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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

No. 12

MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)

THE REPUBLIC OF GUATEMALA

THE STUDY  
ON  
THE IMPROVEMENT  
OF  
WASTEWATER MANAGEMENT  
IN  
THE GUATEMALA METROPOLITAN AREA

FINAL REPORT

VOLUME VI  
DRAWINGS

AUGUST 1996

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JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

MUNICIPAL WATER SUPPLY PUBLIC CORPORATION(EMPAGUA)  
THE REPUBLIC OF GUATEMALA

THE STUDY  
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**FINAL REPORT**

**VOLUME VI  
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	C. Laws, Regulations and Standards on Water Pollution Control
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	F. Industrial Effluents and Questionnaire Survey
	G. Existing Small-Scale Sewage Treatment Plants
	H. EMPAGUA's Administration
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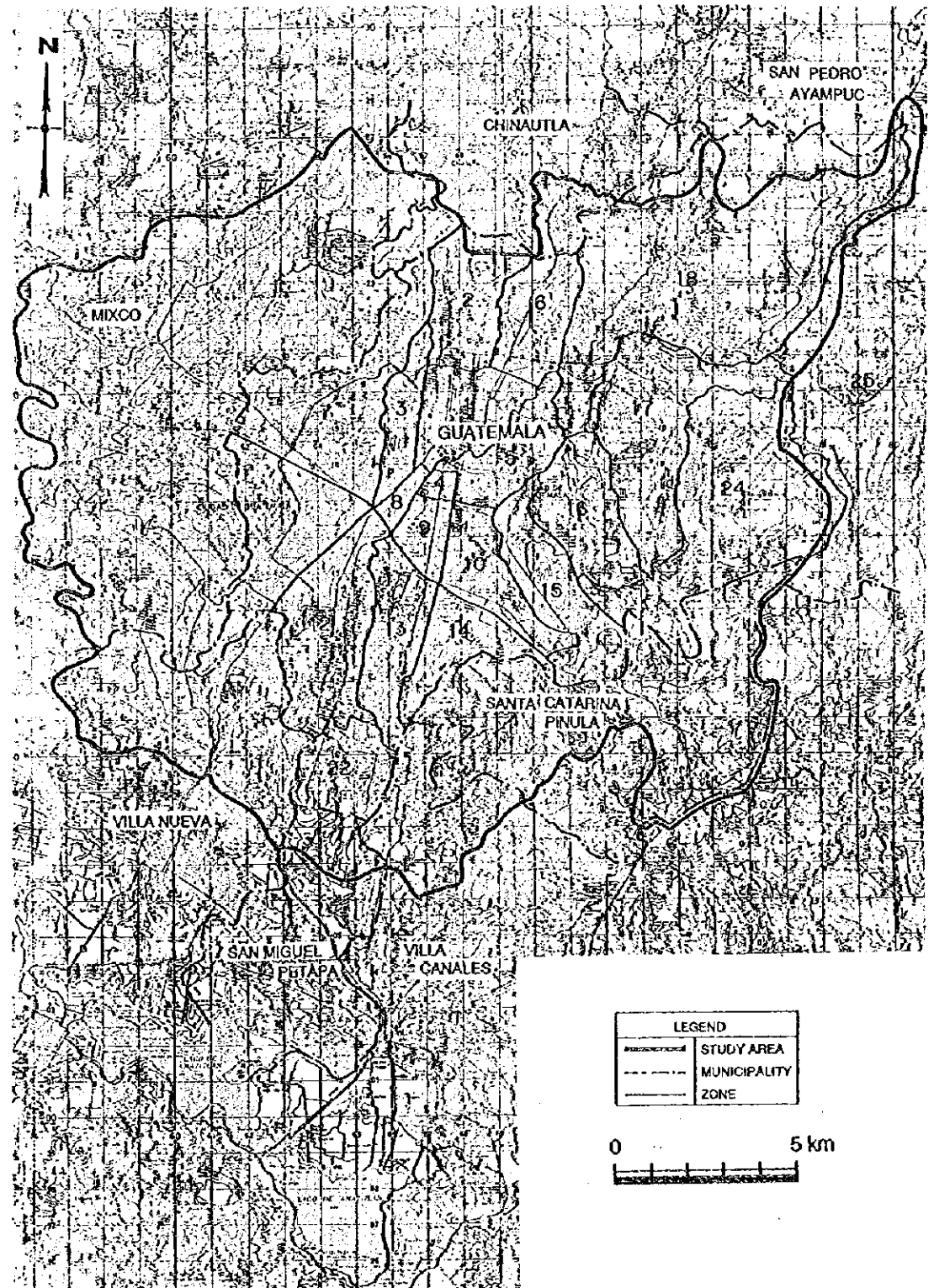
Note: Design calculation of First Stage Project is the same as that of South 3 Region for Feasibility Study as described in Supporting Report M.

## **TOPOGRAPHIC SURVEY**

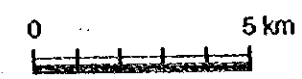
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LOCATION OF THE REPUBLIC OF GUATEMALA

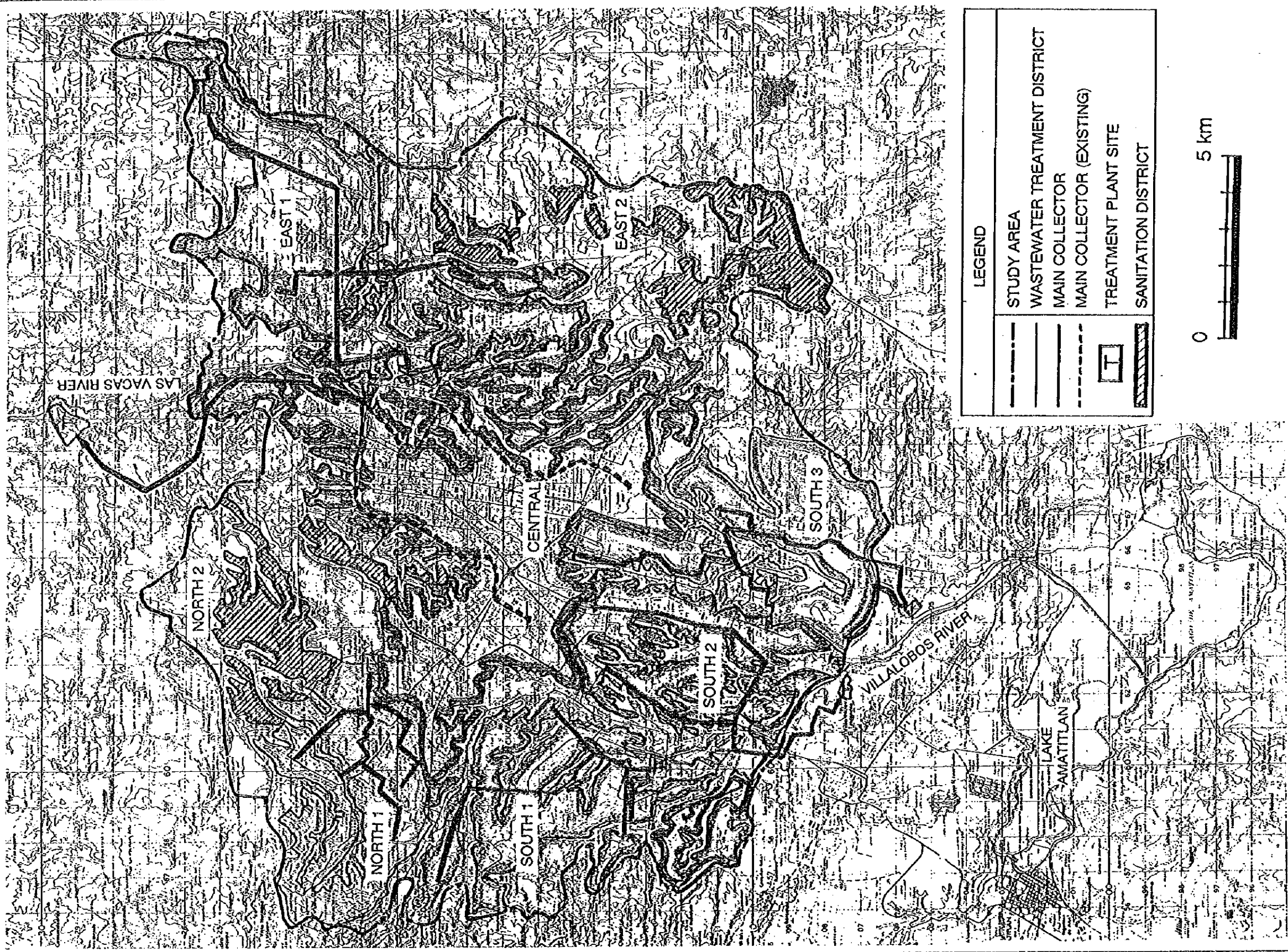


LEGEND	
	STUDY AREA
	MUNICIPALITY
	ZONE

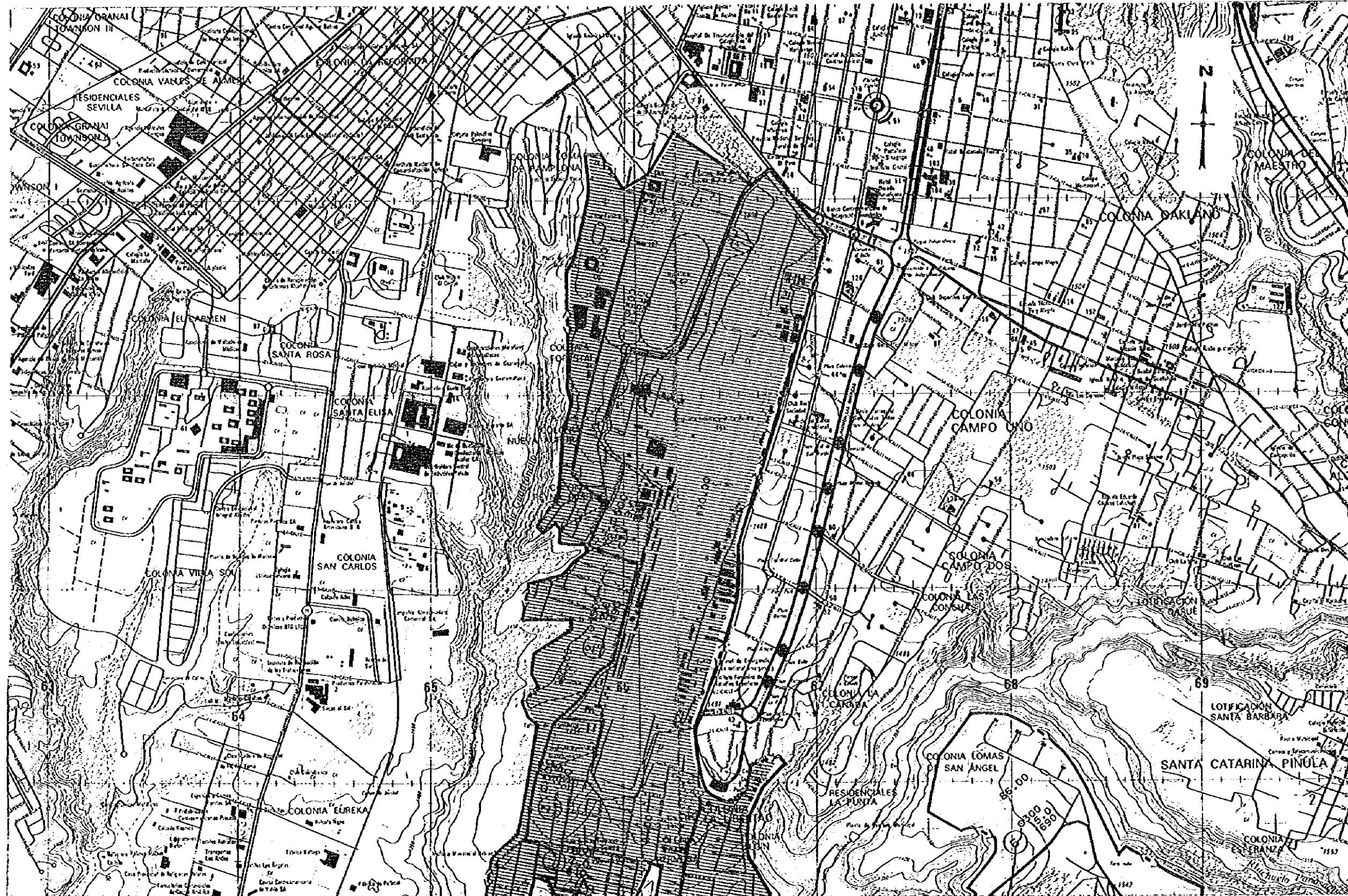


<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Location Map fo Study Area</p>
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<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Proposed Wastewater Management System</p>
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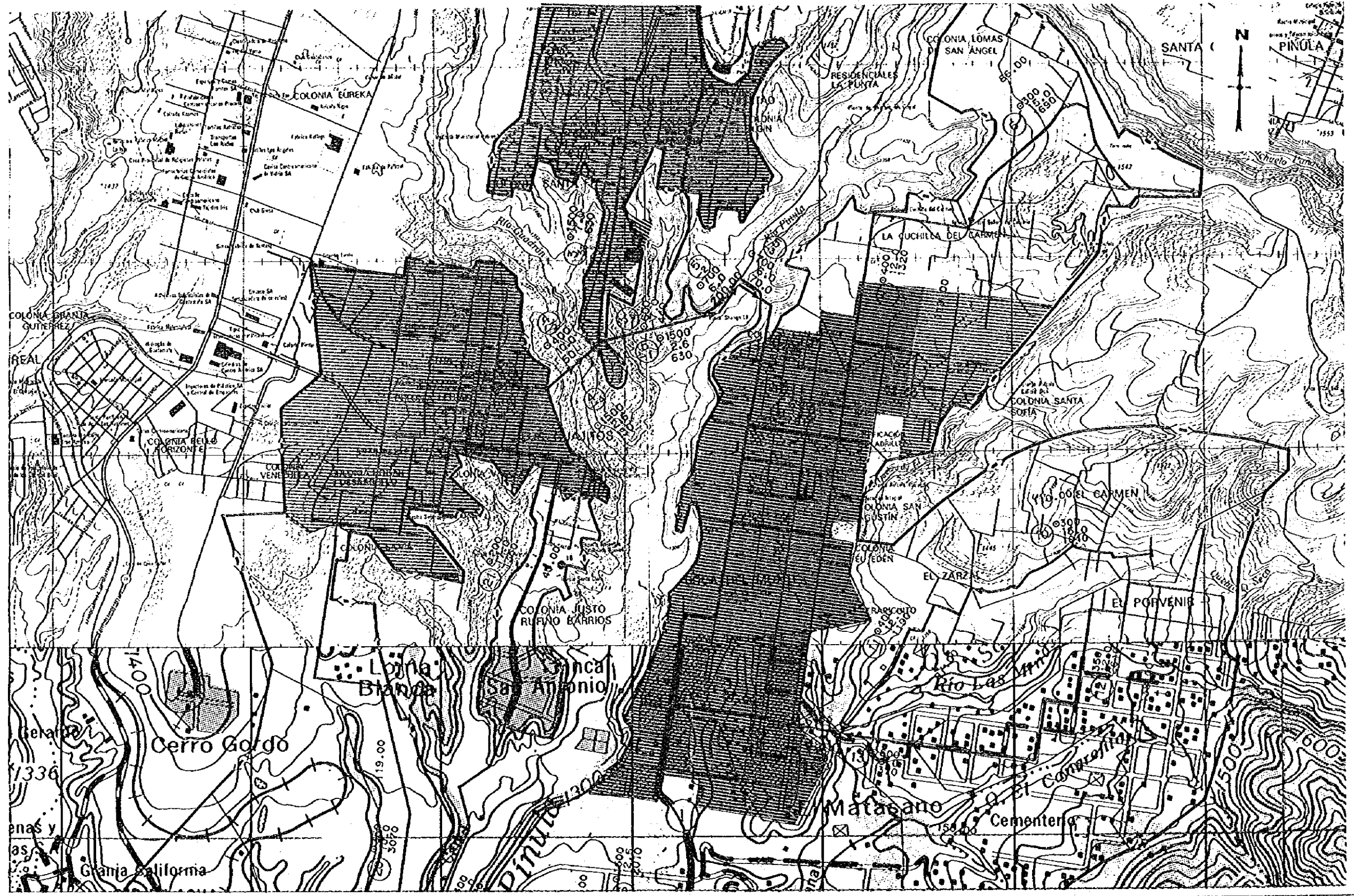
 : FIRST STAGE

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THE REPUBLIC OF GUATEMALA  
 GUATEMALA MUNICIPAL WATER  
 SUPPLY PUBLIC CORPORATION  
 (EMPAGUA)

THE STUDY ON  
 THE IMPROVEMENT OF WASTEWATER  
 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Layout of Pinula Main Collector (1/3)



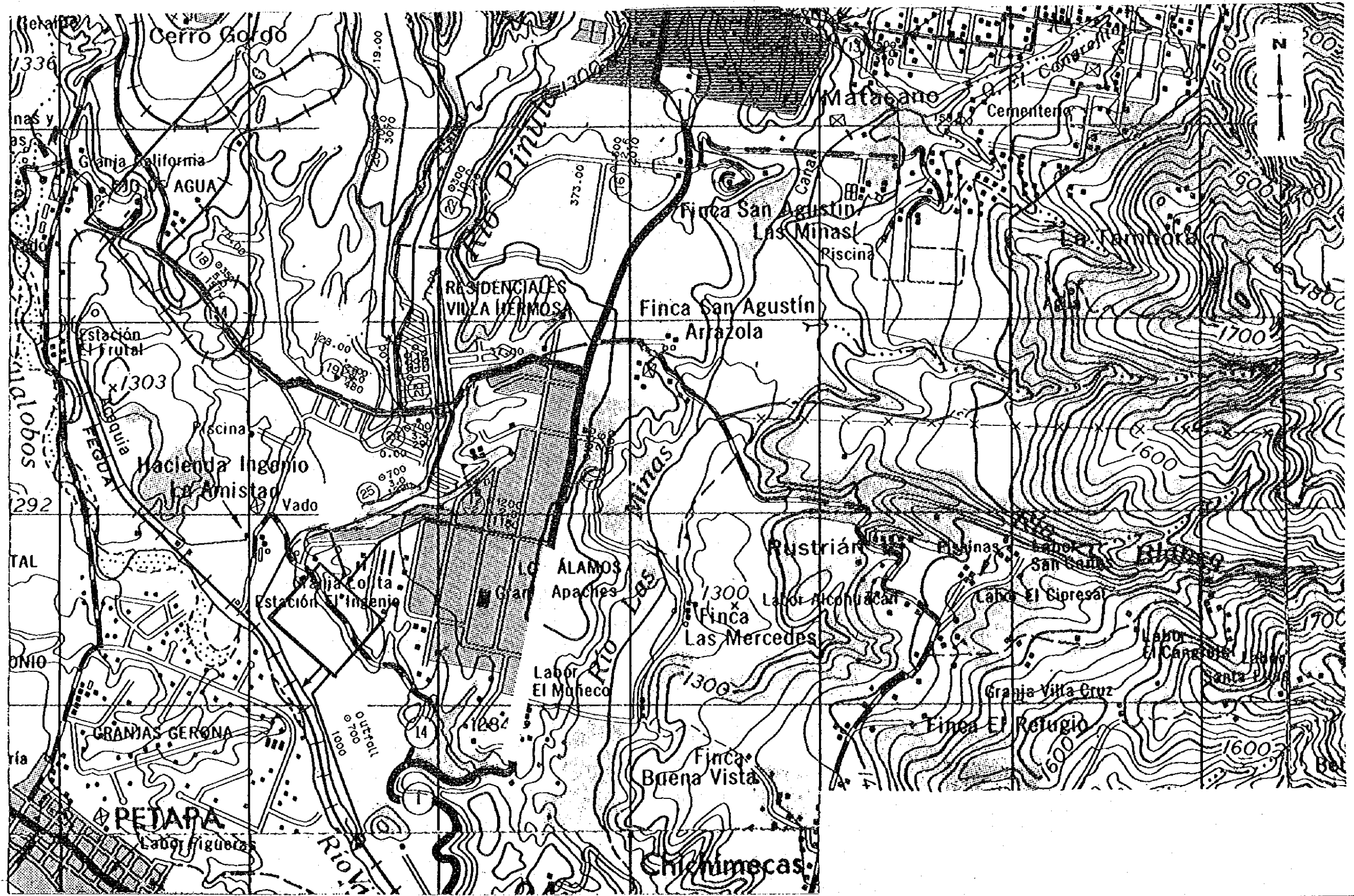
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THE REPUBLIC OF GUATEMALA  
 GUATEMALA MUNICIPAL WATER  
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 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Layout of Pinula Main Collector (2/3)

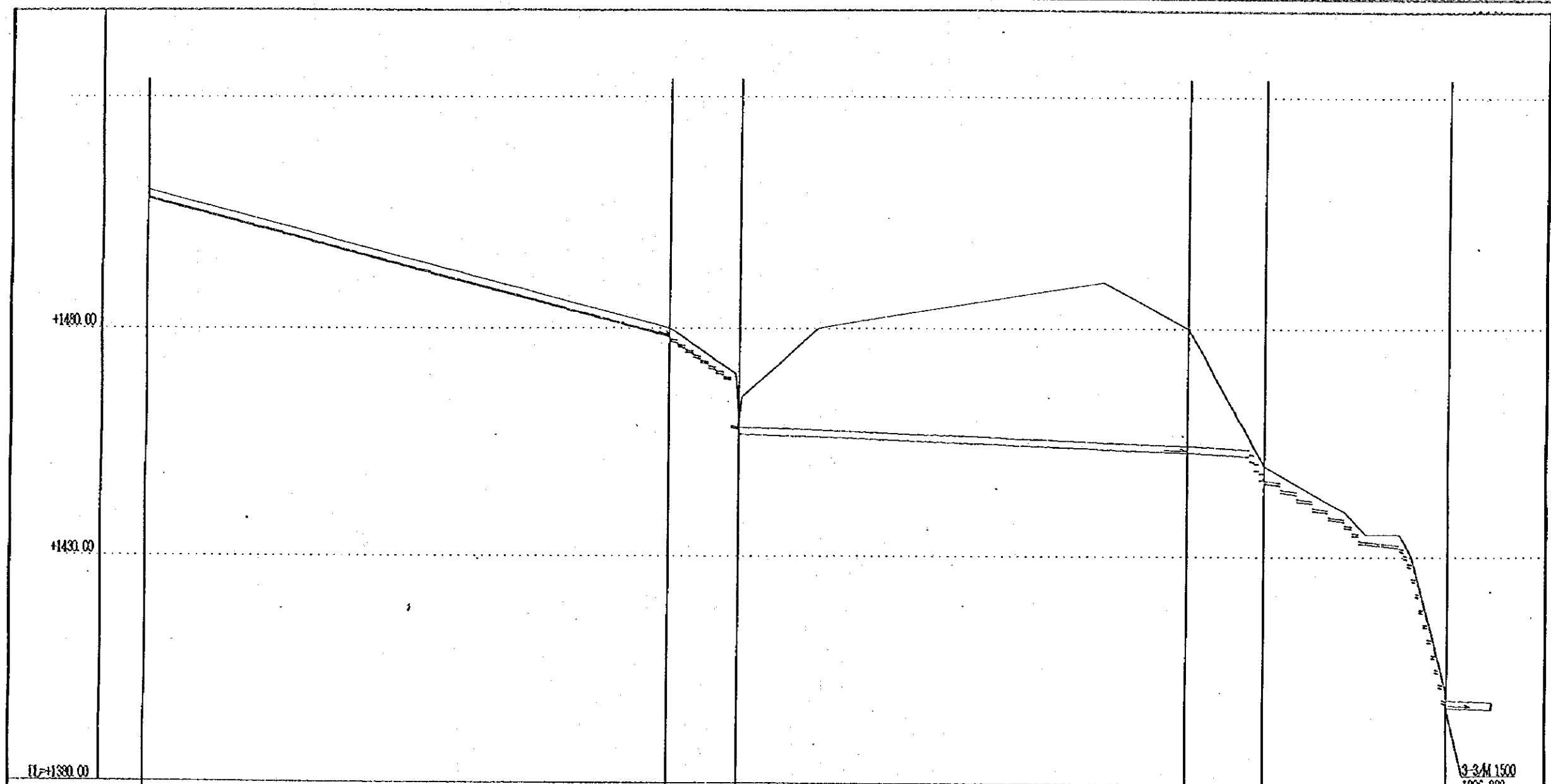


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THE REPUBLIC OF GUATEMALA  
 GUATEMALA MUNICIPAL WATER  
 SUPPLY PUBLIC CORPORATION  
 (EMPAGUA)

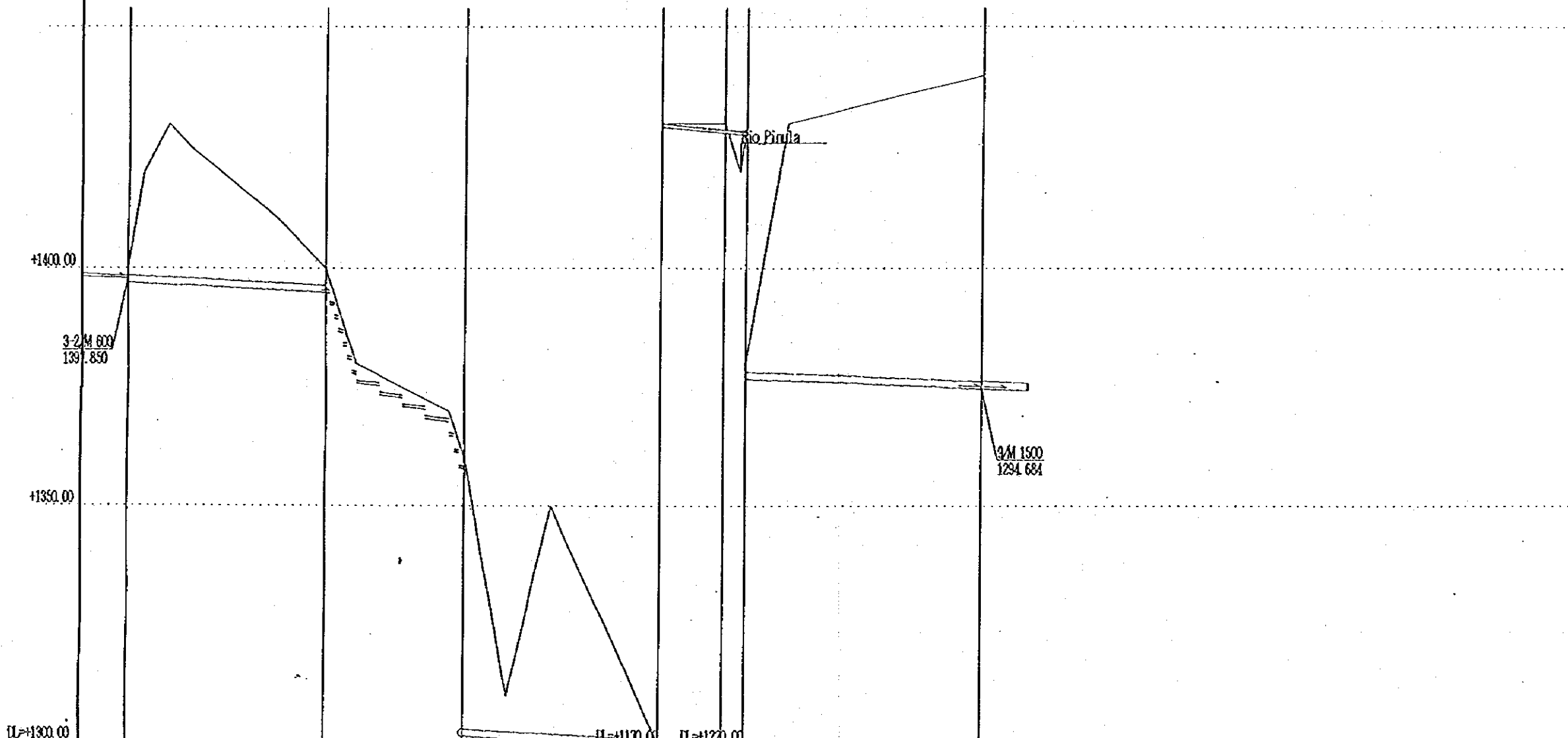
THE STUDY ON  
 THE IMPROVEMENT OF WASTEWATER  
 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Layout of Pinula Main Collector (3/3)



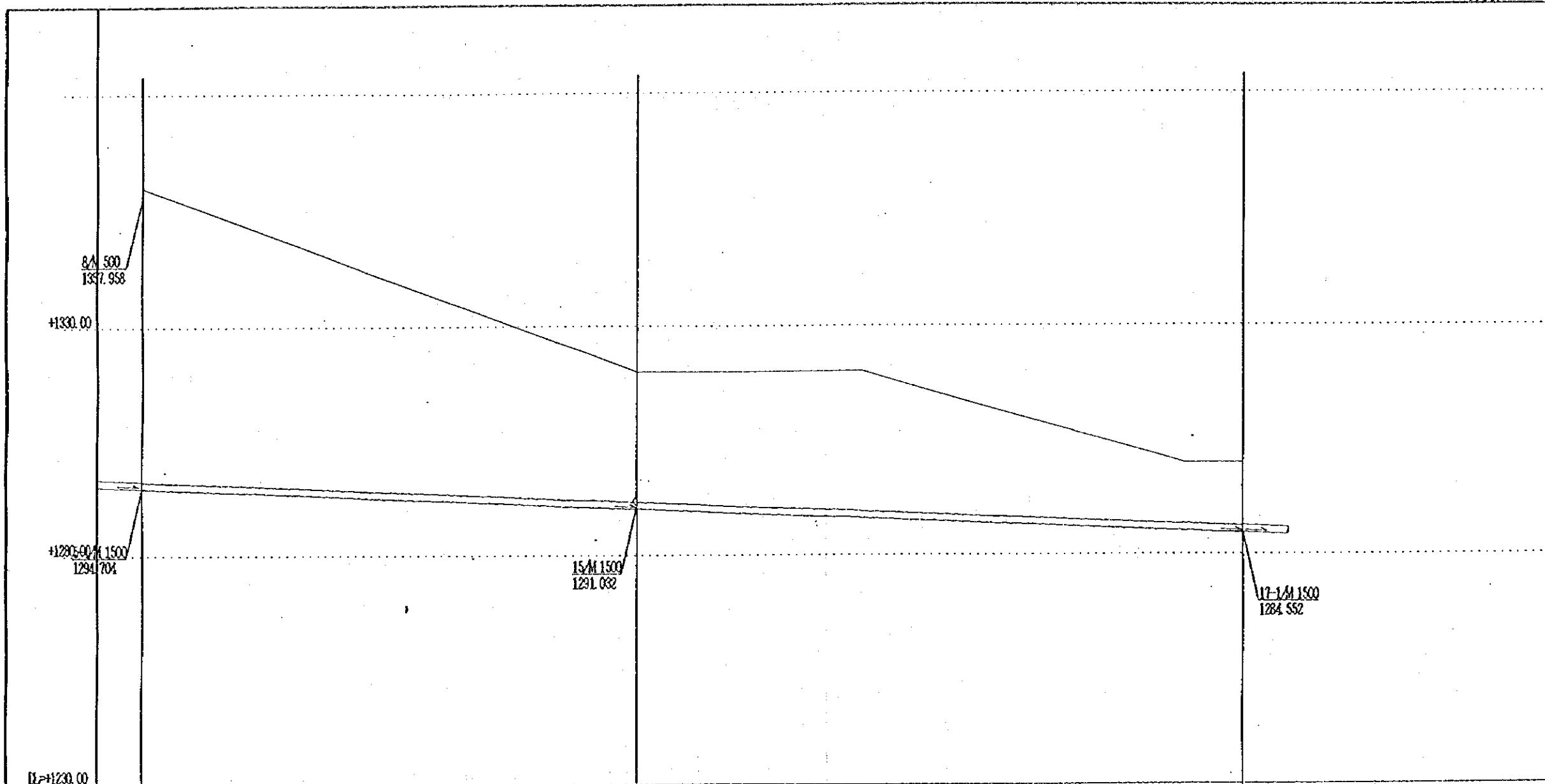
Sewer Line No.		1M	2-1M	2-2M	3-1M	3-2M
V=1/1000	Diam (mm)	300	500	1500	1500	600
H=1/15000	Slope (‰)	15.0	9.0	2.6	2.6	1.0
	Length (m)	1730.00	230.00	1490.00	280.00	610.00
Ground Elevation(m)	0.00-1510.00	1730.00-1490.00	1960.00-1460.00	3450.00-1480.00	3710.00-1450.00	4200.00-1400.00
Earth Cover (m)	1.62-1.510.00	2.52-1.52	1.53-1.50	2.55-2.51	3.12-3.12	1.50-1.50
Invert Elevation(m)	1396.888	1478.170	1456.888	1452.888	1446.888	1397.888
Cu. Length (m)	0.00	1730.00	1960.00	3450.00	3710.00	4200.00

THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)	THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA	TITLE Longitudinal Section of Pinula Main Collector for South 3 Region (177)
	JAPAN INTERNATIONAL COOPERATION AGENCY	



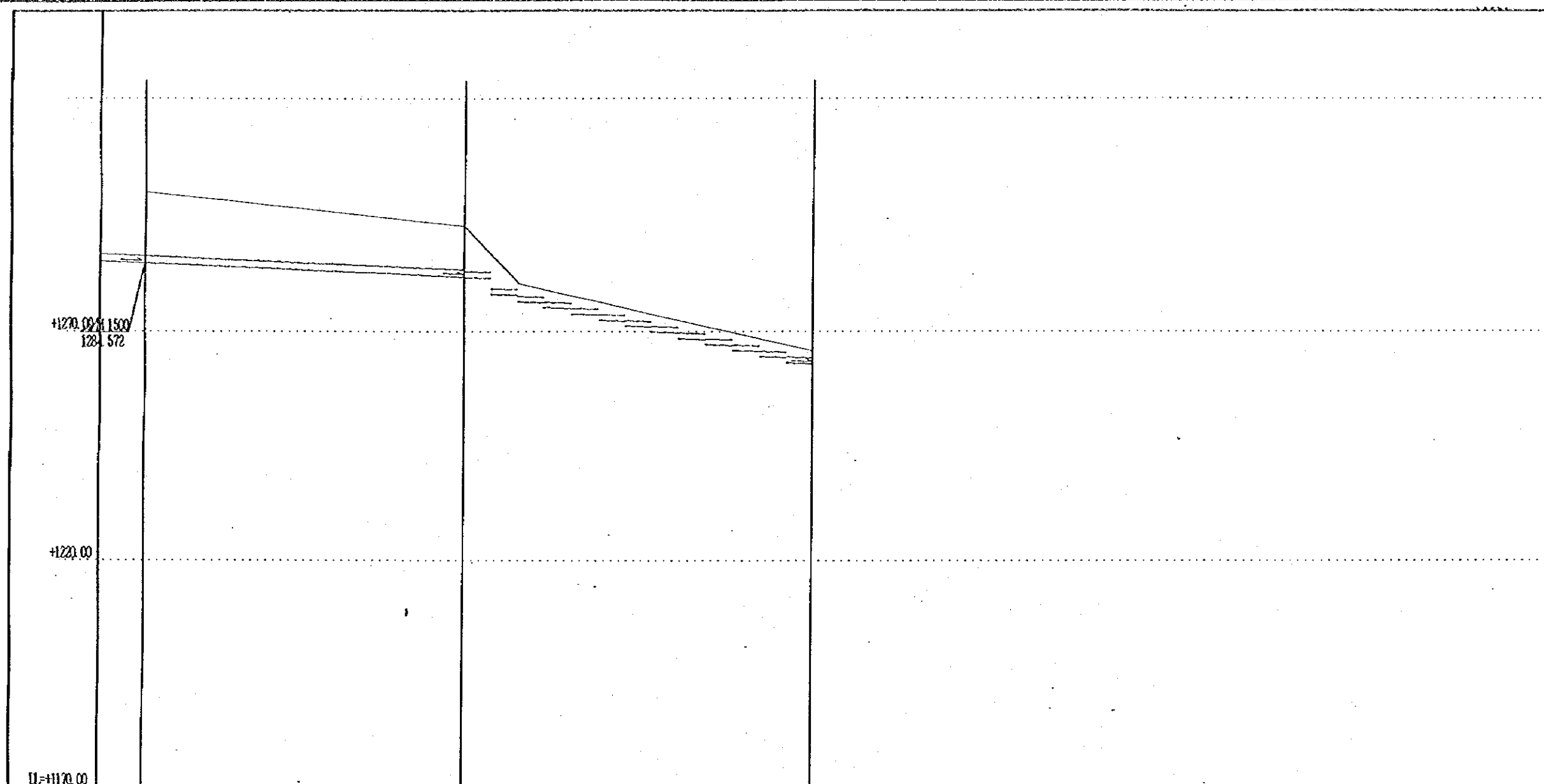
Sewer Line No.	3-3M	3-4M	5-1M	5-2M	5-3M	5-4M
V=1/1000 Diam (mm)	1500	1500	1500	700	700	1500
H=1/15000 Slope (%)	2.6	7.0	2.6	6.0	6.0	2.6
Length (m)	630.00	440.00	630.00	200.00	70.00	760.00
Ground Elevation(m)	1400.00	1400.00	1360.00	1300.00	1300.00	1360.00
Earth Cover (m)	1.50	2.46	1.50	0.67	1.21	1.61
Invert Elevation(m)	1391.850	1391.850	1387.850	1298.220	1298.220	1294.684
Cu. Length (m)	4320.00	4950.00	5580.00	6220.00	6290.00	7050.00

THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)	THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA	TITLE Longitudinal Section of Pinula Main Collector for South 3 Region (2/7)
	JAPAN INTERNATIONAL COOPERATION AGENCY	



Sewer Line No.		94	164
V=1/1000 Diam (mm)		1500	1500
H=1/15000 Slope (%)		2.6	2.6
Length (m)		1630.00	2010.00
Ground Elevation (m)	7050.00 - 1294.694 - 83.70 - 1350.00	8680.00 - 1291.032 - 28.21 - 1320.00	10680.00 - 1284.572 - 13.82 - 1300.00
Earth Cover (m)			
Invert Elevation (m)			
Cu. Length (m)			

THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)	THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA	TITLE Longitudinal Section of Pinula Main Collector for South 3 Region (3/7)
	JAPAN INTERNATIONAL COOPERATION AGENCY	



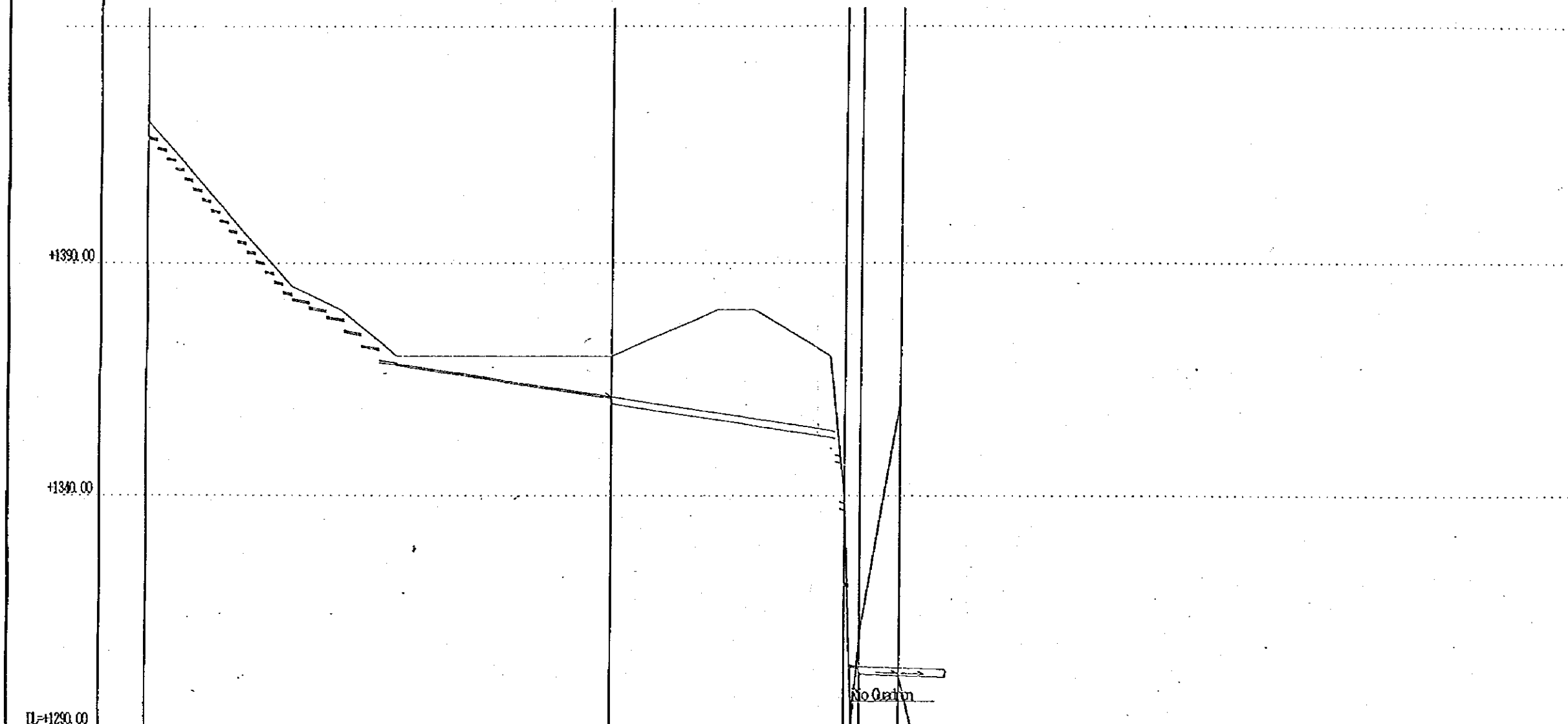
Sewer Line No.	17-1/M	17-2/M	To the Wastewater Treatment Plant
V=1/1000 Diam (mm)	1500	1200	
H=1/15000 Slope (%)	2.6	2.0	
Length (m)	1060.00	1150.00	
Ground Elevation(m)	1270.00	1262.60	1265.70
Earth Cover (m)	13.84	9.38	1.50
Invert Elevation(m)	1264.552	1261.556	1259.05
Cu. Length (m)	10630.00	11750.00	12000.00

THE REPUBLIC OF GUATEMALA  
 GUATEMALA MUNICIPAL WATER  
 SUPPLY PUBLIC CORPORATION  
 (EMPAGUA)

THE STUDY ON  
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 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Longitudinal Section of Pinula Main  
 Collector for South 3 Region (4/7)



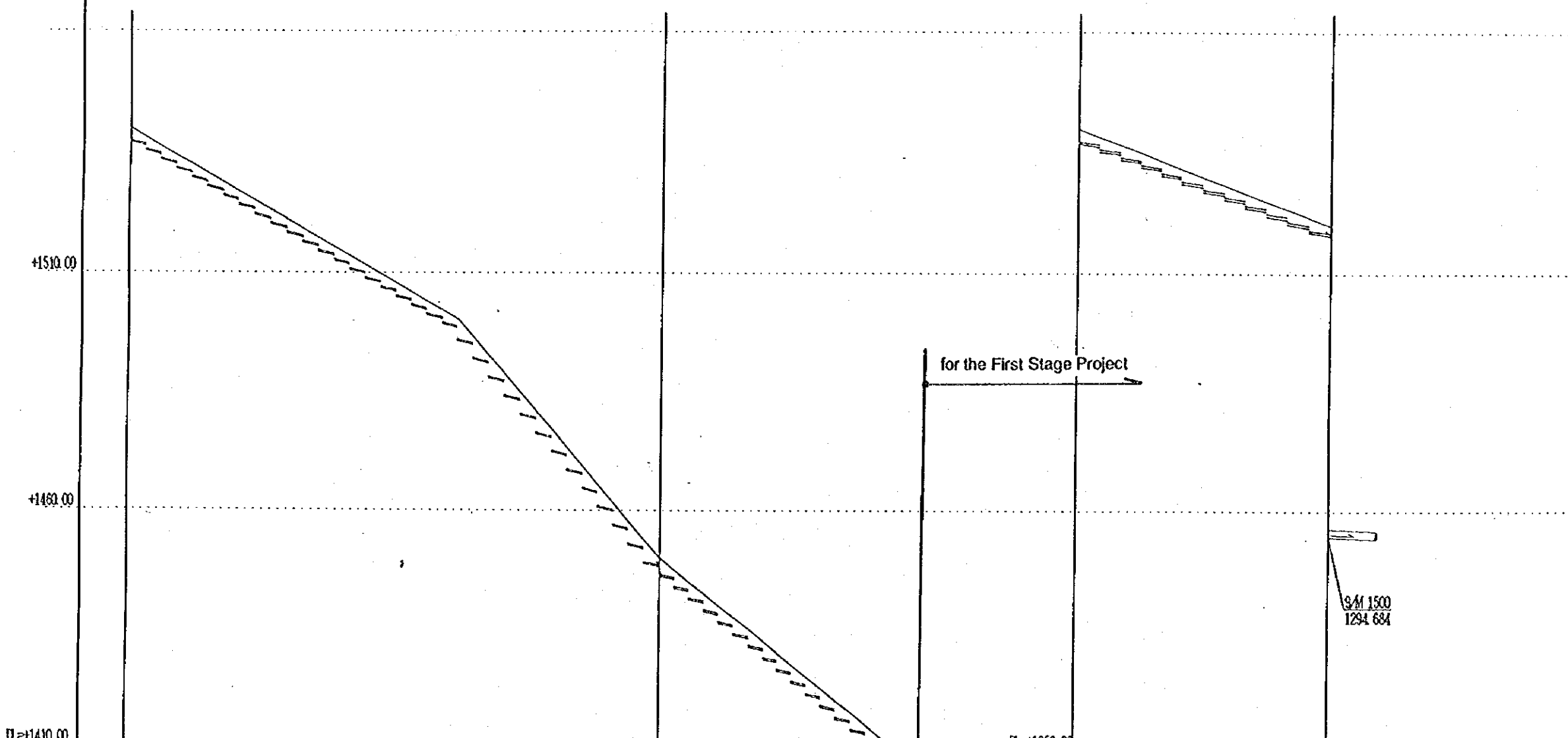


Sewer Line No.		4-1/M	4-2/M	4-3/M	4-4/M
V=1/1000	Diam (mm)	400	1500	400	1500
H=1/15000	Slope (‰)	10.0	10.0	0.0	2.6
	Length (m)	1510.00	760.00	50.00	130.00
Ground Elevation(m)				1340.00	1310.00
Earth Cover (m)		8.72	8.62	1.50	1.68
Invert Elevation(m)		1280.95	1288.75	1288.75	1301.47
Cu. Length (m)		0.00		2270.00	2283.00

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THE STUDY ON  
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 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Longitudinal Section of Pinula Main  
 Collector for South 3 Region (5/7)

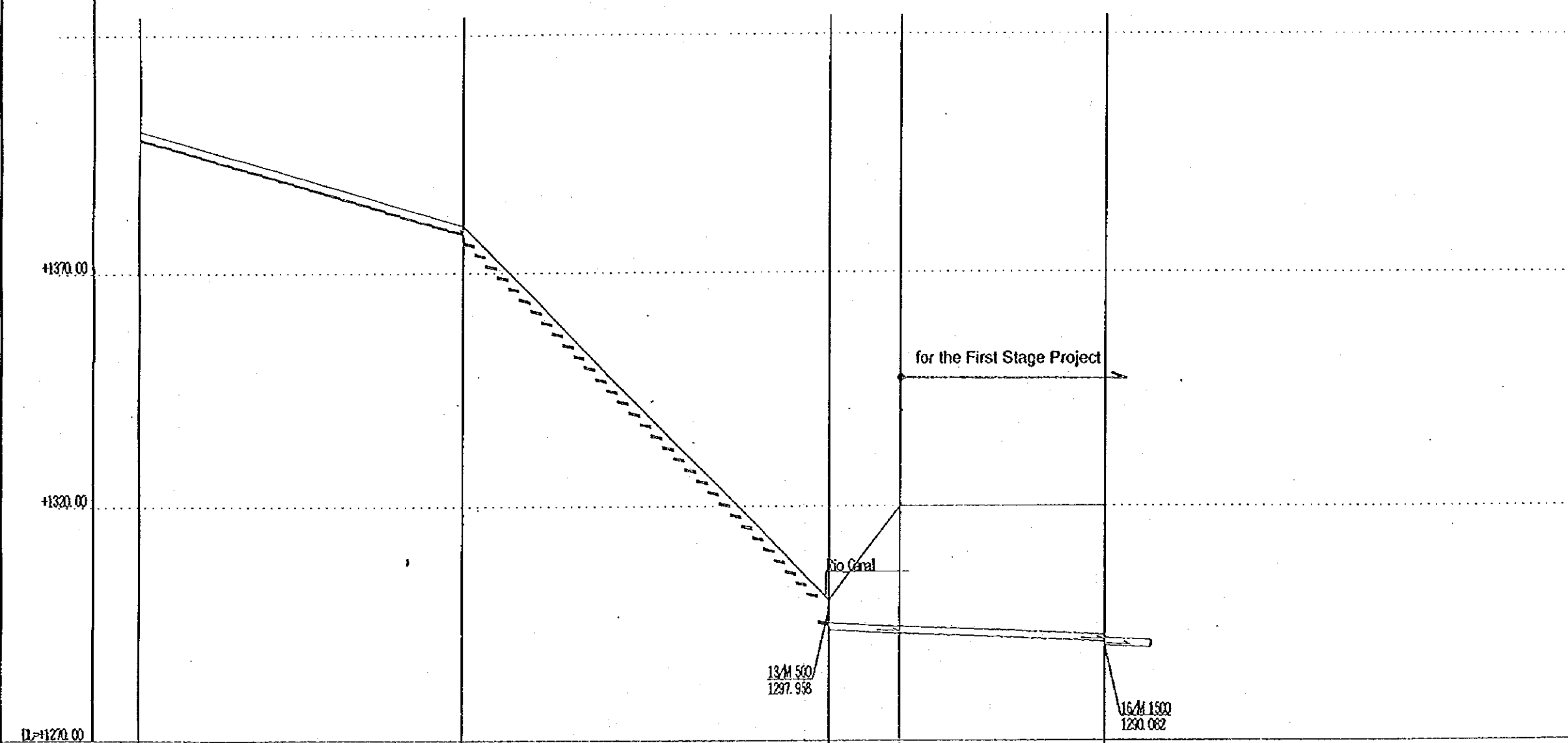


Sewer Line No.		6M	7M	8M
V=1/1000	Diam (mm)	300	400	500
H=1/15000	Slope (%)	15.0	12.0	9.0
	Length (m)	1690.00	1320.00	810.00
Ground Elevation(m)		1497.00	1450.00	1380.00
Earth Cover (m)		2.64	2.58	1.50
Invert Elevation(m)		1481.00	1438.00	1371.00
Cu. Length (m)		0.00	0.00	0.00

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 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

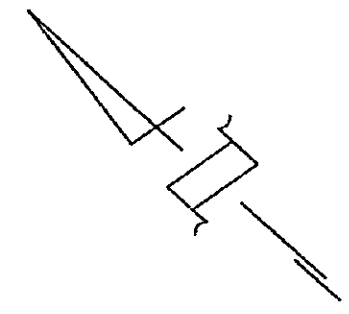
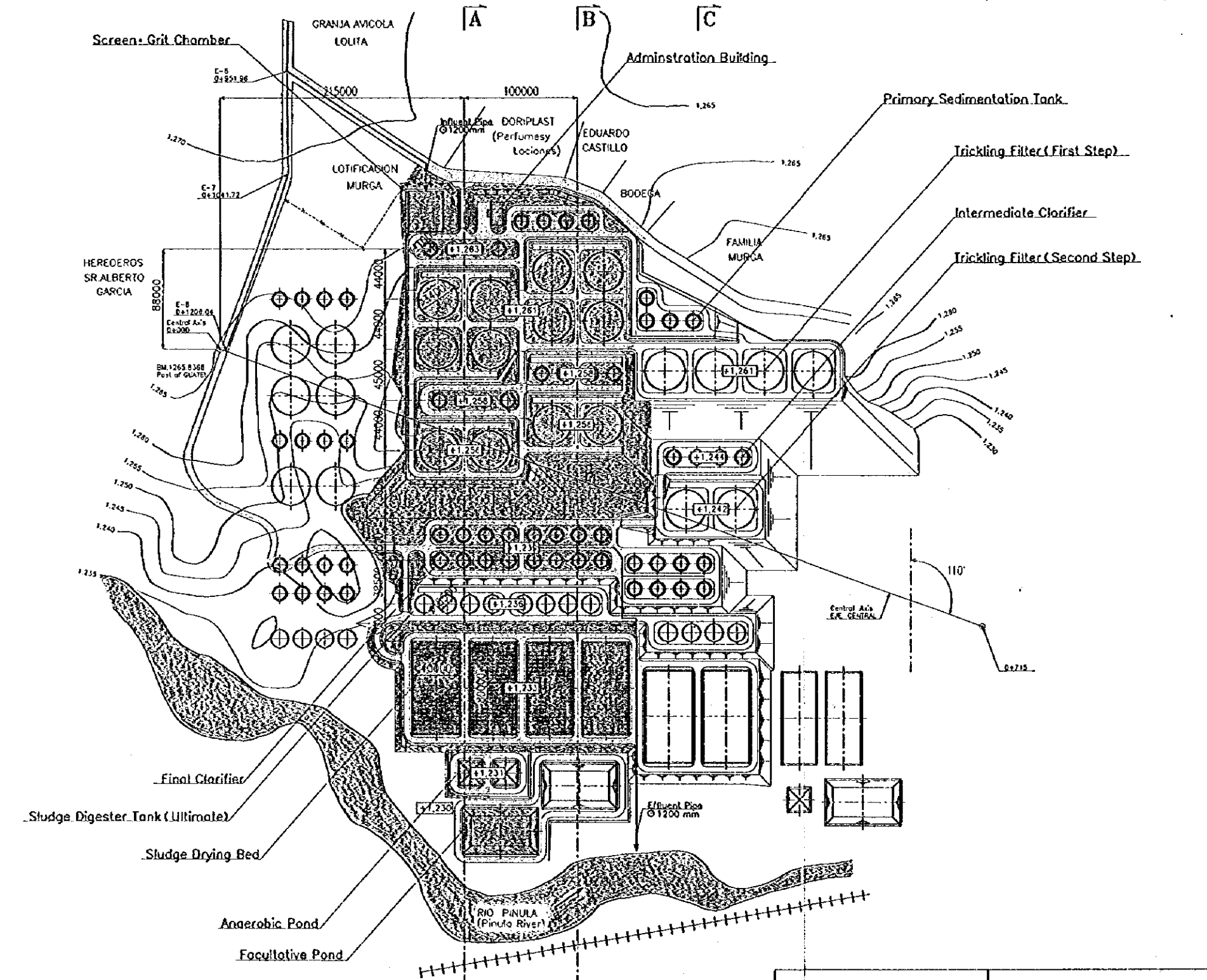
TITLE  
 Longitudinal Section of Pinula Main  
 Collector for South 3 Region (6/7)



	0+00	1+00	2+00	2+60	3+20
Sewer Line No.					
Y=1/1000 Diam (mm)		10M 300	11M 400	14M 1500	15M 1500
H=1/15000 Slope (%)		15.0	12.0	2.6	2.6
Length (m)		1040.00	1190.00	230.00	680.00
Ground Elevation(m)	1350.00	1330.00	1300.00	1300.00	1320.00
Earth Cover (m)	1.71	2.29	2.92	2.56	2.18
Invert Elevation(m)	1297.95	1278.17	1291.55	1292.87	1291.02
Cu. Length (m)	0.00	1040.00	1190.00	230.00	680.00

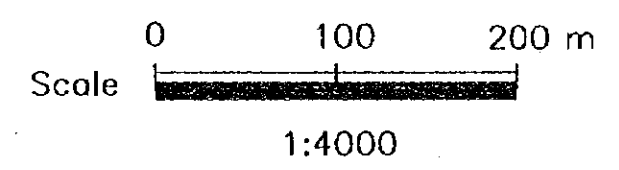
THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)	THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA	TITLE Longitudinal Section of Pinula Main Collector for South 3 Region (7/7)
	JAPAN INTERNATIONAL COOPERATION AGENCY	

# Layout Plan of Wastewater Treatment Plant (South3 WWTP)



EST.	P.O.	RUMBO	DIST.
6	7	S 47° 17' 00"	89.76
7	8	S 68° 35' 20"	164.32
8	9	S 89° 54' 00"	13.90

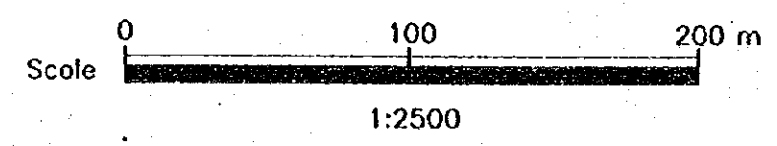
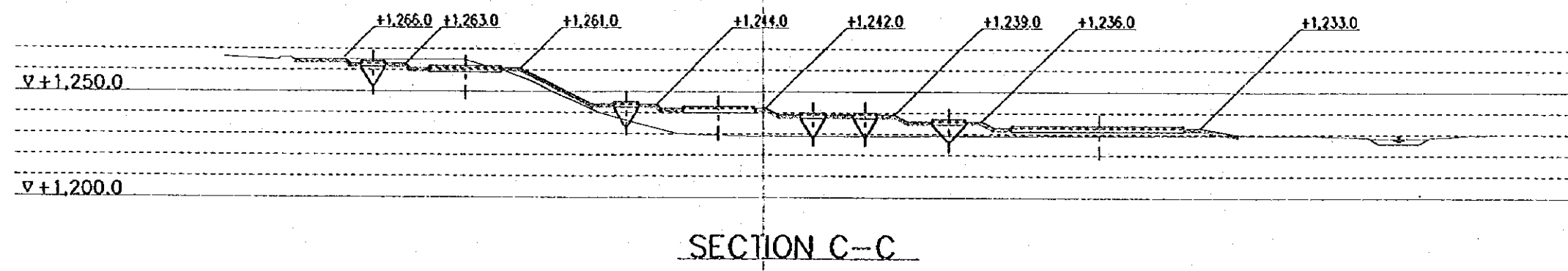
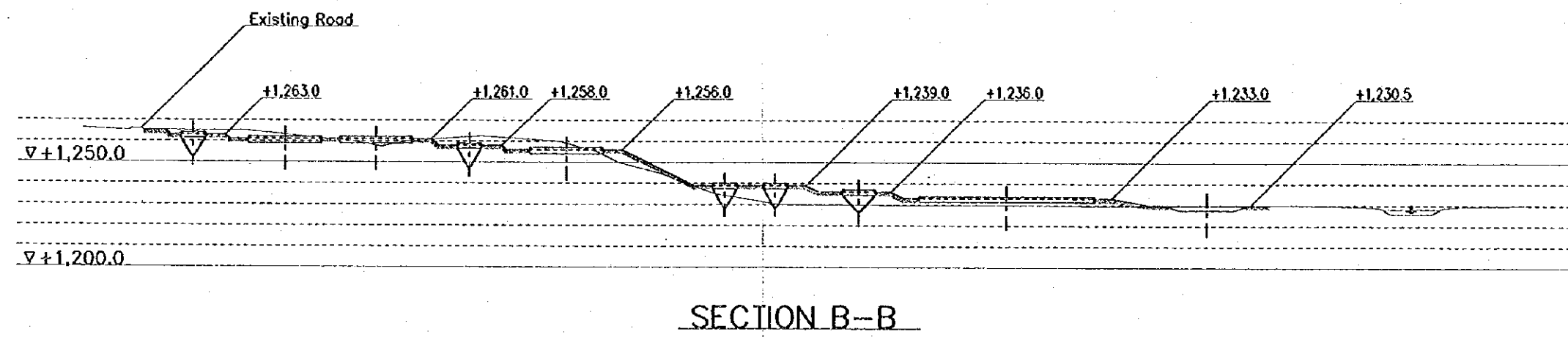
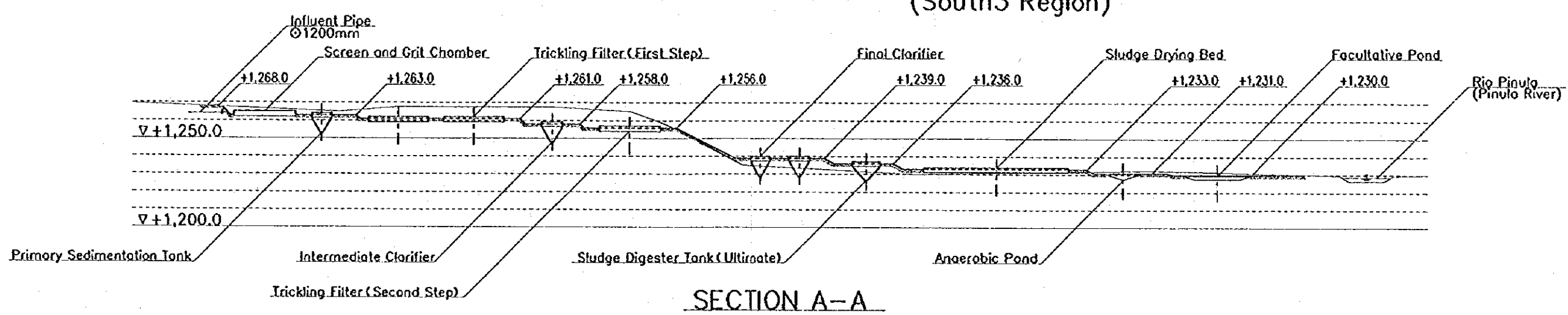
EST.	P.O.	RUMBO	DIST.
E-8	Central Axis 0+200	S 21° 42' 00"	5.94
	Central Axis 0+713	S 21° 42' 00"	715.00



Note: Colored Facilities are for First Stage

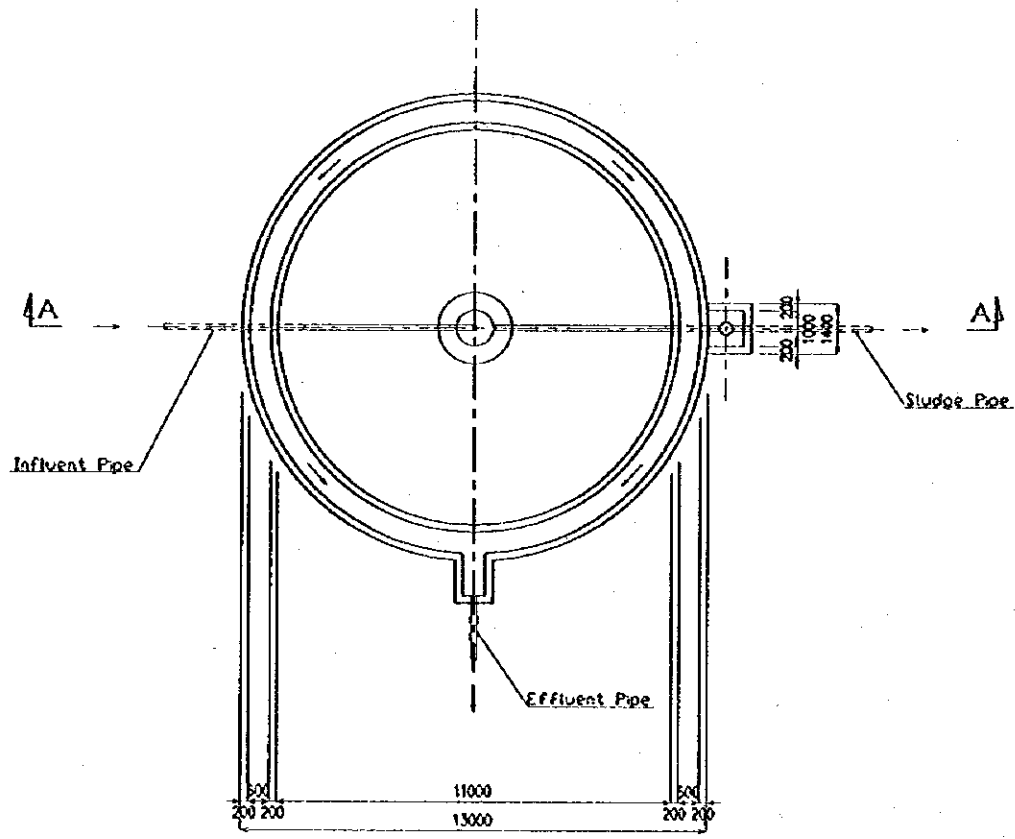
<p>THE REPUBLIC OF GUATEMALA</p> <p>GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA</p> <p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE</p> <p>Layout Plan for the First Stage Project (South 3 WWTP)</p>
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## Hydraulic Profile for First Stage Facilities (South3 Region)

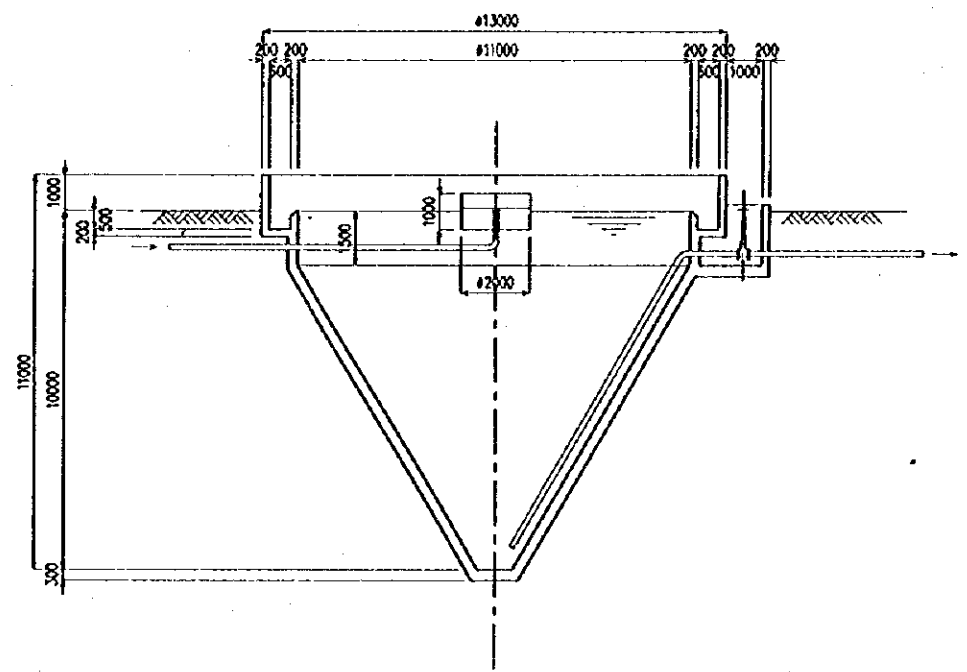


<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Hydraulic Profile for the First Stage Project (South 3 WWTP)</p>
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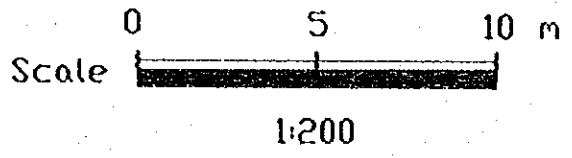
# Primary Sedimentation Tank Intermediate and Final Clarifier



PLAN

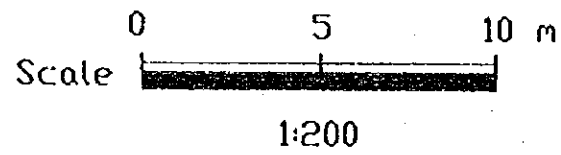
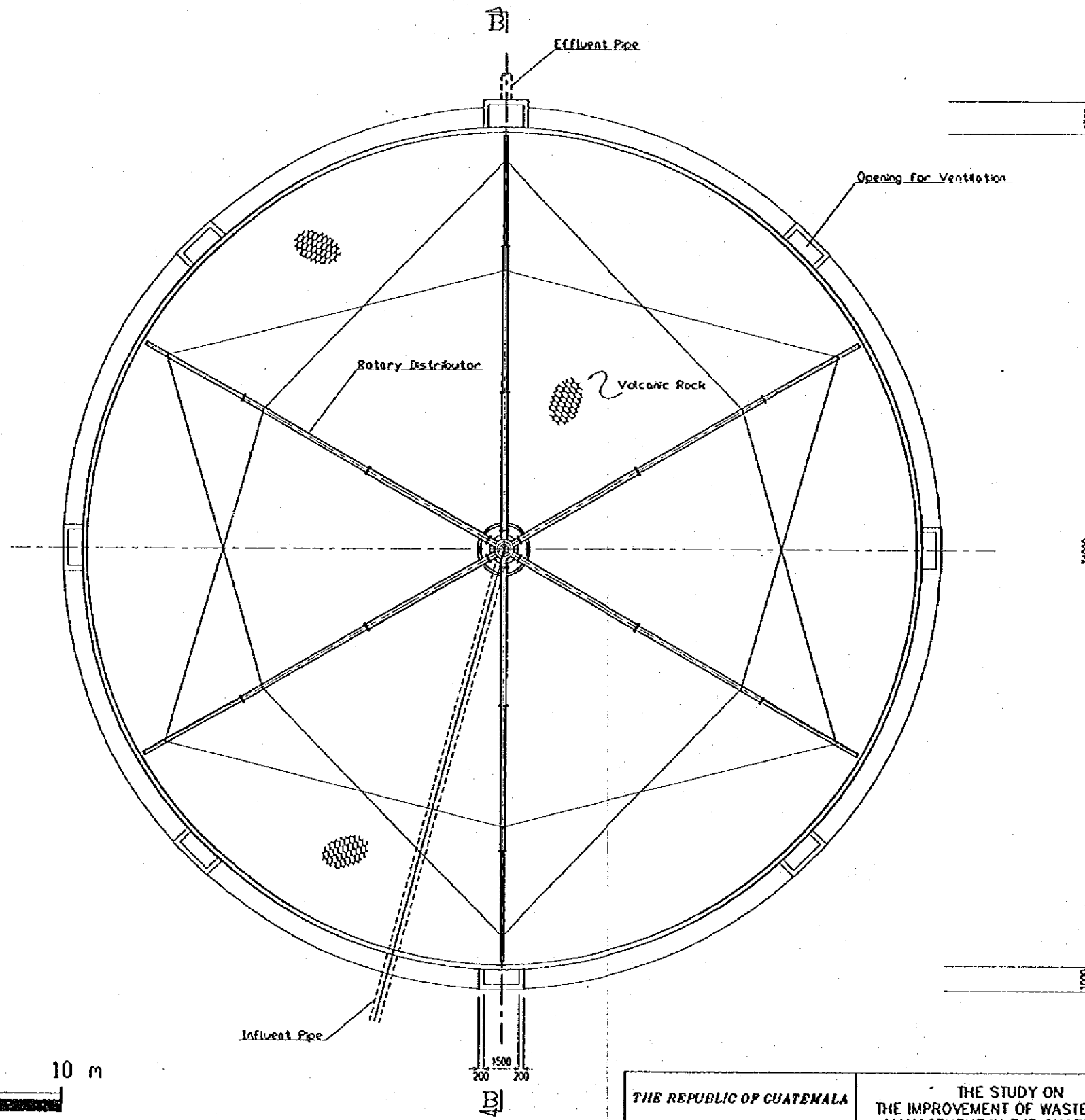


SECTION A-A



<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA</p> <p>JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Sedimentation Tank and Clarifiers for the First Stage Project (South 3 WWTP)</p>
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# Trickling Filter



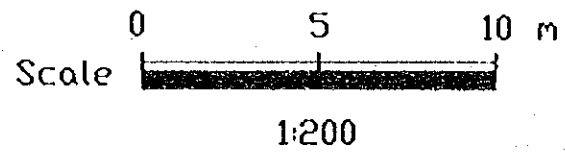
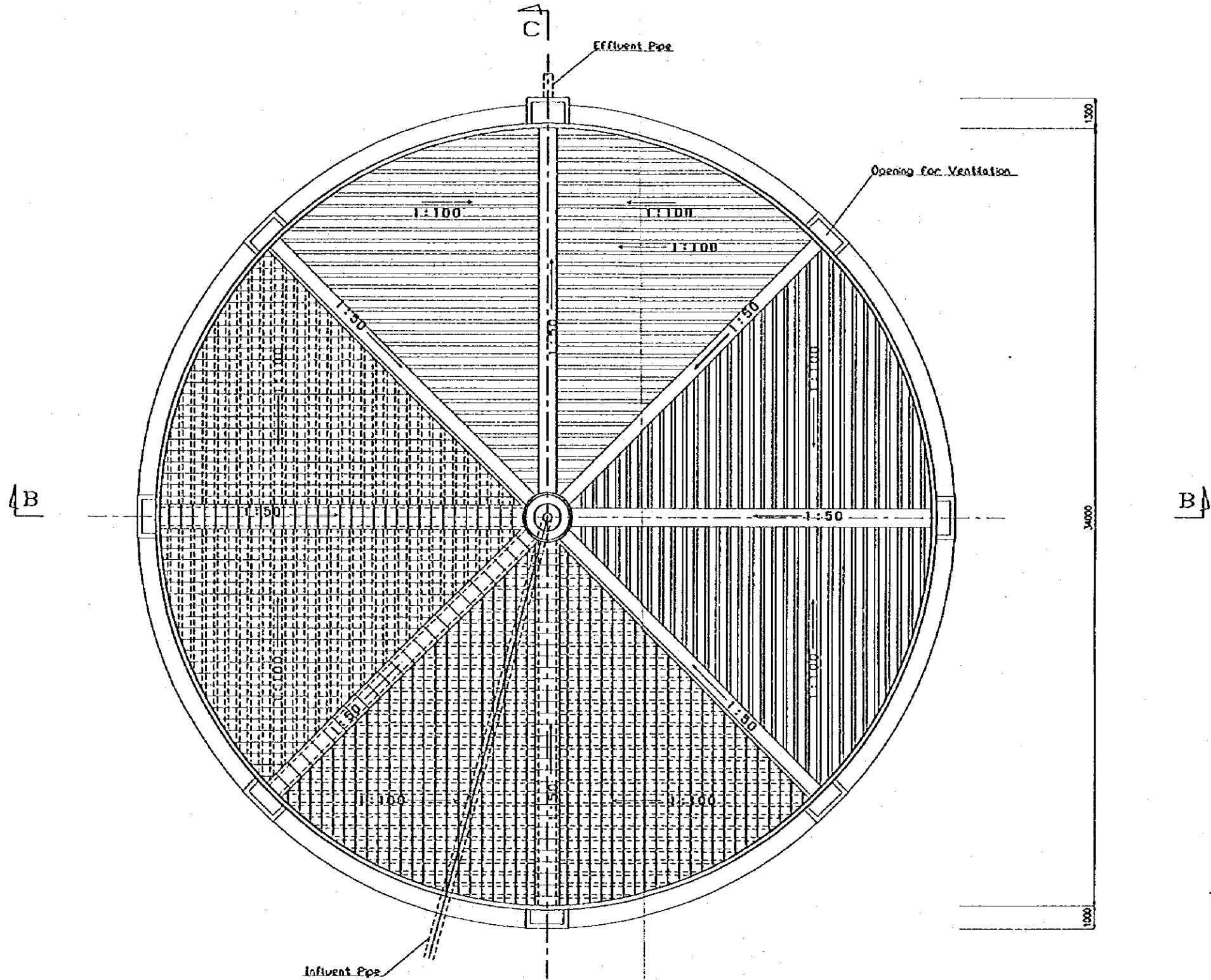
PLAN

THE REPUBLIC OF GUATEMALA  
 GUATEMALA MUNICIPAL WATER  
 SUPPLY PUBLIC CORPORATION  
 (EMPAGUA)

THE STUDY ON  
 THE IMPROVEMENT OF WASTEWATER  
 MANAGEMENT IN THE GUATEMALA  
 METROPOLITAN AREA  
 JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
 Trickling Filter for the First Stage Project  
 (South 3 WWTP) (1/3)

# Trickling Filter



SECTION A-A

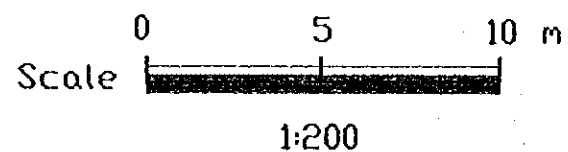
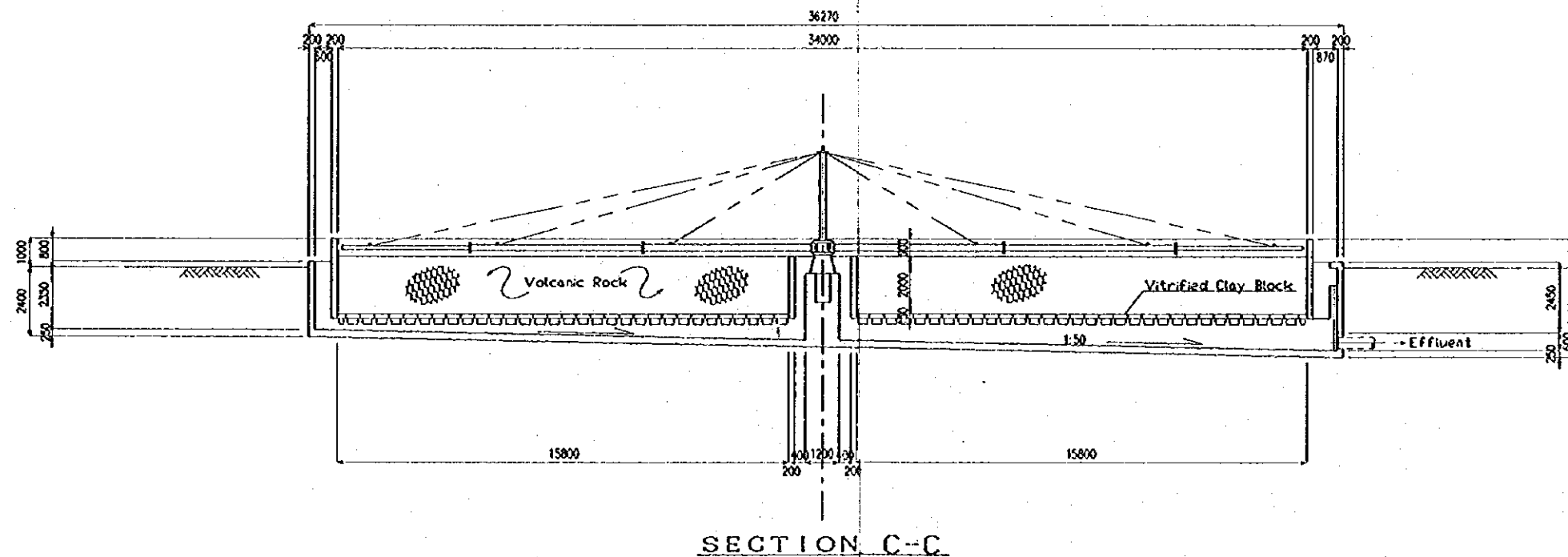
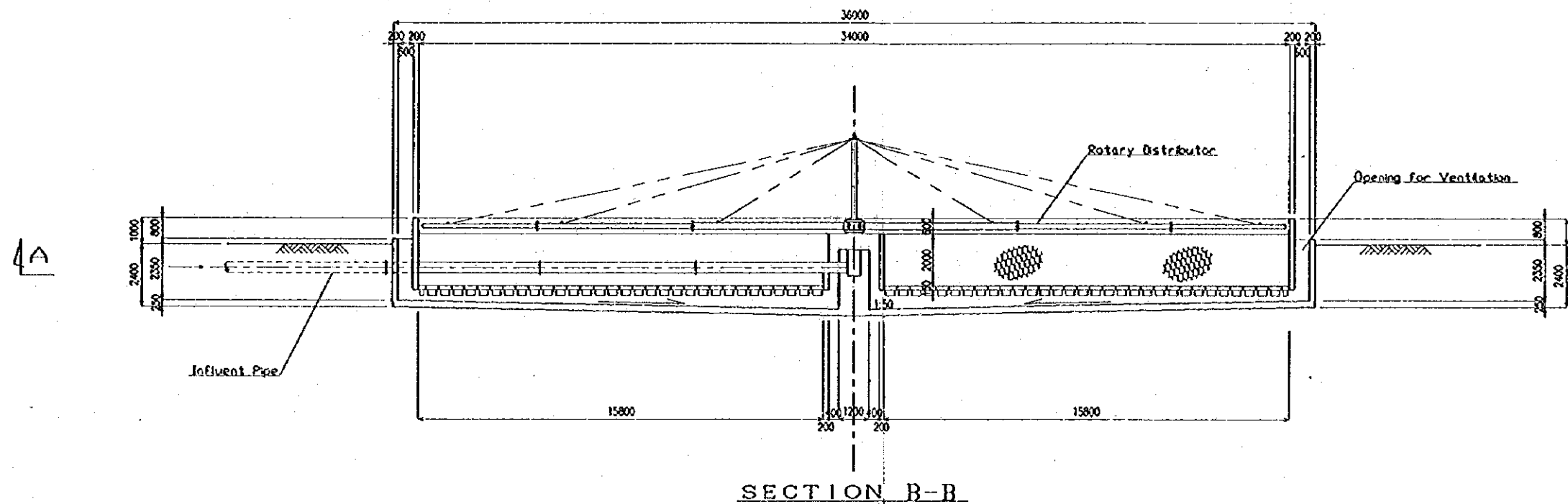
THE REPUBLIC OF GUATEMALA  
GUATEMALA MUNICIPAL WATER  
SUPPLY PUBLIC CORPORATION  
(EMPAGUA)

THE STUDY ON  
THE IMPROVEMENT OF WASTEWATER  
MANAGEMENT IN THE GUATEMALA  
METROPOLITAN AREA  
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE  
Trickling Filter for the First Stage Project  
(South 3 WWTP) (2/3)

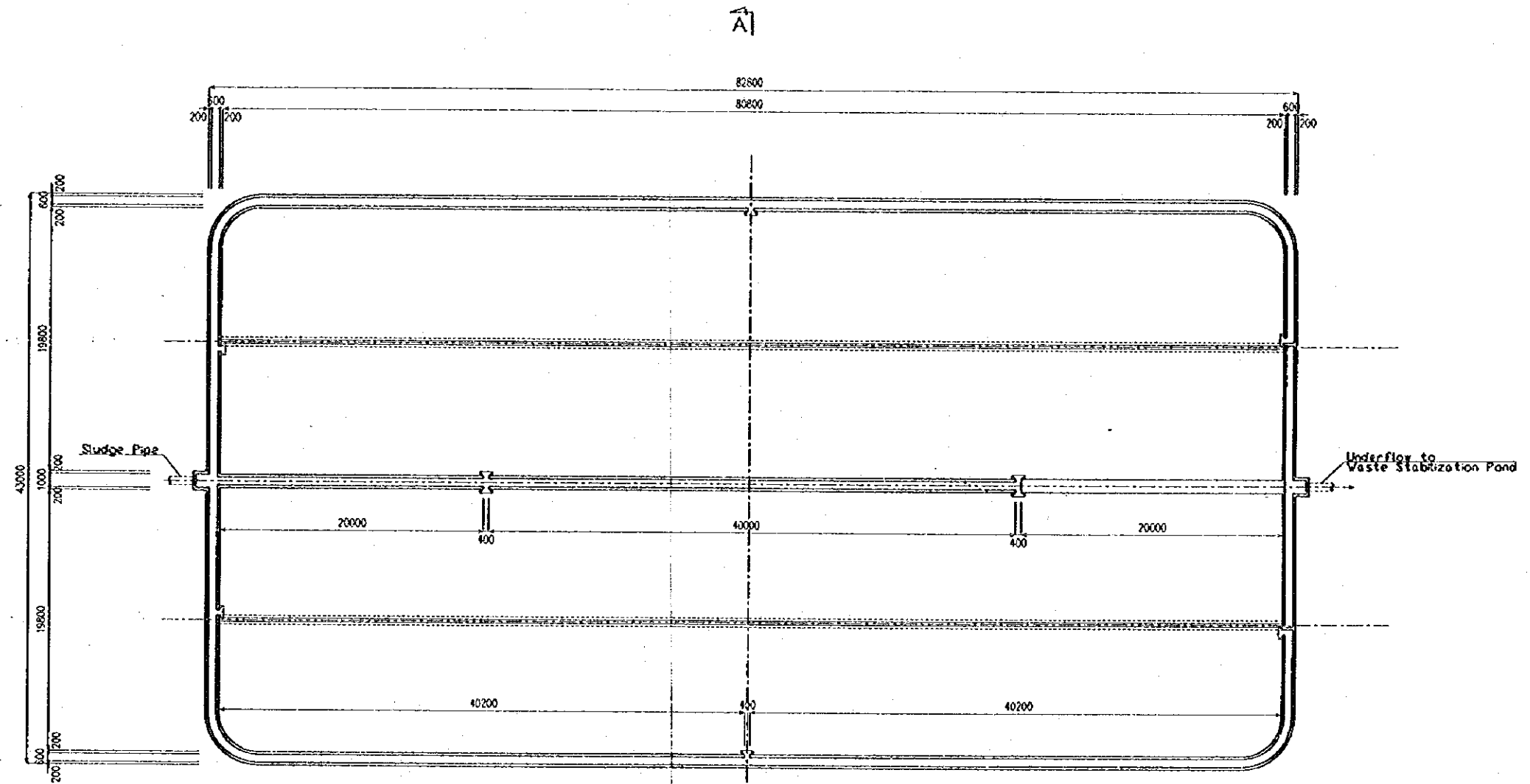


# Trickling Filter



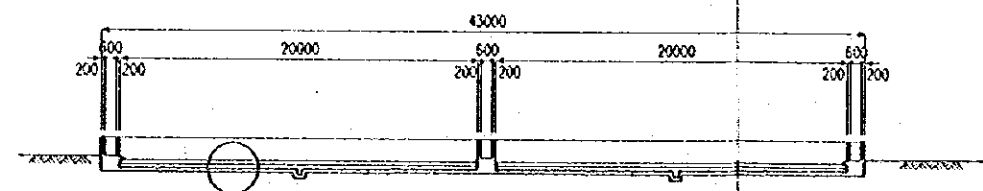
<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Trickling Filter for the First Stage Project (South 3 WWTP) (3/3)</p>
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Sludge Drying Bed

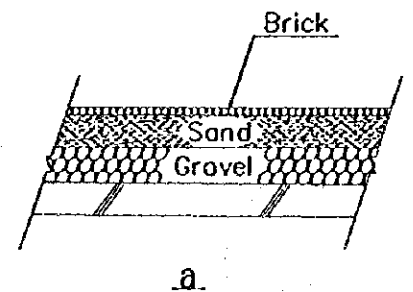


A

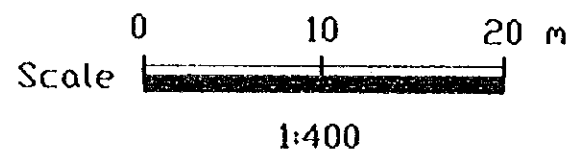
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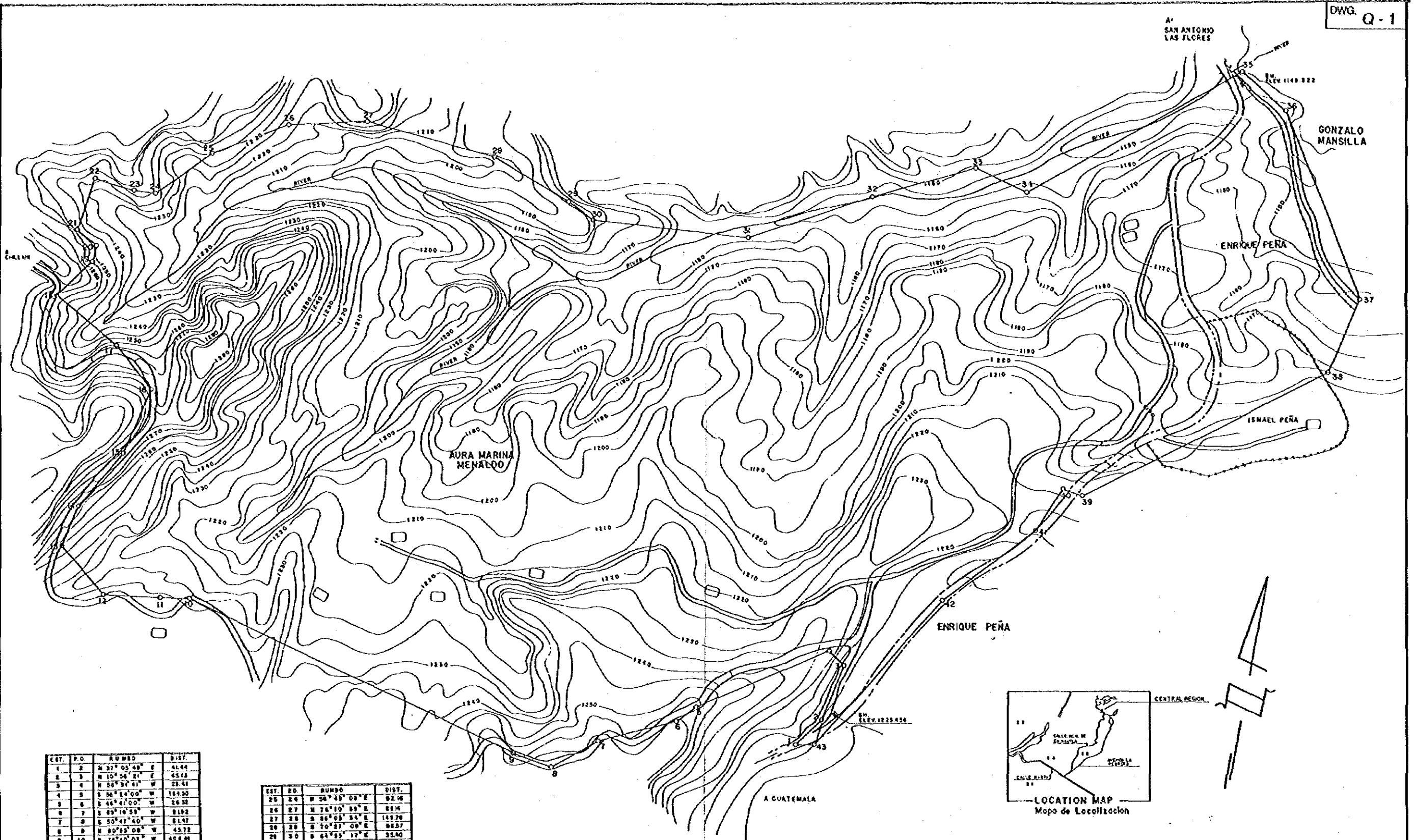
SECTION A-A



a



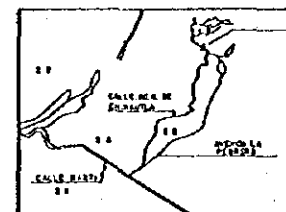
<p>THE REPUBLIC OF GUATEMALA GUATEMALA MUNICIPAL WATER SUPPLY PUBLIC CORPORATION (EMPAGUA)</p>	<p>THE STUDY ON THE IMPROVEMENT OF WASTEWATER MANAGEMENT IN THE GUATEMALA METROPOLITAN AREA JAPAN INTERNATIONAL COOPERATION AGENCY</p>	<p>TITLE Sludge Drying Bed for the First Stage Project (South 3 WWTP)</p>
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EST.	P.O.	RUMBO	DIST.
1	2	N 37° 05' 48" E	41.44
2	3	N 10° 56' 21" E	45.18
3	4	N 58° 30' 41" W	23.41
4	5	S 54° 24' 00" W	164.30
5	6	S 46° 41' 00" W	26.38
6	7	S 63° 10' 58" W	81.92
7	8	S 50° 47' 40" W	81.47
8	9	N 80° 53' 08" W	45.72
9	10	N 78° 10' 01" W	40.46
10	11	S 78° 47' 21" W	33.64
11	12	S 62° 22' 13" W	85.83
12	13	N 52° 39' 13" W	71.89
13	14	N 11° 39' 15" E	47.86
14	15	N 20° 21' 01" E	78.51
15	16	N 13° 52' 24" E	74.75
16	17	N 50° 23' 48" W	43.22
17	18	S 37° 37' 29" W	86.33
18	19	S 24° 33' 01" E	55.09
19	20	S 64° 53' 28" E	18.98
20	21	S 81° 42' 07" W	27.79
21	22	N 08° 04' 15" E	40.47
22	23	S 85° 08' 43" E	46.94
23	24	S 88° 48' 41" E	24.81
24	25	S 44° 08' 20" E	78.64

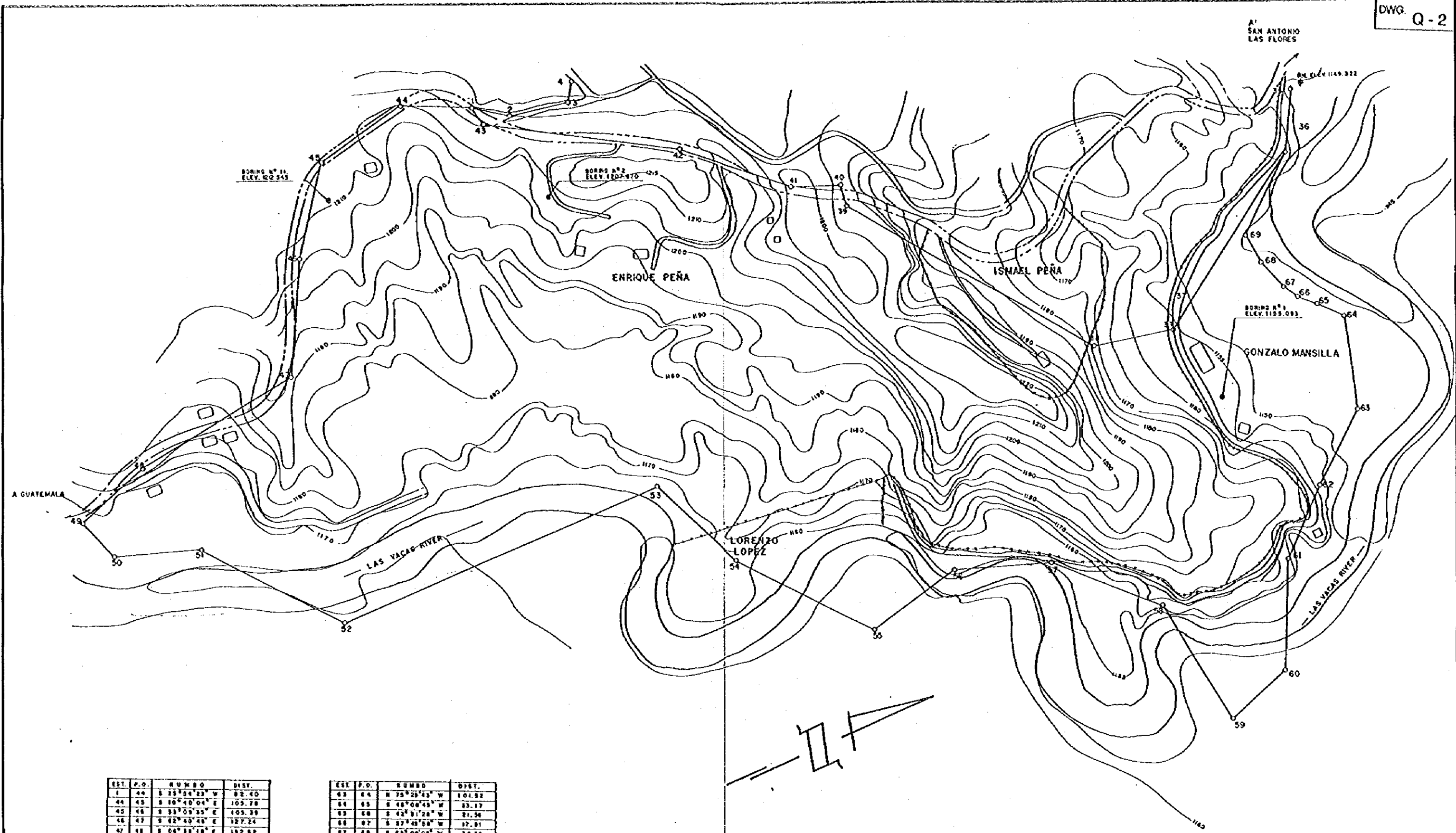
EST.	P.O.	RUMBO	DIST.
25	26	N 54° 29' 08" E	92.16
26	27	N 76° 10' 58" E	88.14
27	28	S 86° 03' 54" E	149.26
28	29	N 70° 27' 08" E	98.57
29	30	S 64° 33' 17" E	35.40
30	31	N 65° 07' 42" E	176.67
31	32	N 60° 38' 58" E	148.41
32	33	N 63° 48' 22" E	122.08
33	34	S 76° 04' 33" E	82.74
34	35	N 49° 31' 23" E	272.97
35	36	S 80° 35' 47" E	81.88
36	37	S 33° 38' 58" E	228.70
37	38	S 12° 21' 42" W	89.04
38	39	S 31° 31' 52" W	216.42
39	40	N 82° 03' 17" W	234.
40	41	S 31° 10' 14" W	658.
41	42	S 41° 17' 30" W	129.30
42	43	S 31° 07' 50" W	218.81
43	44	S 78° 11' 07" W	61.94

AREA. 69 Ha. = 6,670.0506 Ha<sup>2</sup>



SINBOLOGIA	Legend
	CARRETERA PRINCIPAL MAIN ROAD
	CALLE DE TERRACERIA TERRACERIA ROAD
	CERCO FENCE
	CASA HOUSE

**swissboring**  
 WASTEWATER MANAGEMENT FOR THE  
 GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del  
 Area Metropolitana  
 TOPOGRAPHIC SURVEY  
 Levantamiento Topografico  
 TOPOGRAPHIC MAP OF WWTP IN CENTRAL REGION  
 Mapa Topografico Site WWTP Region Central

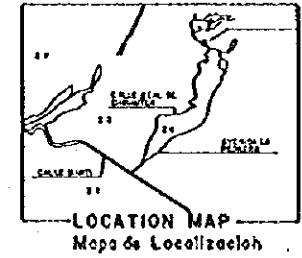


EST.	P.O.	RUMBO	DIST.
1	44	S 25° 54' 23" W	82.40
24	45	S 10° 40' 04" E	105.78
45	46	S 33° 03' 35" E	105.38
46	47	S 42° 40' 46" E	127.24
47	48	S 04° 33' 18" E	182.82
48	49	S 17° 43' 17" E	88.05
49	50	N 45° 21' 13" E	41.76
50	51	N 25° 07' 09" E	103.11
51	52	N 50° 33' 01" E	181.83
52	53	N 00° 35' 55" E	385.88
53	54	N 63° 44' 29" E	125.32
54	55	N 30° 30' 26" E	184.60
55	56	N 06° 00' 12" W	100.99
56	57	N 16° 24' 32" W	111.83
57	58	N 25° 35' 35" E	128.06
58	59	N 81° 52' 12" E	141.42
59	60	N 14° 52' 59" W	88.60
60	61	N 63° 44' 29" W	125.32
61	62	N 47° 17' 17" W	89.52
62	63	N 35° 16' 12" W	90.34

EST.	P.O.	RUMBO	DIST.
43	44	N 75° 25' 43" W	104.82
44	45	S 48° 00' 43" W	23.17
45	46	S 42° 31' 24" W	81.34
46	47	S 87° 45' 58" W	17.81
47	48	S 65° 00' 03" W	38.25
48	49	S 85° 04' 19" W	34.39
49	50	N 42° 55' 34" W	102.72
50	51	S 33° 36' 58" E	226.706
51	52	S 12° 11' 42" W	89.04
52	53	S 82° 57' 55" W	311.42
53	54	N 69° 08' 17" W	23.11
54	55	S 22° 30' 34" W	55.88
55	56	S 41° 47' 30" W	88.30
56	57	S 21° 03' 50" W	213.61
57	58	S 78° 11' 07" W	81.84

AREA. 49Ha = 5,218.50 Mis<sup>2</sup>

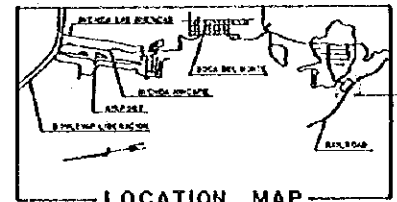
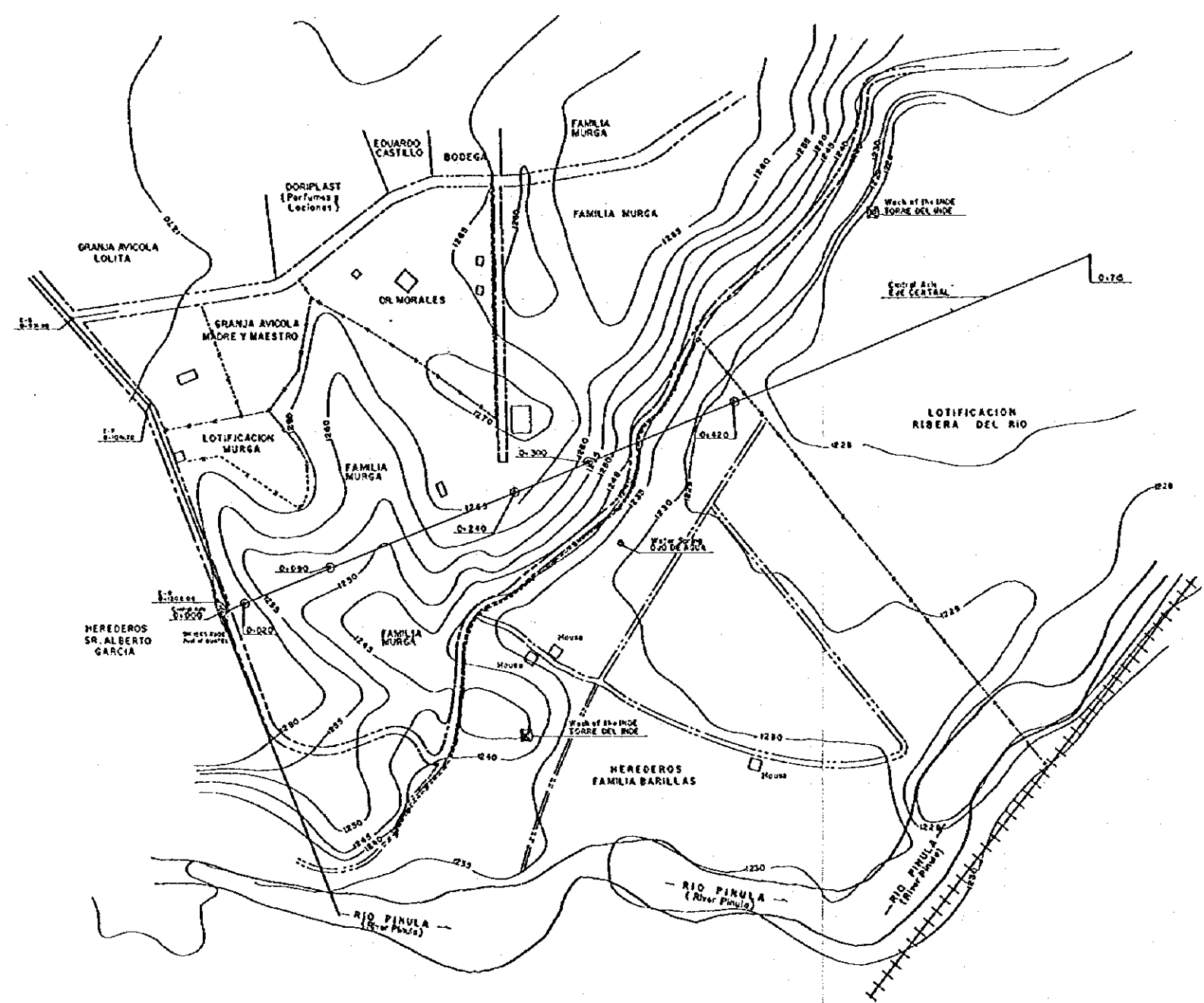
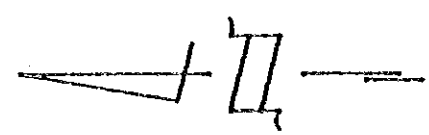
SIMBOLOGIA Legend	
	CARRETERA PRINCIPAL MAIN ROAD
	CALLE DE TERRACERA TERRACERY ROAD
	CERCO FENCE
	B.M. B.M.
	CASA HOUSE



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WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del Area Metropolitana  
 TOPOGRAPHIC SURVEY  
 Levantamiento Topografico  
 TOPOGRAPHIC MAP OF WWTP IN CENTRAL REGION  
 Mapa Topografica Site WWTP Region Central

S=1/4,000



LOCATION MAP  
Mapa de Localizacion

SIMBOLOGIA		Legend
—+—+—+—	VIA FERREA	Railroad
— — — — —	CALLE	Street
- - - - -	CERCO	Fence
⊙	BASE	Post
⊠	TORRE	Watch
— — — — —	EJE CENTRAL	Control Axis

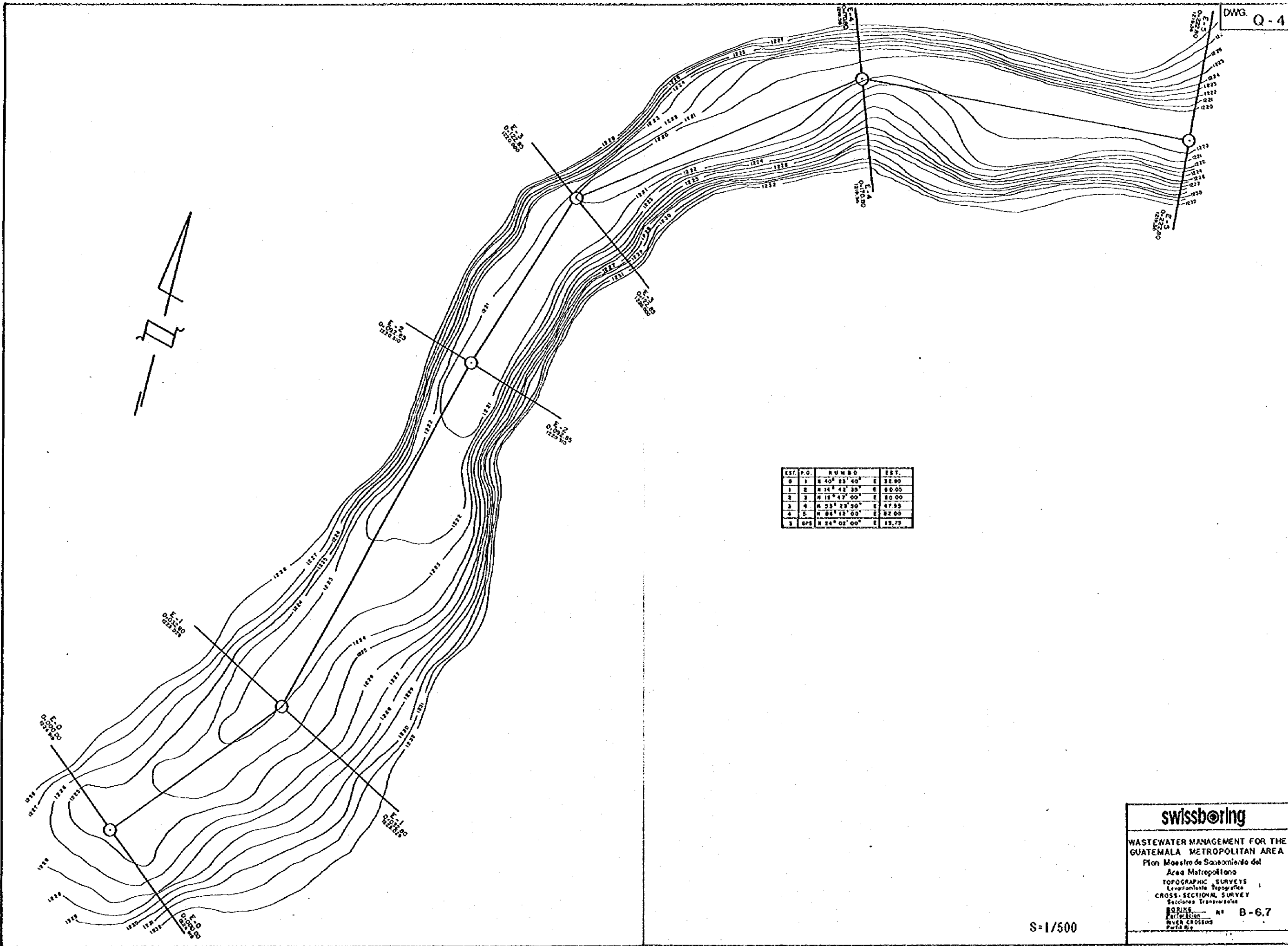
EST.	P.O.	RUMBO	DIST.
A	7	S 47° 17' 00" W	89.74
T	8	S 68° 35' 20" W	144.32
B	8M	S 89° 54' 00" W	13.90

EST.	P.O.	RUMBO	DIST.
E-B	Control Axis 0+000	N 21° 42' 00" W	5.94
	Control Axis 0+715	S 21° 42' 00" E	715.00

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WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana  
TOPOGRAPHIC SURVEYS  
Levantamiento Topografico  
TOPOGRAPHIC MAP OF WWTTP IN SOUTH REGION  
Mapa Topografico Sitio WWTTP Region Sur 3

S=1/4,000



EST.	P.O.	RUMBO	EST.
0	1	N 40° 23' 40" E	38.00
1	2	N 34° 42' 35" E	60.00
2	3	N 18° 47' 00" E	10.00
3	4	N 53° 23' 30" E	47.55
4	5	N 84° 12' 00" E	32.00
5	6/5	N 24° 02' 00" E	19.75

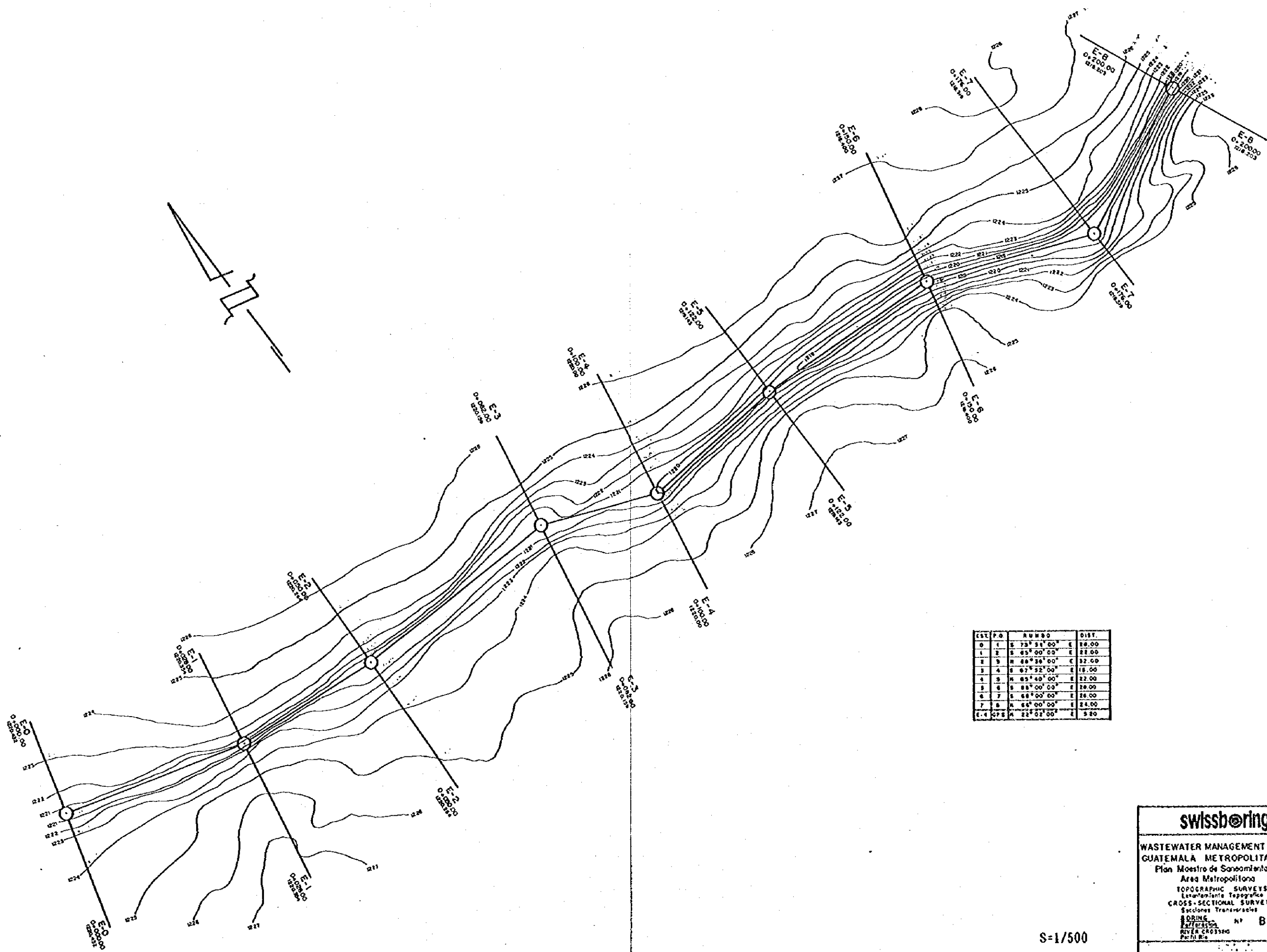
**swissboring**

WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana

TOPOGRAPHIC SURVEYS  
Levantamiento Topográfico  
CROSS-SECTIONAL SURVEY  
Secciones Transversales

BOYNE  
Perforación N° B-6.7  
RIVER CROSSINGS  
Punto No.

S=1/500

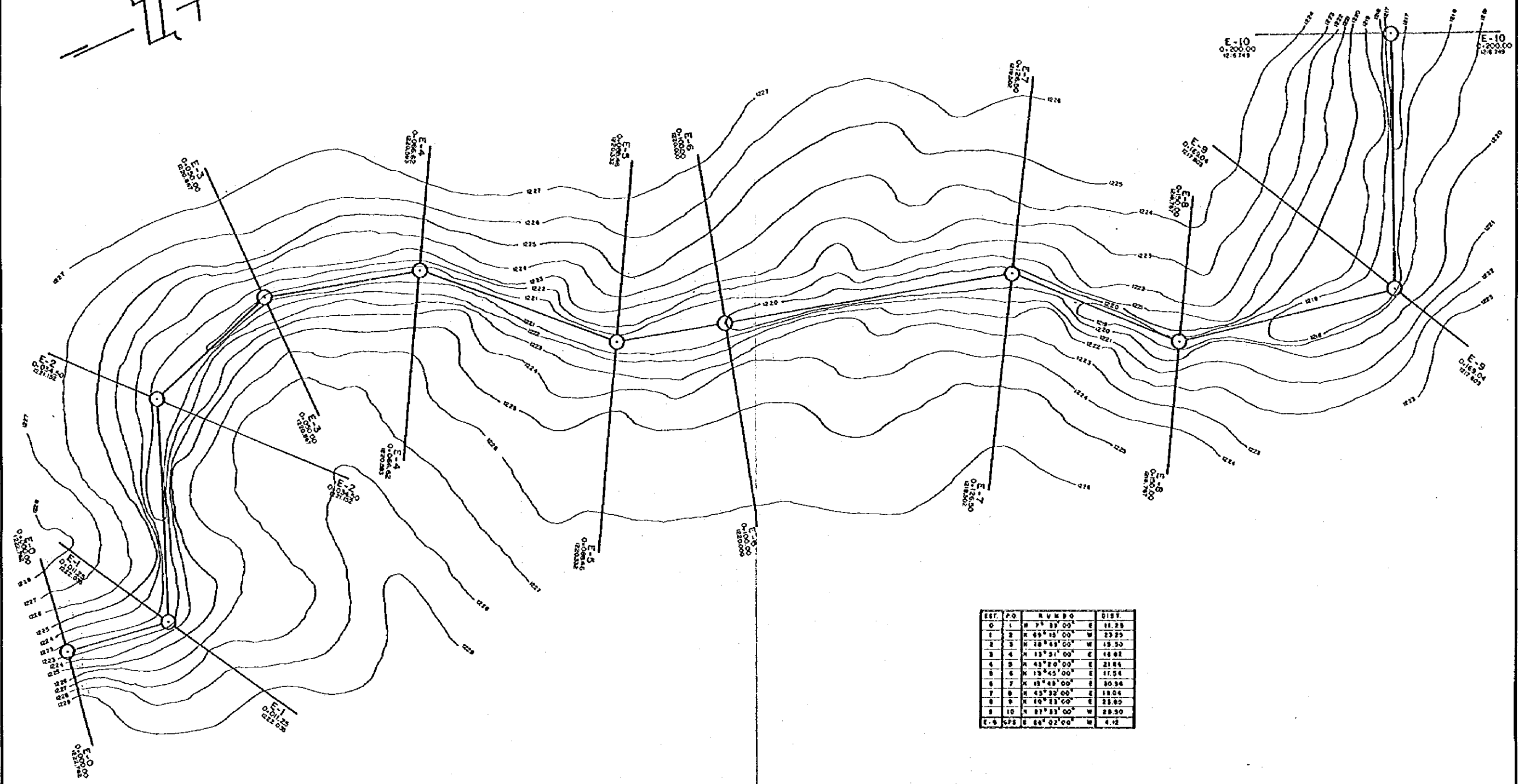
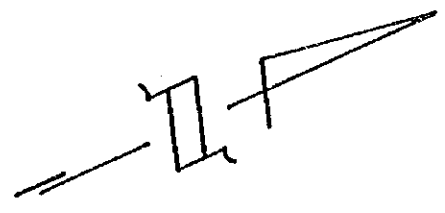


EST.	P.O.	RUMBO	DIST.
0	1	S 75° 51' 00" E	18.00
1	2	S 45° 00' 00" E	22.00
2	3	N 46° 34' 00" E	32.00
3	4	E 67° 52' 00" E	18.00
4	5	N 85° 40' 00" E	22.00
5	6	S 88° 00' 00" E	28.00
6	7	S 68° 00' 00" E	26.00
7	8	N 68° 00' 00" E	24.00
8	9	N 22° 02' 00" E	5.80

S=1/500

**swissboring**

WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana  
TOPOGRAPHIC SURVEYS  
Levantamiento Topografico  
CROSS-SECTIONAL SURVEY  
Secciones Transversales  
BORING Nº B-8  
REFERENCIA  
RIVER CROSSING  
Punto B



EST.	P.O.	NUMBO	DIST.
0	1	N 7° 37' 00"	E 11.28
1	2	N 65° 15' 00"	W 23.29
2	3	N 18° 45' 00"	W 15.50
3	4	N 13° 31' 00"	E 18.01
4	5	N 43° 20' 00"	E 21.85
5	6	N 13° 45' 00"	E 11.54
6	7	N 13° 45' 00"	E 30.94
7	8	N 43° 32' 00"	E 18.01
8	9	N 10° 13' 00"	E 28.80
9	10	N 51° 33' 00"	W 28.50
E-6	CPA	E 68° 02' 00"	W 4.12

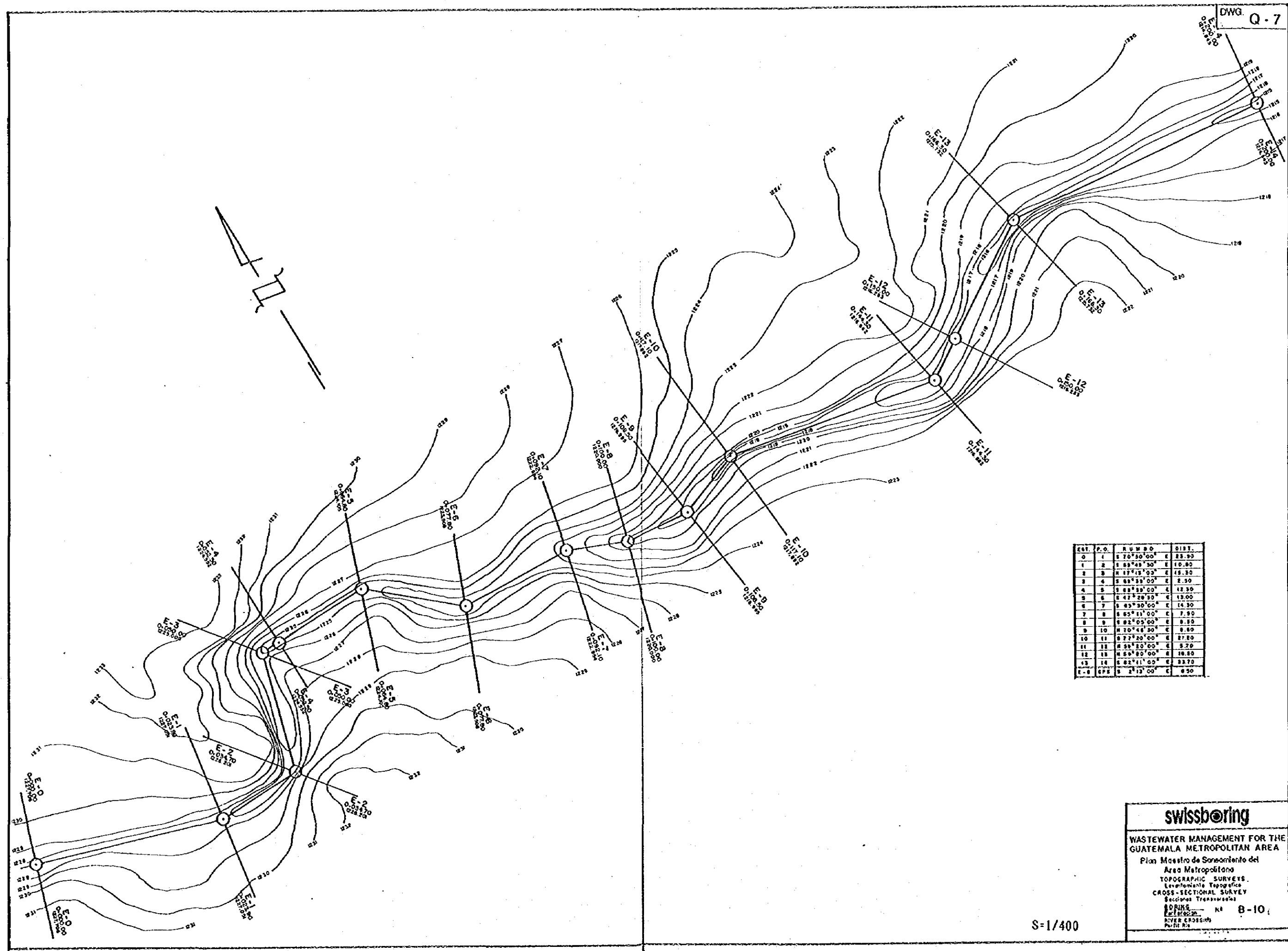
S=1/400

**swissboring**

WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Área Metropolitana  
TOPOGRAPHIC SURVEYS  
Levantamiento Topográfico  
CROSS-SECTIONAL SURVEY  
Secciones Transversales

BOULEVARD #1 8-9  
RIVER CROSSING  
PATA RIA





EST.	P.O.	RUMBO	DISE.
0	1	E 70°30'00"	E 23.90
1	2	E 89°45'30"	E 10.80
2	3	N 17°15'00"	E 15.30
3	4	S 83°55'00"	E 2.50
4	5	S 83°59'00"	E 12.30
5	6	S 47°20'30"	E 13.00
6	7	S 43°30'00"	E 14.30
7	8	S 65°11'00"	E 7.90
8	9	S 82°05'00"	E 9.80
9	10	N 70°44'30"	E 9.80
10	11	S 72°20'00"	E 27.80
11	12	N 55°20'00"	E 3.20
12	13	N 64°20'00"	E 18.80
13	14	S 82°11'00"	E 33.70
14	15	S 21°13'00"	E 9.50

**swissoring**

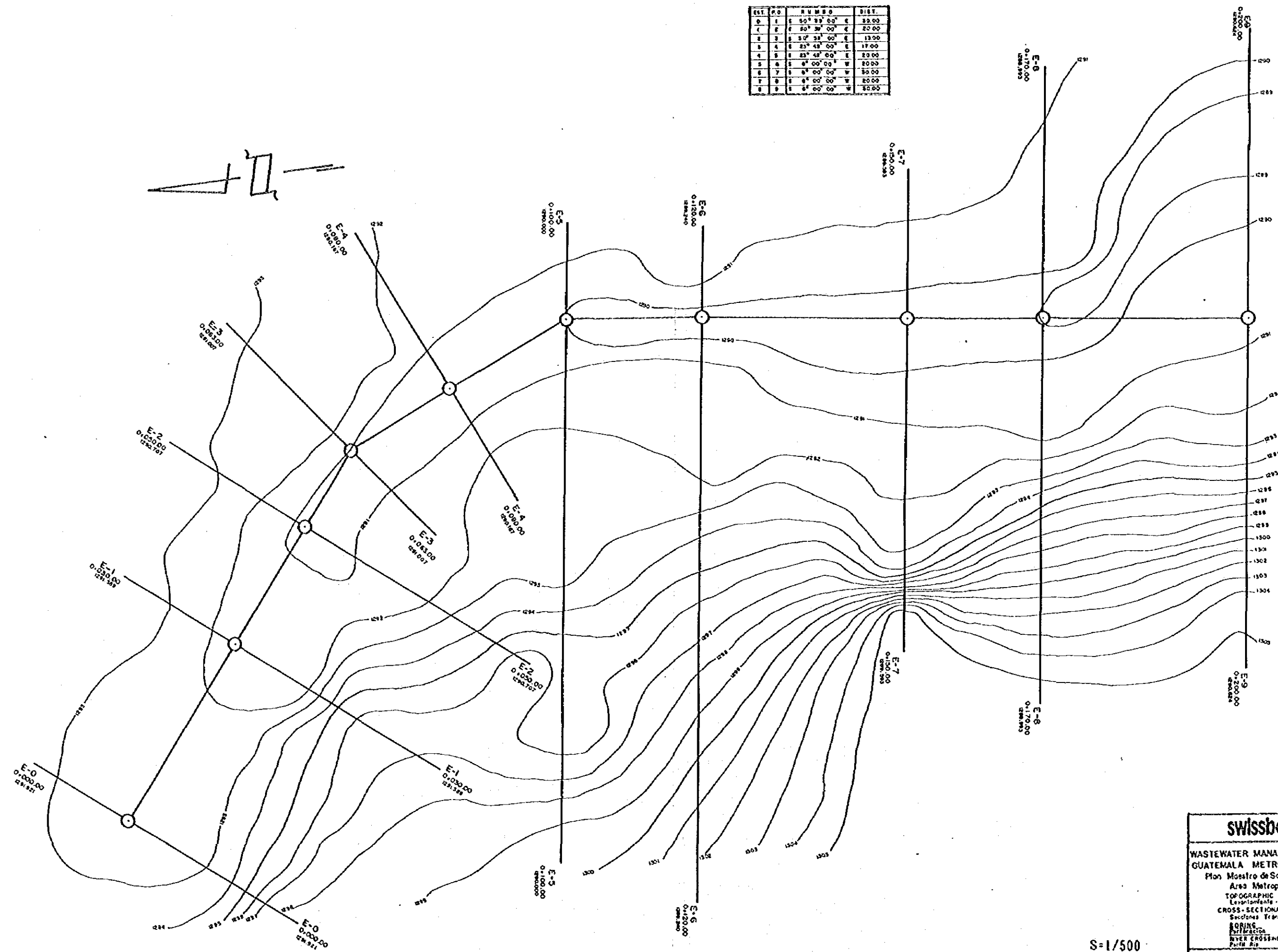
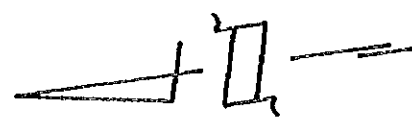
WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana  
TOPOGRAPHIC SURVEYS.  
Levantamiento Topografico  
CROSS-SECTIONAL SURVEY  
Secciones Transversales

SWISS  
ENGINEERING  
RIVER CROSSING  
PART No.

Nº B-10

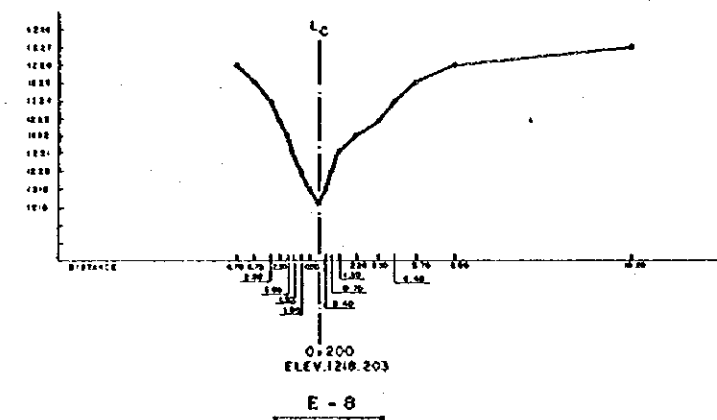
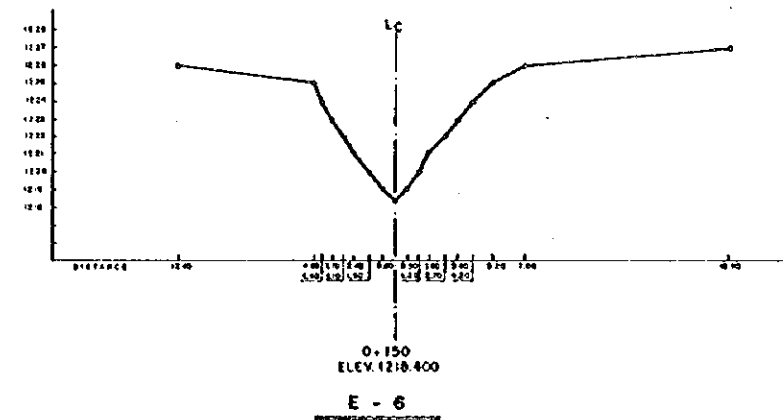
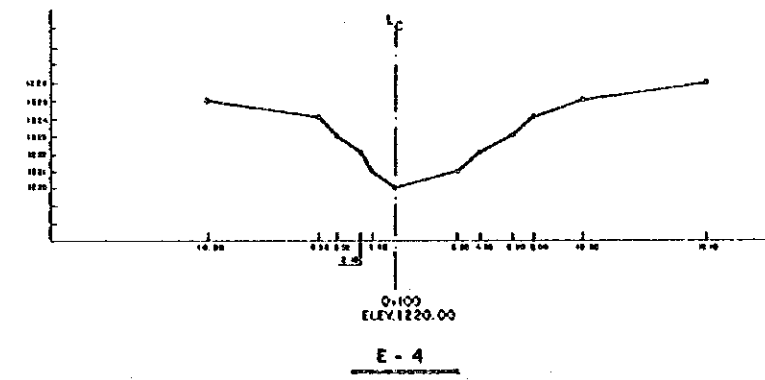
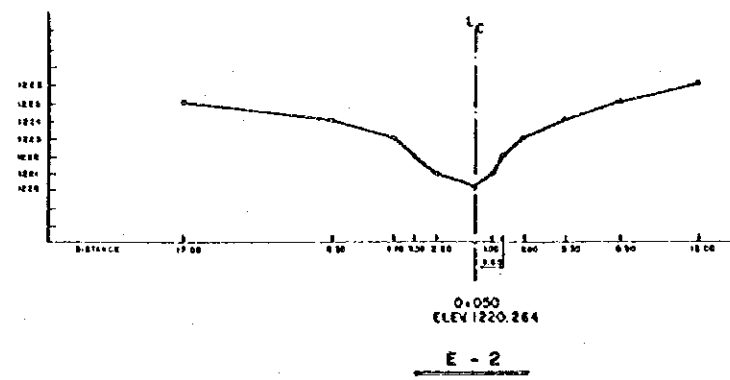
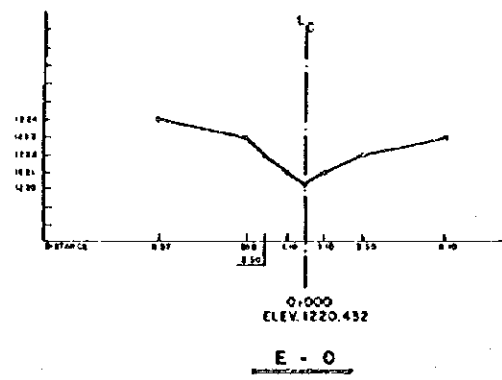
S=1/400

EST.	P.O.	N	V	M	S	D	DIST.
1	1	1	50°	25'	00"	0'	20.00
1	2	1	50°	25'	00"	0'	20.00
1	3	1	30°	34'	00"	0'	13.00
1	4	1	25°	42'	00"	0'	17.00
1	5	1	67°	00'	00"	0'	20.00
1	6	1	67°	00'	00"	0'	20.00
1	7	1	67°	00'	00"	0'	20.00
1	8	1	67°	00'	00"	0'	20.00
1	9	1	67°	00'	00"	0'	20.00
1	10	1	67°	00'	00"	0'	20.00

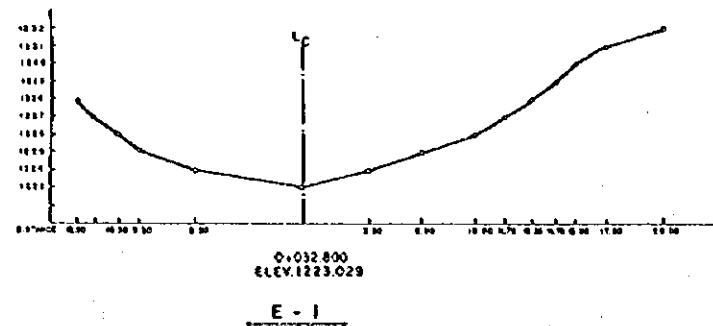
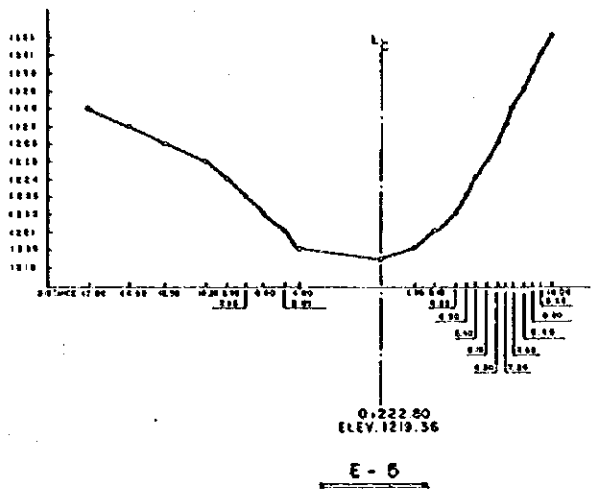
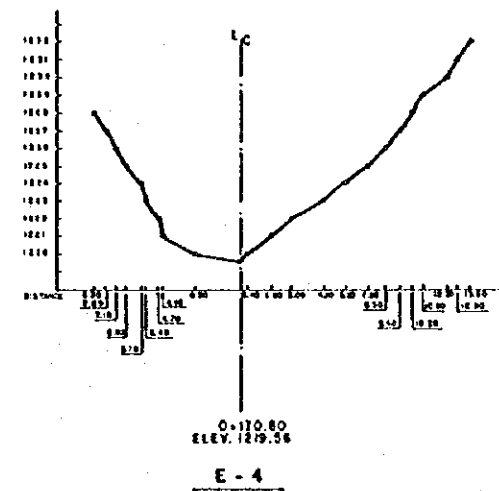
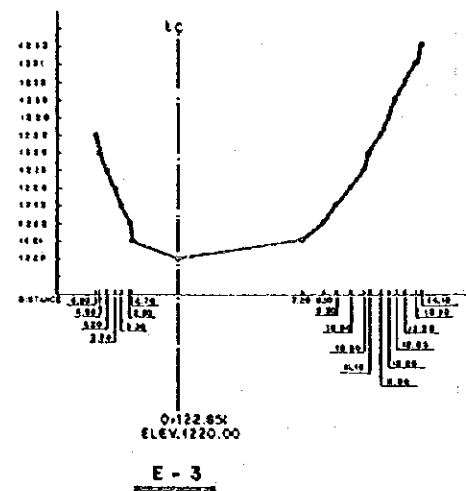
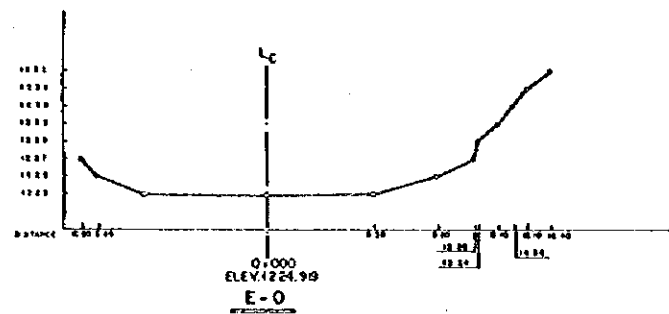


**swissboring**  
 WASTEWATER MANAGEMENT FOR THE  
 GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del  
 Área Metropolitana  
 TOPOGRAPHIC SURVEYS  
 Levantamiento Topográfico  
 CROSS-SECTIONAL SURVEY  
 Secciones Transversales  
 BRING  
 Partición N° B-12  
 RIVER CROSSING  
 PACTM 8/11

S=1/500



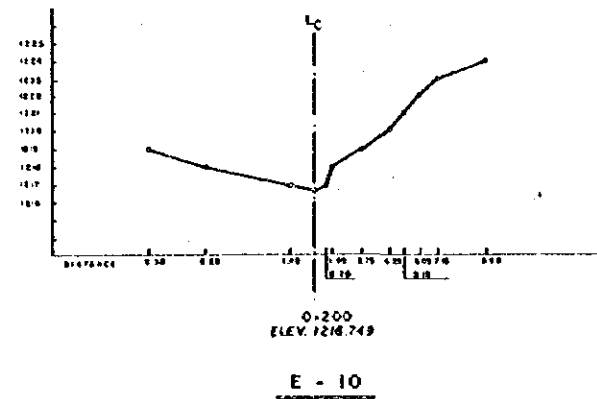
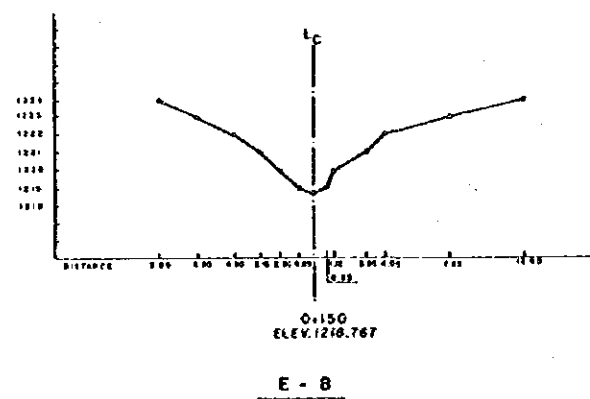
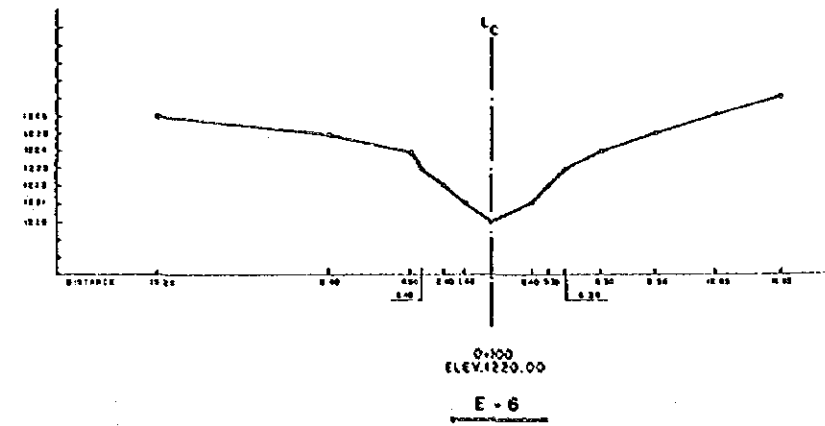
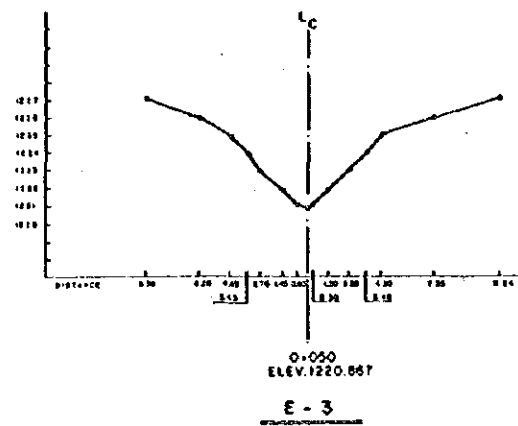
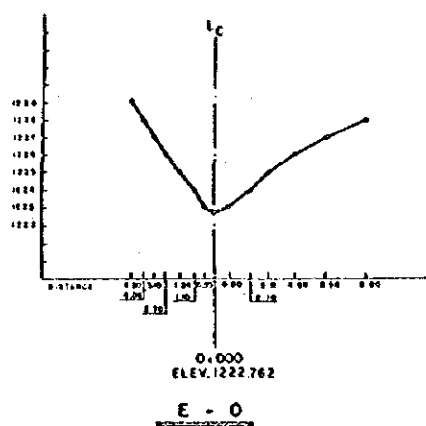
**CROSS-SECTIONAL SURVEY B-8**



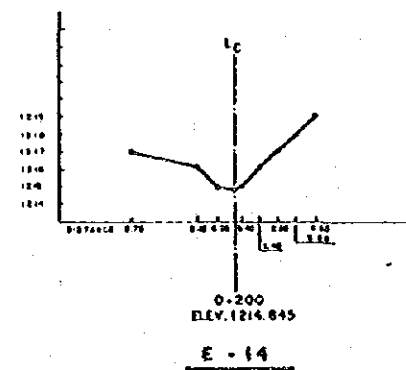
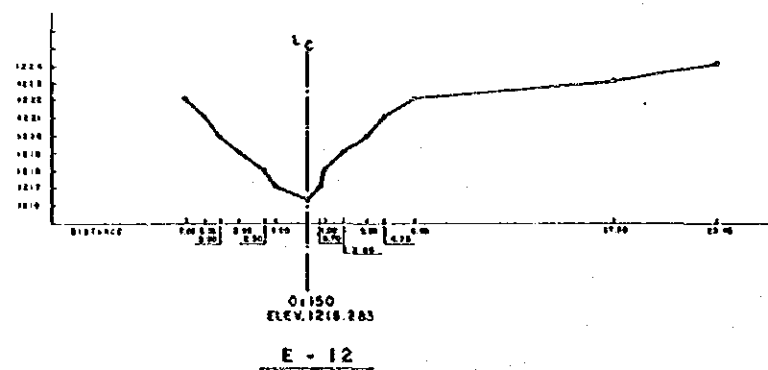
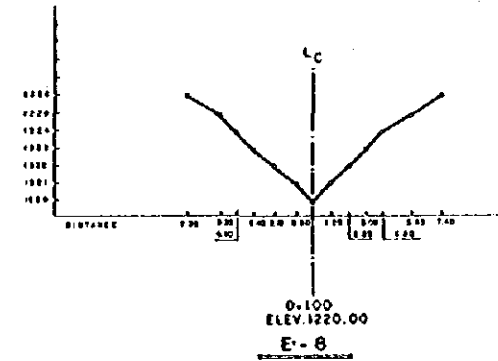
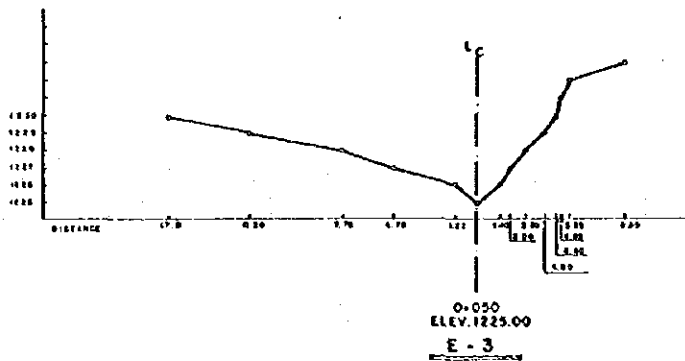
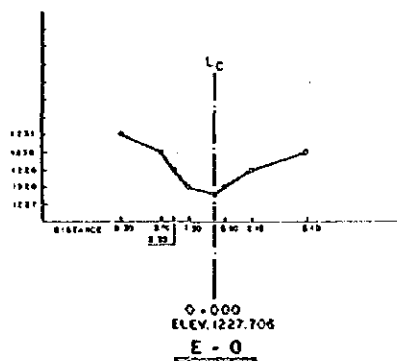
**CROSS-SECTIONAL SURVEY B-6.7**

**swissboring**  
 WASTEWATER MANAGEMENT FOR THE  
 GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del  
 Area Metropolitana  
 TOPOGRAPHIC SURVEYS  
 Levantamiento Topografico  
 CROSS-SECTIONAL SURVEY  
 Secciones Transversales  
 NO. 8-6.7  
 Parcelas B-8  
 RIVER CROSENS B-8  
 Perfil Rio

S=1/400(H, V)



**CROSS - SECTIONAL SURVEY B-9**



**CROSS - SECTIONAL SURVEY B-10**

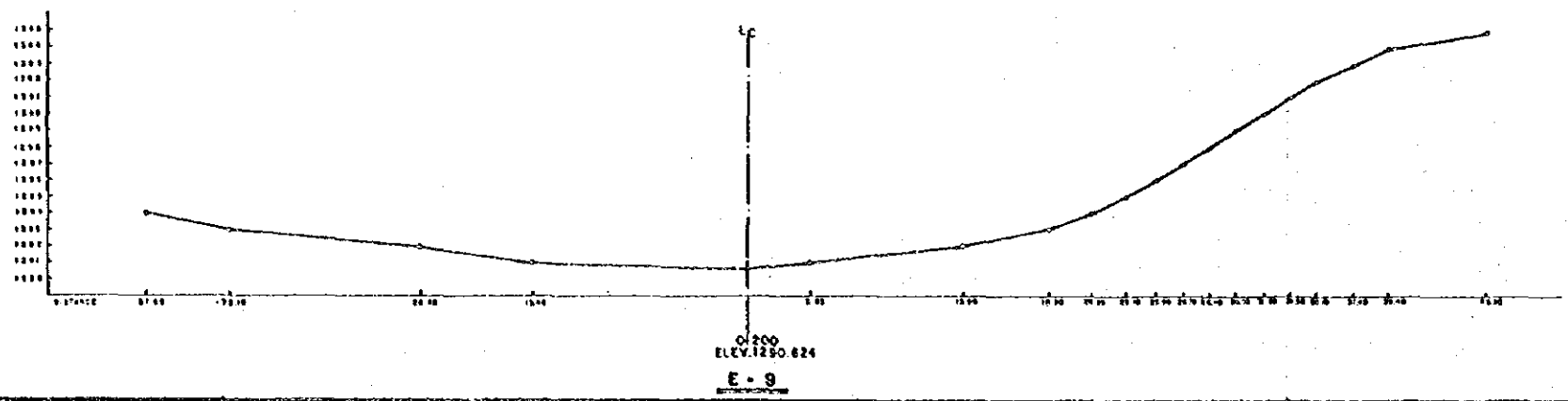
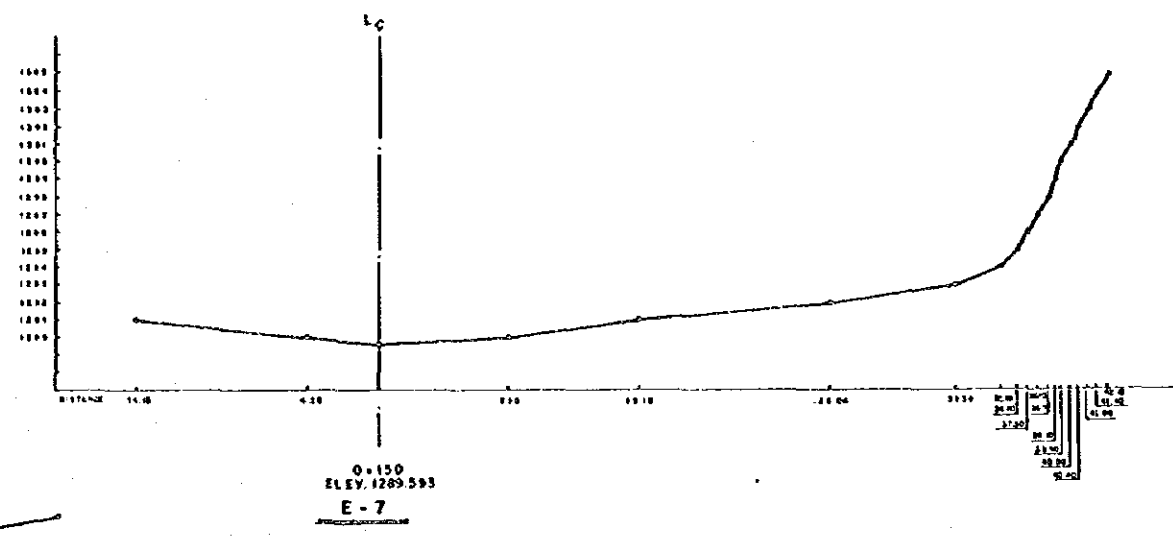
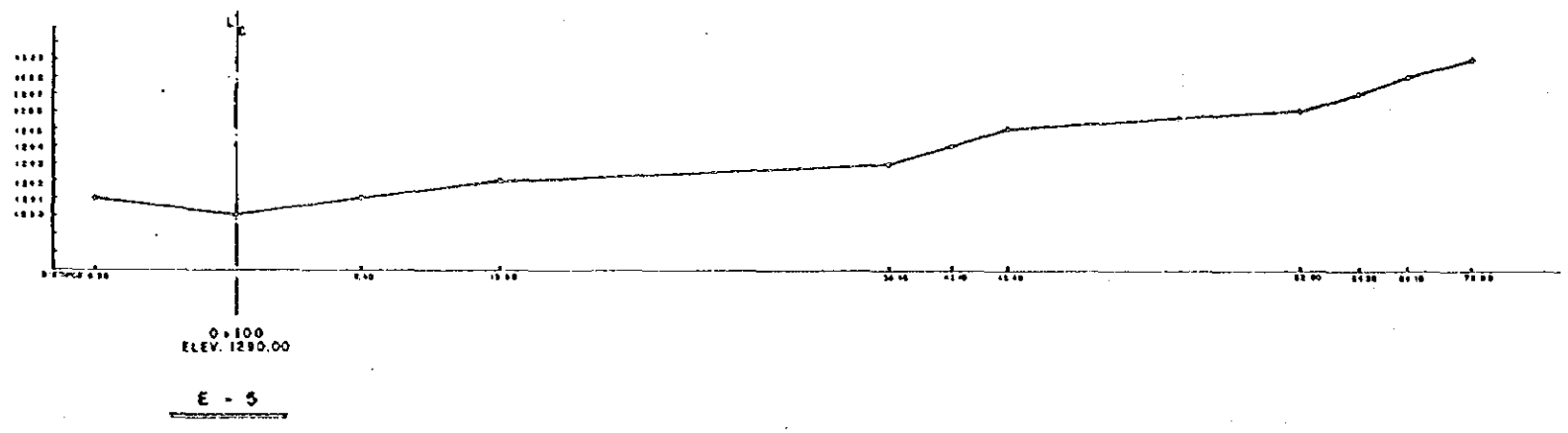
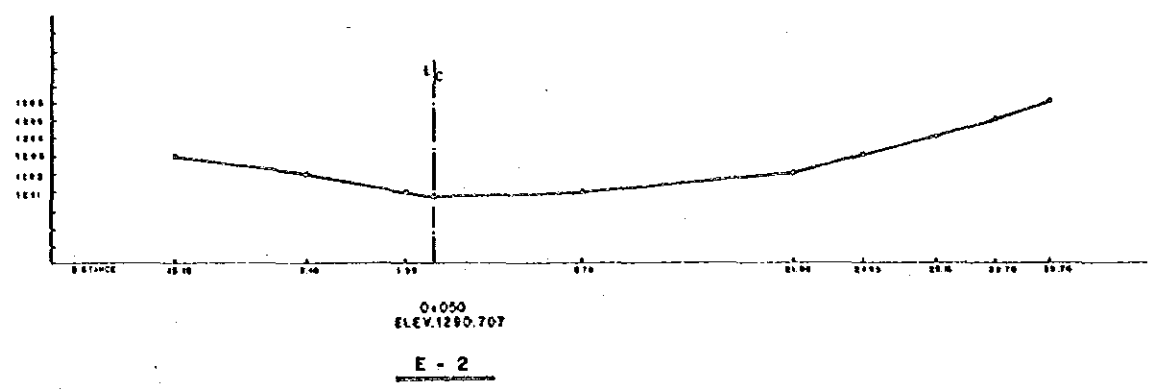
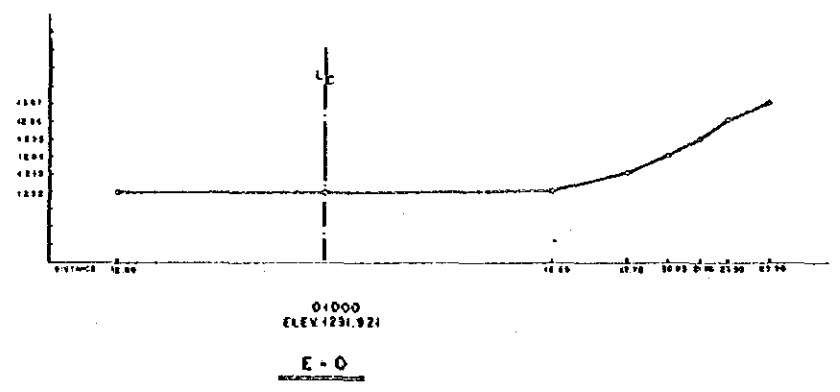
**swissboring**

WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana

TOPOGRAPHIC SURVEYS  
Levantamiento Topográfico  
CROSS-SECTIONAL SURVEY  
Secciones Transversales

BORING No. B-9  
Partición B-10  
RIVER CROSSESS  
Pa. 51 No.

S=1/400(H, V)

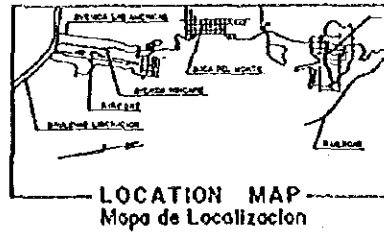


**swissboring**

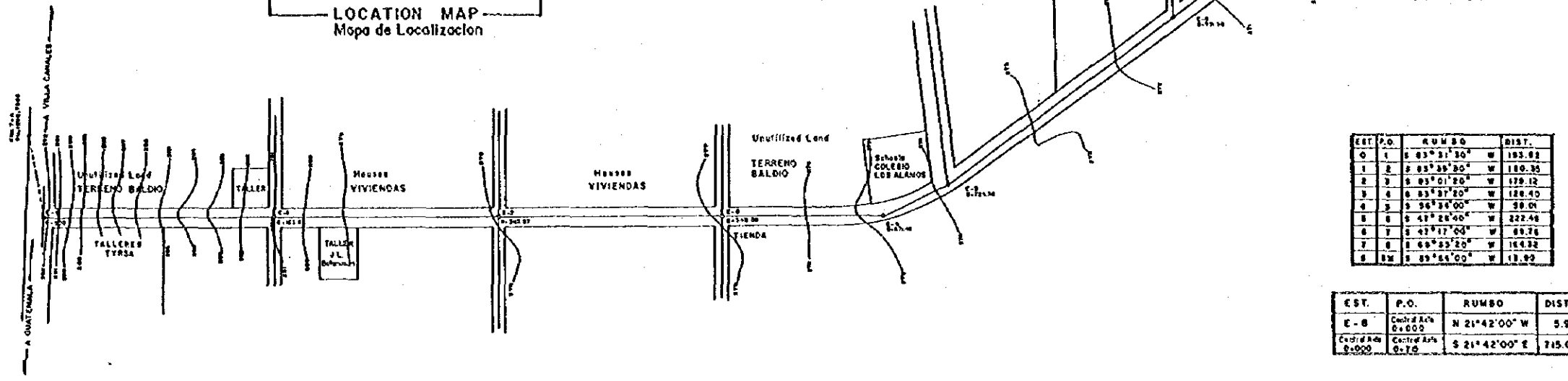
WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana  
TOPOGRAPHIC SURVEYS  
Levantamiento Topografico  
CROSS-SECTIONAL SURVEY  
Seccion de Transversal de  
SANEAMIENTO  
Pantarras  
RIVER CROSSINGS  
Puente Rio

B-12

S=1/400(H, V)



LONGITUDINAL SURVEY



EST.	P.O.	RUMBO	DIST.
0	1	S 83° 31' 30" W	193.83
1	2	S 83° 29' 30" W	180.35
2	3	S 83° 01' 20" W	179.12
3	4	S 83° 37' 20" W	188.40
4	5	S 26° 38' 00" W	59.01
5	6	S 47° 28' 00" W	222.48
6	7	S 47° 17' 00" W	89.76
7	8	S 68° 23' 20" W	164.22
8	8M	S 89° 54' 00" W	13.80

EST.	P.O.	RUMBO	DIST.
E-8	Central Axis 0+000	N 21° 42' 00" W	5.94
Central Axis 0+000	Central Axis 0+75	S 21° 42' 00" E	715.00

**swissboring**

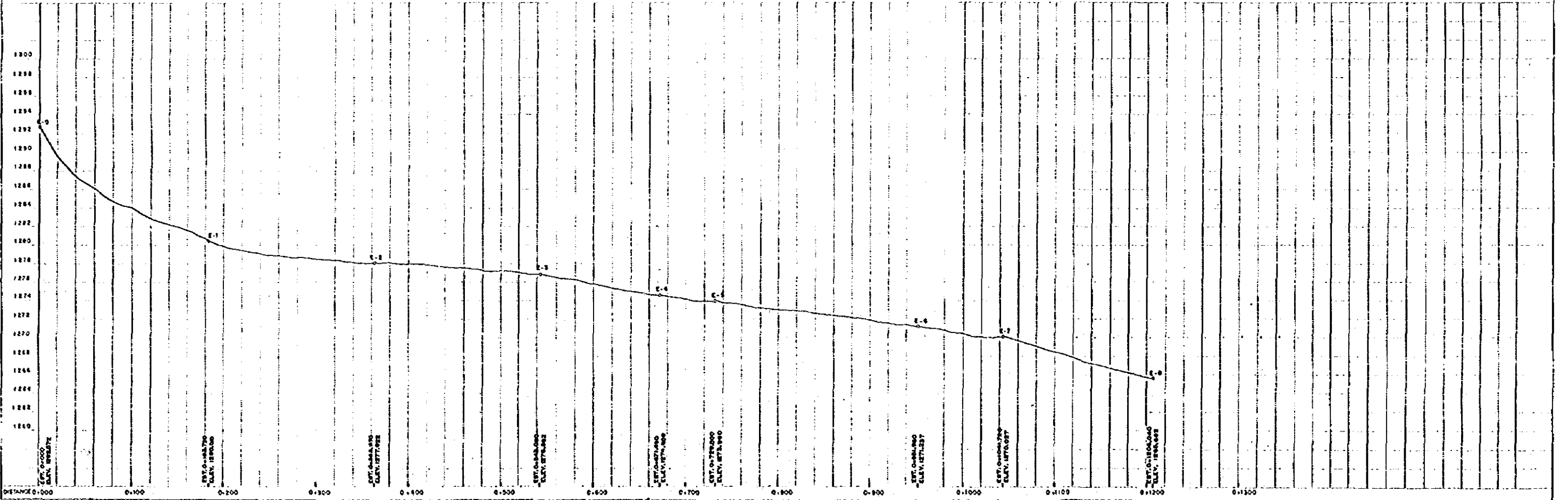
WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA

Plan Maestro de Saneamiento del Area Metropolitana

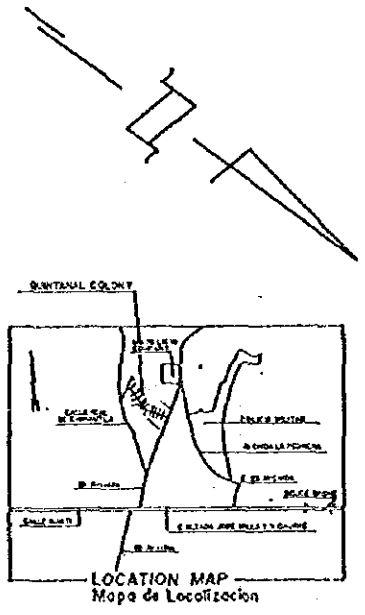
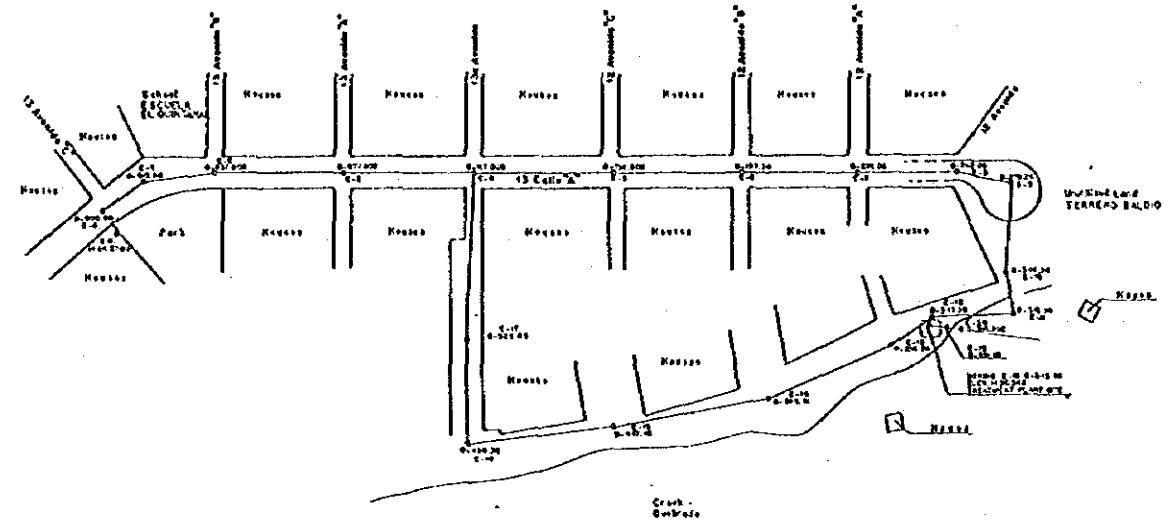
LONGITUDINAL SURVEY  
Levantamiento Longitudinal

COLLECTOR SEWER MAIN ROUTES IN SOUTH 3 REGION  
Colector Principal de Drenajes de Agua Negra de la Region Sur 3

S=1/4,000(H)  
S=1/400 (V)



PLAN  
 DATE: 10/10/00  
 PROJECT: WASTE WATER COLLECTION SYSTEM FOR THE GUATEMALA METROPOLITAN AREA  
 DRAWN BY: J. GARCIA  
 CHECKED BY: J. GARCIA  
 SCALE: 1/2000



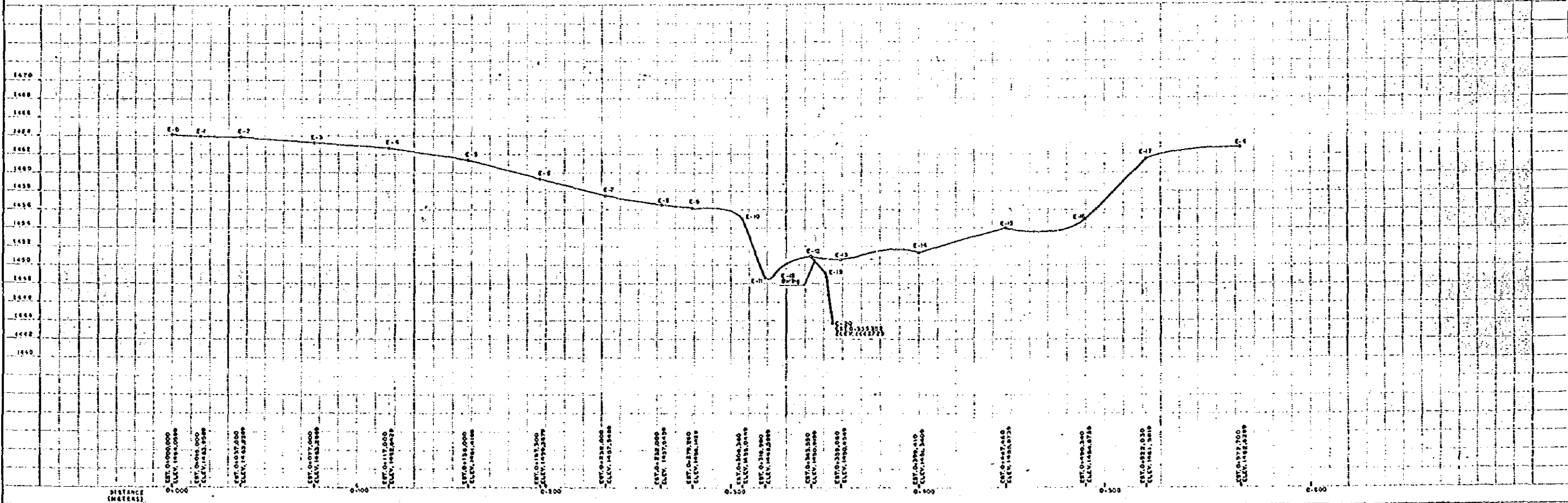
ST. NO.	P.C.	Bearing	Dist.	P.S.T.
0	1	N 72° 42' 34" W	12.00	
1	2	N 44° 22' 00" W	22.01	
2	3	N 34° 43' 33" W	40.00	
3	4	N 34° 43' 33" W	40.00	
4	5	N 34° 43' 33" W	41.00	
5	6	N 34° 43' 33" W	39.30	
6	7	N 34° 43' 33" W	34.70	
7	8	N 34° 43' 33" W	30.00	
8	9	N 25° 47' 12" E	17.86	
9	10	N 55° 47' 05" E	27.10	
10	11	N 44° 41' 38" E	18.62	
11	12	E 35° 35' 12" E	24.97	
12	13	S 71° 43' 18" E	19.31	
13	14	S 80° 00' 00" E	40.32	
14	15	S 43° 41' 34" E	40.65	
15	16	S 43° 41' 34" E	42.88	
16	17	S 31° 47' 42" E	31.69	
17	18	S 35° 54' 39" W	30.93	
18	19	N 80° 00' 00" E	8.30	
19	20	N 29° 04' 32" W	9.22	
20	21	N 29° 04' 32" W	4.23	

**swissboring**

WASTEWATER MANAGEMENT FOR THE  
 GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del  
 Area Metropolitana  
 LONGITUDINAL SURVEY FOR PIPE LINE  
 ROUTE OF SANITATION SERVICE AREA  
 Perfil Longitudinal de las Colecciones de Alcantarillado  
 para el Servicio de Areas de Saneamiento  
 QUINTANA COLONY  
 Colonia Quintana

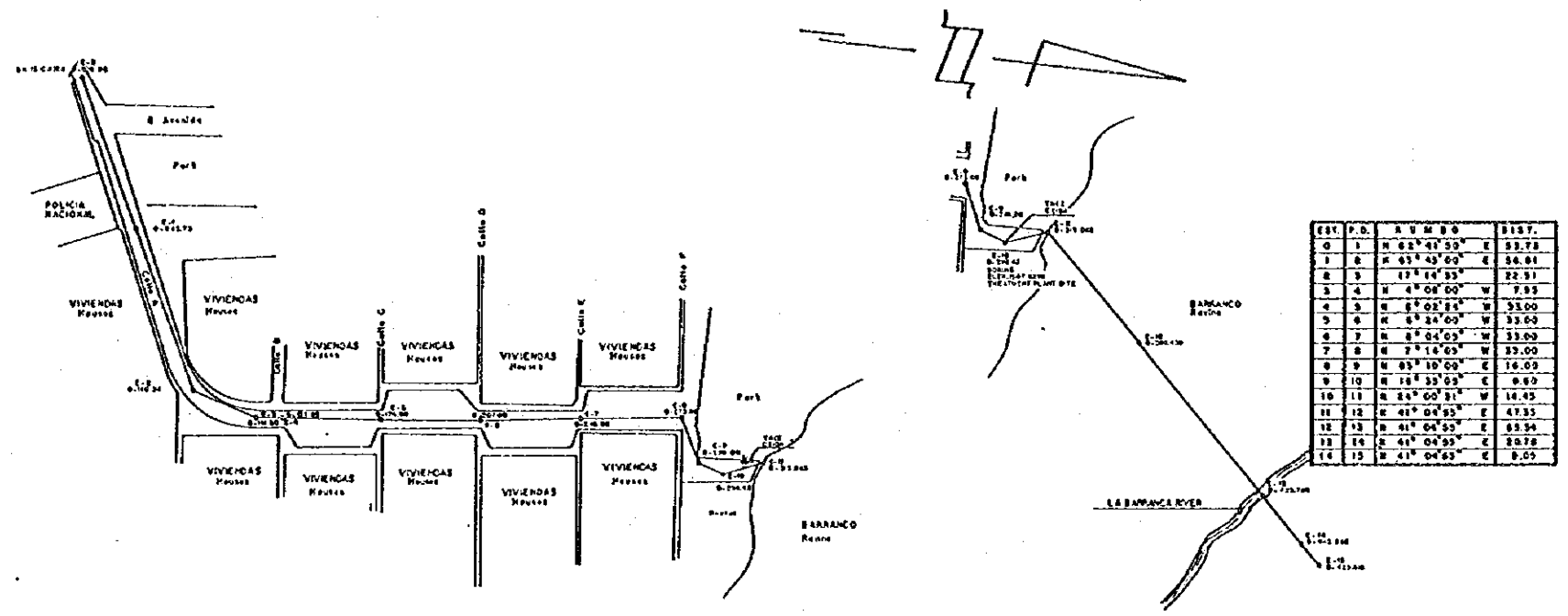
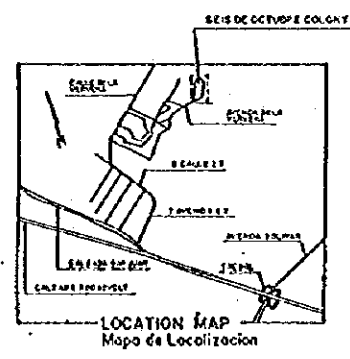
S=1/2,000(H)  
 S=1/400 (V)

PROFILE  
 DATE: 10/10/00  
 PROJECT: WASTE WATER COLLECTION SYSTEM FOR THE GUATEMALA METROPOLITAN AREA  
 DRAWN BY: J. GARCIA  
 CHECKED BY: J. GARCIA  
 SCALE: 1/2000



**PLAN**

DATE	10/10/78
BY	J.M.
CHECKED	J.M.
SCALE	1:2000 (H) 1:400 (V)



EST.	P.D.	ANGULO	DIST.
0	1	N 63° 47' 50" E	55.78
1	2	N 43° 43' 50" E	54.81
2	3	N 44° 54' 50" E	22.91
3	4	N 08° 08' 00" W	7.89
4	5	N 02° 12' 14" W	53.00
5	6	N 34° 00' 00" W	33.00
6	7	N 04° 00' 00" W	33.00
7	8	N 14° 00' 00" W	33.00
8	9	N 10° 00' 00" E	14.00
9	10	N 33° 00' 00" E	0.80
10	11	N 24° 00' 31" W	14.45
11	12	N 42° 04' 55" E	47.35
12	13	N 41° 04' 55" E	63.54
13	14	N 41° 04' 55" E	20.78
14	15	N 41° 04' 55" E	8.50

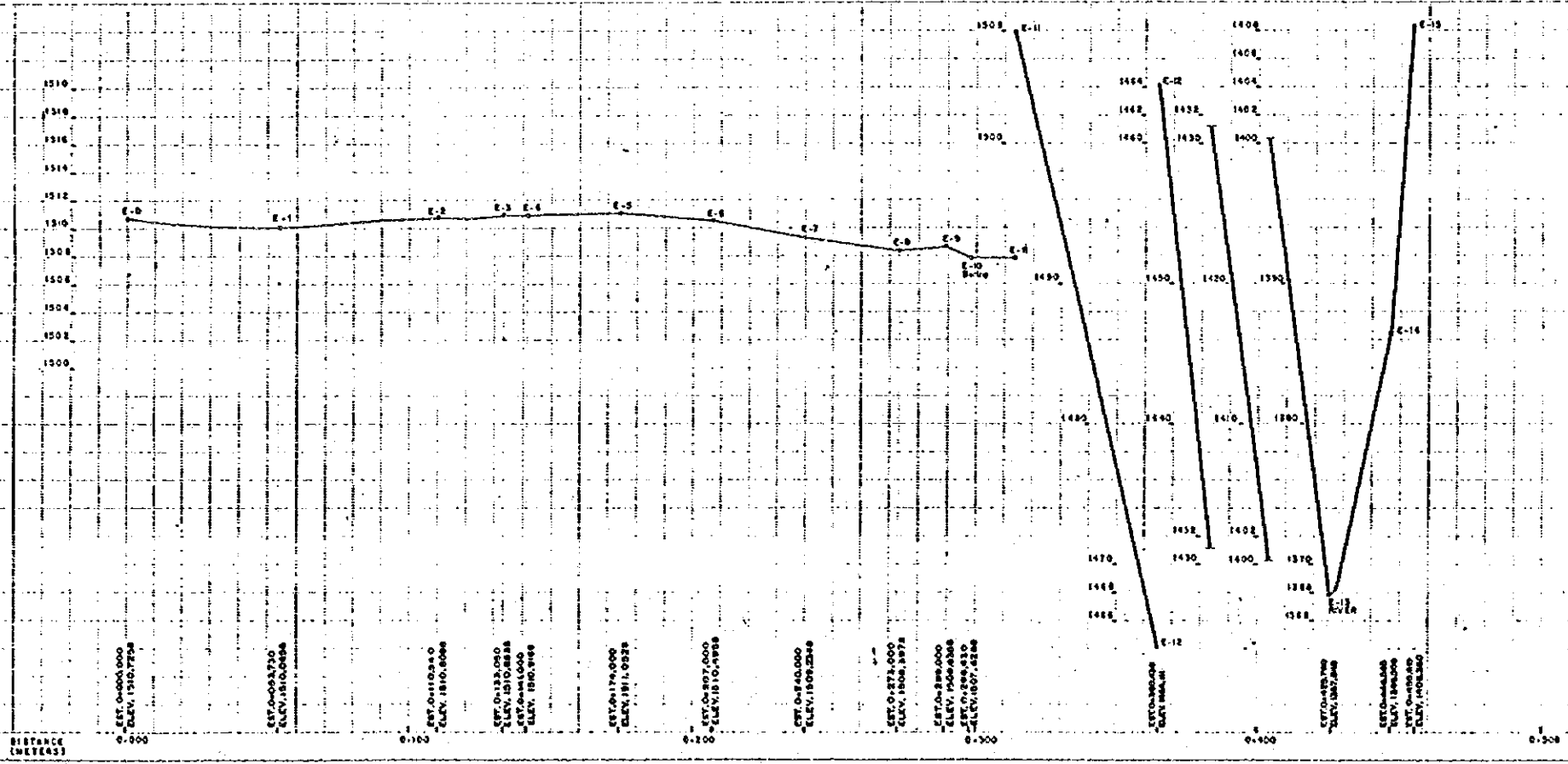
**swissboring**

WASTEWATER MANAGEMENT FOR THE  
GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del  
Area Metropolitana  
LONGITUDINAL SURVEY FOR PIPELINE  
ROUTE OF SANITATION SERVICE AREA  
Perfil Longitudinal de las Colectoras de Alcantarillado  
para el Servicio de Saneamiento  
SEIS DE OCTUBRE COLONY  
Calle 6 de Octubre

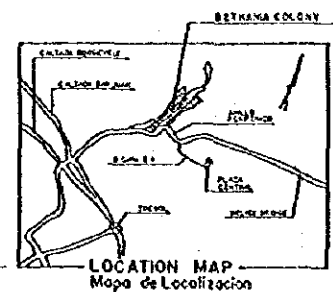
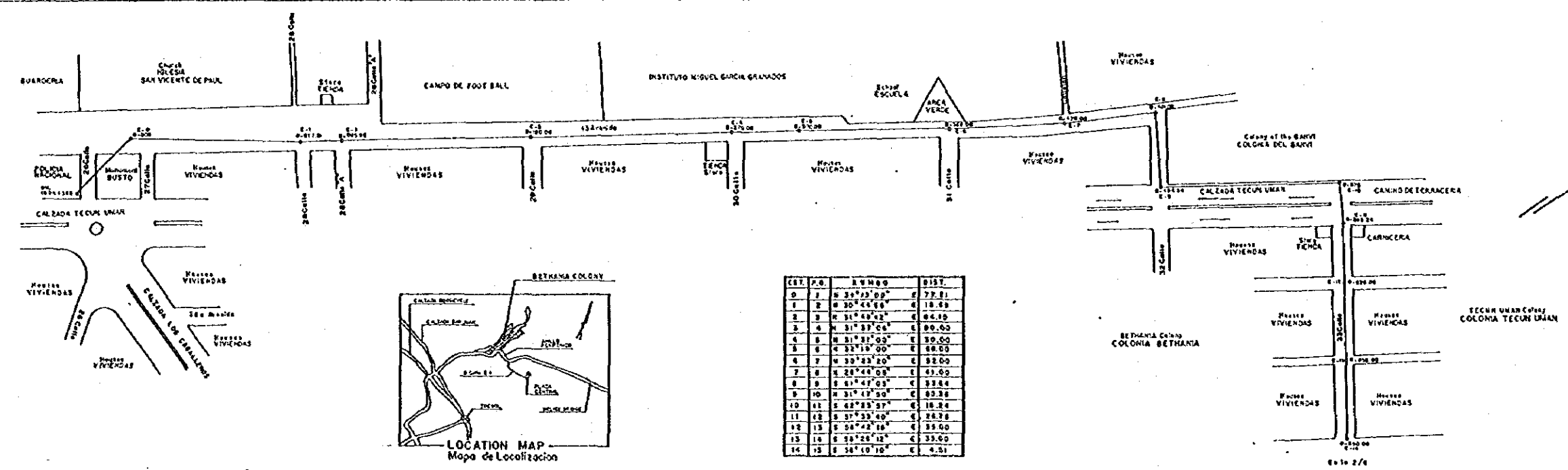
S=1/2,000(H)  
S=1/400 (V)

**PROFILE**

DATE	10/10/78
BY	J.M.
CHECKED	J.M.
SCALE	1:2000 (H) 1:400 (V)







EST.	P.O.	B.W.M.O.	DIST.
0	1	35° 25' 00"	0.00
1	2	30° 45' 00"	10.48
2	3	31° 48' 00"	04.10
3	4	31° 37' 00"	00.00
4	5	31° 37' 00"	30.00
5	6	32° 18' 00"	00.00
6	7	30° 23' 20"	00.00
7	8	30° 44' 00"	00.00
8	9	31° 47' 00"	00.00
9	10	31° 47' 00"	00.00
10	11	32° 23' 37"	16.24
11	12	32° 33' 40"	22.28
12	13	32° 42' 10"	33.00
13	14	32° 54' 12"	33.00
14	15	34° 10' 10"	4.51

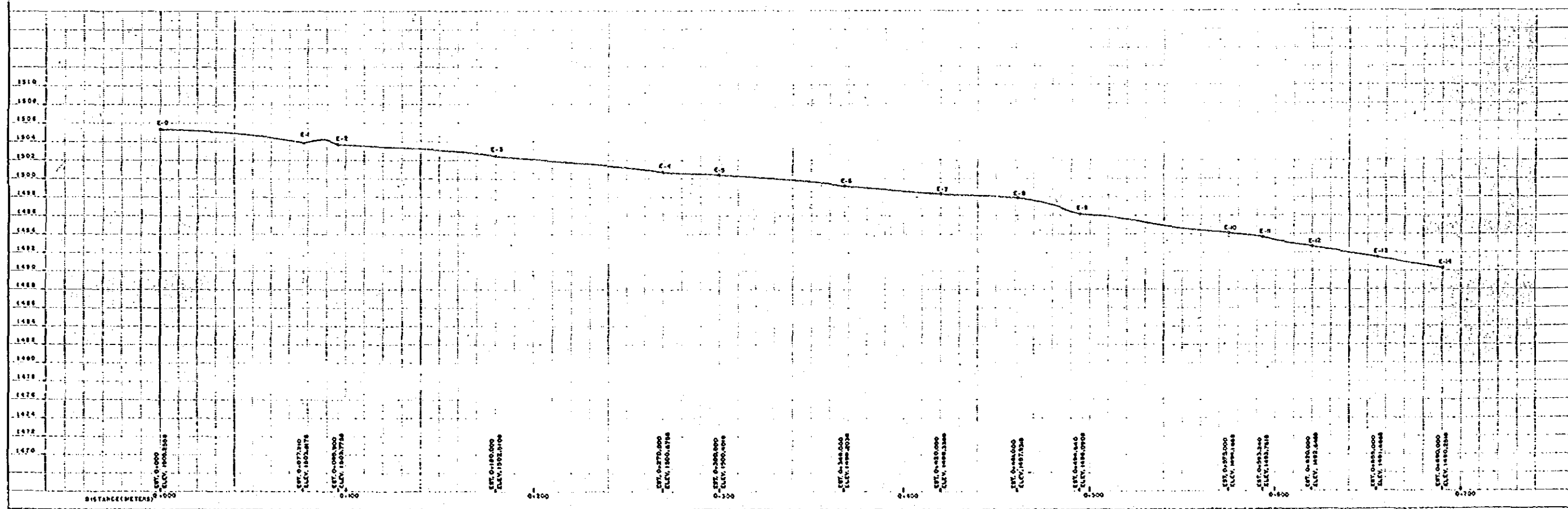
SECTION: "A"

**swissboring**

WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA  
 Plan Maestro de Saneamiento del Area Metropolitana  
 LONGITUDINAL SURVEY FOR PIPE LINE  
 ROUTE OF SANITATION SERVICE AREA  
 Perfil Longitudinal de las Caceras de Alcaldarido para el Servicio de Saneamiento  
 BETHANIA COLONY  
 Colonia Bethania

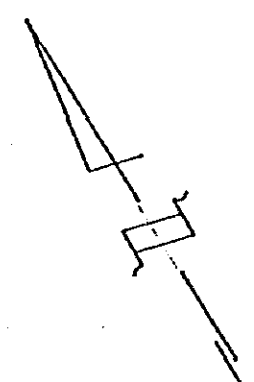
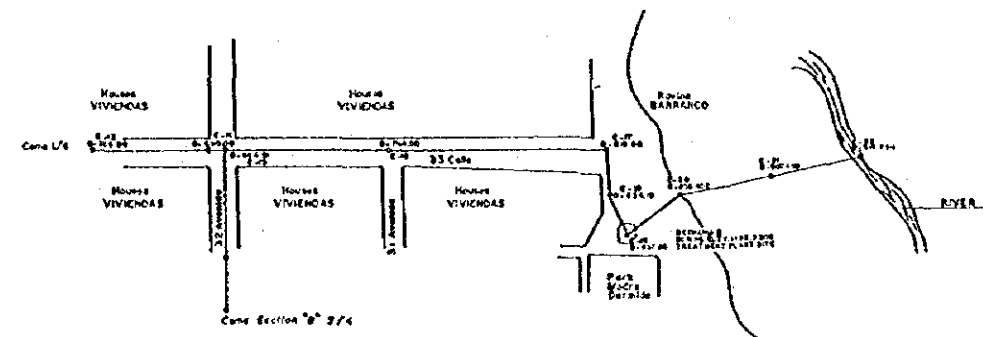
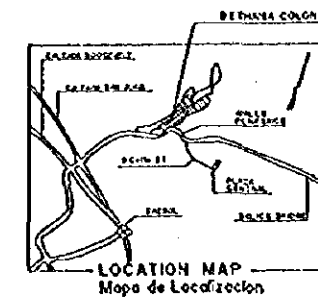
1/4

S=1/2,000(H)  
 S=1/400 (V)



PLAN

PROFILE



SECTION: "A"

EST. P.O.	Bearing	DIST.
14 15	S 88° 10' 00" E	6.91
14 16	S 88° 05' 50" E	54.00
16 17	S 88° 05' 50" E	62.00
17 18	S 30° 14' 00" W	14.18
18 19	E 08° 38' 42" W	43.51
19 20	N 84° 38' 04" E	20.367
20 21	S 87° 28' 18" E	29.047
21 22	S 70° 42' 54" E	57.781

**swissboring**

WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA

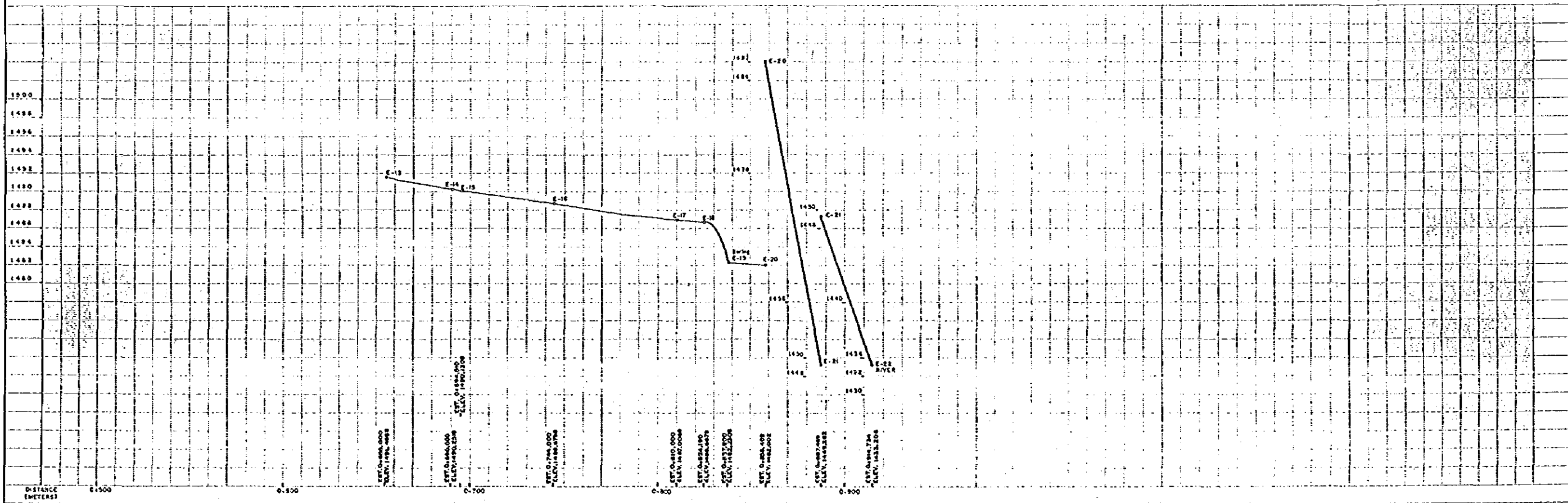
Plan Maestro de Saneamiento del Area Metropolitana

LONGITUDINAL SURVEY FOR PIPE LINE ROUTE OF SANITATION SERVICE AREA

Partid Longitudinal de las Estructuras de Adecuación para el Servicio de Areas de Saneamiento BETHANIA COLONY Colonia Bethania I

2 / 4

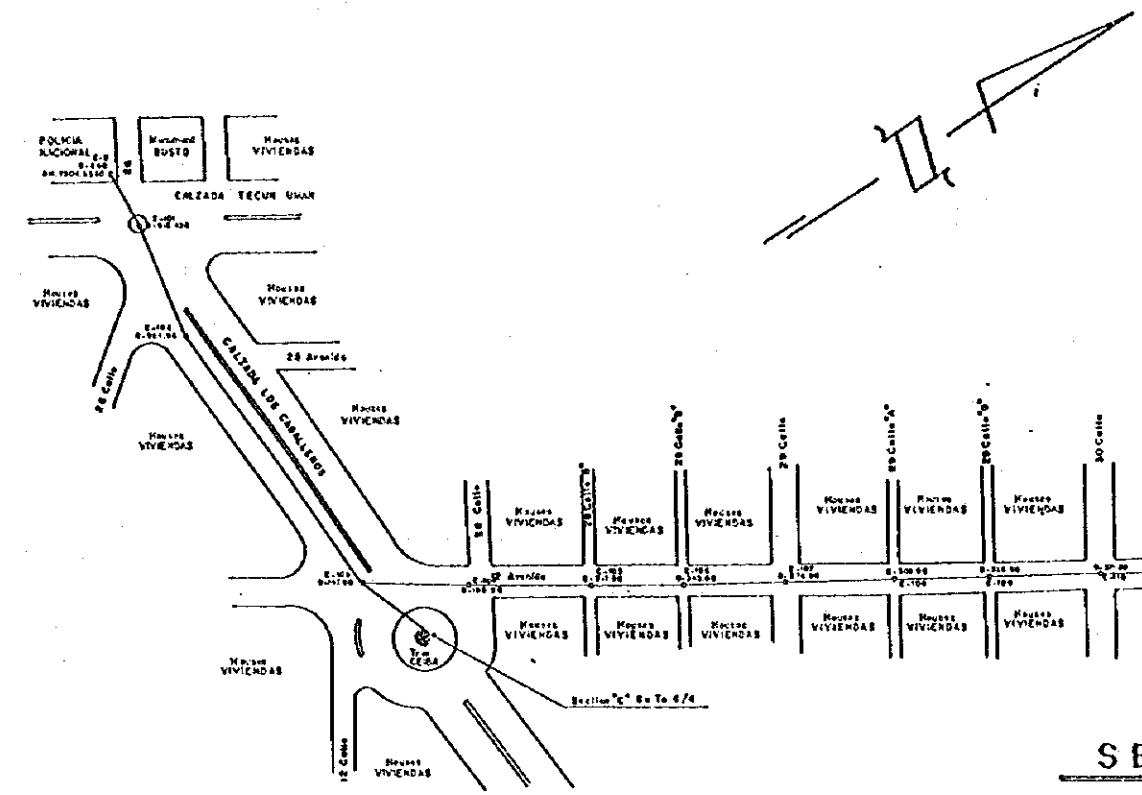
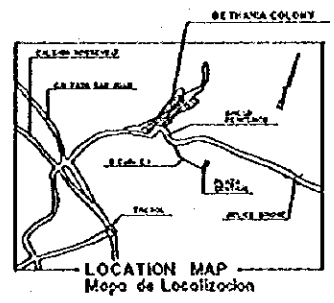
S=1/2,000(H)  
S=1/400 (V)



PLAN  
NOTE BOOK

PROFILE  
NOTE BOOK

EST.	P.O.	NUMBER	DIST.
0	101	S 85°02'12"	E 18.43
101	102	N 84°58'48"	E 34.42
102	103	N 87°04'48"	E 32.07
103	104	N 33°04'00"	E 37.00
104	105	N 33°04'00"	E 37.00
105	106	N 34°58'48"	E 28.00
106	07	N 21°12'48"	E 31.00
107	108	N 31°03'55"	E 33.00
108	109	N 31°03'42"	E 29.00
109	110	N 31°04'00"	E 35.00
110	111	N 31°02'10"	E 32.00
111	112	N 31°01'00"	E 30.00
112	113	N 55°03'00"	E 33.00
113	114	N 31°02'00"	E 32.00
114	115	N 32°00'32"	E 28.00
115	116	N 31°40'00"	E 34.00
116	117	N 31°04'00"	E 31.00
117	118	N 31°03'55"	E 18.00
118	119	N 31°02'48"	E 33.44



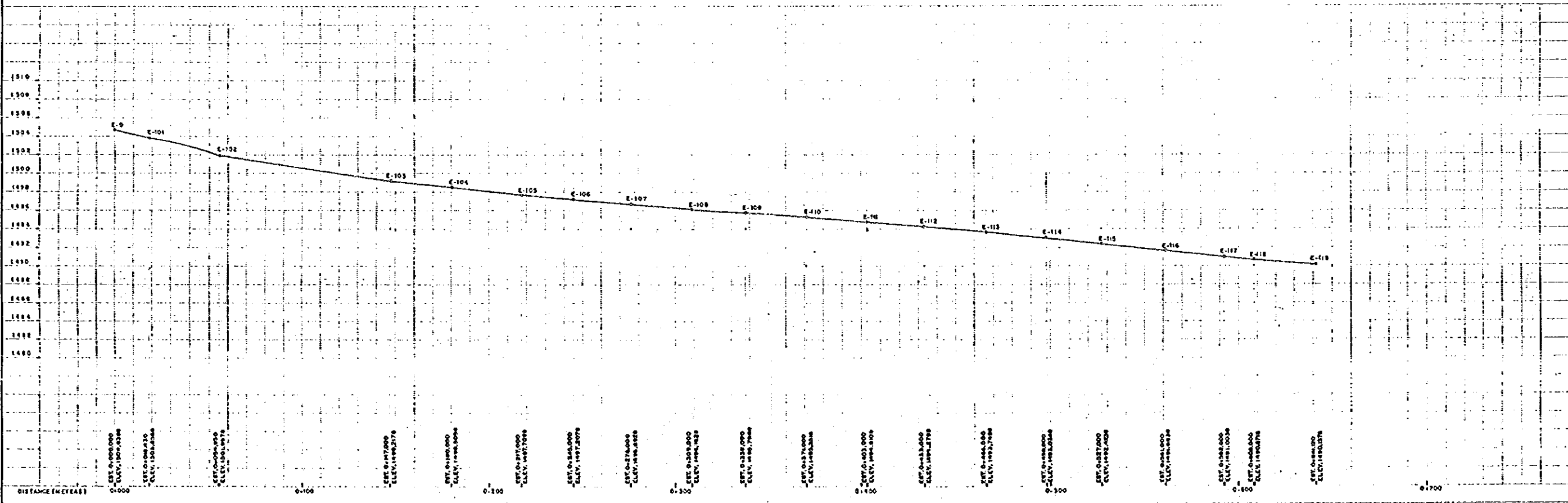
SECTION: "B"

S=1/2,000(H)  
S=1/400 (V)

**swissboring**

WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA  
Plan Maestro de Saneamiento del Area Metropolitana  
LONGITUDINAL SURVEY FOR PIPE LINE ROUTE OF SANITATION SERVICE AREA  
Perfil Longitudinal de las Colectoras de Alcantarillado para el Servicio de Areas de Saneamiento BETHANA COLONY Catedral Bethana

3/4

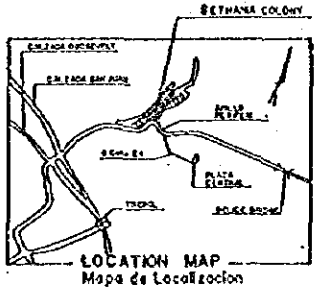
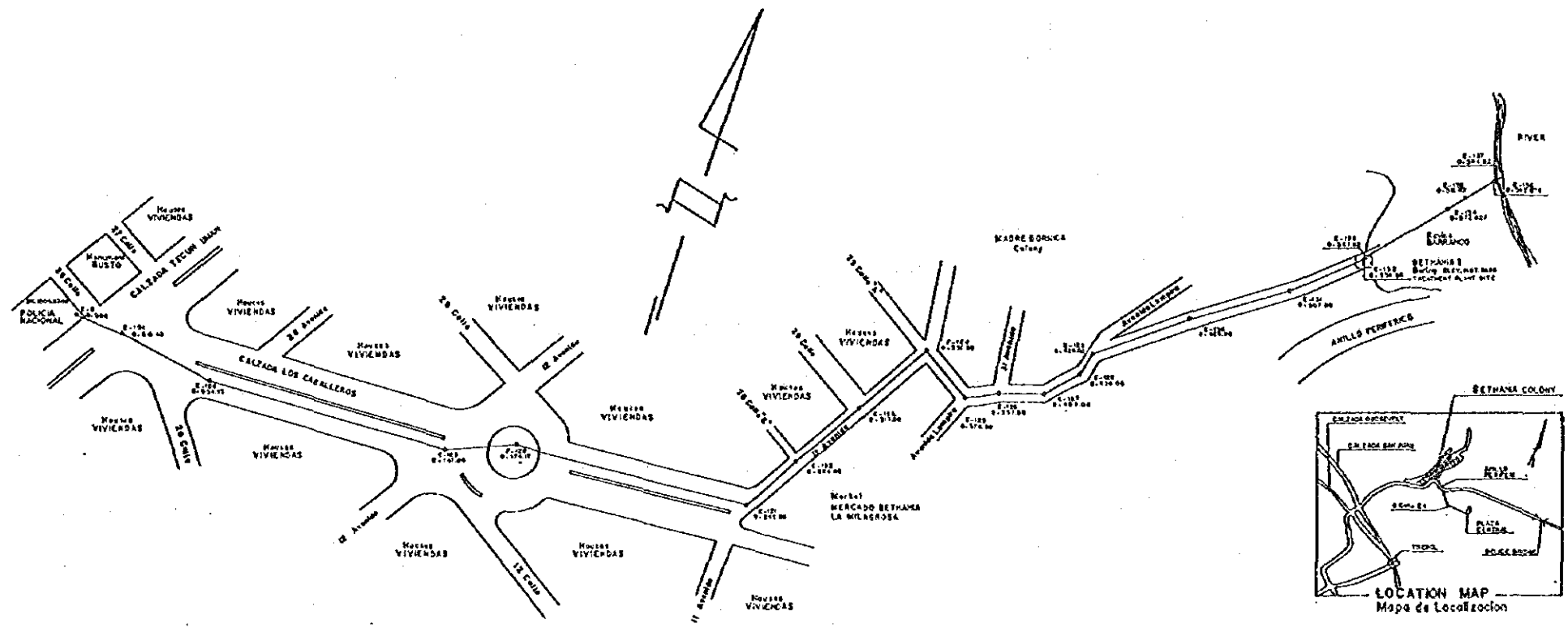


PLAN

PROFILE

STATION	P.O.	NUMBER	DIST.
0	101	S 23° 02' 12" E	18.43
101	102	S 60° 41' 12" E	38.80
102	103	W 01° 02' 43" E	92.07
103	104	W 07° 43' 00" E	22.06
104	105	W 05° 25' 20" E	37.96
105	106	N 31° 31' 23" E	24.00
106	107	N 31° 30' 00" E	31.00
107	108	W 31° 30' 00" E	34.00
108	109	S 28° 25' 24" E	33.00
109	110	W 24° 42' 00" E	13.00
110	111	W 20° 42' 00" E	18.00
111	112	W 43° 42' 00" E	18.00
112	113	W 12° 18' 00" E	8.00
113	114	W 00° 23' 00" E	22.00
114	115	W 25° 41' 00" E	38.00
115	116	W 47° 02' 25" E	28.44
116	117	W 10° 28' 00" E	0.88
117	118	W 40° 42' 44" E	34.00
118	119	W 40° 42' 44" E	43.78
119	120	W 40° 42' 44" E	54.83
120	121	W 40° 42' 44" E	57.20

PLAN  
 1:1000  
 DATE: 08/01/00  
 BY: J. G. GONZALEZ  
 CHECKED: J. G. GONZALEZ  
 APPROVED: J. G. GONZALEZ



SECTION: "C"

S=1/2,000 (H)  
 S=1/400 (V)

**swissboring**

WASTEWATER MANAGEMENT FOR THE GUATEMALA METROPOLITAN AREA  
 Pion Moestra de Saneamiento del Area Metropolitana  
 LONGITUDINAL SURVEY FOR PIPE LINE ROUTE OF SANITATION SERVICE AREA  
 Perfil Longitudinal de las Colecciones de Alcantarillado para el Servicio de Areas de Saneamiento BETHANA COLONY  
 Colonia Bethana

4/4

PROFILE  
 1:1000  
 DATE: 08/01/00  
 BY: J. G. GONZALEZ  
 CHECKED: J. G. GONZALEZ  
 APPROVED: J. G. GONZALEZ

