8. Organization and Management

The existing organization as described in 3. "Existing Water Supply" of Part One is recommended to be reorganized into a "water district" as defind under PD 198 (as amended by PD 768 and 1479), whose organizational set-up is required to conform with LWUA guidances and requirements.

These LWUA guidances and requirements are found to be effective and practical to strengthen the functional capacity of the organization in the following three respects:

a. Technical
b. Commercial
c. Administrative and Financial

The review of the functional capacities of the existing management reveals that its commercial capacity is comparatively weaker than other capacities. It is therefore recommended that the personnel for commercial activities be strengthened. With future expansion of the water district, a manager responsible for commercial functions will become necessary in addition to those for administrative and technical functions.

The number of water district employees depends primarily on the total number of service connections; or more employees for more connections.

Regards should be paid to the quality of water districts employees. Employees need training to enhance their capability. Salaries should also be attractive enough to recruit efficient employees.

PART THREE: FEASIBILITY STUDY

1. General
2. Target Year and Project Area
3. Estimation of Population Served and Water Demand
4. Immediate Improvement and Expansion Works
5. Water Source
6. Design Criteria, Alternative Plans and Preliminary Design
7. Construction, Operation and Management Schedule
8. Materials, Labor Force and Contractor's Ability
9. Construction and Procurement Methods
10. Cost Estimate
11. Organization and Operation and Management Plan
12. Financial Feasibility Analysis
13. Economic Feasibility Analysis
14. Alternative Feasibility Study

1. General

This Part Three treats the feasibility study for two different cases of project formation. One case (Case 1) is for a project of Phase I (Target Year: 1987) defined in Part Two: Master Plan, and the other case (Case 2) is intended to make, in addition, an alternative study for a project comprising Phase I and Phase II (Target Year: 1993) as defined in the Master Plan.

The project of Case 1 aims, basically, to remedy the prevailing poor water supply condition by rehabilitation and expansion of the facilities as early as possible with low cost. On the other hand, the alternative study for Case 2 explores the feasibility and suitability of the project with Phases I and II combined, as stated above, which extends over a medium terms of about ten years after the commencement of project construction. The main purpose of this project, if found to be feasible, is to secure reliable drinking water supply over a fairly long period and remove restraints of poor water service, experienced long since, on the development of the municipality as a local commercial center.

2. Target Year and Project Area

2.1 Target Year for Study

As described in the preceding section the present feasibility study deals with the two cases, thus the target year for study, in this section, represents two different periods of Phase I and Phase II defined in the master plan. Phase I program is starting from the year 1982 up to the year 1987 and Phase II program covers the period of another 6 years from 1988 up to 1993.

2.2 Project Area

The project area for the feasibility study is delineated as the poblacion areas of Ilowod and Market Area, and the urban barangays of Bagumbayan, Binitayan, Kimonting Maropoy, Sagpon, San Roque, Sipi, and Tagao including rural barangays presently served by the existing water supply systems enroute of the transmission pipelines and their adjoining areas which are considered to develop and require water supply within the period until the end of target year of the study.

The Daraga WD's total project area for the Phase I covers approximately 680 ha mostly in the poblacion area and adjoining urban barangays of Sipi, Kimantong, San Roque, Bagumbayan, Binitayan, Maroroy and Tagas, and including rural barangays presently served by the existing water supply systems enroute of the transmission pipelines. The served area in Phase II is expanded to 1,480 ha; taking in the newly developed housing areas adjoining the poblacion area and rural barangays located in between Budiao Spring and the poblacion area.

The present served area and projected areas by phase are shown in Table 2.3.1, Table 2.2.1 and Fig 2.2.1.

3. Estimation of Population Served and Water Demand

3.1 Estimation of Population Served

Based on the projected total population in the study area and the projected served area by design year, which are described in the Part Two: Master Plan, the population in the served area is estimated annually for the feasibility study period of Phase I (1987) and Phase II (1993).

The annual population in the served area in each demand area is extrapolated based on the master plan projection figures in the design years of 1987 and 1993, as shown in Table 3.3.1.

The coverage of served population for the feasibility study in the projected served area has been estimated based on the above population in the served area taking account of the willingness-to-connect of the projected consumers and future improvement of the consumer's living standard.

The annual served population in each demand area is estimated up to the year 1993 and shown in Table 3.3.2 and Fig 3.3.1.

3.2 Estimation of Water Demand

The overall average day water demand for the WD is estimated based on the served population and the average unit water demand, which is including demands for domestic, commercial/industrial, institutional and unaccounted-for-water. The annual average day demand is extrapolated from the demands in the design years of 1987 and 1993, taking account of the sources of supply and the extended served area as well as the served population, and shown in Table 3.3.3.

Table 3.3.1 Projected Population in Served Area in Daraga WD

Years	Urban Area T.P	Urban Area P.S.A	Rural Area T.P	Rural Area P.S.A	Total Area T.P	Total Area P.S.A
1980	25,889	25,889	47,324	6,443	73,213	32,332
1981	26,570	26,570	48,330	6,580	74,900	33,150
1982	27,270	27,270	49,350	6,720	76,620	33,990
1983	27,980	27,980	50,400	6,870	78,380	34,850
1984	28,720	28,720	51,470	7,070	80,190	35,790
1985	29,470	29,470	52,560	7,270	82,030	36,740
1986	30,240	30,240	53,670	7,480	83,910	37,720
1987	31,038	31,038	54,808	7,701	85,846	38,739
1988	31,590	31,590	55,710	8,360	87,300	39,950
1989	32,160	32,160	56,630	8,490	88,790	40,650
1990	32,740	32,740	57,560	11,510	90,300	44,250
1991	33,330	33,330	58,510	14,630	91,840	47,960
1992	33,920	33,920	59,470	17,840	93,390	51,760
1993	34,531	34,531	60,452	21,531	94,983	56,062
2010	44,846	44,846	77,494	28,701	122,340	73,547

Note : T.P - Total Population in the Study Area
P.S.A - Population in the Served Area

Table 3.3.2 Estimated Water Demand in Daraga WD

	Urban Area		Rural Area		Total Area	
Years	P.S	W.D	P.S	W.D	P.S	W.D
1980	16,900	1,620	1,000	100	17,900	1,720
1981	17,200	1,980	1,000	100	18,200	2,080
1982	17,800	1,980	1,000	100	18,800	2,080
1983	19,000	2,090	1,100	110	20,100	2,200
1984	20,600	2,170	1,200	120	21,800	2,290
1985	21,000	4,570	1,300	116	22,300	4,686
1986	21,400	4,800	1,400	126	22,800	4,926
1987	21,730	5,063	1,540	140	23,270	5,203
1988	22,600	5,266	3,300	307	25,900	5,573
1989	23,700	5,522	5,100	485	28,800	6,007
1990	24,700	5,755	6,900	662	31,600	6,417
1991	25,700	5,988	8,500	833	34,200	6,821
1992	26,600	6,198	10,200	1,010	36,800	7,208
1993	27,610	6,433	11,630	1,175	39,240	7,608
2010	44,846	12,826	22,960	2,985	67,806	15,811

Note : P.S - Population Served
W.D - Average Day Demand

Table 3.3.3 Projected Population Served in Daraga WD

Years	Urban Area P.S.A	Urban Area P.S	Rural Area P.S.A	Rural Area P.S	Total Area P.S.A	Total Area P.S
1980	25,889	16,900	6,443	1,000	32,332	17,900
1981	26,570	17,200	6,580	1,000	33,150	18,200
1982	27,270	17,800	6,720	1,000	33,990	18,800
1983	27,980	19,000	6,870	1,000	34,850	20,100
1984	28,720	20,600	7,070	1,200	35,790	21,800
1985	29,470	21,000	7,270	1,300	36,740	22,300
1986	30,240	21,400	7,480	1,400	37,720	22,800
1987	31,038	21,730	7,701	1,540	38,739	23,270
1988	31,590	22,600	8,360	3,300	39,950	25,900
1989	32,160	23,700	8,490	5,100	40,650	28,800
1990	32,740	24,700	11,510	6,900	44,250	31,600
1991	33,330	25,700	14,630	8,500	47,960	34,200
1992	33,920	26,600	17,840	10,200	51,760	36,800
1993	34,531	27,610	21,531	11,630	56,062	39,240
2010	44,846	44,846	28,701	22,960	73,547	67,806

Note : P.S.A - Population in the Served Area
P.S - Population Served

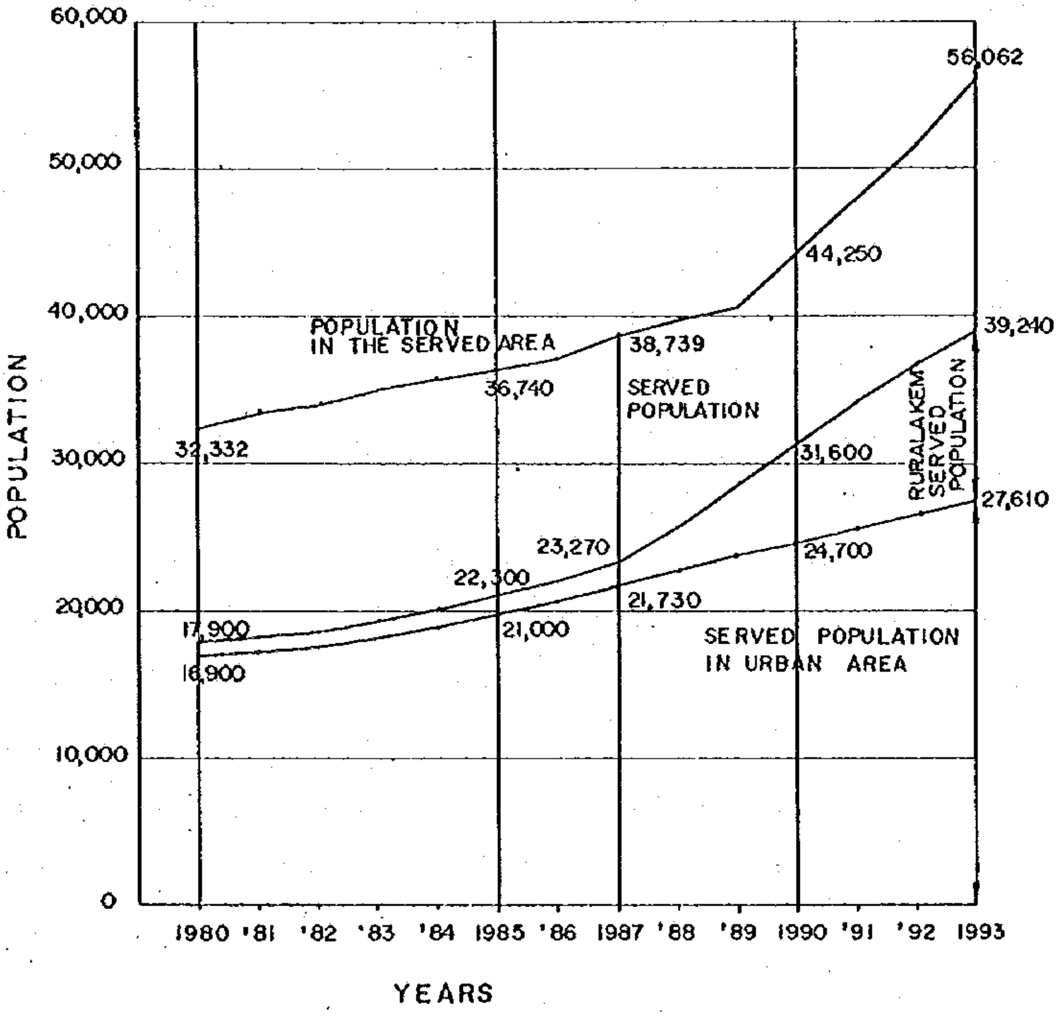


Fig 3.3.1 Projected Served Population

4. Immediate Improvement and Expansion Works

The project area is in extremely poor water supply condition, as summarized below from description in 3. Existing Water Supply in PART ONE of the Report.

1) Water pressure is too low throughout the day, and the periphery of the project area cannot get water from the mains. It is due to the fact that the present water demand has outgrown the supply capacity of the existing water supply system and the decreased supply capacity of intake facilities and transmission pipeline being damaged by the recent flood.

2) The Albay Provincial Waterworks System being split, two water districts were formed as of October 1, 1981, namely, the Daraga and Legaspi City Water Districts. Although the major water sources are located in the Daraga Water District, water supply to the Legaspi City Water District has to be continued until a new water source system of the latter water district is completed.

3) The metered service connections are only 186 or 15 percent of the total connections.

Works proposed to cope with this situation are as follows, as detailed in the master plan in PART TWO.

New meters should be installed at all service connections that do not presently have meters. Existing meters that cannot be repaired should also be replaced with new meters. All pending applications for service connection should be processed and meters installed in those areas where distribution facilities exist or can be extended at minimum cost. It is recommended that the Water District purchase available spane parts for the repair of existing meters and also purchase 1,300 meters so that the above recommendation is realized.

4) Existing networks in the poblacion are not necessarily enough in size and routes. Distribution pipelines, therefore will be reinforced by the project.

(a) Phase I Program

(1) Banadero Spring System

The intake facilities and the transmission pipéline of the Banadero system have been damaged frequently by flood. Although the role of the existing transmission pipeline is to be transfered to a new transmission pipeline in the future, the existing pipeline must supply water both Daraga and Legaspi City until the completion of the new system, Buyoan Spring system, for Legaspi City WD. In this respect, the existing pipeline system is needed to be repaired as described below:

i. Restore intake facilities with intake pipes and a collection chamber.

ii. Restore pipes at intake with 150 mm diameter pipes to connect the above connection chamber with the existing transmission pipeline.

iii. Restore all missing, broken or damaged pipes at river crossing sections of Malaboc and Bañag.

(2) Budiao Spring System

The upstream section of the transmission pipeline which has often been damaged by floods and has leaks, will be replaced by a new pipeline with ø350 mm diameter pipes and a length of 1,200 m from Budiao Spring to Malabog main road.

(3) Bulk and House Meters

To measure all production and distribution, bulk meters will be installated at strategic points and all the connections will be metered to measure consumption and charge by the meter readings.

(4) Distribution Mains

Distribution mains will be strengthened in the in the present served area and extended to the newly developed and developing area, as shown in the Fig 3.6.6.

Following primary and secondary distribution mains are to be provided in this phase.

Diameter	Length
∅200 mm	1,000 m
∅150 mm	1,000 m
∅100 mm	2,000 m
∅ 75 mm	2,000 m
∅ 50 mm	5,000 m

(b) Phase II Program

(1) Bañadero Spring System

To radicaly improve the said situation caused by flood most of the yield will be transmitted to the Budiao Spring by pumping and through a new pipeline, from where the production of both Budiao and Bañadero will be transmitted to the new reservoir. For this measure, pumping facilities and a new transmission pipeline with 200 mm diameter pipes and a length of 1,400 m from Bañadero to Budiao are required.

(2) Budiao Spring System

To increase the supply capacity of the system, a transmission pipeline will be constructed in this phase to connect the new transmission pipeline constructed in Phase I, and be laid parallel to the existing pipeline with 350 mm diameter pipes and a length of 3,000 m from Malabog main road to the proposed reservoir required in this phase.

In addition to the above, a regurating reservoir will be constructed, which also serves to reduce the excessive water pressure in the transmission pipeline.

(3) New Reservoir

As mentioned above, a regurating reservoir with a capacity of 1,600 m^3 will be constructed near the poblacion.

(4) Bulk and House Meters

To measure the distribution amount bulk meters will be installed at strategic points and all connections added in this phase will be metered to measure consumption and charge by the meter readings.

(5) Distribution mains

Distribution mains will be constructed from the reservoir to the poblacion and strengthened in the served area extended to the newly developed and developing areas. Following primary and secondary distribution mains are to be provided in this phase:

Diameter	Length
ø300 mm	1,200 m
ø200 mm	400 m
ø150 mm	1,160 m
ø100 mm	3,300 m
ø 75 mm	3,300 m
ø 50 mm	41,600 m

5. Water Sources

The total yeilds of Budiao and Bañadero springs can meet the water demand of the Water District until the target year of the Phase II program. The present actual capacity of the two springs is somewhat below the total yields, because the intake facilities of the Bañadero spring and part of the transmission pipelines are not functioning.

As described in Appendix 4. Study on Water Sources, there are other springs in the Water District area, but their yields are too small for the use of the Water District.

5.1 Bañadero Spring

The spring has a yield of 2,940 cu m/day according to the existing record. Presently, the yield cannot be measured because the intake facility is broken by the recent flood. The elevation of the spring is about 112 m above sea level. For the Phase I measurement, the existing transmission pipeline is planned to be repaired at the damaged sections. In the Phase II program a transmission pipeline with 200 mm diameter pipes together with a pumping facility is proposed to transmit the water to the Budiao spring. The water is potable after it is mixed with the Budiao spring water.

5.2 Budiao Spring

The Budiao springs No. 1 and No. 2 have total yield of 7,360 cu m/day which was measured in the field. The yield is found almost unchangeable by season according to observation of inhabitants and analysis of rainfall data. The elevations of the springs are 123 m and 118 m above sea level, high enough for gravity supply to the District. The water quality of spring is potable without any treatment.

6. Design Criteria, Alternative Plans and Preliminary Design

6.1 Design Criteria

Design criteria to be used for the present feasibility study are detailed in Appendix 7: Design Criteria for Planning.

6.2 Alternative Plans

Possible alternative designs will be checked, as discussed below, for the following two items which have rather large impact on construction costs and influence suitability of the system for the local conditions.

(1) Routing of Transmission Line from Banadero Spring

Two alternative routes are conceivable for the Banadero spring system as shown in Fig 3.6.1, namely, 1) its existing route of the transmission line and 2) to conduct the spring water to the Budiao collection chamber and then transmit via the existing route for the Budiao spring using the same pipeline route.

From the technical standpoint, the first alternative route is not adequate, because the route crosses a few rivers and the pipeline is often flushed by mudflows, leading to difficulty in its maintenance. In addition, as the water of the spring has a fairly high concentration of sulfate, it is necessary and appropriate to mix it with the water from the Budiao spring. For the above reasons, the second alternative route is taken for the present study.

(2) Location of Reservoir

There are two possible alternatives for siting the reservoir as shown in Fig 3.6.2, i.e., 1) on the Bongalon hilly area, with ground reservoirs, and 2) in the Daraga poblacion, with elevated tanks.

According to the siting and the type of reservoir, the construction cost varies, and therefore, a rough cost comparison is made as shown in Table 3.6.1 . From the table, the alternative I, ground reservoir system, is concluded to be more economical and suitable.

Table 3.6.1 Alternative Plans of Reservoir for Budiao System

Item Type of Reservoir	Alternative I Ground Reservoir	Alternative II Elevated Tank
Location	At Bongalon Area	In the poblacion
Ground Elevation (m)	+ 60	+ 15
High Water Level (m)	+ 63	+ 40
Height of Tank (m)		+ 25
Capacity of Reservoir (m^3)	1,600 x 2	1,600 x 2
Transmission Pipe (m)		
ø 350 mm	4,200	5,500
ø 200 mm	500	-
Distribution Pipe (m)		
ø 350 mm	1,000	-
ø 250 mm	500	300
Construction Cost ('000 Pesos)		
Reservoir	3,060	8,383
Transmission Pipe	5,272	6,522
Distribution Pipe	1,363	237
Total	9,695	15,142

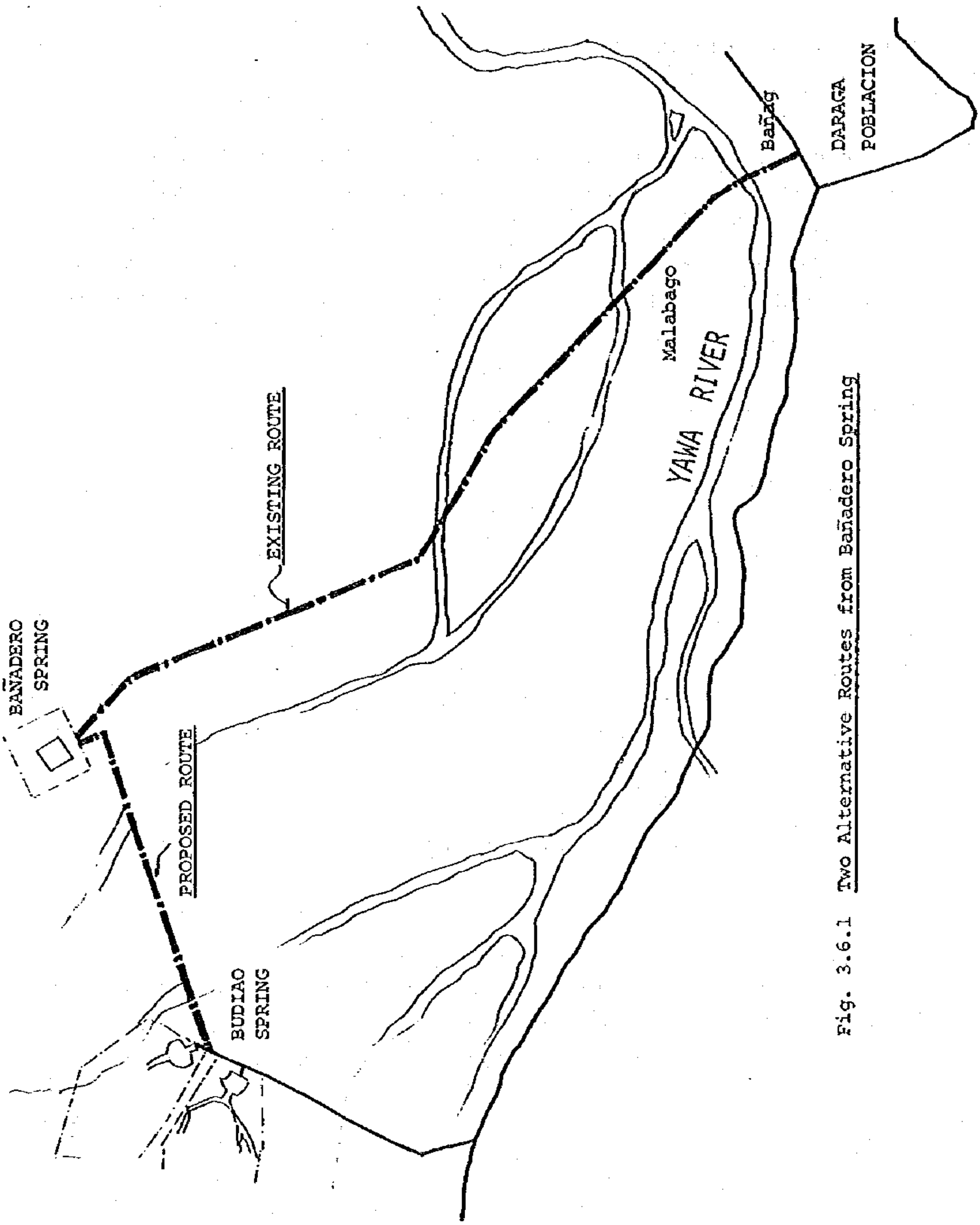


Fig. 3.6.1 Two Alternative Routes from Bañadero Spring

6.3 Preliminary Design

Dimensions, capacities, and structural features of major facilities which are to be newly constructed to meet the water requirement in 1987 and 1993, are prepared in accordance with the above design criteria and the result of the study of alternative plans in the foregoing sub-sections and shown below. Schematic figure for the preliminary design is shown in Fig 3.6.3.

1. Phase I Program

a. Banadero System

(1) Intake Facilities:

(a) Collection Chamber
Made of reinforced concrete
Capacity and Number: 150 m^3 x 1 unit

(b) Intake Pipe
Perforated RC pipe
Diameter and Length: ø1,000 mm x 100 m

(c) Cobble Stones and Gravels
Volume: 1,000 m^3

(2) Repair of Transmission Pipeline:
Diameter and Length: ø150 mm x 200 m at Malabago River Crossing
ø150 mm x 100 m at Banag River Crossing
ø150 mm x 100 m at Collection Chamber

b. Budiao System

Installation of Transmission Pipeline:
(From the Budiao Spring to Malabog Main Road)
Diameter and Length: ø350 mm x 1,200 m

c. Reinforcement and Expansion of Distribution Pipelines:

(1) ø200 mm x 1,000 m
(2) ø150 mm x 1,000 m
(3) ø100 mm x 2,000 m
(4) ø 75 mm x 2,000 m
(5) ø 50 mm x 5,000 m

d. Other Equipment:

(1) Service Meter:
ø13 mm x 1,223 pcs.

(2) Bulk Meter
ø350 mm x 1 pc.
ø200 mm x 1 pc.
ø150 mm x 2 pcs.

(3) Valve:
ø200 mm - ø75 mm, 20 pcs.

(4) Fire Hydrant:
30 pcs.

(5) Chlorinator:
2 sets

(6) Vehicle:
2 units

2. Phase II Program

a. Banadero System

Daraga

(1) 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

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

b. Budiao System

(1) Construction of Ground Reservoir:
(Constructed in Bongalon Area)
Made of reinforced concrete
Capacity and number of unit: 1,600 m^3 x 2 units
(See Fig 3.6.4)

(2) Installation of Transmission Pipelines:
(From Malabog main road to the proposed ground reservoir)
Diameter and Length: ø350 mm x 3,000 m; and
ø200 mm x 500 m

c. Reinforcement and Expansion of Distribution Pipelines

(1) ø350 mm x 1,000 m
(2) ø300 mm x 1,200 m
(3) ø250 mm x 500 m
(4) ø200 mm x 400 m
(5) ø150 mm x 1,160 m
(6) ø100 mm x 3,300 m
(7) ø 75 mm x 3,300 m
(8) ø 50 mm x41,600 m

d. Other Equipment:

(1) Service Meter
ø13 mm x 5,789 pcs.

(2) Bulk Merer:

ø350 mm x 1 pc.

ø300 mm x 1 pc.

ø250 mm x 3 pcs.

ø200 mm x 5 pcs.

(3) Valve:

ø300 mm - ø75 mm, 32 pcs.

(4) Fire Hydrant

38 pcs.

(5) Chlorinator:

1 set

(6) Vehicle:

1 unit

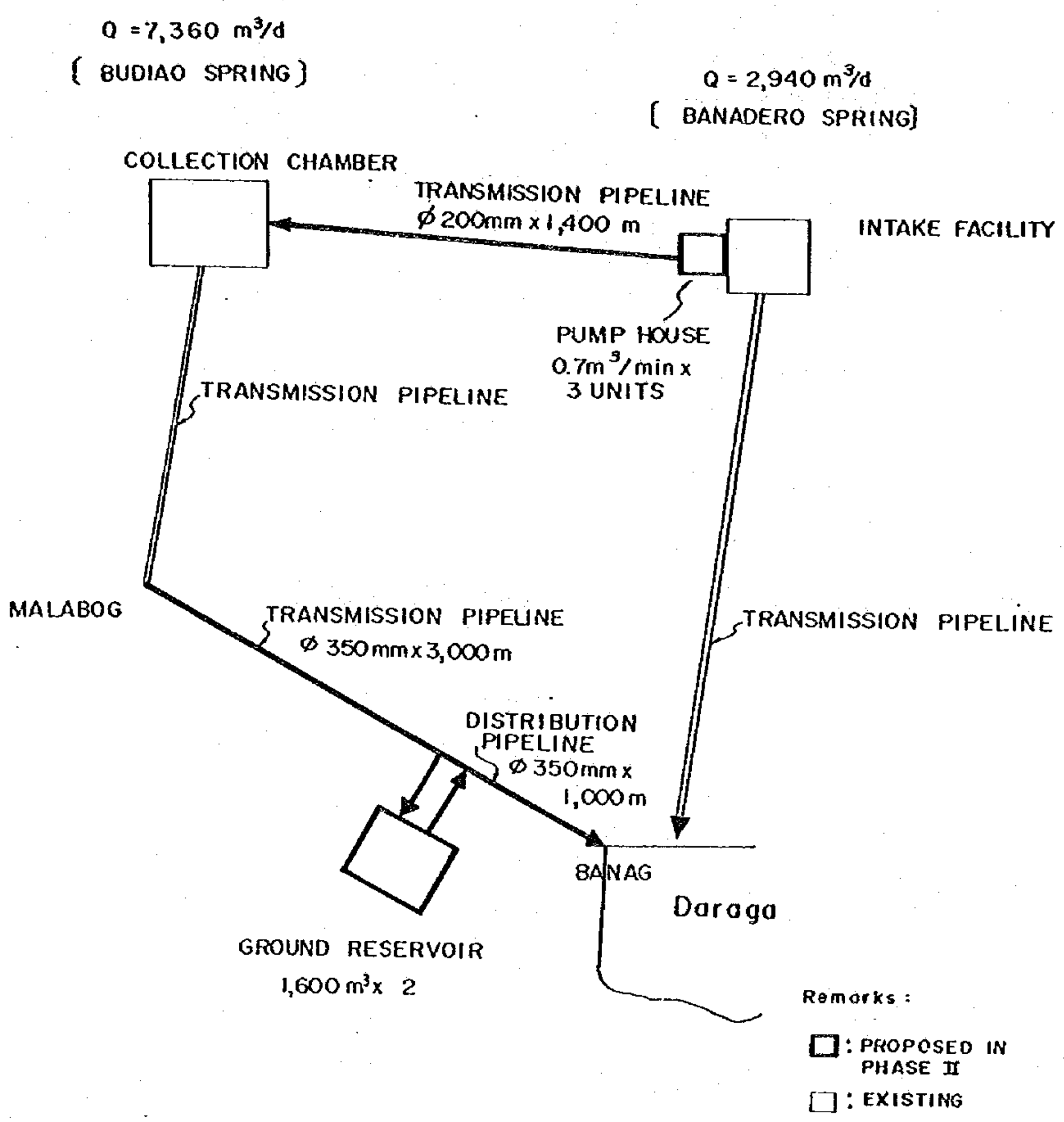


Fig 3.6.2 Schematic Diagram for Preliminary Design for Phase II

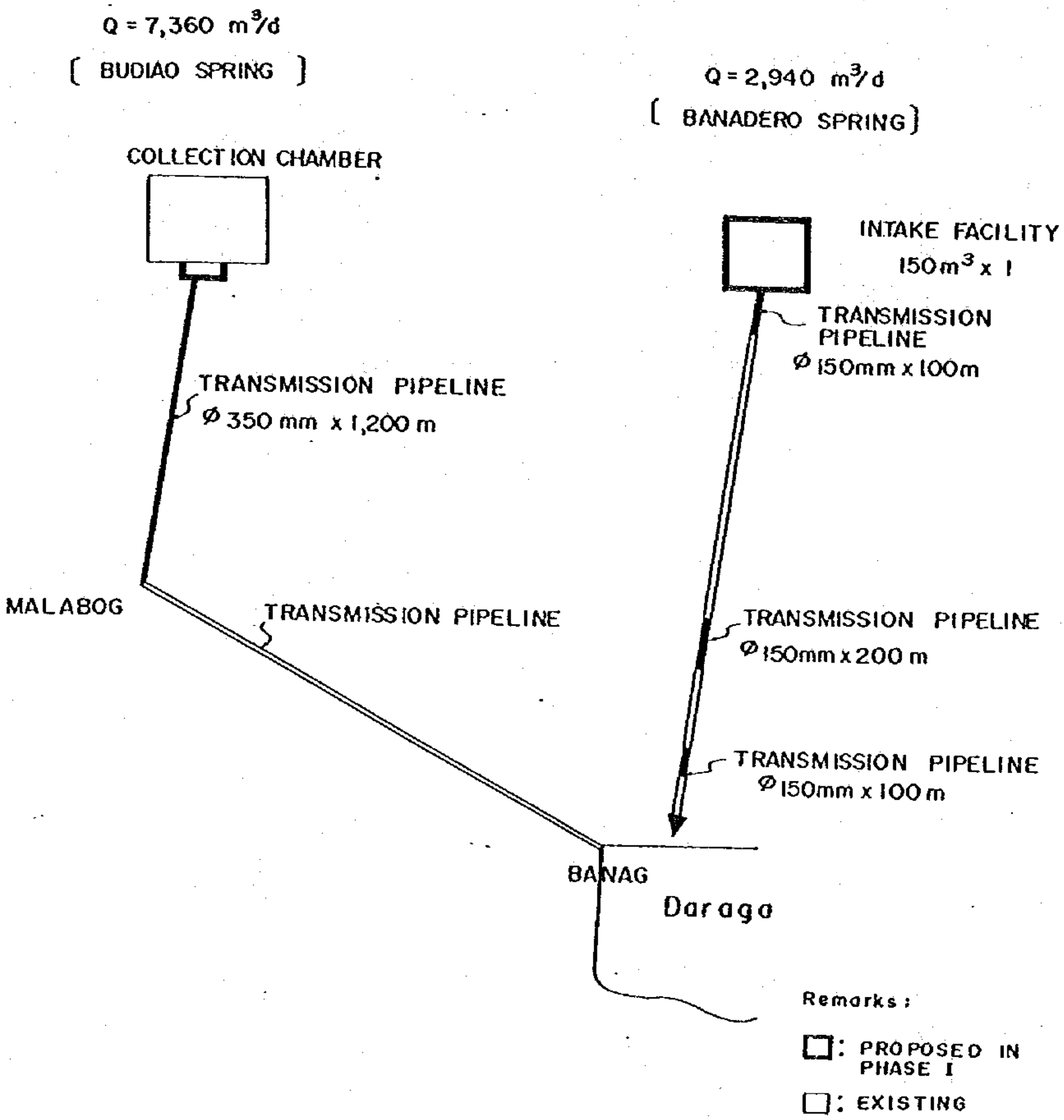


Fig 3.6.3 Schematic Diagram for Preliminary Design for Phase I

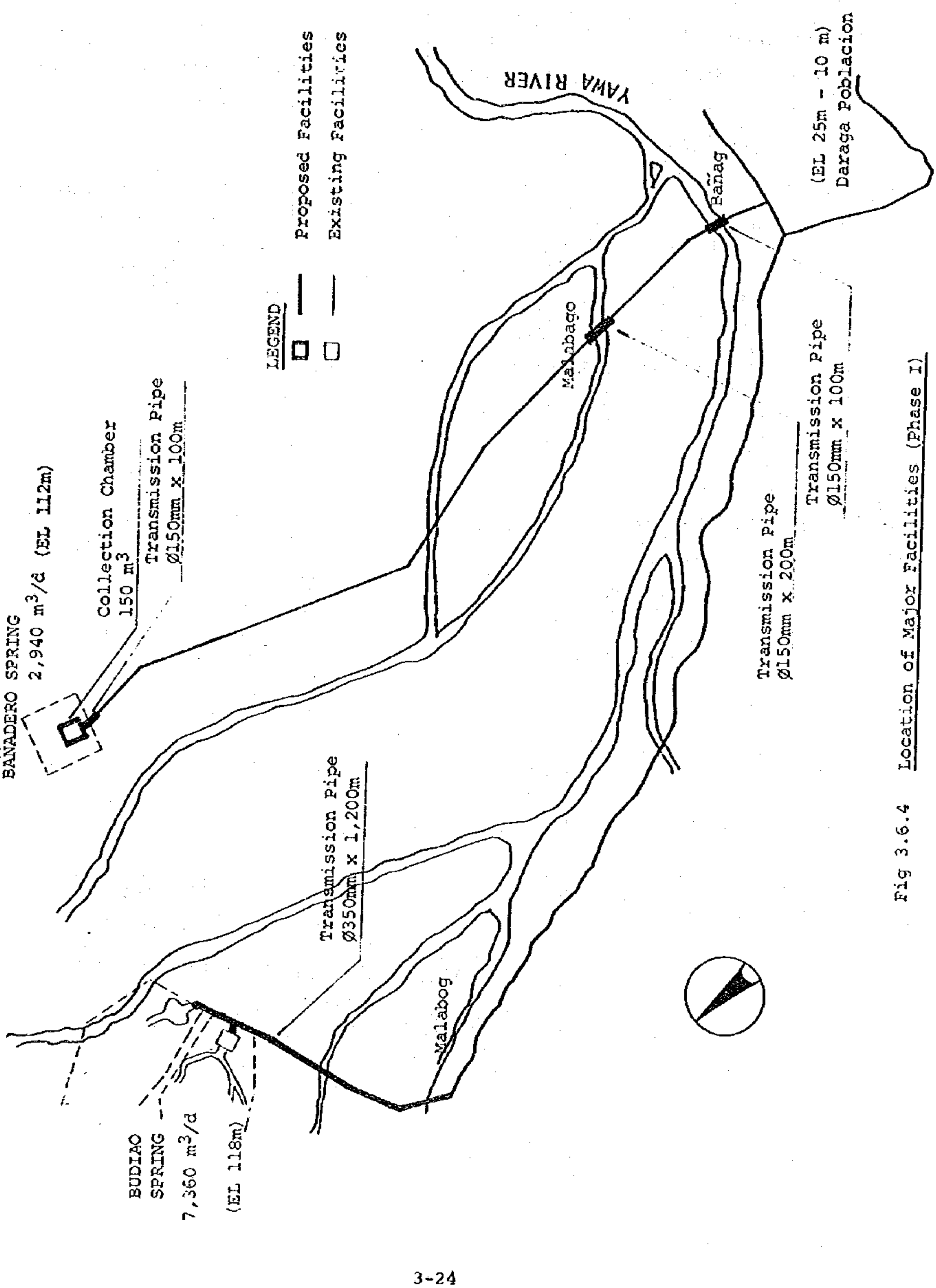


Fig 3.6.4 Location of Major Facilities (Phase I)

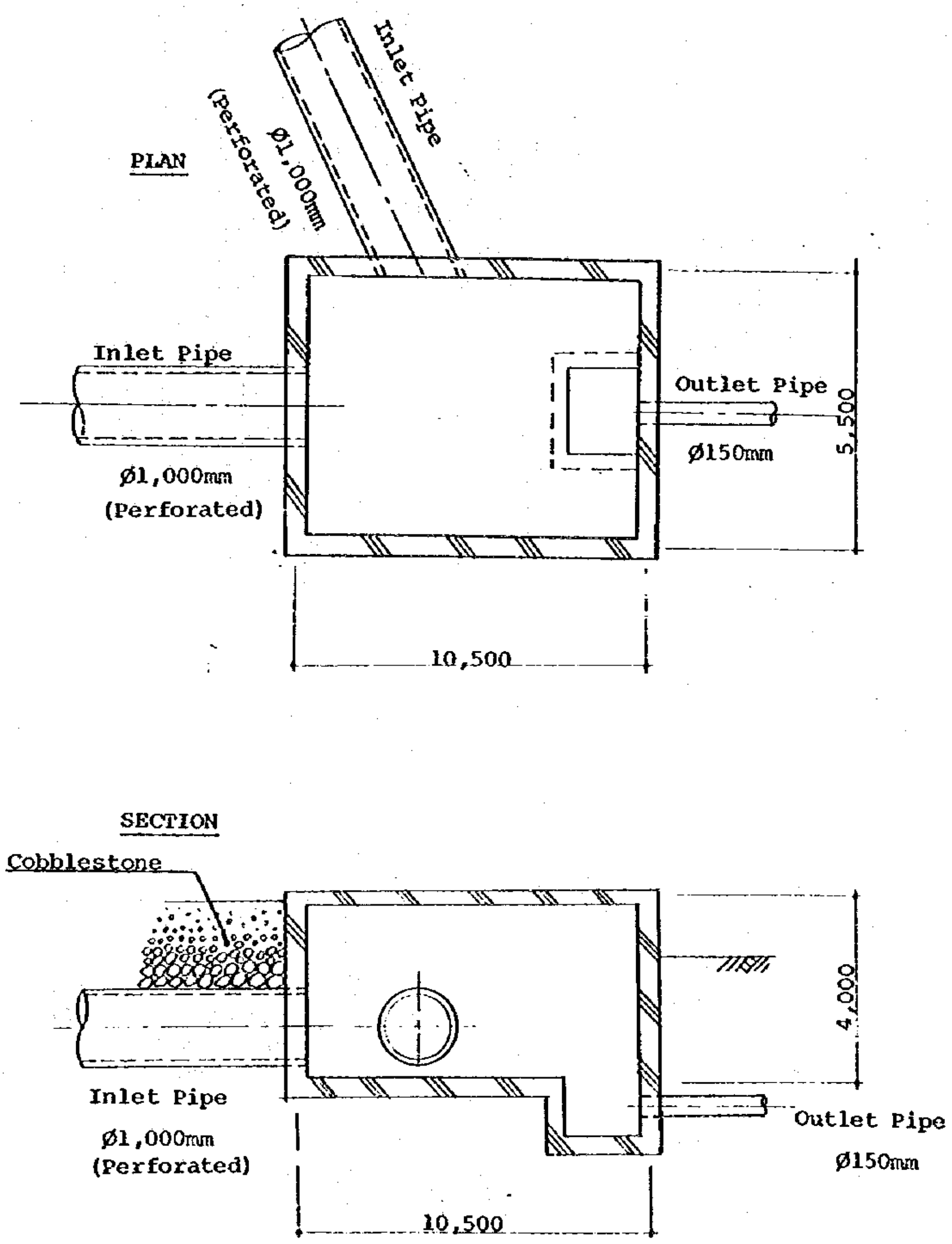


Fig 3.6.5 Collection Chamber (V = 150 m^3)
(Bañadero)

Daraga

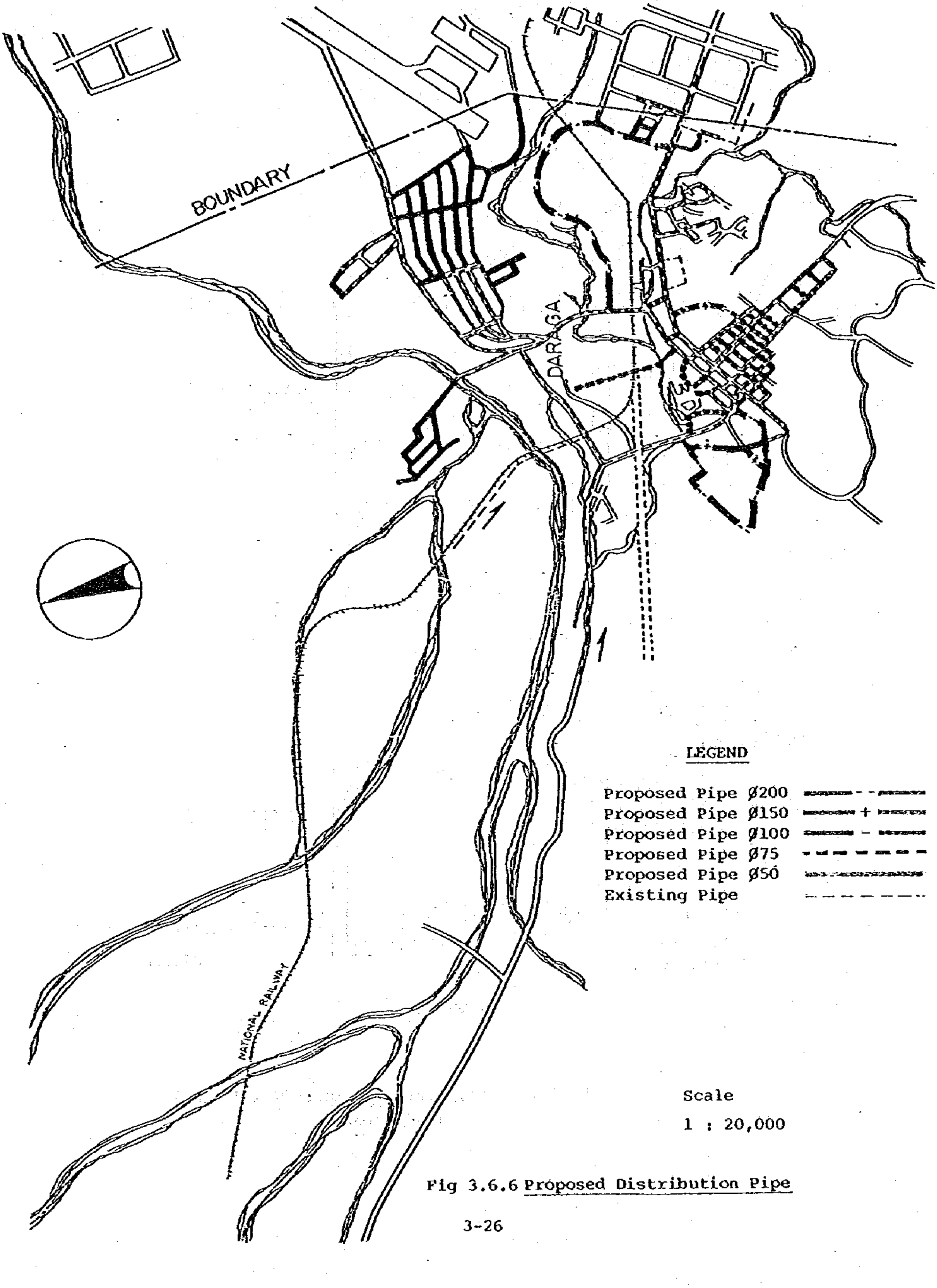


Fig 3.6.6 Proposed Distribution Pipe

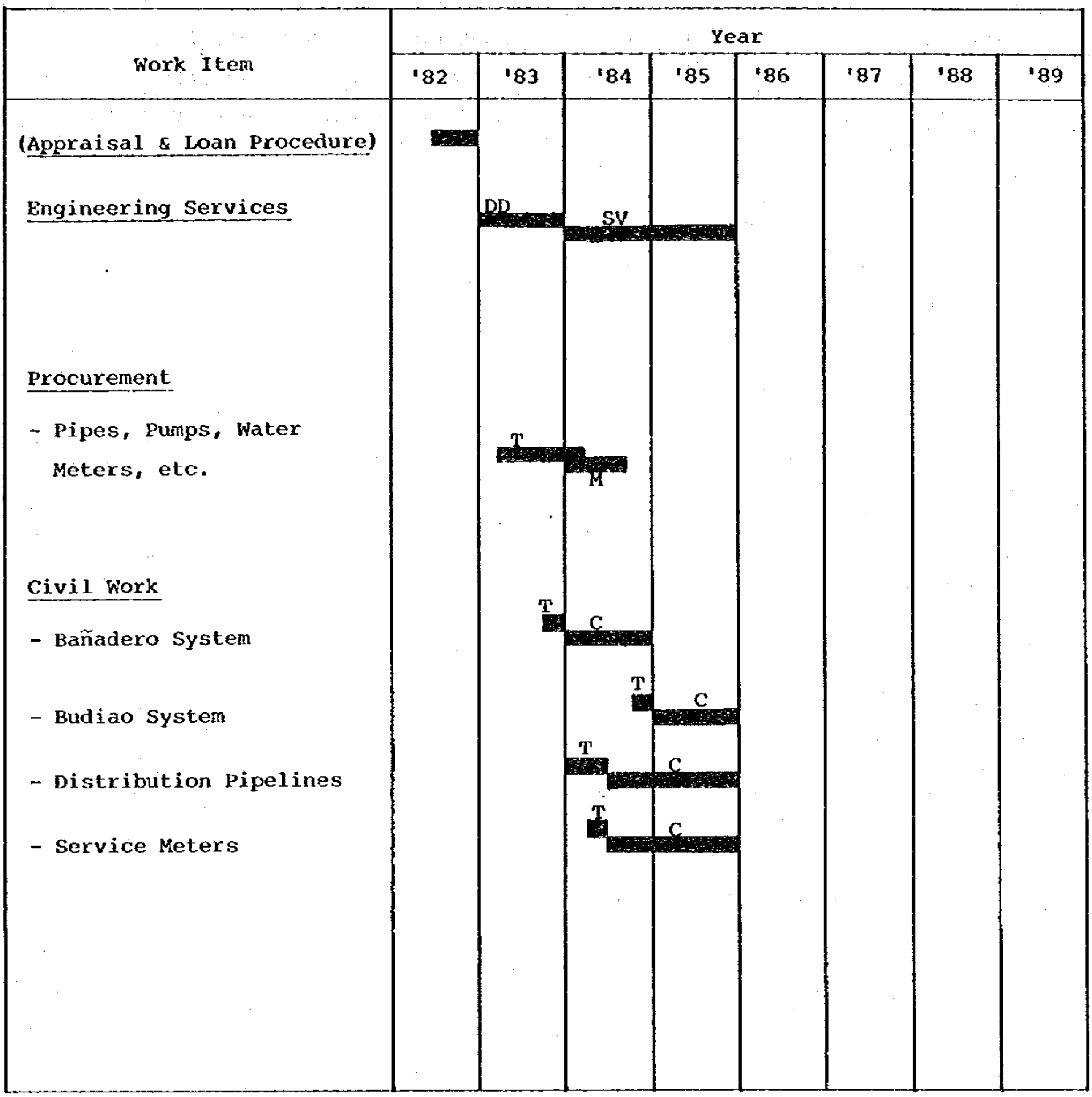
7. Construction, Operation and Maintenance Schedule

7.1 Construction Schedule

The following Fig 3.7.1 shows the construction schedule for the project. In the chart, all timings of detailed design, tendering, manufacturing, shipping, construction and installation are indicated.

Fig 3.7.1 Construction Schedule

(Phase I)



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

7.2 Operation and Maintenance Schedule

Personnel of the Water District needed for operation and maintenance is scheduled, as shown in the following table.

Table 3.7.1 Staffing Schedule for Operation/ Maintenance (Phase I)

Staff \ Year	1982	1983	1984	1985	1986	1987
General Manager	1	1	1	1	1	1
Administrative Staff	3	3	3	4	4	5
Technical Staff	6	6	6	7	8	9
Commercial Staff	5	5	6	7	8	11
- Meter readers, bill collectors and inspectors	(3)	(3)	(4)	(4)	(5)	(7)
- Other employees	(2)	(2)	(2)	(3)	(3)	(4)
Total Staff	15	15	16	19	21	26
Number of Service Connections	1,340	1,382	1,544	1,804	2,097	2,456

Daraga.

8. Materials; Labor Force and Contractor's Ability

8.1 Materials

1) Sand and Gravel

Sand and gravel are locally available for concrete aggregates, pipe bedding, road surfacing and other works.

2) Cement

Cement is manufactured in large quantities in the Philippines. At present, there are 18 operating cement plants in the Philippines; 11 in Luzon; 2 in the Visayas and 5 in Mindanao. No serious or special problem is likely to arise with respect to cement requirements of any water supply project in the Philippines.

3) Reinforcing Steel

There are 27 steel mills in the country fabricating steel reinforcing bars. Steel manufacturing normally conforms to ASTM standards. Sizes of bars vary from 60 to 25 mm. For large sizes, bars are available in plain or deformed sections.

4) Pipe Materials

a) Asbestos Cement Pipe

Asbestos Cement Pipe is being manufactured by two manufacturers with factories in Metropolitan Manila; Eternit and Italit. The pipe is widely accepted in the Philippines and usually chosen for small diameter pipes (80 mm to 300 mm).

Pressure pipe is available in size from 80 mm to 600 mm for rated working pressure of 130 psi. Pipes are usually manufactured according to ISO R-160 specifications and supplied in 4-meters lengths. Asbestos pipe conforming the AWWA standard C-400 can be manufactured by the local plants but at higher cost than ISO pipes.

Locally produced asbestos cement are normally joined with a coupling of the same composition and strength as the pipe. Joints are sealed with double "O" rubber rings, though mechanical joints (Gibault joints) are also produced locally.

b) Steel Pipe

LWUA has accredited four steel pipe manufacturers in accordance with its standards for steel pipes and specials. Steel pipe is usually used in distribution and transmission lines as well as in plant system and usually available in different commercial sizes. Pipes can be cement lined according to AWWA standard C205.

c) Plastic Pipe

Early production of plastic pipes was in sizes below 50 mm and are used for service lines and household plumbing system.

To date, LWUA has accredited 5 local manufacturers of plastic pipes. Plastic pipe materials acceptable to LWUA are PVC, PE and PB. A tentative standards have been adopted by LWUA for the manufacture of these plastic pipes. Pipe sizes are from 10 mm to 300 mm in diameter.

d) Ductile Cast Iron Pipe, Valves and Hydrants

Ductile cast iron pipe, valves and hydrants are generally imported except gate valves of small sizes which are locally manufactured.

8.2 Labor Force

For any particular area in the Philippines, there is no immediate problem on the availability of common labor and skills in the construction work involved in water supply system development or improvement.

8.3 Contractor's Ability

Construction contractors with the competence and resource to undertake all or portions of a waterworks project are generally available in the province. In areas where local construction contractor's capabilities and expertise are not available or are deficient in some respects, several Metropolitan Manila-based firms can be utilized for any and almost all of the work required in the development and/or improvement of a water supply system. Certain work requires the use of specialized equipment not available in the locality nor owned by a particular construction contractor. In such cases, these specialized equipment may be available from government regional offices doing infrastructure projects and can be availed of by construction contractor on a rental basis.

9. Construction and Procurement Methods

The implementation of the project is the responsibility of the Water District under financing, supervision and guidance of LWUA. Funds necessary for the construction are to be financed through LWUA both for foreign and local currency sources. LWUA has prepared all procedures and manuals needed for construction and operation of the water supply system of the water districts, and in addition keep staff to supervise and guide works of the districts in the field. In case external technical resources are requires to assist the water districts, local and foreign consultants are available, and have been widely used for similar works.

9.1 Construction Method

The Water District has convenient transportation systems of land, air and sea. The District is linked·with Metro Manila by a highways; the distance is about 500 km. Domestic air flight can connect with the capital city in about two hours. A good sea port is situated in the neighboring Legaspi City.

Regarding power which will be required for the construction work of the project, electricity can be supplied by the existing power system, and, if required, some civil work machines can be operated with the power of engines. Therefore, the present project will not encounter any difficulty of power supply.

For civil works construction, contractors, including general contractors, will be selected by local competitive bidding after prequalification of bidders. Such qualified contractors with ability and construction equipment are sufficiently available in the country. The prequalifications and tendering will be carried out by the Water District under the guidance of LWUA. To assist the tendering and supervision of construction, consultants will be hired by the District, and during the period of construction, engineers of the District will be trained in construction management and supervision of construction works. And also the engineers and operators concerned of the Water District will be given knowledge and skill in operation of the completed facilities.

9.2 Procurement Method

Procurement of materials and equipment will be carried out, in principle, on a basis of open international competitive bidding. The procedures for the above will be in accordance with the guidelines of the foreign landing agency which may finance the foreign currency component of the project cost.

Major steps of the procurement procedures are as follows:

1) Advertisement of tenders
2) Bidding
3) Evaluation of the bids with assistance of consultants
4) Award of contracts
5) Manufacturing and shipping by the suppliers, and acceptance
6) Installation of equipment by the suppliers or contractors, and acceptance

Major items of materials and equipment to be imported are as follows:

1) Pipes, fittings, valves and fire hydrants
2) Pumps and motors
3) Electric equipment
4) Bulk meters and service meters
5) Chlorinators
6) Vehicles

10. Cost Estimate and Disbursement Schedule

10.1 Cost Estimate

Table 3.10.1 presents summary of the project cost for the proposed program which is detailed in the table of disbursement schedule. The costs are broken down into foreign and local currency components. Cost for engineering and contingencies for physical and price escalation are allowed in addition to the construction costs.

Conditions and assumptions on which the estimation is carried out are as below, and cost data relating to the estimation are attached to the Report as Appendix 8.

1) All of costs and prices presented in the Table are as of July 1981.
2) Unit costs, as far as available, are taken from the list of costs prepared by LWUA.[1/]
3) Unit costs not included in the above list are current prices in the market.
4) Some of the unit costs of LWUA are modified so as to fit for the present project.
5) Local currency portion for the above includes costs for handling, storage and local transportation.
6) Engineering cost is assumed as 10.5 percent of the basic construction cost for the detailed design and 3.5 percent of the basic construction cost for the construction supervision.
7) Physical contingency is allowed by 10 percent of the basic construction cost and engineering cost.
8) Foreign currency exchange rate applied is: US$1.00≑ ₱7.80.

1/ Addendum to Methodology Manual, 1981.

Table 3.10.1 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	1,030	396	634
B. Budiao System	1,723	1,028	695
C. Reinforcement/Expansion of Distribution Pipelines	1,665	1,115	550
D. Equipment	1,457	1,063	394
Sub Total	5,875	3,602	2,273
Detailed Design Cost (10.5%)	617	378	239
Supervision Cost (3.5 %)	206	126	80
Land Cost	100	-	100
Total	6,798	4,106	2,692
Physical Contingency (10 %)	680	411	269
Total	7,478	4,517	2,961
Price Contingency	4,311	2,592	1,719
Grand Total (Project Cost)	11,789	7,109	4,680
	(Equivalent to US$1.51 M)	(Equivalent to US$0.91 M)	(Equivalent to US$ 0.60M)

10.2 Disbursement Schedule

In accordance with the projected construction schedule as mentioned in the Fig 3.7.1, the annual disbursement schedule of the construction cost of the project is prepared, and shown in Table 3.10.2. The above schedule also contains detailed cost estimates and their breakdowns for each major work.

Table 3.10.2 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. Bañadero System															
a) Intake Facilities (150 m³ x 1)	700	175	525			175	525								
b) Transmission Pipeline (ø150 mm x 400 m)	330	221	109			221	109								
B. Budiao System															
a) Transmission Pipeline (ø350 mm x 1,200 m)	1,423	953	470					953	470						
b) Transmission Outlet Construction	300	75	225					75	225						
C. Reinforcement/Expansion of Distribution Pipelines															
a) ø200 mm x 1,000 m	390	261	129			157	77	104	52						
b) ø150 mm x 1,000 m	275	184	91			110	55	74	36						
c) ø100 mm x 2,000 m	360	241	119			120	60	121	59						
d) ø 75 mm x 2,000 m	240	161	79			80	40	81	39						
e) ø 50 mm x 5,000 m	400	268	132			134	66	134	66						
D. Other Equipment															
a) Service Meter (ø13 mm x 1,223)	802	618	184			618	92	0	92						
b) Bulk Meter (ø350 mm x 1, ø200 mm x 1, ø150 mm x 2)	50	40	10			40	5	0	5						
c) Valve (20)	120	88	32			88	16	0	16						
d) Fire Hydrant (30)	202	133	69			133	35	0	34						
e) Chlorinator (2)	20	18	2			18	1	0	1						
f) Vehicle (2)	140	70	70			70	70	0	0						
g) Spareparts and Equipment	123	96	27			96	27								

(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
Sub-Total	5,875	3,602	2,273			2,060	1,178	1,542	1,095						
Detailed Design Cost (10.5%)	617	378	239	378	239										
Supervision Cost (3.5%)	206	126	80			63	40	63	40						
Land Cost	100		100				100								
Total	6,798	4,106	2,692	378	239	2,123	1,318	1,605	1,135						
Physical Contingency (10%)	680	411	269	38	24	212	132	161	113						
Total	7,478	4,517	2,961	416	263	2,335	1,450	1,766	1,248						
Price Contingency	4,311	2,592	1,719	134	85	1,216	756	1,242	878						
Grand Total (Project Cost)	11,789	7,109	4,680	550	348	3,551	2,206	3,008	2,126						

11. Organization, Operation and Management Plan

Success of the project depends largely on how well to operate the completed water supply system including the management of water supply business. From this standpoint, the following is recommended with special emphasis on earliest fulfillment.

(1) Organization

The Water District is a new organization which was formed in October 1981 taking over the facilities and some staff from the former Albay Provincial Waterworks System. The organization is expected to function efficiently as intended with staff to be strengthened from now on. In this connection, the precedence experienced in the days of the Provincial Waterworks should be reflected so as to obtain maximum efficiency of the organization. Major points are as follows:

1) Planned development of the water supply facilities was lacking. Engineering staff should be well provided.

2) Leakage and wastage were excessively large. Technical personnel together with necessary equipment and materials should be provided.

3) Funding for maintenance of the facilities was short. To recover the investment, metering and collection should be performed to the fullest extent, and to this end, enough staff should be provided.

(2) Operation

The following are essential for maintaining the water supply system in most efficiently working condition.

1) Repair of Leaks

Reduction of leakage and wastage is the most effective measure to substantially increase water supply. The Water District should concentrate its effort on reduction of leakage and wastage.

2) Improvement of Plumbing Systems

So far many irregular pumbing systems have been installed so as to take water from the extremely low water pressure. These will become causes for water leakage or wastage. Structure and materials of the service piping system must be controlled by the Water District before the project is completed and put in effect.

3) Prevention of Contamination

The area of the spring water source is easily accessible, and possibility of contaminating the water source is considered high. By way of fencing the area and watching out, contamination of the water source must be prevented.

(3) Management

The management aspects of the water supply will undergo the following: 1) the District is to sustain itself in the financial terms; 2) the burden of debt service increases to a great extent. To cope with this new situation, the District must strengthen itself financially by metering all connections and also revising the current water rate structure.

In order to realize the above purposes, it is recommended to put in force the following:

1) To strengthen the organization as shown in Fig 3.11.1.
2) To upgrade the ability of leading staff of the organization by participating in the training courses held by LWUA.
3) To train all the employees of the organization so as for every employee to perform his assignment efficiently and satisfactorily.

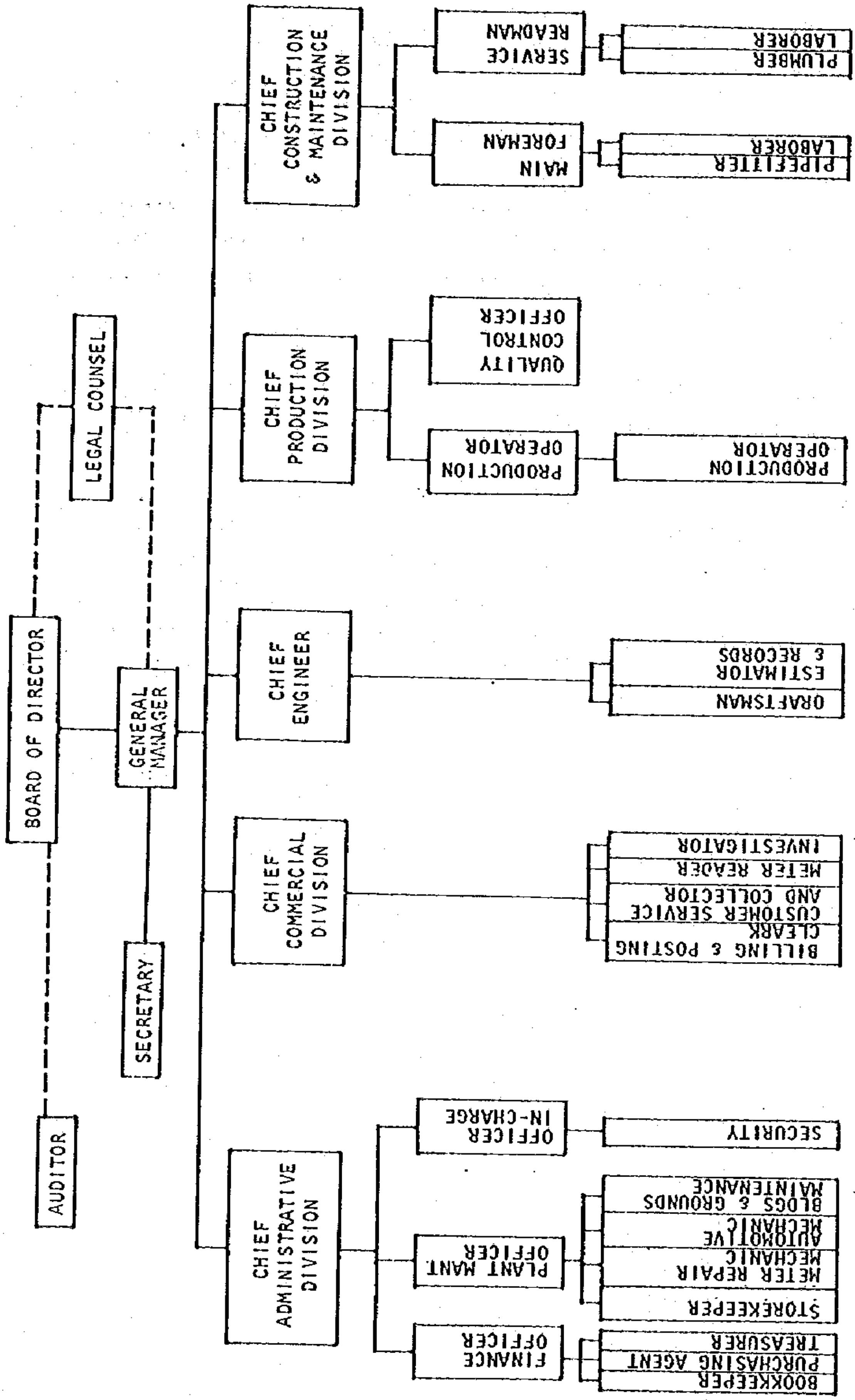


Fig 3.11.1 Proposed Organization Chart

12. Financial Feasibility Analysis

As in the case with all forecasts, many assumptions and estimates must be made concerning future financial conditions. In making these assumptions, efforts were made to comply with the methods and rules of feasibility study being practiced by the LWDA, but consideration was also paid to the practices prevailing in Japan as well as in other Asian countries.

Many of the assumptions deal with matters that can be controlles by management, and these assumptions represent guidelines for managing the project so as to achieve the predicted results.

12.1 Source of Funds and Rate of Interest on Borrowing

The length of the project period and the magnitude of the recommended capital investment program as shown in Financial Table 1 will require stable long-term borrowing.

In this financial feasibility study, forecasts are constructed on the assumption that 100 % of the total capital investment is financed by government loans. Forecasts of loan disbursements and debt service are presented in Financial Table 3.

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

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

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

12.2 Financial Feasibility

Carefully constructed financial forecasts based on the above mentioned assumptions indicate that the proposed program will be positively viable in financial terms.

12.3 Water Rate

In calculating revenue, water rates for domestic users were projected less than 5% of the average household income of the Water District area. Although major increases in water rates will be required, allocation of additional costs to non-domestic customers and progressive rate structuring allows the construction of cross-subsidized rates for basic household requirements. (See Financial Table 7)

One of the salient features of the proposed program is that the revenue unit costs at 1981 constant prices of production toward the target year, will be significantly lower than at present.

13. Economic Feasibility

13.1 Benefits

Major benefits, direct and indirect, of the project are as follows:

a. Increase of Served Population and Area:
Served population in the target year is estimated at 23,270, which is a gain of 30 % over the present served population. And the served area will increase from 400 hectares to 680 hectares in the target year.

b. Rise of Water Pressure and Elimination of Intermittent Supply
Present insufficient water pressure will be rectified to a normal level and "dried up" areas and intermittent supply will be all eliminated. Tanks and pumps of the plumbing system which consumers have provided will be no more required.

c. Supply of Safe Water
The existing water supply facilities are vulnerable to contamination because the pipelines are sometimes under negative pressure. When the project is completed and the water pressure is raised, consumers will be free from such contamination and the safety of water will be assured.

d. Healthy Environment
Living environment in the whole poblacion will greatly be enhanced with 24-hour continuous water supply.

e. Employment Opportunity
The civil works of the project together with accompanying connection works on the part of consumers will increase employment opportunities in the area.

f. Increase in Land Values

Other than the generation of employment, the water supply improvement project will contribute to an increase in the land value of the service area.

g. Reduction in Fire Damage

The project include the installation of fire hydrants, which with projected increase in water pressure will result in savings due to reduced fire damage.

13.2 Internal Economic Rate of Return

An attempt was made to determine the economic viability of the recommended master plan program through the mechanism of benefit-cost comparison. This mechanism considered only quantifiable benefits. It is however to be noted that the quantifiable benefits are not necessarily more important than the unquantifiable ones.

In this study, quantifiable benefits included (1) beneficial value of water, (2) water quality benefits; and (3) reduction in fire damage.

In addition these three items of quantifiable benefits, " benefits to the nation " were included as benefits in making benefit-cost comparison. National interest effects for the Daraga Water Supply System were estimated to be equal to 10 percent of the total of volume, quality and fire loss reduction benefits.

The calculations of internal economic rates of return have been subjected to sensitivity analyses using various adjustments as follows:

1) Cost value without conversion

Calculation was made with cost values as used in financial forecasts.

2) Cost value with Conversion A

   i. Foreign costs -- raised by use of 1.25 factor (Scarcity of foreign exchange)
   ii. Common labor -- lowered by 0.5 factor (Unemployment alternative)
   iii. Residual local cost -- reduced by 0.95 factor (Removal of hidden taxes)

3) Cost value with Conversion B

   i. Foreign cost -- cnconverted
   ii. Common labor -- converted as 2), ii, above
   iii. Residual local cost -- converted as 2), iii, above

4) Cost value with Conversion C

   i. Foreign cost -- converted as 2), i, above
   ii. Common labor -- unconverted
   iii. Residual local cost -- unconverted

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

1) Based on Cost Value without Conversion: 46 %
2) Based on Cost Value with Conversion A: 43 %
3) Based on Cost Value with Conversion B: 49 %
4) Based on Cost Value with Conversion C: 40 %

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

(P1,000'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

I

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

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.

Daraga

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

I

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

I

FINANCIAL TABLE 9C

SUMMARY OF REVENUE UNITS

Year	Residential and Governmental				Commercial and Industrial				Total
	Service			Total R & C	Service			Total C & I	All
	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

ECONOMIC TABLE 1

DARAGA WATER SUPPLY PROJECT
SUMMARY OF PROJECT COST

I

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

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

I

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.								

I

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

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

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 I

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

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
ECONOMIC COSTS DISTRIBUTED TO YEARS
₱ x 1,000

I

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			

I

ECONOMIC TABLE 4-C

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

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 6-0

DARAGA WATER SUPPLY PROJECT — I

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. 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

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.										

I

ECONOMIC TABLE 6-B

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

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

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

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

I

ECONOMIC TABLE 8-0

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	Replacement 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	Replacement 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	Replacement 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

I

DARAGA WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

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

I

ECONOMIC TABLE 10-B

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