6.3 Direct Construction Costs

Direct construction cost for work items are presented below and breakdown of direct cost is shown in Table 6.2.1. Breakdown of Direct Cost.

Item	Foreign	Local	Total
1. Water Production/Supply System			
(1) Type I Manual Power Pump System	48,465	7,916	56,381
(2) Type II Motorized Pump System	5,783	5,510	11,293
(3) Type III Reservoir Filtration Distribution System	4,278	6,685	10,963
(4) Type IV Water Wagon Distribution System	1,146	658	1,804
Sub-Total	59,672	2,079	80,441
2. O/M Facilities/Equipments	3,650	684	4,334
3. Access Road Improvement/ Construction Works	190	1,715	1,905
4. Monitoring System	1,137	1,644	2,781
5. Preparatory Works (3% of Local Cost)	-	744	744
Total	64,649	25,556	90,205

TABLES

Table 1.1 Water Supply Service Rate in Dominican Republic (1988)

	Total Locality	Overall Population (a)	Service Locality	Service Population (b)	Water Service Rate % (b/a)
Urban Area	130	1,669,528	128	1,349,870	81
Rural Area	8,615	2,613,004	1,507	572,862	22
Total	-	4,282,532	-	1,922,732	45

Table 1.2 Water Supply Service Rate in Four Western Provinces (1988)

Population / Province	Urban Area			Rural Area			Total		
	Population	Service P.	Service Rate	Population	Service P.	Service Rate	Population	Service Pop.	Service Rate
MONTE CRISTI	34,232	34,184	99	57,055	2,554	4	91,287	36,738	40
DAJABON	19,516	19,516	100	43,645	18,856	45	63,161	38,372	61
ELIAS PIÑA	14,956	12,295	82	56,605	1,954	3	71,561	14,249	20
INDEPENDENCIA	23,209	23,209	100	19,221	4,086	21	42,430	27,295	64
Total	91,913	89,204	97	176,526	27,450	16	268,439	116,654	43

Table 1.3 Population Census in Four Western Provinces

PROVINCES	URBAN POPULATION		RURAL POPULATION								TOTAL POPULATION
			Under 200		200~400		Over 400		TOTAL		
	No. of cities	Population	No. of villages	Population	No.	Population	No.	Population	No. of cities	Population	
Monte Cristi	6	30,837	63	6,028	35	10,003	45	36,023	148	52,054	82,891
Dajabon	4	17,513	98	11,208	53	14,997	16	13,208	167	38,413	56,926
Elias Piña	5	12,866	205	19,142	55	14,976	27	18,401	287	52,519	65,385
Independencia	6	28,593	46	3,125	11	2,857	10	12,306	64	18,288	46,881
Total	21	89,809	417	39,503	154	42,838	98	77,938	669	162,274	252,083

Note: ☐ Proposed Area

Source : Detail data of the 1981 population census.

Table 1.4 INAPA Water Supply System

Population	Water Supply System	Water Supply Method
Less than 200	Hand Pumps	A point water service from community wells
200 - 400	Windmill Pumps	Borehole → Windmill pump → Elevated reservoir → Communal faucet
More than 400	Water Pipeline	Borehole → Submersible pump → Distribution pipeline → Communal faucet, or water treatment of the surface water → Distribution pipeline

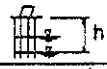
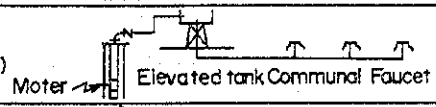
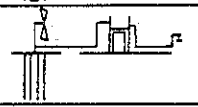
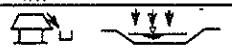
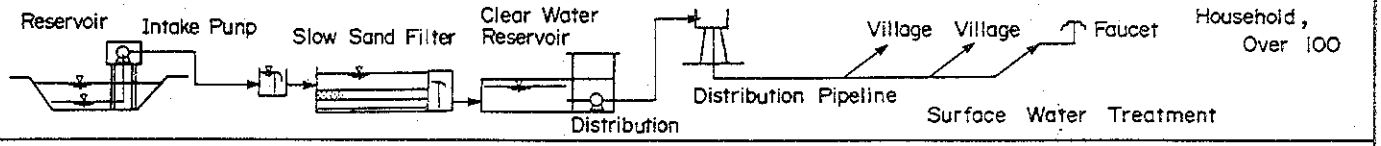
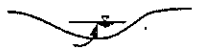
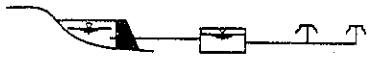
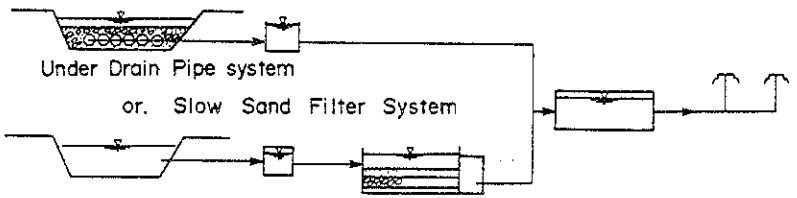
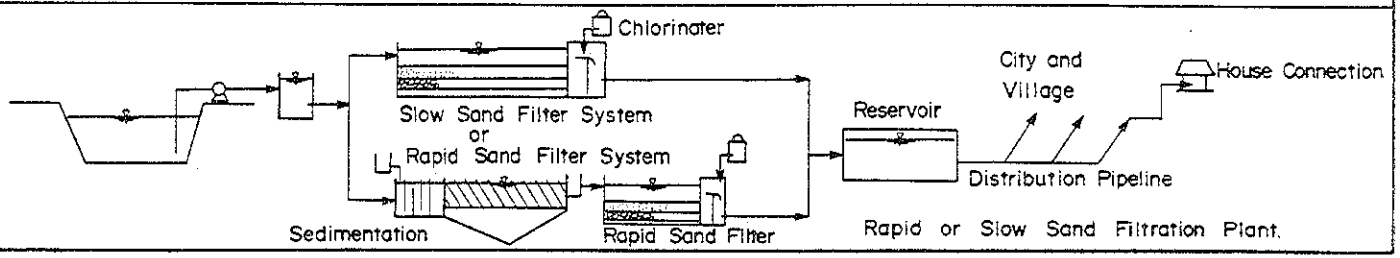
Table 1.5 Water Consumption Standard

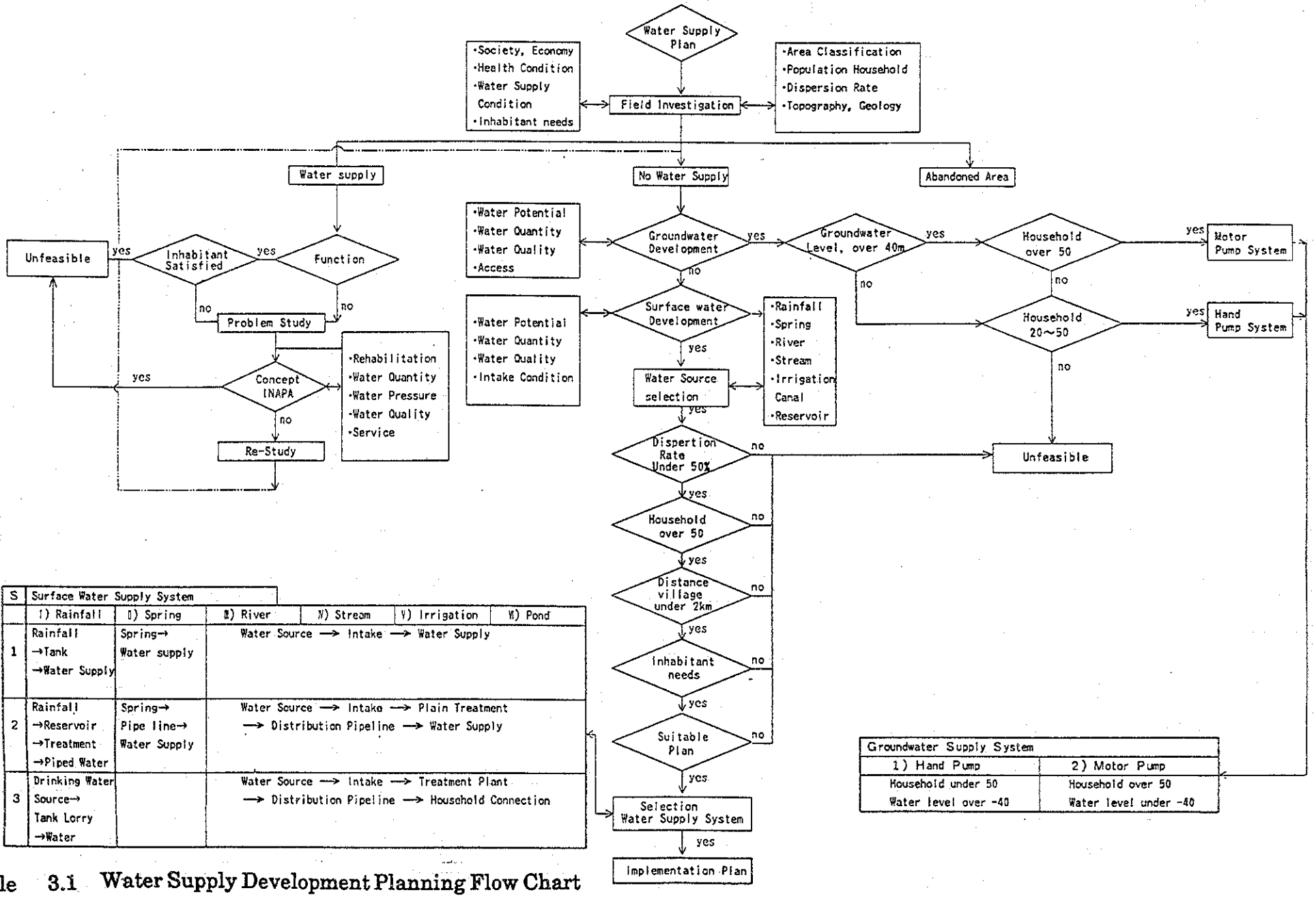
Population	Water Consumption	Water Supply System
Less than 5,000	150 l/c/d	House connection
5,001 - 10,000	150	do
10,001 - 30,000	200	do
30,001 - 70,000	250	do
70,001 - 150,000	300	do
Daily maximum demand = (Service {p[i;atopm)×(Average Water Consumption)×1.2 Hourly maximum demand = (Service {p[i;atopm)×(Average Water Consumption)×1.8		
200~5,000	40 l/c/d	Hand pump system, walking distance less than 500 m
	60	Hand pump system, walking distance less than 500 m Communal faucet, walking distance more than 500 m
	100	Communal faucet, walking distance less than 500 m
	150	Household connection
More than 5,000	Same as INAPA standard	
The daily maximum and hourly maximum amount are the same as the INAPA Standard		

Table 1.6 Drinking Water Quality Standard

	Drnking Water Quality Standard				
	Japan	INAPA		W.H.O.	
		Desirable Level	Maximum Permissible Level	Desirable Level	Maximum Permissible Level
Acid-Carbopnate HCO_3 (mg/ℓ)					
Chlorine $C\ell$ (mg/ℓ)	<200	200	600	200	600
Sulfate SO_4 (mg/ℓ)		200	400	200	400
Potassium K (mg/ℓ)		–	–	–	–
Sodium Na (mg/ℓ)		–	–	–	–
Calcium Ca (mg/ℓ)		187.5	500	75	200
Magnesium Mg (mg/ℓ)		125	600	30	150
Nitrogen-Nitrate NO_3-N (mg/ℓ)	<10	45		10	
Nitrogen-Nitrate NO_2-N (mg/ℓ)	Not simultaneously with NH_4-N				
Nitrogen-Ammonium NH_4-N (mg/ℓ)	Not simultaneously with NO_2-N				
Fluorine F (mg/ℓ)	<0.8	0.6	1.7	0.6	
Phosphorus P_2O_5	–	–	–	–	–
Hexavalent Chromium Cr^6 (mg/ℓ)	<0.05	–	–	0.05	
Total Iron Fe (mg/ℓ)	<0.3	0.1	1.0	0.1	1.0
Copper Cu (mg/ℓ)	<1.0	–	–	0.05	1.5
Zinc Zn (mg/ℓ)	<1.0	–	–	–	–
Manganese Mn (mg/ℓ)	<0.3	0.05	0.5	0.05	0.5
lead Pb (mg/ℓ)	<0.1	–	–	0.1	
Total-Hardness	<300	100	500	100	500
pH	5.8~8.6	6.5	9.2	6.5	9.2
Turbidity (°C)	<2	5	25	5	25
Color (Kind)	<5	5	50	15	50
Odor (Kind)					
Temperature (°C)		not offensive		not offensive	
Total Solids	<500	500	1500	500	1500
Alcalinity	–	400		–	–
$KMnO_4$ (mg/ℓ)				–	–
Bacillus (general)	100			–	–
Colon bacillus	None				

Table 2.1 Classification of the Water Supply System

Water Source		Water Supply System	Standard Condition
G. Groundwater	I) Borehole	1)  Hand Pump	Household ; Under 50 and Over 20 Water Level ; $h_D < 40^m$
		2)  Motorized Pump	Household ; Over 50 Water level ; $h_D < 40^m$
		3)  Windmill Pump	Population ; 200 400, Wind Velocity $3.0^{m/s}$ Water Level ; $h_D < 40^m$
S. Surface Water	I) Rain Water	1)  Collected from Tank or Reservoir	
		2) 	
	II) Spring Water	1)  Collected by Person	
		2)  Collected by Public	
	III) River IV) Stream V) Irrigation Canal VI) Reservoir	1)  Collected by Person, boiled before Drinking	
		2)  Semi Water Treatment Plant. Without Chlorine Application	
		3)  Rapid or Slow Sand Filtration Plant.	



S	Surface Water Supply System					
	I) Rainfall	II) Spring	III) River	IV) Stream	V) Irrigation	VI) Pond
1	Rainfall →Tank →Water Supply	Spring→ Water supply	Water Source → Intake → Water Supply			
2	Rainfall →Reservoir →Treatment →Piped Water	Spring→ Pipe line→ Water Supply	Water Source → Intake → Plain Treatment → Distribution Pipeline → Water Supply			
3	Drinking Water Source→ Tank Lorry →Water		Water Source → Intake → Treatment Plant → Distribution Pipeline → Household Connection			

Groundwater Supply System	
1) Hand Pump	2) Motor Pump
Household under 50	Household over 50
Water level over -40	Water level under -40

Table 3.1 Water Supply Development Planning Flow Chart

Table 3.2 Classification of the Existing Water Supply System

Water Source	Water Supply System	Condition
G. Groundwater	Ⅰ. Hand Pump Ⅱ. Motorized Pump Ⅲ. Windmill Pump	1) Broken; poor water quality; not used at present 2) Presently used but with insufficient amount 3) Effectively functioning
S. Surface Water	Ⅰ. Rain Water Ⅱ. Spring	1) Insufficient all year round 2) Insufficient during the dry season 3) Sufficient
	Ⅲ. River Ⅳ. Stream Ⅴ. Irrigation Canal Ⅵ. Reservoir	1) Boiled before drinking 2) Plain water treatment system, without chlorine application 3) Final water treatment system, with chlorine application

Table 3.3.1 Water Supply Development Plan Monte Cristi Province 1/2

Monte Cristi		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
				ℓ/c/d	ℓ/min										
1	El Duro	80	480	60	72	Canal	S-V-1)	Very poor	From Monte Cristi City Water Supply				S-III-3)	S-C	×
2	Esabel de Torres	72	311	15	4	Rainfall	S-I-1)	Very poor	Tank Lorry Supply				S-I-1)	S-B	○
3	Hato Viejo	32	150	40	15	River	S-III-1)	Very poor	G	High	Good	Good	G-I-1)	G-A	○
4	Las Aquitas	153	692	40	23	Rainfall	S-I-1)	Very poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
5	Paladero				Dispersed		Dispersed							-	-
6	Las Clavellinas				Dispersed		Dispersed							-	-
7	La Pinta	156	680	60	102	Hand P.×4	G-I-2)	Poor	G	High	Poor	Good	G-I-2)	G-A	○
8	Batey Higuero	501	2,253	100	187	River Canal	S-III/V-1)	Very poor	G	High	Good	Good	G-I-2)	G-A	○
9	Las Penás	63	277	100	23	River	S-III-3)	Good	From Monte Cristi City Water Supply				S-III-3)	S-C	×
10	Batey Juliana	60	340	60	17	River	S-III-3)	Good	From Maguaca Treatment Plant Supply				S-III-3)	S-C	×
11	Los Conucos	98	483	40	16	Rainfall	S-I-1)	Very poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
12	Paso Real				Dispersed		Dispersed							-	-
13	Cerro Gordo Arriba	98	431	100	36	River	S-III-1)	Very poor	G	High	Good	Good	G-I-2)	G-A	○
14	Penà Ranchaderos	97	432	100	36	River	S-III-1)	Very poor	G	High	Good	Good	G-I-2)	G-A	○
15	Los Gorilas				Dispersed		Dispersed							-	-
16	El Papayo	63	277	100	23	Spring	S-II-3)	Good	Spring Water Supply by INAPA				S-II-2)	S-C	×
17	Estero Balsa	53	233	40	8	Spring	S-II-1)	Very poor	Tank Lorry Supply				S-I-1)	S-B	○
18	Cabeza de Toro	80	560	60	28	River	S-III-1)	Poor	G	Very low (Water level -60m)	Poor	Good	S-III-1)	S-C	×
19	Guayubincito	94	429	60	21	River	S-III-1)	Poor	G	Very low	Poor	Good	S-III-1)	S-C	×
20	El Mangal	55	241	100	17	River	S-III-3)	Good	From Guajubin City Water Supply				S-III-3)	S-C	×
21	El Cayal	97	424	40	14	Reservoir	S-VI-1)	Very poor	Surface Water Treatment Plant Supply				S-VI-3)	S-A	○
22	Hato al Medio Arriba	68	300	150	37	River	S-III-3)	Good	From Jaibon City Water Supply				S-III-3)	S-C	×
23	Los Amaceyes	50	218	40	18	River	S-III-1)	Very poor	G	Very low (Water level -60m)	Poor	Good	S-III-1)	S-C	×

Table 3.3.1 Water Supply Development Plan Monte Cristi Province 2/2

Monte Cristi		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
24	Jobo Corcobado	471	2,068	60 ℓ/c/d	103 ℓ/min	Canal	S-V -1)	Very Poor	G	High	Good	Good	G-I -2)	G-A	○
25	Gozuela	200	1,500	100	125	Borehole	G-I -2)	Poor	G	High	Good	Good	G-I -2)	G-A	○
26	Baitoa				Village		Dispersion							–	–
27	Sanita	95	760	40	76	Spring Canal	G-$\frac{II}{V}$ -1)	Poor	G	Low	Low	Good	G-I -1)	G-B	○
28	Marmoleja				Dispersed		Dispersed							–	–
29	La Cabuya				Dispersed		Dispersed							–	–
30	Buen Hombre	89	423	40	14	Rainfall	S-I -1)	Very Poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
31	Las Canas	70	245	40	8	Rainfall	S-I -1)	Very Poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
32	Las Brigidas	19	95	40	3	Rainfall	S-I -1)	Very Poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
33	Loma Atravezada	67	280	40	12	Rainfall	S-I -1)	Very Poor	Tank Lorry Supply				S-I -1)	S-B	○
34	Sabana Cruz	148	647	40	21	Rainfall	S-I -1)	Very Poor	Surface Water Treatment Supply				S-VI-3)	S-A	○
35	El Cacao				Village		Dispersion							–	–
36	La Horca	63	263	40	26	River Borehole	S-III -1) G-III -2)	Poor	G	Very Low	Poor	Good	S-III -3)	S-C	×
37	El Mansutia	92	336	40	11	Rainfall	S-I -1)	Very Poor	Tank Lorry Supply				S-I -1)	S-B	○
	Total	3,248	15,828		1,089 ℓ/min										

Note: Groundwater Development
- ○ G-A, 7
- ○ G-B, 1
- × G-C, –

} Implementation Plan: 8 villages

Surface Water Development
- ○ S-A, 7
- ○ S-B, 4

} Implementation Plan: 11 villages

} 19 villages

- × S-C, 10 { Existing water supply: 6 villages; Ground water potential very low and water level over -40m: 4 villages }
- Dispersed Villages – 8

Table 3.3.2 Water Supply Development Plan Dajabon Province 1/3

Dajabon		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
				ℓ/c/d	ℓ/min										
1	Palo Blanco	93	366	60	18	Borehole	G-Ⅰ-1)	Good	JICA	Model construction			G-Ⅰ-2)	G-C	×
2	Cayaco	94	377	40	56	Hand Pump×4	G-Ⅰ-2)	Poor	G	High	Good	Good	G-Ⅰ-2)	G-A	○
3	Laja	50	400	40	40	Hand Pump×4	G-Ⅰ-2)	Poor	G	High	Good	Good	G-Ⅰ-1)	G-B	○
4	La Cienage	138	712	40	70	Hand Pump×4	G-Ⅰ-3)	Good	G	High	Good	Good	G-Ⅰ-1)	G-C	×
5	Clavellina	102	418	40	62	Hand Pump×1	G-Ⅰ-1)	Poor	G	High	Good	Good	G-Ⅰ-1)	G-B	○
6	Sabana Santiago	92	396	40	40	Hand Pump×	G-Ⅰ-3)	Good	G	High	Good	Good	G-Ⅰ-1)	G-C	×
7	El Rodeo	328	1,697	60	84	Hand Pump×4 River	G-Ⅰ-3)	Good	INAPA'S under Construction					S-C	×
8	La Gorra	131	642	60	32	Hand Pump×5	G-Ⅰ-2)	Very poor	G	Low	Poor	Good	G-Ⅰ-1)	G-A	○
9	La Barrera	42	198	40	20	Hand Pump×1	G-Ⅰ-2)	Poor	G	Low	Poor	Good	G-Ⅰ-1)	G-B	○
10	El Estrecho	25	200	40	20	Hand Pump×1	G-Ⅰ-1)	Very poor	G	Low	Poor	Good	G-Ⅰ-1)	G-A	○
11	El Llano	65	276	40	27	Hand Pump×1 River	G-Ⅰ-1 S-Ⅲ-1)	Very poor	G	Low	Poor	Good	G-Ⅰ-1)	G-A	○
12	Tamarindo	32	186	40	19	River	S-Ⅲ-1)	Poor	G	Low	Poor	Very poor	S-Ⅲ-1)	S-C	×
13	La Peñita	89	388	40	39	Hand Pump×1 Reservoir	G-Ⅰ-1 S-Ⅵ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
14	Pueblo Nuevo	65	243	40	24	Stream	S-Ⅳ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
15	La Ceiha	300	2,400	60	120	River	S-Ⅲ-3)	Good	S	Rio Masacre Treatment Plant Supply				S-C	×
16	Castellar	43	344	60	17	River	S-Ⅲ-3)	Poor	S	Expation D-5 La Ceiba. INAPA				S-C	×
17	Masaquito				Village		Dispersion							-	-
18	El Cajuil	78	390	40	39	Hand Pump River	G-Ⅰ-1) S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
19	Arroyo Azul	16	128	40	13	River	S-Ⅲ-1)	Poor	G	Low	Good	Very poor	S-Ⅲ-1)	S-C	×
20	El Aguacate	57	312	40	31	River Hand P.×1	S-Ⅲ-1) G-Ⅰ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
21	La Peñita	69	374	40	37	River Hand P.×1	S-Ⅲ-1) G-Ⅰ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
22	Los Pozos	20	120	40	4	River	FUDECO'S Constructing at present							S-C	×
23	La Avanzada	35	210	40	21	Spring	S-Ⅱ-2	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○

Table 3.3.2 Water Supply Development Plan Dajabon Province 2/3

Dajabon		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
				ℓ/c/d	ℓ/min										
24	Palo Blanco	50	296	40										S-C	×
25	Arroyo de la Jagua	60	360	40	40	River	FUDECO's constructing at present for household connection							S-C	×
26	La Jagua	90	540	40										S-C	×
27	La Luisa	83	407	60	20	River	FUDECO construction							S-C	×
28	Los Cacaos	7	34	40	1	River	S-Ⅲ-1)	Poor	Village Dispersion					-	-
29	Sabana Gurabo	273	1,638	60	82	River	INAPA construction							S-C	×
30	Los Sosias	5	120	40	4	River	S-Ⅲ-1)	Poor	Village Dispersion					-	-
31	Pinal Claro	71	347	40	34	Hand pump×2	G-Ⅰ-2)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
32	Paso de Jacinto	25	120	60	6	Stream	S-Ⅳ-3)	Good	From Monte Grande					S-C	×
33	Piedra Blanca	49	400	40	40	River Hand pump×4	S-Ⅲ-1) G-Ⅰ-2)	Good	G	Low	Good	Good	G-Ⅰ-1)	G-C	×
34	La Hoya	38	228	40	23	Hand pump×1 River	G-Ⅰ-1) S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
35	Los Indios	70	349	60	17	Partido River	S-Ⅲ-1)	Good	From Partido Water Supply					S-C	×
36	La Pinã	81	377	60	18	Partido River	S-Ⅲ-1)	Poor	From Partido Water Supply					S-C	×
37	Partido	68	334	60	17	River	S-Ⅲ-2)	Good	Partido Slow Sand Filtration Plant Supply					S-C	×
38	Sangre Linda	87	439	60	22	Partido Hand pump×2	G-Ⅰ-2)	Good	From Partido Water Supply					S-C	×
39	Buen Gusto	79	328	40	33	Hand pump×1 River	G-Ⅰ-1) S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
40	La Culata	63	378	60	19	Partido	S-Ⅲ-2)	Good	From Partido Water Supply					S-C	×
41	La Huasima	825	4,950	60	247	River	S-Ⅲ-1)	Poor	From River Intake and Plain Treatment Supply					S-C	×
42	Vaca Gorda													S-C	×
43	Aminilla	133	677	47	68	Hand pump×6	G-Ⅰ-2)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
44	Carrizal	72	432	60	21	Stream	S-Ⅳ-2	Good	Construction by FUDECO					S-C	×
45	Mariano Cestero	95	570	40	56	Hand pump×1 River	G-Ⅰ-2) S-Ⅲ-1)	Very poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
46	Jimenez Abaja	52	312	40	31	River	S-Ⅲ-1)	Poor	From Restaracion Water Supply					S-C	×

Table 3.3.2 Water Supply Development Plan Dajabon Province 3/3

Dajabon		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
47	La Pocilga	20	138	40 ℓ/c/d	14 ℓ/min	Spring	S-Ⅱ-1)	Poor	Dispersed					-	-
48	Agua Blanca	50	300	40	30	Spring	S-Ⅱ-1)	Poor	G	Very low	Good	Very poor	S-Ⅱ-1)	S-C	×
49	Valle Nuevo	52	312	40	21	River	S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
50	Neyta	32	192	40	19	River	S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
51	Los Cerezoso Quita	18	108	40	10	River	S-Ⅲ-2)	Good	Construction by FUDECO					S-C	×
52	Manpaque	10	60	40	1	Spring	S-Ⅱ-1)	Poor	Dispersed					-	-
53	Monte Grande	99	594	60	30	Plain treatment plant from river by INAPA								S-C	×
54	Manuel Bueno	172	1,032	60	52	Plain treatment plant from river by FUDECO with No.24, 25, 26								S-C	×
55	Las Lagunas	87	522	40	52	River	S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-B	○
	Total	4,870	27,671		1,861 ℓ/min										

Note: Groundwater Development
- ○ G-A, 6
- ○ G-B, 15
- × G-C, 4

} Implementation Plan: 21 villages
Water Supply Condition Good at Present: 4

Surface Water Development
- ○ S-A, -
- ○ S-B, -

} Implementation Plan: 0

× S-C, 25 Existing Water Supply: 22 villages; Access very poor: 3 villages

Dispersed Villages - 5 Less than 20 Households

Total 55

Table 3.3.3 Water Supply Development Plan Elias Piña Province 1/3

Elias Piña		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
1	Guazumal Arriba	24	192	60 ℓ/c/d	10 ℓ/min	River	S-Ⅲ-1)	Poor	From Elias Pina City water supply					S-C	×
2	Sabacón Abajo	27	162	40	16	River	S-Ⅲ-1)	Poor	G	Low	Good	Very poor	S-Ⅲ-1)	S-C	×
3	El Cedro	41	175	40	17	Spring	S-Ⅱ-1)	Poor	G	Very low	Good	Poor	S-Ⅲ-1)	S-C	×
4	Los Corocitos	84	484	40	48	River	S-Ⅲ-1)	Poor	G	Very low	Good	Poor	S-Ⅲ-1)	S-C	×
5	La Cabra-El Cerro	35	210	40	21	River	S-Ⅲ-1)	Poor	G	Very low	Good	Very poor	S-Ⅲ-1)	S-C	×
6	Sabana Campo	30	180	40	18	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
7	Potroso	92	552	60	28	River	S-Ⅲ-1)	Poor	From Canderon water supply by INAPA					S-C	×
8	Macasia	115	690	40	69	Hand pump×6	G-Ⅰ-2)	Very poor	G	Low	Good	Poor	G-Ⅰ-1)	G-A	○
9	Carrera Verde	35	210	40	21	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
10	Lamedero	35	210	40	21	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
11	La Margarita	188	1,128	60	56	Hand pump×2	G-Ⅰ-1)	Poor	G	Very low	Good	Good	S-Ⅲ-1)	S-C	×
12	Pozo Hondo	46	276	40	27	River	S-Ⅲ-1)	Poor	G	Low	Good	Very poor	S-Ⅲ-1)	S-C	×
13	Hato Nuevo	33	198	40	20	River	S-Ⅲ-1)	Poor	G	Low	Good	Very poor	S-Ⅲ-1)	S-C	×
14	El Hueso	63	346	40	34	Spring	S-Ⅱ-1)	Poor	From Elias Pina City water supply					S-C	×
15	El Duan	43	237	40	43	Spring	S-Ⅱ-1)	Poor	From Elias Pina City water supply					S-C	×
16	El Cañita	25	138	40	14	Spring	S-Ⅱ-1)	Poor	G	Low	Good	Very poor	S-Ⅱ-1)	S-C	×
17	Los Memisos	30	180	40	18	Spring	S-Ⅱ-1)	Poor	G	Low	Good	Very poor	S-Ⅱ-1)	S-C	×
18	Mata Bonita	21	126	40	13	River	S-Ⅲ-1)	Poor	G	Very low	Good	Poor	S-Ⅲ-1)	S-C	×
19	El Mamoncito	55	313	40	32	Hand pump×1 River	G-Ⅰ-2) S-Ⅲ-1)	Very poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
20	El Fondo	60	329	40	33	From Pedro Santana water supply								S-C	×
21	San Andrés	19	114	40	11	Canal	S-Ⅴ-1)		G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
22	Guayabal	114	629	40	44	Hand pump×2	G-Ⅰ-2)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
23	Hato Viejo	47	259	40	26	Hand pump×3	G-Ⅰ-1)	Very poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○

Table 3.3.3 Water Supply Development Plan Elias Piña Province 2/3

Elias Pina		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
24	Pilón	50	300	40 ℓ/c/d	30 ℓ/min	Hand Pump×1	G-Ⅰ-1)	Very poor	G	Low	Good	Poor	G-Ⅰ-1)	G-A	○
25	Guaroa	36	216	40	21	Hand Pump×2	G-Ⅰ-1)	Very poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
26	Los Yareyes	60	332	40	33	Wind Pump Hand Pump	G-Ⅰ-3) G-Ⅰ-1)	Very poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
27	El Cantón	39	234	40	8	FUDECO construction water supply								S-C	×
28	Benancio	128	808	40	81	Hand pump×9 River	G-Ⅰ-2) S-Ⅲ-1)	Poor	G	Low	Very poor	Good	S-Ⅲ-1)	S-C	×
29	Bruno	42	252	40	25	Canal	S-Ⅴ-1)	Poor	G	Very low	Poor	Good	S-Ⅴ-1)	S-C	×
30	La Joya	70	420	60	21	River	S-Ⅲ-1)	Poor	From Elias Pina city water supply					S-C	×
31	Palo Seco	64	350	40	35	Spring	S-Ⅱ-1)	Poor	G	Very low	Poor	Good	S-Ⅱ-1)	S-C	×
32	Juan Cano	39	234	40	23	Spring	S-Ⅱ-1)	Very poor	G	Low	Poor	Good	G-Ⅰ-1)	G-A	○
33	La Lajita	69	414	40	41	Spring	S-Ⅱ-1)	Poor	G	Very low	Poor	Good	S-Ⅱ-1)	S-C	×
34	Las Lagunas	77	365	40	36	Spring	S-Ⅱ-2)	Very poor	G	Very low	Good	Very poor	S-Ⅱ-1)	S-C	×
35	Yerba Buena	49	225	40	22	Stream	S-Ⅳ-1)	Poor	S	Good	Good	Very poor	S-Ⅳ-1)	S-C	×
36	Cañada del Barrero	42	225	40	22	River	S-Ⅲ-1)	Poor	G	Low	Good	Good	G-Ⅰ-1)	G-A	○
37	Sonador	250	1,500	2154 40	72	From Sonador water supply by INAPA								S-C	×
38	La Sajonada	70	420											S-C	×
39	Los Ranchitos	39	234											S-C	×
40	Los Mesas	40	240	40	8	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
41	Los Caños	33	198	40	7	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-B	○
42	Los Pajaritos	30	180	250 40	12	FUDECO construction water supply								S-C	×
43	Boca del Botads	42	170											S-C	×
44	Los Jaquelles	20	120	40	4	River	S-Ⅲ-1)	Poor	Dispersed					-	-
45	Los Botados de Victorino	5	30	40	1	River	S-Ⅲ-1)	Poor	Dispersed					-	-

Table 3.3.3 Water Supply Development Plan Elias Piña Province 3/3

Elias Pina		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
46	Sabana de la Lomo	118	708	906 ℓ/c/d 40	30 ℓ/min	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-A	○
47	Juan García	33	198						G	Low	Good	Poor	G-Ⅰ-1)	G-A	○
48	Madre Vieja	54	324	40	11	River	S-Ⅲ-1)	Poor	G	Low	Good	Poor	G-Ⅰ-1)	G-A	○
49	El Corbano	27	102	40	3	Hand pump×1 River	S-Ⅰ-2) S-Ⅲ-1)	Poor	G	Very low	Good	Poor	S-Ⅲ-1)	S-C	×
50	Arroyo Grande	24	144	40	5	Stream	S-Ⅳ-1)	Poor	G	Low	Good	Very poor	S-Ⅳ-1)	S-C	×
51	El Pomito	14	84	40	3	Stream	S-Ⅳ-1)	Poor	G	Low	Good	Very poor	S-Ⅳ-1)	S-C	×
52	Robinzar	65	390	40	13	Stream	S-Ⅳ-1)	Poor	From Dio Limio City Water Supply Plan					S-C	×
53	Musu						Santiago Rodoriguez Province							-	-
54	Guayajayuco	30	180	40	6	Spring	S-Ⅳ-1)	Poor	S	Low	Good	Very poor	S-Ⅱ-1)	S-C	×
55	Villain	40	240	40	8	Spring	S-Ⅳ-1)	Good	S	High	Good	Very poor	S-Ⅱ-1)	S-C	×
	Total	2,961	17,175		1.22 ℓ/min										

Note: Groundwater Development
○ G-A, 12 villages
○ G-B, 6
× G-C, –
} Implementation Plan: 18 villages

Surface Water Development
× S-A, –
× S-B, –
× S-C, 34

Existing Water Supply: 14, Groundwater Potential Very Low: 10, Access Very Poor: 10

Dispersed Villages – 3

Total 55

Table 3.3.4 Water Supply Development Plan Independencia 1/1

Independencia		Basic Estimates				Existing Water Supply			Development Plan					Implementation Plan	
No.	Village	Household	Population	Consumption	Demand	Source	System	Condition	Source	Potential	Quality	Access	System	Priority	Symbol
1	Palma Dulce				Village		Dispersion							-	-
2	Angel Felix	141	738	40	25	Spring	S-II-1)	Good	S	Low	Good	Poor	S-II-1)	S-C	×
3	Sabana Real	50	270	40	9	Spring	S-II-1)	Good	S	Low	Good	Poor	S-II-1)	S-C	×
4	Los Pinos del Eden	117	745	40	25	Spring	S-II-1)	Good	S	Low	Good	Good	S-II-1)	S-C	×
5	Bartolome	61	391	40	13	Spring	S-II-2)	Good	S	High	Good	Good	S-II-1)	S-C	×
6	Angostura	176	1,078	40	36	Spring	S-II-2)	Good	INAPA Groundwater Supply					G-C	×
7	Paso de los Novillos	46	230	40	8	Spring	S-II-1)	Good	S	Low	Good	Good	S-II-1)	S-C	×
8	El Maniel	33	204	40	7	Spring	S-II-1)	Good	S	Low	Good	Good	S-II-1)	S-C	×
9	Barreras	61	202	40	7	Spring	S-II-1)	Good	S	Low	Good	Very poor	S-II-1)	S-C	×
10	Gajo del Rancho				Village		Dispersion								
11	Batey 9	181	1,175	40	39	Spring	S-II-1)	Good	S	High	Good	Good	S-II-1)	S-C	×
	Total	866	5,033												

Note: Groundwater Development
G-A, 0
G-B, 0
G-C, 1 Existing Motorized Pump System

Surface Water Development
S-A, 0
S-B, 0
S-C, 8 { Water supply condition: good 7; Access: very poor 1 }

Village Dispersion - 2

Total 11

Table 3.4.1 1/4) Non Urgent Water Supply Plan

Monte Cristi		Village Condition			Recommendation of Water Supply Development Plan			
No.	Village	Household	Population	Water Supply	Groundwater Development	Existing Water Supply services	Future Plan	System
1	El Duro	80	480	Very poor	Impossible; very poor quality	none	From Monte Cristi T.P. INAPA	S-Ⅲ-3)
9	Las Penás	63	277	Good	Poor	From Monte Cristi T.P. by INAPA		S-Ⅲ-3)
10	Batey Juliana	60	340	Good	Poor	From Maguaca T.P.		S-Ⅲ-3)
16	El Papayo	63	277	Good	Poor	Spring water supply by INAPA		S-Ⅱ-2)
18	Cabeza de Toro	80	560	Poor	Impossible; very low potential	none	From Guajubin T.P. INAPA	S-Ⅲ-3)
19	Guayubincito	94	429	Poor	Impossible; very low potential	none	From Guajubin T.P. INAPA	S-Ⅲ-3)
20	El Mangal	55	241	Good	Poor	From Guajubin T.P. INAPA		S-Ⅲ-3)
22	Hato al Medio Arriba	68	300			From Jaibon T.P. INAPA		S-Ⅲ-1)
23	Los Amaceyes	50	218	Very poor	Impossible, very low potential	none	From River	S-Ⅲ-1)
36	La Horca	63	263	Poor	Impossible, very low potential	none	From River	
	Subtotal 10 village	55	241	Good	Poor	From Guajubin T.P. by INAPA		S-Ⅲ-3)
Dajabon								
1	Palo Blanco	93	366	Good	Possible	Model Construction by JICA		G-Ⅰ-2)
4	La Cienage	138	712	Good	Possible	Hand Pump		G-Ⅰ-1)
6	Sabana Santiago	92	396	Good	Possible	Hand Pump		G-Ⅰ-1)
7	El Rodeo	328	1,697	Good	Poor	Under Construction by INAPA		S-Ⅲ-2)
12	Tamarindo	32	186	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
15	La Ceiha	300	2,400	Poor	Poor	From Masacre T.P. by INAPA		S-Ⅲ-2)
16	Castellar	43	344	Poor	Poor	none	From La Ceiba by INAPA	S-Ⅲ-2)
19	Arroyo Azul	16	128	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
22	Los Pozos	20	120	Good	Poor	Under Construction by FUDECO		S-Ⅲ-2)
24	Palo Blanco	50	296	Poor				
25	Arroyo de la Jagua	60	360	Poor	Poor	Under Construction by FUDECO		S-Ⅲ-2)
26	La Jagua	90	540	Poor				

Table 3.4.1 (2/4) Non Urgent Water Supply Plan

Dajabon		Village Condition			Recommendation of Water Supply Development Plan			
No.	Village	Household	Population	Water Supply	Groundwater Development	Existing Water Supply Services	Future Plan	System
27	La Luisa	83	407	Good	Poor	Water supply by FUDECO		S-Ⅲ-2)
29	Sabana Gurabo	273	1,638	Good	Poor	Water supply by INAPA		S-Ⅲ-2)
32	Paso de Jacinto	25	120	Good	Poor	From Monte Grande T.P. by INAPA		S-Ⅲ-2)
33	Piedra Blanca	49	400	Good	Possible	Hand pump		G-Ⅰ-1)
35	Los Indios	70	349	Good	Poor	From Partido T.P. by INAPA		S-Ⅲ-2)
36	La Piná	81	377	Poor	Poor	From Partido T.P. by INAPA		S-Ⅲ-2)
37	Partido	68	334	Good	Poor	From Partido T.P. by INAPA		S-Ⅲ-2)
38	Sangre Linda	87	439	Good	Poor	From Partido T.P. by INAPA		S-Ⅲ-2)
40	La Culata	63	378	Good	Poor			S-Ⅲ-2)
41	La Huasima	825	4,950	Poor	Poor	Water supply facility broken	Rehabilitation by INAPA	S-Ⅲ-2)
42	Vaca Gorda							S-Ⅲ-2)
44	Canizal	72	432	Good	Poor	Water supply by FUDECO		S-Ⅲ-2)
46	Jimenez Abaja	52	312	Poor	Poor	none	From Restauracion INAPA	S-Ⅱ-1)
48	Aqua Blanca	50	300	Poor	Impossible; potential and access very poor	none	From Spring	S-Ⅲ-2)
51	Las Cerezoso Quita	18	108	Good	Poor	Water supply by FUDECO		S-Ⅲ-2)
53	Monte Grande	99	594	Good	Poor	Water supply by FUDECO		S-Ⅲ-2)
54	Manuel Bueno	172	1,032	Poor	Poor	Under Construction by FUDECO		S-Ⅲ-2)
	Subtotal 29 village							

Table 3.4.1 (3/4)

Non Urgent Water Supply Plan

Elias Piña		Village Condition			Recommendation of Water Supply Development Plan			
No.	Village	Household	Population	Water Supply	Groundwater Development	Existing Water Supply Services	Future Plan	System
1	Guazumal Arriba	24	192	Poor	Poor	Constructed pipeline	From Elias Pina by INAPA	S-Ⅲ-3)
2	Sabacón Abajo	27	162	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
3	El Cedro	41	175	Poor	Impossible; very low potential	none	From River	S-Ⅲ-1)
4	Las Corocitos	84	484	Poor	Impossible; very low potential	none	From River	S-Ⅲ-1)
5	La Cabra-El Cerro	35	210	Poor	Impossible; potential and access very poor	none	From River	S-Ⅲ-1)
7	Potroso	92	552	Poor	Poor	Constructed pipeline	From Candeson by INAPA	S-Ⅲ-2)
11	La margarita	188	1,128	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
12	Pozo Hondo	46	276	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
13	Hato Nuevo	33	198	Poor	Impossible; very poor access	none	From River	S-Ⅲ-1)
14	El Hueso	63	346	Poor	Poor	Constructed pipeline	From Elias Pina by INAPA	S-Ⅲ-3)
15	El Duan	43	237	Poor	Poor	Constructed pipeline	From Elias Pina by INAPA	S-Ⅲ-3)
16	El Cañita	25	138	Poor	Impossible; very poor access	none	From Spring	S-Ⅱ-1)
17	Los Memisos	30	180	Poor	Impossible; very poor access	none	From Spring	S-Ⅱ-1)
18	Mata Bonita	21	126	Poor	Impossible; very low potential	none	From River	S-Ⅲ-1)
20	El Fondo	60	329	Poor	Poor	Constructed pipeline	From Pedro Santana INAPA	S-Ⅲ-2)
27	El Cantón	39	234	Good	Poor	Water supply by FUDECO		S-Ⅱ-2)
28	Benancio	128	808	Poor	Impossible; very poor quality	none	From River	S-Ⅲ-1)
29	Bruno	42	252	Poor	Impossible; very low potential	none	From Canal	S-Ⅴ-1)
30	La Joya	70	420	Poor	Poor	Constructed pipeline	From Elias Pina by INAPA	S-Ⅲ-3)
31	Palo Seco	64	350	Poor	Impossible; very low potential	none	From Spring	S-Ⅱ-1)
33	La Lajita	69	414	Poor	Impossible; very low potential	none	From Spring	S-Ⅱ-1)
34	Las Lagunas	77	365	Poor	Impossible; very low potential	none	From Spring	S-Ⅱ-1)
35	Yerba Buena	49	225	Poor	Impossible; very poor access	none	From Stream	S-Ⅳ-1)

Table 3.4.1 (4/4)

Non Urgent Water Supply Plan

Eliás Piña		Basic Estimates			Recommendation of Water Supply Development Plan			
No.	Village	Household	Population	Water Supply	Grpoundwater Development	Existing Water Supply Services	Future Plan	System
37	Sonador	250	1,500	Poor			From Monte Cristi T.P. INAPA	
38	La Sajonada	70	420	Poor	Poor	Under construction from Sonador by INAPA		S-Ⅲ-2)
39	Los Ranchitos	39	234	Poor				
42	Los Pajaritos	30	180	Poor	Poor	Under construction by FUDECO		S-Ⅲ-2)
43	Boca del Botads	42	170	Poor				
49	El Corbano	27	102	Poor	Impossible; very low potential	none	From River	S-Ⅲ-1)
50	Arroyo Grande	24	144	Poor	Impossible; very poor access	none	From Stream	S-Ⅳ-1)
51	El Pomito	14	84	Poor	Impossible; very poor access	none	From Stream	S-Ⅳ-1)
52	Robinzar	65	390	Poor	Poor	none	From Dio Limio by INAPA	S-Ⅲ-2)
54	Guayajayuco	30	180	Poor	Impossible; very poor access	none	From Spring	S-Ⅱ-1)
55	Villain	40	240	Poor		none	From Spring	S-Ⅱ-1)
	Subtotal 34 villages							
	Independencia							
2	Angel Felix	141	738	Good	Poor	none	From Spring	S-Ⅱ-1)
3	Sabana Real	50	270	Good	Poor	none	From Spring	S-Ⅱ-1)
4	Los Pinos del Eden	117	745	Good	Poor	none	From Spring	S-Ⅱ-1)
5	Bastolome	61	391	Good	Poor	none	From Spring	S-Ⅱ-1)
6	Angostura	176	1,078	Good	Possible	Groundwater supply by INAPA		
7	Paso de los Novillos	46	230	Good	Possible	none	From Spring	S-Ⅱ-1)
8	El Maniel	33	204	Good	Possible	none	From Spring	S-Ⅱ-1)
9	Barreras	61	202	Good	Impossible; very poor access	none	From Spring	S-Ⅱ-1)
11	Batey 9	181	1,175	Good	possible	none	From Spring	S-Ⅱ-1)
	Subtotal 9 villages							
	Total 82 villages							

Table 3.5 Water Supply Development Plan for 158 Villages-Summary

	Groundwater			Surface Water							Total			
Project Classification	G-A	G-B	G-C	S-A	S-B	S-C					Village Dispersion	Situation		
Situation	Most Urgent	Urgent	Good Facilities	Most Urgent	Urgent	Existing Facilities	Ground Water Potential: Very low	Access: Very Poor	Water Supply: Good	Total				
Symbol	○	○	×	○	○	×					–	○	×	Total
Monte Cristi	7	1	–	7	4	5	3	–	2	10	8	19	10	37
Dajabon	6	15	4	–	–	22	–	3	–	25	5	21	29	55
Elias Piña	12	6	–	–	–	14	10	10	–	34	3	18	34	55
Independecia	–	–	1	–	–	–	–	1	7	8	2	–	9	11
Total	25	22	5	7	4	41	13	14	9	77	18	58	82	158

Table 5.2.1 General Implementation Program of the Water Supply Project-General

Type	Water Supply System	Monte Cristi		Dajabon		Eliàs Pina		Independencia		Total	
		Village	Population	Village	Population	Village	Population	Village	Population	Village	Population
I	Hand Pump	2	910	20	7,227	18	5,580	–	–	40	13,717
II	Motorized Pump	6	7,364	1	377	–	–	–	–	7	7,741
III	Surface Water Treatment	7	3,009	–	–	–	–	–	–	7	3,009
IV	Drinking Water Service by Tank lorry	4	1,160	–	–	–	–	–	–	4	1,160
Total	Implementation Program (I)	19	12,443	21	7,604	18	5,580	–	–	58	25,627
	Development Plan (D)	37	15,828	55	27,671	55	17,175	11	5,033	158	65,707
	(I) / (D) %	51	78.6	38.0	27.5	33	32.4	–	–	36	39.0

Table 5.2.1-1 Implementation Program 1/4

1. Type I : Hand pump system G-I-1)

Flow Chart :

Borehole 1) Underground water level : over 40m
2) Household : over 20 → Hand pump → Inhabitant water supply

No.	Village	Basic Estimates: Household	Population	Consumption	Demand	Drilling: Depth	Diameter	Rig	Water level	Water yield	Number	Situation: Access	Test Drilling	Hydrogeo. Zone
Monte Cristi														
3	Hato Viejo	32	150	40 ℓ/c/d	15 ℓ/min	70	10-5/8"	Percussion	20 m	100 ℓ/min	2	Good	3 Las Aquas	II
27	Sanita	95	760	40	76	70	〃	〃	〃	〃	3	Good	3 Las Aquas	II
	Sub total: 2 villages	127	910		91						5			
Dajabon														
3	Laja	50	400	40	40	120	10-5/8"	Rotary & Percussion	40	100~200	4	Good	11 Esperon 12 Chacuey	III 3
5	Clarellina	102	418	40	42	100	〃	R&P	40	100~200	4	Good	11 Esperon	III 3
8	La Gorra	131	642	60	32	100	〃	〃	40	10	6	Good	14 La Borra	IV 2
9	La Barrera	42	198	40	20	100	〃	〃	40	10	2	Good	14 La Borra	IV 2
10	El Estrecho	25	200	40	20	100	〃	〃	40	10	2	Good	14 La Borra	IV 2
11	El Clano	65	276	40	27	100	〃	〃	40	10	3	Good	14 La Borra	IV 2
13	La Peñita	89	388	40	39	80	〃	〃	20	10~15	4	Good	16 La Penita Abajo	IV 1
14	Pueblo Nuevo	65	243	40	24	80	〃	〃	20	10	2	Good	16 La Penita Abajo	IV 1
18	El Cajuil	78	390	40	39	80	〃	〃	20	10~20	4	Good	17 La Penita Arriba	IV 1
20	El Aquacate	57	312	40	31	80	〃	〃	20	10~20	3	Good	〃	IV 1
21	La Peñita	69	374	40	37	80	〃	〃	20	10~20	4	Good	〃	IV 1
23	La Avanzada	35	210	40	21	80	〃	〃	20	10~20	2	Good	〃	IV 1
31	Pinal Claro	71	347	40	34	80	〃	〃	20	10~15	4	Good	15 Buen Gristo 16 Penita Abajo	IV 2
34	La Joya	38	228	40	23	80	〃	〃	20	10~15	2	Good	16 Penita Abajo	IV 1
39	Buen Gusto	79	328	40	33	100	〃	〃	40	10	3	Good	14 La Gorra	IV 1
43	Aminilla	133	677	40	68	100	〃	〃	40	10	7	Good	18 Mariano 27 Cestero	IV 2
45	Mariano Cestero	95	570	40	56	80	〃	〃	40	10	6	Good	18 Mariano 27 Cestero	IV 2
49	Valle Nuevo	52	312	40	21	80	〃	〃	40	10	3	Good	18 Mariano 27 Cestero	IV 2
50	Neyta	32	192	40	19	80	〃	〃	40	10	2	Good	17 Penito Abajo	IV 2
55	Las Lagunas	87	522	40	52	80	〃	〃	40	10	5	Good	14 La Borra	IV 1
	Sub total: 20 villages	1,395	7,227		678						72			

Table 5.2.1-2 Implementation Program 2/4

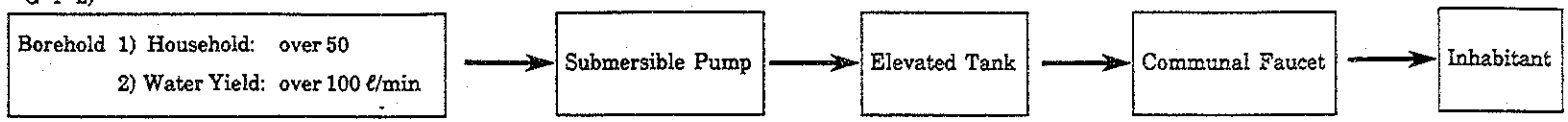
Elias Pina

		Basic Estimates				Drilling						Situation		
No.	Village	Household	Population	Consumption	Demand	Depth	Diameter	Rig	Water level	Water Yield	Number	Access	Test Drilling	Hydrogeo. Zone
6	Sabana Campo	30	180	40 ℓ/c/d	18 ℓ/min	80	10-1/5"	Percussion	40 m	10 ℓ/min	2	Poor	21 Lamesdero	V 1
8	Macasia	115	690	40	69	80	〃	〃	40	10	7	Poor	21 Lamesdero	V 1
9	Carrera Verde	35	210	40	21	80	〃	〃	40	10	2	Poor	21 Lamesdero	V 1
10	Lamedero	35	210	15	8	80	〃	〃	40	10	2	Good	21 Lamesdero	V 1
19	El Mamoncito	55	313	40	32	80	〃	〃	40	10~20	2	Good	19 El Mamoncito	V 1
21	San Andrés	19	114	40	11	60	〃	〃	40	10~20	2	Poor	〃	
22	Guayabal	114	629	40	44	80	〃	〃	40	10~20	6	Good	〃	V 1
23	Hato Viejo	47	259	40	26	80	〃	〃	40	10~20	3	Good	〃	V 1
24	Pilón	50	300	40	30	80	〃	〃	40	10~20	3	Good	〃	V 1
25	Guaroa	36	216	40	21	80	〃	〃	40	10~20	2	Good	〃	V 1
26	Los Yareyes	60	332	40	33	80	〃	〃	40	10~20	3	Good	〃	V 1
32	Juan Cano	39	234	40	23	60	〃	〃	40	20	2	Good	24 Asiento Miguel	V 1
36	Cañada del Banero	42	225	40	22	60	〃	〃	40	20	2	Good	〃	V 1
40	Los Mesas	40	240	40	8	60	〃	〃	40	20	2	Poor	〃	V 1
41	Los Caños	33	198	40	7	60	〃	〃	40	20	2	Poor	〃	V 1
46	Sabana dela Lomo	118	708	40	30	60	〃	〃	40	20	7	Poor	〃	V 1
47	Juan Garcia	33	198				〃	〃	40	20	2	Poor	〃	V 1
48	Madre Vieja	54	324	40	11	60	〃	〃	40	20	3	Poor	〃	V 1
Sub total: 18 villages		955	5,580		414						54			
Total: 40 villages		2,238	13,717		1,055						131			

Table 5.2.1-3 Implementation Program 3/4

2. Type Ⅱ : Motorized Pump System G-Ⅰ-2)

Flowchart :



No.	Village	Basic Projection: Household	Population	Consumption ℓ/c/d	Demand ℓ/min	Drilling: Depth m	Diameter	Rig	Water level -m	Water Yield ℓ/min	Facilities: Pump kw KVA	Elevated Tank m³	Faucet	Pipeline	Situation: Test Drilling	Hydrogeol. Zone
Monte Cristi																
7	La Pinra	156	680	100	56	80	10-1/5"	Percussion	20	100	1.5 . 10	30	3	φ50 500 φ75 100	5 La Pinta	Ⅲ2
8	Batey Higuero	501	2,253	100	187	80	〃	〃	20	300	2.2 . 10	100	5	φ75 200 φ100 600	3 Las Aquas	Ⅱ
13	Cerro Gorob Arriba	98	431	100	36	80	〃	〃	20	100	1.5 . 10	20	3	φ50 1000	6 Ranchaduo	Ⅲ1
14	Penã Ranchaderas	97	432	100	36	80	〃	〃	20	100	1.5 . 10	20	3	φ50 500 φ75 100	6 Ranchaduo	Ⅲ1
24	Jabon Corcovado	471	2,068	60	86	80	〃	〃	30	100	2.2 . 10	50	5	φ50 500 φ75 1500 φ100 600	4 Jobo Corcobado	Ⅱ
25	Gozuela	200	1,500	60	75	80	〃	〃	20	100	1.5 . 10	40	4	φ50 200 φ75 1100	3 Las Aquas	Ⅲ2
Sub Total: 6 villages		1,523	7,364		476							260	23	φ50 2700 φ75 3,000 φ100 1,200		
Dajabon																
2	Cayuco	94	377	60	16	80	10-1/5"	Rotary & percussion	40	100~200	1.5, 10	10	2	φ50 200	10 La Vigia	Ⅲ3
Sub Total: 1 village		94	377		16											
Total: 7 villages								Rotary & Percussion								
		1,617	7,741		492			Percussion 6								

Table 5.2.1-4 Implementation Program 4/4

3. Type Ⅲ : Surface Water Treatment System for Reservoir S-Ⅰ-2)

Flowchart : Rainfall → Reservoir → Intake pump → Slow Sand Filter → Clear Water Reservoir (Chlorination) → Distribution Pump → Transportation Pipeline → Elevated Tank → Distribution Pipeline → Communal Faucet → Residents

Monte Cristi		Basic Estimates				Intake Facilities			Treatment Plant				Distribution Facilities			
No.	Village	Household	Population	Consumption	Demand	Reservoire Volume			Capacity	Slow Sand Filter	Chlorinator	Clear Water Reservoir	Pump	Elevated tank	Faucet	Pipeline
4	Las Aquitas	153	692	40 ℓ/c/d	23 ℓ/min	m³ 50,000	ℓ/min 72	kw 0.4×2	m³/d 100	m 8.0×3.2×2 m Basin Flow Velocity 4.0 m/d	2 unit	m 4×4×2.5 m	-	– m³	4	φ100 1.0 km
30	Buen Hombre	89	423	〃	14							40m³	3.7kw×2	24	3	φ75 1.0
31	Las Canas	70	245	〃	8							R.T=9.6 Hour		–	1	φ50 2.2
32	Las Brigidas	19	95	〃	3									4	1	
North Central: 4 villages		331	1,455		48 (69.0m³/d)										9	4.2 km
11	Las Canucos	98	483	40	16	m³ 50,000	ℓ/min 72	kw 0.4×2	m³/d 100	8.0×3.2×2 Flow Velocity 4.0 m/d	2 unit	40×40×2.5 V =40m³ R.T=9.6 Hour	5.5kw×2	10	3	φ100 4.5
21	El Cayal	97	424	〃	14									10	2	475 1.0 φ50 3.4
34	Sabana Cruz	148	647	〃	21									–	3	–
North East: 3 villages		343	1,554		51 (73.0m³/d)										8	
															km	
Total: 7 villages		674	3,009		99 (142m³/d)										φ100 5.5 φ75 2.0 φ50 5.6	13.1 km

4. Type Ⅳ : Tank Lorry Supply System S-Ⅰ-1)

Flowchart : Rainfall Collection and City Water Supply by Tank Lorry → Drinking Water Tank → Residents

Monte Cristi		Basic Estimates				Transportation System		
No.	Village	Household	Population	Consumption	Demand	Tank Vol.	Distance from Treatment Plant	Tank Lorry Unit
2	Isabel de Torres	72	311	15 ℓ/c/d	ℓ/min 3.8, (5.6) m³/d	24 m³	Average 20 Kar	8 ton × 2 unit with pump
17	Estero Balsa	53	233	15	2.9, (4.2)	16	〃	
33	Loma Afravezada	67	280	15	3.5, (5.0)	24	〃	
37	El Mansutia	92	336	15	4.2, (6.0)	30	〃	
Total; 4 villages		223	1,160		14.4, (20.8)	94		

Table 6.2.1 Direct Construction Cost (Unit : RD$)

Item	Foreign	Local	Total
1. Water Production/Supply System			
(1) Type Ⅰ, Manual Power Pump System			
1) Drilling	30,996,525	5,469,975	36,466,500
2) Casing/Strainer works	14,075,883	1,739,717	15,815,600
3) Pump Installation Works	3,392,769	419,331	3,812,100
4) Concrete Base floor works	-	286,890	286,890
Sub-Total	48,465,177	7,915,913	56,381,090
(2) Type Ⅱ Motorized Pump System			
1) Boring Drilling	2,051,560	362,040	2,413,600
2) Casing Works Strainer	620,980	76,780	697,760
3) Equipment/Installation	1,561,800	203,000	1,764,800
4) Pump House	80,000	324,000	400,400
5) Elevated Water Tank	722,400	2,889,600	3,612,000
6) Pipe Line	745,642	1,409,358	2,165,000
7) Fauicet	-	245,525	245,525
Total	5,782,382	5,510,303	11,292,685
(3) Type Ⅲ, Reservoir Filtration Booster Pump System			
1) Reservoir	-	1,216,000	1,216,000
2) Intake Works/Pump	226,130	233,088	459,218
3) Treatment Plant	1,947,050	817,510	2,764,560
4) Elevated Water Tank	157,380	629,520	786,900
5) Pipe Line	1,915,924	3,621,428	5,537,352
6) Faucet	-	166,957	166,957
Motor Bicycle*1	32,000	-	32,000
Sub-Total	428,484	6,684,503	10,962,987

(4) Type Ⅳ, Water Wagon Distribution System			
Water Wagon *2	(1,420,000)	-	-
1) Water Tank	1,145,739	658,574	1,804,313
Sub-Total	1,145,739	658,574	1,804,313
Total	59,671,782	20,769,293	80,441,075

2. OM Facilities/Equipment			
(1) O/M Office			
OM Office Fixtures	105,000	595,000	700,000
Sub-Total	15,750	89,250	105,000
	120,750	684,250	805,000
(2) O/M Equipment			
Truck Crane/Vehicles	988,500	-	988,500
Water Wagon	1,420,000	-	1,420,000
Workshop Car	1,120,500	-	1,120,500
Sub-Total	3,529,000	-	3,529,000
Total	3,649,750	684250	4,334,000

3. Access Road Improvement/Construction Works			
Improvement Works	97,500	877,500	975,000
Construction Works	520	4,700	5,220
River crossing Works	-92,580	833,100	925,680
Sub-Total	190,600	1,715,300	1,905,900

4.	Monitoring System			
	Monitoring Well	1,087,000	1643000	2,730,000
	Automatic Water Level Meter *3	5,000	–	50,000
	Sub-Total	1,137,000	1,643,000	2,780,000
5.	Preparatory Works (3% of local portion)	–	744,355	74,435
	Grand Total	64,649,132	25,556,198	90,205,330

*1: Separate from the official O/M equipments
*2: Include in the official O/M equipment
*3: Only one level meter was estimated because 6-Nos. meters will use exisiting one

6.2.1-1 Direct Construction Cost - Breakdown (Unit : RD$)

(1) Type - I System

(1) - 1) Drilling

1US$ = ¥130
1US$ = 12.45 RD$
1RD$ = ¥10.44

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	350	m	3,450	1,026,375	181,125	1,207,500	
Dajabon	6,340	"	3,450	18,592,050	3,280,950	21,873,000	
Elias Piña	3,880	"	3,450	11,378,100	2,007,900	13,386,000	
Total	10,570	m	3,450	30,996,525	5,469,975	36,466,500	
				85%	15%		

(1) Type-1 System

(1) - 2) Casing/Strainer Works

1US$ = ¥130
1US$ = 12.45 RD$
1RD$ = ¥10.44

Item		Quantity	Unit	Unit Price	Foreign (89%)	Local (11%)	Total	Remarks
Monte Cristi	Casing Pipe	250	m	1,120	249,200	30,800	280,000	
	Strainer	100	"	2,340	208,260	25,740	234,000	
Sub-Total		350			457,460	56,540	514,000	
Dajabon	Casing Pipe	4,424	m	1,120	4,409,843	545,037	4,954,880	
	Strainer	1,916	"	2,340	3,990,262	493,178	4,483,440	
Sub-Total		6,340			8,400,105	1,038,215	9,438,320	
Monte Cristi	Casing Pipe	2,636	m	1,120	2,627,564	324,756	2,952,320	
	Strainer	1,244	"	2,340	2,590,754	320,206	2,910,960	
Sub-Total		3,880			5,218,318	644,962	5,863,280	
Total					14,075,883	1,739,717	15,815,600	

(1) Type - 1 System

(1) - 3) Pump Installation Works

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi Hand Pump	5	piece	29,100	129,495	16,005	145,500	
Dajabon	72	"	29,100	1,864,728	230,472	2,095,200	
Elias Piña	54	"	29,100	1,398,546	172,854	1,571,400	
Total	131			3,392,769	419,331	3,812,100	

(1) Type - 1 System

(1) - 4) Concrete Basefloor Works

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	Faucet	5	set	2,190	0	10,950	10,950	
Dajabon	Faucet	72	"	2,190	0	157,680	157,680	
Elian Piña	Faucet	54	"	2,190	0	118,260	118,260	
Total		131				286,890	286,890	

(2) Type - Ⅱ System

(2) - 1) Drilling

Item	Quantity	Unit	Unit Price	Foreign 85%	Local 15%	Total	Remarks
Monte Cristi	480	m	4,310	1,758,480	310,320	2,068,800	
Dajabon	80	"	4,310	293,080	51,720	344,800	
Total	560	m		2,051,560	362,040	2,413,600	

(2) Type-Ⅱ System

(2) - 2) Casing/Strainer

Item		Quantity	Unit	Unit Price	Foreign (89%)	Local (11%)	Total	Remarks
Monte Cristi	Casing Pipe	216	m	1,120	215,320	26,600	241,920	
	Strainer	144	"	2,340	299,860	37,100	336,960	
Sub-Total					515,180	63,700	578,880	
Dajabon	Casing Pipe	56	m	1,120	55,820	6,900	62,720	
	Strainer	24	"	2,340	49,980	6,180	56,160	
Sub-Total					105,800	13,080	118,880	
Total					620,980	76,780	697,760	

(2) Type - II System

(2) - 3) Equipment Installation

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	Submersible Pump 1.5 kw	4	piece	88,600	313,600	40,800	354,400	
	Submersible Pump 2.2 kw	2	"	100,900	178,600	23,200	201,800	
	Generator 7.7 kva	6	"	161,000	854,900	111,100	966,000	
Sub-total					1,347,100	175,100	1,522,200	
Dajabon	Submersible Pump 1.5 kw	1	piece	88,600	78,400	10,200	88,600	
	Generator 6.3 kva	1	"	154,000	136,300	17,700	154,000	
Sub-Total					214,700	27,900	242,600	
Total					1,561,800	203,000	1,764,800	

(2) Type - Ⅱ System

(2) - 4) Pump House

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	6		57,200	68,600	274,600	343,200	
Dajabon	1		57,200	11,400	45,800	57,200	
Total				80,000	320,400	400,400	

(2) Type - II System

(2) - 5) Elevated Water Tank

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	6	270	m^3	12,900	696,600	2,786,400	3,483,000	
Dajabon	1	10	m^3	12,900	25,800	103,200	129,000	
Total					722,400	2,889,600	3,612,000	

(2) Type - Ⅱ System

(2) - 6) Pipe Line

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	φ50	2,700	m	230	214,866	406,134	621,000	
	φ75	3,000	"	320	332,160	627,840	960,000	
	φ100	1,200	"	440	182,700	345,300	528,000	
Sub-Total					729,726	1,379,274	2,109,000	
Dajabon	φ50	200	m	230	15,916	30,084	46,000	
Sub-Total					15,916	30,084	46,000	
Total					745,642	1,409,358	2,155,000	

(2) Type - Ⅱ System

(2) - 7) Faucet

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	23		9,821	0	225,883	225,883	
Dajabon	2		9,821	0	19,642	19,642	
Sub-Total				0	245,525	245,525	

(3) Type - Ⅲ System

(3) - 1) Reservoir

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	Los Aquitas	1		608,000	0	608,000	608,000	3-1-1
	Los Aquitas	1		608	0	608,000	608,000	3-1-1
Sub-Total					0	1,216,000	1,216,000	

(3) Type-Ⅲ System

(3) - 2) Intake Works/Pump

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Pump Station Monte Cristi	Los Aquitas	1		162,106	67,906	94,200	162,106	3-2-1
	Los Sabana Cruz	1		162,106	67,906	9,400	162,106	3-2-1
Sub-Total					135,812	188,400	324,212	
Monte Cristi	Los Aquitas	1		67,503	45,159	22,344	67,503	3-3-1
	Los Sabana Cruz	1		67,503	45,159	22,344	67,503	3-3-1
Sub-Total					90,318	446,880	135,006	
Total					226,130	233,088	459,218	

(3) Type - Ⅲ System

(3) - 3) Water Treatment Plant

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi	Los Aquitas	1		1,531,680	1,135,815	395,865	1,531,680	3-4-1
	Los Aquitas	1		1,232,880	811,235	321,645	1,232,880	3-4-2
Sub-Total					1,947,050	817,510	2,764,560	

(3) Type - Ⅲ System

(3) - 4) Elevated Water Tank

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi								
Los Aquitas	6t (12,900/t)	1		77,400	15,500	61,900	77,400	
Los Aquitas	24t	1		309,600	61,900	247,700	309,600	
Los Sabana Cruz	21t	1		270,900	54,180	216,720	270,900	
Los Conucos	10t	1		129,000	25,800	103,200	129,000	
Sub-Total					157,380	629,520	786,900	

(3) Type - Ⅲ System

(3) - 5) Pipe Line

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi								
Los Aquitas Pipe	φ100	1,000	m	437			437,000	
	φ175	1,000	"	317			317,000	
	φ50	7,200	"	230			1,656,000	
Valve	φ100	1	piece	4,752			4,752	
	φ75	1	"	3,330			3,330	
	φ50	7	"	2,668			18,676	
Los Sabana Cruz Pipe	φ100	4,500	m	437			1,966,500	
	φ75	1,000	"	317			317,000	
	φ50	3,400	"	230			782,000	
Valve	φ100	5	piece	4,752			23,760	
	φ75	1	"	3,330			3,330	
	φ50	3	"	2,668			8,004	
Sub-Total					1,915,924	3,612,428	5,537,352	

(3) Type - Ⅲ System

(3) - 6) Faucet

Item		Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Faucet Monte Cristi	Los Aquitas	9		9,821			88,389	with meter
Monte Cristi	Los Sabana Cruz	8		9,821			78,568	
Sut-Total					0	166,957	166,957	

(4) Type - Ⅳ System

(4) - 1) Water Tank

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi							
4000×4000×1000	1		407,691			407,691	4-1-1
4000×4000×1500	2		447,549			895,098	4-1-2
4000×5000×1500	1		501,524			501,524	4-1-3
Sub-Total				1,145,739	658,574	1,804,313	

2. O/M Facilities

2 - (1) O/M Office Building/Fixtures

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi							6-1
Office Building (60m2)	1		350,000			350,000	
Office Fixtures	1					52,500	office 15%
Sub-Total				60,400	342,100	402,500	
Elias Piña							
Office Building (60m2)	1		350,000			350,000	
Office Fixtures	1					52,500	office 15%
Sub-Total				60,400	342,100	402,500	
Total				120,800	684,200	805,000	

2. O/M Facilities

2 - (2) O/M Equipment

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi							
Water Wagon (8m³)	2	piece	710,000			1,420,000	
Crane Truck (4t)	1	"	421,000			421,000	
Pick-up	1	"	114,500			114,500	
Motor Bicycle	1	"	16,000			16,000	
Sub-Total				1,971,500	0	1,971,500	
Elias Piña							
Crane Truck (4t)	1	piece	421,000			421,000	
Motor Bicycle	1	"	16,000			16,000	
Sub-Total				437,000	0	437,000	
Traveling Workshop				1,120,500	0	1,120,500	
Sub-Total				1,120,500	0	1,120,500	
Total				3,529,000	0	3,529,000	

3. Access Road

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Construction Works							5-1
Dajabon				0	0	0	
Elias Piña				520	4,700	5,220	
Sub-Total				520	4,700	5,220	
Improvement Work							
Dajabon				15,000	135,000	150,000	5-2
Elias Piña				82,500	742,500	825,000	
Sub-Total				97,500	877,500	975,000	
River Crossing Work							5-3
Dajabon				0	0	0	
Elias Piña				92,580	833,100	925,680	
Sub-Total				92,580	833,100	925,680	
Total				190,600	1,715,300	1,905,900	

4. Monitoring System

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monitoring Well				1,087,000	1,643,000	3,730,000	
Automatic Water Level Meter				50,000	-	50,000	
Sub-Total				1,137,000	1,643,000	2,780,000	

6.2.1-2 Unit Price of Direct Construction Cost

1) Material/Equipment 1/3

Item	Quantity	Unit	Unit Price
Earth Works			
Excavation (manual)	1	m^3	15
Excavation (Machine)	1	"	12
Backfill	1	"	6
Banking	1	"	14
Removal of Surplus Soil	1	"	6
Material			
Sand	1	m^3	250
Gravel	1	"	185
Crushed Stone	1	"	300
Cement	1	"	1,058
Wood	1	"	1,100
Sand (for Water Treatment)	1	"	750
Gravel (for Water Treatment)	1	"	555
Concrete 140 kg/cm^2	1	"	765
Concrete 160 kg/cm^2	1	"	805
Concrete 180 kg/cm^2	1	"	825
Concrete 210 kg/cm^2	1	"	880
Concrete 240 kg/cm^2	1	"	950
Mortar (1:3)	1	"	780
Mortar (1:4)	1	"	916
Mortar (1:2)	1	"	1,251
Mortar (1:10)	1	"	699
Formboard (A)	1	m^2	73
Formboard (B)	1	"	100

1) Material/Equipment 2/3

Item		Quantity	Unit	Unit Price
Formboard (C)		1	m^2	115
Reinforcing Bar		1	t	7,600
Iron Plate		1	"	12,500
Concrete Blocks	4"	1	piece	6
Concrete Blocks	6"	1	"	7.23
Concrete Blocks	8"	1	"	9.46
Concrete Blocks	10"	1	"	15.80
Concrete Blocks	12"	1	"	16.81
Brick		1	"	3.0
PVC Pipe	1/2"	1	m	4.2
PVC Pipe	2"	1	"	13.75
PVC Pipe	3"	1	"	24.75
PVC Pipe	4"	1	"	39.89
PVC Pipe	5"	1	"	90.74
Galvanized Steel Pipe	2"	1	"	164
Galvanized Steel Pipe	3"	1	"	226.3
Galvanized Steel Pipe	4"	1	"	311.6
Galvanized Steel Pipe	6"	1	"	459.2
Galvanized Steel Pipe	8"	1	"	590.4
Galvanized Steel Pipe	10"	1	"	738
Stop Valve	2"	1	"	2,229
Stop Valve	3"	1	"	2,748
Stop Valve	4"	1	"	3,960
Stop Valve	6"	1	"	6,052
Stop Valve	8"	1	"	9,169

1) Material/Equipment 3/3

Item		Quantity	Unit	Unit Price
Stop Valve	10"	1	m	19,374
Air Valve	1/2"	1	"	3,400
Air Valve	3/4"	1	"	3,450
Air Valve	1"	1	"	3,950
Submersible Pump	1.5 kw (220v/60 Hz)	1		73,750
Submersible Pump	2.2 kw (220v/60 Hz)	1		84,100
Submersible Pump	3.7 kw (220v/60 Hz)	1		139,080
Multi-Stage Centrifugal Turbine Pump	5.5 kw (220v/60 Hz)	1		49,520
Centirfugal Turbine Pump	3.7 kw (220v/60 Hz)	1		17,050
Centirfugal Turbine Pump	0.4 kw (220v/60 Hz)	1		10,440
Hand Pump		1		29,100
Generator	18.74 kva	1		234,600
Generator	13.6 kva	1		220,300
Generator	12.21 kva	1		153,200
Generator	7.7 kva	1		140,800
Generator	6.3 kva	1		134,100
Casing Pipe	6"	1	m	980
Strainer	6"	1	"	2,030
Fuel Gasoline		1	ℓ	5.3
Diesel Oil		1	"	3.62
Mobil Oil		1	"	28

6.2.1-2 Unit Price of Direct Construction Cost

2) Labor Cost

Item	Quantity	Unit	Unit Price
Operator	1	month	2,500
Driver (Light)	1	"	2,000
Driver (Heavy)	1	"	2,500
Assistant Driver	1	"	2,000
Carpenter	1	"	1,800
Plumber	1	"	1,800
Labour Worker	1	"	2,000
Mason	1	"	1,800
Plasterer	1	"	2,000
Foreman	1	"	2,200
Common Laborer	1	"	1,500
Watchman	1	"	1,200

3) O/M Staff

Item	Quantity	Unit	Unit Price
Engineer (Senior)	1	month	6,000
Engineer (Junior)	1	"	4,000
Asst. Engineer	1	"	3,000
Operator (Truck with Crane)	1	"	2,500
Driver (Water Wagon & Pick-up)	1	"	2,000
Labourer	1	"	1,200
Watchman	1	"	1,200

6.2.2 Spare Parts Costs

Type - Ⅰ ~Type Ⅲ

Item			Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Type Ⅰ	Pump		13	set	25,910	336,830		336,830	
Type Ⅱ	Pump	1.5 kw	2	"	78,411	156,822		156,822	
		2.2 kw	1	"	89,297	89,297		89,297	
	Generator	7.7 kva	1	"	161,000	161,000		161,000	
	Pipe	φ50	135	m	204	27,540		27,540	
		φ75	150	"	2,805	42,075		42,075	
		φ100	60	"	386.7	23,190		23,190	
	Valve	φ50	9	set	2,361.1	21,249		21,249	
		φ75	10	"	2,947	29,470		29,470	
		φ100	4	"	4,205.4	16,822		16,822	
	Faucet		13	"	3,805.5	49,472		49,472	
	Meter		10	"	1,960	19,600		19,600	
Type Ⅲ	Generator	18.74 kva	1	"	270,000	270,000		270,000	
	Pipe	φ50	530	m	204	108,120		108,120	
		φ75	100	"	280.5	28,050		28,050	

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
φ100	275	m	386.7	106,343		106,343	
Valve φ50	35	set	2,361.1	82,635		82,635	
φ75	7	"	2,947	20,692		20,629	
φ100	18	"	4,205.4	75,697		75,697	
Faucet	9	"	3,805.5	34,250		34,250	
Meter	3	"	1,960	5,880		5,880	
Sub-total				1,704,971		1,704,971	

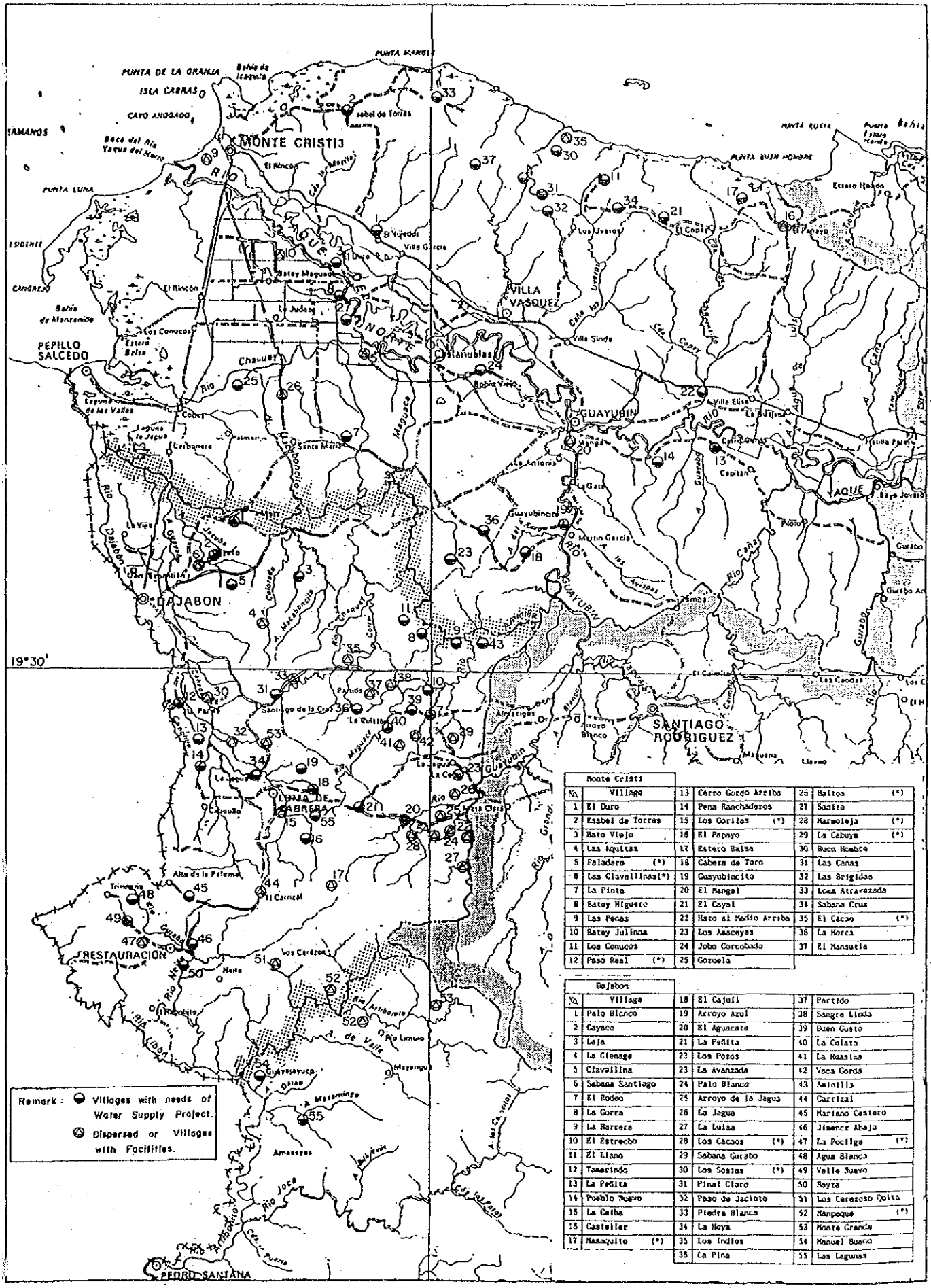
6.2.3 Land Acquisition Costs

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Monte Cristi							
Type-1 5×10m²=50							
Type-2 6×230m²=1,380							
Type-3 52×70,000m²=140,000							
Type-4 4×60m²=240	14.18	ha	9.960		141,233	141,233	
Office 1×100m²=100							
Dajabon							
Type-1 72×10m²=720	0.10	ha	9.960		996	996	
Type-2 1×230m²=230							
Elias Piña							
Type-1 54×10m²=540	0.07	ha	9.960		697	697	
Office 1×100m²=100							
Total					142,926	142,926	

6.2.4 Administration and Engineering Costs

Item	Quantity	Unit	Unit Price	Foreign	Local	Total	Remarks
Detail Design Stage							
Administration				209,723	1,697,181	1,906,904	
Engineering Services				3,277,991	449,154	3,727,145	
Sub-Total				3,487,714	2,146,335	5,634,049	
Construction Stage							
Administration				352,806	2,854,255	3,207,061	
Engineering Services				5,717,480	783,410	6,500,890	
Sub-Total				6,070,286	3,637,665	9,707,951	
Total				9,558,000	5,784,000	15,342,000	

FIGURES

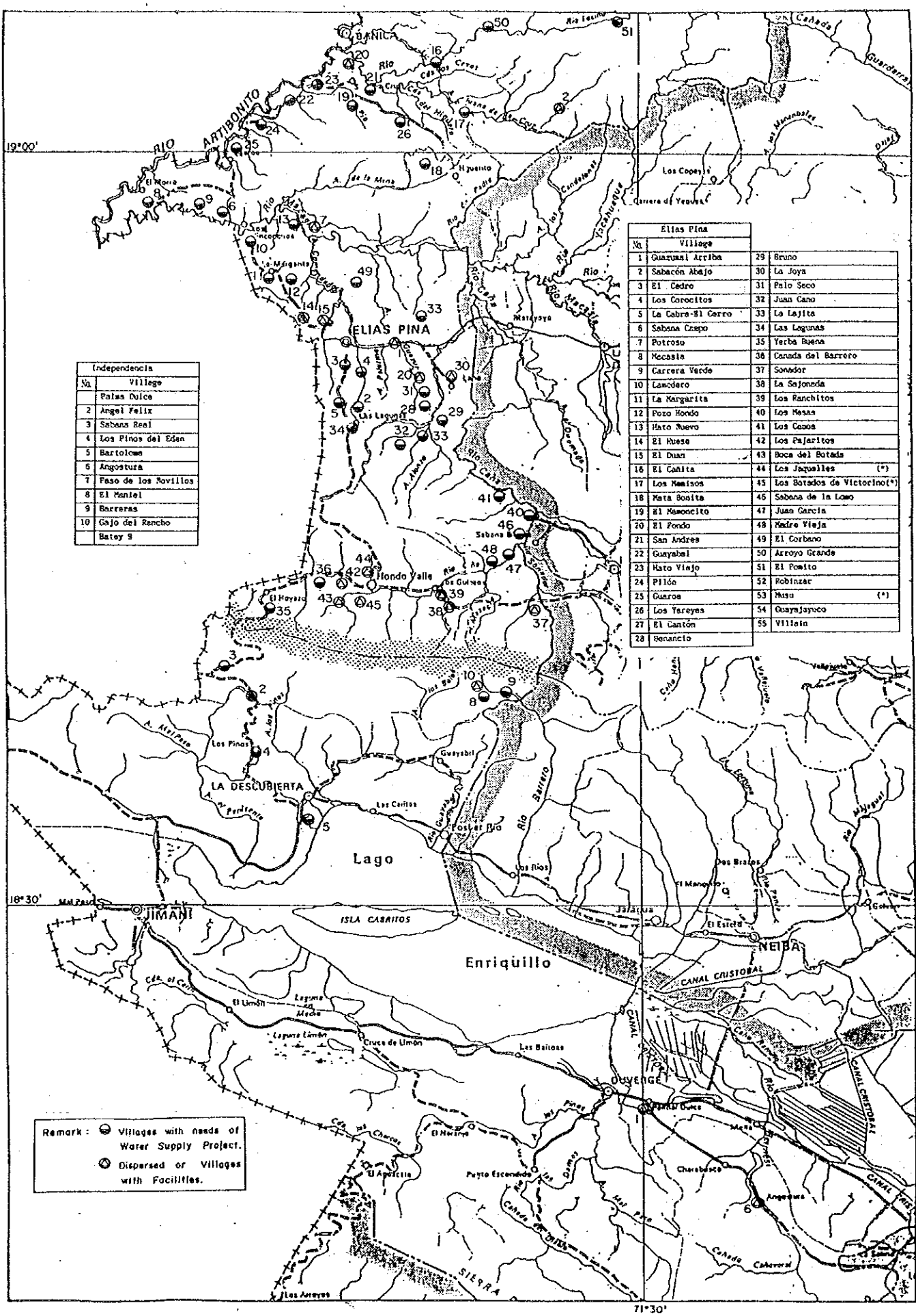


Monte Cristi					
No.	Village	13	Cerro Gordo Arriba	26	Baitoa (*)
1	El Duro	14	Pena Ranchaderos	27	Sanita
2	Esabel de Torres	15	Los Corilos (*)	28	Hamolleja (*)
3	Hato Viejo	16	El Papayo	29	La Cabuya (*)
4	Las Aquitas	17	Estero Balsa	30	Buen Hombre
5	Paladero (*)	18	Cabeza de Toro	31	Las Canas
6	Las Clavellinas(*)	19	Guayubicito	32	Las Brigidas
7	La Pinta	20	El Mangal	33	Loma Atravezada
8	Batey Higuero	21	El Cayal	34	Sabana Cruz
9	Las Penas	22	Hato al Medio Arriba	35	El Cacao (*)
10	Batey Julinna	23	Los Asaceyes	36	La Horca
11	Los Conucos	24	Jobo Corcobado	37	El Mansutia
12	Paso Real (*)	25	Gozuela		

Dajabon					
No.	Village	18	El Cajuil	37	Partido
1	Palo Blanco	19	Arroyo Azul	38	Sangre Linda
2	Cayaco	20	El Aguacate	39	Buen Gusto
3	Laja	21	La Pedita	40	La Culata
4	La Cienaga	22	Los Pozos	41	La Huasina
5	Clavellina	23	La Avanzada	42	Vaca Gorda
6	Sabana Santiago	24	Palo Blanco	43	Amolilla
7	El Rodeo	25	Arroyo de la Jagua	44	Carrizal
8	La Gorra	26	La Jagua	45	Mariano Castoro
9	La Barrera	27	La Luisa	46	Jimenez Abajo
10	El Estrecho	28	Los Cacaos (*)	47	La Pocilga (*)
11	El Llano	29	Sabana Gurabo	48	Agua Blanca
12	Tamarindo	30	Los Sosias (*)	49	Valle Nuevo
13	La Pedita	31	Pinal Claro	50	Hoyta
14	Pueblo Nuevo	32	Paso de Jacinto	51	Los Cerezoso Quita
15	La Caiba	33	Piedra Blanca	52	Manpoque (*)
16	Castellar	34	La Hoya	53	Monte Grande
17	Manaquito (*)	35	Los Indios	54	Manuel Bueno
		36	La Pina	55	Las Lagunas

Fig. 3.1.1 Villages Location Map (1/2)

0 5 10 15 km

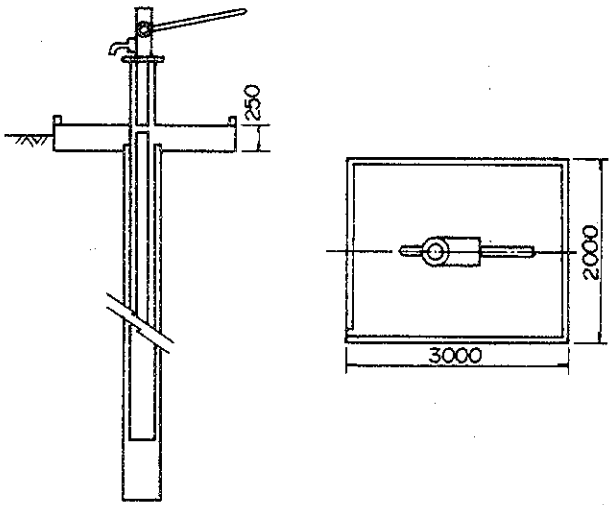


No.	Village
	Palma Dulce
2	Angel Felix
3	Sabana Real
4	Los Pinos del Edén
5	Bartolome
6	Angostura
7	Paso de los Novillos
8	El Mantel
9	Barreras
10	Gajo del Rancho
	Batey 9

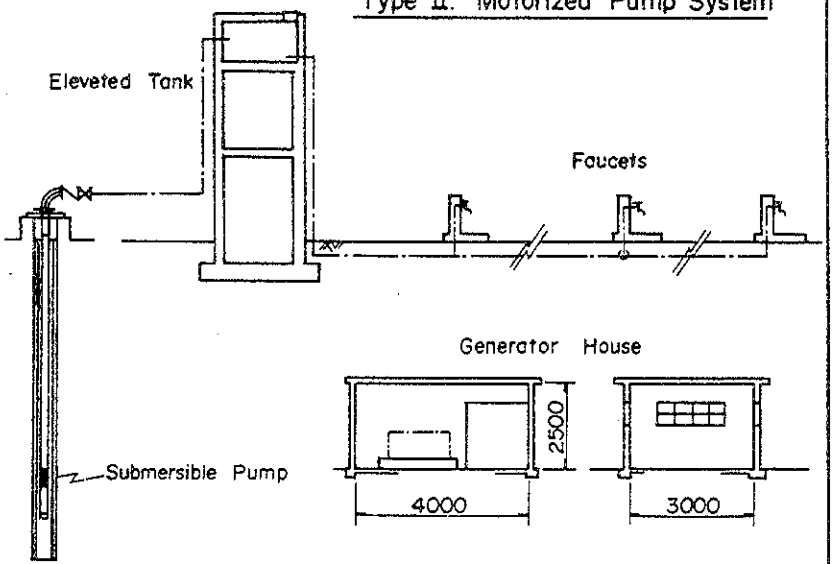
No.	Village	No.	Village
1	Guarumal Arriba	29	Bruno
2	Sabacón Abajo	30	La Joya
3	El Cedro	31	Palo Seco
4	Los Corocitos	32	Juan Cano
5	La Cabra-El Cerro	33	La Lajita
6	Sabana Crespo	34	Las Lagunas
7	Potroso	35	Yerba Buena
8	Mecasia	36	Cañada del Barrero
9	Carrera Verde	37	Sonador
10	Lamedero	38	La Sajoneda
11	La Margarita	39	Los Ranchitos
12	Pozo Hondo	40	Los Mesas
13	Hato Nuevo	41	Los Conos
14	El Huese	42	Los Pajaritos
15	El Duan	43	Boca del Botado
16	El Canita	44	Los Jaguelles (*)
17	Los Manisos	45	Los Botados de Victorino(*)
18	Mata Bonita	46	Sabana de la Loma
19	El Mamoncito	47	Juan Garcia
20	El Pondo	48	Madre Vieja
21	San Andres	49	El Corbano
22	Guayabal	50	Arroyo Grande
23	Hato Viejo	51	El Pomito
24	Pilón	52	Robinzar
25	Guaros	53	Musu (*)
26	Los Yareyes	54	Guayajayuco
27	El Cantón	55	Villain
28	Benancio		

Fig 3.1.2 Villages Location Map (2/2)

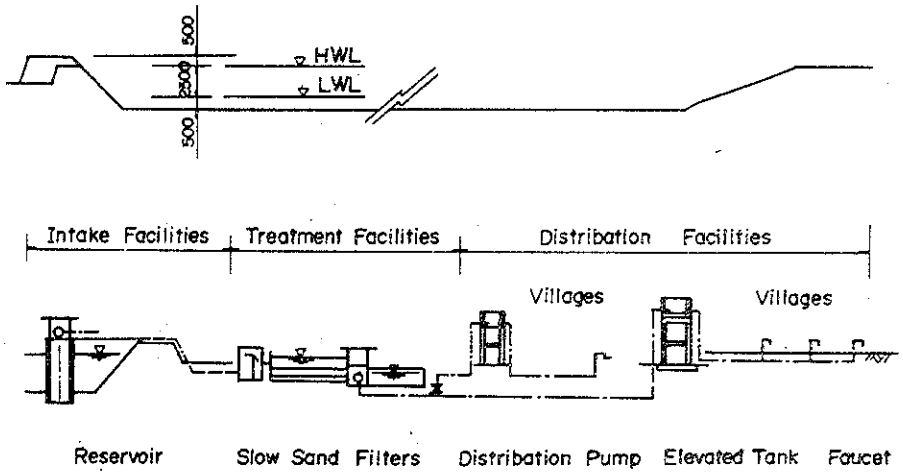
Type I. Hand Pump System



Type II. Motorized Pump System



Type III. Water Treatment System



Type IV Tank Car Service System

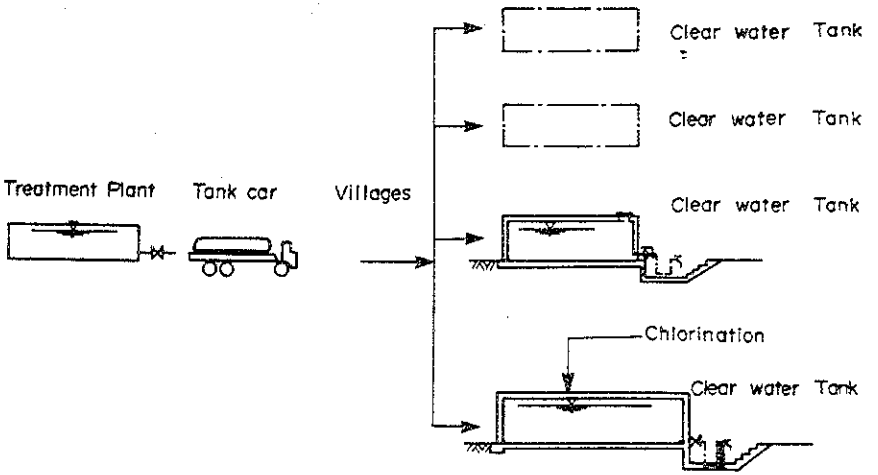


Fig. 5. 1 Water Supply Development System. Type I – Type IV

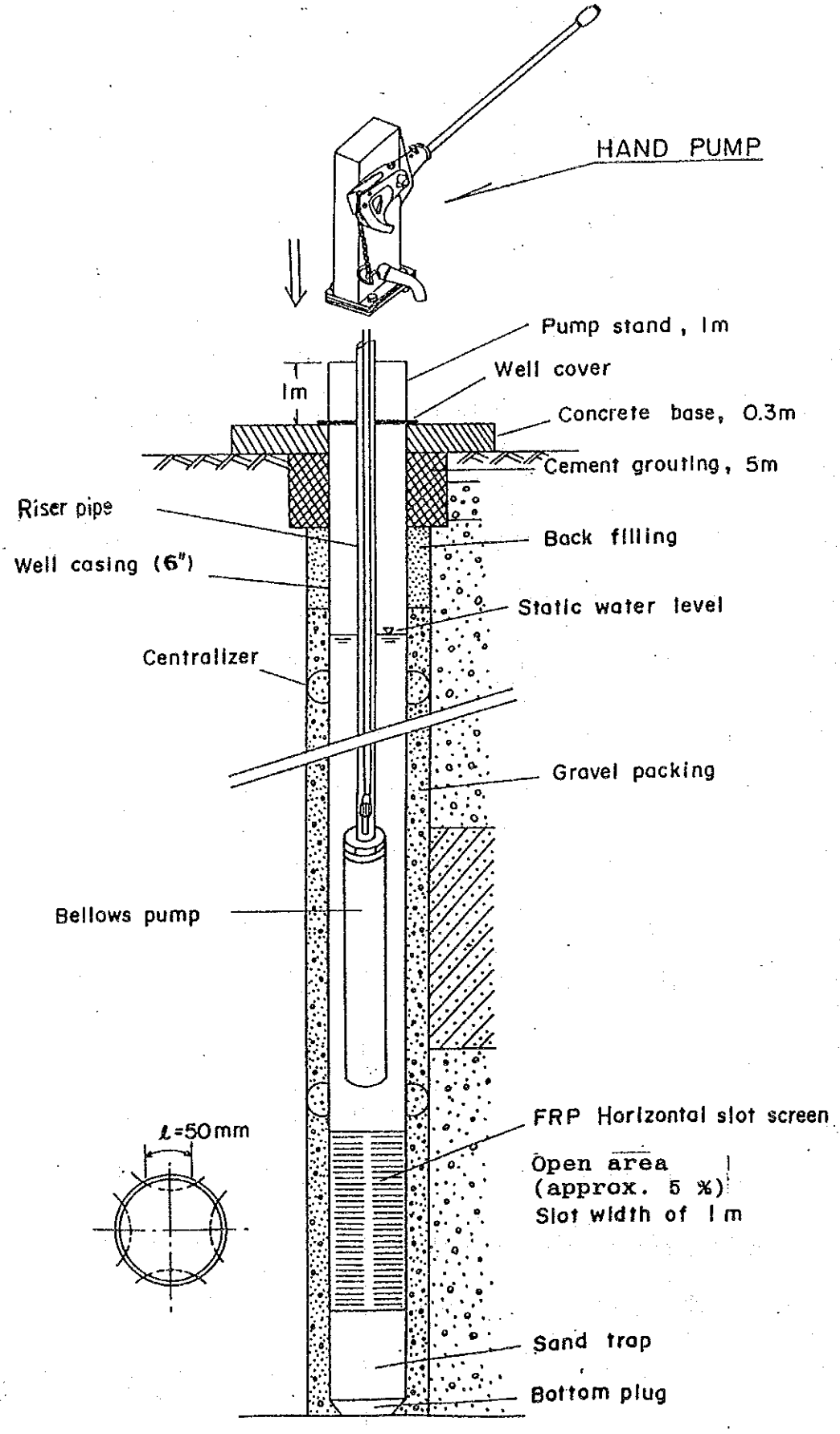


Fig. 5.1.2 Standard Design of the Well (Hand Pump)

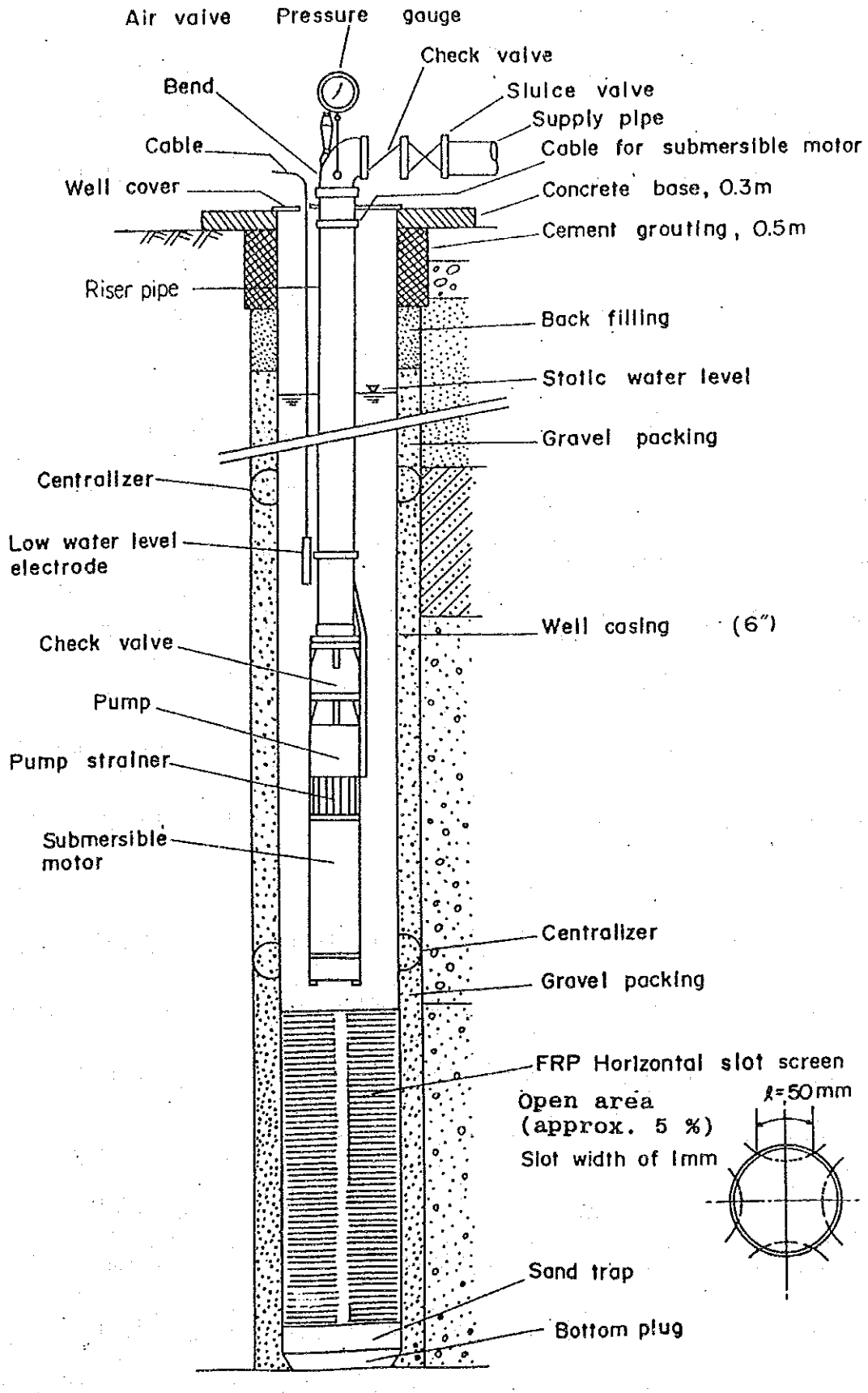
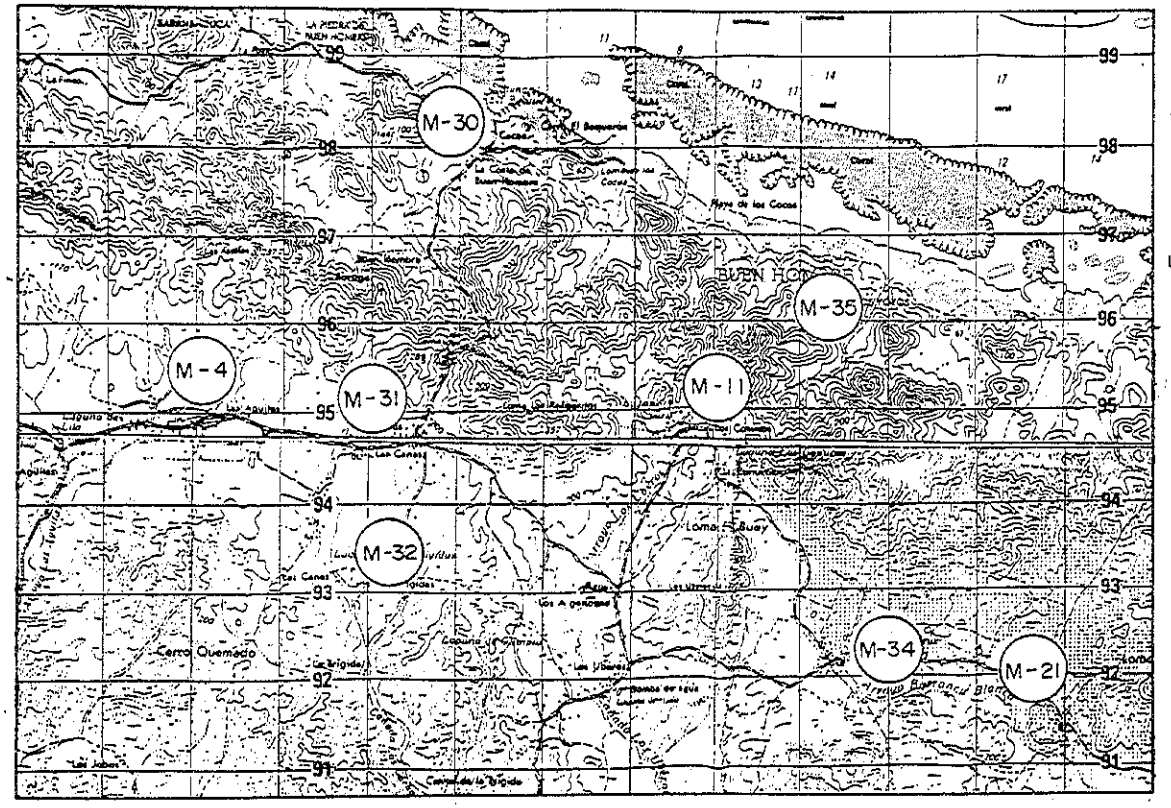
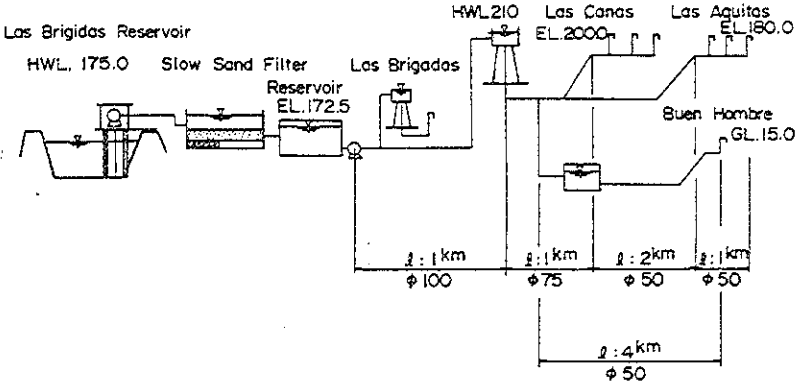


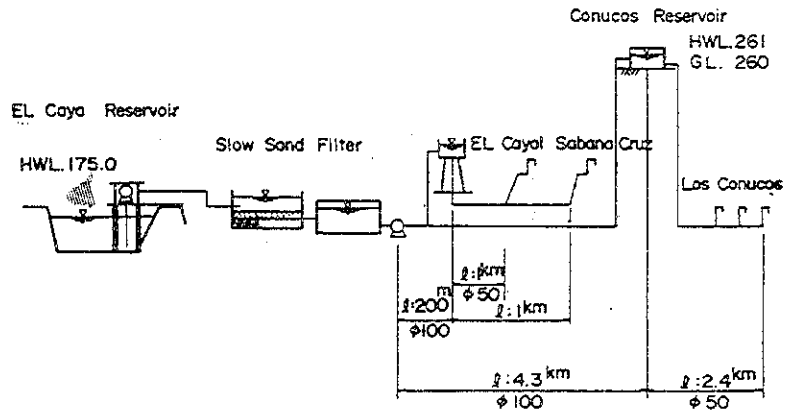
Fig. 5.1.3 Standard Design of the Well (Motorized Pump)



Central Treatment Plant System Flow Chart



East Treatment Plant System Flow Chart



Northern Mountain Central					Northern Mountain East				
No.	Village	Household	Population	Demand	No.	Village	Household	Population	Demand
				ℓ/min					ℓ/min
4	Las Aquitas	153	692	23	11	Los Canucos	98	483	16
30	Buen Hombre	89	423	14	21	El Cayal	97	424	14
31	Las Canas	70	245	8	34	Sabana Cruz	148	647	21
32	Las Brigidas	19	95	3					
	Total	331	1455	48 (m^3/d) (69.0 m^3/d)			343	1554	51 (m^3/d) (73.0 m^3/d)

Fig. 5.1.4 Type III Surface Water Treatment System

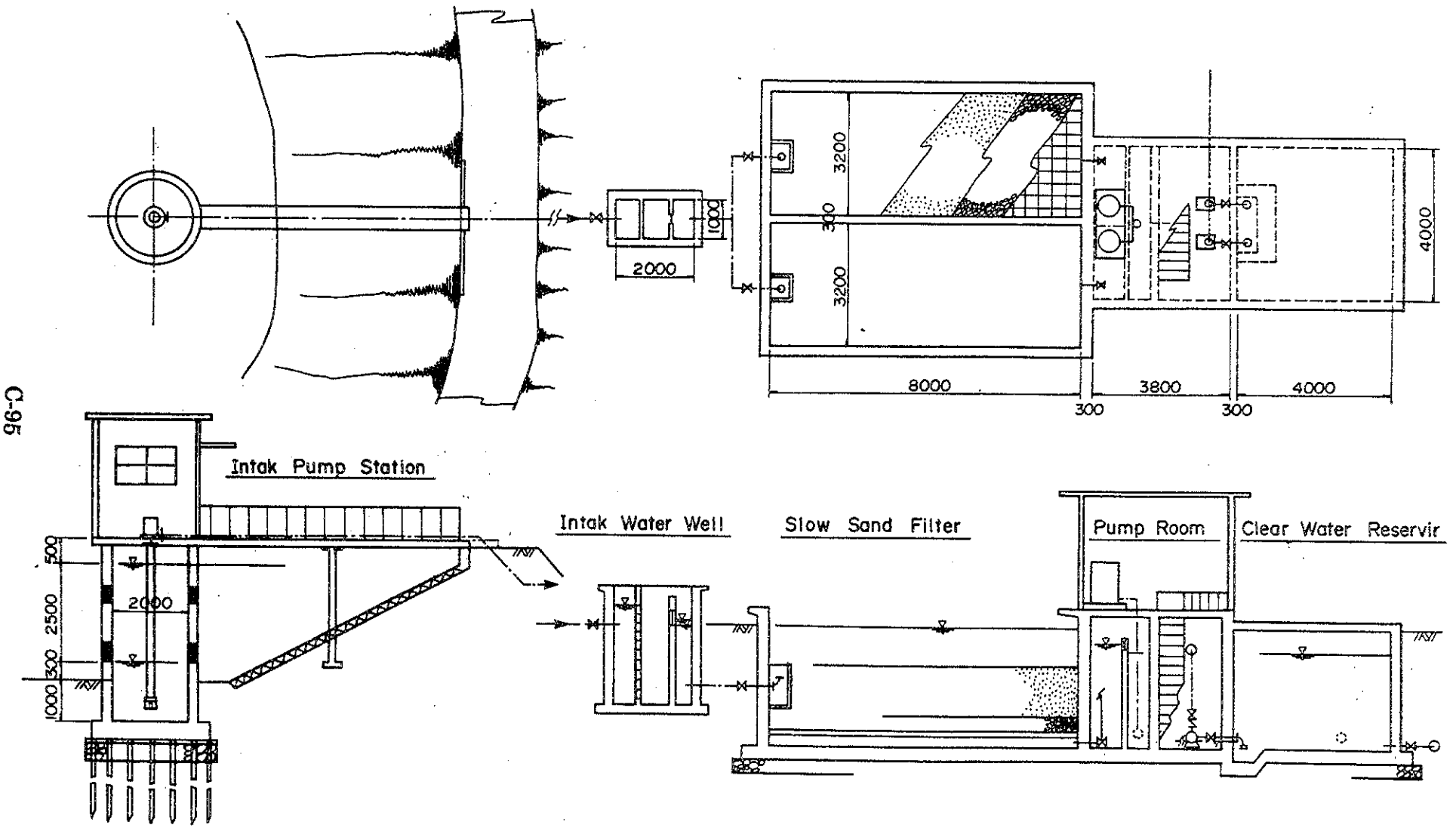


Fig. 5.1.5 Las Aguitas Water Treatment Plant