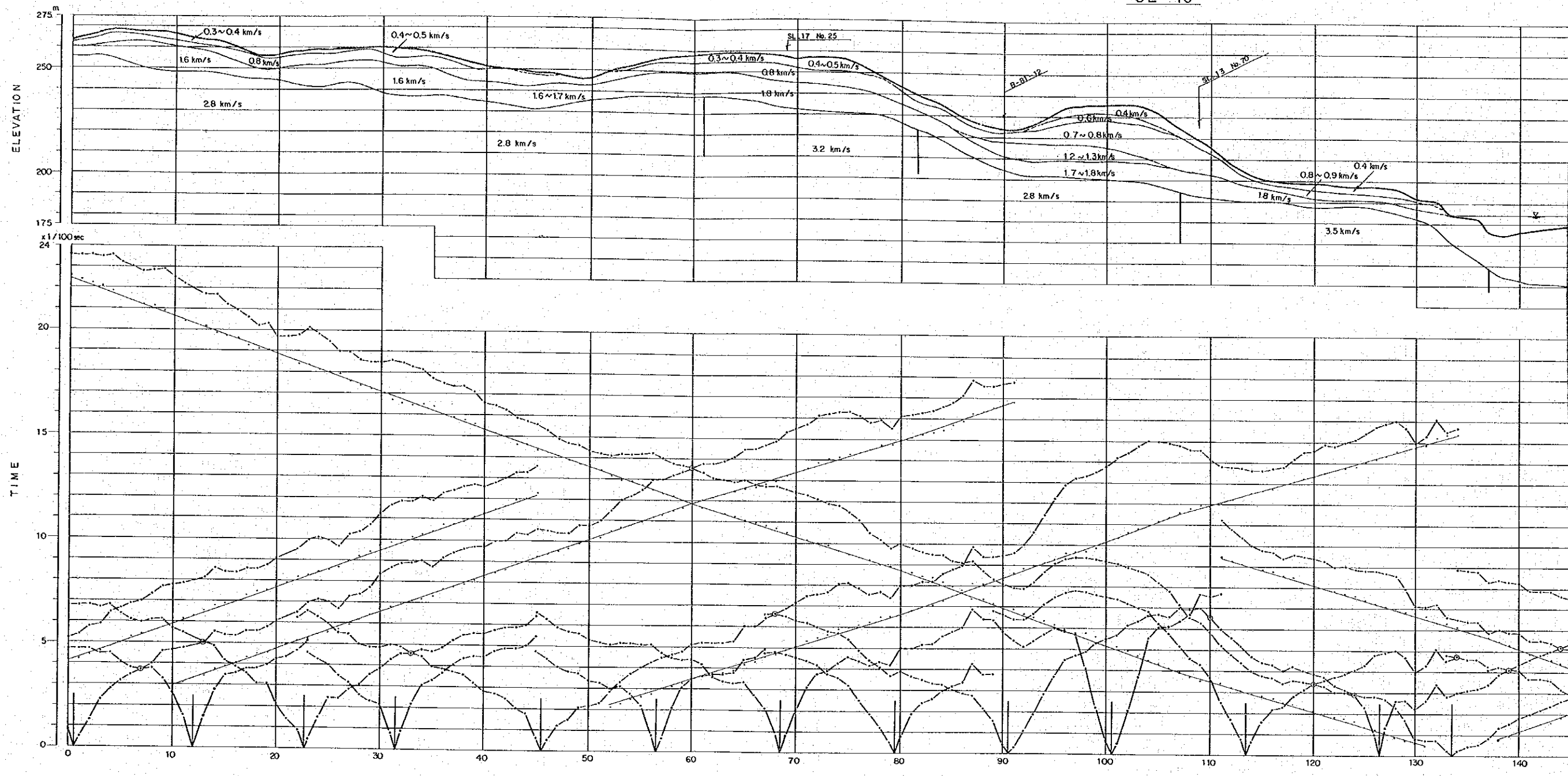
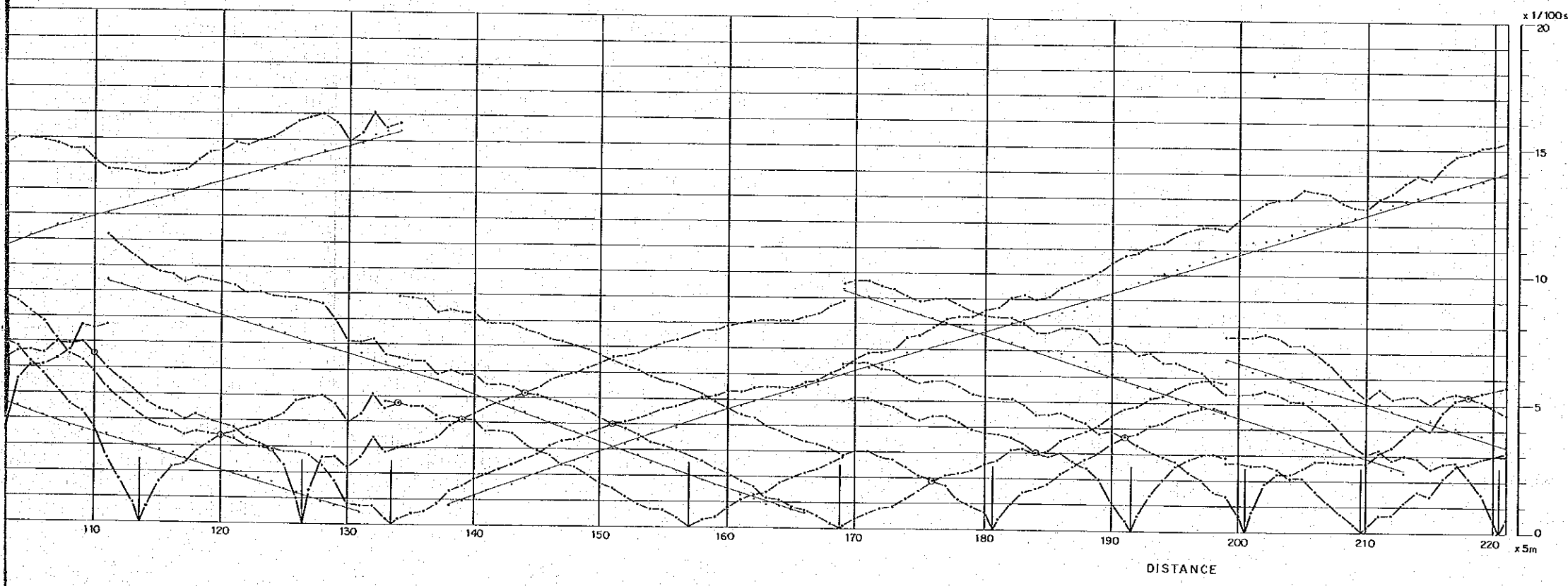
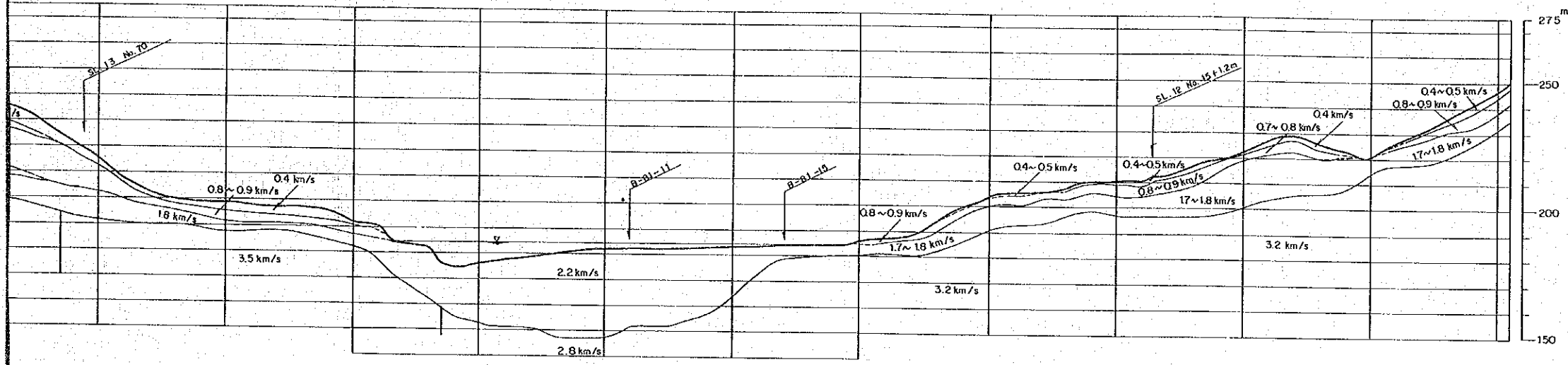


SL - 10

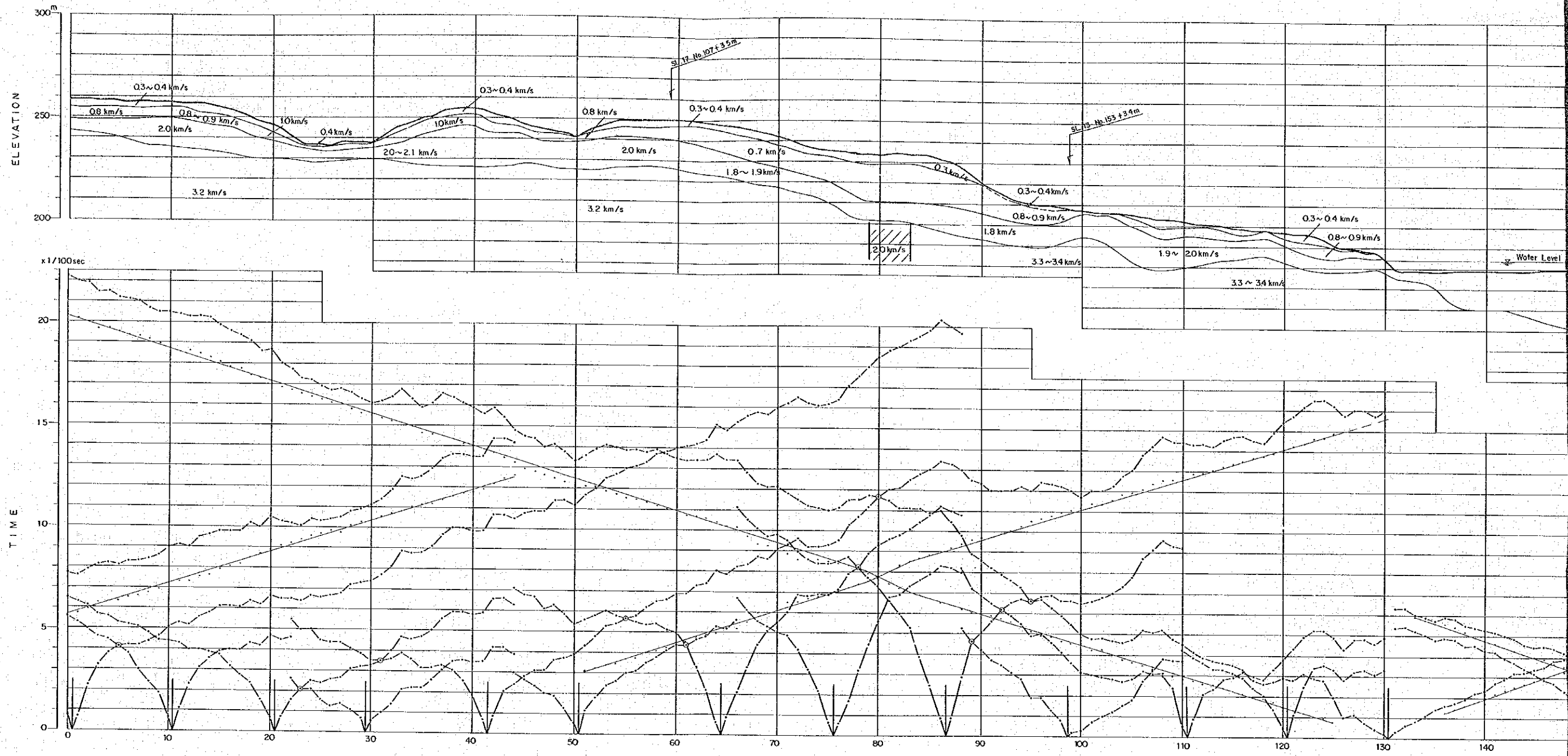


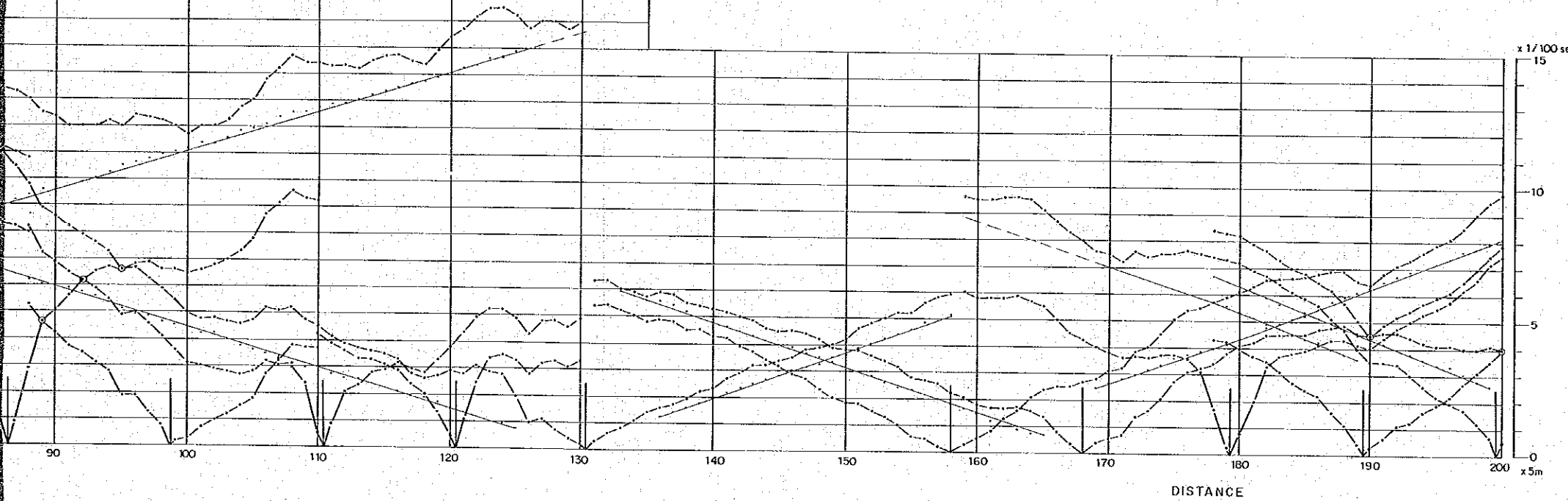
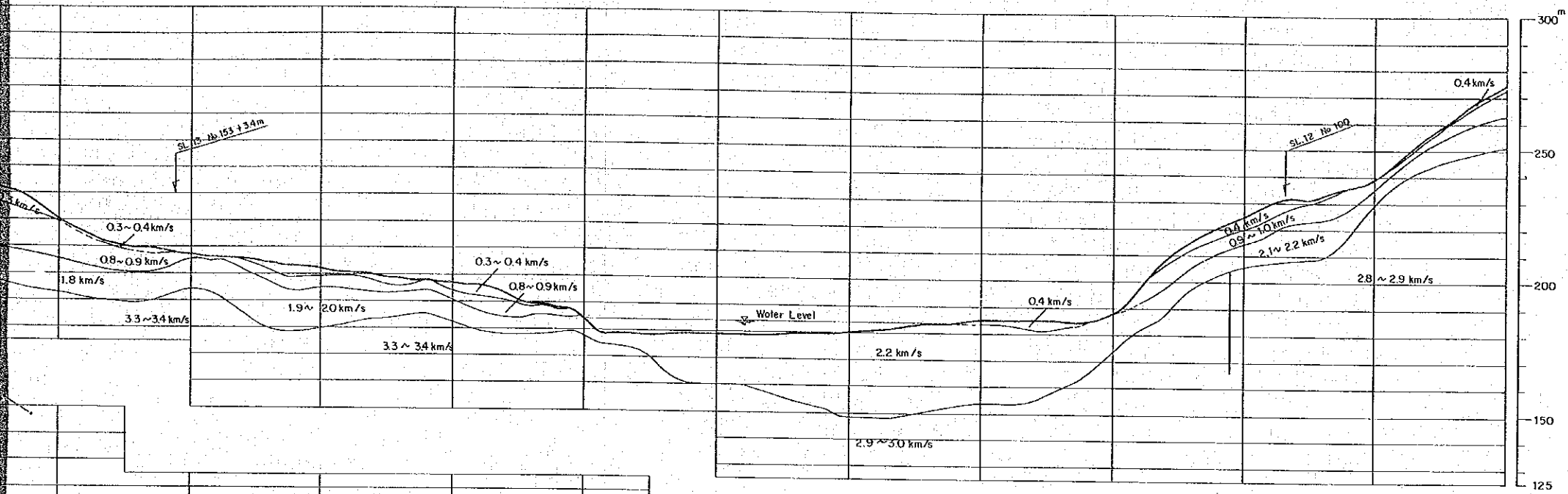
SL-10



SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SL-10

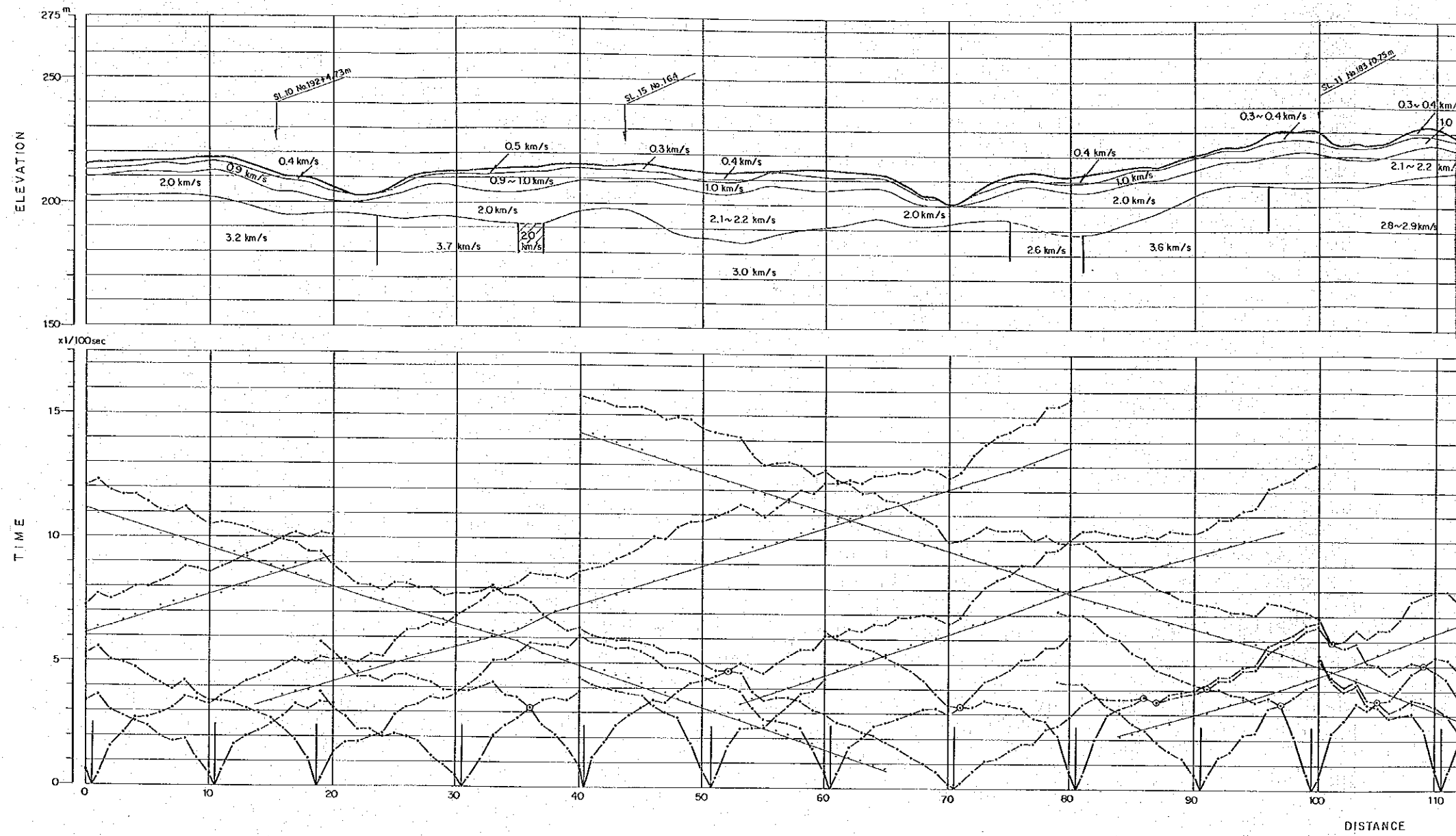
HIS MAJESTY'S GOVERNMENT OF NEPAL  
SAPT GANDAKI HYDROELECTRIC  
POWER DEVELOPMENT PROJECT  
FEASIBILITY REPORT  
JAPAN INTERNATIONAL COOPERATION AGENCY

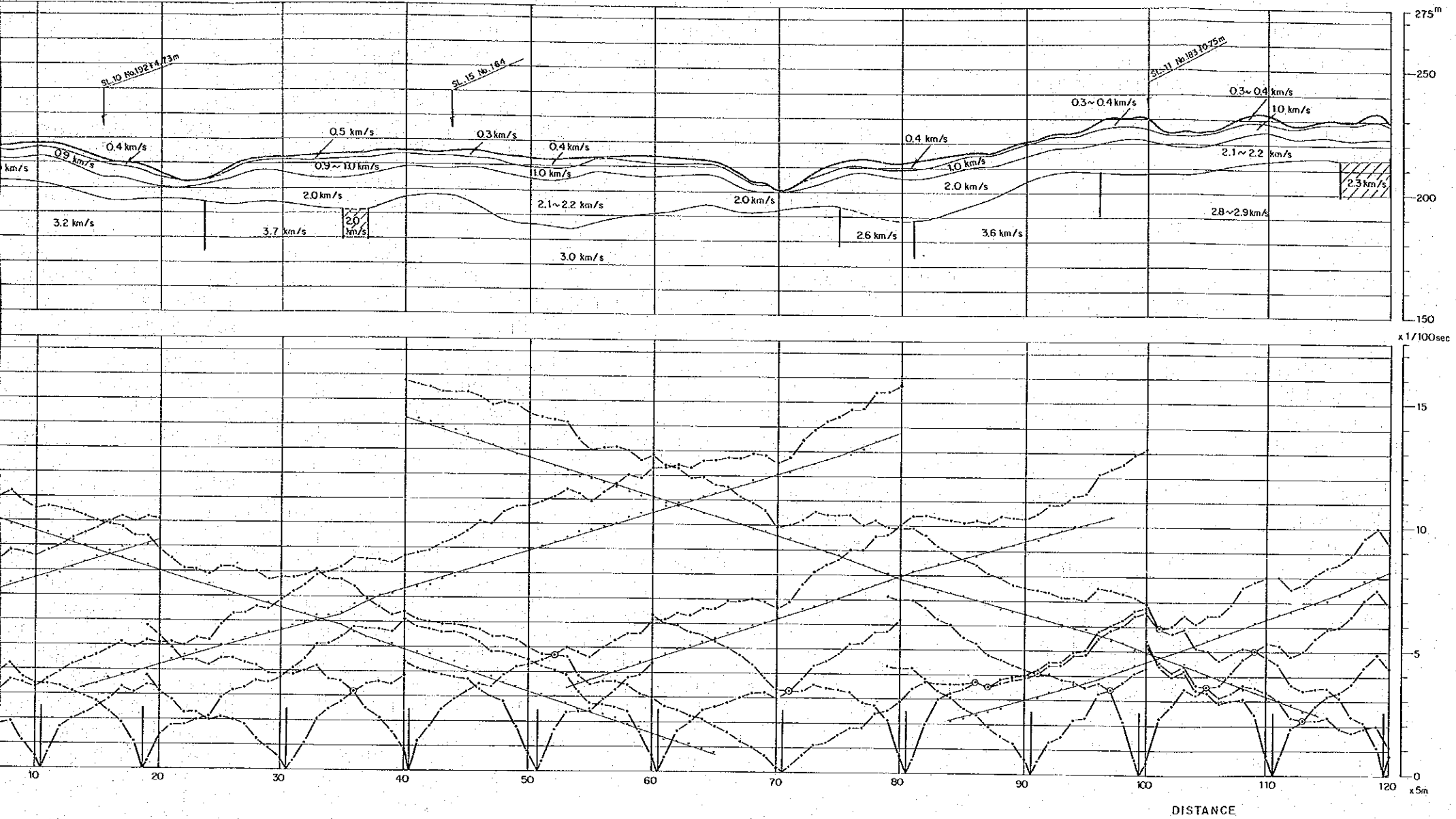




SEISMIC REFRACTION PROFILE  
 TIME-DISTANCE PLOT  
 AND  
 INTERPRITATION  
 PROFILE NO. SL-11

HIS MAJESTY'S GOVERNMENT OF NEPAL  
 SAPT GANDAKI HYDROELECTRIC  
 POWER DEVELOPMENT PROJECT  
 FEASIBILITY REPORT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

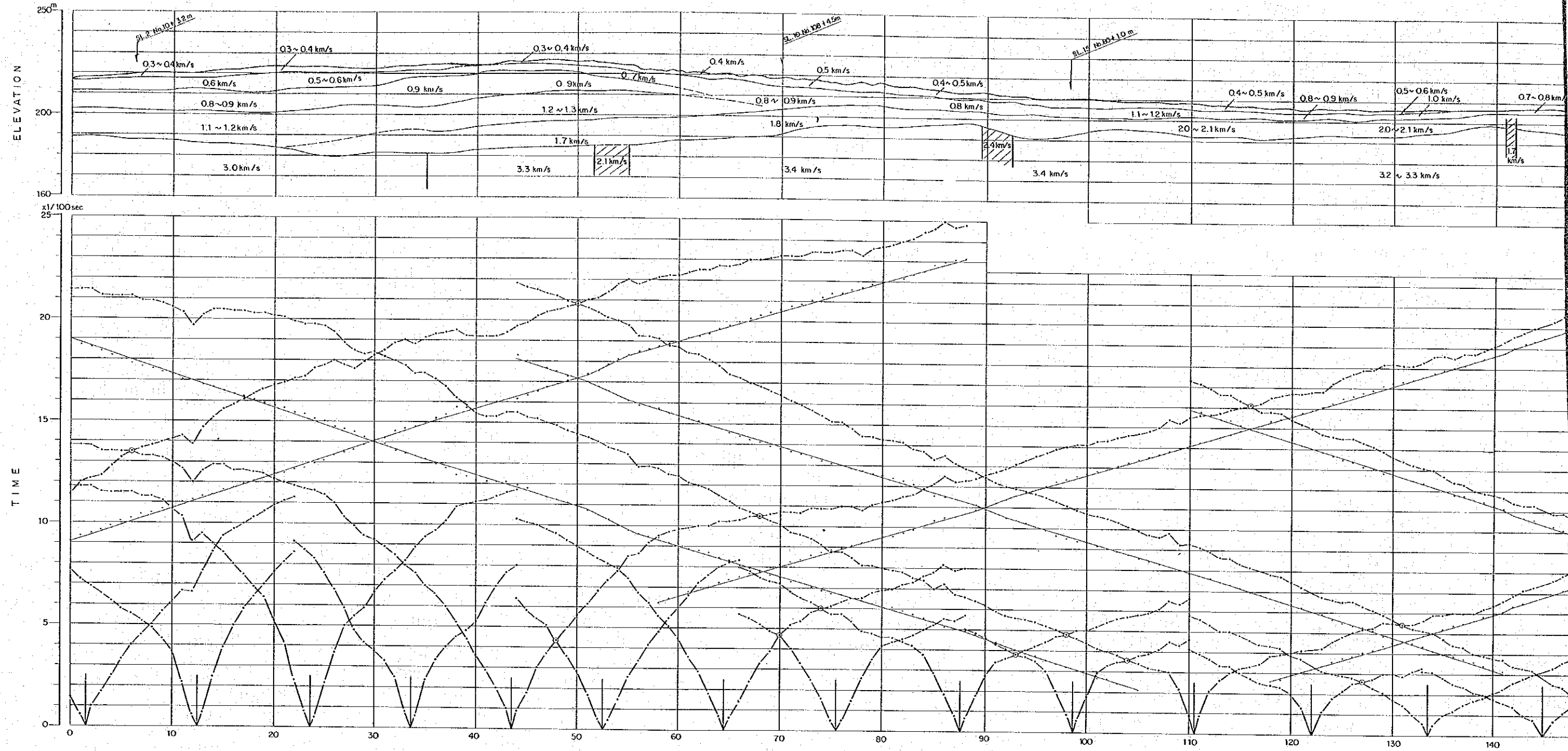




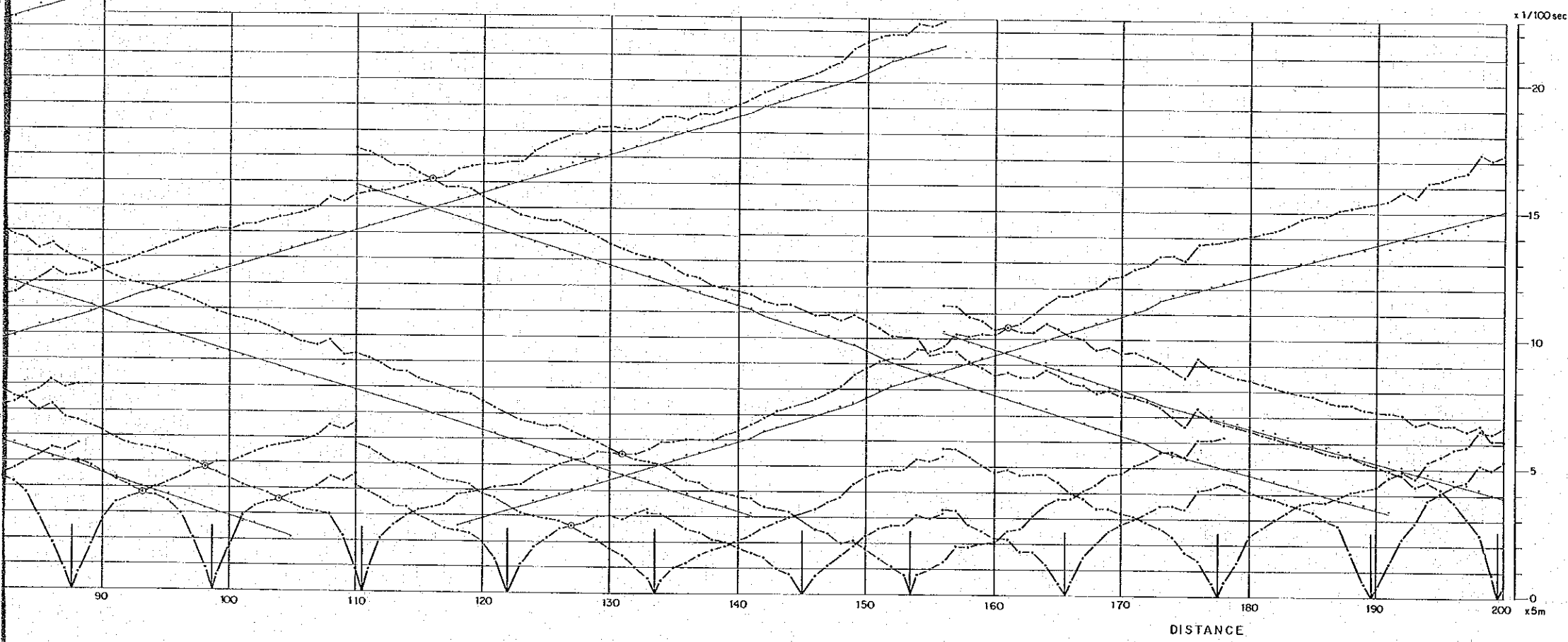
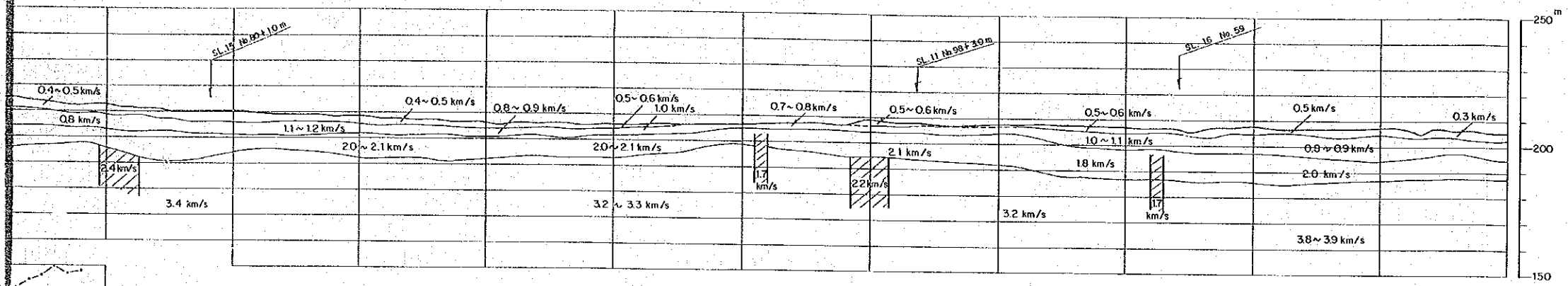
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 TIME-DISTANCE PLOT  
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 INTERPRITATION  
 PROFILE NO. SL-12

HIS MAJESTY'S GOVERNMENT OF NEPAL  
 SAPT GANDAKI HYDROELECTRIC  
 POWER DEVELOPMENT PROJECT  
 FEASIBILITY REPORT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

SL - 13

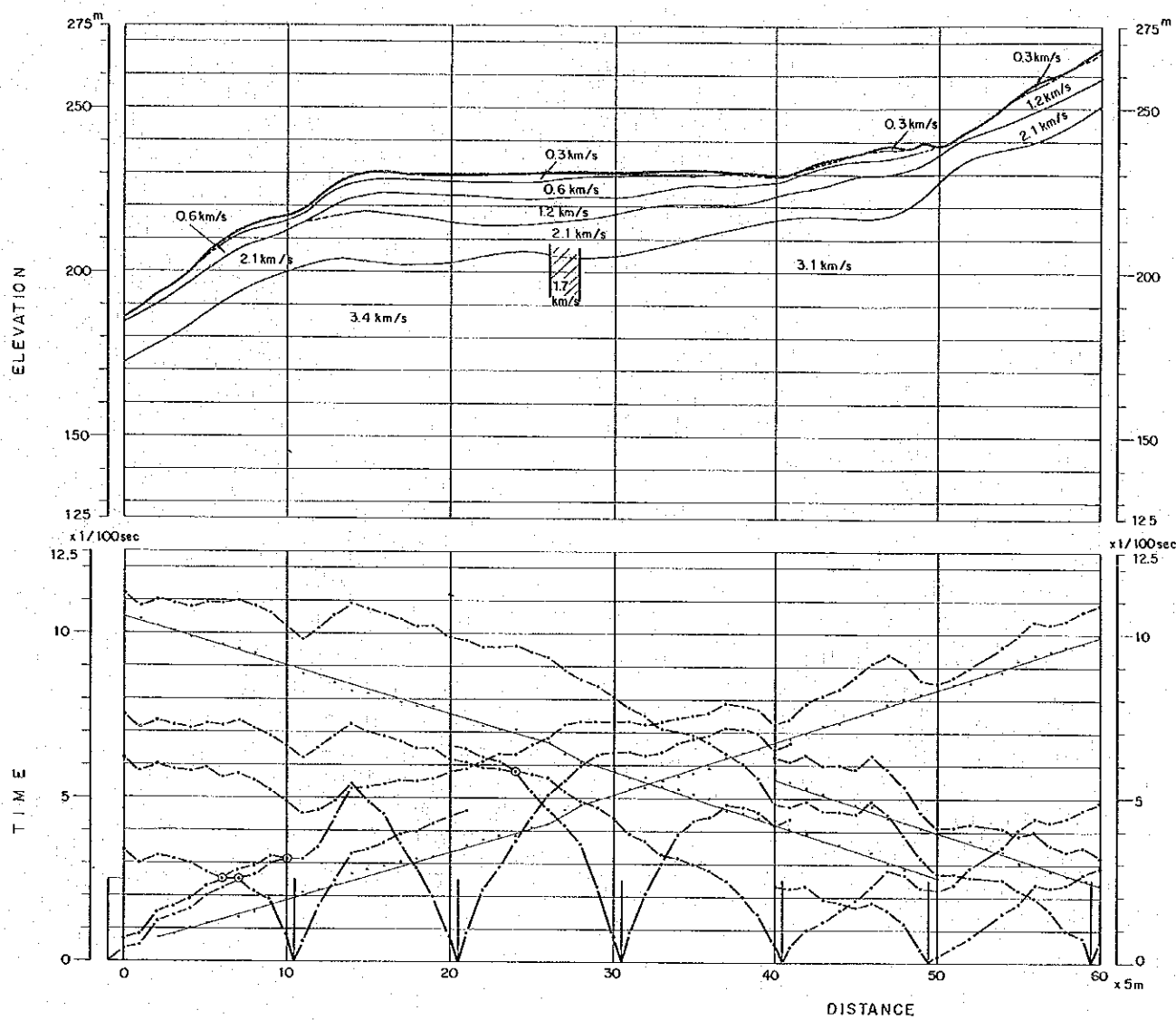


SL-13



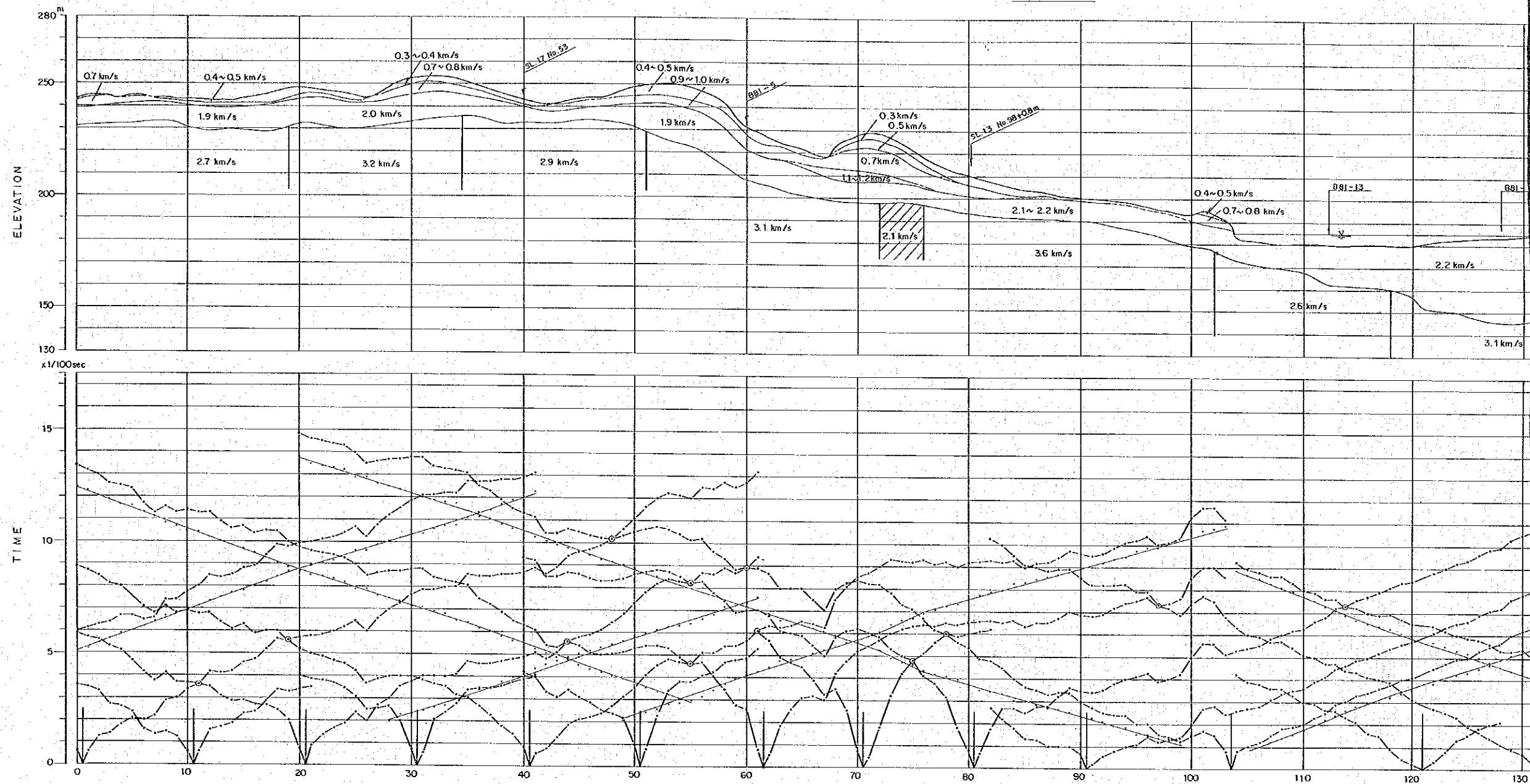
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 TIME-DISTANCE PLOT  
 AND  
 INTERPRITATION  
 PROFILE NO. SL-13



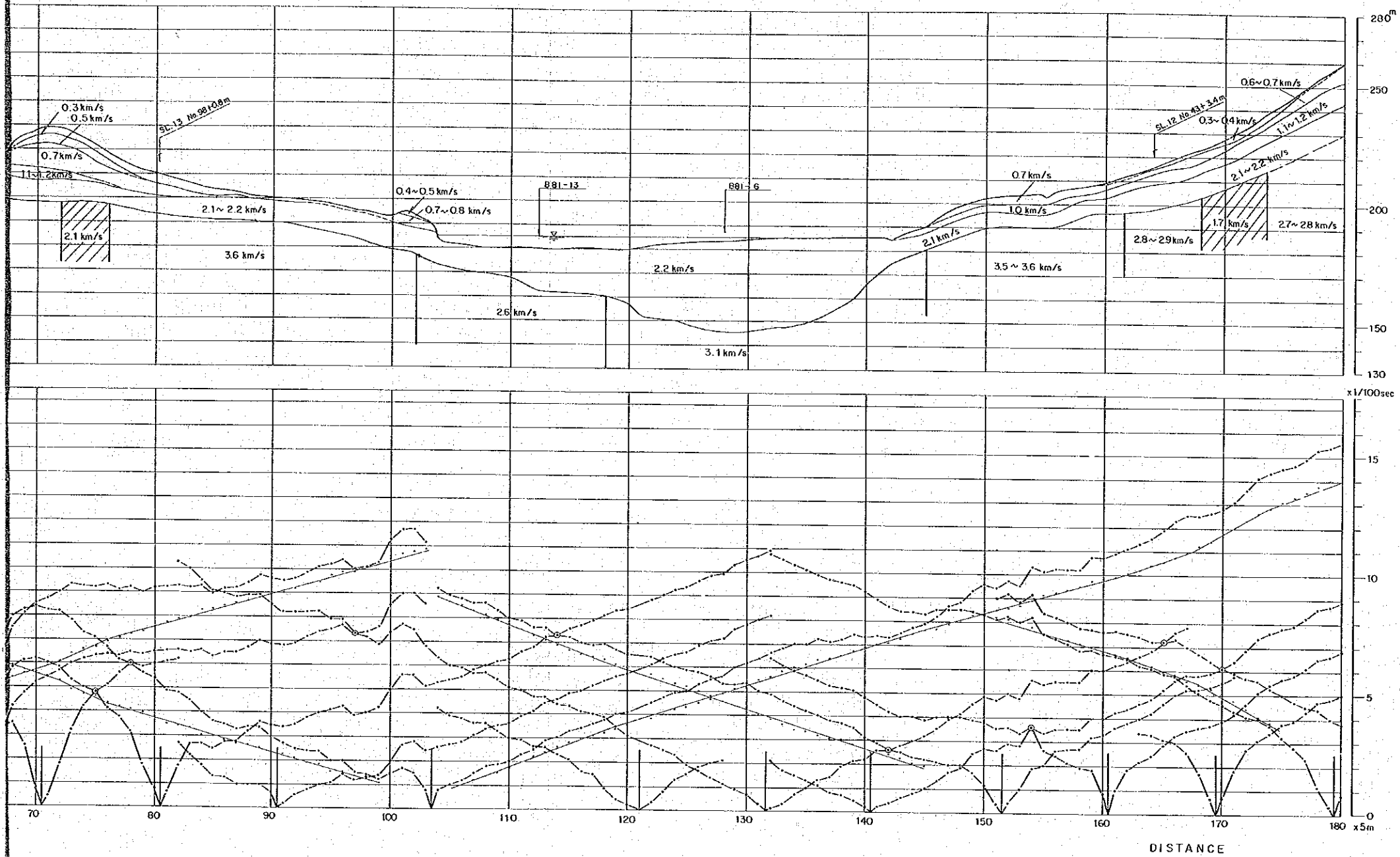


SEISMIC REFRACTION PROFILE  
 TIME-DISTANCE PLOT  
 AND  
 INTERPRITATION  
 PROFILE NO. SL-14

HIS MAJESTY'S GOVERNMENT OF NEPAL  
 SAPT GANDAKI HYDROELECTRIC  
 POWER DEVELOPMENT PROJECT  
 FEASIBILITY REPORT  
 JAPAN INTERNATIONAL COOPERATION AGENCY

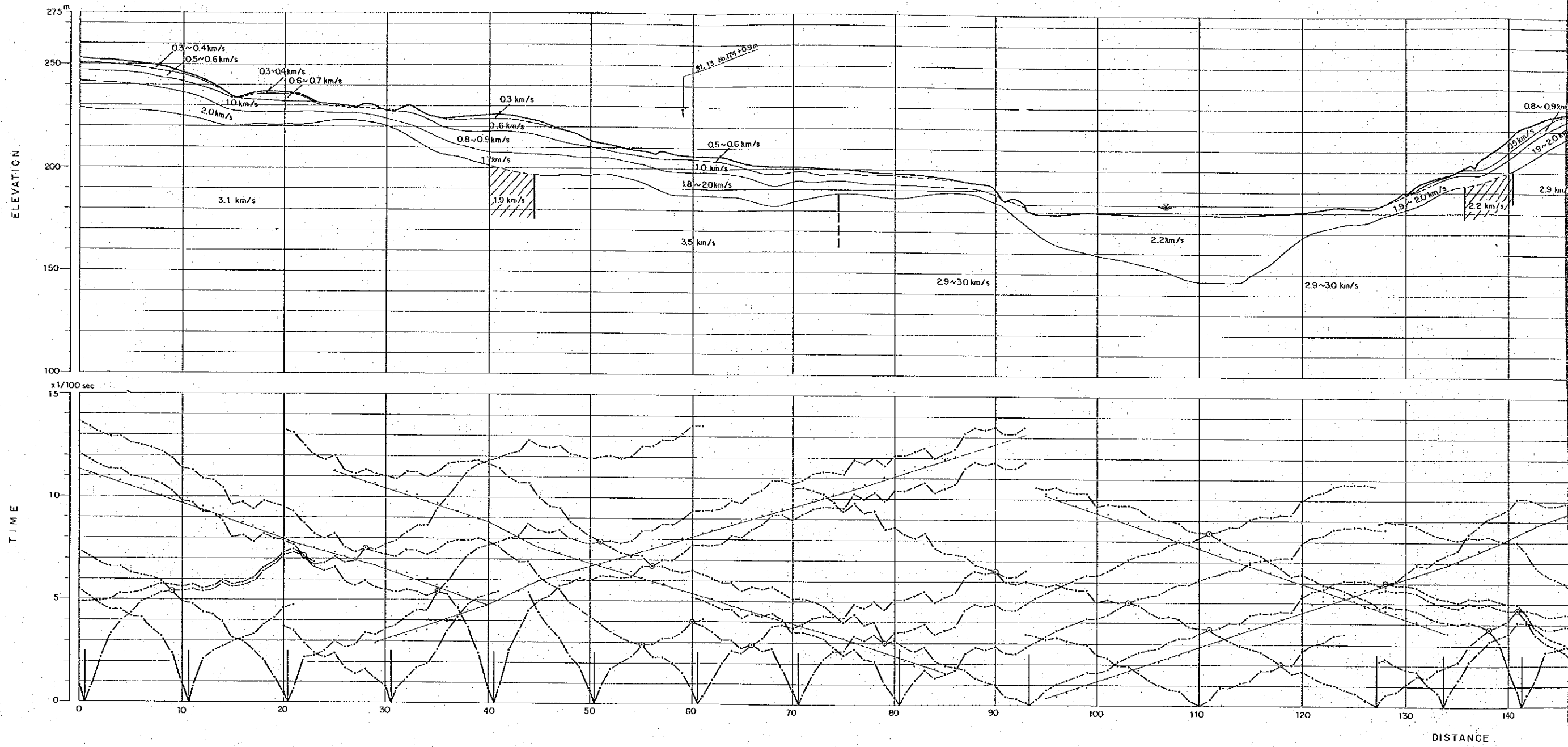


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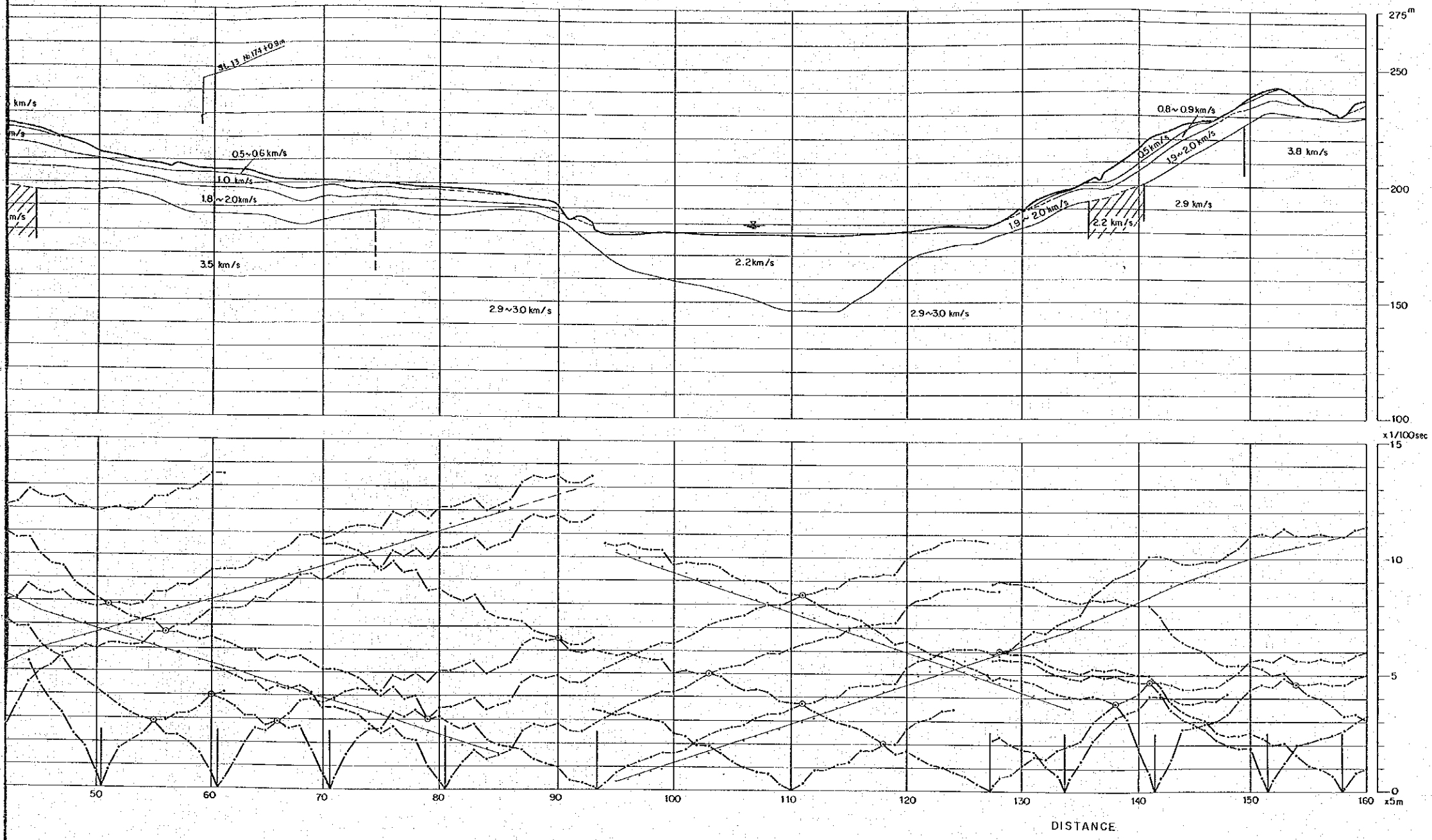


SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SL-15

SL-16

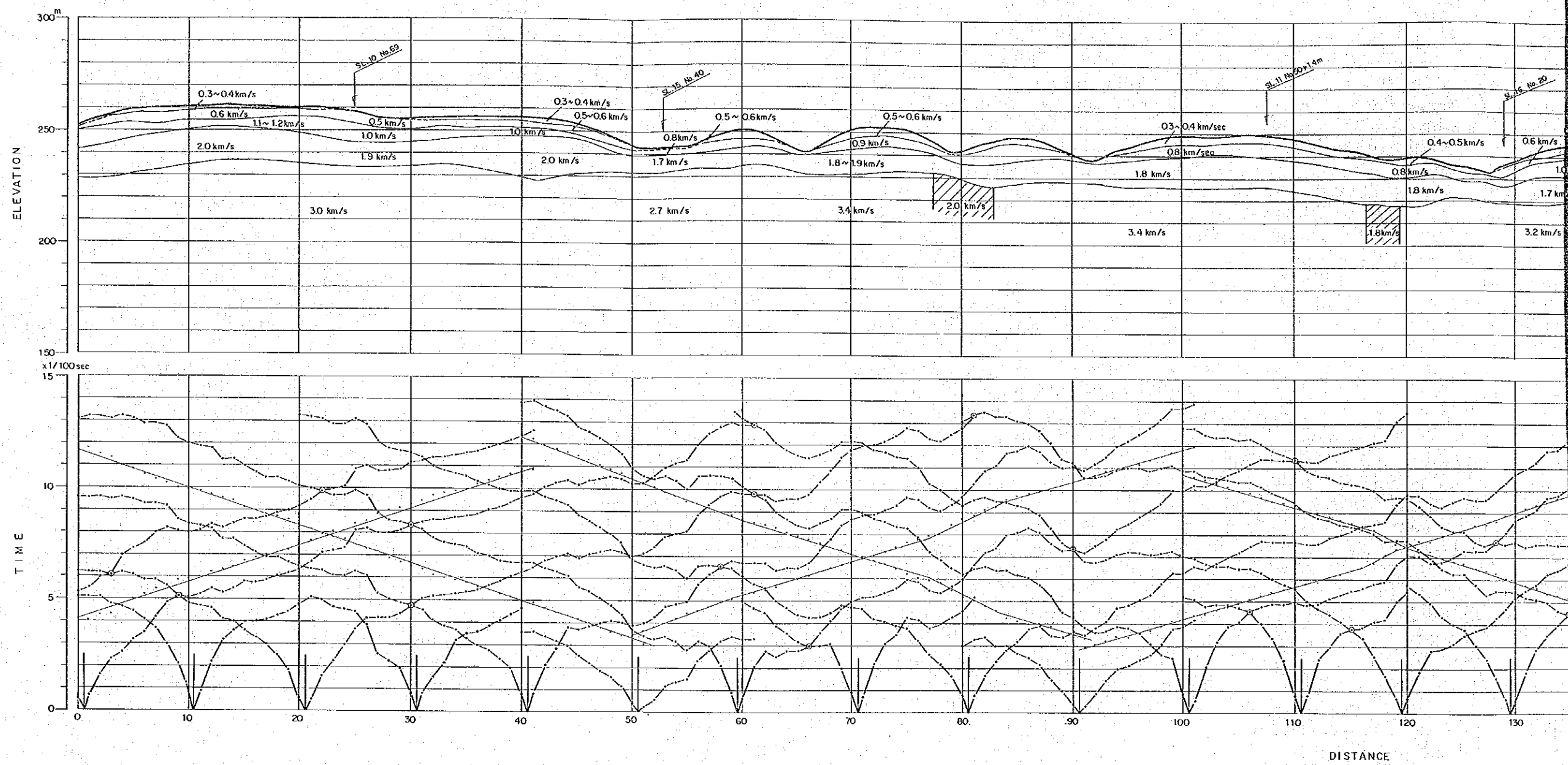


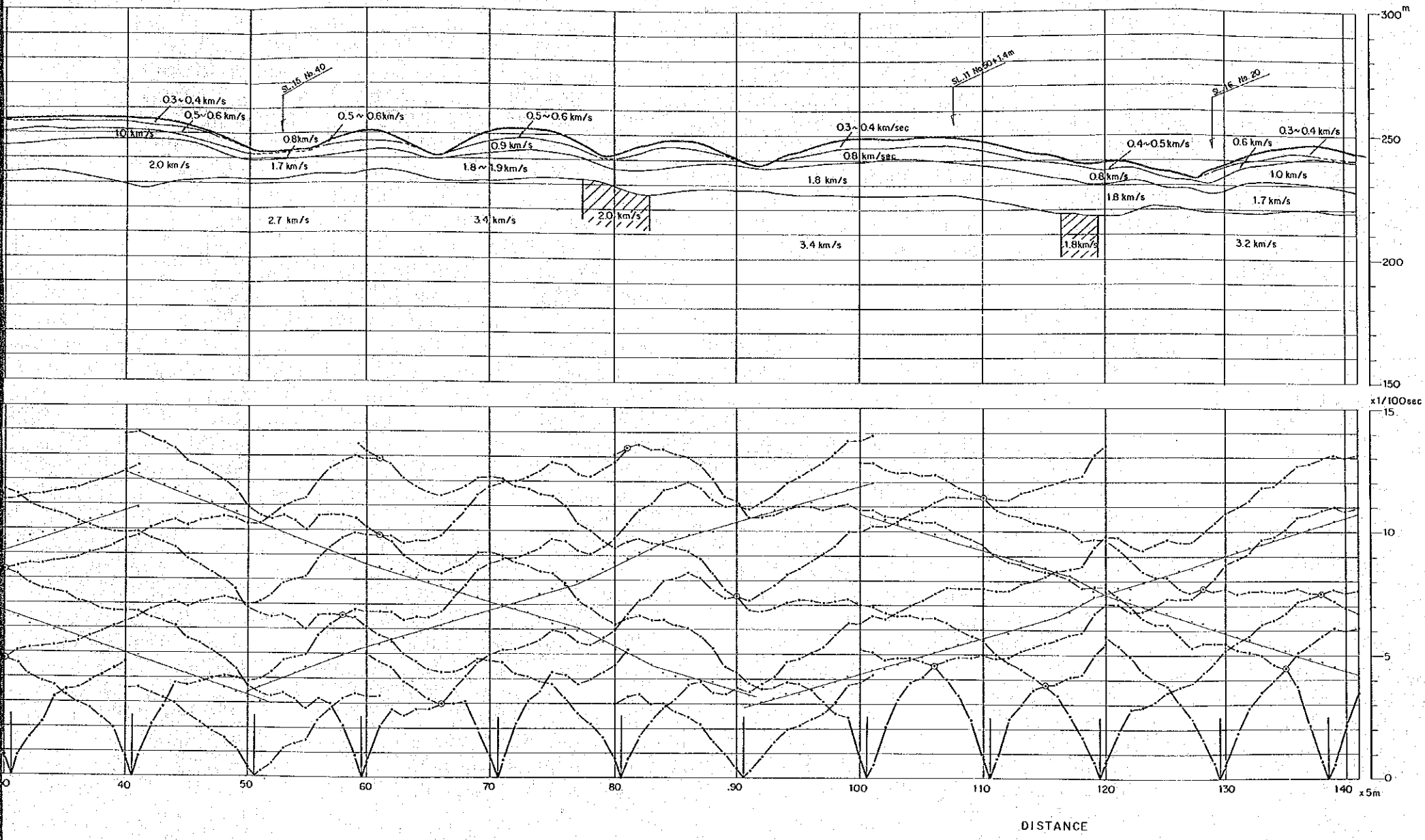
SL-16



SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SL-16

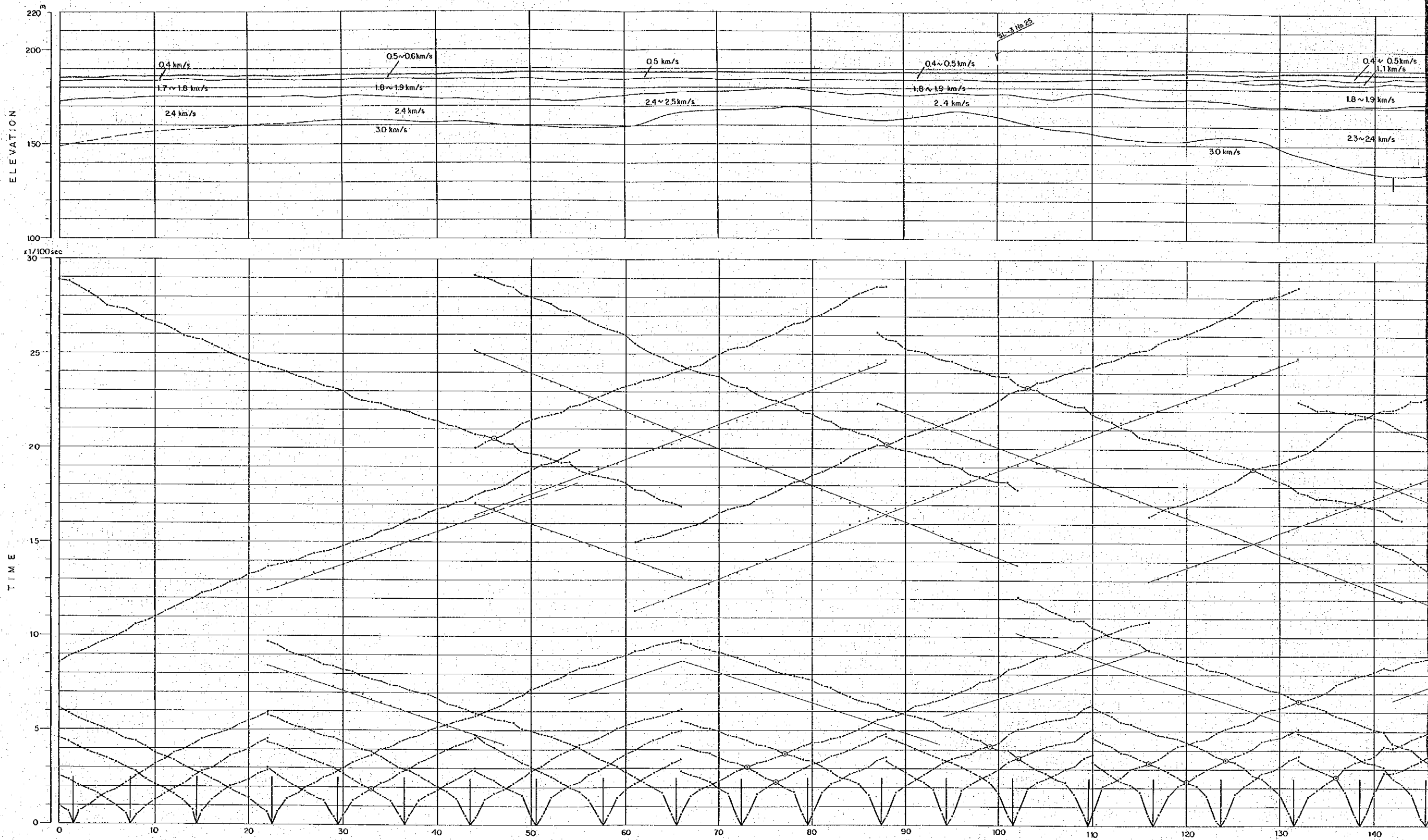
HIS MAJESTY'S GOVERNMENT OF NEPAL  
SAPT GANDAKI HYDROELECTRIC  
POWER DEVELOPMENT PROJECT  
FEASIBILITY REPORT  
JAPAN INTERNATIONAL COOPERATION AGENCY



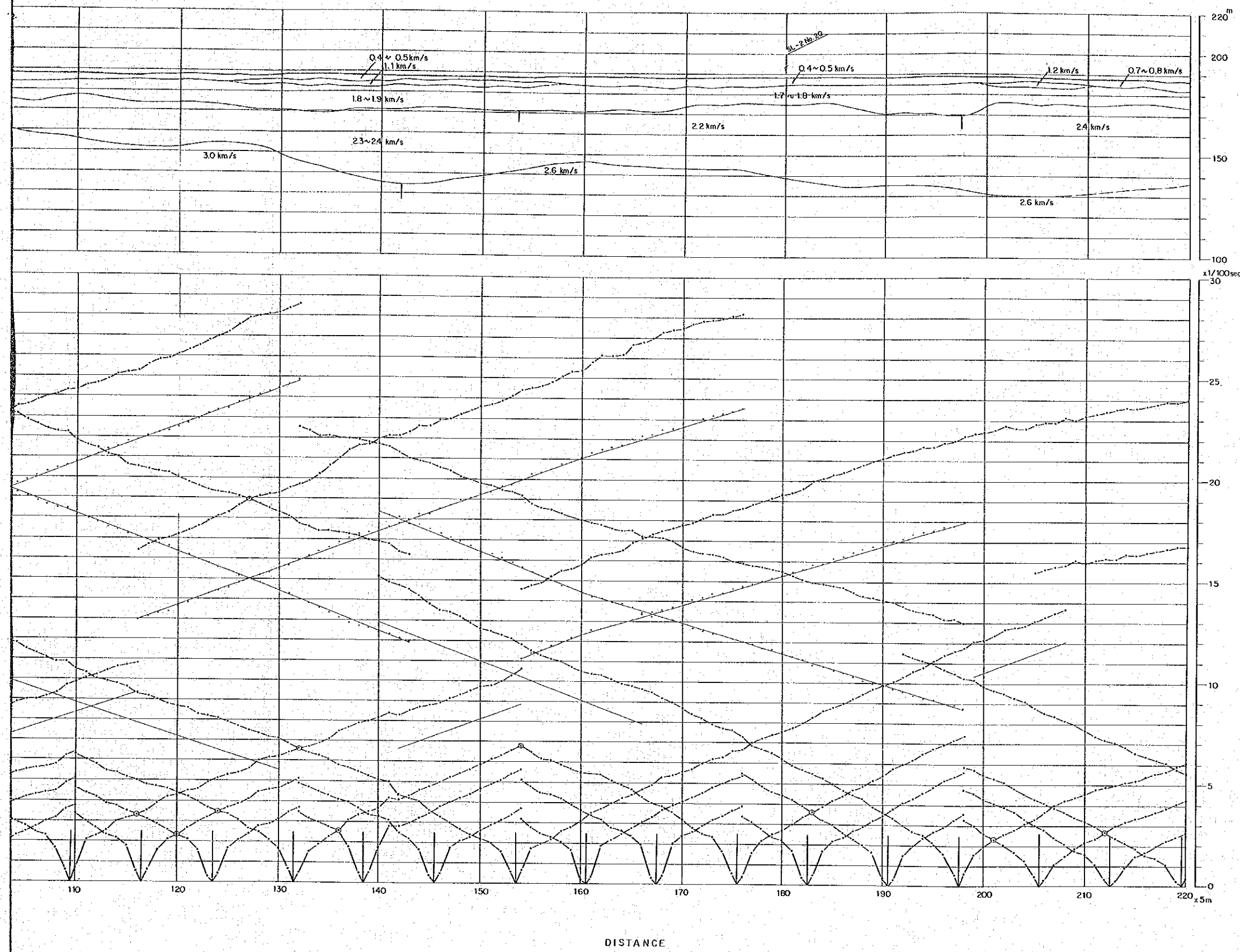


SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SL-17

HIS MAJESTY'S GOVERNMENT OF NEPAL  
SAPT GANDAKI HYDROELECTRIC  
POWER DEVELOPMENT PROJECT  
FEASIBILITY REPORT  
JAPAN INTERNATIONAL COOPERATION AGENCY



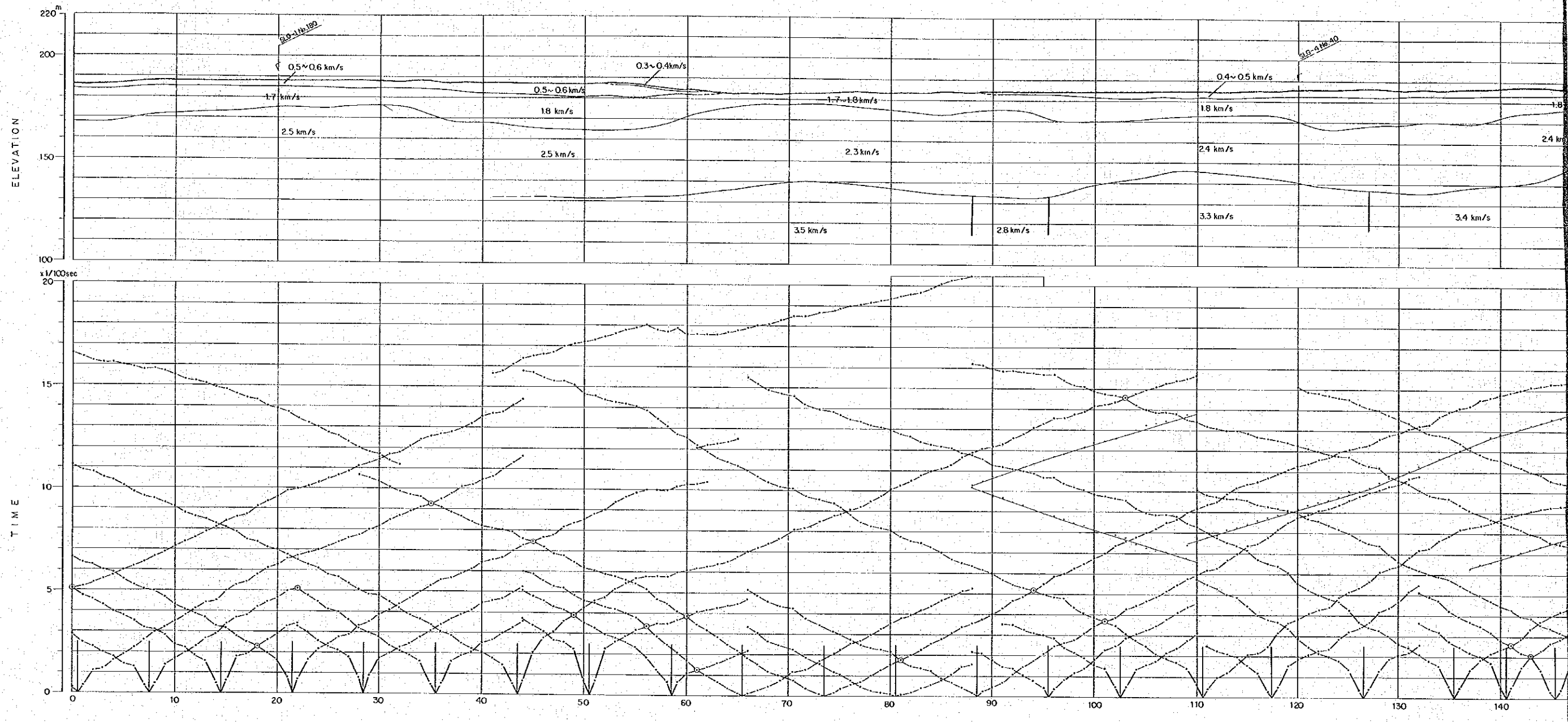




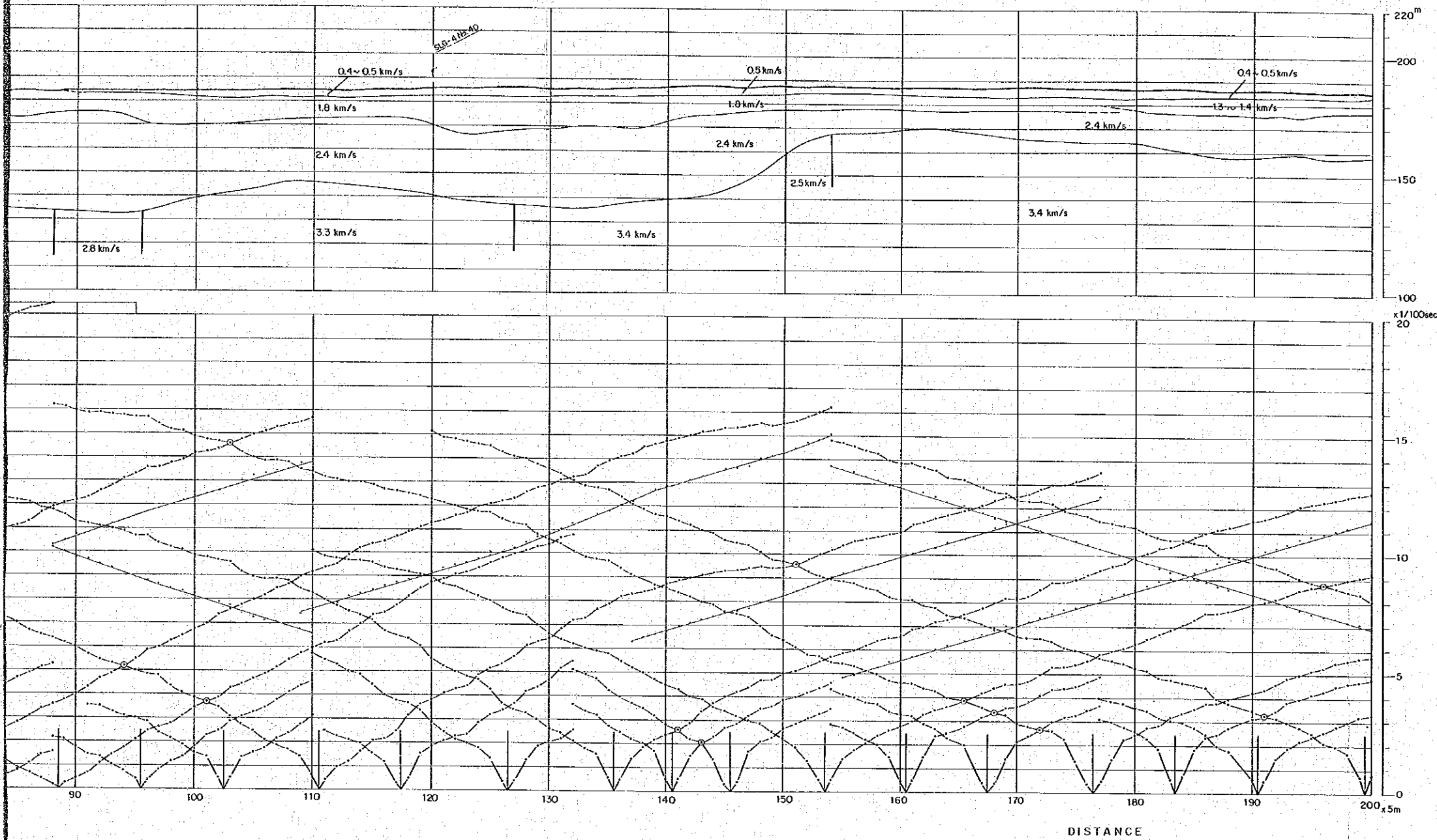
SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SLG-1

HIS MAJESTY'S GOVERNMENT OF NEPAL  
SAPT GANDAKI HYDROELECTRIC  
POWER DEVELOPMENT PROJECT  
FEASIBILITY REPORT  
JAPAN INTERNATIONAL COOPERATION AGENCY

SL-G-2



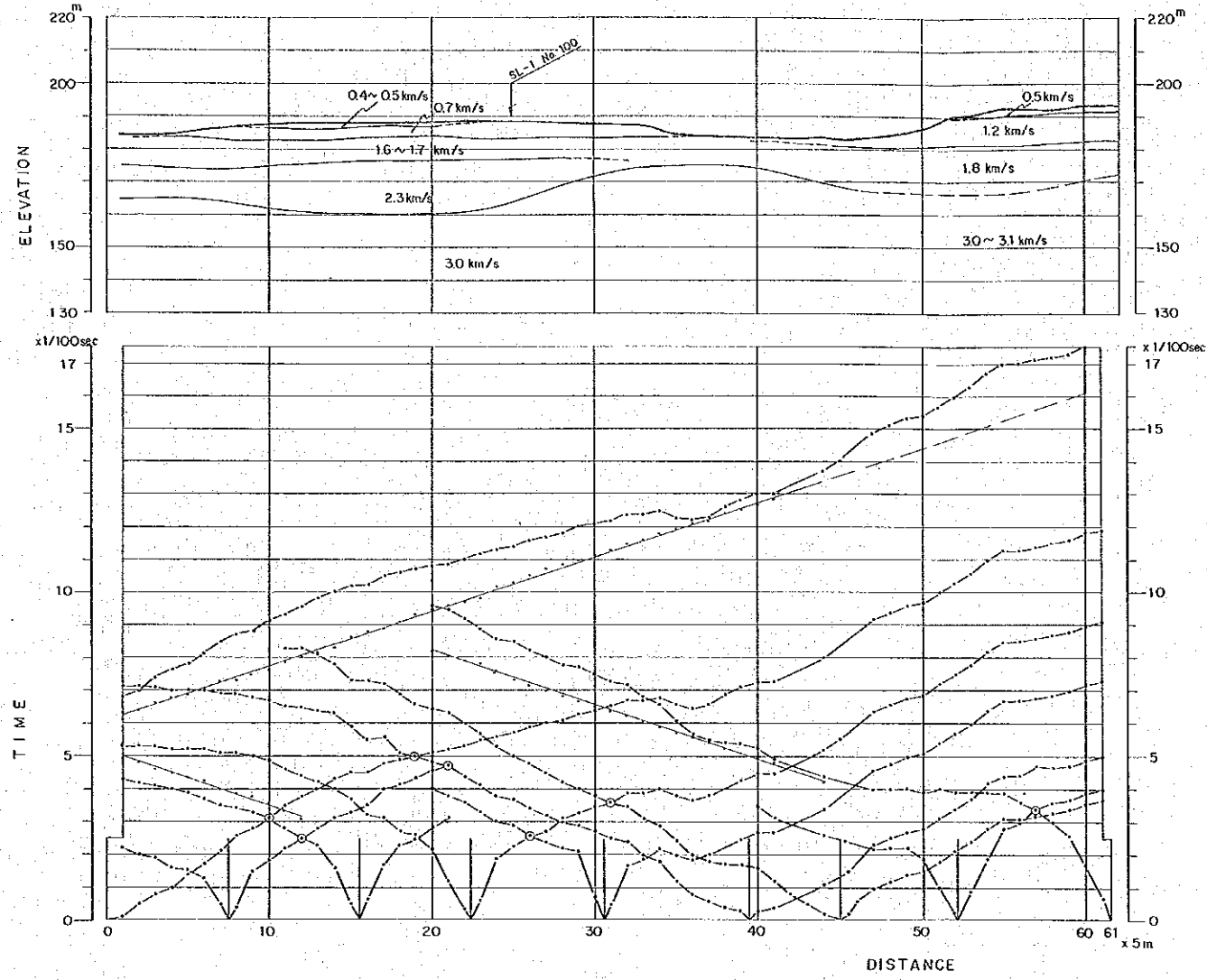
SL-G-2



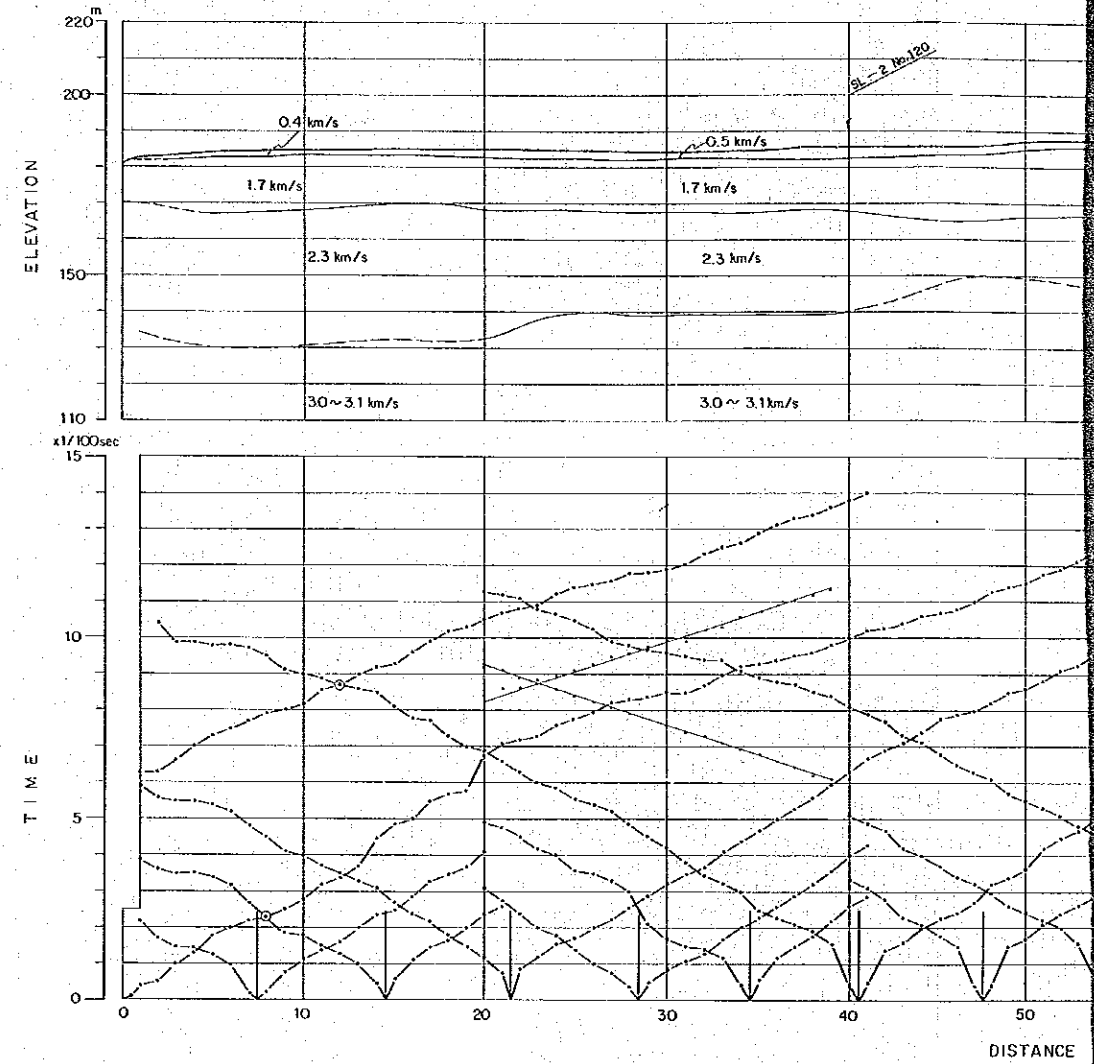
SEISMIC REFRACTION PROFILE  
TIME-DISTANCE PLOT  
AND  
INTERPRITATION  
PROFILE NO. SLG-2

HIS MAJESTY'S GOVERNMENT OF NEPAL  
SAPT GANDAKI HYDROELECTRIC  
POWER DEVELOPMENT PROJECT  
FEASIBILITY REPORT  
JAPAN INTERNATIONAL COOPERATION AGENCY

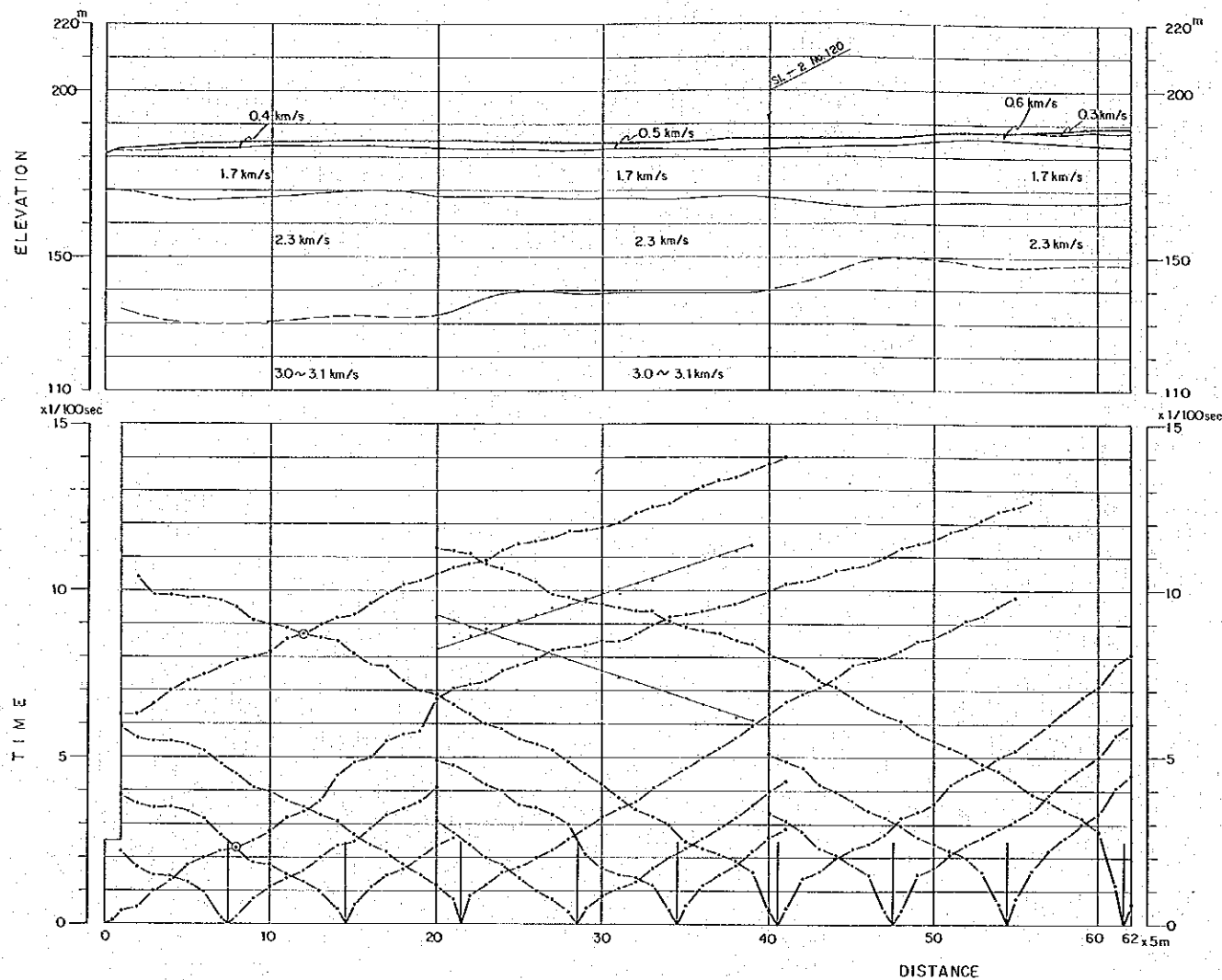
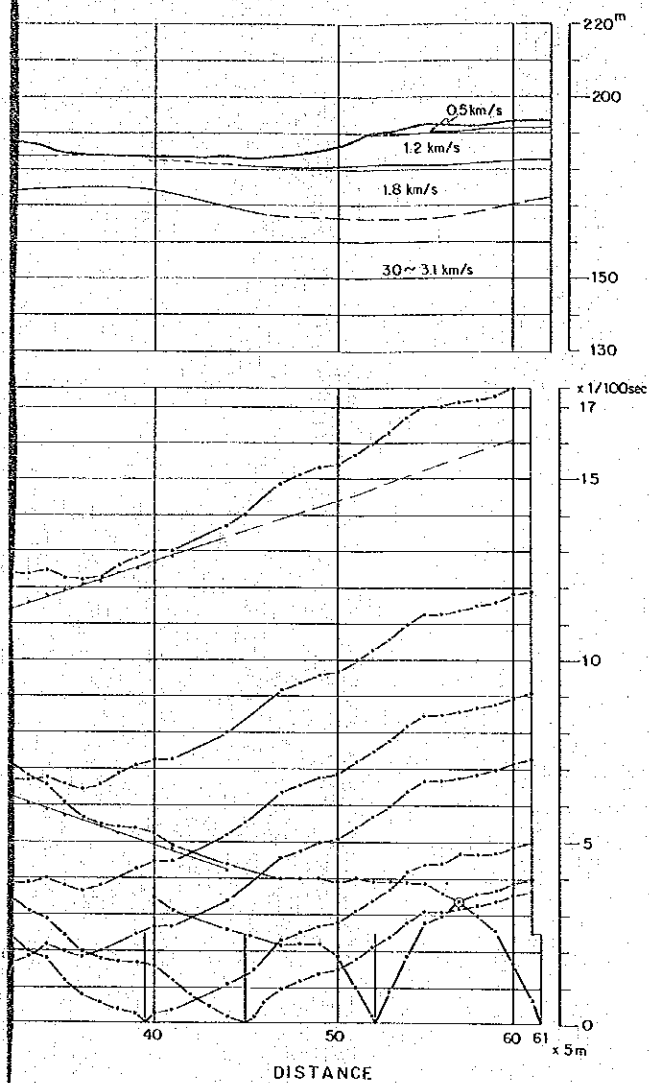
SL-G-3



SL-G-4



SL-G-4



SEISMIC REFRACTION PROFILES  
 TIME-DISTANCE PLOT  
 AND  
 INTERPRITATION  
 PROFILE NOS. SLG-3 AND SLG-4

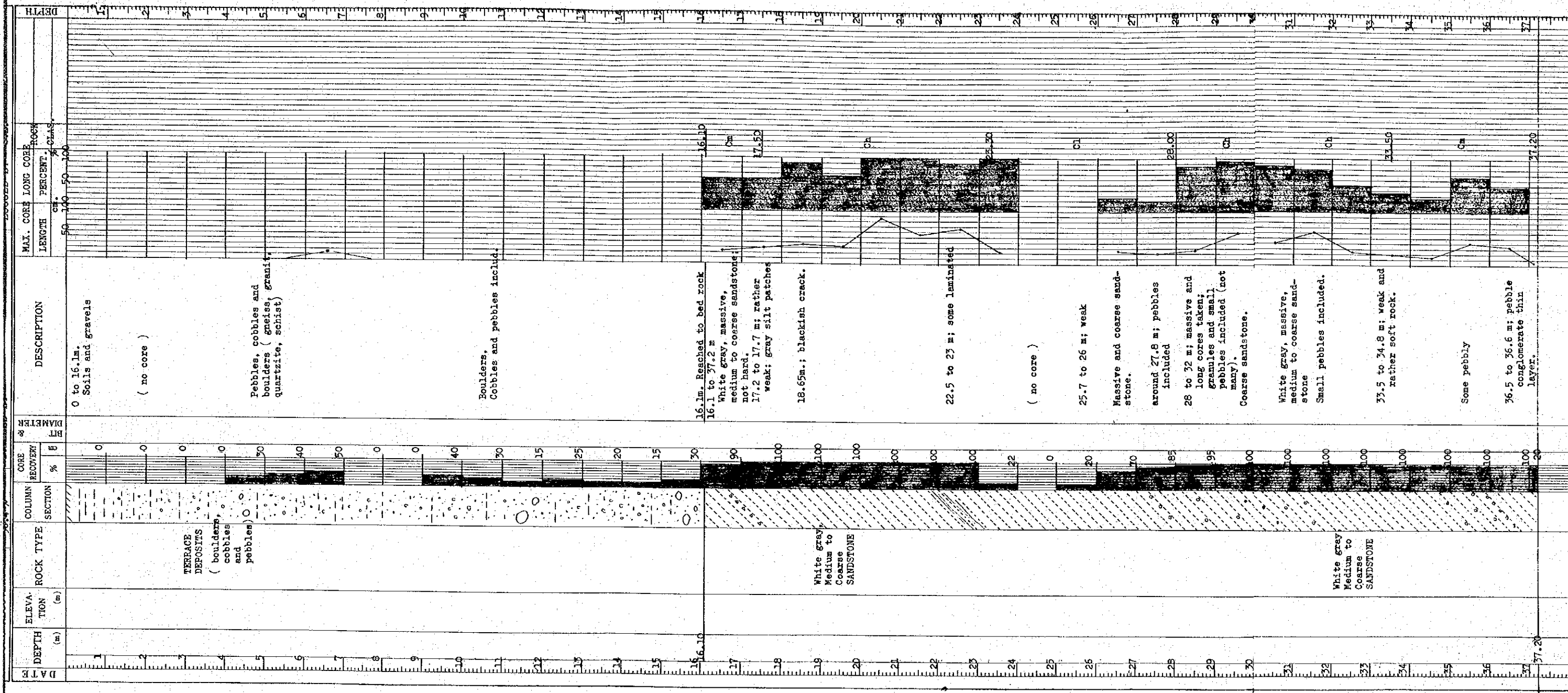


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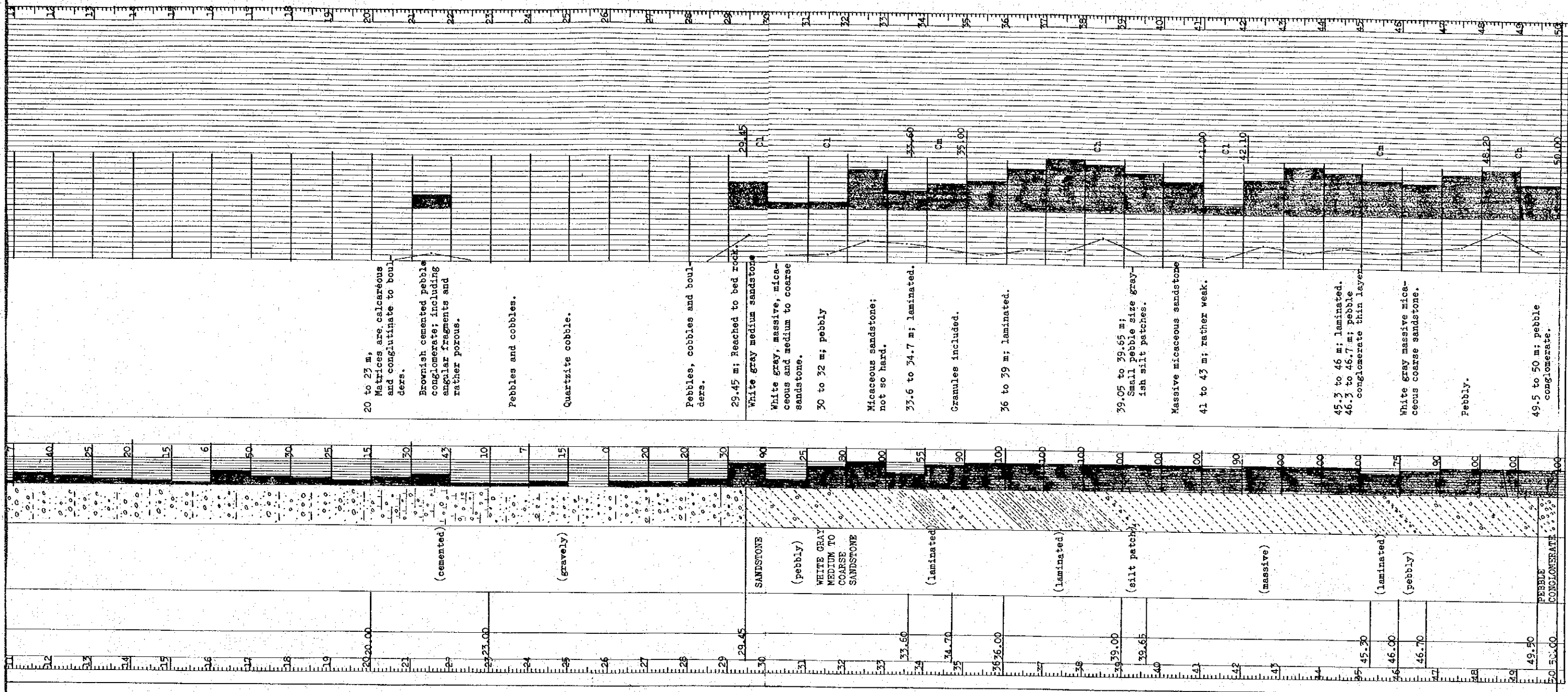
DRILL LOG (47 SHEETS)

GEOLOGICAL RECORD OF DRILL HOLE									
PROJECT		SAFT GANDAKI PROJECT		LOCATION		LEFT BANK		HOLE No. DG-1	
ELEVATION OF GROUND SURFACE		DIAMETER OF HOLE		DEPTH OF HOLE		INCLINATION OF HOLE		VERTICAL	
CORE RECOVERY		MACHINE		DATE OF DRILLING		LOGGED BY		S.K.	
DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	RECOVERY %	DIAMETER (cm)	DESCRIPTION	MAX. CORE LENGTH (cm)	LONG CORE PERCENT	ROCK CLASS.
0				0	100	0 to 16.1m. Soils and gravels			
1				0	100	(no core)			
2				0	100				
3		TERRACE DEPOSITS (boulders, cobbles and pebbles)		0	100	Pebbles, cobbles and boulders (gneiss, granite, quartzite, schist)			
4				0	100				
5				0	100				
6				0	100				
7				0	100				
8				0	100				
9				0	100				
10				0	100				
11				0	100				
12				0	100				
13				0	100				
14				0	100				
15				0	100				
16	16.10			0	100				
16.1				30	100	16.1m. Reached to bed rock			
17				90	100	White gray, massive, medium to coarse sandstone; not hard.			
18				100	100	17.2 to 17.7 m; rather weak; gray silt patches			
19		White gray, Medium to Coarse SANDSTONE		100	100	18.65m.; blackish crack.			
20				100	100				
21				100	100				
22				100	100				
23				100	100	22.5 to 23 m; some laminated			
24				100	100				
25				100	100	(no core)			
26				100	100	25.7 to 26 m; weak			
27				100	100	Massive and coarse sandstone.			
28				100	100	around 27.8 m; pebbles included			
29				100	100	28 to 32 m; massive and long cores taken; granules and small pebbles included (not many).			
30				100	100	Coarse sandstone.			
31				100	100	White gray, massive, medium to coarse sandstone			
32		White gray, Medium to Coarse SANDSTONE		100	100	Small pebbles included.			
33				100	100				
34				100	100	33.5 to 34.8 m; weak and rather soft rock.			





GEOLOGICAL RECORD OF DRILL HOLE									
PROJECT		SAPT GANDAKI PROJECT		LOCATION		DAM SITE LEFT BANK		HOLE No. DG-2	
ELEVATION OF GROUND SURFACE		DEPTH OF HOLE		INCLINATION OF HOLE		VERTICAL			
DIA		CORE RECOVERY		MACHINE		DATE OF DRILLING		LOGGED BY S.K.	
DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	CORE RECOVERY %	BIT DIAMETER	DESCRIPTION	MAX. CORE LONG LENGTH cm	PERCENT CLASS %	DEPTH
0		TOP SOIL		80		0 to 1 m. Blackish brown top soil.	50	100	0
1	1.00	TERRACE DEPOSITS (silty)		80		Dark brownish micaceous soil; silty			1
2	2.50	(sandy)		80		Sandy; coarse sands and granules included.			2
8	8.15	(sandy)		80		8.15 to 9 m. no core.			8
9		(gravelly)		10					9
10				15					10
11				7					11
12				40					12
13				25					13
14				20					14
15				15					15
16				6					16
17				50					17
18				30					18
19				25					19
20	20.00			15		20 to 23 m. Matrices are calcareous and conglomerate to boulders.			20
21				30					21
22				20					22
23	23.00	(cemented)		43		Brownish cemented pebble conglomerate; including angular fragments and rather porous.			23
24				10					24
25		(gravelly)		7					25
26				15					26
27				0					27
28				20					28
29				20					29
29.45	29.45			30		29.45 m; Reached to bed rock.			29.45
30		SANDSTONE		90		White gray medium sandstone			30
31		(pebbly)		25		White gray, massive, micaceous and medium to coarse sandstone.			31
32		WHITE GRAY MEDIUM TO COARSE SANDSTONE		80		30 to 32 m; pebbly			32
33				00		Micaceous sandstone; not so hard.			33
33.60	33.60			55		33.6 to 34.7 m; laminated.			33.60
34		(laminated)							34



20 to 23 m, Matrices are calcareous and conglutinate to boulders.

Brownish cemented pebble conglomerate; including angular fragments and rather porous.

Pebbles and cobbles.

Quartzite cobble.

Pebbles, cobbles and boulders.

29.45 m; Reached to bed rock.

White gray medium sandstone  
White gray, massive, micaceous and medium to coarse sandstone.

30 to 32 m; pebbly

Micaceous sandstone; not so hard.

33.6 to 34.7 m; laminated.

Cranules included.

36 to 39 m; laminated.

39.05 to 39.65 m; Small pebble size grayish silt patches.

Massive micaceous sandstone

41 to 43 m; rather weak.

45.3 to 46 m; laminated.  
46.3 to 46.7 m; pebble conglomerate thin layer

White gray massive micaceous coarse sandstone.

Pebbly.

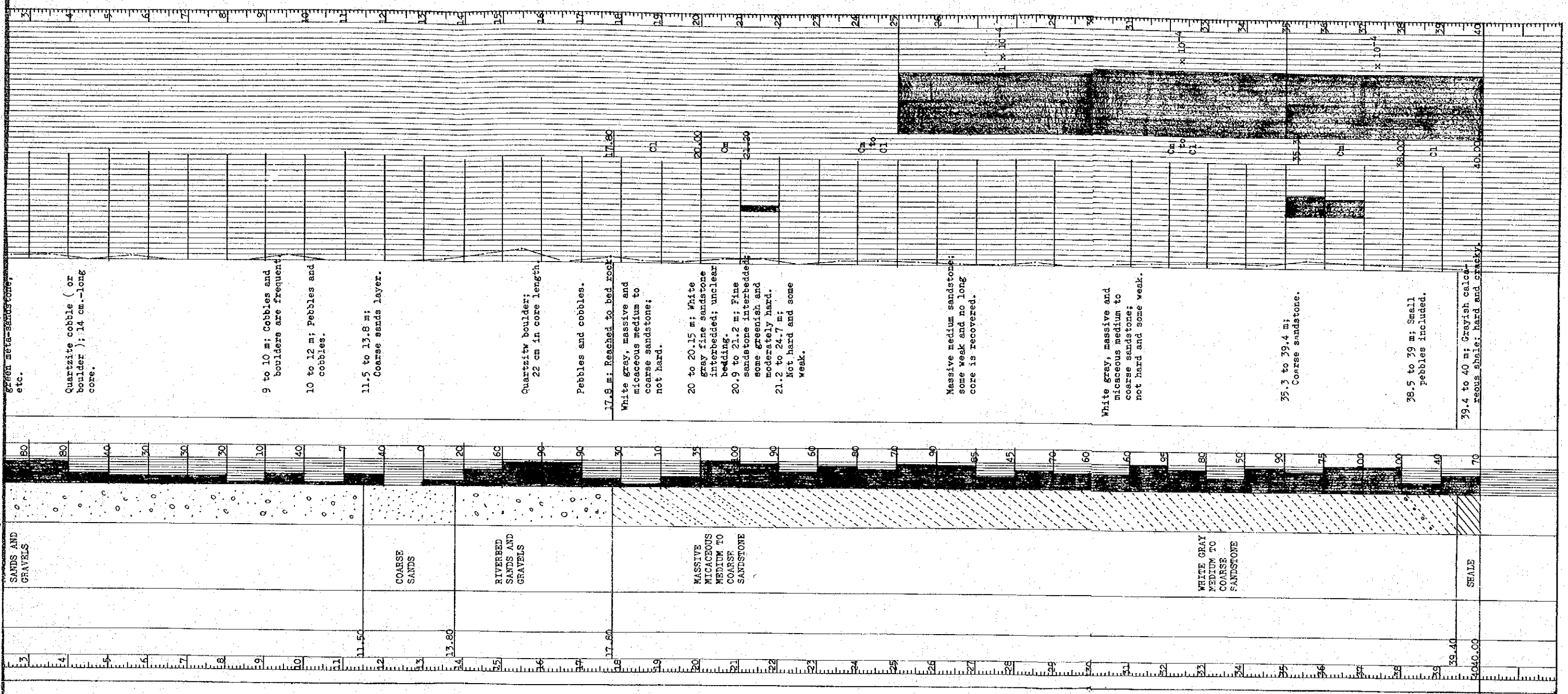
49.5 to 50 m; pebble conglomerate.

GEOLOGICAL RECORD OF DRILL HOLE HOLE No. DG-3									
PROJECT		SAPT SANDAKI PROJECT		LOCATION		RIVERBED: UPSTREAM			
ELEVATION OF GROUND SURFACE		DIAMETER OF HOLE		DEPTH OF HOLE		INCLINATION OF HOLE		VERTICAL	
CORE RECOVERY		57.0 %		MACHINE		DATE OF DRILLING		LOGGED BY S.K.	
DATE	DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	CORE RECOVERY %	BIT DIAMETER	DESCRIPTION	MAX. CORE LENGTH cm.	LONG CORE PERCENT CLAS.
	0						0 to 15.5 m; Riverbed sands and gravels.		
	2		RIVERBED SANDS AND GRAVELS		50		Boulders and cobbles of quartzite, quartz-schist and slate.		
	4				10				
	6				25		Boulders, cobbles and pebbles of quartzite, granite and gneiss.		
	8				15				
	10				25				
	12				0		Boulders.		
	14				70				
	16				20				
	18				0		9 to 15 m; no core; (sandy?)		
	20				0				
	22				0				
	24				0				
	26				0				
	28				0				
	30				0				
	31.50				0				
	15.50				0		15.5 m. Reached to bed rock		
	15.50				50		White gray, massive, micaceous and medium to coarse sandstone.		
	17		White gray Medium to Coarse SANDSTONE		100		16 to 17.5 m; Pebbles included.		
	18				100		17.5 to 19.5 m; weakness		
	19				100				
	20		(silt patch)		100		19.3 to 19.5 m; Subangular and soft silt pebbles included.		
	21				100		19.5 to 20 m; Grayish silt patches.		
	21.05				100				
	22				100		21.05 to 25.3 m; Gray to dark gray well laminated silt to very fine sandstone.		
	23		Laminated SILTSTONE AND SANDSTONE		100		at 23 m; fault breccia ( 5 cm thick )		
	24				100		Long cores.		
	25				100				
	26				100		25.3 to 31.3 m; White gray, massive and micaceous medium sandstone.		
	27		White gray Medium SANDSTONE		100		Massive and long cores.		
	28				100				
	29				100		29.1 to 29.7 m; Rather weak.		
	30				100		29.7 to 31.3 m; Long cores and good condition.		
	31				100				
	31.30				30				

**GEOLOGICAL RECORD OF DRILL HOLE**      HOLE No. B80-1

PROJECT	SAPT GANDAKI PROJECT	LOCATION	RIVERBED
ELEVATION OF GROUND SURFACE	40.0 M	INCLINATION OF HOLE	VERTICAL
DIAMETER OF HOLE	100 to 46 mm	DATE OF DRILLING	FEB.23 to MAR.11, 1981
CORE RECOVERY	57.2 %	DRILLED BY	M.K.JDO
		MACHINE	TONE UD-5
		LOGGED BY	S.KUMAZAWA

DATE	DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	CORE RECOVERY %	DIAMETER (mm)	DESCRIPTION	MAX. CORE LONG CORE ROCK COEFFICIENT OF PERMEABILITY CLASS (cm/sec)	
								cm	x 10 <sup>-5</sup>
	0						0 to 17.8 m; Riverbed sands and gravels.		
	2		RIVERBED SANDS AND GRAVELS		80	80	Pebbles, cobbles and boulders of quartzite, granite, schist, gneiss, green meta-sandstone, etc.		
	4				80	80	Quartzite cobble (or boulder); 14 cm.-long core.		
	9				10	10	9 to 10 m; Cobbles and boulders are frequent.		
	10				40	40	10 to 12 m; Pebbles and cobbles.		
	11.5				7	7	11.5 to 13.8 m; Coarse sands layer.		
	13.8		COARSE SANDS		40	40			
	17.8		RIVERBED SANDS AND GRAVELS		20	20	Quartzite boulder; 22 cm in core length.		
	17.8				60	60	Pebbles and cobbles.		
	17.8				90	90	17.8 m. Reached to bed rock.		
	19				10	10	White gray, massive and micaceous medium to coarse sandstone; not hard.		
	20		MASSIVE MICACEOUS MEDIUM TO COARSE SANDSTONE		35	35	20 to 20.15 m; White gray fine sandstone interbedded; unclear bedding.		
	21				100	100	20.9 to 21.2 m; fine sandstone interbedded; some greenish and moderately hard.		
	21.2				90	90	21.2 to 24.7 m; Not hard and some weak.		
	24				60	60			
	26				80	80	Massive medium sandstone; some weak and no long core is recovered.		
	27				90	90			
	28				85	85			
	28				45	45			
	29				70	70			
	31		WHITE GRAY MEDIUM TO COARSE SANDSTONE		60	60	White gray, massive and micaceous medium to coarse sandstone; not hard and some weak.		
	32				95	95			
	33				80	80			
	34				50	50			

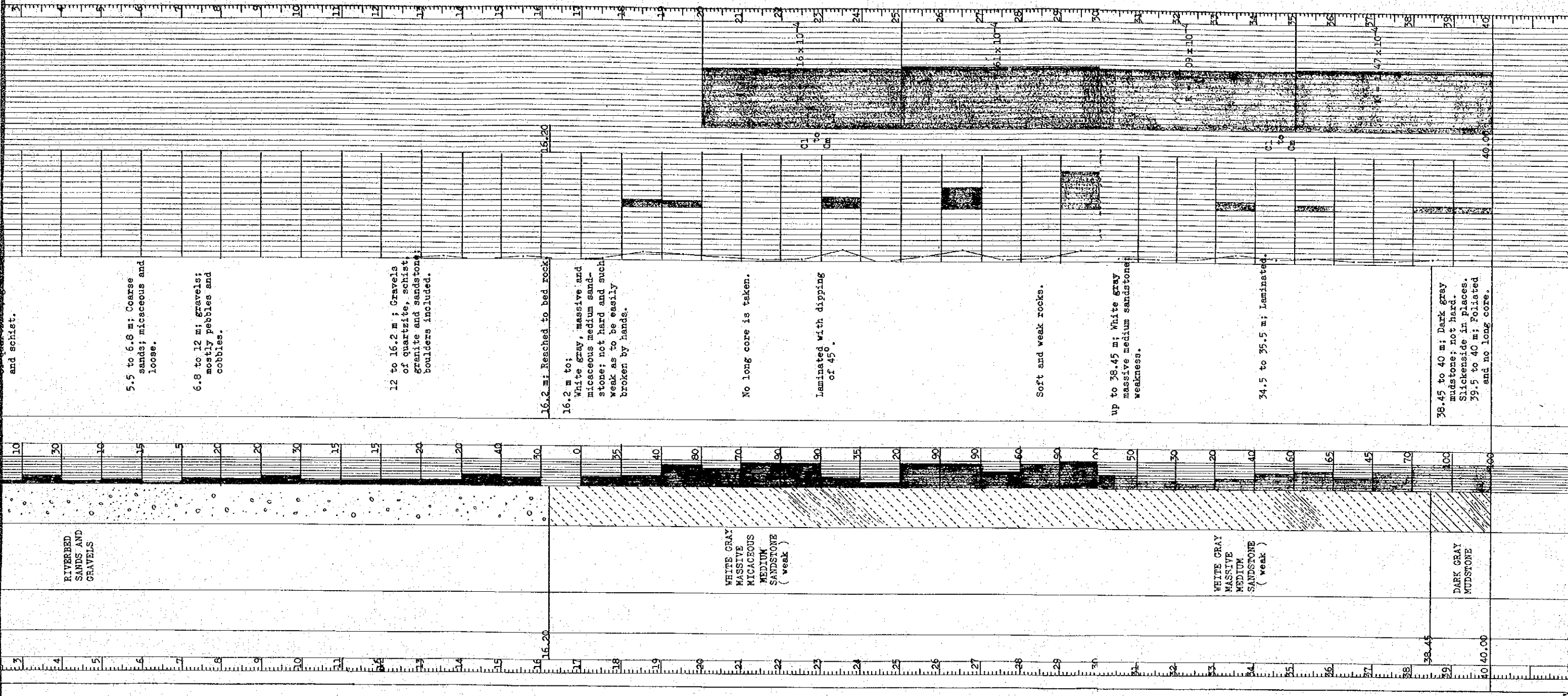




**GEOLOGICAL RECORD OF DRILL HOLE**      HOLE No. B80-2

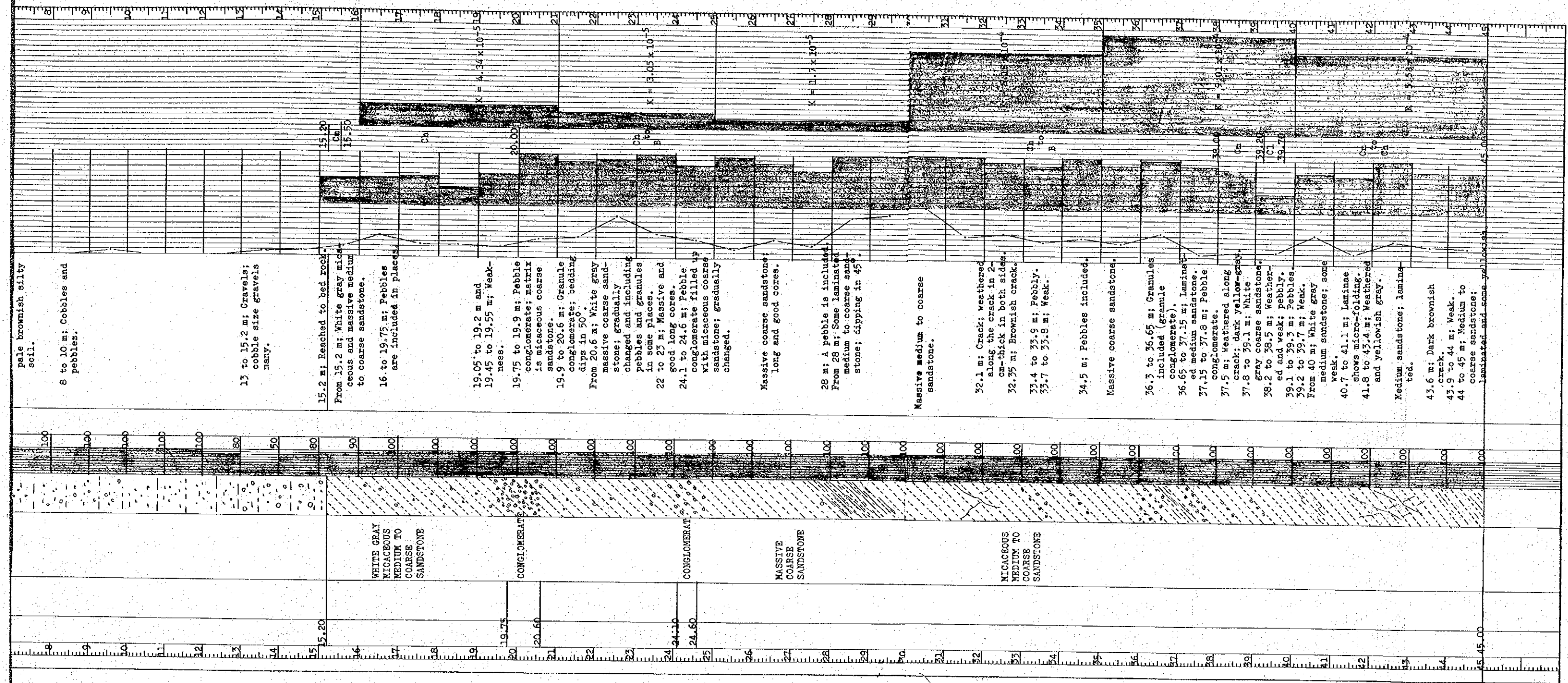
PROJECT: SAFT GANDAKI PROJECT      LOCATION: DAM SITE: RIVERBED  
 ELEVATION OF GROUND SURFACE: 40.0 M      INCLINATION OF HOLE: VERTICAL  
 DIAMETER OF HOLE: 100 to 56 mm      MACHINE: TD-5      DATE OF DRILLING: MAR. 13 to 22, 1981  
 CORE RECOVERY: 45.6%      DRILLED BY: W. KIDO      LOGGED BY: S. KUMAZAWA

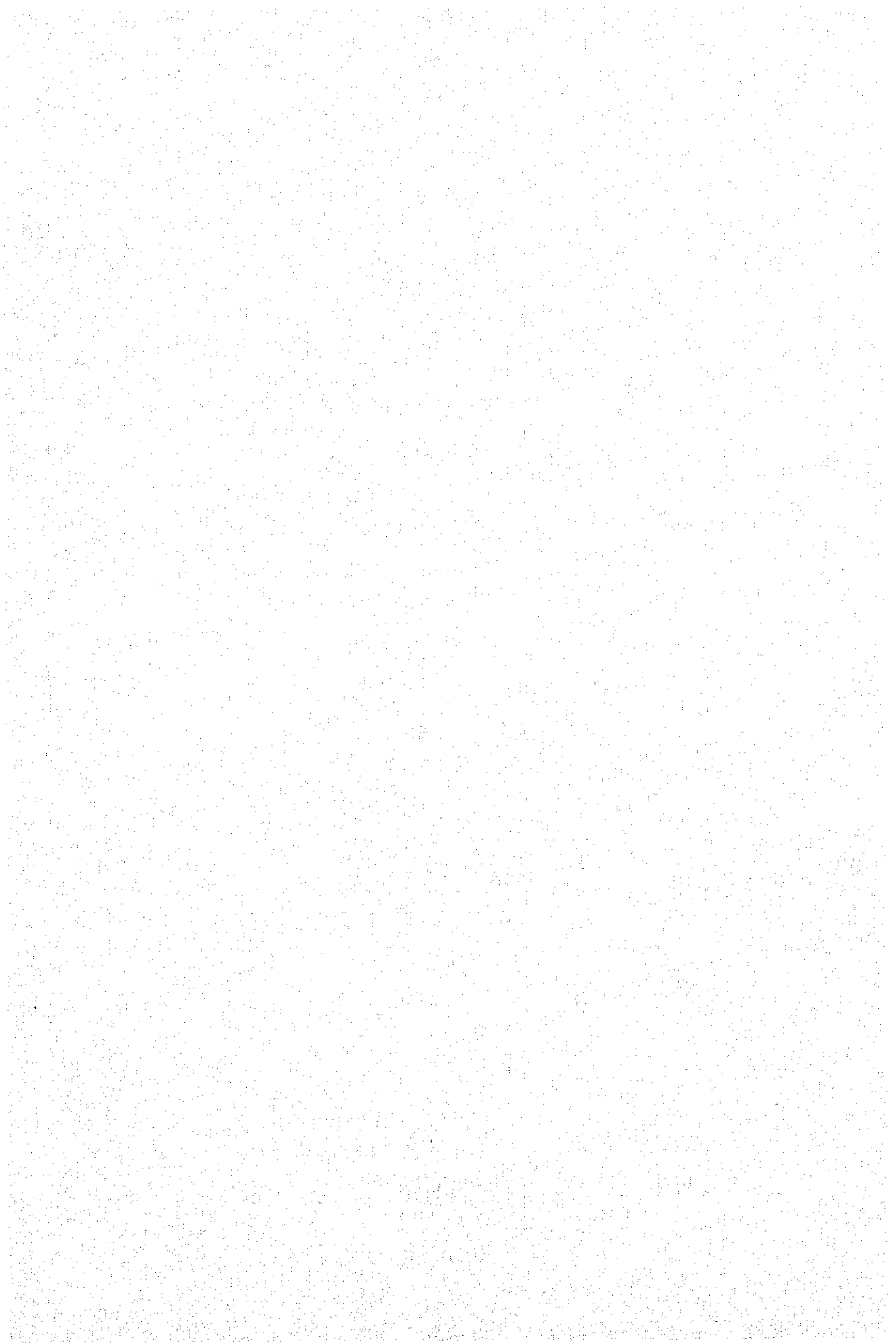
DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	CORE RECOVERY %	CORE DIAMETER	DESCRIPTION	MAX. CORE LONG CORE		Coefficient of permeability (cm/sec) x 10 <sup>-5</sup>
							PERCENT	ROCK	
0 to 16.2		RIVERBED SANDS AND GRAVELS		30	30	0 to 16.2 m; Riverbed sands and gravels.			
0 to 5.5				45	45	0 to 5.5 m; Gravels, pebbles and cobbles of quartzite, granite and schist.			
5.5 to 6.8				10	10	5.5 to 6.8 m; Coarse sands; micaceous and loose.			
6.8 to 12				30	30	6.8 to 12 m; Gravels; mostly pebbles and cobbles.			
12 to 16.2				15	15	12 to 16.2 m; Gravels of quartzite, schist, granite and sandstone; boulders included.			
16.2	16.20			15	15	16.2 m to: Reached to bed rock			
16.2 to 34.5		WHITE GRAY MASSIVE MICACEOUS MEDIUM SANDSTONE (weak)		30	30	16.2 m to: White gray, massive and micaceous medium sandstone; not hard and such weak as to be easily broken by hands.			
34.5 to 35.5				35	35	No long core is taken.			
35.5 to 36.45				40	40	Laminated with dipping of 45°.			
36.45 to 39.5				80	80	Soft and weak rocks.			
39.5 to 45.5				70	70	up to 36.45 m; White gray massive medium sandstone; weakness.			
45.5 to 50				90	90				
50 to 54				90	90				
54 to 58				60	60				
58 to 62				90	90				
62 to 66				90	90				
66 to 70				50	50				
70 to 74				30	30				
74 to 78				20	20				
78 to 82				40	40				
82 to 86				20	20				
86 to 90				40	40				





GEOLOGICAL RECORD OF DRILL HOLE									
PROJECT		SAPT SANDAKI PROJECT		LOCATION		DAW SITE: LEFT BANK		HOLE No. B80-3	
ELEVATION OF GROUND SURFACE		100 to 66 mm		DEPTH OF HOLE		45.0 M		INCLINATION OF HOLE	
DIAMETER OF HOLE		100 to 66 mm		MACHINE		KOKEN OB-2L		DATE OF DRILLING	
CORE RECOVERY		97.8 %		DRILLED BY		T. KODAMA		LOGGED BY	
								S. KUMAZAWA	
								FEB. 28 to MAR. 18, 1981	
								VERTICAL	
DEPTH (m)	ELEVATION (m)	ROCK TYPE	COLUMN SECTION	CORE RECOVERY %	BIT DIAMETER	DESCRIPTION	MAX. CORE LONG CORE LENGTH PERCENT.	ROCK CLASS	Coefficient of permeability (cm/sec) x 10 <sup>-4</sup>
0 to 15.2		TOP SOIL		100		Terrace deposits; Gravels and soils.			
0 to 0.4		SILTY SOIL		100		0 to 0.4 m; Top soil; grayish brown.			
0.4 to 1.8				100		0.4 to 1.8 m; Pale brown silty soil with small rock fragments.			
1.8 to 15.2				100		1.8 to 15.2 m; Terrace deposits; gravels filled up with pale brownish silty soil; including boulders.			
1.9 to 3.75				100		1.9 to 3.75 m; Cobbles and boulders of quartzite and granite.			
4 to 4.8		TERRACE DEPOSITS		100		4 to 4.8 m; Smaller size gravels; pebbles and granules.			
5.8				100		5.8 m; Quartzite boulder.			
6 to 8				100		6 to 8 m; Pebbles with pale brownish silty soil.			
8 to 10				100		8 to 10 m; Cobbles and pebbles.			
13 to 15.2				100		13 to 15.2 m; Gravels; cobble size gravels many.			
15.2				80		15.2 m; Reached to bed rock.			
15.2 to 19.45		WHITE GRAY MICACEOUS MEDIUM TO COARSE SANDSTONE		90		From 15.2 m; White gray micaceous and massive medium to coarse sandstone.		Ch	15.20
16 to 19.75				100		16 to 19.75 m; Pebbles are included in places.		Ch	15.75
19.05 to 19.2				100		19.05 to 19.2 m and 19.45 to 19.55 m; Weakness.			
19.75 to 19.9				100		19.75 to 19.9 m; Pebble conglomerate; matrix is micaceous coarse sandstone.			
19.9 to 20.6		CONGLOMERATE		100		19.9 to 20.6 m; Granule conglomerate; bedding dips in 50°.			
20.6 to 24.1				100		From 20.6 m; White gray massive coarse sandstone; gradually changed and including pebbles and granules in some places.			
22 to 23				100		22 to 23 m; Massive and good long cores.			
24.1 to 24.6		CONGLOMERATE		100		24.1 to 24.6 m; Pebble conglomerate filled up with micaceous coarse sandstone; gradually changed.			
28 to 32.1		MASSIVE COARSE SANDSTONE		100		Massive coarse sandstone; long and good cores.			
28				100		28 m; A pebble is included.			
28 to 32.35				100		From 28 m; Some laminated medium to coarse sandstone; dipping in 45°.			
32.35 to 33.4				100		Massive medium to coarse sandstone.			
32.1 to 32.35				100		32.1 m; Crack; weathered along the crack in 2-cm-thick in both sides.			
32.35 to 33.4				100		32.35 m; Brownish crack.			
33.4 to 33.7				100		33.4 to 33.7 m; Pebbly.			
33.7 to 33.8				100		33.7 to 33.8 m; Weak.			





# DRILL LOG

HOLE NO. BB1-1 SHEET NO. 1 OF 1

PROJECT		SAPT GANDAKI PROJECT			DEPTH	30 M	ELEVATION				
SITE		DAMSITE A; LEFT BANK		COORDINATE	INCLINATION	VERTICAL	DRILL RIG				
AVERAGE CORE RECOVERY		77.7%		DATE	FROM OCT.20 TO NOV.6	DRILLED	LOGGED				
						by M. KIDO	by KUMAZAWA				
DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY	MAX. CORE LENGTH	WATER IN TEST PERMEABILITY (K)	DEPTH
	1.20		Top Soil		Dark reddish brown						
	2				Yellowish brown Sands and silts with gravels.	66 mm					
	3										
	4				1.4 to 1.6 m; Including a decomposed sandstone boulder.						
	5										
	6										
	7		Terrace Deposits								
	8				8 to 10 m; Gravels are not many. 8.5 to 9.5 m; Extremely micaceous.						
	9										
	10										
	11				10.6 m; Granite boulder.						
	12				11 to 13 m; No core.						
	13										
	14				13 to 15.1 m; Dirty gray and muddy.						
	15				14.7 to 15 m; Blackish						
	16				15.1 to 18.8 m; Yellowish gray and/or yellowish brown sandy silt with gravels.						
	17										
	18										
	19		Terrace Deposits		18.8 to 20.0 m; Gravely. Quartzite and granite boulders are contained.	66 mm					
	20				20.0 to 23.3 m; Dirty brownish gray sandy silt with gravels.						
	21										
	22										
	23				23.3 to 30.0 m; Terrace gravels. Including quartzite boulders commonly.						
	24										
	25										
	26										
	27										
	28										
	29										
	30										

LOG FORM-B

HOLE NO. BB1-1

\*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 10kg/cm<sup>2</sup>  
 \*DEPTH and ELEVATION are in meter  
 \*DIAMETER is in millimeter