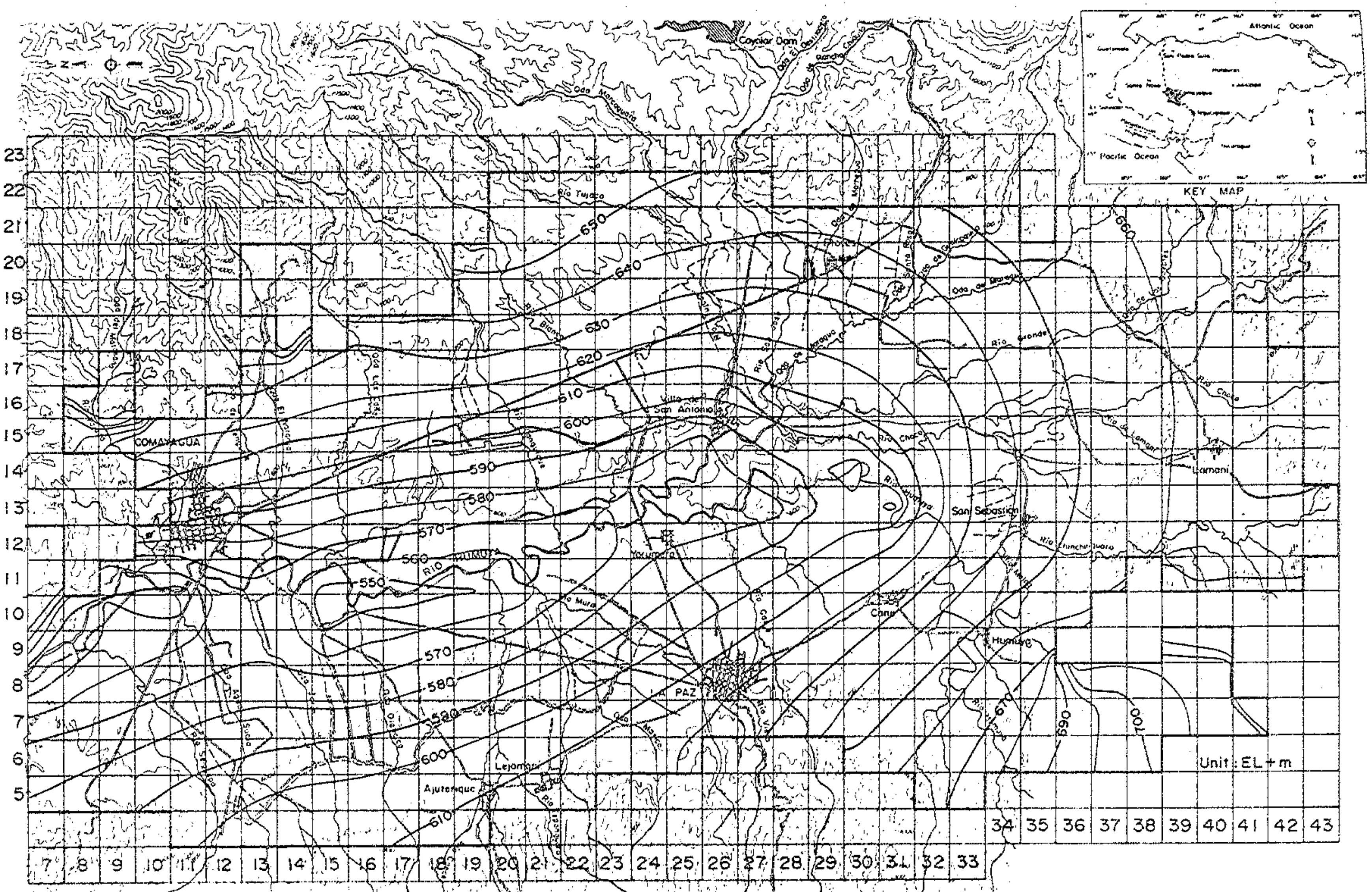

図4.2.8(1) 地下水シミュレーション結果 (1/2)

ー現況復元：不圧地下水ー

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SUBTERRANEAS DEL VALLE DE COMAYAGUA

AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

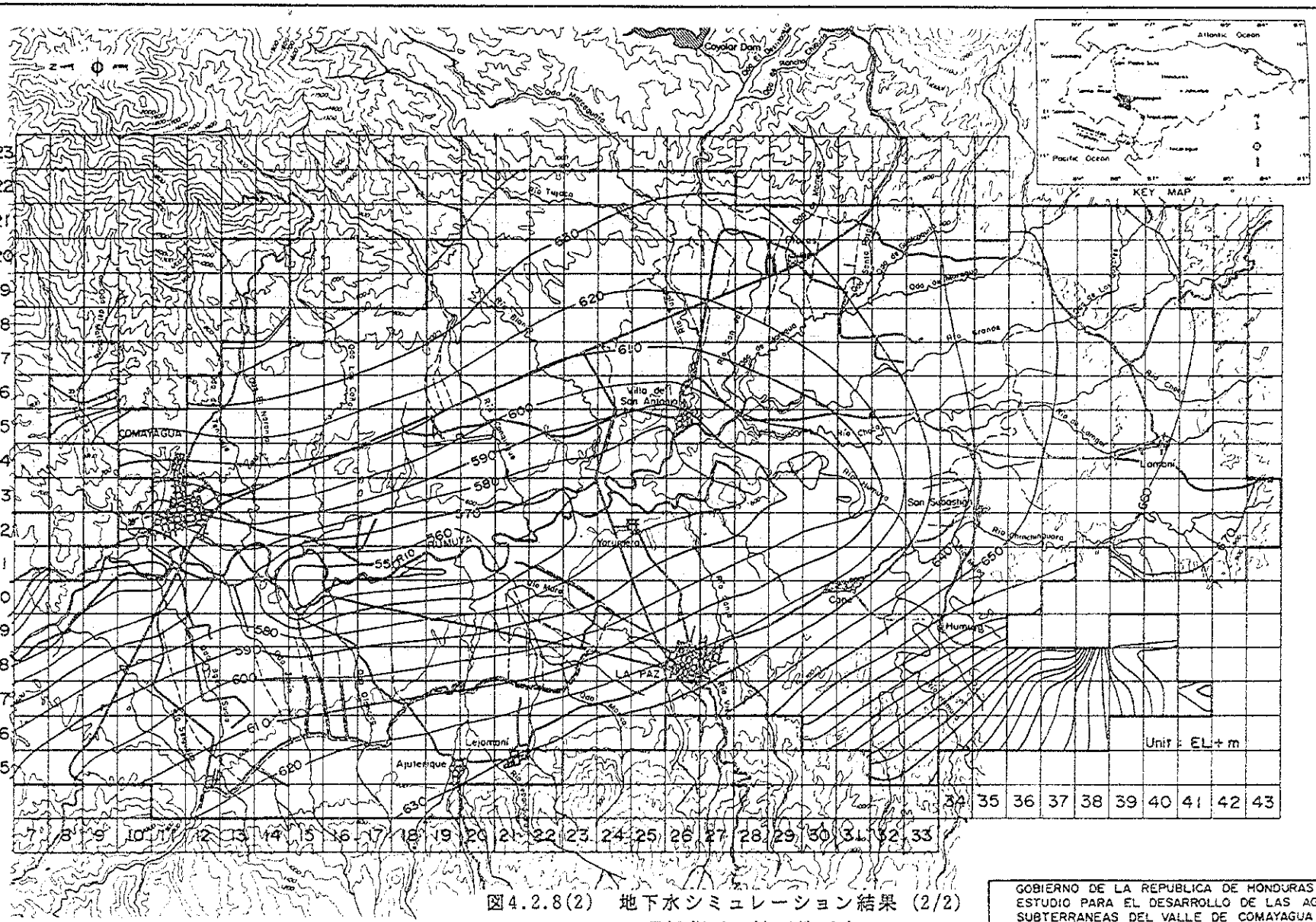

図4.2.8(2)　地下水シミュレーション結果 (2/2)
－現況復元：被圧地下水－

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AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

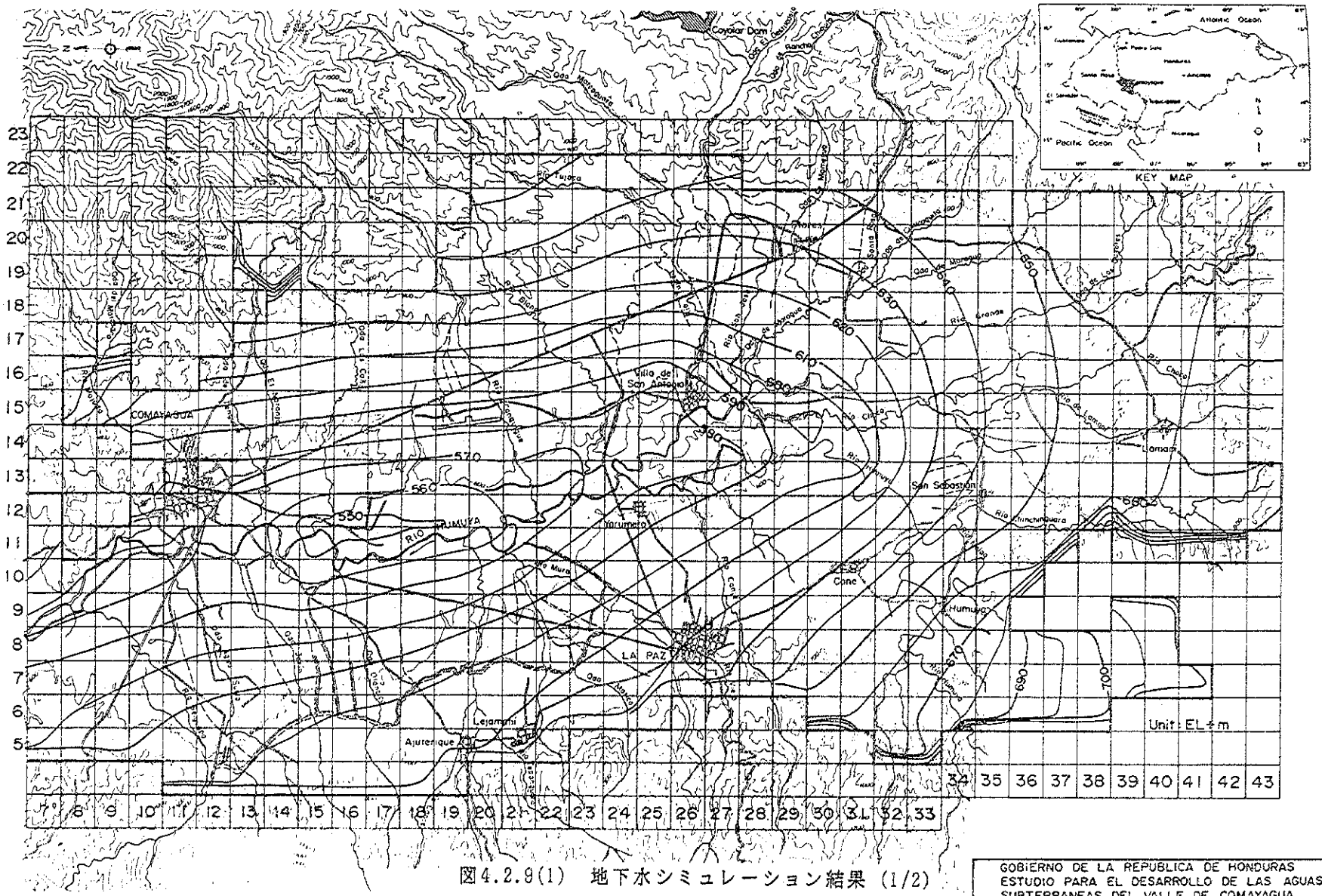

図4.2.9(1)　地下水シミュレーション結果 (1/2)

－将来予測：不圧地下水－

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AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

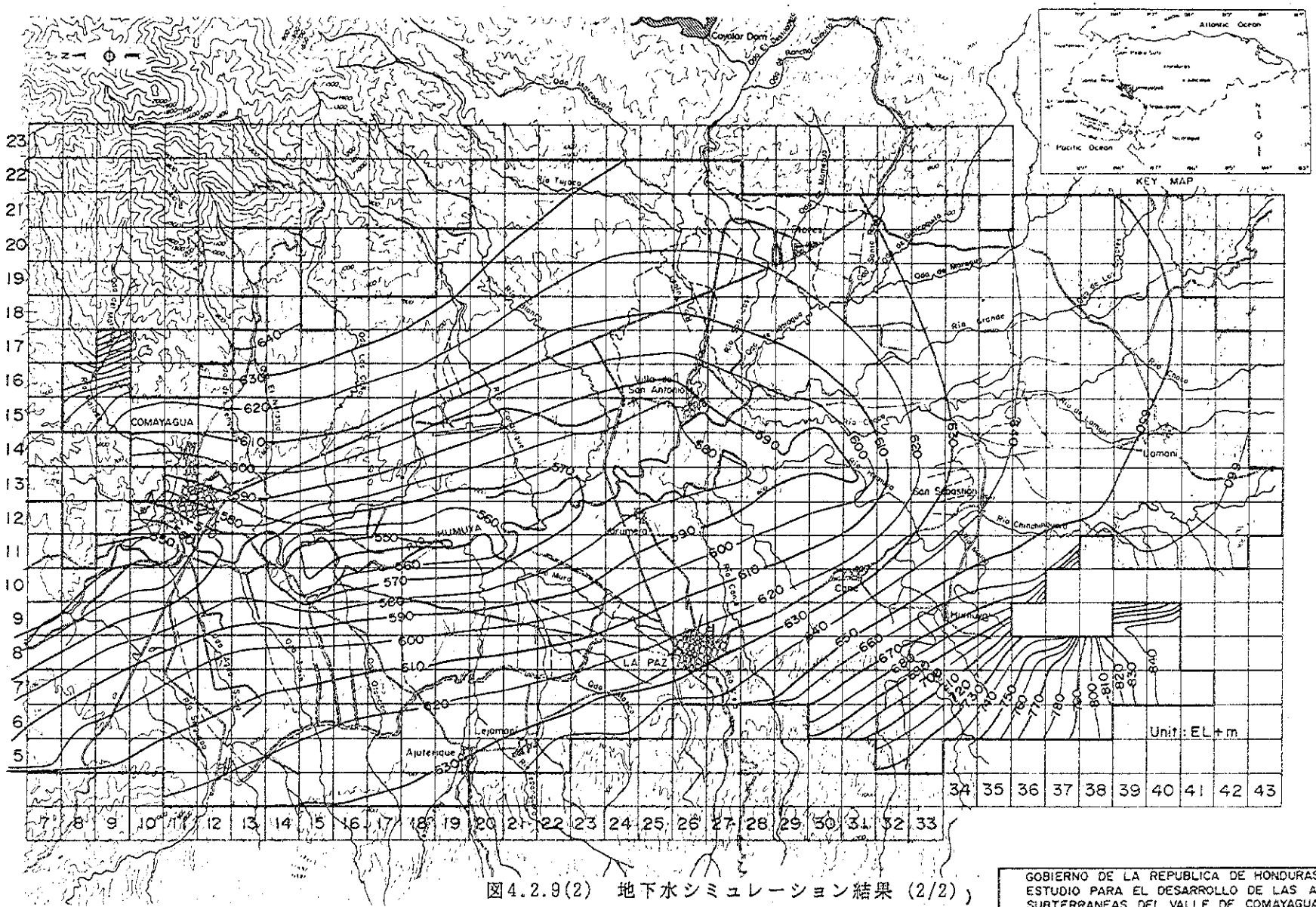

図4.2.9(2)　地下水シミュレーション結果（2/2）
－将来予測：被圧地下水－

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AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

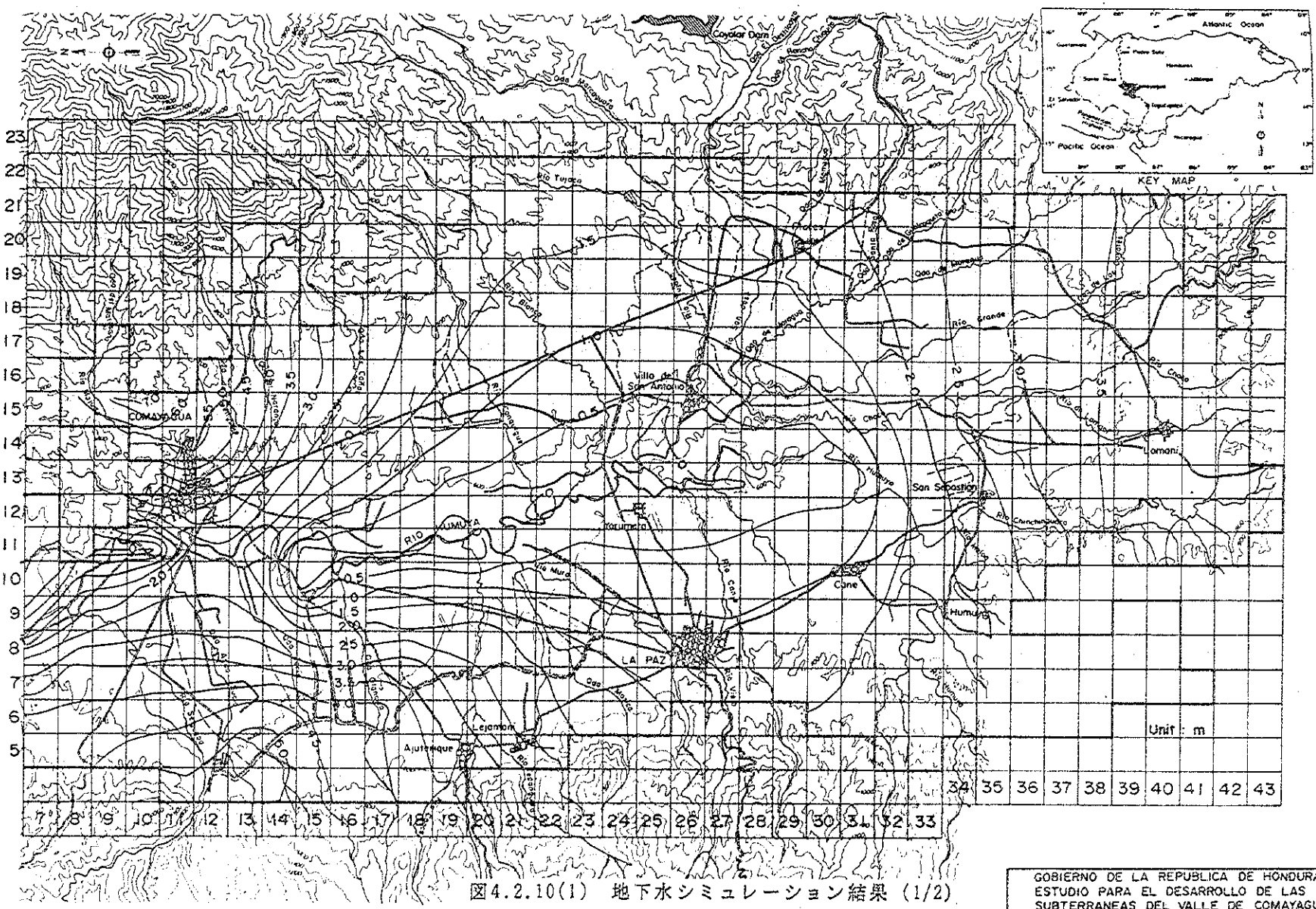

図4.2.10(1)　地下水シミュレーション結果（1/2）

－将来の地下水位低下量：不圧地下水－

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AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

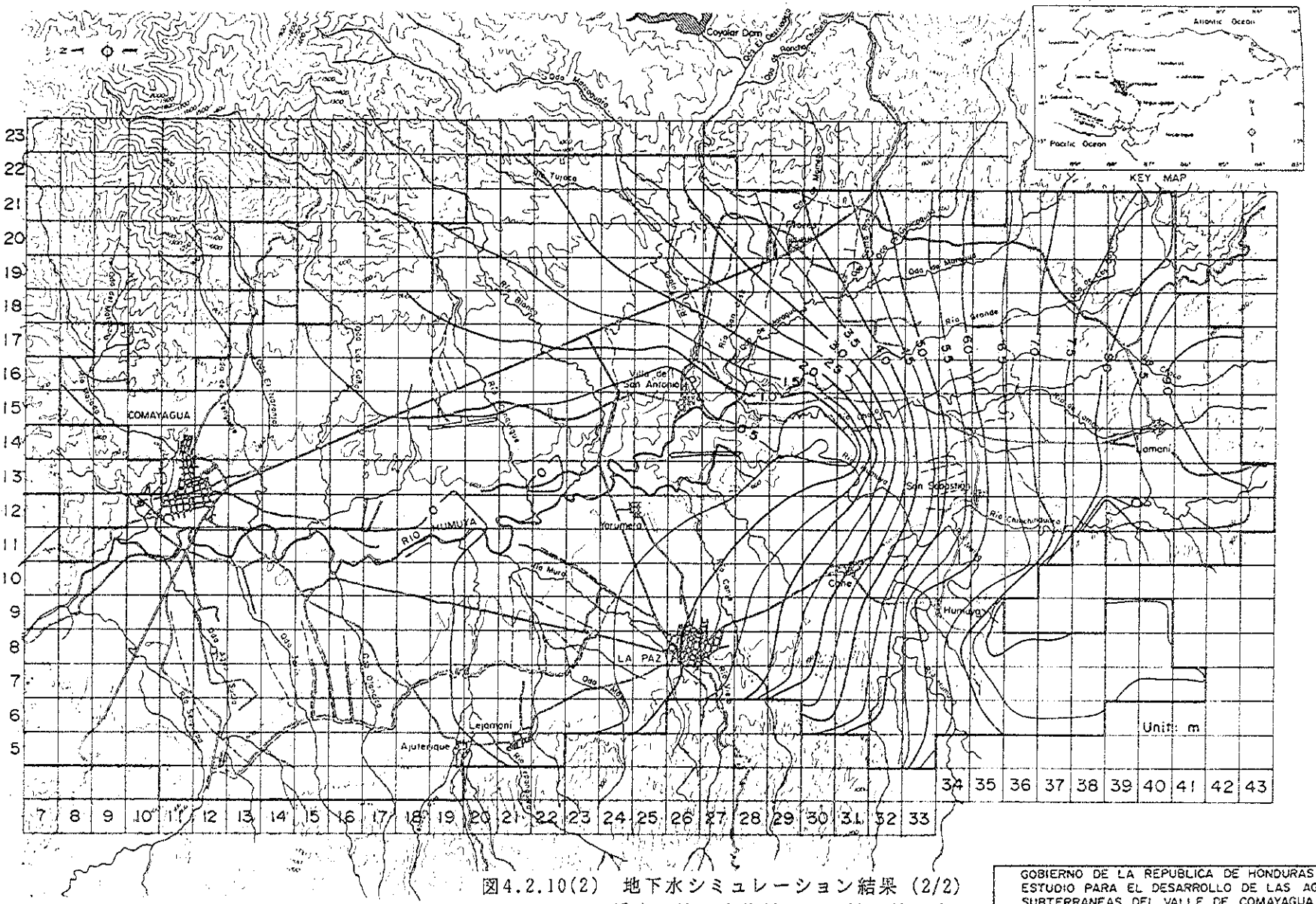

図4.2.10(2) 地下水シミュレーション結果 (2/2)
ー将来の地下水位低下量：被圧地下水ー

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AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

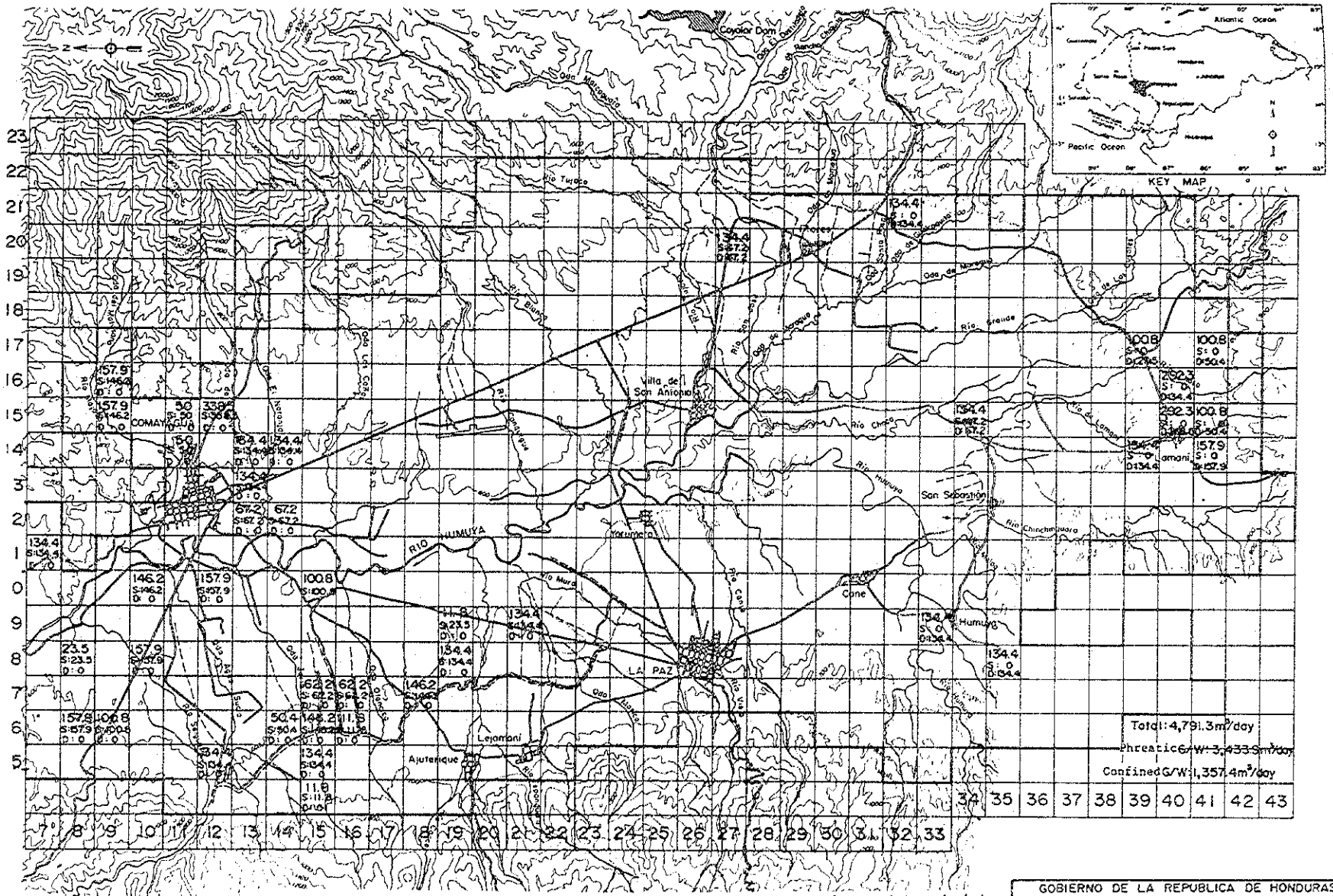

図5.1.1(1) 将来の地下水汲み上げ量分布図 (1/2)

- NEWLY DEVELOPED -

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ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA

AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

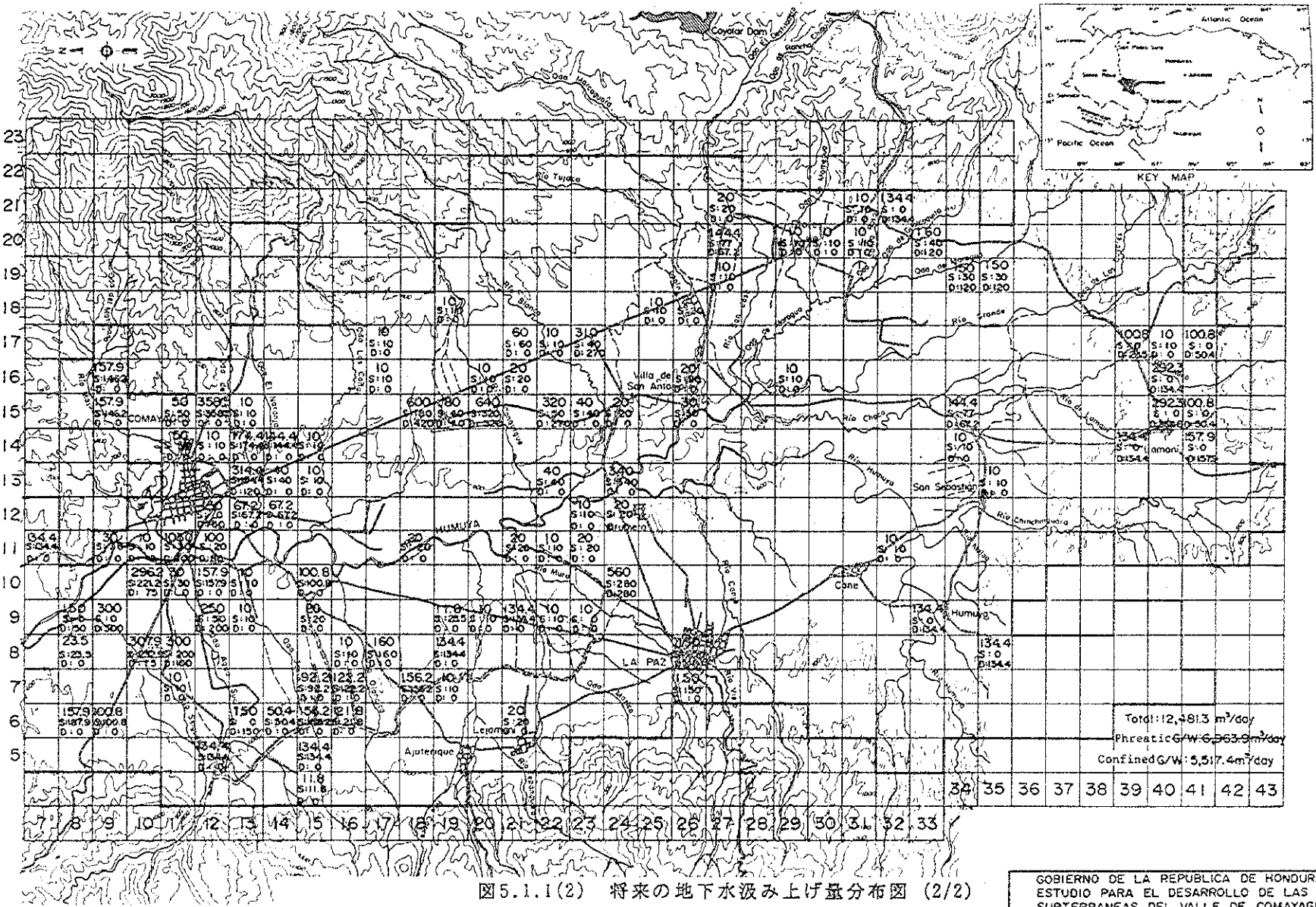

図5.1.1(2)　将来の地下水汲み上げ量分布図 (2/2)

- TOTAL IN 2000 -

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA

AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

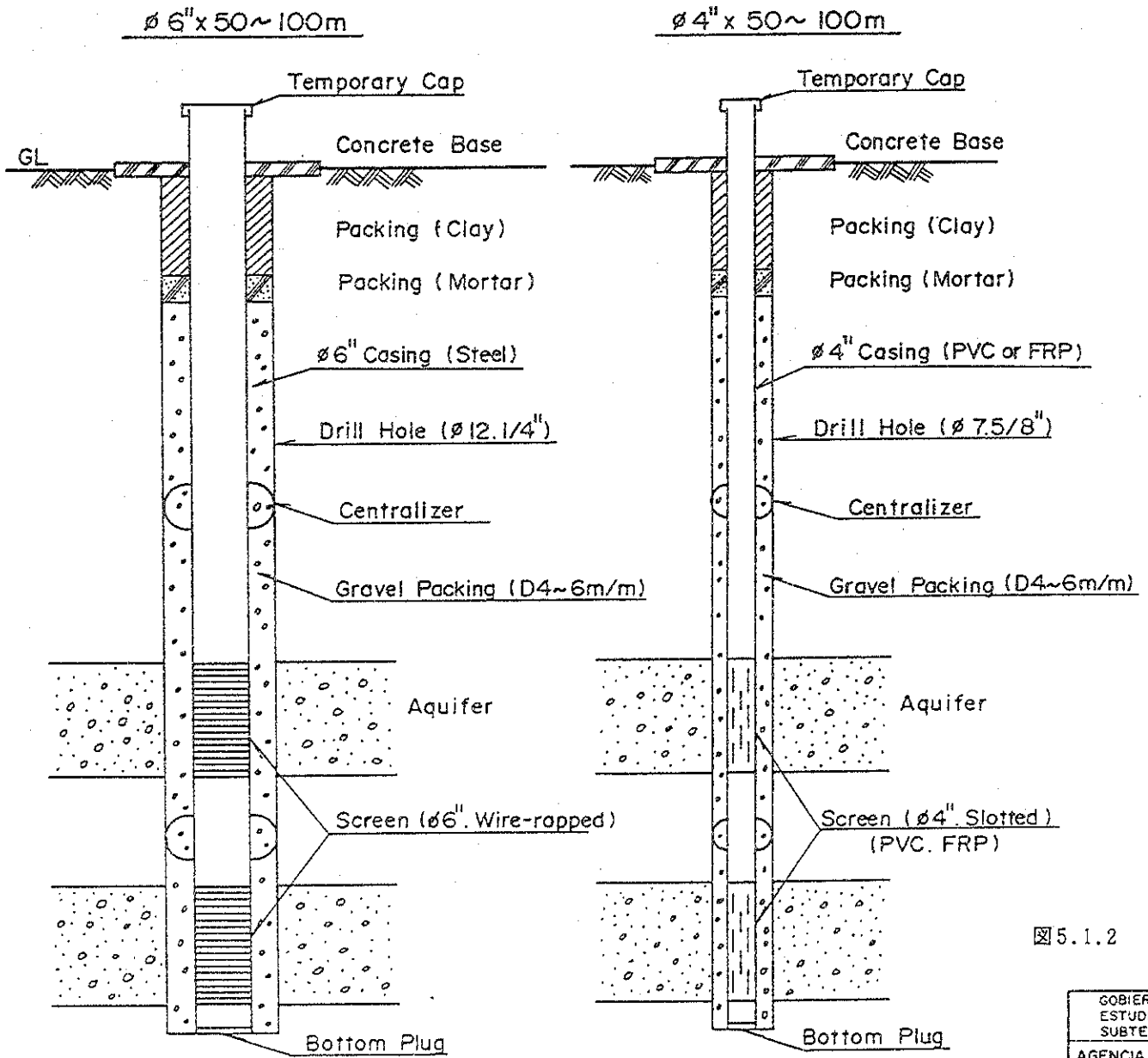

図5.1.2　標準生産井模式図

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ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

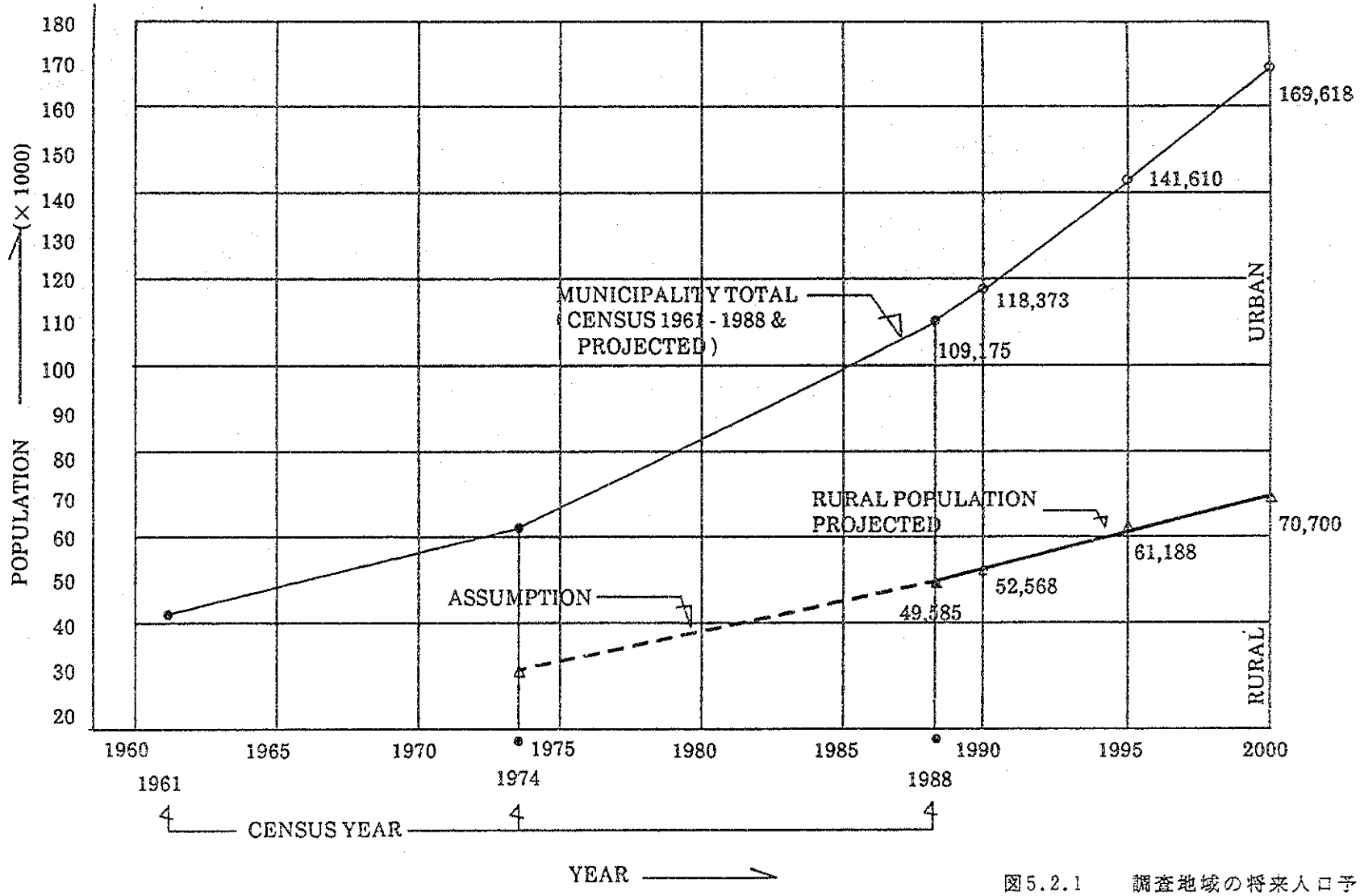
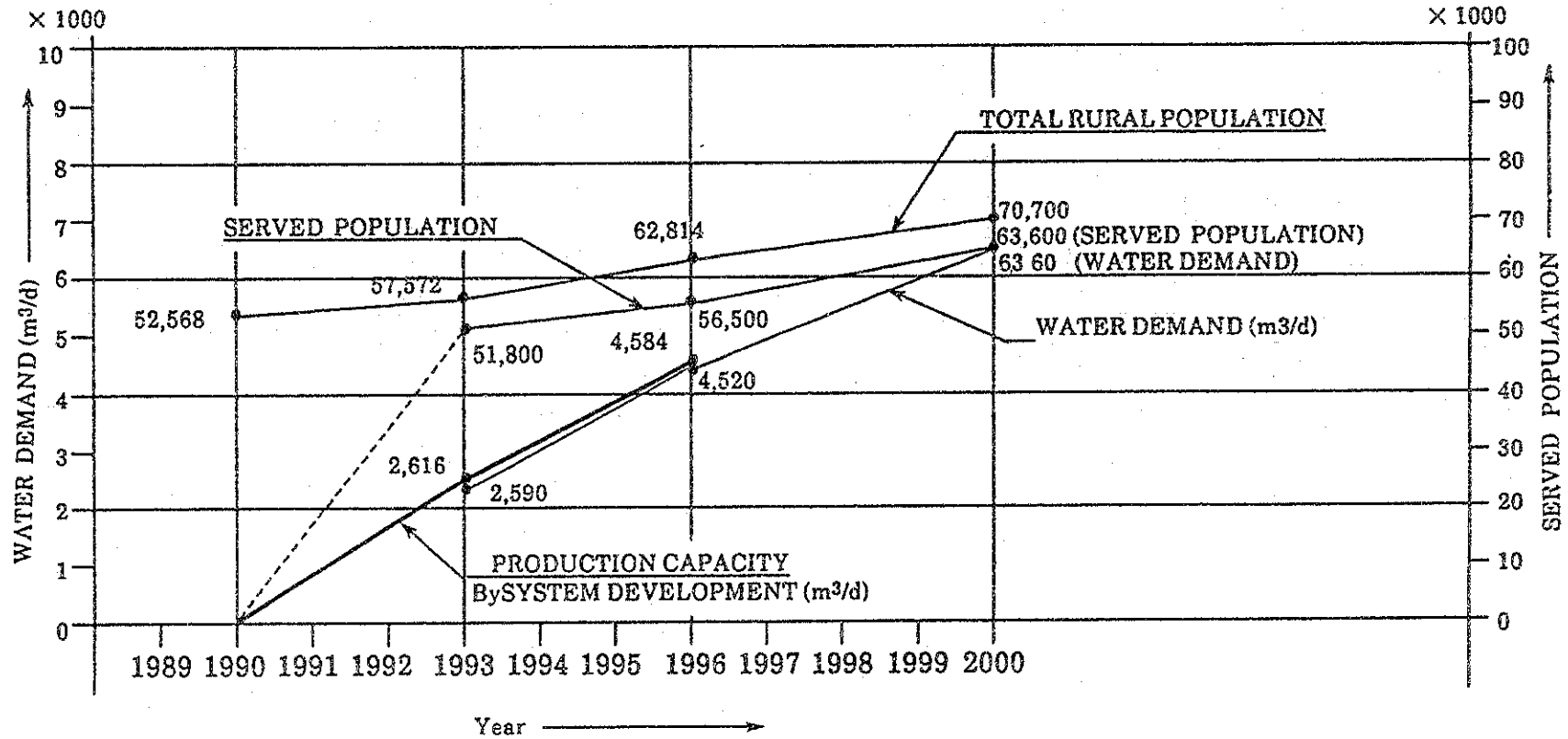


図5.2.1　調査地域の将来人口予測

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS
SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON



SYSTEM DEVELOP-MENT STAGE	1st STAGE	2nd STAGE	3rd STAGE
	1990 - 1993	1993 - 1996	1997 - 2000

図5.2.2　調査地域の将来の水需要

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

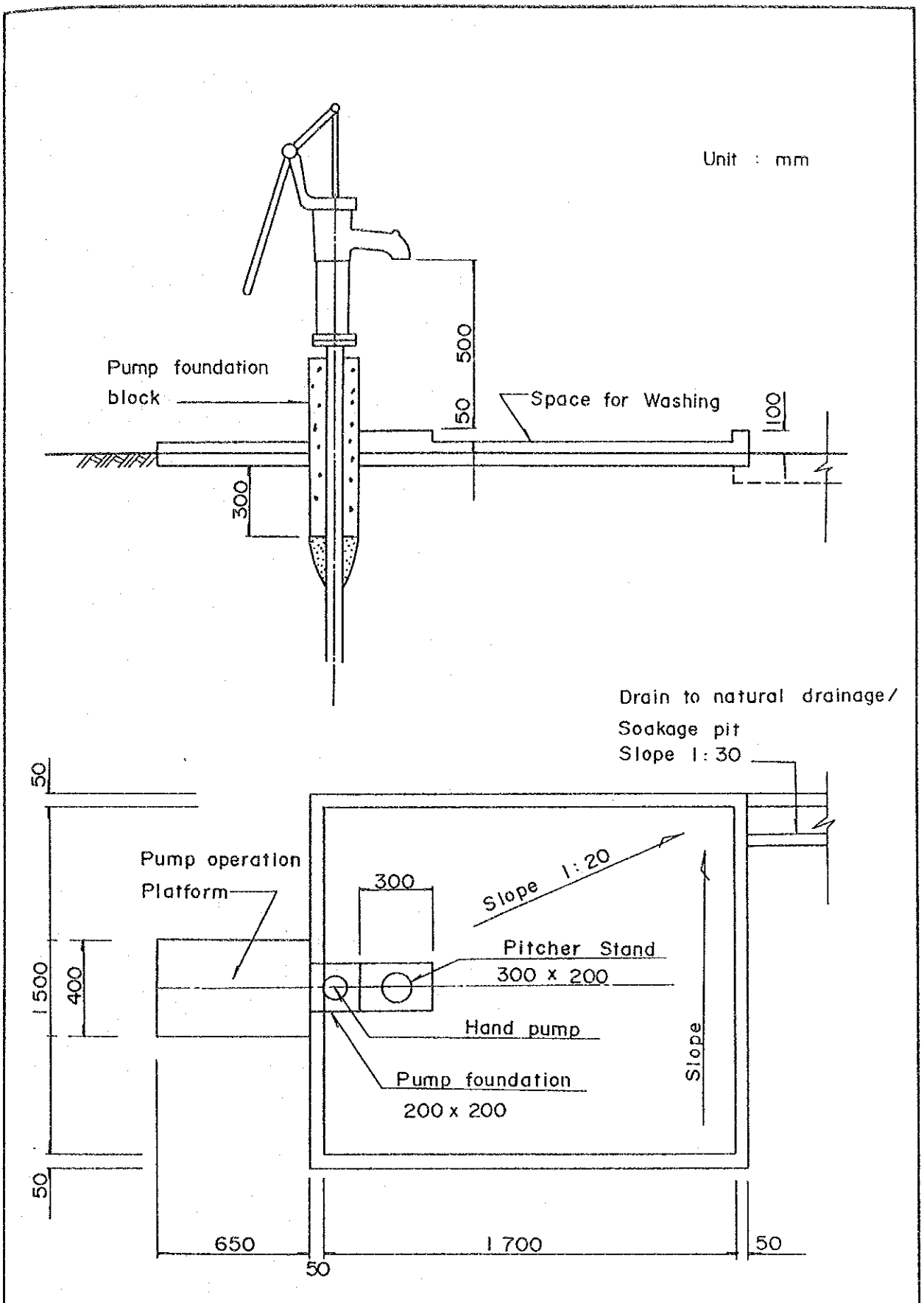


図5.3.1　村落給水施設 －タイプⅠ－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

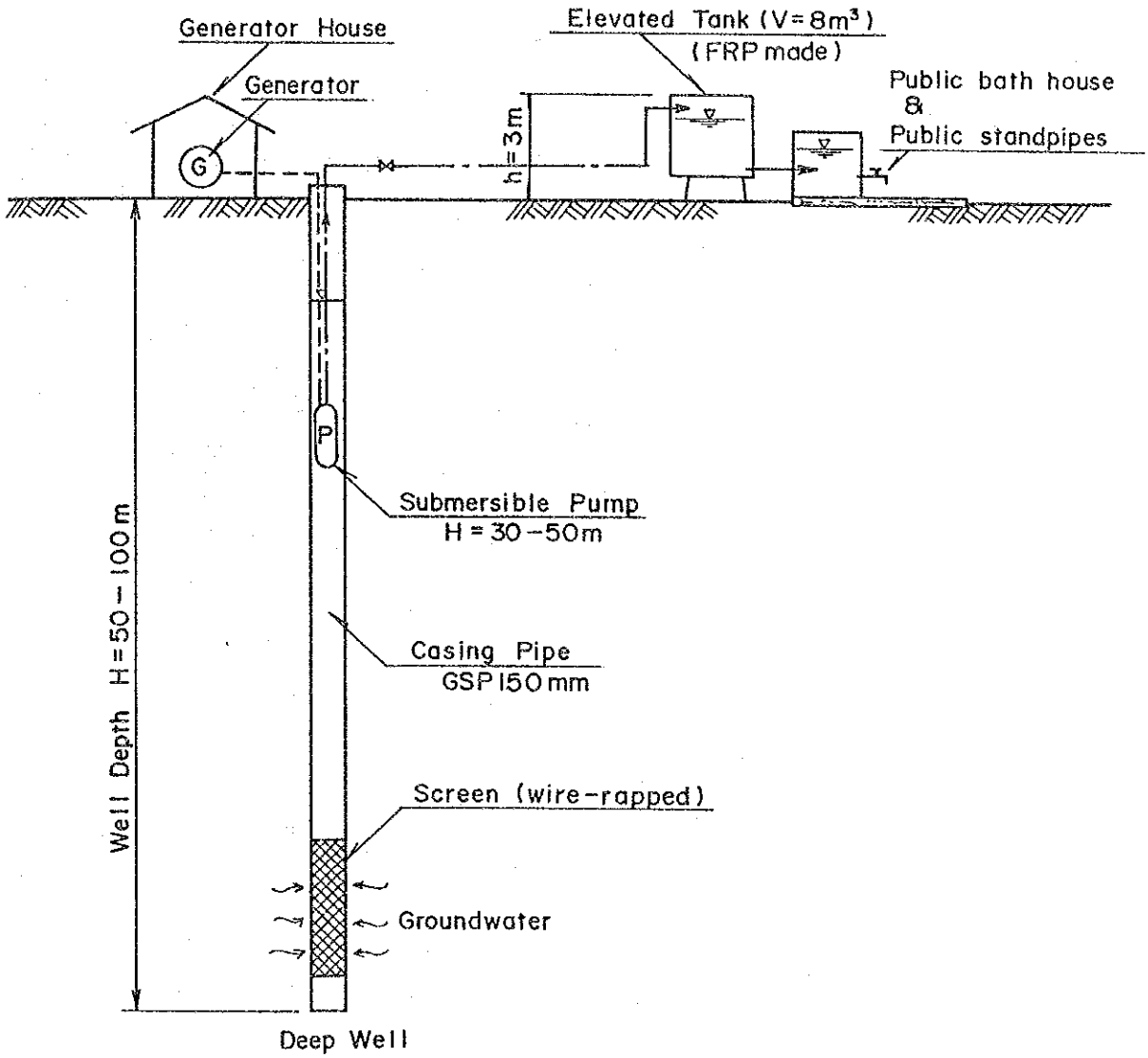


図5.3.2　村落給水施設 －タイプII－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

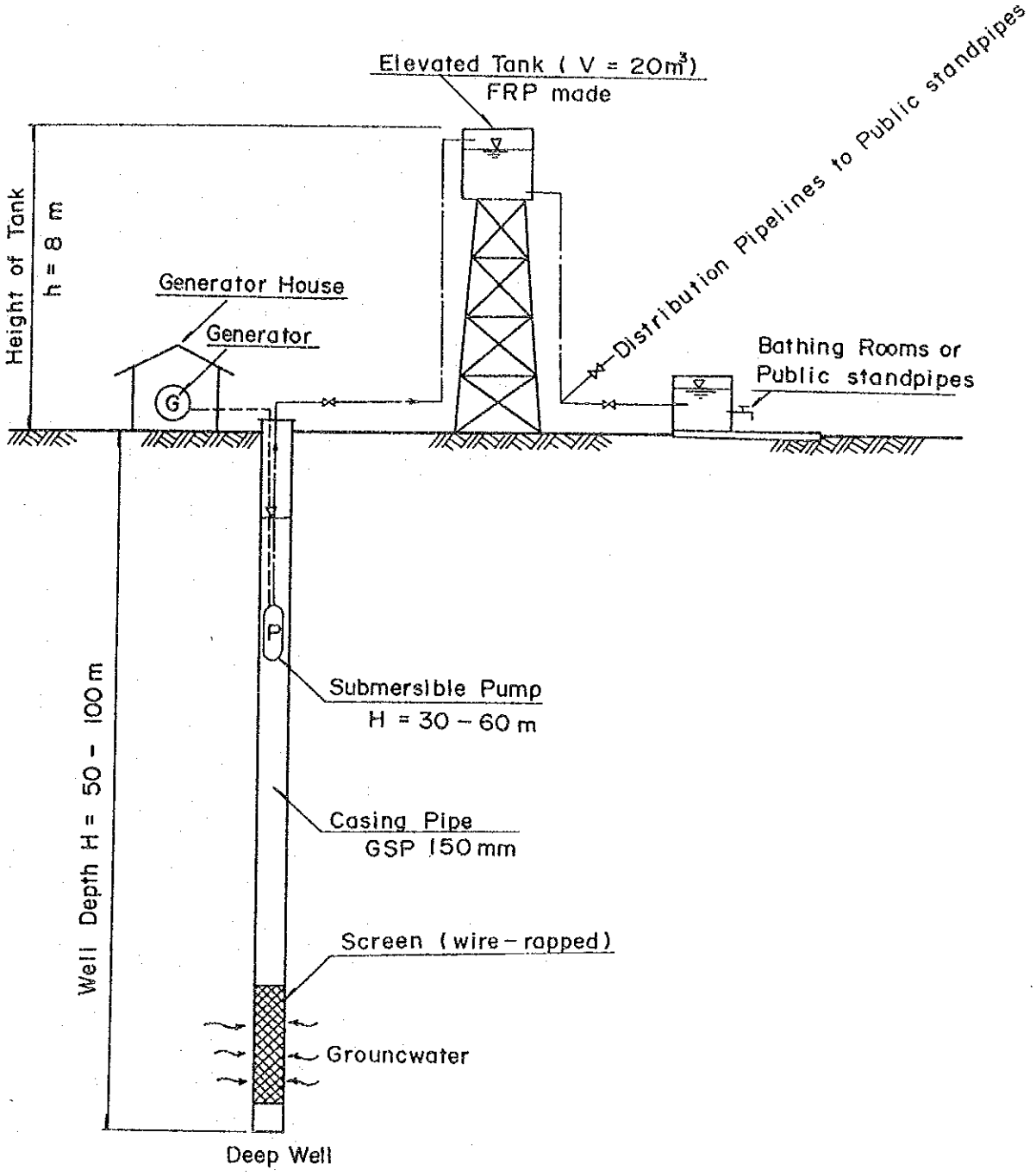


図5.3.3　村落給水施設 －タイプIII－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

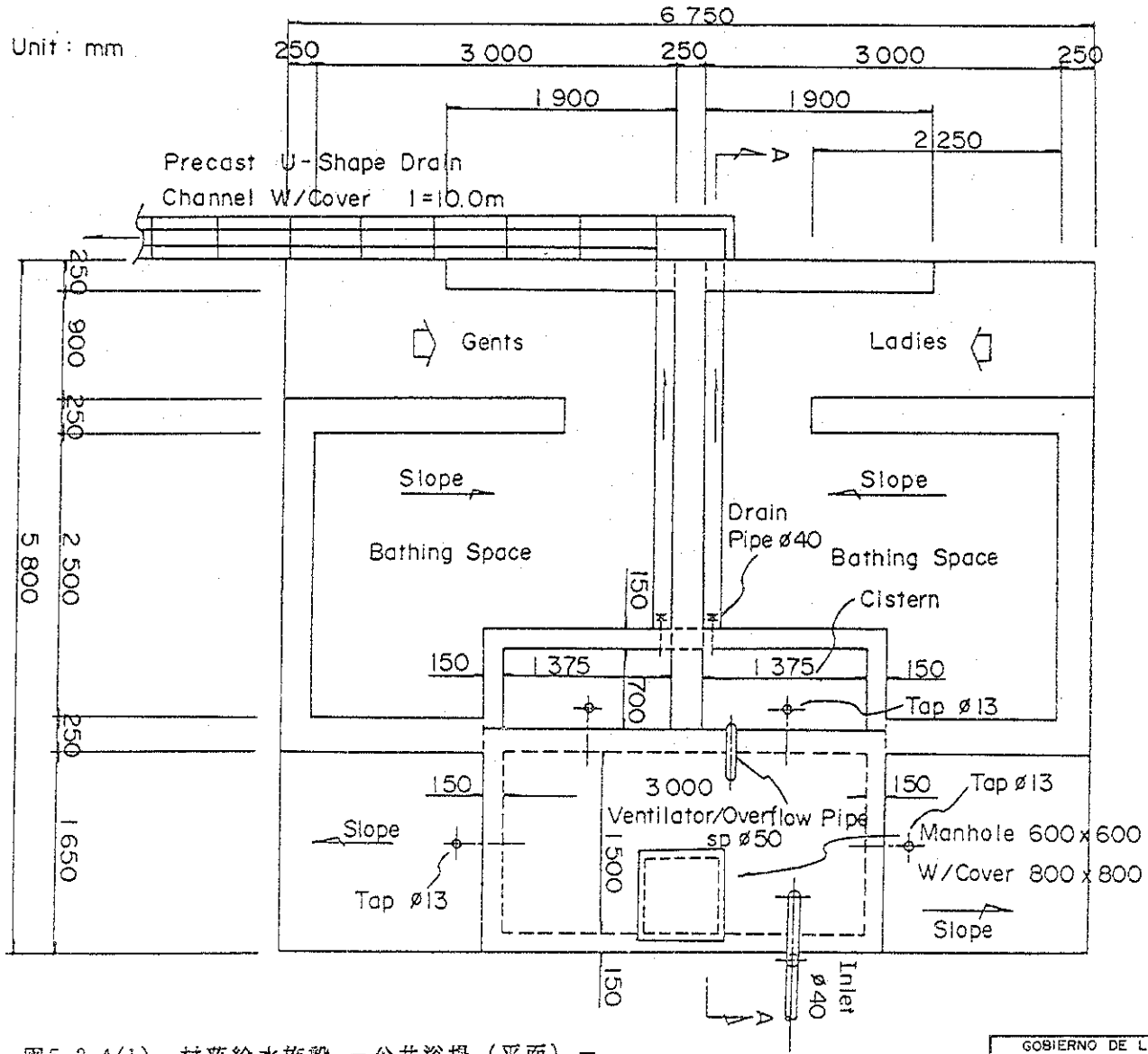


図5.3.4(1) 村落給水施設 －公共浴場（平面）－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

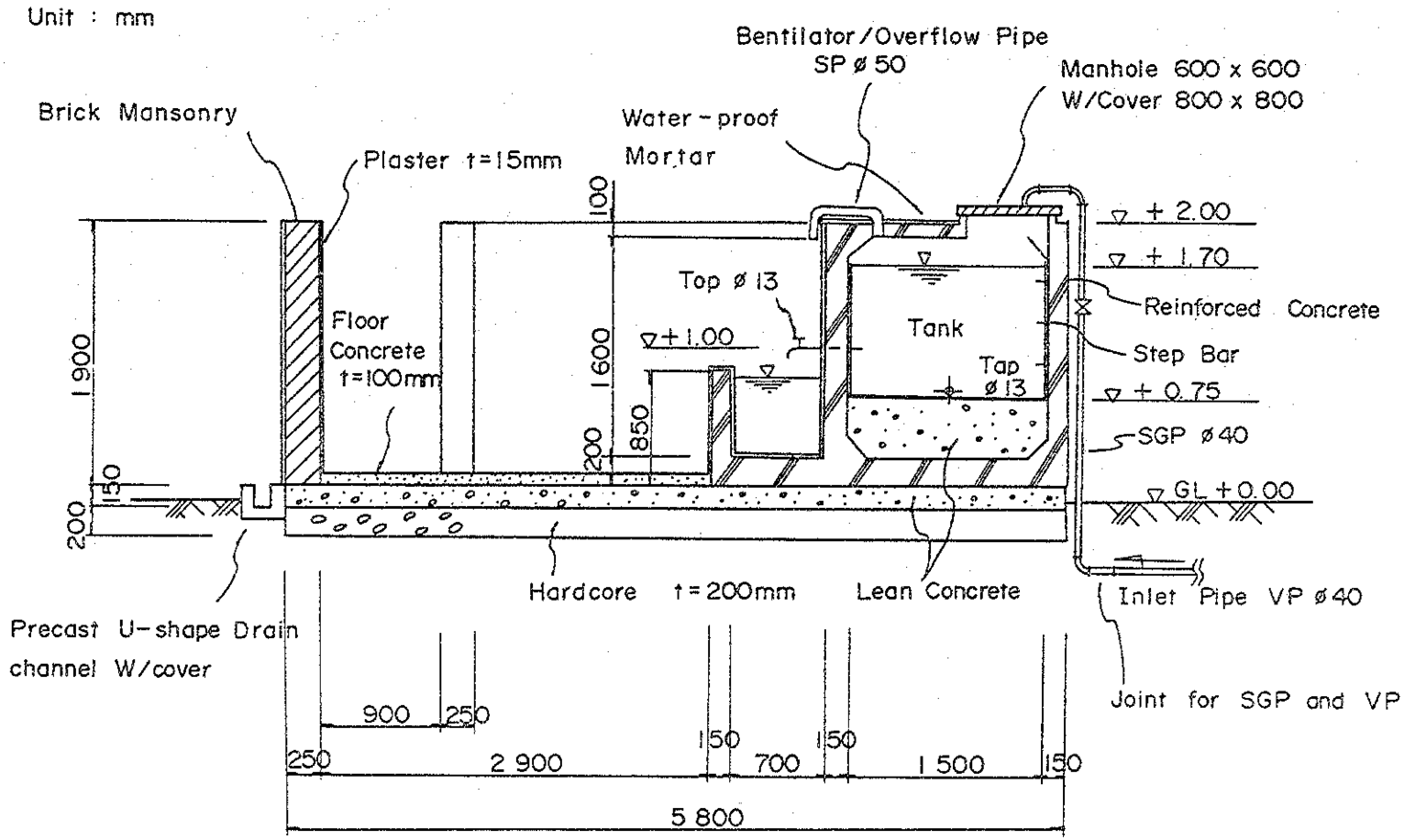


図5.3.4(2) 村落給水施設 －公共浴場（断面）－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

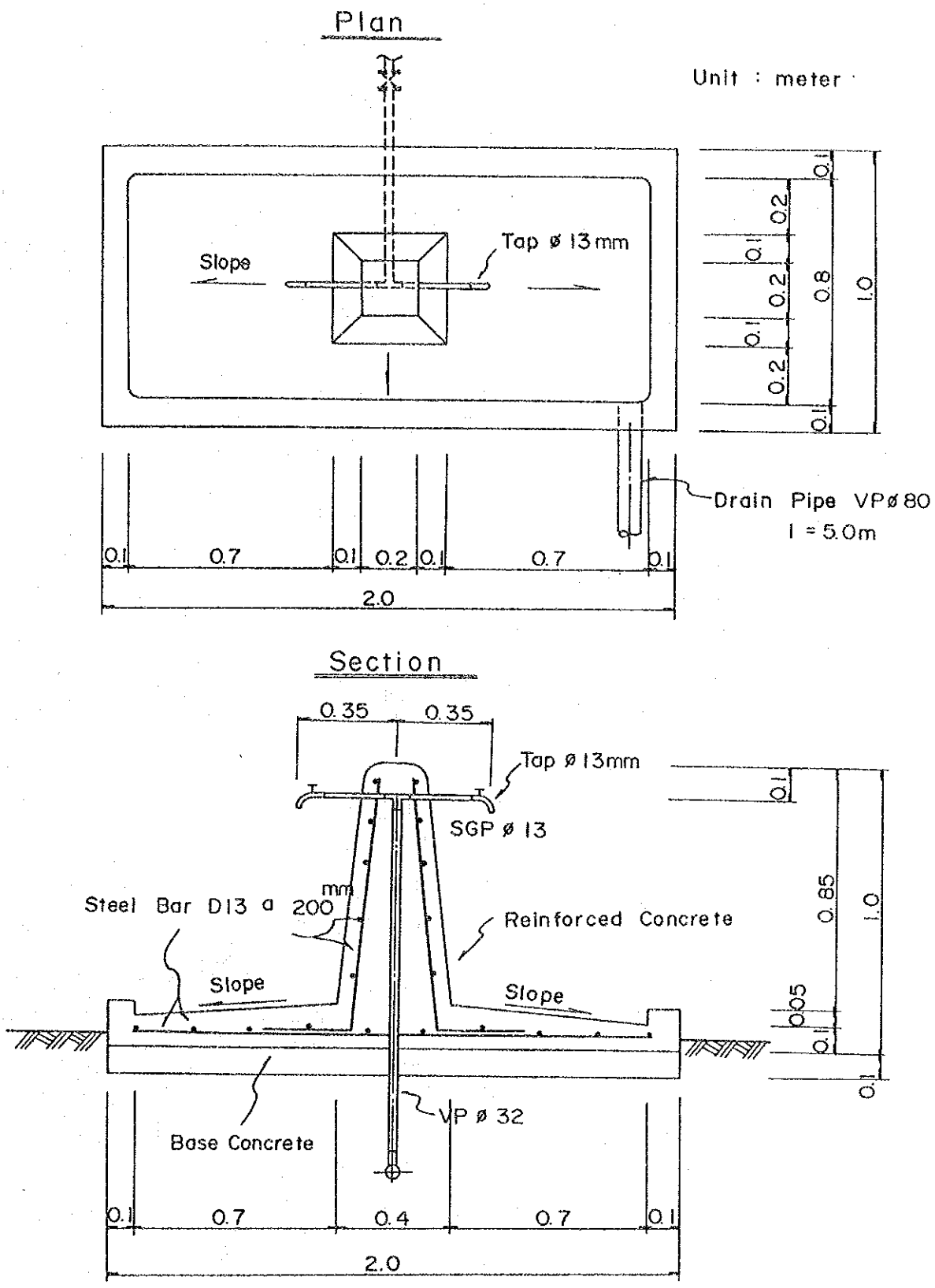
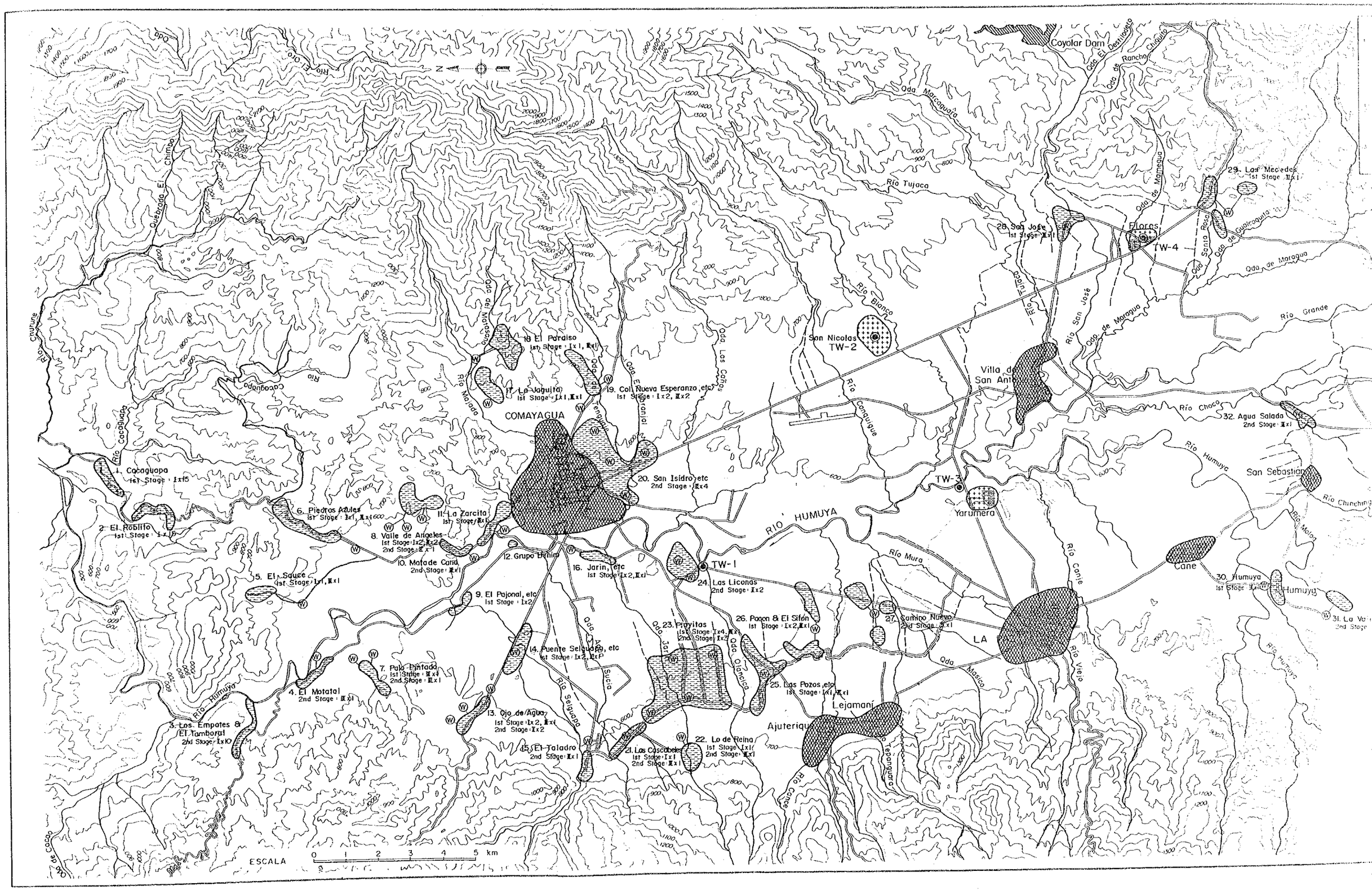


図5.3.5　村落給水施設 －共同栓－

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON


Coyolar Dam
Qda. El Destilado
Qda. de Rancho Chiquito
Qda. Marcaguaja
Río Tujaca
Qda. de Mamequa
29. Las Mercedes
1st Stage: IIx1
28. San José
1st Stage: IIx1
Flores
TW-4
Qda. Santa Rosa
Qda. de Guacaguara
Qda. de Moragua
Río Grande
Río Blanco
San Nicolas
TW-2
Villa de San Antonio
Río Tujaca
Río San José
Qda. de Moragua
Río Choco
32. Agua Salada
2nd Stage: IIx1
Río Humuya
San Sebastian
Río Chinchina
Río Melon
TW-3
Yarumera
RIO HUMUYA
Río Mura
Río Canie
Cane
30. Humuya
1st Stage: IIx1
Humuya
31. La Va
2nd Stage
LA
Qda. Mastica
Río Viejo
Río Humuya
Lejamani
Ajuteriqui
Río Tepanguara
Río Conde
Río Conguique
Río Blanco
Qda. Las Cañas
Qda. Jarin
Qda. Olancica
Qda. Sucia
Río Selguapa
Qda. del Matasano
Río Naida
Qda. del Teriguana
Qda. el Tranjal
COMAYAGUA
18. El Paraiso
1st Stage: Ix1, IIx1
17. La Jaguita
1st Stage: Ix1, IIx1
19. Col. Nueva Esperanza, etc
1st Stage: Ix2, IIx2
20. San Isidro, etc
2nd Stage: IIx4
1. Cacaguapa
1st Stage: Ix15
2. El Robillo
1st Stage: Ix10
6. Piedras Azules
1st Stage: Ix1, IIx1
11. La Zarcita
1st Stage: IIx1
8. Valle de Angeles
1st Stage: Ix2, IIx2
2nd Stage: IIx1
10. Matade Caria
2nd Stage: IIx1
12. Grupo Benino
16. Jarin, etc
1st Stage: Ix2, IIx1
TW-1
24. Las Liconas
2nd Stage: IIx2
5. El Sauce
1st Stage: Ix1, IIx1
9. El Pajonal, etc
1st Stage: Ix2
26. Pacon & El Sifón
1st Stage: Ix2, IIx1
27. Camino Nuevo
2nd Stage: IIx1
23. Proyitas
1st Stage: Ix4, IIx1
2nd Stage: Ix3
14. Puente Selguapa, etc
1st Stage: Ix2, IIxP
7. Palo Pintado
1st Stage: IIx1
2nd Stage: IIx1
4. El Matatal
2nd Stage: IIx1
25. Las Pozos, etc
1st Stage: Ix1, IIx1
13. Ojo de Agua
1st Stage: Ix2, IIx1
2nd Stage: Ix2
3. Los Empotes & El Tamborial
2nd Stage: Ix10
15. El Taladro
2nd Stage: IIx1
21. Las Cascabeles
1st Stage: Ix1
2nd Stage: IIx1
22. La de Reina
1st Stage: Ix1
2nd Stage: IIx1
Río Cacaguapa
Río Humuya
Qda. de Cacao
ESCALA
0 1 2 3 4 5 km

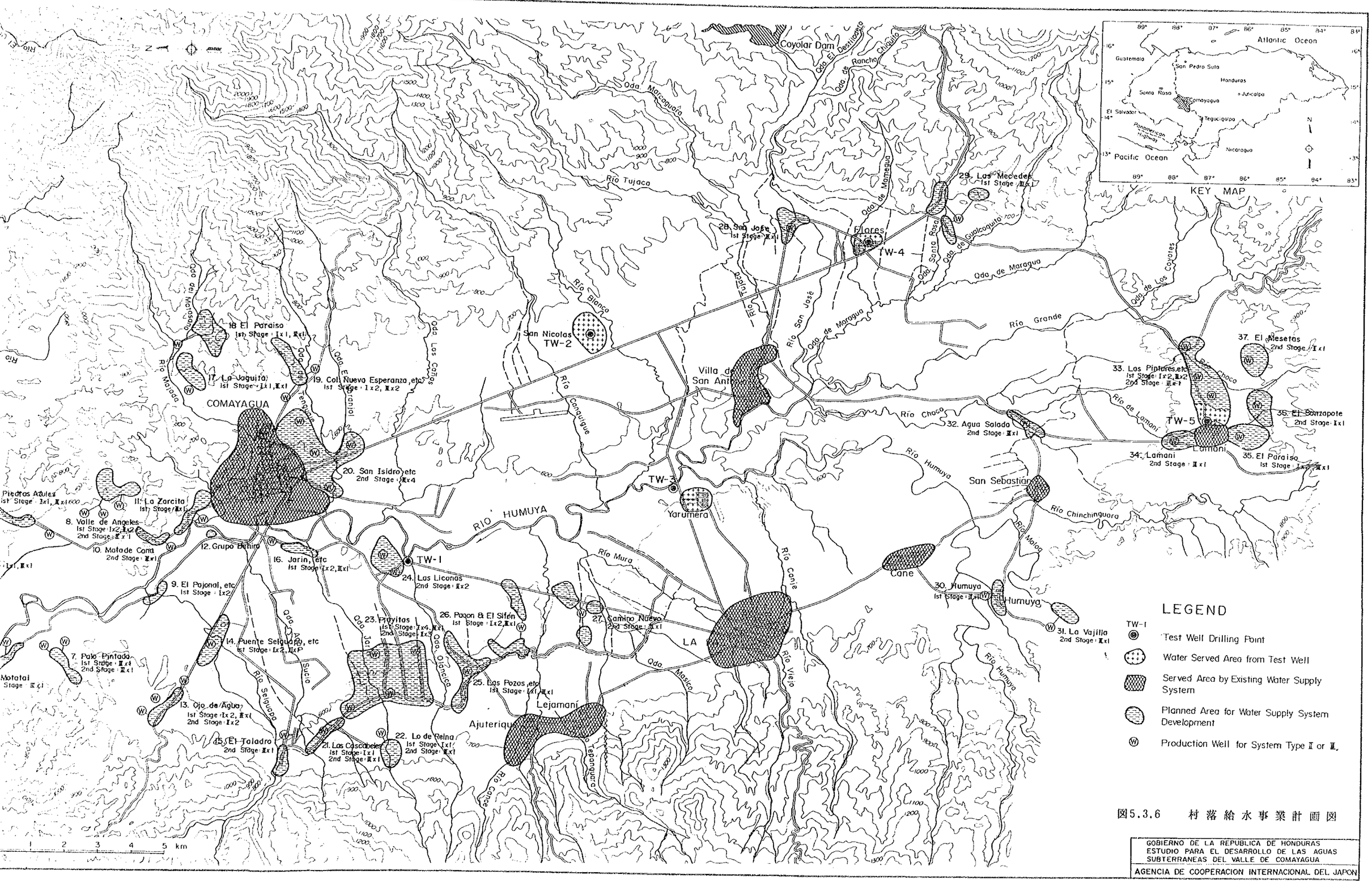


図5.3.6　村落給水事業計画図

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

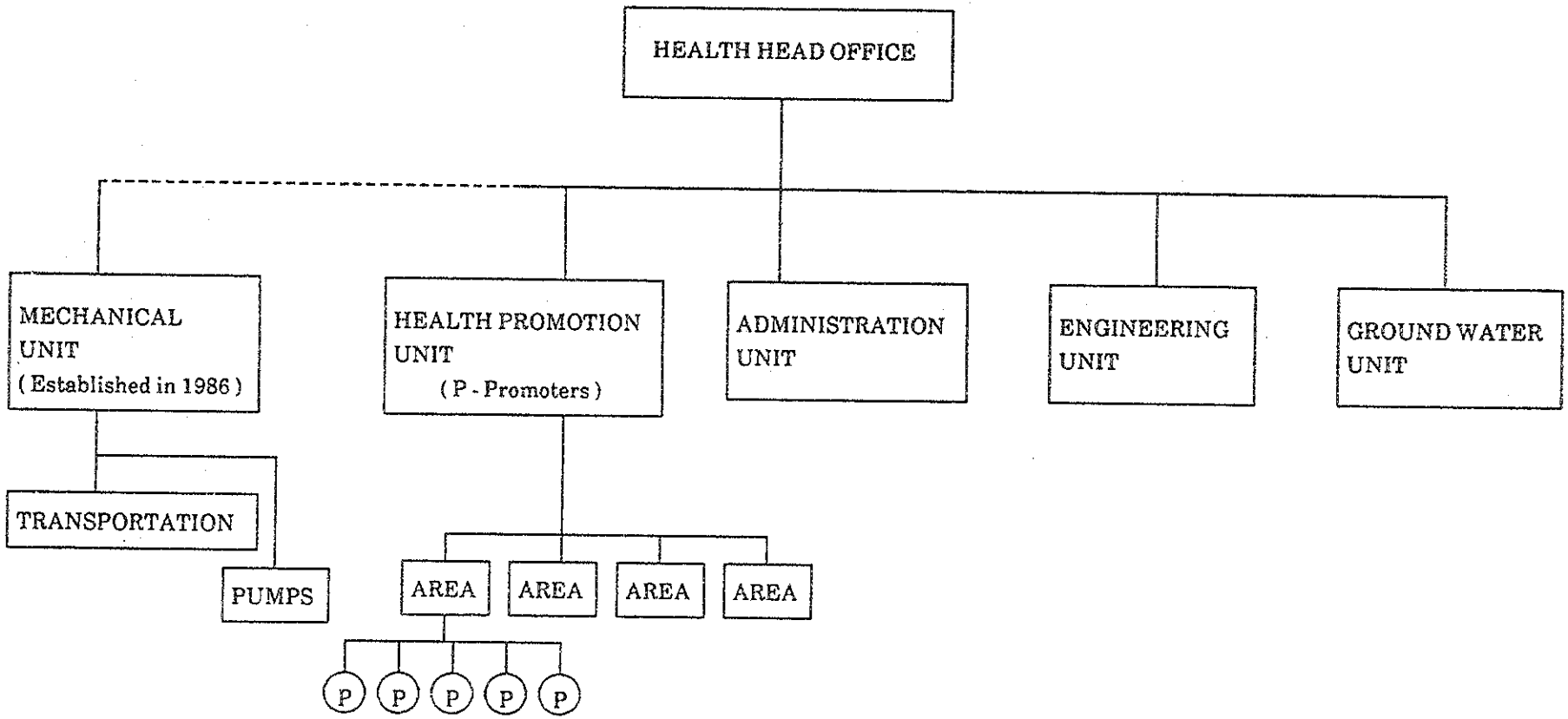


図6.1.1　現状の維持管理組織

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

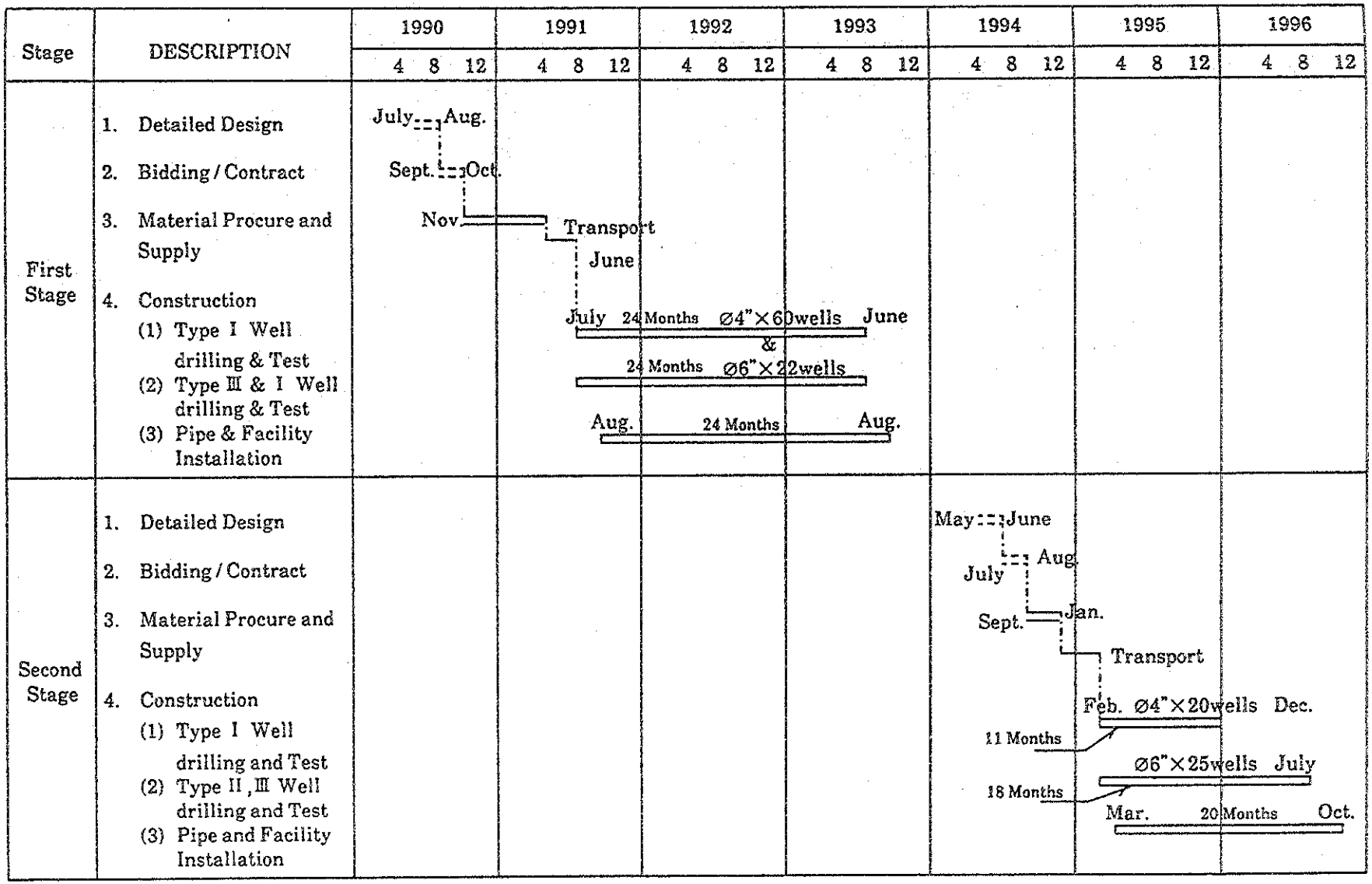


図6.3.1　村落給水事業の工事工程図

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

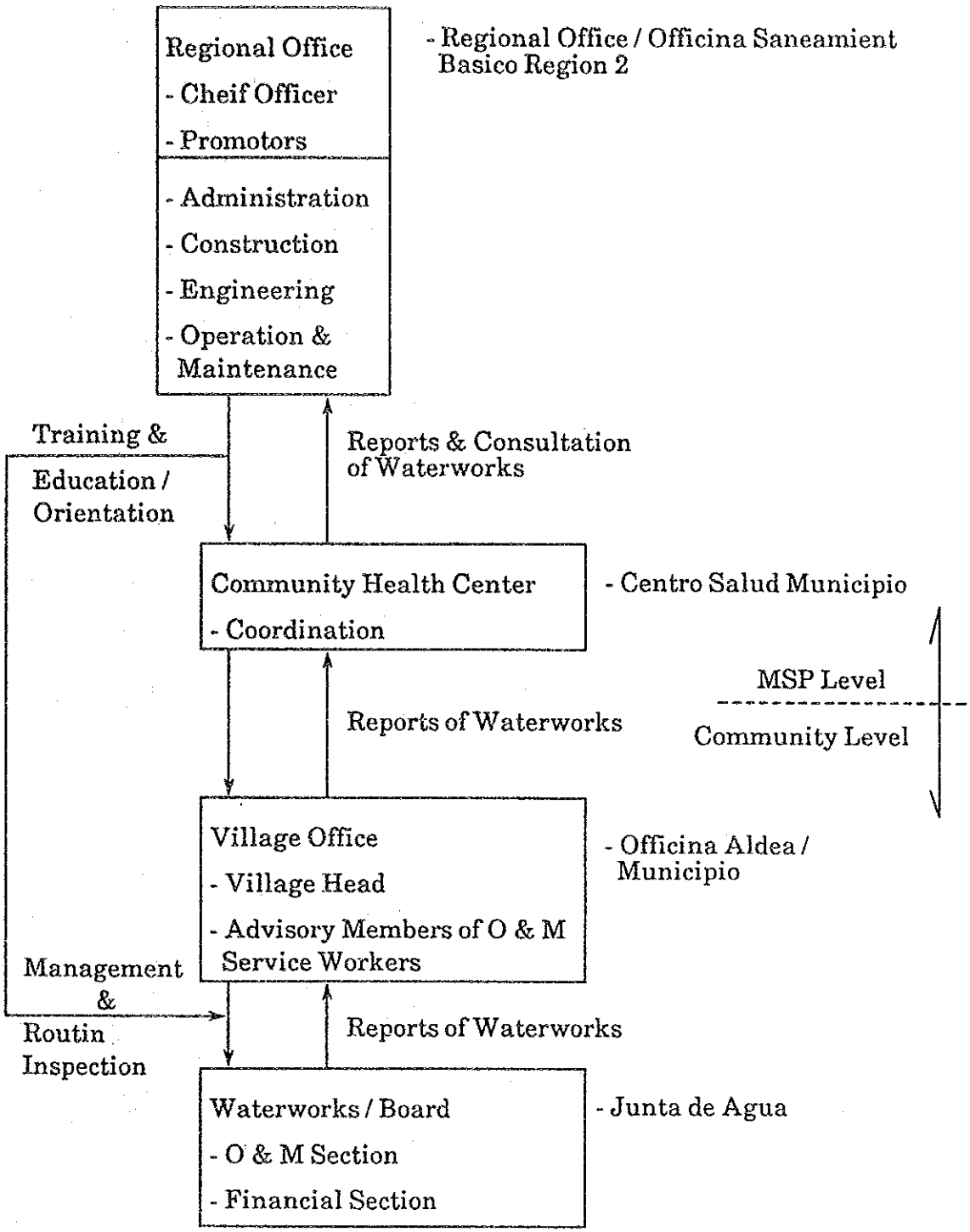


図6.5.1　推奨される運転維持管理組織図

GOBIERNO DE LA REPUBLICA DE HONDURAS
ESTUDIO PARA EL DESARROLLO DE LAS AGUAS SUBTERRANEAS DEL VALLE DE COMAYAGUA
AGENCIA DE COOPERACION INTERNACIONAL DEL JAPON

表1.2.1　調査地域の水道給水現況

Municipality	Population (1988) Total	Urban	Rural	Served Popu. 1988	(%)	Population (Not Served) Total	Urban	Rural	Administrative Authority	System and Water Source
1. Comayagua	59,534	36,416	23,118	30,084	51	29,450	6,332	23,118	SANAA	Piped/Spring
2. Ajuterique	6,803	3,666	3,137	3,670	54	3,133	0	3,133	Municipal	Piped/Spring
3. Humuya	1,371	0	1,371	1,371	100	0	0	0	Municipal	
4. Lamani	3,572	0	3,572	3,572	100	0	0	0	Municipal	Piped/River
5. Lejamani	3,123	2,797	326	2,790	89	333	7	326	Municipal	Piped/Spring
6. San Sebastian	1,506	0	1,506	1,506	100	0	0	0	Municipal	Piped/River
7. Villa de San Anto.	11,429	5,746	5,683	5,750	50	5,679	0	5,679	Municipal	Piped
8. La Paz*1	19,900	10,965	8,935	12,240	62	7,660	0	7,660	SANAA	Piped/River & Spring
9. Cane	1,937	0	1,937	1,776	92	161	0	161	SANAA	Piped/La Paz
Total	109,175	59,590	49,585	62,759*2	57	46,416	6,339	40,077		

*1 Including Yarumela (Piped system, Deep well water source)
*2 Served Population: Urban = 53,251 (59,590 - 6,339)
Rural = 9,508 (49,585 - 40,077)

表1.2.2　地方農村部における水需要

Sample No.	1.	2.	3.	4.	5.
Water consumption (litre/day)	120	60	60	100	120
No. Family member	5	3	10	5	4
Per capita consumption (LPCD)	24	20	6	20	30

Note: 1. Water consumption is obtained by water bringing times per day multiplying volume of container or bucket used.

2. Per capita consumption is estimated by - water consumption (l/day) divided by No. family member.

表2.1.1 調 査 数 量 表

Item	Quantity	Remarks
1. Meteoro-Hydrological Survey		
(1) Runoff measurement	4 times	performed by the JICA Team[1]
(2) Monthly runoff measurement	6 times	perfprmed by MPH
2. Geophysical Exploration		
(1) VLF electromagnetic survey	111 points	performed by the JICA Team
(2) Electric resistivity survey	91 points	do
3. Observation of Groundwater level		
(1) Simultaneous observation	3 times	do
(2) Monitoring (by automatic recorder & manual)	6 wells	do
4. Water Quality Analysis		
(1) for hydrogeological purposes	46 samples	do
(2) for drinking water	46 samples	performed by the MPH
(3) test wells	9 samples	performed by the JICA Team & MPH[2]
5. Well Drilling and related Works (at five locations)		
(1) Well drilling		performed by Contructor[3]
a. Pumping well (test well)	505 m	
b. observation hole	570 m	
(2) Casing & screens		
a. Pumping well (test well)	496 m	
b. observation hole	515 m	
(3) Logging	5 lots	do
(4) Pumping test	5 lots	do
(5) Installation of temporary water supply facilities	5 lots	

Note: 1. JICA study team in cooperation with MPH counterpart engineers
2. Of 9 samples, 5 samples were collected at the end of the continuous pumping test and 4 samples are in-situ samples.
3. Contractor selected by the JICA study team

表4.1.1(1) VLF電磁波探査結果 (1/3)

Spot No.	Field Data Appa.OHM	Field Data Angle(°)	The First Layer Resist.(ohm)	The First Layer Thick.(m)	The 2nd Lay. Resist.(ohm)	Loc. of neaby ES STA.
1	110	56	300	12	60	
2	40	70	100	14	7	
3	7	45	7	-	7	STA 1
4	10	36	10	9	34	STA 1 and 2
5	7	45	7	-	7	STA 1 and 2
6	15	39	10	2	21	STA 1
7	3	45	3	-	3	STA 1 and 2
8	7	43	10	20	13	STA 2
9	75	55	100	18	30	STA 96
10	20	36	10	3	33	STA 3
11	19	43	10	1	22	STA 6
12	12	35	10	20	15*	STA 7
13	9	40	6	20	15	STA 8
14	30	44	10	1	33	STA 9
15	62	44	30	1	65	STA 11
16	7	11	7	20	10	STA 12
17	8	50	30	1	6	STA 12 and 13
18	7	28	5	20	10*	STA 13.
19	9	37	4	20	15*	STA 13
20	8	30	4	20	10*	STA 14
21	1	45	1	-	1	STA 14
22	9	40	6	20	10*	STA 14
23	4	44	4	20	5	STA 14
24	10	53	30	3	7	STA 15
25	21	44	10	1	22	STA 15
26	40	46.5	60	20	10*	STA 15
27	39	40	15	20	45*	STA 15 and 16
28	20	40.5	10	1	25	STA 16 and 17
29	20	45<	10	1	25	STA 17
30	3	10	1	20	15	STA 17 and 18
31	24	45	24	-	24	STA 19
32	15	43	8	20	20*	STA 20
33	9	38	10	20	20*	STA 21
34	3.5	45	3.5	-	3.5	STA 22
35	24	55	30	10	10	STA 23
36	8	45	8	-	8	STA 24
37	3	-	3	-	3	STA 24
38	16	59	30	6	7	STA 24
39	9	-	9	-	9	STA 24
40	9	45	9	-	9	STA 27

* The Resistivity value of the second layer is inferred from the nearby elcectric resistivity sounding spots.

表4.1.1(2) VLF電磁波探査結果 (2/3)

Spot No.	Field Data Appa.OHM	Field Data Angle(°)	The First Layer Resist.(ohm)	The First Layer Thick.(m)	The 2nd Lay. Resist.(ohm)	Loc. of neaby ES STA.
41	15	40	10	2	20	STA 28
42	20	48	30	4	15	STA 29
43	11	45	11	-	11	STA 30
44	12	40	10	4	17	STA 33
45	10	33	2	20	22*	STA 35
46	4	-	4	-	4	STA 36
47	8	42	8	10	18	STA 36
48	11	40	10	10	16	STA 37
49	12	44	10	10	13	STA 37
50	15	40	7	10	15	STA 37
51	16	40	7	10	16	STA 37
52	9	44	7	10	8	STA 40
53	10	40	10	10	16	STA 41
54	23	40	7	10	25*	STA 42
55	21	38	10	1	30	STA 46
56	20	39	10	2	25	STA 47
57	4	40	4	10	7	STA 47
58	10	33	4	7	16	STA 47
59	43	45	43	-	43	STA 48
60	8	-	8	-	8	STA 48
61	17	35	5	20	15*	STA 49
62	4	48	4	20	3	STA 50
63	19	45	19	-	19	STA 51
64	14	44	10	1	16	STA 52
65	9	38	7	10	18	STA 53
66	11	44	10	10	12	STA 54
67	20	40	10	2	25	STA 55
68	9	40	5	10	14*	STA 59
69	30	40	9	10	35*	STA 59'
70	19	48	30	4	15	STA 60
71	40	59	300	6	24	
72	41	38	9	20	50*	STA 61
73	21	45	21	-	21	STA 61
74	38	50	100	4	32	STA 61
75	20	40	10	2	26	STA 63
76	45	39	4	20	50*	STA 65
77	22	44	10	1	23	STA 66
78	20	33	10	2	30*	STA 91
79	10	30	2	20	20*	STA 68
80	10	40	10	8	18	STA 68

* The Resistivity value of the second layer is inferred from the nearby elcectric resistivity sounding spots.

表4.1.1(3) VLF電磁波探査結果 (3/3)

Spot	Field Data		The First Layer		The 2nd Lay.	
No.	Appa.OHM	Angle(°)	Resist.(ohm)	Thick.(m)	Resist.(ohm)	Loc. of neaby ES STA.
81	23	30	10	4	60	STA 68
82	9	41	8	10	17	STA 69
83	13	39	10	7	22	STA 69
84	8	31	2	2	15*	South of Cane
85	8	31	2	2	15*	STA 73
86	10	36	8	10	24	STA 74
87	17	55	20	2	12	STA 75
88	28	35	8	3	45	STA 75
89	70	45	70	-	70	STA 76
90	25	38	10	1	35	STA 76 and 77
91	30	44	10	1	32	
92	33	43	10	1	35	STA 77
93	19	36	10	2	30	STA 77 and 78
94	38	46	10	2	37	STA 78
95	32	47	20	2	30	STA 78 and 79
96	24	35	10	2	37*	STA 79
97	40	40	10	1	50	STA 79 and 80
98	29	47	30	20	27	STA 80
99	16	40	10	1	21	STA 81
100	9	40	8	20	20*	STA 81
101	15	39	10	1	22	STA 71
102	15	45	15	-	15	STA 71
103	7	43	7	10	13	STA 83
104	11	47	11	10	12	STA 83
105	19	44	10	1	20	STA 84
106	20	45	20	-	20	STA 86
107	16	40	10	1	21	STA 87
108	16	44	10	1	17	STA 88
109	22	45	22	-	22	STA 89
110	10	30	2	20	20*	STA 89
111	38	45	38	-	38	STA 89

* The Resistivity value of the second layer is inferred from the nearby elcectric resistivity sounding spots.

表4.1.2　電気比抵抗値による地層区分

Layer	Thickness (in meter)	Resistivity (in ohm-m)	Assumed Geological Condition	Relation to Hydrogology	Typical Profile
Layer 1	0 to 30	15 to 135*	Above ground water level, the upper part of the Layer 4. Mainly sand/gravels with silt or clay of thinly intercalated.	No ground water through year. Highly permeable.	E, F, G, H, VI,VII,VIII
		11 to 81*	Above ground water level, the upper part of the Layer 2, 3. Mainly sandy silt and sand with thin clay intercalated.	do.	K, L, M, N, O, III, IV, V
Layer 2	0 to 60 (Ave. 30)	7 to 54* (Ave. 20)	Below ground water level. Sand and gravel in the margin of the basin. Sand/silt in the center of the basin. Mainly the fan deposits	Aquifer "Fair"	A, B, C, D, E, F, G, H, I, J, K, L, VI,VII,VIII
Layer 3	0 to 50 (Ave. 40, Max.120 near Cane)	1 to 15* (Ave. 3)	Maily clay and silty clay. Partly silty sand or sand at the southern area of Villa de San Antonio, 5km far away. Well developped thickly at the western area of Cane.	Aquiclude. Locally aquitard. At southern area of Villa de San Antonio	I, J, K, L, M, I, II, III
Layer 4	30 to 120 (Ave. 80)	7 to 18* (Ave. 10)	Mainly fine, well consolidated sand. Corse sand in the margin of the basin. Extremely thick in the east side of the basin.	Semi-aquifer "Good"	III, IV, V, VI,VII,VIII O, P
4(a)	about 30	12 to 70	In the southern parts of the basin, shown on Prof. O & P, the Layer 4 can be subdivided into the such three layers as 4(a), 4(b) and 4(c).		
4(b)	about 60	7 to 30			
4(c)	about 30	9 to 16			
Layer 5	60 to 80 (Ave. 70)	2 to 6* (Ave. 4)	Mainly clay and clayey silt. Silt develops in the margin of the basin.	Aquiclude	E, F, H, J K
	do.	4 to 10* (Ave. 6)	Mainly clayey silt, partly sandy silt in the margin of the basin.	Aquiclude,partly aquitard.	do.
Basement		15 to 45 (Ave. 20)	Welded tuff of Tertiary age	Impermeable	A, B, C, D, E, I, O, P, Q
		27 to 110	Sedimentary rocks or granodiorite of Mesozoic age.	do.	do.

* Some exceptional high or low values in extremely thin intercalated layer are neglected.

表4.1.3　試験井・観測孔掘削結果

No.	Location	Well No.	Drill*1 Depth	Casing*2 Depth	Distance b/w OH & TW	Height Dif.*3 b/w OH & TW
1	Las Liconas	OH-1	100 m	67 m	18.50 m	+ 0.04 m
		TW-1	73	72		
2	San Nicolas	OH-2	130	127	15.40	+ 0.25
		TW-2	127	124		
3	Yarumela	OH-3	100	86	22.30	- 1.63
		TW-3	90	90		
4	Flores	OH-4	120	115	15.10	- 0.22
		TW-4	115	115		
5	Lamani	OH-5	120	120	17.00	+ 0.15
		TW-5	100	95		
	TOTAL	OH	570			
		TW	505			

*1. Drill Dia. ; Observation Holes ... 10 inches
Test Wells ..... 14-3/4 inches

*2. Casing Dia.; Observation Holes ... 4 inches
Test Wells ..... 8 inches

*3. Height Dif.; Difference between casing top elevations of a test well and a observation hole, i.e.
(El. of OH) - (El. of TW)

表4.1.4　さく井工事所用日数表

(Unit : day)

Location	Las Liconas		San Nicolas		Yarumela		Flores		Lamani	
Well No.	OH-1	TW-1	OH-2	TW-2	OH-3	TW-3	OH-4	TW-4	OH-5	TW-5
Drill Depth (m)	100	73	130	127	100	90	120	115	120	100
Casing Depth (m)	67	72	127	124	86	90	115	115	120	95
Operation Items										
A. Site preparation, transport and installation of drilling rig	0.5	3	4	2	4	2	1	1	2	1
B. Drilling operation, logging investigations, parmanent casing & screens installation	9	13	31	23	7	13	6	7	17	17
C. Gravel Packing and development	3.5	3	8	4	2	5	5	5	5	5
D. Clay and mortar filling, construction of basement	0.5	1	1	1	1	1	1	1	1	1
E. Recovery work for accident	0	0	0	0	0	0	0	0	7	0
F. Disassembly and removal of drilling rig	0.5	1	1	1	1	1	1	1	1	1
G. Waiting time and holiday (no work due to heavy rain)	3	7	19 (3)	33	0	61	44	37	34	41
H. Total days	17	28	63	64	15	83	58	52	67	66
I. Actual operation days (H - E - G)	14	21	44	31	15	22	14	15	33	25

表4.1.5　ケーシング及びスクリーンパイプ数量一覧表

No.	Location	Well No.	Spec. of Casing Pipes and Screens: Dia. (inch)	Depth (m)	Screen Position (m - m)	PVC pipes: blind (m)	slotted (m)	total (m)	steel pipes: blind (m)	slotted (m)	wire-wrapped (m)	total (m)
1	Las Liconas	OH-1	4	67	21-32, 35-38, 54-62	45	22	67	-	-	-	-
		TW-1	8	72	20-26, 35-41, 53-59, 63-69	-	-	-	48	-	24	72
2	San Nicolas	OH-2	4	127	12-18, 23-29, 58-63, 90-96, 113-125	-	-	-	92	35	-	127
		TW-2	8	124	12-18, 26-32, 52-55, 61-64, 93-105, 118-123	89	35	124	-	-	-	-
3	Yarumela	OH-3	4	86	15-33, 42-48, 73-76	59	27	86	-	-	-	-
		TW-3	8	90	12-34, 38-41, 46-49, 61-67, 87-90	-	-	-	53	-	37	90
4	Flores	OH-4	4	115	17-20, 43-46, 58-64, 73-76, 81-82.5, 90-91.5, 101-113	-	-	-	85	30	-	115
		TW-4	8	115	18-21, 44-47, 58-61, 73-76, 79-82, 90-93, 101-113	-	-	-	85	-	30	115
5	Lamani	OH-5	4	120	21-43, 76-80, 84-90, 113-119	-	-	-	82	38	-	120
		TW-5	8	95	29-37, 40-43, 58-61, 76-91	66	29	95	-	-	-	-
	TOTAL	OH	4	-	------	104	49	153	259	103	-	362
		TW	8	-	------	155	64	219	186	-	91	277

表4.1.6(1) 揚水試験結果一覧表 (1/3)

Location	Test	Test Well Q(l/s)	Test Well Sw(m)	Test Well SC(l/s.m)	Observ.Hole Sw (m)
Las Liconas	(S.W.L)		(2.85)		(2.63)
TW-1	Step Draw-	0.5	8.46	0.06	2.03
&	down Test	0.9	20.68	0.04	4.88
OH-1		1.1	27.87	0.04	7.77
	Continuous Pump. Test	0.7	21.88	0.03	7.17
San Nicolas	(S.W.L)		(7.10)		(7.33)
TW-2	Step Draw-	4.0	2.23	1.79	1.20
&	down Test	6.0	3.83	1.57	1.86
OH-2		8.0	5.94	1.35	2.80
		10.0	7.77	1.29	3.78
	Continuous Pump. Test	7.0	7.39	0.95	4.65
Yarumela	(S.W.L)		(8.83)		(7.38)
TW-3	Step Draw-	2.0	2.37	0.84	0.66
&	down Test	4.0	5.48	0.73	0.76
OH-3		6.2	9.11	0.68	2.05
		8.7	16.00	0.54	2.66
		11.8	31.81	0.37	2.86
	Continuous Pump. Test	6.2	14.35	0.43	2.70
Flores	(S.W.L)		(11.00)		(11.00)
TW-4	Step Draw-	5.0	2.08	2.40	0.55
&	down Test	7.4	2.91	2.54	0.93
OH-4		10.0	4.13	2.42	1.37
		13.0	5.60	2.32	1.92
	Continuous Pump. Test	12.0	6.56	1.83	3.08
Lamani	(S.W.L)		(35.61)		(35.60)
TW-5	Step Draw-	3.5	1.02	3.43	0.29
&	down Test	5.0	1.81	2.76	0.50
OH-5		7.5	2.45	3.06	0.81
		8.8	2.92	3.01	0.97
	Continuous Pump. Test	6.0	1.69	3.55	0.40

Remarks; Q : Discharge rate
Sw: Drawdown
SC: Specific capacity

S.W.L. : Static Water Level

表4.1.6(2) 揚水試験結果一覧表 (2/3)

Location	Transmissivity (m^2/day) Test Well CPT*1	Test Well RT*2	Observ. Hole CPT*1	Observ. Hole RT*2	Avg.	Pumping Rate (l/s)	Final Draw Down (m) Test Well	Final Draw Down (m) Observ. Hole	Radius of Infuluence (m)	Aquifer Loss of Pumping Well (m)	Well Loss Drawdown (m)	Well Loss (%)
1. Las Liconas	2.64	3.11	1.15	1.98	2.22	0.7	21.88	7.17	98	21.88*3	0.00	0
2. San Nicolas	83.23	127.24	61.50	106.44	94.60	7.0	7.39	4.65	1,495	7.39*3	0.00	0
3. Yarumela	91.63	131.12	26.22	89.95	84.73	6.2	14.35	2.70	328	8.14	6.21	44
4. Flores	231.42	267.27	253.02	287.52	259.81	12.0	6.56	3.08	1,939	6.27	0.29	5
5. Lamani	247.09	263.56	152.05	168.23	207.73	6.0	1.69	0.40	47	1.69*3	0.00	0

Remarks. *1 : Continuous Pumping Test *2 : Recovery Test
*3 : Since Calculated value is larger than the observed drawdown,
it is supposed that whole the drawdown was cuased only by the aquifer loss.

表4.1.6(3) 揚水試験結果一覧表 (3/3)

Location	Result of Pumping: Pumping Rate(l/s)	WL of TW*1: SWL(m)	WL of TW*1: PWL(m)	Transmissivity average (m^2/day)	Total Screen Length (m)	Hydraulic Conductivity (cm/sec)	Hydrogeological Condition: Type of Main Aquifer	Ratio of Sand Layer*2: Shallow G/W	Ratio of Sand Layer*2: Deep G/W
1. Las Liconas	0.7	3.78	25.66	2.22	24.0	1.07×10^{-4} (0.093 m/day)	Artesian G/W (Deep G/W)	70% (10m)	20% (90m)
2. San Nicolas	7.0	7.08	14.47	94.60	35.0	3.13×10^{-3} (2.703 m/d)	do.	80 (33.5)	20 (116.5)
3. Yarumela	6.2	8.95	23.30	84.73	37.0	2.65×10^{-3} (2.29 m/d)	Phereatic G/W (Shallow G/W)	74 (33.5)	20 (56.5)
4. Flores	12.0	11.06	17.62	259.81	30.0	1.00×10^{-2} (8.660 m/d)	Artesian G/W (Deep G/W)	60 (25.0)	55 (90.0)
5. Lamani	6.0	35.67	37.36	207.73	29.0	8.29×10^{-3} (7.163 m/d)	do.	65 (50.0)	40 (50.0)

Remarks. *1 : WL = Water Level, TW = Test Well, SWL = Static Water Level, PWL = Pumping Water Level
*2 : Values in parentheses are the total thicknesses of each aquifer confirmed through the well drilling.

表4.2.1　水収支シミュレーション結果 その1

unit : MCM

Month	Las Higueras 1972 OBS.	Las Higueras 1972 CALC.	Las Higueras 1983 OBS.	Las Higueras 1983 CALC.	Las Higueras 1986 OBS.	Las Higueras 1986 CALC.	Las Higueras 1988 OBS.	Las Higueras 1988 CALC.	La Encantada 1972 OBS.	La Encantada 1972 CALC.	La Encantada 1983 OBS.	La Encantada 1983 CALC.	La Encantada 1986 OBS.	La Encantada 1986 CALC.	La Encantada 1988 OBS.	La Encantada 1988 CALC.
1	4.92	5.48	3.19	5.32	3.59	5.45	2.73	5.16	11.81	13.42	10.07	7.45	2.65	10.56	8.81	7.46
2	3.96	5.40	5.41	4.86	3.16	4.80	2.58	4.80	9.45	9.46	6.49	5.74	8.70	7.06	8.17	5.95
3	3.73	5.40	6.01	5.24	3.35	5.28	2.66	5.09	8.19	7.31	7.67	6.33	7.70	6.40	7.38	6.34
4	5.48	7.40	5.82	14.40	5.72	5.08	2.96	17.88	9.87	12.10	7.93	13.77	7.13	6.14	7.14	16.24
5	16.08	66.35	4.64	15.00	5.02	69.45	3.61	59.95	14.64	50.66	4.95	21.41	8.91	73.12	8.74	63.26
6	104.03	42.97	3.40	259.79	5.95	67.34	62.12	231.42	36.01	101.18	31.43	370.66	23.77	104.72	88.24	392.73
7	10.31	6.24	0.51	39.62	3.65	7.62	0.51	157.49	12.27	23.30	37.72	55.08	17.50	19.55	99.31	273.01
8	13.99	5.68	1.39	151.83	5.72	18.41	95.60	204.19	18.01	14.46	25.48	87.08	21.16	27.14	135.25	317.65
9	9.26	33.75	1.61	102.13	15.66	76.46	181.19	161.37	29.74	74.18	112.50	268.80	49.17	141.08	247.90	329.23
10	9.15	34.87	1.47	0.84	15.86	64.75	54.81	54.59	35.82	65.86	102.49	243.11	39.01	87.21	102.29	172.54
11	6.84	6.14	2.00	32.79	7.64	13.34	17.71	6.80	16.73	9.30	46.81	72.99	29.15	35.70	37.51	27.85
12	3.88	5.23	1.66	7.27	5.38	5.20	9.74	5.36	8.09	6.35	20.15	26.03	14.43	9.13	24.01	23.30

Note　OBS. : Observed monthly runoff volume
calc. : Calculated monthly runoff volume

表4.2.2　水収支シミュレーション結果 その２

Year : 1988

Tenguaje (c.a.=20.0 km^2)			Ranchitos (c.a.=42.3 km^2)			Chilcares (c.a.=62.3 km^2)			Humuya (c.a.=207.4 km^2)		
date	obsvd. (cms)	calcltd. (cms)	date	obsvd. (cms)	calcltd. (cms)	date	obsvd. (cms)	calcltd. (cms)	date	obsvd. (cms)	calcltd. (cms)
3/15	LT.0.01	0.024	3/15	0.12	0.057	3/18	LT.0.01	0.148	3/18	0.20	0.428
5/19	LT.0.01	0.023	5/25	0.16	0.056	5/25	LT.0.01	0.146	5/25	0.18	0.425
6/24	0.27	0.742	6/24	3.00	2.419	6/24	1.23	1.683	6/24	2.50	19.757
7/	0.09	0.081	7/	0.68	0.711	7/	0.83	0.994	7/	0.30	0.436
8/	1.00	1.075	9/	1.96	1.771	8/			9/	1.70	1.628
10/	0.45	0.430	10/	2.74	1.999	10/	1.91	1.897	10/	1.82	1.901
11/	0.12	0.105	11/	1.29	0.426	11/	0.07	0.157	11/	1.03	1.394
12/	0.09	0.075	12/	0.15	0.071	12/	0.00	0.157	12/	0.31	0.455

note : Runoff measurement from Mar. to Jun. was carried out by JICA study team.
Runoff measurement from Jul. to Dec. was carried out by MPH counterpart.

表4.2.3　コマヤグア盆地の地表水と地下水の水収支表

(Estimation of G/W potential in whole basin.)

Year	(1) Rainfall (mm)	(2) Runoff (mm)	(3) Evaporation (mm)	Ground Water Recharge Volume (4) Total (mm)	(4) Total (m3/day)	phreatic (mm)	confined (mm)	(5)* (2)+(3)+(4) (mm)	G/W ratio to rainfall (%)
1967	1398.4	762.6	629.6	17.4	98120	8.7	8.7	1409.7	1.2
1968	1266.9	573.0	670.4	17.6	99087	8.8	8.8	1261.0	1.4
1969	2205.9	1434.4	702.5	17.9	100966	9.0	9.0	2154.9	0.8
1970	1282.7	594.8	670.8	18.3	103149	9.2	9.2	1284.0	1.4
1971	1297.0	656.9	624.5	18.4	103543	9.2	9.2	1299.8	1.4
1972	771.1	201.3	601.1	18.4	103419	9.2	9.2	820.8	2.4
1973	1240.9	556.5	660.4	18.1	101810	9.0	9.0	1235.0	1.5
1974	1316.6	590.3	706.5	18.3	102710	9.1	9.1	1315.1	1.4
1975	1142.7	547.2	584.2	18.3	102845	9.1	9.1	1149.7	1.6
1976	1661.6	908.7	734.7	18.5	104004	9.2	9.2	1662.0	1.1
1977	1273.7	555.6	716.4	18.4	103734	9.2	9.2	1290.5	1.4
1978	1346.7	529.5	799.7	18.4	103723	9.2	9.2	1347.7	1.4
1979	1166.6	389.9	761.6	18.5	104116	9.3	9.3	1170.0	1.6
1980	1220.9	550.2	660.9	18.6	104600	9.3	9.3	1229.7	1.5
1981	1473.5	723.3	716.1	18.7	104926	9.3	9.3	1458.1	1.3
1982	1015.4	392.4	630.1	18.8	105534	9.4	9.4	1041.2	1.8
1983	1287.7	557.0	698.6	18.7	105118	9.3	9.3	1274.2	1.5
1984	1419.5	736.2	655.4	19.0	106963	9.5	9.5	1410.6	1.3
1985	1031.8	353.9	679.4	19.0	106884	9.5	9.5	1052.3	1.8
1986	882.5	267.6	632.5	18.8	105939	9.4	9.4	918.9	2.1
1987	1004.9	373.6	628.6	18.7	104949	9.3	9.3	1020.9	1.9
1988	1552.9	772.0	742.8	18.8	105489	9.4	9.4	1533.6	1.2
Ave.	1284.5	592.1	677.6	18.4	103710	9.2	9.2	1288.2	1.5

* Deficit between (1) and (5) is supplied from the storage of the previous year and the surplus is added to the storage.

表5.2.1　調査地域内市町村毎の将来人口

Municipality	Year 1961	1974	@(%)	1988	@(%)	1990	@(%)	1995	@(%)	2000
1. Comayagua	19,055	30,760	3.8	59,534	4.8	65,386	4.0	79,552	4.0	96,787
Rural	9,528	14,819	3.5	23,118	3.2	24,621	3.2	28,821	3.2	33,737
2. Ajuterique	3,132	5,126	3.9	6,803	2.0	7,078	2.0	7,815	2.0	8,628
3. Humuya	581	601	0.3	1,371	6.1/3.2	1,460	2.0	1,612	2.0	1,780
4. Lamani	2,844	2,850	0.0	3,572	1.6	3,687	1.6	3,992	1.6	4,322
5. Lejamani	1,455	2,127	3.0	3,123	2.8	3,300	2.8	3,789	2.8	4,350
6. San Sebastian	1,269	1,527	1.4	1,506	-0	1,506	1.0	1,583	1.0	1,664
7. Villa de San Antonio	4,408	6,169	2.6	11,429	4.5	12,480	4.0	15,184	4.0	18,474
8. La Paz	8,876	11,775	2.2	19,900	3.8	21,441	3.8	25,836	3.8	31,132
9. Cane	1,164	1,370	1.3	1,937	2.5	2,035	2.0	2,247	2.0	2,481
Total	42,784	62,305	2.9	109,175	4.1	118,373	3.6	141,610	3.6	169,618

表5.2.2(1) 調査地域内農村部の将来人口 (1/2)

Municipality		Year 1988	@(%)	1990	@(%)	1991	@(%)	1992	@(%)	1993	@(%)	1994	@(%)	1995	@(%)
1. Comayagua	(Total)	(59,534)		(65,386)		(68,001)		(70,721)		(73,550)		(76,492)		(79,552)	
	Rural	23,118	38.8	24,621	37.7	25,409	37.4	26,222	37.1	27,061	36.8	27,927	36.5	28,821	36.2
2. Ajuterique	(Total)	(6,803)		(7,078)		(7,220)		(7,364)		(7,511)		(7,662)		(7,815)	
	Rural	3,137	46.1	3,255	46.0	3,320	46.0	3,387	46.0	3,455	46.0	3,524	46.0	3,595	46.0
3. Humuya	(Total)	(1,371)		(1,460)		(1,489)		(1,519)		(1,549)		(1,580)		(1,612)	
	Rural	1,371	100.0	1,460	100.0	1,489	100.0	1,519	100.0	1,549	100.0	1,580	100.0	1,612	100.0
4. Lamani	(Total)	(3,572)		(3,687)		(3,746)		(3,806)		(3,867)		(3,929)		(3,992)	
	Rural	3,572	100.0	3,687	100.0	3,746	100.0	3,806	100.0	3,867	100.0	3,929	100.0	3,992	100.0
5. Lejamani	(Total)	(3,123)		(3,300)		(3,392)		(3,488)		(3,585)		(3,686)		(3,789)	
	Rural	326	10.4	330	10.0	340	10.0	349	10.0	360	10.0	370	10.0	380	10.0
6. San Sebastian	(Total)	(1,506)		(1,506)		(1,521)		(1,536)		(1,552)		(1,567)		(1,583)	
	Rural	1,506	100.0	1,506	100.0	1,521	100.0	1,536	100.0	1,552	100.0	1,567	100.0	1,583	100.0
7. Villa de San Anto.	(Total)	(11,429)		(12,480)		(12,979)		(13,498)		(14,038)		(14,600)		(15,184)	
	Rural	5,683	49.7	6,240	50.0	6,489	50.0	6,749	50.0	7,017	50.0	7,299	50.0	7,590	50.0
8. La Paz	(Total)	(19,900)		(21,441)		(22,256)		(23,101)		(23,979)		(24,890)		(25,836)	
	Rural	8,935	44.9	9,434	44.0	9,793	44.0	10,165	44.0	10,551	44.0	10,952	44.0	11,368	44.0
9. Cane	(Total)	(1,937)		(2,035)		(2,076)		(2,117)		(2,160)		(2,203)		(2,247)	
	Rural	1,937	100.0	2,035	100.0	2,076	100.0	2,117	100.0	2,160	100.0	2,203	100.0	2,247	100.0
Total Municipal.	(Total)	(109,175)		(118,373)		(122,681)		(127,152)		(131,792)		(136,610)		(141,610)	
	Rural	49,585	45.4	52,568	44.4	54,183	44.2	55,850	43.9	57,572	43.7	59,351	43.4	61,188	43.2

表5.2.2(2)　調査地域内農村部の将来人口 (2/2)

Municipality		Year 1996	@(%)	1997	@(%)	1998	@(%)	1999	@(%)	2000	@(%)
1. Comayagua	(Total)	(82,734)		(86,043)		(89,485)		(93,064)		(96,787)	
	Rural	29,743	36.0	30,695	35.7	31,677	35.4	32,690	35.1	33,737	34.9
2. Ajuterique	(Total)	(7,971)		(8,131)		(8,293)		(8,459)		(8,628)	
	Rural	3,667	46.0	3,740	46.0	3,815	46.0	3,892	46.0	3,969	46.0
3. Humuya	(Total)	(1,644)		(1,677)		(1,711)		(1,745)		(1,780)	
	Rural	1,644	100.0	1,677	100.0	1,711	100.0	1,745	100.0	1,780	100.0
4. Lamani	(Total)	(4,056)		(4,121)		(4,187)		(4,254)		(4,322)	
	Rural	4,056	100.0	4,121	100.0	4,187	100.0	4,254	100.0	4,322	100.0
5. Lejamani	(Total)	(3,895)		(4,004)		(4,116)		(4,232)		(4,350)	
	Rural	390	10.0	401	10.0	413	10.0	425	10.0	435	10.0
6. San Sebastian	(Total)	(1,599)		(1,615)		(1,631)		(1,647)		(1,664)	
	Rural	1,599	100.0	1,615	100.0	1,631	100.0	1,647	100.0	1,664	100.0
7. Villa de San Anto.	(Total)	(15,791)		(16,423)		(17,080)		(17,763)		(18,474)	
	Rural	7,895	50.0	8,211	50.0	8,539	50.0	8,879	50.0	9,237	50.0
8. La Paz	(Total)	(26,818)		(27,837)		(28,894)		(29,992)		(31,132)	
	Rural	11,528	43.0	11,966	43.0	12,420	43.0	12,894	43.0	13,075	42.0
9. Cane	(Total)	(2,292)		(2,338)		(2,385)		(2,432)		(2,481)	
	Rural	2,292	100.0	2,338	100.0	2,385	100.0	2,432	100.0	2,481	100.0
Total Municipal.	(Total)	(146,801)		(152,189)		(157,782)		(163,589)		(169,618)	
	Rural	62,814	42.8	64,764	42.6	66,778	42.3	68,858	42.1	70,700	41.7

表5.2.3　村落給水事業の各整備段階給水人口

Year	Projected Rural Population Total	Projected Served Population	(%)
1988	49,585	10,000 1/ (approx.)	(17)
1990	52,568	(10,000)	
1993	57,572	51,800	(90)
1996	62,814	56,500	(90)
2000	70,700	63,600	(90)

Note: 1/ Ref. Table 1.2.1 PRESENT WATER SUPPLIES IN STUDY AREA

表5.2.4　村落給水事業の各整備段階水需要

Year	Served Population	Water Demands (m^3/d)	Water consumption per capita (l/d)
1989/1990	10,000	(250*)	(25)
1993	51,800	2,590	50
1996	56,500	4,520	80
2000	63,600	6,360	100

Note: * Potential demand supposing 25 LPCD

表5.3.1(1) 村落給水事業計画一覧表(1/2)

No.	Community	No. of Households	Population	Type and No. of system 1st Stage	2nd Stage	Dimension & Nos. of Production Wells 4"x50m	4"x100m	6"x50m	6"x100m
<<< Comayagua >>>									
1.	Cacaguapa	74	425	I * 15	---	15	-	-	-
2.	El Roblito	66	434	I * 15	---	15	-	-	-
3.	Los Empates & El Tamboral	40	218	---	I * 10	10	-	-	-
4.	El Motatal	31	182	---	III * 1	-	-	1	-
5.	El Sauce	90	375	III * 1, I * 1	---	1	-	1	-
6.	Piedras Azules			III * 1, I * 1	---	1	-	1	-
7.	Palo Pintado	161	955	III * 1	III * 1	-	-	2	-
8.	Valle de Angeles	145	720	III * 2, I * 2	II * 1	2	-	3	-
9.	Escuela Normal & El Pajonal	4	31	I * 2	---	2	-	-	-
10.	Mata de Cana	27	263	---	III * 1	-	-	1	-
11.	La Zarcita	218	965	III * 1	---	-	-	1	-
12.	Grupo Benito Cadena	12	84	I * 1	---	1	-	-	-
13.	Ojo de Agua	97	497	III * 1, I * 2	II * 2	2	-	3	-
14.	Puente Selguapa, El Pajonal No.1 & El Porvenir	84	503	III * 1, I * 2	---	2	-	1	-
15.	El Taladro	56	368	---	III * 1	-	-	1	-
16.	Jarin & Asentamiento Barrio	28	193	III * 1, I * 2	---	2	-	1	-
17.	La Jaguita	55	405	III * 1, I * 1	---	1	-	1	-
18.	El Paraiso	35	204	III * 1, I * 1	---	1	-	1	-
19.	Col. Nueva Esperanze & Capiro	70	446	III * 2, I * 2	---	2	-	2	-
20.	San Isidro & the suburbs of Comayagua			---	III * 4	-	-	4	-
	Not Specified Area in Comayagua			---	I * 10	10	-	-	-
	Total (Comayagua)			I * 47	I * 20	67	-	-	-
				II * 0	II * 3	-	-	3	-
				III * 13	III * 8	-	-	21	-

表5.3.1(2) 村落給水事業計画一覧表(2/2)

No.	Community	No. of Households	Population	Type and No. of system 1st Stage	2nd Stage	Dimension & Nos. of Production Wells 4"x50m	4"x100m	6"x50m	6"x100m
<<< La Paz >>>									
21.	Las Cascabeles	24	153	I * 1	III * 1	1	-	1	-
22.	Lo de Reina	29	208	I * 1	III * 1	1	-	1	-
23.	Playitas			III * 1, I * 4	II * 3	4	-	4	-
24.	Las Liconas	86	298	---	II * 2	-	-	2	-
25.	Las Pozos, Los Capantillos & Las Paredos	22	221	III * 1, I * 1	---	1	-	1	-
26.	Pacon & El Sifon	46	258	III * 1, I * 2	---	2	-	1	-
27.	Camino Nuevo	46	141	---	III * 1	-	-	1	-
28.	San Jose	44	227	III * 1	---	-	-	-	1
29.	Las Mecedes & El Varillal	111	519	III * 1	---	-	-	1	-
30.	Humuya	91	400	III * 1	---	-	-	-	1
31.	La Vajilla			---	III * 1	-	-	1	-
32.	Agua Salada			---	III * 1	-	-	-	1
33.	Los Pintores & Choco	326	1749	III * 2, I * 2	III * 1	-	2	-	3
34.	Lamani			---	III * 1	-	-	-	1
35.	El Paraiso	40	176	III * 1, I * 2	---	-	2	-	1
36.	El Sonzapote	7	50	---	II * 1	-	-	-	1
37.	El Mesetas	7	29	---	II * 1	-	-	-	1
	Total (La paz)			I * 13	I * 0	9	4	-	-
				II * 0	II * 7	-	-	5	2
				III * 9	III * 7	-	-	8	8
		Total							
	Ground Total	I * 80		I * 60	I * 20	76	4	-	-
		II * 10		II * 0	II * 10	-	-	8	2
		III * 37		III * 22	III * 15	-	-	29	8
					Total	76	4	37	10

表5.4.1 事業費積算結果

Unit: Lps 10^3

Item	1st Stage			2nd Stage			Total of 1st & 2nd Stage		
	FC	LC	total	FC	LC	total	FC	LC	total
Direct Construction Cost									
Well Drilling	7,996	876	8,872	2,496	681	3,177	10,492	1,557	12,049
Pipe & facility installation	4,112	4,545	8,657	3,497	3,301	6,798	7,609	7,846	15,455
Work shop & Mainte. Equip.	992	0	992	183	0	183	1,175	0	1,175
sub-total	13,100	5,421	18,521	6,176	3,982	10,158	19,276	9,403	28,680
Engineering & Administration	1,619	268	1,887	1,382	235	1,617	3,001	503	3,504
Physical Contingency	2,208	853	3,061	1,133	632	1,765	3,341	1,485	4,826
Total	16,927	6,542	23,469	8,691	4,849	13,540	25,618	11,391	37,010
Price Contingency	4,232	2,177	6,409	6,390	4,163	10,553	10,622	6,340	16,962
Grand Total	21,159	8,719	29,878	15,081	9,012	24,093	36,240	17,731	53,972

表5.4.2　事業費の年別支払計画

I. 1st Stage

Unit: Lps 10^3

Item	Total		1990		1991		1992		1993	
	FC	LC	FC	LC	FC	LC	FC	LC	FC	LC
Direct Construction Cost	13,100	5,421	0	0	10,361	1,355	1,826	2,711	913	1,355
Engineering & Administration	1,619	268	277	29	335	60	671	119	336	60
sub-total	14,719	5,688	277	29	10,696	1,415	2,497	2,830	1,249	1,415
Physical Contingency	2,208	853	41	4	1,605	212	375	425	187	212
Total	16,927	6,542	318	33	12,301	1,627	2,872	3,255	1,436	1,627
Price Contingency	4,232	2,177	32	3	2,583	342	951	1,077	666	755
Ground Total	21,159	8,719	350	36	14,884	1,969	3,823	4,332	2,102	2,382

II. 2nd Stage

Unit: Lps 10^3

Item	Total		1990		1991		1992	
	FC	LC	FC	LC	FC	LC	FC	LC
Direct Construction Cost	6,176	3,982	3,506	0	1,335	1,991	1,335	1,991
Engineering & Administration	1,382	235	276	29	553	103	553	103
sub-total	7,558	4,216	3,782	29	1,888	2,094	1,888	2,094
Physical Contingency	1,133	632	567	4	283	314	283	314
Total	8,691	4,849	4,349	33	2,171	2,408	2,171	2,408
Price Contingency	6,390	4,163	2,655	20	1,675	1,858	2,060	2,285
Ground Total	15,081	9,012	7,004	53	3,846	4,266	4,231	4,693

表5.4.3　施設の運営維持管理費

Unit: Lps 10^3

Year in Order	Year	O&M Cost		Replacement Cost	Residual Value of Equipment	Total
		Facilities and others	Supporting Vehicles			
1	1990	0	0	0	0	0
2	1991	0	0	0	0	0
3	1992	113	0	0	0	113
4	1993	241	0	0	0	241
5	1994	315	0	0	0	315
6	1995	315	0	0	0	315
7	1996	419	0	0	(1,056)	419
8	1997	524	0	0	0	524
9	1998	524	90	0	0	614
10	1999	524	90	0	0	614
11	2000	524	90	0	0	614
12	2001	524	90	0	0	614
13	2002	524	90	0	0	614
14	2003	524	90	0	0	614
15	2004	524	90	0	0	614
16	2005	524	90	0	0	614
17	2006	449	90	839	0	1,378
18	2007	449	90	1,057	0	1,596
19	2008	449	90	97	0	636
20	2009	524	90	0	0	614
21	2010	512	90	999	0	1,601
22	2011	512	90	842	0	1,444
23	2012	524	90	0	0	614
24	2013	524	90	0	0	614
25	2014	524	90	0	0	614
26	2015	524	90	0	0	614
27	2016	524	90	0	0	614
28	2017	524	90	0	0	614
29	2018	524	90	0	0	614
30	2019	524	90	0	0	614

表5.5.1　経済的費用と便益

Unit: 10^3 Lps.

Year	Economic Cost			Economic Benefit
	Construction cost	OMR cost	Total	
1. 1990	345	0	345	0
2. 1991	13,644	0	13,644	0
3. 1992	5,559	95	5,654	992
4. 1993	2,779	206	2,985	2,151
5. 1994	4,376	269	4,645	2,809
6. 1995	4,158	269	4,427	2,809
7. 1996	4,158	357	4,515	4,288 *1
8. 1997	0	447	447	4,083
9. 1998	0	524	524	4,083
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
16. 2005	0	524	524	4,083
17. 2006	0	1,299	1,299	4,083
18. 2007	0	1,517	1,517	4,083
19. 2008	0	557	557	4,083
20. 2009	0	524	524	4,083
21. 2010	0	1,513	1,513	4,083
22. 2011	0	1,356	1,356	4,083
23. 2012	0	524	524	4,083
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
30. 2019	0	524	524	4,083

Note: *1 includes residual value of Lps. 1,056 thousand

表6.2.1　村落給水事業で計画する給水施設の概要

Component	Unit	Quantity 1st. stage	2nd. stage	Total
1. D 4" Deep well, equiped with sylinder type head pump				
Type I　D 4" * 50 m	unit	56	20	76
D 4" * 100 m	unit	4	0	4
total		60	20	80
2. D 6" Deep well, equiped with electric motor pump				
Type II　D 6" * 50 m	unit	0	8	8
D 6" * 100 m	unit	0	2	2
Type III　D 6" * 50 m	unit	17	12	29
D 6" * 100 m	unit	5	3	8
total		22	25	47
3. Elevated FRP water tank V 20 m^3, H 8 m, with suppoting strucrure	unit	22	7	29
4. FRP water tank V 8 m^3, H 3 m	unit	32	43	75
5. Public bath house	unit	54	50	104
6. Public stand pipe	unit	100	50	150
7. Distribution pipes				
D 80 mm	m	14,200	8,400	22,600
D 40 mm	m	24,500	10,500	35,000
Miscellaneous works	lot	1	1	2