

14. Alternative Feasibility Study

14.1 General

This section deals, as previously described in 1. General, with a study for a project comprising Phase I and Phase II in order to explore the feasibility.

14.2 Proposed Water Supply Plan

The project area for the target year covers approximately 4,906 ha, the population served increases to 72,982 and the total water demand is 14,980 cu m/d, which are described in the preceding sections of this part.

The schematic diagram and the location of major facilities for proposed water supply systems are shown in Figs 3.14.1 and 3.14.2. The facilities to be constructed are recapitulated in Table 3.14.1. The construction schedule is as Fig 3.14.3 and the project cost and disbursement schedule are shown in Table 3.14.2 and Table 3.14.3 respectively.

14.3 Financial Feasibility Analysis

14.3.1 Source of Funds and Rate of Interest on Borrowing

In this financial feasibility study, forecasts are constructed on the assumption that 25% of the total capital investment is financed by government subsidies and the rest by the government loans. Forecasts of loan disbursement and debt service are presented in Financial Table 3.

These estimates are based on the assumption that the Water District will be able to obtain loan funds through government sources (LWUA), which represent a blending of funds obtained locally and internationally.

The assumed interest rate is 9.0 percent per annum and other assumed terms include a six-year period (construction period) of grace on principal payment, and twenty-four year instalment repayment.

Approximately 60% of the project cost is composed of foreign currency portions and the rest composed of local currency portions. In view of the magnitude of foreign currency requirements, the government is recommended to seek loans from foreign sources such as the Overseas Economic Cooperation Fund, Japan (OECF), the World Bank or the Asian Development Bank, though the effect of such borrowing will not directly affect the forecasts of the Water District's financial performance.

14.3.2 Financial Feasibility

Carefully constructed financial forecasts based on the above mentioned assumptions indicate that the project covering Phase I and II will be positively viable in financial terms.

14.3.3 Water Rate

In calculating revenue, water rates for domestic user were projected less than 5% of the average household income of the Water District Area. (See Financial Table 7)

One of the salient features of the project is that the revenue units costs at 1981 constant prices of production toward the target year period 1990-1993, will be significantly lower than at present.

14.4 Economic Feasibility Analysis

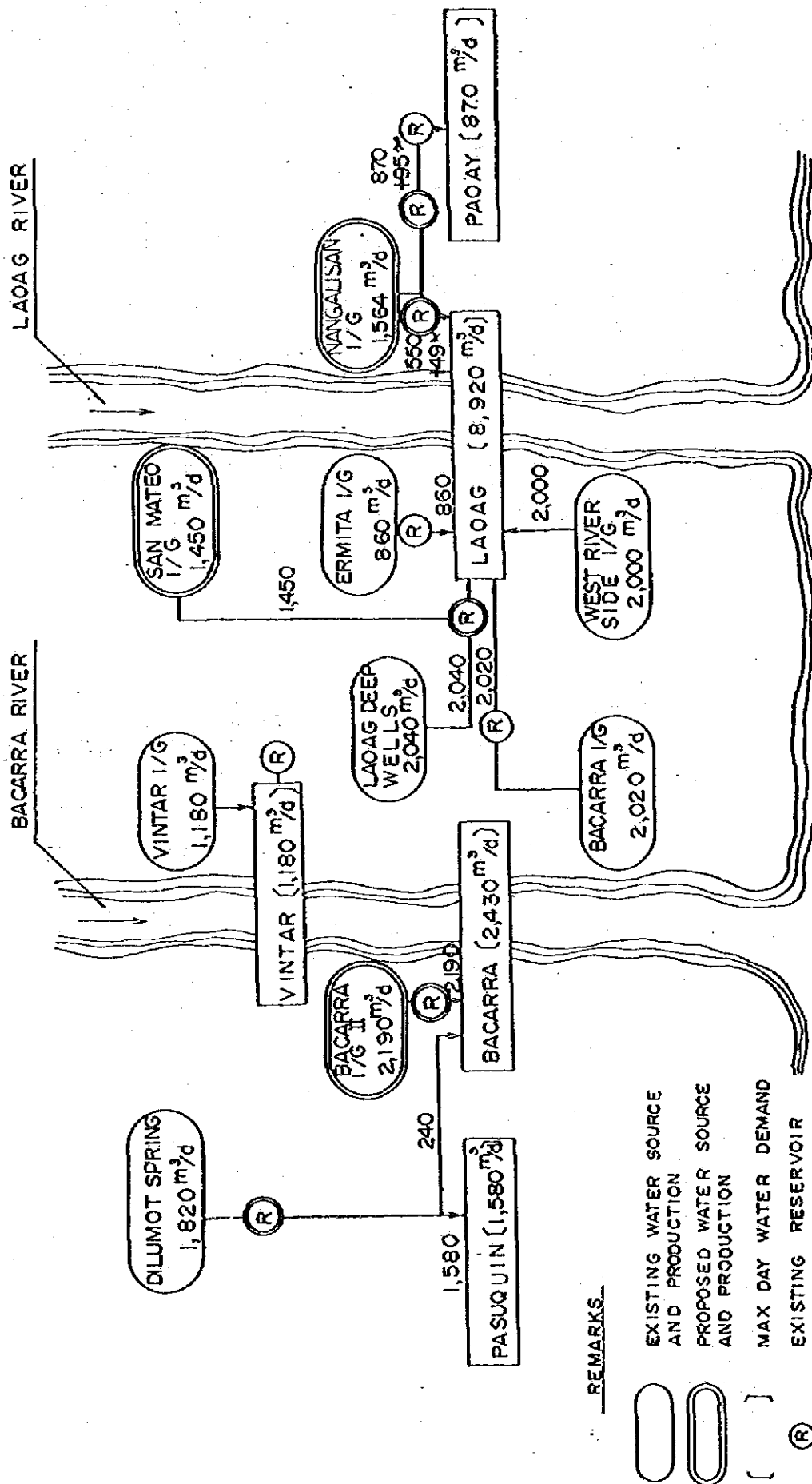
14.4.1 Increase of Served Population and Area

Served population in the target year is estimated at 72,982 which is a gain of 290% over the present served population. And the served area will increase from 1,280 ha to 4,906 ha in the target year.

14.4.2 Internal Economic Rate of Return

The internal economic rate of return calculated proved positive economic viability as to the recommended master plan as shown below.

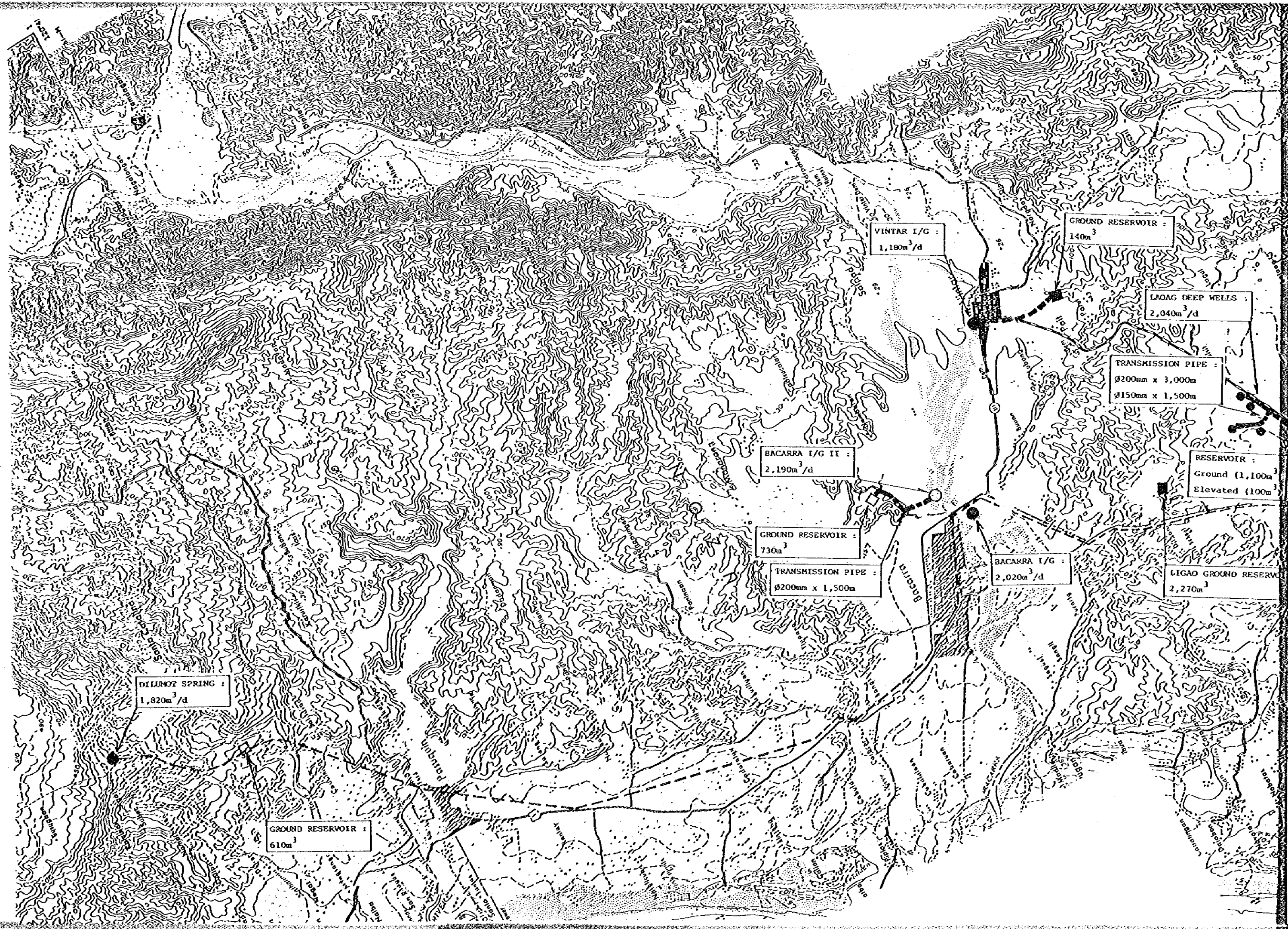
- 1) Based on Cost Value without Conversion: 10 %
- 2) Based on Cost Value with Conversion A : 9 %
- 3) Based on Cost Value with Conversion B : 11 %
- 4) Based on Cost Value with Conversion C : 9 %

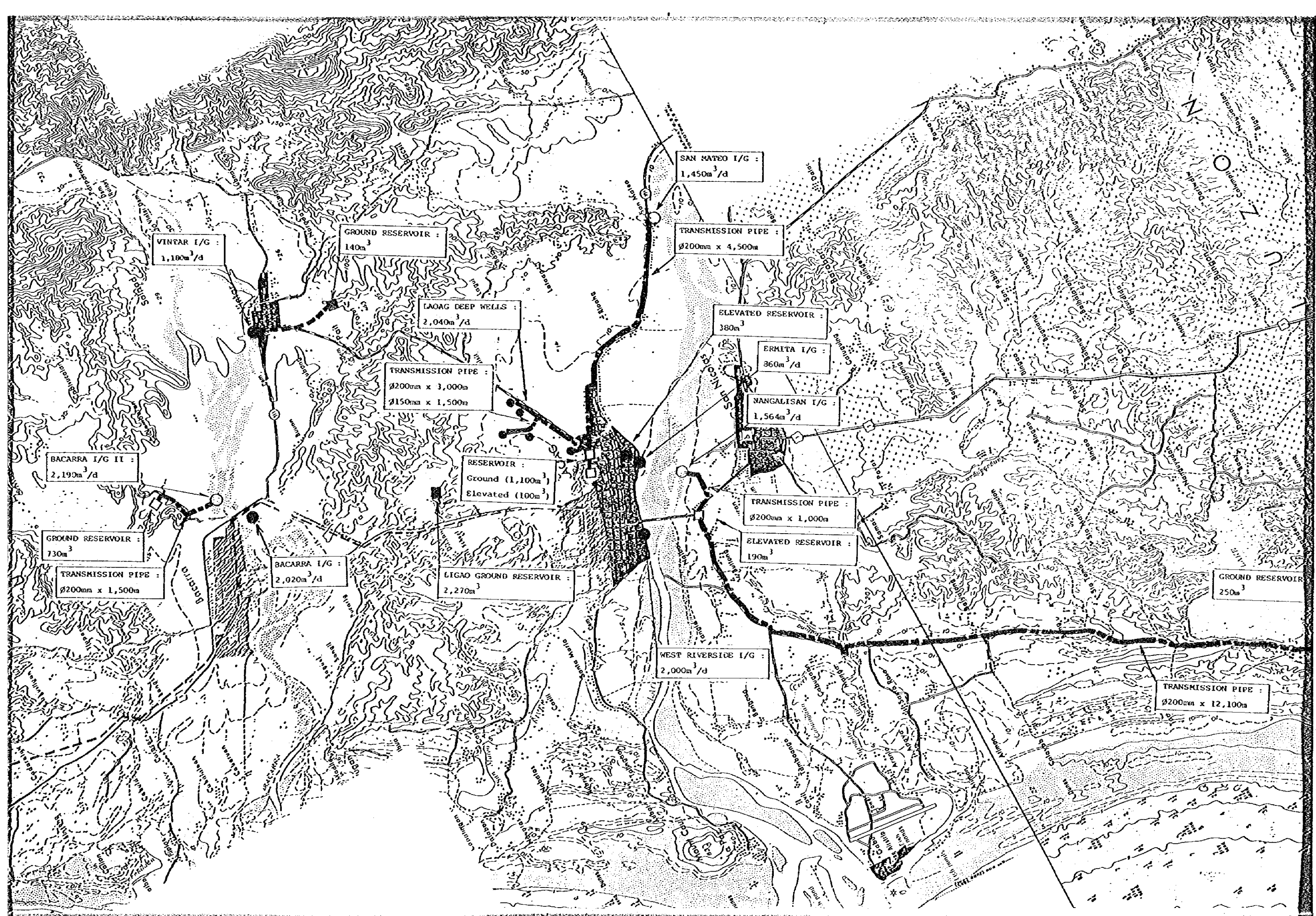


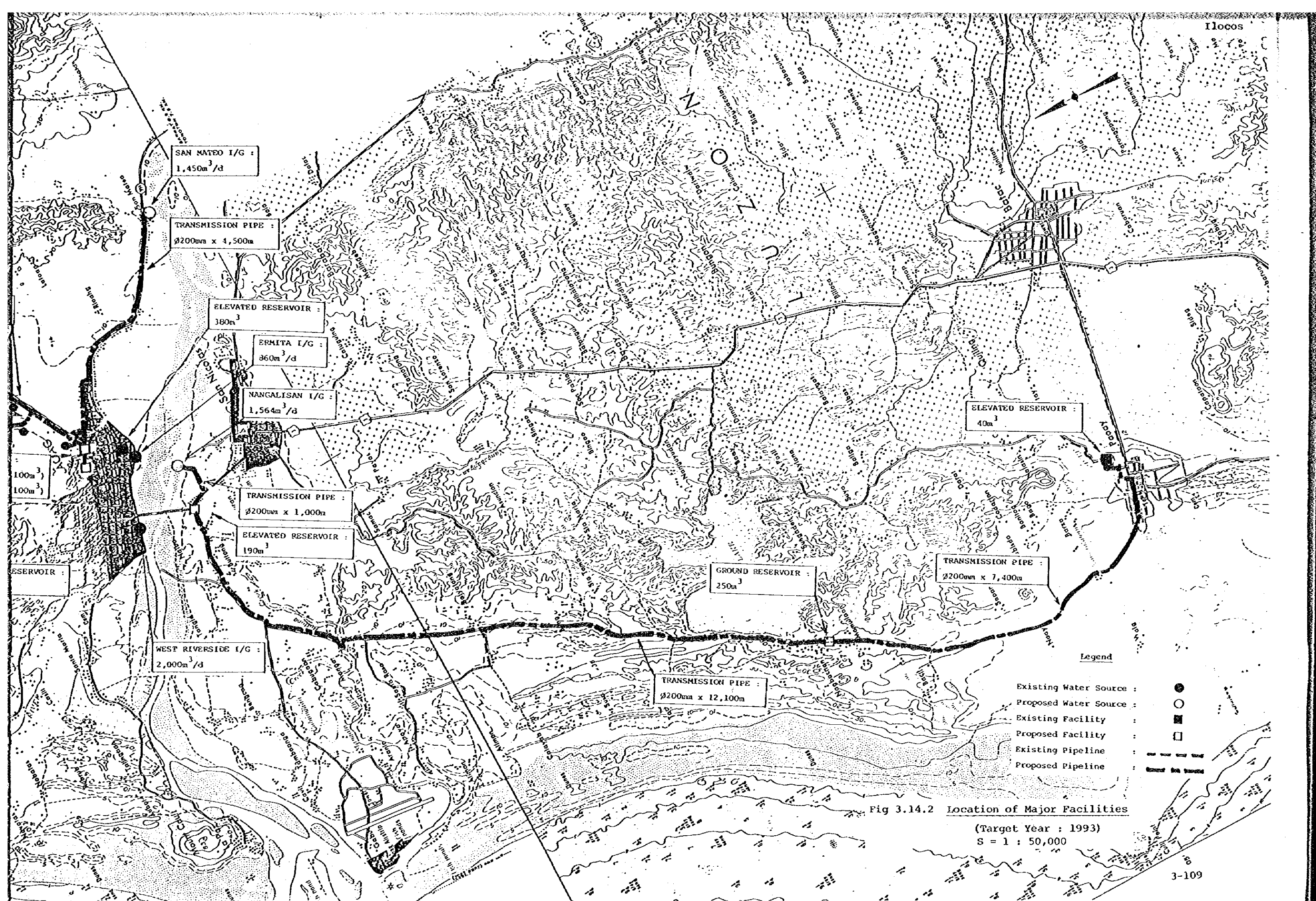
Ilocos
(I + II)

SOUTH CHINA SEA

Fig 3.14.1 Proposed Water Supply System
(Target Year : 1993)







<p>A. Dilumot Spring System</p> <p>a) Ground Reservoir (610 m³ x 1)</p> <p>B. West Riverside I/G System</p> <p>a) Intake Pump (23.1 l/s, H = 30 m)</p> <p>C. Vintar I/G System</p> <p>a) Intake Pump (13.7 l/s, H = 40 m)</p> <p>D. Bacarra I/G II System</p> <p>a) Infiltration Gallery (ø1,000 mm x 110 m)</p> <p>b) Intake Pump Station (25.3 l/s, H = 50 m)</p> <p>c) Transmission Pipe (ø 200 mm x 1,500 m)</p> <p>d) Ground Reservoir (730 m³ x 1)</p> <p>E. San Mateo I/G System</p> <p>a) Infiltration Gallery (ø1,000 mm x 80 m)</p> <p>b) Intake Pump Station (16.8 l/s, H = 50 m)</p> <p>c) Transmission Pipe (ø200 mm x 4,500 m)</p>	<p>I. Valve</p> <p>a) ø250 mm x 3 pcs</p> <p>b) ø200 mm x 42 pcs</p> <p>c) ø150 mm x 59 pcs</p> <p>d) ø100 mm x 127 pcs</p> <p>e) ø 75 mm x 137 pcs</p> <p>f) ø 50 mm x 226 pcs</p> <p>J. Fire Hydrant (418 pcs)</p> <p>K. Bulk Meter</p> <p>a) ø250 mm x 2 pcs</p> <p>b) ø200 mm x 9 pcs</p> <p>c) ø150 mm x 9 pcs</p> <p>L. Chlorinator (13 units)</p> <p>M. Service Connection (ø13 mm x 12,196 pcs)</p> <p>N. Vehicle (3 cars)</p>	<p>F. Laoag Deep Wells System</p> <p>a) Pump Station (5.8 l/s, 7 kw, 5 units)</p> <p>b) Transmission Pipe (ø200 mm x 3,000 m) (ø150 mm x 1,500 m)</p> <p>c) Ground Reservoir (1,100 m³ x 1)</p> <p>d) Distribution Pump (50.5 l/s, H = 30 m)</p> <p>e) Elevated Reservoir (100 m³ x 1)</p> <p>G. Nangalisan I/G System</p> <p>a) Infiltration Gallery (ø1,000 mm x 80 m)</p> <p>b) Intake Pump Station (18.3 l/s, H = 60 m)</p> <p>c) Transmission Pipe (ø200 mm x 20,500)</p> <p>d) Ground Reservoir (250 m³ x 1)</p> <p>e) Elevated Reservoir (190 m³ x 1)</p> <p>H. Distribution Pipe</p> <p>a) ø200 mm x 7,600 m</p> <p>b) ø150 mm x 17,200 m</p> <p>c) ø100 mm x 37,900 m</p> <p>d) ø 75 mm x 41,000 m</p> <p>f) ø 50 mm x 67,600 m</p>
---	--	---

table Table 3.14.1 Facilities to be Constructed

(Target Year : 1993)

Fig 3.14.3 Construction Schedule

(Target Year : 1993)

Work Item	Year							
	'82	'83	'84	'85	'86	'87	'88	'89
<u>(Appraisal & Loan Procedure)</u>	■							
<u>Engineering Services</u>		DD			SV			
<u>Procurement</u>								
- Transmission & distribution pipes, pumps, water meters, etc.		T	M					
<u>Civil Work</u>								
- Dilumot Spring System			T	C				
- Bacarra I/G II System					T	C		
- San Mateo I/G System						T	C	
- Laoag Deep Wells System				T	C			
- Nangalisan I/G System		T	C					
- Transmission and distribution pipes, pumps, water meters, etc.		T			C			

Note: DD = Detailed Design
SV = Supervision of Construction
T = Tendering Procedure (Advertisement/Tendering/Evaluation/Award)
M = Manufacturing & Shipping
C = Construction/Installation

Table 3.14.2 Project Cost

(Target Year : 1993)

Ilocos
(I + II)

Note: - Unit = One Thousand Pesos = '000 Pesos
 - Prices as of 1st July 1981
 - Foreign Exchange Rate: US \$ 1.00 = Peso 7.80

Work Items	Cost		
	Total Cost	Foreign Currency Component	Local Currency Component
A. Dilumot Spring System	826	207	619
B. West Riverside I/G System	243	219	24
C. Vintar I/G System	194	175	19
D. Bacarra I/G II System	2,844	1,290	1,554
E. San Mateo I/G System	3,422	2,125	1,297
F. Laoag Deep Wells System	5,949	3,088	2,861
G. Nangalisan I/G System	10,154	6,080	4,074
H. Distribution Pipe	24,844	16,645	8,199
I. Valve	1,666	1,215	451
J. Fire Hydrant	2,801	1,849	952
K. Bulk Meter	173	138	35
L. Chlorinator	130	117	13
M. Service Meter	7,771	5,984	1,787
N. Vehicle	210	105	105
Sub Total	61,227	39,237	21,990
Detailed Design Cost (10.5%)	6,429	3,857	2,572
Supervision Cost (3.5 %)	2,143	1,286	857
Land Cost	200	-	200
Total	69,999	44,380	25,619
Physical Contingency (10%)	7,000	4,438	2,562
Total	76,999	48,818	28,181
Price Contingency	52,610	32,251	20,359
Grand Total (Project Cost)	129,609	81,069	48,540
	(Equivalent to US\$16.62 M)	(Equivalent to US\$10.40 M)	(Equivalent to US\$6.22 M)

Table 3.14.3 Disbursement Schedule
(Target Year : 1993)

NOTE:

- F/C = Foreign Currency Component
- L/C = Local Currency Component
- Unit: One Thousand Pesos = 1,000 Pesos
- Prices: As of 1st July 1981
- Foreign Exchange Rate: US\$1.00 = Pesos 7.80

Description	Cost		Yearly Disbursement											
	Total Cost	Breakdown	1983		1984		1985		1986		1987		1988	
			F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
A. Dilimet Spring System														
a) Ground Reservoir (610 m ³ x 1)	826	207 619					207 619							
B. West Riverside I/C System														
a) Intake Pump (23.2 l/s, H = 30 m)	243	219 24			219	24								
C. Vintar I/C System														
a) Intake Pump (13.7 l/s, H = 40 m)	194	175 19			175	19								
D. Bacarra I/C II System														
a) Infiltration Gallery (ø1,000 mm x 110 m)	440	110 330									110	330		
b) Intake Pump Station (25.3 l/s, H = 50 m)	600	360 240									360	240		
c) Transmission Pipe (ø 200 mm x 1,500 m)	878	588 290									588	290		
d) Ground Reservoir (730 m ³ x 1)	926	232 694											232	694
E. San Mateo I/C System														
a) Infiltration Gallery (ø1,000 mm x 80 m)	320	80 240									80	240		
b) Intake Pump Station (16.8 l/s, H = 50 m)	469	281 188									281	188		
c) Transmission Pipe (ø200 mm x 4,500 m)	2,633	1,764 869											1,764	869

(to be continued)

NOTE:

- F/C = Foreign Currency Component
- L/C = Local Currency Component
- Unit: One Thousand Pesos = '000
- Prices: As of 1st July 1981
- Foreign Exchange Rate: US\$1.00 =

Description	Cost				Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988		
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	
F. Laoag Deep Wells System																
a) Pump Station (5.8 l/s, 7 kw, 5 units)	1,075	602	473													
b) Transmission Pipe (ø200 mm x 3,000 m) (ø150 mm x 1,500 m)	1,755 619	1,176 415	579 204													
c) Ground Reservoir (1,100 m³ x 1)	1,204	301	903													
d) Distribution Pump (50.5 l/s, H = 30 m)	771	463	308													
e) Elevated Reservoir (100 m³ x 1)	525	131	394													
G. Nangalisan I/G System																
a) Infiltration Gallery (ø1,000 mm x 80 m)	320	80	240			80	240									
b) Intake Pump Station (18.3 l/s, H = 60 m)	522	313	209			313	209									
c) Transmission Pipe (ø200 mm x 20,500)	7,995	5,357	2,638			3,423	1,686		1,934	952						
d) Ground Reservoir (250 m³ x 1)	467	117	350						117	350						
e) Elevated Reservoir (190 m³ x 1)	850	213	637						213	637						
H. Distribution Pipe																
a) ø200 mm x 7,600 m	2,964	1,986	978			993	489		596	293						
b) ø150 mm x 17,200 m	4,730	3,169	1,561			1,585	781		951	466						
c) ø100 mm x 37,900 m	6,822	4,571	2,251			2,286	1,126		1,371	675						
d) ø 75 mm x 41,000 m	4,920	3,296	1,624			1,648	812		989	487						
e) ø 50 mm x 67,600 m	5,408	3,623	1,785			1,812	893		1,087	357						
															178	

(to be continued)

NOTE:

- F/C = Foreign Currency Component
- L/C = Local Currency Component
- Unit: One Thousand Pesos = '000 Pesos
- Prices: As of 1st July 1981
- Foreign Exchange Rate: US\$1.00 = Pesos 7.80

(Thousand Pesos)

Description	Cost		Yearly Disbursement											
	Total Cost	Breakdown	1983		1984		1985		1986		1987		1988	
			F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
I. Valve														
a) ø250 mm x 3 pcs	25	18		7	18	7								
b) ø200 mm x 42 pcs	256	187		69	94	35		21		37		13		
c) ø150 mm x 59 pcs	251	183		68	92	34		20		36		14		
d) ø100 mm x 127 pcs	425	310		115	155	58		35		62		22		
e) ø 75 mm x 137 pcs	370	270		100	135	50		30		54		20		
f) ø 50 mm x 226 pcs	339	247		92	124	46		18		49		10		9
J. Fire Hydrant														
(418 pcs)	2,801	1,849		952	925	476		286		369		190		
K. Bulk Meter														
a) ø250 mm x 2 pcs	20	16		4	16	4								
b) ø200 mm x 9 pcs	90	72		18	72	18								
c) ø150 mm x 9 pcs	63	50		13	50	13								
L. Chlorinator														
(13 units)	130	117		13	117	13								
M. Service Connection														
(ø13 mm x 12,196 pcs)	7,771	5,984		1,787	5,984	894		357				179		178
N. Vehicle														
(3 cars)	210	105		105	105	105								

(to be continued)

Present - 1984: 15% Annual both for F/C and L/C
1985 - 1989: 12% Annual both for F/C and L/C
1990 - : 10% Annual both for F/C and L/C

(50504 Purnouch)

Description	Cost			Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988	
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
Sub-Total	61,227	39,237	21,990			20,421	8,032	9,732	6,377	5,669	3,999	1,419	1,654	1,996	1,928
Design Cost (10.5%)	6,429	3,857	2,572			2,572									
Supervision Cost (3.5%)	2,143	1,286	857			386	257	257	171	257	171	193	129	193	129
Land Cost	200		200				200								
Total	69,999	44,380	25,619			20,807	8,489	9,989	6,548	5,926	4,170	1,612	1,783	2,189	2,057
Physical Contingency (10%)	7,000	4,438	2,562			257	849	999	655	592	417	161	178	219	206
Total	76,999	48,818	28,181			2,829	9,338	10,988	7,203	6,518	4,587	1,773	1,961	2,408	2,263
Price Contingency	52,610	32,251	20,359			905	4,856	7,692	5,042	5,931	4,174	2,021	2,236	3,347	3,146
Grand Total (Project Cost)	129,609	81,069	48,540			3,734	14,194	18,680	12,245	12,449	8,761	3,794	4,197	5,755	5,409

Ilocos
(I + II)

FINANCIAL TABLE 1

I + II

ILOCOS NORTE WATER SUPPLY PROJECT
PROJECT COSTS BY YEAR OF CONSTRUCTION
(P1,000's)

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	210		210				
2. Chlorinator	130		130				
3.							
4. Wells and Pumps	3,874		959	645	1,201	1,069	
5. Meters	173		173				
6. Distribution System	24,844		12,425	7,274	4,789	178	178
7. Transmission System	13,880		5,109	4,366	894	878	2,633
8. Fire Hydrants	2,801		1,401	841	559		
9. Reservoir	4,798			2,143	1,729		926
10. Valves	1,666		848	483	317	9	9
11. I/G	1,080		320			760	
12.							
13. Service Connection	7,771		6,878	357	179	179	178
14. Engineering	6,429	6,429					
15. Supervision	2,143		643	428	428	322	322
16. Land	200		200				
17. Physical Contingency	7,000	643	2,930	1,654	1,009	339	425
18.							
TOTAL, 7-1-81	76,999	7,072	32,226	18,191	11,105	3,734	4,671
ESCALATION FACTORS		1.3225	1.5209	1.7034	1.9078	2.1367	2.3931
ESCALATED COSTS	129,609	9,335	48,984	30,925	21,210	7,991	11,164

FINANCIAL TABLE 2
 ILOCOS NORTE WATER SUPPLY PROJECT
 OPERATION AND MAINTENANCE COSTS
 (P1,000's)

I + II

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor 1/	Amount
1981	209	76	261	546	1.000000	546
1982	209	80	292	581	1.150000	668
1983	212	92	314	618	1.322500	817
1984	253	97	382	732	1.520875	1,113
1985	309	111	495	915	1.703380	1,559
1986	368	124	625	1,117	1.907785	2,131
1987	429	133	824	1,386	2.136719	2,962
1988	468	143	984	1,595	2.393126	3,817
1989	511	154	1,176	1,841	2.680301	4,934
1990	556	163	1,429	2,148	2.948331	6,333
1991	599	172	1,722	2,493	2.243164	8,085
1992	638	182	2,136	2,956	3.567480	10,546
1993	682	182	2,722	3,586	3.924228	14,072
1994	682	182	2,722	3,586	4.316651	15,480
1995	682	182	2,722	3,586	4.748316	17,028
1996	682	182	2,722	3,586	5.233148	18,730
1997	682	182	2,722	3,586	5.745463	20,603
1998	682	182	2,722	3,586	6.320009	22,664

1/ Escalation currently 15 percent per year to 1984 (1981 = 1.00),
 12 percent per year between 1985 and 1989 and 10 percent per year
 in 1990 and afterwards.

Ilocos

I + II

FINANCIAL TABLE 3
ILOCOS NORTE WATER SUPPLY PROJECT
LOAN DISBURSEMENTS AND DEBT SERVICE
(P1,000's)

Year	Disbursement ^{1/}		Loans Outstanding		Interest Payments ^{4/}		Principal Payments ^{3/}	Total Debt Service
	Grant _{25%}	Loan _{75%}	Beginning	Ending	First Year _{2/}	Later Years		
1981								
1982								
1983	2,334	7,001		7,316				
1984	12,246	36,738	7,316	46,365				
1985	7,731	23,194	46,365	74,775				
1986	5,303	15,907	74,775	98,127				
1987	1,998	5,993	98,127	113,220				
1988	2,791	8,373	113,220	132,159				
1989			132,159	131,854		11,894	305	12,199
1990			131,854	129,922		11,867	1,932	13,799
1991			129,922	126,806		11,693	3,116	14,809
1992			126,806	122,718		11,413	4,088	15,501
1993			122,718	118,000		11,045	4,718	15,763
1994			118,000	112,493		10,620	5,507	16,127
1995			112,493	106,986		10,124	5,507	15,631
1996			106,986	101,479		9,629	5,507	15,136
1997			101,479	95,972		9,133	5,507	14,640
1998			95,972	90,465		8,637	5,507	14,144

^{1/} From Financial Table 1.

^{2/} Disbursements assumed to be equally spread during year. Charge with 50 per cent of annual interest in first year.

^{3/} Principal payments made in equal yearly instalments.

^{4/} Interest capitalized during construction.

FINANCIAL TABLE 4

ILOCOS NORTE WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(P1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		546	546		546	1,845	0.30
1982		668	668		668	2,081	0.32
1983		817	817		817	2,224	0.37
1984		1,113	1,113		1,113	2,412	0.46
1985		1,559	1,559		1,559	2,609	0.60
1986		2,131	2,131		2,131	3,117	0.68
1987		2,962	2,962		2,962	3,695	0.80
1988		3,817	3,817		3,817	4,077	0.94
1989	12,199	4,934	17,133	857	17,990	4,496	4.00
1990	13,799	6,333	20,132	1,007	21,139	4,995	4.23
1991	14,809	8,085	22,894	2,289	25,183	5,418	4.65
1992	15,501	10,546	26,047	2,605	28,652	5,746	4.99
1993	15,763	14,072	29,835	2,984	32,819	6,864	4.78
1994	16,127	15,480	31,607	3,161	34,768	6,864	5.07
1995	15,631	17,028	32,659	3,266	35,925	6,864	5.23
1996	15,136	18,730	33,866	3,387	37,253	6,864	5.43
1997	14,640	20,603	35,243	3,524	38,767	6,864	5.65
1998	14,144	22,664	36,808	3,681	40,489	6,864	5.90

1/ Reserve estimate equal to 10 per cent of total costs. (5 per cent for the first two years)

2/ Revenue units from Tables 9A, 9B and 9C.

3/ Revenue units divided into costs with reserves.

FINANCIAL TABLE 5 - A

ILOCOS NORTE WATER SUPPLY PROJECT
ABILITY TO PAY FOR WATER

I + II

Year	Ave. Monthly Family Income <u>1/</u>	Available 5%	Average Family Size	Household Water Use		Revenue Units Per Month <u>2/</u>	Max. Ability Per Rev. Unit
				lpcd	Cubic Meters/ Month		
1981	843.00	42.15	6.20	91	17	33	1.28
1982	969.45	48.47	6.19	91	17	33	1.47
1983	1,114.87	55.74	6.18	91	17	33	1.69
1984	1,282.10	64.11	6.17	91	17	33	1.94
1985	1,435.95	71.79	6.16	91	17	33	2.18
1986	1,608.27	80.41	6.15	93	17	33	2.44
1987	1,801.26	90.66	6.14	102	19	36	2.52
1988	2,017.41	100.87	6.13	102	19	36	2.80
1989	2,259.50	112.98	6.12	103	19	36	3.14
1990	2,485.45	124.27	6.11	103	19	36	3.45
1991	2,733.99	136.69	6.10	105	19	36	3.80
1992	3,007.40	150.37	6.09	104	19	36	4.18
1993	3,308.13	165.41	6.08	102	19	36	4.59

1/ Average monthly income escalated by 15 per cent per year to 1984, 12 per cent per year between 1985 and 1989, and 10 per cent in 1990 and afterwards.

2/ Assumed 1/2" service.

FINANCIAL TABLE 5 - B
ILOCOS NORTE WATER SUPPLY PROJECT
ABILITY TO PAY FOR WATER

I + II

1 Year	2 Ave. Monthly Family Income 1/	3 Available 5%	4 Average Family Size	5 Household Water Use		7 Revenue Units Per Month 2/	8 Max. Ability Per Rev. Unit
				lpcd	Cubic Meters/ Month		
1994	3,638.94	181.95	6.07	102	19	36	5.05
1995	4,002.84	200.14	6.06	102	19	36	5.56
1996	4,403.12	220.16	6.05	102	19	36	6.12
1997	4,843.43	242.17	6.04	102	18	35	6.92
1998	5,327.78	266.39	6.03	102	18	35	7.61

1/ Average monthly income escalated by 15 percent year to 1984, 12 percent per year between 1985 and 1989, and 10 percent in 1990 and afterwards.

2/ Assumed 1/2" service.

Ilocos
I + II

FINANCIAL TABLE 6 - A
 ILOCOS NORIE WATER SUPPLY PROJECT
 ILLUSTRATIVE CASH FLOW TABLE
 ₱1,000's EXCEPT CHARGES PER UNIT

Year	Revenue Units 1/	Charges per Unit	Gross Revenues	Net Revenue 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1981	1,845	0.80	1,476	95	1,402	546		546	856	856
1982	2,081	0.80	1,665	95	1,582	668		668	914	1,770
1983	2,222	1.25	2,778	95	2,639	817		817	1,822	3,592
1984	2,426	1.90	4,609	96	4,425	1,113		1,113	3,312	6,904
1985	2,589	1.90	4,919	96	4,722	1,559		1,559	3,163	10,067
1986	3,117	2.45	7,637	96	7,331	2,131		2,131	5,200	15,267
1987	3,695	2.50	9,238	97	8,961	2,962		2,962	5,999	21,266
1988	4,077	2.80	11,416	97	11,074	3,817		3,817	7,257	28,523
1989	4,496	3.15	14,162	97	13,738	17,133	708	17,841	-4,103	24,420
1990	4,955	3.45	17,095	98	16,753	20,132	855	20,987	-4,234	20,186
1991	5,418	3.80	20,588	98	20,176	22,894	2,059	24,593	-4,417	15,769
1992	5,846	4.18	24,436	98	23,948	26,047	2,444	28,491	-4,543	11,226
1993	6,371	4.59	29,243	98	28,658	29,835	2,924	32,759	-4,101	7,125

1/ From Tables 9A, 9B and 9C.

2/ Gross revenues from water sales reduced by bad debt allowance.

3/ Total of project debt service, operation and maintenance costs.

4/ Ten percent of gross water sales, after completion of construction. (5 percent for the first two years)

5/ Includes the costs of replacing the first complement of project components with seven years of life expectancy.

FINANCIAL TABLE 6 - B

ILOCOS NORTE WATER SUPPLY PROJECT
ILLUSTRATIVE CASH FLOW TABLE
P1,000's EXCEPT CHARGES PER UNIT

I + II

Year	Revenue Units 1/	Charges Per Unit	Gross Revenues	Net Revenues 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1994	6,371	5.05	32,174	98	31,531	31,607	3,217	34,824	-3,293	3,832
1995	6,371	5.50	35,041	98	34,340	32,659	3,504	36,163	-1,823	2,009
1996	6,371	6.00	38,226	98	37,461	33,866	3,823	37,689	-228	1,781
1997	6,371	6.00	38,226	98	37,461	35,243	3,823	39,066	-1,605	176
1998	6,371	7.00	44,597	98	43,705	36,808	4,460	41,268	3,329	3,505

1/ From Tables 9A, 9B and 9C.

2/ Gross revenues from water sales reduced by bad debt allowance.

3/ Total of project debt service, operation and maintenance costs.

4/ Ten percent of gross water sales, after completion of construction.

5/ Includes costs of replacing the first complement of project components with seven years of life expectancy.

Ilocos

I + II

Ilocos

I + II

FINANCIAL TABLE 7
ILOCOS NORTE WATER SUPPLY PROJECT
ILLUSTRATIVE RATE SCHEDULE

DOMESTIC AND GOVERNMENTAL SERVICE CONNECTIONS, 1/2"

Year	First 10 m ³ 1/	Charge for Each Added m ³ 2/			Charge 3/ per Revenue Unit
		11-20	21-45	over 45	
1981	20.00	0.96	1.12	1.36	0.80
1982	20.00	0.96	1.12	1.36	0.80
1983	31.25	1.50	1.75	2.13	1.25
1984	47.50	2.28	2.66	3.23	1.90
1985	47.50	2.28	2.66	3.23	1.90
1986	61.25	2.94	3.43	4.17	2.45
1987	62.50	3.00	3.50	4.25	2.50
1988	70.00	3.36	3.92	4.76	2.80
1989	78.75	3.78	4.41	5.36	3.15
1990	86.25	4.14	4.83	5.87	3.45
1991	95.00	4.56	5.32	6.46	3.80
1992	104.50	5.02	4.85	7.11	4.18
1993	114.75	5.51	6.43	7.80	4.59

Note: 1/ To obtain charge per m³ for the first 10 m³ classified by connection size, multiply R.U. charge shown in 3/ above by the following connection size factors.
Domestic : 1.0 for 3/8"; 2.5 for 1/2"; 4.0 for 3/4"; 8 for 1"
Commercial: 5.0 for 1/2"; 8.0 for 3/4"; 16.0 for 1"; 40.0 for 1 1/2"

2/ To obtain charge for each added m³, multiply R.U. charges shown in 3/ by the following block factors.
Domestic : 1.2 for 11-20 m³; 1.4 for 21-45 m³; 1.7 for over 45 m³
Commercial: 2.4 for 21-45 m³; 2.8 for 45-100 m³; 2.4 for over 100 m³

FINANCIAL TABLE 8

TLACOS NORTE
 WATER SUPPLY PROJECT I + II
 GROWTH IN POPULATION, SERVICE CONNECTIONS
 AND IN DELIVERED AND PROCURED WATER

Year	Ave. Number Service Connections	Number For Service	Persons Served	Daily Use lpcd <u>l/</u>	Annual Water Supply (1,000 M ³)		
					Delivered	% Unacct.	Produced
1981	3,166	7.9	25,000	114	1,044	45	1,898
1982	3,598	7.8	28,000	114	1,187	43	2,081
1983	3,713	7.7	28,700	114	1,277	40	2,122
1984	4,024	7.8	31,200	114	1,388	40	2,314
1985	4,663	7.4	34,550	116	1,457	40	2,428
1986	5,419	7.2	39,200	122	1,743	37	2,767
1987	6,366	6.9	44,125	128	2,054	34	3,112
1988	7,237	6.7	48,500	128	2,269	32	3,337
1989	8,171	6.5	53,150	129	2,507	30	3,581
1990	9,344	6.3	58,600	129	2,766	28	3,841
1991	10,628	6.0	63,400	131	3,020	26	4,081
1992	12,496	5.4	68,000	130	3,230	25	4,306
1993	15,122	4.8	72,982	128	3,419	25	4,588

l/ Liters per capita per day.

tlacós

FINANCIAL TABLE 9A

ILOCOS NORTE WATER SUPPLY PROJECT
CALCULATION OF REVENUE UNITS

A) AVERAGE NUMBER OF CONCESSIONAIRES

Year	Residential and Government					Commercial and Industrial					Total
	3/8"	1/2"	3/4"	1"	S-Total	1/2"	3/4"	1"	1 1/2"	S-Total	
1981	876	2,015	26	3	2,920	211	22	12	1	246	3,166
1982	940	2,161	28	3	3,132	218	23	13	2	256	3,388
1983	950	2,181	28	3	3,162	223	23	13	2	261	3,423
1984	1,097	2,525	33	4	3,659	235	25	14	2	276	3,935
1985	1,299	2,986	39	4	4,328	286	30	17	2	335	4,663
1986	1,484	3,415	45	5	4,949	401	42	24	3	470	5,419
1987	1,724	3,968	52	6	5,750	526	55	31	4	616	6,366
1988	1,980	4,555	59	7	6,601	543	57	32	4	636	7,237
1989	2,254	5,187	68	8	7,517	558	59	33	4	654	8,171
1990	2,601	5,984	78	9	8,672	574	60	34	4	672	9,344
1991	2,981	6,857	89	10	9,938	589	62	35	4	690	10,628
1992	3,537	8,134	106	12	11,789	604	64	35	4	707	12,496
1993											

B) SERVICE REVENUE UNITS PER CUBIC METER

Year	Residential and Government					Commercial and Industrial					Total
	1.00	2.50	4.0	8.0	S-total	5.0	8.0	16.0	40.0	S-Total	
1981	876	5,038	104	24	6,042	1,055	176	192	40	1,463	7,505
1982	940	5,403	112	24	6,479	1,090	184	208	80	1,562	8,041
1983	950	5,453	112	24	6,539	1,115	184	208	80	1,587	8,126
1984	1,097	6,313	132	32	7,574	1,175	200	224	80	1,679	9,253
1985	1,299	7,458	156	32	8,945	1,430	240	272	80	2,022	10,967
1986	1,484	8,538	180	40	10,242	2,005	336	384	120	2,845	13,087
1987	1,724	9,920	208	48	11,900	2,630	440	496	160	3,726	15,626
1988	1,980	11,383	236	56	13,655	2,715	456	512	160	3,843	17,498
1989	2,254	12,968	272	64	15,558	2,790	472	528	160	3,950	19,508
1990	2,601	14,960	312	72	17,945	2,870	480	544	160	4,054	21,999
1991	2,981	17,143	356	80	20,560	2,945	496	560	160	4,161	24,721
1992	3,537	20,335	424	96	24,392	3,020	512	560	160	4,252	28,644
1993	4,318	24,828	520	112	29,778	3,115	528	576	160	4,379	34,157

FINANCIAL TABLE 9B1
 ILOCOS NORTE WATER SUPPLY PROJECT
 I + II
 CALCULATION OF REVENUE UNITS

DOMESTIC

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	11 - 20 cum		21 - 45 cum		over 45 cum		Total CRU's
				cum	x 1.2	cum	x 1.4	cum	x 1.7	
1981	929	350	579	350	420	229	320	-	-	740
1982	1,056	376	680	376	451.2	304	425.6	-	-	876.8
1983	1,137	379	758	379	454.8	379	530.6	-	-	985.4
1984	1,235	439	796	439	526.8	357	499.8	-	-	1,026.6
1985	1,297	519	778	519	622.8	259	362.6	-	-	985.4
1986	1,551	594	957	594	712.8	363	508.2	-	-	1,221
1987	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1988	2,019	792	1,227	792	950	435	609	-	-	1,559
1989	2,231	902	1,329	902	1,082	427	597.8	-	-	1,679.8
1990	2,461	1,041	1,420	1,041	1,249	380	532	-	-	1,781
1991	2,688	1,193	1,495	1,193	1,431.6	302	422.8	-	-	1,854.4
1992	2,875	1,415	1,460	1,415	1,698	45	63	-	-	1,761
1993	3,043	1,727	1,316	1,316	1,579	-	-	-	-	1,579

FINANCIAL TABLE 9B2

ILOCOS NORTE WATER SUPPLY PROJECT
 CALCULATION OF WATER REVENUES UNITS

I + II

COMMERCIAL

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	21 - 45 cum		46 - 100 cum		Over 100 cum		Total CRU's
				cum	x 2.4	cum	x 2.8	cum	x 3.4	
1981	115	30	85	85	204	-	-	-	-	204
1982	131	31	100	100	240	-	-	-	-	240
1983	140	31	109	109	262	-	-	-	-	262
1984	153	33	120	116	278	-	-	-	-	289
1985	160	40	120	120	278	-	-	-	-	288
1986	192	56	136	136	326	-	-	-	-	326
1987	226	74	152	152	365	-	-	-	-	365
1988	250	76	174	174	418	-	-	-	-	418
1989	276	78	198	198	475	-	-	-	-	475
1990	304	81	223	223	535	-	-	-	-	535
1991	332	83	249	249	598	-	-	-	-	598
1992	355	85	270	270	648	-	-	-	-	648
1993	376	87	289	289	694	-	-	-	-	694

FINANCIAL TABLE 9C

SUMMARY OF REVENUE UNITS

I + II

Year	Residential and Governmental				Commercial and Industrial				Total All
	Service			Total R & C	Service			Total C & I	
	RU/Serv. Connection	Multiplied by 0.12	Commodity Rev. Units		RU/Serv. Connection	Multiplied by 0.12	Commodity Rev. Units		
1981	6,042	725	740	1,465	1,463	176	204	380	1,845
1982	6,479	777	877	1,654	1,562	187	240	427	2,081
1983	6,539	785	985	1,770	1,587	190	262	452	2,222
1984	7,574	909	1,027	1,936	1,679	201	289	490	2,426
1985	8,945	1,073	985	2,058	2,022	243	288	531	2,589
1986	10,242	1,229	1,221	2,450	2,845	341	326	667	3,117
1987	11,900	1,428	1,455	2,883	3,726	447	365	812	3,695
1988	13,655	1,639	1,559	3,198	3,843	461	418	879	4,077
1989	15,558	1,867	1,680	3,547	3,950	474	475	949	4,496
1990	17,945	2,153	1,781	3,934	4,054	486	535	1,021	4,955
1991	20,560	2,467	1,854	4,321	4,161	499	598	1,097	5,418
1992	24,392	2,927	1,761	4,688	4,252	510	648	1,158	5,846
1993	29,778	3,573	1,579	5,152	4,379	525	694	1,219	6,371

ECONOMIC TABLE 1

I + II

ILOCOS NORTE WATER SUPPLY PROJECT
SUMMARY OF PROJECT COST

Costs as of July 1, 1981 in 1,000 Pesos

Components	Total Cost	Foreign Currency Portion	Local Currency Portion
1. Vehicles	210	105	105
2. Chlorinator	130	117	13
3. Wells and Pump	3,874	2,413	1,461
4. Meters	173	138	35
5. Distribution System	24,844	16,645	8,199
6. Transmission System	13,880	9,300	4,580
7. Fire Hydrants	2,801	1,849	952
8. Reservoirs	4,798	1,201	3,597
9. Valves	1,666	1,215	451
10. I/G	1,080	270	810
11. Service Connection	7,771	5,984	1,787
12. Engineering	6,429	3,857	2,572
13. Supervision	2,143	1,286	857
14. Land	200		200
15.			
16.			
17.			

Source: From Cost Estimates

ECONOMIC TABLE 2
ILOCOS NORTE WATER SUPPLY PROJECT
 I + II
 ANNUAL DEMAND AND GROSS PRODUCTION IN 1,000 M³

1	2	3	4	5	6		7	8	9
Year	Average Connections	Persons Per Service Connection	Population Served	Average Water Use		Net Increase in Delivered Volume	Unaccounted Percentage	Annual Production	
				Liters/ Capita Per Day	Water Delivered Annually				
1981	3,166	7.9	25,000	114	1,044	-	45	1,878	
1982	3,598	7.8	28,000	114	1,187	-	43	2,081	
1983	3,713	7.7	28,700	114	1,277	-	40	2,128	
1984	4,024	7.8	31,200	114	1,388	111	40	2,314	
1985	4,663	7.4	34,550	116	1,457	180	40	2,428	
1986	5,419	7.2	39,200	122	1,743	466	37	2,761	
1987	6,366	6.9	44,125	128	2,054	777	34	3,112	
1988	7,237	6.7	48,500	128	2,269	992	32	3,337	
1989	8,171	6.5	53,150	129	2,507	1,230	30	3,581	
1990	9,344	6.3	58,600	129	2,766	1,489	28	3,841	
1991	10,628	6.0	63,400	131	3,020	1,743	26	4,081	
1992	12,496	5.4	68,000	130	3,230	1,953	25	4,306	
1993	15,122	4.8	72,982	128	3,419	2,142	25	4,588	

ECONOMIC TABLE 3-A

ILOCOS NORTE WATER SUPPLY PROJECT
 CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST
 Costs as of July 1, 1981 in 1,000 Pesos

I + II

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value		
					Foreign x 1.25	Labor x 0.5	Residual x 0.95
1. Vehicles	105	105	-	105	131	-	100
2. Chlorinator	117	13	1	12	146	1	11
3. Wells and Pump	2,413	1,461	731	730	3,016	366	694
4. Meters	138	35	7	28	173	4	27
5. Distribution System	16,645	8,199	3,280	4,919	20,806	1,640	4,673
6. Transmission System	9,300	4,580	1,145	3,435	11,625	573	3,263
7. Fire Hydrants	1,849	952	381	571	2,311	191	542
8. Reservoirs	1,201	3,597	2,338	1,259	1,501	1,169	1,196
9. Valves	1,215	451	180	271	1,519	90	257
10. I/G	270	810	405	405	338	203	385
11. Service Connection	5,984	1,787	357	1,430	7,480	179	1,359
12. Engineering Cost	3,857	2,572	-	2,572	4,821	-	2,443
13. Supervision	1,286	857	-	857	1,608	-	814
14. Land	-	200	-	200	-	-	190
15.							
16.							
17.							

ECONOMIC TABLE 3-B

ILOCOS NORTE WATER SUPPLY PROJECT
 CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST
 Costs as of July 1, 1981 in 1,000 Pesos

I + II

Ilocos

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value		
					Foreign x 1.0	Labor x 0.5	Residual x 0.95
1. Vehicles	105	105	-	105	105	-	100
2. Chlorinator	117	13	1	12	117	1	11
3. Wells and Pumps	2,413	1,461	731	730	2,413	366	694
4. Meters	138	35	7	28	138	4	27
5. Distribution System	16,645	8,199	3,280	4,919	16,645	1,640	4,673
6. Transmission System	9,300	4,580	1,145	3,435	9,300	573	3,263
7. Fire Hydrants	1,849	952	381	571	1,849	191	542
8. Reservoirs	1,201	3,597	2,338	1,259	1,201	1,169	1,196
9. Valves	1,215	451	180	271	1,215	90	257
10. I/G	270	810	405	405	270	203	385
11. Service Connection	5,984	1,787	357	1,430	5,984	179	1,359
12. Engineering Cost	3,857	2,572	-	2,572	3,857	-	2,443
13. Supervision	1,286	857	-	857	1,286	-	814
14. Land	-	200	-	200	-	-	190
15.							
16.							
17.							

ECONOMIC TABLE 3-C

ILOCOS NORTE WATER SUPPLY PROJECT
 CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST
 Costs as of July 1, 1981 in 1,000 Pesos

I + II

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value		
					Foreign x 1.25	Labor x 1.0	Residual x 1.0
1. Vehicles	105	105	-	105	131	-	105
2. Chlorinator	117	13	1	12	146	1	12
3. Wells and Pump	2,413	1,461	731	730	3,016	731	730
4. Meters	138	35	7	28	173	7	28
5. Distribution System	16,645	8,199	3,280	4,919	20,806	3,280	4,919
6. Transmission System	9,300	4,580	1,145	3,435	11,625	1,145	3,435
7. Fire Hydrants	1,849	952	381	571	2,311	381	571
8. Reservoirs	1,201	3,597	2,338	1,259	1,501	2,338	1,259
9. Valves	1,215	451	180	271	1,519	180	271
10. I/G	270	810	405	405	338	405	405
11. Service Connection	5,984	1,787	357	1,430	7,480	357	1,430
12. Engineering Cost	3,857	2,572	-	2,572	4,821	-	2,572
13. Supervision	1,286	857	-	857	1,608	-	857
14. Land	-	200	-	200	-	-	200
15.							
16.							
17.							

ECONOMIC TABLE 4-0

ILOCOS NORTE WATER SUPPLY PROJECT
ECONOMIC COSTS DISTRIBUTED TO YEARS
P x 1,000

Value without CONVERSION

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	210		210				
2. Chlorinator	130		130				
3. Wells and Pumps	3,874		959	645	1,201	1,069	
4. Meters	173		173				
5. Distribution System	24,844		12,425	7,274	4,789	178	178
6. Transmission System	13,880		5,109	4,366	894	878	2,633
7. Fire Hydrants	2,801		1,401	841	559		
8. Reservoirs	4,798			2,143	1,729		926
9. Valves	1,666		848	483	317	9	9
10. I/G	1,080		320			760	
11. Service Connection	7,771		6,878	357	179	179	178
12. Engineering	6,429	6,429					
13. Supervision	2,143		643	428	428	322	322
14. Land	200		200				
15.							
16.							
17.							
18.							
Total	69,999	6,429	29,296	16,537	10,096	3,395	4,246

ECONOMIC TABLE 4-A
 ILOCOS NORTE WATER SUPPLY PROJECT
 ECONOMIC COSTS DISTRIBUTED TO YEARS
 P x 1,000

Value with CONVERSION A

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	231		231				
2. Chlorinator	158		158				
3. Wells and Pumps	4,076		1,009	679	1,263	1,125	
4. Meters	204		204				
5. Distribution System	27,119		13,563	7,940	5,228	194	194
6. Transmission System	15,461		5,691	4,863	996	978	2,933
7. Fire Hydrants	3,044		1,523	914	607		
8. Reservoirs	3,866			1,727	1,393		746
9. Valves	1,866		950	541	355	10	10
10. I/G	926		274			652	
11. Service Connection	9,018		7,982	414	208	208	206
12. Engineering Cost	7,264	7,264					
13. Supervision	2,422		726	484	484	364	364
14. Land	190		190				
15.							
16.							
17.							
18.							
Total	75,845	7,264	32,501	17,562	10,534	3,531	4,453

ECONOMIC TABLE 4-B
 ILOCOS NORTE WATER SUPPLY PROJECT
 ECONOMIC COSTS DISTRIBUTED TO YEARS
 ₱ x 1,000

Value with CONVERSION B

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	205		205				
2. Chlorinator	129		129				
3. Wells and Pumps	3,473		860	578	1,077	958	
4. Meters	169		169				
5. Distribution System	22,958		11,482	6,722	4,426	164	164
6. Transmission System	13,136		4,835	4,132	846	831	2,492
7. Fire Hydrants	2,582		1,292	775	515		
8. Reservoir	3,566			1,593	1,285		688
9. Valves	1,562		795	453	297	9	8
10. I/G	858		254			604	
11. Service Connection	7,522		6,658	346	173	173	172
12. Engineering	6,300	6,300					
13. Supervision	2,100		630	419	419	316	316
14. Land	190		190				
15.							
16.							
17.							
18.							
Total	64,750	6,300	27,499	15,018	9,038	3,055	3,840

ECONOMIC TABLE 4-C
 ILOCOS NORTE WATER SUPPLY PROJECT
 ECONOMIC COSTS DISTRIBUTED TO YEARS
 P x 1,000

Value with CONVERSION C

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	236		236				
2. Chlorinator	159		159				
3. Wells and Pumps	4,477		1,108	745	1,388	1,236	
4. Meters	208		208				
5. Distribution System	29,005		14,506	8,492	5,591	208	208
6. Transmission System	16,205		5,965	5,097	1,044	1,025	3,074
7. Fire Hydrants	3,263		1,632	980	651		
8. Reservoirs	5,098			2,277	1,837		984
9. Valves	1,970		1,003	571	375	11	10
10. I/G	1,148		340			808	
11. Service Connection	9,267		8,202	426	214	213	212
12. Engineering	7,393	7,393					
13. Supervision	2,465		740	492	492	371	370
14. Land	200		200				
15.							
16.							
17.							
18.							
Total	81,094	7,393	34,299	19,080	11,592	3,872	4,858

ECONOMIC TABLE 5
ILOCOS NORTE WATER SUPPLY PROJECT
OPERATION AND MAINTENANCE EXPENSES
 Costs as of July 1, 1981 in 1,000 Pesos

Year	Power	Chemicals	Others	Total	Net Costs
1981	209	76	261	546	
1982	209	80	292	581	
1983	212	92	314	618	37
1984	253	97	382	732	151
1985	309	111	495	915	334
1986	368	124	625	1,117	536
1987	429	133	824	1,386	805
1988	468	143	984	1,595	1,014
1989	511	154	1,176	1,841	1,260
1990	556	163	1,429	2,148	1,567
1991	599	172	1,722	2,493	1,912
1992	638	182	2,136	2,956	2,375
1993	682	182	2,722	3,586	3,005

Base Year = 1983

ECONOMIC TABLE 6-0
 ILOCOS NORTE WATER SUPPLY PROJECT
 LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
 P x 1,000

Value without CONVERSION

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	210				210
2. Chlorinator	130				130
3. Wells and Pumps		3,874			3,874
4. Meters		173			173
5. Distribution System			24,844		24,844
6. Transmission System			13,880		13,880
7. Fire Hydrants			2,801		2,801
8. Reservoirs			4,798		4,798
9. Valves			1,666		1,666
10. I/G			1,080		1,080
11. Service Connection			7,771		7,771
12. Land				200	200

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984	1985	1986	1987		1999	2000	2001	2002	
2. Meters	1984					1999				

ECONOMIC TABLE 6-A
ILOCOS NORTE WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
P x 1,000

Value with CONVERSION A

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	231				231
2. Chlorinator	158				158
3. Wells and Pumps		4,076			4,076
4. Meters		204			204
5. Distribution System			27,119		27,119
6. Transmission System			15,461		15,461
7. Fire Hydrants			3,044		3,044
8. Reservoirs			3,866		3,866
9. Valves			1,866		1,866
10. I/G			926		926
11. Service Connection			9,018		9,018
12. Land				190	190

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984	1985	1986	1987		1999	2000	2001	2002	
2. Meters	1984					1999				

ECONOMIC TABLE 6-B

ILOCOS NORTE WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
P x 1,000

Value with CONVERSION B

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	205				205
2. Chlorinator	129				129
3. Wells and Pumps		3,473			3,473
4. Meters		169			169
5. Distribution System			22,958		22,958
6. Transmission System			13,136		13,136
7. Fire Hydrants			2,582		2,582
8. Reservoirs			3,562		3,562
9. Valves			1,562		1,562
10. I/G			858		858
11. Service Connection			7,522		7,522
12. Land				190	190

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998			
2. Chlorinator	1984					1991	1998			

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984	1985	1986	1987		1999	2000	2001	2002	
2. Meters	1984					1999				

ECONOMIC TABLE 6-C
ILOCOS NORTE WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
P x 1,000

Value of CONVERSION C

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	236				236
2. Chlorinator	159				159
3. Wells and Pumps		4,477			4,477
4. Meters		208			208
5. Distribution System			29,005		29,005
6. Transmission System			16,205		16,205
7. Fire Hydrants			3,263		3,263
8. Reservoirs			5,098		5,098
9. Valves			1,970		1,970
10. I/G			1,148		1,148
11. Service Connection			9,267		9,267
12. Land				200	200

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998			
2. Chlorinator	1984					1991	1998			

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984	1985	1986	1987		1999	2000	2001	2002	
2. Meters	1984					1999				

ECONOMIC TABLE 7-0
 ILOCOS NORTE WATER SUPPLY PROJECT
 CALCULATION OF SALVAGE VALUES
 ₱ x 1,000

Value without CONVERSION

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	200	75%	150
50 Year Life, Year Constructed			
1 1984	26,981	42%	11,332
2 1985	15,464	44%	6,804
3 1986	8,467	46%	3,895
4 1987	2,004	48%	962
5 1988	3,924	50%	1,962
15 Year Life, Year of Replacement			
1 1999	1,132	7%	79
2 2000	645	13%	84
3 2001	1,201	20%	240
4 2002	1,069	27%	289
7 Year Life, Years of Final Replacement			
1 2012	340	86%	292
Total	61,427		26,089

Ilocos

I + II

ECONOMIC TABLE 7-A
ILOCOS NORTE WATER SUPPLY PROJECT
CALCULATION OF SALVAGE VALUES
P x 1,000

Value with CONVERSION A

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	190	75%	143
50 Year Life, Year Constructed			
1 1984	29,983	42%	12,593
2 1985	16,399	44%	7,216
3 1986	8,787	46%	4,042
4 1987	2,042	48%	980
5 1988	4,089	50%	2,045
15 Year Life, Year of Replacement			
1 1984	1,213	7%	85
2 1985	679	13%	88
3 1986	1,263	20%	253
4 1987	1,125	27%	304
7 Year Life, Years of Final Replacement			
1 1984	389	86%	335
Total	66,159		28,084

ECONOMIC TABLE 7-B
 ILOCOS NORTE WATER SUPPLY PROJECT
 CALCULATION OF SALVAGE VALUES
 P x 1,000

Value with CONVERSION B

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	190	75%	143
50 Year Life, Year Constructed			
1 1984	25,316	42%	10,633
2 1985	14,021	44%	6,169
3 1986	7,542	46%	3,469
4 1987	1,781	48%	855
5 1988	3,524	50%	1,762
15 Year Life, Year of Replacement			
1 1984	1,029	7%	72
2 1985	578	13%	75
3 1986	1,077	20%	215
4 1987	958	27%	259
7 Year Life, Years of Final Replacement			
1 1984	334	86%	287
Total	56,350		23,939

ECONOMIC TABLE 7-C
ILOCOS NORTE WATER SUPPLY PROJECT
 CALCULATION OF SALVAGE VALUES
 P x 1,000

Value with CONVERSION C

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	200	75%	150
50 Year Life, Year Constructed			
1 1984	31,648	42%	13,292
2 1985	17,843	44%	7,851
3 1986	9,712	46%	4,468
4 1987	2,265	48%	1,087
5 1988	4,488	50%	2,244
15 Year Life, Year of Replacement			
1 1984	1,316	7%	92
2 1985	745	13%	97
3 1986	1,388	20%	278
4 1987	1,236	27%	334
7 Year Life, Years of Final Replacement			
1 1984	395	86%	340
Total	71,236		30,233

ECONOMIC TABLE 8-0
 ILOCOS NORTE WATER SUPPLY PROJECT
 SUMMARY OF ALL PROJECT COSTS
 Costs as of July 1, 1981 in 1,000 Pesos

Value without CONVERSION

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	6,429	37		6,466		
1984	29,296	151		29,447		
1985	16,537	334		16,871		
1986	10,096	536		10,632		
1987	3,395	805		4,200		
1988	4,246	1,014		5,260		
1989		1,260		1,260		
1990		1,567		1,567		
1991		1,912	340	2,252		
1992		2,375		2,375		
1993		3,005		3,005		
1994		3,005		3,005		
1995		3,005		3,005		
1996		3,005		3,005		
1997		3,005		3,005		
1998		3,005	340	3,345		
1999		3,005	1,132	4,137		
2000		3,005	645	3,650		
2001		3,005	1,201	4,206		
2002		3,005	1,069	4,074		
2003		3,005		3,005		
2004		3,005		3,005		
2005		3,005	340	3,345		
2006		3,005		3,005		
2007		3,005		3,005		
2008		3,005		3,005		
2009		3,005		3,005		
2010		3,005		3,005		
2011		3,005		3,005		
2012		3,005	340	3,345		
Total	69,999	70,091	5,407	145,497	(26,089)	119,408

ECONOMIC TABLE 8-A

ILOCOS NORTE WATER SUPPLY PROJECT
SUMMARY OF ALL PROJECT COSTS
Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION A

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	7,264	37		7,301		
1984	32,501	151		32,652		
1985	17,562	334		17,896		
1986	10,534	536		11,070		
1987	3,531	805		4,336		
1988	4,453	1,014		5,467		
1989		1,260		1,260		
1990		1,567		1,567		
1991		1,912	389	2,301		
1992		2,375		2,375		
1993		3,005		3,005		
1994		3,005		3,005		
1995		3,005		3,005		
1996		3,005		3,005		
1997		3,005		3,005		
1998		3,005	389	3,394		
1999		3,005	1,213	4,218		
2000		3,005	679	3,684		
2001		3,005	1,263	4,268		
2002		3,005	1,125	4,130		
2003		3,005		3,005		
2004		3,005		3,005		
2005		3,005	389	3,394		
2006		3,005		3,005		
2007		3,005		3,005		
2008		3,005		3,005		
2009		3,005		3,005		
2010		3,005		3,005		
2011		3,005		3,005		
2012		3,005	389	3,394		
Total	75,845	70,091	5,836	151,772	(28,084)	123,688

ECONOMIC TABLE 8-B

ILOCOS NORTE WATER SUPPLY PROJECT
SUMMARY OF ALL PROJECT COSTS
 Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION B

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	6,300	37		6,337		
1984	27,499	151		27,650		
1985	15,018	334		15,352		
1986	9,038	536		9,574		
1987	3,055	805		3,860		
1988	3,840	1,014		4,854		
1989		1,260		1,260		
1990		1,567		1,567		
1991		1,912	334	2,246		
1992		2,375		2,375		
1993		3,005		3,005		
1994		3,005		3,005		
1995		3,005		3,005		
1996		3,005		3,005		
1997		3,005		3,005		
1998		3,005	334	3,339		
1999		3,005	1,029	4,034		
2000		3,005	578	3,583		
2001		3,005	1,077	4,082		
2002		3,005	958	3,963		
2003		3,005		3,005		
2004		3,005		3,005		
2005		3,005	334	3,339		
2006		3,005		3,005		
2007		3,005		3,005		
2008		3,005		3,005		
2009		3,005		3,005		
2010		3,005		3,005		
2011		3,005		3,005		
2012		3,005	334	3,339		
Total	64,750	70,091	4,978	139,819	(23,939)	115,880

ECONOMIC TABLE 8-C

ILOCOS NORTE WATER SUPPLY PROJECT
SUMMARY OF ALL PROJECT COSTS
Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION C

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	7,393	37		7,430		
1984	34,299	151		34,450		
1985	19,080	334		19,414		
1986	11,592	536		12,128		
1987	3,872	805		4,677		
1988	4,858	1,014		5,872		
1989		1,260		1,260		
1990		1,567		1,567		
1991		1,912	395	2,307		
1992		2,375		2,375		
1993		3,005		3,005		
1994		3,005		3,005		
1995		3,005		3,005		
1996		3,005		3,005		
1997		3,005		3,005		
1998		3,005	395	3,400		
1999		3,005	1,316	4,321		
2000		3,005	745	3,750		
2001		3,005	1,388	4,393		
2002		3,005	1,236	4,241		
2003		3,005		3,005		
2004		3,005		3,005		
2005		3,005	395	3,400		
2006		3,005		3,005		
2007		3,005		3,005		
2008		3,005		3,005		
2009		3,005		3,005		
2010		3,005		3,005		
2011		3,005		3,005		
2012		3,005	395	3,400		
Total	81,094	70,091	6,265	157,450	(30,233)	127,217

ECONOMIC TABLE 9
 ILOCOS NORTE WATER SUPPLY PROJECT
 BENEFITS AT 1981 PRICES
 (P x 1,000)

Year	Volume	Qualitative	Fire Loss Reduction	Total	National Interest Adjustment
1982					
1983					
1984	411	472	111	994	1,193
1985	666	945	147	1,758	2,110
1986	1,724	1,417	184	3,325	3,990
1987	2,875	1,417	231	4,523	5,428
1988	3,670	1,417	274	5,361	6,433
1989	4,551	1,417	320	6,288	7,546
1990	5,509	1,417	379	7,305	8,766
1991	6,449	1,417	442	8,308	9,970
1992	7,226	1,417	535	9,178	11,014
1993	7,925	1,417	665	10,007	12,008
1994	7,925	1,417	665	10,007	12,008
1995	7,925	1,417	665	10,007	12,008
1996	7,925	1,417	665	10,007	12,008
1997	7,925	1,417	665	10,007	12,008
1998	7,925	1,417	665	10,007	12,008
1999	7,925	1,417	665	10,007	12,008
2000	7,925	1,417	665	10,007	12,008
2001	7,925	1,417	665	10,007	12,008
2002	7,925	1,417	665	10,007	12,008
2003	7,925	1,417	665	10,007	12,008
2004	7,925	1,417	665	10,007	12,008
2005	7,925	1,417	665	10,007	12,008
2006	7,925	1,417	665	10,007	12,008
2007	7,925	1,417	665	10,007	12,008
2008	7,925	1,417	665	10,007	12,008
2009	7,925	1,417	665	10,007	12,008
2010	7,925	1,417	665	10,007	12,008
2011	7,925	1,417	665	10,007	12,008
2012	7,925	1,417	665	10,007	12,008
Total	191,581	39,676	15,923	247,180	296,610

ECONOMIC TABLE 10-0

ILOCOS NORIE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value without CONVERSION

Year	Total Cost	Total Benefit	Net Benefit	Present Net Benefit
1982				
1983	6,466	-	-6,466	-6,466
1984	29,447	1,193	-28,254	-25,687
1985	16,871	2,110	-14,761	-12,200
1986	10,632	3,990	- 6,642	-4,991
1987	4,200	5,428	1,228	839
1988	5,260	6,423	1,173	728
1989	1,260	7,546	6,286	3,549
1990	1,567	8,766	7,199	3,695
1991	2,252	9,970	7,718	3,602
1992	2,375	11,014	8,639	3,665
1993	3,005	12,008	9,003	3,472
1994	3,005	12,008	9,003	3,157
1995	3,005	12,008	9,003	2,870
1996	3,005	12,008	9,003	2,609
1997	3,005	12,008	9,003	2,372
1998	3,345	12,008	8,663	2,075
1999	4,137	12,008	7,871	1,714
2000	3,650	12,008	8,358	1,655
2001	4,206	12,008	7,802	1,404
2002	4,074	12,008	7,934	1,298
2003	3,005	12,008	9,003	1,339
2004	3,005	12,008	9,003	1,218
2005	3,345	12,008	8,663	1,065
2006	3,005	12,008	9,003	1,006
2007	3,005	12,008	9,003	915
2008	3,005	12,008	9,003	832
2009	3,005	12,008	9,003	756
2010	3,005	12,008	9,003	688
2011	3,005	12,008	9,003	625
2012	3,345	12,008	34,752*	2,193*
Salvage(-)	26,089			
Total	119,408	296,610	177,202	-3

Rate of Return = 0.10

ECONOMIC TABLE 10-A

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION A

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	7,301	-	-7,301	-7,301
1984	32,652	1,193	-31,459	-28,822
1985	17,896	2,110	-15,786	-13,250
1986	11,070	3,990	-7,080	-5,444
1987	4,336	5,428	1,092	769
1988	5,467	6,433	966	624
1989	1,260	7,546	6,286	3,717
1990	1,567	8,766	7,199	3,900
1991	2,301	9,970	7,669	3,806
1992	2,375	11,014	8,639	3,928
1993	3,005	12,008	9,003	3,751
1994	3,005	12,008	9,003	3,436
1995	3,005	12,008	9,003	3,148
1996	3,005	12,008	9,003	2,884
1997	3,005	12,008	9,003	2,642
1998	3,394	12,008	8,614	2,316
1999	4,218	12,008	7,790	1,919
2000	3,684	12,008	8,324	1,879
2001	4,268	12,008	7,740	1,601
2002	4,130	12,008	7,878	1,492
2003	3,005	12,008	9,003	1,563
2004	3,005	12,008	9,003	1,432
2005	3,394	12,008	8,614	1,255
2006	3,005	12,008	9,003	1,202
2007	3,005	12,008	9,003	1,101
2008	3,005	12,008	9,003	1,009
2009	3,005	12,008	9,003	924
2010	3,005	12,008	9,003	847
2011	3,005	12,008	9,003	776
2012	3,394	12,008	36,698*	2,896*
Salvage (-)	28,084			
Total	123,688	296,610	172,922	0

* Values include salvage.

Rate of Return = 0.09

ECONOMIC TABLE 10-B

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION B

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	6,337	-	-6,337	-6,337
1984	27,650	1,193	-26,457	-23,879
1985	15,352	2,110	-13,242	-10,787
1986	9,574	3,990	-5,584	-4,106
1987	3,860	5,428	1,568	1,041
1988	4,854	6,433	1,579	946
1989	1,260	7,546	6,286	3,398
1990	1,567	8,766	7,199	3,513
1991	2,246	9,970	7,724	3,402
1992	2,375	11,014	8,639	3,434
1993	3,005	12,008	9,003	3,230
1994	3,005	12,008	9,003	2,915
1995	3,005	12,008	9,003	2,631
1996	3,005	12,008	9,003	2,375
1997	3,005	12,008	9,003	2,143
1998	3,339	12,008	8,669	1,863
1999	4,034	12,008	7,974	1,547
2000	3,583	12,008	8,425	1,475
2001	4,082	12,008	7,926	1,252
2002	3,963	12,008	8,045	1,147
2003	3,005	12,008	9,003	1,159
2004	3,005	12,008	9,003	1,046
2005	3,339	12,008	8,669	909
2006	3,005	12,008	9,003	852
2007	3,005	12,008	9,003	769
2008	3,005	12,008	9,003	694
2009	3,005	12,008	9,003	626
2010	3,005	12,008	9,003	565
2011	3,005	12,008	9,003	510
2012	3,339	12,008	32,608*	1,668*
Salvage(-)	23,939			
Total	115,880	296,610	180,730	1

* Values include salvage.

Rate of Return = 0.11

ECONOMIC TABLE 10-C

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION C

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	7,430	-	-7,430	-7,430
1984	34,450	1,193	-33,257	-30,644
1985	19,414	2,110	-17,304	-14,692
1986	12,128	3,990	-8,138	-6,367
1987	4,677	5,428	751	541
1988	5,872	6,433	561	373
1989	1,260	7,546	6,286	3,847
1990	1,567	8,766	7,199	4,060
1991	2,307	9,970	7,663	3,982
1992	2,375	11,014	8,639	4,136
1993	3,005	12,008	9,003	3,972
1994	3,005	12,008	9,003	3,660
1995	3,005	12,008	9,003	3,372
1996	3,005	12,008	9,003	3,107
1997	3,005	12,008	9,003	2,863
1998	3,400	12,008	8,608	2,523
1999	4,321	12,008	7,687	2,076
2000	3,750	12,008	8,258	2,055
2001	4,393	12,008	7,615	1,746
2002	4,241	12,008	7,767	1,641
2003	3,005	12,008	9,003	1,752
2004	3,005	12,008	9,003	1,615
2005	3,400	12,008	8,608	1,423
2006	3,005	12,008	9,003	1,371
2007	3,005	12,008	9,003	1,263
2008	3,005	12,008	9,003	1,164
2009	3,005	12,008	9,003	1,073
2010	3,005	12,008	9,003	988
2011	3,005	12,008	9,003	911
2012	3,400	12,008	38,841*	3,620*
Salvage(-)	30,233			
Total	127,217	296,610	169,393	1

* Values include salvage.

Rate of Return = 0.09

15. Special Study

15.1 General

In view of the possibility that there will be formed two separate water districts in Ilocos Norte, one for Laoag City and the another for Pasuquin, Bacarra, Vintar and Paoay, a special study is conducted for the two plans described below.

15.2 Proposed Water Supply System

The schematic figure of the proposed water supply system is shown in Fig 3.15.1. Tables 3.15.3 and 3.15.4 indicate the disbursement schedules for Laoag and other four municipalities.

15.3 Financial Feasibility

In this financial study, the same methods were applied as in the study of Phase I of the Master Plan for the Ilocos Norte Metropolitan Water District which comprises Laoag, Pasuquin, Bacarra, Vintar and Paoay.

The financial forecasts thus constructed indicate that the Phase I project for the possible water district for Laoag will be positively viable without receiving any Government grants, while that for the water district for other four municipalities will be viable only if it is given a Government grant equivalent to 35 % of the capital investment.

Table 3.15.1 Capital Investment

District for Laoag and other four municipality	P64,352 thousand
District for Laoag	29,633 thousand
District for other four Municipalities	38,468 thousand

Table 3.15.2 Water Rates Applicable (Revenue Unit Charge)

Year	District for Laoag and other four municipalities	District for Laoag	District for other four municipalities ^{1/}
1982	P 0.80	P 0.80	P 0.80
1983	1.20	1.28	1.25
1984	1.20	1.60	1.65
1985	2.00	1.90	1.85
1986	2.00	1.90	1.95
1987	2.70	2.20	2.20
1988	2.70	2.35	2.45
1989	3.40	2.60	2.75
1990	3.40	2.90	3.00

^{1/} Projected on the assumption that Government grant equivalent to 35 % of total capital investment is given.

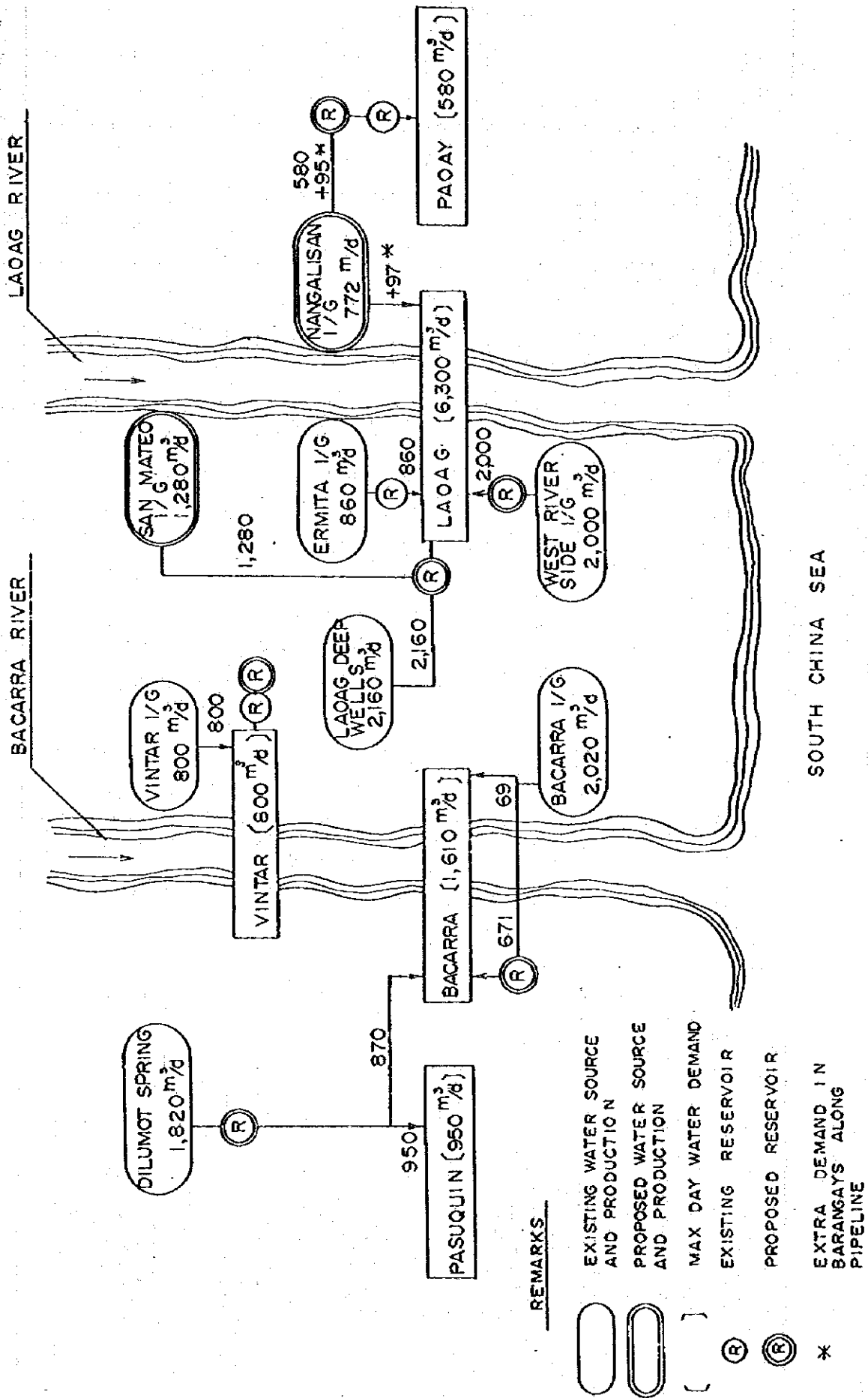


Fig 3.15.1 Proposed Water Supply System

Table 3.15.3 Disbursement Schedule for Laoag

NOTE: - F/C = Foreign Currency Component
 - L/C = Local Currency Component
 - Unit: One Thousand Pesos = '000 Pesos
 - Prices: As of 1st July 1981
 - Foreign Exchange Rate: US\$1.00 = Pesos 7.80

(Thousand Pesos)

Description	Cost				Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988		
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	
A. West Riverside I/C System																
a) Intake Pump (23.1 l/s, H = 30 m)	243	219	24			219	24									
b) Transmission Pipe (ø150 mm x 1,000 m)	275	184	91							184	91					
c) Ground Reservoir (570 m ³ x 1)	791	198	593							198	593					
d) Distribution Pump Station (28.9 l/s, H = 30 m)	554	332	222							332	222					
e) Elevated Reservoir (100 m ³ x 1)	525	131	394							131	394					
B. Laoag Deep-Well System																
a) Deep Well Pump Station (5.8 l/s, 7 kw, 5 units)	1,075	602	473			361	284	241	189							
b) Transmission Pipe (ø200 mm x 1,000 m)	1,755	1,176	579			784	386	392	193							
c) Grand Reservoir (1,050 m ³ x 1)	619	415	204			208	102	207	102							
d) Distribution Pump Station (49.6 l/s, H = 30 m)	1,168	292	876					292	876							
e) Elevated Reservoir (100 m ³ x 1)	765	459	306					459	306							
	525	131	394					131	394							
C. San Mateo I/C System																
a) Infiltration Gallery (ø1,000 mm x 70 m)	280	70	210			70	210									
b) Intake Pump Station (14.8 l/s, H = 60 m)	460	276	184			276	184									
c) Transmission Pipe (ø150 mm x 4,500 m)	1,856	1,244	612			1,244	612									

(to be continued)

NOTE: - F/C = Foreign Currency Component
 - F/C = Local Currency Component
 - Unit: One Thousand Pesos = '000 Pesos
 - Prices: As of 1st July 1981
 - Foreign Exchange Rate: US\$1.00 = Pesos 7.80

NOTE: Price Escalation Rate
 (Price Contingency)

Present - 1984: 15% Annual both for F/C and L/C
 1985 - 1989: 12% Annual both for F/C and L/C
 1990 - : 10% Annual both for F/C and L/C

Description	Cost		Yearly Disbursement											
	Total Cost	Breakdown	1983		1984		1985		1986		1987		1988	
			F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
D. Distribution Pipe a) #250 mm x 600 m b) #150 mm x 3,500 m c) #100 mm x 2,500 m	342 963 450	229 645 302	113 318 148		115 323 151	57 159 74	114 322 151	56 159 74						
E. Valve a) #250 mm x 2 pcs b) #200 mm x 2 pcs c) #150 mm x 17 pcs d) #100 mm x 9 pcs	17 72 31	13 53 23	4 9 8		7 5 27 12	2 2 10 4	6 4 26 11	2 1 9 4						
F. Fire Hydrant (44 pcs)	295	195	100		98	50	97	50						
G. Bulk Meter a) #200 mm x 2 pcs b) #150 mm x 8 pcs	20 56	16 45	4 11		16 45	4 11								
H. Chlorinator (7 units)	70	63	7		63	7								
I. Service Meter (#13mm x 1,746pcs)	1,135	874	261		874	131		130						
J. Stored Material	159	124	35		124	35								
K. Vehicle (1 car)	70	35	35		35	35								
Sub-Total	14,583	8,355	6,228		5,057	2,383	2,453	2,545	845	1,300				
Detailed Design Cost (10.5%)	1,531	919	612		122	82	92	61	92	61				
Supervision Cost (3.5%)	510	306	204			100								
Land Cost	100		100											
Total Physical Contingency (10%)	16,724	9,580	7,144		5,179	2,565	2,545	2,606	937	1,361				
	1,674	959	715		518	257	255	261	94	136				
Total Price Contingency	18,398	10,539	7,859		5,697	2,822	2,800	2,867	1,031	1,497				
	11,235	6,184	5,051		2,962	1,467	1,960	2,007	938	1,362				
Grand Total (Project Cost)	29,633	16,723	12,910		8,659	4,289	4,760	4,874	1,969	2,859				

Ilocos

- F/C - Foreign Currency Component

- F/C - Foreign Currency Component

- L/C = Local Currency Component

UNIT: One thousand pesos = 1,000 pesos
prices: As of 1st July 1981

- Foreign Exchange Rate: US\$1.

Thompson, James

Description	Cost		Yearly Disbursement									
	Total Cost	Breakdown	1983		1984		1985		1986		1987	
		F/C L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
A. Dilumot Spring System												
a) Transmission Pipe (\$150 mm x 2,900 m)	1,200	804 396			536 264		268 132					
b) Break Pressure Chamber (15m ³ x 3)	232	58 174			39 116		19 58					
c) Ground Reservoir (610 m ³ x 1)	826	207 619					207 619					
B. Bacarra I/C System												
a) Transmission Pipe (\$150 mm x 2,000-m)	825	553 272			553 272				245 735			
b) Elevated Reservoir (230 m ³ x 1)	980	245 735										
C. Vintar I/C System												
a) Intake Pump (13.7 l/s, H = 40 m)	194	175 19			175 19							
b) Ground Reservoir (130 m ³ x 1)	308	77 231							77 231			
D. Nangalisan I/C System												
a) Infiltration Gallery (\$1,000 mm x 50 m)	200	50 150			50 150							
b) Intake Pump Station (11.9 l/s, H = 60 m)	404	242 162			242 162							
c) Transmission Pipe (\$200 mm x 20,500 m)	7,995	5,357 2,638					5,357 2,638					
d) Ground Reservoir (160 m ³ x 1)	351	88 263			88 263							
E. Distribution Pipe												
a) \$150 mm x 4,000 m	1,100	737 363			369 182		368 109					
b) \$100 mm x 8,500 m	1,530	1,025 505			513 253		512 152					
c) \$ 50 mm x 5,200 m	416	279 137			140 69		139 41					

(to be continued)

NOTE: - F/C = Foreign Currency Component
 - F/C = Local Currency Component
 - Unit: One Thousand Pesos = 1000 Pesos
 - Prices: As of 1st July 1981
 - Foreign Exchange Rate: US\$1.00 = Pesos 7.80

NOTE: Price Escalation Rate
 (Price Contingency)

Present - 1984: 15% Annual both for F/C and L/C
 1985 - 1989: 12% Annual both for F/C and L/C
 1990 - : 10% Annual both for F/C and L/C

Description	Cost		Yearly Disbursement											
	Total Cost	Breakdown	1983		1984		1985		1986		1987		1988	
			F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
F. Valve														
a) ø200 mm x 11 pcs	67	49		18		25		9						
b) ø150 mm x 17 pcs	72	53		19		27		10						
c) ø100 mm x 29 pcs	97	71		26		36		13						
d) ø 50 mm x 18 pcs	27	20		7		10		4						
G. Fire Hydrant (84 pcs)	563	372		191		186		96						
H. Bulk Meter														
a) ø200 mm x 4 pcs	40	32		8		32		8						
b) ø150 mm x 6 pcs	42	34		8		34		8						
I. Chlorinator (4 sets)	40	36		4		36		4						
J. Service Meter (ø13 mm x 1.454pcs)	945	728		217		728		109						
K. Stored Material	160	125		35		125		35						
L. Vehicle (2 cars)	140	70		70		70		70						
Sub-Total	18,754	11,487		7,267		4,014		2,116						
Detailed Design Cost (10.5%)	1,989	1,181		788		158		105						
Supervision Cost (3.5%)	656	394		262										
Land Cost	100	100		100				100						
Total	21,479	13,062		8,417		4,172		2,321						
Physical Contingency (10%)	2,148	1,306		842		417		232						
Total	23,627	14,368		9,259		4,589		2,553						
Price Contingency	14,841	8,939		6,002		2,386		1,328						
Grand Total (Project Cost)	38,468	23,207		15,261		6,975		3,881						

FINANCIAL TABLE 1
LAOAG WATER SUPPLY PROJECT
PROJECT COSTS BY YEAR OF CONSTRUCTION
(P1,000's)

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	70		70				
2. Chlorinator	70		70				
3. Stored Material	159		159				
4. Wells & Pump	3,097		1,348	1,195	554		
5. Meters	76		76				
6. Distribution System	1,755		879	876			
7. Transmission System	4,505		3,336	894	275		
8. Fire Hydrants	295		148	147			
9. Reservoirs	3,009			1,693	1,316		
10. Valves	132		69	63			
11. I/G	280		280				
12. Service Connection	1,135		1,005	130			
13. Engineering Cost	1,531	1,531					
14. Supervision	510		204	153	153		
15. Land Cost	100		100				
16. Physical Contingency	1,674	153	775	516	230		
17.							
18.							
TOTAL, 7-1-81	18,398	1,684	8,519	5,667	2,528		
ESCALATION FACTORS	11,235	539	4,429	3,967	2,300		
ESCALATED COSTS	29,633	2,223	12,948	9,634	4,828		

FINANCIAL TABLE 2
 LAOAG WATER SUPPLY PROJECT
 OPERATION AND MAINTENANCE COSTS
 (P1,000's)

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor 1/	Amount
1981	195	43	148	386	1,000,000	386
1982	195	46	159	400	1,150,000	460
1983	195	52	171	418	1,322,500	553
1984	195	54	187	436	1,520,815	663
1985	241	62	203	506	1,703,380	862
1986	289	69	218		1,907,785	1,099
1987	336	74	238	648	2,136,719	1,384
1988	336	74	238	648	2,393,126	1,551
1989	336	74	238	648	2,680,301	1,737
1990	336	74	238	648	2,948,331	1,911
1991						
1992						
1993						
1994						
1995						
1996						
1997						
1998						

1/ Escalation currently 15 percent per year to 1984 (1981 = 1.00), 12 percent per year between 1985 and 1989 and 10 percent per year in 1990 and afterwards.

FINANCIAL TABLE 3
 LAOAG WATER SUPPLY PROJECT
 LOAN DISBURSEMENTS AND DEBT SERVICE
 (P1,000's)

Year	Disbursement <u>1/</u>		Loans Outstanding		Interest Payments		Principal Payments <u>3/</u>	Total Debt Service
	Grant	Loan	Beginning	Ending	First Year <u>2/</u>	Later Years		
1981								
1982								
1983		2,223		2,223	100			100
1984		12,948	2,223	15,171	582	200		782
1985		9,634	15,171	24,805	433	1,365		1,798
1986		4,828	24,805	29,633	217	2,232		2,449
1987			29,633	29,549		2,664	84	2,748
1988			29,549	28,967		2,645	582	3,227
1989			28,967	28,015		2,585	952	3,537
1990			28,015	26,876		2,497	1,136	3,633
1991			26,876	25,743		2,393	1,136	3,529
1992			25,743	24,607		2,292	1,136	3,428
1993			24,607	23,471		2,188	1,136	3,324
1994			23,471	22,335		2,087	1,136	3,223
1995			22,335	21,199		1,986	1,136	3,122
1996			21,199	20,063		1,882	1,136	3,018
1997			20,063	18,927		1,779	1,136	2,915
1998			18,927	17,791		1,678	1,136	2,814

1/ From Financial Table 1.

2/ Disbursements assumed to be equally spread during year. Charge with 50 per cent of annual interest in first year.

3/ Principal payments according to LWUA year plan.

FINANCIAL TABLE 4

LAOAG WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(P1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves <u>1/</u>	Cost With Reserves	Revenue Units <u>2/</u>	Cost Per Revenue Unit <u>3/</u>
1981		386	386		386	1,033	0.37
1982		460	460		460	1,165	0.39
1983	100	553	653		653	1,245	0.52
1984	782	663	1,445		1,445	1,351	1.07
1985	1,798	862	2,660		2,660	1,461	1.82
1986	2,449	1,099	3,548		3,548	1,746	2.03
1987	2,748	1,384	4,132	207	4,339	2,069	2.10
1988	3,227	1,551	4,778	239	5,017	2,069	2.42
1989	3,537	1,737	5,274	527	5,801	2,069	2.80
1990	3,633	1,911	5,544	554	6,098	2,069	2.95
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							

1/ Reserve estimate equal to 10 per cent of total costs. (5 per cent for the first two years)

2/ Reserve units correspond to the ratio of connections in Laoag City to the total in the area including Pasuquin, Bacarra, Vintar and Paoay.

3/ Reserve units divided into costs with reserves.

FINANCIAL TABLE 5
 LAOAG WATER SUPPLY PROJECT
 ABILITY TO PAY FOR WATER

1	2	3	4	5		6	7	8
Year	Ave. Monthly Family Income <u>1/</u>	Available 5%	Average Family Size	Household Water Use		Cubic Meters/ Month	Revenue Units Per Month <u>2/</u>	Max. Ability Per Rev. Unit
				lpcd				
1981	842.85	42.14	7.99	90		22	40	1.05
1982	969.27	48.46	7.98	90		22	40	1.21
1983	1,114.67	55.73	7.97	90		22	40	1.39
1984	1,281.87	64.09	7.96	90		21	38	1.69
1985	1,435.69	71.78	7.95	90		21	38	1.89
1986	1,607.98	80.39	7.94	98		23	41	1.96
1987	1,800.94	90.05	7.93	98		23	41	2.20
1988	2,017.47	100.85	7.92	102		24	43	2.35
1989	2,259.09	112.95	7.91	103		24	43	2.63
1990	2,485.00	124.25	7.90	103		24	43	2.89
1991								
1992								
1993								

1/ Average monthly income escalated by 15 per cent per year to 1984, 12 per cent per year between 1985 and 1989, and 10 per cent in 1990 and afterwards.

2/ Assumed 1/2" service.

FINANCIAL TABLE 6
 LAOAG WATER SUPPLY PROJECT
 ILLUSTRATIVE CASH FLOW TABLE
 P1,000's EXCEPT CHARGES PER UNIT

Year	Revenue Units 1/	Charges Per Unit	Gross Revenues	Net Revenue 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1981	1,033	0.80	826	95	785	386		386	399	399
1982	1,165	0.80	932	95	885	460		460	425	824
1983	1,245	1.28	1,594	95	1,514	653		653	861	1,685
1984	1,351	1.60	2,162	96	2,076	1,445		1,445	631	2,316
1985	1,461	1.90	2,776	96	2,665	2,660		2,660	5	2,321
1986	1,746	1.90	3,317	96	3,184	3,548		3,548	-364	1,957
1987	2,069	2.20	4,552	97	4,415	4,132	228	4,360	55	2,012
1988	2,069	2.35	4,862	97	4,716	4,778	243	5,021	-305	1,707
1989	2,069	2.60	5,379	97	5,218	5,274	538	5,812	-594	1,113
1990	2,069	2.90	6,000	98	5,880	5,544	600	6,144	-264	849
1991										
1992										
1993										

1/ From Tables 9A, 9B and 9C.

2/ Gross revenues from water sales reduced by bad debt allowance.

3/ Total of project debt service, operation and maintenance costs.

4/ Ten percent of net water sales, after completion of construction. (5 percent for the first two years)

5/ Includes the costs of replacing the first complement of project components with seven years of life expectancy.

FINANCIAL TABLE 1
PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
PROJECT COSTS BY YEAR OF CONSTRUCTION
(P1,000's)

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	140		140				
2. Chlorinator	40		40				
3. Stored Material	160		160				
4. Wells & Pumps	598		598				
5. Meters	82		82				
6. Distribution System	3,046		1,526	1,321	199		
7. Transmission System	10,020		1,625	8,395			
8. Fire Hydrants	563		282	243	38		
9. Reservoir	2,465		351	826	1,288		
10. Valves	263		134	116	13		
11. I/G	200		200				
12. Break Pr. Chamber	232		155	77			
13. Service Connection	945		837	65	43		
14. Engineering Cost	1,969	1,969					
15. Supervision Cost	656		263	197	196		
16. Land Cost	100		100				
17. Physical Contingency	2,148	197	649	1,124	178		
18.							
TOTAL, 7-1-81	23,627	2,166	7,142	12,364	1,955		
ESCALATION FACTORS	14,841	693	3,714	8,655	1,779		
ESCALATED COSTS	38,468	2,859	10,856	21,019	3,734		

FINANCIAL TABLE 2
PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
OPERATION AND MAINTENANCE COSTS
(P1,000's)

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor <u>1/</u>	Amount
1981	13	33	121	167	1,000,000	167
1982	17	35	135	187	1,156,000	215
1983	58	40	145	243	1,322,000	321
1984	67	43	176	286	1,520,875	435
1985	79	49	229	357	1,763,380	608
1986	93	55	289	437	1,907,785	833
1987	108	59	381	548	2,136,719	1,171
1988	108	59	381	548	2,393,128	1,311
1989	108	59	381	548	2,680,301	1,469
1990	108	59	381	548	2,948,331	1,616
1991						
1992						
1993						
1994						
1995						
1996						
1997						
1998						

1/ Escalation currently 15 percent per year to 1984 (1981 = 1.00),
12 percent per year between 1985 and 1989 and 10 percent per year
in 1990 and afterwards.

FINANCIAL TABLE 3
PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
LOAN DISBURSEMENTS AND DEBT SERVICE
(P1,000's)

Year	Disbursement <u>1/</u>		Loans Outstanding		Interest Payments		Principal Payments <u>3/</u>	Total Debt Service
	Grant	Loan	Beginning	Ending	First Year <u>2/</u>	Later Years		
1981								
1982								
1983	1,001	1,858		1,858	83			83
1984	3,800	7,056	1,858	8,914	317	167		484
1985	7,357	13,662	8,914	22,576	614	802		1,416
1986	1,307	2,427	22,576	25,003	109	2,031		2,140
1987			25,003	24,933		2,248	70	2,318
1988			24,933	24,593		2,235	340	2,575
1989			24,593	23,729		2,193	864	3,057
1990			23,729	22,773		2,113	956	3,069
1991			22,773	21,817		2,028	956	2,984
1992			21,817	20,861		1,942	956	2,898
1993			20,861	19,905		1,857	956	2,813
1994			19,905	18,949		1,772	956	2,728
1995			18,949	17,993		1,683	956	2,639
1996			17,993	17,037		1,597	956	2,553
1997			17,037	16,081		1,511	956	2,467
1998			16,081	15,125		1,426	956	2,382

1/ From Financial Table 1.

2/ Disbursements assumed to be equally spread during year. Charge with 50 per cent of annual interest in first year.

3/ Principal payments according to LWUA year plan.

FINANCIAL TABLE 4

PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(P1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves <u>1/</u>	Cost With Reserves	Revenue Units <u>2/</u>	Cost Per Revenue Unit <u>3/</u>
1981		167	167		167	811	0.21
1982		215	215		215	916	0.23
1983	83	321	404		404	979	0.41
1984	484	435	919		919	1,061	0.87
1985	1,416	608	2,024		2,024	1,148	1.76
1986	2,140	833	2,973		2,973	1,371	2.17
1987	2,318	1,171	3,489	174	3,663	1,626	2.25
1988	2,575	1,311	3,886	194	4,080	1,626	2.51
1989	3,057	1,469	4,526	453	4,979	1,626	3.06
1990	3,069	1,616	4,685	469	5,154	1,626	3.17
1991							
1992							
1993							
1994							
1995							
1996							
1997							
1998							

1/ Reserve estimate equal to 10 per cent of total costs. (5 per cent for the first two years).

2/ Reserve units correspond to the ratio of connections in Pasuquin, Bacarra, Vintar and Paoay to the total in the area including Laoag City.

3/ Reserve Units divided into costs with reserves.

FINANCIAL TABLE 5
PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
ABILITY TO PAY FOR WATER

1	2	3	4	5	6	7	8
Year	Ave. Monthly Family Income ^{1/}	Available %	Average Family Size	Household Water Use lpcd	Cubic Meters/ Month	Revenue Units Per Month ^{2/}	Max. Ability Per Rev. Unit
1981	656.55	32.83	5.36	90	14	30	1.09
1982	755.03	37.75	5.35	90	14	30	1.26
1983	868.29	43.42	5.34	90	14	30	1.45
1984	999.53	49.93	5.33	90	14	30	1.66
1985	1,119.47	55.92	5.32	90	14	30	1.86
1986	1,253.81	62.63	5.31	98	16	32	1.96
1987	1,404.27	70.15	5.30	98	16	32	2.19
1988	1,572.78	78.57	5.29	102	16	32	2.46
1989	1,761.51	87.99	5.28	103	16	32	2.75
1990	1,937.66	96.97	5.27	103	16	32	3.03
1991							
1992							
1993							

^{1/} Average monthly income escalated by 15 per cent per year to 1984, 12 per cent per year between 1985 and 1989, and 10 per cent in 1990 and afterwards.

^{2/} Assumed 1/2" service.

FINANCIAL TABLE 6
PASUQUIN, BACARRA, VINTAR & PAOAY WATER SUPPLY PROJECT
ILLUSTRATIVE CASH FLOW TABLE
P1,000's EXCEPT CHARGES PER UNIT

Year	Revenue Units 1/	Charges Per Unit	Gross Revenues	Net Revenue 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1981	811	0.80	649	95	617	167		167	450	450
1982	916	0.80	733	95	696	215		215	481	931
1983	979	1.25	1,224	95	1,163	404		404	759	1,690
1984	1,061	1.65	1,751	96	1,681	919		919	762	2,452
1985	1,148	1.85	2,124	96	2,039	2,024		2,024	15	2,467
1986	1,371	1.95	2,673	96	2,566	2,973		2,973	-407	2,060
1987	1,626	2.20	3,577	97	3,470	3,489	183	3,672	-202	1,858
1988	1,626	2.45	3,984	97	3,864	3,886	199	4,085	-221	1,637
1989	1,626	2.75	4,472	97	4,338	4,526	447	4,973	-635	1,002
1990	1,626	3.00	4,878	98	4,780	4,685	488	5,173	-393	609
1991										
1992										
1993										

1/ From Tables 9A, 9B and 9C.

2/ Gross revenues from water sales reduced by bad debt allowance.

3/ Total of project debt service, operation and maintenance costs.

4/ Ten percent of net water sales, after completion of construction. (5 percent for the first two years)

5/ Includes the costs of replacing the first complement of project components with seven years of life expectancy.

APPENDIXES

1. Water Quality
2. Infiltration Galleries
3. Water Pressure on the Transmission Pipeline
4. Variation of Water Pressure in Laoag
5. Study on Water Sources
6. Socio-Economic Study
7. Design Criteria for Planning
8. Procedure of Projection of Population and Water Demand
9. Basic Cost Data

Appendix 1 Water Quality

Results of water quality analysis of the existing water sources presently used in the study area and the water quality standard for drinking water of the Philippines are shown in Tables 1, 2 and 3. Remarkable items of the water quality found are commented below.

1) Spring Water

- a. All spring water except that of the Bararin spring has as low value of turbidity as requiring no treatment for drinking purpose.
- b. Hardness concentrations of the spring water are higher than the permissible value of the standard, but lower than the maximum permissible value.
- c. Chloride and sulfate concentrations are remarkably low.
- d. A few numbers of bacteria and coliform groups are found.

2) Riverbed Water

- a. The water of the Ermita gallery has high turbidity occasionally when the river water gets turbid. The reason is explained in Appendix 2.
- b. Conductivity of water of the Erimita and West River Side galleries located along the Laoag River is high compared with that of other sampled water. The reason is explained in Appendix 2.
- c. Water of the above two galleries has comparatively high contents of bacteria and coliform groups.

3) Lake Water

- a. Turbidity at each sampling point is low.
- b. Dissolved matters represented by conductivity, hardness and chloride are low.
- c. All samples have few bacteria and coliform groups.

Table 1 Water Quality of Existing Water Sources

Item	Source	Sampling date (1981)	Dunaluan Spring	Bararamin Spring	Bararamin Spring	Emrita Gallery	Emrita Gallery	Emrita Gallery	West River-side Gallery	West River-side Gallery	Bacarra Gallery	Bacarra Gallery	Bacarra River at San Mate	Lacop River at Westside	Lacop River at Vinear	Bacarra River at	Bacarra
Weather		22 July	clouded	clouded	22 July	23 July	24 July	27 July	23 July	27 July	24 July	27 July	22 July	23 July	23 July	23 July	24 July
Atm. Temperature (°C)		28	26	26	31	30	30	31	30	30	29	31	28.5	31	31	31	29
Water Temperature (°C)		23.5	22.5	24	27.5	28	28.5	29.5	29.5	28	28.5	27	27	27	27	28	29.5
Turbidity (mg/l)		0	40	3	20	18	0	0	0	0	0	40	50	50	8	7	
Conductivity		430	500	500	650	650	950	920	920	320	305	330	220	230	260	275	
Hardness (mg/l)		205	270	190	220	230	330	300	300	125	120	140	80	85	85	100	
Calcium (mg/l)		62	88	36	56	-	96	-	-	38	-	-	24	22	-	28	
Magnesium (mg/l)		12.2	12.2	9.7	19.4	-	22	-	-	9.7	-	-	49	7.3	-	7.3	
Chloride (mg/l)		8	6	7	62	74	88	80	80	6	7	7	5	7	5	5	
pH		7.2	7.5	7.3	7.4	7.3	7.4	7.5	7.5	7.3	7.3	7.2	7.0	7.2	7.4	7.4	
Alkalinity (mg/l)		100	100	85	75	80	130	125	125	60	70	65	40	50	60	70	
Sulfate (mg/l)		3	1.5	-	22	-	24	-	-	3	-	-	13	8.5	-	4.8	
Ammonia-N (mg/l)		less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	0.3	less than 0.3	less than 0.3	
Nitrate-N (mg/l)		14.5	12.8	19.8	31	-	21.1	-	-	19.6	-	-	23.3	16.7	-	17.2	
Iron (mg/l)		0.065	0.2	0.065	-	-	0.06	-	-	0.09	-	-	0.065	0.07	-	0.13	
Vanadene (mg/l)		0.02	0.2	0.10	Nil	-	Nil	-	-	0.10	-	-	Nil	Nil	-	Nil	
Total Bacteria (/ ml)		80	negative	300	2,000	-	1,500	1,800	1,800	500	700	-	2,000	more than 3,000	more than 3,000	2,000	
Coliform group (/ 100 ml)		70	negative	300	550	-	400	500	500	90	200	-	200	200	150	230	
Dissolved Oxygen (%)		80	86	82	72	75	55	45	45	68	73	78	86	82	80	80	
Dissolved Oxygen (mg/l)		6.66	6.32	7.61	5.62	5.91	4.23	3.41	3.41	5.27	5.61	5.91	6.76	6.45	6.20	6.06	

Items	Sources	P A O A Y										L A K E										
		Barong-abong Spring	Tanarong Spring	Mungayri Spring	Borok Spring	Bantay Spring	No.1	0 m	1 m	2 m	3 m	4 m	5 m	No.2	0 m	1 m	3 m	5 m	No.3	0 m	No.4	0 m
Sampling Date (1981)		22 July	24 July	25 July	27 July	31 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July	30 July
Weather		clouded	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine	fine
Aton. Temperature (°C)		28.5	30	26.5	30	29	30	30	29	30	30	30	30	30	30	30	30	30	30	30	30	30
Water Temperature (°C)		25.5	29	23.5	29.5	27	27	29.9	28.1	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
Turbidity (mg/l)		0	0	0	0	0	0	3	3	5	5	5	5	4	4	4	4	5	4	4	3	3
Conductivity		245	650	450	150	410	245	240	240	245	245	245	245	238	235	235	245	240	240	240	235	235
Hardness (mg/l)		100	320	240	60	340	85	80	80	85	85	85	85	80	80	80	80	80	80	80	80	80
Calcium (mg/l)		28	110	76	12	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium (mg/l)		7.3	10.9	12.2	7.3	14.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (mg/l)		81	13	7	60	70	31	31	31	32	32	32	32	31	31	31	31	32	31	31	31	31
pH		7.0	7.6	7.6	7.0	7.2	7.2	7.2	7.3	7.2	7.2	7.0	6.8	7.0	7.4	7.4	7.2	6.8	7.0	7.0	7.0	7.0
Alkalinity (mg/l)		60	80	80	30	70	45	45	45	40	40	40	40	40	40	40	40	40	40	40	40	40
Sulfate (mg/l)		1.5	2	2.5	Nil	1.0	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia-N (mg/l)		less than 0.3	0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	-	-	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3	less than 0.3
Nitrate-N (mg/l)		16.7	13.2	13.9	16.5	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (mg/l)		0.075	0.065	0.04	0.11	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (mg/l)		0.25	0.03	Nil	0.02	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Bacteria (/ml)		500	15	800	800	100	30	-	-	-	negative	-	-	7	-	-	-	-	-	30	30	30
Coliform group (/100ml)		90	negative	80	150	negative	negative	-	-	-	negative	-	-	negative	-	-	-	-	negative	negative	negative	negative
Dissolved Oxygen (%)		90	24	82	42	70	96	88	98	88	58	50	35	72	80	80	48	25	80	80	80	80
Dissolved Oxygen (mg/l)		7.25	1.83	6.82	3.18	5.50	7.02	6.04	7.25	6.04	4.43	3.87	2.72	5.31	5.93	5.88	3.69	1.94	5.88	5.86	5.86	5.86
Water depth (m)		Up to 1.2m	Pacey	Up to 1.2m	Pacey	Becarra	5.6	-	-	-	-	-	-	5.1	-	-	-	-	-	-	-	-
Place		Up to 1.2m	Pacey	Up to 1.2m	Pacey	Becarra	5.6	-	-	-	-	-	-	5.1	-	-	-	-	-	-	-	-

Table 3 Water Quality Standard
Key Parameters of the Philippines
Standard for Drinking Water

<u>Parameters</u> ^{1/}	<u>Permissible Level</u> ^{2/}	<u>Maximum Permissible</u> ^{2/}
Coliform groups	No detecting in 100 ml	-
Total Bacteria	10/ml	-
Odor	Unobjectionable	-
Taste	Unobjectionable	-
Color	5 units	50 units
Turbidity	5 units	25 units
Total solids	500	1,500
pH	7.0 - 8.5	6.5 - 9.2
Total hardness	100	500
Calcium, as Ca	75	200
Magnesium, as Mg	50	150
Chloride, as Cl	200	600
Sulfate, as SO ₄	200	400
Nitrate, as NO ₃	-	30
Iron, as Fe	0.3	1.0
Manganese, as Mn	0.1	0.5

1/ The above table shows only main parameters of the Standard, which are considered essential for judging characteristics of drinking water quality.

2/ All units are in mg/l, unless otherwise stated.