14. フィージビリティスタディ その2

14.1 はじめに

ここでは、本編の冒頭で述べたように、第一期と第二期を合わせたプロジェクトのフィージビリティを検討する。

14.2 水道計画

本編で述べてきたように目標年次（１９９３年）における給水区域は 1,９８０ha、給水人口は４９,８４０人、日最大水需要量は 9,８００m^3／日である。

水道計画の概要については図 3.１4.1～図 3.１4.3 に、計画施設は表 3.１4.1 に示した。また図 3.１4.4 に建設計画、表 3.１4.2 に概算事業費、表 3.１4.3 に投資計画を示す。

14.3 財政評価

14.3.1 財源および借入金利

本スタディでは、ＬＷＵＡの指示に従い投資額の２５％を政府補助とし、７５％を政府ローンとする条件を用いる。年毎の投資額及び返済額を表３に示す。この検討は、政府機関であるＬＷＵＡが国内、国外からの資金を得て、水道区がＬＷＵＡから資金を得られるという前提で進める。

また、年利は９％で、６年間（建設期間）は元金据置で返済期限は据置期間を含めて３０年間である。事業費の６1.７％が外貨分で、残りは内貨分となっている。外貨については、フィリピン政府はＯＥＣＦ、世界銀行、アジア開発銀行などの融資機関に借款を求めることになろう。

14.3.2 分析結果

前述の仮定、条件に基づいた財政分析の結果、第一期と第二期を合わせたプロジェクトは財政面でフィージブルであることがわかった。

なお、本件では政府補助金２５％という条件で計算を行った。補助金率を一段階下げて２０％とした場合の財政分析結果は累積残高—Cumulative Net Income—が赤字になる年が発生し、フィージビリティは成立しない。—本編末尾の分析資料参照。

14.3.3 水道料金

収入計算において家事用水道料金は、水道区の平均世帯収入の５％以下で設定した。

14.4 経済評価

14.4.1 給水人口、給水区域の増加

目標年次の給水人口は49,840人で現在に較べて101%の増である。

給水区域は現在480haで目標年次に1,980haに増加する。

14.4.2 内部収益率

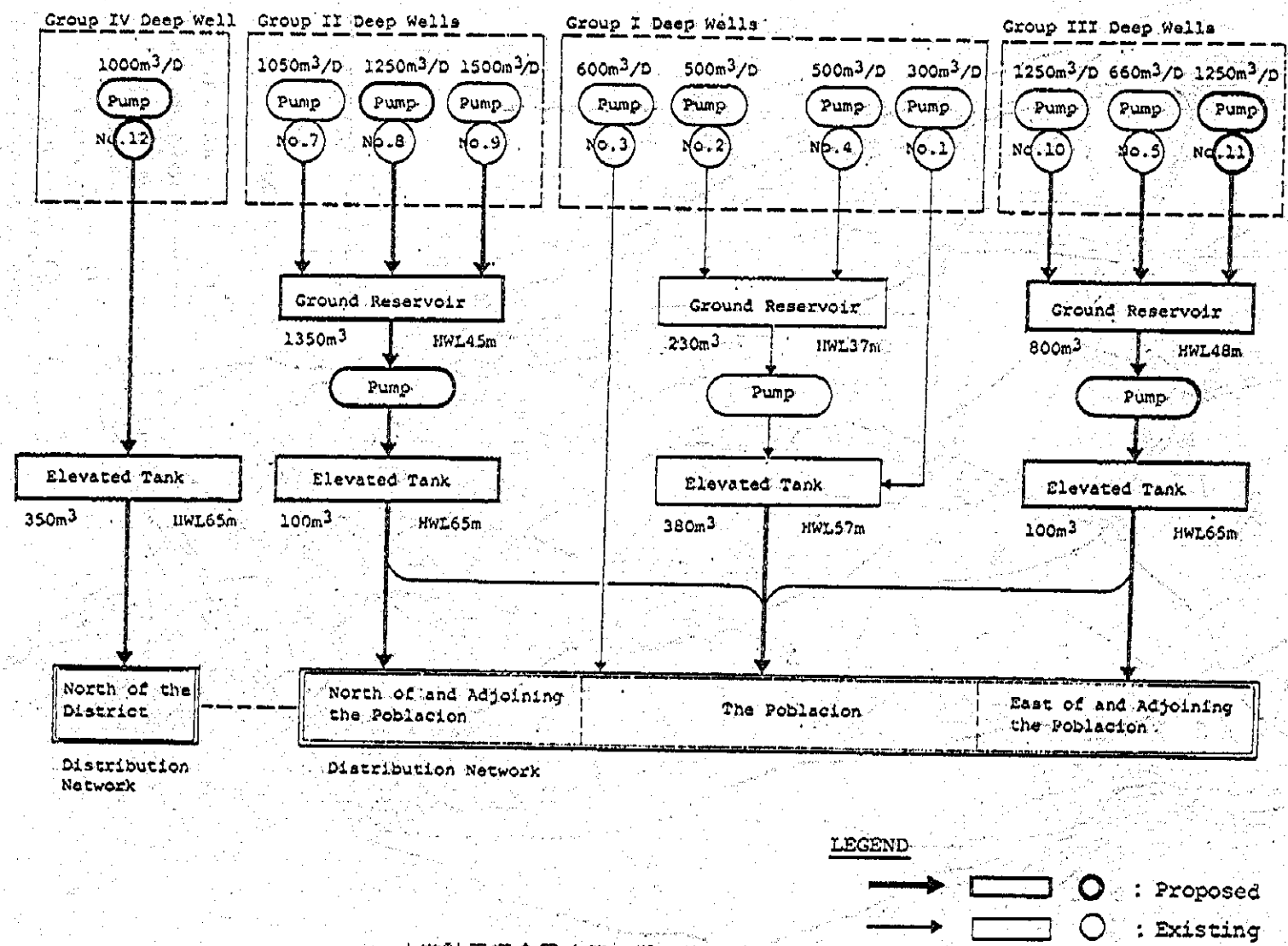
内部収益率（IERR）を計算した結果、以下に示すように本プロジェクトは経済的に妥当である。

1) 換算係数を用いない場合 ： 18%

2) 換算ケースAの場合 ： 17%

3) 換算ケースBの場合 ： 19%

4) 換算ケースCの場合 ： 16%



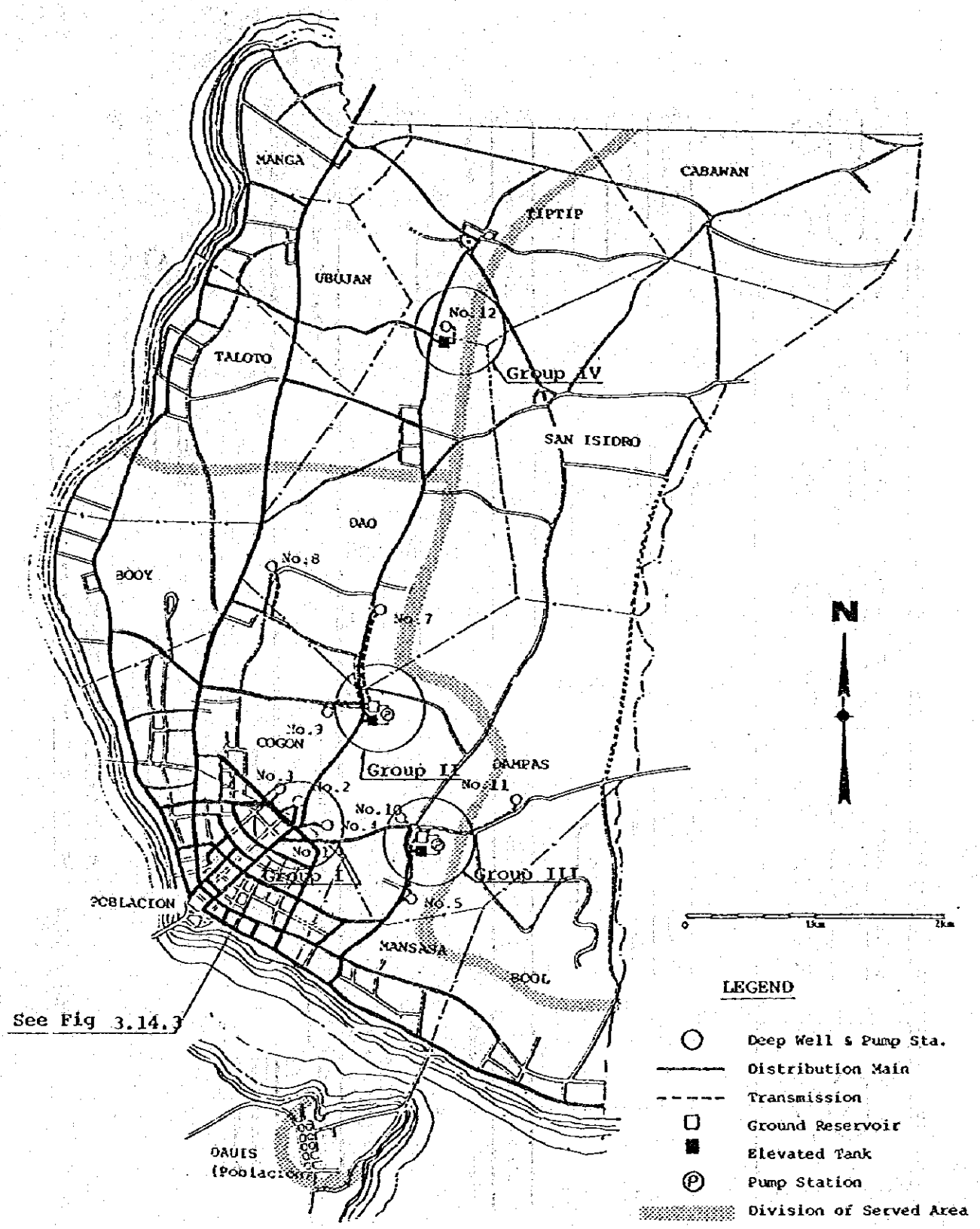
水道計画概念図（第一期＋第二期）

Fig 3.14.1 Schematic Diagram of Proposed Water Supply System

Tagbilaran
(I + II)

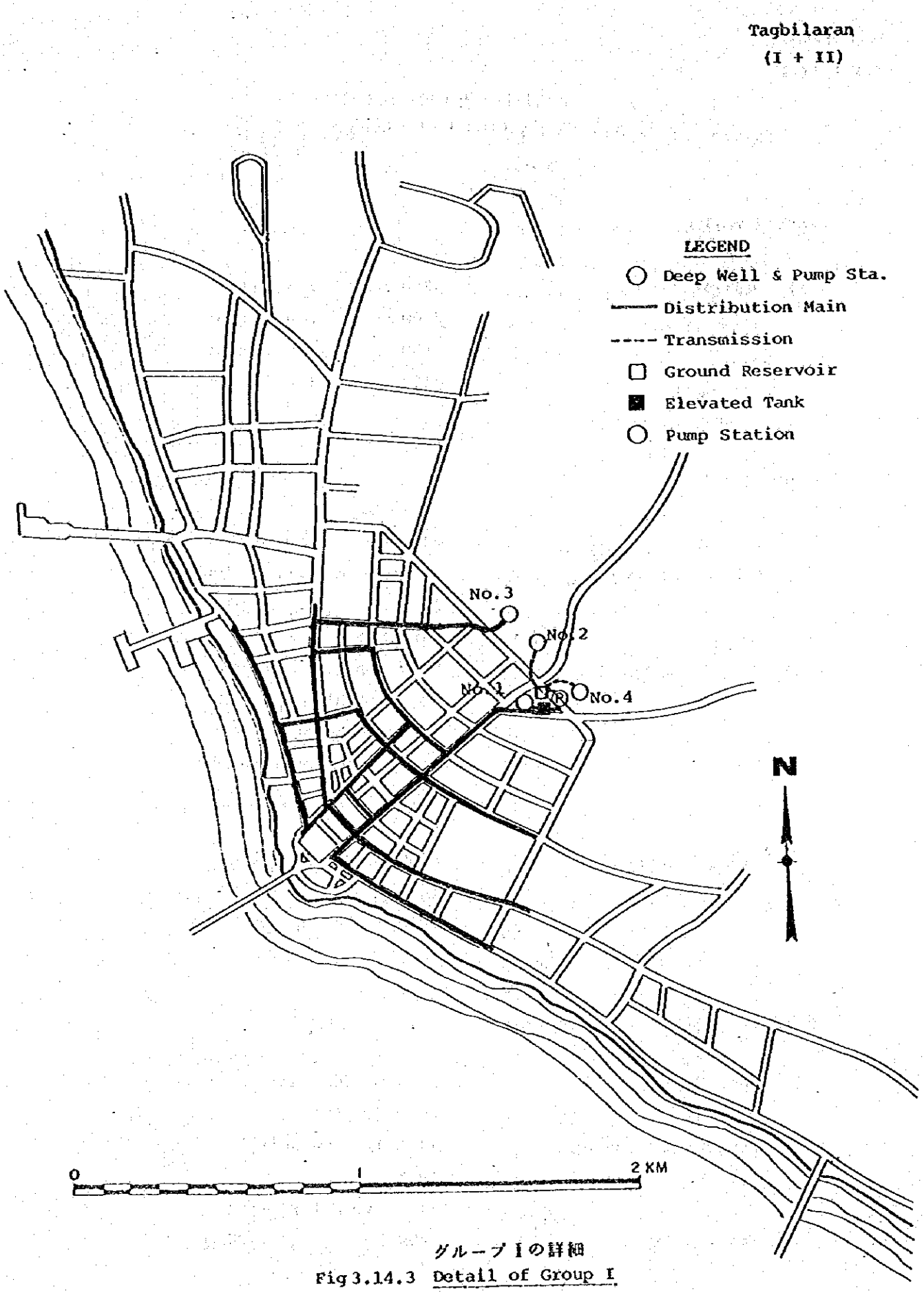
Tagbilaran

(I + II)



水道計画（第一期＋第二期）

Fig 3.14.2 Proposed Water Supply System for Year 1993



グループ I の詳細

Fig 3.14.3 Detail of Group I

Tagbilaran

(I + II)

計画施設一覧（第一期＋第二期）

Table 3.14.1 Facilities to be Constructed

Group I Works

1) Distribution	ø250 mm	L = 1000 m
	ø200 mm	L = 750 m
	ø150 mm	L = 9600 m
	ø100 mm	L = 5300 m

Group II Works

1) Transmission	ø200 mm L = 3100 m
2) Ground Reservoir	Reinforced Concrete Made
	1350 m^3
	HWL 45 m
3) Pump Station	62.9 l/s (Capacity)
	30 m (Total Dynamic Head)
	Electric Motor Drive
4) Elevated Tank	Reinforced Concrete Made
	100 m^3
	HWL 65 m
5) Distribution	ø250 mm L = 2500 m
	14.5 l/s (Capacity)
	70 m (Total Dynamic Head)

Group III Works

1) Deep Well	ø250 mm (Casing Diameter)
	60 m (Depth)
2) Deep Well Pump Sta.	14.5 l/s (Capacity)
	29 KW
	Electric Motor Drive
3) Transmission	ø200 mm L = 1900 m

4)	Ground Reservoir	Reinforced Concrete Made
		800 m^3
		HWL 48 m
5)	Pump Station	39.1 l/s (Capacity)
		30 m (Total Dynamic Head)
		Electric Motor Drive
6)	Elevated Tank	Reinforced Concrete Made
		HWL 65 m, 100 m^3
7)	Distribution	ø200 mm L = 1750 m

Group IV Works

1)	Deep Well	ø250 mm (Casing Diameter)
		50 m (Depth)
2)	Deep Well Pump Sta.	11.6 l/s (Capacity)
		29 KW
		Electric Motor Drive
3)	Distribution	ø100 mm L = 11500 m

Meters, Valves and Other Appurtenances

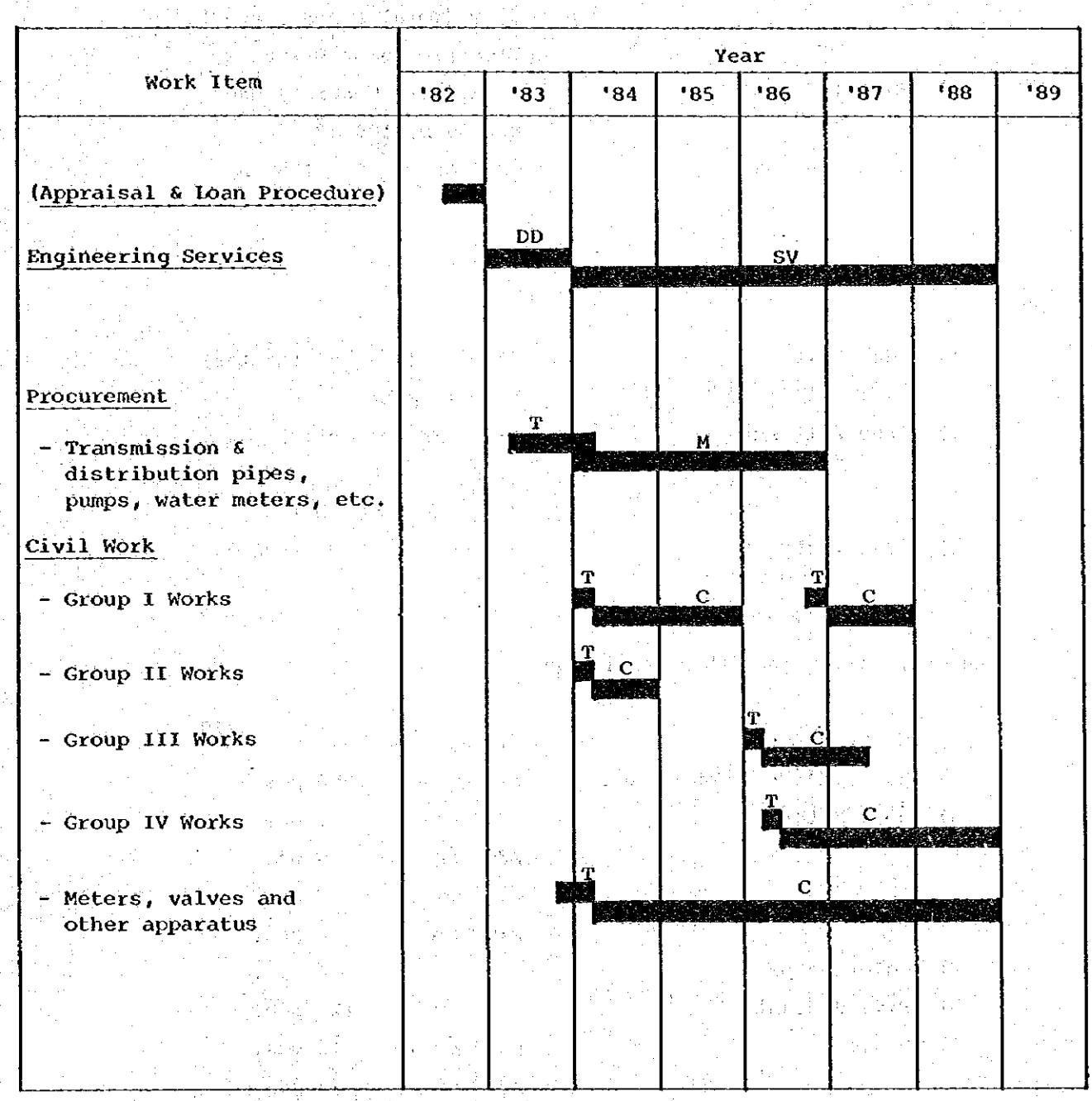
1)	Water Meter	ø13 mm	1800 pcs.
2)	Water Meter & Connection	ø13 mm	5960 pcs.
3)	Bulk Meter	ø250 mm	3 pcs.
		ø200 mm	9 pcs.
		ø150 mm	7 pcs.
		ø100 mm	2 pcs.
4)	Chlorinator		4 pcs.
5)	Fire Hydrant		127 pcs.
6)	Valve	ø250 mm	12 pcs.
		ø200 mm	13 pcs.
		ø150 mm	32 pcs.
		ø100 mm	56 pcs.
7)	Pressure Gauge		10 pcs.

Tagbilaran

(I + II)

実施工程（第一期＋第二期）

Fig 3.14.4 Construction Schedule



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 事業費（第一期＋第二期） Project Cost

Tagbilaran (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. Group I Works	4,457	2,987	1,470
B. Group II Works	5,425	2,817	2,608
C. Group III Works	4,090	1,968	2,122
D. Group IV Works	2,645	1,645	1,000
E. Meters, Valves and Other Appurtenances	6,370	4,742	1,628
Sub Total	22,987	14,159	8,828
Detailed Design Cost (10.5%)	2,414	1,448	966
Supervision Cost (3.5 %)	805	483	322
Land Cost	71	-	71
Total	26,277	16,090	10,187
Physical Contingency (10 %)	2,628	1,609	1,019
Total	28,905	17,699	11,206
Price Contingency	22,286	13,887	8,399
Grand Total (Project Cost)	51,191 (Equivalent to US$6.56 M)	31,586 (Equivalent to US$4.05M)	19,605 (Equivalent to US$2.51 M)

年度別投資計画（第一期＋第二期）

Table 3.14.3 Disbursement Schedule

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. Group I Works															
a) Distribution ø250 mm x 1,000 m	570	382	188			382	188								
b) ø200 mm x 750 m	292	196	96									196	96		
c) ø150 mm x 9,600 m	2,641	1,770	871			1,493	735					277	136		
d) ø100 mm x 5,300 m	954	639	315					398	196			241	119		
B. Group II Works															
a) Transmission (ø200 mm x 3,100 mm)	1,209	810	399			810	399								
b) Ground Reservoir (1,350 m^3)	1,372	343	1,029			343	1,029								
c) Pump Station (62.9 ℓ/s)	879	527	352			527	352								
d) Elevated Tank (100 m^3)	407	102	305			102	305								
e) Distribution (ø250 mm x 2,500 m)	1,425	955	470			955	470								
f) Pump for No. 8 Well (14.5 ℓ/s)	133	80	53			80	53								
C. Group III Works															
a) Deep Well (ø250 mm x 60 m)	275	80	195							80	195				
b) Deep Well Pump Sta. (14.5 ℓ/s)	340	190	150							190	150				
c) Transmission (ø200 mm x 1,900 m)	741	496	245							496	245				
d) Ground Reservoir (800 m^3)	982	246	736							246	736				
e) Pump Station (39.1 ℓ/s)	662	397	265							397	265				
f) Elevated Tank (100 m^3)	407	102	305							102	305				
g) Distribution (ø200 mm x 1,750 m)	683	457	226									457	226		

(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	F/C	L/C
D. Group IV Works															
a) Deep Well (ø250 mm x 50 m)	235	68	167							68	167				
b) Deep Well Pump Sta. (11.6 ℓ/s)	340	190	150							95	75	95	75		
c) Distribution (ø100 mm x 11,500 m)	2,070	1,387	683											1,387	683
E. Meters, Valves and Other Appurtenances															
a) Water Meter (ø13 mm x 1,813 pcs)	272	209	63			209	63								
b) Water Meter & Connection (ø13 mm x 5,957 pcs)	3,872	2,981	891			604	181	425	127	651	194	651	194	650	195
c) Bulk Meter (ø250 mm x 3 pcs)	30	24	6			24	6								
d) Bulk Meter (ø200 mm x 9 pcs)	90	72	18			13	5			59	13				
e) Bulk Meter (ø150 mm, ø100 mm) x 9 pcs	60	48	12			38	9							10	3
f) Chlorinator (4 pcs)	40	36	4			18	2			9	1			9	1
g) Fire Hydrant (127 pcs)	901	594	307			411	212			92	48	91	47		
h) Valve (ø250 mm x 12 pcs)	100	73	27			73	27								
i) Valve (ø200 mm x 13 pcs)	79	58	21			13	5			32	11	13	5		
j) Valve (ø200 mm x 32 pcs)	136	99	37			84	31					15	6		
k) Valve (ø100 mm x 56 pcs)	188	137	51					27	10			17	6	93	35
l) Pressure Gauge (10 pcs)	3	2	1			2	1								

(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

(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
m) Vehicle (3 cars)	210	105	105			70	70			35	35				
n) Stored Materials	389	304	85			179	50					125	35		
Sub-Total	22,987	14,159	8,828	0	0	6,430	4,193	850	333	2,552	2,440	2,178	945	2,149	917
Detailed Design Cost (10.5%)	2,414	1,448	966	1,448	966										
Supervision Cost (3.5%)	805	483	322			175	116	44	29	88	59	88	59	88	59
Land Cost	71	0	71			0	37			0	24			0	10
Total	26,277	16,090	10,187	1,448	966	6,605	4,346	894	362	2,640	2,523	2,266	1,004	2,237	986
Physical Contingency (10%)	2,628	1,609	1,019	145	97	660	435	89	36	264	252	227	100	224	99
Total	28,905	17,699	11,206	1,593	1,063	7,265	4,781	983	398	2,904	2,775	2,493	1,104	2,461	1,085
Price Contingency	22,286	13,887	8,399	514	343	3,784	2,490	691	280	2,636	2,519	2,834	1,255	3,428	1,512
Grand Total (Project Cost)	51,191	31,586	19,605	2,107	1,406	11,049	7,271	1,674	678	5,540	5,294	5,327	2,359	5,889	2,597

財 政 評 価 分 析 表

（第一期＋第二期）

FINANCIAL TABLE 1

TAGBILARAN WATER SUPPLY PROJECT

PORJECT COSTS BY YEAR OF CONSTRUCTION

(₱1,000's)

I + II

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	210	-	140	-	70	-	-
2. Chlorinators	40	-	20	-	10	-	10
3. Wells & Pumps	2,864	-	1,012	-	1,682	170	-
4. Meters & Gauges	4,327	-	1,155	552	917	845	858
5. Distribution System	8,635	-	4,223	594	-	1,748	2,070
6. Transmission System	1,950	-	1,209	-	741	-	-
7. Ground Reservoir	2,354	-	1,372	-	982	-	-
8. Elevated Tank	814	-	407	-	407	-	-
9. Valves	503	-	233	37	43	62	128
10. Fire Hydrants	901	-	623	-	140	138	-
11. Engineering	2,414	2,414	-	-	-	-	-
12. Supervision	805	-	291	73	147	147	147
13. Land	71	-	37	-	24	-	10
14. Stored Materials	389	-	229	-	-	160	-
15. Physical Contingency	2,628	242	1,095	125	516	327	323
16.							
17.							
18.							
TOTAL, 7-1-81	28,905	2,656	12,046	1,381	5,679	3,597	3,546
ESCALATION FACTORS		1.322500	1.520875	1.703380	1.907785	2.136719	2.39312
ESCALATED COSTS	51,191	3,513	18,320	2,352	10,834	7,686	8,486

FINANCIAL TABLE 2

TAGBILARAN WATER SUPPLY PROJECT
OPERATION AND MAINTENANCE COSTS
(₱1,000's)

I + II

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor 1/	Amount
1981	239	69	354	662	1.000000	662
1982	247	71	352	670	1.150000	771
1983	257	74	344	675	1.322500	893
1984	267	77	336	680	1.520875	1,034
1985	269	77	397	743	1.703380	1,266
1986	283	81	416	780	1.907785	1,488
1987	300	86	439	825	2.136719	1,763
1988	315	91	508	914	2.393126	2,187
1989	332	96	562	990	2.680301	2,653
1990	351	101	606	1,058	2.948331	3,119
1991	370	107	655	1,132	3.243164	3,671
1992	392	113	703	1,208	3.567480	4,310
1993	414	119	752	1,285	3.924228	5,043
1994	414	119	752	1,285	4.316651	5,547
1995	414	119	752	1,285	4,748316	6,102
1996	414	119	752	1,285	5.223148	6,712
1997	414	119	752	1,285	5.745463	7,383
1998	414	119	752	1,285	6.320009	8,121

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.

Tagbilaran

FINANCIAL TABLE 3

TAGBILARAN WATER SUPPLY PROJECT
LOAN DISBURSEMENTS AND DEBT SERVICE
(₱1,000's)

I + II

Year	Disbursement 1/		Loans Outstanding		Interest Payments		Principal Payments 3/	Total Debt Service
	Grant	Loan	Beginning	Ending	First Year 2/	Later Years		
1981								
1982								
1983	878	2,635		2,635	118			118
1984	4,580	13,740	2,635	16,375	618	237		855
1985	588	1,764	16,375	18,139	79	1,473		1,552
1986	2,708	8,126	18,231	26,265	365	1,631		1,996
1987	1,922	5,764	26,254	32,029	259	2,362		2,621
1988	2,121	6,365	32,018	38,394	286	2,880		3,166
1989			38,394	38,286		3,450	108	3,558
1990			38,286	37,606		3,427	680	4,107
1991			37,606	36,854		3,366	752	4,118
1992			36,854	35,764		3,292	1,090	4,382
1993			35,764	34,434		3,187	1,330	4,517
1994			34,434	32,840		3,062	1,594	4,656
1995			32,840	31,246		2,920	1,594	4,514
1996			31,246	29,652		2,778	1,594	4,372
1997			29,652	28,058		2,633	1,594	4,227
1998			28,058	26,464		2,489	1,594	4,083

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

TAGBILARAN WATER SUPPLY PROJECT

I + II

CASH REQUIREMENTS PER REVENUE UNIT
(₱1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		662	662		662	1,714	0.39
1982		771	771		771	1,832	0.42
1983	118	893	1,011		1,011	1,916	0.53
1984	855	1,034	1,889		1,889	2,130	0.89
1985	1,552	1,266	2,818		2,818	2,235	1.26
1986	1,996	1,488	3,484		3,484	2,386	1.46
1987	2,621	1,763	4,384		4,384	2,560	1.71
1988	3,166	2,187	5,353		5,353	2,776	1.93
1989	3,558	2,653	6,211	311	6,522	3,014	2.16
1990	4,107	3,119	7,226	361	7,587	3,275	2.32
1991	4,118	3,671	7,789	779	8,568	3,557	2.41
1992	4,382	4,310	8,692	869	9,561	3,829	2.50
1993	4,517	5,043	9,560	956	10,516	4,064	2.59
1994	4,656	5,547	10,203	1,020	11,223	4,064	2.76
1995	4,514	6,102	10,616	1,062	11,678	4,064	2.87
1996	4,372	6,712	11,084	1,108	12,192	4,064	3.00
1997	4,227	7,383	11,610	1,161	12,771	4,064	3.14
1998	4,083	8,121	12,204	1,220	13,424	4,064	3.30

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

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

3/ Reserve units divided into costs with reserves.

FINANCIAL TABLE 5 - A

TAGBILARAN WATER SUPPLY PROJECT

ABILITY TO PAY FOR WATER

1	2	3	4	5	6	7	8
Year	Ave. Monthly Family Income 1/	Available 5%	Average Family Size	Household Water Use		Revenue Units Per Month 2/	Max. Ability Per Rev. Unit
				lpcd	Cubic Meters/ Month		
1981	724.56	36.23	5.73	84	14	29	1.25
1982	833.24	41.66	5.72	84	14	29	1.44
1983	958.23	47.91	5.71	83	14	29	1.65
1984	1,101.96	55.10	5.70	82	14	29	1.90
1985	1,234.19	61.71	5.69	85	15	30	2.06
1986	1,382.29	69.11	5.68	89	15	30	2.30
1987	1,548.17	77.41	5.67	93	16	31	2.50
1988	1,733.95	86.70	5.66	94	16	31	2.80
1989	1,942.03	97.10	5.65	97	16	31	3.13
1990	2,136.23	106.81	5.64	98	17	32	3.34
1991	2,349.85	117.49	5.63	101	17	32	3.67
1992	2,584.84	129.24	5.62	102	17	32	4.04
1993	2,843.32	142.17	5.60	102	17	32	4.44

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

TAGBILARAN WATER SUPPLY PROJECT

ABILITY TO PAY FOR WATER

I + II

Year	Ave. Monthly Family Income 1/	Available 5%	Average Family Size	Household Water Use		Revenue Units Per Month 2/	Max. Ability Per Rev. Unit
				lpcd	Cubic Meters/ Month		
1994	3,127.67	156.38	5.60	102	17	32	4.89
1995	3,440.42	172.02	5.60	102	17	32	5.38
1996	3,784.46	189.22	5.60	102	17	32	5.91
1997	4,162.90	208.15	5.60	102	17	32	6.50
1998	4,579.20	228.96	5.60	102	17	32	7.15

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.

FINANCIAL TABLE 6 - A

TAGBILARAN WATER SUPPLY PROJECT

I + II

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	1,714	1.10	1,885	95	1,791	662		662	1,129	1,129
1982	1,832	1.10	2,015	95	1,914	771		771	1,143	2,272
1983	1,916	1.45	2,778	95	2,639	1,011		1,011	1,628	3,900
1984	2,130	1.45	3,089	96	2,965	1,889		1,889	1,076	4,976
1985	2,235	1.45	3,241	96	3,111	2,818		2,818	293	5,269
1986	2,386	1.80	4,295	96	4,123	3,484		3,484	639	5,908
1987	2,560	1.80	4,608	97	4,470	4,384		4,384	86	5,994
1988	2,776	1.80	4,997	97	4,847	5,353		5,353	-506	5,488
1989	3,014	2.20	6,631	97	6,432	6,211	332	6,543	-111	5,377
1990	3,275	2.20	7,205	98	7,061	7,226	360	7,586	-525	4,852
1991	3,557	2.20	7,825	98	7,669	7,789	783	7,572	-903	3,949
1992	3,829	2.50	9,573	98	9,381	7,692	957	9,649	-268	3,681
1993	4,064	2.50	10,160	98	9,957	9,560	1,016	10,576	-619	3,062

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

TAGBILARAN WATER SUPPLY PROJECT
ILLUSTRATIVE CASH FLOW TABLE
₱1,000'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	4,064	2.75	11,176	98	10,952	10,203	1,118	11,321	-369	2,693
1995	4,064	2.75	11,176	98	10,952	10,616	1,118	11,734	-782	1,909
1996	4,064	3.00	12,192	98	11,948	11,084	1,219	12,303	-355	1,554
1997	4,064	3.00	12,192	98	11,948	11,610	1,219	12,829	-881	673
1998	4,064	3.25	13,208	98	12,944	12,204	1,321	13,525	-581	92

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 dirst complement of project components with seven years of life expectancy.

FINANCIAL TABLE 7

TAGBILARAN 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	27.50	1.32	1.54	1.87	1.10
1982	27.50	1.32	1.54	1.87	1.10
1983	36.25	1.74	2.03	2.47	1.45
1984	36.25	1.74	2.03	2.47	1.45
1985	36.25	1.74	2.03	2.47	1.45
1986	45.00	2.16	2.52	3.06	1.80
1987	45.00	2.16	2.52	3.06	1.80
1988	45.00	2.16	2.52	3.06	1.80
1989	55.00	2.64	3.08	3.74	2.20
1990	55.00	2.64	3.08	3.74	2.20
1991	55.00	2.64	3.08	3.74	2.20
1992	62.50	3.00	3.50	4.25	2.50
1993	62.50	3.00	3.50	4.25	2.50

Note: 1/ To obtain charge per m^3 for the first 10 m^3 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"
Commerical: 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 m^3, multiply R.U. charges shown in 3/ by the following block factors.

Domestic : 1.2 for 11-20 m^3; 1.4 for 21-45 m^3; 1.7 for over 45 m^3
Commercial: 2.4 for 21-45 m^3; 2.8 for 45-100 m^3; 2.4 for over 100 m^3

FINANCIAL TABLE 8

TAGBILARAN WATER SUPPLY PROJECT

GROWTH IN POPULATION, SERVICE CONNECTIONS AND IN DELIVERED AND PROCURED WATER

I + II

1	2	3	4	5	6	7	8
Year	Ave. Number Service Connections	Number For Service	Persons Served	Daily Use lpcd 1/	Annual Water Supply (1,000 M^3)		
					Delivered	% Unacct.	Produced
1981	2,528	9.7	24,600	105	944	45	1,716
1982	2,818	9.0	25,500	105	1,012	43	1,776
1983	3,255	8.7	28,050	105	1,075	40	1,792
1984	3,783	8.3	30,900	105	1,185	40	1,975
1985	4,129	8.0	32,400	110	1,242	40	2,070
1986	4,337	7.7	33,000	115	1,324	37	2,102
1987	4,585	7.3	33,640	116	1,423	34	2,156
1988	5,030	7.1	35,700	118	1,543	32	2,269
1989	5,525	6.9	38,000	121	1,676	30	2,394
1990	6,160	6.5	40,000	123	1,819	28	2,526
1991	6,865	6.3	42,900	126	1,971	26	2,663
1992	7,640	6.0	45,600	128	2,117	25	2,823
1993	8,485	5.7	48,240	127	2,236	25	2,981

1/ Liters per capita per day.

FINANCIAL TABLE 9A

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF REVENUE UNITS

I + II

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	643	1,478	19	2	2,142	330	34	20	2	386	2,528
1982	729	1,676	22	2	2,429	332	35	20	2	389	2,818
1983	855	1,962	24	3	2,844	351	36	22	2	411	3,255
1984	903	2,076	27	3	3,009	337	36	20	2	395	3,404
1985	1,002	2,305	30	3	3,340	340	36	20	2	398	3,738
1986	1,113	2,560	33	4	3,710	342	36	20	3	401	4,111
1987	1,254	2,884	38	4	4,180	346	36	20	3	405	4,585
1988	1,380	3,174	41	5	4,600	367	39	21	3	430	5,030
1989	1,521	3,498	46	5	5,070	389	41	22	3	455	5,525
1990	1,704	3,919	51	6	5,680	410	43	24	3	480	6,160
1991	1,908	4,388	57	7	6,360	431	45	25	4	505	6,865
1992	2,133	4,906	64	7	7,110	453	48	25	4	530	7,640
1993	2,379	5,472	71	8	7,930	474	50	27	4	555	8,485

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	643	3,695	76	16	4,430	1,650	272	320	80	2,322	6,572
1982	729	4,190	88	16	5,023	1,660	280	320	80	2,340	7,363
1983	813	4,673	96	24	5,606	1,675	280	320	80	2,355	7,961
1984	903	5,190	108	24	6,225	1,685	288	320	80	2,373	8,598
1985	1,002	5,763	120	24	6,909	1,700	288	320	80	2,388	9,297
1986	1,113	6,400	132	32	7,677	1,710	288	320	120	2,438	10,115
1987	1,254	7,210	152	32	8,648	1,730	288	320	120	2,458	11,106
1988	1,380	7,935	164	40	9,519	1,835	312	336	120	2,603	12,122
1989	1,521	8,745	184	40	10,490	1,945	328	352	120	2,745	13,235
1990	1,704	9,798	204	48	11,754	2.050	344	384	120	2,898	14,652
1991	1,908	10,970	228	56	13,162	2,155	360	400	160	3,075	16,237
1992	2,133	12,265	256	56	14,710	2,265	384	400	160	3,209	17,919
1993	2,379	13,680	284	64	16,407	2,370	400	432	160	3,362	19,769

FINANCIAL TABLE 9B1

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF REVENUE UNITS

I + II

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	840	257	583	257	308	326	456	-	-	764
1982	901	292	609	292	350	317	444	-	-	794
1983	957	341	616	341	409	275	385	-	-	794
1984	1,055	361	694	361	433	333	466	-	-	899
1985	1,105	401	704	401	481	303	424	-	-	905
1986	1,178	445	733	445	534	288	403	-	-	937
1987	1,267	502	765	502	602	263	368	-	-	970
1988	1,373	552	821	552	662	269	377	-	-	1,039
1989	1,492	608	884	608	730	276	386	-	-	1,116
1990	1,619	682	937	682	818	255	357	-	-	1,175
1991	1,754	763	991	763	916	228	319	-	-	1,235
1992	1,884	853	1,031	853	1,024	178	249	-	-	1,273
1993	1,990	952	1,038	952	1,142	86	120	-	-	1,262

FINANCIAL TABLE 9B2

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF WATER REVENUES UNITS

I + II

COMMERCIAL

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	11 - 45 cum		46 - 100 cum		Over 100 cum		Total CRU's
				cum	x 2.4	cum	x 2.8	cum	x 3.4	
1981	104	46	58	58	139	-	-	-	-	139
1982	111	47	64	64	154	-	-	-	-	154
1983	118	49	69	69	166	-	-	-	-	166
1984	130	47	83	83	199	-	-	-	-	199
1985	137	48	89	89	214	-	-	-	-	214
1986	146	48	98	98	235	-	-	-	-	235
1987	156	49	107	107	257	-	-	-	-	257
1988	170	52	118	118	283	-	-	-	-	283
1989	184	55	129	129	310	-	-	-	-	310
1990	200	58	142	142	341	-	-	-	-	341
1991	217	61	156	156	374	-	-	-	-	374
1992	233	64	169	169	406	-	-	-	-	406
1993	246	67	179	179	430	-	-	-	-	430

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	4,430	532	764	1,296	2,322	279	139	418	1,714
1982	5,023	603	794	1,397	2,340	281	154	435	1,832
1983	5,606	673	794	1,467	2,355	283	166	449	1,916
1984	6,225	747	899	1,646	2,373	285	199	484	2,130
1985	6,909	829	905	1,734	2,388	287	214	501	2,235
1986	7,677	921	937	1,858	2,438	293	235	528	2,386
1987	8,648	1,038	970	2,008	2,458	295	257	552	2,560
1988	9,519	1,142	1,039	2,181	2,603	312	283	595	2,776
1989	10,490	1,259	1,116	2,375	2,745	329	310	639	3,014
1990	11,754	1,411	1,175	2,586	2,898	348	341	689	3,275
1991	13,162	1,579	1,235	2,814	3,075	369	374	743	3,557
1992	14,710	1,765	1,273	3,038	3,209	385	406	791	3,829
1993	16,407	1,969	1,262	3,231	3,362	403	430	833	4,064

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（第一期＋第二期）

ECONOMIC TABLE 1

TAGBILARAN WATER SUPPLY PROJECT

SUMMARY OF PROJECT COST

Costs as of July 1, 1981 in 1,000 Pesos I + II

Components	Total Cost	Foreign Currency Portion	Local Currency Portion
1. Vehicles	210	105	105
2. Chlorinators	40	36	4
3. Wells & Pumps	2,864	1,532	1,332
4. Meters & Gauges	4,327	3,337	990
5. Distribution System	8,635	5,786	2,849
6. Transmission System	1,950	1,306	644
7. Ground Reservoir	2,354	589	1,765
8. Elevated Tank	814	204	610
9. Valves	503	367	136
10. Fire Hydrants	901	594	307
11. Engineering	2,414	1,448	966
12. Supervision	805	483	322
13. Land	71	-	71
14. Stored Materials	389	304	85
15.			
16.			
17.			

Source: From Cost Estimates

ECONOMIC TABLE 2

TAGBILARAN WATER SUPPLY PROJECT

ANNUAL DEMAND AND GROSS PRODUCTION IN 1,000 M^3

I + II

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	Unacounted Percentage	Annual Production
				Liters/ Capita Per Day	Water Delivered Annually			
1981	2,528	9.7	24,600	105	944	-	45	1,716
1982	2,818	9.0	25,500	105	1,012	-	43	1,776
1983	3,255	9.7	28,050	105	1,075	-	40	1,792
1984	3,783	8.3	30,900	105	1,185	110	40	1,975
1985	4,129	8.0	32,400	110	1,242	167	40	2,070
1986	4,337	7.7	33,000	115	1,324	249	37	2,102
1987	4,585	7.3	33,640	116	1,423	348	34	2,156
1988	5,030	7.1	35,700	118	1,543	468	32	2,269
1989	5,525	6.9	38,000	121	1,676	601	30	2,394
1990	6,160	6.5	40,000	123	1,819	744	28	2,526
1991	6,865	6.3	42,900	126	1,917	842	26	2,663
1992	7,640	6.0	45,600	128	2,117	1,042	25	2,823
1993	8,485	5.7	48,240	127	2,236	1,161	25	2,981

ECONOMIC TABLE 3-A

TAGBILARAN WATER SUPPLY PROJECT

CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST

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

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	Total
1. Vehicles	105	105	-	105	131.3	-	99.8	231.1
2. Chlorinators	36	4	0.4	3.6	45	0.2	3.4	48.6
3. Wells & Pumps	1,532	1,332	661	661	1,915	330.5	627.9	2,873.4
4. Meters & Gauges	3,337	990	198	792	4,171.3	99	752.4	5,022.7
5. Distribution System	5,786	2,849	569.8	2,279.2	7,232.5	284.9	2,165.2	9,682.6
6. Transmission System	1,306	644	161	483	1,632.5	805	458.9	2,171.9
7. Ground Reservoir	589	1,765	1,147.3	617.7	736.3	573.7	586.8	1,897.1
8. Elevated Tank	204	610	396.5	213.5	255	198.25	202.8	665.05
9. Valves	367	136	54.4	81.6	458.8	27.2	77.5	563.5
10. Fire Hydrants	594	307	122.8	184.2	742.5	61.4	175	978.9
11. Engineering	1,448	966	-	966	1,810	-	917.7	2,727.7
12. Supervision	483	322	-	322	603.8	-	305.9	909.7
13. Lands	-	71	-	71	-	-	67.5	67.5
14. Stored Materials	304	85	-	85	380	-	81	461
15.								
16.								
17.								

ECONOMIC TABLE 3-B

TAGBILARAN 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 1.0	Labor x 0.5	Residual x 0.95	Total
1. Vehicles	105	105	-	105	105	-	99.8	204.8
2. Chlorinators	36	4	0.4	3.6	36	0.2	3.4	39.6
3. Wells & Pumps	1,532	1,322	661	661	1,532	330.5	627.9	2,490.4
4. Meters & Gauges	3,337	990	198	792	3,337	99	752.4	4,188.4
5. Distribution System	5,786	2,849	569.8	2,279.2	5,786	284.9	2,165.2	8,236.1
6. Transmission System	1,306	644	161	483	1,306	80.5	458.9	1,845.4
7. Ground Reservoir	589	1,765	1,147.3	617.7	589	573.7	586.8	1,749.5
8. Elevated Tank	204	610	396.5	213.5	204	198.25	202.8	605.1
9. Valves	367	136	54.4	81.6	367	27.2	77.5	471.7
10. Fire Hydrants	594	307	122.8	184.2	594	61.4	175	830.4
11. Engineering	1,448	966	-	966	1,448	-	917.7	2,365.7
12. Supervision	483	322	-	322	483	-	305.9	788.9
13. Lands	-	71	-	71	-	-	67.5	67.5
14. Stored Materials	304	85	-	85	304	-	81	385
15.								
16.								
17.								

ECONOMIC TABLE 3-C

TAGBILARAN 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	Total
1. Vehicles	105	105	-	105	131.3	-	105	236.3
2. Chlorinators	36	4	0.4	3.6	45	0.4	3.6	49
3. Wells & Pumps	1,532	1,322	661	661	1,915	661	661	3,237
4. Meters & Gauges	3,337	990	198	792	4,171.3	198	792	5,161.3
5. Distribution System	5,786	2,849	569.8	2,279.2	7,232.5	569.8	2,279.2	10,081.5
6. Transmission System	1,306	644	161	483	1,632.5	161	483	2,276.5
7. Ground Reservoir	589	1,765	1,147.3	61.7	736.3	1,147.3	61.7	1,945.3
8. Elevated Tank	204	610	396.5	213.5	255	396.5	213.5	865
9. Valves	367	136	54.4	81.6	458.8	54.4	81.6	594.8
10. Fire Hydrants	594	307	122.8	184.2	742.5	122.8	184.2	1,049.5
11. Engineering	1,448	966	-	966	1,810	-	966	2,776
12. Supervision	483	322	-	322	603.8	-	322	925.8
13. Lands	-	71	-	71	-	-	71	71
14. Stored Materials	304	85	-	85	380	-	85	465
15.								
16.								
17.								

ECONOMIC TABLE 4-0

TAGBILARAN WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I + II

Value without CONVERSION

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	210	–	140	–	70	–	–
2. Chlorinators	40	–	20	–	10	–	10
3. Wells & Pumps	2,864	–	1,012	–	1,682	170	–
4. Meters & Gauges	4,327	–	1,155	552	917	845	858
5. Distribution System	8,635	–	4,223	594	–	1,748	2,070
6. Transmission System	1,950	–	1,209	–	741	–	–
7. Ground Reservoir	2,354	–	1,372	–	982	–	–
8. Elevated Tank	814	–	407	–	407	–	–
9. Valves	503	–	233	37	43	62	128
10. Fire Hydrants	901	–	623	–	140	138	–
11. Engineering	2,414	2,414	–	–	–	–	–
12. Supervision	805	–	291	73	147	147	147
13. Land	71	–	37	–	24	–	10
14. Stored Materials	389	–	229	–	–	160	–
15.							
16.							
17.							
18.							
Total	26,277	2,414	10,951	1,256	5,163	3,270	3,223

ECONOMIC TABLE 4-A

TAGBILARAN WATER SUPPLY PROJECT
ECONOMIC COSTS DISTRIBUTED TO YEARS
₱ x 1,000

I + II

Value with CONVERSION A

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	231	–	155	–	76	–	–
2. Chlorinators	49	–	25	–	12	–	12
3. Wells & Pumps	2,873	–	1,006	–	1,695	172	–
4. Meters & Gauges	5,023	–	1,341	641	1,064	981	996
5. Distribution System	9,683	–	4,744	678	–	1,937	2,324
6. Transmission System	2,172	–	1,347	–	825	–	–
7. Ground Reservoir	1,897	–	1,100	–	797	–	–
8. Elevated Tank	656	–	328	–	328	–	–
9. Valves	564	–	259	39	51	68	147
10. Fire Hydrants	979	–	675	–	157	147	–
11. Engineering	2,728	2,728	–	–	–	–	–
12. Supervision	910	–	328	90	164	164	164
13. Land	68	–	35	–	23	–	10
14. Stored Materials	461	–	271	–	–	190	–
15.							
16.							
17.							
18.							
Total	28,294	2,728	11,614	1,448	5,192	3,659	3,653

ECONOMIC TABLE 4-B

TAGBILARAN WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I + II

Value with CONVERSION B

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	205	–	137	–	68	–	–
2. Chlorinators	40	–	20	–	10	–	10
3. Wells & Pumps	2,490	–	872	–	1,469	149	–
4. Meters & Gauges	4,188	–	1,118	534	888	818	830
5. Distribution System	8,236	–	4,036	577	–	1,647	1,976
6. Transmission System	1,845	–	1,144	–	701	–	–
7. Ground Reservoir	1,750	–	1,015	–	735	–	–
8. Elevated Tank	605	–	303	–	302	–	–
9. Valves	472	–	217	33	42	57	123
10. Fire Hydrants	830	–	573	–	133	124	–
11. Engineering	2,366	2,366	–	–	–	–	–
12. Supervision	789	–	284	79	142	142	142
13. Lands	68	–	35	–	23		10
14. Stored Materials	385		227			158	
15.							
16.							
17.							
18.							
Total	24,269	2,366	9,981	1,223	4,513	3,095	3,091

ECONOMIC TABLE 4-C

TAGBILARAN WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I + II

Value with CONVERSION C

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	236	–	158	–	78	–	–
2. Chlorinators	49	–	25	–	12	–	12
3. Wells & Pumps	3,237	–	1,133	–	1,910	194	–
4. Meters & Gauges	5,161	–	1,378	658	1,094	1,008	1,023
5. Distribution System	10,082	–	4,940	706	–	2,016	2,420
6. Transmission System	2,277	–	1,412	–	865	–	–
7. Ground Reservoir	1,945	–	1,128	–	817	–	–
8. Elevated Tank	865	–	433	–	432	–	–
9. Valves	595	–	274	42	54	71	154
10. Fire Hydrants	1,050	–	725	–	168	157	–
11. Engineering	2,776	2,776	–	–	–	–	–
12. Supervision	926	–	333	92	167	167	167
13. Lands	71	–	37	–	24	–	10
14. Stored Materials	465	–	274	–	–	191	–
15.							
16.							
17.							
18.							
Total	29,735	2,776	12,250	1,498	5,621	3,804	3,786

ECONOMIC TABLE 5

TAGBILARAN WATER SUPPLY PROJECT

OPERATION AND MAINTENANCE EXPENSES

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

I + II

Year	Power	Chemicals	Others	Total	Net Costs
1981	239	69	354	662	
1982	247	71	352	670	
1983	257	74	344	675	5
1984	267	77	336	680	10
1985	269	77	397	743	73
1986	283	81	416	780	110
1987	300	86	439	825	155
1988	315	91	508	914	244
1989	332	96	562	990	320
1990	351	101	606	1,058	388
1991	370	107	655	1,132	462
1992	392	113	703	1,208	538
1993	414	119	752	1,285	615

Base Year = 1983

ECONOMIC TABLE 6-0

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ x 1,000

Value without CONVERSION

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	210				210
2. Chlorinators	40				40
3. Wells & Pumps		2,864			2,864
4. Meters & Gauges		4,327			4,327
5. Distribution System			8,635		8,635
6. Transmission System			1,950		1,950
7. Ground Reservoir			2,354		2,354
8. Elevated Tank			814		814
9. Valves			503		503
10. Fire Hydrants			901		901
11. Land				71	71
12. Stored Materials	389				389

7 Year Items	Years of Installation					Years of Replacement					
1. Vehicles	1984	1986				1991	1993	1998	2000	2005	2007 2012
2. Chlorinators	1984	1986	1988			1991	1993	1995	1998	2000	2002 2004 2012
3. Stored Materials	1984	1987				1991	1994	1998	2001	2005	
						2008	2012				

15 Year Items	Years of Installation					Years of Replacement				
1. Wells & Pumps	1984	1986	1987			1999	2001	2002		
2. Meters & Gauges	1984	1985	1986	1987	1988	1999	2000	2001	2002	2003

ECONOMIC TABLE 6-A

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ 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. Chlorinators	49				49
3. Wells & Pumps		2,873			2,873
4. Meters & Gauges		5,023			5,023
5. Distribution System			9,683		9,683
6. Transmission System			2,172		2,172
7. Ground Reservoir			1,897		1,897
8. Elevated Tank			656		656
9. Valves			564		564
10. Fire Hydrants			979		979
11. Land				68	68
12. Stored Materials	461				461

7 Year Items	Years of Installation					Years of Replacement					
1. Vehicles	1984	1986				1991	1993	1998	2000	2005	200 2012
2. Chlorinators	1984	1986	1988			1991	1993	1995	1998	2000	2002 2004 2012
3. Stored Materials	1984	1987				1991	1994	1998	2001	2005	
						2008	2012				

15 Year Items	Years of Installation					Years of Replacement				
1. Wells & Pumps	1984	1986	1987			1999	2001	2002		
2. Meters & Gauges	1984	1985	1986	1987	1988	1999	2000	2001	2002	

I + II

ECONOMIC TABLE 6-B

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ 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. Chlorinators	40				40
3. Wells & Pumps		2,490			2,490
4. Meters & Gauges		4,188			4,188
5. Distribution System			8,236		8,236
6. Transmission System			1,845		1,845
7. Ground Reservoir			1,750		1,750
8. Elevated Tank			605		605
9. Valves			472		472
10. Fire Hydrants			830		830
11. Lands				68	68
12. Stored Materials	385				385

7 Year Items	Years of Installation					Years of Replacement					
1. Vehicles	1984	1986				1991	1993	1998	2000	2005	2007 2012
2. Chlorinators	1984	1986	1988			1991	1993	1995	1998	2000	
						2002	2005	2007	2009	2012	
3. Stored Materials	1984	1987				1991	1994	1998	2001	2005	2008 2012

15 Year Items	Years of Installation					Years of Replacement				
1. Wells & Pumps	1984	1986	1987			1999	2001	2002		
2. Meters & Gauges	1984	1985	1986	1987	1988	1999	2000	2001	2002	2003

ECONOMIC TABLE 6-C

I + II

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ x 1,000

Value with CONVERSION C

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	236				236
2. Chlorinators	49				49
3. Wells & Pumps		3,237			3,237
4. Meters & Gauges		5,161			5,161
5. Distribution System			10,082		10,082
6. Transmission System			2,277		2,277
7. Ground Reservoir			1,945		1,945
8. Elevated Tank			865		865
9. Valves			595		595
10. Fire Hydrants			1,050		1,050
11. Lands				71	71
12. Stored Materials	465				465

7 Year Items	Years of Installation					Years of Replacement					
1. Vehicles	1984	1986				1991	1993	1998	2000	2005	2007 2012
2. Chlorinators	1984	1986	1988			1991	1993	1995	1998	2000	
						2002	2005	2007	2009	2012	
3. Stored Materials	1984	1987				1991	1994	1998	2001	2005	2008 2012

15 Year Items	Years of Installation					Years of Replacement				
1. Wells & Pumps	1984	1986	1987			1999	2001	2002		
2. Meters & Gauges	1984	1985	1986	1987	1988	1999	2000	2001	2002	2003

I + II

ECONOMIC TABLE 7-0

TAGBILARAN 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	37		
1986	24 71	75%	53
1988	10		
50 Year Life, Year Constructed			
1 1984	8,067	42%	3,388
2 1985	631	44%	278
3 1986	2,313	46%	1,064
4 1987	1,948	48%	935
5 1988	2,198	50%	1,099
15 Year Life, Year of Replacement			
1 1999	2,167	7%	152
2 2000	552	13%	72
3 2001	2,599	20%	520
4 2002	1,015	27%	274
5 2003	858	33%	283
7 Year Life, Years of Final Replacement			
1 2007	80	14%	11
2 2008	160	29%	46
3 2009	10	43%	4
4 2012	389	86%	335
Total			8,514

ECONOMIC TABLE 7-A

I + II

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF SALVAGE VALUES

₱ 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	35		
1986	23 68	75%	51
1988	10		
50 Year Life, Year Constructed			
1 1984	8,453	42%	3,550
2 1985	717	44%	315
3 1986	2,158	46%	993
4 1987	2,152	48%	1,033
5 1988	2,471	50%	1,236
15 Year Life, Year of Replacement			
1 1999	2,347	7%	164
2 2000	641	13%	83
3 2001	2,759	20%	552
4 2002	1,153	27%	311
5 2003	996	33%	329
7 Year Life, Years of Final Replacement			
1 1907	88	14%	12
2 1908	190	29%	55
3 1909	12	43%	5
4 1912	451	86%	388
Total			9,077

I + II

ECONOMIC TABLE 7-B

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF SALVAGE VALUES

₱ 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	35		
1986	23 68	75%	51
1988	10		
50 Year Life, Year Constructed			
1 1984	7,288	42%	3,061
2 1985	610	44%	268
3 1986	1,913	46%	880
4 1987	1,828	48%	877
5 1988	2,099	50%	1,050
15 Year Life, Year of Replacement			
1 1999	1,990	7%	139
2 2000	534	13%	69
3 2001	2,357	20%	471
4 2002	967	27%	261
5 2003	830	33%	274
7 Year Life, Years of Final Replacement			
1 1907	78	14%	11
2 1908	158	29%	46
3 1909	10	43%	4
4 1912	384	86%	330
Total			7,792

ECONOMIC TABLE 7-C

TAGBILARAN WATER SUPPLY PROJECT

I + II

CALCULATION OF SALVAGE VALUES

₱ 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	37		
1986	24 71	75%	53
1988	10		
50 Year Life, Year Constructed			
1 1984	8,912	42%	3,743
2 1985	748	44%	329
3 1986	2,336	46%	1,075
4 1987	2,244	48%	1,077
5 1988	2,574	50%	1,287
15 Year Life, Year of Replacement			
1 1999	2,511	7%	176
2 2000	658	13%	86
3 2001	3,004	20%	601
4 2002	1,202	27%	325
5 2003	1,023	33%	338
7 Year Life, Years of Final Replacement			
1 1907	90	14%	13
2 1908	191	29%	55
3 1909	12	43%	5
4 1912	457	86%	393
Total			9,556

I + II

ECONOMIC TABLE 8-0

TAGBILARAN 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	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	2,414	5		2,419		
1984	10,951	10		10,961		
1985	1,328	73		1,401		
1986	5,091	110		5,201		
1987	3,270	155		3,425		
1988	3,223	244		3,467		
1989		320		320		
1990		388		388		
1991		462	389	851		
1992		538		538		
1993		615	80	695		
1994		615	160	775		
1995		615	10	625		
1996		615		615		
1997		615		615		
1998		615	389	1,004		
1999		615	2,167	2,782		
2000		615	632	1,247		
2001		615	2,759	3,374		
2002		615	1,025	1,640		
2003		615	858	1,473		
2004		615		615		
2005		615	389	1,004		
2006		615		615		
2007		615	80	695		
2008		615	160	775		
2009		615	10	625		
2010		615		615		
2011		615		615		
2012		615	389	1,004		
Total	26,277	14,605	9,497	50,379	(8,514)	41,865

ECONOMIC TABLE 8-A

TAGBILARAN WATER SUPPLY PROJECT

I + II

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	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	2,728	5		2,733		
1984	11,629	10		11,639		
1985	1,510	73		1,583		
1986	5,082	110		5,192		
1987	3,683	155		3,838		
1988	3,662	244		3,906		
1989		320		320		
1990		388		388		
1991		462	451	913		
1992		538		538		
1993		615	88	703		
1994		615	190	805		
1995		615	12	627		
1996		615		615		
1997		615		615		
1998		615	451	1,066		
1999		615	2,347	2,962		
2000		615	729	1,344		
2001		615	2,949	3,564		
2002		615	1,165	1,780		
2003		615	996	1,611		
2004		615		615		
2005		615	451	1,066		
2006		615		615		
2007		615	88	703		
2008		615	190	805		
2009		615	12	627		
2010		615		615		
2011		615		615		
2012		615	451	1,066		
Total	28,294	14,605	10,570	53,469	(9,077)	44,392

I + II

ECONOMIC TABLE 8-B

TAGBILARAN 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	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	2,366	5		2,371		
1984	9,994	10		10,004		
1985	1,275	73		1,348		
1986	4,421	110		4,531		
1987	3,115	155		3,270		
1988	3,098	244		3,342		
1989		320		320		
1990		388		388		
1991		462	384	846		
1992		538		538		
1993		615	78	693		
1994		615	158	773		
1995		615	10	625		
1996		615		615		
1997		615		615		
1998		615	384	999		
1999		615	1,990	2,605		
2000		615	612	1,227		
2001		615	2,515	3,130		
2002		615	977	1,592		
2003		615	830	1,445		
2004		615		615		
2005		615	384	999		
2006		615		615		
2007		615	78	693		
2008		615	158	773		
2009		615	10	625		
2010		615		615		
2011		615		615		
2012		615	384	999		
Total	24,269	14,605	8,952	47,826	(7,792)	40,034

ECONOMIC TABLE 8-C

I + II

TAGBILARAN 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	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	2,776	5		2,781		
1984	12,265	10		12,275		
1985	1,563	73		1,636		
1986	5,508	110		5,618		
1987	3,828	155		3,983		
1988	3,795	244		4,039		
1989		320		320		
1990		388		388		
1991		462	457	919		
1992		538		538		
1993		615	90	705		
1994		615	191	806		
1995		615	12	627		
1996		615		615		
1997		615		615		
1998		615	457	1,072		
1999		615	2,511	3,126		
2000		615	748	1,363		
2001		615	3,195	3,810		
2002		615	1,214	1,829		
2003		615	1,023	1,638		
2004		615		615		
2005		615	457	1,072		
2006		615		615		
2007		615	90	705		
2008		615	191	806		
2009		615	12	627		
2010		615		615		
2011		615		615		
2012		615	457	1,072		
Total	29,735	14,605	11,105	55,445	(9,556)	45,889

ECONOMIC TABLE 9

I + II

TAGBILARAN WATER SUPPLY PROJECT
BENEFITS AT 1981 PRICES
(₱ x 1,000)

Year	Volume	Qualitative	Fire Loss Reduction	Total	National Interest Adjustment
1982					
1983					
1984	407	398	206	1,011	1,112
1985	618	795	227	1,640	1,804
1986	921	1,193	250	2,364	2,600
1987	1,288	1,193	280	2,761	3,037
1988	1,732	1,193	308	3,233	3,556
1989	2,224	1,193	339	3,756	4,132
1990	2,753	1,193	379	4,325	4,758
1991	3,115	1,193	424	4,732	5,205
1992	3,855	1,193	472	5,520	6,072
1993	4,296	1,193	526	6,015	6,617
1994	4,296	1,193	526	6,015	6,617
1995	4,296	1,193	526	6,015	6,617
1996	4,296	1,193	526	6,015	6,617
1997	4,296	1,193	526	6,015	6,617
1998	4,296	1,193	526	6,015	6,617
1999	4,296	1,193	526	6,015	6,617
2000	4,296	1,193	526	6,015	6,617
2001	4,296	1,193	526	6,015	6,617
2002	4,296	1,193	526	6,015	6,617
2003	4,296	1,193	526	6,015	6,617
2004	4,296	1,193	526	6,015	6,617
2005	4,296	1,193	526	6,015	6,617
2006	4,296	1,193	526	6,015	6,617
2007	4,296	1,193	526	6,015	6,617
2008	4,296	1,193	526	6,015	6,617
2009	4,296	1,193	526	6,015	6,617
2010	4,296	1,193	526	6,015	6,617
2011	4,296	1,193	526	6,015	6,617
2012	4,296	1,193	526	6,015	6,617
Total	102,833	33,404	13,405	149,642	164,616

ECONOMIC TABLE 10-0

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

I + II

Cost Value without CONVERSION

Year	Total Cost	Total Benefit	Net Benefit	Present Net Benefit
1982				
1983	2,419	-	-2,419	-2,419
1984	10,961	1,112	-9,849	-8,361
1985	1,401	1,804	403	290
1986	5,201	2,600	-2,601	-1,591
1987	3,425	3,037	-388	-201
1988	3,467	3,556	89	39
1989	320	4,132	3,812	1,427
1990	388	4,758	4,370	1,388
1991	851	5,205	4,354	1,174
1992	538	6,072	5,534	1,267
1993	695	6,617	5,922	1,151
1994	775	6,617	5,842	964
1995	625	6,617	5,992	839
1996	615	6,617	6,002	714
1997	615	6,617	6,002	606
1998	1,004	6,617	5,613	481
1999	2,782	6,617	3,835	279
2000	1,247	6,617	5,370	332
2001	3,374	6,617	3,243	170
2002	1,640	6,617	4,977	221
2003	1,473	6,617	5,144	194
2004	615	6,617	6,002	192
2005	1,004	6,617	5,613	153
2006	615	6,617	6,002	139
2007	695	6,617	5,922	116
2008	775	6,617	5,842	97
2009	625	6,617	5,992	85
2010	615	6,617	6,002	72
2011	615	6,617	6,002	61
2012	1,004	6,617	14,127*	122*
Salvage(-)	8,514			
Total	41,865	164,616	122,751	1

Rate of Return = 0.18

Tagbilaran

ECONOMIC TABLE 10-A

I + II

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION A

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	2,733	-	-2,733	-2,733
1984	11,639	1,112	-10,527	-9,034
1985	1,583	1,804	221	163
1986	5,192	2,600	-2,592	-1,638
1987	3,838	3,037	-801	-434
1988	3,906	3,556	-350	-163
1989	320	4,132	3,812	1,523
1990	388	4,758	4,370	1,498
1991	913	5,205	4,292	1,263
1992	538	6,072	5,534	1,397
1993	703	6,617	5,914	1,281
1994	805	6,617	5,812	1,080
1995	627	6,617	5,990	956
1996	615	6,617	6,002	822
1997	615	6,617	6,002	705
1998	1,066	6,617	5,551	560
1999	2,962	6,617	3,655	316
2000	1,344	6,617	5,273	392
2001	3,564	6,617	3,053	195
2002	1,780	6,617	4,837	265
2003	1,611	6,617	5,006	235
2004	615	6,617	6,002	242
2005	1,066	6,617	5,551	192
2006	615	6,617	6,002	178
2007	703	6,617	5,914	151
2008	805	6,617	5,812	127
2009	627	6,617	5,990	112
2010	615	6,617	6,002	97
2011	615	6,617	6,002	83
2012	1,066	6,617	14,628*	173*
Salvage(-)	9,077			
Total	44,392	164,616	120,224	4

* Values include salvage.

Rate of Return = 0.17

ECONOMIC TABLE 10-B

I + II

TAGBILARAN WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value, with CONVERSION B

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	2,371	-	-2,371	-2,371
1984	10,004	1,112	-8,892	-7,457
1985	1,348	1,804	456	321
1986	4,531	2,600	-1,931	-1,139
1987	3,270	3,037	-233	-115
1988	3,342	3,556	214	89
1989	320	4,132	3,812	1,326
1990	388	4,758	4,370	1,275
1991	846	5,205	4,359	1,067
1992	538	6,072	5,534	1,136
1993	693	6,617	5,924	1,020
1994	773	6,617	5,844	844
1995	625	6,617	5,992	726
1996	615	6,617	6,002	610
1997	615	6,617	6,002	511
1998	999	6,617	5,618	401
1999	2,605	6,617	4,012	240
2000	1,227	6,617	5,390	271
2001	3,130	6,617	3,487	147
2002	1,592	6,617	5,025	178
2003	1,445	6,617	5,172	153
2004	615	6,617	6,002	149
2005	999	6,617	5,618	117
2006	615	6,617	6,002	105
2007	693	6,617	5,924	87
2008	773	6,617	5,844	72
2009	625	6,617	5,992	62
2010	615	6,617	6,002	52
2011	615	6,617	6,002	44
2012	999	6,617	13,410*	82*
Salvage(-)	7,792			
Total	40,034	164,616	124,582	3

* Values include salvage.

Rate of Return = 0.19

Tagbilaran

I + II

ECONOMIC TABLE 10-C

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION C

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	2,781	-	-2,781	-2,781
1984	12,275	1,112	-11,163	-9,646
1985	1,636	1,804	168	125
1986	5,618	2,600	3,018	-1,947
1987	3,983	3,037	-946	-528
1988	4,039	3,556	-483	-233
1989	320	4,132	3,812	1,587
1990	388	4,758	4,370	1,572
1991	919	5,205	4,286	1,333
1992	538	6,072	5,534	1,487
1993	705	6,617	5,912	1,373
1994	806	6,617	5,811	1,166
1995	627	6,617	5,990	1,039
1996	615	6,617	6,002	899
1997	615	6,617	6,002	777
1998	1,072	6,617	5,545	620
1999	3,126	6,617	3,491	338
2000	1,363	6,617	5,254	439
2001	3,810	6,617	2,807	203
2002	1,829	6,617	4,788	299
2003	1,638	6,617	4,979	268
2004	615	6,617	6,002	280
2005	1,072	6,617	5,545	223
2006	615	6,617	6,002	209
2007	705	6,617	5,912	178
2008	806	6,617	5,811	151
2009	627	6,617	5,990	134
2010	615	6,617	6,002	116
2011	615	6,617	6,002	101
2012	1,072	6,617	15,101*	219*
Salvage(-)	9,556			
Total	45,889	164,616	118,727	1

* Values include salvage.

Rate of Return = 0.16

政府補助金率算定のための財政分析資料

〔政府補助金率を一段階低い２０％（対総投資額）
の財政分析結果は非有意。〕

Tagbilaran

I + II

FINANCIAL TABLE 3

TAGBILARAN WATER SUPPLY PROJECT

LOAN DISBURSEMENTS AND DEBT SERVICE

(₱1,000's)

Year	Disbursement 1/		Loans Outstanding		Interest Payments		Principal Payments 3/	Total Debt Service
	Grant 20%	Loan 80%	Beginning	Ending	First Year 2/	Later Years		
1981								
1982								
1983	878	2,810		2,810	126			126
1984	3,664	14,656	2,810	17,466	660	253		913
1985	470	1,882	17,466	19,348	85	1,572		1,657
1986	2,167	8,667	19,348	28,015	390	1,741		2,131
1987	1,537	6,149	28,015	34,164	277	2,521		2,798
1988	1,697	6,789	34,164	40,953	306	3,075		3,381
1989			40,953	40,836		3,686	117	3,803
1990			40,836	40,108		3,675	728	4,403
1991			40,108	39,302		3,610	806	4,416
1992			39,302	38,135		3,537	1,167	4,704
1993			38,135	36,711		3,432	1,424	4,856
1994			36,711	35,005		3,304	1,706	5,010
1995			35,005	33,299		3,150	1,706	4,856
1996			33,299	31,593		2,997	1,706	4,703
1997			31,593	29,887		2,843	1,706	4,549
1998			29,887	28,181		2,690	1,706	4,396

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

TAGBILARAN WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(₱1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		662	662		662	1,714	0.39
1982		771	771		771	1,832	0.42
1983	126	893	1,019		1,019	1,916	0.53
1984	913	1,034	1,947		1,947	2,130	0.91
1985	1,657	1,266	2,923		2,923	2,235	1.31
1986	2,131	1,488	3,619		3,619	2,386	1.52
1987	2,798	1,763	4,561		4,561	2,560	1.78
1988	3,381	2,187	5,568		5,568	2,776	2.01
1989	3,803	2,653	6,456	323	6,779	3,014	2.25
1990	4,403	3,119	7,522	376	7,898	3,275	2.41
1991	4,416	3,671	8,087	809	8,896	3,557	2.50
1992	4,704	4,310	9,014	901	9,915	3,829	2.59
1993	4,856	5,043	9,899	990	10,889	4,064	2.68
1994	5,010	5,547	10,557	1,056	11,613	4,064	2.86
1995	4,856	6,102	10,958	1,096	12,054	4,064	2.97
1996	4,703	6,712	11,415	1,142	12,557	4,064	3.09
1997	4,549	7,383	11,932	1,193	13,125	4,064	3.23
1998	4,396	8,121	12,517	1,252	13,769	4,064	3.39

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 6 - A

TAGBILARAN 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	1,714	1.10	1,885	95	1,791	662		662	1,129	1,129
1982	1,832	1.10	2,015	95	1,914	771		771	1,143	2,272
1983	1,916	1.45	2,778	95	2,639	1,019		1,019	1,620	3,892
1984	2,130	1.45	3,089	96	2,965	1,947		1,947	1,018	4,910
1985	2,235	1.45	3,241	96	3,111	2,923		2,923	188	5,098
1986	2,386	1.80	4,295	96	4,123	3,619		3,619	504	5,602
1987	2,560	1.80	4,608	97	4,470	4,561		4,561	-91	5,511
1988	2,776	1.80	4,997	97	4,847	5,568		5,568	-721	4,790
1989	3,014	2.20	6,631	97	6,432	6,456	332	6,788	-356	4,434
1990	3,275	2.20	7,205	98	7,061	7,522	360	7,882	-821	3,613
1991	3,557	2.20	7,825	98	7,669	8,087	783	8,870	-1,201	2,412
1992	3,829	2.50	9,573	98	9,381	9,014	957	9,971	-590	1,822
1993	4,064	2.50	10,160	98	9,957	9,899	1,016	10,915	-958	864

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

TAGBILARAN WATER SUPPLY PROJECT
ILLUSTRATIVE CASH FLOW TABLE
₱1,000's EXCEPT CHARGES PER UNIT

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	4,064	2.75	11,176	98	10,952	10,557	1,118	11,675	-723	141
1995	4,064	2,75	11,176	98	10,952	10,958	1,118	12,076	-1,124	-983
1996	4,064	3.00	12,192	98	11,948	11,415	1,219	12,634	-686	-1,669
1997	4,064	3.00	12,192	98	11,948	11,932	1,219	13,151	-1,203	-2,872
1998	4,064	3.25	13,208	98	12,944	12,517	1,321	13,838	-894	-3,766

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 dirst complement of project components with seven years of life expectancy.

資　　料

1. 水質試験記録 …… A 1

2. 配水管の水圧分布 …… A 2

3. 水 源 調 査 …… A 3

4. 建設単価資料 …… A 4

5. 社会経済状況 …… A 5

6. 計画のための設計基準 …… A 6

7. 人口および水需要の予測方法 …… A 7

資料1　水質試験記録

調査地域内で利用されている既存水源と将来のための計画水源の水質試験結果とフィリピンの飲料水の水質基準を表1、2および3に示した。水質について特に注意を要する項目を下に示す。

1）既存の深井戸水

a. 濁度は0である。

b. 硬度は水質基準の許容値より高い。

c. 6号井の水は特に塩分濃度が高く、1号井・2号井および3号井の水は基準の許容値より塩分濃度が高い。

d. 細菌、大腸菌は、含んでない。

2）計　画　水　源

a. ロボック川及びアバタン川の表流水は濁度が高く、無数の細菌、大腸菌を含んでいる。

b. ビリビリ湧泉の水は飲用可能である。

c. 私設の井戸水は硬度は高く、濁度は低い。

Tagbilaran

水質分析表（既存深井戸）

Table 1 Water Quality of Existing Wells

Deep Well / Items	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6 2/	No. 7	No. 8	No. 9
Sampling Date	8 July	8 July	7 July	8 July	8 July	7 July	20 Oct	7 July	11 July
Weather	Cloudy	Fine	Fine	Fine	Fine	Fine	Fine	Fine	Cloudy
Atmoshperic Temperature (°C)	27.0	31.0	29.0	31.0	31.0	30.0	-	30.0	30.0
Water Temperature (°C)	27.5	27.5	27.5	27.5	27.5	27.0	28.0	27.5	28.0
Turbidity	0	0	0	0	0	0	0	0	0
Conductivity(μ℧/cm	1300	1700	1500	700	550	2600	600	500	500
Hardness (mg/l) (as $CaCO_3$)	500	600	540	370	350	680	340	210	360
Calcium (mg/l)	192	212	160	126	114	240	104	104	112
Magnesium (mg/l)	22	7.3	7.3	6.1	6.1	21.9	20	4.9	7.3
PH	7.3	7.4	7.2	7.3	7.3	7.4	7.8	7.2	7.0
Alkalinity (mg/l)	140	180	140	130	140	80	190	100	150
Chloride (mg/l)	470	370	300	110	25	740	30	30	70
Sulfate (mg/l)	54	15	33	3	2	64	4	7.5	7.5
Ammonia-N (mg/l) 1/	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)	15.8	23	14	16.7	17.6	18	23.3	13.6	20.2
Iron (mg/l)	0.02	0.01	0.01	0.02	0.01	0.0	0.02	0.01	0.01
Manganese (mg/l)	0.08	0.20	0.13	0.18	0.10	0.0	0.2	0.0	0.3
Bacteria(/ml)	negative	negative	negative	negative	10	600	30	20	280
Coliform Group (/100 ml)	negative	negative	negative	negative	negative	32	10	7	150
Dissolved Oxygen (mg/l)	6.09	5.62	4.53	5.31	6.25	5.97	4.23	4.37	5.19
Dissolved Oxygen (%)	78	72	58	68	80	76	70	56	67

1/ A reading of less than 0.3 is not calibrated in the equipment.

2/ The well was abandoned July 1981 because of the salinization of water.

水質分析表（各種水源） Tagbilaran

Table 2 Water Quality of Potential Water Sources

Sampling Point / Items	The Loboc River	The Abatan River	Bilibili Spring	Cabawan Spring	Manga Private Well	Tiptip Private Well	Taloto Private Well	Cogon Private Well(1)	Cogon Private Well(2)
Sampling Date	11 July	11 July	11 July	9 July	9 July	10 July	9 July	10 July	10 July
Weather	cloudy	cloudy	cloudy	fine	fine	fine	fine	fine	fine
Atmoshperic Temperature (°C)	31.5	31.0	32.0	32.0	30.0	31.0	31.0	32.0	32.0
Water Temperature (°C)	26.5	28.0	27.0	26.5	28.0	28.5	28.0	27.5	28.5
Turbidity	50	10	0	0	0	0	20	0	15
Conductivity(μ℧/cm)	375	2,800	550	520	1,900	500	800	600	550
Hardness (mg/l) (as $CaCO_3$)	240	-	320	-	-	300	-	390	360
Calcium (mg/l)	64	-	122	-	-	-	-	-	-
Magnesium (mg/l)	6.1	-	6.1	-	-	-	-	-	-
PH	7.0	7.7	7.2	7.8	7.6	7.4	7.4	7.8	7.8
Alkalinity (mg/l)	100	-	180	-	-	180	-	160	170
Chloride (mg/l)	18	800	32	-	-	30	-	18	55
Sulfate (mg/l)	4	-	2	-	-	-	-	-	-
Ammonia-N (mg/l)1/	0.8	-	0.3	0.4	-	less than 0.3	-	0.5	less than 0.3
Nitrate-N (mg/l)	18.9	-	15	-	-	-	-	-	-
Iron (mg/l)	0.13	-	0.03	-	-	-	-	-	-
Manganese (mg/l)	0.18	-	0.0	-	-	-	-	-	-
Bacteria(/ml)	2,000	1,000	35	1,000	-	30	-	more than 3,000	-
Coliform Group (/100 ml)	1,000	350	negative	480	-	15	-	more than 1,000	-
Dissolved Oxygen (mg/l)	7.29	5.97	5.66	5.54	5.97	6.46	5.89	6.72	6.24
Dissolved Oxygen (%)	92	77	72	70	77	84	76	86	82

1/ A reading of less than 0.3 is not calibrated in the equipment.

Table 3 フィリピン国飲料水質基準
Water Quality Standard
Key Parameters of Philippines
Standard for Drinking Water

Parameters[1/]	Permissible Level[2/]	Maximum Permissible[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	1500
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
Sulfates, 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.

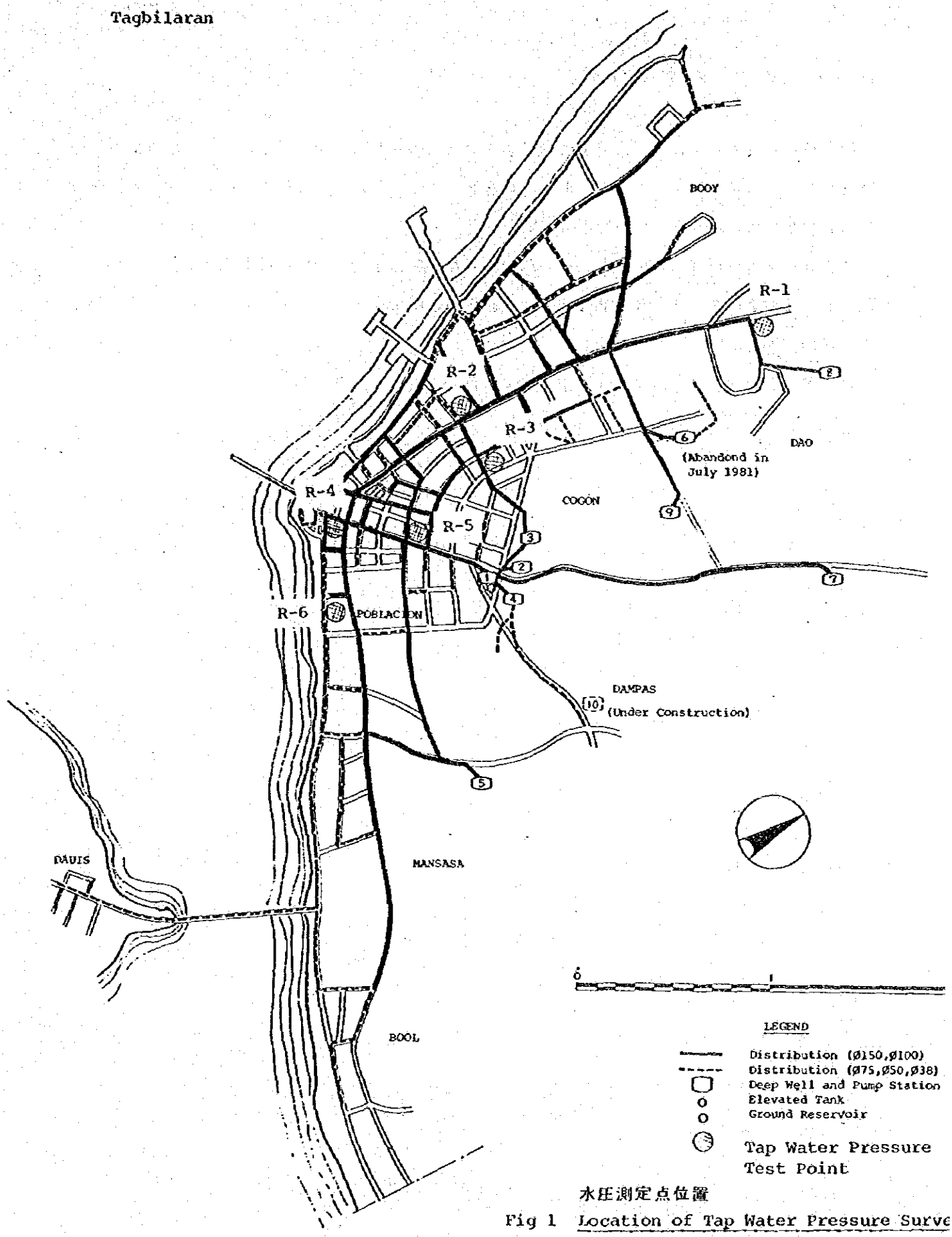
資料2　配水管の水圧分布

給水栓における水圧について図1に示すように市内の6ケ所において24時間記録計を用いて調査した。その結果は図2のようである。地点R－1は8号井からの配水幹線沿いにあり、他の地点と比較してかなり高い水圧を有している。

地点R－2は、ほぼ市の中心部に近い所であるが、終日1kg／cm² 前後の水圧を保っている。地点R－3およびR－4では、0.4kg／cm² 以下の水圧で、1日のうち数時間はほとんど水のでない状態である。

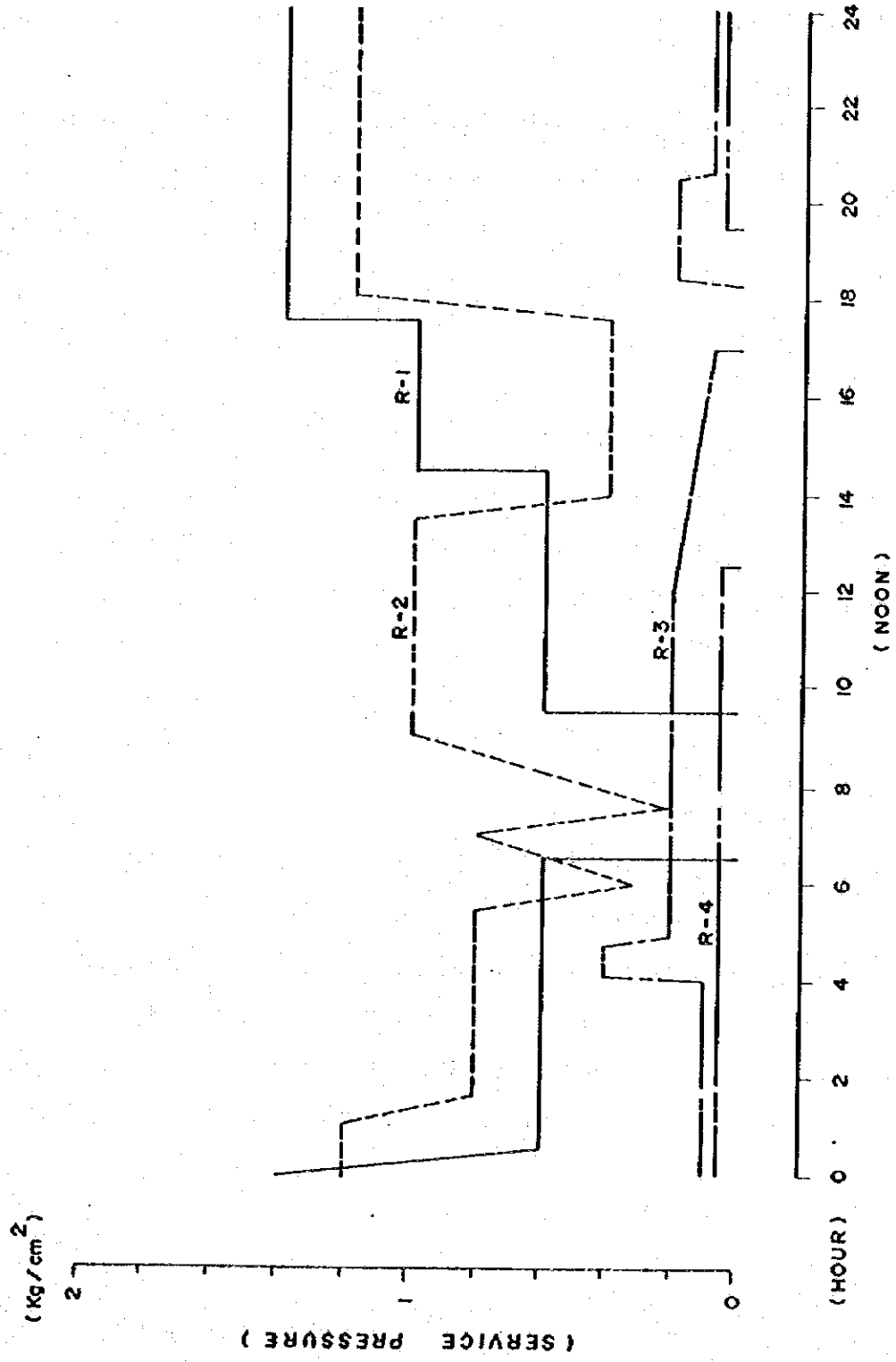
地点R－5およびR－6では1日中ほとんど水のでない状態である。

Tagbilaran



水圧測定点位置

Fig 1 Location of Tap Water Pressure Surve



水圧測定結果

Fig 2 Variation of Water Pressure in Tagbilaran City