

## **II.2 Drilling Logs**



Table 2 DRILLING LOGS

Drawing No.	Hole No.	Drilled Length (m)	Permeability Test (nos)	Standard Penetration Test (nos)
1.	Damsite BD-1 (Inclined hole of 45°)	80	16	-
2.	Damsite BD-2 (Vertical hole)	50	9	-
3.	Damsite BD-3 (Vertical hole)	50	9	-
4.	Damsite BD-4 (Vertical hole)	50	9	-
5.	Damsite BD-5 (Vertical hole)	50	9	-
6.	Damsite BD-6 (Vertical hole)	50	9	-
7.	Damsite BD-7 (Inclined hole of 45°)	80	15	-
8.	Damsite BD-8 (Inclined hole of 45°)	40	7	-
9.	Saddle Damsite BS-1 (Vertical hole)	30	6	8
10.	Saddle Damsite BS-2 (Vertical hole)	35	7	8
11.	Saddle Damsite BS-3 (Vertical hole)	35	7	7
12.	Intake BW-1 (Vertical hole)	70	-	-
13.	Headrace Tunnel BW-2 (Vertical hole)	65	-	-
14.	Surge Tank BW-3 (Vertical hole)	90	-	-
15.	Penstock Line BW-4 (Vertical hole)	40	-	-
16.	Power House BW-5 (Vertical hole)	70	-	-
17.	Rigari Quarry BQ-1 (Vertical hole)	30	-	-
18.	Quarry-2 Site BQ-2 (Vertical hole)	35	-	-
19.	Quarry-2 Site BQ-3 (Vertical hole)	35	-	-
Total 19 Holes,		985 m,	103 nos,	23 nos



COORDINATION X: 9947,026.00 Y: 727,126.00  
 ELEVATION: 1564.50m. ANGLED 45° TO EAST DIRECTION

DRILL LOG

HOLE NO. BD 1 SHEET NO. 1 OF 19

HOLE NO. BD 1

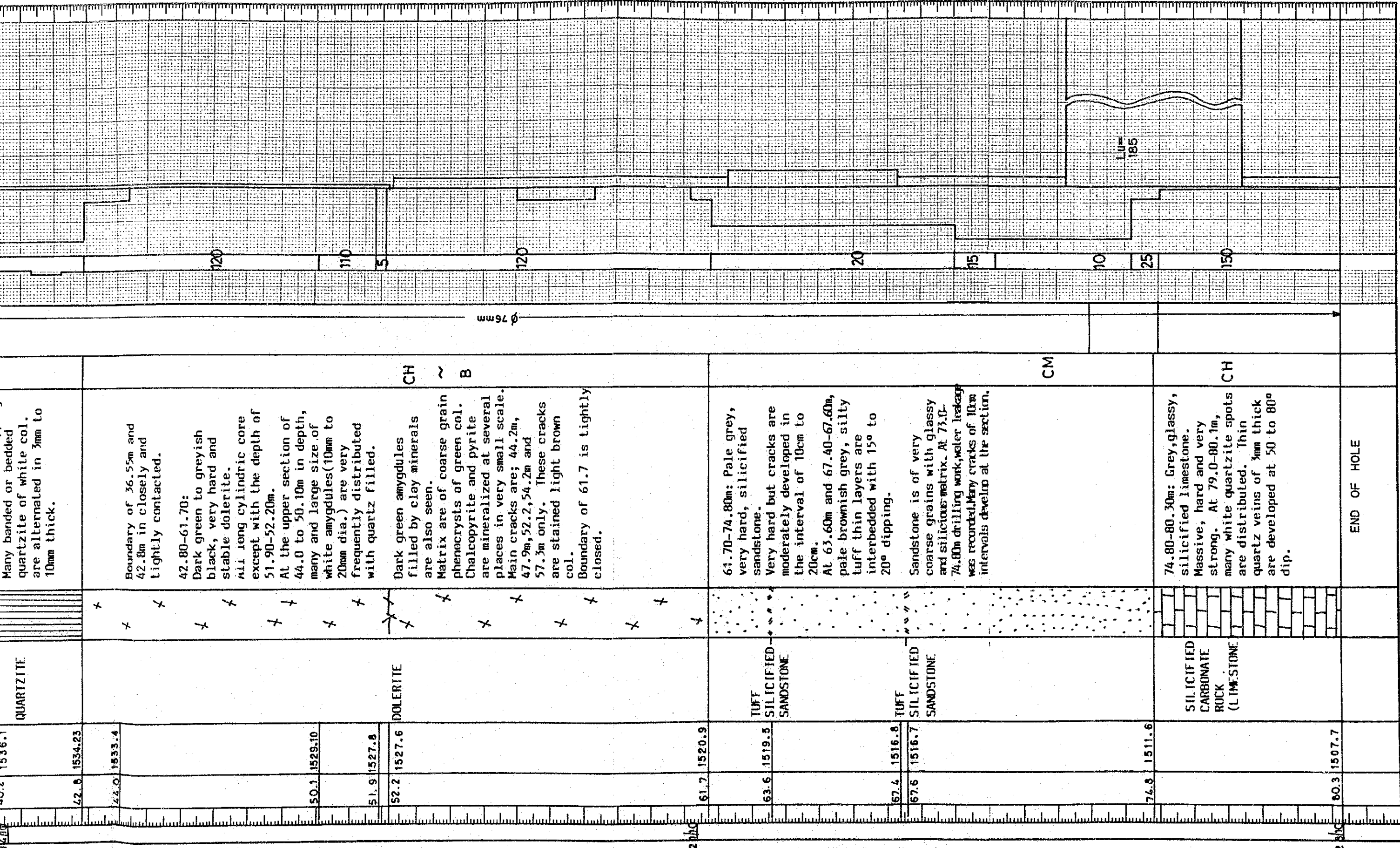
( 19 )

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
								%	%		
2/19			OVERBURDEN (DEBRIS/CLAY)		0-7.50m: Dark red to brownish red laterite soil with much rock fragments of talus deposits derived from upper portion. Angular rock fragments are of dolerite and andesite of 1-5cm dia.						
	7.5	1559.20	BOULDERS AND SOIL (DEBRIS)		7.50-9.65m: Various kinds of boulders of 10 to 20cm dia. such as purple andesite, dolerite shalestone.						
	9.65	1557.68	SHALE (WEATHERED AND ALTERED)		9.65-15.10m: Dark grey, fragiled by weathering, fault nearby located and altering by dolerite intrusion, shale stone. The rock is contained angular dark grey shale fragments as same as matrix.	CL					
	15.1	1553.82	SHALE (ALTERED)		15.10-17.70m: Dark bluish grey, stable and hard shale stone. No indication of weathering. All cylindrical core with altered conditions by dolerite thin dyke intrusion.	CM					
	17.70	1551.98	DOLERITE DYKE INTRUSION		17.70-18.65m: Dark bluish grey, fragiled and fractured dolerite with much amygdules of 1-5mm.	CL					
	18.0	1551.77	FAULT FRACTURED ZONE OF SANDY SHALE		18.65-23.40m: Grey to brown, completely fragmented shale stone by faulting and developing cracks. Ca or seam is not much contained along the cracks. Bedding plane of 24° dip	CL ? D					
	23.4	1547.9	DOLERITE		23.40-29.35m: Dark grey to purple grey, very hard and stable dolerite.	CH					
	29.35	1543.75	DOLERITE		Cracks of 10 to 40cm intervals white amygdules (5mm to 20mm dia.) and thin veins (5mm thick) of quartz are scattered sporadically. All cylindrical core.	CH					
	30.15	1543.18	DOLERITE		29.35-30.15m: Many cracks are developing in 45° dip with ave. 5cm intervals. 30.15-35.30m: Dark grey, very hard and stable dolerite. No conspicuous phenocrysts but not glassy matrix. Coarse grain black minerals are unformed.	CM					
	35.3	1539.54	DOLERITE		35.3-36.55m: Dark greenish grey dolerite. Many dark green phenocrysts are found out. (dia. 1-5mm)	CH					
	36.55	1538.66									



HOLE NO. ( )

HOLE NO. ( 1 )



NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.

COORDINATION X: 9947,25100 Y: 726,838,00  
 ELEVATION: 1659.70m.  
 HOLE NO. BD 2 SHEET NO. 2 OF 19

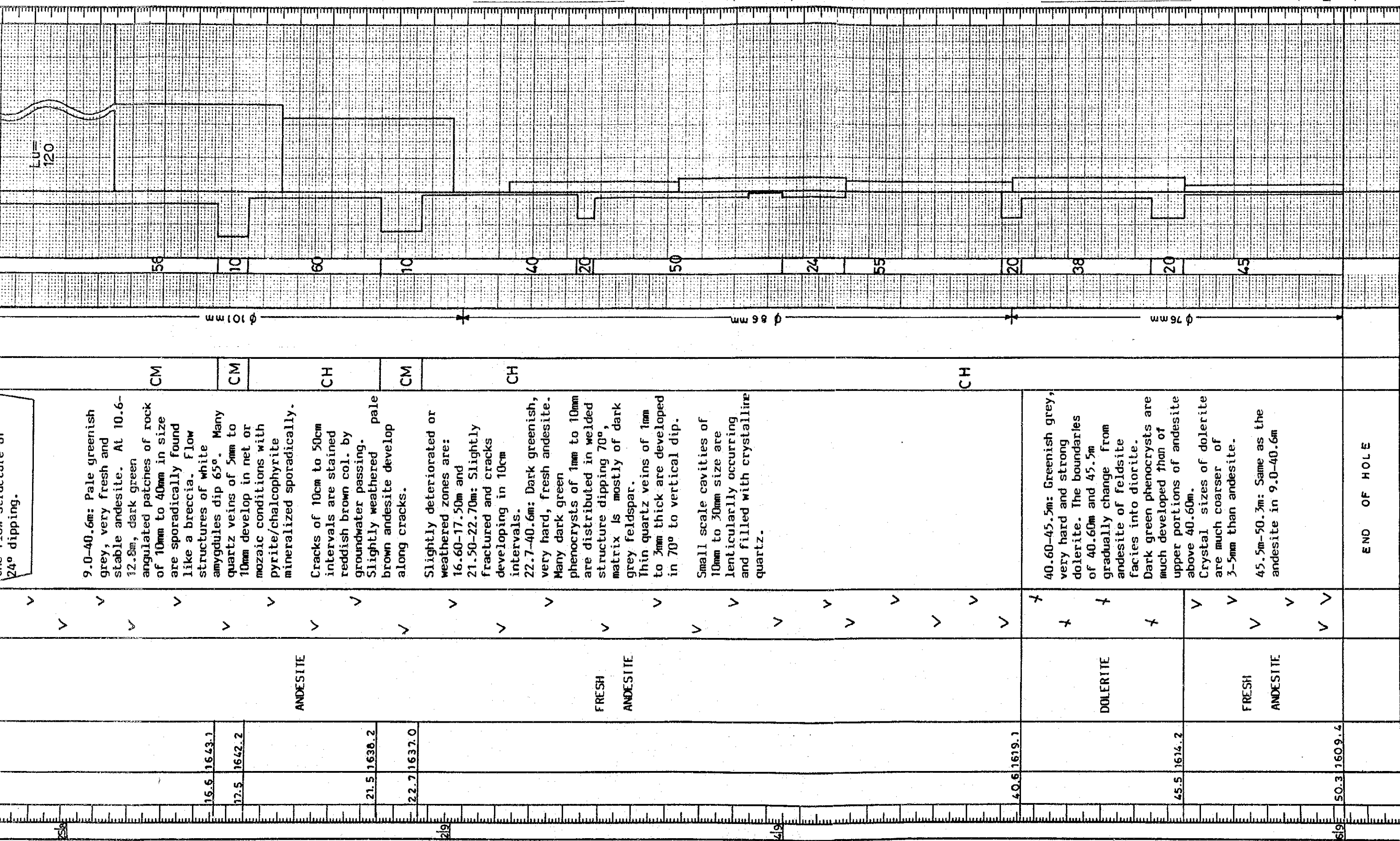
DRILL LOG

HOLE NO. BD 2

( 19 )

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
206	0.7	1659.0	TOP SOIL	X	0.0-0.7m: Dark red lateritic soil of cultivated land		Ø150mm				
	1.6	1658.1	RESIDUAL SOIL		0.7-1.6m: Red to chocolate col. laterite with gravels.						
	7.0	1652.7	HEAVILY TO COMPLETELY WEATHERED ANDESITE	Diagonal hatching	1.6-7.0m: Brown to red completely decomposed and heavily weathered andesite. Some parts such as 2.0m, 3.7m and 6.0m are remained a little hard cores. Mostly very fragile through this section and clayey in some parts.	D	Ø146mm	20			
	9.0	1650.7	SLIGHTLY WEATHERED ANDESITE	✓	7.00-9.00m: Dark greenish grey, very hard andesite with cracks of 10cm to 50cm intervals. White amygdules of 5-10mm are frequently distributed in the flow structure of 24° dipping.	CM	Ø131mm	56		LU > 100	
	16.6	1643.1		✓	9.0-40.6m: Pale greenish grey, very fresh and stable andesite. At 10.6-12.8m, dark green angulated patches of rock of 10mm to 40mm in size are sporadically found like a breccia. Flow structures of white amygdules dip 65°. Many quartz veins of 5mm to 10mm develop in net or mozaic conditions with pyrite/chalcophyrite mineralized sporadically.	CM	8.7m	56		LU = 120	
	17.5	1642.2		✓		CM	Ø101mm	10			
	21.5	1638.2	ANDESITE	✓	Cracks of 10cm to 50cm intervals are stained reddish brown col. by groundwater passing. Slightly weathered pale brown andesite develop along cracks.	CH		60			
	22.7	1637.0		✓	Slightly deteriorated or weathered zones are: 16.60-17.50m and 21.50-22.70m: Slightly fractured and cracks developing in 10cm intervals.	CM		10			
			FRESH ANDESITE	✓	22.7-40.6m: Dark greenish, very hard, fresh andesite. Many dark green phenocrysts of 1mm to 10mm are distributed in welded structure dipping 70°, matrix is mostly of dark grey feldspar. Thin quartz veins of 1mm to 3mm thick are developed in 70° to vertical dip.	CH		40			
				✓	Small scale cavities of 10mm to 30mm size are lenticularly occurring and filled with crystalline quartz.			20			
				✓				50			
				✓				24			
				✓				55			





NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.

COORDINATION X:9947,138.00 Y:727,076.00  
 ELEVATION 1560.00m.

DRILL LOG

HOLE NO. BD 3 SHEET NO. 3 OF 19

HOLE NO. BD 3

( 19 )

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH		
8/9	1.0	1559.0	TOP SOIL		0-1.0m: Reddish brown plastic clay soil with tree roots		Chisel	2					
	1.5	1558.5	COMPLETELY WEATHERED		1.0-1.5m: Light yellowish brown, completely weathered/ decomposed rock of quartzite.	D		10					
	2.9	1557.1	HEAVILY WEATHERED QUARTZITE		1.5-2.9m: Pale brown, heavily weathered, coarse grain quartzite. Along the cracks of 5-10cm intervals, yellowish clay intercalated in 3mm to 5mm thick.	CL	2.0m						
	5.55	1554.45	VERY SLIGHTLY WEATHERED QUARTZITE		2.9-5.5m: Dark grey, slightly weathered, very stable quartzite. Cracks of 5-10cm intervals are stained reddish yellow.	CM							
	9.0	1551.0	FRESH QUARTZITE		5.55-34.45m: Grey, coarse grain, very hard quartzite. Quartz veins dipping in various angles are distributed frequently with thickness of 3-10mm. Main cracks are 9.0m, 10.2m, 11.65m, 12.8m, 17.0m, 18.1m, and 19.60m. These cracks are stained yellowish brown.	CH							
	9.4	1550.6											
	10.2	1549.8											
	10.5	1549.5											
	11.65	1548.35											
	12.80	1547.2											
	17.0	1543.0	TUFF INTERCALATED		17.00-17.35m: Black col. coarse mica minerals are concentrated, probably its origin is from argillaceous parts interbedded. 20.70-21.1m: Thick white quartz vein of 10mm is developed. The dip is 60° 22.6-24.25m: Cracks are developed frequently in the intervals of 5-15cm. 23.60-23.95m and 26.75-27.10m: Greenish grey shal tuff intercalation. Flaky or fragile. Dip of the tuff layers is 60°.	CH							
	17.35	1542.65											
	18.1	1541.9											
	19.6	1540.4											
	23.6	1536.4	FRESH QUARTZITE		Main cracks are 26.45m, 35.2m and 38.0m	CH							
	23.95	1536.05											
	26.45	1533.55											
	26.75	1533.25											
	27.1	1532.9											
	34.45	1525.55	FINE TO MARG		The boundaries of 34.45m	CH							
	35.2	1524.8											
	38.0	1522.0											

10.5	1549.5	FRESH QUARTZITE	Quartz veins dipping in various angles are distributed frequently with thickness of 3-10mm. Main cracks are 9.0m, 10.2m, 11.65m, 12.8m, 17.0m, 18.1m, and 19.60m. These cracks are stained yellowish brown.	CH	B
11.65	1548.35				
12.80	1547.2				
17.0	1543.0				
17.35	1542.65	FRESH QUARTZITE	17.00-17.35m: Black col. coarse mica minerals are concentrated, probably its origin is from argillaceous parts interbedded.	CH	SS
18.1	1541.9				
19.6	1540.4				
23.6	1536.4	TUFF INTERCALATED	20.70-21.1m: Thick white quartz vein of 10mm is developed. The dip is 60° 22.6-24.25m: Cracks are developed frequently in the intervals of 5-15cm. 23.60-23.95m and 26.75-27.10m: Greenish grey shal tuff intercalation. Flaky or fragile. Dip of the tuff layers is 60°.	CH	SS
26.75	1533.25				
27.1	1532.9				
34.45	1525.55	FRESH QUARTZITE	Main cracks are 26.45m, 35.2m and 38.0m	CH	SS
35.2	1524.8				
38.0	1522.0				
43.0	1517.0	FINE TO COARSE PSAMMITIC QUARTZITE	34.45-43.00m: Pale grey to grey, fine to coarse grain, sandy quartzite. Very hard and stable. The boundaries of 34.45m and 43.0m between quartzite and sandy quartzite are gradually transformed. Various degrees of size and thickness of white quartz veins are found in many places.	CH	SS
44.75	1515.25				
47.4	1512.6				
48.2	1511.8				
50.15	1509.85	FRESH QUARTZITE	43.00-50.15m: Grey, very hard, massive quartzite. All cylindrical core. Main cracks are 44.75m, 47.40m and 48.20m. These cracks are stained yellowish brown col.	CH	SS
50.15	1509.85				
			END OF HOLE		

φ 76mm

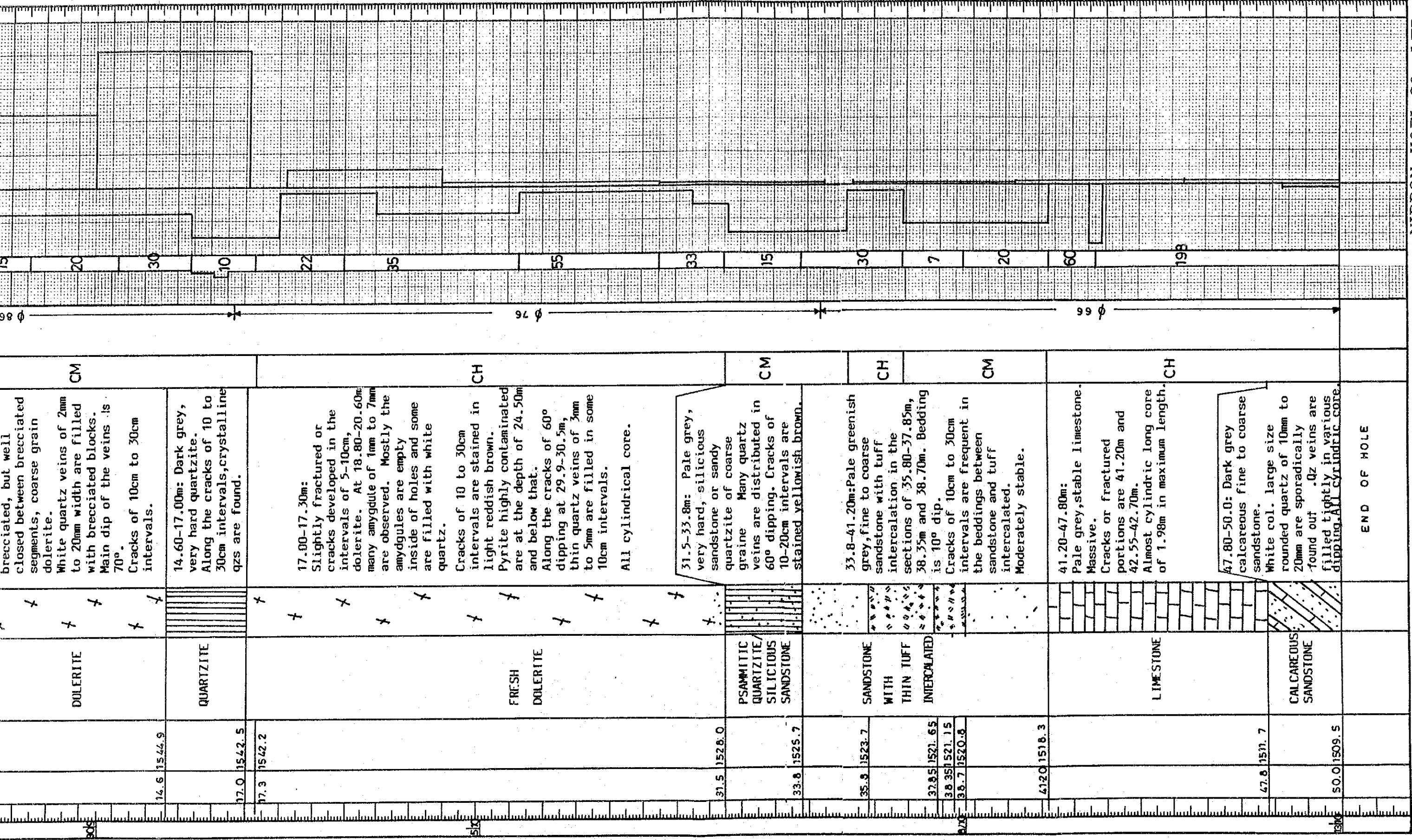
NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.

COORDINATION X:9947,113,00 Y:727,128,00  
ELEVATION 1559.50m.

HOLE NO. BD 4 SHEET NO. 4 OF 19

DRILL LOG

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	0.50	1559.0	TOP SOIL		0-0.5m: Sandy silt with pebble and gravel, grass roots contains. 0-3.0m: Sand gravel and boulder of 1cm to 10cm dia composed by andesite, dolerite.		1.0m 150mm				
	3.0	1556.5	RIVER SAND/ GRAVEL			CL ~ CM					
	8.8	1550.7	SLIGHTLY WEATHERED DOLERITE		3.0-8.8m: Greyish green dolerite of coarse grain phenocrysts. Dark green amygdule of clay mineral (chlorite) of 5mm to 30mm dia. are frequently distributed. Cracks of 5 to 10cm intervals dip various degrees.						
	14.6	1544.9	DOLERITE		8.8-14.6m: Dark green, brecciated, but well closed between brecciated segments, coarse grain dolerite. White quartz veins of 2mm to 20mm width are filled with brecciated blocks. Main dip of the veins is 70°. Cracks of 10cm to 30cm intervals.	CM					
	17.0	1542.5	QUARTZITE		14.60-17.00m: Dark grey, very hard quartzite. Along the cracks of 10 to 30cm intervals, crystalline qzs are found.						
	17.3	1542.2			17.00-17.30m: Slightly fractured or cracks developed in the intervals of 5-10cm, dolerite. At 18.80-20.60m many amygdule of 1mm to 7mm are observed. Mostly the amygdules are empty inside of holes and some are filled with white quartz. Cracks of 10 to 30cm intervals are stained in light reddish brown. Pyrite highly contaminated are at the depth of 24.50m and below that. Along the cracks of 60° dipping at 29.9-30.5m, thin quartz veins of 3mm to 5mm are filled in some 10cm intervals. All cylindrical core.	CH					
	31.5	1528.0	PSAMMITIC QUARTZITE/SILICIOUS SANDSTONE		31.5-33.8m: Pale grey, very hard, silicious sandstone or sandy quartzite of coarse graine. Many quartz veins are distributed in 60° dipping. Cracks of 10-20cm intervals are stained yellowish brown.	CM					
	33.8	1525.7									
	35.8	1523.7	SANDSTONE WITH THIN TUFF		33.8-41.20m: Pale greenish grey, fine to coarse sandstone with tuff intercalation in the sections of 35.80-37.85m, to 35m and 38 70m Bedding	CH					



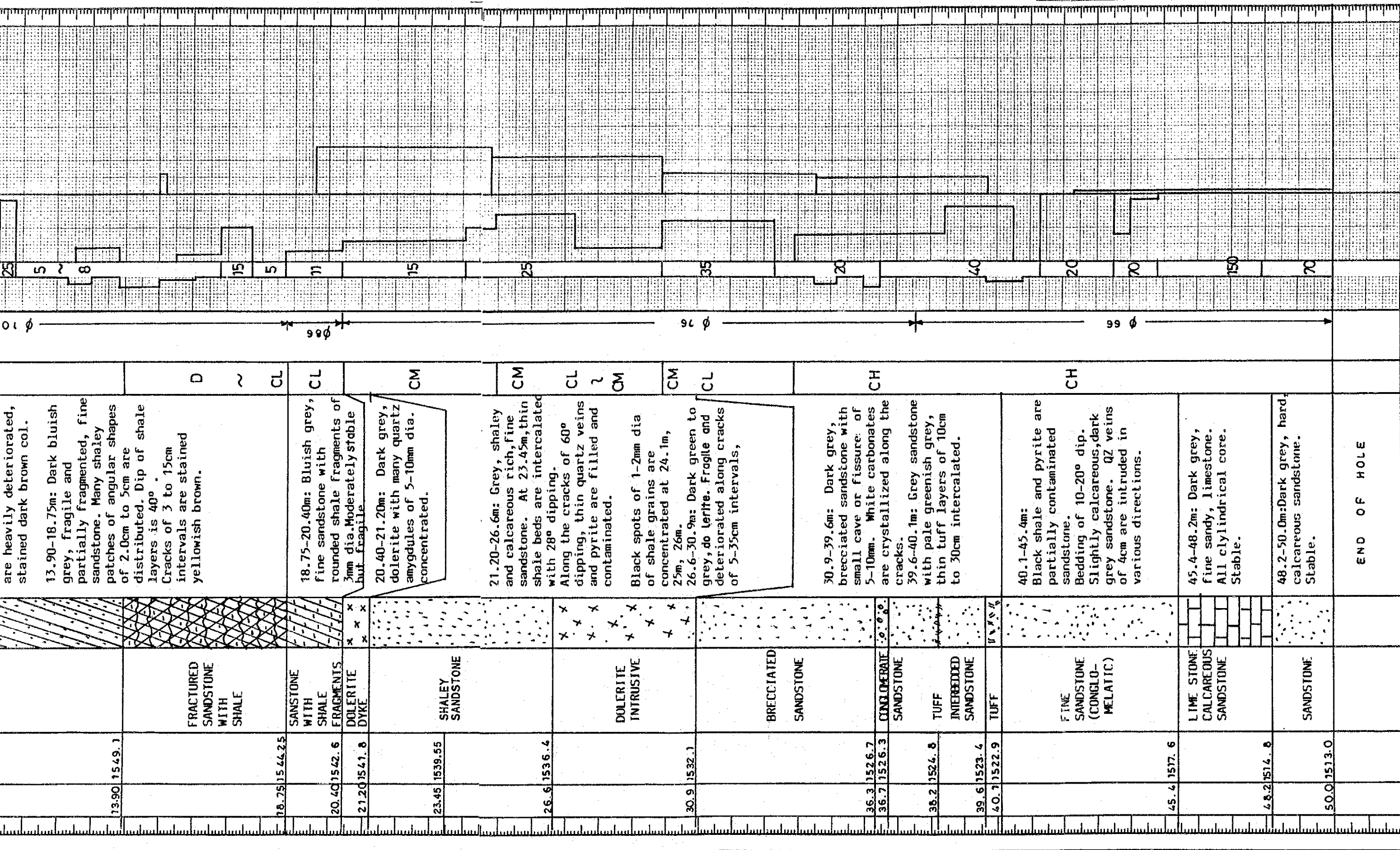
NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.

COORDINATION X:9947,096.00 Y:727,165.00  
 ELEVATION 1563.00m.  
 HOLE NO. BD 5 SHEET NO. 5 OF 19

DRILL LOG

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY %	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	0.50	1562.5	TOP SOIL		0-0.5m: Reddish brown, laterite of top soil with organic contents.						
	3.90	1559.1	DEBRIS/CLAY		0.5-4.80m: Light reddish brown laterite with many deteriorated gravels of andesite, dolerite. Plasticity						
	4.80	1558.2	DEBRIS		4.80-13.90m: Bluish to dark brown, completely fragmented and weathered sandstone.						
	13.90	1549.1	BLUISH SANDSTONE		Fractured zone is 3.90-8.60m (cracks of 3cm interval), 9.1-10.2m (cracks of 5-8 cm intervals), and 10.8-13.00m (cracks of ave. 5cm intervals). Fragile and crack surfaces are heavily deteriorated, stained dark brown col.	CL					
	18.75	1544.25	FRACTURED SANDSTONE WITH SHALE		13.90-18.75m: Dark bluish grey, fragile and partially fragmented, fine sandstone. Many shaley patches of angular shapes of 2.0cm to 5cm are distributed. Dip of shale layers is 40°. Cracks of 3 to 15cm intervals are stained yellowish brown.	D ~ CL					
	20.40	1542.6	SANDSTONE WITH SHALE FRAGMENTIS		18.75-20.40m: Bluish grey, fine sandstone with rounded shale fragments of 3mm dia. Moderately stable but fragile.	CL					
	21.20	1541.8	DOLERITE DYKE		20.40-21.20m: Dark grey, dolerite with many quartz amygdules of 5-10mm dia. concentrated.	CM					
	23.45	1539.55	SHALEY SANDSTONE		21.20-26.6m: Grey, shaley and calcareous rich, fine sandstone. At 23.45m, thin shale beds are intercalated with 28° dipping. Along the cracks of 60° dipping, thin quartz veins and pyrite are filled and contaminated.	CM					
	26.6	1536.4	DOLERITE INTRUSIVE		Black spots of 1-2mm dia of shale grains are concentrated at 24.1m, 25m, 26m. 26.6-30.9m: Dark green to grey, dolerite. Fragile and deteriorated along cracks of 5-35cm intervals,	CL ? CM					
	30.9	1532.1	BRECCIATED SANDSTONE		30.9-39.6m: Dark grey, brecciated sandstone with small cave or fissure of 5-10mm. White carbonates are crystallized along the cracks. 39.6-40.1m: Grey sandstone	CL					
	36.3	1526.7	CONGLOMERATE SANDSTONE			CH					
	36.7	1526.3									

H



NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.

LOCATION X: 9946, 968.00, Y: 727, 430.00, ELEVATION: 1680.50m.

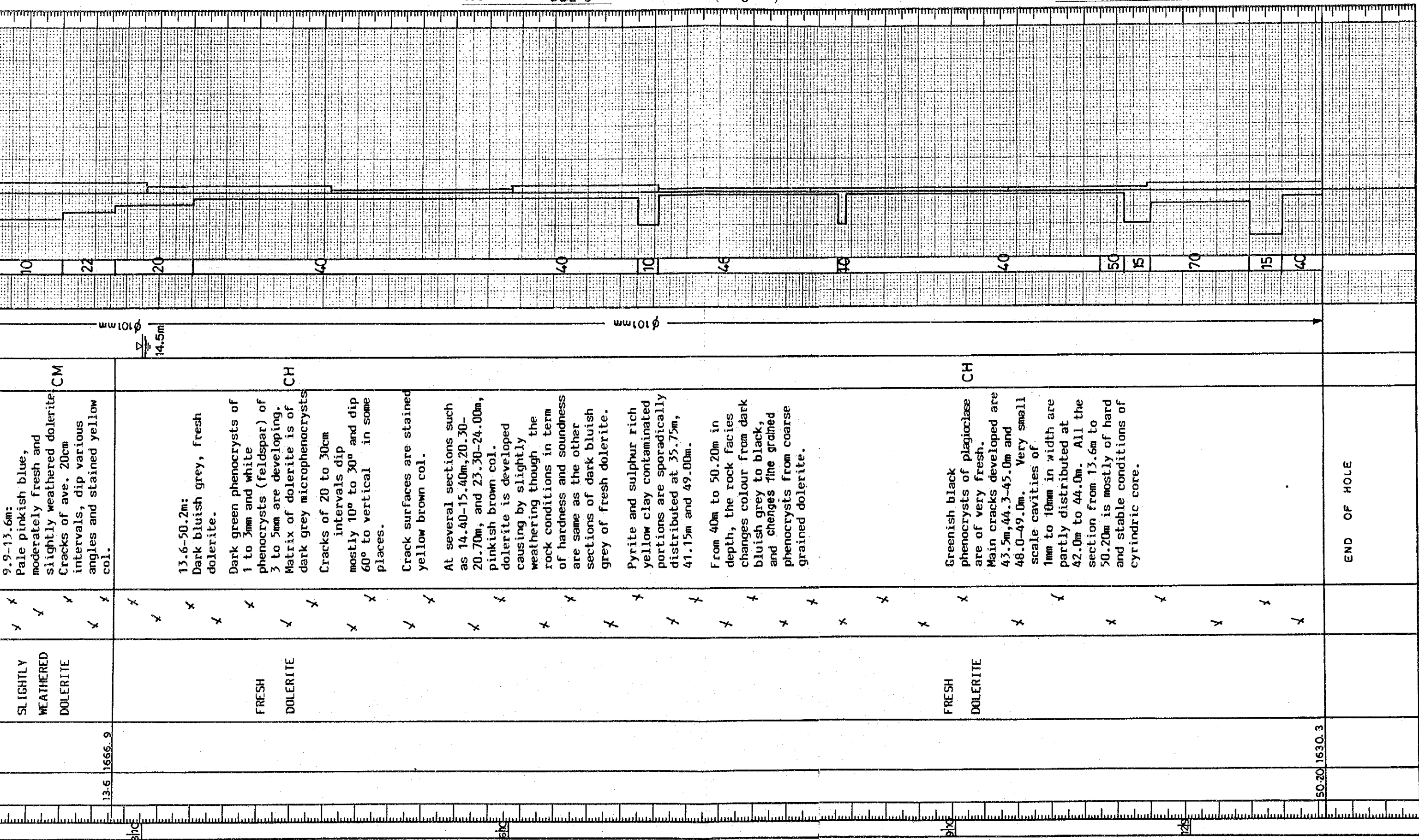
DRILL LOG HOLE NO. BD\_6 SHEET NO. 6 OF 19

HOLE NO. BD\_6

( 6 )

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY %	R. Q. D.	WATER PRESSURE TEST LUGEON VALUE	DEPTH
29/6	1.0	1679.5	TOP SOIL	X	0-1.0m: Dark reddish brown organic clay of top soil with grass roots. 1.0-3.0m: Red laterite silty clay of residual soil.		←	0			
	3.0	1677.5	WEATHERED DOLERITE	X	3.0-5.3m: Pale brown weathered dolerite. Open cracks developing in the intervals of ave. 10cm. All the cracks are stained reddish brown.	CL	←	20			
	5.3	1675.2	MODERATELY WEATHERED DOLERITE	X	5.3-9.9m: Pale brown to pinkish blue, moderately weathered dolerite remaining the hard rock conditions between cracks. White col. amygdules of 5 to 8mm dia. are frequently scattered. Cracks intervals of 10 to 20cm.	CL ~ CM	←	10			
	9.9	1670.6	SLIGHTLY WEATHERED DOLERITE	X	9.9-13.6m: Pale pinkish blue, moderately fresh and slightly weathered dolerite. Cracks of ave. 20cm intervals, dip various angles and stained yellow col.	CM	←	44			
	13.6	1666.9	FRESH DOLERITE	X	13.6-50.2m: Dark bluish grey, fresh dolerite. Dark green phenocrysts of 1 to 3mm and white phenocrysts (feldspar) of 3 to 5mm are developing. Matrix of dolerite is of dark grey microphenocrysts Cracks of 20 to 30cm intervals dip mostly 10° to 30° and dip 60° to vertical in some places. Crack surfaces are stained yellow brown col. At several sections such as 14.40-15.40m, 20.30-20.70m, and 23.30-24.00m, pinkish brown col. dolerite is developed causing by slightly weathering though the rock conditions in term of hardness and soundness are same as the other sections of dark bluish grey of fresh dolerite. Pyrite and sulphur rich yellow clay contaminated portions are sporadically distributed at 35.75m, 41.15m and 49.00m. From 40m to 50.20m in depth, the rock facies changes colour from dark bluish grey to black, and changes fine grained phenocrysts from coarse grained dolerite.	CH	←	15			
				X			←	10			
				X			←	22			
				X			←	20			
				X			←	40			
				X			←	40			
				X			←	10			
				X			←	46			
				X			←	10			





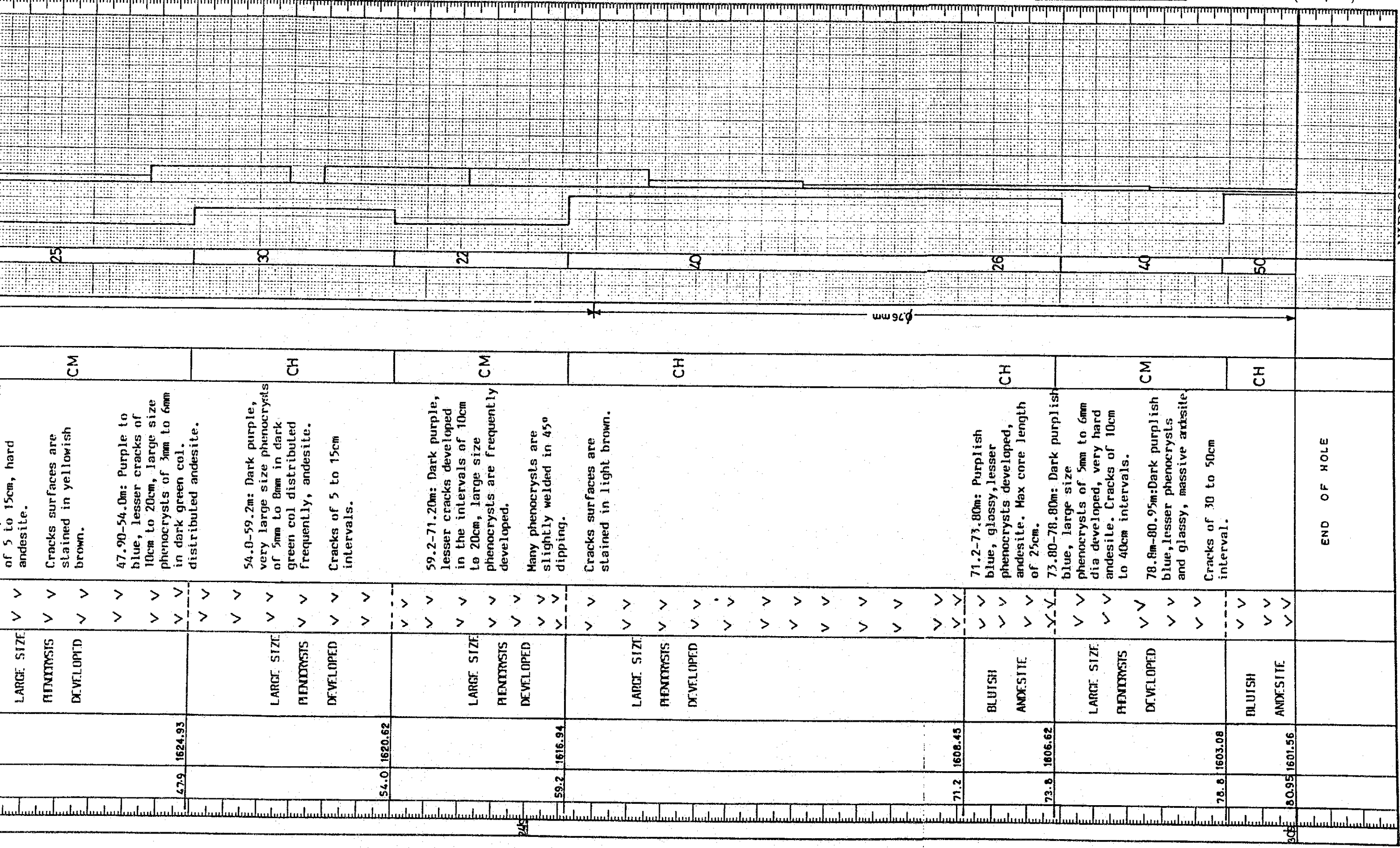
NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.





HOLE NO. ( )

HOLE NO. ( 7 )



NIPPON KOEI CO., LTD.  
CONSULTING ENGINEERS, TOKYO.