13. 経 済 評 価

13.1 便　　益

事業便益は以下のようにまとめることができる。

① 給水人口の増加

目標年次の１９８７年には、給水人口が２３,２７０人になると予測される。これは現状の３０％増である。

② 水圧の増加と時間給水の解消

現状の不十分な水圧が増加すると共に、"水無し地域"と時間制限給水の問題が解消される。

また従来、受水者が用意していた水槽や加圧ポンプなどは不要となるはずである。

③ 安 全 な 水

現状では配水管が時として負圧となり、汚水を管内にひきこむ危険があるが、本事業完成後は水圧が上昇するので、このような危険の機会は大巾に減少することになる。

④ 環 境 改 善

２４時間給水の実現によつて、給水区域内の生活環境は大きく改善されよう。

⑤ 雇用機会の促進

本事業の実施により、土木工事の面で市民に雇用の機会を与えることになる。

⑥ 地価の上昇

水道施設の完備によつて、土地の価値が上昇する。

⑦ 火災損害の減少

本事業には、消火栓の設置および消火水量の貯水が含まれ、かつ水圧が増加するので消火活動の点から、火災時の損害を減少させるのに寄与する。

13.2 内部収益率

事業の経済的妥当性を判定するために投下資本と回収便益の比較検討を行つた。これは数量化できるものが、できないものより必らずしも重要度が高いわけではないことを留意しておく必要がある。

ここでは数量化できる便益として、①給水量増加の便益、②水質改善の便益及び③火災損失の減少を計上した。

上記の数量化できる便益のほか、本事業の国民経済への波及効果を便益として計上した。

本水道区の場合、ＬＷＵＡの基準に従い上記３便宜の合計額の１０％を本事業の国民経済への波及便益とみなした。

内部収益率の計算は次のような種々の換算係数を用いる感度解析によった。

1) 換算係数を用いない場合

2) 換算ケースＡ

- 外　貨 …… 1.２５倍とする（外貨不足要因）
- 普通人夫賃 …… 0.５倍とする（失業対策効果）
- その他の内貨 …… 0.９５倍とする（関接税相当分の除外）

3) 換算ケースＢ

- 外　貨 …… 元の数値
- 普通人夫賃 …… ケースＡと同じ
- その他の外貨 …… ケースＡと同じ

4) 換算ケースＣ

- 外　貨 …… ケースＡと同じく1.２５倍
- 普通人夫賃 …… 元の数値
- その他の内貨 …… 元の数値

上記のそれぞれの場合について内部収益率の計算結果は次のようになり、経済的に妥当である。

1) 換算係数を用いない場合：４６％

2) 換算ケースＡの場合　　：４３％

3)　〃　Ｂ　〃　　：４９％

4)　〃　Ｃ　〃　　：４０％

財　政　評　価　分　析　表

（第　一　期）

FINANCIAL TABLE 1

DARAGA WATER SUPPLY PROJECT

PORJECT COSTS BY YEAR OF CONSTRUCTION

(P1,000's)

I

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Chlorinators	20	-	19	1	-	-	-
2. Vehicles	140	-	140	-	-	-	-
3. Spareparts & Equipment	123	-	123	-	-	-	-
4. Meters	852	-	755	97	-	-	-
5. Intake Facilities	700	-	700	-	-	-	-
6. Transmission	2,053	-	330	1,723	-	-	-
7. Distribution	1,665	-	899	766	-	-	-
8. Valves	120	-	104	16	-	-	-
9. Fire Hydrants	202	-	168	34	-	-	-
10. Engineering	617	617	-	-	-	-	-
11. Supervision	206	-	103	103	-	-	-
12. Lands	100	-	100	-	-	-	-
13. Physical Contingency	680	62	344	274	-	-	-
14.							
15.							
16.							
17.							
18.							
TOTAL, 7-1-81	7,478	679	3,785	3,014			
ESCALATION FACTORS		1.322500	1.520875	1.703380			
ESCALATED COSTS	11,789	898	5,757	5,134			

FINANCIAL TABLE 2

DARAGA WATER SUPPLY PROJECT

OPERATION AND MAINTENANCE COSTS

(₱1,000's)

I

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor 1/	Amount
1981	-	30	174	204	1.000000	204
1982	-	31	174	205	1.150000	236
1983	-	32	174	206	1.322500	272
1984	-	33	183	216	1.520875	329
1985	-	68	210	278	1,703380	474
1986	-	72	229	301	1.907785	574
1987	-	76	274	350	2.136719	748
1988	-	76	274	350	2.393126	838
1989	-	76	274	350	2.680301	938
1990	-	76	274	350	2.948331	1,032
1991	-	76	274	350	3.243164	1,135
1992	-	76	274	350	3.567480	1,249
1993	-	76	274	350	3.924228	1,373
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

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

I

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		898		898	40			40
1984		5,757	898	6,655	259	81		340
1985		5,134	6,655	11,789	231	599		830
1986			11,789	11,753		1,061	36	1,097
1987			11,753	11,487		1,058	266	1,324
1988			11,487	11,015		1,034	472	1,506
1989			11,015	10,543		991	472	1,463
1990			10,543	10,071		949	472	1,421
1991			10,071	9,599		906	472	1,378
1992			9,599	9,127		864	472	1,336
1993			9,127	8,655		821	472	1,293
1994								
1995								
1996								
1997								
1998								

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

DARAGA WATER SUPPLY PROJECT

CASH REQUIREMENTS PER REVENUE UNIT

(₱1,000's)

I

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		204	204		204	739	0.28
1982		236	236		236	770	0.31
1983	40	272	312		312	847	0.37
1984	340	329	669		669	890	0.75
1985	830	474	1,304		1,304	1,610	0.81
1986	1,097	574	1,671		1,671	1,924	0.87
1987	1,324	748	2,072	104	2,176	2,162	1.01
1988	1,506	838	2,344	117	2,461	2,162	1.14
1989	1,463	938	2,401	240	2,641	2,162	1.22
1990	1,421	1,032	2,453	245	2,698	2,162	1.25
1991	1,378	1,135	2,513	251	2,764	2,162	1.28
1992	1,336	1,249	2,585	259	2,844	2,162	1.32
1993	1,293	1,373	2,666	267	2,933	2,162	1.36
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 from Tables 9A, 9B and 9C.

3/ Reserve units divided into costs with reserves.

FINANCIAL TABLE 5 - A

DARAGA 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	490.00	24.50	5.62	50	8	25	0.98
1982	563.50	28.18	5.61	50	8	25	1.13
1983	648.03	32.40	5.60	50	8	25	1.30
1984	745.23	37.26	5.59	50	8	25	1.49
1985	834.66	41.73	5.58	101	17	35	1.26
1986	934.82	46.74	5.57	109	18	35	1.34
1987	1,046.99	52.35	5.56	118	19	36	1.45
1988	1,172.64	58.63	5.55	117	19	36	1.63
1989	1,313.35	65.67	5.54	117	19	36	1.82
1990	1,444.69	72.24	5.53	117	19	36	2.01
1991	1,589.15	79.46	5.52	118	19	36	2.21
1992	1,748.07	87.41	5.51	118	19	36	2.43
1993	1,922.88	96.15	5.50	116	19	36	2.67

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 - A

I

DARAGA 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	739	0.70	517	95	491	204		204	287	287
1982	770	0.70	539	95	512	236		236	276	563
1983	847	1.04	881	96	846	312		312	534	1,097
1984	890	1.04	926	96	889	669	46	715	174	1,271
1985	1,610	1.04	1,674	96	1,607	1,304	84	1,388	219	1,490
1986	1,924	1.14	2,193	97	2,128	1,671	219	1,890	238	1,728
1987	2,162	1.14	2,465	97	2,391	2,072	247	2,319	72	1,800
1988	2,162	1.36	2,940	97	2,852	2,344	294	2,638	214	2,014
1989	2,162	1.36	2,940	98	2,881	2,401	294	2,695	186	2,200
1990	2,162	1.68	3,632	98	3,560	2,453	363	2,816	744	2,944
1991	2,162	1.68	3,632	98	3,560	2,513	363	2,876	684	3,628
1992	2,162	2.03	4,389	98	4,301	2,585	439	3,024	1,277	4,905
1993	2,162	2.03	4,389	98	4,301	2,666	439	3,105	1,196	6,101

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 7

DARAGA WATER SUPPLY PROJECT

ILLUSTRATIVE RATE SCHEDULE

I

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	17.50	0.84	0.98	1.19	0.70
1982	17.50	0.84	0.98	1.19	0.70
1983	26.00	1.25	1.46	1.77	1.04
1984	26.00	1.25	1.46	1.77	1.04
1985	26.00	1.25	1.46	1.77	1.04
1986	28.50	1.37	1.60	1.94	1.14
1987	28.50	1.37	1.60	1.94	1.14
1988	34.00	1.63	1.90	2.31	1.36
1989	34.00	1.63	1.90	2.31	1.36
1990	42.00	2.02	2.35	2.86	1.68
1991	42.00	2.02	2.35	2.86	1.68
1992	50.75	2.44	2.84	3.45	2.03
1993	50.75	2.44	2.84	3.45	2.03

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 46-100 m^3; 3.4 for over 100 m^3

FINANCIAL TABLE 8

DARAGA WATER SUPPLY PROJECT

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

I

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	1,223	14.9	18,200	63	418	45	759
1982	1,267	13.6	18,800	63	433	43	759
1983	1,511	13.3	20,100	63	482	40	803
1984	1,677	13.0	21,800	63	502	40	839
1985	1,922	11.6	22,300	126	1,026	40	1,710
1986	2,171	10.5	22,800	136	1,132	37	1,798
1987	2,456	9.5	23,270	148	1,253	34	1,899
1988	2,456	9.5	23,270	148	1,253	34	1,899
1989	2,456	9.5	23,270	148	1,253	34	1,899
1990	2,456	9.5	23,270	148	1,253	34	1,899
1991	2,456	9.5	23,270	148	1,253	34	1,899
1992	2,456	9.5	23,270	148	1,253	34	1,899
1993	2,456	9.5	23,270	148	1,253	34	1,899

1/ Liters per capita per day.

FINANCIAL TABLE 9A

DARAGA WATER SUPPLY PROJECT
CALCULATION OF REVENUE UNITS

I

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	339	780	10	1	1,130	78	10	3	2	93	1,223
1982	374	860	12	1	1,247	78	10	3	2	93	1,340
1983	386	887	12	1	1,285	80	11	4	2	97	1,382
1984	434	997	12	2	1,445	85	11	4	2	102	1,547
1985	490	1,126	14	2	1,632	143	19	7	3	172	1,804
1986	557	1,280	16	2	1,855	202	27	10	3	242	2,097
1987	640	1,472	19	3	2,134	270	35	12	5	322	2,456
1988											
1989											
1990											
1991											
1992											
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	339	1,950	40	8	2,337	390	80	48	80	598	2,935
1982	374	2,150	48	8	2,580	390	80	48	80	598	3,178
1983	386	2,218	48	8	2,660	400	88	64	80	632	3,292
1984	434	2,493	48	16	2,991	425	88	64	80	657	3,648
1985	490	2,815	56	16	3,377	715	152	112	120	1,099	4,476
1986	557	3,200	64	16	3,837	1,010	216	160	120	1,506	5,343
1987	640	3,680	76	24	4,420	1,350	280	192	200	2,022	6,442
1988											
1989											
1990											
1991											
1992											
1993											

FINANCIAL TABLE 9B1

DARAGA WATER SUPPLY PROJECT

CALCULATION OF REVENUE UNITS

I

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	372	136	236	136	163	100	140	-	-	303
1982	385	150	235	150	180	85	119	-	-	299
1983	429	154	275	154	185	121	169	-	-	354
1984	447	173	274	173	208	101	141	-	-	349
1985	913	196	717	196	235	521	729	-	-	964
1986	1,007	223	784	223	268	561	785	-	-	1,053
1987	1,115	256	859	256	307	603	844	-	-	1,151
1988	1,115	256	859	256	307	603	844	-	-	1,151
1989	1,115	256	859	256	307	603	844	-	-	1,151
1990	1,115	256	859	256	307	603	844	-	-	1,151
1991	1,115	256	859	256	307	603	844	-	-	1,151
1992	1,115	256	859	256	307	603	844	-	-	1,151
1993	1,115	256	859	256	307	603	844	-	-	1,151

FINANCIAL TABLE 9B2

DARAGA WATER SUPPLY PROJECT

CALCULATION OF WATER REVENUES UNITS

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	46	11	35	35	84	-	-	-	-	84
1982	48	11	37	37	89	-	-	-	-	89
1983	53	12	41	41	98	-	-	-	-	98
1984	55	12	43	43	103	-	-	-	-	103
1985	113	21	92	72	173	20	56	-	-	229
1986	125	29	96	96	230	-	-	-	-	230
1987	138	39	99	99	238	-	-	-	-	238
1988	138	39	99	99	238	-	-	-	-	238
1989	138	39	99	99	238	-	-	-	-	238
1990	138	39	99	99	238	-	-	-	-	238
1991	138	39	99	99	238	-	-	-	-	238
1992	138	39	99	99	238	-	-	-	-	238
1993	138	39	99	99	238	-	-	-	-	238

FINANCIAL TABLE 9C

SUMMARY OF REVENUE UNITS

I

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	2,337	280	303	583	598	72	84	156	739
1982	2,580	310	299	609	598	72	89	161	770
1983	2,660	319	354	673	632	76	98	174	847
1984	2,991	359	349	708	657	79	103	182	890
1985	2,377	285	964	1,249	1,099	132	229	361	1,610
1986	3,837	460	1,053	1,513	1,506	181	230	411	1,924
1987	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1988	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1989	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1990	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1991	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1992	4,420	530	1,151	1,681	2,022	243	238	481	2,162
1993	4,420	530	1,151	1,681	2,022	243	238	481	2,162

経　済　評　価　分　析　表

（第一期）

ECONOMIC TABLE 1

DARAGA WATER SUPPLY PROJECT

SUMMARY OF PROJECT COST

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

I

Components	Total Cost	Foreign Currency Portion	Local Currency Portion
1. Chlorinators	20	18	2
2. Vehicles	140	70	70
3. Spareparts & Equipment	123	96	27
4. Meters	852	658	194
5. Intake Facilities	700	175	525
6. Transmission	2,053	1,249	804
7. Distribution	1,665	1,115	550
8. Valves	120	88	32
9. Fire Hydrants	202	133	69
10. Engineering	617	378	239
11. Supervision	206	126	80
12. Lands	100	-	100
13.			
14.			
15.			
16.			
17.			

Source: From Cost Estimates

ECONOMIC TABLE 2

DARAGA WATER SUPPLY PROJECT

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

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	1,223	14.9	18,200	63	418	-	45	759
1982	1,267	13.6	18,800	63	433	-	45	759
1983	1,511	13.3	20,100	63	482	-	40	803
1984	1,677	13.0	21,800	63	502	20	40	836
1985	1,922	11.6	22,300	126	708	226	40	1,710
1986	2,171	10.5	22,800	136	960	478	37	1,798
1987	2,456	9.5	23,270	148	1,253	771	34	1,899
1988	2,456	9.5	23,270	148	1,253	771	34	1,899
1989	2,456	9.5	23,270	148	1,253	771	34	1,899
1990	2,456	9.5	23,270	148	1,253	771	34	1,899
1991	2,456	9.5	23,270	148	1,253	771	34	1,899
1992	2,456	9.5	23,270	148	1,253	771	34	1,899
1993	2,456	9.5	23,270	148	1,253	771	34	1,899

ECONOMIC TABLE 3-A

DARAGA 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. Chlorinator	18	2	0.2	1.8	22.5	0.1	1.7	24.3
2. Vehicles	70	70	-	70	87.5	-	66.5	154
3. Spareparts & Equipment	96	27	-	27	120	-	25.7	145.7
4. Meters	658	194	38.8	155.2	822.5	194	147.4	989.3
5. Intake Facilities	175	525	341.3	183.7	218.8	170.7	174.5	564
6. Transmission	1,249	804	201	603	1,561.3	100.5	572.9	2,234.7
7. Distribution	1,115	550	220	330	1,393.8	110	313.5	1,817.3
8. Valves	88	32	12.8	19.2	110	6.4	18.2	134.6
9. Fire Hydrants	133	69	44.9	24.1	166	22.5	22.9	211.4
10. Engineering	378	239	-	239	472.5	-	227.1	699.6
11. Land	-	100	-	100	-	-	95	95
12. Supervision	126	80	-	80	157.5	-	76.0	233.5
13.								
14.								
15.								
16.								
17.								

ECONOMIC TABLE 3-B

DARAGA WATER SUPPLY PROJECT

CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST

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

I

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. Chlorinator	18	2	0.2	1.8	18	0.1	1.7	19.8
2. Vehicles	70	70	-	70	70	-	66.5	136.5
3. Spareparts & Equipment	96	27	-	27	96	-	25.7	121.7
4. Meters	658	194	38.8	155.2	658	19.4	147.4	824.8
5. Intake Facilities	175	525	341.3	183.7	175	170.7	174.5	520.2
6. Transmission	1,249	804	201	603	1,249	100.5	572.9	1,922.4
7. Distribution	1,115	550	220	330	1,115	110	313.5	1,538.5
8. Valves	88	32	12.8	19.2	88	6.4	18.2	112.6
9. Fire Hydrants	133	69	44.9	24.1	133	22.5	22.9	178.4
10. Engineering	378	239	-	239	378	-	227.1	605.1
11. Land	-	100	-	100	-	-	95	95
12. Supervision	126	80	-	80	126	-	76	202
13.								
14.								
15.								
16.								
17.								

ECONOMIC TABLE 3-C

DARAGA WATER SUPPLY PROJECT

CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST

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

I

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. Chlorinator	18	2	0.2	1.8	22.5	0.2	1.8	24.5
2. Vehicles	70	70	-	70	87.5	-	70	157.5
3. Spareparts & Equipment	96	27	-	27	120	-	27	147
4. Meters	658	194	38.8	155.2	822.5	38.8	155.2	1,016.5
5. Intake Facilities	175	525	341.3	183.7	218.8	341.3	183.7	743.8
6. Transmission	1,249	804	201	603	1,561.3	201	603	2,365.3
7. Distribution	1,115	550	220	330	1,393.8	220	330	1,943.8
8. Valves	88	32	12.8	19.2	110	12.8	19.2	142
9. Fire Hydrants	133	69	44.9	24.1	166	44.9	24.1	235
10. Engineering	378	239	-	239	472.5	-	239	711.5
11. Land	-	100	-	100	-	-	100	100
12. Supervision	126	80	-	80	157.5	-	80	237.5
13.								
14.								
15.								
16.								
17.								

ECONOMIC TABLE 4-0

DARAGA WATER SUPPLY PROJECT I

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

Value without CONVERSION

Components	Total	1983	1984	1985	1986	1987	1988
1. Chlorinator	20	-	19	1	-	-	-
2. Vehicles	140	-	140	-	-	-	-
3. Spareparts & Equipment	123	-	123	-	-	-	-
4. Meters	852	-	755	97	-	-	-
5. Intake Facilities	700	-	700	-	-	-	-
6. Transmission	2,053	-	330	1,723	-	-	-
7. Distribution	1,665	-	899	766	-	-	-
8. Valves	120	-	104	16	-	-	-
9. Fire Hydrants	202	-	168	34	-	-	-
10. Engineering	617	617	-	-	-	-	-
11. Lands	100	-	100		-	-	-
12. Supervision	206	-	103	103	-	-	-
13.							
14.							
15.							
16.							
17.							
18.							
Total	6,798	617	3,441	2,740			

ECONOMIC TABLE 4-A

DARAGA WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I

Value with CONVERSION A

Components	Total	1983	1984	1985	1986	1987	1988
1. Chlorinator	24.3	-	23	1.3	-	-	-
2. Vehicles	154	-	154	-	-	-	-
3. Spareparts & Equipment	145.7	-	145.7	-	-	-	-
4. Meters	989.3	-	880.5	108.8	-	-	-
5. Intake Facilities	564	-	564	-	-	-	-
6. Transmission	2,234.7	-	357.6	1,877.1	-	-	-
7. Distribution	1,817.3	-	981.3	836	-	-	-
8. Valves	134.6	-	117.1	17.5	-	-	-
9. Fire Hydrants	211.4	-	175.5	35.9	-	-	-
10. Engineering	699.6	699.6	-	-	-	-	-
11. Lands	95	-	95	-	-	-	-
12. Supervision	233.5	-	116.5	117.0	-	-	-
13.							
14.							
15.							
16.							
17.							
18.							
Total	7,303.4	699.6	3,610.2	2,993.6			

ECONOMIC TABLE 4-B

DARAGA WATER SUPPLY PROJECT

I

ECONOMIC COSTS DISTRIBUTED TO YEARS
₱ x 1,000

Value with CONVERSION B

Components	Total	1983	1984	1985	1986	1987	1988
1. Chlorinator	19.8	-	18.8	1	-	-	-
2. Vehicles	136.5	-	136.5	-	-	-	-
3. Spareparts & Equipment	121.7	-	121.7	-	-	-	-
4. Meters	824.8	-	734.1	90.7	-	-	-
5. Intake Facilities	520.2	-	520.2	-	-	-	-
6. Transmission	1,922.4	-	307.6	1,614.8	-	-	-
7. Distribution	1,538.5	-	830.8	707.7	-	-	-
8. Valves	112.6	-	98	14.6	-	-	-
9. Fire Hydrants	178.4	-	148.1	30.3	-	-	-
10. Engineering	605.1	605.1	-	-	-	-	-
11. Lands	95	-	95	-	-	-	-
12. Supervision	202	-	101	101	-	-	-
13.							
14.							
15.							
16.							
17.							
18.							
Total	6,277	605.1	3,111.8	2,560.1			

ECONOMIC TABLE 4-C

DARAGA WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

P x 1,000

I

Value with CONVERSION C

Components	Total	1983	1984	1985	1986	1987	1988
1. Chlorinator	24.5	-	23.3	1.2			
2. Vehicles	157.5	-	157.5	-			
3. Spareparts & Equipment	147	-	147	-			
4. Meters	1,016.5	-	904.7	111.8			
5. Intake Facilities	743.8	-	743.8	-			
6. Transmission	2,365.3	-	378.4	1,986.9			
7. Distribution	1,943.8	-	1,049.7	894.1			
8. Valves	142	-	123.5	18.5			
9. Fire Hydrants	235	-	195	40			
10. Engineering	711.5	711.5	-	-			
11. Lands	100	-	100	-			
12. Supervision	233.5	-	116.5	117			
13.							
14.							
15.							
16.							
17.							
18.							
Total	7,820.4	711.5	3,939.4	3,169.5			

ECONOMIC TABLE 5

DARAGA WATER SUPPLY PROJECT

OPERATION AND MAINTENANCE EXPENSES

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

I

Year	Power	Chemicals	Others	Total	Net Costs
1981	-	30	174	204	-
1982	-	31	174	205	-
1983	-	32	174	206	1
1984	-	33	183	216	11
1985	-	68	210	278	73
1986	-	72	229	301	96
1987	-	76	274	350	145
1988	-	76	274	350	145
1989	-	76	274	350	145
1990	-	76	274	350	145
1991	-	76	274	350	145
1992	-	76	274	350	145
1993	-	76	274	350	145

Base Year = 1983

ECONOMIC TABLE 6-Q

DARAGA WATER SUPPLY PROJECT I
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. Chlorinator	20				20
2. Vehicles	140				140
3. Spareparts & Equipment	123				123
4. Meters		852			852
5. Intake Facilities			700		700
6. Transmission			2,053		2,053
7. Distribution			1,665		1,665
8. Valves			120		120
9. Fire Hydrants			202		202
10. Lands				100	100
11.					
12.					

7 Year Items	Years of Installation					Years of Replacement				
1. Chlorinators	1984	1985				1991	1992	1998	1999	2005
						2006	2012			
2. Vehicles	1984					1991	1998	2005	2012	
3. Spareparts & Equipment	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Meters	1984	1985				1999	2000			
2.										
3.										
4.										

ECONOMIC TABLE 6-A

I

DARAGA 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. Chlorinators	24.3				24.3
2. Vehicles	154				154
3. Spareparts & Equipment	145.7				145.7
4. Meters		989.3			989.3
5. Intake Facilities			564		564
6. Transmission			2,234.7		2,234.7
7. Distribution			1,817.3		1,817.3
8. Valves			134.6		134.6
9. Fire Hydrants			211.4		211.4
10. Lands				95	95
11.					
12.					

7 Year Items	Years of Installation					Years of Replacement				
1. Chlorinators	1984	1985				1991	1992	1998	1999	2005
						2006	2012			
2. Vehicles	1984					1991	1998	2005	2012	
3. Spareparts & Equipment	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Meters	1984	1985				1999	2000			
2.										
3.										
4.										

ECONOMIC TABLE 6-B

I

DARAGA 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. Chlorinators	19.8				19.8
2. Vehicles	136.5				136.5
3. Spareparts & Equipment	121.7				121.7
4. Meters		824.8			824.8
5. Intake Facilities			520.2		520.2
6. Transmission			1,922.4		1,922.4
7. Distribution			1,538.5		1,538.5
8. Valves			112.6		112.6
9. Fire Hydrants			178.4		178.4
10. Lands				95	95
11.					
12.					

7 Year Items	Years of Installation					Years of Replacement				
1. Chlorinators	1984	1985				1991	1992	1998	1999	2005
						2006	2012			
2. Vehicles	1984					1991	1998	2005	2012	
3. Spareparts & Equipment	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Meters	1984	1985				1999	2000			

ECONOMIC TABLE 6-C

I

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

Value with CONVERSION C

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Chlorinators	24.5				24.5
2. Vehicles	157.5				157.5
3. Spareparts & Equipment	147				147
4. Meters		1,016.5			1,016.5
5. Intake Facilities			743.8		743.8
6. Transmission			2,365.3		2,365.3
7. Distribution			1,943.8		1,943.8
8. Valves			142		142
9. Fire Hydrants			235		235
10. Lands				100	100
11.					
12.					

7 Year Items	Years of Installation					Years of Replacement				
1. Chlorinators	1984	1985				1991	1992	1998	1999	2005
						2006	2012			
2. Vehicles	1984					1991	1998	2005	2012	
3. Spareparts & Equipment	1984					1991	1998	2005	2012	

15 Year Items	Years of Installation					Years of Replacement				
1. Meters	1984	1985				1999	2000			
2.										
3.										
4.										

I

ECONOMIC TABLE 7-0

DARAGA 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	100	75%	75
50 Year Life, Year Constructed			
1 1984	2,201	42%	924
2 1985	2,539	44%	1,117
15 Year Life, Year of Replacement			
1 1999	755	7%	53
2 2000	97	13%	13
7 Year Life, Years of Final Replacement			
1 2006	1	0%	0
2 2012	282	86%	243
Total			2,425

ECONOMIC TABLE 7-A

I

DARAGA 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	95	75%	71
50 Year Life, Year Constructed			
1 1984	2,195.5	42%	922
2 1985	2,766.5	44%	1,217
15 Year Life, Year of Replacement			
1 1999	880.5	0.0%	-
2 2000	108.8	6.7%	7
7 Year Life, Years of Final Replacement			
1 2006	1.3	0.0%	0
2 2012	322.7	86%	276
Total			2,493

I

ECONOMIC TABLE 7-B

DARAGA 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	95	75%	71
50 Year Life, Year Constructed			
1 1984	1,904.7	42 %	800
2 1985	2,367.4	44%	1,042
15 Year Life, Year of Replacement			
1 1999	734.1	7%	51
2 2000	90.7	13%	12
7 Year Life, Years of Final Replacement			
1 2006	1	0%	0
2 2012	277	86%	238
Total			2,214

ECONOMIC TABLE 7-C I

DARAGA WATER SUPPLY PROJECT
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	100	75%	75
50 Year Life, Year Constructed			
1 1984	2,490.4	42%	1,046
2 1985	2,939.5	44%	1,293
15 Year Life, Year of Replacement			
1 1999	904.7	7%	63
2 2000	111.8	13%	15
7 Year Life, Years of Final Replacement			
1 2006	1.2	0%	0
2 2012	327.8	86%	282
Total			2,774

ECONOMIC TABLE 8-0 I

DARAGA 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	617	1		618		
1984	3,441	11		3,452		
1985	2,740	73		2,813		
1986		96		96		
1987		145		145		
1988		145		145		
1989		145		145		
1990		145		145		
1991		145	282	427		
1992		145	1	146		
1993		145		145		
1994		145		145		
1995		145		145		
1996		145		145		
1997		145		145		
1998		145	282	427		
1999		145	756	901		
2000		145	97	242		
2001		145		145		
2002		145		145		
2003		145		145		
2004		145		145		
2005		145	282	427		
2006		145	1	146		
2007		145		145		
2008		145		145		
2009		145		145		
2010		145		145		
2011		145		145		
2012		145	282	427		
Total	6,798	3,951	1,983	12,732	(2,425)	10,307

ECONOMIC TABLE 8-A

I

DARAGA 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	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	700	1		701		
1984	3,610	11		3,621		
1985	2,994	73		3,067		
1986		96		96		
1987		145		145		
1988		145		145		
1989		145		145		
1990		145		145		
1991		145	323	468		
1992		145	1	146		
1993		145		145		
1994		145		145		
1995		145		145		
1996		145		145		
1997		145		145		
1998		145	323	468		
1999		145	882	1,027		
2000		145	109	254		
2001		145		145		
2002		145		145		
2003		145		145		
2004		145		145		
2005		145	323	468		
2006		145	1	146		
2007		145		145		
2008		145		145		
2009		145		145		
2010		145		145		
2011		145		145		
2012		145	323	468		
Total	7,304	3,951	2,285	13,540	(2,493)	11,047

ECONOMIC TABLE 8-B

DARAGA WATER SUPPLY PROJECT I

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	605	1		606		
1984	3,112	11		3,123		
1985	2,560	73		2,633		
1986		96		96		
1987		145		145		
1988		145		145		
1989		145		145		
1990		145		145		
1991		145	277	422		
1992		145	1	146		
1993		145		145		
1994		145		145		
1995		145		145		
1996		145		145		
1997		145		145		
1998		145	277	422		
1999		145	735	880		
2000		145	91	236		
2001		145		145		
2002		145		145		
2003		145		145		
2004		145		145		
2005		145	277	422		
2006		145	1	146		
2007		145		145		
2008		145		145		
2009		145		145		
2010		145		145		
2011		145		145		
2012		145	277	422		
Total	6,277	3,951	1,936	12,164	(2,214)	9,950

ECONOMIC TABLE 8-C

DARAGA WATER SUPPLY PROJECT

I

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	712	1		713		
1984	3,939	11		3,950		
1985	3,170	73		3,243		
1986		96		96		
1987		145		145		
1988		145		145		
1989		145		145		
1990		145		145		
1991		145	328	473		
1992		145	1	146		
1993		145		145		
1994		145		145		
1995		145		145		
1996		145		145		
1997		145		145		
1998		145	328	473		
1999		145	906	1,051		
2000		145	112	257		
2001		145		145		
2002		145		145		
2003		145		145		
2004		145		145		
2005		145	328	473		
2006		145	1	146		
2007		145		145		
2008		145		145		
2009		145		145		
2010		145		145		
2011		145		145		
2012		145	328	473		
Total	7,821	3,951	2,332	14,104	(2,774)	11,330

ECONOMIC TABLE 9

DARAGA WATER SUPPLY PROJECT I

BENEFITS AT 1981 PRICES

(₱ x 1,000)

Year	Volume	Qualitative	Fire Loss Reduction	Total	National Interest Adjustment
1982					
1983					
1984	74	178	70	322	354
1985	836	357	81	1,274	1,401
1986	1,769	535	94	2,398	2,638
1987	2,853	535	111	3,499	3,849
1988	2,853	535	111	3,499	3,849
1989	2,853	535	111	3,499	3,849
1990	2,853	535	111	3,499	3,849
1991	2,853	535	111	3,499	3,849
1992	2,853	535	111	3,499	3,849
1993	2,853	535	111	3,499	3,849
1994	2,853	535	111	3,499	3,849
1995	2,853	535	111	3,499	3,849
1996	2,853	535	111	3,499	3,849
1997	2,853	535	111	3,499	3,849
1998	2,853	535	111	3,499	3,849
1999	2,853	535	111	3,499	3,849
2000	2,853	535	111	3,499	3,849
2001	2,853	535	111	3,499	3,849
2002	2,853	535	111	3,499	3,849
2003	2,853	535	111	3,499	3,849
2004	2,853	535	111	3,499	3,849
2005	2,853	535	111	3,499	3,849
2006	2,853	535	111	3,499	3,849
2007	2,853	535	111	3,499	3,849
2008	2,853	535	111	3,499	3,849
2009	2,853	535	111	3,499	3,849
2010	2,853	535	111	3,499	3,849
2011	2,853	535	111	3,499	3,849
2012	2,853	535	111	3,499	3,849
Total	76,857	14,980	3,131	94,968	104,467

ECONOMIC TABLE 10-0

DARAGA WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

I

Cost Value without CONVERSION

Year	Total Cost	Total Benefit	Net Benefit	Present Net Benefit
1982				
1983	618	-	-618	-618
1984	3,452	354	-3,098	-2,124
1985	2,813	1,401	-1,412	-664
1986	96	2,638	2,542	819
1987	145	3,849	3,704	818
1988	145	3,849	3,704	561
1989	145	3,849	3,704	385
1990	145	3,849	3,704	264
1991	427	3,849	3,422	167
1992	146	3,849	3,703	124
1993	145	3,849	3,704	85
1994	145	3,849	3,704	58
1995	145	3,849	3,704	40
1996	145	3,849	3,704	27
1997	145	3,849	3,704	19
1998	427	3,849	3,422	12
1999	901	3,849	2,948	7
2000	242	3,849	3,607	6
2001	145	3,849	3,704	4
2002	145	3,849	3,704	3
2003	145	3,849	3,704	2
2004	145	3,849	3,704	1
2005	427	3,849	3,422	1
2006	146	3,849	3,703	1
2007	145	3,849	3,704	0
2008	145	3,849	3,704	0
2009	145	3,849	3,704	0
2010	145	3,849	3,704	0
2011	145	3,849	3,704	0
2012	427	3,849	5,847*	0*
Salvage(-)	2,425			
Total	10,307	104,467	94,160	2

* Value include salvage.

Rate of Return = 0.46

ECONOMIC TABLE 10-A

DARAGA WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION A

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	701	-	-701	-701
1984	3,621	354	-3,267	-2,286
1985	3,067	1,401	-1,666	-816
1986	96	2,638	2,542	871
1987	145	3,849	3,704	888
1988	145	3,849	3,704	621
1989	145	3,849	3,704	435
1990	145	3,849	3,704	304
1991	468	3,849	3,381	194
1992	146	3,849	3,703	149
1993	145	3,849	3,704	104
1994	145	3,849	3,704	73
1995	145	3,849	3,704	51
1996	145	3,849	3,704	36
1997	145	3,849	3,704	25
1998	468	3,849	3,381	16
1999	1,027	3,849	2,822	9
2000	254	3,849	3,595	8
2001	145	3,849	3,704	6
2002	145	3,849	3,704	4
2003	145	3,849	3,704	3
2004	145	3,849	3,704	2
2005	468	3,849	3,381	1
2006	146	3,849	3,703	1
2007	145	3,849	3,704	1
2008	145	3,849	3,704	1
2009	145	3,849	3,704	0
2010	145	3,849	3,704	0
2011	145	3,849	3,704	0
2012	468	3,849	5,874*	0*
Salvage(-)	2,493			
Total	11,047	104,467	93,420	0

* Values include salvage.

Rate of Return = 0.43

ECONOMIC TABLE 10-B

I

DARAGA WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION B

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	606	-	-606	-606
1984	3,123	354	-2,769	-1,855
1985	2,633	1,401	-1,232	-553
1986	96	2,638	2,542	765
1987	145	3,849	3,704	747
1988	145	3,849	3,704	500
1989	145	3,849	3,704	335
1990	145	3,849	3,704	225
1991	422	3,849	3,427	139
1992	146	3,849	3,703	101
1993	145	3,849	3,704	68
1994	145	3,849	3,704	45
1995	145	3,849	3,704	30
1996	145	3,849	3,704	20
1997	145	3,849	3,704	14
1998	422	3,849	3,427	8
1999	880	3,849	2,969	5
2000	236	3,849	3,613	4
2001	145	3,849	3,704	3
2002	145	3,849	3,704	2
2003	145	3,849	3,704	1
2004	145	3,849	3,704	1
2005	422	3,849	3,427	1
2006	146	3,849	3,703	0
2007	145	3,849	3,704	0
2008	145	3,849	3,704	0
2009	145	3,849	3,704	0
2010	145	3,849	3,704	0
2011	145	3,849	3,704	0
2012	422	3,849	5,641*	0*
Salvage(-)	2,214			
Total	9,950	104,467	94,517	0

* Values include salvage.

Rate of Return = 0.49

ECONOMIC TABLE 10-C

DARAGA WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION C

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	713	-	-713	-713
1984	3,950	354	-3,596	-2,562
1985	3,243	1,401	-1,842	-935
1986	96	2,638	2,542	919
1987	145	3,849	3,704	954
1988	145	3,849	3,704	680
1989	145	3,849	3,704	484
1990	145	3,849	3,704	345
1991	473	3,849	3,376	224
1992	146	3,849	3,703	175
1993	145	3,849	3,704	125
1994	145	3,849	3,704	89
1995	145	3,849	3,704	63
1996	145	3,849	3,704	45
1997	145	3,849	3,704	32
1998	473	3,849	3,376	21
1999	1,051	3,849	2,798	12
2000	257	3,849	3,592	11
2001	145	3,849	3,704	8
2002	145	3,849	3,704	6
2003	145	3,849	3,704	4
2004	145	3,849	3,704	3
2005	473	3,849	3,376	2
2006	146	3,849	3,703	2
2007	145	3,849	3,704	1
2008	145	3,849	3,704	1
2009	145	3,849	3,704	1
2010	145	3,849	3,704	0
2011	145	3,849	3,704	0
2012	473	3,849	6,150	0
Salvage(-)	2,774			
Total	11,330	104,467	93,137	-3

* Values include salvage.

Rate of Return = 0.40

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1,４８０ha、給水人口は３９,２４０人、日最大水需要量は9,１３０m³／日である。

水道計画の概要については図3.１４.１、図3.１４.２に、計画施設は表3.１４.１に示した。また図3.１４.３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２０％を政府補助とし、８０％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５９.０％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２０％という条件で計算を行った。補助金率を一段階下げて１５％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、フィージビリディは成立しない。 — 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39,240人で現在に較べて120%の増である。

給水区域は現在400haで目標年次に1,480ha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 ： 22%

2) 換算ケースAの場合 ： 18%

3) 換算ケースBの場合 ： 24%

4) 換算ケースCの場合 ： 17%

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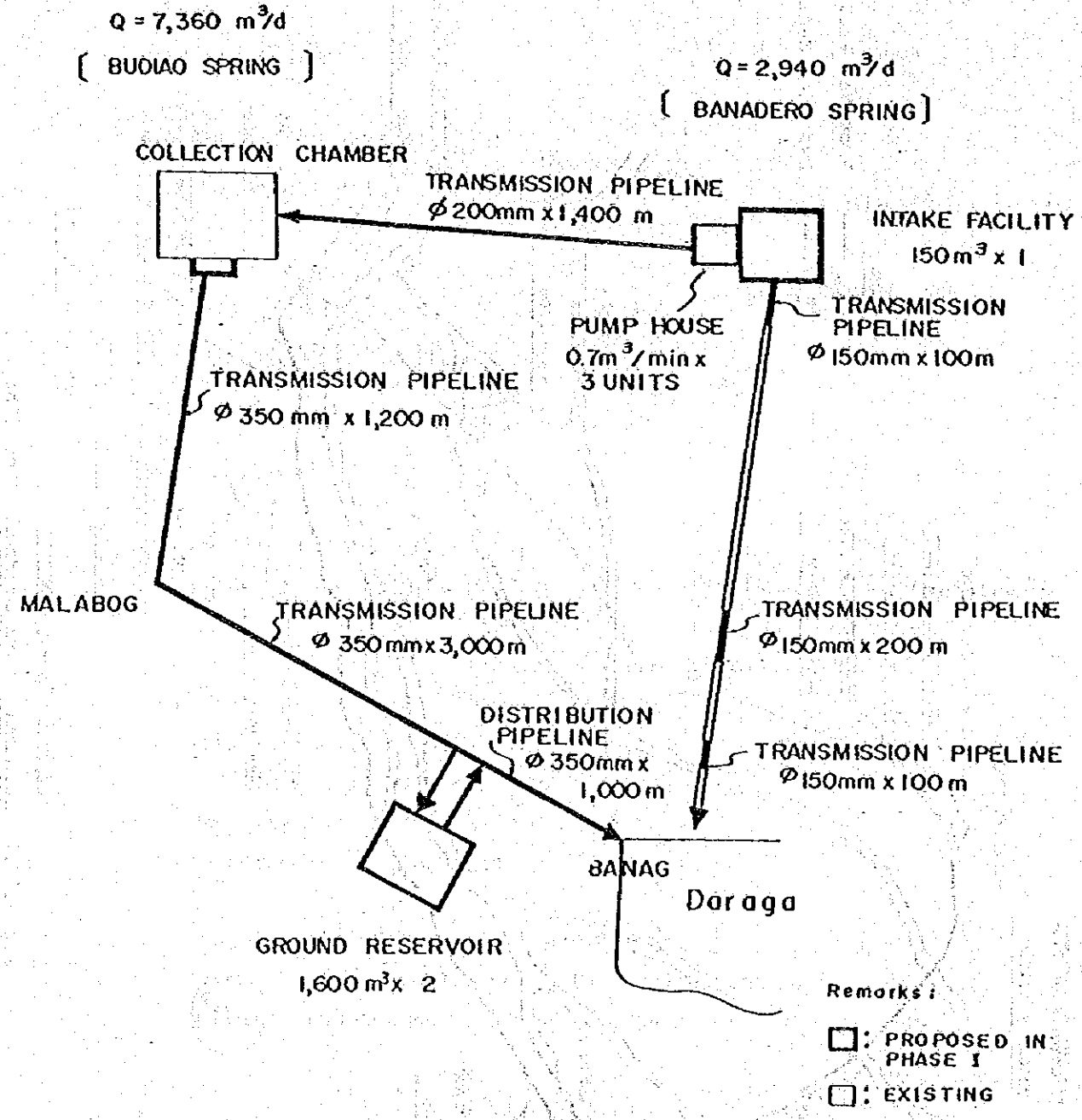
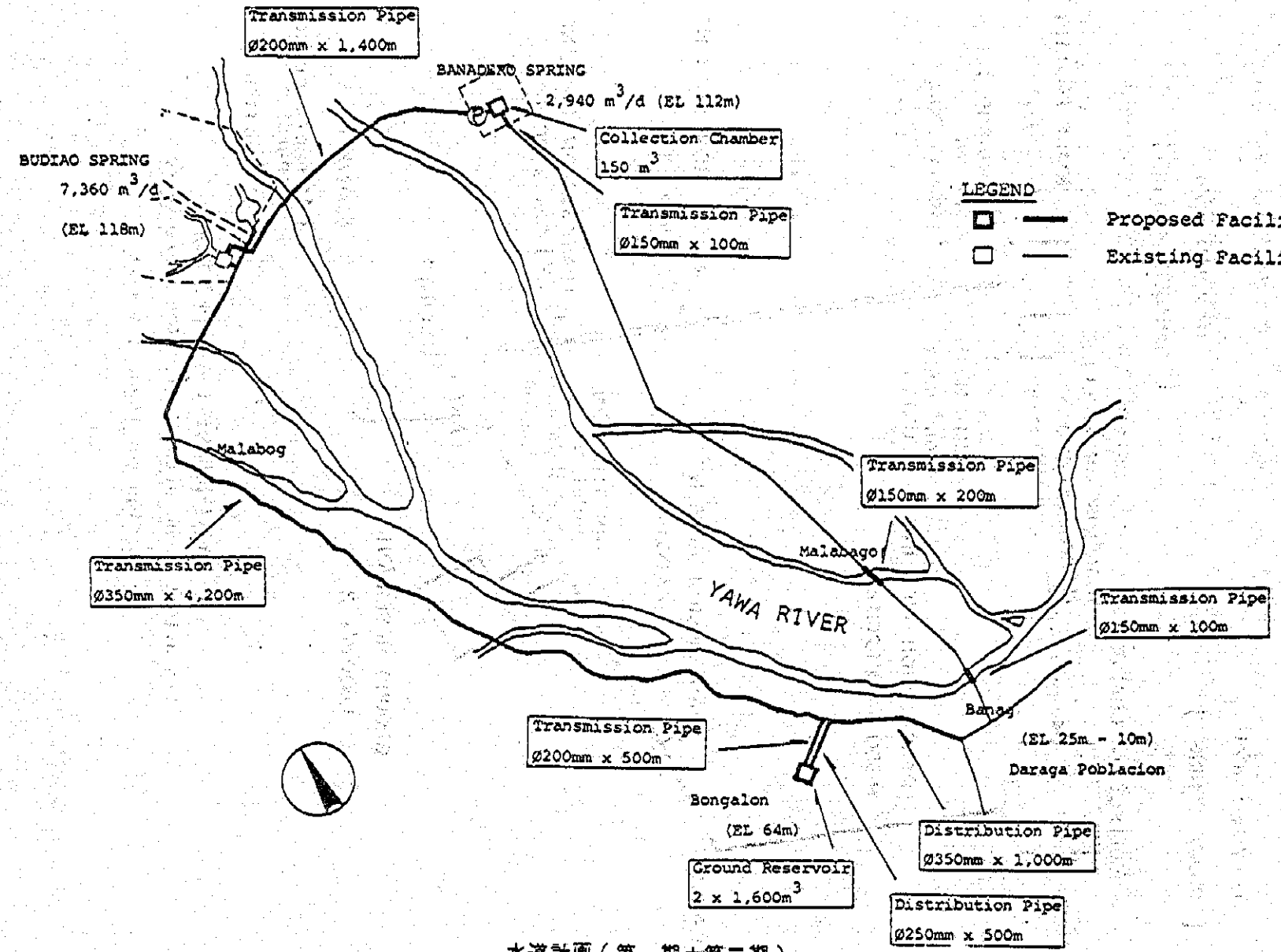
(I + II)



水道計画概念図（第一期＋第二期）

Fig 3.14.1 Schematic Diagram for Preliminary Design for Phase (I + II)



水道計画（第一期＋第二期）

Fig 3.14.2 Location of Major Facilities (Phase I + II)

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(I + II)

計画施設一覧（第一期＋第二期）

Table 3.14.1 Facilities Required

1) Bañadero System

a. Intake Facilities:

i. Collection Chamber
Made of reinforced concrete
Capacity and Number: 150 m^3 x 1 unit

ii. Intake Pipe
Perforated RC pipe

iii. Diameter and Length: ø1,000 mm x 100 m
Cobble Stones and Gravels
Volume: 1,000 m^3

b. Repair of Transmission Pipeline:
Diameter and Length: ø150 mm x 200 m at Malabago River Crossing
ø150 mm x 100 m at Bañag River Crossing
ø150 mm x 100 m at Collection Chamber

c. Intake Pump Station:
Type of pump: Turbine Pump
Capacity: 0.7 m^3/min x 30 m x 7.5 kw
Number of unit: 3 units

d. Installation of Transmission Pipeline:
(From the Bañadero Spring to the Budiao Spring)
Diameter and Length: ø200 mm x 1,400 m

2) Budiao System

a. Installation of Transmission Pipeline:
(From the Budiao Spring to the Ground Reservoir)
Diameter and Length: ø350 mm x 4,200 m
ø200 mm x 500 m

- to be continued -

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(I + II)

b. Construction of Ground Reservoir:
(Constructed in Bongalon Area)
Made of reinforced concrete
Capacity and number of unit: 1,600 m^3 x 2 units

c. Installation of Transmission Pipelines:
(From the ground reservoir to Banag Junction)
Diameter and Length: ø350 mm x 1,000 m; and
ø250 mm x 500 m

3) Reinforcement and Expansion of Distribution Pipelines

a. ø300 mm x 1,200 m
b. ø200 mm x 1,400 m
c. ø150 mm x 2,160 m
d. ø100 mm x 5,300 m
e. ø 75 mm x 5,300 m
f. ø 50 mm x 14,040 m

4) Other Equipment:

a. Service Meter:
ø13 mm x 7,012 pcs

b. Bulk Meter:
ø350 mm x 2 pcs
ø300 mm x 1 pc.
ø250 mm x 3 pcs
ø200 mm x 6 pcs

c. Valve:
ø300 mm x 4 pcs
ø200 mm x 5 pcs

- to be continued -

ø150 mm x 8 pcs
ø100 mm x 18 pcs
ø 75 mm x 17 pcs

d. Fire Hydrant:
68 pcs

e. Chlorinator:
3 sets

f. Vehicle:
3 units

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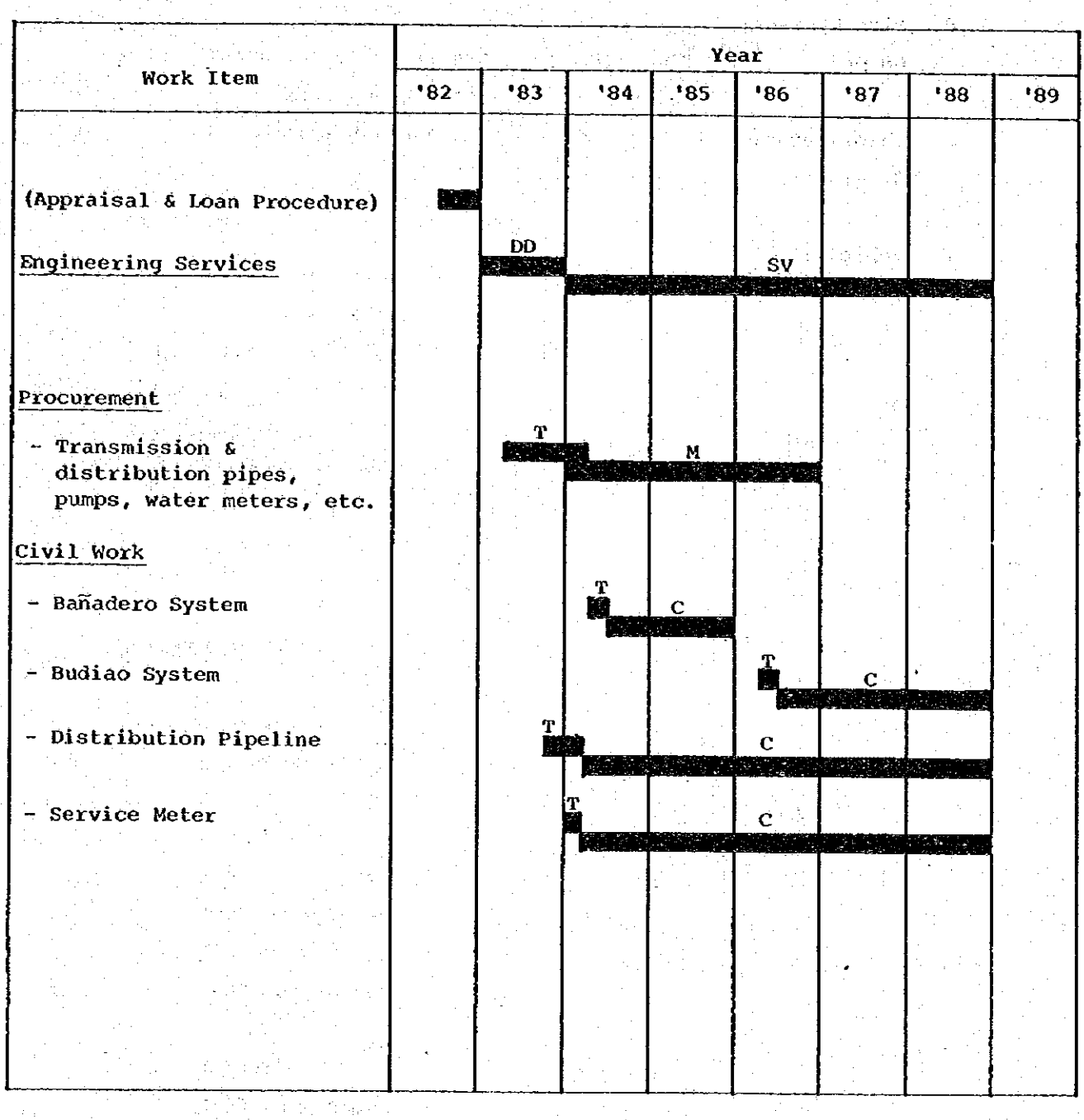
(I + II)

実施工程（第一期＋第二期）

Fig 3.14.3 Construction Schedule



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

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(I + II)

事業費（第一期+第二期）

Table 3.14.2 Project Cost

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. Banadero System	2,824	1,530	1,294
B. Budiao System	9,695	5,210	4,485
C. Reinforcement/Expansion of Distribution Pipelines	4,633	3,105	1,528
D. Equipment	5,662	4,249	1,413
Sub Total	22,814	14,094	8,720
Detailed Design Cost (10.5%)	2,396	1,480	916
Supervision Cost (3.5 %)	798	493	305
Land Cost	156	-	156
Total	26,164	16,067	10,097
Physical Contingency (10 %)	2,617	1,607	1,010
Total	28,781	17,674	11,107
Price Contingency	21,987	12,273	9,714
Grand Total (Project Cost)	50,768	29,947	20,821
	(Equivalent to US$6.51 M)	(Equivalent to US$3.84 M)	(Equivalent to US$2.67 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. Banadero System															
a) Intake Facilities (150 m^3 x 1)	700	175	525			175	525								
b) Transmission (ø150 mm x 400 m)	330	221	109			221	109								
c) Pump House (0.7 m^3/min x 30m^H x 3)	972	583	389			233	156	350	233						
d) Transmission (ø200 mm x 1,400 m)	822	551	271			220	108	331	163						
B. Budiao System															
a) Transmission (ø350 mm x 1,200 m)	1,423	953	470					953	470						
b) Ground Reservoir (1,600 m^3 x 2)	3,060	765	2,295							383	1,148			382	1,147
c) Transmission (ø350 mm x 3,000 m)	3,555	2,382	1,173							2,382	352		821		
(ø200 mm x 500 m)	294	197	97							197					97
d) Distribution (ø350 mm x 1,000 m)	790	529	261							529	100		161		
(ø250 mm x 500 m)	573	384	189							384					189
C. Reinforcement/Expansion of Discribution															
a) ø300 mm x 1,200 m	780	523	257			523	257								
b) ø200 mm x 1,400 m	546	366	180			146	72	220	108						
c) ø150 mm x 2,160 m	594	398	196			100	49	99	49	199	49		49		
d) ø100 mm x 5,300 m	954	639	315			170	63	169	63	300	63		63		63
e) ø 75 mm x 5,300 m	636	426	210			85	42	85	42	256	42		42		42
f) ø 50 mm x 14,040 m	1,123	753	370			151	74	151	74	451	74		74		74

(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
D. Other Equipment															
a) Service Meter (ø13 mm x 7,012)	4,558	3,510	1,048			3,510	210		210		210		209		209
b) Bulk Meter (ø350 mm x 2, ø300 mm x 1) (ø250 mm x 3, ø200mm-100mm x 6)	102	82	20			41	5	41	7						8
c) Valve (52)	312	228	84			57	20	57	20	114			24		20
d) Fire Hydrant (68)	450	297	153			100	50			197	50		23		30
e) Chlorinator (3)	30	27	3					27	2						1
f) Vehicle (3)	210	105	105			70	70	35	35						
Sub-Total	22,814	14,094	8,720			5,802	1,810	2,518	1,476	5,392	2,088		1,466	382	1,880
Detailed Design Cost (10.5%)	2,396	1,480	916	480	916										
Supervision Cost (3.5%)	798	493	305			99	61	99	61	99	61	98	61	98	61
Land Cost	156		156				108		48						
Total	26,164	16,067	10,097	1,480	916	5,901	1,979	2,617	1,585	5,491	2,149	98	1,527	480	1,941
Physical Contingency (10%)	2,617	1,607	1,010	148	92	590	198	262	158	549	215	10	153	48	194
Total	28,781	17,674	11,107	1,628	1,008	6,491	2,177	2,879	1,743	6,040	2,364	108	1,680	528	2,135
Price Contingency	21,987	12,273	9,714	525	325	3,381	1,134	2,025	1,226	5,483	2,146	123	1,909	736	2,974
Grand Total (Project Cost)	50,768	29,947	20,821	2,153	1,333	9,872	3,311	4,904	2,969	11,523	4,510	231	3,589	1,264	5,109

財　政　評　価　分　析　表

（第一期＋第二期）

Daraga

I + II

FINANCIAL TABLE 1

DARAGA WATER SUPPLY PROJECT

PORJECT COSTS BY YEAR OF CONSTRUCTION

(₱1,000's)

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Intake Facilities	700	-	700	-	-	-	-
2. Ground Reservoir	3,060	-	-	-	1,531	-	1,529
3. Transmission	6,424	-	658	1,917	2,931	821	97
4. Distribution	5,996	-	1,732	1,060	2,447	389	368
5. Valves	312	-	77	77	114	24	20
6. Fire Hydrant	450	-	150	-	247	23	30
7. Pumps	972	-	389	583	-	-	-
8. Meters	4,660	-	3,766	258	210	209	217
9. Chlorinator	30	-	-	29	-	-	1
10. Vehicle	210	-	140	70	-	-	-
11. Engineering	2,396	2,396	-	-	-	-	-
12. Lands	156	-	108	48	-	-	-
13. Physical Contingency	2,617	240	788	420	764	163	242
14. Supervision	798	-	160	160	160	159	159
15.							
16.							
17.							
18.							
TOTAL, 7-1-81	28,781	2,636	8,668	4,622	8,404	1,788	2,663
ESCALATION FACTORS		1.322500	1.520875	1.703380	1.907785	2.136719	2.393121
ESCALATED COSTS	50,768	3,486	13,183	7,873	16,033	3,820	6,373