

**APPENDIX A   DRILLING LOGS AND  
BOREHOLE PERMEABILITY TEST DATA**



# DRILL LOG

HOLE NO. KB-1 SHEET NO. 1 OF 1

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	30.00 M	ELEVATION	2223.58 M	
SITE		Kipipiri Quarry Site		COORDINATE	948 508.72 : 211 229.96	INCLINATION	90°	DRILL RIG		
AVERAGE CORE RECOVERY				DATE	FROM 16/DEC TO 29/DEC	DRILLED	MOWLEM	LOGGED	JICA	
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	DEPTH
16/DEC	0.60	2222.98	TOP SOIL		Dark Brown Clayey Soil Comparatively Hard					
17/DEC					0.60~2.10 m Non-weathered grey hard porous welded tuff.					
18/DEC					Brown along discontinuities spaced less than 30 cm.					
19/DEC					2.10~7.90 m Highly weathered brown soft welded tuff like clayey soil.					
20/DEC	7.90	2215.68	WELDED TUFF							
21/DEC	8.90	2214.68	NON-WELDED TUFF		Light brown to brown moderately weathered slightly friable non-welded tuff.					
22/DEC					8.90~10.10 m Moderately weathered brown massive tuff.					
23/DEC					Slightly friable to friable joints spaced less than 10 m.					
24/DEC					10.10~12.90 m Fresh grey massive sandy tuff with scattered big scoria or pumice.					
25/DEC					Slightly friable with joints spaced more than 50 cm.					
26/DEC					12.90~18.50 m Moderately weathered light brown massive tuff.					
27/DEC					Slightly friable to friable with joints spaced less than 10 cm.					
28/DEC					18.50~21.10 m Fresh grey massive sandy tuff.					
29/DEC					Slightly friable to friable with joints spaced more than 50 cm.					
					21.10~23.50 m Moderately weathered light brown massive tuff.					
					Slightly friable to friable with joints spaced 30 to 10 cm.					
					23.50~30.00 m Fresh(?) light grey soft (Unconsolidated) fine tuff.					
					Core recovery is very low.					
	30.00	2193.58	MASSIVE TUFF & LAKE SEDIMENTS		END OF BOREHOLE					

\* R.Q.D. is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%  
 \* LUGEON VALUE is 1/min/m under injection water pressure of 10kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. KB-2

SHEET NO. 1 OF 1

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	20.00 M		ELEVATION	2207.87 M	
SITE		Kipipiri Quarry Site		COORDINATE	948 632.75 ; 211 059.35		INCLINATION	90°		DRILL RIG	
AVERAGE CORE RECOVERY				DATE	FROM 2/JAN TO 5/JAN		DRILLED	MOWLEM		LOGGED	JICA
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	DEPTH
								%	cm	50 (%)	
2 / JAN	1			~ ~	0.00-0.25 m Moderately weathered slightly friable brown welded tuff with joints spaced less than 10 cm.						
	2			~ ~							
	3			~ ~	0.25-4.00 m Fresh grey very hard welded tuff tuff with brown colored joints spaced 30 to 10 cm.						
	4			~ ~							
	5			~ ~	4.00-14.13 m Fresh dark grey very hard welded tuff with brown colored joints spaced more than 50 cm.						
	6			~ ~							
	7			~ ~							
	8			~ ~	9.60-12.50 m Scoria & lithic fragment are less.						
	9			~ ~							
	10			~ ~							
3 / JAN	11			~ ~							
	12			~ ~							
5 / JAN	13			~ ~							
	14	14.13	2193.74	WELDED TUFF							
	15	15.33	2192.54	NON-WEI DED TUFF		Fresh grey non-welded tuff layer Slightly friable to friable.					
	16			" "		Moderately weathered slightly friable to friable massive tuff with joints spaced 50 to 30 cm.					
	17			" "							
	18			" "		15.33-16.32 m Porous					
	19			" "		17.00-17.32 m Sandy tuff					
	20	20.00	2187.87	MASSIVE TUFF & LAKE SEDIMENTS							
					END OF BOREHOLE						

HOLE NO. KB-2

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LOG FORM-B

- \* R.Q.D. is Rock Quality Designation. R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%
- \* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. KB-3 SHEET NO. 1 OF 1

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	20.00 M	ELEVATION	2191.00 M	
SITE		Kipipiri Quarry Site		COORDINATE	949 095.41 : 210 881.86	INCLINATION	90°	DRILL RIG		
AVERAGE CORE RECOVERY				DATE	FROM 6/JAN TO 7/JAN	DRILLED	MOWLEM	LOGGED	JICA	
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	DEPTH
6/JAN	1			~ ~	0.00-0.40 m Drilled without water sandlike core.					1
	2			~ ~	0.40-6.44 m Fresh dark grey very hard welded tuff with partially brown colored joints spaced more than 50 cm.					2
	3			~ ~						3
	4			~ ~						4
	5			~ ~						5
	6	6.44	2184.56	WELED TUFF	~ ~					
7/JAN	7		HIGH WELED TUFF	~ ~	Fresh dark grey very hard high welded tuff with joints spaced more than 50 cm, with clay seam.					7
	8	8.24	2182.76	~ ~						8
	9			~ ~	Fresh dark grey very hard welded tuff with joints spaced more than 50 cm.					9
	10			~ ~	8.00-8.60 m Slightly porous					10
	11	11.00	2180.00	WELED TUFF	~ ~					11
	12	12.00	2179.00	NON- WELED TUFF	~ ~					12
	13			" "	12.00-13.17 m Slightly weathered light brown lapili tuff with high inclined joints spaced 50 to 30 cm.					13
	14			" "						14
	15			" "	13.17-16.50 m Slightly weathered light brown silt to sand grade tuffaceous sediments.					15
	16			" "						16
	17			" "	Bedding at flat to 10° friable with light brown colored joints spaced more than 50 cm.					17
	18			" "						18
	19			" "	16.50-20.00 m Slightly weathered light brown slightly friable lapili tuff with light brown colored joints spaced 50 to 30 cm.					19
	20	20.00	2171.00	MASSIVE TUFF & LAKE SEDIMENTS	" "					
					END OF BOREHOLE					

\* R.Q.D. is Rock Quality Designation, R.Q.D. = (Total length of cylindrical cores longer than 10 cm) / (Total core length) x 100%  
 \* LUGON VALUE is l/min/m under injection water pressure of 10 kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. KB-4 SHEET NO. 1 OF 1

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	30.00 M	ELEVATION	2179.59 M
SITE		Kipipiri Quarry Site		COORDINATE	949 000.68:210 801.83	INCLINATION	90°	DRILL RIG	
AVERAGE CORE RECOVERY				DATE	FROM 8/JAN TO 13/JAN	DRILLED	MOWLEM	LOGGED	JICA
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.
								%	50 (%)
9/JAN	1.00	2178.59	TOP SOIL	X	Brown soil with little grass roots.				
10/JAN	2.15	2177.44	WELDED TUFF	~	Moderately weathered brownish grey hard welded tuff with joints spaced less than 10 cm.				
	3.35	2176.24	HIGH WELDED TUFF	~	Fresh to slightly weathered very hard high welded tuff with inclined closely spaced joints.				
	6.30	2173.29	WELDED TUFF	~	Fresh dark grey very hard welded tuff with brown collared joints spaced more than 50 cm.				
	8.50	2171.09	NON-WELDED TUFF	~	Fresh to slightly weathered dark grey hard non-welded tuff with joints spaced 30 to 10 cm.				
	8.50~20.35 m			" "	Moderately weathered light brown slightly friable to friable lapili tuff with joints spaced less than 30 cm.	Recorded Lowest			
	20.35~24.90 m			" "	Fresh light grey slightly friable to friable lapili tuff with joints spaced more than 50 cm.	(10.05)			
	24.90~30.00 m			" "	Moderately weathered greenish light grey slightly friable to friable lapili tuff with joints spaced more than 50 cm.				
13/JAN	30.00	2149.59	MASSIVE TUFF & LAKE SEDIMENTS	" "	END OF BOREHOLE				

HOLE NO. KB-4

LOG FORM-B

- \* R. Q. D. is Rock Quality Designation, R. Q. D. = (Total length of cylindrical cores longer than 10 cm) / (Total core length) x 100%
- \* LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm<sup>2</sup>
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-1 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	75.00 M	ELEVATION	2151.42 M		
SITE		MALEWA DAM SITE		COORDINATE	951 851.76 : 211 422.99	INCLINATION	90°	DRILL RIG			
AVERAGE CORE RECOVERY				DATE	FROM 14/APR TO 28/APR	DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
	0.20	2151.22	TOP SOIL	~ ~	Black humic soil including grass roots			% cm 50 (%)			
	1			~ ~	0.20~1.80 m						1
	2			~ ~	Moderately weathered brown slightly friable welded tuff with brown colored joints spaced more than 50 cm.					Lu = 3.1	2
	3			~ ~						K = 3.33 X 10 <sup>-5</sup>	3
	4			~ ~	1.80~2.85 m					Pc = 4.2	4
	5			~ ~	Slightly weathered grey very hard welded tuff with brown colored joints spaced more than 50 cm.						5
	6			~ ~							6
	7			~ ~	2.85~14.30 m						7
	8			~ ~	Fresh dark grey very hard welded tuff with brown colored joints spaced more than 30 cm.					Lu = 1.4	8
	9			~ ~						K = 1.59 x 10 <sup>-5</sup>	9
	10			~ ~						Pc = 6.2	10
	11			~ ~							11
	12			~ ~							12
	13			~ ~						Lu = 0.9	13
	14			~ ~	14.30~16.30 m					K = 1.00 x 10 <sup>-5</sup>	14
	15			~ ~	Slightly weathered yellowish brown hard welded tuff with brown colored joints spaced 30 to 10 cm.					Pc = 2.5	15
	16	2135.12	WELDED TUFF	~ ~							16
	17	2134.12	NON-WELDED TUFF	~ ~	Fresh dark grey friable non-welded tuff					Lu = 0.0	17
	18			~ ~						K = 0.0	18
	19			~ ~	Fresh, partially slightly weathered yellowish brown slightly friable lake sediments with brown colored joints spaced more than 50 cm.					Pc = 0.6	19
	20			~ ~							20
	21			~ ~	Alternating beds of tuffaceous siltstone, sandstone, conglomerate and lapili tuff with lamina of 7° to 10° dip.						21
	22			~ ~							22
	23			~ ~							23
	24			~ ~						(K = 6.89 x 10 <sup>-5</sup> )	24
	25			~ ~							25
	26	2124.72	LAKE SEDIMENTS	~ ~						Lu = 2.5	26
	27			~ ~	Fresh grey partially yellowish slightly friable massive tuffs (lapili tuff) with discolored joints spaced more than 50 cm.					K = 2.97 x 10 <sup>-5</sup>	27
	28			~ ~						Pc = 2.6	28
	29			~ ~							29
	30		MASSIVE TUFFS	~ ~							30

HOLE NO. MB-1

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\* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%  
 \* LUUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-1 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
19/APR	31.15	2120.27	MASSIVE TUFFS	" "	Slightly weathered brown to yellowish brown hard non welded tuff (lapili tuff) with brown colored joints spaced more than 30 cm.		% cm			31
22/APR	40.45	2110.97	NON-WELDED TUFF	" "	40.45-43.00 m 46.63-49.06 m Slightly weathered ocher hard welded tuff with joints spaced 50 to 30 cm, partially 30 to 10 cm. 43.00-46.63 m Fresh dark grey very hard welded tuff with joints spaced 50 to 30 cm.	Recorded Lowest (40.50)			Lu = 2.4 K = 2.68 x 10 <sup>-4</sup> Pc = 2.6	32
23/APR	49.06	2102.36	WELDED TUFF	" "	Slightly weathered ocher to brown slightly friable non-welded tuff (lapili tuff) with joints spaced more than 30 cm.				Lu = 1.4 K = 1.53 x 10 <sup>-5</sup> Pc = 2.8	33
24/APR	52.65	2098.77	NON-WELDED TUFF	" "	Moderately weathered ocher slightly friable massive tuffs (lapili tuff to tuff breccia) with joints spaced more than 50 cm.				Lu = 1.2 K = 1.39 x 10 <sup>-5</sup>	34
25/APR	63.65	2087.77	MASSIVE TUFFS	" "					Lu = 1.0 K = 1.07 x 10 <sup>-5</sup> Pc = 7.0	35
26/APR			LAKE SEDIMENTS	" "					Lu = 0.8 K = 8.9 x 10 <sup>-6</sup> Pc = 5.6	36
									Lu = 0.01 K = 2.00 x 10 <sup>-7</sup> Pc = 5.8	37

HOLE NO. MB-1

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LOG FORM-C



# DRILL LOG

HOLE NO. MB-1 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
27/ APR	66				63.65-68.75m Slightly to moderately weathered slightly friable to friable lake sediments (tuffaceous sandstone) with lamina of 5° dip.					Lu = 0.0 K = 0.0 Pc = 1.0	66
	67										67
	68										68
	69										69
	70										70
	71										71
	72										72
	73										73
	74										74
	75										75
28/ APR	53.00	2101.42	LAKE SEDIMENTS		68.75-75.00 m Fresh grey to greenish grey hard to slightly friable lake sediments (alternating beds of tuffaceous sandstone and tuff) with lamina of 5° dip.					Lu = 0.5 K = 5.50 x 10 <sup>-6</sup> Pc = 7.8	69
											70
											71
											72
											73
											74
											75
					END OF BOREHOLE						76

HOLE NO. MB-1

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# DRILL LOG

HOLE NO. MB-2 SHEET NO. 1 OF 2

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	65.00 M	ELEVATION	2087.83 M		
SITE		MALEWA DAM SITE		COORDINATE	951 971.18 : 211 426.13	INCLINATION	90°	DRILL RIG			
AVERAGE CORE RECOVERY				DATE	FROM 11/MAY TO 24/MAY	DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
								%	cm	50 (%)	
11/MAY	1			Δ	0.00~0.50 m Brown soil.						1
	2			Δ Δ							2
	3			Δ	0.50~4.45 m Boulder of 65 cm in max. diameter and gravels.						3
12/MAY	4	4.45	2083.38	COLLUVIUM	Δ Δ		Recorded Lowest				4
	5				4.45~8.20 m Fresh greenish grey slightly friable to friable lake sediments (alternating beds of medium to coarse sandstone and conglomerates with lamina of 5° dip) with joints spaced more than 50 cm.		▽ (5.15)			(K = 6.23 x 10 <sup>-3</sup> )	5
	6									Lu = 4.3	6
	7									K = 4.50 x 10 <sup>-5</sup>	7
	8									Pc = 4.4	8
13/MAY	9				8.20~22.75 m Fresh greenish grey hard to slightly friable lake sediments (fine alternating beds of tuffaceous sandstone, tuff and lapili tuff with lamina of 5° to 8° dip) with joints spaced more than 50 cm.					Lu = 3.1	9
	10									K = 3.52 x 10 <sup>-5</sup>	10
	11									Pc = 6.4	11
14/MAY	12				19.70~21.90m Weakly sheared zone with some slickenside.						12
	13										13
	14										14
	15										15
	16										16
	17										17
	18										18
15/MAY	19										19
	20										20
	21										21
	22										22
	23	22.75	2065.08	LAKE SEDIMENTS						Lu = 10.2	23
	24				22.75~26.90 m Fresh yellowish grey slightly friable massive tuffs (lapili tuff) including large scoria and pumice with joints spaced more than 50 cm.					K = 1.16 x 10 <sup>-4</sup>	24
	25			" "						Pc = 8.4	25
	26			" "							26
	27			" "						Lu = 0.4	27
	28			" "						K = 4.20 x 10 <sup>-6</sup>	28
17/MAY	29										29
	30										30
					MASSIVE TUFFS						

HOLE NO. MB-2

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LOC FORM-B

\* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindrical cores longer than 10 cm) / (Total core length) x 100%  
 \* LUGER VALUE is 1/min/m under injection water pressure of 10 kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-2 SHEET NO. 2 OF 2

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
17/MAY	31			" "	26.90~41.35 m					Lu = 0.6 K = 6.90 x 10 <sup>-6</sup>	31
	32			" "	Fresh dark grey partially						32
	33			" "	(34.00~36.30 m) whitish						33
	34			" "	slightly friable massive tuffs						34
18/MAY	35			" "	(lapili tuff and tuff) including						35
	36			" "	small scoria and much, small						36
	37			" "	lithic fragments, with joints						37
	38			" "	spaced more than 50 cm.						38
	39			" "							39
19/MAY	40			" "							40
	41	41.35	2046.48	" "							41
	42		MASSIVE TUFFS	" "							42
	43				Fresh greenish grey slightly					Lu = 1.5 K = 1.63 x 10 <sup>-5</sup>	43
	44				friable lake sediments (alternating						44
	45				beds of lapili tuff, tuff,						45
20/MAY	46				tuffaceous sandstone and little						46
	47				conglomerates with lamina of 5°						47
	48				to 12° dip) with joints spaced						48
	49				more than 50 cm.						49
21/MAY	50										50
	51										51
	52									Lu = 1.1 K = 1.20 x 10 <sup>-5</sup>	52
	53										53
22/MAY	54										54
	55										55
	56										56
23/MAY	57										57
	58									Lu = 1.5 K = 1.69 x 10 <sup>-5</sup>	58
	59										59
	60										60
24/MAY	61										61
	62										62
	63									Lu = 1.9 K = 2.16 x 10 <sup>-5</sup>	63
	64										64
	65	65.00	2022.83	LAKE SEDIMENTS	END OF BOREHOLE						65

HOLE NO. MB-2

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LOG FORM-C

# DRILL LOG

HOLE NO. MB-3 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2153.33 M								
SITE		MALEWA DAM SITE		COORDINATE	952 119.34 : 211 382.80	INCLINATION	90°	DRILL RIG									
AVERAGE CORE RECOVERY				DATE	FROM 6/MAY TO 17/MAY	DRILLED	MOWLEM	LOGGED	JICA								
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH						
								%	50 (%)								
6 / MAY	1		WELDED TUFF	~ ~ ~	Fresh dark grey very hard welded tuff with discolored joints spaced more than 50 cm.												
	2			~ ~ ~													
	3	3.05		2150.28								~ ~ ~					
	4											3.05~6.00 m					
	5				Slightly weathered yellowish brown to brown hard lake sediments (alternating beds of tuff, tuffaceous sandstone and conglomerates with lamina 5° to 10° dip) with joints spaced more than 50 cm, partially 30 to 10 m.												
	6																
	7																
	8																
	9																
	10																
	11	10.70	2142.63	LAKE SEDIMENTS	6.00~10.70 m												
	12				Fresh dark grey slightly friable to friable lake sediments.												
	13				Rock facies same as above.												
	14																
15																	
16																	
17																	
7 / MAY	18		NON-WELDED TUFF	~ ~ ~	10.70~12.25 m												
	19											Moderately weathered brown slightly friable lapili tuff with joints spaced more than 50 cm.					
	20											12.25~14.00 m					
	21	14.00		2139.33								Fresh dark grey.					
	22				Rock facies same as above.												
	23																
	24																
	25																
	26																
	27																
	28																
	29																
	30																
	31																
32																	
33																	
34																	
35																	
8 / MAY	36		WELDED TUFF	~ ~ ~	Fresh dark grey very hard welded tuff including much scoria and lithic fragments with joints spaced more than 50 cm.												
	37											~ ~ ~					
	38											~ ~ ~					
	39											~ ~ ~					
	40																
	41																
	42																
	43																
	44																
	45																
	46																
	47																
	48																
	49																
50																	
51																	
52																	
53																	
54																	
9 / MAY	55		WELDED TUFF	~ ~ ~	Fresh dark grey very hard welded tuff including much scoria and lithic fragments with joints spaced more than 50 cm.												
	56											~ ~ ~					
	57											~ ~ ~					
	58											~ ~ ~					
	59																
	60																
	61																
	62																
	63																
	64																
	65																
	66																
	67																
	68																
69																	
70																	
71																	
72																	
73																	
10 / MAY	74		WELDED TUFF	~ ~ ~	Fresh dark grey very hard welded tuff including much scoria and lithic fragments with joints spaced more than 50 cm.												
	75											~ ~ ~					
	76											~ ~ ~					
	77											~ ~ ~					
	78																
	79																
	80																
	81																
	82																
	83																
	84																
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91																	
92																	
93																	
94																	
95																	
96																	
97																	
98																	
99																	
100																	

HOLE NO. MB-3

(1/3)

LOG FORM-B

- \* R.Q.D. is Rock Quality Designation. R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%
- \* LUGON VALUE is 1/min/m under injection water pressure of 10kg/cm<sup>2</sup>
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-3 SHEET NO. 1 OF 3

PROJECT				STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2153.33 M
SITE				MALEWA DAM SITE				COORDINATE	952 119.34 : 211 382.80	INCLINATION	90°
AVERAGE CORE RECOVERY				DATE				FROM 6/MAY TO 17/MAY			
				DRILLED				MOWLEM			
				LOGGED				JICA			
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
								%	50 (%)		
6 / MAY	1			~	Fresh dark grey very hard welded tuff with discolored joints spaced more than 50 cm.						1
	2			~							2
	3	3.05	2150.28	WELDED TUFF						Lu = 5.0	3
	4			---	3.05~6.00 m					K = 4.92 x 10 <sup>-5</sup>	4
	5			---	Slightly weathered yellowish brown to brown hard lake sediments (alternating beds of tuff, tuffaceous sandstone and conglomerates with lamina 5° to 10° dip) with joints spaced more than 50 cm, partially 30 to 10 m.					Pc = 2.7	5
	6			---							6
	7			---						Lu = 3.0	7
	8			---	6.00~10.70 m					K = 3.44 x 10 <sup>-5</sup>	8
	9			---	Fresh dark grey slightly friable to friable lake sediments.					Pc = 2.2	9
	10			---	Rock facies same as above.						10
	11	10.70	2142.63	LAKE SEDIMENTS							11
	12			///	10.70~12.25 m					Lu = 4.0	12
	13			///	Moderately weathered brown slightly friable lapili tuff with joints spaced more than 50 cm.					K = 4.59 x 10 <sup>-5</sup>	13
	14	14.00	2139.33	NON-WELDED TUFF	12.25~14.00 m					Pc = 6.3	14
	15			///	Fresh dark grey.						15
	16			///	Rock facies same as above.						16
	17			~	Fresh dark grey very hard welded tuff including much scoria and lithic fragments with joints spaced more than 50 cm.					Lu = 0.7	17
	18			~						K = 7.70 x 10 <sup>-6</sup>	18
	19			~						Pc = 3.5	19
	20			~							20
	21			~						Lu = 2.9	21
	22			~						K = 3.30 x 10 <sup>-5</sup>	22
	23			~						Pc = 4.7	23
	24			~							24
	25	25.50	2127.83	WELDED TUFF							25
	26			///	Fresh dark grey friable lapili tuff with joints spaced more than 50 cm.					Lu = 0.8	26
	27			///						K = 8.60 x 10 <sup>-6</sup>	27
	28	27.90	2125.43	NON-WELDED TUFF						Pc = 3.6	28
	29			---							29
	30			LAKE SEDIMENTS							30

HOLE NO. MB-3

1/3

LOG FORM-B

- \* R.Q.D. is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%
- \* LUGERON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-3 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
10/MAY	31				Slightly weathered light grey hard to slightly friable lake sediments (alternating beds of tuff tuffaceous sandstone and conglomerates with lamina of 0° to 5° dip) with slightly discolored joints spaced more than 50 cm.		%	cm		31
11/MAY	32								Lu = 0.8	32
	33								K = 9.20 x 10 <sup>-6</sup>	33
	34								Pc = 8.7	34
	35									35
	36									36
	37	36.85	2116.48	LAKE SEDIMENTS					Lu = 0.5	37
	38			" "	Fresh dark grey friable massive tuffs (scoria rich lapili tuff) with slightly discolored joints spaced more than 30 cm.				K = 5.20 x 10 <sup>-6</sup>	38
	39			" "					Pc = 4.6	39
	40			" "						40
	41			" "					Lu = 1.2	41
	42	41.69	2111.64	MASSIVE TUFFS					K = 1.29 x 10 <sup>-5</sup>	42
	43				Moderately weathered yellow brown to brown hard to slightly friable non-welded tuff (lapili tuff) with discolored joints spaced more than 10 cm.				Pc = 5.1	43
	44									44
	45								Lu = 0.9	45
	46								K = 1.01 x 10 <sup>-5</sup>	46
	47								Pc = 6.8	47
	48									48
	49									49
	50	50.65	2102.68	NON-WELDED TUFF						50
	51				50.65-53.22 m				Lu = 0.6	51
	52				Slightly weathered light grey hard welded tuff with joints spaced more than 50 cm.				K = 7.40 x 10 <sup>-6</sup>	52
	53									53
	54				53.22-61.60 m					54
	55				Fresh dark grey very hard welded tuff with joints spaced more than 30 cm.				Lu = 0.7	55
	56								K = 7.50 x 10 <sup>-6</sup>	56
	57									57
	58									58
	59									59
	60									60
	61	61.60	2091.73	WELDED TUFF					Lu = 1.0	61
	62								K = 1.12 x 10 <sup>-5</sup>	62
	63				Fresh dark grey slightly friable to friable non-welded tuff (lapili tuff) with joints spaced 50 cm.				Pc = 7.4	63
	64									64
	65	64.70	2088.63	NON-WELDED TUFF						65

LOG FORM-C

HOLE NO. MB-3

( 2/3 )

# DRILL LOG

HOLE NO. MB-3 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
16 / MAY	66			" "	Fresh dark grey slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.	Recorded Lowest				Lu = 37.3	66
	67			" "	63.2~64.4 m	▽				K = 4.39 x 10 <sup>-4</sup>	67
	68			" "	Weakly sheared with flat slickenside.	(66.40)				Pc = 2.2	68
17 / MAY	69		MASSIVE TUFFS	" "							69
	70	2083.33		" "	END OF BOREHOLE						70

HOLE NO. MB-3

( 3 / 3 )

LOG FORM-C

# DRILL LOG

HOLE NO. MB-4 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2129.77 M		
SITE		MALEWA DAM SITE		COORDINATE	951 924.40:271 441.91	INCLINATION	90°	DRILL. RIG			
AVERAGE CORE RECOVERY				DATE	FROM 10/DEC TO 23/DEC	DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
								%	50 (%)		
10/DEC	0.60	2129.17	TOP SOIL		Brown clay soil						
				Δ	Brown sandy soil including much gravels.						
	2.35	2127.42	COLLUVIUM	Δ Δ							
					Fresh to slightly weathered dark grey slightly friable lake sediments (alternating beds of tuffaceous sandstone and conglomerates with lamina of 0° to 5° drip).					(K = 4.15 x 10 <sup>-4</sup> )	
	5.10	2124.67	LAKE SEDIMENTS								
				" "	Fresh to slightly weathered dark grey slightly friable massive tuffs (lapili tuff and tuff)					Lu = 14.2	
	8.00	2121.77	MASSIVE TUFFS	" "						K = 12.59 x 10 <sup>-4</sup>	
				" "						Pc = 0.9	
					Slightly weathered light brown, partially dark grey hard non-welded tuff (lapili tuff including large scoria) with brown colored joints spaced 50 to 30 cm.						
										Lu = 36.1	
										K = 4.04 x 10 <sup>-4</sup>	
										Pc = 0.7	
										Lu = 0.0	
										K = 0.0	
										Pc = 0.4	
	18.40	2111.37	NON-WELDED TUFF								
				~ ~	18.40-25.60 m						
				~ ~	Fresh dark grey very hard welded tuff with slightly brown colored joints spaced more than 50 cm.						
				~ ~							
				~ ~	25.60-29.25 m						
				~ ~	Slightly weathered light brown hard welded tuff with slightly brown colored joints spaced 50 to 30 cm.					Lu = 0.8	
				~ ~						K = 8.59 x 10 <sup>-6</sup>	
				~ ~						Pc = 2.6	
				~ ~							
				~ ~						Lu = 1.0	
				~ ~						K = 1.09 x 10 <sup>-5</sup>	
				~ ~						Pc = 2.5	
				~ ~							
	29.25	2100.52	WELDED TUFF								

\* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%  
 \* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter



# DRILL LOG

HOLE NO. MB-4 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
16/DEC	31	2087.97	NON-WELDED TUFF		Fresh to slightly weathered dark grey friable lapili tuff with joints spaced 50 to 30 cm.				Lu = 2.2 K = $2.55 \times 10^{-5}$ Pc = 4.5	31
17/DEC	32			" "	Slightly weathered brownish grey slightly friable massive tuffs (lapili tuff including large and much scoria) with joints spaced more than 50 cm.					32
	33			" "						33
	34			" "						34
	35			" "						35
	36			" "						36
	37			" "					Lu = 1.5 K = $1.77 \times 10^{-5}$ Pc = 6.6	37
	38			" "						38
	39			" "						39
	40			" "						40
	41			" "						41
19/DEC	42	2087.62	MASSIVE TUFFS	" "					Lu = 7.0 K = $8.09 \times 10^{-5}$ Pc = 5.6	42
	43				42.15~46.05 m Slightly weathered brownish grey friable lake sediments (medium to fine grained tuffaceous sandstone and little conglomerates with lamina of flat to 5° dip) with light brown colored joints spaced more than 50 cm.					43
	44									44
	45									45
	46								Lu = 9.9 K = $1.14 \times 10^{-4}$ Pc = 3.2	46
	47									47
	48									48
20/DEC	49				46.05~64.15 m Fresh grey to greenish grey slightly friable lake sediments (alternating beds of tuff, tuffaceous silt, sandstone and conglomerates with lamina of 0° to 5° dip) with joints spaced more than 50 cm.					49
	50									50
	51								Lu = 13.5 K = $1.55 \times 10^{-4}$ Pc = 6.0	51
	52									52
	53									53
	54									54
21/DEC	55									55
	56									56
	57								Lu = 5.2 K = $5.93 \times 10^{-5}$ Pc = 9.0	57
	58									58
	59									59
	60									60
22/DEC	61									61
	62									62
	63									63
	64	2065.62	LAKE SEDIMENTS	" "					Lu = 1.4 K = $1.60 \times 10^{-5}$ Pc = 5.3	64
	65			" "						65

LOC FORM-C

HOLE NO. MB-4

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# DRILL LOG

HOLE NO. MB-4 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	CB			
23/DEC	67	2059.77	MASSIVE TUFFS	" "	Fresh grey slightly friable massive tuffs (lapili tuff including large scoria and pumice) with joints spaced more than 50 cm.					$Lu = 0.41$ $K = 4.67 \times 10^{-6}$ $P_c = 4.9$	67
	70.00				END OF BOREHOLE						

HOLE NO. MB-4

( 3/3 )

LOC FORM-C

# DRILL LOG

HOLE NO. MB-5 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2131.97 M		
SITE		MALEWA DAM SITE		COORDINATE	952 048.30 : 211 418.29	INCLINATION	90°	DRILL RIG			
AVERAGE CORE RECOVERY				DATE	FROM 22/DEC TO 16/JAN	DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
								% cm	50 (%)		
22/DEC	1.70	2130.27	TOP SOIL		0.00-1.20 m Blackish humic soil. 1.20-1.70 m Boulder of welded tuff.						
					1.70-6.20 m Slightly weathered grey hard to slightly friable alternating beds of sandstone and conglomerates with brown colored joints spaced more than 50 cm.					(K = 2.4 x 10 <sup>-3</sup> )	
23/DEC					6.20-7.40 m Moderately weathered brown friable sediments same as above.					Lu = 8.5 K = 9.77 x 10 <sup>-5</sup> Pc = 3.5	
					7.40-9.85 m Fresh dark grey slightly friable sediments same as above.						
28/DEC	9.85	2122.12	LAKE SEDIMENTS								
					Fresh dark grey slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.					Lu = 9.3 K = 1.07 x 10 <sup>-4</sup> Pc = 4.5	
29/DEC	15.00	2116.97	MASSIVE TUFFS								
					Slightly to moderately weathered light brown hard to slightly friable non-welded tuff (lapili tuff) with brown colored joints spaced 50 to 30 cm.					Lu = 8.1 K = 9.28 x 10 <sup>-5</sup> Pc = 4.2	
					Weathering grade increasing downward.						
7/JAN										Lu = 7.8 K = 9.00 x 10 <sup>-5</sup> Pc = 4.5	
	25.25	2106.72	NON-WELDED TUFF								
					25.25-28.25 m					Lu = 9.5 K = 1.09 x 10 <sup>-4</sup> Pc = 1.2	
					32.50-34.70 m Slightly weathered light brown hard welded tuff with brown colored joints spaced 50 to 30 cm.						
9/JAN			WELDED TUFF								

HOLE NO. MB-5

(1/3)

LOG FORM-B

\*R.Q.D is Rock Quality Designation, R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%  
 \*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>  
 \*DEPTH and ELEVATION are in meter  
 \*DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-5 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
10 / JAN	31			~ ~	28.25-32.50 m Fresh dark grey very hard welded tuff with slightly brown colored joints spaced more than 50 cm.					Lu = 6.7 K = $7.70 \times 10^{-5}$ Pc = 1.2	31
	32			~ ~							32
	33			~ ~							33
	34			~ ~							34
	35	34.70	2097.27	WELDED TUFF							35
11 / JAN	36	36.00	2095.97	NON-WELDED TUFF	Fresh dark grey slightly friable lapili tuff.					Lu = 27.6 K = $3.18 \times 10^{-4}$ Pc = 4.7	36
	37			" "	36.00-44.00 m Slightly, partially moderately weathered brownish grey to brown slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.	Recorded Lowest					37
	38			" "							38
	39			" "							39
	40			" "		(38.20)					40
12 / JAN	41			" "	44.00-50.00 m Fresh grey slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.					Lu = 7.3 K = $8.41 \times 10^{-5}$ Pc = 5.2	41
	42			" "							42
	43			" "							43
	44			" "							44
	45			" "							45
13 / JAN	46			" "						Lu = 20.1 K = $2.31 \times 10^{-4}$ Pc = 6.5	46
	47			" "							47
	48			" "							48
	49			" "							49
	50	50.00	2081.97	MASSIVE TUFFS							50
14 / JAN	51			---	Fresh greenish grey slightly friable lake sediments with joints spaced more than 50 cm.					Lu = 12.6 K = $1.45 \times 10^{-4}$ Pc = 6.3	51
	52			---	50.00-55.75 m Fine to coarse tuffaceous sandstone with lamina of 0° to 5° dip.						52
	53			---							53
	54			---							54
	55			---	55.75-67.55 m Alternating beds of tuff and tuffaceous sandstone, rich in tuff.						55
15 / JAN	56			---						Lu = 13.3 K = $1.52 \times 10^{-4}$ Pc = 3.3	56
	57			---							57
	58			---							58
	59			---							59
	60			---							60
16 / JAN	61			---						Lu = 1.1 K = $1.21 \times 10^{-5}$ Pc = 9.4	61
	62			---							62
	63			---							63
	64			---							64
	65			---							65
			LAKE SEDIMENTS								

HOLE NO. MB-5

( 2/3 )

LOG FORM-C

# DRILL LOG

HOLE NO. MB-5 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
16 / JAN	66 67 68 69 70	2061.97	LAKE SEDIMENTS		67.55~70.00 m Fine to coarse sandstone with cross lamina.					$Lu = 0.7$ $K = 8.22 \times 10^{-6}$ $Pc = 9.2$	66 67 68 69 70
					END OF BOREHOLE						

HOLE NO. MB-5

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LOG FORM-C

HOLE NO. MB-6 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM					DEPTH	70.00 M	ELEVATION	2088.24 M		
SITE		MALEWA DAM SITE		COORDINATE	951 977.86 : 211 524.01		INCLINATION	90°	DRILL RIG			
AVERAGE CORE RECOVERY				DATE	FROM 23/NOV TO 11/DEC		DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	& BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH	
								% cm	50 (%)			
23 / NOV	1			X	Blackish humic soil						1	
	2	2.10	2086.14		TOP SOIL						2	
	3			Δ	Brown clay soil and gravels (max. 15 cm in diameter).					(K = 4.16 x 10 <sup>-2</sup> )	3	
	4			Δ Δ							4	
	5			Δ							5	
	6	6.25	2081.99	Δ Δ	COLLUVIUM'		Recorded Lowest ▽ (6.20)			Lu = 10.6 K = 1.22 x 10 <sup>-4</sup>	6	
24 / NOV	7				6.25~8.35 m Fresh grey slightly friable to friable lake sediments (sandy tuff).						7	
	8				8.35~15.00 m Fresh grey slightly friable lake sediments, medium to coarse tuffaceous sandstone accompanied by coaly shale (6.90~7.60 cm) with almost flat lamina.						8	
	9											9
	10											10
	11											11
	12										Lu = 9.8 Pc = 8.5	12
	13											13
25 / NOV	14				LAKE SEDIMENTS						14	
	15	15.00	2073.24									15
	16			" "		Fresh dark grey slightly friable massive tuffs (lapili tuff characterized by large scoria).					Lu = 9.7 K = 1.11 x 10 <sup>-4</sup>	16
	17			" "								17
26 / NOV	18			" "							18	
	19			" "							19	
	20			" "							20	
	21			" "						Lu = 12.6 K = 1.45 x 10 <sup>-4</sup> Pc = 8.5	21	
	22			" "							22	
	23			" "							23	
27 / NOV	24			" "							24	
	25			" "							25	
	26	25.80	2062.44		MASSIVE TUFFS						26	
	27				25.80~30.00 m Fresh grey slightly friable to friable sediments (alternating beds of tuff and tuffaceous sandstone accompanied by coaly shale).					Lu = 12.0 K = 1.38 x 10 <sup>-4</sup> Pc = 8.5	27	
28 / NOV	28				LAKE SEDIMENTS						28	
	29											29
	30											30

- \* R.Q.D. is Rock Quality Designation,  $R.Q.D. = (\text{Total length of cylindric cores longer than } 10 \text{ cm}) / (\text{Total core length}) \times 100\%$
- \* LUGONE VALUE is l/min/m under injection water pressure of  $10 \text{ kg/cm}^2$
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-6 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
28 NOV	31				30.00~43.00 m Fresh grey slightly friable lake sediments, alternating beds of tuff and tuffaceous sandstone accompanied by diatomite (36.00 m±) with almost flat lamina.					Lu = 3.2 K = $3.65 \times 10^{-5}$	31
1 DEC	35									Lu = 1.8 K = $2.10 \times 10^{-5}$	35
2 DEC	41									Lu = 1.7 K = $1.98 \times 10^{-5}$	41
3 DEC	45				43.00~70.00 m Fresh brownish light grey slightly friable to friable lake sediments, alternating beds of tuff and tuffaceous coarse sandstone with lamina of 0° to 5° dip.					Lu = 5.2 K = $6.03 \times 10^{-5}$ Pc = 8.5	45
5 DEC	49									Lu = 4.7 K = $5.46 \times 10^{-5}$ Pc = 8.6	49
16 DEC	53									Lu = 2.1 K = $2.44 \times 10^{-5}$	53
7 DEC	57									Lu = 1.0 K = $1.10 \times 10^{-5}$	57
8 DEC	61										61
9 DEC	65										65

HOLE NO. MB-6

( 2/3 )

# DRILL LOG

HOLE NO. MB-6 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
11/DEC	66 67 68 69 70	70.00	2018.24							Lu = 1.1 K = 1.23 x 10 <sup>-5</sup>	66 67 68 69 70
					END OF BOREHOLE						

HOLE NO. MB-3

( 3/3 )



# DRILL LOG

HOLE NO. MB-7 SHEET NO. 1 OF 1

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2159.60 M		
SITE		MALEWA DAM SITE		COORDINATE	951 575.24 : 211 443.75	INCINATION	90°	DRILL RIG			
AVERAGE CORE RECOVERY				DATE	FROM 27/OCT TO 16/NOV	DRILLED	MOWLEM	LOGGED	JICA		
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
								%	cm	50 %	
27/OCT				~ ~	Fresh dark grey hard welded tuff with brown colored joints spaced 30 to 10 cm.						
	3.55	2156.05	WELDED TUFF	~ ~							
28/OCT				---	Slightly to moderately weathered light brown friable, partially slightly friable lake sediments (alternating beds of conglomerates, sandstone tuff and lapili tuff with almost flat lamina) with joints spaced more than 50 cm.					Lu = 5.8 K = 6.34 x 10 <sup>-5</sup> Pc = 2.5	
30/OCT				---							
				---						Lu = 10.5 K = 1.18 x 10 <sup>-4</sup> Pc = 2.7	
				---							
				---						Lu = 0.9 K = 9.92 x 10 <sup>-6</sup> Pc = 0.6	
1/NOV				///	Fresh dark grey friable non-welded tuff (lapili tuff) with joints spaced more than 50 cm.						
	16.00	2143.60	NON-WELDED TUFF	///							
				~ ~	Fresh dark grey very hard welded tuff with partially brown colored joints spaced more than 50 cm.					Lu = 0.0 K = 0.0 Pc = 1.6	
				~ ~							
				~ ~							
				~ ~							
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				~ ~							
2/NOV				~ ~							
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HOLE NO. MB-7

(1/3)

\* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100%  
 \* LUIGON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-7 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
6/NOV	31				Alternating beds of tuff, lapilli tuff, sandstone and conglomerates with intercalation of diatomite. (33.00-33.40 m)				Lu = 13.5 K = $1.55 \times 10^{-4}$ Pc = 7.4	31
7/NOV	32									32
8/NOV	33									33
9/NOV	34									34
10/NOV	35									35
11/NOV	36									36
12/NOV	37	36.80	LAKE SEDIMENTS						Lu = 1.5 K = $1.71 \times 10^{-5}$ Pc = 2.1	37
13/NOV	38			" "	Fresh dark grey friable massive tuffs (lapilli tuff including large scoria) with joints spaced more than 50 cm.					38
14/NOV	39			" "						39
15/NOV	40			" "						40
16/NOV	41			" "						41
17/NOV	42			" "					Lu = 9.0 K = $1.04 \times 10^{-4}$ Pc = 3.6	42
18/NOV	43	43.30	MASSIVE TUFFS	" "						43
19/NOV	44	2116.30			Slightly weathered light grey to light brown slightly friable to friable non-welded tuff (lapilli tuff).					44
20/NOV	45									45
21/NOV	46				Large pumice (3-4 cm in diameter) included below 49.50 m.				Lu = 11.4 K = $1.31 \times 10^{-4}$ Pc = 3.2	46
22/NOV	47									47
23/NOV	48									48
24/NOV	49									49
25/NOV	50									50
26/NOV	51								Lu = 13.2 K = $1.51 \times 10^{-4}$ Pc = 8.6	51
27/NOV	52									52
28/NOV	53									53
29/NOV	54									54
30/NOV	55	55.80	NON-WELDED TUFF							55
1/NOV	56	2103.80								56
2/NOV	57				Slightly weathered dark grey hard welded tuff with joints spaced more than 50 cm.				Lu = 0.1 K = $7.90 \times 10^{-7}$ Pc = 4.6	57
3/NOV	58									58
4/NOV	59	59.00	WELDED TUFF							59
5/NOV	60	2100.60								60
6/NOV	61				Slightly weathered yellowish grey slightly friable non-welded tuff (lapilli tuff).					61
7/NOV	62								Lu = 0.1 K = $1.57 \times 10^{-6}$ Pc = 2.3	62
8/NOV	63									63
9/NOV	64	64.55	NON-WELDED TUFF							64
10/NOV	65	2095.05								65

HOLE NO. MB-7

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LOG FORM-C

# DRILL LOG

HOLE NO. MB-7 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
15/NOV	66			" "	Slightly weathered yellowish brown slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.				[REDACTED]	Lu = 0.7 K = $8.77 \times 10^{-6}$ Pc = 4.7	66
	67			" "							67
	68			" "							68
	69			" "							69
16/NOV	70	2089.60	MASSIVE TUFFS	" "	END OF BOREHOLE						70

HOLE NO. MB-7

( 3/3 )

LOC FORM-C'

HOLE NO. MB-8      SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MELEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2157.03 M			
SITE		MALEWA DAM SITE		COORDINATE	951 691.86 : 211 434.88	INCLINATION	90°	DRILL RIG				
AVERAGE CORE RECOVERY				DATE	FROM 9/NOV TO 18/NOV	DRILLED	MOWLEM	LOGGED	JICA			
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	& BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
								%	cm			
9 / NOV	1		LAKE SEDIMENTS	---	Slightly to moderately weathered grey to light brown slightly friable to friable lake sediments (alternating beds of conglomerates, sandstone and silt with cross lamina) with partially brown colored joints spaced more than 30 cm.					50 (%)		1
	2			---								2
	3			---								3
	4			---								4
	5			---								5
	6			---								6
	7			---								7
10 / NOV	8	7.80	2149.23	---	Fresh dark grey hard to slightly friable non-welded tuff (lapili tuff) with joints spaced more than 50 cm.					50 (%)		8
	9			---								9
	10			---								10
	11			---								11
	12			---								12
	13			---								13
	14			---								14
11 / NOV	15	12.50	2144.53	/ / /	Fresh dark grey very hard to hard welded tuff with brown colored joints spaced more than 50 cm.					50 (%)		15
	16			/ / /								16
	17			/ / /								17
	18			/ / /								18
	19			/ / /								19
	20			/ / /								20
	21			/ / /								21
12 / NOV	22	21.80	2135.23	- ~ -	Slightly weathered yellowish brown hard non-welded tuff (lapili tuff) with brown colored joints spaced more than 50 cm.					50 (%)		22
	23			- ~ -								23
	24			- ~ -								24
	25			- ~ -								25
	26			- ~ -								26
	27			- ~ -								27
	28			- ~ -								28
12 / NOV	29	24.70	2132.33	/ / /	24.70-32.10 m Slightly to moderately weathered grey to yellowish brown slightly friable to friable sediments (alternating beds of tuff and tuffaceous sandstone).					50 (%)		29
	30			/ / /								30
	31			/ / /								31
	32			/ / /								32
	33			/ / /								33
	34			/ / /								34
	35			/ / /								35

- R.Q.D. is Rock Quality Designation,  $R.Q.D. = (\text{Total length of cylindric cores longer than } 10 \text{ cm}) / (\text{Total core length}) \times 100\%$
- LUGEON VALUE is  $\text{l/min/m}$  under injection water pressure of  $10 \text{ kg/cm}^2$
- DEPTH and ELEVATION are in meter
- DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-8 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
12 / NOV	31				32.10~35.00 m Fresh dark grey hard to slightly friable sediments (conglomerates and sandstone) with faint lamina.						31
	32										32
	33										33
	34										34
	35	3500	2122.03	LAKE SEDIMENTS							35
13 / NOV	36			" "	Fresh dark grey partially light brown friable to soft massive tuffs (lapili tuff).						36
	37			" "							37
	38			" "							38
	39	3900	2118.03	MASSIVE TUFFS							39
	40										40
14 / NOV	41				Slightly weathered yellowish brown hard, partially slightly friable non-welded tuff (lapili tuff) with partially brown colored joints spaced more than 50 cm.						41
	42										42
	43										43
	44										44
	45										45
15 / NOV	46				Fresh greenish grey very hard welded tuff with brown colored joints spaced more than 50 cm.						46
	47										47
	48										48
	49										49
	50	50.00	2107.03	NON-WELDED TUFF							50
16 / NOV	51				Slightly weathered yellowish brown hard non-welded tuff (lapili tuff) with partially brown colored joints spaced more than 50 cm.						51
	52										52
	53										53
	54										54
	55	55.70	2101.33	WELDED TUFF							55
17 / NOV	56				Slightly weathered brown slightly friable massive tuffs (lapili tuff) with joints spaced more than 50 cm.						56
	57										57
	58										58
	59	59.80	2097.23	NON-WELDED TUFF							59
	60										60
	61			" "							61
	62			" "							62
	63			" "							63
	64			" "							64
	65			MASSIVE TUFFS							65

LOG FORM-C

HOLE NO. MB-8

( 2/3 )

# DRILL LOG

HOLE NO. MB-8 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
17/NOV	66			" "	(as above)						66
	67			" "							67
18/NOV	68			" "							68
	69			" "							69
	70	2087.03	MASSIVE TUFFS	" "							70
					END OF BOREHOLE						

HOLE NO. MB-8

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LOG FORM-C

HOLE NO. MB-9 SHEET NO. 1 OF 3

HOLE NO. MB-9

 $\frac{1}{3}$ 

- A-28

# DRILL LOG

HOLE NO. MB-9 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
					(as above)					
7 / NOV	31									31
	32									32
	33	32.55	LAKE SEDIMENTS							33
	34	2124.70		" "	Fresh to slightly weathered friable, partially soft massive tuffs (lapili tuff) with brown colored joints spaced more than 50 cm.				Lu=19.3 K=2.22x10 <sup>-4</sup> Pc=1.2	34
	35			" "						35
	36			" "						36
	37	36.70	MASSIVE TUFFS							37
8 / NOV	38				Slightly weathered yellowish brown hard non-welded tuff (lapili tuff) with brown colored joints spaced more than 50 cm.				Lu=0.8 K=8.63x10 <sup>-6</sup> Pc=3.1	38
	39									39
	40									40
	41									41
9 / NOV	42									42
	43									43
	44									44
	45	45.30	NON-WELDED TUFF						Lu=1.7 K=2.00x10 <sup>-5</sup> Pc=3.8	45
	46	2111.95								46
10 / NOV	47				Fresh dark grey hard welded tuff with joints spaced more than 50 cm.					47
	48								Lu=2.7 K=3.11x10 <sup>-5</sup> Pc=4.1	48
	49									49
	50									50
	51									51
11 / NOV	52									52
	53									53
	54	54.10	WELDED TUFF						Lu=12.3 K=1.41x10 <sup>-4</sup> Pc=9.3	54
	55									55
	56				Slightly weathered grey to yellowish brown hard non-welded tuff with brown colored joints spaced more than 50 cm.					56
12 / NOV	57									57
	58	57.30	NON-WELDED TUFF							58
	59	2099.95		" "	Slightly to moderately weathered dark brown slightly friable massive tuffs (lapili tuff) with joints more than 50 cm.				Lu=12.0 K=1.38x10 <sup>-4</sup> Pc=9.4	59
	60			" "						60
	61			" "						61
	62			" "						62
13 / NOV	63			" "						63
	64			" "					Lu=9.0 K=1.03x10 <sup>-4</sup>	64
	65		MASSIVE TUFFS	" "						65

LOG FORM-C

HOLE NO. MB-9

( 2/3 )



# DRILL LOG

HOLE NO. MB-9 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
14 / NOV	66			" "	(as above)						66
	67			" "							67
	68	69.10	2089.15	MASSIVE TUFFS	" "						
	69			---	Fresh dark grey slightly friable to friable sediments, alternating beds of sandstone and lapili tuff.						69
	70	70.00	2087.25	LAKE SEDIMENT						Lu=7.4 K=8.46x10 <sup>-5</sup> Pc=2.9	70
					END OF BOREHOLE						

LOG FORM-C

HOLE NO. MB-9

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# DRILL LOG

HOLE NO. MB-10 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM				DEPTH	70.00 M	ELEVATION	2160.22 M
SITE		MALEWA DAM SITE		COORDINATE	952 : 214.98 : 211 306.71	INCLINATION	90°	DRILL RIG	
AVERAGE CORE RECOVERY				DATE	FROM TO	DRILLED	MOWLEM	LOGGED	JICA
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	RIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	
								%	50 (%)
29 / DEC	1				0.00~4.43 m Fresh partially moderately weathered grey friable to soft lake sediments.(sandy tuff).				
	2								
	3								
	4								
	5				4.43~8.43 m Moderately weathered brownish grey friable sediments (alternating beds of tuff and coarse sandstone) with slightly brown colored joints spaced more than 50 cm.				(K=2.29x10 <sup>-3</sup> )
	6								
	7								
	8	8.43	2151.79	LAKE SEDIMENTS					Lu=143.2
	9				Moderately weathered brownish grey friable massive tuffs with brown colored joints spaced 30 to 10 cm.				K=1.61x10 <sup>-3</sup>
	10			" "					Pc=0.7
	11			" "					
	12			" "					
	13			" "					Lu=99.9
	14			" "					K=1.12x10 <sup>-3</sup>
	15			" "					Pc=0.9
30 / DEC	16	16.50	2143.72	MASSIVE TUFFS					
	17				Fresh dark grey very hard partially hard welded tuff with brown colored joints spaced more than 10 cm.				Lu=9.0
	18								K=1.01x10 <sup>-4</sup>
	19								Pc=8.7
	20								
	21								
	22	22.30	2137.92	WELDED TUFF					
	23				Fresh grey to brownish grey slightly friable to soft lake sediments (alternating beds of sandstone, siltstone and tuff with cross lamina of 0° to 5° dip) with brown colored joints spaced more than 50 cm.				Lu=2.5
	24								K=2.81x10 <sup>-5</sup>
	25								Pc=2.6
	26								
	27								
	28								
1 / DEC	29	29.60	2130.42	LAKE SEDIMENTS					Lu=2.4
	30								K=2.7x10 <sup>-5</sup>
									Pc=8.8

\* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%  
 \* LUGEON VALUE is U/min/m under injection water pressure of 10kg/cm<sup>2</sup>  
 \* DEPTH and ELEVATION are in meter  
 \* DIAMETER is in millimeter

LOG FORM-B

HOLE NO. MB-10

(1/3)

# DRILL LOG

HOLE NO. MB-10 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	cm			
2 / DEC	31	2127.62	NON-WELDED TUFF		Fresh to slightly weathered dark grey partially brown slightly friable lapili tuff with slightly brown colored joints spaced more than 30 cm.	Recorded Lowest (35.20)				Lu=12.9 K=1.44x10 <sup>-4</sup> Pc=7.8	31
	32										32
	33										33
	34										34
	35										35
3 / DEC	36	2115.72	WELDED TUFF		Fresh dark grey very hard welded tuff with slightly brown colored joints spaced more than 50 cm, partially 50 to 10 cm.					Lu=1.7 K=1.96x10 <sup>-5</sup>	36
	37										37
	38										38
	39										39
	40										40
4 / DEC	41	2113.12	NON-WELDED TUFF		Fresh dark grey slightly friable to soft lapili tuff.					Lu=1.8 K=2.05x10 <sup>-5</sup>	41
	42										42
	43										43
	44										44
	45										45
5 / DEC	46	2104.52	LAKE SEDIMENTS		Fresh grey to brownish grey, friable sediments (alternating beds of tuff tuffaceous sandstone and conglomerates with rare lamina of 5° dip) with slightly brown colored joints spaced more than 50 cm.					Lu=3.5 K=3.90x10 <sup>-5</sup> Pc=5.8	46
	47										47
	48										48
	49										49
	50										50
6 / DEC	51	2104.52	LAKE SEDIMENTS		55.70~60.00 m Fresh dark grey slightly friable massive tuff (lapili tuff including much scoria and rock fragments).					Lu=3.5 K=4.00x10 <sup>-5</sup> Pc=7.7	51
	52										52
	53										53
	54										54
	55										55
7 / DEC	56	2104.52	LAKE SEDIMENTS		60.00~65.60 m Slightly weathered brown to light brown hard to slightly friable lapili tuff.					Lu=8.6 K=9.61x10 <sup>-5</sup> Pc=9.5	56
	57										57
	58										58
	59										59
	60										60
7 / DEC	61	2104.52	MASSIVE TUFFS							Lu=29.6 K=3.40x10 <sup>-4</sup> Pc=4.1	61
	62										62
	63										63
	64										64
	65										65

HOLE NO. MB-10

(2/3)

LOG FORM-C

HOLE NO. MB-10 SHEET NO. 3 OF 3

$$\left( \frac{5}{3} \right)$$

# DRILL LOG

HOLE NO. MB-11 SHEET NO. 1 OF 3

PROJECT		STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM				DEPTH	70.00 M		ELEVATION	2115.20 M	
SITE		MALEWA DAM SITE		COORDINATE	951741.62 211656.39		INCLINATION	90°		DRILL RIG	
AVERAGE CORE RECOVERY				DATE	FROM 21/NOV TO 2/DEC		DRILLED			LOGGED	
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	R.Q.D.	WATER PRESSURE TEST	DEPTH
								%	50 (%)		
21/NOV	1				0.00-3.70 m Fresh dark grey soft lake sediments (alternating beds of sandstone, lapili tuff and siltstone with lamina of 5° dip).						
	2										
	3										
	4										
	5				3.70-11.10 m Fresh, partially slightly weathered friable lake sediments, alternating beds of siltstone, tuff and sandstone with lamina of conglomerates, with intercalation of diatomite (3.70-4.10 m).					(K=1.13x10 <sup>-3</sup> )	
	6										
	7										
	8										
	9									Lu=14.2	
	10									K=1.60x10 <sup>-4</sup>	
	11									Pc=4.2	
	12										
	13				11.10-32.85 m Fresh grey soft lake sediments, alternating beds of sandstone and silt with lamina of 0° to 5° dip.						
	14									Lu=15.0	
	15									K=1.68x10 <sup>-4</sup>	
	16									Pc=4.6	
	17										
	18				Almost of core shaped like slice or sand.						
	19									Lu=5.6	
	20									K=6.28x10 <sup>-5</sup>	
	21									Pc=3.8	
	22										
	23									Lu=9.4	
	24									K=1.10x10 <sup>-4</sup>	
	25									Pc=0.8	
	26										
	27									Lu=32.7	
	28									K=3.76x10 <sup>-4</sup>	
	29									Pc=5.5	
	30		LAKE SEDIMENTS								

HOLE NO. MB-11

(1/3)

- \* R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm) / (Total core length) × 100%
- \* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm<sup>2</sup>
- \* DEPTH and ELEVATION are in meter
- \* DIAMETER is in millimeter

# DRILL LOG

HOLE NO. MB-11 SHEET NO. 2 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY	R. Q. D.	WATER PRESSURE TEST	DEPTH
					(as above)					
25/NOV	31									31
	32									32
	33	32.85	LAKE SEDIMENTS			Recorded Lowest				33
	34			" "	Slightly weathered brownish grey slightly friable massive tuffs (lapili tuff with much scoria and rock fragments).	(33.30)			Lu=15.3 K=1.76x10 <sup>-4</sup> Pc=0.8	34
	35			" "						35
	36			" "						36
26/NOV	37			" "						37
	38			" "						38
	39			" "					Lu=3.3 K=3.79x10 <sup>-5</sup>	39
	40			" "						40
	41	41.70	MASSIVE TUFFS	" "						41
	42	2073.50			Moderately weathered light brown, partially grey slightly friable to friable sediments (tuff, sandy tuff with lamina of conglomerate).				Lu=14.5 K=1.66x10 <sup>-4</sup> Pc=9.3	42
	43									43
	44									44
	45									45
	46									46
	47									47
27/NOV	48									48
	49									49
	50									50
	51									51
	52									52
	53	51.85	LAKE SEDIMENTS	" "						53
	54	2063.35		" "	Fresh dark grey slightly friable, partially soft massive tuffs (lapili tuff).				Lu=2.0 K=2.31x10 <sup>-5</sup>	54
	55			" "						55
	56			" "						56
	57			" "						57
	58	58.10	MASSIVE TUFFS	" "					Lu=2.5 K=2.91x10 <sup>-5</sup> Pc=9.4	58
	59	2057.10			Slightly weathered light brown slightly friable to soft lake sediments (alternating beds of tuff, sandstone, conglomerate and siltstone with lamina and cross lamina of 0° to 5° dip).					59
	60									60
	61									61
	62									62
	63								Lu=1.6 K=1.82x10 <sup>-5</sup> Pc=9.1	63
	64									64
	65		LAKE SEDIMENTS							65

HOLE NO. MB-11

( 2/3 )

LOG FORM-C

# DRILL LOG

HOLE NO. MB-11 SHEET NO. 3 OF 3

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	GROUNDWATER LEVEL	CORE RECOVERY		R. Q. D.	WATER PRESSURE TEST	DEPTH
							%	CM			
11/DEC	66.00	2049.20	LAKE SEDIMENTS		(as above)						66.1
2/DEC	67.00			" "	Fresh dark grey slightly friable massive tuffs (lapili tuff).						67.1
	68.00			" "							68.1
	69.00			" "							69.1
	70.00	2045.20	MASSIVE TUFFS	" "						Lu=0.2 K=1.97x10 <sup>-6</sup>	70.1
					END OF BOREHOLE						71.1

HOLE NO. MB-11

( 3/3 )

LOC FORM-C

## APPENDIX B    X-RAY TEST OF BORING CORES



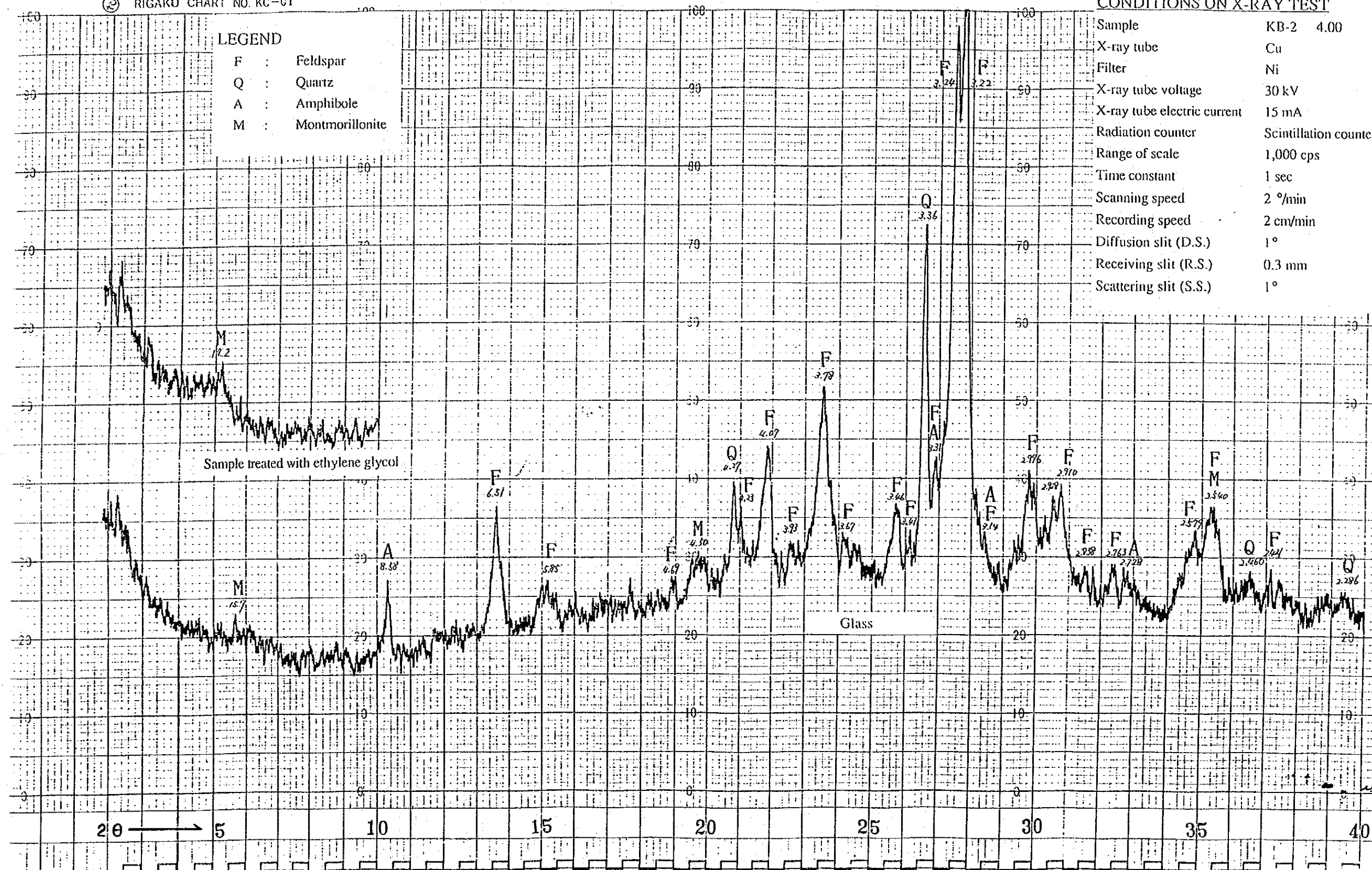
② RIGAKU CHART NO. KC-G1

LEGEND

F : Feldspar  
Q : Quartz  
A : Amphibole  
M : Montmorillonite

CONDITIONS ON X-RAY TEST

Sample KB-2 4.00  
X-ray tube Cu  
Filter Ni  
X-ray tube voltage 30 kV  
X-ray tube electric current 15 mA  
Radiation counter Scintillation counter  
Range of scale 1,000 cps  
Time constant 1 sec  
Scanning speed 2 °/min  
Recording speed 2 cm/min  
Diffusion slit (D.S.) 1°  
Receiving slit (R.S.) 0.3 mm  
Scattering slit (S.S.) 1°



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MINISTRY OF WATER DEVELOPMENT  
NATIONAL WATER CONSERVATION  
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THE STUDY FOR CONSTRUCTION OF DAM  
IN MALEWA RIVER SYSTEM  
GREATER BAKURU WATER SUPPLY PROJECT  
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JAPAN INTERNATIONAL COOPERATION AGENCY

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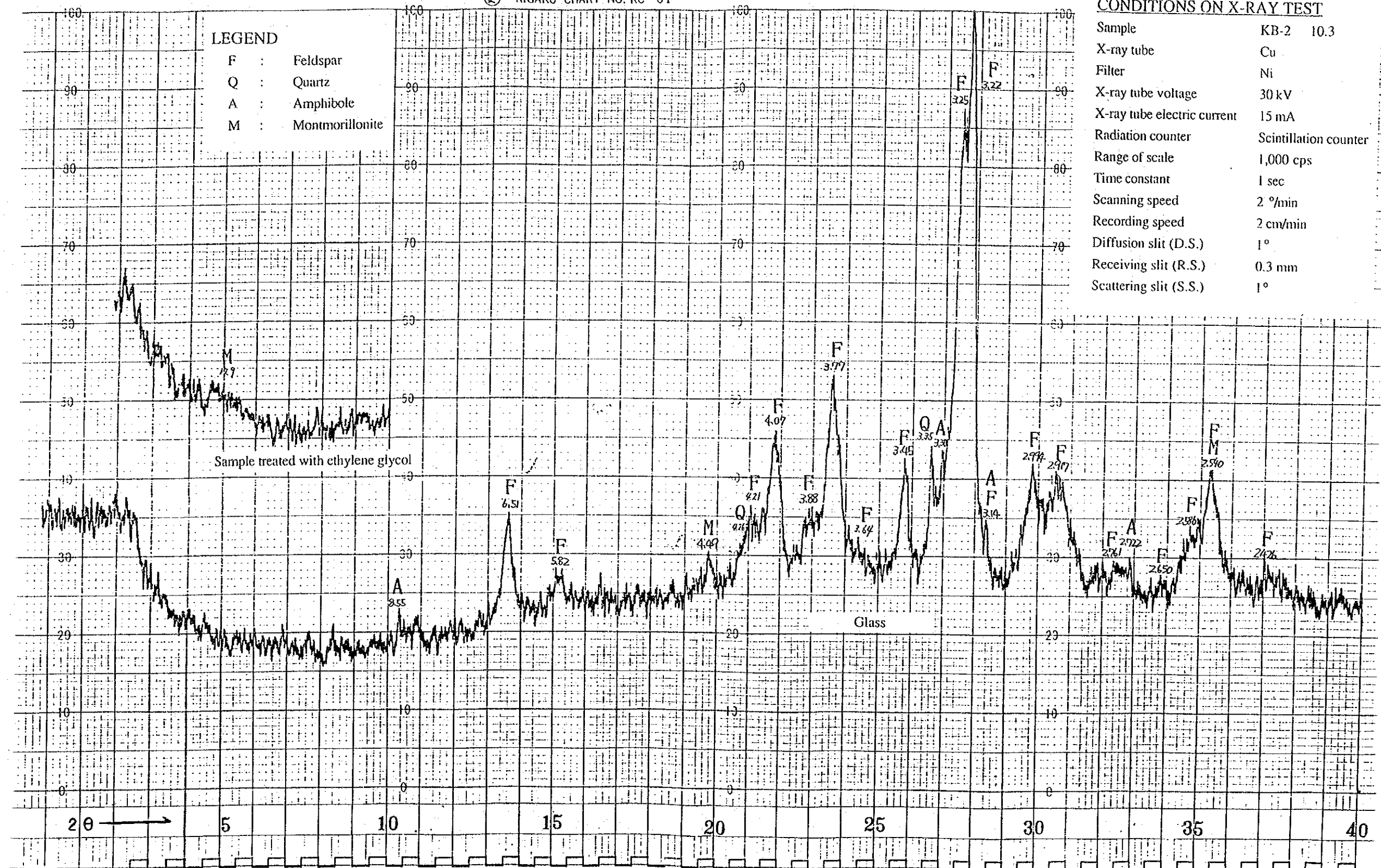
② RIGAKU CHART NO. KC-01

LEGEND

F : Feldspar  
Q : Quartz  
A : Amphibole  
M : Montmorillonite

CONDITIONS ON X-RAY TEST

Sample KB-2 10.3  
X-ray tube Cu  
Filter Ni  
X-ray tube voltage 30 kV  
X-ray tube electric current 15 mA  
Radiation counter Scintillation counter  
Range of scale 1,000 cps  
Time constant 1 sec  
Scanning speed 2 °/min  
Recording speed 2 cm/min  
Diffusion slit (D.S.) 1°  
Receiving slit (R.S.) 0.3 mm  
Scattering slit (S.S.) 1°



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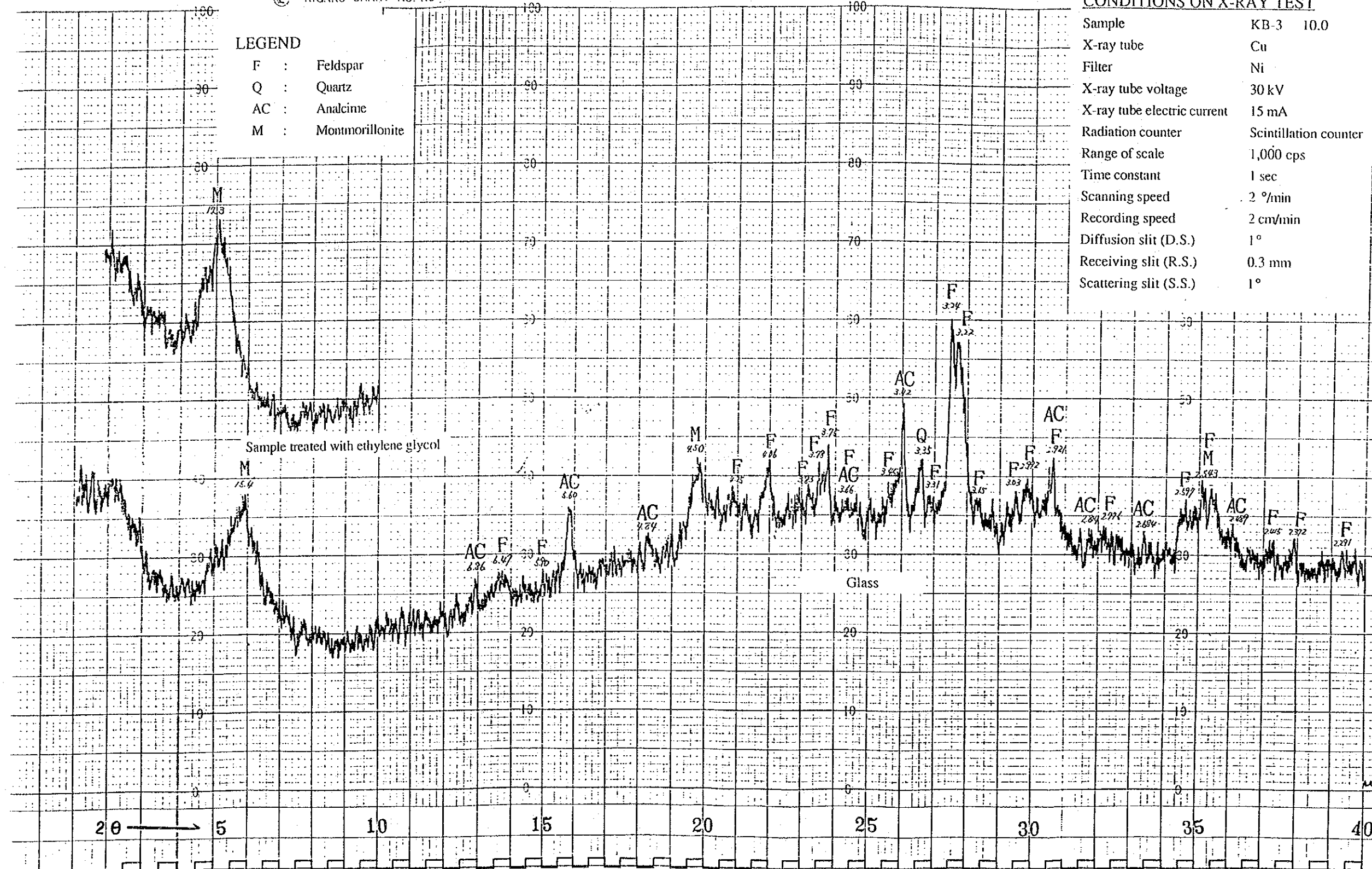
② RIGAKU CHART NO. KC-01

LEGEND

F : Feldspar  
Q : Quartz  
AC : Analcime  
M : Montmorillonite

CONDITIONS ON X-RAY TEST

Sample KB-3 10.0  
X-ray tube Cu  
Filter Ni  
X-ray tube voltage 30 kV  
X-ray tube electric current 15 mA  
Radiation counter Scintillation counter  
Range of scale 1,000 cps  
Time constant 1 sec  
Scanning speed 2 °/min  
Recording speed 2 cm/min  
Diffusion slit (D.S.) 1°  
Receiving slit (R.S.) 0.3 mm  
Scattering slit (S.S.) 1°



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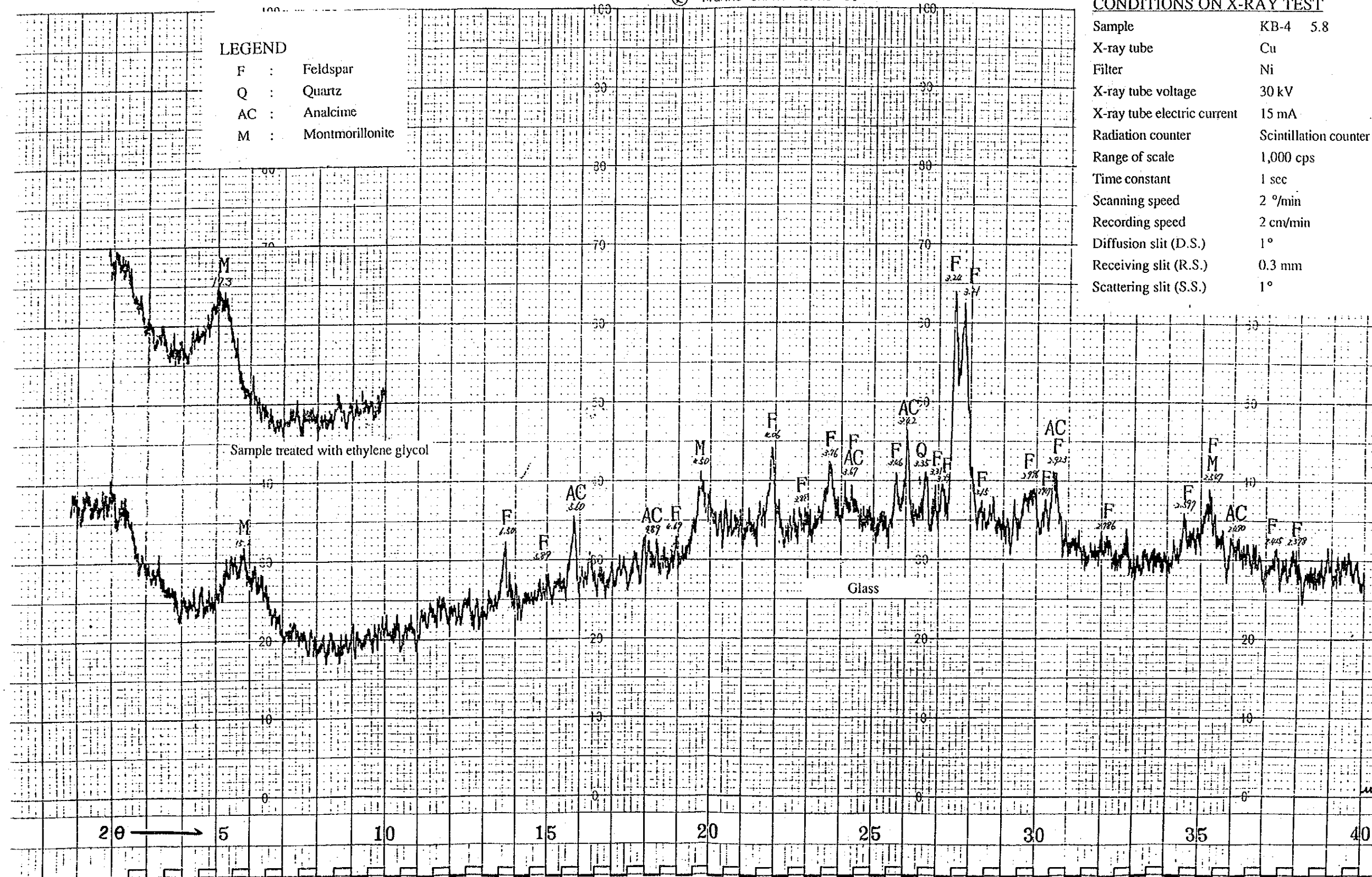
FIGAKU CHART NO. KC-01

LEGEND

F : Feldspar  
Q : Quartz  
AC : Analcime  
M : Montmorillonite

CONDITIONS ON X-RAY TEST

Sample KB-4 5.8  
X-ray tube Cu  
Filter Ni  
X-ray tube voltage 30 kV  
X-ray tube electric current 15 mA  
Radiation counter Scintillation counter  
Range of scale 1,000 cps  
Time constant 1 sec  
Scanning speed 2 °/min  
Recording speed 2 cm/min  
Diffusion slit (D.S.) 1°  
Receiving slit (R.S.) 0.3 mm  
Scattering slit (S.S.) 1°



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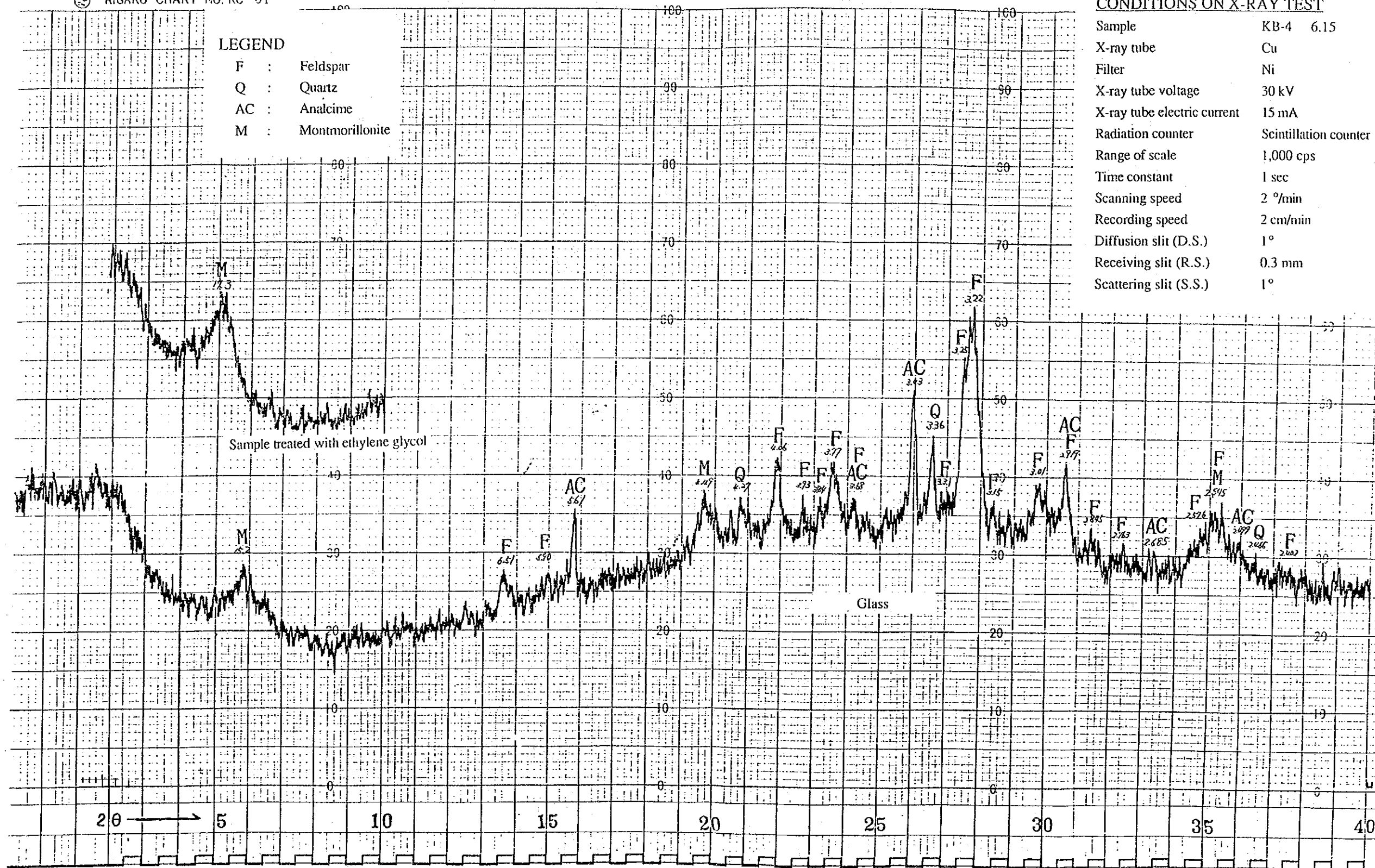
⊙ RIGAKU CHART NO. KC-01

### LEGEND

F : Feldspar  
Q : Quartz  
AC : Analcime  
M : Montmorillonite

### CONDITIONS ON X-RAY TEST

Sample	KB-4	6.15
X-ray tube	Cu	
Filter	Ni	
X-ray tube voltage	30 kV	
X-ray tube electric current	15 mA	
Radiation counter	Scintillation counter	
Range of scale	1,000 cps	
Time constant	1 sec	
Scanning speed	2 °/min	
Recording speed	2 cm/min	
Diffusion slit (D.S.)	1 °	
Receiving slit (R.S.)	0.3 mm	
Scattering slit (S.S.)	1 °	



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