6. Design Criteria, Alternative Plans and Preliminary Design

6.1 Design Criteria

(1) Conceptual Water Supply System

The Water District is formed of a number of scattered served areas, and besides is taking water from many water sources, small and large, also scattered widely in the District area. From the standpoints of economy of construction cost and convenience of operation and management of the facilities, it is appropriate to make grouping of the served areas together with water sources into a limited number of nearly independent water supply systems. In Phase II, from the geographical distribution, Pasuquin and Bacarra will be grouped into one system, Vintar one, and finally Laoag and Paoay one. Until this conceptual picture of water supply systems is realized, the served areas in Phase I will be complemented by one another, as required, by way of connecting transmission or distribution pipelines.

Pasuquin and Bacarra in Phase I will have a water supply system using the spring sources and the Bacarra infiltration gallery and their incremental water demand in Phase II will be met by riverbed water of the Bacarra River.

Vintar will have an independent water supply system using the existing infiltration gallery in the both periods of Phase I and Phase II.

Paoay will constitute a served area taking water from the proposed water source: an infiltration gallery which is located at Barangay Nangalisan.

Laoag will have a water supply system using the two existing infiltration galleries at the Laoag River, the existing Bacarra infiltration gallery and existing deep wells in the area and its Phase II water demand will be met by addition of riverbed water intakes.

(2) Design Criteria

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

6.2 Alternative Plans

For the served areas in the Water District, some alternative plans of the water supply system including water sources are conceivable. Merits and demerits of such plans are discussed below to select most suitable plans to be implemented.

(1) Selection of Water Sources for Bacarra, Laoag and Paoay

There are three water sources selected for the served areas of Bacarra and Laoag, as described in the preceding section 5. The intake of riverbed water by infiltration galleries at Bacarra and San Mateo and Nangalisan has been selected for the present study, because (1) the method is an already proved one by the existing water supply system, and (2) the sites selected are similar to or better than the existing ones as indicated by the present site observation and study of geology in the area. Deep wells sunk already in the Laoag area are also a promising water source proved by test pumping. Hence they have been adopted for the present planning.

To confirm the appropriateness of the above selection, factors affecting the selection will be further considered in depth in the following.

1) Deep Wells

The existing deep wells in Laoag will take unconfined groundwater probably to be recharged by the Laoag River, because sediments of the same origin constitute the riverbed and the alluvium where the deep wells have been sunk. It implies that (1) the wells may withdraw in the paddy field water as well, and on the otherhand it means that (2) the deep well is another type of taking riverbed water in this area.

Regarding the first point above, it must be studied in the future what impact will be given to the paddy field by the operation of the wells, and also how the water quality of the wells will change by continued operation. Therefore, the plan to utilize the existing wells is determined from a conservative standpoint, not extending the possibility of groundwater to drilling new wells.

On the second point, the deep wells in this area have similar function to the infiltration gallery, because they take eventually the riverbed water. If this is admitted, similar methods in between the two methods, deep well and infiltration gallery, are conceivable, such as shallow well with a big diameter, or shallow well with radial collector pipes at a location near the river. When an increase of withdrawal quantity is required, all these methods should be studied.

2) Infiltration Gallery

Intake of riverbed water by the infiltration gallery is a widely practiced method. When the riverbed condition as well as the river flow condition is proper for this method, it is recommendable as the existing ones show good performance.

There are other methods for intake of riverbed water which are usually practicable as mentioned in the above item 1), when the intake quantity is within thousands of cu m/day. That the infiltration gallery is adopted for the present feasibility study is because its reliability is made sure from the past experience, and no information on other methods ever used in this region is available at this stage of study.

Considering the availability together with the advantage of riverbed water, further detailed investigations are recommendable, including selection of methods to be adopted.

(2) Siting of Reservoir for Laoag Area

There are three potential sites for reservoirs required to meet the increased water demand in the Laoag area, i.e., 1) the site of the existing Ligao reservoir, 2) the site of the existing Ermita reservoir, and 3) a site near Camp Juan (hereinafter referred to provisionally as Camp Juan hill) which is selected by the present study. The siting of the reservoir governs the future water system of the District. Therefore, the above three sites are carefully compared from various standpoints, as indicated below.

1) Ligao:

Elevation 65 m. Land for future expansion available. Distance to Laoag poblacion 3 km; improvement of the existing reservoir needed.

2) Ermita:

Elevation 30 m, insufficient for supply to the whole poblacion area. Land for future expansion not available. Situated in the poblacion area. Existing reservoir 380 cu m, insufficient for future increased water demand.

3) Camp Juan Hill:

Elevation 35 m, land for future expansion available. Situated in the poblacion area. Presently, no obstacles for reservoir construction existent.

From the above comparison, the last alternative site is most favorable, so it is selected for construction of the reservoir for the present project. And design of transmission pipelines and distribution networks will be made based on this siting.

Regarding the existing reservoirs at Ligao and Ermita, they will be used, after some improvement works, for the local water supply in their vicinities.

6.3 Preliminary Design

Dimensions, capacities, and the structural features of major facilities which are to be improved and/or newly constructed for the water requirement in Phase I and II, in accordance with the design criteria and the results of the alternative plan study in the fore-subsections are described below and shown in Fig 3.6.1 through 3.6.11.

With regard to facilities, to be transfered to the Water District, necessary equipment/works are included in the present project.

6.3.1 Phase I

(1) Dilumot Spring System

a. Replacement of Transmission Pipeline: 150 mm x 2,900 m
(From the Dilumot Spring to a new ground reservoir)

b. Construction of 3 Break-Pressure Chambers: 15 cu m per chamber

c. Construction of Ground Reservoir: 610 cu m

d. Chlorinator: 1 set

e. Bulk Meter: 200 mm x 1 pc, 150 mm x 1 pc

(2) Bacarra Infiltration Gallery System

a. Construction of Intake Pump Station: Turbine pump, 15.8 l/s, H=70 m

b. Installation of Transmission Pipeline: 150 mm x 2,000 m
(From the Bacarra I/G to a new elevated reservoir)

c. Construction of Elevated Reservoir: 230 cu m, L.W.L. +20 m above ground level

d. Roofing of Ligao Reservoir: 1,100 sq m

e. Chlorinator: 2 sets

f. Bulk Meter: 300 mm x 1 pc, 200 mm x 1 pc, 150 mm x 2 pcs

(3) West Riverside Infiltration Gallery System

a. Replacement of Intake Pump: Turbine pump, 23.1 l/s H=30 m

b. Installation of Transmission Pipeline: 150 mm x 1,000 m

c. Construction of Ground Reservoir: 570 cu m

d. Construction of Distribution Pump Station: Turbine pump, 28.9 l/s, H=30 m

e. Construction of Elevated Reservoir: 100 cu m, L.W.L +20 m above ground level

f. Chlorinator: 1 set

g. Bulk Meter: 150 mm x 2 pcs

(4) Ermita Infiltration Gallery System

a. Chlorinator: 1 set

b. Bulk Meter: 150 mm x 2 pcs

(5) Vintar Infiltration Gallery System

a. Installation of Intake Pump: Turbine pump, 13.7 l/s, H=40 m

b. Construction of Ground Reservoir: 130 cu m

c. Chlorinator: 1 set

d. Bulk Meter: 150 mm x 2 pcs

Note: Regarding the pump to be installed in Phase I for Vintar, its capacity is decided to be enough for Phase II capacity. This is due to the result of an economic comparative study which shows installation of a pump enough for Phase II capacity, at Phase I stage, is found more economical than the case that Phase I capacity pump originally to be installed at Phase I stage will be replaced by a bigger capacity pump at Phase II.

(The above consideration is also applied for Nangalisan infiltration gallery system of item (7).)

(6) Laoag Deep Wells System

a. Construction of 5 Deep Well Pump Stations: Submersible pump, 5.8 l/s, 7 kw

b. Installation of Transmission Pipeline: 200 mm x 3,000 m, 150 mm x 1,500 m

c. Construction of Ground Reservoir: 620 cu m

d. Construction of Elevated Reservoir: 100 cu m, L.W.L. +20 m above ground level

e. Construction of Distribution Pump Station: Turbine pump, 31.3 l/s, H=30 m

f. Chlorinator: 5 sets

g. Bulk Meter: 200 mm x 2 pcs, 150 mm x 5 pcs

(7) Nangalisan Infiltration Gallery System

a. Construction of Infiltration Gallery:
   i) Infiltration Gallery: 1,000 mm x 50 m
   ii) Intake Pump Station: Turbine pump, 11.9 l/s, H=60 m

b. Installation of Transmission Pipeline: 200 mm x 20,500 m

c. Construction of Ground Reservoir: 160 cu m

d. Chlorinator: 1 set

e. Bulk Meter: 200 mm x 3 pcs, 150 mm x 1 pcs

(8) Reinforcement of Distribution Pipeline (Unit = Meters)

Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
200 mm	600	-	-	-	-	600
150 mm	3,500	1,000	2,000	1,000	-	7,500
100 mm	2,500	2,000	2,000	2,000	2,500	11,000
50 mm	-	-	-	2,900	2,300	5,200

(9) Valve (Unit = Pieces)

Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
200 mm	4	-	-	-	11	15
150 mm	14	6	8	4	-	32
100 mm	9	7	7	7	9	39
50 mm	-	-	-	10	8	18

(10) Fire Hydrant (Unit = Pieces)

Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
44	20	27	20	17	128

(11) Service Meter (Unit = Pieces)

Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
13 mm	1,746	183	248	578	445	3,200

6.3.2 Phase II

(1) San Mateo Infiltration Gallery System

a. Construction of Infiltration Gallery:
   i. Infiltration gallery: 1,000 mm x 80 m
   ii. Intake pump station: Turbine pump, 16.8 l/s, H = 50 m
b. Installation of Transmission Pipeline: 200 mm x 4,500 m
   (From the pump station to a new ground reservoir)
c. Construction of Ground Reservoir: 490 cu m
d. Construction of Distribution Pump Station: Turbine pump, 21.0 l/s, H = 30 m
e. Chlorinator: 1 set
f. Bulk Meter: 200 mm x 2 pcs

(2) Bacarra Infiltration Gallery II System

a. Construction of Infiltration Gallery:
   i. Infiltration gallery: 1,000 mm x 110 m
   ii. Intake pump station: Turbine pump, 25.3 l/s, H = 50 m
b. Installation of Transmission Pipeline: 200 mm x 1,500 m
   (From the pump station to a new ground reservoir)
c. Construction of Ground Reservoir: 500 cu m
d. Chlorinator: 1 set
e. Bulk Meter: 200 mm x 2 pcs

(3) Vintar Infiltration Gallery System

a. Construction of Ground Reservoir: 130 cu m

(4) Bacarra Infiltration Gallery System

a. Construction of Intake Pump Station: Turbine pump, 7.6 l/s, H = 70 m
b. Chlorinator: 1 set
c. Bulk Meter: 150 mm x 1 pc

(5) Nangalisan Infiltration Gallery System

a. Construction of Infiltration Gallery:
   i. Infiltration Gallery: 1,000 mm x 30 m
   ii. Intake Pump Station: Turbine pump, 6.4 l/s, H = 35 m

b. Installation of Transmission Pipeline: 150 mm x 1,000 m
c. Construction of Elevated Reservoir: 190 cu m, L.W.L. + 20 m above ground level
d. Construction of Ground Reservoir: 90 cu m
e. Chlorinator: 1 set
f. Bulk Meter: 150 mm x 3 pcs

(6) Reinforcement and Expansion of Distribution Pipeline (Unit = Meters)

Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
200 mm	-	5,500	1,500	-	-	7,000
150 mm	4,700	1,000	2,000	1,000	1,000	9,700
100 mm	10,400	5,000	8,500	1,000	2,000	26,900
75 mm	9,000	13,700	7,800	3,500	7,000	41,000
50 mm	33,200	8,100	12,600	4,600	3,900	62,400

(7) Valve (Unit = Pieces)

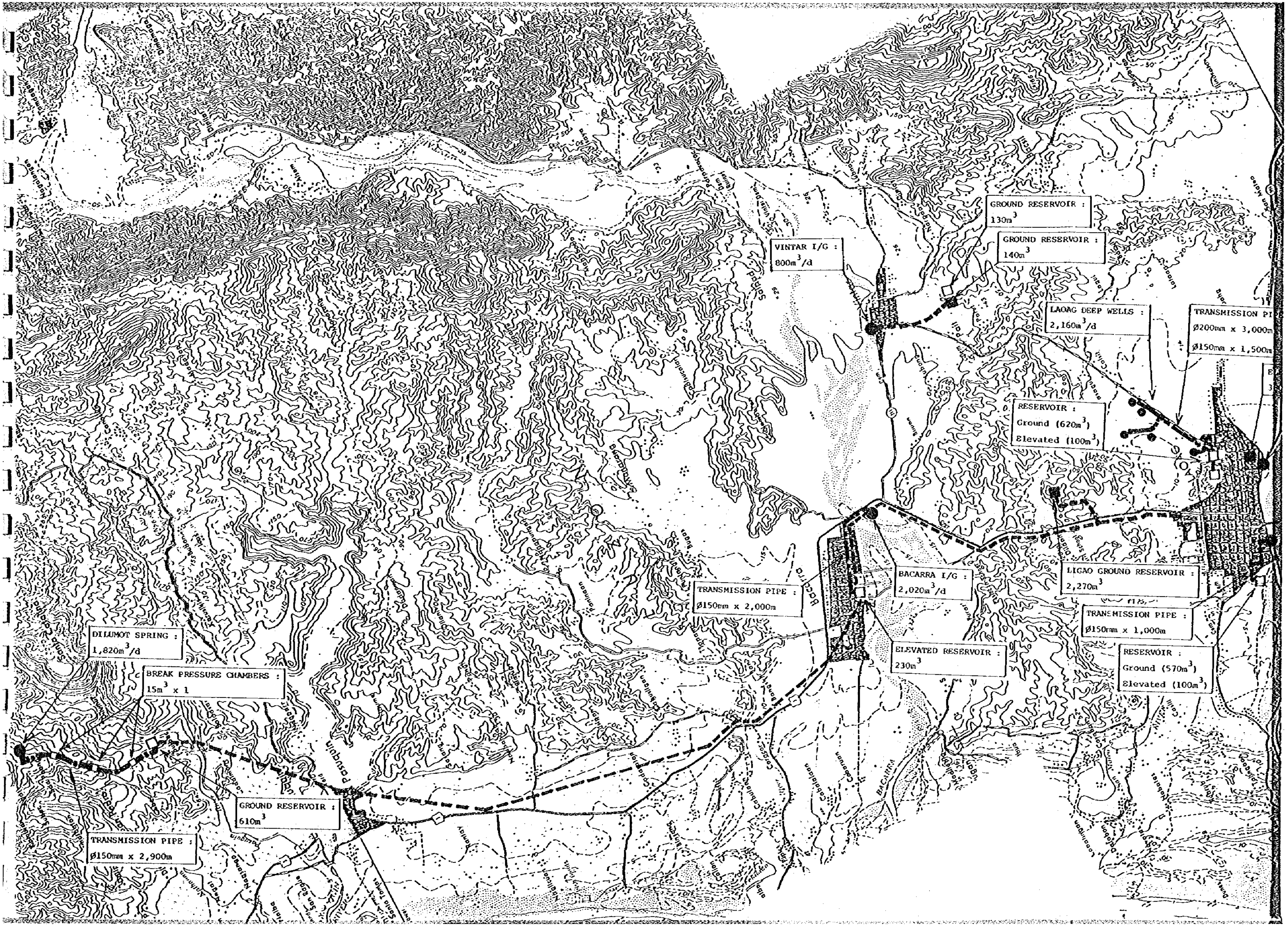
Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
200 mm	6	19	6	-	-	31
150 mm	16	4	7	4	4	35
100 mm	35	17	29	4	7	92
75 mm	30	46	26	12	24	138
50 mm	111	27	42	16	13	209

(8) Fire Hydrant (Unit = Pieces)

Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
101	77	80	14	20	292

(9) Service Meter (Unit = Pieces)

Dia	Laoag	Pasuquin	Bacarra	Vintar	Paoay	Total
13 mm	5,181	954	1,639	684	538	8,996



GROUND RESERVOIR : 130m^3
GROUND RESERVOIR : 140m^3
VINTAR I/G : 800m^3/d
LAOAG DEEP WELLS : 2,160m^3/d
TRANSMISSION PI
Ø200mm x 3,000m
Ø150mm x 1,500m
RESERVOIR : Ground (620m^3) Elevated (100m^3)
TRANSMISSION PIPE : Ø150mm x 2,000m
BACARRA I/G : 2,020m^3/d
LIGAO GROUND RESERVOIR : 2,270m^3
TRANSMISSION PIPE : Ø150mm x 1,000m
ELEVATED RESERVOIR : 230m^3
RESERVOIR : Ground (570m^3) Elevated (100m^3)
DILUMOT SPRING : 1,820m^3/d
BREAK PRESSURE CHAMBERS : 15m^3 x 1
GROUND RESERVOIR : 610m^3
TRANSMISSION PIPE : Ø150mm x 2,900m
BACARRA

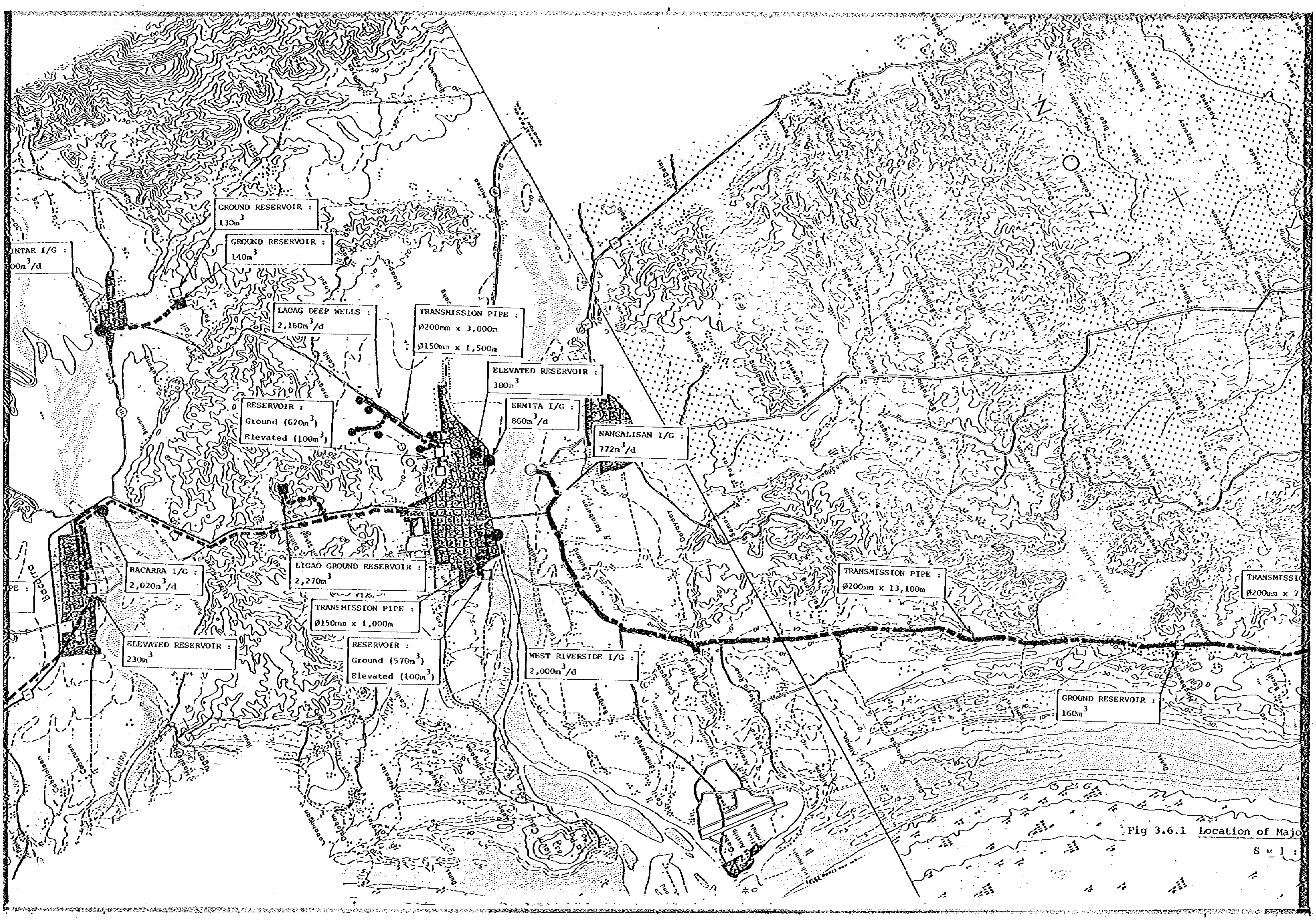


Fig 3.6.1 Location of Majo

S = 1 :

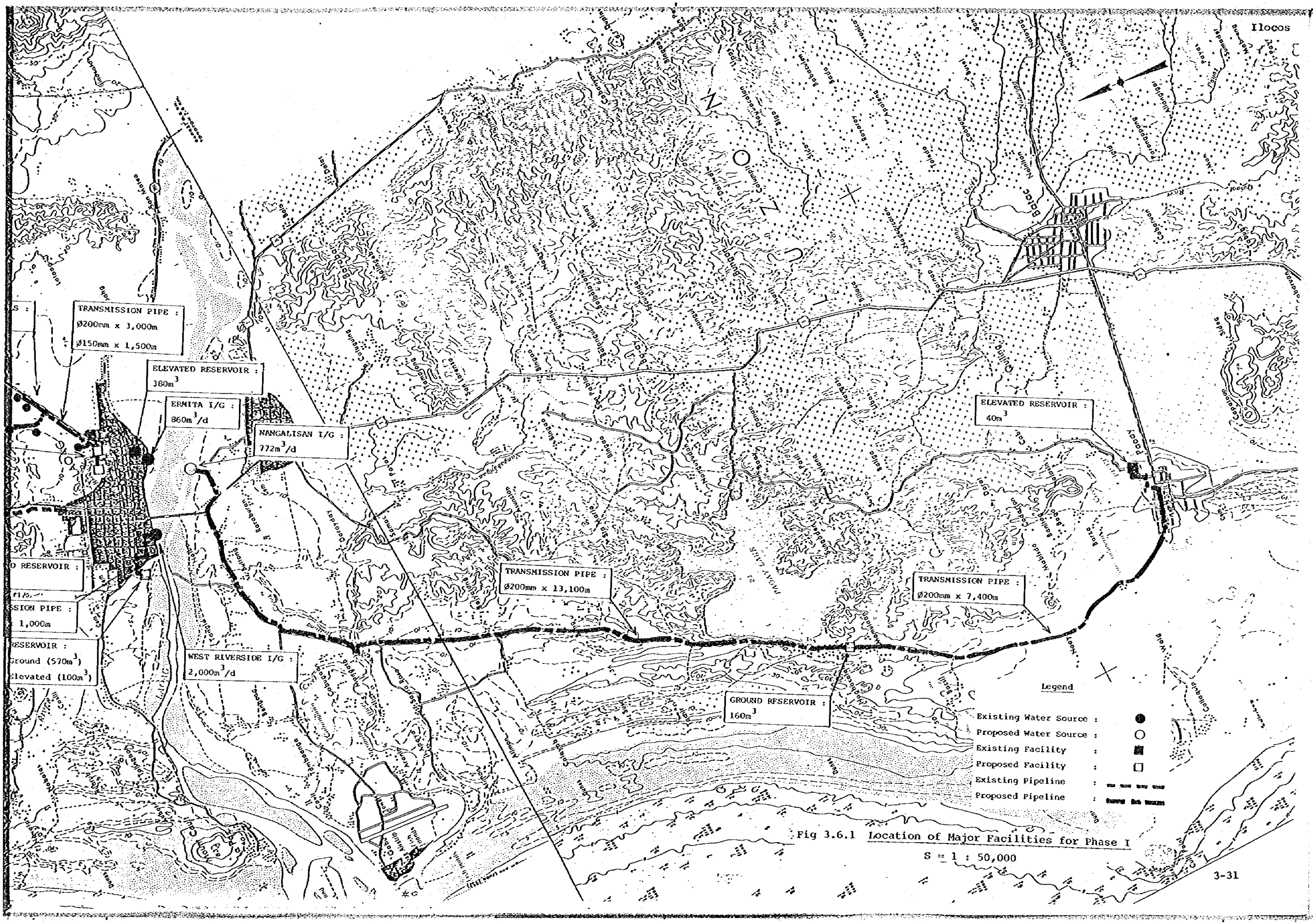


Fig 3.6.1 Location of Major Facilities for Phase I

S = 1 : 50,000

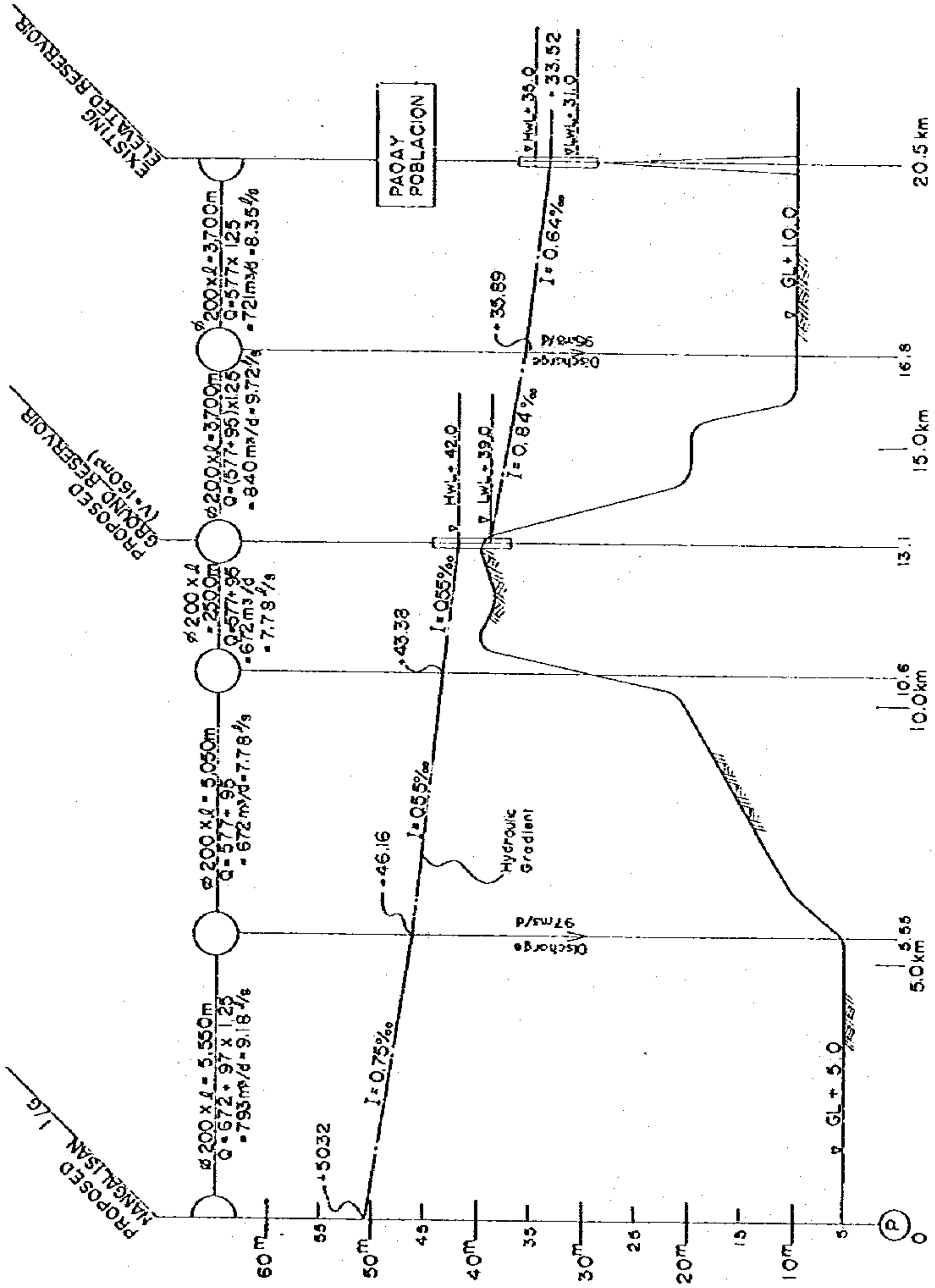


Fig 3.6.2 **Profile of Transmission Pipeline in Paoay System**

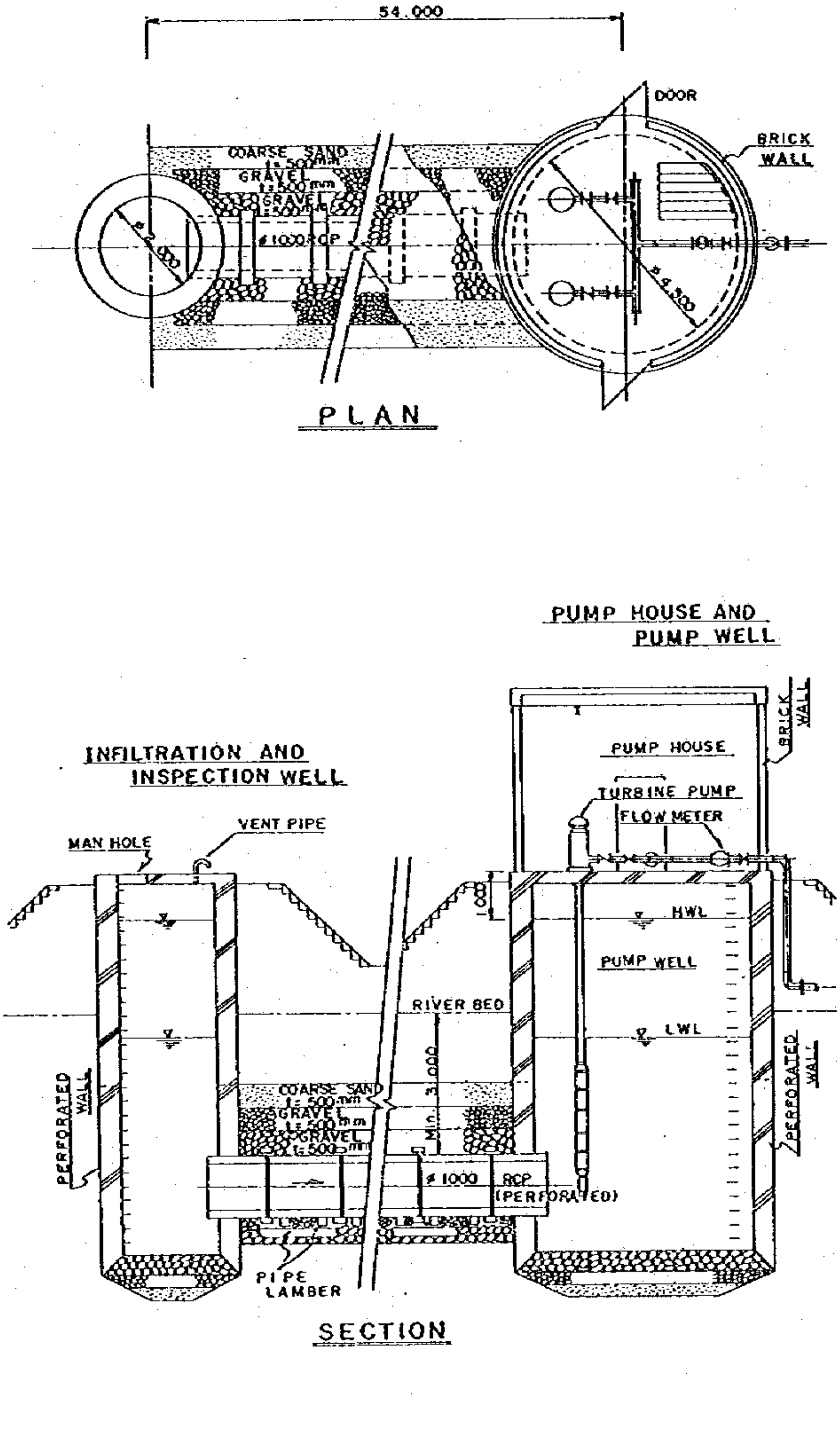


Fig 3.6.3 Typical Drawing of Infiltration Gallery

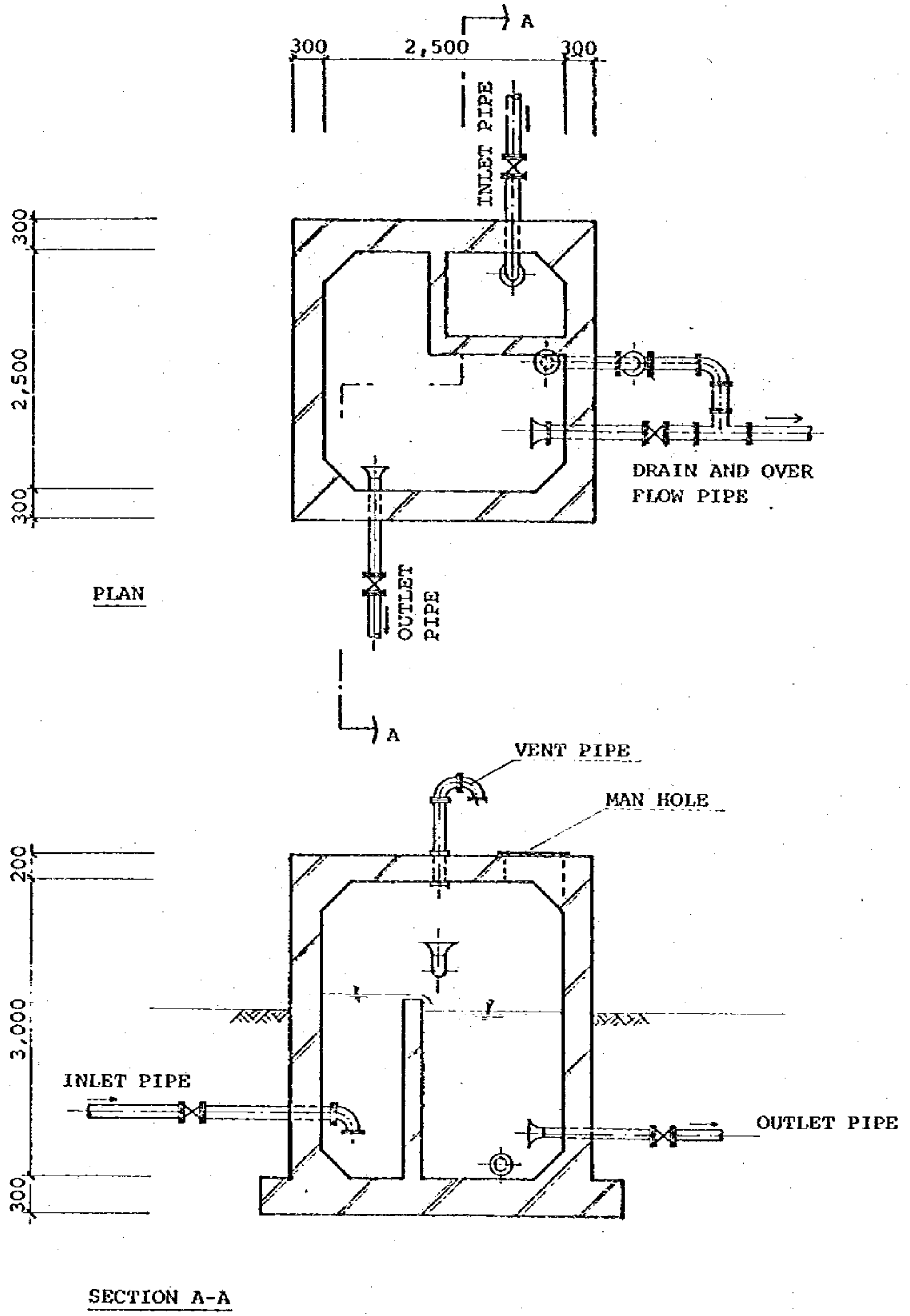
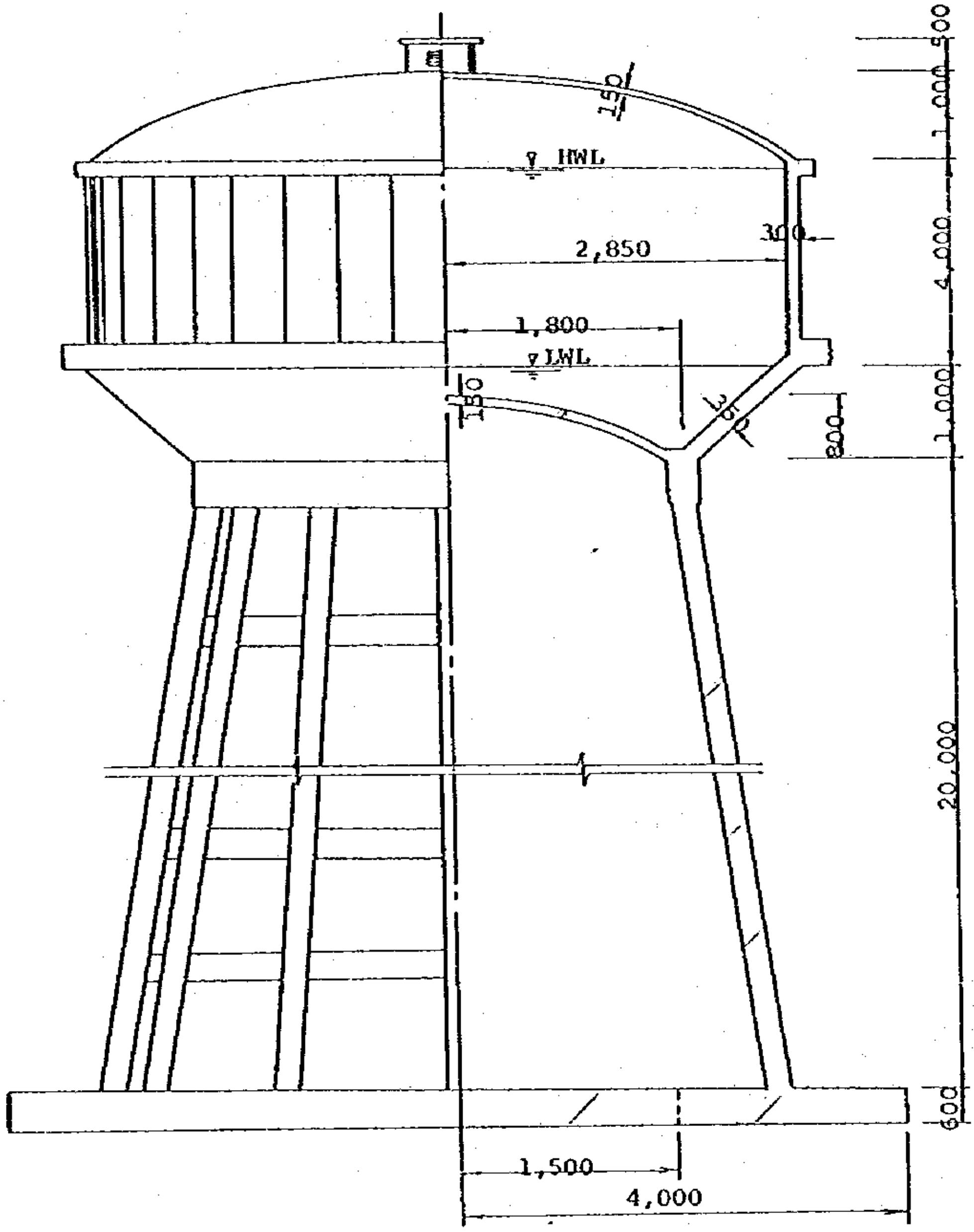


Fig 3.6.4 Break-Pressure Chamber
(V =15 m^3)



(Unit : mm)

Fig 3.6.5 Typical Drawing of Elevated Reservoir
(V = 100 m^3)

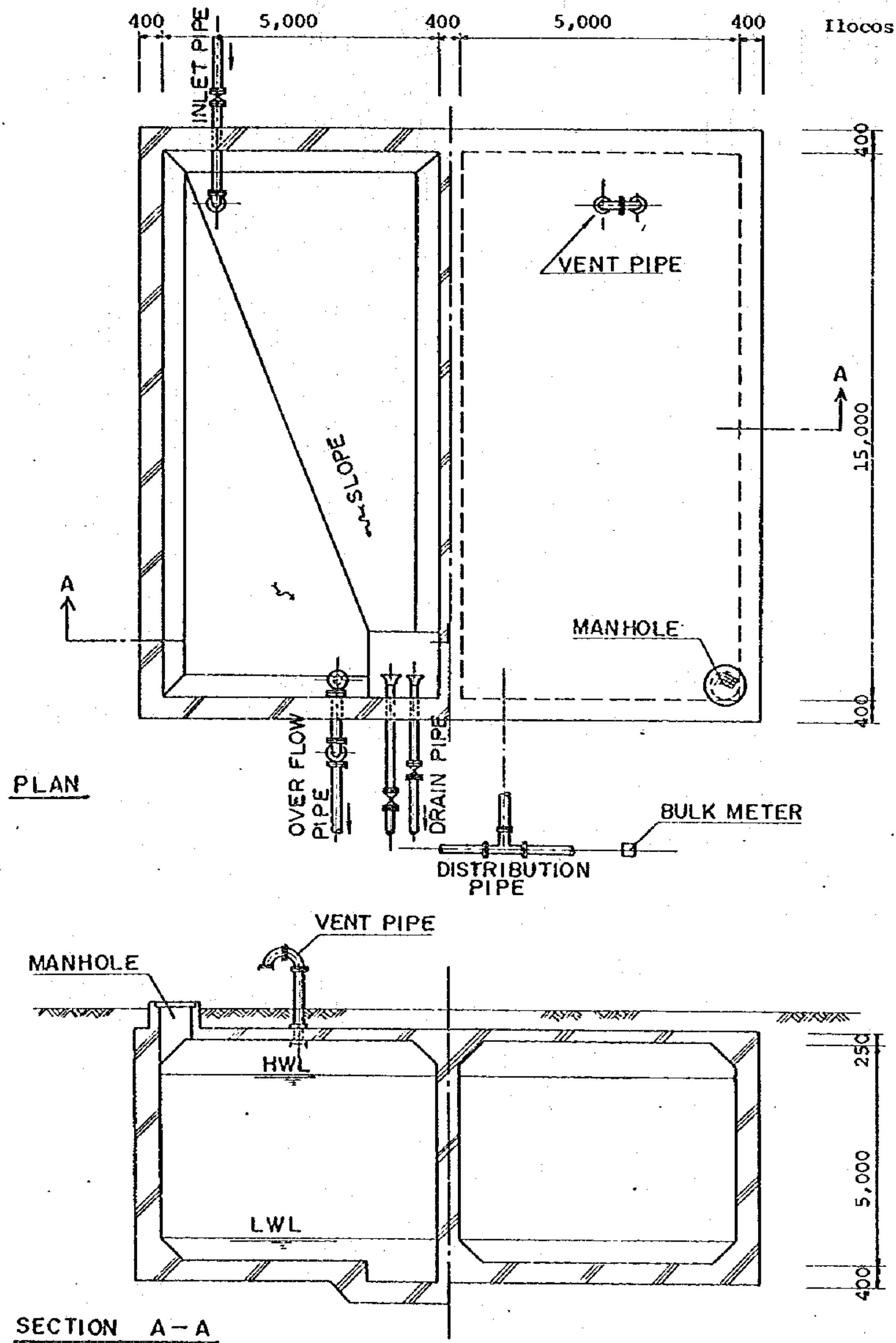


Fig 3.6.6 Typical Drawing of Ground Reservoir
($V = 610\ m^3$)

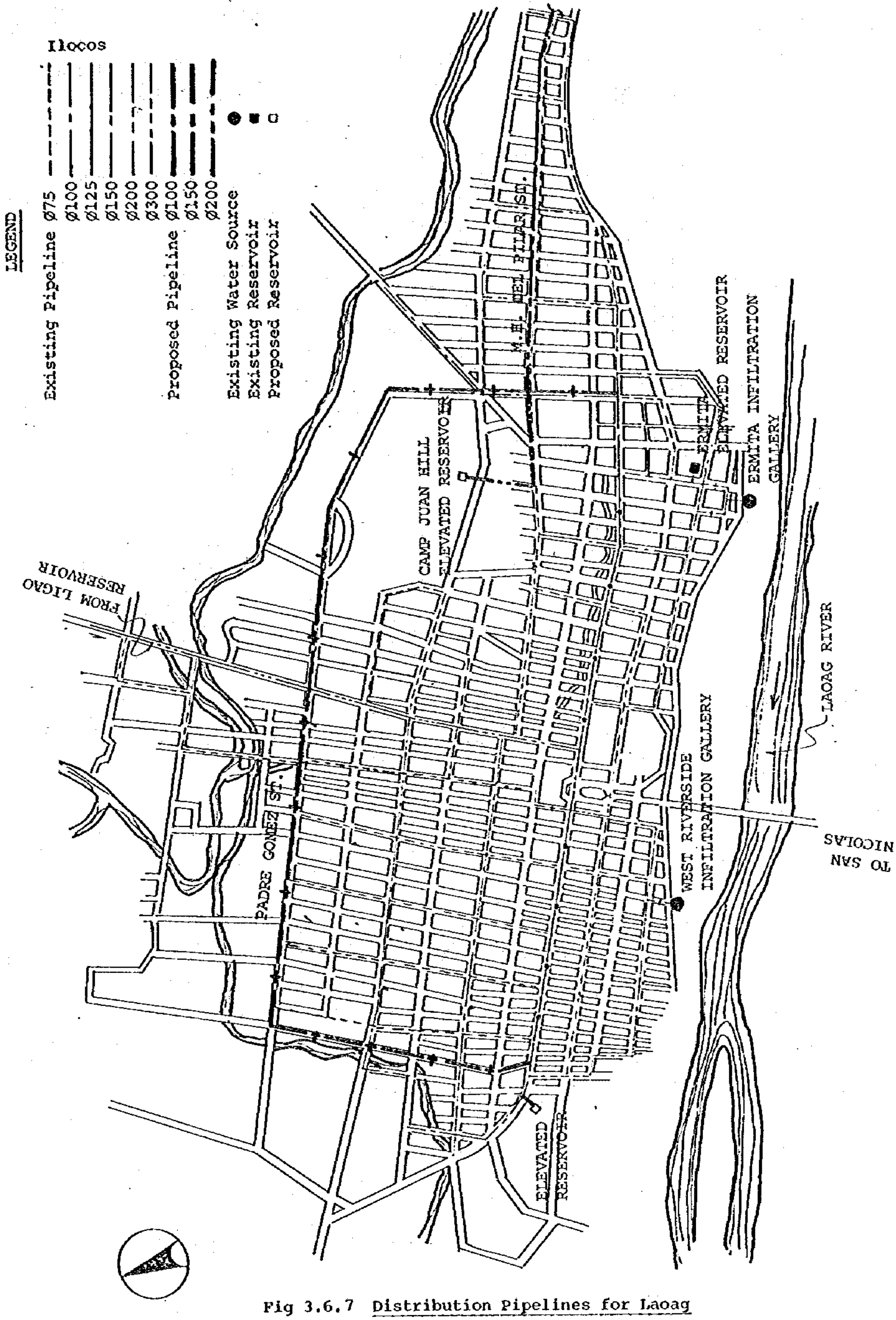


Fig 3.6.7 Distribution Pipelines for Laoag

LEGEND

Existing Pipeline Ø75
Proposed Pipeline Ø100
Ø150

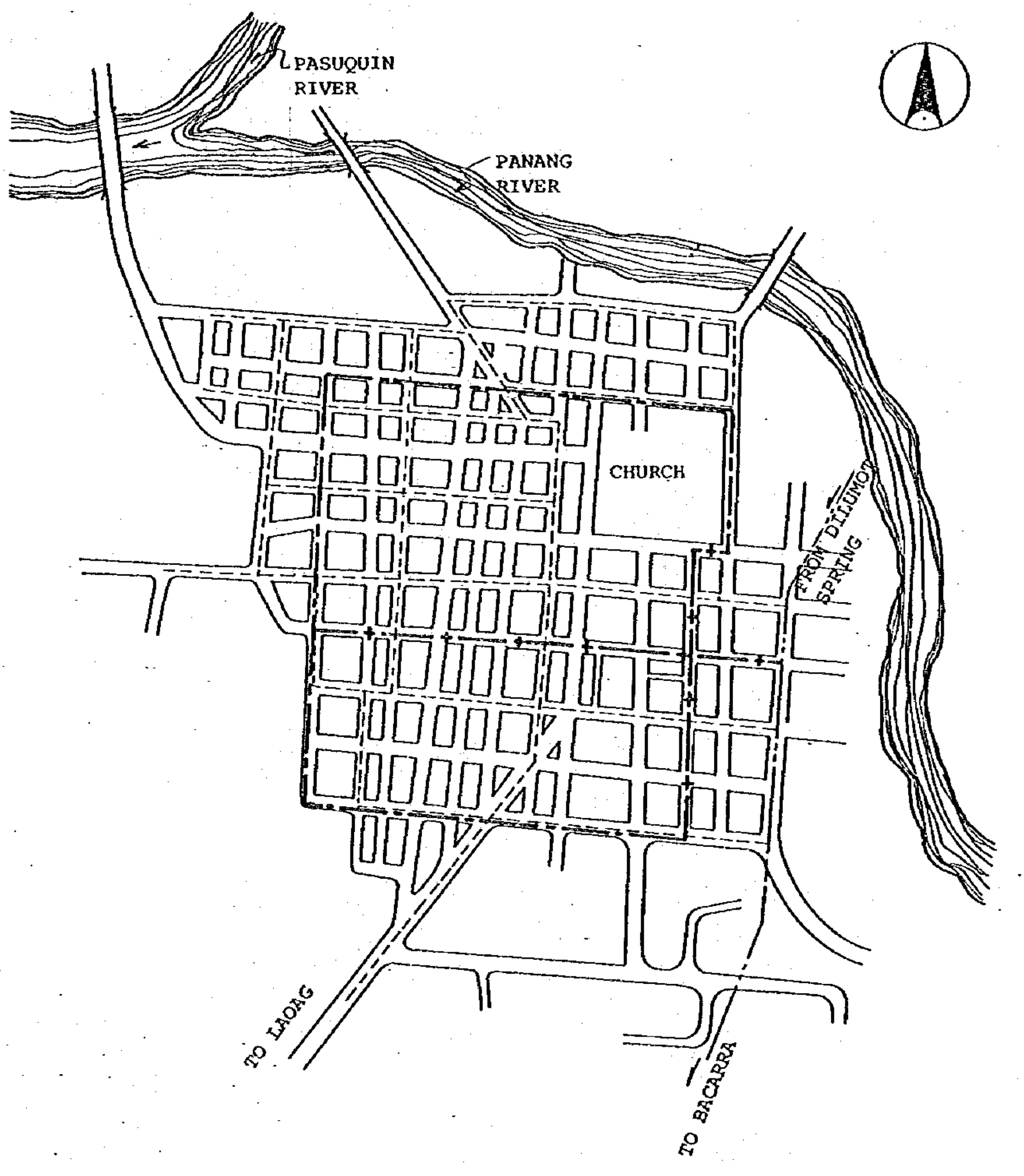


Fig 3.6.8 Distribution Pipelines for Pasuquin

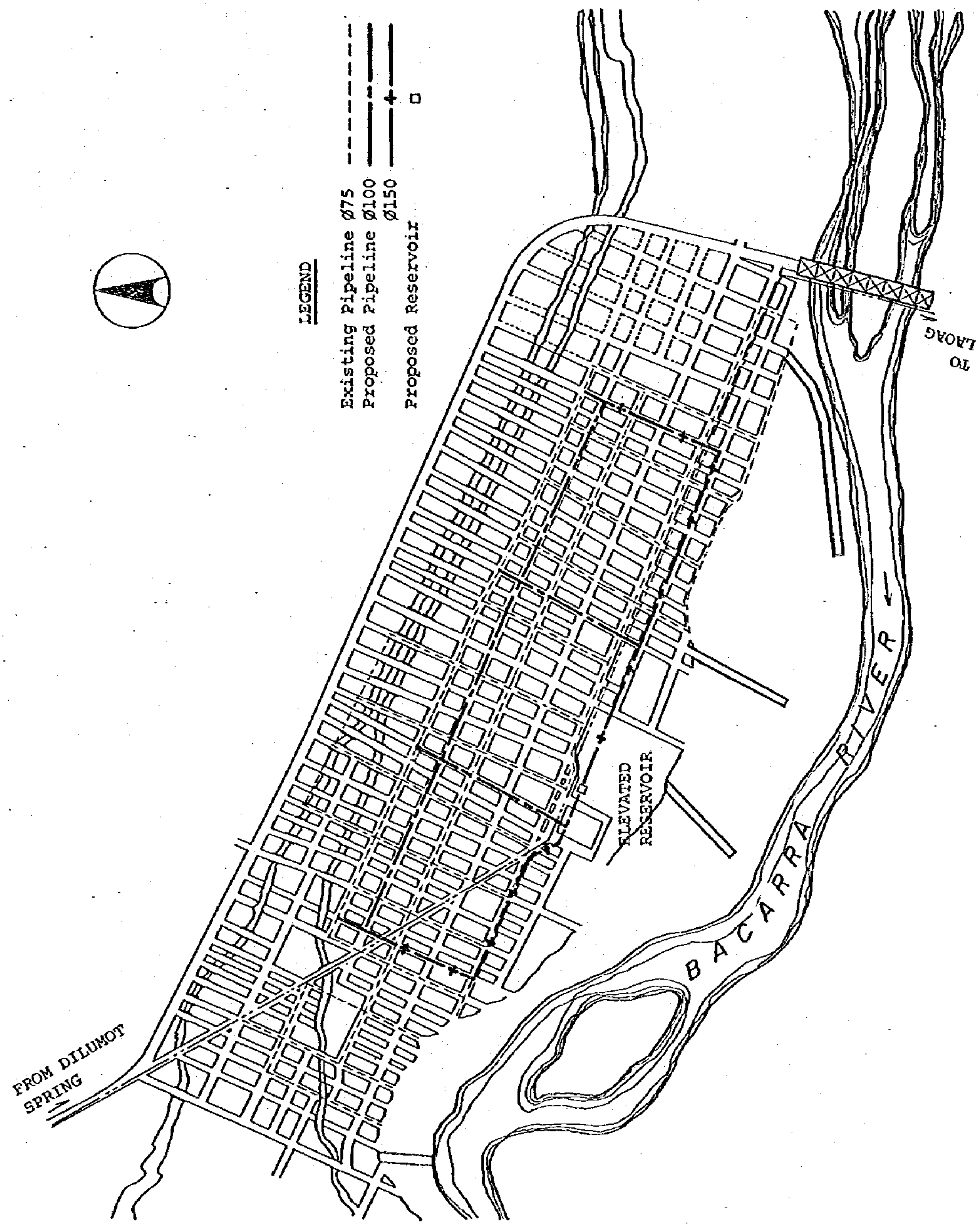


Fig 3.6.9 Distribution Pipelines for Bacarra

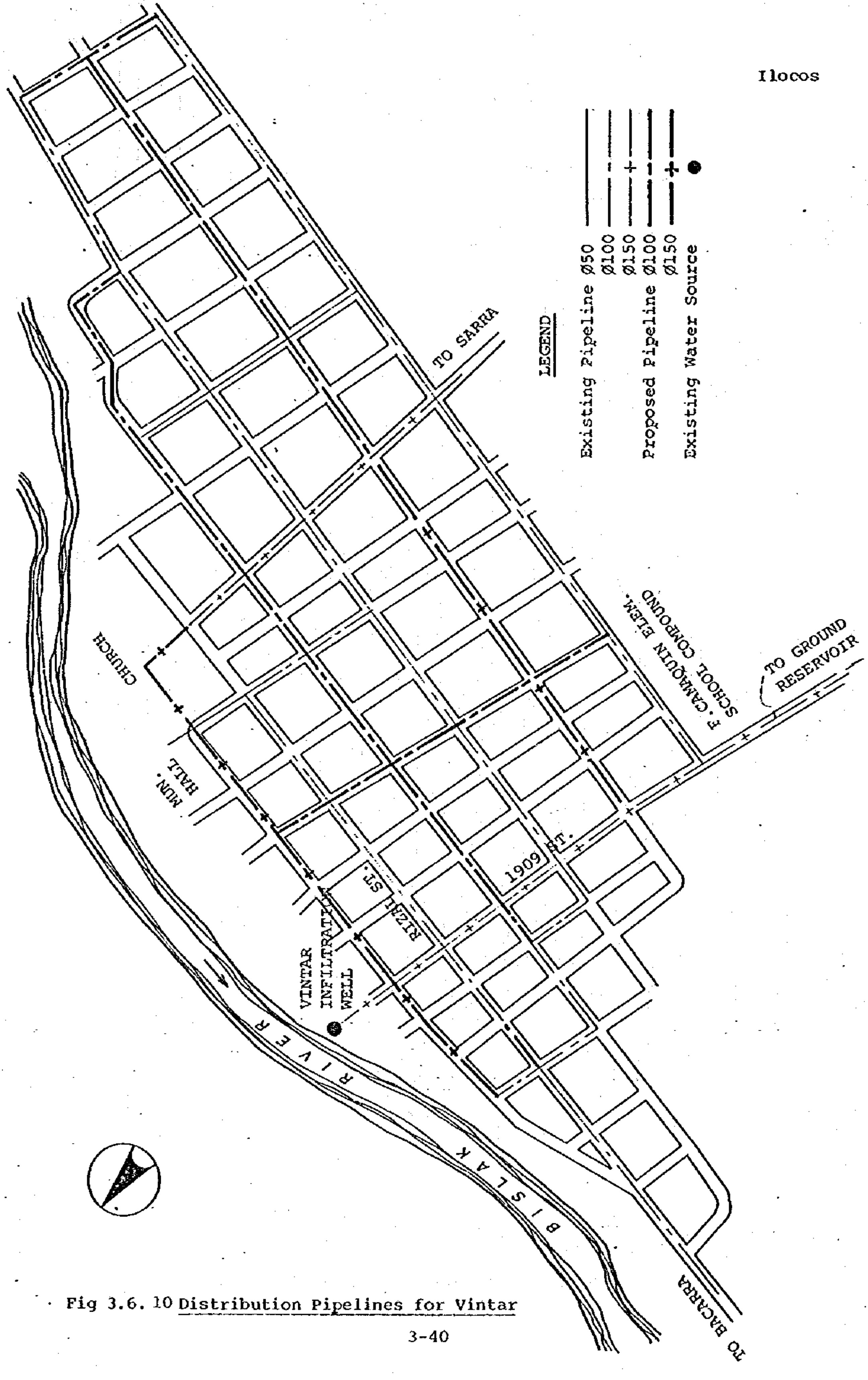


Fig 3.6. 10 Distribution Pipelines for Vintar

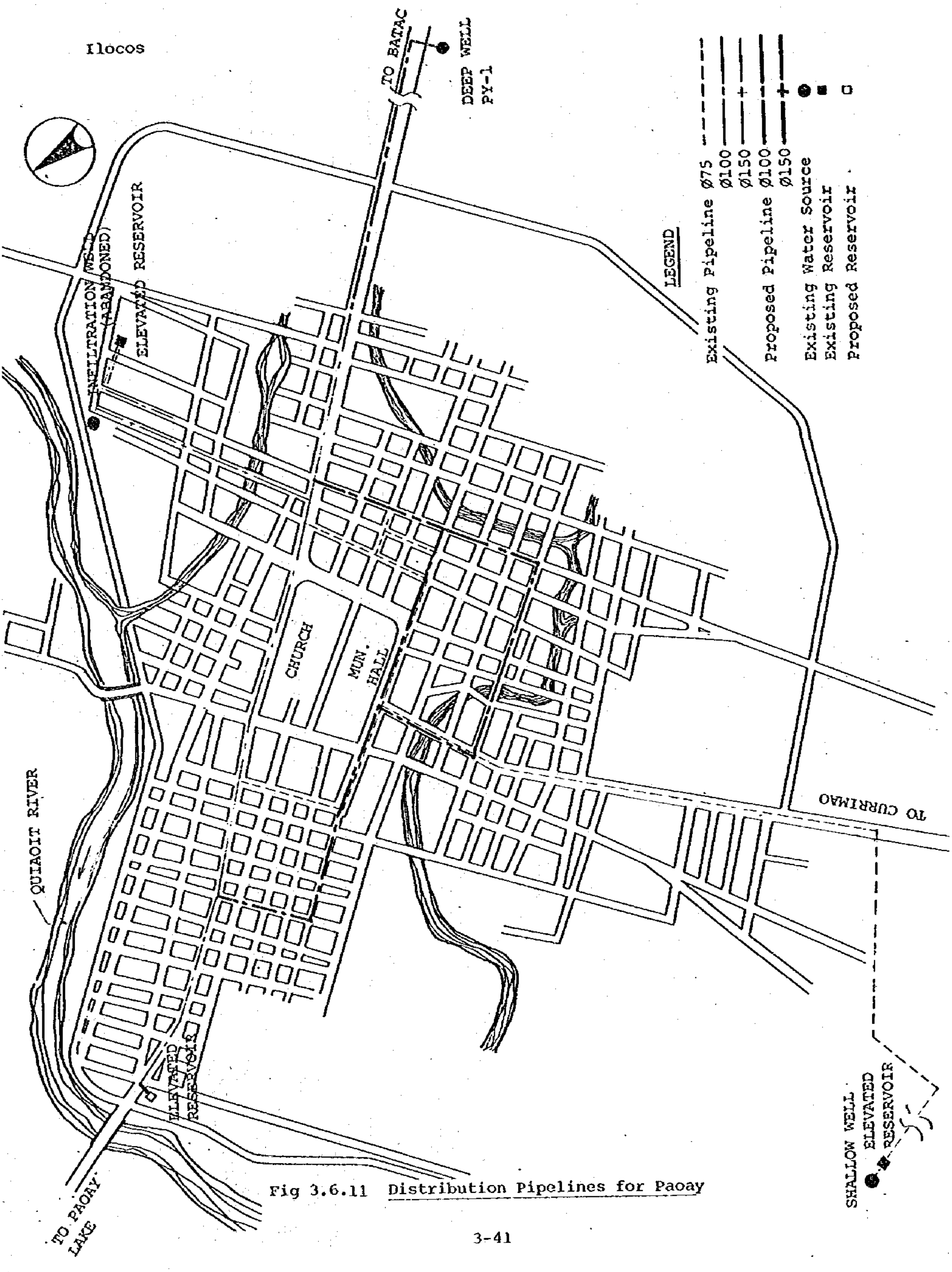


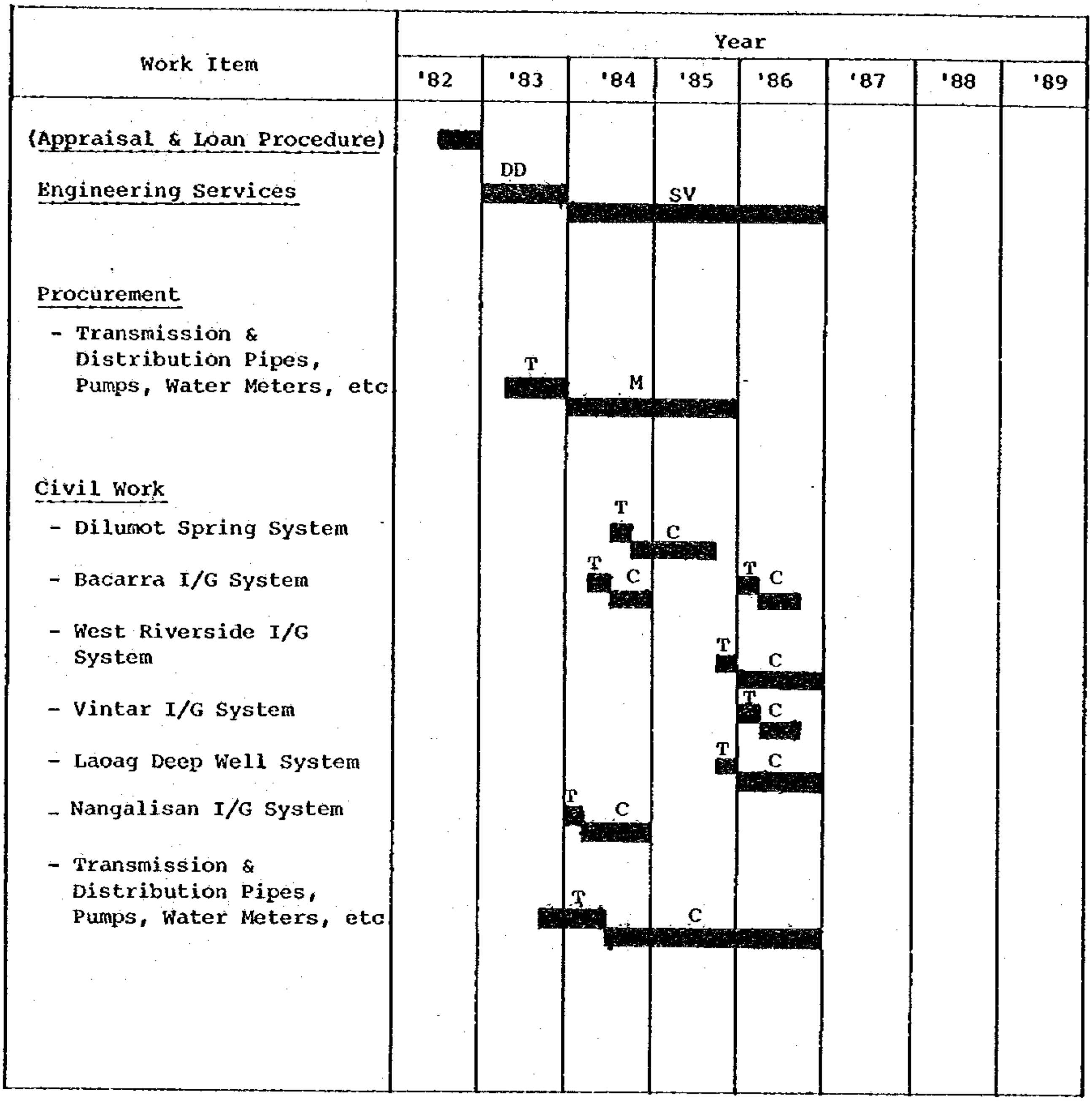
Fig 3.6.11 Distribution Pipelines for Paoay

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
(Target year: 1987)



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	6	6	7	7	8	8
Technical Staff	11	14	15	16	18	22
Commercial Staff	9	9	11	14	15	16
- Meter readers, bill collectors and inspectors	(5)	(5)	(6)	(8)	(8)	(9)
- Other employees	(4)	(4)	(5)	(6)	(7)	(7)
Total Staff	27	30	34	38	42	47
Number of Service Connections	3,388	3,423	3,935	4,663	5,419	6,366

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 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 procures and manuals needed for construction and operation of the water supply system of the water districts, and in addition keeps staff to supervise and guide works of the districts in the field. In case external technical resources are required to assist the water districts, local and foreign consultants are available, and have been widely used for similar works.

9.1 Construction Method

Ilocos Norte is well provided with local and international transportation facilities. A highway, all paved, runs from the Capital to the project area. A seaport, which is located close to the area, is open to international and local transportation of goods. And within the project area, paved roads serve for all local transportation. With regard to transportation, therefore, the project will have no inconvenience.

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 and well drillers, 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 prequalification 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, 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 lending 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 9.

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 for Phase I

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

Work Items	Cost		
	Total Cost	Foreign Currency Component	Local Currency Component
A. Dilumot Spring System	2,258	1,069	1,189
B. Bacarra I/G System	2,520	1,159	1,361
C. West Riverside I/G System	2,388	1,064	1,324
D. Vintar I/G System	502	252	250
E. Laoag Deep Wells System	5,389	2,882	2,507
F. Nangalisan I/G System	8,950	5,737	3,213
G. Distribution Pipe	4,693	3,145	1,548
H. Valve	386	282	104
I. Fire Hydrant	858	566	292
J. Bulk Meter	185	148	37
K. Chlorinator	120	108	12
L. Service Meter	2,080	1,602	478
M. Stored Material	305	238	67
N. Vehicle	140	70	70
Sub Total	30,774	18,322	12,452
Detailed Design Cost (10.5%)	3,231	1,939	1,292
Supervision Cost (3.5 %)	1,077	646	431
Land Cost	200	-	200
Total	35,282	20,907	14,375
Physical Contingency (10 %)	3,529	2,091	1,438
Total	38,811	22,998	15,813
Price Contingency	25,541	14,603	10,938
Grand Total (Project Cost)	64,352	37,601	26,751
	(Equivalent to US$8.25 M)	(Equivalent to US$4.82 M)	(Equivalent to US$3.43 M)

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. Dilumot Spring System															
a) Transmission Pipe (ø150 mm x 2,900 m)	1,200	804	396			536	264	268	132						
b) Break Pressure Chamber (15 m^3 x 3)	232	58	174			39	116	19	58						
c) Ground Reservoir (610 m^3 x 1)	826	207	619					207	619						
B. Bacarra I/G System															
a) Intake Pump Station (15.8 ℓ/s, H = 70 m)	522	313	209			313	209								
b) Transmission Pipe (ø150 mm x 2,000 m)	825	553	272			553	272								
c) Elevated Reservoir (230 m^3 x 1)	980	245	735							245	735				
d) Roofing of Ligao (1,100 m^2)	193	48	145			48	145								
C. West Riverside I/G System															
a) Intake Pump (23.1 ℓ/s, H = 30 m)	243	219	24			219	24								
b) Transmission Pipe (ø150 mm x 1,000 m)	275	184	91							184	91				
c) Ground Reservoir (570 m^3 x 1)	791	198	593							198	593				
d) Distribution Pump Station (28.9 ℓ/s, H = 30 m)	554	332	222							332	222				
e) Elevated Reservoir (100 m^3 x 1)	525	131	394							131	394				
D. Vintar I/G System															
a) Intake Pump (13.7 ℓ/s, H = 40 m)	194	175	19			175	19								

(to be continued)

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

(Thousand Pesos)

Description	Cost			Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988	
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
b) Ground Reservoir (130 m³ x 1)	308	77	231							77	231				
E. Laoag Deep Wells System															
a) Deep Well Pump Station (5.8 ℓ/s, 7 kw, 5 units)	1,075	602	473					361	284	241	189				
b) Transmission Pipe (ø200 mm x 3,000 m)	1,755	1,176	579					784	386	392	193				
(ø150 mm x 1,500 m)	619	415	204					208	102	207	102				
c) Ground Reservoir (620 m³ x 1)	834	209	625							209	625				
d) Distribution Pump Station (31.3 ℓ/s, H = 30 m)	581	349	232							349	232				
e) Elevated Reservoir (100 m³ x 1)	525	131	394							131	394				
F. Nangalisan I/G System															
a) Infiltration Gallery (ø1,000 mm x 50 m)	200	50	150			50	150								
b) Intake Pump Station (11.9 ℓ/s, H = 60 m)	404	242	162			242	162								
c) Transmission Pipe (ø200 mm x 20,500 m)	7,995	5,357	2,638					5,357	2,638						
d) Ground Reservoir (160 m³ x 1)	351	88	263			88	263								
G. Distribution Pipe															
a) ø200 mm x 600 m	234	157	77			79	39	78	38						
b) ø150 mm x 7,500 m	2,063	1,382	681			691	341	691	204		136				
c) ø100 mm x 11,000 m	1,980	1,327	653			664	327	663	196		130				
d) ø 50 mm x 5,200 m	416	279	137			279	69		41		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
H. Valve															
a) ø200 mm x 15 pcs	92	67	25			34	13	33	12						
b) ø150 mm x 32 pcs	136	99	37			50	19	49	11		7				
c) ø100 mm x 39 pcs	131	96	35			48	18	48	11		6				
d) ø 50 mm x 18 pcs	27	20	7			20	4		2		1				
I. Fire Hydrant (128 pcs)	858	566	292			283	146	283	88		58				
J. Bulk Meter															
a) ø300 mm x 1 pc	10	8	2			8	2								
b) ø200 mm x 7 pcs	70	56	14			56	14								
c) ø150 mm x 15 pcs	105	84	21			84	21								
K. Chlorinator (12 units)	120	108	12			108	12								
L. Service Meter (ø13 mm x 3,200 pcs)	2,080	1,602	478			1,602	239		143		96				
M. Stored Material	305	238	67			238	67								
N. Vehicle (2 cars)	140	70	70			70	70								
Sub-Total	30,774	18,322	12,452			6,577	3,025	9,049	4,965	2,696	4,462				
Detailed Design Cost (10.5%)	3,231	1,939	1,292	1,939	1,292										
Supervision Cost (3.5%)	1,077	646	431			258	172	194	130	194	129				
Land Cost	200		200				100		100						
Total	35,282	20,907	14,375	1,939	1,292	6,835	3,297	9,243	5,195	2,890	4,591				
Physical Contingency (10%)	3,529	2,091	1,438	194	129	684	330	924	520	289	459				
Total	38,811	22,998	15,813	2,133	1,421	7,519	3,627	10,167	5,715	3,179	5,050				
Price Contingency	25,541	14,603	10,938	683	455	3,910	1,886	7,117	4,001	2,893	4,596				
Grand Total (Project Cost)	64,352	37,601	26,751	2,816	1,876	11,429	5,513	17,284	9,716	6,072	9,646				

Ilocos

11. Organization, Operation and Management Plan

Success of the project depends largely on how efficiently to operate the complete 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 existing organization of Metropolitan Waterworks System is fairly well organized and sufficiently staffed. However, the performance of the organization is not necessarily satisfactory. The main cause for this is considered that maintenance works, which are generally to be carried out by a technical division, are not well performed, and further the cause for this is considered to be insufficient, funding for such works. Therefore, it is proposed to reinforce the present "Planning, Programming, Construction and Maintenance" division, as shown in Fig 3.11.1 together with budhetary reinforcement for the works.

(2) Operation

In view of the past experience in operation of the water supply facilities and also taking into consideration the characteristics of the water supply system, the followings are of primary importance to achieve most efficient operation of the water supply system.

1) Leak Repair

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) Full Use of Spring Water

Cheapest water in terms of operating cost is spring water. To realize full use of the spring water, the present project is to provide a regulating reservoir. When with the reservoir any surplus of the spring system is found available, such surplus should be distributed to the adjoining served area by regulating the valve on the connection pipeline, which results in reduction of pump operating hours.

3) Operating Hours of Pumps

Operating hours of all pumps, of wells and infiltration galleries, should be determined based on water requirement. As the present project is to provide all necessary bulk meters, the amount of water requirement can be firmly determined. On the other hand, variation of water level in the reservoirs also will be obtained. Operating hours of pumps can be decided based on the above two factors.

4) Ermita Infiltration Gallery

If the actual water requirement is found to be lower than projected, intake at the Ermita gallery should be reduced as far as practicable. For the water produced by this gallery has very poor water quality, and if chlorination should cease by any reason, contaminated water may happen to be distributed to the served area.

(3) Management

When the present Waterworks System is reformed to a water district, the management aspects of the water supply will undergo the following: 1) the District 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.
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.

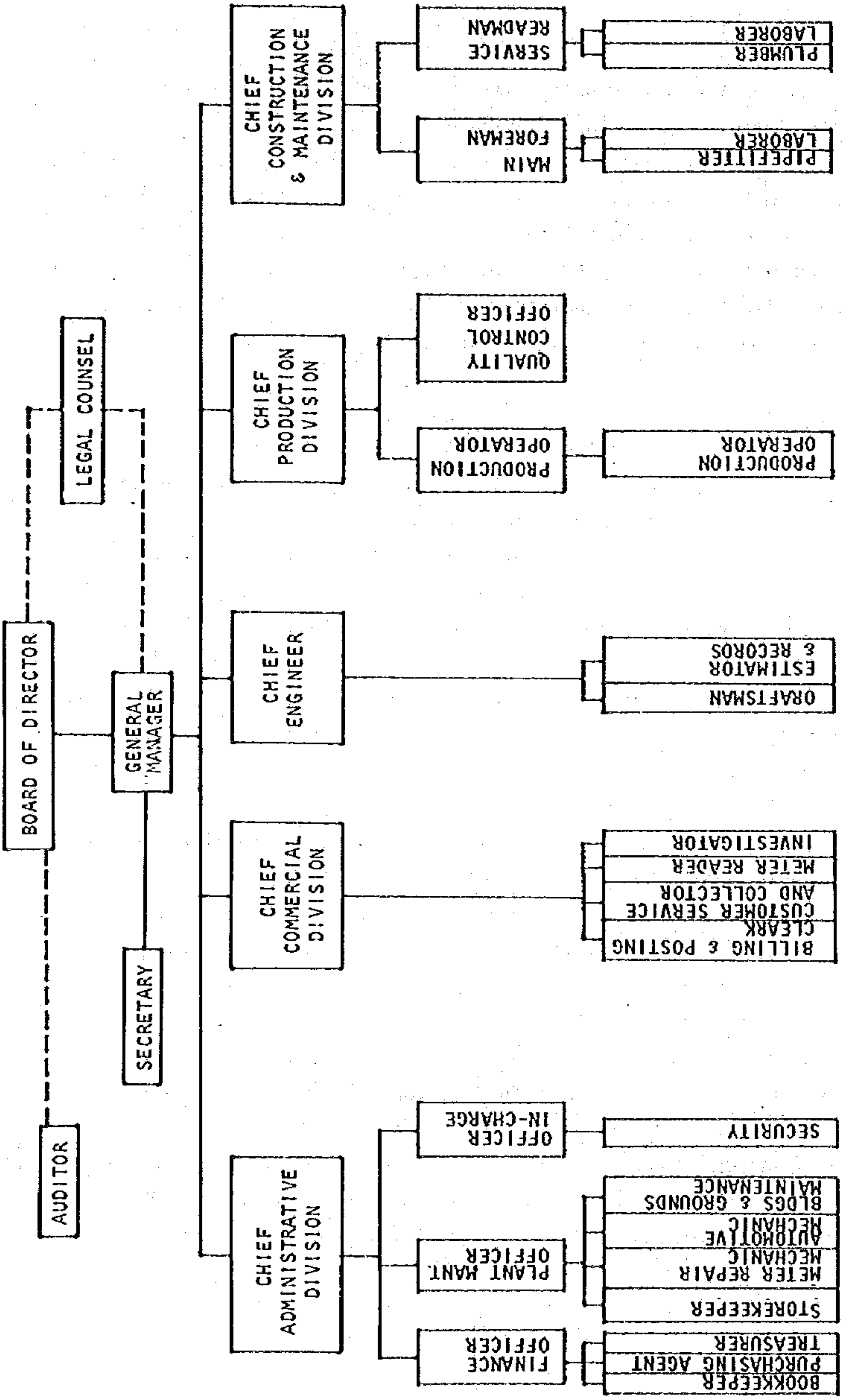


Fig 3.11.1 Proposed Organization Chart

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 LWUA, 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 controlled 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 four year period (construction period) of grace on principal payment, and twenty-six 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 and Asian Development Bank, though the effect of such borrowing will not direct 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 recommended master plan 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 recommended master plan program is that the revenue unit costs at 1981 constant prices of production toward the target year period, will be significantly lower than at present.

13. Economic Feasibility Analysis

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 44,125 which is a gain of 177% over the present served population. And the served area will increase from 1,280 hectares to 2,701 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 includes 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) benefical 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 Ilocos Norte Water Supply System were estimated to be equal to 20 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: 13 %
2) Based on Cost Value with Conversion A: 12 %
3) Based on Cost Value with Conversion B: 14 %
4) Based on Cost Value with Conversion C: 11 %

FINANCIAL TABLE 1

I

Ilocos Norte 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. Vehicles	140		140				
2. Chlorinator	120		120				
3. Stored Materials	305		305				
4. Wells & Pumps	3,573		1,363	645	1,565		
5. Meters	185		185				
6. Distribution System	4,693		2,489	1,911	293		
7. Transmission System	12,669		1,629	9,875	1,169		
8. Fire Hydrants	858		429	371	58		
9. Elevated Reservoir	2,030				2,030		
10. Ground Reservoir	3,110		351	826	1,933		
11. Valves	386		206	166	14		
12. I/G & Roofing of Ligao	393		393				
13. Break Pr. Chamber	232		155	77			
14. Service Connection	2,080		1,841	143	96		
15. Engineering	3,231	3,231					
16. Supervision	1,077		430	324	323		
17. Land	200		100	100			
18. Physical Contingency	3,529	323	1,014	1,444	748		
TOTAL, 7-1-81	38,811	3,554	11,146	15,882	8,229		
ESCALATION FACTORS		1.3225	1.5209	1.7034	1.9078		
ESCALATED COSTS	64,352	4,692	16,942	27,000	15,718		

FINANCIAL TABLE 2

ILOCOS NORTE 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	209	76	261	546	1.000000	546
1982	209	80	292	581	1.150000	668
1983	212	92	314	618	1.322500	817
1984	253	97	382	732	1.520875	1,113
1985	309	111	495	915	1.703380	1,559
1986	368	124	625	1,117	1.907785	2,131
1987	429	133	824	1,386	2.136719	2,962
1988	429	133	824	1,386	2.680301	3,715
1989	429	133	824	1,386	2.680301	3,715
1990	429	133	824	1,386	2.948331	4,086
1991	429	133	824	1,386	3.243164	4,495
1992	429	133	824	1,386	3.567480	4,945
1993	429	133	824	1,386	3.924228	5,439
1994	429	133	824	1,386	4.316651	5,983
1995	429	133	824	1,386	4.748316	6,581
1996	429	133	824	1,386	5.223148	7,239
1997	429	133	824	1,386	5.745463	7,963
1998	429	133	824	1,386	6.320009	8,760

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

ILOCOS NORTE 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		4,692		4,692	211			211
1984		16,942	4,692	21,634	762	422		1,184
1985		27,000	21,634	48,634	1,215	1,946		3,161
1986		15,718	48,634	64,352	707	4,376		5,083
1987			64,352	64,172		5,786	180	5,966
1988			64,172	63,342		5,756	830	6,586
1989			63,342	62,474		5,659	868	7,257
1990			62,474	60,002		5,477	2,472	7,949
1991			60,002	57,530		5,255	2,472	7,728
1992			57,530	55,058		5,033	2,472	7,505
1993			55,058	52,586		4,810	2,472	7,282
1994			52,586	50,114		4,586	2,472	7,058
1995			50,114	47,642		4,364	2,472	6,836
1996			47,642	45,170		4,142	2,472	6,614
1997			45,170	42,698		3,919	2,472	6,391
1998			42,698	40,226		3,697	2,472	6,169

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.

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FINANCIAL TABLE 4
ILOCOS NORTE WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(P1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		546	546		546	1,845	0.30
1982		668	668		668	2,081	0.32
1983	211	817	1,028		1,028	2,224	0.46
1984	1,184	1,113	2,297		2,297	2,412	0.95
1985	3,161	1,559	4,720		4,720	2,609	1.81
1986	5,083	2,131	7,214		7,214	3,117	2.31
1987	5,966	2,962	8,928	446	9,374	3,695	2.54
1988	6,586	3,715	10,301	515	10,816	3,695	2.93
1989	7,527	3,715	11,242	1,124	12,366	3,695	3.35
1990	7,949	4,086	12,035	1,204	13,239	3,695	3.58
1991	7,728	4,495	12,223	1,222	13,445	3,695	3.64
1992	7,505	4,945	12,450	1,245	13,695	3,695	3.71
1993	7,282	5,439	12,721	1,272	13,993	3,695	3.79
1994	7,058	5,983	13,041	1,304	14,345	3,695	3.88
1995	6,836	6,581	13,417	1,342	14,759	3,695	3.99
1996	6,614	7,239	13,853	1,385	15,238	3,695	4.12
1997	6,391	7,963	14,354	1,435	15,789	3,695	4.27
1998	6,169	8,760	14,929	1,493	16,422	3,695	4.44

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

ILOCOS NORTE WATER SUPPLY PROJECT
ABILITY TO PAY FOR WATER

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	843.00	42.15	6.20	91	17	33	1.28
1982	969.45	48.47	6.19	91	17	33	1.47
1983	1,114.87	55.74	6.18	91	17	33	1.69
1984	1,282.10	64.11	6.17	91	17	33	1.94
1985	1,435.95	71.79	6.16	91	17	33	2.17
1986	1,608.27	80.41	6.15	93	17	33	2.44
1987	1,801.26	90.06	6.14	102	19	36	2.50
1988	2,017.41	100.87	6.13	102	19	36	2.80
1989	2,256.50	112.98	6.12	103	19	36	3.14
1990	2,485.45	124.27	6.11	103	19	36	3.45
1991	2,733.99	136.69	6.10	105	19	36	3.80
1992	3,007.40	150.37	6.09	104	19	36	4.18
1993	3,308.13	165.41	6.08	102	19	36	4.60

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

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

Year	Revenue Units 1/	Charges Per Unit	Gross Revenues	Net Revenue 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1981	1,845	0.80	1,476	95	1,402	546		546	856	856
1982	2,081	0.80	1,665	95	1,582	668		668	914	1,770
1983	2,222	1.20	2,666	95	2,533	1,028		1,028	1,505	3,275
1984	2,426	1.90	4,609	96	4,425	2,297		2,297	2,128	5,403
1985	2,589	2.10	5,437	96	5,220	4,720		4,720	500	5,903
1986	3,117	2.40	7,481	96	7,182	7,214		7,214	-32	5,871
1987	3,695	2.50	9,238	97	8,961	8,928		8,928	33	5,904
1988	3,695	2.80	10,346	97	10,036	10,301	517	10,818	-782	5,122
1989	3,695	3.10	11,455	97	11,111	11,242	573	11,815	-704	4,418
1990	3,695	3.45	12,748	98	12,493	12,035	1,275	13,310	-817	3,601
1991	3,695	3.80	14,041	98	13,760	12,223	1,404	13,627	133	3,734
1992	3,695	4.18	15,445	98	15,136	12,450	1,545	13,995	1,141	4,875
1993	3,695	4.60	16,997	98	16,657	12,721	1,700	14,421	2,236	7,111

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

ILOCOS NORTE WATER SUPPLY PROJECT

ILLUSTRATIVE RATE SCHEDULE

DOMESTIC AND GOVERNMENTAL SERVICE CONNECTIONS, 1/2"

Year	First 10 m^3 1/	Charge for Each Added m^3 2/			Charge 3/ per Revenue Unit
		11-20	21-45	over 45	
1981	20.00	0.96	1.12	1.36	0.80
1982	20.00	0.96	1.12	1.36	0.80
1983	30.00	1.44	1.68	2.04	1.20
1984	47.50	2.28	2.66	3.23	1.90
1985	52.50	2.52	2.74	3.57	2.10
1986	60.00	2.88	3.36	4.08	2.40
1987	62.50	3.00	3.50	4.25	2.50
1988	70.00	3.36	3.92	4.76	2.80
1989	77.50	3.72	4.34	5.27	3.10
1990	86.25	4.14	4.83	5.87	3.45
1991	95.00	4.56	5.32	6.46	3.80
1992	104.50	5.02	5.85	7.11	4.18
1993	115.00	5.52	6.44	7.82	4.60

Note: 1/ To obtain charge per m^3 for the first 10 m^3 classified by connection size, multiply R.U. charge shown in 3/ above by the following connection size factors.

Domestic : 1.0 for 3/8"; 2.5 for 1/2"; 4.0 for 3/4"; 8 for 1"
Commerical: 5.0 for 1/2"; 8.0 for 3/4"; 16.0 for 1"; 40.0 for 1 1/2"

2/ To obtain charge for each added m^3, multiply R.U. charges shown in 3/ by the following block factors.

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

FINANCIAL TABLE 8

ILOCOS NORTE WATER SUPPLY PROJECT
GROWTH IN POPULATION, SERVICE CONNECTIONS
AND IN DELIVERED AND PROCURED WATER

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	3,166	7.9	25,000	114	1,044	45	1,898
1982	3,598	7.8	28,000	114	1,186	43	2,081
1983	3,713	7.7	28,700	114	1,277	40	2,128
1984	4,024	7.8	31,200	114	1,388	40	2,314
1985	4,663	7.4	34,550	116	1,457	40	2,428
1986	5,419	7.2	39,200	122	1,743	37	2,767
1987	6,366	6.9	44,125	128	2,054	34	3,112
1988	6,366	6.9	44,125	128	2,054	34	3,112
1989	6,366	6.9	44,125	128	2,054	34	3,112
1990	6,366	6.9	44,125	128	2,054	34	3,112
1991	6,366	6.9	44,125	128	2,054	34	3,112
1992	6,366	6.9	44,125	128	2,054	34	3,112
1993	6,366	6.9	44,125	128	2,054	34	3,112

1/ Liters per capita per day.

FINANCIAL TABLE 9A

ILOCOS NORTE WATER SUPPLY PROJECT
CALCULATION OF REVENUE UNITS

A) AVERAGE NUMBER OF CONCESSIONAIRES

Year	Residential and Government					Commercial and Industrial					Total
	3/8"	1/2"	3/4"	1"	S-Total	1/2"	3/4"	1"	1 1/2"	S-Total	
1981	876	2,015	26	3	2,920	211	22	12	1	246	3,166
1982	940	2,161	28	3	3,132	218	23	13	2	256	3,388
1983	950	2,181	28	3	3,162	223	23	13	2	261	3,423
1984	1,097	2,525	33	4	3,659	235	25	14	2	276	3,935
1985	1,299	2,986	39	4	4,328	286	30	17	2	335	4,663
1986	1,484	3,415	45	5	4,949	401	42	24	3	470	5,419
1987	1,724	3,968	52	6	5,750	526	55	31	4	616	6,366
1988											
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	876	5,038	104	24	6,042	1,055	176	192	40	1,463	7,505
1982	940	5,403	112	24	6,479	1,090	184	208	80	1,562	8,041
1983	950	5,453	112	24	6,539	1,115	184	208	80	1,587	8,126
1984	1,097	6,313	132	32	7,574	1,175	200	224	80	1,679	9,253
1985	1,299	7,458	156	32	8,945	1,430	240	272	80	2,022	10,967
1986	1,484	8,538	180	40	10,242	2,005	336	384	120	2,845	13,087
1987	1,724	9,920	208	48	11,900	2,630	440	496	160	3,726	15,626
1988											
1989											
1990											
1991											
1992											
1993											

FINANCIAL TABLE 9B1

ILOCOS NORTE WATER SUPPLY PROJECT

CALCULATION OF REVENUE UNITS

DOMESTIC

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	11 - 20 cum		21 - 45 cum		over 45 cum		Total CRU's
				cum	x 1.2	cum	x 1.4	cum	x 1.7	
1981	926	350	579	350	420	229	320	-	-	740
1982	1,056	376	680	376	451.2	304	425.6	-	-	876.8
1983	1,137	379	758	379	454.8	379	530.6	-	-	985.4
1984	1,235	439	796	439	526.8	357	499.8	-	-	1,026.6
1985	1,297	519	778	519	622.8	259	362.6	-	-	985.4
1986	1,551	594	957	594	712.8	363	508.2	-	-	1,221
1987	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1988	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1989	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1990	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1991	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1992	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2
1993	1,828	690	1,138	690	828	448	627.2	-	-	1,455.2

FINANCIAL TABLE 9B2

ILOCOS NORTE 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	115	30	85	85	204	-	-	-	-	204
1982	131	31	100	100	240	-	-	-	-	240
1983	140	31	109	109	262	-	-	-	-	262
1984	153	33	120	116	278	4	11	-	-	289
1985	160	40	120	120	288	-	-	-	-	288
1986	192	56	136	136	326	-	-	-	-	326
1987	226	74	152	152	365	-	-	-	-	365
1988	226	74	152	152	365	-	-	-	-	365
1989	226	74	152	152	365	-	-	-	-	365
1990	226	74	152	152	365	-	-	-	-	365
1991	226	74	152	152	365	-	-	-	-	365
1992	226	74	152	152	365	-	-	-	-	365
1993	226	74	152	152	365	-	-	-	-	365

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	6,042	725	740	1,465	1,463	176	204	380	1,845
1982	6,479	777	877	1,654	1,562	187	240	427	2,081
1983	6,539	785	985	1,770	1,587	190	262	452	2,222
1984	7,574	909	1,027	1,936	1,679	201	289	490	2,426
1985	8,945	1,073	985	2,058	2,022	243	288	531	2,589
1986	10,242	1,229	1,221	2,450	2,845	341	326	667	3,117
1987	11,900	1,428	1,455	2,883	2,883	447	365	812	3,695
1988									
1989									
1990									
1991									
1992									
1993									

ECONOMIC TABLE 1

I

ILOCOS NORTE WATER SUPPLY PROJECT
SUMMARY OF PROJECT COST

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

Components	Total Cost	Foreign Currency Portion	Local Currency Portion
1. Vehicles	140	70	70
2. Chlorinator	120	108	12
3. Stored Materials	305	238	67
4. Wells & Pumps	3,573	2,232	1,341
5. Meters	185	148	37
6. Distribution System	4,693	3,145	1,548
7. Transmission System	12,669	8,489	4,180
8. Fire Hydrants	858	566	292
9. Elevated Reservoir	2,030	507	1,523
10. Ground Reservoir	3,110	779	2,331
11. Valves	386	282	104
12. I/G & Roofing of Ligao	393	98	295
13. Break Pr. Chamber	232	58	174
14. Service Connection	2,080	1,602	478
15. Engineering	3,231	1,939	1,292
16. Supervision	1,077	646	431
17. Land	200	-	200

Source: From Cost Estimates

ECONOMIC TABLE 2

ILOCOS NORTE WATER SUPPLY PROJECT

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

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	3,166	7.9	25,000	114	1,088	-	45	1,878
1982	3,598	7.8	28,000	114	1,187	-	43	2,081
1983	3,713	7.7	28,700	114	1,277	-	40	2,128
1984	4,024	7.8	31,200	114	1,388	111	40	2,314
1985	4,663	7.4	34,550	116	1,457	180	40	2,428
1986	5,419	7.2	39,200	122	1,743	466	37	2,761
1987	6,366	6.9	44,125	128	2,054	777	34	3,112
1988								
1989								
1990								
1991								
1992								
1993								

ECONOMIC TABLE 3-A

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

I

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.25	Labor x 0.5	Residual x 0.95	Total
1. Vehicles	70	70	-	70	88	-	67	155
2. Chlorinator	108	12	1	11	135	1	10	146
3. Stored Material	238	67	-	67	298	-	64	362
4. Wells & Pumps	2,232	1,341	671	670	2,790	336	637	3,763
5. Meters	148	37	7	30	185	4	29	218
6. Distribution System	3,145	1,548	619	929	3,931	310	883	5,124
7. Transmission System	8,489	4,180	1,045	3,135	10,611	523	2,978	14,112
8. Fire Hydrants	566	292	117	175	708	59	166	933
9. Elevated Reservoir	507	1,523	990	533	634	495	506	1,635
10. Ground Reservoir	779	2,331	1,515	816	974	758	775	2,507
11. Valves	282	104	42	62	353	21	59	433
12. I/G & Roofing of Ligao	98	295	148	147	123	74	140	337
13. Break Pr. Chamber	58	174	113	61	73	57	58	188
14. Service Connection	1,602	478	96	382	2,003	48	363	2,414
15. Engineering	1,939	1,292	-	1,292	2,424	-	1,227	3,651
16. Supervision	646	431	-	431	808	-	409	1,217
17. Land	-	200	-	200	-	-	190	190

I

ECONOMIC TABLE 3-B

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

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.0	Labor x 0.5	Residual x 0.95	Total
1. Vehicles	70	70	-	70	70	-	67	137
2. Chlorinator	108	12	1	11	108	1	10	119
3. Stored Material	238	67	-	67	238	-	64	302
4. Wells and Pumps	2,232	1,341	671	670	2,232	336	637	3,205
5. Meters	148	37	7	30	148	4	29	181
6. Distribution System	3,145	1,548	619	929	3,145	310	883	4,338
7. Transmission System	8,489	4,180	1,045	3,135	8,489	523	2,978	11,990
8. Fire Hydrants	566	292	117	175	566	59	166	791
9. Elevated Reservoirs	507	1,523	990	533	507	495	506	1,508
10. Ground Reservoirs	779	2,331	1,515	816	779	758	775	2,312
11. Valves	282	104	42	62	282	21	59	362
12. I/G & Roofing of Ligao	98	295	148	147	98	74	140	312
13. Break Pr. Chamber	58	174	113	61	58	57	58	173
14. Service Connection	1,602	478	96	382	1,602	48	363	2,013
15. Engineering	1,939	1,292	-	1,292	1,939	-	1,227	3,166
16. Supervision	646	431	-	431	646	-	409	1,055
17. Land	-	200	-	200	-	-	190	190

ECONOMIC TABLE 3-C

ILOCOS NORTE WATER SUPPLY PROJECT

CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST

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

I

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.25	Labor x 1.0	Residual x 1.0	Total
1. Vehicles	70	70	-	70	88	-	70	158
2. Chlorinator	108	12	1	11	135	1	11	147
3. Stored Materials	238	67	-	67	298	-	67	365
4. Wells and Pumps	2,232	1,341	671	670	2,790	671	670	4,131
5. Meters	148	37	7	30	185	7	30	222
6. Distribution System	3,145	1,548	619	929	3,931	619	929	5,479
7. Transmission System	8,489	4,180	1,045	3,135	10,611	1,045	3,135	14,791
8. Fire Hydrants	566	292	117	175	708	117	175	1,000
9. Elevated Reservoir	507	1,523	990	533	634	990	533	2,157
10. Ground Reservoir	779	2,331	1,515	816	974	1,515	816	3,305
11. Valves	282	104	42	62	353	42	62	457
12. I/G & Roofing of Ligao	98	295	148	147	123	148	147	418
13. Break Pr. Chamber	58	174	113	61	73	113	61	247
14. Service Connector	1,602	478	96	382	2,003	96	382	2,481
15. Engineering	1,939	1,292	-	1,292	2,424	-	1,292	3,716
16. Supervision	646	431	-	431	808	-	431	1,239
17. Land	-	200	-	200	-	-	200	200

I

ECONOMIC TABLE 4-0

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

Value without CONVERSION

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	140		140				
2. Chlorinator	120		120				
3. Stored Materials	305		305				
4. Wells and Pump	3,573		1,363	645	1,565		
5. Meters	185		185				
6. Distribution System	4,693		2,489	1,911	293		
7. Transmission System	12,669		1,625	9,875	1,169		
8. Fire Hydrants	858		429	371	58		
9. Elevated Reservoir	2,030				2,030		
10. Ground Reservoir	3,110		351	826	1,933		
11. Valves	386		206	166	14		
12. I/G & Roofing of Ligao	393		393				
13. Break Pr. Chamber	232		155	77			
14. Service Connection	2,080		1,843	143	96		
15. Engineering	3,231	3,231					
16. Supervision	1,077		430	324	323		
17. Land	200		100	100			
18.							
Total	35,282	3,231	10,132	14,438	7,481		

ECONOMIC TABLE 4-A

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

Value with CONVERSION A

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	155		155				
2. Chlorinator	146		146				
3. Stored Material	362		362				
4. Wells and Pumps	3,763		1,436	679	1,648		
5. Meters	218		218				
6. Distribution System	5,124		2,718	2,086	320		
7. Transmission System	14,112		1,810	11,000	1,302		
8. Fire Hydrants	933		467	403	63		
9. Elevated Reservoir	1,635				1,635		
10. Ground Reservoir	2,507		283	666	1,558		
11. Valves	433		231	186	16		
12. I/G & Roofing of Ligao	337		337				
13. Break Pr. Chamber	188		126	62			
14. Service Connection	2,414		2,137	166	111		
15. Engineering	3,651	3,651					
16. Supervision	1,217		486	366	365		
17. Land	190		95	95			
18.							
Total	37,385	3,651	11,007	15,709	7,018		

I

ECONOMIC TABLE 4-B

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

Value with CONVERSION B

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	137		137				
2. Chlorinator	119		119				
3. Stored Materials	302		302				
4. Wells and Pumps	3,205		1,223	578	1,404		
5. Meters	181		181				
6. Distribution System	4,338		2,301	1,766	271		
7. Transmission System	11,990		1,538	9,346	1,106		
8. Fire Hydrants	791		396	342	53		
9. Elevated Reservoir	1,508				1,508		
10. Ground Reservoir	2,312		261	614	1,437		
11. Valves	362		193	156	13		
12. I/G & Roofing of Ligab	312		312				
13. Break Pr. Chamber	173		116	57			
14. Service Connection	2,013		1,782	138	93		
15. Engineering	3,166	3,166					
16. Supervision	1,055		421	317	317		
17. Land	190		95	95			
18.							
Total	32,154	3,166	9,377	13,409	6,202		

ECONOMIC TABLE 4-C

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

Value with CONVERSION C

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	158		158				
2. Chlorinator	147		147				
3. Stored Materials	365		365				
4. Wells and Pumps	4,131		1,576	746	1,809		
5. Meters	222		222				
6. Distribution System	5,479		2,906	2,231	342		
7. Transmission System	14,791		1,897	11,529	1,365		
8. Fire Hydrants	1,000		500	432	68		
9. Elevated Reservoir	2,157				2,157		
10. Ground Reservoir	3,305		373	878	2,054		
11. Valves	457		244	196	17		
12. I/G & Roofing of Ligao	418		418				
13. Break Pr. Chamber	247		165	82			
14. Service Connection	2,481		2,196	171	114		
15. Engineering	3,716	3,716					
16. Supervision	1,239		495	373	371		
17. Land	200		100	100			
18.							
Total	40,513	3,716	11,762	16,738	8,297		

ECONOMIC TABLE 5

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

Year	Power	Chemicals	Others	Total	Net Costs
1981	209	76	261	546	
1982	209	80	292	581	
1983	212	92	314	618	37
1984	253	97	382	732	151
1985	309	111	495	915	334
1986	368	124	625	1,117	536
1987	429	133	824	1,386	805
1988	429	133	824	1,386	805
1989	429	133	824	1,386	805
1990	429	133	824	1,386	805
1991	429	133	824	1,386	805
1992	429	133	824	1,386	805
1993	429	133	824	1,386	805

Base Year = 1983

ECONOMIC TABLE 6-0

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

Value without CONVERSION

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	140				140
2. Chlorinator	120				120
3. Stored Material	305				305
4. Wells and Pumps		3,573			3,573
5. Meters		185			185
6. Distribution			4,693		4,693
7. Transmission			12,669		12,669
8. Fire Hydrants			858		858
9. Reservoir			5,140		5,140
10. Valves			386		386
11. I/G & Roofing Ligao, B.P.C.			625		625
12. Service Connection			2,080		2,080
13. Land				200	200

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

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

ECONOMIC TABLE 6-A

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

Value with CONVERSION A

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	155				155
2. Chlorinators	146				146
3. Stored Materials	362				362
4. Wells and Pumps		3,763			3,763
5. Meters		218			218
6. Distribution			5,124		5,124
7. Transmission			14,112		14,112
8. Fire Hydrants			933		933
9. Reservoir			4,142		4,142
10. Valves			433		433
11. I/G & Roofing of Ligac & B.P.C.			525		525
12. Service Connection			2,414		2,414
13. Land				190	190

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinators	1984					1991	1998	2005	2012	
3. Stored Materials	1984					1991	1998	2005	2012	

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

ECONOMIC TABLE 6-B

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

Value with CONVERSION B

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	137				137
2. Chlorinator	119				119
3. Stored Materials	302				302
4. Wells and Pumps		3,205			3,205
5. Meters		181			181
6. Distribution			4,338		4,338
7. Transmission			11,990		11,990
8. Fire Hydrants			791		791
9. Reservoir			3,820		3,820
10. Valves			362		362
11. I/G & Roofing of Ligao, B.P.C.			485		485
12. Service Connection			2,013		2,013
13. Land				190	190

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

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

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ECONOMIC TABLE 6-C

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

Value with CONVERSION C

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	158				158
2. Chlorinators	147				147
3. Stored Materials	365				365
4. Wells and Pumps		4,131			4,131
5. Meters		222			222
6. Distribution			5,479		5,479
7. Transmission			14,791		14,791
8. Fire Hydrants			1,000		1,000
9. Reservoir			5,462		5,462
10. Valves			457		457
11. I/G & Roofing Ligao, B.P.C.			665		665
12. Service Connection			2,481		2,481
13. Land				200	200

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

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

ECONOMIC TABLE 7-0

ILOCOS NORTE WATER SUPPLY PROJECT
CALCULATION OF SALVAGE VALUES
₱ x 1,000

Value without CONVERSION

Components		Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased				
	1984	100	75%	75
	1985	100	75%	75
50 Year Life, Year Constructed				
1	1984	7,489	42%	3,145
2	1985	13,369	44%	5,882
3	1986	5,593	46%	2,573
15 Year Life, Year of Replacement				
1	1999	1,548	7%	108
2	2000	645	13%	84
3	2001	1,565	20%	313
7 Year Life, Years of Final Replacement				
1	2012	565	86%	486
Total		30,974		12,741

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ECONOMIC TABLE 7-A

ILOCOS NORTE 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
1985	95	75%	71
50 Year Life, Year Constructed			
1 1984	8,109	42%	3,406
2 1985	14,569	44%	6,410
3 1986	5,005	46%	2,302
15 Year Life, Year of Replacement			
1 1999	1,654	7%	116
2 2000	679	13%	88
3 2001	1,648	20%	330
7 Year Life, Years of Final Replacement			
1 2012	663	86%	570
Total	32,517		13,364

ECONOMIC TABLE 7-B

ILOCOS NORTE 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
1985	95	75%	71
50 Year Life, Year Constructed			
1 1984	6,899	42%	2,898
2 1985	12,419	44%	5,464
3 1986	4,481	46%	2,061
15 Year Life, Year of Replacement			
1 1999	1,404	7%	98
2 2000	578	13%	75
3 2001	1,404	20%	281
7 Year Life, Years of Final Replacement			
1 2005	558	86%	480
Total	27,933		11,499

ECONOMIC TABLE 7-C

ILOCOS NORTE 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
1985	100	75%	75
50 Year Life, Year Constructed			
1 1984	8,699	42%	3,654
2 1985	15,519	44%	6,828
3 1986	6,117	46%	2,814
15 Year Life, Year of Replacement			
1 1999	1,798	7%	126
2 2000	746	13%	97
3 2001	1,809	20%	362
7 Year Life, Years of Final Replacement			
1 2005	670	86%	576
Total	35,558		14,607

ECONOMIC TABLE 8-0

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

Value without CONVERSION

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	3,231	37		3,268		
1984	10,132	151		10,283		
1985	14,438	334		14,772		
1986	7,481	536		8,017		
1987		805		805		
1988		805		805		
1989		805		805		
1990		805		805		
1991		805	565	1,370		
1992		805		805		
1993		805		805		
1994		805		805		
1995		805		805		
1996		805		805		
1997		805		805		
1998		805	565	1,370		
1999		805	1,548	2,353		
2000		805	645	1,450		
2001		805	1,565	2,370		
2002		805		805		
2003		805		805		
2004		805		805		
2005		805	565	1,370		
2006		805		805		
2007		805		805		
2008		805		805		
2009		805		805		
2010		805		805		
2011		805		805		
2012		805	565	1,370		
Total	35,282	21,988	6,018	63,288	(12,741)	50,547

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ECONOMIC TABLE 8-A

ILOCOS NORTE WATER SUPPLY PROJECT

SUMMARY OF ALL PROJECT COSTS

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

Value with CONVERSION A

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	3,651	37		3,688		
1984	11,007	151		11,158		
1985	15,709	334		16,043		
1986	7,018	536		7,554		
1987		805		805		
1988		805		805		
1989		805		805		
1990		805		805		
1991		805	663	1,468		
1992		805		805		
1993		805		805		
1994		805		805		
1995		805		805		
1996		805		805		
1997		805		805		
1998		805	663	1,468		
1999		805	1,654	2,459		
2000		805	679	1,484		
2001		805	1,648	2,453		
2002		805		805		
2003		805		805		
2004		805		805		
2005		805	663	1,468		
2006		805		805		
2007		805		805		
2008		805		805		
2009		805		805		
2010		805		805		
2011		805		805		
2012		805	663	1,468		
Total	37,385	21,988	6,633	66,006	(13,364)	52,642

ECONOMIC TABLE 8-B

ILOCOS NORTE WATER SUPPLY PROJECT

SUMMARY OF ALL PROJECT COSTS

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

Value with CONVERSION B

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	3,166	37		3,203		
1984	9,377	151		9,528		
1985	13,409	334		13,743		
1986	6,202	536		6,738		
1987		805		805		
1988		805		805		
1989		805		805		
1990		805		805		
1991		805	558	1,363		
1992		805		805		
1993		805		805		
1994		805		805		
1995		805		805		
1996		805		805		
1997		805		805		
1998		805	558	1,363		
1999		805	1,404	2,209		
2000		805	578	1,383		
2001		805	1,404	2,209		
2002		805		805		
2003		805		805		
2004		805		805		
2005		805	558	1,363		
2006		805		805		
2007		805		805		
2008		805		805		
2009		805		805		
2010		805		805		
2011		805		805		
2012		805	558	1,363		
Total	32,154	21,988	5,618	59,760	(11,499)	48,261

ECONOMIC TABLE 8-C

ILOCOS NORTE WATER SUPPLY PROJECT

SUMMARY OF ALL PROJECT COSTS

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

Value with CONVERSION C

Year	Cost of Facilities	Net O & M	Replacement Costs	Total	Salvage	Net Cost
1982						
1983	3,716	37		3,753		
1984	11,762	151		11,913		
1985	16,738	334		17,072		
1986	8,297	536		8,833		
1987		805		805		
1988		805		805		
1989		805		805		
1990		805		805		
1991		805	670	1,475		
1992		805		805		
1993		805		805		
1994		805		805		
1995		805		805		
1996		805		805		
1997		805		805		
1998		805	670	1,475		
1999		805	1,941	2,746		
2000		805	746	1,551		
2001		805	1,809	2,614		
2002		805		805		
2003		805		805		
2004		805		805		
2005		805	670	1,475		
2006		805		805		
2007		805		805		
2008		805		805		
2009		805		805		
2010		805		805		
2011		805		805		
2012		805	670	1,475		
Total	40,513	21,988	7,176	69,677	(14,607)	55,070

ECONOMIC TABLE 9

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

Year	Volume	Qualitative	Fire Loss Reduction	Total	National Interest Adjustment
1982					
1983					
1984	411	472	111	994	1,193
1985	666	945	147	1,758	2,110
1986	1,724	1,417	184	3,225	3,870
1987	2,875	1,417	231	4,523	5,428
1988	2,875	1,417	231	4,523	5,428
1989	2,875	1,417	231	4,523	5,428
1990	2,875	1,417	231	4,523	5,428
1991	2,875	1,417	231	4,523	5,428
1992	2,875	1,417	231	4,523	5,428
1993	2,875	1,417	231	4,523	5,428
1994	2,875	1,417	231	4,523	5,428
1995	2,875	1,417	231	4,523	5,428
1996	2,875	1,417	231	4,523	5,428
1997	2,875	1,417	231	4,523	5,428
1998	2,875	1,417	231	4,523	5,428
1999	2,875	1,417	231	4,523	5,428
2000	2,875	1,417	231	4,523	5,428
2001	2,875	1,417	231	4,523	5,428
2002	2,875	1,417	231	4,523	5,428
2003	2,875	1,417	231	4,523	5,428
2004	2,875	1,417	231	4,523	5,428
2005	2,875	1,417	231	4,523	5,428
2006	2,875	1,417	231	4,523	5,428
2007	2,875	1,417	231	4,523	5,428
2008	2,875	1,417	231	4,523	5,428
2009	2,875	1,417	231	4,523	5,428
2010	2,875	1,417	231	4,523	5,428
2011	2,875	1,417	231	4,523	5,428
2012	2,875	1,417	231	4,523	5,428
Total	77,551	39,676	6,448	123,575	148,301

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ECONOMIC TABLE 10-0

ILOCOS NORTE WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value without CONVERSION

Year	Total Cost	Total Benefit	Net Benefit	Present Net Benefit
1982				
1983	3,268	-	-3,268	-3,268
1984	10,283	1,193	-9,090	-8,079
1985	14,772	2,110	-12,662	-10,002
1986	8,017	3,870	-4,147	-2,912
1987	805	5,428	4,623	2,885
1988	805	5,428	4,623	2,564
1989	805	5,428	4,623	2,279
1990	805	5,428	4,623	2,025
1991	1,370	5,428	4,058	1,580
1992	805	5,428	4,623	1,600
1993	805	5,428	4,623	1,422
1994	805	5,428	4,623	1,264
1995	805	5,428	4,623	1,123
1996	805	5,428	4,623	998
1997	805	5,428	4,623	887
1998	1,370	5,428	4,058	692
1999	2,353	5,428	3,075	466
2000	1,450	5,428	3,978	536
2001	2,370	5,428	3,058	366
2002	805	5,428	4,623	492
2003	805	5,428	4,623	437
2004	805	5,428	4,623	389
2005	1,370	5,428	4,058	303
2006	805	5,428	4,623	307
2007	805	5,428	4,623	273
2008	805	5,428	4,623	243
2009	805	5,428	4,623	216
2010	805	5,428	4,623	192
2011	805	5,428	4,623	170
2012	1,370	5,428	16,799*	550*
Salvage(-)	12,741			
Total	50,547	148,301	97,754	-2

Rate of Return = 0.13

ECONOMIC TABLE 10-A

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION A

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	3,688	-	-3,688	-3,688
1984	11,158	1,193	-9,965	-8,929
1985	16,043	2,110	-13,933	-11,186
1986	7,554	3,870	-3,684	-2,650
1987	805	5,428	4,623	2,980
1988	805	5,428	4,623	2,670
1989	805	5,428	4,623	2,392
1990	805	5,428	4,623	2,144
1991	1,468	5,428	3,960	1,645
1992	805	5,428	4,623	1,721
1993	805	5,428	4,623	1,542
1994	805	5,428	4,623	1,382
1995	805	5,428	4,623	1,238
1996	805	5,428	4,623	1,109
1997	805	5,428	4,623	994
1998	1,468	5,428	3,960	763
1999	2,459	5,428	3,969	513
2000	1,484	5,428	3,944	610
2001	2,453	5,428	2,975	412
2002	805	5,428	4,623	574
2003	805	5,428	4,623	514
2004	805	5,428	4,623	461
2005	1,468	5,428	3,960	354
2006	805	5,428	4,623	370
2007	805	5,428	4,623	332
2008	805	5,428	4,623	297
2009	805	5,428	4,623	266
2010	805	5,428	4,623	239
2011	805	5,428	4,623	214
2012	1,468	5,428	17,324*	718*
Salvage(-)	13,364			
Total	52,642	148,301	95,659	1

* Values include salvage.

Rate of Return = 0.12

ECONOMIC TABLE 10-B

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION B

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	3,203	-	-3,203	-3,203
1984	9,528	1,193	-8,335	-7,322
1985	13,743	2,110	-11,633	-8,978
1986	6,738	3,870	-2,868	-1,944
1987	805	5,428	4,623	2,753
1988	805	5,428	4,623	2,419
1989	805	5,428	4,623	2,125
1990	805	5,428	4,623	1,867
1991	1,363	5,428	4,065	1,442
1992	805	5,428	4,623	1,441
1993	805	5,428	4,623	1,266
1994	805	5,428	4,623	1,112
1995	805	5,428	4,623	977
1996	805	5,428	4,623	858
1997	805	5,428	4,623	754
1998	1,363	5,428	4,065	582
1999	2,209	5,428	3,219	405
2000	1,383	5,428	4,045	447
2001	2,209	5,428	3,219	313
2002	805	5,428	4,623	394
2003	805	5,428	4,623	346
2004	805	5,428	4,623	304
2005	1,363	5,428	4,065	235
2006	805	5,428	4,623	235
2007	805	5,428	4,623	206
2008	805	5,428	4,623	181
2009	805	5,428	4,623	159
2010	805	5,428	4,623	140
2011	805	5,428	4,623	123
2012	1,363	5,428	15,564*	363*
Salvage(-)	11,499			
Total	48,261	148,301	100,040	0

* Values include salvage.

Rate of Return = 0.14

ECONOMIC TABLE 10-C

ILOCOS NORTE WATER SUPPLY PROJECT
INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION C

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	3,753	-	-3,753	-3,753
1984	11,913	1,193	-10,720	-9,694
1985	17,072	2,110	-14,962	-12,235
1986	8,833	3,870	-4,963	-3,670
1987	805	5,428	4,623	3,091
1988	805	5,428	4,623	2,796
1989	805	5,428	4,623	2,528
1990	805	5,428	4,623	2,286
1991	1,475	5,428	3,953	1,768
1992	805	5,428	4,623	1,869
1993	805	5,428	4,623	1,690
1994	805	5,428	4,623	1,529
1995	805	5,428	4,623	1,382
1996	805	5,428	4,623	1,250
1997	805	5,428	4,623	1,130
1998	1,475	5,428	3,953	874
1999	2,746	5,428	2,682	536
2000	1,551	5,428	3,877	701
2001	2,614	5,428	2,814	460
2002	805	5,428	4,623	684
2003	805	5,428	4,623	618
2004	805	5,428	4,623	559
2005	1,475	5,428	3,953	432
2006	805	5,428	4,623	457
2007	805	5,428	4,623	413
2008	805	5,428	4,623	374
2009	805	5,428	4,623	338
2010	805	5,428	4,623	306
2011	805	5,428	4,623	276
2012	1,475	5,428	18,560*	1,003*
Salvage(-)	14,607			
Total	55,070	148,301	93,231	-2

* Values include salvage.

Rate of Return = 0.11