

Fig. 5.8.1

Geological Log. of Borehole

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Lower Tekel Dam Site							
Hole No	L-1 (1)	Elevation of Ground Level	105.29 m	Ground Water Level	-39.6 m	Bit Size	76 (NX)X							
Date	Beginning	July 27th, 1981	Operator	Chen Ming KHON	Casing	m to m								
	Ending	August 14th, 1981	Supervisor	Takaji 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. (%)	Logon Value. (Ln) Permeability. K (cm ² /s)			Result of Rock Tests	Rock Classification
										(K) 10 ⁻²	10 ⁻³	10 ⁻⁴		
	104.19	1.10		Reddish brown	Top soil		Very soft clayey soil containing organic material							
		2.80		Gray										
		3.30		Reddish brown			Clayey Very soft							
		4.60		Light gray	Shale	Completely weathered								
		7.00		Reddish brown			Clayey Very strong weathered Very soft							
	93.99	9.50		Gray or brown	Sandstone	Highly weathered	Very cracky Iron oxide stained crack with clay in crack zone							
	93.79	11.50		Light gray	Sandstone	Moderately weathered	Very cracky Iron oxide stained crack cracky zone							CL
	90.59	14.70		Reddish purple	Shale	Moderately weathered	Clayey and cracky Cracky zone							
	87.69	17.60		Reddish purple	Shale	Slightly weathered	Crackly Crack with clay						605-16.18 D = 2.538 σ _c = 208	CM
	85.20	20.00		Light gray	Sandstone	Slightly weathered	Very cracky Crack with clay Iron oxide stained crack							CL near CM

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

D_{sp} : Density, Specimen in Air. (grf/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.2

Geological Log. of Borehole

Project Name				Total Hydro-elastic Power Development Project			Site Name		Lower Total Dam site					
Hole No.	L-1 (2)			Elevation of Ground Level	106.29 m			Ground Water Level	-39.5 m					
Date	Beginning	July 17th, 1981		Operator	Chen Ming KHON			Coring	m to m					
	Ending	August 14th, 1981		Supervisor	Tobeji SUGIMOTO Shice 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. (%)	Logan Value (L _v) Permeability (K) (cm ² /sec)			Result of Rock Tests	Rock Classification
								20 (0.08)	20 (0.08)	(L _v) 10 ¹	10 ²	10 ³		
	83.95	24.30		Light gray	Medium sandstone	Slightly weathered	Cracky Iron oxide stained crack						2050-20.74 0.257 0c-1168	CL CM
				Light gray	Medium sandstone	Slightly weathered	Cracky Very hard							CM
	79.29	29.00		Light gray	Medium sandstone	Slightly weathered	Very hard							CM
	78.29	30.00		Light gray	Medium sandstone	Slightly weathered	Very hard							CM
				Whitish gray	Medium quartzite sandstone	Fresh	Very hard							CM
	69.39	35.00		Gray to brown	Cracky shale		Fractured zone mainly clay							O
	68.59	36.70		Red	Shale	Fresh	Hard							CM
	68.39	36.90		Light yellow	Medium sandstone	Slightly weathered	Cracky zone							CL
		38.6		Gray			Cracky							CM
		38.8		Light gray			Cracky							CM

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

O : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.3

Geological Log. of Borehole

Project Name		Tatal Hydro-electric Power Development Project			Site Name		Lower Tatal Dam Site								
Hole No	L-1 (3)		Elevation of Ground Level	105.29 m	Ground Water Level	-39.6 m	Bit Size	16(NX)%"							
Date	Beginning	July 17th, 1981		Operator	Chen Ming KHOON		Geology	m to m							
	Ending	August 14th, 1981		Supervisor	Tetsuji SUGIMOTO Sairei 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. (%)	Logcon Value. (Ln) Permeability, K (cm/m)			Result of Rock Tests	Rock Classification	
	20(0:08)							20(0:08)	(Ln) 10 ⁵	1	10	10 ⁶			
										(K) 10 ⁵	10 ²	10 ³			
45		41.00	X	Light grey	Quartzose sandstone	Slightly weathered	Cracky Hard Cracky zone Crack with clay	44	44						CN
		41.10													
45		43.00	X	Brown Gray	Muddy shale		Fossil clay Fractured zone	42	42						CN
		44.10													
45		44.50	X	Brown Gray	Muddy shale		Fossil clay Fractured zone	42	42						CN
		46.50													
45		45.20	X	Reddish purple	Shale	Fresh	Hard	50	50						CN
		50.00													
50		55.29	X					40	40						CN
		60.00													

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

σ : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.4

Geological Log. of Borehole

Project Name				Taket Hydro-electric Power Development Project		Site Name		Lower Taket Dam Site						
Hole No		C-2 (1)		Elevation of Ground Level		65.13 m		Ground Water Level						
Date		Beginning		October 2nd, 1961		Operator		Cooling						
		Ending		October 10th, 1961		Supervisor		Dry Drilling						
						Taketji SUGIMOTO		m to m						
						Shiro OGANO		m to m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logan Value (L _v) Permeability K (cm ² /s)			Result of Rock Tests	Check Classification
										(L _v) ¹	10 ¹	10 ²		
	51.63	3.30		Brownish gray	River Deposits		Boulder and sand	20(0)80	20(0)80	(K) 10 ¹	10 ²			
	47.83	7.30		Gray	Sandstone	Slightly weathered	Very cracky non indurated crack including shale patch							CM
	46.13	9.00		Gray	Sandstone	Fresh	Cracky Hard							CM
	42.93	12.20		Light gray	Overconsolidated Sandstone	Fresh	Cracky Hard interbedded with shale layer						0.24-0.31 D = 2.617 σ _c = 2902	CM
	41.53	13.60		Gray	Sandstone	Fresh	Hard							CM
	38.33	16.80		Gray	Sandstone	Fresh	Cracky including shale patch							CM
	38.03	17.10		Black	Shale		Medium hard							CL
	36.73	18.40		Gray	Sandstone	Fresh	Hard							CM
				Whitish gray	Overconsolidated Sandstone	Fresh	Cracky Hard							CM

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.5

Geological Log of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Lower Tekoi Dam Site							
Hole No	L-2 (2)	Elevation of Ground Level	55.13 m	Ground Water Level	-1.4 m	Bit Size	76(NX)%							
Date	Beginning	October 2nd, 1981	Operator				Casing	m to m						
	Ending	October 10th, 1981	Supervisor	Takeshi SUGIMOTO Shigeo 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 (%)	Logan Value, (Ln) Penetration, K (kg/cm ²)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Ln) 10 ¹ 1 10 10 ²	(K) 10 ⁴ 10 ⁵ 10 ⁶			
	31.13	24.00		Whitish grey	Quartzose sandstone	Fresh	Cracky		24				CM	
				Light green to reddish purple	Shale	Fresh	Cracky		30				CL	
	26.73	28.40		Reddish purple	Shale	Fresh	Very hard		100				B	
				Light blue	Quartzose sandstone	Fresh	Very hard		100				B	
	24.43	30.70							60				CH	
	21.93	33.20		Grey	Sandstone	Fresh	Very hard including shale patch		50				CH	
				Dark grey	Shaly sandstone	Fresh	Very hard		100				B	
	15.33	38.90							80				CH	
	15.13	40.00		Dark grey	Shaly sandstone	Fresh	Hard		34				CH	
					Shale		Fractured zone clayey						D	

A. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

ρ : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.6

Geological Log. of Borehole

Project Name		Total Hydro-electric Power Development Project			Site Name	Lower	Total	Dem	Site				
Hole No	L-3 (1)		Elevation of Ground Level	72.83 m		Ground Water Level	416.5 m		Bit Size	16 (HX)%			
Date	Beginning	August 16th, 1981		Operator	Cheu Ming KHOON		Casing	m to m					
	Ending	September 22nd, 1981		Supervisor	Tetsuji SUJIMOTO 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)	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Lu) 10 ¹ 10 ² 10 ³	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	72.33	0.50		Dark gray	Sandy silt		Containing organic material						
	71.83	1.00		Light gray	Sandstone	Highly weathered	Very craky						D
				Light gray	Sandstone	Moderately weathered	Craky Iron oxide stained crack						CL
	69.33	3.50		Light gray	Sandstone	Slightly weathered	Craky Iron oxide stained crack						CL
	67.43	5.40		Light gray	Sandstone	Moderately weathered	Very craky Iron oxide stained crack						CL
	65.73	7.10		Light gray	Quartzose Sandstone	Fresh	Very hard						CH
	63.13	9.70		Light gray	Quartzose Sandstone	Highly weathered	Very craky Iron oxide stained crack						CL
	60.83	12.00		Light gray	Quartzose Sandstone	Slightly weathered	Very hard However, cracks are weathered at brown colour.					2.80-13.00 D= 2.895 (C= 85)	CH
	57.83	15.00		Light gray and brown	Quartzose sandstone		Craky with Crack with clay including shale patch						CL
	56.53	16.30		Light gray to blue	Quartzose sandstone	Fresh	Very Hard						CH

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.7

Geological Log of Borehole

Project Name		Tetoi Hydro-electric Power Development Project			Site Name	Lower Tetoi Dam Site								
Hole No	L-3 (2)	Elevation of Ground Level		72.83 m	Ground Water Level	-10.5 m	Bit Size	76 (NX) %						
Date	Beginning	August 16th, 1981	Operator	Chen Ming KHOON	Casing	m to m								
	Ending	September 22nd, 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 (%)	Logan Value. (L _v) Permeability. K (m ² /m)			Result of Rock Tests	Rock Classification
								20 10 0 80	20 0 0 80	(L _v) 10 ¹ 10 ² 10 ³				
	51.83	21.00		Light grey to blue	Quartzose sandstone	Fresh	Very hard							
	48.23	24.60		Light grey	Sandstone	Fresh to slightly weathered	Very hard including shale patch							CH
	47.63	25.20		Grey	Shaly sandstone		Crack and soft							CL
	45.83	27.00		Grey	Sandstone		Hard interbedded with shale layer							CM
	45.53	27.30		Dark grey			Fractured zone							D
	42.03	30.80		Dark grey	Shaly sandstone	Fresh	Hard							CH
	40.83	32.00		Dark grey	Shaly sandstone	Fresh	Cracky							CM
	37.73	35.10		Grey			Fractured zone							D
	37.53	35.30		Grey	Sandstone	Fresh	Very hard							CH
	35.43	37.40		Black	Shale	Fresh	Hard							CH
	33.83	39.00												

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

ρ : Density, Specimen In Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.8

Geological Log of Borehole

Project Name		Takil Hydro-electric Power Development Project			Site Name		Lower Takil Dam Site							
Hole No	L-4 (1)	Elevation of Ground Level	98.31 m	Ground Water Level	-26.8m	Bit Size	76 (NX) %							
Date	Beginning	September 27th, 1981	Operator				Logging	m to m						
	Ending	October 6th, 1981	Supervisor	Tokuji SUBIMOTO 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 (%)	Logan Value (L _v) Permeability (K (cm ² /m))			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(L _v) 10 ⁻² 1 10 10 ²	(K) 10 ⁻⁸ 10 ⁻⁵ 10 ⁻²			
	97.01	1.30	F-1	Khaki	Sandy soil	Completely weathered	Top soil and sandy soil Containing organic material							
				Khaki to Brown	Sandstone	Completely weathered	Mainly sand including breccia and clay							D
	93.21	5.10		Light grey to Brown	Sandstone	Highly weathered	Soft and very cracky							CL
	90.61	7.70		Light grey	Sandstone	Moderately weathered	Cracky							D
	90.31	8.00		Light grey	Sandstone	Moderately weathered	Cracky							CM
				Light grey	Sandstone	Slightly weathered	Hard							CH
	87.01	11.30		Grey	Sandstone	Slightly weathered	Cracky							CM
	86.31	12.00		Grey to Reddish	Shale	Completely weathered	Fractured zone Very soft Mony clay							D
	85.01	13.30		Grey to Reddish	Shale	Slightly weathered	Soft							CL
	83.31	15.00		Grey to Reddish	Shaly Sandstone	Slightly weathered	Hard							CM
	81.31	17.00		Grey to Brown	Shaly sandstone	Slightly weathered	Cracky							CH
	78.31	20.00		Grey to Brown	Shaly sandstone	Slightly weathered	Cracky							CL

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air (g/cm³)

σ_c : Unconfined Compression Strength (Kgf/cm²)

Checked

Fig. 5.8.9

Geological Log. of Borehole

Project Name		Tehat Hydro-electric Power Development Project			Site Name	Level	Tehat Dam Site							
Hole No	L-4 (2)	Elevation of Ground Level	98.31 m <th>Ground Water Level</th> <td>-26.8 m <th>Bit Size</th> <td colspan="2">76 (NX) %</td> </td>	Ground Water Level	-26.8 m <th>Bit Size</th> <td colspan="2">76 (NX) %</td>	Bit Size	76 (NX) %							
Date	Beginning	September 27th, 1981	Operator				Casing	m to m						
	Ending	October 6th, 1981	Supervisor	Tokuji SUGIMOTO Shiro OGANO			Dry Drilling	m to m						
Scale	Elevation (m)	Depth (m)	No. of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logten Value. (L ₁₀) Permeability. K (cm/sec)			Result of Rock Tests	Rock Classification
										(L ₁) 10 ¹	1 10 10	(K) 10 ¹ 10 ² 10 ³		
	76.11	22.20		Light grey to Brown	Sandstone	Slightly weathered	Cracky and soft	20 (008)	20 (018)					CL
	74.61	23.70		Gray	Sandstone	Slightly weathered	Cracky							CM CH
	72.41	25.90		Gray to Reddish	Shale	Fresh	Hard							CH
	67.61	30.70		Dark grey	Silty Sandstone	Fresh	Hard							CM CH
	63.61	34.60		Dark grey	Silty Sandstone	Fresh	Hard However cracky							CM CH
	62.21	36.10		Gray	Shale	Fresh	Hard							CK
	60.31	38.00		Gray to Reddish	Shale	Fresh	Hard However cracky							CM
	59.11	38.70		Reddish	Sandstone	Fresh	Very cracky							CL
		38.70		Reddish	Sandstone	Fresh	Hard							CH

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

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

σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.10

Geological Log. of Borehole

Project Name		Taket Hydro-electric Power Development Project			Site Name		Upper Total		Dm 911						
Hole No		L-4 (3)		Elevation of Ground Level		98.31 m		Ground Water Level		-26.8 m					
Date		Beginning		September 27th, 1981		Operator		Coring		76 (NX) %					
		Ending		October 6th, 1981		Supervisor		Taket SUGIMOTO		Dry Drilling					
						SHIRA OGANO									
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan V. (L _v)			Result of Rock Tests	Rock Classification	
										Permeability, K (cm ² /m)					
										(L _v) 10 ⁻⁶	1	10	10 ⁻³		
	56.31	4200		Reddish	Shale	Fresh	Hard								
	54.61	4370		Greenish grey	Sandstone	Fresh	Hard including Shale patch								CH
	37.31	5100		Greenish grey	Sandstone	Fresh	Cracky								CH CH

R. Q. D : Rock Quality Classification

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

Checked

Fig. 5.8.11

Geological Log. of Borehole

Project Name				Tobal Hydro-electric Power Development Project			Site Name		Lower Total Dam Site					
Hole No	LD-1 ()			Elevation of Ground Level	56.48 m		Ground Water Level	-0.2 m		Bit Size	76 (NX) %			
Date	Beginning	August 12th, 1982		Operator	Tokuji FUJII		Casing	0.0m to 2.5 m						
	Ending	August 12th, 1982		Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 2.4 m						
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value. (Ln) Permeability. K (cm/sec)			Result of Rock Tests	Rock Classification
										(Ln) 10 ⁻¹ 1 10 10 ²	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³			
0	53.03	2.45		Brown	River deposits		Coarse sand and pebble containing organic material	20 (0.08)	20 (0.08)					
	52.79	4.00		Purple	Sandy shale	Moderately weathered	Medium hard Iron oxide stained crack at 45°							CL
	52.52	4.26					Fractured zone							CM
	52.69	6.10		Grayish purple	Shale	Highly weathered	Soft Cracky							CL
		7.00				Slightly weathered	Hard Clean crack at 65°, 60°						5.00 ~ 6.20 G = 2.316 G _c = 499	CM
	54.69	9.10				Moderately weathered	Medium hard Crack at 60°, 20°							CM
		9.10		Grayish purple	Sandy shale	Slightly weathered	Hard Crack at 60°, 30°, 60° Joint at 25°							CL
10	52.87	10.90		Light Gray	Fine sandstone	Fresh	Hard Clean crack at 60°, 30°, 20° Crack Joint at 35°							CM
	50.64	12.90					Hard Cracky zone Crack with clay							CM
	41.48	14.00		Gray	Medium quartzose sandstone	Slightly weathered	Hard Cracky zone Clean crack at 40° 60° with quartz Joint at 35° with shale							CM CL
	36.48	18.00												

A. Q. D ; Rock Quality Designation

Legend - Result of Rock Tests

Depth
 G : Density, Specimen in Air. (g/cm³)
 G_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.12

Geological Log of Borehole

Project Name		Tekes Hydro-electric Power Development Project			Site Name	Lower	Total	Dom. Str.				
Hole No	LD-2 (1)	Elevation of Ground Level	126.00 m	Ground Water Level	-24.0m	Bit Size	76 (NX)%					
Date	Beginning	July 11th, 1982	Operator	KRISHNAN A, THANGAVELU		Casing	0.0m to 0.4 m					
	Ending	July 30th, 1982	Supervisor	Takeshi SUBIMOTO Shige OGANO		Dry Drilling	0.0m to 0.0 m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Valg. (Lg) Permeability, K (cm/sec)	Result of Rock Tests	Rock Classification
								20 (100%)	20 (100%)	(Lg) 10 ¹ 10 ¹⁰ (K) 10 ¹ 10 ¹⁰		
	125.69	0.50		Yellowish brown	Clayey Soil		Containing organic material					
		2.10		Reddish yellow ochre	Shale	Completely weathered	Including bracte.					
		2.60		Brown			Very soft					
		3.40		Whitish yellow	Shale							
	121.89	4.20		Grayish white	Shale	Completely weathered	Including bracte					
		8.60		Grayish white	Shale or Mudstone	Completely weathered	Very soft Fractured zone Metallic clay Including bracte					
	116.49	9.00		Whitish gray	Silty shale	Completely weathered	Very soft Crack at 45° with clay					
	116.09	10.00		Brown	Shale		Fractured zone					
	115.69	10.40		Brown	Fine quartzite sandstone		Iron Oxide stained crack at 70°					
	115.14	10.95		Gray	Mudstone	Highly weathered	Soft Crack with clay					
	113.79	12.30		Grayish brown	Sandstone		Medium hard partly crack at 70°					
	112.19	13.80		Dark grey	Shale	Slightly weathered	Hard Green crack at 40°				420-440 D=2254 σc=563	CH
	110.44	15.65		Brown			Fractured zone					
	110.09	16.00		Dark grey	Shale	Moderately weathered	Medium hard Iron oxide stained crack at 80°, 80° with calcite Crack interval 6 to 7 cm					CL
	107.39	18.70		Whitish gray	Mudstone		Soft					
	106.99	19.10		Brown	M. Quartzite sandstone	Highly weathered	Cracky					
	106.59	19.50		Gray	Clayey sandstone		Fracture zone Including bracte					

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. 5.8.13

Geological Log. of Borehole

Project Name		Tekoi Hydro-electric Power Development Project			Site Name		Lower Tekoi Dam Site								
Hole No	L D-2(2)	Elevation of Ground Level	126.09 m	Ground Water Level	-24.0m	Bit Size	76 (NX) %								
Date	Beginning	July 11th, 1982	Operator	KRISHNANA THANGAVELU		Casing	0.0m to 8.4 m								
	Ending	July 30th, 1982	Supervisor	Tekuji SUGIMOTO Shiro O GANO		Dry Drilling	0.0m to 8.0m								
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value. (Lv) Permeability. K (cm/s)			Result of Rock Tests	Rock Classification	
	(K) 10 ¹	10 ²	10 ³												
28	105.69	20.40		Grey	Clay (Mudstone)		Fractured zone	20 (10/8)	20 (10/8)						D CM
				Purplish grey	Shale	Moderately weathered	Medium hard Mainly crack of 50° Iron oxide stained Crack of 60, 68° with calcite crack Interval 6 to 7cm	35	34						CL CM
25		25.00					Crocky zone Iron oxide stained crack	36	35						CM
	100.09	26.00					Hard clean crack of 50, 60°	45	44						CM
	97.09	29.00		Purplish grey	Shale	Moderately weathered	Very soft fractured zone	40	40						O
30	96.09	30.00					Medium hard Crocky Iron oxide stained crack with clay	40	22						CM
		32.50					Hard Clean crack of 45°	38	38						
		33.00					Hard Iron oxide stained crack of 60° Crack of 40° with clay	75	55						CH
35	91.09	36.00		Purplish grey	Shale	Fresh	Hard Iron oxide stained crack of 20°	60	62						
		37.00				Slightly weathered	Hard. Iron oxide stained crack of 20°	80	80						
	88.09	38.00					Medium hard Crocky zone with brownish clay	74	74						CM CH
	87.19	38.90		Purplish brown			Hard Clean crack of 40°	56	56						CH B
40				Purplish grey	Shale	Fresh	Hard Clean crack of 40°								

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (grd/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.14 Geological Log of Borehole

Project Name		Tahel Hydro-electric Power Development Project			Site Name		Lower Tahel Dam Site								
Hole No	LO-2(3)		Elevation of Ground Level	126.09 m		Ground Water Level	-24.0m								
Date	Beginning	July 11th, 1982		Operator	KRISHNAN A/ THANDAYELU		Bit Size	16 (NX) %							
	Ending	July 30th, 1982		Supervisor	Tokuji SUGIMOTO Shige OGANO		Casing	0.0m 106.4 m							
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value. (Lv) Permeability, K (cm ² /sec)			Result of Rock Tests	Rock Classification	
										(Ln) 10 ⁻¹	10 ⁻²	10 ⁻³			
		43.00		Purplish gray	Slate	Fresh	Clean crack at 30-41.6m Iron oxide stained crack at 42.1m Hard Clean crack at 3-40	20/10/80	3/0/80						CH Poor
	82.14	43.95		Purplish gray	Staly sandstone	Fresh	Very hard Clean crack at 40-45.6m Clean crack at 47.3m at 45° Cracky zone Crack with staly Very hard Clean crack at 50-49.15m								CL CH

R. Q. D : Rock Quality Designation

Legend Results of Rock Tests

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

checked

Fig. 5.8.15

Geological Log. of Borehole

Project Name		Tekki Hydro-electric Power Development Project			Site Name		Lower Tekki Dam Site							
Hole No	(6-3(1))	Elevation of Ground Level		63.79 m	Ground Water Level	-7.5 m	Bit Size	76 (HX) %						
Date	Beginning	July 15th, 1982		Operator	ABD MAJID HJ OMER		Coating	0.0m to 3.5 m						
	Ending	August 18th, 1982		Supervisor	TEKJI SUGIMOTO SHIRO OGANO		Dry Drilling	0.0m to 3.4 m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (Lu)			Result of Rock Tests	Rock Classification
								20 10 0 80	20 10 0 80	Permeability K (cm/m)	(Lu) 10 ³	10 10		
		1.00		Brown	Sandy soil		Containing organic material							
	61.69	2.10		Reddish Yellow Other										
	60.34	3.45		Whitish Brown	Medium quartzose sandstone	Completely weathered	Very soft Sand and cracky rocks							D
		5.00		Dark Grey	Fine sandstone	Moderately weathered	Hard Iron oxide stained crack of 25°, 60°							CL
	57.39	6.40			6.4m to 6.50m Shale		Iron oxide stained joint of 25°						CM	
	56.79	7.00											CL	
	55.69	8.10		Light Brown	Shaly sandstone		Hard. Iron oxide stained crack of 25, 60					720~740 D = 2.604 G = 961	CL	
		9.00			Fine sandstone	Moderately weathered	Cracky, Iron oxide stained crack						CL	
	54.29	9.50		Whitish Grey	Sandstone		Hard.						CM	
	53.79	10.00		Dark Grey	F. sandstone & Shale		Iron oxide stained crack of 60°, 30°						CM	
	53.29	10.50		Greyish Brown	Medium sandstone		Joint of 25°						CL	
	51.79	12.00		Grey	Silty shale	Moderately weathered	Hard Iron oxide stained crack of 45°, 30°					1157~1173 D = 2.629 G = 436	CH	
	51.04	12.76					Cracky zone Iron oxide stained crack						CL	
	49.84	13.95		Dark Grey	Shaly sandstone		Hard.							
		14.20		Grey	Shale	Slightly weathered	Iron oxide stained crack of 60°						CH	
		14.40		Dark Grey	F. sandstone									
		14.60		Dark Grey	Shale									
		14.90		Grey	Fine sandstone		Joint of 25°							
	49.64	15.15		Dark Grey	Shaly sandstone									
	48.09	15.40		Grey	Medium sandstone		Cracky zone, Iron oxide stained crack							
	47.79	16.00		Dark Grey	Shaly sandstone	Moderately weathered								
	46.99	16.80		Grey	Fine sandstone	weathered	Hard Iron oxide stained crack of 70°, 80°							
	49.39	17.40												
	45.79	18.00		Grey	Shale		Cracky zone						CU	
	44.92	18.87			18.6 to 18.27 Shale	Highly weathered	Hard Iron oxide stained crack of 60°, 40°, 80°							
	44.44	19.35			19.24-19.35 Shale	Moderately weathered	Joint of 30°							
	43.79	20.00												

R. Q. D : Rock Quality Designation

F: sandstone; f: fine sandstone

checked

Legend Result of Rock Tests

Depth
 D : Density, Specimen in Air. (g/cm³)
 G : Unconfined Compression Strength. (Kg/cm²)

Fig. 5.8.16

Geological Log. of Borehole

Project Name		Takil Hydro-electric Power Development Project			Site Name		Lower Taji Dam Site									
Hole No	LQ-3(2)	Elevation of Ground Level		63.79 m	Ground Water Level	-7.5 m	Bit Size	16 (NX) %								
Date	Beginning	July 15 th, 1982		Operator	ABDMAJID HJ OMER		Coalog	0.0m 143.5 m								
	Ending	August 18 th, 1982		Supervisor	Tokuji SUZUMOTO SIRA OGANO		Dry Drilling	0.0m 143.4 m								
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)		R. Q. D (%)	Logan Value. (Lu)			Result of Rock Tests	Rock Classification	
								20 (100%)	20 (100%)		Permeability. K (cm/m)	10 ¹	10 ²			10 ³
	40.04	23.75		Grey	Fine sandstone	Highly weathered to Moderately weathered	Crocky zone Medium hard Iron oxide stained crock Joint of 25° to 30°									CL red
	39.79	24.00		Dark Grey	Shale		Joint of 30°									CM
	39.39	24.40		Grey	Medium quartzose sandstone											
	39.19	24.60		Dark Grey	Shaly sandstone		Crocky Hard									
		25.60			Shale	Moderately weathered	Clean crack of 40° Joint of 30° with shale.			10						CM red CL
		27.05			Shale					5						CL
		28.00		Light Grey	Medium quartzose sandstone		Very hard Clean crack of 40°, 60°, 70°, 80°			5						CL red CM
		30.00				Slightly weathered				10						CM
		30.45			Shale		Clean joint of 25° to 30°			20						CM
		31.09	32.70		Dark grey	Shale				65						CH
		32.85		Light grey	Medium quartzose sandstone	Slightly weathered to fresh	Crocky zone Clean crack Joint of 30°			70						CL
	29.94	33.85		Dark Grey	Shale					50						
	29.59	34.20			Shale					50						
		34.75			Shale					50						
		38.00		Light Grey	Medium quartzose sandstone	Fresh	Very hard Clean crack at 60°			65						CH
						Slightly weathered	Very hard Clean crack at 60° with white clay Clean joint of 50°			40						

R. Q. D.: Rock Quality Description

Legend Result of Rock Tests

D: Density, Specimen in Air. (g/cm³)
 σ_c: Unconfined Compression Strength. (Kg/cm²)

Checked

Fig. 5.8.17

Geological Log of Borehole

Project Name				Tekel Hydro-electric Power Development Project		Site Name		Lower Tekel Dam Site							
Hole No		LD-3(3)		Elevation of Ground Level		63.79 m		Ground Water Level		-7.5 m		Bit Size		76 (NX) %	
Date		Beginning		July 15 th, 1982		Operator		ABD MAJID HJ OVER		Casing		0.0m to 3.5 m			
		Ending		August 18 th, 1982		Supervisor		Tokuji SUGIMOTO Saira OGANO		Dry Drilling		0.0m to 3.4 m			
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Ingeon Value. (L _v) Permeability, K (cm/sec)			Result of Rock Tests	Rock Classification	
								20 40 60 80	20 40 60 80	(L _v) 10 ⁻²	1	10	10 ²		
	21.79	42.00		Light grey	Medium quartzose sandstone	Slightly weathered	Very hard Clean crack of 60° With quartz & clay Clean joint of 50°		60						CH
	20.84	42.95		Light Grey	Shale		Fractured zone								D
		45.10		Purplish Grey	Shale	Fresh	Hard Clean crack of 60° Joint of 30°		70						B
	16.44	47.35		Purplish Grey											
	15.69	48.10		Grey	Sandy shale	Fresh	Hard Clean crack of 60°		50						CL CM
	14.79	49.00		Grey	Fine sandstone				50						CH

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ₁ : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.18

Geological Log. of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Lower Takoi Dam Site					
Hole No	LD-4 (1)	Elevation of Ground Level	59.40 m	Ground Water Level	-4.5 m	Bit Size	75(NX)X					
Date	Beginning	July 10 th, 1982	Operator	Tokoyoshi FUJII		Casing	n to n					
	Ending	August 10 th, 1982	Supervisor	Tateji SUGIMOTO Shiro OGANO		Dry Drilling	n to n					
Scale	Elevation(m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Values (Lp) Permeability K (cm ² /m)	Result of Rock Tests	Rock Classification
								2040(85)	2040(85)	(Lp) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	56.40	3.00		Whitish brown	Medium quartzose sandstone		Hard Iron oxide stained crack of 65°, 70° Joint of 30°					
	55.00	4.40		Brown			Cracky zone Medium hard Iron oxide stained					CL
	53.90	5.50		Whitish brown		Slightly weathered	Hard Iron oxide stained crack of 40°, 50° Joint of 30°					
	52.95	6.45		Grey	Sandy shale							
	52.40	7.00		Grey	Medium quartzose sandstone							
	51.80	7.60		Dark grey	Shale		Fractured zone					D
	50.45	8.95		Black	Fine quartzose sand stone shale		Very hard Crack of 70° with quartz Joint of 30°					
	49.40	10.00		Grey	Medium quartzose sandstone							
	46.40	13.00		Grey	Fine quartzose sandstone	Slightly weathered	Very hard Clean crack of 50° 60°, 70°, 85° Joint of 30°					CM
	44.80	14.60				Moderately weathered	Very hard Iron oxide stained crack of 80°					
	43.30	16.00				Slightly weathered	Very hard Iron oxide stained crack of 80°					
	42.55	16.85					Fractured zone cracky					
	41.40	18.00		Greyish green	Shaly sandstone	Slightly weathered	Very hard					CC
	39.40	20.00		Greyish	Fine sandstone	Fresh	Very hard Clean crack of 40°					CH

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

DATE

Fig. 5.8.19

Geological Log of Borehole

Project Name		Tekol Hydro-Electric Power Development Project			Site Name		Lower Tekol Dam Site					
Hoje No	LD - 4 (2)	Elevation of Ground Level	59.40 m <th>Ground Water Level</th> <td>-4.5 m</td> <th>Bit Size</th> <td>76 (NX)X</td>	Ground Water Level	-4.5 m	Bit Size	76 (NX)X					
Date	Beginning	July 10 th, 1982	Operator	Takayoshi FUJII	Casing	m to m						
	Ending	August 10 th, 1982	Supervisor	Takaji 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 (%)	Logon Value (Lp) Permeability K (cm ² /m)	Result of Rock Tests	Rock Classification
								2049(08)	2049(08)	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	21.00			Greenish green	Fine sandstone	Slightly weathered	Very hard Crack of 70°, 60°					CM
	22.30						Very hard Crack of 30°, 40°		40			CL
	22.50				Shale							
	22.95				Shale							
	23.40			Grey	Shale		Hard Joint of 30°		22			
	34.40	25.00		Greenish grey	Sandy shale	Fresh	Very hard Crack of 90°, 80°		5			CH
	32.70	26.70				Slightly weathered	Hard Crack of 40°, 60°, 70°		5			
	32.20	27.20		Greenish grey	Shale							
	31.40	28.00					Cracky zone		20			CC
	30.60	28.80		Grey	Fine Sandstone		Hard Joint of 25°		47			CH
	30.15	29.25					Cracky zone					
	24.40	35.00		Greenish grey	Shaly sandstone	Fresh	Very hard		0			B
	23.20	36.20		Grey	Clay with Breccia	Slightly weathered	Hard Joint of 25° to 20° Fractured zone		0			CH
	36.90			Grey	36.85-36.95 shale				5			
	20.80	38.60		Grey	Fine Gneissic sandstone	Slightly weathered	Very hard Joint of 25°		40			CH
	39.15			Grey					5			
	40.00			Purplish grey	Shale	Fresh	Very hard Clean crack of 30°, 60°		75			B

R. Q. D. Rock Quality Designation

Legend Result of Rock Tests

Depth

D: Density, Specimen in Air. (g/cm³)

UC: Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.20

Geological Log. of Borehole

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Lower Tekel Dam Site						
Hole No	LD-4(3)	Elevation of Ground Level	59.40 m <th>Ground Water Level</th> <td>-4.6 m <th>Bit Size</th> <td>76(NX)%</td> </td>	Ground Water Level	-4.6 m <th>Bit Size</th> <td>76(NX)%</td>	Bit Size	76(NX)%						
Date	Beginning	July 10th, 1982	Operator	Tokoyoshi FUJII	Casing	m to							
	Ending	August 10th, 1982	Supervisor	Takaji SUGIMOTO Sairei OGANO	Dry Drilling	m to							
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 ² /s)	Result of Rock Tests	Rock Classification
								20 (0.08)	20 (0.08)	(Lu) 10 ¹ 10 ² 10 ³	(K) 10 ¹ 10 ² 10 ³		
		42.00		Grey			Very hard						
				Purplish grey	Shale	Fresh	Clean crack of 30°, 60°						B
	13.05	46.35		Greenish Grey									
		47.00		Grey	Shaly Sandstone	Fresh	Very hard						
		49.00											
	9.40	50.00					Very hard						
		50.20					Clean crack of 65°						
	9.00	50.50			Fine sandstone								CH
	8.65	50.75		Dark grey	Fine sandstone	Slightly weathered	Hard						
	8.20	51.25			Shale		Clean joint at 30°						D
	7.90	51.50			Shale		Fractured zone						CH
		55.00		Light grey	Fine quartzose sandstone		Hard						CL
							Cracky zone						
		56.55											
	2.60	56.80		Dark grey	Shale	Slightly weathered	Very hard						
							Crack at 30°, 60°						
	2.10	57.30					Clean joint at 30°						
							Cracky zone						
	0.40	59.00		Light grey	Fine quartzose sandstone		Very hard						
							Clean crack of 30°, 60°						
							Cracky zone						
							Hard						CL

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air (g/cm³)

σ_c : Unconfined Compression Strength (Kg/cm²)

checked

Fig. 5.8.21

Geological Log. of Borehole

Project Name		Tekoi Hydro-electric Power Development Project			Site Name		Lower Tekoi Dam Site								
Hole No	D-4(4)	Elevation of Ground Level	59.40 m	Ground Water Level	-4.5 m	Bit Size	76 (NX)%								
Date	Beginning	July 10th, 1982	Operator	Tokuyoshi FUJII		Coaling	m to m								
	Ending	August 10th, 1982	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 (%)	Logon Value. (Lp) Permeability. K (cm/s)			Result of Rock Tests	Rock Classification	
										(Lp) 10 ¹	10 ²	10 ³			
	0							20.40 (0.8)	20.0 (0.8)						
	-5.10	64.50		Light grey	Fine quartzose sandstone	Slightly weathered	Cracky zone Hard Clean crack of 50°, 70°, 40°								CL near CM
	-5.60	65.00		Light grey	Shale		Hard								
	-8.60	68.00		Grey	Shale 67.25m shale 67.55m shale	Slightly weathered	Clean crack of 70°, 40° Joint at 30 to 40°								CM
	-11.45	70.85			Shale Fine sandstone		Hard Crack of 70°, 80° Joint of 40°								
	-12.00	71.40		Dark grey	Shaly sandstone										CH
	-12.60	72.00					Cracky zone Hard								CM
	-13.60	73.00		Light grey	Fine quartzose sandstone										
	-17.40	76.60		Grey		Slightly weathered	Fractured zone Mainly breccia including clay								D
	-19.45	78.65		Grey	Shale										
	-20.60	80.00			Alteration of shale and sandstone										

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Dp : Density, Specimen In Air. (g/cm³)
σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig.5.8.22

Geological Log. of Borehole

Project Name		Takil Hydro-electric Power Development Project			Site Name		Lower Takigi Dam Site					
Hole No.	LO-5 (1)	Elevation of Ground Level	67.77 m	Ground Water Level	-32.5 m	Bit Size	16 (NX) %					
Date	Beginning	July 15 th, 1982	Operator	Tokoyoshi FUJII		Casing	0.0m to 4.0 m					
	Ending	August 3 rd, 1982	Supervisor	Tokuji SUJIMOTO Shigeo OKANO		Dry Drilling	0.0m to 193.6 m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logon Value. (L _u) Permeability. K (cm ² /m)	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(L _u) 10 ⁻¹ 1 10 10 ¹ (K) 10 ⁻⁵ 10 ⁻⁷ 10 ⁻⁹		
		1.05		Yellow ochre	Sandy soil		Containing organic material					
	85.97	1.80		Brown								
		5.00		Brown	Fine quartzose sandstone	Completely weathered	Soft Mainly sand including breccia					O
		7.00		Whitish brown								CL
		10.00		Greyish white		Moderately weathered	Medium hard Mainly crack of 60° Iron oxide stained crack Joint of 20° with clay				9.80~10.00 D= 2.59t R= 1393	CM
	73.77	14.00			Fine quartzose sandstone		Hard Mainly crack of 50° Iron oxide stained crack					
		14.50										
		15.20		Grey		Slightly weathered	Very hard Iron oxide stained crack of 60°, 65°, 30° Joint of 25° with iron oxide					CH
	70.39	17.40		Grey	Shaly sandstone	Moderately weathered	Medium hard crack of 50°					CM
		18.20		Brownish grey	Sandy shale		Soft					CM near
	69.17	18.60		Greyish brown	Fine sandstone	Slightly weathered	Hard crack of 60°					CL
	68.83	19.95		Grey	Shale							

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.23

Geological Log. of Borehole

Project Name		Tekoi Hydro-Electric Power Development Project			Site Name		Lower Tekoi Dam Site								
Hole No	L6-5 (?)	Elevation of Ground Level		87.77 m	Ground Water Level	-32.5 m	Bit Size	76 (NX) %							
Date	Beginning	July 15th, 1982		Operator	Tokoyoshi FUJII		Coaling	0.0m to 4.0 m							
	Ending	August 3rd, 1982		Supervisor	Tekuji SUGIMOTO Shiro OSAHO		Dry Drilling	0.0m to 3.6 m							
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logcon Value. (Ln) Permeability. K (cm ² /m)				Result of Rock Tests	Rock Classification
											(Ln) 10 ⁻¹	1	10		
	67.67	20.10			Shale			20	20	20	20				
				Grey	Fine sandstone	Slightly weathered	Hard Joint of 20° Crack of 50°, 60°, 80° Iron oxide stained crack and joint								CM
	63.62	24.15			23.6m Shale									CM	
	63.02	24.75		Dark grey	Shaly sandstone		Hard, Joint of 20°							CL	
				Grey	Fine sandstone	Moderately weathered	Hard Iron oxide stained crack of 70° Clean joint of 20°							CM	
		27.00					Crocky zone								
	69.22	28.55					Iron oxide stained crack							CL	
	58.37	29.40		Purple	Shale	Moderately weathered								CL	
	57.97	29.80		Grey	Fine sandstone										
	57.52	30.25		Greenish grey	Shale	Slightly weathered									
				Grey	Shaly sandstone	Fresh	Hard Clean crack of 40°, 80° Joint of 20°							CH	
		34.40												CL	
		34.70				Slightly weathered	Hard Joint of 20° with shale Many joint							CM or CH	
	50.07	37.70		Grey	Fine sandstone	Slightly weathered	Very hard. Clean crack of 50°, 80°, 60° Clean joint of 20°								
	48.37	39.40		Grey	Shale										
	47.92	39.70		Grey	Shale										

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

DEPTH

ρ : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.24

Geological Log. of Borehole

Project Name		Tetol Hydro-electric Power Development Project			Site Name		Lower Tetol Dam Site								
Hole No.	LD-5(3)		Elevation of Ground Level		87.77 m		Ground Water Level	-32.5m		Bit Size	76(NX)X				
Date	Beginning		July 10th, 1982		Operator		Tokoyoshi FUJII		Casing	00m 64.0m					
	Ending		August 3rd, 1982		Supervisor		Takeshi SUBIMOTO Shiro OGANO		Dry Drilling	00m 143.6m					
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value. (L _v)			Results of Rock Tests	Rock Classification	
										Permeability, K					
	(cm)	(cm)								(cm)	10 ⁻¹	10 ⁻²	10 ⁻³		
	47.32	40.45		Grey	Shale fine sandstone	Slightly Weathered	Very hard Clean joint at 20°	20(20)80	20(20)80						CH CH CH
		45.05		Purplish grey	Shale	Fresh	Very hard Clean crack 45.5m Crack at 30°								B
				Purple											
	38.07	49.70					Crack at 40°, 60°								CH B
	37.77	50.00		Grey	F. sandstone										

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_t : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.25

Geological Log of Borehole

Project Name		Tekol Hydro-Electric Power Development Project			Site Name		Lower Tekol Dam Site								
Hole No	LD-6(1)	Elevation of Ground Level		114.40 m	Ground Water Level	-32.0m	Bit Size	76(NX)%							
Date	Beginning	July 15th, 1982		Operator	Jetsuharu IZUMI		Coring	0.0m to 4.7 m							
	Ending	July 31st, 1982		Supervisor	Takaji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 4.7 m							
Core	Direction (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (Lv) Permeability. K (cm/sec)			Result of Rock Tests	Rock Classification	
											(Lv) 10 ⁻²	1			10
S	11325	0.50		Brown	Sandy soil		Containing organic material	20 10 60 80	20 10 60 80						
		1.15		Yellow ochre											
		3.00		Whitish brown	Medium quartzose sandstone	completely weathered	Very soft including brachia								
		3.70		Yellowish brown											
		4.60		Greyish white											
		5.00		Whitish grey											
		5.55		Brown											
		7.35		Whitish grey	Highly weathered	Soft including brachia	CL								
		7.90		Grey	Shale	Completely weathered	Very soft								8.05 ~ 8.20 D = 2.536 Cc = 1197
		8.00		Whitish grey	Medium quartzose sandstone	Moderately weathered	Medium hard. Iron oxide stained crack Crack of 45°, 60°								
		10.80		Grey	Shale	Slightly weathered	Medium hard Iron oxide stained crack Crack of 45°, 60°								
		11.35		Whitish grey	Fine quartzose sandstone										
		12.00		Dark grey	Shale	Medium quartzose sandstone	Cracky, Iron oxide stained crack fractured zone including clay								CL
		12.35		Whitish brown											
		12.50		Whitish brown	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 45°, 70°								CM
14.50		Brown													
15.00		Whitish brown	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 45°, 70°	CL									
16.00		Whitish brown													
16.40		Whitish brown	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 45°, 70°	CL									
17.50		Whitish brown													
19.00		Whitish brown	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 45°, 70°	CL									
19.00		Whitish brown													

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (g/cm³)

Cc : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.26

Geological Log. of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name	Lower Takai Dam Site						
Hole No	L O - 6 (2)	Elevation of Ground Level	114.40 m	Ground Water Level	-32.0 m	Bit Size	76 (NX) %					
Date	Beginning	July 15 th , 1982	Operator	Tetsuhoro IZUMI		Coring	0.0m 144.7 m					
	Ending	July 31 st , 1982	Supervisor	Tokuji SUGIMOTO Shigeo OKANO		Dry Drilling	0.0m 144.7 m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logon Value, (Lg) Permeability, K (cm/s)	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	93.65	20.75		Whitish brown	Medium quartzose sandstone	Moderately weathered	Hard iron oxide stained crack at 45°, 70°		5			CL
	93.05	21.35		Grey	Sandy shale		Cracky with iron oxide					
		22.00		Brown			Hard.		30			
		23.25		Purplish grey	Silty shale	Slightly weathered	Iron oxide stained crack at 45°, 20°		75			
	90.50	23.90		Whitish grey			Iron oxide stained joint at 25° to 30°		65			
	89.85	24.55		Whitish grey					75			CH
		26.40		Purplish grey	Fine sandstone	Slightly weathered	Hard iron oxide stained crack at 40°, 50°		65			
	88.00	27.30				Fresh	Hard.		90			
	86.40	28.00		Purplish grey	Shale		Crack at 25°, 45°		90			
		29.05		Whitish grey	2900-2900m Shale	Moderately weathered	Hard.		95			
	84.40	30.00			Fine sandstone		Iron oxide stained crack at 40°, 55°, 70°		7			
	84.10	30.30			Silty sandstone	Slightly weathered	Joint at 40°		4			CM
		32.00				Fresh	Hard.		4			
	82.40	32.00		Whitish grey			Joint at 40°		62			
	81.40	33.00			Fine sandstone		Iron oxide stained crack at 45°, 65°, 70°		47			CH
		36.10					Hard.		66			
				Purplish grey			Crack at 55°		45			
	76.50	37.90				Slightly weathered	Hard.		76			
	76.00	38.40		Brown	Silty sandstone		Iron oxide stained crack at 40°, 60°		25			
	75.40	39.00		Grey	Fine sandstone	Fresh	Joint at 45°		25			
		40.00				Slightly weathered	Hard.		10			CL

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 ρ : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.27

Geological Log. of Borehole

Project Name		Tekdi Hydro-Electric Power Development Project			Site Name		Lower Tekdi Dam Site							
Hole No	LD-6 (3)	Elevation of Ground Level	114.40 m	Ground Water Level	-32.0m	Bill Size	76 (NX)%							
Date	Beginning	July 15 th, 1982	Operator	Tetsuharu IZUMI		Casing	0.0m to 4.7 m							
	Ending	July 31 st, 1982	Supervisor	Tetsuji SUBIMOTO Shiro OGANO		Dry Drilling	0.0m to 4.7 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Color	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Values (Lv) Permeability (K (cm/m))			Result of Rock Tests	Rock Classification
								20 (0) 10 (0)	20 (0) 10 (0)	(L) 10 ² 1 10 10 ²				
	71.25	43.15		Grey	Fine sandstone	Slightly weathered	Very hard Crack at 45° to 55° Clean joint at 45° to 50°							
	70.65	43.75		Grey	Mudstone									CH
		48.00		Grey	Shaly sandstone	Fresh	Very hard Clean crack at 60°, 70°, 80° Clean joint at 30° to 40°							CH
	66.15	48.25		Grey	Shale Shaly sandstone	Slightly weathered to fresh	Hard crack at 60° Joint at 30° to 40°							CM
	64.40	50.00												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

0821A

0 : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.28

Geological Log. of Borehole

Project Name		Tskoi Hydro-electric Power Development Project			Site Name		Lower Tskoi Dam Site					
Hole No	LD-7()		Elevation of Ground Level	64.34 m	Ground Water Level	-3.3 m	Bit Size	76 (NX) %				
Date	Beginning	August 31st, 1982		Operator	Tokofumi KOBAYASHI		Casing	0.0m to 2.0 m				
	Ending	September 3rd, 1982		Supervisor	Tokuji SUKIMOTO Shiro OGANO		Dry Drilling	0.0m to 2.8 m				
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logon Value (Ln) Permeability, K (cm ² /s)	Result of Rock Tests	Rock Classification
	63.46	0.90	Y	Brown	River bed deposits		Containing organic material (Sand, clay)	20 (100%)	20 (100%)			
		2.00	O	Reddish brown	Talus		Mainly breccia with sand and clay					
	61.59	2.75	O	Brown								
	60.79	3.55		Whitish grey	Shaly sandstone		Soft Iron oxide stained crack with clay					
	60.34	4.00		Brownish grey	Silty shale	Highly weathered	With breccia					
	60.09	4.25		Brown	Clay							
		4.60										
	59.34	5.00		Whitish grey			Soft, Iron oxide stained crack					
		7.20		Purplish grey	Silty shale	Moderately weathered	Medium hard Iron oxide stained crack at 70°, 50° Joint at 20°					
	56.54	7.80		Purple	Fine sandstone	Highly weathered	Joint at 30° Medium hard Mainly iron oxide stained crack with brownish clay					
	56.14	8.20		Purplish brown	Sandy shale							
		9.00		Greyish brown								
	54.04	10.30		Greyish brown	Fine sandstone							
	53.74	10.60		Greyish brown	Sandy shale							
	53.34	11.00		Brown			Cracks with iron oxide					
	52.59	11.75		Brown / Grey	Fine sandstone		Iron oxide stained crack					
	51.24	13.10		Grey	Shaly sandstone		Hard, Joint at 30° rotatable joint					
		14.45		Dark grey		Slightly weathered	Hard					
		16.20		Purplish grey	Shale		Crack at 70°, 80° with calcite					
		19.00		Purple		Slightly weathered to fresh						
	44.34	20.00					Hard Calcite stained crack at 80°					

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

DEPTH

D : Density, Specimen in Air. (g/cm³)

UC : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.29

Geological Log of Borehole

Project Name		Tekai Hydro-electric Power Development Project			Site Name	Lower Tekai Dam Site							
Hole No	L0-8 (1)	Elevation of Ground Level	59.31 m	Ground Water Level	-1.7 m	Bit Size	76(NX)%						
Date	Beginning	August 31st, 1982	Operator	Tokuyoshi FUJII		Casing	0.0m to 6.0 m						
	Ending	September 4th, 1982	Supervisor	Tekuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 6.0 m						
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logos Value (Lw)	Permeability K (cm/sec)	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Lw) 10 ¹ 10 ² 10 ³	10 ¹ 10 ² 10 ³		
		2.85		Brown	River bed deposits		Fine sand Containing organic material						
		5.60		Brownish grey	River bed deposits		Sand and pebble gravel						
	5381	5.60		Greyish purple	Shale	Completely weathered	Very soft clayey						
	5231	7.00		Light grey	Mudstone		Very soft clayey						O
	51.11	8.20		Whitish brown	Mudstone		Very soft clayey						O near CL
				Greyish brown	Sandy shale	Highly weathered	Soft iron oxide stained crack with clay						CL
	4831	11.00		Greyish brown	Mudstone	Highly weathered	Soft						CL
	4766	11.45		Grey	With shale 12.45m Sandstone	Slightly weathered	Hard Clean joint of 30° Clean crack of 60°, 70°					12.65-12.80 D = 2.594 σ _c = 2272	CH
	4731	12.60		Grey	Mudstone	Slightly weathered	Hard						CL
	44.31	15.00		Greyish brown	Fine quartzose sandstone	Moderately to slightly weathered	Hard Cracky Iron oxide stained crack						CL
	43.60	15.65		Light grey		Slightly weathered	Hard Cracky With quartz and quartz vein						CH near CL
	3931	20.00											CL

R. Q. D.: Rock Quality Designation

Legend Result of Rock Tests

D_{sp}: Density, Specimen in Air (g/cm³)

σ_c: Unconfined Compression Strength (Kg/cm²)

σ_c: Unconfined Compression Strength (Kg/cm²)

checked

Fig. 5. 8. 30

Geological Log. of Borehole

Project Name		Tobit Hydro-electric Power Development Project			Site Name		Lower Tokoi Dam Site					
Hole No	L D-8 (2)	Elevation of Ground Level	59.31 m	Ground Water Level	-1.7 m	Bit Size	16 (NX)X					
Date	Beginning	August 31st, 1982	Operator	TokoyosN FUJII		Coring	00m 146.0 m					
	Ending	September 4th, 1982	Supervisor	Tobit SUBIMOTO Shige OAHNO		Dry Drilling	00m 146.0 m					
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lagoon Value (Lp) Permeability, K (cm ² /m)	Result of Rock Tests	Rock Classification
								20 00 00	20 00 00	(Lp) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	37.31	22.00		Light grey	Fine quartzose sandstone	Slightly weathered	Hard Crocky Clean crack					CM ter CL

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

Q : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 6.8.31

Geological Log of Borehole

Project Name				Tekol Hydro-electric Power Development Project		Site Name		Lower Tekol Dam Site				
Hold No	LD-9 ()	Elevation of Ground Level	54.80 m <th>Ground Water Level</th> <td>106 m <th>Bit Size</th> <td>14(NX)%</td> </td>	Ground Water Level	106 m <th>Bit Size</th> <td>14(NX)%</td>	Bit Size	14(NX)%					
Date	Beginning	August 19th, 1982	Operator	T. RATHINAVELU		Casing	0.0m to 15.0 m					
	Ending	October 4th, 1982	Supervisor	Tokuji SUGIMOTO Shiro O SANO		Dry Drilling	0.0m to 6.2 m					
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value (Lw) Permeability, K (cm/m)	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Lw) 10 ⁻¹ 1 10 10 ²		
				Brown	River bed deposits		Mainly coarse sand including pebble gravel					
	49.60	5.00		Brown	River bed deposits		Mainly cobble including sand					
	46.00	8.60										
	44.90	9.90		Brownish yellow and grey	River bed deposits		Mainly pebble including sand					
	43.95	10.85					Mainly pebble including sand					
	42.45	12.35		Dark grey	Silty shale	Highly weathered	Medium hard Cracky Iron oxide stained crack					
	42.10	12.70			S. sandstone							
	41.20	13.60		Dark grey	Sandy shale (36 ^m - 137 ^m)	Moderately weathered	Hard. Iron oxide stained crack of 20, 70, 90° - 136 ^m , Joint of 20°					Cr
	40.60	14.20			S. sandstone							
	40.10	14.70		Grey	Shaly sandstone		Cracky, Iron oxide stained crack. - 147 ^m , Joint of 20°					
	39.85	14.95		Dark grey	Shale							
		15.10										
	38.90	15.90		Light grey	Sandstone	Moderately weathered	Hard, Iron oxide stained crack of 50°, 80°					
	38.25	16.55		Brown yellowish brown	Coarse Q sandstone	weathered	Medium hard. Joint at 25°					Cr
	37.60	17.20		Brownish grey	Medium quartzose sandstone							
	36.95	17.85		Light grey	Medium quartzose sandstone	Slightly weathered	Very hard. Iron oxide stained crack of 10°, 20°, 40°					
	36.40	18.40		Grey	Sandstone							
	34.80	20.00		Whitish grey	Medium quartzose sandstone	Slightly weathered to Fresh	Very hard. Iron oxide stained crack of 30°, 50° Clean crack of 30°, 60°				# 26-18.40 D= 2578 Cc= 681	Cr

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depla
 D : Density, Specimen in Air. (g/cm³)
 c_u : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.32

Geological Log. of Borehole

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Lower Tekel Dönü Site								
Hole No	LD-10 ()	Elevation of Ground Level	67.50 m	Ground Water Level	-0.7 m	Blk Size	76 (NX)X								
Date	Beginning	August 10th, 1982	Operator	ABD MAJID HJ ÖMER	Casing	0.0m to 2.9 m									
	Ending	August 30th, 1982	Supervisor	Tokuji SUGIMOTO Shiro OGANO	Dry Drilling	0.0m to 2.9 m									
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value, (L _g) Permeability, K (cm ² /m)			Result of Rock Tests	Rock Classification	
										(L _g) 10 ¹ 10 ² 10 ³	(K) 10 ¹ 10 ² 10 ³				
	56.50	1.00		Brown	Soil		Containing organic material, sand								
		2.00			River bed deposits		Clayey sand								
		2.35						Pebble, sand							
		3.00		Yellowish brown				Clayey sand							
	54.35	3.15		Brown			Pebble, sand								
		4.00		Whitish brown	Fine quartzose sandstone		Soft								
		5.00		Brownish white		Clay		Medium hard. Iron oxide stained crack							
	52.50	5.00					Fract at 50°								
		5.75					Fractured zone. Mainly clay breccia								
		6.70		Whitish brown	Shale	Highly weathered	Crocky zone								
	50.50	7.00							Iron oxide stained crack with clay						
		8.00					Medium hard. Crack at 60°, 40°								
		9.20		Whitish grey	Fine quartzose sandstone		Joint at 25°								
	47.80	9.20						Iron oxide stained crack, Joint							
		10.00					Very crocky. Medium hard.								
				Brownish white			Iron oxide stained crack with clay								
		12.65													
		13.00			Clay										
		13.40		Brown				Fractured zone. Very soft. Mainly clay with breccia							
	43.25	14.25													
				Purplish grey	Shale	Moderately weathered	Medium hard. Crocky								
	41.80	15.70							Fractured zone						
		16.00													
		16.10		Purple											
		16.60													
		17.55		Grey			Medium hard. Crocky								
		18.20													
	39.35	18.20		Black											
					Grey sandstone	Moderately weathered to slightly weathered									
		20.00							Hard to very hard. Clean crack at 70°						
	37.50	20.00													

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen In Air. (g/cm³)
 DC : Unconfined Compression Strength. (Kgf/cm²)

Checked

Fig. 5.8.33

Geological Log. of Borehole

Project Name		Tekoi Hydro-electric Power Development Project			Site Name	Lower Tekoi Dam Site								
Hole No	LD-II ()	Elevation of Ground Level		78.95 m	Ground Water Level	-120 m	Bit Size	76(NX)X						
Date	Beginning	August 4th, 1982	Operator	Tetsuharu Izumi	Casing	00m to 20m								
	Ending	August 6th, 1982	Supervisor	Tokuji SUBIMOTO Siro OGANO	Dry Drilling	00m to 20m								
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value. (L _v) Permeability. K (cm/s)			Result of Rock Tests	Rock Classification
								20 0 0 0 0	20 0 0 0 0	(L _v) 10 ⁻¹ 1 10 10 ²	(K) 10 ⁻⁴ 10 ⁻² 10 ⁰			
	78.25	0.70	1	Brown	Soil		Containing organic material, sandy							
				Yellowish brown	Coarse quartzose sandstone	Completely weathered	Very soft, Sandy, including breccia Interbedded with clayey shale							D
	73.96	5.00		Whitish brown	Quartzose sandstone	Highly weathered	Cracky, soft Crack with iron oxide and clay							
		6.00		Whitish brown		Completely weathered								
	72.06	6.90		Whitish brown										Q
		8.00		Whitish brown	m m 800 to 805 Shale		Joint at 50° Medium hard.							
		10.00		Whitish brown	m m 1000 to 1005 Shale	Highly weathered	Mainly crack at 40° Iron oxide stained crack							Cw near Q
	67.75	11.20		Whitish brown			Joint at 60°							
	67.45	11.40		Grey	Shale		Soft, Joint at 40°							
	66.96	12.00		Whitish brown	F.O. sandstone									
	66.25	12.70		Light grey	Shale	Highly weathered	Medium hard, Cracky, Iron oxide stained crack							
	65.75	13.20		Whitish brown	F.O. sandstone		Joint at 55°							Q
	65.55	13.40		Grey	Shale									
	64.95	14.00		Whitish brown	F.O. sandstone									
	64.50	14.45		Purplish brown	Shale	Moderately weathered	Hard, Iron oxide stained crack at 40°							
		15.00		Whitish purple			Joint at 60°							
	63.25	15.70		Whitish brown	Fine quartzose sandstone	Highly weathered								Cw near Q
				Whitish grey	sandstone									
	61.95	17.00		Whitish grey			Hard							
	61.85	17.10		Grey	Shale	Moderately weathered	Mainly crack at 40°, 60°							7.17-17.33 D=2585 C=1079
				Whitish grey	Fine quartzose sandstone		Iron oxide stained crack							
		19.00												
	59.70	19.25		Purple	Shale									
	59.45	19.50												
	58.95	20.00		Whitish grey	F.O. sandstone									Q

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

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

checked

Fig. 5.8.34 Geological Log. of Borehole

Project Name		Taket Hydro-electric Power Development Project			Site Name		Lower Takai Don Site						
Hole No	LD-12 (1)	Elevation of Ground Level	88.52 m	Ground Water Level	-27.0 m	Bit Size	76 (NX) %						
Date	Beginning	August 8th, 1982	Operator	Tetsuharu IZUMI		Casing	0.0m to 27 m						
	Ending	August 24th, 1982	Supervisor	Tetsuji SUZUMOTO Shiro OGANO		Dry Drilling	0.0m to 20 m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value (Lp) Permeability, K (cm/m)		Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Lp) 10 ⁻¹ 10 ⁻²	(K) 10 ⁻¹ 10 ⁻²		
	86.62	1.90	F. F.	Brown	Soil		Sandy, Clay containing organic material						
		4.00		Brown		Completely weathered	Very soft. Sandy, with clay including breccia Iron oxide stained Joint at 20°						D
		5.00		Whitish brown	Quartzose sandstone								
		6.60				Moderately weathered	Medium hard Iron oxide stained crack at 30°, 50°, 60°						Ch
		7.00		Whitish grey									Ch
	80.42	8.10				Highly weathered	Medium hard Crack at 80° with clay						
		10.00		Whitish grey	Fine quartzose sandstone	Moderately weathered	Medium hard. Iron oxide stained crack at 60°						
	78.37	10.13		Purplish grey									
	77.37	10.25				Highly weathered	Medium hard. Iron oxide stained crack						Cl
	77.32	11.20			Fine quartzose sandstone		Hard. Iron oxide stained crack at 40°, 50°						Ch
		13.00											
	74.52	14.00			Shale	Moderately weathered	Hard. Iron oxide stained						Ch
	74.32	14.20		Greenish brown			Joint at 10°, 15° Joint at 20°						
		15.00		Light grey	Quartzose sandstone	Slightly weathered							B
	72.42	16.00			Shale	Moderately weathered	Hard. Iron oxide stained crack at 80° Joint at 20°						Ch
	72.22	16.30		Grey									
		17.40		Whitish grey									Ch
		18.00			Quartzose sandstone	Highly weathered	Cracky zone with iron oxide						Ch
				Brownish grey			Hard Iron oxide stained crack at 60°, 80°						Ch

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5. 8. 35

Geological Log of Borehole

Project Name		Tekoi Hydro-Electric Power Development Project			Site Name		Lower Tekoi Dam Site							
Hole No	LD-12 (2)	Elevation of Ground Level	8852 m <th>Ground Water Level</th> <td>-27.0 m <th>Bit Size</th> <td colspan="3">76 (NX) %</td> </td>	Ground Water Level	-27.0 m <th>Bit Size</th> <td colspan="3">76 (NX) %</td>	Bit Size	76 (NX) %							
Date	Beginning	August 8th, 1982	Operator	Tetsuharu [ZUMI]		Casing	0.0m to 2.7 m							
	Ending	August 24th, 1982	Supervisor	Tetsuji SUBIMOTO Shiro OGAHO		Dry Drilling	0.0m to 20 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (Lp) Permeability. K (cm/sec)			Result of Rock Tests	Rock Classification
										(Lp) 10 ⁻² 10 ⁻³ 10 ⁻⁴	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³			
0	67.62	20.90		Brownish grey	Quartzose sandstone	Highly weathered	Hard. Iron oxide stained crack of 60°, 80°	21	21					
	67.42	21.10		Dark grey	Shale									
	66.52	22.00		Light grey	Quartzose sandstone		Hard to medium hard Iron oxide stained crack of 60°, 70°, 80°	57	57					Cm
	66.35	22.17			F. sandstone									
	66.15	22.37		Grey, D. Grey	Shale									Ch
	65.73	22.73		Grey	F. sandstone	Moderately weathered	Joint at 20°	24	24					
	65.32	23.20			Shale									
	65.17	23.35			F. sandstone									
	64.67	23.85		Dark grey	Shale		Medium hard Iron oxide stained crack of 70°	37	37					
	64.57	24.00			F. sandstone									
	63.92	24.60		/ Grey	24.6m F. sandstone		Joint at 20°	3	3					
	63.37	25.15			Shale									
	63.22	25.30			F. sandstone									
	63.07	25.45			Shale									
	62.37	26.15					Fractured zone with clay							D
				Brown	Fine quartzose sandstone	Highly weathered	Cracky zone Medium hard Iron oxide stained crack							Cc
	59.77	28.75												
	59.12	29.40		Light grey			Iron oxide stained crack of 50°							
	58.52	30.00		Grey			Cracky	20	20					Cm
		30.60												
				Light grey	Fine quartzose sandstone		Hard. Joint at 25° Crack of 40°, 50°	22	22					Cs
														near Cm
	54.57	33.65												
	54.42	34.10		Dark grey	Shale	Moderately weathered		43	43					
				Light grey	Fine quartzose sandstone		Hard. Joint at 25° Iron oxide stained crack of 40°, 60°, 65° Crack of 40° with purplish clay	20	20					Cm
	50.87	37.65						25	25					
				Greyish green			Medium hard	25	25					Cc
		38.50												
				Purplish grey	Shale	Moderately weathered	Hard. Crack of 45°, 70°	10	10					Cc

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen (N Air. (g/cm³))
 UC : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5. 8. 36

Geological Log. of Borehole

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Lower Tekel Dam Site							
Hole No.	LD-12 (3)	Elevation of Ground Level		88.52 m	Ground Water Level	-27.0 m	Bit Size	16 (NX) %						
Date	Beginning	August 8 th, 1982		Operator	Tetsuharu IZUMI		Casing	0.0m to 27 m						
	Ending	August 12 th, 1982		Supervisor	Tetsuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 2.0 m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value (L _v) Permeability (K)			Result of Rock Tests	Rock Classification
											(L _v) 10 ⁻¹	10 ⁻²		
0		4040		Purplish grey	Shale	Moderately weathered	Hard. Crack at 45°, 70°	20 (0.08)	20 (0.08)					
	4245	4100		Greenish grey	Shale									
		4300		Grey	Sandstone									
	4552	4300		Grey	4306 shale									
		4520		Grey	Fine sandstone	Slightly weathered to Fresh	Very hard. Clean crack at 40°, 60°, 70° Clean joint at 20°							
5	4332	4520		Light grey	Fine quartzose sandstone									
	4112	4240		Dark grey	Shale									
	4077	4275		Grey	Fine sandstone									
	4017	4835		Dark grey	Shale									
	3942	4910		Grey	Fine sandstone	Moderately weathered	Medium hard. Joint at 20° Crack at 40°, 60° Iron oxide stained crack and joint							
20	3852	5000		Light grey	F. quartzose sandstone									

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.37

Geological Log. of Borehole

Project Name		Tetel Hydro-Electric Power Development Project			Site Name		Lower Tetel Dam Site								
Hole No		LO-13 ()		Elevation of Ground Level		76.17 m		Ground Water Level		-11.0 m		Bit Size		76 (NX)%	
Date		Beginning		August 31st, 1982		Operator		Tetsuharu IZUMI		Cooling		09m to 25 m			
		Ending		September 1st, 1982		Supervisor		Tetsuji SUGIMOTO Shiro OGANO		Dry Drilling		00m to 23 m			
Scale	Elevation(m)	Depth(m)	Mark of Sample	Color	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logeo Value. (Lu)			Result of Rock Tests	Rock Classification	
										Permeability. K (cc/m)					
										(L) 10^1	1	10^2			
										(K) 10^1	10^3	10^5			
	75.57	0.60	F. T.	Black brown	Clayey soil		Consolidating organic material								
		1.25		Brownish red			Very soft.								
		1.75		Yellowish brown	Quartzose sandstone	Completely weathered	Mainly sand including breccia							D	
		2.25		Brownish red											
		2.75		Yellowish brown											
	73.42	2.75													
		4.30		Greyish brown			Soft. Iron oxide stained crack at 40°, 50°, 80° with whitish and brownish clay								
	71.87	4.30			Shale	Highly weathered								Cl	
		5.00		Greyish brown			Medium hard. Iron oxide stained crack of 40°, 60°								
		6.15		Brown	Quartzose sandstone		Joint at 20° with brownish clay								
	70.02	6.15													
		6.80		Brownish grey			Hard. Iron oxide stained crack at 60°								
	68.82	7.35		Greyish white		Moderately weathered	40° Joint at 20°							Cl	
	68.57	7.60		Brownish grey	Shale									Cu	
		8.50		Brownish grey	Fine sandstone		Hard. Iron oxide stained crack at 60°								
	67.17	9.00		Greyish purple			40° Joint at 20°								
		10.30		Greyish purple			Hard. Iron oxide stained crack at 30°, 40°								
		10.85		Brown		Moderately weathered	Soft. Crack at 40°, 70° with brownish clay								
	65.02	11.15			11.15m-11.30m										
		12.00		Greyish purple	Clayey shale		Hard. Crack of 30°, 50° with iron oxide								
	64.17	12.00													
		12.35		Dark grey	Shale	Moderately weathered	Medium hard. Iron oxide stained crack at 85°								
		13.00		Light grey		Highly weathered	Medium hard. Iron oxide stained crack of 30°								
	62.17	14.00		Grey											
		14.80		Brown	F. Sandstone		Soft. Iron oxide stained crack at 80°								
	61.37	14.80			Shale										
	61.07	15.10		Brownish grey	F. sandstone	Highly weathered	Hard. Joint at 20°								
		15.85			Shale		Crack at 70° with clay								
	60.32	15.85													
	59.17	16.00		Brown	F. sandstone		Medium hard. Joint at 20°								
	59.87	16.30		Light grey	Shale		Crack at 70° with clay								
	59.62	16.55		Purple	F. sandstone										
	58.27	16.90		Brownish grey	Shale		Medium hard. Joint at 20°								
	58.07	17.10		Brown	F. sandstone		Crack at 70° with clay								
		19.50		Light grey	Fine Sandstone	Moderately weathered to slightly weathered	Hard. Iron oxide stained crack at 30°, 60°								
	56.27	19.50					18.8m; Crack of 10° with iron oxide								
		19.90		Brown	Shale		Joint at 20° with clay								
	56.17	19.90													

Legend Result of Rock Tests

DEPTH
 ρ: Density, Specimen in Air. (g/cm³)
 σ: Unconfined Compression Strength. (Kg/cm²)

8.50-8.95
 D=2543
 Cc= 536
 checked

Fig. 5.8.38

Geological Log. of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Lower Tekoi Dam Site							
Hole No	LD-10 (1)		Elevation of Ground Level	113.50 m		Ground Water Level	-31.0 m		Bit Size	76 (NX) %				
Date	Beginning		August 1st, 1982		Operator	KRISHNAN A. THAYAGALU		Coring	0.0m to 2.0 m					
	Ending		August 16th, 1982		Supervisor	Tokuji SUBIMOTO SHIRO OGANO		Dry Drilling	0.0m to 1.2 m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value (L _v) Permeability K (cm/s)			Result of Rock Tests	Rock Classification
										(L _v) 10 ⁻¹	10 ⁻²	10 ⁻³		
	112.60	0.50		Brown	Clayey soil		Containing organic material	20	40	0	0	0		
		4.30		Purplish grey	Shale	Completely weathered	Soft. Crack of 30° with clay	20	30	0	0	0		D
	108.75	4.75		Brown	465-475 ^m Sandstone			20	40	0	0	0		Q near Ck
	108.50	5.00		Whitish grey	Mudstone	Highly weathered	Soft. Iron oxide stained crack of 30°, 40°	20	40	0	0	0		Ck
	107.25	6.25		Purplish grey	Shale	Highly weathered	Soft. Crack with clay	20	30	0	0	0		600-615 D: 2306 σt: 736
	106.35	7.15		Brown	Shale	Highly weathered	fractured zone	20	30	0	0	0		
	105.85	7.65		Purplish grey	Shale	Highly weathered	fractured zone	20	30	0	0	0		
	105.60	7.90												
	105.10	8.40			79 to 80 ^m Conglomerate	Highly weathered	Soft. Fractured zone with gravel	20	30	0	0	0		Q
	104.10	9.40					Crack of 40° with clay	20	30	0	0	0		
		10.00		Purplish grey	Shale	Moderately weathered	Medium hard Iron oxide stained crack of 45°, 70° Joint at 35°	20	35	0	0	0		Ck near Ck
	100.40	13.40			Sandstone			20	35	0	0	0		
	99.50	14.00		Purplish brown	Shale	Highly weathered	Soft. Crack of 70° with clay	20	30	0	0	0		Ck near Q
		14.50		Yellowish brown	Stony sandstone	Highly weathered	Soft. Crack of 70° with clay	20	30	0	0	0		
	97.50	16.00			Mudstone		Soft	20	30	0	0	0		
	97.20	16.30		Whitish grey	Quartzose sandstone	Highly weathered	Medium hard Iron oxide stained crack of 60°, 70°	20	30	0	0	0		Q
	94.45	19.65		Light grey	Shale			20	30	0	0	0		
	94.00	19.50		Whitish brown	Shale		Cracky zone Medium hard	20	30	0	0	0		

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

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

σt : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 6.8.39

Geological Log. of Borehole

Project Name		Tekol Hydro - electric Power Development Project		Site Name		Lower Tekol - Dom Site									
Hole No	LD-14 (2)	Elevation of Ground Level	113.50 m	Ground Water Level	-31.0 m	Bit Size	76 (HX)%								
Date	Beginning	August 1st, 1982	Operator	KRISHNAN & THANGAVELU	Coring	0.0m to 2.0 m									
	Ending	August 16th, 1982	Supervisor	Takaji SUGIMOTO Shiro OGANO	Dry Drilling	0.0m to 2.2 m									
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value (L _o) Permeability (K (cm ² /m))			Result of Rock Tests	Rock Classification	
	2040 (0.8)									2040 (0.8)	(L _o) 10 ²	10 ¹⁰			10 ³
0	93.10	20.40			Shale 20.4m		Medium hard								Cl
		20.80		Whish brown	Quartzose sandstone	Highly weathered	Iron oxide stained crack at 50°, 70° Joint at 30°								Cx near Cl
		23.00													Cl near Cx
		24.00													Cl
	6915	24.35			C. quartzose sandstone										Cx
	8890	24.60													Cl
5		25.00		Whish grey	Sandy shale	Highly weathered	Iron oxide stained crack at 70°								Cl
	8825	25.25													Cx
		26.30		Greyish white	Quartzose sandstone	Moderately weathered	Hard. Crack at 70°								Cx
		28.00													
		28.00		Dork grey	Shale	Slightly weathered	Hard. Joint at 30°								
	8430	29.20													
	8405	29.45			F. sandstone										
		29.50			Shale	Fresh	Hard.								
	8360	29.90													
10		30.10			F. sandstone		Joint at 35° to 30°								Cx
		31.60													
		32.00													
		32.00		Whish brown			Cracky zone Iron oxide stained crack								
	8050	33.00			Fine sandstone	Moderately weathered	Medium hard. Iron oxide stained. crack at 45°, 60° Clean joint at 60° with shale								
		33.50		Grey											
		35.20													
15		35.20		Greyish brown											
		36.00													
		37.00			Fine quartzose sandstone	Moderately weathered	Medium hard								
		37.00		Greyish white		Highly weathered	Iron oxide stained crack at 70° to 80°								
		39.75													
20		39.75		Grey	Sandy shale		Soft. Joint at 30°								

R. Q. D. : Rock Quality Designation

Legend: Result of Rock Tests
 Depth
 O : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.40

Geological Log. of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Lower Tekol Dam Site								
Hole No.	LD-14 (3)	Elevation of Ground Level	113.50 m	Ground Water Level	-31.0 m	Bit Size	76 (NX)%								
Date	Beginning	August 1st, 1982	Operator	KRISHNAN & THANGAVELU	Casing	00m to 20m									
	Ending	August 16th, 1982	Supervisor	Tokuji SUGIMOTO Shigeo OGANO	Dry Drilling	00m to 1.2m									
Casing	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Visc. (Lg) Permeability, K (cm/sec)			Result of Rock Tests	Rock Classification	
	2040 (0.8)	2040 (0.8)	(L) 10 ⁻¹	10 ⁻²	10 ⁻³	(K) 10 ⁻⁶	10 ⁻⁵	10 ⁻⁴							
0	73.15	40.35		Grey	Sandy shale		Soft Joint at 30°								
		41.50		Whitish brown					10						
				Greyish white	Quartzose sandstone		Hard. Iron oxide stained crack at 70°, 80° Joint at 30°		25						
									68						
									20						
									56						
		45.60			Shale 45.6m	Moderately weathered									
		46.00				to									
				Light grey		Slightly weathered	Hard. Iron oxide stained crack at 70°, 55° with limonite Joint at 20°		20						
									40						
									40						
10	63.50	20.00													
15															
20															

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 5.8.41

Geological Log. of Borehole

Project Name		Tata Hydro-electric Power Development Project			Site Name		Lower Quality Area							
Hole No	LQ-1 (1)	Elevation of Ground Level	124.69 m	Ground Water Level	-31.0 m	Bit Size	16 (NX)%							
Date	Beginning	August 19 th , 1982	Operator	T. KRISHNAN <th>Casing</th> <td colspan="3">0.0m to 4.5 m</td>		Casing	0.0m to 4.5 m							
	Ending	September 6 th , 1982	Supervisor	Tetsuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 2.5 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (Log) Permeability K (cm/m)			Result of Rock Tests	Rock Classification
										(L) 10 ¹ 10 ² 10 ³	(K) 10 ¹ 10 ² 10 ³			
0	123.52	0.10	1	Brown	Clayey soil		Containing organic material							
	120.44	4.25		Brown	Medium quartzose sandstone	Completely weathered	Very soft. Mostly sand with clay including breccia							D
	119.94	4.75		Brown	Clay (shale)									
5	119.69	5.00		Brown	Mq sandstone									
		5.75		Greyish white										CL
		6.20		Brown	Coarse quartzose sandstone	Completely weathered	Very soft. Sandy clay fractured zone							D
	117.69	7.00		Whitish brown		Highly weathered	Hard. Cracky Iron oxide stained crack							
	115.99	8.70		Brown	Medium quartzose sandstone									CL
10	115.09	9.60		Greyish brown	Shale	Completely weathered	Soft. Clayey							
	113.44	11.25		Greyish white	Mq sandstone									
	112.92	11.70		Grey	Shale	Moderately weathered	Hard. Iron oxide stained crack of 35°, 65°							CL
	112.74	11.95		Greyish white	Medium quartzose sandstone									CL
	111.69	13.00		Brown	Shale									D
	111.33	13.30		Greenish white	Fine quartzose sandstone	Highly weathered	Soft. Cracky Iron oxide stained crack.							CL
	110.79	13.90		Purplish brown	Shale									CL
	110.24	14.43												
		14.70		Purplish grey	Fine sandstone	Moderately weathered	Hard. Iron oxide stained crack of 65°							CL
15		18.00												
	106.19	18.50		Grey	Shale		Hard. Cracky Iron oxide stained							D
	105.94	18.75		Purplish grey	Fine sandstone		Hard. Iron oxide stained crack of 60°, 40°							CL
20	104.69	20.00												

R. Q. D : Rock Quality Designation
 Legend Result of Rock Tests
 O: sandstone, Quartzose sandstone
 FQ: sandstone, Fine quartzose sandstone
 D: Density, Specimen in Air (g/cc)
 UC: Unconfined Compression Strength (Kg/cm²)

465-1500
 D=2094
 UC=750

checked

Fig. 5.8.42

Geological Log. of Borehole

Project Name		Tata Hydro-electric Power Development Project			Site Name		Lower Quarry Area								
Hole No	LO-1 (2)	Elevation of Ground Level		124.69 m	Ground Water Level	-31.0 m	Bit Size	75 (NX) %							
Date	Beginning	August 19th, 1982		Operator	T. KRISHNAN		Coaling	0.0m to 4.5 m							
	Ending	September 5th, 1982		Supervisor	Tokuji SUBIMOTO Shigeo OSAHO		Dry Drilling	0.0m to 2.5 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Values (Lg) Permeability, K (m ² /m)			Result of Rock Tests	Rock Classification	
	20 (10) 80							20 (10) 80	(Lg) 10 ¹ 10 ¹⁰	10 ¹ 10 ¹⁰	10 ¹ 10 ¹⁰				
				Greyish white	Fine quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 60°, 80° 40°, 50° Joint of 30°								
	97.74	26.80		Dark grey											
		26.55		Brownish white	Quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 60°, 70°								
	94.94	29.75		Brownish white	Fine quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 60°, 40°, 70°								
	91.19	33.50		Brown	Coarse quartzose sandstone	Moderately weathered	Cracky zone Fractured zone Very soft								
	90.79	33.90		Brownish white	Fine quartzose sandstone	Moderately weathered	Medium hard. Cracky Iron oxide stained crack								
	89.69	35.00		Brownish white	Coarse quartzose sandstone	weathered	Hard								
	88.54	36.15		Brownish white	Sandy shale Conglomerate		Joint of 30°								
	87.29	37.40		Brownish white	Quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 40°, 50°								
	86.93	37.70													
	86.72	37.90													

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 5.8.43

Geological Log. of Borehole

Project Name		Tata Hydro-electric Power Development Project			Site Name		Lower Quarry Area							
Hole No	LQ-1 (3)	Elevation of Ground Level	124.69 m	Ground Water Level	-31.0 m	Bit Size	76(NX)X							
Date	Beginning	August 19th, 1982	Operator	T. KRISHNAN	Casing	00m to 45 m								
	Ending	September 5th, 1982	Supervisor	Tokuji SUJIMOTO Siro OGANO	Dry Drilling	00m to 25 m								
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value. (Lw) Permeability. K (cm/m)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³	10 ⁻¹ 10 ⁻² 10 ⁻³			
		43.00					Joint at 30° Hard Iron oxide stained crack at 40°, 50°						4120-4130 D= 2543 Cc= 336	
		46.00		Brownish white	Quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack at 40°, 60°							Cy
		48.50					Hard. Iron oxide stained crack at 50°, 70°							
		49.60		Light grey	Shale Coarse quartzose sandstone		Cracky. Iron oxide stained crack							Cc
		50.00		Brownish white	Quartzose sandstone									

R. Q. D.; Rock Quality Designation

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

checked

Fig. 5.8.44

Geological Log. of Borehole

Project Name				Tehel Hydro-electric Power Development Project		Site Name		Lower Quality Area						
Hole No	LO-2 (1)	Elevation of Ground Level	139.40 m <th>Ground Water Level</th> <td>-25.0 m</td> <th>Bit Size</th> <td>16 (N)X</td> <th colspan="4">Result of Rock Tests</th>	Ground Water Level	-25.0 m	Bit Size	16 (N)X	Result of Rock Tests						
Date	Beginning	September 6th, 1982	Operator	T. KRISHNAN		Logging	00m-104.5 m	Result of Rock Tests						
	Ending	September 19th, 1982	Supervisor	TAKUJI SUZUMOTO SAITO OGAKO		Dry Drilling	00m-104.5 m	Result of Rock Tests						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value (Ls) Permeability, K (cm/m)			Result of Rock Tests	Rock Classification
										(Ls) 10 ⁻¹	10 ⁻²	10 ⁻³		
0	139.15	0.25		Brown	Sandy soil									
	138.1	1.30		Yellowish brown		Completely weathered	Very soft							
	136.10	4.30		Brownish yellow	Fine quartzose sandstone		Mainly sand with sandstone breccia							D
	133.60	5.80					Medium hard							
	132.25	7.15		Whitish grey	Medium quartzose sandstone	Highly weathered	Crack at 50°, 60° with clay							Cc
	131.70	7.70		Grey	Shale		Soft, clayey shale							
	130.90	8.80		Brownish yellow	8.5m Purplish shale		Medium hard							
	130.00	9.85			9.35m to 9.4m Purple shale		Iron oxide stained crack at 50°, 45°, 30°							
	129.40	10.00			10.0m to 10.1m Greyish shale		Joint at 30° with clayey shale							
	128.85	10.55		Light brown	10.55m Purplish shale		Medium hard, Iron oxide stained crack at 50°, 45°, 30°							Cd
	122.40	12.00					Joint at 30°							
	126.20	13.20		Light grey	Fine quartzose sandstone	Moderately weathered	Partly quartz vein							
	125.85	13.55		Brownish yellow			Cracky							
	125.00	14.40		Light grey	Medium quartzose sandstone		With brownish clay							Cc
	124.85	14.55		Brownish purple	Shale		Cracky							
	123.40	16.00		Light grey	Medium quartzose sandstone		Hard							
	122.35	17.05		Purplish brown			Fractured zone Very cracky with brownish clay							
	122.15	17.25		Purplish grey	Shale	Highly weathered	Cracky zone, Iron oxide stained crack with clay.							
	121.30	18.10		Whitish grey	Quartzose sandstone	to	Sandstone with Greyish shale patch							Cc
	131.75	18.55		Purplish grey	Clayey shale	Moderately weathered								
	130.40	19.00		Whitish grey	Quartzose sandstone									
	120.10	19.30		Purplish grey	Clayey shale									
	118.43	19.85		Grey	9.85m to 20.00m Clay		Fractured zone. Soft to medium hard Iron oxide stained crack with clay							

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen in Atr. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

630-1346 CM
 D12575
 Cc-2129

checked

Fig. 5.8.45

Geological Log. of Borehole

Project Name		Tata Hydro-electric Power Development Project			Site Name		Lower Quarry Area								
Hole No	LD-2 (2)	Elevation of Ground Level		139.40 m	Ground Water Level	-25.0m	Bit Size	76 (NX) %							
Date	Beginning	September 6th, 1962		Operator	T. KRISHNAN		Casing	00m to 4.5m							
	Ending	September 19th, 1962		Supervisor	Takeshi SUZUMOTO Shiro OGANO		Dry Drilling	00m to 4.5m							
Scale	Dimensions (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logeo Value. (L _v)			Results of Rock Tests	Rock Classification	
	(K)							(K)	10 ¹	10 ²	10 ³				
0	118.85	20.55		Brown	20.55m; Clayey shale	Highly weathered	Froctured zone Soft to medium hard Iron oxide stained crack with clay								
	118.40	21.00		Light brown	Medium quartzose sandstone	Moderately weathered	Cracky zone Medium hard Crack with clay								C ₂
	117.40	22.00		Whitish grey	22.45m; Clayey shale		Cracky Medium hard Iron oxide stained crack Joint at 40°								
	116.30	23.10		Grey and purplish red	Clayey shale		Partly with sandstone fragments								
	115.95	23.45		Light brown to light grey	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack of 50°, 60°, 70° Joint at 40°								C ₂
	113.10	26.25		Brown	Clayey shale										
	112.85	26.45		Brown	Coarse quartzose sandstone	Highly weathered	Cracky zone Iron oxide stained crack with clay								C ₂
	112.40	27.00		Brown	Coarse quartzose sandstone	Highly weathered	Cracky zone Iron oxide stained crack with clay								C ₂
	110.80	28.60		Light brown	Medium quartzose sandstone		Hard. Iron oxide stained crack at 20°, 60° Joint at 40°								C ₂
	108.05	31.35		Brownish grey	Coarse quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack at 50°, 70°								C ₂
	106.80	32.60		Whitish grey	Fine quartzose sandstone		Cracky zone								C ₂
	106.20	33.20		Light grey	Shale		Iron oxide stained crack.								C ₂
	105.80	33.60		Brown	Medium quartzose sandstone		Hard. Iron oxide stained crack at 40°, 50°, 70°								C ₂
	104.80	34.60		Brownish grey	Fine sandstone		Joint at 30°								C ₂
	103.40	36.00		Greyish white	Sandy sandstone		Hard. Iron oxide stained crack at 40°, 70° 50°, 60°								C ₂
	102.55	36.85		Light grey	Fine sandstone		Hard. Iron oxide stained crack at 40°, 70° 50°, 60°								C ₂
	102.30	37.00		Whitish grey	Medium quartzose sandstone		Hard Iron oxide stained crack at 40° 50°, 60°, Joint at 30° with clay								C ₂

2910-2920
D = 2548
σ_c = 513

R. Q. D : Rock Quality Designation

Legend: Result of Rock Tests
 D: Density, Specimen in Air (g/cm³)
 σ_c: Unconfined Compression Strength (Kg/cm²)

checked

Fig. 5.8.46

Geological Log. of Borehole

Project Name		Tatal Hydro-electric Power Development Project			Site Name		Lower Quarry Area						
Hole No	LQ-2(3)	Elevation of Ground Level	139.40 m	Ground Water Level	-250 m	Site Size	16 (NX)%						
Date	Beginning	September 6th, 1982	Operator	T. KRISHNAN		Castig	0.0m to 4.6 m						
	Ending	September 19th, 1982	Supervisor	Takuji SUGIMOTO Shiro OGANO		Dry Drilling	0.0m to 4.3 m						
Scale	Diagrams (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value. (L _n)			Result of Rock Tests	Rock Classification
	Depth (m)								Permeability. K (cm/m)	10 ¹	10 ²		
							20 (0.85)	20 (0.80)	(K) 10 ¹	10 ²	10 ³		
	40.90		Whish grey	Medium quartzose sandstone	Moderately weathered	Hard. Iron oxide stained crack at 40°, 50°, 60° Joint of 30° with clay	53	51					
	42.00		Light brown										
	43.10		Light brown	Coarse quartzose sandstone	Highly weathered	Hard. Cracky Iron oxide stained crack Joint of 30° with iron oxide Hard. Iron oxide stained crack at 30°, 40°, 80°	13	30					
	44.00								Brown				
	45.00		Light brown			Hard							
	45.60		Light grey	Shale									
	45.95		Whish grey	Coarse quartzose sandstone	Moderately weathered	Cracky zone Hard. Iron oxide stained crack at 30°, 50°, Joint of 30° with iron oxide	22	25					
	46.10								Light grey				
	46.60		Whish grey	Medium quartzose sandstone			1	0					
	47.00								Medium quartzose sandstone				
	47.60		Whish grey	Shale (clay)			0	0					
	48.10								Medium quartzose sandstone				
	48.40		Whish grey	Medium quartzose sandstone		Hard. Iron oxide stained crack at 20°, 50°, 60°, 30° Joint of 40°							
	49.50		Grey	Clayey shale									
	49.70		Light grey	Mq sandstone									
	50.00												

R. Q. D ; Rock Quality Designation

Legend Result of Rock Tests

Depth

0 : Density, Specimen in Air. (g/cc)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked