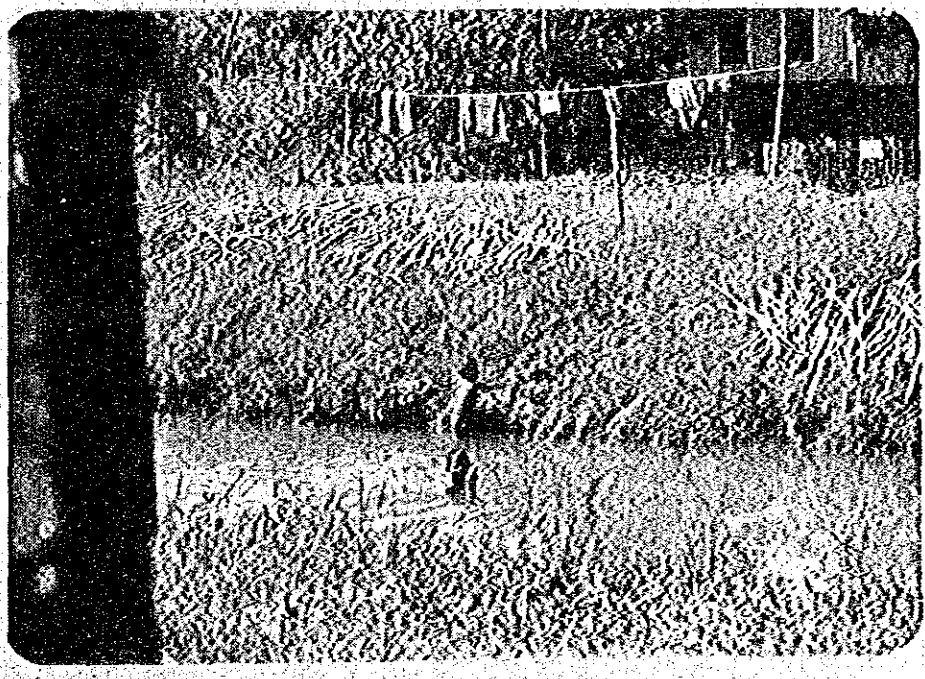
APPENDIXES



MAROS RAW WATER CANAL

APPENDIX I

MINUTES OF MEETING

1.1 PROGRESS REPORT (II)

1.2 DRAFT FINAL REPORTS ON MASTER PLAN AND FEASIBILITY STUDY

MINUTES OF MEETING

FOR

PROGRESS REPORT (II)

ON

FEASIBILITY STUDY

OF

WATER SUPPLY DEVELOPMENT PROJECT

OF

UJUNG PANDANG

25TH JULY 1985 IN JAKARTA

JAPAN INTERNATIONAL COOPERATION AGENCY

The meeting between Cipta Karya and the JICA Team on the Progress Report (II) for the Feasibility Study on Ujung Pandang Water Supply Development Project was held in Jakarta July 24, 1985 with attendance of the Authorities concerned as shown in the sheet attached hereto. Major comments made by Cipta Karya and the Authorities concerned on the Progress Report (II) are as follows :

1. Regarding rehabilitation of the Maros transmission canal, costs of the three alternatives (cases) should be also summarized in the Report.

2. The capacity of clear water reservoir should be planned to have 5 hour storage.

3. The capacity of new treatment plant to be constructed under Phase 2 should be the same with that of Phase 1, i.e., 500 l/sec.

4. The Team should ammend the implementation schedule developed in the Progress Report (II). The period required for international tendering & award of contract, procurement of materials & equipment to be imported, and civil work should be assumed on an actual basis.

5. Financial analysis should consider followings :

   - To employ 9%, 10% and 11% as the interest rate of BLN and RDI for financial projection,
   - To accumulate the interest during construction period . This should be repaid after grace period by PDAM on the basis of flat rate,
   - To consider self-financing for investment in order to decrease the amount of PMP,
   - To employ the "rate of depreciation for financial projection" for the calculation of tax; Table 4.5 should show only the column of depreciation rate for financial projection,
   - To utilize 15 years service life for PVC pipes and 10 years for machineries in computing the depreciation,
   - To consider the raw water charge of Rp 5/m3 (clear water basis) to be paid by PDAM in the financial projection,
   - To revise/ammend the installment schedule of connections so as to generate revenues as efficiently as possible, and
   - To use Rp 100,000 as installing charge of connection in 1985 and its escalated figures thereafter.

6. New system to be completed under Stage I Project takes irrigation water available at Bili Bili. The decrease of the canal water might be a serious impact on the people inhabited near the canal. Cipta Karya desires that such social impacts caused by raw water extraction are to be described futher.

7. The report should show the projection of the raw water development by DGWRD.

8. Table A-30 should be corrected.

9. The report should show the projection of construction cost based on financing sources.

10. The report should recommend the need of authority responsible for monitoring the capacity of the Maros River due to forestation.

11. The report should specify the source of financing for each item of construction.

12. The cash flow shall consider the all investment of Stage I Project, including expansion of Panaikang Treatment Plant in 1987 with a capacity of 500 l/sec.

Jakarta July 25, 1985
For Japan International Cooperation Agency (JICA)

MR. TABU FUMIHIRO
JICA STUDY TEAM LEADER

IR. SOERATMO NOTODIPOERO
DIRECTOR WATER SUPPLY
DIRECTORATE GENERAL
CIPTA KARYA

MR. USAMI TSUNAO
JICA ADVISORY TEAM, CHAIRMAN

DIREKTORAT AIR BERSIH
DIREKTORAT JENDERAL CIPTA KARYA
DEPARTEMEN PEKERJAAN UMUM

DAFTAR - HADIR

Undangan Rapat / Invitation : UJUNG PANDANG WATER SUPPLY DEV. PROJECT

Hari/Tanggal / Day/Date : RABU, 24 JULI 1985

Tempat / Place : RUANG RAPAT CIPTA KARYA " BOROBUDUR ROOM " LANTAI II

Jam / Time : 09.00 WIB

Pimpinan Rapat / Chairman : IR. SOERATMO NOTODIPOERO / IR. MARDJONO

No.	Nama / Name	Instansi / Office	Jabatan / Occupation	Tanda-tangan / Signature
1	MARDJONO NOTODIHARDJO	DEP. PU.	KARO PERENC	[signature]
2	Tsuneo USAMI	JICA		[signature]
3	Akira KOIZUMI	JICA		[signature]
4	Ryuzo Nishimaki	JICA		[signature]
5	Norio Matsuda	JICA Jakarta	Assistant Resident Representative	[signature]
6	Darmawan Saleh	Directorate W.S.	Subdit Pengaturan	[signature]
7	AMALNATSIR	U.PANDANG	KA. PEREKONOMIAN	[signature]
8.	Soebagijo	P.D.A.M U.Pand		[signature]
9	B. Heryanto	PEMDA KOLUP	Ka. Bappeda	[signature] 24/7 '85
10.	Ling. P.	Ay. RUR. [illegible]		[signature]
11	CHAIRUL - S.	[illegible]	–	[signature]
12	PRIYONO	DAB		[signature]
13.	Joko R	–		[signature]
14.	Haryoyo	DITKTD		[signature]
15.	A [illegible]	Dit. BPP	Staf Subdit P2AL	[signature]
16.	PANDJI [illegible]	BIRO PERENC. PU	Staf	[signature]
17	EDY WAHYONO	Dit. BPP	Staf Renc	[signature]
18	Djoko Mursito	Dit B.P	Staf	[signature]
19	Amiruddin.	Dit BPCK.	Staff.	[signature]
20	Prastoro	DAB	Staf	[signature]

DIREKTORAT AIR BERSIH
DIREKTORAT JENDERAL CIPTA KARYA
DEPARTEMEN PEKERJAAN UMUM

DAFTAR-HADIR

Undangan Rapat / Invitation : UNTUK PEMBAHASAN WATER SUPPLY DEV. PROJECT

Hari/Tanggal / Day/Date : Rabu, 24 - Juli - 1985

Tempat / Place : Ruang Rapat Direktur DTAE

Jam / Time : 09.00 WIB

Pimpinan Rapat / Chairman : Ir. SURATMO NOTOMIHARDJO / Ir. MARGUNA

No.	Name / Name	Instansi / Office	Jabatan / Occupation	Tanda-tangan / Signature
21.	ADI SUSETYO	DAB	STAF	
22.	MOCHAMMAD NATSIR	DAB	STAF	
23	YUHEI FUKUDA	JICA	STUDY TEAM	
24	Hideki Kondo	JICA	STUDY TEAM	
25	Fumihiro Tabu	JICA	STUDY TEAM	
26	Hiroyasu Yuda	JICA	"	
27.	Hidajat Kuslani	BP.	"	

SUMMARY OF MEETING

1. Date : July 20, 1985

2. Place : PAB Sulawesi Selatan Office

3. Attendants : Refer to the attached sheet

4. Issues Discussed :

4.1 The Team should describe the strategy to cope with the raw water shortage that is suspected to occur in the severe dry season.

4.2 Some items described in the design criteria are not necessarily supported by the sufficient information. The concept of design criteria should be clarified further for the following items;

1) Peak factor
2) Standby ratio for pumping facilities
3) Design capacity of clear water reservoir
4) Friction loss coefficient in Hazen-William's formula

4.3 The cost estimates made in the progress report (II) should disclose more detailed breakdown of construction costs.

4.4 Distribution pipelines to be replaced under rehabilitation work should be clarified on a figure or drawing.

4.5 The cost effectiveness of power receiving from PLN should be verified in comparison with the installation of generators. Further, the two alternatives, namely, 1) construction of an elevated tank and 2) installation of generators should be also studied to cope with the suspension of the treatment plant during power failure.

4.6 Disbursement schedule of the Stage I Project should be attached to the report.

4.7 The weir to be constructed at the existing irrigation intake should have a gate for the purpose of periodical flushing. This will ensure the stable extraction of raw water.

4.8 Cipta Karya desires that financial analysis on the rehabilitation work is to be carried out in the course of the Feasibility Study.

Pemimpin Proyek Air Bersih Sulawesi Selatan	Kabid Teknik, Kanwil PU Sulawesi Selatan
IR. IING PARVANARAYA	IR. M. YASIR BARDA, Dipl. HE

DISCUSSION MEETING .

RAPAT / MEETING :PEMBAHASAN PROGRES REPORT (II) FESIBILITY STUDY PERLUASAN SISTIM PENYEDIAAN AIR BERSIH KOTA UJUNG PANDANG .

HARI,TGL / DATE :SABTU, 20 JULI 1985

TEMPAT / PLACE :KANTOR PROYEK PENINGKATAN SARANA AIR BERSIH .

JAM / TIME :PK. 09.^{00}

PIMPINAN / CHAIRMAN :Ir. LING HARVANARAYA .

No	Nama / Name	Instansi / Office	Jabatan / Occupation	Tanda Tangan / Signature
1.	Ling P.	PSAB. Sulsel.	pimpro.	[signature]
2.	T. Tabu	JICA STUDY TEAM		[signature]
3.	Ryuzo Nishimaki	JICA H.Q		[signature]
4.	Tsuneo Usami	JICA		[signature]
5	Akira Koizumi	JICA		[signature]
6	Yousuke Kobayashi	JICA STUDY TEAM		[signature]
7	Hideki Kondo	— " —		[signature]
8	Masayuki Mori	— " —		[signature]
9	Yuki [illegible]	"		[signature]
10.	M. Rusli [illegible]	Bappeda Tkt I Sulsel		[signature]
11.	Soebagijo	[illegible]		[signature]
12.	Burhan	DPUSJ		[signature]
13	Chairil S.	DOB	...	[signature]
14.	M. Yasin Baeh	KANWIL DPUP		[signature]
15	Prasetyo	[illegible]	Staff	[signature]
16.	E. Sariani	PPSAB	Staff	[signature]
17	H. [illegible]	JICA		[signature]

MINUTES OF MEETING

FOR

DRAFT FINAL MASTER PLAN

AND FEASIBILITY STUDY REPORTS

ON

DJUANDA PANDARAN WATER SUPPLY DEVELOPMENT PROJECT

IN

THE REPUBLIC OF INDONESIA

15TH OCTOBER 1985 IN JAKARTA

JAPAN INTERNATIONAL COOPERATION AGENCY

The meeting between Cipta Karya and the JICA teams on the draft final Master Plan and Feasibility Study Reports on Ujung Pandang Water Supply Development Project was held in Jakarta October 14th, 1985 with attendance of the Authorities concerned as shown in the attached sheet hereto. Major comments made by Cipta Karya and the Authorities concerned on the draft final Reports are as follows:

1. It should be described that the planned intake facilities can extract Bili Bili irrigation water even at the time of periodical maintenance of the canal.

2. Hourly peak factor to be applied is 1.6 on basis of average daily demand.

3. It was suggested that method of rehabilitation of the existing transmission canal should be studied further at the stage of detailed design.

4. The terms 'PMP' and 'RDI' should be replaced to 'Interest free government loan' and 'Domestic loan at normal interest rate' respectively.

5. Financial analysis should consider following:

   1) Contribution to PEMDA is to be taken out in the financial projection.

   2) The cost of rehabilitation for the distribution network is to be financed by PDAM's own fund.

3) Average installing charge and security deposit should coincide with the figure as tabulated below. The water rate is to be increased accordingly.

Item	1985	1995	Thereafter
Installing Charge (Rp.1,000/connect.)	100	150	To be increased
Security Deposit (Rp.1,000/connect.)	40	75	To be increased

Jakarta October 15, 1985
For Japan International Cooperation Agency (JICA)

MR. TABU FUMIHIRO
JICA STUDY TEAM LEADER

IR. PRIYONO SALIM
Subdirector of Planning
Division, DAB
DIRECTORATE GENERAL
CIPTA KARYA

MR. OSAMI TSUNAO
JICA ADVISORY TEAM, CHAIRMAN

DIREKTORAT AIR BERSIH
DIREKTORAT JENDERAL CIPTA KARYA
DEPARTEMEN PEKERJAAN UMUM

DAFTAR-HADIR

Undangan Rapat / Invitation : USUNG PANDANG MSP

Hari/Tanggal / Day/Date : 4 OKTOBER 1995

Tempat / Place : Ruang Rapat Pembinaan Bidang Cipta Karya
Lt I W.I. Jl. Raden Patah I A Jakarta

Jam / Time :

Pimpinan Rapat / Chairman :

No.	Nama / Name	Instansi / Office	Jabatan / Occupation	Tanda-tangan / Signature
1.	M. YASIR BAEDA	KANWIL DEP. PU. PROP SUL-SEL	ANGGOTA LSC	
2.	B. HERYANTO	KIPPEDA TK II U.P	- " -	
3.	PANJI [illegible]	BIRO PEREN. P.U.	staf	
..	..	..	..	..
5.	H.A.A. SAHUDA	BAPPEDA SUL SEL	FISK/SIPIL	
6.	[illegible]	P.P.U.M. U.P	[illegible]	
7.	JING P.	PY. PERS. BERE.	[illegible]	
8.	CHAIRUL	DAB	staff	
9.	P.R. [illegible]	DAB		
10.	T. [illegible]	JICA HPQ	Staf. JICA	
11.	N. Matsuda	JICA Jakarta	Asst. Representative	
12.	[illegible]	[illegible]		
13.	[illegible]	"		
14.	[illegible]	"		
15.	[illegible]			
16.	Tsuyoo USAMI	JICA		
17.	Takeshi SHIMAZAKI	JICA		
18.	HARSOYO	DPKTD	Kel. Perama	
19.	DJAMALUDIN. A	DIT. BPCK	Kel. Unit II staf	

DIREKTORAT AIR [illegible]
DIREKTORAT JENDERAL CIPTA KARYA
DEPARTEMEN PEKERJAAN UMUM

D A F T A R - H A D I R

Undangan Rapat / Invitation : .....

.....

Hari/Tanggal / Day/Date : .....

Tempat / Place : .....

Jam / Time : .....

Pimpinan Rapat / Chairman : .....

No.	Name / Name	Instansi / Office	Jabatan / Occupation	Tanda-tangan / Signature
20	Widagdo	Dit. BPP	[illegible]	
21	[illegible]	Dit. BPP	[illegible]	
22	EDY WAHYONO	Dit. BPP	Staff	
23	JOKO R	D.A.B	Rawa Water Section	
	[illegible]	[illegible]		

SUMMARY OF MEETING

1. Date : October 9th, 1985

2. Place : PAB Sulawesi Selatan Office

3. Attendants : Refer to the attached sheet

4. Issues Discussed:

4.1 It was informed that the local government is planning to construct new cross roads from Gowa through Ujung Pnadang to Maros in the near future.

4.2 The local steering committee gave a full support and consent to the water supply planning described in the Master Plan and Feasibility Study reports submitted by JICA.

Director Utama, Perusahaan Daerah Air Minum KMUP	Kabid Teknik, Kanwil PU Sulawesi Selatan
Ir. SOEBAGIJO H.	IR. M. YASIR BAEDA, Dipl. HE

PROYEK PENINGKATAN SARANA AIR BERSIH SULAWESI SELATAN .

Undangan Steering Commitee / Steering Commitee Invitasion : Pembahasan Draft Final Report Master Plan dan Feasibility Study Proyek Air Bersih - UP

Hari dan tanggal / Date and day : Rabu, 9 Oktober 1985

Tempat / Place : Ruang rapat PPSABSS

Jam / Time : 09.00 WITA

Pimpinan / Chairman : Ir. Yasir Baeda Dipl HE

NO	Nama / Name	Instansi / Office	Jabatan / Occupation	Tanda tangan / Signature
1.	M. Yasir Baeda	Kanwil Dep PU Prop Sulsel	Ka Sibidang	
2.	Soebagijo	P.U. Pusat	Direktur	
3.	Fumihiro Tabu	JICA Study Team		
4	Hiroyasu Yoda	"		
5	Hideki Kondo	"		
6.	Yuhei Tokuda	"		
7	Junji Ishizaka	JICA HDQ	M. M.	
8	Toshiaki Shinzaki	JICA Advisory Com.	"	
9	Tsuneo USAMI	"	"	
10	Bonar Simanjuntak	Penyelenggara PPSABSS	Pengawas	
11.	E. SAPTARI	PPSABSS	Counterpart	
12.	H.A.A. SAHERA	Bappeda Tk I	Fisforr	
13.	Fahlil Abdullah	BAPPEDA Tk I.	Kabid.	

APPENDIX II

REHABILITATION OF MAROS TRANSMISSION CANAL

2.1 General

2.2 Method of Survey

2.3 Results of Survey

2.4 Rehabilitation of the Canal

2.5 Recommendation

APPENDIX II REHABILITATION OF MAROS TRANSMISSION CANAL

2.1 General

Survey on Water Losses at Existing Transmission Canal conducted during Master Plan period had revealed that major water losses are taking place at the downstream of the canal within a few kilometer from the Panaikang treatment plant. (Refer to Figure 3.2 Measurement of Water Flow in Transmission Canal of the Supporting Reports).

During the period of the Feasibility Study, the survey on Maros Transmission canal was again conducted to ascertain how inhabitants along the canal depend on the canal water and to examine how much extent the water is bacteriologically contaminated. Since most of such inhabitants gathers along the span of 4 km from the Panaikang treatment plant, the survey was conducted mainly along the downstream. Scope of rehabilitation work of the canal is proposed herein on the basis of the above survey.

2.2 Method of Survey

Water sampling tests were carried out at 6 points of the canal as shown in Figure A.2.1, including four points where the former survey during Master Plan period was conducted and additional two near Panaikang. Especially at the survey points near Panaikang, the Team examined chlorine consumption as well as bacteriological characteristics to specify the effects of contaminated raw water to the treatment processes.

Following are the items asked at the interview to the residents;

1) Whether the Canal water are being consumed by the inhabitants and their poultry,

2) Whether human wastes and garbage are dumped into the canal, and
3) Whether groundwater is available or not near the canal.

2.3 Results of Survey

Team's major findings through the survey are as follows:

1) Water losses from the existing canal account for about 30% of the total flow, the half occuring at the downstream span of a few kilometers from the Panaikang treatment plant.

2) The canal is contaminated by human wastes and sewage particularly at the downstream along which many houses are congested. (See Table A.2.1 and Figure A.2.2)

3) It is often observed at the open cut section that many plants and algae grown in the water are reducing the conveyance capacity of the canal.

Considering the above, it is recommended that a 4-km span of the canal from Panaikang should be repaired to reduce water losses and contamination as early as possible.

2.4 Rehabilitation of the Canal

There are several ways for a rehabilitation of the canal. The Team selected three alternatives as shown in Figure A.2.3, considering the present situation of the canal. Each alternative has folllowing advantages/disadvantages.

Case 1 - to install pipeline or concrete conduit in the canal.
1) It requires sand and earth to backfill the existing canal,

2) Its cost is less expensive than Case 2, as summarized in Table A.2.2.,
3) The canal becomes free from contamination, and
4) The canal backfilled is available for another purpose.

Case 2 - to install pipeline or concrete conduit under the existing road outside the canal.

1) Preparatory works, i.e., sheet piling, dewatering pumps, an access road, etc. are necessary for rehabilitation,
2) It requires sand and earth to backfill the existing canal,
3) Its investment cost is relatively high, and
4) The canal becomes free from contamination.

Case 3 - to repair the base and embankment of the canal with concrete lining and to install fence and drain at both sides along the canal.

1) It is relatively moderate in investment cost,
2) It requires periodical patrol for maintenance, and
3) Human contamination will possibly continue to a certain extent.

From the above, the Team recommends that the downstream span of 4 km be repaired employing the method of Case 1. It is not costly as comparared to Case 2 and ensures that the canal is completely free from human contamination.

In the meantime, the above figure of 4 km in length was determined through comparison of capital cost and length of span to be repaired. As for pipe materials to be laid in the canal, reinforced concrete pipes or corrugated steel pipes should be utilized from economical and technical points of view as can be seen in Table A.2.3.

2.5 Recommendation

Based on surveys on the Maros transmission canal conducted several times during the period of the Master Plan and the Feasibility Study and a series of discussions with authorities concerned in Ujung Pandang, the Team proposed rehabilitation work of the canal. PDAM is, however, recommended to conduct similar preliminary surveys as described above prior to the commencement of the rehabilitation work for the purpose of data compilation on water losses and geographical conditions of the canal. In case groundwater near the canal be influenced drastically by the repair work, inhabitants who depend on groundwater for daily consumption are to be given a priority to use clear water supplied from the plant.

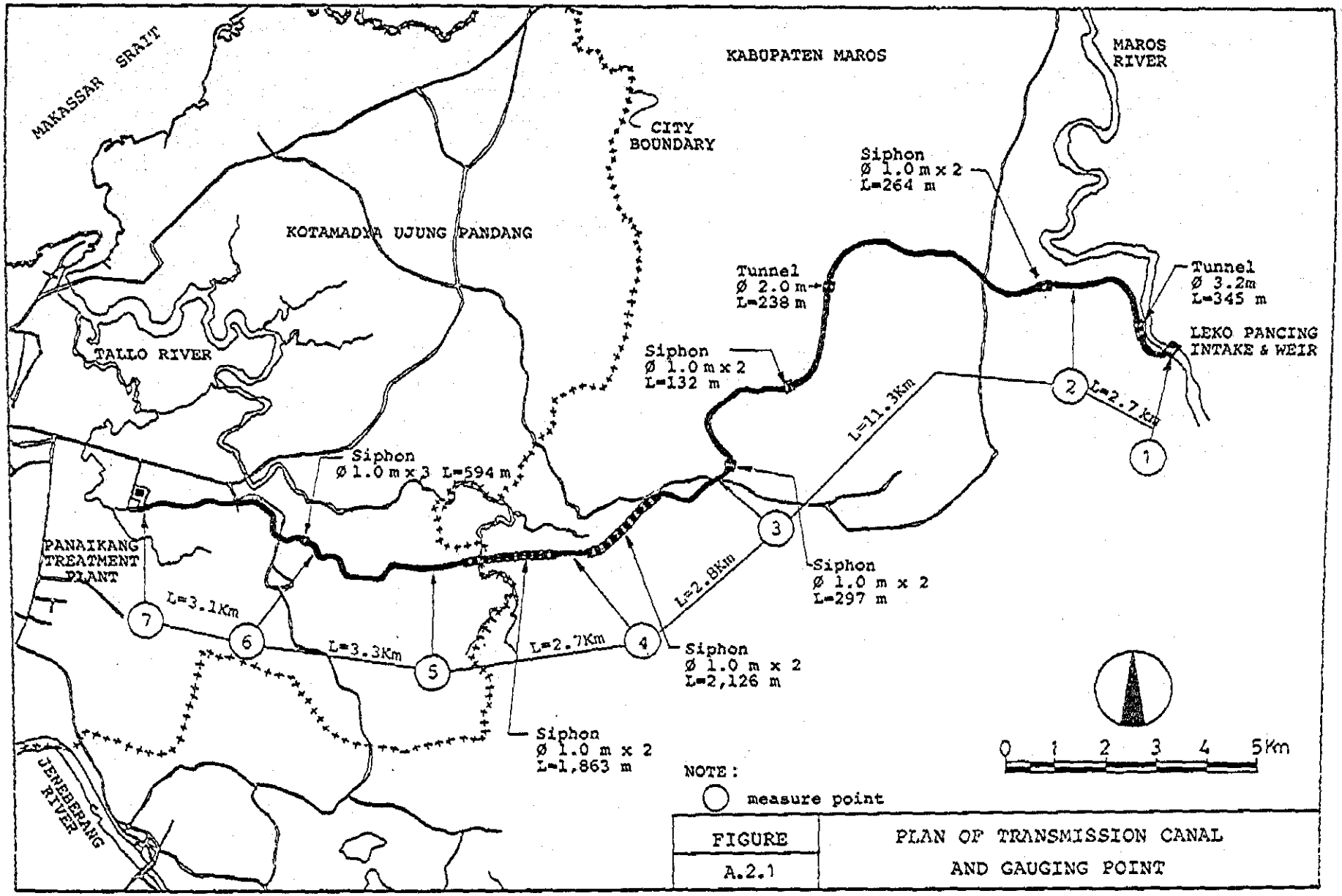

MAKASSAR STRAIT
KABUPATEN MAROS
MAROS RIVER
CITY BOUNDARY
Siphon
Ø 1.0 m x 2
L=264 m
KOTAMADYA UJUNG PANDANG
Tunnel
Ø 2.0 m
L=238 m
Tunnel
Ø 3.2m
L=345 m
LEKO PANCING
INTAKE & WEIR
TALLO RIVER
Siphon
Ø 1.0 m x 2
L=132 m
L=11.3Km
L=2.7Km
Siphon
Ø 1.0 m x 3 L=594 m
PANAIKANG
TREATMENT
PLANT
L=2.8Km
Siphon
Ø 1.0 m x 2
L=297 m
L=3.1Km
L=3.3Km
L=2.7Km
Siphon
Ø 1.0 m x 2
L=2,126 m
Siphon
Ø 1.0 m x 2
L=1,863 m
JENEBERANG
RIVER
0 1 2 3 4 5Km
NOTE :
measure point
FIGURE
A.2.1
PLAN OF TRANSMISSION CANAL
AND GAUGING POINT

TABLE A.2.1 WATER QUALITY ANALYSIS OF MAROS RAW WATER CANAL

No. of Sampling point	Total Colonise (N/ml)	Coliform Group (N/100 ml)	Turbidity (Degree)
1	434	0	50
2	-	-	105
3	669	0	70
4	-	-	-
5	676	100	95
6	735	400	73
7	1,050	500	105

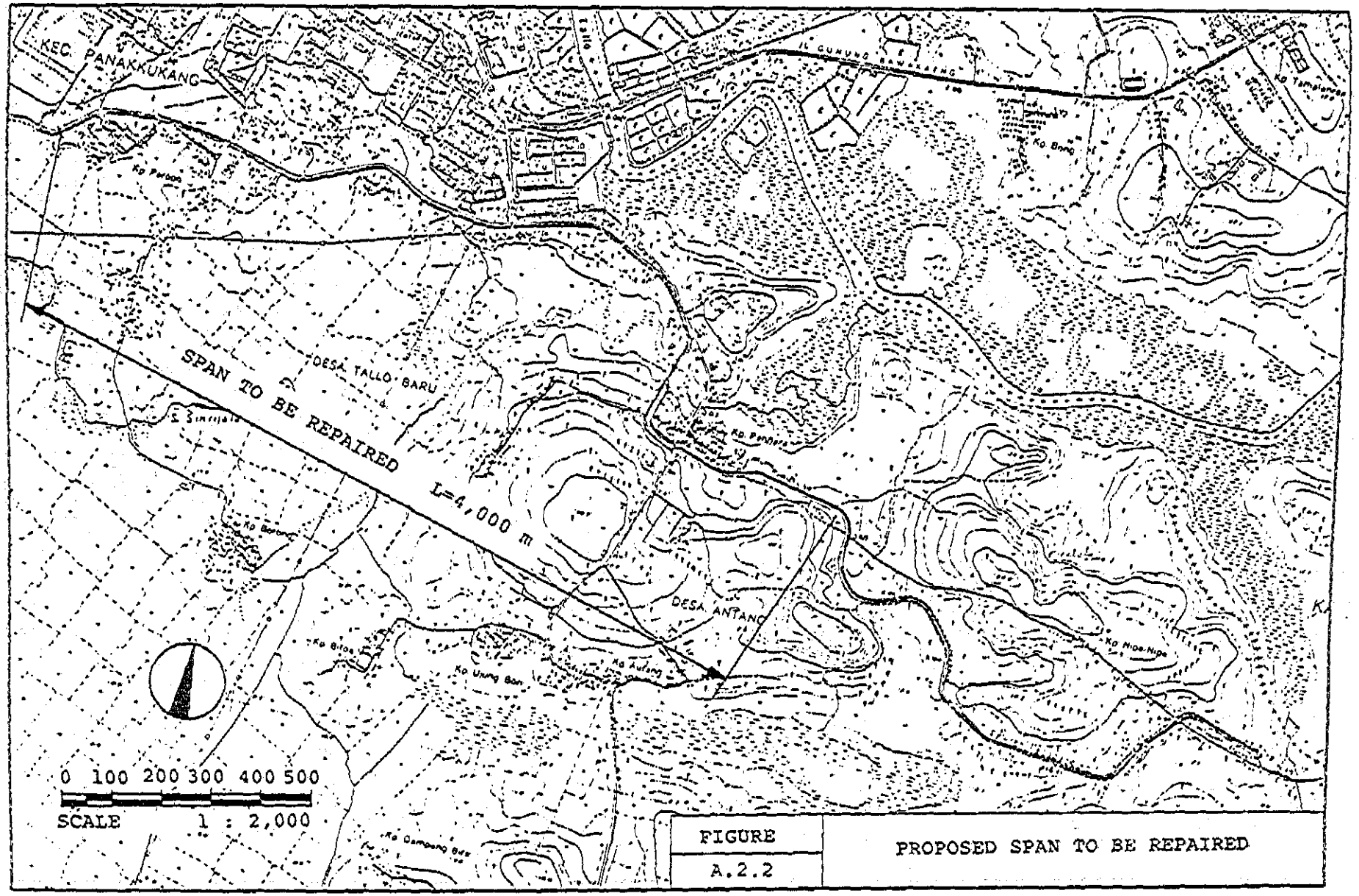
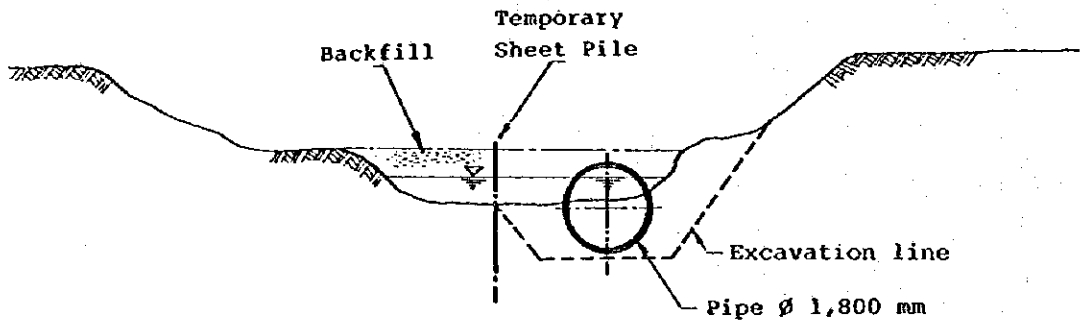
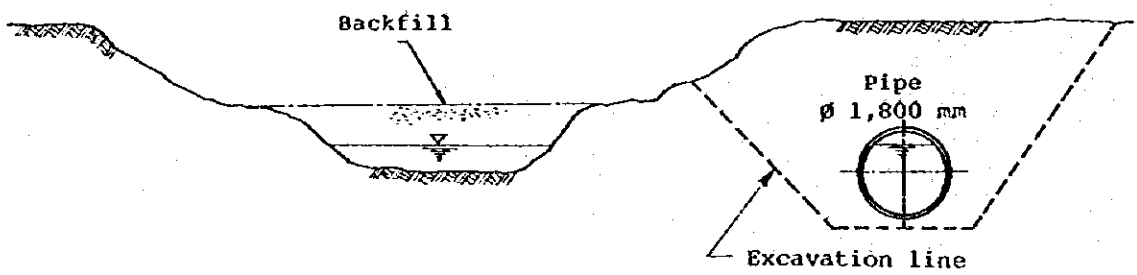


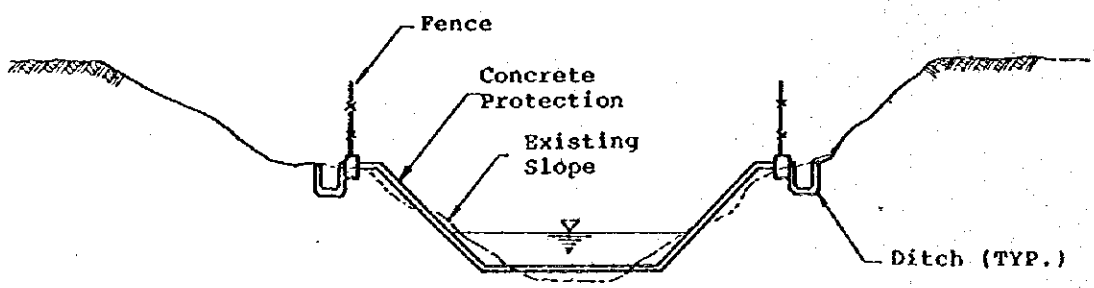
FIGURE	PROPOSED SPAN TO BE REPAIRED
A.2.2	



CASE - 1



CASE - 2



CASE - 3

FIGURE	REHABILITATION OF MAROS CANAL
A.2.3	

TABLE A.2.2 COST COMPARISON FOR REHABILITATION OF MAROS CANAL

Description	case 1	case 2	case 3
- Excavation	21,840	6,240	3,120
- Disposal/stock	2,638	2,638	1,370
- Backfill	12,168	3,042	0
- Pipe Installation	380,400	380,400	0
- Bank Protection	0	0	21,750
- U-ditch	0	0	14,000
- Fence	0	0	40,000
- Temporary work	75,700	143,200	143,200
- Others	7,254	4,480	6,560
---- T O T A L ----	500,000	540,000	230,000

Unit: Rp./meter

TABLE A.2.3 Comparison of Pipe Materials

Pipe Material	Ratio of Cost *	Description
1) Concrete Pipe	1.0	- Locally available
2) Corrugated Steel Pipe	1.0	- Locally available
3) Fiberglass Reinforced Plastic Pipe	1.6	- pipes in required dia are not available
4) Steel Pipe	1.8	- To be imported
5) Ductile Iron Pipe	1.8	- To be imported

* ..... It shows the ration of cost to that of concrete pipe.

APPENDIX III

PRELIMINARY DESIGN

3.1 Water Treatment Processes to be Applied for New Treatment Plant

3.2 Dimension of Planned Facilities

3.3 Drawing of Major Facilities

APPENDIX III PRELIMINARY DESIGN

3.1 Water Treatment Processes to be Applied for New Treatment Plant

In order to meet the water supply target in 1995, the Master Plan proposed to construct a water treatment plant at Desa Mangngasa in the city of Ujung Pandang, with Bili Bili irrigation water from the Jeneberang river as a raw water source for the plant.

Water treatment processes and chemical dosing rate, etc. to treat this Bili Bili raw water are studied in this section.

3.1.1 Characteristics of Raw Water Quality

The result of raw water quality analysis at Bili Bili intake is shown in Table A.3.1 and characteristics of the raw water are summarized below:

1) Fluctuation of turbidity is remarkable according to seasons. While turbidity of the water is stable between 5 to 10 ppm in dry season, its fluctuation is large between 15 to 130 ppm in wet seasons. Average turbidity in wet season was 56 ppm as high as eight times compared with the one in dry season which is 7 ppm. This is important factor to be taken into account for treatment processes.

2) Dissolved solids such as alkalinity and hardness are lower in average in wet season, say, by 30 to 40 % comparing to dry season. The reason for this may be that the dissolved solids were diluted by rainfall water.

3) As far as Anmonium, Coliform, Bacteria and COD are concerned, raw water has not been polluted by domestic sewage, and it is considered appropriate to use for the water supply in terms of quality.

3.1.2 Flow of Treatment Process

Taking into account the characteristics of raw water quality, it is economical and advisable to employ both ordinary rapid sand filtration (pre-chlorination + flocculation & sedimentation + rapid sand filtration) and direct filtration as treatment processes. When turbidity is low in dry season, raw water will be processed by direct filtration, and in other season, water will be processed by ordinary rapid filtration. Dosage rate of alum in direct filtration will be approximately 1/3 of ordinary rapid sand filtration. The processes of this treatment is shown in Figure A.3.1. In future, if raw water source will be changed to Bili Bili Dam where eutrophication is anticipated, water will be properly treated by two stages of rapid mixing, namely, before sedimentation and before filtration. In Figure A.3.1, functions of each process are also detailed at the bottom of the same figure.

3.1.3 Chemicals and Dosage Rate

As for chemicals to be used for water treatment, alum, lime and bleaching powder which are currently used at the existing plants as coagulant, pH control agent and disinfectant respectively are considered appropriate. It is however anticipated that in the future the raw water quality may change and chemicals may be improved along with the advance in technology, and so the above proposed chemicals are to be changed as deemed necessary.

Dosage rates of the above chemicals at several occasions are shown in Table A.3.2. Out of many kinds of chemical feeders, designed herein are simplified and unsophisticated one for easy operation.

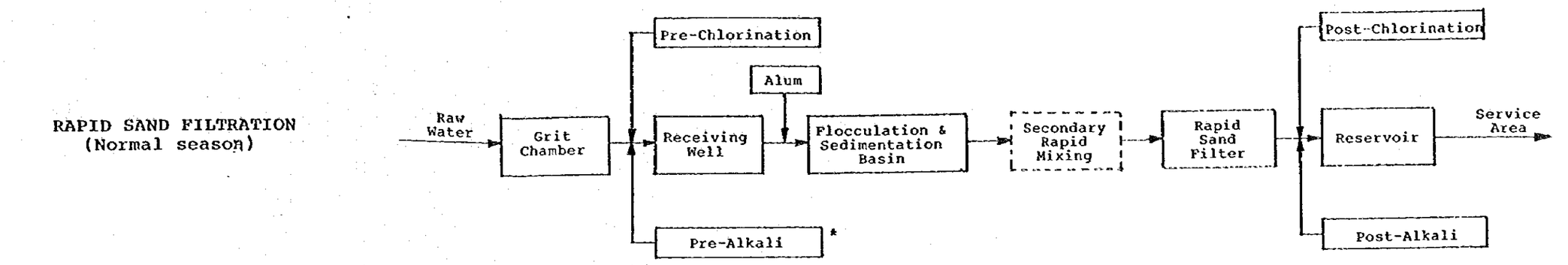
TABLE A.3.1 WATER QUALITY ANALYSIS OF JENEBERANG RIVER
(BILI BILI INTAKE)

Quality Parameter	1984 Sept.1	Oct.11	Nov.21	Dec.10	Dec.19	Dec.21	1985 Jan.17	Mar.30	June4	June17	Ave.(1)	Ave.(2)	Ave.(3)
WATER TEMPERATURE	26.0	27.4	25.0	28.5	24.5	23.5	27.0	25.5	24.8	25.8	25.8	26.0	25.7
pH	7.4	7.8	7.8	7.4	7.0	7.0	7.2	7.8	7.2	7.4	7.4	7.5	7.4
TURBIDITY	5	5	33	28	130	79	15	52	10	9	37	7	56
ALKALINITY	68	52	52	54	26	30	30	40	42	48	44	53	39
TOTAL HARDNESS	2.3	2.8	3.1	2.0	1.3	1.7	1.5	2.0	2.0	2.7	2.1	2.5	1.9
CHLORIDE ION	2	1	1	1	1	1	2	2	2	2	2	2	1
AMMONIA	0.06	0.06	-	-	-	-	0.04	<0.04	0.04	<0.04	0.05	0.04	0.04
DISSOLVED IRON	0.10	0.15	-	-	-	-	0.10	0.05	<0.05	0.15	0.11	0.08	0.08
MANGANESE	<0.03	0.03	-	-	-	-	<0.03	<0.03	<0.03	<0.03	0.03	0.01	0.0
COLIFORM GROUP	200	900	100	200	600	100	400	100	1,800	100	450	750	250
TOTAL COLONIES	172	444	588	460	1,260	588	371	448	483	770	558	467	619
DISSOLVED OXYGEN	-	-	-	-	-	7.2	7.0	-	8.0	7.9	7.5	4.0	7.1
C O D	-	-	2.6	1.5	2.5	1.6	0.8	1.9	1.2	0.7	1.6	0.5	1.8

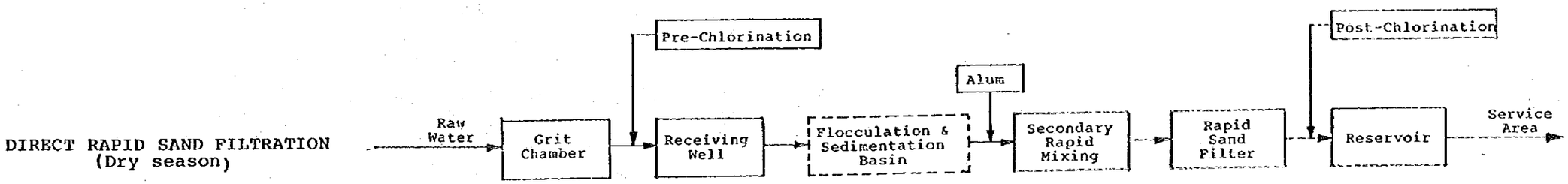
Note ; Ave.(1) : The average of all the figures.
Ave.(2) : The average of the figures in dry season (June - Oct.)
Ave.(3) : The average of the figures in rainy season (Nov. - May)

Table A.3.2 CHEMICAL DOSAGE RATE

	RAPID SAND FILTRATION (Normal Seasons)		DIRECT FILTRATION (Dry Season)	
	Ave. Rate (ppm)	Range (ppm)	Ave. Rate (ppm)	Rage (ppm)
Pre-Chlorination	1.0	0.5- 0.3	1.0	0.5-0.3
Pre-Alkali	-	0- 30.0	-	-
Alum	25.0	15.0-100.0	5.0	5.0
Post-Chlorination	1.0	0- 2.0	1.0	0-2.0
Post-Alkali	10.0	0- 30.0	-	-



* ... Pre-alkali should be feeded in case the raw water exceeds to 500 degrees in turbidity.



1) Pre-Chlorination : Pre-chlorination will be required to prevent growth of algae in the treatment facilities, kill plankton and remove iron and manganese in the raw water.

2) Pre-Alkali Treatment : Alkalinity in the raw water in the wet season may be 20 to 30 mg/l, when turbidity of source water rises. For treatment of such water, pre-alkali dosage is necessary. In the dry season, alkalinity may be rather high, 50 to 70 mg/l, not requiring pre-alkali treatment.

3) Post-Alkali Treatment : Alum consumes Alkalinity in water treatment, (Alum of 1 mg/l consumes Alkalinity of 0.45 mg/l), and pH value falls accordingly. Therefore, to protect pipe of the water supply system from corrosion, pH value of water for distribution must be raised by alkali treatment.

4) Post-Chlorination : To ensure the safety of the treated water, post-chlorination will be needed, even though break-point pre-chlorination should be applied, considering chlorine consumption during treatment processes.

5) Secondary Rapid Mixing : In dry seasons when raw water turbidity decreases to a level of less than 10 degrees, direct filtration without sedimentation process is to be applied to reduce dosage rate of alum, which is rather economical than normal treatment method.

FIGURE	FLOW SHEET OF TREATMENT PROCESSES
A.3.1	

3.2 Dimension of Planned Facilities

3.2.1 Raw Water Intake Facilities

1) Intake weir (phase 1)
   - Intake point : Bili Bili Irrigation Intake
   - Intake water level: Min. + 41.00 above the sea
   - Weir formed by gabion with a flush gate

2) Raw Water Canal (Phase 1)
   - Open channel : approx. L = 1,500 m
   - Width of the bottom: 5.0 m
   - Slope of the bank : 1 : 1.0

3) Grit Chamber (Phase 1)
   - Dimension : B 6.5 m x L 19.0 m x H 2.5 m
   - Retention time : 10 minutes
   - De-sanding : Manual removal, more frequently than once a year

3.2.2 Raw Water Transmission Pipeline (Phase 1)

- RCP, DIP, SP or FRPP: ϕ 1,200 mm L = 1,200 m
- RCP, DIP, SP or FRPP: ϕ 1,100 mm L = 13,800 m
- DIP or SP : ϕ 1,100 mm L = 4,500 m
- Main valve & its appurtenances : ϕ 1,100 mm x 1 set

3.2.3 Mangngasa Treatment Plant

1) Receiving well and Mixing well (Phase 1)
   - Dimension : B 2.5 m x L 5.0 m x H 5.0 m
   - Retention time : 2 minutes
   - Mixing method : Mixing by water fall

2) Flocculation basin (Phases 1 & 2)
   - Dimension : B 8.5 m x L 12.5 m x H 3.5 m x 2 basins
   - Retention time : 20 minutes
   - Flocculation method: Vertical & horizontal

3) Sedimentation Basin (Phases 1 & 2)

- Dimension	: B 12.5 m x L 64.0 m x H 3.5 m x 2 basins
- Retention time	: 3 hours
- Type	: Horizontal flow
- Overflow rate	: 1.2 m3/m2/hour (= 30 m/day)
- De-sludge	: Manual sludge removal

4) Filter (Phase 1 & 2)

- Dimension	: B 7.0 m x L 9.0 m
- Number of bed	: 6 beds
- Type	: Constant-rate filtration (Interfilter-washing filtration)
- Filtration rate	: 120 m3/m2/day (= 5m/hour)
- Filter sand	: Single media of filter sand, Thickness 70 cm
- Filter gravel	: Thickness 25 cm
- Washing system	: Surface wash 0.2 m3/min/m2, Backwashing 0.7 m3/min/m2

5) Clear Water Reservoir (Phases 1 & 2)

- Dimension	: B 60.0 m x L 30.0 m x H 5.0
- Retention time	: 5 hours

6) Distribution Pump Station (Phase 1)

- Dimension	: B 12.0 m x L 56.0 m, Two-story
- Basement floor	: 750 m2 with pump room
- First floor	: 750 m2 with electric room, entrance, office, etc.

7) Administration Building (Phase 1)

- Dimension	: B 14.0 m x L 25.0 m, Two-story
- First floor	: Office space, meeting room, laboratory, etc.

- Second floor : Meeting room, control room, etc.

8) Chemical Building (Phase 1)
- Dimension : B 12.0 m x L 27.0 m, Two-story
- First floor : Alum, lime and chlorine, Solution tanks
- Second floor : Storage and feeding equipments

9) Waste water Pond (Phase 1)
- Dimension : B 15.0 m x L 35.0 m x H 2.5 m x 2 basins
- Pump room : B 7.0 x L 15.0 m

10) Work shop and Storage Building (Phase 1)
- Work shop : B 8.0 m x L 16.0 m
- Storage Building : B 8.0 m x L 16.0 m

11) Staff House (Phase 1)
- Dimension : B 8.0 m x L 10.0 m with a yard
- Number of House : 4 houses

12) Distribution Pumps (Phases 1 & 2)
- Large pumps : 20 m3/min. x 40 m x 250 kw x 4 units (1 standby)
- Small pumps : 10 m3/min. x 40 m x 130 kw x 2 units (1 standby)
- Filter Surface pumps : 20 m3/min. x 20 m x 95 kw x 2 units (1 standby)

13) Chemical Feeding Facilities (phases 1 & 2)
- Alum system : solution tanks (3), Elevated tanks (3), Transfer pumps (3 unit, 1 standby)

- Lime system : solution tanks (2), saturation tanks (3), Feed pumps (2 units, 1 standby)
- Chlorins system : solution tanks (2), Header tanks (2), Transfer pumps (2 units, 1 standby)

14) Electrical Equipment (Phases 1 & 2)
- High Voltage Transformer (22/3.3 kV) : 2 units
- Low Voltage Transformer (3,300/380-220V) : 2 units
- Emergency Generator (750 kVA) : 2 units

3.2.4. Distribution System

1) Trunk Main

Dia. (mm)	Pipe Length (m) Phase 1	Phase 2	Pipe Material
1,000	1,600	-	DIP/SP
900	1,340	-	- di -
700	1,510	-	- di -
600	1,750	-	- di -
500	10,280	650	- di -
400	8,950	920	- di -
350	-	4,860	- di -
300	8,480	3,160	- di -
Total	33,910	16,700	

2) Secondary Main

Dia. (mm)	Pipe Length (m) Phase 1	Phase 2	Pipe Material
250	5,720	1,820	DIP/SP/ACP
200	25,156	20,124	- di -
150	16,311	13,050	- di -
Total	47,187	34,994	

3) Service Main

Dia. (mm)	Pipe Length (m) Phase 1	Phase 2	Pipe Material
100	48,102	38,480	PVC/GSP
75	44,640	35,712	- di -
50	104,294	83,435	- di -
Total	197,036	57,627	

4) Distribution Tower

- Volume : 3,000 m3
- High water level : 27 m (above sea level)

5) River Crossing

- ϕ 500 mm L = 100 m (Tallo river) (Phase 1)
- ϕ 150 mm L = 110 m (Tallo river) (Phase 1)
- ϕ 150 mm L = 200 m (Jeneberang river) (Phase 2)

6) Service Meter

Phase 1 : 45,400 each
Phase 2 : 15,100 "

7) Public Standpipe

Phase 1 : 1,500 each
Phase 2 : 100 "

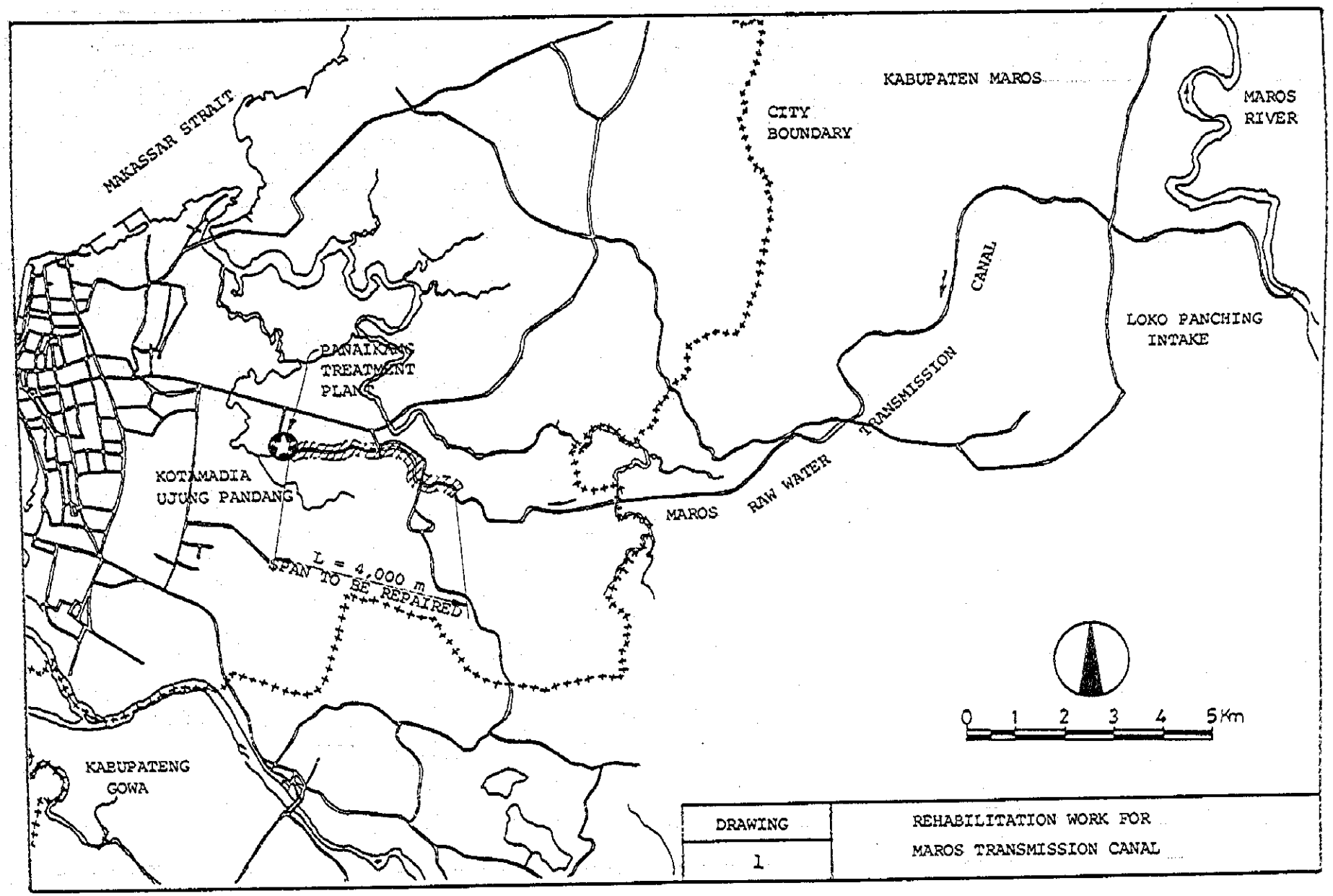
8) Fire Hydrant

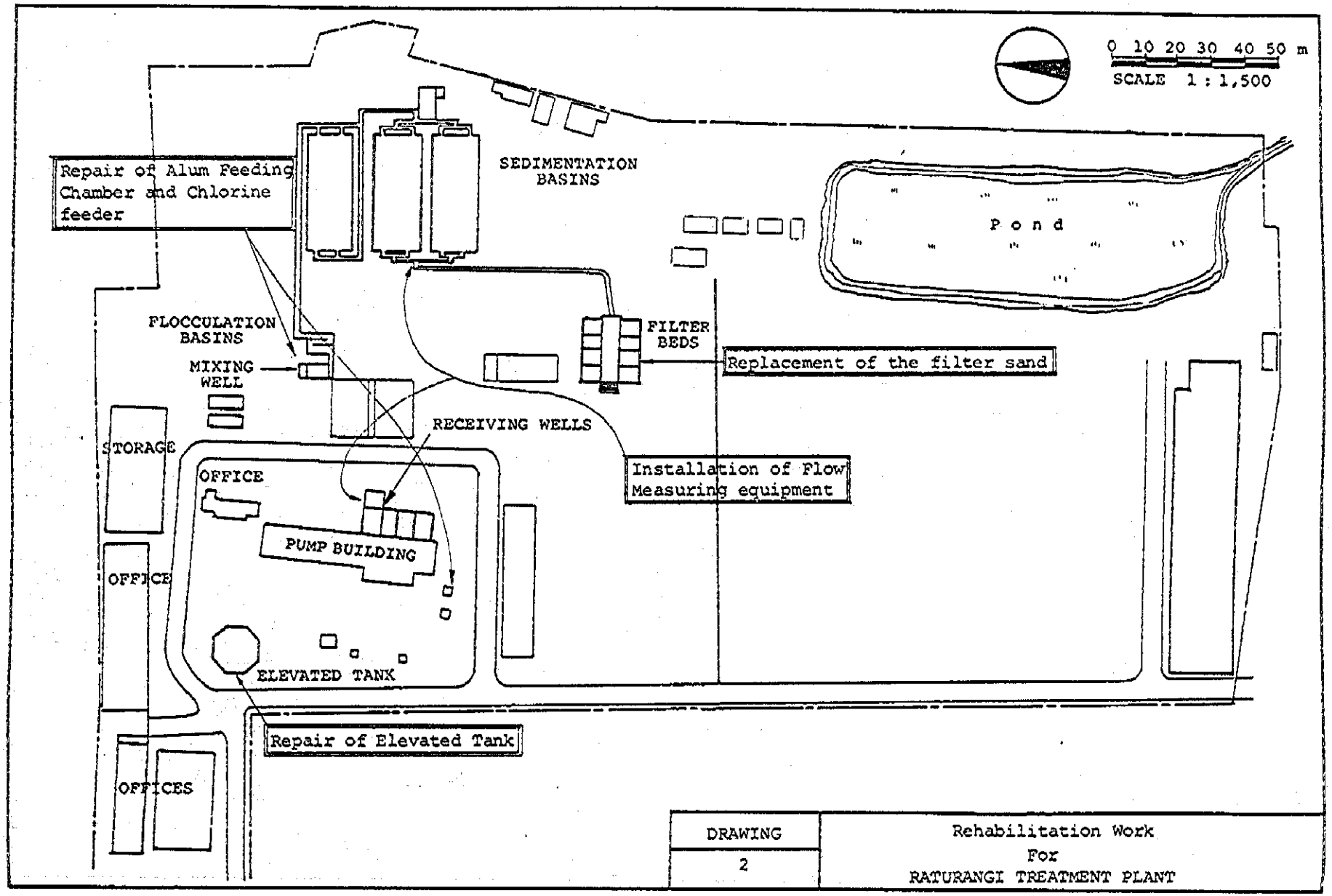
Phase 1 : 80 each
Phase 2 : 30 "

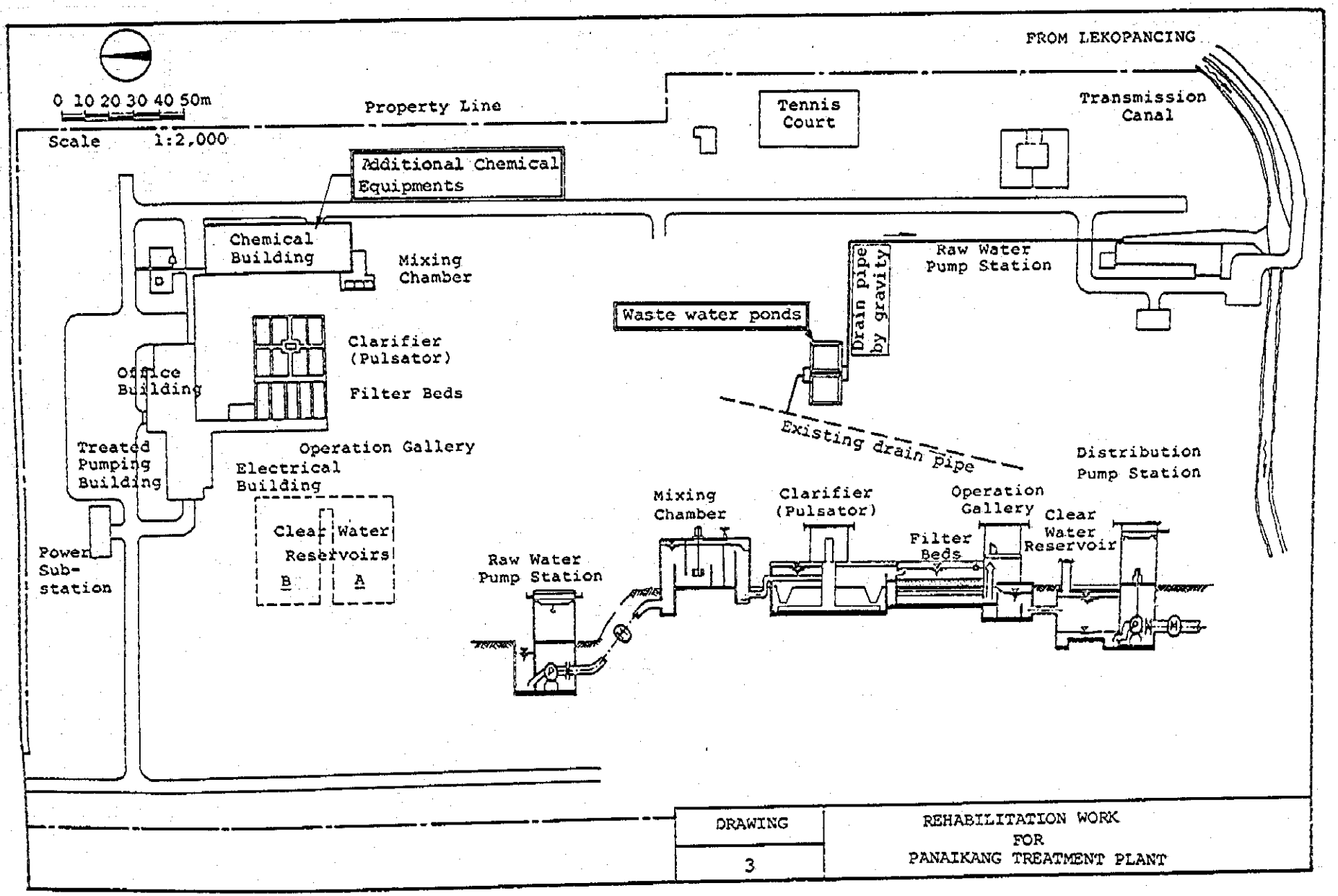
3.3 Drawings of Major Facilities

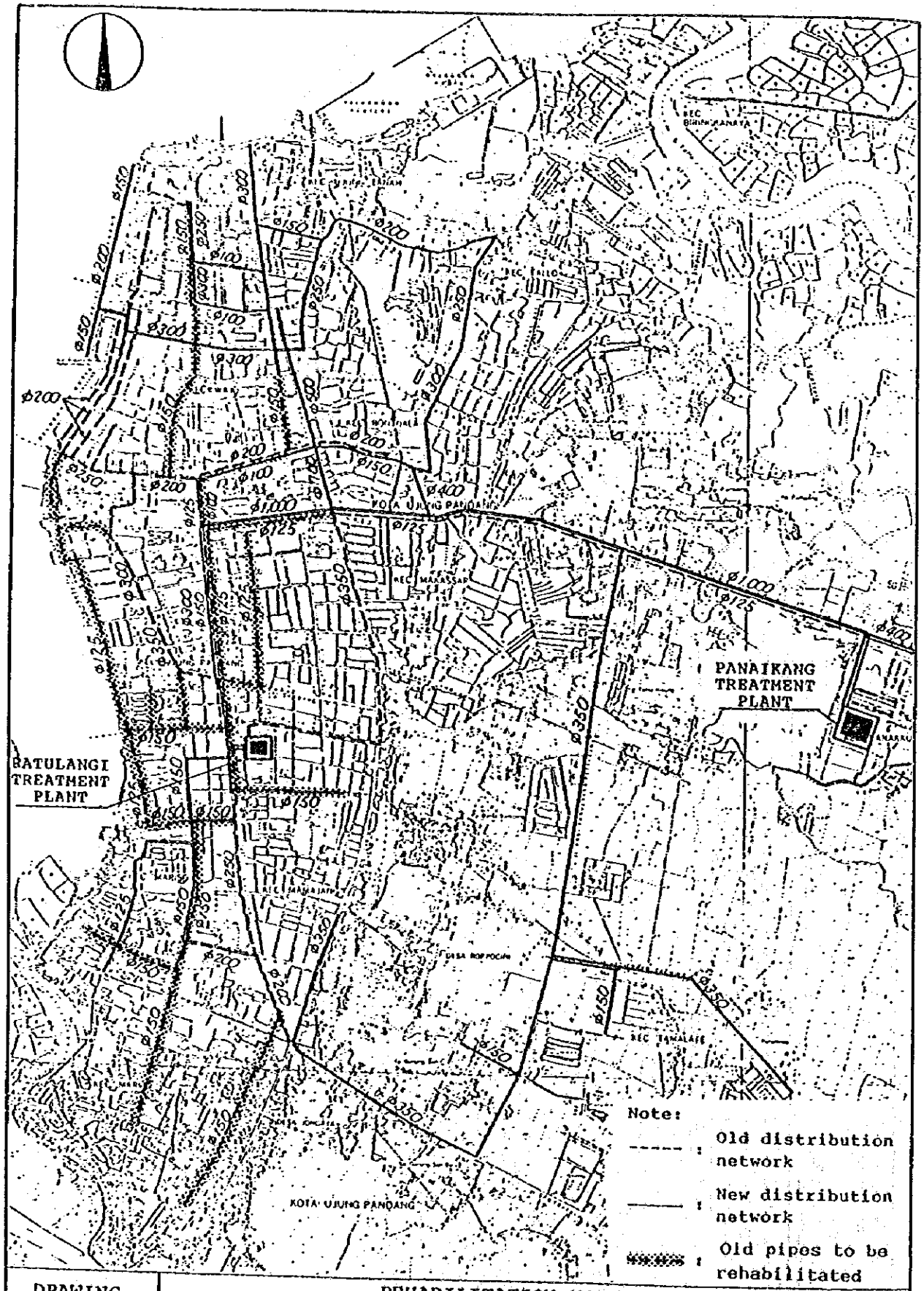
LIST OF DRAWINGS

DWG. NO.	T I T L E
	Rehabilitation Work
1.	Maros Raw Water Canal
2.	Ratulangi Treatment Plant
3.	Panaikang Treatment Plant
4.	Distribution Pipelines
	Mangngasa System
5.	Grit Chamber
6.	Profile of Raw Water Transmission Pipeline
7.	Receiving & Mixing Well and Flocculation & Sedimentation Basins
8.	Filter
9.	Clear Water Reservoir
10.	Distribution Pump Station
11.	Alum Feeding System
12.	Lime Feeding System
13.	Chlorination System
14.	Single Line Diagram

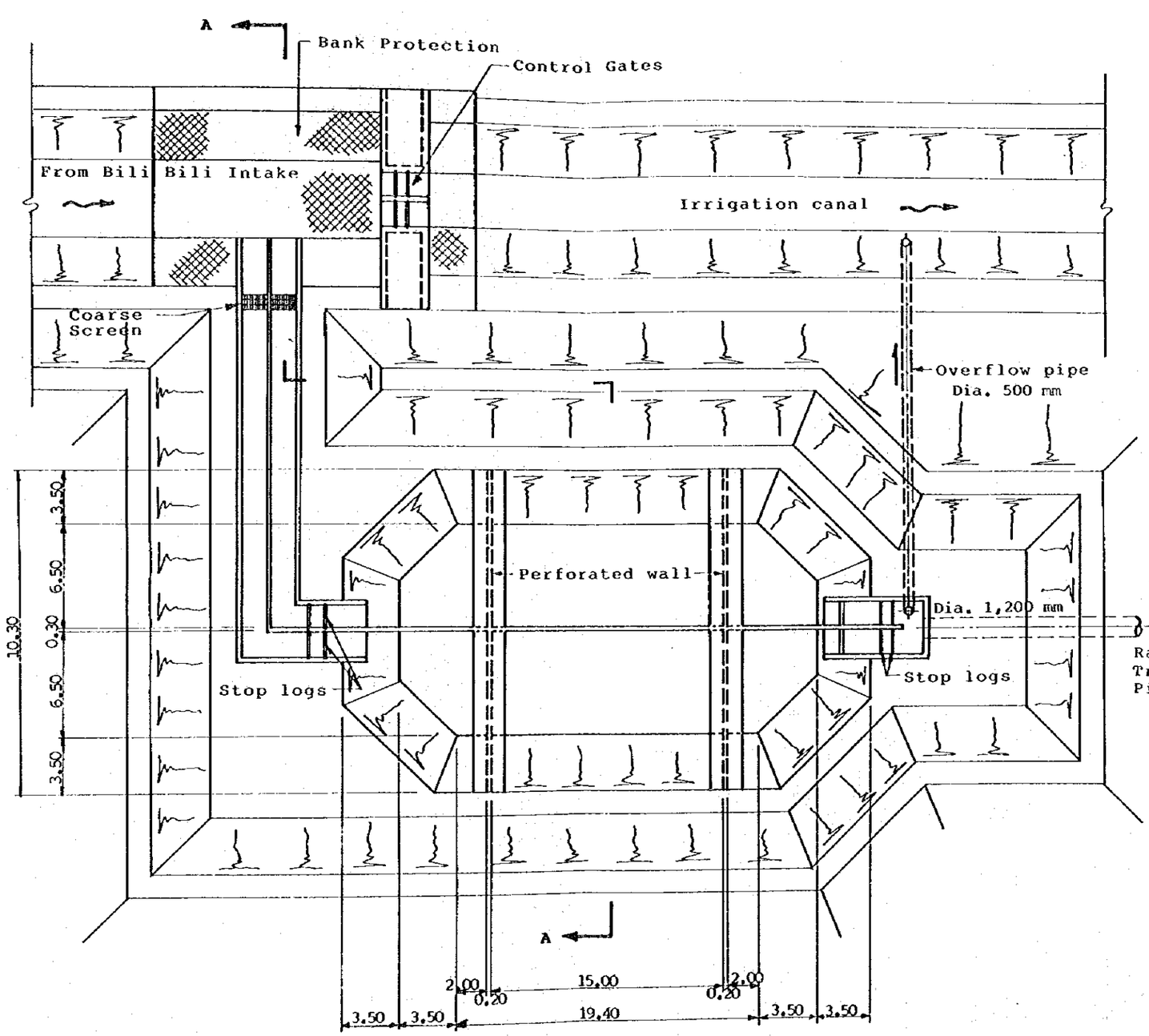

MAKASSAR STRAIT
KABUPATEN MAROS
CITY BOUNDARY
MAROS RIVER
CANAL
LOKO PANCHING INTAKE
PANAIKANG TREATMENT PLANT
TRANSMISSION
KOTAMADIA UJUNG PANDANG
MAROS RAW WATER
L = 4,000 m SPAN TO BE REPAIRED
KABUPATENG GOWA
0 1 2 3 4 5 Km
DRAWING
1
REHABILITATION WORK FOR MAROS TRANSMISSION CANAL


0 10 20 30 40 50 m
SCALE 1 : 1,500
Repair of Alum Feeding Chamber and Chlorine feeder
SEDIMENTATION BASINS
Pond
FLOCCULATION BASINS
MIXING WELL
FILTER BEDS
Replacement of the filter sand
RECEIVING WELLS
STORAGE
OFFICE
Installation of Flow Measuring equipment
PUMP BUILDING
OFFICE
ELEVATED TANK
Repair of Elevated Tank
OFFICES
DRAWING
2
Rehabilitation Work
For
RATURANGI TREATMENT PLANT

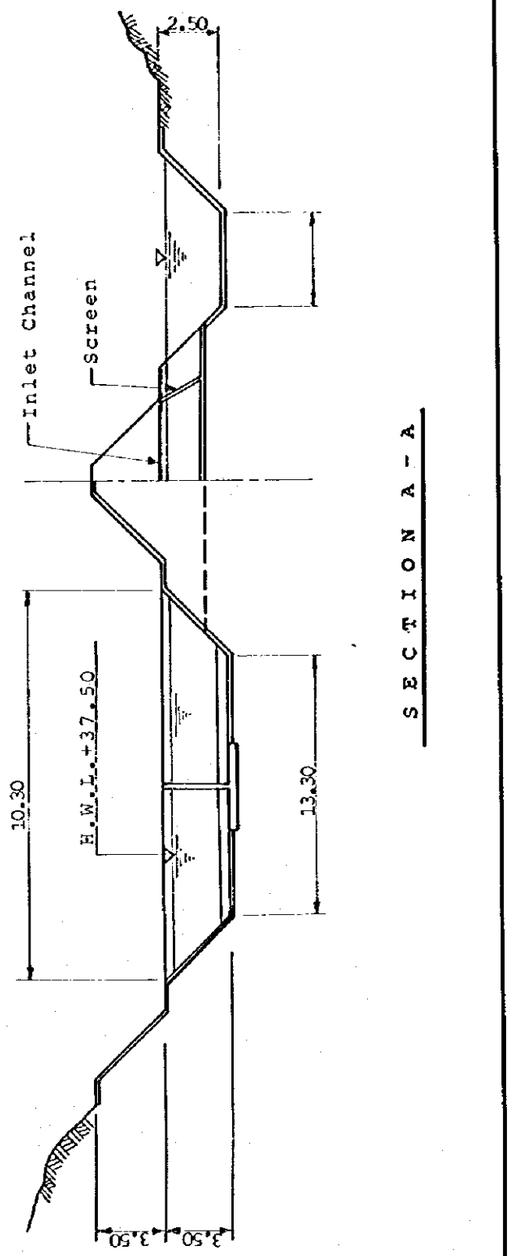

FROM LEKOPANCING
0 10 20 30 40 50m
Scale 1:2,000
Property Line
Tennis Court
Transmission Canal
Additional Chemical Equipments
Chemical Building
Mixing Chamber
Raw Water Pump Station
Waste water ponds
Drain pipe by gravity
Clarifier (Pulsator)
Office Building
Filter Beds
Existing drain pipe
Treated Pumping Building
Operation Gallery
Electrical Building
Distribution Pump Station
Clear Water Reservoirs
B
A
Power Sub-station
Mixing Chamber
Clarifier (Pulsator)
Operation Gallery
Clear Water Reservoir
Filter Beds
Raw Water Pump Station
DRAWING
3
REHABILITATION WORK
FOR
PANAIKANG TREATMENT PLANT



DRAWING	REHABILITATION WORK FOR DISTRIBUTION PIPELINES
4	

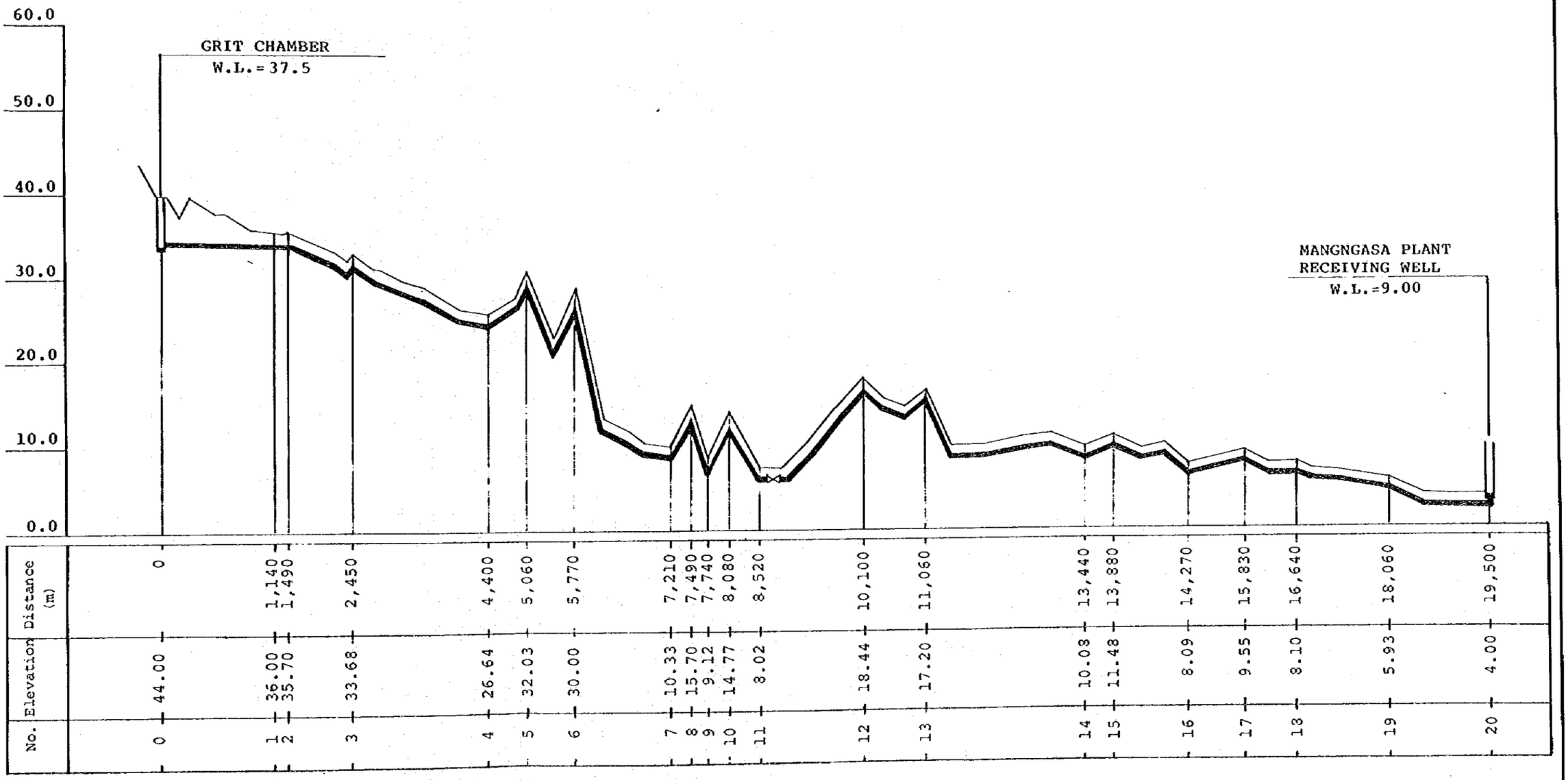


P L A N



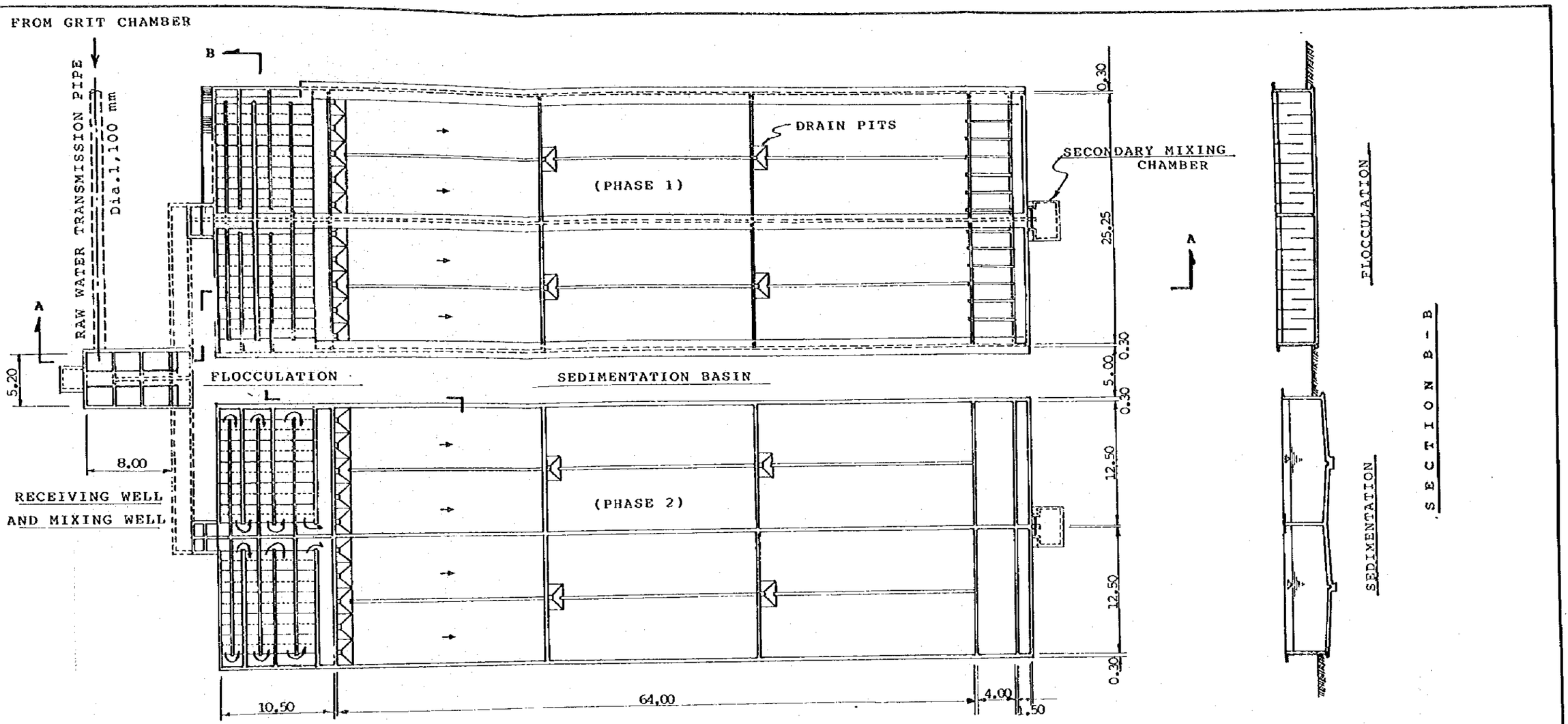
S E C T I O N A - A

DRAWING	GRIT CHAMBER
5	

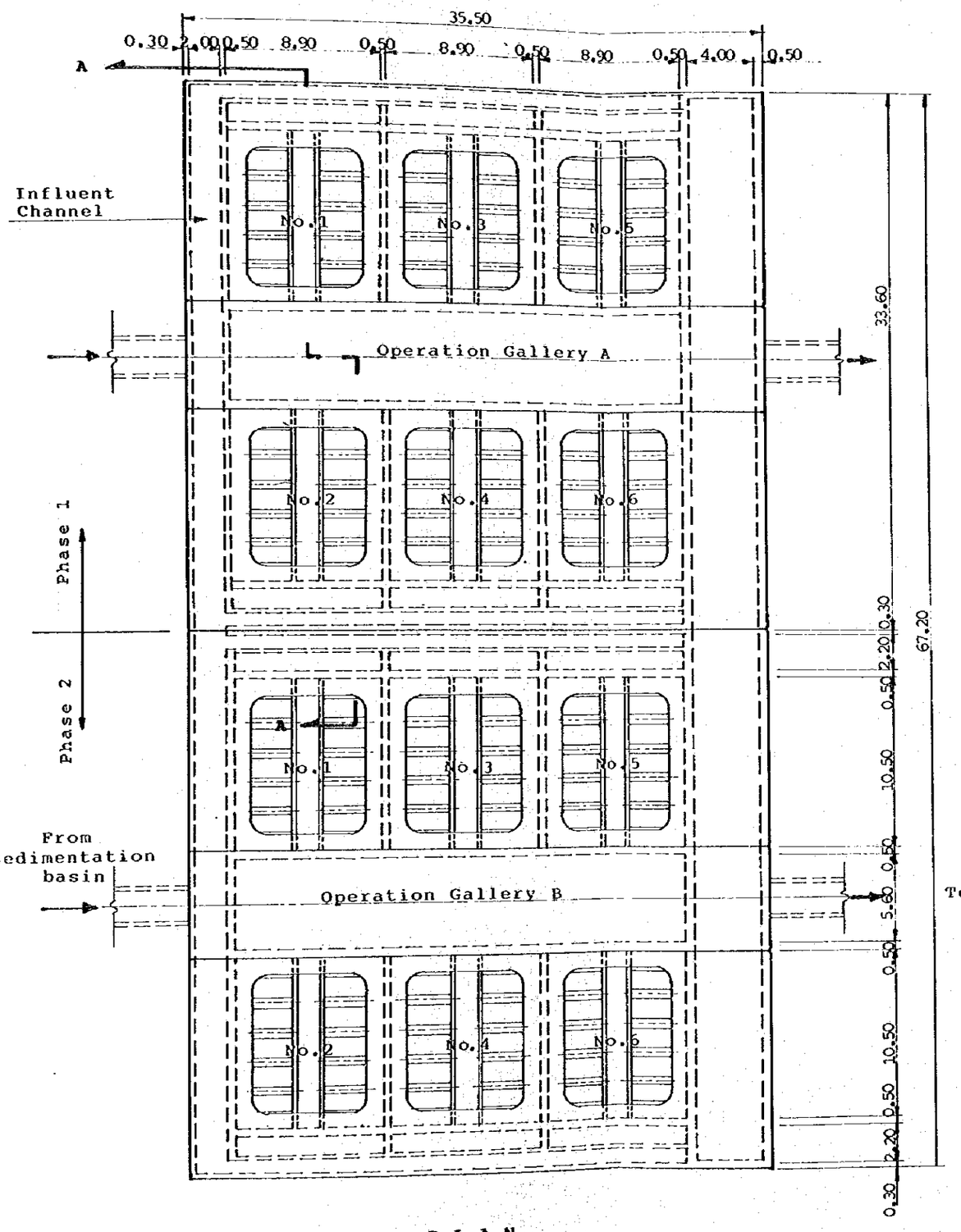


No.	Elevation	Distance (m)
0	44.00	0
1	36.00	1,140
2	35.70	1,490
3	33.68	2,450
4	26.64	4,400
5	32.03	5,060
6	30.00	5,770
7	10.33	7,210
8	15.70	7,490
9	9.12	7,740
10	14.77	8,080
11	8.02	8,520
12	18.44	10,100
13	17.20	11,060
14	10.08	13,440
15	11.48	13,880
16	8.09	14,270
17	9.55	15,830
18	8.10	16,640
19	5.93	18,060
20	4.00	19,500

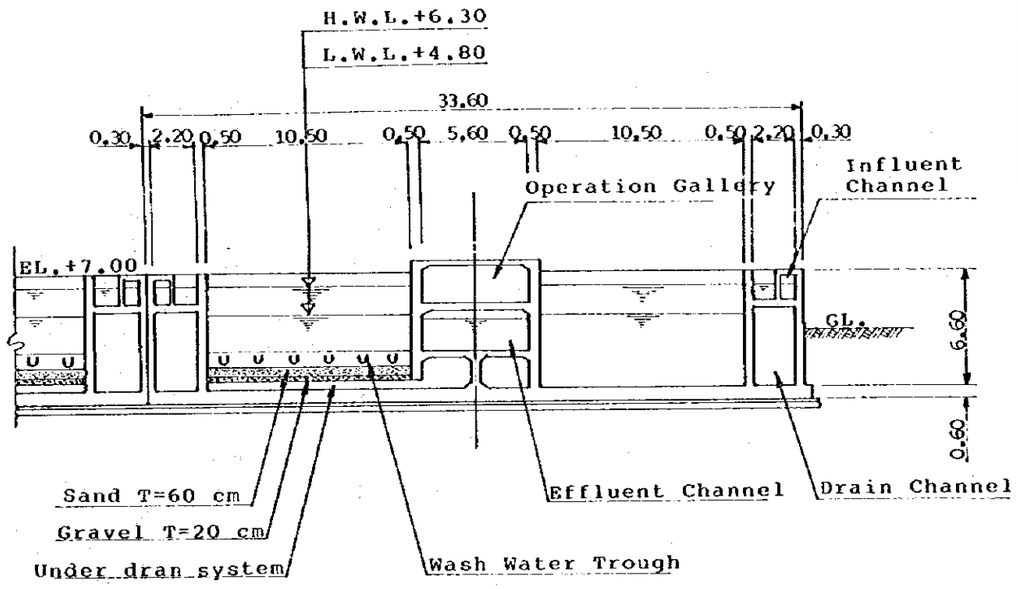
DRAWING	PROFILE OF RAW WATER TRANSMISSION PIPELINE
6	



DRAWING	RECEIVEING WELL, MIXING WELL AND FLOCCULATION & SEDIMENTATION BASIN
7	

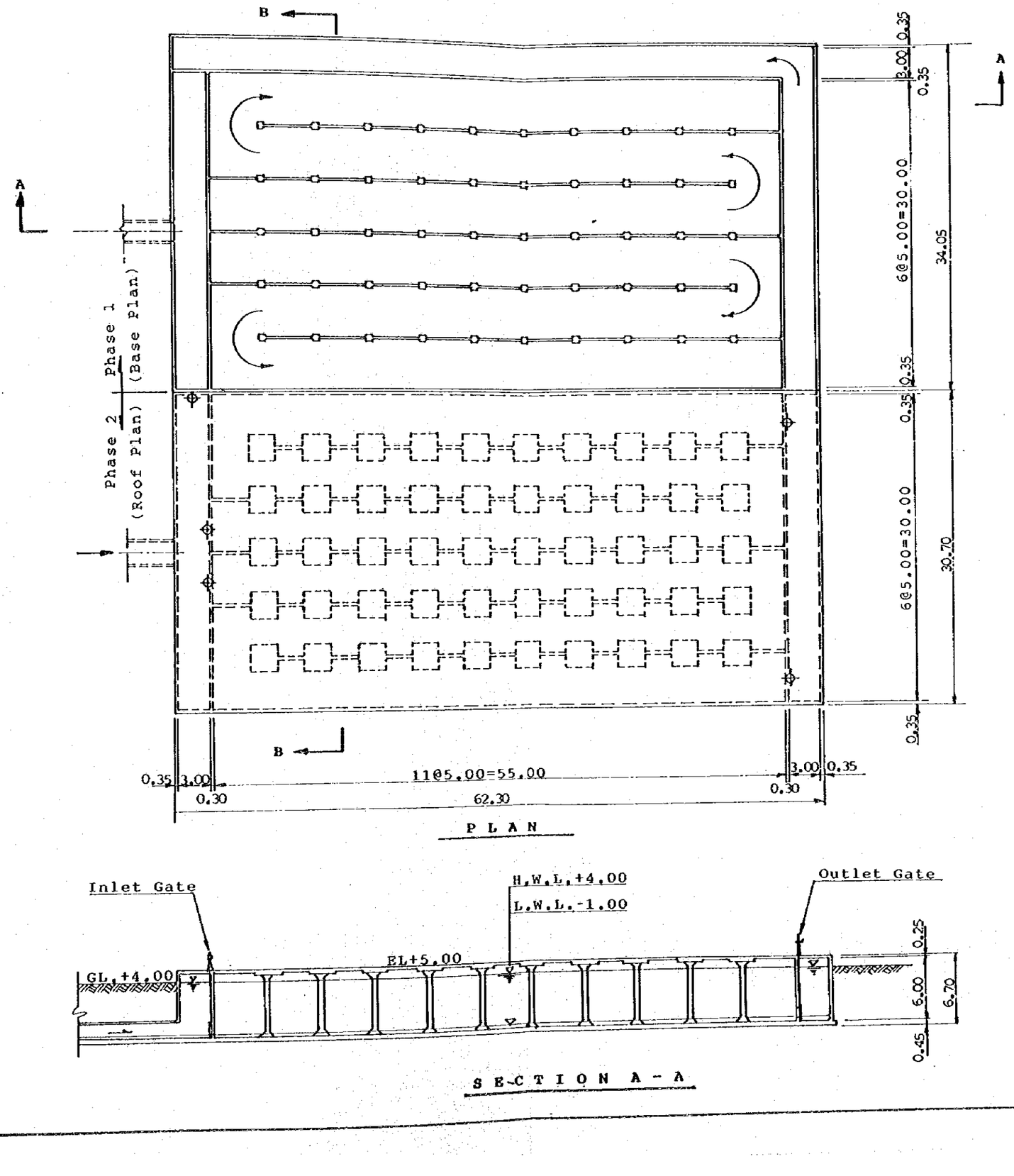


P L A N



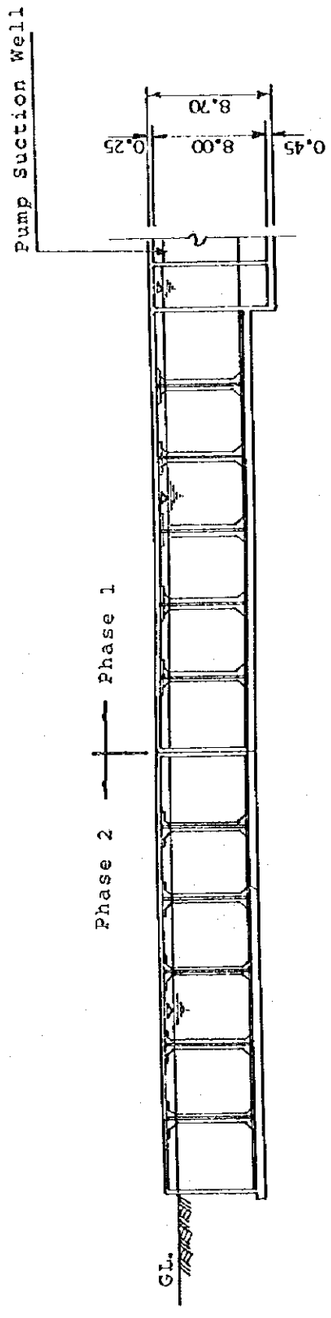
S E C T I O N A - A

DRAWING	FILTERS
8	



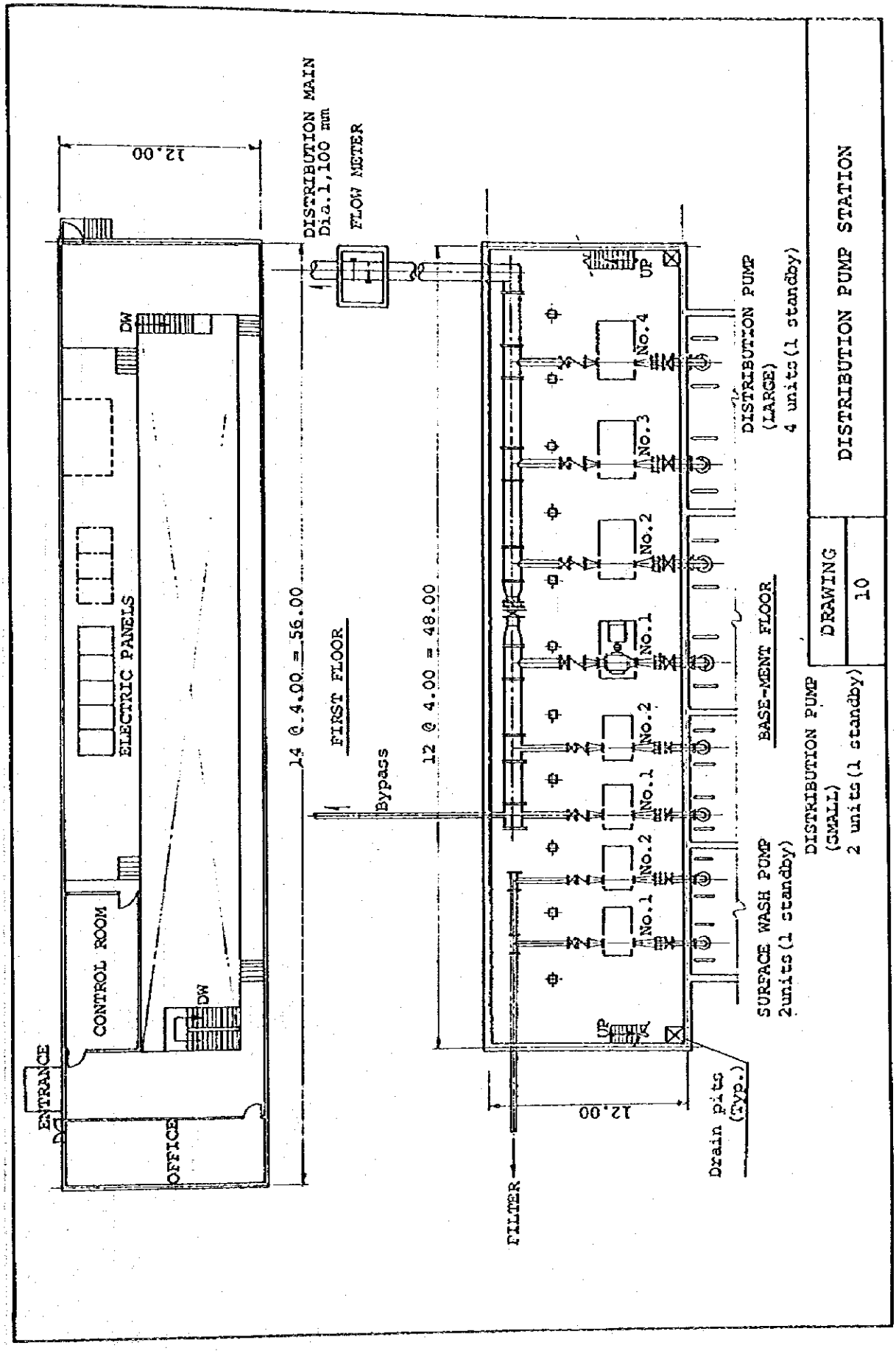
P L A N

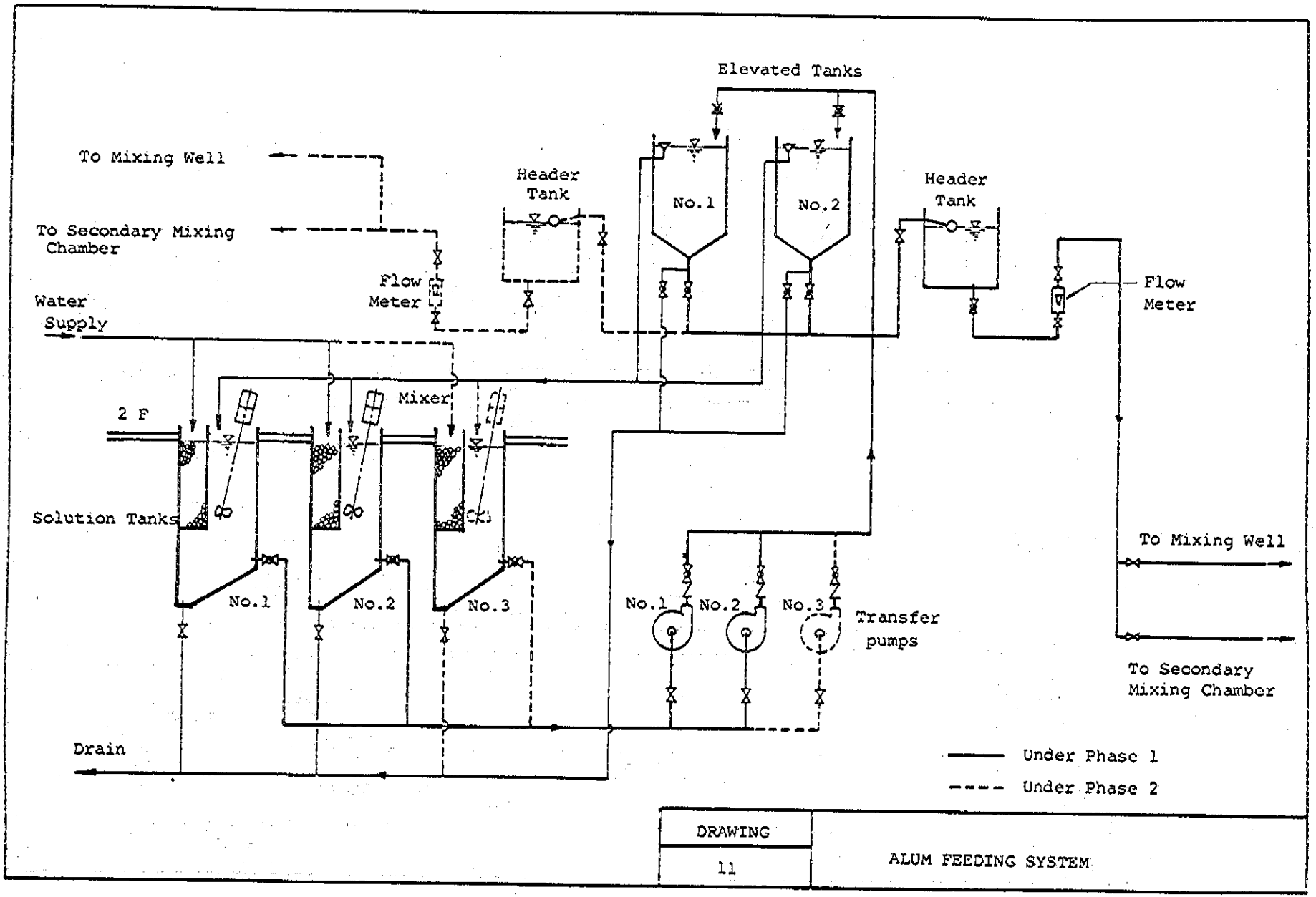
S E C T I O N A - A

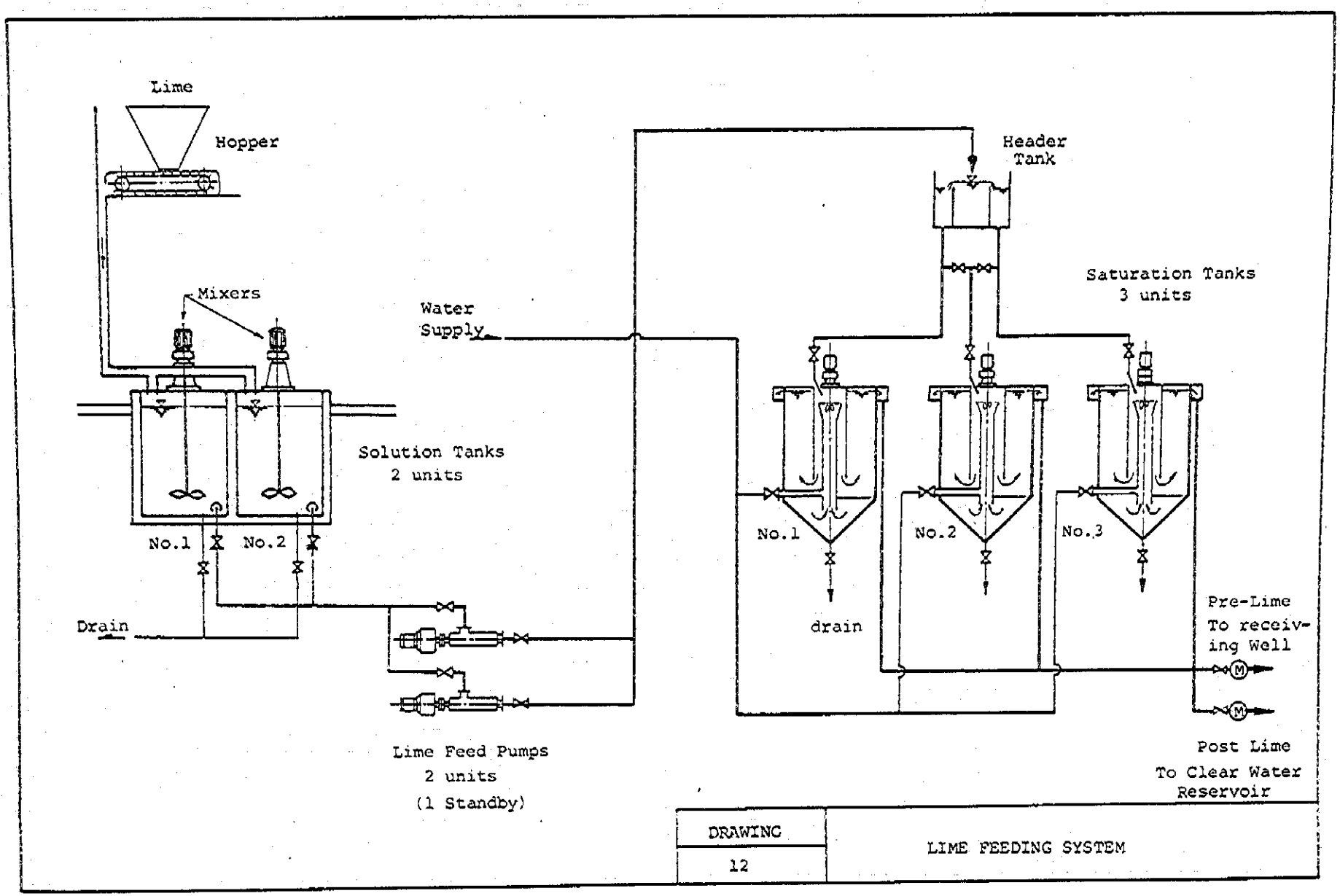


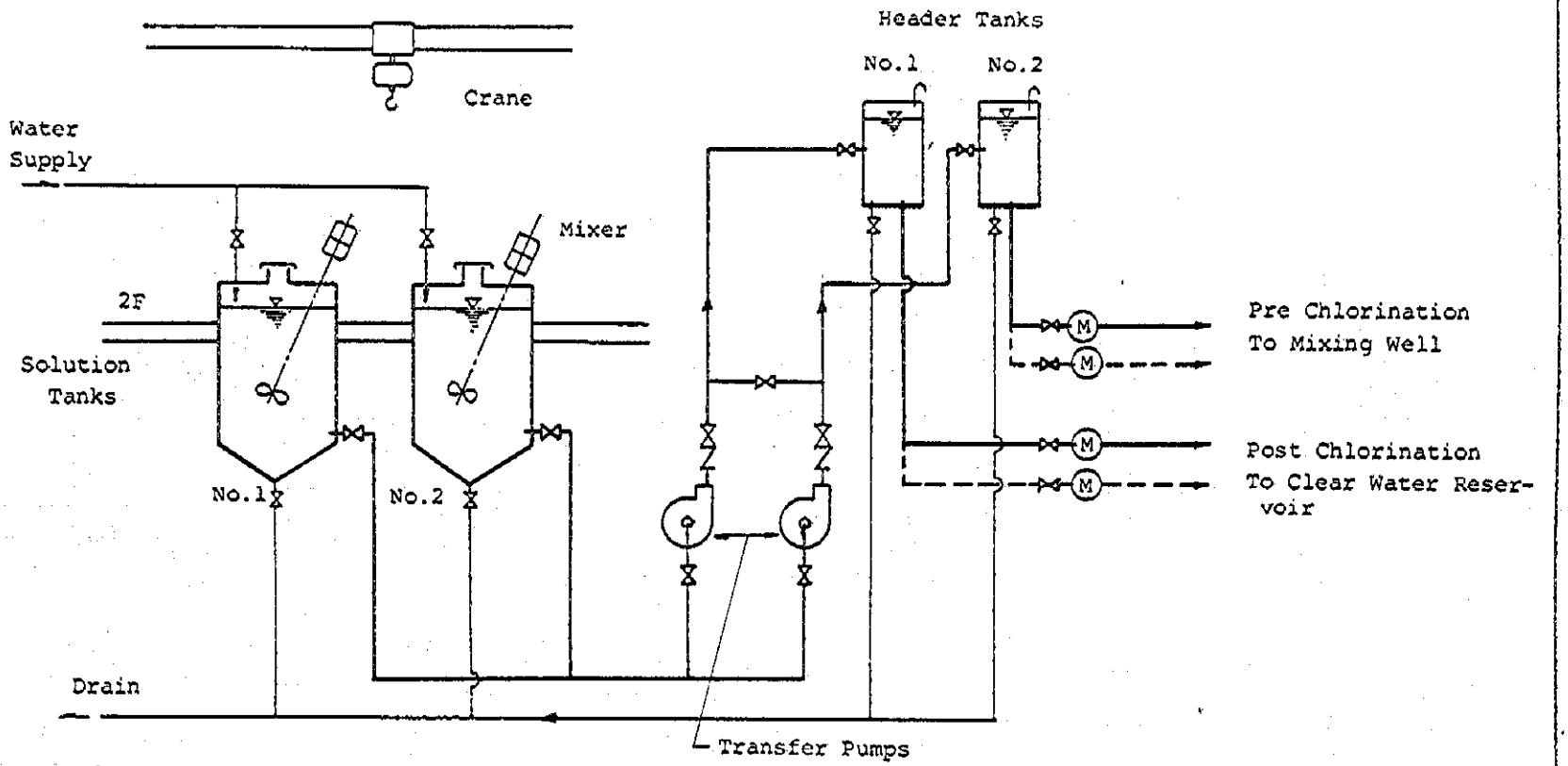
S E C T I O N B - B

DRAWING	CLEAR WATER RESERVOIR
9	

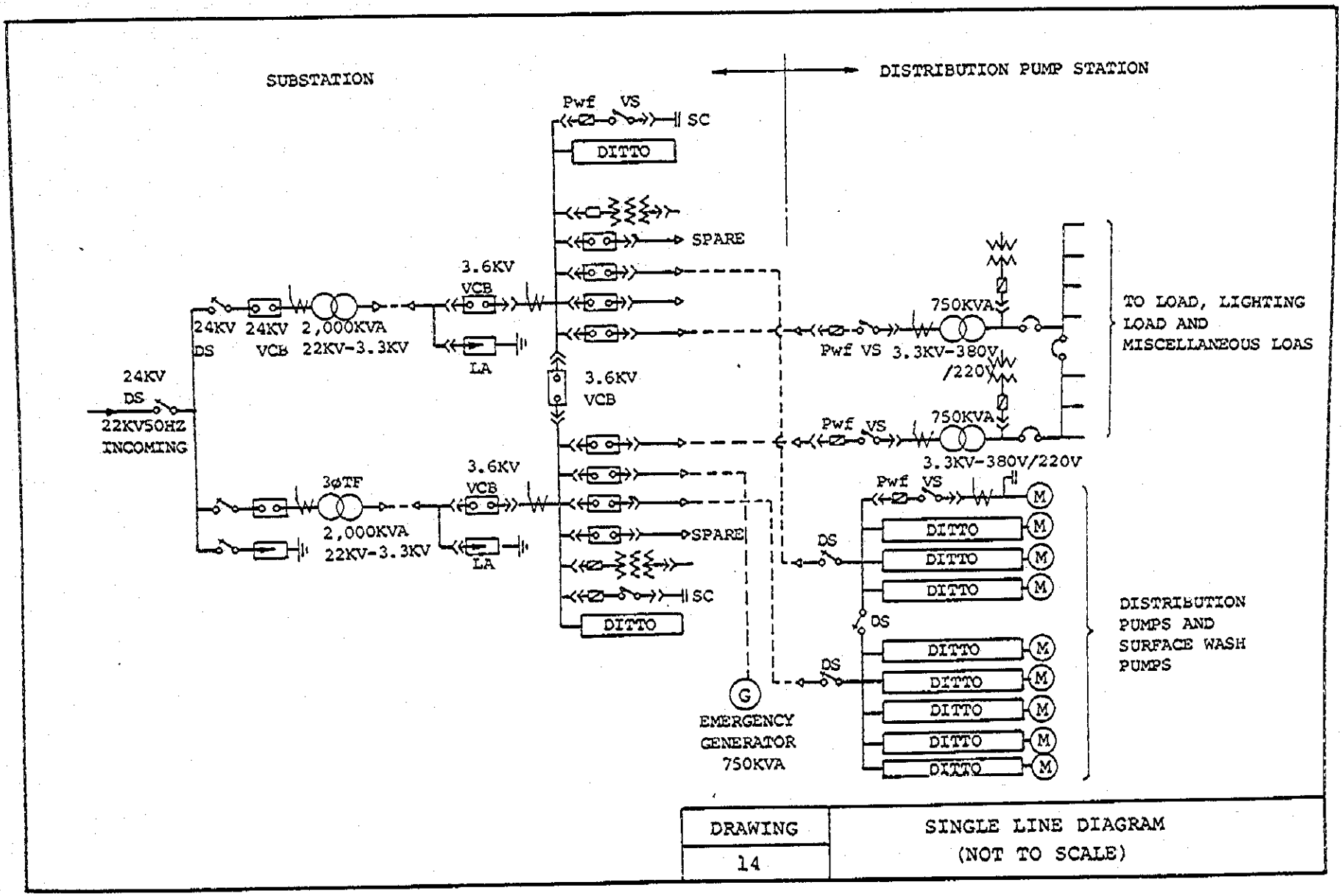

DISTRIBUTION PUMP STATION
DRAWING
10
DISTRIBUTION MAIN
Dia.1,100 mm
FLOW METER
12.00
DW
ELECTRIC PANELS
CONTROL ROOM
ENTRANCE
OFFICE
14 @ 4.00 = 56.00
FIRST FLOOR
Bypass
12 @ 4.00 = 48.00
BASE-MENT FLOOR
UP
No.4
No.3
No.2
No.1
DISTRIBUTION PUMP
(LARGE)
4 units(1 standby)
SURFACE WASH PUMP
2units(1 standby)
DISTRIBUTION PUMP
(SMALL)
2 units(1 standby)
Drain pits
(Typ.)
FILTER


Elevated Tanks
To Mixing Well
To Secondary Mixing Chamber
Water Supply
Flow Meter
Header Tank
No.1
No.2
Header Tank
Flow Meter
2 F
Mixer
Solution Tanks
No.1
No.2
No.3
No.1
No.2
No.3
Transfer pumps
To Mixing Well
To Secondary Mixing Chamber
Drain
Under Phase 1
Under Phase 2
DRAWING
11
ALUM FEEDING SYSTEM


Lime
Hopper
Mixers
Water Supply
Header Tank
Saturation Tanks
3 units
Solution Tanks
2 units
No.1
No.2
Drain
No.1
No.2
No.3
drain
Pre-Lime
To receiving Well
Lime Feed Pumps
2 units
(1 Standby)
Post Lime
To Clear Water Reservoir
DRAWING
12
LIME FEEDING SYSTEM



DRAWING	CHLORINATION SYSTEM
13	


SUBSTATION
DISTRIBUTION PUMP STATION
Pwf VS SC
DITTO
SPARE
3.6KV VCB
24KV DS
24KV VCB
24KV 2,000KVA 22KV-3.3KV
LA
3.6KV VCB
22KV50HZ INCOMING
3φTF
2,000KVA 22KV-3.3KV
3.6KV VCB
SPARE
SC
DITTO
LA
750KVA
Pwf VS 3.3KV-380V /220V
TO LOAD, LIGHTING LOAD AND MISCELLANEOUS LOAS
750KVA
Pwf VS
3.3KV-380V/220V
Pwf VS
DS
DITTO
DITTO
DITTO
DS
DS
DITTO
DITTO
DITTO
DITTO
DITTO
DISTRIBUTION PUMPS AND SURFACE WASH PUMPS
G
EMERGENCY GENERATOR 750KVA
DRAWING
14
SINGLE LINE DIAGRAM
(NOT TO SCALE)

APPENDIX IV

UNIT COST AND BREAKDOWN OF CONSTRUCTION COST

APPENDIX IV UNIT COST AND BREAKDOWN OF CONSTRUCTION COST

This Appendix presents unit costs and basic data used for cost estimate of Stage I Porject. All costs are estimated at the current price as of 1985. Unit costs and breakdown of construction cost in the following pages, which are listed below:

Number	Particulars
A.4.1	Unit price for Material and Labour
A.4.2	Unit price for Construction
A.4.3	Unit cost of Chemicals
A.4.4	Electrical Power Cost
A.4.5	Breakdown of Construction (Phase 1)
A.4.6	Breakdown of Construction (Phase 2)
A.4.7	Costruction Cost of Stage I Porject

Aboves are estimated with reference to the following:

- BASIC PRICE (Feb. s/d March 1985) : DPU
  Daftar Harga Satuan Bahan Bangunan
  dan Upah Kerja di Sulawesi Sulatan
- UNIT PRICE (Jan. s/d March 1985) : DPU
  Daftar Satuan Pekerjaan
- Jeneberang River Flood Control : JICA
  Project (Phase II) March 1982
- Jakarta Water Supply Development : JICA
  Project (F/S) December 1984
- Bili Bili Dam Feasibility Study : JICA
  Report

TABLE A.4.1 UNIT COST OF MATERIALS AND LABOUR

DESCRIPTIOM	UNIT	UNIT PRICE
(MATERIAL)		
Portland Cement	kg	88
Aggregate d=25 mm	m^3	7,500
Aggregate d=40 mm	m^3	7,350
Bedding Sand	m^3	3,600
Masonary Sand	m^3	3,750
Concrete Sand	m^3	7,000
Broken stone	m^3	9,000
Reinforcing bar	kg	500
Bending wire	kg	1,100
Wood Plate (1st)	m^3	260,000
Wood Plate (2nd)	m^3	150,000
Wood Plate (3rd)	m^3	115,000
Dolken wood	m^3	40,000
Nail	kg	750
Clay brick (big)	pc	25
Clay brick (small)	pc	22
Steel shapes	kg	520
Plywood t=10 mm	plt	6,500
(LABOUR COST)		
General worker	day	2,000
Carpenter	day	3,000
Mason	day	3,000
Painter	day	2,750
Iron worker	day	2,750
Plumber	day	3,000
Foreman (general)	day	2,500
Foreman (carpenter)	day	3,500
Foreman (mason)	day	3,250
Foreman (painter)	day	3,250
Foreman (iron)	day	3,250
Foreman (plumber)	day	3,500
Electrician	day	3,000
Wall painter	day	2,500
Asphalt make man	day	2,500
Rent for Concrete mixer	day	25,000
Rent for roller	day	30,000

Note: Working hour is 7 hour/day; 40 hours/week.

TABLE A.4.2 Unit Price for Civil Work
(as of June 1985)

Item	Unit	Price (Rp.)
Soil Excavation (excavator)	m3	890
Soil Excavation (manpower)	"	1,560
Hard Soil Excavation	"	4,160
Backfill (excavated soil)	"	390
Backfill (sand)	"	5,130
Disposal (site C)	"	685
Disposal (L= 5km)	"	2,750
Demolition of Pavement	m2	290
Pavement (t = 50 - 75 m)	"	1,120
Pavement (t = 100 - 150 mm)	"	6,000
Scaffolding	"	1,256
Concrete, class 250	m3	49,145
Reinforcing Steel Bar	ton	669,000
Form Work	m2	3,820
Mortal t = 20 mm	"	2,405

TABLE A.4.3 Unit Cost of Chemical

Chemical	Unit Cost (Rp./kg)
Alum	240
Chlorine	2,200
Quick Lime	80

Note; Table shows unit cost of chemicals applied for Panaikang Treatment Plant at the price as of June 1985.

TABLE A.4.4 Electric Power Cost

Item	Unit Cost
1) Connection charge	15,000 Rp./km
2) Deposit for billing	14,000 Rp./KVA
3) Basic charge	2,100 Rp./KVA/month
4) Consumption charge	
For time :	
22:00-18:00	60.5 Rp./Kwh
18:00-22:00	96.5 Rp./Kwh

Note; All above costs are given by PLN Ujung Pandang at the interview on 17 June 1985.

Table A.4.5 Cost Breakdown (Phase 1)

Item No.	Description	F/C 1,000US $	L/C Million Rp.	TOTAL Million Rp.
1.	Rehabilitation			
1.1	Maros raw water canal	1,348	937	2,440
1.2	Ratulangi Plant	0	19	19
1.3	Panaikang Plant	17	48	67
1.4	Distribution Pipeline & House Meters	588	1,778	2,434
	total 1.	1,953	2,782	4,960
2.	New Water Supply System			
2.1	Land Acquisition			
	2.1.1 Intake site	0	14	14
	2.1.2 Transmission route	0	18	18
	2.1.3 Mangngasa site	0	1,134	1,134
	Subtotal 2.1	0	1,166	1,166
2.2	Intake Facilities	0	826	826
2.3	Raw Water Transmission Pipe	3,212	2,228	5,809
2.4	Mangngasa Treatment Plant			
	2.4.1 Site Preparation	0	149	149
	2.4.2 Receiving Well	1	34	35
	2.4.3 Floccu. & Sedimentation	42	301	348
	2.4.4 Filter	180	394	595
	2.4.5 Clear Water Reservoir	97	355	463
	2.4.6 Wastewater Pond	0	210	210
	2.4.7 Buildings	0	700	700
	2.4.8 Yard Piping	146	223	386
	2.4.9 Landscaping	0	204	204
	2.4.10 Mechanical Equipment	975	217	1,304
	2.4.11 Chemical Equipment	448	111	611
	2.4.12 Electrical Equipment	1,624	878	2,689
	2.4.13 Instrumentation	280	95	407
	Subtotal 2.4	3,793	3,871	8,100
2.5	Power Receiving Facility	0	48	48
2.6	Distribution Facilities			
	2.6.1 Trunk Main	3,954	2,110	6,519
	2.6.2 Secondary Main	1,304	810	2,264
	2.6.3 Service Main	1,631	1,611	3,430
	2.6.4 House connection & Meter	0	1,589	1,589
	2.6.5 Public Standpipe	0	588	588
	Subtotal 2.6	6,889	6,708	14,389
2.7	Distribution Tower	1,040	0	1,160
	total 2.	14,934	14,847	31,498
	----- TOTAL OF PHASE 1 -----	16,887	17,629	36,458

Table A.4.6 Cost Breakdown (Phase 2)

Item No.	Description	F/C 1,000US $	L/C Million Rp.	TOTAL Million Rp.
1.	New Water Supply System			
1.1	Mangngasa Treatment Plant			
	1.1.1 Site Preparation	0	109	109
	1.1.2 Floccu. & Sedimentation	42	301	348
	1.1.3 Filter	180	394	595
	1.1.4 Clear Water Reservoir	97	355	463
	1.1.5 Yard Piping	49	74	129
	1.1.6 Landscaping	0	65	65
	1.1.7 Mechanical Equipment	376	94	513
	1.1.8 Chemical Equipment	199	49	271
	1.1.9 Electrical Equipment	629	315	1,016
	1.1.10 Instrumentation	109	37	159
	Subtotal 1.1	1,681	1,793	3,667
1.2	Distribution Facilities			
	1.2.1 Trunk Main	539	433	1,034
	1.2.2 Secondary Main	939	577	1,624
	1.2.3 Service Main	1,059	1,282	2,463
	1.2.4 House Connection & Meter	0	529	529
	1.2.5 Public Standpipe	0	39	39
	Subtotal 1.2	2,537	2,860	5,689
	----- TOTAL OF PHASE 2 -----	4,218	4,653	9,356
	===== TOTAL OF STAGE I =====	21,105	22,282	45,814

Note: 1 thousand US$ =1.115 million Rp.

TABLE A.4.7 CONSTRUCTION COST OF STAGE I PROJECT

UNIT F/C : thousand US$
L/C : million Rp.

DESCRIPTION	TOTAL F/C	TOTAL L/C	1986 F/C	1986 L/C	1987 F/C	1987 L/C	1988 F/C	1988 L/C	1989 F/C	1989 L/C	1990 F/C	1990 L/C	1991 F/C	1991 L/C	1992 F/C	1992 L/C	1993 F/C	1993 L/C	1994 F/C	1994 L/C	1995 F/C	1995 L/C
I. PHASE 1 PROJECT																						
1) Rehabilitation																						
-Maros Transmission Canal	1,348	937	0	0	0	0	0	0	810	587	538	350	0	0	0	0	0	0	0	0	0	0
-Ratulangi Treatment Plant	0	19	0	7	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Panaikang Treatment Plant	17	48	0	0	0	0	0	18	17	30	0	0	0	0	0	0	0	0	0	0	0	0
-Distribution Pipelines & House Meters	588	1,778	0	0	0	1,422	0	0	588	356	0	0	0	0	0	0	0	0	0	0	0	0
SUB TOTAL OF 1)	1,953	2,782	0	7	0	1,434	0	18	1,415	973	538	350	0	0	0	0	0	0	0	0	0	0
2) Mangngasa System																						
-Land Acquisition	0	1,166	0	583	0	583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Intake Facilities	0	826	0	0	0	263	0	313	0	250	0	0	0	0	0	0	0	0	0	0	0	0
-Transmission Pipelines	3,212	2,228	0	0	0	0	0	477	1,606	876	1,606	875	0	0	0	0	0	0	0	0	0	0
-Treatment Plant	3,793	3,871	0	0	0	774	0	774	480	774	2,049	775	1,264	774	0	0	0	0	0	0	0	0
-Power Receiving	0	48	0	0	0	0	0	0	0	0	0	48	0	0	0	0	0	0	0	0	0	0
-Distribution Pipelines & House Meters	6,889	6,708	0	0	0	0	0	1,287	2,013	1,685	2,417	1,682	2,459	1,819	0	235	0	0	0	0	0	0
-Distribution Tower	1,040	0	0	0	0	0	0	0	348	0	692	0	0	0	0	0	0	0	0	0	0	0
SUB TOTAL OF 2)	14,934	14,847	0	583	0	1,620	0	2,851	4,447	3,585	6,764	3,380	3,723	2,593	0	235	0	0	0	0	0	0
3) Administration (2%)	0	353	0	12	0	61	0	57	0	91	0	75	0	52	0	5	0	0	0	0	0	0
4) Engineering Services	2,526	1,360	0	0	1,089	587	340	183	433	233	355	191	309	166	0	0	0	0	0	0	0	0
5) Physical Contingency (10%)	1,942	1,934	0	60	109	370	34	311	630	488	766	400	403	281	0	24	0	0	0	0	0	0
SUB TOTAL OF 1)-5)	21,355	21,276	0	662	1,198	4,072	374	3,420	6,925	5,370	8,423	4,396	4,435	3,092	0	264	0	0	0	0	0	0
6) Price Contingency	7,006	7,597	0	73	161	766	76	927	1,897	1,933	2,956	2,000	1,916	1,722	0	176	0	0	0	0	0	0
Total of Phase 1 Project	28,361	28,873	0	735	1,359	4,838	450	4,347	8,822	7,303	11,379	6,396	6,351	4,814	0	440	0	0	0	0	0	0
II. PHASE 2 PROJECT																						
1) Treatment Plant	1,681	1,793	0	0	0	0	0	0	0	0	0	0	0	618	1,223	742	458	433	0	0	0	0
2) Distribution Pipelines & House Meters	2,537	2,860	0	0	0	0	0	0	0	0	0	0	0	280	630	671	945	1,065	962	676	0	168
3) Administration (2%)	0	93	0	0	0	0	0	0	0	0	0	0	0	18	0	28	0	30	0	14	0	3
4) Engineering Services	375	469	0	0	0	0	0	0	0	0	375	203	232	127	90	49	90	47	88	43	0	0
5) Physical Contingency (10%)	509	520	0	0	0	0	0	0	0	0	38	20	23	104	194	149	149	157	105	73	0	17
SUB TOTAL OF 1)-5)	5,602	5,735	0	0	0	0	0	0	0	0	413	223	255	1,147	2,137	1,639	1,642	1,732	1,155	806	0	188
6) Price Contingency	3,176	4,113	0	0	0	0	0	0	0	0	145	101	110	639	1,107	1,092	1,000	1,354	814	731	0	196
Total of Phase 2 Project	8,778	9,848	0	0	0	0	0	0	0	0	558	324	365	1,786	3,244	2,731	2,642	3,086	1,969	1,537	0	384
III. PHASE I + PHASE II																						
Total of STAGE I PROJECT	37,139	38,721	0	735	1,359	4,838	450	4,347	8,822	7,303	11,937	6,720	6,716	6,600	3,244	3,171	2,642	3,086	1,969	1,537	0	384

APPENDIX V

FINANCIAL ANALYSIS

5.1 Financial Statements

5.2 Selection of Financing Sources

5.3 Financial Internal Rate of Return

APPENDIX V FINANCIAL ANALYSIS

5.1 Financial Statements

Tables A.5.1, A.5.2 and A.5.3 are the detailed financial statements based on recommended financial plan and proposed water rate. Notes and assumptions for financial projection are listed below.

5.1.1 Inflation

1) Price escalation for local costs is estimated at 15 % for 1984, 11 % for 1985, and 7 % per annum thereafter, and for foreign costs at 7.5 % for 1984, 7.0 % for 1985, and 6.0 % thereafter. For projecting future prices, these rates are used uniformly unless otherwise specified.

5.1.2 Income Statement

2) Production Capacity: Increases in capacity after completion of the Stage I Project are not considered. However, Ratulangi plant is considered to be abandoned as scheduled.

3) Bad debt, bill collection, accounts receivable are programed based on PDAM's past trends as shown below:

TARGET BILL COLLECTION RATE

	1985	1986	1987	1988 1989	1990 1992	1993 1995	1996 2000
First year	65.3 %	69.4	69.4	73.4	77.2	77.2	77.2
Second year	14.7	13.1	15.6	14.1	12.8	14.8	16.8
TOTAL	80.0	82.5	85.0	87.5	90.0	92.0	94.0
Bad debt */	20.0	17.5	15.0	12.5	10.0	8.0	6.0

*/ Bill collection after the third year was neglected.

4) Operating Costs: Unit costs of chemicals, power, and personnel are detailed in Appendix IV. Based on past records analysis, maintenance costs and administration, sales expenses, etc. are calculated using following formulas:

Maintenance Costs = (Chemical + Power + Personnel Costs) x 7.5 %

Administration, Sales Expenses, etc. = Personnel Cost x 17.5 %

5) Depreciation of the fixed assets: historic cost and revalued cost are provided on a straight-line method. Useful life and depreciation rate employed are as follows:

Item	Useful Life	Depreciation Rate
Land	infinite	-
Building, Structure	40 years	2.5 %
Treatment Plant	40	2.5
Pipes Iron Pipes	40	2.5
PVC Pipes	15	6.67
Machinery	10	10
Office & Technical Equipment	10	10
Vehicles	5	20

Based on future composition of fixed assets, depreciation rates are forecasted using following formulas:

Historic Cost Basis: Rate(T) = 2.92 +0.070x(T-1985) (%)
Revalued Cost Basis: Rate(T) = 2.935+0.085x(T-1985) (%)

As for the rates in 1996 and thereafter, they are considered to be equal to that of 1995, because any substatial increase in fixed assets during that period is not expected.

6) Taxes are calculated according to the following schedule:

Net Income	Tax Rate
Rp. 0 - 10 million	15 percent
Rp. 10 - 50 million	25 percent
Rp. more than 50 million	35 percent

7) Working ratio is defined as :

$$\frac{\text{Total Operating Expenses}}{\text{Operating Revenues}} \times 100\ (\%)$$

8) Operating ratio is defined as :

$$\frac{\text{Total Operating Expenses + Depreciation}}{\text{Operating Revenues}} \times 100\ (\%)$$

9) Rate of Return is defined as :

$$\frac{\text{Net Operating Earnings after Tax}}{\text{Average Net Fixed Assets in Operation}} \times 100\ (\%)$$

5.1.3 Balance Sheet

10) Revaluation of fixed assets is made for the year 1984 taking account of the inflation effects before that year. Revaluation is also made every year after 1984 assuming that the value of fixed assets increases at the rate of domestic inflation. The difference between the revalued and historic cost of net fixed assets in operation is entered into the liability side as revaluation surplus.

11) Interest capitalization surplus is the difference between capitalized interest calculated in the case the whole funds are financed by loan, and the actual amount of accumulated debt as a interest during construction.

12) Debt/Debt & Equity Ratio is defined as :

$$\frac{\text{Long-Term Debt}}{\text{Long-Term Debt+Equity}} \times 100 \ (\%)$$

5.1.4 Funds Flow Statement

13) Debt-service of foreign and local currency loan of Stage I Project is calculated applying conditions as 30-year repayment period including 6-year grace period for BLN, 20-year including 6-year for DLNI at 9 percent interest rate, capitalizing interest during construction.

14) Debt service coverage is defined as :

$$\frac{\text{Internal Cash Generation}}{\text{Total Debt Service}} \ (\text{times})$$

TABLE A.5.1 INCOME STATEMENT

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Water Requirements [Daily Average] (l/s)	--	--	290.0	335.0	350.0	430.0	520.0	630.0	780.0	940.0	1030.0	1130.0	1230.0	1320.0	1410.0	1520.0	1620.0	1720.0	1850.0	1940.0
Production Capacity (l/s)	650.0	650.0	650.0	650.0	650.0	650.0	1150.0	1150.0	1250.0	1750.0	1750.0	1750.0	2250.0	2250.0	2250.0	2200.0	2200.0	2200.0	2200.0	2200.0
Plant Utilization Factor (%)	73.4	78.7	87.6	88.7	94.0	98.2	69.6	78.3	83.2	67.1	73.6	80.7	68.3	73.3	78.3	85.9	91.0	94.5	96.8	98.2
Water Production (l/s)	477.0	512.0	569.0	576.0	610.9	638.3	800.0	900.0	1040.0	1175.0	1287.5	1412.5	1537.5	1650.0	1762.5	1890.0	2002.5	2078.8	2130.0	2161.3
Accounted-for Water Ratio (%)	50.0	50.0	50.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Sold Water (l/s)	238.0	256.0	285.0	288.0	336.0	383.0	520.0	630.0	780.0	940.0	1030.0	1130.0	1230.0	1320.0	1410.0	1512.0	1602.0	1663.0	1704.0	1729.0
Total Connection (1,000 connect.)	19.5	22.7	26.3	28.8	32.0	38.5	46.9	56.5	67.1	77.6	87.1	93.8	99.1	104.2	109.0	113.8	118.6	123.3	127.5	131.5
Connection Increase (1,000 connect.)	4.0	3.2	3.6	2.5	3.2	6.5	8.4	9.6	10.6	10.6	9.5	6.7	5.3	5.1	4.8	4.8	4.8	4.7	4.2	4.0
Accumulated Inflation Factor (%)	64.2	70.6	79.1	87.0	100.0	111.0	118.8	127.1	136.0	145.5	155.7	166.6	178.2	190.7	204.1	218.4	233.6	250.0	267.5	286.2
Ave. Water Tariff: Real Term (Rp/m3)	156.2	148.9	178.0	167.9	178.0	178.0	183.0	188.0	194.0	200.0	206.0	211.0	215.0	219.0	223.0	227.0	231.0	234.0	237.0	240.0
: Nom. Term (Rp/m3)	100.3	105.1	140.8	146.1	178.0	197.6	217.4	238.9	263.8	291.0	320.7	351.5	383.1	417.6	455.1	495.8	539.6	585.0	634.0	686.9
Ave. Connection Charge: Norm. (Rp/month/con.)	485.4	472.6	680.4	664.4	700.0	700.0	900.0	900.0	900.0	1200.0	1200.0	1200.0	1500.0	1500.0	1500.0	1800.0	1800.0	1800.0	1800.0	1800.0
Ave. Installing Charge: Norm. (Rp.1,000/con.)	88.3	63.5	64.1	65.7	100.0	100.0	100.0	100.0	100.0	125.0	125.0	125.0	150.0	150.0	150.0	180.0	180.0	180.0	180.0	180.0
Ave. Security Deposit: Norm. (Rp.1,000/con.)	38.4	40.6	38.6	34.6	40.0	40.0	40.0	40.0	40.0	55.0	55.0	55.0	75.0	75.0	75.0	95.0	95.0	95.0	95.0	95.0
Operating Revenues																				(Unit; million Rp.)
Water Revenue	755.6	846.4	1244.7	1325.8	1884.1	2380.1	3570.8	4708.7	6451.2	8603.4	10417.9	12573.2	14822.1	17376.3	20265.6	23706.7	27179.7	30747.6	34017.3	37357.1
Connection and Other Revenues	113.4	128.9	209.0	212.9	255.4	296.1	461.2	558.1	666.9	1041.5	1185.8	1302.5	1736.1	1829.7	1918.8	2406.2	2509.9	2612.5	2708.6	2797.2
Installing Revenue	346.3	206.9	227.5	165.8	310.0	630.0	810.0	920.0	1025.0	1281.3	1150.0	812.5	760.0	765.0	720.0	864.0	864.0	846.0	756.0	720.0
Less: Bad Debt	23.6	40.7	53.8	57.3	376.8	416.5	535.6	588.6	806.4	860.3	1041.8	1257.3	1185.8	1390.1	1621.2	1422.4	1630.8	1844.9	2041.0	2241.4
Total Revenue	1215.3	1182.2	1681.1	1647.2	2072.7	2889.7	4306.4	5598.2	7336.7	10065.9	11711.9	13430.9	16152.4	18580.9	21283.2	25554.5	28922.8	32361.2	35440.9	38632.9
Operating Expenses																				
Operating Expenses	614.3	754.5	884.9	2861.9	1201.4	1468.0	1991.8	2391.8	2915.6	3466.4	4130.1	4916.1	5716.8	6747.1	7935.0	9308.2	10897.6	12694.8	14719.0	17185.9
: Chemical	129.8	135.9	139.6	156.7	170.2	197.5	336.3	401.0	496.9	576.6	678.1	798.5	904.9	1041.4	1193.0	1361.7	1542.9	1714.3	1879.2	2040.0
: Power	162.5	199.6	163.4	269.5	245.1	284.5	446.8	532.2	659.2	769.8	904.5	1065.2	1173.8	1350.9	1546.3	1754.8	1988.4	2209.3	2421.7	2629.0
: Personnel	233.2	321.0	431.1	615.0	604.0	759.9	920.0	1110.9	1338.2	1615.1	1943.1	2330.1	2784.2	3340.3	3992.2	4766.4	5681.2	6781.5	8076.4	9733.4
: Maintenance	45.8	41.0	61.4	73.9	76.4	93.1	127.7	153.3	187.1	222.1	264.4	314.5	364.7	429.9	504.9	591.2	690.9	802.9	928.3	1080.2
: Administration, Sales Expenses, etc.	43.0	57.0	89.4	1746.6	105.7	133.0	161.0	194.4	234.2	282.6	340.0	407.8	487.2	584.6	698.6	834.1	994.2	1186.8	1413.4	1703.3
Installing Cost	234.6	80.4	184.8	64.4	155.0	175.1	240.6	292.6	348.5	373.1	357.9	271.1	231.9	243.3	244.8	262.1	280.3	293.8	281.0	286.4
Total Operating Expenses	872.5	875.6	1123.5	2926.3	1356.4	1643.1	2232.4	2684.4	3264.1	3839.5	4488.0	5187.2	5946.7	6990.4	8179.8	9570.3	11177.9	12988.6	15000.0	17472.3
Earnings before Depreciation	342.8	306.6	557.6	-1279.1	716.3	1246.6	2074.0	2913.8	4072.6	6226.4	7223.9	8243.7	10205.7	11590.5	13103.4	15984.2	17744.9	19372.6	20440.9	21160.6
Less: Depreciation: (Historic Cost)	210.4	226.3	516.6	533.0	307.9	341.0	538.4	598.4	734.2	2126.1	2835.1	3211.9	3964.2	4272.5	4443.5	4560.4	4608.5	4665.5	4727.6	4797.9
: Revalued Cost	--	--	--	(1824.3)	754.6	853.8	1108.0	1263.4	1509.3	3066.1	4042.5	4753.5	5912.7	6702.3	7413.0	8037.7	8631.5	9273.2	9962.0	10704.3
Earnings before Interest	132.4	80.3	41.1	-1812.2	-38.3	392.8	966.0	1650.4	2563.3	3160.3	3181.4	3490.2	4293.0	4888.2	5690.4	7946.5	9113.4	10099.4	10478.9	10456.3
Less: Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.7	96.7	96.7	92.6	88.6	84.6	5727.9	5410.8	5093.7	7033.6	6581.0	6128.2	5675.5
: Tax	29.2	22.5	39.9	0.0	0.0	131.5	332.1	537.8	857.3	1066.3	1075.1	1184.6	1466.9	0.0	91.9	992.5	721.9	1225.4	1516.7	1667.3
Total Expenses	1112.1	1124.4	1680.0	3459.3	2111.0	2628.4	3672.5	4582.3	5727.4	8068.6	9698.2	11213.9	13410.9	19420.6	21095.5	23694.2	27564.9	30068.2	32606.9	35519.4
Net Earnings	103.2	57.8	1.1	-1812.2	-38.3	261.3	633.9	1015.9	1609.3	1997.3	2013.7	2217.0	2741.5	-839.7	187.7	1860.3	1357.9	2293.0	2834.0	3113.5
Contribution to PEMDA Ujung Pandang	84.7	12.5	51.5	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Retained Earning	18.5	45.3	-50.4	-1861.9	-38.3	261.3	633.9	1015.9	1609.3	1997.3	2013.7	2217.0	2741.5	-839.7	187.7	1860.3	1357.9	2293.0	2834.0	3113.5
Ave. Net Operational Assets: Historic Cost	8719.9	8872.0	8755.0	8498.2	8309.9	8670.9	12017.3	15577.5	17677.2	39301.3	68010.1	79948.2	91322.3	100804.0	101451.0	100370.0	98686.2	96134.2	93722.1	91436.9
: Revalued Cost	--	--	--	19689.2	20617.3	22335.6	26704.3	31516.5	35102.3	58326.0	90043.9	106911.0	124023.0	139998.0	147745.0	153785.0	159113.0	163384.0	167488.0	171356.0
Working Ratio (%)	71.8	74.1	66.8	177.7	65.4	56.9	51.8	48.0	44.5	38.1	38.3	38.6	36.8	37.6	38.4	37.5	38.6	40.1	42.3	45.2
Operating Ratio: Historic Cost (%)	89.1	93.2	97.6	210.0	80.3	68.7	64.3	58.6	54.5	59.3	62.5	62.5	61.4	60.6	59.3	55.3	54.6	54.6	55.7	57.6
: Revalued Cost (%)	--	--	--	288.4	101.8	86.4	77.6	70.5	65.1	68.6	72.8	74.0	73.4	73.7	73.3	68.9	68.5	68.8	70.4	72.9
Rate of Return : Historic Cost (%)	1.2	0.7	0.0	-6.1	1.5	3.4	4.2	4.6	6.0	3.3	2.1	2.0	2.2	0.4	1.0	2.1	2.0	2.8	3.3	3.8
: Revalued Cost (%)	--	--	--	-9.2	-0.2	1.2	2.4	3.2	4.6	3.4	2.2	2.1	2.2	-0.6	0.1	1.2	0.9	1.4	1.7	1.8

TABLE A.5.2 BALANCE SHEET

(Unit; millon Rp.)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Assets																				
Operational Assets: (Historic Cost)	9508.2	9781.1	10000.1	10159.6	10543.6	11406.3	17596.2	19119.1	22944.7	65017.3	84883.7	94191.0	113913.0	120351.0	122750.0	125978.0	127307.0	128882.0	130596.0	132540.0
: Revalued Cost	--	--	--	22898.8	25710.2	26270.8	35685.9	39604.0	46085.5	91252.2	117343.0	134661.0	163560.0	181142.0	195853.0	212357.0	228045.0	245000.0	263197.0	282809.0
Less Accumulated Depreciation: (H/C)	659.5	885.8	1385.3	1918.3	2165.2	2442.9	2525.0	3035.4	3674.0	5685.4	8195.4	10982.9	14476.1	18179.0	22020.7	25967.4	29946.0	33975.0	38058.2	42203.1
: R/C	--	--	--	3209.6	4164.8	5145.0	5403.1	6853.9	8631.0	12054.7	16452.8	21730.2	28443.6	36262.0	45244.2	55401.2	66774.7	79502.2	93718.6	109575.0
Net Operational Assets: (H/C)	8848.7	8895.3	8614.8	8241.3	8378.4	8963.4	15071.2	16083.7	19270.7	59331.9	76688.3	83208.1	99436.5	102172.0	100729.0	100011.0	97361.4	94906.9	92537.3	90336.4
: R/C	--	--	--	19689.2	21545.4	23125.8	30282.8	32750.1	37454.5	79197.5	100890.0	112931.0	135116.0	144880.0	150609.0	156956.0	161271.0	165497.0	169478.0	173234.0
Construction in Progress	0.0	0.0	15.0	1219.0	1499.0	3084.0	4096.0	8269.0	22967.0	3976.0	3139.0	7235.0	1157.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Fixed Assets	8848.7	8895.3	8629.8	20908.2	23044.4	26209.8	34378.8	41019.1	60421.5	83173.5	104029.0	120166.0	136273.0	144880.0	150609.0	156956.0	161271.0	165497.0	169478.0	173234.0
Cash/Bank	32.7	17.4	23.6	14.2	349.0	588.8	-1570.0	344.1	1976.2	6133.8	11177.0	16402.9	19549.1	20196.3	22523.6	24008.7	25756.9	28757.5	32807.3	37496.7
Accounts Receivable	1139.3	1305.7	1560.1	833.2	365.6	402.4	698.2	812.4	1087.0	1338.7	1603.8	1906.4	2589.5	2988.9	3436.8	4531.3	5138.4	5761.2	6332.5	6913.8
Other Receivables/Advanced Payment	400.3	456.5	490.5	493.0	678.2	821.6	1116.2	1342.2	1632.1	1919.8	2244.0	2593.6	2973.4	3495.2	4089.9	4785.1	5589.0	6494.3	7500.0	8736.2
Inventories	91.1	99.9	173.9	179.2	576.1	655.2	859.5	1025.5	1510.5	2079.3	2600.7	3004.1	3406.8	3622.0	3765.2	3923.9	4031.8	4137.4	4237.0	4330.9
Total Current Assets	1663.4	1879.4	2248.4	1519.6	1968.9	2468.0	1103.9	3524.2	6205.8	11471.6	17625.5	23907.0	28518.8	30302.4	33815.5	37249.0	40516.1	45150.4	50876.8	57477.6
Total Assets	10512.1	10736.3	10878.2	22427.8	25013.3	28677.8	35482.7	44543.3	66627.3	94645.1	121655.0	144073.0	164792.0	175183.0	184425.0	194205.0	201787.0	210648.0	220355.0	230712.0
Liabilities and Equity																				
Reserves	240.3	298.1	299.2	-1105.0	-1143.3	-882.0	-248.1	767.8	2377.1	4374.4	6388.1	8605.1	11346.6	10506.9	10694.6	12554.9	13912.8	16205.8	19039.8	22153.3
Revaluation Surplus	--	--	--	11447.9	13613.7	15121.9	16740.7	18860.5	21153.0	23774.8	29318.7	36381.0	44286.1	53744.3	63885.9	74428.5	85415.5	96704.5	108289.0	120153.0
Interest Capitalization Surplus	0.0	0.0	0.0	0.0	0.0	0.0	66.2	463.4	1006.5	1901.1	3065.2	4334.2	5531.7	5531.7	5531.7	5531.7	5531.7	5531.7	5531.7	5531.7
Central Government Subsidy (DIP)	6836.8	6836.8	6851.8	6981.8	7261.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8	8111.8
Local Government Subsidy [PEMDA]	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6	2151.6
Total Equity	9228.7	9286.5	9302.6	19476.3	21883.8	24503.3	26822.2	30355.1	34800.0	40313.7	49035.4	59583.7	71427.8	80046.3	90375.6	102779.0	115123.0	128705.0	143124.0	158101.0
Long-Term Borrowings: at Interest (BLN)	0.0	0.0	0.0	1074.0	1074.0	1074.0	2589.0	3091.0	12928.0	26193.2	33636.4	37208.6	38792.2	39624.8	38262.4	36492.2	34722.0	32951.8	31181.6	29411.4
: at Interest (GLNI)	0.0	0.0	0.0	0.0	0.0	0.0	1226.0	4349.0	8289.0	12909.0	19509.0	22680.0	24491.8	24754.6	23864.4	21886.8	19909.2	17931.6	15954.0	13976.4
: Interest-free (IFGL)	0.0	0.0	0.0	0.0	0.0	735.0	2094.0	3318.0	6111.0	8211.0	8211.0	7624.5	7038.0	6451.5	5865.0	5278.5	4692.0	4105.5	3519.0	2932.5
Borrowings for Interest during Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	246.7	841.8	2730.5	6402.9	11673.6	17142.2	17765.1	18859.8	19772.6	18490.2	17207.8	15925.4	14643.0
Accounts Payable	567.4	601.4	590.5	805.2	855.2	905.2	955.2	1005.2	1055.2	1105.2	1155.2	1229.0	1428.7	1686.8	1983.8	2327.0	2724.4	3173.7	3679.8	4296.5
Security Deposit	716.0	848.4	985.1	1072.3	1200.3	1460.3	1796.3	2178.3	2602.3	3182.5	3705.0	4073.5	4471.0	4853.5	5213.5	5669.5	6125.5	6572.0	6971.0	7351.0
Total Liabilities	1283.4	1699.8	1575.6	2951.5	3129.5	4174.5	8660.5	14188.2	31827.3	54331.4	72619.5	84489.2	93363.9	95136.3	94048.9	91426.6	86663.3	81942.4	77230.8	72610.8
Total Liabilities & Equity	10512.1	10736.3	10878.2	22427.8	25013.3	28677.8	35482.7	44543.3	66627.3	94645.1	121655.0	144073.0	164792.0	175183.0	184425.0	194205.0	201787.0	210648.0	220355.0	230712.0
Working Capital excluding Cash (million Rp)	1063.3	1260.6	1634.3	700.2	764.7	974.0	1718.7	2176.9	3174.4	4232.6	5293.3	6275.1	7541.0	8419.3	9308.1	10913.3	12034.8	13219.2	14389.7	15684.4
Debt/(Debt & Equity) Ratio (%)	0.0	0.0	0.0	5.2	4.7	6.9	18.1	26.6	44.7	55.4	58.0	57.1	55.0	52.5	49.0	44.8	40.3	35.9	31.7	27.8

TABLE A.5.3 FUNDS FLOW STATEMENT

(Unit; million Rp.)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Sources of Cash																				
Net Cash Inflow from Normal Operation	419.6	270.1	61.7	68.8	779.8	1165.8	1333.2	2301.8	2639.8	4682.1	5610.6	6445.8	7870.4	11094.7	12482.7	13842.5	16357.5	17609.3	18152.7	18578.6
Inflow																				
Water Revenue as Cash	383.4	576.8	842.3	818.9	1397.1	1857.3	2798.2	3865.8	5224.7	7445.9	8958.1	10712.0	12782.9	14827.0	17126.4	20159.2	22920.4	25754.0	28352.4	30999.1
Collected Receivables	127.8	229.8	285.5	258.0	833.2	365.6	402.4	698.2	812.4	1087.0	1338.7	1603.8	1906.4	2589.5	2988.9	3436.8	4531.3	5138.4	5761.2	6332.5
Less: Increase in Advanced Payment	100.8	56.2	34.0	105.7	185.2	143.4	294.6	226.0	289.9	287.7	324.2	349.6	379.8	521.8	594.7	695.2	803.9	905.3	1005.7	1236.2
Installing Revenue	346.3	208.9	227.5	118.8	310.0	630.0	810.0	920.0	1025.0	1281.3	1150.0	812.5	780.0	765.0	720.0	864.0	864.0	846.0	756.0	720.0
Security Deposit	150.7	132.4	136.7	87.2	128.0	260.0	336.0	382.0	424.0	580.2	522.5	368.5	397.5	382.5	360.0	456.0	456.0	446.5	399.0	380.0
Outflow																				
Total Expenses	956.2	1124.5	1718.2	3611.3	2111.0	2628.4	3672.5	4582.3	5727.4	8068.6	9698.2	11213.9	13410.9	19420.6	21095.5	23694.2	27564.9	30068.2	32606.9	35519.4
Less: Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.7	96.7	96.7	92.6	88.6	84.6	5727.9	5410.8	5093.7	7033.6	6581.0	6128.2	5675.5
: Depreciation	210.4	226.3	516.6	632.0	754.6	853.8	1108.0	1263.4	1509.3	3066.1	4042.5	4753.5	5912.7	6702.3	7413.0	8037.7	8631.5	9273.2	9962.0	10704.3
: Accounts Payable Increase	318.4	34.0	-10.9	214.7	50.0	50.0	50.0	50.0	50.0	50.0	50.0	73.8	199.7	258.1	297.0	343.2	397.4	449.3	506.1	616.7
Inventories Increase	12.9	8.8	74.0	5.3	396.9	79.1	204.3	166.0	485.0	568.8	521.4	403.4	402.7	215.2	143.2	158.7	187.9	105.6	99.6	93.9
External Financing Source	0.0	0.0	15.0	1204.0	280.0	1585.0	4100.0	4849.0	16570.0	20030.0	14088.0	6788.0	6032.0	3732.0	384.0	0.0	0.0	0.0	0.0	0.0
Panaikang Expasion: BLN	0.0	0.0	0.0	1074.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
: DIP	0.0	0.0	15.0	130.0	280.0	850.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phase 1/ Stage 1 : BLN	0.0	0.0	0.0	0.0	0.0	0.0	1515.0	502.0	9837.0	12688.0	7081.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
: GINI	0.0	0.0	0.0	0.0	0.0	0.0	1226.0	3123.0	3940.0	4296.0	4814.0	440.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
: IFBL	0.0	0.0	0.0	0.0	0.0	735.0	1359.0	1224.0	2793.0	2100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phase 2/ Stage 1 : BLN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	622.0	407.0	3617.0	2946.0	2195.0	0.0	0.0	0.0	0.0	0.0	0.0
: GINI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	324.0	1786.0	2731.0	3086.0	1537.0	384.0	0.0	0.0	0.0	0.0	0.0
Total Cash Generated	419.6	270.1	76.7	1272.8	1059.8	2750.8	5433.2	7150.8	19209.8	24712.1	19698.6	13233.8	13902.4	14826.7	12866.7	13842.5	16357.5	17409.3	18152.7	18578.6
Uses of Cash																				
Investment: Panaikang	468.0	272.9	219.0	1232.5	280.0	850.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
: Phase 1	0.0	0.0	0.0	0.0	0.0	735.0	6353.0	4849.0	17140.0	19084.0	11895.0	440.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
: Phase 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	946.0	2193.0	6348.0	6032.0	3732.0	384.0	0.0	0.0	0.0	0.0	0.0
: Routine Work	0.0	0.0	0.0	0.0	445.0	926.0	1239.0	291.0	341.0	383.0	430.0	500.0	529.0	609.0	634.0	1647.0	1959.0	2211.0	2358.0	2597.0
Amortization: BLN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.8	44.8	44.8	1362.4	1362.4	1362.4	1770.2	1770.2	1770.2	1770.2	1770.2
: GINI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1274.2	1274.2	1274.2	1977.6	1977.6	1977.6	1977.6	1977.6
: IFGL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	586.5	586.5	586.5	586.5	586.5	586.5	586.5	586.5	586.5
: Capitalized Interest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	887.5	887.5	887.5	1282.4	1282.4	1282.4	1282.4	1282.4
Interest : BLN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.7	96.7	96.7	92.6	88.6	84.6	3706.7	3545.1	3383.4	4360.0	4148.9	3937.7	3726.5
: GINI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2021.2	1865.7	1710.3	2673.6	2432.1	2190.5	1949.0
Contribution to PEMDA Ujung Pandang	84.7	12.5	51.5	49.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cash Used	552.7	285.4	270.5	1282.2	725.0	2511.0	7592.0	5236.7	17577.7	20554.5	14655.4	8007.9	10756.2	14179.5	10539.4	12357.4	14609.3	14408.7	14102.9	13889.2
Increase in Cash	-133.1	-15.3	6.2	-9.4	334.8	239.8	-2158.8	1914.1	1632.1	4157.6	5043.2	5225.9	3146.2	647.2	2327.3	1485.1	1748.2	3000.6	4049.8	4689.4
Cash at End	32.7	17.4	23.6	14.2	349.0	588.8	-1570.0	344.1	1976.2	6133.8	11177.0	16402.9	19549.1	20196.3	22523.6	24008.7	25756.9	28757.5	32807.3	37496.7
Total Debt Service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.7	96.7	141.5	137.4	719.9	4195.2	9838.5	9521.4	10710.4	12650.3	12197.7	11746.9	11292.2
Debt Service Coverage (times)	—	—	—	—	—	—	—	30.1	42.1	44.0	52.6	11.5	2.4	1.2	1.4	1.5	1.4	1.6	1.7	1.9
Note: Working Capital Needed	392.9	197.3	373.7	-934.1	436.1	209.3	744.7	456.2	999.5	1058.2	1060.7	981.8	1265.9	878.3	888.8	1605.2	1121.5	1184.4	1170.5	1294.7

5.2 FINANCING PLAN

This subsection intends to work out the financing plan. Possible combination of financing sources and interest rates will be studied by way of examining financial burden incurred by repayment of loan, and a financing plan to be adopted will be proposed hereunder taking duly into consideration the comments on 'Draft Final Reports' made at the Meeting. (Refer to Appendix I 'Minutes of Meeting'.)

1) Probable financing sources and interest rates are as follows:

   a. Eight cases of DLNI, IFGL and PDAM's own fund.

	Combination Case							(%)
	1	2	3	4	5	6	7	8
DLNI	50	60	70	80	90	100	80	90
IFGL	50	40	30	20	10	0	0	0
Own Funds	0	0	0	0	0	0	20	10

   b. Three cases of interest rate, i.e., 9%, 10% and 11% for DLNI and IFGL.

2) Table A.5.4 shows the debt service computed for each combination of the fund sources and interest rates stated above. The annual distribution in percentage of the debt service resembles each other regardless of the total amount of repayment. For this reason, all combinations are largely classified into 11 groups for Phase 1 and 6 groups for Phase 2 as illustrated in Figure A.5.1.

3) Judging from long-term marginal cost and FIRR, Phase 2 Project is considered economically more efficient than Phase 1. This enables the conditions for funding for Phase 2 Project to be more lenient. From this viewpoint, 11 financing patterns for Phase 1 and 6 patterns for Phase 2 will create further combinations as shown in Table A.5.5. The number of combinations totals to 65 as presented in Table A.5.6.

4) The repayment schedules of 65 combinations are listed in Table A.5.7 and impacts of debt service on water rate are calculated as illustrated on Figure A.5.2. In this Figure, the area below "Margin for Debt Service" implies that the repayment is preferably to be situated in. All the curves computed exceed the margin for some period. However, the exceedings in Cases 1 and 16 are the least, exceeding the margin for a short period. Considering this situation and the current practice of financing, Case 11 (B-X pattern) and Case 16 (C-X pattern) are selected as a recommendable financing plan. The amounts of funds to be financed from each financing source are given in Table A.5.8.

5) Future financial situations are projected employing the above financing plan and average water rate, which are summarized in Table A.5.9.

6) The financing plan thus worked out is further revised/refined taking into consideration both results of financial projection and comments made by Cipta Karya at the Meeting. The financing plan finally proposed is to finance the rehabilitation of distribution network by own funds and other work items by the fund sources explained above.

TABLE A.5.4 (A) LOAN (F/C AND L/C) REPAYMENT OF TWENTY-FOUR FINANCING PATTERNS (PHASE I)

Financing Pattern					Repayment (million Rp.)											
L/C Sources (%)					2/	Annual Amort.		Total 1992 --	Distribution to Chronological Sequence (%)							
No.	GLNI	IFGL	Own Funds	Interest Rate (%)	Capitalized Interest	Principal	Cap. Interest	2000	1992	1993	1994	1995	1996	1997	1998	1999	2000
(1a)	50	50	0	9	16.360.1	3.380.0	891.1	66.743.7	3.1	6.4	14.2	13.8	13.4	12.9	12.5	12.1	11.6
(1b)				10	18.448.2	3.380.0	1.005.7	72.191.5	2.9	6.1	14.4	13.9	13.5	13.0	12.5	12.1	11.6
(1c)				11	20.594.8	3.380.0	1.123.6	77,928.6	2.6	5.8	14.6	14.1	13.6	13.1	12.6	12.1	11.6
(2a)	60	40	0	9	17.547.2	3.380.0	982.4	69.158.2	3.0	6.3	14.3	13.9	13.4	13.0	12.5	12.0	11.6
(2b)				10	19.791.2	3,380.0	1.109.0	74.964.9	2.8	6.0	14.5	14.0	13.5	13.0	12.5	12.1	11.6
(2c)				11	22.099.3	3.380.0	1.239.3	81.082.3	2.5	5.7	14.7	14.1	13.6	13.1	12.6	12.1	11.6
(3a)	70	30	0	9	18.735.8	3.380.0	1.073.9	71.578.8	2.9	6.2	14.4	13.9	13.5	13.0	12.5	12.0	11.5
(3b)				10	21.135.8	3.380.0	1,212.4	77.744.3	2.7	5.9	14.6	14.1	13.6	13.1	12.6	12.0	11.5
(3c)				11	23.605.4	3.380.0	1,355.2	84.242.7	2.4	5.6	14.7	14.2	13.7	13.1	12.6	12.1	11.5
(4a)	80	20	0	9	19.922.5	3.380.0	1.165.1	73.995.0	2.8	6.1	14.5	14.0	13.5	13.0	12.5	12.0	11.5
(4b)				10	22.478.8	3.380.0	1,315.7	80.520.0	2.6	5.8	14.7	14.2	13.6	13.1	12.6	12.0	11.5
(4c)				11	25.109.6	3.380.0	1.470.9	87.398.3	2.4	5.6	14.8	14.3	13.7	13.2	12.6	12.0	11.5
(5a)	90	10	0	9	21.110.8	3.380.0	1.256.5	76.414.4	2.7	6.1	14.6	14.1	13.6	13.0	12.5	12.0	11.5
(5b)				10	23.823.0	3.380.0	1.419.1	83.298.5	2.5	5.8	14.8	14.2	13.7	13.1	12.6	12.0	11.5
(5c)				11	26.615.5	3.380.0	1,586.7	90.557.7	2.3	5.5	14.9	14.3	13.8	13.2	12.6	12.0	11.4
(6a)	100	0	0	9	22.298.4	3.380.0	1.347.9	78.832.3	2.6	6.0	14.7	14.1	13.6	13.1	12.5	12.0	11.4
(6b)				10	25.166.8	3.380.0	1.522.5	86.075.7	2.4	5.7	14.8	14.3	13.7	13.1	12.6	12.0	11.4
(6c)				11	28.120.6	3.380.0	1.702.5	93.715.1	2.2	5.4	15.0	14.4	13.8	13.2	12.6	12.0	11.4
(7a)	80	0	20 1/	9	19.922.5	2.967.5	1.165.1	70.370.5	2.5	5.9	14.7	14.2	13.6	13.1	12.6	12.0	11.5
(7b)				10	22.478.8	2.967.5	1.315.7	76.895.5	2.3	5.6	14.8	14.3	13.7	13.2	12.6	12.1	11.5
(7c)				11	25.109.6	2.967.5	1.470.9	83.773.8	2.1	5.3	15.0	14.4	13.8	13.2	12.6	12.1	11.5
(8a)	90	0	10 1/	9	21.110.8	3.173.7	1.256.5	74.601.7	2.5	5.9	14.7	14.1	13.6	13.1	12.5	12.0	11.5
(8b)				10	23.823.0	3.173.7	1,419.1	81.485.8	2.3	5.6	14.8	14.3	13.7	13.1	12.6	12.0	11.5
(8c)				11	26.615.5	3,173.7	1,586.7	88.745.0	2.1	5.4	15.0	14.4	13.8	13.2	12.6	12.0	11.4
				Average:	22.167.7	3.302.7	1.291.4	79.263.1	2.5	5.8	14.7	14.1	13.6	13.1	12.6	12.0	11.5

1/ In addition to the above repayment, these six patterns invest own funds during construction.

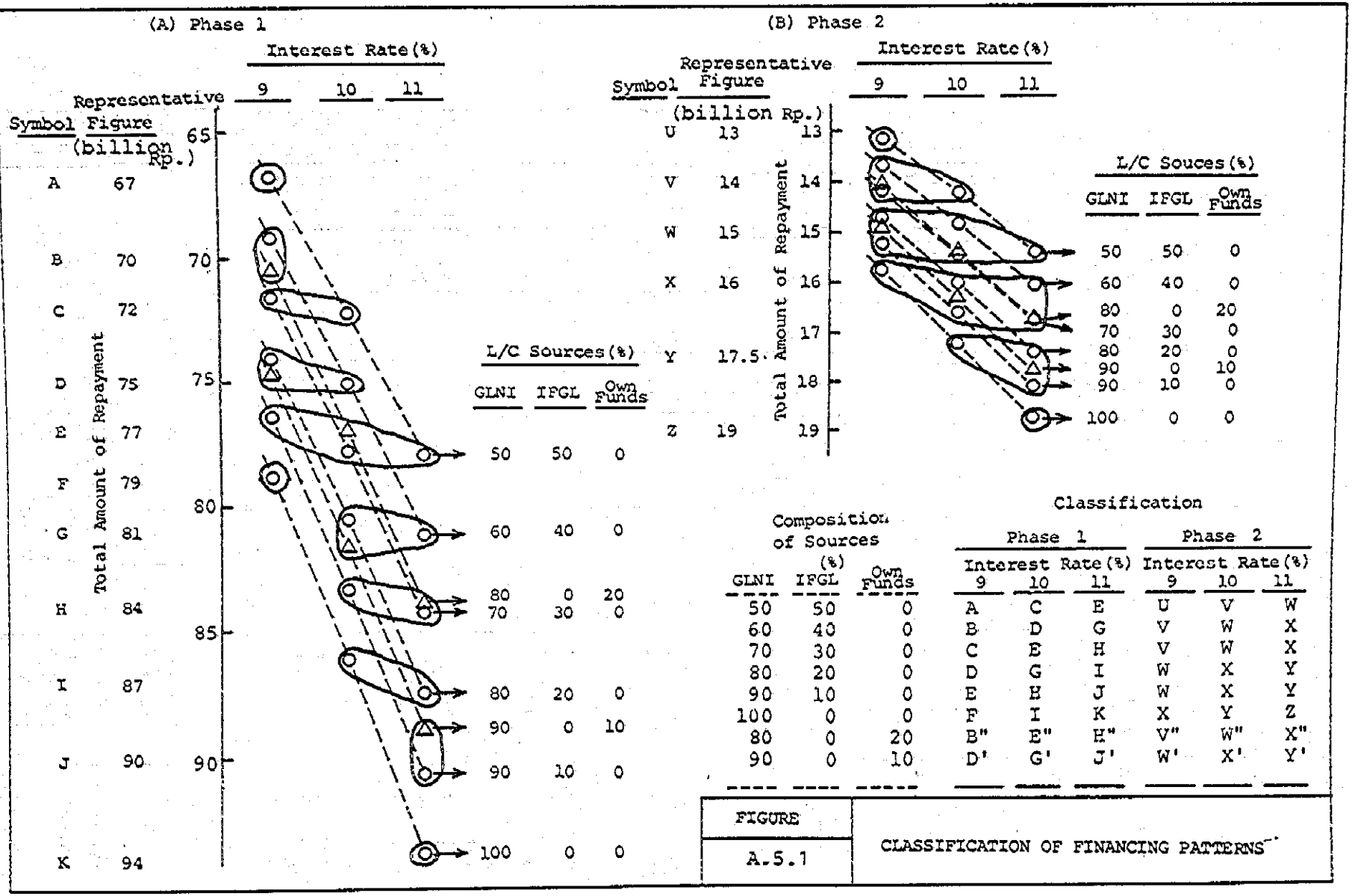
2/ This is the actual amount of debt for interest during construction.

TABLE A.5.4 (B) LOAN (F/C AND L/C) REPAYMENT OF TWENTY-FOUR FINANCINGPATTERNS (PHASE 2)

Financing Pattern						Repayment (million Rp.)				Distribution to Chronological Sequence (%)				
	L/C Sources(%)				2/	Annual Amort.		Total						
No.	GLNI	IFGL	Own Funds	Interest Rate (%)	Capitalized Interest	Principal	Cap. Interest	1996 -- 2000		1996	1997	1998	1999	2000
(1a)	50	50	0	9	5.181.5	1.111.2	268.5	13.136.0		10.5	23.4	22.7	22.0	21.3
(1b)				10	5.838.6	1.111.2	302.6	14.227.9		9.9	23.6	22.9	22.1	21.4
(1c)				11	6.513.8	1.111.2	337.7	15.377.7		9.4	23.8	23.0	22.3	21.5
(2a)	60	40	0	9	5.535.2	1.111.2	293.8	13.657.5		10.3	23.5	22.8	22.1	21.3
(2b)				10	6.237.5	1.111.2	331.1	14.824.2		9.7	23.7	23.0	22.2	21.4
(2c)				11	6.959.0	1.111.2	369.5	16.052.9		9.2	23.9	23.1	22.3	21.5
(3a)	70	30	0	9	5.889.1	1.111.2	319.1	14.179.5		10.1	23.6	22.9	22.1	21.3
(3b)				10	6.636.7	1.111.2	359.6	15.421.2		9.5	23.8	23.0	22.2	21.4
(3c)				11	7.404.5	1.111.2	401.3	16.728.5		9.0	24.0	23.2	22.3	21.5
(4a)	80	20	0	9	6.243.0	1.111.2	344.4	14.701.8		9.9	23.7	22.9	22.1	21.3
(4b)				10	7.035.6	1.111.2	388.1	16.018.3		9.4	23.9	23.1	22.2	21.4
(4c)				11	7.849.8	1.111.2	433.1	17.404.3		8.9	24.1	23.2	22.3	21.5
(5a)	90	10	0	9	6.596.8	1.111.2	369.6	15.224.0		9.7	23.8	23.0	22.2	21.3
(5b)				10	7.434.4	1.111.2	416.6	16.615.7		9.2	24.0	23.1	22.3	21.4
(5c)				11	8.295.0	1.111.2	464.9	18.080.5		8.7	24.2	23.3	22.4	21.4
(6a)	100	0	0	9	6.950.8	1.111.2	394.9	15.746.0		9.6	23.9	23.0	22.2	21.3
(6b)				10	7.833.5	1.111.2	445.1	17.212.5		9.0	24.1	23.2	22.3	21.4
(6c)				11	8.740.4	1.111.2	496.7	18.756.0		8.6	24.3	23.3	22.4	21.4
(7a)	80	0	20	9	6.243.0	970.6	344.4	13.998.8		9.4	23.9	23.1	22.2	21.4
(7b)				10	7.035.6	970.6	388.1	15.315.3		8.9	24.1	23.2	22.3	21.5
(7c)				11	7.849.8	970.6	433.1	16.701.3		8.4	24.3	23.4	22.4	21.5
(8a)	90	0	10	9	6.596.8	1.040.9	369.6	14.872.0		9.5	23.9	23.1	22.2	21.3
(8b)				10	7.434.4	1.040.9	416.6	16.263.7		9.0	24.1	23.2	22.3	21.4
(8c)				11	8.295.0	1.040.9	464.9	17.728.5		8.5	24.3	23.3	22.4	21.5
				Average:	6.942.9	1.084.8	381.4	15.760.2		9.3	23.9	23.1	22.2	21.4

1/ In addition to the above repayment, these six patterns invest own funds during construction.

2/ This is the actual amount of debt for interest during construction.



Composition of Sources (%)			Classification					
			Phase 1			Phase 2		
			Interest Rate (%)			Interest Rate (%)		
GLNI	IFGL	Own Funds	9	10	11	9	10	11
50	50	0	A	C	E	U	V	W
60	40	0	B	D	G	V	W	X
70	30	0	C	E	H	V	W	X
80	20	0	D	G	I	W	X	Y
90	10	0	E	H	J	W	X	Y
100	0	0	F	I	K	X	Y	Z
80	0	20	B"	E"	H"	V"	W"	X"
90	0	10	D'	G'	J'	W'	X'	Y'

FIGURE A.5.1 CLASSIFICATION OF FINANCING PATTERNS

TABLE A.5.5 COMBINATION OF FINANCING SOURCES PATTERN

Phase 1 Financing Sources Pattern	Interest Rate and Typical Financing Pattern	Phase 2 Financing Sources Pattern								
		50	60	70	80	90	100	90	80	:GLNI (Source)
		50	40	30	20	10	0	0	0	:IFGL (Source)
		0	0	0	0	0	0	10	20	:Own (Source)
		Typical Financing Pattern								
		U V W	V W X	V W X	W X Y	W X Y	X Y Z	W' X' Y'	V" : 9 % W" : 10 % X" : 11 %	Interest Rate
(1)			AV CW EX	AV CW EX	AW CX EY	AW CX EY	AX CY EZ	AW' CX' EY'	AV" CW" EX"	
GLNI: 50	9%--→ A									
IFGL: 50	10%--→ C									
Own : 0	11%--→ E									
(2)				BV DW GX	BW DX GY	BW DX GY	BX DY GZ	BW' DX' GY'	BV" DW" GX"	
GLNI: 60	9%--→ B									
IFGL: 40	10%--→ D									
Own : 0	11%--→ G									
(3)					CW EX HY	CW EX HY	CX EY HZ	CW' EX' HY'	CV" EW" HX"	
GLNI: 70	9%--→ C									
IFGL: 30	10%--→ E									
Own : 0	11%--→ H									
(4)						DW GX IY	DX GY IZ	DW' GX' IY'	DV" GW" IX"	
GLNI: 80	9%--→ D									
IFGL: 20	10%--→ G									
Own : 0	11%--→ I									
(5)							EX HY JZ	EW' HX' JY'	EV" HW" JX"	
GLNI: 90	9%--→ E									
IFGL: 10	10%--→ H									
Own : 0	11%--→ J									
(6)								FW' IX' KY'	FV" IW" KX"	
GLNI: 100	9%--→ F									
IFGL: 0	10%--→ I									
Own : 0	11%--→ K									
(7)									D'V" G'W" J'X"	
GLNI: 90	9%--→ D'									
IFGL: 0	10%--→ G'									
Own : 10	11%--→ J'									
(8)									B"V" E"W" H"X"	
GLNI: 80	9%--→ B"									
IFGL: 0	10%--→ E"									
Own : 20	11%--→ H"									

LEGEND
' : Own Funds 10 %
" : Own Funds 20 %
[ ] : Possible Combinations

Note :
In view of economical efficiency of Phase 2 Project, the combinations except the above are not considered herewith.

TABLE A.5.6 POSSIBLE COMBINATION OF FINANCING PATTERN

Phase 2 Pattern / Interest Rate (%) / Phase 1 Pattern	U			V			W			X			Y			Z		
	9	10	11	9	10	11	9	10	11	9	10	11	9	10	11	9	10	11
A				○ ▲			○ △			○								
B				○ ▲ ■			○ △			○								
C				▲			○ ○ △ ▲			○ ○ △			○					
D				▲ ◆			○ ○ △ ▲			○ ○ △			○					
E				▲			△ ▲ ■			○ ○ ○ △ ▲			○ ○ △			○		
F				▲			△											
G							▲ ◆			○ ○ △ ▲			○ ○ △			○		
H							▲			△ ▲ ■			○ ○ △			○		
I							▲			△ ▲			○ △			○		
J										▲ ◆			△			○		
K										▲			△					

LEGEND

Ratio of Own Funds	Phase 2 0 %	Phase 2 10 %	Phase 2 20 %
Phase 1 0 %	○	△	▲
Phase 1 10 %	—	—	■
Phase 1 20 %	—	—	◆

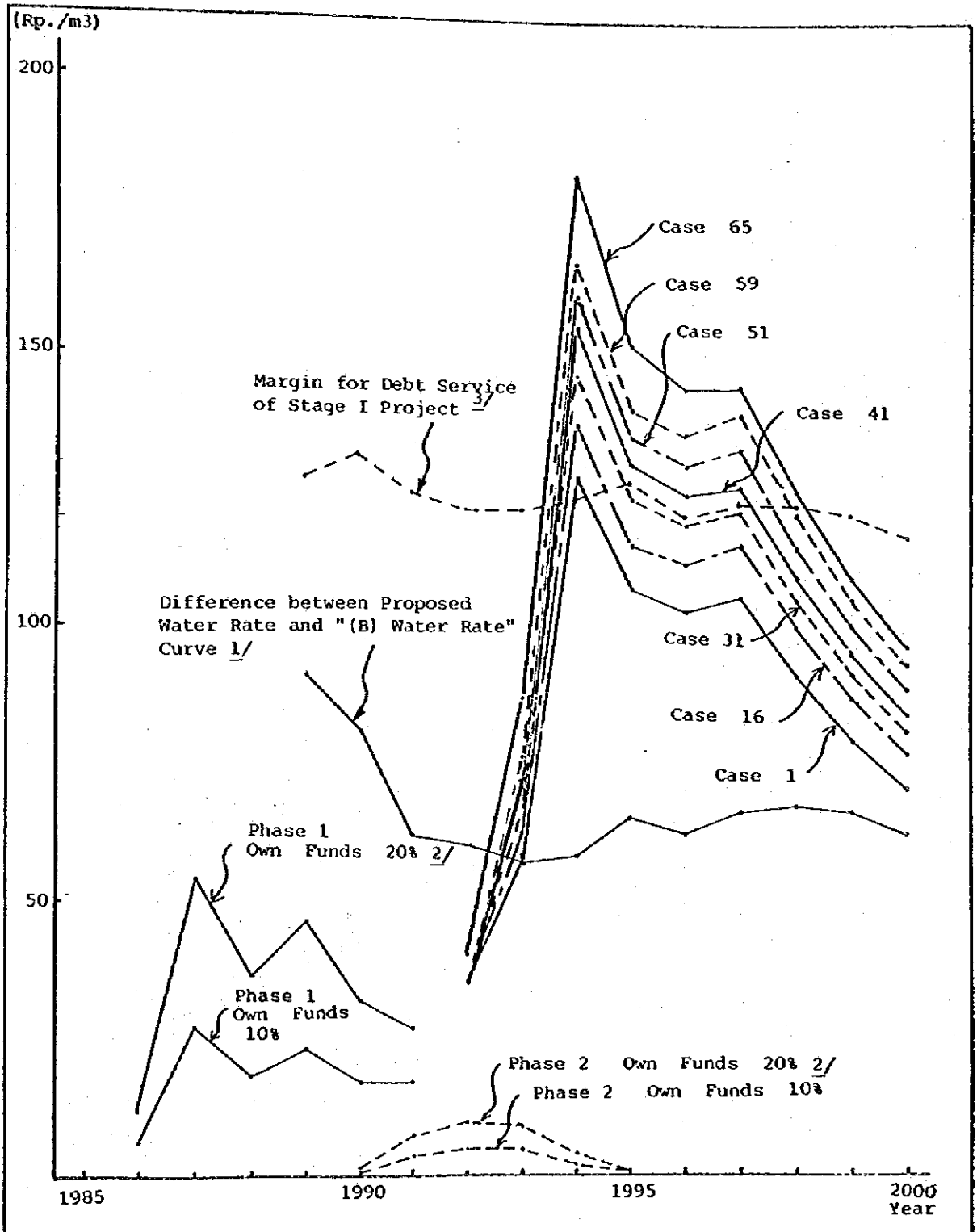
Note : 65 Cases in Total

No.	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
1 : A V	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,186.5	5,141.9	4,613.4	4,765.2	5,157.4	4,646.4	4,147.8	3,724.2	35,619
2 : A V''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,532.7	5,302.9	4,651.1	4,765.2	5,157.4	4,646.4	4,147.8	3,724.2	36,765
3 : A W	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,186.5	5,141.9	4,613.4	4,808.3	5,259.7	4,736.8	4,230.8	3,799.0	36,014
4 : A W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,359.9	5,222.6	4,632.0	4,808.3	5,259.7	4,736.8	4,230.8	3,799.0	36,588
5 : A X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,186.5	5,141.9	4,613.4	4,851.3	5,362.0	4,829.2	4,313.8	3,873.7	36,410
6 : B V	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,287.5	5,379.4	4,826.5	4,957.5	5,329.5	4,799.2	4,285.7	3,847.9	36,951
7 : B V'	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,633.7	5,540.4	4,864.3	4,957.5	5,329.5	4,799.2	4,285.7	3,847.9	38,098
8 : B'' V''	132.4	814.8	683.7	1,074.3	923.7	847.8	1,360.1	2,633.7	5,540.4	4,864.3	4,957.5	5,329.5	4,799.2	4,285.7	3,847.9	42,095
9 : B W	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,287.5	5,379.4	4,826.5	5,000.6	5,431.8	4,891.6	4,368.7	3,922.7	37,347
10 : B W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,460.9	5,460.2	4,845.2	5,000.6	5,431.8	4,891.6	4,368.7	3,922.7	37,920
11 : B X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,287.5	5,379.4	4,826.5	5,043.6	5,534.1	4,984.0	4,451.7	3,997.4	37,742
12 : C V''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,701.0	5,698.8	5,006.3	5,085.7	5,446.2	4,902.4	4,377.7	3,930.3	38,986
13 : C W	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,354.8	5,537.8	4,988.6	5,128.8	5,546.5	4,994.8	4,460.7	4,005.1	38,235
14 : C W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,528.2	5,618.6	4,987.2	5,128.8	5,546.5	4,994.8	4,460.7	4,005.1	38,809
15 : C W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,701.0	5,698.8	5,006.3	5,128.8	5,546.5	4,994.8	4,460.7	4,005.1	39,382
16 : C X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,354.8	5,537.8	4,988.6	5,171.8	5,648.8	5,087.2	4,543.7	4,079.9	38,631
17 : C X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,528.2	5,618.6	4,987.2	5,171.8	5,648.8	5,087.2	4,543.7	4,079.9	39,204
18 : C Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,354.8	5,537.8	4,988.6	5,236.4	5,802.3	5,225.8	4,668.2	4,192.0	39,224
19 : D V''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,802.1	5,936.3	5,219.5	5,278.1	5,616.3	5,057.2	4,515.6	4,054.0	40,319
20 : D' V''	66.7	407.4	342.3	536.8	484.5	538.2	1,468.2	2,802.1	5,936.3	5,219.5	5,278.1	5,616.3	5,057.2	4,515.6	4,054.0	42,323
21 : D W	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,455.8	5,775.3	5,181.8	5,321.1	5,718.6	5,149.6	4,598.6	4,128.8	39,568
22 : D W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,629.2	5,856.1	5,200.4	5,321.1	5,718.6	5,149.6	4,598.6	4,128.8	40,141
23 : D W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,802.1	5,936.3	5,219.5	5,321.1	5,718.6	5,149.6	4,598.6	4,128.8	40,714
24 : D X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,455.8	5,775.3	5,181.8	5,364.1	5,820.9	5,242.0	4,681.6	4,203.6	39,963
25 : D X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,629.2	5,856.1	5,200.4	5,364.1	5,820.9	5,242.0	4,681.6	4,203.6	40,537
26 : D Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,455.8	5,775.3	5,181.8	5,428.7	5,974.4	5,380.6	4,806.1	4,315.7	40,556
27 : E V''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,869.4	6,094.7	5,361.6	5,406.3	5,731.0	5,160.4	4,607.6	4,136.5	41,207
28 : E W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,696.6	6,016.5	5,342.5	5,449.3	5,833.3	5,252.8	4,690.6	4,211.3	41,029
29 : E W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,869.4	6,094.7	5,361.6	5,449.3	5,833.3	5,252.8	4,690.6	4,211.3	41,603
30 : E'' W''	132.4	814.8	683.7	1,074.3	923.7	847.8	1,360.1	2,869.4	6,094.7	5,361.6	5,449.3	5,833.3	5,252.8	4,690.6	4,211.3	45,600
31 : E X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,523.2	5,933.7	5,323.8	5,492.3	5,935.6	5,345.2	4,773.6	4,286.0	40,851
32 : E X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,696.6	6,016.5	5,342.5	5,492.3	5,935.6	5,345.2	4,773.6	4,286.0	41,425
33 : E X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,869.4	6,094.7	5,361.6	5,492.3	5,935.6	5,345.2	4,773.6	4,286.0	41,998
34 : E Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,523.2	5,933.7	5,323.8	5,556.9	6,089.1	5,483.8	4,898.1	4,398.2	41,445
35 : E Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,696.6	6,016.5	5,342.5	5,556.9	6,089.1	5,483.8	4,898.1	4,398.2	42,018
36 : E Z	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,523.2	5,933.7	5,323.8	5,621.5	6,242.6	5,622.4	5,022.6	4,510.4	42,038
37 : F V''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	2,936.7	6,253.1	5,503.7	5,534.5	5,845.7	5,263.6	4,699.6	4,218.9	42,095
38 : F W'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,763.9	6,172.8	5,484.5	5,577.5	5,948.0	5,356.0	4,782.6	4,293.7	41,918
39 : G W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,004.1	6,411.4	5,645.7	5,705.7	6,062.8	5,459.2	4,874.5	4,376.2	43,379
40 : G'' W''	66.7	407.4	342.3	536.8	484.5	538.2	1,468.2	3,004.1	6,411.4	5,645.7	5,705.7	6,062.8	5,459.2	4,874.5	4,376.2	45,384
41 : G X	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,657.8	6,250.4	5,608.0	5,748.7	6,165.1	5,551.6	4,957.5	4,451.0	42,628
42 : G X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,831.2	6,331.2	5,626.6	5,748.7	6,165.1	5,551.6	4,957.5	4,451.0	43,202
43 : G X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,004.1	6,411.4	5,645.7	5,748.7	6,165.1	5,551.6	4,957.5	4,451.0	43,775
44 : G Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,657.8	6,250.4	5,608.0	5,813.3	6,318.6	5,690.2	5,082.0	4,563.1	43,221
45 : G Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,831.2	6,331.2	5,626.6	5,813.3	6,318.6	5,690.2	5,082.0	4,563.1	43,795
46 : G Z	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,657.8	6,250.4	5,608.0	5,877.9	6,472.0	5,828.8	5,206.5	4,675.3	43,815
47 : H W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,105.1	6,649.0	5,858.9	5,898.0	6,234.9	5,614.0	5,012.5	4,499.9	44,712
48 : H X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,932.2	6,568.7	5,839.8	5,941.1	6,337.2	5,706.4	5,095.5	4,574.6	44,534
49 : H X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,105.1	6,649.0	5,858.9	5,941.1	6,337.2	5,706.4	5,095.5	4,574.6	45,107
50 : H'' X''	132.4	814.8	683.7	1,074.3	923.7	847.8	1,360.1	3,105.1	6,649.0	5,858.9	5,941.1	6,337.2	5,706.4	5,095.5	4,574.6	49,104
51 : H Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,758.8	6,488.0	5,821.1	6,005.6	6,490.6	5,845.0	5,219.9	4,686.8	44,554
52 : H Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	2,932.2	6,568.7	5,839.8	6,005.6	6,490.6	5,845.0	5,219.9	4,686.8	45,127
53 : H Z	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,758.8	6,488.0	5,821.1	6,070.2	6,644.1	5,983.6	5,344.4	4,799.0	45,147
54 : I W''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,206.1	6,886.5	6,072.0	6,090.3	6,407.0	5,768.8	5,150.4	4,623.6	46,044
55 : I X'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	3,033.3	6,806.3	6,052.9	6,133.4	6,509.3	5,861.2	5,233.4	4,698.3	45,867
56 : I X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,206.1	6,886.5	6,072.0	6,133.4	6,509.3	5,861.2	5,233.4	4,698.3	46,440
57 : I Y	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,859.9	6,725.5	6,034.3	6,197.9	6,662.7	5,999.8	5,357.9	4,810.5	45,886
58 : I Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	3,033.3	6,806.3	6,052.9	6,197.9	6,662.7	5,999.8	5,357.9	4,810.5	46,460
59 : I Z	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,859.9	6,725.5	6,034.3	6,262.5	6,816.2	6,139.4	5,482.4	4,922.7	46,480
60 : J X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,307.1	7,124.1	6,265.1	6,325.7	6,681.4	6,016.0	5,371.3	4,822.0	47,772
61 : J' X''	66.7	407.4	342.3	536.8	484.5	538.2	1,468.2	3,307.1	7,124.1	6,265.1	6,325.7	6,681.4	6,016.0	5,371.3	4,822.0	49,777
62 : J Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	3,134.3	7,043.8	6,266.0	6,390.2	6,834.8	6,154.6	5,495.8	4,934.2	47,793
63 : J Z	0.0	0.0	0.0	0.0	0.0	0.0	1,237.9	2,960.9	6,963.1	6,247.4	6,454.8	6,988.3	6,293.2	5,620.3	5,046.3	47,812
64 : K X''	0.0	0.0	0.0	0.0	44.7	229.3	1,565.7	3,441.8	7,440.8	6,569.3	6,582.1	6,910.8	6,222.4	5,555.3	4,986.9	49,549
65 : K Y'	0.0	0.0	0.0	0.0	22.0	115.0	1,401.8	3,268.9	7,360.6	6,550.2	6,646.6	7,064.3	6,361.0	5,679.7	5,099.1	49,569

TABLE A.5.7
TOTAL DEBT SERVICE OF
SIXTY FIVE COMBINED PATTERNS

Note;

Expenditure from own funds is considered to be a kind of debt service
(e.g.,Case 2, Case 8)



Note:

1/ "(B) Water Rate" curve is shown in Figure 5.3.

2/ Expenditure from own funds is considered to be a kind of debt service.

3/ Refer to "(A) Water Rate" curve in Figure 5.3.

FIGURE	IMPACT OF DEBT SERVICE ON WATER RATE
A.5.2	

TABLE A.5.8 Preliminary Financing Plan And Financial Projection

(Unit: million Rp.)

Project	Total	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Phase 1																
F/C : BLN	31.623	-	1.515	502	9.837	12.688	7.081	-								
L/C : DLNI	17.839	-	1.226	3.123	3.940	4.296	4.814	440								
IFGL	11.034	735	3.612	1.224	3.363	2.100	-	-								
Phase 2																
F/C : BLN	9.787					622	407	3.619	2.946	2.195						
L/C : DLNI	9.848					324	1.786	2.731	3.086	1.537						
Financial Projection																
Change in Cash		240	94	1.914	2.202	4.158	5.043	5.024	2.945	446	2.126	1.284	1.547	2.799	3.848	4.488
Cash at End		589	683	2.597	4.799	8.957	14.000	19.024	21.969	22.415	24.540	25.824	27.370	30.169	34.017	38.505
Total Debt Service		0	0	97	97	142	137	922	4.397	10.040	9.723	10.912	12.852	12.399	11.947	11.494
Debt Service Coverage (times)		-	-	30.1	42.1	44.0	52.6	8.9	2.3	1.2	1.3	1.5	1.4	1.6	1.7	1.8
Debt/Debt & Equity Ratio (%)		6.9	23.3	30.4	47.1	56.7	59.0	57.9	55.7	53.2	49.6	45.3	40.8	36.4	32.1	28.2

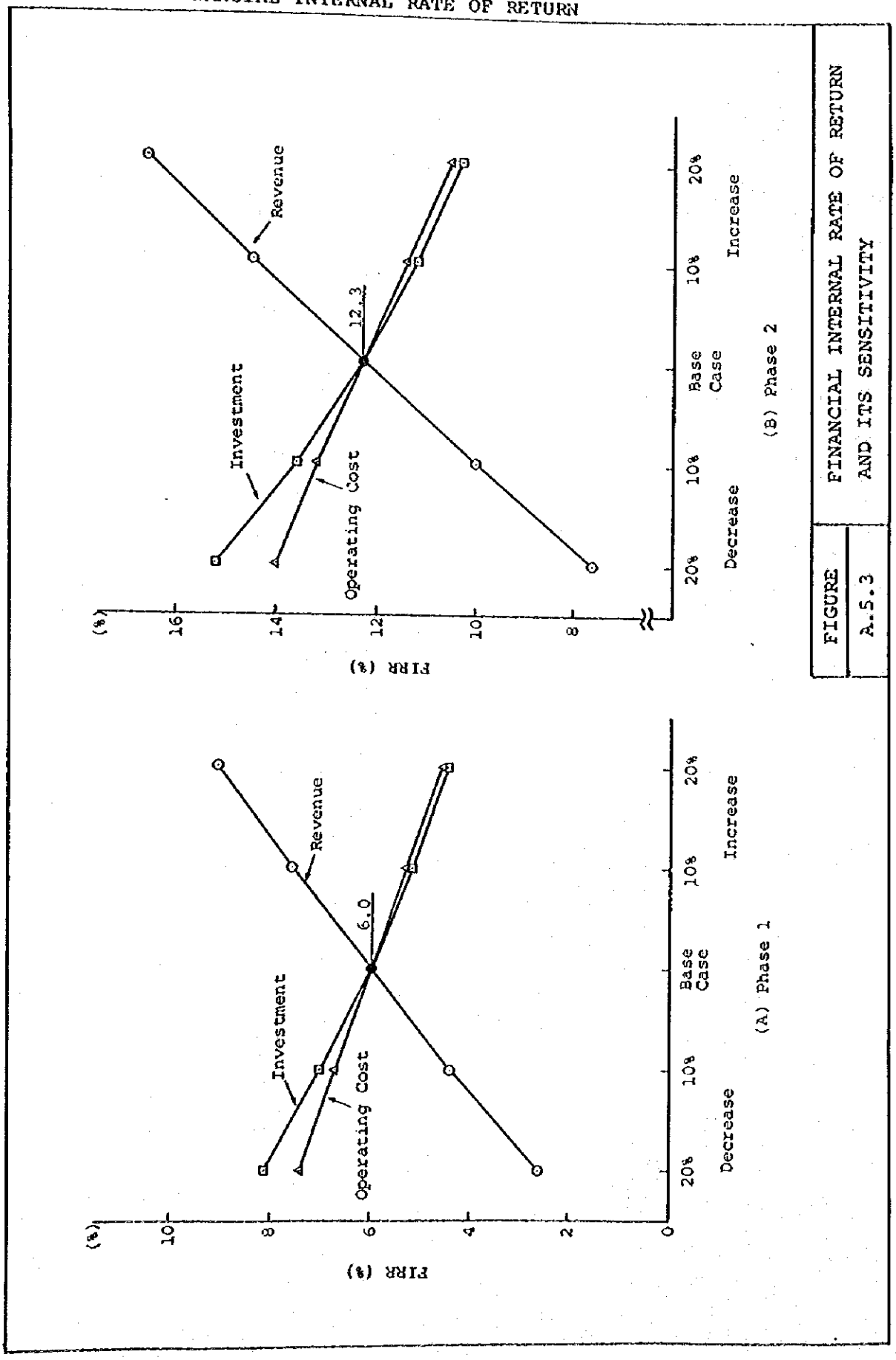


FIGURE	FINANCIAL INTERNAL RATE OF RETURN AND ITS SENSITIVITY
A.5.3	

APPENDIX VI

SCOPE OF ENGINEERING SERVICES

The engineering services hereinafter described in this Appendix are in connection with Stage I project of Ujung Pandang Water Supply, which are split into two, namely, Phases 1 and 2 with target years of 1992 and 1995 respectively. Major components of Stage I Project are listed in Table A.6.1.

The services to be rendered and performed by Consultants under Phases 1 and 2 shall consist of:

Phase 1

a) Assistance to Cipta Karya in implementing rehabilitation work including tendering, bid evaluation, and construction supervision.

b) Preparation of detailed designs, specification and tender documents including invitation to bid, form and conditions of contract, estimates of cost, preliminary construction schedules, drawings and related documents for the procurement of goods and construction of Mangngasa system with 500 l/sec capacity through local/international competitive bidding in accordance with guidelines of agencies concerned. Detailed design shall be founded on the review of previous studies on treatment processes and the topographical and geological investigations at the sites of intake facilities, treatment plant, water tank and pipe bridges.

c) Services during stages of tendering and construction, including assistance in the prequalification of contractors, analysis of bids, recommendations for award of contract, administration of construction contracts, supervision of construction and installation works, preparation of operation and maintenance mannuals, and a test operation.

d) On-the-job-training of PDAM personnel during design and construction phases up to commissioning of project works so that operation of the system and management of PDAM will function effectively and overseas training of key-personnel designated by PDAM/CIPTA KARYA.

Phase 2

a) Preparation of detailed design, specification and tender documents including invitation to bid, form and conditions of contract, estimates of cost, preliminary construction schedules, drawings and related documents for the procurement of goods and expansion work of Mangngasa system with 500 l/sec capacity as described above. During the period of detailed design, the review of the Feasibility Study shall be made which consists of especially review of implementation and construction schedules, financial analysis, and other studies/surveys to be required.

b) Services during stages of tendering and construction, including assistance in the prequalification of contractors, analysis of bids, recommendations for award of contracts, administration of construction contracts, supervision of construction and installation work, preparation of operation and maintenance manuals, and a test operation.

c) On-the-job training of PDAM personnel during construction phase up to commissioning.

TABLE A.6.1 FACILITIES TO BE CONSTRUCTED/REHABILITATED

FACILITIES	DESCRIPTION
PHASE 1	
Maros Transmission Canal	- Rehabilitation
Ratulangi Treatment Plant	- Rehabilitation including replacement of filter sand, repair of the elevated tank, installation of flow measuring equipment, and repair work of chemical feeders.
Panaikang Treatment Plant	- Rehabilitation including upgrading of production capacity, and reuse of waste water and drain.
Existing Distribution Network	- Rehabilitation of old network
Intake Facilities and Raw Water Transmission Pipeline	- Construction of a weir and a grit chamber, repair of irrigation canal and installation of transmission pipeline, 1.5 km in length.
Mangngasa Treatment Plant (Capacity : 500 l/sec)	- Construction of a receiving well, a mixing chamber, flocculation and sedimentation basins, a secondary mixing well, filters, clear water reservoirs and other necessary facilities.
Distribution Network	- Installation of trunk, secondary and service mains, of which length totals to 278 km. - Construction of a distribution tower.
House Meters with Connection Pipes & Public Standpipes	- Installation of 45,400 units (House Meters) - Installation of 1,500 units (Public standpipes)
PHASE 2	
Mangngasa Treatment Plant (Capacity : 500 l/sec)	- Expansion of the treatment plant constructed under Phase 1, including construction of flocculation and sedimentation basins, a secondary mixing well, filters, clear water reservoirs and other necessary facilities.
Distribution Network	- Installation of trunk, secondary and service mains, of which length totals to 109 km.
House Meters with Connection Pipes & Public Standpipes	- Installation of 15,100 units (House Meters) - Insatllation of 100 units (Public Standpipes)