

Table H.2.8.7 Tubercrops Export in Different Countries (1983-1986)

Volume : Metric Tons
Value : U. S. Dollar

Countries	1983		1984		1985		1986	
	Volume	Value	Volume	Value	Volume	Value	Volume	Ratio (%)
Canada	270.9	130.0	189.0	72.0	221.8	95.6	242.9	(2.3)
U. S. A.	5,617.5	2,396.9	6,049.6	2,506.0	6,201.8	2,861.6	7,906.1	(75.3)
Puerto Rico	167.8	70.7	276.1	126.1	470.2	226.8	521.6	(5.0)
Colombia	455.8	59.5	456.0	60.0	329.9	46.7	258.8	(2.5)
W. Germany	205.8	86.9	111.6	42.6	33.6	17.7	230.5	(2.2)
Holland	621.1	240.1	520.8	213.8	303.9	122.9	569.3	(5.4)
England	417.1	175.4	577.6	260.4	316.6	144.4	672.2	(6.4)
Others	88.8	34.7	301.4	160.2	128.3	52.9	94.7	(0.9)
Total	7,844.8	3,194.2	8,482.1	3,441.1	8,206.1	3,568.6	10,496.1	(100)
Average Price \$/kg	-	0.40	-	0.40	-	0.43	-	-
[Growth Rate]	100	100	108	107	105	112	134	171

Source: Tabulados de Exportacion, Direccion General de Estadisticas y Censos Anos 1983-1986

Table H.2.8.8 Yam New York Market Price (1982-1986)

Unit: US\$/5 lb carton

Year Month	82		83	84		85		86	
	Colombia	Brazil		Colombia	Brazil	Colombia	Brazil	Colombia	Brazil
1	27.00	—	NO DATA	—	24.50	—	23.0	22.33	24.17
2	27.00	—		—	24.50	—	23.0	20.25	24.0
3	2.40	—		22.0	24.50	—	23.0	19.80	24.0
4	25.50	—		22.0	26.80	—	23.0	19.75	23.88
5	24.75	—		24.0	27.50	23.0	25.0	29.50	23.13
6	24.20	—		24.0	28.50	23.0	27.50	19.50	23.50
7	24.25	—		23.50	29.50	23.0	27.15	19.88	22.38
8	24.50	29.50		25.50	27.75	23.0	29.0	20.0	22.0
9	—	30.00		25.50	24.87	23.70	23.60	20.0	21.0
10	30.00	29.00		25.50	23.00	24.0	24.0	21.75	22.88
11	30.20	29.00		—	23.00	24.0	24.0	21.75	22.88
12	28.20	—		—	23.00	24.00	24.0	24.1	24.10
Year Average	26.20	29.38		24.00	25.65	23.46	24.60	20.57	23.00
Price per M. tons	1,966	2,192	—	1,791	1,914	1,750	1,835	1,535	1,716

Source: Market News Service (USDA)

Table H.2.8.9 Agricultural Cooperatives in the Study Area

Name of Cooperatives	Coope Bataan	Coope Cinco	Coope Veintiocho	Acoo Agro	Coope Sara
Location	Bataan	Bataan	Veintiocho Millas	Bataan	Sara (Bataan)
Classification of Activities	Production (banana) Consume	Production (banana)	Production (platano, cacao)	Rice Platano (rice, platano, fruit, cacao)	Consume
Number of Members	42	30	150	14	105
Number of Employees	100	97	7	7	2
Production Area (ha)	282	144	-	-	None
Other Area (ha)	134	56	44	63	1
Total Area (ha)	416	200	-	-	1
Capital Fund (₱)	2,500	-	160,740	-	60,186

Source: JICA Study Team

Table H.2.8.10 Agricultural Supporting Services

INSTITUTION	Technical Assistance	Investigation	Titling	Education	Organization	Infrastructure	Credit	Crop Insurance	Others
S.B.N			○		○		○		
JAPDEVA	○						○		
I.D.A	○		○		○				
M.A.G	○	○		○	○				
I.N.A				○	○				○
CATIE		○							
ASSANA		○							○
C.N.P									○
Municipalida						○			
M.O.P.T						○			
I.N.S								○	
INFOCOOP					○				○
BANDECO	○								

Remarks : (1) ○ : Institution in activity
 (2) Others: Promotion and improvement of womens position.
 Vocational training, etc.

Table H.2.8.11 World Demand for Agricultural Production

Unit: Million Metric Tons

	Consumption		Demand Forecast Total		Increased. (%)		Growth Rate (%)	
	1969-71	1980	1985	1990	1990/70	1990/70	1990/70	annually
Cereals	1,207	1,538	1,725	1,910	58.3		2.3	
Wheat	332	404	447	490	47.6		2.0	
Paddy	310	400	447	493	59.1		2.3	
Others	565	734	831	927	64.0		2.5	
Tubercrops (Starch)	279	321	342	361	29.2		1.3	
Sugar	82	107	124	145	76.8		2.6	
Beans	52	69	79	91	73.5		2.8	
Vegetables	223	290	330	374	67.7		2.6	
Fruits	158	214	250	290	83.5		3.1	
Meat	107	144	168	197	84.7		3.1	
Cattle	39	51	60	70	80.1		3.0	
Mutton and lamb	7	10	12	14	104.5		3.6	
Pigs	36	46	53	61	71.4		2.7	
Poultry	16	24	29	36	125.4		4.1	
Eggs	19	25	29	34	75.1		2.8	
Fish	41	57	68	81	96.3		3.4	
Milk	389	476	532	587	53.3		2.2	
(Skim Milk)	(40)	50	58	(66)	(65.5)		(2.6)	
Cheese	9	12	14	16	74.4		2.8	
Oil and fats	33	43	49	57	70.8		2.7	
Butter	5	6	7	8	49.3		2.0	
Vegetable oil	22	30	35	41	81.9		3.0	

Table H.2.8.12 Commodity Consumption per Capita in Costa Rica in 1985

Item	Consumption (kg/year/person)	Consumption for Group
1 Rice	60.11	
2 Wheat	43.96	124.93
3 Maize	20.86	
4 Cassava	20.90	24.14
5 Potato	13.24	
6 Beans	9.76	9.76
7 Tomato	9.88	
8 Onion	2.68	14.46
9 Other vegetables	1.90	
10 Banana	20.33	
11 Plantain	23.56	
12 Orange	40.39	97.78
13 Pineapple	3.65	
14 Papaya	2.52	
15 Other fruits	7.33	
16 Beef	23.18	
17 Pork	3.79	32.10
18 Chicken	5.13	
19 Egg	9.05	9.05
20 Milk	83.49	112.89
21 Dairy Products	29.40	
22 Fish	2.52	2.52
23 Cooking Oil	0.22	64.92
24 Sugar	64.70	
25 Coffee	6.95	7.70
26 Cocoa/Tea	0.75	
27 Spicery	0.14	0.14

Source: Food Balance Sheet. SEPSA

Table H.2.8.13 Cacao Export in Different Countries
(Costa Rica 1983-1985)

Volume : Metric Tons
Value : U. S. Dollar

Countries	1983		1984		1985		1986		
	Volume	Value	Volume	Value	Volume	Value	Volume	Ratio (%)	
U. S. A.	17.4	19.7	69.7	133.5	460.2	718.5	27.8	(1.1)	50.2
W. Germany	65.6	86.4	4.4	5.2	332.9	610.1	251.5	(9.7)	402.6
Japan	653.5	915.7	768.9	1,407.4	596.0	1,013.7	1,018.7	(39.2)	1,597.4
France	-	-	-	-	40.5	72.3	1,298.1	(50.0)	2,051.1
Others	-	-	-	-	20.4	40.4	-	-	-
Total	736.5	1,021.8	843.0	1,546.1	1,450.0	2,455.0	2,596.1	(100)	4,102.3
Average Price \$ / kg	-	1.38	-	1.83	-	1.69	-	-	1.58
[Growth Rate]	100	100	114	151	197	240	352	-	401

Source: Estadísticas de Exportación, Dirección General de Estadísticas y Censos Anos 1983-1986

Table H.2.8.14 Cacao Actual Production/Projected and Consumption
in the World

Area	Year	Actual			Projected	Growth Rate	
		1970	1980	1983	1990	1970-80	1980-90
		thousand metric tons				(%)	
World		1,388	1,616	1,518	2,060	1.5	2.5
Developing Countries		1,388	1,616	1,518	2,060	1.5	2.5
(Latin America)		(371	555	543	708)	(4.1	2.5)
		Cacao Consumption					
Area	Year	Actual			Projected	Growth Rate	
		1970	1980	1983	1990	1970-80	1980-90
World		1,410	1,533	1,725	1,801	0.8	1.6
Developing Countries		140	192	225	275	3.2	3.7
(Latin America)		(111	134	152	192)	(1.9	3.7
Developed Countries		1,270	1,341	1,500	1,526	0.5	1.3
Canada		(37	33	44	39)	(Δ 1.1	1.7)
U. S. A.		(364	342	412	386)	(Δ 0.6	1.2)
Belgium		(24	33	37	34)	(3.2	0.3)
France		(80	101	111	114)	(2.4	1.2)
Germany		(160	164	172	170)	(0.2	0.4)
Italy		(31	40	47	46)	(2.6	1.4)
Netherland		(36	31	34	29)	(Δ 1.5	Δ 0.7)
United Kingdom		(115	99	109	105)	(Δ 1.5	0.6)
Spain		(35	29	38	34)	(Δ 1.9	1.6)
Switzerland		(21	27	28	29)	(2.5	0.7)
E. Europe USSR		(210	254	263	315)	(1.9	2.2)
Japan		(50	56	72	74)	(1.1	2.8)

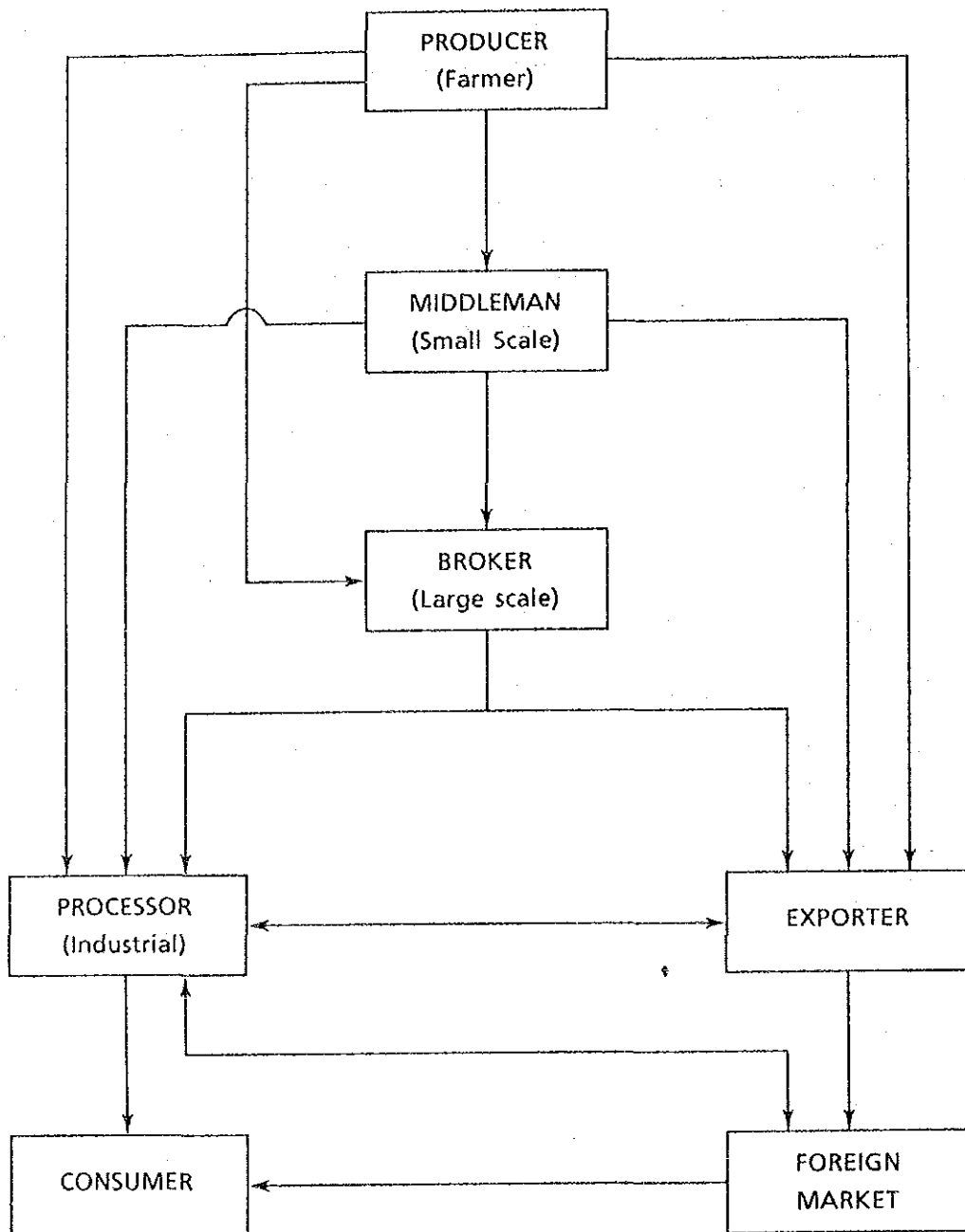
Source: FAO

Table H.2.8.15 Tubercrops actual Production/Projected Consumption
in the World

Area \ Year	Actual			Projected	Growth Rate	
	1970	1980	1983	1990	1970-80	1980-90
	thousand metric tons				(%)	
World	540,008	554,460	562,656	626,226	0.3	1.2
Developing Countries	293,419	342,538	357,298	422,002	1.6	2.1
(Latin America)	(49,337	45,111	40,866	54,520)	(Δ 0.9	1.9)
Developed Countries	246,589	211,922	205,358	204,224	Δ 1.5	Δ 0.4
	Cacao Consumption					
Area \ Year	Actual			Projected	Growth Rate	
	1970	1980	1983	1990	1970-80	1980-90
	thousand metric tons				(%)	
World	542,444	561,936	-	626,090	0.4	1.1
Developing Countries	288,734	326,771	-	399,685	1.2	2.0
(Latin America)	(49,325	45,306	-	53,758)	(Δ 0.8	1.7)
Developed Countries	253,710	235,165	-	226,405	Δ 0.8	Δ 0.4

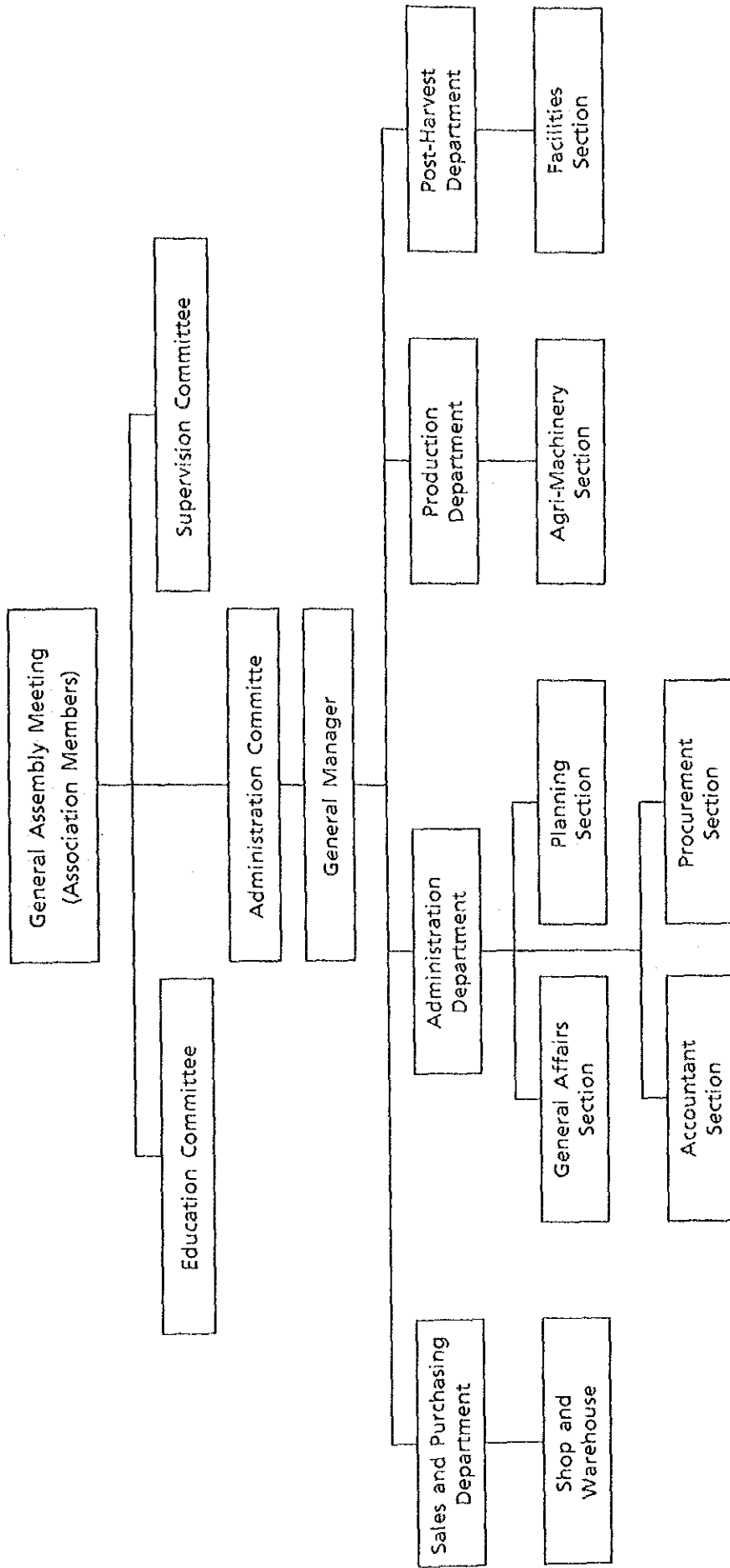
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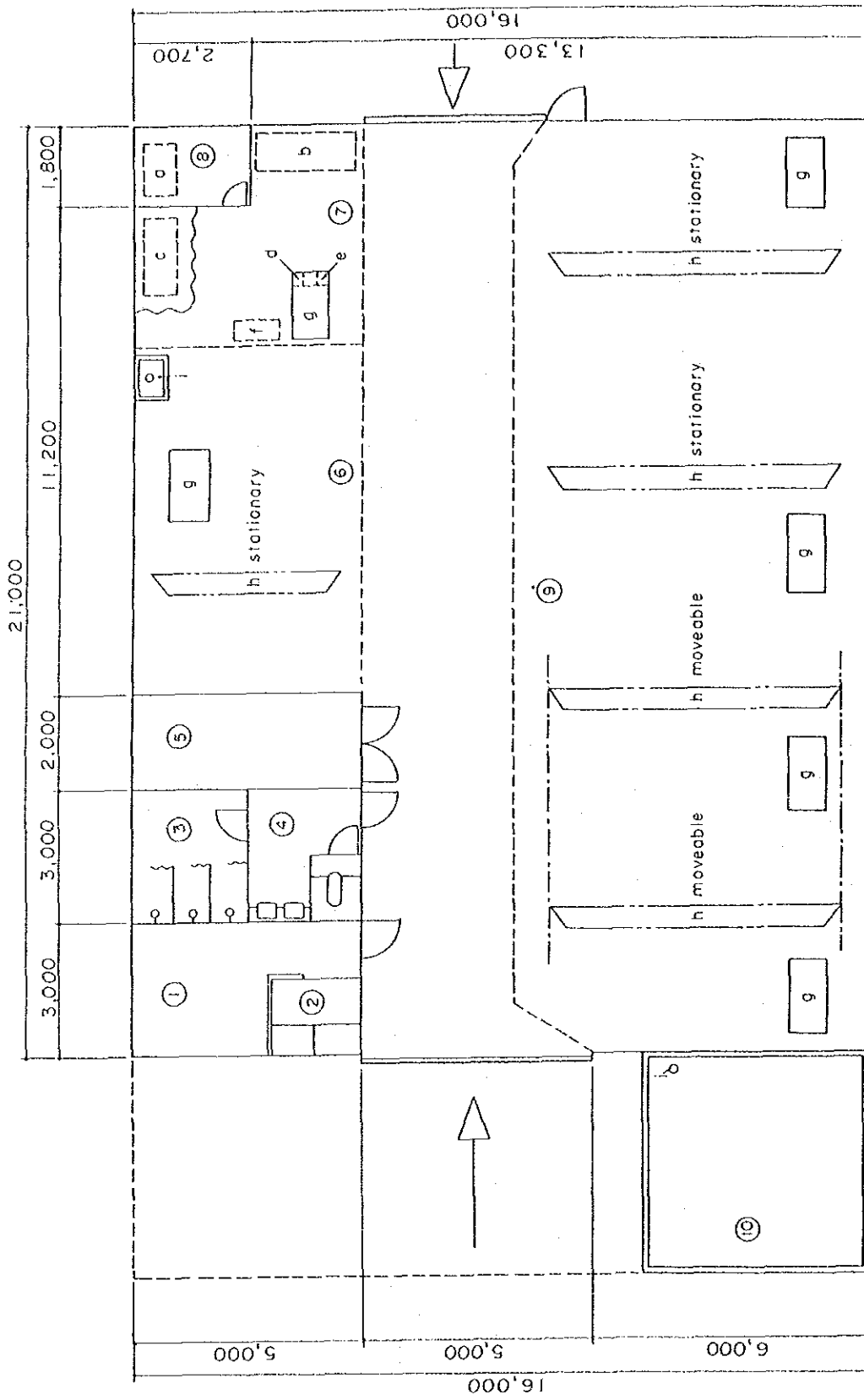
Figure H.2.8.1 Cacao Marketing System in Costa Rica



Source: SEPSA

Figure H.3.8.1 Proposed Agricultural Cooperatives Organization Chart





- Rooms**
- ① Office
 - ② Locker
 - ③ Shower room
 - ④ Washroom
 - ⑤ Equipment: room (tools parts)
 - ⑥ Inspection/adjustment
 - ⑦ Machinery workshop
 - ⑧ Compressor room
 - ⑨ Machinery adjustment
 - ⑩ Washing place
- Machines**
- a Compressor
 - b Manual oil pressure
 - c Welding machine
 - d Grinder
 - e Vice
 - f Parts washing stand
 - g Working stand (5 sets)
 - h Chain block
 - i Water supply (hydrant)

Figure H.3.8.2 Proposed Agricultural Machinery center

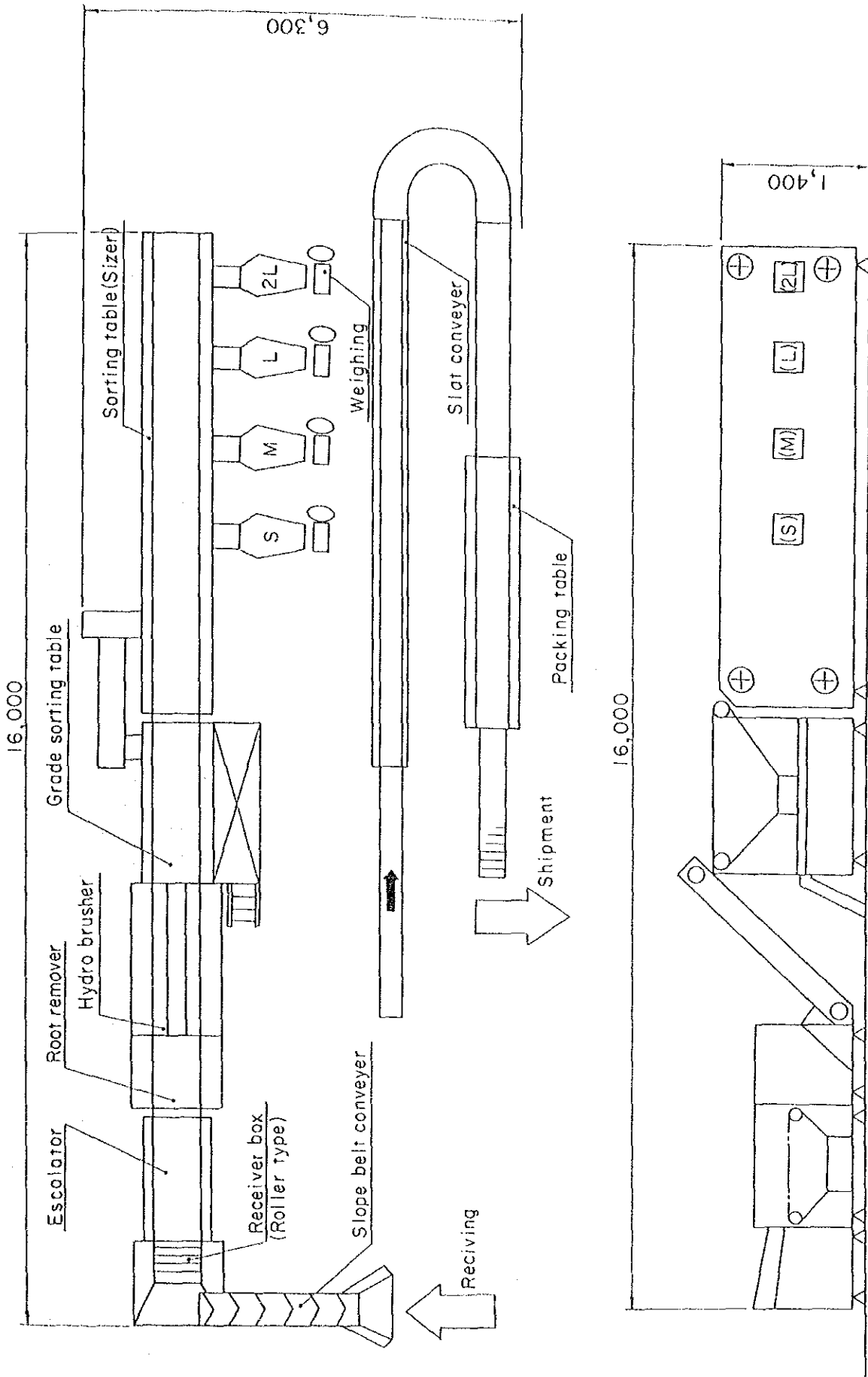


Figure H.3.8.3 Proposed Tubercrops/Vegetable Processing Facilities

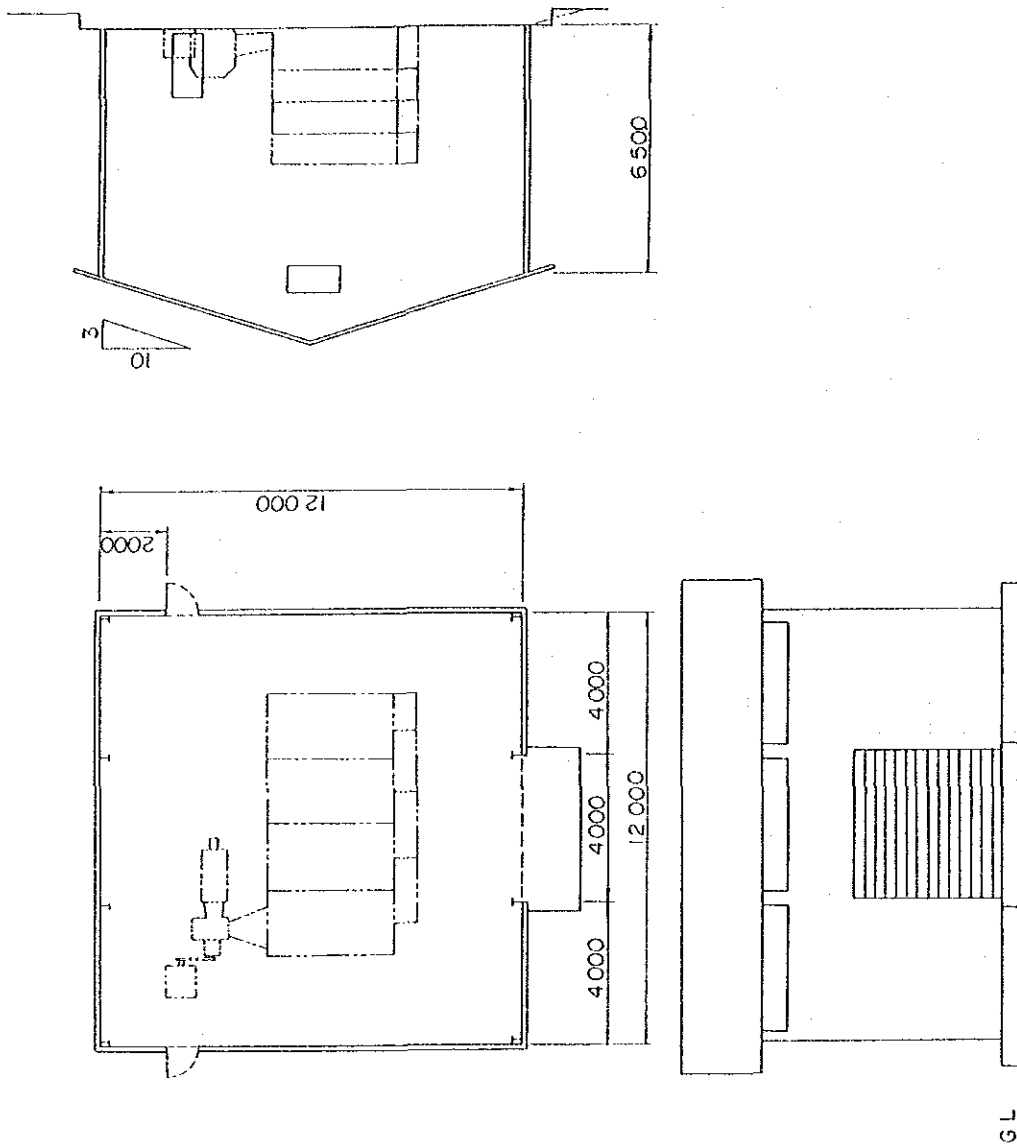


Figure H.3.8.4 Proposed Cacao Fermentation and Drying Facilities
 (1) Fermentation House

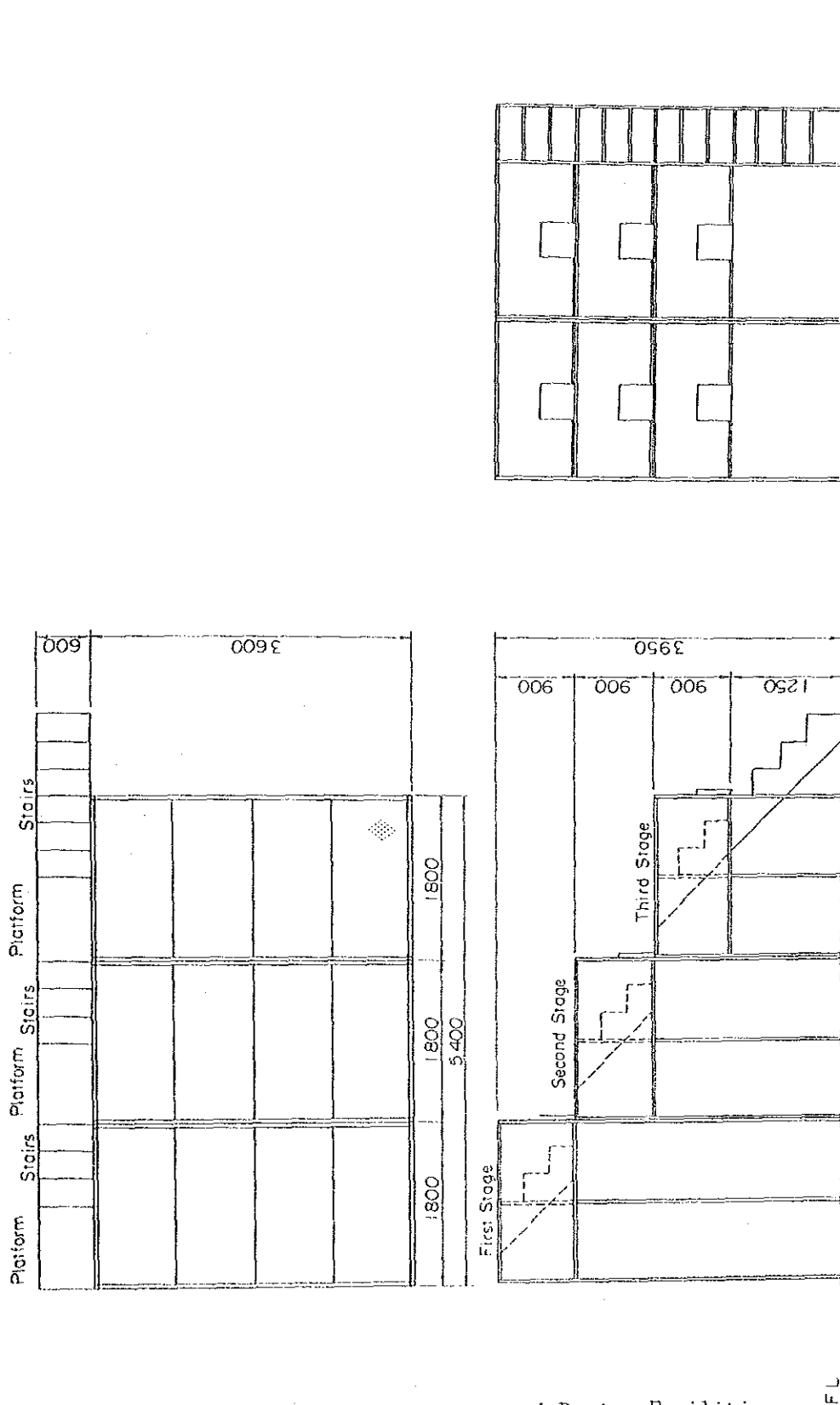


Figure H.3.8.5 Proposed Cacao Fermentation and Drying Facilities
 (2) Fermentation House

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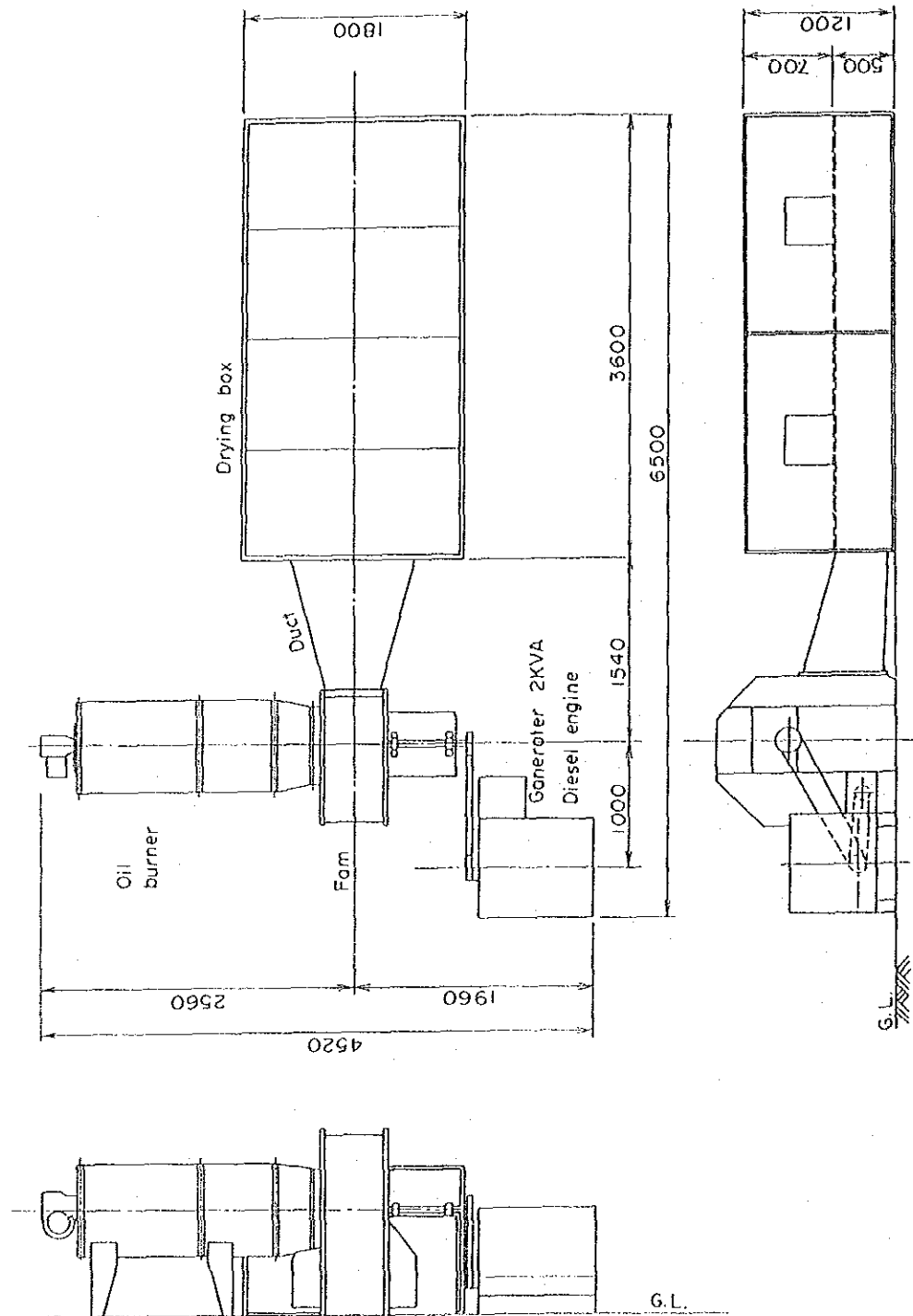


Figure H.3.8.6 Proposed Cacao Fermentation and Drying Facilities
(Dryer)

Figure H.3.8.5 New York Wholesale Market Price in 1985

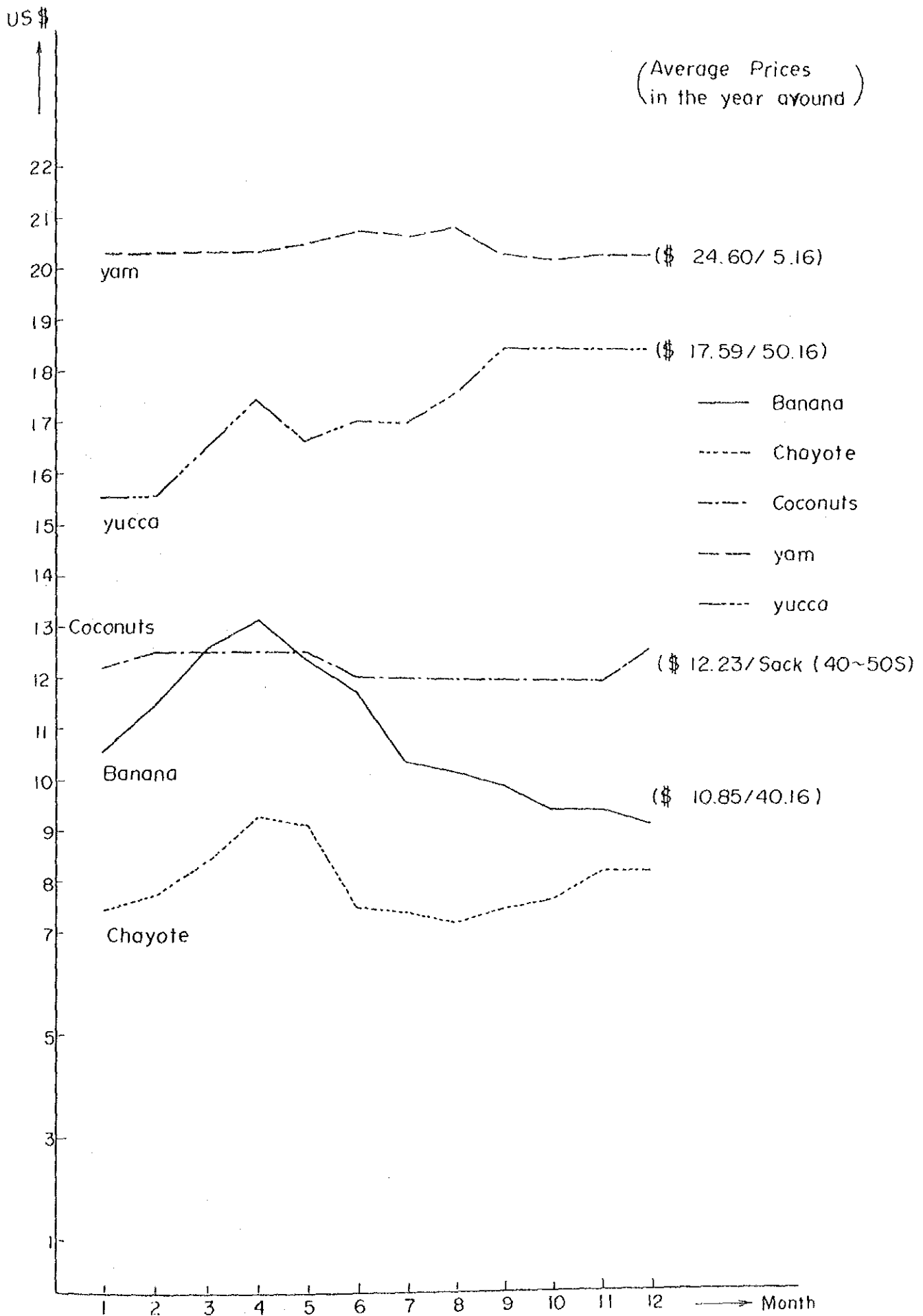


Figure H.3.8.6 New York Wholesale Market Price in 1982

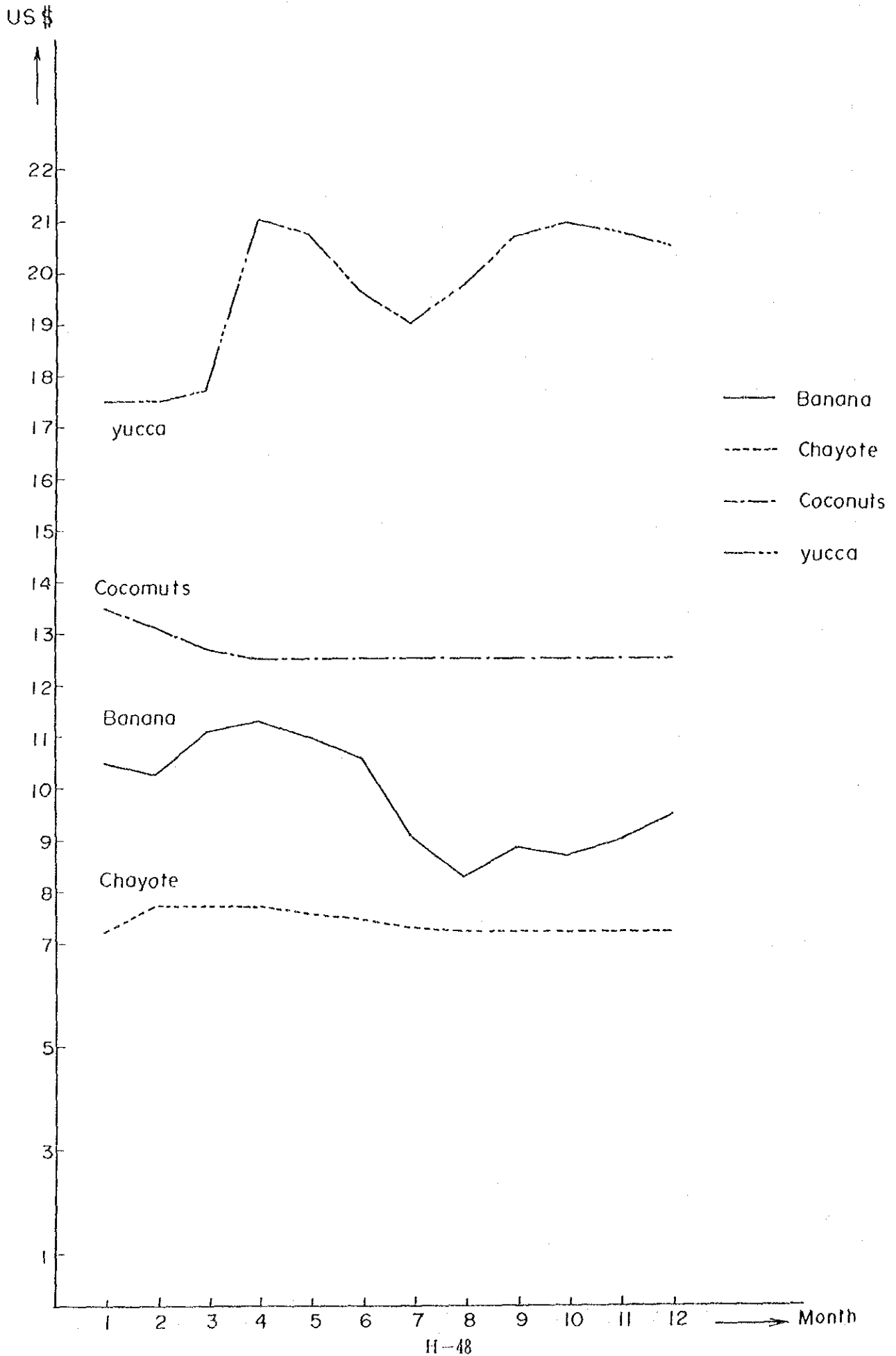
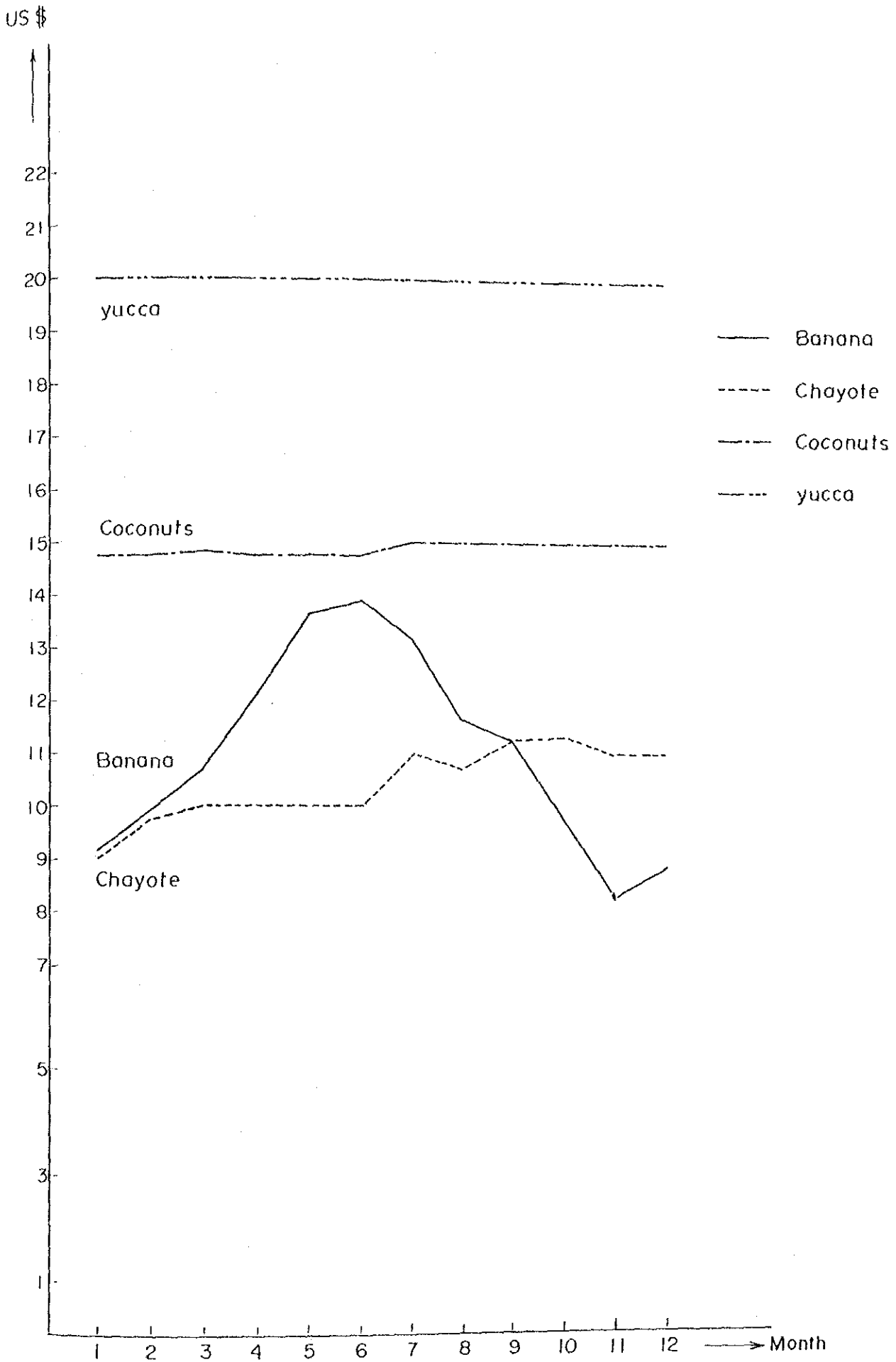


Figure H.3.8.7 Boston Wholesale Market Price in 1982



Annex I Settlement and Rural Development

Annex I. Settlement and Rural Development

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I.1 Farm Villages

The characteristics of the farm villages in the Study Area can be roughly classified into three types that directly relate to the Area's historical background and to its major crops. The village types are as follows:

1) Street-side Type

During the past era of banana plantation enterprises that began in 1833 and decayed due to the Sigatoka Negra disease during the 1932-1945 period, Bataan Centro, Matina, and 28 Millas were developed as banana collecting stations of the railroad that was constructed in 1890. These areas became urbanized as a result of being transportation terminals. Housing was developed along the roads that were improved in earlier days.

2) Colony Type

Villages in the vicinity of the banana plantation enterprises and cooperative banana fields developed into colony types, concentrated into single lots because of the drainage and road arrangement pattern.

In the Sara Area, the location of schools, athletic fields, housing and commercial areas were designated during the early stages of the settlement. Therefore, colony type villages were developed around present facilities.

3) Scattered Type

Scattered type villages exist in the livestock farming areas and single-crop rice growing areas of the settlement and plantation areas for the convenience of the farming patterns.

I.2 Farm Village Improvement Plan

As a result of the field surveys, the well water quality test reveals the necessity of installing water supply and sewage treatment facilities. For this reason, the following plans are recommended for the Development Project:

In general, the wells in the Limon area are shallow, having depths of from 3 to 4 m. Either buckets or hand pumps are used to draw the well water.

The degree of water contamination in the shallow wells is higher than for the deeper wells. The quality of ground water at deeper levels is higher than in shallower levels. Also, a larger quantity of water can be supplied from the deeper wells. It is therefore desirable to dig wells that are deeper than the existing one.

Hand pumps can be used to obtain water from wells that are up to 7 m deep. In preferred environmental locations, shallow wells can be dug if there is sufficient space around them.

Wells shall be located far enough away from sources of water contamination, such as toilets, septic tanks, sewage, pig pens, etc.

As shown in Fig. I.2.1, there are two types of shallow wells; open wells and closed wells.

1) Open Wells

The well has an open top. After digging a hole below the water table, earthenware or concrete pipes are installed as the casing. Dust and contaminated water tend to fall into the open well. The open well is not sanitary. In areas subjected to flooding, the open well, especially, is not suitable. The minimum distance between a well and a toilet shall be taken more than 5 m.

2) Closed Wells

This type of well is closed with a concrete lid at a level of about 3 m below ground surface.

Above the lid, earthenware pipes having diameters of less than 30 cm which are joined by cement mortar are to be installed. The area around the piping is filled in with soil.

Closed wells are more sanitary than open wells because rainwater or other obstructions cannot fall in.

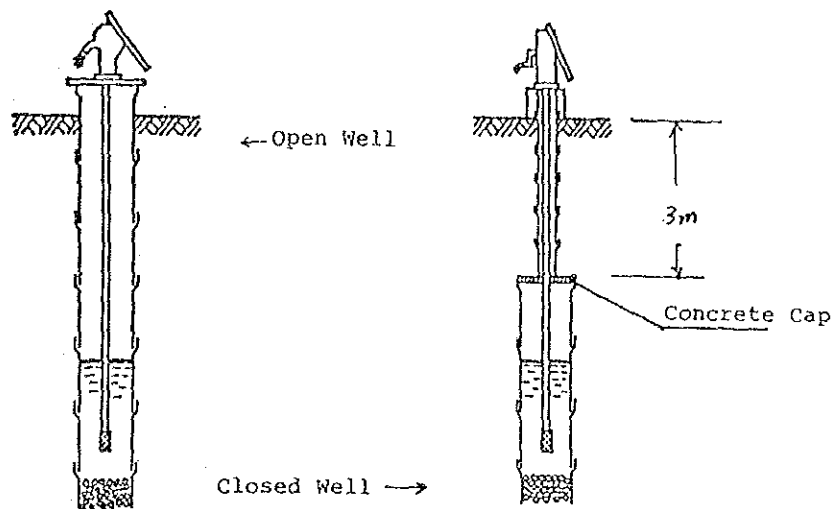


Fig. 1.2.1 Shallow Wells

(1) Small-scale Water Supply Plan

Except for those areas having deep wells, the installation of small-scale water supply systems with new deep wells seems to be desirable for Goschen, Davao, Cuatro Millas, Barmonte Oeste, and Bataan. Basically, the water supply system will be a deep well and elevated water supply tank type. Cuatro Millas, having about 60 households, was selected for the model area of the water supply system installation.

(2) Sewage Treatment Facility

Domestic waste water actually creates problems in highly populated areas or in such areas where the population density is higher than a certain level. Since scattered type villages have large environmental capacities, no domestic waste-water problem exists in them.

A small-scale farming household has a shack that is detached from the main residence that is used as a toilet and as a place to bathe. When the toilet pit becomes filled, the shack is moved to a different location thereby allowing the waste to decompose and infiltrate into the ground. For this reason, wells are to be located at a distance from toilet sites.

Even in colony and street-side type villages, pit type toilets are used. Waste in some pits is removed by a vacuum truck and is then disposed of on unused land where it decomposes. This method of utilizing the soils' natural capability for disposing of waste has several excellent characteristics.

There are two basic methods for disposing waste that utilize either an entire ecological system or part of the system. One method is to place soil (ecological system) into the treatment facility. The other method is to reuse waste as water resources or fertilizer sources by recycling it into farmlands or forests.

Septic tanks -- widely used in the United States -- are called decomposition tanks. The main element of the decomposition system is soil. The system is actually a septic tank and soil absorption system (ST system). The ST system treats domestic sewage (waste water and soil). Thirty percent of American households presently use the ST system.

The following is a typical example of the ST system:

Fig. I.2.2 shows the structure of a septic tank. Once domestic sewage flows into the tank, the oil and scum floats and the solid particles settle on the bottom forming a sludge layer. The scum and sludge is removed once every three to five years. The waste water will infiltrate directly into the ground through a trench. Even in soil with a high infiltration rate, the daily water infiltration rate will be about 30 to 50 mm due to the forming of a biological mat at the boundary of the soil and gravel filling.

Table I.2.1 gives an example of the quality of the water treated by the ST system. From the table it can be understood that the BOD, SS, colon bacillus, viruses, ammonia, and phosphorous are sufficiently removed at a point 1 meter beneath the trench. However, substantial amounts of nitrate still exists. Therefore, in an area where large amounts of waste water infiltration occurs, the nitrate content in the ground water may become higher. In the ST system, the nitrate removal rate is 1/2 to 3/4 of the total amount.

Two or three trenches are to be provided to cope with ST system failures. By utilizing the trenches in turn, the infiltration function will be maintained at a high rate. This method is called the dual system.

In order to prevent ground water from contamination, the following conditions shall be satisfied:

- a) In areas where drinking water wells exist, the distance between the water table and a trench shall be 9 to 12 m in a weathered granite zone, and from 3 to 6 m in an alluvium strata.
- b) In order to keep the nitrate content rate in local ground water below the public environmental standard, the housing density shall be less than one per 0.8 ha.

- c) For proper operation and maintenance purposes, each septic tank shall be periodically inspected.

Table I.2.1 Quality of Treated Water by Septic Tank^{a)}

	Inflow Water	Effluent Water from Septic Tank	30cm beneath Trench	90cm beneath Trench
Bod mg/l	270-400	140-175	0	0
S S mg/l	300-400	45-65	0	0
Colon bacillis MPN/100 ml	1×10^8 - 1×10^8	1×10^2 - 1×10^2	0-100	
Virus PFU/ml ^{b)}	Unknown	1×10^5 - 1×10^7	0-1,000	0
Total Nitrogen	100-150	50-60	-	-
Ammoniacal NH ₄	60-120	30-60	B-60	B
Nitrate NO ₂	1	1	B-40	B-40
Total phosphorus mg/l	10-40	10-30	B-10	B-1

- (Note) a. 1 lansel et al., 1980
b. PFU = plaque forming units.
c. B = background.

Soil Disposal Facility Using Trench Infiltration Method:

Examples of the soil disposal system using the trench infiltration method are shown in the pamphlet issued by the U.S. Environmental Protection Agency^a. Domestic sewage flows into a decomposition tank. The effluent from the tank is discharged through a trench into the soil where it is absorbed and decomposed.

The capillary infiltration method used in Japan is shown in Fig. I.2.2. In this method, the trench is installed about 50 cm below ground surface and the effluent infiltrates into the soil at that point. This method effectively disposes of sewage by utilizing

bacteria activity in the ground to the fullest extent. The standard design for this method requires a 10 m long trench for disposing the sewage from one household having four family members.

- a) U.S. EPA, PRD-10 (1980) Small Waste Water System, Alternative Systems for Small Communities and Rural Areas.

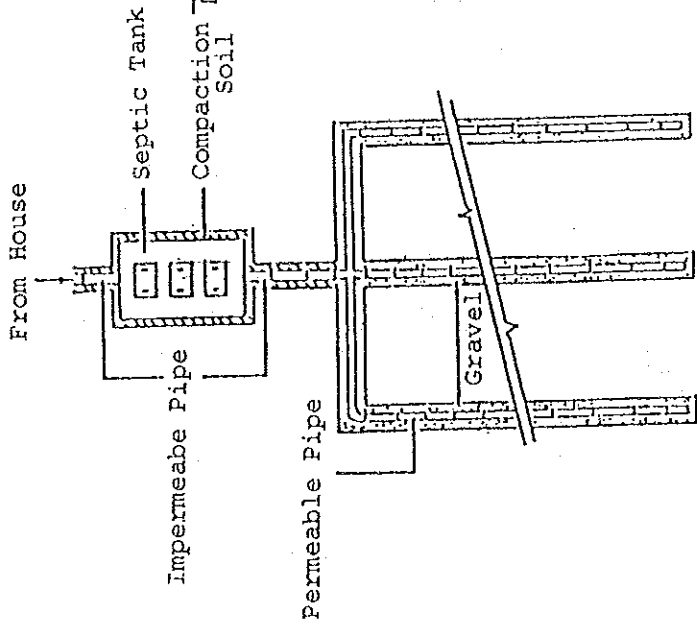
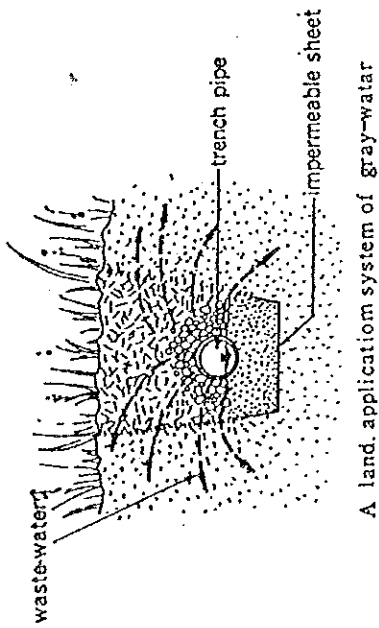


Fig. I.2.2. Septic Tank and Soil Absorption System

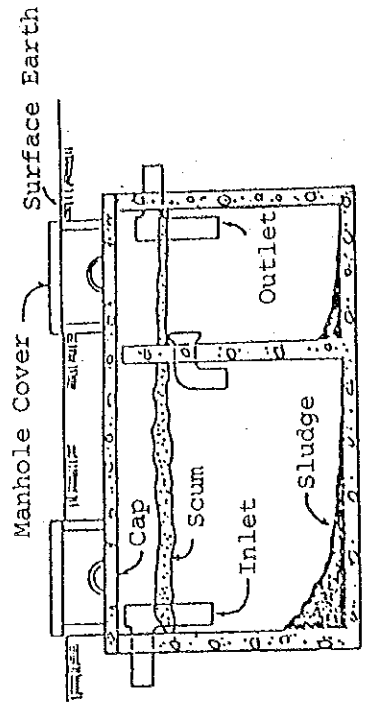


Fig. I.2.3. Septic Tank

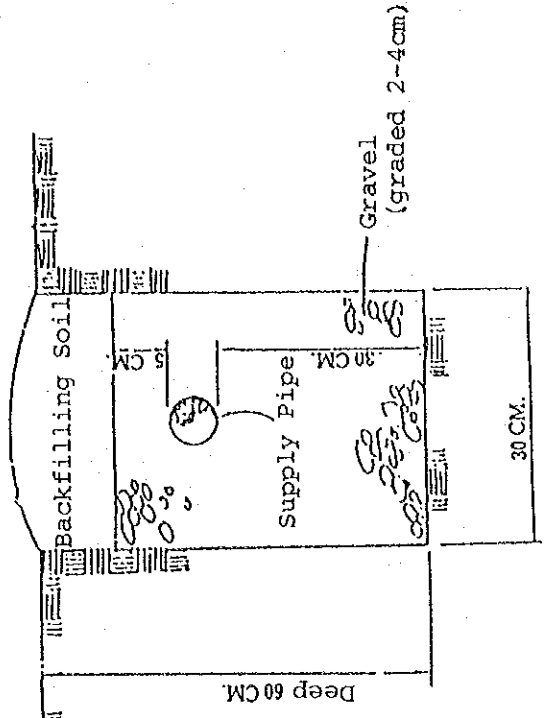


Fig. I.2.4. Permeable Trench

I.3 Approximate Cost Estimation of Small-Scale Water Supply Plan

As the following items for the water supply plan have not yet been clarified, the cost estimate is not very accurate.

- (1) Without conducting geological surveys and pumping tests, deep well construction locations and the usable amount of well water can not be determined.
- (2) The boundaries of the water supply areas vary greatly depending upon the conditions of household distribution in the areas. Water supply boundaries are to be within the boundaries of villages (colony type).
- (3) It is desirable for wells to be located in the center of water supply boundaries. However, depending upon the topographical, land use, geological, and land ownership conditions, well locations may have to be revised.
- (4) Without conducting land surveys it is difficult to determine pipe lengths, pipe types and the needed fittings.
- (5) As the village population is not known, it is assumed that a household consists of five persons.

Calculation Criteria -- AYA Equation and Assumptions:

- (1) Average daily water use per person:

$$\begin{aligned} & 150 \text{ liter/day/person} - - - - - A \\ & = 0.0017361 \text{ liter/sec/person} \end{aligned}$$

(2) Maximum daily water supply amount:

$$\begin{aligned} & A \times 1.25 \times \text{future population} \text{ --- --- --- --- --- } B \\ & = 98,437.5 \text{ liter/day} = 1.1393 \text{ liter/sec} \end{aligned}$$

(3) Maximum hourly water supply amount:

$$\begin{aligned} & A \times 1.50 \times \text{future population}/24 \text{ --- --- --- --- --- } C \\ & = 4.92 \text{ m}^3/\text{hr} = 82 \text{ liter/min} \end{aligned}$$

(4) Present population:

$$\begin{aligned} & 60 \text{ households} \times 5 \text{ persons/household (assumed)} \\ & = 300 \text{ persons} \end{aligned}$$

(5) Future population:

Average annual increase rate: 3.55% over a 20 year period.

Thus, 525 persons.

(6) Determination of water storage tank capacity:

Elevated Tank Type (made of steel):

$$\begin{aligned} & \text{One-hour's supply at maximum usage} \\ & = 4.92 \text{ m}^3 \doteq 5.0 \text{ m}^3 \end{aligned}$$

Long Tank type (made of concrete block):

$$\begin{aligned} & A \times \text{future population} \times 0.4 \\ & = 31.5 \text{ m}^3 \doteq 32.0 \text{ m}^3 \end{aligned}$$

The elevated tank type is used in areas where water pressure in the pipes becomes insufficient.

Once the water is pumped into the elevated tank from a low tank it is then distributed by gravity flow to each household.

As the construction cost of an elevated tank is high, the tank capacity was determined to be that which can supply the maximum one-hour water use. The capacity of the low tank was determined to be that which can supply 40% of the maximum daily use.

- (7) Two water faucets (one for the kitchen and one for the bathing place) are to be installed per household. However, the number of faucets may be increased for a large family or a necessity to install faucets inside and outside depending upon household conditions. The water pressure at a faucet is to be 1.5 kg/cm^2 (assumed).
- (8) The depth of a deep well is to be 40 m (assumed).
- (9) Hydraulic gradient in the water supply pipe is to be 3%.
- (10) The cost estimate was made based on the unit construction costs and water rates that are shown in the examples of San Joaquin de Siquirres.

Table I.3.1 Cost Estimate Roughly of Small Water-Supply System

classification	kind	length (m)	quantity + 3 %	unit price (e)	amount (e)
I. Class of pipe	Pipe PVC 100mm	600	103	1,000	103,000
	75	200	35	878.4	30,744
	64	1,200	206	780	160,680
	50	1,450	249	534	132,966
	38	470	81	342	27,702
	25	840	145	185	26,825
	12	360	62	108	6,696
Sub total (A)		5,120	881		488,613
II. Accessory total (B)	(A) × 20 %				97,723 586,336
III. Reserve Grand total (C)	(B) × 10 %				58,634 644,970
IV. Tank	High tank 5m				40,000
	" Low tank 32m				73,200
Pump & Moter	head 30m	82ℓ /min	1.5HP	HP/Per 12,437.8	18,333
"	" 40m	82ℓ /min	2.0HP	" 12,437.8	25,000
Deep Well	" 40m		40m	5,000	200,000
Sub total(D)					356,533
Reserve total (E)	(D) × 10 %				35,653 392,186
Grand Total (F)	(C) + (E)				1,037,156
V. Construction Cost	(e 32,000 / Mon × 8 Month - 10%				281,600
Incidental expenses	G × 12 %				33,792
Overhead expenses	G × 30 %				84,480
Material expense	(F + e 8,000 × 8 Month) - 10%				1,211,271
Grand Total					1,611,143 ≐ 1,620,000

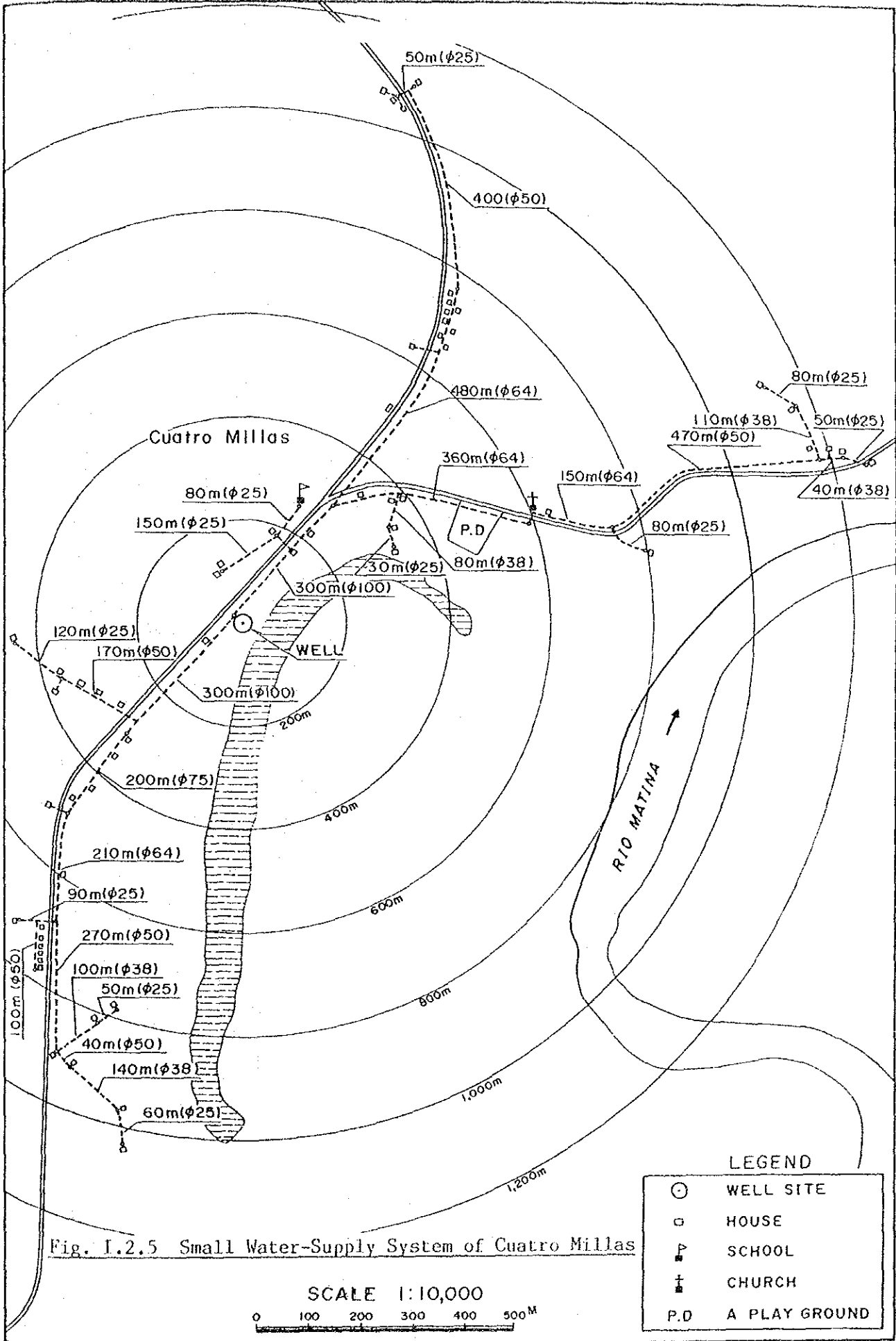
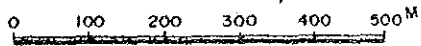
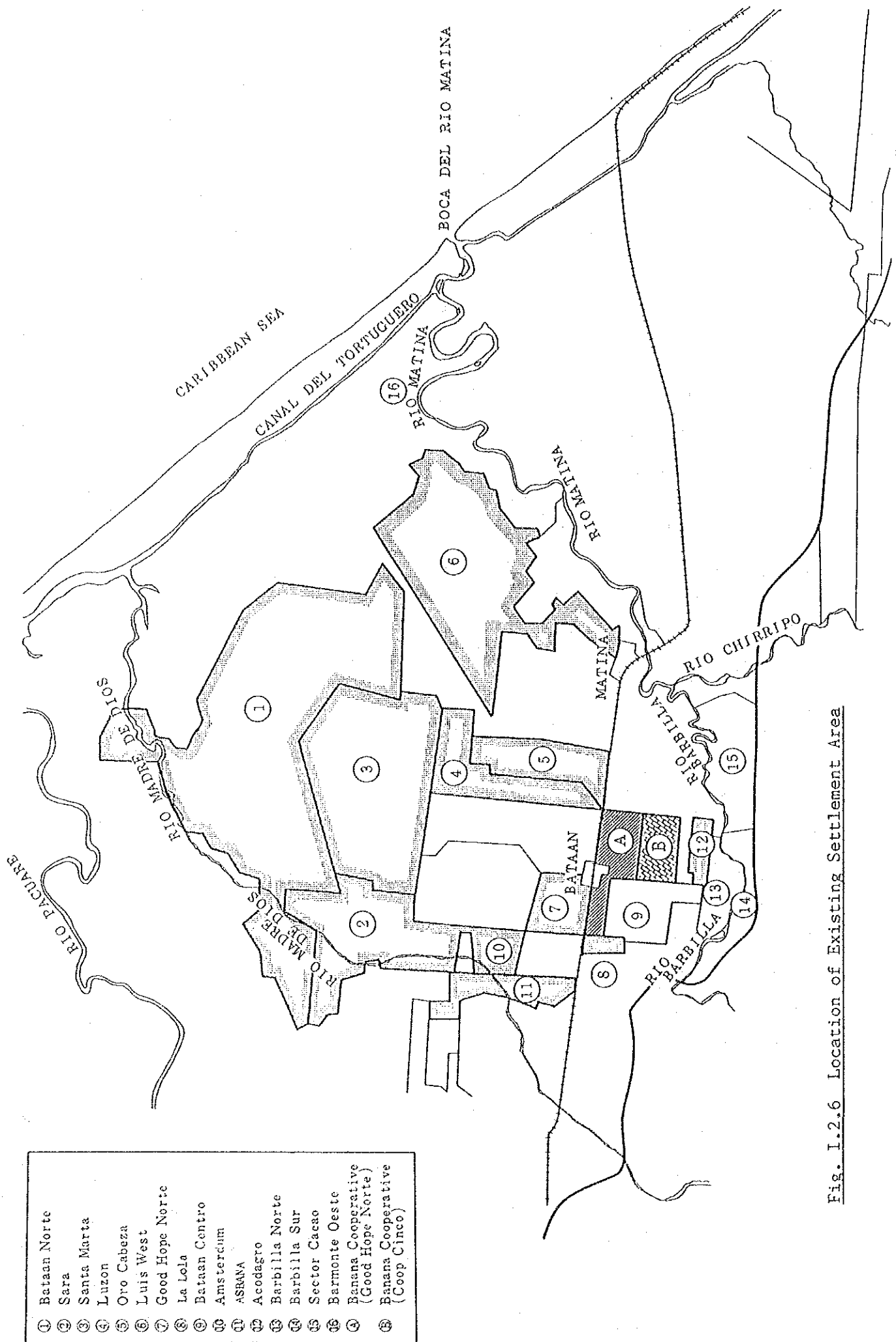


Fig. I.2.5 Small Water-Supply System of Cuatro Millas

SCALE 1:10,000





- ① Bataan Norte
- ② Sara
- ③ Santa Marta
- ④ Luzon
- ⑤ Oro Cabeza
- ⑥ Luis West
- ⑦ Good Hope Norte
- ⑧ La Lola
- ⑨ Bataan Centro
- ⑩ Amsterdum
- ⑪ ASRANA
- ⑫ Acodagro
- ⑬ Barbilla Norte
- ⑭ Barbilla Sur
- ⑮ Sector Cacao
- ⑯ Barmonte Oeste
- ⑰ Banana Cooperative (Good Hope Norte)
- ⑱ Banana Cooperative (Coop Cinco)

Fig. I.2.6 Location of Existing Settlement Area

Annex J Road

Annex J. Road

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Table J.1 Design Norm of Road

Table J.2 Actual Situation of Existing Roads

Table J.3 Planning Road Network

J.1 Existing Road Conditions

Table J.1.1 shows the conditions of the roads in a planning area classified into four classes.

Class	Classification
A	National Road Route No. 32
B	Road with 6 m or more effective width
C	Road with 4 m or more and 6 m or less effective width
D	Road with less than 4 m effective width

J.2 Road Network Improvement Plan

J.2.1 Planning Standard

The roads planned in the Area are classified into four classes based on the design standards of MOPT.

Table J.1 Design Norm of Road

Description	Class	D.T.V.D	Effective width(m)	Right of way	Pavement
Main Road	Class III	400-1999	6.5	25.0	Bitumen Pavement
Trunk Road	Class IV	100- 399	6.0	20.0	Gravel Pavement
Lateral Road	Class V	50- 99	4.0	20.0	Gravel Pavement
Farm Road	Class VI	° 50	3.0	20.0	Gravel Pavement

(Note) D.T.V.D ; Design traffic volume per day

J.2.2 Road Network Improvement Plan

The road network planned in this area consists of principal roads connecting a main road starting from National Road Route No.32 with main villages in each district and branch road connecting these principal roads each other.

Fig.3.5.1 in the Main Report shows the planning road network and Table J.2 shows the distance of existing road.

Table J.2 Actual Situation of Existing Roads

Section	Distance	Classification	Remarks
1. National Road Route 32	15.7	A	
2. R32 - Matina	4.3	B	
3. Matina - Cuatro Millas	5.9	C	
4. Cuatro Millas - Rio Matina	6.0	D	
5. Siete Millas	1.3	D	
6. Cuatro Millas - Qda. Lyon	5.7	D	
7. Matina - Luisa	3.4	D	
8. Matina - Bataan	5.3	C	
9. R32 - Bataan	5.3	B	
10. R32 - Davao	3.1	C	
11. Margarita - Santa Marta	5.0	C	
12. Margarita - Luzon - Sta. Marta	6.9	D	
13. 24 Millas	1.3	D	
14. Luzon	0.4	D	
15. Margarita	0.6	E	
16. Santa Marta	2.4	E	
17. Sta. Marta - San Juan Goschen	3.5	D	
18. Bataan	1.9	E	
19. Bataan - 28 Millas	4.0	C	
20. R32 - Rio Madre de Dios	3.8	C	
21. La Lola	2.2	E	
22. ASBANA	1.4	E	
23. Bataan - Sara	5.9	C	
24. Sara - Rio Madre de Dios	2.1	C	
25. Sara	7.6	E	
26. Sara - Goschen	8.3	C	
27. Goschen - Canal Principal	5.1	D	
28. Goschen	1.6	E	
	15.7	A	
	9.6	B	
	43.4	C	
	33.6	D	
	17.7	E	
Total	120.0		

Table J.3 Planning Road Network

Description	Section	Distance (Km)			Remarks
		Existing	Rehabili.	Cons. Total	
Main Road	N.R. 32 - LA. PENA - SANTA MARTA - SARA	-	10.6	5.4	N.R. 804, 805, 808
Sub Total		-	10.6	5.4	16.0
Trunk Road					16.0
No. 1	LA PENA - MATINA	-	1.7	-	N.R. 808
No. 2	BATAAN - MATINA - CUATRO MILLAS - BATAAN	4.0	24.7	3.1	N.R. 804, 805
No. 3	N.R. 32 - BATAAN	5.0	-	-	N.R. 804
No. 4	N.R. 32 - RIO MADRE DE DIOS	-	3.7	-	
No. 5	BATAAN - VEINTIOCHO MILLAS	-	2.5	-	
No. 6	GOSCHEN	-	2.8	-	
No. 7	CANAL PRINCIPAL	-	-	5.1	
Sub Total		9.0	35.4	8.2	52.6
Lateral Road					
No. 1	CUATRO MILLAS - RIO MATINA	-	5.8	-	
No. 2	HILDA	-	-	2.9	
No. 3	HILDA - VEINTITRES MILLA	-	-	8.3	
No. 4	LUISA - MATINA	-	3.3	1.4	
No. 5	VEINTICUATRO MILLAS - LUZON - SANTA MARTA	-	6.9	-	
No. 6	SANTA MARTA	-	3.5	-	
No. 7	CANAL SARA - HELVETIA	-	-	5.8	
No. 8	GOSCHEN - SANTA MARTA - AGRO LUZON	-	-	8.3	
No. 9	CANAL SARA - BATAAN NORTE	1.4	0.2	6.1	
No. 10	BATAAN	1.3	-	-	
No. 11	RIO MADRE DE DIOS	-	-	15.4	
No. 12	RIO MADRE DE DIOS - DAVAO	-	-	5.9	
No. 13	VEINTICUATRO MILLAS - DAVAO	-	-	3.2	
No. 14	N.R. 32 - DAVAO	3.1	-	-	
No. 15	N.R. 32 - RIO BARBILLA	-	-	1.5	
Sub Total		5.8	19.7	58.8	84.3
Total		14.8	65.7	72.4	152.9
National Road		15.7	-	-	15.7
Grand Total		20.5	65.7	72.4	168.6

**Annex K Project Implementation and Operation
& Maintenance**

Annex K. Project Implementation and Operation
& Maintenance

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K.1 Project Implementation

K.1.1 Construction Volume

The construction volume of the Project is calculated follows;

Item	Unit	Volume
1) Drainage Canal Work		
Length	km	141
Excavation	m3	4,035,000
2) Flood Protection Work		
Length	km	57
Excavation	m3	1,768,000
Embankment	m3	965,000
3) Road Work		
Length	km	138
Excavation	m3	552,000
Embankment	m3	163,000
Bridge	place	38
4) Land Consolidation Work		
Area	ha	9,690
Excavation	m3	1,161,000
Embankment	m3	124,000

K.1.2 Construction Schedule

1) Construction period

Construction period is decided to be two and a half years,

taking into consideration total quantities of construction and similar kind of construction works.

Construction seasons of each civil work are arranged considering the construction equipment and relationship among each work.

2) Working hours and days

The construction works are planned to be carried out with net working hours of seven hours per day and 25 working days per month except the earth work that will be carried out with 22 working days per month due to suspension by rainfall.

3) Implementation schedule of the Project

The construction will be commenced from the third year after completion of the feasibility Study taking into consideration the loan procedures, details design and tendering for contract.

In the beginning of the road construction, the drainage canal and the flood protection works will be commenced. After that, the lateral drainage canal and lateral road works will be commenced.

K. 2 Operation & Maintenance

1) Precondition

The operation and maintenance office will be placed in Bataan. Building and motor pool will be used the same one of construction work.

Operation and maintenance work will be carried out by the contract method under the supervision of SENARA.

SENARA will be stationed the minimum at this office in order to operation and maintenance work for the facilities.

The beneficiaries - farmers and banana plantations - will be burdened with all the cost required to operation and maintenance work including administration cost. The major O & M equipment will belong to SENARA.

2) Staff personnel

Charge	Person	Salary (month)	Salary (year)
Chief	1	¢ 48,327.50	¢ 579,930
Engineer	2	46,157.50	1,107,780
Technician	2	14,850.00	356,400
Mechanic	1	16,750.00	201,000
Clerk	7	12,850.00	1,079,400
Driver	10	11,650.00	1,398,000
Guardman	1	11,450.00	137,400
Office worker	1	11,450.00	137,400
Total			¢ 4,997,310

3) Vehicles

Item	Unit	Unit price	Total	Running cost <u>1/</u> (Annually)
Pickup	3	Ø 850,000	Ø 2,550,000	Ø 206,000
Motorcycle	2	Ø 137,500	Ø 275,000	Ø 31,000
Total			Ø 2,825,000	Ø 237,000

Note: 1/ Included fuel and cost of repairing
The life; Pickup : 5 years
Motorcycle: 3 years

4) Office supplies

Stationary, etc.: C 100,000 annually.

5) Operation & maintenance equipment

Equipment	Unit	Life (year)	Price (Ø)	Annual running cost (Ø)
Backhoe 0.7 m ³	1	15	10,048,000	1,305,000
Motorgrader	1	15	6,161,000	902,000
Dragline 1.6 m ³	1	15	28,135,000	2,349,000
Dump track	1	8	2,036,000	1,444,000
Bulldozer	1	15	5,606,000	923,000
Total				6,923,000

The equipment for operation & maintenance will be replaced in the course of its life.

6) Operation & maintenance cost

According to the cost calculated based on the operation and maintenance plan, the amount to be borne per ha is estimated at Ø1,282.

Table K.2 Annual Operation and Maintenance Cost

Unit:  1,000

Item	Cost
Administrative personnel cost	4,997
Administrative mobil running cost	237
Office supplies	100
Running cost of O/M equipment	6,923
Reserve	368
Total	12,625

Table K.3 Replacement Cost of O & M Equipment

Unit:  1,000

Equipment	Spec.	Life	Replacement cost
Backhoe	0.70 m ³	15	10,048
Motorgrader	180 ps	15	6,161
Drumline	1.62 m ³	15	28,135
Dumptruck	13.5 t	15	2,036
Bulldozer	11 t	8	5,606
Pickup	1 t	5	2,550
Motorcycle	125 cc	3	275

Annex L Cost Estimation

Annex L. Cost Estimation

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Table L.2.1	Personnel Expenses of Site Office
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L.1 Project Cost

L.1.1 Condition of Cost Estimation

The Project cost is estimated under the following conditions.

1) Equipment Cost

The construction works will be executed on the contract basis. The Construction machinery and equipment required for the construction will be provided by the contractor. Accordingly, only depreciation costs of machinery and equipment are included in the equipment cost.

2) Basic Unit Price

The basic rate of labor, material and construction equipment is estimated in the prevailing rate in the Republic of Costa Rican. Detailed basic rate is shown in Table L.1.1. and L.1.2.

3) Construction Cost

The construction cost is divided into the foreign and local currency portion. The local currency portion is estimated on the basis of the current price in the Republic of Costa Rican as of December, 1987. The construction cost is estimated based on unit cost of individual working items.

4) Physical Contingency

The physical contingency is set at 5% of the cost.

L.1.2 Project Cost

The estimated project cost is shown in Table L.1.3 and breakdown in Table L.1.3(1) to (5).

Table L.1.1 Labor Rates

Unit: Colon

<u>Description</u>	<u>Rate/hr</u>
Labor	55
Driver (Heavy equipment)	110
Skilled labor	90
Foreman	120
Assistant	70

Table L.1.2 Unit Price of Construction Material

Unit : Colon

<u>Description</u>	<u>Unit</u>	<u>Total</u>
Cement	sack	175
Reinforce Bar	Kg	34
Diesel	lt.	19
Concrete Pipe		
40 cm	m	1,776
60 cm	m	3,376
70 cm	m	3,836
80 cm	m	5,140
90 cm	m	5,920
100 cm	m	6,998
120 cm	m	9,204

Table L.1.3 Project Cost

Description	Cost (₹)			Remarks
	F/C	L/C	Total	
1. Land Purchasing				
Inside		82,497,000	82,497,000	
Outside		43,988,000	43,988,000	
Whole		126,485,000	126,485,000	
2. Civil Work				
2.1 Drainage Canal				
Inside	779,509,903	176,595,778	956,105,680	
Outside	225,617,118	43,998,939	269,616,056	
Whole	1,005,127,020	220,594,716	1,225,721,736	
2.2 Flood Protection Work				
Inside	449,163,689	74,006,294	523,169,983	
Outside	231,703,888	38,712,632	270,416,520	
Whole	680,867,577	112,718,926	793,586,503	
2.2 Road Work				
Inside	223,685,971	64,932,387	288,618,359	
Outside	7,390,828	3,651,134	11,041,961	
Whole	231,076,799	68,583,521	299,660,320	
2.3 Land Consolidation	232,046,620	89,374,160	321,420,780	
2.4 Total (2.1 - 2.3)				
Inside	1,684,406,183	404,908,619	2,089,314,802	
Outside	464,711,833	86,362,704	551,074,537	
Whole	2,149,118,016	491,271,323	2,640,389,339	
3. Other Facilities				
Water Supply Faci.	782,665	7,217,335	8,000,000	
Processing Faci.	110,682,000	12,298,000	122,980,000	
Agri. Machinery Center	79,310,000	0	79,310,000	
Sub Total	190,774,665	19,515,335	210,290,000	
4. Engineering & Supervising				
Inside	192,314,700	21,368,300	213,683,000	
Outside	49,596,300	5,510,700	55,107,000	
Total	241,911,000	26,879,000	268,790,000	
5. Administration Cost				
Inside	649,980	10,145,637	10,795,616	
Outside	199,667	3,116,633	3,316,300	
Whole	849,647	13,262,270	14,111,917	
6. Total (1 - 5)				
Inside	2,068,345,195	541,551,524	2,609,896,718	
Outside	514,308,133	135,861,404	650,169,537	
Whole	2,582,653,328	677,412,928	3,260,066,256	
7. Price Escalation				
Inside	283,363,292	74,192,559	357,555,850	
Outside	70,460,214	18,613,012	89,073,227	
Whole	353,823,506	92,805,571	446,629,077	
8. Grand Total (6-7)				
Inside	2,351,708,486	615,744,082	2,967,452,569	
Outside	584,768,347	154,474,417	739,242,764	
Whole	2,936,476,834	770,218,499	3,706,695,333	

Table L.1.3 (1) Land Purchasing Prices

Description	Unit	Quantity	Cost (¢)			Remarks
			F/C	L/C	Total	
1. Drainage canal						
(1) Principal Canal No.1	ha	77.3		4,469,000	4,469,000	
- do - No.2	ha	47.4		2,767,000	2,767,000	
- do - No.3	ha	50.8		1,778,000	1,778,000	
- do - No.4	ha	73.4		3,337,000	3,337,000	
- do - No.5	ha	120.8		5,615,500	5,615,500	
- do - No.6	ha	20.1		1,383,500	1,383,500	
- do - No.7	ha	14.1		846,000	846,000	
- do - No.8	ha	7.1		426,000	426,000	
Sub Total	ha	411.0		20,622,000	20,622,000	
(2) Secondary Canal No.1	ha	101.4		7,810,000	7,810,000	
- do - No.2	ha	59.4		2,711,500	2,711,500	
- do - No.3	ha	50.5		1,767,500	1,767,500	
- do - No.4	ha	87.8		4,563,000	4,563,000	
- do - No.5	ha	39.7		1,389,500	1,389,500	
- do - No.9	ha	16.5		732,500	732,500	
- do - No.10	ha	5.7		342,000	342,000	
- do - No.11	ha	8.6		759,000	759,000	
Sub Total	ha	369.6		20,075,000	20,075,000	
(3) Total	ha	780.6		40,697,000	40,697,000	
2. Flood Protection Work						
(1) Inside the Area						
Left bank of Rio MATINA	ha	318.0		35,380,000	35,380,000	
Left bank of Rio BARBILLA	ha	35.0		1,700,000	1,700,000	
Right bank of Rio BARBILLA	ha	37.0		2,220,000	2,220,000	
Left bank of Rio CHIRRIPO	ha	4.0		240,000	240,000	
Sub Total	ha	394.0		39,540,000	39,540,000	
(2) Outside the Area						
Right bank of Rio MATINA	ha	277.0		40,940,000	40,940,000	
Right bank of Rio CHIRRIPO	ha	4.0		240,000	240,000	
Sub Total	ha	281.0		41,180,000	41,180,000	
(3) Total	ha	675.0		80,720,000	80,720,000	
3. Road Works						
Main Roads	ha	10.8		378,000	378,000	
Trunk Roads	ha	16.4		574,000	574,000	
Lateral Roads	ha	117.6		4,116,000	4,116,000	
Total	ha	144.8		5,068,000	5,068,000	
4. Grand Total	ha	1,600.4		126,485,000	126,485,000	

Table L.1.3 (2) Drainage Canal

Description	Unit	Quantity	Cost (¢)			Remarks
			F/C	L/C	Total	
1. Principal canal						
No.1	Km	11.75	117,944,867	25,491,064	143,435,930	
No.2	Km	11.70	40,569,642	10,557,027	51,126,669	
No.3	Km	9.50	52,685,947	12,279,134	64,965,081	
No.4	Km	11.60	96,972,214	21,682,707	118,654,921	
No.5	Km	14.40	451,234,235	87,997,877	539,232,111	
No.6	Km	2.65	42,156,600	8,507,549	50,664,148	
No.7	Km	1.90	39,797,401	8,039,868	47,837,269	
No.8	Km	1.00	13,971,725	2,928,052	16,899,777	
Sub Total	Km	64.50	855,332,629	177,483,277	1,032,815,906	
2. Secondary Canal						
No.1	Km	23.05	42,769,783	11,797,532	54,567,315	
No.2	Km	11.60	23,952,255	7,125,923	31,078,178	
No.3	Km	9.60	21,475,267	6,081,216	27,556,483	
No.4	Km	18.70	36,640,096	10,290,982	46,931,078	
No.5	Km	7.40	9,445,864	3,701,579	13,147,443	
No.9	Km	3.35	8,146,378	2,173,983	10,320,361	
No.10	Km	1.15	4,015,770	1,003,855	5,019,625	
No.11	Km	1.60	3,348,977	936,370	4,285,347	
Sub Total		76.45	149,794,391	43,111,439	192,905,830	
3. Total	Km	140.95	1,005,127,020	220,594,716	1,225,721,736	

Table L.1.3 (3) Flood Protection Works

Description	Unit	Quantity	Cost (¢)			Remarks
			F/C	L/C	Total	
1. Inside the Area						
Left bank of Rio MATINA	Km	16.40	225,691,415	37,550,078	263,241,493	
Left bank of Rio BARBILLA	Km	9.50	107,413,745	17,453,826	124,867,571	
Right bank of Rio BARBILLA	Km	9.50	108,215,045	17,583,602	125,798,646	
Left bank of Rio CHIRRIPO	Km	2.15	7,843,484	1,418,788	9,262,272	
Sub Total	Km	37.55	449,163,688	74,006,294	523,169,982	
2. Outside the Area						
Right bank of Rio MATINA	Km	16.40	222,941,570	37,156,492	260,098,062	
Right bank of Rio CHIRRIPO	Km	2.15	8,762,318	1,556,141	10,318,459	
Sub Total	Km	18.55	231,703,889	38,712,632	270,416,521	
3. Total	Km	56.10	680,867,577	112,718,926	793,586,503	

Table L.1.3 (4) Road Works

Description	Unit	Quantity	Cost (₹)			Remarks
			F/C	L/C	Total	
1. Road work						
Main Road	Km	16.0	20,532,724	3,159,878	23,692,602	
Trunk Roads	Km	43.6	42,856,022	6,733,707	49,589,729	
Lateral Roads	Km	138.1	77,445,572	12,250,008	89,695,580	
Sub Total	Km	197.7	140,834,318	22,143,593	162,977,910	
2. Bridge						
Bridge	pl.	38	90,242,482	46,439,928	136,682,410	
			231,076,799	68,583,521	299,660,320	

Table L.1.3 (5) Land Consolodation

Description	Unit	Quantity	Amount			Remarks
			F/C	L/C	Total	
1. A little improved area	ha	400	7,163,600	2,897,200	10,060,800	
2. No improved area	ha	7,250	167,634,500	68,527,000	236,161,500	
3. Proposed banana plantation	ha	2,040	57,248,520	17,949,960	75,198,480	
Total	ha	9,690	232,046,620	89,374,160	321,420,780	

L.2 Administration Cost

Table L.2.1 Personnel Expenses of Site Office

<u>Engages</u>	<u>Number</u>	<u>Salary (monthly)</u>	<u>Salary (yearly)</u>
Manager	1	₺ 50,187.50	₺ 602,250.00
Administrator	1	48,327.50	579,930.00
Engineer	1	46,157.50	553,890.00
Technician	2	29,700.00	356,400.00
Person in charge of machinery	1	16,750.00	201,000.00
Person in charge of materials	1	12,650.00	151,800.00
Clerk	2	25,700.00	308,400.00
Driver	2	23,300.00	279,600.00
Servent	1	11,450.00	137,400.00
Guard	2	22,900.00	274,800.00
Total	14	287,122.50	3,445,470.00

(US\$50,116.-)

Table L.2.2 Running Cost of Vehicles

<u>Item</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total</u>	<u>Running cost (yearly)</u>
Jeep	1	US\$15,000.-	US\$12,000.-	US\$714.-
Pickup	3	12,000.-	36,000.-	2,142.-
Motorcycle	3	3,000.-	9,000.-	675.-
Sub-total				3,531.-
* Miscellaneous				5,000.-
Total				8,531.-

Annex M Project Evaluation

Annex M. Project Evaluation

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M.1 Economic Evaluation

The economic evaluation of the Project has been made by the parameters employed in the Master Plan Study, but the followings were employed in the exchange rate and the prices of agricultural input.

- 1) The exchange rate of US\$1.00 = ₪ 68.75 as formal rate of December 24, 1987 is used.
- 2) The prices of agricultural input as of December 1987 is applied. The prices to be used for this study is calculated by multiplying the variation percentage of price index elaborated by the Ministry of Economy, Industry and Commerce. The variation percentage of index between May and December indicates about 8.0%.

As a result of price examination, the prices of agricultural products have not varied much since the Master Plan Study. Hence, the prices used for the Master Plan Study is applied to this economic evaluation.

M.1.1 Project Benefits

- 1) Benefit by agricultural production

Without Project	: ₪ 1,867,149
With Project	: ₪ 866,112
Increased (Benefit)	: ₪ 1,001,037

- 2) Benefit by saving in cost of transportation

Annual benefit : ₪ 16,473,000

- 3) Benefit by reduction of banana's damage loss annual benefit:

₪ 110,603,000

After completion of the project, total amount of annual project benefit in the target period is estimated at ₪ 1,128,113,000

M.1.2 Costs

1) Project costs

Project cost excluding rural communities post-harvest and farm machinery facilities and price contingency is estimated at $\text{C} 2,156,661,000$ calculated by multiplying shadow exchange price factor 0.9 and it will be paid corresponding to the implementation schedule described in Annex K. Annual outlay is estimated as follows:

	unit : $\text{C} 1,000$				
<u>Year</u>	<u>1st year</u>	<u>2nd year</u>	<u>3rd year</u>	<u>4th year</u>	<u>5th year</u>
Project cost	20,446	153,602	363,775	981,084	637,754

2) Operation and maintenance cost

Annual operation and maintenance cost for the facilities after completion of the project is shown in Annex K.

3) Replacement cost

Replacement cost of each replacement period of O & M equipment will be required as described in Annex K.

4) Production cost

Production cost of the project is estimated as follows:

	unit: ¢ 1,000				
Year	1st year	2nd year	3rd year	4th year	5th year
Without Project:	268,737	268,737	268,737	268,737	268,737
With Project :	1,288,561	1,052,734	1,124,914	1,129,850	1,134,849
Increased cost :	1,019,824	783,997	856,177	861,113	866,112

Production of banana is estimated on the assumption that the banana plantation is managed by cooperative.

Details are shown in Table M.1.3.

M.1.3 Economic Internal Rate of Return

Based on the benefit and cost as mentioned above, economic internal rate of return is calculated under the assumption that project life is 50 years. A result of this calculation is EIRR = 23%.

Detail is shown in Table M.1.6.

M.1.4 Benefit and Cost Ratio and Net Present Value

Benefit and cost ration (B/C) and net present value (N.P.V.) with a 8%, 10% and 18% discount rate is calculated as follows:

Discount rate	8%	10%	18%
B/C(%)	1.50	1.40	1.07
N.P.V. (¢ 1,000)	170,270,461	111,496,743	10,632,413

Details are shown in Table M.1.7.

M.1.5 Sensitivity Analysis

Sensitivity analysis have been made considering the parameters employed such as increase in construction cost, reduction in production, and combinations of these parameters.

Case 1. A 20% increase in construction cost	:	20.7 %
Case 2. A 10% reduction in production	:	20.0 %
Case 3. A combination of 1 and 2	:	18.0 %

Detailed analysis is shown in Table M.1.8 (1) to (3).

M.2 Financial Analysis

The foreign currency portion of the project cost will be procured by the international banking institution and the local currency one will be covered under the responsibility of the Costa Rica,

Preconditions of the financing plan are as follows:

(1) Financing

Year	F/C	L/C	Total
1	27,625	4,940	32,565
2	110,263	159,809	270,072
3	510,687	102,018	612,705
4	1,277,030	232,321	1,509,351
5	793,963	248,940	1,042,903
Total	2,719,568	748,028	3,467,596

(2) Interest and amortization

Annual Interest Rate	:	4.0%
Loan Period	:	25 years
Grace Period	:	5 years
Amortization	:	Semi-annual repayment with constant amount uniformity of the principal

Detailed analysis is shown in Main Report, Table 5.2.2.

M.3 Financial Analysis of Model Farmers

Balance of farm household economy of model farmer is presented in Table M.2.1(1) to (5) and M.2.2(1) to (5). Agricultural gross income is calculated based on the estimated yield with the Project and the financial price of crops in 1987. Production costs are also expressed in financial price.

Family labor cost is excluded from the production cost. Farmer's allotment of O & M and withdrawal costs is distributed according to a size of farm land.

Annual interest of farm credit is set up 24% of short period and 15% of long period, and its period of borrowing follows the loan condition of BNCR.

Table M.1.1 Total Amount of Production Value

Unit: Ø1,000

	Without Project	With Project	Incremental Production
Banana	-	1,168,853	1,168,853
Cacao	40,074	295,932	255,858
Coconut	7,488	53,485	45,997
Plantain	14,025	72,250	58,225
Black pepper	-	89,444	89,444
Rice	247,080	370,620	123,540
Maize	5,741	18,453	12,712
Kidney bean	716	17,894	17,178
Tuber crops	20,160	110,880	90,720
Livestock	4,437	9,059	4,622
Total	339,721	2,206,870	1,867,149

Table M.1. 2 Total Amount of Production Cost

Unit:Ø1,000

Crops	Without Project	With Project	Incremental Production Cost
Banana	-	563,927	563,927
Cacao	34,596	120,612	86,016
Coconut	5,255	31,481	26,226
Plantain	11,303	47,871	36,568
Black pepper	-	24,898	24,898
Rice	191,064	245,195	54,131
Maize	5,077	12,688	7,611
Kidney bean	676	12,313	11,637
Tuber crops	17,841	69,984	52,143
Livestock	2,925	5,880	2,955
Total	268,737	1,134,849	866,112

Table M. 1.4 Return and Production Cost of Livestock per Head

Unit: Ø1,000

Item	Production	Target Yield (t/head)	Unit Price (per t)	Gross Income	NPV
Without Project	96 t	0.25	46,218	4,437	1,512
With Project	196 t	0.25	43,218	9,059	3,179

Table M 1. 5 Benefit by Saving in Cost of Transportation

1. Condition

	Capacity	Velocity	Transported Distance
Without Project	2 ton truck	15 km	8 km
With Project	8 ton truck	30 km	3 km

2. Cost

Description	Without Project	With Project
Capacity (90%)	1.8 ton	7.2 ton
Traveling hour	0.53 hour	0.1 hour
Traveling hour per ton	0.29 hr/ton	0.01 hr/ton
Depreciation	US\$2.62	US\$7.14
Fuel	1.31	3.48
Driver	1.02	1.02
Operating cost per hour	4.95	11.64
Transporting cost per ton	1.44	0.12

3. Benefit by saving in cost of transportation

$$1.44 - 0.12 = 1.32 \text{ US\$/ton (90.75 \text{ \textcent}/\text{ton})}$$

Year	Production(t)	Farm Input(t)	Total (t)	Benefit (¢1,000)
1	87,682	11,080	98,762	8,963
2	151,244	11,080	162,324	14,731
3	158,731	11,080	169,511	15,383
4	165,658	11,080	176,738	16,039
5	168,141	11,080	179,221	15,357
6	168,696	11,080	179,776	16,315
7	170,446	11,080	181,526	16,473

Table M.1.3 Agricultural Return and Production Cost per Ha
(Economic)

	Production Cost										Target Yield (t/ha)	Unit Price (t)	Gross Income (A)	M.P.V (B)	B/A (%)	
	Seed	Fert.	Agro. Chem.	Labor	Mach.	Others	Total									
1. Banana																
With Project	(76,000)	129,754	234,281	80,200		18,000	462,235				49.0	18,810	921,690	459,455	50	
2. Cacao																
Without Project	(14,664)	5,440	3,168	12,822		1,035	22,465				0.25	102,754	25,688	3,223	13	
With Project	(16,188)	11,328	4,931	24,585		1,035	41,879				1.0		102,754	60,875	59	
3. Coconut																
Without Project	(5,600)	7,170	2,303	6,795		155	16,423				2.2	10,697	23,533	7,110	30	
With Project	(11,360)	30,167	7,109	24,959		726	62,961				10.0		106,970	44,009	41	
4. Plantain																
Without Project	(7,600)															
Without Project	3,000	2,583	18,629	12,128		1,335	37,675				5.5	8,500	46,750	9,075	19	
With Project	5,400	16,851	37,258	33,080		3,152	95,741				17.0		144,500	48,759	34	
5. Black pepper																
With Project	(178,750)	44,521	7,225	83,998		2,578	138,322				2.2	223,509	491,940	353,618	72	
6. Rice																
Without Project	5,036	5,221	7,880	7,296	6,943	566	32,942				3.0	14,200	38,340	5,398	14	
With Project	5,283	6,731	13,523	8,442	7,568	728	42,275				(2.7)		58,220	15,945	27	
7. Maize																
Without Project	705	4,614	1,051	7,839		298	14,507				1.2	13,669	16,402	1,895	12	
With Project	1,015	5,562	1,810	8,140	5,983	960	23,497				2.5		34,172	10,675	31	
8. Kidney bean																
Without Project	1,857	2,579	2,871	9,292		305	15,904				0.5	35,788	17,894	990	5	
With Project	3,280	3,804	7,701	12,770	7,583	2,373	37,311				1.5		53,582	16,371	30	
9. Tuber crops																
Without Project	7,700	4,725	8,697	33,854	10,368	8,995	74,339				6.0	14,000	84,000	9,561	12	
With Project	9,450	6,160	13,244	48,983	10,368	8,995	97,200				11.0		154,000	56,800	37	

Table M.1.6 Estimation of EIRR (Original)

(UNIT : ₱ 1,000)

YEAR	PROJECT COSTS				INCREMENTAL BENEFIT	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	PRODUCTION COST	TOTAL		
1	20,446	0	0	20,446	0	-20,446
2	153,602	0	0	153,602	0	-153,602
3	363,775	0	0	363,775	0	-363,775
4	981,084	0	0	981,084	0	-981,084
5	637,754	0	0	637,754	0	-637,754
6	0	12,625	1,019,824	1,032,449	222,202	-810,247
7	0	12,625	783,997	796,622	1,498,253	701,631
8	0	12,900	856,177	869,077	1,664,254	795,177
9	0	12,625	861,113	873,738	1,779,534	905,796
10	0	15,175	866,112	881,287	1,969,178	1,087,891
11	0	12,900	866,112	879,012	1,975,347	1,096,335
12	0	12,625	866,112	878,737	1,994,225	1,115,488
13	0	14,661	866,112	880,773	1,994,225	1,113,452
14	0	12,900	866,112	879,012	1,994,225	1,115,213
15	0	15,175	866,112	881,287	1,994,225	1,112,938
16	0	12,625	866,112	878,737	1,994,225	1,115,488
17	0	12,900	866,112	879,012	1,994,225	1,115,213
18	0	12,625	866,112	878,737	1,994,225	1,115,488
19	0	12,625	866,112	878,737	1,994,225	1,115,488
20	0	65,475	866,112	931,587	1,994,225	1,062,638
21	0	14,661	866,112	880,773	1,994,225	1,113,452
22	0	12,625	866,112	878,737	1,994,225	1,115,488
23	0	12,900	866,112	879,012	1,994,225	1,115,213
24	0	12,625	866,112	878,737	1,994,225	1,115,488
25	0	15,175	866,112	881,287	1,994,225	1,112,938
26	0	12,900	866,112	879,012	1,994,225	1,115,213
27	0	12,625	866,112	878,737	1,994,225	1,115,488
28	0	12,625	866,112	878,737	1,994,225	1,115,488
29	0	14,936	866,112	881,048	1,994,225	1,113,177
30	0	15,175	866,112	881,287	1,994,225	1,112,938
31	0	12,625	866,112	878,737	1,994,225	1,115,488
32	0	12,900	866,112	879,012	1,994,225	1,115,213
33	0	12,625	866,112	878,737	1,994,225	1,115,488
34	0	12,625	866,112	878,737	1,994,225	1,115,488
35	0	65,475	866,112	931,587	1,994,225	1,062,638
36	0	12,625	866,112	878,737	1,994,225	1,115,488
37	0	14,661	866,112	880,773	1,994,225	1,113,452
38	0	12,900	866,112	879,012	1,994,225	1,115,213
39	0	12,625	866,112	878,737	1,994,225	1,115,488
40	0	17,211	866,112	883,323	1,994,225	1,110,902
41	0	12,900	866,112	879,012	1,994,225	1,115,213
42	0	12,625	866,112	878,737	1,994,225	1,115,488
43	0	12,625	866,112	878,737	1,994,225	1,115,488
44	0	12,900	866,112	879,012	1,994,225	1,115,213
45	0	65,200	866,112	931,312	1,994,225	1,062,913
46	0	12,625	866,112	878,737	1,994,225	1,115,488
47	0	12,900	866,112	879,012	1,994,225	1,115,213
48	0	14,661	866,112	880,773	1,994,225	1,113,452
49	0	12,625	866,112	878,737	1,994,225	1,115,488
50	0	15,450	866,112	881,562	1,994,225	1,112,663
51	0	12,625	866,112	878,737	1,994,225	1,115,488
52	0	12,625	866,112	878,737	1,994,225	1,115,488
TOTAL	2,156,661	782,741	40,763,927	43,703,329	90,871,993	47,168,664

INTERNAL RATE OF RETURN (IRR) = 23.0%

Table M.1.7 Estimation of B/C and NPV

(UNIT : THOUSAND ₪)

YEAR	PROJECT COSTS	INCREMENTAL BENEFITS	PROJECT RETURN	NET PRESENT VALUE		
				DIS. RATE	DIS. RATE	DIS. RATE
				8.00%	10.00%	18.00%
1	20,446	0	-20,446	-18,931	-18,587	-17,327
2	153,602	0	-153,602	-150,620	-145,531	-127,642
3	363,775	0	-363,775	-439,397	-418,841	-349,046
4	981,084	0	-981,084	-1,160,523	-1,088,934	-855,079
5	637,754	0	-637,754	-1,594,567	-1,484,929	-1,133,847
6	1,032,449	222,202	-810,247	-2,105,160	-1,942,293	-1,433,988
7	796,622	1,498,253	701,631	-1,695,766	-1,582,245	-1,213,728
8	869,077	1,664,254	795,177	-1,266,156	-1,211,289	-1,002,181
9	873,738	1,779,534	905,796	-813,033	-827,143	-797,964
10	881,287	1,969,178	1,087,891	-309,129	-407,714	-590,106
11	879,012	1,975,347	1,096,335	161,071	-23,455	-412,589
12	878,737	1,994,225	1,115,488	604,046	331,974	-259,522
13	880,773	1,994,225	1,113,452	1,013,460	654,501	-130,041
14	879,012	1,994,225	1,115,213	1,393,147	948,171	-20,138
15	881,287	1,994,225	1,112,938	1,743,991	1,214,600	72,810
16	878,737	1,994,225	1,115,488	2,069,592	1,457,363	151,760
17	879,012	1,994,225	1,115,213	2,370,999	1,678,002	218,650
18	878,737	1,994,225	1,115,488	2,650,149	1,878,632	275,351
19	878,737	1,994,225	1,115,488	2,908,621	2,061,023	323,403
20	931,587	1,994,225	1,062,638	3,136,608	2,218,977	362,195
21	880,773	1,994,225	1,113,452	3,357,802	2,369,439	396,642
22	878,737	1,994,225	1,115,488	3,562,985	2,506,472	425,887
23	879,012	1,994,225	1,115,213	3,752,923	2,631,017	450,666
24	878,737	1,994,225	1,115,488	3,928,835	2,744,268	471,669
25	881,287	1,994,225	1,112,938	4,091,343	2,846,987	489,429
26	879,012	1,994,225	1,115,213	4,242,122	2,940,560	504,509
27	878,737	1,994,225	1,115,488	4,381,767	3,025,647	517,293
28	878,737	1,994,225	1,115,488	4,511,067	3,102,998	528,126
29	881,048	1,994,225	1,113,177	4,630,542	3,173,172	537,288
30	881,287	1,994,225	1,112,938	4,741,142	3,236,953	545,051
31	878,737	1,994,225	1,115,488	4,843,785	3,295,069	551,645
32	879,012	1,994,225	1,115,213	4,938,801	3,347,888	557,231
33	878,737	1,994,225	1,115,488	5,026,801	3,395,917	561,966
34	878,737	1,994,225	1,115,488	5,108,282	3,439,580	565,980
35	931,587	1,994,225	1,062,638	5,180,153	3,477,393	569,219
36	878,737	1,994,225	1,115,488	5,250,010	3,513,478	572,101
37	880,773	1,994,225	1,113,452	5,314,574	3,546,223	574,539
38	879,012	1,994,225	1,115,213	5,374,451	3,576,038	576,609
39	878,737	1,994,225	1,115,488	5,429,906	3,603,149	578,363
40	883,323	1,994,225	1,110,902	5,481,041	3,627,695	579,843
41	879,012	1,994,225	1,115,213	5,528,573	3,650,095	581,103
42	878,737	1,994,225	1,115,488	5,572,595	3,670,464	582,171
43	878,737	1,994,225	1,115,488	5,613,356	3,688,982	583,075
44	879,012	1,994,225	1,115,213	5,651,088	3,705,812	583,842
45	931,312	1,994,225	1,062,913	5,684,387	3,720,394	584,461
46	878,737	1,994,225	1,115,488	5,716,744	3,734,306	585,012
47	879,012	1,994,225	1,115,213	5,746,697	3,746,951	585,478
48	880,773	1,994,225	1,113,452	5,774,388	3,758,428	585,873
49	878,737	1,994,225	1,115,488	5,800,074	3,768,880	586,208
50	881,562	1,994,225	1,112,663	5,823,797	3,778,358	586,492
51	878,737	1,994,225	1,115,488	5,845,819	3,786,997	586,732
52	878,737	1,994,225	1,115,488	5,866,210	3,794,850	586,936
TOTAL	43,703,329	90,871,993	47,168,664	170,270,461	111,496,743	10,632,413

B/C (Original) = 2.08 B/C (10 % Dis. rate) = 1.40
 B/C (8 % Dis. rate) = 1.50 B/C (18 % Dis. rate) = 1.07

Table M.1.8 Estimation of Sensitivity Analysis (Case 1)
(UNIT : THOUSAND ₱)

YEAR	PROJECT COSTS			TOTAL	INCREMENTAL BENEFIT	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	PRODUCTION COST			
1	24,535	0	0	24,535	0	-24,535
2	184,322	0	0	184,322	0	-184,322
3	436,530	0	0	436,530	0	-436,530
4	1,177,301	0	0	1,177,301	0	-1,177,301
5	765,305	0	0	765,305	0	-765,305
6	0	12,625	1,019,824	1,032,449	222,202	-810,247
7	0	12,625	783,997	796,622	1,498,253	701,631
8	0	12,900	856,177	869,077	1,664,254	795,177
9	0	12,625	861,113	873,738	1,779,534	905,796
10	0	15,175	866,112	881,287	1,969,178	1,087,891
11	0	12,900	866,112	879,012	1,975,347	1,096,335
12	0	12,625	866,112	878,737	1,994,225	1,115,488
13	0	14,661	866,112	880,773	1,994,225	1,113,452
14	0	12,900	866,112	879,012	1,994,225	1,115,213
15	0	15,175	866,112	881,287	1,994,225	1,112,938
16	0	12,625	866,112	878,737	1,994,225	1,115,488
17	0	12,900	866,112	879,012	1,994,225	1,115,213
18	0	12,625	866,112	878,737	1,994,225	1,115,488
19	0	12,625	866,112	878,737	1,994,225	1,115,488
20	0	65,475	866,112	931,587	1,994,225	1,062,638
21	0	14,661	866,112	880,773	1,994,225	1,113,452
22	0	12,625	866,112	878,737	1,994,225	1,115,488
23	0	12,900	866,112	879,012	1,994,225	1,115,213
24	0	12,625	866,112	878,737	1,994,225	1,115,488
25	0	15,175	866,112	881,287	1,994,225	1,112,938
26	0	12,900	866,112	879,012	1,994,225	1,115,213
27	0	12,625	866,112	878,737	1,994,225	1,115,488
28	0	12,625	866,112	878,737	1,994,225	1,115,488
29	0	14,936	866,112	881,048	1,994,225	1,113,177
30	0	15,175	866,112	881,287	1,994,225	1,112,938
31	0	12,625	866,112	878,737	1,994,225	1,115,488
32	0	12,900	866,112	879,012	1,994,225	1,115,213
33	0	12,625	866,112	878,737	1,994,225	1,115,488
34	0	12,625	866,112	878,737	1,994,225	1,115,488
35	0	65,475	866,112	931,587	1,994,225	1,062,638
36	0	12,625	866,112	878,737	1,994,225	1,115,488
37	0	14,661	866,112	880,773	1,994,225	1,113,452
38	0	12,900	866,112	879,012	1,994,225	1,115,213
39	0	12,625	866,112	878,737	1,994,225	1,115,488
40	0	17,211	866,112	883,323	1,994,225	1,110,902
41	0	12,900	866,112	879,012	1,994,225	1,115,213
42	0	12,625	866,112	878,737	1,994,225	1,115,488
43	0	12,625	866,112	878,737	1,994,225	1,115,488
44	0	12,900	866,112	879,012	1,994,225	1,115,213
45	0	65,200	866,112	931,312	1,994,225	1,062,913
46	0	12,625	866,112	878,737	1,994,225	1,115,488
47	0	12,900	866,112	879,012	1,994,225	1,115,213
48	0	14,661	866,112	880,773	1,994,225	1,113,452
49	0	12,625	866,112	878,737	1,994,225	1,115,488
50	0	15,450	866,112	881,562	1,994,225	1,112,663
51	0	12,625	866,112	878,737	1,994,225	1,115,488
52	0	12,625	866,112	878,737	1,994,225	1,115,488
TOTAL	2,587,993	782,741	40,763,927	44,134,661	90,871,993	46,737,332

INTERNAL RATE OF RETURN (IRR) = 20.7%

Table M.1.8 Estimation of Sensitivity Analysis (Case 2)

(UNIT : THOUSAND ₱)

YEAR	PROJECT COSTS				INCREMENTAL BENEFIT	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	PRODUCTION COST	TOTAL		
1	20,446	0	0	20,446	0	-20,446
2	153,602	0	0	153,602	0	-153,602
3	363,775	0	0	363,775	0	-363,775
4	981,084	0	0	981,084	0	-981,084
5	637,754	0	0	637,754	0	-637,754
6	0	12,625	1,019,824	1,032,449	206,316	-826,133
7	0	12,625	783,997	796,622	1,360,732	564,110
8	0	12,900	856,177	869,077	1,510,427	641,350
9	0	12,625	861,113	873,738	1,614,245	740,507
10	0	15,175	866,112	881,287	1,784,947	903,660
11	0	12,900	866,112	879,012	1,790,504	911,492
12	0	12,625	866,112	878,737	1,807,510	928,773
13	0	14,661	866,112	880,773	1,807,510	926,737
14	0	12,900	866,112	879,012	1,807,510	928,498
15	0	15,175	866,112	881,287	1,807,510	926,223
16	0	12,625	866,112	878,737	1,807,510	928,773
17	0	12,900	866,112	879,012	1,807,510	928,498
18	0	12,625	866,112	878,737	1,807,510	928,773
19	0	12,625	866,112	878,737	1,807,510	928,773
20	0	65,475	866,112	931,587	1,807,510	875,923
21	0	14,661	866,112	880,773	1,807,510	926,737
22	0	12,625	866,112	878,737	1,807,510	928,773
23	0	12,900	866,112	879,012	1,807,510	928,498
24	0	12,625	866,112	878,737	1,807,510	928,773
25	0	15,175	866,112	881,287	1,807,510	926,223
26	0	12,900	866,112	879,012	1,807,510	928,498
27	0	12,625	866,112	878,737	1,807,510	928,773
28	0	12,625	866,112	878,737	1,807,510	928,773
29	0	14,936	866,112	881,048	1,807,510	926,462
30	0	15,175	866,112	881,287	1,807,510	926,223
31	0	12,625	866,112	878,737	1,807,510	928,773
32	0	12,900	866,112	879,012	1,807,510	928,498
33	0	12,625	866,112	878,737	1,807,510	928,773
34	0	12,625	866,112	878,737	1,807,510	928,773
35	0	65,475	866,112	931,587	1,807,510	875,923
36	0	12,625	866,112	878,737	1,807,510	928,773
37	0	14,661	866,112	880,773	1,807,510	926,737
38	0	12,900	866,112	879,012	1,807,510	928,498
39	0	12,625	866,112	878,737	1,807,510	928,773
40	0	17,211	866,112	883,323	1,807,510	924,187
41	0	12,900	866,112	879,012	1,807,510	928,498
42	0	12,625	866,112	878,737	1,807,510	928,773
43	0	12,625	866,112	878,737	1,807,510	928,773
44	0	12,900	866,112	879,012	1,807,510	928,498
45	0	65,200	866,112	931,312	1,807,510	876,198
46	0	12,625	866,112	878,737	1,807,510	928,773
47	0	12,900	866,112	879,012	1,807,510	928,498
48	0	14,661	866,112	880,773	1,807,510	926,737
49	0	12,625	866,112	878,737	1,807,510	928,773
50	0	15,450	866,112	881,562	1,807,510	925,948
51	0	12,625	866,112	878,737	1,807,510	928,773
52	0	12,625	866,112	878,737	1,807,510	928,773
TOTAL	2,156,661	782,741	40,763,927	43,703,329	82,375,081	38,671,752

INTERNAL RATE OF RETURN (IRR) = 20.0%

Table M.1.8 Estimation of Sensitivity Analysis (Case 3)

(UNIT : THOUSAND ₱)

YEAR	PROJECT COSTS				INCREMENTAL BENEFIT	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	PRODUCTION COST	TOTAL		
1	24,535	0	0	24,535	0	-24,535
2	184,322	0	0	184,322	0	-184,322
3	436,530	0	0	436,530	0	-436,530
4	1,177,301	0	0	1,177,301	0	-1,177,301
5	765,305	0	0	765,305	0	-765,305
6	0	12,625	1,019,824	1,032,449	206,316	-826,133
7	0	12,625	783,997	796,622	1,360,732	564,110
8	0	12,900	856,177	869,077	1,510,427	641,350
9	0	12,625	861,113	873,738	1,614,245	740,507
10	0	15,175	866,112	881,287	1,784,947	903,660
11	0	12,900	866,112	879,012	1,790,504	911,492
12	0	12,625	866,112	878,737	1,807,510	928,773
13	0	14,661	866,112	880,773	1,807,510	926,737
14	0	12,900	866,112	879,012	1,807,510	928,498
15	0	15,175	866,112	881,287	1,807,510	926,223
16	0	12,625	866,112	878,737	1,807,510	928,773
17	0	12,900	866,112	879,012	1,807,510	928,498
18	0	12,625	866,112	878,737	1,807,510	928,773
19	0	12,625	866,112	878,737	1,807,510	928,773
20	0	65,475	866,112	931,587	1,807,510	875,923
21	0	14,661	866,112	880,773	1,807,510	926,737
22	0	12,625	866,112	878,737	1,807,510	928,773
23	0	12,900	866,112	879,012	1,807,510	928,498
24	0	12,625	866,112	878,737	1,807,510	928,773
25	0	15,175	866,112	881,287	1,807,510	926,223
26	0	12,900	866,112	879,012	1,807,510	928,498
27	0	12,625	866,112	878,737	1,807,510	928,773
28	0	12,625	866,112	878,737	1,807,510	928,773
29	0	14,936	866,112	881,048	1,807,510	926,462
30	0	15,175	866,112	881,287	1,807,510	926,223
31	0	12,625	866,112	878,737	1,807,510	928,773
32	0	12,900	866,112	879,012	1,807,510	928,498
33	0	12,625	866,112	878,737	1,807,510	928,773
34	0	12,625	866,112	878,737	1,807,510	928,773
35	0	65,475	866,112	931,587	1,807,510	875,923
36	0	12,625	866,112	878,737	1,807,510	928,773
37	0	14,661	866,112	880,773	1,807,510	926,737
38	0	12,900	866,112	879,012	1,807,510	928,498
39	0	12,625	866,112	878,737	1,807,510	928,773
40	0	17,211	866,112	883,323	1,807,510	924,187
41	0	12,900	866,112	879,012	1,807,510	928,498
42	0	12,625	866,112	878,737	1,807,510	928,773
43	0	12,625	866,112	878,737	1,807,510	928,773
44	0	12,900	866,112	879,012	1,807,510	928,498
45	0	65,200	866,112	931,312	1,807,510	876,198
46	0	12,625	866,112	878,737	1,807,510	928,773
47	0	12,900	866,112	879,012	1,807,510	928,498
48	0	14,661	866,112	880,773	1,807,510	926,737
49	0	12,625	866,112	878,737	1,807,510	928,773
50	0	15,450	866,112	881,562	1,807,510	925,948
51	0	12,625	866,112	878,737	1,807,510	928,773
52	0	12,625	866,112	878,737	1,807,510	928,773
TOTAL	2,587,993	782,741	40,763,927	44,134,661	82,375,081	38,240,420

INTERNAL RATE OF RETURN (IRR) = 18.0%

Table M.2.1 (1) Profit and Loss Statement of Model Farmer (Model: A)

Year	Income			Expenditure				Balance (A)-(B)	
	Farm Income	Sundry Income	Sub Total (A)	Production cost	O & M Charge	Interest (credit)	Living expenses		Sub total (B)
1	64,183	0	64,183	345,635		45,074	140,000	530,609	-466,426
2	251,583	0	251,583	176,190		48,240	140,000	364,430	-112,847
3	466,162	0	466,162	202,945		60,315	140,000	403,260	62,902
4	775,741	0	775,741	202,945		49,875	140,000	392,820	382,921
5	796,741	0	796,741	202,945		49,875	140,000	392,820	403,921
6	796,741	0	796,741	202,945		20,475	140,000	363,420	433,321
7	796,741	0	796,741	202,945		12,075	140,000	355,020	441,721
8	796,741	0	796,741	202,945		0	140,000	342,945	453,796
9	796,741	0	796,741	202,945		0	140,000	342,945	453,796
10	796,741	0	796,741	202,945		0	140,000	342,945	453,796

Table M.2.1 (2) Profit and Loss Statement of Model Farmer (Model: B)

Year	Income			Expenditure				Balance (A)-(B)	
	Farm Income	Sundry Income	Sub Total (A)	Production cost	O & M Charge	Interest (credit)	Living expenses		Sub total (B)
1	358,502	0	358,502	377,402		51,317	140,000	568,719	-210,217
2	736,052	0	736,052	435,711		81,780	140,000	657,491	78,561
3	1,004,786	0	1,004,786	435,711		62,100	140,000	637,811	366,975
4	1,062,836	0	1,062,836	435,711		35,400	140,000	611,111	451,725
5	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125
6	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125
7	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125
8	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125
9	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125
10	1,062,836	0	1,062,836	435,711		0	140,000	575,711	487,125

Table M.2.1 (3) Profit and Loss Statement of Model Farmer (Model: C)

Year	Income			Expenditure				Balance (A)-(B)	
	Farm Income	Sundry Income	Sub Total (A)	Production cost	O & M Charge	Interest (credit)	Living expenses		Sub total (B)
1	404,250	0	404,250	202,876		36,846	140,000	379,722	24,528
2	439,750	0	439,750	254,116		29,940	140,000	424,056	15,694
3	474,750	0	474,750	322,920		35,175	140,000	498,095	-23,345
4	698,950	0	698,950	351,524		42,900	140,000	534,424	164,526
5	733,950	0	733,950	353,696		42,900	140,000	536,596	197,354
6	768,350	0	768,350	353,696		27,900	140,000	521,596	246,754
7	888,750	0	888,750	353,696		20,400	140,000	514,096	374,654
8	888,750	0	888,750	353,696		0	140,000	493,696	395,054
9	888,750	0	888,750	353,696		0	140,000	493,696	395,054
10	888,750	0	888,750	353,696		0	140,000	493,696	395,054

Table M.2.1 (4) Profit and Loss Statement of Model Farmer (Model: D)

Year	Income			Expenditure				Balance (A)-(B)	
	Farm Income	Sundry Income	Sub Total (A)	Production cost	O & M Charge	Interest (credit)	Living expenses		Sub total (B)
1	334,535	0	334,535	440,405		53,696	140,000	634,101	-299,566
2	490,388	0	490,388	286,077		66,450	140,000	492,527	-2,139
3	744,093	0	744,093	288,450		60,750	140,000	489,200	254,893
4	803,946	0	803,946	288,450		60,750	140,000	489,200	314,746
5	803,946	0	803,946	288,450		60,750	140,000	489,200	314,746
6	803,946	0	803,946	288,450		35,925	140,000	464,375	339,571
7	803,946	0	803,946	288,450		11,100	140,000	439,550	364,396
8	803,946	0	803,946	288,450		0	140,000	428,450	375,496
9	803,946	0	803,946	288,450		0	140,000	428,450	375,496
10	803,946	0	803,946	288,450		0	140,000	428,450	375,496

Table M.2.1 (5) Profit and Loss Statement of Model Farmer (Model: E)

Year	Income			Expenditure				Balance (A)-(B)	
	Farm Income	Sundry Income	Sub Total (A)	Production cost	O & M Charge	Interest (credit)	Living expenses		Sub total (B)
1	703,271	0	703,271	405,598		51,172	140,000	596,770	106,501
2	808,046	0	808,046	405,598		6,240	140,000	551,838	256,208
3	880,765	0	880,765	405,598		0	140,000	545,598	335,167
4	949,382	0	949,382	405,598		0	140,000	545,598	403,784
5	991,382	0	991,382	405,598		0	140,000	545,598	445,784
6	991,382	0	991,382	405,598		0	140,000	545,598	445,784
7	991,382	0	991,382	405,598		0	140,000	545,598	445,784
8	991,382	0	991,382	405,598		0	140,000	545,598	445,784
9	991,382	0	991,382	405,598		0	140,000	545,598	445,784
10	991,382	0	991,382	405,598		0	140,000	545,598	445,784

Table M.2.2 (1) Estimation of Cash Flow of Model Farmer (Model: A)

Year	1	2	3	4	5	6	7	8	9	10
Initial Fund	255,000	179,407	122,561	265,964	648,885	856,807	1,234,128	1,595,350	2,049,146	2,502,943
Farm Credit (Long)	196,000	56,000	80,500							
Farm Credit (Short)	43,500	43,500	43,500							
Sub Total (A)	494,500	278,907	246,561	265,964	648,885	856,807	1,234,128	1,595,350	2,049,146	2,502,943
Required Fund (Stage I)										
Production Cost	247,319	104,974	131,729	131,729	131,729	131,729	131,729	131,729	131,729	131,729
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (B)	317,319	174,974	201,729	201,729	201,729	201,729	201,729	201,729	201,729	201,729
Farm Income	64,015	83,583	87,162	90,741	90,741	90,741	90,741	90,741	90,741	90,741
Sundry Income										
Sub Total (C)	64,015	83,583	87,162	90,741	90,741	90,741	90,741	90,741	90,741	90,741
Interest (Short)	5,163	5,220	5,220	0	0	0	0	0	0	0
Repayment (Short)	43,500	43,500	43,500	0	0	0	0	0	0	0
Sub Total (D)	48,663	48,720	48,720	0	0	0	0	0	0	0
Balance Carried Forward	192,534	138,797	83,274	154,976	537,897	745,819	1,123,140	1,484,362	1,938,158	2,391,955
Farm Credit (Short)	58,500	58,500	58,500							
Sub Total (E)	251,034	197,297	141,774	154,976	537,897	745,819	1,123,140	1,484,362	1,938,158	2,391,955
Required Fund (Stage II)										
Production Cost	71,216	71,216	71,216	71,216	71,216	71,216	71,216	71,216	71,216	71,216
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (F)	141,216	141,216	141,216	141,216	141,216	141,216	141,216	141,216	141,216	141,216
Farm Income	168,000	168,000	379,000	685,000	706,000	706,000	706,000	706,000	706,000	706,000
Sundry Income										
Sub Total (G)	168,000	168,000	379,000	685,000	706,000	706,000	706,000	706,000	706,000	706,000
Term-end Fund										
Interest (Long)	29,400	37,800	49,875	49,875	49,875	20,475	12,075	0	0	0
Interest (Short)	10,511	5,220	5,220	0	0	0	0	0	0	0
Repayment (Long)	0	0	0	0	186,000	56,000	80,500	0	0	0
Repayment (Short)	58,500	58,500	58,500	0	0	0	0	0	0	0
Sub Total (H)	98,411	101,520	113,595	49,875	245,875	76,475	92,575	0	0	0
Balance Carried Forward	179,407	122,561	265,964	648,885	856,807	1,234,128	1,595,350	2,049,146	2,502,943	2,956,739

Table M.2.2 (2) Estimation of Cash Flow of Model Farmer(Model: B)

Year	1	2	3	4	5	6	7	8	9	10
Initial Fund	140,000	107,782	422,345	611,320	799,047	1,286,173	1,773,299	2,260,425	2,747,552	3,234,678
Farm Credit (Long)	178,000	236,000								
Farm Credit (Short)	82,000	82,000								
Sub Total (A)	400,000	425,782	422,345	611,320	799,047	1,286,173	1,773,299	2,260,425	2,747,552	3,234,678
Required Fund (Stage I)										
Production Cost	274,799	333,107	333,107	333,107	333,107	333,107	333,107	333,107	333,107	333,107
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (B)	344,799	403,107	403,107	403,107	403,107	403,107	403,107	403,107	403,107	403,107
Farm Income	124,250	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750
Sundry Income										
Sub Total (C)	124,250	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750
Interest (Short)	9,797	9,840	0	0	0	0	0	0	0	0
Repayment (Short)	82,000	82,000	0	0	0	0	0	0	0	0
Sub Total (D)	91,797	91,840	0	0	0	0	0	0	0	0
Balance Carried Forward	87,655	90,586	178,988	367,964	555,690	1,042,816	1,529,943	2,017,069	2,504,195	2,991,321
Farm Credit (Short)	85,000	85,000								
Sub Total (E)	172,655	175,586	178,988	367,964	555,690	1,042,816	1,529,943	2,017,069	2,504,195	2,991,321
Required Fund (Stage II)										
Production Cost	102,604	102,604	102,604	102,604	102,604	102,604	102,604	102,604	102,604	102,604
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (F)	172,604	172,604	172,604	172,604	172,604	172,604	172,604	172,604	172,604	172,604
Farm Income	234,252	576,302	845,036	875,086	903,086	903,086	903,086	903,086	903,086	903,086
Sundry Income										
Sub Total (G)	234,252	576,302	845,036	875,086	903,086	903,086	903,086	903,086	903,086	903,086
Term-end Fund										
Interest (Long)	26,700	62,100	62,100	35,400	0	0	0	0	0	0
Interest (Short)	14,820	9,840	0	0	0	0	0	0	0	0
Repayment (Long)	0	0	178,000	236,000	0	0	0	0	0	0
Repayment (Short)	85,000	85,000	0	0	0	0	0	0	0	0
Sub Total (H)	126,520	156,940	240,100	271,400	0	0	0	0	0	0
Balance Carried Forward	107,782	422,345	611,320	799,047	1,286,173	1,773,299	2,260,425	2,747,552	3,234,678	3,721,804

Table M.2.2 (3) Estimation of Cash Flow of Model Farmer(Model: C)

Year	1	2	3	4	5	6	7	8	9	10
Initial Fund	0	124,529	190,224	251,380	467,407	564,762	761,517	1,051,672	1,395,227	1,790,282
Farm Credit (Long)	100,000	50,000	84,500	51,500						
Farm Credit (Short)	54,500	31,000								
Sub Total (A)	154,500	205,529	274,724	302,880	467,407	564,762	761,517	1,051,672	1,395,227	1,790,282
Required Fund (Stage I)										
Production Cost	84,183	135,423	204,227	232,831	235,003	235,003	235,003	235,003	235,003	235,003
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (B)	154,183	205,423	274,227	302,831	305,003	305,003	305,003	305,003	305,003	305,003
Farm Income	124,250	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750
Sundry Income										
Sub Total (C)	124,250	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750	159,750
Interest (Short)	4,328	3,720	0	0	0	0	0	0	0	0
Repayment (Short)	54,500	31,000	0	0	0	0	0	0	0	0
Sub Total (D)	58,828	34,720	0	0	0	0	0	0	0	0
Balance Carried Forward	65,740	125,137	160,248	159,800	322,155	419,510	616,265	906,420	1,249,975	1,645,030
Farm Credit (Short)	97,500	64,000	29,000	29,000						
Sub Total (E)	163,240	189,137	189,248	188,800	322,155	419,510	616,265	906,420	1,249,975	1,645,030
Required Fund (Stage II)										
Production Cost	118,693	118,693	118,693	118,693	118,693	118,693	118,693	118,693	118,693	118,693
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (F)	188,693	188,693	188,693	188,693	188,693	188,693	188,693	188,693	188,693	188,693
Farm Income	280,000	280,000	315,000	539,200	574,200	608,600	729,000	729,000	729,000	729,000
Sundry Income										
Sub Total (G)	280,000	280,000	315,000	539,200	574,200	608,600	729,000	729,000	729,000	729,000
Term-end Fund										
Interest (Long)	15,000	22,500	35,175	42,900	42,900	27,900	20,400	0	0	0
Interest (Short)	17,518	3,720	0	0	0	0	0	0	0	0
Repayment (Long)	0	0	0	0	100,000	50,000	84,500	51,500	0	0
Repayment (Short)	97,500	64,000	29,000	29,000	0	0	0	0	0	0
Sub Total (H)	130,018	90,220	64,175	71,900	142,900	77,900	104,900	51,500	0	0
Balance Carried Forward	124,529	190,224	251,380	467,407	564,762	761,517	1,051,672	1,395,227	1,790,282	2,185,337

Table M.2.2 (4) Estimation of Cash Flow of Model Farmer(Model: D)

Year	1	2	3	4	5	6	7	8	9	10
Initial Fund	145,500	11,433	174,795	503,688	818,452	967,715	1,141,804	1,432,217	1,807,731	2,183,244
Farm Credit (Long)	165,500	165,500	74,000							
Farm Credit (Short)	137,500	70,000								
Sub Total (A)	448,500	246,933	248,795	503,688	818,452	967,715	1,141,804	1,432,217	1,807,731	2,183,244
Required Fund (Stage I)										
Production Cost	330,237	175,909	178,282	178,282	178,282	178,282	178,282	178,282	178,282	178,282
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (B)	400,237	245,909	248,282	248,282	248,282	248,282	248,282	248,282	248,282	248,282
Farm Income	182,317	248,467	287,834	327,201	327,201	327,201	327,201	327,201	327,201	327,201
Sundry Income										
Sub Total (C)	182,317	248,467	287,834	327,201	327,201	327,201	327,201	327,201	327,201	327,201
Interest (Short)	16,451	8,400	0	0	0	0	0	0	0	0
Repayment (Short)	137,500	70,000	0	0	0	0	0	0	0	0
Sub Total (D)	153,951	78,400	0	0	0	0	0	0	0	0
Balance Carried Forward	76,629	171,092	288,347	582,607	897,371	1,046,634	1,220,723	1,511,136	1,886,550	2,262,163
Farm Credit (Short)	104,000	9,500								
Sub Total (E)	180,629	180,592	288,347	582,607	897,371	1,046,634	1,220,723	1,511,136	1,886,550	2,262,163
Required Fund (Stage II)										
Production Cost	110,168	110,168	110,168	110,168	110,168	110,168	110,168	110,168	110,168	110,168
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (F)	180,168	180,168	180,168	180,168	180,168	180,168	180,168	180,168	180,168	180,168
Farm Income	152,218	241,921	456,259	476,763	476,763	476,763	476,763	476,763	476,763	476,763
Sundry Income										
Sub Total (G)	152,218	241,921	456,259	476,763	476,763	476,763	476,763	476,763	476,763	476,763
Term-end Fund										
Interest (Long)	24,825	49,650	60,750	60,750	60,750	35,925	11,100	0	0	0
Interest (Short)	12,420	8,400	0	0	0	0	0	0	0	0
Repayment (Long)	0	0	0	0	165,500	165,500	74,000	0	0	0
Repayment (Short)	104,000	9,500	0	0	0	0	0	0	0	0
Sub Total (H)	141,245	67,550	60,750	60,750	226,250	201,425	85,100	0	0	0
Balance Carried Forward	11,433	174,795	503,688	818,452	967,715	1,141,804	1,432,217	1,807,731	2,183,244	2,558,758

Table M.2.2 (5) Estimation of Cash Flow of Model Farmer(Model: E)

Year	1	2	3	4	5	6	7	8	9	10
Initial Fund	120,000	226,502	482,712	817,879	1,221,663	1,667,448	2,113,232	2,559,017	3,004,801	3,450,586
Farm Credit (Long)										
Farm Credit (Short)	173,500	26,000								
Sub Total (A)	293,500	252,502	482,712	817,879	1,221,663	1,667,448	2,113,232	2,559,017	3,004,801	3,450,586
Required Fund (Stage I)										
Production Cost	182,059	182,059	182,059	182,059	182,059	182,059	182,059	182,059	182,059	182,059
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (B)	252,059	252,059	252,059	252,059	252,059	252,059	252,059	252,059	252,059	252,059
Farm Income	251,714	326,988	346,771	365,187	365,187	365,187	365,187	365,187	365,187	365,187
Sundry Income										
Sub Total (C)	251,714	326,988	346,771	365,187	365,187	365,187	365,187	365,187	365,187	365,187
Interest (Short)	20,787	3,120	0	0	0	0	0	0	0	0
Repayment (Short)	173,500	26,000	0	0	0	0	0	0	0	0
Sub Total (D)	194,287	29,120	0	0	0	0	0	0	0	0
Balance Carried Forward	98,869	298,312	577,424	931,007	1,334,791	1,780,576	2,226,360	2,672,145	3,117,929	3,563,714
Farm Credit (Short)	195,000									
Sub Total (E)	293,869	298,312	577,424	931,007	1,334,791	1,780,576	2,226,360	2,672,145	3,117,929	3,563,714
Required Fund (Stage II)										
Production Cost	223,539	223,539	223,539	223,539	223,539	223,539	223,539	223,539	223,539	223,539
Living Expenses	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Sub Total (F)	293,539	293,539	293,539	293,539	293,539	293,539	293,539	293,539	293,539	293,539
Farm Income	451,557	481,058	533,994	584,195	626,195	626,195	626,195	626,195	626,195	626,195
Sundry Income										
Sub Total (G)	451,557	481,058	533,994	584,195	626,195	626,195	626,195	626,195	626,195	626,195
Term-end Fund										
Interest (Long)	0	0	0	0	0	0	0	0	0	0
Interest (Short)	30,385	3,120	0	0	0	0	0	0	0	0
Repayment (Long)	0	0	0	0	0	0	0	0	0	0
Repayment (Short)	195,000	0	0	0	0	0	0	0	0	0
Sub Total (H)	225,385	3,120	0	0	0	0	0	0	0	0
Balance Carried Forward	226,502	482,712	817,879	1,221,663	1,667,448	2,113,232	2,559,017	3,004,801	3,450,586	3,896,370

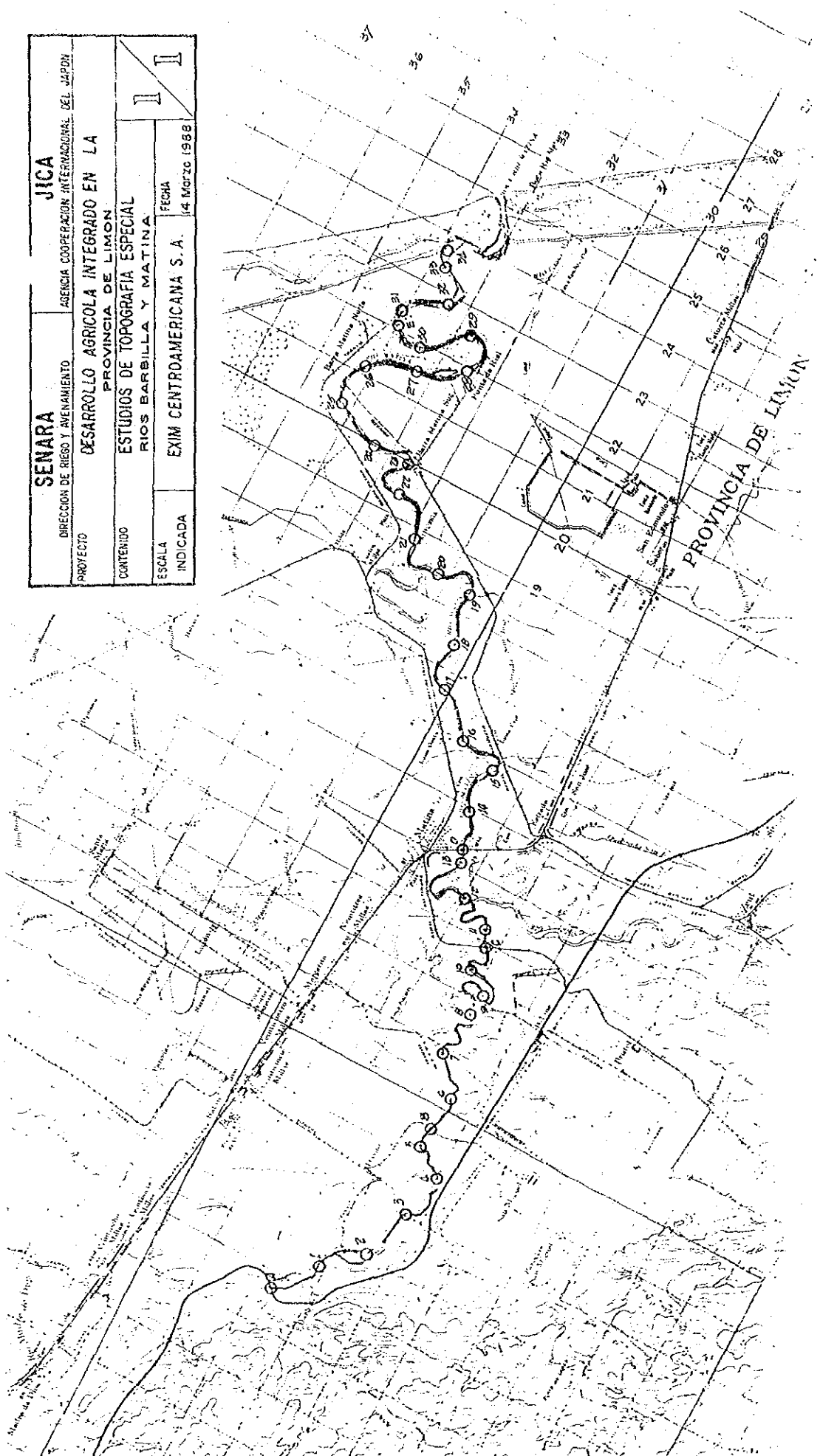
Annex N Others

N. 1 Topographical Survey

In order to plan the flood protection facilities and bridges, profile and cross section levelings of Rio Matina and Rio Barbilla have been carried out.

The 32 km between Barbilla bridge and the Canal del Tortuguero were surveyed and cross section levelings were made at one km intervals.

SENARA		JICA	
DIRECCION DE RIEGO Y BIENAMIENTO		AGENCIA COOPERACION INTERNACIONAL DEL JAPON	
PROYECTO		DESARROLLO AGRICOLA INTEGRADO EN LA PROVINCIA DE LIMON	
CONTENIDO		ESTUDIOS DE TOPOGRAFIA ESPECIAL RIOS BARBILLA Y MATINA	
ESCALA	INDICADA	FECHA	14 Marzo 1988
		EXIM CENTROAMERICANA S. A.	



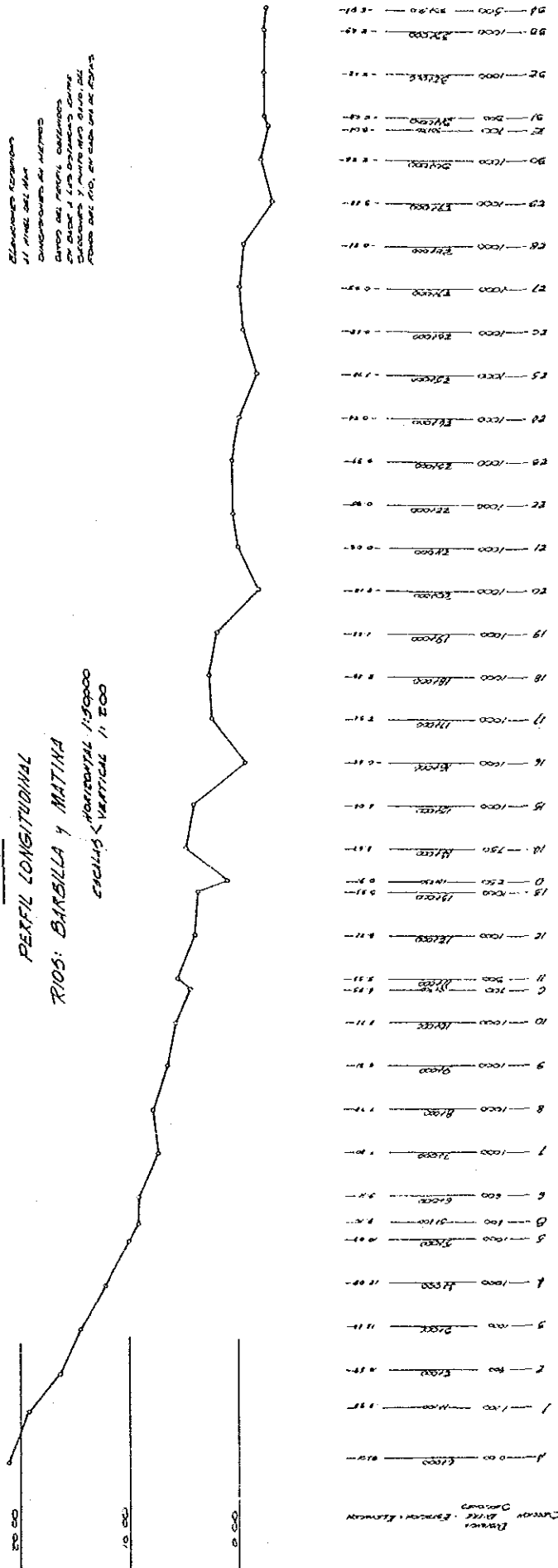
JICA

PERFIL LONGITUDINAL

RIOS: BARBILLA Y MATINA

CICLOS HORIZONTAL 1:50000
CICLOS VERTICAL 1:200

NOTAS
 ELIMINAR SECCIONES
 SI HAY DEL RÍO
 CONSIDERAR EL NIVEL
 SUPERIOR DEL RÍO
 EN CASO DE PERIL, CAJONCILLO
 EN CASO DE LOS DENTADOS EN EL
 CORTADO Y NIVEL MÁS ALTO DEL
 RÍO EN CASO DE LAS OBRAS DE
 RECONSTRUCCIÓN DEL RÍO



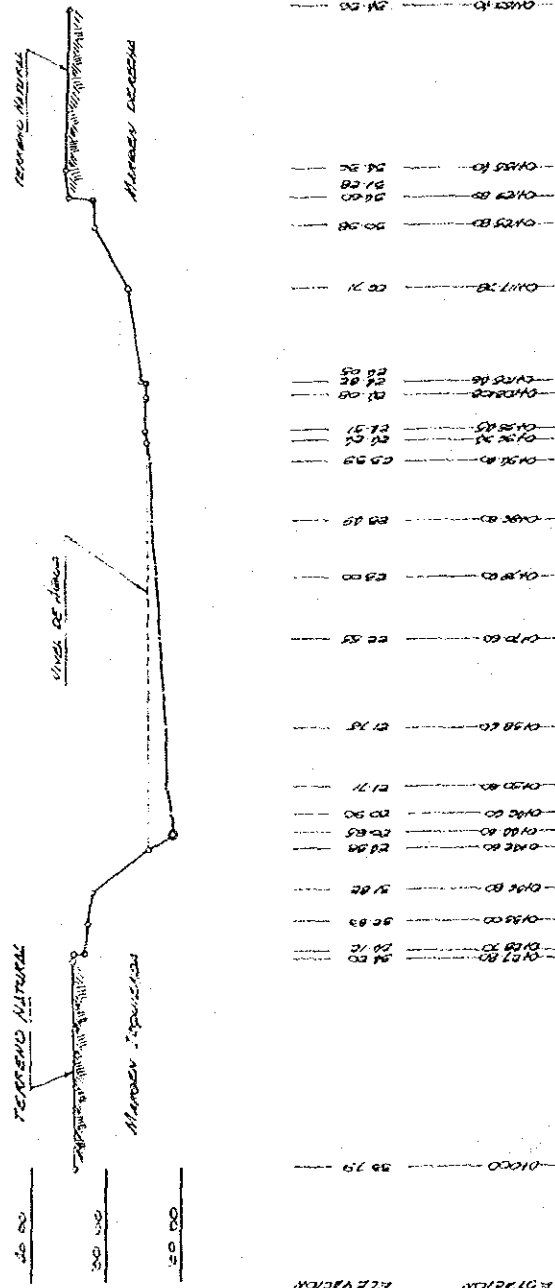
JICA

SECCION EN 'A' (RIO BARBILLA)

0+000.00 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
HORIZONTAL 1:500
VERTICAL 1:500

NOTAS
SECCION PARALELA A LA
CORRIENTE DEL RIO (DE NUNO A NUNO)
DEL PUESTO SOBRE EL RIO
BARBILLA EN CARRETERA
SINGAPORE - LIMON
DIRECCION MARINA DE SURESTE
ELEVACION = 20.85
TODOS LOS DATOS ESTABLECIDOS
EN METROS
ELEVACIONES REFERIDAS AL
NIVEL DEL MAR

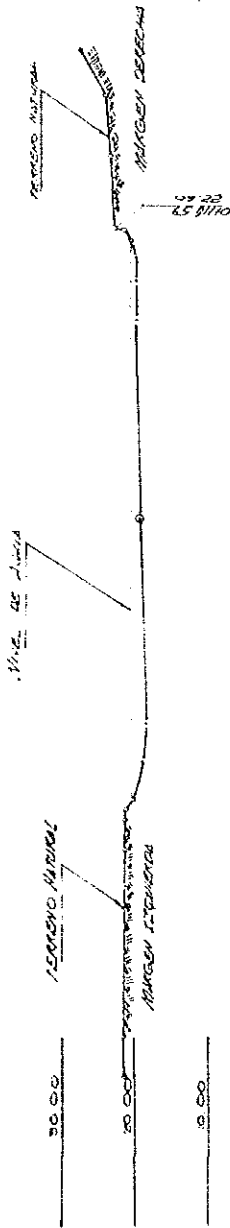


UICA
SECCION N° 1
(RIO BARBILLA)

< 1:100 DE PERFIL LONGITUDINAL DEL RIO >

ESCALAS HORIZONTAL 1:500
 VERTICAL 1:500

PROYECTO MAZDA DE CHUBEC
 ELEVACION - 19 56
 TPOOS LOS OAVOS EDERIFICADOS
 EN METROS
 ELEVACIONES REFERENCAS AL
 NIVEL DEL MAR



ESTACION	ELEVACION
0+00	21.89
0+05	21.51
0+10	21.85
0+15	21.57
0+20	21.57
0+25	21.57
0+30	21.57
0+35	21.57
0+40	21.57
0+45	21.57
0+50	21.57
0+55	21.57
0+60	21.57
0+65	21.57
0+70	21.57
0+75	21.57
0+80	21.57
0+85	21.57
0+90	21.57
0+95	21.57
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1+15	21.57
1+20	21.57
1+25	21.57

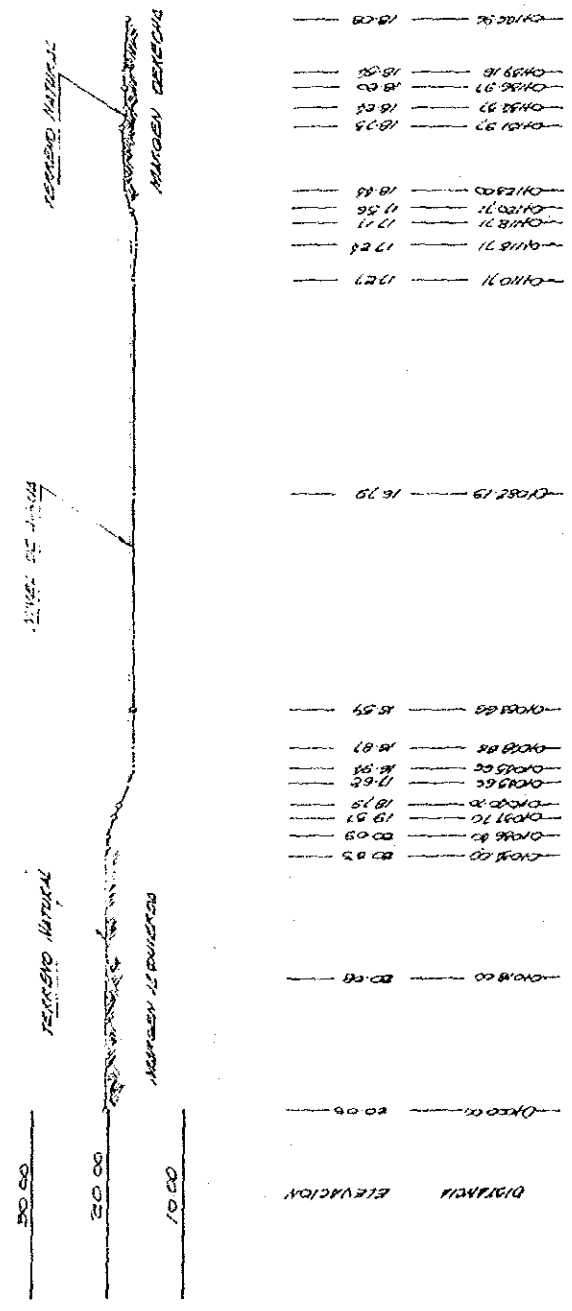
JICA

SECCION N° 2
(RIO BARROILIA)

(21000 DE PERTA LONGITUDINAL DEL RIO)

ESCALAS
HORIZONTAL 1:500
VERTICAL 1:500

PROYECTO: ALIENIA S.S. - ANDES
ELEVACION = 16.99
POROT, 100 METROS ESPESOR, 1.0000
EN METROS
ELEVACIONES REFERIDAS AL
NIVEL DEL MAR



JICA

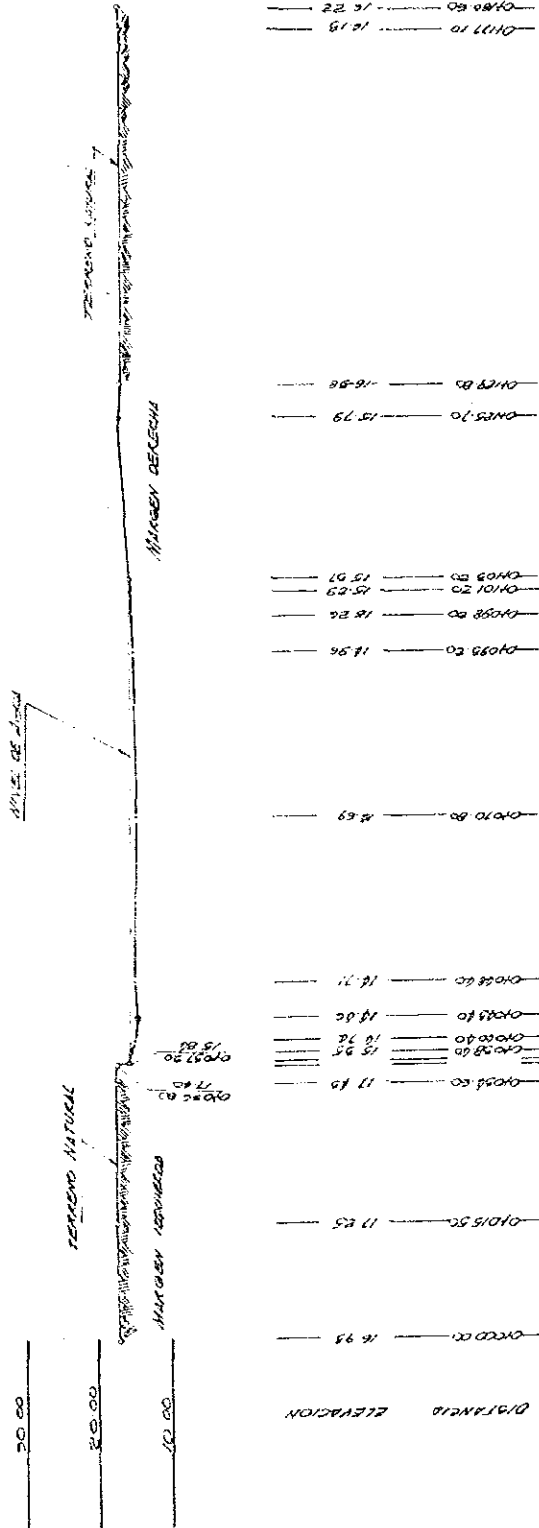
SECCION N° 3

(RIO BUNILLA)

< 31000 DE PERFIL LONGITUDINAL DEL RIO >

ESCALAS HORIZONTAL 1:500
VERTICAL 1:500

• MEDICION HECHA DE EXACTO
ELEVACION 15.86
POR LOS DATOS ESTACIONADOS
EN METROS
ELEVACION REFERIDA
AL NIVEL DEL MAR
ELEVACION PROMEDIO DE
NIVEL DEL AGUA = 15.96



JICA

SECCION N° 4 (RIO BARBILLA)

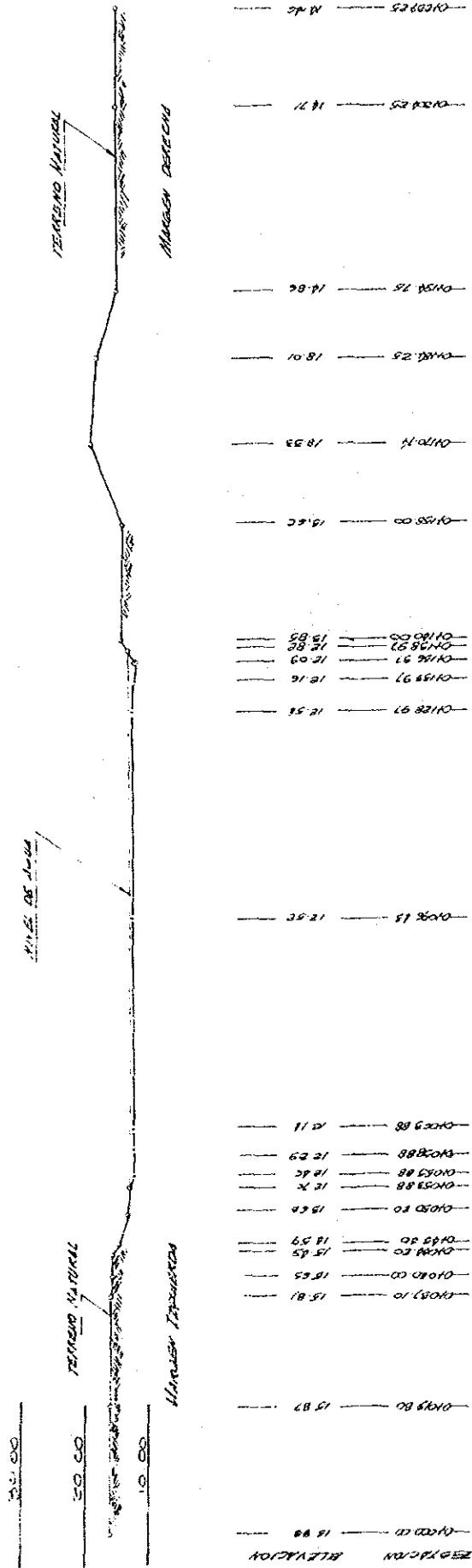
< ALTO DE PERFIL LONGITUDINAL DEL RIO >

ESCALAS HORIZONTAL 1:500
VERTICAL 1:500

PROFUNDIDAD MÁXIMA DE AGUAS
ELEVACION = 12.03
TODOS LOS DATOS ANOTADOS
EN METROS

ELEVACIONES REFERIDAS
AL NIVEL DEL MAR

ELEVACION PROMEDIO DE
NIVEL DE AGUA = 16.79



JICA

SECCION EN 'B'
(RIO DARDILLA)

< 5+500 DE PERFIL LONGITUDINAL DEL RIO >

ESCALA < HORIZONTAL 1:500
VERTICAL 1:500 >

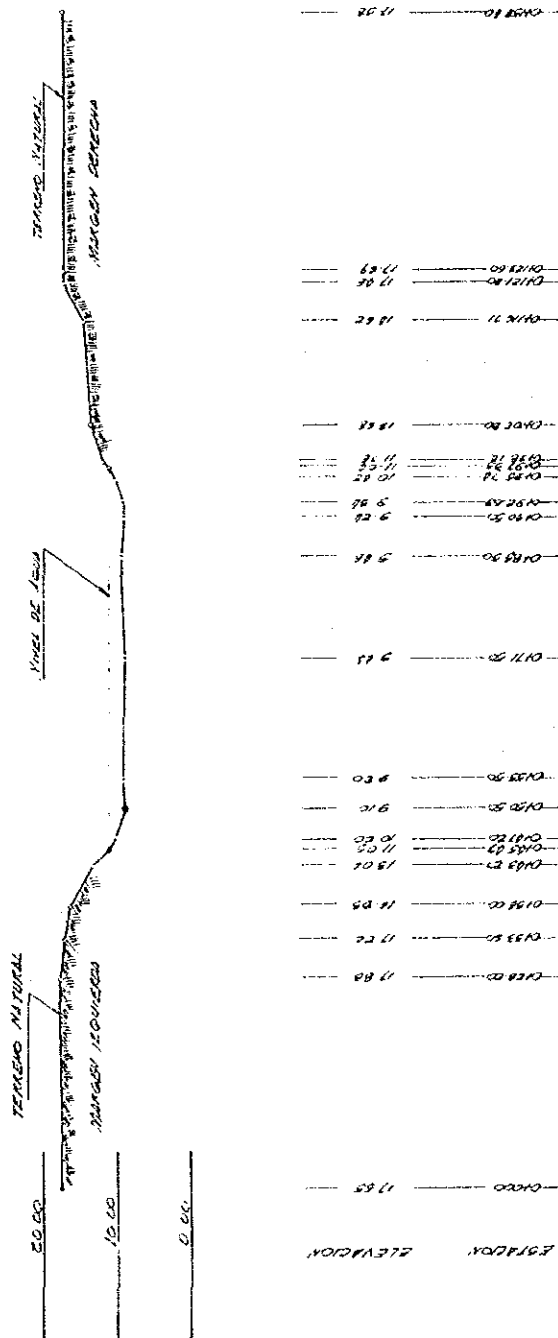
NOTAS

SECCION PARALELA A LA CORONA,
(DE AGUAS VIVAS) DEL PUENTE
DADO EL RIO DARDILLA EN
CARRETERA

PROFUNDIDAD MAXIMA DE BARRIO
ELEVACION: 5.10

TODO LOS DATOS ESTIMADOS
EN METROS

ELEVACIONES REFERIDAS
AL NIVEL DEL MAR



JICA

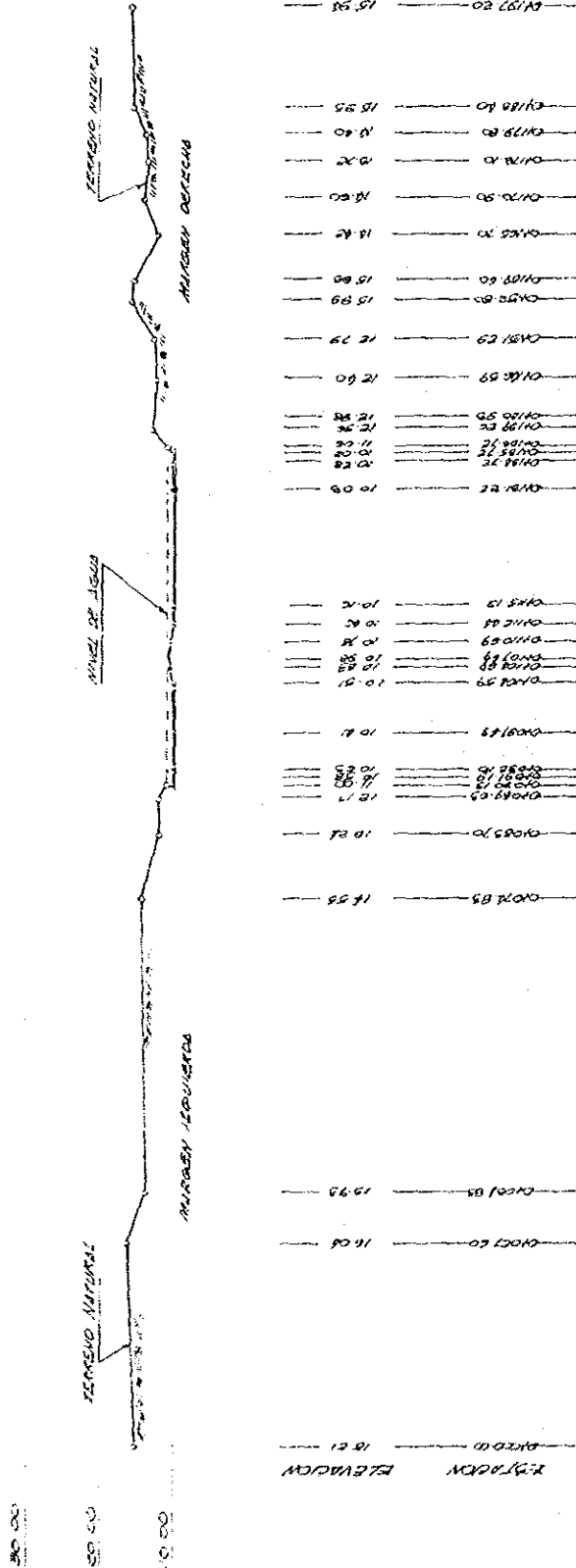
(SECCION N° 5.)

RIO BARBILLA

(Escala de Perfil Longitudinal del Rio)

ESCALAS - HORIZONTAL 1:500
VERTICAL 1:500

PROYECTO MAQUINA DE BOMBEO
ELEVACION =
TODOS LOS DATOS ESTABLECIDOS
EN METROS
ELEVACIONES REFERIDAS AL
NIVEL DEL MAR
ELEVACION PROMEDIO DE
NIVEL DE AGUA



JICA

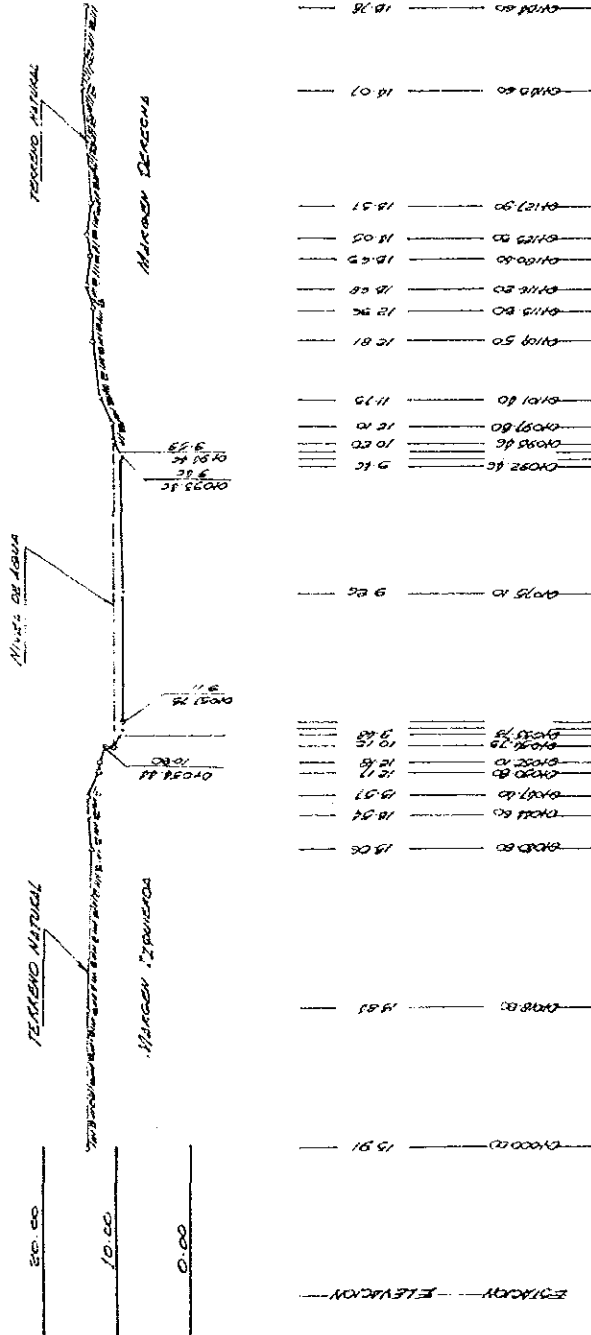
SECCION N° 6

RIO BARILLA

51000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS HORIZONTAL 1:500
VERTICAL 1:500

PROYECTO MARCA DE FONDO
ELEVACIONE S+1
POR LOS PUNTOS ESPALFADOS
EN METROS
ELEVACION REFERIDA
AL NIVEL DEL MAR
ELEVACION PROMEDIO DE NIVEL
DE AGUA 10.14



JICA

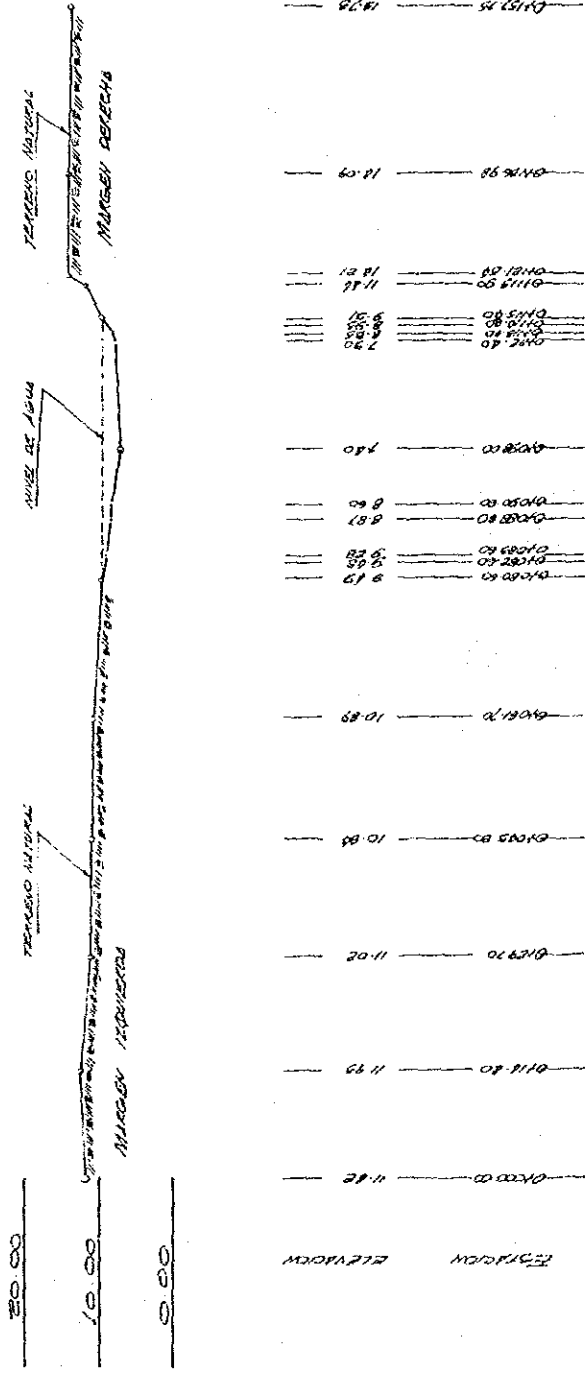
SECCION No 7

RIO CARONILLA

TRAZADO DE PERFIL LONGITUDINAL DEL RIO

SECCIONES
 HORIZONTAL 1:500
 VERTICAL 1:500

- RECONSTRUCCION MAQUINA DE CEMENTO ELEVACION 7.50
- TODOS LOS DATOS ESTABLECIDOS EN METROS
- ESTACIONES REFERIDAS AL NIVEL DEL MAR
- ELEVACION PROMEDIO DE NIVEL DE AGUA = 7.50



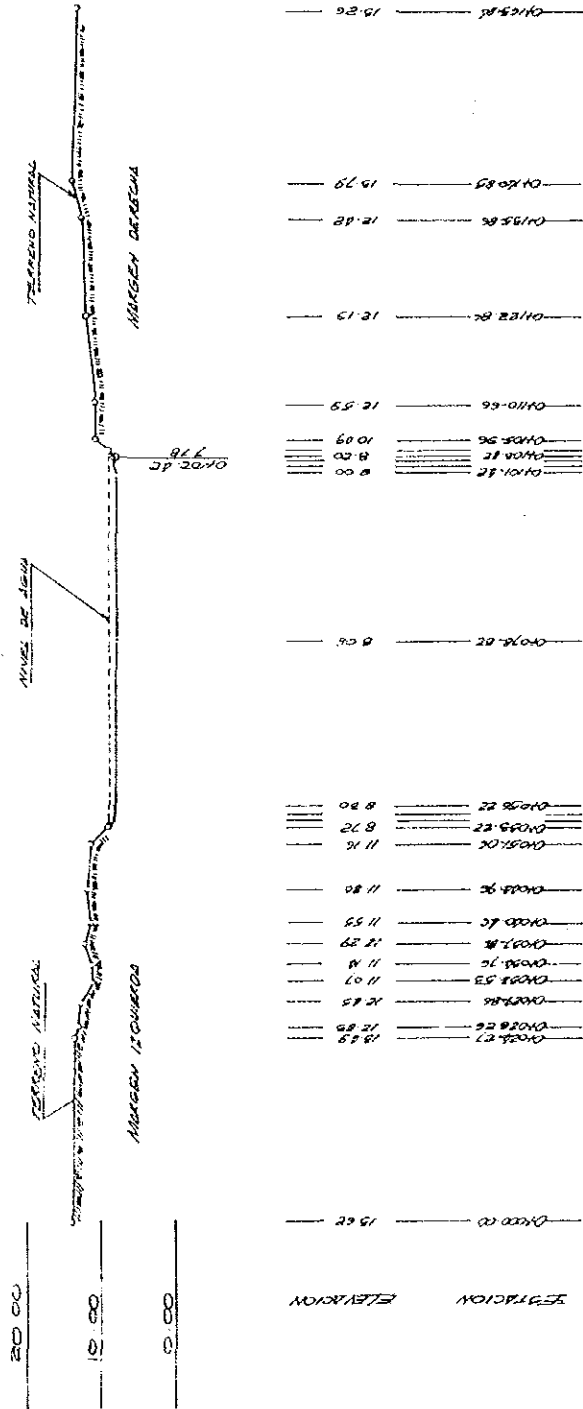
JICA

SECCION N° 8
RIO BARBILLA

BANCO DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
HORIZONTAL 1:500
VERTICAL 1:500

PROYUNION NIVELA DE SONDAS
 ELEVACION 7.78
 TODOS LOS DATOS ESTERIFICADOS
 EN METROS
 ELEVACION REFERIDA
 AL NIVEL DEL MAR
 ELEVACION PROMEDIO PE
 NIVEL DE AGUA 8.70



JICA

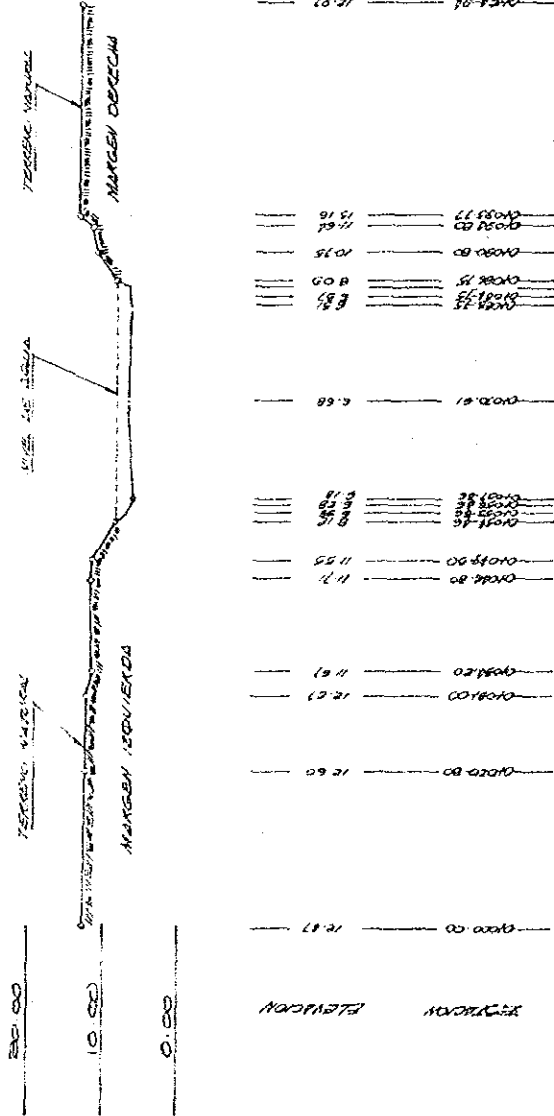
SECCION N° 9

RIO BARBILLA

91000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
 HORIZONTAL 1:500
 VERTICAL 1:500

PROFUNDIDAD MÁXIMA DEL RIO
 8.9 METROS
 ELIMINADO CON LA OBRERA
 CALIDAD DE
 TUBOS LOS CAYOS CON CERRIL
 EN MARCA
 LA CANTIDAD REFERENCIAL
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE NIVEL
 DE AGUA = 8.08



JICA

SECCION Nº 10

RIO BARBILLA

101000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500

0 = ALTURAS MÁXIMA DE DEMANDA
ELEVACION 5.77

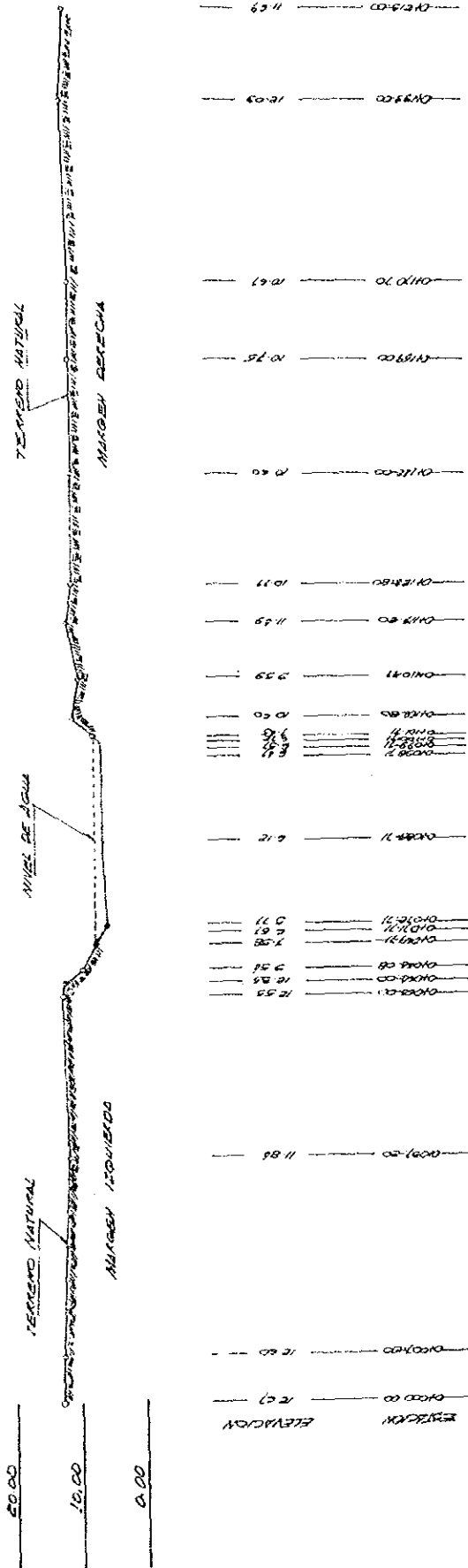
10000 LOS DATOS ESTABLECIDOS
EN MEDIO

ELEVACIONES REFERIDAS AL

NIVEL DEL MAR

ELEVACION PROMEDIO DE

NIVEL DE AGUA = 7.52



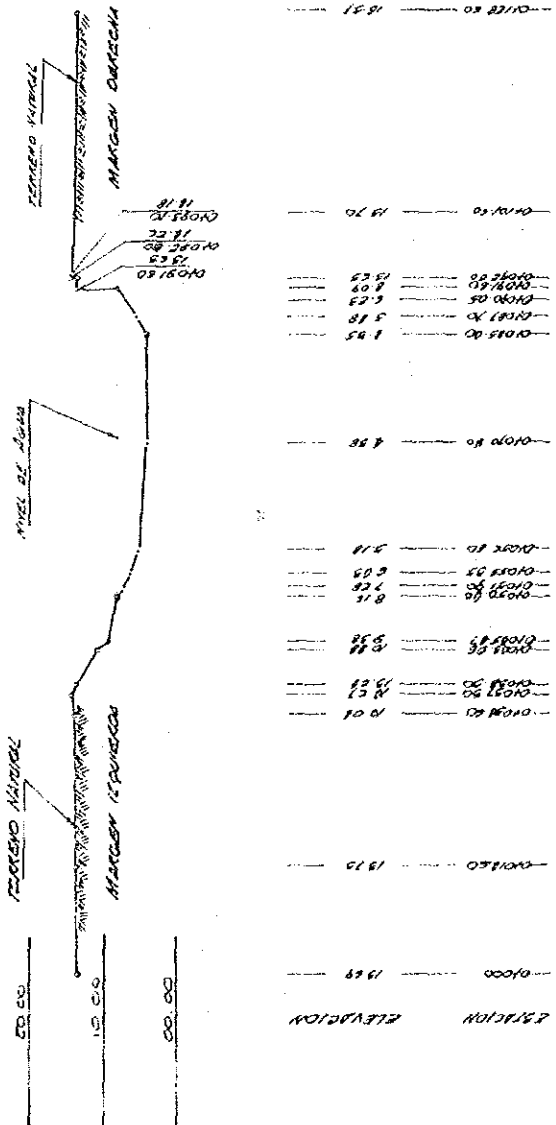
UICA

SECCION "C" (RIO BARRILLA)

<104700 DEL PUNTO LONGITUDINAL DEL RIO >

ESCALAS
 HORIZONTAL 1:500
 VERTICAL 1:500

NOTAS:
 SECCION TRANSVERSA A LA CORONA
 (DE JUNIO 1968), DEL PUENTE
 SOBRE EL RIO BARRILLA EN
 CARRETERA
 • PROMUNDO MARGEN DE BARRIO
 ELEVACION: 4.59.
 7000 LOS DATOS ESTABLECIDOS
 EN METROS
 ELEVACION REFERIDA AL
 NIVEL DEL MAR



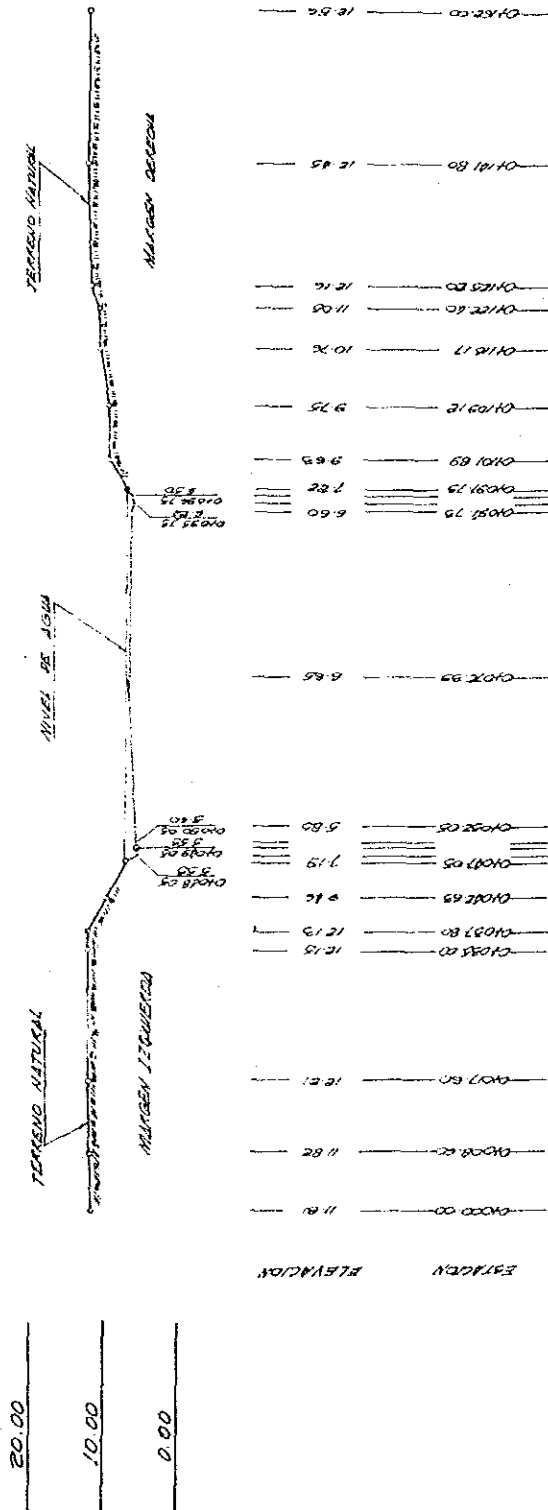
JICA

SECCION N° 11 RIO BARBILLA

1/1000 DE PERFIL LONGITUDINAL DEL RIO

ESCALA HORIZONTAL 1:500
VERTICAL 1:500

0 Diferencial Máximo de Coseco
Elevación 5.55
Todos los datos referidos al
en Metro
Elevaciones referidas al
nivel del mar
Elevación Promedio de
nivel de agua 7.50



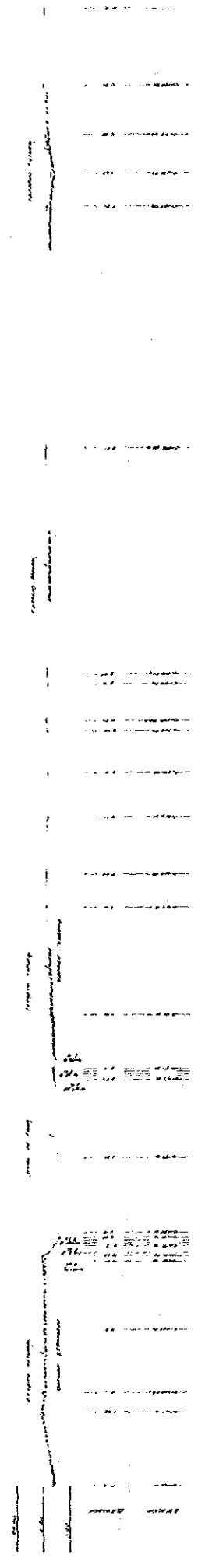
LICA

SECTION 4112
RD 40/10/10

IF ONE OF THESE CONDITIONS ARE TO

1. A person who is a member of the
2. A person who is a member of the
3. A person who is a member of the
4. A person who is a member of the

PROPERTY / NATIONAL / NO



SICA

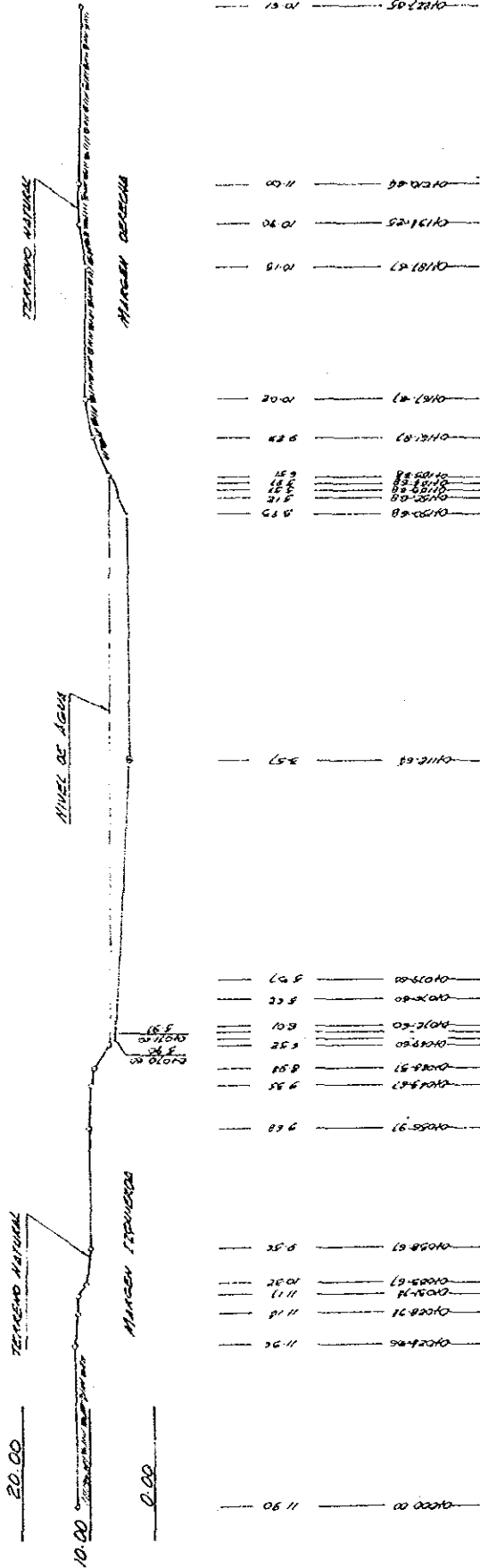
SECCION N° 13

RIO MATINA

15,000 DE PERFIL LONGITUDINAL DEL RIO

SECCION
 HORIZONTAL 1:500
 VERTICAL 1:500

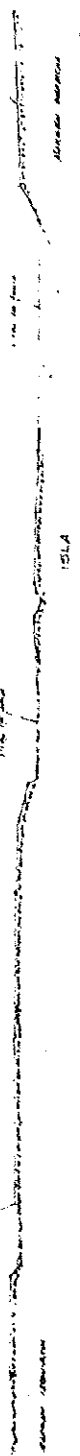
PROYECTO MATINA DE SANJOSE
 ELEVACION: 5.57
 TRAZO LOS DATOS ESTACIONADOS
 EN METROS
 ELEVACIONES REFERIDAS AL
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE NIVEL
 DE AGUA: 6.55



JICA
SECTION D
TRD 001/1998

TRD 001/1998 - ENVIRONMENTAL IMPACT
 STUDY REPORT

TRD 001/1998 - ENVIRONMENTAL IMPACT
 STUDY REPORT



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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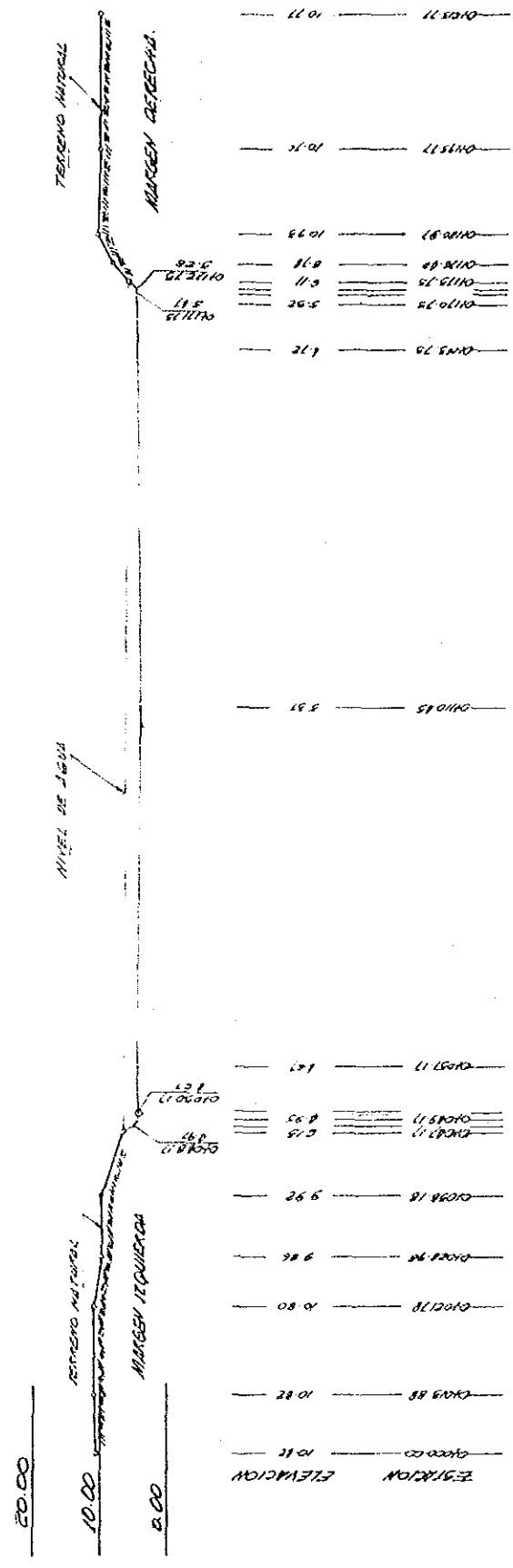
JICA

SECCION N° 14
RIO MATINA

METODO DE PERFIL LONGITUDINAL DEL RIO

• PROYUNDO ALIUM DE SONDAS
ELEVACION: 8.27
TODOS LOS DATOS ESPECIFICADOS
EN METROS
ELEVACIONES REFERIDAS AL
NIVEL DEL MAR
ELEVACION PROMEDIO DE
NIVEL DE AGUA = 6.12

ESCALAS
HORIZONTAL 1:500
VERTICAL 1:500



JICA

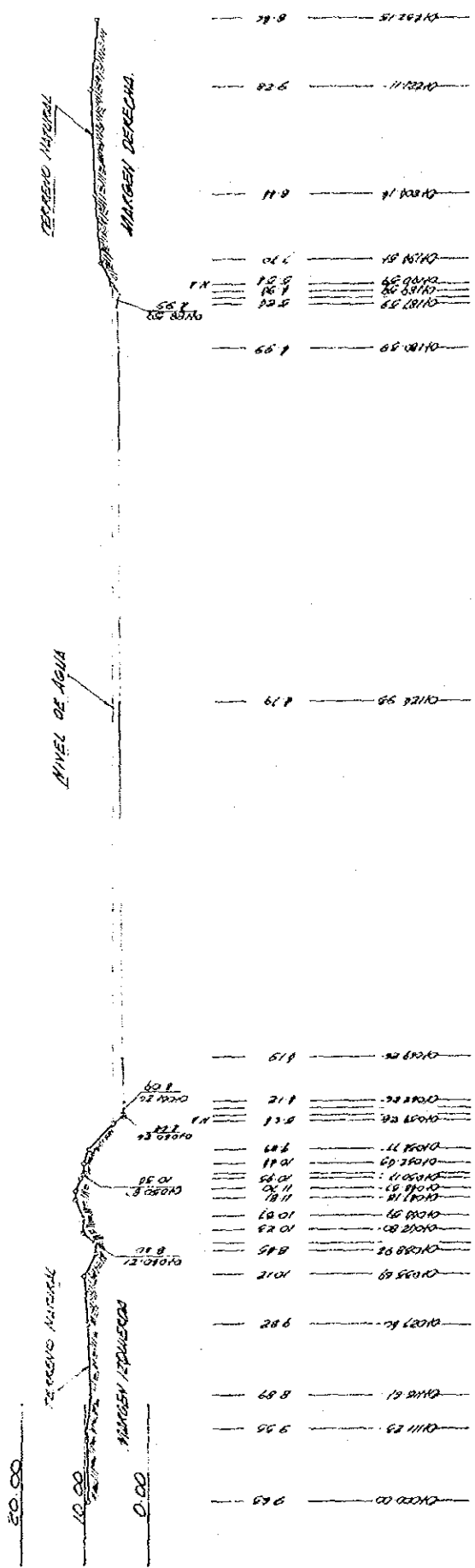
SECCION No. 15

RIO MARTINA

151.000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
 HORIZONTAL 1:500
 VERTICAL 1:500

© Muestreo de Muestras de Suelos
 Elevación =
 Todos los datos expresados
 en metros
 Elevaciones referidas al
 Nivel del Mar
 Elevación promedio de
 Nivel de Agua =



JICA

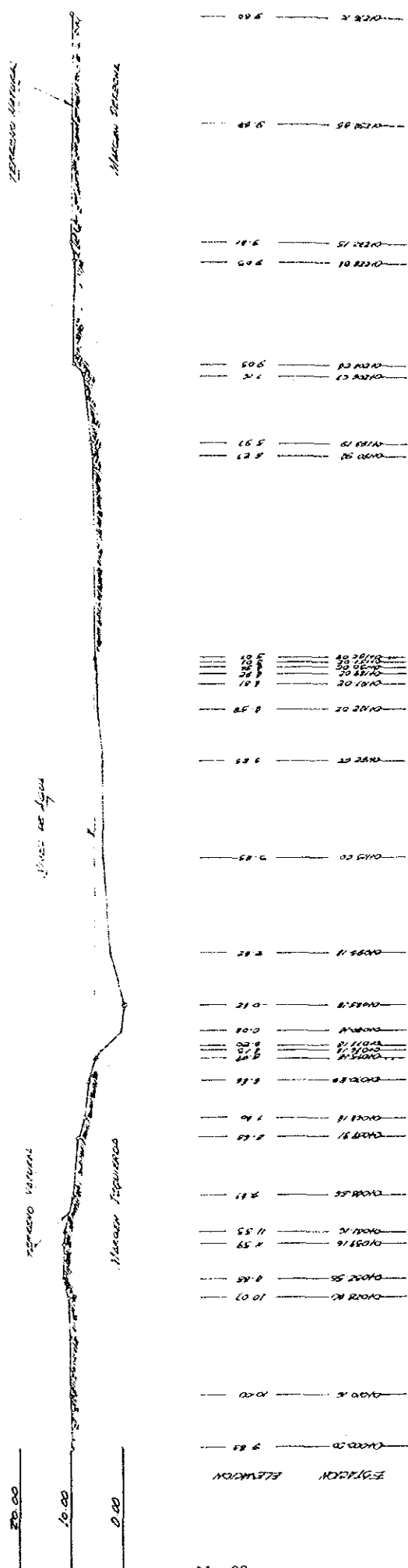
SECCION N° 16

16+000 DE PERFIL LONGITUDINAL DEL RIO

RIO MATINA

ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500

6 Promedio Mismo al Sonado
ELEVACION = -0.42
TODOS LOS DATOS TOMADOS
EN METROS
ELEVACIONES TOMADAS
A PARTIR DEL MAR
ELEVACION PROMEDIO DE
NIVEL DE AGUA = 5.08



ESTACION	ELEVACION
0+00	0.00
0+20	0.00
0+40	0.00
0+60	0.00
0+80	0.00
1+00	0.00
1+20	0.00
1+40	0.00
1+60	0.00
1+80	0.00
2+00	0.00
2+20	0.00
2+40	0.00
2+60	0.00
2+80	0.00
3+00	0.00
3+20	0.00
3+40	0.00
3+60	0.00
3+80	0.00
4+00	0.00
4+20	0.00
4+40	0.00
4+60	0.00
4+80	0.00
5+00	0.00
5+20	0.00
5+40	0.00
5+60	0.00
5+80	0.00
6+00	0.00
6+20	0.00
6+40	0.00
6+60	0.00
6+80	0.00
7+00	0.00
7+20	0.00
7+40	0.00
7+60	0.00
7+80	0.00
8+00	0.00
8+20	0.00
8+40	0.00
8+60	0.00
8+80	0.00
9+00	0.00
9+20	0.00
9+40	0.00
9+60	0.00
9+80	0.00
10+00	0.00
10+20	0.00
10+40	0.00
10+60	0.00
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13+40	0.00
13+60	0.00
13+80	0.00
14+00	0.00
14+20	0.00
14+40	0.00
14+60	0.00
14+80	0.00
15+00	0.00
15+20	0.00
15+40	0.00
15+60	0.00
15+80	0.00
16+00	0.00

JICA

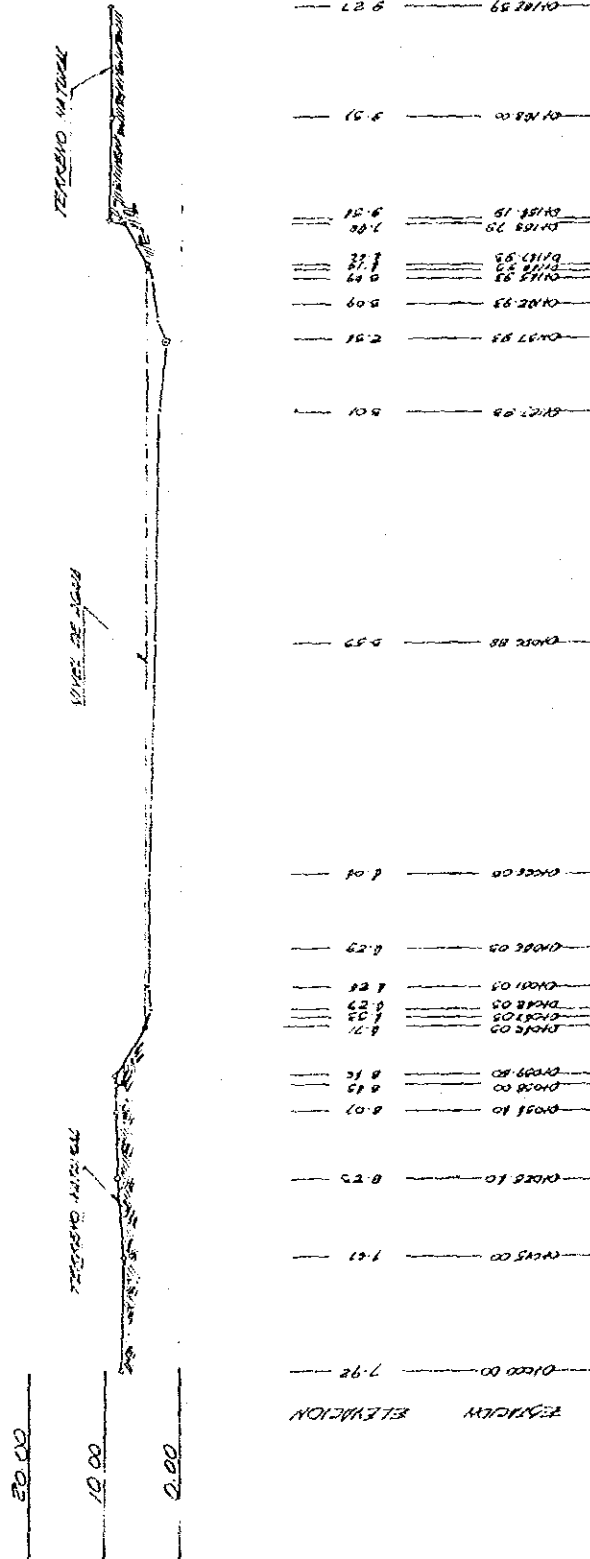
SECCION N° 17

17+000 DE PERFIL LONGITUDINAL DEL RIO

RIO MATANA

ESCALA
 HORIZONTAL 1:500
 VERTICAL 1:500

- PROFUNDIDAD MÁXIMA DE FONDEO ELEVACION 8.54
- TROZO LOS CUROS ESTACIONADOS EN METROS
- ESTACIONES REFERIDAS AL NIVEL DEL MAR
- ELEVACION PROMEDIO DE NIVEL DE AGUA: 8.69



JICA

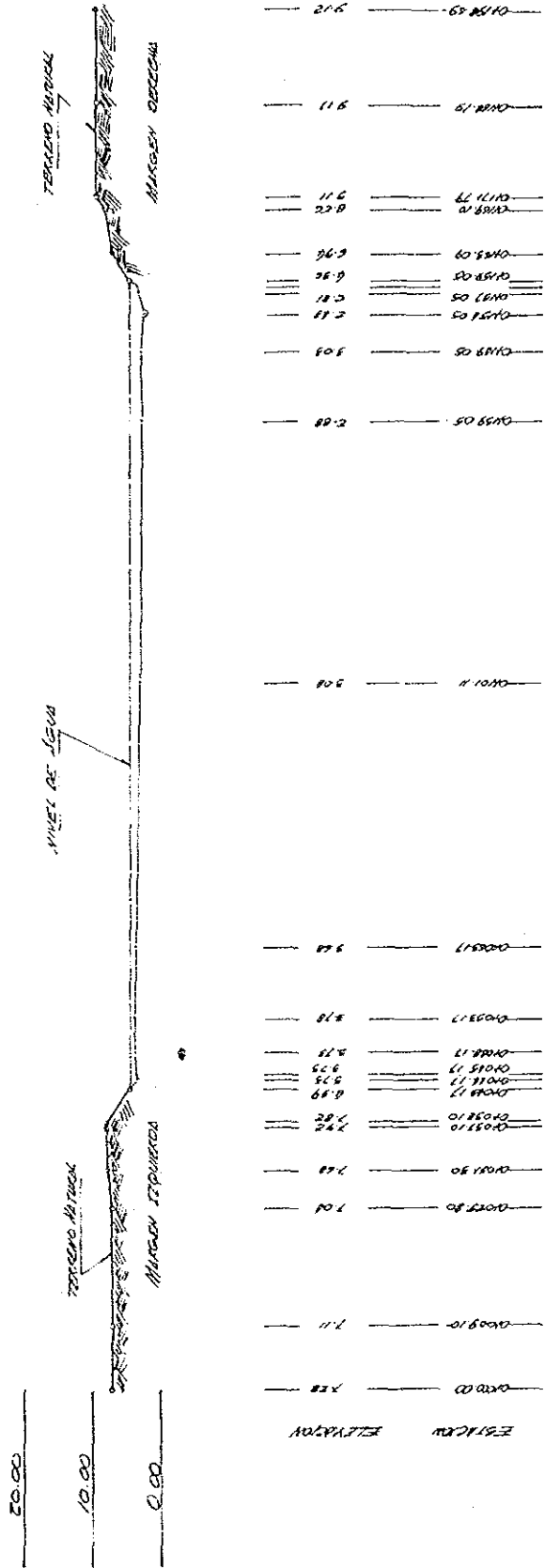
SECCION N° 18

RIO MARTINA

18+000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
 HORIZONTAL 1:500
 VERTICAL 1:500

Regulación de Sondeo
 ELEVACION 2.82
 RELEVANTES RETENIDOS AL
 NIVEL DEL MAR
 7000 LOS CUBO RECONSTRUICION
 DEL MURDO
 ELEVACION PROMEDIO DE
 NIVEL DE AGUA = 4.38



JICA

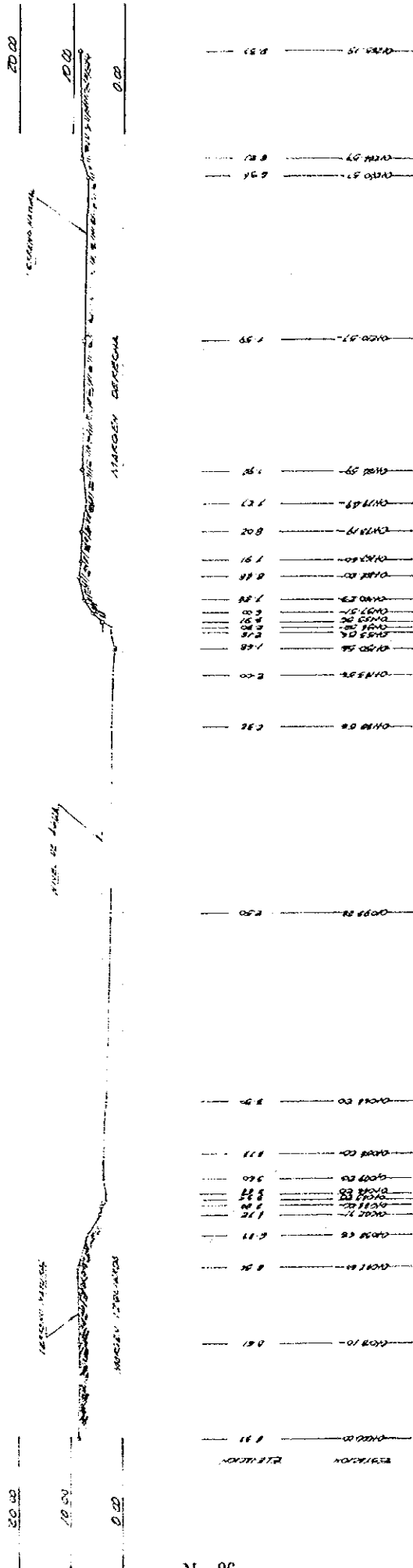
SECCION No 19

RIO MATINA

1:50,000 DE ESCALA LONGITUDINAL DEL RIO

SECCION \swarrow HORIZONTAL 1:500
 \searrow VERTICAL 1:500

TRANSFORMACION ALTIMETRIA DE TIEMPO
 PLANTACION = 1.58
 CORRIGIENDO CON LOS DATOS
 DEL MARIANO
 RECONSTRUCCION DEL CANAL
 EN EL AÑO 1954
 TRANSFORMACION DEL
 NIVEL DE FONDO = 3.70

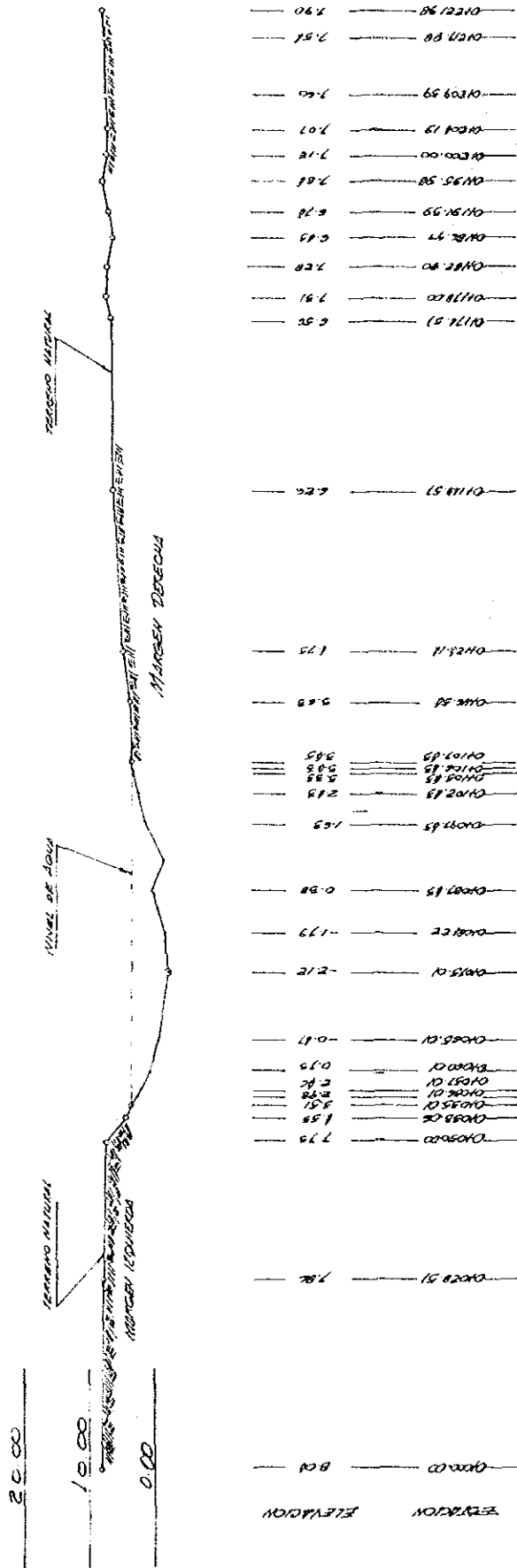


JICA

SECCION N° 20
 RIO MATINA
 CORTADO DE PERFIL LONGITUDINAL DEL RIO

• PROFUNDIDAD MÁXIMA DE SONDEO
 ELEVACION - E.V.E
 TODOS LOS DATOS ESTIMADOS
 EN METROS
 ELEVACIONES REFERIDAS AL
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE
 NIVEL DE AGUA = 5.98

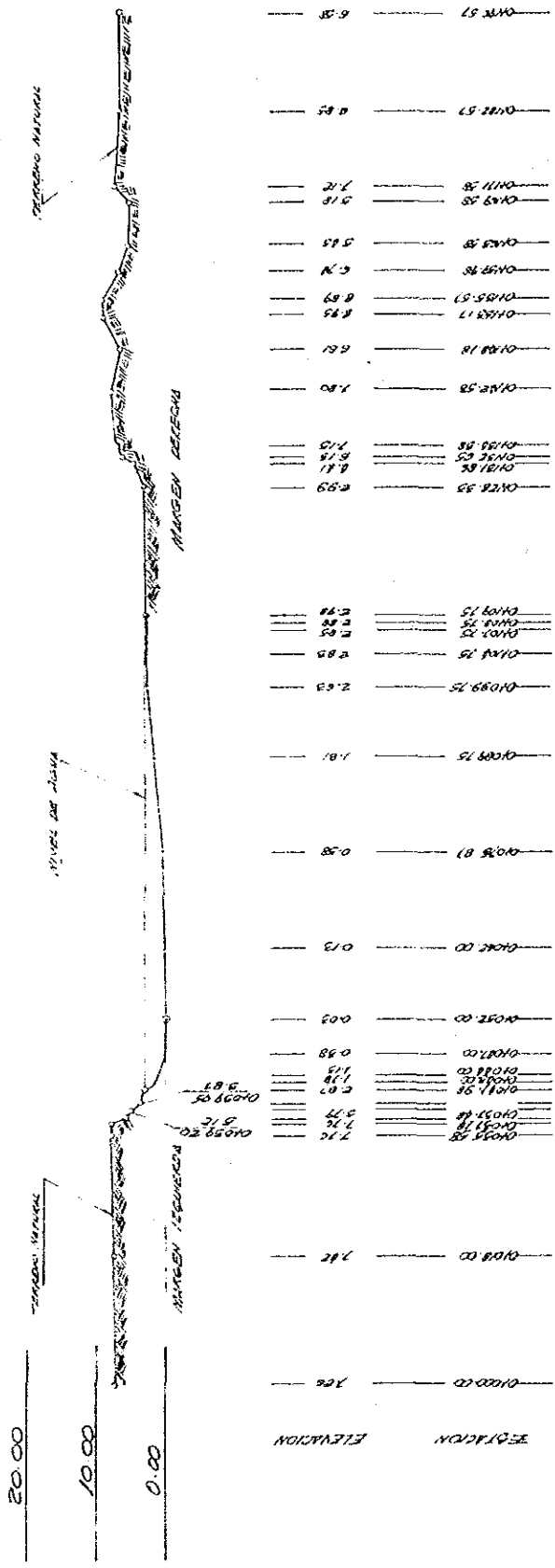
ESCALAS
 VERTICAL 1:500
 HORIZONTAL 1:500



JICA

SECCION N° 21
 RIO MATINA
 EJEMPLO DE PERFIL LONGITUDINAL DEL RIO
 ESCALAS HORIZONTAL 1:500
 VERTICAL 1:500

PROYUNDO MAXIMO DE CUBIERTOS
 ELEVACION = 0.05
 TODOS LOS DATOS REPRESENTADOS
 EN METROS
 ELEVACIONES REFERIDAS AL
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE
 NIVEL DE AGUA = 2.95



JICA

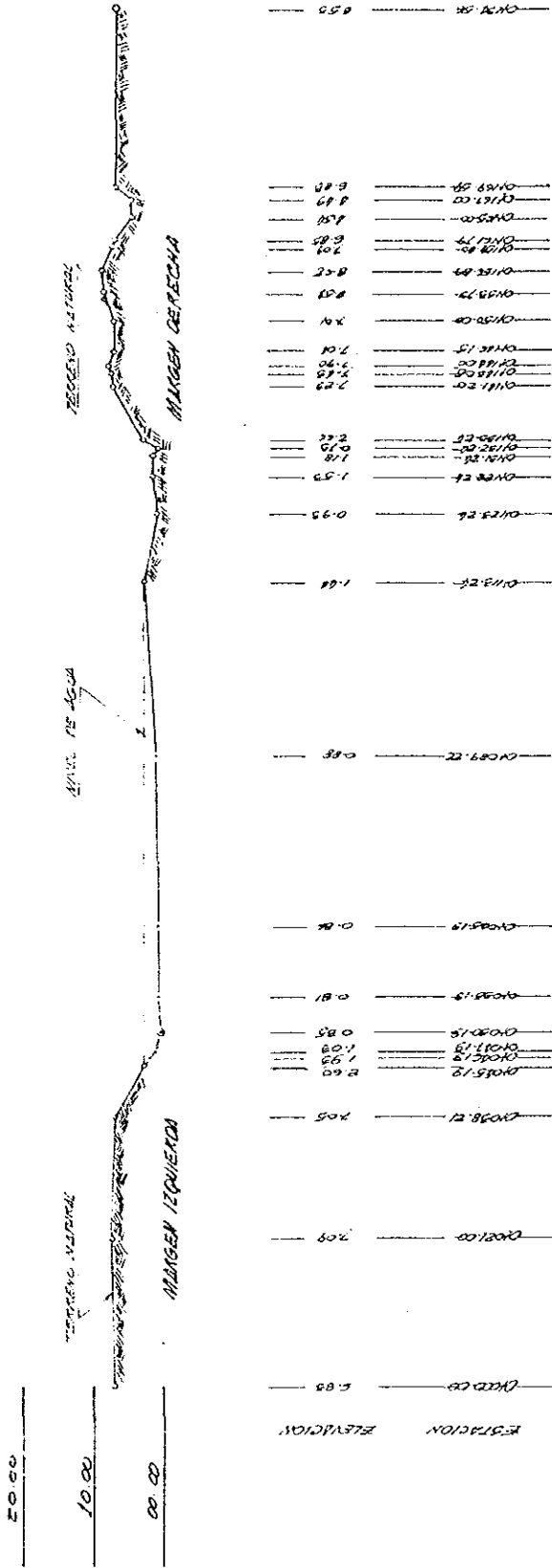
SECCION N° 22

RIO MATINA

SECCION DE PERFIL LONGITUDINAL DEL RIO

- PROFUNDIDAD MÁXIMA DE FUNDOS: ELEVACION = 0.95
- TENDIDO EN OTRAS SECCIONES FIJADAS EN METRO
- ELEVACIONES REFERIDAS AL NIVEL DEL MAR
- ELEVACION PROMEDIAL DE NIVEL DEL MAR = 2.63

ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500



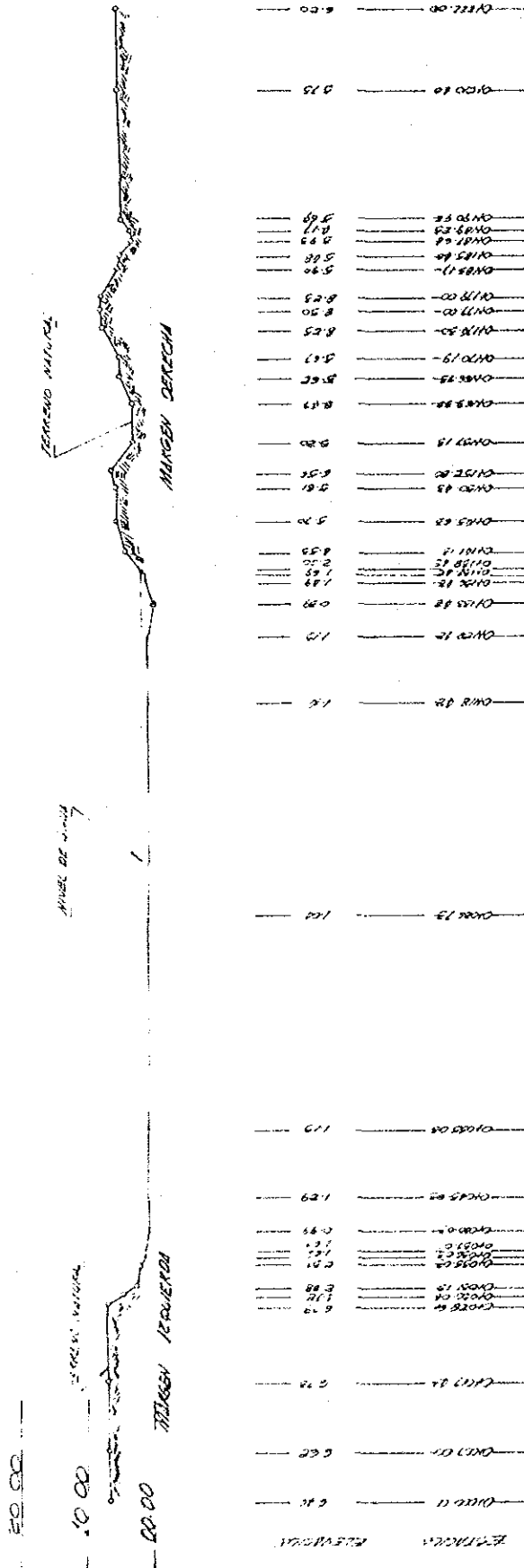
VICA

SECCION N° 23 RIO MARTINA

ESCALA DE PERAL LONGITUDINAL DEL RIO

ESCALA HORIZONTAL 1:500
ESCALA VERTICAL 1:500

- PREDIMENSIONAL PARA ESTIMAR EL COSTO DE LA OBRA
- PREDIMENSIONAL PARA ESTIMAR EL COSTO DE LA OBRA EN MATERIALES
- PREDIMENSIONAL PARA ESTIMAR EL COSTO DE LA OBRA EN MANO DE OBRERA
- PREDIMENSIONAL PARA ESTIMAR EL COSTO DE LA OBRA EN MANO DE OBRERA Y MATERIALES
- PREDIMENSIONAL PARA ESTIMAR EL COSTO DE LA OBRA EN MANO DE OBRERA Y MATERIALES Y MANO DE OBRERA



JICA

SECCION N°24

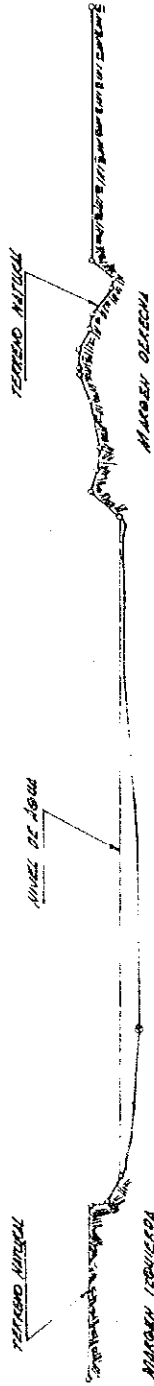
RIO MATINA

ENFOQUE DE PERFIL LONGITUDINAL DEL RIO

PROYUNION MAXIMA DE DADOS
 ELEVACION = -0.38
 TODOS LOS DATOS ESTABLECIDOS
 EN METROS
 ELEVACIONES REFERIDAS AL
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE
 NIVEL DE AGUA = 2.17

ESCALAS < HORIZONTAL 1:500
 VERTICAL 1:500

20.00
 10.00
 00.00



ESTACION	ELEVACION
0+00.00	5.89
0+27.00	6.30
0+50.00	6.78
0+51.10	5.99
0+52.00	5.21
0+53.00	1.82
0+54.00	1.82
0+55.00	0.72
0+56.50	0.33
0+70.00	0.36
0+70.00	0.32
0+72.00	1.92
0+78.00	1.77
0+81.00	1.75
0+82.00	2.19
0+87.00	2.10
0+92.00	3.25
0+93.00	3.25
0+94.00	3.25
0+95.00	3.25
0+96.00	3.25
0+97.00	3.25
0+98.00	3.25
0+99.00	3.25
0+99.50	3.25
1+00.00	3.25
1+01.00	3.25
1+02.00	3.25
1+03.00	3.25
1+04.00	3.25
1+05.00	3.25
1+06.00	3.25
1+07.00	3.25
1+08.00	3.25
1+09.00	3.25
1+10.00	3.25
1+11.00	3.25
1+12.00	3.25
1+13.00	3.25
1+14.00	3.25
1+15.00	3.25
1+16.00	3.25
1+17.00	3.25
1+18.00	3.25
1+19.00	3.25
1+20.00	3.25
1+21.00	3.25
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1+23.00	3.25
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1+27.00	3.25
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1+30.00	3.25
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1+69.00	3.25
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1+73.00	3.25
1+74.00	3.25
1+75.00	3.25
1+76.00	3.25
1+77.00	3.25
1+78.00	3.25
1+79.00	3.25
1+80.00	3.25
1+81.00	3.25
1+82.00	3.25
1+83.00	3.25
1+84.00	3.25
1+85.00	3.25
1+86.00	3.25
1+87.00	3.25
1+88.00	3.25
1+89.00	3.25
1+90.00	3.25
1+91.00	3.25
1+92.00	3.25
1+93.00	3.25
1+94.00	3.25
1+95.00	3.25
1+96.00	3.25
1+97.00	3.25
1+98.00	3.25
1+99.00	3.25
2+00.00	3.25

JICA

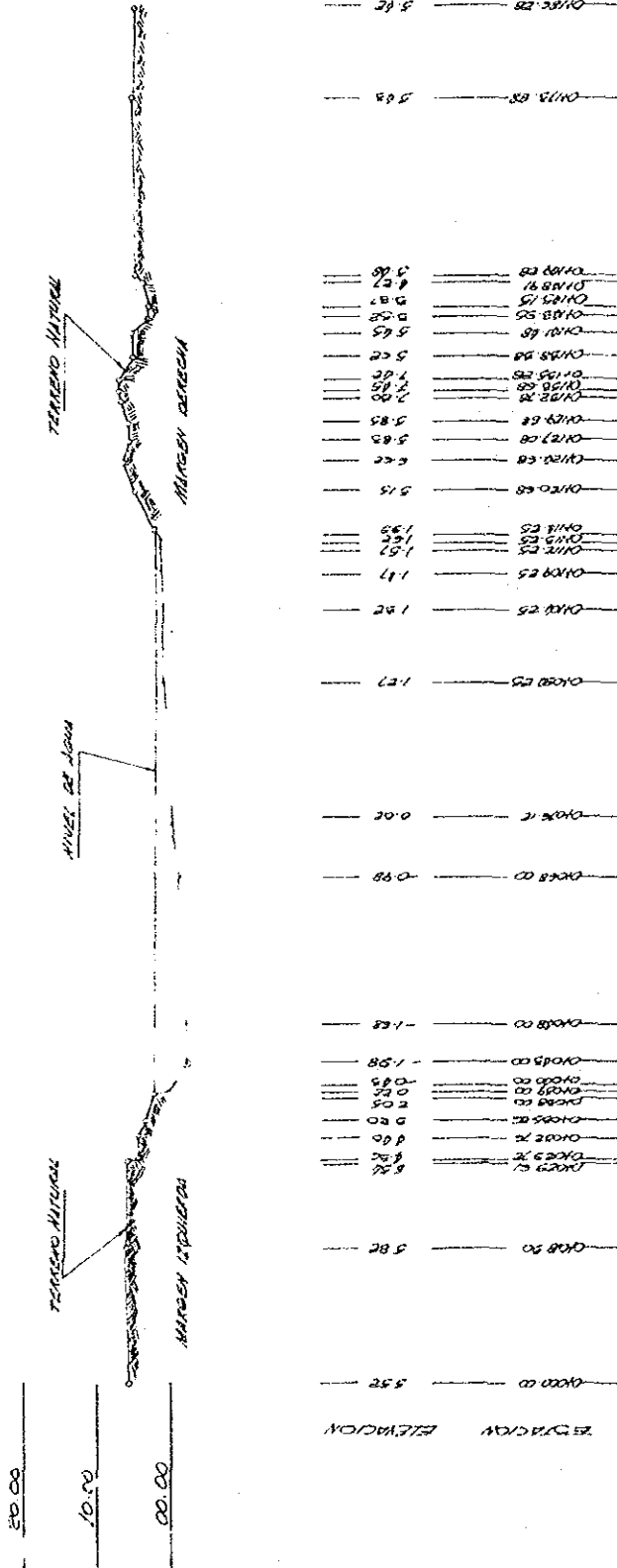
SECCION N° 25

RIO MATINA

ESTUDIO DE PERFIL LONGITUDINAL DEL RIO

ESCALAS
 HORIZONTAL 1:500
 VERTICAL 1:500

PROYECTO DE OBRAS DE
 CONSTRUCCION DE OBRAS DE
 RECONSTRUCCION DEL
 CANTON DE
 MATINA
 EN EL CANTON DE
 MATINA
 EN EL CANTON DE
 MATINA

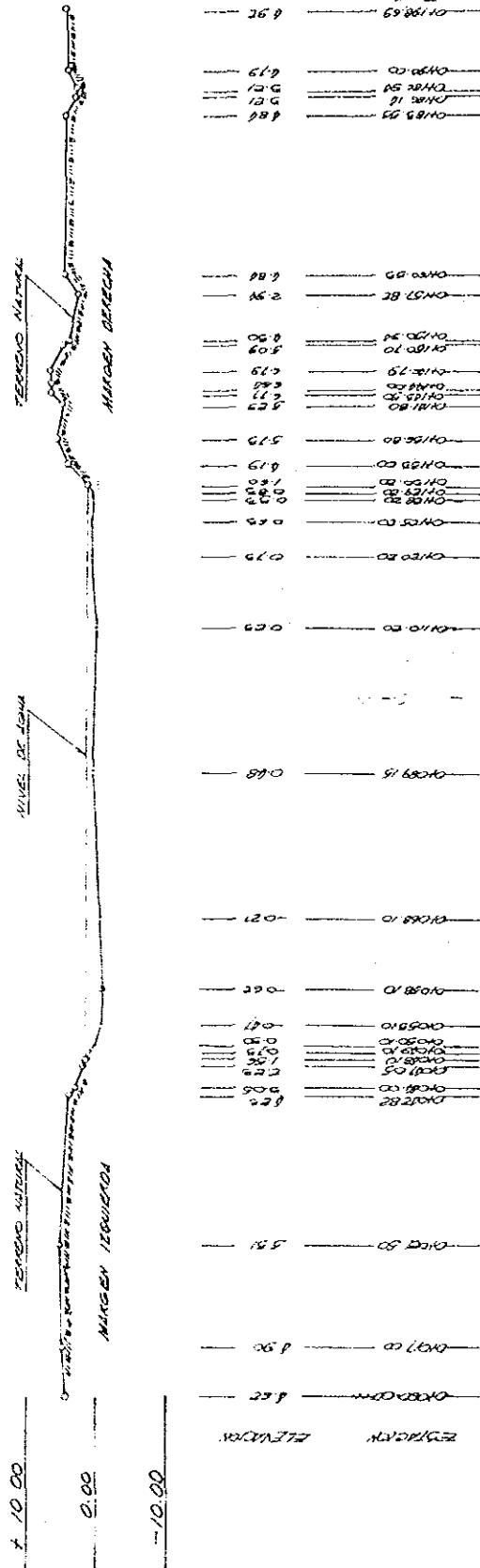


JICA

SECCION N°26 RIO MATINA ESTUDIO DE PERFIL LONGITUDINAL DEL RIO

ESCALAS < HORIZONTAL 1:200
VERTICAL 1:500

- 0. ESTACIONAMIENTO DEL RIO EN ESTACIONES
- 1. ESTACIONES DE MUESTREO
- 2. ESTACIONES DE MUESTREO
- 3. ESTACIONES DE MUESTREO
- 4. ESTACIONES DE MUESTREO
- 5. ESTACIONES DE MUESTREO
- 6. ESTACIONES DE MUESTREO
- 7. ESTACIONES DE MUESTREO
- 8. ESTACIONES DE MUESTREO
- 9. ESTACIONES DE MUESTREO
- 10. ESTACIONES DE MUESTREO
- 11. ESTACIONES DE MUESTREO
- 12. ESTACIONES DE MUESTREO
- 13. ESTACIONES DE MUESTREO
- 14. ESTACIONES DE MUESTREO
- 15. ESTACIONES DE MUESTREO
- 16. ESTACIONES DE MUESTREO
- 17. ESTACIONES DE MUESTREO
- 18. ESTACIONES DE MUESTREO
- 19. ESTACIONES DE MUESTREO
- 20. ESTACIONES DE MUESTREO
- 21. ESTACIONES DE MUESTREO
- 22. ESTACIONES DE MUESTREO
- 23. ESTACIONES DE MUESTREO
- 24. ESTACIONES DE MUESTREO
- 25. ESTACIONES DE MUESTREO
- 26. ESTACIONES DE MUESTREO
- 27. ESTACIONES DE MUESTREO
- 28. ESTACIONES DE MUESTREO
- 29. ESTACIONES DE MUESTREO
- 30. ESTACIONES DE MUESTREO
- 31. ESTACIONES DE MUESTREO
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- 33. ESTACIONES DE MUESTREO
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- 38. ESTACIONES DE MUESTREO
- 39. ESTACIONES DE MUESTREO
- 40. ESTACIONES DE MUESTREO
- 41. ESTACIONES DE MUESTREO
- 42. ESTACIONES DE MUESTREO
- 43. ESTACIONES DE MUESTREO
- 44. ESTACIONES DE MUESTREO
- 45. ESTACIONES DE MUESTREO
- 46. ESTACIONES DE MUESTREO
- 47. ESTACIONES DE MUESTREO
- 48. ESTACIONES DE MUESTREO
- 49. ESTACIONES DE MUESTREO
- 50. ESTACIONES DE MUESTREO
- 51. ESTACIONES DE MUESTREO
- 52. ESTACIONES DE MUESTREO
- 53. ESTACIONES DE MUESTREO
- 54. ESTACIONES DE MUESTREO
- 55. ESTACIONES DE MUESTREO
- 56. ESTACIONES DE MUESTREO
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- 91. ESTACIONES DE MUESTREO
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- 93. ESTACIONES DE MUESTREO
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- 95. ESTACIONES DE MUESTREO
- 96. ESTACIONES DE MUESTREO
- 97. ESTACIONES DE MUESTREO
- 98. ESTACIONES DE MUESTREO
- 99. ESTACIONES DE MUESTREO
- 100. ESTACIONES DE MUESTREO



JICA

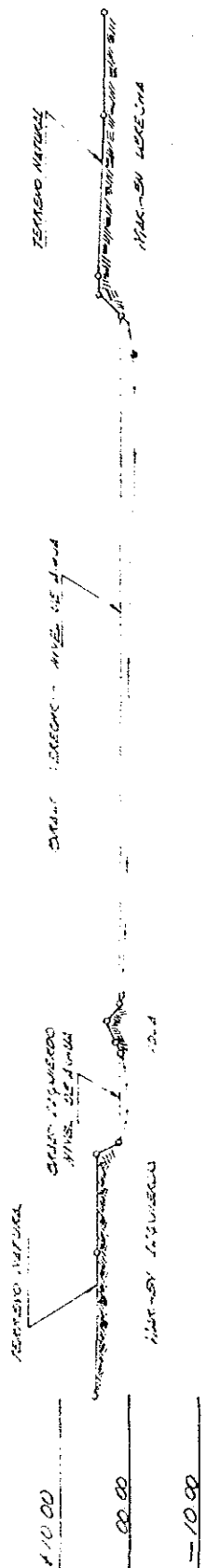
SECCION N° 27

RIO MATINA

ESTUDIO DE PERFIL LONGITUDINAL DEL RIO

ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500

0. ESTACIONES 110.00 - 110.50
110.50 - 111.00
111.00 - 111.50
111.50 - 112.00
112.00 - 112.50
112.50 - 113.00
113.00 - 113.50
113.50 - 114.00



ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500

ESTACION	ELEVACION
110.00	00.00
110.10	00.00
110.20	00.00
110.30	00.00
110.40	00.00
110.50	00.00
110.60	00.00
110.70	00.00
110.80	00.00
110.90	00.00
111.00	00.00
111.10	00.00
111.20	00.00
111.30	00.00
111.40	00.00
111.50	00.00
111.60	00.00
111.70	00.00
111.80	00.00
111.90	00.00
112.00	00.00
112.10	00.00
112.20	00.00
112.30	00.00
112.40	00.00
112.50	00.00
112.60	00.00
112.70	00.00
112.80	00.00
112.90	00.00
113.00	00.00
113.10	00.00
113.20	00.00
113.30	00.00
113.40	00.00
113.50	00.00
113.60	00.00
113.70	00.00
113.80	00.00
113.90	00.00
114.00	00.00

JICA

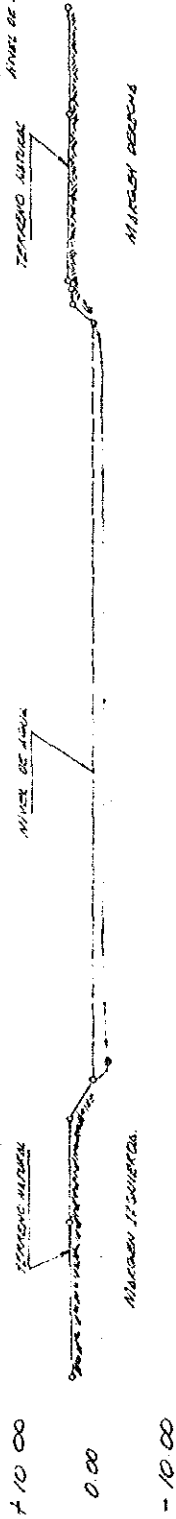
SECCION N° 28

RIO MATINA

28+000 DE PERFIL LONGITUDINAL DEL RIO

ESCALAS ← HORIZONTAL 1:500
 VERTICAL 1:500

• PROMEDIO MARINA DE JORDAO
 ELEVACION = -0.81
 PARA LOS DATOS LONGITUDINALES
 EN METROS
 ELEVACIONES REFERIDAS A:
 NIVEL DEL MAR
 ELEVACION PROMEDIO DE
 ANOS DE 1944 - 1951



ESTACION	ELEVACION
0.00	0.00
0.10	0.00
0.20	0.00
0.30	0.00
0.40	0.00
0.50	0.00
0.60	0.00
0.70	0.00
0.80	0.00
0.90	0.00
1.00	0.00
1.10	0.00
1.20	0.00
1.30	0.00
1.40	0.00
1.50	0.00
1.60	0.00
1.70	0.00
1.80	0.00
1.90	0.00
2.00	0.00
2.10	0.00
2.20	0.00
2.30	0.00
2.40	0.00
2.50	0.00
2.60	0.00
2.70	0.00
2.80	0.00
2.90	0.00
3.00	0.00
3.10	0.00
3.20	0.00
3.30	0.00
3.40	0.00
3.50	0.00
3.60	0.00
3.70	0.00
3.80	0.00
3.90	0.00
4.00	0.00
4.10	0.00
4.20	0.00
4.30	0.00
4.40	0.00
4.50	0.00
4.60	0.00
4.70	0.00
4.80	0.00
4.90	0.00
5.00	0.00
5.10	0.00
5.20	0.00
5.30	0.00
5.40	0.00
5.50	0.00
5.60	0.00
5.70	0.00
5.80	0.00
5.90	0.00
6.00	0.00
6.10	0.00
6.20	0.00
6.30	0.00
6.40	0.00
6.50	0.00
6.60	0.00
6.70	0.00
6.80	0.00
6.90	0.00
7.00	0.00
7.10	0.00
7.20	0.00
7.30	0.00
7.40	0.00
7.50	0.00
7.60	0.00
7.70	0.00
7.80	0.00
7.90	0.00
8.00	0.00
8.10	0.00
8.20	0.00
8.30	0.00
8.40	0.00
8.50	0.00
8.60	0.00
8.70	0.00
8.80	0.00
8.90	0.00
9.00	0.00
9.10	0.00
9.20	0.00
9.30	0.00
9.40	0.00
9.50	0.00
9.60	0.00
9.70	0.00
9.80	0.00
9.90	0.00
10.00	0.00

JICA

SECCION N° 28

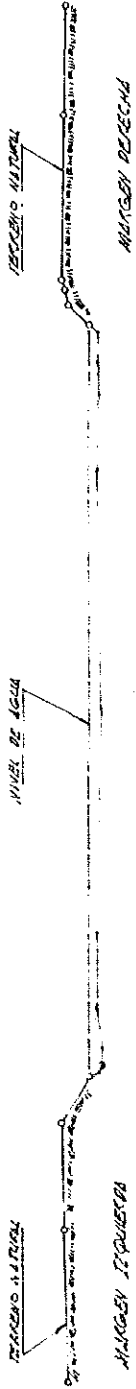
RIO MATINA

ESPALDO DE PERFIL LONGITUDINAL DEL RIO

- PROYECTADO NIVEL DE TIERRAS ELEVACION = -0.80
- TODOS LOS DATOS ESTACIONADOS EN METROS
- ELEVACIONES REFERIDAS AL NIVEL DEL MAR
- ELEVACION PROMEDIO DE NIVEL DE AGUA = 1.01

ESCALAS
HORIZONTAL 1:500
VERTICAL 1:500

1.00
0.00
-1.00



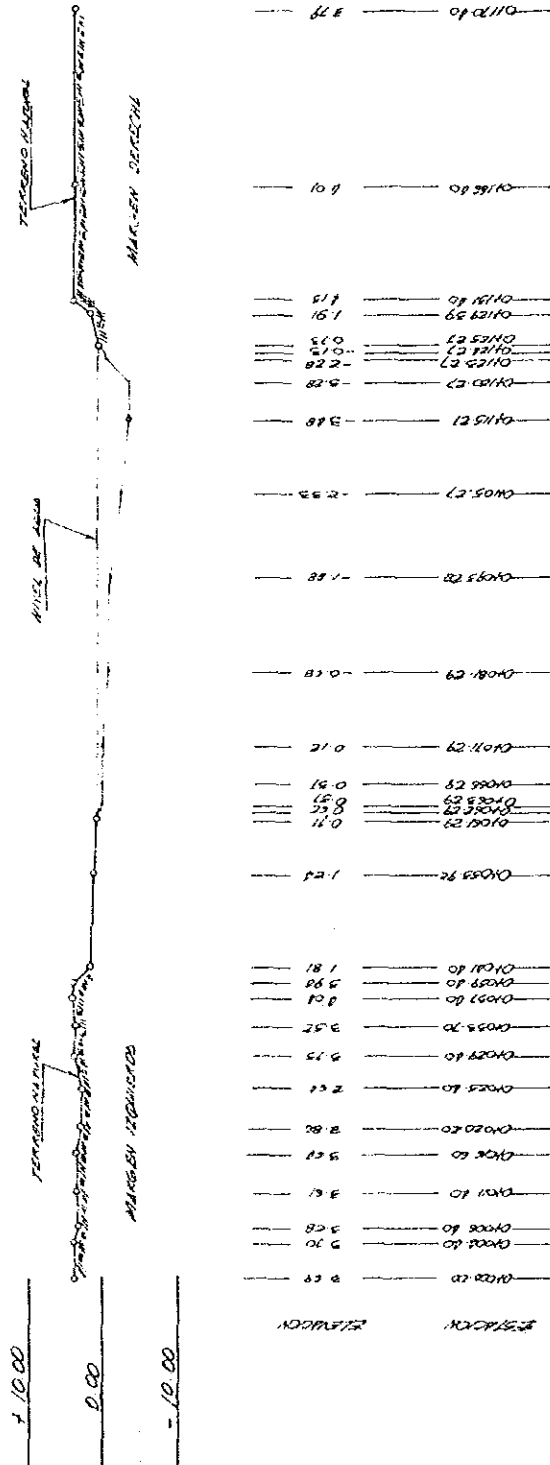
Stationing	Elevation
0+00	00.00
0+10	1.00
0+20	0.87
0+30	1.00
0+40	0.85
0+50	0.85
0+60	0.85
0+70	0.85
0+80	0.85
0+90	0.85
1+00	0.85
1+10	0.85
1+20	0.85
1+30	0.85
1+40	0.85
1+50	0.85
1+60	0.85
1+70	0.85
1+80	0.85
1+90	0.85
2+00	0.85
2+10	0.85
2+20	0.85
2+30	0.85
2+40	0.85
2+50	0.85
2+60	0.85
2+70	0.85
2+80	0.85
2+90	0.85
3+00	0.85
3+10	0.85
3+20	0.85
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3+40	0.85
3+50	0.85
3+60	0.85
3+70	0.85
3+80	0.85
3+90	0.85
4+00	0.85
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49+50	0.85
49+60	0.85
49+70	0.85
49+80	0.85
49+90	0.85
50+00	0.85
50+10	0.85
50+20	0.85
50+30	0.85
50+40	0.85
50+50	0.85
50+60	0.85
50+70	0.85
50+80	0.85
50+90	0.85
51+00	0.85
51+10	0.85
51+20	0.85
51+30	0.85
51+40	0.85
51+50	0.85
51+60	0.85
51+	

VICA

SECCION Nº 29 RIO MATINA ESTUDIO DE PERFIL LONGITUDINAL DEL RIO

ESCALAS < HORIZONTAL 1:500
VERTICAL 1:500

FORMACION ALTIMETRIA DE DADOS
ELEVACION - 0.00
TODOS LOS DATOS ESTAN EN METROS
ELEVACIONES REFERIDAS
AL NIVEL DEL MAR
ELEVACION PROYECTO DE
NIVEL DE AGUA - 0.72



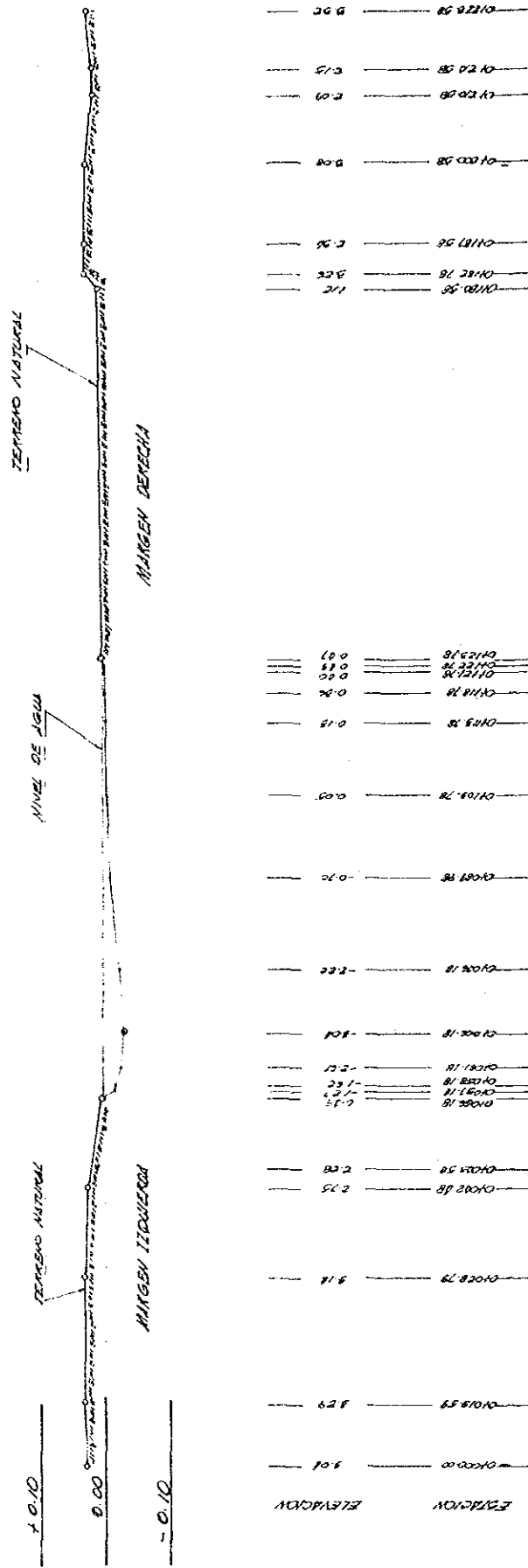
JICA

SECCION E RIO MATINA

30,1700 DE PERFIL LONGITUDINAL DEL RIO

PROYECTO MAPAS DE BARRIO
ELEVACION = 3.00
TODOS LOS DATOS ANTERIORES
EN METROS
ELEVACION REFERIDA AL
NIVEL DEL MAR
ELEVACION PROMEDIO DE
DEL NIVEL DE AGUA = 0.45

ESCALA < HORIZONTAL 1:500
VERTICAL 1:500



ESTACION	ELEVACION
0+00	0.00
0+10	0.00
0+20	0.00
0+30	0.00
0+40	0.00
0+50	0.00
0+60	0.00
0+70	0.00
0+80	0.00
0+90	0.00
1+00	0.00
1+10	0.00
1+20	0.00
1+30	0.00
1+40	0.00
1+50	0.00
1+60	0.00
1+70	0.00
1+80	0.00
1+90	0.00
2+00	0.00
2+10	0.00
2+20	0.00
2+30	0.00
2+40	0.00
2+50	0.00
2+60	0.00
2+70	0.00
2+80	0.00
2+90	0.00
3+00	0.00
3+10	0.00
3+20	0.00
3+30	0.00
3+40	0.00
3+50	0.00
3+60	0.00
3+70	0.00
3+80	0.00
3+90	0.00
4+00	0.00
4+10	0.00
4+20	0.00
4+30	0.00
4+40	0.00
4+50	0.00
4+60	0.00
4+70	0.00
4+80	0.00
4+90	0.00
5+00	0.00
5+10	0.00
5+20	0.00
5+30	0.00
5+40	0.00
5+50	0.00
5+60	0.00
5+70	0.00
5+80	0.00
5+90	0.00
6+00	0.00
6+10	0.00
6+20	0.00
6+30	0.00
6+40	0.00
6+50	0.00
6+60	0.00
6+70	0.00
6+80	0.00
6+90	0.00
7+00	0.00
7+10	0.00
7+20	0.00
7+30	0.00
7+40	0.00
7+50	0.00
7+60	0.00
7+70	0.00
7+80	0.00
7+90	0.00
8+00	0.00
8+10	0.00
8+20	0.00
8+30	0.00
8+40	0.00
8+50	0.00
8+60	0.00
8+70	0.00
8+80	0.00
8+90	0.00
9+00	0.00

JICA

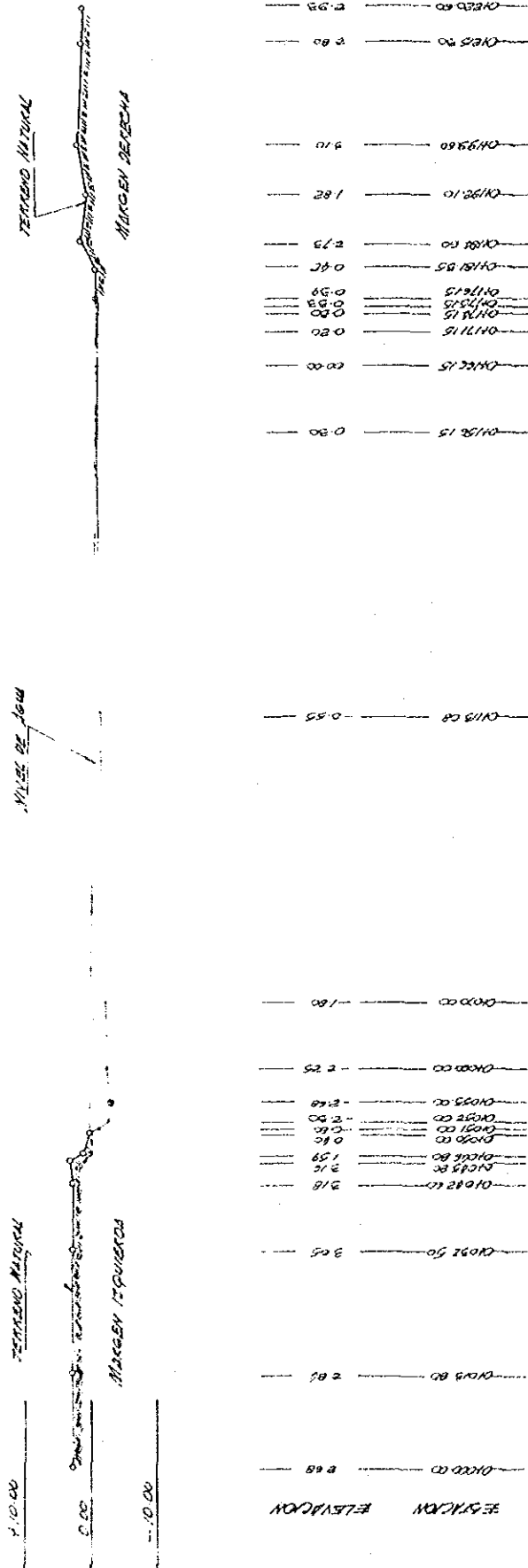
SECCION N° 31

RIO MATINA

311000 DE PERFIL LONGITUDINAL DEL RIO

ESCALA 3 < HORIZONTAL 1:500
VERTICAL 1:500

PROY. NO. 1000, MATINA DE OCHOBO
ASOCIACION "E. O. B."
TODOS LOS DATOS EMPERICOS
SON METROS
ELEVACIONES REFERIDAS AL
NIVEL DEL MAR
ELEVACION PROMEDIO DE
NIVEL DE AGUA = 0.20

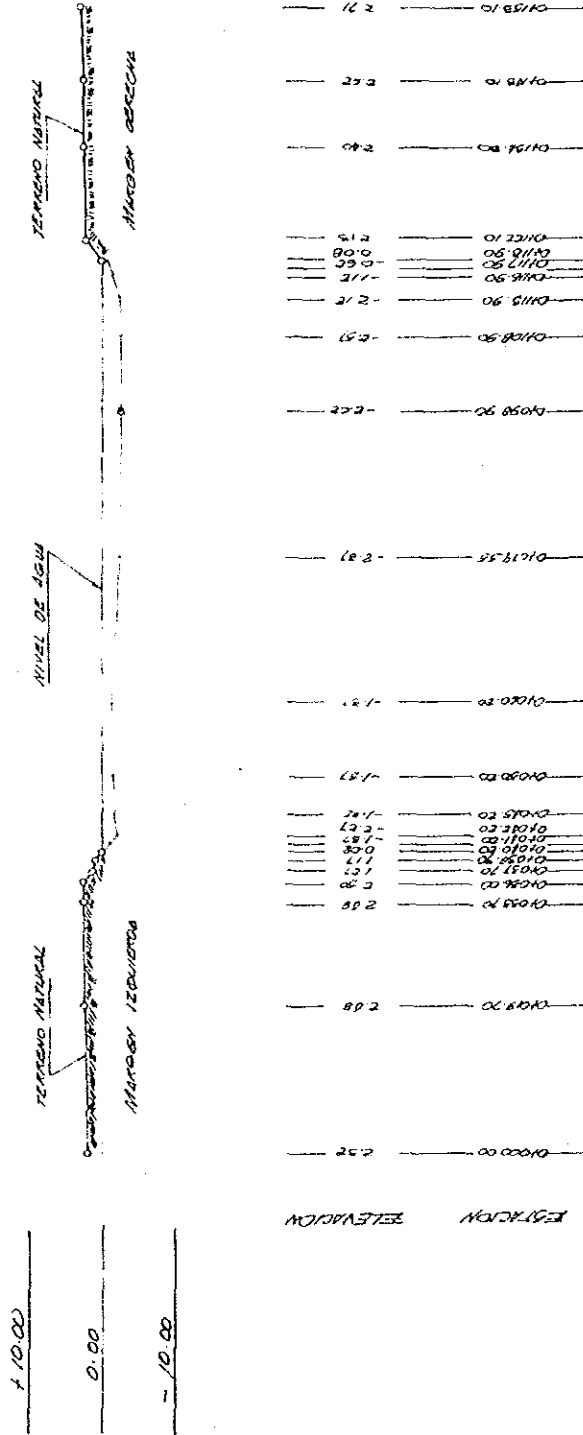


JICA

SECCION N° 32
 RIO MATINA
 52+000 DE PERFIL LONGITUDINAL DEL RIO

PROYECTO ANILAS DE TIEMPO
 ESTACION N° 32
 ADMINISTRACIONES COM. SUP. CARRIL
 CANTON N° 35
 PROV. BOL. 1944
 ELITECERCA DE CARRIL
 SECCION N° 32
 NIVEL DE AGUA - 0.00

ESCALAS < HORIZONTAL 1:500
 VERTICAL 1:500



JICA

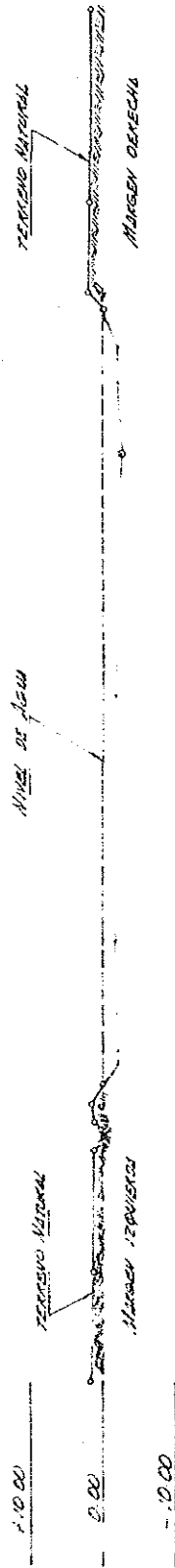
SECCION Nº 33

RIO MATINA

33/1000 DE PERFIL LONGITUDINAL DEL RIO

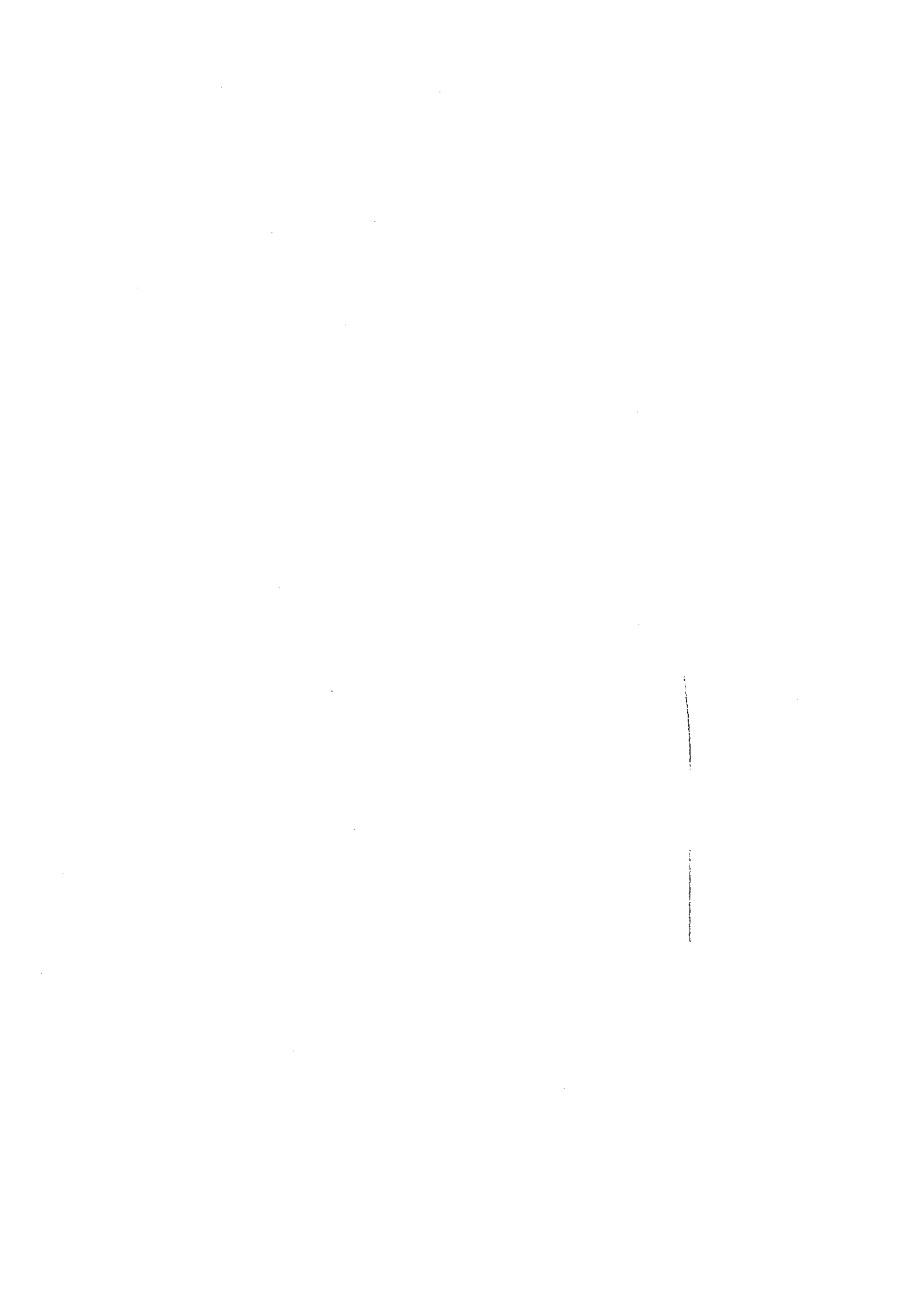
7) INFORMACION MANEJO DE TRAZADO.
 8) ELEVACION: -2.63
 PODOS LOS DATOS ESPECIFICADOS EN METRO
 ELEVACIONES REFERIDAS A L. NIVEL DEL AGUA
 ELEVACIONES REFERIDAS A NIVEL DE AGUA = C.C.

ESCALAS $\left\{ \begin{array}{l} \text{HORIZONTAL 1:500} \\ \text{VERTICAL 1:500} \end{array} \right.$



ELEVACION

1.17	0105.00
1.83	0105.10
0.15	0105.20
0.17	0105.30
1.57	0105.40
1.57	0105.50
1.83	0105.60
1.83	0105.70
1.83	0105.80
1.83	0105.90
1.83	0106.00
1.83	0106.10
1.83	0106.20
1.83	0106.30
1.83	0106.40
1.83	0106.50
1.83	0106.60
1.83	0106.70
1.83	0106.80
1.83	0106.90
1.83	0107.00
1.83	0107.10
1.83	0107.20
1.83	0107.30
1.83	0107.40
1.83	0107.50
1.83	0107.60
1.83	0107.70
1.83	0107.80
1.83	0107.90
1.83	0108.00
1.83	0108.10
1.83	0108.20
1.83	0108.30
1.83	0108.40
1.83	0108.50
1.83	0108.60
1.83	0108.70
1.83	0108.80
1.83	0108.90
1.83	0109.00
1.83	0109.10
1.83	0109.20
1.83	0109.30
1.83	0109.40
1.83	0109.50
1.83	0109.60
1.83	0109.70
1.83	0109.80
1.83	0109.90
1.83	0110.00



JICA