Fig. 4.11.1 Geological Log of Borehole

Project Name	Tokoi Hydro-electric Power Development Project			Site Name	Upper Tokoi Dam Site		
Hole No	U-1 (1)	Elevation of Ground Level	159.46 m	Ground Water Level	- 3.72 m	Bit Size	76 (NX) mm
Date	Beginning	August 30th, 1981.	Operator			Casing	m to m
	Ending	September 14th, 1981	Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0	159.86	0.60	1-1	Khaki	Top Soil		Containing Organic Material					
5				Brown	Shaly Sandstone	Completely Weathered	Clayey Including Breccia		20 10			D
10	146.46	13.00										
15		15.20		Brown to Khaki	Quartzose Sandstone	Completely Weathered	Sandy Including Breccia					
	143.26	16.20							0			
				Brown to Grey	Quartzose Sandstone	Highly Weathered	Very Cracky Iron Oxide Stained Crack		17			
	141.26	18.20										
20				Light Grey to Brown	Quartzose Sandstone	Moderately Weathered	Very Cracky Iron Oxide Stained Crack.					C_L

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (gr f / cm³)

σ_c : Unconfined Compression Strength. (Kg f / cm²)

checked

Fig. 4.11.2 Geological Log of Borehole

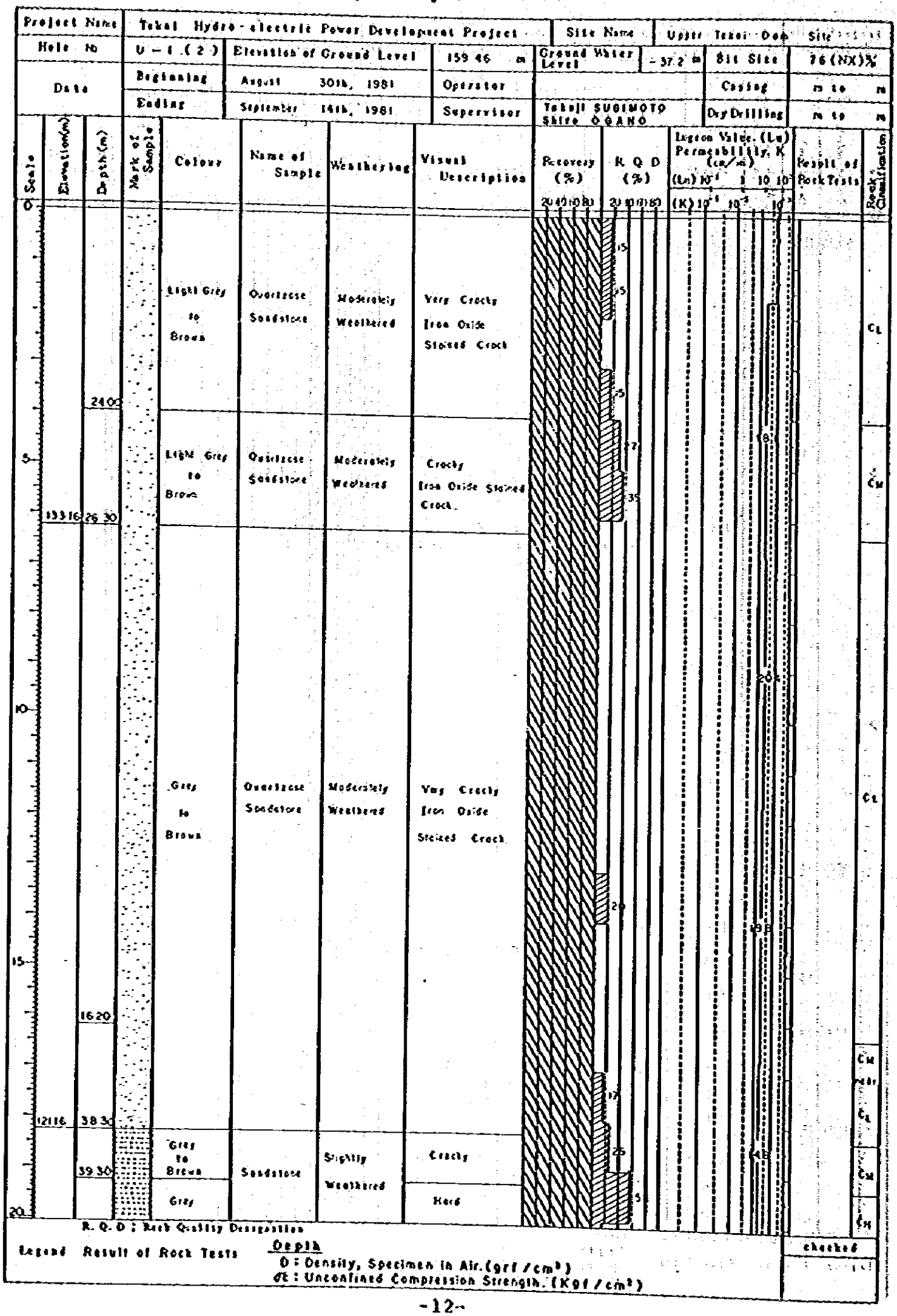


Fig.4.11.3 Geological Log. of Borehole

Project Name	Tekai Hydro-electric Power Development Project			Site Name	Upper Tekai Dam Site		
Hole No	U-1 (3)	Elevation of Ground Level	159.46 m	Ground Water Level	- 37.2 m	Bit Size	76 (NX)%
Date	Beginning	August 30th, 1981	Operator			Casing	m to m
	Ending	September 14th, 1981	Supervisor	Takuji SUGIMOTO Shiro OGANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) Permeability K (cm/s)	Result of Rock Tests	Rock Classification
0		40.30		Grey			Hard					CH
		42.10		Grey to Brown	Sandstone	Slightly Weathered	Very Cracky Iron Oxide Stained Crack		13			CM
												CL
		43.50		Light Grey			Cracky		27			CM
5		46.00		Light Grey	Sandstone	Slightly Weathered	Hard		10 73 65			CH
10												
15												
20												

Recovery (%) scale: 20 40 60 80; R Q D (%) scale: 20 40 60 80; (Lu) 10^{-1} 1 10 10^{2}; (K) 10^{-6} 10^{-5} 10^{-3}

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests Depth
D : Density, Specimen in Air (grf/cm³)
σt : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.4 Geological Log of Borehole

Project Name	Tekel Hydro-electric Power Development Project			Site Name	Upper Tekel Dam Site		
Hole No	U-2 (1)	Elevation of Ground Level	100.13 m	Ground Water Level	-23.80 m	Bit Size	76 (NX) %
Date	Beginning	September 23rd, 1981	Operator			Casing	m to m
	Ending	October 1st, 1981	Supervisor	Tetsuji SUGIMOTO Shiro OOANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0	99.43	0.70		Brown	Top Soil (Soil)		Containing Organic Material					
	95.83	4.30		Grey	Sandstone	Moderately Weathered	Cracky Iron Oxide Stained Crack					CM
5	94.33	5.80		Light Grey	Quartzose Sandstone	Slightly Weathered	Hard					CH
	91.53	8.60		Light Grey	Quartzose Sandstone	Moderately Weathered	Cracky Iron Oxide Stained Crack					B
10	90.13	10.00		Light Grey	Quartzose Sandstone		Hard					CH
	88.63	11.50		Brown	Quartzose Sandstone	Slightly Weathered	Fractured zone Mainly Breccia Including Brownish Clay					D
	88.13	12.00		Light Grey	Quartzose Sandstone		Hard					CH
15				Grey to Dark Grey	Shaly Sandstone	Slightly Weathered	Cracky					CM
20	80.33	19.80		Black	Shale							
	80.13	20.00										

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth

D : Density, Specimen in Air. (gf / cm³)

σt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig.4.11.5 Geological Log of Borehole

Project Name	Total Hydro-electric Power Development Project			Site Name	Upper Tokoi Dam Site		
Hole No	U-2 (2)	Elevation of Ground Level	100.13 m	Ground Water Level	-23.80 m	Bit Size	76 (NX) %
Date	Beginning	September 23rd, 1981	Operator			Casing	m to m
	Ending	October 1st, 1981	Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0				Grey to Dark Grey	Shaly Sandstone	Slightly Weathered	Cracky		3			C_M
	78.83	21.30		Dark Grey	Conglomerate	Fresh	Hard		55			C_H
	76.53	23.60		Dark Grey to Black	Shale	Fresh	Hard		58			
5		26.20		Dark Grey to Black	Shale	Fresh	Hard		52			
		27.00		Dark Grey to Black	Shale	Fresh	Cracky		18			
				Dark Grey to Black	Shale	Fresh	Very Hard		73			
10	70.13	30.00		Dark Grey	Shaly Sandstone	Fresh	Very Hard		55			B
	68.53	31.60		Black	Shale	Fresh	Very Hard		95			
15	64.33	35.80		Dark Grey	Shaly Sandstone	Fresh	Hard		72			C_H
		36.60		Dark Grey	Shaly Sandstone	Fresh	Cracky		25			C_M ~ C_H
20	60.43	39.70		Dark Grey	Sandstone	Fresh	Very Hard		35			C_H

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (gr / cm³)

σc : Unconfined Compression Strength. (Kg / cm²)

checked

Fig.4.11.6 Geological Log of Borehole

Project Name	Tekai Hydro-electric Power Development Project			Site Name	Upper Tekai Dam Site
Hole No	U-2 (3)	Elevation of Ground Level	100.13 m	Ground Water Level	-23.80 m
Date	Beginning	September 23rd, 1981	Operator		
	Ending	October 1st, 1981	Supervisor	Takeji SUGIMOTO, Shiro OHANO	

Bit Size: 76 (NX) mm
Coring: m to m
Dry Drilling: m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/s)	Result of Rock Tests	Rock Classification
0	56.13	44.00		Dark Grey	Sandstone	Fresh	Very Hard	20 40 60 80 100	20 40 60 80	(Lu) 10^{2} 1 10^{-1} 10^{-2} (K) 10^{-3} 10^{-4} 10^{-5} 10^{-6}		CH
5												
10												
15												
20												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth

D : Density, Specimen in Air. (gf / cm³)

q_u : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig. 4. 11. 7 Geological Log. of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokai Dam Site		
Hole No.	U – 3 (1)	Elevation of Ground Level	72.69 m	Ground Water Level	0.0 m	Bit Size	76 (NX) mm
Date	Beginning	August 26th, 1981	Operator			Casing	m to m
	Ending	September 11th, 1981	Supervisor	Takuji SUGIMOTO, Shiro OGANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0	71.79	0.90			River Bed Deposits		Mainly Gravel, with Sand.					
		1.60		Greyish Brown	Sandstone	Highly Weathered	Very Cracky Iron Oxide Stained Crack		38			CL near CM
	69.29	3.40		Light Grey	Sandstone	Moderately Weathered	Cracky, Iron Oxide Stained Crack		78			CM
	68.69	4.00		Grey to Yellow	Arcose Sandstone				34			
		7.40		Grey to Brown	Sandstone	Highly Weathered	Very Cracky		11			CL
	65.09	7.60		Black	Shale		Cracky		11			
		9.30		Light Grey	Sandstone	Moderately Weathered	Very Cracky Iron Oxide Stained Crack		16			CM
	62.69	10.00		Grey to Brown	Sandstone		Very Cracky		25			CL from CM
		10.80		Light Grey	Sandstone	Slightly Weathered	Very Hard		53			CM
		11.60		Light Grey			Cracky		35			CM
		13.10		Light Grey	Sandstone	Slightly Weathered	Hard		39			CM
	59.19	13.50					Cracky		29			CM
		15.90		Grey	Sandstone	Fresh	Very Hard		65			CM
	56.79								51			
		18.00		Greyish Blue	Sandstone	Slightly Weathered	Cracky, Hard		22			CM near CH
		19.80		Light Grey	Sandstone	Slightly Weathered	Hard		51			CH
20				Grey			Cracky		60			CM

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gr / cm³)
qt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig. 4.11.8 Geological Log of Borehole

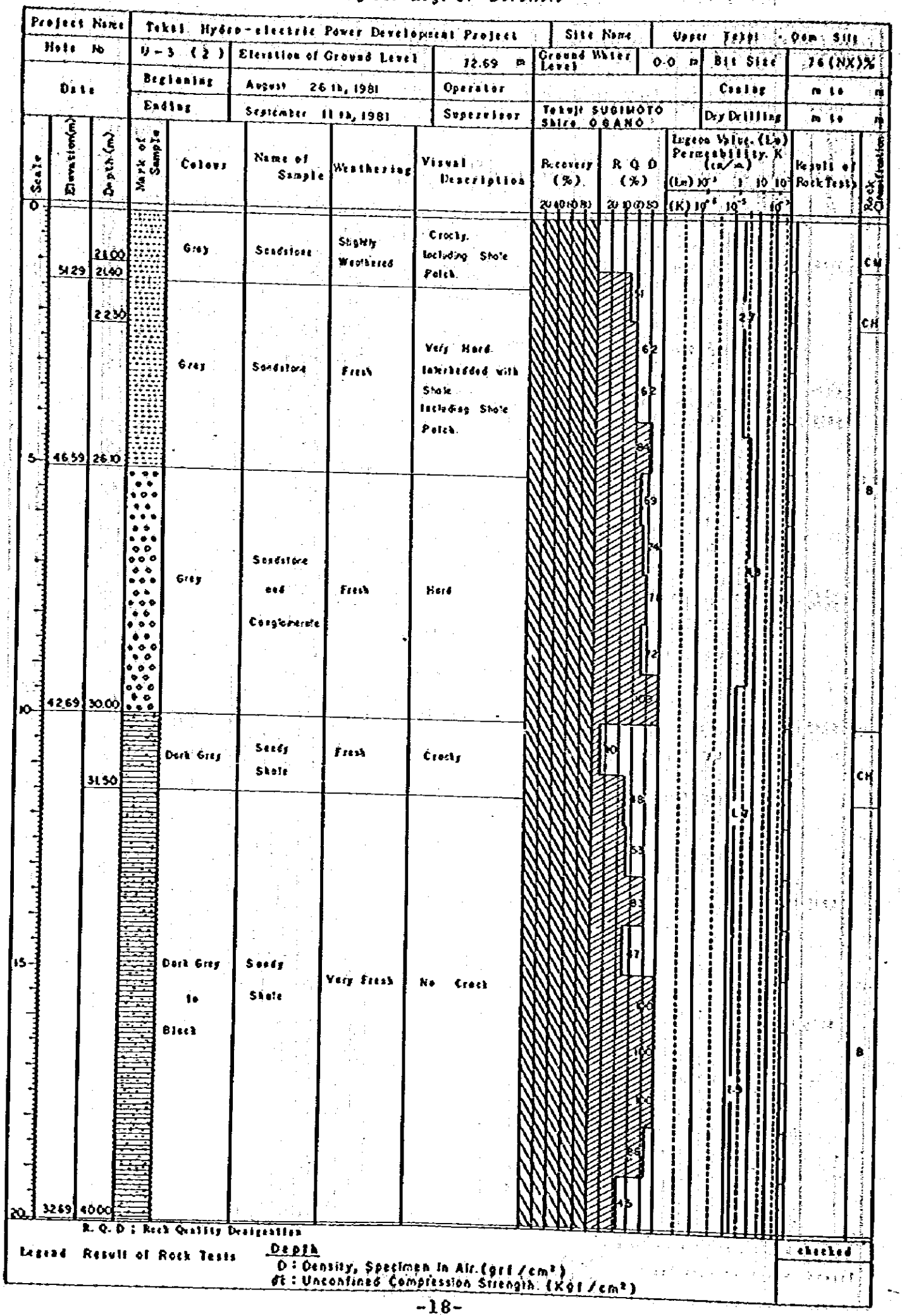


Fig. 4.11.9 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tekai Dam Site
Hole No	U-4 (1)	Elevation of Ground Level	99.35 m	Ground Water Level	-19.1 m
Date	Beginning	September 15th, 1981	Operator		
	Ending	September 29th, 1981	Supervisor	Takeji SUGIMOTO, Shiro OBANO	

Bit Size: 76 (NX) mm
Casing: m to m
Dry Drilling: m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Legeon Value (Lu) (Permeability, K) (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{2} 1 10 10^{2} (K) 10^{-3} 10^{-2} 10^{-1}		
	98.05	1.30		Brown to Khaki	Clayey sand		Top soil. Containing organic material					
		2.70		Brown	Sandstone	Completely weathered	Sandy. Including breccia		10			D
5	94.25	5.10		Brown to Light grey		Highly weathered	Very crocky. Crack with iron oxide		25			
	91.95	7.40		Light grey to Brown	Quartzose sandstone	Moderately weathered	Crocky. Iron oxide stained crack		32 15 5			CL
	90.65	8.70		Brown	Quartzose sandstone	Highly weathered	Crocky and soft. Crack with clay Fractured zone		0			
	89.65	9.70		Grey to Brown	Quartzose sandstone		Crocky. Crack with iron oxide					
10		10.30				Moderately weathered	Crocky		55			CM
				Light grey	Quartzose sandstone	Slightly weathered	Hard however crocky.		39 45 22 25			CM near CH
15		16.10							56			
	81.55	17.80		Grey to Brown			Crocky		45 38			
				Light grey	Sandstone	Slightly weathered	Hard		65 46			CH
20												CM

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf / cm³)
qu : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig.4.11.10 Geological Log of Borehole

Project Name	Tokoi Hydro-electric Power Development Project			Site Name	Upper Tokoi Dam Site		
Hole No.	U-4 (2)	Elevation of Ground Level	99.35 m	Ground Water Level	-19.1 m	Bit Size	76 (NX) mm
Date	Beginning	September 15th, 1981	Operator			Casing	m to m
	Ending	September 29th, 1981	Supervisor	Tokuji SUGIMOTO Shiro OSANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability (cm/sec) (K)	Result of Rock Tests	Rock Classification
0				Light grey	Sandstone	Slightly weathered	Cracky					CM
		22.30										
		23.60		Light grey			Hard					CH
				Light grey			Cracky					CM
5		25.00		Grey	Sandstone	Fresh	Hard					CH
	72.55	26.80		Black	Shale		Soft					
	72.35	27.00		Grey	Sandstone		Hard					
	72.15	27.20		Black	Shale		Soft					
	71.85	27.50		Grey	Sandstone	Fresh	Hard					
	71.05	28.30		Black	Shale		Soft					
	70.75	28.60		Grey	Sandstone		Hard					
	70.55	28.80		Black	Shale		Soft					
	70.35	29.00		Grey	Sandstone	Fresh	Hard					CH
10	69.35	30.00		Black	Shale		Soft					
	69.15	30.20		Grey	Sandstone	Fresh	Cracky					CM
	68.05	31.30		Grey to Black	Conglomerate	Fresh	Hard					CH
	66.65	32.70		Grey	Sandstone	Fresh	Hard					CH
15	63.35	36.00		Black	Shale	Fresh	Hard					
	62.65	36.70		Light grey	Sandstone	Fresh	Hard					CM
	62.15	37.20		Light grey			Very cracky Cracky zone					
	60.55	38.80		Grey			Very hard					CH
20												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (gf/cm³)

σc : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.11 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project		Site Name	Upper Tokai Dam Site	
Hole No	U-4 (3)	Elevation of Ground Level	99.35 m	Ground Water Level	-19.1 m	Bit Size	76 (NX) mm
Date	Beginning	September 15th, 1981	Operator			Casing	m to m
	Ending	September 29th, 1981	Supervisor	Tokuji SUGIMOTO, Seiko OHANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0				Grey	Sandstone	Fresh	Very hard	20 40 60 80	20 40 60 80 100	(Lu) 10^{-1} 1 10 10^{2} (K) 10^{-6} 10^{-5} 10^{-4}		CH
5		45.00		Light grey to Grey	Sandstone	Fresh	Hard, however cracky					CM, MCr, CH
10	49.35	50.00										
15												
20												

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
ρ : Density, Specimen in Air (gr f / cm³)
qt : Unconfined Compression Strength (Kg f / cm²)

checked

Fig. 4.11.12 Geological Log of Borehole

Project Name	Tekal Hydro-electric Power Development Project			Site Name	Upper Tekal Dam Site		
Hole No.	U-5 (1)	Elevation of Ground Level	150.63 m	Ground Water Level	-19.7 m	Bit Size	76 (NX) mm
Date	Beginning	October 1st, 1981	Operator			Casing	m to m
	Ending	October 11th, 1981	Supervisor	Tokuji SUGIMOTO Shiro OHNO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability (K) (cm/sec)	Result of Rock Tests	Rock Classification
0	149.73	0.90		Brown	Sandy & Clayey soil		Top soil					
	148.73	1.90		White to Brown	Shale	Completely weathered	Clayey					
	147.33	3.30		Ligth grey	Shaly sandstone	Completely weathered	Soft					
5	142.43	8.20		Brown	Shaly sandstone	Highly weathered	Very cracky and soft					D
		9.80		White to Brown	Quartzose sandstone	Highly weathered	Very cracky Crack with clay		0			
10									34			
									31			
15				White to Brown	Quartzose sandstone	Highly weathered	Very cracky					Cl
	133.03	17.60										
	131.93	18.70		Grey	Shale	Highly weathered	Fractured zone including breccia and clay					D
20	130.73	19.90		Light grey	Quartzose sandstone		Very cracky					Cl
					Shaly sandstone		Fractured zone					D

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (grf / cm³)

qt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig.4.11.13 Geological Log of Borehole

Project Name	Tokat Hydro-electric Power Development Project			Site Name	Upper Tokay Dam Site		
Hole No	U-5 (2)	Elevation of Ground Level	150.63 m	Ground Water Level	-19.7 m	Bit Size	76 (NX) mm
Date	Beginning	October 1st, 1981	Operator			Casing	m to m
	Ending	October 11th, 1981	Supervisor	Tetsuji SUGIMOTO, Saito OBANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{-1} 1 10 10^{2} (K) 10^{-4} 10^{-3} 10^{-2}		
	127.63	23.00		Grey to Brown	Shaly sandstone	Highly weathered	Fractured zone Soft and crocky. Including clay					D
		24.00		Grey to Brown	Sandstone	Moderately weathered	Crocky. Crack with iron oxide					CL
5	123.33	27.30		Grey	Sandstone	Slightly weathered	Crocky		33 26 47	1.25	26.40-26.55 D=2.648 Rc= 913	CM
		28.70		Grey	Sandstone	Fresh	Very crocky		20			CL
10		30.30					Crocky		20 15			CM
		33.80		Grey	Sandstone	Fresh	Hard		56 68 39 21	9		CH
15		35.00		Grey	Sandstone	Fresh	Crocky		28			CH or CH
	114.63	36.00		Grey			Very hard		9			CH
				Grey	Sandstone	Fresh	Hard, however crocky		35 24 35 0	2		CM
20	111.03	39.60										CH

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth

D : Density, Specimen in Air (gf / cm³)

σc : Unconfined Compression Strength (Kgf / cm²)

checked

Fig. 4.11.14 Geological Log of Borehole

Project Name	Tokei Hydro-electric Power Development Project			Site Name	Upper Tokei Dam Site
Hole No.	U-5 (3)	Elevation of Ground Level	150.63 m	Ground Water Level	-19.7 m	Bit Size	76 (NX) mm
Date	Beginning	October 1st, 1981	Operator			Casing	m to m
	Ending	October 11th, 1981	Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) Permeability (cm/sec) (K)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{-2} 1 10 10^{2} (K) 10^{-5} 10^{-3} 10^{-1} 10^{1}		
5		46.00		Grey	Sandstone	Fresh	Hard, however crocky		30 29 6 53 33 2	1		CH
		49.00		Grey	Sandstone	Fresh	Hard		58 80 33			
10	100.63	50.60		Grey	Sandstone	Fresh	Very hard		90			B
15												
20												

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf / cm³)
σt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig. 4.11.15 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project		Site Name	Upper Tokai Dam Site	
Hole No	UD-1( )	Elevation of Ground Level	75.83 m	Ground Water Level	-1.0 m	Bit Size	76 (NX) mm
Date	Beginning	September 29th, 1982.	Operator	Takoshi TOYA	Casing	m to m
	Ending	October 1st, 1982.	Supervisor	Takuji SUGIMOTO, Shiro OGANO	Dry Drilling	m to m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{2} 1 10^{-1} 10^{-2} (K) 10^{-6} 10^{-5} 10^{-4}		
	72.88	2.95		Brownish White / Brown	River Deposits		Boulder of Quartzose Sandstone; Mainly Pebble Including Sand and Clay					
	71.83	4.00		Brown			Medium Hard Cracky		2		317~332	
	70.83	5.00					Cracky Zone with Clay				D=2.430	
5				Brownish White	Medium Quartzose Sandstone	Highly Weathered	Medium Hard Iron Oxide Stained Crack at 60°, 45°, 65°		0		Rc=562	
		7.00		Whitish Brown			Crack at 50°, 30° with Clay		13			CL
	67.83	8.00		Brown			Cracky Zone					
	67.33	8.50				Moderately Weathered	Hard Iron Oxide Stained Crack at 70°, 30°, 85°		10			
10		10.00		Light Grey	Medium Quartzose Sandstone		Very Hard Clean Crack at 30°, 50° Iron Oxide Stained at 40°, 60°		39			
		12.20m			Shale		Iron Oxide Stained Crack at 40°, 60°		32			Cm
	62.53	13.30							8			
		14.80		Light Grey	Coarse Quartzose Sandstone		Very Hard Clean Crack at 40° Joint at 65°		40			
15	60.83	15.00							58			
				Grey	Medium Quartzose Sandstone		Fractured Zone Soft Mainly Breccia Including Clay					D
	56.83	19.00										
				Light Grey			Cracky Clean Crack at 60°, 90°		83			Cm ~ Cm
20		20.00										

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf / cm³)
qt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig. 4.11.16 Geological Log of Borehole

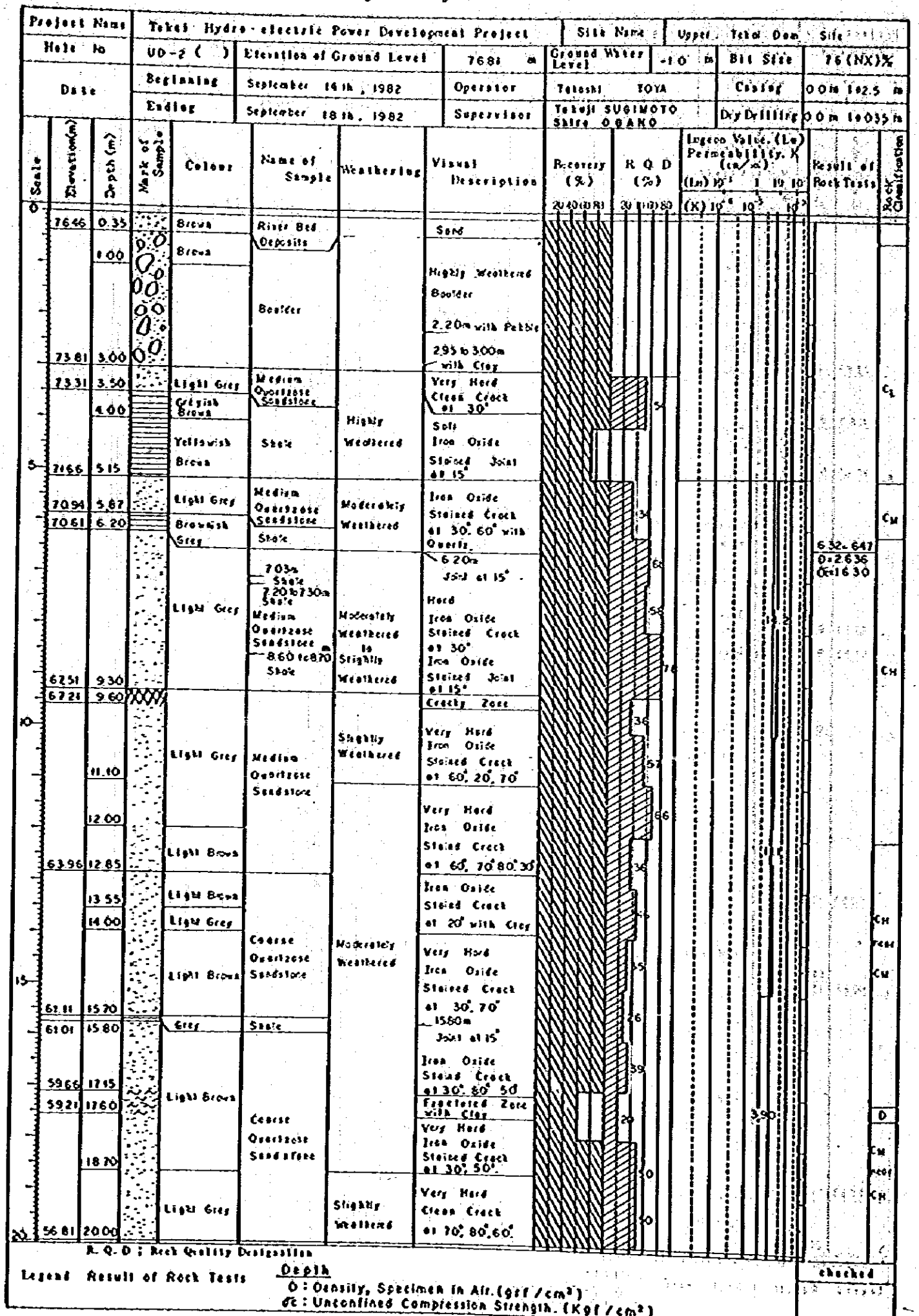


Fig. 4.11.17 Geological Log of Borehole

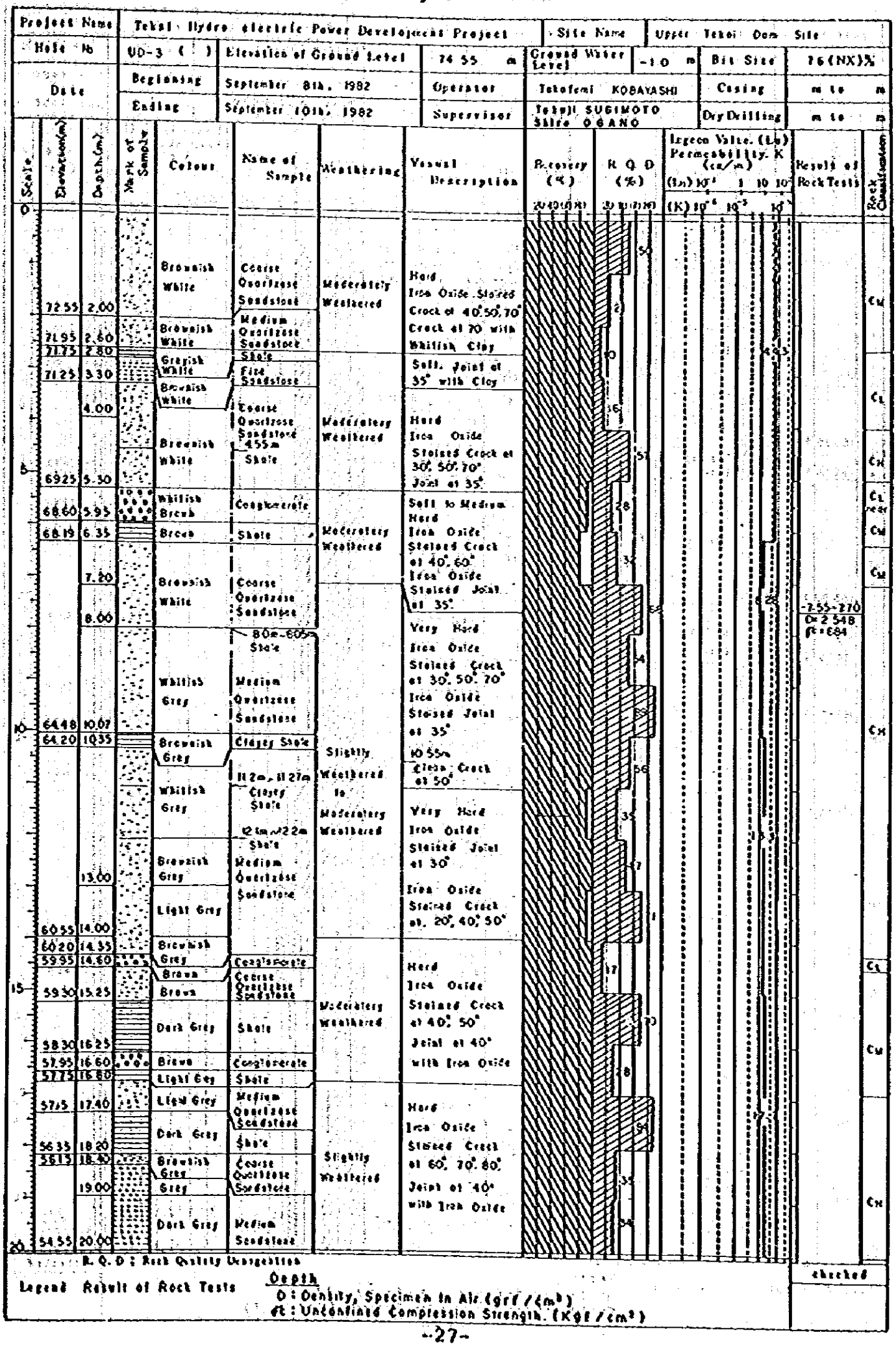


Fig.4.11.18 Geological Log of Borehole

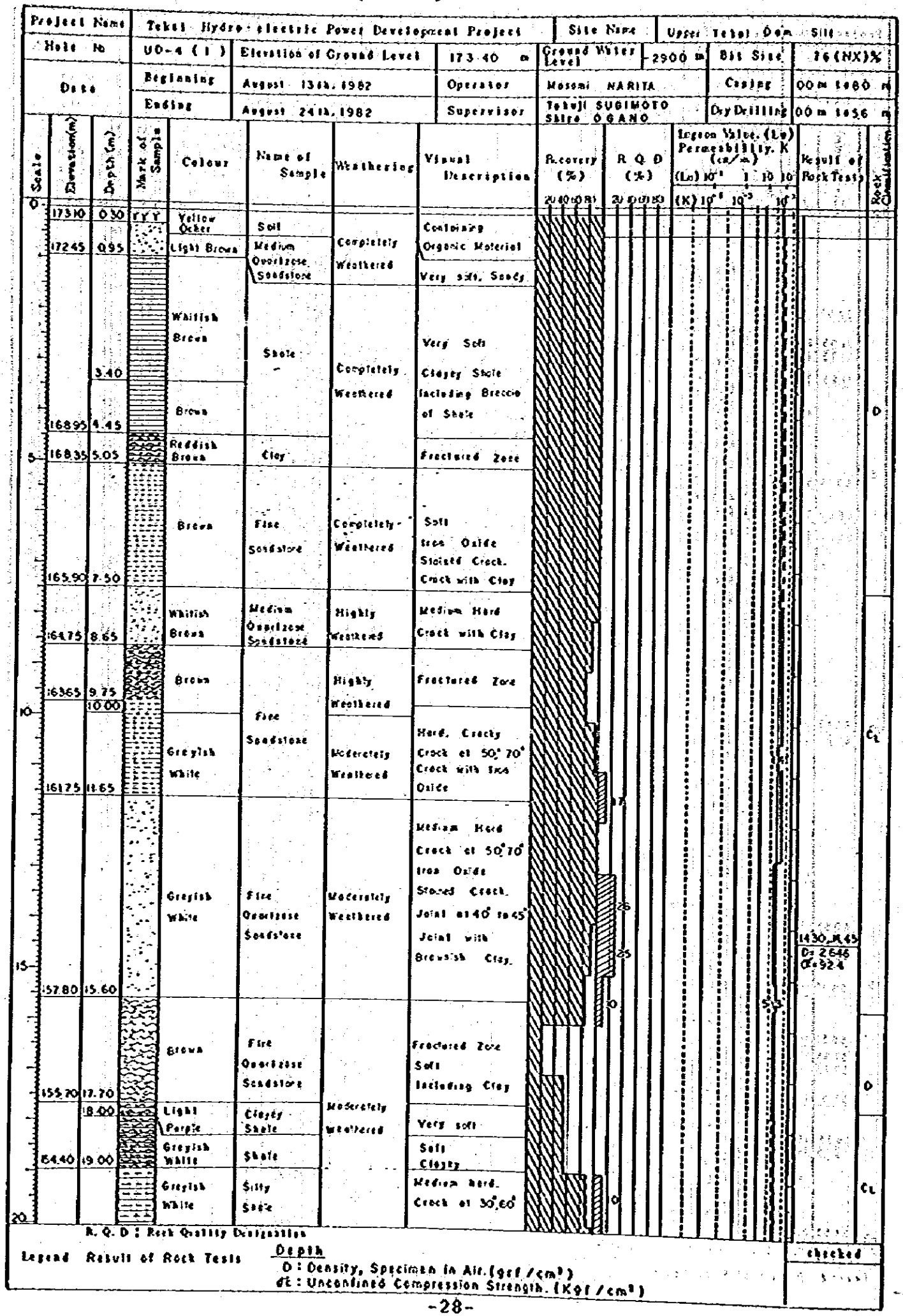


Fig4.11.19 Geological Log of Borehole

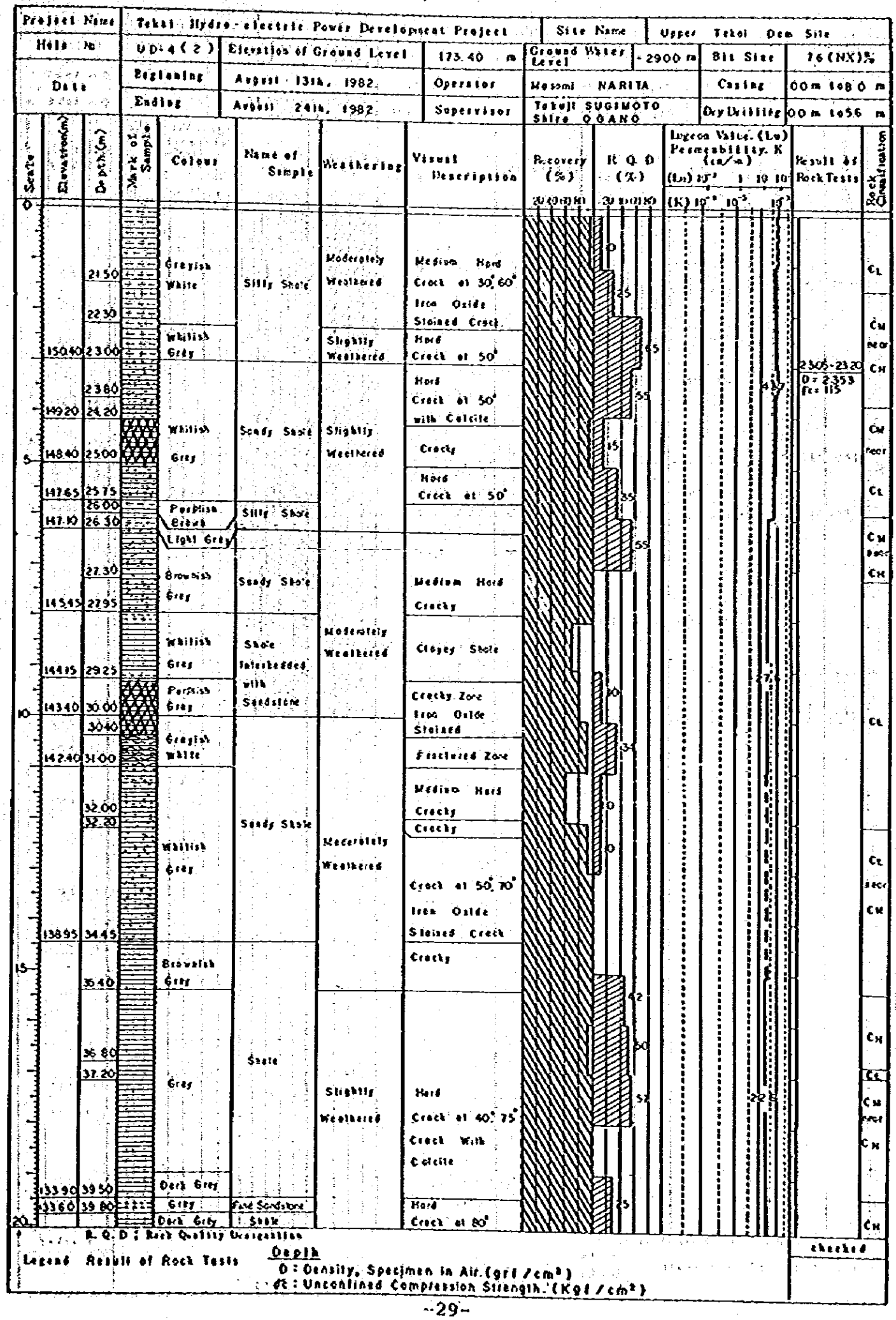


Fig. 4.1.1.20 Geological Log of Borehole

Project Name	Tokuyama Hydro-electric Power Development Project			Site Name	Upper Tokuyama Dam Site		
Hole No.	UD-4 (3)	Elevation of Ground Level	173.40 m	Ground Water Level	-2900 m	Bit Size	76 (NX) mm
Date	Beginning	August 13th, 1982	Operator	Masami NARITA		Casing	0.0 m to 68.0 m
	Ending	August 24th, 1982	Supervisor	Takeji SUGIMOTO, Shiro OGANO		Dry Drilling	0.0 m to 165.6 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R.Q.D (%)	Lugeon Value (Lu) / Permeability (cm/s) (In) (K)	Result of Rock Tests	Rock Classification
0	131.95	41.45		Dark Grey	Shale	Slightly Weathered	Hard Crack at 60°		54			
	128.50	44.90		Dark Grey	Sandy Shale	Fresh	Hard Crack at 70°		75			CH
5	127.40	46.00		Dark Grey	Shale	Slightly Weathered	Crack at 60° Iron Oxide Stained Crack		78			
10	123.40	50.00		Dark Grey	Sandy Shale	Fresh	Hard Crack at 45°, 60°		65			
15												
20												

R.Q.D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf/cm³)
σc : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.21 Geological Log of Borehole

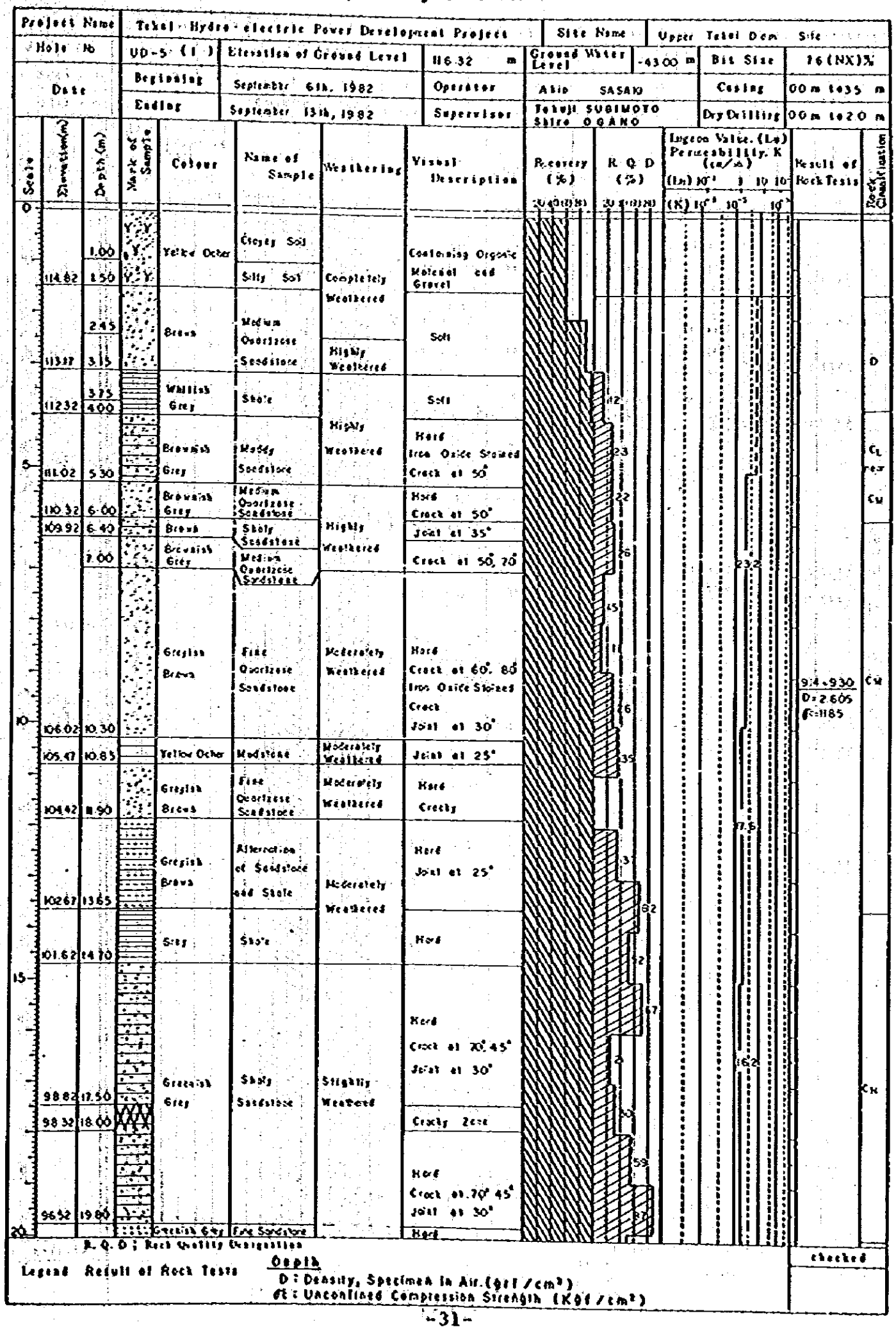


Fig. 4.11.22 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokai Dam Site		
Hole No	UD-5 (2)	Elevation of Ground Level	116.32 m	Ground Water Level	-43.00 m	Bit Size	76 (NX) mm
Date	Beginning	September 6th, 1982	Operator	Akio SASAKI		Casing	0.00 m to 35 m
	Ending	September 13th, 1982	Supervisor	Tetsuji SUGIMOTO, Shiro OGANO		Dry Drilling	0.00 m to 20 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/s)	Result of Rock Tests	Rock Classification
0								20 40 60 80 100	20 40 60 80 100	(Lu) 10^{1} 1 10^{-1} 10^{-2} (K) 10^{-4} 10^{-5} 10^{-6}		
	94.92	20.80		Greenish Grey	Fine Sandstone	Slightly Weathered	Hard Joint at 30°		69			C_M
	94.12	21.40										
		20.00					Hard					
	94.12	22.20		Greenish Grey	Alternation of Sandstone and Shale	Slightly Weathered	Crack at 50°					C_L
	93.27	23.05					Crocky Zone					
	92.17	24.15		Greenish Grey	Fine Sandstone	Moderately Weathered	Hard Crack at 60°, 40°, Crocky		5			C_M
5							Very Hard Crack at 40°, 60°		45			C_L
	89.17	27.10		Greenish Grey	Sandy Shale	Slightly Weathered			37			
	88.67	27.65					Crocky Zone					
		28.50			Interbedded with Fine Sandstone		Very Hard Crack at 40°, 60° 29.1m Crack at 60°		5			C_H
10	85.32	30.00							50			
	85.72	30.60		Brownish Grey	Fine Sandstone				2			
		31.10					Hard Crack at 35°					
		32.20		Brownish Grey	Alternation of Sandstone and Shale	Slightly Weathered	32.1m Crack at 60°		7			C_M
	83.47	32.85										
				Greenish Grey	Sandy Shale		Iron Oxide Stained Crack		28			
	82.27	34.05		Grey	Shaly Sandstone	Slightly Weathered	Joint at 35°		31			
	81.56	34.76										
15	81.32	35.00		Brownish Grey	Fine Sandstone		Crack at 70° with Iron Oxide		24			
				Greenish Grey								C_H
		35.90		Grey	Shaly Sandstone	Slightly Weathered	Very Hard Crack at 50° to 60° Joint at 30° Iron Oxide Stained Crack and joint		52			
		37.00										
	78.57	37.75		Dark Grey					35			
	78.42	37.90		Brown	Coarse Sandstone				26			
	77.57	38.75		Grey	Shaly Sandstone				31			
	77.32	39.00		Greenish Grey	Clayey Shale		Fractured Zone					D
				Brownish Grey	Coarse Quartzose Sandstone		39.1m Iron Oxide Stained Crack		25			C_M
20	76.32	40.00										

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests Depth
... D : Density, Specimen in Air. (gf / cm³)
q_c : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig.4.11.23 Geological Log of Borehole

Project Name	Tokai Hydro electric Power Development Project			Site Name	Upper Tokai 04m Site		
Hole No	UO-5 (3)	Elevation of Ground Level	116.32 m	Ground Water Level	-43.00 m	Bit Size	76 (NX)mm
Date	Beginning	September 6th, 1982	Operator	Akio SASAKI		Casing	00m to 35 m
	Ending	September 13th, 1982	Supervisor	Tokuji SUGIMOTO Shire OGANO		Dry Drilling	00m to 20 m

Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) Permeability K (cm/sec) (Lu) 10^{-1} 1 10 10 (K) 10^{-6} 10^{-5} 10^{-4}	Result of Rock Tests	Rock Classification
0		40.30						20 40 60 80 100	20 40 60 80 100			CM
	71.37	44.95		Light Grey	Medium Quartzose Sandstone	Fresh	Very Hard Clean Crack at 80° Iron Oxide Stained Crack at 30°		27 62 30 47 74	0.9 0.8		CH
5		45.50		Black	Shale		Hard Joint at 30°					
		46.00		Light Grey	Medium Quartzose Sandstone Interbedded with Black Shale		Hard Joint at 30° Crack at 60, 70°		63 17			CM CH
	69.52	46.80		Light Grey								
		47.90		Grey	Fine Sandstone	Fresh			89	2.7		CH
	68.12	48.20										
	67.32	49.00		Black	Shale		Very Hard Crack of 40 and 50° with Calcite		30			CM
	66.62	49.70		Grey	Fine Sandstone		Joint at 50°		0			B
10	66.32	50.00		Black	Shale							
15												
20												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

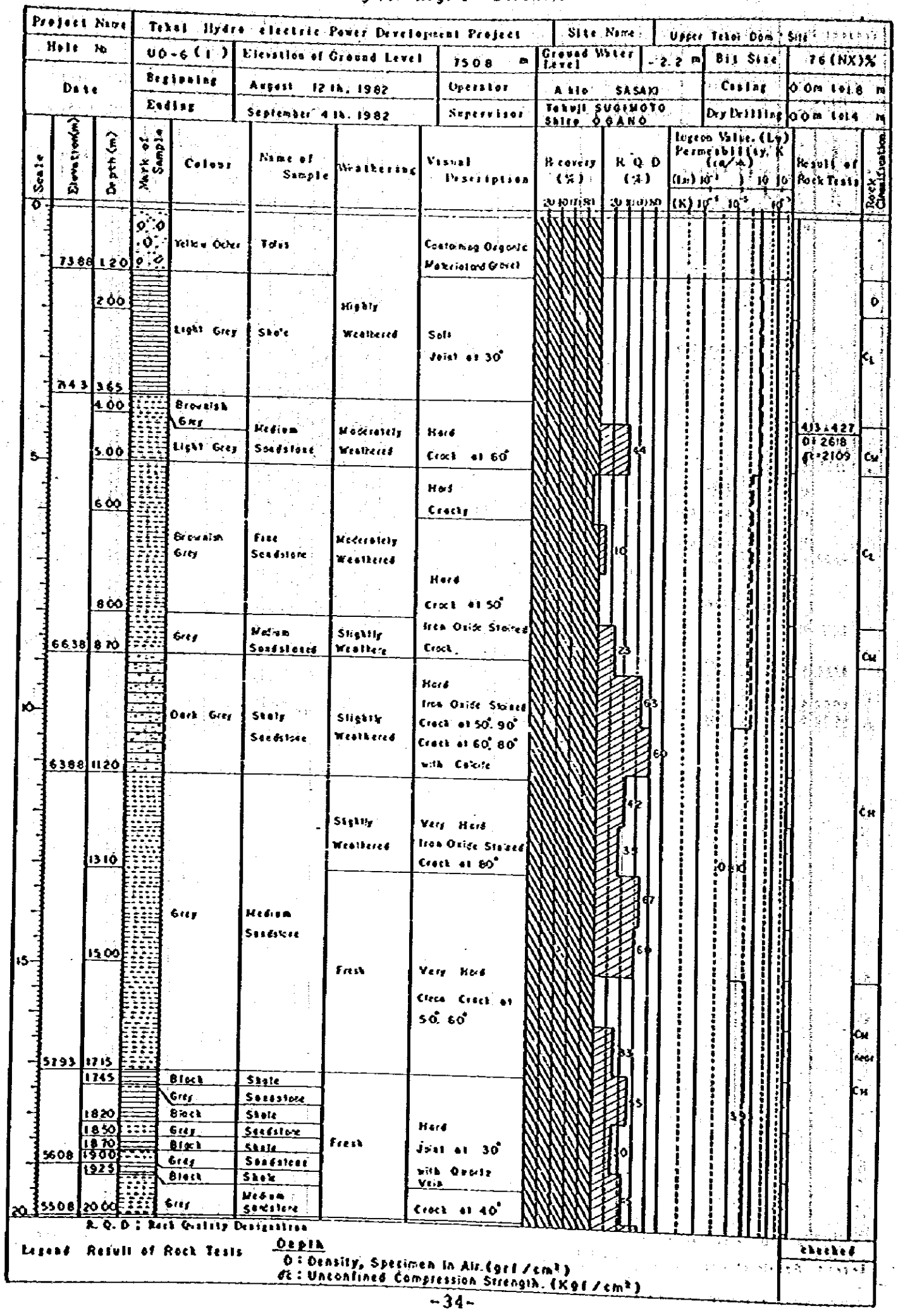
Depth

D : Density, Specimen in Air. (gf/cm³)

qu : Unconfined Compression Strength (Kgf/cm²)

checked

Fig. 4.11.24 Geological Log of Borehole



R.Q.D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air (gr/cm³)

qc : Unconfined Compression Strength (Kgf/cm²)

Fig. 4. 11. 25. Geological Log of Borehole

Project Name	Takai Hydro Electric Power Development Project			Site Name	Upper Teto Dam Site
Hole No	UD-6 (2)	Elevation of Ground Level	75.08 m	Ground Water Level	-2.2 m
Date	Beginning	August 12th, 1982	Operator	Asio SASAKI	
	Ending	September 4th, 1982	Supervisor	Takeji SUGIMOTO, Shiro OGANO	
Bit Size	76 (NX) mm				
Casing	0.0 m to 1.8 m				
Dry Drilling	0.0 m to 1.4 m				

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Legeon Value (Lv) Permeability K (cm/sec) (In) 10^{-1} 1 10 10^{2} (K) 10^{-6} 10^{-5} 10^{-4}	Result of Rock Tests	Rock Classification
0		20.50		Black	Shale	Fresh	Hard					CM
		20.80		Black Grey	M. Sandstone, Shale		Joint at 35°					CH
	53.98	21.10		Black Grey	M. Sandstone, Shale							
							Cracky Zone					
	53.08	22.00				Fresh	Crack with Calcite					CL
		22.65										
				Grey	Medium Sandstone	Very Fresh	Very Hard, Clean Crack at 40°, Joint at 30°					
	50.65	24.43										
		24.85		Dark Grey	Sandy Shale							
5		25.30		Dark Grey	Shale							CH
		25.60		Grey	Silty Sandstone							
	49.08	26.00		Grey	Fine Sandstone, Shale, Fine Sandstone	Very Fresh	Very Hard, Joint at 40°, with Quartz Vein					B
	47.83	27.25		Grey								
		27.63		Black	Shale							
		28.42		Grey	Medium Sandstone		Very Hard, Clean Crack at 50°, Joint at 30°					
		28.65		Black	Shale	Very Fresh						CH
		29.00		Grey	Medium Sandstone							
		29.95										
10					Shale							
				Grey	Medium Sandstone		Hard, Joint at 30°					B
	44.18	30.90										
	43.78	31.30		Black	Shale	Fresh						
				Grey	Fine Sandstone		Interbedded with Shale					CM
	43.08	32.00										
		32.30		Black	Shale		Cracky					
		32.55		Grey	Fine Sandstone							
		32.82				Fresh						
	42.08	33.00		Grey	Shale to Medium Sandstone		Hard					
	41.63	33.45										
15												CH
				Light Grey	Mudstone	Very Fresh	Hard, Crack at 50°, 70°					B
	37.53	37.55										
				Light Grey	Silty Shale	Very Fresh	Very Hard					B
20												

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf / cm³)
qt : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig. 4.11.26 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokai Dam Site
Hole No	UD-6 (3)	Elevation of Ground Level	1506 m	Ground Water Level	-2.2 m
Date	Beginning	August 12th, 1982	Operator	Akio SASAKI	
	Ending	September 4th 1982.	Supervisor	Tokuji SUGIMOTO, Shiro OGANO	

Bit Size: 76 (NX)mm
Casing: 0.0m to 16.8 m
Dry Drilling: 0.0m to 1.9 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{1} 1 10^{-1} 10^{-2} (K) 10^{-3} 10^{-5} 10^{-7}		
				Light Grey	Silty Shale	Very Fresh	Very Hard					
	31.38	43.70					43.1m Crack at 40° with Calcite					
				Dark Grey	Sandy Shale		Hard 44.8m Crack at 40° with Calcite					
5		45.00										
	28.58	46.50		Grey	Shaly Sandstone							
				Dark Grey	Sandy Shale	Very Fresh	Very Hard					
		49.40										
10		50.00		Grey	Fine Sandstone							
	24.28	50.80		Dark Grey	Sandy Shale							
				Grey	Shaly Sandstone		51.9m Crack at 60° with Calcite					
	21.08	54.00					53.9m Quartz Vein					
15				Light Grey	Mudstone							
	19.58	55.50										
				Grey	Silty Shale		56.1m Crack at 60°					
	18.08	57.00				Very Fresh						
							57.25m Crack at 35°					
				Dark Grey	Sandy Shale		59.2m Crack at 60° with Calcite.					
20												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gr/cm³)
qc : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.27 Geological Log of Borehole

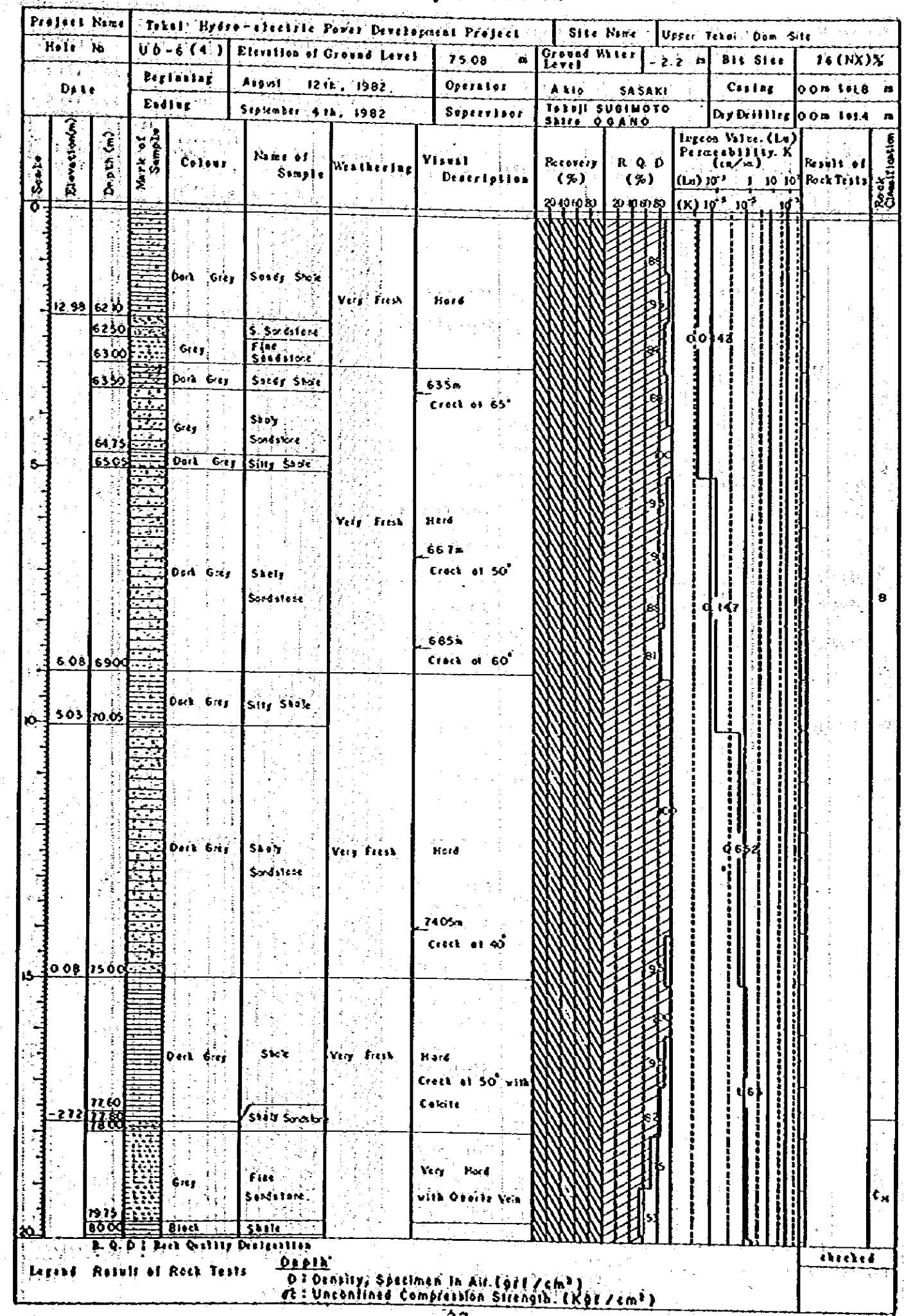


Fig.4.11.28 Geological Log of Borehole

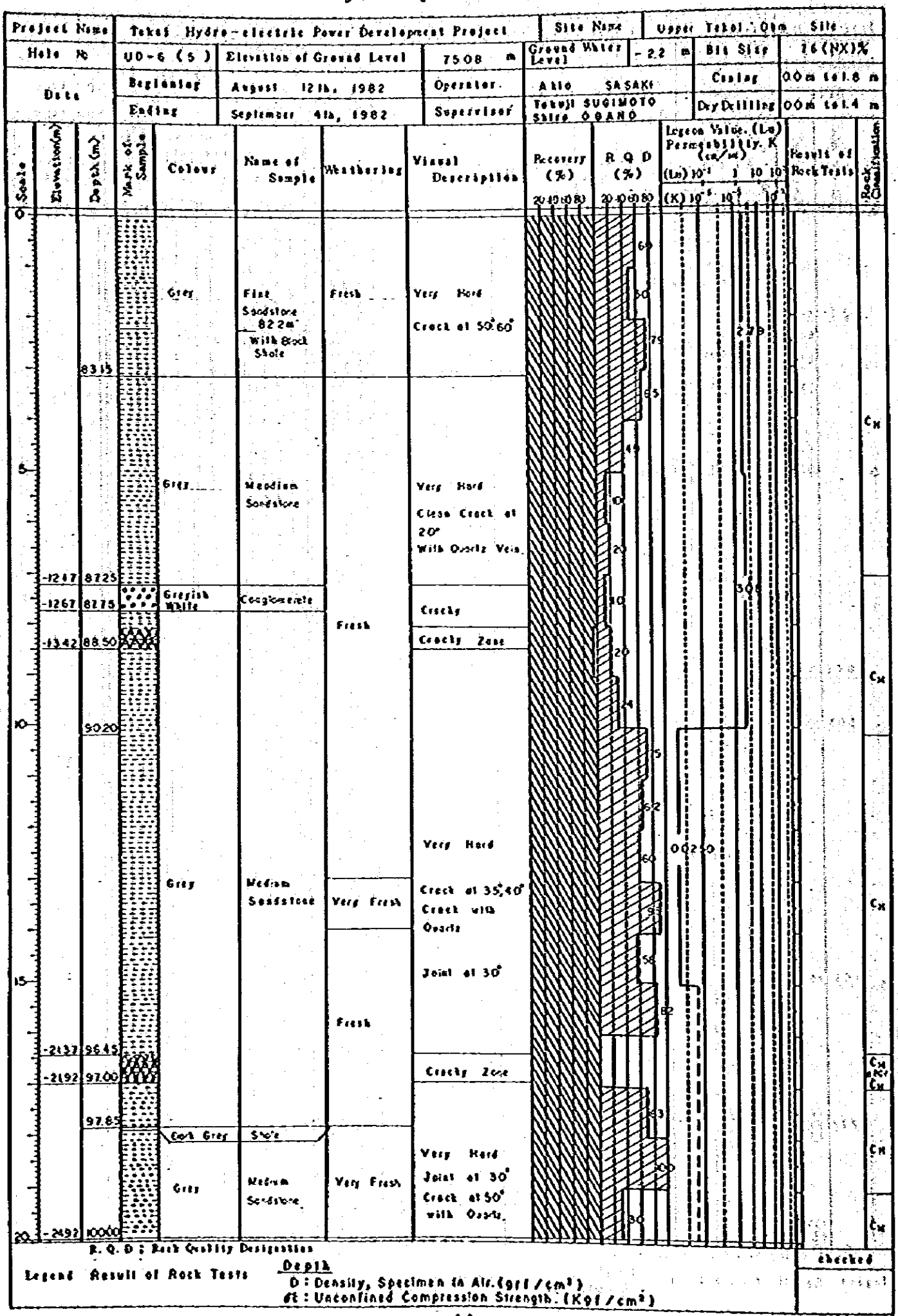
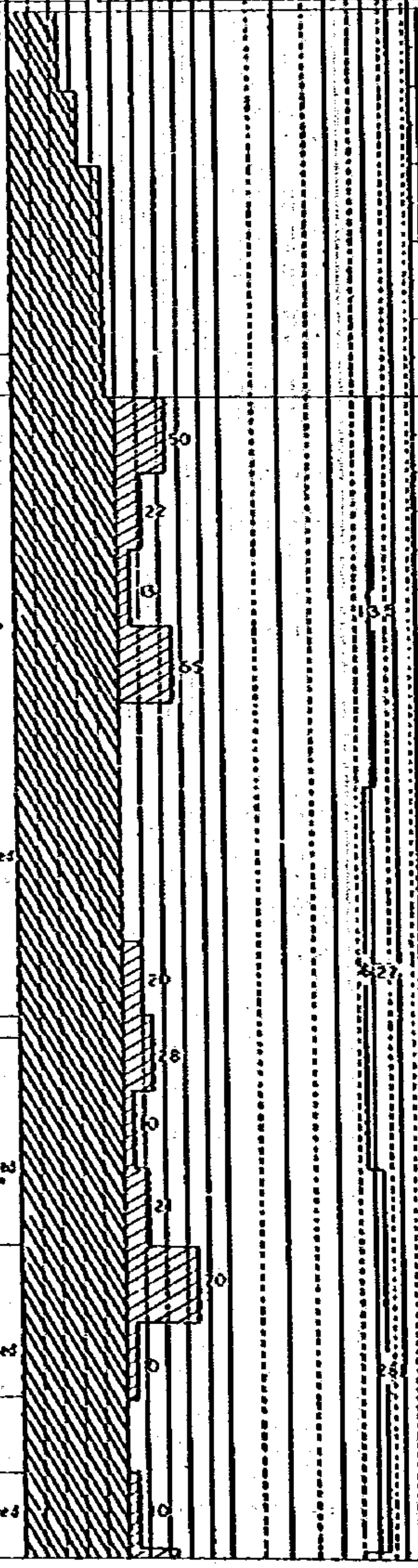


Fig. 4.11.29 Geological Log of Borehole

Project Name	Tekai Hydro electric Power Development Project	Site Name	Upper Tekai Dam Site		
Hole No	UD-7 (1)	Elevation of Ground Level	86.79 m	Ground Water Level	-12.0 m
Bit Size	76 (NX)%				
Date – Beginning	August 12th, 1982	Operator	Masatatsu NARITA	Casing	0.0m to 2.5 m
Date – Ending	September 10th, 1982	Supervisor	Takeji SUGIMOTO, Shiro OGANO	Dry Drilling	0.0m to 0.35 m

Elevation (m)	Depth (m)	Colour	Name of Sample	Weathering	Visual Description	Result of Rock Tests	Rock Classification
86.49	0.30		Soil		Containing Organic Material		
82.29	4.50	Yellowish Brown	Boulder of Quartzose Sandstone, Clayey Soil, Sand		Talus Deposits		
81.79	5.00	Reddish Brown	Clay		Talus Deposits		
	5.70	Brownish Grey	Coarse Quartzose Sandstone			5.23~5.33 D: 2.459 σt: 580	
	8.00	Greyish Brown	7.4m with Clayey Shale		Medium Hard, Crack at 40,70°, Joint at 30°		CL
	10.00	Brown to Brownish White	Medium Quartzose Sandstone	Highly Weathered	Crack at 60°		CM
	12.00	Greyish Brown			Joint at 30°, Iron Oxide Stained Crack with Clay		CL
	13.00	Brownish White					
	13.30	Brown	Coarse Quartzose Sandstone		Soil		
	15.00	Greyish White		Moderately Weathered	Medium Hard, Iron Oxide Stained Crack at 40,70°, Joint at 35°		CM
	16.00						
	18.00	Light Grey to Brownish Grey	Medium Quartzose Sandstone	Slightly Weathered	Hard, Iron Oxide Stained Crack at 60°		CH
	19.00				Hard, Cracky		CM
	20.00	Whitish Brown		Moderately Weathered	Hard, Iron Oxide Stained Crack at 60°		



R.Q.D ; Rock Quality Designation

Legend Result of Rock Tests: Depth; D : Density, Specimen in Air. (grf/cm³); σt : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.30 Geological Log of Borehole

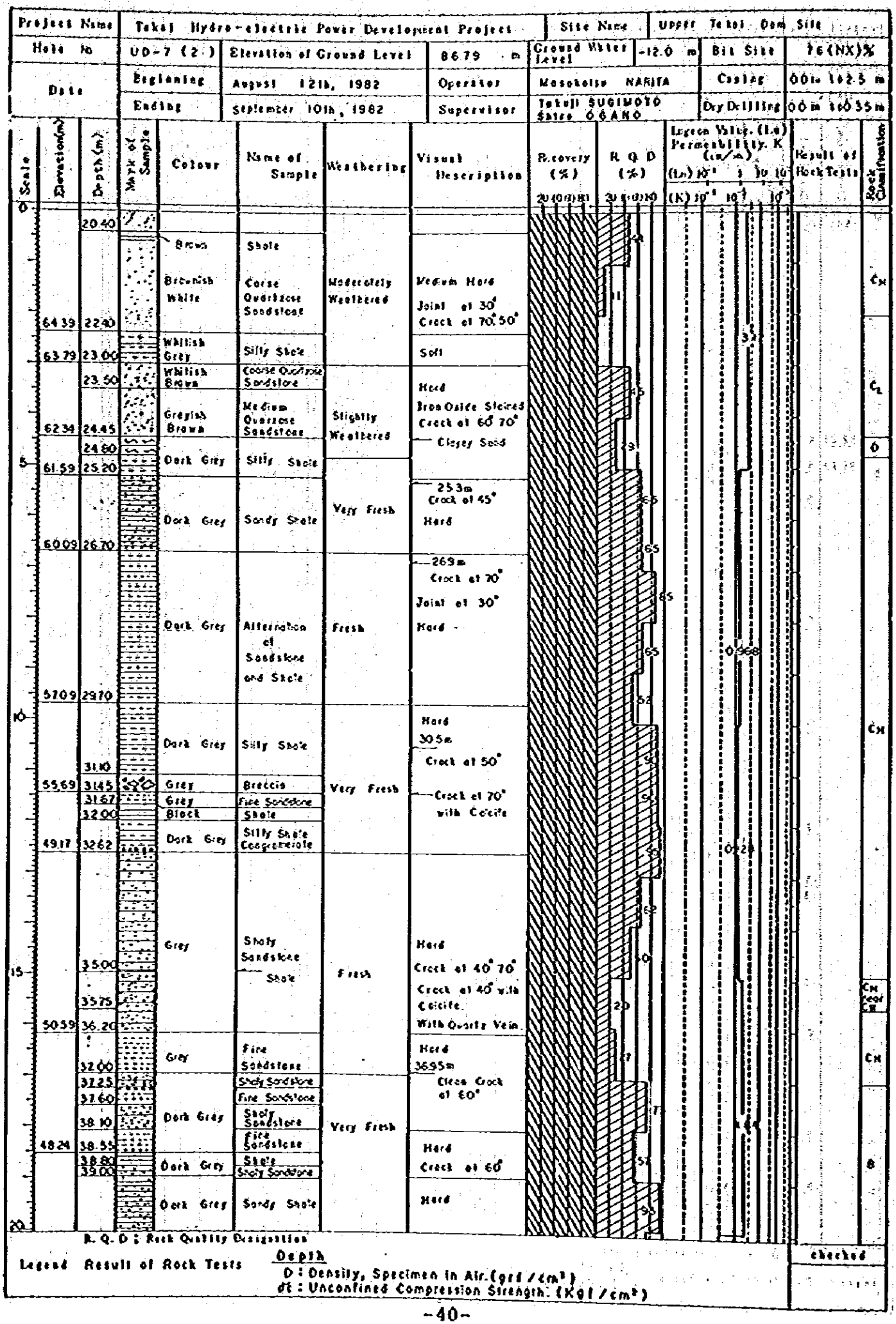


Fig. 4.11.31 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokai Dam Site		
Hole No	UD-7 (3)	Elevation of Ground Level	86.79 m	Ground Water Level	-12.0 m	Bit Size	76 (NX)mm
Date	Beginning	August 12th, 1982	Operator	Masahiro NARITA		Casing	0.0m to 2.5 m
	Ending	September 10th, 1982	Supervisor	Tokuji SUGIMOTO, Shiro OGANO		Dry Drilling	0.0m to 40.35 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0		40.85		Dark Grey	Sandy Shale	Very Fresh	40.35m Joint at 30° with Calcite.					
		41.00			Fine Sandstone		41m Joint at 30° with Calcite					
		42.80		Dark Grey	Shale		Hard					
		43.00			Shaly Sandstone							
	43.19	43.60		Dark Grey	Shale							
	42.29	44.50			Silty Shale							
5		44.95		Grey	Fine Sandstone							
		45.20			With Silty Shale	Very Fresh	Hard, Open Crack at 50°					
				Grey	Fine Sandstone		Interbedded with Shale, Joint at 30°					B
	38.64	48.15										
10				Dark Grey	Sandy Shale	Very Fresh	Hard, Joint at 30°					
	35.79	51.00										
		51.80		Dark Grey	Shaly Sandstone	Fresh	51.55m Crack at 50° with Calcite. Hard					
	33.99	52.80		Grey								
	33.59	53.20		Dark Grey	Sandy Shale							
	32.64	54.15		Whitish Grey	Medium Quartzose Sandstone	Fresh	Very Hard with Black Shale					
	32.39	54.40		Black	Shale							
15				Grey	Medium Sandstone	Fresh	Hard, Joint at 30°, 57.9m Crack at 50° with Quartz					
		58.00										
		58.70										
	27.74	59.05										
				Dark Grey	Shale	Fresh	Hard, Crack at 60°, 45°					Cm
20		59.85		Grey	Fine Sandstone							

R.Q.D ; Rock Quality Designation

checked

Legend Result of Rock Tests

Depth
D : Density, Specimen in Air. (gf / cm³)
σc : Unconfined Compression Strength. (Kgf / cm²)

Fig. 4.11.32 Geological Log of Borehole

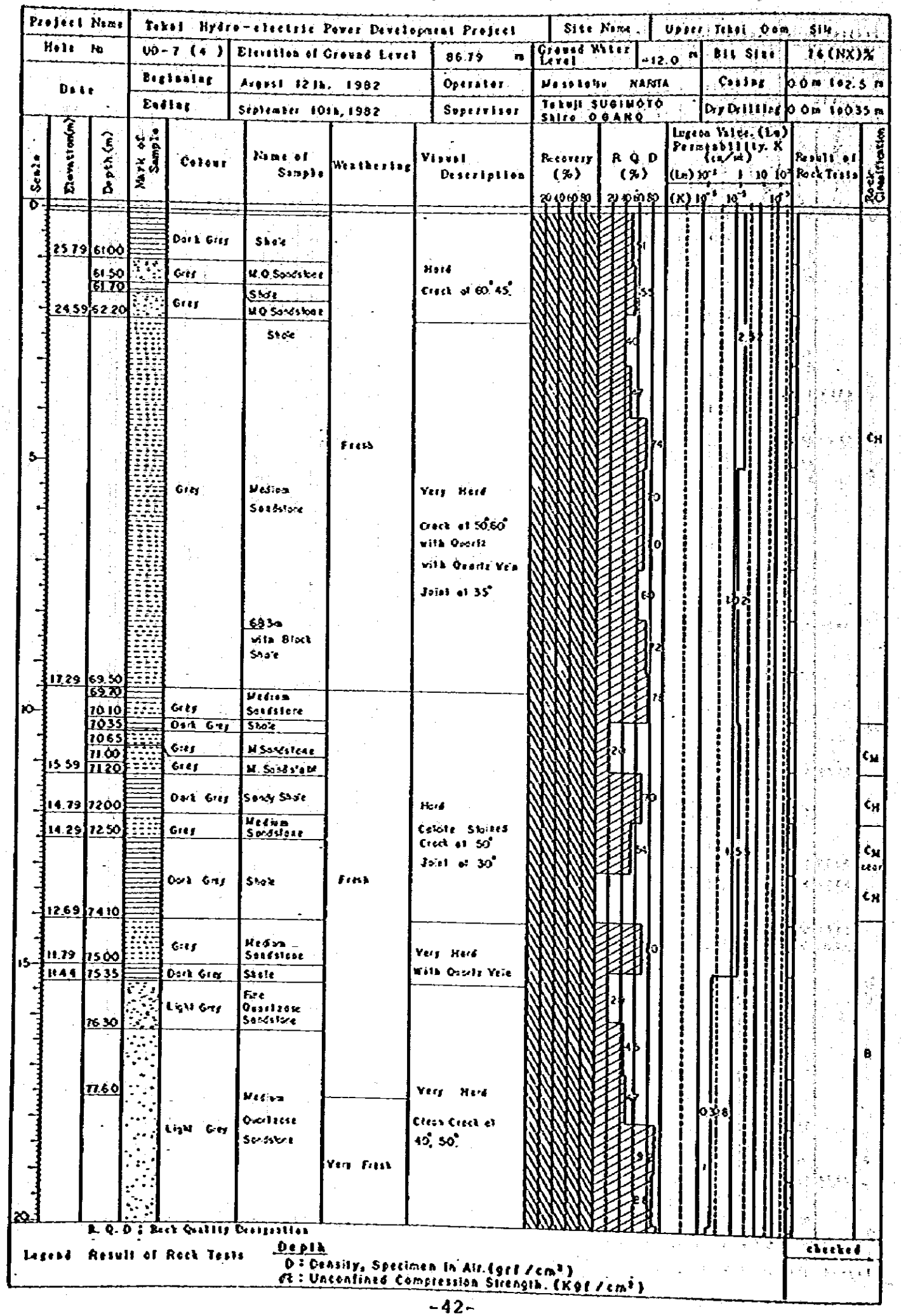


Fig. 4.11.33 Geological Log of Borehole

Project Name	Tekel Hydro-electric Power Development Project			Site Name	Upper Tekel Dam Site		
Hole No.	U0-7(S)	Elevation of Ground Level	86.79 m	Ground Water Level	-120 m	Bit Size	76 (NX) mm
Date	Beginning	August 12th, 1982	Operator	Masatoshi NARITA		Casing	0.0m to 2.5 m
	Ending	September 10th, 1982	Supervisor	Teruji SUGIMOTO, Shiro OHANO		Dry Drilling	0.0m to 10.35 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0							80.2m Clean Crack at 40°					
							Clean Crack at 75°					
				Light Grey	Medium Quartzose Sandstone	Very Fresh				0.176		B
							84.4m Clean Crack at 40°					
							Joint at 65°					
		87.65										
		88.40		White Grey	Coarse Quartzose Sandstone					0.192		C_H
				Light Grey	Medium Quartzose Sandstone		83.45m Crack at 50°					B
	-3.01	89.80										
	-3.21	90.00		Dark Grey	Shale							
10				Light Grey	Medium Quartzose Sandstone	Very Fresh	Very Hard					
		91.35										
		92.00		Dark Grey			With Shale			0.314		
				Grey								
	-6.06	92.65										
	-6.46	93.05		Dark Grey	Shale							
		93.25			Shaly Sandstone		93.75m Clean Crack at 60°					
15				Grey	Medium Quartzose Sandstone	Very Fresh	Very Hard					B
							95.7m With Shale					
	-9.25	96.25										
	-9.81	96.60		Black	Shale							
	-10.46	97.25		Dark Grey	Shaly Sandstone		97.25m Joint at 70°					
				Grey	Medium Sandstone					0.160		
	-11.96	98.15				Very Fresh	Hard					
	-11.76	98.55		Dark Grey	Shale / M. Sandstone							
				Dark Grey	Sandy Shale		99.05m Joint at 70°					
	-12.91	99.70										
20	-13.21	100.00		Grey	M. Sandstone		With Slick Patch					

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gr / cm³)
σc : Unconfined Compression Strength. (Kg / cm²)

checked

Fig. 4.11.34 Geological Log of Borehole

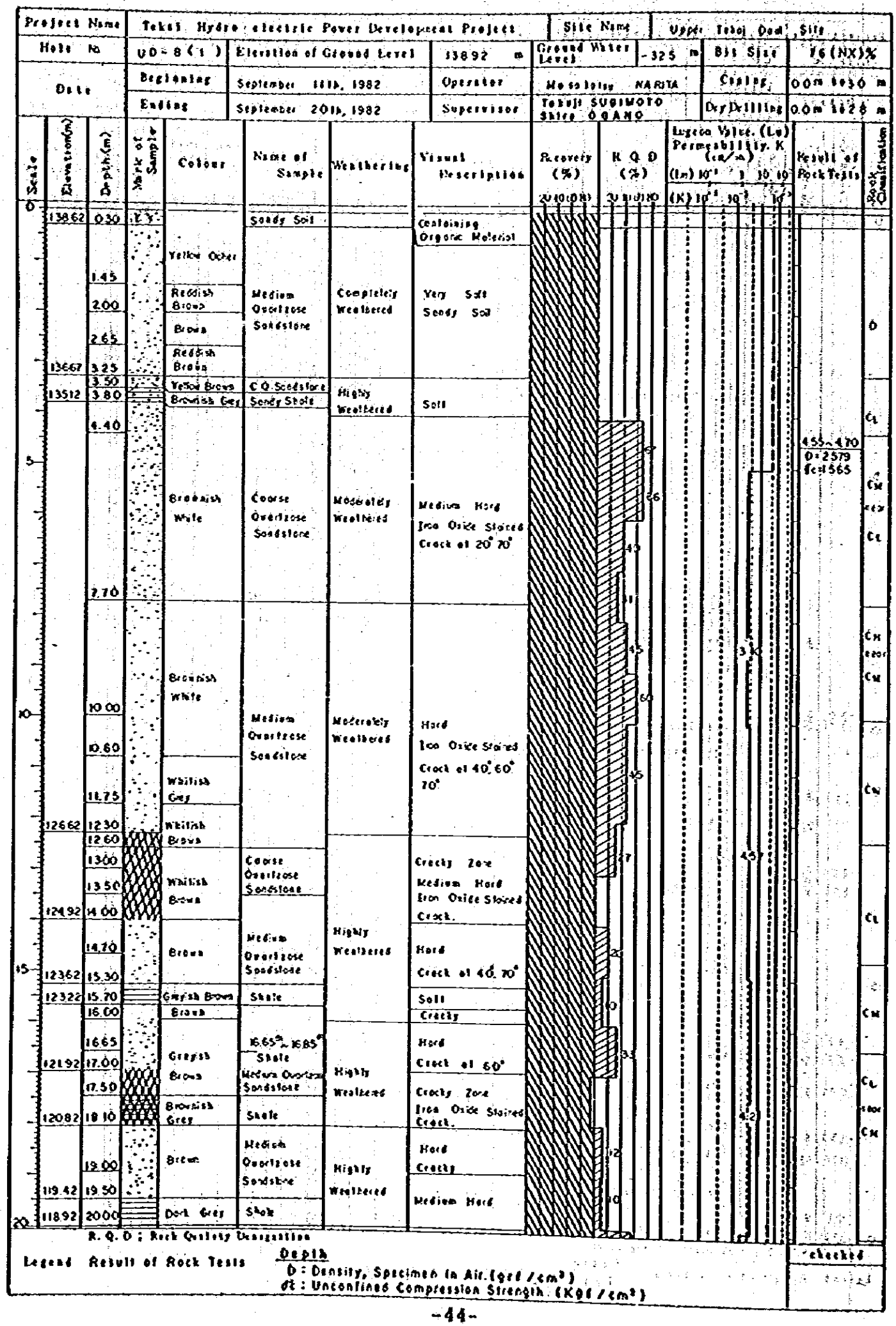


Fig.4.11.35 Geological Log of Borehole

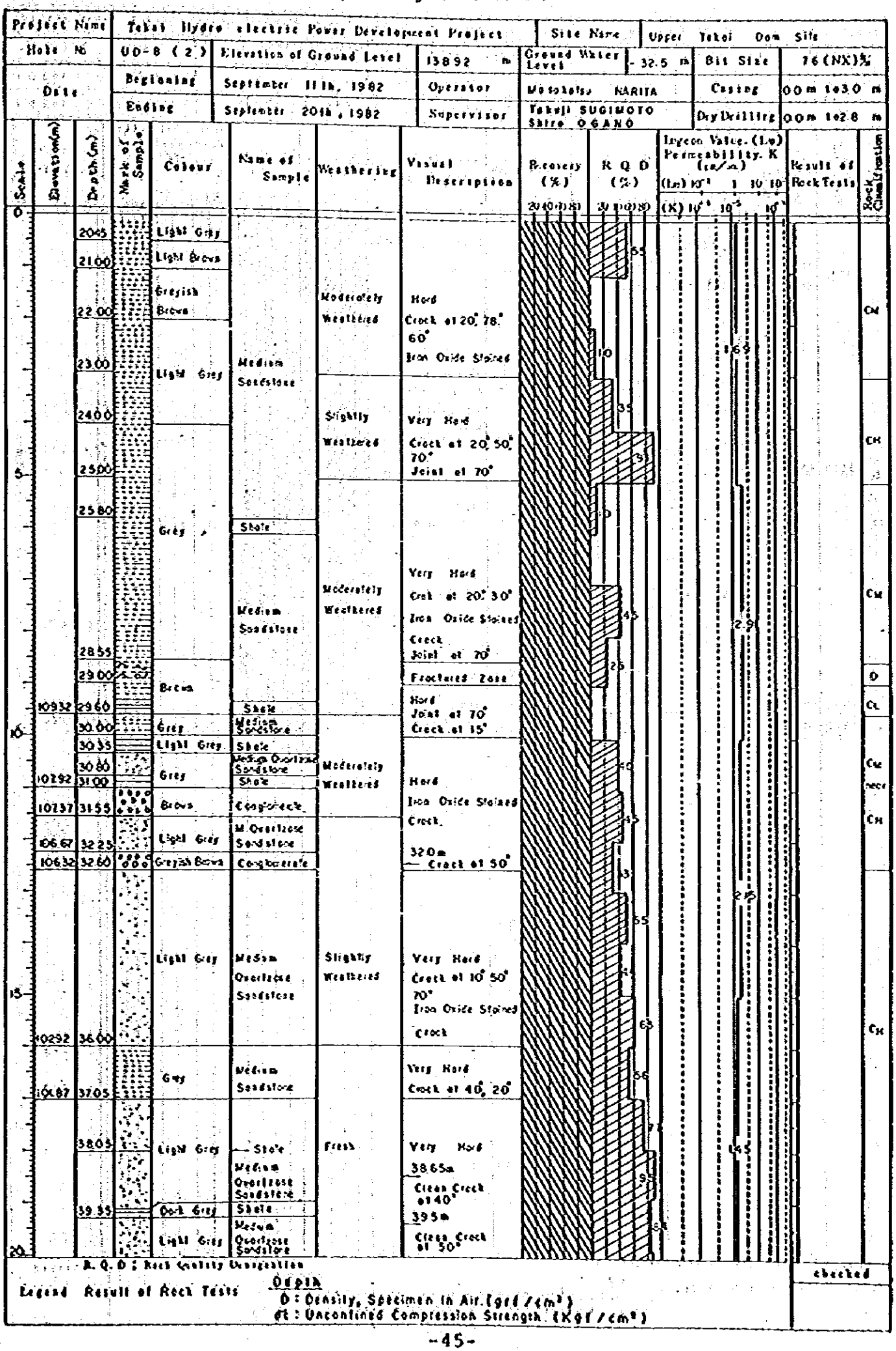
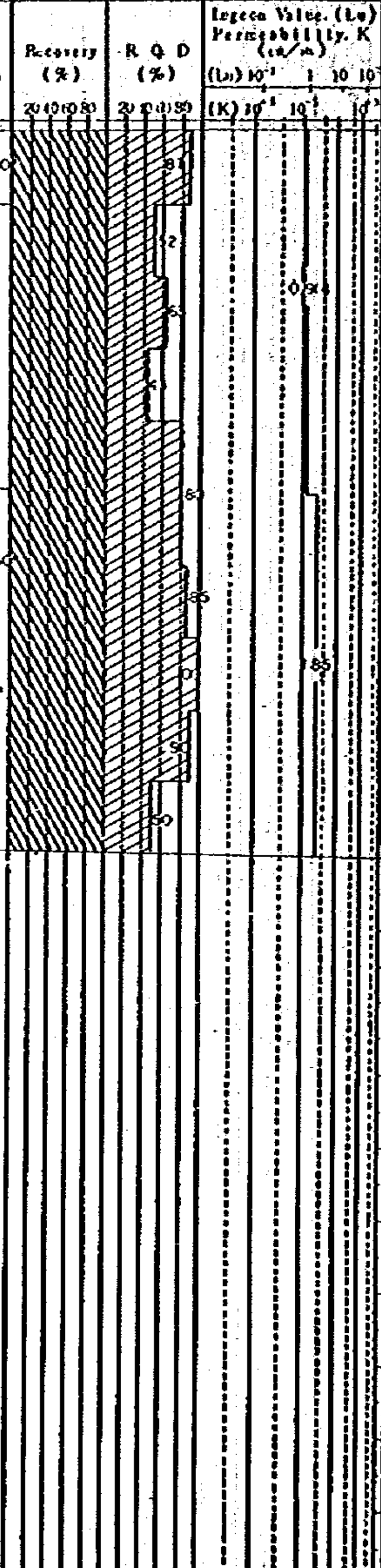


Fig. 4.11.36 Geological Log of Borehole

Project Name	Tekai Hydro-electric Power Development Project		Site Name	Upper Tekai Dam Site	
Hole No	UD-8 (3)	Elevation of Ground Level 138.92 m	Ground Water Level -32.5 m	Bit Size	76 (NX)%
Date	Beginning	September 11th, 1982	Operator: Masakatsu NARITA	Casing	0.0m to 3.0 m
	Ending	September 20th, 1982	Supervisor: Tetsuji SUGIMOTO, Shiro OGANO	Dry Drilling	0.0m to 2.8 m

Elevation (m)	Depth (m)	Colour	Name of Sample	Weathering	Visual Description	Rock Classification
97.72	41.05	Light Grey	Medium Quartzose Sandstone	Fresh	Open Crack at 40°,60°	
	41.20	Dark Grey	Shale			
93.92	45.00	Grey	Fine Sandstone	Slightly Weathered to Fresh	Very Hard Crack at 50°,70° Iron Oxide Stained Crack Joint at 60°	C_H
69.27	49.65	Light Grey	Fine Quartzose Sandstone	Fresh	45.8m Clean Crack at 40°,60° Very Hard Clean Crack at 20°,70°	
88.92	50.00	Grey	Medium Sandstone		49.7m Joint at 70°	



Legend
R. Q. D : Rock Quality Designation
Result of Rock Tests: Depth
D : Density, Specimen in Air (gf/cm³)
σ_t : Unconfined Compression Strength (Kgf/cm²)

checked

Fig. 4.11.37 Geological Log of Borehole

Project Name	Tekal Hydro-electric Power Development Project			Site Name	Upper Tekai Dam Site		
Hole No	UD-9 ( )	Elevation of Ground Level	72.00 m	Ground Water Level	10.2 m	Bit Size	76 (NX)mm
Date	Beginning	September 14th, 1982	Operator	Akio SASAKI		Casing	0.00m to 5.5 m
	Ending	September 15th, 1982	Supervisor	Tekaji SUGIMOTO, Shiro OGANO		Dry Drilling	0.00m to 48 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R.Q.D (%)	Legeon Value (Lu) Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{-6} 1 10 10^{2} (K) 10^{-6} 10^{-5} 10^{-3}		
	68.00	4.00		Brown	River Bed Deposits		Mainly Coarse Quartz Sand					
	67.20	4.80		Brown								
5		7.20		Dark Grey	Silty Shale	Moderately Weathered to Slightly Weathered	Hard Iron Oxide Stained Crack at 10°,80° Crack at 50°,70° with Calcite.		0			CM near CL
	63.85	8.15		Dark Grey	Sandy Shale				12			
		8.90		Grey	Shaly Sandstone	Fresh	Hard Clean Crack at 50° Crack at 75° with Calcite		65			CH
		9.00		Dark Grey	Sandy Shale				100			
10	62.00	10.00		Grey	Shaly Sandstone						970~985 D=2.676 σc=563	
		10.60		Dark Grey	Sandy Shale				0			
		10.85		Grey	Shaly Sandstone		Cracky Zone Medium Hard With Clay and Calcite.		23			CM
	60.00	12.00		Dark Grey	Silty Shale				25			
		13.45					Hard		35			
		13.80		Dark Grey	Shaly Sandstone		Clean Crack at 68°,80° Crack at 30°,60° with Calcite.		0			
15	57.00	15.00				Slightly Weathered						
				Dark Grey	Silty Shale		Fractured Zone Mainly Breccia Containing Clay					D
	55.60	16.40					16.90m Iron Oxide Stained Crack at 70°		20			CL
	54.90	17.10		Dark Grey	Shale		Hard Crack at 30°,50° with Clay Joint at 50° with Calcite.		0			CM near CH
	53.70	18.30		Grey	Shaly Sandstone				22			
20	52.20	19.80		Dark Grey	Sandy Shale							
	52.00	20.00										

R.Q.D ; Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air. (gf/cm³)
σt : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.38 Geological Log of Borehole

Project Name	Tokul Hydro-electric Power Development Project			Site Name	Upper Tokul Dam Site		
Hole No	UD-10 ( )	Elevation of Ground Level	96.12 m	Ground Water Level	-30 m	Bit Size	76 (NX) mm
Date	Beginning	September 23rd, 1982	Operator	Tokufumi KOBAYASHI		Casing	0.0m to 29 m
	Ending	September 25th, 1982	Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 18 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Legeon Value. (Lg) Permeability. K (cm/sec) (Lu) 10^{-1} 1 10 10^2 (K) 10^{-3} 10^{-5} 10^{-7}	Result of Rock Tests	Rock Classification
0	95.52	0.60		Yellowish Brown	Clayey Soil		Containing Organic Material					
		3.10		Reddish Brown	Medium Quartzose Sandstone	Completely Weathered	Very Soft Mainly Sand With Clay Including Breccia					D
	92.37	3.75										
		4.50		Whitish Brown			Crocky Soil Iron Oxide Stained					CL
5		5.00		Whitish Grey			Crock With Clay					
		6.00		Brownish Grey			Crocky Medium Hard Crack at 50°, 70° With Brownish Clay		2			CH
		7.00		Brownish White			Joint at 40° With Whitish Greyish Clay		31			
				Brown	Medium Quartzose Sandstone	Highly Weathered	Medium Hard Iron Oxide Stained Crack at 30°, 60°, 80° with Brownish Clay		20 47 60			
10							10.70m Crack at 20° with Brownish Clay Iron Oxide Stained Crack at 50°, 60°, 70° 80° Joint at 30°		33 45 0			
		11.95		Greyish Purple	11.95m to 12.00m Slate							
	83.32	12.80		Brown	M. Quartzose Sandstone							
	83.12	13.00		Grey	Shale							
		13.40		Brown	Coarse Quartzose Sandstone		Hard Iron Oxide Stained Crack at 30°, 60°		65			CM
		14.00		Brownish Grey								
15				Greyish White			Hard Iron Oxide Stained Crack at 30°, 40°, 50°, 60° Crack at 30°, 50° with Whitish Clay		47 66		15.60 ~ 15.75 D = 2.599 σ_c = 1089	CH
		16.00										
		17.00			Medium Quartzose Sandstone	Moderately Weathered			58			
				Purplish White			Hard Iron Oxide Stained Crack at 30°, 40°, 60°, 70°		5 41			
		19.00										
20	76.12	20.00		Greyish White					36			

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air (gf / cm³)
σ_t : Unconfined Compression Strength. (Kgf / cm²)

checked

Fig.4.11.39 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project		Site Name	Upper Tokoi Dam Site	
Hole No.	UD-11 (1)	Elevation of Ground Level	126.96 m	Ground Water Level	-4.2 m
Date	Beginning	September 12th, 1982	Operator	Tokutomi KOBAYASHI	
	Ending	September 21st, 1982	Supervisor	Yukuji SUGIMOTO, Shiro OGANO	

Bit Size	76 (NX) mm
Casing	0.00 m to 13.75 m
Dry Drilling	0.00 m to 13.30 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R.Q.D (%)	Degree Value (Lu) Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0	126.60	0.30		Brown	Clayey Soil							
		1.30		Yellowish Brown			Containing Organic Material Including Breccia					
		2.60		Reddish Brown	Talus Deposits							
		2.80			Clay							
		3.65		Yellowish Brown	Talus Deposits	Completely Weathered	Very Soft Mainly Clayey Soil and Breccia of Completely Weathered Fine Sandstone					
	119.96	7.00										
	119.46	7.50		Light Brown	Clay							
		8.35			Talus Deposits							
				Reddish Brown	Clay		Very Soft Clayey Soil Including Breccia					
	117.71	9.25			Talus Deposits							
10		10.65		Light Brown								
		12.00		Whitish Grey	Clayey Shale	Completely Weathered	Very Soft					
	113.61	13.35		Greyish Brown								
		14.00		Light Grey	Clayey Mudstone		Clayey and Very Cracky, With Clay					
		14.75		Brownish Grey		Completely Weathered						
15	111.48	15.55		Light Grey	Mudstone		Iron Oxide Stained Crack at 60° Inclined					
		16.00		Greyish Brown								
		18.00		Brownish Grey	Shale	Highly Weathered	Soft Iron Oxide Stained Joint at 25° Cracky Iron Oxide Stained Crack					
		19.00		Brownish Grey	18.8m Fine Sandstone Sandy Shale	Highly Weathered	Very Cracky, Soft Iron Oxide Stained Crack With Clay Joint at 30°					
20	107.21	19.75		Light Grey	Sandstone							
		20.00										

R.Q.D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air (gf/cm³)

qu : Unconfined Compression Strength (Kgf/cm²)

checked

Fig. 4.11.40 Geological Log of Borehole

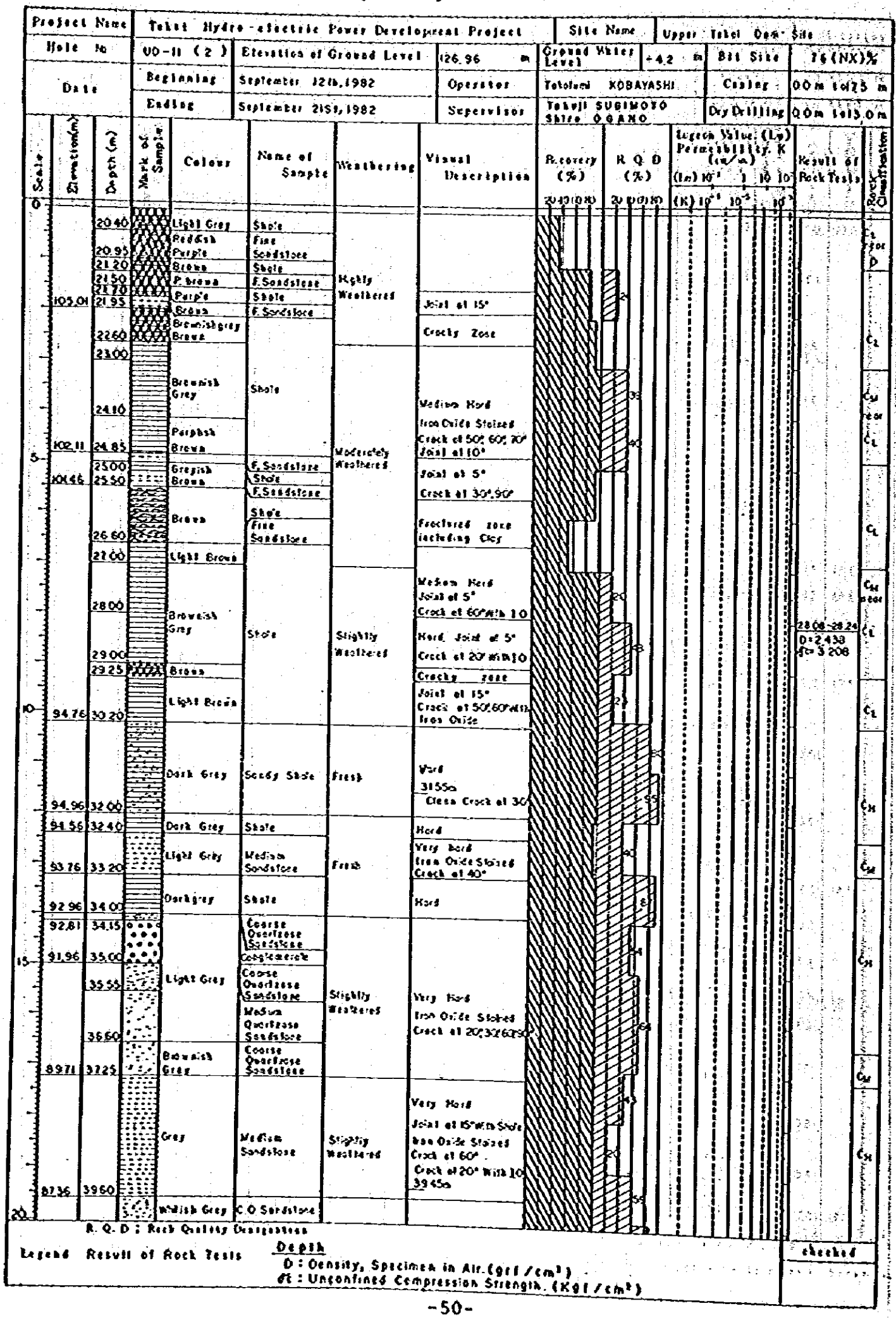


Fig.4.11.41 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokoi Dam Site
Hole No	UD-11 (3)	Elevation of Ground Level	126.96 m	Ground Water Level	-4.2 m	Bit Size	76 (NX) mm
Date	Beginning	September 12th, 1982	Operator	Tokofumi KOBAYASHI	Casing	0.00 m to 12.5 m
	Ending	September 21st, 1982	Supervisor	Takeji SUGIMOTO, Shiro OGANO	Dry Drilling	0.00 m to 130 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0		4.10		Whitish Grey	Medium Quartzose Sandstone	Slightly Weathered to Fresh	4.04m Iron Oxide Stained Crack at 60° Very Hard	20 40 60 80	20 40 60 80	(Lu) 10^{1} 1 10 10^{2} (K) 10^{-6} 10^{-5} 10^{-4}		
		4.10										
		4.25		Black	Shale							
		4.70		Grey	H.G Sandstone		Hard Joint at 20°					
	84.81	4.215		Black	Shale	Slightly Weathered						
				Whitish grey	Coarse Quartzose Sandstone		Very Hard Iron Oxide Stained Crack at 30°, 85°					
		4.500										
				Grey	Medium Sandstone	Slightly Weathered	4.86m Clean Crack at 25° Very Hard Iron Oxide Stained Crack at 20°, 10°				4.525-4.540 D=2.615 fc=2.030	CH
5		4.590										
		4.605		Black	Shale							
		4.700		Grey	Medium Sandstone	Fresh	Very Hard Clean Crack at 50° With Quartz Vein					
		4.760					Very Hard Iron Oxide Stained Crack at 40°					
		4.785		Black	Shale		Crocky With Iron Oxide					
		4.800		Grey	Medium Sandstone	Slightly Weathered	Very Hard Joint at 25°					
	77.66	4.930					Hard Crocky With Iron Oxide					
10	76.96	5.000		Light Grey	Medium Quartzose Sandstone							CM
15												
20												

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests — Depth
D : Density, Specimen in Air (gf/cm³)
fc : Unconfined Compression Strength (Kgf/cm²)

checked

Fig.4.11.42 Geological Log of Borehole

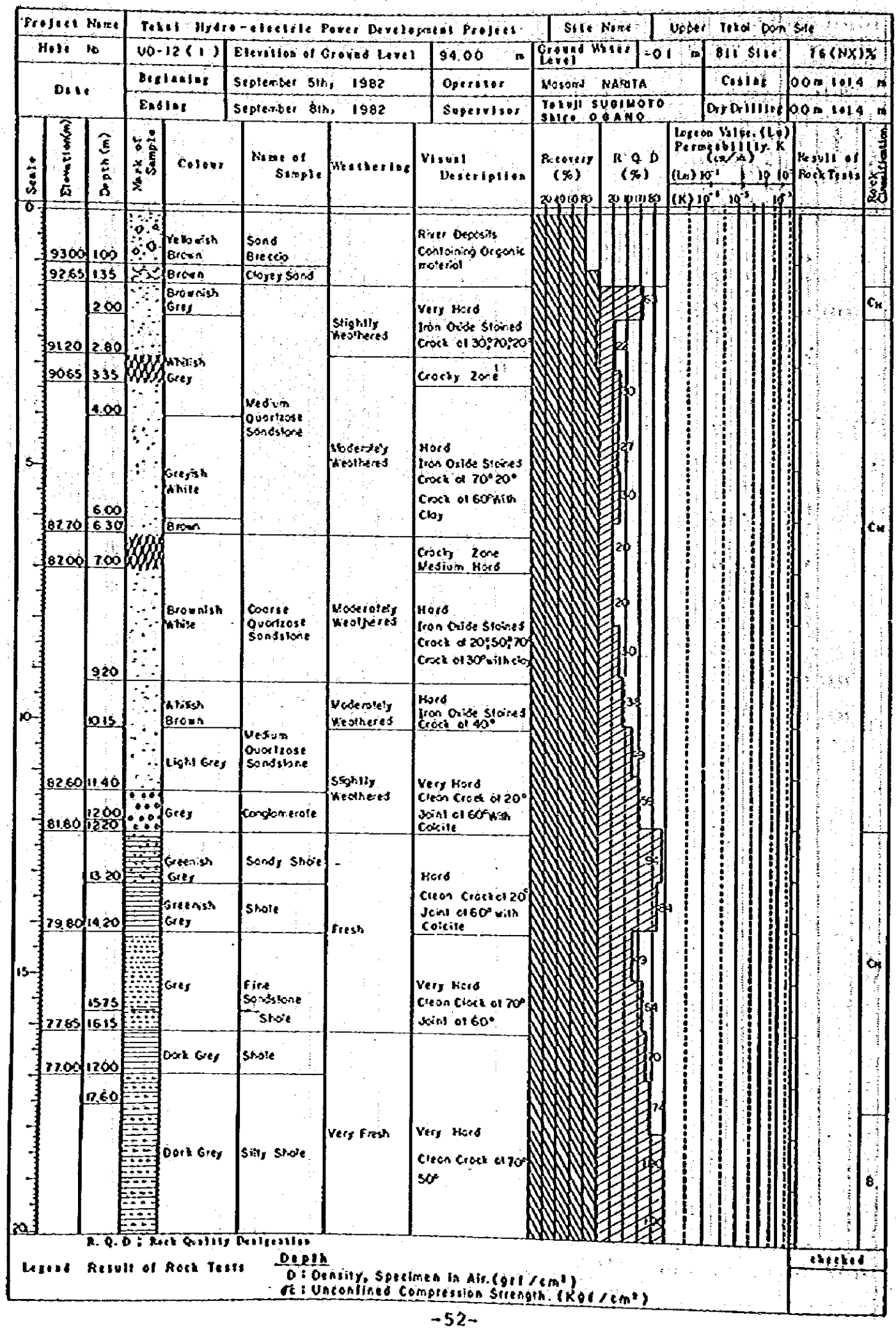


Fig. 4.11.43 Geological Log. of Borehole

Project Name	Tokuyama Hydro-electric Power Development Project			Site Name	Upper Tokuyama Dam Site		
Hole No.	UD-12 (2)	Elevation of Ground Level	94.00 m	Ground Water Level	-0.1 m	Bit Size	76 (NX) mm
Date	Beginning	September 5th, 1982	Operator	Masami NARITA		Casing	0.00 m to 14.4 m
	Ending	September 8th, 1982	Supervisor	Takeji SUGIMOTO, Shiro OGANO		Dry Drilling	0.00 m to 14.4 m

Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R.Q.D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0								20 40 60 80	20 40 60 80	(Lu) 10^{-1} 1 10 10^{2} (K) 10^{-6} 10^{-5} 10^{-4}		
	72.45	21.55		Dark grey	Silty Shale	Very Fresh	Very Hard Clean Crack at 70°,50°		91			
		22.05		Dark Grey	Sandy Shale	Slightly Weathered to Fresh	Very Hard Iron Oxide Stained Crack at 60°,50° Joint at 60°		83			Cx
		22.25		Grey	Fine Sandstone							
		22.65		Dark Grey	Sandy Shale				77			
	71.00	23.00		Grey	Fine Sandstone							
				Dark Grey	Silty Shale				58			B
	69.00	25.00				Very Fresh	Very Hard		100			
5	68.65	25.35		Grey	Fine Sandstone		25.35m Clean Crack at 15° Joint at 65°		90		25.35-25.55 D=2.639 σ_c= 613	
				Dark Grey	Shaly Sandstone				100			
		26.95			26.90m to 27.00m Shale							
	66.20	27.80							82			Cx
				Grey	Fine Sandstone	Fresh	Very Hard Iron Oxide Stained Crack at 30°,90°,40°,50°		75			
	65.20	28.80										
		29.00					29.30m Clean Crack at 50°					
				Dark Grey	Shaly Sandstone				98			
10	64.00	30.00										
15												
20												

R.Q.D : Rock Quality Designation

checked

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (gf/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

Fig.4.11.44 Geological Log of Borehole

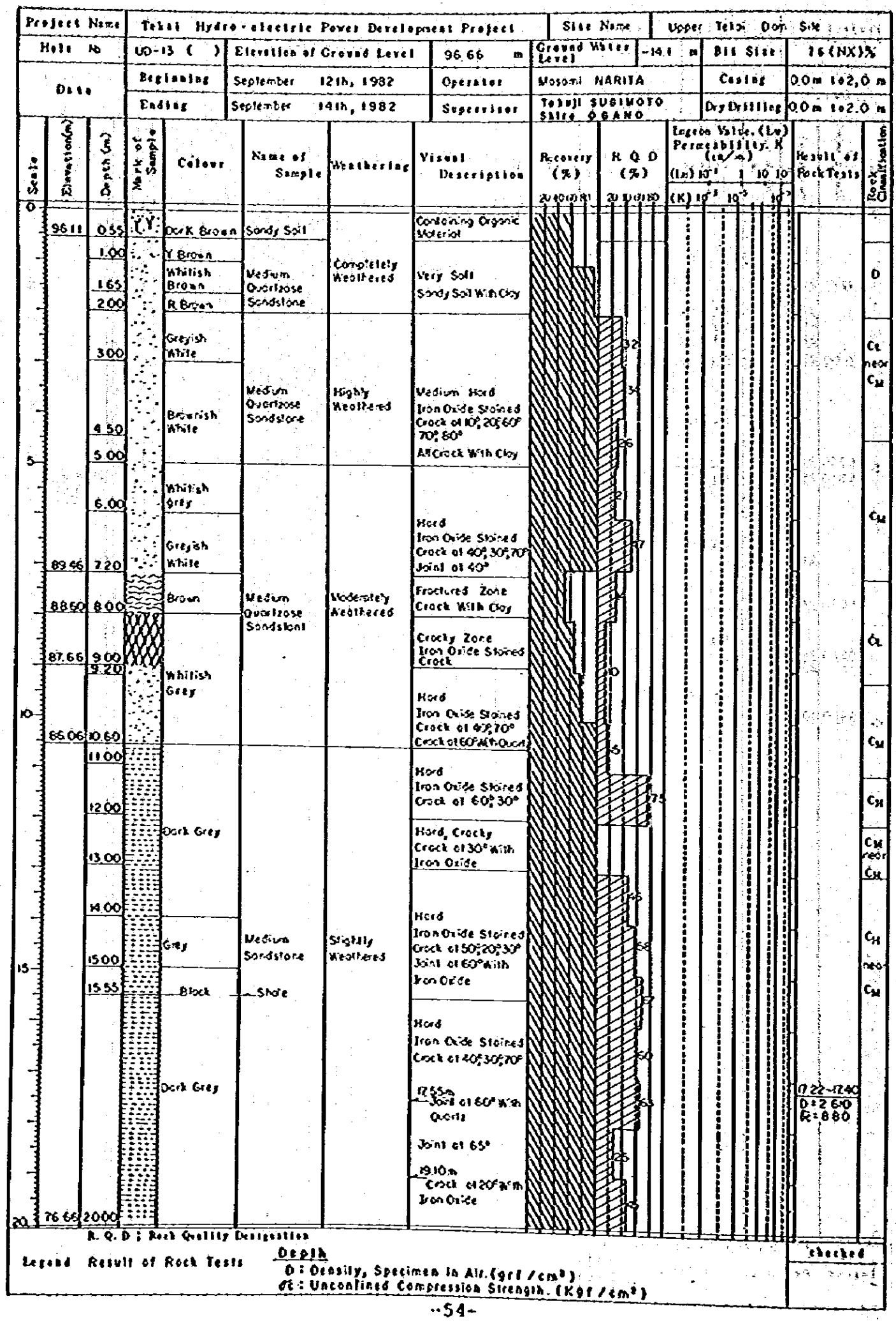


Fig. 4.11.45 Geological Log of Borehole

Project Name	Tokai Hydro-electric Power Development Project			Site Name	Upper Tokai Dam Site		
Hole No	UD-14 ( )	Elevation of Ground Level	109.68 m	Ground Water Level	m	Bit Size	76 (NX) mm
Date	Beginning	September 1ST, 1982	Operator	Masami HARITA		Casing	0.00m to 0.8 m
	Ending	September 4th, 1982	Supervisor	Tokuji SUGIMOTO, Shiro OGANO		Dry Drilling	0.00m to 0.8 m

Scale	Elevation(m)	Depth(m)	Mark of Sampler	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) / Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
0	108.93	0.75		Brown	Talus Deposits		Mainly Breccia With Sand, Clay					
		1.00		Brown								D
	108.33	1.35		Greyish Brown	Siltstone							
		1.75			Fine Sandstone							
				Brown	Shale							
	107.33	2.35			Fine Sandstone	Highly Weathered	Medium Hard Iron Oxide Stained Crack at 30°,40°,50°,60°					C_L
	106.63	3.05		Greyish Brown	Siltstone		All Crack with Brownish Clay					
	105.88	3.80		Light Grey	Fine Sandstone							Cw
		4.00		Greyish White								
					Siltstone	Moderately Weathered	Hard Crack at 50° with Clay Iron Oxide Stained Crack at 30° 60°					
5	102.48	5.00		Light Grey								
		5.25		Brown								
		6.00		Grey	Fine Sandstone	Slightly Weathered	Hard Iron Oxide Stained Crack at 30°, 20° Crack at 10° with Iron Oxide				6.30-6.47 D=2.660 Sc= 456	Cw
	102.48	7.20		Dark Grey								
	101.68	8.00		Dark Grey	Shale		Hard, Iron Oxide Stained Crack at 50°					Cw
				Dark Grey	Sandy Shale		Hard Joint at 20° Iron Oxide Stained Crack at 35°, 70°, 80° Crack at 70° With Iron Oxide Joint at 25°					
10	100.53	9.15										
				Dark Grey	Shale							
	97.93	11.75					11.75m Joint at 40°					
		12.05		Grey	Fine Sandstone							
				Light Grey	Shale	Slightly Weathered	Medium Hard Cracky, Iron Oxide Stained Crack					Cw near
				Light Grey	Fine Sandstone							C_L
		13.35										
		14.00		Brown			Fractured Zone Soft Mainly Breccia with Clay Iron Oxide Stained Crack					D
				Brownish Grey								
		15.00			Medium Sandstone							
15				Grey								
	93.93	15.75					Cracky, With Calcite Joint at 50					
		16.25		Dark Grey	Shale							
				Grey	Fine Sandstone		Cracky					
		16.85										
	93.43	17.20		Dark Grey	Shale		Clean Crack at 40°, 50°, 60° With Quartz Vein					
		18.00										
				Grey	Fine Sandstone	Slightly Weathered to Fresh	Cracky Clean Crack at 20° 50°, 60					C_M
	90.28	19.40										
20	89.68	19.95		Dark Grey	Shale							

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air (gf / cm³)

qu : Unconfined Compression Strength (Kgf / cm²)

checked