TABLES

Table 1 ECONOMIC TARGETS OF FIFTH NATIONAL PLAN

Description	Unit	Fourth Plan (1977-1981)	Fifth Plan (1982-1986)
Trade deficit			
Average annual value	฿10^6	45,300	78,400
Trade deficit/GDP	%	7.6	5.9
Current account deficit			
Average annual value	฿10^6	37,400	53,000
Current account deficit/GDP	%	6.3	4.1
Export of goods			
Growth in value	%/yr	21.9	22.3
Growth in volume	%/yr	10.5	11.3
Import of goods			
Growth in value	%/yr	26.3	18.1
Growth in volume	%/yr	10.9	7.2
Economic growth			
GDP	%/yr	7.3	6.6
Agriculture	%/yr	3.5	4.5
Manufacturing	%/yr	9.3	7.6
Mining	%/yr	12.6	16.4
Population growth	%/yr	2.1	1.5

Data Source: NESDB

Table 2 INFRASTRUCTURE DEVELOPMENT PLAN

Infrastructure	Facilities	Construction Period
Ports	Sattahip: rehabilitation	1983 - 1984
	Sattahip: two new berths	1983 - 1986
	Sattahip: four new berths	1984 - 1990
	Laem Chabang: breakwater, etc.	1987 - 1988
	Laem Chabang: four new berths	1988 - 1992
	Sattahip or Laem Chabang: four new berths	1993 - 1997
Railway	Chachoengsao - Sattahip	1981 - 1983
	Sattahip - Map Ta Phut	1983 - 1985
	North East link	1983 - 1985
	Laem Chabang spur	1989 - 1991
Road/1	Sattahip - Rayong: upgrading	1985 - 1986
	Rayong bypass: extension	1985 - 1986
	Pattaya - Sattahip: upgrading	1985 - 1986
	Pattaya spur road: development	1985 - 1986
	Map Ta Phut - Route 319: upgrading	1986 - 1987
	Chon Buri - Pattaya: improvement	1986 - 1987
	Chon Buri bypass: upgrading	1986 - 1988
	Route 314: upgrading	1987 - 1990
	Chon Buri - Pattaya: upgrading	1989 - 1990
	Route 315: improvement	1990 - 1991
	Laem Chabang urban road	1990 - 1991
	Pattaya - Sattahip: improvement	1991 - 1995
	Siracha - Laem Chabang bypass	1991 - 1998
Water Supply/2	Dok Krai dam: extension	1982 - 1984
	Dok Krai - Map Ta Phut pipeline	1982 - 1984
	Nong Pla Lai dam	1983 - 1986
	Map Ta Phut - Sattahip pipeline	1983 - 1986
	Treatment works	1983 - 1984
	Map Ta Phut - Sattahip - Ban Phe pipeline	1985 - 1988
	Dok Krai - Laem Chabang - Map Prachan pipeline	1989 - 1991
	Thap Ma dam and pipeline	1992 - 1994
Electricity	Substation 3 at Rayong	1983
	Line from Substation 2 at Rayong	1983
	Substation at Laem Chabang	1991
	Ao Phai - Laem Chabang line	1991
Telephones	Map Ta Phut exchange	1985
	Laem Chabang exchange	1985
Telex	Map Ta Phut/Rayong/Sattahip exchange	1985

/1: Initial programme
/2: Phase I

Data Source: ESS

Table 3 PROJECTED POPULATION AND DOMESTIC WATER DEMAND

Year	Description	Unit	1	2	3	4	5	6	7	8	9	10	Total
1986	Population	10^3	310.4	154.6	14.8	112.9	82.1	18.3	113.5	17.8	25.7	188.0	1,038.1
	Urban	10^3	35.8	148.2	0	59.1	64.0	14.1	21.5	15.1	13.3	48.2	419.3
	Rural	10^3	274.6	6.4	13.8	53.8	18.1	4.2	92.0	2.7	12.4	139.8	618.8
	Water Demand	$10^6m^3/yr$	3.2	12.5	0.1	5.1	4.4	0.4	1.6	0.7	0.9	4.2	33.1
	Urban	$10^6m^3/yr$	1.4	12.4	0	4.8	4.3	0.4	1.0	0.7	0.8	3.3	29.1
	Rural	$10^6m^3/yr$	1.8	0.1	0.1	0.3	0.1	0	0.6	0	0.1	0.9	4.0
1991	Population	10^3	324.5	169.5	16.1	140.0	107.0	19.4	123.2	18.6	32.0	209.0	1,159.3
	Urban	10^3	37.0	163.1	0	81.4	87.0	14.8	24.4	15.9	19.4	57.5	500.5
	Rural	10^3	287.5	6.4	16.1	58.6	20.0	4.6	98.8	2.7	12.6	151.5	658.8
	Water Demand	$10^6m^3/yr$	5.1	12.8	0.2	7.1	8.0	0.8	2.9	0.9	1.6	6.0	45.4
	Urban	$10^6m^3/yr$	2.0	12.7	0	6.4	7.8	0.8	1.9	0.9	1.5	4.3	38.3
	Rural	$10^6m^3/yr$	3.1	0.1	0.2	0.7	0.2	0	1.0	0	0.1	1.7	7.1
1996	Population	10^3	327.7	191.3	16.4	173.7	130.9	20.2	125.2	19.1	38.9	228.2	1,271.6
	Urban	10^3	38.2	184.9	0	114.0	110.8	15.4	25.3	16.5	26.3	71.7	603.1
	Rural	10^3	289.5	6.4	16.4	59.7	20.1	4.8	99.9	2.6	12.6	156.5	668.5
	Water Demand	$10^6m^3/yr$	6.9	17.9	0.3	12.4	11.2	1.0	3.9	1.0	2.8	9.3	66.7
	Urban	$10^6m^3/yr$	2.3	17.8	0	11.4	10.9	0.9	2.4	1.0	2.6	6.8	56.1
	Rural	$10^6m^3/yr$	4.6	0.1	0.3	1.0	0.3	0.1	1.5	0	0.2	2.5	10.6
2001	Population	10^3	316.3	216.8	15.4	222.2	154.7	20.1	120.8	19.3	48.2	249.8	1,383.6
	Urban	10^3	39.2	210.8	0	166.4	136.7	15.9	25.8	16.9	35.9	90.8	738.4
	Rural	10^3	277.1	6.0	15.4	55.8	18.0	4.2	95.0	2.4	12.3	159.0	645.2
	Water Demand	$10^6m^3/yr$	8.3	23.4	0.3	19.8	15.5	1.1	4.9	1.1	4.2	12.9	91.5
	Urban	$10^6m^3/yr$	2.5	23.3	0	18.6	15.2	1.0	2.9	1.1	4.0	9.6	78.2
	Rural	$10^6m^3/yr$	5.8	0.1	0.3	1.2	0.3	0.1	2.0	0.0	0.2	3.3	13.3

Note: The water demand is indicated in terms of the source water demand.

Table 4 INDUSTRIAL WATER DEMAND

(Unit: $10^6 m^3/yr$)

Description	1	2	3	4	5	6	7	8	9	10	Total
1986											
Projected by ESS	3.3	0	0	5.4	0	0	3.9	0	33.0	0	45.6
Existing	4.3	0	2.3	2.1	0.7	0	0	0	0	1.6	11.0
Total	7.6	0	2.3	7.5	0.7	0	3.9	0	33.0	1.6	56.6
1991											
Projected by ESS	6.6	0	0	13.9	0	0	3.9	0	35.8	0	60.2
Existing	4.3	0	2.3	2.1	0.7	0	0	0	0	1.6	11.0
Total	10.9	0	2.3	16.0	0.7	0	3.9	0	35.8	1.6	71.2
1996											
Projected by ESS	6.6	0	0	17.4	0	0	3.9	0	38.5	0	66.4
Existing	4.3	0	2.3	2.1	0.7	0	0	0	0	1.6	11.0
Total	10.9	0	2.3	19.5	0.7	0	3.9	0	38.5	1.6	77.4
2001											
Projected by ESS	6.6	0	0	25.7	0	0	3.9	0	41.3	0	77.5
Existing	4.3	0	2.3	2.1	0.7	0	0	0	0	1.6	11.0
Total	10.9	0	2.3	27.8	0.7	0	3.9	0	41.3	1.6	88.5

Note: Figures are indicated in terms of the source water demand.

Table 5 REPRESENTATIVE RIVER AND RIVER MAINTENANCE FLOW

Zone No.	Representative River	Balance Point	Maintenance Flow m^3/s	Maintenance Flow $10^6 m^3/yr$
1	Khlong Luang	Khlong Luang damsite	0.06	1.9
1-1	Ban Bung	Ban Bung dam	0.013	0.4
2	Khlong Yai Cheng	Estuary	0	0
3	Bang Phra	Bang Phra dam	0.03	1.0/1
4	Khlong Bang Lamung	Estuary	1.01	3.2/2
5	Map Prachan	Map Prachon dam	0.08	2.5
6	Huai Yai	Estuary	0	0
7	—	—	-	-
8	Khlong Phayun	Estuary	0	0
9	Khlong Huai Yai	Estuary	0	0
10	Rayong	Ban Khai weir	0.38	12.0
10-1	Khlong Thap Ma	Thap Ma damsite	0.33	10.5

/1: It was 8.0 x $10^6 m^3/yr$ in Study Report on Long-term Water Supply Plan.

/2: River maintenance flow at Nongkho dam; to be withdrawn between the dam and the estuary.

Table 6 WATER BALANCE FOR 1986 UNDER PROPOSED WATER RESOURCES DEVELOPMENT CONDITIONS

(Unit: MCM/yr)

Zone	1	1-1	2	3	4	5	6	7	8	9	10	10-1	TOTAL
DEMANDS													
1. Domestic Water													
Urban	1.2	0.2	12.4	0	4.8	4.3	0.4	1.0	0.7	0.8	3.3	-	29.1
Rural	1.8	0	0.1	0.1	0.3	0.1	0	0.6	0	0.1	0.9	-	4.0
Sub-total	3.0	0.2	12.5	0.1	5.1	4.4	0.4	1.6	0.7	0.9	4.2		33.1
2. Industrial Water	0	4.3	0	7.7 1/	5.4	0.7	0	3.9	0	33.0	1.6	-	56.6
3. Irrigation Water	0	0	0	15.4 2/	0	0	0	0	0	0	140.9	-	156.3
4. Maintenance Flow	1.9	0.4	0	1.0	3.2	2.5	0	0	0	0	12.0	-	21.0
Total	4.9	4.9	12.5	24.2	13.7	7.6	0.4	5.5	0.7	33.9	158.7	-	267.0
Available Local Water	1.1	0.4	0	0	0	0	0	0	0.4	0.2	0	-	2.1
WITHDRAWAL	3.8	4.5	12.5	24.2	13.7	7.6	0.4	5.5	0.3	33.7	158.7	-	264.9
Available River Water	3.5	0	0	0	8.8	0	0.4	0	0	0	38.2	-	50.9
DEFICIT	0.3	4.5	12.5	24.2	4.9	7.6	0	5.5	0.3	33.7	120.5	-	214.0
Water Supply Capacity of Existing and Proposed Dam	0	11.7	0	34.7	12.6	9.2	0	0	0	0	159.3	-	227.5
BALANCE	0.3	-7.2	12.5	-10.5	-7.7	-1.6	0	5.5	0.3	33.7	-38.8	-	-13.5

1/ Including 3.3 MCM and 2.1 MCM/yr to be diverted to Zone 1 and Zone 4, respectively

2/ To be diverted to Zone 2

Note; (1) The proposed dam is New Ban Bung, which replaces the existing Ban Bung dam.

(2) Figures with a mark (-) in line of BALANCE mean an excess in supply capacity, while figures without mean a shortage.

Table 7 WATER BALANCE FOR 1991 UNDER PROPOSED WATER RESOURCES DEVELOPMENT CONDITIONS

(Unit: MCM/yr)

Zone	1	1-1	2	3	4	5	6	7	8	9	10	10-1	TOTAL
DEMANDS													
1. Domestic Water													
Urban	1.7	0.3	12.7	0	6.4	7.8	0.8	1.9	0.9	1.5	4.3	0	38.3
Rural	3.1	0	0.1	0.2	0.7	0.2	0	1.0	0	0.1	1.7	0	7.1
Sub-total	4.8	0.3	12.8	0.2	7.1	8.0	0.8	2.9	0.9	1.6	6.0	0	45.4
2. Industrial Water	0	4.3	0	11.0 1/	13.9	0.7	0	3.9	0	35.8	1.6	0	71.2
3. Irrigation Water	60.1	0	0	15.4 2/	0	0	0	0	0	0	140.9	0	216.4
4. Maintenance Flow	1.9	0.4	0	1.0	3.2	2.5	0	0	0	0	12.0	0	21.0
Total	66.8	5.0	12.8	27.6	24.2	11.2	0.8	6.8	0.9	37.4	160.5	0	354.0
Available Local Water	1.1	0.4	0	0	0	0	0	0	0.4	0.2	0	0	2.1
WITHDRAWAL	65.7	4.6	12.8	27.6	24.2	11.2	0.8	6.8	0.5	37.2	160.5	0	351.9
Available River Water	0	0	0	0	14.0	0	0.8	0	0	0	30.9	0	45.7
DEFICIT	65.7	4.6	12.8	27.6	10.2	11.2	0	6.8	0.5	37.2	129.6	0	306.2
Water Supply Capacity of Existing and Proposed Dams	79.8	11.7	0	34.7	12.6	9.2	0	0	0	0	221.7	0	369.7
BALANCE	-14.1	-7.1	12.8	-7.1	-2.4	2.0	0	6.8	0.5	37.2	-92.1	0	-63.5

1/ Including 6.6 MCM/yr and 2.1 MCM/yr to be diverted to Zone 1 and Zone 4 respectively

2/ To be diverted to Zone 2

Note; (1) The proposed dams are New Ban Bung, Khlong Luang and Khlong Yai.

(2) Figures with a mark (-) in line of BALANCE mean an excess in supply capacity, while figures without mark mean a shortage.

Table 8 WATER BALANCE FOR 1996 UNDER PROPOSED WATER RESOURCES DEVELOPMENT CONDITIONS

(Unit: MCM/yr)

Zone	1	1-1	2	3	4	5	6	7	8	9	10	10-1	TOTAL
DEMANDS													
1. Domestic Water													
Urban	1.9	0.4	17.8	0	11.4	10.9	0.9	2.4	1.0	2.6	6.8	0	56.1
Rural	4.6	0	0.1	0.3	1.0	0.3	0.1	1.5	0	0.2	2.5	0	10.6
Sub-total	6.5	0.4	17.9	0.3	12.4	11.2	1.0	3.9	1.0	2.8	9.3	0	66.7
2. Industrial Water	0	4.3	0	11.0 1/	17.4	0.7	0	3.9	0	38.5	1.6	0	77.4
3. Irrigation Water	60.1	0	0	15.4 2/	0	0	0	0	0	0	140.9	30.6	247.0
4. Maintenance Flow	1.9	0.4	0	1.0	3.2	2.5	0	0	0	0	12.0	10.5	31.5
Total	68.5	5.1	17.9	27.7	33.0	14.4	1.0	7.8	1.0	41.3	163.8	41.1	422.6
Available Local Water	1.1	0.4	0	0	0	0	0	0	0.4	0.2	0	0	2.1
WITHDRAWAL	67.4	4.7	17.9	27.7	33.0	14.4	1.0	7.8	0.6	41.1	163.8	41.1	420.5
Available River Water	0	0		0	16.8	0	0.9	0	0	0	31.3	0	49.0
DEFICIT	67.4	4.7	17.9	27.7	16.2	14.4	0.1	7.8	0.6	41.1	132.5	41.1	371.5
Water Supply Capacity of Existing and Proposed Dams	79.8	11.7	0	34.7	12.6	9.2	0	0	0	0	221.7	41.3	411.0
BALANCE	-12.4	-7.0	17.9	-7.0	3.6	5.2	0.1	7.8	0.6	41.1	-89.2	-0.2	-39.5

1/ Including 6.6 MCM/yr and 2.1 MCM/yr to be diverted to Zone 1 and Zone 4 respectively

2/ To be diverted to Zone 2

Note; (1) The proposed dams are New Ban Bung, Khlong Luang, Khlong Yai and Khlong Thap Ma.

(2) Figures with a mark (-) in line of BALANCE mean an excess in supply capacity, while figures without mark mean a shortage.

Table 9 WATER BALANCE FOR 2001 UNDER PROPOSED WATER RESOURCES DEVELOPMENT CONDITIONS

(Unit: MCM/yr)

Zone	1	1-1	2	3	4	5	6	7	8	9	10	10-1	TOTAL
DEMANDS													
1. Domestic Water													
Urban	2.1	0.4	23.3	0	18.5	15.2	1.0	2.9	1.1	4.0	9.7	0	78.2
Rural	5.8	0	0.1	0.3	1.2	0.3	0.1	2.0	0	0.2	3.3	0	13.3
Sub-total	7.9	0.4	23.4	0.3	19.7	15.5	1.1	4.9	1.1	4.2	13.0	0	91.5
2. Industrial Water	0	4.3	0	11.0 1/	25.7	0.7	0	3.9	0	41.3	1.6	0	88.5
3. Irrigation Water	60.1	0	0	15.4 2/	0	0	0	0	0	0	140.9	30.6	247.0
4. Maintenance Flow	1.9	0.4	0	1.0	3.2	2.5	0	0	0	0	12.0	10.5	31.5
Total	69.9	5.1	23.4	27.7	48.6	18.7	1.1	8.8	1.1	45.5	167.5	41.1	458.5
Available Local Water	1.1	0.4	0	0	0	0	0	0	0.4	0.2	0	0	2.1
WITHDRAWAL	68.8	4.7	23.4	27.7	48.6	18.7	1.1	8.8	0.7	45.3	167.5	41.1	456.4
Available River Water	0	0	0	0	19.6	0	1.0	0	0	0	31.8	0	52.4
DEFICIT	68.8	4.7	23.4	27.7	29.0	18.7	0.1	8.8	0.7	45.3	135.7	41.1	404.0
Water Supply Capacity of Existing and Proposed Dams	79.8	11.7	0	34.7	12.6	9.2	0	0	0	0	221.7	41.3	411.0
BALANCE	-11.0	-7.0	23.4	-7.0	16.4	9.5	0.1	8.8	0.7	45.3	-86.0	-0.2	-7.0

1/ Including 6.6 MCM/yr and 2.1 MCM/yr to be diverted to Zone 1 and Zone 4 respectively

2/ To be diverted to Zone 2

Note: (1) The proposed dams are New Ban Bung, Khlong Luang, Khlong Yai and Khlong Thap Ma.

(2) Figures with a mark (-) in line of BALANCE mean an excess in supply capacity, while figures without mark mean a shortage.

Table 10 SALIENT FEATURES OF DAMS IN OPERATION, UNDER CONSTRUCTION AND PLANNING

Description	Unit	Existing						Under construction	Under planning	
		Bang Phra	Map Prachan	Dok Krai	Ban Bung	Phluta Luang	Khlong Bang Phai	Nong Kho	New Ban Bung	Nong Pla Lai
1. Purpose		D & I, A	D & I, A	D & I, A, F	D & I, A	D & I	D & I	D & I, A	D & I, A	A, F
2. Year of completion		1975	1979	1975	1958	N.A	N.A	-	-	-
3. Zone		3	5	10	1-1	7	7	4	1-1	10
4. Name of river		Huai Sukhrip	Huai Nong Pru	Khlong Dok Krai	Ban Bung	Phluta Luang	Khlong Bang Phai	Huai Nong Kho	Ban Bung	Nong Pla Lai
5. Catchment area	km^3	123	37.9	291	51.2			48.3	51.2	408
6. Average annual inflow	$10^6 m^3$	43.9/1	13.5/1	103.8	12.2/1			17.2/1	12.2/1	126.1
7. Reservoir										
Gross storage capacity	$10^6 m^3$	120.0	17.0	70.8	2.9			26.0	21.9	200.7
Surcharge capacity	$10^6 m^3$	10.0	2.2	20.0	1.0			7.0	7.8	43.5
Active storage capacity	$10^6 m^3$	104.0	14.0	46.8	0.4			18.0	12.5	144.4
Dead storage capacity	$10^6 m^3$	6.0/2	0.8	4.0	1.5			1.0	1.6	12.8
Flood water surface	El.m	30.6	45.7	52.6	77.1			66.5	84.3	47.0
High water surface	El.m	30.0	45.0	50.6	76.3			65.0	82.1	45.0
Low water surface	El.m	18.8/3	36.0	38.6/3	75.8			57.5	76.1	33.3
Reservoir surface area at HWS	km^2	15.8	2.8	8.8	1.2			4.4	3.2	20.2
Net regulated outflow	$10^6 m^3/yr$	34.7	9.2	56.8	2.2			12.6	11.7	102.5
8. Dam										
Type		Earth-fill	Earth-fill	Earth-fill	Earth-fill			Earth-fill	Earth-fill	Earth-fill
Height	m	24.0	17.0	24.6	8.5			17.0	21.5	31.0
Crest elevation	El.m	31.5	47.0	54.6	78.8			68.0	86.3	49.0
Crest length	m	1,720	2,060	1,500	1,400			2,000	2,800	4,000
Volume	$10^6 m^3$	N.A.	N.A.	N.A.	N.A.			N.A.	1.4	3.2
9. Spillway										
Type		Morning glory	Morning glory	Morning glory	Open Chute			Open chute	Open chute	Open chute
Discharge capacity	m /s	65.0	37.0	N.A.	N.A.			108	125	700
Crest elevation of overflow section	El.m	300	45.0	50.6	76.3			65.0	82.1	38.0
Crest length of overflow section	m	N.A	ø6.0	ø10.0	N.A.			40.0	20.0	20.0

/1 : Estimated from Dok Krai

/2 : Derived from the area-storage curve prepared by RID

/3 : Estimated assuming sediment deposits in horizontal layer.

Note; N.A. : Not available

D & I : Domestic and industrial water supply

A : Irrigation

F : Flood control

Table 11 FEATURES OF POTENTIAL DAM SCHEMES AT SELECTED DEVELOPMENT SCALE

	Unit	Khlong Luang	Pa Daeng	Huai Bung	Huai Takhian Tia	Khlong Na Klua	Huai Chak Nok	Huai Yai	Khlong Thap Ma	Khlong Yai
Reservoir										
Catchment area	km^2	526.0	53.8	68.5	33.0	22.3	18.1	65.9	158.0	218.0
Average annual run-off	$10^6 m^3$	125.2	18.8	23.9	11.5	7.8	6.3	23.0	55.2	87.0
High Water surface	El.m.	39.7	66.6	28.0	30.3	31.1	14.7	25.6	25.6	50.3
Low water surface	El.m.	33.8	61.7	22.3	25.0	25.0	10.0	19.9	16.2	40.6
Reservoir storage capacity										
Gross storage	$10^6 m^3$	141.0	16.6	21.2	10.2	6.9	5.6	20.4	59.9	93.6
Active storage	$10^6 m^3$	125.2	15.0	19.1	9.2	6.2	5.0	18.4	55.2	87.0
Dead storage	$10^6 m^3$	15.8	1.6	2.1	1.0	0.7	0.6	2.0	4.7	6.6
Reservoir surface area at HWS	km^2	32.8	5.4	5.9	2.8	1.8	1.5	4.6	10.4	16.8
Net regulated outflow	$10^6 m^3$	80.4	11.6	16.0	7.8	5.2	4.3	15.6	41.3	62.4
Dam										
Type of dam		Earth-fill	Earth-fill	Earth-fill	Earth-fill	Earth-fill	Earth-fill	Earth-fill	Earth-fill	Earth-fill
Dam crest elevation	El.m.	42.7	69.6	31.0	33.3	34.1	17.7	28.6	28.6	53.3
Length of dam crest	m.	3,790.0	1,880.0	2,730.0	1,900.0	1,400.0	1,410.0	3,720.0	770.0	4,090.0
Dam height	m.	19.7	15.1	14.5	13.8	14.6	11.2	14.1	20.1	21.3
Dam volume	$10^3 m^3$	2,070.0	578.0	760.0	570.0	560.0	400.0	1,910.0	870.0	2,570.0

Table 12 SUMMARY OF CLIMATE

Climatological Features	Observation Station	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual	Data Source
Air Temparature (°C)															
Mean	Chon Buri	29.6	29.3	28.9	28.6	28.3	27.9	27.3	26.7	25.8	25.9	27.4	28.8	27.9	(1)
	Sattahip	29.7	29.2	28.9	28.4	28.4	27.9	27.1	26.5	26.1	26.7	27.9	28.9	27.9	(1)
	B. Nong Mapring	28.1	28.1	27.8	27.9	27.7	27.4	27.2	26.0	25.0	24.7	26.0	27.4	26.9	(2)
Mean Max.	Chon Buri	34.1	33.3	32.5	31.9	31.6	31.2	31.3	31.1	31.0	31.3	32.1	33.2	32.0	(1)
	Sattahip	34.6	33.3	32.7	32.4	32.5	32.2	31.9	32.2	32.4	33.2	33.6	34.1	32.9	(1)
	B. Nong Mapring	35.1	33.5	33.4	33.0	32.9	32.9	33.1	32.9	33.1	33.5	33.7	34.9	33.5	(2)
Mean Min.	Chon Buri	25.4	25.4	25.5	25.0	24.9	24.4	23.8	22.1	20.3	20.1	22.4	24.2	23.6	(1)
	Sattahip	26.5	26.2	26.4	25.7	25.6	25.0	24.0	22.6	21.6	22.1	24.2	25.6	24.6	(1)
	B. Nong Mapring	21.6	22.6	21.5	22.0	21.6	20.9	21.2	19.1	16.7	15.9	18.3	20.0	20.1	(2)
Extreme Max.	Chon Buri	38.0	37.8	37.1	35.5	34.7	34.4	34.8	35.2	36.1	36.2	36.6	37.0	38.0	(1)
	Sattahip	40.5	40.5	37.2	37.8	37.2	37.4	36.2	37.4	38.3	39.0	39.4	39.5	40.5	(1)
	B. Nong Mapring	40.0	40.0	39.0	43.5	39.0	40.0	38.9	40.0	38.5	38.5	39.4	39.3	43.5	(2)
Extreme Min.	Chon Buri	20.4	21.2	21.0	20.5	20.9	20.6	18.2	14.2	12.0	9.9	16.5	17.5	9.9	(1)
	Sattahip	21.0	21.5	20.9	19.0	21.5	19.0	19.5	15.0	12.8	12.3	16.8	18.7	12.3	(1)
	B. Nong Mapring	16.2	18.5	18.5	19.0	20.2	19.5	15.2	10.5	9.0	8.0	10.0	9.8	8.0	(2)
Relative Humidity (%)															
Mean	Chon Buri	71.0	75.0	75.0	75.0	76.0	80.0	80.0	73.0	66.0	67.0	71.0	71.0	73.0	(1)
	Sattahip	77.0	79.0	76.0	77.0	77.0	81.0	83.0	76.0	70.0	70.0	75.0	76.0	76.0	(1)
	B. Nong Mapring	92.2	94.5	94.9	94.8	94.9	95.6	94.6	90.1	88.0	92.5	92.8	93.5	93.2	(2)
Mean Max.	Chon Buri	87.6	88.8	87.6	88.5	90.0	92.3	93.0	89.5	85.1	85.0	88.2	87.8	88.6	(1)
	Sattahip	87.3	88.8	86.0	87.4	87.6	90.7	93.3	89.0	84.7	84.2	88.2	87.6	87.9	(1)
Mean Min.	Chon Buri	56.7	60.8	61.8	62.9	64.0	67.1	66.7	57.2	50.1	52.0	56.2	56.6	59.3	(1)
	Sattahip	61.1	66.6	65.5	64.2	65.9	68.3	69.1	60.7	53.0	51.2	57.0	59.9	61.9	(1)
Extreme Min.	Chon Buri	29.0	32.0	42.0	43.0	45.0	46.0	42.0	29.0	22.0	20.0	25.0	23.0	20.0	(1)
	Sattahip	33.0	43.0	43.0	47.0	48.0	45.0	38.0	28.0	21.0	25.0	17.0	29.0	17.0	(1)
Evaporation (mm)															
	B. Nong Mapring	111.3	102.4	93.3	95.0	90.0	77.7	91.2	96.7	101.7	99.4	93.5	112.0	1,164.2	(2)
	Bang Phra	115.9	109.7	101.0	97.3	91.8	78.3	85.1	87.5	84.7	76.2	76.9	103.1	1,110.1	(2)
	Ban Mai	121.3	111.6	107.7	106.6	103.8	90.9	98.8	96.6	107.7	109.1	107.5	125.9	1,287.5	(2)
Wind Velocity (km/hr)															
	Chon Buri	11.9	10.9	13.2	12.2	12.0	9.8	9.3	11.5	12.2	11.9	13.0	13.2	11.7	(1)
	Sattahip	13.3	13.3	18.2	17.4	16.9	13.7	10.7	12.6	13.2	11.1	12.6	13.7	13.9	(1)
Cloud Cover (Oktas)															
	Chon Buri	4.7	6.1	6.5	6.7	6.9	6.7	5.8	4.5	3.6	3.9	3.8	4.0	5.2	(1)
	Sattahip	4.9	6.4	6.5	6.8	6.9	6.9	6.0	4.8	3.7	3.9	4.1	4.3	5.4	(1)
Rainfall (mm)															
	Rayong	62.9	210.7	120.8	122.3	112.2	203.6	203.6	63.2	8.6	17.8	47.6	53.3	1,226.6	(2)
	Ban Khai	87.8	215.3	161.3	123.9	131.4	238.7	195.9	68.2	11.5	24.6	30.1	42.2	1,330.8	(2)
	Sattahip	76.3	193.6	74.4	98.4	97.0	211.5	275.0	86.5	15.5	21.6	41.5	53.6	1,244.9	(2)
	Bang Lamung	102.6	158.6	89.6	94.5	113.6	220.1	252.7	61.5	9.3	10.4	36.9	48.7	1,198.4	(2)
	Si Racha	88.3	150.6	110.8	113.6	131.7	257.7	218.1	51.3	13.7	11.1	31.4	38.7	1,216.5	(2)
	Bang Phra	113.2	161.9	120.3	124.7	154.6	295.4	222.6	48.9	10.2	10.5	41.2	45.6	1,349.1	(2)
	Chon Buri	77.6	158.8	119.4	152.2	162.4	295.2	210.9	53.9	6.0	13.9	23.3	34.1	1,307.6	(2)
	Ban Bung	94.5	151.9	117.8	129.4	136.7	217.5	182.2	41.2	9.4	8.1	26.3	45.3	1,160.3	(2)

Data Source: (1) Climatological Data of Thailand, 25 Year Period (1951-1975), MD.
(2) RID

Table 13 MONTHLY MEAN RUN-OFFS AT KHLONG LUANG DAMSITE

(Unit: m^3/s)

Water Year	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Annual
1968	0.28	0.83	0.88	0.35	6.71	5.45	6.99	0.26	0.02	0.01	0.01	0.02	1.82
1969	0.02	0.08	0.08	0.07	2.36	20.28	6.25	0.58	0.01	0.01	0.01	0.05	2.48
1970	0.48	0.97	7.55	6.40	5.15	7.66	4.64	0.28	0.08	0.00	0.00	0.01	2.77
1971	0.02	0.19	1.85	0.53	7.62	19.36	14.89	2.72	0.11	0.01	0.03	0.00	3.95
1972	0.39	0.09	8.02	1.57	0.47	21.49	24.00	2.05	0.65	0.09	0.02	0.05	4.91
1973	0.04	0.53	1.30	5.97	6.61	22.50	9.53	0.92	0.15	0.15	0.27	0.41	4.03
1974	1.22	1.92	1.24	2.45	6.95	12.97	59.36	10.81	1.09	0.45	0.86	0.29	8.30
1975	0.32	1.86	1.04	6.80	3.16	20.79	24.49	3.78	0.46	0.26	0.59	0.47	5.34
1976	0.84	1.50	2.02	1.59	6.74	16.73	14.29	9.93	0.47	0.25	0.22	0.25	4.57
1977	0.21	0.91	1.10	3.02	4.14	4.08	6.30	0.79	0.24	0.17	1.57	0.54	1.92
1978	2.46	11.39	4.55	9.34	4.68	26.87	10.99	1.13	0.32	0.23	0.20	0.17	6.03
1979	0.73	2.64	1.20	0.46	0.77	1.65	4.10	0.19	0.16	0.12	0.05	0.51	1.04
1980	0.38	0.22	8.50	3.08	13.20	10.88	6.75	1.48	0.22	0.19	0.15	0.20	3.77
1981	9.76	3.83	1.05	1.75	2.51	23.26	9.23	4.18	0.49	0.12	0.09	0.05	4.70
Average	1.23	1.92	2.88	3.10	5.08	15.28	14.41	2.79	0.32	0.15	0.29	0.22	3.98

Catchment Area : 526 km^2

Table 14 SOIL GROUP, SOIL SERIES AND THEIR EXTENSION IN THE KHLONG LUANG SCHEME AREA

Soil Group	Soil Series	Map Symbol	Surveyed Area		Potential Irrigable Area		Scheme Area	
			(ha)	(%)	(ha)	(%)	(ha)	(%)
Soils of Recent Alluvium	Don Muang series (Dm)	11	810	3	220	2	50	-
	Ongkharak series (Ok)	12	80	-	-	-	-	-
	Rangsit series (Rs)	13	1,230	4	190	2	-	-
	Mahaphot series (Ma)	14	2,060	7	800	7	180	2
			4,180	14	1,210	11	230	2
Soils of Semi-recent Alluvium	Chon Buri series (Cb)	16	9,040	30	6,410	55	4,420	57
	Klaeng series (Kl)	18	4,950	16	2,860	24	2,070	27
	Ban Bung series (Bbg)	26	560	2	-	-	-	-
			14,550	48	9,270	79	6,490	84
Soils of Old Alluvium	Sattahip series (Sh)	28	950	3	60	-	70	1
	Satuk, mottled/Ban Bung (Suk-m/Bbg)	30	1,540	5	70	1	70	1
	Satuk, mottled variant (Suk-m)	32	2,630	9	700	6	700	9
	Korat, ironstone deeper subsoil var. (Kt-ird)	35	760	3	200	2	200	3
	Phon Phisai, no mottled clay var. (Pp)	36	190	1	30	-	40	-
	Don Rai series (Dr)	37	540	2	20	-	-	-
	Satuk series (Suk)	38	4,300	14	140	1	-	-
	Mae Rim, clayey skeletal var. (Mr-c.ske)	46	380	1	-	-	-	-
			11,290	38	1,220	10	1,080	14
Soils of Transported Material and Residuum, and Others	Nong Mot series (Nm)	74	180	-	-	-	-	-
	Total		30,200	100	11,700	100	7,800	100

Table 15 ECONOMIC COMPARISON OF ALTERNATIVES, KHLONG LUANG DAM SCHEME

(Unit: ฿ 10^6)

Alternatives	1-1	1-2	1-3	1-4	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4
Features												
Dam Crest El. (m)	41.5	42	42.5	43	41.5	42	42.5	43	41.5	42	42.5	43
H.W.L. (m)	38.5	39	39.5	40	38.5	39	39.5	40	38.5	39	39.5	40
Active Storage (10^6 m^3)	89	103	119	135	89	103	119	135	89	103	119	135
Irrigation Area (ha)	5,900	6,700	7,200	7,400	5,300	6,100	6,600	6,800	4,500	5,300	5,800	6,000
Cropping Intensity (%)	130	130	130	130	140	140	140	140	150	150	150	150
Cost												
1. Dam Works	772.20	823.68	880.11	923.67	772.20	823.68	880.11	923.67	772.20	823.68	880.11	923.67
2. Irrigation Facilities	321.75	345.51	370.26	380.16	304.92	326.70	339.57	349.47	284.13	304.92	318.78	323.73
3. Pipeline System	399.17	399.17	399.17	399.17	399.17	399.17	399.17	399.17	399.17	399.17	399.17	399.17
4. Engineering Service	150.98	159.22	168.08	173.72	148.79	156.77	164.09	169.73	146.09	153.94	161.39	166.39
5. Government Administration	47.50	49.72	52.08	53.45	46.66	48.78	50.55	51.91	45.62	47.69	49.51	50.63
Base Cost	1,691.60	1,777.29	1,869.70	1,930.17	1,671.74	1,755.10	1,833.48	1,893.95	1,647.21	1,729.40	1,808.95	1,863.58
6. Physical Contingency	253.74	266.59	280.45	289.53	250.76	263.26	275.02	284.09	247.08	259.41	271.34	279.54
Project Cost	1,945.34	2,043.89	2,150.15	2,219.69	1,922.50	2,018.36	2,108.51	2,178.05	1,894.29	1,988.80	2,080.29	2,143.12
Annual Equivalent Cost	159.02	167.07	175.76	181.44	157.14	164.99	172.35	178.03	154.85	162.57	170.05	175.19
7. O & M Cost	20.67	21.05	21.45	21.72	20.59	20.95	21.30	21.57	20.48	20.84	21.19	21.44
8. Replacement Cost	38.43	39.10	39.52	39.69	37.93	38.60	39.02	39.19	37.25	37.93	38.35	38.51
(I) Annual Cost	218.12	227.22	236.73	242.85	215.66	224.54	232.67	238.79	212.58	221.34	229.59	235.14
Benefit												
9. Irrigation Benefit	148.82	169.00	181.61	186.66	145.00	166.88	180.56	186.03	137.60	162.06	177.35	183.46
10. Water Supply Benefit	165.96	165.96	165.96	165.96	165.96	165.96	165.96	165.96	165.96	165.96	165.96	165.96
11. Production Foregone	33.57	36.06	38.54	41.03	33.57	36.06	38.54	41.03	33.57	36.06	38.54	41.03
(II) Annual Benefit	281.22	298.91	309.03	311.59	277.39	296.79	307.98	310.97	269.99	291.97	304.77	308.40
(III) Net Benefit (B-C)	63.10	71.69	72.30	68.74	61.73	72.26	75.31	72.18	57.41	70.63	75.18	73.26
(IV) Benefit-Cost Ratio (B/C)	1.29	1.32	1.31	1.28	1.29	1.32	1.32	1.30	1.27	1.32	1.33	1.31

Table 16 PROJECTED POPULATION AND DOMESTIC WATER DEMAND OF THE KHLONG LUANG RIVER BASIN

Description	Unit	1986	1991	1996	2001
Population					
Urban Area	10^3	29.6	30.7	31.6	32.6
Phanat Nikhom	10^3	13.8	14.2	14.5	14.9
Tha Bun Mi	10^3	5.7	6.2	6.6	6.9
Nong Tamlung	10^3	10.1	10.3	10.5	10.8
Rural Area	10^3	274.6	287.5	289.5	277.1
Total	10^3	304.2	318.2	321.1	309.7
Domestic Water Demand					
Urban Area		1.2	1.7	1.9	2.1
Phanat Nikhom	$10^6m^3/yr$	0.7	0.8	0.9	1.0
Tha Bun Mi	$10^6m^3/yr$	0.2	0.3	0.4	0.4
Nong Tamlung	$10^6m^3/yr$	0.3	0.6	0.6	0.7
Rural Area	$10^6m^3/yr$	1.8	3.1	4.6	5.8
Total	$10^6m^3/yr$	3.0	4.8	6.5	7.9

Note: Figures are expressed in terms of source water demand.

Table 17 INVESTMENT COST BY COMPONENT

(Unit: ฿ 10^3)

Description	First Stage			Second Stage		
	Foreign Currency Portion	Local Currency Portion	Total	Foreign Currency Portion	Local Currency Portion	Total
I. Dam						
1. Preparatory Works	12,860	21,380	34,240			
2. Care of River	3,210	5,340	8,550			
3. Dam	313,780	510,920	824,700			
4. Spillway	7,600	23,480	31,080			
5. Contractor's Administration Cost	11,810	19,640	31,450			
6. Contractor's Profit	21,930	36,470	58,400			
7. Tax	-	30,550	30,550			
Sub-total	371,190	647,780	1,018,970			
8. Compensation & Relocation		272,020	272,020			
9. Engineering Services	71,330	30,570	101,900			
10. Administration Cost of Executive Agency	-	20,380	20,380			
Sub-total	442,520	970,750	1,413,270			
11. Physical Contingency	66,380	145,610	211,990			
Sub-total	508,900	1,116,360	1,625,260			
12. Price Contingency	243,890	600,400	844,290			
Total	752,790	1,716,760	2,469,550			
II. Raw Water Conveyance System						
1. Preparatory Works	16,140	3,860	20,000	13,590	2,070	15,660
2. Civil Works	3,650	17,700	21,350	-	-	-
3. Mechanical Works	135,680	20,700	156,380	131,280	20,650	151,930
4. Electrical Works	22,070	210	22,280	4,650	60	4,710
5. Contractor's Administration Cost	6,210	1,490	7,700	5,230	800	6,030
6. Contractor's Profit	11,540	2,760	14,300	9,720	1,480	11,200
7. Tax	-	7,480	7,480	-	5,860	5,860
Sub-total	195,290	54,200	249,490	164,470	30,920	195,390
8. Compensation	-	300	300	-	-	-
9. Engineering Services	13,970	6,000	19,970	10,940	4,690	15,630
10. Administration Cost of Executive Agency/1	-	21,680	21,680	-	7,820	7,820
Sub-total	209,260	82,180	291,440	175,410	43,430	218,840
11. Physical Contingency	31,390	12,320	43,710	26,310	6,520	32,830
Sub-total	240,650	94,500	335,150	201,720	49,950	251,670
12. Price Contingency	147,620	76,080	223,700	281,430	96,880	378,310
Total	388,270	170,580	558,850	483,150	146,830	629,980
III. Irrigation						
1. Preparatory Works	8,000	44,800	52,800			
2. Intake Structure	8,700	19,200	27,900			
3. Canal Construction	70,800	168,900	239,700			
4. Contractor's Administration Cost	3,060	8,150	11,210			
5. Contractor's profit	5,690	15,140	20,830			
6. Tax	-	10,890	10,890			
Sub-total	96,250	267,080	363,330			
7. Compensation & Relocation	-	9,150	9,150			
8. Engineering Services	33,060	14,170	47,230			
9. Administration Cost of Executive Agency/2	21,800	19,900	41,700			
Sub-total	151,110	310,300	461,410			
10. Physical Contingency	22,680	46,540	69,220			
Sub-total	173,790	356,840	530,630			
11. Price Contingency	103,820	272,760	376,580			
Total	277,610	629,600	907,210			
Grand Total	1,418,670	2,516,940	3,935,610	483,150	146,830	629,980

/1: Including comission to PEA

/2: Including cost for O&M equipment

Table 18 DISBURSEMENT SCHEDULE OF INVESTMENT COST

FIRST STAGE

(Unit: ฿ 10^3)

Item	Summary			1985		1986		1987		1988		1989		1990		1991	
	Total	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.
1. Compensation & Relocation	281,470	-	281,470	-	136,010	-	136,010	-	2,750	-	3,950	-	2,750	-	-	-	-
2. Dam	1,018,970	371,190	647,780	-	-	11,140	19,430	96,510	161,950	111,360	187,860	118,780	220,240	33,400	58,300	-	-
3. Water Conveyance System	249,490	195,290	54,200	-	-	-	-	-		42,960	11,920	64,450	17,880	64,450	17,880	23,430	6,520
4. Irrigation	363,330	96,250	267,080	-	-	-	-	-	20,650	29,310	80,350	31,890	78,820	27,260	67,870	7,790	19,390
Sub-total	1,913,260	662,730	1,250,530	-	136,010	11,140	155,440	96,510	185,350	183,630	284,080	215,120	319,690	125,110	144,050	31,220	25,910
5. Engineering Services	169,100	118,360	50,740	11,890	5,090	19,260	8,260	19,690	8,240	23,950	10,060	24,900	11,080	12,310	5,280	6,360	2,730
6. Administration Cost of Exec. Agency	83,760	21,800	61,960	-	3,030	-	5,280	-	5,920	4,360	12,980	8,720	16,070	4,360	12,150	4,360	6,530
Sub-total	2,166,120	802,890	1,363,230	11,890	144,130	30,400	168,980	116,200	199,510	211,940	307,120	248,740	346,840	141,780	161,480	41,940	35,170
7. Physical Contingency	324,920	120,450	204,470	1,780	21,620	4,560	25,340	17,430	29,920	31,790	46,070	37,320	52,030	21,270	24,220	6,300	5,270
Sub-total	2,491,040	923,340	1,567,700	13,670	165,750	34,960	194,320	133,630	229,430	243,730	353,190	286,060	398,870	163,050	185,700	48,240	40,440
8. Price Contingency	1,444,570	495,330	949,240	2,280	34,810	9,080	64,320	48,170	106,480	114,400	215,630	167,880	307,750	116,390	176,190	37,130	44,060
Grand Total	3,935,610	1,418 670	2,516,940	15,950	200,560	44,040	258,640	181,800	335,910	358,130	568,820	453,940	706,620	279,440	361.890	85,370	84,500

SECOND STAGE

Item	Summary			1992		1993		1994		1995		1996	
	Total	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. Water Conveyance System	195,390	164,470	30,920	-	-	36,180	6,810	54,280	10,200	54,280	10,200	19,730	3,710
2. Irrigation	-	-	-	-	-	-	-	-	-	-	-	-	-
Sub-total	195,390	164,470	30,920	-	-	36,180	6,810	54,280	10,200	54,280	10,200	19,730	3,710
3. Engineering Services	15,630	10,940	4,690	2,620	1,130	2,410	1,030	2,410	1,030	2,410	1,030	1,090	470
4. Administration Cost of Exec. Agency	7,820	-	7,820	-	250		1,720	-	2,460	-	2,470	-	920
Sub-total	218,840	175,410	43,430	2,620	1,380	38,590	9,560	56,690	13,690	56,690	13,700	20,820	5,100
5. Physical Contingency	32,830	26,310	6,520	390	210	5,790	1,430	8,500	2,060	8,500	2,060	3,130	760
Sub-total	251,670	201,720	49,950	3,010	1,590	44,380	10,990	65,190	15,750	65,190	15,760	23,950	5,860
6. Price Contingency	378,310	281,430	96,880	3,020	2,140	51,430	17,500	86,810	29,190	98,970	33,680	41,200	14,370
Grand Total	629,980	483,150	146,830	6,030	3,730	95,810	28,490	152,000	44,940	164,160	49,440	65,150	20,230

Table 19 MAJOR CONSTRUCTION PLANT AND EQUIPMENT OF KHLONG LUANG DAM

Item	Capacity	Quantity
Aggregate plant	80 tons/hr	1 set
Concrete plant	18 cft x 1	1 set
Bulldozer W/R	32 tons	5 nos.
Bulldozer	32 tons	5 nos.
- do -	21 tons	5 nos.
- do -	16 tons	5 nos.
Back hoe	1.2 m^3	8 nos.
- do -	0.7 m^3	2 nos.
Power shovel	1.2 m^3	4 nos.
Tractor shovel	2.2 m^3	7 nos.
- do -	1.8 m^3	1 no.
Wheel loader	3.2 m^3	2 nos.
- do -	2.2 m^3	1 no.
- do -	1.8 m^3	2 nos.
Dump truck	15 tons	57 nos.
- do.-	8 tons	100 nos.
Vibration roller	10 tons	5 nos.
Diesel engine generator	150 kW	2 nos.
Agitator truck	3.2 m^3	4 nos.
Motor grader	3.7 m	2 nos.
Road roller	8/10 tons	4 nos.
Hydraulic crane	25 tons	1 no.
Water tanker	8 m^3	6 nos.
Asphalt spreader	30 l/min	6 nos.
Tractor & trailer	30 tons	1 no.
Spare parts	-	L.S.

Table 20 FINANCIAL AND ECONOMIC PRICE OF AGRICULTURAL INPUTS AND OUTPUTS

(Unit: Baht/ton)

Item	Financial Price	Economic Price
Rice (paddy) - Local variety	3,000	8,430
Rice (paddy) - Improved variety	2,850	8,010
Groundnuts	6,000	10,530
Mungbeans	8,500	15,120
Sugarcane	500	500
Cassava	700	1,250
Vegetables	5,400	8,970
Seed - Rice	3,600	9,860
- Groundnuts	9,000	16,110
- Mungbeans	10,000	17,900
- Sugarcane	0.015/set	0.027/set
- Vegetables	22/kg	36/kg
Fertilizer - Compound (16:20:0)	6,400	10,640
- Compound (15:15:15)	6,460	10,740
- Compound (13:13:21)	6,360	10,570
- Urea	6,000	9,970
Agro-chemicals		
- Insecticides	70/500 gr	120/kg
- Herbicides	70/2 ℓ	120/2 ℓ
- Rodenticides	2.4/kg	4/kg
Wage - Light work	30/day	34/day
- Heavy work	40/day	45/day

Note; Detail of economic price is presented in the Sectoral Report III, " Agriculture Development Plan."

Table 21 AGRICULTURE BENEFIT

Crop	Price (฿/t)	Production (t/ha)	Gross Production Value (฿/ha)	Production Cost (฿/ha)	Net Production Value (฿/ha)	Area (ha)	Benefit (฿ 10^3)
With Project							
Rice (Local)	8,430	4.0	33.720	6,930	26,790	1,320	35,363
Rice (High Yielding)	8,010	4.5	36,050	8,800	27,250	5,280	143,880
Mungbeans	15,120	1.5	22,680	5,160	17,520	420	7,358
Groundnuts	10,530	2.5	26,330	4,990	21,340	1,610	34,357
Vegetable	8,950	10.0	89,500	15,600	73,900	610	45,079
Total	-					9,240	266,037
Without Project							
Rice (Local)	8,430	1.8	15,170	4,480	10,690	3,970	42,439
Rice (High Yielding)	8,010	2.3	18,420	7,220	11,200	2,650	29,680
Groundnuts	10,530	1.3	13,690	2,910	10,780	80	862
Sugarcane	500	45.3	22,670	8,140	14,530	390	5,667
Cassava	1,250	16.0	20,000	3,180	16,820	400	6,728
Total	-					7,490	85,376

Table 22 DISBURSEMENT SCHEDULE OF ECONOMIC INVESTMENT COST

FIRST STAGE

(Unit: ₹ 10^3)

Item	Summary			1985		1986		1987		1988		1989		1990		1991	
	Total	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.
1. Dam	895,830	371,190	524,640	-	-	11,140	15,740	96,510	131,160	111,360	152,140	118,780	178,380	33,400	47,220	-	-
2. Water Conveyance System	234,990	195,290	39,700	-	-	-	-	-	-	42,960	8,740	64,450	13,100	64,450	13,100	23,430	4,760
3. Irrigation	314,020	96,250	217,770	-	-	-	-	-	17,030	29,310	65,500	31,890	64,180	27,260	55,270	7,790	15,790
Sub-total	1,444,840	662,730	782,110	-	-	11,140	15,740	96,510	148,190	183,630	226,380	215,120	255,660	125,110	115,590	31,220	20,550
4. Engineering Services	161,450	118,360	43,090	11,890	4,330	19,260	7,020	19,690	7,000	23,950	8,540	24,900	9,410	12,310	4,480	6,360	2,310
5. Administration Cost of Exec. Agency	66,060	21,800	44,260	-	-	-	2,090	-	6,290	4,360	10,660	8,720	12,740	4,360	7,980	4,360	4,500
Sub-total	1,672,350	802,890	869,460	11,890	4,330	30,400	24,850	116,200	161,480	211,940	245,580	248,740	277,810	141,780	128,050	41,940	27,360
6. Physical Contingency	250,860	120,450	130,410	1,780	650	4,560	3,720	17,430	24,220	31,790	36,830	37,320	41,670	21,270	19,210	6,300	4,110
Grand Total	1,923,210	923,340	999,870	13,670	4,980	34,960	28,570	133,630	185,700	243,730	282,410	286,060	319,480	163,050	147,260	48,240	31,470

SECOND STAGE

Item	Summary			1992		1993		1994		1995		1996	
	Total	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. Water Conveyance System	185,770	164,470	21,300	-	-	36,180	4,680	54,280	7,030	54,280	7,030	19,730	2,560
Sub-total	185,770	164,470	21,300	-	-	36,180	4,680	54,280	7,030	54,280	7,030	19,730	2,560
2. Engineering Services	14,930	10,940	3,990	2,620	960	2,410	880	2,410	880	2,410	880	1,090	390
3. Administration Cost of Exec. Agency	7,430	-	7,430	-	310	-	1,630	-	2,310	-	2,310	-	870
Sub-total	208,130	175,410	32,720	2,620	1,270	38,590	7,190	56,690	10,220	56,690	10,220	20,820	3,820
4. Physical Contingency	31,210	26,310	4,900	390	190	5,790	1,080	8,500	1,530	8,500	1,530	3,130	570
Grand Total	239,320	201,720	37,620	3,010	1,460	44,380	8,270	65,190	11,750	65,190	11,750	23,950	4,390

Table 23 BENEFIT - COST STREAM

(Unit: ฿ 10^6)

No.	Year	Cost				Benefit				(B)-(C)
		Investment Cost	Operation & Maintenance Cost	Replacement Cost	Total (C)	Domestic & Industrial Water Supply	Irrigation Water Supply	Flood Control	Total (B)	
1	1985	18.7	0.0	0.0	18.7	0.0	0.0	0.0	0.0	-18.7
2	1986	63.5	0.0	0.0	63.5	0.0	0.0	0.0	0.0	-63.5
3	1987	319.3	0.0	0.0	319.3	0.0	0.0	0.0	0.0	-319.3
4	1988	526.1	0.0	0.0	526.1	0.0	0.0	0.0	0.0	-526.1
5	1989	605.5	0.0	0.0	605.5	0.0	0.0	0.0	0.0	-605.5
6	1990	310.3	1.8	0.0	312.1	0.0	15.7	49.8	65.6	-246.6
7	1991	79.7	9.2	0.0	88.9	97.7	51.8	49.8	199.2	110.3
8	1992	4.5	10.8	0.0	15.3	131.0	87.9	49.8	268.8	253.5
9	1993	52.7	11.5	0.0	64.1	162.0	106.0	49.8	317.8	253.7
10	1994	76.9	12.4	0.0	89.3	195.4	124.1	49.8	369.2	279.9
11	1995	76.9	13.2	0.0	90.1	226.3	142.1	49.8	418.2	328.1
12	1996	28.3	16.5	0.0	44.8	259.7	142.1	49.8	451.6	406.7
13	1997	0.0	17.4	0.0	17.4	293.0	142.1	49.8	484.9	467.5
14	1998	0.0	18.2	0.0	18.2	326.4	142.1	49.8	518.3	500.1
15	1999	0.0	19.0	19.7	38.6	357.4	142.1	49.8	549.2	510.6
16	2000	0.0	19.9	0.0	19.9	390.7	142.1	49.8	582.6	562.7
17	2001	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
18	2002	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
19	2003	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
20	2004	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
21	2005	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
22	2006	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
23	2007	0.0	20.8	38.0	58.8	424.1	142.1	49.8	616.0	557.3
24	2008	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
25	2009	0.0	20.8	19.7	40.4	424.1	142.1	49.8	616.0	575.6
26	2010	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
27	2011	0.0	20.8	10.7	31.5	424.1	142.1	49.8	616.0	584.6
28	2012	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
29	2013	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
30	2014	0.0	20.8	20.3	41.1	424.1	142.1	49.8	616.0	575.0
31	2015	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
32	2016	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
33	2017	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
34	2018	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
35	2019	0.0	20.8	19.7	40.4	424.1	142.1	49.8	616.0	575.6
36	2020	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
37	2021	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
38	2022	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
39	2023	0.0	20.8	38.0	58.8	424.1	142.1	49.8	616.0	557.3
40	2024	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
41	2025	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
42	2026	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
43	2027	0.0	20.8	10.7	31.5	424.1	142.1	49.8	616.0	584.6
44	2028	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
45	2029	0.0	20.8	19.7	40.4	424.1	142.1	49.8	616.0	575.6
46	2030	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
47	2031	0.0	20.8	181.0	201.8	424.1	142.1	49.8	616.0	414.3
48	2032	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
49	2033	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
50	2034	0.0	20.8	0.0	20.8	424.1	142.1	49.8	616.0	595.3
	Total	2,162.6	856.5	377.4	3,396.4	16,858.7	6,070.2	2,241.0	25,169.9	21,773.4

Table 24 DISBURSEMENT SCHEDULE OF ALLOCATED INVESTMENT COST

(Unit: ฿10³)

Year	Domestic and Industrial Water Supply			Irrigation			Total
	Foreign Currency Portion	Local Currency Portion	Sub-total	Foreign Currency Portion	Local Currency Portion	Sub-total	
FIRST STAGE							
1985	5,100	64,180	69,280	8,610	108,300	116,910	186,190
1986	11,330	80,630	91,960	27,740	142,740	170,480	262,440
1987	59,760	95,220	154,980	98,200	200,470	298,670	453,650
1988	145,710	151,360	297,070	182,700	366,140	548,840	845,910
1989	201,470	204,410	405,880	218,230	436,030	654,260	1,060,140
1990	156,840	102,500	259,340	112,200	240,130	352,330	611,670
1991	48,940	21,650	70,590	36,430	62,850	99,280	169,870
Sub-total	629,150	719,950	1,349,100	684,110	1,556,660	2,240,770	3,589,870
SECOND STAGE							
1992	6,040	3,720	9,760	-	-	-	9,760
1993	95,810	28,490	124,300	-	-	-	124,300
1994	151,990	44,950	196,940	-	-	-	196,940
1995	164,150	49,440	213,590	-	-	-	213,590
1996	65,160	20,230	85,390	-	-	-	85,390
Sub-total	483,150	146,830	629,980	-	-	-	629,980
Total	1,112,300	866,780	1,979,080	684,110	1,556,660	2,240,770	4,219,850

Table 25 FINANCIAL CASH FLOW FOR DOMESTIC AND INDUSTRIAL DEVELOPMENT

(Unit: ¥10^3)

No.	Year	Loan Disburse-ment	Accu-mulated Loan	Revenue (A)	Expenditure					Gross Income (A)-(B)	Government Subsidy	Total Income	Accu-mulated Income
					OM & R Cost (1)	OM & R Cost (2)	Repayment on Loan Interest	Repayment on Loan Capital	Total (B)				
1.	1985	5,100	5,100	0	0	0	178	0	178	-178	178	0	0
2.	1986	11,330	16,430	0	0	0	575	0	575	-575	575	0	0
3.	1987	59,760	76,190	0	0	0	2,666	0	2,666	-2,666	2,666	0	0
4.	1988	145,710	221,900	0	0	0	7,766	0	7,766	-7,766	7,766	0	0
5.	1989	201,470	423,370	0	0	0	14,817	0	14,817	-14,817	14,817	0	0
6.	1990	156,840	580,210	0	0	0	20,307	0	20,307	-20,307	20,307	0	0
7.	1991	48,940	629,150	13,120	8,200	5,730	22,020	0	35,950	-22,830	22,830	0	0
8.	1992	6,040	635,190	17,600	11,000	6,530	22,231	0	39,762	-22,162	22,162	0	0
9.	1993	95,810	731,000	21,760	13,600	7,330	25,585	0	46,515	-24,755	24,755	0	0
10.	1994	151,990	882,990	26,240	16,400	8,230	30,904	255	55,790	-29,550	29,550	0	0
11.	1995	164,150	1,046,885	30,400	19,000	9,030	36,640	821	65,492	-35,092	35,092	0	0
12.	1996	65,160	1,111,223	34,880	21,800	12,430	38,892	3,809	76,932	-42,052	42,052	0	0
13.	1997	0	1,107,414	39,360	24,600	13,330	38,759	11,095	87,784	-48,424	48,424	0	0
14.	1998	0	1,096,319	43,840	27,400	14,230	38,371	21,168	101,170	-57,330	57,330	0	0
15.	1999	0	1,075,150	48,000	30,000	15,030	37,630	29,010	111,671	-63,671	63,671	0	0
16.	2000	0	1,046,140	52,480	32,800	15,930	36,614	31,457	116,802	-64,322	64,322	0	0
17.	2001	0	1,014,682	56,960	35,600	16,830	35,513	31,759	119,703	-62,743	62,743	0	0
18.	2002	0	982,923	56,960	35,600	16,830	34,402	36,550	123,382	-66,422	66,422	0	0
19.	2003	0	946,373	56,960	35,600	16,830	33,123	44,149	129,702	-72,742	72,742	0	0
20.	2004	0	902,223	56,960	35,600	16,830	31,577	52,357	136,365	-79,405	79,405	0	0
21.	2005	0	849,866	56,960	35,600	16,830	29,745	55,615	137,790	-80,830	80,830	0	0
22.	2006	0	794,251	56,960	35,600	16,830	27,798	55,615	135,844	-78,884	78,884	0	0
23.	2007	0	738,636	56,960	35,600	54,930	25,852	55,615	171,997	-115,037	115,037	0	0
24.	2008	0	683,021	56,960	35,600	16,830	23,905	55,615	131,951	-74,991	74,991	0	0
25.	2009	0	627,406	56,960	35,600	16,830	21,959	55,615	130,004	-73,044	73,044	0	0
26.	2010	0	571,791	56,960	35,600	16,830	20,012	55,615	128,058	-71,098	71,098	0	0
27.	2011	0	516,176	56,960	35,600	16,830	18,066	55,615	126,111	-69,151	69,151	0	0
28	2012	0	460,561	56,960	35,600	27,530	16,119	55,615	134,864	-77,904	77,904	0	0
29.	2013	0	404,946	56,960	35,600	16,830	14,173	55,615	122,218	-65,258	65,258	0	0
30.	2014	0	349,331	56,960	35,600	16,830	12,226	55,360	120,017	-63,057	63,057	0	0
31.	2015	0	293,971	56,960	35,600	16,830	10,289	54,793	117,512	-60,552	60,552	0	0
32.	2016	0	239,178	56,960	35,600	16,830	8,371	51,805	112,607	-55,647	55,647	0	0
33.	2017	0	187,372	56,960	35,600	16,830	6,558	44,520	103,508	-46,548	46,548	0	0
34.	2018	0	142,852	56,960	35,600	16,830	4,999	34,446	91,876	-34,916	34,916	0	0
35.	2019	0	108,406	56,960	35,600	16,830	3,794	26,604	82,829	-25,869	25,869	0	0
36.	2020	0	81,801	56,960	35,600	16,830	2,863	24,157	79,450	-22,490	22,490	0	0
37.	2021	0	57,644	56,960	35,600	16,830	2,017	23,855	78,303	-21,343	21,343	0	0
38.	2022	0	33,788	56,960	35,600	16,830	1,182	19,065	72,677	-15,717	15,717	0	0
39.	2023	0	14,723	56,960	35,600	54,930	515	11,465	102,511	-45,551	45,551	0	0
40.	2024	0	3,258	56,960	35,600	16,830	114	3,258	55,802	1,158	0	1,158	1,158
41.	2025	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	5,688
42.	2026	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	10,218
43.	2027	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	14,748
44.	2028	0	0	56,960	35,600	27,530	0	0	63,130	-6,170	0	-6,170	8,578
45.	2029	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	13,108
46.	2030	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	17,638
47.	2031	0	0	56,960	35,600	201,630	0	0	237,230	-180,270	162,632	-17,638	0
48.	2032	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	4,530
49.	2033	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	9,060
50.	2034	0	0	56,960	35,600	16,830	0	0	52,430	4,530	0	4,530	13,590

Note: OM & R (1); OM & R cost for distribution and purification
OM & R (2); OM & R cost for raw water conveyance

Table 26 FINANCIAL CASH FLOW FOR IRRIGATION DEVELOPMENT

(Unit: $B10^3$)

No.	Year	Loan Disbursement	Accumulated Loan	Outflow				Inflow			Balance of Payment (B) - (A)
				O M&R Cost	Repayment on Loan Interest	Repayment on Loan Capital	Total (A)	Project Revenue	Government Subsidy	Total (B)	
1	1985	8,610	8,610	0	301	0	301	0	301	301	0
2	1986	27,740	36,350	0	1,272	0	1,272	0	1,272	1,272	0
3	1987	98,200	134,550	0	4,709	0	4,709	0	4,709	4,709	0
4	1988	182,700	317,250	0	11,103	0	11,103	0	11,103	11,103	0
5	1989	218,230	535,480	0	18,741	0	18,741	0	18,741	18,741	0
6	1990	112,200	647,680	1,330	22,668	0	23,998	1,320	22,668	23,998	0
7	1991	36,430	684,110	3,590	23,943	0	27,533	3,590	23,943	27,533	0
8	1992	0	684,110	4,420	23,943	0	28,363	4,420	23,943	28,363	0
9	1993	0	684,110	4,420	23,943	0	28,363	4,420	23,943	28,363	0
10	1994	0	684,110	4,420	23,943	430	28,794	4,420	24,374	28,794	0
11	1995	0	683,679	4,420	23,928	1,817	30,166	4,420	25,746	30,166	0
12	1996	0	681,862	4,420	23,865	6,727	35,012	4,420	30,592	35,012	0
13	1997	0	675,134	4,420	23,629	15,862	43,912	4,420	39,492	43,912	0
14	1998	0	659,272	4,420	23,074	26,774	54,268	4,420	49,848	54,268	0
15	1999	0	632,498	26,220	22,137	32,384	80,741	4,420	76,321	80,741	0
16	2000	0	600,114	4,420	21,003	34,205	59,629	4,420	55,209	59,629	0
17	2001	0	565,908	4,420	19,806	34,205	58,432	4,420	54,012	58,432	0
18	2002	0	531,700	4,420	18,609	34,205	57,235	4,420	52,815	57,235	0
19	2003	0	497,497	4,420	17,412	34,205	56,037	4,420	51,617	56,037	0
20	2004	0	463,292	4,420	16,215	34,205	54,840	4,420	50,420	54,840	0
21	2005	0	429,086	4,420	15,018	34,205	53,643	4,420	49,223	53,643	0
22	2006	0	394,881	4,420	13,820	34,205	52,446	4,420	48,026	52,446	0
23	2007	0	360,675	4,420	12,623	34,205	51,249	4,420	46,829	51,249	0
24	2008	0	326,470	4,420	11,426	34,205	50,051	4,420	45,631	50,051	0
25	2009	0	292,264	26,220	10,229	34,205	70,654	4,420	66,234	70,654	0
26	2010	0	258,059	4,420	9,032	34,205	47,657	4,420	43,237	47,657	0
27	2011	0	223,853	4,420	7,834	34,205	46,460	4,420	42,040	46,460	0
28	2012	0	189,648	4,420	6,637	34,205	45,263	4,420	40,843	45,263	0
29	2013	0	155,442	4,420	5,440	34,205	44,065	4,420	39,645	44,065	0
30	2014	0	121,237	26,930	4,243	33,775	64,948	4,420	60,528	64,948	0
31	2015	0	87,462	4,420	3,061	32,388	39,869	4,420	35,449	39,869	0
32	2016	0	55,074	4,420	1,927	27,478	33,825	4,420	29,405	33,825	0
33	2017	0	27,596	4,420	965	18,343	23,728	4,420	19,308	23,728	0
34	2018	0	9,253	4,420	323	7,431	12,175	4,420	7,755	12,175	0
35	2019	0	1,821	26,220	63	1,821	28,105	4,420	23,685	28,105	0
36	2020	0	0	4,420	0	0	4,420	4,420	0	4,420	0
37	2021	0	0	4,420	0	0	4,420	4,420	0	4,420	0
38	2022	0	0	4,420	0	0	4,420	4,420	0	4,420	0
39	2023	0	0	4,420	0	0	4,420	4,420	0	4,420	0
40	2024	0	0	4,420	0	0	4,420	4,420	0	4,420	0
41	2025	0	0	4,420	0	0	4,420	4,420	0	4,420	0
42	2026	0	0	4,420	0	0	4,420	4,420	0	4,420	0
43	2027	0	0	4,420	0	0	4,420	4,420	0	4,420	0
44	2028	0	0	4,420	0	0	4,420	4,420	0	4,420	0
45	2029	0	0	26,220	0	0	26,220	4,420	21,800	26,220	0
46	2030	0	0	4,420	0	0	4,420	4,420	0	4,420	0
47	2031	0	0	4,420	0	0	4,420	4,420	0	4,420	0
48	2032	0	0	4,420	0	0	4,420	4,420	0	4,420	0
49	2033	0	0	4,420	0	0	4,420	4,420	0	4,420	0
50	2034	0	0	4,420	0	0	4,420	4,420	0	4,420	0

FIGURES

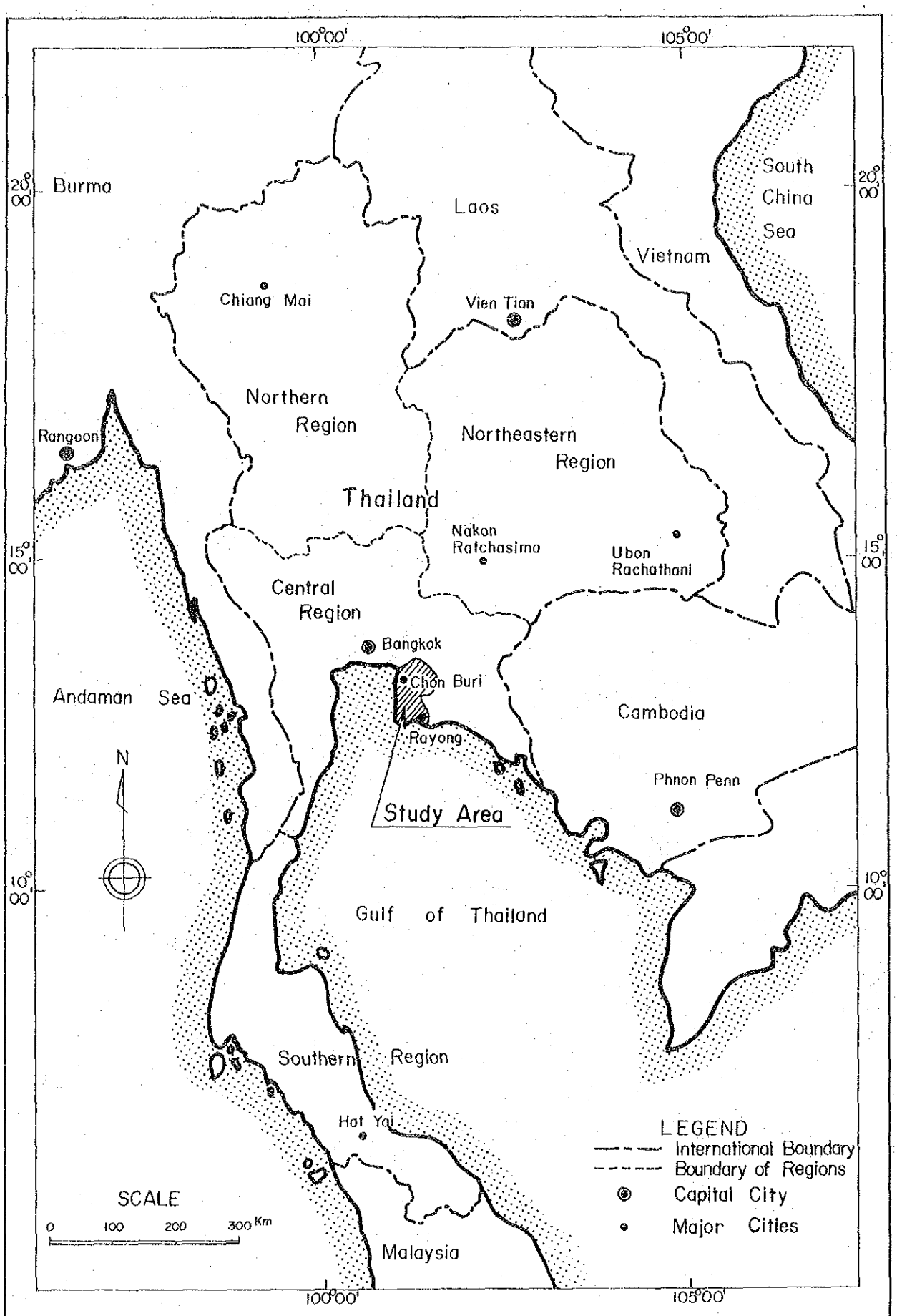

Fig. 1 Map of Thailand

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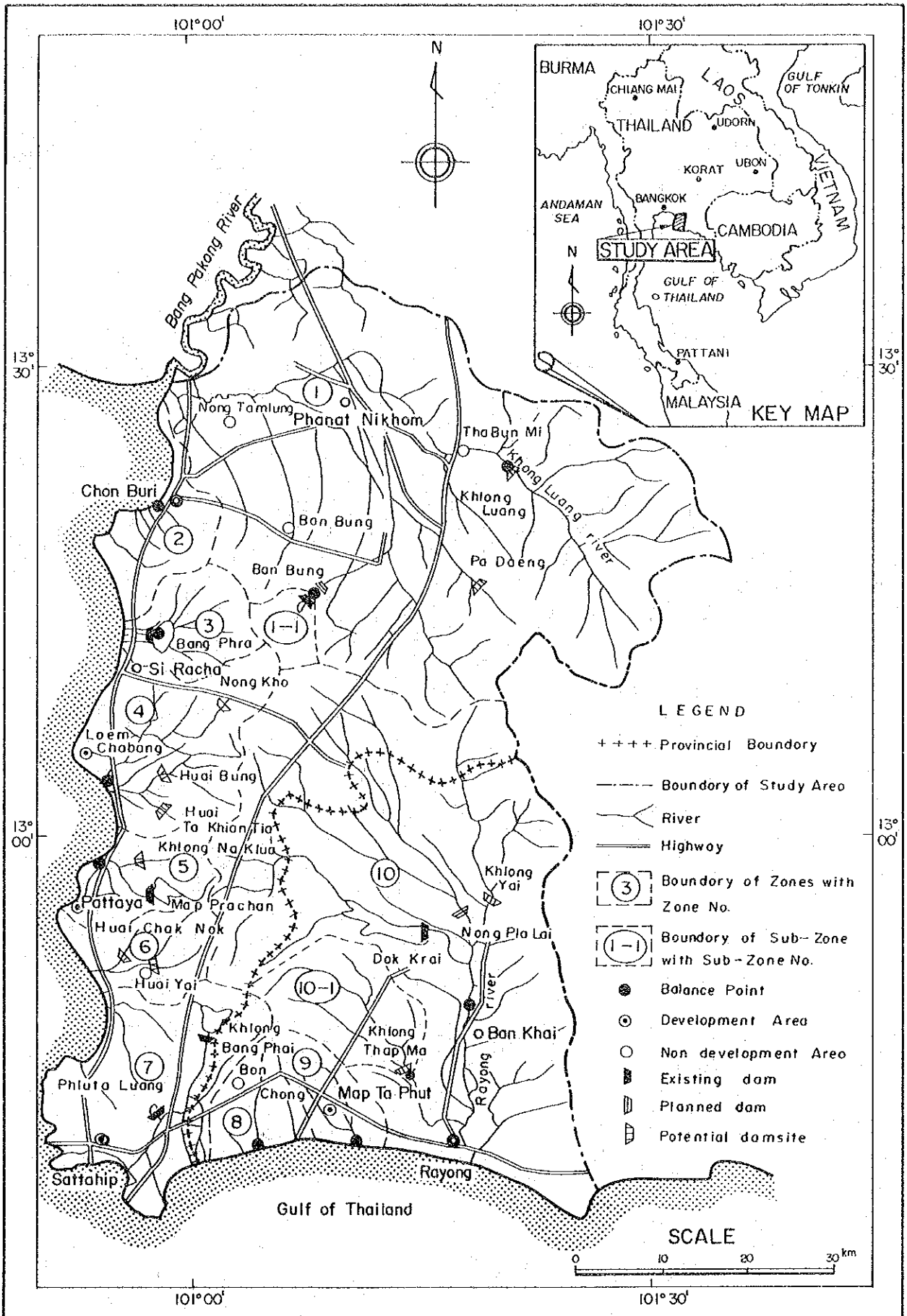

Fig. 2 Map of Study Area

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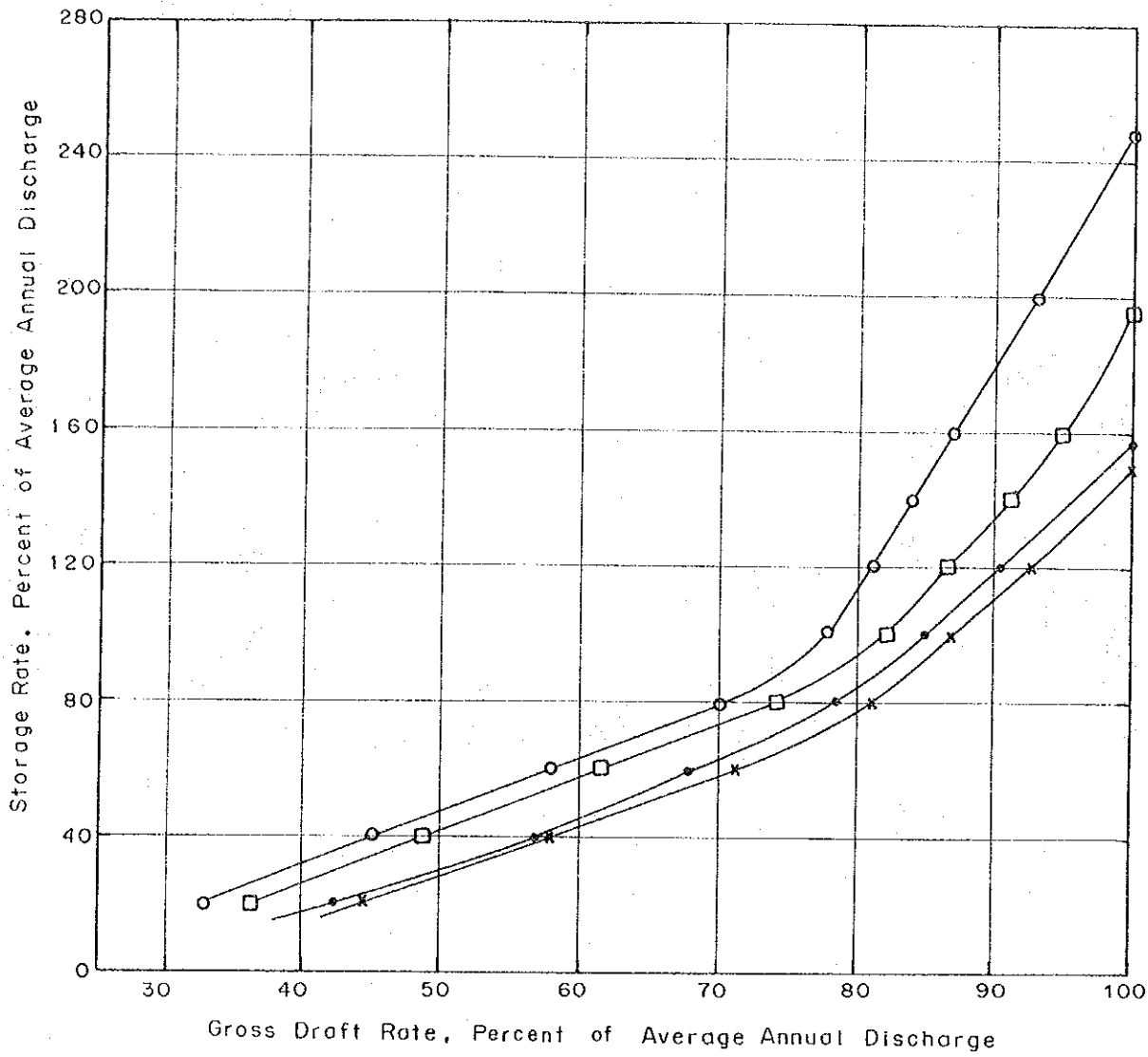

LEGEND

- Dok Krai reservoir, applicable to all existing reservoirs, Khlong Thap Mo and all potential reservoirs, except Pa Daeng
- Nong Pla Lai reservoir
- Khlong Luang reservoir, applicable to Pa Daeng
- Khlong Yai reservoir

Fig. 3 Storage – Draft Curve

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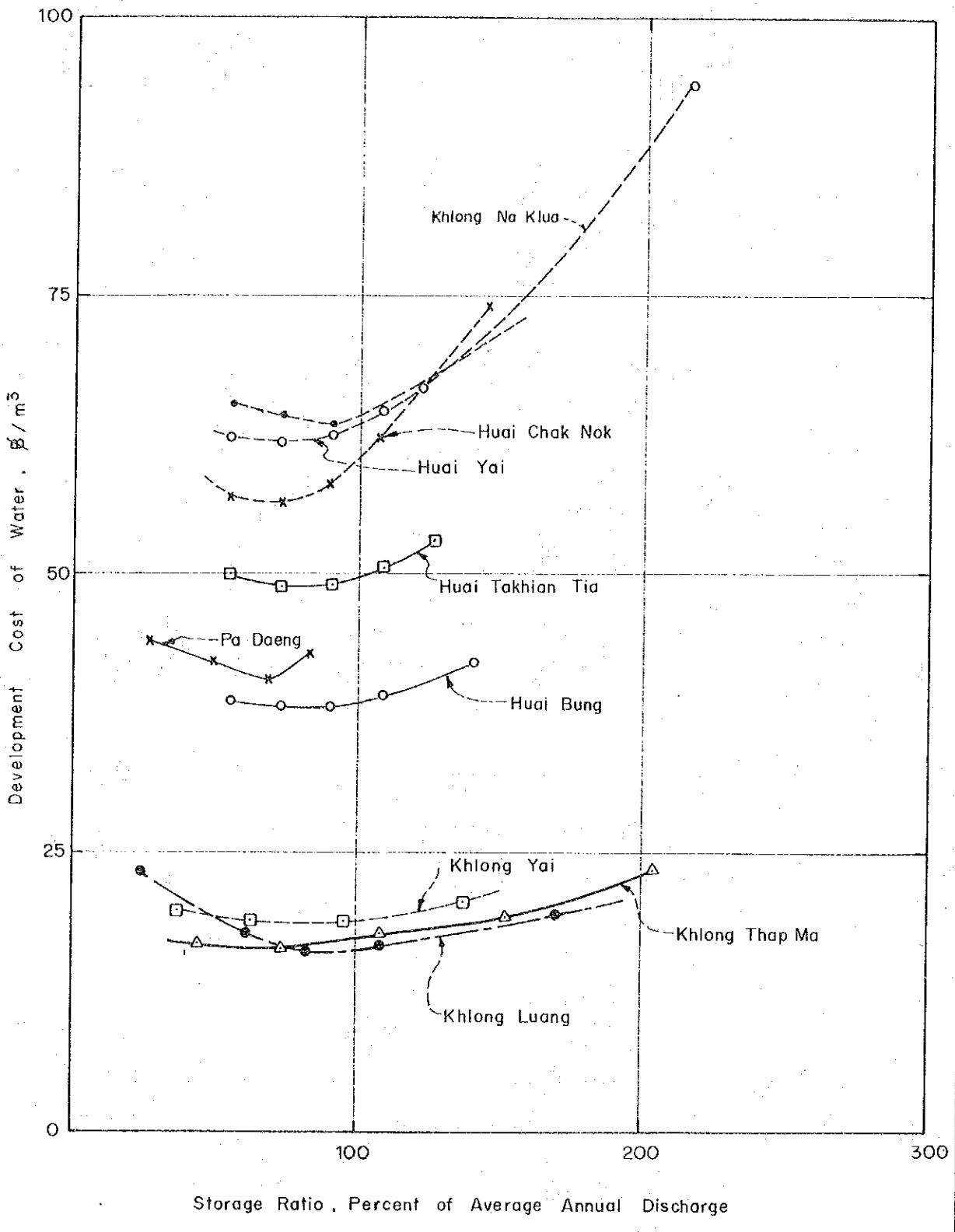

Fig. 4 Relation between Storage Ratio and Development Cost of Water

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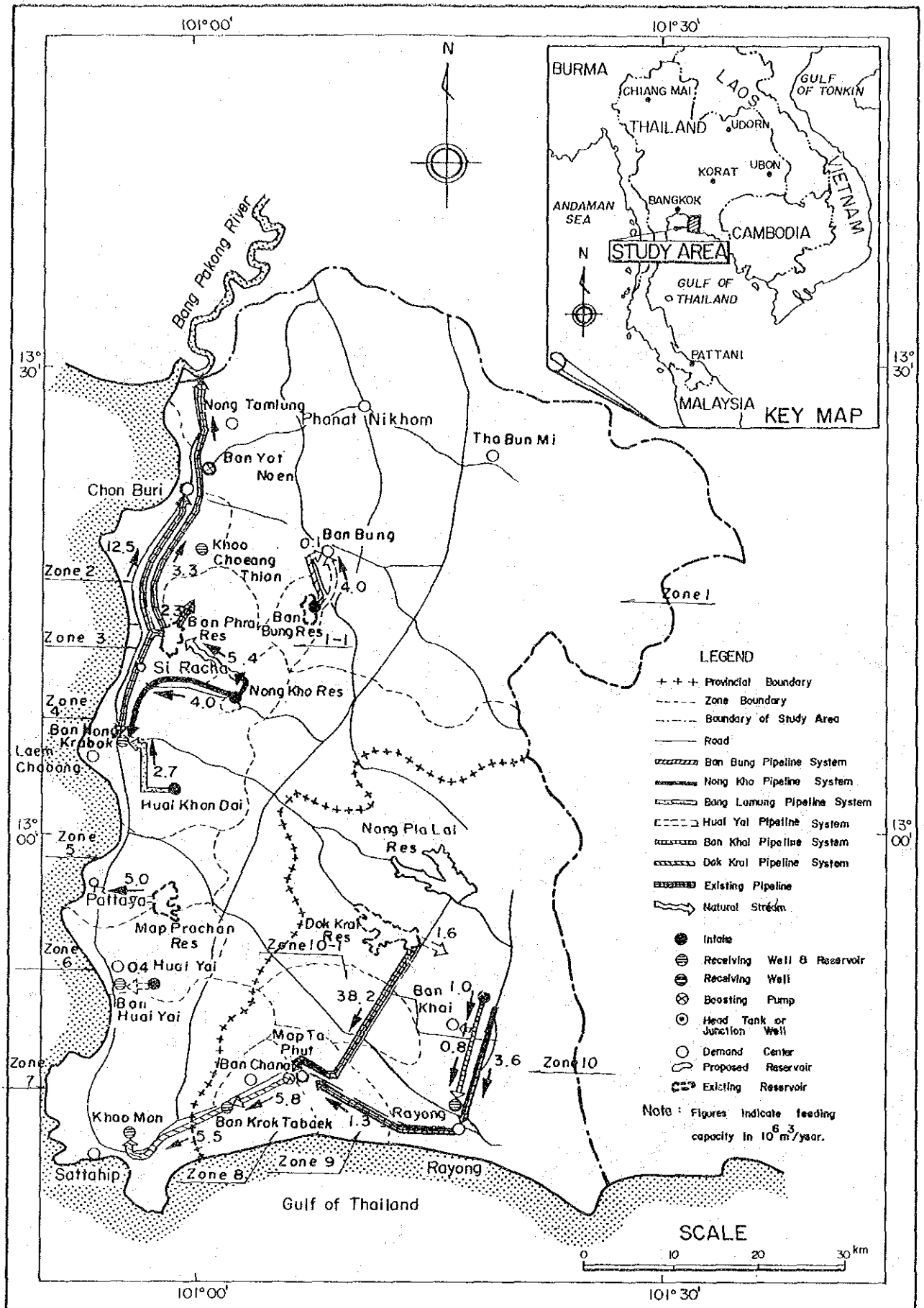

Fig. 5 General Layout of Proposed Development Plan for 1986

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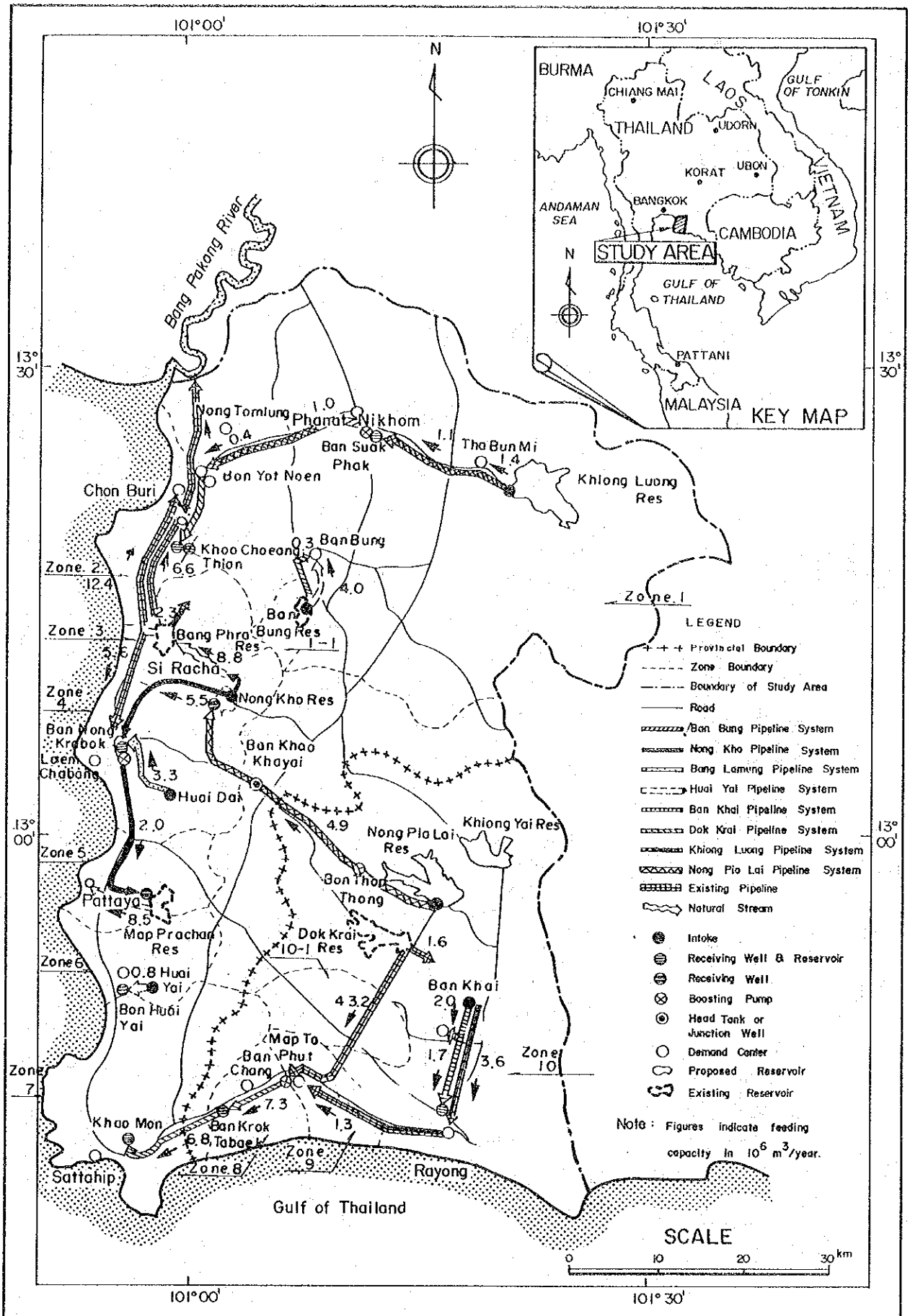

Fig. 6 General Layout of Proposed Development Plan for 1991

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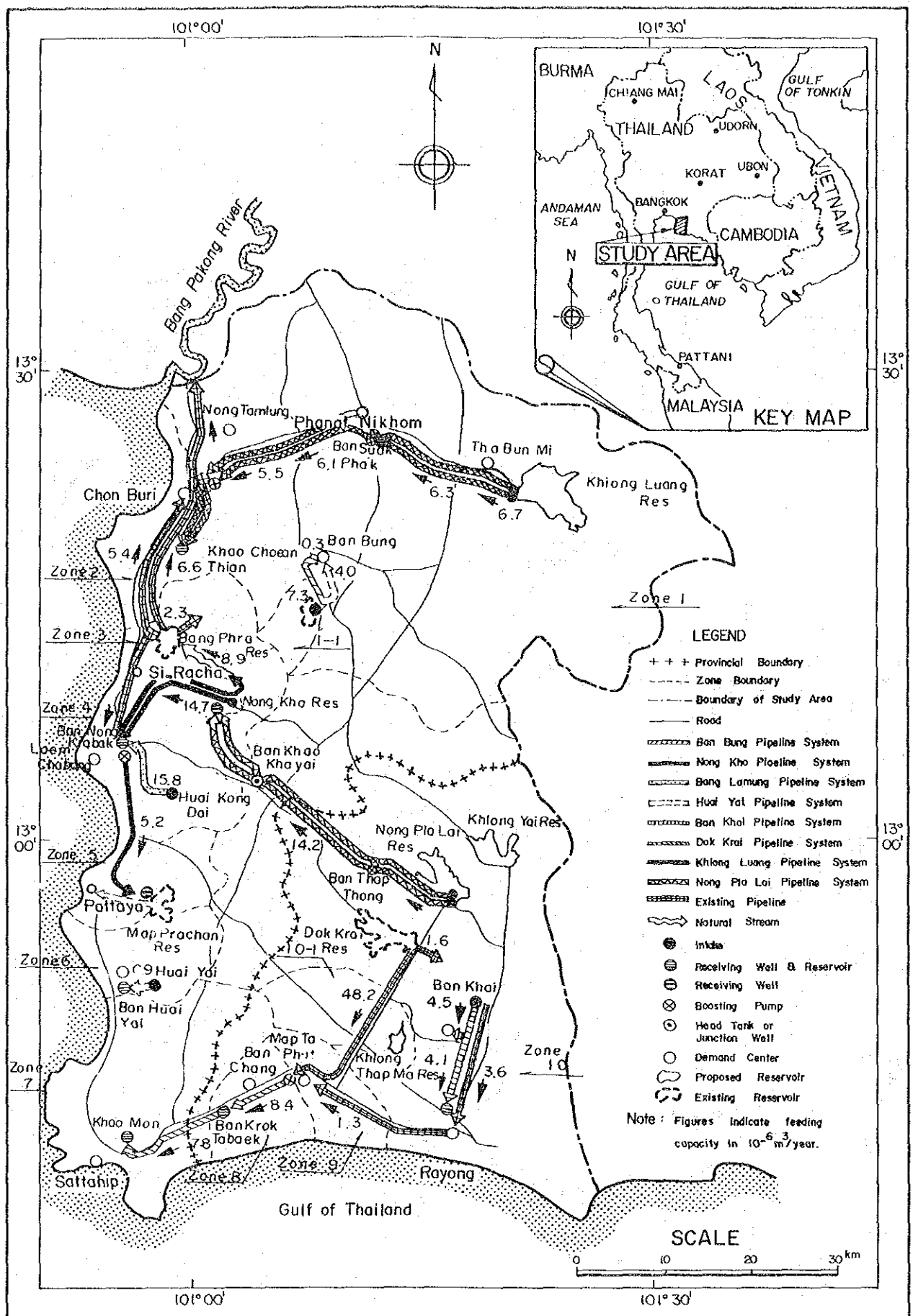

Fig.7 General Layout of Proposed Development Plan for 1996

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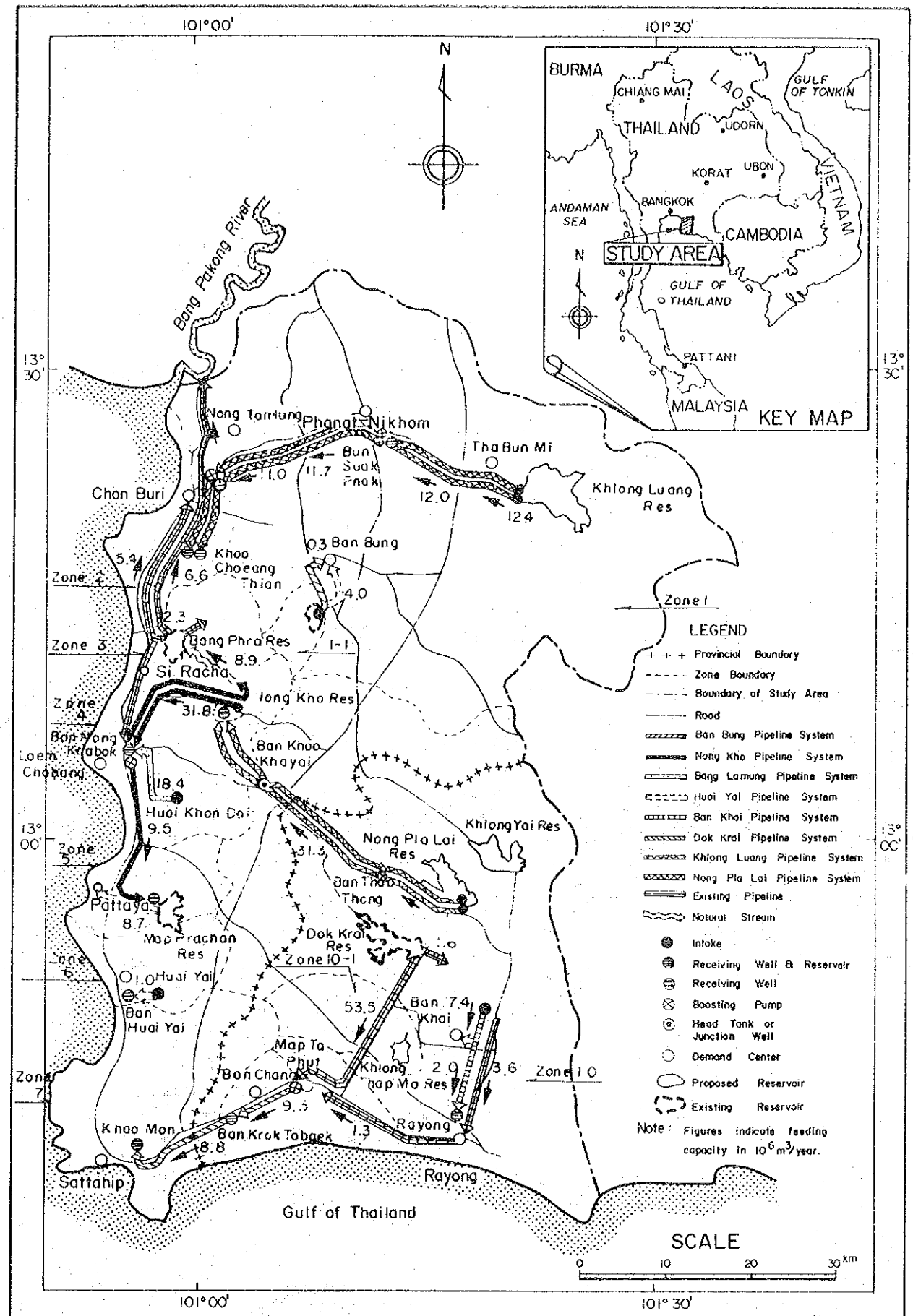

Fig. 8 General Layout of Proposed Development Plan for 2001

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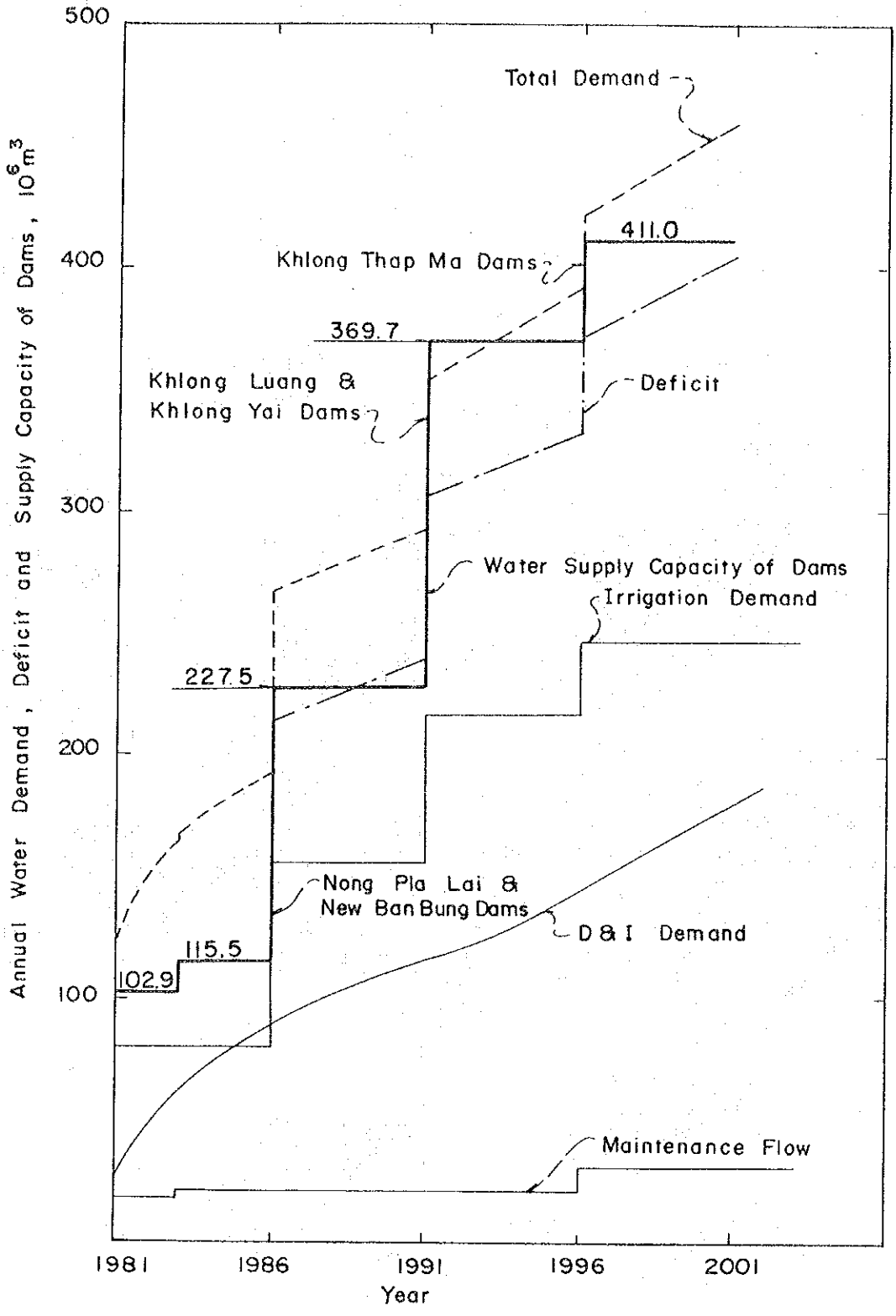

Fig. 9 Relationship among Water Demand, Deficit and Water Supply Capacity of Dams

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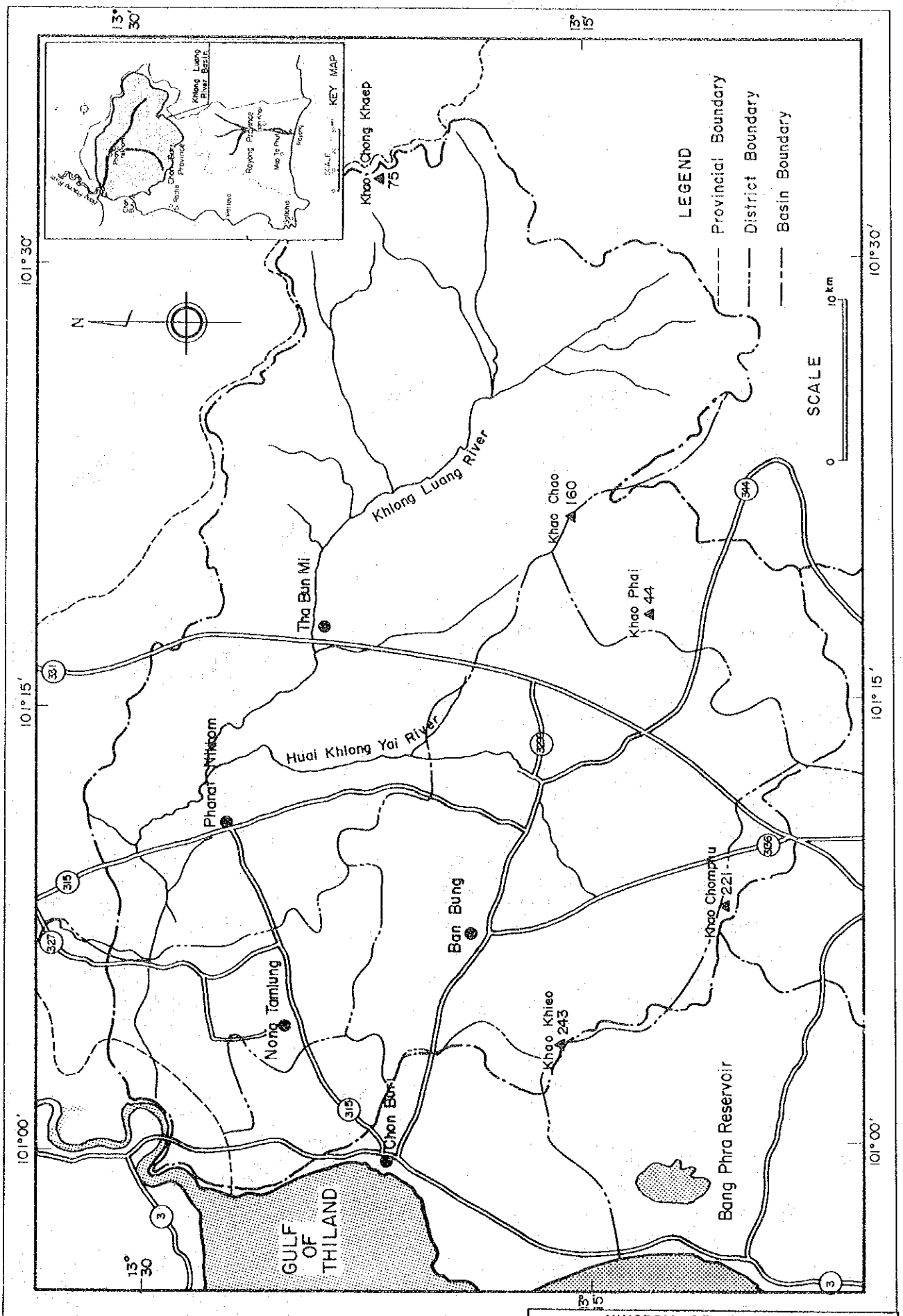

Fig. 10 Map of Khlong Luang River Basin

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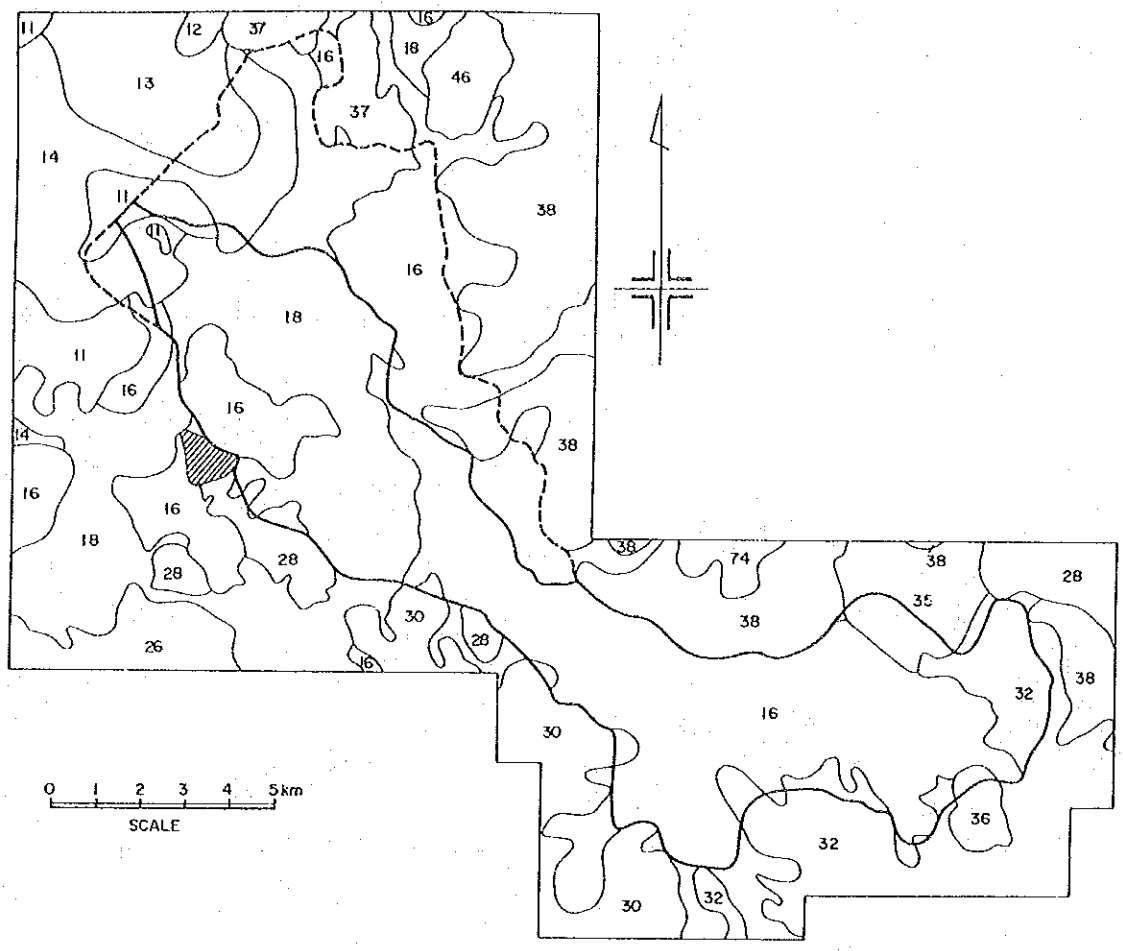

Topography	Materials	Soil Series No. Associated	Study Area (ha)	(%)	Potential Irrigable Area (ha)	(%)	Proposed Scheme Area (ha)	(%)
Former Tidal Flat	Brackish Deposits	11. 12. 13. 14	4,180	14	1,210	11	230	2
Lower Terrace	Riverine Alluvium	16. 18. 26	14,550	48	9,270	79	6,490	84
Higher Terrace	Riverine Alluvium	28. 30. 32. 35 36. 37. 38. 46	11,290	38	1,220	10	1,080	14
Residual Hill and Footslope	Granite Rocks	74	180	–	–	–	–	–
		Total	30,200	100	11,700	100	7,800	100

Fig.11 Soil Map of the Khlong Luang Scheme Area

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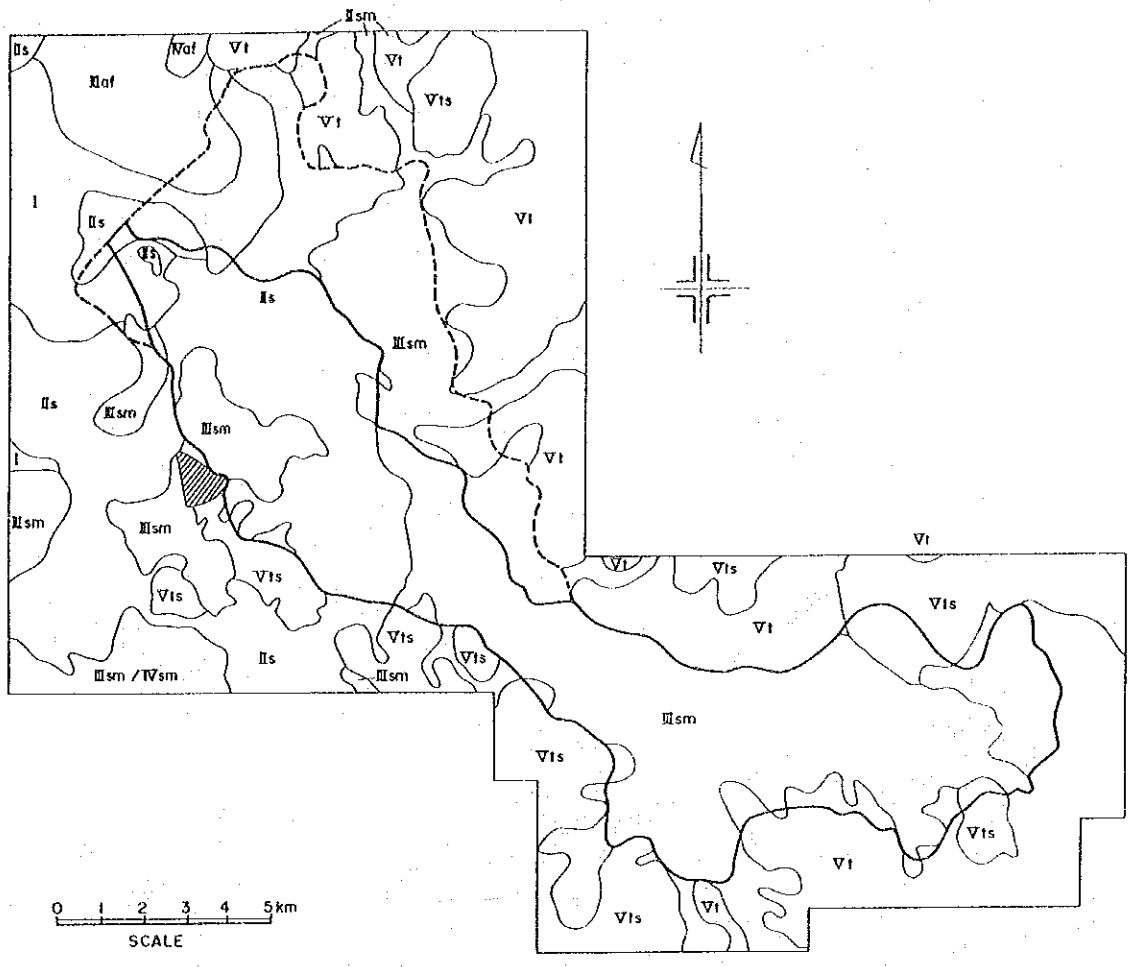

Sutability Class	Study Area	Potential Irrigable Area	Proposed Scheme Area
I	1.830	830	210
II	5.580	2.970	2.120
III	10.500	6.300	4.410
III / IV	610	—	—
IV	70	—	—
V	11. 610	1.600	1.060
Total	30.200	11.700	7.800

(Unit : Ha)

Potential Irrigable Area

Proposed Scheme Area

Fig.12 Land Capability Map for Paddy of the Khlong Luang Scheme Area

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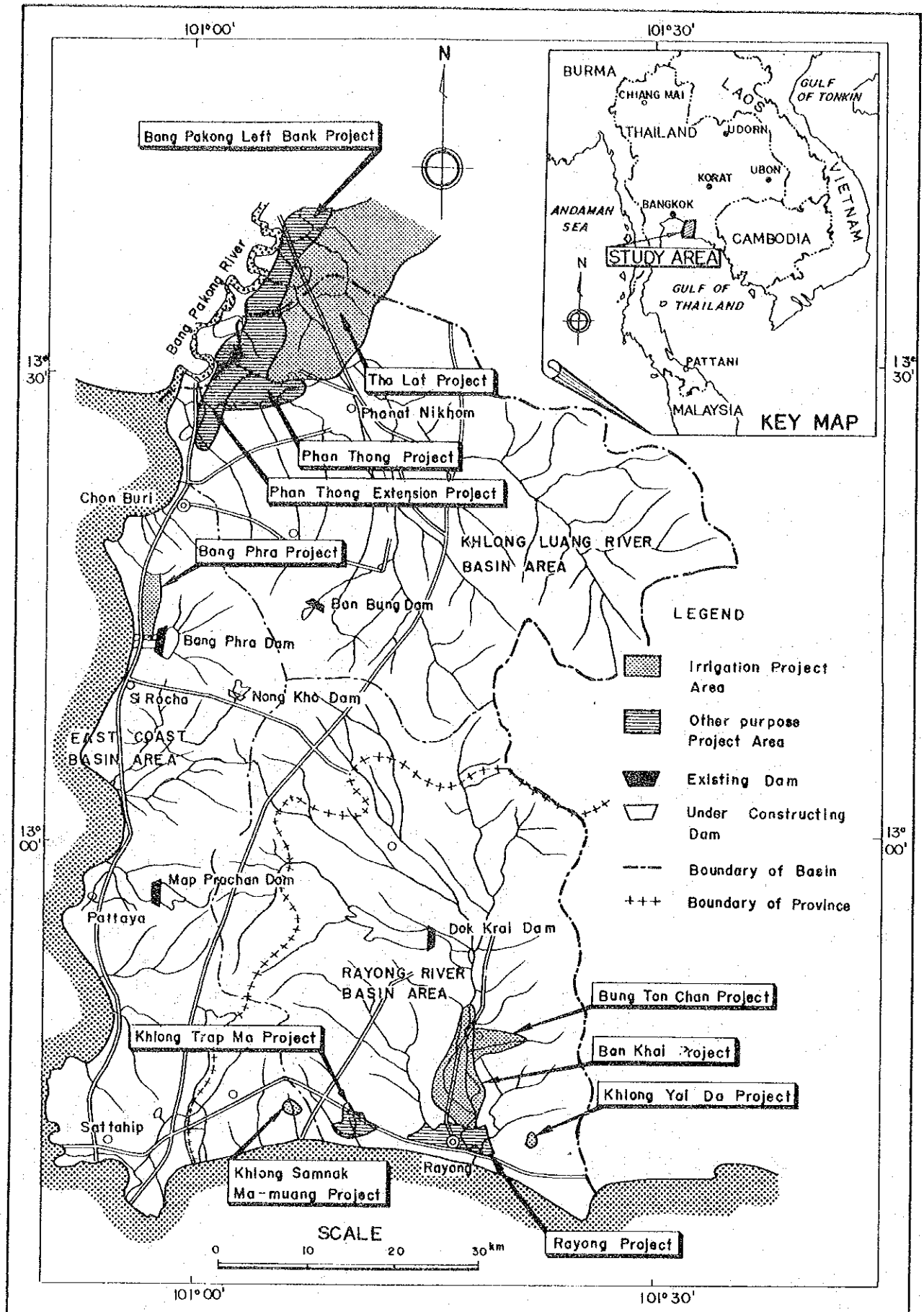

Fig. 13 Location of Existing Irrigation Project

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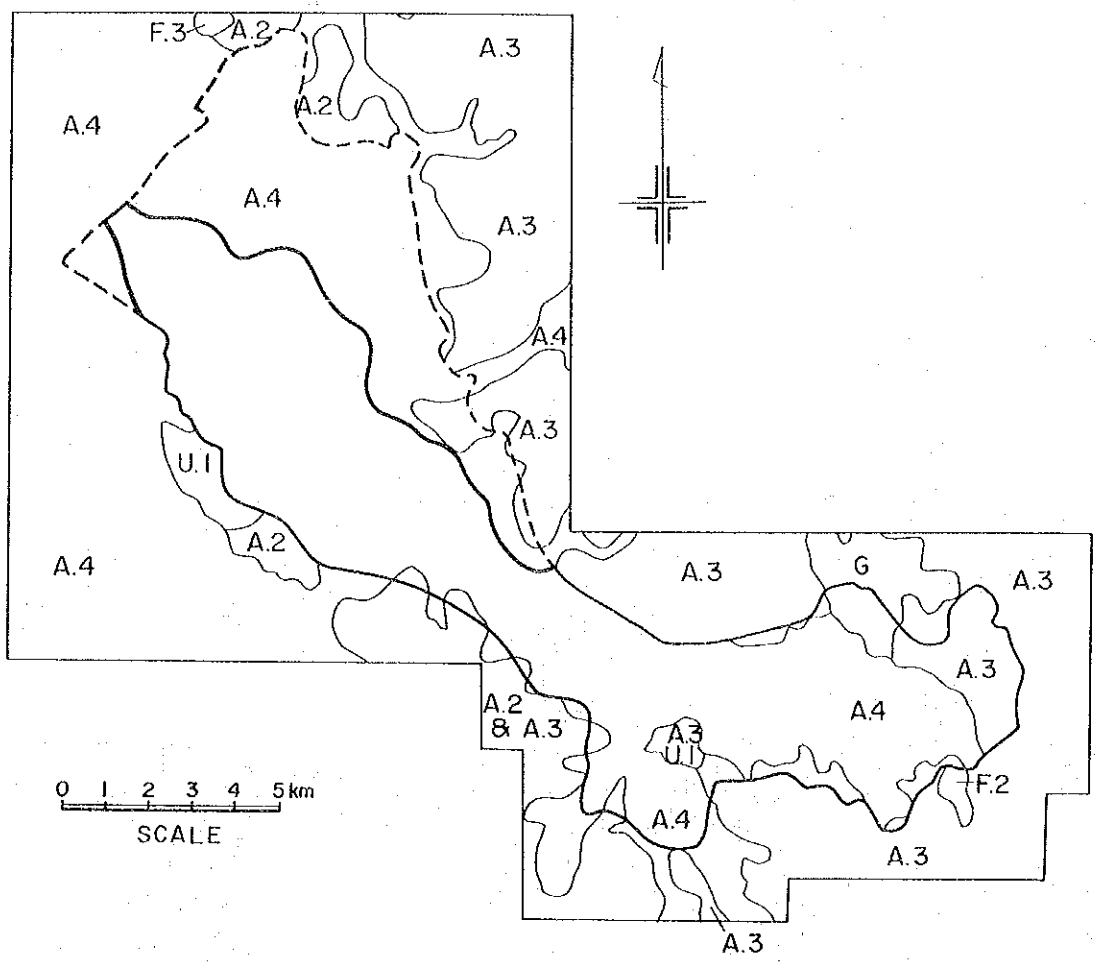

LEGEND

Land Use			Study Area		Potential Irrigable Area		Proposed Scheme Area	
Class	Subclass	Map Symbol	(ha)	(%)	(ha)	(%)	(ha)	(%)
Urban area	Residential and commercial	U.1	300	1	40	–	80	1
Agricultural land	Perennial crop	A.2	1,410	5	260	3	60	1
	Field crop	A.3	8,780	29	1,020	9	870	11
	Raddy field	A.4	19,050	63	10,210	87	6,620	85
Grassland		G	570	2	170	1	170	2
Forest	Hill and mountain forest	F.2	60	–	–	–	–	–
	Mangrove	F.3	30	–	–	–	–	–
		Total	30,200	100	11,700	100	7,800	100

Potential Irrigable Area

Proposed Scheme Area

Fig.14 Present Land Use Map of the Khlong Luang Scheme Area

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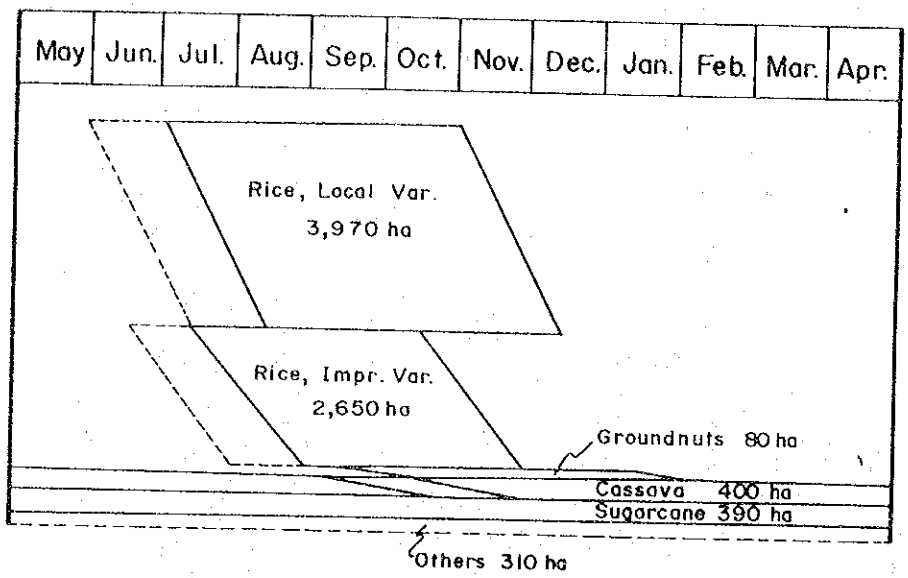
Khlong Luang Irrigation Scheme

Present



Proposed

(Cropping Intensity 1.4)

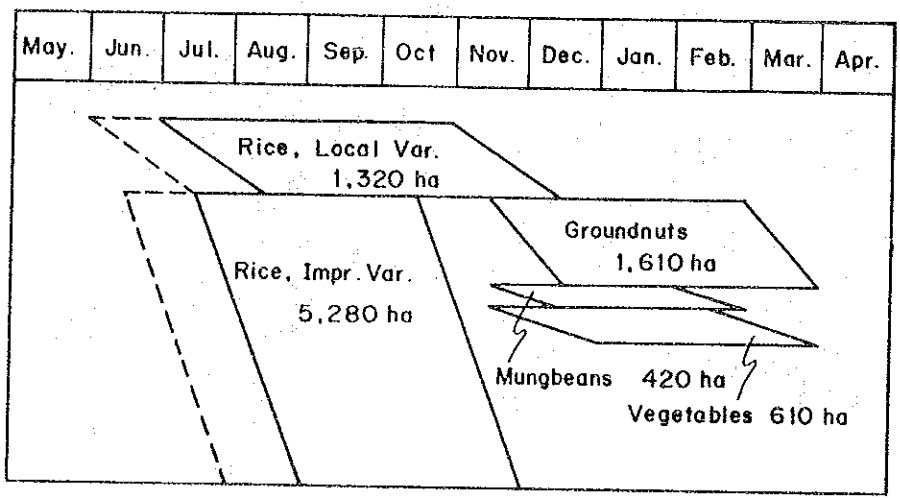


Fig. 15 Present and Proposed Cropping Patterns

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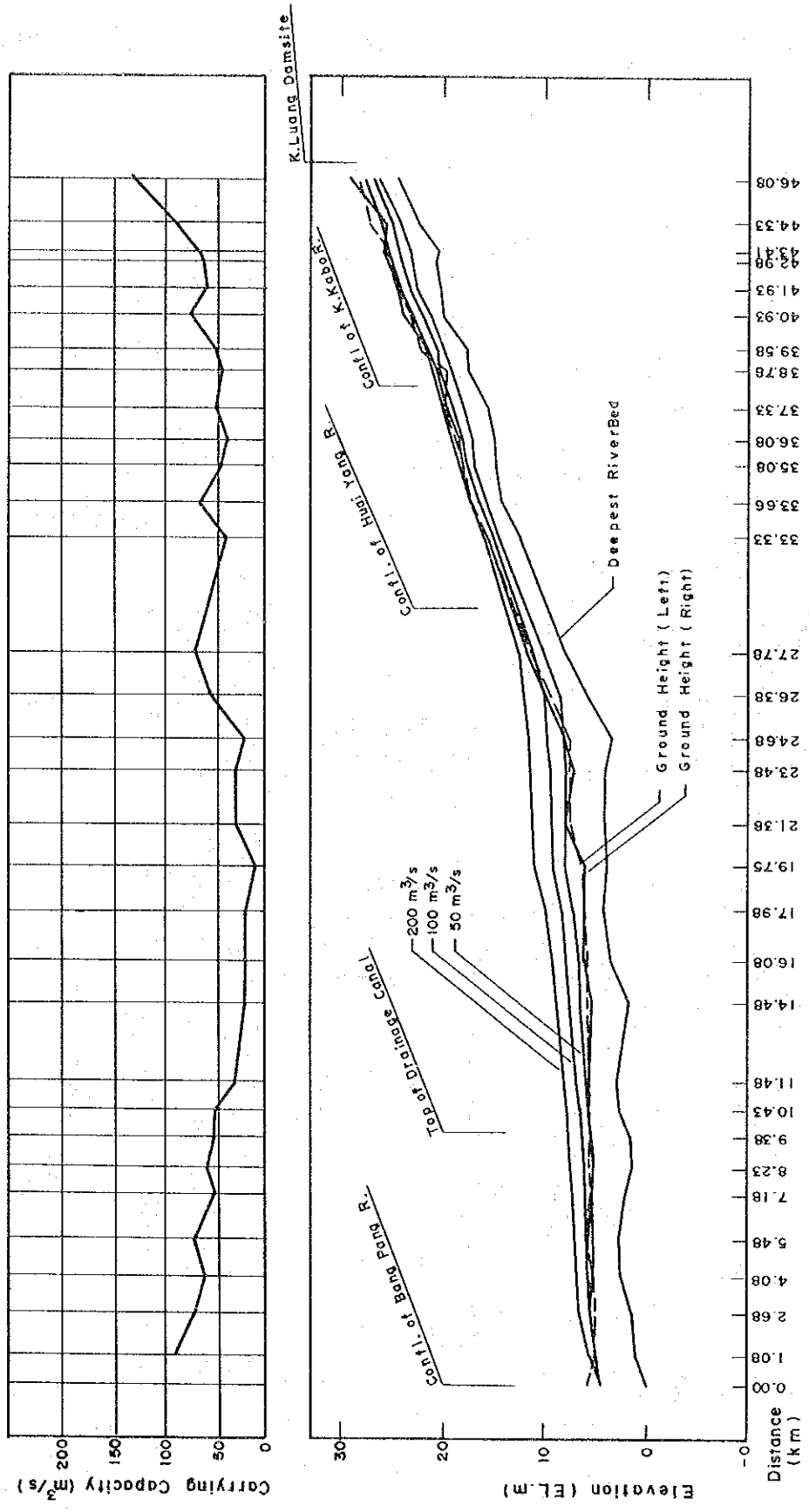

Fig. 16 Longitudinal Profile and Channel Capacity of Khlong Luang River

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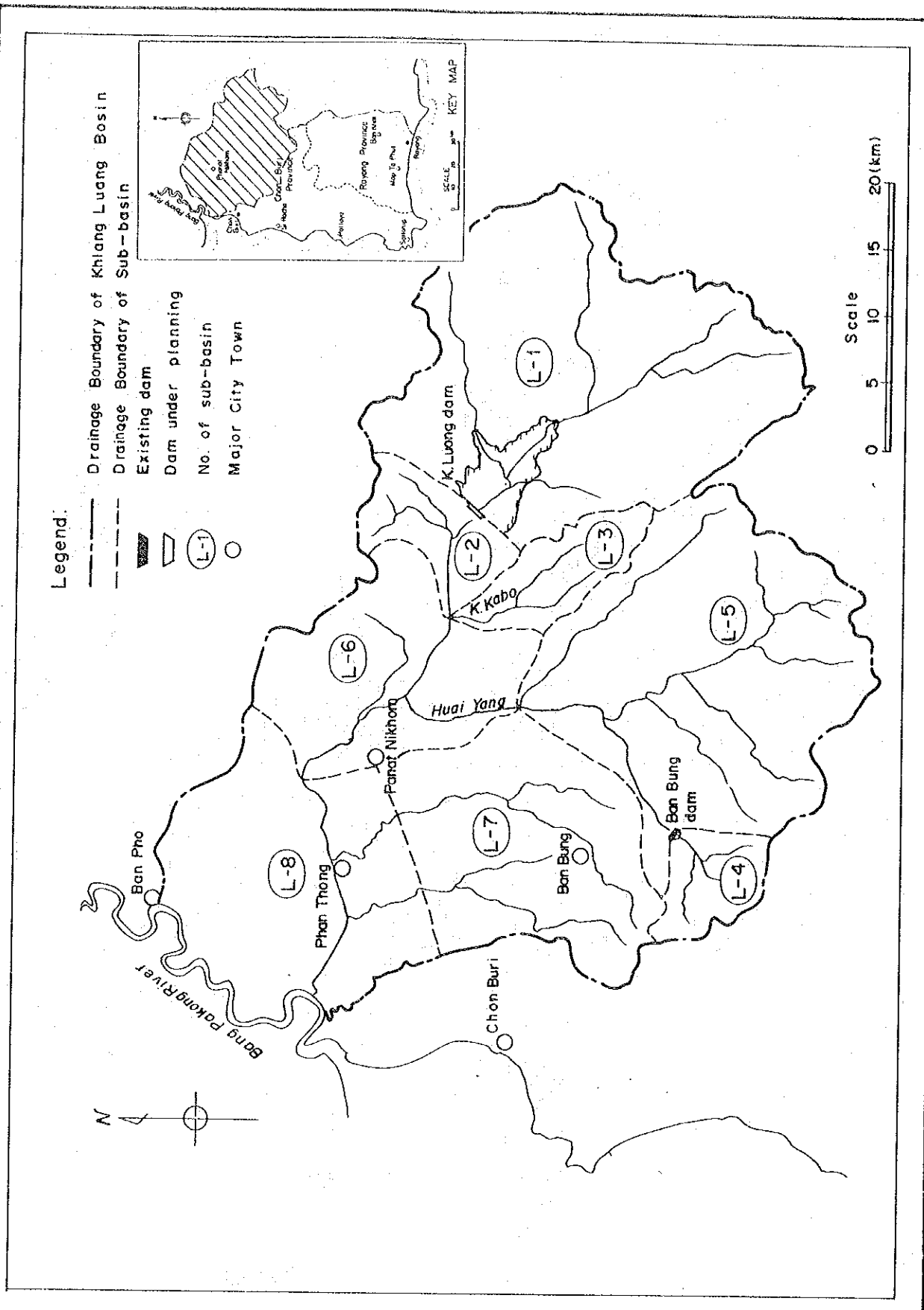

Fig.17 Sub-basins of Khlong Luang River Basin for Runoff Analysis

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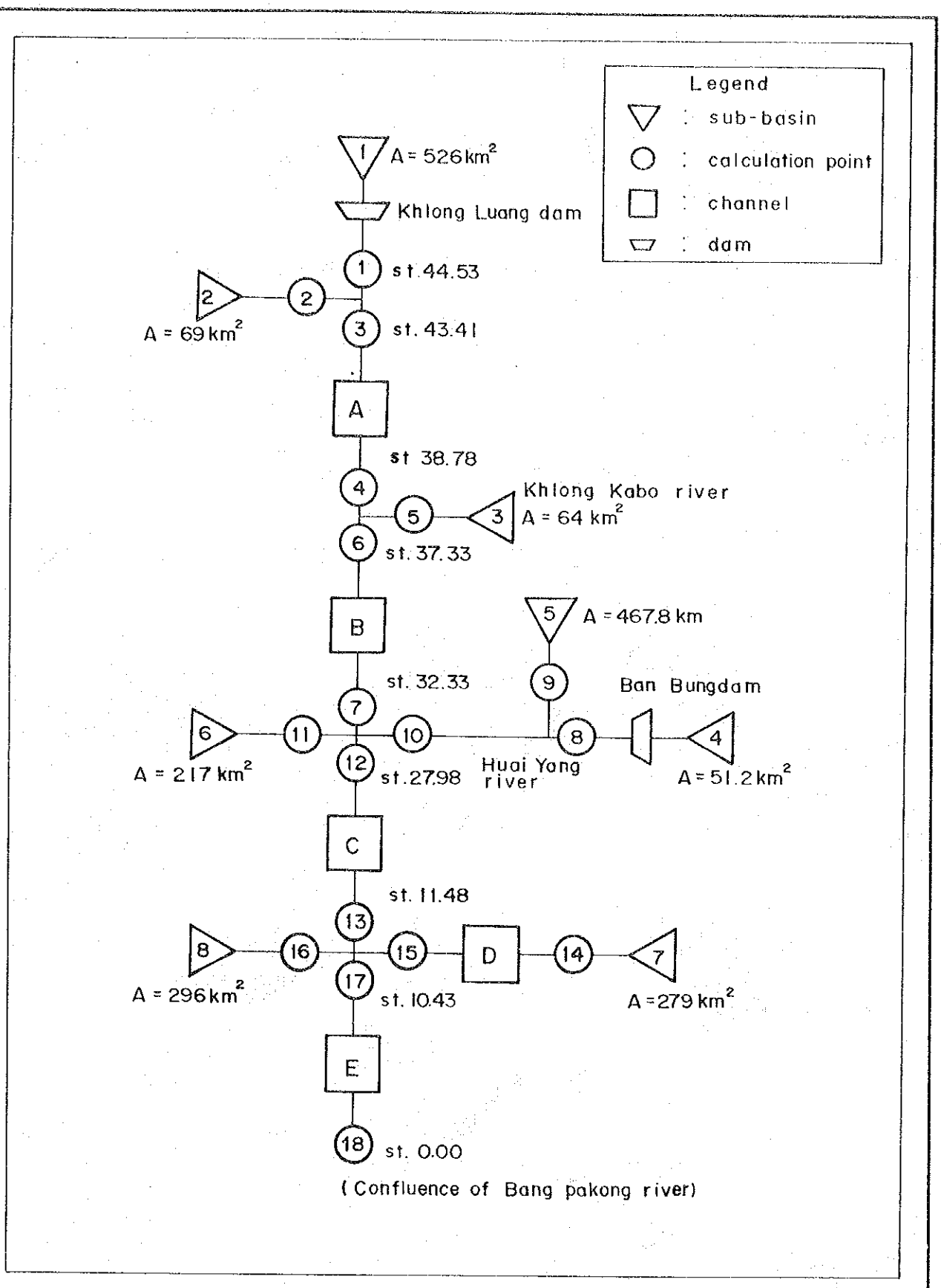

Fig. 18 Runoff Calculation Model Diagram of Khlong Luang River Basin

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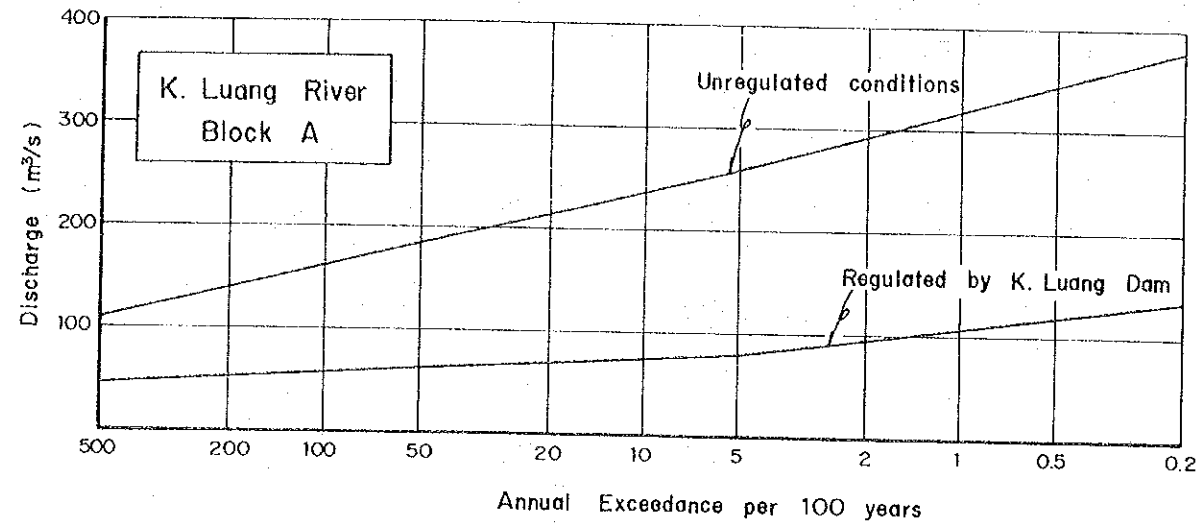

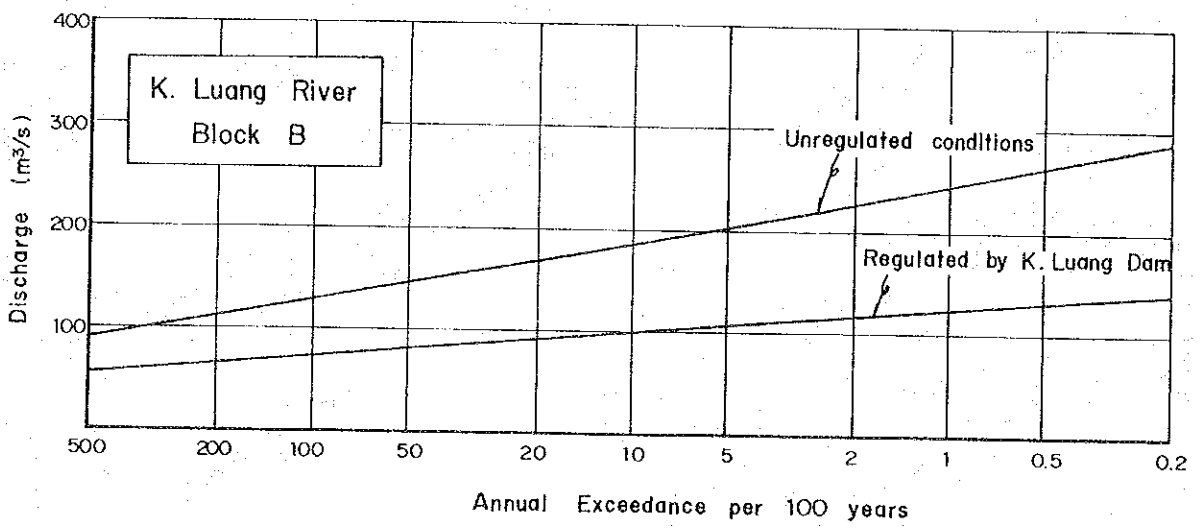

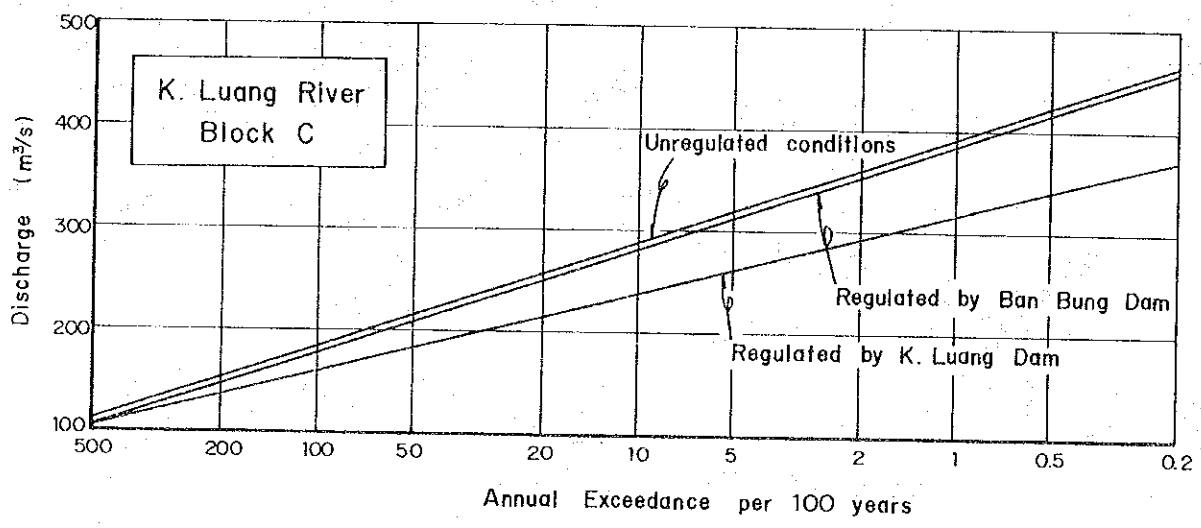

Fig. 19 Flood Frequency Curve of Khlong Luang River (1/2)

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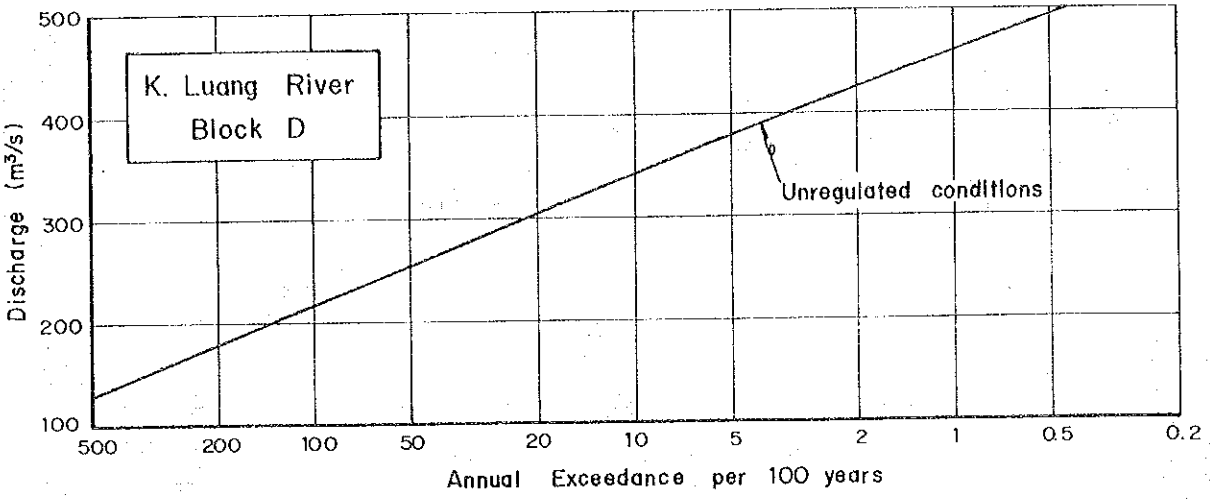

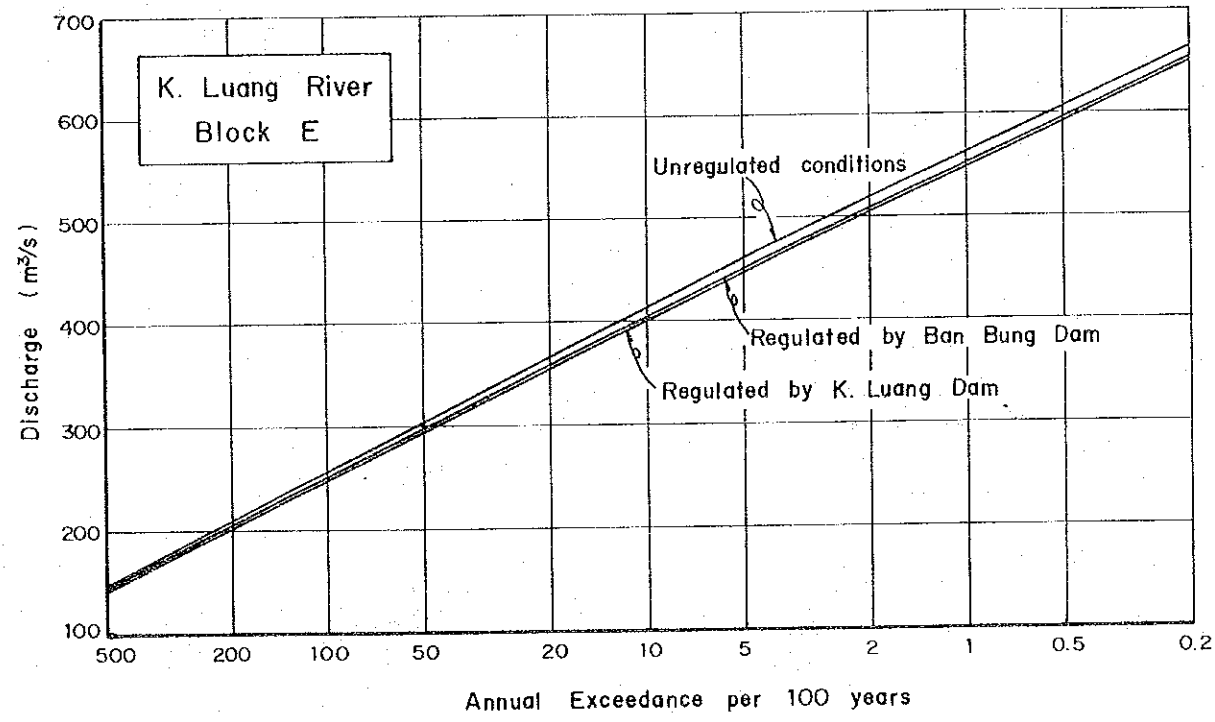

Fig. 19 Flood Frequency Curve of Khlong Luang River (2/2)

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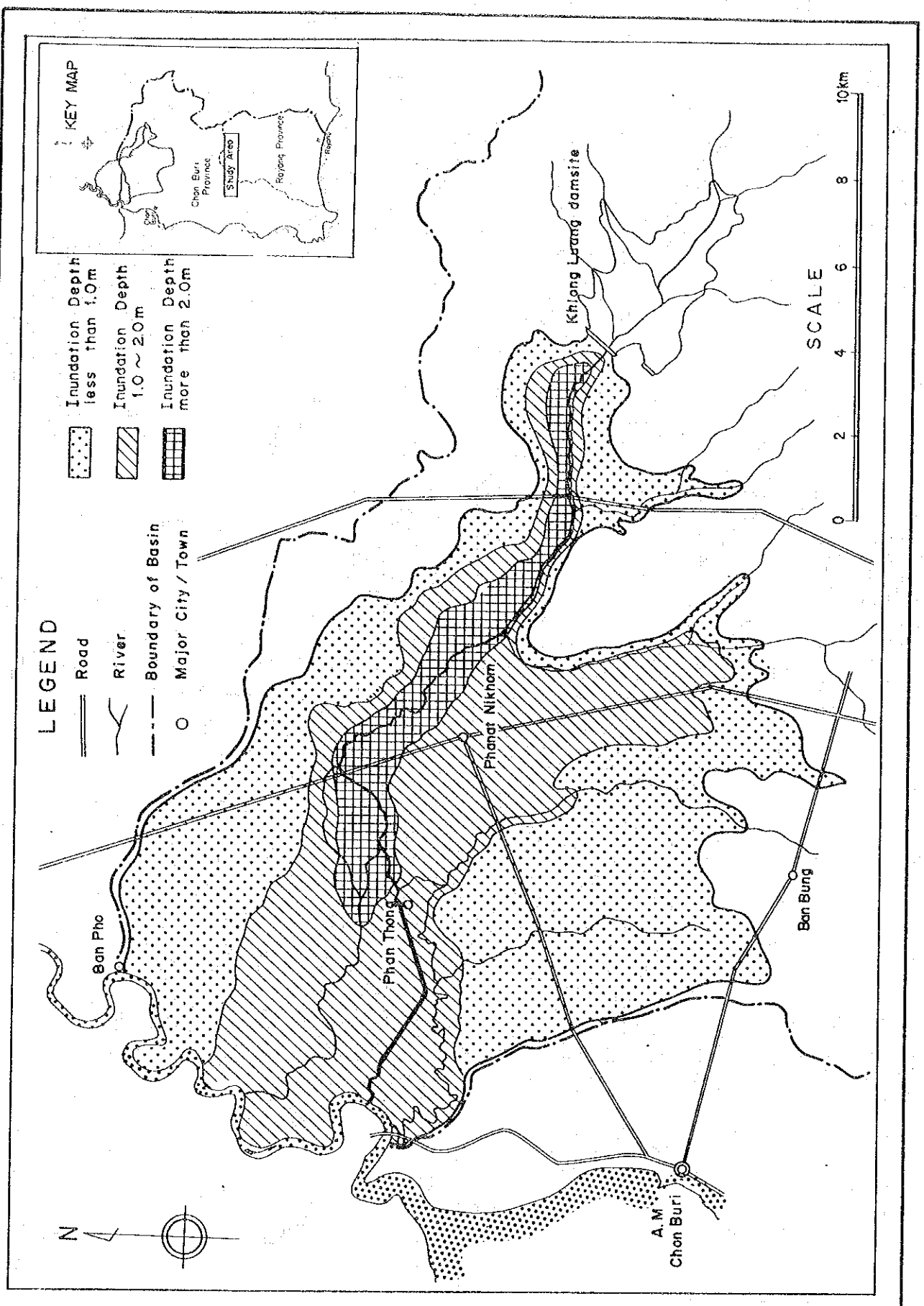

Fig.20 Inundation Area of Khlong Luang River Basin (1974)

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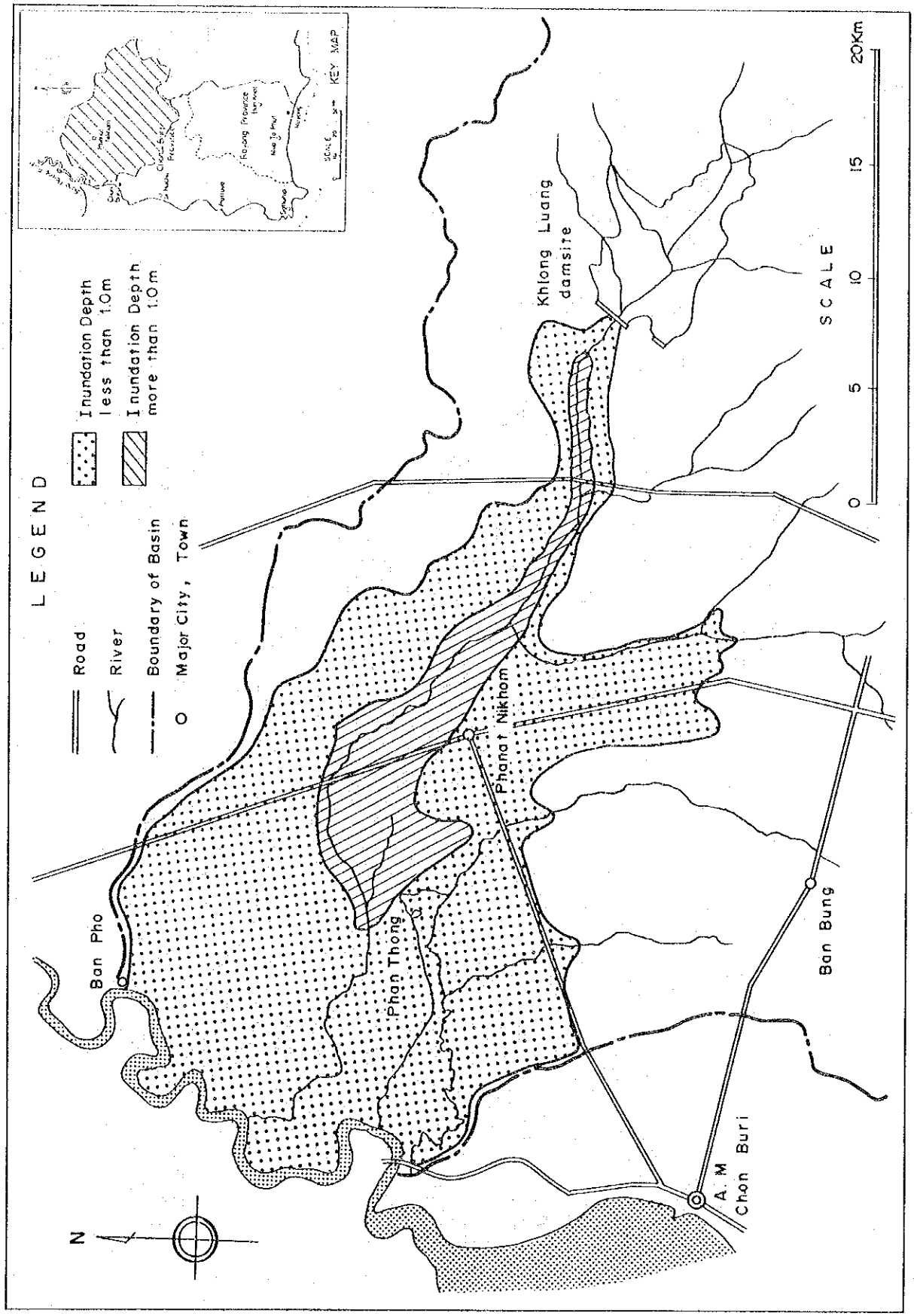

Fig.21 Inundation Area of Khlong Luang River Basin (1981)

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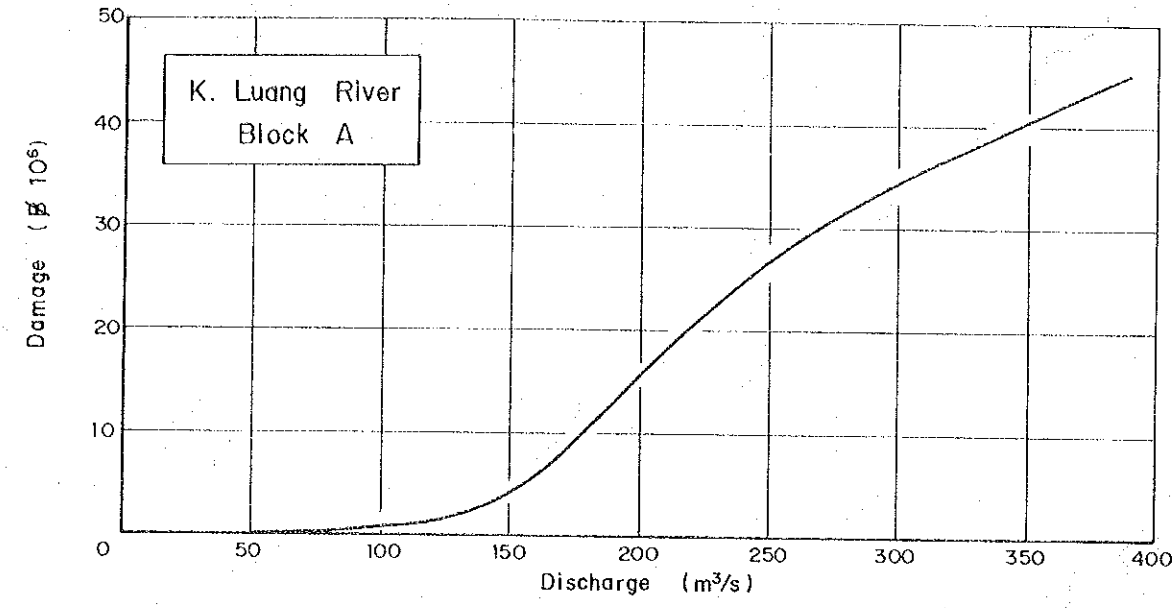

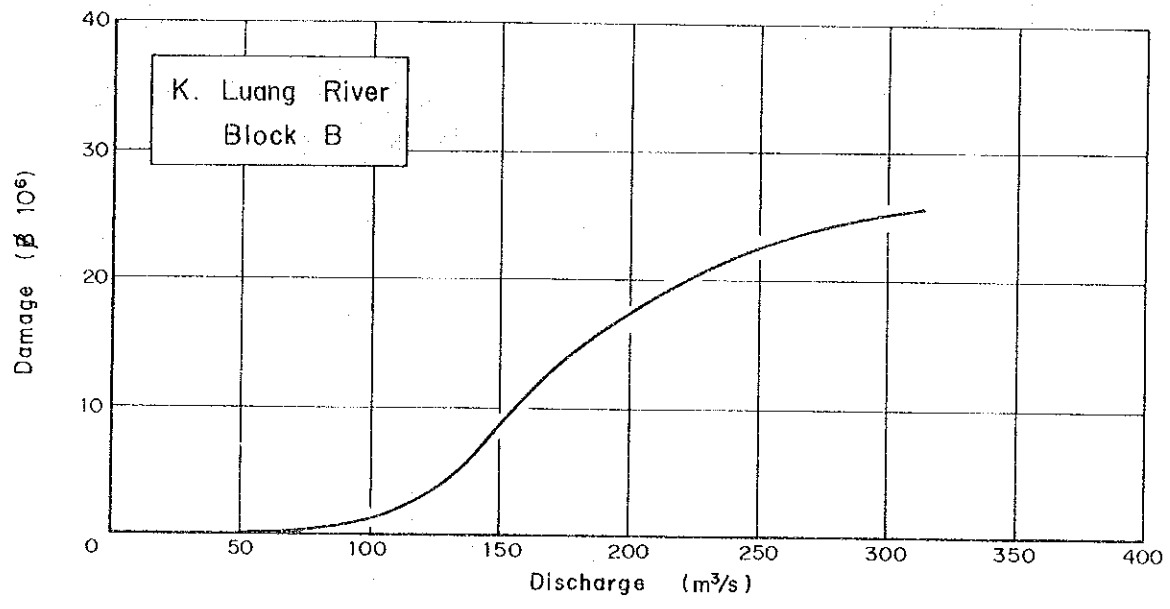

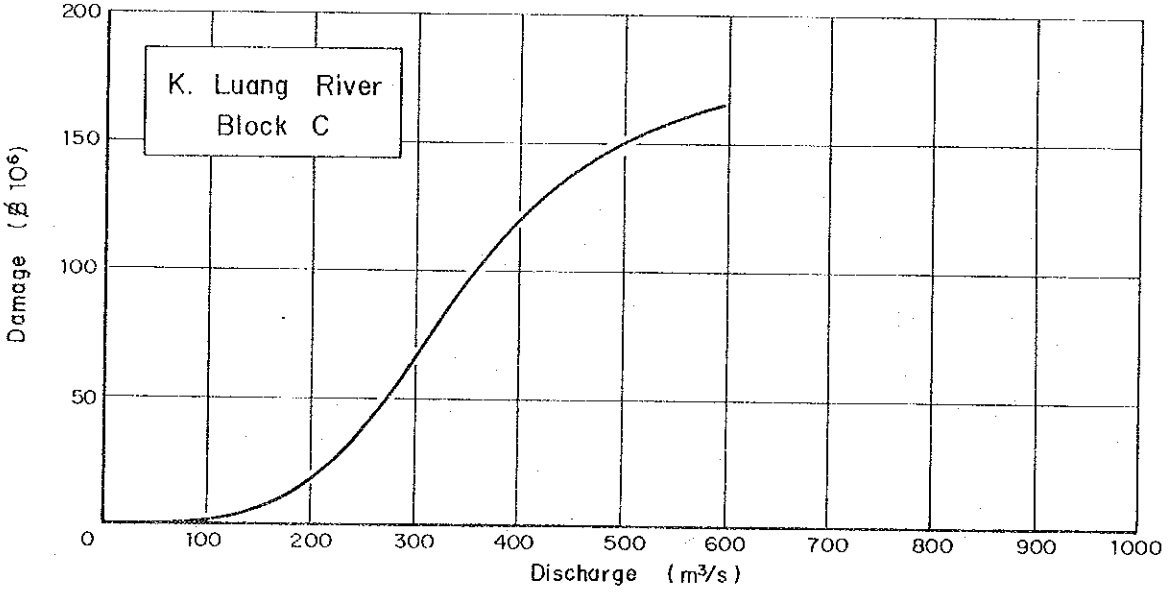

Fig. 22 Flood Damage Curve of Khlong Luang River (1/2)

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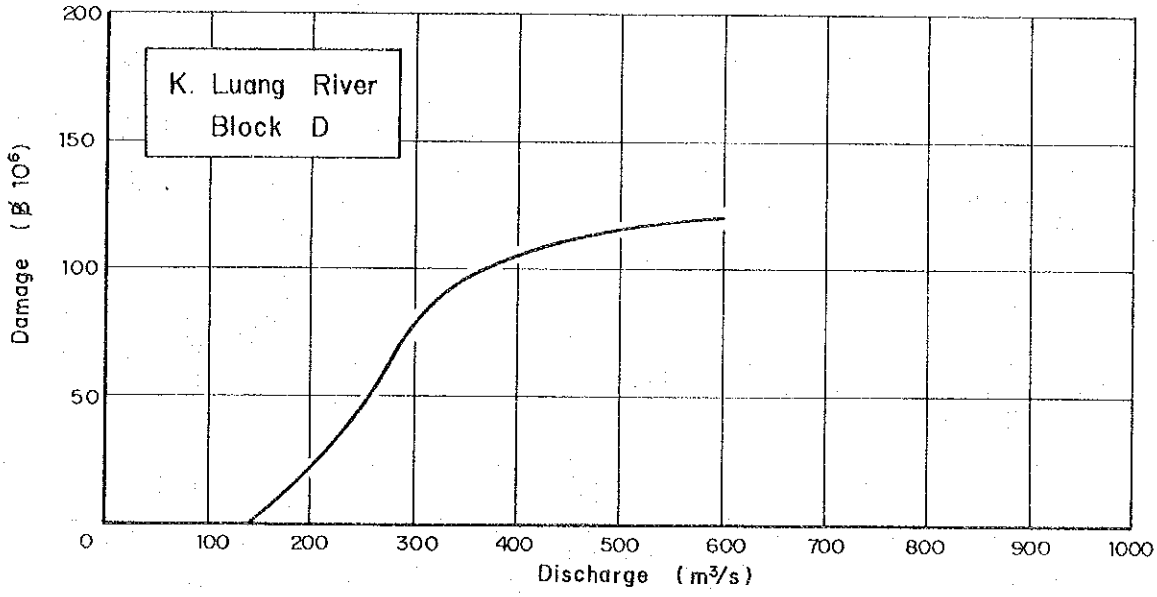

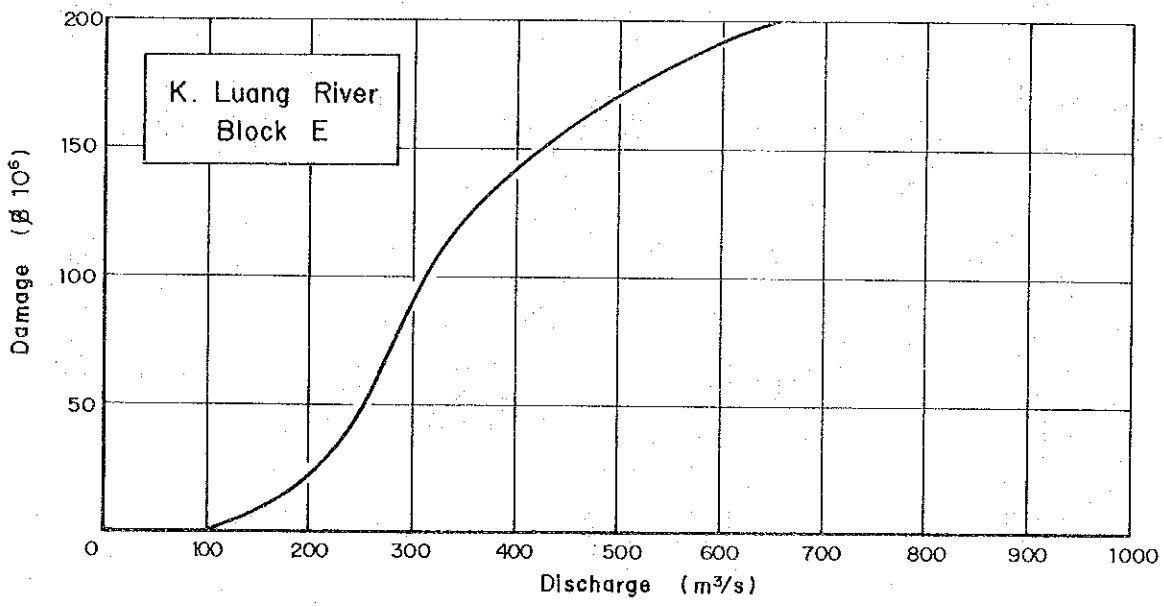

Fig. 22 Flood Damage Curve of Khlong Luang River (2/2)

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THE EAST COAST WATER RESOURCES DEVELOPMENT PROJECT PHASE II
JAPAN INTERNATIONAL COOPERATION AGENCY

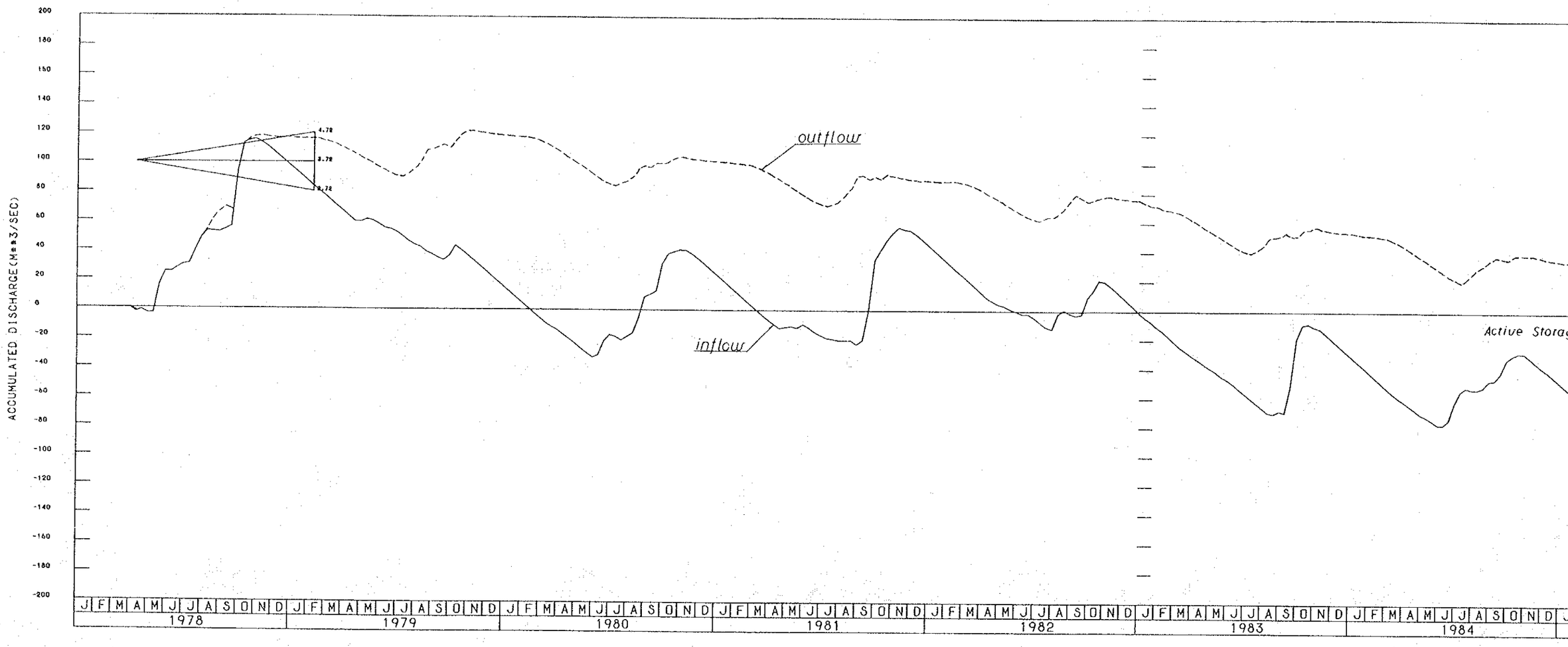

Fig. 23 Mass Curve of Inflow and Outflow at Khlong Luang Dam

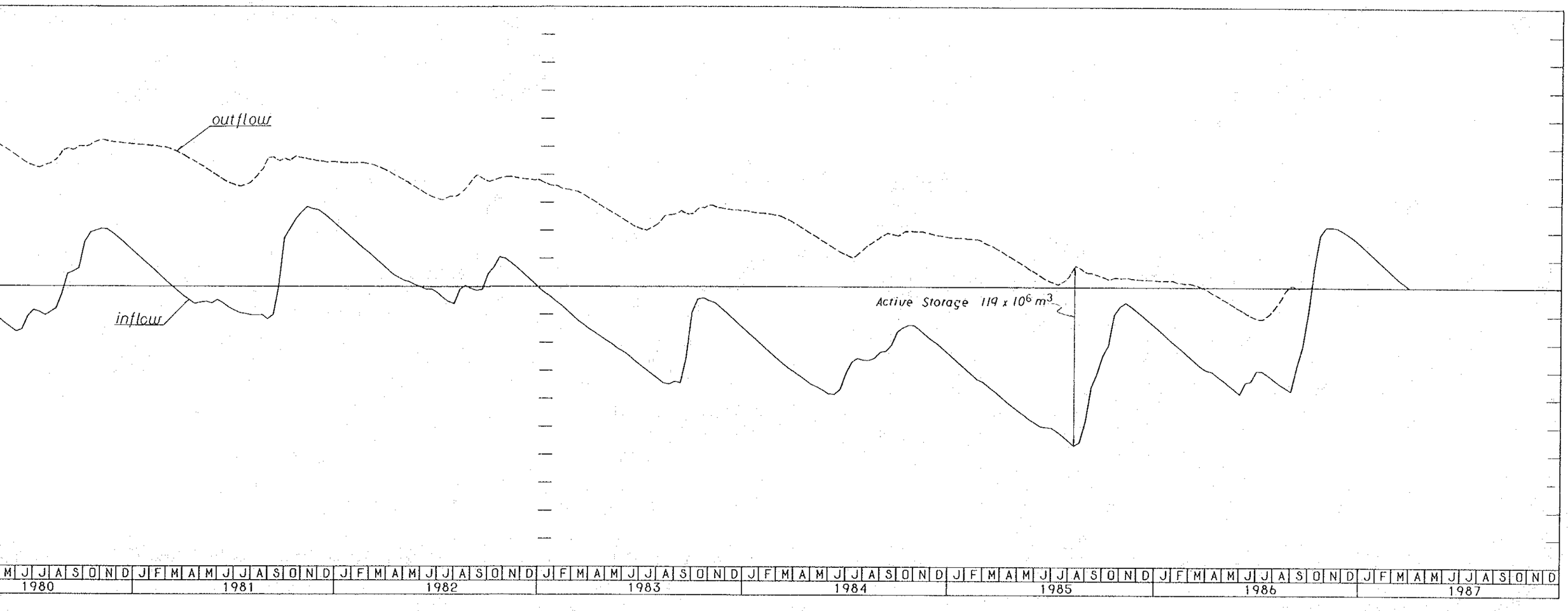

Fig. 23 Mass Curve of Inflow and Outflow at Khlong Luang Dam

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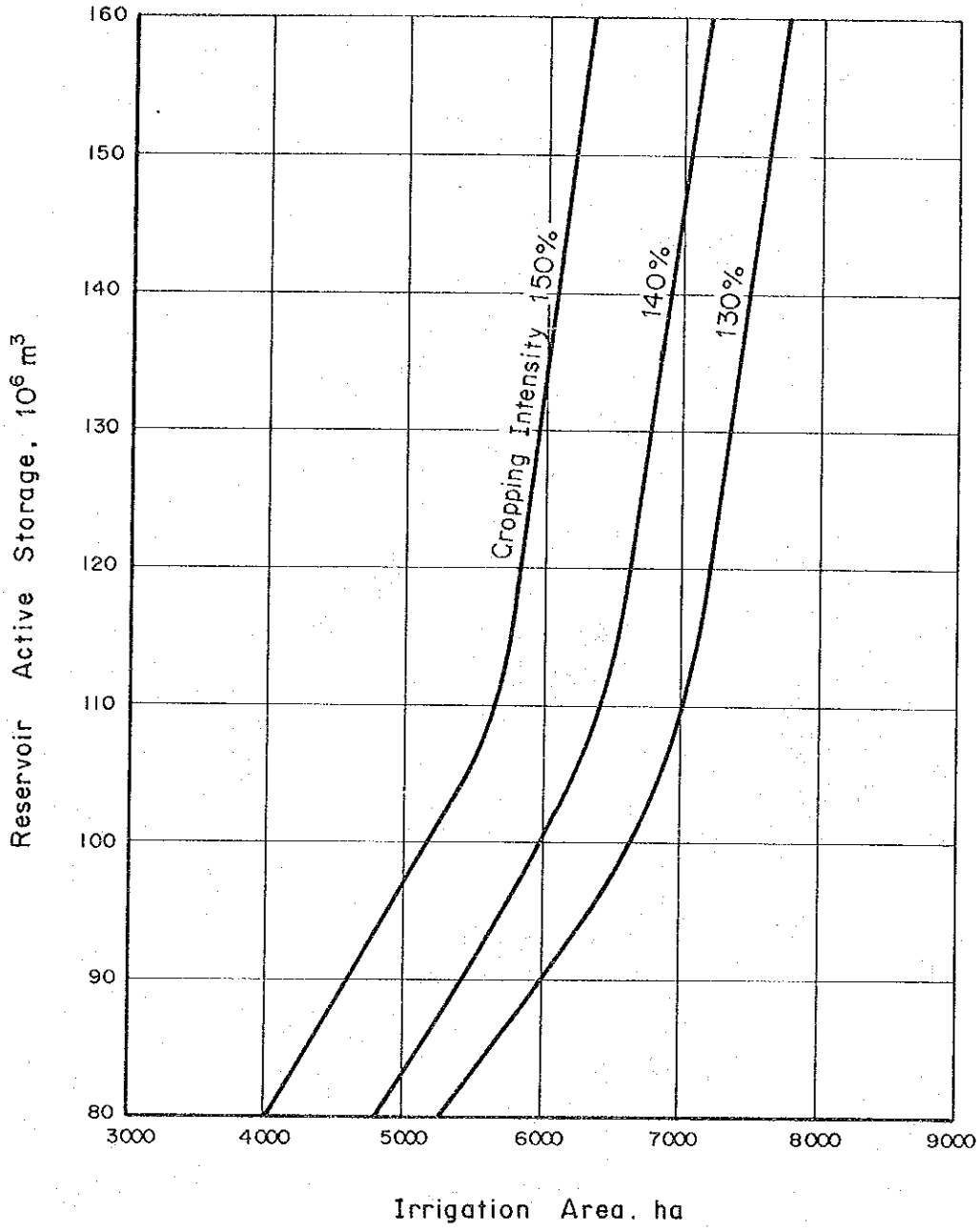

Fig. 24 Relationship between Irrigation Area, Cropping Intensity and Reservoir Active Storage Capacity, Khlong Luang Dam Scheme

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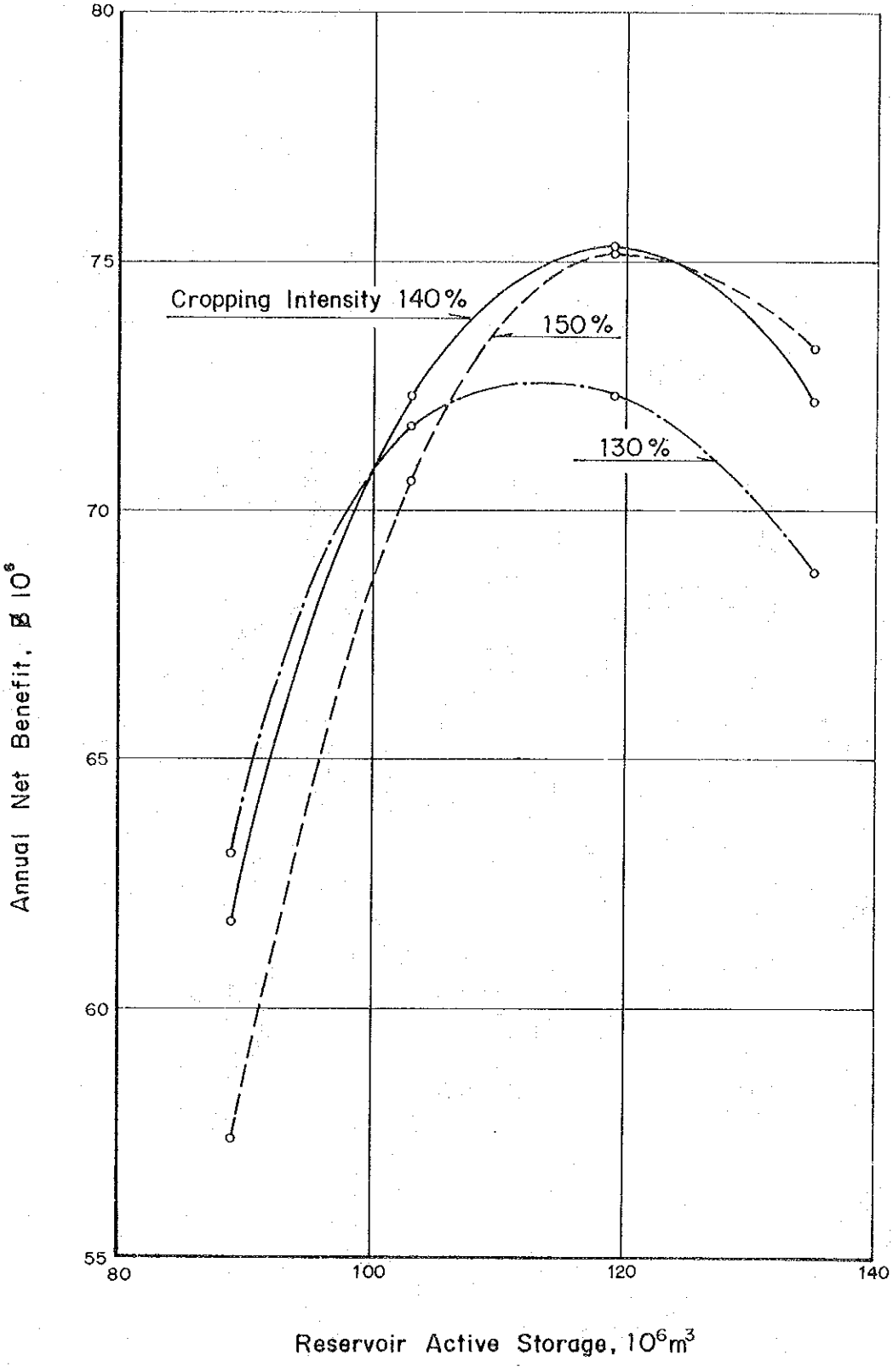

Fig. 25 Economic Comparison of Alternatives, Khlong Luang Dam Scheme

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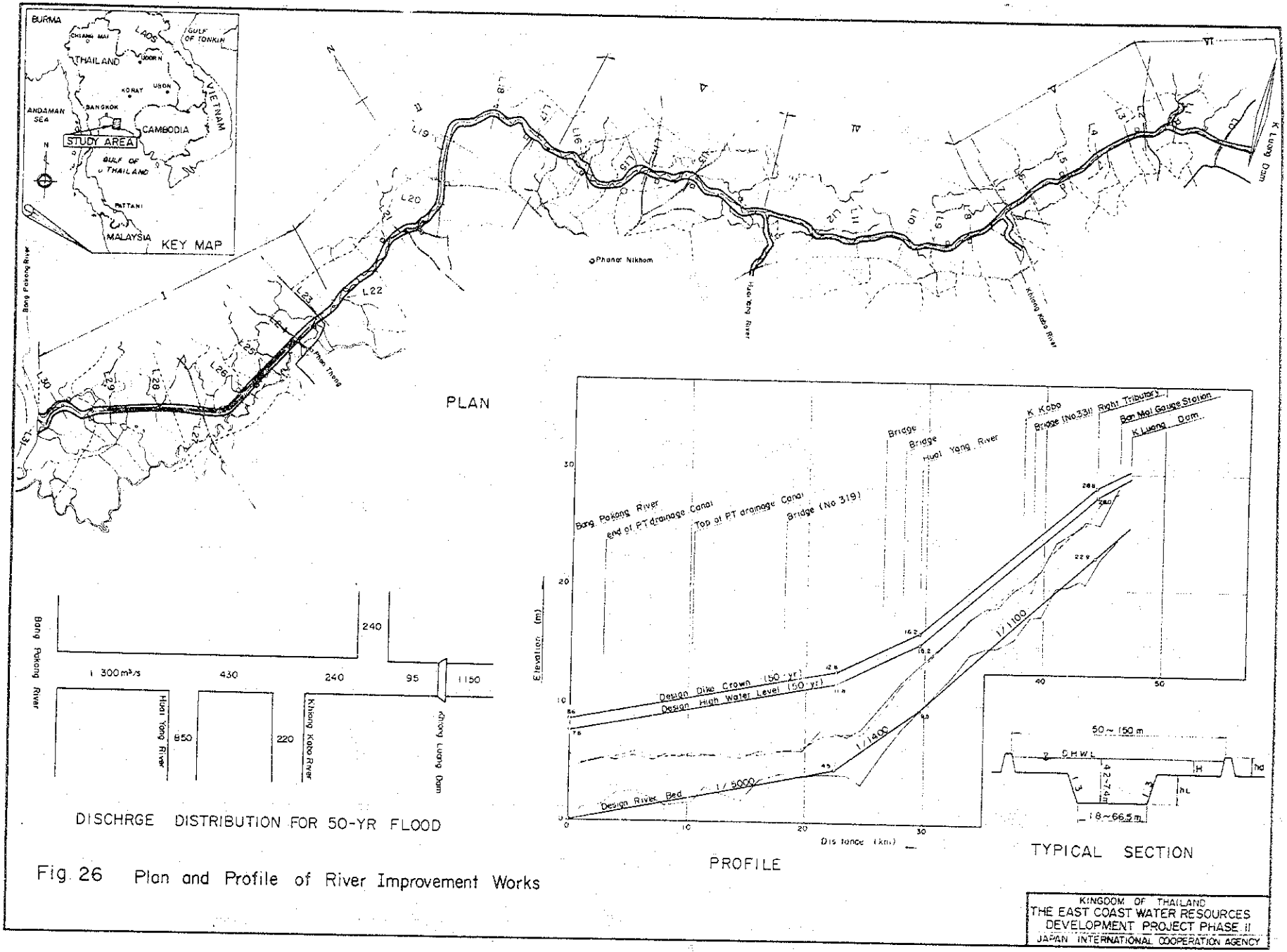

Fig. 26 Plan and Profile of River Improvement Works

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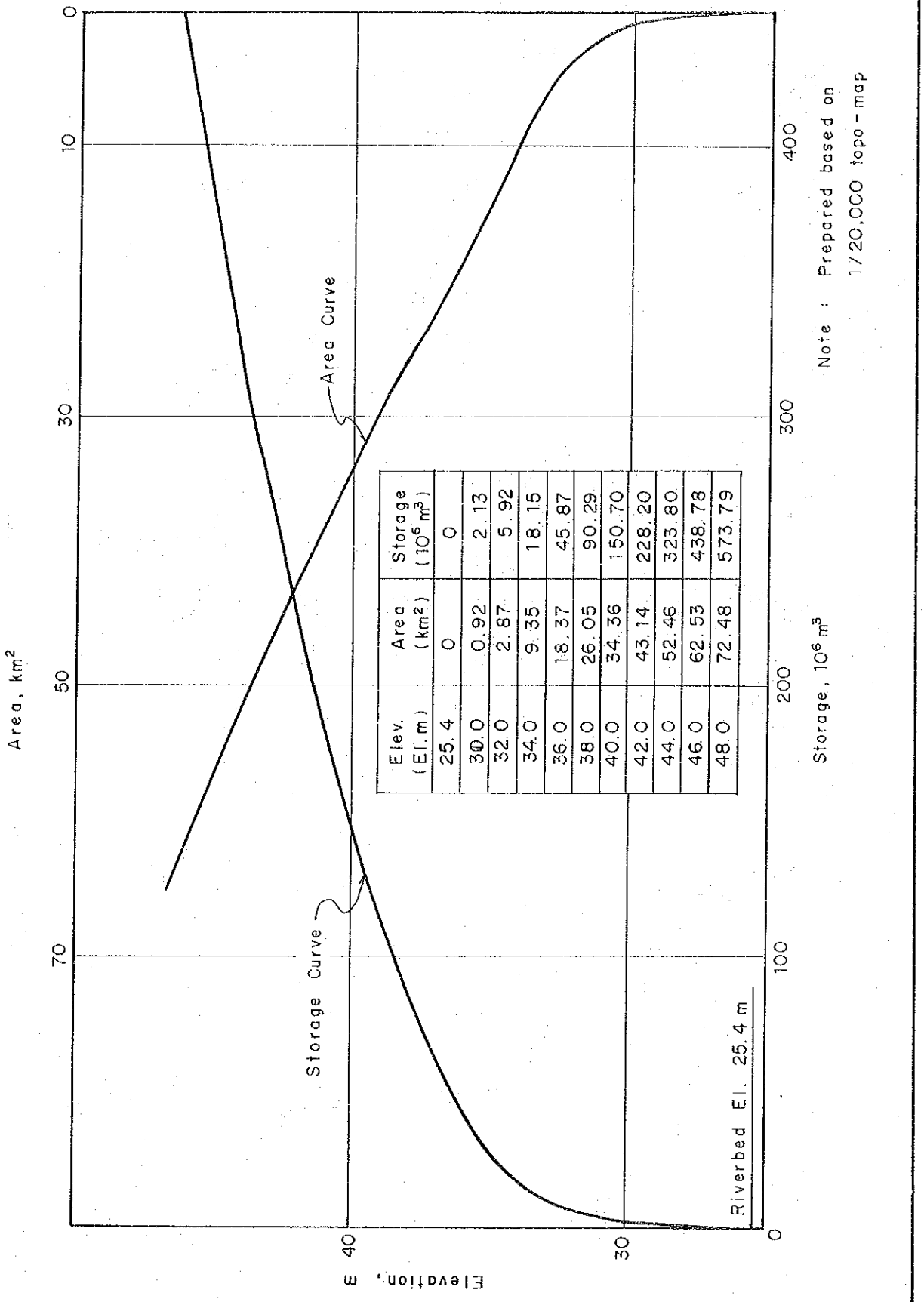

Elev. (El. m)	Area (km^2)	Storage ($10^6 m^3$)
25.4	0	0
30.0	0.92	2.13
32.0	2.87	5.92
34.0	9.35	18.15
36.0	18.37	45.87
38.0	26.05	90.29
40.0	34.36	150.70
42.0	43.14	228.20
44.0	52.46	323.80
46.0	62.53	438.78
48.0	72.48	573.79

Fig. 27 Area– Storage Curve of Khlong Luang Reservoir

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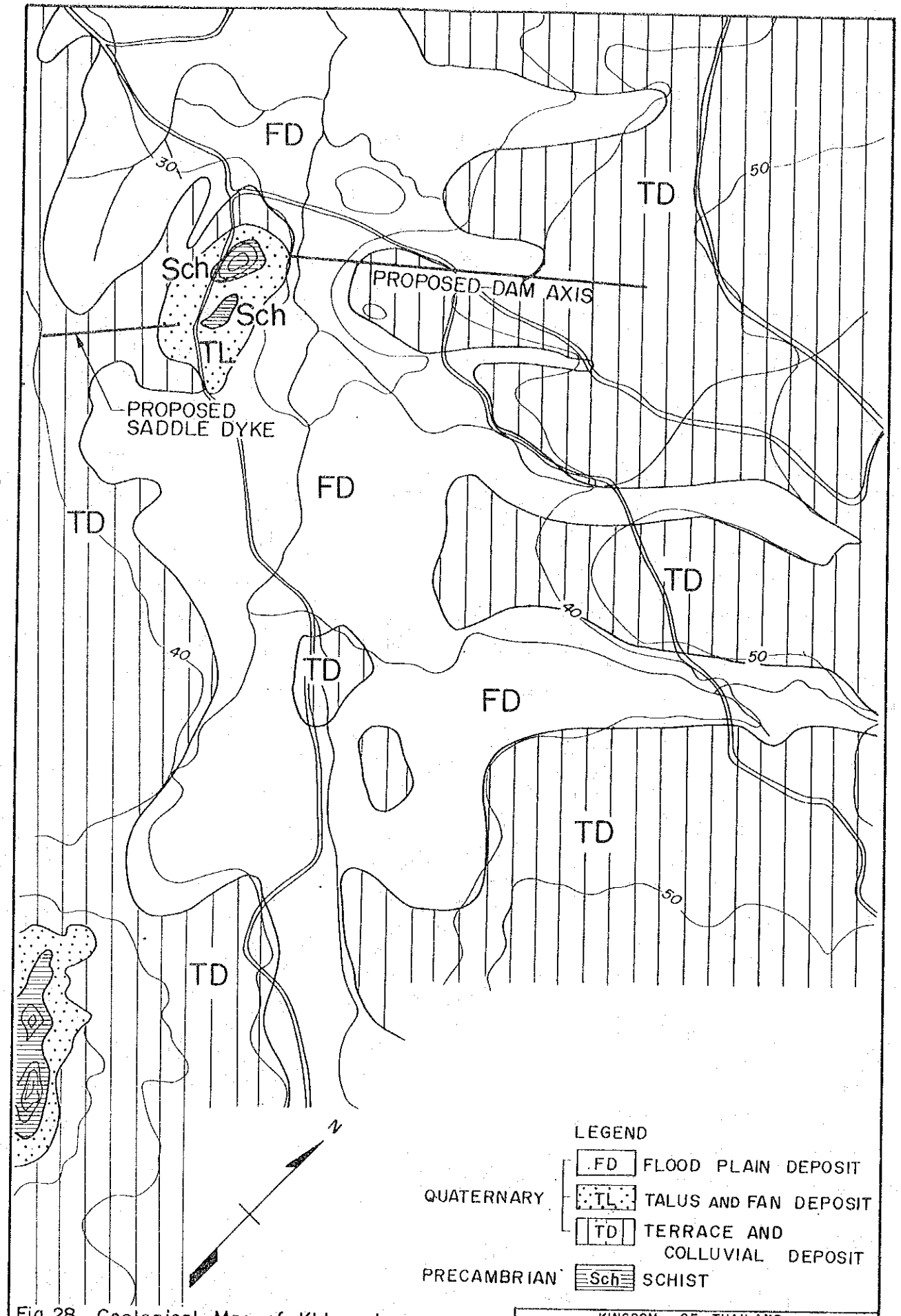

Fig.28 Geological Map of Khlong Luang Reservoir Area

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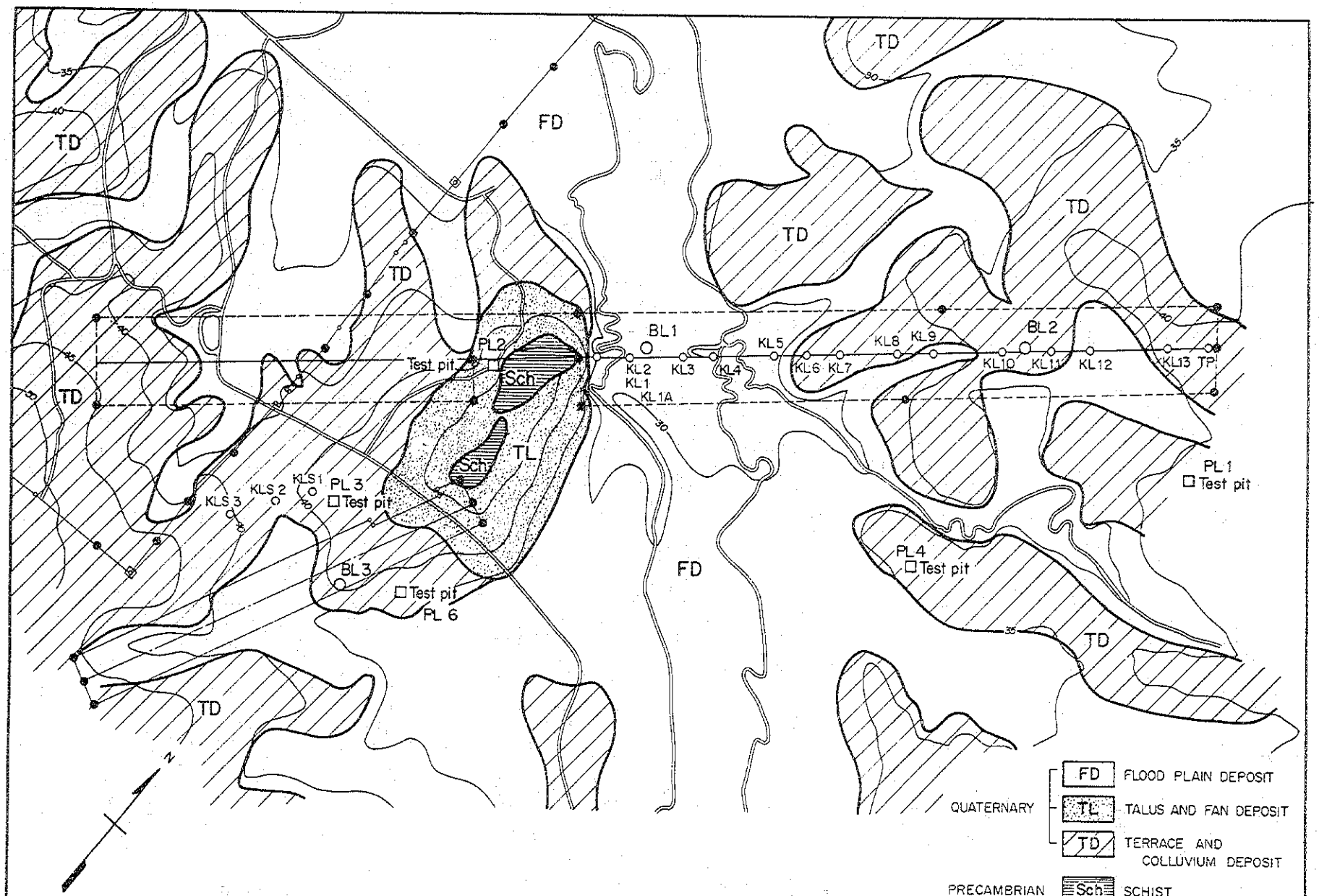

Fig.29 Geological Map of Khlong Luang Damsite

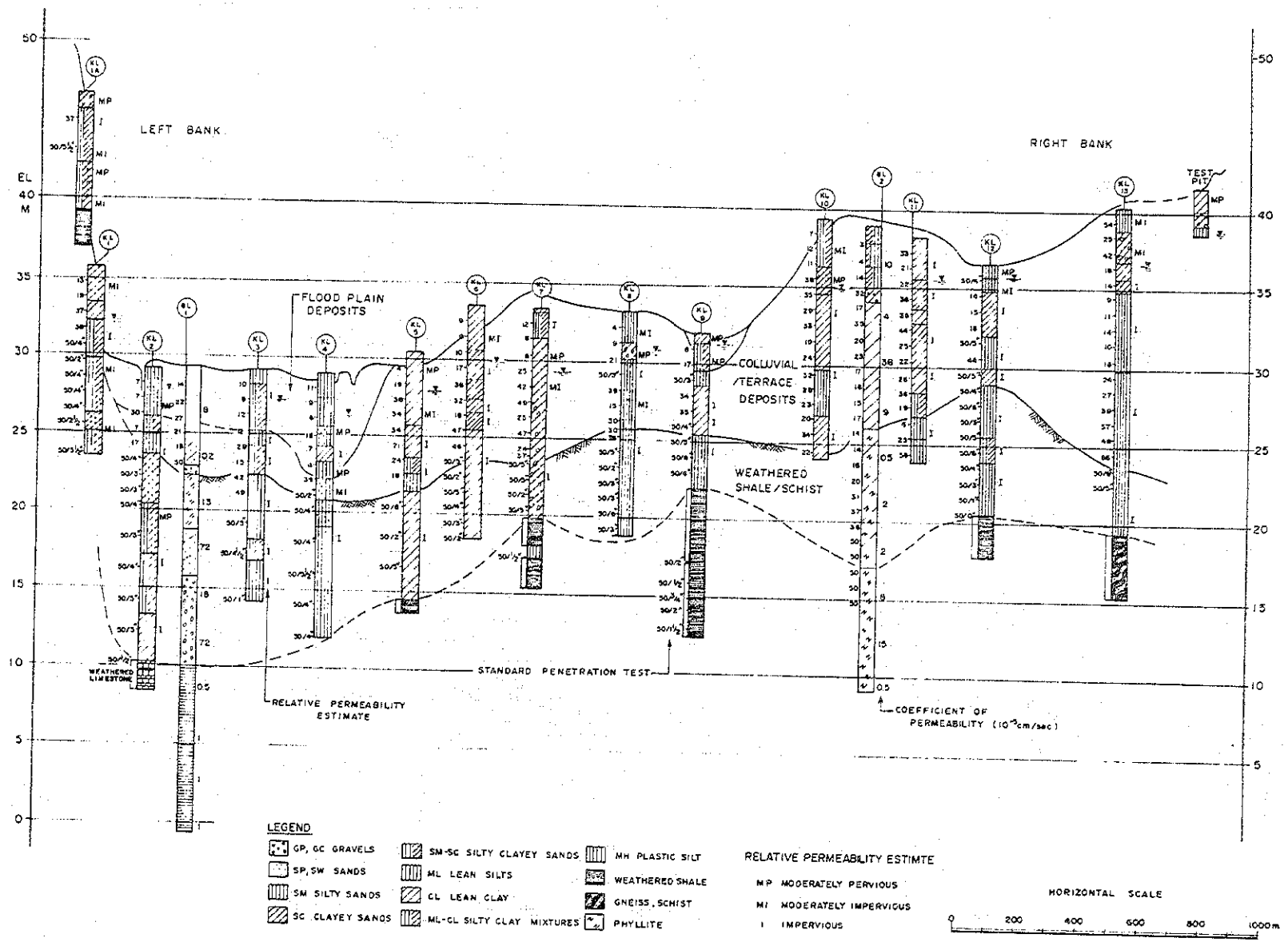

Fig. 30 Geological Profile of Khlong Luang Damsite

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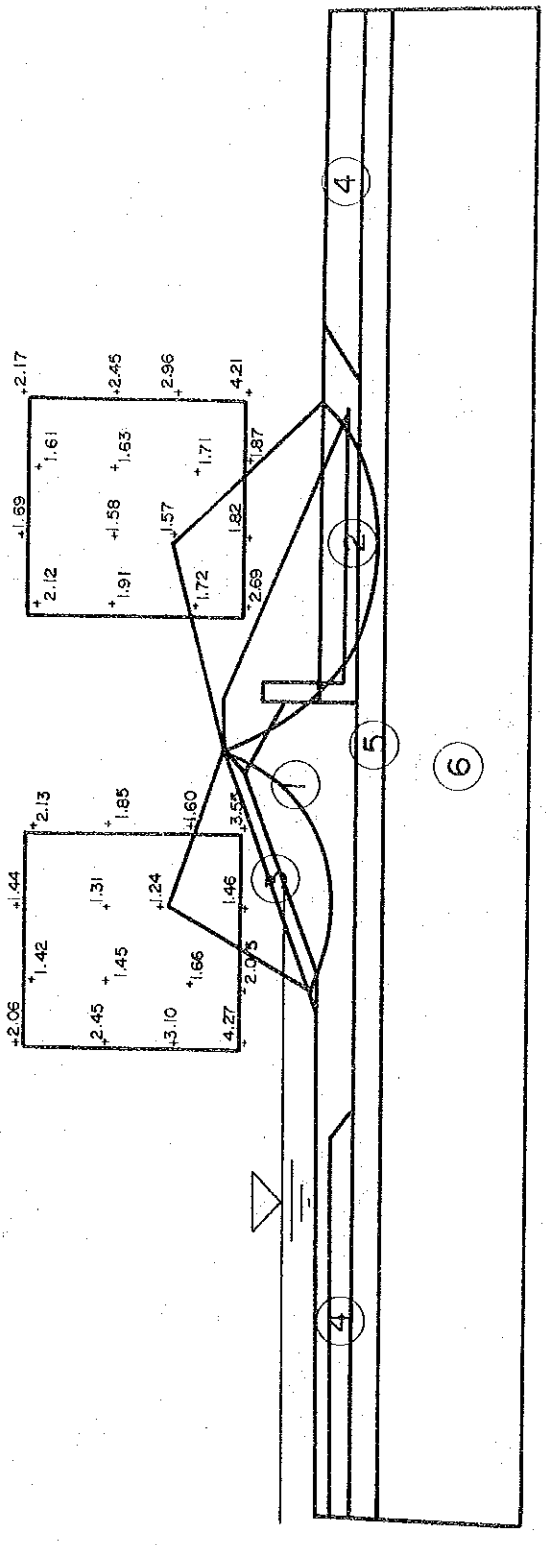

0 SCALE = 1/1000 50.0 M

MINIMUM SAFETY FACTOR (SEISMIC)		
	UP STREAM SIDE	DOWN STREAM SIDE
NORMAL	—	—
SEISMIC	1.238	1.572

MATERIAL	COHESION (T/M²)	FRICTION (DEG)	W (WET) (T/M³)	W (SAT) (T/M³)	W (SUB) (T/M³)
1	1.00	30.00	1.98	2.14	1.14
2	0.00	35.00	1.85	2.15	1.15
3	0.00	40.00	1.90	2.15	1.15
4	2.00	25.00	1.80	1.85	0.85
5	2.00	28.00	1.85	1.94	0.94
6	10.00	35.00	2.10	2.30	1.30
ACCELERATION OF EARTHQUAKE				0.050	

Fig.31 Stability Analysis (1/2)
(Low Water Surface)

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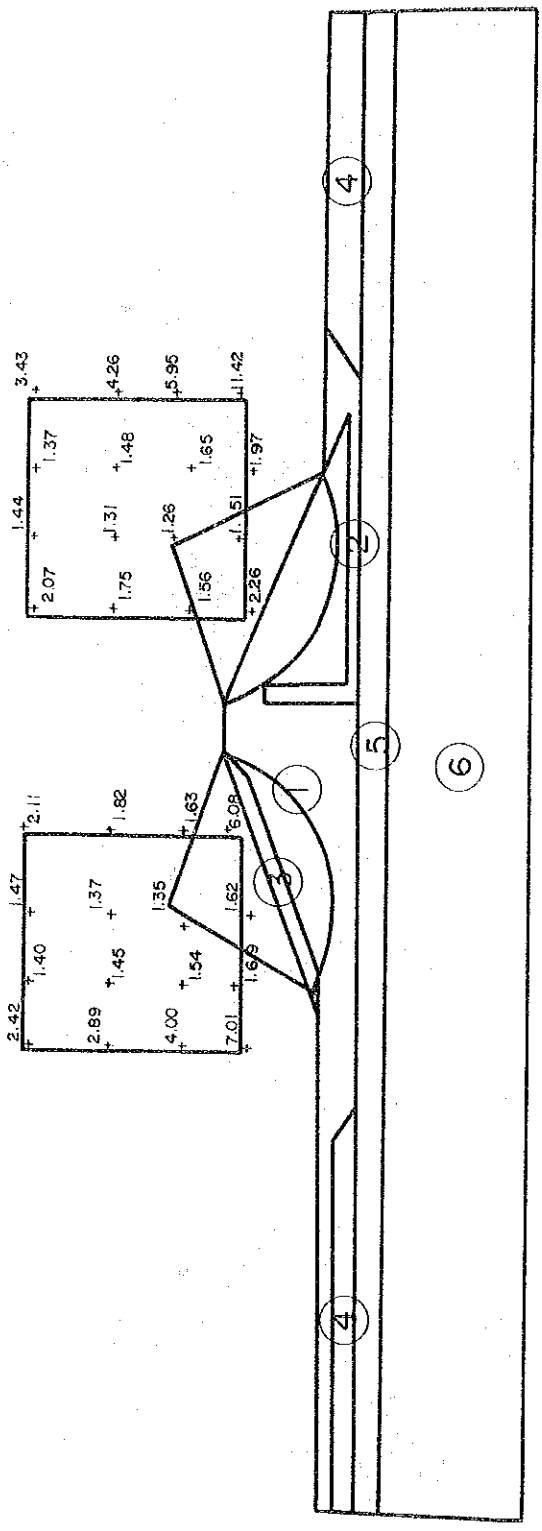

0 SCALE = 1 / 1 000 50.0 M

MINIMUM SAFETY FACTOR (NORMAL)		
	UP STREAM SIDE	DOWN STREAM SIDE
NORMAL	1.350	1.258
SEISMIC	—	—

MATERIAL	COHESION (T/M²)	FRICTION (DEG)	W (WET) (T/M³)	W (SAT) (T/M³)	W (SUB) (T/M³)
1	1.00	30.00	1.98	2.14	1.14
2	0.00	35.00	1.85	2.15	1.15
3	0.00	40.00	1.90	2.15	1.15
4	2.00	25.00	1.80	1.85	0.85
5	2.00	28.00	1.85	1.94	0.94
6	10.00	35.00	2.10	2.30	1.30

Fig.31 Stability Analysis (2/2)
(Reservoir Empty After Completion)

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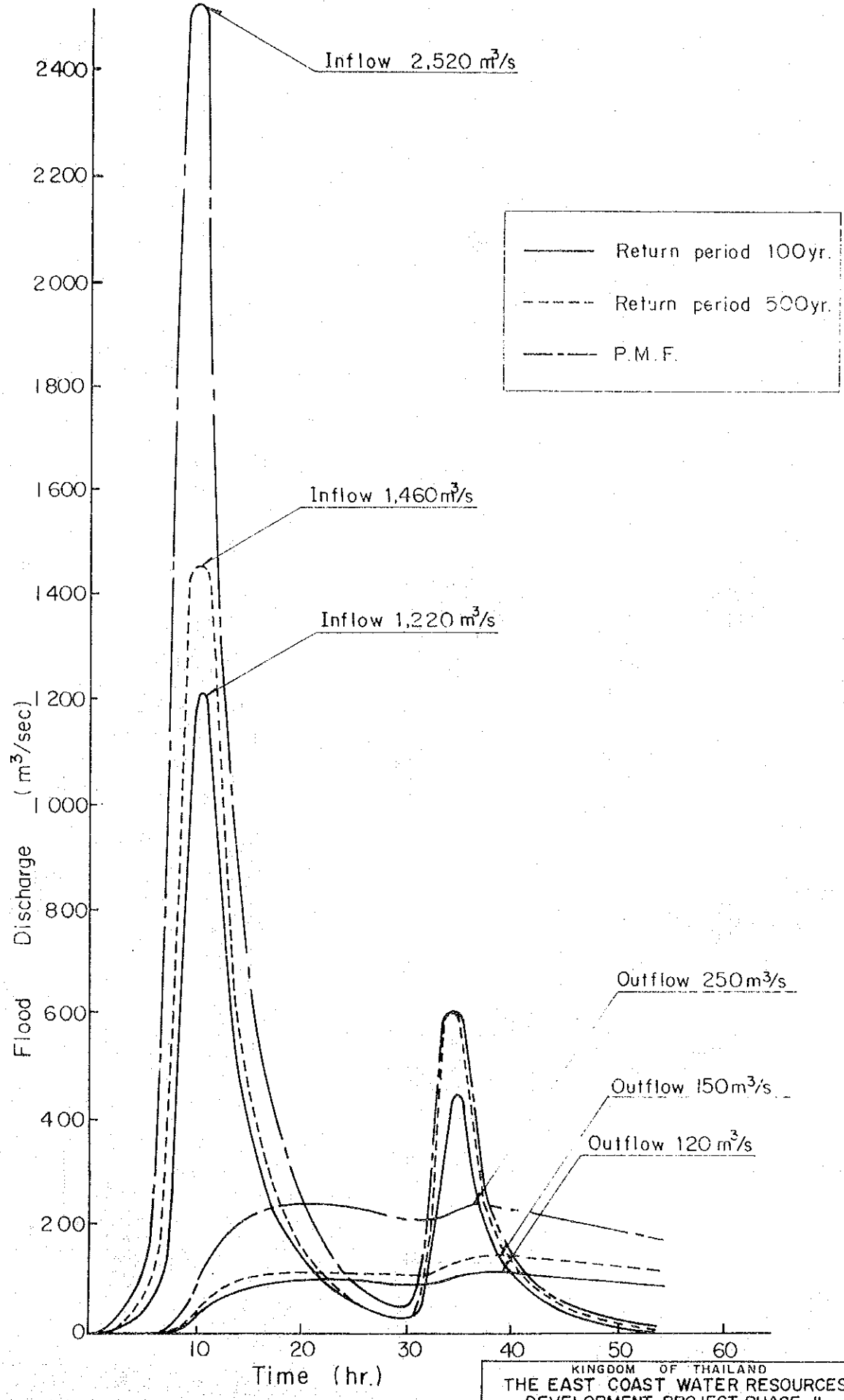

Fig. 32 Flood Routing, Khlong Luang Dam

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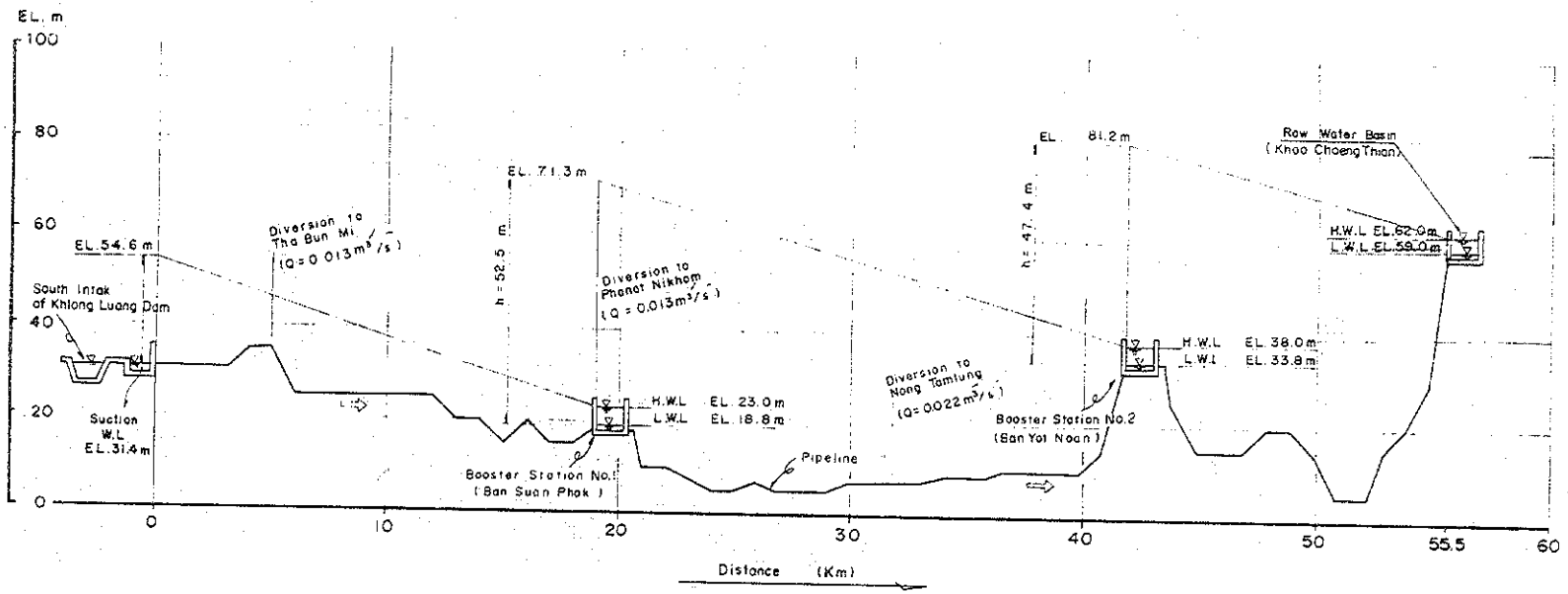

	5.0 km	14.0 km	12.8 km	10.0 km	13.7 km
Discharge (m^3/s)	0.520 (1st phase:0.26) (2nd phase:026)	0.500 (1st phase : 0.25 2nd phase : 0.25)	0.480 (1st phase : 0.24 2nd phase : 0.24)	0.460 (1st phase : 0.23 2nd phase : 0.23)	0.460 (1st phase : 0.23 (2nd phase : 0.23)
Diameter (mm)	600 x 2	600 x 2	600 x 2	600 x 2	600 x 2
Hydraulic Gradient (1/1000)	1.76	1.63	1.51	1.40	1.40
Length (km)	5.0	14.0	12.8	10.0	13.7
Friction Loss (m)	8.8	22.8	19.3	14.0	19.2
Velocity (m/sec)	0.92	0.88	0.85	0.81	0.81
Total Friction Loss (m)	—	31.6	33.3		19.2
Net Head (m)		23.2	52.5		47.4
Gross Head (m)		30.0	60.0		50.0

Fig. 33 Hydraulic Gradient Line of Khlong Luang Pipeline System
(from Khlong Luang to Khao Choeng Thian)

	WORK ITEMS	Q'ty
FIRST STAGE	1. Multi - purpose Dam	
	1.1. Investigation & Design	
	1.2. Tender & Contract Award	
	1.3. Land Acquisition & Compensation	
	1.4 Mobilization & Preparatory Work	
	1.5. Core of River	
	1.6. Main Dam	Ex. 1971,000 m³ Em. 2972,000 m³
	1.7. Spillway	Conc. 6,800m³
	1.8. Saddle Dam	Em. 298,000m³
	2. Water Conveyance System	
	2.1. Investigation & Design	
	2.2. Tender & Contract Award	
	2.3. Land Acquisition	
	2.4. Mobilization & Preparatory Work	
	2.5. Intake	0.26m³/s 110kw x 2
	2.6 Pipeline	ø 600mm 55.5 km
	2.7. Booster P/S	190kw x 2 | 160kw x 2
	2.8. Receiving Facilities	Conc. 1,900 m³
	3. Irrigation & Drainage System	
	3.1. Investigation & Design	
	3.2. Tender & Contract Award	
	3.3. Land Acquisition	
	3.4. Mobilization & Preparatory Work	
	3.5. Intake	N : Conc. 800m³ S : Conc. 2,200m³
	3.6. Main Canal	N : 31.1km S : 21.8km
	3.7. Latral Canal	N : 15 km S : 19 km
	3.8. Drainage Canal	37 km
SECON STAGE	4. Water Coveyance	
	4.1. Review of Design	
	4.2. Tender & Contract Award	
	4.3. Mobilization & Preparatory Work	
	4.4. Intake	0.26m³/s 110kw
	4.5. Pipeline	ø 600mm 55.5 km
	4.6 Booster P/S	190kw | 160kw

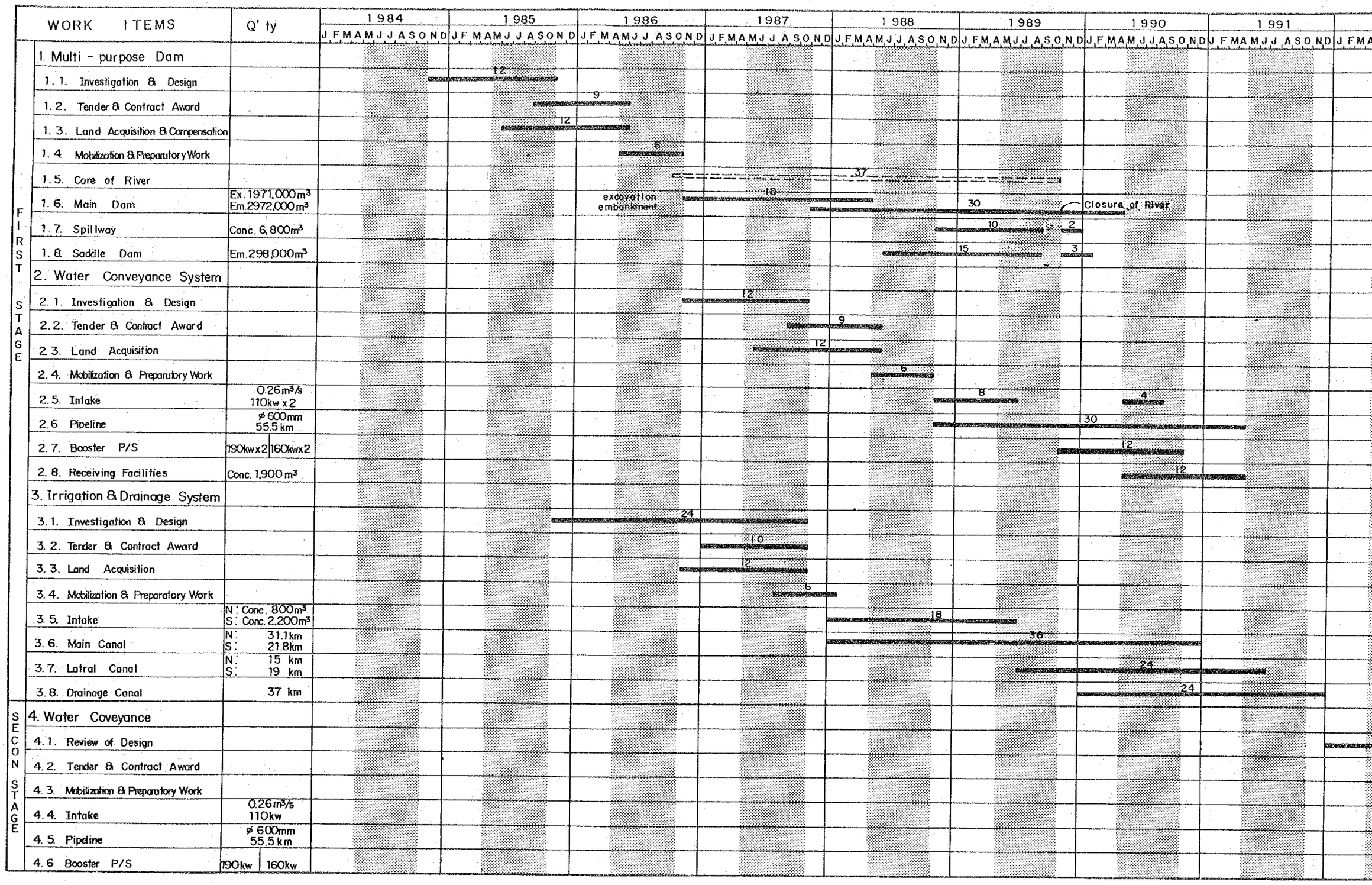

Fig.34 Implementation Schedule of Khlong Luang Dam Scheme

1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

9

6

37

excavation embankment 19

30

Closure of River

10 2

15 3

12

9

12

6

8 4

30

12

12

24

10

12

6

18

36

24

24

10

9

6

4

30

4

Ex : Excavation

Em : Embankment

Conc : Concrete

N : North Canal

S : South Canal

Wet Season

Dry Season

10 Months

ementation Schedule of Khlong Luang Dam Scheme

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JAPAN INTERNATIONAL COOPERATION AGENCY

Fig.35 Organization Chart of Royal Irrigation Department

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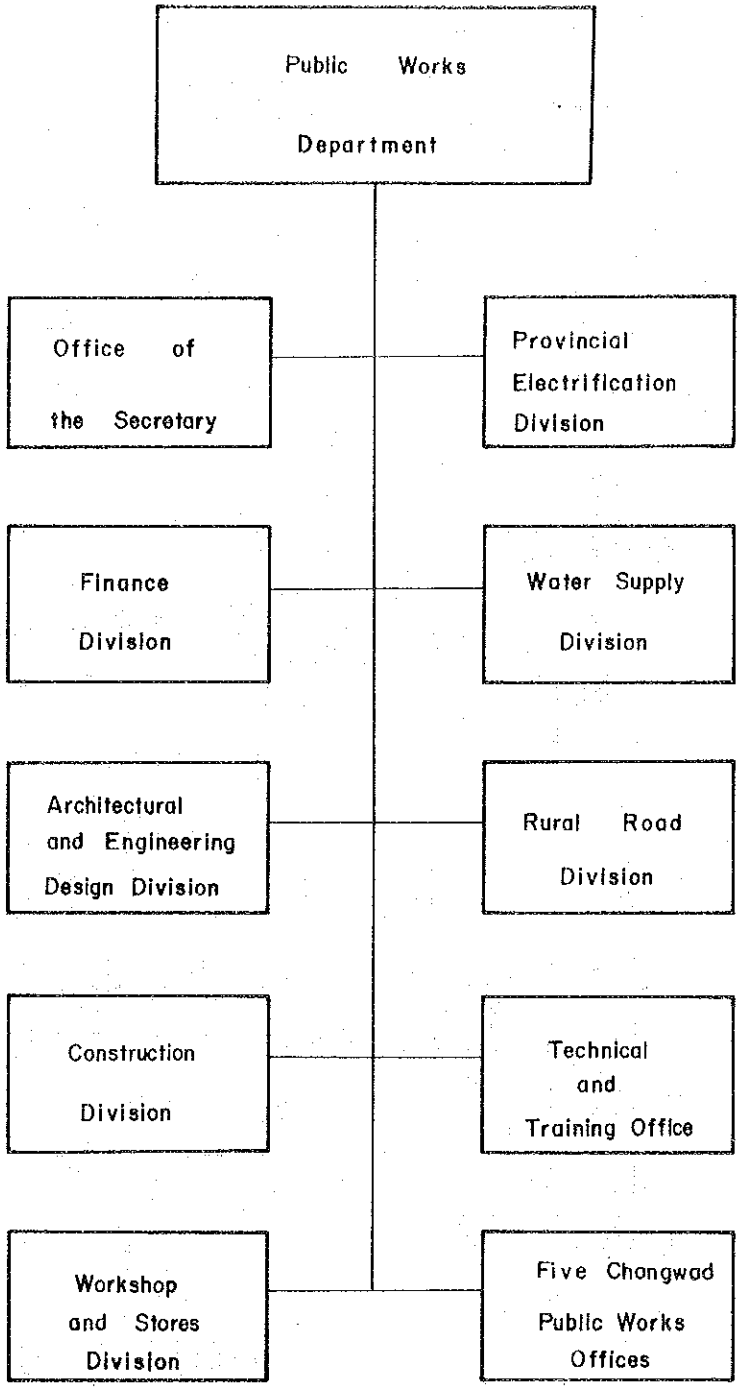

Fig. 36 Organization Chart of Public Works Department

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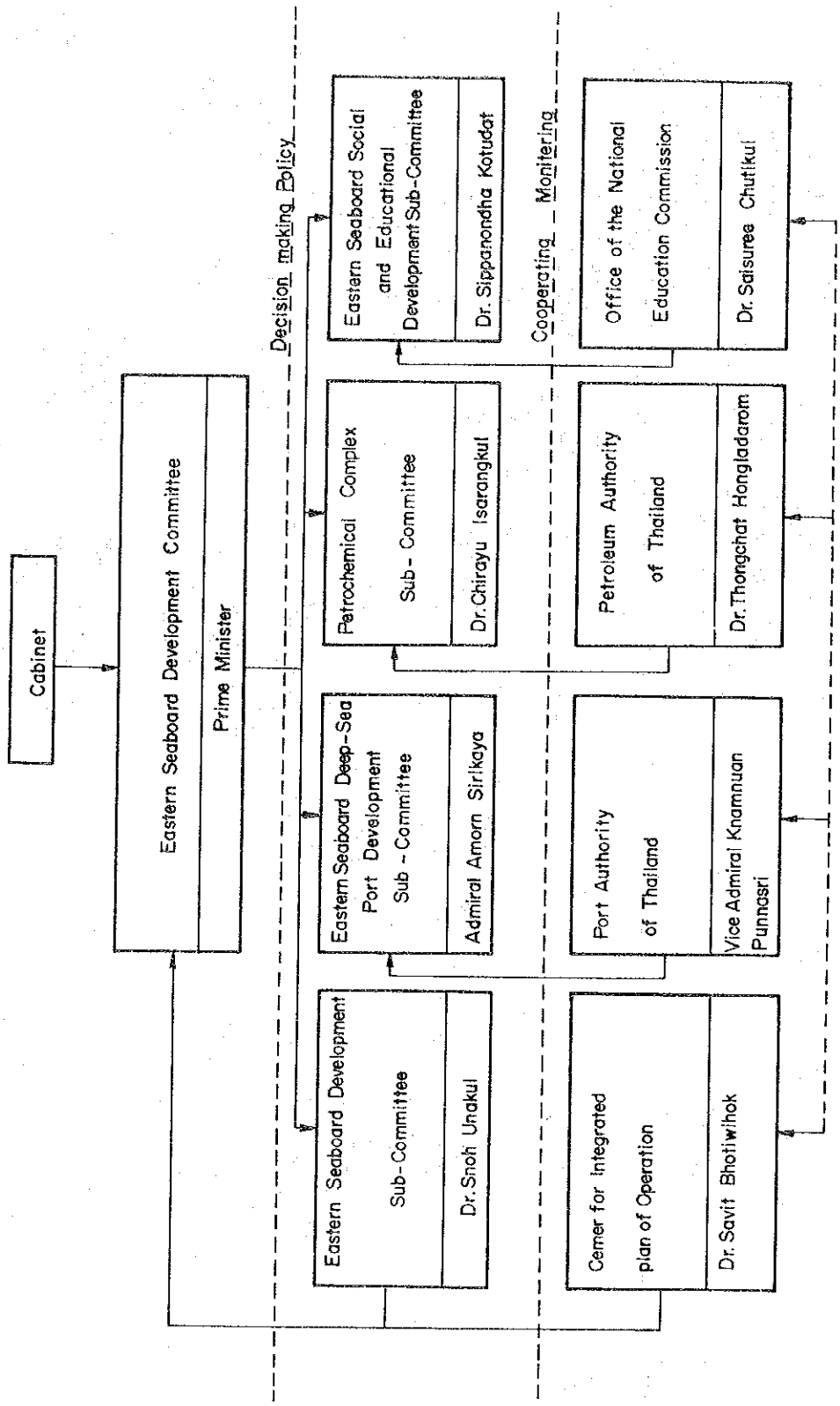

Fig. 37 Organization Chart of Eastern Seaboard Development Committee

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