

**RECORD OF GEOLOGICAL  
INVESTIGATION**



**RECORD OF GEOLOGICAL INVESTIGATION  
AND CONSTRUCTION MATERIAL INVESTIGATION**

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***C1 MUTONGA DAM SITE GEOLOGY***

## ***C1.1 Drilling Logs of Mutonga Dam Site***



**DRILLING LOG**

Hole inclination: Vertical  
Azimuth:

Project: Mutonga/Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 45.00m

Hole EL: 554.60m  
Northing: 9,953,043.65  
Easting: 352,391.11

Hole No: M95-1  
(1/2)

Date	Depth(m)	FL (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	GW Level	Lugosec (m)	Lu	Depth(m)	
	0.5	554.1		Gravel	100	6						0-0.50m: Orange brown angular, fine and medium in sandy matrix				1	
	2.1	552.5			100	6	2.1					0.50-2.10m: Slime (sand)				2	
	3.2			Mafic gneiss	100	21	3.2	B	4	b	CM	2.10-12.45m Slightly weathered, foliated at 60°, laminated and banded, light grey with dark grey biotite laminae, medium and coarse grained biotite - quartz - feldspar, semi-pelitic	3.8			3	
	4.35				100	15	4.35	B	3	b	CH					4	
	5.1				100	73	5.1	A	1	b	CH	With rare pink granite zones upto 30cm.				5	
	6.25				100	38	6.25	A	3	b	CH	Joints, 0-60°, concordant and discordant, rough, limonite coated with biotite sheen.		213.9		6	
	6.9				100	67	6.9	A	1	b	CH	5.20-5.50m; granitic.				7	
	8				100	58										8	
	9.1				100	63	9.1	A	3	b	CH		8.8			9	
	10.1				100	100	10.1	A	1	b	CH					10	
	10.6						10.6	A	3	b	CH					11	
	11.15						11.15	A	2	b	CH					12	
	11.5					11.5	A	4	b	CM			363.4		11		
	12.4	542.1			100	99	12.4	A	1	b	CH				12		
	13.2			Granitic gneiss	100	97	13.2	A	2	b	CH	12.45-14.70m Slightly weathered, faintly foliated at 60°, pink coarse grained	13.2			13	
	14				100	98	14	A	1	b	CH	Joints, 10-40°, rough, limonite coated				14	
	14.7	539.9			100	99	14.7	A	3	b	CH				15		
	16			Mafic gneiss	100	95						14.70-30.00m Slightly weathered, foliated at about 60°, dark gray with light grey lamination, medium and coarse grained mafic biotite - horn blende	0.1			16	
	17				100	92						With occasional pink granitic zones, 28.60-29.30m.				17	
	18				100	92						Joints, 30-60°, orange limonite/dark green earthy mineral lined.	18.2			18	
	19				100	85										19	
	20				100	94										20	
	21				100	100									5.1		21
	22				100	100											22
	23				100	99								22.9			23
	24				100	94											24
	25				100	100											25
	26			100	100											26	
	27			100	100											27	
	28			100	100											28	
	29			100	100		29.5	A	1	b	CH		23.9			29	
	30			100	100		29.7	A	5	b	CH					30	
							30.00	A	1	b	CH					30	

**DRILLING LOG**  
 Hole inclination: Vertical  
 Azimuth

Project: Mutonga/Grand Falls Hydropower Project  
 Site: Mutonga  
 Total Length: 45.00m

Hole EL: 554.60m  
 Northing: 9,953,643.65  
 Easting: 382,391.11

Hole No: M195-1  
 (372)

Date	Depth(m)	EL. (m)	Log	Rock type	Core (%)		RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W. Level	Lugoon (m)	Lu	Depth(m)		
	31			Mafic gneiss	100		70						30.00-35.00m Slightly weathered, foliated at about 60°, dark grey with light grey lamination, medium and coarse grained mafic biotite - horn blende  With occasional pink granitic zones.  Joints: 30-60°, orange limonite/dark green earthy mineral lined.				31		
	32				100		83												32
	33				100		95												33
	34				100		100												34
	35				100		93												35
	36				100		94												36
	37				100		100	37.15	A	1	b	CH							37
	38				100		86	38.4	A	3	b	CH							38
	39	39.05	515.5		100		54	39	A	2	b	CH							39
	40				100		55	39.25	A	3	b	CH							40
	41			Granite	100		69						39.05-43.45m Slightly weathered, pink-brown coarse grained With discordant contact with gneiss Joints: 0-80°, rough, with orange green limonite coated.				41		
	42				100		83	41.75	A	1	b	CH							42
	43				100		81	42.35	A	2	b	CH							43
	44	43.45	511.1		100		81	42.75	A	4	b	CM							44
	45	45.00	509.8	Mafic gneiss	100		78	43.5	A	3	b	CH	43.45-45.00m Slightly weathered, foliated at 40°, dark grey medium to coarse grained biotite. With discordant contact with gneiss. Joints: rare, 40°, rough, limonite coated.				45		
	46				100		78	45.00	A	1	b	CH							46
	47												Date commenced: 20/8/95 Date completed: 23/8/95				47		
	48																	48	
	49																	49	
	50																	50	
	51																	51	
	52																	52	
	53																	53	
	54																	54	
	55																	55	
	56																	56	
	57																	57	
	58																	58	
	59																	59	
	60																	60	



**DRILLING LOG**  
Hole inclination Vertical  
Azimuth

Project Mutonga Grand Falls Hydropower Project  
Site Mutonga  
Total Length: 30.15m

Hole EL: 537.59m  
Northing 9,952,978.41  
Easting 382,372.66

Hole No M95-2  
(1/1)

Date	Depth(m)	EL. (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	CW Level	Lugeon (m)	Lu	Depth(m)	
	1			Sandy silt	0	0						0-2.30m Reddish brown sandy silt, partly clayey.				1	
	2	535.2			0	0	2.30										2
	3				70	30	2.6	D	5	d	D						3
	4				80	60	3.6	D	5	d	D						4
	5				74	0	3.9	D	4	d	D						5
	6				74	0	4.25	D	5	d	D						6
	7				93	27	4.55	D	3	d	CL						7
	8				98	32	7.9	C	3	c	CL						8
	9	528.2		Mafic gneiss	82	39	8.45	B	3	c	CM					9	
	10				100	32	8.65	B	3	c	CM						10
	11	526.1			100	45	9.1	B	3	c	CM						11
	12				100	62	9.35	B	5	b	CL						12
	13				100	85	10.5	A	3	b	CH						13
	14				100	90	11.25	A	2	b	CH						14
	15				100	67	11.5	B	5	b	CL						15
	16				100	56	11.75	A	3	b	CH						16
	17				100	51	12.4	A	1	b	CH						17
	18				100	52	17.3	A	1	b	CH						18
	19			100	100	17.8	B	4	b	CM						19	
	20			100	100	20.25	A	1	b	CH						20	
	21			100	100	20.6	A	3	b	CH						21	
	22			100	91											22	
	23			100	94											23	
	24			100	100											24	
	25			100	100											25	
	26			100	100											26	
	27			100	96											27	
	28			100	87											28	
	29			100	93											29	
	30	507.4		100	71	30.15	A	1	a	B						30	

Date commenced: 21/8/95  
Date completed: 22/8/95

**DRILLING LOG**

Hole inclination: Vertical  
Azimuth

Project: Mutonga Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 50.30m

Hole EL: 512.98m  
Northing: 9,952,838.43  
Easting: 382,330.74

Hole No: M95-3  
(1/2)

Date	Depth(m)	EL (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W. Level	Lugeon (m)	Lu	Lugon (m)
	1	511.8		Sand	0	0						0-1.10m: Brown, medium, river bed deposit				1
	2	510.4		Sand	0	0						1.10-2.50m: Grey, fine, river bed deposit				2
	3	509.9		Silt	0	0	3.00					2.50-3.00m: Greenish grey, sandy silt				3
	4			Mafic gneiss	100	36	3.3 3.6	A	2	b	CH CM	3.00-12.00m Slightly weathered, foliated at 80°, dark grey, medium and coarse grained mafic biotite - hornblende				4
	5				100	55						Zonally disintegrated to sandy materials				5
	6				100	18	6	A	1	b	CH	With granite vein 20cm at 11.65m	5.5			6
	7				67	10	6.45 6.6 7.1	A	3 5	b	CH CL	Joints; 10-20°, 50-70°, rough, orange limonite coated with green chloritic veneer.				7
	8				84	32	7.5 7.95	A	3 1	b	CH CH	6.60-7.10m, 8.70-9.50m & 10.30-10.50m, slime (sand)		2.6		8
	9				70	37	8.45 8.7	A B	4 5	b	CM CL					9
	10				45	9	9.5									10
	11				74	1	10.3 10.5	A	4	b	CM		10.1			11
	12	500.9			100	0	11.35	B	4	b	CM					12
	13				100	27	12 12.2 12.6 12.85	B B A B	5 4 3 5	b	CL CM CH CL	12.00-24.55m Slightly weathered, foliated at 40-60°, dark grey with thin light grey lamination, medium and coarse grained mafic biotite - hornblende		7.2		13
	14			100	59	13.5	A	3	b	CH	With occasional black graphite flakes in thin dark bands.				14	
	15			100	91						Joints; rare, 10-20°, 50-70° concordant and discordant, rough, limonite coated, rarely calcite lined.	15			15	
	16			100	53										16	
	17			100	75										17	
	18			100	83									2	18	
	19			100	79										19	
	20			100	56	19.75	A	1	b	CH		20			20	
	21			100	90	20.55	A	3	b	CH					21	
	22			100	47										22	
	23			100	73	22.85	A	1	b	CH		0.6			23	
	24	24.55	488.4	100	87	23.45	A	3	b	CH					24	
	25			100	65							24.55-30.00m Slightly weathered, foliated and thinly laminated at 40-60°, grey, less dark than above, medium and coarse grained quartz - feldspar - hornblende - biotite, semi-pelitic	25			25
	26			100	93							With occasional whitish quartzose bands.				26
	27			100	92							Joints; very rare, 40-80°, concordant and discordant, rough, limonite coated/rarely carbonate lined.		1.9		27
	28			100	92										28	
	29			100	92										29	
	30			100	98	30.00	A	1	b	CH					30	

**DRILLING LOG**

Hole inclination Vertical  
Azimuth

Project Mutonga Grand Falls Hydropower Project  
Site Mutonga  
Total Length: 50.30m

Hole EL: 512.98m  
Northing: 9,952,838.43  
Easting: 382,330.74

Hole No M35-3  
(2/2)

Date	Depth(m)	EL (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	CW Level	Lugoon (m)	Lu	Depth(m)								
	31			Mafic gneiss	100	100						30.00-35.00m Slightly weathered, foliated and thinly laminated at 40-60°, grey, less dark than above, medium and coarse grained quartz - feldspar - hornblende - biotite, semi-pelitic  With occasional whitish quartzose bands  Joints, very rare, 40-80°, concordant and discordant, rough, limonite coated rarely carbonate lined	30.25	1.9		31								
	32				100	100														32				
	33				100	91	33.55	A	1	b	CH								0	33				
	34				100	89	34.5	A	3	b	CH										34			
	35				100	100															35			
	36				100	100										35.00-50.30m Slightly weathered, grey, coarse and medium grained quartz - feldspar - hornblende - biotite  Joints, rare, 10-20°, 50-70°, rough, limonite coated, calcite lined	35.25			36				
	37				100	77	36.7	A	1	b	CH												37	
	38				100	63	37.8	A	2	b	CH										0		38	
	39				100	42	38.2	A	5	b	CH												39	
	40				100	62	39.8	A	1	b	CH												40	
	41				100	87	40.25	A	4	b	CM								40.25				41	
	42				100	93	40.7	A	3	b	CH													42
	43				100	92																0		43
	44				100	79	43.7	A	2	b	CH													44
	45				100	69	44.25	A	1	b	CH													45
	46				100	85	45	A	3	b	CH			45.2							46			
	47				100	88	46.75	A	2	b	CH											47		
	48				100	89	47.4	A	1	b	CH									0		48		
	49				100	100	47.65	A	3	b	CH											49		
	50	50.30	462.6		100	100	48.1	A	1	b	CH											50		
	51						48.6	A	2	b	CH									51				
	52												Date commenced: 9/8/95 Date completed: 15/8/95					52						
	53																			53				
	54																			54				
	55																			55				
	56																		56					
	57																		57					
	58																		58					
	59																		59					
	60																		60					

**DRILLING LOG**

Hole inclination: Vertical  
Azimuth:

Project: Mutonga Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 30.00m

Hole EL: 535.84m  
Northing: 9,952,696.04  
Easting: 382,288.82

Hole No. M95-4  
(1/1)

Date	Depth(m)	EL. (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W. Level	Lugeon (m)	Lu	Depth(m)	
	1			Sandy silt	100	0						0-2.00m: Reddish brown, silty sand, with some quartz and gneiss gravels				1	
	2	533.8			100	0	2									2	
	3	533.1		Limestone			3	D	5	d	D	2.00-2.70m Highly weathered, machine broken, pinkish brown, fine grained secondary kunker, with gneiss fragments				3	
	4			Pegmatite	91	0	3.4	D	5	d	D					4	
	5	531.0			76	0	3.8	D	5	d	D	2.70-4.80m: Highly weathered, machine broken, coarse grained quartz, feldspar, rare biotite.				5	
	6	529.6			100	0	4.8	C	5	c	D	3.00-3.40m and 3.80-4.80m, no core and slime (sand). Gray, fine and medium sand (disintegrated gneiss)				6	
	7			Mafic gneiss	100	51	6.20	C	2	c	CM	4.80-6.20m Moderately weathered, white very coarse grained, mainly feldspar, little quartz and biotite.				7	
	8				100	52							5.00-5.20m, micaceous. Bottom: 4 orange brown kunker limestone filling at horizontal	7.7			8
	9				87	63	8	B	3	b	CH						9
	10				8.1	63	8.1	B	5	b	CL						10
	11				73	55	8.5	B	3	b	CH						11
	12				9.5	55	9	B	3	b	CH						12
	13				10.2	55	9.5	C	4	c	CL						13
	14				84	49	11	A	2	b	CH						14
	15				11.3	49	11.3	A	3	b	CH						15
	16				67	42							6.20-17.00m Slightly, partly moderately weathered, foliated at 60°, grey with light grey felsic bands, coarse grained mafic, biotite with occasional more weathered grey micaceous biotite zones. With pegmatite bands upto 20cm. Joints; subhorizontal and 60-70°, rough/planar limonite coated.				16
	17	518.8			100	75						6.20-6.25m, red soil filling in joint.	12.7			17	
	18				100	95						8.10-8.50m & 11.00-11.30m, no core recovery.				18	
	19				100	90										19	
	20				100	93										20	
	21	17.00	518.8		100	97	17.00	A	1	b	CH	17.00-30.00m Fresh, foliated at 40-60°, and banded, dark grey with green tinge, with light colored lamination banding, coarse grained mafic; hornblende - biotite.  With rare light grey/white quartzose bands few cm upto 70cm with mafic inclusions  Joints; very rare, 40-70°, concordant and discordant, rough, with green chloritic shear/limonite.				21	
	22			Mafic gneiss	100	100										22	
	23				100	100											23
	24				100	100											24
	25				100	100											25
	26				100	100											26
	27				100	100											27
	28				100	100											28
	29				100	100											29
	30	505.8			100	100											30

**DRILLING LOG**

Hole inclination Vertical  
Azimuth

Project Mutonga Grand Falls Hydropower Project  
Site Mutonga  
Total Length: 50.20m

Hole EL: 549.15m  
Northing 9,952,528.75  
Easting 382,238.43

Hole No M95-5  
(1/2)

Date	Depth (m)	FL (m)	Log	Rock type	Core (%)	RQD (%)	Depth (m)	Hardness	Core shape	Weathering	Rock class	Description	GW Level	Lugeon (m)	Lu	Depth (m)	
	1			Sandy silt	0	0						0-2.00m: Reddish brown sandy silt, with some quartz and gneiss gravels. Bottom 50cm, slime (sand)				1	
	2	547.1				100	0	1.5									2
	3			Mafic gneiss	100	12	3.15	D	3	d	D	2.00-10.20m Moderately weathered, foliated and banded at 60°, dark grey, coarse grained mafic biotite		3		3	
	4					96	19	3.6	D	5	d	D	Foliation bands with linked microfolds				4
	5					80	35	4.7	C	3	e	CL	Joints, 0°, 40-60° & 90°, rough, with reddish clay filling brown calcareous lining/limonite coating		34		5
	6					94	32	6	C	3	e	CL	From 9.85m, slightly weathered				6
	7					100	28	6.6	C	4	e	CL	3.80-4.00m, no core recovery.				7
	8					100	0	6.9	C	2	e	CM			7.2		8
	9					100	0	7.2	B	4	b	CM					9
	10	538.9				85	15	8.5	C	4	e	CL					10
	11				Granitic gneiss	95	30	9.85	B	4	b	CM			10.1		10
	12						100	45	10.5	A	3	b	CH	10.20-20.00m Slightly weathered, foliated at 60°, pink brown with light grey patches, coarse grained granitic			
	13					100	85	11.1	A	2	b	CH	With occasional dark grey ungranitic mafic biotite rock zones 5cm to 50cm thick.		46		12
	14					100	86	12.4	A	3	b	CH	Joints, 0-80°, rough, limonite coated/red stained.				13
	15					100	46	12.8	A	1	b	CH	15.30-17.00m, mafic.				14
	16					100	71	13.6	A	3	b	CH			15.4		15
	17					100	78	14	A	5	b	CL					16
	18					100	78	15.15	A	3	b	CH				18.4	17
	19					100	100										18
	20	529.1		Mafic gneiss		100	100						20.00-30.00m: Slightly weathered, foliated and banded at 60°, dark grey with light grey bands, coarse grained mafic biotite.		20.05		20
	21					100	100						Joints, medium steep and steep, rough, calcite lined/limonite coated.				21
	22					100	100										22
	23					100	100								0		23
	24					100	89										24
	25					100	82	24.9	A	1	b	CH					25
	26					100	95	25.1	A	4	b	CM			25.3		26
	27					100	100										27
	28					100	94	27.6	A	1	b	CH			0.4		28
	29					100	40	27.9	A	3	b	CH					29
	30				100	61	28.5	A	1	b	CH					30	
					100	61	28.95	A	3	b	CH					30	
					100	61	30.00	A	1	b	CH					30	

**DRILLING LOG**  
Hole inclination: Vertical  
Azimuth:

Project: Mutonga/Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 50.20m

Hole FL: 549.15m  
Northing: 9,952,528.75  
Easting: 382,238.43

Hole No: M95-5  
(2/2)

Date	Depth(m)	FL (m)	Leg	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W. Level	Lugeon		Depth(m)	
														(m)	Lu		
							30.3	A	1	b	CHI						
							30.5	A	3	b	CHI						
	31				100	73	31	A	1	b	CHI						31
							31.25	A	3	b	CHI						
	32				100	71											32
	33				100	71									0		33
	34				100	71											34
	35				100	69											35
	36				100	67							35.65				36
	37				100	76											37
	38			Mafic gneiss	100	96											38
	39				100	83									0		39
	40				100	83	39.4	A	1	b	CHI						40
	41				100	84							40.65				41
	42				100	86											42
	43				100	86									0		43
	44				100	87											44
	45				100	87											45
	46				100	93							45.55				46
	47				100	100											47
	48				100	100									0		48
	49				100	100											49
	50	50.20	498.9		100	100	50.20	A	1	a	B						50
	51																51
	52																52
	53																53
	54																54
	55																55
	56																56
	57																57
	58																58
	59																59
	60																60

**DRILLING LOG**

Hole inclination Vertical  
Azimuth

Project Mutonga/Grand Falls Hydropower Project  
Site Mutonga  
Total Length: 30.00m

Hole FL: 553.49m  
Northing: 9,933,442.83  
Easting: 382,557.00

Hole No. M95-6  
(1/1)

Date	Depth(m)	FL (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G/W Level	Lugeon (m)	Lu	Depth(m)	
	1			Sandy silt	100	0						0-1.00m: Reddish brown sandy silt 1.00-2.50m: Slime (sand)				1	
	2				100	0											2
	2.5	550.9		Mafic gneiss	100	0	2.5									3	
	3				100	0							2.50-5.30m Highly weathered, machine broken, dark grey, medium grained biotite. Joints, subhorizontal and vertical, orange stained				4
	4				100	0	3.8	D	5	d	D		3.80-5.30m; slime (sand)				5
	5	548.1		Mafic gneiss	100	0	5.3									6	
	6				100	60							5.30-14.35m Moderately weathered, foliated at 50°, dark grey, medium and coarse grained, mafic biotite rich.			0.4	7
	7				100	77	7.3	C	3	e	CL		With pinkish brown granitic gneiss in the zones below: 5.30-6.00m 7.50-9.00m 11.30-11.90m				8
	8				100	9	9.1	B	3	e	CM		7.30-9.10m, clayey soil filling in joints				9
	9				100	26	9.65	C	4	e	CL		12.50-14.35m; slime (sand).	9.8			10
	10				100	33	10.4	D	5	d	D		Joints, 10-50°, with brown calcareous earthy lining				11
	11				100	33	11.3	C	3	e	CL						11
	12				100	33	11.8	B	3	e	CM						12
	13				80	17	12.5	C	3	e	CL						13
	14				60	0	14.35										14
	14.35	539.1		Mafic gneiss	73	44	14.55	B	4	b	CM					15	
	15				73	44	15.65	B	3	b	CH		14.35-20.20m Slightly weathered, foliated at 60°, dark grey, medium and coarse grained, mafic biotite rich.				16
	16				87	72	16.9	B	1	b	CH		Zonally machine disintegrated, with occasional augen structure.			13.7	17
	17				100	100	17.45	B	4	b	CM		16.35-17.00m; granitic.				18
	18				94	3	17.8	C	5	e	D		Joints, subhorizontal and 60°, rough, limonite coated				19
	19				68	13	19.2						17.80-19.20m; no core recovery.				20
	20	20.2	533.2		Mafic gneiss	68	14	20.2	B	3	b	CH					20
	21					100	100							20.20-30.00m Slightly weathered, foliated at 50°, laminated and banded, light grey/dark grey, medium and coarse grained, migmatitic, mafic - granitic, quartz - feldspar, biotite.			
	22			100		100							With non-migmatitic finely laminated zones.			1.9	22
	23			100		100							With rare pink pegmatite veins upto 30cm thick.				23
	24			100		100							Joints, very rare.				24
	25			100		100											25
	26			100		98									25.45		26
	27			100		97											27
	28			100		96										0.1	28
	29			100		96							Date commenced: 19/8/95 Date completed: 21/8/95				29
	30	30.00	523.4		100	100	30.00	A	1	b	CH					30	

**DRILLING LOG**

Hole inclination: Vertical  
Azimuth:

Project: Mutonga/Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 10.10m

Hole EL: 553.35m  
Northing: 9,953,360.55  
Easting: 382,563.81

Hole No: M95.7  
(1/1)

Date	Depth(m)	EL (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W Level	Lugeon (m)	Lu	Depth(m)			
	1			Sandy silt	0	0						0-1.00m: Reddish sandy silt. 1.00-2.00m: Light gray-green, clayey silt with some gravels.				1			
	2	551.3			0	0												2	
	3			Mafic gneiss	100	0						2.00-4.50m Slime (sand, mafic gneiss).				3			
	4	548.8			100	0												4	
	5			Granite	80	0	4.5	D	5	d	D	4.50-10.10m Highly to slightly weathered, pink brown coarse grained. 4.50-6.80m, highly to moderately weathered. Below 6.80m, slightly weathered. Joints: 0-90°, rough, orange green stained. 5.00-6.00m & 6.50-6.80m; no core recovery (slime).				5			
	6				30	0	6											6	
	7				35	0	6.5	C	4	c	CL							7	
	8				100	9	6.8											8	
	9				100	12	7.5	B	5	b	CL							9	
	10	543.2			100	0	7.65	B	3	b	CH							10	
							8.3	B	5	b	CL								
							8.7	B	4	b	CM								
							9	B	5	b	CL								
							9.3	B	3	b	CH								
						9.55	B	4	b	CM									
						10.10	B	5	b	CL									
	11											Date commenced: 18/8/95 Date completed: 18/8/95				11			
	12																12		
	13																13		
	14																14		
	15																15		
	16																16		
	17																17		
	18																18		
	19																19		
	20																20		
	21															21			
	22															22			
	23															23			
	24															24			
	25															25			
	26															26			
	27															27			
	28															28			
	29															29			
	30															30			



**DRILLING LOG**  
Hole inclination: Vertical  
Azimuth:

Project: Mutonga/Grand Falls Hydropower Project  
Site: Mutonga  
Total Length: 30.00m

Hole E.L.: 609.31m  
Northing: 9,951,746.57  
Easting: 382,100.05

Hole No: MQ95-1  
(1/1)

Date	Depth(m)	EL. (m)	Log	Rock type	Core (%)	RQD (%)	Depth(m)	Hardness	Core shape	Weathering	Rock class	Description	G.W. Level	Lugeon (m)	Lu	Depth(m)		
	1			Sandy silt	100	0						0-2.50m Reddish brown sandy silt, with some quartz and gneiss gravels, cobbles and boulders.				1		
	2				100	0											2	
	3	2.5	607.0			100	0						2.50-5.10m Slime (sand, with quartz gravels & cobbles of granite)				3	
	4					100	0										4	
	5	5.1	604.4	Granitic gneiss	100	0	5.10	C	5	c	D	5.10-8.40m Slightly, partly moderately weathered, faintly foliated at 70°, light grey with pink patches Occasional mafic gneiss inclusions Joints, 20-40° & 80°, rough, orange stained				5		
	6				100	36	5.85	A	2	b	CH						6	
	7				100	62	6.85	A	2	b	CH						7	
	8				100	98	7.35	A	3	b	CH						8	
	9	8.4	601.1	Mafic gneiss	100	100	8.95	A	1	b	CH	8.40-16.50m Slightly weathered, faintly foliated at 60°, dark grey, medium to coarse grained mafic biotite rich. With occasional pink discordant granitic zones few cm to 65cm.				9		
	10				100	93	9.65	A	3	b	CH						10	
	11				100	93											11	
	12				100	93	11.7	A	1	b	CH	9.70-10.15m, granite. 12.30-12.90m, granite.						12
	13				100	96	12.45	A	3	b	CH	Joints, 20-40°, 60°, rough, limonite coated						13
	14				100	93	13.6	A	1	b	CH							14
	15				100	95	14.1	A	3	b	CH							15
	16				100	92	15.4	A	1	b	CH							16
	17	16.5	593.0			100	93	16.6	A	2	b	CH	16.50-17.85m: Slightly weathered, gray with pink patches, medium and coarse grained biotite. With occasional aplite veins					17
	18	17.85	591.6		Granitic gneiss	100	93						17.85-19.10m: Slightly weathered, whitish, coarse grained granitic. Bottom 60cm, pegmatite					18
	19	19.1	590.4	100		100							19.10-20.50m: Slightly weathered, foliated at 60°, dark grey, mainly biotite. Joints; horizontal, brown stained.				19	
	20			Mafic gneiss	100	100											20	
	21	20.5	589.0	Granitic gneiss	100	100	20.7	A	1	b	CH	20.50-27.50m Slightly weathered, white with pink tinge, coarse grained With very faint foliation at 60°. With occasional dark grey patches.					21	
	22				100	100	21.2	A	3	b	CH							22
	23				100	100							25.50-27.50m, more granitized					23
	24				100	100												24
	25				100	100												25
	26	25.5	584.0			100	100	26.5	A	1	b	CH	27.50-28.35m: Slightly weathered, light grey, uniform, unfoliated medium grained Joints; 10°, planar/rough, limonite coated					26
	27				100	100	26.8	A	3	b	CH							27
	28	27.5	582.0		Dolomite	100	33	27.3	A	1	b	CH	28.35-30.00m: Slightly weathered, foliated and laminated, pink, coarse grained Joints; 10°, rough, limonite coated.					28
	29	28.35	581.1	100		55	28.9	A	3	b	CH							29
	30	30.00	579.5	Mafic gneiss	100	76	29.75	A	1	b	CH	Date commenced: 14/8/95 Date completed: 17/8/95					30	
					100	76	30.00	A	3	b	CH							30

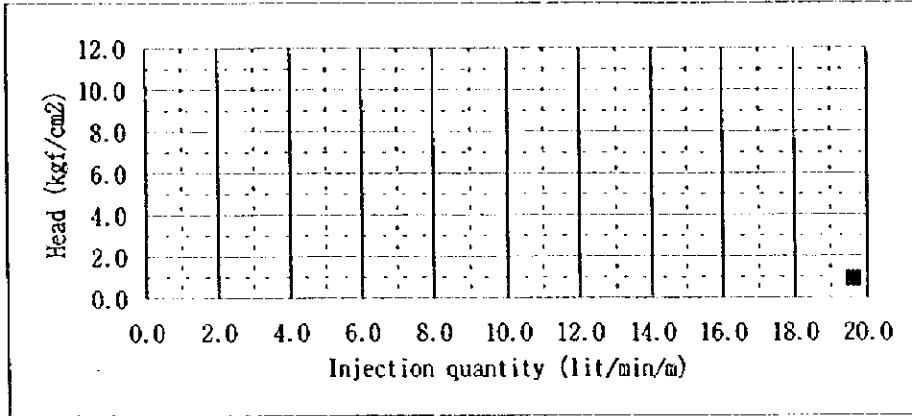
***C1.2 Lugeon Test Results of Mutonga  
Dam Site***

WATER PRESSURE TEST RECORD

Hole No. M95-1 1/8  
 Test section (m) 3.80 - 8.80

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
0.80	98.1	19.6	5.00	1.00	90.00	3.15	0.9	218.9

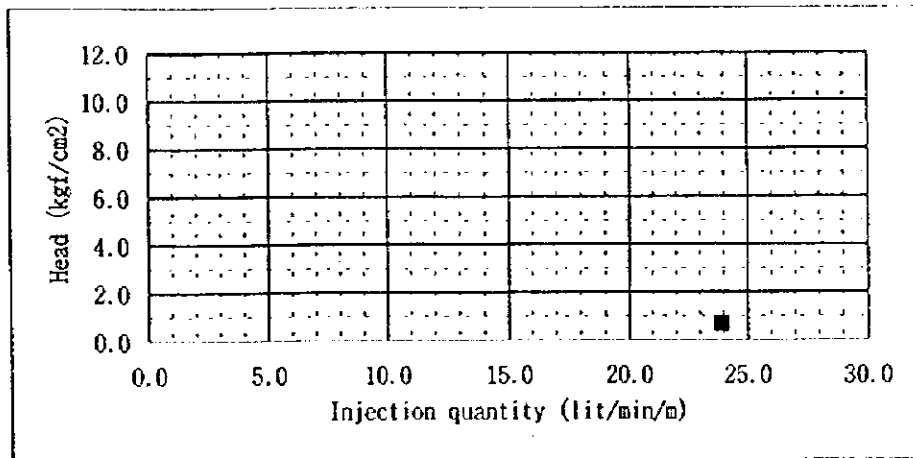
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-1 2/8  
 Test section (m) 8.80 - 13.20

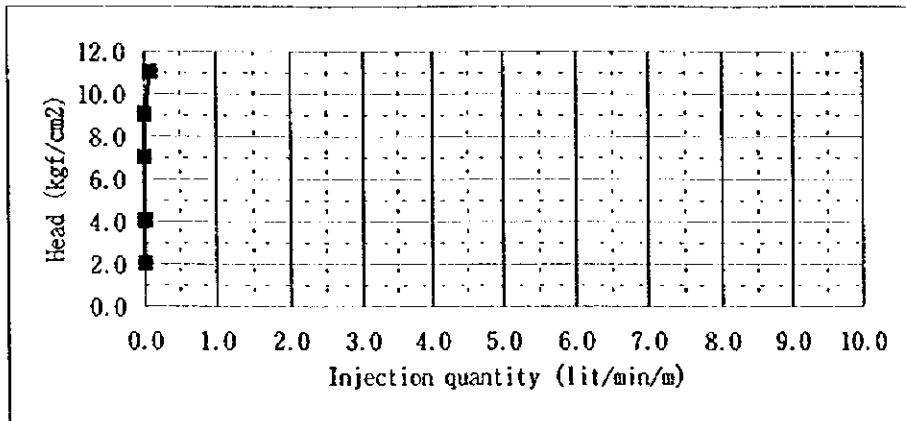
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
0.20	105.3	23.9	4.40	0.50	90.00	11.20	0.7	363.4



WATER PRESSURE TEST RECORD

Hole No. M95-1 3/8  
 Test section (m) 13.20 - 18.20

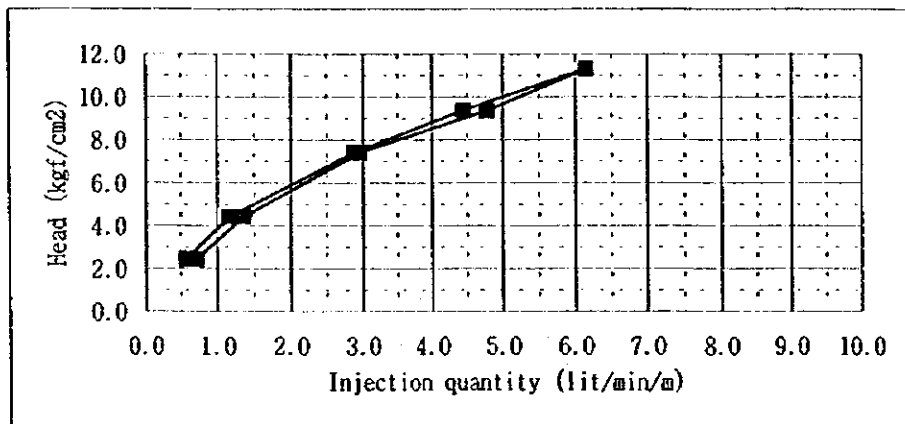
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	0.60	90.00	9.80	2.0	0.0
3.00	0.0	0.0	5.00	0.60	90.00	9.80	4.0	0.0
6.00	0.0	0.0	5.00	0.60	90.00	9.80	7.0	0.0
8.00	0.0	0.0	5.00	0.60	90.00	9.80	9.0	0.0
10.00	0.4	0.1	5.00	0.60	90.00	9.80	11.0	0.1



WATER PRESSURE TEST RECORD

Hole No. M95-1 4/8  
 Test section (m) 18.20 - 22.90

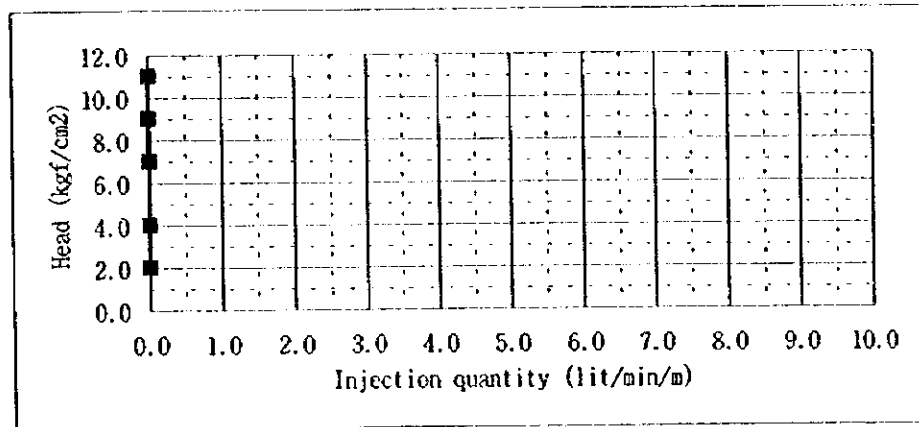
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	3.4	0.7	4.70	1.60	90.00	12.60	2.4	3.0
3.00	6.4	1.4	4.70	1.60	90.00	12.60	4.4	3.1
6.00	13.9	3.0	4.70	1.60	90.00	12.60	7.4	4.0
8.00	22.5	4.8	4.70	1.60	90.00	12.60	9.4	5.1
10.00	28.9	6.1	4.70	1.60	90.00	12.60	11.3	5.4
8.00	20.9	4.4	4.70	1.60	90.00	12.60	9.4	4.8
6.00	13.5	2.9	4.70	1.60	90.00	12.60	7.4	3.9
3.00	5.5	1.2	4.70	1.60	90.00	12.60	4.4	2.7
1.00	2.7	0.6	4.70	1.60	90.00	12.60	2.4	2.4



WATER PRESSURE TEST RECORD

Hole No. M95-1 5/8  
 Test section (m) 22.90 - 28.90

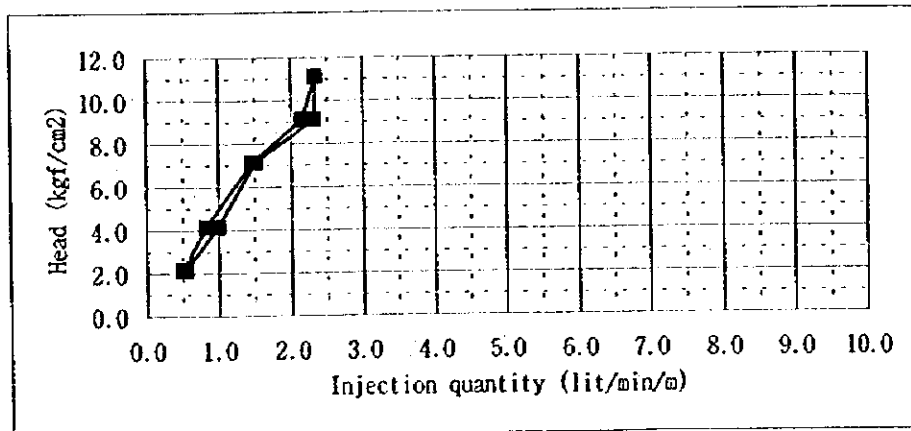
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	6.00	1.50	90.00	8.90	2.0	0.0
3.00	0.0	0.0	6.00	1.50	90.00	8.90	4.0	0.0
6.00	0.0	0.0	6.00	1.50	90.00	8.90	7.0	0.0
8.00	0.0	0.0	6.00	1.50	90.00	8.90	9.0	0.0
10.00	0.0	0.0	6.00	1.50	90.00	8.90	11.0	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-1 6/8  
 Test section (m) 28.90 - 34.25

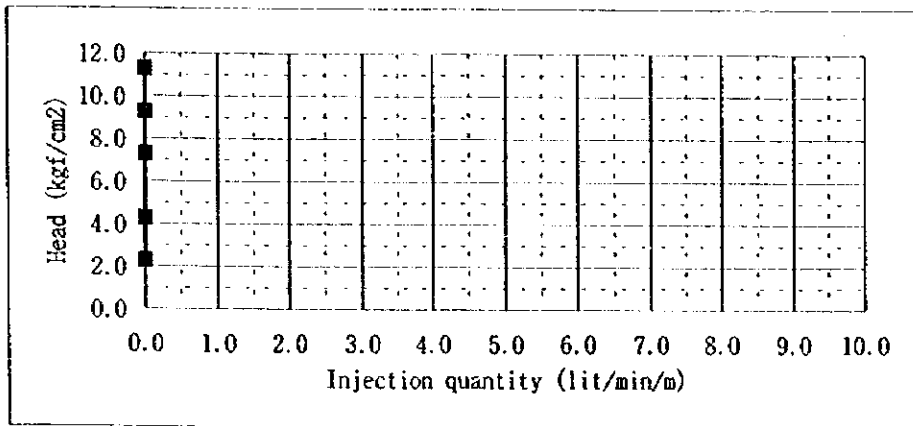
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	2.9	0.5	5.35	1.40	90.00	10.10	2.1	2.5
3.00	5.3	1.0	5.35	1.40	90.00	10.10	4.1	2.4
6.00	8.1	1.5	5.35	1.40	90.00	10.10	7.1	2.1
8.00	12.4	2.3	5.35	1.40	90.00	10.10	9.1	2.5
10.00	12.5	2.3	5.35	1.40	90.00	10.10	11.1	2.1
8.00	11.5	2.1	5.35	1.40	90.00	10.10	9.1	2.4
6.00	7.9	1.5	5.35	1.40	90.00	10.10	7.1	2.1
3.00	4.4	0.8	5.35	1.40	90.00	10.10	4.1	2.0
1.00	2.7	0.5	5.35	1.40	90.00	10.10	2.1	2.3



WATER PRESSURE TEST RECORD

Hole No. M95-1 . 7/8  
 Test section (m) 34.25 - 40.30

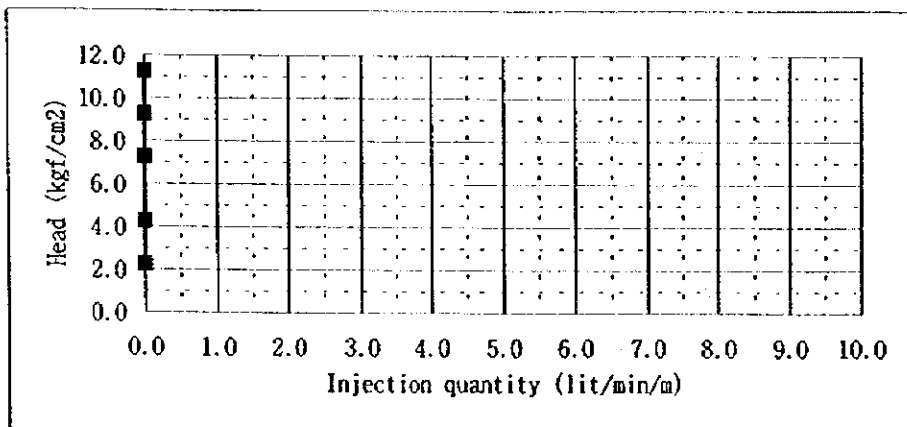
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	6.05	0.55	90.00	12.25	2.3	0.0
3.00	0.0	0.0	6.05	0.55	90.00	12.25	4.3	0.0
6.00	0.0	0.0	6.05	0.55	90.00	12.25	7.3	0.0
8.00	0.0	0.0	6.05	0.55	90.00	12.25	9.3	0.0
10.00	0.0	0.0	6.05	0.55	90.00	12.25	11.3	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-1 8/8  
 Test section (m) 40.30 - 45.00

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	4.70	0.50	90.00	12.00	2.3	0.0
3.00	0.0	0.0	4.70	0.50	90.00	12.00	4.3	0.0
6.00	0.0	0.0	4.70	0.50	90.00	12.00	7.3	0.0
8.00	0.0	0.0	4.70	0.50	90.00	12.00	9.3	0.0
10.00	0.0	0.0	4.70	0.50	90.00	12.00	11.3	0.0

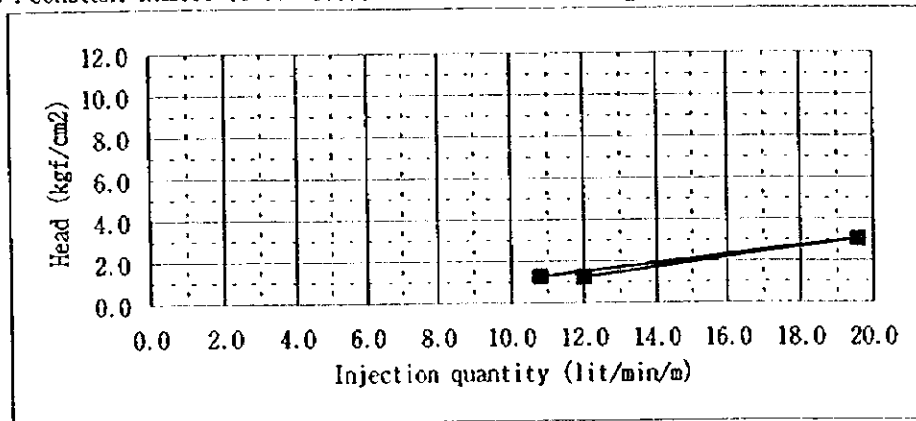


WATER PRESSURE TEST RECORD

Hole No. M95-2 1/5  
Test section (m) 4.00 - 9.00

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	51.0	10.8	0.10	5.00	0.80	90.00	2.70	1.3
3.00	97.9	19.6	0.32	5.00	0.80	90.00	2.70	3.0
1.00	60.0	12.0	0.12	5.00	0.80	90.00	2.70	1.2

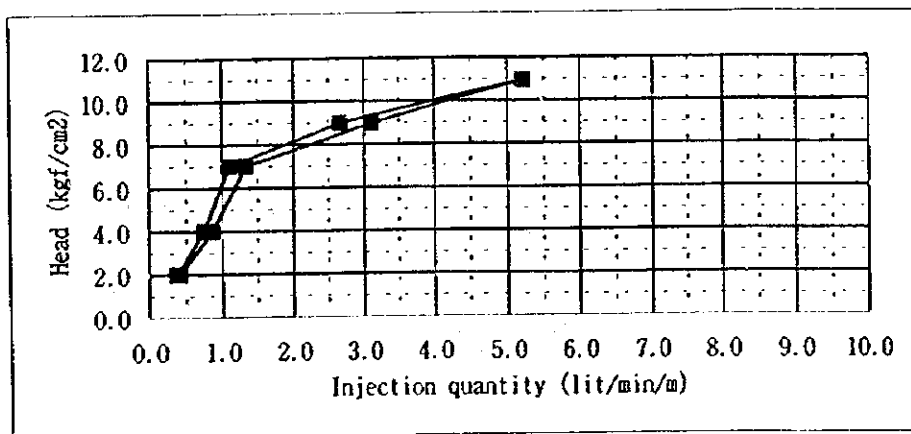
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-2 2/5  
Test section (m) 10.30 - 15.40

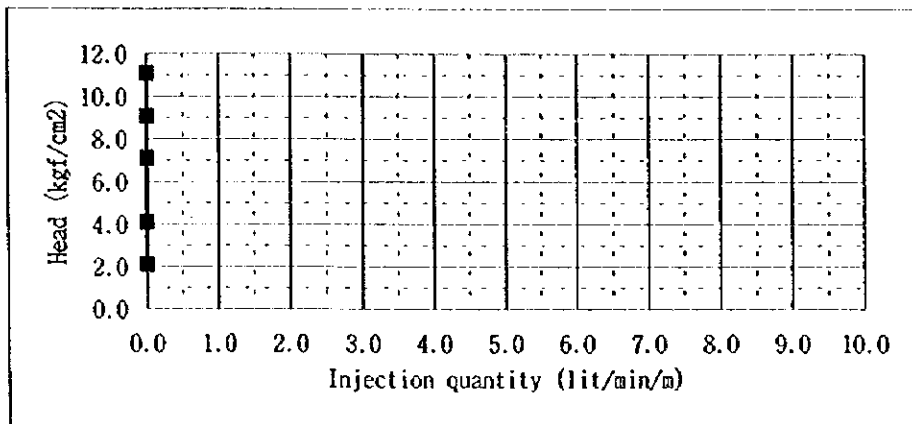
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	2.1	0.4	0.00	5.10	1.00	90.00	9.00	2.1
3.00	4.4	0.9	0.00	5.10	1.00	90.00	9.00	2.2
6.00	6.8	1.3	0.00	5.10	1.00	90.00	9.00	1.9
8.00	15.9	3.1	0.02	5.10	1.00	90.00	9.00	3.5
10.00	26.6	5.2	0.06	5.10	1.00	90.00	9.00	4.8
8.00	13.6	2.7	0.01	5.10	1.00	90.00	9.00	3.0
6.00	5.6	1.1	0.00	5.10	1.00	90.00	9.00	1.6
3.00	3.8	0.7	0.00	5.10	1.00	90.00	9.00	1.9
1.00	1.9	0.4	0.00	5.10	1.00	90.00	9.00	1.9



WATER PRESSURE TEST RECORD

Hole No. M95-2 3/5  
 Test section (m) 15.40 - 20.45

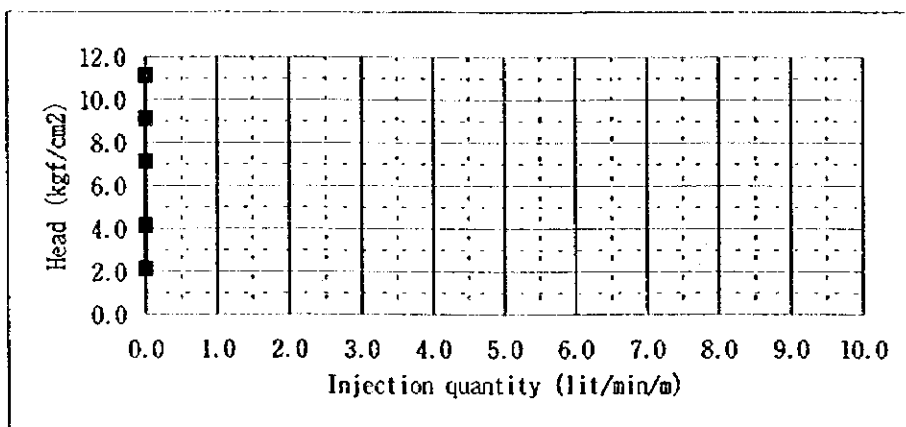
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.05	1.40	90.00	9.55	2.1	0.0
3.00	0.0	0.0	5.05	1.40	90.00	9.55	4.1	0.0
6.00	0.0	0.0	5.05	1.40	90.00	9.55	7.1	0.0
8.00	0.0	0.0	5.05	1.40	90.00	9.55	9.1	0.0
10.00	0.0	0.0	5.05	1.40	90.00	9.55	11.1	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-2 4/5  
 Test section (m) 20.45 - 25.60

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.15	0.90	90.00	10.50	2.1	0.0
3.00	0.0	0.0	5.15	0.90	90.00	10.50	4.1	0.0
6.00	0.0	0.0	5.15	0.90	90.00	10.50	7.1	0.0
8.00	0.0	0.0	5.15	0.90	90.00	10.50	9.1	0.0
10.00	0.0	0.0	5.15	0.90	90.00	10.50	11.1	0.0

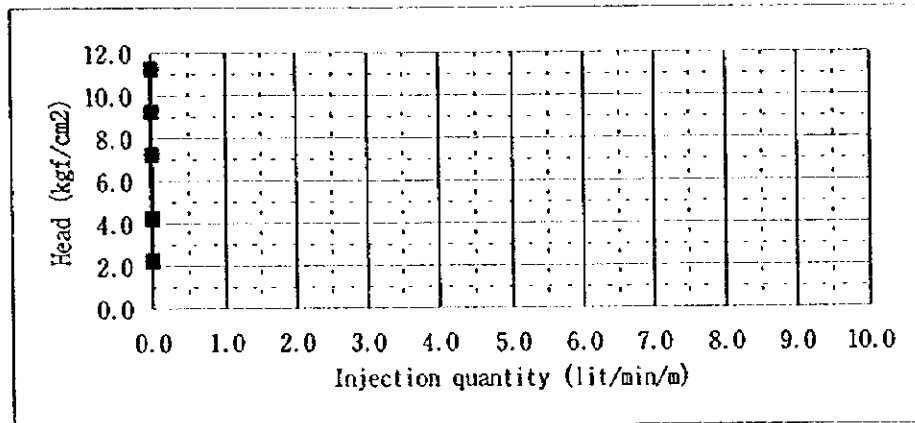




WATER PRESSURE TEST RECORD

Hole No. M95-2 5/5  
 Test section (m) 25.15 - 30.15

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect. L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	0.80	90.00	11.50	2.2	0.0
3.00	0.0	0.0	5.00	0.80	90.00	11.50	4.2	0.0
6.00	0.0	0.0	5.00	0.80	90.00	11.50	7.2	0.0
8.00	0.0	0.0	5.00	0.80	90.00	11.50	9.2	0.0
10.00	0.0	0.0	5.00	0.80	90.00	11.50	11.2	0.0

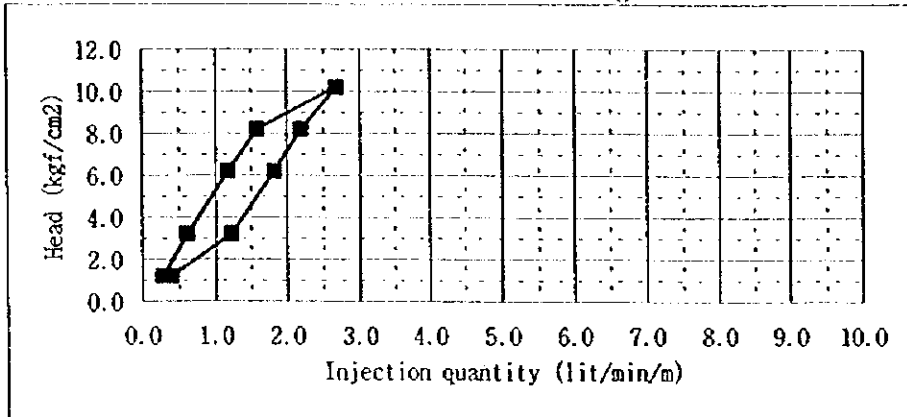


WATER PRESSURE TEST RECORD

Hole No. M95-3 1/9  
 Test section (m) 5.50 - 10.10

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	1.8	0.4	0.00	4.60	0.80	90.00	1.2	3.3
3.00	5.6	1.2	0.00	4.60	0.80	90.00	3.2	3.8
6.00	8.4	1.8	0.00	4.60	0.80	90.00	6.2	2.9
8.00	10.1	2.2	0.00	4.60	0.80	90.00	8.2	2.7
10.00	12.3	2.7	0.01	4.60	0.80	90.00	10.2	2.6
8.00	7.3	1.6	0.00	4.60	0.80	90.00	8.2	1.9
6.00	5.4	1.2	0.00	4.60	0.80	90.00	6.2	1.9
3.00	2.8	0.6	0.00	4.60	0.80	90.00	3.2	1.9
1.00	1.3	0.3	0.00	4.60	0.80	90.00	1.2	2.4

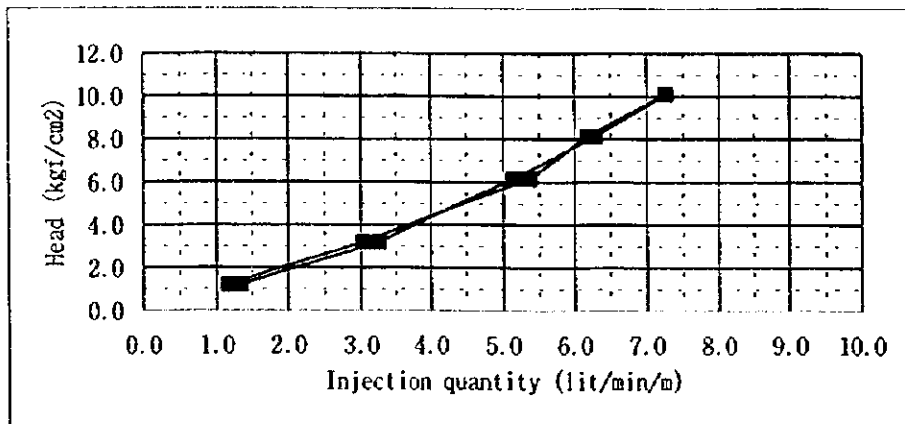
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-3 2/9  
 Test section (m) 10.10 - 15.00

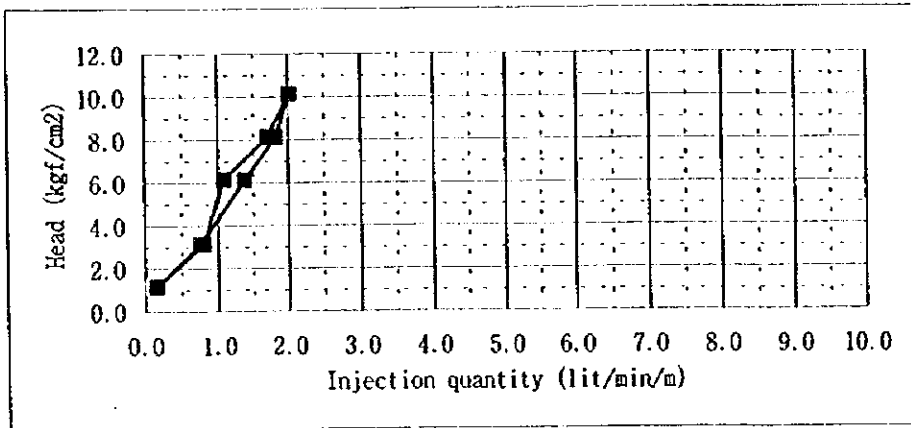
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	6.6	1.3	0.00	4.90	0.70	90.00	1.2	11.3
3.00	16.0	3.3	0.02	4.90	0.70	90.00	3.2	10.3
6.00	25.2	5.1	0.05	4.90	0.70	90.00	6.2	8.4
8.00	30.8	6.3	0.07	4.90	0.70	90.00	8.1	7.7
10.00	35.6	7.3	0.09	4.90	0.70	90.00	10.1	7.2
8.00	30.3	6.2	0.07	4.90	0.70	90.00	8.1	7.6
6.00	26.3	5.4	0.05	4.90	0.70	90.00	6.1	8.7
3.00	14.9	3.0	0.02	4.90	0.70	90.00	3.2	9.6
1.00	5.7	1.2	0.00	4.90	0.70	90.00	1.2	9.7



WATER PRESSURE TEST RECORD

Hole No. M95-3 3/9  
Test section (m) 15.00 - 20.00

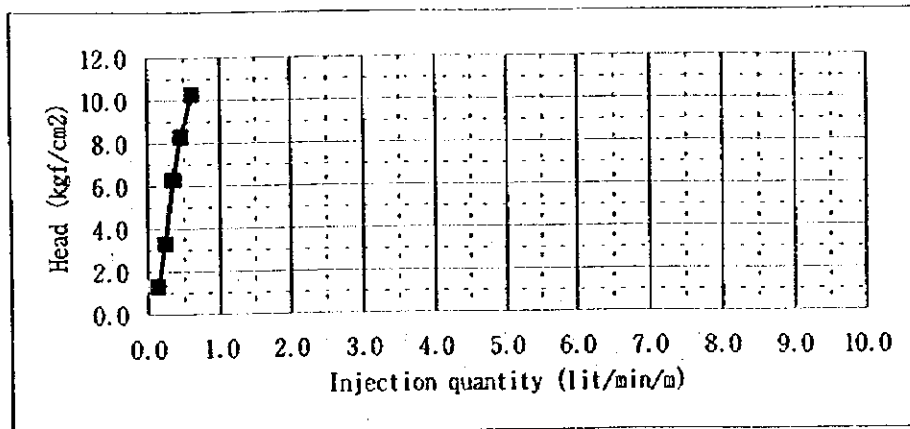
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min)	Injection quantity (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.8	0.2	0.00	5.00	0.40	90.00	1.00	1.1	1.4
3.00	3.8	0.8	0.00	5.00	0.40	90.00	1.00	3.1	2.4
6.00	6.9	1.4	0.01	5.00	0.40	90.00	1.00	6.1	2.2
8.00	9.1	1.8	0.01	5.00	0.40	90.00	1.00	8.1	2.2
10.00	10.1	2.0	0.01	5.00	0.40	90.00	1.00	10.1	2.0
8.00	8.5	1.7	0.01	5.00	0.40	90.00	1.00	8.1	2.1
6.00	5.4	1.1	0.00	5.00	0.40	90.00	1.00	6.1	1.8
3.00	4.0	0.8	0.00	5.00	0.40	90.00	1.00	3.1	2.5
1.00	0.8	0.2	0.00	5.00	0.40	90.00	1.00	1.1	1.4



WATER PRESSURE TEST RECORD

Hole No. M95-3 4/9  
Test section (m) 20.00 - 25.00

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min)	Injection quantity (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.7	0.1	0.00	5.00	1.40	90.00	1.50	1.3	1.1
3.00	1.2	0.2	0.00	5.00	1.40	90.00	1.50	3.3	0.7
6.00	1.7	0.3	0.00	5.00	1.40	90.00	1.50	6.3	0.5
8.00	2.3	0.5	0.00	5.00	1.40	90.00	1.50	8.3	0.6
10.00	3.1	0.6	0.00	5.00	1.40	90.00	1.50	10.3	0.6
8.00	2.3	0.5	0.00	5.00	1.40	90.00	1.50	8.3	0.6
6.00	1.8	0.4	0.00	5.00	1.40	90.00	1.50	6.3	0.6
3.00	1.2	0.2	0.00	5.00	1.40	90.00	1.50	3.3	0.7
1.00	0.7	0.1	0.00	5.00	1.40	90.00	1.50	1.3	1.1

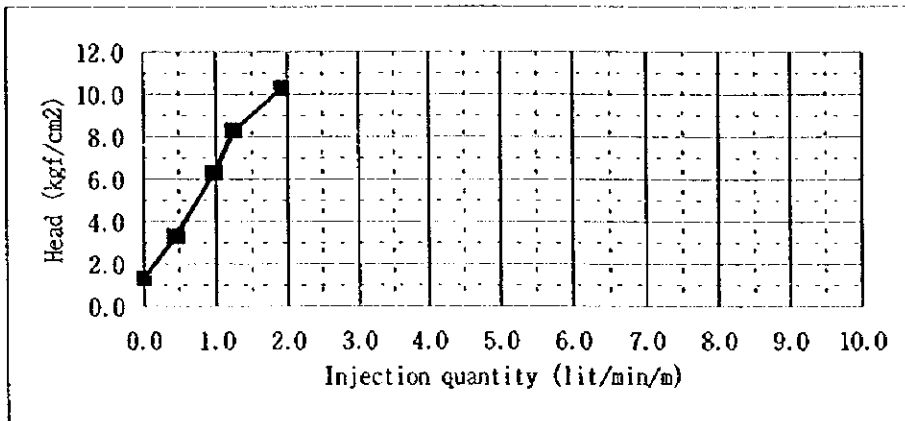


WATER PRESSURE TEST RECORD

Hole No. M95-3  
 Test section (m) 25.00 - 30.25

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Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.25	0.80	90.00	2.20	1.3	0.0
3.00	2.5	0.5	5.25	0.80	90.00	2.20	3.3	1.4
6.00	5.1	1.0	5.25	0.80	90.00	2.20	6.3	1.5
8.00	6.5	1.2	5.25	0.80	90.00	2.20	8.3	1.5
10.00	10.1	1.9	5.25	0.80	90.00	2.20	10.3	1.9
8.00	6.6	1.3	5.25	0.80	90.00	2.20	8.3	1.5
6.00	5.2	1.0	5.25	0.80	90.00	2.20	6.3	1.6
3.00	2.3	0.4	5.25	0.80	90.00	2.20	3.3	1.3
1.00	0.0	0.0	5.25	0.80	90.00	2.20	1.3	0.0

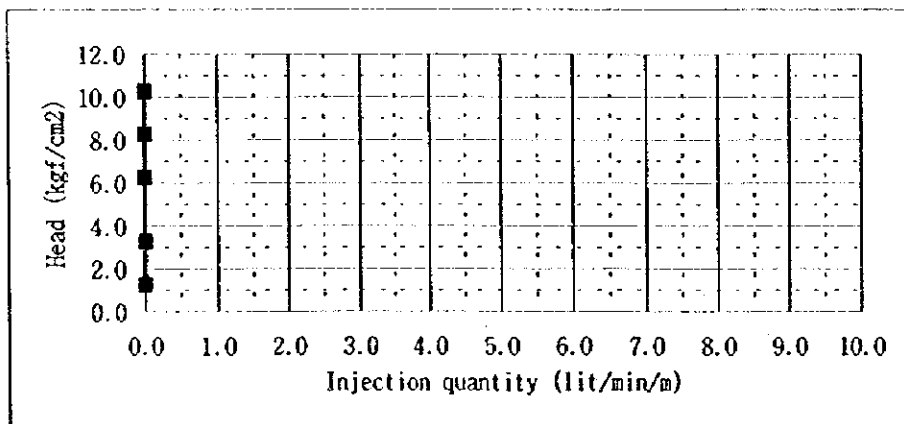


WATER PRESSURE TEST RECORD

Hole No. M95-3  
 Test section (m) 30.25 - 35.25

6/9

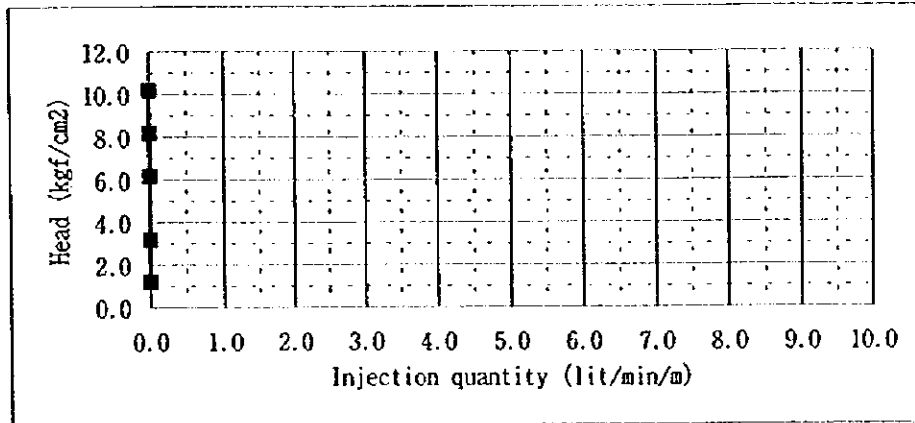
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	1.55	90.00	1.05	1.3	0.0
3.00	0.0	0.0	5.00	1.55	90.00	1.05	3.3	0.0
6.00	0.0	0.0	5.00	1.55	90.00	1.05	6.3	0.0
8.00	0.0	0.0	5.00	1.55	90.00	1.05	8.3	0.0
10.00	0.0	0.0	5.00	1.55	90.00	1.05	10.3	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-3 7/9  
 Test section (m) 35.25 - 40.25

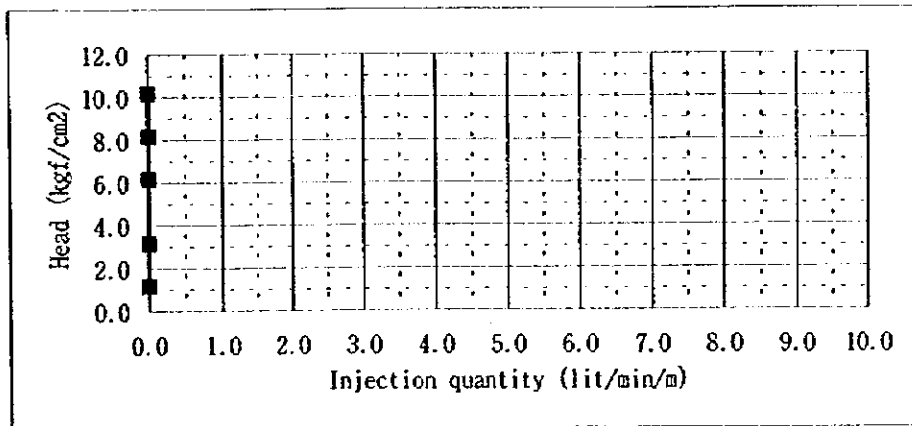
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	1.05	90.00	0.80	1.2	0.0
3.00	0.0	0.0	5.00	1.05	90.00	0.80	3.2	0.0
6.00	0.0	0.0	5.00	1.05	90.00	0.80	6.2	0.0
8.00	0.0	0.0	5.00	1.05	90.00	0.80	8.2	0.0
10.00	0.0	0.0	5.00	1.05	90.00	0.80	10.2	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-3 8/9  
 Test section (m) 40.25 - 45.20

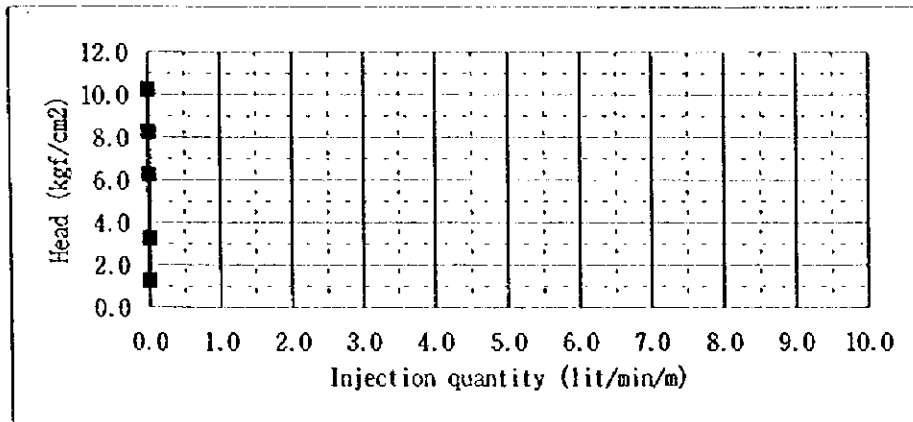
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	4.95	0.55	90.00	1.05	1.2	0.0
3.00	0.0	0.0	4.95	0.55	90.00	1.05	3.2	0.0
6.00	0.0	0.0	4.95	0.55	90.00	1.05	6.2	0.0
8.00	0.0	0.0	4.95	0.55	90.00	1.05	8.2	0.0
10.00	0.0	0.0	4.95	0.55	90.00	1.05	10.2	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-3 9/9  
 Test section (m) 45.20 - 50.30

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.10	1.60	90.00	0.80	1.2	0.0
3.00	0.0	0.0	5.10	1.60	90.00	0.80	3.2	0.0
6.00	0.0	0.0	5.10	1.60	90.00	0.80	6.2	0.0
8.00	0.0	0.0	5.10	1.60	90.00	0.80	8.2	0.0
10.00	0.0	0.0	5.10	1.60	90.00	0.80	10.2	0.0

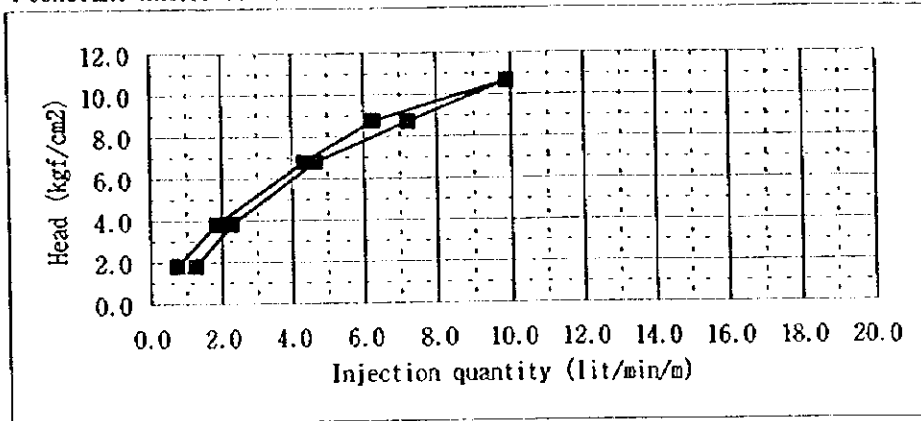


WATER PRESSURE TEST RECORD

Hole No. M95-4 1/5  
Test section (m) 7.70 - 12.70

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	3.7	0.7	5.00	1.60	90.00	6.45	1.8	4.1
3.00	9.2	1.8	5.00	1.60	90.00	6.45	3.8	4.8
6.00	21.7	4.3	5.00	1.60	90.00	6.45	6.8	6.4
8.00	31.3	6.3	5.00	1.60	90.00	6.45	8.7	7.2
10.00	49.4	9.9	5.00	1.60	90.00	6.45	10.6	9.3
8.00	36.1	7.2	5.00	1.60	90.00	6.45	8.7	8.3
6.00	23.3	4.7	5.00	1.60	90.00	6.45	6.8	6.9
3.00	11.4	2.3	5.00	1.60	90.00	6.45	3.8	6.0
1.00	6.3	1.3	5.00	1.60	90.00	6.45	1.8	7.0

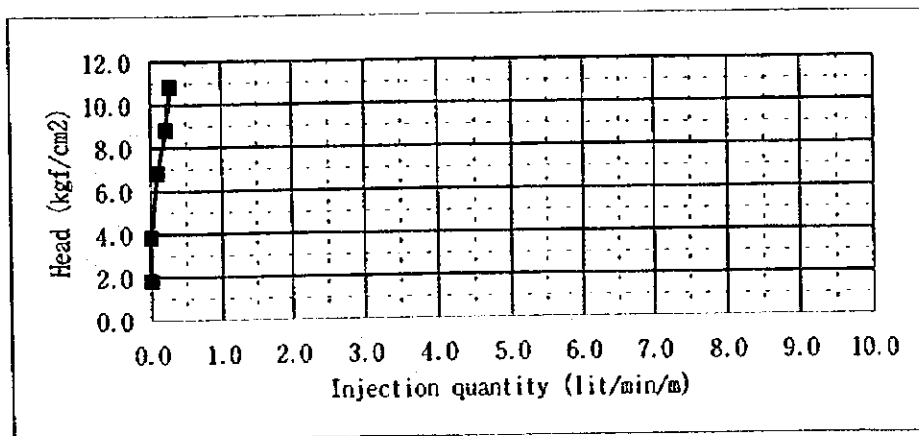
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-4 2/5  
Test section (m) 12.70 - 17.70

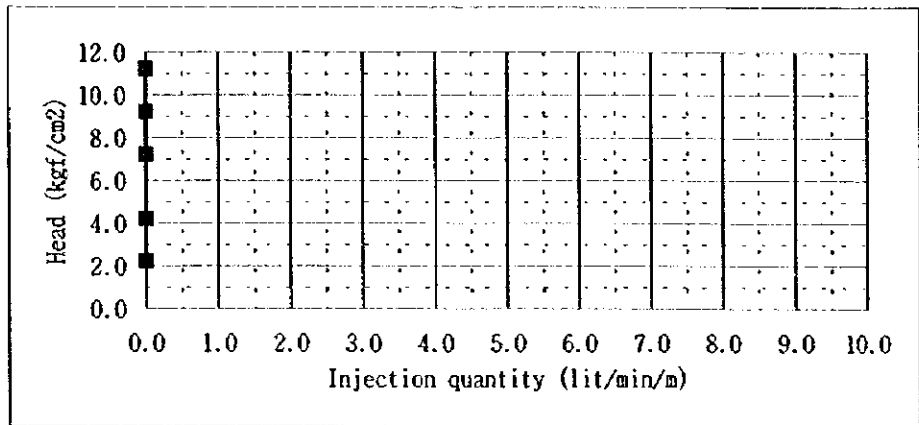
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	1.30	90.00	6.80	1.8	0.0
3.00	0.0	0.0	5.00	1.30	90.00	6.80	3.8	0.0
6.00	0.5	0.1	5.00	1.30	90.00	6.80	6.8	0.1
8.00	1.1	0.2	5.00	1.30	90.00	6.80	8.8	0.2
10.00	1.4	0.3	5.00	1.30	90.00	6.80	10.8	0.3
8.00	1.1	0.2	5.00	1.30	90.00	6.80	8.8	0.2
6.00	0.5	0.1	5.00	1.30	90.00	6.80	6.8	0.1
3.00	0.0	0.0	5.00	1.30	90.00	6.80	3.8	0.0
1.00	0.0	0.0	5.00	1.30	90.00	6.80	1.8	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-4 3/5  
 Test section (m) 17.70 - 22.70

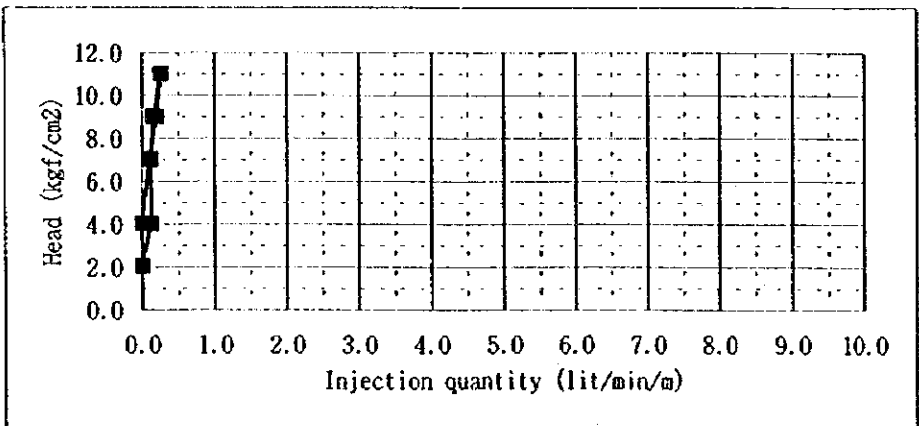
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	0.70	90.00	11.45	2.2	0.0
3.00	0.0	0.0	5.00	0.70	90.00	11.45	4.2	0.0
6.00	0.0	0.0	5.00	0.70	90.00	11.45	7.2	0.0
8.00	0.0	0.0	5.00	0.70	90.00	11.45	9.2	0.0
10.00	0.0	0.0	5.00	0.70	90.00	11.45	11.2	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-4 4/5  
 Test section (m) 22.70 - 27.70

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	1.60	90.00	8.60	2.0	0.0
3.00	0.6	0.1	5.00	1.60	90.00	8.60	4.0	0.3
6.00	0.6	0.1	5.00	1.60	90.00	8.60	7.0	0.2
8.00	0.8	0.2	5.00	1.60	90.00	8.60	9.0	0.2
10.00	1.3	0.3	5.00	1.60	90.00	8.60	11.0	0.2
8.00	1.0	0.2	5.00	1.60	90.00	8.60	9.0	0.2
6.00	0.5	0.1	5.00	1.60	90.00	8.60	7.0	0.1
3.00	0.0	0.0	5.00	1.60	90.00	8.60	4.0	0.0
1.00	0.0	0.0	5.00	1.60	90.00	8.60	2.0	0.0

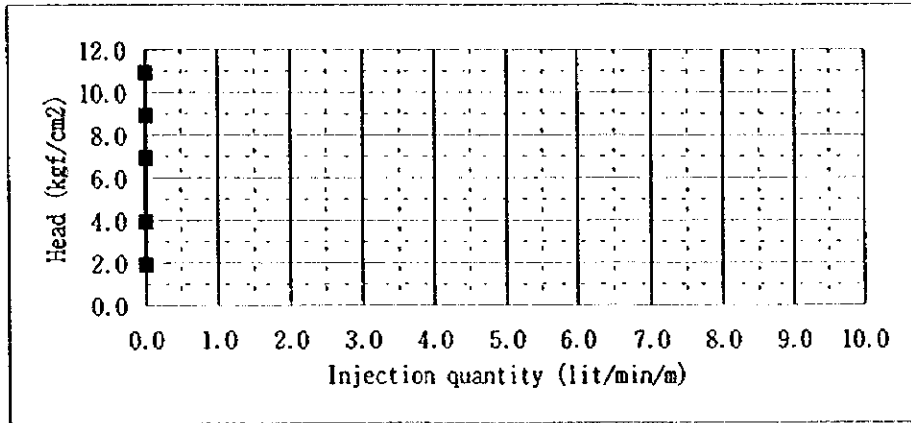




WATER PRESSURE TEST RECORD

Hole No. M95-4 5/5  
 Test section (m) 25.00 - 30.00

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	0.80	90.00	8.50	1.9	0.0
3.00	0.0	0.0	5.00	0.80	90.00	8.50	3.9	0.0
6.00	0.0	0.0	5.00	0.80	90.00	8.50	6.9	0.0
8.00	0.0	0.0	5.00	0.80	90.00	8.50	8.9	0.0
10.00	0.0	0.0	5.00	0.80	90.00	8.50	10.9	0.0

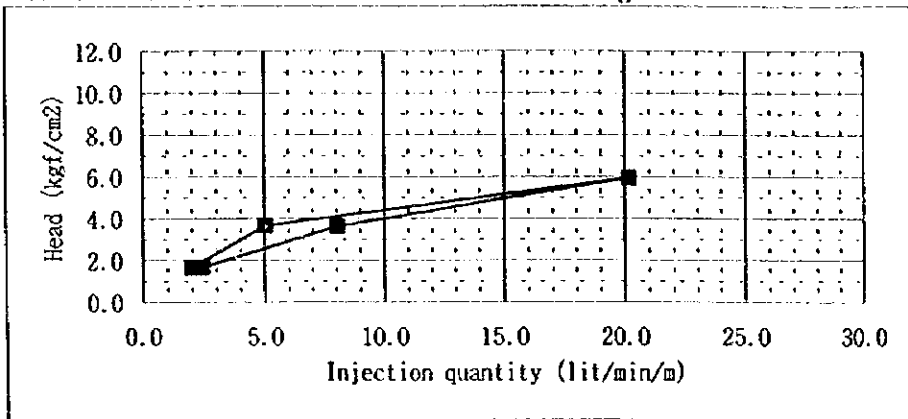


WATER PRESSURE TEST RECORD

Hole No. M95-5  
Test section (m) 3.00 - 7.20

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w.level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	10.1	2.4	4.20	1.60	90.00	5.00	1.7	14.5
3.00	33.8	8.0	4.20	1.60	90.00	5.00	3.6	22.2
5.50	84.7	20.2	4.20	1.60	90.00	5.00	5.9	34.0
3.00	21.1	5.0	4.20	1.60	90.00	5.00	3.6	13.8
1.00	8.4	2.0	4.20	1.60	90.00	5.00	1.7	12.1

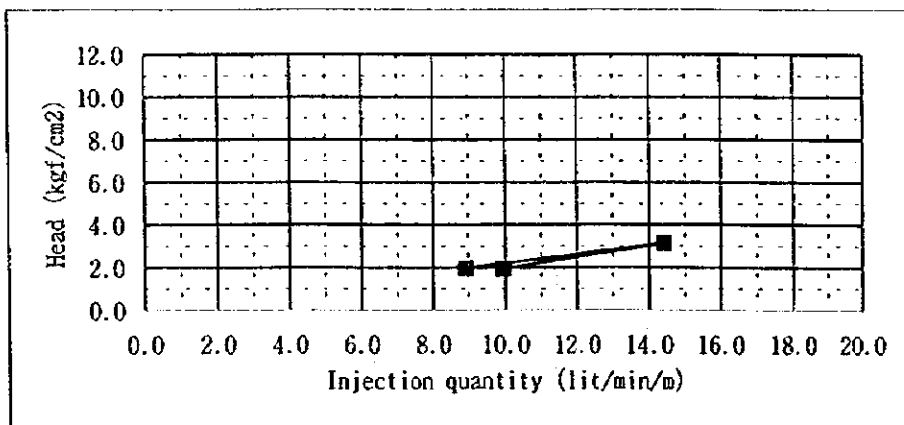
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-5  
Test section (m) 10.10 - 15.10

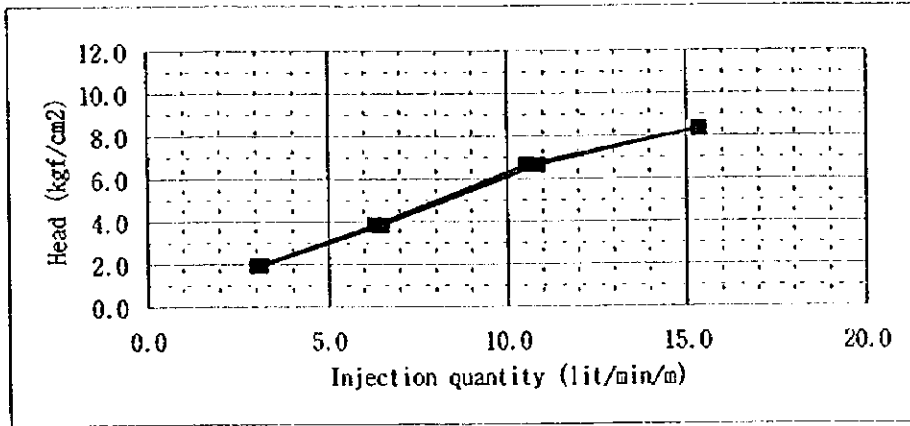
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w.level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	49.8	10.0	5.00	0.70	90.00	10.50	1.9	51.5
2.40	72.1	14.4	5.00	0.70	90.00	10.50	3.1	46.0
1.00	44.6	8.9	5.00	0.70	90.00	10.50	2.0	45.2



WATER PRESSURE TEST RECORD

Hole No. M95-5 3/9  
 Test section (m) 15.10 - 20.05

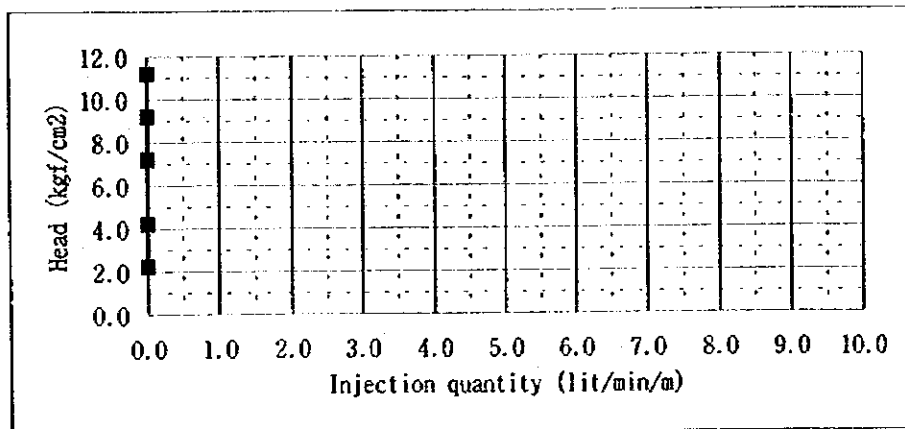
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	15.5	3.1	4.95	0.20	90.00	9.30	1.9	16.3
3.00	32.2	6.5	4.95	0.20	90.00	9.30	3.8	16.9
6.00	53.8	10.9	4.95	0.20	90.00	9.30	6.6	16.4
8.00	76.0	15.4	4.95	0.20	90.00	9.30	8.3	18.4
6.00	52.2	10.5	4.95	0.20	90.00	9.30	6.7	15.8
3.00	31.3	6.3	4.95	0.20	90.00	9.30	3.8	16.4
1.00	15.0	3.0	4.95	0.20	90.00	9.30	1.9	15.7



WATER PRESSURE TEST RECORD

Hole No. M95-5 4/9  
 Test section (m) 20.05 - 25.30

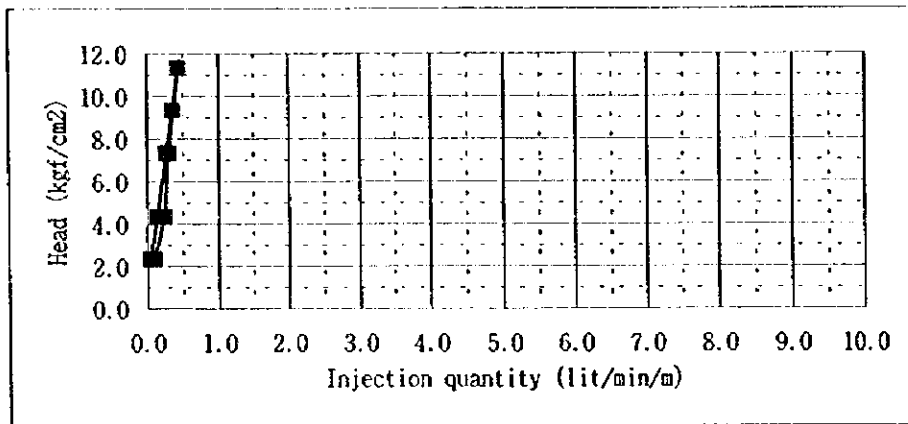
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.25	1.40	90.00	10.70	2.2	0.0
3.00	0.0	0.0	5.25	1.40	90.00	10.70	4.2	0.0
6.00	0.0	0.0	5.25	1.40	90.00	10.70	7.2	0.0
8.00	0.0	0.0	5.25	1.40	90.00	10.70	9.2	0.0
10.00	0.0	0.0	5.25	1.40	90.00	10.70	11.2	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-5 5/9  
 Test section (m) 25.30 - 30.30

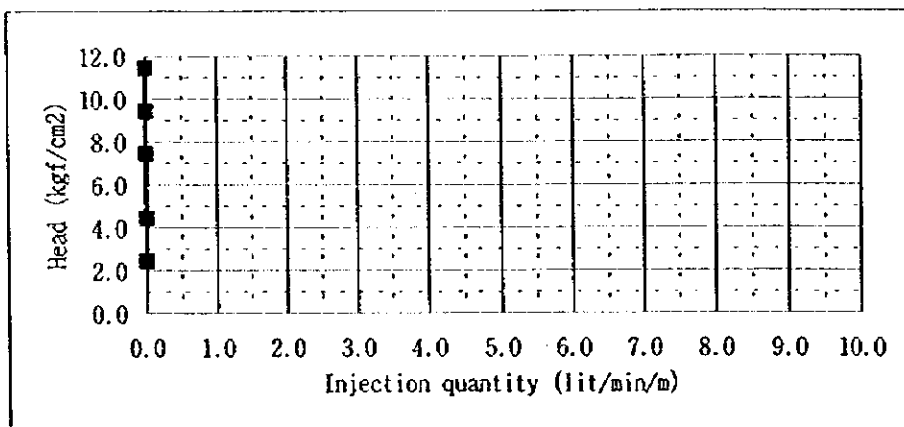
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.5	0.1	5.00	0.50	90.00	12.80	2.3	0.4
3.00	1.2	0.2	5.00	0.50	90.00	12.80	4.3	0.6
6.00	1.5	0.3	5.00	0.50	90.00	12.80	7.3	0.4
8.00	1.8	0.4	5.00	0.50	90.00	12.80	9.3	0.4
10.00	2.2	0.4	5.00	0.50	90.00	12.80	11.3	0.4
8.00	1.8	0.4	5.00	0.50	90.00	12.80	9.3	0.4
6.00	1.3	0.3	5.00	0.50	90.00	12.80	7.3	0.4
3.00	0.7	0.1	5.00	0.50	90.00	12.80	4.3	0.3
1.00	0.2	0.0	5.00	0.50	90.00	12.80	2.3	0.2



WATER PRESSURE TEST RECORD

Hole No. M95-5 6/9  
 Test section (m) 30.30 - 35.65

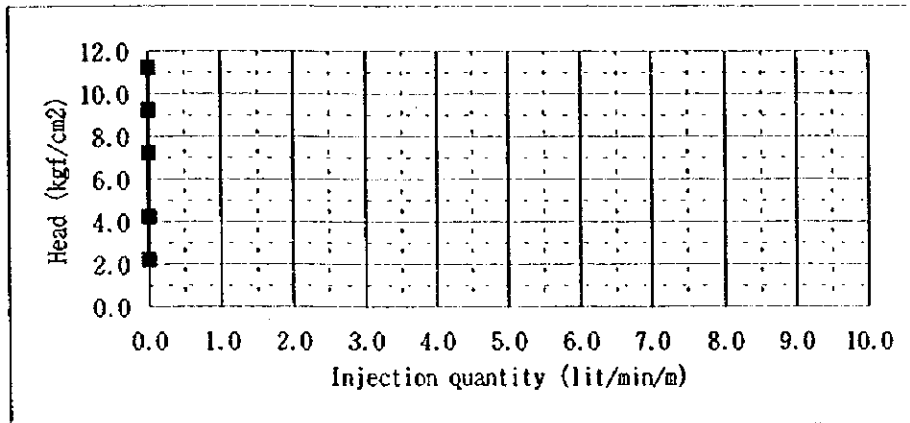
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.35	1.50	90.00	12.80	2.4	0.0
3.00	0.0	0.0	5.35	1.50	90.00	12.80	4.4	0.0
6.00	0.0	0.0	5.35	1.50	90.00	12.80	7.4	0.0
8.00	0.0	0.0	5.35	1.50	90.00	12.80	9.4	0.0
10.00	0.0	0.0	5.35	1.50	90.00	12.80	11.4	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-5 7/9  
 Test section (m) 35.65 - 40.65

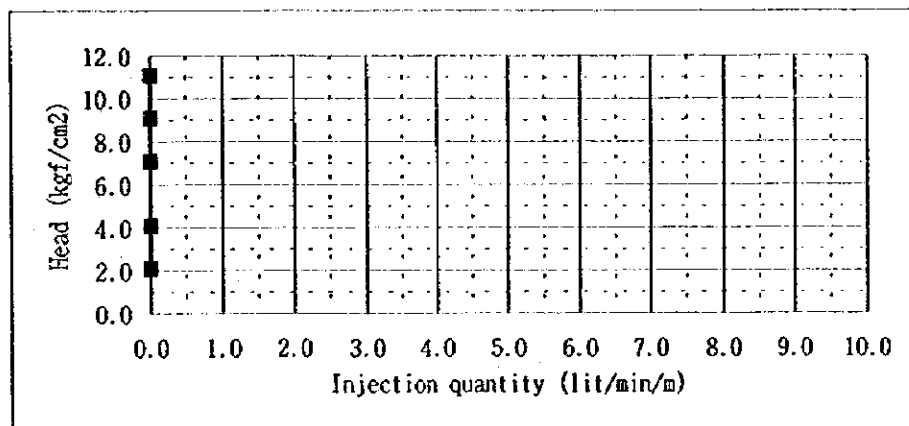
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.00	0.70	90.00	11.50	2.2	0.0
3.00	0.0	0.0	5.00	0.70	90.00	11.50	4.2	0.0
6.00	0.0	0.0	5.00	0.70	90.00	11.50	7.2	0.0
8.00	0.0	0.0	5.00	0.70	90.00	11.50	9.2	0.0
10.00	0.0	0.0	5.00	0.70	90.00	11.50	11.2	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-5 8/9  
 Test section (m) 40.65 - 45.55

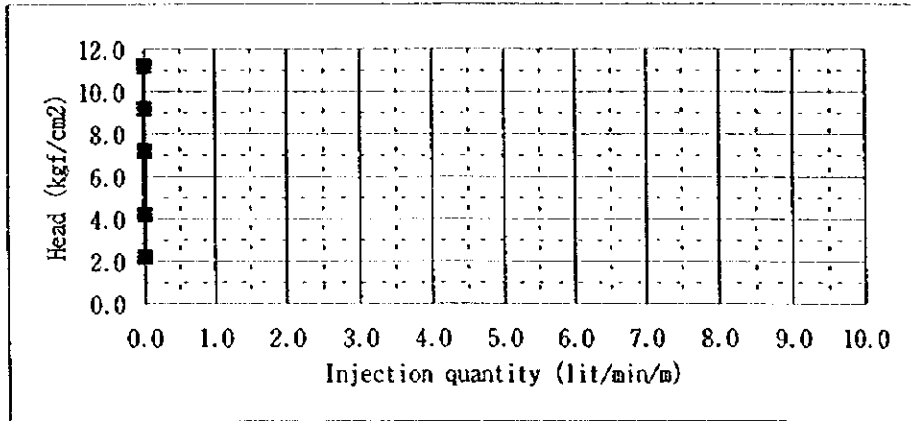
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	4.90	0.30	90.00	10.50	2.1	0.0
3.00	0.0	0.0	4.90	0.30	90.00	10.50	4.1	0.0
6.00	0.0	0.0	4.90	0.30	90.00	10.50	7.1	0.0
8.00	0.0	0.0	4.90	0.30	90.00	10.50	9.1	0.0
10.00	0.0	0.0	4.90	0.30	90.00	10.50	11.1	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-5 9/9  
 Test section (m) 45.55 - 50.20

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	4.65	1.40	90.00	10.50	2.2	0.0
3.00	0.0	0.0	4.65	1.40	90.00	10.50	4.2	0.0
6.00	0.0	0.0	4.65	1.40	90.00	10.50	7.2	0.0
8.00	0.0	0.0	4.65	1.40	90.00	10.50	9.2	0.0
10.00	0.0	0.0	4.65	1.40	90.00	10.50	11.2	0.0

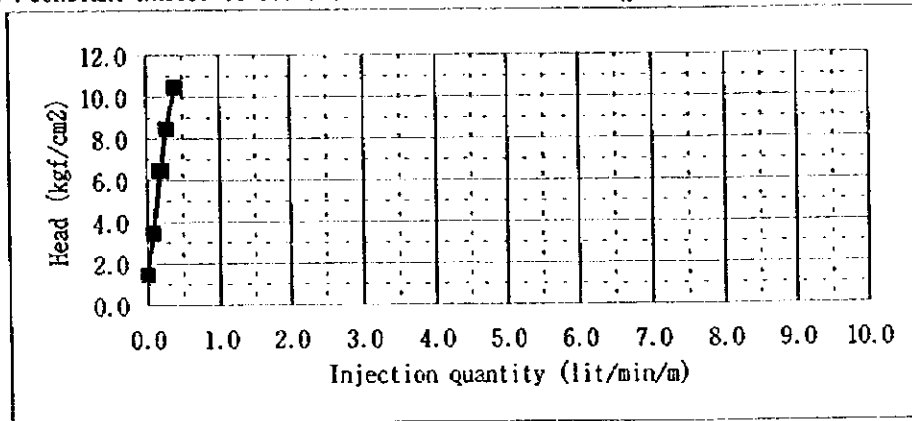


WATER PRESSURE TEST RECORD

Hole No. M95-6 1/4  
Test section (m) 4.00 - 9.80

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	0.0	0.0	5.80	0.80	90.00	3.80	1.5	0.0
3.00	0.5	0.1	5.80	0.80	90.00	3.80	3.5	0.2
6.00	1.2	0.2	5.80	0.80	90.00	3.80	6.5	0.3
8.00	1.6	0.3	5.80	0.80	90.00	3.80	8.5	0.3
10.00	2.3	0.4	5.80	0.80	90.00	3.80	10.5	0.4
8.00	1.6	0.3	5.80	0.80	90.00	3.80	8.5	0.3
6.00	1.0	0.2	5.80	0.80	90.00	3.80	6.5	0.3
3.00	0.5	0.1	5.80	0.80	90.00	3.80	3.5	0.2
1.00	0.0	0.0	5.80	0.80	90.00	3.80	1.5	0.0

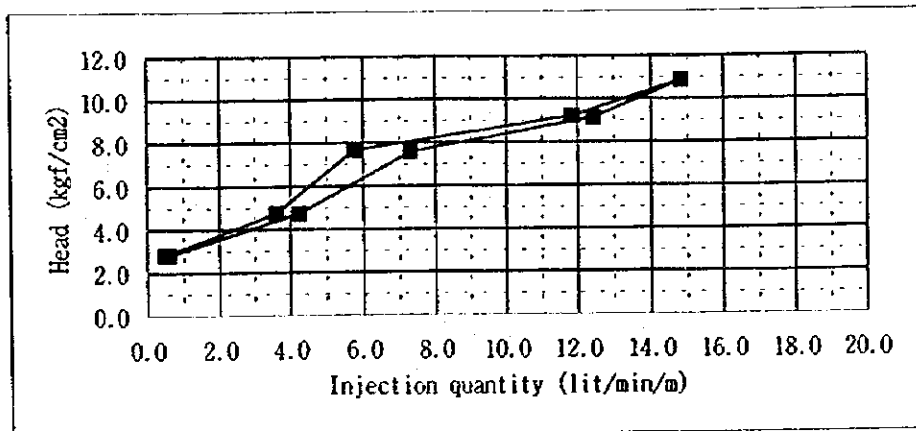
6.90E-05 : Constant number of rod friction loss for BW boring rod



WATER PRESSURE TEST RECORD

Hole No. M95-6 2/4  
Test section (m) 13.50 - 20.00

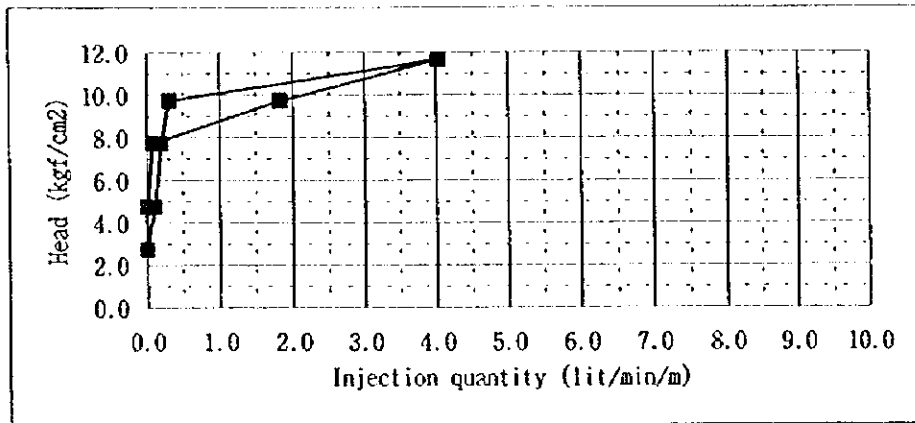
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w. level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit
1.00	3.9	0.6	6.50	1.30	90.00	16.75	2.8	2.1
3.00	27.7	4.3	6.50	1.30	90.00	16.75	4.7	9.0
6.00	47.5	7.3	6.50	1.30	90.00	16.75	7.6	9.6
8.00	80.8	12.4	6.50	1.30	90.00	16.75	9.1	13.6
10.00	96.4	14.8	6.50	1.30	90.00	16.75	10.9	13.7
8.00	77.0	11.8	6.50	1.30	90.00	16.75	9.2	12.9
6.00	37.5	5.8	6.50	1.30	90.00	16.75	7.7	7.5
3.00	23.5	3.6	6.50	1.30	90.00	16.75	4.7	7.6
1.00	3.2	0.5	6.50	1.30	90.00	16.75	2.8	1.8



WATER PRESSURE TEST RECORD

Hole No. M95-6 3/4  
 Test section (m) 20.00 - 25.45

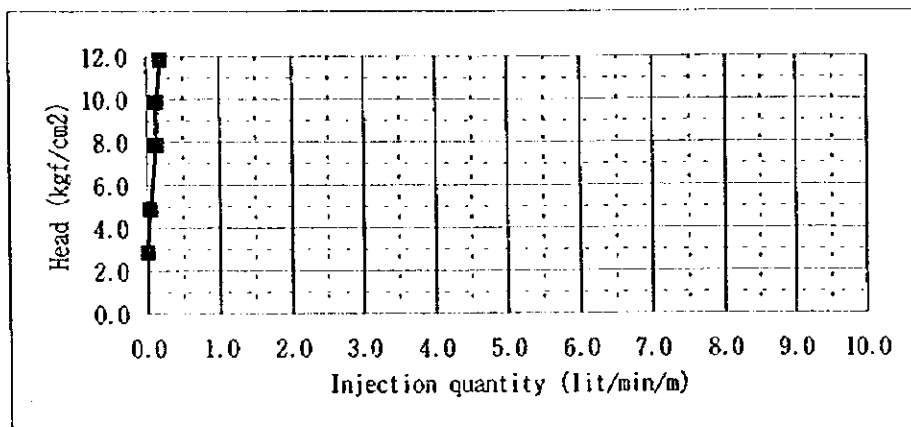
Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w.level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit	
1.00	0.0	0.0	0.00	5.45	1.30	90.00	16.00	2.7	0.0
3.00	0.6	0.1	0.00	5.45	1.30	90.00	16.00	4.7	0.2
6.00	1.1	0.2	0.00	5.45	1.30	90.00	16.00	7.7	0.3
8.00	1.7	0.3	0.00	5.45	1.30	90.00	16.00	9.7	0.3
10.00	22.0	4.0	0.07	5.45	1.30	90.00	16.00	11.7	3.5
8.00	10.0	1.8	0.01	5.45	1.30	90.00	16.00	9.7	1.9
6.00	0.5	0.1	0.00	5.45	1.30	90.00	16.00	7.7	0.1
3.00	0.0	0.0	0.00	5.45	1.30	90.00	16.00	4.7	0.0
1.00	0.0	0.0	0.00	5.45	1.30	90.00	16.00	2.7	0.0



WATER PRESSURE TEST RECORD

Hole No. M95-6 4/4  
 Test section (m) 25.45 - 30.00

Gauge pressure (kgf/cm <sup>2</sup> )	Injection quantity (lit/min) (l/min/m)	Friction head loss (kgf/cm <sup>2</sup> )	Test sect.L (m)	Gauge height (m)	Hole angle (deg.)	Ground w.level (m)	Total head (kg/cm <sup>2</sup> )	Lugeon unit	
1.00	0.0	0.0	0.00	4.55	0.25	90.00	18.30	2.9	0.0
3.00	0.2	0.0	0.00	4.55	0.25	90.00	18.30	4.9	0.1
6.00	0.6	0.1	0.00	4.55	0.25	90.00	18.30	7.9	0.2
8.00	0.6	0.1	0.00	4.55	0.25	90.00	18.30	9.9	0.1
10.00	0.9	0.2	0.00	4.55	0.25	90.00	18.30	11.9	0.2





***C1.3 Bore Holes Water Level Record of  
Mutonga Dam Site***



**1 Record of water level in boreholes (Mutonga: 1/2)**  
(after the completion of drilling works)

Date	Left abutment				River bed	
	M95-1 (EL.554.60m)		M95-2 (EL.537.59m)		M95-3 (EL.512.98m)	
	Depth(m)	EL.(m)	Depth(m)	EL.(m)	Depth(m)	EL.(m)
Aug. 19					0.75	512.23
20					0.75	512.23
21					0.75	512.23
22					0.75	512.23
23	11.85	542.75	5.50	532.09	0.75	512.23
24	20.30	534.30	8.45	529.14	0.80	512.18
25	24.35	530.25	9.30	528.29	0.80	512.18
26	25.45	529.15	9.55	528.04	0.80	512.18
27	25.95	528.65	9.75	527.84	0.80	512.18
28					0.90	512.08
29					0.90	512.08
30					0.90	512.08

Date	Right abutment				Spillway	
	M95-4 (EL.535.84m)		M95-5 (EL.549.15m)		M95-6 (EL.553.49m)	
	Depth(m)	EL.(m)	Depth(m)	EL.(m)	Depth(m)	EL.(m)
Aug. 19	19.25	516.59	14.35	534.80		
20	19.35	516.49	14.60	534.55		
21	19.40	516.44	14.75	534.40		
22	19.50	516.34	14.90	534.25		
23	19.50	516.34	15.05	534.10	19.15	534.34
24	19.55	516.29	15.15	534.00	19.80	533.69
25	19.60	516.24	15.25	533.90	20.30	533.19
26	19.65	516.19	15.40	533.75	20.65	532.84
27	19.65	516.19	15.45	533.70	21.00	532.49
28	19.65	516.19	15.55	533.60		
29	19.65	516.19	15.60	533.55		
30	19.65	516.19	15.70	533.45		

**2 Record of water level in boreholes (Mutonga: 2/2)**  
 (Measured at morning before start drilling works)

M95-1 Hole mouth EL.(m) 554.60

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/21	13.20	11.00	543.60
1995/8/22	26.10	11.20	543.40
1995/8/23	40.50	12.25	542.35

M95-2 Hole mouth EL.(m) 537.59

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/22	12.40	7.00	530.59
1995/8/23	30.15	11.50	526.09

M95-3 Hole mouth EL.(m) 512.98

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/10	4.70	0.30	512.68
1995/8/11	10.10	1.20	511.78
1995/8/12	15.75	1.10	511.88
1995/8/13	28.15	1.75	511.23
1995/8/14	35.25	1.05	511.93
1995/8/15	46.40	0.90	512.08
1995/8/16	50.30	0.70	512.28

M95-4 Hole mouth EL.(m) 535.84

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/11	10.50	10.45	525.39
1995/8/12	25.50	8.45	527.39

M95-5 Hole mouth EL.(m) 549.15

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/12	12.35	4.70	544.45
1995/8/13	23.40	10.00	539.15
1995/8/14	35.65	12.80	536.35
1995/8/15	50.20	10.50	538.65

M95-6 Hole mouth EL.(m) 553.49

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/20	9.80	2.30	551.19
1995/8/21	25.45	16.00	537.49
1995/8/22	30.00	18.30	535.19

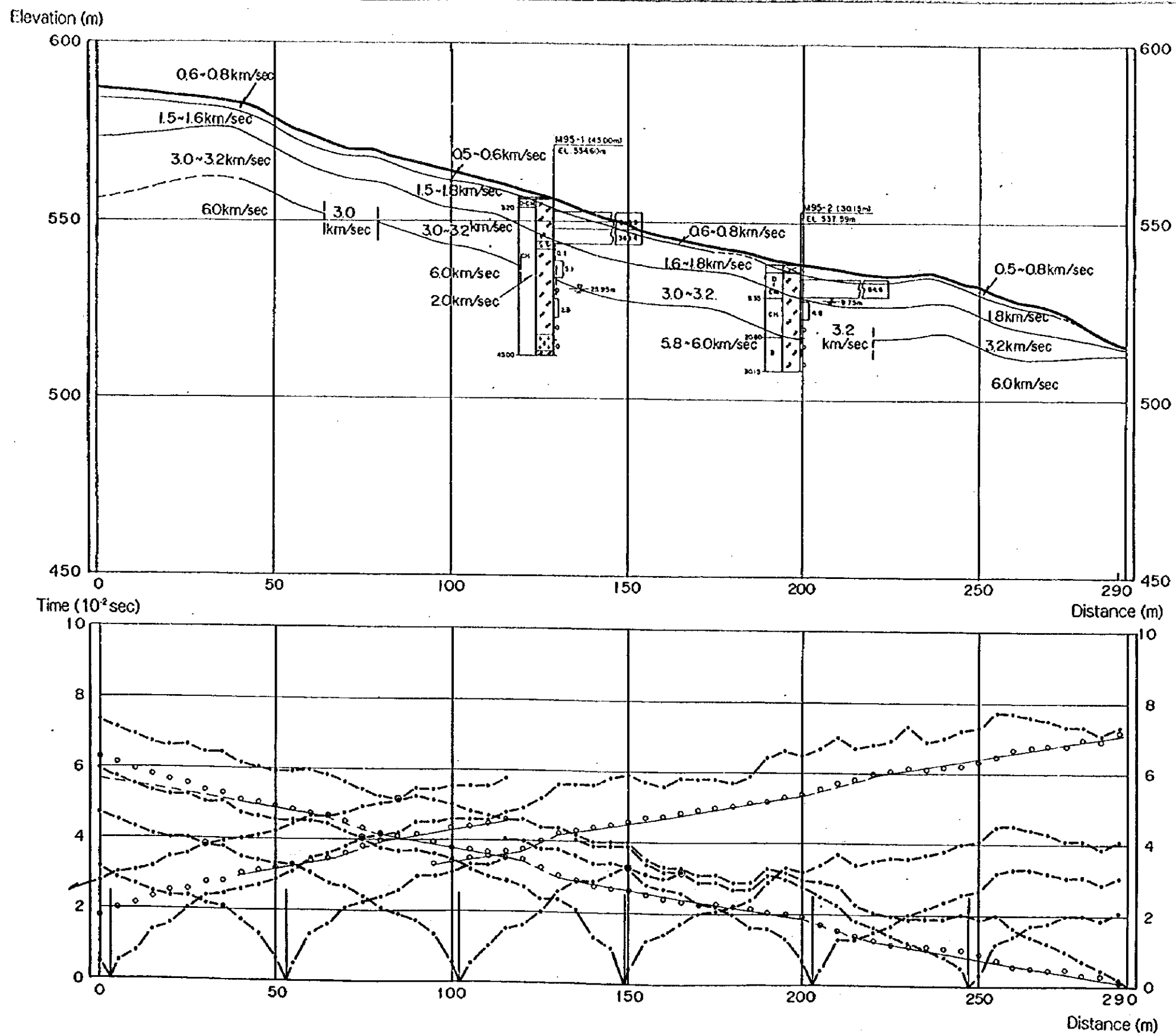
M95-7 Hole mouth EL.(m) 553.35

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/19	10.10	6.20	547.15

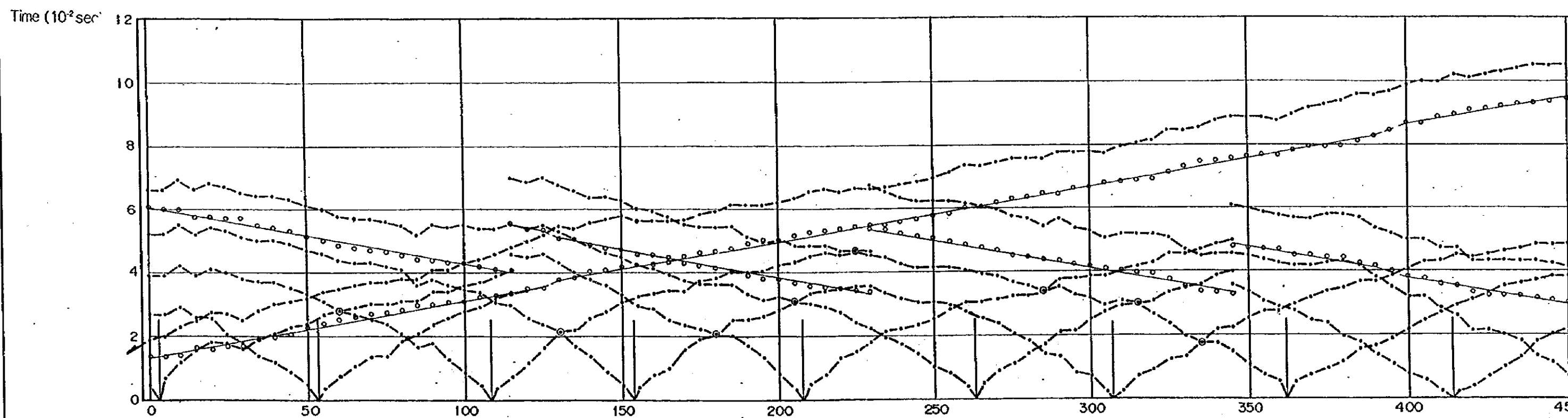
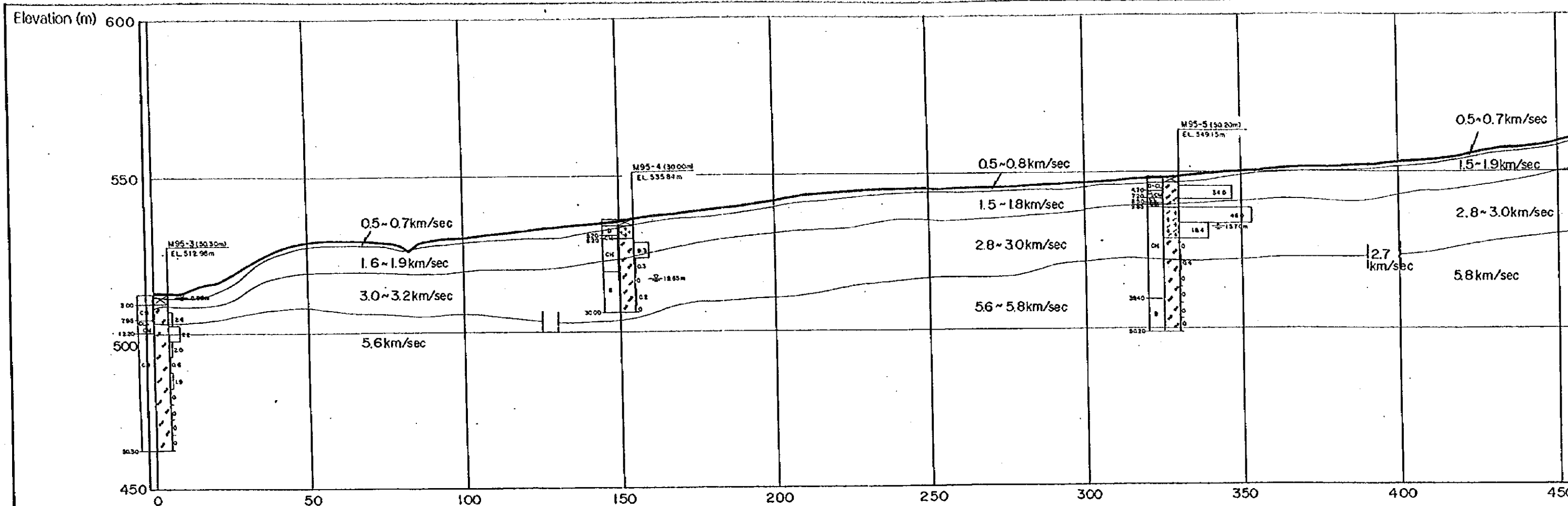
MQ95-1 Hole mouth EL.(m) 609.51

Date	Depth of hole (m)	Depth of water level(m)	EL. of water level(m)
1995/8/15	6.60	2.80	606.71
1995/8/16	13.50	4.80	604.71
1995/8/17	27.00	8.45	601.06

***C1.4 Seismic Prospecting Investigation of  
Mutonga Dam Site***

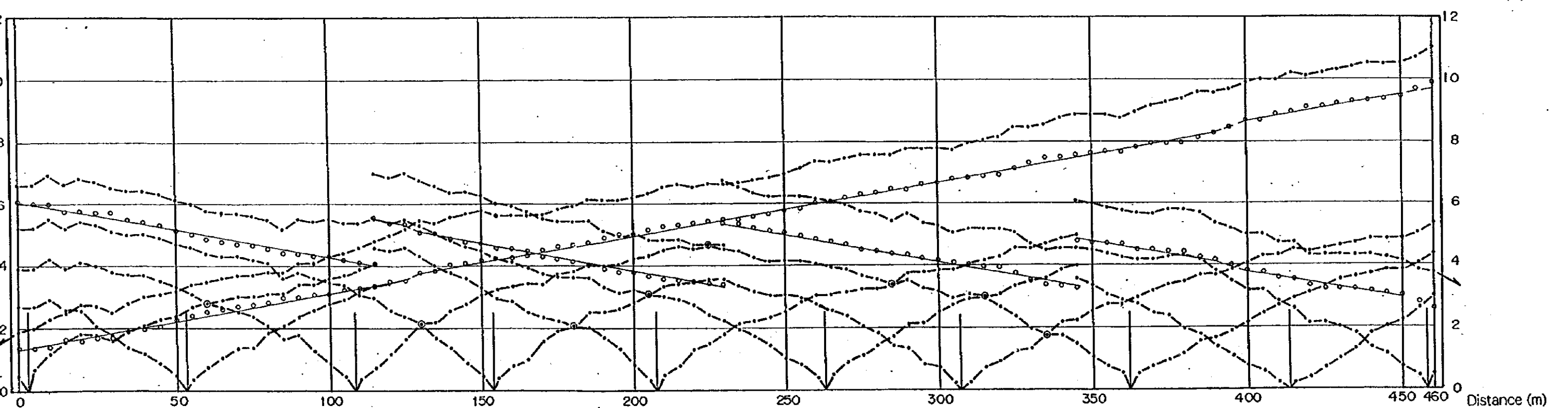
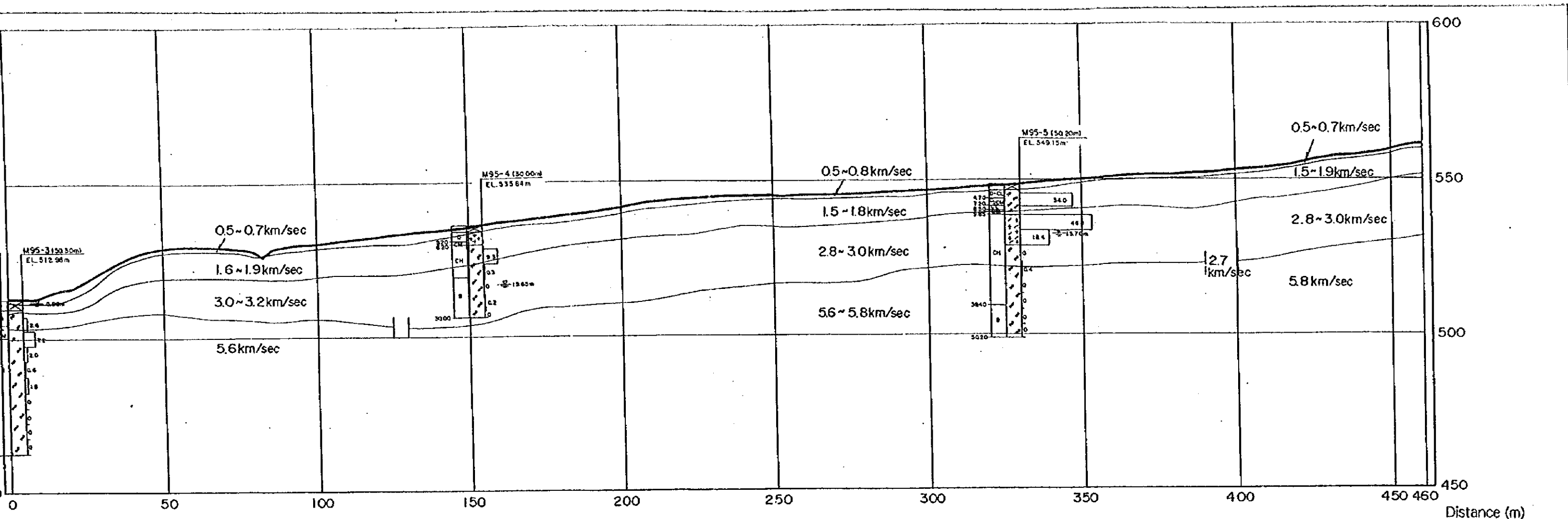


JAPAN INTERNATIONAL COOPERATION AGENCY	Seismic Prospecting Investigation and Geological Profile on M95-A	Fig. No. C1.1
REPUBLIC OF KENYA		
MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



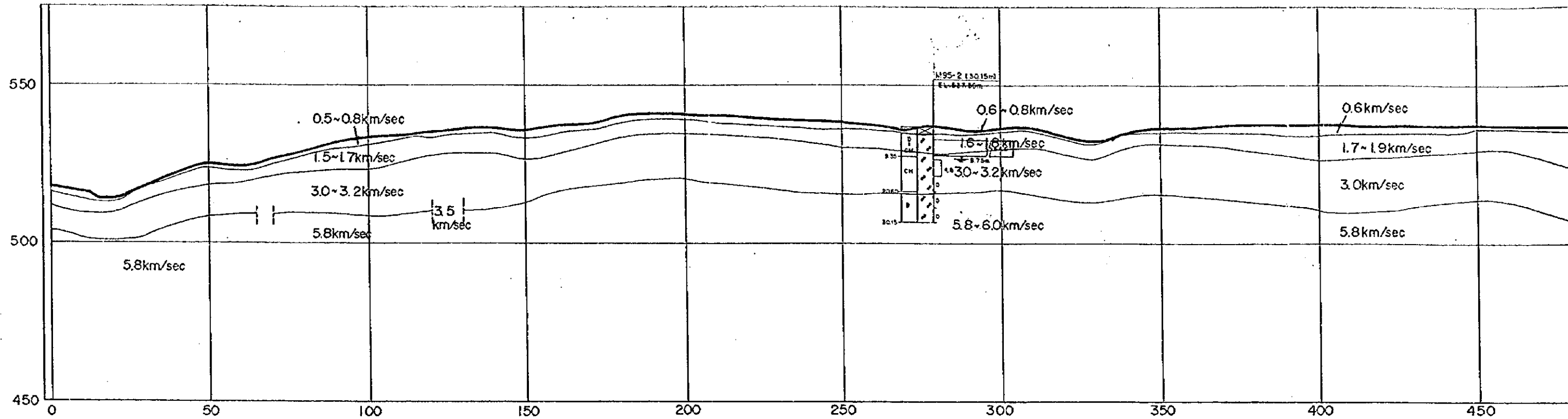
JAPAN INTERNATIONAL COOPERATION AGENCY  
 REPUBLIC OF KENYA  
 MUTONGA/GRAND FALLS HYDROPOWER PROJECT

Seismic Prospecting Inves  
 Geological Profile on M95

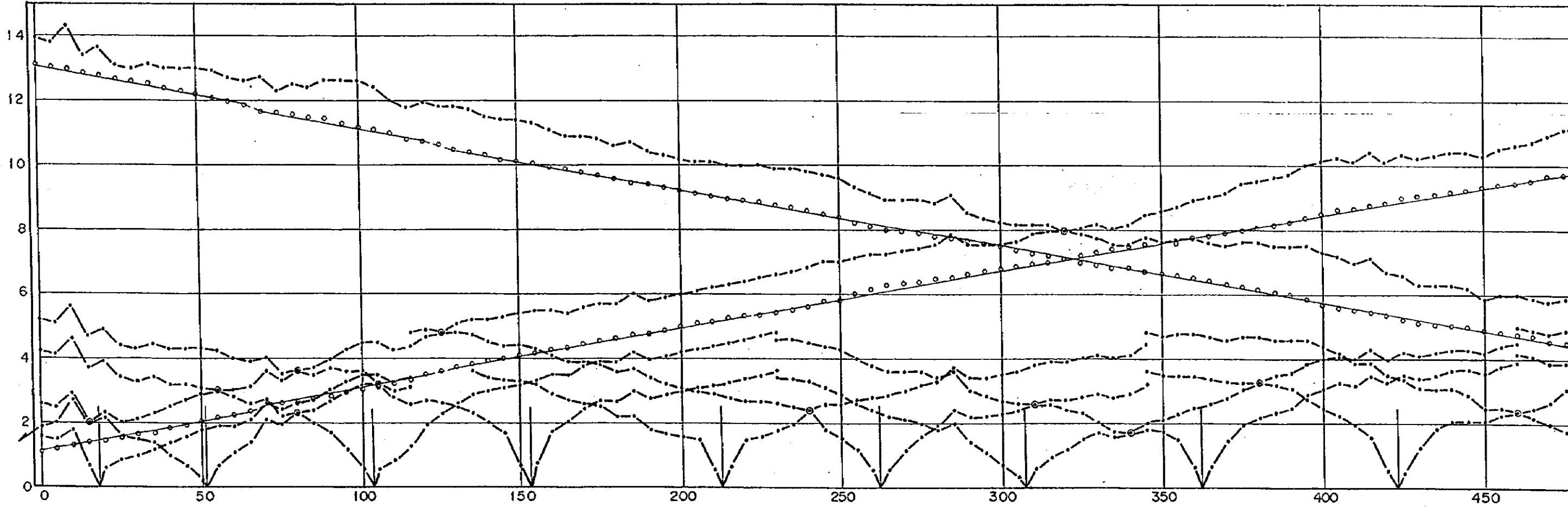


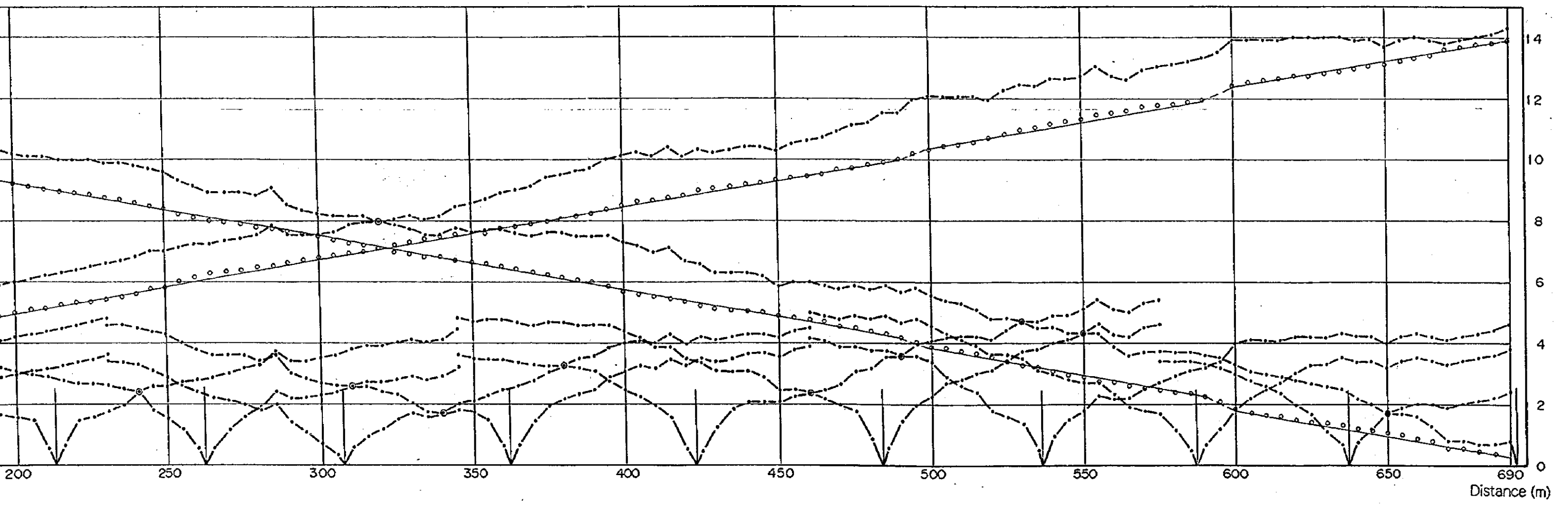
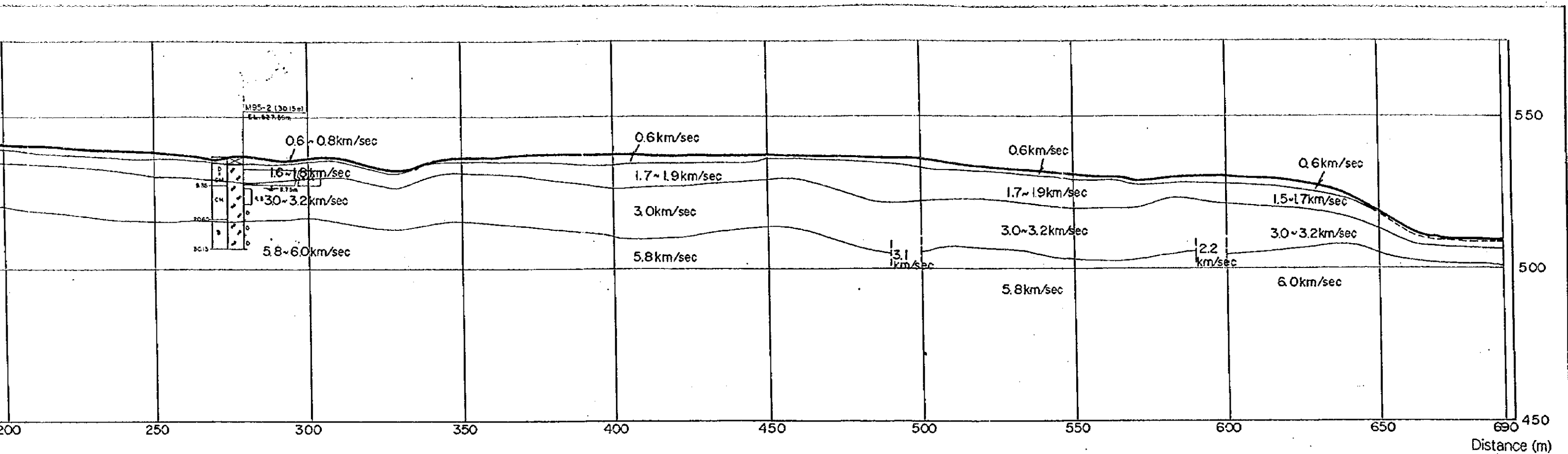


Elevation (m)

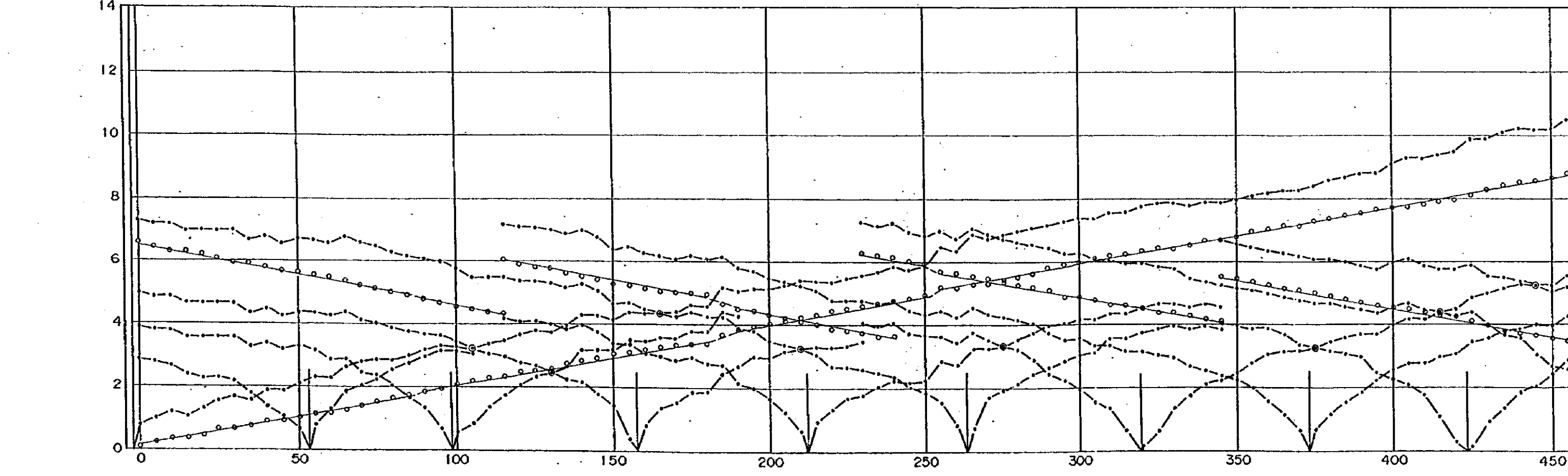
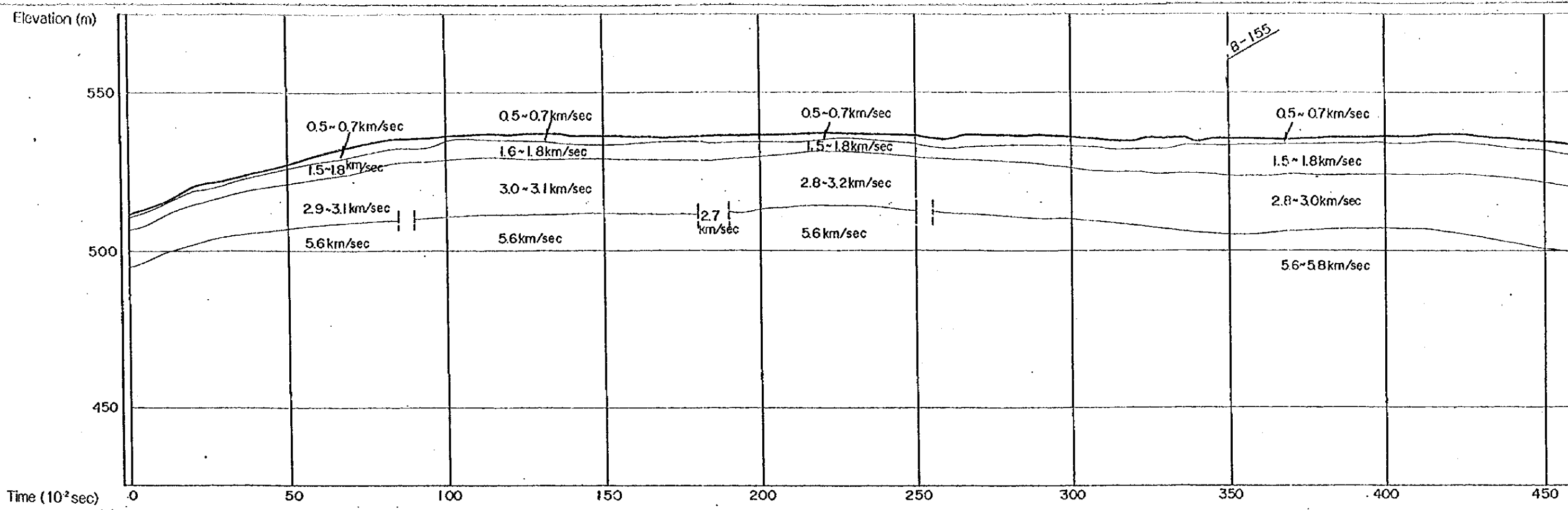


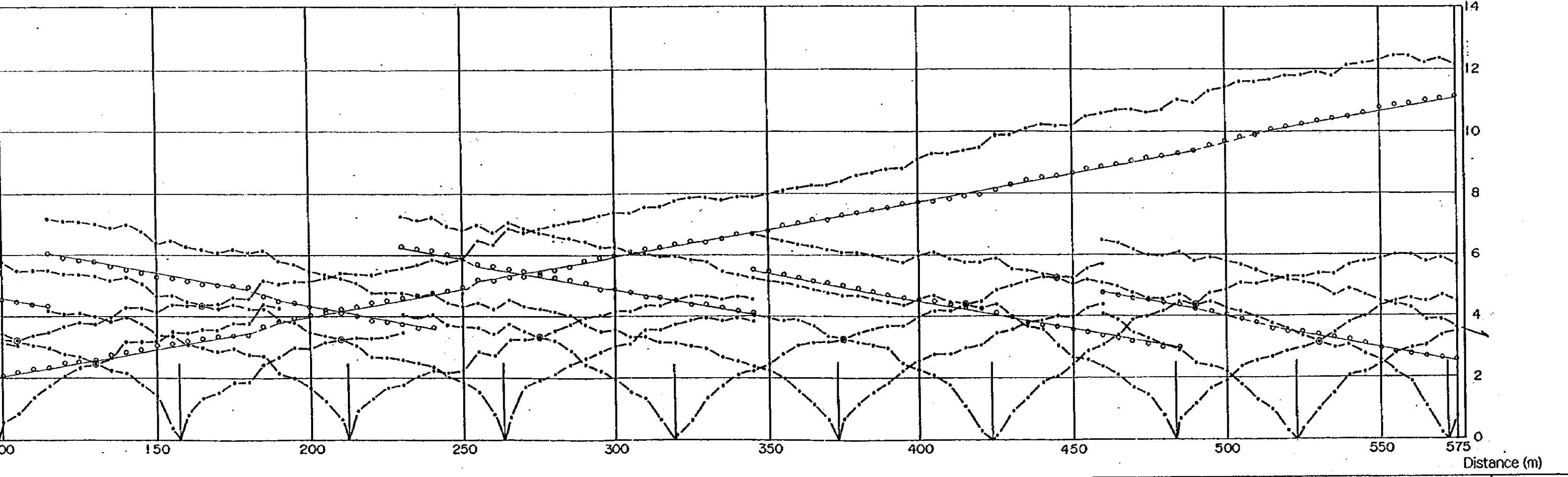
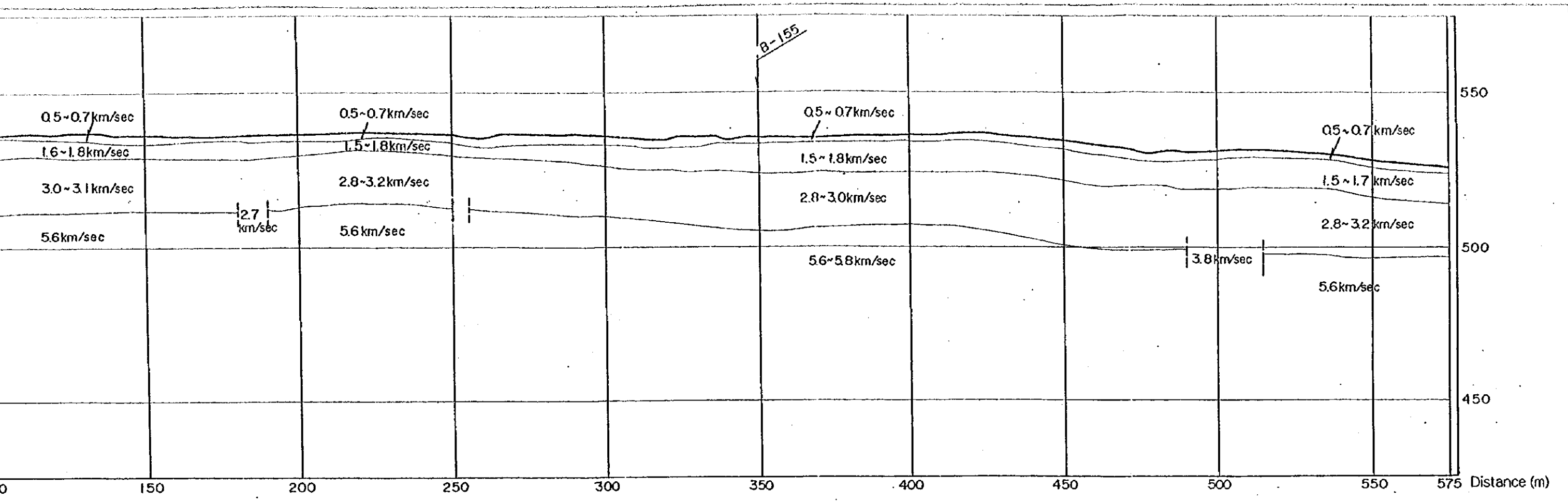
Time (10<sup>2</sup>sec)





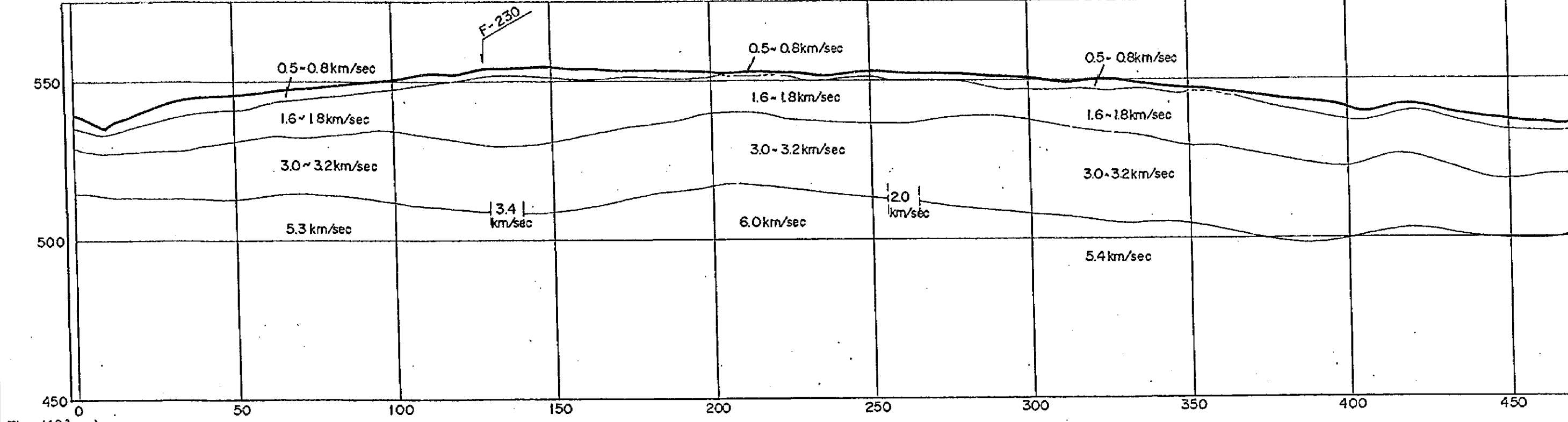
JAPAN INTERNATIONAL COOPERATION AGENCY	Seismic Prospecting Investigation and Geological Profile on M95-C	Fig. No. C 1.3
MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



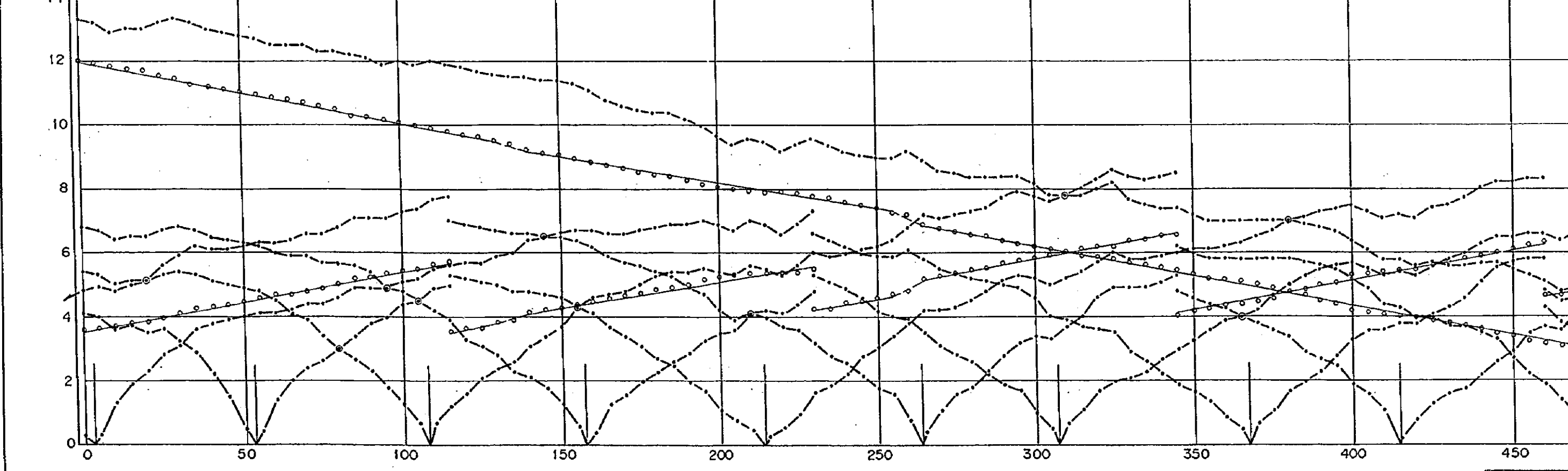


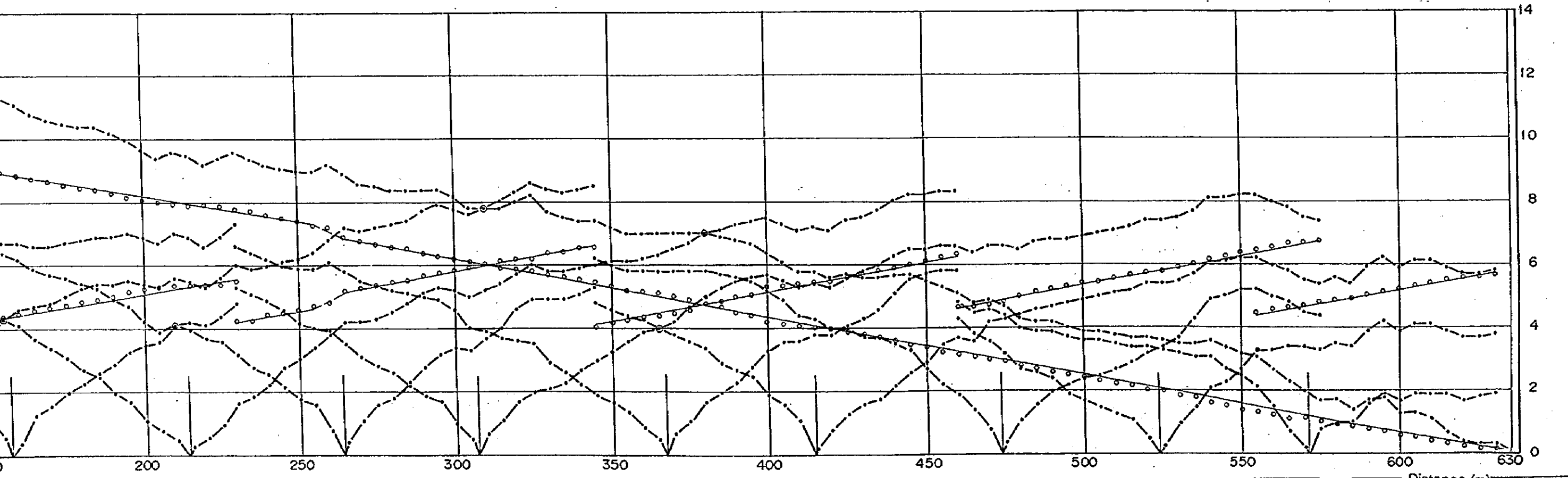
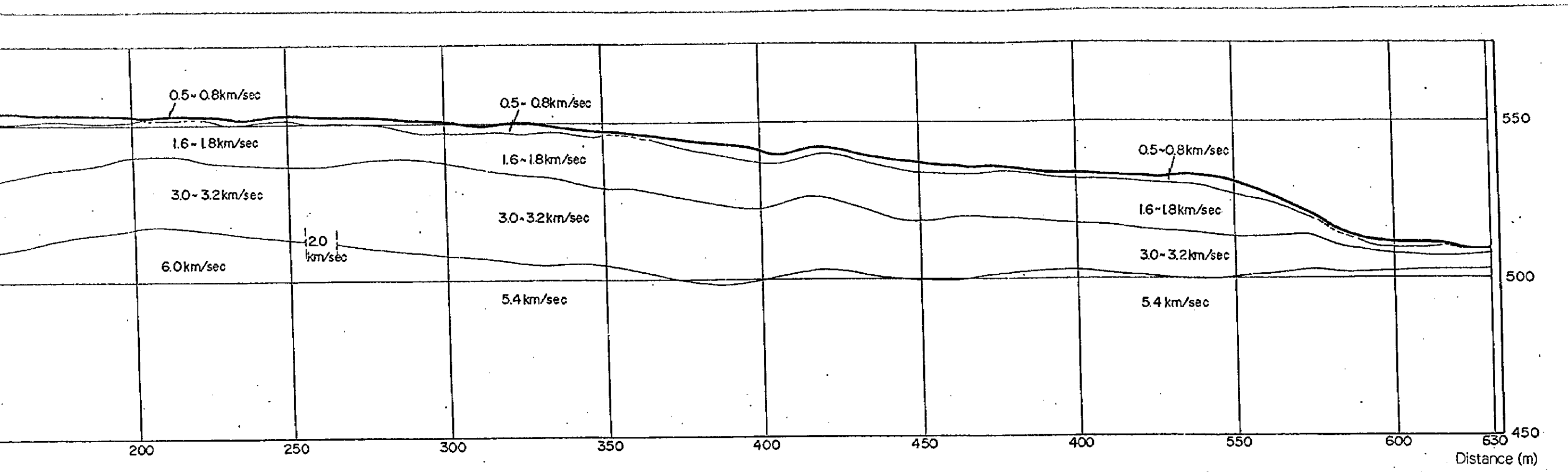
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Seismic Prospecting Investigation and Geological Profile on M95-D	Fig. No. C1.4
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Elevation (m)



Time (10<sup>2</sup> sec)

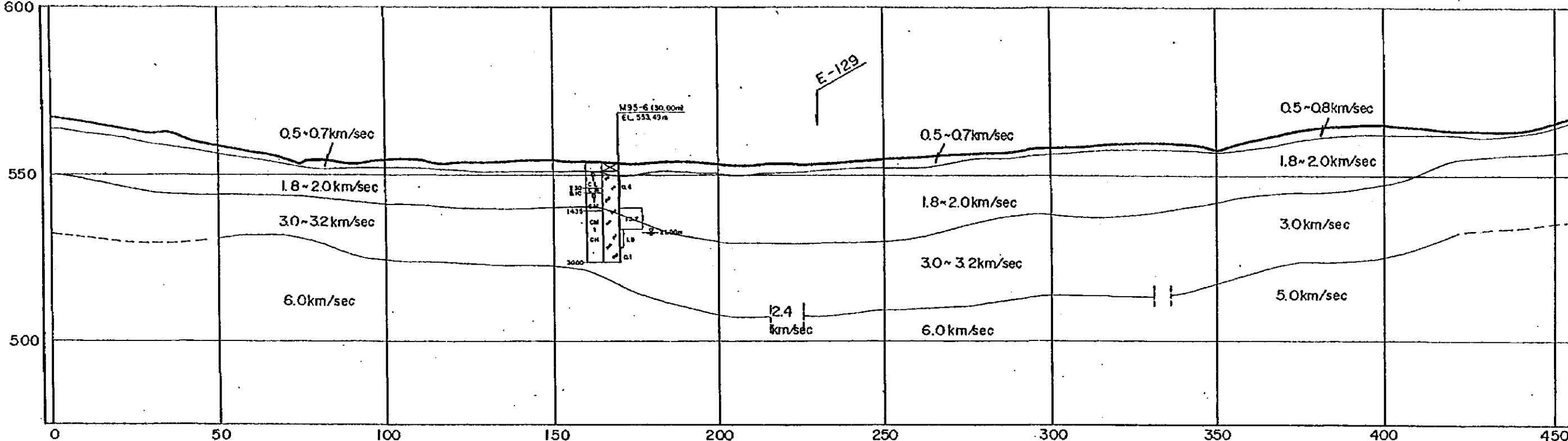




JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Seismic Prospecting Investigation and Geological Profile on M95-E	Fig. No. C1.5
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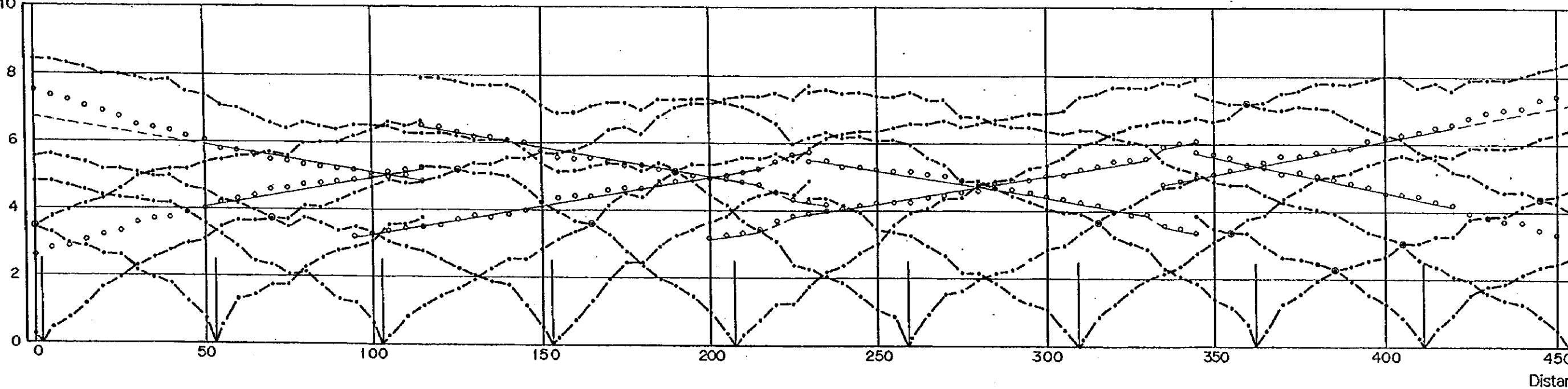
Elevation (m)

600



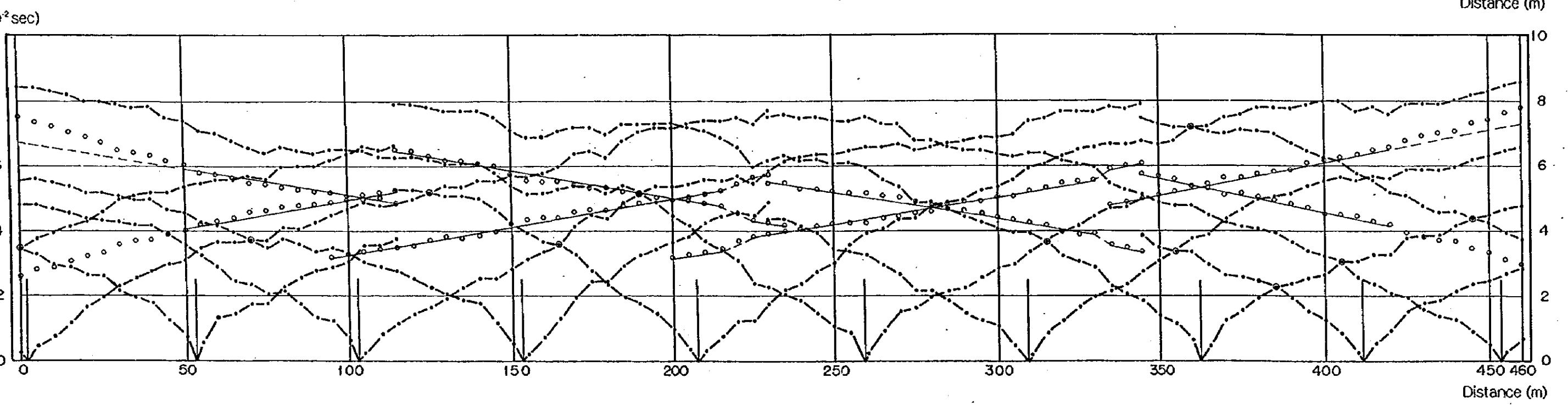
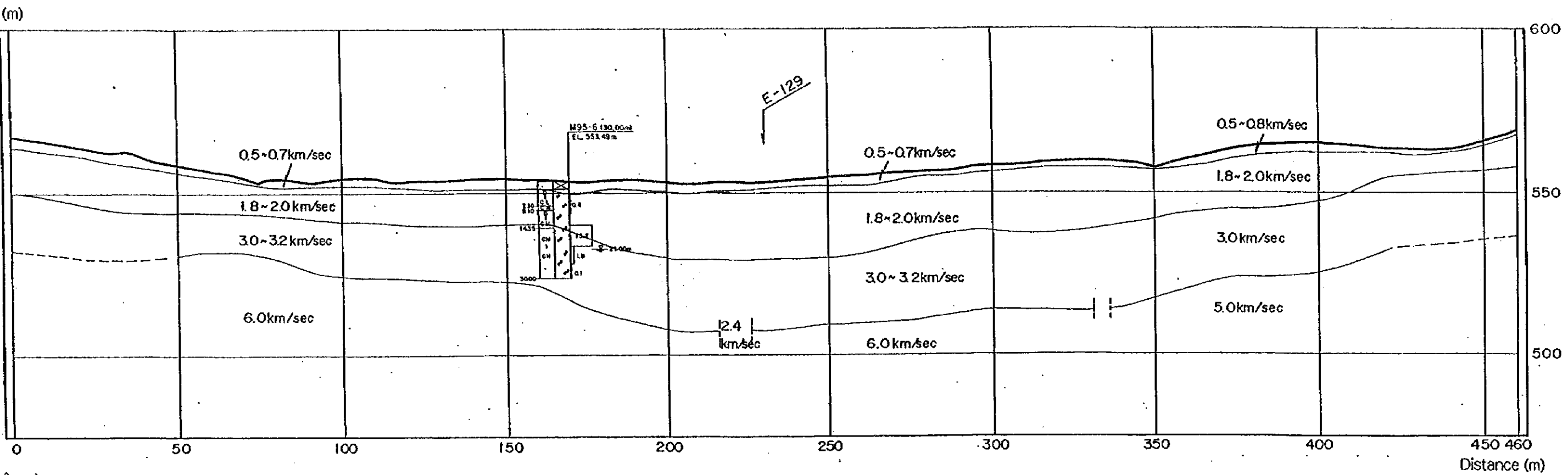
Time ( $10^2$  sec)

10



JAPAN INTERNATIONAL COOPERATION AGENCY  
REPUBLIC OF KENYA  
MUTONGA/GRAND FALLS HYDROPOWER PROJECT

Seismic Prospecting Investigation  
Geological Profile on M95-



JAPAN INTERNATIONAL COOPERATION AGENCY	Seismic Prospecting Investigation and	Fig. No.
REPUBLIC OF KENYA	Geological Profile on M95-F	C1.6
MUTONGA/GRAND FALLS HYDROPOWER PROJECT		