TABLE 4-3 HYDROLOGICAL EFFECTIVENESS IN WATER STAGE

(Unit: M.S.L.m)

Return Period	Below Sungguminasa				Above Sungguminasa (12.0 K point)	
	City-Side Area		Mountain-Side Area			
	w/o	w	w/o	w	w/o	w
2 - year	2.03	1.27	1.45	1.30	9.4	8.1
2.4 - year	2.05	1.60	1.50	1.34	9.7	8.7
5 - year	2.61	1.78	2.04	1.42	9.9	9.2
10 - year	2.82	1.94	2.53	1.55	10.0	10.0
30 - year	2.86	2.01	2.82	1.77	10.0	10.4
50 - year	2.89	2.07	2.86	1.88	10.0	10.4

Table 4-4 FUTURE DEMAND OF MUNICIPAL AND INDUSTRIAL WATER

(Unit: m^3/day)

Distinguish	1985	1990	1995	2000
Houses	47,180	64,812	91,555	127,911
Public Facilities	1,887	2,991	4,578	6,396
Industry	23,400	29,100	31,100	33,100
Trading	8,580	9,610	10,770	12,070
Hotels	2,003	2,244	2,515	2,817
Sea Port	328	361	394	426
Office	4,804	5,816	7,043	8,527
Hospitals	674	890	1,168	1,523
Schools	3,002	5,609	9,684	15,228
Mosques	630	780	930	1,140
Sub-Total (m^3/day)	92,488	122,213	159,737	209,138
Loss	39,638	52,377	68,459	89,631
Total (m^3/day)	139,126	174,590	228,196	298,769
(l/sec)	1,526	2,021	2,641	3,458
Adjusted Volume (l/sec)	[1,500]	[2,000]	[2,700]	[3,500]

Table 4-5 INCOME OF CROP

Varieties	Yield (ton/ha)	Unit Price (Rp/ton)	Gross Products (Rp/ha)	Production Cost (Rp/ha)	Income (Rp/ha)
Paddy	2.5	71,500	178,750	64,000	114,750
Maize	0.7	35,000	24,500	4,850	19,650
Green bean	0.5	125,000	62,500	3,500	59,000
Cassava	7.0	10,000	70,000	10,400	59,600

Table 4-6 GROWTH PERIOD OF VARIETIES OF PADDY

(Unit: Number of Days)

Varieties of Paddy	Growth Period of Seedlings	After Transplanting		Total Growth Period
		Irrigation	Cultivatio	
1. C4 - 63	20 - 25	95	105	125 - 130
2. PB - 26	20 - 25	95	105	125 - 130
3. PB - 32	21 - 27	108 - 109	118 - 119	140 - 145
4. PB - 36	18 - 21	82 - 89	92 - 99	110 - 120
5. Citarum	20 - 25	95	105	125 - 130

Note 1 : Persuasion seed sowing : 7 - 10 days
Note 2 : Puddling : 10 - 14 days

Table 4-7 IDENTIFICATION OF BASIC YEAR FOR PLANNING

Benefitted Area: 19,200 ha

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Volume dependent on reservoir supply (x $10^6 m^3$)	--	--	--	--	--	241	190	69	178	198
Order of the "drought year"	7th	1st	9th	6th	10th	2nd	5th	8th	4th	3rd

Note: The order of the "drought year" was determined based on the rainfall amount during dry season at Hasanuddin.

Table 4-8 CALCULATION OF EVAPOTRANSPIRATION (Modified Penman Method)

(Unit: mm/day)

	Crop Consumptive use factor	1976		1977		1978		1979		1980	
		E	Er	E	Er	E	Er	E	Er	E	Er
Jan.	1.27	4.476	5.7	4.067	5.2	4.377	5.6	3.742	4.8	3.577	4.5
Feb.	1.15	4.357	5.0	4.015	4.6	4.443	5.1	3.763	4.3	3.477	4.0
Mar.	0.75	4.079	3.1	4.638	3.5	4.689	3.5	3.724	2.8	4.181	3.1
Apr.	*	5.136	*	5.000	*	5.079	*	4.312	*	4.116	*
May	0.92	4.625	4.3	4.753	4.4	4.302	4.0	3.963	3.6	4.049	3.7
Jun.	1.12	4.227	4.7	4.078	4.6	4.267	4.8	3.921	4.4	3.761	4.2
Jul.	1.27	4.792	6.1	4.929	6.3	4.134	5.3	3.851	4.9	4.179	5.3
Aug.	1.15	5.673	6.5	5.425	6.2	5.053	5.8	4.593	5.3	4.536	5.2
Sep.	0.75	6.308	4.7	6.372	4.8	5.228	3.9	4.955	3.7	5.238	3.9
Oct.	*	5.860	*	6.879	*	5.944	*	5.097	*	5.215	*
Nov.	0.92	5.084	4.7	5.918	5.4	5.181	4.8	4.986	4.6	4.925	4.5
Dec.	1.15	4.116	4.7	4.664	5.4	4.142	4.8	3.864	4.4	3.656	4.2

Table 4-9 DIVERSION REQUIREMENTS DURING DRY SEASON (1976)

	Unit	May	Jun.	Jul.	Aug.	Sep.
Unit Water Requirement	l sec/ha	1.433	1.212	1.463	1.527	1.238
Bili-Bili Intake (4,000 ha)	m^3/sec	*1) 0- 4.396	4.848	5.852	6.108	*2) 4.952-0
Kampili Intake (15,200 ha)	m^3/sec	*1) 0-16.706	18.422	22.238	23.210	*2) 18.818-0
Total (19,200 ha)	m^3/sec	*1) 0-21.102	23.270	28.090	29.318	*2) 23.770-0

* 1) : May 0% - 76.7% area
* 2) : Sep. 100% - 0% area

Table 4-10 ECONOMIC PRICE OF RICE (GABA)
- Import Substitution Price -

(Unit: Rp/ton)

1. International Market Price (F.O.B. Bangkok) /1 US$557	348,125
2. External Transportation Cost (Bangkok - Ujung Pandang)	8,125
3. Port Handling Charge and Storing Cost (including cost of sacks) /2	5,710
4. Selling Price of Rice at Ex-mill Gate	361,960
5. Milling Charge	- 6,000
6. Handling and Transportation Cost (Farm gate to mill)	- 2,700
7. Economic Farm Gate Price of Dry Stalk Paddy	353,260 [353,000]

Note: /1 : Source - Price prospects for Major Primary Commodities IBRD, 1980

Projected price to 1985 in 1980 constant US dollars.

/2 : Handling charge at harbor 30 Rp/ton
Storing chasrge 7 Rp/ton/day x 240 days
Cost of sacks 4000 Rp/ton

Table 4-11 IRRIGATION BENEFITS

Description	W/O Project	W/Project	Increment
1. Planted Area (ha)			
-wet season paddy field	24,000	24,000	0
-dry season paddy field	2,400	19,200	16,800
2. Unit Yield (ton/ha)			
-wet season rice	2.62	3.12	0.50
-dry season rice	2.24	3.12	0.88
3. Project Price of Paddy (Rp/ton)			
-rice (Gaba)	353,000	353,000	0
4. Unit Production Cost (Rp/ha)			
-wet season rice	180,000	190,000	10,000
-dry season rice	190,000	200,000	10,000
5. Gross Production Value (1x2x3) ($x10^6$ Rp)	24,095	47,579	23,484
-wet season rice	22,197	26,433	4,236
-dry season rice	1,898	21,146	19,248
6. Total Production Cost (1 x 4) ($x10^6$ Rp)	4,776	8,400	3,624
-wet season rice	4,320	4,560	240
-dry season rice	456	3,840	3,384
7. Net Production Value (5 - 6) ($x10^6$ Rp)	19,319	39,179	19,860
-wet season rice	17,877	21,873	3,996
-dry season rice	1,442	17,306	15,864
8. Crop Damage Due to Water Shortage ($x10^6$ Rp)	0.0	282	282
-wet season rice	0.0	109	109
-dry season rice	0.0	173	173
9. Adjusted Net Production Value (7 - 8) ($x10^6$ Rp)	19,319	38,897	19,578
-wet season rice	17,877	21,764	3,887
-Dry season rice	1,442	17,133	15,691

Table 4-12 RELATION BETWEEN IRR AND MAXIMUM AVAILABLE DISCHARGE

Maximum available discharge m^3/s	Maximum output KW	Annual generated energy MWH	Construction cost x 10^6 US$	Unit construction cost per kWH (sending end) US$/KWH	Internal Rate of Return %
22	7,700	54,610	17,651	0.323	13.2
32	11,200	69,600	22,052	0.317	13.3
42	14,900	80,580	25,851	0.321	12.9
62	22,200	94,570	31,122	0.329	12.5

Table 4-13 GENERATED ENERGY AT BILI-BILI HYDRO POWER STATION

(Unit: MWH)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1976	8,333	7,795	8,333	4,836	4,074	6,751	7,581	6,561	2,336	557	422	723	58,301
1977	7,883	7,526	8,333	7,800	3,604	5,775	8,307	7,490	2,967	3,853	1,618	5,889	71,041
1978	8,277	7,526	8,333	5,539	4,036	4,730	6,873	7,077	2,953	7,911	6,449	6,521	76,225
1979	8,333	7,526	8,333	6,717	6,110	3,991	7,432	6,959	2,689	4,583	2,085	5,792	70,549
1980	8,269	7,795	8,333	8,064	5,214	6,891	7,339	6,349	2,485	2,483	1,312	7,309	71,843

Table 5-1 LAND ACQUISITION AND HOUSE EVACUATION

Classification	Amount
1. Land	
Cultivated land	
Paddy Field	660 ha
Field	120 ha
Forest	350 ha
Bamboo	305 ha
Residential Area	156 ha
2. Houses	790 nos
3. Relocation of Road	19 km
4. Relocation of Pumping Station	1 place

Table 6-1 MAIN CONSTRUCTION MACHINERY FOR DAM

No.	Machinery	Capacity	Unit
1	Bulldozer	32 ton	12
2	Bulldozer w/Ripper	32 ton	12
3	Bulldozer	21 ton	20
4	Dump truck	20 ton	30
5	Dump truck	8 ton	54
6	Dozer shovel	2.0 m^3	7
7	Wheel loader	3.1 m^3	11
8	Backhoe	Hyd. 1.2 m^3	5
9	Ordinary truck	3.0 ton	15
10	Truck crane	Hyd. 50 ton	2
11	Truck mixer	3.0 m^3	6
12	Concrete pump car	40 m^3/hr.	2
13	Tractor and Trailer	30 ton	1
14	Water tanker	8 kl.	3
15	Fuel tanker	8 kl.	5
16	Vibration roller	15 ton	5
17	Tamping roller	13.5 ton	4
18	Road roller	10 ton	4
19	Soil compactor	22 ton	4
20	Motor grader	3.7 m	5
21	Boring machine	max. 150 m	20
22	Grout mixer and pump	200 l.	20
23	Crawler drill	3 in.	8
24	Rock breaker	4 in.	10
25	Log drill w/sinker	1.5 in.	30
26	Pick hammer		30
27	Portable air compressor	17 m^3/min.	20
28	Concrete mixer	0.5 m^3	6
29	Concrete bucket	0.8 m^3	3
30	Concrete vibrator	flexible 130 ø	5
31	Concrete vibrator	flexible 40 ø	10
32	Concrete vibrator	moul type	5
33	Vibrator roller	5 ton	5
34	Rammer	80 kg	15
35	Air tamper		30
36	Centrifugal pump	8 in.	5
37	Turbine pump	3 m^3/min.	5
38	Submergible pump	8 in.	5
39	Submergible pump	4 in.	5
40	Submergible pump	2 in.	7
41	Sand pump	1 m^3/min.	6
42	Diesel generator	500 kW	2
43	Screening plant	125 t/hr.	1
44	Concrete plant	1 m^3 x 2	1

Table 6-2 CONSTRUCTION COST OF BILI-BILI DAM

Work Item	Unit	Quantity	Total Amount ($\times 10^3$ US$)	Foreign Currencey ($\times 10^3$ US$)	Local Currency ($\times 10^3$ US$)
1. Civil Works					
Excavation	m^3	890,000	5,266	2,609	2,657
Embankment	m^3	6,280,000	42,205	28,771	23,434
Spillway	L.S.	1	32,140	16,586	15,554
Foundation	L.S.	1	9,000	5,940	3,060
Intake	L.S.	1	524	270	254
Headrace channel	L.S.	1	162	87	75
Diversion	L.S.	1	14,466	7,390	7,076
Preparatory works	L.S.	1	10,377	5,166	5,211
Sub-total	-	-	114,140	56,819	57,321
2. Gates & Equipment	L.S.	1	2,638	2,239	399
3. Road Relocation	km	19	2,500	250	2,250
4. Land Acquisition	ha	780	5,360	-	5,360
5. House Evacuation	P.C.	790	380	-	380
6. Relocation of Pumping St.	P.C.	1	700	665	35
7. Engineering Service	L.S.	1	10,990	9,190	1,800
Sub-total (1-7)	-	-	136,708	69,163	67,545
8. Physical Contingency	L.S.	1	20,506	10,374	10,132
Grand-total (1-8)	-	-	157,214	79,537	77,677

Table 6-3 MAIN CONSTRUCTION MACHINERY FOR RIVER IMPROVEMENT

No.	Machinery	Capacity	Unit
1	Dredger	800 PS	1
2	Anchor Barge	35 PS	1
3	Wheel Loader	2.1 m^3	3
4	Wheel Loader	1.2 m^3	4
5	Back Hoe	1.2 m^3	4
6	Back Hoe	0.7 m^3	4
7	Asphalt Engine Sprayer	200 l	1
8	Asphalt Finisher	2.4 - 3.6 m	1
9	Road Roller	10/12 ton	1
10	Tire Roller	8/20 ton	1
11	Vibration Roller	25 ton	5
12	Soil Compactor	90 kg	10
13	Tamper	80 kg	10
14	Bull Dozer	21 ton	8
15	Bull Dozer	11 ton	4
16	Dump Truck	8 ton	90

Table 6-4 CONSTRUCTION COST OF RIVER IMPROVEMENT

Work Item	Unit	Quantity	Total Amount ($x10^3$ US$)	Foreign Currency ($x10^3$ US$)	Local Currency ($x10^3$ US$)
1. Civil Works					
Dredging	m^3	816,000	2,685	1,371	1,314
Excavation	m^3	1,320,000	6,559	3,443	3,116
Embankment	m^3	270,000	1,565	761	804
Filling	m^3	360,000	1,043	507	536
Sodding	m^2	347,000	441	-	441
Revetment	m	5,400	732	-	732
Groyne	P.C.	54	123	-	123
Sluice	P.C.	2	44	2	42
Drainage ditch	m	1,200	69	34	35
Groundsill	P.C.	2	405	19	386
Diversion channel of S. Garassi	m^3	80,000	352	176	176
Preparatory works	L.S.	1	1,402	631	771
Sub-total	-	-	15,420	6,944	8,476
2. Gates	P.C.	2	42	-	42
3. Land Acquisition	ha	43	1,376	-	1,376
4. House Evacuation	P.C.	85	204	-	204
5. Engineering Service	L.S.	1	2,885	2,488	397
Sub-total (1 - 5)	-	-	19,927	9,432	10,495
6. Physical Contingency	L.S.	1	2,990	1,415	1,575
Grand-total (1 - 6)	-	-	22,917	10,847	12,070

Table 6-5 CONSTRUCTION COST OF WATER SUPPLY

Work Item	Total Amount ($\times 10^3$ US$)	Foreign Currency ($\times 10^3$ US$)	Local Currency ($\times 10^3$ US$)
1. Civil Works			
Gate-controlled division works	197	36	161
Sand basin & regulating basin	238	70	168
Pipeline & appurtenant structures	8,981	4,535	4,446
Preparatory works	942	464	478
Sub-total	10,358	5,105	5,253
2. Gates & Equipment			
Gates	42	-	42
Ductile cast-iron pipe	17,151	17,151	-
Valves	44	44	-
Sub-total	17,237	17,195	42
3. Land Acquisition	11	-	11
4. Compensation	80	-	80
5. Engineering Service	3,153	2,727	426
Sub-total (1 - 5)	30,839	25,027	5,812
6. Physical Contingency	4,626	3,754	872
Grand-total (1 - 6)	35,465	28,781	6,684

Table 6-6 CONSTRUCTION COST OF IRRIGATION

Work Item	Total Amount ($x10^3$ US$)	Foreign Currencey ($x10^3$ US$)	Local Currency ($x10^3$ US$)
1. Main Works			
Work I (S.C. & R.F.)	5,400	778	4,622
Work II (S.C. & R.F.)	5,400	778	4,622
Work III	5,833	984	4,849
S.C. & R.F.	5,400	778	4,622
Kampili main channel	433	206	227
Work IV	6,214	1,018	5,196
S.C. & R.F.	5,400	778	4,622
Bili-Bili connecting channel	648	161	487
Bili-Bili existing channel	166	79	87
Sub-total	22,847	3,558	19,289
2. Engineering Service	3,100	2,640	460
Sub-total (1-2)	25,947	6,198	19,749
3. Physical Contingency	3,892	930	2,962
Grand-total (1-3)	29,839	7,128	22,711

Note: S.C. & R.F. = Secondary Channel and Relevant Facilities

Table 6-7 CONSTRUCTION COST OF HYDRO POWER

Work Item	Total Amount ($x10^3$ US$)	Foreign Currency ($x10^3$ US$)	Local Currency ($x10^3$ US$)
1. Civil Works			
Intake	491	270	221
Headrace tunnel	152	87	65
Penstock	525	254	271
Power house	6,156	3,426	2,730
Tailrace channel	1,021	524	497
Preparatory works	835	456	379
Sub-total	9,180	5,017	4,163
2. Gates & Penstock	1,392	1,182	210
3. Generating Equipment	5,955	5,590	365
4. Transmission line & Sub-station	3,640	2,320	1,320
5. Engineering Service	1,885	1,613	272
Sub-total (1-5)	22,052	15,722	6,330
6. Physical Contingency	3,308	2,358	950
Grand-total (1-6)	25,360	18,080	7,280

Table 7-1 ANNUAL DISBURSEMENT OF THE PROJECT COST

(Unit : x10^6 US$)

WORK ITEM	F.C.	L.C.	TOTAL	1982		1983		1984		1985		1986		1987	
				F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
D A M	151.43	158.76	310.19	-	-	2.83	0.85	1.51	0.28	0.23	2.02	18.68	20.40	20.27	26.05
RIVER IMPROVEMENT	38.77	66.18	104.95	1.22	0.19	0.30	0.04	1.71	3.52	2.82	6.97	2.61	7.25	2.63	7.44
MUNICIPAL & INDUSTRIAL WATER SUPPLY	56.91	14.79	71.70	-	-	-	-	-	-	-	-	1.63	0.27	0.87	0.17
IRRIGATION	13.93	48.60	62.53	-	-	-	-	-	-	1.19	0.24	0.04	-	2.17	9.99
HYDRO-POWER	36.97	17.22	54.19	-	-	-	-	-	-	-	-	-	-	1.28	0.25
T O T A L	298.01	305.55	603.56	1.22	0.19	3.13	0.89	3.22	3.80	4.24	9.23	22.96	27.92	27.22	43.90

(CONTINUED)

WORK ITEM	1988		1989		1990		1991		1992		1993		1994		1995	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
D A M	28.15	36.38	34.03	44.14	27.93	28.64	3.74	-	3.75	-	3.75	-	3.75	-	2.81	-
RIVER IMPROVEMENT	1.59	0.24	0.80	0.11	0.53	0.02	3.92	3.90	4.95	7.39	5.37	7.73	5.96	9.88	4.36	11.50
MUNICIPAL & INDUSTRIAL WATER SUPPLY	13.90	4.42	20.30	5.82	13.38	4.11	1.43	-	1.44	-	1.44	-	1.44	-	1.08	-
IRRIGATION	2.37	10.99	3.07	12.58	3.43	14.80	0.35	-	0.35	-	0.35	-	0.35	-	0.26	-
HYDRO-POWER	0.04	-	6.18	5.69	24.95	11.28	0.95	-	0.95	-	0.95	-	0.95	-	0.72	-
T O T A L	46.05	52.03	64.38	68.34	70.22	58.85	10.39	3.90	11.44	7.39	11.86	7.73	12.45	9.88	9.23	11.50

Table 7-2 ANNUAL DISBURSEMENT OF THE BASE COST

(Unit : x10^6 US$)

WORK ITEM	F.C.	L.C.	TOTAL	1982		1983		1984		1985		1986		1987	
				F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
D A M	69.16	67.55	136.71	-	-	2.17	0.61	1.02	0.18	0.07	1.16	11.59	10.55	11.44	12.24
RIVER IMPROVEMENT	16.56	24.21	40.77	0.99	0.16	0.20	0.03	1.19	2.26	1.83	4.00	1.52	3.75	1.39	3.50
MUNICIPAL & INDUSTRIAL WATER SUPPLY	25.03	5.81	30.84	-	-	-	-	-	-	-	-	1.02	0.14	0.48	0.08
IRRIGATION	6.20	19.75	25.95	-	-	-	-	-	-	0.79	0.14	-	-	1.23	4.72
HYDRO-POWER	15.72	6.33	22.05	-	-	-	-	-	-	-	-	-	-	0.80	0.13
T O T A L	132.67	123.65	256.32	0.99	0.16	2.37	0.64	2.21	2.44	2.69	5.30	14.13	14.44	15.34	20.67

(CONTINUED)

WORK ITEM	1988		1989		1990		1991		1992		1993		1994		1995	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
D A M	14.68	15.55	16.30	17.15	11.89	10.11	-	-	-	-	-	-	-	-	-	-
RIVER IMPROVEMENT	0.70	0.10	0.23	0.04	0.08	0.01	1.58	1.25	1.86	2.16	1.85	2.05	1.90	2.38	1.24	2.52
MUNICIPAL & INDUSTRIAL WATER SUPPLY	7.55	1.88	10.11	2.26	5.87	1.45	-	-	-	-	-	-	-	-	-	-
IRRIGATION	1.23	4.72	1.46	4.91	1.49	5.26	-	-	-	-	-	-	-	-	-	-
HYDRO-POWER	-	-	3.13	2.21	11.79	3.99	-	-	-	-	-	-	-	-	-	-
T O T A L	24.16	22.25	31.23	26.57	31.12	20.82	1.58	1.25	1.86	2.16	1.85	2.05	1.90	2.38	1.24	2.52

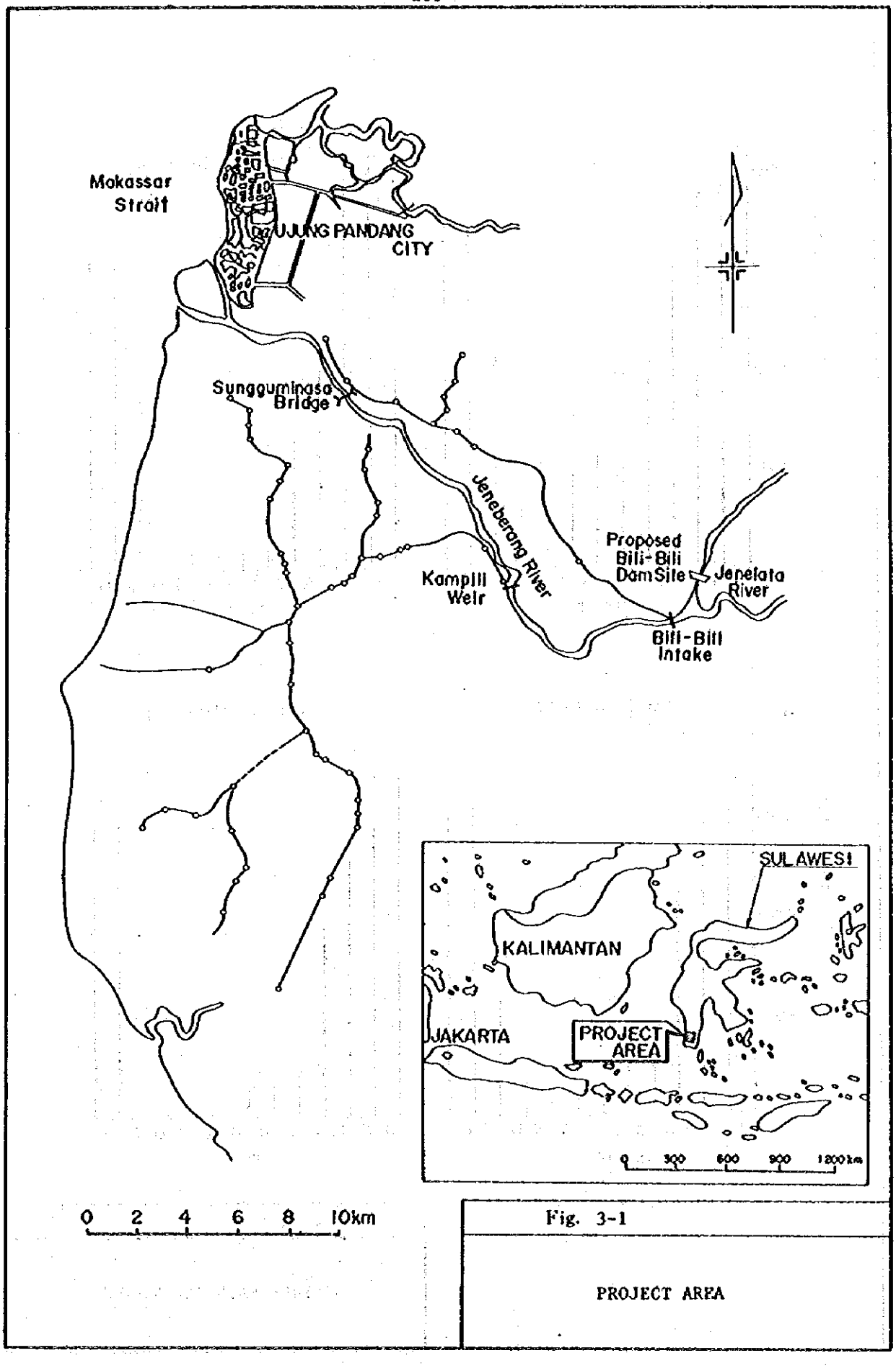


Fig. 3-1

PROJECT AREA

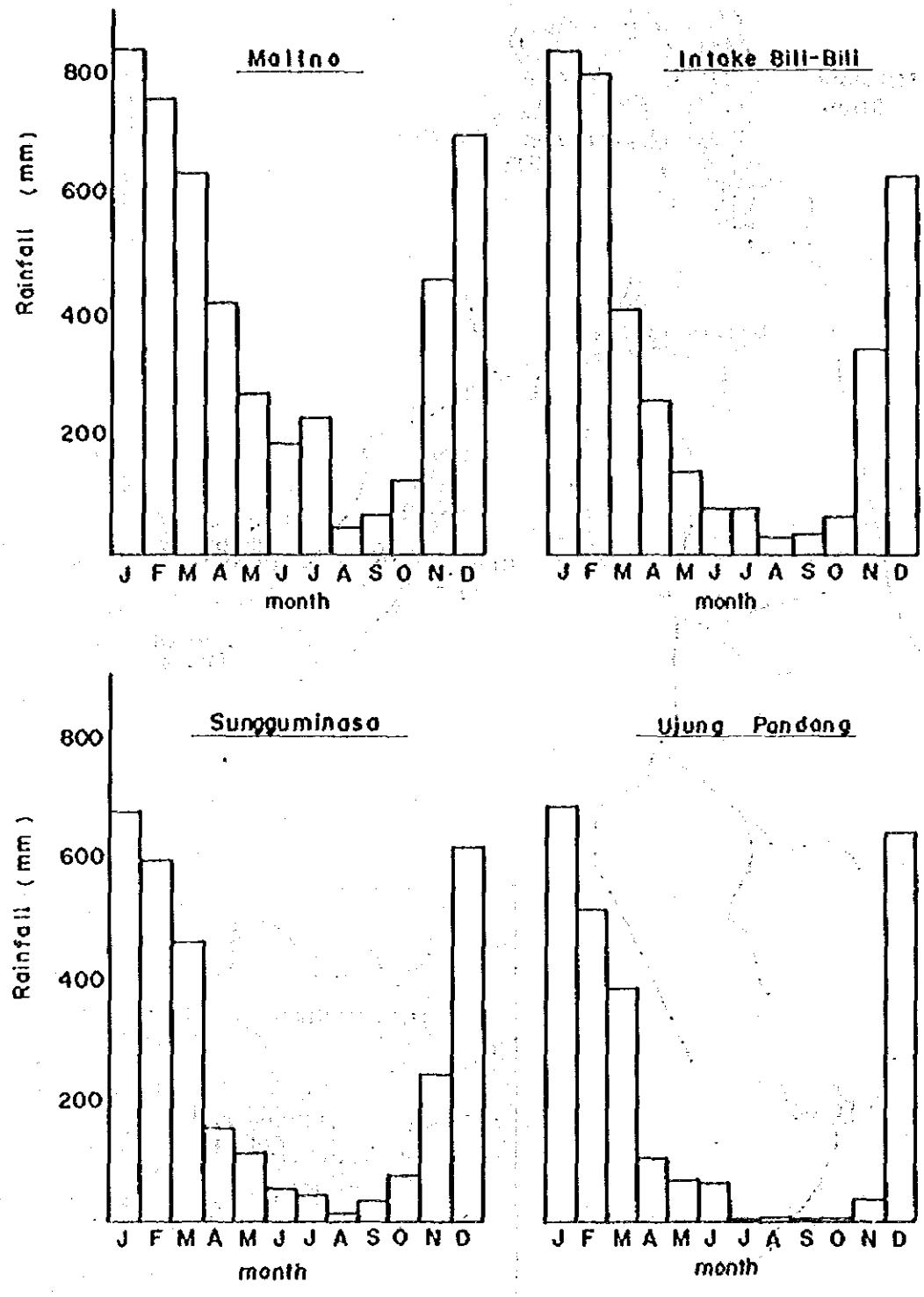


Fig. 3-2

MONTHLY RAINFALL RECORD

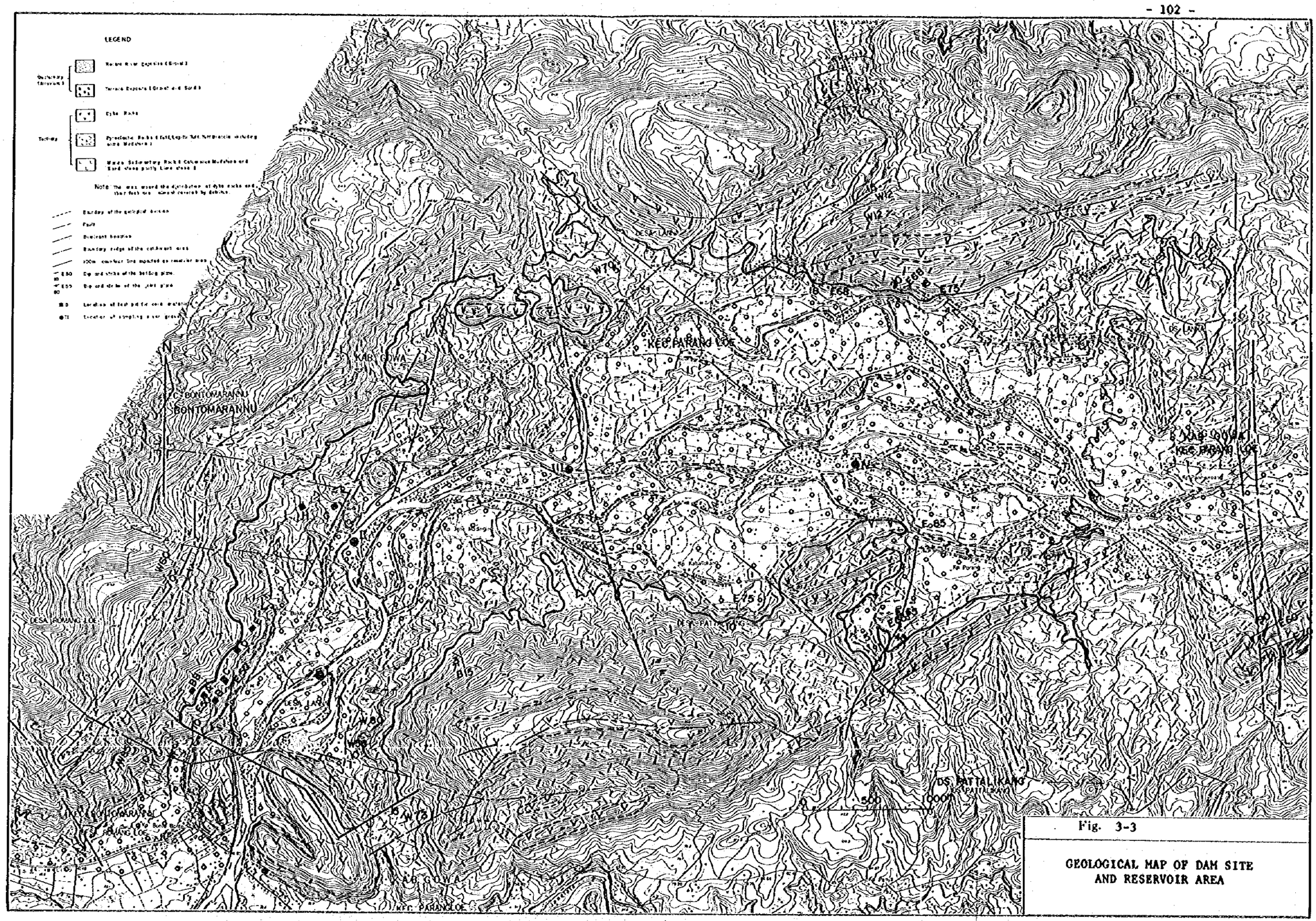


Fig. 3-3

GEOLOGICAL MAP OF DAM SITE AND RESERVOIR AREA

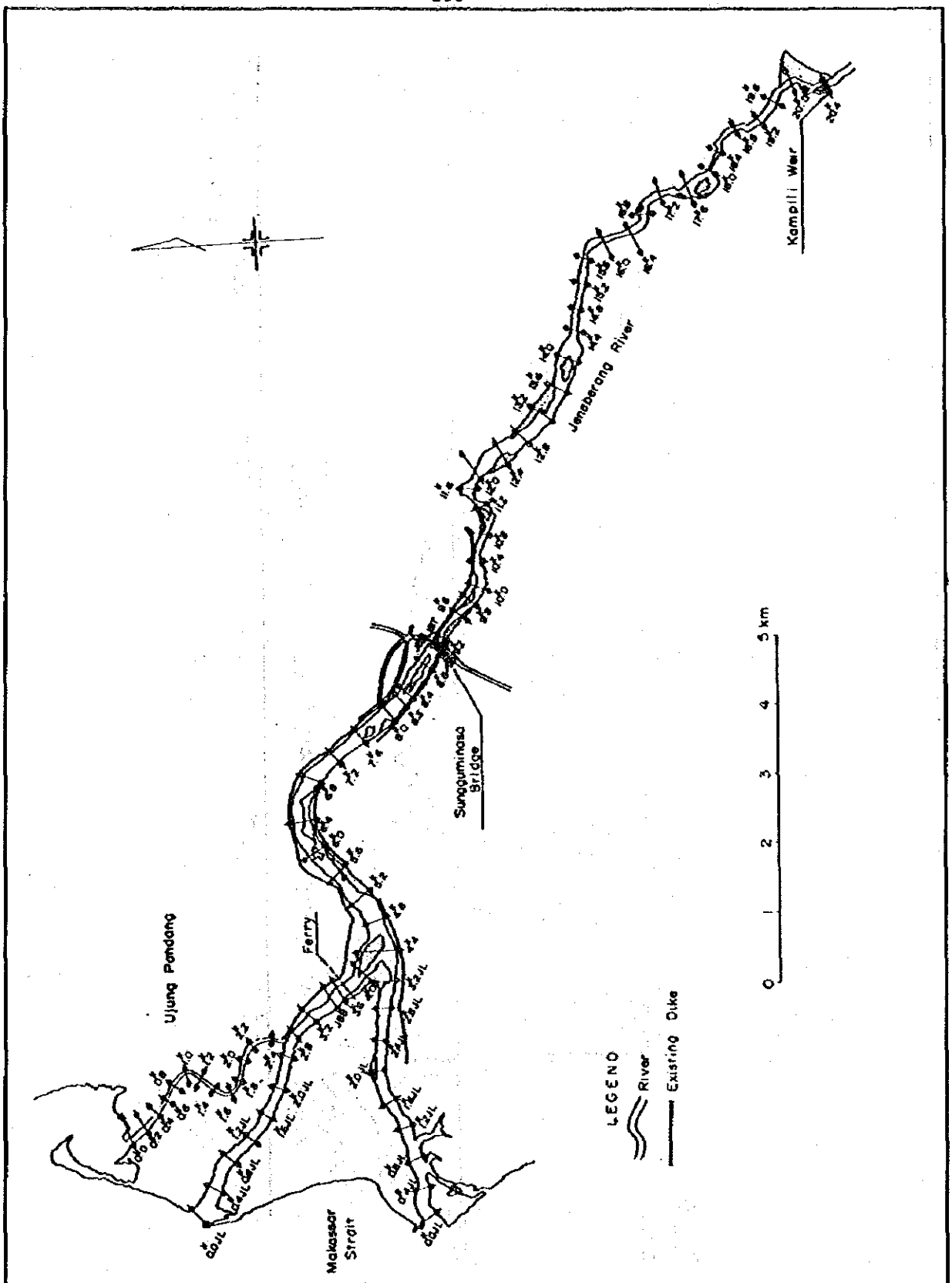


Fig. 3-4

GENERAL MAP OF THE JENEBERANG RIVER COURSE

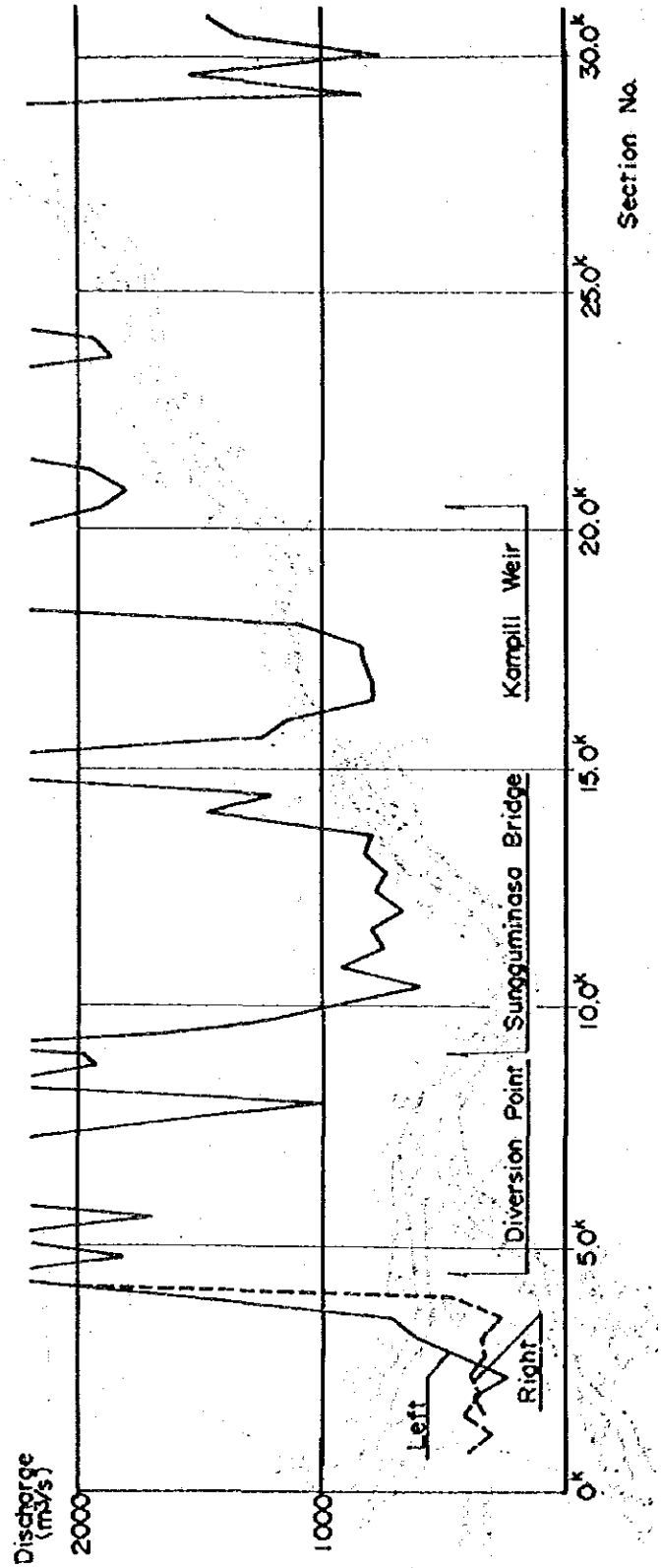
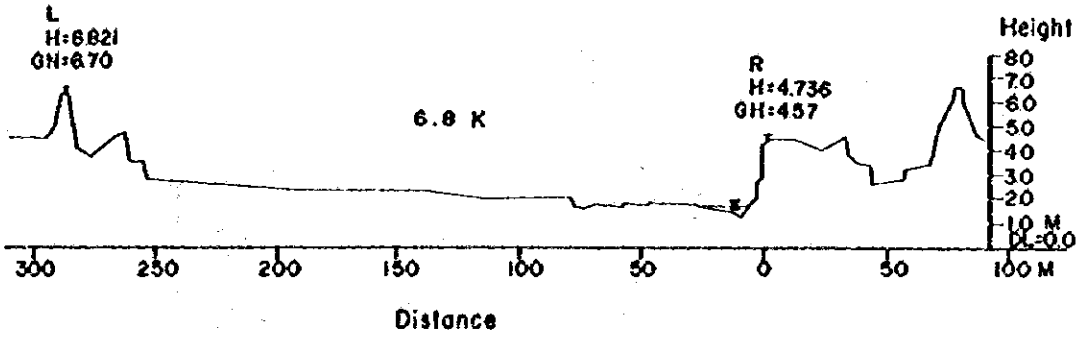
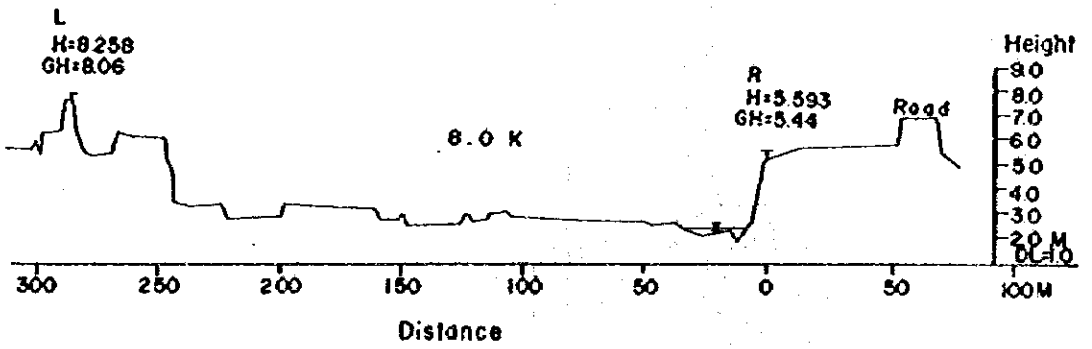


Fig. 3-5

PRESENT FLOW CAPACITY OF JENEBERANG RIVER





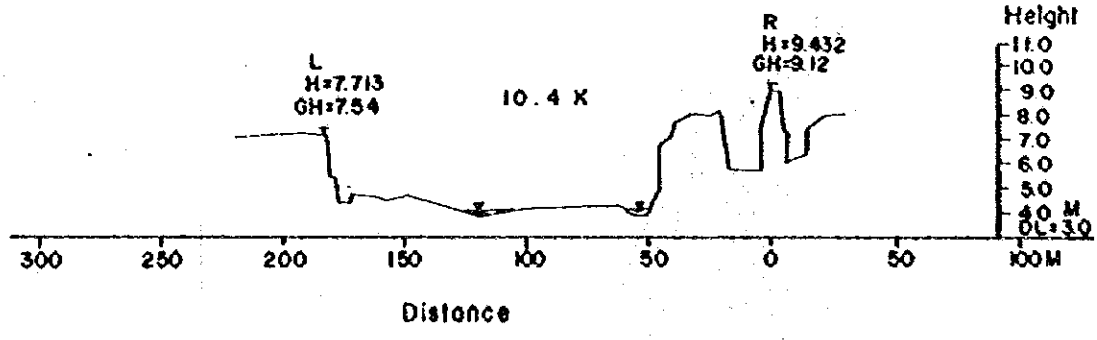


Fig. 3-6

CROSS-SECTION OF THE JENEBERANG RIVER

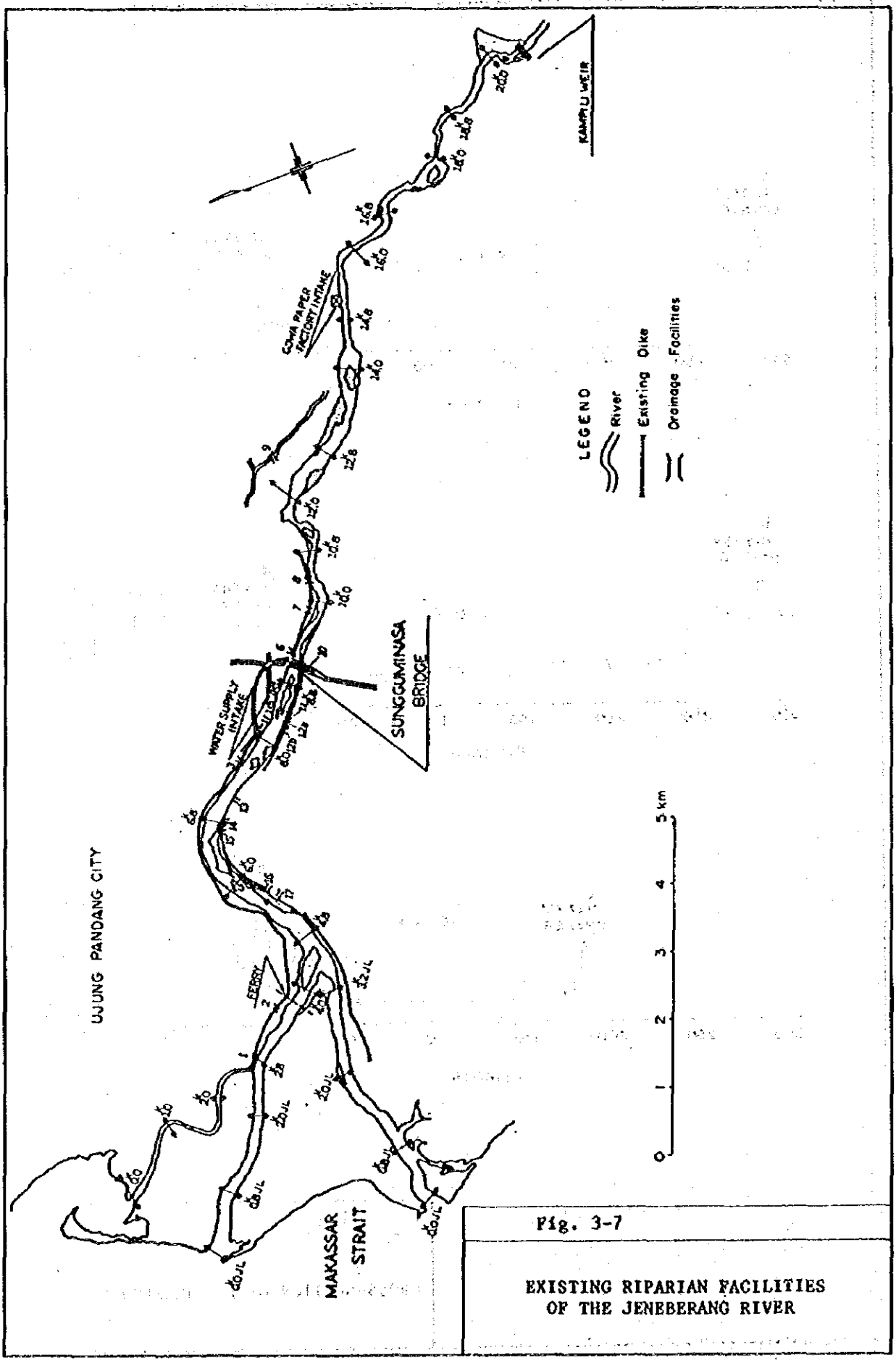


Fig. 3-7

EXISTING RIPARIAN FACILITIES
OF THE JENEBERANG RIVER

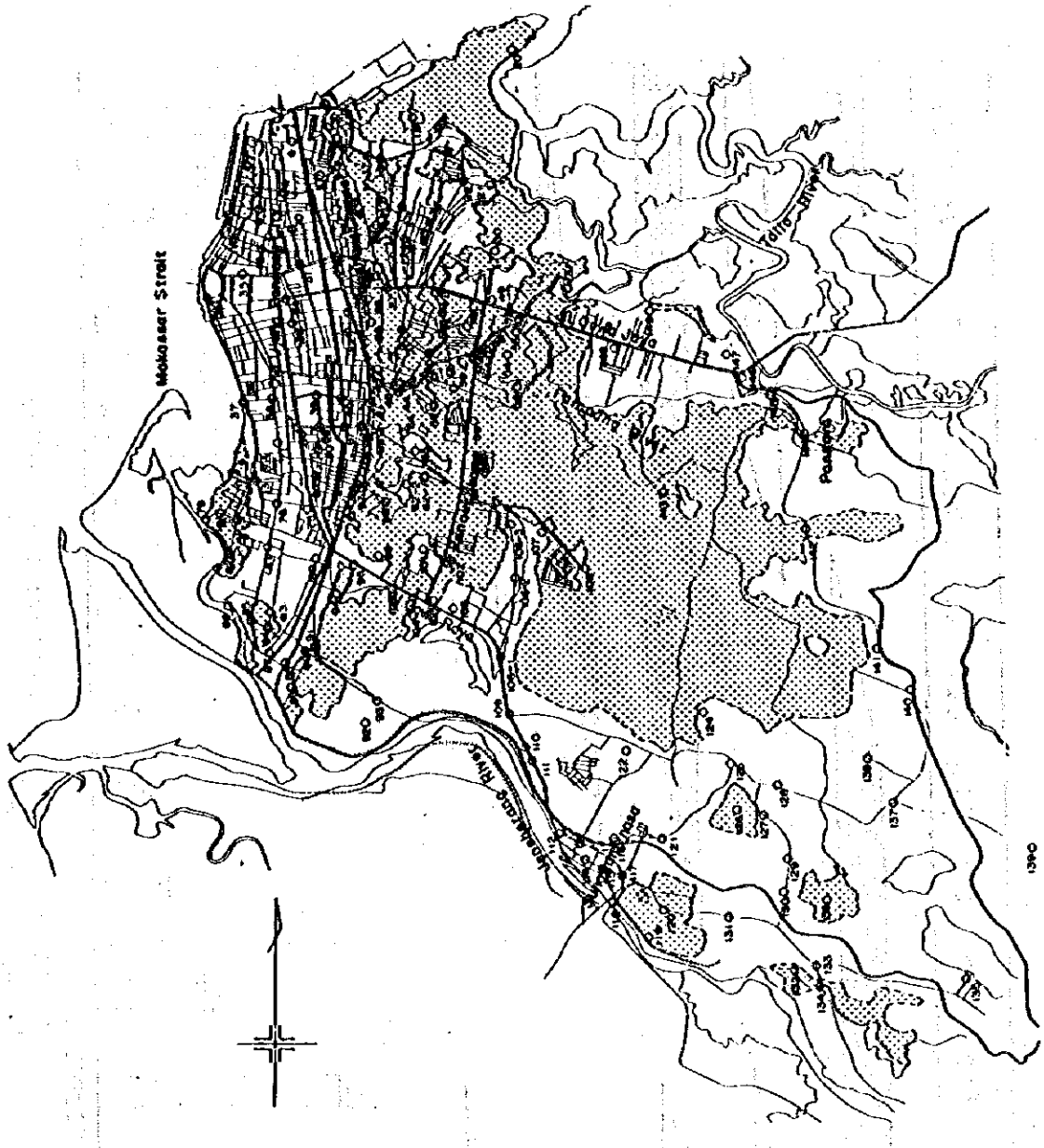


Fig. 3-8

INUNDATION MAP OF THE FLOOD OF JAN.1976

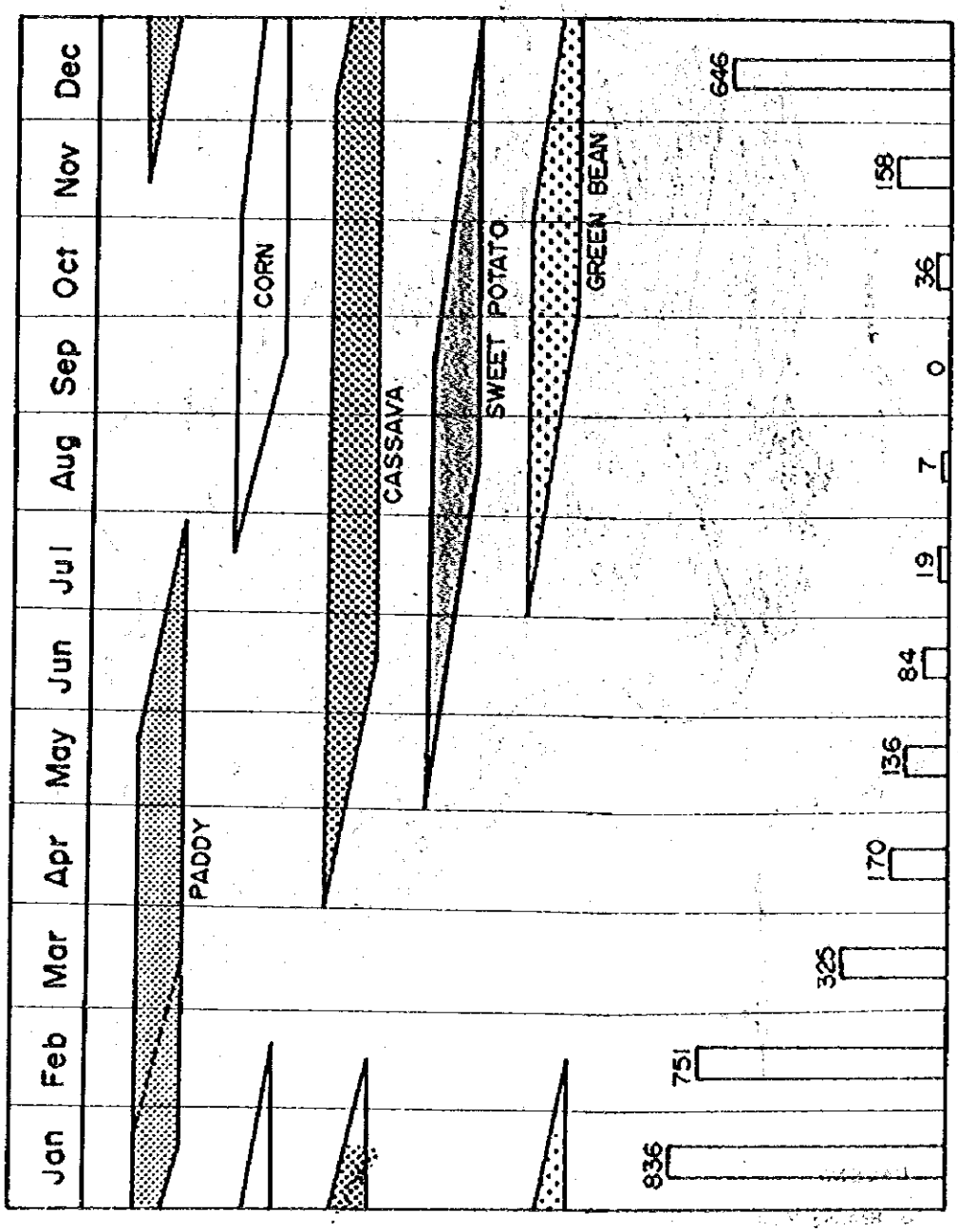


Fig. 3-9

PRESENT CROPPING & RAIN FALL PATTERN IN PROJECT AREA

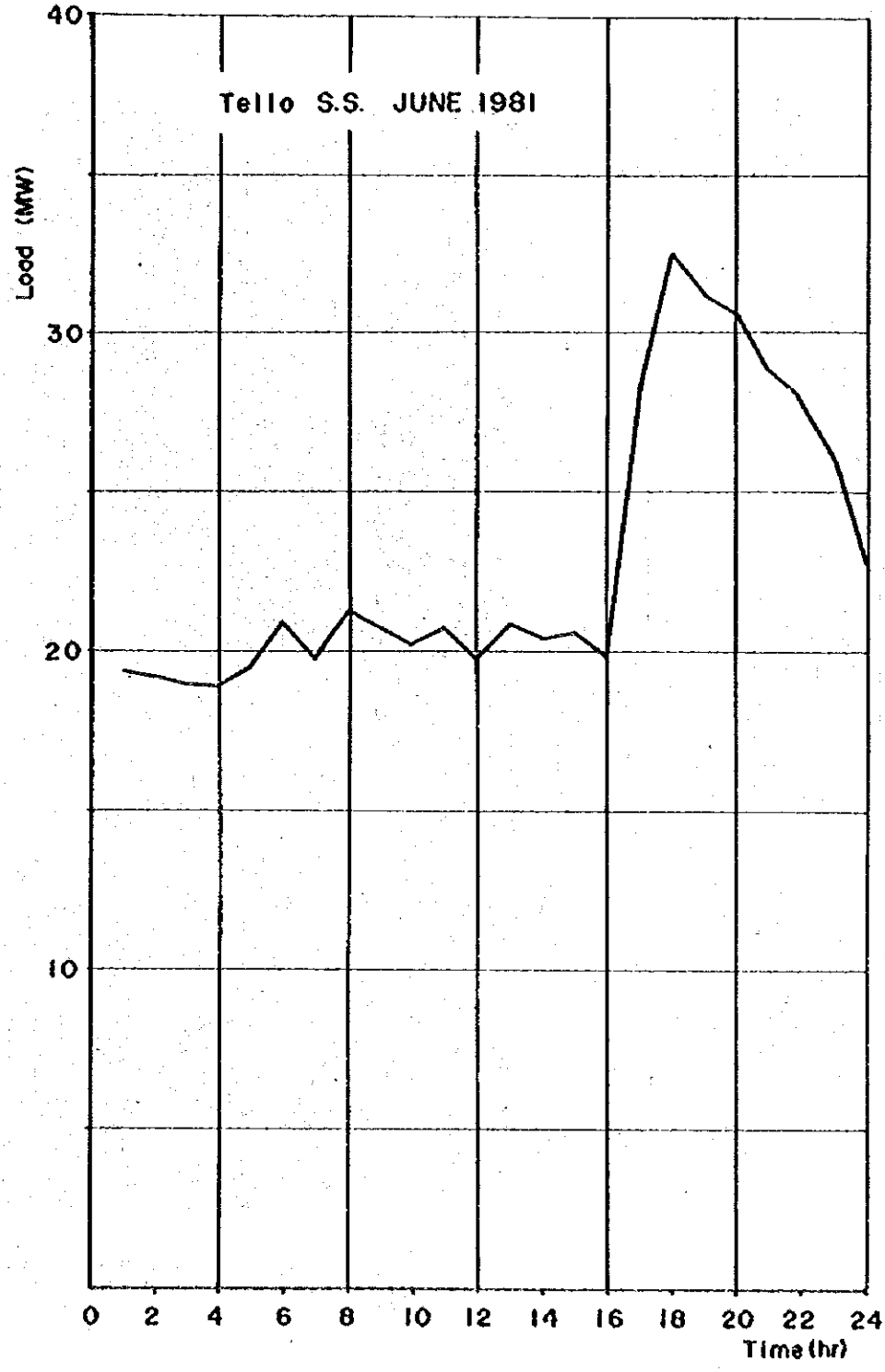


Fig. 3-10

DAILY LOAD CURVE

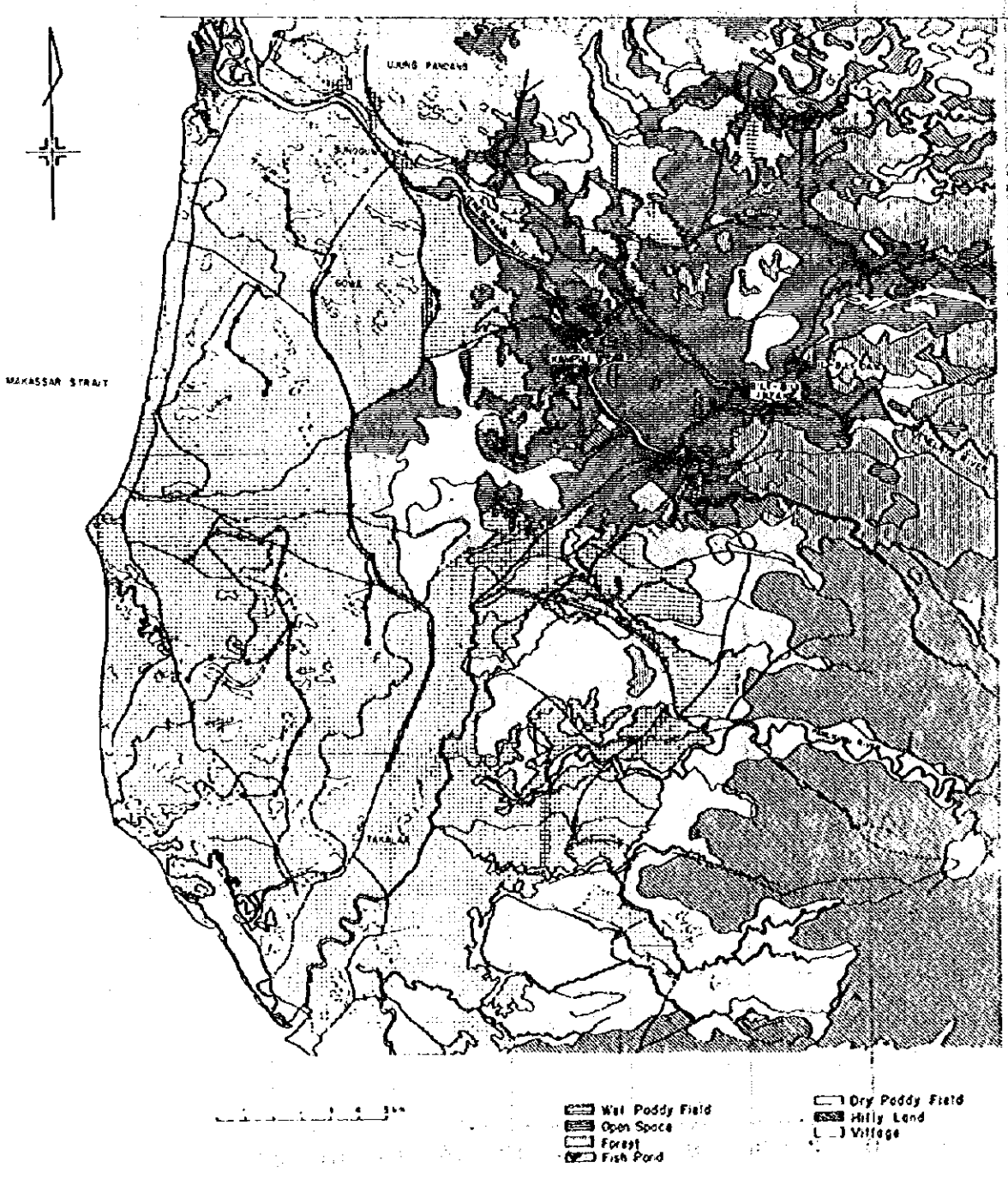


Fig. 3-11

LAND USE MAP

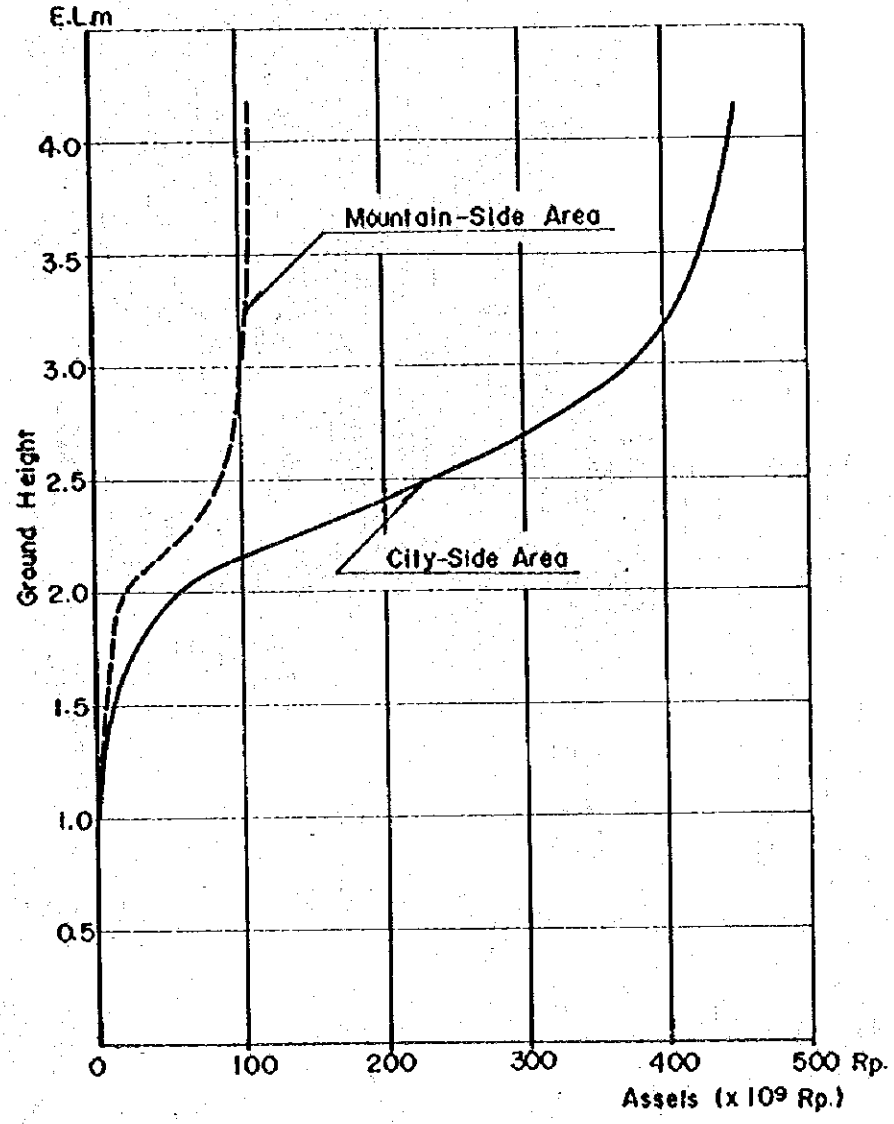


Fig. 3-12

RELATION CURVE BETWEEN GROUND HEIGHT AND THE EXISTING ASSETS

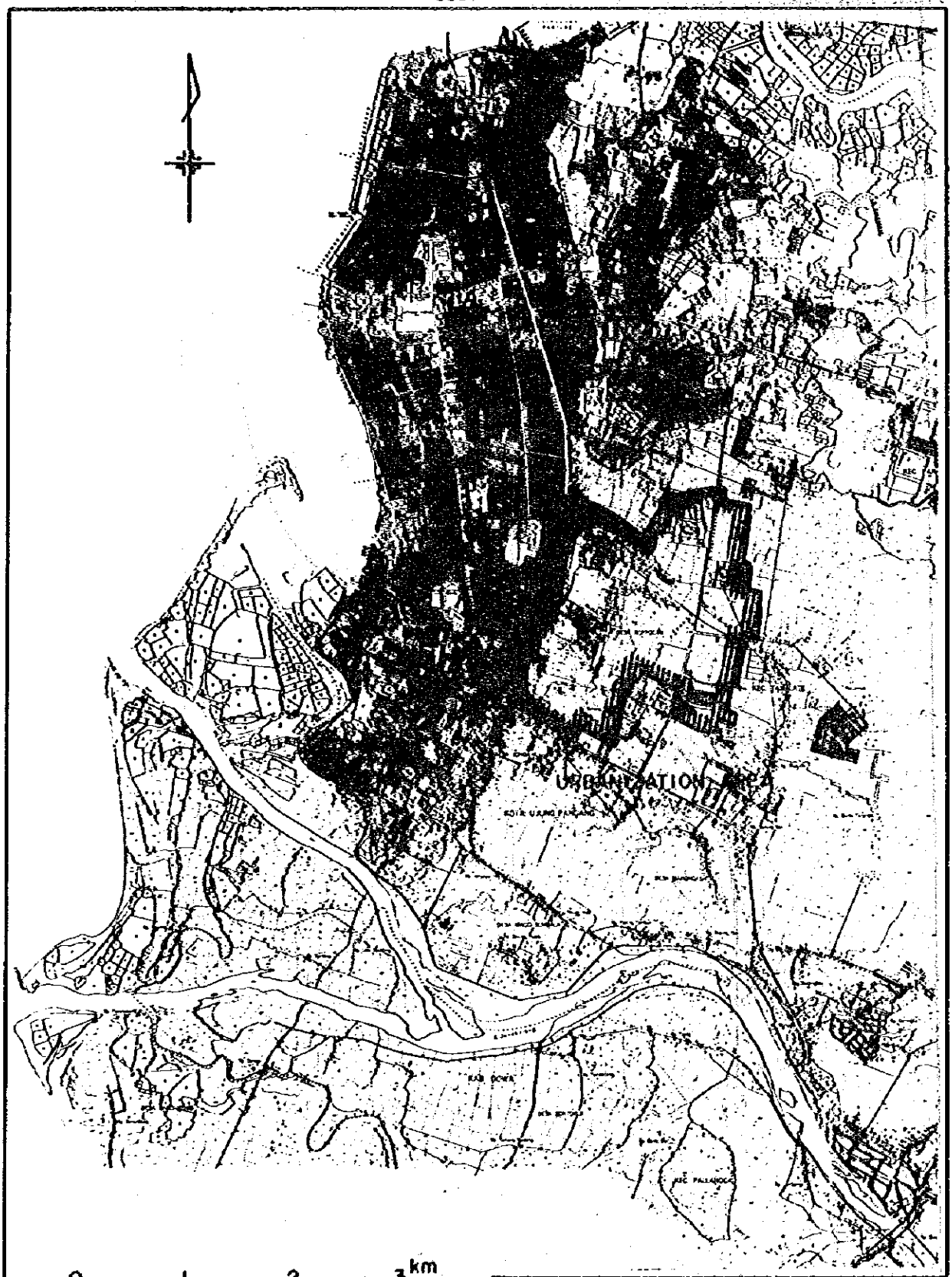


Fig. 3-13

LOCATION OF THE FIRST STAGE URBANIZATION AREA

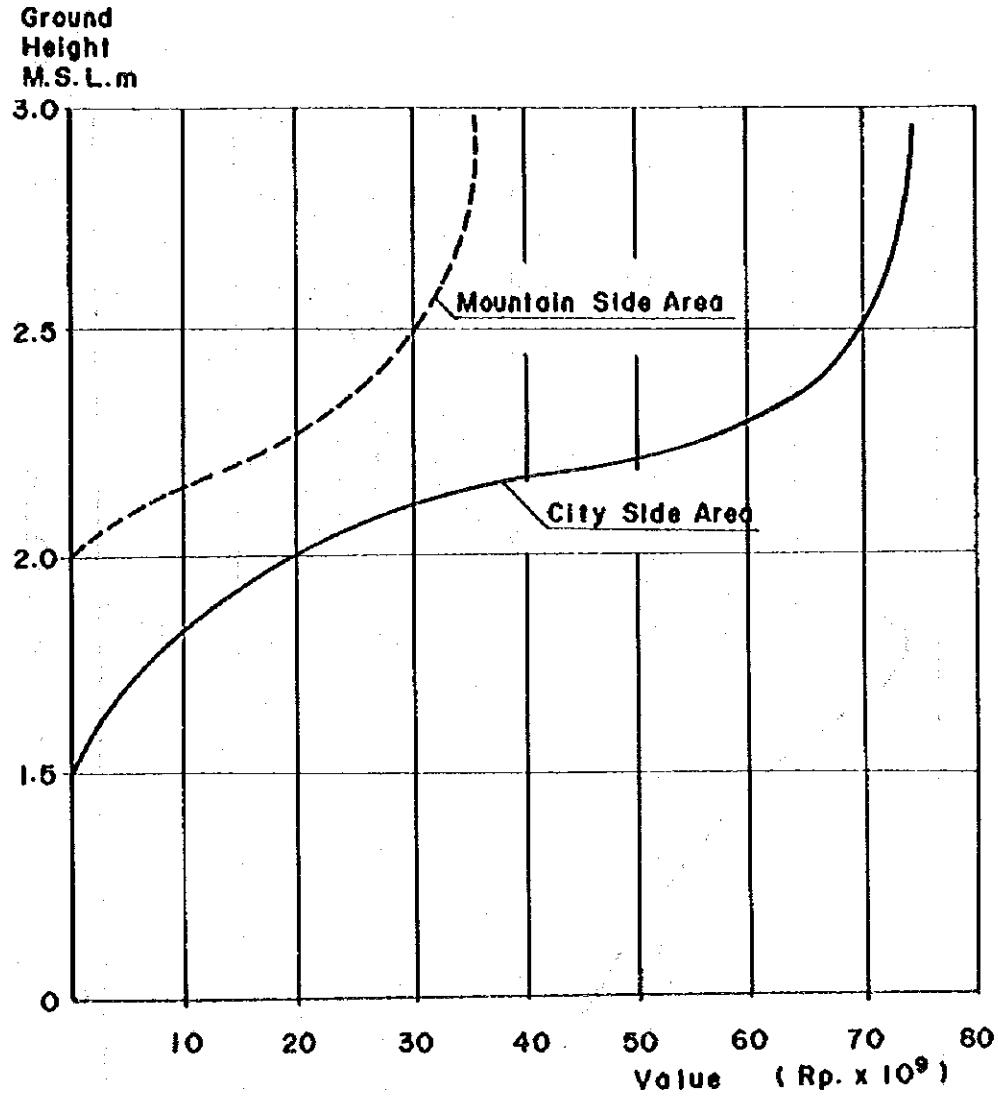


Fig. 3-14

RELATION CURVE BETWEEN
GROUND HEIGHT AND ASSETS
IN THE FIRST STAGE URBANIZATION AREA

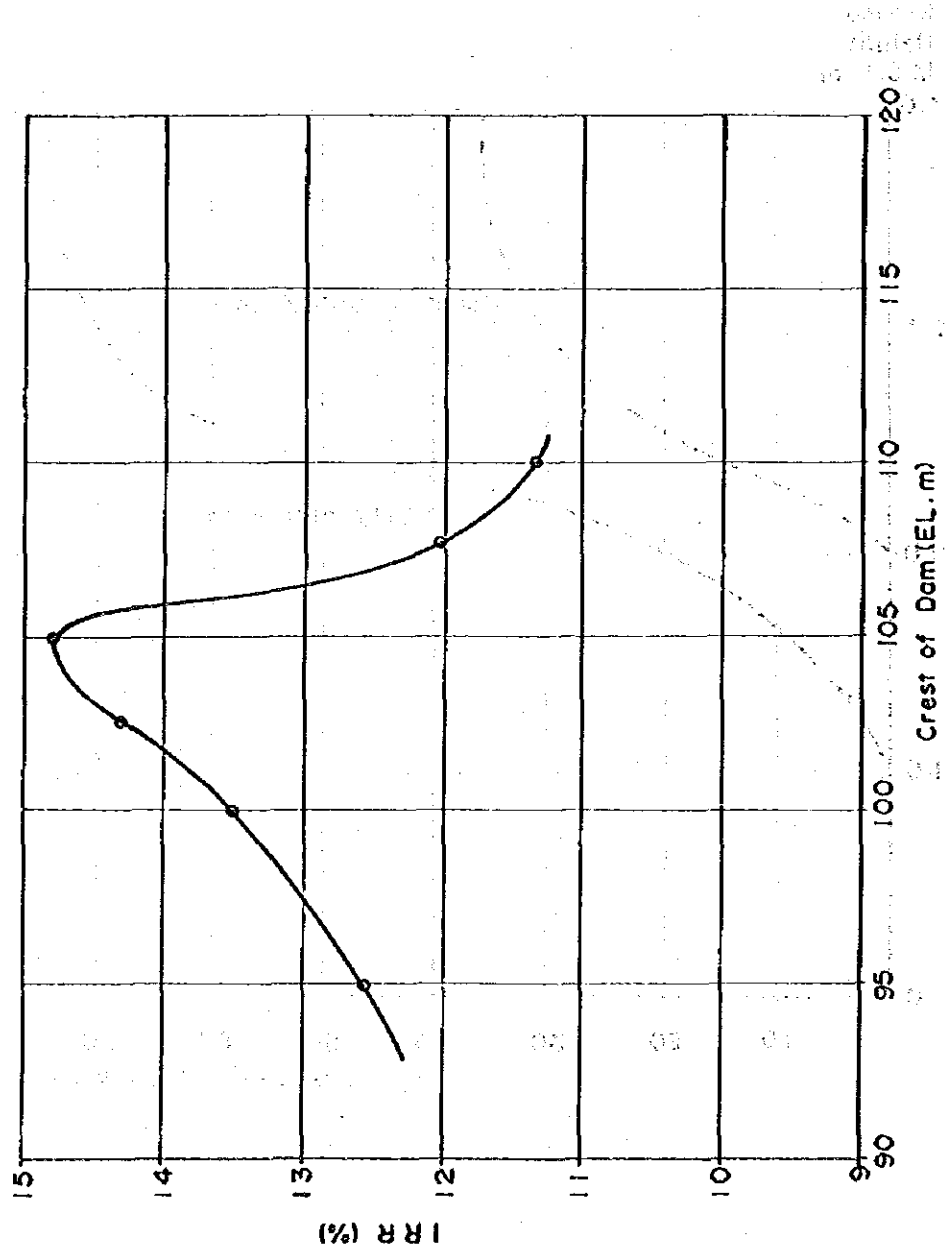
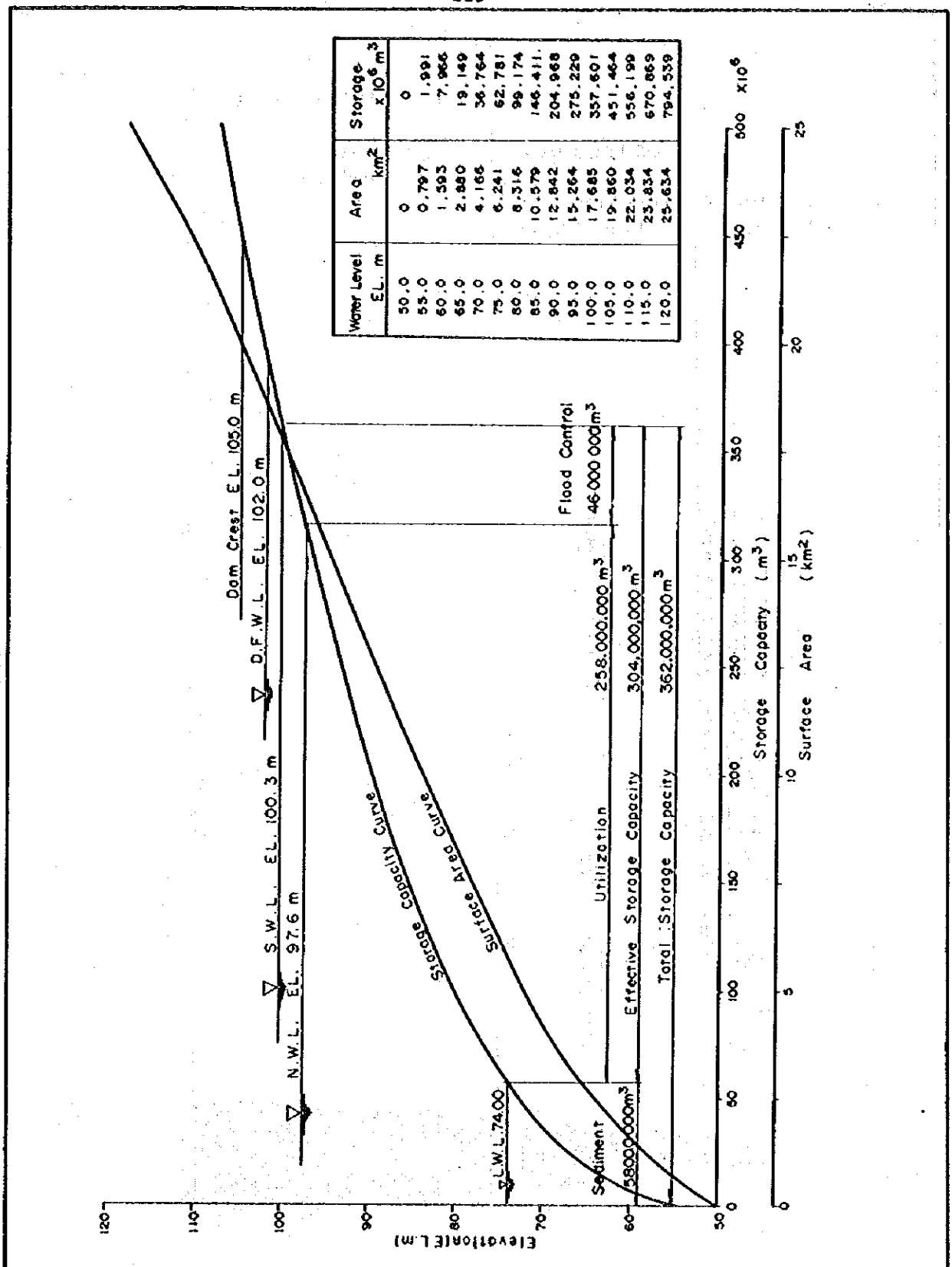


Fig. 4-1

RELATION BETWEEN IRR AND DAM HEIGHT



Water Level E.L. m	Area km²	Storage x 10⁶ m³
50.0	0	0
55.0	0.797	1.991
60.0	1.593	7.966
65.0	2.880	19.149
70.0	4.166	36.764
75.0	6.241	62.781
80.0	8.316	99.174
85.0	10.579	146.411
90.0	12.842	204.968
95.0	15.264	275.229
100.0	17.685	357.601
105.0	19.860	451.464
110.0	22.034	556.199
115.0	23.834	670.869
120.0	25.634	794.539

Fig. 4-2

RELATION CURVE BETWEEN ELEVATION AND STORAGE CAPACITY

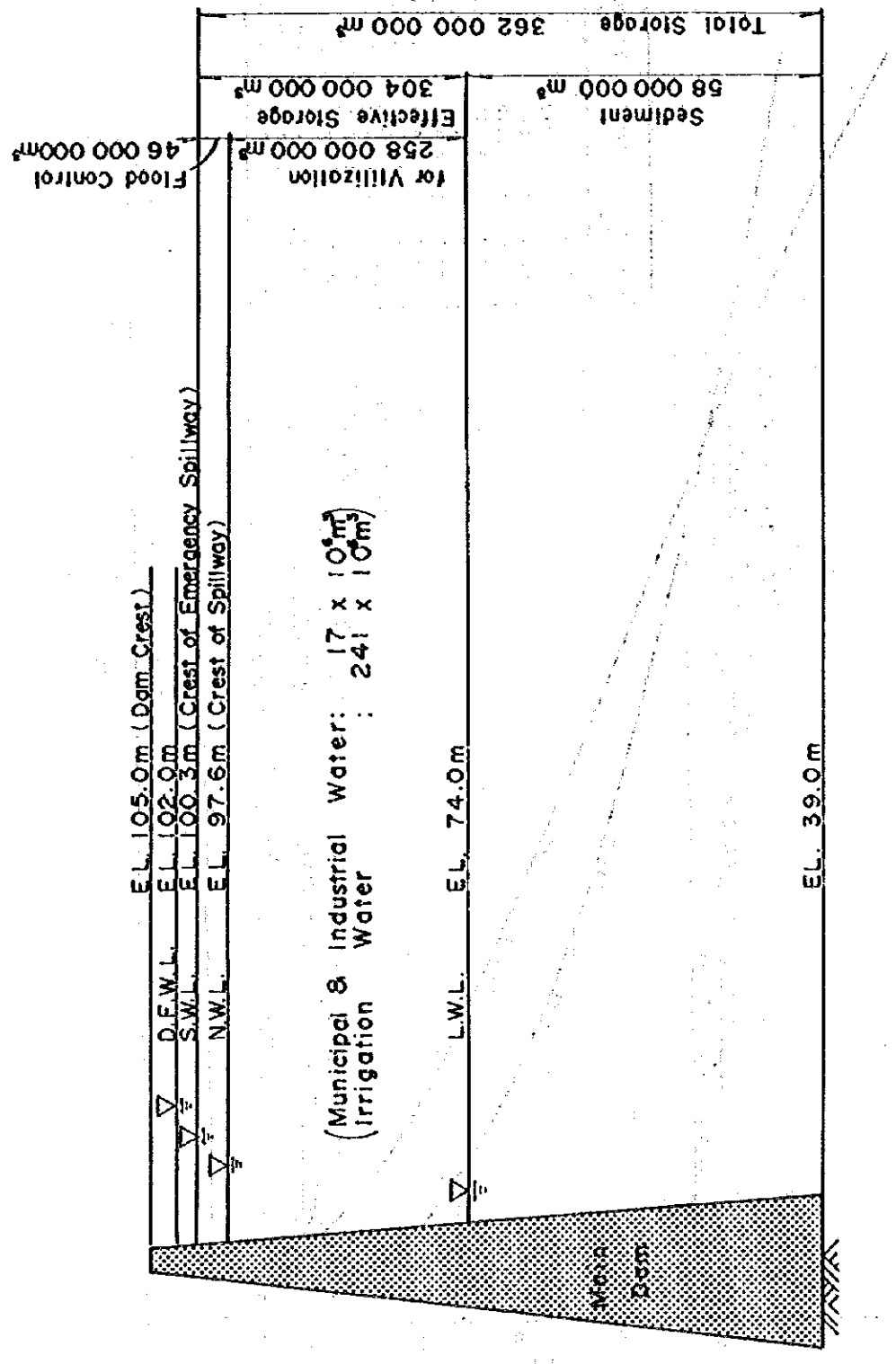
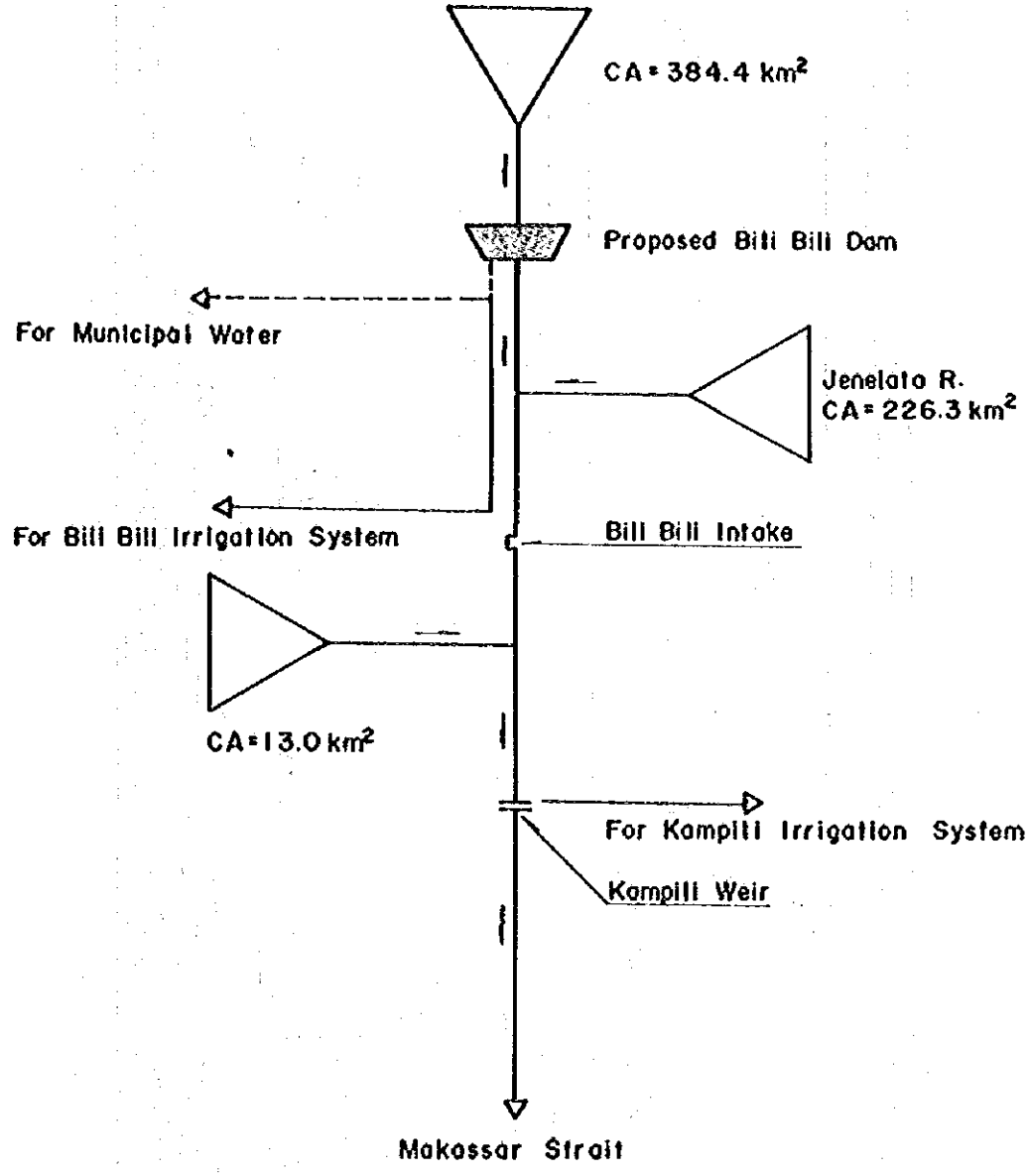


Fig. 4-3

ALLOCATION OF RESERVOIR STORAGE



LEGEND

CA= : Catchment Area

: Irrigation Channel

: Pipeline

Fig. 4-4

SCHEMATIC DIAGRAM OF
WATER UTILIZATION SYSTEM

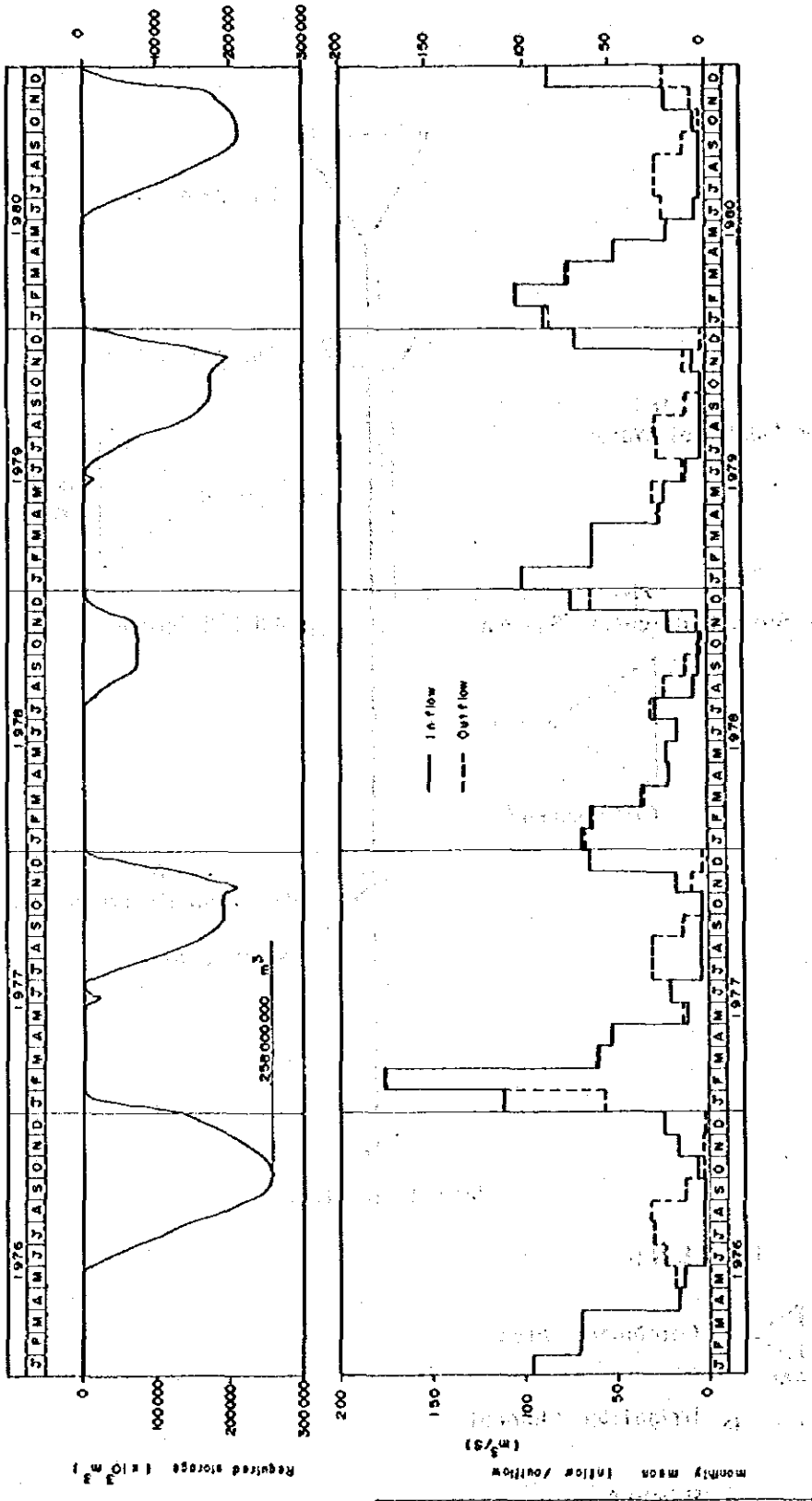


Fig. 4-5

VARIATION OF REQUIRED STORAGE

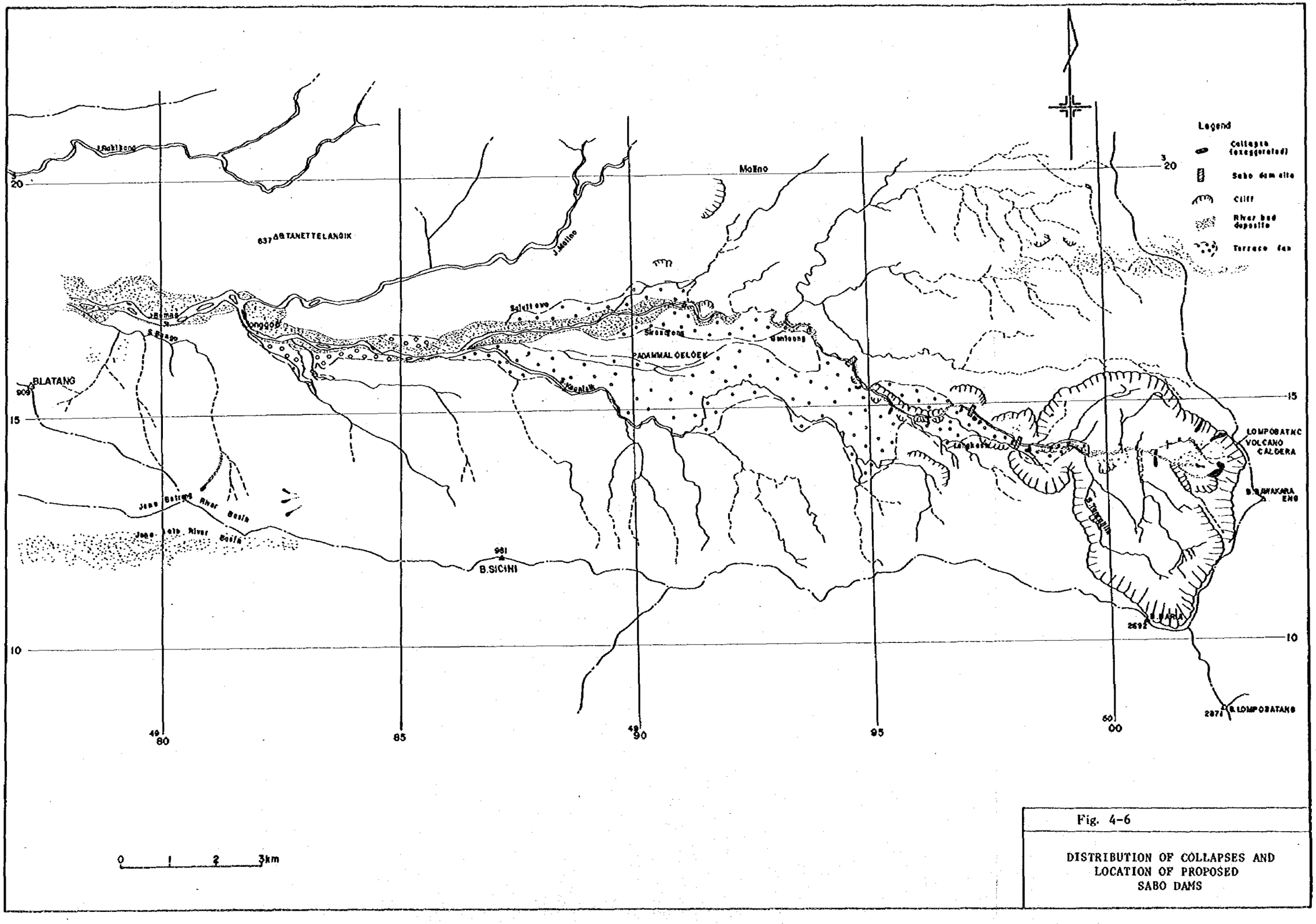


Fig. 4-6

DISTRIBUTION OF COLLAPSES AND LOCATION OF PROPOSED SABO DAMS

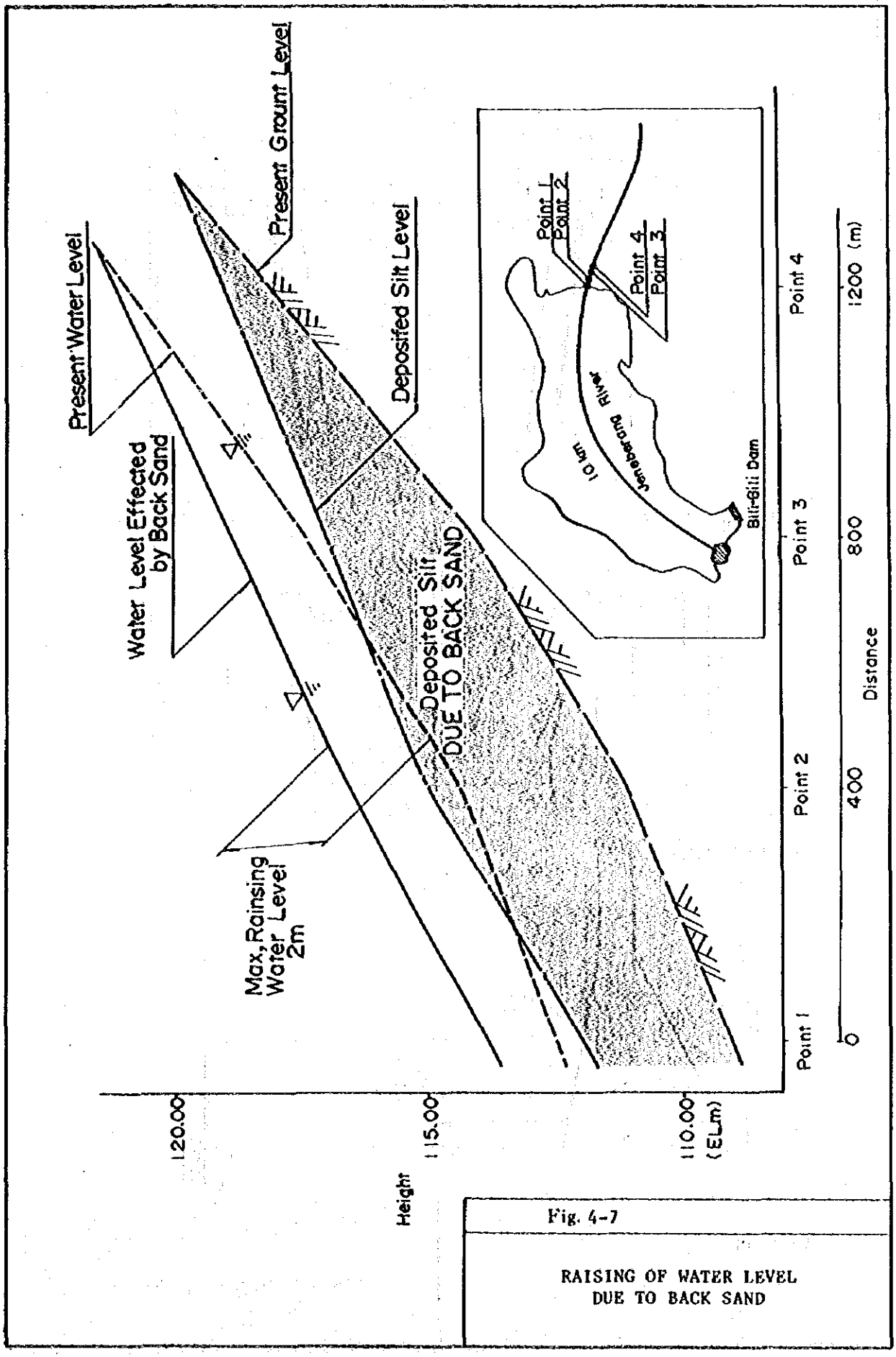
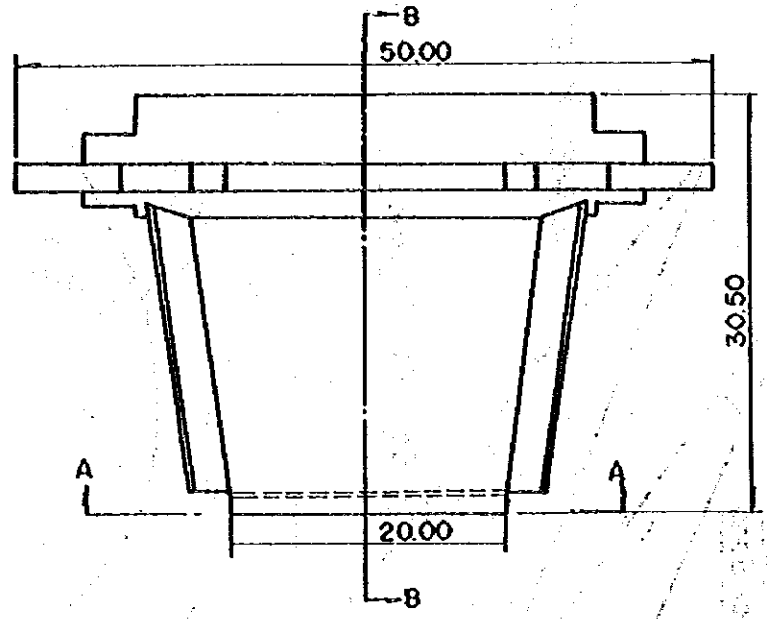
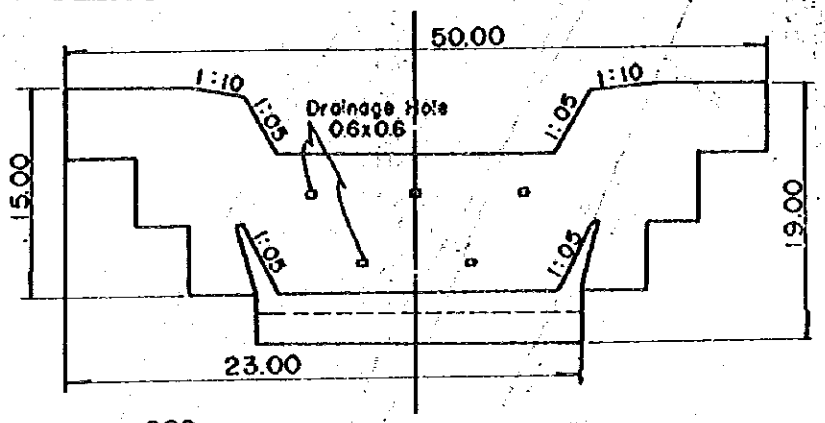


Fig. 4-7

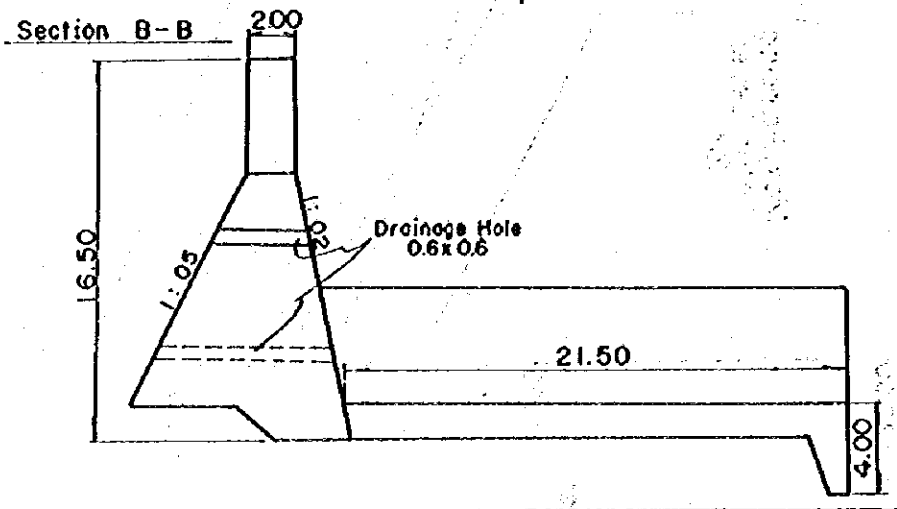
RAISING OF WATER LEVEL DUE TO BACK SAND



Section A—A



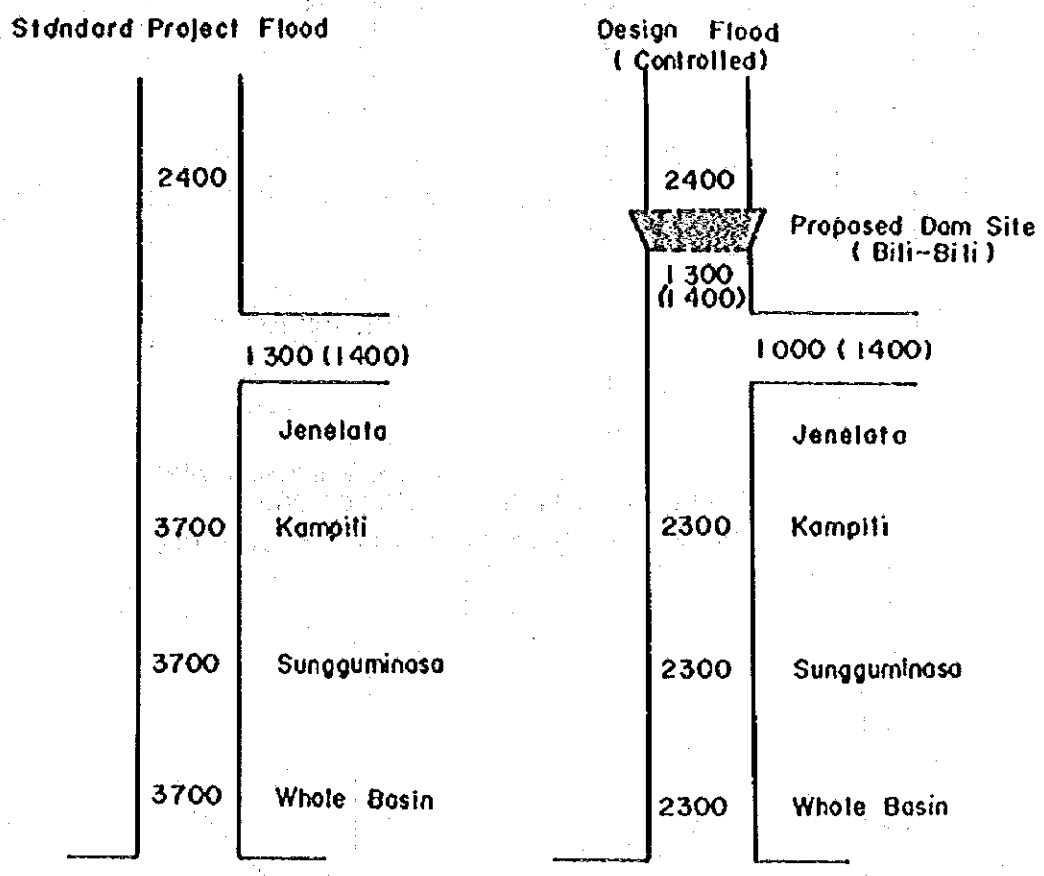
Section B-B



Unit : m

Fig. 4-8

GENERAL PLAN OF SABO DAM



NOTE: Figures show discharge to join the main stream.

( ) shows the peak discharge at Jenelata.

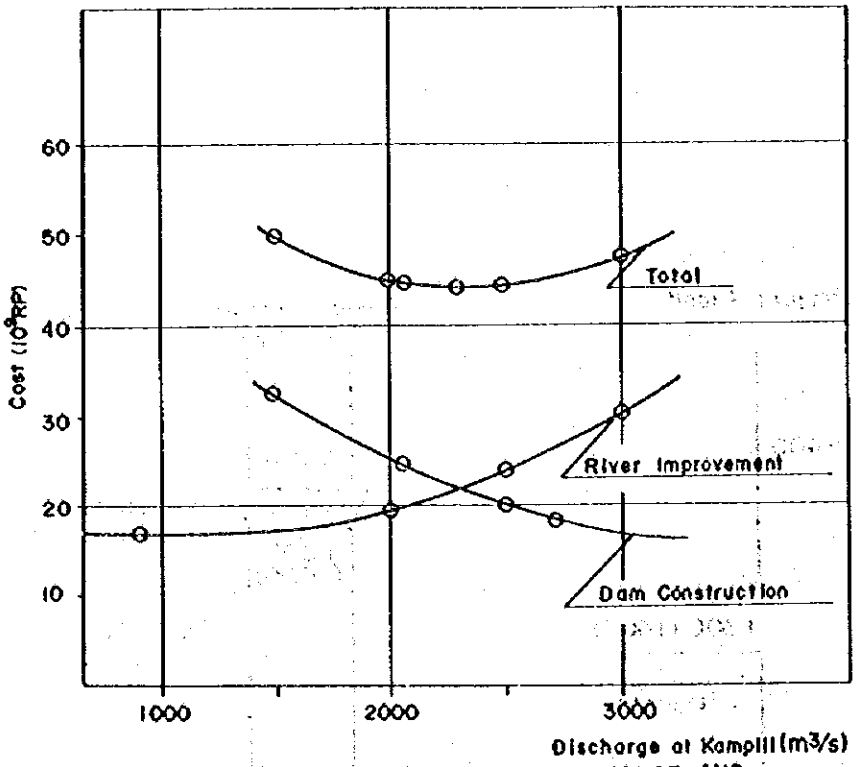
( ) shows the peak discharge after dam control.

Unit : m^3/s

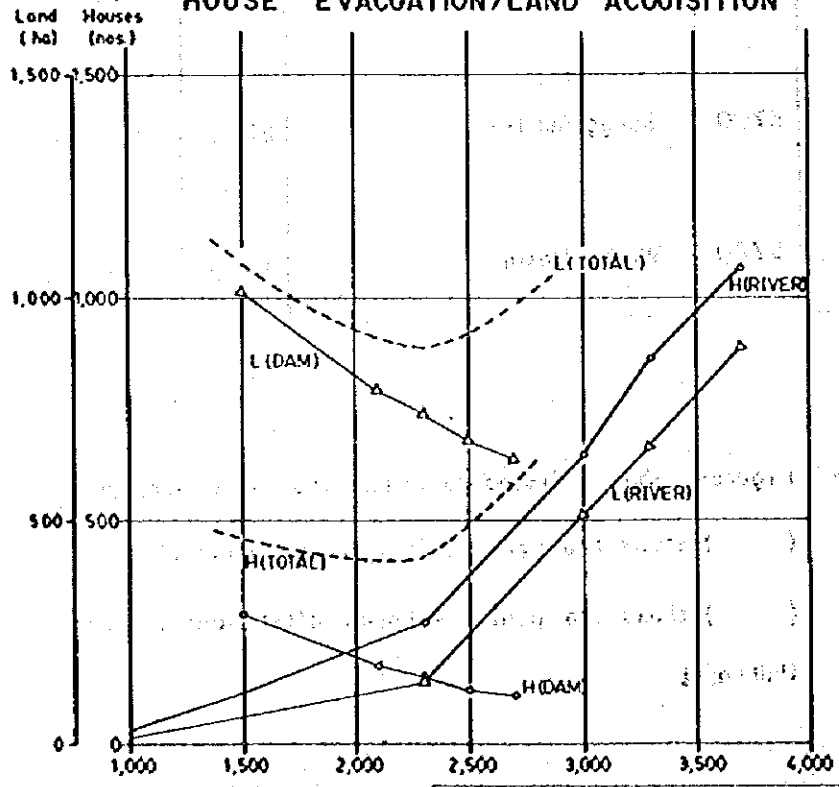
Fig. 4-9

STANDARD PROJECT AND DESIGN FLOOD
(50-YEAR RETURN PERIOD)

RELATION BETWEEN COST AND DISCHARGE AT KAMPILI



RELATION BETWEEN DISCHARGE AND HOUSE EVACUATION/LAND ACQUISITION



LEGEND
H : House Evacuation
L : Land Acquisition

Fig. 4-10

OPTIMUM SHARE OF DESIGN FLOOD BETWEEN DAM AND RIVER

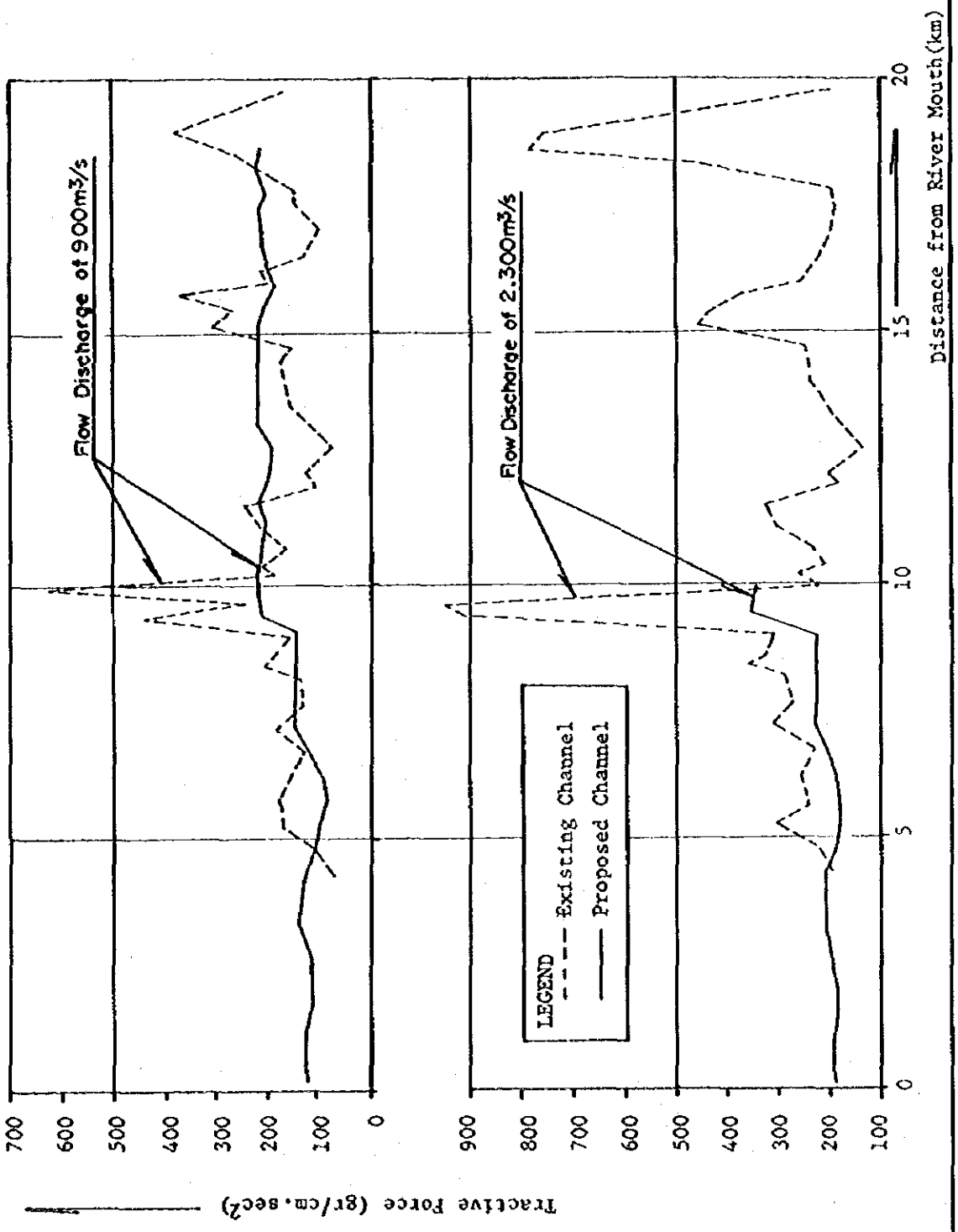


Fig. 4-11

COMPARISON OF TRACTIVE BETWEEN EXISTING CHANNEL AND PROPOSED CHANNEL

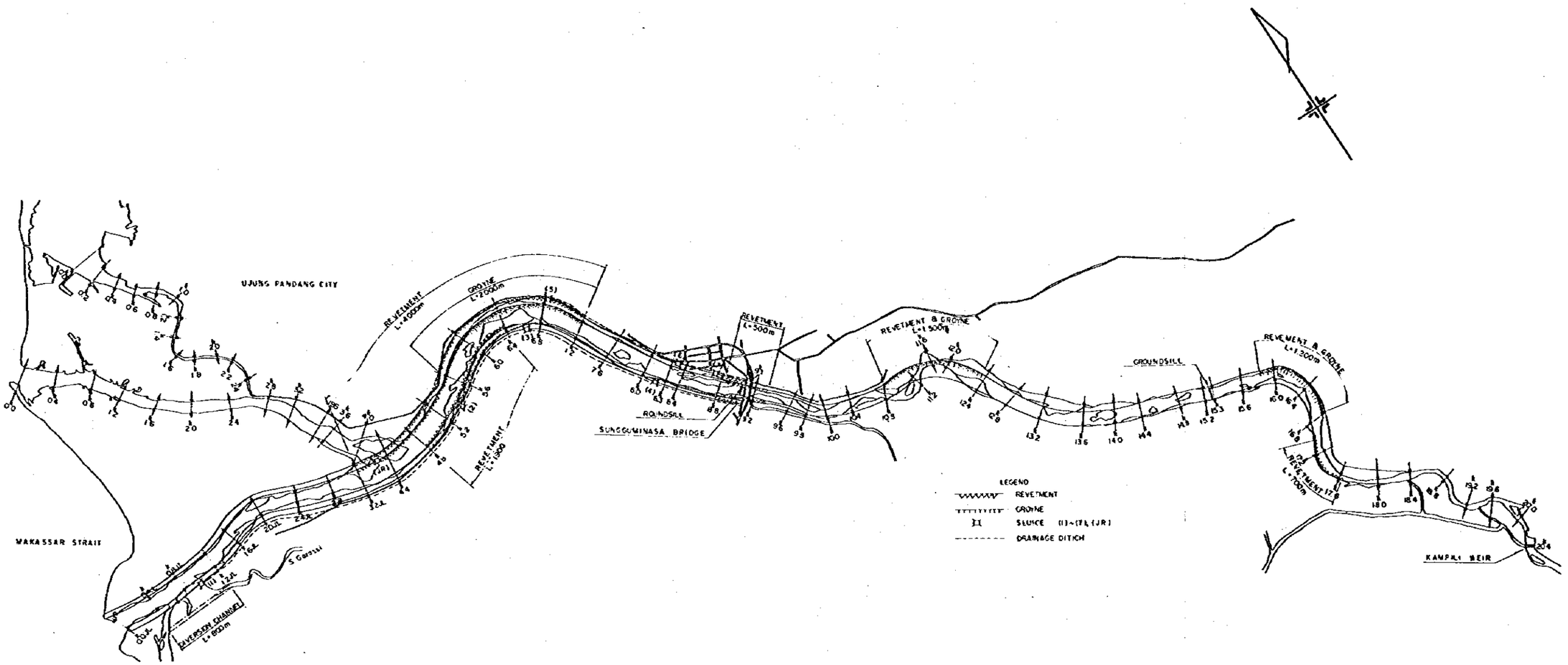


Fig. 4-12

PROPOSED ALIGMENT OF
THE JENEBERANG RIVER

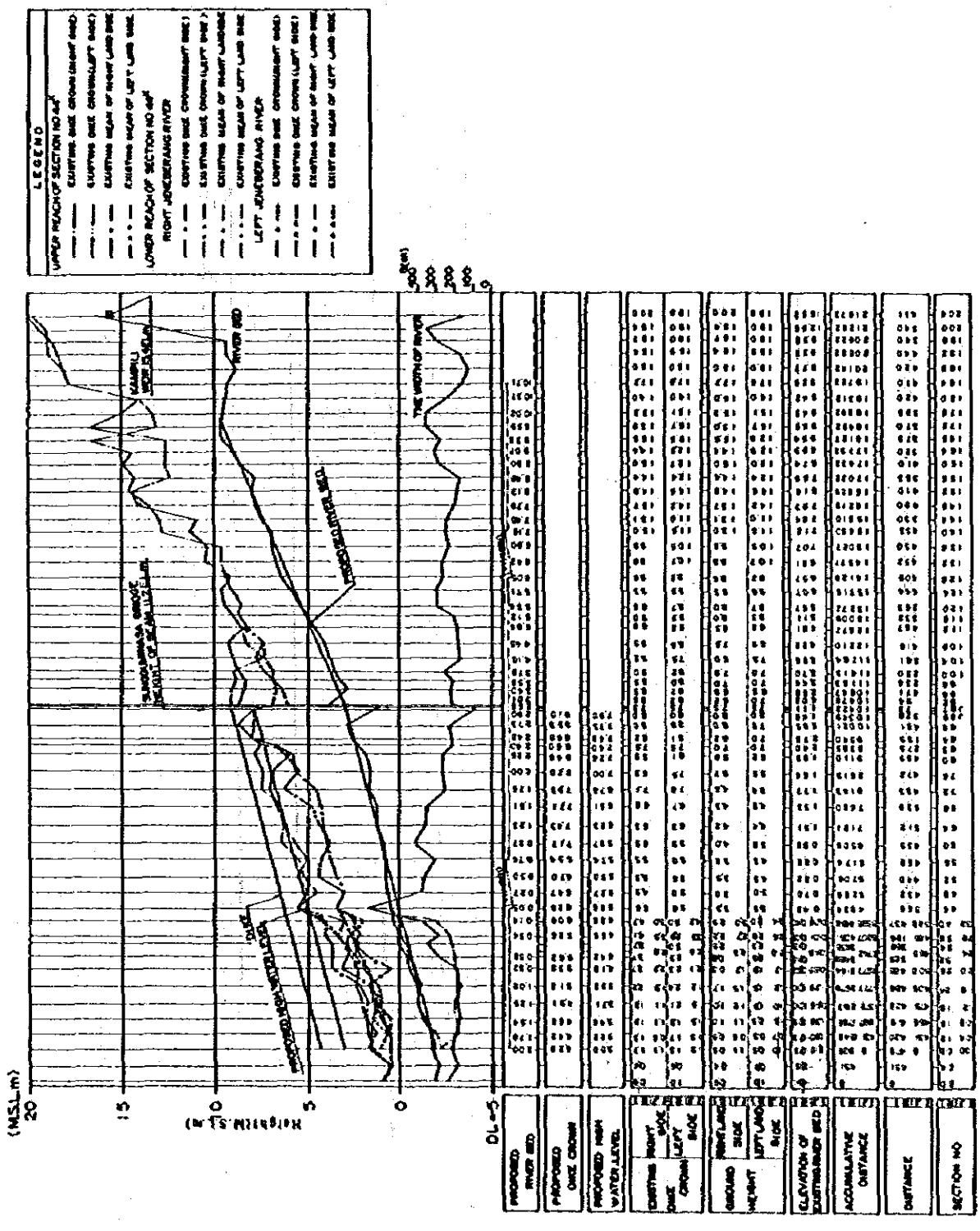


Fig. 4-13

PROPOSED LONGITUDINAL PROFILE
OF THE JENEBERANG RIVER

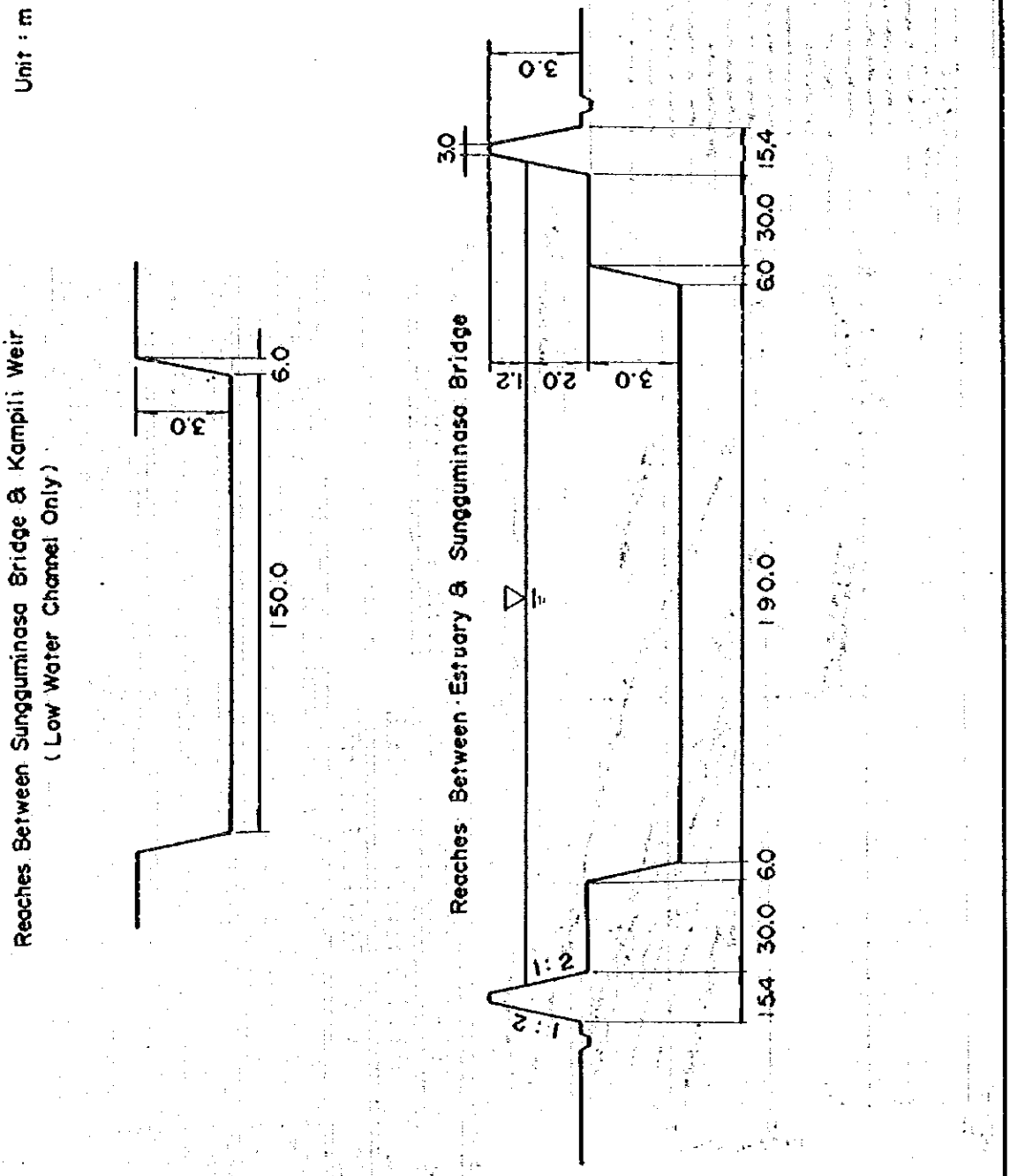
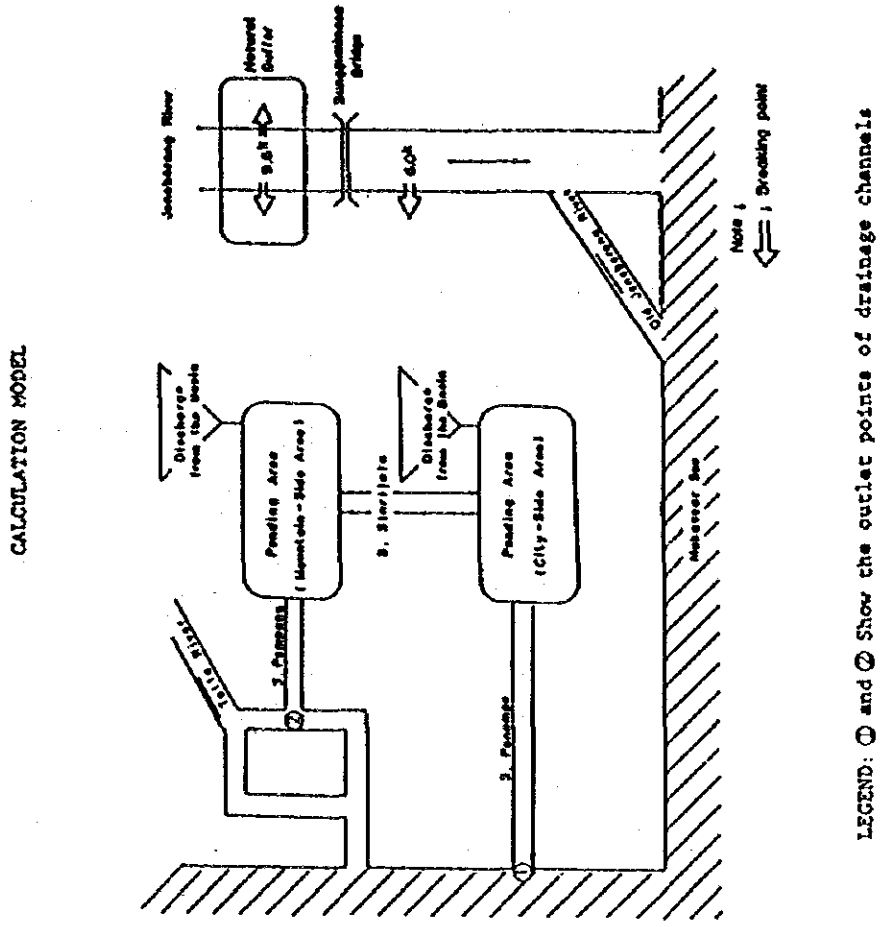


Fig. 4-14

STANDARD CROSS-SECTION



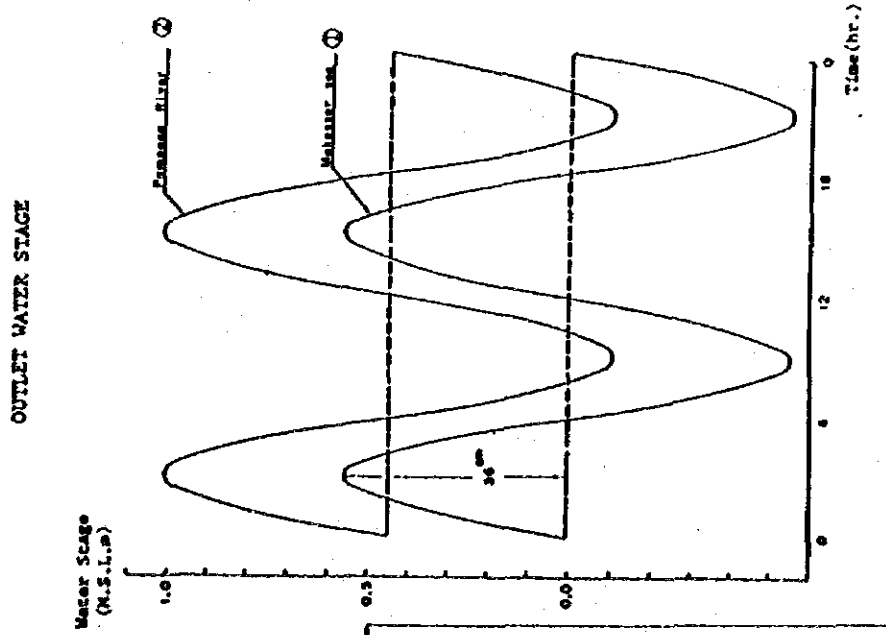


Fig. 4-15

CALCULATION MODEL AND
OUTLET WATER STAGE
(PRESENT SITUATION)

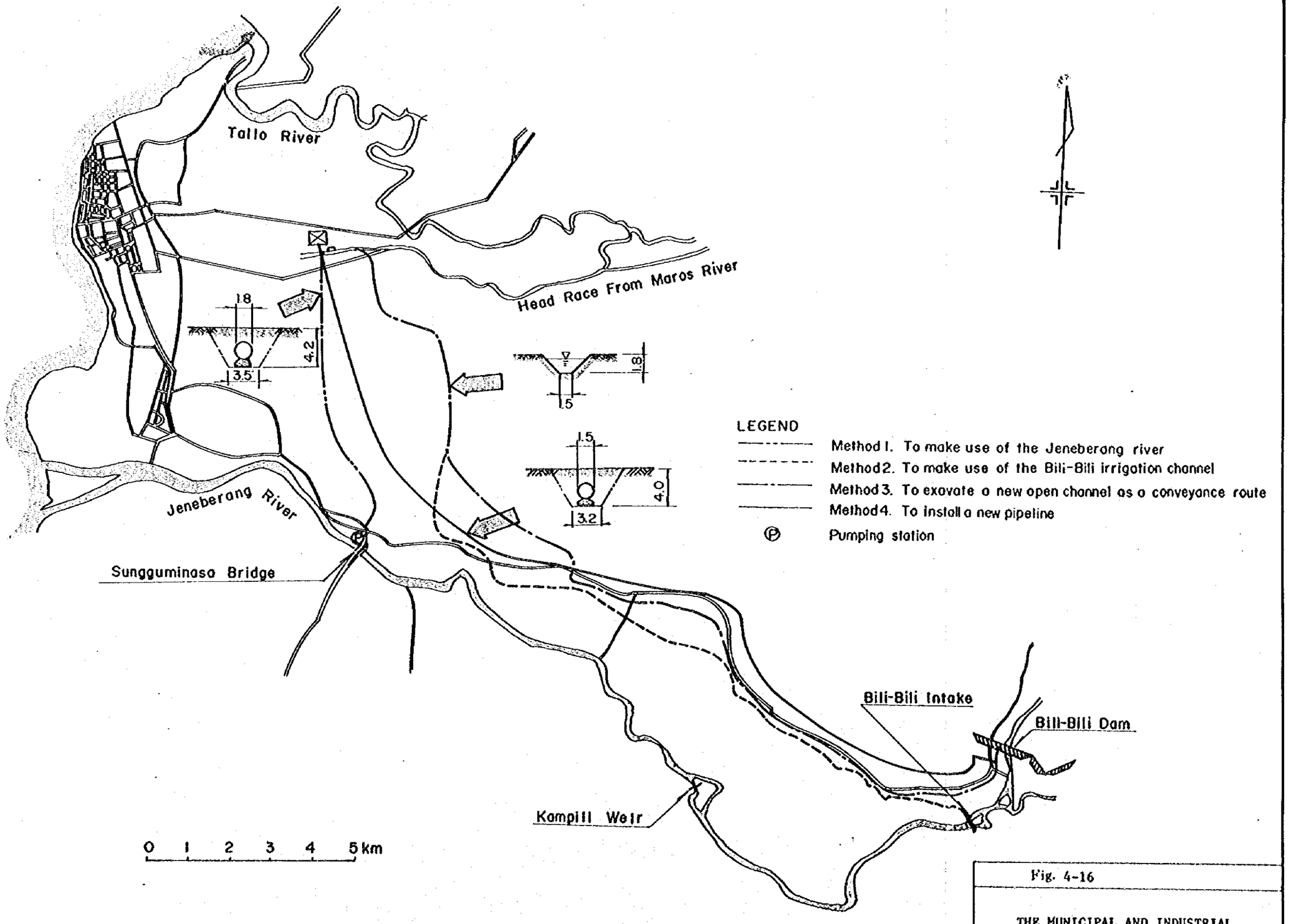


Fig. 4-16

THE MUNICIPAL AND INDUSTRIAL WATER HEADRACE ROUTE

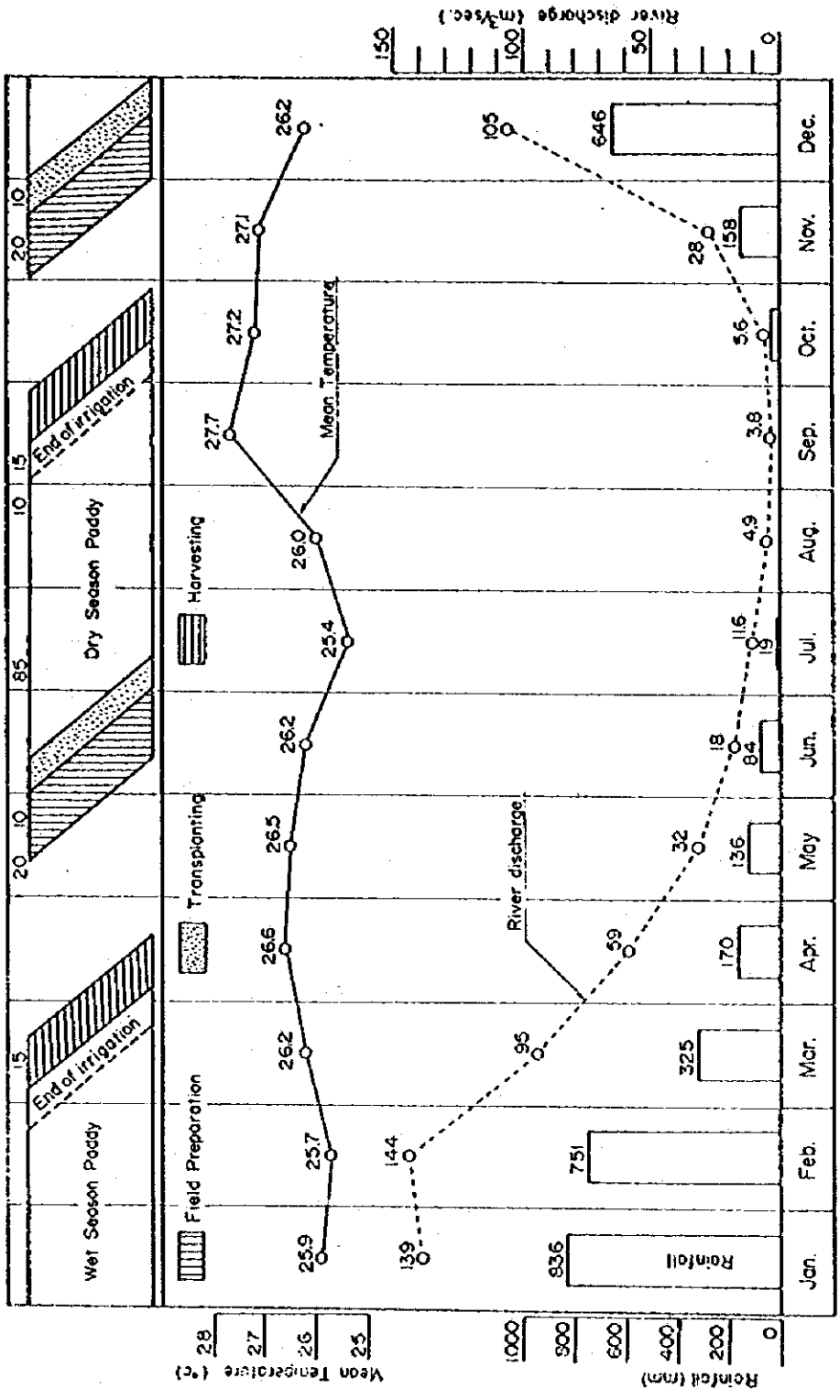


Fig. 4-17

PROPOSED CROPPING PATTERN

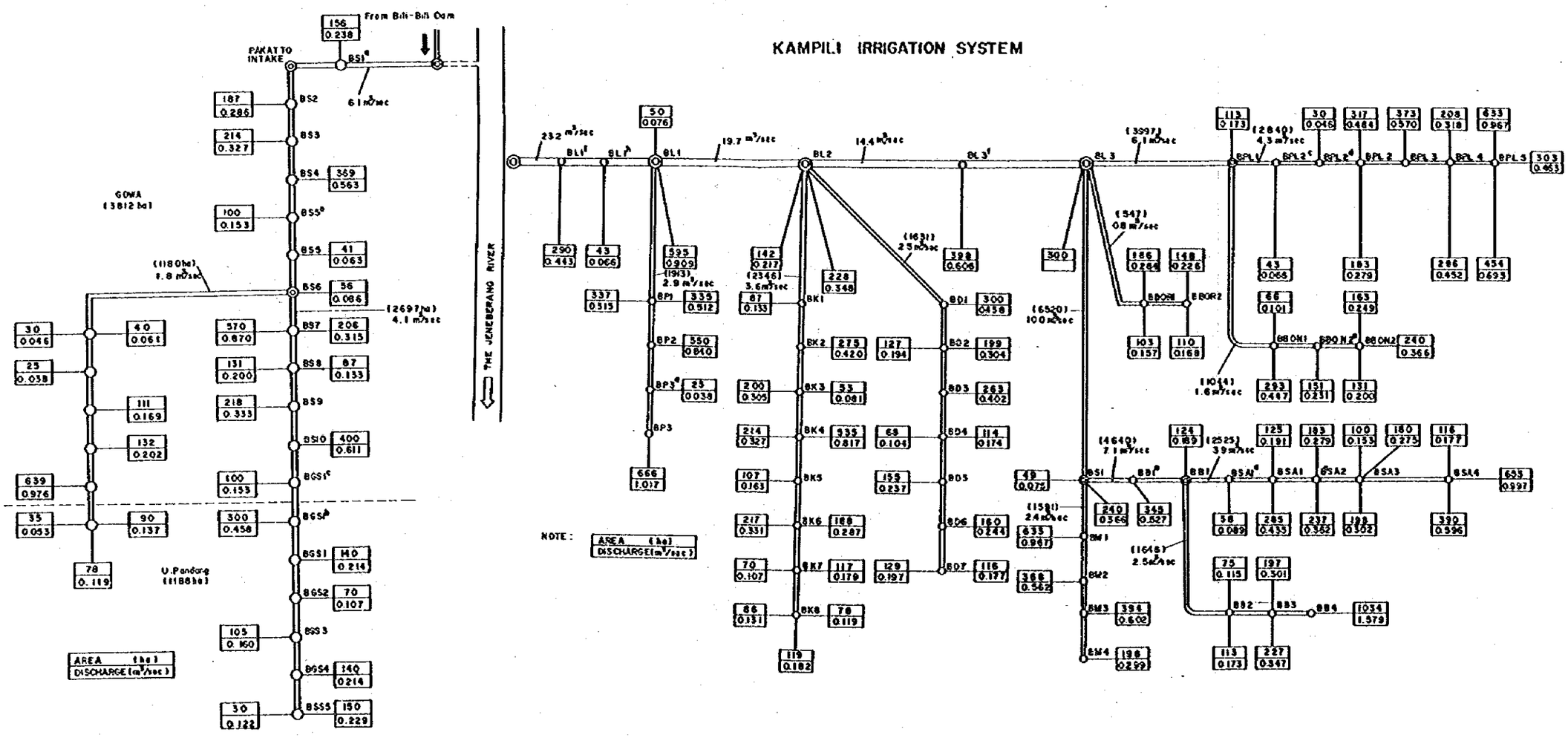


Fig. 4-18

DIAGRAM OF DISTRIBUTION SYSTEM
(BILI-BILI AND KAMPILI)

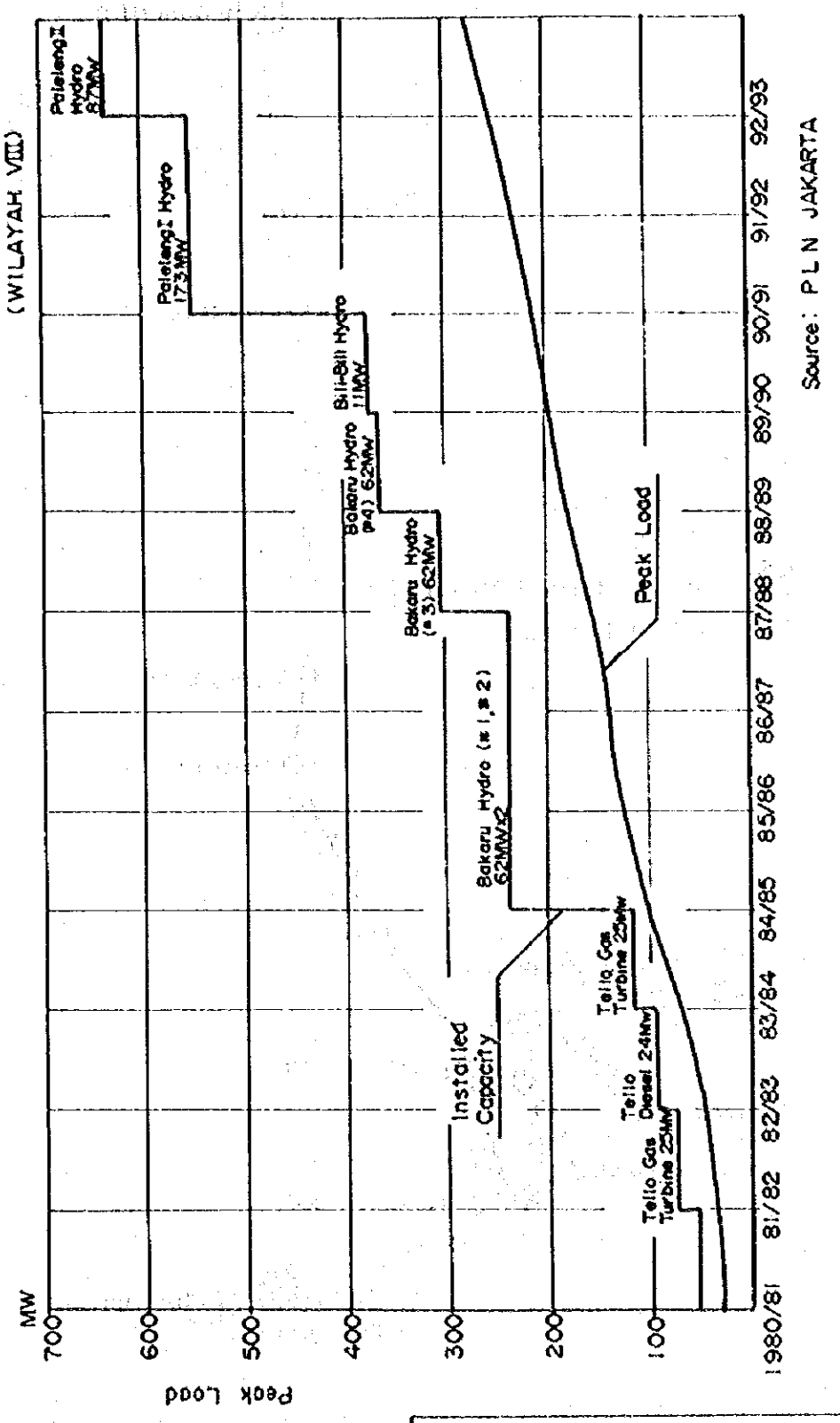


Fig. 4-19

FUTURE DEMAND & EXPANSION PROGRAM

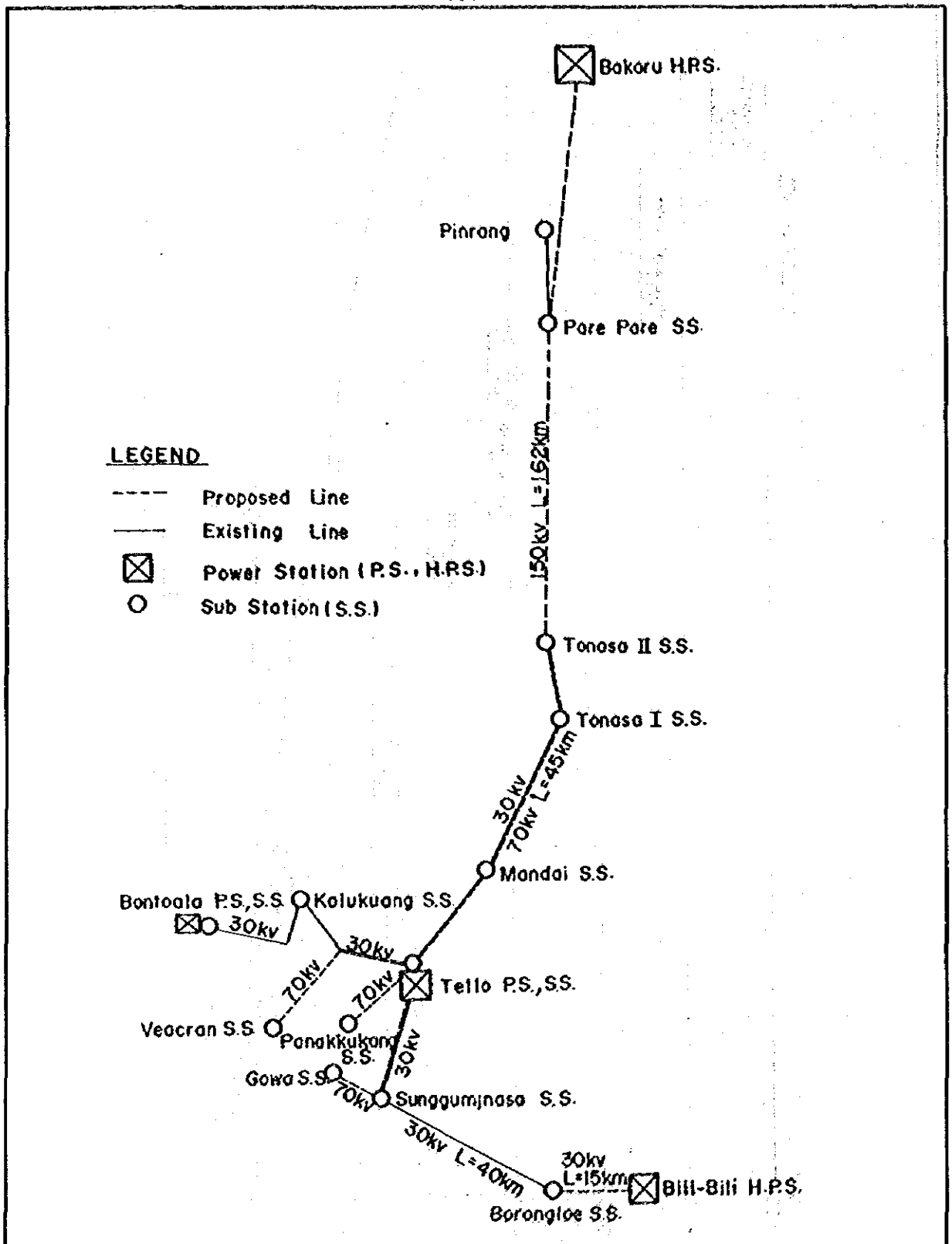


Fig. 4-20

TRANSMISSION LINES

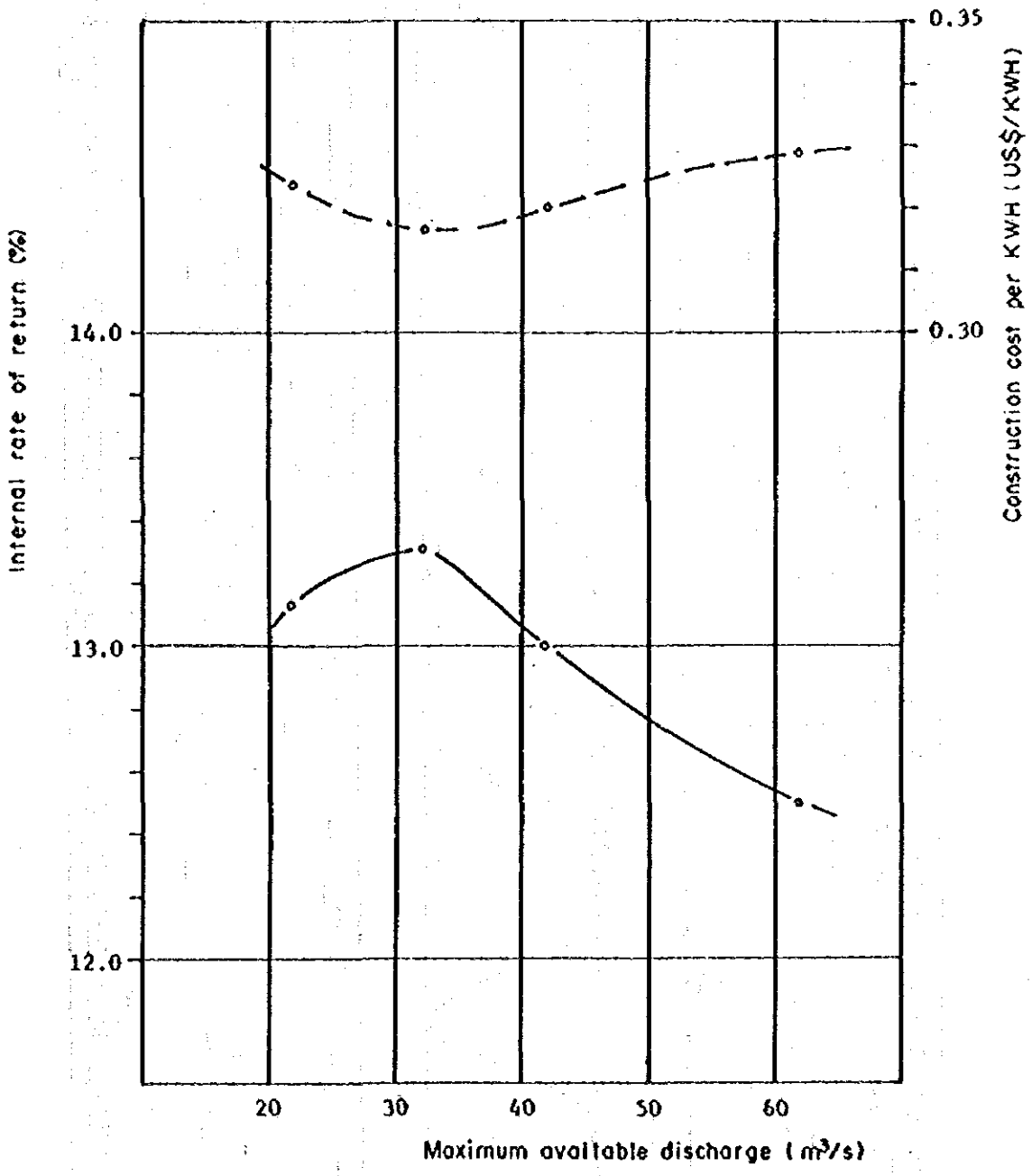


Fig. 4-21

RELATION BETWEEN IRR AND MAXIMUM AVAILABLE DISCHARGE

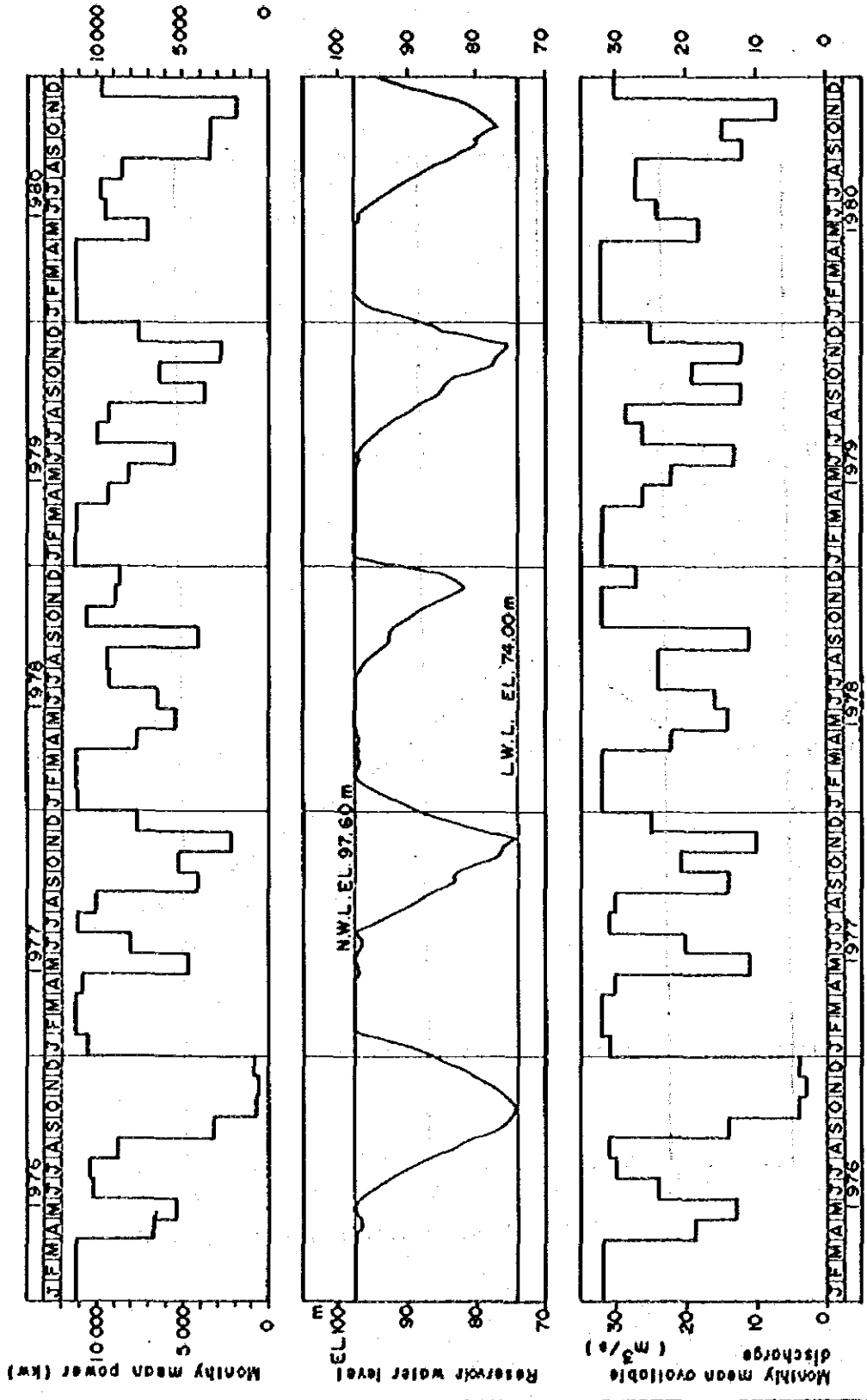


Fig. 4-22

OPERATION DIAGRAM OF HYDRO POWER

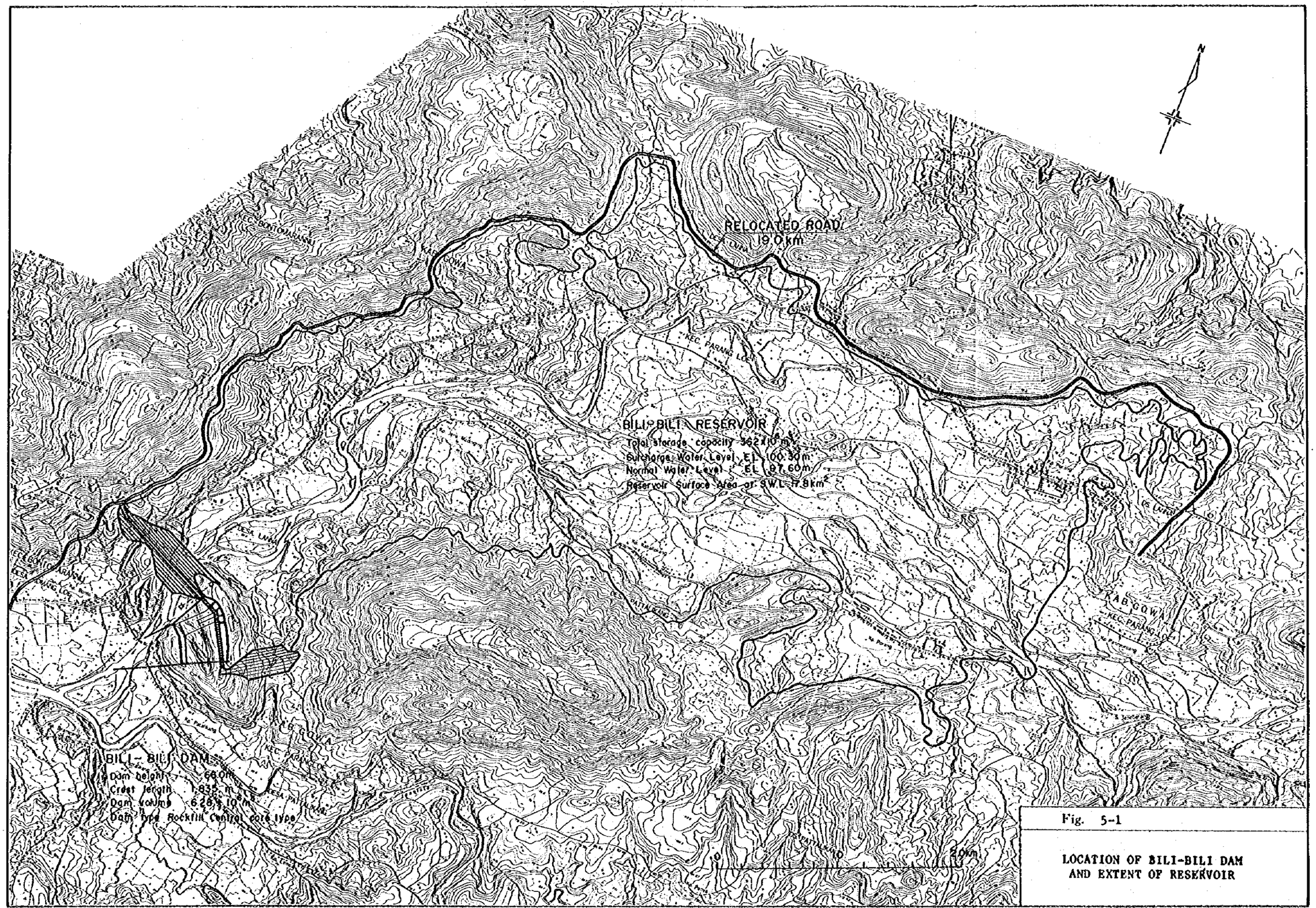
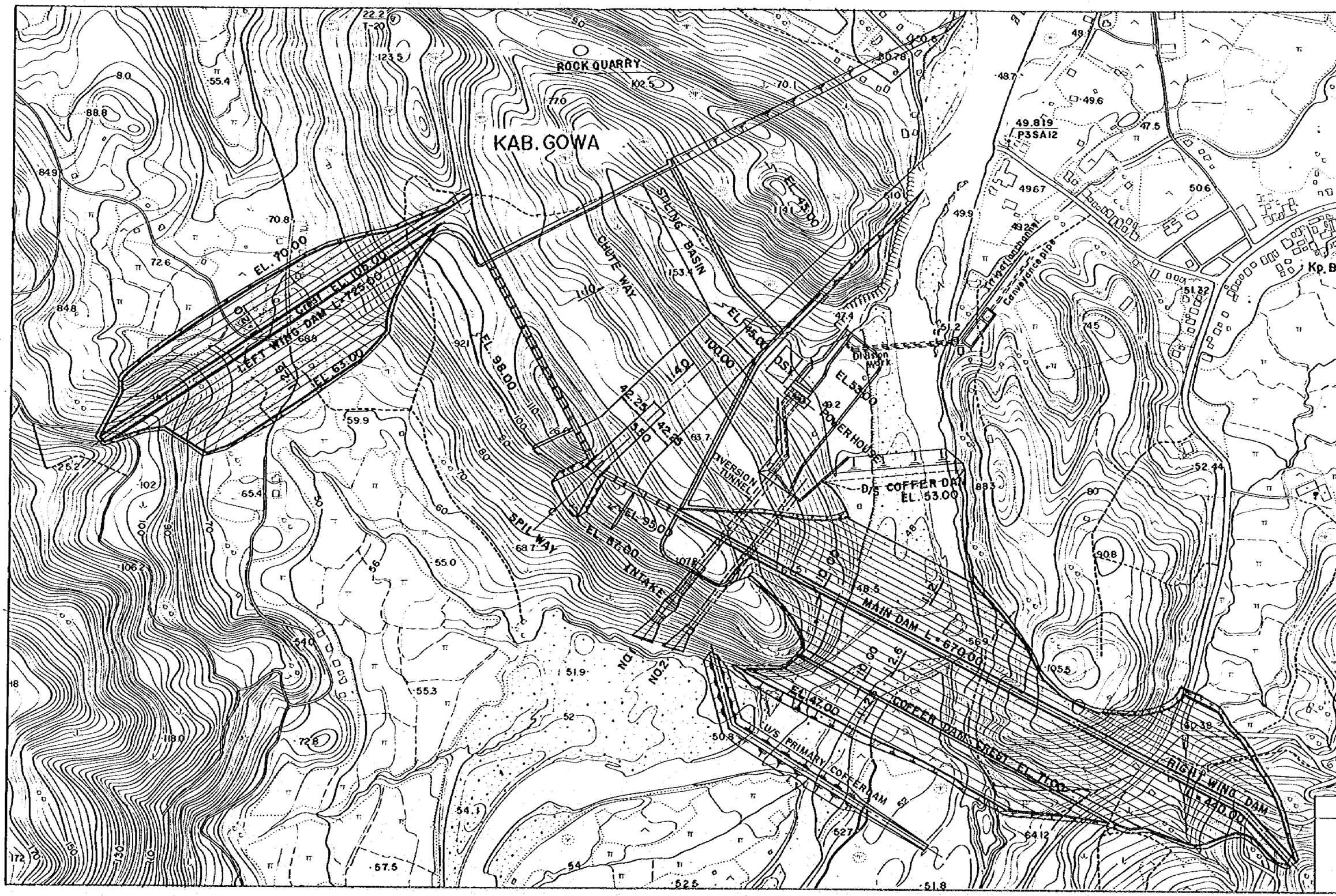


Fig. 5-1

LOCATION OF BILI-BILI DAM AND EXTENT OF RESERVOIR


KAB. GOWA
ROCK QUARRY
SPILLING BASIN
CHUTE WAY
EL. 45.00
EL. 70.00
LEFT WING DAM L=725.00
EL. 100.00
EL. 63.00
EL. 98.00
Irrigation canal
Conveyance pipe
Division Work
EL. 55.00
POWER HOUSE
D/S COFFER DAM
EL. 53.00
DIVERSION TUNNEL
EL. 95.00
EL. 87.00
SPILL WAY
INTAKE
NO.1
NO.2
MAIN DAM L=670.00
EL. 47.00
U/S PRIMARY COFFERDAM
COFFER DAM CREST EL. 71.00
RIGHT WING DAM
L=430.00
49.819
P3SA12

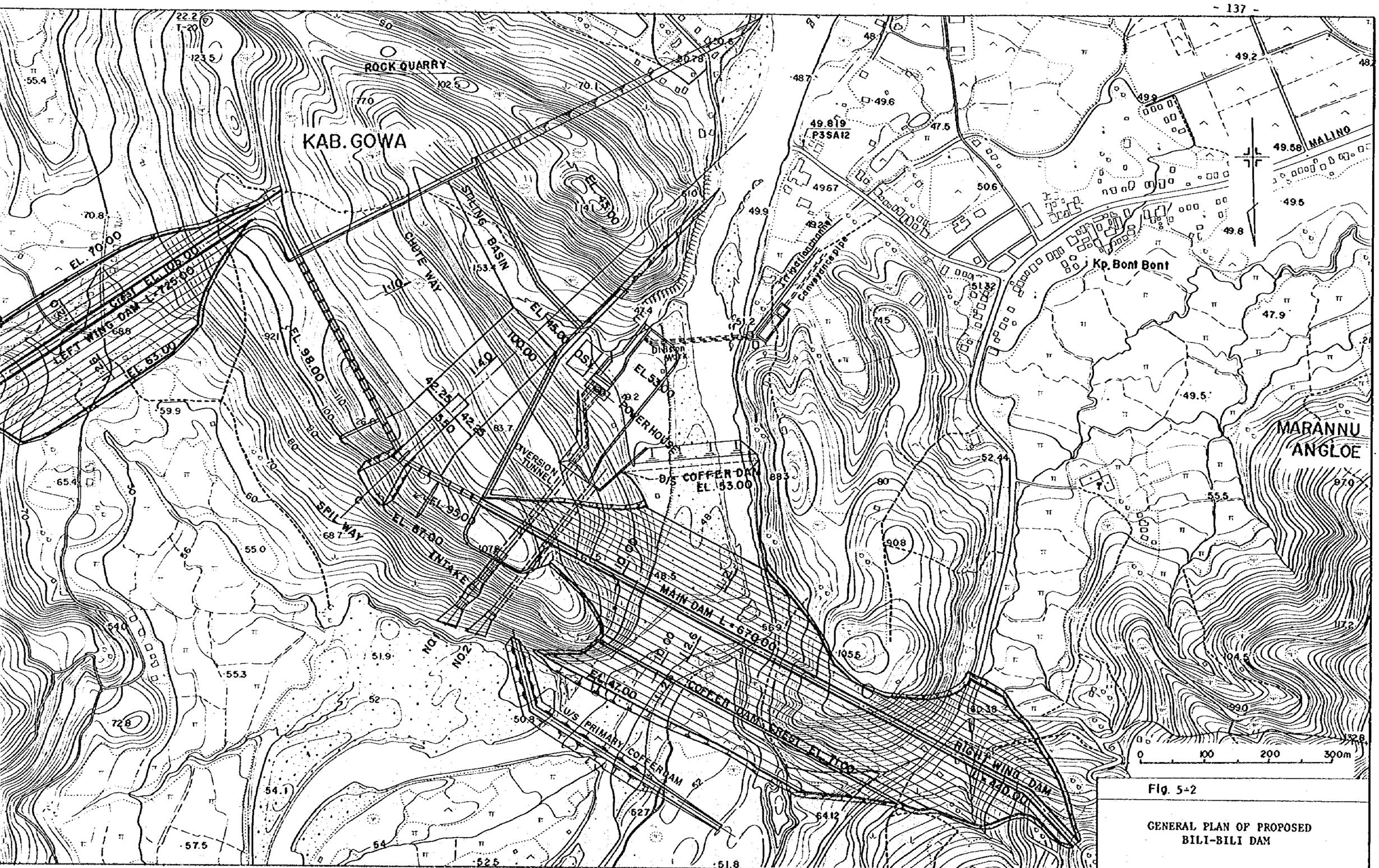
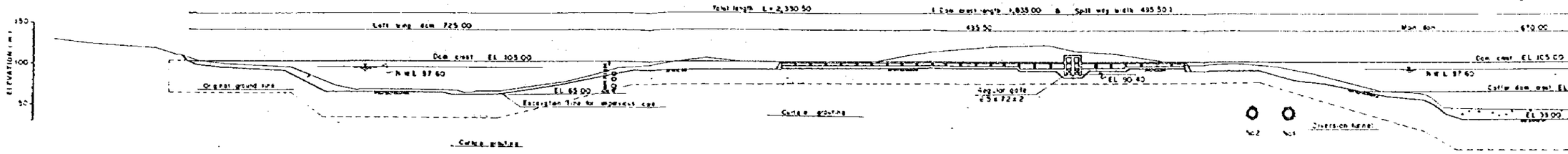


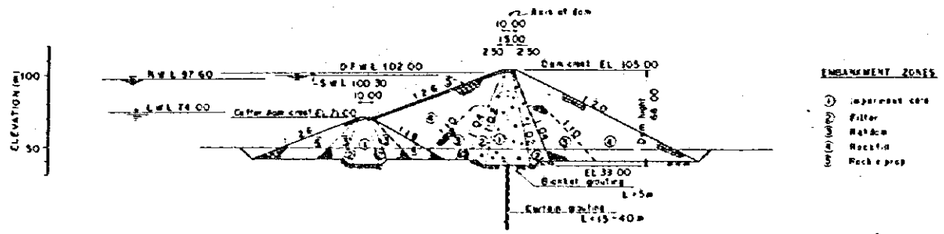
Fig. 5-2

GENERAL PLAN OF PROPOSED
BILI-BILI DAM

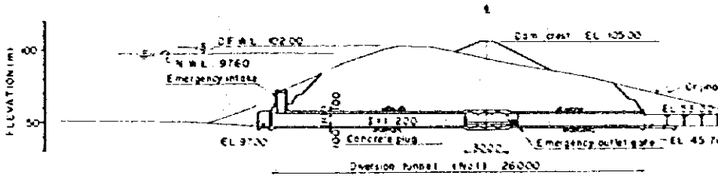
PROFILE ALONG AXIS OF DAM



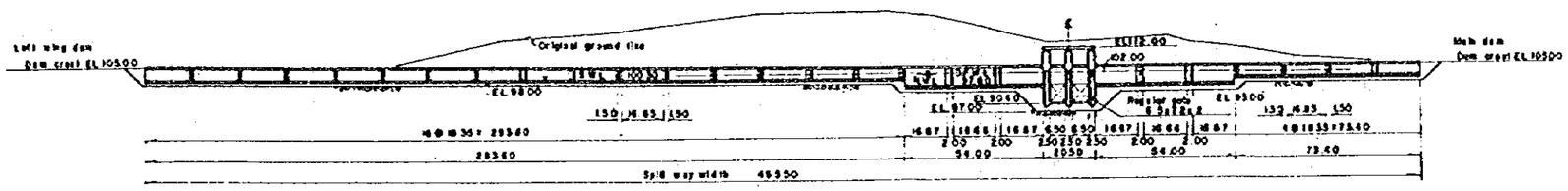
TYPICAL CROSS SECTION OF DAM

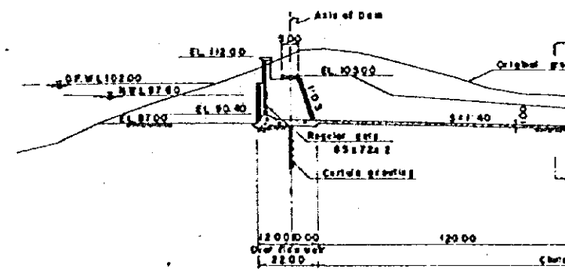


PROFILE OF DIVERSION TUNNEL



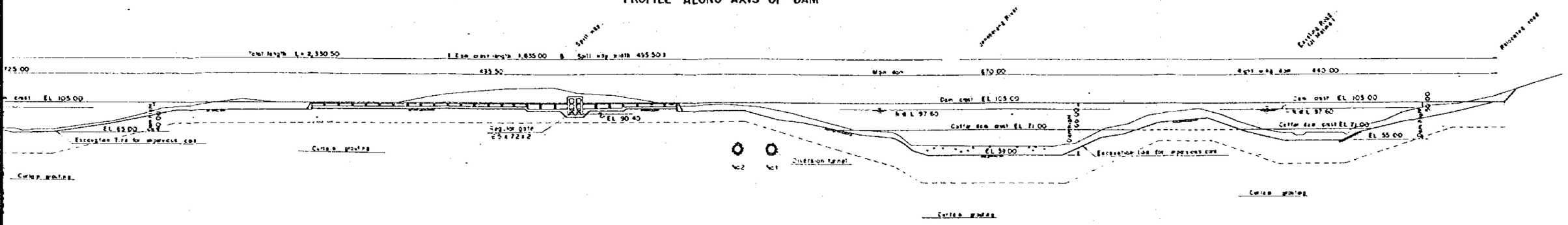
OVER · FLOW WEIR—FRONT VIEW OF SPILLWAY

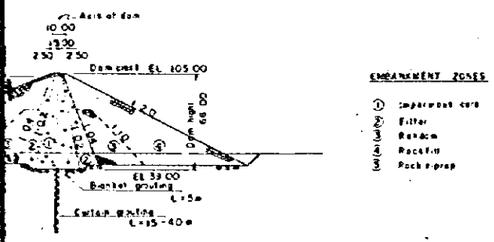




PROFILE OF

PROFILE ALONG AXIS OF DAM

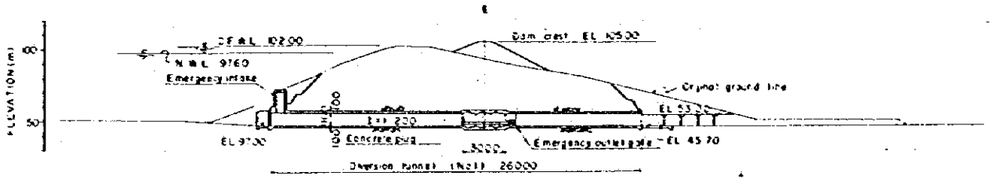




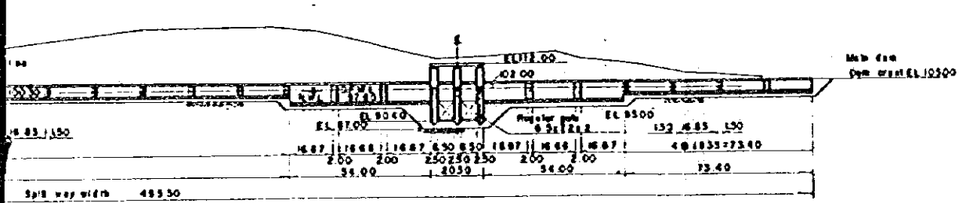
EMBANKMENT ZONES

① Impervious core
② Filter
③ Random
④ Rockfill
⑤ Rock riprap

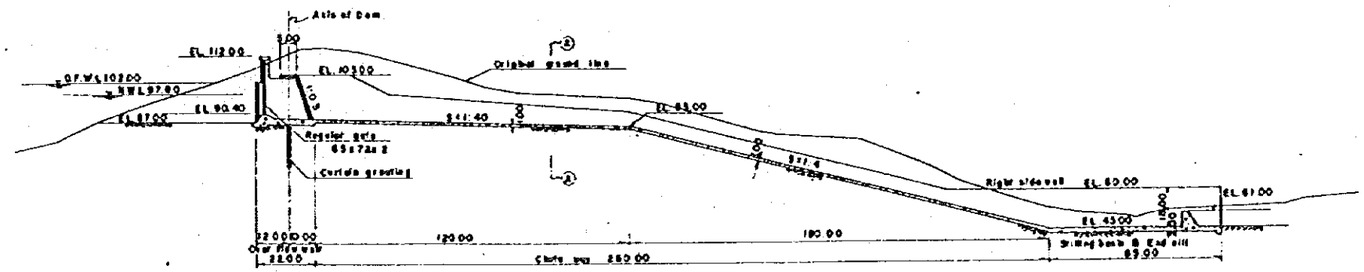
CROSS SECTION OF DAM



PROFILE OF DIVERSION TUNNEL



OVER · FLOW WEIR–FRONT VIEW OF SPILLWAY



PROFILE OF SPILLWAY

Unit: m

Fig. 5-3

DAM AND SPILLWAY PROFILE AND CROSS-SECTIONS

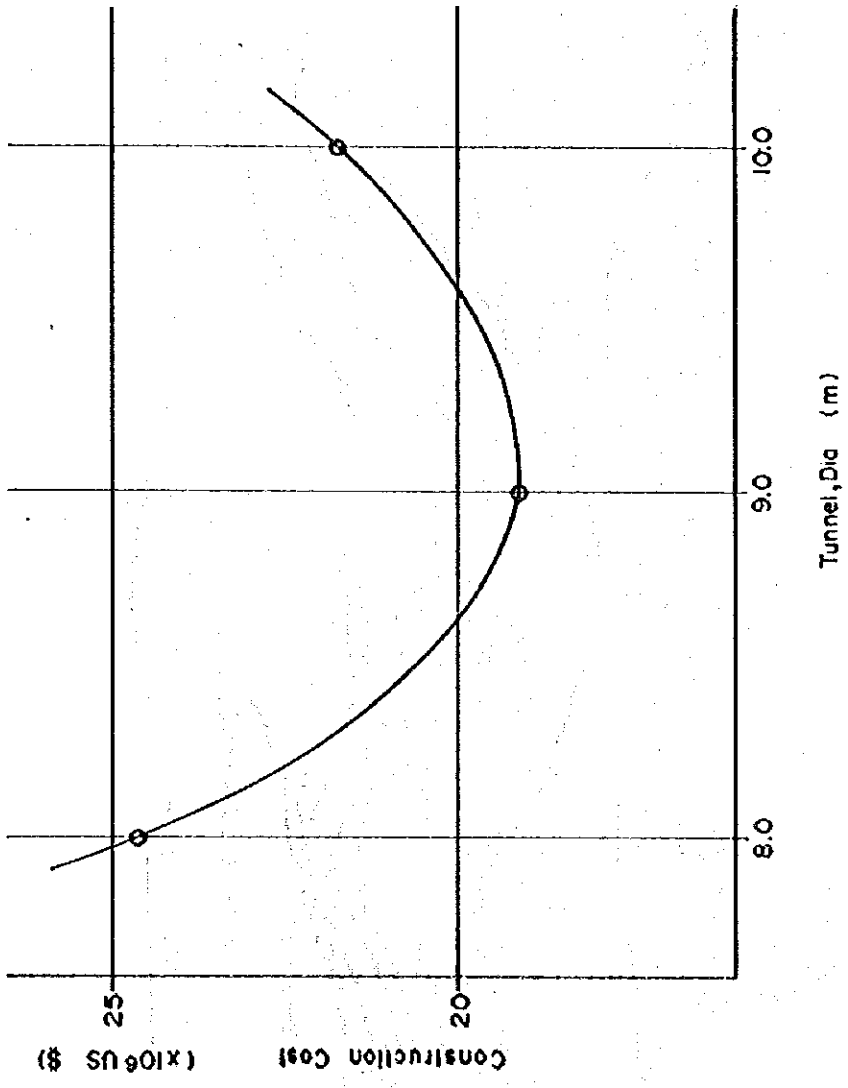


Fig. 5-4

ECONOMICAL COMPARISON
OF DIVERSION TUNNELES

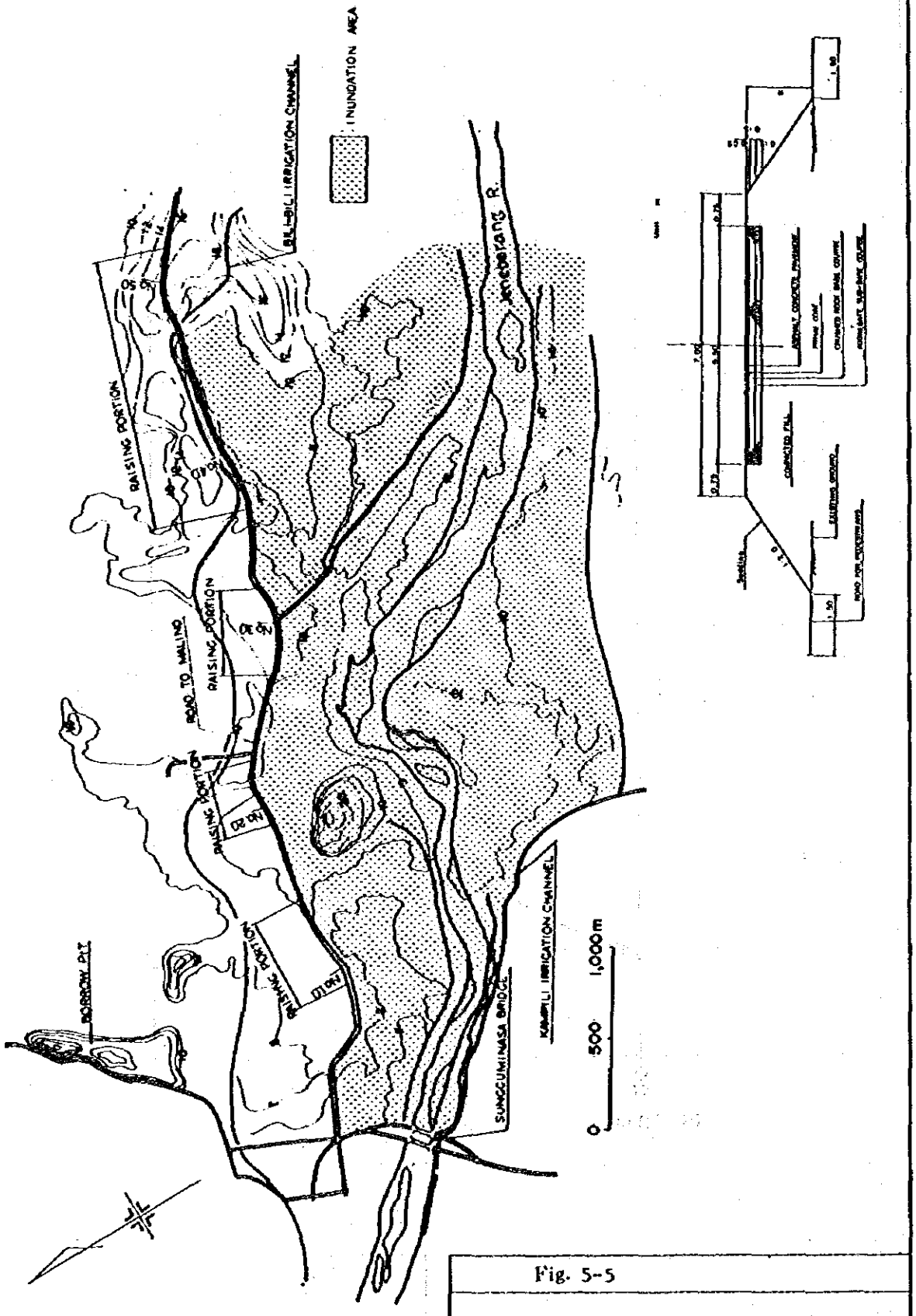


Fig. 5-5

ROAD RAISING SECTION