Table A.4.2.2-4 Proposed Volume of Input Materials

Input Materials	Unite	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion	Pasture	Sub Total		Total
		Wet	Dry	Wet	Dry	Wet	Wet	Dry	Dry	Dry		Wet	Dry	
		2,850 1)	1,200	1,950	450	450	1,200	1,200	1,200	750	550	7,000	4,800	11,800
1. Seeds	t	48.5	20.4	95.6	22.1	0.02	0.4	0.4	0.8	2.4		144.52	46.1	190.62
2. Fertilizer														
16-20-0	t	598.5	312.0	358.8	87.8		390	390				1,347.3	789.8	2,137.1
15-15-15	t								883.2	535.5			1,418.7	1,418.7
20-20-0	t					144.9					50.0	194.9	—	194.9
15-10-20	t					269.1						269.1	—	269.1
46-0-0	t	393.3	393.3				220.8	228.0	552.0	278.0		614.1	1,442.1	2,056.2
Boron	t								24.0			—	24.0	24.0
3. Insecticides														
Lannate	t					1.4	1.7	1.7		0.5		3.1	2.2	5.3
Volaton	t	37.1	15.6									37.1	15.6	52.7
Folidol	ℓ			2,730	630	1,800				3,000		4,530	3,630.0	8,160.0
Metasistox	ℓ								3,600			—	3,630.0	3,630.0
Tamaron	ℓ			2,925	675		9,600	9,600	3,600			12,525.0	13,875.0	26,400.0
Belmark	ℓ								3,600			—	3,600.0	3,600.0
4. Fungicides														
Antracol	t						7.8	7.8		3.8		7.8	11.6	19.4
Trimiltox	t									1.1		—	1.1	1.1
5. Herbicides														
Gesaprin	t	5.7	2.4									5.7	2.4	8.1
Trifluralin	ℓ			3,900	900		2,400	2,400	2,400	1,500		6,300.0	7,200.0	13,500.0
Hedonal Amin	ℓ					2,700						2,700.0	—	2,700.0
Hedonal Ester	ℓ					1,350						1,350.0	—	1,350.0
Gramoxon	ℓ											550.0		
6. Parasiticides														
Asuntol	ℓ										8.3	8.3		
Catsol	ℓ										11.0	11.0		
7. Preventive Injection														
Triple	ℓ										2.8	2.8		
8. Food														
Solt	t										41.8			

Table A.4.2.2-5 Proposed Total Cost of Input Materials

Unit : Q

Input Materials	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion	Pasture	Sub Total		Total
	Wet	Dry	Wet	Dry	Wet	Wet	Dry	Dry	Dry		Wet	Dry	
1. Seeds	57.720	26.700	105.160	24.310	1.800	55.600	55.600	176.240	130.320		220.280	413.170	633.450
2. Fertilizer													
16 — 20 — 0	311.220	162.240	186.580	45.660		202.800	202.800				700.600	410.700	1.111.300
15 — 15 — 15								468.100	283.820		—	751.920	751.920
20 — 20 — 0					75.350					26.000	101.350	—	101.350
15 — 10 — 20					139.930						139.930	—	139.930
46 — 0 — 0	169.120	169.120				94.940	94.940	237.360	118.680		264.060	620.100	884.160
Boron								91.200			—	91.200	91.200
Sub Total											1.205.940	1.873.920	3.079.860
3. Insecticides													
Lannate					135.800	164.900	164.900		48.500		300.700	213.400	514.100
Volaton	96.460	40.560									96.460	40.560	137.020
Folidol			38.220	8.820	25.200				42.000		63.420	50.820	114.240
Metasistox								129.600			—	129.600	129.600
Tamaron			61.425	14.175		201.600	201.600	75.600			263.025	291.375	554.400
Belmark								108.000			—	108.000	108.000
Sub Total											723.605	833.755	1.557.360
4. Fungicides													
Antracol						113.880	113.880		55.480		113.880	169.360	283.240
Trimiltox									17.600		—	17.600	17.600
Sub Total											113.880	186.960	300.840
5. Herbicides													
Gesaprin	71.250	30.000									71.250	30.000	101.250
Trifluralin			46.800	10.800		28.800	28.800	28.800	18.000		75.600	88.400	162.000
Hedonal Amin					17.550						17.550	—	17.550
Hedonal Ester					12.825						12.825		12.825
Gramoxon										6.600	6.600	—	6.600
Sub Total											183.825	116.400	300.225
6. Parasiticides													
Asuntol										1.273	1.273	—	1.273
Catsol										4.840	4.840	—	4.840
Sub Total											6.113	—	6.113
7. Preventive injection													
Triple										280	280	—	280
8. Peed													
Salt										18.392	18.392	—	18.392
Total	705.770	428.620	438.185	103.765	408.455	862.520	862.520	1.314.900	714.400	57.385	2.472.315	3.424.205	5.896.520

Source : Table A.3.4.5-5, A.4.4.1-2

Table A.4.2.2-6 Proposed Labour Requirement for Crops

(unit : man - day/ha)

Operation	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion
	Wet	Dry	Wet	Dry	Wet	Wet	Dry	Dry	Dry
1. Sowing/Transplanting	4	4	5	5	11	12	12	11	68
2. Fertilizer Application									
a. Basal Application	2	2	3	3	5	4	4	8	3
b. Top dressing	1	1	—	—	5	4	4	8	3
Sub Total	3	3	3	3	10	8	8	16	6
3. Weeding									
a. 1 st weeding	7	5	9	5	6	5	4	11	20
b. 2 nd weeding	11	8	—	—	11	10	8	—	26
Sub Total	18	13	9	5	17	15	12	11	46
4. Spraying									
a. Insecticides	2	2	2	2	23	9	11	20	13
b. Fungicides	—	—	—	—	23	9	11	—	13
c. Herbicides	3	3	3	3	3	3	3	3	3
Sub Total	5	5	5	5	49	21	25	23	29
5. Irrigation	6	30	6	24	6	7	27	30	46
6. Harvesting	25	18	17	22	80	70	75	33	55
7. Transporting	2	2	1	1	21				
8. Packing					4				
Total	63	75	46	65	198	133	159	124	250

Table A.4.2.2-7 Proposed Monthly Labour Requirement

(Unit : man-day/month)

Crops	Area	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total
Maize	4.050ha													
W [1] • B1 [2]	1.200	4.812	10.128	10.104	6.516	6.120	16.332	10.800	10.788					75.600
W • B2	1.200	4.812	10.128	10.104	6.516	6.120	16.332	10.800	10.788					75.600
W-D • B4	450					1.346	5.175	5.175	7.875	4.725	4.054			28.350
D • B3	1.200						8.796	13.500	14.496	11.700	18.900	14.604	8.004	90.000
Kidney bean	2.400													
D ~ W B2	1.200	12.012	9.192	9.204							4.404	16.788	16.800	68.400
W B4	750	3.653	6.405	6.398	8.153	5.400	4.491							34.500
D B4	450	3.447	3.451							1.651	6.296	6.300	4.505	25.650
Tobacco														
W B4	450	7.308	8.735	10.827	23.355	21.928	15.147							87.300
Tomato	2.400													
W • B3	1.200		10.284	16.884	21.684	43.476	39.276	27.996						159.600
D • B1	1.200							15.612	21.564	25.044	50.772	47.808	30.000	190.800
Broccoli														
D • B2	1.200							20.508	25.932	36.324	35.712	23.724	6.600	148.800
Onion														
D • B4	750					26.655	35.655	44.130	38.152	29.153	13.755			187.500
Pasture														
W ~ D	550	550	550	550	550	550	550	550	550	550	550	550	550	6.600
Total	11.800	36.594	58.873	64.071	66.774	111.595	141.754	149.071	130.145	109.147	134.443	109.774	66.459	1.178.700

Note : 1) W ····· Wet Season D ····· Dry Season 2) B1 : No. of rotation block

Table A.4.2.2-8 Proposed Unit Production Cost

(1). Maize in Wet Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	285.71	285.71
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	78.57	78.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				469.99
B. Variable Cost				
Seeds	kg	17	1.19	20.23
Insecticides	kg	13	2.60	33.80
Herbicides	kg	2	12.50	25.00
Fertilizer	kg	210	0.52	109.20
Fertilizer	kg	138	0.43	59.34
Sub Total				247.57
C. Labour Cost				
Sowing	man/day	4	5.00	20.00
Weeding				
a. 1st Weeding	man/day	7	5.00	35.00
b. 2nd Weeding	man/day	11	5.00	55.00
Spraying				
a. Insecticides	man/day	2	5.00	10.00
b. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	2	5.00	10.00
b. Top Dressing	man/day	1	5.00	5.00
Irrigation	man/day	6	5.00	30.00
Harvesting	man/day	25	5.00	125.00
Transporting	man/day	2	5.00	10.00
Sub Total				315.00
Total				1,032.56
2. Indirect Cost				
Administrative Expense	5 %			51.63
Physical Contingency	10 %			103.26
Interest	8 %	4 month		27.53
Total				182.42
Grand Total				1,214.98

(2). Maize in Dry Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	285.71	285.71
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				469.99
B. Variable Cost				
Seeds	kg	17	1.19	19.89
Insecticides	kg	13	2.60	33.80
Herbicides	kg	2	12.50	25.00
Fertilizer	kg	260	0.52	135.20
Fertilizer	kg	138	0.43	59.34
Sub Total				273.23
C. Labour Cost				
Sowing	man/day	4	5.00	20.00
Weeding				
a. 1st Weeding	man/day	5	5.00	25.00
b. 2nd Weeding	man/day	8	5.00	40.00
Spraying				
a. Insecticides	man/day	2	5.00	10.00
b. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	2	5.00	10.00
b. Top Dressing	man/day	1	5.00	5.00
Irrigation	man/day	30	5.00	150.00
Harvesting	man/day	18	5.00	90.00
Transporting	man/day	2	5.00	10.00
Sub Total				375.00
Total				1,118.22
2. Indirect Cost				
Administrative Expense	5 %			55.99
Physical Contingency	10 %			111.82
Interest	8 %	4 month		29.82
Total				197.54
Grand Total				1,315.76

(3). Kidney beans in Wet Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	285.71	285.71
Plowing, Harrowing	ha	1	42.86	42.86
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				427.14
B. Variable Cost				
Seeds	kg	49	1.10	53.90
Insecticides	ℓ	1.5	21.00	31.50
Insecticides	ℓ	1.4	14.00	19.60
Herbicides	ℓ	2	12.00	24.00
Fertilizer	kg	184	0.52	95.68
Sub Total				224.68
C. Labour Cost				
Sowing	man/day	5	5.00	25.00
Weeding	man/day	9	5.00	45.00
Spraying				
a. Insecticides	man/day	2	5.00	10.00
b. Herbicides	man/day	3	5.00	15.00
Fertilizer Application	man/day	3	5.00	15.00
Irrigation	man/day	6	5.00	30.00
Harvesting	man/day	17	5.00	85.00
Transporting	man/day	1	5.00	5.00
Sub Total				225.00
Total				876.82
2. Indirect Cost				
Administrative Expense	5 %			43.84
Physical Contingency	10 %			87.68
Interest	8 %	4 month		23.38
Total				154.90
Grand Total				1,031.72

(4). Kidney beans in Dry Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	285.71	285.71
Plowing, Harrowing	ha	1	42.86	42.86
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				427.14
B. Variable Cost				
Seeds	kg	49	1.10	53.90
Insecticides	ℓ	1.5	21.00	31.50
Insecticides	ℓ	1.4	14.00	19.60
Herbicides	ℓ	2	12.00	24.00
Fertilizer	kg	195	0.52	101.40
Sub Total				230.40
C. Labour Cost				
Sowing	man/day	5	5.00	25.00
Weeding	man/day	5	5.00	25.00
Spraying				
a. Insecticides	man/day	2	5.00	10.00
b. Herbicides	man/day	3	5.00	15.00
Fertilizer Application	man/day	3	5.00	15.00
Irrigation	man/day	24	5.00	120.00
Harvesting	man/day	22	5.00	110.00
Transporting	man/day	1	5.00	5.00
Sub Total				325.00
Total				982.54
2. Indirect Cost				
Administrative Expense	5 %			49.13
Physical Contingency	10 %			98.25
Interest	8 %	4 month		26.20
Total				173.58
Grand Total				1,156.12

(5). Tobacco in Wet Season

I t e m	U n i t	Quontity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	535.71	535.71
Plowing, Harrowing	ha	1	107.13	107.13
Ridging	ha	1	35.71	35.71
Irrigation Cost	ha	1	70.00	70.00
Sub Total				748.55
B. Variable Cost				
Seeds	kg	0.043	90.00	3.88
Insecticides	kg	3	97.00	291.00
Insecticides	ℓ	4	14.00	56.00
Fungicides	kg	1.5	14.60	21.90
Herbicides	ℓ	6.0	6.50	39.00
Herbicides	ℓ	3.0	9.50	28.50
Fertilizer	kg	598.0	0.52	310.96
Fertilizer	kg	322.0	0.52	167.44
Sub Total				918.68
C. Labour Cost				
Raising seedling				280.00
Transplanting	man /day	11	5.00	55.00
Weeding				
a. 1st Weeding	man/day	11	5.00	55.00
b. 2nd Weeding	man/day	11	5.00	55.00
Spraying				
a. Insecticides	man/day	23	5.00	115.00
b. Fungicides	man/day	23	5.00	115.00
c. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	5	5.00	25.00
b. Top Dressing	man/day	5	5.00	25.00
Irrigation	man/day	7	5.00	35.00
Harvesting	man/day	80	5.00	400.00
Transporting	man/day	22	5.00	110.00
Sub Total				1,285.00
D. Other's				
Classification				1,686.69
Packing	man/day	4	5.00	20.00
Sub Total				1,706.00
Total				4,658.92
2. Indirect Cost				
Administrative Expense	5 %			232.95
Physical Contingency	10 %			465.89
Interest	8 %	4 month		124.23
Total				823.08
Grand Total				5,482.00

(6). Tomato in Wet Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	428.57	428.57
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				612.85
B. Variable Cost				
Seeds	kg	0.32	139.00	44.48
Insecticides	ℓ	8.00	21.00	168.00
Insecticides	kg	1.4	97.00	135.80
Fungicides	kg	6.5	14.6	94.90
Herbicides	ℓ	2	12.0	24.00
Fertilizer	kg	325	0.52	169.00
Fertilizer	kg	184	0.43	79.17
Sub Total				715.30
C. Labour Cost				
Raising Seedling				133.57
Transplanting	man/day	12	5.00	60.00
Weeding				
a. 1st Weeding	man/day	5	5.00	25.00
b. 2nd Weeding	man/day	10	5.00	50.00
Spraying				
a. Insecticides	man/day	9	5.00	45.00
b. Fungicides	man/day	9	5.00	45.00
c. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	4	5.00	20.00
b. Top Dressing	man/day	4	5.00	20.00
Irrigation	man/day	7	5.00	35.00
Harvesting	man/day	70	5.00	350.00
Sub Total				798.57
Total				2,126.22
2. Indirect Cost				
Administrative Expense	5 %			106.34
Physical Contingency	10 %			212.67
Interest	8 %	4 month		56.71
Total				303.38
Grand Total				2430.10

(7). Tomato in Dry Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	428.57	428.57
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				612.85
B. Variable Cost				
Seeds	kg	0.32	139.00	44.48
Insecticides	ℓ	8.0	21.00	168.00
Insecticides	kg	1.4	97.00	135.80
Fungicides	kg	6.5	14.60	94.90
Fertilizer	kg	325	0.52	169.00
Fertilizer	kg	184	0.43	79.12
Sub Total				715.30
C. Labour Cost				
Raising Seedling				133.57
Transplanting	man/day	12	5.00	60.00
Weeding				
a. 1st Weeding	man/day	4	5.00	20.00
b. 2nd Weeding	man/day	8	5.00	40.00
Spraying				
a. Insecticides	man/day	11	5.00	55.00
b. Fungicides	man/day	11	5.00	55.00
c. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	4	5.00	20.00
b. Top Dressing	man/day	4	5.00	20.00
Irrigation	man/day	27	5.00	135.00
Harvesting	man/day	75	5.00	375.00
Sub Total				928.57
Total				2,256.72
2. Indirect Cost				
Administrative Expense	5 %			112.84
Physical Contingency	10 %			225.67
Interest	8 %	4 month		60.17
Total				398.68
Grand Total				2,655.40

(8). Broccoli in Dry Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
1. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	428.57	428.57
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	42.85	42.85
Irrigation Cost	ha	1	70.00	70.00
Sub Total				627.13
B. Variable Cost				
Seeds	kg	0.69	220.30	152.00
Insecticides	ℓ	3	36.00	108.00
Insecticides	ℓ	3	21.00	63.00
Insecticides	ℓ	3	30.00	90.00
Herbicides	ℓ	2	12.00	24.00
Fertilizer	kg	736	0.53	390.08
Fertilizer	kg	460	0.43	197.80
Fertilizer	kg	20	3.80	76.00
Sub Total				1,100.88
C. Labour Cost				
Raising Seedling				252.86
Transplanting	man/day	11	5.00	55.00
Weeding	man/day	11	5.00	55.00
Spraying				
a. Insecticides	man/day	20	5.00	100.00
b. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	8	5.00	40.00
b. Top Dressing	man/day	8	5.00	40.00
Irrigation	man/day	30	5.00	150.00
Harvesting	man/day	33	5.00	165.00
Sub Total				872.86
Total				2,600.87
2. Indirect Cost				
Administrative Expense	5 %			130.04
Physical Contingency	10 %			260.09
Interest	8 %	3 month		52.02
Total				442.15
Grand Total				3,043.02

(9). Onion in Dry Season

I t e m	U n i t	Quantity	Unit Cost	Total Cost
I. Direct Cost				
A. Fixed Cost				
Land Rental Cost	ha	1	428.57	428.57
Plowing, Harrowing	ha	1	85.71	85.71
Ridging	ha	1	28.57	28.57
Irrigation Cost	ha	1	70.00	70.00
Sub Total				612.85
B. Variable Cost				
Seeds	kg	3.22	54.30	174.85
Insecticides	ℓ	4.0	14.00	56.00
Insecticides	kg	0.69	97.00	66.93
Fungicides	kg	5.06	14.60	73.88
Fungicides	kg	1.5	16.00	24.00
Herbicides	ℓ	2.0	12.00	24.00
Fertilizer	kg	714	0.52	371.28
Fertilizer	kg	368	0.43	158.24
Sub Total				925.18
C. Labour Cost				
Raising Seedling				174.28
Transplanting	man/day	68	5.00	340.00
Weeding				
a. 1st Weeding	man/day	20	5.00	100.00
b. 2nd Weeding	man/day	26	5.00	130.00
Spraying				
a. Insecticides	man/day	13	5.00	65.00
b. Fungicides	man/day	13	5.00	65.00
c. Herbicides	man/day	3	5.00	15.00
Fertilizer Application				
a. Basal Application	man/day	3	5.00	15.00
b. Top Dressing	man/day	3	5.00	15.00
Irrigation	man/day	46	5.00	230.00
Harvesting	man/day	55	5.00	275.00
Sub Total				1,474.78
Total				2,962.31
2. Indirect Cost				
Administrative Expense	5 %			148.12
Physical Contingency	10 %			296.23
Interest	8 %	4 month		78.99
Total				523.34
Grand Total				3,485.65

Table A.4.2.2-9 Gross and Net Production Value per Hectare

Crops		Unit Yield (t /ha)	Farm Gate Price (Q /t)	Gross Production Value (Q /ha)	Production Cost (Q/ha)	Net Production Value (Q/ha)
"Present"						
Maize	W	2.7	400	1,080	1,024	56
	D	3.2	400	1,280	1,210	70
Kidney bean	W	1.1	1,090	1,199	826	373
	D	1.4	1,090	1,526	1,010	516
Tobacco	W	1.4	4,460	6,244	5,328	916
Tomato	W	17.0	260	4,420	2,134	2,286
	D	18.5	260	4,810	2,410	2,400
Broccoli	D	8.3	500	4,150	2,772	1,378
Onion	D	8.5	590	5,015	3,315	1,700
"Without"						
Maize	W	2.8	400	1,120	1,024	96
	D	3.4	400	1,360	1,303	57
Kidney bean	W	1.2	1,090	1,308	826	482
	D	1.5	1,090	1,635	1,103	532
Tobacco	W	1.4	4,460	6,244	5,328	916
Tomato	W	17.9	260	4,654	2,134	2,520
	D	19.4	260	5,044	2,482	2,562
Broccoli	D	8.3	500	4,150	2,844	1,306
Onion	D	8.7	590	5,133	3,388	1,745
"With"						
Maize	W	3.8	400	1,520	1,215	305
	D	4.1	400	1,640	1,316	324
Kidney bean	W	1.8	1,090	1,962	1,032	930
	D	2.0	1,090	2,180	1,156	1,024
Tobacco	W	1.9	4,460	8,474	5,482	2,992
Tomato	W	24.0	260	6,240	2,430	3,810
	D	26.0	260	6,760	2,655	4,105
Broccoli	D	10.5	500	5,250	3,043	2,207
Onion	D	12.0	590	7,080	3,486	3,594

Table A.4.2.2-10 Gross and Net Production Value

Crops		Area (ha)	Yield (t)	Gross Production Value (1,000 Q)	Total Production Cost (1,000 Q)	Net Production Value (1,000 Q)
"Present"						
Maize	W	3,110	8,397	3,359	3,185	174
	D	24	77	31	29	2
Kidney bean	W	600	660	719	496	223
	D	57	80	87	56	31
Tobacco	W	480	672	2,997	2,546	451
Tomato	W	610	10,370	2,696	1,302	1,394
	D	259	4,792	1,246	624	622
Broccoli	D	340	2,822	1,411	942	469
Onion	D	130	1,105	652	431	221
Pasture		1,000		474	378	95
Total		6,610		13,672	9,990	3,682
"Without Project"						
Maize	W	3,110	8,708	3,483	3,185	298
	D	24	82	33	36	2
Kidney bean	W	600	720	785	496	289
	D	57	86	94	63	31
Tobacco	W	480	672	2,997	2,546	451
Tomato	W	610	10,919	2,839	1,302	1,537
	D	259	5,025	1,306	643	663
Broccoli	D	340	2,822	1,411	956	455
Onion	D	130	1,131	667	440	227
Pasture		1,000		474	378	95
Total		6,610		14,089	10,024	4,064
"With Project"						
Maize	W	2,850	10,830	4,332	3,463	869
	D	1,200	4,920	1,968	1,579	389
Kidney bean	W	1,950	3,510	3,826	2,012	1,814
	D	450	900	981	520	461
Tobacco	W	450	855	3,813	2,467	1,346
Tomato	W	1,200	28,800	7,488	2,916	4,572
	D	1,200	31,200	8,112	3,186	4,926
Broccoli	D	1,200	12,600	6,300	3,652	2,648
Onion	D	750	9,000	5,310	2,615	2,695
Pasture		550		260	208	52
Total		11,800		42,390	22,618	19,772

(2) Farming Program

Table A.4.2.2-11 Present Monthly Labour Requirement

(1) Small Size

(Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize	ha													
W [1] 1st [2]	1.7	3.4	18.2	18.1	14.6		14.2	14.2	14.2					96.9
W 2nd	0.1				0.1	1.2	1.8	0.9	1.7					5.7
D	0.1							0.9	1.6	1.6	2.1	1.4	0.6	8.2
Kidney beans														
W 1st	0.3	1.2	3.3	2.3	2.6	2.6								12.0
D	0.1	1.1								1.2	1.6	1.3	1.7	6.9
Tobacco														
W	0.3	5.7	7.5	8.1	20.7	14.4								56.4
Tomato														
W 1st	0.1	0.6	1.3	1.7	3.4	2.9	2.2							12.1
W 2nd	0.4				1.6	8.4	7.7	13.4	17.3					48.4
D	0.3							3.0	6.2	7.1	11.5	14.9	5.3	48.0
Broccoli														
D	0.2							2.5	7.0	7.0	5.3	4.0		25.8
Onion														
D	0.2							7.1	10.0	12.2	10.4	7.6	3.3	50.6
Pasture														
W ~D	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.2
Total	3.9	12.1	30.4	30.3	43.1	29.6	26.0	42.1	58.1	29.2	31.0	29.3	11.0	372.2
Total Family Labour		60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	720.0
Family Labour on Farm		12.1	30.4	30.3	43.1	29.6	26.0	42.1	58.1	29.2	31.0	29.3	11.0	372.2
Employment Labour		0	0	0	0	0	0	0	0	0	0	0	0	0
Surplus Family Labour		47.9	29.6	29.7	16.9	30.4	34.0	17.9	1.9	30.8	29.0	30.7	49.0	347.8
Family Labour out of Farm		19.2	11.8	11.9	6.8	12.1	13.6	7.1	0.8	12.3	11.6	12.3	19.6	139.1

Note : 1) W : Wet season D : Dry season
2) 1st : First cropping 2nd : Second cropping

Source : Table A.3.3.4-8

Table A.4.2.2-11 Present Monthly Labour Requirement

2) Medium Size (Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize	ha													
W [1] • 1st [2]	10.0	20.1	106.8	106.6	86.5		83.4	83.3	83.3					570
W • 2nd	0.7				0.9	8.2	12.8	6.3	11.7					39.9
D	0.1							0.9	1.6	1.6	2.1	1.4	0.6	8.2
Kidney bean														
W • 1st	2.6	10.4	28.6	19.5	23.4	22.1								104
D	0.3	3.1								3.5	5.0	3.7	5.4	20.7
Tobacco														
W	1.5	28.5	37.5	40.5	103.5	72.0								282
Tomato														
W • 1st	1.4	9.0	18.1	23.6	47.4	41.0	30.3							169.4
W • 2nd	0.4				1.6	8.4	7.7	13.4	17.3					48.4
D	0.5							4.9	10.4	11.9	19.1	24.9	8.8	80.0
Broccoli														
D	0.7							8.7	24.4	24.6	18.6	14.0		90.3
Onion														
D	0.1							3.6	5.0	6.0	5.2	3.8	1.7	25.3
Pasture														
W ~D	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	12.0
Total		72.1	192.0	191.2	264.3	152.7	135.2	122.1	154.7	48.6	51.0	48.8	17.5	1,450.2
Total Family Labour		70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	840.0
Family Labour on Farm		70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	48.6	51.0	48.8	17.5	725.9
Employment Labour		2.1	122.0	121.2	194.3	82.7	65.2	52.1	84.7	0	0	0	0	724.3
Surplus Family Labour		0	0	0	0	0	0	0	0	21.4	19.0	21.2	52.5	114.1
Family Labour out of Farm		0	0	0	0	0	0	0	6	8.5	7.4	8.5	21.0	45.6

Source : Table A.3.3.4-8, Table 4.4.2-1

Table A.4.2.2-11 Present Monthly Labour Requirement

3) Large Size

(Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize	ha													
W [1] • 1st [2]	31.8	63.9	339.6	339	275.1		265.2	264.9	264.9					1,812.6
W • 2nd	—													
D	0.2							1.8	3.2	3.3	4.2	2.7	1.2	16.4
Kidney bean														
W • 1st	5.3	21.2	58.3	39.8	47.7	45								212
D	0.1	1.1								1.2	1.6	1.3	1.7	6.9
Tobacco														
W	6.0	114	150	162	414	288								1,128
Tomato														
W • 1st	4.0	25.8	51.6	67.5	135.5	117	86.6							484
W • 2nd	—													
D	2.3							22.5	47.8	54.7	88.2	114.5	40.3	368
Broccoli														
D	5.1							63.3	177.8	179.5	135.3	102		657.9
Onion														
D	0.1							3.6	5.0	6.0	5.2	3.8	1.7	25.3
Pasture														
W ~D	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	375.6
Total		257.3	630.8	639.6	903.6	481.3	383.1	387.4	530.0	276.0	265.8	255.6	76.2	5,086.7
Total Family Labour		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	1140.0
Family Labour on Farm		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	76.2	1121.2
Employment Labour		162.3	535.8	544.6	808.6	386.3	288.1	292.4	435.0	181.0	170.8	160.6	0	3965.5
Surplus Family Labour		0	0	0	0	0	0	0	0	0	0	0	18.8	18.8
Family Labour out of Farm		0	0	0	0	0	0	0	0	0	0	0	(7.5)	0

Note : 1) W : Wet season 2) 1st : First cropping
D : Dry season 2nd : Second cropping

Source : Table 4.4.2-1, Table A.3.3.4-8

Table A.4.2.2-12 Proposed Monthly Labour Requirement

1) Small Size (Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize	ha													
W [1]	1.1	4.4	9.3	9.3	6.0	5.6	14.9	9.9	9.9					69.3
W ~D	0.2					0.6	2.3	2.3	3.5	2.1	1.8			12.6
D [1]	0.5						3.7	5.6	6.0	4.9	7.9	6.1	3.3	37.5
Kidney bean														
D ~ W	0.6	6.0	4.6	4.6							2.2	8.4	8.4	34.2
W	0.4	1.9	3.4	3.4	4.4	2.9	2.4							18.4
D	0.3	2.3	2.3							1.1	4.2	4.2	3.0	17.1
Tobacco														
W	0.2	3.3	3.9	4.8	10.4	9.7	6.7							38.8
Tomato														
W	0.8			6.9	11.2	14.5	28.9	26.2	18.7					106.4
D	0.8							10.4	14.4	16.7	33.8	31.9	20.0	127.2
Broccoli														
D	0.6							10.8	15.4	22.0	18.3	7.9		74.4
Onion														
D	0.4					14.2	19.0	23.6	20.4	15.5	7.3			100.0
Pasture														
W ~D	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		17.9	23.5	29.0	32.0	47.5	77.9	88.8	88.3	62.3	75.5	58.5	34.7	635.9
Total Family Labour		60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	720.0
Family Labour on Farm		17.9	23.5	29.0	32.0	47.5	60.0	60.0	60.0	60.0	60.0	58.5	34.7	543.1
Employment Labour		0	0	0	0	0	17.9	28.8	28.3	2.3	15.5	0	0	92.8
Surplus Family Labour		42.1	36.5	31.0	28.0	12.5	0	0	0	0	0	1.5	25.3	176.9
Family Labour out of Farm		37.9	32.8	27.9	25.2	11.2	0	0	0	0	0	1.4	22.8	159.2

Note : W : Wet season D : Dry season
Source : Table 4.4.2-1, Table A.4.2.2-6

Table A.4.2.2-12 Proposed Monthly Labour Requirement

2) Medium Size (Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize	ha													
W	8.1	32.5	68.4	68.2	44.0	41.3	110.2	72.9	72.8					510.3
W ~ D	1.5					4.5	17.2	17.2	26.3	15.8	13.5			94.5
D	4.2						30.8	47.3	50.7	41.0	66.1	51.1	28.0	315.0
Kidney bean														
D ~ W	4.6	46.0	35.2	35.8							16.9	64.4	64.4	262.2
W	2.8	13.6	23.9	23.9	30.4	20.2	16.8							128.8
D	1.8	13.8	13.8							6.6	25.2	25.2	18.0	102.6
Tobacco														
W	1.2	19.5	23.3	28.8	62.3	58.5	40.4							232.8
Tomato														
W	4.0			34.3	56.3	72.3	144.9	130.9	93.3					532.0
D	4.1							53.3	73.7	85.6	173.5	163.3	102.5	651.9
Broccoli														
D	2.6							48.6	66.6	95.2	79.6	34.4		322.4
Onion														
D	3.5					124.4	166.4	205.9	178.0	136.1	64.2			875.0
Pasture														
W ~D	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	6.0
Total		125.9	165.1	191.0	193.5	321.7	527.2	574.6	561.9	380.8	439.5	338.9	213.4	4,033.5
Total Family Labour		70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	840.0
Family Labour on Farm		70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	840.0
Employment Labour		55.9	95.1	121.0	123.5	251.7	457.2	504.6	491.9	310.8	369.5	268.9	143.4	3193.5
Surplus Family Labour		0	0	0	0	0	0	0	0	0	0	0	0	0
Family Labour out of Farm		0	0	0	0	0	0	0	0	0	0	0	0	0

Source : Table A.3.3.4-8, Table 4.4.2-1

Table A.4.2.2-12 Proposed Monthly Labour Requirement

3) Large Size

(Unit : man-day/month)

Crops	Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Maize														
W	32.0	128.3	270.1	269.4	173.8	163.2	435.5	288.0	287.7					2.016.0
W ~ D	6.0					17.9	69	69	105	63	54.1			378.0
D	16.1						118	181.1	194.5	157	253.8	195.9	107.4	1.207.5
Kidney bean														
D ~ W	12.0	120.1	91.9	92							44	168	168	684.0
W	7.6	37.1	64.9	64.8	82.6	54.7	45.5							349.6
D	5.1	39.1	39.1							18.7	71.3	71.4	51.1	290.7
Tobacco														
W	7.3	118.6	141.7	175.6	378.9	355.7	245.7							1.416.2
Tomato														
W	10.3			88.3	144.9	186.1	373.2	337.1	240.3					1.369.9
D	10.3							134	185.1	214.9	435.8	410.4	257.5	1.637.7
Broccoli														
D	19.8							355	506.9	725.1	606	262.2		2.455.2
Onion														
D	4.3					152.8	204.4	253	218.7	167.2	78.9			1.075.0
Pasture														
W ~D	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	213.6
Total		461.0	625.5	707.9	798.0	948.2	1.509.1	1.635.0	1.756.0	1.363.7	1.561.5	1.125.7	601.8	13.093.4
Total Family Labour		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	1140.0
Family Labour on Farm		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	1140.0
Employment Labour		366.0	530.5	612.9	703.0	853.2	1414.1	1540.0	1661.0	1268.7	1466.5	1030.7	506.8	11953.4
Surplus Family Labour		0	0	0	0	0	0	0	0	0	0	0	0	0
Family Labour out of Farm		0	0	0	0	0	0	0	0	0	0	0	0	0

Table A.4.2.2-13 Proposed Volume of Input Materials per Household

Input Materials		Farm Size					
		Small		Medium		Large	
		Without	With	Without	With	Without	With
1. Seeds							
Maize	kg	33	31	184	235	545	920
Kidney bean	kg	20	64	142	451	265	1,210
Tobacco	kg	0.02	0.01	0.06	0.05	0.3	0.3
Tomato	kg	0.3	0.6	0.8	2.6	2	6.6
Broccoli	kg	0.2	0.4	0.5	1.8	3.5	13.7
Onion	kg	0.6	1.3	0.3	11.3	0.3	13.8
2. Fertilizer							
16-20- 0	kg	579	950	2,322	6,191	6,326	19,607
15-15-15	kg	110	688	437	4,238	2,866	17,428
20-20- 0	kg	106	64	574	432	4,780	3,971
15-10-20	kg	179	120	897	718	3,588	4,365
46- 0- 0	kg	553	965	2,223	5,877	7,625	21,946
Boron	kg	-	18	-	78		594
3. Insecticides							
Lannate	kg	2.2	3.1	7.8	17.4	26.9	53.8
Volaton	kg	24	13.5	140	180	415.6	703.0
Folidol	ℓ	2.4	4.2	10	31.7	31.8	80.9
Metasistox	ℓ	0.6	1.8	2.1	7.8	15.3	59.4
Tomaron	ℓ	4.3	16.6	12.5	86.3	43.7	260.9
Belmark	ℓ	0.6	1.8	2.1	7.8	15.3	59.4
4. Fungicides							
Antracol	kg	6.1	12.7	16	72.5	45.6	167
Trimiltox	kg	0.3	0.6	0.2	5.3	0.2	6.5
5. Herbicides							
Gesaprin	kg	-	3.6	-	27.6	-	108
Hedonal Amin	ℓ	1.8	1.2	9	7.2	36	43.8
Hedonal Ester	ℓ	0.9	0.6	4.5	3.6	18	22.0
Trifluralin	ℓ	-	7.8	-	46.8	-	138.8
gramoxon	ℓ	0.1	-	1	0.5	31.3	17.8
6. Parasiticides							
Asuntol	ℓ	0.002	-	0.015	0.008	0.5	0.3
Catsal	ℓ	0.002	-	0.02	0.01	0.6	0.4
Triple	ℓ	0.001	-	0.005	0.003	0.2	0.09
7. Feed							
Salt	kg	7.6	-	76	38	2,379	1,353

Table A.4.2.2-14 Total Cost of Input Materials per Household

(Unit : Q)

Input Materials		Unit Price	Farm Size					
			Small		Medium		Large	
			Without	With	Without	With	Without	With
1. Seeds								
Maize	kg	1.19	39	37	219	280	649	1.095
Kidney bean	kg	1.1	22	70	156	496	292	1.331
Tobacco	kg	90	2	1	5	5	27	27
Tomato	kg	139	42	83	111	361	278	917
Broccoli	kg	220.3	44	88	110	397	771	3.018
Onion	kg	54.3	33	71	16	614	16	749
Sub Total			182	350	617	2.153	2.033	7.137
2. Fertilizer								
16-20- 0	kg	0.52	301	494	1.207	3.219	3.290	10.196
15-15-15	kg	0.53	58	365	232	2.246	1.519	9.237
20-20- 0	kg	0.52	55	33	298	225	2.486	2.065
15-10-20	kg	0.52	93	62	466	373	1.866	2.270
46- 0- 0	kg	0.43	238	415	956	2.527	3.279	9.437
Boron	kg	3.8	-	68	-	296	-	2.257
Sub Total			745	1.437	3.159	8.886	12.440	35.462
3. Insectlcides								
Lannate	kg	97	213	301	757	1.688	2.609	5.219
Volaton	kg	2.6	62	35	364	468	1.081	1.828
Folidol	Q	14	34	59	140	444	445	1.133
Metasistox	Q	36	22	65	76	281	551	2.138
Tamaron	Q	21	90	349	263	1.821	918	5.481
Belmark	Q	30	18	54	63	234	459	1.782
Sub Total			439	863	1.663	4.936	6.063	17.581
4. Fungicides								
Antracol	kg	14.6	89	185	234	1.059	666	2.438
Trimitox	kg	16.0	5	10	3	85	3	104
Sub Total			94	195	237	1.144	669	2.542
5. Herbicides								
Gesaprin	kg	12.5	-	45	-	345	-	1.350
Hedonal Amin	Q	6.5	12	8	59	47	234	285
Hedonal Ester	Q	9.5	9	6	43	34	171	209
Trifluralin	Q	12	-	94	-	562	-	1.666
Gramoxon	Q	12	1	0	12	6	376	214
Sub Total			22	153	114	994	781	3.724
6. Parasiticides								
Asuntol	Q	153.3	0.3	0	2	1	77	46
Catsal	Q	440	0.9	0	9	4	264	176
Triple	Q	100	0.1	0	0.5	0.3	20	9
Sub Total			1.3	0	11.5	5.3	361	231
7. Feed								
Salt	kg	0.44	3	0	33	17	1.047	595
Total			1.486.3	2.998	5.834.5	18.135.3	23.394	67.272

Table A.4.2.2-15 Gross Production Value per Household

(Unit : Q)

Farm Size	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion	Pasture	Total	
	W	D	W	D	W	W	D	D	D			
"Present"												
Small	1.944	128	360	153	1.873	2.210	1.443	830	1.003	47	9.991	
Medium	11.556	128	3.117	458	9.366	7.956	2.405	2.905	502	474	38.867	
Large	34.344	256	6.355	153	37.464	17.680	11.063	21.165	502	14.836	143.818	
"Without Project"												
Small	2.016	136	392	164	1.873	2.327	1.513	830	1.027	47	10.325	
Medium	11.984	136	3.401	491	9.366	8.377	2.522	2.905	513	474	40.169	
Large	35.616	272	6.932	164	37.464	18.616	11.601	21.165	513	14.836	147.179	
"With Project"												
Small	1.976	820	1.962	654	1.695	4.992	5.408	3.150	2.832	0	23.489	
Medium	14.592	6.888	14.519	3.924	10.169	24.960	27.716	13.650	24.780	237	141.435	
Large	57.760	28.404	38.455	11.118	61.860	64.272	69.628	103.950	30.444	8.437	472.328	

Note : 1) Unit Gross Production Value × Cropping Area

Table A.4.2.2-16 Production Cost per Household

(Unit : Q)

Farm Size	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion	Pasture	Total
	W	D	W	D	W	W	D	D	D		
"Present"											
Small	1.843	121	248	101	1.598	1.067	723	555	663	38	6.957
Medium	10.957	121	2.148	303	7.992	3.841	1.205	1.942	332	378	29.219
Large	32.563	242	4.378	101	31.968	8.536	5.543	14.147	332	11.831	109.641
"Without Project"											
Small	1.843	127	248	107	1.598	1.067	735	562	671	38	6.996
Medium	10.957	127	2.148	321	7.992	3.841	1.225	1.968	336	378	29.293
Large	32.563	254	4.378	107	31.968	8.536	5.633	14.336	336	11.831	109.942
"With Project"											
Small	1.580	658	1.082	347	1.096	1.944	2.124	1.826	1.394	0	12.001
Medium	11.684	5.527	7.637	2.081	6.578	9.720	10.886	7.912	12.201	189	74.395
Large	46.170	21.188	20.227	5.898	40.019	25.029	27.347	60.251	14.990	6.728	267.845

Note : 1) Unit Production Cost × Cropping Area

Table A.4.2.2-17 Net Production Value per Household

(Unit : Q)

Farm Size	Maize		Kidney bean		Tobacco	Tomato		Broccoli	Onion	Pasture	Total
	W	D	W	D	W	W	D	D	D		
"Present"											
Small	101	7	112	52	275	1,143	720	275	340	9	3,034
Medium	599	7	970	155	1,374	4,115	1,200	963	170	96	9,648
Large	1,781	14	1,977	52	5,496	9,144	5,520	7,018	170	3,005	34,177
"Without Project"											
Small	173	9	144	57	275	1,260	778	268	356	9	3,328
Medium	1,027	9	1,253	170	1,374	4,536	1,297	937	177	96	10,876
Large	3,053	18	2,554	57	5,496	10,080	5,968	6,829	177	3,005	37,237
"With Project"											
Small	897	162	930	307	598	3,048	3,284	1,324	1,438	0	11,488
Medium	2,928	1,361	6,882	1,843	3,590	15,240	16,831	5,738	12,579	48	67,040
Large	11,590	5,216	18,228	5,222	21,841	39,243	42,281	43,699	15,454	1,709	204,483

Note : 1) Unit Net Production Value × Cropping Area

Table A.4.2.2-18 Production Volume by Farm Size

(Unit : t/house hold)

Crops		Farm Size								
		Small Size			Medium Size			Large Size		
		Present	Without	With	Present	Without	With	Pesent	Without	With
Maize	Wet	4.86	5.04	4.94	28.89	39.96	36.48	85.86	85.04	144.4
	Dry	0.32	0.34	2.05	0.32	0.34	17.22	0.64	0.68	66.01
	Sub Total	5.18	5.38	6.99	29.21	30.30	53.70	86.50	89.72	210.01
Kidney beans	Wet	0.33	0.36	1.80	2.86	3.12	13.32	5.83	6.36	35.28
	Dry	0.14	0.15	0.60	0.42	0.45	3.60	0.14	0.15	10.20
	Sub Total	0.47	0.51	2.40	3.28	3.57	16.92	5.97	6.51	45.48
Tobacco	Wet	0.42	0.42	0.38	2.10	2.10	2.28	8.40	8.40	13.87
Tomato	Wet	8.50	8.95	19.20	30.60	32.22	96.00	68.00	71.60	247.30
	Dry	5.55	5.82	20.80	9.25	9.70	106.60	42.55	44.62	267.80
	Sub Total	14.05	14.77	40.00	39.85	41.92	202.60	110.55	116.22	515.00
Broccoli	Dry	1.66	1.66	6.30	5.81	5.81	27.3	42.33	42.33	207.90
Onion	Dry	1.70	1.74	4.80	0.85	0.87	42.0	0.85	0.87	51.60
Pasture : Milk 1)		54.80	59.80	0	598.00	598.00	299.00	18,717.4	18,717.4	10,644.4
Beef		0.006	0.006	0	0.06	0.06	0.03	1.9	1.9	1.09

Note : 1) Unit : ℓ

Family Expenditure

To sustain the living of the lowest level in the rural area, monthly family expenditure is required Q164.40 per a family of 6 members, or Q27.40 per capita (Los Rasgos Fundamentales de la Formacion Social Guatemalteca, Universidad de San Carlos de Guatemala, 1980).

This amount is corrected to Q59.46 per capita using an inflation rate (217%: 1980 to 1987, Banco de Guatemala). Assuming that the living standard in the project area is higher than the national average by 20%, monthly family expenditure is Q71.35 per capita or about Q856 per year.

Annual family expenditure by farm scale is shown in Table A.4.2.2-19.

Table A.4.2.2-19 Household Expenses

(Quetzel)

Number of families		Family expenditure
Small-scale (Sub-families)	6.5	5,564
Middle-scale (Families)	7.1	6,078
Large-scale (Multi-families)	8.4	7,190

Household Consumption

Maize and kidney beans are basic crops for family consumption and the surplus portion is sold.

Table A.4.2.2-20 Productions of Maize and Kidney beans per Farm

(t)

		Maize	Kidney beans
Small-scale	Present	5.18	0.47
	Without	5.38	0.51
	With	6.99	2.40
Middle-scale	Present	29.21	3.28
	Without	30.30	3.57
	With	53.70	16.92
Large-scale	Present	86.50	5.97
	Without	89.72	6.51
	With	210.41	45.48

Source: Table A.4.2.2-18

Annual consumption per capita of maize is 164 kg and that of kidney beans is 35 kg (Impacto del Crecimiento de la Poblacion en la Salud, la Educacion, el Abastecimiento Alimenticio y en el Empleo, SEGEPLAN, 1984). Annual consumption and amount by farm scale are shown in Table A.4.2.2-21.

Table A.4.2.2-21 Household Consumption and Amount

	Number of families	Consumption (kg)		Amount (Q)		Total (Q)
		Maize	Kidney beans	Maize (Q0.4/kg)	Kidney beans (Q1.09/kg)	
Sub-families (Small-scale)	6.5	1,066	228	426	249	675
Families (Middle-scale)	7.1	1,164	249	466	271	737
Multi-families (Large-scale)	8.4	1,378	294	551	320	871

4.2.3 Marketing and Processing of Agricultural Products

(1) Marketing channel of agricultural products

1) Demand and supply forecast

a. Export

Vegetables and tobacco are major export crops among crops produced in this Area. Tobacco exporters forecast that a more increase in exports is not expected. On the other hand, it is considered that there is room to expand export of vegetables mainly to the USA and El Salvador.

Information of FAO indicates that El Salvador, Germany, France, Canada, etc. are highly dependent on import tomatoes and onions (Table A.4.2.3-1). Broccoli is exported mainly to the USA. Fig. A.4.2.3-1 shows price fluctuation of some vegetables in the USA market and proves that the market price rises in the dry season of this area. This dry season is winter in the USA, when reduction in domestic production increases dependence on import.

b. Domestic demand

DIRYA forecasts an increase in domestic demand for agricultural products on the basis of population increase in the Republic (Table A.4.2.3-3). In addition, the domestic consumption of vegetables is only 1/4 to 1/5 times vegetables consumed in advanced countries in vegetable consumption per capita (Table A.4.2.3-3). Region VI included the project area shows the least consumption of vegetables in the Republic (Table A.4.2.3-4).

These situations leads to the forecast that demand for vegetables both in the domestic market and in the project area will continue to increase for the future.

2) Measures for improvement of marketing

The water resource development plan and agricultural development plan enable improvement of cropping rate in the dry season and diversification of crops, and expands productions in the project area. Further stabilized progress of the development plan involves measures for improvement of marketing, as shown below.

At present most tomatoes are exported to El Salvador, and broccoli mainly to the USA. Export tomatoes are intended mainly for salad, however, the following 2 tomato processing shops (*1) are established to increase the added value of tomatoes, and have business relation with farmers in this Area. Each of these shops suffers from the working rate of as low as 50 to 60%, and seems to have a potential capability of processing tomatoes increased in production.

On the other hand, broccoli exporters have a plan to double the present processing capacity.

To effectively utilize processing facilities of private enterprisers and to intensify marketing functions, a wholesale market should be established in this Area which is an expected major vegetable source. For this purpose, a production organization by production farmers should be brought up. The future problem of this development plan will be formation of a system that farmers have a concern with marketing through the wholesale market.

However, any agricultural organization should be progressively brought up through some steps. Such steps are proposed in Fig. A.4.2.4-3.

*1 INCODEPA tomato processing shop (Zacapa Department)

Tomato processing capacity: 7 tons/hour
(estimated annual processing capacity: 36,000 tons)

Present working rate : 65%

2 Kern's tomato processing shop (Guatemala City)

Tomato processing capacity: 350 tons/day
(84,000 tons/year)

Present working rate : 50%

Table A.4.2.3-1 Mainly Country Consumer of Tomato and Onion

Product Country	Production(a) (1,000t)	Import (b) (1,000t)	Export (c) (1,000t)	Consumer (a+b-c)=(1,000t)	Export rate to Consumer (%)
Tomato					
USA	8,247	386	67.7	8,565.3	4.5
Canada	618	138.4	3.6	752.8	18.4
Honduras	28	-	-	28	0
Guatemala	93F	-	19	74	0
France	372	253	11.8	613.2	41.3
Germany	75	399	1.3	452.7	83.7
El. Salvador	27	16.3	-	43.3	37.6
Onion					
USA	1,980	119.6	57.3	2,156.9	5.5
Canada	148	69.9	22.1	195.8	35.7
Honduras	3F	-	-	3F	0
Guatemala	20F	-	7F	13F	0
France	175	153.9	33.1	295.3	51.9
Germany	57	367.7	12.2	412.5	89.1
El. Salvador	3F	8F	-	12F	66.7

Source : Production & trade year book of FAO (1985)

Table A.4.2.3-2 Future Requirement of Agricultural Products

(Unit: ton)

Product \ Year	1984	1990	1995	2000
Maize	622 631	763 379	881 560	1 014 401
Kidney Beans	210 044	257 525	297 394	342 208
Rice	120 025	147 157	169 940	195 547
Vegetable	660 138	809 366	934 668	1 075 510
Fruit	330 069	404 683	467 334	537 755
Sugar	147 552	303 512	350 500	403 316
Milk	682 644	836 958	966 531	1 112 175
Egg	67 514	82 776	95 591	109 995
Meat	247 552	303 512	350 500	403 316
Fat	45 009	55 184	63 727	73 330

Source : Calculos Division de Estudios, DIRYA.

Table A.4.2.3-3 Vegetable Consumption per Capita in Main Country

Country	Unit	Vegetable Consumption
Guatemala	kg/year	20.4
USA	"	99.1
Canada	"	85.1
France	"	111.5
Germany	"	68.5
Japan	"	109.2

Source : Food Balance Sheet (FAO; 1985)

Table A.4.2.3-4 Vegetable Consumption per Capita by Region

Item	Region	Region I	Region II	Region III	Region IV	Region V	Region VI	Region VII
Vegetable	kg/ year	21.4	22.3	13.1	32.8	14.7	12.3	14.1

Source : MAGA

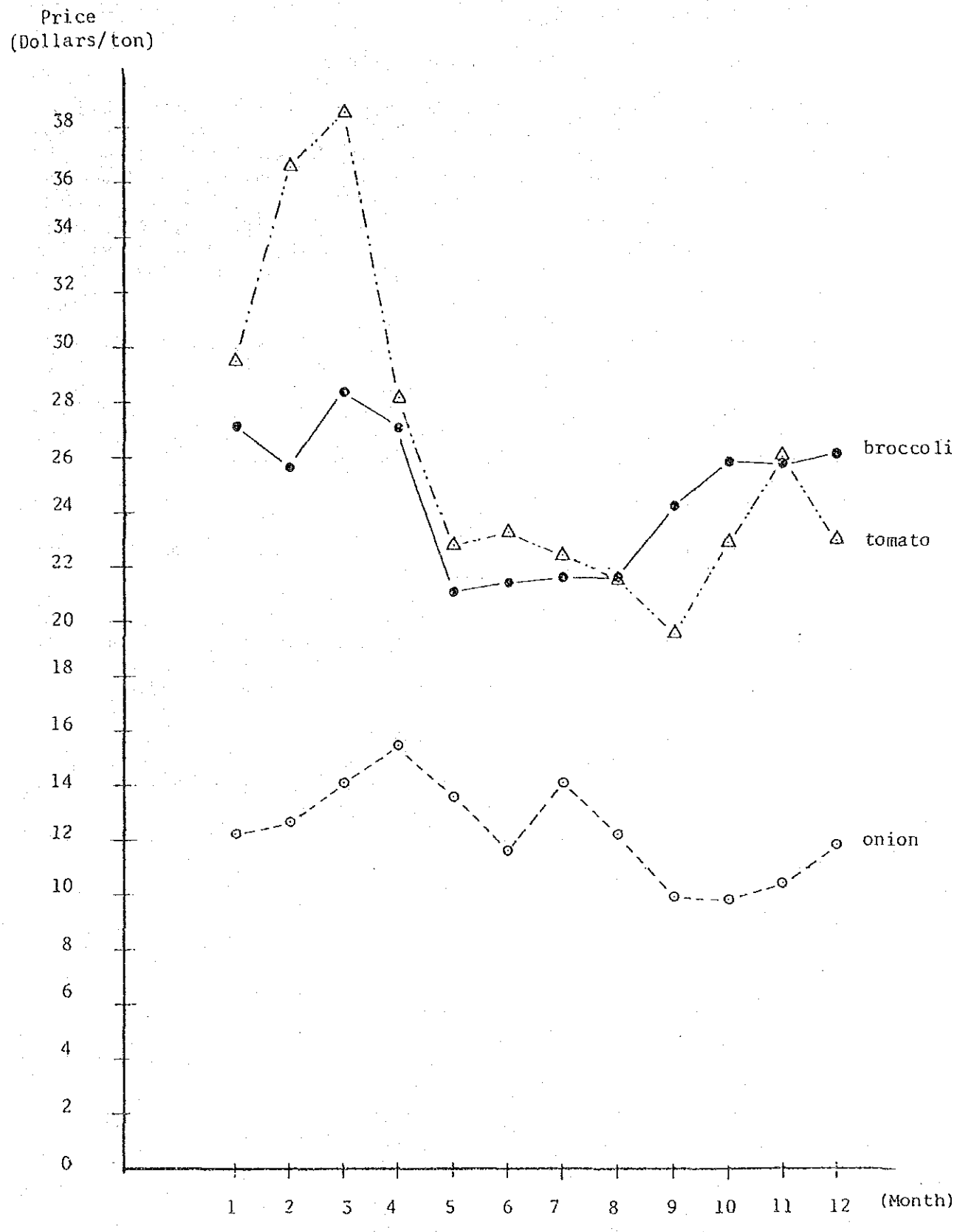


Fig. A.4.2.3-1 Monthly Average of Price Fluctuation in USA Market (1981 - 1986)

4.2.4 Related Agricultural Institutions

(1) Consolidation of agricultural extension system

The present project is oriented to rationalize utilization of irrigation water through development of water resources, and the project implementation system is formed by organizations headed by DIRYA. On the other hand, stabilization and expansion of agricultural production involve cooperation of ICTA (agricultural reserch institution) with DIGESA (agricultural extension institutions), etc. For this reason, the agricultural extension system should be incorporated into the project implementation system and promoted, as shown in Fig. A.4.2.4-1.

In addition, Fig. A.4.2.4-2 shows a relationship between the extension system and farmers. According to survey by ICTA, intensification of research on vegetables requires 2 technical officials, 5 assistants, and 2 vehicles. However, the present extension system employs only one adviser, and is too poor. At least 4 or 5 advisers should be assigned and exhibit mobility with autobicycles, vehicles, etc.

(2) Upbringing of farmers' organization

Rate of organization is low especially in Jutiapa Department and Jalapa Department among the Republic.

Intension of farmers was researched for organization and farmers' organization, in which farmers are deeply interested, as shown in Table A.4.2.4-1. However, upbringing of farmers' organization involves education, enlightenment, organizing, and implementation.

Fig. A.4.2.4-4 shows the necessary procedure.

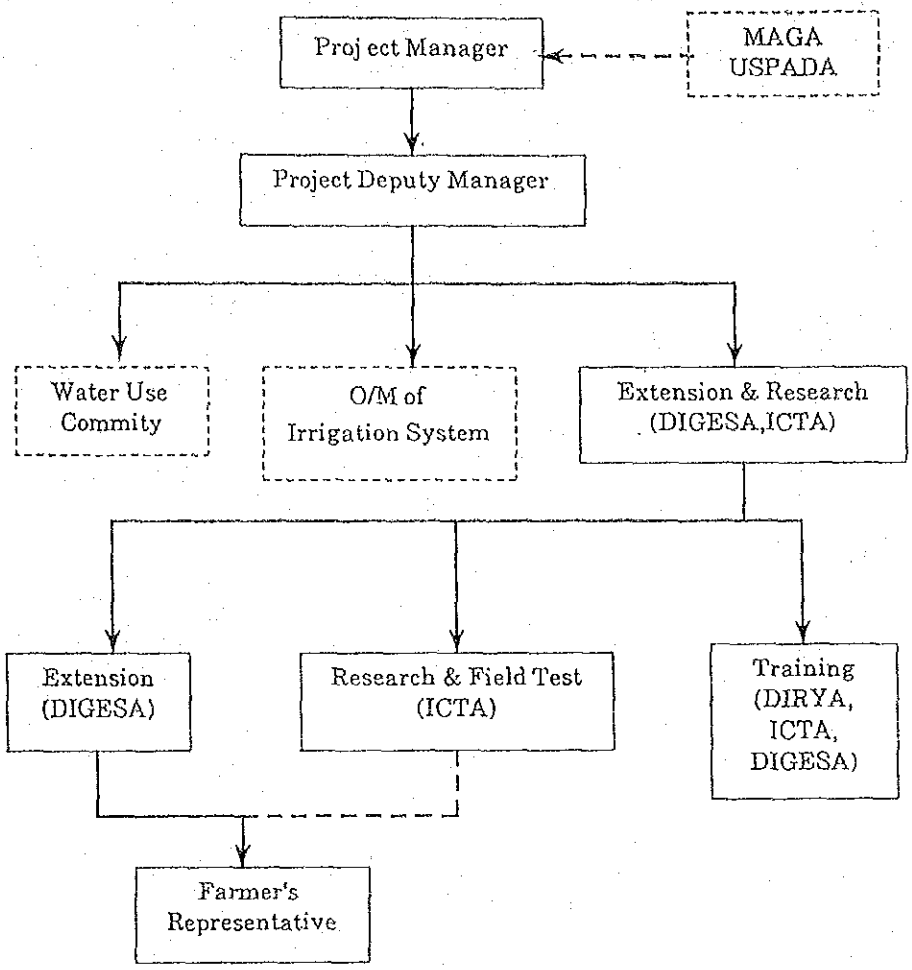


Fig. A.4.2.4-1 Organization of Agricultural Extension and Research

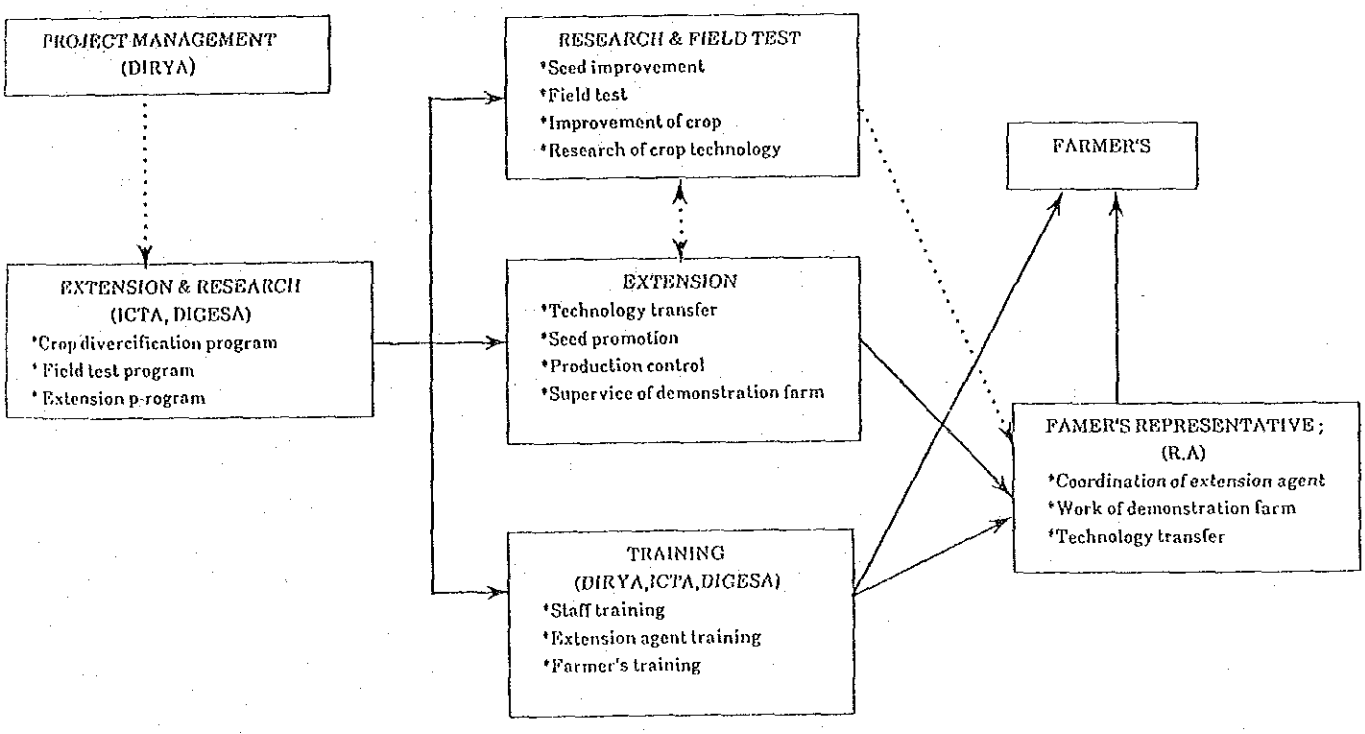


Fig. A.4.2.4-2 Flow of Agricultural Research and Extension

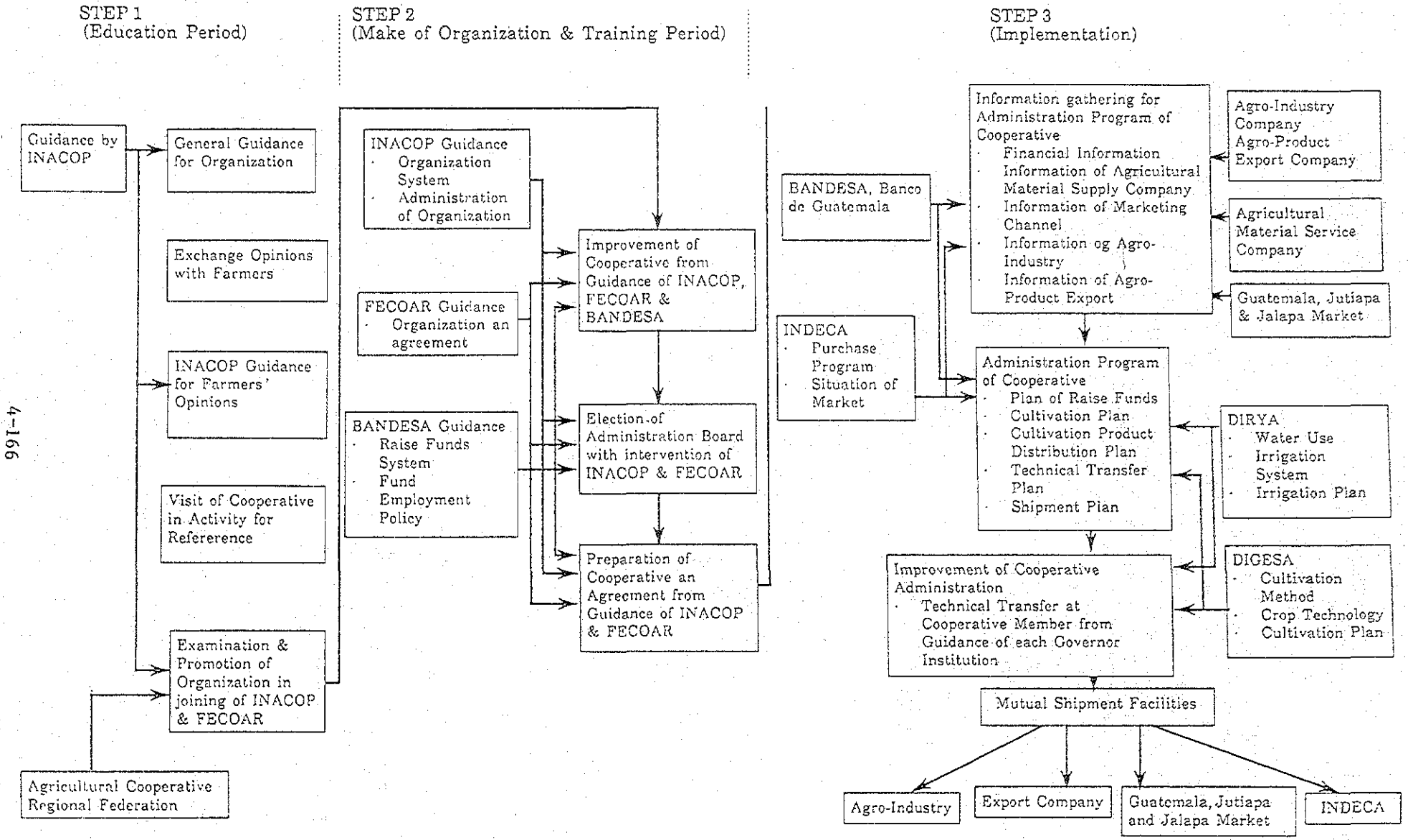


Fig. A.4.2.4-3 Flow of Organization

Table A.4.2.4-1 Questionnaire on Organizatin in Monjas Area

Item	Yes	Possible	No	Total
Is it possible to make Farmer's Organization?	39	11	15	65
%	60	17	23	100

Item	Yes	Yes, but with support by Government or private enterprise.	No	Total
Will you cooperate for Farmer's Organization?	37	22	6	65
%	57	34	9	100

Item	Supply of Agricultural Material & Marketing	Credit	Agro-Industry	Not define	Total
What organization do you hope?	47	8	9	1	65
%	72	12	14	2	100

4.3 Facility Plan

4.3.1 Dam and Regulating Reservoir Plan

(1) Geology of Guirila Dam Site

Fig. A.4.3.1-1 Geological Map at Guirila Dam Site
Fig. A.4.3.1-2 Boring Log of PM-1 Point
Fig. A.4.3.1-3 Boring Log of PM-2 Point
Fig. A.4.3.1-4 A Curve of Electric Prospecting

(2) Stability Analysis of Dam

Table A.4.3.1-1 Design Values
Table A.4.3.1-2 Results of Stability Analysis
Fig. A.4.3.1-5 Flow Chart of Stability Analysis of Fill Dam by Sliding Surface Method
Fig. A.4.3.1-6 Stability Analisis of Guirila Dam (Full Water)
Fig. A.4.3.1-7 Stability Analiasis of Guirila Dam (Middle Water)

(3) Results of Permeability Test

(4) Results of Specific Gravity and Humidity

(5) Results of Unconfined Compression of Boring Core at PM-1

(6) Results of Specific Gravity

(7) Wave Uprush

(8) Drawing

Fig. A.4.3.1-8 General Plan of Guirila Dam
Fig. A.4.3.1-9 Typical Cross Section and Longitudinal Section of Saddle Dam
Fig. A.4.3.1-10 Typical Cross Section and Longitudinal Section of Saddle Dam
Fig. A.4.3.1-11 Diversion Tunnel and Intake Facility
Fig. A.4.3.1-12 Spillway

4.3.2 Irrigation Facility Plan

(1) Summary of Irrigation Canal

Table A.4.3.2-1 Summary of Irrigation Canal

(2) Irrigation Facility Design

Fig. A.4.3.2-1 Plan and LogitudinalProfile of Driving Canal
Fig. A.4.3.2-2 Ostua Diversion Weir
Fig. A.4.3.2-3 Plan and Longitudinal Profile of Main Irrigation Canal North Diversion Canal
Fig. A.4.3.2-4 Plan and Longitudinal Profile of Main Irrigation Canal South Diversion Canal

(1) Geology of Guirila Dam Site

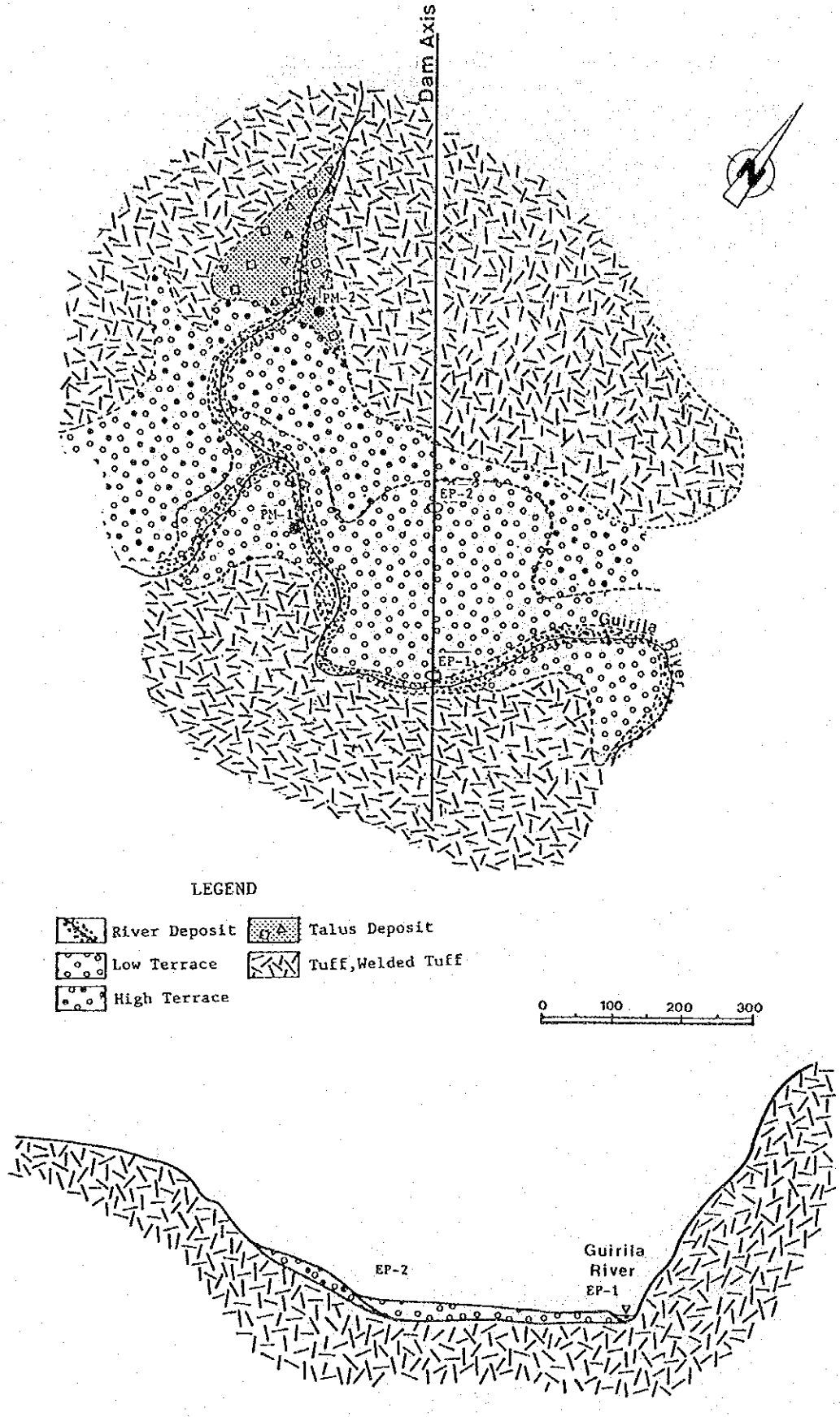


Fig. A.4.3.1-1 Geological Map at Guirila Dam Site

BORING LOG

Boring NO. PM-1

Boring Point : Proposed Dam Site of Guirila River
South Side of Near of River Course
on the River Terrace

Ground Level : 1001.3 M.A.S.L

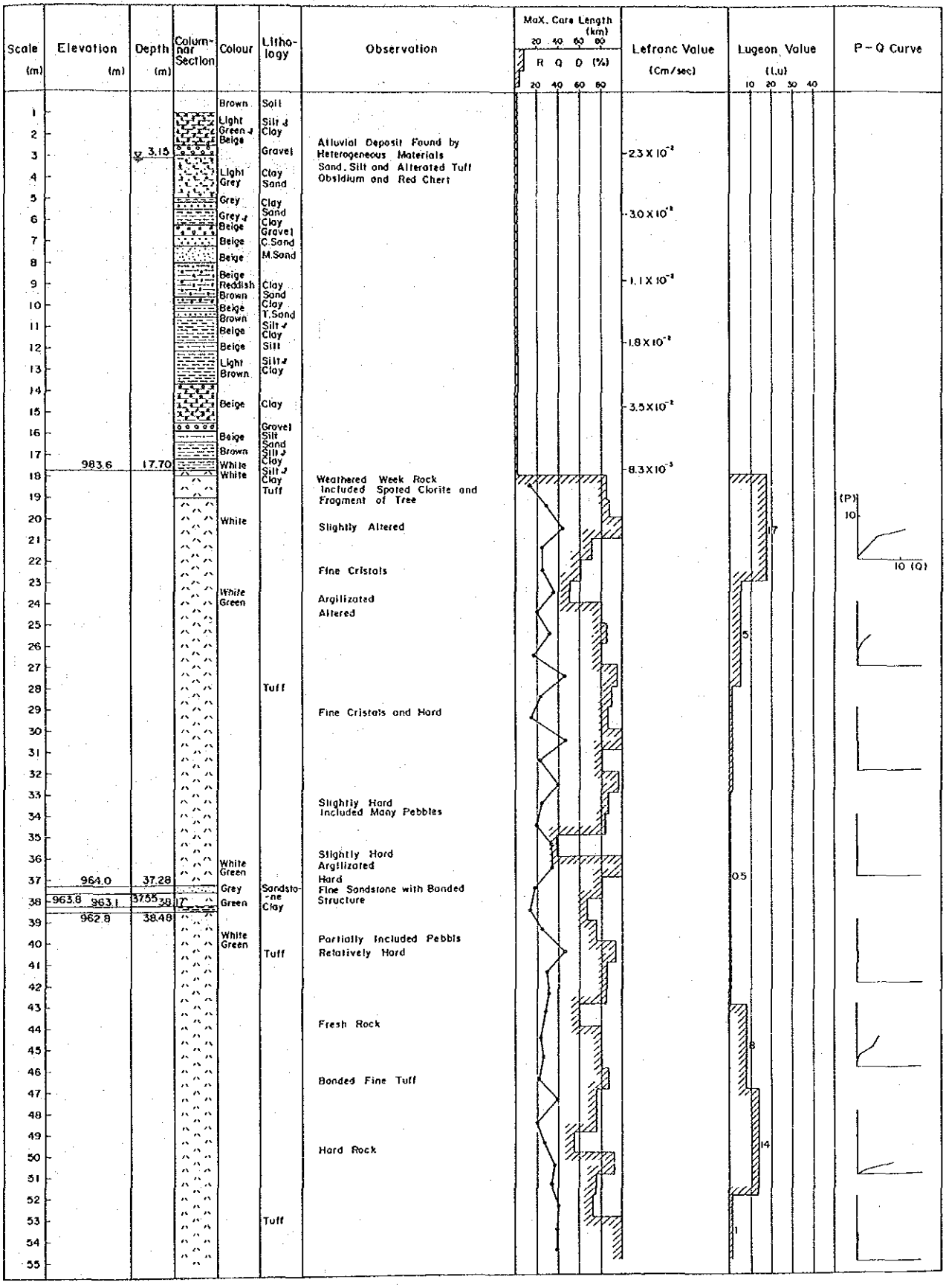


Fig. A.4.3.1-2 Boring Log of PM-1 Point

BORING LOG

Boring NO. PM-2

Boring Point : Proposed Dam Site of Guirila River
North Side of River Course
on the Left Piedmont

Ground Level : 1012.2 M.A.S.L

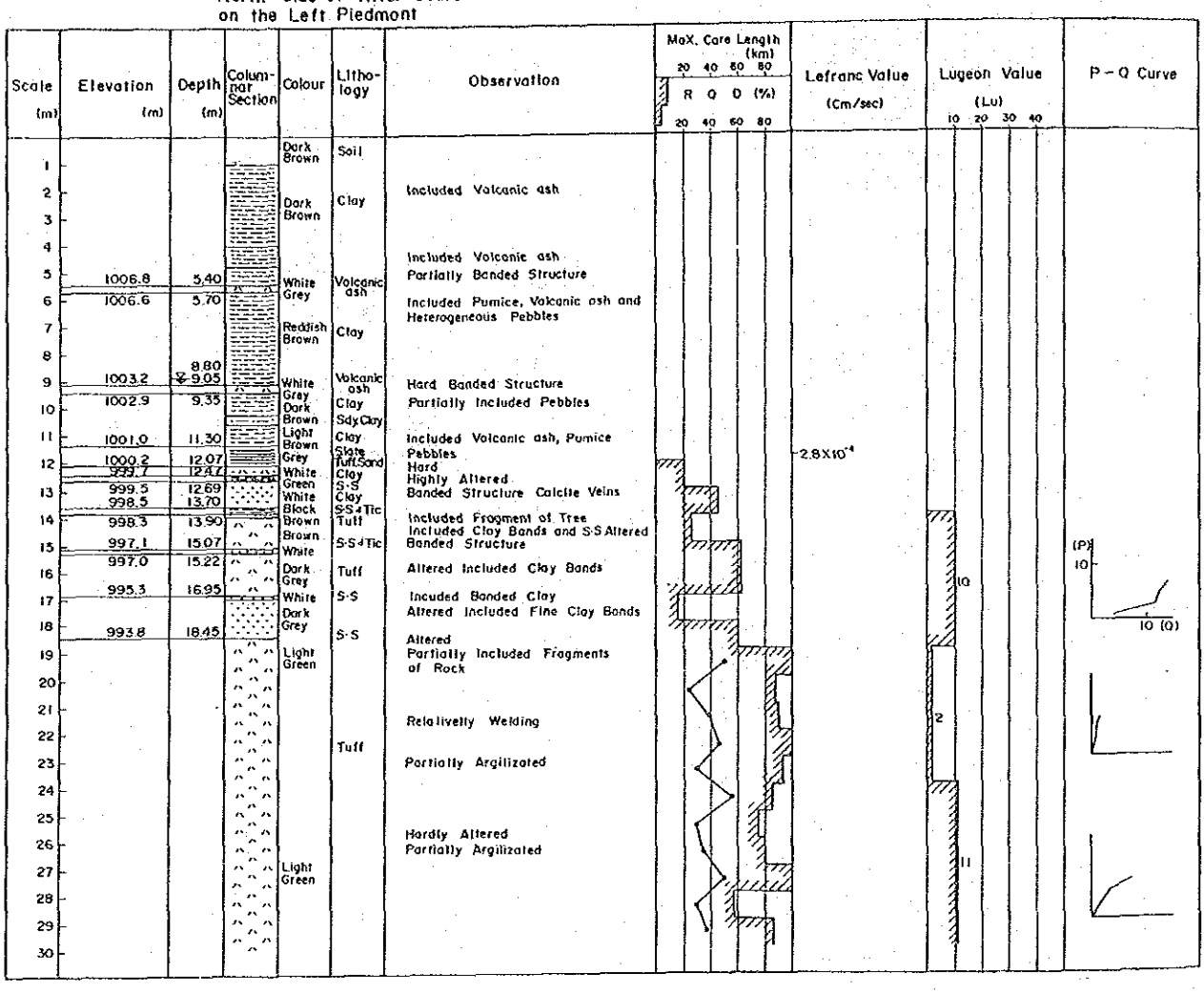
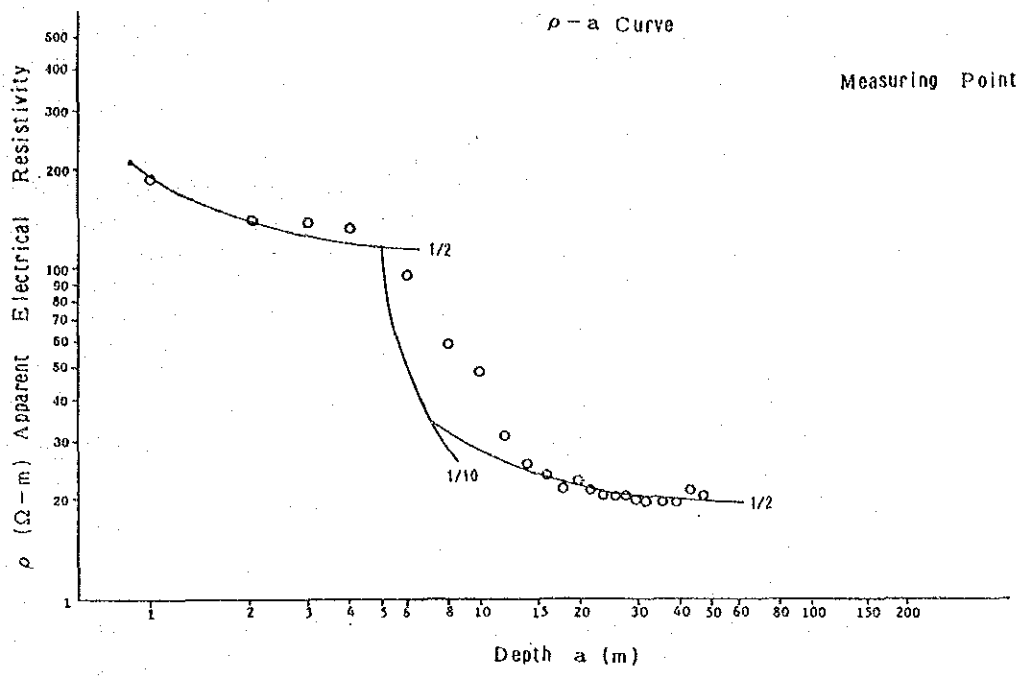
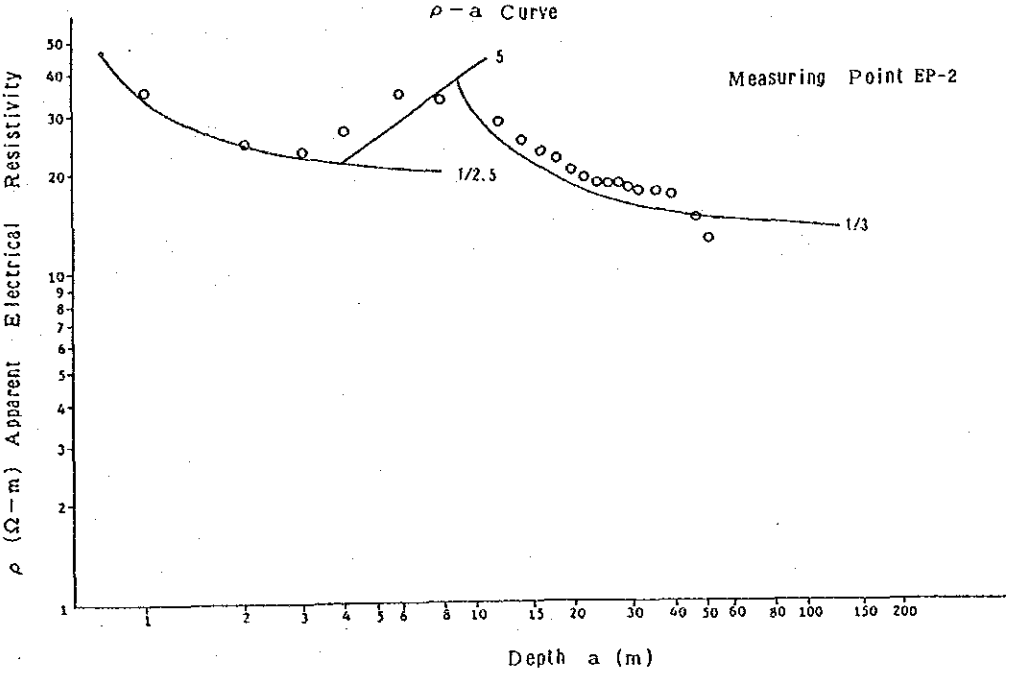


Fig. A.4.3.1-3 Boring Log of PM-2 Point



Electric Resistivity (Ω－m)	225	112.5	12	18



Electric Resistivity (Ω－m)	19	19.6	110	13.3

Fig. A.4.3.1-4 ρ- a Curve of Electric Prospecting

(2) Stability Analysis of dam

a. Method of Stability Analysis

Stability of the dam was studied by using the slice method to the slip circle surface taking into consideration the property of embankment materials and condition of dam foundation.

The dam shall be safe against sliding failure under the following conditions:

Condition 1: At the end of dam construction
Condition 2: Reservoir is at high water level and seepage is steady
Condition 3: Reservoir is at full water level and seepage is steady
Condition 4: Reservoir is at intermediate water level and seepage is steady
Condition 5: Reservoir at rapid drawdown from full water level to low water level

Notes : For conditions 4 and 5, stability analyses are conducted on the upstream slope only.

The safety factor against the sliding surface method is defined at the ratio of sliding moment resisting moment acting on the slip surface. The safety factor for these conditions is obtained by the following formula.

$$SF = \frac{\sum (C.L + (N-U-Ne) \times \tan \theta)}{(T + Te)}$$

where,
SF: Safety factor
N : Normal force acting on slip circle of each slice
T : Tangential force acting on slip circle of each slice
U : Pore pressure acting on slip circle of each slice
Ne: Normal force of earthquake load acting on slip circle of each slice
Te: Tangential force of earthquake load acting on slip circle of each slice
θ : Angle of internal friction of materials on slip circle of each slice
C : Cohesion of materials of slip circle of each slice
L : Arc length of slip circle of each slice

The safety factor shall not be less than 1.2 in any conditions.

b. Design Values

Design values to be used for stability analysis of the dam were determined based on the results of material test and referred to the other dams. The design values are as follows:

Table A.4.3.1-1 Design Values

Materials or Name of Zone	Wet Density (t/m^3)	Saturated Density (t/m^3)	Cohesion (t/m^2)	Internal Angle ( )
Impervious material	1.69	1.72	5.0	20° - 00'
Randam material	1.69	1.72	3.5	30° - 00'
Filter material	2.00	2.10	0	40° - 00'
Previous material	2.00	2.10	0	35° - 00'

Note: The design value of impervious material was applied at the maximum dry density by compaction test taking into consideration the property of material and construction condition. The shear strength of impervious material was obtained from a triaxial compressive strength test under the unconsolidated-undrained condition.
Other design values except impervious material were assumed based on design values of embankment materials of dams constructed in Japan.

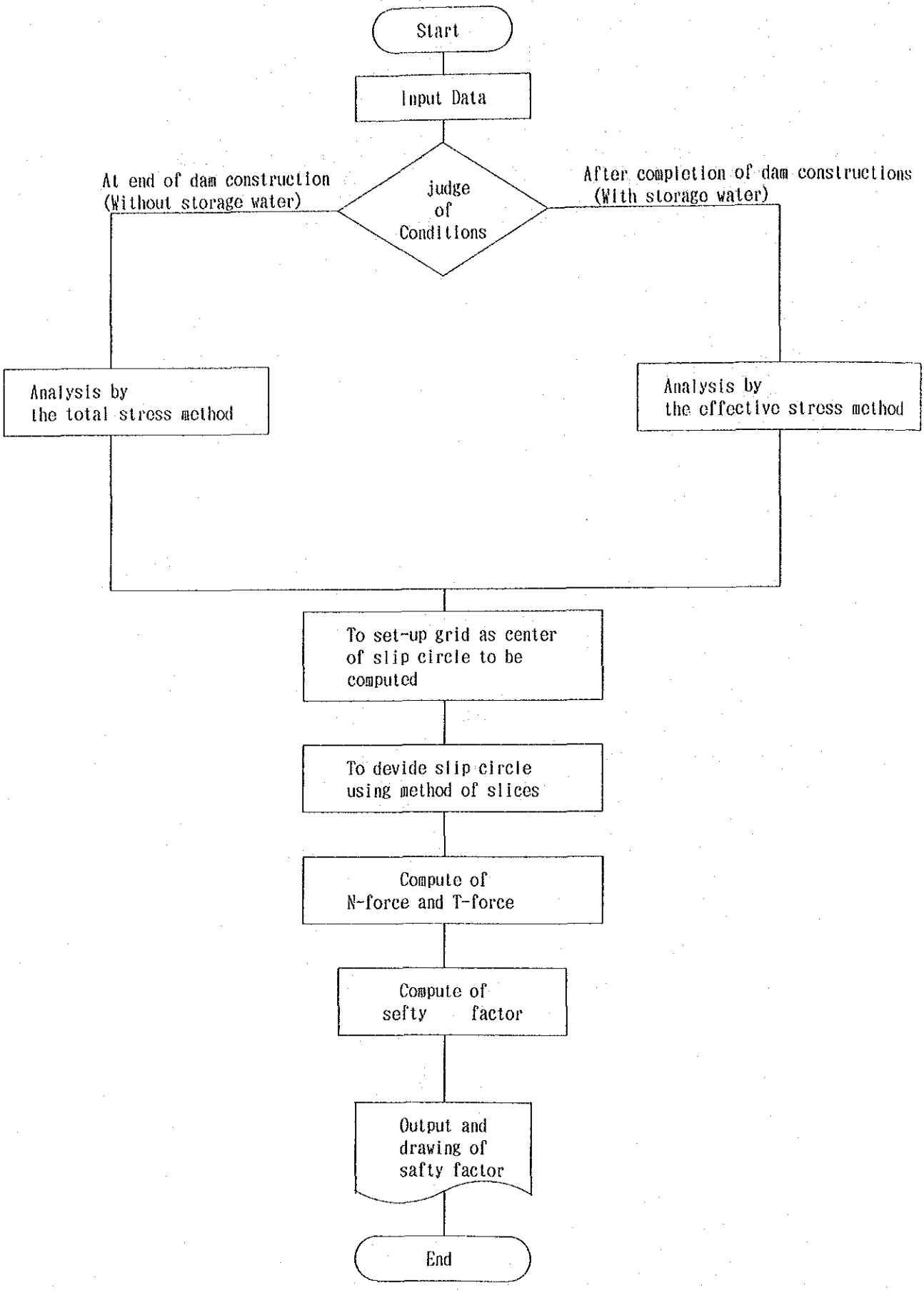


Fig. A.4.3.1-5 Flow Chart of Stability Analysis of Fill Dam by Sliding Surface Method

c. Results of Stability Analysis

The stability analysis of dam was performed by the computer under the above conditions. The results are as follows:

Table A.4.3.1-2 Results of Stability Analysis

Conditions	Earthquake Force	Water Level	Slope	Safety Factor
1	k = 0.06	-	Upstream	1.887
			Downstream	1.618
2	k = 0.06	HWL 1041.00	Upstream	1.784
			Downstream	1.618
3	k = 0.12	HWL 1039.50	Upstream	1.326
			Downstream	1.402
4	k = 0.12	MWL 1025.00	Upstream	1.233
5	k = 0.12	FWL to LWW	Upstream	1.391

Note: The contour of safety factory of the representative cases are shown in Fig. A.4.3.1-6 and Fig. A.4.3.1-7.

STABILITY ANALYSIS OF GUIRILA DAM

CONDITION : FULL WATER

WATER LEVEL : WL 1039.50 m

EARTHQUAKE FORCE : K = 0.12

MIN. SAFTY FACTOR : SF = 1.402

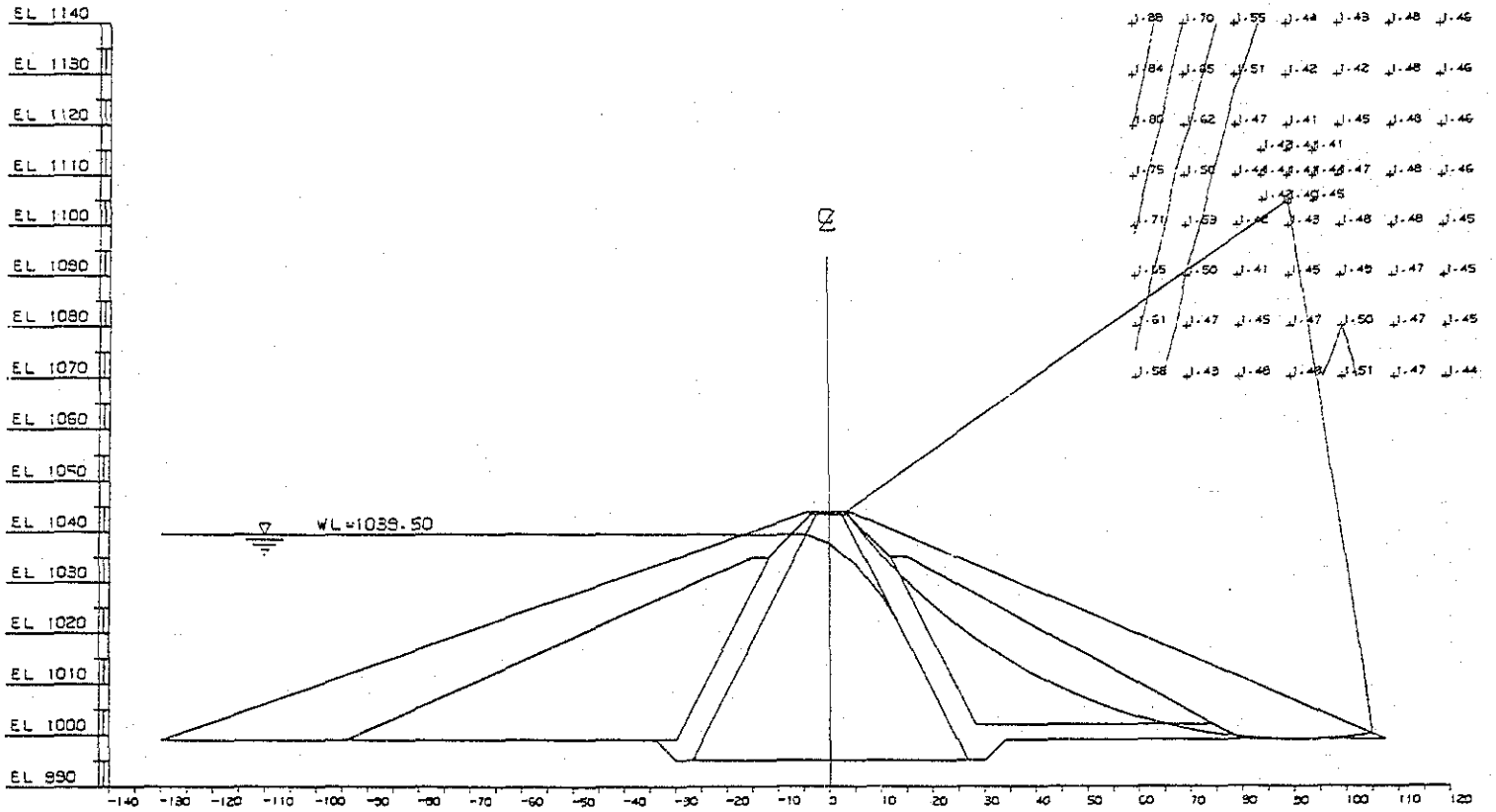


Fig.A.4.3.1-6 Stability Analisis of Guirila Dam
(Full Water)

STABILITY ANALYSIS OF GUIRILA DAM

CONDITION : MIDDLE WATER

WATER LEVEL : WL 1025.00 m

EARTHQUAKE FORCE : K = 0.12

MIN. SAFTY FACTOR : SF = 1.233

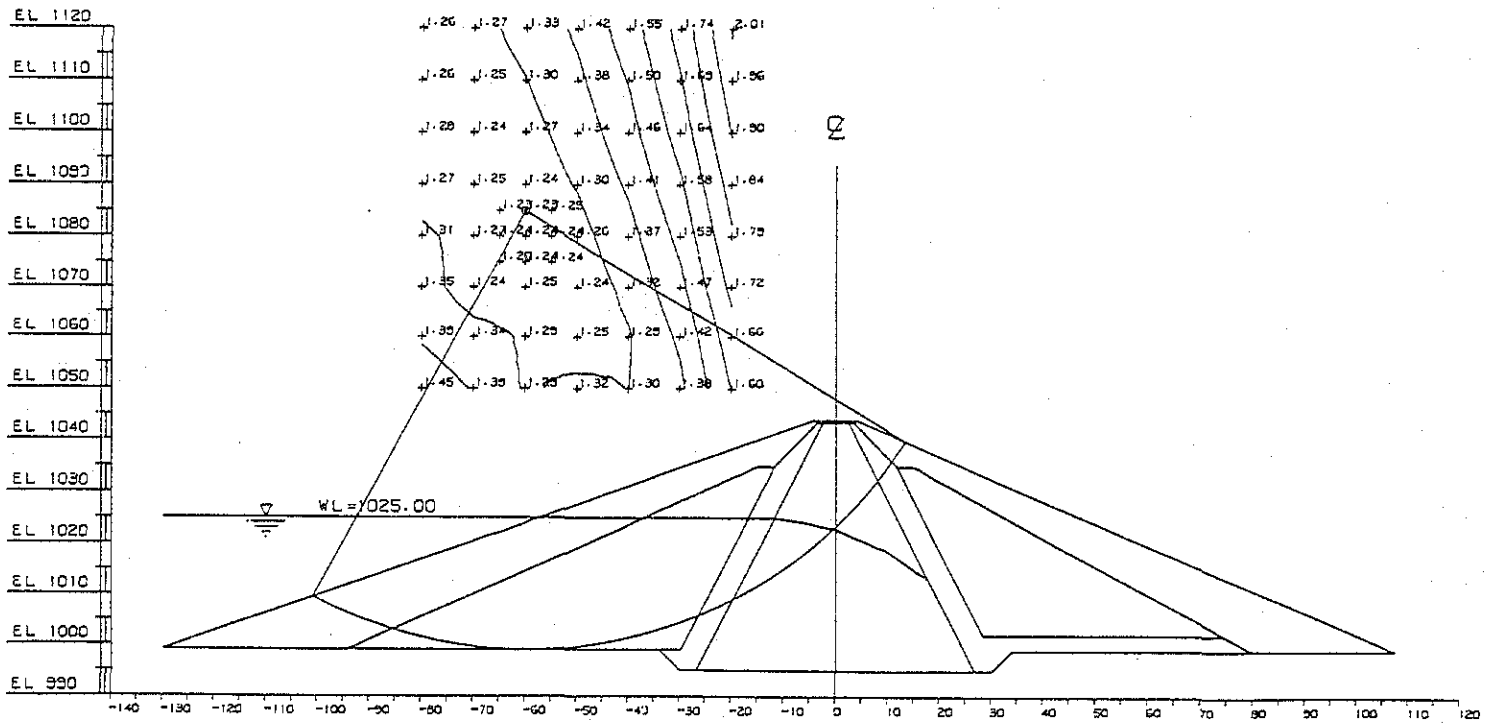


Fig.A.4.3.1-7 Stability Analiasis of Guirila Dam
(Middle Water)

(3) Results of Permeability Test

O.T. No. 40508
Informe No. 159.88.S S

INTERESADO: SANYU Consultants Inc.

PROYECTO: Irrigación de Monjas Jalapa

ASUNTO: Ensayos de permeabilidad

FECHA: 12 de enero de 1988

Descripción del suelo: Limo rojizo

Ensayo No. 1:

A la compactación: Punto 2 de la curva de compactación
w = 38%
γ_d = 1,222.4 kg/m3 (76.4 lbs/pie3)
K = 6.8×10^{-8} cm/seg

Ensayo No. 2:

A la compactación: Punto 1 de la curva de compactación
w = 36.7%
γ_d = 1,206.4 kg/m3 (75.4 lbs/pie3)
K = 5.2×10^{-7} cm/seg

Atentamente,

Dr. Rodolfo Hernández A.
Jefa Sección Mecánica de Suelos

Vo.Bo.
Ing. Aníbal Rodas Mazariegos
Director CII

SUMMARY OF SOIL TESTS

Sample No.	Unified Soil Classification	Grain-Size Analysis: Gravel 4.76 mm (%)	sand 0.074 mm (%)	silt 0.005 mm (%)	clay (%)	Max. Particle Size (mm)	Specific Gravity of Soil Gs	Atterberg Limit: Liquid Limit (%)	Plastic Limit (%)	Plasticity Index Ip	Compaction Test: Field Moisture Content (%)	Opt. Water Content (%)	Max.Dry Density (g/cm3)	Method
MJ-1	MH	0	9.9	39.1	51.0	10.0	2.44	-	-	-	32.7	38.0	1.224	ASTM

Sample No.	D-Value $= \frac{rd}{Max.rd}$ (%)	Specimen Initial Condition: Dry Density (g/cm3)	Wet Density (g/cm3)	Water Content (%)	Void Ratio e	Degree of Saturation (%)	Permeability Test: Method	Coefficient of Permeability (cm/sec)	Triaxial Test(U-U): Cohesion (t/m2)	Friction Angle (°)
MJ-1	100	1.224	1.689	38.0	0.993	93.4	Falling	6.8×10^{-8}	10.0	24°-00
	95	1.160	1.676	44.5	1.103	98.4		-	3.4	11°-00
	98.5	1.206	1.649	36.7	1.023	87.5		5.2×10^{-7}	-	-

(4) Results of Specific Gravity and Humidity

O.T. No. 40508
INFORME No. 014.87.SS

INTERESADO: SANYU CONSULTANTS INC.

PROYECTO: Irrigación de Monjas

ASUNTO: Ensayos de Gravedad Específica y Humedad Natural

FECHA: 26 de octubre de 1987

MUESTRA: Limo rojizo

1. Gravedad Específica
   Norma: ASTM D-854

   G.S. = 2.44
   20°C

2. Humedad Natural
   Norma: ASTM D-2216

   ω = 32.7%

NOTA: La muestra fue proporcionada por el interesado.

Atentamente,

Dr. Rodolfo Hernández A.
Jefe Sección Mecánica de Suelos CII

Vo.Bo.
Ing. Aníbal Rodas Mazariegos
Director CII

emr.

ENSAYO GRANULOMETRICO

INFORME No. 0014-SC O.T. No. 40508

SECCION MECANICA DE SUELOS

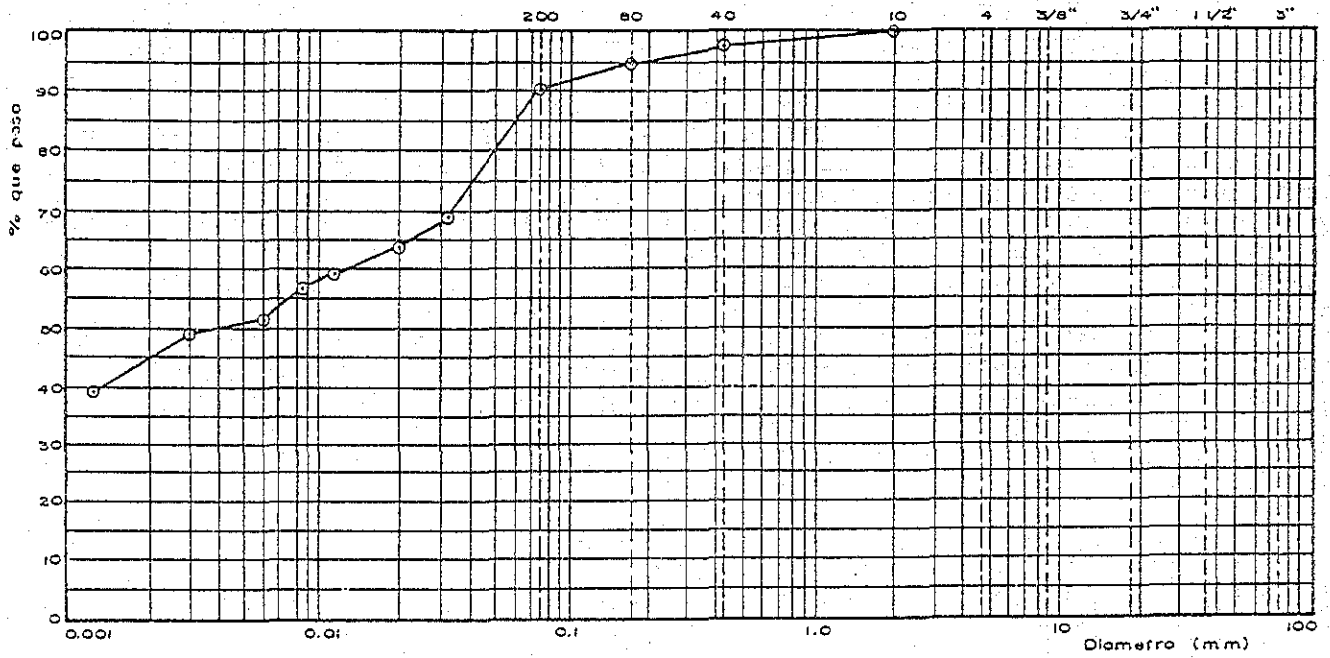
Fecha 26 - 10 - 87

Interesado Sanyu Consultants INC.

Tipo de Ensayo Con tamices y por sedimentación Norma ASTM D - 422

Proyecto Irrigación Monjas, Jalapa Ubicacion Jalapa

Muestra No. Procedencia Jalapa



Analisis con Tamices

Tamiz	% que pasa
10	100
40	97.8
80	95.1
200	90.1

Analisis por Sedimentacion

Diamet. mm	% que pasa
0.032	68.8
0.020	63.6
0.012	58.6
0.0085	57.2
0.0061	52.1
0.0028	47.6
0.0013	37.8

Grava ____ %

Arena 9 %

Limos 40 %

Arcillas 51 %

Descripcion del suelo: Limo de alta compresibilidad color rojizo (Gs. 2.44)

Clasificacion. SCU. ____ PRA. A-7-5

Observaciones. ____

Jefe de Laboratorio

Vo. Bo.

X

Director CII

CENTRO DE INVESTIGACIONES DE INGENIERIA

CIUDAD UNIVERSITARIA ZONA 12 • GUATEMALA, C. A.

O. T. No. 40508

INFORME No. 00141-SC

Interesado: SANYU CONSULTANTS INC.

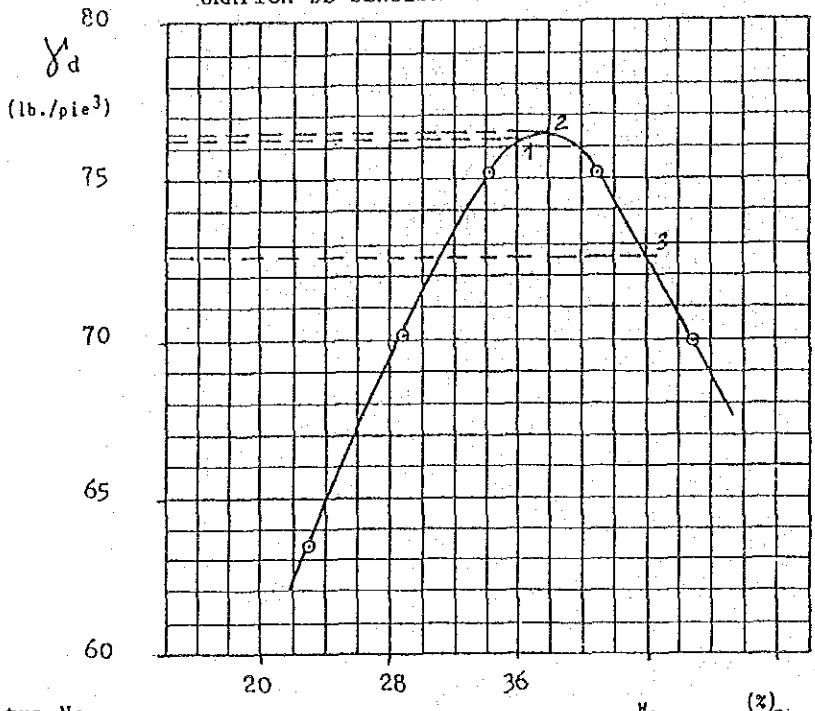
Asunto: Ensayo de compactación: Proctor Estandard (x) Norma: D-698
Proctor Modificado ( ) Norma:

Proyecto: Irrigación de Monjas Jalapa

Ubicación: Jalapa

Fecha: 26-10-87

GRAFICA DE DENSIDAD SECA-HUMEDAD RELATIVA



Muestra No. _____

Descripción del suelo Limo de alta compresibilidad color roji o

Densidad seca óptima γd ope(m) 1.224 t/m³ 76.5 lb/pie³

Humedad óptima: w ope(m) 38 %

Observaciones: _____

Atentamente,

Vo.Bo. x _____
DIRECTOR DEL CII

_____
Jefe Departamento de Suelos

CENTRO DE INVESTIGACIONES DE INGENIERIA
LABORATORIO DE SUELOS

INFORME No. 00142-SC

O.T. No. 40508

ENSAYO DE COMPRESION TRIAXIAL, DIAGRAMA DE MOHR

Interesado: Sanyu Consultants INC

Proyecto: Irrigación Nonjas, Jalapa

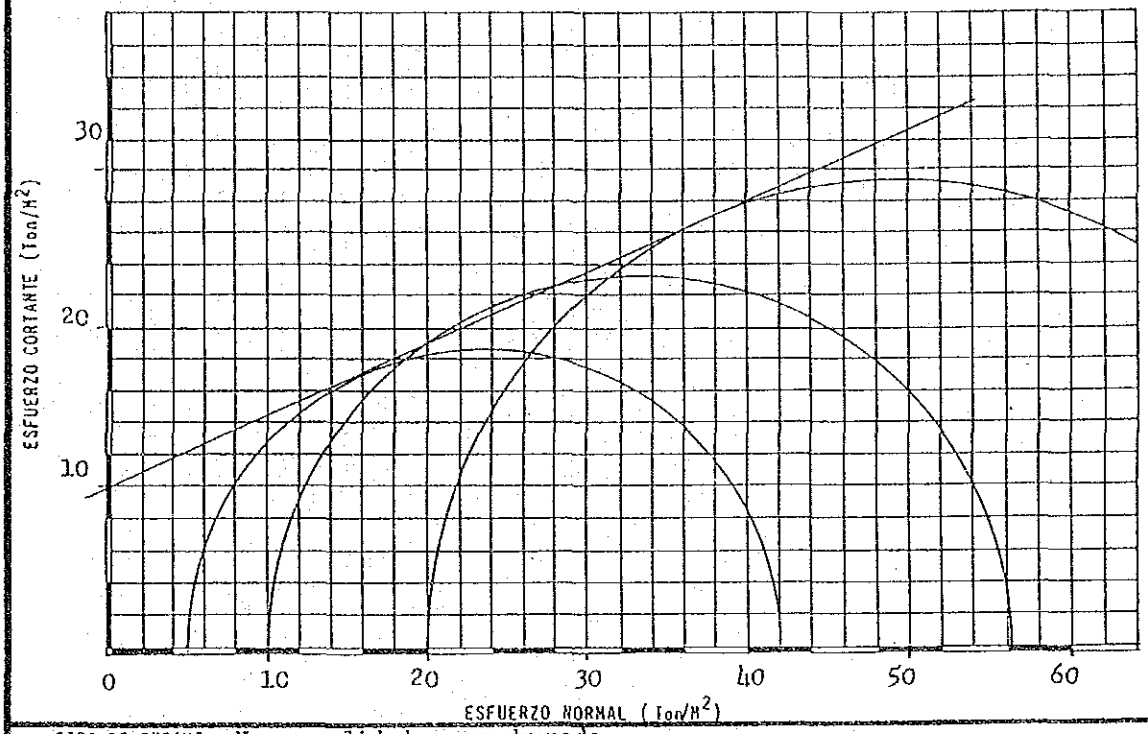
Ubicación: Jalapa

Fecha: 26-10-87

PARAMETROS DE CORTE: $\phi = 24°$

$C = 10$ ton/m^2

Muestra No. Punto 2 de la curva de compactación



TIPO DE ENSAYO: No consolidado - no drenado

DESCRIPCION DEL SUELO: Limo de alta compresibilidad color rojizo

DIMENSION Y TIPO DE LA PROBETA: Diámetro = 6.35cm; altura= 12.7cm. compactada

PROBETA No.	1	2	3				
PRESION LATERAL σ_3 (Ton/M^2)	5	10	20				
DESVIADOR EN ROTURA q_r (TON /M^2)	37.8	46.6	58.1				
PRESION INTERSTICIAL u (Ton/M^2)							
DEFORMACION EN ROTURA ε_r (%)	5.5	13.0	14.5				
DENSIDAD SECA γ_d (Ton/M^3)	1.22	1.21	1.22				
HUMEDAD w (%)	37.8	38.8	37.8				

Vo.Bo. X

DIRECTOR CII

Jefe Sección Mecánica de Suelos

CENTRO DE INVESTIGACIONES DE INGENIERIA

LABORATORIO DE SUELOS

INFORME No. 0014J-SC O.T. No. 40508

ENSAYO DE COMPRESION TRIAXIAL, DIAGRAMA DE MOHR

Interesado: Sanyu Consultants INC

Proyecto: Irrigación Monjas, Jalapa

Ubicación: Jalapa

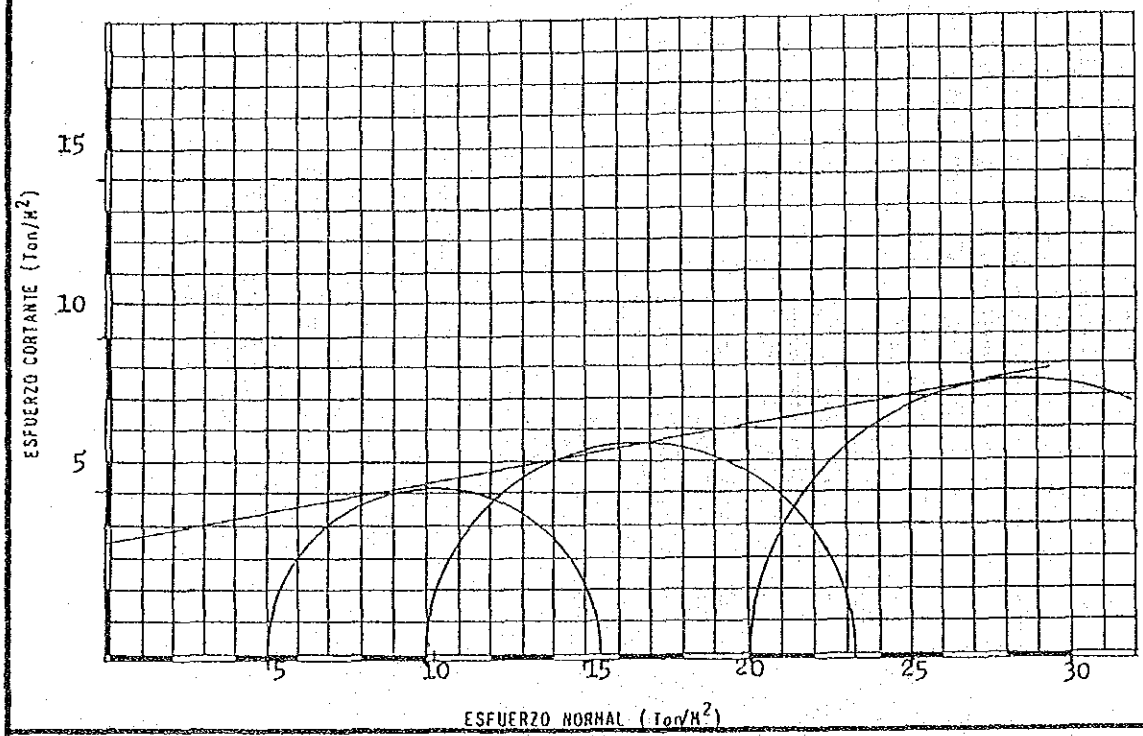
Fecha: 26 de octubre de 1987

PARAMETROS DE CORTE: ϕ=11°

C=3.4 ton/m^2

Norma: D-2850

Muestra No. Punto 3 de la Curva de Compactación



TIPO DE ENSAYO: No consolidado-no drenado

DESCRIPCION DEL SUELO: Limo de alta compresibilidad color rojizo

DIMENSION Y TIPO DE LA PROBETA: Diámetro:6.35 cm; altura:12.7cm.Compactada

PROBETA No.	1	2	3				
PRESION LATERAL σ_3 (Ton/M^2)	5	10	20				
DESVIADOR EN ROTURA q (TON /M^2)	10.5	13.0	17.1				
PRESION INTERSTICIAL u (Ton/M^2)							
DEFORMACION EN ROTURA ε_r (%)	4.5	6.0	7.0				
DENSIDAD SECA γ_d (Ton/M^3)	1.140	1.150	1.160				
HUMEDAD w (%)	44.4	44.8	44.5				

Vo.Bo. X

DIRECTOR CII

Jefe Sección Mecánica de Suelos

CENTRO DE INVESTIGACIONES DE INGENIERIA

LABORATORIO DE SUELOS

O.T.No.40527

INFORME No. 545-C

INTERESADO: Sanyu Consultants INC

PROYECTO: Irrigación de Monjas

MUESTRA: 4 testigos de 2"

ASUNTO: Ensayo a compresión

FECHA: 26.10.87

I. RESULTADOS:

No.	DENSIDAD Kg/m^3	DIAMETRO cm.	ALTURA NIVELADA cm	RE/A/D cm.	ESFUERZO Kg/cm^2
1	2,104.36	4.46	9.43	2.11	197.25
2	2,084.83	4.46	9.49	2.13	188.28
3	2,074.49	4.45	9.40	2.11	156.32
4	2,155.06	4.47	9.43	2.11	357.03

Atentamente,

Vo.Bo.
Ing. Aníbal Rodas Mazariegos
DIRECTOR C.I.I.

Ing. Erik Rosales Torres
JEFE SECCION CONCRETOS.

AFM:ERT:aebr

O.T.No.4052 ?

Informe No. 552-87-SC

INTERESADO: Sanyu Consultants Inc.

PROYECTO: Irrigación de Monjas

MUESTRA: 4 Testigos

ASUNTO: Peso Específico

FECHA: 29 de Octubre de 1987

I. RESULTADOS:

Muestra	Norma de Ensayo		Peso Específico
No. 1	ASTM	C-127	2.21
No. 2	ASTM	C-127	2.22
No. 3	ASTM	C-127	2.22
No. 4	ASTM	C-127	2.20

Atentamente,

Ing. Erik Rosales Torres
Jefe Sección de Concretos

Vo.Bo.
Ing. Aníbal Rodas M.
Director
C.I.I.

(5) Results of Unconfined Compression of Boring Core at PM-1 O.T.No.4C527

INFORME No. 545-C

INTERESADO: Sanyu Consultants INC

PROYECTO: Irrigación de Monjas

MUESTRA: 4 testigos de 2"

ASUNTO: Ensayo a compresión

FECHA: 26.10.87

I. RESULTADOS:

No.	DENSIDAD Kg/m^3	DIAMETRO cm.	ALTURA NIVELADA cm	RE/A/D cm.	ESFUERZO Kg/cm^2
1	2,104.36	4.46	9.43	2.11	197.25
2	2,084.83	4.46	9.49	2.13	188.28
3	2,074.49	4.45	9.40	2.11	156.32
4	2,155.06	4.47	9.43	2.11	357.03

Atentamente,

Vo.Bo.
Ing. Aníbal Rodas Mazariegos
DIRECTOR C.I.I.

Ing. Erik Rosales Torres
JEFE SECCION CONCRETOS.

ARM:ERT:aebr

(6) Results of Specific Gravity

O.T.No.4052

Informe No. 552-87-SC

INTERESADO: Sanyu Consultants Inc.

PROYECTO: Irrigación de Monjas

MUESTRA: 4 Testigos

ASUNTO: Peso Específico

FECHA: 29 de Octubre de 1987

I. RESULTADOS:

Muestra	Norma de Ensayo		Peso Específico
No. 1	ASTM	C-127	2.21
No. 2	ASTM	C-127	2.22
No. 3	ASTM	C-127	2.22
No. 4	ASTM	C-127	2.20

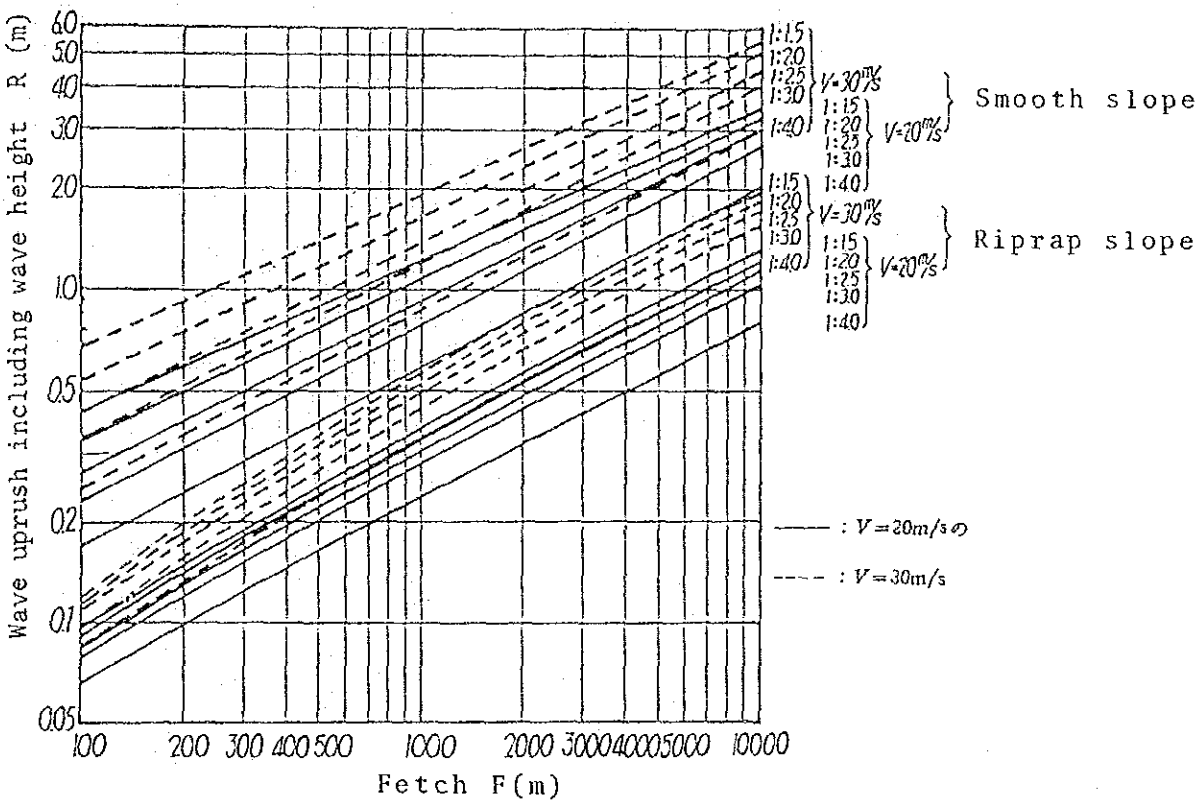
Atentamente,

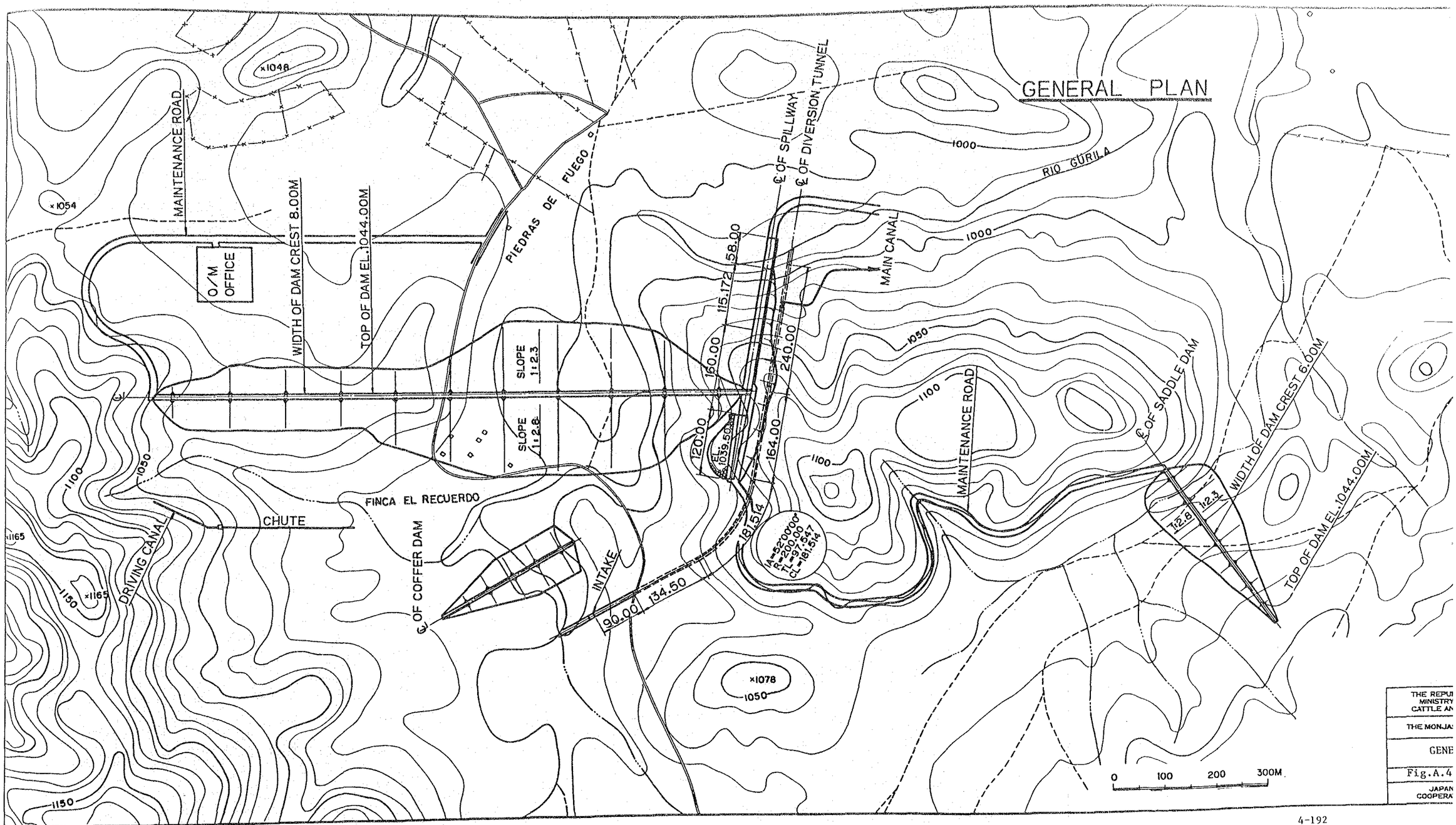
Ing. Erik Rosales Torres
Jefe Sección de Concretos

Vo.Bo.
Ing. Aníbal Rodas M.
Director
C.I.I.

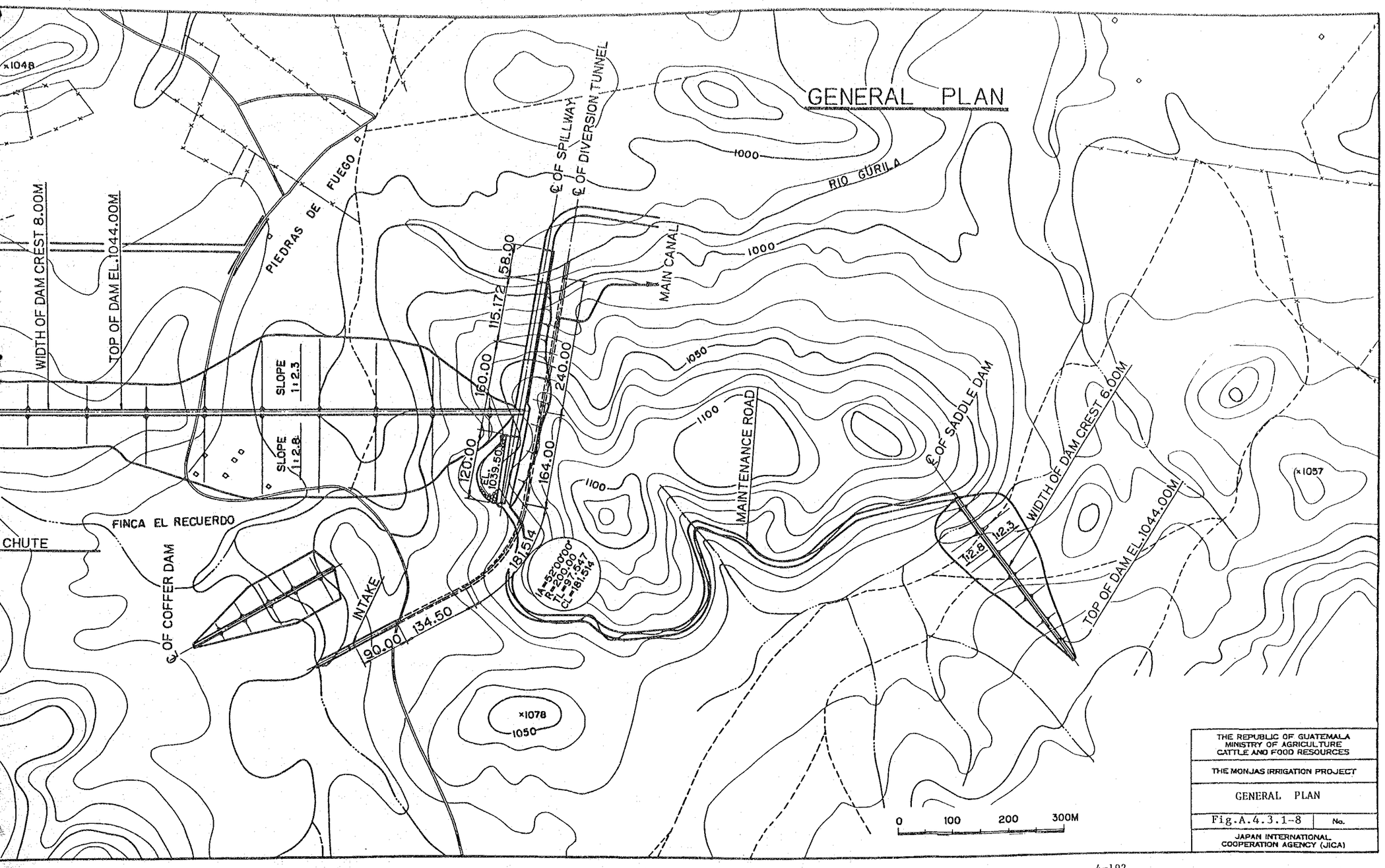
(7) Wave Uprush

WAVE UPRUSH OBTAINED BY COMBINING THE SMB METHOD WITH SAVILLE METHOD

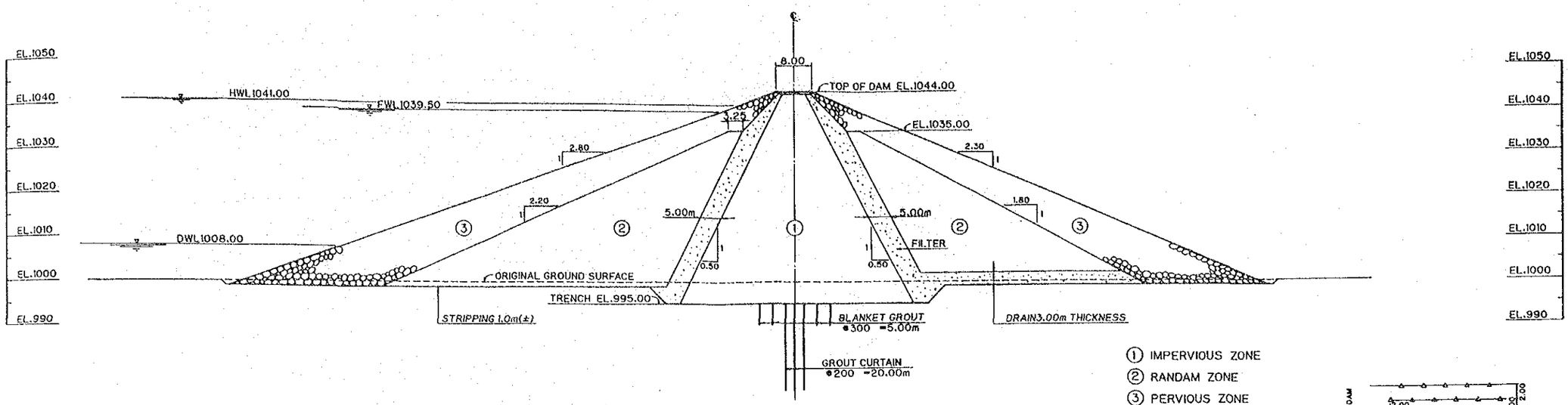



GENERAL PLAN
MAINTENANCE ROAD
O/M OFFICE
WIDTH OF DAM CREST 8.00M
TOP OF DAM EL.1044.00M
PIEDRAS DE FUEGO
℄ OF SPILLWAY
℄ OF DIVERSION TUNNEL
RIO GURILA
MAIN CANAL
SLOPE 1:2.3
SLOPE 1:2.8
115.172
58.00
160.00
240.00
120.00
EL.1039.50
164.00
181.514
IA=52°00'00"
R=200.00
T=97.547
CL=181.514
MAINTENANCE ROAD
℄ OF SADDLE DAM
WIDTH OF DAM CREST 6.00M
TOP OF DAM EL.1044.00M
1:2.8
1:2.3
FINCA EL RECUERDO
CHUTE
DRIVING CANAL
℄ OF COFFER DAM
INTAKE
90.00
134.50
1000
1050
1100
1150
1165
×1048
×1054
×1078
×1165
0 100 200 300M
THE REPU
MINISTRY
CATTLE AN
THE MONJA
GENE
Fig.A.4
JAPAN
COOPERA

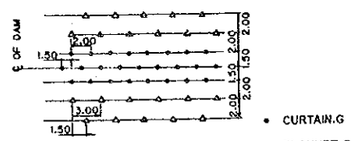
GENERAL PLAN



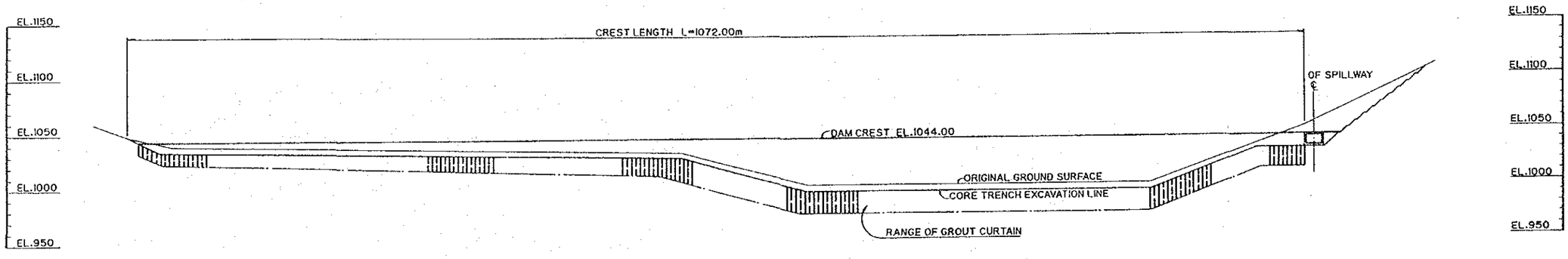
THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES
THE MONJAS IRRIGATION PROJECT
GENERAL PLAN
Fig.A.4.3.1-8 | No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



TYPICAL CROSS SECTION OF MAIN DAM



GROUT PATTERN

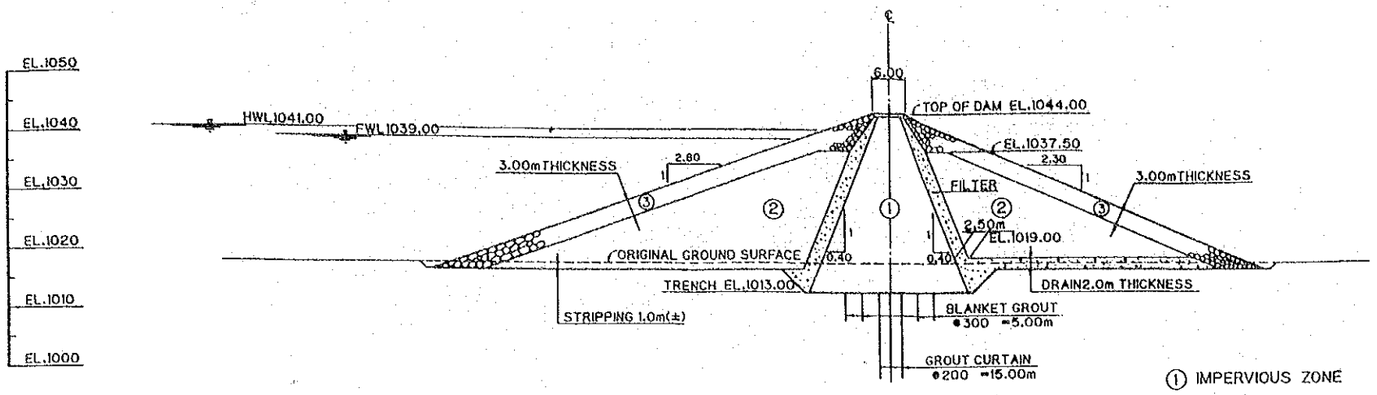


LONGITUDINAL SECTION ALONG DAM AXIS

0 40 80 120 160 200M

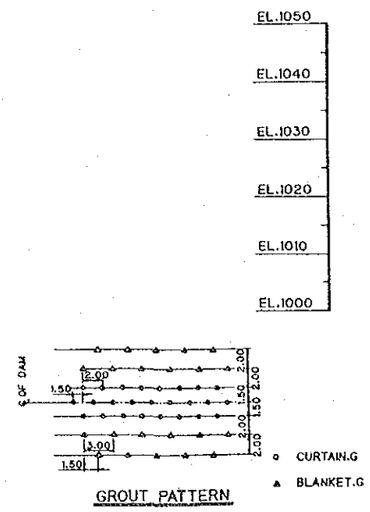
STATION	DISTANCE m	ORIGINAL GROUND SURFACE EL.	CORE TRENCH EL.
- 30	0.00	1049.0	1045.0
NO. 1	30.00	1042.0	1037.0
+ 10	40.00	1040.0	1034.0
NO. 2	130.00	1038.0	1033.0
NO. 3	230.00	1036.0	1031.0
NO. 4	330.00	1034.0	1029.0
+ 80	410.00	1032.0	1028.0
NO. 5	430.00	1032.0	1027.0
+ 70	500.00	1031.0	1026.0
NO. 6	530.00	1024.0	1018.0
+ 80	610.00	1002.0	996.0
NO. 7	630.00	1000.0	995.0
NO. 8	730.00	1000.0	995.0
NO. 9	830.00	1000.0	995.0
NO. 10	930.00	1000.0	995.0
NO. 11	1030.00	1038.0	1032.0
+ 30	1060.00	1049.0	1045.0

THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES	
THE MONJAS IRRIGATION PROJECT	
TYPICAL CROSS SECTION AND LONGITUDINAL SECTION OF MAIN DAM	
Fig.A.4.3.1-9	No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

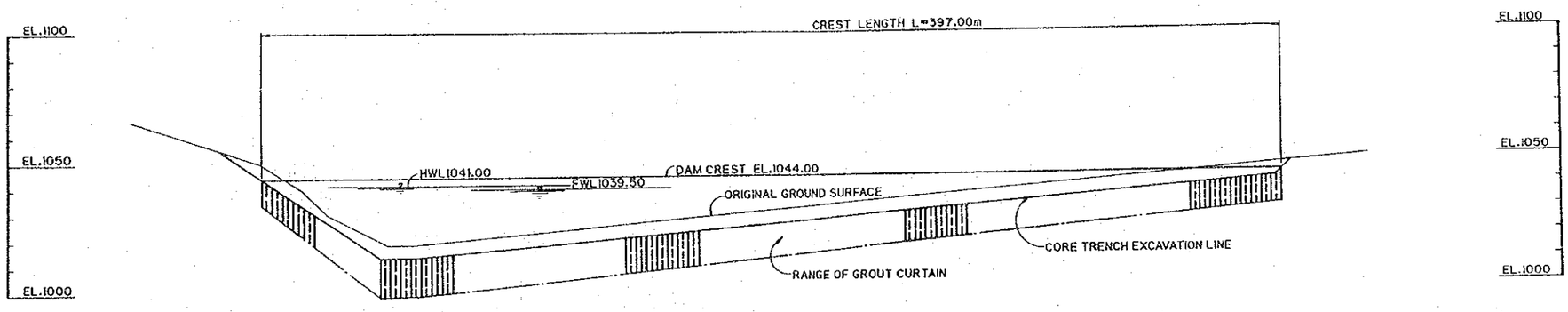


TYPICAL CROSS SECTION OF SADDLE DAM

0 10 20 30 40 50M



GROUT PATTERN

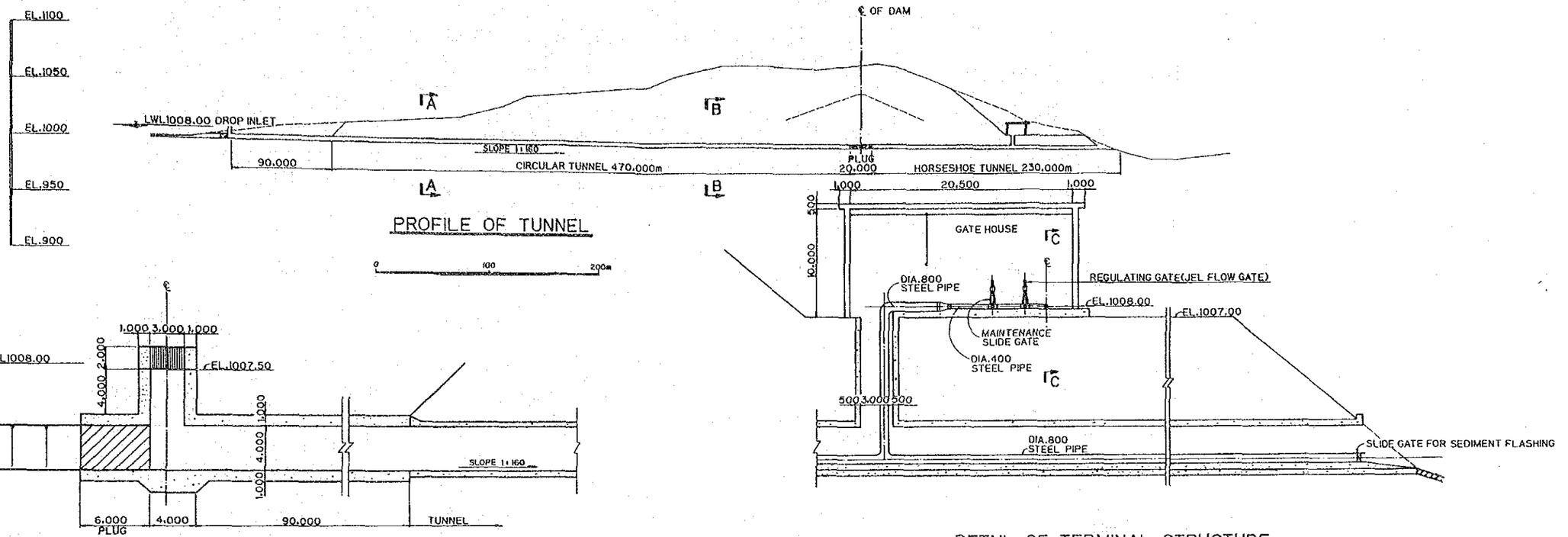


LONGITUDINAL SECTION ALONG DAM AXIS

0 20 40 60 80 100M

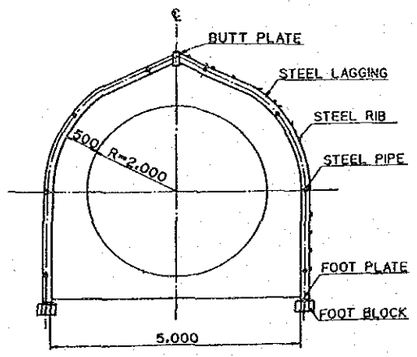
STATION		NO. 1	+45.0 NO. 2	+10.0	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	+45.0 NO. 9
DIS-TANCE	m	0.00	45.00 50.00		100.00	150.00	200.00	250.00	300.00	350.00	395.00 400.00
ORIGI-NAL GROUND SURFACE	EL.	1050.0	1019.5 1018.0		1021.8	1026.6	1030.5	1034.7	1039.0	1043.0	1046.9 1047.0
CORE TRENCH	EL.	1044.0	1013.0 1013.0		1016.5	1021.0	1025.0	1029.2	1033.9	1038.0	1041.5 1047.0

THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES	
THE MONJAS IRRIGATION PROJECT	
TYPICAL CROSS SECTION AND LONGITUDINAL SECTION OF SADDLE DAM	
Fig.A.4.3.1-10	No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

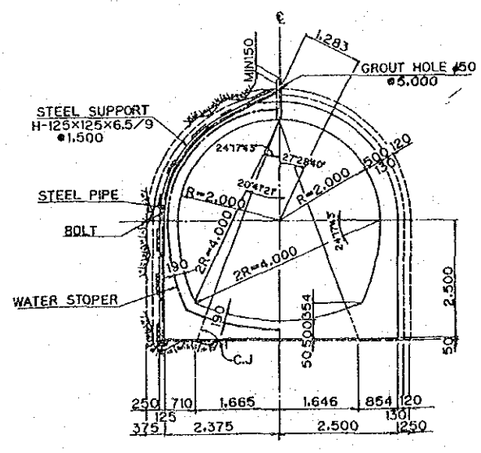


PROFILE OF TUNNEL

INLET

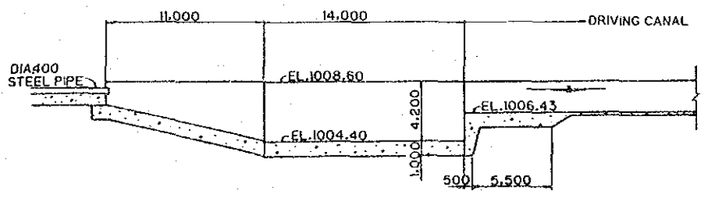


A-A SECTION



B-B SECTION

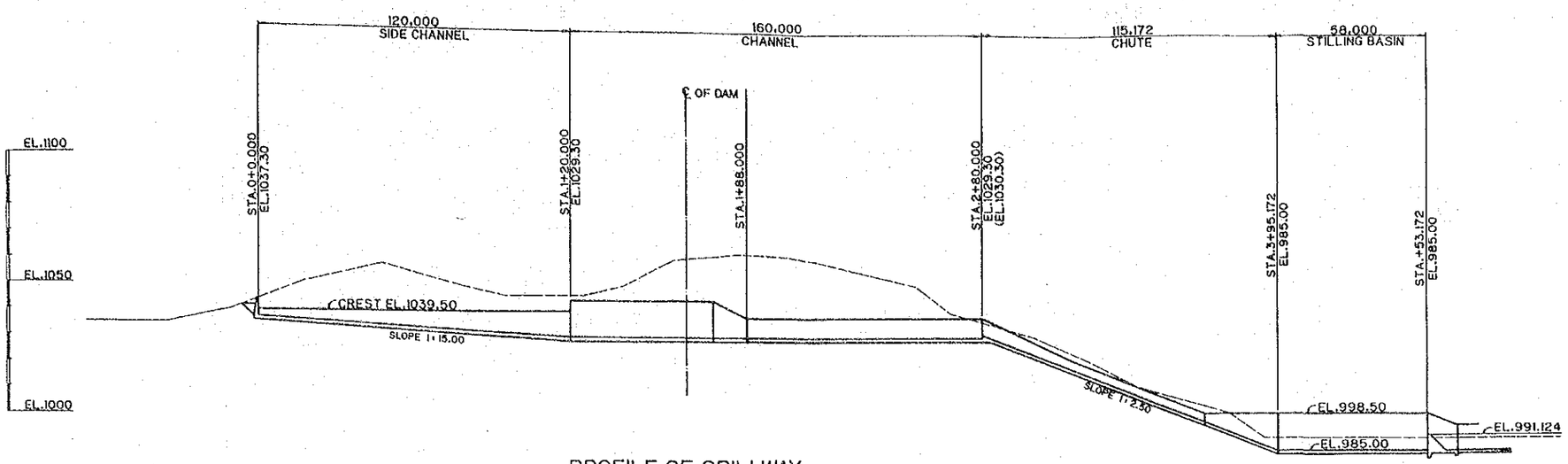
DETAIL OF TERMINAL STRUCTURE



C-C SECTION STILLING BASIN

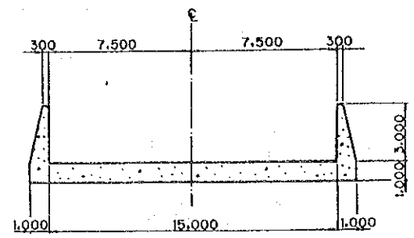
0 10 20m

THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES
THE MONJAS IRRIGATION PROJECT
DIVERSION TUNNEL INTAKE FACILITY
Fig.A.4.3.1-11 | No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

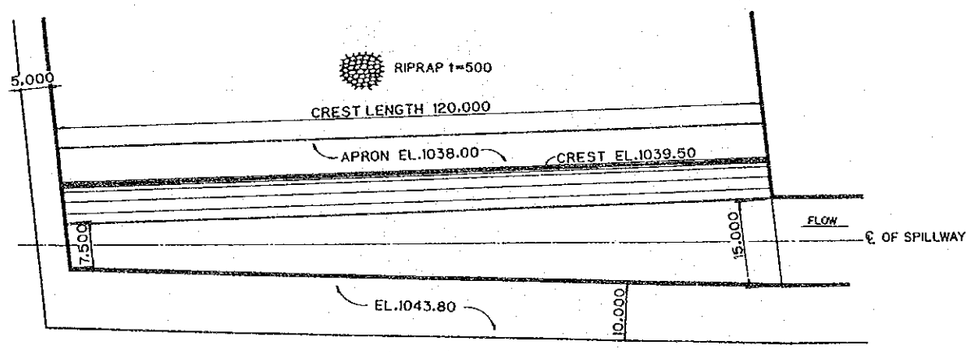


PROFILE OF SPILLWAY

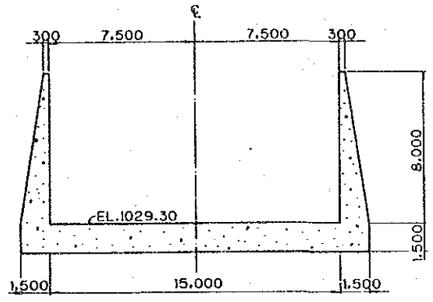
0 50 100M



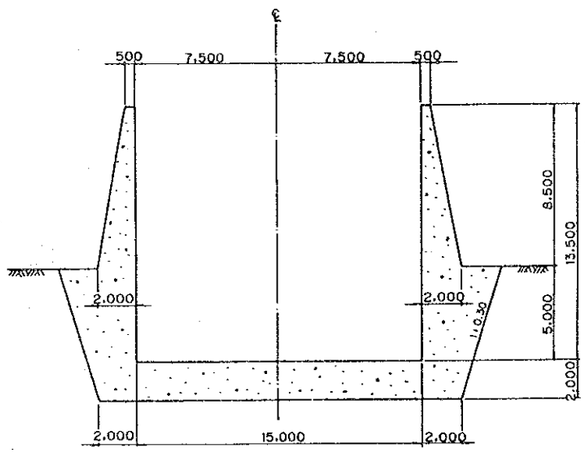
CHUTE



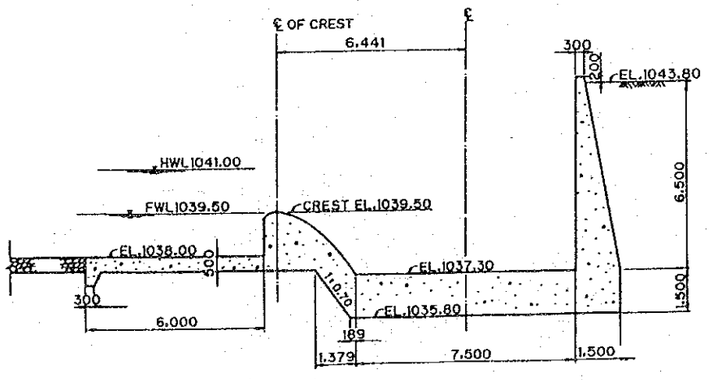
SIDE CHANNEL



STA.1+88.000



STILLING BASIN



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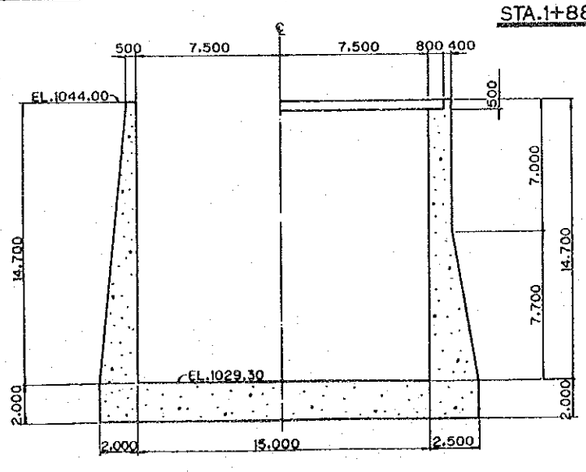

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THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES
THE MONJAS IRRIGATION PROJECT
SPILLWAY
Fig.A.4.3.1-12 ; No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

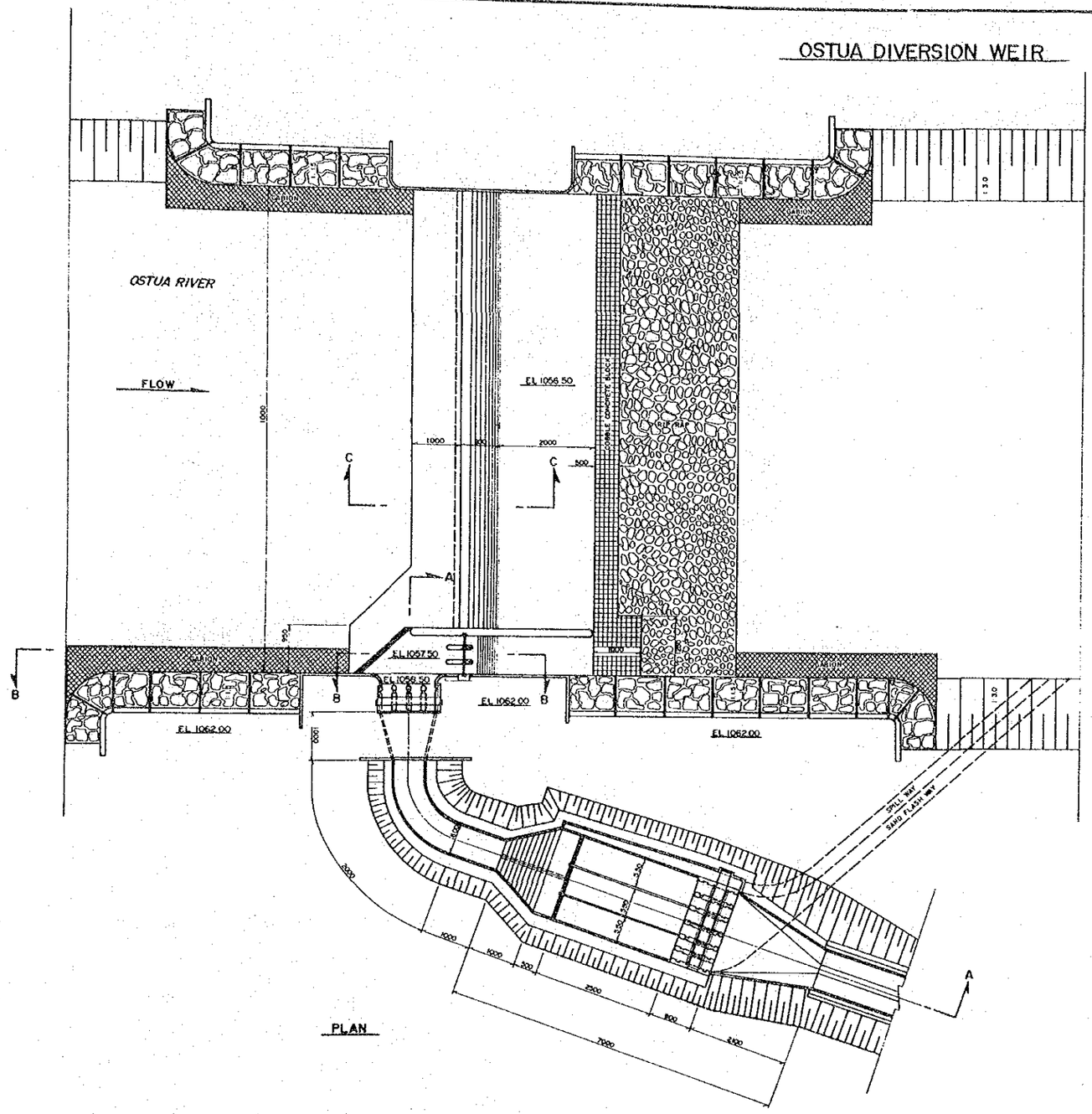
Table A.4.3.2-1 Summary of Irrigation Canal

Name of Canal	Length (m)	Q (m^3/s)	Canal Dimension (m)		Siphone Dimension (m)		Division Work (NOs)	Drops (NOs)	Cross Work (NOs)	I
			B	h	B	H				
1. Driving Canal	1,450	4.0	1.80	1.30	—	—				1/4000
〃	6,435	4.0	1.40	1.30	—	—	2			1/3000
Siphon D-1	370	4.0	—	—	1.40	1.40				—
〃 D-2	420	4.0	—	—	1.40	1.40				—
〃 D-3	340	4.0	—	—	1.40	1.40				—
〃 D-4	130	4.0	—	—	1.40	1.40				—
〃 D-5	355	4.0	—	—	1.40	1.40				—
Total	9,500	—	—	—	—	—	2			—
2. Diversion Canal										
South Diversion	500	3.28	1.2	1.10	—	—	3	—	—	1/2000
〃	1,625	1.888	1.0	1.05	—	—	2	—	—	1/4000
〃	5,500	0.909	0.60	0.78	—	—	3	—	—	1/3000
Siphon S-1	375	1.888	—	—	1.0	1.0	—	—	—	
Sub-total	8,000	—	—	—	—	—	8	—	—	
North Diversion	3,100	2.227 ~ 2.019	1.0	0.95 ~ 1.0	—	—	3	1	—	1/2000
〃	5,800	1.526 ~ 1.256	0.8	0.80 ~ 0.85	— —	— —	9	—	—	1/2000
〃	5,200	0.615	0.5	0.65	—	—	4	—	—	1/2000
Siphon N-1	100	1.526	—	—	1.2	1.2	—	—	—	
〃 N-2	50	1.413	—	—	1.0	1.0	—	—	—	
〃 N-3	500	1.413	—	—	1.0	1.0	—	—	—	
〃 N-4	30	1.413	—	—	1.0	1.0	—	—	—	
〃 N-5	20	1.256	—	—	1.0	1.0	—	—	—	
〃 N-6	50	0.615	—	—	1.0	1.0	—	—	—	
〃 N-7	50	0.615	—	—	1.0	1.0	—	—	—	
〃 N-8	50	0.615	—	—	1.0	1.0	—	—	—	
〃 N-9	250	0.615	—	—	1.0	1.0	—	—	—	
Sub-total	15,200						16	1		
Total	23,200						24	1		
3. Main Canal										
Ovejero Main Canal	2,370	0.418	0.5	0.55	—	—	5	—	—	1/2000
Siphon OV-1	30	0.418	—	—	1.0	1.0	—	—	—	
OV-2	300	0.418	—	—	1.0	1.0	—	—	—	
Sub-total	2,700	—	—	—	—	—	5	—	—	
San Pedro Main Canal	2,820	0.722	0.5	0.45	—	—	5	2	—	1/300
Siphon SP-1	30	0.418	—	—	1.0	1.0	—	—	—	
〃 SP-2	150	0.418	—	—	1.0	1.0	—	—	—	
Sub-total	3,000	—	—	—	—	—	5	2	—	

Name of Canal		Length (m)	Q (m^3/s)	Canal Dimension (m)		Siphone Dimension (m)		Division Work (NOs)	Drops (NOs)	Cross Work (NOs)	I
				B	h	B	H				
Honjas Main Canal		2,500	0.691	0.5	0.45	—	—	6	7		1/300
Siphon	M-1	200	0.691	—	—	1.0	1.0	—	—	—	
	M-2	100	0.691	—	—	1.0	1.0	—	—	—	
Sub-total		2,800	—	—	—	—	—	6	7	—	
Salamo Main Canal		4,600	0.826 ~ 0.506	0.5	0.40 ~ 0.50			10	4	—	1/300
Siphon	SA-1	100	0.826	—	—	1.0	1.0	—	—	—	
	SA-2	300	0.506	—	—	1.0	1.0	—	—	—	
Sub-total		5,000	—	—	—	—	—	10	4	—	
San Juancito Main Canal		4,200	0.627 ~ 0.412	0.5	0.35 ~ 0.45	—	—	5	—	—	1/1000
Siphon	SJ-1	200	—	—	—	1.0	1.0	—	—	—	
	SJ-2	100	—	—	—	1.0	1.0	—	—	—	
Sub-total		4,500	—	—	—	—	—	5	—	—	
Total		18,000	—	—	—	—	—	31	13		
4. Lateral Canal											
Ovejero Lateral	OV-1	1,000	0.126	0.3	0.29	—	—	3	1	2	1/1000
	OV-2	1,250	0.087	0.3	0.24	—	—	2	1	1	1/1000
	OV-3	1,650	0.137	0.3	0.30	—	—	3	1	1	1/1000
Siphon	OV-3-1	50	0.137	—	—	1.0	1.0	—	—	—	
〃	OV-3-2	50	0.137	—	—	1.0	1.0	—	—	—	
Sub-total		4,000						8	3	4	
San Pedro Lateral	SP-1	1,875	0.200	0.3	0.36	—	—	3	2	1	1/1000
	SP-2	1,000	0.137	0.3	0.30	—	—	2	1	1	1/1000
	SP-3	3,150	0.074	0.3	0.23	—	—	3	1	1	1/1000
Siphon	SP-3-1	50	0.074	—	—	1.0	1.0	—	—	—	
〃	SP-3-2	50	0.074	—	—	1.0	1.0	—	—	—	
Sub-total		6,125	—	—	—	—	—	8	4	3	
Hoyo Lateral	HO-1	4,150	0.149	0.3	0.31	—	—	7	2	1	1/1000
Siphon	HO-1-1	50	0.149	—	—	1.0	1.0	—	—	—	
〃	HO-1-2	50	0.149	—	—	1.0	1.0	—	—	—	
〃 Lateral	HO-2	1,000	0.053	0.3	0.19	—	—	2	—	—	
Lateral	HO-3	2,450	0.168	0.3	0.33	—	—	5	—	—	
Siphon	HO-3-1	50	0.168	—	—	1.0	1.0	—	—	—	
Sub-total		7,750	—	—	—	—	—	14	2	1	
Honjas Lateral	H-1	1,000	0.257	0.3	0.40	—	—	2	—	—	1/1000
〃	H-2	825	0.161	0.3	0.32	—	—	2	—	—	1/1000
Siphon	H-2-1	50	0.161	—	—	1.0	1.0	—	—	—	1/1000
〃 Lateral	H-3	1,000	0.167	0.3	0.33	—	—	2	—	—	
Sub-total		2,875	—	—	—	—	—	6			
Salamo Lateral	SA-1	1,900	0.171	0.3	0.33	—	—	3		2	1/1000
Siphon	SA-1-1	100	0.171	—	—	1.0	1.0	—	—	—	
Lateral	SA-2	275	0.073	—	—	—	—	1	—	—	1/1000
Siphon	SA-2-1	100	0.073	—	—	1.0	1.0	—	—	—	

Name of Canal		Length (m)	Q (m^3/s)	Canal Dimension (m)		Siphone Dimension (m)		Division Work (NOs)	Drops (NOs)	Cross Work (NOs)	I
				B	h	B	H				
Lateral	SA-3	1,900	0.149	0.3	0.31	—	—	2	—	—	1/1000
Siphon	SA-3-1	100	0.149	—	—	1.0	1.0	—	—	—	
Sub-total		4,375	—	—	—	—	—	6	—	2	
San Juancito Lateral	SJ-1	2,400	0.144	0.3	0.31	—	—	3	4	2	1/1000
Siphon	SJ-1-1	50	0.144	—	—	1.0	1.0	—	—	—	
〃	SJ-1-2	50	0.144	—	—	1.0	1.0	—	—	—	
Sub-total		2,500	—	—	—	—	—	3	4	2	
Lateral	L-1	2,650	0.175	0.3	0.34	—	—	5	7	1	1/1000
Siphon	L-1-1	100	0.175	—	—	1.0	1.0	—	—	—	
Lateral	L-2	1,350	0.185	0.3	0.34	—	—	3	1	1	1/1000
Siphon	L-2-1	50	0.185	—	—	1.0	1.0	—	—	—	
〃	L-2-2	50	0.185	—	—	1.0	1.0	—	—	—	
〃	L-2-3	50	0.185	—	—	1.0	1.0	—	—	—	
Lateral	L-3	825	0.054	0.3	0.19	—	—	2	—	—	
Siphon	L-3-1	50	0.054	—	—	1.0	1.0	—	—	—	
Lateral	L-4	900	0.054	0.3	0.19	—	—	2	—	—	
Siphon	L-4-1	50	0.054	—	—	1.0	1.0	—	—	—	
〃	L-4-2	50	0.054	—	—	1.0	1.0	—	2	—	
Lateral	L-5	1,250	0.025	0.3	0.13	—	—	3	3	1	
〃	L-6	1,250	0.120	0.3	0.28	—	—	3	5	—	
〃	P-1	2,550	0.207	0.3	0.36	—	—	4	—	—	
Siphon	P-1-1	50	0.207	—	—	1.0	1.0	—	—	—	
	P-1-2	50	0.207	—	—	1.0	1.0	—	—	—	
	P-1-3	100	0.207	—	—	1.0	1.0	—	—	—	
Sub-total		11,375	—	—	—	—	—	22	18	3	
Total		39,000						67	31	15	
Grand-total		89,700						124	45	15	

OSTUA DIVERSION WEIR



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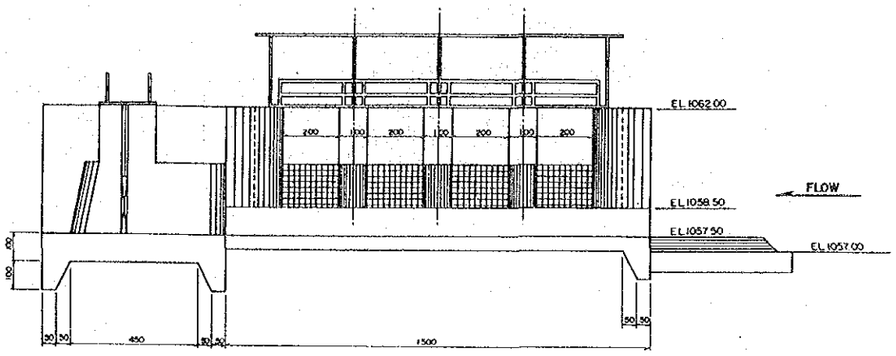
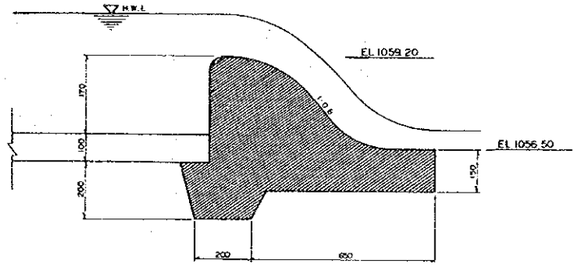
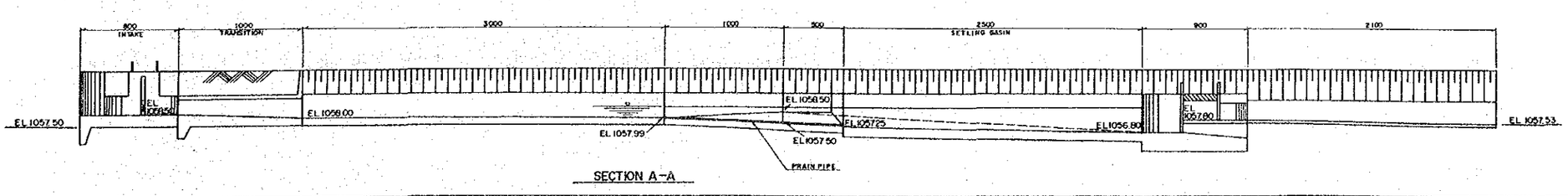


SECTION B-B



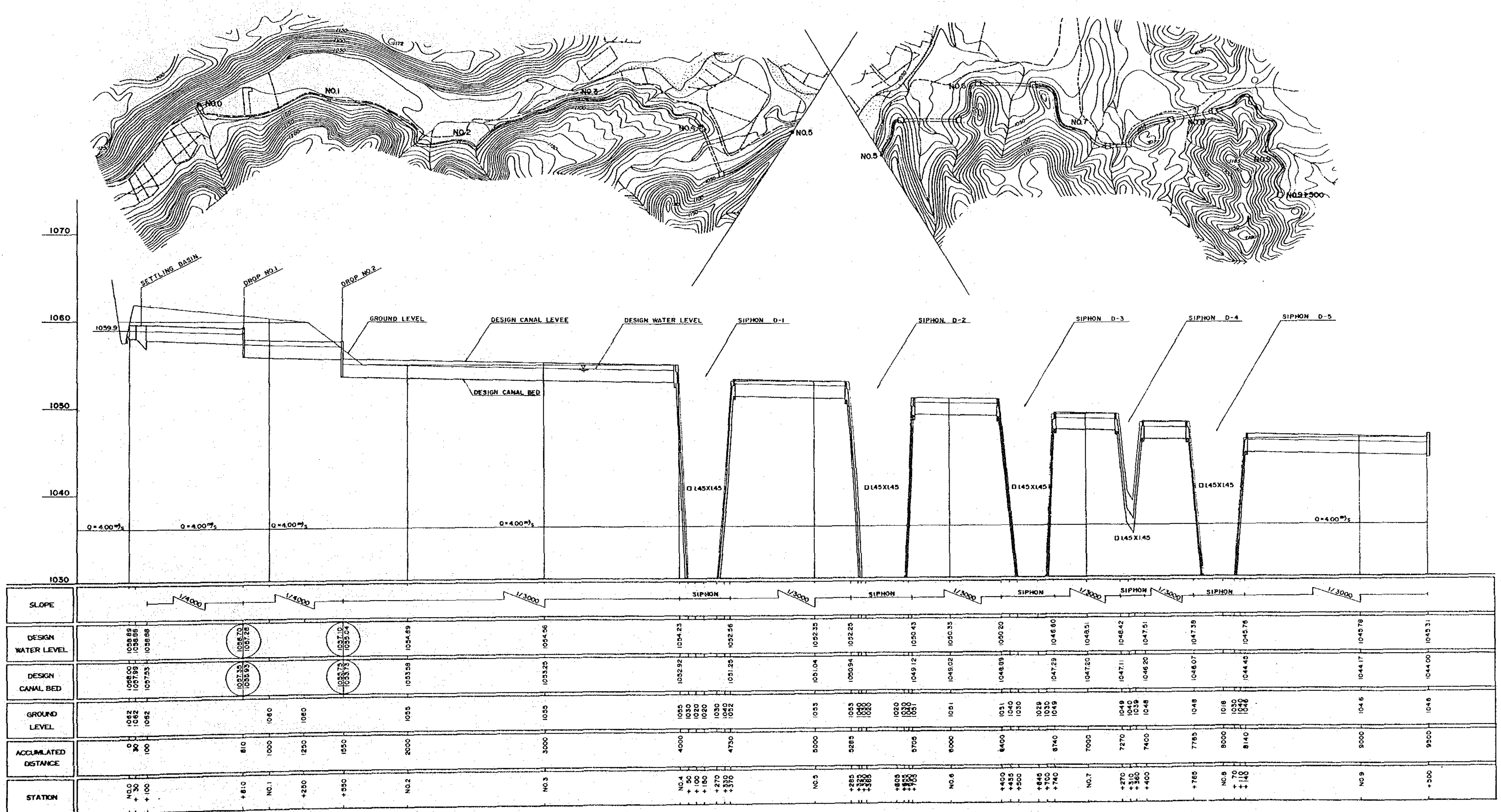
SECTION C-C



SECTION A-A

THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES	
THE MONJAS IRRIGATION PROJECT	
OSTUA DIVERSION WEIR	
Fig. A.4.3.2-1	No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

PLAN AND LONGITUDINAL PROFILE OF DRIVING CANAL



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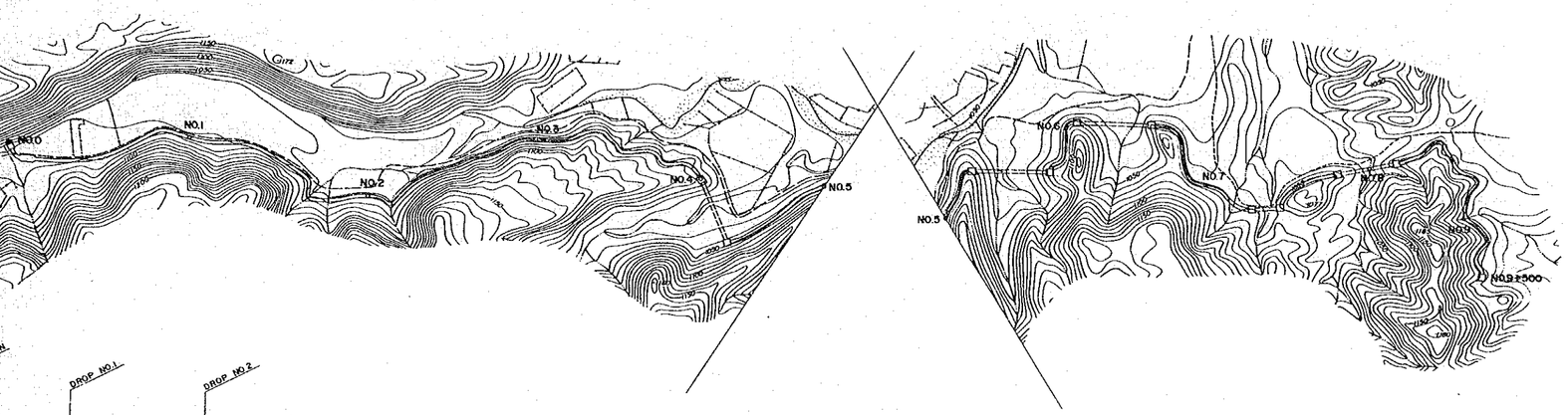
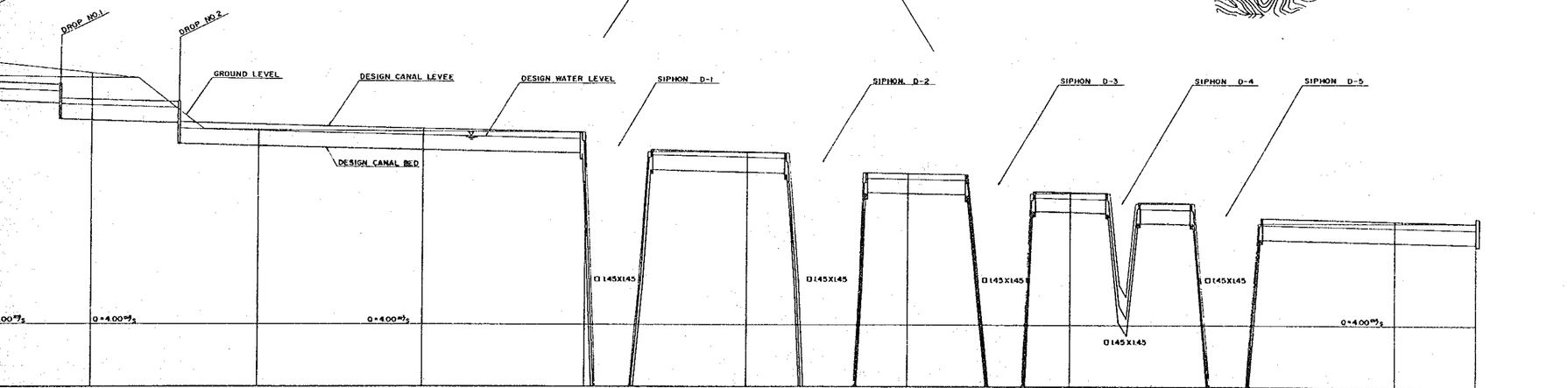
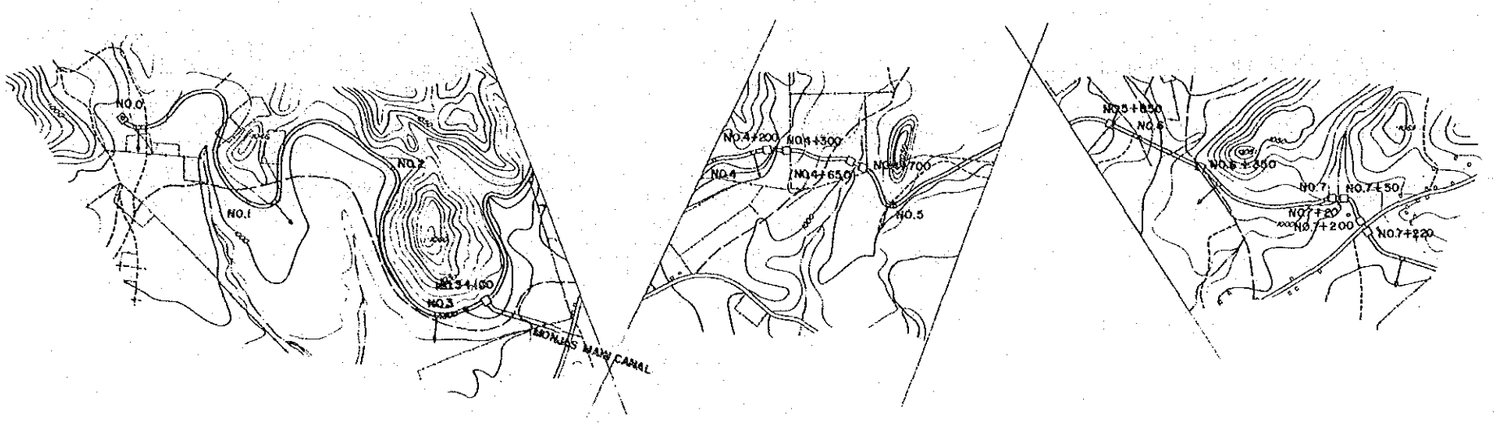
PLAN AND LONGITUDINAL PROFILE OF DRIVING CANAL

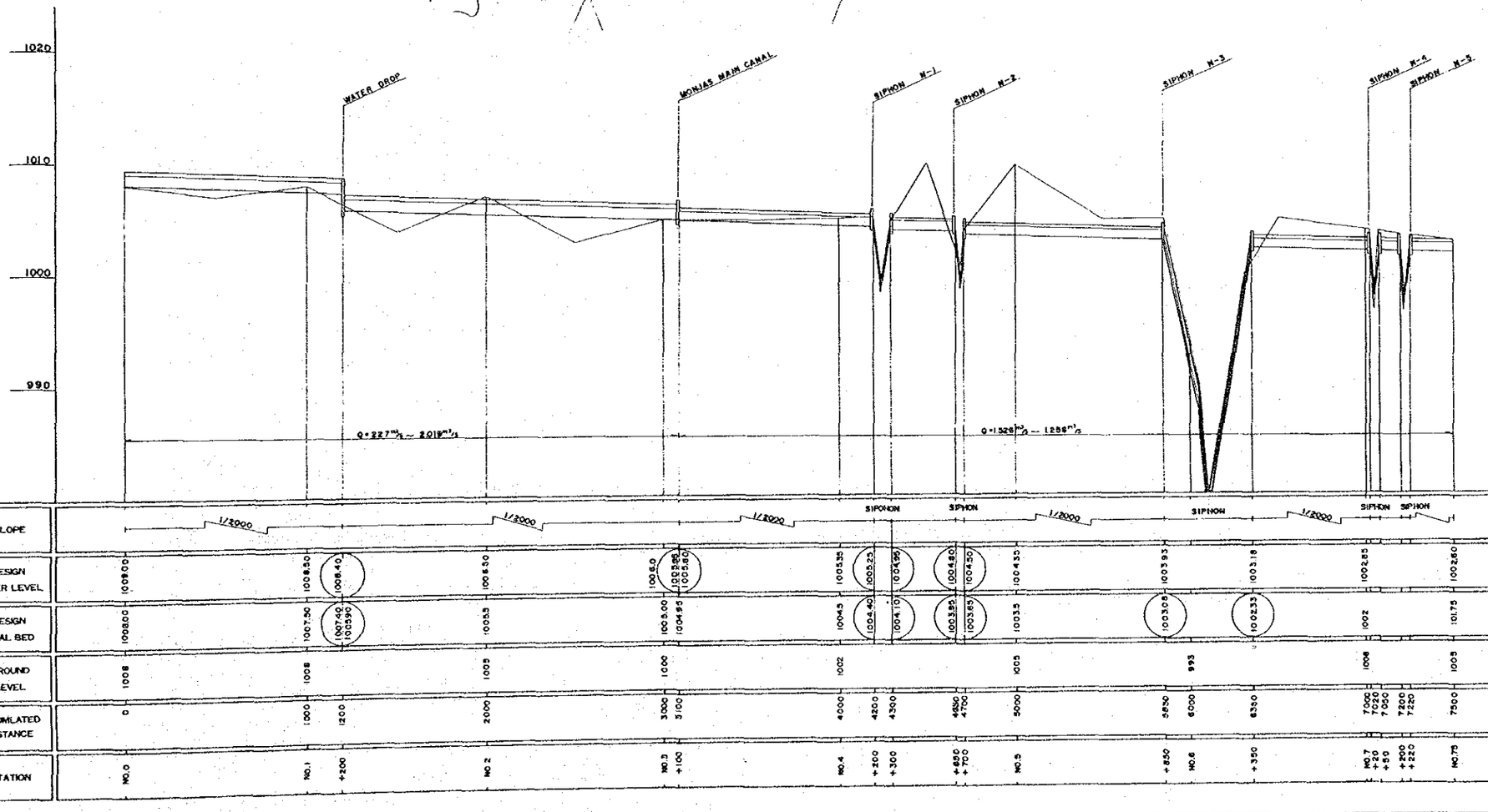




THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES	
THE MONJAS IRRIGATION PROJECT	
PLAN AND LONGITUDINAL PROFILE OF DRIVING CANAL	
Fig. A.4.3.2-2	No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

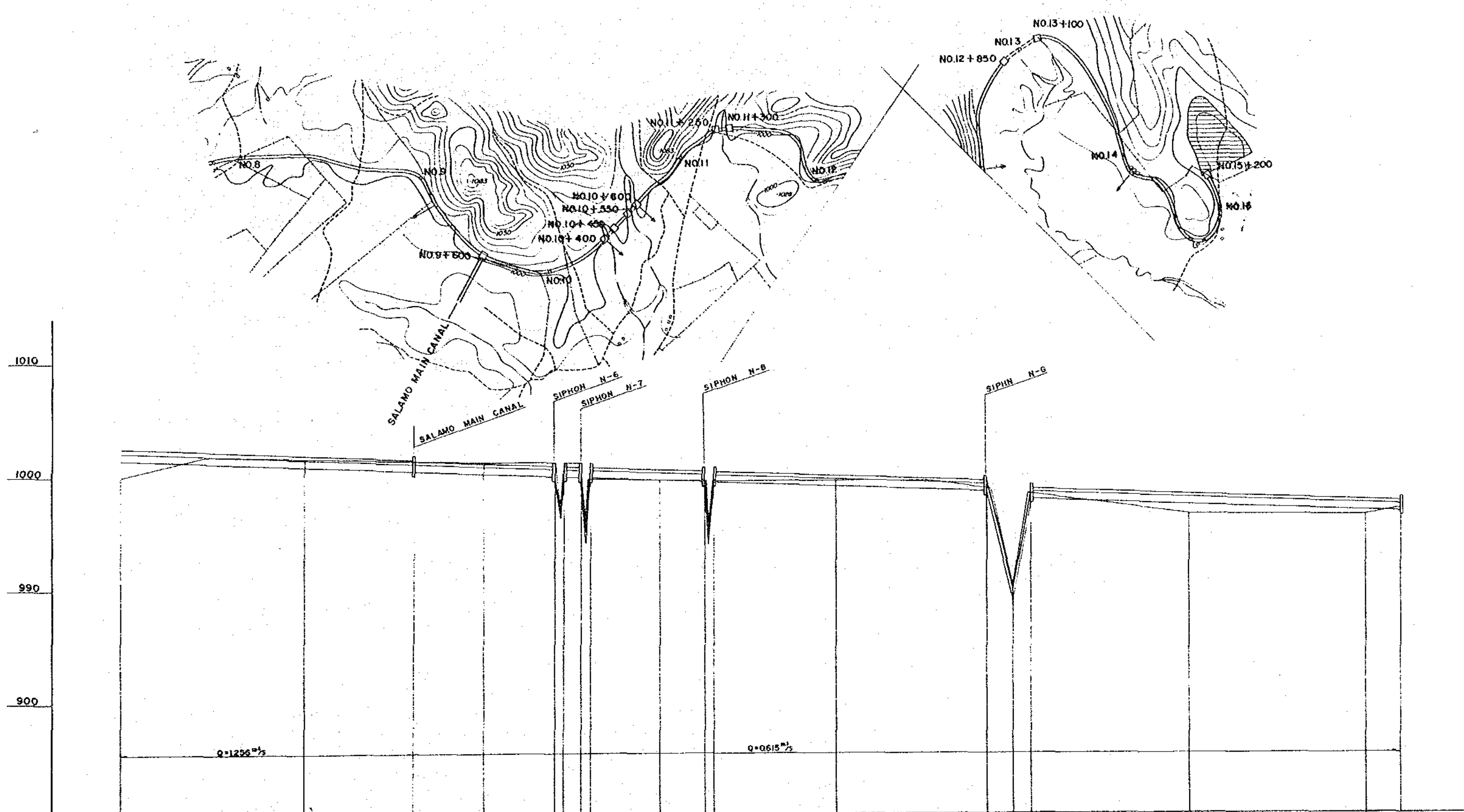
PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL
NORTH DIVERSION CANAL (1/2)





THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES	
THE MONJAS IRRIGATION PROJECT	
PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL NORTH DIVERSION CANAL (1/2)	
Fig. A.4.3.2-3	No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL
NORTH DIVERSION CANAL (2/2)



	NO.8	NO.9	+600	NO.10	+400	+450	+550	+600	NO.11
SLOPE		1/2000			SIPHON	SIPHON	SIPHONE		1/2000
DESIGN WATER LEVEL	1002.30	1001.80	1001.50 / 1001.35	1001.15	1000.95		1000.88		1000.65
DESIGN CANAL BED	1001.50	1001.00	1000.70	1000.50	1000.30		1000.23		1000.00
GROUND LEVEL	1000	1003		1003					1000
ACCUMLATED DISTANCE	8.000	9000	9600	10,000	10,400	10,450	10,550	10,600	11,000
STATION	NO.8	NO.9	+600	NO.10	+400	+450	+550	+600	NO.11

	+250	+300	NO.12	+850	NO.13	+100	NO.14	NO.15	+200
SLOPE	SIPHON		1/2000	SIPHON			1/2000		
DESIGN WATER LEVEL	1000.53		1000.15	999.73		999.10	998.65	998.15	998.05
DESIGN CANAL BED	999.88		999.50	999.08		998.45	998.00	997.50	997.40
GROUND LEVEL			1000				998	998	
ACCUMLATED DISTANCE	11,250	11,300	12000	12,850	13,000	13,100	14000	15 000	15200
STATION	+250	+300	NO.12	+850	NO.13	+100	NO.14	NO.15	+200

THE REPUBLIC OF GUATEMALA
MINISTRY OF AGRICULTURE
CATTLE AND FOOD RESOURCES

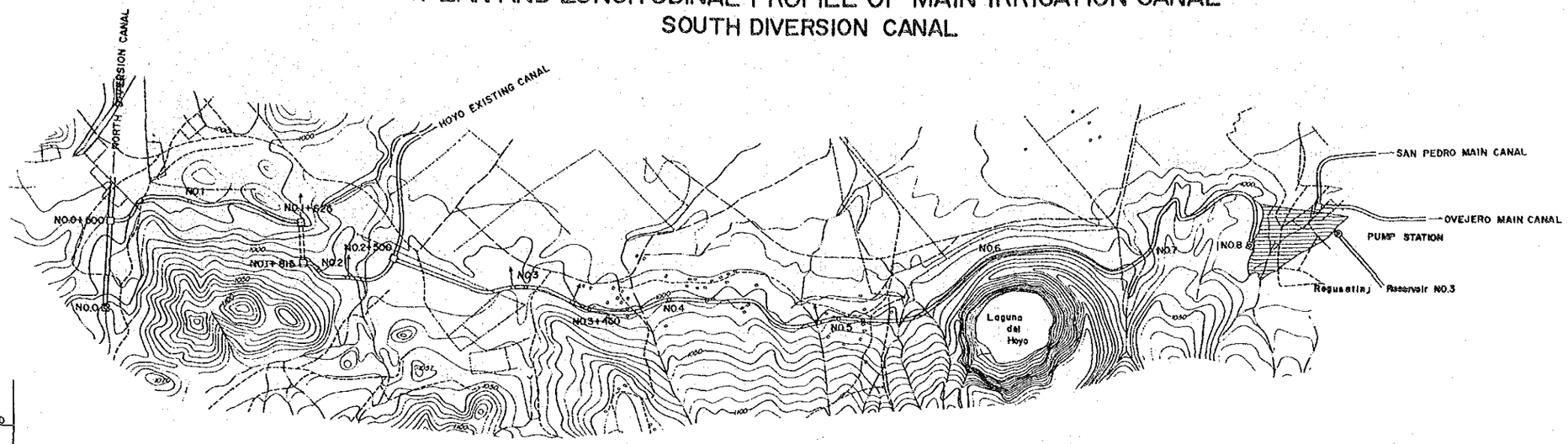
THE MONJAS IRRIGATION PROJECT

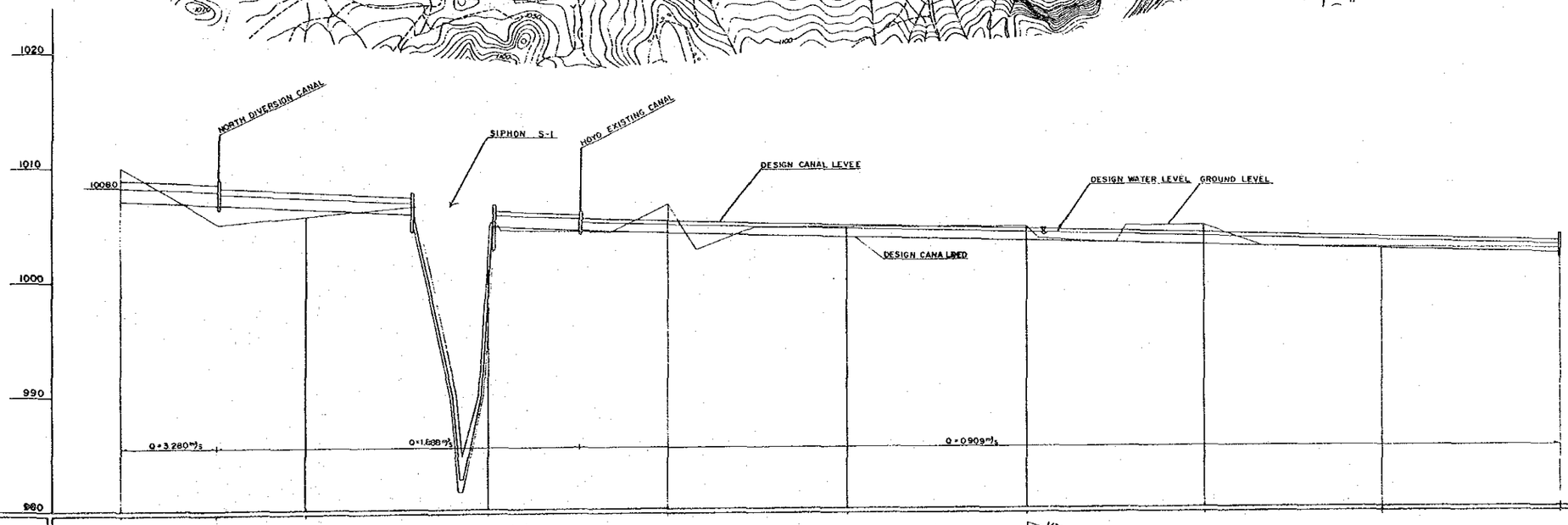
PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL NORTH DIVERSION CANAL (2/2)

Fig. A.4.3.2-3 No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL
SOUTH DIVERSION CANAL





SLOPE	1/2000		1/4000		SIPHON		1/4000						1/3000						
DESIGN WATER LEVEL	1008.00	1007.73	1007.70	1007.58	1007.42	1007.42	1005.02	1004.90	1004.85	1004.47	1004.14	1003.81	1003.48	1003.15	1002.82				
DESIGN CANAL BED	1006.92	1006.67	1006.67		1006.39	1006.39	1003.99	1003.87		1003.69	1003.36	1003.03	1002.70	1002.37	1002.04				
GROUND LEVEL	1010	1005		1005	1005		1005	1003		1007	1003	1005	1005	1005	1000	1003			
ACCUMULATED DISTANCE	0	500		1000	1625		2000	2500		3000	3140	3450	4000	5000	6000	7000	8000		
STATION	NO.0	+500		NO.1	+625		NO.2	+500		NO.3	+140	+450	NO.4	NO.5	NO.6	NO.7	NO.8		

THE REPUBLIC OF GUATEMALA MINISTRY OF AGRICULTURE CATTLE AND FOOD RESOURCES
THE MONJAS IRRIGATION PROJECT
PLAN AND LONGITUDINAL PROFILE OF MAIN IRRIGATION CANAL SOUTH DIVERSION CANAL
Fig. A.4.3.2-4 | No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)