

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT HOLE No. UB-2 (SHEET 5 OF 28)

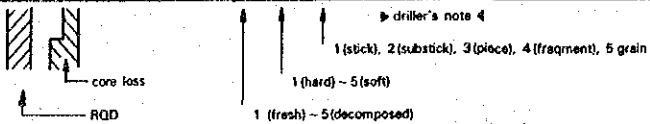
LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	20-11-1990
ELEVATION	1.103.20 m	DEPTH OF OVERBURDEN	1.13 m	COMPLETED	30-11-1990
COORDINATE	X 399.294.00 Y 451.945.00	LENGTH OF ROCK DRILLING	48.87 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	60.0°	TOTAL LENGTH OF CORE	48.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N→S	CORE RECOVERY	97.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING					
20m			0 → 100%								20.0m		
1									1	At 20 ^m -40 ^m hard, compact and fresh as a whole, but very slightly exfoliative in part.	0.2 Lu	1	
2									2	Partially cross-joints (to lamina or bedding plane) with very slightly discolored planes are observable.	P _{max} = 10.2 kgf/cm ²	2	
3									3				3
4									4	Boundary between medium-grained sandstone and fine-grained sandstone shows a gradual change.	0.6 Lu	4	
5									5				5
6									6	According to the Lugeon tests, rocks are impermeable at 20 ^m to 40 ^m .	P _{max} = 10.24 kgf/cm ²	6	
7									7				7
8									8		25.0m	8	
9									9			9	
30									30		30.0m	30	
1									1			1	
2									2		35.0m	2	
3									3			3	
4									4		40.0m	4	
5									5			5	
6									6		1.65 Lu	6	
7									7			7	
8									8		P _{max} = 10.23 kgf/cm ²	8	
9									9			9	
40									40			40	

Medium-grained sandstone with fine-grained sandstone bands

NQ (Bit size)

Grey ~ light grey ~ dark grey



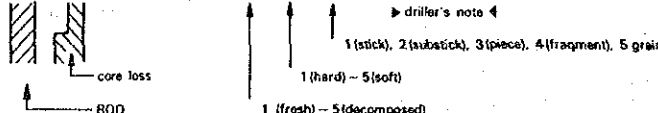
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. UB-2 (SHEET 6 of 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	20-11-1990
ELEVATION	1,103.20 m	DEPTH OF OVERBURDEN	1.13 m	COMPLETED	30-11-1990
COORDINATE	X 399.294.00 Y 451.945.00	LENGTH OF ROCK DRILLING	48.87 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	60.0°	TOTAL LENGTH OF CORE	48.85 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	N→S	CORE RECOVERY	97.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION			
					COLOR	WEATHERING	HARDNESS	CORE CUTTING								
40m			0 → 100%								40.0m	4040m				
1	Medium-grained sandstone with fine-grained sandstone bands	NQ (Bit size)	100%		Grey				2	At 40m-49m, hard, compact, and fresh as a whole.	LUGEON 0.85 Lu P _{max} = 10.23 kgf/cm ² 45.0m 2.2 Lu P _{max} = 10.23 kgf/cm ² 50.0m	1				
2					Light grey			2	Some joints and/or cracks with very slightly discolored planes.	2		2	whity cores at 41.3m-41.5m.	2		
3								2				3			3	
4								1				1			4	
5								1				1			5	
6															6	
7															7	
8															8	
9															9	
50															50	
1											1					
2											2					
3											3					
4											4					
5											5					
6											6					
7											7					
8											8					
9											9					
0											0					



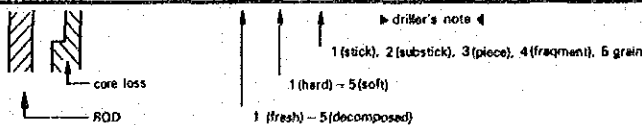
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. UB-3 (SHEET 7 of 28)

LOCATION UPSTREAM DAM DEPTH OF HOLE 50.00 m COMMENCED 30 - 10 - 1990
 ELEVATION 1,224.75m DEPTH OF OVERBURDEN 0.00 m COMPLETED 11 - 11 - 1990
 COORDINATE X 399.384.20 LENGTH OF ROCK DRILLING 50.00 m DRILLED BY CIMCOSA
Y 451.943.94 TOTAL LENGTH OF CORE 43.36 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90.0 CORE RECOVERY 86.7 %
 BEARING OF ANGLE HOLE _____

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING					
0m			0 → 100%								0	0m	
1	Residual soil & strongly weathered sandstone (mainly medium-grained)	NX Casing pipe	100%		Brown-grey slimes. Brown	5	5	5		Gravelish and discolored cores and brownish sandy slime at 0m-5m.	LUGEON	1	
2						5	5	5		Probably residual soil and strongly weathered sandstone.		2	
3						4	4	(4)				3	
4						4	4	4		-5.0		4	
5						4	4	4		At 5.0m-10.0m, core recovery is about 50% or less.		5	
6						5	5	5		Only brown-grey gravelish cores are recovered.		6	
7						(5)	(5)	5		Probably brittle, cracky, and loosened rocks by weathering.		7	
8												8	
9												9	
10												10	
1	Medium-grained sandstone partially with fine-grained sandstone bands	NQ (Bit size)	100%		Brown ~ grey	3	3	3		Generally core length is less than 15cm.	No Lugeon tests	1	
2						(4)	(4)	(4)		Discolored and gravelish cores in part.		2	
3						3~4	4	~3				3	
4						3				Possibly very cracky and somewhat loosened rocks.		4	
5						3	3	3				5	
6						5	5	5				6	
7						(2)	(4)					7	
8						(4)						8	
9						3	4	~3				9	
20							20						



GEOLOGIC LOG OF DRILL HOLE

PIRRIS

PROJECT

HOLE No. UB-3 (SHEET 8 OF 28)

LOCATION UPSTREAM DAM DEPTH OF HOLE 50.00 m COMMENCED 30 - 10 - 1990
 ELEVATION 1,224.75 m DEPTH OF OVERBURDEN 0.00 m COMPLETED 11 - 11 - 1990
 COORDINATE X 390.394.20 LENGTH OF ROCK DRILLING 50.00 m DRILLED BY CIMCOSA
Y 451.943.94 TOTAL LENGTH OF CORE 43.36 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90.0° CORE RECOVERY 86.7 %
 BEARING OF ANGLE HOLE _____

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING					
2.0m			0 → 100%								0	20m	
1					Greyish brownish grey	3	3	3		Generally very cracky			
2					Greyish brownish grey	(4)	2	(4)		21.5 Discolored and gravelish cores with partially clayey materials at 21.5m-23.5m.			
3					Greyish brownish grey	3	3	4					
4										23.5			
5						(4)	4			Mainly medium-grained sandstone, partially with fine-grained sandstone bands. A few quartz veins along cross-joints. Sorting structure (dipping at 15°-20° from horizontal level) is dimly observable as a whole.			
6						2	3						
7													
8													
9						3	(4)			Generally cracky and somewhat weathered rocks at 23.5m-42.15m.			
30						3	4						
1										Longwise cracks or joints at 24.0m-24.5m, 31.0m-31.8m and 32.4m-33.2m.			
2						(4)	3						
3						Grey	3	3					
4													
5													
6						Whity grey	3	4		Clear laminae dipping about 20° at 36.0m-36.2m.			
7						Greyish brownish grey	(4)	3		Some cracks and/or joints are discolored along their planes.			
8							3	3					
9													
40							2	(4)					

Medium-grained sandstone, partially with fine-grained sandstone bands.

NQ (Bit size)

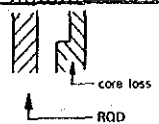
Whity grey

Greyish brownish grey

Greyish brownish grey

No Lugeon tests

35.6m
Packer could not be set at 35.6m.



driller's note
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

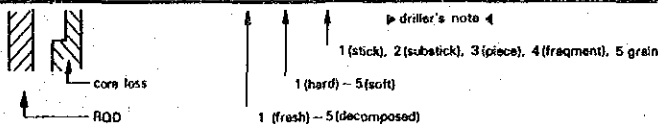
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. UB-3 (SHEET 9 OF 28)

LOCATION	UPSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	30 - 10 - 1990
ELEVATION	1,224.75 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	11 - 11 - 1990
COORDINATE	X 399.394.20 Y 451.843.94	LENGTH OF ROCK DRILLING	50.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	43.36 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	86.7 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH		
4.0m			0 → 100%									0	40.0m	
1	Medium-grained sandstone, partially with fine-grained sandstone bands	[Log symbols]	[Core recovery symbols]	NQ (Bit size)	Grey ~ brownish grey	3	3	3	Lithologically hard but cracky in general.	C - 40.5m			1	
2					(4)	2	(4)	42.15					(d)	(13.6 Lu)
3	Coarse-grained sandstone	[Log symbols]	[Core recovery symbols]	NQ (Bit size)	Dark grey	2	1	1	Generally hard, compact and fresh, but somewhat cracky. Some cracks and/or joints are rather discolored along their planes.	C - 45.0m			3	P _{max} = 9.0 kgf/cm ²
4						(3)	(2)	5						
5						1	3	3					4	(b)
6	Medium-grained sandstone	[Log symbols]	[Core recovery symbols]	NQ (Bit size)	Dark grey - grey	(3)	2	3	Partially interbedded with coarse-grained sandstone.				6	
7						(3)	(2)	1					1	7
8	Coarse-grained sandstone	[Log symbols]	[Core recovery symbols]	NQ (Bit size)	Dark grey - grey	2	2	2	Coarse-grained sandstone at 48.1m - 49.0m. Generally massive and fresh.				8	P _{max} = 9.5 kgf/cm ²
9						1	(3)	1					(3)	9
50	Bottom of hole at 50.0m													
1	Notes on Lugeon tests;													
2	- The Lugeon value with () is estimated from the P-Q curve.													
3	- A injection pressure at 10 kgf/cm ² could not be kept at 45.0m - 50.0m.													
4														
5														
6														
7														
8														
9														
0														



GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-1 (SHEET 10 of 28)

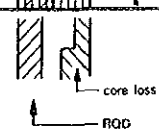
LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 - 1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 - 1991
COORDINATE	X 399.482.50 Y 451.518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTA-KIND OF BIT OF CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER			
0m			0 → 100%								0 RE.	40	0m	
0.3					3-4	3-4	4	0.3	Gravelish cores with brownish color. Compact, rather fresh cores except a part at 2.6m-3.1m. Some cracks with clayey materials. (Apparently loosened rocks)		No Lugeon tests			
1					2	1	2							
2					5	5	2							
2.6					(3)	(3)	2							
3					3	3	3-4							
3.1					2	1	3							
4					5	5	5							
5					(3)	(3)	2							
5.75								5.75	Generally cracky					
6														
6					3	3	3							
7					5	5	5							
8					2	2	4							
9							3							
10					3	4		10.0m						
10.5								10.5	Hard, compact, rather fresh, stick cores with a few joints or cracks. Their planes slightly weathered in part.					
11					1	1								
12					2	5	5							
13							2							
14					2	2								
15								15.0	Slightly cracky at 15.0m-18.0m.					
16					2	2	2							
17					5									
18					3	2	2	18.0	Lengthwise cracks at 18.1m-18.7m.					
19					5	5	5							
20					3	3	3							
20					3	3	3	19.5	Somewhat cracky.					

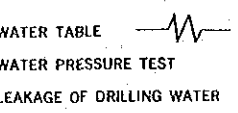
Dolerite ~ Basalt

NX casing pipe

NQ (bit size)



driller's note
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) - 5 (soft)
1 (fresh) - 5 (decomposed)



0 RE. LUGEON

5.8m

(6.3^{Lu})
P_{max} = 3.8 kgf/cm²

10.0m

11.0m

(7.2^{Lu})
P_{max} = 5.9 kgf/cm²

15.0m

(C)

0.4^{Lu}

18.0m

P_{max} = 11.6 kgf/cm²

20.0m

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-1 (SHEET 11 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 -1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 -1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
2.0m			0 → 100%									0	20.0m	
1								3 3 3	Somewhat cracky				1	
2								1 2	Hard, compact, rather fresh.		0.2 Lu		2	
3								2 1	Partially a few calcite veins.		P _{max} = 11.5 kg/cm ²		3	
4								2 1					4	
5									25.0				5	
6									Somewhat cracky as a whole.				6	
7									Partially discolored by weathering.		19 Lu		7	
8								2 2 3	Slightly brittle at cracky parts.		P _{max} = 11.9 kg/cm ²		8	
9									Cracks (dip: 60°~80°) with yellow clay films at 28.3m~29.3m.				9	
30								3 3 2					30	
1													1	
2											0.2 Lu		2	
3											P _{max} = 11.9 kg/cm ²		3	
4													4	
5									34.2				5	
6								1 2	Hard, compact, rather fresh.				6	
7								2 1	Partially a few calcite veins.		0.2 Lu		7	
8											P _{max} = 13.2 kg/cm ²		8	
9													9	
40									40.3				40	

Dolerite ~ Basalt

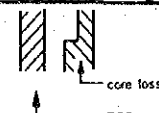
NA (Bit size)

Grey ~ dark brown

Dark greenish grey

Grey ~ yellowish grey

Grey ~ greenish grey



driller's note
 1 (tick), 2 (subtick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

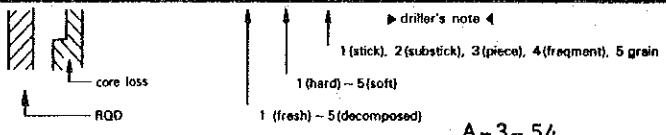
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-1 (SHEET 12 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	5 - 4 - 1991
ELEVATION	1,148.76 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	13 - 4 - 1991
COORDINATE	X 399,432.50 Y 451,518.00	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTA- TIOUS KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE			DEPTH	ELEVATION			
					COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING		WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER					
0m			0 → 100%									0	40.0m				
1	Basalt	V		NQ (Bit size)	2	1~2	2~	40.3	Generally somewhat cracky. Cracky parts are discolored and slightly brittle by weathering. Longitudinal cracks with weathered planes at 41.3m-42.3m and 48.8m-49.9m.	-	-	-	-	-			
2															2	3	16 Lu
3															5	5	P _{max} = 11.0 kgf/cm ²
4															3	2	
5															2		45.0m
6															5	5	0.1 Lu
7															(3)	(3)	P _{max} = 14.2 kgf/cm ²
8															2	3	50.0m
9															5	5	0 Lu
10															3	2	P _{max} = 14.2 kgf/cm ²
11	Dolerite	V		Grey ~ brownish grey ~ yellowish brown at joint/crack planes	2	5	5	White and/or calcite veins in part. Slightly brittle in part with veins.	-	-	-	-	-	-			
12															3		
13															2	3	
14															5	5	
15															3	2	55.0m
16															2	2	0 Lu
17															5	5	P _{max} = 14.9 kgf/cm ²
18															(3)	(3)	
19															2	3	
20															5	5	
21	3	2	59.5														
22																	



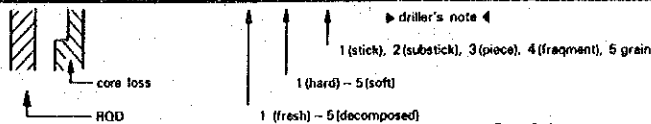
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-1 (SHEET 13 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00m	COMMENCED	5 - 4 - 1991
ELEVATION	1,148.76m	DEPTH OF OVERBURDEN	0.00m	COMPLETED	13 - 4 - 1991
COORDINATE	X 399.432.50 Y 451.518.00	LENGTH OF ROCK DRILLING	70.00m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.80m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.20%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION																																			
					COLOR	WEATHERING	HARDNESS	CORE CUTTING																																									
60m			0 → 100%									60.0m																																					
1	Dolerite ~ Basalt	NQ (Bit size)			Dark grey	2	2	2	Generally fresh, partially somewhat cracky.	60.0m	Lu	P _{max} = 14.9 kgf/cm ²	60.0m																																				
2															3	3	Longitudinal cracks with slightly weathered planes at 69.4m - 70.0m	65.0m	Lu	P _{max} = 14.9 kgf/cm ²	65.0m																												
3															2	2						Bottom of hole at 70.0m	Lu	P _{max} = 14.9 kgf/cm ²	70.0m																								
4															2	2										Note on Lugeon tests: - The Lugeon value with () is estimated from the P-Q curve.	Lu	P _{max} = 14.9 kgf/cm ²	70.0m																				
5															2-3	3														1 (hard) - 5 (soft)	Lu	P _{max} = 14.9 kgf/cm ²	70.0m																
6															2-3	3																		1 (fresh) - 5 (decomposed)	Lu	P _{max} = 14.9 kgf/cm ²	70.0m												
7															2	2																						1 (hard) - 5 (soft)	Lu	P _{max} = 14.9 kgf/cm ²	70.0m								
8															5	2																										1 (fresh) - 5 (decomposed)	Lu	P _{max} = 14.9 kgf/cm ²	70.0m				
9															1	2																														1 (hard) - 5 (soft)	Lu	P _{max} = 14.9 kgf/cm ²	70.0m
10															2-3	3																																	



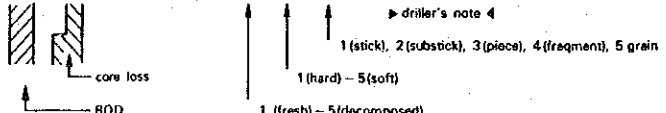
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-2 (SHEET 14 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 -1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 -1991
COORDINATE	399.532.82 451.515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTA- KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHER- ING	HARD- NESS	CORE CUTTING					
0m			0-100%								0	40	0m
0.5									0.5	Slimes			
1	Residual soil(?)								2	Generally hard, compact, and fresh and somewhat cracky in part.			
2									2				
3									2				
4									2				
5									2				
6									2				
7	Basalt								2	Generally cracky, Most of crack/joint planes are discolored by weathering.			
8									2				
9									2				
10									2				
11									2				
12									2				
13									2				
14									2				
15									2				
16									2				
17									2				
18									2				
19									2				
20									2				



No Lugeon tests

5.8m
(43 Lu)
 $P_{max} = 3.8 \text{ kgf/cm}^2$

10.0m
10.6m
(7 Lu)
 $P_{max} = 6.3 \text{ kgf/cm}^2$

15.0m
(34 Lu)
 $P_{max} = 6.8 \text{ kgf/cm}^2$

20.0m

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

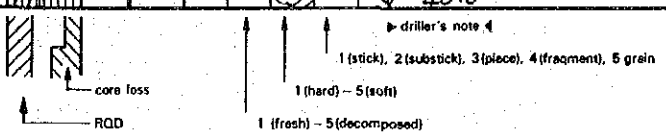
HOLE No. LB-2 (SHEET 15 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 - 1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 - 1991
COORDINATE	X 399.532.82 Y 251.515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING							
0			0 → 100%										0	1150.00	
1					Grey ~ dark greenish grey	2	3	3		Lithologically hard and compact, but slightly cracky.	(c)		20.0		
2					Grey ~ dark greenish grey (3)	2	2	2		-21.6	(b)				
3					Cracky (part)	2	2	3		Generally rather cracky.					
4					Cracky (part)	3	3	3		Gravelish and discolored Cores at 23.0 ^m -24.0 ^m and 26.4 ^m -26.75 ^m .	(c)				
5					Yellowish brown (part)	3	2	4							
6					Grey ~ yellowish brown	2	2	3			(d)		25.0		
7					Grey ~ yellowish brown	3	3	3-4		-26.75					
8										Generally hard and compact, but slightly cracky.					
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															
32															
33															
34															
35															
36															
37															
38															
39															
40															

Dolomite ~ Basalt

NQ (Bit size)



driller's note 4
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-2 (SHEET 16 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	70.00 m	COMMENCED	8 - 3 - 1991
ELEVATION	1,150.00 m	DEPTH OF OVERBURDEN	0.00 m	COMPLETED	22 - 3 - 1991
COORDINATE	X 399.532.82 Y 451.515.20	LENGTH OF ROCK DRILLING	70.00 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	69.50 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	99.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
4.0m			0 → 100%									40.0m	4.0m	
1					2	2	3	3	40.5					
2					2	2	2	2	Generally hard and compact, but slightly cracky.		18.0 Lu			
3					2	2	2	2			P _{max} = 10.6 kgf/cm ²			
4					2	2	2	2	Longitudinal cracks and/or joints at 45.0 ^m -45.5 ^m , 45.7 ^m -46.2 ^m , and 48.0 ^m -48.9 ^m .					
5					2	2	2	2				45.0m		
6					2	2	2	2						
7					2	2	2	2			14.0 Lu			
8					2	2	2	2			P _{max} = 13.8 kgf/cm ²			
9					2	2	2	2	48.5					
10					2	2	2	2	Somewhat cracky as a whole.			50.0m		
11					2	2	2	2	Discolored along crack and/or joint planes.			50.5m		
12					2	2	2	2	Longitudinal cracks and/or joints at 50.4 ^m -51.0 ^m , 54.0 ^m -54.5 ^m , and 56.2 ^m -57.1 ^m .		0.7 Lu			
13					2	2	2	2			P _{max} = 13.8 kgf/cm ²			
14					2	2	2	2	Somewhat brittle at cracky part.			55.0m		
15					2	2	2	2				55.5m		
16					2	2	2	2			1.2 Lu			
17					2	2	2	2			P _{max} = 13.7 Lu			
18					2	2	2	2	Hard, compact and fresh in lithologic.					
19					2	2	2	2	Generally massive.					
20					2	2	2	2				60.0m	60.0m	

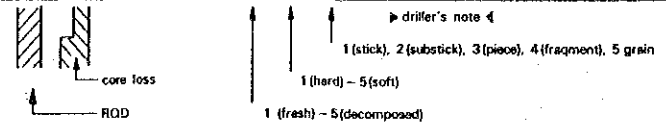
Dolerite ~ Basalt

NQ (Bit size)

Yellowish brown (Cracky part)

Grey ~ dark greenish grey ~ (3)

Dark greenish grey



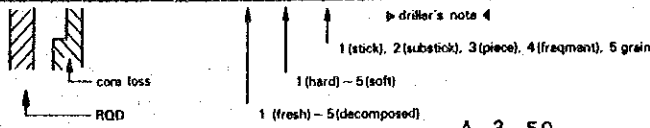
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-2 (SHEET 17 of 28)

LOCATION DOWNSTREAM DAM DEPTH OF HOLE 70.00 m COMMENCED 8 - 3 -1991
 ELEVATION 1,150.00 m DEPTH OF OVERBURDEN 0.00 m COMPLETED 22 - 3 -1991
 COORDINATE X 399.532.92 LENGTH OF ROCK DRILLING 70.00 m DRILLED BY CIMCOSA
 Y 451.515.20 ANGLE FROM HORIZONTAL 90.0° TOTAL LENGTH OF CORE 69.50 m LOGGED BY JICA
 BEARING OF ANGLE HOLE CORE RECOVERY 99.3 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION															
					COLOR	WEATHERING	HARDNESS	CORE CUTTING																					
6.0m			0 → 100%									0	60.0m	40	60m														
1	Dolerite ~ Basalt	✓		NQ (Bit size)	Dark greenish grey	1	2	2	Lithologically hard. compact and fresh. Generally massive. Partially a few oblique joints with very slightly discolored planes.				1		1														
2		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	
3		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
4		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
5		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
6		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
7		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
8		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
9		✓														1	2	2	2	2	2	2	2	2	2	2	2	2	2
70																										70.0m	70	70	
1													1																
2													2																
3													3																
4													4																
5													5																
6													6																
7													7																
8													8																
9													9																
0													0																



GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-3 (SHEET 18 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11 - 12 - 1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7 - 1 - 1991
COORDINATE	X 399.549.44 Y 451.466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE			DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS		CORE CUTTING	WATER PRESSURE TEST		
0m			0 → 100%								0m	
0-1	Top soil							Gravelly cores only. Topsoil and/or strongly weathered bedrock.				
1-2								Core recovery poor in general. Slimes at 3.4m-4.0m.				
2-3								(Probably strongly weathered rocks with rather hard blocks in part)				
3-4								5.0				
4-5								Generally cracky, moderately weathered along cracks and/or joints.				
5-6								Recovered cores easily broken into gravel size.				
6-7								(Weathered and cracky rocks possibly somewhat loosened as a whole)				
7-8								11.1				
8-9								Partially hard and compact, but generally rather cracky.				
9-10								White veins in part.				
10-11								Crackly parts somewhat weathered and brittle.				
11-12								3				
12-13								(3)				
13-14								(2)				
14-15								17.8				
15-16								Crack and somewhat brittle at 17.8m-21.7m.				
16-17								3				
17-18								4				
18-19												
19-20												

Dolerite ~ Basalt

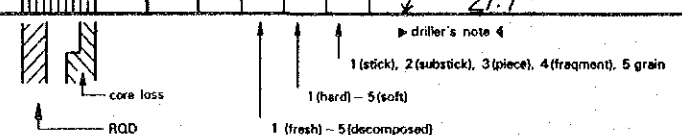
NX Casing Pipe
Dark greenish grey ~ (brown)

Dark brown

Dark grey ~ dark brown

Grey ~ light greenish grey

No Lugeon tests



GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-3 (SHEET 19 OF 28)

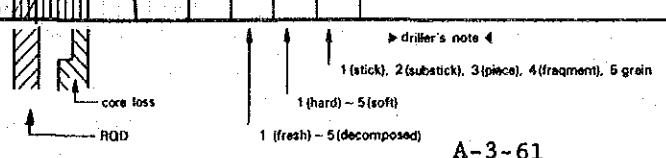
LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11-12-1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7-1-1991
COORDINATE	X 399.599.44 Y 451.466.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9%		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
2.0m			0-100%									40.20m		
1		✓			Grey	3	3	3	Cracky and somewhat brittle.	(c)			1	
2		✓			Grey	3	3	4	21.7	(d)			2	
3		✓			dark greenish-grey		2	2	Cracked moderately at 21.7m - 36.1m.				3	
4		✓			ish grey		1	1	Partially somewhat weathered along cracks and/or joints.				4	
5		✓			Grey	(1)	(3)	(3)					5	
6		✓			Grey	3	3	(4)	White thin veins in part.				6	
7		✓			light greenish grey	2	2	2					7	
8		✓			Grey	(3)	3-4	2					8	
9		✓			Dark greenish grey	(3)	2	2					9	
10		✓			Dark greenish grey	2	2	2		(c)	No Lugeon tests		10	
11		✓			Grey	(3)	1	1					11	
12		✓			dark greenish grey	2	2	2	Longitudinal and oblique joints with slightly weathered planes at	(b)			12	
13		✓			Grey	(3)	(3)	(3)	33.5m - 33.85m and 34.5m - 34.9m.				13	
14		✓											14	
15		✓											15	
16		✓											16	
17		✓			Grey	3	3	3	Somewhat cracky at 36.1m - 41.5m.				17	
18		✓			Grey	1	1	1	Slightly brecciated and reconsolidated at 36.1m - 36.2m and 38.1m - 38.4m.				18	
19		✓			Grey	2	(2)	2					19	
20		✓											20	

Basalt

NQ (Bit size)

Dolerite



GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-3 (SHEET 20 OF 28)

LOCATION DOWNSTREAM DAM DEPTH OF HOLE 100.0 m COMMENCED 11 - 12 - 1990
 ELEVATION 1,239.25 m DEPTH OF OVERBURDEN 0.0 m COMPLETED 7 - 1 - 1991
 COORDINATE X 399.599.44 LENGTH OF ROCK DRILLING 100.0 m DRILLED BY CIMCOSA
 Y 451.466.66 TOTAL LENGTH OF CORE 96.9 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90 CORE RECOVERY 96.9%

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT OF CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
4.0m			0 → 100%							0	40.0m	40.0m
1		✓					3	3	Somewhat cracky.			
2		✓					2	(2)	41.5		(100 Lu)	
3		✓					2	3	Cores broken into small pieces in part.		P _{max} = 5.5 kgf/cm ²	
4		✓					5	5				
5		✓					3	(4)				
6		✓							45.9		45.0m	
7		✓					2	2	Partially cracky, but rather massive as a whole.		46.3m	
8		✓					5	5			(48 Lu)	
9		✓					3	3	48.8 Cracky part		P _{max} = 7.9 kgf/cm ²	
50		✓					5	5	49.2		50.0m	
1		✓					2	(4)				
2		✓					5	5			(32 Lu)	
3		✓					3	4	Crackly part and somewhat massive part alternate at 52.1m - 64.1m.		P _{max} = 7.9 kgf/cm ²	
4		✓					5	3				
5		✓					2	3	Slightly discolored at cracky parts.		55.0m	
6		✓					5	5	Oblique and horizontal cracks and/or joints are slightly distinguished.		(47 Lu)	
7		✓					3	(4)				
8		✓					2	2			P _{max} = 6.9 kgf/cm ²	
9		✓					2	3				
60		✓					5	5			60.0m	60
		✓					3	(4)				

Dolerite ~ Basalt

NQ (Bit size)

Grey ~ dark greenish grey

Dark greenish grey

Grey ~ dark greenish grey



driller's note 4
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-3 (SHEET 21 of 28)

LOCATION DOWNSTREAM DAM DEPTH OF HOLE 100.0 m COMMENCED 11 - 12 - 1990
 ELEVATION 1,239.25 m DEPTH OF OVERBURDEN 0.0 m COMPLETED 7 - 1 - 1991
 COORDINATE 399.599.44 LENGTH OF ROCK DRILLING 100.0 m DRILLED BY CIMCOSA
451.466.66 TOTAL LENGTH OF CORE 96.9 m LOGGED BY JICA
 ANGLE FROM HORIZONTAL 90° CORE RECOVERY 96.9%

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	LUGEON				
6.0m			0 → 100%								0	60m	
1		✓					2 3						
2		✓					3 (4)				61.3m		
3		✓					3 3				25 Lu		
4		✓					2 2				P _{max} = 12.3 kgf/cm ²		
5		✓					2 2				65.0m		
6		✓					3 (4)				8 Lu		
7		✓					2 3						
8		✓					3 (4)				P _{max} = 16.8 kgf/cm ²		
9		✓					2 2						
10		✓					2 3				70.0m		
11		✓					3 (4)						
12		✓					2 2				71.5m		
13		✓					2-3 3				17.5 Lu		
14		✓											
15		✓					2 2				P _{max} = 13.5 kgf/cm ²		
16		✓					2 2				75.0m		
17		✓					2 2				75.6m		
18		✓					2 2				18 Lu		
19		✓					1 (3)						
20		✓									P _{max} = 11.3 kgf/cm ²		
80											80.0m		

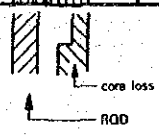
Dolerite ~ Basalt

NQ (Bit size)

dark greenish grey
Grey
Dark greenish grey
Grey ~ dark greenish grey

2 3
3 (4) Rather cracky as a whole.
3 3
2 2 4
64.1
Rather massive part and slightly cracky part are alternated.
Cracky parts are somewhat discolored and slightly deteriorated lithologically.
3 (4)
2 2
2 3
3 (4)
2 2
2 3
73.0
Generally hard, compact, and fresh at 73.0m - 80.9m.
2 2
Some planes of joints and/or cracks are somewhat discolored by weathering, but others are rather fresh.
2
1 (3)

61.3m
25 Lu
(d)
P_{max} = 12.3 kgf/cm²
65.0m
8 Lu
P_{max} = 16.8 kgf/cm²
70.0m
71.5m
17.5 Lu
(b)
P_{max} = 13.5 kgf/cm²
75.0m
75.6m
18 Lu
P_{max} = 11.3 kgf/cm²



driller's note 4
1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
1 (hard) - 5 (soft)
1 (fresh) - 5 (decomposed)

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-3 (SHEET 22 OF 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	100.0 m	COMMENCED	11 - 12 - 1990
ELEVATION	1,239.25 m	DEPTH OF OVERBURDEN	0.0 m	COMPLETED	7 - 1 - 1991
COORDINATE	X 399.589.44 Y 451.486.66	LENGTH OF ROCK DRILLING	100.0 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90°	TOTAL LENGTH OF CORE	96.9 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	96.9 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE		DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER PRESSURE TEST		LEAKAGE OF DRILLING WATER			
8.0m			0 → 100%										8.0m	
1							2	2		Generally hard, compact and fresh.				
							1	(3)		80.9				
2							2	2		Rather hard and compact, but cracked moderately as a whole.				
							2	3						
3														
4							2	3						
5														
6														
7							(3)	2						
8														
9														
90														
1														
2							2	3		Cracky and somewhat brittle as a whole. About 30% cores recovered are gravelish.				
3														
4							(3)	2						
5														
6														
7														
8														
9														
100														

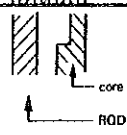
Basalt

NQ (Bit size)

dark greenish grey

Dolerite

Grey



driller's note 4
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

Note on Lugeon tests:
 - The Lugeon value with () is estimated from the P-Q curve.

No Lugeon tests

GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-4 (SHEET 23 OF 28)

LOCATION: DOWNSTREAM DAM DEPTH OF HOLE: 50.00 m COMMENCED: 12-1-1991
 ELEVATION: 1,201.32 m DEPTH OF OVERBURDEN: 18.25 m COMPLETED: 17-1-1991
 COORDINATE: X 399.618.70 Y 451.447.35 LENGTH OF ROCK DRILLING: 31.75 m DRILLED BY: CIMCOSA
 ANGLE FROM HORIZONTAL: 60° 0' TOTAL LENGTH OF CORE: 32.23 m LOGGED BY: JICA
 BEARING OF ANGLE HOLE: S14°43'E CORE RECOVERY: 64.5%

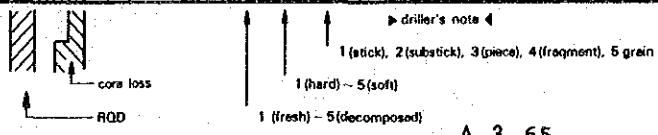
DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION	
					COLOR	WEATHERING	HARDNESS	CORE CUTTING							
0m			0-100%									0	40	0m	3
0-8.0		Recovered brownish slimes (sandy silt) only at 0m-8.0m.													
8.0-9.7		Recovered brownish grey slimes (sand) only at 8.0-9.7m.													
9.7-10.0		Gravelish cores only.													
10.0-13.85		Recovered mainly sandy slimes. Gravelish cores at 13.85m-14.0m and 15.95m-16.0m.													
13.85-15.95															
15.95-17.7															
17.7-19.0		Weathered rocks. Cores easily broken into pieces.													
19.0-24.35		Somewhat weathered rocks at 19.0m-24.35m.													
24.35-20	Dolerite Basalt														

Overburden (Topsoil and talus deposits)

NQ (Bit size) NX Casing pipe

Dark brown ~ brownish grey

No Lugeon tests



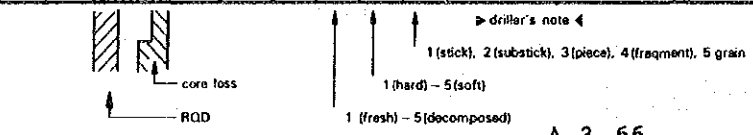
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-4 (SHEET 24 of 28)

LOCATION	DOWNSTREAM DAM	DEPTH OF HOLE	50.00 m	COMMENCED	12 - 1 - 1991
ELEVATION	1,201.32 m	DEPTH OF OVERBURDEN	18.25 m	COMPLETED	17 - 1 - 1991
COORDINATE	X 399.678.10 Y 451.447.35	LENGTH OF ROCK DRILLING	31.75 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	60.0°	TOTAL LENGTH OF CORE	32.23 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE	S14°43'E	CORE RECOVERY	64.5 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE			DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING		WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER		
2.0m			0 → 100%									0	40.20m	
1		Basalt			3	3	3	2	Partially somewhat hard, compact and massive, but cracky and weathered along most of cracks and/or joints.	(c)				
2					3	3	3	3						
3					(2)	2	2	3		(d)				
4								2						
5								3						
6					2	2	2	2	Hard and compact but somewhat cracky in part.	(c)				
7								1	Most of cracks and/or joints are discolored due to weathering.	(b)				
8					(3)	(3)	(3)	3						
9														
30														
1														
2									Somewhat cracky as a whole.					
3					2	2	2	3	Oblique cross-joint sets are slightly remarkable.					
4														
5					3	3	3	3	Somewhat discolored and gravelish cores in part.	(c)				
6														
7														
8														
9														
40														



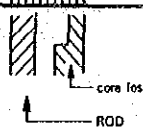
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. LB-4 (SHEET 25 OF 28)

LOCATION DOWNSTREAM DAM DEPTH OF HOLE 50.00 m COMMENCED 12 - 1 - 1991
 ELEVATION 1,201.32 m DEPTH OF OVERBURDEN 18.25 m COMPLETED 17 - 1 - 1991
 COORDINATE X 399.678.18 Y 451.447.35 LENGTH OF ROCK DRILLING 31.75 m DRILLED BY CIMCOSA
 ANGLE FROM HORIZONTAL 60.0° TOTAL LENGTH OF CORE 32.23 m LOGGED BY JICA
 BEARING OF ANGLE HOLE S14°43'E CORE RECOVERY 64.5 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE				DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING						
4.0m			0 → 100%									0	40.40m	
1	Dolerite ~ Basalt	<		NQ (Bit size)	Grey~dark greenish grey		2	2	Hard and compact, but slightly crack as a whole.			40.9 m	1	
2		2	2				2.7 Lu	2						
3		(3)	(3)										3	
4							44.55	Mostly gravelish and discolored cores.					45.0 m	5
5		3	3											
6	5	5	5	Weathered and cracky Zone.	(c)	7								
7	4	4	4	48.15			Somewhat massive.	8						
8	2	2	2	Grey	(b)	9								
9	(3)	(3)	(3)				Bottom of hole at 50.0m	(b)	50.0 m					
50														
1														
2														
3														
4														
5														
6														
7														
8														
9														
0														



driller's note
 1 (stick), 2 (substick), 3 (piece), 4 (fragment), 5 grain
 1 (hard) - 5 (soft)
 1 (fresh) - 5 (decomposed)

is estimated

A-3-67

ELECTRIC POWER DEVELOPMENT CO., LTD.
 TOKYO, JAPAN

GEOLOGIC LOG OF DRILL HOLE

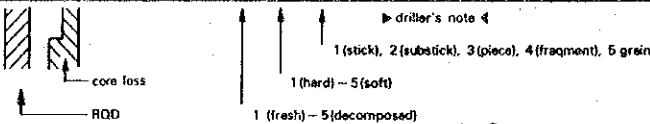
PIRRIS PROJECT

HOLE No. PB-1 (SHEET 26 of 28)

LOCATION	POWER STATION	DEPTH OF HOLE	35.00 m	COMMENCED	15 - 3 - 1991
ELEVATION	327.93 m	DEPTH OF OVERBURDEN	35.00 m	COMPLETED	7 - 4 - 1991
COORDINATE	398.04 T. 21 447.460. 21	LENGTH OF ROCK DRILLING	0 m	DRILLED BY	CIMCOSA
ANGLE FROM HORIZONTAL	90.0°	TOTAL LENGTH OF CORE	16.56 m	LOGGED BY	JICA
BEARING OF ANGLE HOLE		CORE RECOVERY	47.3 %		

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE WATER PRESSURE TEST LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION			
0m			0 → 100%								0	0m
0-3.5		Top soil, slope wash and terrace deposits			Dark brown				Mostly slime (silt and/or sand) with a few gravels. Surface deposits of terrace.			
3.5-10.5		Sand and gravel (terrace deposits?)			Grey ~ greyey brown ~ light brown				Gravelish cores including round pebbles and some sandy materials (slime?). Supposedly terrace deposits.			
10.5-19.5		Huge boulders?			Dark green ~ greenish grey	2	2	2	Hard, compact, fresh and rather massive monzonite-diorite. A few discolored cracks or joints. Very huge boulders?			
19.5-20		(Terrace deposits?)			Dark green ~ greyey brown	1	3	3	Gravelish cores only. Total core recovery is 40 ~ 50% in average at 14m - 20m. Some round gravels in recovered materials. Terrace or colluvial deposits?			

No Lugeon tests



GEOLOGIC LOG OF DRILL HOLE

PIRRIS

PROJECT

HOLE No. PB-1 (SHEET 27 of 28)

LOCATION POWER STATION DEPTH OF HOLE 35.00 m COMMENCED 15 - 3 - 1991
 ELEVATION 327.93 m DEPTH OF OVERBURDEN 35.00 m COMPLETED 7 - 4 - 1991
 COORDINATE $\begin{matrix} X & 398.047 & 21 \\ Y & 441.460 & 21 \end{matrix}$ LENGTH OF ROCK DRILLING 0 m DRILLED BY CIMCOSA
 ANGLE FROM HORIZONTAL 90.0° TOTAL LENGTH OF CORE 16.56 m LOGGED BY JICA
 BEARING OF ANGLE HOLE _____ CORE RECOVERY 47.3 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					DESCRIPTION	WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	WATER TABLE						
2.0m			0 → 100%										0	2.0m	
1										Partially, 10 ^{cm} ~ 20 ^{cm} long cores which are hard and fresh in lithologic are recovered, but mostly gravelish cores including some round gravels.				1	
2										At 20 ^m - 35 ^m , core recovery is 30 ~ 40% in average.				2	
3										Terrace or colluvial deposits ?				3	
4														4	
5														5	
6														6	
7														7	
8														8	
9														9	
10														10	
11														11	
12														12	
13														13	
14														14	
15														15	
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35														35	

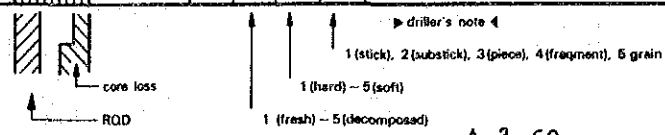
Terrace deposits ?

NQ (Bit size)

Dark green ~ greenish grey ~ dark grey ~ grey

No Lugeon tests

Bottom of hole at 35.0m



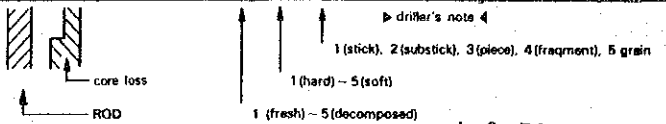
GEOLOGIC LOG OF DRILL HOLE

PIRRIS PROJECT

HOLE No. PB-2 (SHEET 28 of 28)

LOCATION PENSTOCK ROUTE DEPTH OF HOLE 20.00 m COMMENCED 10-3-1991
 ELEVATION 547.29 m DEPTH OF OVERBURDEN 11.00 m COMPLETED 13-3-1991
 COORDINATE X 397.546, Y 442.085 LENGTH OF ROCK DRILLING 9.00 m DRILLED BY CIMCOSA
 ANGLE FROM HORIZONTAL 90.0° TOTAL LENGTH OF CORE 7.67 m LOGGED BY JICA
 BEARING OF ANGLE HOLE _____ CORE RECOVERY 38.4 %

DEPTH	ROCK NAME	LOG	CORE RECOVERY	CEMENTATION KIND OF BIT CASING	OBSERVATION OF CORE					WATER TABLE	WATER PRESSURE TEST	LEAKAGE OF DRILLING WATER	DEPTH	ELEVATION
					COLOR	WEATHERING	HARDNESS	CORE CUTTING	DESCRIPTION					
0m			0-100%									0	40	0m
0-1	Residual soil (?)				Brown ~ yellowish brown				Brown ~ yellowish brown slime (silty ~ sandy) with a few brittle rock fragments.					
1-2									2.0					
2-4					Brown ~ yellowish brown	5	5	5	Brown ~ greyey brown slime (silty ~ sandy) with a few gravelish cores.					
4-5	Decomposed basalt (?)					5	5	5	Probably decomposed basalt or basic volcanic rock.	(d)				
5-7					Brown ~ yellowish brown	4	4	(4)		(e)				
7-9						4	4	4	8.85					
9-10					Grey	(3)	(3)	(3)	Light brownish grey slime with gravelish cores and some cobbel-size cores.		No Lugeon tests			
10-11						3	3	3	10.9					
11-12						(4)	(2)		Somewhat brittle cores including a few gravelish cores and greyey slime.	(d)				
12-13					Greenish grey ~ salmon-pinkish grey	3	3	4		(c)				
13-14						(4)	4	3		(c)				
14-15									15.6					
15-17	Basalt					2	2	3	Somewhat hard and compact as a whole. Partially slightly brittle.	(c)				
17-18						5	5	5		(d)				
18-19						3	3	2		(d)				
19-20									Bottom of hole at 20.0m					



A-3-6 Core Photograph

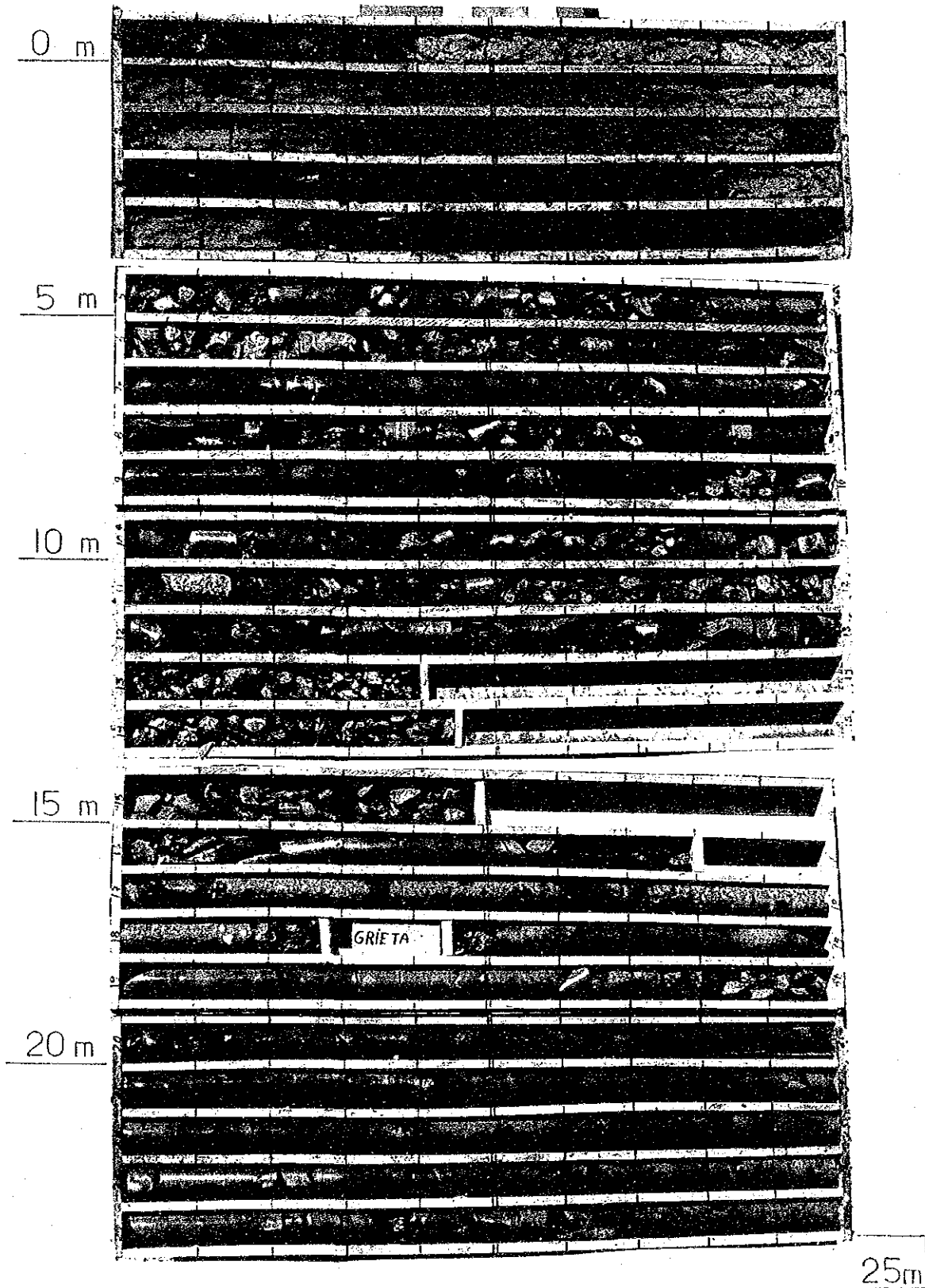
	<u>Sheet No.</u>
(1) UB-1	1 to 2
(2) UB-2	3 to 4
(3) UB-3	5 to 6
(4) LB-1	7 to 4
(5) LB-2	10 to 12
(6) LB-3	13 to 16
(7) LB-4	17 to 18
(8) PB-1	19 to 20
(9) PB-2	21

DEPTH

From 0 m

To 25 m

HP. PIRRIS UB-1



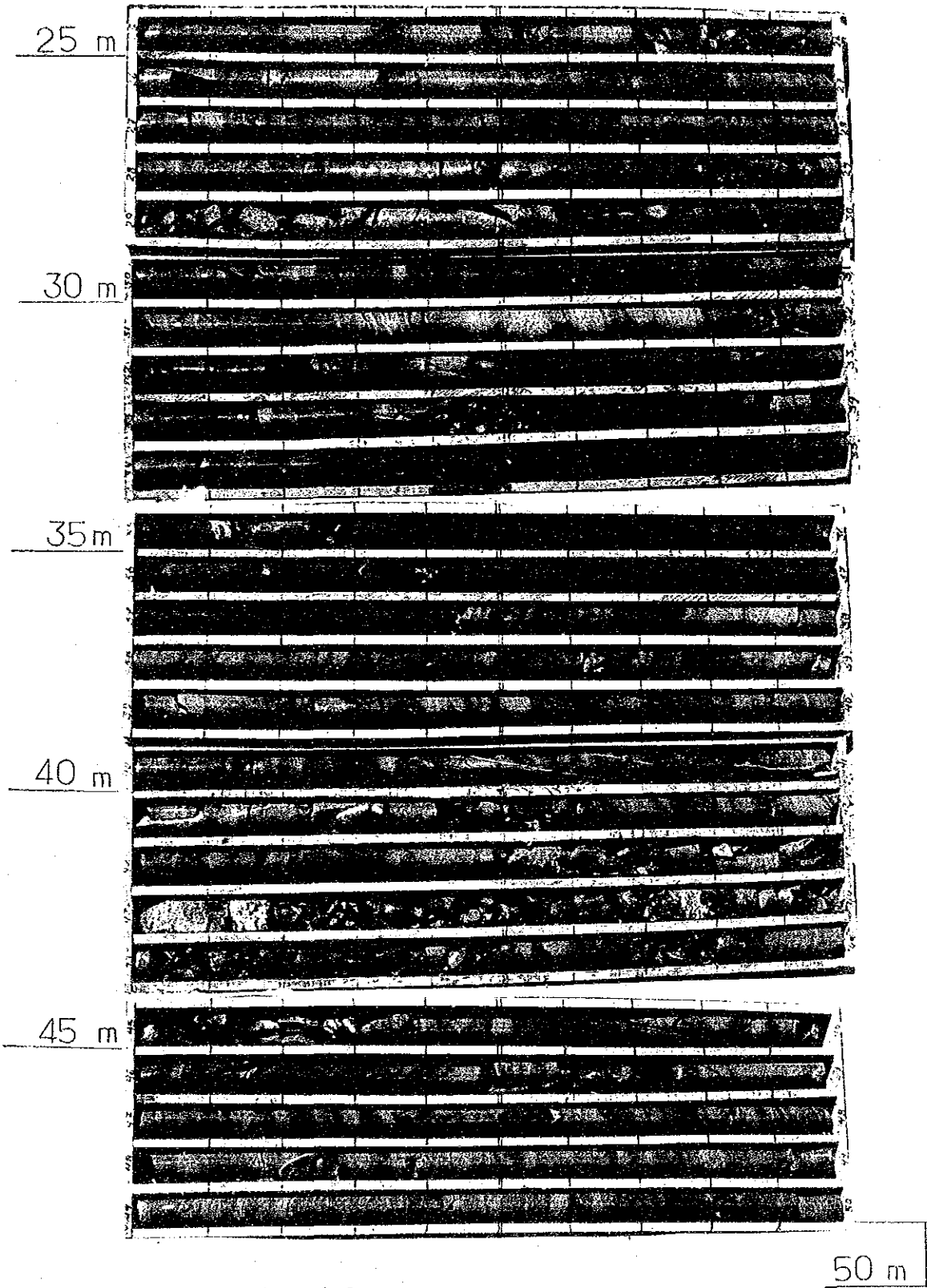
DRILLHOLE UB-1

Sheet (2 - 21)

DEPTH

From 25 m

To 50 m

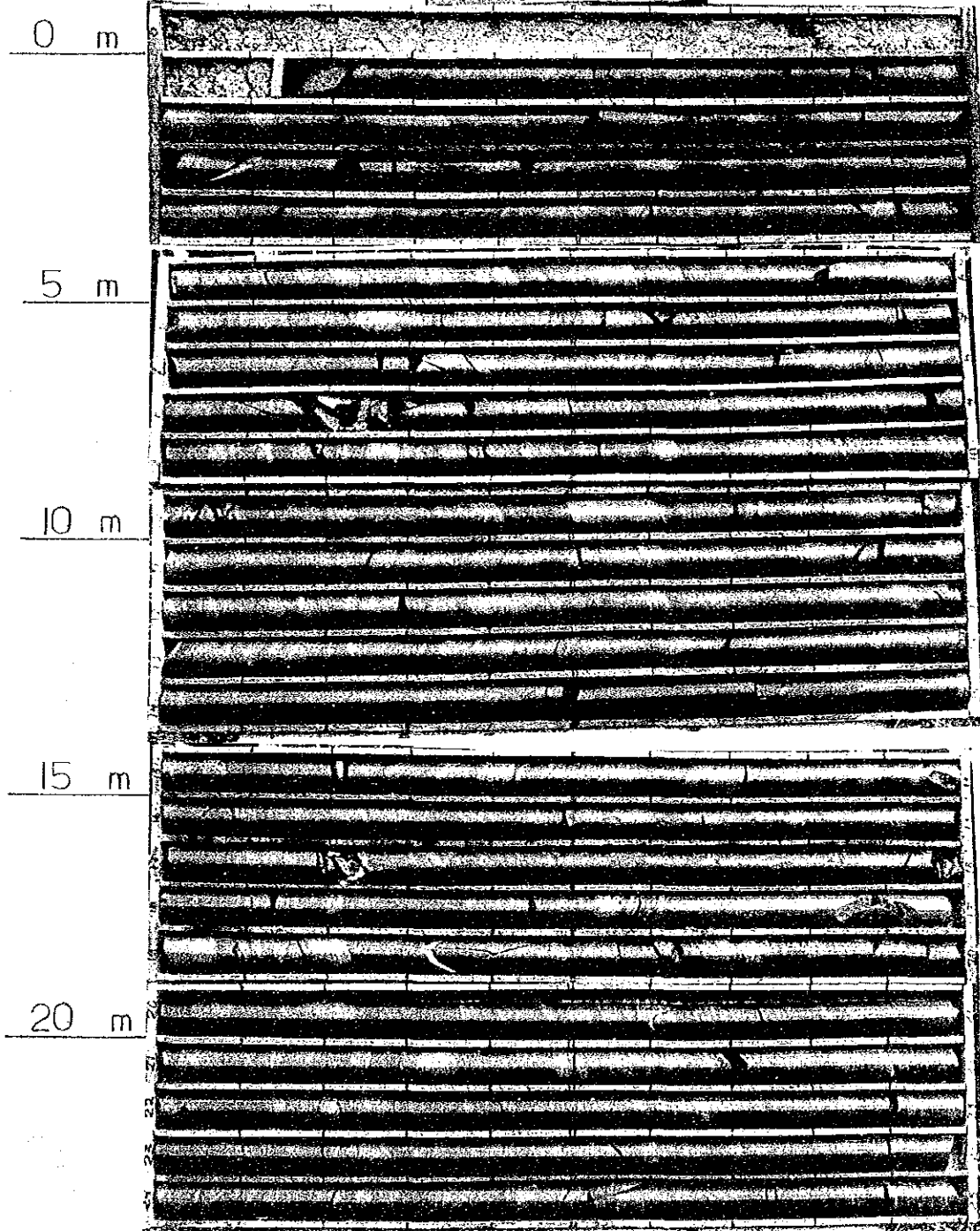


DEPTH

From 0 m

To 25 m

HP PIRIS UB-2

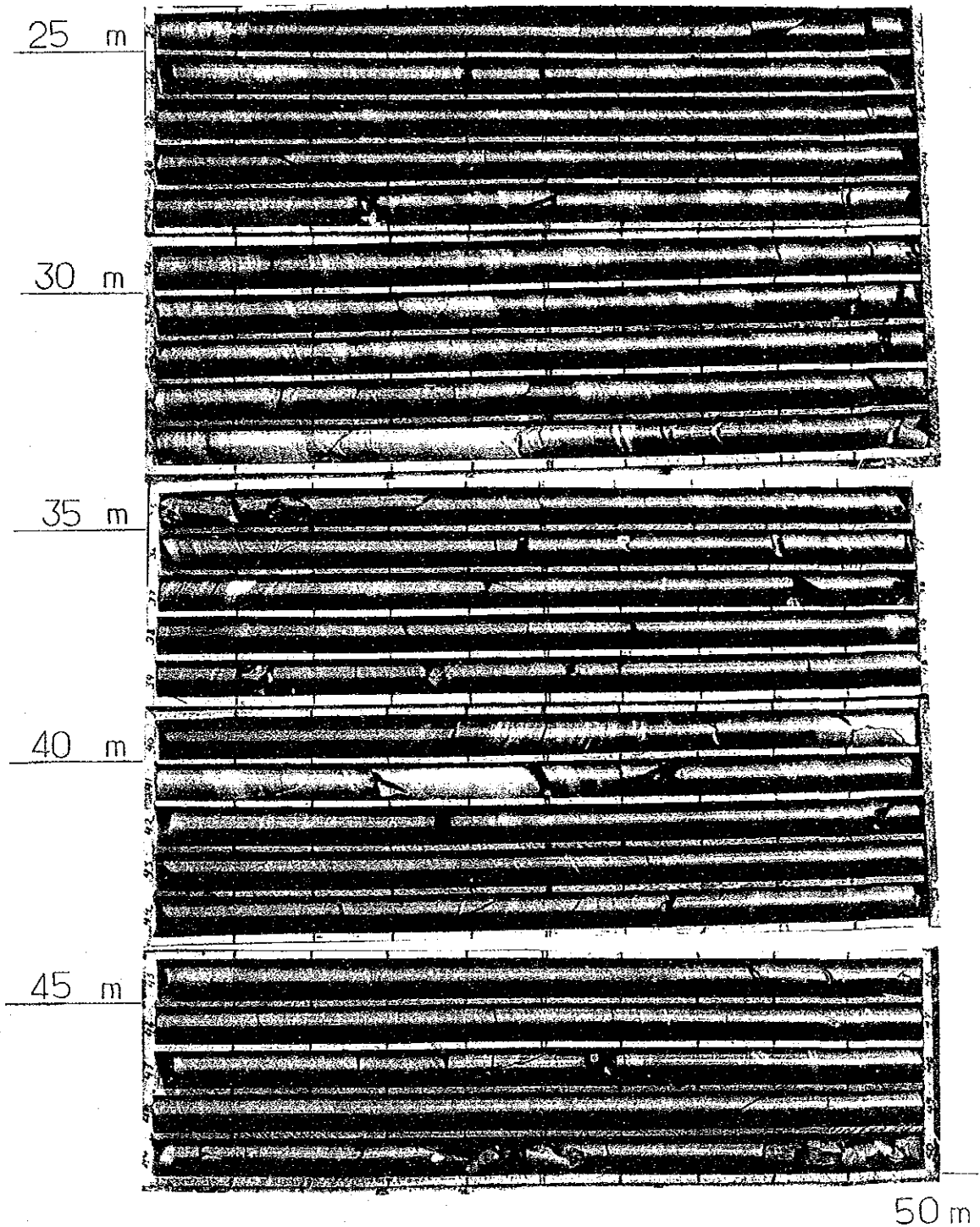


25 m

DEPTH

From 25 m

To 50 m

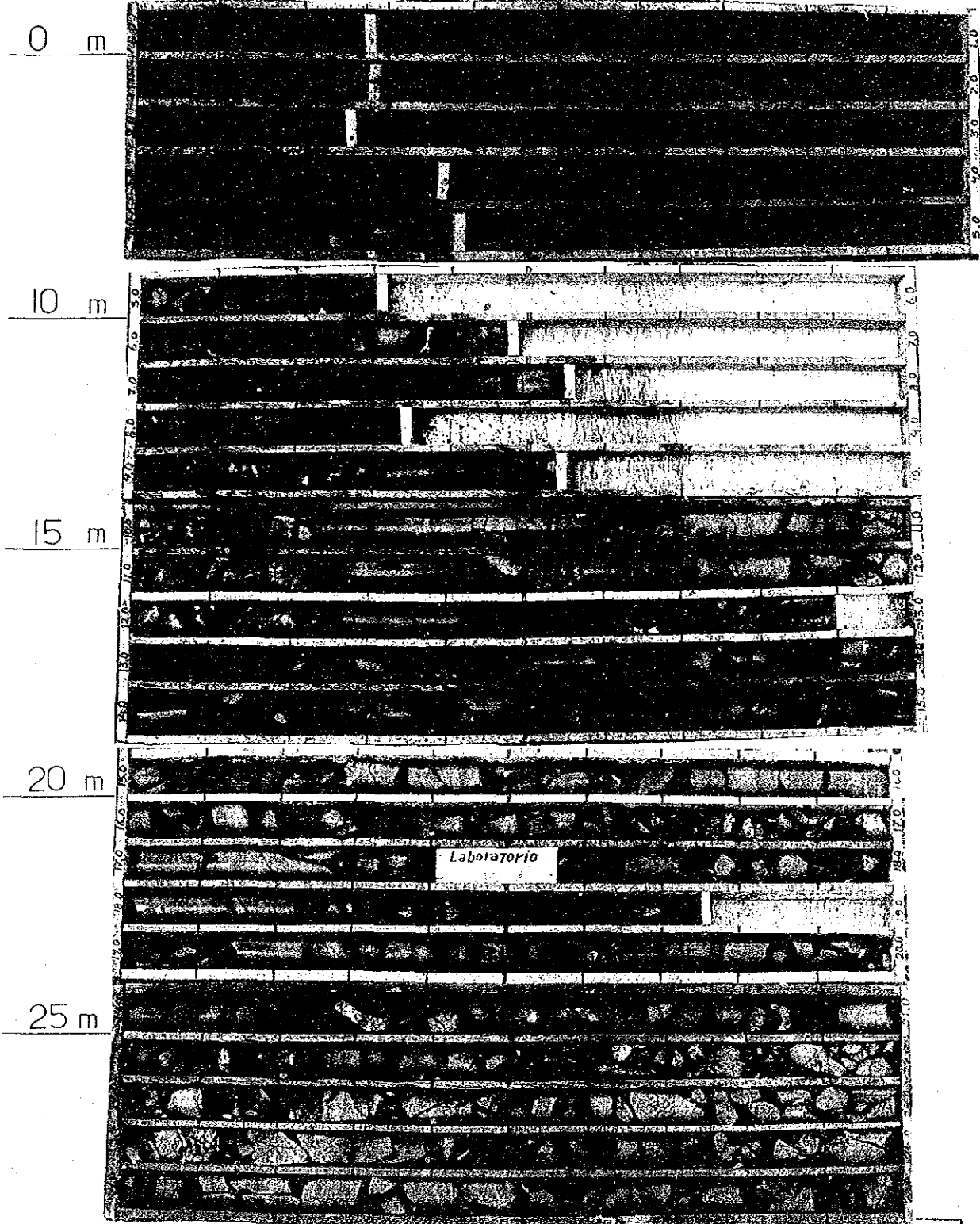


DEPTH

From 0 m

To 25 m

HP. PIRRIS UB-3

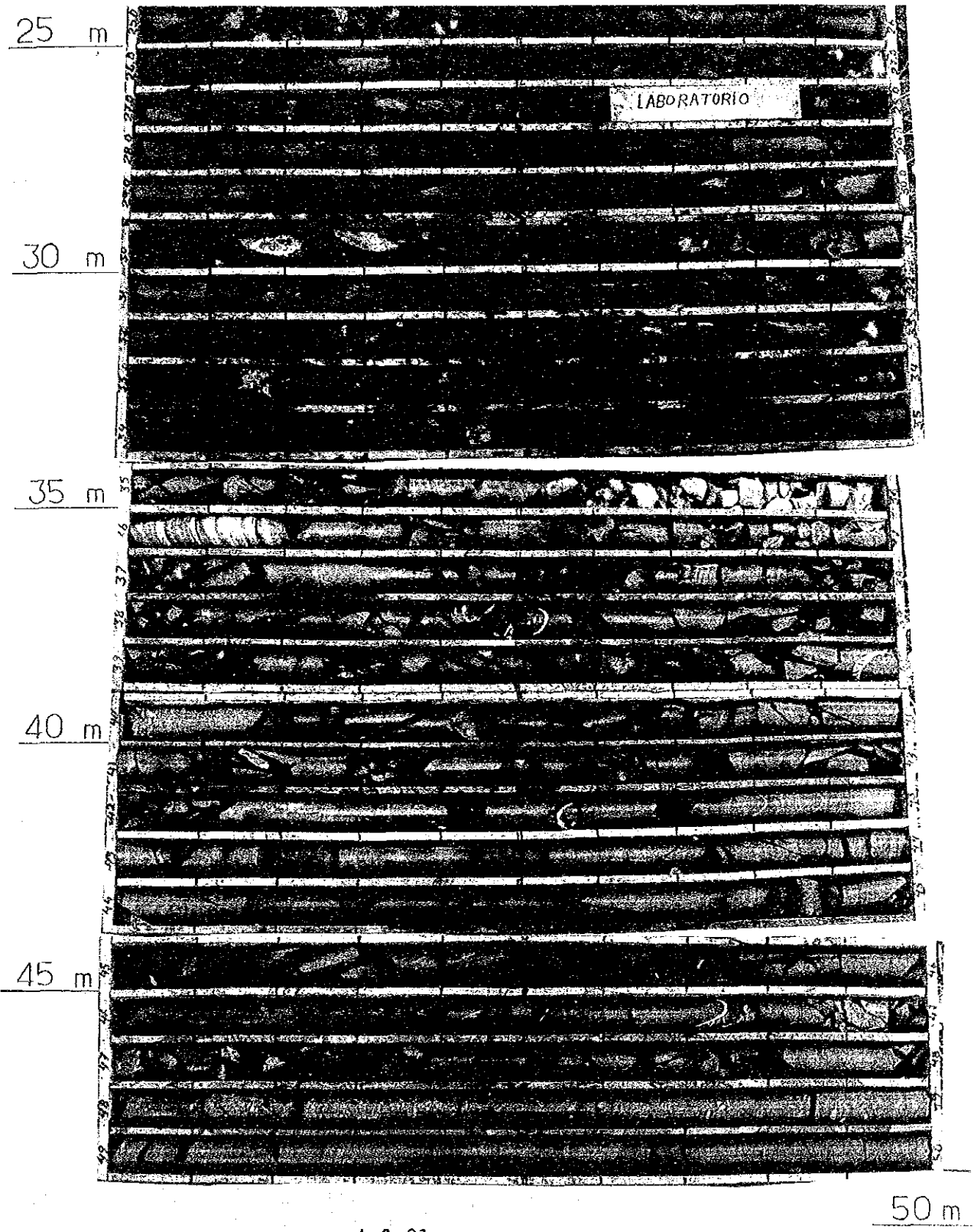


25 m

DEPTH

From 25 m

To 50 m

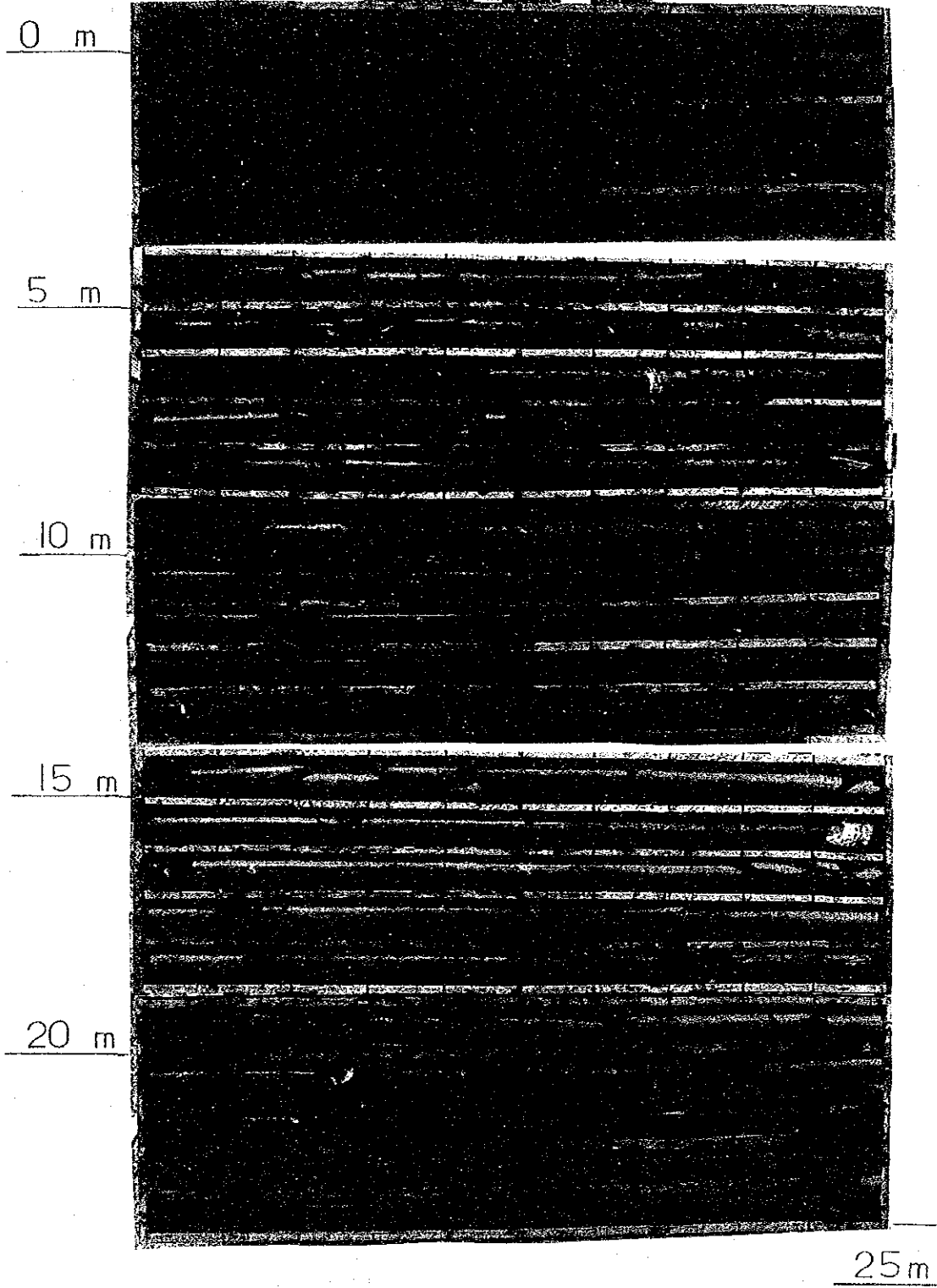


DEPTH

From 0 m

To 25 m

HP. PIRRIS LB-1



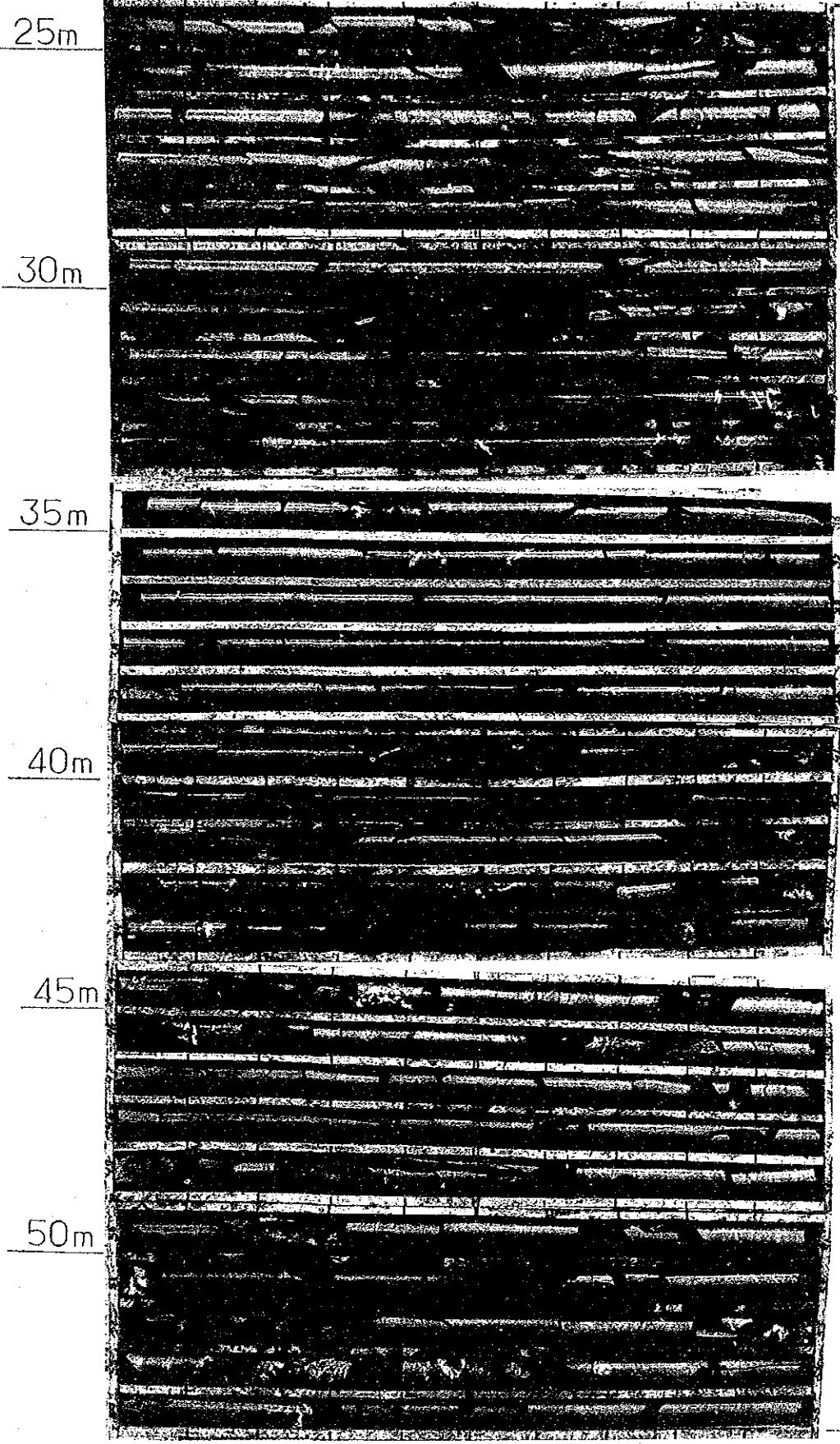
DRILLHOLE LB-1

DEPTH

From 25 m

Sheet (8 - 21)

To 55 m



55m

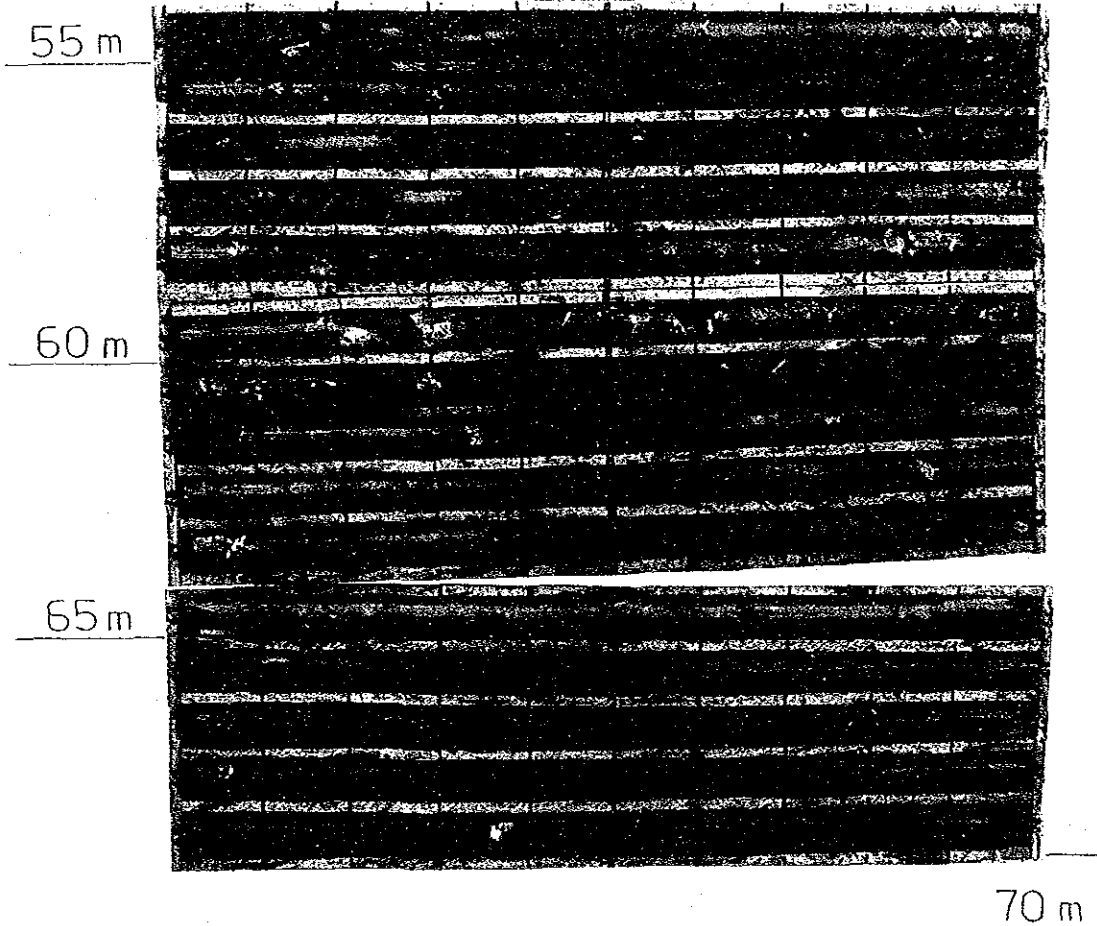
DRILLHOLE LB-1

Sheet (9 - 21)

DEPTH

From 55 m

To 70 m

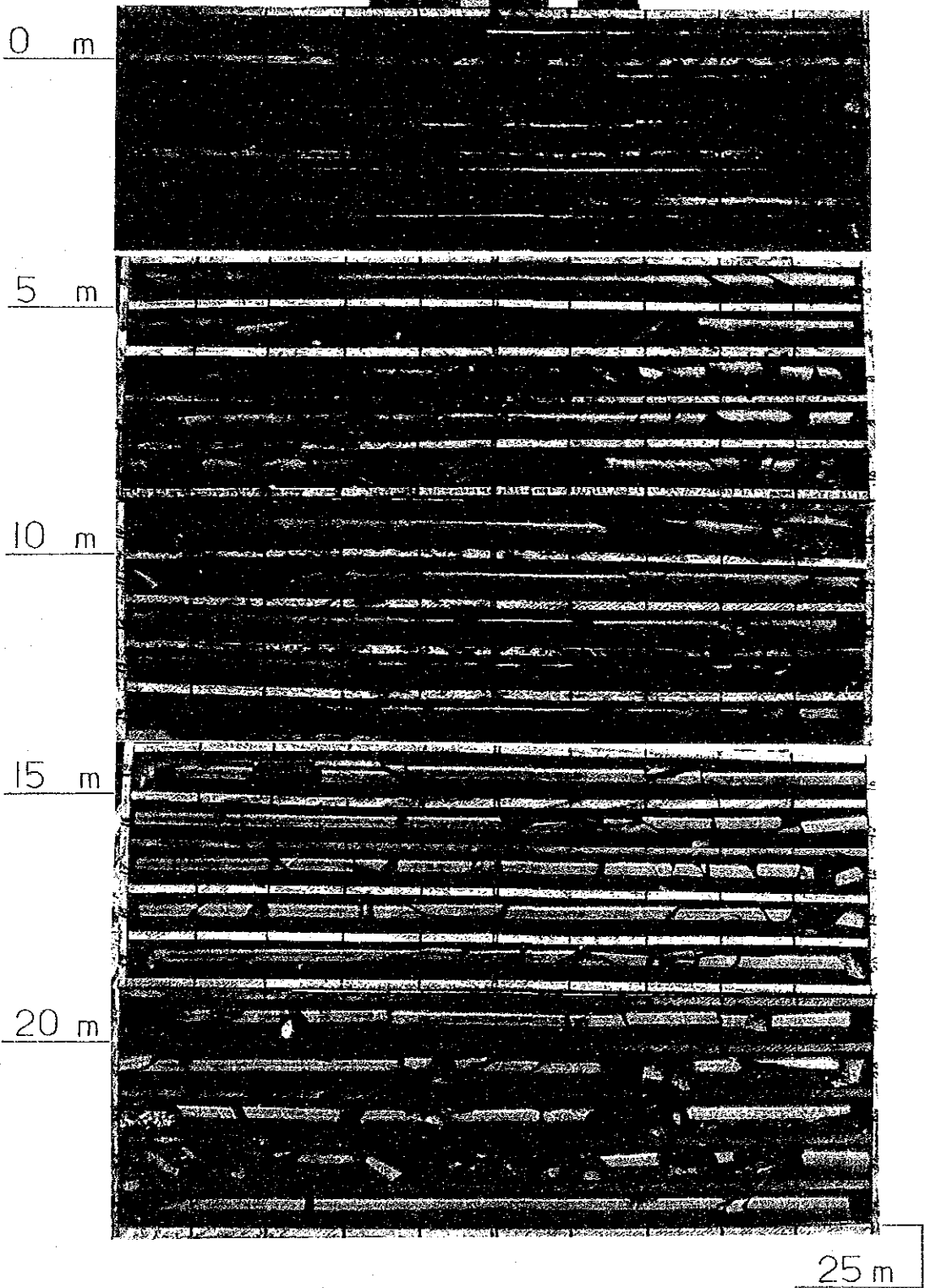


DEPTH

From 0 m

To 25 m

H.P. PIRRIS LB-2



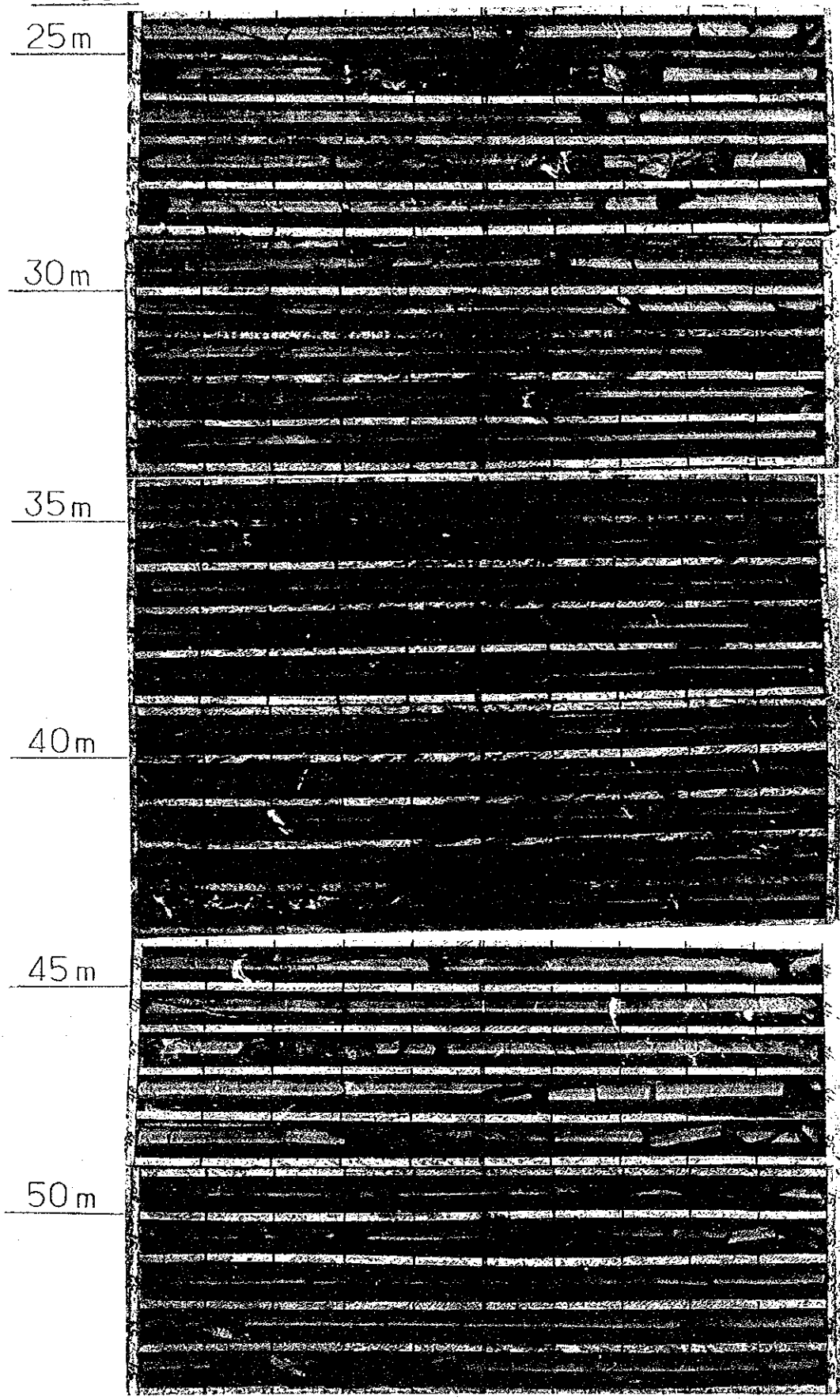
DRILLHOLE LB-2

DEPTH

From 25 m

Sheet (11-21)

To 55 m



55 m

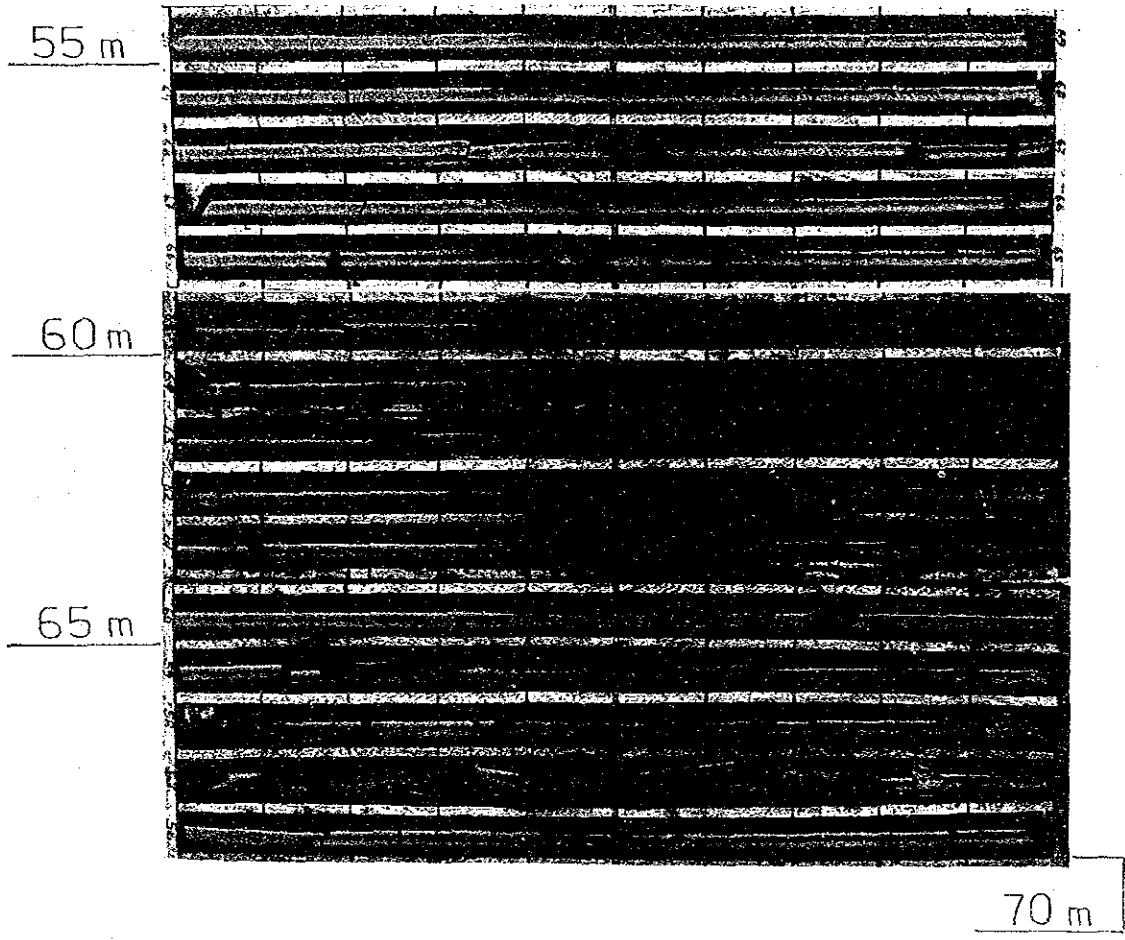
DRILLHOLE LB-2

Sheet (12-21)

DEPTH

From 55 m

To 70 m

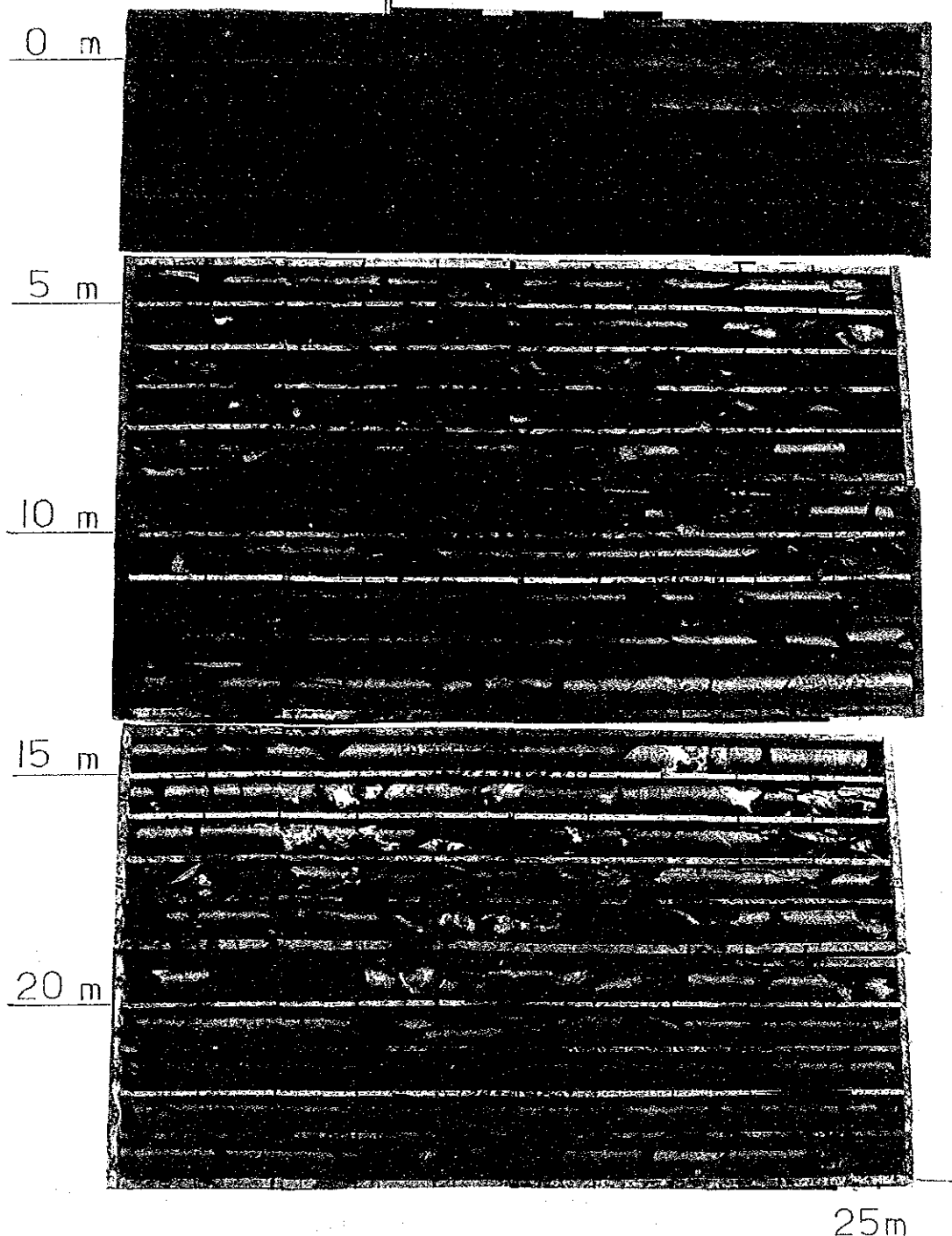


DEPTH

From 0 m

To 25 m

H.P. PIRRIS LB-3



25m

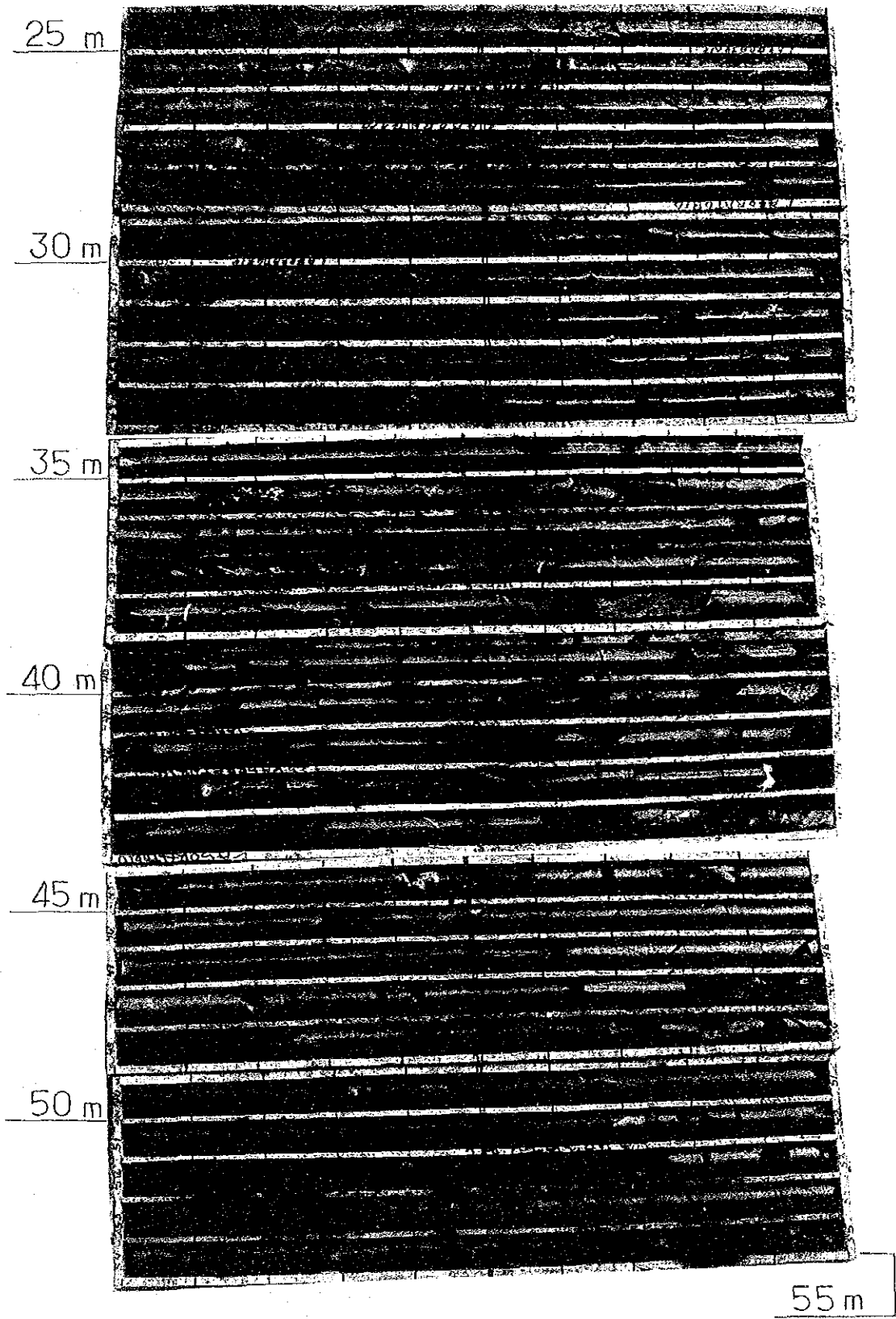
DRILLHOLE LB-3

Sheet (14-21)

DEPTH

From 25 m

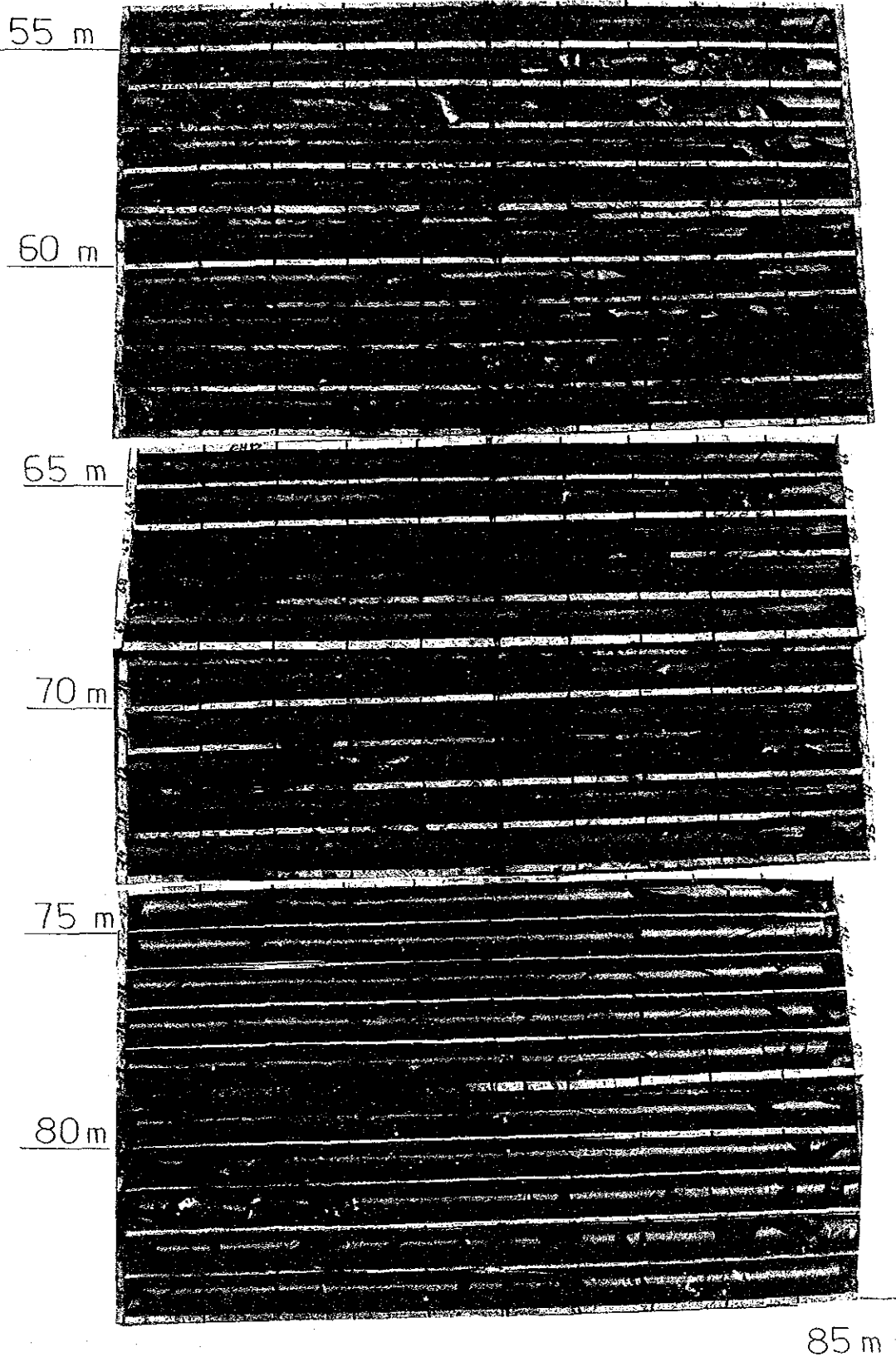
To 55 m



DEPTH

From 55 m

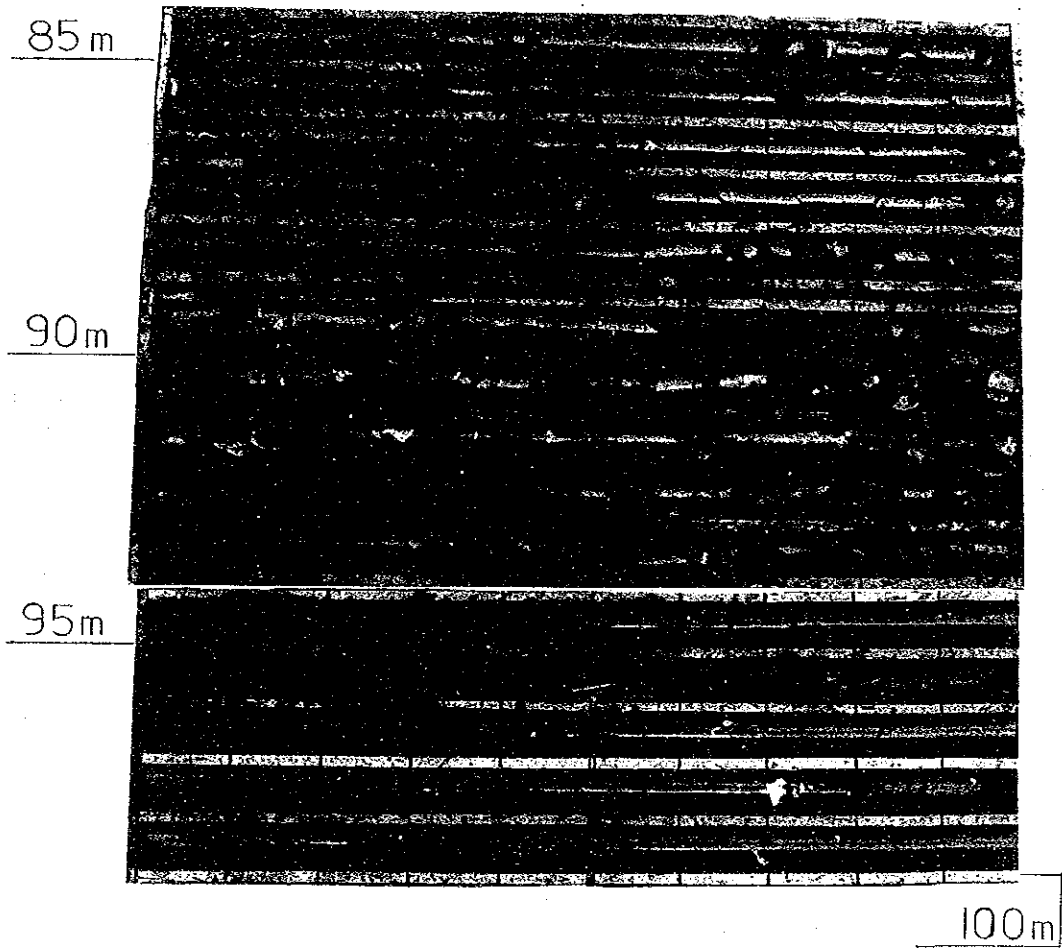
To 85 m



DEPTH

From 85 m

To 100 m

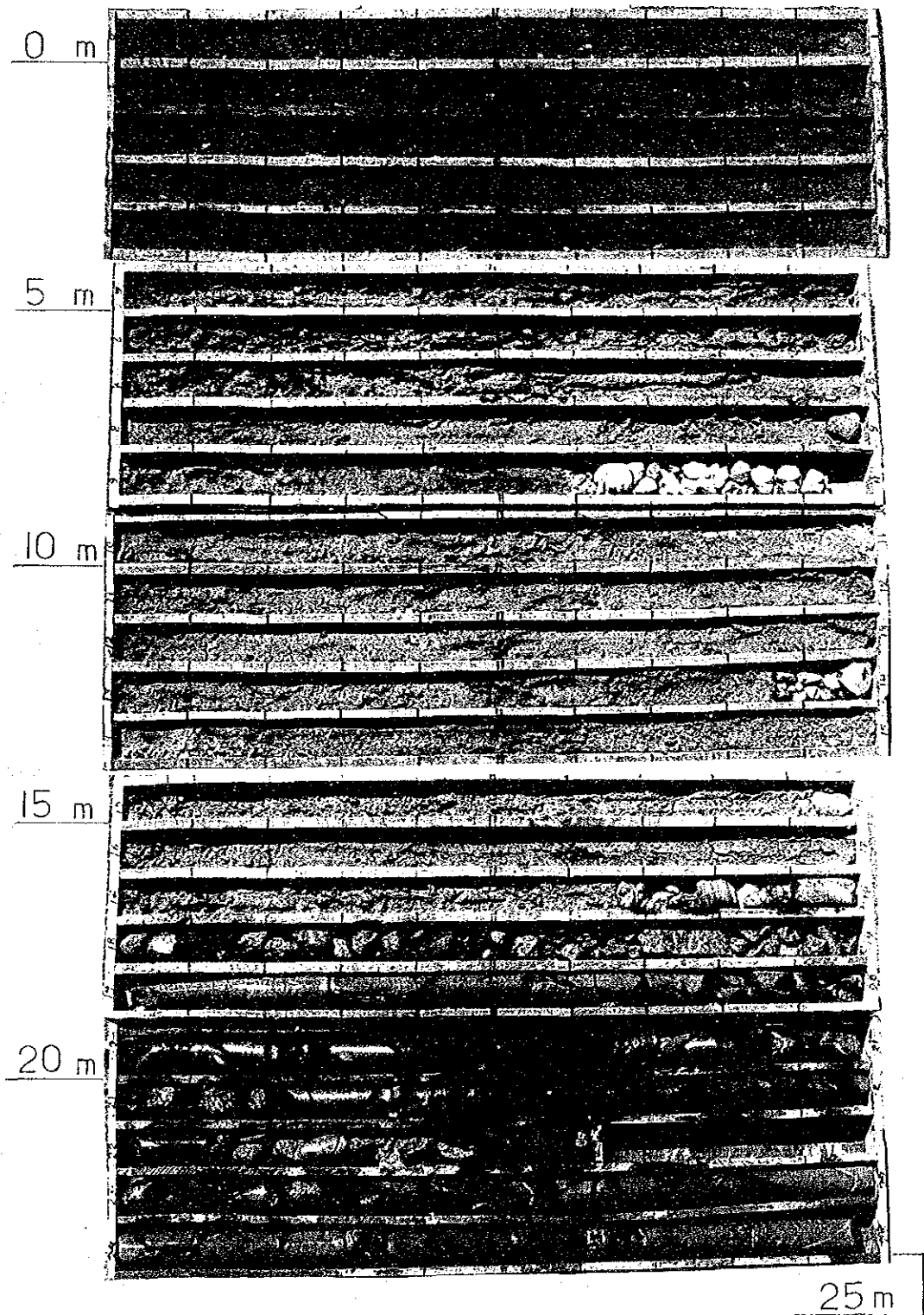


DEPTH

From 0 m

To 25 m

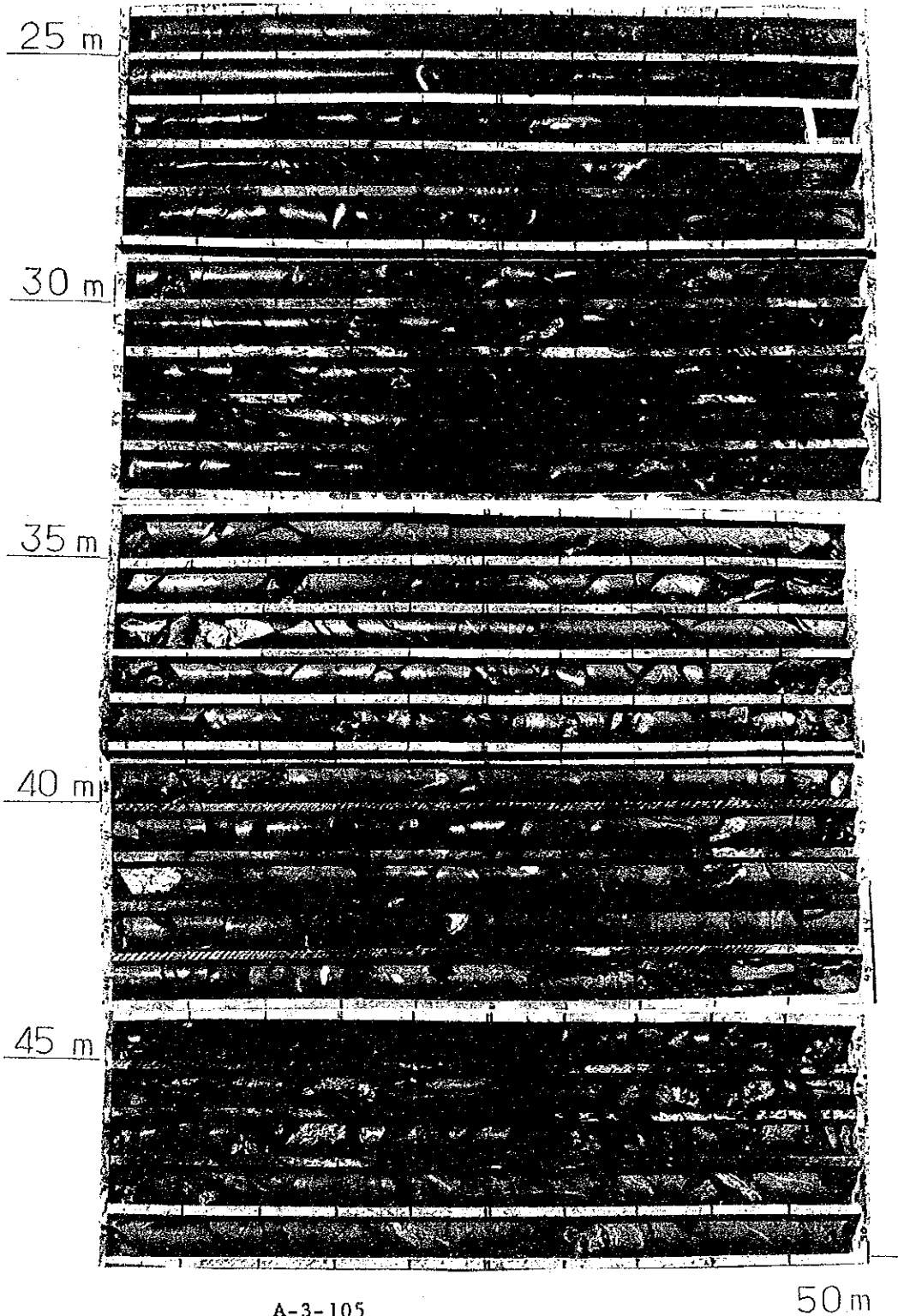
HP PIRRI LB-4



DEPTH

From 25 m

To 50 m

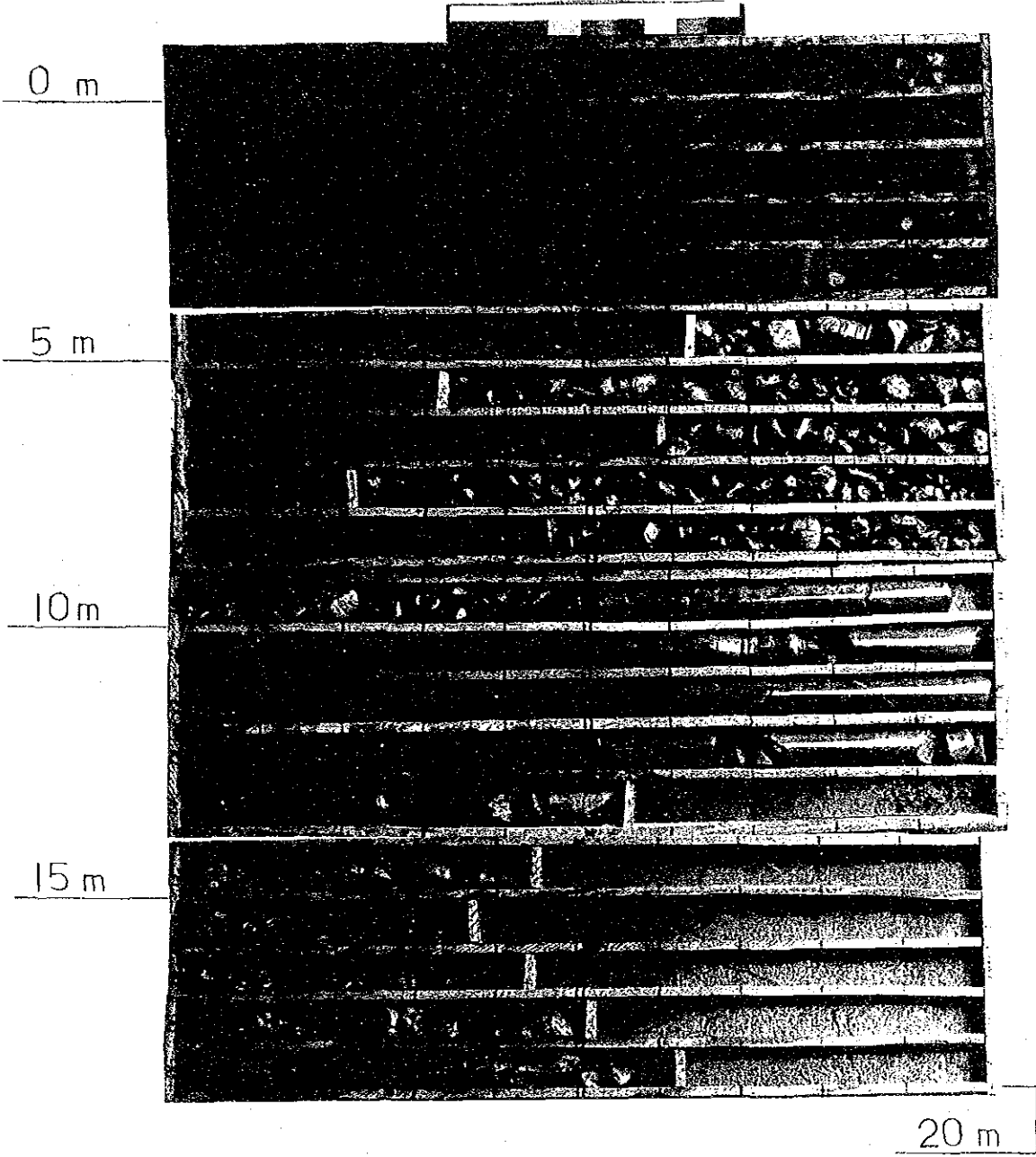


DEPTH

From 0 m

To 20 m

H.P. PIRRIS PB-1



DRILLHOLE PB-1

Sheet (20-21)

DEPTH

From 20 m

To 35 m

