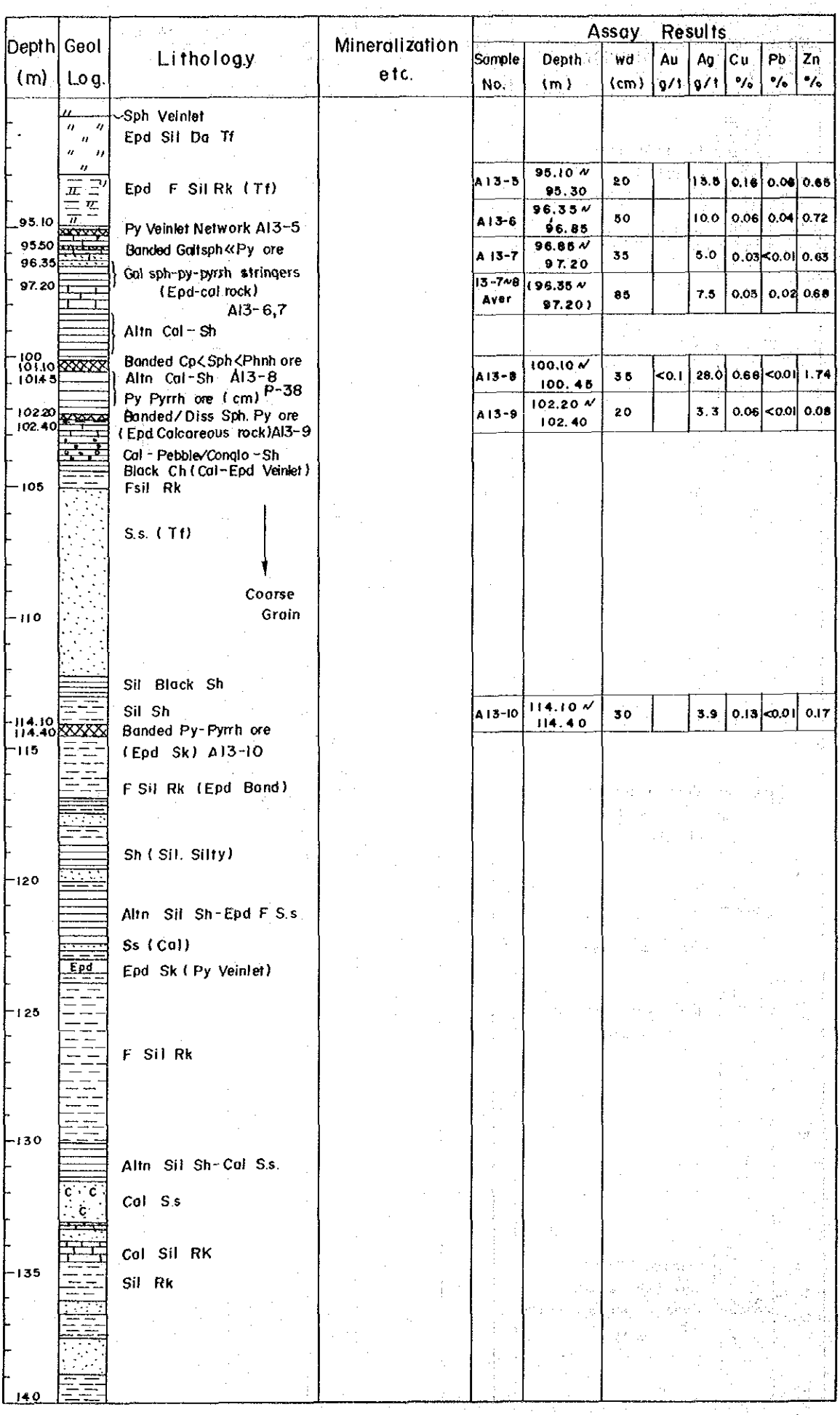
Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A13-1	23.10 ~ 23.65	55		215.0	1.56	1.28	9.93
A 13-2	23.65 ~ 24.20	55	0.41	175.0	0.93	1.34	9.76
Aver.	23.10 ~ 24.20	110	0.41	195.0	1.25	1.31	9.85

Fig. 3-9 Geological Log of MJI-13

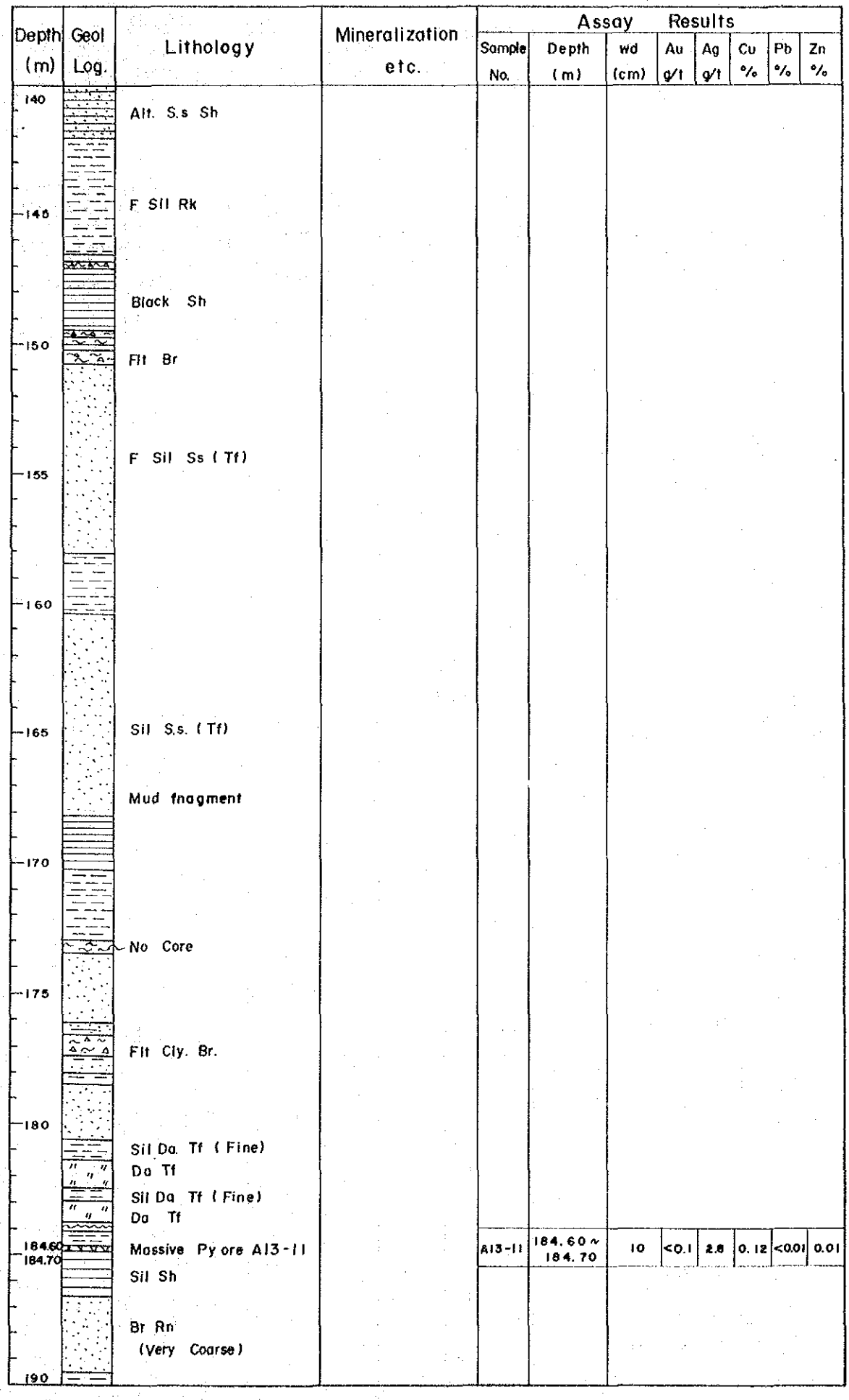


Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A13-3	66.80 ~ 67.00	20		8.5	0.25	0.02	0.11
A13-4	86.30 ~ 86.75	45		94.0	1.07	0.39	2.70

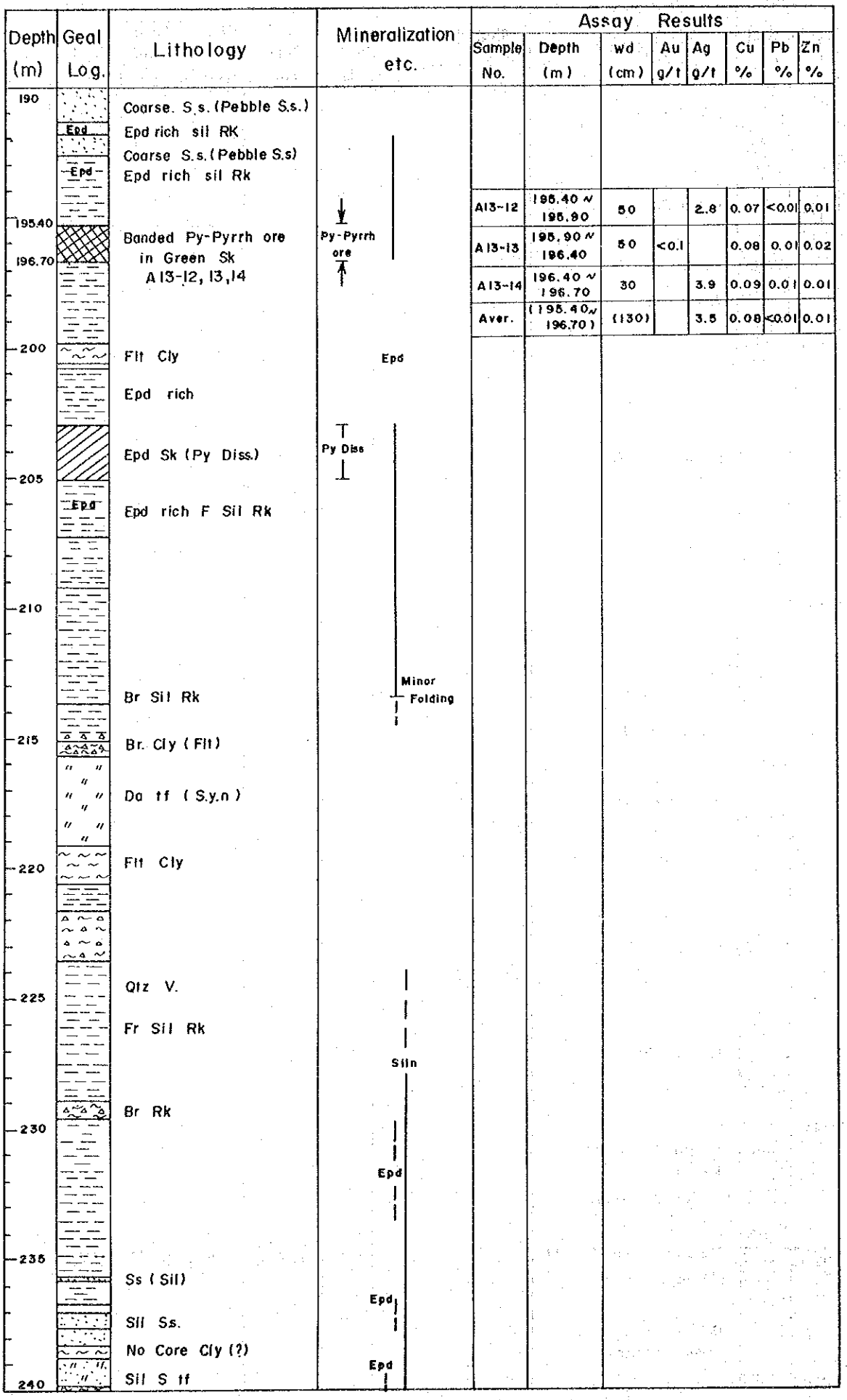


Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A13-5	95.10 ~ 95.30	20		13.5	0.16	0.06	0.65
A13-6	96.35 ~ 96.85	50		10.0	0.06	0.04	0.72
A13-7	96.85 ~ 97.20	35		5.0	0.03	<0.01	0.63
13-7~8 Aver	(96.35 ~ 97.20)	85		7.5	0.05	0.02	0.68
A13-8	100.10 ~ 100.45	35	<0.1	28.0	0.66	<0.01	1.74
A13-9	102.20 ~ 102.40	20		3.3	0.06	<0.01	0.08
A13-10	114.10 ~ 114.40	30		3.9	0.13	<0.01	0.17



Assay Results							
Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A13-11	184.60 ~ 184.70	10	<0.1	2.8	0.12	<0.01	0.01



Assay Results

Sample No.	Depth (m)	wd (cm)	Au g/t	Ag g/t	Cu %	Pb %	Zn %
A13-12	195.40 ~ 195.90	50		2.8	0.07	<0.01	0.01
A13-13	195.90 ~ 196.40	50	<0.1		0.08	0.01	0.02
A13-14	196.40 ~ 196.70	30		3.9	0.09	0.01	0.01
Aver.	(195.40 ~ 196.70)	(130)		3.5	0.08	<0.01	0.01