

Depth (m)	General Geologic Description, Engineering Properties of Rock/Materials, and Drilling Remarks etc.
0 - 3	Residual Soil, brownish, highly plastic with traces of silty materials, completely weathered.
3 - 200	<p>Volcanic Breccia, sound rock starts at depth 28m. The upper portion of sound rock is generally poor with recoveries ranging from ground particles to broken chips and fragments and several core pieces, relatively short.</p> <p>Searing was observed at 23.17 m and 26.37m.</p> <p>Recementing along these sheared structures is tight. Rock is friable to hard.</p> <p>Lower portion is sound rock, broken to massive with breakages attributed to mechanical handling. Joints are widely distributed along core samples ranging from stringers or hairline sized to several mm thick, recemented with quartz calcite minerals.</p> <p>Lapilli Tuff, noted at 63.67 m to 84.67 m, blocky to meassive sound and hard to very hard rock.</p>
200 - 310	Volcanic Breccia with andesite intrusions noted at 244.50 m to 265.91 m depth and

277.23 m to 309.05 m. Physical characteristics of rocks are hard to very hard, sound, and broken to massive with minor inclusions of chips and fragments at mid section. Sheared and brecciated sections are of considerable amount with a minimum interval spacing of 5 m.

Most of these structures with presence of extreme jointings were observed along the andesitic rock, although generally tight and recemented with quartz-calcite minerals. Myolinite and chalky material were also noted on some of these structures.

Drilling was difficult but with an average of 85% grayish return water, reducing volume as depth increases.

310 - 400

This portion shows andesites intruding volcanic breccia in alternate sections, measuring 2 m min. and 35 m max. thickness.

Recoveries are mostly core pieces with angular chips and fragments at 363.52 m to 367.5 m depth. Rock samples are slightly to extremely jointed with fractures that have initiated from these joints. Calcites are the predominant recementing minerals ranging from hairline to several mm thick.

Rock is sound, hard to very hard and very broken to massive.

Rotary drilling was difficult all throughout with no return water.

A graphical log with general descriptions is attached herein for immediate reference, as shown in Fig.2-2-36.

(3) Comments and Recommendations

- 1) The existence of water leakage at depth 312.7 m to the bottom of the hole is possible due to no return of circulation water during drilling operations.

Negative Factors

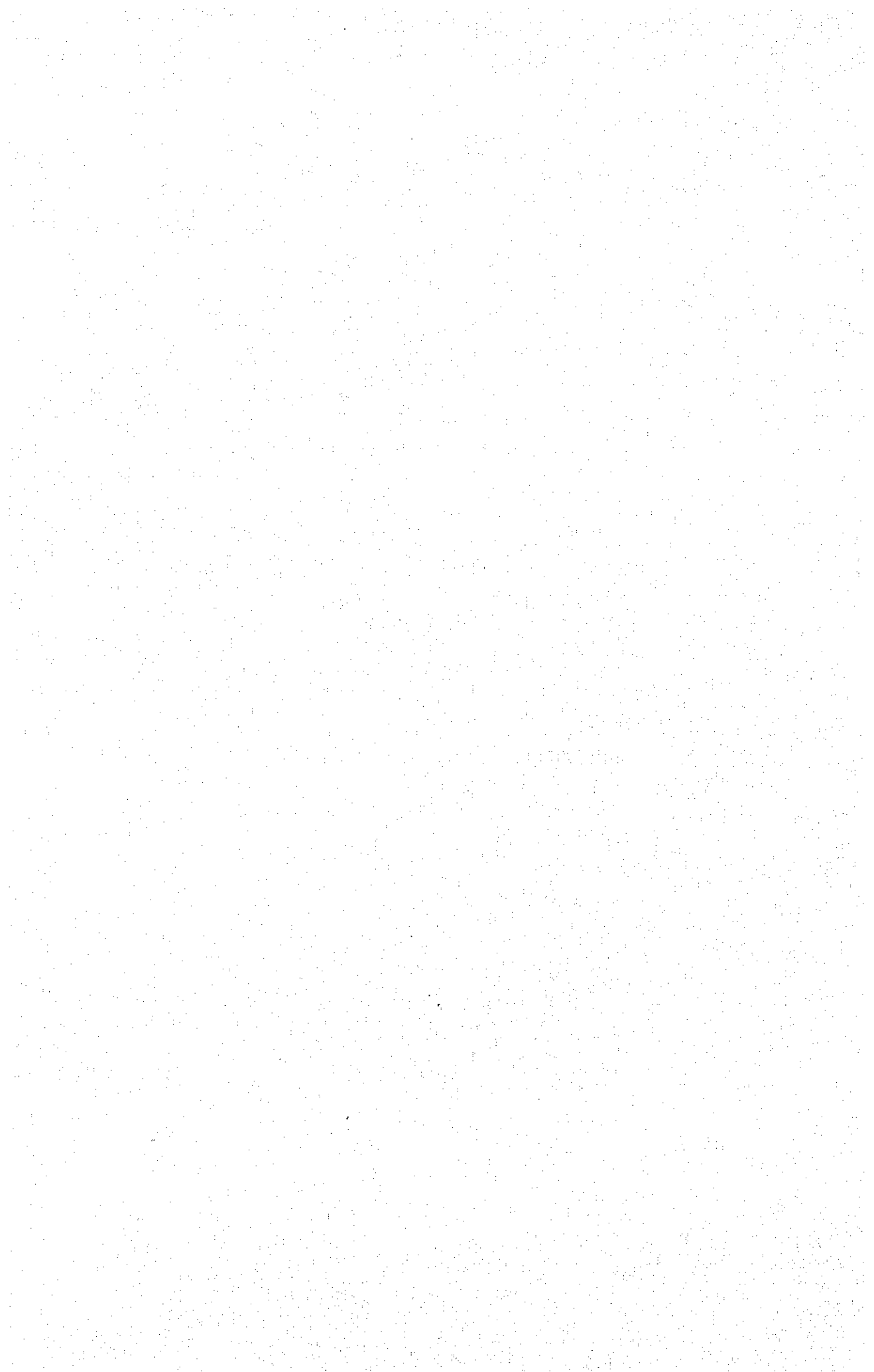
- a) Ground water elevation was measured at 312.7 m after completion of the drill hole. The above water table is unreliable since introduced circulation water possibly accumulated. No further measurement was conducted after the initial reading.
- b) The presence of brecciated and sheared structures from 310 m to 200 m above were generally healed and tight. These structures are insufficiently absorbent due to the high percentage of return water, but can also be considered a possible factor to the existence of chalky materials along some structures.
- c) Fractures below 310 m are generally tight, with slight alternation of cementing materials, predominantly carbonaceous minerals.

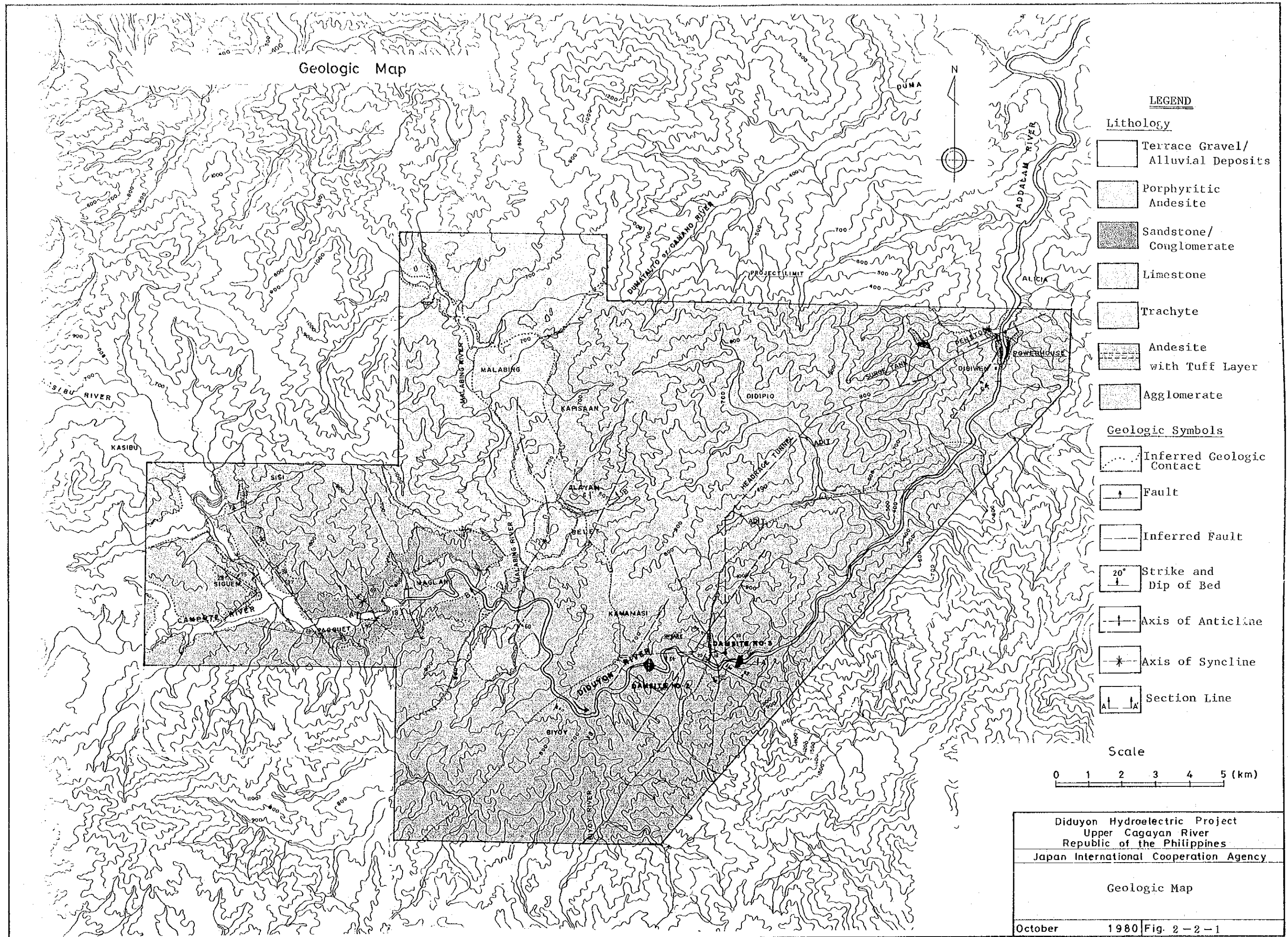
Water Loss can be attributed to possible slaking not vivid through ocular investigation. It would be therefore advisable to conduct laboratory tests on these samples.

- 2) Confirmation of slaking at a depth of 363 m lacks substantial data, thus, the following observations

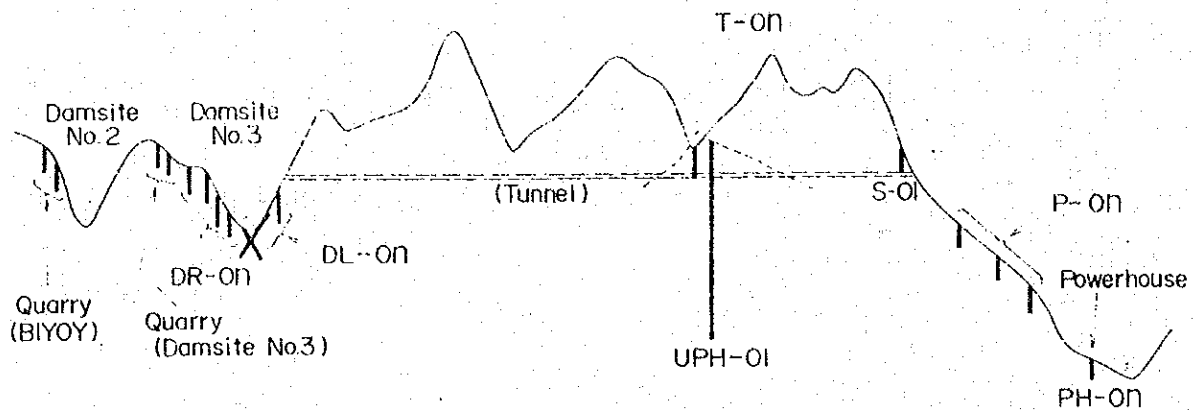
are possible factors and or evidence of slaking at this depth;

- a) Grouting was applied at depth 363.87 m to 364.5 m due to consistent blocking of the core bit that might be caused by caving of fragments. During the grouting process the first three (3) bags of cement introduced in the hole were washed out, prompting EGI drillers to end seven (7) bags of cement and three (3) bags of bentonite to block the cave in section. Recoveries afterwards were mostly chips and fragments.
 - b) Volcanic breccia intruded by andesites became darker compared to the same rock type above it, a possible indication of metamorphism altering the composition of the original rock. Samples should be taken for petrographic analysis to determine possible alterations.
- 3) The presence of a steep dipping fault along the Didipio creek can be another possible factor. These must be confirmed by detailed mapping and additional bore holes.





Distribution of Boreholes



Location	Borehole	Length (m)	Remarks
Damsite No.3	DR - 01	70	
	DR - 02	50	Inclined drilling
	DR - 03	50.1	
	DR - 04	100	Inclined drilling
	DR - 05	70.2	
	DR - 06	100	
	DR - 06A	70	
	DR - 07	70.1	
	DR - 07A	65	
	DR - 08	50	
	DR - 09	50	
	DR - 09A	50.1	
	DL - 01	—	
	DL - 02	—	
DL - 03	50		
DL - 04	100	Inclined drilling	
	Total	945.5	
Damsite No.2	D2R - 01	60	
	D2R - 02	40	
	D2L - 01	40	
	Total	140	
Quarry	A - 01	50	Drilling implemented, but with few core samples unfit for geological interpretation.
	A - 02	(35)	
	A - 03	50	
	A - 04	50	
	A - 05	50	
	Total	200 (35)	
Water way	T - 01	40	
	T - 02	40	
	T - 03	40	
	T - 04	40	
	Total	160	
Surge Tank & Penstock	S - 01	100	
	P - 01	22.7	
	P - 02	20	
	P - 03	20	
	Total	162.7	
Powerhouse	PH - 01A	40	
	PH - 02	40	
	PH - 03	40	
	UPH - 01	400	
	Total	520	
Grand Total		2128.2	

Diduyan Hydroelectric Project
Upper Cagayan River
Republic of the Philippines
Japan International Cooperation Agency

Geologic Logs of Boreholes

October 1980 Fig. 2-1-2

Legend

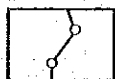
Geology

Symbols	Name	
	Rs	Residual Soil / Talus deposits
	Gr	Terrace Gravel / Alluvial Deposits
	Agg	Agglomerate
	Tfbr	Tuff breccia
	Tf	Tuff
	Ad Tf br alt	Alternation of Andesite and Tuff breccia
	Ad	Andesite
	Por	Porphyrite
		Gouge (Fault Clay)
		Fractured or Sheared Zone
		Completely or Highly Weathered Zone

Core Recovery and R. Q. D.



Core Recovery



R. Q. D.

Diduyon Hydroelectric Project Upper Cagayan River Republic of the Philippines	
Japan International Cooperation Agency	
Geologic Logs of Boreholes	
October	1980
Fig. 2-2-3	

Fig. 2-2-4 (I) GEOLOGIC LOG OF DR-01

BOREHOLE No.		DR - 01			ELEVATION			672.67m			INCLINATION		90°		TOTAL DEPTH		70 m	
DEPTH	GEOLOGY					CORE RECOVERY					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS		
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)												
						20	40	60	80	100	5	10	15	20				
3.1	(stippled)	Rs																brown, silty clay, slightly plastic.
4.8	(vertical lines)	Agg	A-2											CH				3.1~4.80m slightly weathered.
6.1	(diagonal lines)	Agg												D				4.8~6.1m highly weathered.
10.1	(cross-hatched)	Ad		F-2										B				grayish to reddish brown, fresh and hard.
10.1	(cross-hatched)	Agg																Clasts are mostly andesitic, reddish brown, sub-angular to sub-rounded and pebbly.
13.5	(cross-hatched)	Ad																Matrix is fine to medium grained and well cemented.
16.5	(cross-hatched)	Agg																Joints are generally filled with rhodochrosite vein.
20	(cross-hatched)	Agg	F-1	D-1														
21.6	(cross-hatched)	A-1																
23.3	(cross-hatched)			F-2														
25	(cross-hatched)																	
26.3	(cross-hatched)																	
30	(cross-hatched)																	
31.4	(cross-hatched)			F-1														
33.1	(cross-hatched)																	
35	(cross-hatched)																	
38.61	(cross-hatched)																	38.61m Slickenside observed.
40	(cross-hatched)																	
41.4	(cross-hatched)		A-1	F-2														
43.5	(cross-hatched)		TO															
44.0	(cross-hatched)		A-2															
44.0	(cross-hatched)			F-1														43.5~44.0m Cracky and slightly weathered, 60° oriented joint observed.
45	(cross-hatched)																	
46.3	(cross-hatched)																	
50	(cross-hatched)		A-1															

To be continued

Fig. 2-2-4(2) GEOLOGIC LOG OF DR-01

BOREHOLE No.		DR-01		ELEVATION		672.67 ^m		INCLINATION		90°		TOTAL DEPTH		70 m	
DEPTH	G E O L O G Y					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15		
50	[Symbol: Diagonal dashes]	Agg	A-1	F-1	D-1	[Core Recovery & R.Q.D. Data]				8.2				B	
			A-1 TO A-2			[Core Recovery & R.Q.D. Data]				4.4					
60						[Core Recovery & R.Q.D. Data]				3.2					
70						[Core Recovery & R.Q.D. Data]				3.0					

Fig. 2-2-5 GEOLOGIC LOG OF DR-02

BOREHOLE No.		DR-02		ELEVATION		601.31 m		INCLINATION		50°		TOTAL DEPTH		50 m						
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS					
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15			20				
10	Agg.			F-2	D-2 TO D-1									CL	0~1.85m broken to short cores.					
				F-3												CH	0~5.1m slightly weathered			
				F-1																
20	Agg.			A-2																
				A-1																
30	Agg.			A-1																
40	Agg.																			
50	Agg.																			

Fig. 2-2-6 GEOLOGIC LOG OF DR-03

BOREHOLE No.		DR-03		ELEVATION		556.47 m		INCLINATION		90°		TOTAL DEPTH		50.1 m		
DEPTH	SYM-BOL	GEOLOGY			CORE RECOVERY					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
		NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)					5 10 15 20					
0-10	[Symbol]	Agg.	A-2	F-2	D-2										CM B	0~1.8m slightly weathered. dark grayish with purplish tints. fresh and hard. Clasts are mostly andesitic, sub rounded to angular and pebbly to cobbly. Matrix is coarse to fine grained and well cemented.
				F-1												1.3
10-20	[Symbol]	Agg.		F-2												Joint is generally oriented 40~70° and filled with rhodochrosite. 14.3~15.4m andesitic flow or dyke.
					F-1											
20-30	[Symbol]	Agg.	A-1		D-1											24.5~24.9m andesitic flow or dyke.
					F-2											
30-40	[Symbol]	Agg.		F-3												
					F-5											
40-50	[Symbol]	Agg.														
					F-2											
50-50.1	[Symbol]	Agg.														
					F-2											
50-50.1	[Symbol]	Agg.														
					F-1											

Fig. 2-2-7(1) GEOLOGIC LOG OF DR-04

BORE HOLE No. DR-04		ELEVATION 553.77 m				INCLINATION 45°				TOTAL DEPTH 100 m				
DEPTH	GEOLOGY				CORE RECOVERY				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	B.R.Q.D. (%)				5 10 15 20				
0 - 12.5	Gr													alluvial deposit. big boulder of agglomerate.
12.5 - 20	Agg		?	?	D-2 TO D-1							3.4	B	It consists with numerous boulders of andesite, purplish gray, fresh, very hard and massive. Joints are rare and tightly filled with rhodochrosite.
20 - 30	A-1				F-1 TO F-2							3.2		20.5 ~ 21.8 m andesitic dyke or sill, chilled margin observed.
30 - 38	Ad				F-2							0.7		
38 - 40	A-2				F-4							9.5		30m ~ bottom no return water porphyritic andesite, light gray to gray, very hard, chilled margin observed.
40 - 48	A-1				F-1 TO F-2							0.7		
48 - 50	Agg				F-2 TO F-3							0.9	B	
50 - 55	A-2 TO A-1				F-3							1.6		

To be continued

Fig. 2-2-7(2) GEOLOGIC LOG OF DR-04

BOREHOLE No.		DR - 04		ELEVATION		553.77m		INCLINATION		45°		TOTAL DEPTH		100 m		
DEPTH	G E O L O G Y						CORE RECOVERY & R.O.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS		20	40	60	80	100	5	10	15		
50	[Symbol: small triangles]		A-2											2.2		56.4~60.1m andesitic lava flow or dyke
				F-2												
						D-1									1.5	
60			A-1												1.7	64.2~65.9m andesitic lava flow with flow-breciated structure.
			Agg.		F-4										0.3	
					F-3											
20				A-2		D-1									0.6	CH 71.1~72.2m 72.5~73.1m 73.5~75m andesitic lava flow
					F-4	TO D-2										
					F-1										0.5	B
80				A-1	F-2	D-1									0.4	81.7~82.8m andesitic lava flow
				F-1										1.5		
90														3.1	91.4~91.8m andesitic lava flow	
				F-2										8.6		
100																

Fig. 2-2-8 (1) GEOLOGIC LOG OF DR-05

BOREHOLE No.		DR-05		ELEVATION		652.78m		INCLINATION		90°		TOTAL DEPTH		70.2 m		
DEPTH	G E O L O G Y			CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS			
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5				10	15
3.0		Rs.														silty clay with sub-angular pebbles. 3.0~5.5m
			A-4	F-4	D-4											D grayish to brownish, highly weathered and extremely jointed.
					D-2											B gray to purplish gray, fresh and hard. Clasts are andesitic, pebbly to cobbly and sub-angular to sub-rounded.
10																Some rhodochrosite filled joints observed.
					F-2											0.3
																0.3
20																0.4
		Agg.														20~50m slightly altered
			A-1													0.3
					D-1											0.3
30																0.3
					F-3											31.8 m thin andesitic dyke
																0.3
					F-2											0.2
																0.2
40																0.2
					F-1											0.3
																0.3
50																0.3

To be continued

Fig. 2-2-8(2) GEOLOGIC LOG OF DR-05

BOREHOLE No.		DR - 05		ELEVATION		652.78 ^m		INCLINATION		90°		TOTAL DEPTH		70.2 ^m		
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15			20
30				F-1									0.3			
				F-2												
				F-1										0.4		
60			Agg. A-1			D-1										59m ~ bottom
					F-2											no return water
				F-1									0.3			
				F-1												
				F-2									0.2			
70																
70.2																

Fig. 2-2-9(1) GEOLOGIC LOG OF DR-06

BOREHOLE No.		DR - 06		ELEVATION		648.97m		INCLINATION		90°		TOTAL DEPTH		100 m		
DEPTH	G E O L O G Y			CORE RECOVERY					LUGEON				ROCK CLASSIFICATION	REMARKS		
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	R. Q. D. (%)					VALUE					
						00	40	60	80	100	5	10	15	20		
		Rs.														pale brown, silty.
7.8																7.8~26.1 m completely weathered (non core)
10																Clasts are sub-angular to sub-rounded and pebbly to cobbly. Matrix is medium to coarse grained.
20		Agg.	A-5	?	D-5											
																26.1~33.5m light brown to grayish. highly weathered and friable.
30			A-4	F-4 TO F-5	D-4											
			A-3	F-4	D-4											
			A-4	F-4	D-4											
			A-3		D-3											gray to brownish gray, moderately weathered.
				F-4 TO F-5	D-4 TO D-3											37.5~50m numerous rhodochrosite filled joints observed. thickness varying from stringer to 10 cm.
40			A-3	F-5	D-3											CL
			A-2	F-4	D-2											38.7~47.6m andesitic lava flow
		Ad.	A-2	F-3												CM
			A-3	F-4 TO F-3												43.4~48.1m several 60~70° oriented slip planes observed.
			A-2	F-3	D-2											
50		Agg.														23

To be continued

Fig. 2-2-9(2) GEOLOGIC LOG OF DR-06

BOREHOLE No.		DR-06		ELEVATION		648.97 ^m		INCLINATION		90°		TOTAL DEPTH		100 m		
DEPTH	G E O L O G Y			CORE RECOVERY & R.Q.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS		
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15	20
50	[Symbol]		A-2	F-3	D-2	[Core Recovery & R.Q.D. (%) Graph]					6.6				CM	50~92.3m slightly weathered and altered. grayish with purplish flints. joints dominant and several slip planes observed and oriented at 50~90°.
			A-1	F-4												
				F-3 TO F-4												
				F-4												
			A-2								2.2					
60	[Symbol]		A-1			[Core Recovery & R.Q.D. (%) Graph]					5.3					
				F-3 TO F-4												
			A-2	F-3												
				F-2 TO F-3							5.2					
70	[Symbol]	Agg.	A-1			[Core Recovery & R.Q.D. (%) Graph]					11.2					
				F-2												
				F-4												
	[Symbol]		A-2	F-3		[Core Recovery & R.Q.D. (%) Graph]					9.0					
				F-4												
80	[Symbol]			F-4		[Core Recovery & R.Q.D. (%) Graph]					4.3					
				F-3							5.1					
90	[Symbol]			F-3		[Core Recovery & R.Q.D. (%) Graph]					5.1				CL	92.3m~bottom moderately to highly weathered. numerous rhodochrosite veins observed and altered. 94.3~94.5m horizontally displaced minute vertical fault observed.
				F-4												
				D-3							5.1					
				D-2							6.1					
100	[Symbol]					[Core Recovery & R.Q.D. (%) Graph]										

Fig. 2-2-10(1) GEOLOGIC LOG OF DR-06A

BOREHOLE No.		DR-06A		ELEVATION		651.00m		INCLINATION		90°		TOTAL DEPTH		70 m	
DEPTH	G E O L O G Y				CORE RECOVERY & R.Q.D. (%)				LUCEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15
3.1		Rs.													light brown, silty to slightly plastic.
10															3.1~21.5m brownish, completely weathered, (non core)
20			A-5											D	
30			A-2												brownish to grayish, porphyritic.
			A-4	F-4											26~32m highly weathered, grayish to brownish
40			A-3	F-3										CL	grayish with reddish to purplish tints. moderately to slightly weathered.
			Agg.												10.3 rodochrosite filled joint observed.
50			A-2	F-4										CH	38.6m sheared and brecciated.
				F-2 TO F-3											40.5~42m slightly swelled
															46.3~46.7m brecciated
														B	

To be continued

Fig. 2-2-10(2) GEOLOGIC LOG OF DR-06A

BOREHOLE No.		DR-06A		ELEVATION		65.00 m		INCLINATION		90°		TOTAL DEPTH		70 m	
DEPTH	G E O L O G Y			CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE		ROCK CLASSIFICATION	REMARKS				
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80			100	5	10	15
50	[Symbol: small dashes]	Agg.	F-2 TO F-3	D-2 TO D-1	D-2 TO D-1	[Graph: Core recovery & R.Q.D. (%) vs Depth]				02		CH	51-66m numerous joints observed filled with rhodochrosite. 54.2-54.3m open cavities.		
				F-3 TO F-4										D-1	
60				F-2 TO F-3											12
				F-1										D-2	10
70				D-1											

Fig. 2-2-11(i) GEOLOGIC LOG OF DR-07

BOREHOLE No.		DR - 07		ELEVATION		653.15 m		INCLINATION		90°		TOTAL DEPTH		70.1 m		
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15			20
0 - 8.4		Rs.														brownish, silty to slightly plastic with few pebbles.
8.4 - 10			A-5													pale brown to dark brown, highly weathered.
10 - 17			A-4		?											10~13m completely weathered.
17 - 17.8			A-4													17~17.8m completely weathered.
17.8 - 20		Agg	A-3													highly weathered and extremely jointed
20 - 26			F-4													grayish, slightly weathered. joints are filled with rhodochrosite and oriented at 35~50°
26 - 30			A-2													26~31m 35~45° oriented shear planes observed and refilled with rhodochrosite and quartz.
30 - 35			F-3													
35 - 40			F-4													
40 - 45			F-3													
45 - 50			F-2													

To be continued

Fig. 2-2-11 (2) GEOLOGIC LOG OF DR-07

BOREHOLE No.		DR - 07		ELEVATION		653.15 ^m		INCLINATION		90°		TOTAL DEPTH		70.1 m	
DEPTH	SYM-BOL	G E O L O G Y				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
		NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15		
50	[Symbol: Aggregates]	Agg		F-2											
				F-3											
60				A-1											
				F-2											
70 70.1															

61.3 ~ 618m
fractured zone observed and oriented at 20°

Fig. 2-2-12(1) GEOLOGIC LOG OF DR-07A

BOREHOLE No. DR-07A		ELEVATION 655.00m		INCLINATION 90°		TOTAL DEPTH 65 m			
DEPTH	GEOLOGY				CORE RECOVERY & R.O.D. (%)	LUGEON VALUE	ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT					HARDNESS
3.1		Rs.							brown plastic and silty.
3.1-18.3m								D	pale brown to gray, completely weathered (non-core)
10			?	?	?				
20									grayish with reddish brown tints, moderately weathered.
20-35m		Agg.	A-3	F-4	D-2			CL	Joints are filled with rhodochrosite and oriented at 20~70°
30			A-3 TO A-2				10.4		25~35m iron stain and weathering observed along some joints.
30			A-3						
30			A-2						
30				F-3 TO F-2	D-1			CM	
30				F-4			3.6	GL	
30					D-3			CM	
30			A-3						slightly weathered to fresh.
30			A-2 TO A-1	F-1	D-2		3.2	CH	slightly jointed and hard.
30				F-2					clasts are pebbly and matrix is fine to medium grained.
30			A-3 TO A-2	F-3	D-3			CM	
30			A-2	A-3	D-4 TO D-3		2.4	CL	42~45m moderately weathered
30			A-3	F-4	D-4				
30			A-3 TO A-2	F-3	D-2				
30			A-2	F-2			2.1	CH	47.5~47.7m highly weathered
30					D-3 TO D-2				

To be continued

Fig. 2-2-12(2) GEOLOGIC LOG OF DR-07A

BOREHOLE No.		DR-07A		ELEVATION 655.00 m		INCLINATION 90°		TOTAL DEPTH 65 m							
DEPTH	G E O L O G Y				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	30	40	60	80	100	5	10			15
50	Agg.		A-2	F-2	D-3 TO D-2					2.1				CH	50.3 m slip plane (slicken side) with rhodochrosite vein.
			A-1	F-1	D-2 TO D-1					2.3				CH	58.8~59.8 m slightly weathered and altered.
60										1.3					
65															

Fig. 2-2-13

GEOLOGIC LOG OF DR-08

BOREHOLE No.		DR-08		ELEVATION		66914 m		INCLINATION		90°		TOTAL DEPTH		50 m		
DEPTH	GEOLOGY			CORE RECOVERY & R.Q.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS		
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15	20
0-9.0		Rs														brownish, soft and plastic.
9.0-20.0																brownish, completely weathered.
20.0-30.0		Agg.														highly weathered
30.0-32.0		A-4		F-4 TO F-5												
32.0-34.0				F-4												
34.0-36.0				F-3												CL
36.0-38.0				D-2												CH
38.0-40.0		A-2														gray with purplish tints. clasts are pebbly and matrix is fine to medium grained.
40.0-42.0				F-2												
42.0-44.0																
44.0-46.5																
46.5-48.0																
48.0-50.0																
50.0																

Fig. 2-2-14 GEOLOGIC LOG OF DR-09

BOREHOLE No.		DR-09		ELEVATION		688.38 ^m		INCLINATION		90°		TOTAL DEPTH		50 m	
DEPTH	GEOLOGY			CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS		
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5			10	15
9.2	[Symbol: small triangles]	Rs.													brownish silty to slightly plastic.
10															
	[Symbol: inverted triangles]	Ad.	A-5	?											highly weathered. recovers mostly sub-angular to sub-rounded fragments of andesite.
20	[Symbol: horizontal dashes]	Agg.	A-3	F-4	D-3										grayish moderately weathered.
			A-4												highly weathered and heavily oxidized and friable.
			A-4 TO A-3	F-5 TO F-4											
30			A-4		D-4										
				?											brownish gouge?
			A-3 TO A-4	F-3 TO F-4	D-3										35m slicken side observed with rhodochrosite vein.
				?											CL
40															39~41m dark bluish gray highly altered and slightly expansible.
			A-3	F-4	D-3										
			A-3 TO A-2	F-3 TO D-2											CL
															top ~ bottom rocks are slightly sheared.
50															

Fig. 2-2-15 GEOLOGIC LOG OF DR-09A

BOREHOLE No. DR-09A		ELEVATION				INCLINATION				90°	TOTAL DEPTH	50.1 m				
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15			20
0 - 9.2	[Symbol]	Rs.														brownish and plastic.
9.2 - 10	[Symbol]		A-5	?	D-50											9.2~16.8m dark brown and slightly plastic. (only sludge)
10 - 20	[Symbol]	Agg.	A-4	F-4	D-4										D	light brown. completely weathered.
20 - 28.6	[Symbol]			F-4 TO F-3												grayish. highly weathered.
28.6 - 29	[Symbol]		A-3	F-4 TO F-2	D-3											28.6~29m few slickenside observed and oriented at 50°
29 - 32	[Symbol]			F-2											CL	29~32m grayish with purplish tints. moderately weathered.
32 - 37.5	[Symbol]		A-4	F-3 TO F-2						16.4					D	32~42m yellowish brown. highly weathered.
37.5 - 38.1	[Symbol]									19.4						37.5~38.1m brownish clay, gouge?
38.1 - 40	[Symbol]															38.1~40m dark gray. slightly expansible.
40 - 42	[Symbol]															40m slickenside observed and oriented at 40°
42 - 50.1	[Symbol]		?	?	?										CL	42~50.1m light brown. moderately weathered to fresh.
	[Symbol]		A-2 TO A-1	F-2											CM	clasts are pebbly and matrix is coarse grained.
	[Symbol]				D-1										CH	top^ bottom rocks are slightly sheared.
50.1	[Symbol]															CL

Fig. 2-2-16 GEOLOGIC LOG OF DL-03

BOREHOLE NO.		DL-03		ELEVATION		578.78m		INCLINATION		90°		TOTAL DEPTH		50m	
DEPTH	GEOLOGY				CORE RECOVERY & R.Q.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15		
3.3	Rs.														light brown to grayish. silty with traces of coarse grained particles.
		A-3			D-2										3.3 ~ 5.6m grayish moderately weathered and joints dominant.
		A-2		F-3	D-1 TO D-2										5.6m ~ bottom grayish with reddish purplish tints.
10	Agg.														fresh, very hard and massive.
				F-2											joints are very rare and tightly filled with rhodochrosite. clasts are pebbly to cobbly.
		A-1		F-1	D-1										12 ~ 12.2m slightly weathered.
				F-2											
20	Agg.														
				F-1											24.6m slightly brecciated and recemented with rhodochrosite.
				F-2											
30	Agg.														
				F-1											35.1m return water lost.
				F-2											
40	Agg.														
				F-1											38m slightly brecciated and recemented with rhodochrosite.
				F-2											
50	Agg.														
				F-1											
			F-2												

Fig. 2-2-17(1) GEOLOGIC LOG OF DL-04

BOREHOLE No. DL-04		ELEVATION 567.08m		INCLINATION 5.0°		TOTAL DEPTH 100m								
DEPTH	GEOLOGY					CORE RECOVERY				LUGEON VALUE	ROCK CLASSIFICATION	REMARKS		
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)								
						20	40	60	80	100	0	10	20	
4.5		Rs												light brown silty with coarse grained particles
4.5 ~ 10.2				?										4.5 ~ 10.2m grayish joints dominant
10.2 ~ 20		Agg												10.2m ~ bottom grayish with purplish tints. fresh to slightly weathered. very hard and massive. joints are rare and tightly filled with rhodochrosite. clasts are pebbly to cobbly. matrix is fine to coarse grained.
20 ~ 21.1											2.4			
21.1 ~ 22												12.8		CM 21.1 ~ 22m joints dominant
22 ~ 25.2														25.2 ~ 25.9m specks of rhodochrosite distributed
25.2 ~ 25.9														
25.9 ~ 30														
30 ~ 33.1														
33.1 ~ 36.8														
36.8 ~ 40														
40 ~ 43.1														
43.1 ~ 46.4														
46.4 ~ 49.7														
49.7 ~ 50														

To be continued

Fig. 2-2-17 (2) GEOLOGIC LOG OF DL-04

BOREHOLE No.		DL - 04		ELEVATION		56708m		INCLINATION		5 0°		TOTAL DEPTH		100 m	
DEPTH	SYM-BOL	G E O L O G Y				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
		NAME	WEATH-ERING	JOINT	HARD-NESS	20	40	60	80	100	5	10	15		
50	[Symbol]		A-1	F-1	D-1									B	53.9 ~ 55m slightly brecciated and cemented with rhodochrosite.
					F-2										
60	[Symbol]			F-1											62.6 ~ 62.9m cavities and specks of rhodochrosite observed.
						Agg									
70	[Symbol]		A-2	F-2											
					To A-1	F-3									
80	[Symbol]			F-4	D-1 TO D-2										
						F-3									
90	[Symbol]		A-1		D-1										
					F-2										
	[Symbol]			F-3											
						?									
100	[Symbol]														

Fig. 2-2-18(1) GEOLOGIC LOG OF D2R-01

BOREHOLE No. D2R-01		ELEVATION 586.32 ^m		INCLINATION 90°		TOTAL DEPTH 60 ^m													
DEPTH	GEOLOGY				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS					
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15	20			
10	[Symbol]	Ad.	A-3	?	?	D-2 TO D-4									D	grayish brown highly to moderately weathered. fractured.			
						F-3											CL	grayish with purplish to brownish tints. joints dominant. joints are stained with iron oxides.	
						F-3	D-2											CH	grayish with purplish tints. porphyritic.
						F-4	D-3											CM	
						F-3	D-2 TO D-1											CL	
						F-3	D-2 TO D-1											CH	
20	[Symbol]	Agg.	A-2	F-2	F-1	D-2										dark gray with purplish tints. slightly weathered to fresh. clasts are pebbly to bouldery.			
						F-2	D-2 TO D-1										rhodochrosite filled joints are rare.		
						F-3													
						F-2													
30	[Symbol]	Agg.	A-2	F-2	F-4														
						F-3													
						F-2													
40	[Symbol]	Agg.	A-1 TO A-2	F-2	D-1														
						F-2													
50	[Symbol]	Agg.	A-1 TO A-2	F-2	D-1														
						F-2													

F-2 D-2 TO D-1 To be continued 2-73

Fig. 2-2-18(2) GEOLOGIC LOG OF D2R-01

BOREHOLE No. D2R-01		ELEVATION 586.32 ^m		INCLINATION 90°		TOTAL DEPTH 60 m									
DEPTH	GEOLOGY				CORE RECOVERY				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	8 R.Q.D. (%)				5 10 15 20					
60		Agg.	A-1	D-2										CH	
			To A-2	F-2	To D-1										
			A-1	F-1											

Fig. 2-2-19 GEOLOGIC LOG OF D₂R-02

BOREHOLE No. D ₂ R-02		ELEVATION 655.60 ^m		INCLINATION 90°		TOTAL DEPTH 40 m										
DEPTH	GEOLOGY					CORE RECOVERY & R.O.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15			20
		R _s														brownish. include many boulders of agglomerate and andesite.
15.7			A-2	?	?										D	light brown to grayish. highly altered. highly weathered and friable.
20		Agg.	A-4			D-2										
			A-3		F-3										D	grayish. moderately to slightly weathered and highly altered.
30			A-2												(CL)	
						D-3										
			A-3												CL (CM)	
40																0.9

Fig. 2-2-20 GEOLOGIC LOG OF D2L - 01

BOREHOLE No. D2L - 01		ELEVATION 651.30 m		INCLINATION 90°		TOTAL DEPTH 40 m									
DEPTH	GEOLOGY				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15
		Rs													brownish. slightly plastic to silty.
9.0				F-1											grayish with reddish purplish tints.
10		A-3 A-5 A-3 A-2		F-1 F-3 F-2										D	highly weathered. grayish. moderately weathered. grayish with purplish tints.
		Agg.		F-1										CH	slightly weathered to fresh. clasts are pebbly to cobbly. matrix is coarse grained.
20		A-1		F-2	D-2 TO D-1										rhodochrosite filled joints are rare
				F-3											
30				F-2											
				F-1	D-1										
40															

Fig. 2-2-21 GEOLOGIC LOG OF A-01

BOREHOLE No. A-01		ELEVATION 584.35m		INCLINATION 90°		TOTAL DEPTH 50 m				
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)	LUGEON VALUE	ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS					5
0 - 3.6	Rs									talus deposit. consists with dark brownish silty clay and boulders.
3.6 - 10		A-2	F-4	D-2						grayish slightly weathered. joints dominant. hard.
10 - 20	Agg		F-3 F-4 F-4 F-3 F-4 F-3							10m ~ bottom usable for aggregate.
20 - 30			F-3 F-4							
30 - 40				D-2 TO D-1						very hard
40 - 50			F-3 F-2	D-2 TO D-1						CH

Fig. 2-2-22 GEOLOGIC LOG OF A-03

BOREHOLE No. A - 03		ELEVATION 625.70m		INCLINATION 90°		TOTAL DEPTH 50 m									
DEPTH	GEOLOGY				CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATH-ERING	JOINT	HARD-NESS	20	40	60	80	100	5	10			15
6.7		Rs													brownish silty to slightly plastic.
10		A-5		?	D-5										dark brown completely weathered. 6.7~ 23m
20		Ad.													only sludge. brownish to grayish.
30		A-2	F-4		D-2										grayish slightly to moderately weathered. altered joints dominant.
35.2															35.2~ 44.3m
40															dark brown silty to slightly plastic. completely weathered. only sludge
50															44.3m~ bottom brownish clay with some boulders. fractured or sheared zone. top to bottom unusable for aggregate.

Fig. 2-2-23 GEOLOGIC LOG OF A-04

BORE HOLE No. A-04		ELEVATION			INCLINATION 90°				TOTAL DEPTH	50 m	
DEPTH	GEOLOGY			CORE RECOVERY & R.Q.D. (%)	LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING		JOINT	HARDNESS	5	10			15
3.9	Rs										brownish, silty to sandy with some pebbles and boulders of andesite.
10	Ad				D-5					CL	grayish with brownish coatings. highly weathered. joints dominant or crushed.
20	A-5				D-2						
					F-5						
					D-3						
					D-5						
30	A-4									D	Light gray. porphyritic. 25.2m bottom grayish with shades of reddish brown. highly to moderately weathered. fine grained texture.
					D-4						
					F-5						
					F-4					CL	35.4m bottom medium hard. usable for aggregate.
					F-4					CM	
40	A-3				F-3						
					D-3					CH	
					F-2						
50											top ~ bottom altered.

Fig. 2-2-24 GEOLOGIC LOG OF A-05

BOREHOLE No.		A - 05		ELEVATION		INCLINATION		90°		TOTAL DEPTH		50 m			
DEPTH	G E O L O G Y				CORE RECOVERY					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	R. Q. D. (%)					5 10 15 20				
3.0	Rs														Light brown, slightly plastic to silty.
3.0~7.8m		A-5	?	?										D	light brown, completely weathered.
7.8~11.9m		A-3	F-3	D-2										CL	Light gray, moderately weathered.
11.9~			F-2											CM	porphyritic, grayish, slightly weathered, joints are stained with limonite.
11.5~15.4m		A-2												CM	hard to very hard, no return water.
24.9~44.1m			F-2	D-1										CH	
			F-3											CM	no return water.
			F-1												
			F-2												
			F-3	D-1 TO D-2										CL	
			F-4	D-2											joints dominant
			F-3	D-1 TO D-2										CM	
			F-2											CL	
				?										CM	
			F-4											CH	
														CM	
11.9~bottom				D-1 TO D-2										CH	usable for aggregate.
			F-2	D-1											

Fig. 2-2-25 GEOLOGIC LOG OF T-01

LITHOLOGY		GEOLOGY		CORE RECOVERY & R.Q.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS			
DEPTH	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15	20			
0 - 8.6		Rs														brownish to light brownish. silty to sandy. slightly plastic.	
8.6 - 10			A-4	F-4												light brown to gray. highly weathered. joints dominant.	
10 - 14.7		Agg		F-5 TO F-4	D-4 TO D-5											clasts are granular. matrix is andesitic, medium grained and moderately cemented.	
14.7 - 19.7			A-3	F-4											CL	14.7 ~ 19.7m moderately weathered.	
19.7 - 20																D	
20 - 28			A-2	F-3 TO F-1	D-2 TO D-3											CL	19.7 ~ bottom grayish to light gray. slightly weathered. joints are rare.
28 - 30																CH	
30 - 40																	

Fig. 2-2-26 GEOLOGIC LOG OF T-02

BOREHOLE No.		T - 02		ELEVATION		632.28 m		INCLINATION		90°		TOTAL DEPTH		40 m		
DEPTH	G E O L O G Y					CORE RECOVERY & R.Q.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	30	40	60	80	100	5	10	15	20		
0 - 5.5	Gr															pale brown. pebbly to bouldery
5.5 - 10		A-3		F-3	D-3											Light gray. Light gray with greenish tints.
10 - 20				F-2 F-2 TO F-3	D-2											clasts are granular and matrix is fine to medium grained medium hard.
20 - 30	Agg			F-1												23.8 ~ 24.2 m joints dominant.
30 - 40				F-4 F-2	D-3											32.6 ~ 33 m joints dominant.
40 - 40				F-4 F-2												

BOREHOLE No. T-03		ELEVATION 643.06 m		INCLINATION 90°		TOTAL DEPTH 40 m									
DEPTH	GEOLOGY			CORE RECOVERY & R.O.D. (%)					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15
3.5	[Symbol: irregular dots]	R s													brownish silty to sandy, slightly plastic.
			A-5												
				F-5 TO F-4											
10			A-4												Light brown to light gray.
			A-3												
			Agg	A-4 TO A-3											hairline joints are tightly filled with rhodochrosite or calcite.
				F-3 TO F-2											porphyritic andesite clasts and fine grained matrix.
20			A-2												
			Ad	Agg											gray, fine grained texture. joints are tightly filled with rhodochrosite.
			Ad												
30				F-2											
			A-2 TO A-1												Light gray to light gray with greenish shades.
			Agg												clasts are porphyritic andesitic and granular. matrix is medium grained.
40				F-1											
				D-3											
				D-2											

Fig. 2-2-28 GEOLOGIC LOG OF T-04

BOREHOLE No. T-04		ELEVATION 651.08m		INCLINATION 9.0°		TOTAL DEPTH 40m									
DEPTH	GEOLOGY					CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10	15		
0 - 10	Gr														top and bottom portion mainly consist of gravels. middle portion is clayey to sandy and brownish.
10 - 14.7															
14.7 - 20			A-5	F-5	D-2										pale brown to grayish
20 - 25.8			A-4												
25.8 - 30	Ad		A-3 TO A-4	F-4	D-2									D	grayish. 25.8m opened rhodochrosite geode observed. some rhodochrosite filled joints observed. grayish with reddish brown tints.
30 - 40	Agg		A-2	F-2	D-1									CH	crasts are granular.
40 - 40															

Fig. 2-2-29(1) GEOLOGIC LOG OF S-01

BOREHOLE No. S-01		ELEVATION 695.64 ^m		INCLINATION 90°		TOTAL DEPTH 100 ^m				
DEPTH	GEOLOGY				CORE RECOVERY & R.Q.D. (%)	LUGEON VALUE	ROCK CLASSIFICATION	REMARKS		
	SYMBOL	NAME	WEATHERING	JOINT					HARDNESS	5
10	[Symbol: small triangles]	A-3				[Graph: Core recovery & R.Q.D. (%) vs Depth]		CL	grayish. joints are filled with quartz.	
									CH	3.4~3.7m fractured.
									CM	
20	[Symbol: small triangles]	A-2						CH	very hard. joints oriented at 35~45°	
30	[Symbol: small triangles]	Ad	A-1	F-3	D-1				plnt oriented at 0~90°	
40	[Symbol: small triangles]	Agg	A-1	F-2				B	40.0~40.17m fault? oriented at 5°	
50	[Symbol: small triangles]								grayish with purplish fints.	

To be continued

Fig. 2-2-29(2) GEOLOGIC LOG OF S-01

BOREHOLE No.		S - 01		ELEVATION		695.64 ^m		INCLINATION		90°		TOTAL DEPTH		100 m				
DEPTH	GEOLOGY					CORE RECOVERY					LUGEON VALUE				ROCK CLASSIFICATION	REMARKS		
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)												
						20	40	60	80	100	5	10	15	20				
	[Symbol: small triangles]															B	light gray. joints are filled with rhodochrosite and quartz.	
																CH		
60	[Symbol: small triangles]	Agg	A-1 to A-2	F-2	D-2												B	joints are filled with rhodochrosite
				CH														
70	[Symbol: small triangles]			F-3													CH	
				B														
80	[Symbol: small triangles]		A-1 to A-2	F-1	D-1												B	Light gray with purplish tints.
				CH														
90	[Symbol: small triangles]	Ad	A-1 to A-2	F-2	D-2												CH	Light gray, porphyritic.
				B														
100	[Symbol: small triangles]			F-1	D-1												B	

Fig. 2-2-30 GEOLOGIC LOG OF P-01

BOREHOLE No.		P - 01		ELEVATION		528.54m		INCLINATION		90°		TOTAL DEPTH		22.7 m					
DEPTH	GEOLOGY						CORE RECOVERY				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS			
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	B. R. Q. D. (%)				5 10 15 20									
	▲▲▲▲▲	Rs														reddish brown to grayish brown. clayey. plastic.			
10																			
13.7	▼▼▼▼▼	?																	
	▼▼▼▼▼	Ad	A-4			D-5											light gray. friable.		
				F-3															
				To															
20						F-4													
						D-3													
22.7																			

Fig. 2-2-31 GEOLOGIC LOG OF P-02

BOREHOLE No.		P-02		ELEVATION		335.67m		INCLINATION		90°		TOTAL DEPTH		20m		
DEPTH	GEOLOGY					CORE RECOVERY				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)				5 10 15 20						
		Rs														brownish clayey and highly plastic.
7.3																yellowish gray friable.
10		A-4														
		A-3														D
		Ad														
		A-2														
20																grayish porphyritic.
																CM

Fig. 2-2-32 GEOLOGIC LOG OF P-03


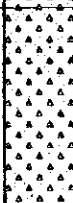

BOREHOLE No. P-03		ELEVATION 196.05 ^m		INCLINATION 90°		TOTAL DEPTH 20 m									
DEPTH	GEOLOGY					CORE RECOVERY				LUGEON VALUE	ROCK CLASSIFICATION	REMARKS			
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	R.Q.D. (%)									
						20	40	60	80	100	5	10	15	20	
															brownish plastic clayey materials with boulders.
10		Rs													light brown.
15.8		Ad	A-4 TO A-3	F-5	D-5 D-4									D	light gray friable.
20															

Fig. 2-2-33 GEOLOGIC LOG OF PH-01A

BOREHOLE No. PH-01A		ELEVATION 74.24m		INCLINATION 90°		TOTAL DEPTH 40 m									
DEPTH	GEOLOGY				CORE RECOVERY & R.O.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS	
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5	10			15
0 - 8.5	Rs Gr														brownish silty slightly plastic. 31-8.5m brownish gray to grayish. andesitic boulders. terrace gravels.
8.5 - 10		A-3													grayish stained along joints. porphyritic.
10 - 20		Ad		F-2 TO F-3										CL	grayish. clasts are andesitic.
20 - 30		Agg		F-3										D CM CH	matrix is slightly decomposed and partly friable. dark gray joints dominant and filled with quartz / calcite.
30 - 40		A-3 A-2												CM CH	brownish with shades of purple.

Fig. 2-2-34 GEOLOGIC LOG OF PH-02

BOREHOLE No.		PH-02		ELEVATION 71.00 m		INCLINATION 90°		TOTAL DEPTH 40 m											
DEPTH	GEOLOGY			CORE RECOVERY & R.O.D. (%)		LUGEON VALUE		ROCK CLASSIFICATION	REMARKS										
	SYMBOL	NAME	WEATHERING	JOINT	HARDNESS	80	40			60	80	100	5	10	15	20			
0 - 10	○	Gr																	brownish sediments. silty with traces of coarse grained particles. grayish to light brown andesitic boulders. terrace gravels.
10 - 12.2	○																		
12.2 - 20	▽		A-2																grayish.
20 - 30	▽																		joints are stained and filled with quartz.
30 - 40	▽																		grayish with slightly purplish tints.
40	▽																		

Fig. 2-2-35 GEOLOGIC LOG OF PH-03

BOREHOLE No. PH - 03		ELEVATION 74.14 ^m		INCLINATION 90°		TOTAL DEPTH 40 ^m									
DEPTH	G E O L O G Y				CORE RECOVERY				LUGEON VALUE	ROCK CLASSIFICATION	REMARKS				
	SYM-BOL	NAME	WEATH-ERING	JOINT	HARD-NESS	R. Q. D. (%)									
						20	40	60	80	100	5	10	15	20	
0 - 10	Rs														reddish brown, plastic.
10 - 12.0	Gr														brownish to grayish. mainly consists of andesitic boulders with silty materials. terrace gravels.
12.0 - 20	Ad			F-2 TO F-3	D-1										grayish with purplish tints to light gray.
20 - 22		A-2		D-2											porphyritic. joints are filled with rhodochrosite.
22 - 24				D-1											light gray. tappili tuff.
24 - 26	Tf			D-2										CH	joints are filled with rhodochrosite.
26 - 28				TO D-3										CM	
28 - 30		A-2 TO A-3		F-2											
30 - 32				D-2											CH
32 - 34				D-2											
34 - 36				D-2											
36 - 38				D-2											
38 - 40	Agg		A-2	F-3	D-1										grayish with purplish tints

Fig. 2-2-36 (1) GEOLOGIC LOG OF UPH-01

BOREHOLE No. UPH-01		ELEVATION				INCLINATION 90°				TOTAL DEPTH 400m					
DEPTH	GEOLOGY					CORE RECOVERY				LUGEON VALUE	ROCK CLASSIFICATION	REMARKS			
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	B	R	Q	D				(%)	5	10
3.0	[Pattern]	Rs													brownish highly plastic residual soil and talus deposit.
			A-4			D-3 TO D-2									light brown joints dominant. 6~10.3m no return water.
10	[Pattern]	Agg		?											D grayish to purplish brown.
			A-3			D-1									
	[Pattern]	Agg	A-2	F-1		D-2 TO D-1									CH grayish with purplish tints. hard to very hard.
				F-2		D-2									
20	[Pattern]	Agg		?		D-2 TO D-1									B debs are pebbly to cobbly. joints are rare and filled with quartz.
				F-2		D-2									
30	[Pattern]	Agg				D-1									
				F-1											
	[Pattern]	Agg		?											
				F-2		D-1									
40	[Pattern]	Agg													
				F-1		?									
50	[Pattern]	Agg				D-1									
				F-2		D-1									

To be continued

Fig. 2-2-36 (2) GEOLOGIC LOG OF UPH-01

BOREHOLE No. UPH-0		ELEVATION				INCLINATION 90°				TOTAL DEPTH	400 m						
DEPTH	GEOLOGY			CORE RECOVERY & R.Q.D. (%)				LUGEON VALUE				ROCK CLASSIFICATION	REMARKS				
	SYM-BOL	NAME	WEATHERING	JOINT	HARDNESS	20	40	60	80	100	5			10	15	20	
50	[Symbol: Agg]	Agg		F-2	D-1										B	54.8~57.8m no return water. crystal tuff. tuff grades downward into tuff breccia.	
		Tf			?											clasts are pebbly, tuff and tuff breccia exhibit graded bedding.	
		Tfbr			?											56.3~59.5m clasts are cobbly to bouldery.	
60	[Symbol: Tf]			F-2	D-1											grayish to light grayish. tuff grades downward into lapilli tuff.	
				F-1												64~81.5m lapilli tuff.	
																matrix is medium to coarse grained.	
70	[Symbol: Tf]				?												
				A-2		D-1											75.7~148m 2/3 to 1/5 return water.
						?											
80	[Symbol: Tfbr]				D-2												lapilli tuff grades downward into tuff breccia.
						?											tuff breccia grades downward into agglomerate.
90	[Symbol: Agg]																calcite stringers observed.
						D-1											clasts are cobbly to bouldery.
100					?												

F-1 D-1 To be continued