Appendix 7.7

Log and Photograph of Pit

TEST PIT CGP-1

LOCATION. **Alluvial terrace (west part), left margin of Torola River, upstream Chaparral Dam Site**
DEPTH: 3.00 meter
LOGGED: Geol. **L.Pérez Coordinates and elevation: x=570.590, y=304.401, z =149.00m**

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION	PHOTO
	0.50 1.00 1.50		Sand, light brown, loose, low water content, fine to medium grained, contents few gravel blocks, subrounded up to 10 cm in size, with traces of silt and pumice sand	
			1.90 m	
	2.00 2.50 3.00		Sand and gravel, sand are fine to medium grained, light brown, loose, low water content, contents gravel blocks, volcanics, hard, subrounded to rounded, up to 60 cm in size	
			3.00 m	

TEST PIT CGP-2

LOCATION: **Alluvial terrace (central part), left margin of Torola River, upstream Chaparral Dam Site**
DEPTH: 3.00 meter
LOGGED: Geol. **L.Pérez Coordinates and elevation: x=570.720, y=304.398, z =148.00m**

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION	PHOTO
	0.50 1.00 1.50 2.00 2.50 3.00	3.00 m	Sand and gravel, sand are dark brown, low water content, loose, medium to coarse grained, contents volcanic gravel, subrounded to rounded, hard, up to 80 cm in diameter	

TEST PIT CGP-3

LOCATION: **Alluvial terrace (east part), left margin of Torola River, upstream Chaparral Dam Site**
DEPTH: 3.00 meter
LOGGED: Geol **L.Pérez Coordinates and elevation: x=570.850, y=304.380, z =147.00m**

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION	PHOTO
	0.50 1.00 1 50 2 00 2 50 3.00		Sand and gravel, contents medium to medium grained sand, loose, and volcanic gravel, up to 60 cm in diameter, hard, *subrounded* 1.50 m Tuff, greenish green, highly weathered, fine grained, weak, fissible, poorly cemented, water laid 3.00 m	

TEST PIT CGP-4

LOCATION: **Alluvial terrace (east part), right margin of Torola River, upstream Chaparral Dam Site**
DEPTH 3.15 meter
LOGGED. Geol. **L.Pérez** Elevation: 150.00 mosl COORDINATE N 304,317-E571,003

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION
	0.50		**SILTY SAND;** light brown, low water content, low plasticity.
			0.60 m
	1.00		**GRAVEL AND SAND;** sand is medium to coarse grained, light brown, loose, low water content, contents gravel blocks, hard, subrounded to rounded, up to 20 cm in size
	1.50		
	2.00		
	2.50		
	3.00		
			3.10 m WATER LEVEL
			3.15 m **END OF TEST P**

PHOTO

TEST PIT CGP-5

LOCATION: **Alluvial terrace (east part), right margin of Torola River, upstream Chaparral Dam Site**
DEPTH: 1.95 meter
LOGGED Geol **L.Pérez** ELEVATION. 152.00 mosl COORDINATE N 304,183- E 571,167

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION
	0.50 1.00 1.50 2.00		**GRAVEL AND SAND;** subrounded to well rounded, volcanic blocks up to 30 cm in size, sand is medium to coarse. 1.75 m WATER LEVEL. 1.95 m **END OF TEST PIT**

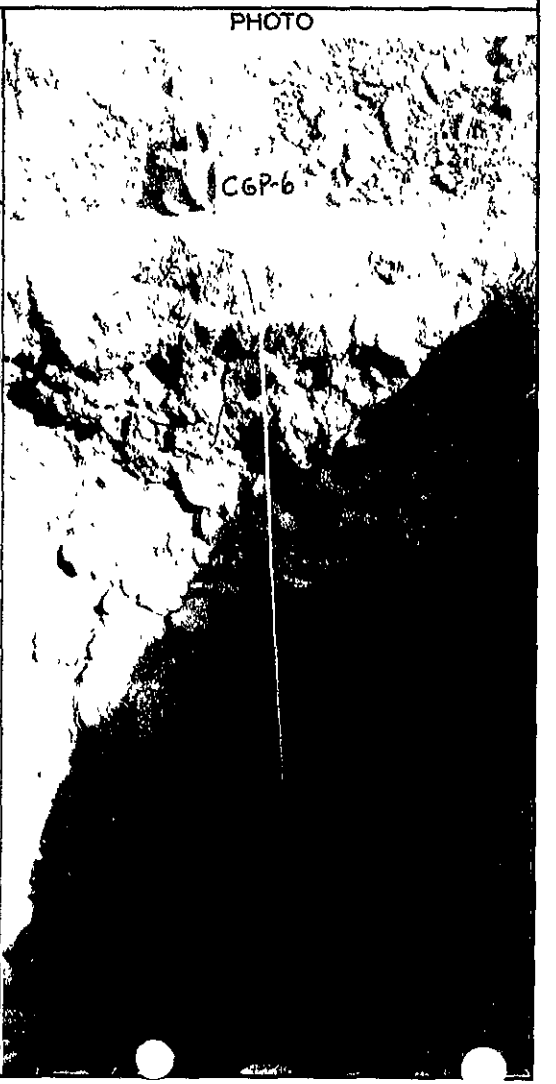
PHOTO

TEST PIT CGP-6

LOCATION. **Alluvial terrace (west part), left margin of Torola River, upstream Chaparral Dam Site**
DEPTH: 3.20 meter
LOGGED: Geol. **L.Pérez** ELEVATION. 154.00 mosl COORDINATES N 570,750- E 304,358

SAMPLE DEPTH	DEPTH m	GRAPHIC	DESCRIPTION
	0		**SILTY SAND;** light brown, low water content, loose, low plasticity
			20 00 cm
	0 50		**SAND AND GRAVEL;** sand is fine to medium grained, low water content, volcanic gravel, subrounded up to 20 cm in size
	1.00		
			1.40 m
	1 50		**GRAVEL AND SAND;** sand is medium to coarse grained, loose, light gray, contents subrounded to well rounded volcanic blocks up to 70 cm in size
	2.00		
	2.50		
	3:00		
			3.20 m END OF TE PIT

PHOTO

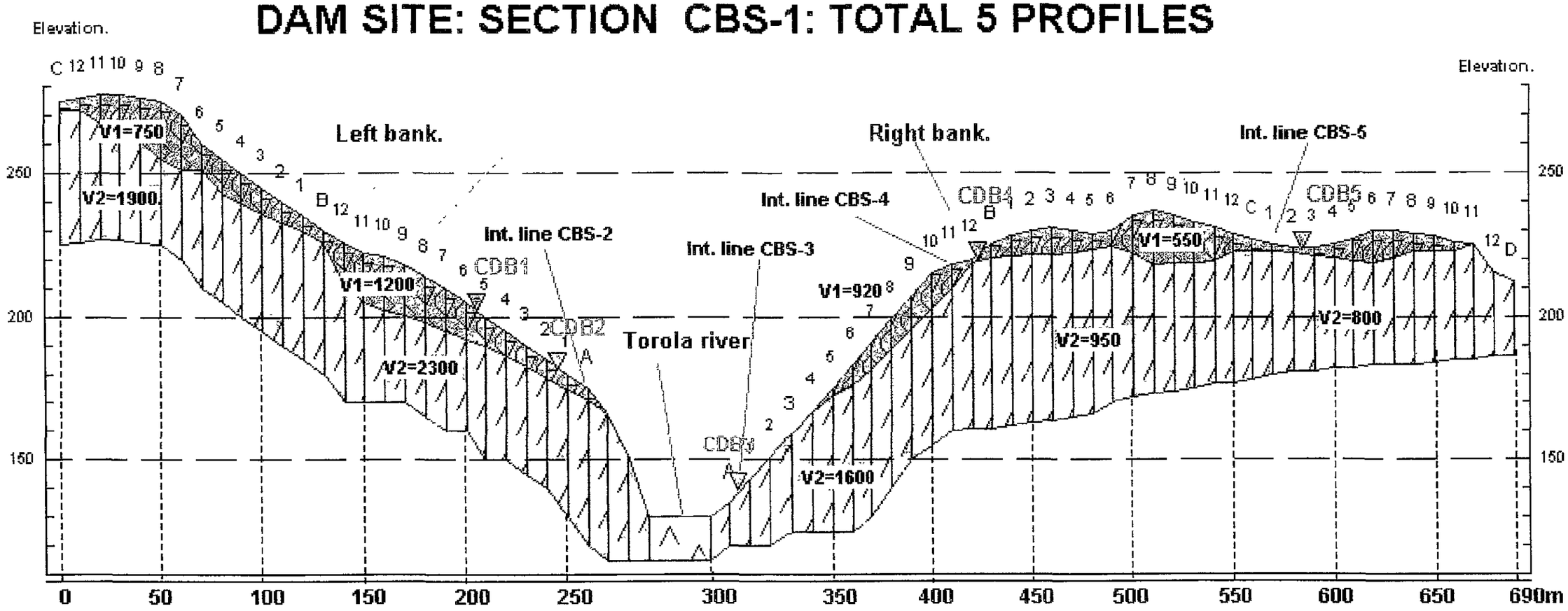


7-7-6

Appendix 7.8

Result of Seismic Prospecting

DAM SITE: SECTION CBS-1: TOTAL 5 PROFILES



LEYEND

Overburden. Weathered rock, residual soil and colluvial deposits.

Local bedrock. Lava and volcanic tuff.

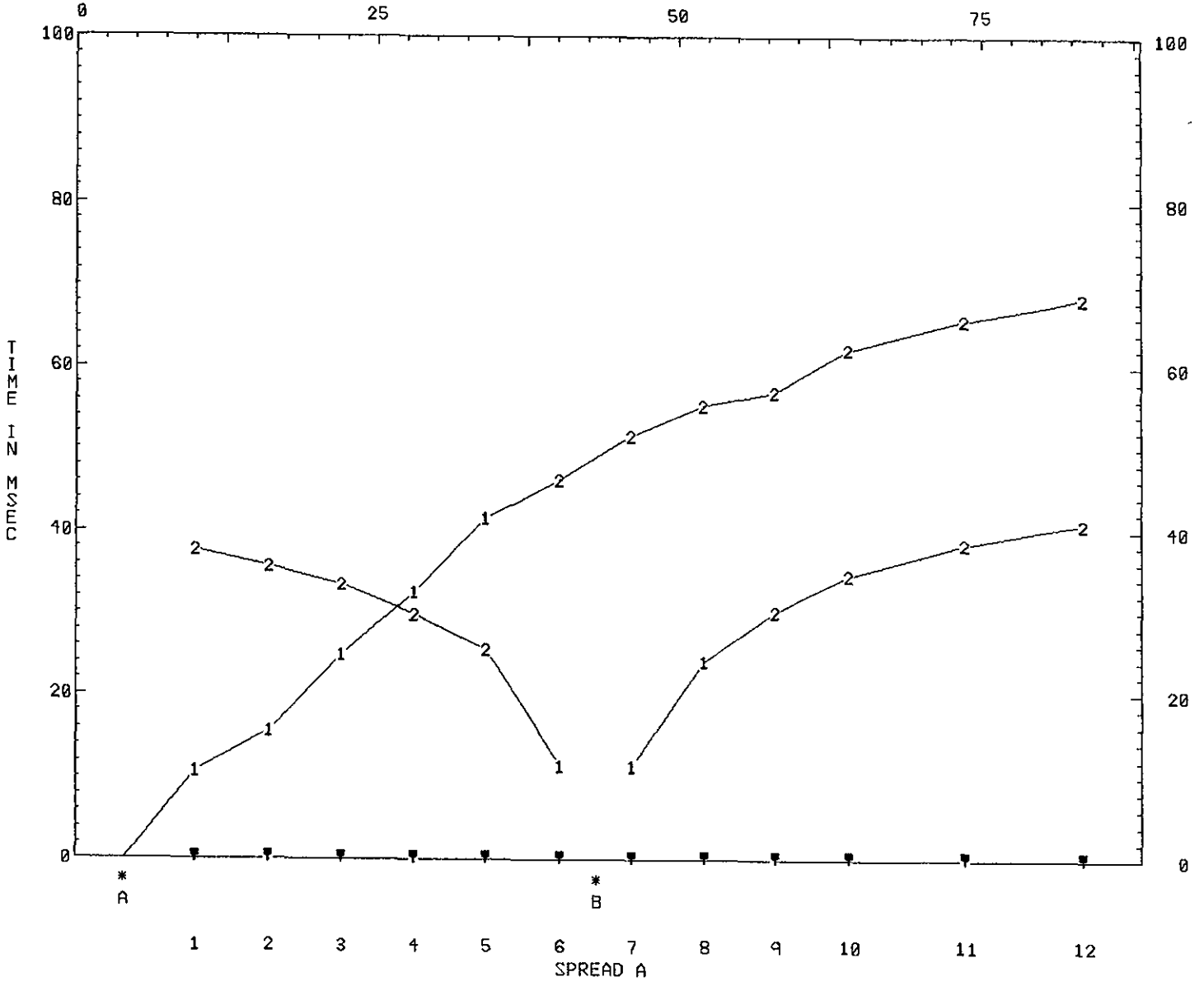
CDB3 ▽ Borehole.

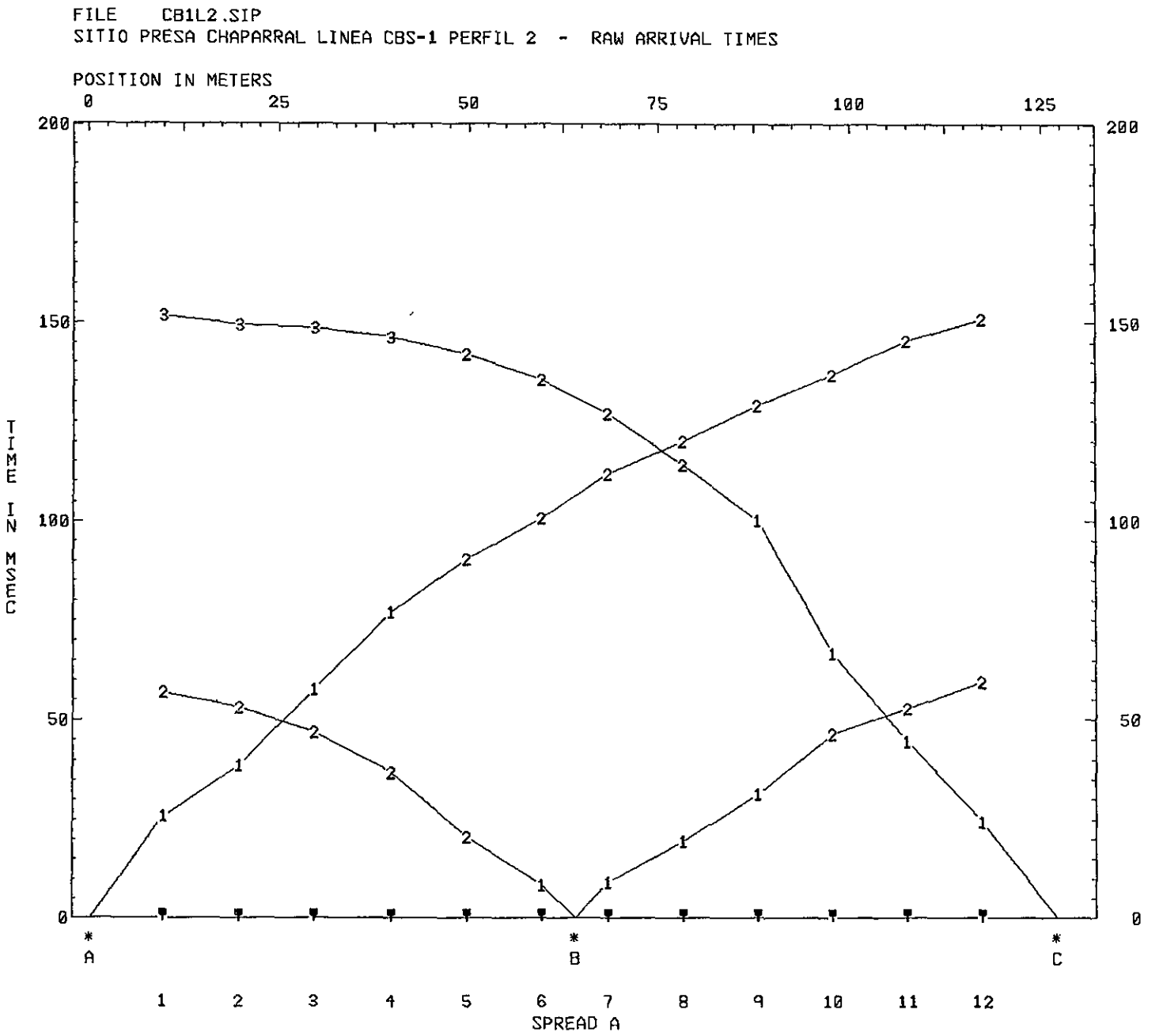
Notes: Geophones every 10 m.
Compresive wave velocity in m/s.

PROJECT.	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT.	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST:	SWISSB @RING
CONTENT:	SECTION CBS-1. DAM AXIS.

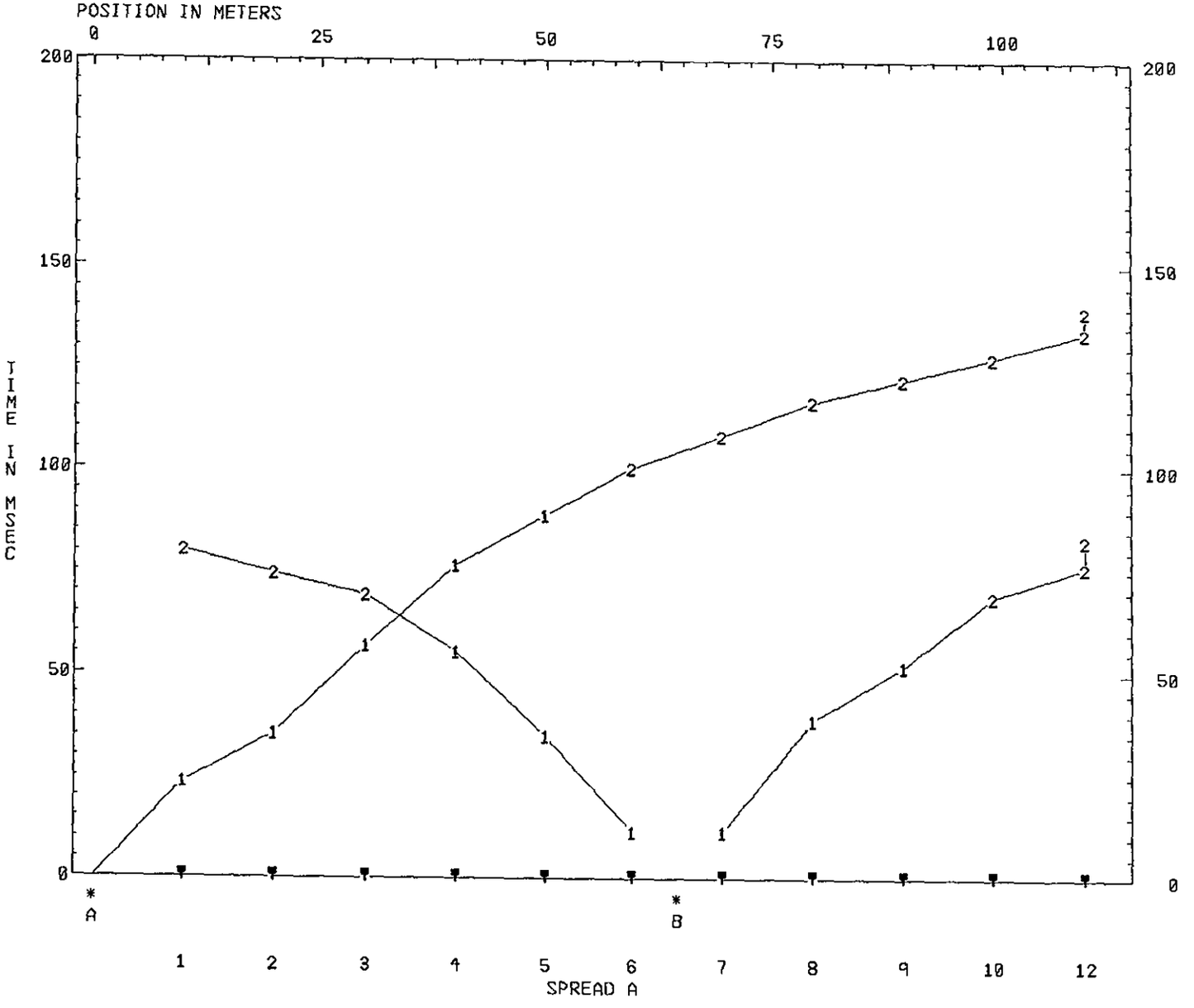
ESCALE	DATE	PLATE No.
INDICATED	DECEMBER 2002	1

FILE CB1L1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-1 M.DERECHA PERFIL 1 - RAW ARRIVAL TIMES




FILE CB1L2.SIP
SITIO PRESA CHAPARRAL LINEA CBS-1 PERFIL 2 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
200
150
100
50
0
TIME IN MSEC
A
B
C
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A

FILE CB1L3.SIP
SITIO PRESA CHAPARRAL LINEA CBS-1 PERFIL 3 - RAW ARRIVAL TIMES



INPUT DATA FILE for CB1L1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB1L1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-1 M.DERECHA PERFIL 1

PROGRAM CONTROL DATA

Spreads	Ext	Lays	Vover	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off SP	Lay Dip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	135.0	0.0	0.0	0.0	0.0	0.0	1
B	187.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	143.0	10.0	0.0	10.75	1	37.62	2
2	151.0	20.0	0.0	15.62	1	35.50	2
3	159.0	30.0	0.0	24.87	1	33.25	2
4	167.0	40.0	0.0	32.37	1	29.75	2
5	175.0	50.0	0.0	41.50	1	25.50	2
6	183.0	60.0	0.0	46.12	2	11.37	1
7	191.0	70.0	0.0	51.62	2	11.37	1
8	199.0	80.0	0.0	55.25	2	24.12	1
9	207.0	90.0	0.0	57.00	2	30.12	2
10	215.0	100.0	0.0	62.12	2	34.50	2
11	218.0	110.0	0.0	65.75	2	38.37	2
12	220.0	120.0	0.0	68.37	2	40.87	2

INPUT DATA FILE for CB1L2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB1L2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-1 PERFIL 2

PROGRAM CONTROL DATA

Sprds	Extis	Layrs	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	OfSP	LDip
1	6	3	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	225.0	0.0	0.0	0.0	0.0	0.0	1
B	233.0	65.0	0.0	0.0	0.0	0.0	0
C	227.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	228.0	10.0	0.0	26.00		157.000		2152.00	3
2	230.0	20.0	0.0	38.50		153.000		2149.60	3
3	231.0	30.0	0.0	57.62		146.750		2148.80	3
4	230.0	40.0	0.0	77.12		136.870		2146.50	3
5	229.0	50.0	0.0	90.37		220.620		2142.00	2
6	230.0	60.0	0.0	100.70	2	8.250		1135.60	2
7	235.0	70.0	0.0	112.00	2	9.125		1127.20	2
8	237.0	80.0	0.0	120.10		219.370		1114.10	2
9	235.0	90.0	0.0	129.20		231.370		1100.30	1
10	233.0	100.0	0.0	136.80		246.250	2	66.62	1
11	231.0	110.0	0.0	145.60		252.870	2	44.62	1
12	229.0	120.0	0.0	151.20		259.620	2	24.50	1

INPUT DATA FILE for CB1L3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB1L3.SIP

SITIO PRESA CHAPARRAL LINEA CBS-1 PERFIL 3

PROGRAM CONTROL DATA

Sprds	Exist	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Of SP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	227.0	0.0	0.0	0.0	0.0	0.0	1
B	230.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	225.0	10.0	0.0	23.50	1	80.12	2
2	224.0	20.0	0.0	35.62	1	74.37	2
3	224.0	30.0	0.0	56.87	1	69.37	2
4	225.0	40.0	0.0	76.37	1	55.37	1
5	227.0	50.0	0.0	88.75	1	34.87	1
6	230.0	60.0	0.0	100.20	2	11.37	1
7	230.0	70.0	0.0	108.20	2	11.50	1
8	229.0	80.0	0.0	116.70	2	38.87	1
9	228.0	90.0	0.0	122.20	2	52.00	1
10	226.0	100.0	0.0	127.50	2	69.12	2
11	225.0	110.0	0.0	133.80	2	76.25	2
12	215.0	120.0	0.0	139.10	2	83.00	2

DEPTH MODEL TABLES for CB1L1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	4.0	135.0	0.0	135.0
B	43.0	187.0	8.2	178.8

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	143.0	0.0	143.0
2	16.0	151.0	0.0	151.0
3	22.0	159.0	0.0	159.0
4	28.0	167.0	0.0	167.0
5	34.0	175.0	2.4	172.6
6	40.0	183.0	7.1	175.9
7	46.0	191.0	9.4	181.6
8	52.0	199.0	10.5	188.5
9	58.0	207.0	11.1	195.9
10	64.0	215.0	12.4	202.6
11	73.5	218.0	7.9	210.1
12	83.3	220.0	1.3	218.7

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	920	
Horizontal		1558

DEPTH MODEL TABLES for CB1L2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

	Surface		Layer 2		Layer 3	
SP	X-Loc	Elev	Depth	Elev	Depth	Elev
A	0.5	225.0	4.5	220.5	51.9	173.1
B	63.9	233.0	9.4	223.6	59.7	173.3
C	127.0	227.0	4.1	222.9	52.8	174.2

	Surface		Layer 2		Layer 3	
Geo	X-Loc	Elev	Depth	Elev	Depth	Elev
1	10.0	228.0	6.8	221.2	54.8	173.2
2	19.8	230.0	8.5	221.5	56.5	173.5
3	29.7	231.0	9.1	221.9	57.2	173.8
4	39.7	230.0	7.8	222.2	55.8	174.2
5	49.6	229.0	5.6	223.4	55.4	173.6
6	59.6	230.0	5.2	224.8	56.8	173.2
7	68.3	235.0	12.6	222.4	61.7	173.3
8	78.1	237.0	18.7	218.3	63.5	173.5
9	87.9	235.0	16.4	218.6	61.4	173.6
10	97.7	233.0	14.0	219.0	59.3	173.7
11	107.4	231.0	11.6	219.4	57.2	173.8
12	117.2	229.0	6.3	222.7	55.1	173.9

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2	Layer 3
Vertical	527	934	
Horizontal		934	4014

DEPTH MODEL TABLES for CB1L3.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

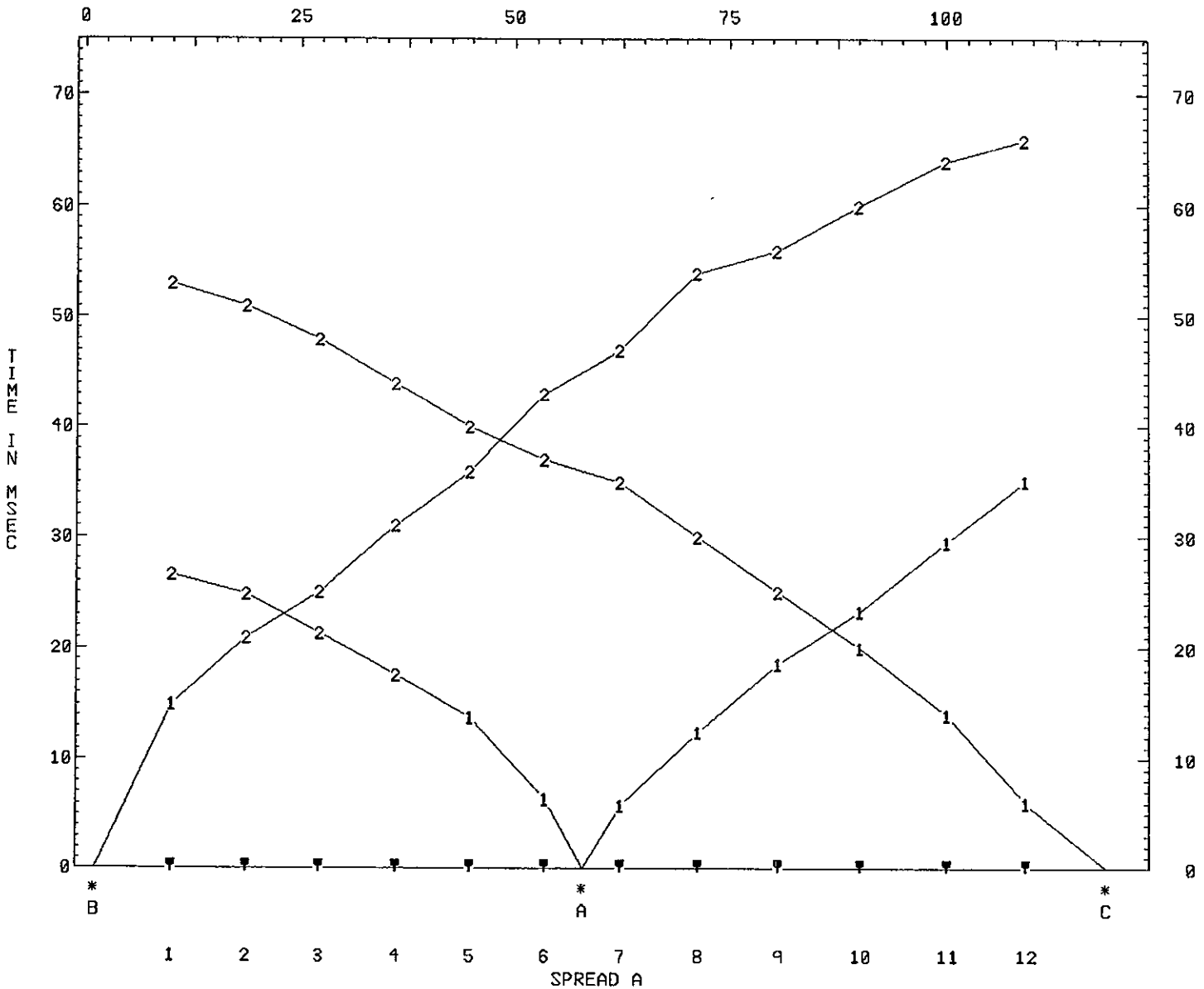
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.2	227.0	3.6	223.4
B	64.2	230.0	10.3	219.7

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	225.0	2.4	222.6
2	19.9	224.0	2.0	222.0
3	29.9	224.0	2.8	221.2
4	39.9	225.0	4.7	220.3
5	49.7	227.0	7.5	219.5
6	59.2	230.0	11.3	218.7
7	69.2	230.0	9.3	220.7
8	79.2	229.0	6.3	222.7
9	89.1	228.0	5.3	222.7
10	98.9	226.0	3.3	222.7
11	108.9	225.0	0.0	225.0
12	108.9	215.0	0.0	215.0

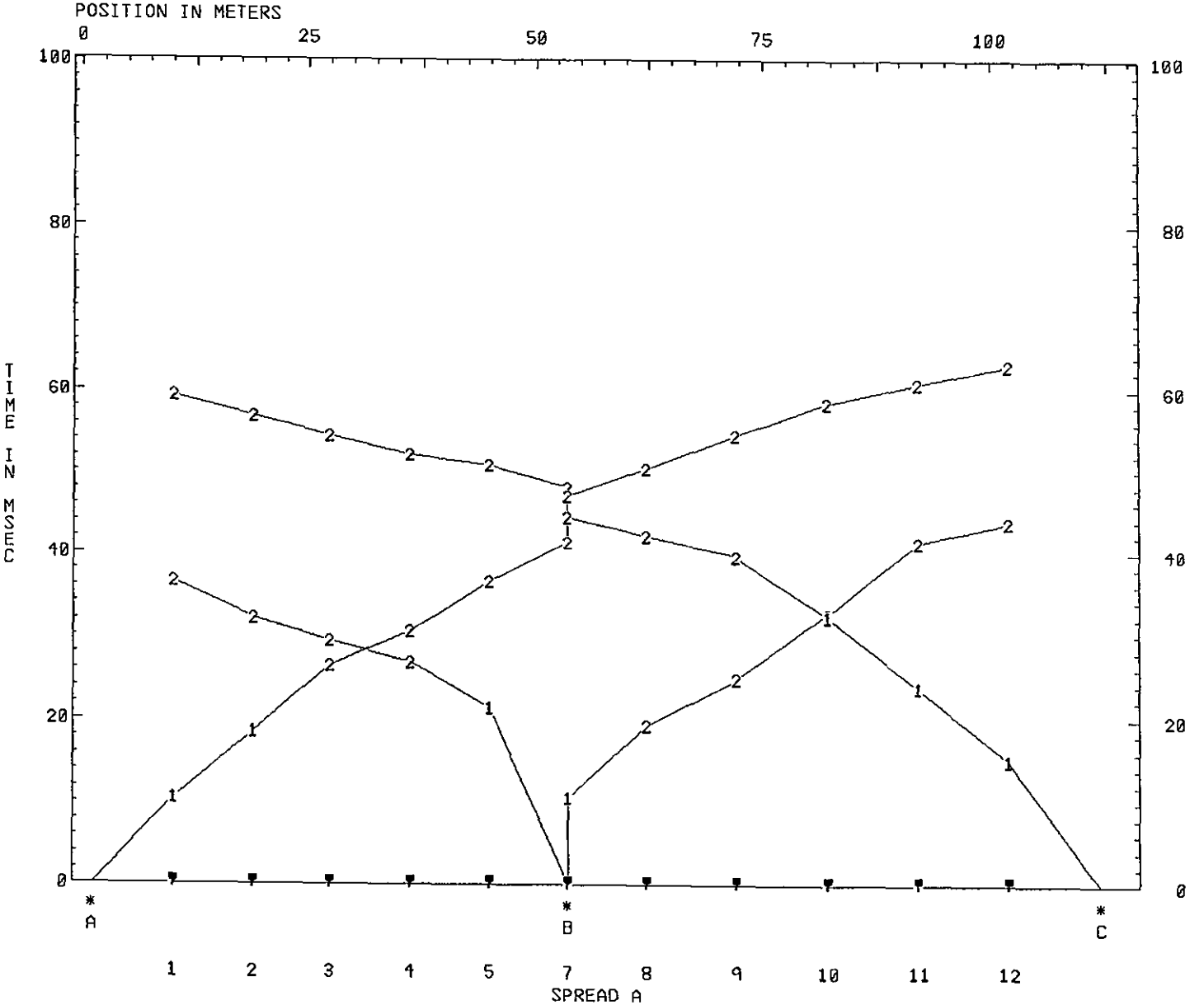
Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	473	
Horizontal		799

FILE CB1P1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-1 M. IZQUIERDA PERFIL 1 - RAW ARRIVAL TIMES



FILE CB1P2.SIP
SITIO PRESA CHAPARRAL LINEA CBS-S M.IZQUIERDA PERFIL 2 - RAW ARRIVAL TIMES



INPUT DATA FILE for CB1P1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB1P1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-1 M. IZQUIERDA PERFIL 1

PROGRAM CONTROL DATA

Spr ds	Ext	Lay rs	Ver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trac e	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0	0.0	0	0	0.5	10.0	0	0	0
							0.0	0.0							

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
B	175.0	0.0	0.0	0.0	0.0	0.0	1
A	207.0	65.0	0.0	0.0	0.0	0.0	0
C	230.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP B	L	SP A	L	SP C	L
1	180.0	10.0	0.0	15.00		126.620		253.000	2
2	185.0	20.0	0.0	21.00		224.750		251.000	2
3	190.0	30.0	0.0	25.00		221.250		248.000	2
4	195.0	40.0	0.0	31.00		217.620		244.000	2
5	200.0	50.0	0.0	36.00		213.750		140.000	2
6	205.0	60.0	0.0	43.00	2	6.250		137.000	2
7	210.0	70.0	0.0	47.00	2	5.750		135.000	2
8	214.0	80.0	0.0	54.00		212.370		130.000	2
9	218.0	90.0	0.0	56.00		218.500		125.000	2
10	221.0	100.0	0.0	60.00		223.250		120.000	1
11	222.0	110.0	0.0	64.00		229.500		114.000	1
12	226.0	120.0	0.0	66.00		235.120	1	6.000	1

INPUT DATA FILE for CB1P2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB1P2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-S M.IZQUIERDA PERFIL 2

PROGRAM CONTROL DATA

Spreads	Extis	Layers	Vover	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	230.0	0.0	0.0	0.0	0.0	0.0	1
B	265.0	65.0	0.0	0.0	0.0	0.0	0
C	275.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	235.0	10.0	0.0	10.50	1	36.37	2	59.25	2
2	240.0	20.0	0.0	18.50	1	32.12	2	56.87	2
3	245.0	30.0	0.0	26.37	2	29.25	2	54.37	2
4	250.0	40.0	0.0	30.50	2	26.75	2	52.12	2
5	255.0	50.0	0.0	36.37	2	21.25	1	50.75	2
6	260.0	60.0	0.0	41.25	2	10.62	1	48.12	2
7	270.0	70.0	0.0	47.00	2	10.62	1	44.50	2
8	275.0	80.0	0.0	50.37	2	19.25	2	42.12	2
9	276.0	90.0	0.0	54.50	2	24.75	2	39.62	2
10	277.0	100.0	0.0	58.50	2	32.62	2	32.25	1
11	277.0	110.0	0.0	60.87	2	41.37	2	23.75	1
12	276.0	120.0	0.0	63.00	2	43.75	2	15.12	1

DEPTH MODEL TABLES for CB1P1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	1.3	175.0	4.4	170.6
A	57.6	207.0	13.5	193.5
C	118.1	230.0	15.8	214.2

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	180.0	5.7	174.3
2	18.7	185.0	6.6	178.4
3	27.3	190.0	7.3	182.7
4	36.0	195.0	8.5	186.5
5	44.6	200.0	10.2	189.8
6	53.3	205.0	13.0	192.0
7	62.0	210.0	15.1	194.9
8	71.1	214.0	16.0	198.0
9	80.3	218.0	17.4	200.6
10	89.8	221.0	19.1	201.9
11	99.8	222.0	17.1	204.9
12	108.9	226.0	14.7	211.3

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1264	
Horizontal		2279

DEPTH MODEL TABLES for CB1P2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

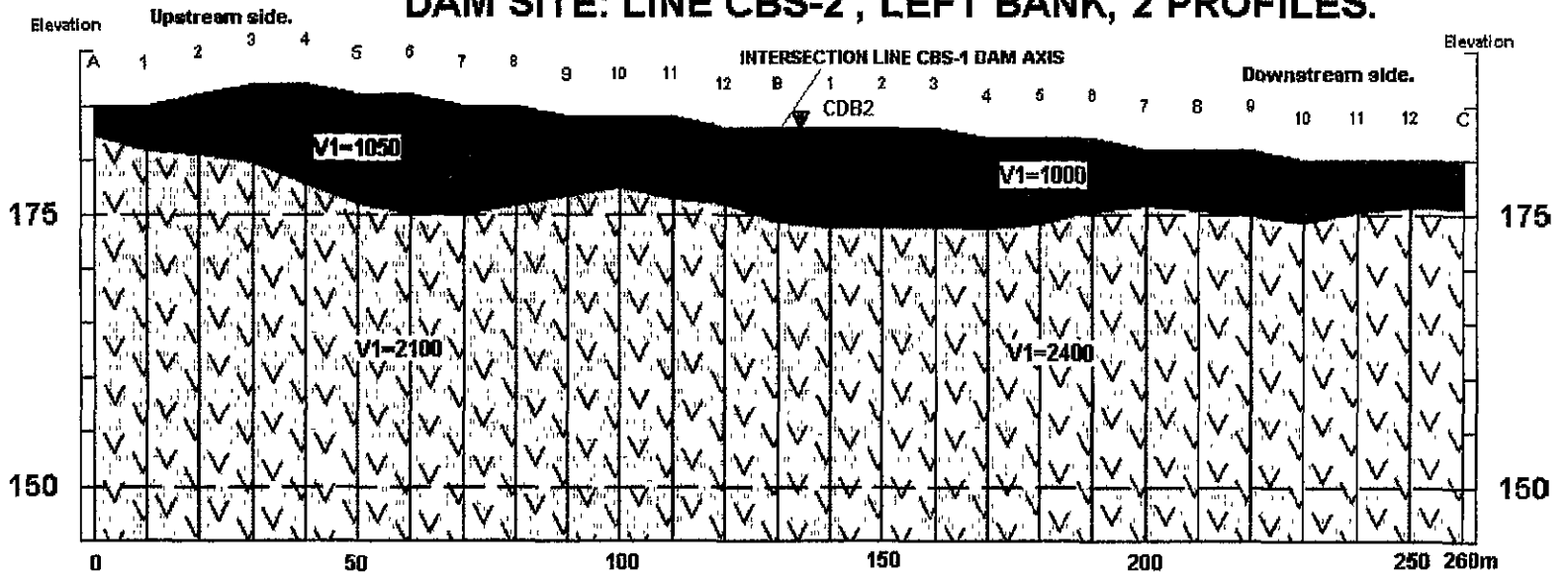
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	1.3	230.0	4.2	225.8
B	53.3	265.0	13.6	251.4
C	111.8	275.0	2.8	272.2

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	235.0	5.1	229.9
2	18.7	240.0	7.0	233.0
3	27.3	245.0	8.9	236.1
4	36.0	250.0	10.7	239.3
5	44.6	255.0	11.8	243.2
6	53.3	260.0	8.6	251.4
7	53.3	270.0	18.6	251.4
8	62.0	275.0	20.0	255.0
9	71.9	276.0	15.0	261.0
10	81.9	277.0	15.2	261.8
11	91.9	277.0	10.0	267.0
12	101.8	276.0	3.8	272.2

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	754	
Horizontal		1918

DAM SITE: LINE CBS-2 , LEFT BANK, 2 PROFILES.



LEYEND

Overburden. Weathered rock, residual soil and colluvial deposits.

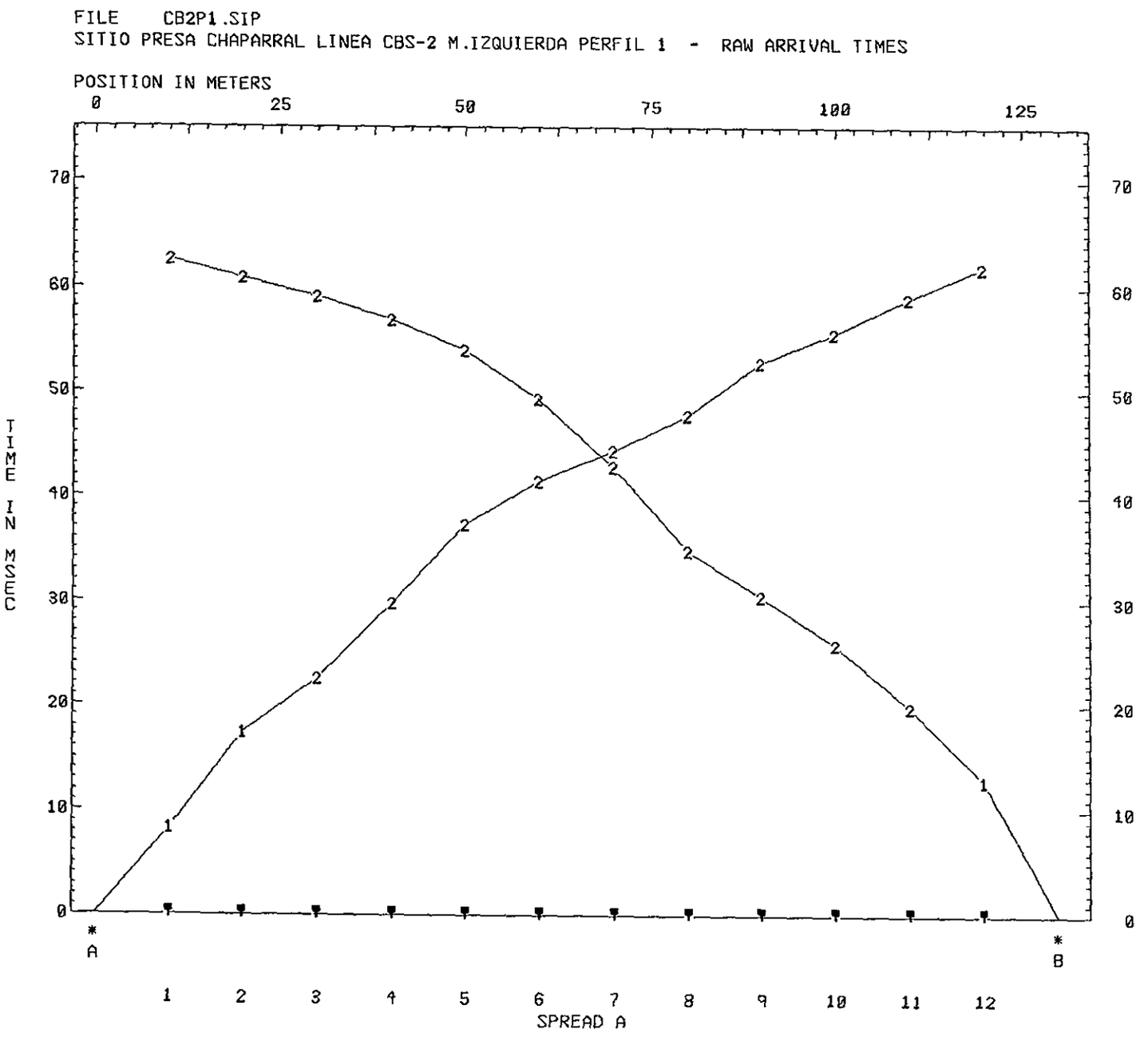
Local bedrock. Lava and volcanic tuff.

Notes: Geophones every 10 m.
Compresive wave velocity in m/s.

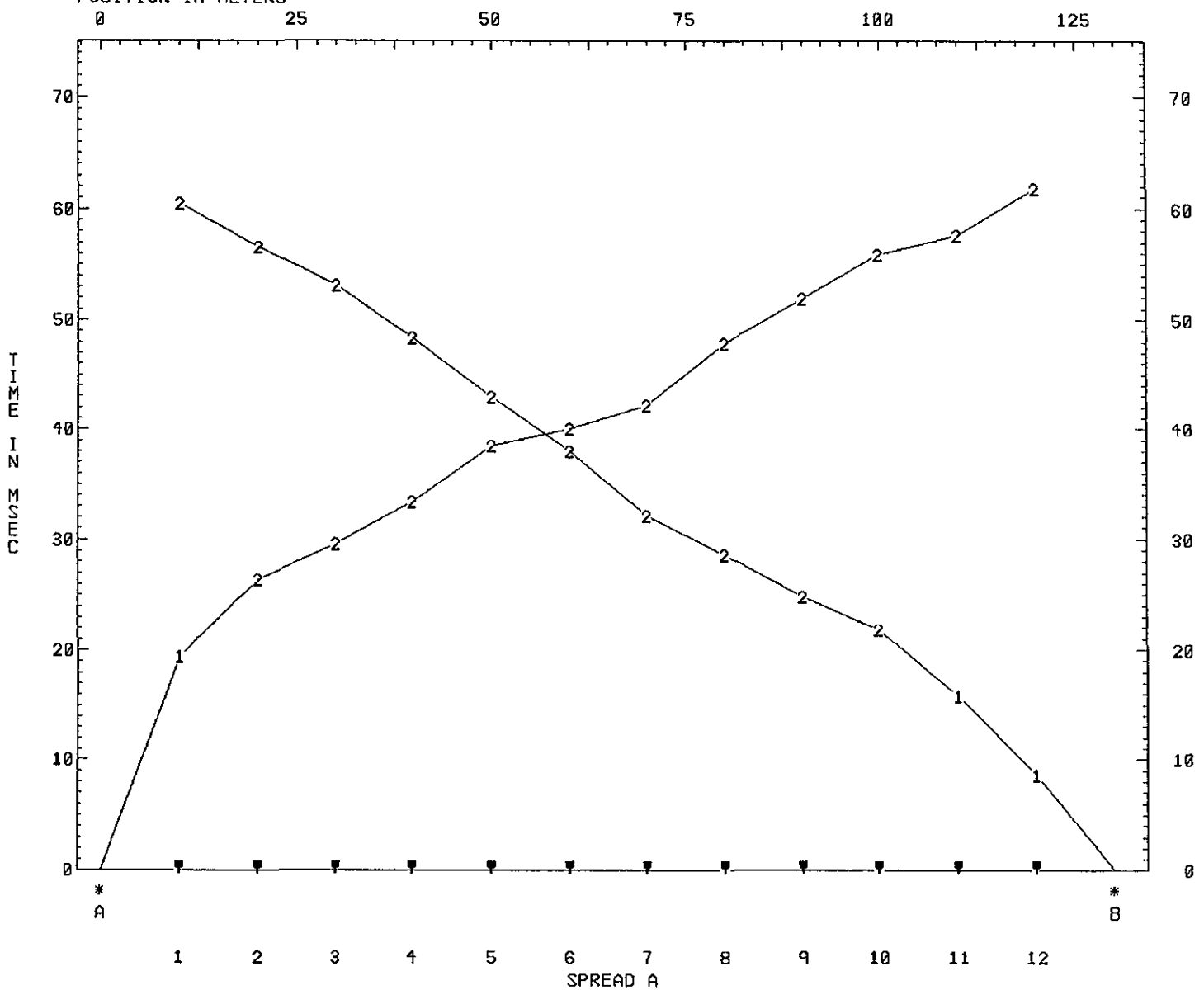
CDB3 ▼ Borehole.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST.	SWISSB ◎RING
CONTENT:	SECTION CBS-2. LEFT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No	2

7-8-17


FILE CB2P1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-2 M.IZQUIERDA PERFIL 1 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
0
10
20
30
40
50
60
70
A
B
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A

FILE CB2P2.SIP
SITIO PRESA CHAPARRAL LINEA CBS-2 M.IZQUIERDA PERFIL 2 - RAW ARRIVAL TIMES



7-8-19

INPUT DATA FILE for CB2P1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB2P1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-2 M.IZQUIERDA PERFIL 1

PROGRAM CONTROL DATA

Sprds	Ext	Lays	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Offset	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	185.0	0.0	0.0	0.0	0.0	0.0	1
B	183.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	185.0	10.0	0.0	8.250	1	62.62	2
2	186.0	20.0	0.0	17.370	1	60.75	2
3	187.0	30.0	0.0	22.500	2	59.12	2
4	187.0	40.0	0.0	29.750	2	56.87	2
5	186.0	50.0	0.0	37.250	2	54.00	2
6	186.0	60.0	0.0	41.500	2	49.25	2
7	185.0	70.0	0.0	44.370	2	42.75	2
8	185.0	80.0	0.0	47.750	2	34.75	2
9	184.0	90.0	0.0	52.750	2	30.37	2
10	184.0	100.0	0.0	55.620	2	25.75	2
11	184.0	110.0	0.0	59.000	2	19.75	2
12	183.0	120.0	0.0	61.870	2	12.75	1

INPUT DATA FILE for CB2P2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB2P2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-2 M.IZQUIERDA PERFIL 2

PROGRAM CONTROL DATA

Sprds	Ext	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	OffSP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	183.0	0.0	0.0	0.0	0.0	0.0	1
B	180.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	183.0	10.0	0.0	19.37	160.370	2	
2	183.0	20.0	0.0	26.37	256.620	2	
3	183.0	30.0	0.0	29.62	253.120	2	
4	182.0	40.0	0.0	33.25	248.250	2	
5	182.0	50.0	0.0	38.50	242.870	2	
6	182.0	60.0	0.0	40.00	238.000	2	
7	181.0	70.0	0.0	42.12	232.120	2	
8	181.0	80.0	0.0	47.87	228.620	2	
9	181.0	90.0	0.0	51.87	224.750	2	
10	180.0	100.0	0.0	55.87	221.750	2	
11	180.0	110.0	0.0	57.62	215.750	1	
12	180.0	120.0	0.0	61.75	2 8.625	1	

DEPTH MODEL TABLES for CB2P1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	185.0	2.6	182.4
B	129.7	183.0	3.8	179.2

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	185.0	4.0	181.0
2	19.9	186.0	5.3	180.7
3	29.9	187.0	7.1	179.9
4	39.9	187.0	9.1	177.9
5	49.8	186.0	9.9	176.1
6	59.8	186.0	10.9	175.1
7	69.8	185.0	9.9	175.1
8	79.8	185.0	9.1	175.9
9	89.7	184.0	7.2	176.8
10	99.7	184.0	6.4	177.6
11	109.7	184.0	5.5	178.5
12	119.7	183.0	4.6	178.4

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1049	
Horizontal		2174

379

DEPTH MODEL TABLES for CB2P2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

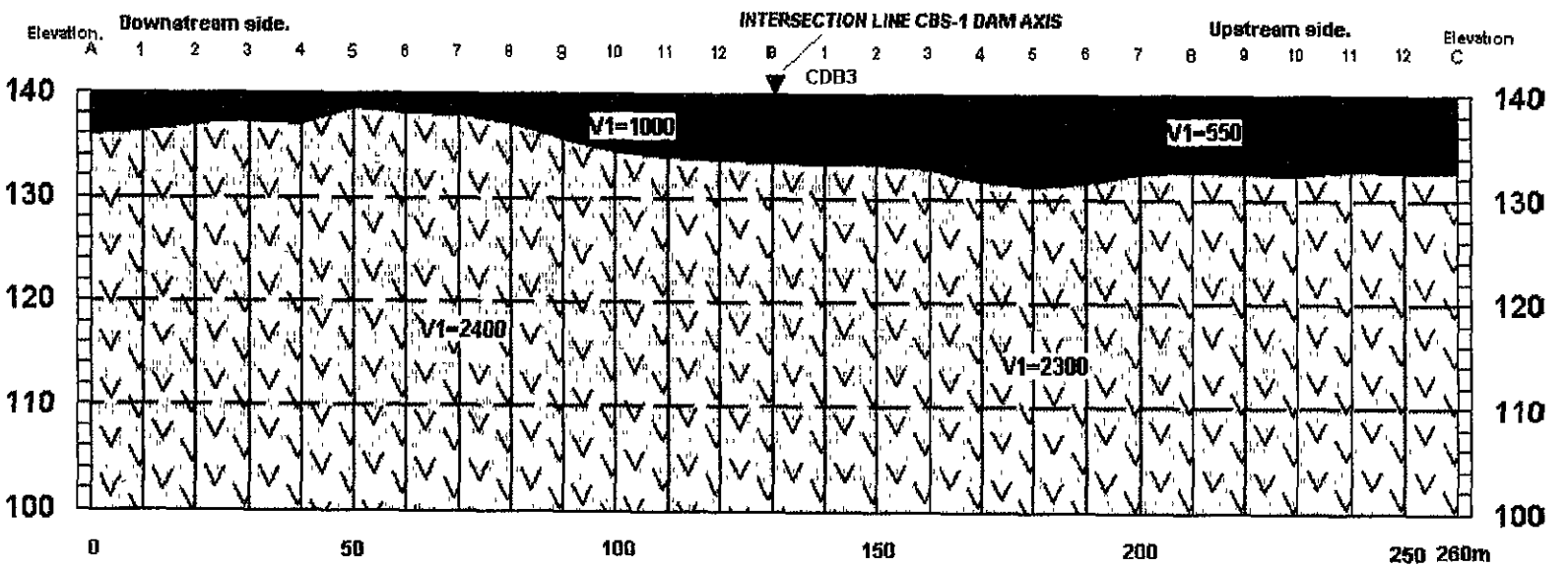
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	183.0	9.5	173.5
B	129.8	180.0	4.4	175.6

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	183.0	9.2	173.8
2	20.0	183.0	9.1	173.9
3	30.0	183.0	9.2	173.8
4	39.9	182.0	8.3	173.7
5	49.9	182.0	7.8	174.2
6	59.9	182.0	6.7	175.3
7	69.9	181.0	5.1	175.9
8	79.9	181.0	5.6	175.4
9	89.9	181.0	6.1	174.9
10	99.8	180.0	5.6	174.4
11	109.8	180.0	4.7	175.3
12	119.8	180.0	4.3	175.7

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	982	
Horizontal		2462

DAM SITE: LINE CBS-3 , RIGHT BANK, 2 PROFILES.



LEYEND

Overburden. Weathered rock, residual soil and colluvial deposits.

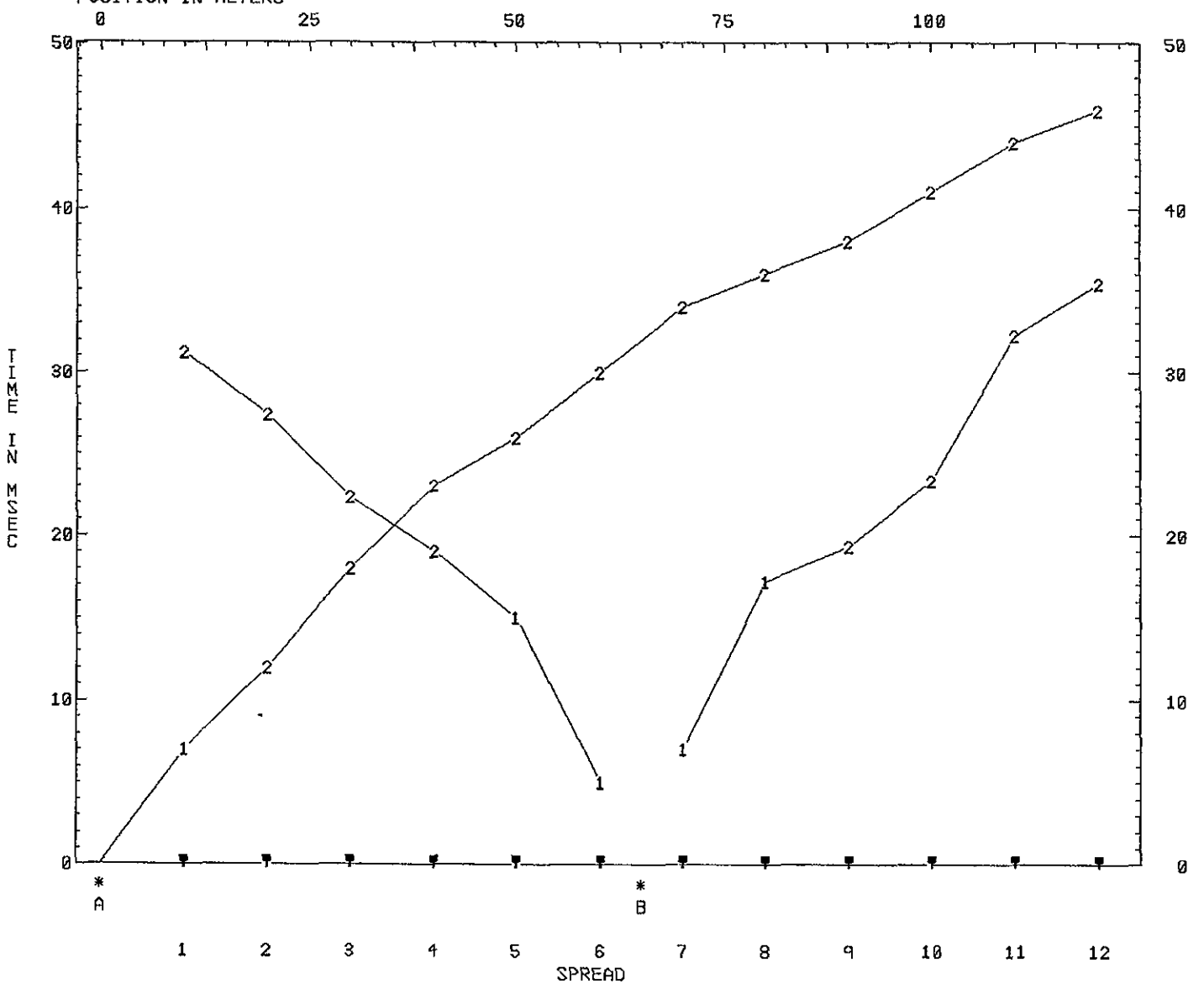
Local bedrock. Lava and volcanic tuff.

Notes: Geophones every 10 m.
Compresive wave velocity in m/s.

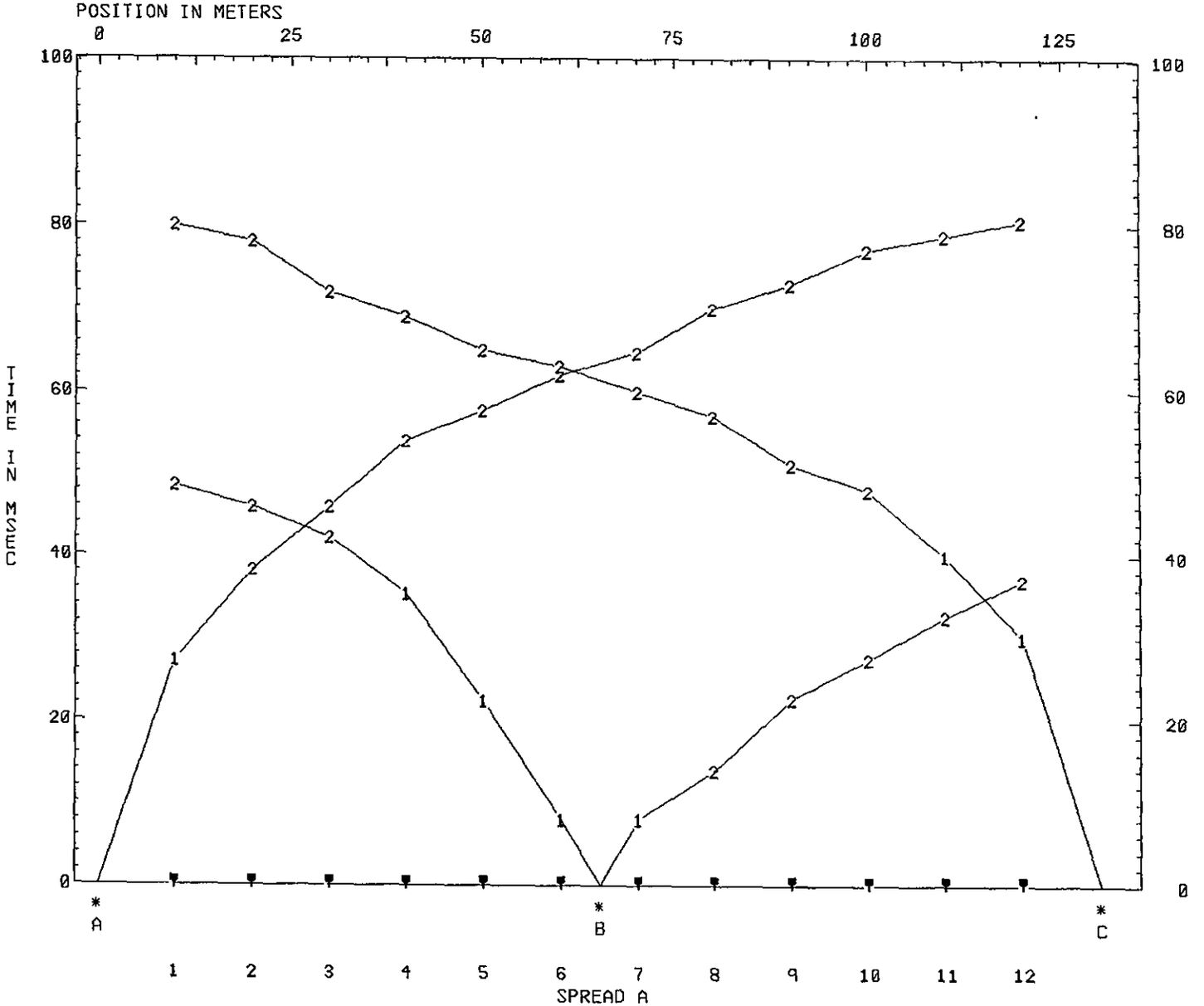
CDB3 ▼ Borehole.

PROJECT.	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB ◎RING
CONTENT:	SECTION CBS-3. RIGHT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No	3

FILE CBSL1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-3 M.DERECHA PERFIL 1 - RAW ARRIVAL TIMES



FILE CB3L2.SIP
SITIO PRESA CHAPARRAL LINEA CBS-3 M.DERECHA PERFIL 2 - RAW ARRIVAL TIMES



INPUT DATA FILE for CB3L1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB3L1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-3 M.DERECHA PERFIL 1

PROGRAM CONTROL DATA

Spreads	Ex	Lays	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Of fSP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	140.0	0.0	0.0	0.0	0.0	0.0	1
B	140.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	140.0	10.0	0.0	7.00	131.150	2	
2	140.0	20.0	0.0	12.00	227.380	2	
3	140.0	30.0	0.0	18.00	222.250	2	
4	140.0	40.0	0.0	23.00	219.000	2	
5	140.0	50.0	0.0	26.00	215.000	1	
6	140.0	60.0	0.0	30.00	2 5.000	1	
7	140.0	70.0	0.0	34.00	2 7.000	1	
8	140.0	80.0	0.0	36.00	217.150	1	
9	140.0	90.0	0.0	38.00	219.320	2	
10	140.0	100.0	0.0	41.00	223.250	2	
11	140.0	110.0	0.0	44.00	232.150	2	
12	140.0	120.0	0.0	46.00	235.400	2	

INPUT DATA FILE for CB3L2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB3L2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-3 M.DERECHA PERFIL 2

PROGRAM CONTROL DATA

Sprds	Extis	Layrs	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	PLOT CONTROL BLim	TLim	Trace	Offset	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	140.0	0.0	0.0	0.0	0.0	0.0	1
B	140.0	65.0	0.0	0.0	0.0	0.0	0
C	140.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	140.0	10.0	0.0	27.12		148.370	2	80.00	2
2	140.0	20.0	0.0	38.12		245.870	2	78.00	2
3	140.0	30.0	0.0	45.90		242.120	2	72.00	2
4	140.0	40.0	0.0	53.90		235.250	1	69.00	2
5	140.0	50.0	0.0	57.62		222.25			

DEPTH MODEL TABLES for CB3L1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	140.0	4.0	136.0
B	65.0	140.0	1.9	138.1

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	140.0	3.6	136.4
2	20.0	140.0	2.9	137.1
3	30.0	140.0	2.7	137.3
4	40.0	140.0	3.0	137.0
5	50.0	140.0	1.3	138.7
6	60.0	140.0	1.9	138.1
7	70.0	140.0	2.0	138.0
8	80.0	140.0	2.8	137.2
9	90.0	140.0	4.2	135.8
10	100.0	140.0	5.5	134.5
11	110.0	140.0	6.1	133.9
12	120.0	140.0	6.3	133.7

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1003	
Horizontal		2413

DEPTH MODEL TABLES for CB3L2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

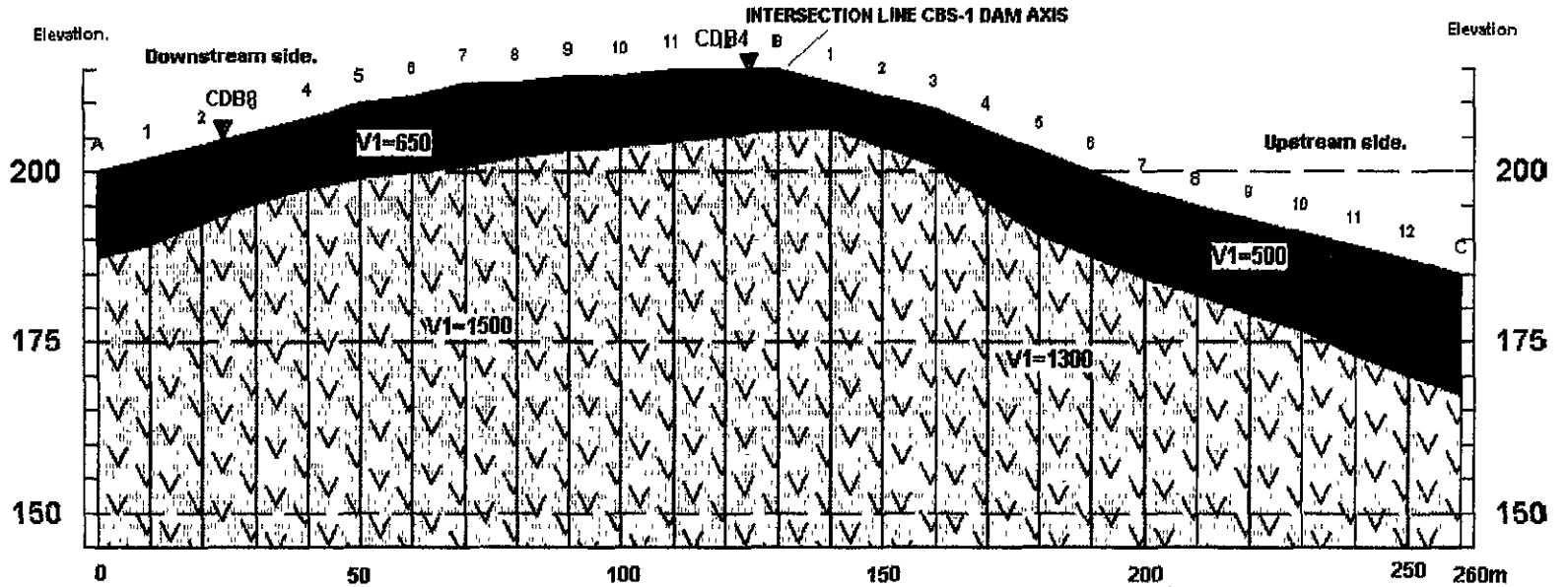
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	140.0	6.1	133.9
B	65.0	140.0	7.9	132.1
C	130.0	140.0	7.3	132.7

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	140.0	6.6	133.4
2	20.0	140.0	6.7	133.3
3	30.0	140.0	7.2	132.8
4	40.0	140.0	8.3	131.7
5	50.0	140.0	8.7	131.3
6	60.0	140.0	8.4	131.6
7	70.0	140.0	7.4	132.6
8	80.0	140.0	7.3	132.7
9	90.0	140.0	7.5	132.5
10	100.0	140.0	7.6	132.4
11	110.0	140.0	7.2	132.8
12	120.0	140.0	7.3	132.7

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	548	
Horizontal		2335

DAM SITE: LINE CBS-4 , RIGHT BANK, 2 PROFILES.



LEYEND

Overburden. Weathered rock, residual soil and colluvial deposits.

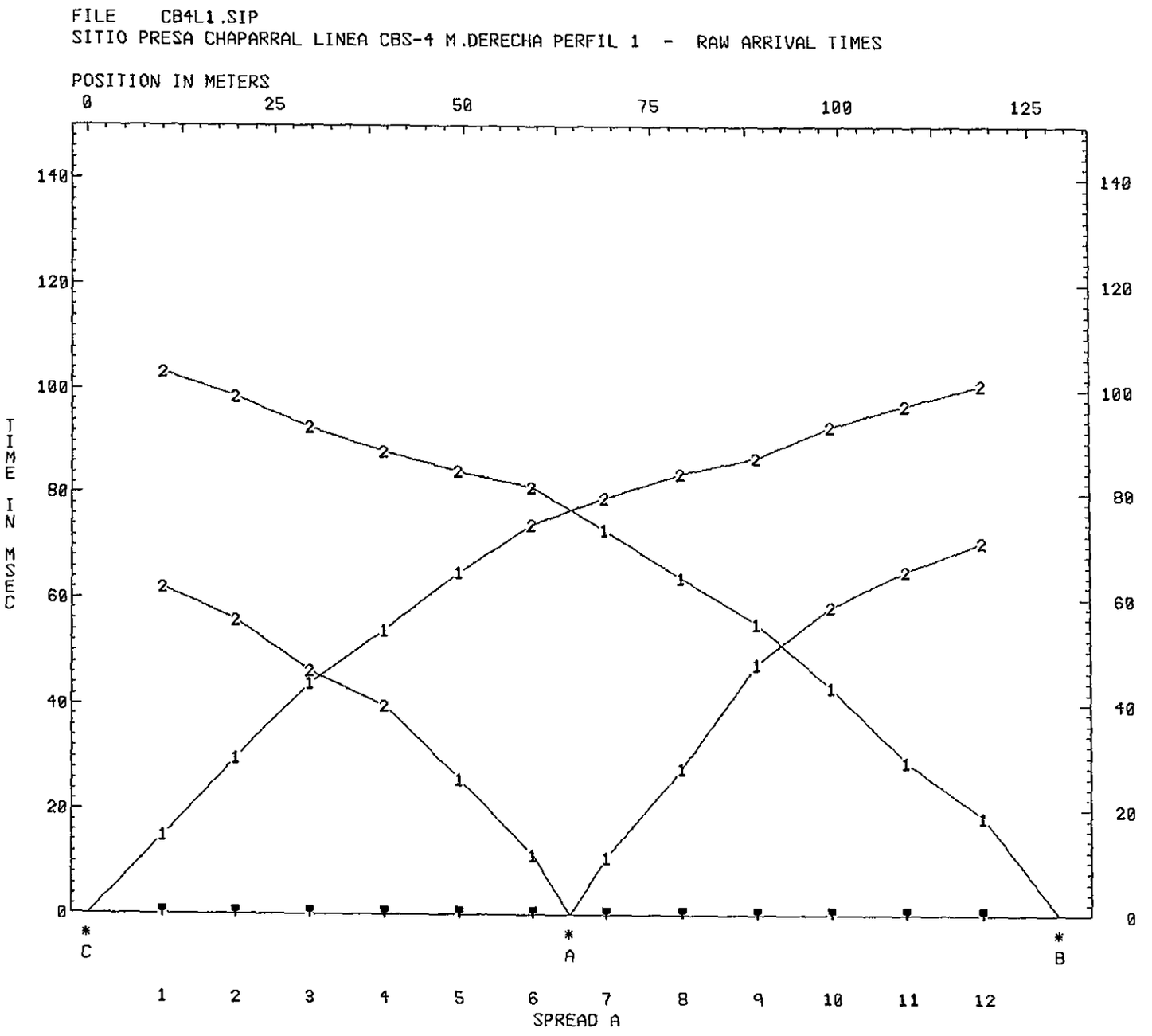
Local bedrock. Lava and volcanic tuff.

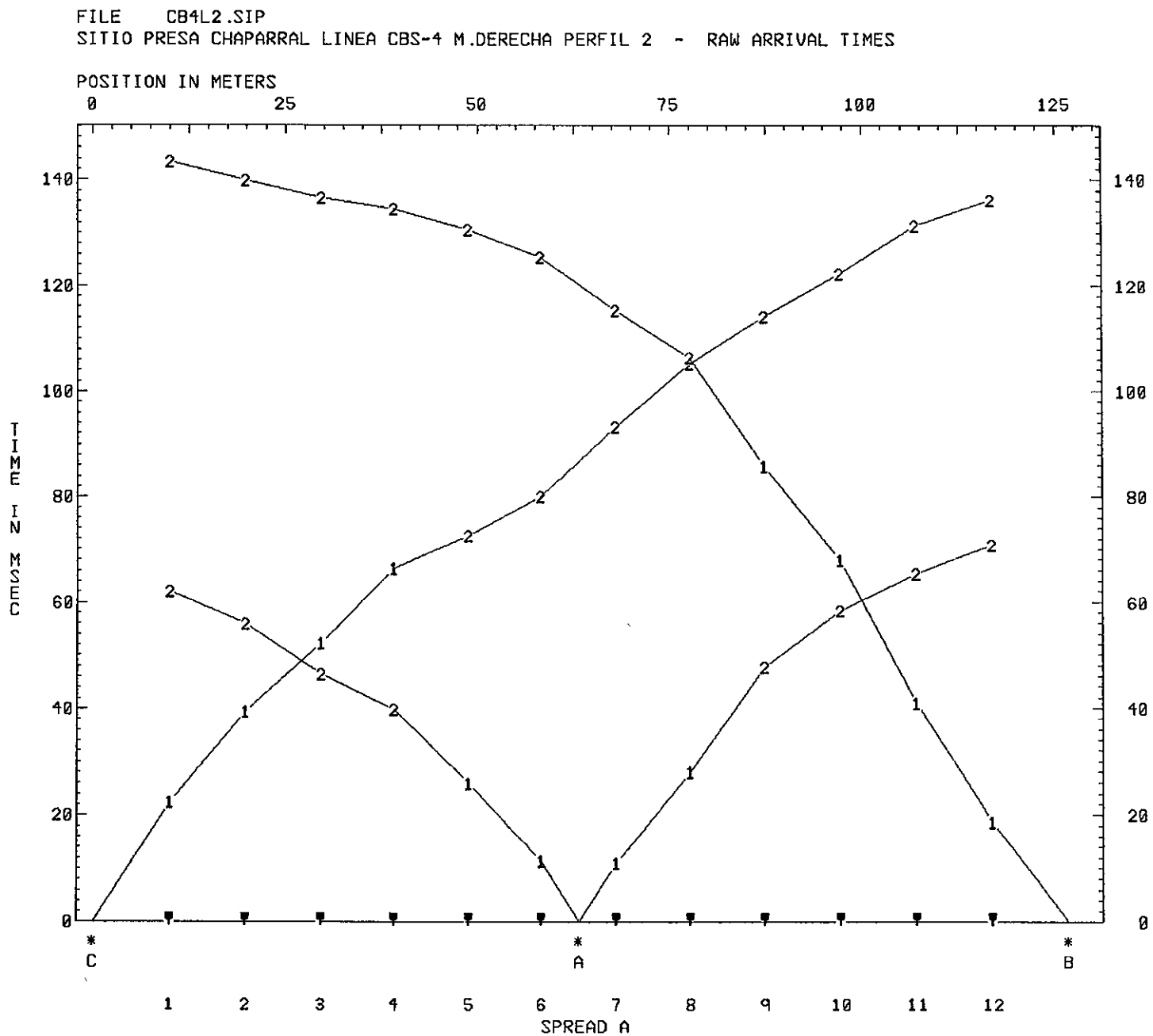
Notes: Geophones every 10 m.
Compresive wave velocity in m/s.

CDB3 ▼ Borehole.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST.	SWISSB ◎RING
CONTENT:	SECTION CBS-4. RIGHT BANK

SCALE	DATE	PLATE No
INDICATED	DECEMBER 2002	4


FILE CB4L1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-4 M.DERECHA PERFIL 1 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
140
120
100
80
60
40
20
0
TIME IN MSEC
C
A
B
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A


FILE CB4L2.SIP
SITIO PRESA CHAPARRAL LINEA CBS-4 M.DERECHA PERFIL 2 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
0
20
40
60
80
100
120
140
C
A
B
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A

INPUT DATA FILE for CB4L1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB4L1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-4 M.DERECHA PERFIL 1

PROGRAM CONTROL DATA

Sprds	Ext	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	OffSP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
C	200.0	0.0	0.0	0.0	0.0	0.0	1
A	212.0	65.0	0.0	0.0	0.0	0.0	0
B	215.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP C	L	SP A	L	SP B	L
1	202.0	10.0	0.0	15.00	1	62.12	2	103.20	2
2	204.0	20.0	0.0	30.00	1	55.75	2	98.65	2
3	206.0	30.0	0.0	44.00	1	46.37	2	92.87	2
4	208.0	40.0	0.0	54.00	1	39.75	2	88.15	2
5	210.0	50.0	0.0	65.00	1	25.87	1	84.32	2
6	211.0	60.0	0.0	74.00	2	11.25	1	81.20	2
7	213.0	70.0	0.0	79.00	2	11.00	1	73.12	1
8	213.0	80.0	0.0	84.00	2	28.00	1	63.85	1
9	214.0	90.0	0.0	87.00	2	47.75	1	55.15	1
10	214.0	100.0	0.0	93.00	2	58.25	2	43.25	1
11	215.0	110.0	0.0	97.00	2	65.37	2	29.15	1
12	215.0	120.0	0.0	101.00	2	70.75	2	18.62	1

INPUT DATA FILE for CB4L2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB4L2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-4 M.DERECHA PERFIL 2

PROGRAM CONTROL DATA

Sprds	Extis	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Spread	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
C	215.0	0.0	0.0	0.0	0.0	0.0	1
A	198.0	65.0	0.0	0.0	0.0	0.0	0
B	185.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP C	L	SP A	L	SP B	L
1	213.0	10.0	0.0	22.25	1	62.12	2	143.30	2
2	211.0	20.0	0.0	39.35	1	55.75	2	139.80	2
3	209.0	30.0	0.0	52.15	1	46.37	2	136.50	2
4	206.0	40.0	0.0	66.25	1	39.75	2	134.50	2
5	203.0	50.0	0.0	72.35	2	25.87	1	130.60	2
6	200.0	60.0	0.0	80.12	2	11.25	1	125.30	2
7	197.0	70.0	0.0	93.15	2	11.00	1	115.20	2
8	195.0	80.0	0.0	105.20	2	28.00	1	106.30	2
9	193.0	90.0	0.0	114.10	2	47.75	2	85.87	1
10	191.0	100.0	0.0	122.20	2	58.25	2	67.87	1
11	189.0	110.0	0.0	131.30	2	65.37	2	40.87	1
12	187.0	120.0	0.0	136.10	2	70.75	2	18.62	1

DEPTH MODEL TABLES for CB4L1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
C	0.2	200.0	12.7	187.3
A	64.0	212.0	11.7	200.3
B	128.8	215.0	8.9	206.1

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	202.0	12.6	189.4
2	19.8	204.0	11.5	192.5
3	29.6	206.0	10.7	195.3
4	39.4	208.0	10.5	197.5
5	49.2	210.0	11.0	199.0
6	59.1	211.0	11.0	200.0
7	68.9	213.0	12.3	200.7
8	78.9	213.0	10.8	202.2
9	88.9	214.0	10.7	203.3
10	98.9	214.0	10.2	203.8
11	108.8	215.0	10.6	204.4
12	118.8	215.0	9.7	205.3

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	644	
Horizontal		1545

DEPTH MODEL TABLES for CB4L2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

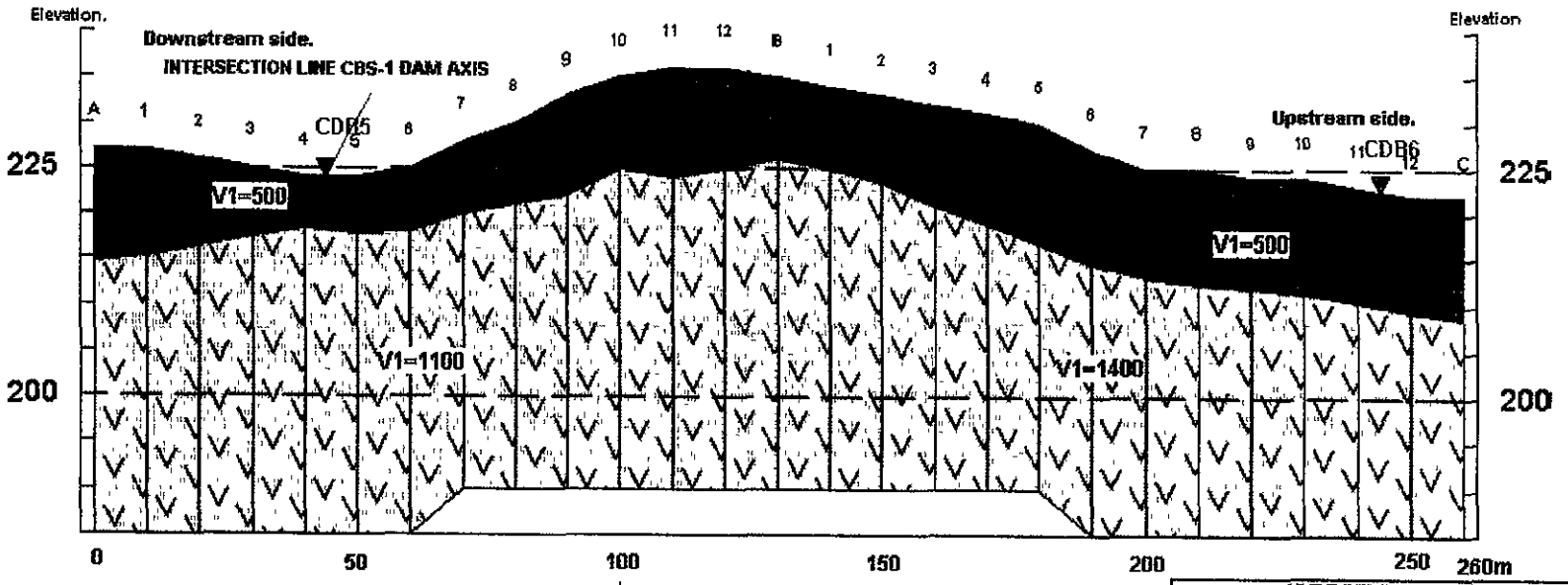
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
C	0.2	215.0	4.7	210.3
A	63.0	198.0	12.1	185.9
B	126.5	185.0	17.8	167.2

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	213.0	6.7	206.3
2	19.8	211.0	7.3	203.7
3	29.6	209.0	8.1	200.9
4	39.1	206.0	10.4	195.6
5	48.7	203.0	12.3	190.7
6	58.2	200.0	12.5	187.5
7	67.8	197.0	12.7	184.3
8	77.6	195.0	13.1	181.9
9	87.3	193.0	13.7	179.3
10	97.1	191.0	14.1	176.9
11	106.9	189.0	15.8	173.2
12	116.7	187.0	16.9	170.1

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	508	
Horizontal		1335

DAM SITE: LINE CBS-5 , RIGHT BANK, 2 PROFILES.



LEYEND

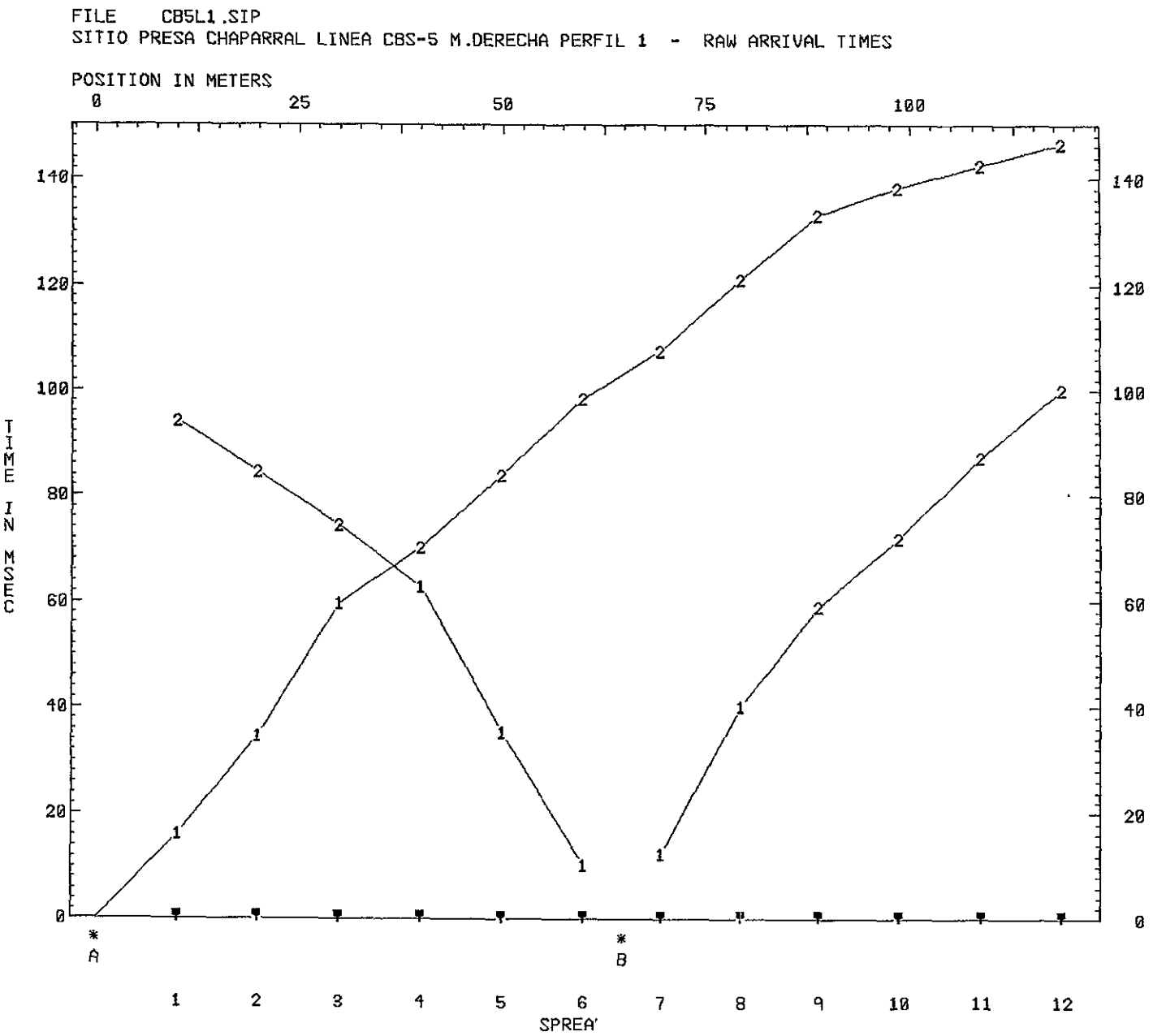
Overburden. Weathered rock, residual soil and colluvial deposits.

Local bedrock. Lava and volcanic tuff.

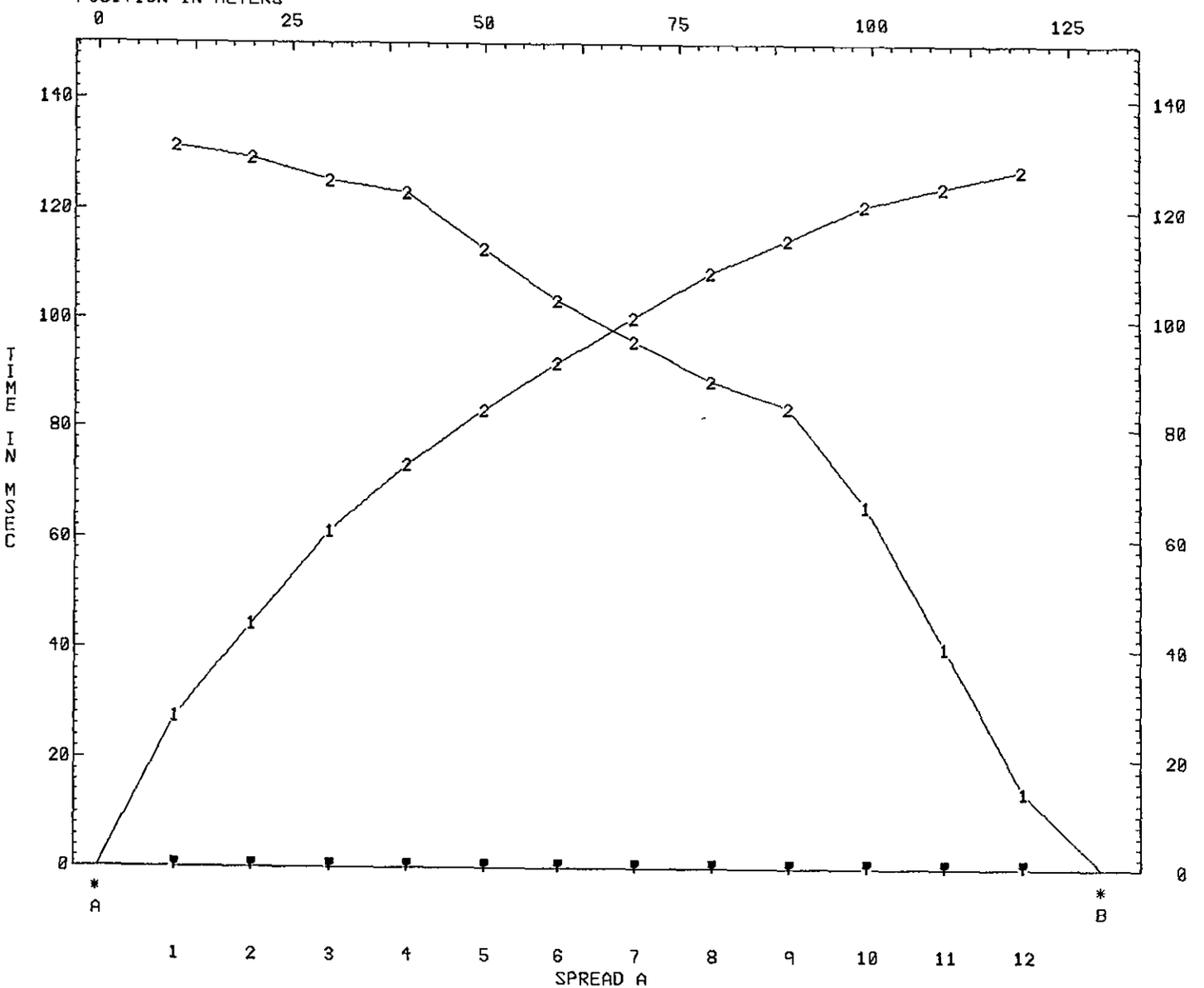
Notes: Geophones every 10 m.
Compresive wave velocity in m/s.

CDB3 ▼ Borehole.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT.	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST.	SWISSB @RING
CONTENT:	SECTION CBS-5. RIGHT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No	5


FILE CB5L1.SIP
SITIO PRESA CHAPARRAL LINEA CBS-5 M.DERECHA PERFIL 1 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
TIME IN MSEC
0
20
40
60
80
100
120
140
A
B
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD

FILE CB5L2.SIP
SITIO PRESA CHAPARRAL LINEA CB5-5 M.DERECHA PERFIL 2 - RAW ARRIVAL TIMES



INPUT DATA FILE for CB5L1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB5L1.SIP

SITIO PRESA CHAPARRAL LINEA CBS-5 M.DERECHA PERFIL 1

PROGRAM CONTROL DATA

Spreads	Exist	Layers	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Of fSP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	227.0	0.0	0.0	0.0	0.0	0.0	1
B	226.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	227.0	10.0	0.0	16.12	1	94.12	2
2	226.0	20.0	0.0	34.62	1	84.50	2
3	225.0	30.0	0.0	59.75	1	74.50	2
4	224.0	40.0	0.0	70.12	2	62.87	1
5	224.0	50.0	0.0	83.87	2	35.37	1
6	225.0	60.0	0.0	98.50	2	10.25	1
7	228.0	70.0	0.0	107.60	2	12.50	1
8	230.0	80.0	0.0	121.00	2	40.12	1
9	233.0	90.0	0.0	133.00	2	59.00	2
10	235.0	100.0	0.0	138.20	2	72.00	2
11	236.0	110.0	0.0	142.50	2	87.12	2
12	236.0	120.0	0.0	146.60	2	100.10	2

INPUT DATA FILE for CB5L2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CB5L2.SIP

SITIO PRESA CHAPARRAL LINEA CBS-5 M.DERECHA PERFIL 2

PROGRAM CONTROL DATA

Sprds	Extis	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	OffSet	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	235.0	0.0	0.0	0.0	0.0	0.0	1
B	222.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	234.0	10.0	0.0	27.62		1131.30	2
2	233.0	20.0	0.0	44.37		1129.20	2
3	232.0	30.0	0.0	61.25		1125.20	2
4	231.0	40.0	0.0	73.25		2123.00	2
5	230.0	50.0	0.0	83.25		2113.00	2
6	227.0	60.0	0.0	92.00		2103.50	2
7	225.0	70.0	0.0	100.30	2	96.12	2
8	225.0	80.0	0.0	108.60	2	88.75	2
9	224.0	90.0	0.0	114.70	2	83.87	2
10	224.0	100.0	0.0	120.80	2	65.87	1
11	223.0	110.0	0.0	124.10	2	40.37	1
12	222.0	120.0	0.0	127.20	2	14.00	1

DEPTH MODEL TABLES for CB5L1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	227.0	12.2	214.8
B	64.6	226.0	7.0	219.0

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	227.0	11.7	215.3
2	19.9	226.0	9.7	216.3
3	29.9	225.0	7.5	217.5
4	39.8	224.0	5.6	218.4
5	49.8	224.0	6.2	217.8
6	59.8	225.0	7.0	218.0
7	69.3	228.0	8.0	220.0
8	79.1	230.0	8.9	221.1
9	88.7	233.0	11.0	222.0
10	98.5	235.0	10.0	225.0
11	108.4	236.0	7.9	228.1
12	118.4	236.0	1.8	234.2

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	472	
Horizontal		1072

DEPTH MODEL TABLES for CB5L2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

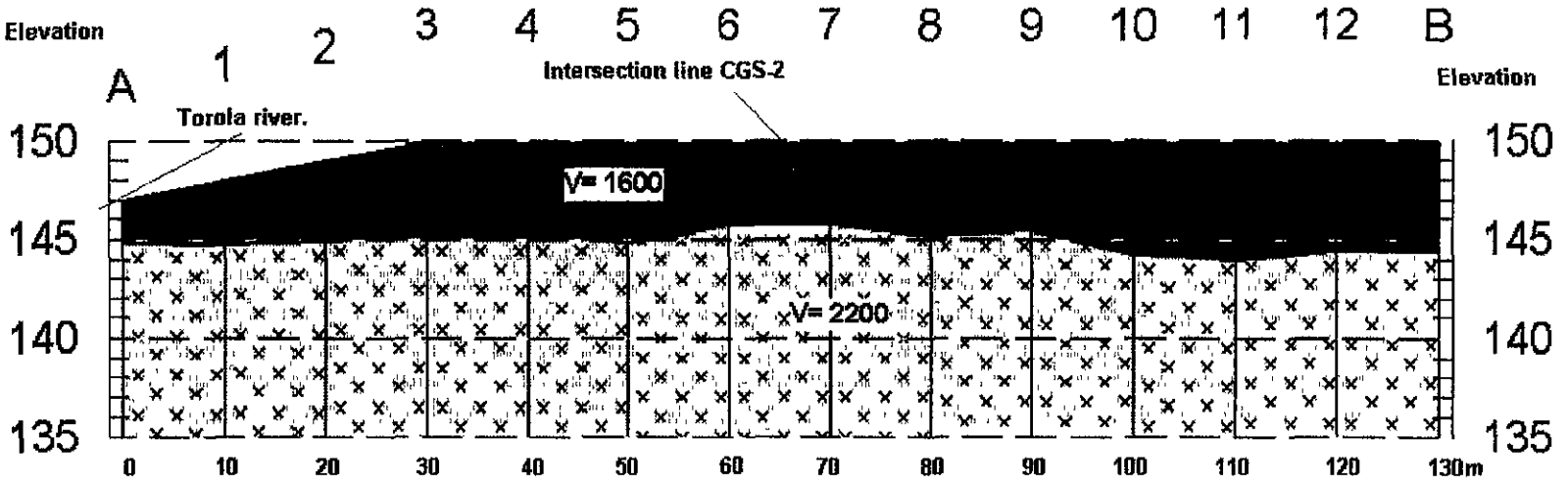
	Surface		Layer 2	
SP	X-Loc	Elev	Depth	Elev
A	0.1	235.0	9.0	226.0
B	129.0	222.0	13.3	208.7

	Surface		Layer 2	
Geo	X-Loc	Elev	Depth	Elev
1	10.0	234.0	9.9	224.1
2	19.9	233.0	10.3	222.7
3	29.9	232.0	11.0	221.0
4	39.8	231.0	12.0	219.0
5	49.8	230.0	13.3	216.7
6	59.3	227.0	12.4	214.6
7	69.1	225.0	11.9	213.1
8	79.1	225.0	12.6	212.4
9	89.1	224.0	12.0	212.0
10	99.1	224.0	12.6	211.4
11	109.0	223.0	12.5	210.5
12	119.0	222.0	12.6	209.4

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	494	
Horizontal		1430

LINE CGS-1 PROFILE 1, BORROW AREA LEFT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

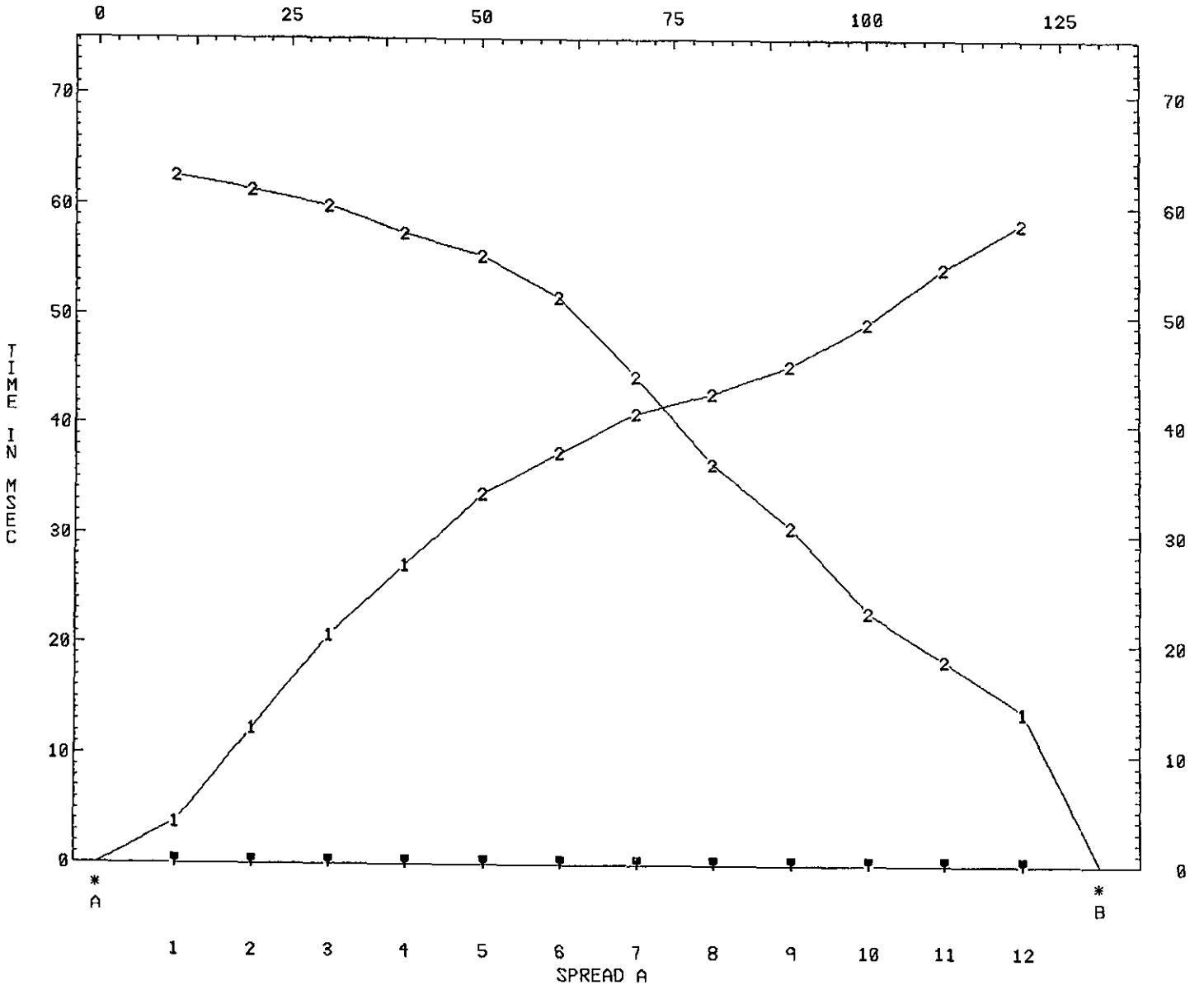
LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico río Lempa.
CONSULTANT	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB @RING
CONTENT	LINE CGS-1 PROFILE 1. LEFT BANK
SCALE INDICATED	DATE DECEMBER 2002
	PLATE No. 6

FILE CG1P1.SIP
RIO TOROLA SITIO PRESTAMO LINEA CGS-1 M.IZQUIERDA PERFIL 1 - RAW ARRIVAL TIMES



INPUT DATA FILE for CG1P1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG1P1.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-1 M.IZQUIERDA PERFIL 1

PROGRAM CONTROL DATA

Sprds	Exist	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Of SP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	147.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	148.0	10.0	0.0	3.750	1	62.62	2
2	149.0	20.0	0.0	12.250	1	61.25	2
3	150.0	30.0	0.0	20.750	1	59.87	2
4	150.0	40.0	0.0	27.120	1	57.37	2
5	150.0	50.0	0.0	33.620	2	55.37	2
6	150.0	60.0	0.0	37.370	2	51.62	2
7	150.0	70.0	0.0	41.120	2	44.50	2
8	150.0	80.0	0.0	42.870	2	36.37	2
9	150.0	90.0	0.0	45.370	2	30.62	2
10	150.0	100.0	0.0	49.250	2	22.87	2
11	150.0	110.0	0.0	54.250	2	18.50	2
12	150.0	120.0	0.0	58.370	2	13.87	1

DEPTH MODEL TABLES for CG1P1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

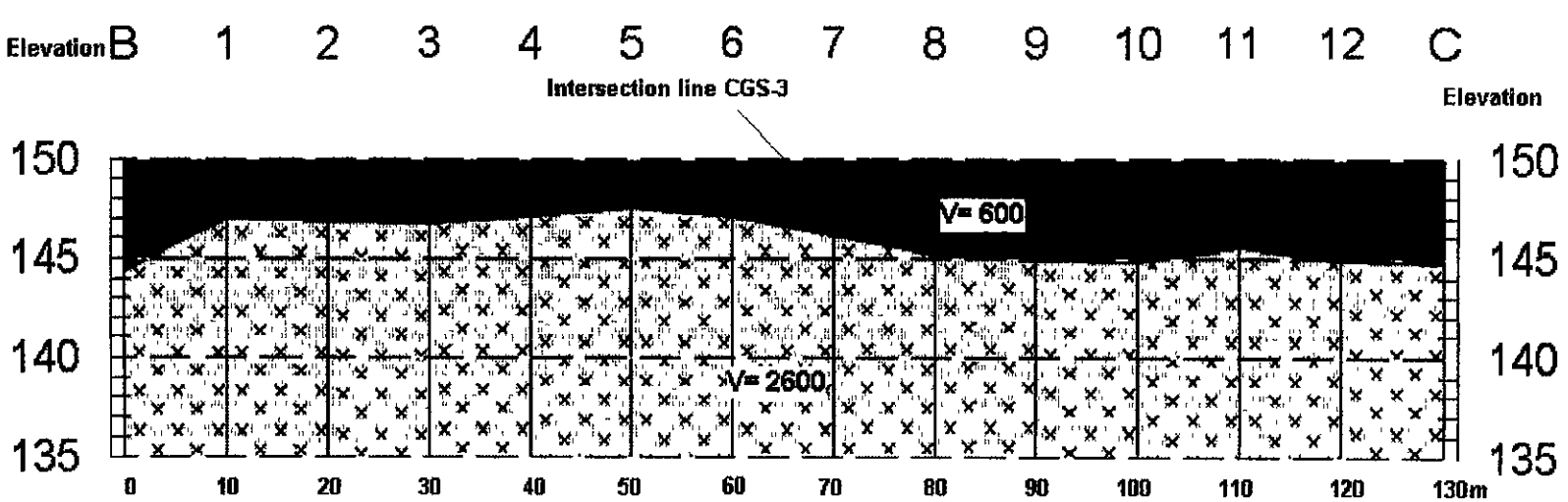
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.1	147.0	12.2	134.8
B	129.9	150.0	5.6	144.4

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	148.0	13.3	134.7
2	19.9	149.0	14.1	134.9
3	29.9	150.0	14.8	135.2
4	39.9	150.0	14.6	135.4
5	49.9	150.0	15.2	134.8
6	59.9	150.0	15.8	134.2
7	69.9	150.0	16.1	133.9
8	79.9	150.0	15.8	134.2
9	89.9	150.0	14.6	135.4
10	99.9	150.0	11.9	138.1
11	109.9	150.0	9.2	140.8
12	119.9	150.0	7.4	142.6

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1588	
Horizontal		2253

LINE CGS-1 PROFILE 2, BORROW AREA LEFT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

LEYEND

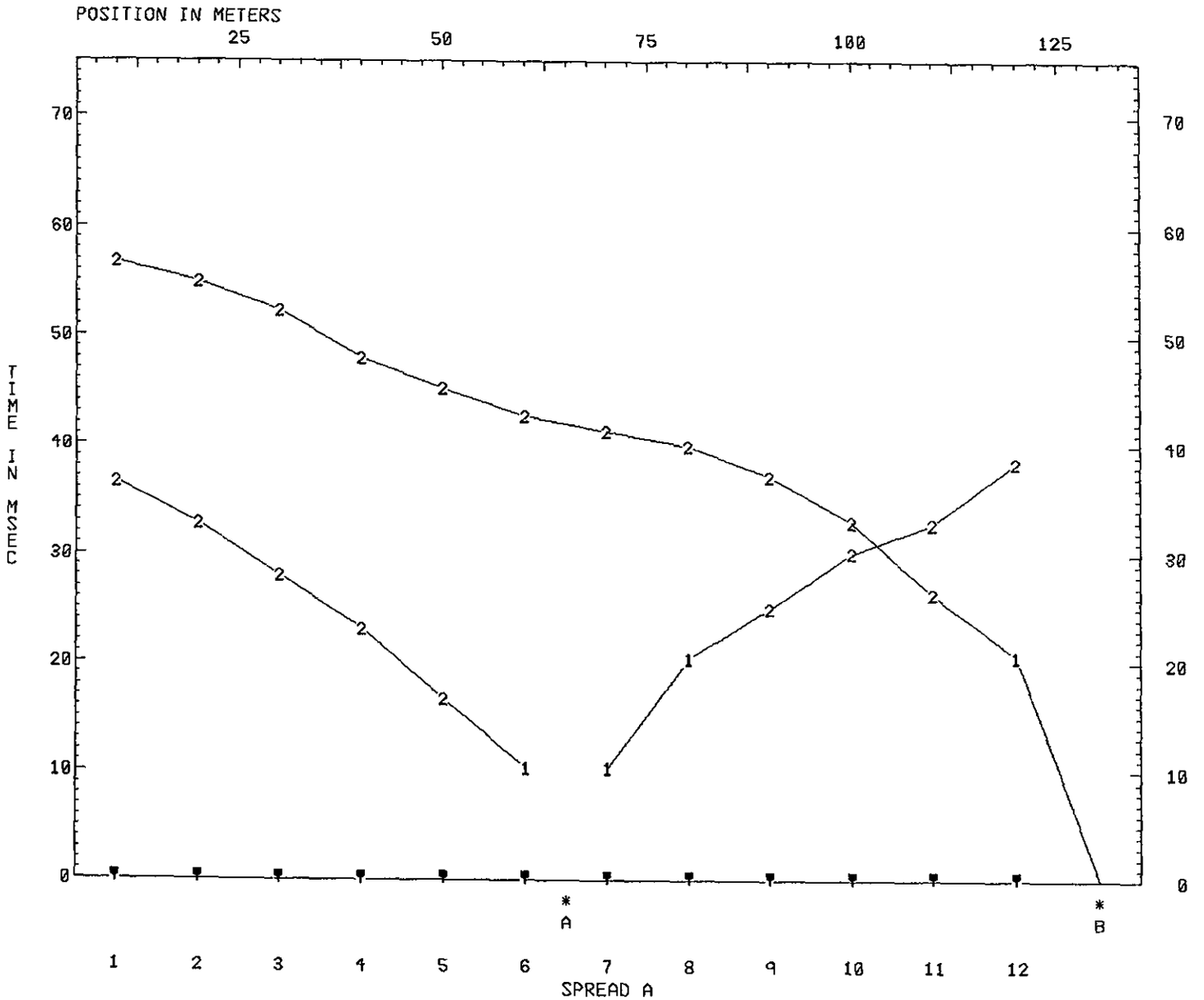
Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST:	SWISSB @RING
CONTENT	LINE CGS-1 PROFILE 2. LEFT BANK

SCALE	DATE	PLATE No
INDICATED	DECEMBER 2002	7

FILE CG1P2.SIP
RIO TOROLA SITIO PRESTAMO LINEA CGS-1 PERFIL 2 - RAW ARRIVAL TIMES



INPUT DATA FILE for CG1P2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG1P2.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-1 PERFIL 2

PROGRAM CONTROL DATA

Sprds	Extis	Layrs	Overs	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	150.0	65.0	0.0	0.0	0.0	0.0	0
B	150.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	150.0	10.0	0.0	36.50	2	56.75	2
2	150.0	20.0	0.0	32.75	2	54.87	2
3	150.0	30.0	0.0	28.00	2	52.25	2
4	150.0	40.0	0.0	23.12	2	48.00	2
5	150.0	50.0	0.0	16.62	2	45.12	2
6	150.0	60.0	0.0	10.25	1	42.62	2
7	150.0	70.0	0.0	10.25	1	41.25	2
8	150.0	80.0	0.0	20.37	1	39.87	2
9	150.0	90.0	0.0	25.00	2	37.12	2
10	150.0	100.0	0.0	30.12	2	33.00	2
11	150.0	110.0	0.0	32.75	2	26.37	2
12	150.0	120.0	0.0	38.37	2	20.62	1

DEPTH MODEL TABLES for CG1P2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

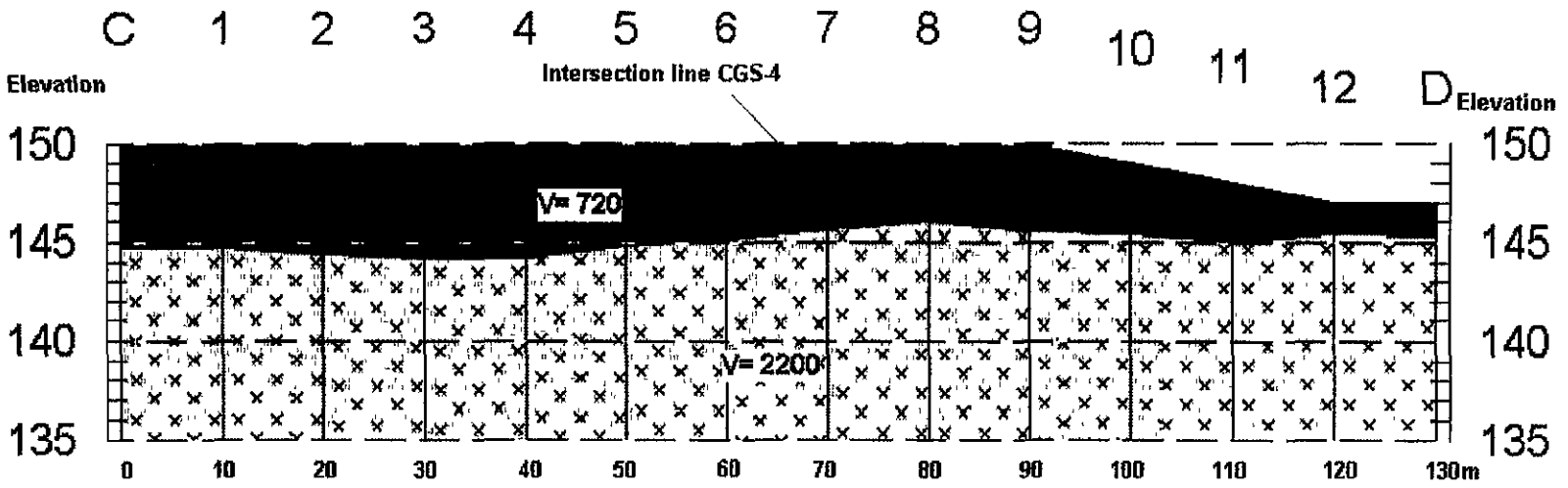
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	65.0	150.0	3.4	146.6
B	130.0	150.0	5.3	144.7

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	150.0	3.0	147.0
2	20.0	150.0	3.2	146.8
3	30.0	150.0	3.3	146.7
4	40.0	150.0	2.9	147.1
5	50.0	150.0	2.5	147.5
6	60.0	150.0	2.9	147.1
7	70.0	150.0	3.9	146.1
8	80.0	150.0	4.8	145.2
9	90.0	150.0	5.1	144.9
10	100.0	150.0	5.2	144.8
11	110.0	150.0	4.5	145.5
12	120.0	150.0	5.1	144.9

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	549	
Horizontal		2627

LINE CGS-1 PROFILE 3, BORROW AREA LEFT BANK



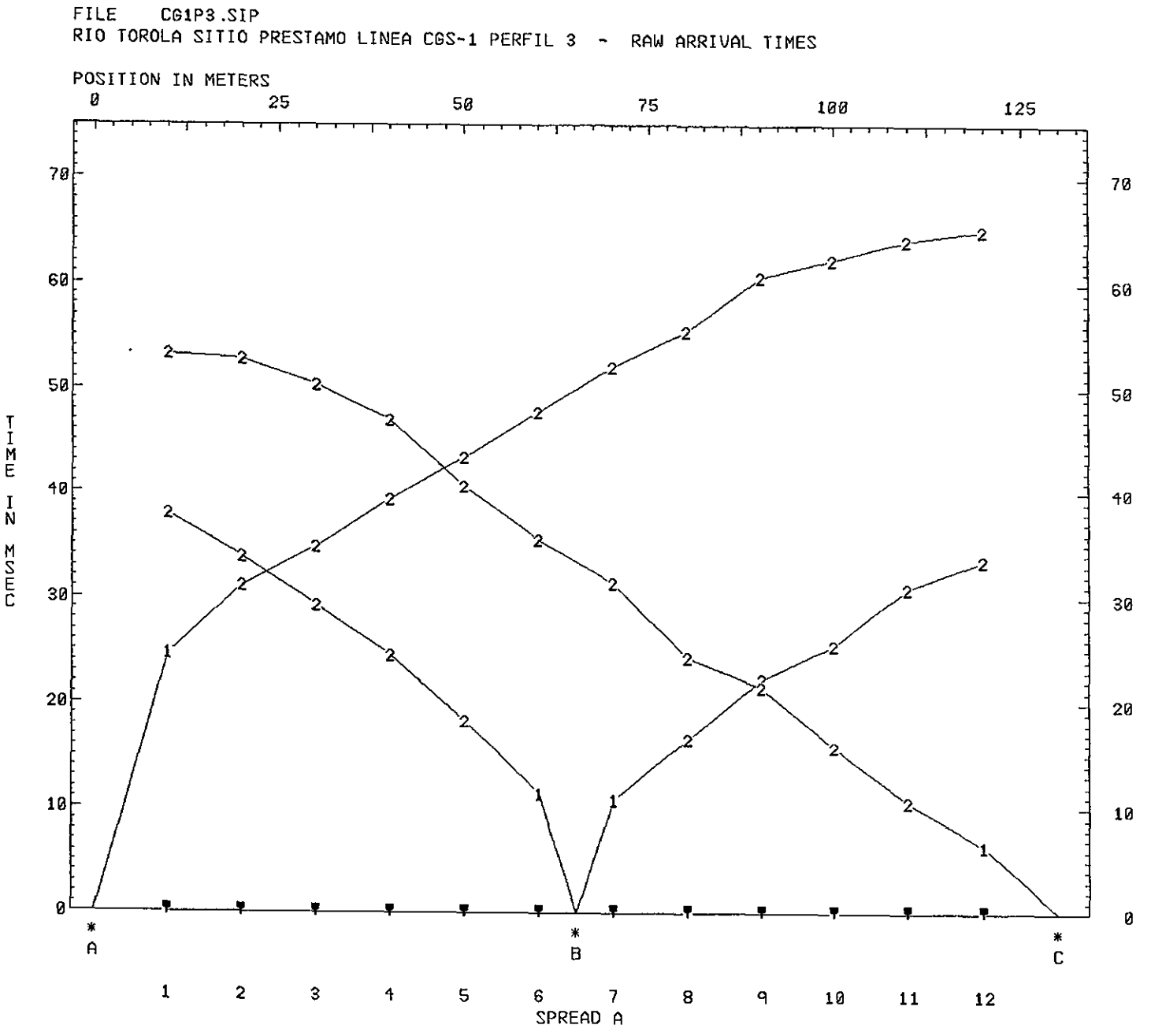
Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico río Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST:	SWISSB @RING
CONTENT:	LINE CGS-1 PROFILE 3. LEFT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No.	8


FILE CG1P3.SIP
RIO TOROLA SITIO PRESTAMO LINEA CGS-1 PERFIL 3 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
0
10
20
30
40
50
60
70
A
B
C
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A

INPUT DATA FILE for CG1P3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG1P3.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-1 PERFIL 3

PROGRAM CONTROL DATA

Sprds	Ext	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off SP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	150.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0
C	147.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	150.0	10.0	0.0	24.62	1	37.87	253.250	2	
2	150.0	20.0	0.0	31.12	2	33.75	252.750	2	
3	150.0	30.0	0.0	34.75	2	29.25	250.370	2	
4	150.0	40.0	0.0	39.25	2	24.50	247.000	2	
5	150.0	50.0	0.0	43.37	2	18.25	240.620	2	
6	150.0	60.0	0.0	47.75	2	11.37	135.500	2	
7	150.0	70.0	0.0	52.12	2	10.75	131.370	2	
8	150.0	80.0	0.0	55.50	2	16.62	224.250	2	
9	150.0	90.0	0.0	60.62	2	22.25	221.500	2	
10	149.0	100.0	0.0	62.25	2	25.50	215.750	2	
11	148.0	110.0	0.0	64.12	2	30.87	210.620	2	
12	147.0	120.0	0.0	65.12	2	33.50	2	6.375	1

DEPTH MODEL TABLES for CG1P3.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

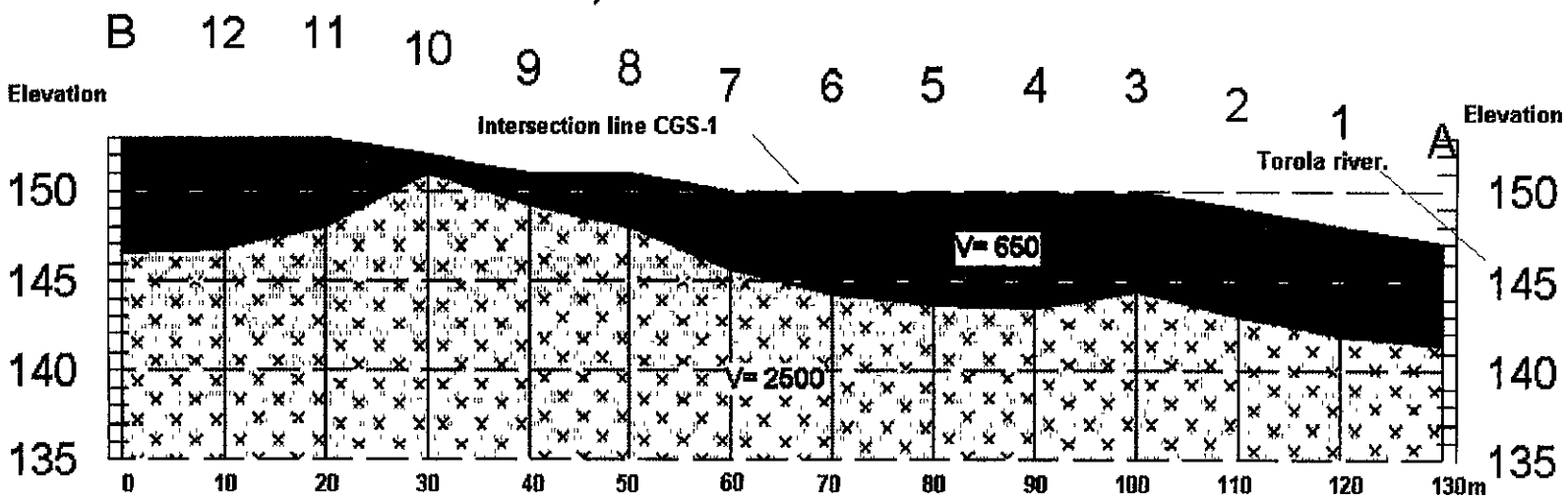
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	150.0	5.4	144.6
B	65.0	150.0	4.6	145.4
C	129.8	147.0	1.7	145.3

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	150.0	5.3	144.7
2	20.0	150.0	5.6	144.4
3	30.0	150.0	5.8	144.2
4	40.0	150.0	5.8	144.2
5	50.0	150.0	5.2	144.8
6	60.0	150.0	4.8	145.2
7	70.0	150.0	4.4	145.6
8	80.0	150.0	4.0	146.0
9	90.0	150.0	4.5	145.5
10	99.9	149.0	3.6	145.4
11	109.9	148.0	2.9	145.1
12	119.8	147.0	1.6	145.4

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	720	
Horizontal		2235

LINE CGS-2, BORROW AREA LEFT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB ⊙RING
CONTENT:	LINE CGS-2. LEFT BANK

SCALE	DATE	PLATE No.
INDICATED	DECEMBER 2002	9

FILE C6S2.SIP
RIO TOROLA SITIO PRESTAMO LINEA C6S-2 M.IZQUIERDA - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
TIME IN MSEC
0
10
20
30
40
50
60
70
SPREAD A
1
2
3
4
5
6
7
8
9
10
11
12
A
B

INPUT DATA FILE for CGS2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CGS2.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-2 M.IZQUIERDA

PROGRAM CONTROL DATA

Sprds	Extis	Layrs	Overs	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	147.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	148.0	10.0	0.0	13.00	1	44.62	2
2	149.0	20.0	0.0	19.37	2	41.37	2
3	150.0	30.0	0.0	22.25	2	36.12	2
4	150.0	40.0	0.0	30.62	2	33.62	2
5	150.0	50.0	0.0	36.25	2	28.00	1
6	150.0	60.0	0.0	39.25	2	13.12	1
7	150.0	70.0	0.0	41.37	2	13.87	1
8	151.0	80.0	0.0	43.00	2	21.00	1
9	151.0	90.0	0.0	45.50	2	29.50	1
10	152.0	100.0	0.0	47.50	2	37.25	1
11	153.0	110.0	0.0	49.62	2	44.75	2
12	153.0	120.0	0.0	50.37	2	49.62	2

DEPTH MODEL TABLES for CGS2.SIP

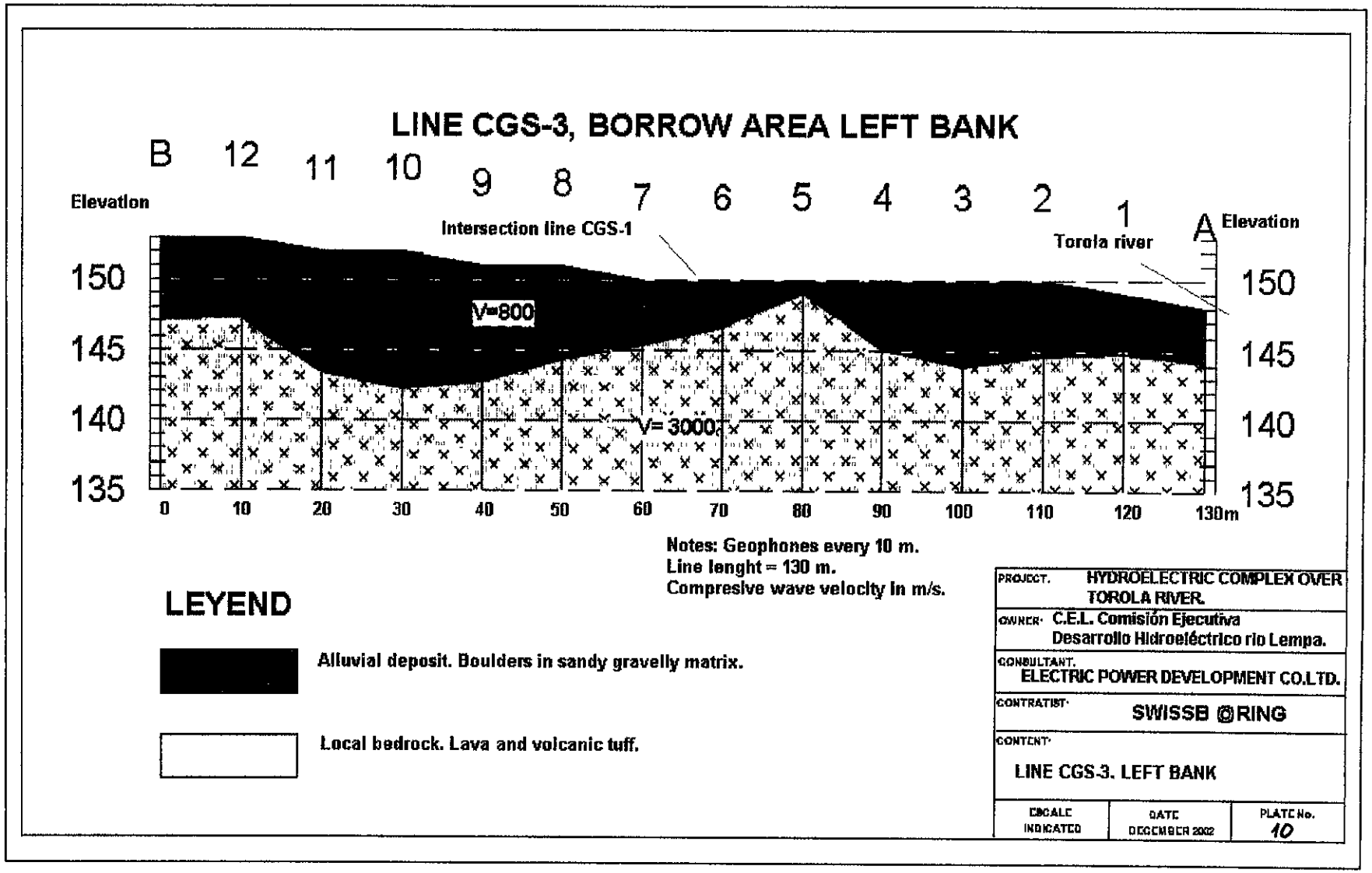
Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.1	147.0	5.5	141.5
B	64.9	150.0	5.1	144.9

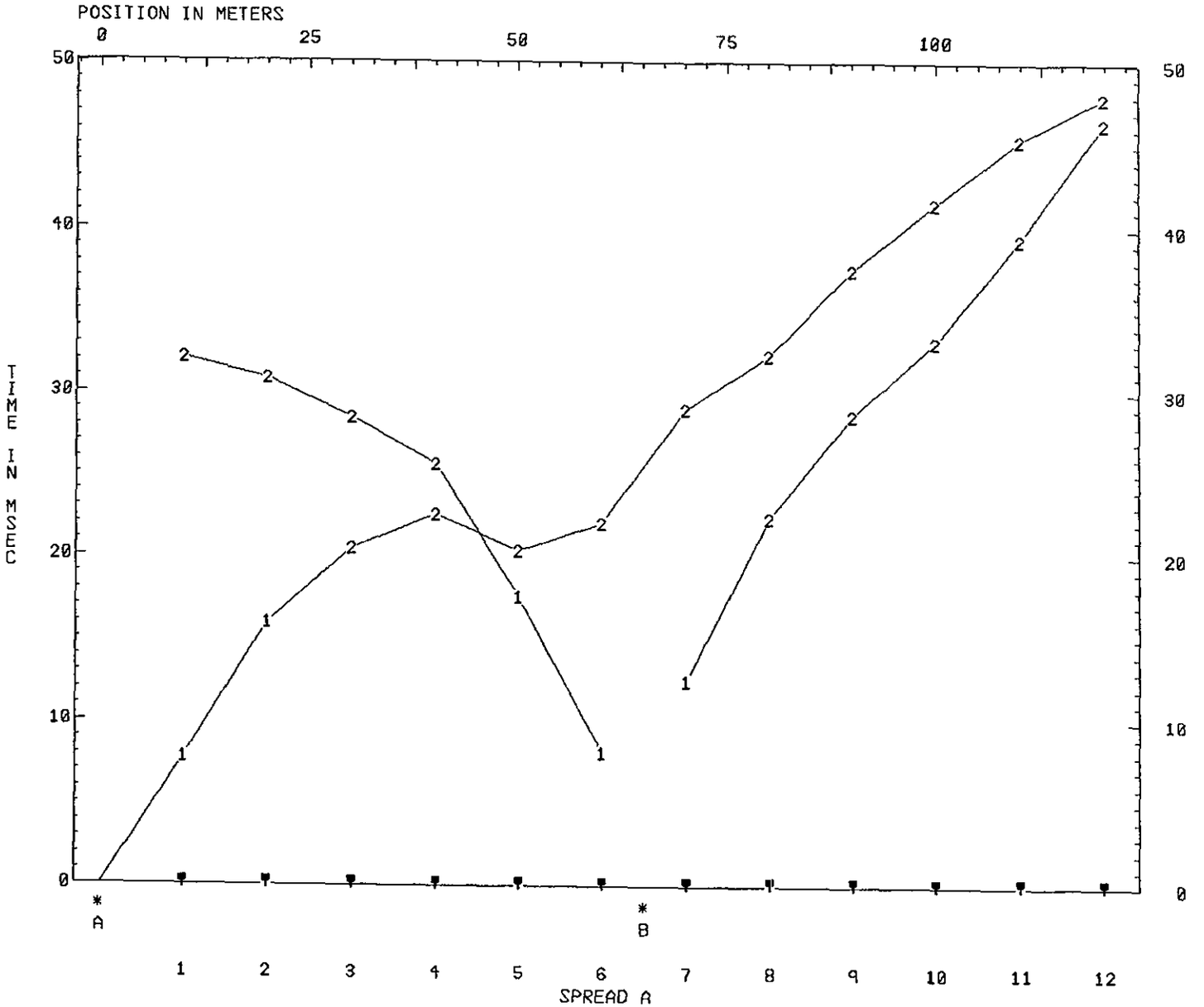
Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	148.0	6.1	141.9
2	19.9	149.0	6.0	143.0
3	29.9	150.0	5.6	144.4
4	39.9	150.0	6.5	143.5
5	49.9	150.0	6.3	143.7
6	59.9	150.0	5.8	144.2
7	69.9	150.0	4.3	145.7
8	79.8	151.0	3.0	148.0
9	89.8	151.0	1.8	149.2
10	99.8	152.0	1.0	151.0
11	109.7	153.0	5.0	148.0
12	119.7	153.0	6.2	146.8

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	649	
Horizontal		2563


LINE CGS-3, BORROW AREA LEFT BANK
B 12 11 10 9 8 7 6 5 4 3 2 1 A
Elevation
Intersection line CGS-1
Torola river
Elevation
150
145
140
135
V=800
V= 3000
0 10 20 30 40 50 60 70 80 90 100 110 120 130m
Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.
LEYEND
Alluvial deposit. Boulders in sandy gravelly matrix.
Local bedrock. Lava and volcanic tuff.
PROJECT. HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER. C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT. ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST. SWISSB ◎RING
CONTENT. LINE CGS-3. LEFT BANK
SCALE INDICATED
DATE DECEMBER 2002
PLATE No. 10

FILE CGS3.SIP
RIO TOROLA SITIO PRESTAMO LINEA CGS-3 M.IZQUIERDA - RAW ARRIVAL TIMES



INPUT DATA FILE for CGS3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CGS3.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-3 M.IZQUIERDA

PROGRAM CONTROL DATA

Spr ds	Ext	Lay rs	VOv er	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trac e	Off SP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	148.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	149.0	10.0	0.0	7.750		132.120	2
2	150.0	20.0	0.0	15.870		130.750	2
3	150.0	30.0	0.0	20.370		228.370	2
4	150.0	40.0	0.0	22.500		225.620	2
5	150.0	50.0	0.0	20.250		217.500	1
6	150.0	60.0	0.0	22.000		2 8.125	1
7	150.0	70.0	0.0	29.000		212.500	1
8	151.0	80.0	0.0	32.250		222.250	2
9	151.0	90.0	0.0	37.500		228.620	2
10	152.0	100.0	0.0	41.500		233.120	2
11	152.0	110.0	0.0	45.370		239.370	2
12	153.0	120.0	0.0	48.000		246.370	2

DEPTH MODEL TABLES for CGS3.SIP

Spread A *Depth and Elev of layers directly beneath SPs and Geos*

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.1	148.0	3.9	144.1
B	64.9	150.0	4.0	146.0

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	149.0	4.2	144.8
2	19.9	150.0	5.4	144.6
3	29.9	150.0	6.1	143.9
4	39.9	150.0	4.9	145.1
5	49.9	150.0	1.0	149.0
6	59.9	150.0	3.4	146.6
7	69.9	150.0	4.6	145.4
8	79.9	151.0	6.7	144.3
9	89.9	151.0	8.3	142.7
10	99.8	152.0	9.8	142.2
11	109.8	152.0	8.6	143.4
12	119.8	153.0	5.8	147.2

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	885	
Horizontal		2924

INPUT DATA FILE for CG1P3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG1P3.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS-1 PERFIL 3

PROGRAM CONTROL DATA

Spreads	Extis	Layers	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Of SP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

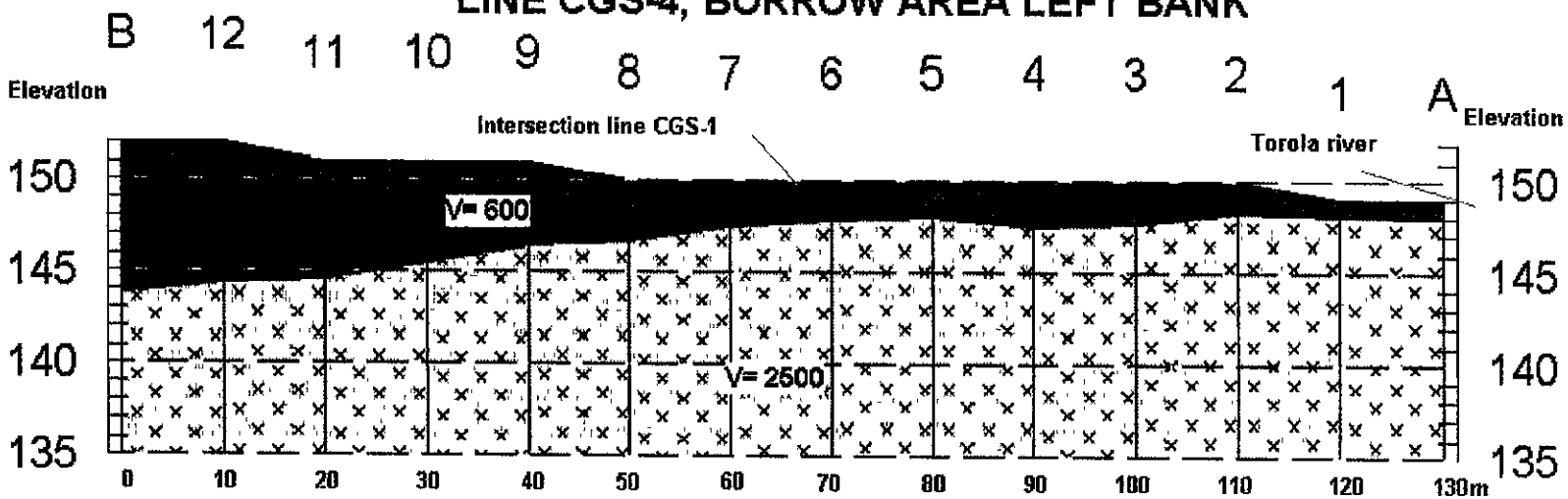
Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	150.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0
C	147.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	150.0	10.0	0.0	24.62	1	37.87	253.250	2	
2	150.0	20.0	0.0	31.12	2	33.75	252.750	2	
3	150.0	30.0	0.0	34.75	2	29.25	250.370	2	
4	150.0	40.0	0.0	39.25	2	24.50	247.000	2	
5	150.0	50.0	0.0	43.37	2	18.25	240.620	2	
6	150.0	60.0	0.0	47.75	2	11.37	135.500	2	
	150.0	70.0	0.0	52.12	2	10.75	131.370	2	
8	150.0	80.0	0.0	55.50	2	16.62	224.250	2	
9	150.0	90.0	0.0	60.62	2	22.25	221.500	2	
10	149.0	100.0	0.0	62.25	2	25.50	215.750	2	
11	148.0	110.0	0.0	64.12	2	30.87	210.620	2	
12	147.0	120.0	0.0	65.12	2	33.50	2	6.375	1

LINE CGS-4, BORROW AREA LEFT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

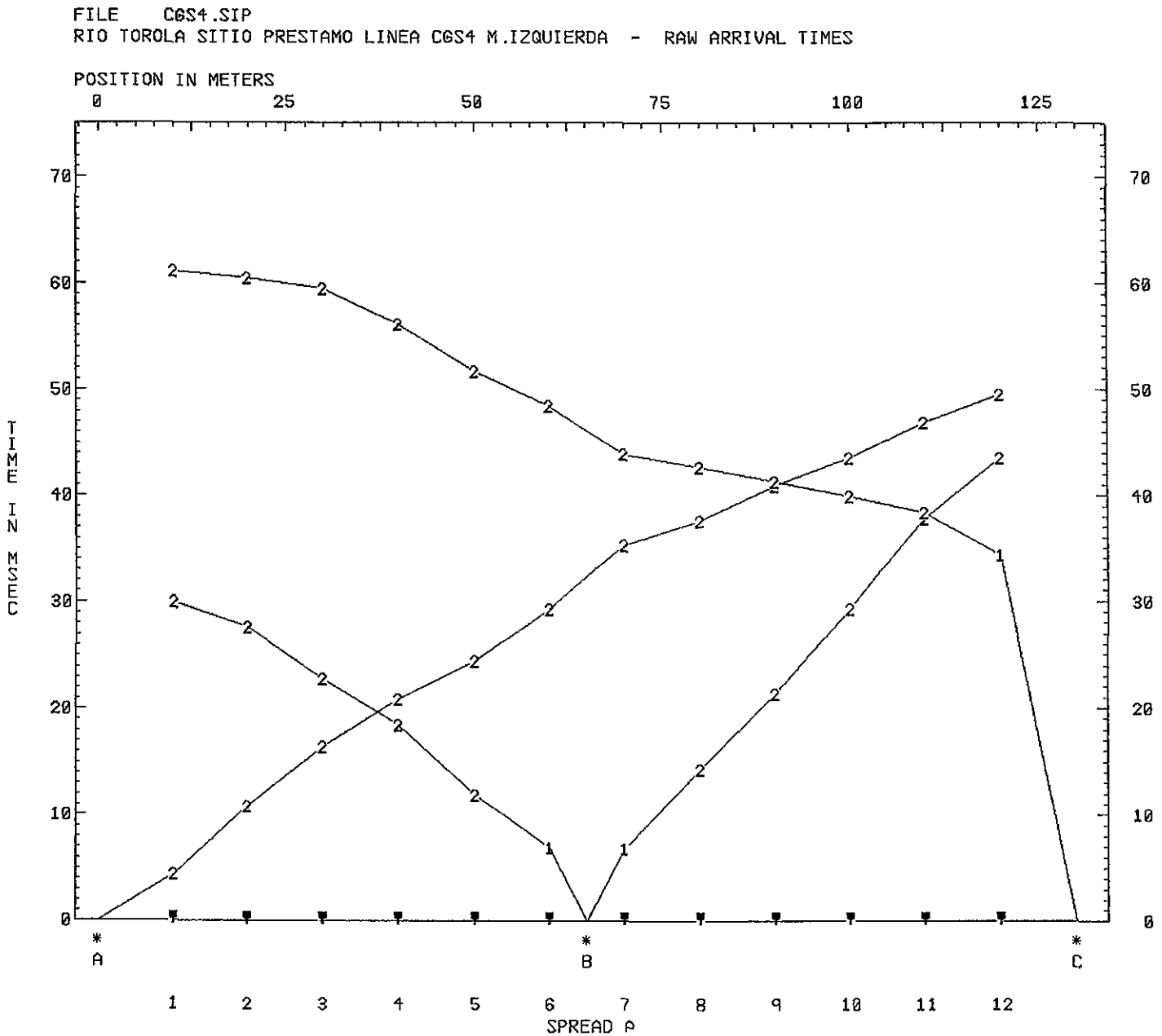
LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT.	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB ⓒ RING
CONTENT:	LINE CGS-4. LEFT BANK

SCALE	DATE	PLATE No.
INDICATED	DECEMBER 2002	11


FILE CGS4.SIP
RIO TOROLA SITIO PRESTAMO LINEA CGS4 M.IZQUIERDA - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
70
60
50
40
30
20
10
0
A
B
C
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD A

INPUT DATA FILE for CGS4.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CGS4.SIP

RIO TOROLA SITIO PRESTAMO LINEA CGS4 M.IZQUIERDA

PROGRAM CONTROL DATA

Spreads	Exist	Layers	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	149.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0
C	152.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	149.0	10.0	0.0	4.375		230.000	2	61.12	2
2	150.0	20.0	0.0	10.750		227.620	2	60.37	2
3	150.0	30.0	0.0	16.370		222.750	2	59.50	2
4	150.0	40.0	0.0	20.870		218.370	2	56.12	2
5	150.0	50.0	0.0	24.370		211.870	2	51.62	2
6	150.0	60.0	0.0	29.250	2	6.875	1	48.37	2
7	150.0	70.0	0.0	35.250	2	6.750	1	43.87	2
8	150.0	80.0	0.0	37.620		214.250	2	42.62	2
9	151.0	90.0	0.0	40.870		221.250	2	41.25	2
10	151.0	100.0	0.0	43.500		229.250	2	39.87	2
11	151.0	110.0	0.0	46.870		237.750	2	38.37	2
12	152.0	120.0	0.0	49.500		243.500	2	34.25	1

DEPTH MODEL TABLES for CGS4.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

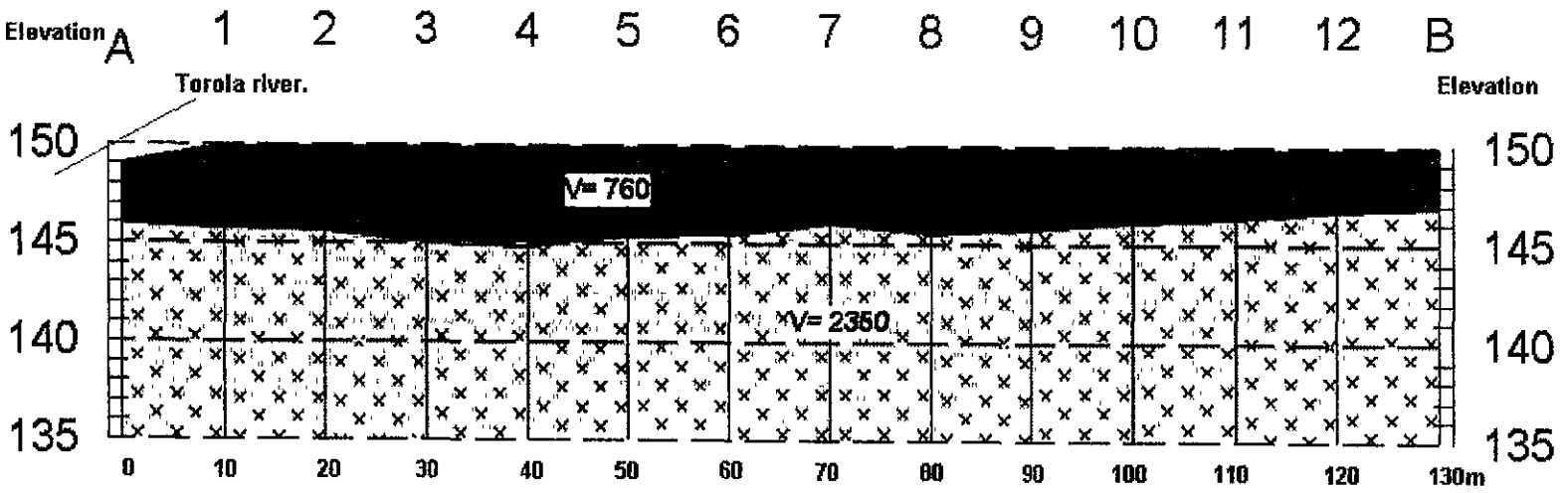
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	149.0	1.0	148.0
B	64.9	150.0	2.4	147.6
C	129.8	152.0	8.2	143.8

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	149.0	0.9	148.1
2	19.9	150.0	1.7	148.3
3	29.9	150.0	2.4	147.6
4	39.9	150.0	2.6	147.4
5	49.9	150.0	2.0	148.0
6	59.9	150.0	2.2	147.8
7	69.9	150.0	2.6	147.4
8	79.9	150.0	3.4	146.6
9	89.9	151.0	4.6	146.4
10	99.9	151.0	5.5	145.5
11	109.9	151.0	6.4	144.6
12	119.8	152.0	7.6	144.4

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	587	
Horizontal		2514

LINE CGS-5 PROFILE 1, BORROW AREA RIGHT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

LEYEND

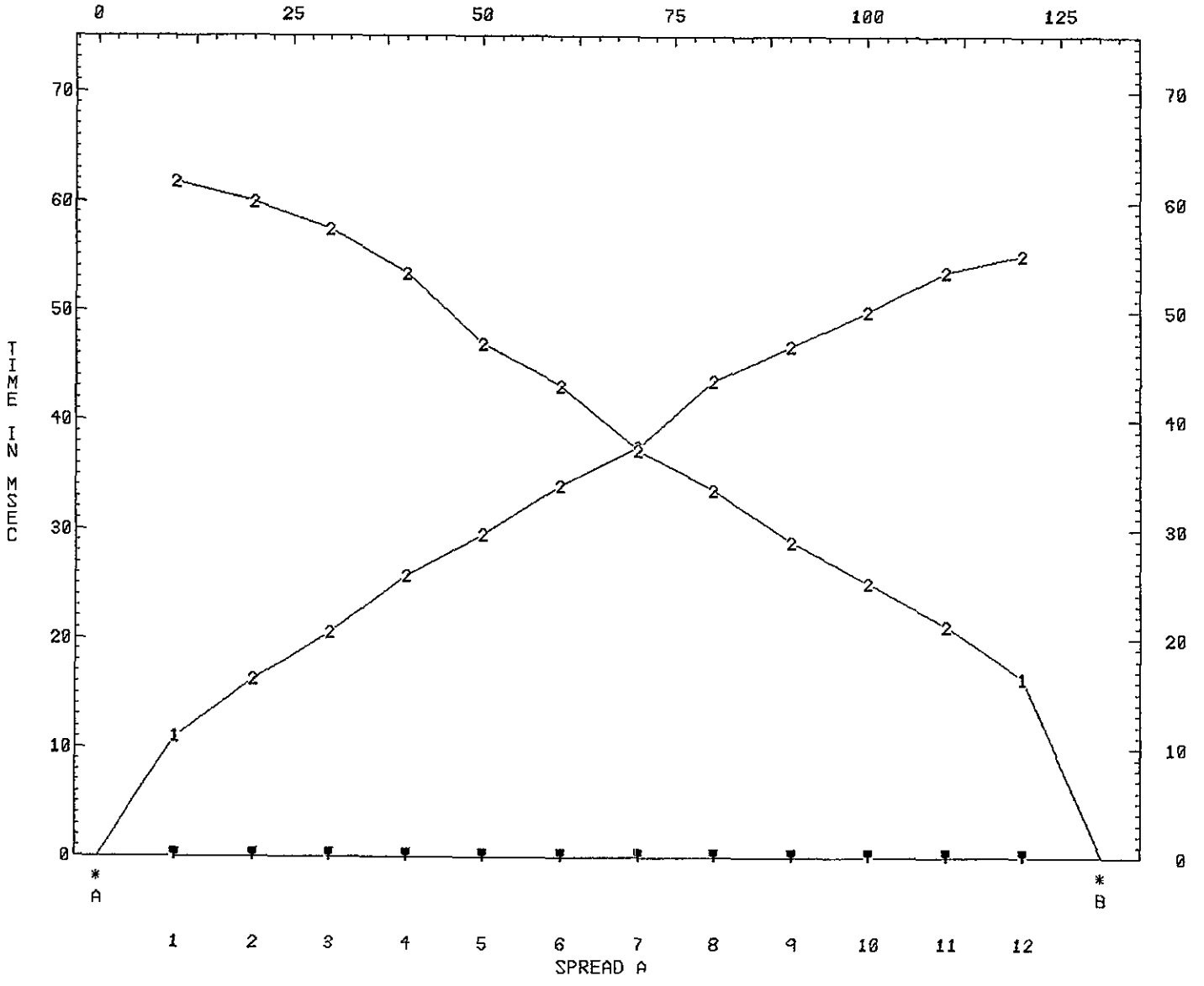
Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico río Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB @RING
CONTENT.	LINE CGS-5 PROFILE 1.RIGHT BANK

SCALE INDICATED	DATE DECEMBER 2002	PLATE No 12

FILE C05L1.SIP
RIO TOROLA SITIO PRESTAMO M. DERECHA LINEA C05-5 PERFIL 1. - RAW ARRIVAL TIMES



7-8-71

INPUT DATA FILE for CG5L1.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG5L1.SIP

RIO TOROLA SITIO PRESTAMO M. DERECHA LINEA CGS-5 PERFIL 1.

PROGRAM CONTROL DATA

Spr ds	Ext	Lay rs	VOv er	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	149.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	150.0	10.0	0.0	11.12	1	61.75	2
2	150.0	20.0	0.0	16.25	2	60.00	2
3	150.0	30.0	0.0	20.62	2	57.37	2
4	150.0	40.0	0.0	25.75	2	53.37	2
5	150.0	50.0	0.0	29.62	2	47.00	2
6	150.0	60.0	0.0	34.00	2	43.12	2
7	150.0	70.0	0.0	37.62	2	37.25	2
8	150.0	80.0	0.0	43.62	2	33.62	2
9	150.0	90.0	0.0	46.75	2	28.87	2
10	150.0	100.0	0.0	50.00	2	25.12	2
11	150.0	110.0	0.0	53.62	2	21.12	2
12	150.0	120.0	0.0	55.12	2	16.37	1

DEPTH MODEL TABLES for CG5L1.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

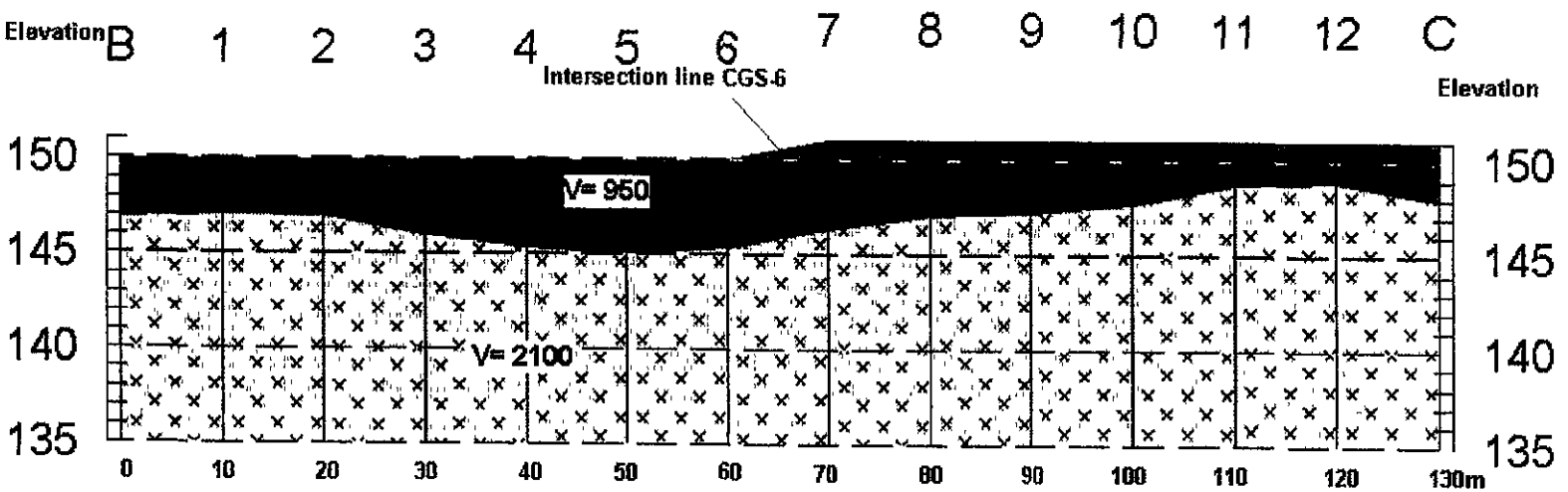
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.1	149.0	3.1	145.9
B	130.0	150.0	3.1	146.9

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	150.0	4.2	145.8
2	20.0	150.0	4.4	145.6
3	30.0	150.0	5.0	145.0
4	40.0	150.0	5.2	144.8
5	50.0	150.0	4.7	145.3
6	60.0	150.0	4.6	145.4
7	70.0	150.0	4.0	146.0
8	80.0	150.0	4.5	145.5
9	90.0	150.0	4.2	145.8
10	100.0	150.0	3.9	146.1
11	110.0	150.0	3.7	146.3
12	120.0	150.0	3.3	146.7

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	755	
Horizontal		2346

LINE CGS-5 PROFILE 2, BORROW AREA RIGHT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

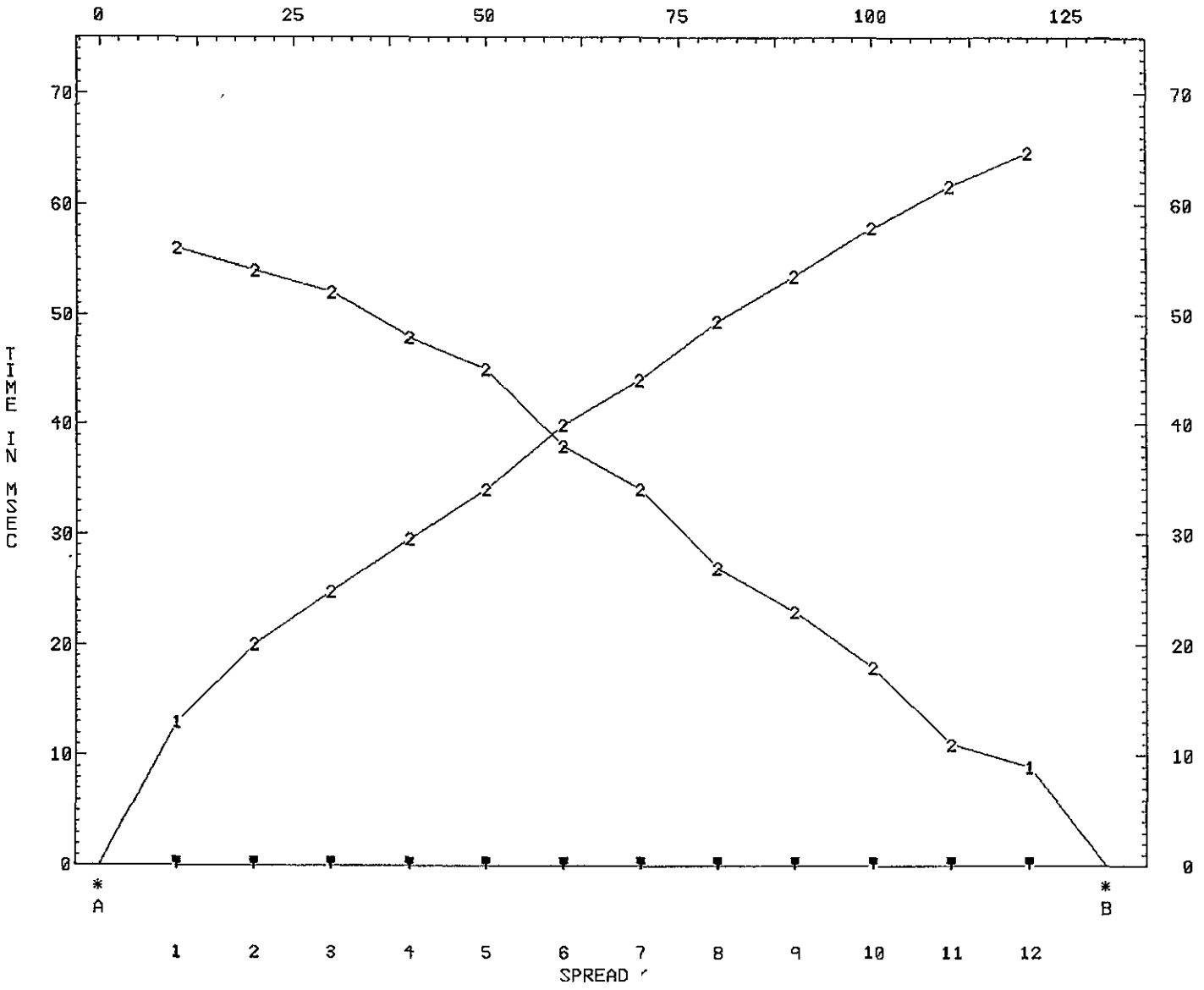
LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB @RING
CONTENT:	LINE CGS-5 PROFILE 2.RIGHT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No	13

FILE C05L2.SIP
RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-5 PERFIL 2 - RAW ARRIVAL TIMES



INPUT DATA FILE for CG5L2.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG5L2.SIP

RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-5 PERFIL 2

PROGRAM CONTROL DATA

Sprds	Exit	Lays	VOver	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	150.0	0.0	0.0	0.0	0.0	0.0	1
B	151.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	150.0	10.0	0.0	13.00	156.000	2	
2	150.0	20.0	0.0	20.12	254.000	2	
3	150.0	30.0	0.0	24.75	252.000	2	
4	150.0	40.0	0.0	29.62	248.000	2	
5	150.0	50.0	0.0	34.00	245.000	2	
6	150.0	60.0	0.0	39.87	238.000	2	
7	151.0	70.0	0.0	44.00	234.000	2	
8	151.0	80.0	0.0	49.37	227.000	2	
9	151.0	90.0	0.0	53.50	223.000	2	
10	151.0	100.0	0.0	57.75	218.000	2	
11	151.0	110.0	0.0	61.62	211.000	2	
12	151.0	120.0	0.0	64.62	2 9.000	1	

DEPTH MODEL TABLES for CG5L2.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

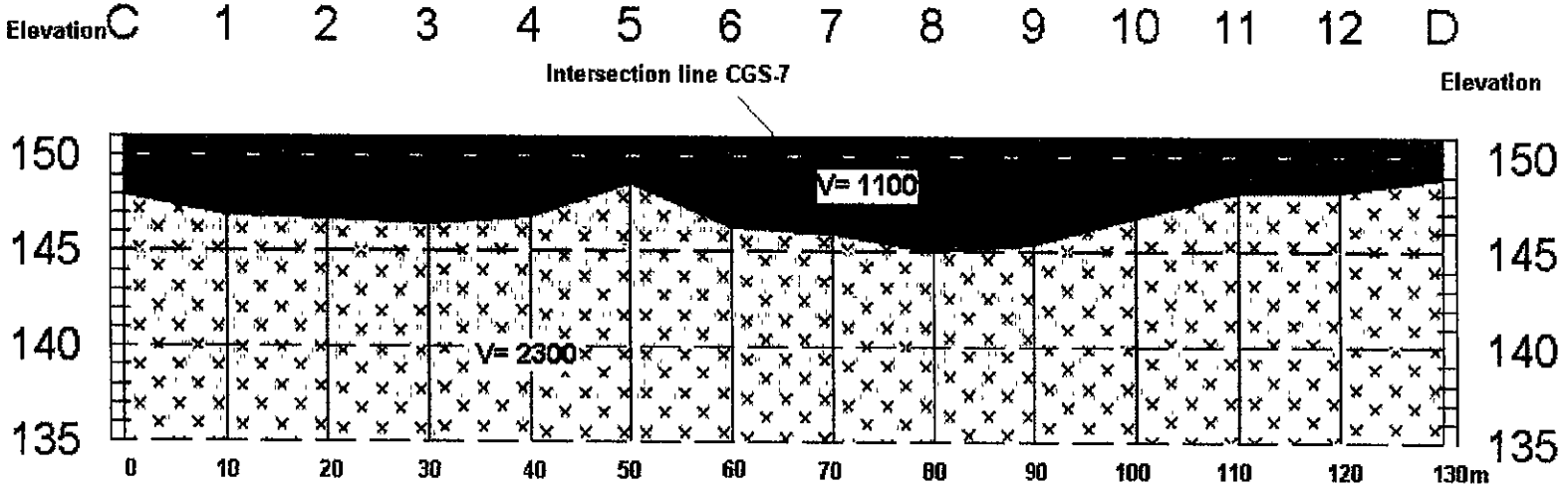
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	150.0	2.4	147.6
B	129.9	151.0	1.5	149.5

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	150.0	2.9	147.1
2	20.0	150.0	3.0	147.0
3	30.0	150.0	4.0	146.0
4	40.0	150.0	4.6	145.4
5	50.0	150.0	5.0	145.0
6	60.0	150.0	4.6	145.4
7	69.9	151.0	4.6	146.4
8	79.9	151.0	3.9	147.1
9	89.9	151.0	3.7	147.3
10	99.9	151.0	3.3	147.7
11	109.9	151.0	2.2	148.8
12	119.9	151.0	2.0	149.0

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	940	
Horizontal		2131

LINE CGS-5 PROFILE 3, BORROW AREA RIGHT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

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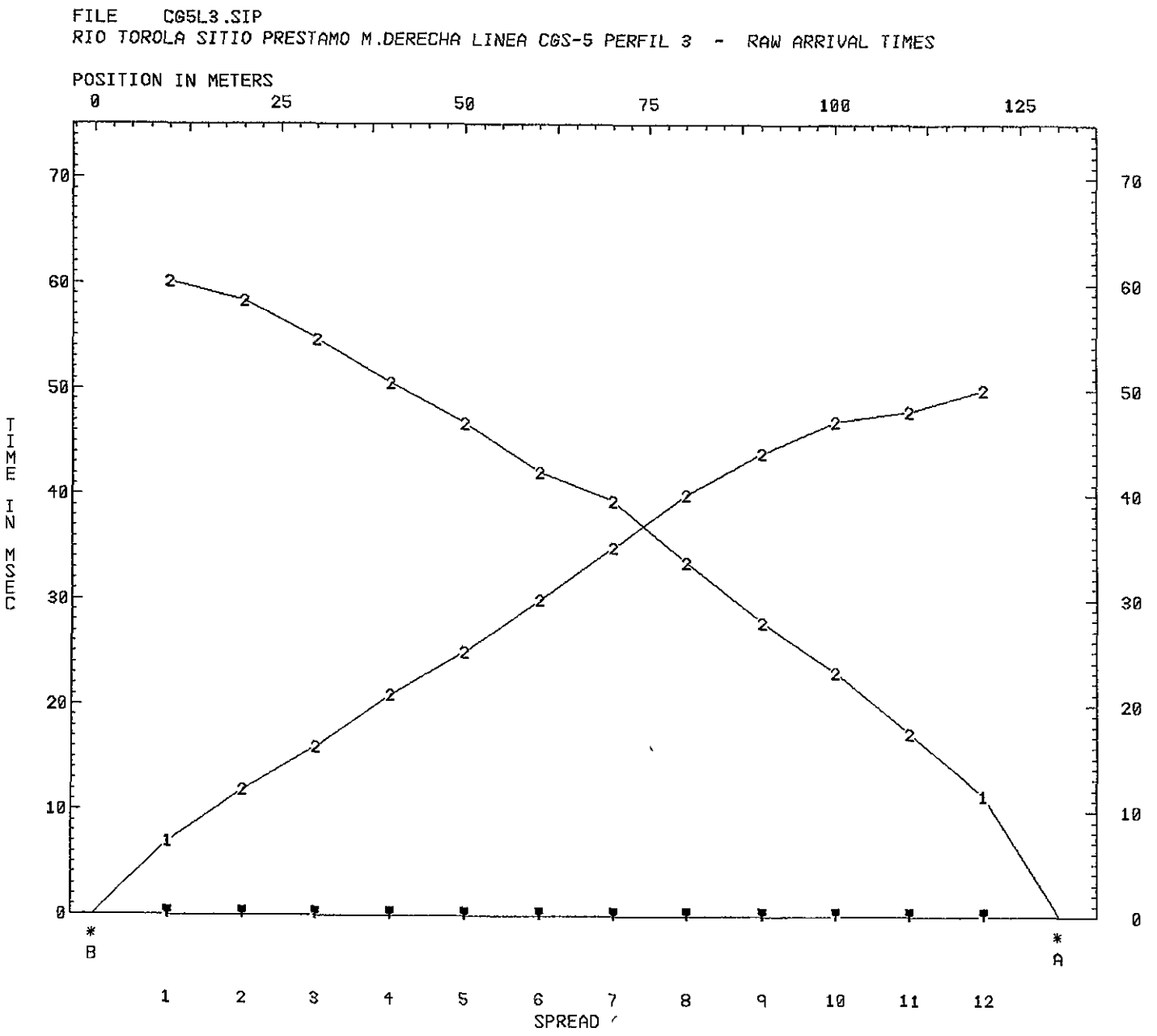
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB ⊙RING
CONTENT	LINE CGS-5 PROFILE 3.RIGHT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No.	14


FILE CG5L3.SIP
RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-5 PERFIL 3 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
70
60
50
40
30
20
10
0
B
A
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD

INPUT DATA FILE for CG5L3.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CG5L3.SIP

RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-5 PERFIL 3

PROGRAM CONTROL DATA

Spreads	Explts	Layers	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	OffSP	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
B	151.0	0.0	0.0	0.0	0.0	0.0	1
A	151.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP B	L	SP A	L
1	151.0	10.0	0.0	7.000	1	60.12	2
2	151.0	20.0	0.0	12.000	2	58.25	2
3	151.0	30.0	0.0	16.000	2	54.62	2
4	151.0	40.0	0.0	21.000	2	50.62	2
5	151.0	50.0	0.0	25.000	2	46.75	2
6	151.0	60.0	0.0	30.000	2	42.12	2
7	151.0	70.0	0.0	35.000	2	39.37	2
8	151.0	80.0	0.0	40.000	2	33.50	2
9	151.0	90.0	0.0	44.000	2	27.75	2
10	151.0	100.0	0.0	47.000	2	23.12	2
11	151.0	110.0	0.0	48.000	2	17.37	2
12	151.0	120.0	0.0	50.000	2	11.50	1

DEPTH MODEL TABLES for CG5L3.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

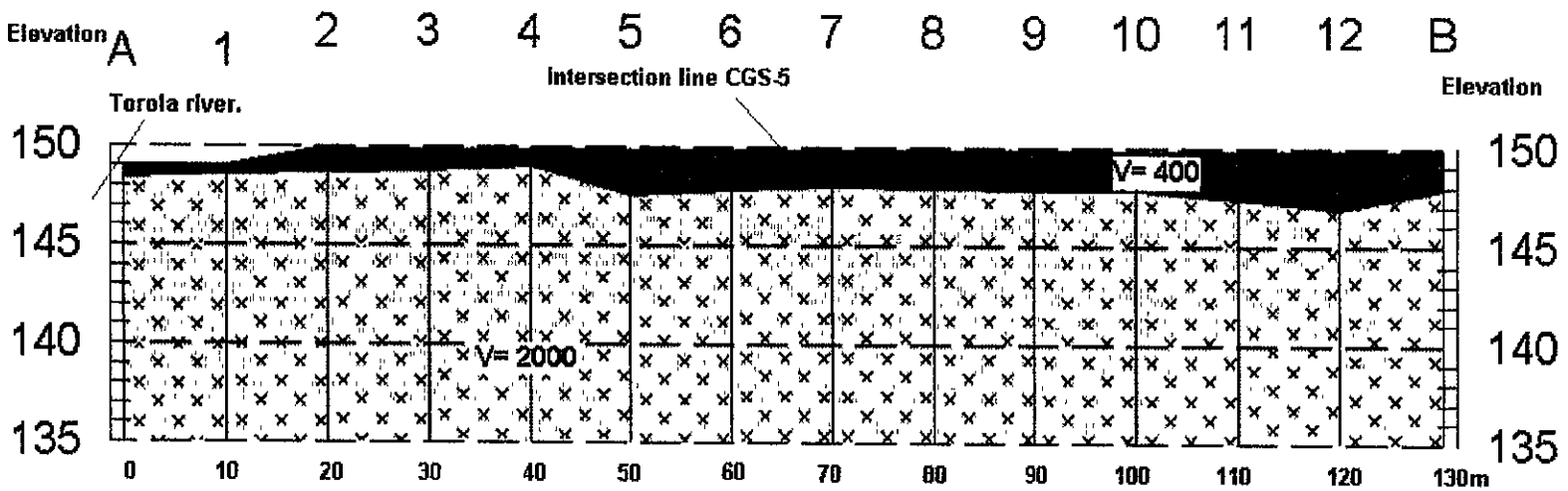
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
B	0.0	151.0	4.2	146.8
A	130.0	151.0	2.1	148.9

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	151.0	4.1	146.9
2	20.0	151.0	4.3	146.7
3	30.0	151.0	4.5	146.5
4	40.0	151.0	4.2	146.8
5	50.0	151.0	2.4	148.6
6	60.0	151.0	4.7	146.3
7	70.0	151.0	5.1	145.9
8	80.0	151.0	6.0	145.0
9	90.0	151.0	5.6	145.4
10	100.0	151.0	4.2	146.8
11	110.0	151.0	2.8	148.2
12	120.0	151.0	2.8	148.2

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	1149	
Horizontal		2335

LINE CGS-6 BORROW AREA RIGHT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

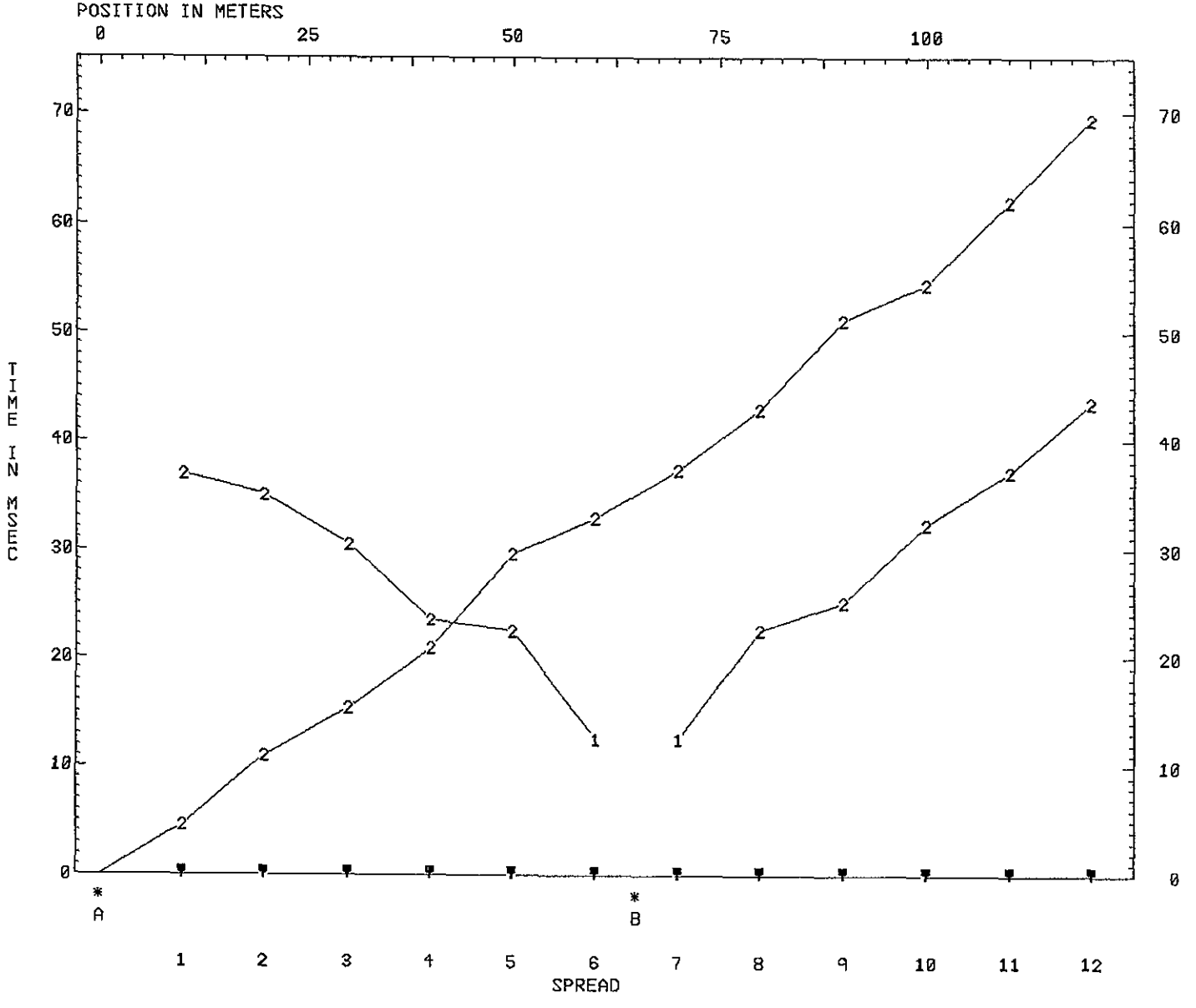
LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB @RING
CONTENT	LINE CGS-6 RIGHT BANK
ESCALE INDICATED	DATE DECEMBER 2002
PLATE No.	15

FILE CGS6.SIP
RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-6 - RAW ARRIVAL TIMES



INPUT DATA FILE for CGS6.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CGS6.SIP

RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-6

PROGRAM CONTROL DATA

Spreads	Exit	Layers	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM CONTROL Pt 1 Elev/X	Pt 2 Elev/X	PLOT CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Offset Scale	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 2 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	149.0	0.0	0.0	0.0	0.0	0.0	1
B	150.0	65.0	0.0	0.0	0.0	0.0	0

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L
1	149.0	10.0	0.0	4.625	2	36.87	2
2	150.0	20.0	0.0	11.000	2	35.00	2
3	150.0	30.0	0.0	15.250	2	30.37	2
4	150.0	40.0	0.0	20.870	2	23.50	2
5	150.0	50.0	0.0	29.620	2	22.37	2
6	150.0	60.0	0.0	32.870	2	12.50	1
7	150.0	70.0	0.0	37.250	2	12.50	1
8	150.0	80.0	0.0	42.870	2	22.50	2
9	150.0	90.0	0.0	51.120	2	25.12	2
10	150.0	100.0	0.0	54.370	2	32.25	2
11	150.0	110.0	0.0	62.000	2	37.12	2
12	150.0	120.0	0.0	69.370	2	43.50	2

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DEPTH MODEL TABLES for CGS6.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

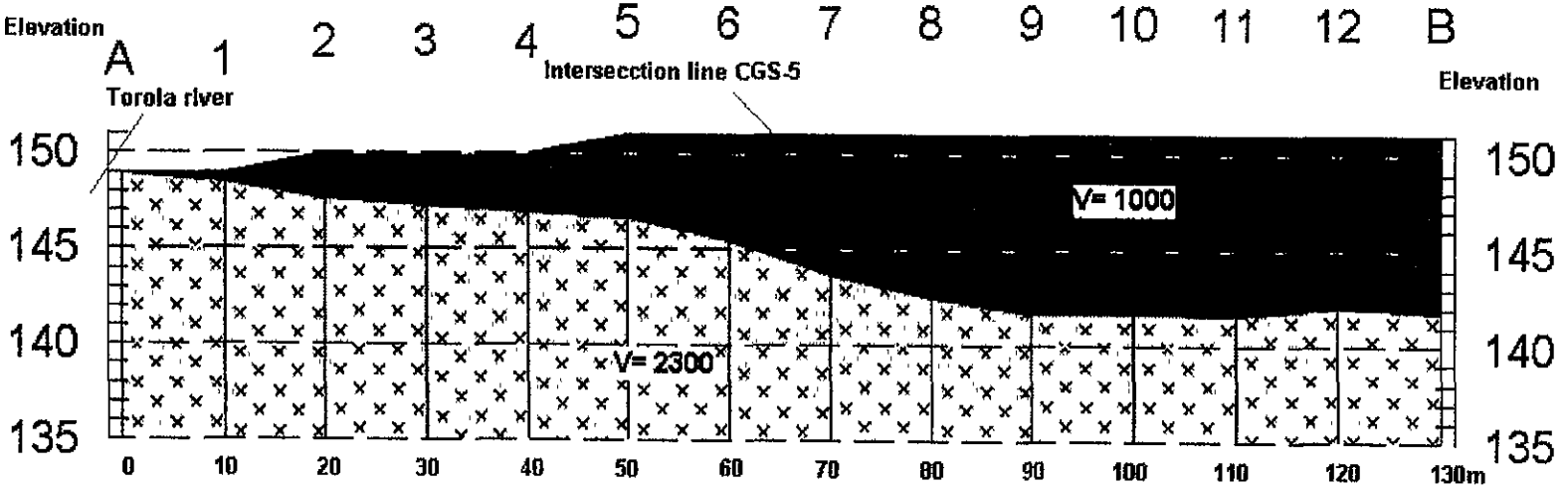
SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	149.0	0.6	148.4
B	64.9	150.0	2.1	147.9

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	149.0	0.4	148.6
2	19.9	150.0	1.3	148.7
3	29.9	150.0	1.2	148.8
4	39.9	150.0	1.0	149.0
5	49.9	150.0	2.4	147.6
6	59.9	150.0	2.2	147.8
7	69.9	150.0	2.0	148.0
8	79.9	150.0	2.1	147.9
9	89.9	150.0	2.2	147.8
10	99.9	150.0	2.2	147.8
11	109.9	150.0	2.6	147.4
12	119.9	150.0	3.1	146.9

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	400	
Horizontal		1897

LINE CGS-7 BORROW AREA RIGHT BANK



Notes: Geophones every 10 m.
Line lenght = 130 m.
Compresive wave velocity in m/s.

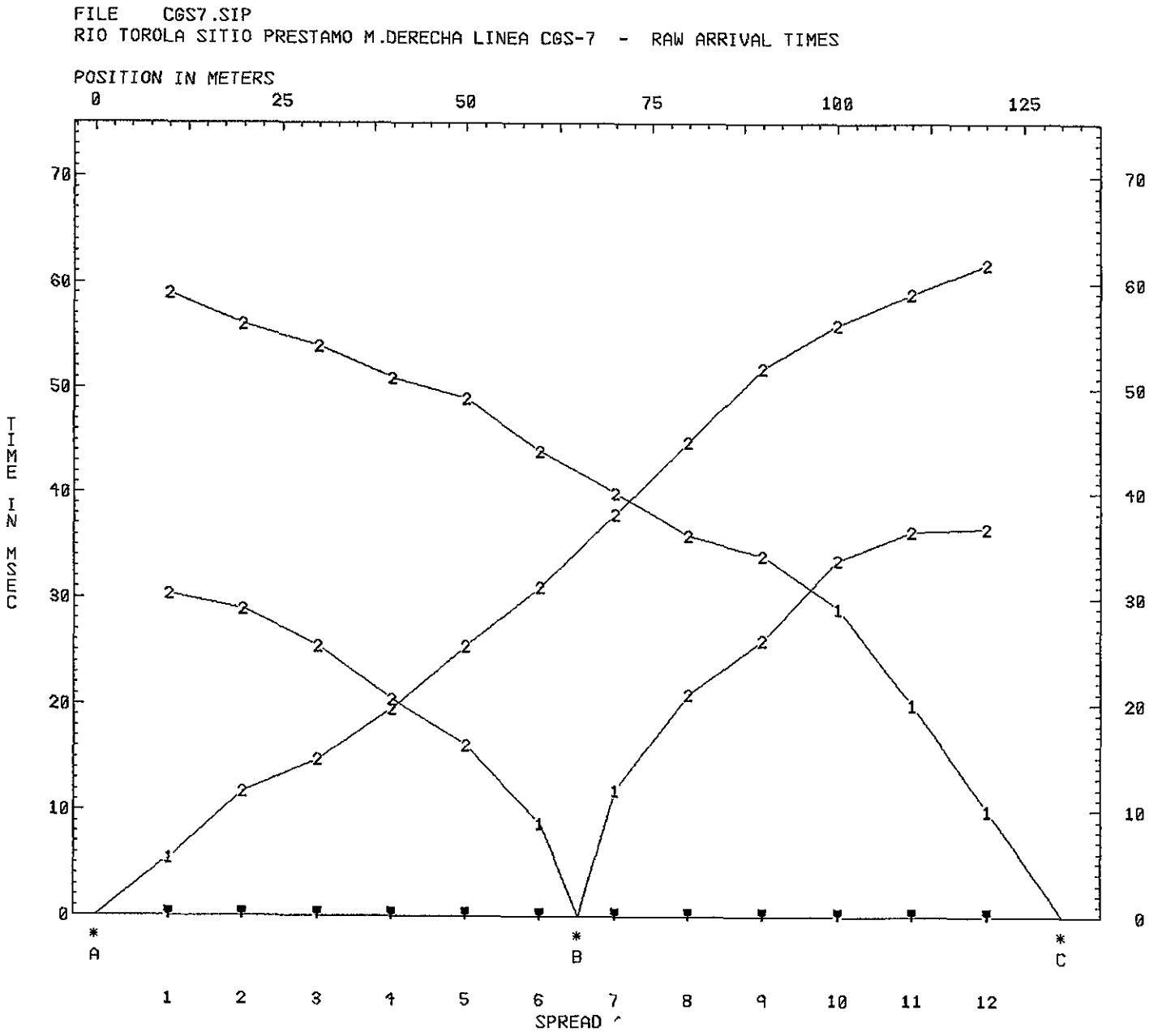
LEYEND

Alluvial deposit. Boulders in sandy gravelly matrix.

Local bedrock. Lava and volcanic tuff.

PROJECT:	HYDROELECTRIC COMPLEX OVER TOROLA RIVER.
OWNER:	C.E.L. Comisión Ejecutiva Desarrollo Hidroeléctrico rio Lempa.
CONSULTANT:	ELECTRIC POWER DEVELOPMENT CO.LTD.
CONTRATIST	SWISSB ⓞRING
CONTENT:	LINE CGS-7 RIGHT BANK
SCALE INDICATED	DATE DECEMBER 2002
PLATE No	16

7-8-86


FILE CGS7.SIP
RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-7 - RAW ARRIVAL TIMES
POSITION IN METERS
0
25
50
75
100
125
TIME IN MSEC
0
10
20
30
40
50
60
70
A
B
C
1
2
3
4
5
6
7
8
9
10
11
12
SPREAD

INPUT DATA FILE for CGS7.SIP

TITLE FOR SIPT2/SIPLUS INPUT DATA SET for CGS7.SIP

RIO TOROLA SITIO PRESTAMO M.DERECHA LINEA CGS-7

PROGRAM CONTROL DATA

Spreads	Exist	Layers	Over	PRINTER PLOT SCALES Elev m/col	Horiz m/row	Time ms/col	DATUM Pt 1 Elev/X	Pt 2 Elev/X	CONTROL Elevations Top	Bottom	BLim	TLim	Trace	Off Set	LDip
1	6	2	0	0.0	0.0	0.0	0.0 0.0	0.0 0.0	0	0	0.5	10.0	0	0	0

SHOTPOINT AND GEOPHONE DATA

Spread A, 3 SP's, 12 Geo's, X-Shift = 0.0, X-True = 0, Units: Meters.

SP	Elev	X-Loc	Y-Loc	Depth	Uphole T	Fudge T	End SP
A	149.0	0.0	0.0	0.0	0.0	0.0	1
B	151.0	65.0	0.0	0.0	0.0	0.0	0
C	151.0	130.0	0.0	0.0	0.0	0.0	2

ARRIVAL TIMES AND LAYERS REPRESENTED

Geo	Elev	X-Loc	Y	SP A	L	SP B	L	SP C	L
1	149.0	10.0	0.0	5.500		130.250	2	59.00	2
2	150.0	20.0	0.0	11.750		228.870	2	56.00	2
3	150.0	30.0	0.0	14.750		225.370	2	54.00	2
4	150.0	40.0	0.0	19.620		220.500	2	51.00	2
5	151.0	50.0	0.0	25.370		216.120	2	49.00	2
6	151.0	60.0	0.0	31.000	2	8.750	1	44.00	2
7	151.0	70.0	0.0	38.000		212.000	1	40.00	2
8	151.0	80.0	0.0	44.870		221.000	2	36.00	2
9	151.0	90.0	0.0	51.870		226.000	2	34.00	2
10	151.0	100.0	0.0	56.000		233.620	2	29.00	1
11	151.0	110.0	0.0	59.000		236.250	2	20.00	1
12	151.0	120.0	0.0	61.750		236.620	2	10.00	1

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DEPTH MODEL TABLES for CGS7.SIP

Spread A Depth and Elev of layers directly beneath SPs and Geos

SP	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
A	0.0	149.0	0.0	149.0
B	64.9	151.0	6.4	144.6
C	129.9	151.0	9.2	141.8

Geo	Surface X-Loc	Surface Elev	Layer 2 Depth	Layer 2 Elev
1	10.0	149.0	0.5	148.5
2	19.9	150.0	2.4	147.6
3	29.9	150.0	2.7	147.3
4	39.9	150.0	3.1	146.9
5	49.9	151.0	4.4	146.6
6	59.9	151.0	5.5	145.5
7	69.9	151.0	7.3	143.7
8	79.9	151.0	8.5	142.5
9	89.9	151.0	9.3	141.7
10	99.9	151.0	9.3	141.7
11	109.9	151.0	9.4	141.6
12	119.9	151.0	8.9	142.1

Velocities used to formulate the Depth Model

Spread A	Layer 1	Layer 2
Vertical	973	
Horizontal		2281

Appendix 7.9

Result of Petrological Analysis

Geotérmica Salvadoreña, S.A. de C.V.
Km. 11 ½ al Puerto de La Libertad, Colonia Utila, Nueva San Salvador
La Libertad, El Salvador, C.A
Teléfonos:(503)211-6700 Fax:(503)211-6746
Email: info@gesal.com.sv

January 24, 2002

Engr Rodolfo Alvarado
Swissboring Overseas Corporation Ltd
Present

Dear Sir

Attached are the petrographic and XRD analyses of five samples collected in Río Torola, Morazan

We hope that these analyses will be of great help for the technical study being undertaken by CEL and the government of Japan

Sincerely yours,

Julio A Guidos

GEOTÉRMICA SALVADOREÑA S.A. DE C.V. GERENCIA DE ESTUDIOS Y EVALUACIÓN

JAG/ecdh

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RESULTS OF PETROGRAPHIC AND XRD ANALYSIS

Origin of samples: Río Torola, Morazán
Submitted by: Swissboring Overseas Corporation Ltd.

I. PETROGRAPHIC ANALYSIS

a. Sample : CDB –1 M-1
Depth: 50.34 – 50.45m

The sample was described megascopically due to the presence of very pronounced striations (Quality = 1), which indicate structural evidences.

b. Megascopic Structural Description:

Very defined striations were observed, indicating the presence of fault. Although the direction was not indicated (top and bottom) and assuming the core was taken in a vertical position, the movement of the block and the measured angle (≈50°) suggest the presence of a reverse fault combined with a strike-slip component, probably sinistral.

These striations indicate a very important fault system in the area.

No filling materials or gouge were observed.

c. Megascopic (petrographic) Description:

The sample is vesicular, brownish, slightly altered. Striations can be recognized by the presence of the alignment of brownish and blackish minerals.

d. Microscopic Description:

The sample is mostly composed of amygdules and primary minerals such as plagioclases (An31-An38), mostly andesine which are twinned and zoned and biotite being altered to clay. Secondary minerals like clay minerals (smectite), chloritic clays and chalcedony fill up the amygdules. Matrix is mostly altered

glass sprinkled with opaque minerals. Veinlets are present, cutting across plagioclase crystals and mostly filled up by secondary biotite, chloritic clays and silica (chalcedony).

Plagioclase –	60%
Biotite –	7%
Clay minerals –	5%
Chloritic clays –	7%
Chalcedony -	5%
Matrix -	16%

e. *Rock name: Amygdaloidal biotite andesite*

II. PETROGRAPHIC ANALYSIS

a. *Sample : CDB –2 M-2*
Depth: 47.10 – 47.20m

b. *Microscopic description:*

The sample is composed of plagioclase (An60-An68), mostly labradorite which are twinned and partially fractured, opaque minerals being altered to hematite, pyroxene being altered to clay and chlorite embedded in a matrix of intergranular crystals of plagioclase and small pyroxenes. Vesicles and veinlets are filled up by chlorite.

Plagioclase –	30%
Opaque minerals –	10%
Pyroxene –	7%
Clay minerals –	10%
Chlorite –	10%
Matrix -	33%

c. *Rock Name: Slightly altered basalt*

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III. PETROGRAPHIC ANALYSIS

a. Sample : CDB –2 M-3
Depth: 54.52-54.63m

b. Microscopic description:

The sample contains abundant fragments of scoria, altered fine lithics and crystals of plagioclases, pyroxene and olivine in a clayey matrix.

Scoria –	**20%**
Plagioclase crystals –	**10%**
Pyroxene crystals –	**7%**
Altered lithics –	**5%**
Olivine crystals -	**1%**
Matrix -	**57%**

c. Rock Name: Scoriaceous lithic-crystal tuff

IV. XRD ANALYSIS

a. Sample : CDB –2 M-3
Depth: 54.52-54.63m

b. ***Mineral composition*:**

XRD analysis identified only few minerals such as plagioclase (anorthite) and saponite (type of smectite) which are in abundance both in fragments of scoria and as individual crystals.

Plagioclase – 87%
Saponite - 13%

V. XRD ANALYSIS

a. Sample : CDB –1 M-1
Depth: 64.85 – 65.00m

b. Mineral composition:

Saponite – 85%
Nontronite – 15%

Both clay minerals belong to smectite group, although saponite belongs to trioctahedral smectite while nontronite to dioctahedral smectite. They are low temperature clay minerals giving around 100 °C as temperature of formation.

VI. XRD ANALYSIS

a. Sample : CDB –2 M-1
Depth: 34.80-34.90m

b. Mineral composition:

Calcite – 51%
Saponite – 41%
Plagioclase - 8%

The only clay mineral present is saponite.

Petrographic and XRD analysis by:
Elizabeth de Henríquez

Structural analysis by:
Marvyn Oziel García

24/01/02

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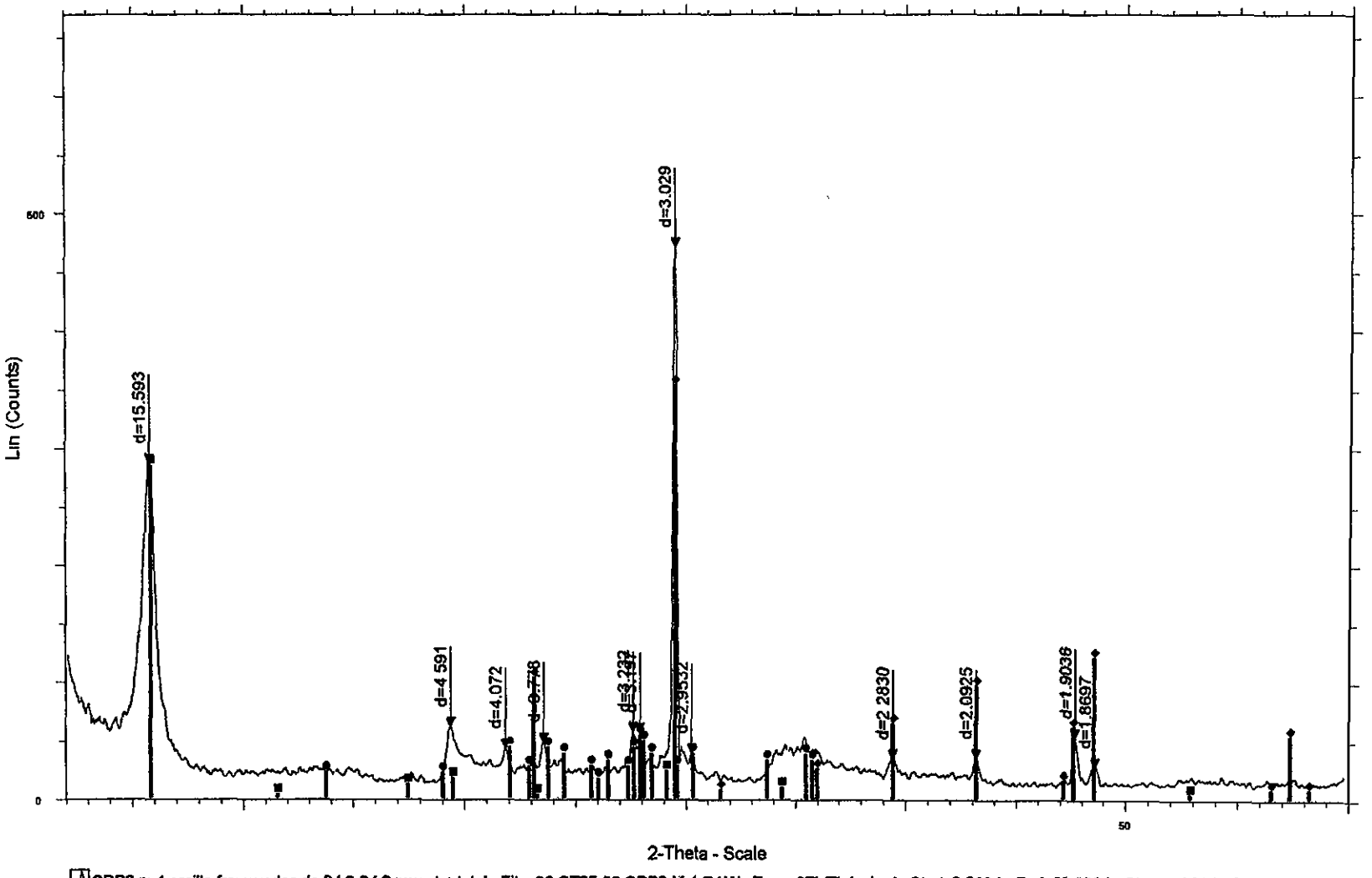
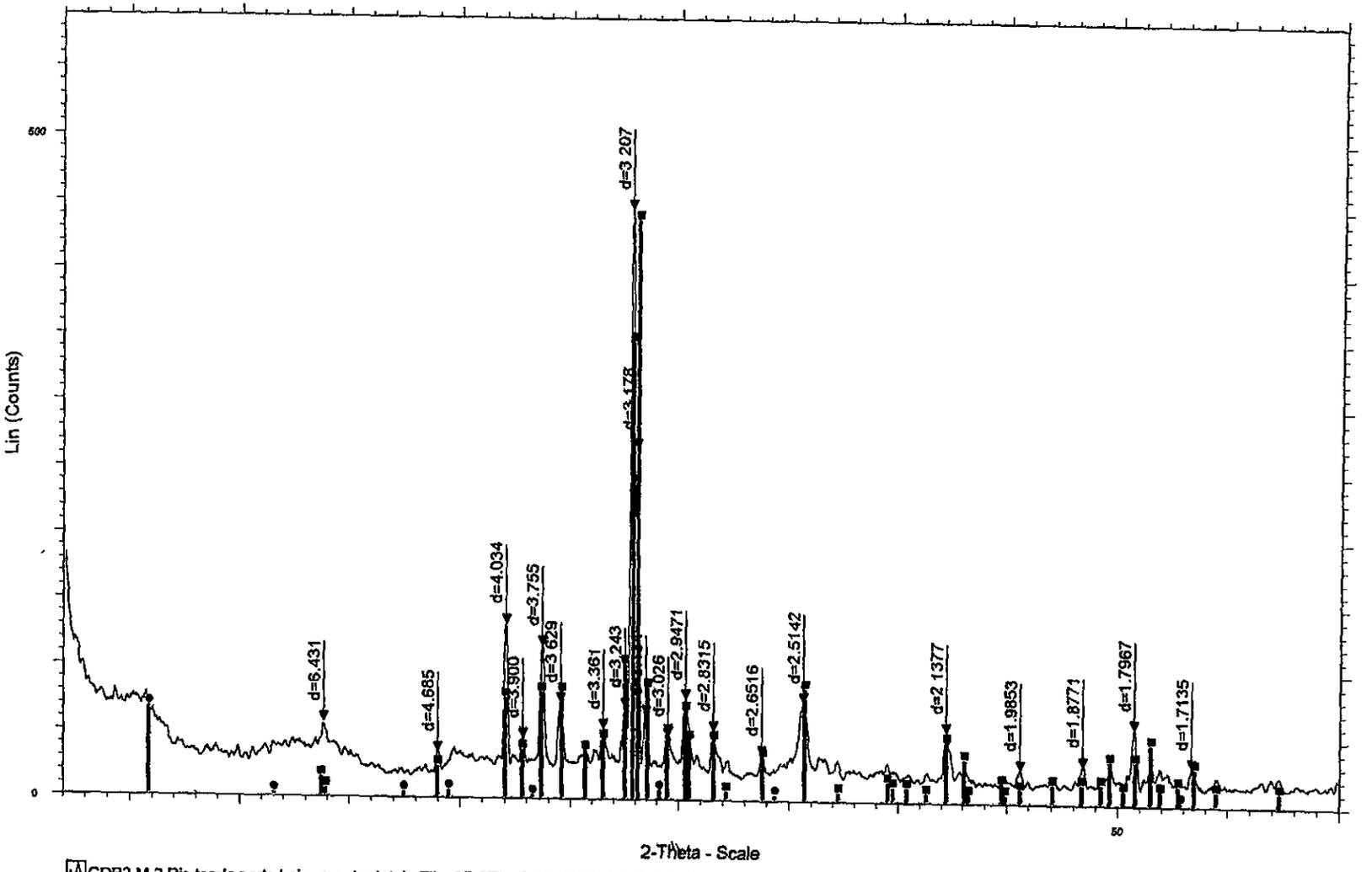
CDB2 M-1 Arcilla en Fracturas de 34.80-34.90m



CDB2 M-3 Toba (54.52 - 54.63 m)

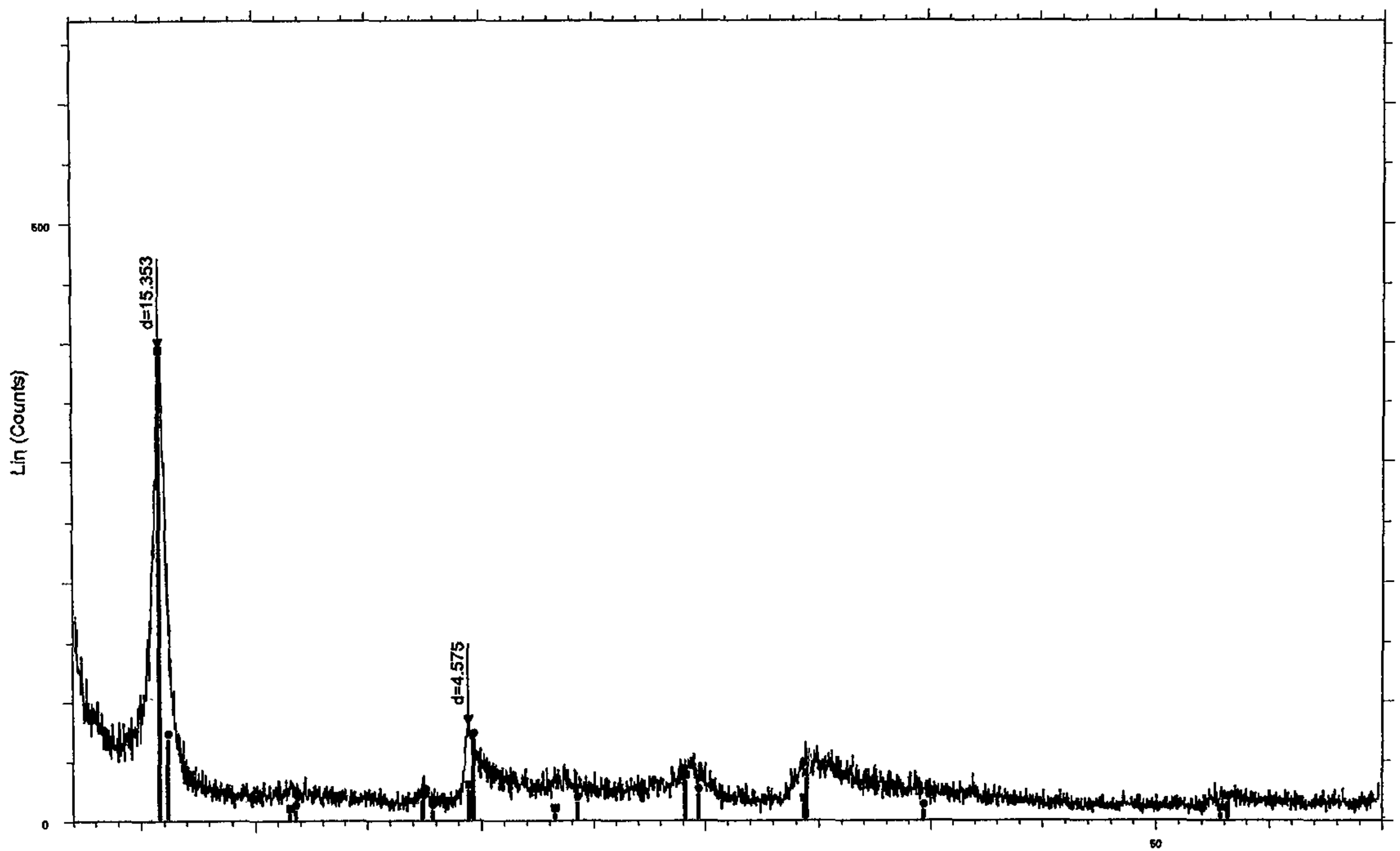


CDB2 M-3 Rio torola parte baja muestra total - File: 27 CT23-02 CDB2 M-3.RAW - Type: 2Th/Th locked - Start: 2.000 ° - End: 60.000 ° - Step: 0.020 ° - Step time: 1.0 s - Temp.: 2

41-1481 (I) - Anorthite, sodian, disordered - (Ca,Na)(Si,Al)4O8 - Y: 97.92 % - d x by: 1.000 - WL: 1.54056

29-1491 (I) - Saponite-15A - Ca0.2Mg3(Si,Al)4O10(OH)2·4H2O - Y: 14.58 % - d x by: 1.000 - WL: 1.54056

CDB1 M-1 Arcilla en Fracturas de 64.85-65.00m



CDB1 m-1 arcilla fracruradas de 64.85-85 muestra total - File: 28 CT24-02 CDB1 M-1.RAW - Type: 2Th/Th locked - Start: 2.000 ° - End: 60.000 ° - Step: 0.020 ° - Step time: 1.0 s

■ 29-1491 (I) - Saponite-15A - $Ca0.2Mg3(Si,Al)4O10(OH)2\ 4H2O$ - Y: 97.92 % - d x by: 1 000 - WL: 1.54056

● 34-0842 (I) - Nontronite-15A - $Ca0.1Fe2(Si,Al)4O10(OH)2\cdot 4H2O$ - Y: 16.67 % - d x by: 1.000 - WL: 1.54056

Geotérmica Salvadoreña, S.A. de C.V.
Km. 11 ½ al Puerto de La Libertad, Colonia Utila, Nueva San Salvador
La Libertad, El Salvador, C.A
Teléfonos:211-6700 Fax:211-6743
Email: info@gesal.com.sv

February 11, 2003

Engr. Rodolfo Alvarado
Swissboring Overseas Corporation Ltd.
Present

Dear Sir:

Attached are the petrographic and XRD analyses of the four samples collected in Río Torola, Morazan.

We hope that these analyses will be of great help for the technical study being undertaken by CEL and the government of Japan.

Sincerely yours,

GEOTÉRMICA SALVADOREÑA, S.A. GERENCIA DE ESTUDIOS Y EVALUACIÓN

Jaime Henorio Mejía

JTM/ecdh

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RESULTS OF PETROGRAPHIC AND XRD ANALYSIS

Origin of samples: Río Torola, Morazán
Submitted by: Swissboring Overseas Corporation Ltd.

I. PETROGRAPHIC ANALYSIS

a. Sample: CDB –4 M-1
Depth: 39.00-39.09m

b. Megascopic Description:

Phenocrysts of dark green prismatic and tabular crystals and plagioclase in a very fine dark glassy matrix.

c. Microscopic Description:

The sample is composed of fine laths of plagioclase, which are twinned and zoned, with the composition mostly of andesine. Plagioclases show partial flow structure. Clinopyroxene is present but is generally altered to brownish green chlorite (in plane polarized light). Few small fragments of olivine are present as phenocryst and as part of the matrix. Phenocrysts of opaque minerals are few, most of them are observed in the matrix. Matrix is mostly glassy with interstitial microlites of feldspar, fragments of pyroxene and opaque minerals.

Plagioclase	**–**	**40%**
Clinopyroxene (unaltered)	**–**	**3%**
Olivine	**–**	**3%**
Opaque minerals	**-**	**3%**
Pyroxene altered to chloritic clays/chlorite	**–**	**7%**
Matrix	**-**	**39%**

d. Rock name: Fine-grained basaltic andesite

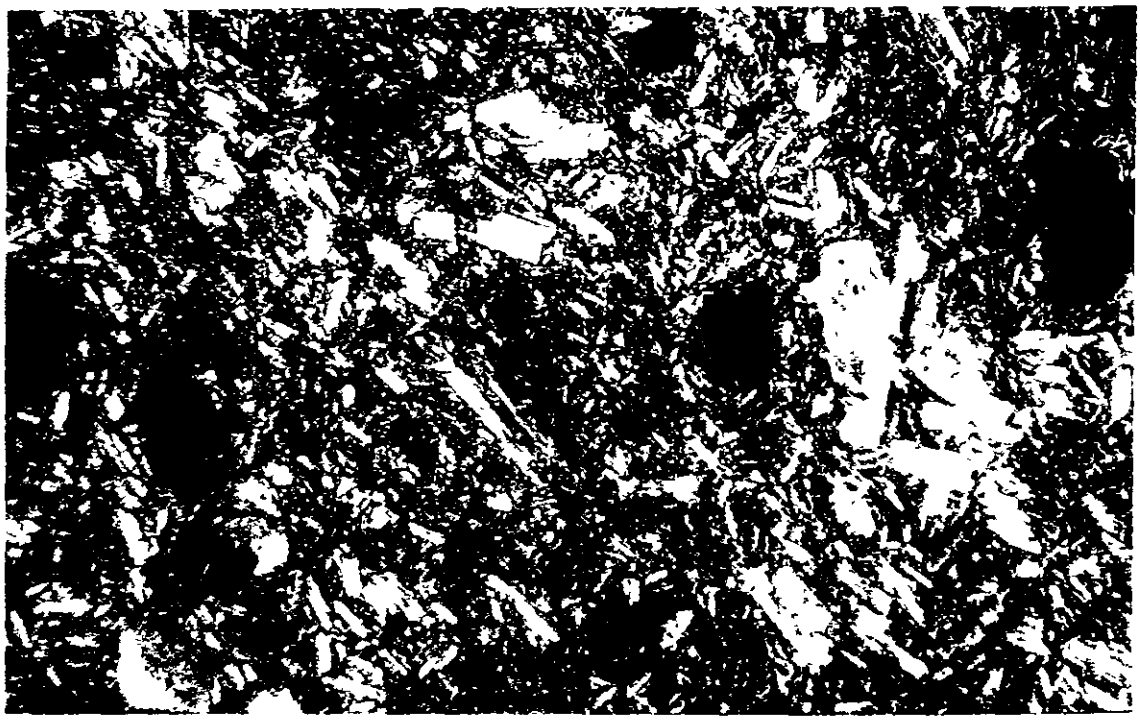

Photo 1 Crystals of olivine, chloritized pyroxene and plagioclases as observed under crossed nicols, sample CDB-4

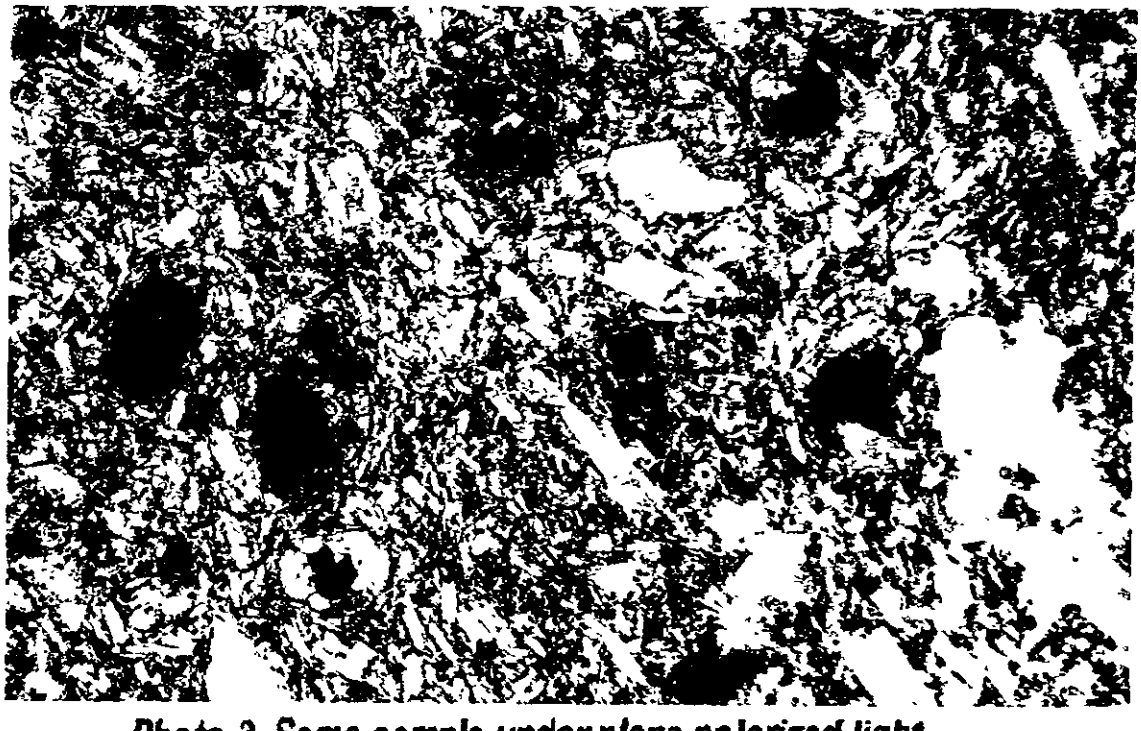

Photo 2 Same sample under plane polarized light

II. PETROGRAPHIC ANALYSIS

a. *Sample. CDB –3 M-2*
Depth: 18.00-18.10m

b. *Megascopic Description.*

Various subangular to angular fragments of lithics, scoria and pumice with varying sizes upto 1.5 cm (as seen from the core), lapilli size, in an argillaceous matrix with silica and chlorite in vesicles.

c. *Microscopic description:*

The sample is composed of angular fragments of mostly andesites with dark glassy matrix, basaltic andesite, scoria and pumice in an argillaceous matrix. Most vesicles are filled up by chloritic clays and chlorite.

d. *Rock Name: Lapilli tuff*

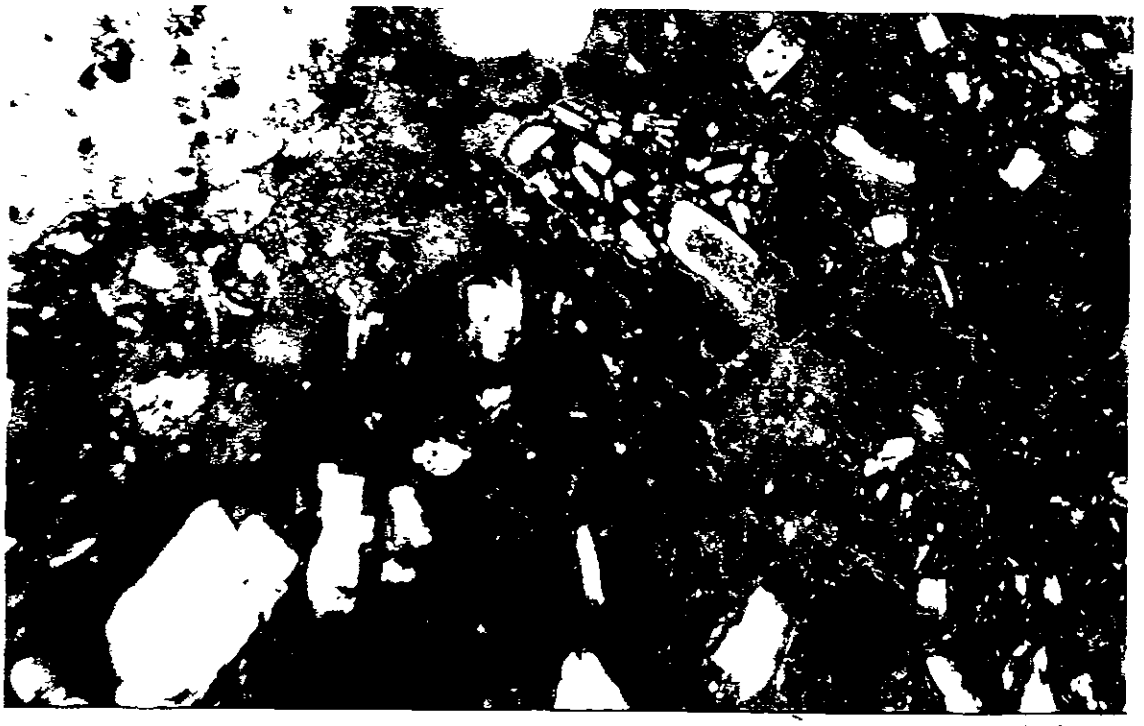

Photo 3 Angular fragments of andesites, basaltic andesites under crossed nicols, sample CDB-3.

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XRD ANALYSIS

III. X-ray Diffraction analysis

a. Sample No: CBD – 3
Depth: 24.40-24.50m

b. Megascopic description:

The sample is color beige mainly with fine particles of clay and other small crystals of plagioclase, quartz and some ferromagnesian minerals.

c. XRD analysis

The sample is composed of clay minerals mostly saponite and montmorillonite which belong to the smectite group. All other primary minerals are masked by the clay minerals. Analysis of clay minerals was done with air dried and glicolated procedure.

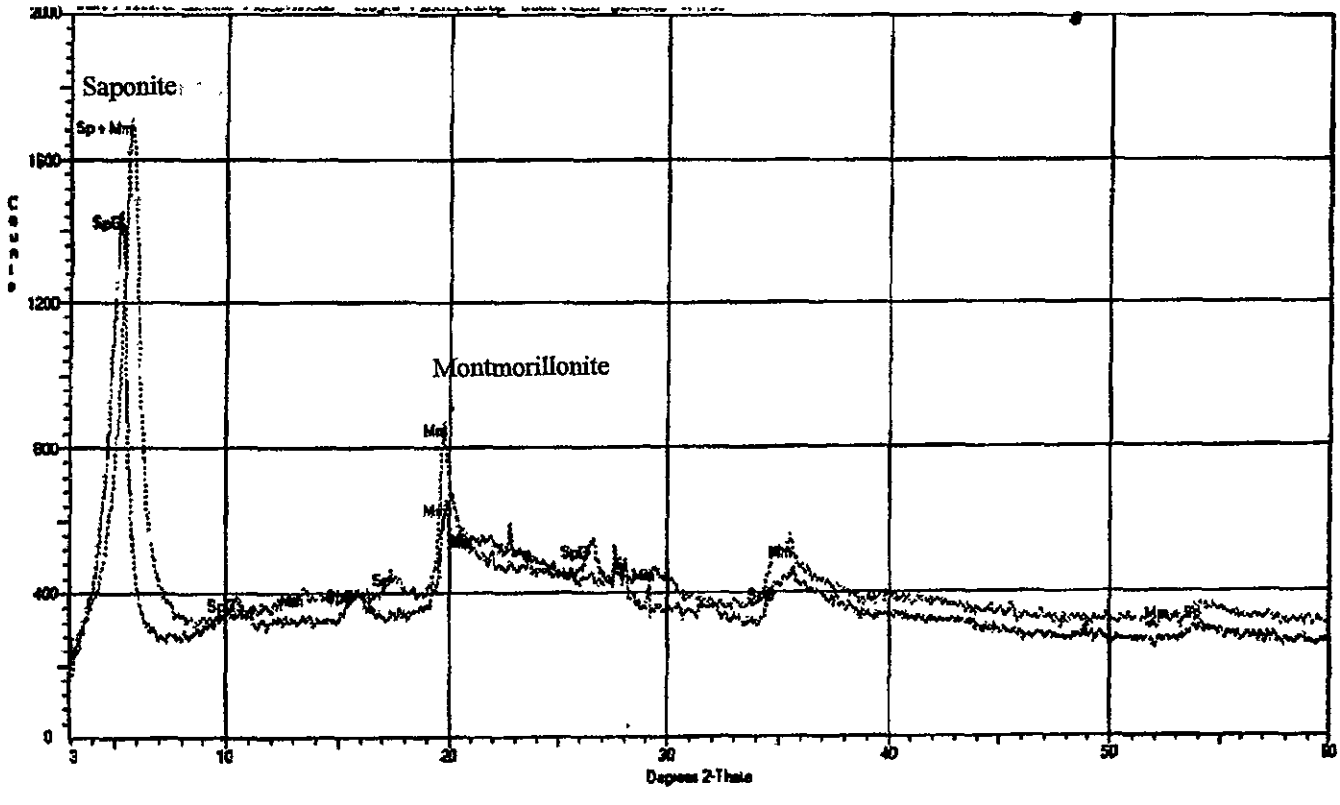

Figure 1 Graph of clay minerals

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IV. X-ray Diffraction analysis

a. Sample No.: CBD-4
Depth: ~~26.65-26.70~~m
62.65 - 62.70

b. Megascopic Description

The sample is dark gray, clayey with rock and crystals fragments highly altered.

c. XRD analysis

Two types of clay minerals are observed: smectite (mostly montmorillonite) and halloysite. Some of the clay minerals in the spectrum are mixed layers of smectite and halloysite.

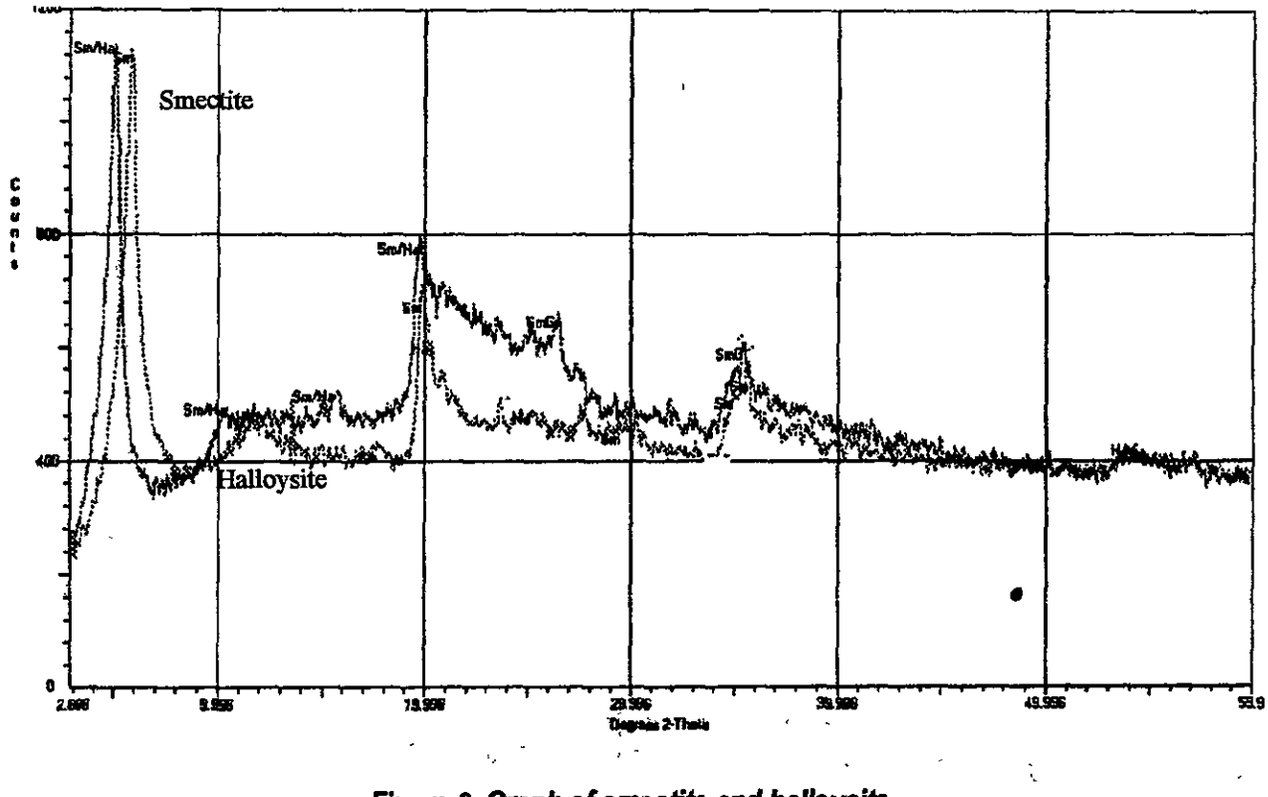

Figure 2 Graph of smectite and halloysite

Comments:

Smectite is a group of clay minerals, both dioctahedral and trioctahedral, all of which display the property of being able to expand and contract their structures while maintaining two-dimensional crystallographic integrity. Expansion takes place as water or some polar organic compound, such as ethylene glycol, enters the interlayer space.

Montomorillonite belongs to the dioctahedral smectite group while saponite is still debatable whether dioctahedral or trioctahedral, as it has a positive charge on the octahedral sheet and a large negative charge on the tetrahedral sheet.

An important source of smectite is the alteration of volcanic glass with relatively high silica content. It also seems to precipitate directly in pores of sandstone and apparently forms in weathering environments characterized by very slow movement of water.

Halloysite belongs to the kaolin minerals. It is a highly disordered form of kaolinite, disordered enough to take water enough into the interlayer space.

Kaolinite and halloysite are probably the most ubiquitous aluminosilicate mineral in soils and permeable bedrock in warm, moist regions forming as a residual weathering product, or sometimes by hydrothermal alteration of other aluminosilicates, especially of feldspars.

Petrographic analysis by:
Elizabeth de Henríquez E C Henriquez

Reviewed by:
Ing. Arturo Quezada

11/02/03

GEOTÉRMICA SALVADOREÑA, S.A. de C.V. GERENCIA DE ESTUDIOS Y EVALUACIÓN AREA DE GEOLOGIA

Appendix 7.10

Result of Laboratory Tests

on

Physical Property at Dam Site

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(469)

ANIBAL RODAS MAZARIEGOS
Ingeniero Civil
Periferico 20-01 Zona 7
Tel. Y Fax 5949644
Guatemala, C.A

MATERIALS QUALITY CONTROL
COMPRESSIVE STRENGTH OF CORES ROCK

TO SWISSBORING (Ing. Rodolfo Alvarado)
PROJECT RIO TOROLA (SAN SALVADOR)
SUBJECT COMPRESSIVE STRENGTH TEST
DATE 23 DE ENERO DE 2002
NOTE CORES CUT WITH DIAMOND BLADE

TEST DATE 23/1/2002

SONDEO No	CORE No	HEIGHT	INITIAL LONG (CM)	FINAL HEIGHT H (CM)	DIAMETER D (CM)	WEIGHT (GRMS)	MAX LOAD (KG)
CDB-1	M-1	50.14 - 50 34	19 80	9.61	4 77	336 40	2960
	M-2	51.58 - 51.85	26 30	9.97	4.76	350 60	1320
	M-3	54 17 - 54 74	25 40	9 82	4.76	367 80	9200
	M-4	64.37 - 64.53	14.80	10 80	4 77	499 20	17200
	M-5	65 00 - 65.25	23.90	9 59	4.77	477.50	20800
	M-6	66 56 - 66.72	14.60	9.68	4 77	480 80	18800
CDB-2	M-1	39 55 - 39 74	17.50	9 61	4.77	384.50	3640
	M-2	42.50 - 42.75	24.20	9 74	4.77	360 80	3480
	M-3	47.20 - 47 44	23 50	9 24	4.77	449.60	17000
	M-4	50.00 - 50 24	19 80	10 11	4 77	499 80	12800
	M-5	54 17 - 54 40	22.30	9.71	4 77	270.60	1520
	M-6	57.25 - 57.51	25 30	9 58	4.77	425 10	5100
CDB-7	M-1	10.75 - 11 00	21.40	9 15	4.77	440.50	17000

SONDEO No	CORE No	HEIGHT	DENSITY KG/M3	SLENDERNESS (H/D)	NET STRESS (KG/CM2)	DESCRIPTION
CDB-1	M-1	50.14 - 50.34	1959.9	2 01	165.7	BASALTO ALTERADO
	M-2	51 58 - 51.85	1977.1	2 09	74.2	BASALTO ALTERADO
	M-3	54.17 - 54 74	2105.8	2.06	517.3	BASALTO ALTERADO
	M-4	64.37 - 64 53	2587.9	2 26	963.0	BASALTO SANO
	M-5	65.00 - 65.25	2787.7	2 01	1164.5	BASALTO SANO
	M-6	66 56 - 66.72	2780.9	2 03	1052.6	BASALTO SANO
CDB-2	M-1	39 55 - 39.74	2240.1	2 01	203.8	BASALTO ALTERADO
	M-2	42.50 - 42 75	2074.0	2 04	194.8	BASALTO ALTERADO
	M-3	47.20 - 47 44	2724.3	1.94	951.8	BASALTO SANO
	M-4	50 00 - 50 24	2767.8	2.12	716.6	BASALTO SANO
	M-5	54.17 - 54 40	1560.3	2 04	65.1	TOBA LITICA
	M-6	57.25 - 57 51	2484.4	2 01	285.5	AGLOMERADO TOBACEO
CDB-7	M-1	10.75 - 11.00	2695.4	1.92	951.8	BASALTO ALTERADO

SUPPLEMENTARY CORE TEST

SONDEO No	CORE No	HEIGHT	INITIAL LONG (CM)	FINAL HEIGHT H (CM)	DIAMETER D (CM)	WEIGHT (GRMS)	MAX LOAD (KG)
CDB-1	M-2	51 58 - 51 85	26 30	7.78	4 76	286 70	6800
	M-5	65.00 - 65.25	23 90	7.71	4 77	379 00	24600
CDB-2	M-2	42.50 - 42 75	24.20	9 29	4 77	349 80	2860
	M-3	47.20 - 47 44	23.50	9.50	4 77	461 40	19600
	M-4	50 00 - 50.24	19 80	7.67	4.77	376 70	14200
	M-6	57.25 - 57 51	25 30	9 57	4.77	431.20	5200

SONDEO No	CORE No	HEIGHT	DENSITY KG/M3	SLENDERNESS (H/D)	NET STRESS (KG/CM2)	DESCRIPTION
CDB-1	M-2	51.58 - 51 85	2071.9	1 63	382.3	BASALTO ALTERADO
	M-5	65 00 - 65.25	2752.2	1.62	1377.3	BASALTO SANO
CDB-2	M-2	42 50 - 42.75	2108.1	1.95	160.1	BASALTO ALTERADO
	M-3	47.20 - 47.44	2719.2	1 99	1097.4	BASALTO SANO
	M-4	50 00 - 50.24	2749.8	1.61	795.0	BASALTO SANO
	M-6	57.25 - 57 51	2522.7	2 01	291.1	AGLOMERADO TOBACEO

ATENTAMENTE

ING. ANIBAL RODAS M.
COL. 627

Appendix 7.11

Result of Laboratory Tests for Concrete Aggregate

Result of Laboratory Tests for Concrete Aggregates

Concrete aggrigate

Basalt Outcrop

Location		C127		C535	C88	C295	C289	C227
		s g.	abs.	L. A	stability			(%)
		(g/cm^3)	(%)	(%)	(%)	pet class	alkali-silica	alkali-silica
Out crop		2 56	3 6	18.2	64.2	basalt	INOCUO	0 0
(O-1)*								

* location of O-1 is shown in Dam site reconnaissance map in Appendix as sampling site OC-1

Gravel and Sand

Fine agrregate

Location	depth	C128		C131	C88	C136	C142	C123
		s g.	abs	L. A	stability		clay lumps	light particles
	(m)	(g/cm^3)	(%)	(%)	(%)	sieve	(%)	
CGP-1	0-1 9	2 32	3.9	20.3	22.5	C	1.7	1 6
CGP-2	0-3	2.28	5.3	21.9	15.8	C	0.7	1 1
CGP-3	0-1.6	2.37	4.3	20.9	13.0	C	1.2	2 2
CGP-4		2.30	6.1		4.6	C	0 4	0 5
CGP-5		2.33	5.4	18.6	7.5	C	0.5	0 0
CGP-6		2.43	5 3		8 3	C	0 6	0 0

Corse aggregate

Location	depth	C127		C535	C88	C136
		s.g.	abs.	L. A.	stability	
	(m)	(g/cm^3)	(%)	(%)	(%)	sieve
CGP-1	0-1.9	2 26	4.7	14 2		↕
CGP-2	0-3	2.75	0.9	17 5		
CGP-3	0-1.6			17 7		
CGP-4		2.52	3.1	15.0	9.8	C
CGP-5		2 56	2.3		4.5	C
CGP-6		2 56	2.5	14 8	7.4	C

(4B (4H)

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C 136-01)

475
(476)

ITCA FEPADE
NUEVA SAN SALVADOR

DEPARTAMENTO INGENIERIA CIVIL Y ARQUITECTURA
LABORATORIOS DE CONTROL DE CALIDAD
SUELOS, CONCRETO, ASFALTO Y MATERIALES

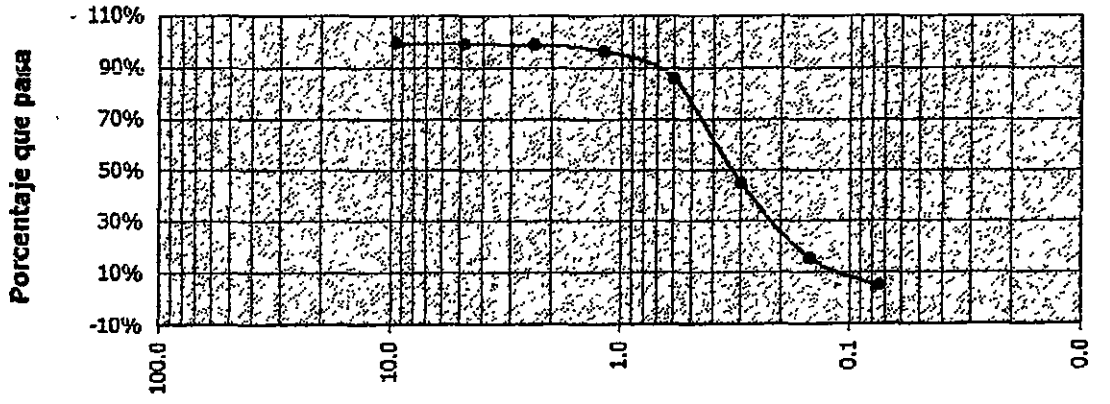
ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 15-Ene-02
TEC. RESPONSIBLE : Arleth Moran
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

o Inicial (grs) = 2,797.0 Sondeo CGP-1, M-1, profundidad 0.00 a 1.90 m.

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happens	Malla (pul)
9.520	12.7	0.45%	0.45%	99.55%	3/8"
4.760	10.1	0.36%	0.82%	99.18%	No.4
2 380	16 2	0.58%	1.39%	98.61%	No, 8
1.190	69.4	2.48%	3.88%	96.12%	No,16
0.590	291.2	10.41%	14.29%	85.71%	No, 30
0.297	1,155.3	41.30%	55.59%	44.41%	No, 50
0.149	815 5	29.16%	84.75%	15.25%	No, 100
0.074	296.0	10.58%	95.33%	4.67%	No, 200
Fondo	130.6	4.67%	100.00%	0.00%	
Sumas	2,797.0				

Modulo de Finura = 1.60



sampling carrier out by applicant

INSTITUTO TECNOLOGICO
CENTROAMERICANO ITCA
LABORATORIOS
DEPTO. INGENIERIA CIVIL Y ARQUITECTURA
ADMON. FEPADE

Ing. Joaquín Humberto Montenegro
Jefe Laboratorios Control de Calidad
Suelos, Concreto, Asfalto y Materiales

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ITCA FEPADE
NUEVA SAN SALVADOR

DEPARTAMENTO INGENIERIA CIVIL Y ARQUITECTURA
LABORATORIOS DE CONTROL DE CALIDAD
SUELOS, CONCRETO, ASFALTO Y MATERIALES

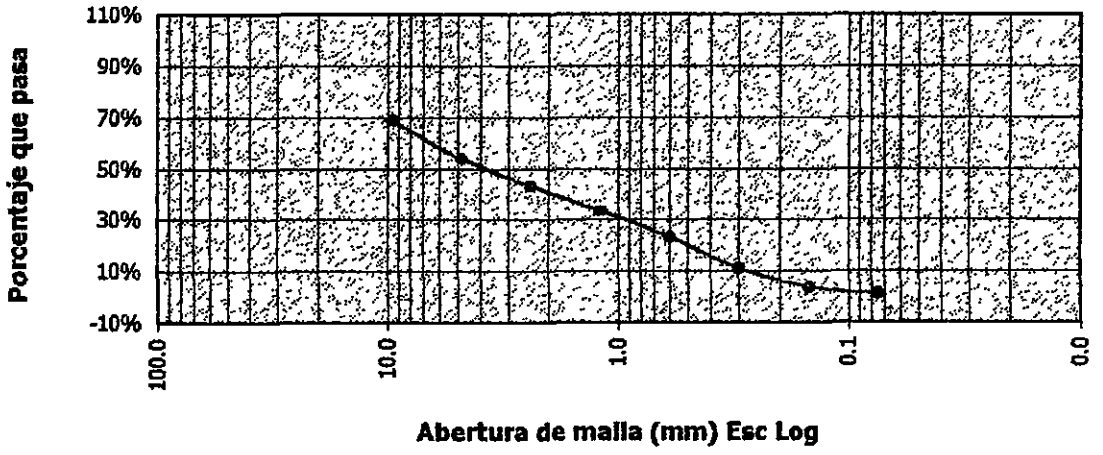
ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

Peso Inicial (grs) = 2,931.0 Sondeo CGP-2 , M-1, profundidad 0.00 a 3.00 m.

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happens	Malla (pul)
9.520	915.5	31.24%	31.24%	68.76%	3/8"
4.760	441.5	15.06%	46.30%	53.70%	No.4
2.380	302.0	10.30%	56.60%	43.40%	No, 8
1.190	290.4	9.91%	66.51%	33.49%	No,16
0.590	296.6	10.12%	76.63%	23.37%	No, 30
0.297	365.0	12.45%	89.08%	10.92%	No, 50
0.149	212.0	7.23%	96.32%	3.68%	No, 100
0.074	74.0	2.52%	98.84%	1.16%	No, 200
Fondo	34.0	1.16%	100.00%	0.00%	
Sumas	2,931.0				

Modulo de Finura = 3.85



sampling carrier out by applicant

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LABORATORIOS
DEPTO. INGENIERIA CIVIL Y ARQUITECTURA
ADMON. FEPADE

Ing. Joaquín Humberto Montenegro
Jefe Laboratorios Control de Calidad
Suelos, Concreto, Asfalto y Materiales

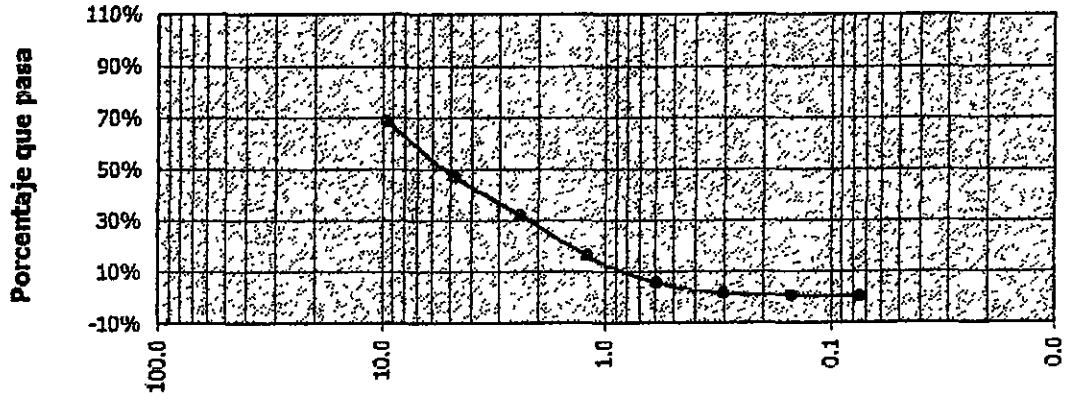
ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

Peso Inicial (grs) = 2,927.0 Sondeo CGP-3 M-1, profundidad 0.00 a 1.60 m.

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happens	Malla (pul)
9.520	917.5	31.35%	31.35%	68.65%	3/8"
4.760	626.3	21.40%	52.74%	47.26%	No.4
2.380	451.1	15.41%	68.16%	31.84%	No, 8
1.190	464.0	15.85%	84.01%	15.99%	No,16
0.590	312.4	10.67%	94.68%	5.32%	No, 30
0.297	113.6	3.88%	98.56%	1.44%	No, 50
0.149	26.3	0.90%	99.46%	0.54%	No, 100
0.074	8.3	0.28%	99.74%	0.26%	No, 200
Fondo	7.5	0.26%	100.00%	0.00%	
Sumas	2,927.0				

Modulo de Finura = 4.45



sampling carrier out by applicant

INSTITUTO TECNOLOGICO CENTROAMERICANO ITCA
LABORATORIOS
DEPTO. INGENIERIA CIVIL Y ARQUITECTURA
ADMON. FEPADE

Ing. Joaquin Humberto Montenegro
Jefe Laboratorios Control de Calidad
Suelos, Concreto, Asfalto y Materiales

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ITCA FEPADE
NUEVA SAN SALVADOR

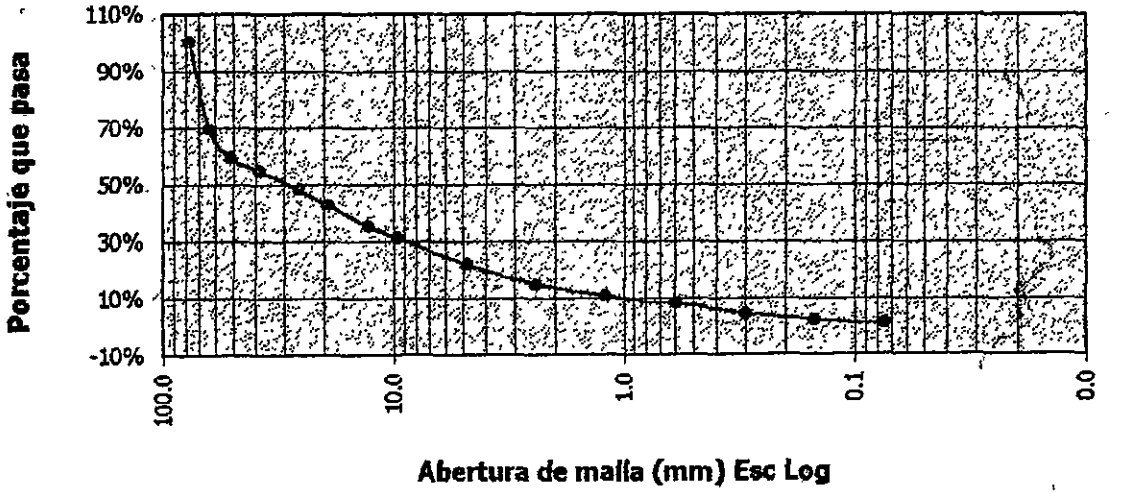
DEPARTAMENTO INGENIERIA CIVIL Y ARQUITECTURA
LABORATORIOS DE CONTROL DE CALIDAD
SUELOS, CONCRETO, ASFALTO Y MATERIALES

ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : CGP-4
DATE EXPERIMENT : 16-Ene-03
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp4

Peso Inicial (grs) = 5,000.0

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happens	Malla (pul)
76.200	0.0	0.00%	0.00%	100.00%	3"
63.500	1,522.0	30.44%	30.44%	69.56%	2 1/2"
50.80	515.0	10.30%	40.74%	59.26%	2"
38.10	234.0	4.68%	45.42%	54.58%	1 1/2"
25.40	337.0	6.74%	52.16%	47.84%	1"
19.10	257.0	5.14%	57.30%	42.70%	3/4"
12.70	364.0	7.28%	64.58%	35.42%	1/2"
9.52	212.0	4.24%	68.82%	31.18%	3/8"
4.760	467.0	9.34%	78.16%	21.84%	No.4
2.380	352.3	7.05%	85.21%	14.79%	No, 8
1.190	196.1	3.92%	89.13%	10.87%	No,16
0.590	141.0	2.82%	91.95%	8.05%	No, 30
0.297	177.1	3.54%	95.49%	4.51%	No, 50
0.149	110.5	2.21%	97.70%	2.30%	No, 100
0.074	57.1	1.14%	98.84%	1.16%	No, 200
Fondo	57.9	1.16%	100.00%	0.00%	
Sumas	5,000.0				



sampling carrier out by applicant

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ADMON. FEPADE

Ing. Joaquín Humberto Montenegro
Jefe Laboratorios Control de Calidad
Suelos, Concreto, Asfalto y Materiales

ITCA FEPADE
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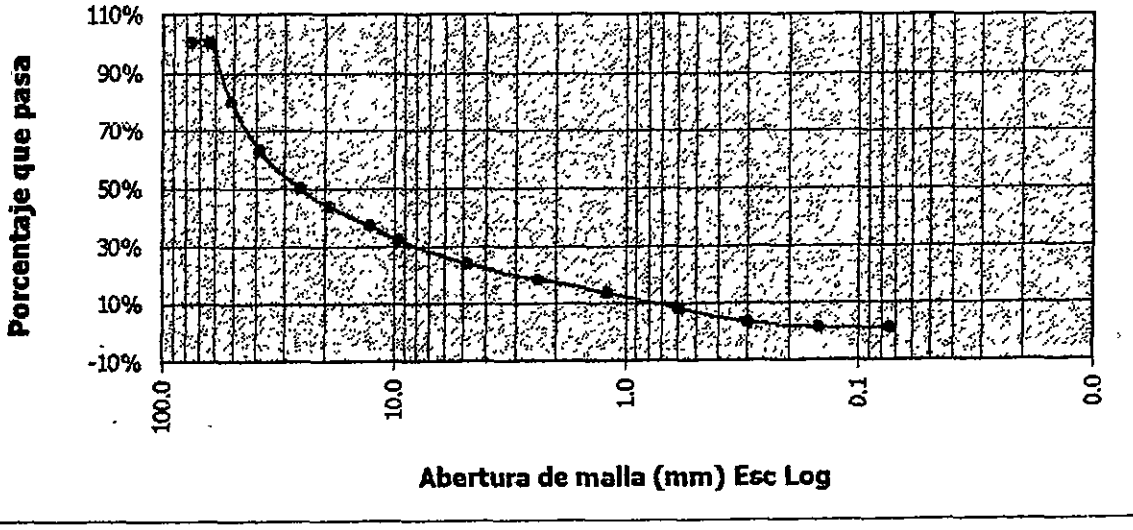
LABORATORIOS DE CONTROL DE CALIDAD
SUELOS, CONCRETO, ASFALTO Y MATERIALES

ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : CGP-5
DATE EXPERIMENT : 16-Ene-03
TEC RESPONSIBLE : Arleth Moran
FILE No . 15-01-03,torola,swissboring,cgp5

Peso Inicial (grs) = 5,000.0

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happene	Malla (pul)
76.20	0.0	0.00%	0.00%	100.00%	3"
63.50	0.0	0.00%	0.00%	100.00%	2 1/2"
50.80	1,009.0	20.18%	20.18%	79.82%	2"
38.10	832.0	16.64%	36.82%	63.18%	1 1/2"
25.40	651.0	13.02%	49.84%	50.16%	1"
19.10	327.0	6.54%	56.38%	43.62%	3/4"
12.70	317.0	6.34%	62.72%	37.28%	1/2"
9.52	265.0	5.30%	68.02%	31.98%	3/8"
4.760	410.0	8.20%	76.22%	23.78%	No.4
2.380	282.9	5.66%	81.88%	18.12%	No, 8
1.190	228.7	4.57%	86.45%	13.55%	No,16
0.590	281.5	5.63%	92.08%	7.92%	No, 30
0.297	236.2	4.72%	96.81%	3.19%	No, 50
0.149	84.2	1.68%	98.49%	1.51%	No, 100
0.074	27.6	0.55%	99.04%	0.96%	No, 200
Fondo	47.9	0.96%	100.00%	0.00%	
Sumas	5,000.0				



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Jefe Laboratorios Control de Calidad
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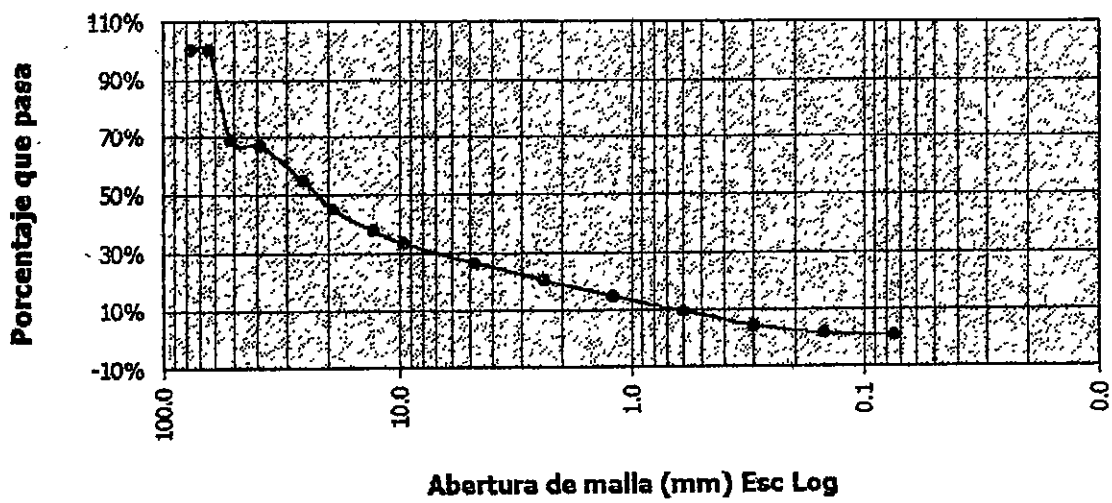
SOUDNESS OF AGGREGATES BY USE OF SODIUM SULFATE OR MAGNESIUM SULFATE (ASTM C 88)

ANALISIS GRANULOMETRICO
ASTM C-136

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : **CGP-6**
DATE EXPERIMENT : 16-Ene-03
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp4

Peso Inicial (grs) = 5,000.0

Malla (mm)	Retained Weigth	Retained parcially	Retained Acumulated	Percentage that happens	Malla (pul)
76.200	0.0	0.00%	0.00%	100.00%	3"
63.500	0.0	0.00%	0.00%	100.00%	2 1/2"
50.80	1,567.0	31.34%	31.34%	68.66%	2"
38.10	84.0	1.68%	33.02%	66.98%	1 1/2"
25.40	620.0	12.40%	45.42%	54.58%	1"
19.10	487.0	9.74%	55.16%	44.84%	3/4"
12.70	371.0	7.42%	62.58%	37.42%	1/2"
9.52	207.0	4.14%	66.72%	33.28%	3/8"
4.760	357.0	7.14%	73.86%	26.14%	No.4
2.380	293.0	5.86%	79.72%	20.28%	No, 8
1.190	294.4	5.89%	85.61%	14.39%	No,16
0.590	245.7	4.91%	90.52%	9.48%	No, 30
0.297	256.1	5.12%	95.64%	4.36%	No, 50
0.149	126.5	2.53%	98.17%	1.83%	No, 100
0.074	48.5	0.97%	99.14%	0.86%	No, 200
Fondo	42.8	0.86%	100.00%	0.00%	
Sumas	5,000.0				



sampling carrier out by applicant

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Jefe Laboratorios Control de Calidad
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SANIDAD AGREGADOS PARA CONCRETO

ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san(O1),31-1-2,swissboring

Sondeo O-1, Muestra M-1,

Granulometria Preparada			Granulometria Designada				Analisis Cualitativo		
Tamiz No	Ret-Parcial M. Original	Preparado (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	PERDIDA Funcion M Original	Particulas Iniciales	Particulas Pulveri.	Particulas Fracturadas
2 ½ " 2 " 1½ "		1,412.0	1¼ "	505.12	64.23%				
1 " 3/4 "			5/8 "						
1/2 " 3/8 "			5/16 " 5/16 "						
No 4			No 5						

Totales

Lost after five cycles = 64.2%

Reactivate used sulfate of sodium

Sample of rock in rough bring for solicitor

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

Sondeo CGP-1 Muestra No M-1, profundidad 0.00 a 1.90 m.

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M. Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	% perdida Funcion M Original
4	0.36%		4			
8	0.58%		8			
16	2.48%		16			
30	10.41%	100.0	30	72.10	27.90%	2.90%
50	41.30%	100.0	50	73.20	26.80%	11.07%
100	29.16%	100.0	100	70.80	29.20%	8.51%
		300.0		216.1		

lost after five cicles = 22.5%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

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SUELOS, CONCRETO, ASFALTO Y MATERIALES

SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

Sondeo CGP-2 Muestra No M-1, profundidad 0.00 a 3.00 m.

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M. Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	% perdida Funcion M Original
4	15.06%	100.0	4	75.00	25.00%	3.77%
8	10.30%	100.0	8	78.40	21.60%	2.23%
16	9.91%	100.0	16	76.80	23.20%	2.30%
30	10.12%	100.0	30	74.60	25.40%	2.57%
50	12.45%	100.0	50	73.50	26.50%	3.30%
100	7.23%	100.0	100	76.70	23.30%	1.69%
		600.0		455.0		

lost after five cicles = 15.8%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Factibilidad Rio Torola
LOCATED : Parte Baja del Rio Torola
DATE EXPERIMENT : 18-Ene-02
TEC. RESPONSIBLE : Mauricio Najera
FILE No : 24-GE,des-san-lig,(CGP),31-1-2,swissboring

Sondeo CGP-3 Muestra No M-1, profundidad 0.00 a 1.60 m.

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M. Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	% perdida funcion M.Origina
4	21.40%	100.0	4	85.70	14.30%	3.06%
8	15.41%	100.0	8	83.10	16.90%	2.60%
16	15.85%	100.0	16	79.00	21.00%	3.33%
30	10.67%	100.0	30	71.90	28.10%	3.00%
50	3.68%	100.0	50	74.00	26.00%	1.01%
100	0.90%		100			
		500.0		393.7		

lost after five cicles = 13.0%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : **CGP-4**
DATE EXPERIMENT : Ene-03
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp4

AGREGADO GRUESO

Granulometria Preparada			Granulometria Designada				Analisis Cualitativo		
Tamiz No	Ret-Parcia M. Origina	reparado (gr antes ensayo	Tamiz No	Retenido (gr ensayado	(%) Perdida	PERDIDA incion M Origir	Particulas Iniciales	Particulas Pulveri.	Particulas Fracturadas
2 ½"	30.4%								
2"	10.3%								
1½"	4.7%	1,481.0	1¼"	1238.4	16.38%	0.8%	12	1	1
1"	6.7%	1,016.0		859.3	15.42%	1.0%	24	1	2
3/4"	5.1%	500.0	5/8"	363.4	27.32%	1.4%	33	5	-.-
1/2"	7.3%	670.0	5/16"	481.5	28.13%	2.0%	130	29	-.-
3/8"	4.2%	330.0	5/16"	218	33.94%	1.4%	189	-.-	-.-
No 4	9.3%	300.0	No 5	201.8	32.73%	3.1%	560		
Total	78.2%	4,297.0		3,362					

lost after five cicles = **9.8%**

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

lost after five cicles (fine + coarse) = **14%**

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : **CGP-4**
DATE EXPERIMENT : **Ene-03**
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp4

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M. Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	%,perdida Funcion M Original
4						
8	7.05%	100.0	8	69.90	30.10%	2.12%
16	3.92%	100.0	16	77.90	22.10%	0.87%
30	2.82%	100.0	30	75.80	24.20%	0.68%
50	3.54%	100.0	50	75.10	24.90%	0.88%
100	2.21%					
		400.0		298.7		

lost after five cicles = 4.6%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

lost after five cicles (fine + coarse) = **14%**

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : **CGP-5**
DATE EXPERIMENT : Ene-03
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp5

AGREGADO GRUESO

Granulometria Preparada			Granulometria Designada				Analisis Cualitativo		
Tamiz No	Ret-Parcial M. Original	Preparado (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	PERDIDA Funcion M Origina	Particulas Iniciales	Particulas Pulveri.	Particulas Fracturadas
2 ½"	0.0%								
2"	20.2%	3,006.0		2878.4	4.24%	0.9%	9	-.-	-.-
1½"	16.6%	2,043.0	1¼"	1905.9	6.71%	1.1%	18	-.-	1
1"	13.0%	1,016.0		927.5	8.71%	1.1%	21	2	-.-
3/4"	6.5%	500.0	5/8"	456.8	8.64%	0.6%	26	1	-.-
1/2"	6.3%	406 0	5/16"	354 0	12.81%	0.8%	75	-.-	1
3/8"	5.3%		5/16"						
No 4	8.2%		No 5						
Total	76.2%	6,971.0		6,523					

Perdida despues de cinco ciclos = 4.5%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

lost after five cicles (coarse + fine) = 12%

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Jefe Laboratorios Control Calidad
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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : Estudio Factibilidad Rio Torola
LOCATED : **CGP-5**
DATE EXPERIMENT : Ene-03
TEC. RESPONSIBLE : Arleth Moran
FILE No : 15-01-03,torola,swissboring,cgp5

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M. Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	% perdida Funcion M Original
4	8.20%	300.0	4	204.40	31.87%	2.61%
8	5.66%	100.0	8	73.90	26.10%	1.48%
16	4.57%	100.0	16	76.10	23.90%	1.09%
30	5.63%	100.0	30	75.60	24.40%	1.37%
50	4.72%	100.0	50	79.30	20.70%	0.98%
100	1.66%					
		700.0		509.3		

lost after five cicles = 7.5%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

lost after five cicles (coarse + fine) = 12%

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Encargado Laboratorios Control Calidad
Suelos y Concreto Asfalto y Materiales

SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR : Ing. Rodolfo Alvarado, SWISSBORING
PROYECT : *Estudio Factibilidad Rio Torola*
LOCATED : **CGP-6**
DATE EXPERIMENT : Ene-03
TEC. RESPONSIBLE : *Arleth Moran*
FILE No : 15-01-03,torola,swissboring,cgp4

AGREGADO GRUESO

Granulometria Preparada			Granulometria Designada				Analisis Cualitativo		
Tamiz No	Rel-Parcial M. Original	Preparado (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	PERDIDA Funcion M Origina	Particulas Iniciales	Particulas Pulveri.	Particulas Fracturadas
2 ½"	0.0%								
2"	31.3%								
1½"	1.7%		1¼"						
1"	12.4%	1,008.0		773.4	23.27%	2.9%	21	2	-.-
3/4"	9.7%	500.0	5/8"	378.0	24.40%	2.4%	29	4	-.-
1/2"	7.4%	670.0	5/16"	472.9	29.42%	2.2%	102	7	-.-
3/8"	4.1%		5/16"						
No 4	7.1%		No 5						
Total	73.9%	2,178.0		1,624					

Perdida despues de cinco ciclos = 7.4%

Observaciones : *sampling carrier out by applicant*
Reactive used sulfate of sodium

lost after five cicles (fine + coarse) = 16%

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Jefe Laboratorios Control Calidad
Suelos, Concreto, Asfalto y Materiales

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SANIDAD AGREGADOS PARA CONCRETO
ASTM C-88

SOLICITOR Ing Rodolfo Alvarado, SWISSBORING
PROYECT . Estudio Factibilidad Rio Torola
LOCATED : **CGP-6**
DATE EXPERIMENT Ene-03
TEC RESPONSIBLE Arleth Moran
FILE No 15-01-03,torola,swissboring,cgp4

Granulometria Preparada			Granulometria Designada			
Tamiz No	Ret-Parc(%) M Original	Retenido (gr) antes ensayo	Tamiz No	Retenido (gr) ensayado	(%) Perdida	% perdida Funcion M Original
4	7 14%	300.0	4	197.40	34.20%	2.44%
8	5 86%	100 0	8	66 90	33.10%	1 94%
16	5 89%	100 0	16	78.30	21.70%	1.28%
30	4 91%	100.0	30	77 10	22.90%	1 13%
50	5.12%	100.0	50	71 00	29.00%	1.49%
100	2 53%					
		700.0		490.7		

lost after five cicles = 8.3%

Observaciones : sampling carrier out by applicant
Reactive used sulfate of sodium

lost after five cicles (fine + coarse) = 16%

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Jefe Laboratorios Control Calidad
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