

Table XIV.1.5 (5/5) AVERAGE DAMAGEABLE VALUE OF FISHPOND (INTAM B2*)

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.

(1) Cultivation Calendar	1st Crop	1st Crop	1st Crop	1st Crop	2nd Crop	2nd Crop	2nd Crop	2nd Crop	2nd Crop	2nd Crop	1st Crop	1st Crop

(2) Cultivated Area	100%	100%	100%	100%	50%	50%	100%	100%	100%	100%	100%	100%
(3) Accum. Cost	69%	82%	94%	100%	25%	47%	57%	69%	82%	94%	100%	100%
(4) Flood Frequency	18%	29%	41%	12%								
(5) (2) x (4)	18%	29%	41%	6%	0%	0%	0%	0%	0%	0%	0%	0%
(6) Damageable Value**	1,091,101	1,922,674	2,826,365	413,382	0	0	0	0	0	0	0	0
(Rp./ha)	0	0	0	293,184								
Average Damageable Value (Rp./ha)	6,546,706											
Rounding (Rp./ha)	6,546,000											

(Remarks)	(a) Economic Production Cost (Rp./ha) = 2,724,500 (Refer to Table XIV.1.7)											
	(b) Yield (ton/ha) = 0.64											
	(c) Economic Price*** (Rp./ton) = 10,982,000											
	(d) Net Income (Rp./ha) = 4,303,000											
	((b) x (c) - (a))											

Notes:
 * Fishpond Cultivation Guideline for Prawn and Milkfish
 ** Damageable Value = (5) x ((3) x (a) + (d))
 *** Weighted average of Prawn and Milkfish
 = ((Economic Price of Prawn) x 0.4 (ton/ha) + (Economic Price of Milkfish) x 0.24 (ton/ha)) / (0.4 + 0.24)

Source : Evaluation of INTAM Program Implementation in Central Java 1991/1992; Fishery Office, Central Java Province

Table XIV.1.6 DAMAGEABLE VALUE OF FISHPOND

	INTAM A1	INTAM A2	INTAM A3	INTAM B1	INTAM B2	Total
Average Damageable Value (Rp./ha)*	3,078,000	12,037,000	29,986,000	2,988,000	6,546,000	
Distrubution	17.14%	24.29%	28.57%	10.00%	20.00%	100.00%
Damageable Value (Rp./ha)	527,657	2,923,271	8,567,429	298,800	1,309,200	13,626,357
Rounding						13,626,000

Note * : Refer to Table XIV.1.5

Source : Evaluation of INTAM Program Implementation in Central Jawa 1991/1992; Fishery Office, Central Jawa Province

Table XIV.1.7 (1/2) ECONOMIC PRODUCTION COST OF FISHPOND (INTAM A)

Description	INTAM A1		INTAM A2		INTAM A3	
	Financial cost (Rp.)	Economic cost* (Rp.)	Financial cost (Rp.)	Economic cost* (Rp.)	Financial cost (Rp.)	Economic cost* (Rp.)
A. Fixed Cost						
1. Pond Construction	750,000	681,000	1,500,000	1,363,000	3,000,000	2,727,000
2. Maintenance of Water Pump	300,000	272,000	1,000,000	909,000	1,600,000	1,454,000
3. Maintenance of Waterwheel	-	-	-	-	937,500	852,000
4. Maintenance of Genset	-	-	-	-	1,250,000	1,136,000
5. Maintenance of Other Equipment	25,000	22,000	50,000	45,000	200,000	181,000
6. Interest	718,875	0	2,187,090	0	6,424,200	0
Sub-Total	1,793,875	975,000	4,737,090	2,317,000	13,411,700	6,350,000
B. Operation Cost						
1. Prawn seed/germ	144,000	130,000	576,000	523,000	1,440,000	1,309,000
2. Milkfish seed/germ	-	-	-	-	-	-
3. Food	100,000	90,000	2,580,000	2,345,000	6,450,000	5,863,000
4. Prawn vitamin	24,000	21,000	80,000	72,000	80,000	72,000
5. Organic fertilizer	50,000	45,000	50,000	45,000	100,000	90,000
6. Urea fertilizer	30,000	27,000	20,000	18,000	-	-
7. TSP fertilizer	13,875	12,000	9,250	8,000	-	-
8. Calcium	50,000	45,000	100,000	90,000	-	-
9. Pump/Waterwheel operation	75,000	68,000	250,000	227,000	750,000	681,000
10. Labor	360,000	288,000	360,000	288,000	900,000	720,000
Sub-Total	846,875	725,000	4,025,250	3,616,000	9,720,000	8,735,000
1 year 2 times :	1,693,750	1,452,000	8,050,500	7,232,000	19,440,000	17,470,000
Total Cost per year	3,487,625	2,427,000	12,787,590	9,549,000	32,851,700	23,820,000
Total Cost per season	1,743,813	1,213,500	6,393,795	4,774,500	16,425,850	11,910,000

Note * : Tax deduction (10%)

Labor cost = 80% of the market wage rate

Source : Evaluation of INTAM Program Implementation in Central Java 1991/1992;
Fishery Office, Central Java Province

Table XIV.1.7 (2/2) ECONOMIC PRODUCTION COST OF FISHPOND (INTAM B)

Description	INTAM B1		INTAM B2	
	Financial Cost (Rp.)	Economic Cost* (Rp.)	Financial Cost (Rp.)	Economic Cost* (Rp.)
A. Fixed Cost				
1. Pond Construction	750,000	681,000	1,000,000	909,000
2. Maintenance of Water Pump	-	-	300,000	272,000
3. Maintenance of Waterwheel	-	-	-	-
4. Maintenance of Genset	-	-	-	-
5. Maintenance of Other Equipment	12,500	11,000	25,000	22,000
6. Interest	473,355	0	1,316,970	0
Sub-Total	1,235,855	692,000	2,641,970	1,203,000
B. Operation Cost				
1. Prawn seed/germ	120,000	109,000	288,000	261,000
2. Milkfish seed/germ	187,500	170,000	150,000	136,000
3. Food	100,000	90,000	1,290,000	1,172,000
4. Prawn vitamin	16,000	14,000	16,000	14,000
5. Organic fertilizer	50,000	45,000	50,000	45,000
6. Urea fertilizer	30,000	27,000	20,000	18,000
7. TSP fertilizer	13,875	12,000	9,250	8,000
8. Calcium	50,000	45,000	50,000	45,000
9. Pump/Waterwheel operation	-	-	150,000	136,000
10. Labor	360,000	288,000	360,000	288,000
Sub-Total	927,375	800,000	2,383,250	2,123,000
1 year 2 times :	1,854,750	1,600,000	4,766,500	4,246,000
Total Cost per year	3,090,605	2,292,000	7,408,470	5,449,000
Total Cost per season	1,545,303	1,146,000	3,704,235	2,724,500

Note * : Tax deduction (10%)

Labor cost = 80% of the market wage rate

Source : Evaluation of INTAM Program Implementation in Central Java 1991/1992;
Fishery Office, Central Java Province

Table XIV.1.8 ECONOMIC PRICE OF PRAWN
(Export Parity Price)

Price level: Jan. 1991 - Dec. 1991
Conversion Rate: US\$ 1.00 = Rp 2,033

Description	Unit	Value
(1) FOB Jakarta (Weighted Average)	US\$/ton	8,406
(2) Rupiah Equivalent	Rp./ton	17,088,800
(3) Port Costs, etc.	Rp./ton	(25,000)
(4) Transportation (Semarang to Jakarta)	Rp./ton	(854,440)
Parity Price	Rp./ton	16,209,360
Rounding	Rp./ton	16,209,000

Source:

Indonesia Foreign Trade Statistics, 1991; Central Bureau of Statistics

Table XIV.1.9 DAMAGEABLE VALUE OF RESIDENTIAL AREA

	Permanent	Semi-Perm.	Temporary	Total
Construction Cost (Rp./m ²)	300,000	225,000	120,000	
Building Coverage	66%	66%	66%	
Area Value (Rp./m ²)	198,000	148,500	79,200	
Distribution	48%	28%	24%	
	95,040	41,996	18,786	155,822
Depreciation (56%)				87,260
Area Value (Rp./ha)				872,603,000
Economic Conversion*				793,275,455
Rounding				793,000,000

Note * : Tax deduction (10%)

Sources :

- (1) Housing and It's Environment 1989; Central Bureau of Statistics
- (2) Regional Statistics 1990; Regional Statistic Office

Table XIV.1.10 DAMAGEABLE VALUE OF BUILDINGS

	Industry	Commercial	Public
Building Value (Rp./m ²)	547,500	594,000	594,000
Building Coverage	66%	66%	66%
Depreciation (56%)	202,356	219,542	219,542
Area Value (Rp./ha)	2,023,560,000	2,195,424,000	2,195,424,000
Economic Conversion* (Rp./ha)	1,839,600,000	1,995,840,000	1,995,840,000
Rounding	1,839,000,000	1,995,000,000	1,995,000,000

Note * : Tax deduction (10%)

Source : Operational Guidance for Implementation of Government Building
Construction 1991-1992;
Cipta Karya, Ministry of Public Works

Table XIV.1.13 CALCULATED FLOOD DAMAGE IN URGENT PROJECT

<Without the Project>

Unit: Million Rp.

Return Period (year)	Wet Paddy	Fishpond			House/Building			Indoor Mobables			Public Facilities			Business Suspension*		Total
		Residential	Industrial	Commercial	Public	Residential	Industrial	Commercial	Residential	Industrial	Commercial	Public	Facilities	Business	Suspension*	
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	1	0	2,686	321	89	137	12,375	2,069	582	1,136	9,077	1,164	29,638			
25	11	89	6,321	691	147	327	28,957	4,450	958	2,726	20,862	2,681	68,219			
50	15	254	10,079	1,066	1,157	640	44,779	6,861	7,535	5,197	36,183	4,655	118,423			
100	18	303	17,384	1,637	2,304	2,100	76,789	10,588	15,391	17,038	67,032	8,613	219,196			

Note * : 6% of the damage to Houses/Buildings and their Indoor Mobables

<With the Project>

Unit: Million Rp.

Return Period (year)	Wet Paddy	Fishpond			House/Building			Indoor Mobables			Public Facilities			Business Suspension*		Total
		Residential	Industrial	Commercial	Public	Residential	Industrial	Commercial	Residential	Industrial	Commercial	Public	Facilities	Business	Suspension*	
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	1,746	0	0	127	8,091	0	0	1,053	5,156	661	16,833			
100	0	0	3,808	13	313	17,465	84	0	2,615	11,371	1,458	37,127				

Note * : 6% of the damage to Houses/Buildings and their Indoor Mobables

Table XIV.1.14. ANNUAL AVERAGE BENEFIT OF URGENT PROJECT FOR WEST FLOODWAY/GARANG RIVER

(Unit : Million Rp.)

Return Period (Yr)	Flood Damage		Damage Reduction	Average Damage Reduction	Expectation	Benefit
	without Project	with Project				
(Year of Land Use Status : 1993)						
5	0	0	0	0	0.00	0
10	29,638	0	29,638	14,819	0.10	1,482
25	68,219	0	68,219	48,929	0.06	2,936
50	118,423	118,423	0	0	0.02	0
100	219,196	219,196	0	0	0.01	0
					Annual Average Benefit	4,418
(Year of Land Use Status : 2015)						
5	0	0	0	0	0.00	0
10	118,171	0	118,171	59,086	0.10	5,909
25	240,978	0	240,978	179,575	0.06	10,774
50	365,206	365,206	0	0	0.02	0
100	538,530	538,530	0	0	0.01	0
					Annual Average Benefit	16,683
Annual Incremental Rate of Annual Average Benefit from 1993 to 2015						6 %/year

Table XIV.1.15 ANNUAL COST AND BENEFIT FLOW OF URGENT PROJECT
FOR WEST FLOODWAY/GARANG RIVER

Unit: Million Rp.

Year	Economic Cost			Benefit	Balance
	Const.	OMR	Total		
1994			2,388	0	-2,388
1995			2,389	0	-2,389
1996			0	0	0
1997	16,806		21,877	0	-21,877
1998	16,778		21,845	2,753	-19,092
1999	7,262		9,453	5,808	-3,645
2000		220	220	7,473	7,253
2001		220	220	7,884	7,664
2002		220	220	8,317	8,097
2003		220	220	8,775	8,555
2004		220	220	9,258	9,038
2005		220	220	9,767	9,547
2006		220	220	10,304	10,084
2007		220	220	10,871	10,651
2008		220	220	11,469	11,249
2009		220	220	12,099	11,879
2010		220	220	12,765	12,545
2011		220	220	13,467	13,247
2012		220	220	14,207	13,987
2013		220	220	14,989	14,769
2014		220	220	15,813	15,593
2015		220	220	16,683	16,463
2016		220	220	16,683	16,463
2017		220	220	16,683	16,463
2018		220	220	16,683	16,463
2019		220	220	16,683	16,463
2020		220	220	16,683	16,463
2021		220	220	16,683	16,463
2022		220	220	16,683	16,463
2023		220	220	16,683	16,463
2024		220	220	16,683	16,463
2025		220	220	16,683	16,463
2026		220	220	16,683	16,463
2027		220	220	16,683	16,463
2028		220	220	16,683	16,463
2029		220	220	16,683	16,463
2030		220	220	16,683	16,463
2031		220	220	16,683	16,463
2032		220	220	16,683	16,463
2033		220	220	16,683	16,463
2034		220	220	16,683	16,463
2035		220	220	16,683	16,463
2036		220	220	16,683	16,463
2037		220	220	16,683	16,463
2038		220	220	16,683	16,463
2039		220	220	16,683	16,463
2040		220	220	16,683	16,463
2041		220	220	16,683	16,463
2042		220	220	16,683	16,463
2043		220	220	16,683	16,463
2044		220	220	16,683	16,463
2045		220	220	16,683	16,463
2046		220	220	16,683	16,463
2047		220	220	16,683	16,463
2048		220	220	16,683	16,463
2049		220	220	16,683	16,463
Total	40,846	11,000	68,952	759,924	740,363
EIRR =					15.9%
(Discount Rate 10%)					
B/C =					1.79
NPV =					31,152

Table XIV.2.1 RESIDENCE DISTRIBUTION

Project Area	Distribution			House
	Permanent (%)	Semi-Perm. (%)	Temporary (%)	Density (No./km2)
Blorong R.	3.78%	7.70%	88.52%	1,549
Silandak R./Bringin R.	42.50%	21.78%	35.71%	1,703
West Floodway/Garang R.	48.00%	28.28%	23.72%	1,751
East Floodway	42.81%	27.20%	29.99%	1,634
Babon R.	46.05%	25.63%	28.33%	928

Source: "Daram Angka 1990," Kantor Statistik
 ("Regional Statistics 1990," Regional Statistics Office)

Table XIV.2.2 (1/2) DAMAGEABLE VALUE OF RESIDENTIAL AREA

	Permanent	Semi-Perm.	Temporary	Total
Construction Cost (Rp./m ²)	300,000	225,000	120,000	
Building Density*	50%	50%	50%	
Area Value (Rp./m ²)	150,000	112,500	60,000	
Distribution*	48%	28%	24%	
	72,000	31,815	14,232	118,047
Depreciation (56%)				66,106
Area Value (Rp./ha)				661,063,000
Economic Conversion**				600,966,364
Rounding				600,000,000

Note *: This rate varies due to the statistical data.

** : Tax deduction (10%)

Sources :

(1) Housing and It's Environment 1989; Central Bureau of Statistics

(2) Regional Statistics 1990; Regional Statistic Office

Table XIV.2.2 (2/2) DAMAGEABLE VALUE OF INDUSTRIAL & BUSINESS AREA

	Industrial	Business
Building Value (Rp./m ²)	547,500	594,000
Building Density*	50%	50%
Depreciation (56%)	153,300	166,320
Area Value (Rp./ha)	1,533,000,000	1,663,200,000
Economic Conversion** (Rp./ha)	1,393,636,364	1,512,000,000
Rounding	1,393,000,000	1,512,000,000

Note *: This rate varies due to the statistical data.

** : Tax deduction (10%)

Source : Operational Guidance for Implementation of Government Building Construction 1991-1992;
Cipta Karya, Ministry of Public Works

Table XIV.2.3 (1/6) CALCULATED FLOOD DAMAGE IN BLORONG R.

Unit: Million Rp.

Return Period (year)	Green Zone	House/Building		Indoor Movables		Public Facilities		Business Suspension	Total	
		Wet Paddy	Fishpond	Residential	Industrial	Business	Industrial			Business
5	775	3,254	2,150	0	0	10,053	0	9,421	0	25,654
10	846	3,809	2,357	0	0	11,100	0	10,389	0	28,502
20	890	3,942	2,513	0	0	11,860	0	11,096	0	30,301
50	936	3,951	2,730	0	0	12,810	0	11,997	0	32,423
100	982	3,957	2,879	0	0	13,471	0	12,622	0	33,910

Table XIV.2.3 (2/6) CALCULATED FLOOD DAMAGE IN BRINGIN R.

Unit: Million Rp.

Return Period (year)	Green Zone	House/Building		Indoor Movables		Public Facilities		Business Suspension	Total	
		Wet Paddy	Fishpond	Residential	Industrial	Business	Industrial			Business
5	0	2,804	0	0	0	0	0	0	0	2,804
10	0	2,922	0	95	0	609	0	198	0	3,824
25	0	2,931	0	142	0	913	0	298	0	4,283
50	0	2,987	0	142	0	913	0	298	0	4,340
100	0	2,996	0	236	0	1,522	0	496	0	5,251

Table XIV.2.3 (3/6) CALCULATED FLOOD DAMAGE IN SILANDAK R.

Unit: Million Rp.

Return Period (year)	Green Zone	House/Building		Indoor Movables		Public Facilities		Business Suspension	Total	
		Wet Paddy	Fishpond	Residential	Industrial	Business	Industrial			Business
5	0	0	283	0	0	1,274	0	729	0	2,286
10	0	0	290	47	0	1,314	304	915	0	2,871
25	0	0	290	331	0	1,314	2,131	1,903	0	5,969
50	0	0	296	426	0	1,355	2,740	2,254	0	7,070
100	0	0	310	426	0	1,435	2,740	2,298	0	7,208

Table XIV.2.3 (4/5) CALCULATED FLOOD DAMAGE IN WEST FLOODWAY/GARANG R.

Unit: Million Rp.

Return Period (year)	Green Zone		House/Building		Indoor Movables		Public Facilities		Business Suspension*		Total
	Wet Paddy	Fishpond	Residential	Industrial	Residential	Industrial	Residential	Industrial	Business	Suspension*	
5	0	0	0	0	0	0	0	0	0	0	0
10	0	0	2,623	2,147	6,211	12,087	13,820	40,448	36,194	4,640	118,171
25	0	0	7,503	5,368	10,094	34,466	34,550	65,728	73,807	9,462	240,978
50	0	0	11,469	9,662	13,976	50,705	62,190	91,007	111,856	14,341	365,206
100	0	0	20,343	14,598	16,891	88,647	94,426	117,536	164,942	21,146	538,530

Note * : 6% of the damage to Houses/Buildings and their Indoor Movables

Table XIV.2.3 (5/6) CALCULATED FLOOD DAMAGE IN EAST FLOODWAY

Unit: Million Rp.

Return Period (year)	Green Zone		House/Building		Indoor Movables		Public Facilities		Business Suspension		Total
	Wet Paddy	Fishpond	Residential	Industrial	Residential	Industrial	Residential	Industrial	Business	Suspension	
5	0	0	0	0	0	0	0	0	0	0	0
10	0	2,070	573	1,898	0	2,677	12,213	0	8,125	0	27,557
25	0	2,618	703	2,947	0	3,273	19,009	0	12,136	0	40,687
50	0	2,913	779	3,389	0	3,642	21,876	0	13,893	0	46,493
100	0	4,313	9,932	5,081	0	45,771	32,918	0	43,853	0	141,868

Table XIV.2.3 (6/6) CALCULATED FLOOD DAMAGE IN BABON R.

Unit: Million Rp.

Return Period (year)	Green Zone		House/Building		Indoor Movables		Public Facilities		Business Suspension		Total
	Wet Paddy	Fishpond	Residential	Industrial	Residential	Industrial	Residential	Industrial	Business	Suspension	
5	0	3,970	2,485	2,577	0	3,644	7,341	0	4,525	0	24,542
10	0	5,674	2,218	2,389	0	10,702	15,448	0	8,674	0	45,105
25	0	5,808	2,422	2,848	0	11,499	18,535	0	9,956	0	51,068
50	0	6,396	2,596	3,223	0	12,202	20,978	0	10,998	0	56,393
100	0	6,846	2,764	4,180	0	12,632	27,228	0	13,199	0	66,849

Table XIV.2.4 (1/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF BLORONG R.

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	25,654	0	25,654	12,827	0.79	10,134
10	28,502	0	28,502	27,078	0.10	2,708
20	30,301	0	30,301	29,401	0.05	1,470
50	32,423	32,423	0	0	0.03	0
100	33,910	33,910	0	0	0.01	0
Total (Annual Average Benefit)						14,312

Table XIV.2.4 (2/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF BRINGIN R.

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	2,804	0	2,804	1,402	0.79	1,108
10	3,824	0	3,824	3,314	0.10	331
25	4,283	0	4,283	4,053	0.06	243
50	4,340	0	4,340	4,312	0.02	86
100	5,251	5,251	0	0	0.01	0
Total (Annual Average Benefit)						1,768

Table XIV.2.4 (3/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF SILANDAK R.

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	2,286	0	2,286	1,143	0.79	903
10	2,871	0	2,871	2,579	0.10	258
25	5,969	0	5,969	4,420	0.06	265
50	7,070	0	7,070	6,520	0.02	130
100	7,208	0	7,208	7,139	0.01	71
Total (Annual Average Benefit)						1,628

Table XIV.2.4 (4/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF WEST FW./GARANG R.

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	0	0	0	0	0.79	0
10	118,171	0	118,171	59,085	0.10	5,909
25	240,978	0	240,978	179,574	0.06	10,774
50	365,206	0	365,206	303,092	0.02	6,062
100	538,530	0	538,530	451,868	0.01	4,519
Total (Annual Average Benefit)						27,264

Table XIV.2.4 (5/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF EAST FLOODWAY

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	0	0	0	0	0.79	0
10	27,557	0	27,557	13,778	0.10	1,378
25	40,687	0	40,687	34,122	0.06	2,047
50	46,493	0	46,493	43,590	0.02	872
100	141,868	0	141,868	94,181	0.01	942
Total (Annual Average Benefit)						5,239

Table XIV.2.4 (6/6) CALCULATION OF ANNUAL AVERAGE BENEFIT OF BABON R.

Unit: Million Rp.

Return Flood Damage Period (Yr)	w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
1.01	0	0	0			
5	24,542	0	24,542	12,271	0.79	9,695
10	45,105	0	45,105	34,823	0.10	3,482
25	51,068	0	51,068	48,087	0.06	2,885
50	56,393	0	56,393	53,731	0.02	1,075
100	66,849	ERR	6,833	31,613	0.01	316
Total (Annual Average Benefit)						17,453

Table XIV.2.5 (1/6) ANNUAL COST AND BENEFIT FLOW OF BLORONG RIVER PROJECT

Unit: Million Rp.

Year	Economic Cost							Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR		
1994								0	0
1995								0	0
1996								0	0
1997								0	0
-9 1998				1,968		197		2,165	0
-8 1999				1,968		197		2,165	0
-7 2000		6,529	508	0		653		7,690	0
-6 2001	2,156	4,897	549	246		730		8,578	0
-5 2002	4,313	3,264	589	410		799		9,375	0
-4 2003	12,939	1,632	1,133	1,230		1,580		18,514	0
-3 2004	10,782		839	1,066		1,185		13,872	0
-2 2005	10,782		839	1,066		1,185		13,872	0
-1 2006	2,156		167	245		240		2,808	0
1 2007						115	115	8,864	8,749
2 2008						115	115	9,396	9,281
3 2009						115	115	9,960	9,845
4 2010						115	115	10,557	10,442
5 2011						115	115	11,191	11,076
6 2012				435		44	115	594	11,852
7 2013				0		0	115	115	12,574
8 2014	5,219		406	435		565	115	6,740	13,328
9 2015							168	168	14,312
10 2016							168	168	14,312
11 2017							168	168	14,312
12 2018							168	168	14,312
13 2019							168	168	14,312
14 2020							168	168	14,312
15 2021							168	168	14,312
16 2022							168	168	14,312
17 2023							168	168	14,312
18 2024							168	168	14,312
19 2025							168	168	14,312
20 2026							168	168	14,312
21 2027							168	168	14,312
22 2028							168	168	14,312
23 2029							168	168	14,312
24 2030							168	168	14,312
25 2031							168	168	14,312
26 2032							168	168	14,312
27 2033							168	168	14,312
28 2034							168	168	14,312
29 2035							168	168	14,312
30 2036							168	168	14,312
31 2037							168	168	14,312
32 2038							168	168	14,312
33 2039							168	168	14,312
34 2040							168	168	14,312
35 2041							168	168	14,312
36 2042							168	168	14,312
37 2043							168	168	14,312
38 2044							168	168	14,312
39 2045							168	168	14,312
40 2046							168	168	14,312
41 2047							168	168	14,312
42 2048							168	168	14,312
43 2049							168	168	14,312
44 2050							168	168	14,312
45 2051							168	168	14,312
46 2052							168	168	14,312
47 2053							168	168	14,312
48 2054							168	168	14,312
49 2055							168	168	14,312
50 2056							168	168	14,312
2057							0	0	0
2058							0	0	0
2059							0	0	0
2060							0	0	0
2061							0	0	0
2062							0	0	0
2063							0	0	0
2064							0	0	0
TOTAL	48,347	16,322	5,030	9,069		7,375	7,976	EIRR =	10.5%

(Discount Rate 10%)
 B/C = 1.07
 NPV = 2,351

Table XIV.2.5 (2/6) ANNUAL COST AND BENEFIT FLOW OF BRINGIN RIVER PROJECT

Unit: Million Rp.

Year	Economic Cost							Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR			
1994								0	0	0
1995								0	0	0
1996								0	0	0
1997								0	0	0
1998								0	0	0
1999								0	0	0
2000								0	0	0
2001								0	0	0
2002								0	0	0
2003								0	0	0
2004								0	0	0
2005								0	0	0
2006								0	0	0
2007								0	0	0
2008								0	0	0
2009								0	0	0
2010								0	0	0
-4 2011				1,186		119		1,305	0	-1,305
-3 2012		2,251	175			225		2,651	0	-2,651
-2 2013	8,539	1,501	781	712		1,075		12,608	0	-12,608
-1 2014	5,693		443	474		617		7,227	177	-7,050
1 2015							157	157	1,768	1,611
2 2016							157	157	1,768	1,611
3 2017							157	157	1,768	1,611
4 2018							157	157	1,768	1,611
5 2019							157	157	1,768	1,611
6 2020							157	157	1,768	1,611
7 2021							157	157	1,768	1,611
8 2022							157	157	1,768	1,611
9 2023							157	157	1,768	1,611
10 2024							157	157	1,768	1,611
11 2025							157	157	1,768	1,611
12 2026							157	157	1,768	1,611
13 2027							157	157	1,768	1,611
14 2028							157	157	1,768	1,611
15 2029							157	157	1,768	1,611
16 2030							157	157	1,768	1,611
17 2031							157	157	1,768	1,611
18 2032							157	157	1,768	1,611
19 2033							157	157	1,768	1,611
20 2034							157	157	1,768	1,611
21 2035							157	157	1,768	1,611
22 2036							157	157	1,768	1,611
23 2037							157	157	1,768	1,611
24 2038							157	157	1,768	1,611
25 2039							157	157	1,768	1,611
26 2040							157	157	1,768	1,611
27 2041							157	157	1,768	1,611
28 2042							157	157	1,768	1,611
29 2043							157	157	1,768	1,611
30 2044							157	157	1,768	1,611
31 2045							157	157	1,768	1,611
32 2046							157	157	1,768	1,611
33 2047							157	157	1,768	1,611
34 2048							157	157	1,768	1,611
35 2049							157	157	1,768	1,611
36 2050							157	157	1,768	1,611
37 2051							157	157	1,768	1,611
38 2052							157	157	1,768	1,611
39 2053							157	157	1,768	1,611
40 2054							157	157	1,768	1,611
41 2055							157	157	1,768	1,611
42 2056							157	157	1,768	1,611
43 2057							157	157	1,768	1,611
44 2058							157	157	1,768	1,611
45 2059							157	157	1,768	1,611
46 2060							157	157	1,768	1,611
47 2061							157	157	1,768	1,611
48 2062							157	157	1,768	1,611
49 2063							157	157	1,768	1,611
50 2064							157	157	1,768	1,611
TOTAL	14,232	3,752	1,399	2,372		2,036	7,850		EIRR =	6.1%

(Discount Rate 10%)
 B/C = 0.64
 NPV = -1,337

Table XIV.2.5 (3/6) ANNUAL COST AND BENEFIT FLOW OF SILANDAK RIVER PROJECT

Unit: Million Rp.

Year	Economic Cost Const. Comp.	Admin.	E/S	Phy. Conti	OMR	Total	Benefit	Balance
1994						0	0	0
1995						0	0	0
1996						0	0	0
1997						0	0	0
1998						0	0	0
1999						0	0	0
2000						0	0	0
2001						0	0	0
2002						0	0	0
2003						0	0	0
2004						0	0	0
2005						0	0	0
2006						0	0	0
2007						0	0	0
2008						0	0	0
2009						0	0	0
2010						0	0	0
-4 2011		926		524	52	1,502	0	-1,502
-3 2012		618	72		93	783	0	-783
-2 2013	3,771		341	314	470	4,896	0	-4,896
-1 2014	2,514		196	209	272	3,191	163	-3,028
1 2015					120	120	1,628	1,508
2 2016					120	120	1,628	1,508
3 2017					120	120	1,628	1,508
4 2018					120	120	1,628	1,508
5 2019					120	120	1,628	1,508
6 2020					120	120	1,628	1,508
7 2021					120	120	1,628	1,508
8 2022					120	120	1,628	1,508
9 2023					120	120	1,628	1,508
10 2024					120	120	1,628	1,508
11 2025					120	120	1,628	1,508
12 2026					120	120	1,628	1,508
13 2027					120	120	1,628	1,508
14 2028					120	120	1,628	1,508
15 2029					120	120	1,628	1,508
16 2030					120	120	1,628	1,508
17 2031					120	120	1,628	1,508
18 2032					120	120	1,628	1,508
19 2033					120	120	1,628	1,508
20 2034					120	120	1,628	1,508
21 2035					120	120	1,628	1,508
22 2036					120	120	1,628	1,508
23 2037					120	120	1,628	1,508
24 2038					120	120	1,628	1,508
25 2039					120	120	1,628	1,508
26 2040					120	120	1,628	1,508
27 2041					120	120	1,628	1,508
28 2042					120	120	1,628	1,508
29 2043					120	120	1,628	1,508
30 2044					120	120	1,628	1,508
31 2045					120	120	1,628	1,508
32 2046					120	120	1,628	1,508
33 2047					120	120	1,628	1,508
34 2048					120	120	1,628	1,508
35 2049					120	120	1,628	1,508
36 2050					120	120	1,628	1,508
37 2051					120	120	1,628	1,508
38 2052					120	120	1,628	1,508
39 2053					120	120	1,628	1,508
40 2054					120	120	1,628	1,508
41 2055					120	120	1,628	1,508
42 2056					120	120	1,628	1,508
43 2057					120	120	1,628	1,508
44 2058					120	120	1,628	1,508
45 2059					120	120	1,628	1,508
46 2060					120	120	1,628	1,508
47 2061					120	120	1,628	1,508
48 2062					120	120	1,628	1,508
49 2063					120	120	1,628	1,508
50 2064					120	120	1,628	1,508
TOTAL	6,285	1,544	609	1,047	887	6,000	EIRR =	12.8%

(Discount Rate 10%)

B/C = 1.28

NPV = 485

Table XIV.2.5 (4/6) ANNUAL COST AND BENEFIT FLOW OF GARANG RIVER/WEST FLOODWAY PROJECT
Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance	
	Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR			
-6	1994	0		2,117		212	0	2,329	0	-2,329
-5	1995	0	1,003	78	3,164	416	0	4,661	0	-4,661
-4	1996	2,525	1,003	274	1,399	493	0	5,694	0	-5,594
-3	1997	20,799		1,618	2,571	2,337	0	27,325	0	-27,325
-2	1998	20,799		1,618	2,571	2,337	0	27,325	2,540	-24,785
-1	1999	8,454		657	994	945	0	11,050	5,385	-5,665
1	2000						271	271	11,376	11,105
2	2001						271	271	12,059	11,788
3	2002						271	271	12,782	12,511
4	2003						271	271	13,549	13,278
5	2004						271	271	14,362	14,091
6	2005						271	271	15,224	14,953
7	2006						271	271	16,137	15,866
8	2007						271	271	17,105	16,834
9	2008						271	271	18,132	17,861
10	2009						271	271	19,220	18,949
11	2010						271	271	20,373	20,102
12	2011						271	271	21,595	21,324
13	2012						271	271	22,891	22,620
14	2013						271	271	24,264	23,993
15	2014						271	271	25,720	25,449
16	2015						271	271	27,264	26,993
17	2016						271	271	27,264	26,993
18	2017						271	271	27,264	26,993
19	2018						271	271	27,264	26,993
20	2019						271	271	27,264	26,993
21	2020						271	271	27,264	26,993
22	2021						271	271	27,264	26,993
23	2022						271	271	27,264	26,993
24	2023						271	271	27,264	26,993
25	2024						271	271	27,264	26,993
26	2025						271	271	27,264	26,993
27	2026						271	271	27,264	26,993
28	2027						271	271	27,264	26,993
29	2028						271	271	27,264	26,993
30	2029						271	271	27,264	26,993
31	2030						271	271	27,264	26,993
32	2031						271	271	27,264	26,993
33	2032						271	271	27,264	26,993
34	2033						271	271	27,264	26,993
35	2034						271	271	27,264	26,993
36	2035						271	271	27,264	26,993
37	2036						271	271	27,264	26,993
38	2037						271	271	27,264	26,993
39	2038						271	271	27,264	26,993
40	2039						271	271	27,264	26,993
41	2040						271	271	27,264	26,993
42	2041						271	271	27,264	26,993
43	2042						271	271	27,264	26,993
44	2043						271	271	27,264	26,993
45	2044						271	271	27,264	26,993
46	2045						271	271	27,264	26,993
47	2046						271	271	27,264	26,993
48	2047						271	271	27,264	26,993
49	2048						271	271	27,264	26,993
50	2049						271	271	27,264	26,993
	2050							0	0	0
	2051							0	0	0
	2052							0	0	0
	2053							0	0	0
	2054							0	0	0
	2055							0	0	0
	2056							0	0	0
	2057							0	0	0
	2058							0	0	0
	2059							0	0	0
	2060							0	0	0
	2061							0	0	0
	2062							0	0	0
	2063							0	0	0
	2064							0	0	0
TOTAL	52,577	2,006	4,245	12,816	6,740	13,550			EIRR =	16.8%

(Discount Rate 10%)
B/C = 2.02
NPV = 54,950

Table XIV.2.5 (5/6) ANNUAL COST AND BENEFIT FLOW OF EAST FLOODWAY PROJECT

Unit: Million Rp.

	Year Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy.	Conti.			
1994							0	0	0
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
1999							0	0	0
2000							0	0	0
2001							0	0	0
2002							0	0	0
2003							0	0	0
2004							0	0	0
2005							0	0	0
2006							0	0	0
2007							0	0	0
2008							0	0	0
-6 2009				841		84	925	0	-925
-5 2010				841		84	925	0	-925
-4 2011		329	26	0		33	388	0	-388
-3 2012	8,070	220	645	673		896	10,504	0	-10,504
-2 2013	8,070		628	673		874	10,245	262	-9,983
-1 2014	4,035		313	335		437	5,120	524	-4,596
1 2015						180	180	5,239	5,059
2 2016						180	180	5,239	5,059
3 2017						180	180	5,239	5,059
4 2018						180	180	5,239	5,059
5 2019						180	180	5,239	5,059
6 2020						180	180	5,239	5,059
7 2021						180	180	5,239	5,059
8 2022						180	180	5,239	5,059
9 2023						180	180	5,239	5,059
10 2024						180	180	5,239	5,059
11 2025						180	180	5,239	5,059
12 2026						180	180	5,239	5,059
13 2027						180	180	5,239	5,059
14 2028						180	180	5,239	5,059
15 2029						180	180	5,239	5,059
16 2030						180	180	5,239	5,059
17 2031						180	180	5,239	5,059
18 2032						180	180	5,239	5,059
19 2033						180	180	5,239	5,059
20 2034						180	180	5,239	5,059
21 2035						180	180	5,239	5,059
22 2036						180	180	5,239	5,059
23 2037						180	180	5,239	5,059
24 2038						180	180	5,239	5,059
25 2039						180	180	5,239	5,059
26 2040						180	180	5,239	5,059
27 2041						180	180	5,239	5,059
28 2042						180	180	5,239	5,059
29 2043						180	180	5,239	5,059
30 2044						180	180	5,239	5,059
31 2045						180	180	5,239	5,059
32 2046						180	180	5,239	5,059
33 2047						180	180	5,239	5,059
34 2048						180	180	5,239	5,059
35 2049						180	180	5,239	5,059
36 2050						180	180	5,239	5,059
37 2051						180	180	5,239	5,059
38 2052						180	180	5,239	5,059
39 2053						180	180	5,239	5,059
40 2054						180	180	5,239	5,059
41 2055						180	180	5,239	5,059
42 2056						180	180	5,239	5,059
43 2057						180	180	5,239	5,059
44 2058						180	180	5,239	5,059
45 2059						180	180	5,239	5,059
46 2060						180	180	5,239	5,059
47 2061						180	180	5,239	5,059
48 2062						180	180	5,239	5,059
49 2063						180	180	5,239	5,059
50 2064						180	180	5,239	5,059
TOTAL	20,175	549	1,612	3,363	2,408	9,000		EIRR =	14.9%

(Discount Rate 10%)
 B/C = 1.54
 NPV = 2,501

Table XIV.2.5 (6/6) ANNUAL COST AND BENEFIT FLOW OF BABON RIVER PROJECT

Unit: Million Rp.

Year	Economic Cost						Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR	Total	
1994							0	0
-20 1995	2,577	1,658		208	208		4,651	-4,651
-19 1996	7,901	1,658		740	740		11,039	-11,039
-18 1997	8,517	829		802	802		10,950	-10,950
-17 1998	8,564			806	806		10,176	-10,072
-16 1999	1,719			121	121		1,961	-1,702
-15 2000						203	203	4,973
-14 2001						203	203	5,284
-13 2002						203	203	5,613
-12 2003						203	203	5,962
-11 2004						203	203	6,332
-10 2005						203	203	6,724
-9 2006						203	203	7,140
-8 2007						203	203	7,580
-7 2008						203	203	8,047
-6 2009				1,183	118	203	1,504	8,745
-5 2010				1,183	118	203	1,504	9,270
-4 2011		4,965	386	0	497	203	6,051	9,826
-3 2012	11,352	3,310	1,140	946	1,561	203	18,512	10,416
-2 2013	11,352		883	946	1,230	203	14,614	11,041
-1 2014	5,676		442	472	615	203	7,408	11,703
1 2015						423	423	17,453
2 2016						423	423	17,453
3 2017						423	423	17,453
4 2018						423	423	17,453
5 2019						423	423	17,453
6 2020						423	423	17,453
7 2021						423	423	17,453
8 2022						423	423	17,453
9 2023						423	423	17,453
10 2024						423	423	17,453
11 2025						423	423	17,453
12 2026						423	423	17,453
13 2027						423	423	17,453
14 2028						423	423	17,453
15 2029						423	423	17,453
16 2030						423	423	17,453
17 2031						423	423	17,453
18 2032						423	423	17,453
19 2033						423	423	17,453
20 2034						423	423	17,453
21 2035						423	423	17,453
22 2036						423	423	17,453
23 2037						423	423	17,453
24 2038						423	423	17,453
25 2039						423	423	17,453
26 2040						423	423	17,453
27 2041						423	423	17,453
28 2042						423	423	17,453
29 2043						423	423	17,453
30 2044						423	423	17,453
31 2045						423	423	17,453
32 2046						423	423	17,453
33 2047						423	423	17,453
34 2048						423	423	17,453
35 2049						423	423	17,453
36 2050						1,301	1,301	17,453
37 2051						423	423	17,453
38 2052						423	423	17,453
39 2053						423	423	17,453
40 2054						423	423	17,453
41 2055						423	423	17,453
42 2056						423	423	17,453
43 2057						423	423	17,453
44 2058						423	423	17,453
45 2059						423	423	17,453
46 2060						423	423	17,453
47 2061						423	423	17,453
48 2062						423	423	17,453
49 2063						423	423	17,453
50 2064						423	423	17,453
TOTAL	57,658	12,420	2,851	7,407	6,816	25,073	EIRR =	13.8%

(Discount Rate 10%)
 B/C = 1.51
 NPV = 18,547

Table XIV.2.6 ANNUAL COST AND BENEFIT FLOW OF FLOOD CONTROL MASTER PLAN

Unit: Million Rp.

Year	Blorong R. Cost		Bringin R. Cost		Silandak R. Cost		Garang R./West FH Cost		East FH Cost		Babon R. Cost		Total Cost	Total Benefit	Balance				
	Main	OMR	Main	OMR	Main	OMR	Main	OMR	Main	OMR	Main	OMR							
-21 1994													2,329	0	-2,329				
-20 1995													4,661	0	-4,661				
-19 1996													5,694	0	-5,694				
-18 1997													27,325	0	-27,325				
-17 1998	2,165								2,540				10,176	104	39,666				
-16 1999	2,165								5,385				1,961	259	15,176				
-15 2000	7,690												0	203	5,176				
-14 2001	8,578									925			0	203	5,487				
-13 2002	9,375									925			0	203	5,816				
-12 2003	18,514									388			0	203	6,165				
-11 2004	13,872									10,504			1,301	203	6,535				
-10 2005	13,872									10,245			1,301	203	6,927				
-9 2006	2,808									5,120			329	5,848	203	7,343			
-8 2007	0	115	8,864										180	3,287	18,309	203	7,783		
-7 2008	0	115	9,396										180	3,484	14,411	203	8,250		
-6 2009	0	115	9,960										180	3,693	7,205	203	8,745		
-5 2010	479	115	10,557				576						180	3,915		423	13,042		
-4 2011	0	115	11,191	1,305			5,514						180	4,150		423	13,824		
-3 2012	6,625	115	11,862	2,651			3,191	145					180	4,399		423	14,654		
-2 2013		168	12,738	12,608				120	1,449				180	4,663		423	15,533		
-1 2014		168	13,502	7,227	177			120	1,536				180	4,942		423	16,465		
1 2015		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
2 2016		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
3 2017		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
4 2018		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
5 2019		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
6 2020		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
7 2021		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
8 2022		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
9 2023		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
10 2024		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
11 2025		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
12 2026		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
13 2027		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
14 2028		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
15 2029		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
16 2030		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
17 2031		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
18 2032		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
19 2033		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
20 2034		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
21 2035		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
22 2036		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
23 2037		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
24 2038		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
25 2039		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
26 2040		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
27 2041		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
28 2042		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
29 2043		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
30 2044		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
31 2045		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
32 2046		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
33 2047		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
34 2048		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
35 2049		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453		
36 2050		168	14,312		157	1,768		120	1,628				180	5,239	1,301	17,453	3,775	67,664	
37 2051		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
38 2052		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
39 2053		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
40 2054		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
41 2055		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
42 2056		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
43 2057		1,462	14,312		157	1,768		120	1,628				785	5,239		423	17,453	3,218	67,664
44 2058		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
45 2059		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
46 2060		168	14,312		157	1,768		120	1,628				180	5,239	1,274	17,453	2,170	67,664	65,494
47 2061		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
48 2062		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664
49 2063		325	14,312		157	1,768		309	1,628				180	5,239		423	17,453	1,664	67,664
50 2064		168	14,312		157	1,768		120	1,628				180	5,239		423	17,453	1,319	67,664

EIRR = 14.1%

(Discount Rate 10%)
B/C = 1.54
NPV = 78,016

Table XIV.2.7 ESTIMATED DAMAGE BY DRAINAGE PROBLEM

Unit: Million Rp

Project	Design Scale (yr)	Green Zone Wet Paddy	House/Building			Indoor Movables			Total
			Residential	Industrial	Business	Residential	Industrial	Business	
Western Semarang	5	11	325	138	0	1,496	848	0	2,819
Central Semarang	5	0	139	159	143	642	977	930	2,990
	10	5	333	474	1,406	1,536	2,918	9,158	15,831
Eastern Semarang	10	2	750	2,182	0	3,458	13,439	0	19,830

Table XIV.2.8 ANNUAL AVERAGE BENEFIT OF URBAN DRAINAGE PROJECT

Project	Design Scale (yr)	Damage Reduction Probability	Damage Reduction (mil.Rp.)	Expected Reduction Value (mil.Rp.)
Western Semarang	5	0.8	2,819	2,255
Central Semarang	5	0.8	2,990	2,392
	10	0.9	15,831	14,248
Eastern Semarang	10	0.9	19,830	17,847

Table XIV.2.9 (1/3) ANNUAL COST AND BENEFIT FLOW OF WESTERN SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR			
1994							0	0	0
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
1999							0	0	0
2000							0	0	0
2001							0	0	0
2002							0	0	0
2003							0	0	0
2004							0	0	0
2005							0	0	0
2006							0	0	0
2007							0	0	0
2008							0	0	0
2009							0	0	0
2010							0	0	0
2011							0	0	0
-3 2012				1,028		103	1,131	0	-1,131
-2 2013		2,250	174	0		225	2,649	0	-2,649
-1 2014	12,330		960	1,027		1,336	15,653	0	-15,653
1 2015						78	78	2,255	2,177
2 2016						78	78	2,255	2,177
3 2017						78	78	2,255	2,177
4 2018						78	78	2,255	2,177
5 2019						78	78	2,255	2,177
6 2020						78	78	2,255	2,177
7 2021						78	78	2,255	2,177
8 2022						78	78	2,255	2,177
9 2023						78	78	2,255	2,177
10 2024						78	78	2,255	2,177
11 2025						78	78	2,255	2,177
12 2026						78	78	2,255	2,177
13 2027						78	78	2,255	2,177
14 2028						78	78	2,255	2,177
15 2029						78	78	2,255	2,177
16 2030						78	78	2,255	2,177
17 2031						78	78	2,255	2,177
18 2032						78	78	2,255	2,177
19 2033						78	78	2,255	2,177
20 2034						78	78	2,255	2,177
21 2035						78	78	2,255	2,177
22 2036						78	78	2,255	2,177
23 2037						78	78	2,255	2,177
24 2038						78	78	2,255	2,177
25 2039						78	78	2,255	2,177
26 2040						78	78	2,255	2,177
27 2041						78	78	2,255	2,177
28 2042						78	78	2,255	2,177
29 2043						78	78	2,255	2,177
30 2044						78	78	2,255	2,177
31 2045						78	78	2,255	2,177
32 2046						78	78	2,255	2,177
33 2047						78	78	2,255	2,177
34 2048						78	78	2,255	2,177
35 2049						78	78	2,255	2,177
36 2050						78	78	2,255	2,177
37 2051						78	78	2,255	2,177
38 2052						78	78	2,255	2,177
39 2053						78	78	2,255	2,177
40 2054						78	78	2,255	2,177
41 2055						78	78	2,255	2,177
42 2056						78	78	2,255	2,177
43 2057						78	78	2,255	2,177
44 2058						78	78	2,255	2,177
45 2059						78	78	2,255	2,177
46 2060						78	78	2,255	2,177
47 2061						78	78	2,255	2,177
48 2062						78	78	2,255	2,177
49 2063						78	78	2,255	2,177
50 2064						78	78	2,255	2,177
TOTAL	12,330	2,250	1,134	2,055		1,664	3,900	EIRR =	10.8%

(Discount Rate 10%)
B/C = 1.08
NPV = 223

Table XIV.2.9 (2/3) ANNUAL COST AND BENEFIT FLOW OF CENTRAL SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR			
1994							0	0	0
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
1999							0	0	0
2000							0	0	0
2001							0	0	0
2002							0	0	0
2003				1,656		166	1,822	0	(1,822)
2004				1,656		166	1,822	0	(1,822)
2005		267	21			27	315	0	(315)
2006	3,973	267	330	331		457	5,358	0	(5,358)
2007	3,973	267	330	331		457	5,358	867	(4,491)
2008	4,768	267	392	397		543	6,367	1,447	(4,920)
-6 2009	4,768	267	392	397		543	6,367	2,199	(4,168)
-6 2010	4,768		371	1,154		593	6,886	3,036	(3,850)
-4 2011	4,768		371	1,154		593	6,886	4,027	(2,859)
-3 2012	4,768	2,536	568	540		785	9,197	5,126	(4,071)
-2 2013	14,876	3,467	1,426	1,240		1,958	22,967	6,647	(16,320)
-1 2014	12,957		1,007	1,081		1,402	16,447	10,258	(6,189)
1 2015						486	486	16,640	16,154
2 2016						486	486	16,640	16,154
3 2017						486	486	16,640	16,154
4 2018						486	486	16,640	16,154
5 2019						486	486	16,640	16,154
6 2020						486	486	16,640	16,154
7 2021						486	486	16,640	16,154
8 2022						486	486	16,640	16,154
9 2023						486	486	16,640	16,154
10 2024						486	486	16,640	16,154
11 2025						486	486	16,640	16,154
12 2026						486	486	16,640	16,154
13 2027						486	486	16,640	16,154
14 2028						486	486	16,640	16,154
15 2029						486	486	16,640	16,154
16 2030						486	486	16,640	16,154
17 2031						486	486	16,640	16,154
18 2032						486	486	16,640	16,154
19 2033						486	486	16,640	16,154
20 2034						486	486	16,640	16,154
21 2035						486	486	16,640	16,154
22 2036						486	486	16,640	16,154
23 2037						486	486	16,640	16,154
24 2038						486	486	16,640	16,154
25 2039						486	486	16,640	16,154
26 2040						486	486	16,640	16,154
27 2041						486	486	16,640	16,154
28 2042						486	486	16,640	16,154
29 2043						486	486	16,640	16,154
30 2044						486	486	16,640	16,154
31 2045						486	486	16,640	16,154
32 2046						486	486	16,640	16,154
33 2047						486	486	16,640	16,154
34 2048						486	486	16,640	16,154
35 2049						486	486	16,640	16,154
36 2050						486	486	16,640	16,154
37 2051						486	486	16,640	16,154
38 2052						486	486	16,640	16,154
39 2053						486	486	16,640	16,154
40 2054						486	486	16,640	16,154
41 2055						486	486	16,640	16,154
42 2056						486	486	16,640	16,154
43 2057						486	486	16,640	16,154
44 2058						486	486	16,640	16,154
45 2059						486	486	16,640	16,154
46 2060						486	486	16,640	16,154
47 2061						486	486	16,640	16,154
48 2062						486	486	16,640	16,154
49 2063						486	486	16,640	16,154
50 2064						486	486	16,640	16,154
TOTAL	59,619	7,338	5,208	9,937		7,690	24,300	EIRR =	15.1%

(Discount Rate 10%)
B/C = 1.57
NPV = 10,179

Table XIV.2.9 (3/3) ANNUAL COST AND BENEFIT FLOW OF EASTERN SEMARANG CITY DRAINAGE AREA
Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR			
1994							0	0	0
1995							0	0	0
1996							0	0	0
1997							0	0	0
1998							0	0	0
1999							0	0	0
2000							0	0	0
2001							0	0	0
2002							0	0	0
2003							0	0	0
2004							0	0	0
2005							0	0	0
-9 2006				2,860		286	3,146	0	(3,146)
-8 2007				2,984		298	3,282	0	(3,282)
-7 2008		5,542	431	0		554	6,527	0	(6,527)
-6 2009	12,683	3,694	1,274	2,330		1,871	21,852	0	(21,852)
-5 2010	12,683	3,694	1,274	2,330		1,871	21,852	2,671	(19,181)
-4 2011	12,683	8,344	1,636	1,119		2,215	25,997	4,608	(21,389)
-3 2012	21,402	6,497	2,170	1,846		2,975	34,890	7,126	(27,764)
-2 2013	24,308		1,890	2,088		2,639	30,925	10,742	(20,183)
-1 2014	19,910		1,548	1,721		2,164	25,343	14,382	(10,961)
1 2015						546	546	17,847	17,301
2 2016						546	546	17,847	17,301
3 2017						546	546	17,847	17,301
4 2018						546	546	17,847	17,301
5 2019						546	546	17,847	17,301
6 2020						546	546	17,847	17,301
7 2021						546	546	17,847	17,301
8 2022						546	546	17,847	17,301
9 2023						546	546	17,847	17,301
10 2024						546	546	17,847	17,301
11 2025						546	546	17,847	17,301
12 2026						546	546	17,847	17,301
13 2027						546	546	17,847	17,301
14 2028						546	546	17,847	17,301
15 2029						546	546	17,847	17,301
16 2030						546	546	17,847	17,301
17 2031						546	546	17,847	17,301
18 2032						546	546	17,847	17,301
19 2033						546	546	17,847	17,301
20 2034						546	546	17,847	17,301
21 2035						546	546	17,847	17,301
22 2036						546	546	17,847	17,301
23 2037						546	546	17,847	17,301
24 2038						546	546	17,847	17,301
25 2039						546	546	17,847	17,301
26 2040						546	546	17,847	17,301
27 2041						546	546	17,847	17,301
28 2042						546	546	17,847	17,301
29 2043						546	546	17,847	17,301
30 2044						546	546	17,847	17,301
31 2045						546	546	17,847	17,301
32 2046						546	546	17,847	17,301
33 2047						546	546	17,847	17,301
34 2048						546	546	17,847	17,301
35 2049						546	546	17,847	17,301
36 2050						546	546	17,847	17,301
37 2051						546	546	17,847	17,301
38 2052						546	546	17,847	17,301
39 2053						546	546	17,847	17,301
40 2054						546	546	17,847	17,301
41 2055						546	546	17,847	17,301
42 2056						546	546	17,847	17,301
43 2057						546	546	17,847	17,301
44 2058						546	546	17,847	17,301
45 2059						546	546	17,847	17,301
46 2060						546	546	17,847	17,301
47 2061						546	546	17,847	17,301
48 2062						546	546	17,847	17,301
49 2063						546	546	17,847	17,301
50 2064						546	546	17,847	17,301
TOTAL	103,669	27,771	10,223	17,278		14,873	27,300	EIRR =	9.5%

(Discount Rate 10%)
B/C = 0.95
NPV = -4,797

Table XIV.2.10 ANNUAL COST AND BENEFIT FLOW OF URBAN DRAINAGE MASTER PLAN

Unit: Million Rp.

Year	Western Semarang		Central Semarang		Eastern Semarang		Total Cost	Total Benefit	Balance			
	Cost Main	OMR	Cost Main	OMR	Cost Main	OMR						
(21) 1994			2,331		1,823		4,154	0	(4,154.00)			
(20) 1995	275		4,151		3,219		7,645	0	(7,645.00)			
(19) 1996		1	4,292		318		3,218	171	7,511	499	(7,011.73)	
(18) 1997		1	2,223	6	560		3,690	297	5,920	868	(5,052.09)	
(17) 1998		1	5,358	31	716			37	456	5,427	1,183	(4,243.92)
(16) 1999		1	5,358	31	1,071			37	483	5,427	1,567	(3,860.24)
(15) 2000		1	6,367	31	1,467			37	512	6,436	1,992	(4,443.78)
(14) 2001		1	6,993	31	1,972			37	543	7,062	2,529	(4,532.75)
(13) 2002		1	6,679	31	2,577			37	575	6,748	3,167	(3,580.93)
(12) 2003		1	8,392	31	3,224			37	610	8,461	3,849	(4,611.81)
(11) 2004		1	19,345	31	4,072			37	646	19,414	4,736	(14,678.46)
(10) 2005	1,116	1	13,263	31	5,918			37	685	14,448	6,621	(7,826.87)
(9) 2006	2,602	1	5,040	115	7,437	2,960		37	726	10,755	8,259	(2,496.11)
(8) 2007	15,440	1	291	486	10,440	3,089		37	961	19,053	11,691	(7,361.62)
(7) 2008		78	1,500	486	11,067	6,141		37	1,229	6,742	13,795	7,053.36
(6) 2009		78	1,590	486	11,731	20,515		37	1,747	21,116	15,068	(6,048.41)
(5) 2010		78	1,685	486	12,434	20,515		37	3,426	21,116	17,546	(3,570.29)
(4) 2011		78	1,786	486	13,180	24,277		37	5,300	24,878	20,267	(4,611.04)
(3) 2012		78	1,893	486	13,971	32,279		37	7,711	32,880	23,576	(9,304.07)
(2) 2013		78	2,007	486	14,810	28,609		37	11,124	29,210	27,940	(1,269.74)
(1) 2014		78	2,127	486	15,698	23,479		37	14,562	24,080	32,388	8,307.93
1 2015		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
2 2016		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
3 2017		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
4 2018		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
5 2019		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
6 2020		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
7 2021		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
8 2022		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
9 2023		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
10 2024		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
11 2025		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
12 2026		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
13 2027		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
14 2028		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
15 2029		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
16 2030		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
17 2031		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
18 2032		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
19 2033		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
20 2034		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
21 2035		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
22 2036		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
23 2037		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
24 2038		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
25 2039		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
26 2040		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
27 2041		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
28 2042		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
29 2043		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
30 2044		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
31 2045		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
32 2046		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
33 2047		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
34 2048		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
35 2049		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
36 2050		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
37 2051		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
38 2052		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
39 2053		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
40 2054		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
41 2055		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
42 2056		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
43 2057		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
44 2058		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
45 2059		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
46 2060		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
47 2061		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
48 2062		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
49 2063		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00
50 2064		78	2,255	486	16,640			546	17,847	1,110	36,742	35,632.00

EIRR = 10.4%

(Discount Rate 10%)

B/C = 1.05

NPV = 4,370

Table XIV.2.11 (1/2) CALCULATION OF ANNUAL AVERAGE BENEFIT OF IRRIGATION
BY KEDUNG SUREN RES.

Unit: 1,000 m3

Return Period (Yr)	Water Shortage w/o Project	Water Shortage w/ Project	Shortage Reduction	Annual Shortage Reduction	Expectation	Benefit
1.01	0.00	0.00	0.00			
2	832.00	0.00	832.00	0.00	0.49	0.00
5	5,880.00	0.00	5,880.00	3,356.00	0.30	1,006.80
10	8,163.00	0.00	8,163.00	7,021.50	0.10	702.15
25	8,163.00	0.00	8,163.00	8,163.00	0.06	489.78
50	8,163.00	0.00	8,163.00	8,163.00	0.02	163.26
100	8,163.00	0.00	8,163.00	8,163.00	0.01	81.63
Total (Annual Average Benefit)						2,443.62

Note: Water shortage is negligible in the case of less than 2 year return period.

Table XIV.2.11 (2/2) CALCULATION OF ANNUAL AVERAGE BENEFIT OF IRRIGATION
BY BABON RES.

Unit: 1,000 m3

Return Period (Yr)	Water Shortage w/o Project	Water Shortage w/ Project	Shortage Reduction	Annual Shortage Reduction	Expectation	Benefit
1.01	0.00	0.00	0.00			
2	0.00	0.00	0.00	0.00	0.49	0.00
5	0.00	0.00	0.00	0.00	0.30	0.00
10	13.00	0.00	13.00	0.00	0.10	0.00
25	13.00	0.00	13.00	13.00	0.06	0.78
50	13.00	0.00	13.00	13.00	0.02	0.26
100	13.00	0.00	13.00	13.00	0.01	0.13
Total (Annual Average Benefit)						1.17

Note: Water shortage is negligible in the case of less than 10 year return period.

Table XIV.2.12 ANNUAL AVERAGE BENEFIT BY IRRIGATION WORKS

River Basin	Irrigation Area (ha)	Water Demand in 2015 (1,000 m ³ /yr)	Water Demand per ha (1,000 m ³ /ha/yr)	Shortage Reduction (1,000 m ³ /yr)	Expected Area Increment (ha)	Rice Production per ha* (ton/ha/yr)	Expected Production Increment (ton/yr)
Babon River	125	3,100	24.60	1.17	0.048	15.00	0.71
Blorong River	3,336	87,300	26.17	2,443.62	93.378	15.00	1,400.67

Note *: Two harvests per year

Table XIV.2.13 (1/3) ANNUAL COST AND BENEFIT FLOW OF KEDUNG SUREN RESERVOIR PROJECT

Unit: Million Rp.

Year	Economic Cost					Benefit			Balance		
	Const.	Comp.	Admin.	E/S	Phy.Conti.	OMR	Total	Public W.		Irrigation	Total
1994							0			0	0.00
1995							0			0	0.00
1996							0			0	0.00
1997							0			0	0.00
-9 1998				3,999	400		4,399			0	-4,399.00
-8 1999				3,999	400		4,399			0	-4,399.00
-7 2000		13,268	1,032	0	1,327		15,627			0	-15,627.00
-6 2001	4,381	9,951	1,115	500	1,483		17,430			0	-17,430.00
-5 2002	8,764	6,633	1,198	833	1,623		19,051			0	-19,051.00
-4 2003	26,293	3,316	2,303	2,983	3,259		38,154			0	-38,154.00
-3 2004	21,910	191	1,719	2,166	2,427		28,413			0	-28,413.00
-2 2005	24,230		1,884	2,359	2,659		31,132			0	-31,132.00
-1 2006	7,862		611	788	865		10,126			0	-10,126.00
1 2007						279	279	21,759.84	253.52	22,013.36	21,734.36
2 2008						279	279	21,759.84	253.52	22,013.36	21,734.36
3 2009						279	279	21,759.84	253.52	22,013.36	21,734.36
4 2010						279	279	21,759.84	253.52	22,013.36	21,734.36
5 2011						279	279	21,759.84	253.52	22,013.36	21,734.36
6 2012						279	279	21,759.84	253.52	22,013.36	21,734.36
7 2013						279	279	21,759.84	253.52	22,013.36	21,734.36
8 2014						279	279	21,759.84	253.52	22,013.36	21,734.36
9 2015						279	279	21,759.84	253.52	22,013.36	21,734.36
10 2016						279	279	21,759.84	253.52	22,013.36	21,734.36
11 2017						279	279	21,759.84	253.52	22,013.36	21,734.36
12 2018						279	279	21,759.84	253.52	22,013.36	21,734.36
13 2019						279	279	21,759.84	253.52	22,013.36	21,734.36
14 2020						279	279	21,759.84	253.52	22,013.36	21,734.36
15 2021						279	279	21,759.84	253.52	22,013.36	21,734.36
16 2022						279	279	21,759.84	253.52	22,013.36	21,734.36
17 2023						279	279	21,759.84	253.52	22,013.36	21,734.36
18 2024						279	279	21,759.84	253.52	22,013.36	21,734.36
19 2025						279	279	21,759.84	253.52	22,013.36	21,734.36
20 2026						279	279	21,759.84	253.52	22,013.36	21,734.36
21 2027						279	279	21,759.84	253.52	22,013.36	21,734.36
22 2028						279	279	21,759.84	253.52	22,013.36	21,734.36
23 2029						279	279	21,759.84	253.52	22,013.36	21,734.36
24 2030						279	279	21,759.84	253.52	22,013.36	21,734.36
25 2031						279	279	21,759.84	253.52	22,013.36	21,734.36
26 2032						279	279	21,759.84	253.52	22,013.36	21,734.36
27 2033						279	279	21,759.84	253.52	22,013.36	21,734.36
28 2034						279	279	21,759.84	253.52	22,013.36	21,734.36
29 2035						279	279	21,759.84	253.52	22,013.36	21,734.36
30 2036						279	279	21,759.84	253.52	22,013.36	21,734.36
31 2037						279	279	21,759.84	253.52	22,013.36	21,734.36
32 2038						279	279	21,759.84	253.52	22,013.36	21,734.36
33 2039						279	279	21,759.84	253.52	22,013.36	21,734.36
34 2040						279	279	21,759.84	253.52	22,013.36	21,734.36
35 2041						279	279	21,759.84	253.52	22,013.36	21,734.36
36 2042						279	279	21,759.84	253.52	22,013.36	21,734.36
37 2043						279	279	21,759.84	253.52	22,013.36	21,734.36
38 2044						279	279	21,759.84	253.52	22,013.36	21,734.36
39 2045						279	279	21,759.84	253.52	22,013.36	21,734.36
40 2046						279	279	21,759.84	253.52	22,013.36	21,734.36
41 2047						279	279	21,759.84	253.52	22,013.36	21,734.36
42 2048						279	279	21,759.84	253.52	22,013.36	21,734.36
43 2049						279	279	21,759.84	253.52	22,013.36	21,734.36
44 2050						279	279	21,759.84	253.52	22,013.36	21,734.36
45 2051						279	279	21,759.84	253.52	22,013.36	21,734.36
46 2052						279	279	21,759.84	253.52	22,013.36	21,734.36
47 2053						279	279	21,759.84	253.52	22,013.36	21,734.36
48 2054						279	279	21,759.84	253.52	22,013.36	21,734.36
49 2055						279	279	21,759.84	253.52	22,013.36	21,734.36
50 2056						279	279	21,759.84	253.52	22,013.36	21,734.36
2057							0			0.00	0.00
2058							0			0.00	0.00
2059							0			0.00	0.00
2060							0			0.00	0.00
2061							0			0.00	0.00
2062							0			0.00	0.00
2063							0			0.00	0.00
2064							0			0.00	0.00
TOTAL	93,440	33,359	9,862	17,627	14,443	13,950				EIRR =	9.5%

(Discount Rate 10%)

B/C = 0.93

NPV = -4,545

Table XIV.2.13 (2/3) ANNUAL COST AND BENEFIT FLOW OF JATIBARANG RES./MUNDINGAN RES./INTERBASIN TRANS. PROJECT
Unit: Million Rp.

Year	Economic Cost				Benefit				Balance			
	Const.	Comp.	Admin.	E/S	Phy.Conti.	OMR	Total	Jatibarang		Mundingan	Inter.	Total
1994							0				0.00	0.00
-7 1995		1,716	133	1,641		336	3,826				0.00	-3,826.00
-6 1996	4,321	1,716	469	6,104	1,214		13,824				0.00	-13,824.00
-5 1997	7,560	13,498	1,638	5,095	2,615		30,406				0.00	-30,406.00
-4 1998	17,323	8,099	1,977	2,776	2,820		32,995				0.00	-32,995.00
-3 1999	19,246	5,399	1,918	3,127	2,778		32,468				0.00	-32,468.00
-2 2000	17,086	0	1,329	2,782	1,987	77	23,261	13,434.34			13,434.34	-9,826.66
-1 2001	4,882	0	380	1,331	622	77	7,292	13,434.34			13,434.34	6,142.34
1 2002	0	18	1	0	2	233	254	13,434.34	15,137.28		28,571.62	28,317.62
2 2003	2,007		156	223	223	233	2,842	13,434.34	15,137.28		28,571.62	25,729.62
3 2004	3,010		235	334	334	233	4,146	13,434.34	15,137.28		28,571.62	24,425.62
4 2005						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
5 2006						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
6 2007						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
7 2008						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
8 2009						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
9 2010						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
10 2011						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
11 2012						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
12 2013						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
13 2014						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
14 2015						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
15 2016						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
16 2017						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
17 2018						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
18 2019						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
19 2020						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
20 2021						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
21 2022						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
22 2023						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
23 2024						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
24 2025						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
25 2026						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
26 2027						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
27 2028						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
28 2029						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
29 2030						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
30 2031						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
31 2032						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
32 2033						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
33 2034						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
34 2035						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
35 2036						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
36 2037						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
37 2038						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
38 2039						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
39 2040						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
40 2041						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
41 2042						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
42 2043						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
43 2044						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
44 2045						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
45 2046						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
46 2047						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
47 2048						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
48 2049						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
49 2050						908	908	13,434.34	15,137.28	5,676.48	34,248.10	33,340.07
50 2051						260	260	13,434.34	15,137.28	5,676.48	34,248.10	33,988.10
2052						0	0				0.00	0.00
2053						0	0				0.00	0.00
2054						0	0				0.00	0.00
2055						0	0				0.00	0.00
2056						0	0				0.00	0.00
2057						0	0				0.00	0.00
2058						0	0				0.00	0.00
2059						0	0				0.00	0.00
2060						0	0				0.00	0.00
2061						0	0				0.00	0.00
2062						0	0				0.00	0.00
2063						0	0				0.00	0.00
2064						0	0				0.00	0.00
TOTAL	75,435	30,446	8,236	23,413	12,931	13,721					EIRR =	16.1%

(Discount Rate 10%)
B/C = 1.79
NPV = 72,955

Table XIV.2.13 (3/3) ANNUAL COST AND BENEFIT FLOW OF BABON RESERVOIR PROJECT

Unit: Million Rp.

Year	Economic Cost					Benefit				Balance	
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR	Total	Public W.	Irrigation		Total
1994							0	0	0	0.00	0.00
1995							0	0	0	0.00	0.00
1996							0	0	0	0.00	0.00
1997							0	0	0	0.00	0.00
1998							0	0	0	0.00	0.00
1999							0	0	0	0.00	0.00
2000							0	0	0	0.00	0.00
2001							0	0	0	0.00	0.00
2002							0	0	0	0.00	0.00
-9 2003				7,330		733	8,063	0	0	0.00	-8,063
-8 2004				7,330		733	8,063	0	0	0.00	-8,063
-7 2005		12,690	987	0		1,269	14,946	0	0	0.00	-14,946
-6 2006	8,329	9,517	1,388	916		1,876	22,026	0	0	0.00	-22,026
-5 2007	16,658	6,345	1,789	1,527		2,453	28,772	0	0	0.00	-28,772
-4 2008	49,974	3,172	4,134	4,581		5,773	67,634	0	0	0.00	-67,634
-3 2009	41,645		3,239	3,970		4,562	53,416	0	0	0.00	-53,416
-2 2010	41,645		3,239	3,970		4,562	53,416	0	0	0.00	-53,416
-1 2011	8,329		648	916		925	10,818	0	0	0.00	-10,818
1 2012						446	446	17,029.44	0.13	17,029.57	16,583.57
2 2013						446	446	17,029.44	0.13	17,029.57	16,583.57
3 2014						446	446	17,029.44	0.13	17,029.57	16,583.57
4 2015						446	446	17,029.44	0.13	17,029.57	16,583.57
5 2016						446	446	17,029.44	0.13	17,029.57	16,583.57
6 2017						446	446	17,029.44	0.13	17,029.57	16,583.57
7 2018						446	446	17,029.44	0.13	17,029.57	16,583.57
8 2019						446	446	17,029.44	0.13	17,029.57	16,583.57
9 2020						446	446	17,029.44	0.13	17,029.57	16,583.57
10 2021						446	446	17,029.44	0.13	17,029.57	16,583.57
11 2022						446	446	17,029.44	0.13	17,029.57	16,583.57
12 2023						446	446	17,029.44	0.13	17,029.57	16,583.57
13 2024						446	446	17,029.44	0.13	17,029.57	16,583.57
14 2025						446	446	17,029.44	0.13	17,029.57	16,583.57
15 2026						446	446	17,029.44	0.13	17,029.57	16,583.57
16 2027						446	446	17,029.44	0.13	17,029.57	16,583.57
17 2028						446	446	17,029.44	0.13	17,029.57	16,583.57
18 2029						446	446	17,029.44	0.13	17,029.57	16,583.57
19 2030						446	446	17,029.44	0.13	17,029.57	16,583.57
20 2031						446	446	17,029.44	0.13	17,029.57	16,583.57
21 2032						446	446	17,029.44	0.13	17,029.57	16,583.57
22 2033						446	446	17,029.44	0.13	17,029.57	16,583.57
23 2034						446	446	17,029.44	0.13	17,029.57	16,583.57
24 2035						446	446	17,029.44	0.13	17,029.57	16,583.57
25 2036						446	446	17,029.44	0.13	17,029.57	16,583.57
26 2037						446	446	17,029.44	0.13	17,029.57	16,583.57
27 2038						446	446	17,029.44	0.13	17,029.57	16,583.57
28 2039						446	446	17,029.44	0.13	17,029.57	16,583.57
29 2040						446	446	17,029.44	0.13	17,029.57	16,583.57
30 2041						446	446	17,029.44	0.13	17,029.57	16,583.57
31 2042						446	446	17,029.44	0.13	17,029.57	16,583.57
32 2043						446	446	17,029.44	0.13	17,029.57	16,583.57
33 2044						446	446	17,029.44	0.13	17,029.57	16,583.57
34 2045						446	446	17,029.44	0.13	17,029.57	16,583.57
35 2046						446	446	17,029.44	0.13	17,029.57	16,583.57
36 2047						446	446	17,029.44	0.13	17,029.57	16,583.57
37 2048						446	446	17,029.44	0.13	17,029.57	16,583.57
38 2049						446	446	17,029.44	0.13	17,029.57	16,583.57
39 2050						446	446	17,029.44	0.13	17,029.57	16,583.57
40 2051						446	446	17,029.44	0.13	17,029.57	16,583.57
41 2052						446	446	17,029.44	0.13	17,029.57	16,583.57
42 2053						446	446	17,029.44	0.13	17,029.57	16,583.57
43 2054						446	446	17,029.44	0.13	17,029.57	16,583.57
44 2055						446	446	17,029.44	0.13	17,029.57	16,583.57
45 2056						446	446	17,029.44	0.13	17,029.57	16,583.57
46 2057						446	446	17,029.44	0.13	17,029.57	16,583.57
47 2058						446	446	17,029.44	0.13	17,029.57	16,583.57
48 2059						446	446	17,029.44	0.13	17,029.57	16,583.57
49 2060						446	446	17,029.44	0.13	17,029.57	16,583.57
50 2061						446	446	17,029.44	0.13	17,029.57	16,583.57
2062							0			0.00	0.00
2063							0			0.00	0.00
2064							0			0.00	0.00

TOTAL 166,580 31,724 15,424 30,540 22,886 22,300

EIRR = 4.9%

(Discount Rate 10%)
 B/C = 0.46
 NPV = -35,410

Table XIV.2.14 ANNUAL COST AND BENEFIT FLOW OF WATER RESOURCES DEVELOPMENT MASTER PLAN

Unit: Million Rp.

Year	Kudun Suren Res.		Benefit	J- M- I		Benefit	Babon Res.		Benefit	Total Cost	Total Benefit	Balance
	Cost Main	OMR		Cost Main	OMR		Cost Main	OMR				
-21 1994										0	0	0
-20 1995				3,826						3,826	0	-3,826
-19 1996				13,824						13,824	0	-13,824
-18 1997				30,406						30,406	0	-30,406
-17 1998	4,399			32,995						37,394	0	-37,394
-16 1999	4,399			32,468						36,867	0	-36,867
-15 2000	15,627			23,184	77	13,434				38,888	13,434	-25,454
-14 2001	17,430			7,215	77	13,434				24,722	13,434	-11,288
-13 2002	19,051			21	233	28,572				19,305	28,572	9,267
-12 2003	38,154			2,609	233	28,572	8,063			49,059	28,572	-20,487
-11 2004	28,413			3,913	233	28,572	8,063			40,622	28,572	-12,050
-10 2005	31,132				260	34,248	14,946			46,338	34,248	-12,090
-9 2006	10,126				260	34,248	22,026			32,412	34,248	1,836
-8 2007		279	22,013		260	34,248	28,772			29,311	56,261	26,950
-7 2008		279	22,013		260	34,248	67,634			68,173	56,261	-11,912
-6 2009		279	22,013		260	34,248	53,416			53,955	56,261	2,306
-5 2010		279	22,013		260	34,248	53,416			53,955	56,261	2,306
-4 2011		279	22,013		260	34,248	10,818			11,357	56,261	44,904
-3 2012		279	22,013		260	34,248		446	17,030	985	73,291	72,306
-2 2013		279	22,013		260	34,248		446	17,030	985	73,291	72,306
-1 2014		279	22,013		260	34,248		446	17,030	985	73,291	72,306
1 2015		279	22,013		260	34,248		446	17,030	985	73,291	72,306
2 2016		279	22,013		260	34,248		446	17,030	985	73,291	72,306
3 2017		279	22,013		260	34,248		446	17,030	985	73,291	72,306
4 2018		279	22,013		260	34,248		446	17,030	985	73,291	72,306
5 2019		279	22,013		260	34,248		446	17,030	985	73,291	72,306
6 2020		279	22,013		260	34,248		446	17,030	985	73,291	72,306
7 2021		279	22,013		260	34,248		446	17,030	985	73,291	72,306
8 2022		279	22,013		260	34,248		446	17,030	985	73,291	72,306
9 2023		279	22,013		260	34,248		446	17,030	985	73,291	72,306
10 2024		279	22,013		260	34,248		446	17,030	985	73,291	72,306
11 2025		279	22,013		260	34,248		446	17,030	985	73,291	72,306
12 2026		279	22,013		260	34,248		446	17,030	985	73,291	72,306
13 2027		279	22,013		260	34,248		446	17,030	985	73,291	72,306
14 2028		279	22,013		260	34,248		446	17,030	985	73,291	72,306
15 2029		279	22,013		260	34,248		446	17,030	985	73,291	72,306
16 2030		279	22,013		260	34,248		446	17,030	985	73,291	72,306
17 2031		279	22,013		260	34,248		446	17,030	985	73,291	72,306
18 2032		279	22,013		260	34,248		446	17,030	985	73,291	72,306
19 2033		279	22,013		260	34,248		446	17,030	985	73,291	72,306
20 2034		279	22,013		260	34,248		446	17,030	985	73,291	72,306
21 2035		279	22,013		260	34,248		446	17,030	985	73,291	72,306
22 2036		279	22,013		260	34,248		446	17,030	985	73,291	72,306
23 2037		279	22,013		260	34,248		446	17,030	985	73,291	72,306
24 2038		279	22,013		260	34,248		446	17,030	985	73,291	72,306
25 2039		279	22,013		260	34,248		446	17,030	985	73,291	72,306
26 2040		279	22,013		260	34,248		446	17,030	985	73,291	72,306
27 2041		279	22,013		260	34,248		446	17,030	985	73,291	72,306
28 2042		279	22,013		260	34,248		446	17,030	985	73,291	72,306
29 2043		279	22,013		260	34,248		446	17,030	985	73,291	72,306
30 2044		279	22,013		260	34,248		446	17,030	985	73,291	72,306
31 2045		279	22,013		260	34,248		446	17,030	985	73,291	72,306
32 2046		279	22,013		260	34,248		446	17,030	985	73,291	72,306
33 2047		279	22,013		260	34,248		446	17,030	985	73,291	72,306
34 2048		279	22,013		260	34,248		446	17,030	985	73,291	72,306
35 2049		279	22,013		260	34,248		446	17,030	985	73,291	72,306
36 2050		279	22,013		908	34,248		446	17,030	1,633	73,291	71,658
37 2051		279	22,013		260	34,248		446	17,030	985	73,291	72,306
38 2052		279	22,013		1,725	34,248		446	17,030	2,450	73,291	70,842
39 2053		279	22,013		260	34,248		446	17,030	985	73,291	72,306
40 2054		279	22,013		260	34,248		446	17,030	985	73,291	72,306
41 2055		279	22,013		411	34,248		446	17,030	1,136	73,291	72,156
42 2056		279	22,013		260	34,248		446	17,030	985	73,291	72,306
43 2057		3,082	22,013		260	34,248		446	17,030	3,788	73,291	69,503
44 2058		279	22,013		260	34,248		446	17,030	985	73,291	72,306
45 2059		279	22,013		260	34,248		446	17,030	985	73,291	72,306
46 2060		279	22,013		260	34,248		446	17,030	985	73,291	72,306
47 2061		279	22,013		260	34,248		446	17,030	985	73,291	72,306
48 2062		279	22,013		260	34,248		5,443	17,030	5,982	73,291	67,309
49 2063		279	22,013		260	34,248		446	17,030	985	73,291	72,306
50 2064		279	22,013		260	34,248		446	17,030	985	73,291	72,306
TOTAL	168,731	18,985	1,276,775	150,461	18,716	2,167,469	267,154	28,635	902,567		EIRR =	11.4%

(Discount Rate 10%)
 B/C = 1.15
 NPV = 34,289

Table XIV:2.15 ESTIMATES OF POPULATION AND RESIDENTIAL AREA PER HOUSEHOLD AND HOUSE IN THE STUDY AREA

Flood Control Projects	Area (Ha.)	Residential Area (Ha.)	Population	Number of Households	Number of Houses	Residential Area Per Household (Ha.)	Residential Area Per House (Ha.)	Population Per Household (A)	Population Per House (B)	(B)/(A)
Blorong River	12,701.0	1,971.1	144,106	34,007	30,537	0.0580	0.0645	4.24	4.72	1.11
Bringin River	1,818.1	145.8	9,926	2,158	1,643	0.0675	0.0887	4.60	6.04	1.31
Silandak River	1,706.7	470.4	39,170	8,551	7,967	0.0550	0.0590	4.58	4.92	1.07
Garang R./W.Floodway	416.4	280.7	22,937	4,614	3,984	0.0608	0.0705	4.97	5.76	1.16
East Floodway	1,397.6	444.9	50,097	11,885	7,918	0.0374	0.0562	4.22	6.33	1.50
Babon River	389.8	182.5	9,270	2,137	2,048	0.0854	0.0891	4.34	4.53	1.04
Total	18,429.6	3,495.2	275,506	63,352	54,097	0.0552	0.0646	4.35	5.09	1.17

Note. 1. Estimates are based on the figures for main Kelurahan and Kecamatan to be inundated.

2. Source: Each Kecamatan in figures 1990, Statistical Office.

Table XIV.2.16 ESTIMATES OF WORKING POPULATION AND AREA PER COMPANY FOR COMMERCE AND INDUSTRY IN SEMARANG CITY

	Number of Working Population	Number of Companies	Number of Working Population Per Company	Area per Company (Ha.) *1)
Commerce	33,941	6,119	5.55	0.0578
Industry	40,149	883	45.47	0.2910

Note. *1) Area per company was estimated by referring to population per household (4.52) and area per household (0.0471ha.) in Semarang City.
Source: 1. Each Kechamatan in figures 1990, Statistical Office.
2. Semarang Municipality in figures 1991, Statistical Office.

Table XIV.2.17 INUNDATION AREA

Unit: Ha.

Name	Return Period (year)	Green Zone Wet Paddy	Fishpond	Residential	Industrial	Business	Total
Blorong R.	5	1,721	265	645	0	0	2,631
	10	1,835	311	685	0	0	2,831
	25	1,913	321	702	0	0	2,936
	50	1,987	321	736	0	0	3,044
	100	2,055	321	758	0	0	3,134
Bringin R.	5	0	284	0	0	0	284
	10	0	296	0	8	0	304
	25	0	296	0	12	0	308
	50	0	300	0	12	0	312
	100	0	300	0	20	0	320
Silandak R.	5	0	0	56	0	0	56
	10	0	0	56	4	0	60
	25	0	0	56	28	0	84
	50	0	0	56	36	0	92
	100	0	0	56	36	0	92
West Floodway/ Garang R.	5	0	0	0	0	0	0
	10	0	0	68	24	64	156
	25	0	0	176	60	104	340
	50	0	0	252	108	144	504
	100	0	0	416	156	164	736
East Floodway	5	0	116	32	68	0	216
	10	0	180	68	92	0	340
	25	0	228	84	140	0	452
	50	0	252	92	160	0	504
	100	0	376	1,216	232	0	1,824
Babon R.	5	0	336	528	132	0	996
	10	0	464	588	164	0	1,216
	25	0	472	624	184	0	1,280
	50	0	520	660	208	0	1,388
	100	0	556	676	268	0	1,500

Table XIV.2.18 HOUSES/BUILDINGS IN INUNDATION AREA

Unit: Houses.

Name	Return Period (year)	Residential	Industrial	Business	Total
Blorong R.	5	656	0	0	656
	10	697	0	0	697
	20	714	0	0	714
	50	748	0	0	748
	100	771	0	0	771
Bringin R.	5	0	0	0	0
	10	0	22	0	22
	25	0	33	0	33
	50	0	33	0	33
	100	0	55	0	55
Silandak R.	5	113	0	0	113
	10	113	2	0	115
	25	113	13	0	126
	50	113	16	0	129
	100	113	16	0	129
West Floodway/ Garang R.	5	0	0	0	0
	10	965	82	1,107	2,154
	25	2,496	206	1,799	4,501
	50	3,574	371	2,491	6,436
	100	5,901	536	2,837	9,274
East Floodway	5	60	27	0	87
	10	127	37	0	164
	25	157	56	0	213
	50	172	64	0	236
	100	2,272	92	0	2,364
Babon R.	5	384	57	0	441
	10	428	70	0	498
	25	454	79	0	533
	50	480	89	0	569
	100	492	115	0	607

Table XIV.2.19 POPULATION SUFFERED FROM FLOOD

Unit: Persons

Name	Return Period (year)	Residential	Industrial	Business	Total
Blorong R.	5	3,098	0	0	3,098
	10	3,289	0	0	3,289
	20	3,371	0	0	3,371
	50	3,532	0	0	3,532
	100	3,639	0	0	3,639
Bringin R.	5	0	0	0	0
	10	0	999	0	999
	25	0	1,499	0	1,499
	50	0	1,499	0	1,499
	100	0	2,499	0	2,499
Silandak R.	5	556	0	0	556
	10	556	82	0	638
	25	556	577	0	1,133
	50	556	742	0	1,298
	100	556	742	0	1,298
West Floodway/ Garang R.	5	0	0	0	0
	10	5,556	3,748	6,145	15,449
	25	14,380	9,371	9,986	33,737
	50	20,589	16,868	13,827	51,284
	100	33,988	24,365	15,747	74,100
East Floodway	5	378	1,227	0	1,605
	10	804	1,660	0	2,464
	25	993	2,526	0	3,519
	50	1,088	2,886	0	3,974
	100	14,381	4,185	0	18,566
Babon R.	5	1,739	2,573	0	4,312
	10	1,937	3,197	0	5,134
	25	2,056	3,587	0	5,643
	50	2,174	4,054	0	6,228
	100	2,227	5,224	0	7,451

Table XIV.2.20 REDUCTION OF INUNDATION AREA

Unit: Ha.

Name	Return Period (Yr)	Inundated Area		Reduction	Average Reduction	Expectation	Expected Average Reduction
		w/o Project	w/ Project				
Blorong R.	1.01	0	0	0			
	5	2,631	0	2,631	1,316	0.79	1,039
	10	2,831	0	2,831	2,731	0.10	273
	20	2,936	0	2,936	2,884	0.05	144
	50	3,044	3,044	0	0	0.03	0
	100	3,134	3,134	0	0	0.01	0
Total (Annual Average Reduction)							1,456
Bringin R.	1.01	0	0	0			
	5	284	0	284	142	0.79	112
	10	304	0	304	294	0.10	29
	20	308	0	308	306	0.05	15
	50	312	0	312	310	0.03	9
	100	320	320	0	0	0.01	0
Total (Annual Average Reduction)							165
Silandak R.	1.01	0	0	0			
	5	56	0	56	28	0.79	22
	10	60	0	60	58	0.10	6
	20	84	0	84	72	0.05	4
	50	92	0	92	88	0.03	3
	100	92	0	92	92	0.01	1
Total (Annual Average Reduction)							36
West Floodway/ Garang R.	1.01	0	0	0			
	5	0	0	0	0	0.79	0
	10	156	0	156	78	0.10	8
	20	340	0	340	248	0.05	12
	50	504	0	504	422	0.03	13
	100	736	0	736	620	0.01	6
Total (Annual Average Reduction)							39
East Floodway	1.01	0	0	0			
	5	216	0	216	108	0.79	85
	10	340	0	340	278	0.10	28
	20	452	0	452	396	0.05	20
	50	504	0	504	478	0.03	14
	100	1,824	0	1,824	1,164	0.01	12
Total (Annual Average Reduction)							159
Babon R.	1.01	0	0	0			
	5	996	0	996	498	0.79	393
	10	1,216	0	1,216	1,106	0.10	111
	20	1,280	0	1,280	1,248	0.05	62
	50	1,388	0	1,388	1,334	0.03	40
	100	1,500	1,440	60	724	0.01	7
Total (Annual Average Reduction)							613

Table XIV.2.21 REDUCTION OF HOUSES/BUILDINGS IN INUNDATION AREA

Unit: Houses

Name	Return Period (Yr)	Inundated Houses/Buildings		Reduction	Average Reduction	Expectation	Expected Average Reduction
		w/o Project	w/ Project				
Blorong R.	1.01	0	0	0			
	5	656	0	656	328	0.79	259
	10	697	0	697	677	0.10	68
	20	714	0	714	706	0.05	35
	50	748	748	0	0	0.03	0
	100	771	771	0	0	0.01	0
Total (Annual Average Reduction)							362
Bringin R.	1.01	0	0	0			
	5	0	0	0	0	0.79	0
	10	22	0	22	11	0.10	1
	20	33	0	33	27	0.05	1
	50	33	0	33	33	0.03	1
	100	55	55	0	0	0.01	0
Total (Annual Average Reduction)							3
Silandak R.	1.01	0	0	0			
	5	113	0	113	56	0.79	45
	10	115	0	115	114	0.10	11
	20	126	0	126	120	0.05	6
	50	129	0	129	127	0.03	4
	100	129	0	129	129	0.01	1
Total (Annual Average Reduction)							67
West Floodway/ Garang R.	1.01	0	0	0			
	5	0	0	0	0	0.79	0
	10	2,155	0	2,155	1,077	0.10	108
	20	4,502	0	4,502	3,328	0.05	166
	50	6,436	0	6,436	5,469	0.03	164
	100	9,274	0	9,274	7,855	0.01	79
Total (Annual Average Reduction)							517
East Floodway	1.01	0	0	0			
	5	87	0	87	43	0.79	34
	10	164	0	164	125	0.10	13
	20	213	0	213	188	0.05	9
	50	235	0	235	224	0.03	7
	100	2,364	0	2,364	1,300	0.01	13
Total (Annual Average Reduction)							76
Babon R.	1.01	0	0	0			
	5	441	0	441	220	0.79	174
	10	498	0	498	469	0.10	47
	20	533	0	533	515	0.05	26
	50	569	0	569	551	0.03	17
	100	607	587	19	294	0.01	3
Total (Annual Average Reduction)							267

Table XIV.2.22 RELIEVED POPULATION FROM FLOOD

Unit: Persons

Name	Return Period (Yr)	Population Suffered from Flood		Relieved Population	Average Relieved Population	Expectation	Expected Average Relieved Reduction
		w/o Project	w/ Project				
Blorong R.	1.01	0	0	0			
	5	3,098	0	3,098	1,549	0.79	1,224
	10	3,289	0	3,289	3,194	0.10	319
	20	3,371	0	3,371	3,330	0.05	167
	50	3,532	3,532	0	0	0.03	0
	100	3,639	3,639	0	0	0.01	0
Total (Annual Average Relieved Population)							1,710
Bringin R.	1.01	0	0	0			
	5	0	0	0	0	0.79	0
	10	999	0	999	500	0.10	50
	20	1,499	0	1,499	1,249	0.05	62
	50	1,499	0	1,499	1,499	0.03	45
	100	2,499	2,499	0	0	0.01	0
Total (Annual Average Relieved Population)							157
Silandak R.	1.01	0	0	0			
	5	556	0	556	278	0.79	220
	10	638	0	638	597	0.10	60
	20	1,133	0	1,133	886	0.05	44
	50	1,298	0	1,298	1,215	0.03	36
	100	1,298	0	1,298	1,298	0.01	13
Total (Annual Average Relieved Population)							373
West Floodway/ Garang R.	1.01	0	0	0			
	5	0	0	0	0	0.79	0
	10	15,449	0	15,449	7,725	0.10	772
	20	33,737	0	33,737	24,593	0.05	1,230
	50	51,284	0	51,284	42,511	0.03	1,275
	100	74,100	0	74,100	62,692	0.01	627
Total (Annual Average Relieved Population)							3,904
East Floodway	1.01	0	0	0			
	5	1,605	0	1,605	803	0.79	634
	10	2,464	0	2,464	2,034	0.10	203
	20	3,519	0	3,519	2,991	0.05	150
	50	3,974	0	3,974	3,747	0.03	112
	100	18,566	0	18,566	11,270	0.01	113
Total (Annual Average Relieved Population)							1,212
Babon R.	1.01	0	0	0			
	5	4,312	0	4,312	2,156	0.79	1,704
	10	5,134	0	5,134	4,723	0.10	472
	20	5,642	0	5,642	5,388	0.05	269
	50	6,229	0	6,229	5,936	0.03	178
	100	7,451	6,801	650	3,439	0.01	34
Total (Annual Average Relieved Population)							2,657

Table XIV.3.1 ANNUAL COST AND BENEFIT FLOW OF WEST FLOODWAY/GARANG RIVER PROJECT

Unit: Million Rp.

		Economic Cost						Benefit Balance	
Year		Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR	Total	
-6	1994	0			2,171	217	0	2,388	0 -2,388
-5	1995	0			3,354	335	0	3,689	0 -3,689
-4	1996	2,496	870	259	1,605	497	0	5,727	0 -5,727
-3	1997	21,268	870	1,708	2,814	2,496	0	29,156	0 -29,156
-2	1998	22,203		1,714	2,977	2,518	0	29,412	2,849 -26,563
-1	1999	10,442		806	1,568	1,202	0	14,018	5,496 -8,522
1	2000						286	286	11,376 11,090
2	2001						286	286	12,059 11,773
3	2002						286	286	12,782 12,496
4	2003						286	286	13,549 13,263
5	2004						286	286	14,362 14,076
6	2005						286	286	15,224 14,938
7	2006						286	286	16,138 15,852
8	2007						286	286	17,106 16,820
9	2008						286	286	18,132 17,846
10	2009						286	286	19,220 18,934
11	2010						286	286	20,373 20,087
12	2011						286	286	21,596 21,310
13	2012						286	286	22,891 22,605
14	2013						286	286	24,265 23,979
15	2014						286	286	25,721 25,435
16	2015						286	286	27,264 26,978
17	2016						286	286	27,264 26,978
18	2017						286	286	27,264 26,978
19	2018						286	286	27,264 26,978
20	2019						286	286	27,264 26,978
21	2020						286	286	27,264 26,978
22	2021						286	286	27,264 26,978
23	2022						286	286	27,264 26,978
24	2023						286	286	27,264 26,978
25	2024						286	286	27,264 26,978
26	2025						286	286	27,264 26,978
27	2026						286	286	27,264 26,978
28	2027						286	286	27,264 26,978
29	2028						286	286	27,264 26,978
30	2029						286	286	27,264 26,978
31	2030						286	286	27,264 26,978
32	2031						286	286	27,264 26,978
33	2032						286	286	27,264 26,978
34	2033						286	286	27,264 26,978
35	2034						286	286	27,264 26,978
36	2035						286	286	27,264 26,978
37	2036						286	286	27,264 26,978
38	2037						286	286	27,264 26,978
39	2038						286	286	27,264 26,978
40	2039						286	286	27,264 26,978
41	2040						286	286	27,264 26,978
42	2041						286	286	27,264 26,978
43	2042						286	286	27,264 26,978
44	2043						286	286	27,264 26,978
45	2044						286	286	27,264 26,978
46	2045						286	286	27,264 26,978
47	2046						286	286	27,264 26,978
48	2047						286	286	27,264 26,978
49	2048						286	286	27,264 26,978
50	2049						286	286	27,264 26,978
TOTAL		56,409	1,740	4,487	14,489	7,265	14,300		EIRR = 16.2%

(Discount Rate 10%)

B/C = 1.90

NPV = 51,626

Table XIV.3.2 ANNUAL AVERAGE BENEFIT FOR COMBINATION OF FLOOD CONTROL DAM AND RIVER IMPROVEMENT (AS PROPOSED FOR MASTER PLAN)

Unit: Million Rp.

Return Period (Yr)	Flood Damage w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
(Year of Land Use Status : 1993)						
5	0	0	0	0	0	0
10	29,638	0	29,638	14,819	0.10	1,482
25	68,219	0	68,219	48,929	0.06	2,936
50	118,423	0	118,423	93,321	0.02	1,866
100	219,196	0	219,196	168,810	0.01	1,688
Total (Annual Average Benefit)						7,972
(Year of Land Use Status : 2015)						
5	0	0	0	0	0	0
10	118,171	0	118,171	59,085	0.10	5,909
25	240,978	0	240,978	179,574	0.06	10,774
50	365,206	0	365,206	303,092	0.02	6,062
100	538,530	0	538,530	451,868	0.01	4,519
Total (Annual Average Benefit)						27,264
Annual Incremental Rate of Annual Average Benefit from 1993 to 2015						6%/year

Table XIV.3.3 ANNUAL AVERAGE BENEFIT FOR RIVER CHANNEL IMPROVEMENT ONLY (AS PROPOSED FOR URGENT PROJECT)

Unit: Million Rp.

Return Period (Yr)	Flood Damage w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
(Year of Land Use Status : 1993)						
5	0	0	0	0	0	0
10	29,638	0	29,638	14,819	0.10	1,482
25	68,219	0	68,219	48,929	0.06	2,936
50	118,423	118,423	0	0	0.02	0
100	219,196	219,196	0	0	0.01	0
Total (Annual Average Benefit)						4,418
(Year of Land Use Status : 2015)						
5	0	0	0	0	0	0
10	118,171	0	118,171	59,085	0.10	5,909
25	240,978	0	240,978	179,574	0.06	10,774
50	365,206	365,206	0	0	0.02	0
100	538,530	538,530	0	0	0.01	0
Total (Annual Average Benefit)						16,683
Annual Incremental Rate of Annual Average Benefit from 1993 to 2015						6%/year

Table XIV.3.4 ANNUAL AVERAGE BENEFIT FOR FLOOD CONTROL DAM ONLY

Unit: Million Rp.

Return Period (Yr)	Flood Damage w/o Project	w/ Project	Damage Reduction	Average Damage Reduction	Expectation	Benefit
(Year of Land Use Status : 1993)						
5	0	0	0	0	0	0
10	29,638	0	29,638	14,819	0.10	1,482
25	68,219	18,861	49,358	39,498	0.06	2,370
50	118,423	40,661	77,762	63,560	0.02	1,271
100	219,196	68,219	150,977	114,370	0.01	1,144
Total (Annual Average Benefit)						6,267
(Year of Land Use Status : 2015)						
5	0	0	0	0	0	0
10	118,171	0	118,171	59,085	0.10	5,909
25	240,978	75,200	165,778	141,974	0.06	8,518
50	365,206	153,259	211,947	188,862	0.02	3,777
100	538,530	240,978	297,552	254,750	0.01	2,547
Total (Annual Average Benefit)						20,752
Annual Incremental Rate of Annual Average Benefit from 1993 to 2015						6%/year

Table XIV.3.5 ESTIMATION OF PROBABLE FLOOD DAMAGE VALUE EFFECTED BY FLOOD CONTROL OF JATIBARANG DAM

Return Period (year)	Without-Dam			With-Dam			Flood Damage		
	Peak Discharge (Qmax)	Overflow Volume (Vmax)	Flood Damage Value	Peak Discharge (Qmax)	Overflow Volume (Vmax)	Estimated from Qmax	Estimated from Vmax	Adopted	
	(m3/s)	(m3)	(mill.Rp.)	(m3/s)	(m3)	(mill.Rp.)	(mill.Rp.)	(mill.Rp.)	
(Year of Land Use Status : 1993)									
5	520	0	0	410	0	0	0	0	
10	630	318,557	29,638	490	0	0	0	0	
25	770	117,254	68,219	590	130,703	18,861	12,079	18,861	
50	880	1,915,034	118,423	670	514,046	40,661	38,311	40,661	
100	980	2,914,641	219,146	770	1,159,743	68,219	67,276	68,219	
(Year of Land Use Status : 2015)									
5	520	0	520	410	0	0	0	0	
10	630	318,557	118,141	490	0	0	0	0	
25	770	117,254	240,978	590	130,703	75,200	48,485	75,200	
50	880	1,915,034	365,206	670	514,046	153,259	146,273	153,259	
100	980	2,914,641	538,530	770	1,159,743	240,978	239,093	240,978	

Table XIV.3.6 ANNUAL COST AND BENEFIT FLOW OF FLOOD CONTROL PLAN
OF WEST FLOODWAY/GARANG RIVER

(SIMULTANEOUS IMPLEMENTATION OF RIVER IMPROVEMENT
AND DAM CONSTRUCTION)

Unit: Million Rp.

Year	Economic Cost				Total	Benefit	Balance
	River Improve.		Dam Consst.				
	Const.	OMR	Const.	OMR			
-6 1994	2,388				2,388	0	-2,388
-5 1995	2,389		1,300		3,689	0	-3,689
-4 1996	0		5,727		5,727	0	-5,727
-3 1997	21,877		7,279		29,156	0	-29,156
-2 1998	21,844		7,568		29,412	2,849	-26,563
-1 1999	9,455		4,563		14,018	5,496	-8,522
1 2000		235		51	286	11,376	11,090
2 2001		235		51	286	12,059	11,773
3 2002		235		51	286	12,782	12,496
4 2003		235		51	286	13,549	13,263
5 2004		235		51	286	14,362	14,076
6 2005		235		51	286	15,224	14,938
7 2006		235		51	286	16,138	15,852
8 2007		235		51	286	17,106	16,820
9 2008		235		51	286	18,132	17,846
10 2009		235		51	286	19,220	18,934
11 2010		235		51	286	20,373	20,087
12 2011		235		51	286	21,596	21,310
13 2012		235		51	286	22,891	22,605
14 2013		235		51	286	24,265	23,979
15 2014		235		51	286	25,721	25,435
16 2015		235		51	286	27,264	26,978
17 2016		235		51	286	27,264	26,978
18 2017		235		51	286	27,264	26,978
19 2018		235		51	286	27,264	26,978
20 2019		235		51	286	27,264	26,978
21 2020		235		51	286	27,264	26,978
22 2021		235		51	286	27,264	26,978
23 2022		235		51	286	27,264	26,978
24 2023		235		51	286	27,264	26,978
25 2024		235		51	286	27,264	26,978
26 2025		235		51	286	27,264	26,978
27 2026		235		51	286	27,264	26,978
28 2027		235		51	286	27,264	26,978
29 2028		235		51	286	27,264	26,978
30 2029		235		51	286	27,264	26,978
31 2030		235		51	286	27,264	26,978
32 2031		235		51	286	27,264	26,978
33 2032		235		51	286	27,264	26,978
34 2033		235		51	286	27,264	26,978
35 2034		235		51	286	27,264	26,978
36 2035		235		51	286	27,264	26,978
37 2036		235		51	286	27,264	26,978
38 2037		235		51	286	27,264	26,978
39 2038		235		51	286	27,264	26,978
40 2039		235		51	286	27,264	26,978
41 2040		235		51	286	27,264	26,978
42 2041		235		51	286	27,264	26,978
43 2042		235		51	286	27,264	26,978
44 2043		235		51	286	27,264	26,978
45 2044		235		51	286	27,264	26,978
46 2045		235		51	286	27,264	26,978
47 2046		235		51	286	27,264	26,978
48 2047		235		51	286	27,264	26,978
49 2048		235		51	286	27,264	26,978
50 2049		235		51	286	27,264	26,978
TOTAL	57,953	11,750	26,437	2,550	98,690	1,227,380	1,204,735

EIRR = 16.2%

(Discount Rate 10%)

B/C = 1.90

NPV = 51,626

Table XIV.3.7 ANNUAL COST AND BENEFIT FLOW OF FLOOD CONTROL PLAN OF WEST FLOODWAY/GARANG RIVER

(ALT 1.: PERIOD FOR RIVER IMPROVEMENT: 1994 TO 1999
PERIOD FOR DAM CONSTRUCTION : 2000 TO 2004)

Unit: Million Rp.

Year	Economic Cost				Benefit		Balance		
	River Improve.		Dam Const.		Total	River Improve. + Dam + River			
	Const.	OMR	Const.	OMR					
-6	1994	2,388				2,388	0	0	-2,388
-5	1995	2,389				2,389	0	0	-2,389
-4	1996	0				0	0	0	0
-3	1997	21,877				21,877	0	0	-21,877
-2	1998	21,844				21,844	2,849	2,849	-18,995
-1	1999	9,455				9,455	5,496	5,496	-3,959
1	2000		235	1,300		1,535	6,961	6,961	5,426
2	2001		235	5,727		5,962	7,379	7,379	1,417
3	2002		235	7,279		7,514	7,822	7,822	308
4	2003		235	7,568		7,803	8,291	8,291	488
5	2004		235	4,563		4,798	8,788	8,788	3,990
6	2005		235		51	286	9,316	15,224	14,938
7	2006		235		51	286	9,875	16,138	15,852
8	2007		235		51	286	10,467	17,106	16,820
9	2008		235		51	286	11,095	18,132	17,846
10	2009		235		51	286	11,761	19,220	18,934
11	2010		235		51	286	12,467	20,373	20,087
12	2011		235		51	286	13,214	21,596	21,310
13	2012		235		51	286	14,007	22,891	22,605
14	2013		235		51	286	14,848	24,265	23,979
15	2014		235		51	286	15,739	25,721	25,435
16	2015		235		51	286	16,683	27,264	26,978
17	2016		235		51	286	16,683	27,264	26,978
18	2017		235		51	286	16,683	27,264	26,978
19	2018		235		51	286	16,683	27,264	26,978
20	2019		235		51	286	16,683	27,264	26,978
21	2020		235		51	286	16,683	27,264	26,978
22	2021		235		51	286	16,683	27,264	26,978
23	2022		235		51	286	16,683	27,264	26,978
24	2023		235		51	286	16,683	27,264	26,978
25	2024		235		51	286	16,683	27,264	26,978
26	2025		235		51	286	16,683	27,264	26,978
27	2026		235		51	286	16,683	27,264	26,978
28	2027		235		51	286	16,683	27,264	26,978
29	2028		235		51	286	16,683	27,264	26,978
30	2029		235		51	286	16,683	27,264	26,978
31	2030		235		51	286	16,683	27,264	26,978
32	2031		235		51	286	16,683	27,264	26,978
33	2032		235		51	286	16,683	27,264	26,978
34	2033		235		51	286	16,683	27,264	26,978
35	2034		235		51	286	16,683	27,264	26,978
36	2035		235		51	286	16,683	27,264	26,978
37	2036		235		51	286	16,683	27,264	26,978
38	2037		235		51	286	16,683	27,264	26,978
39	2038		235		51	286	16,683	27,264	26,978
40	2039		235		51	286	16,683	27,264	26,978
41	2040		235		51	286	16,683	27,264	26,978
42	2041		235		51	286	16,683	27,264	26,978
43	2042		235		51	286	16,683	27,264	26,978
44	2043		235		51	286	16,683	27,264	26,978
45	2044		235		51	286	16,683	27,264	26,978
46	2045		235		51	286	16,683	27,264	26,978
47	2046		235		51	286	16,683	27,264	26,978
48	2047		235		51	286	16,683	27,264	26,978
49	2048		235		51	286	16,683	27,264	26,978
50	2049		235		51	286	16,683	27,264	26,978
TOTAL		57,953	11,750	26,437	2,295	98,435	754,279	1,202,491	1,153,665

EIRR = 16.5%

(Discount Rate 10%)
B/C = 1.95
NPV = 47,881.96

Table XIV.3.8 ANNUAL COST AND BENEFIT FLOW OF FLOOD CONTROL PLAN OF WEST FLOODWAY/GARANG RIVER

(ALT 2.: PERIOD FOR RIVER IMPROVEMENT: 2000 TO 2005
PERIOD FOR DAM CONSTRUCTION : 1995 TO 1999)

Unit: Million Rp.

Year	Economic Cost				Benefit		Balance		
	River Improve.		Dam Const.		Dam	Dam + River			
	Const.	OMR	Const.	OMR					
-6	1994			0		0	0		
-5	1995			1,300		0	-1,300		
-4	1996			5,727		0	-5,727		
-3	1997			7,279		0	-7,279		
-2	1998			7,568		0	-7,568		
-1	1999			4,563		0	-4,563		
1	2000	2,388		51	2,439	8,659	6,220		
2	2001	2,389		51	2,440	9,179	6,739		
3	2002	0		51	51	9,729	9,678		
4	2003	21,877		51	21,928	10,313	-11,615		
5	2004	21,844		51	21,895	10,932	-10,963		
6	2005	9,455		51	9,506	11,588	2,082		
7	2006		235	51	286	12,283	15,852		
8	2007		235	51	286	13,020	16,820		
9	2008		235	51	286	13,801	17,846		
10	2009		235	51	286	14,629	18,934		
11	2010		235	51	286	15,507	20,087		
12	2011		235	51	286	16,438	21,310		
13	2012		235	51	286	17,424	22,605		
14	2013		235	51	286	18,469	23,979		
15	2014		235	51	286	19,577	25,435		
16	2015		235	51	286	20,752	26,978		
17	2016		235	51	286	20,752	26,978		
18	2017		235	51	286	20,752	26,978		
19	2018		235	51	286	20,752	26,978		
20	2019		235	51	286	20,752	26,978		
21	2020		235	51	286	20,752	26,978		
22	2021		235	51	286	20,752	26,978		
23	2022		235	51	286	20,752	26,978		
24	2023		235	51	286	20,752	26,978		
25	2024		235	51	286	20,752	26,978		
26	2025		235	51	286	20,752	26,978		
27	2026		235	51	286	20,752	26,978		
28	2027		235	51	286	20,752	26,978		
29	2028		235	51	286	20,752	26,978		
30	2029		235	51	286	20,752	26,978		
31	2030		235	51	286	20,752	26,978		
32	2031		235	51	286	20,752	26,978		
33	2032		235	51	286	20,752	26,978		
34	2033		235	51	286	20,752	26,978		
35	2034		235	51	286	20,752	26,978		
36	2035		235	51	286	20,752	26,978		
37	2036		235	51	286	20,752	26,978		
38	2037		235	51	286	20,752	26,978		
39	2038		235	51	286	20,752	26,978		
40	2039		235	51	286	20,752	26,978		
41	2040		235	51	286	20,752	26,978		
42	2041		235	51	286	20,752	26,978		
43	2042		235	51	286	20,752	26,978		
44	2043		235	51	286	20,752	26,978		
45	2044		235	51	286	20,752	26,978		
46	2045		235	51	286	20,752	26,978		
47	2046		235	51	286	20,752	26,978		
48	2047		235	51	286	20,752	26,978		
49	2048		235	51	286	20,752	26,978		
50	2049		235	51	286	20,752	26,978		
TOTAL		57,953	10,340	26,437	2,550	97,280	927,869	1,200,081	1,151,822

EIRR = 20.9%

(Discount Rate 10%)

B/C = 2.40

NPV = 56,235.47

Table XIV.3.9 ESTIMATED DAMAGE FOR CENTRAL SEMARANG AREA

Unit: Million Rp

Project	Design Scale (yr)	Green Zone Wet Paddy	House/Building			Indoor Movables			Total
			Residential	Industrial	Business	Residential	Industrial	Business	
Central Semarang	5	0	406	520	801	1,891	3,070	5,886	12,574

Table XIV.3.10 ANNUAL AVERAGE BENEFIT OF URBAN DRAINAGE PROJECT

Project	Design Scale (yr)	Damage Reduction Probability	Damage Reduction (mil.Rp.)	Expected Reduction Value (mil.Rp.)
Central Semarang	5	0.8	12,574	10,059

Table XIV.3.11 ANNUAL COST AND BENEFIT FLOW OF CENTRAL SEMARANG AREA DRAINAGE PROJECT

Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR			
1994							0	0	0
1995				1,254		127	1,381	0	(1,381)
1996				1,252		125	1,377	0	(1,377)
-8 1997		649	50			65	764	0	(764)
-7 1998	2,486	650	307	220		336	3,999	0	(3,999)
-6 1999	3,083		289	248		333	3,953	613	(3,340)
-5 2000	4,312		335	291		460	5,398	991	(4,407)
-4 2001	4,026		313	268		429	5,036	1,544	(3,492)
-3 2002	3,914		305	261		417	4,897	2,126	(2,771)
-2 2003	3,071		240	206		328	3,845	2,757	(1,088)
-1 2004	2,697		211	180		287	3,375	3,341	(34)
1 2005						314	314	5,617	5,303
2 2006						314	314	5,954	5,640
3 2007						314	314	6,311	5,997
4 2008						314	314	6,690	6,376
5 2009						314	314	7,091	6,777
6 2010						314	314	7,516	7,202
7 2011						314	314	7,967	7,653
8 2012						314	314	8,446	8,132
9 2013						314	314	8,952	8,638
10 2014						314	314	9,489	9,175
11 2015						314	314	10,059	9,745
12 2016						314	314	10,059	9,745
13 2017						314	314	10,059	9,745
14 2018						314	314	10,059	9,745
15 2019						314	314	10,059	9,745
16 2020						314	314	10,059	9,745
17 2021						314	314	10,059	9,745
18 2022						314	314	10,059	9,745
19 2023						314	314	10,059	9,745
20 2024						314	314	10,059	9,745
21 2025						314	314	10,059	9,745
22 2026						314	314	10,059	9,745
23 2027						314	314	10,059	9,745
24 2028						314	314	10,059	9,745
25 2029						314	314	10,059	9,745
26 2030						314	314	10,059	9,745
27 2031						314	314	10,059	9,745
28 2032						314	314	10,059	9,745
29 2033						314	314	10,059	9,745
30 2034						314	314	10,059	9,745
31 2035						314	314	10,059	9,745
32 2036						314	314	10,059	9,745
33 2037						314	314	10,059	9,745
34 2038						314	314	10,059	9,745
35 2039						314	314	10,059	9,745
36 2040						314	314	10,059	9,745
37 2041						314	314	10,059	9,745
38 2042						314	314	10,059	9,745
39 2043						314	314	10,059	9,745
40 2044						314	314	10,059	9,745
41 2045						314	314	10,059	9,745
42 2046						314	314	10,059	9,745
43 2047						314	314	10,059	9,745
44 2048						314	314	10,059	9,745
45 2049						314	314	10,059	9,745
46 2050						314	314	10,059	9,745
47 2051						314	314	10,059	9,745
48 2052						314	314	10,059	9,745
49 2053						314	314	10,059	9,745
50 2054						314	314	10,059	9,745
TOTAL	23,589	1,299	2,050	4,180		2,907	15,700	EIRR =	15.7%

(Discount Rate 10%)
B/C = 1.81
NPV = 14,872

Table XIV.3.12 ANNUAL COST AND BENEFIT FLOW OF WATER REOURCES DEVELOPMENT PLAN

Unit: Million Rp.

Year	Economic Cost						Benefit Balance			
	Const.	Comp.	Admin.	E/S	Phy.	Conti.	OMR	Total		
1994								0	0	0
-5 1995				2,259		226		2,485	0	-2,485
-4 1996	4,769	1,662	495	3,067		950		10,943	0	-10,943
-3 1997	8,525	1,662	785	1,743		1,193		13,908	0	-13,908
-2 1998	10,365		799	2,054		1,242		14,460	0	-14,460
-1 1999	6,075		468	1,427		751		8,721	0	-8,721
1 2000							98	98	23,274	23,176
2 2001							98	98	23,274	23,176
3 2002							98	98	23,274	23,176
4 2003							98	98	23,274	23,176
5 2004							98	98	23,274	23,176
6 2005							98	98	23,274	23,176
7 2006							98	98	23,274	23,176
8 2007							98	98	23,274	23,176
9 2008							98	98	23,274	23,176
10 2009							98	98	23,274	23,176
11 2010							98	98	23,274	23,176
12 2011							98	98	23,274	23,176
13 2012							98	98	23,274	23,176
14 2013							98	98	23,274	23,176
15 2014							98	98	23,274	23,176
16 2015							98	98	23,274	23,176
17 2016							98	98	23,274	23,176
18 2017							98	98	23,274	23,176
19 2018							98	98	23,274	23,176
20 2019							98	98	23,274	23,176
21 2020							98	98	23,274	23,176
22 2021							98	98	23,274	23,176
23 2022							98	98	23,274	23,176
24 2023							98	98	23,274	23,176
25 2024							98	98	23,274	23,176
26 2025							98	98	23,274	23,176
27 2026							98	98	23,274	23,176
28 2027							98	98	23,274	23,176
29 2028							98	98	23,274	23,176
30 2029							98	98	23,274	23,176
31 2030							98	98	23,274	23,176
32 2031							98	98	23,274	23,176
33 2032							98	98	23,274	23,176
34 2033							98	98	23,274	23,176
35 2034							98	98	23,274	23,176
36 2035							98	98	23,274	23,176
37 2036							98	98	23,274	23,176
38 2037							98	98	23,274	23,176
39 2038							98	98	23,274	23,176
40 2039							98	98	23,274	23,176
41 2040							98	98	23,274	23,176
42 2041							98	98	23,274	23,176
43 2042							98	98	23,274	23,176
44 2043							98	98	23,274	23,176
45 2044							98	98	23,274	23,176
46 2045							98	98	23,274	23,176
47 2046							98	98	23,274	23,176
48 2047							98	98	23,274	23,176
49 2048							98	98	23,274	23,176
50 2049							98	98	23,274	23,176
TOTAL	29,734	3,324	2,547	10,550		4,362	4,900		EIRR =	28.8%

(Discount Rate 10%)
B/C = 3.81
NPV = 96,030

Table XIV.3.13 ANNUAL COST AND BENEFIT FLOW OF HYDROPOWER GENERATION PLAN

Unit: Million Rp.

Year	Economic Cost						Total	Benefit Balance	
	Const.	Comp.	Admin.	E/S	Phy.	Conti.		OMR	
1994							0	0	0
-5 1995				400		40	440	0	-440
-4 1996	14		5	403		42	465	0	-465
-3 1997	2,713		5	209	212	293	3,432	0	-3,432
-2 1998	2,719			209	213	294	3,435	0	-3,435
-1 1999	3,602			277	280	389	4,548	0	-4,548
1 2000							280	1,105	825
2 2001							280	1,105	825
3 2002							280	1,105	825
4 2003							280	1,105	825
5 2004							280	1,105	825
6 2005							280	1,105	825
7 2006							280	1,105	825
8 2007							280	1,105	825
9 2008							280	1,105	825
10 2009							280	1,105	825
11 2010							280	1,105	825
12 2011							280	1,105	825
13 2012							280	1,105	825
14 2013							280	1,105	825
15 2014							280	1,105	825
16 2015							280	1,105	825
17 2016							280	1,105	825
18 2017							280	1,105	825
19 2018							280	1,105	825
20 2019							280	1,105	825
21 2020							280	1,105	825
22 2021							280	1,105	825
23 2022							280	1,105	825
24 2023							280	1,105	825
25 2024							280	1,105	825
26 2025							280	1,105	825
27 2026							280	1,105	825
28 2027							280	1,105	825
29 2028							280	1,105	825
30 2029							280	1,105	825
31 2030							280	1,105	825
32 2031							280	1,105	825
33 2032							280	1,105	825
34 2033							280	1,105	825
35 2034							280	1,105	825
36 2035							280	1,105	825
37 2036							280	1,105	825
38 2037							280	1,105	825
39 2038							280	1,105	825
40 2039							280	1,105	825
41 2040							280	1,105	825
42 2041							280	1,105	825
43 2042							280	1,105	825
44 2043							280	1,105	825
45 2044							280	1,105	825
46 2045							280	1,105	825
47 2046							280	1,105	825
48 2047							280	1,105	825
49 2048							280	1,105	825
50 2049							280	1,105	825
TOTAL	9,048	10	696	1,508	1,058	14,000		EIRR =	5.9%
									(Discount Rate 10%)
									B/C = 0.66
									NPV = -3,140

Table XIV.3.14 ANNUAL COST AND BENEFIT FLOW OF JATIBARANG DAM PROJECT
(FLOOD CONTROL, WATER RESOURCES AND HYDROPOWER PLANS)

Unit: Million Rp.

Year	Economic Cost					Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.			
1994						0	0	0
-5 1995				3,842	384	4,226	0	-4,226
-4 1996	7,279	2,537	755	5,075	1,490	17,136	0	-17,136
-3 1997	15,700	2,537	1,405	2,867	2,111	24,620	0	-24,620
-2 1998	18,509		1,426	3,342	2,185	25,462	2	-25,460
-1 1999	12,857		990	2,453	1,532	17,832	44	-17,788
1 2000					429	429	28,376	27,947
2 2001					429	429	28,616	28,187
3 2002					429	429	28,870	28,441
4 2003					429	429	29,139	28,710
5 2004					429	429	29,425	28,996
6 2005					429	429	29,728	29,299
7 2006					429	429	30,049	29,620
8 2007					429	429	30,389	29,960
9 2008					429	429	30,750	30,321
10 2009					429	429	31,132	30,703
11 2010					429	429	31,537	31,108
12 2011					429	429	31,966	31,537
13 2012					429	429	32,422	31,993
14 2013					429	429	32,904	32,475
15 2014					429	429	33,416	32,987
16 2015					429	429	34,959	34,530
17 2016					429	429	34,959	34,530
18 2017					429	429	34,959	34,530
19 2018					429	429	34,959	34,530
20 2019					429	429	34,959	34,530
21 2020					429	429	34,959	34,530
22 2021					429	429	34,959	34,530
23 2022					429	429	34,959	34,530
24 2023					429	429	34,959	34,530
25 2024					429	429	34,959	34,530
26 2025					429	429	34,959	34,530
27 2026					429	429	34,959	34,530
28 2027					429	429	34,959	34,530
29 2028					429	429	34,959	34,530
30 2029					429	429	34,959	34,530
31 2030					429	429	34,959	34,530
32 2031					429	429	34,959	34,530
33 2032					429	429	34,959	34,530
34 2033					429	429	34,959	34,530
35 2034					429	429	34,959	34,530
36 2035					429	429	34,959	34,530
37 2036					429	429	34,959	34,530
38 2037					429	429	34,959	34,530
39 2038					429	429	34,959	34,530
40 2039					429	429	34,959	34,530
41 2040					429	429	34,959	34,530
42 2041					429	429	34,959	34,530
43 2042					429	429	34,959	34,530
44 2043					429	429	34,959	34,530
45 2044					429	429	34,959	34,530
46 2045					429	429	34,959	34,530
47 2046					429	429	34,959	34,530
48 2047					429	429	34,959	34,530
49 2048					429	429	34,959	34,530
50 2049					429	429	34,959	34,530
TOTAL	54,345	5,074	4,576	17,579	7,702	21,450	EIRR =	23.2%

(Discount Rate 10%)
B/C = 2.84
NPV = 115,352

Table XIV.3.15 ANNUAL COST AND BENEFIT FLOW OF WATER SUPPLY AND HYDROPOWER GENERATION PROJECT

Unit: Million Rp.

Year	Economic Cost						Total	Benefit	Balance
	Const.	Comp.	Admin.	E/S	Phy. Conti.	OMR			
1994							0	0	0
-5 1995				2,659	266		2,925	0	-2,925
-4 1996	4,783	1,667	496	3,470	992		11,408	0	-11,408
-3 1997	11,238	1,667	994	1,955	1,486		17,340	0	-17,340
-2 1998	13,084		1,008	2,267	1,536		17,895	0	-17,895
-1 1999	9,677		745	1,707	1,140		13,269	0	-13,269
1 2000						378	378	24,379	24,001
2 2001						378	378	24,379	24,001
3 2002						378	378	24,379	24,001
4 2003						378	378	24,379	24,001
5 2004						378	378	24,379	24,001
6 2005						378	378	24,379	24,001
7 2006						378	378	24,379	24,001
8 2007						378	378	24,379	24,001
9 2008						378	378	24,379	24,001
10 2009						378	378	24,379	24,001
11 2010						378	378	24,379	24,001
12 2011						378	378	24,379	24,001
13 2012						378	378	24,379	24,001
14 2013						378	378	24,379	24,001
15 2014						378	378	24,379	24,001
16 2015						378	378	24,379	24,001
17 2016						378	378	24,379	24,001
18 2017						378	378	24,379	24,001
19 2018						378	378	24,379	24,001
20 2019						378	378	24,379	24,001
21 2020						378	378	24,379	24,001
22 2021						378	378	24,379	24,001
23 2022						378	378	24,379	24,001
24 2023						378	378	24,379	24,001
25 2024						378	378	24,379	24,001
26 2025						378	378	24,379	24,001
27 2026						378	378	24,379	24,001
28 2027						378	378	24,379	24,001
29 2028						378	378	24,379	24,001
30 2029						378	378	24,379	24,001
31 2030						378	378	24,379	24,001
32 2031						378	378	24,379	24,001
33 2032						378	378	24,379	24,001
34 2033						378	378	24,379	24,001
35 2034						378	378	24,379	24,001
36 2035						378	378	24,379	24,001
37 2036						378	378	24,379	24,001
38 2037						378	378	24,379	24,001
39 2038						378	378	24,379	24,001
40 2039						378	378	24,379	24,001
41 2040						378	378	24,379	24,001
42 2041						378	378	24,379	24,001
43 2042						378	378	24,379	24,001
44 2043						378	378	24,379	24,001
45 2044						378	378	24,379	24,001
46 2045						378	378	24,379	24,001
47 2046						378	378	24,379	24,001
48 2047						378	378	24,379	24,001
49 2048						378	378	24,379	24,001
50 2049						378	378	24,379	24,001
TOTAL	38,782	3,334	3,243	12,058	5,420	18,900		EIRR =	25.8%
								(Discount Rate 10%)	
								B/C =	3.13
								NPV =	92,890

Table XIV.3.16 ANNUAL COST AND BENEFIT FLOW OF ALL PROJECTS

Unit: Million Rp.

Year	Economic Cost		Admin.	E/S	Phy.	Conti.	OMR	Total	Benefit	Balance
	Const.	Comp.								
1994				2,171		217		2,388	0	(2,388)
-10 1995				7,267		728		7,995	0	(7,995)
-9 1996	7,279	2,537	755	6,327		1,617		18,515	0	(18,515)
-8 1997	32,506	3,186	2,752	4,769		4,047		47,260	0	(47,260)
-7 1998	37,773		3,029	5,464		4,390		50,656	2,849	(47,807)
-6 1999	23,202	0	1,840	3,523		2,675		31,240	6,109	(25,131)
-5 2000	4,312	0	335	291		460	664	6,062	36,745	30,683
-4 2001	4,026		313	268		429	664	5,700	37,982	32,282
-3 2002	3,914		305	261		417	664	5,561	39,286	33,725
-2 2003	3,071		240	206		328	664	4,509	40,684	36,175
-1 2004	2,697		211	180		287	664	4,039	42,082	38,043
1 2005							978	978	45,219	44,241
2 2006							978	978	46,470	45,492
3 2007							978	978	47,795	46,817
4 2008							978	978	49,200	48,222
5 2009							978	978	50,689	49,711
6 2010							978	978	52,268	51,290
7 2011							978	978	53,941	52,963
8 2012							978	978	55,715	54,737
9 2013							978	978	57,595	56,617
10 2014							978	978	59,588	58,610
11 2015							978	978	61,701	60,723
12 2016							978	978	61,701	60,723
13 2017							978	978	61,701	60,723
14 2018							978	978	61,701	60,723
15 2019							978	978	61,701	60,723
16 2020							978	978	61,701	60,723
17 2021							978	978	61,701	60,723
18 2022							978	978	61,701	60,723
19 2023							978	978	61,701	60,723
20 2024							978	978	61,701	60,723
21 2025							978	978	61,701	60,723
22 2026							978	978	61,701	60,723
23 2027							978	978	61,701	60,723
24 2028							978	978	61,701	60,723
25 2029							978	978	61,701	60,723
26 2030							978	978	61,701	60,723
27 2031							978	978	61,701	60,723
28 2032							978	978	61,701	60,723
29 2033							978	978	61,701	60,723
30 2034							978	978	61,701	60,723
31 2035							978	978	61,701	60,723
32 2036							978	978	61,701	60,723
33 2037							978	978	61,701	60,723
34 2038							978	978	61,701	60,723
35 2039							978	978	61,701	60,723
36 2040							978	978	61,701	60,723
37 2041							978	978	61,701	60,723
38 2042							978	978	61,701	60,723
39 2043							978	978	61,701	60,723
40 2044							978	978	61,701	60,723
41 2045							978	978	61,701	60,723
42 2046							978	978	61,701	60,723
43 2047							978	978	61,701	60,723
44 2048							978	978	61,701	60,723
45 2049							978	978	61,701	60,723
46 2050							314	314	10,059	9,745
47 2051							314	314	10,059	9,745
48 2052							314	314	10,059	9,745
49 2053							314	314	10,059	9,745
50 2054							314	314	10,059	9,745
TOTAL	118,780	5,723	9,780	30,727		15,595	48,900		EIRR =	19.8%

(Discount Rate 10%)

B/C = 2.35

NPV = 160,463

XV TOPOGRAPHIC SURVEY

XV TOPOGRAPHIC SURVEY

TABLE OF CONTENTS

	<u>Page</u>
CHAPTER 1 GENERAL CONDITIONS.....	XV-1
CHAPTER 2 DESCRIPTION OF SURVEY WORKS.....	XV-2
2.1 Master Plan Stage.....	XV-2
2.2 Feasibility Study Stage.....	XV-3
CHAPTER 3 WORK EXECUTION.....	XV-5
3.1 Master Plan Stage.....	XV-5
3.2 Feasibility Study Stage.....	XV-9

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>	<u>Page</u>
XV.2.1	General Location Map.....	XV-10
XV.2.2	Outline of Mapping of the Study Area on Scale 1:10,000.....	XV-11
XV.2.3	Ground Control Work of Mapping of the Study Area on Scale 1:10,000....	XV-12
XV.2.4	Location Map of Drainage Channels Surveyed.....	XV-13
XV.2.5	Location Map of Spot Elevation Survey.....	XV-14
XV.2.6	Outline of Mapping of Jatibarang Reservoir on Scale 1:2,500.....	XV-15
XV.2.7	Ground Control Work of Mapping of Jatibarang Reservoir on Scale 1:2,500.....	XV-16
XV.2.8	Location Map of Ground Survey for Urban Drainage.....	XV-17

CHAPTER 1 GENERAL CONDITIONS

Topographic survey for the Project was conducted in the study area during the study period to provide topographic maps, longitudinal profiles and cross sections of the objective rivers and drainage channels. The survey works were entrusted to a local contractor, P.T. Geojaya Teknik (Jakarta), with supervision by the survey expert of the JICA Study Team.

The Doppler point established on Indonesian Datum (ID-74) and the National Bench Mark (TTG) determined from the Mean Sea Level of Jakarta Port, both were fixed by BAKOSURTANAL, were used for the horizontal and vertical reference points, respectively. The survey works carried out during the study period are discussed in the succeeding chapters.

CHAPTER 2 DESCRIPTION OF SURVEY WORKS

2.1 Master Plan Stage

In the Master Plan Stage, (1) photogrammetric mapping, (2) river survey, (3) drainage channel survey, and (4) spot elevation survey were carried out. The work volume of each survey work is tabulated as follows:

(1) Photogrammetric Mapping (refer to Figs. XV.2.1 to XV.2.3)

Preparation of aerial photos: 207 sheets
(Scale: 1:25,000; taken in 1990)

Establishment of geodetic monument and pricking : 19 points

Control point survey (GPS) : 19 points

Leveling : 180 km

Field verification : 400 km²

Aerial triangulation : 63 models

Plotting/Editing : 400 km²

Drawing (Scale: 1:10,000) : 400 km²

(2) River Survey (refer to Fig. XV.2.1)

Objective rivers : Blorong River
: Silandak River
: East Floodway
: Babon River

Longitudinal profile survey : 62.7 km

Cross sectional survey : 304 sections

Check survey for West : 10.25 km

Floodway leveling

Cross sectional check survey: 6 sections

(3) Drainage Channel Survey (refer to Figs. XV.2.1 and XV.2.4)

Number of objective drainage: 11 channels
channels

Longitudinal profile survey : 47.3 km

Cross sectional survey : 162 sections

(4) Spot Elevation Survey (refer to Fig. XV.2.5)

Number of spot elevation : 173 spots
surveys

2.2 Feasibility Study Stage

In the Feasibility Study Stage, (1) photogrammetric mapping for the Jatibarang reservoir area and (2) ground survey for the Urban Drainage Plan were carried out. The work volume of each survey work is tabulated as follows:

(1) Photogrammetric Mapping (refer to Figs. XV.2.1, XV.2.6 and XV.2.7)

Preparation of aerial photos: 30 sheets
(Scale: 1:25,000; taken in 1990)

Establishment of geodetic monument and pricking : 5 points

Control point survey (GPS) : 5 points

Leveling : 40 km

Field verification : 7 km²

Aerial triangulation : 8 models

Plotting/Editing : 7 km²

Drawing (Scale: 1:2,500) : 7 km²

(2) Ground Survey for Urban Drainage (refer to Fig. XV.2.8)

Topographic survey at pumping stations : 125,000 m²

Cross sectional survey for connection channel : 39 sections

Longitudinal profile survey : 5 km

CHAPTER 3 WORK EXECUTION

3.1 Master Plan Stage

The following works were conducted by the local contractor, P.T. Geojaya Teknik, in accordance with the contract and the specifications provided by the JICA Study Team.

Field Works

(1) Photogrammetric Mapping

(a) Aerial photograph

The aerial photographs taken in 1990 with the scale of 1:25,000 were used to develop photogrammetric maps with the scale of 1:10,000.

(b) Control point survey (GPS)

Nineteen (19) ground control points were newly set for aerial triangulation. Planimetric positioning of the ground control points was determined by GPS (Global Positioning System).

(c) Geodetic monument and pricking

Control point monuments were set at places suitable for maintenance, and the monumentation was carried out in conformity with the Indonesian specifications. Spot elevations by direct leveling were pricked on twice-enlarged aerial photographs for aerial triangulation.

(d) Field verification

Field verification for approx. 400 km², which is subject to mapping as shown in Fig. XV.2.2, was made using twice-enlarged photos. Field verification was performed in accordance with the map symbols and their application rules, using aerial photos and available data based on the preliminary photo interpretation.

(2) Ground Survey

Longitudinal profile and cross sectional surveys for the four objective river courses were carried out. Each cross section was extended to twice the river width. The location of the objective river courses is as shown in Fig. XV.2.1.

Longitudinal profile and cross sectional surveys were also carried out for the 11 drainage channels in Semarang City. The location of the 11 drainage channels is as shown in Fig. XV.2.4.

Spot elevation survey was conducted at 173 points with 500 m mesh along West Floodway/Garang River and the drainage channels to provide data for the estimation of inundation damage. The location of spot elevation points is as shown in Fig. XV.2.5.

Indoor Works

Aerial triangulation, plotting/editing and drawing were performed based on the field survey results.

(1) Photogrammetric Mapping

(a) Aerial Triangulation

Sixty-three (63) models were adjusted by the block adjustment method using individual models. Pass points, tie points and kilometer posts on aerial photos and the orientation elements required for the plotting/editing and cartography were computed by using the survey results of the control point survey and minor order leveling.

(b) Plotting/Editing

Based on the results of aerial triangulation, control point survey and field verification, topographic features necessary for mapping were measured and delineated by plotting machines with colored ballpoint pens to produce the manuscript sheets and orientation records.

- Mapping scale and work volume (1:10,000 and 400 km²)
- Control interval (2 m; 1 m for half interval contours)
- Format of manuscript sheet (80 cm x 60 cm; 19 sheets)
- Map symbols and their application rules and cartographic standards were agreed upon based on the results of the field verification.

(c) Fair Drawing

Fair drawings were performed on the marginal design sheets of 1:10,000 scale topographic maps in accordance with the rules of annotations discussed with the Indonesian counterparts.

Original drawings were performed in the order given below by a standard drafting (fair drawing) method based on the compilation manuscript, as well as the map symbols and their application rules.

- Spot height
- Annotations
- Linear features
- Building symbols
- Building, planimetric features
- Vegetation symbols
- Vegetation boundary
- Contour lines

Index maps to adjoining sheets are shown in Fig. XV.2.2.

(2) Ground Survey

The longitudinal profiles and cross sections for the four rivers and 11 drainage channels were prepared based on the results of the field survey with the scales shown below.

Rivers

Longitudinal profile H = 1:10,000
 V = 1:100

Cross section	H = 1:500; V = 1:100
	H = 1:200; V = 1:100
	H = 1:100; V = 1:100

Drainage Channels

Longitudinal profile	H = 1:10,000
	V = 1:100

Cross section	H = 1:200; V = 1:100
	H = 1:100; V = 1:100

3.2 Feasibility Study Stage

The following works were conducted by the same local contractor, P.T. Geojaya Teknik, under the supervision of the JICA Study Team:

Field Works

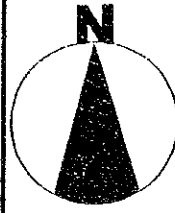
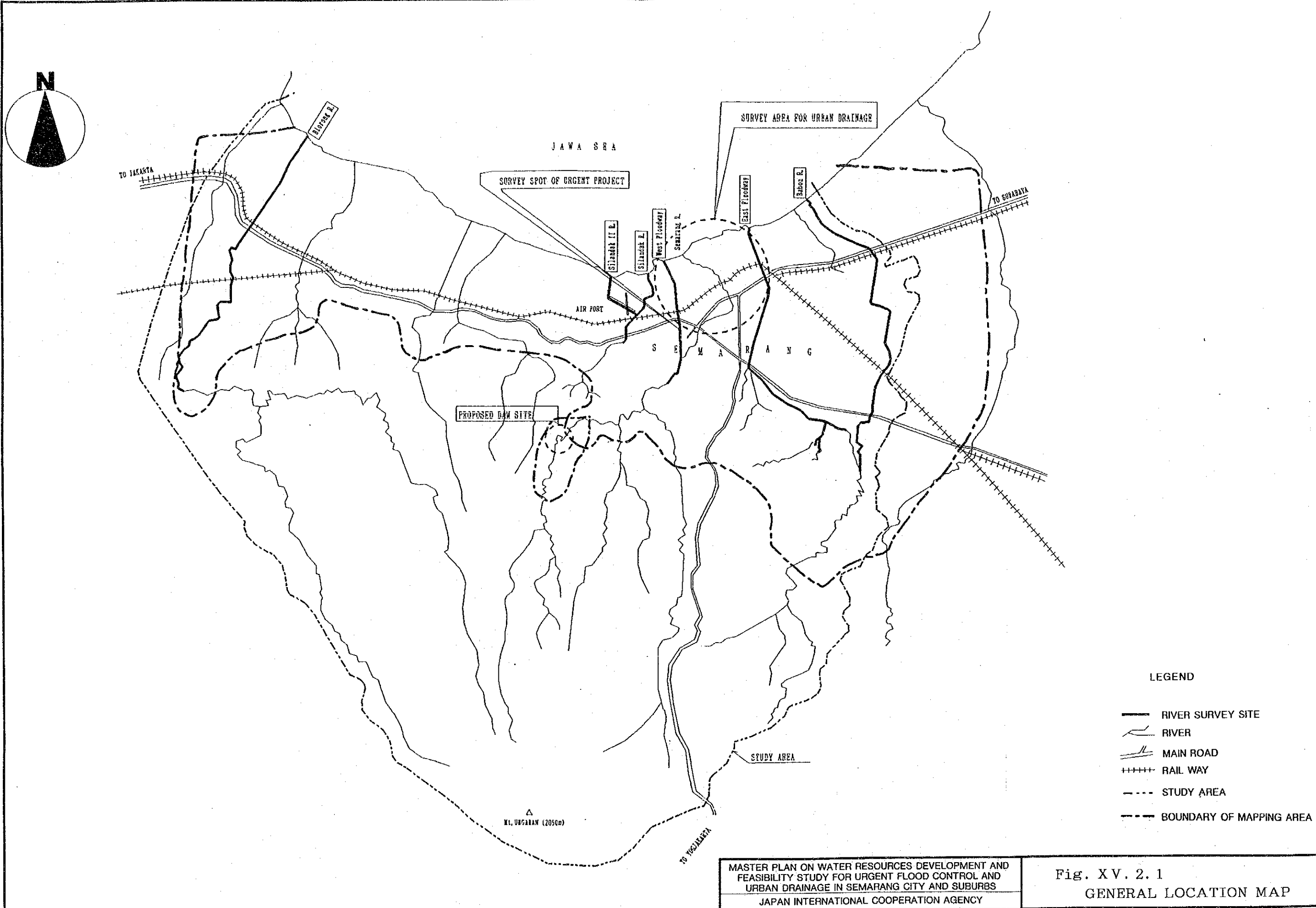
(1) Photogrammetric Mapping

Photogrammetric mapping with the scale of 1:2,500 for the reservoir area of Jatibarang Dam, which was selected as the priority project in the Master Plan, was carried out with the same procedure applied to the Master Plan Stage. The location of the mapping area is as shown in Figs. XV.2.1 and XV.2.6.

(2) Ground Survey for Urban Drainage

The ground survey for urban drainage was carried out for the proposed locations of three pumping stations, one gate structure and two access channels.

FIGURES

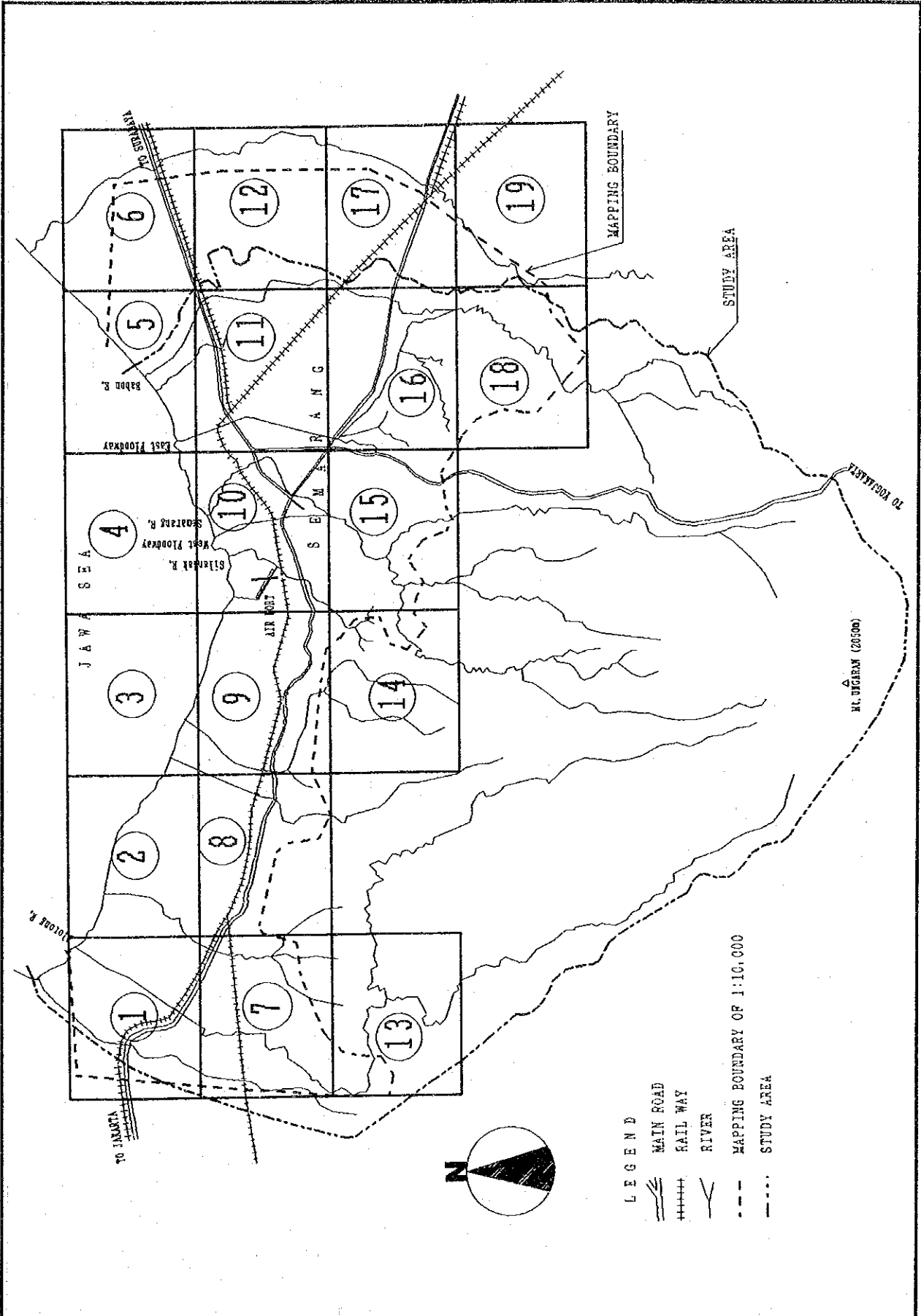


LEGEND

- RIVER SURVEY SITE
- RIVER
- MAIN ROAD
- ++++ RAIL WAY
- - - STUDY AREA
- - - BOUNDARY OF MAPPING AREA

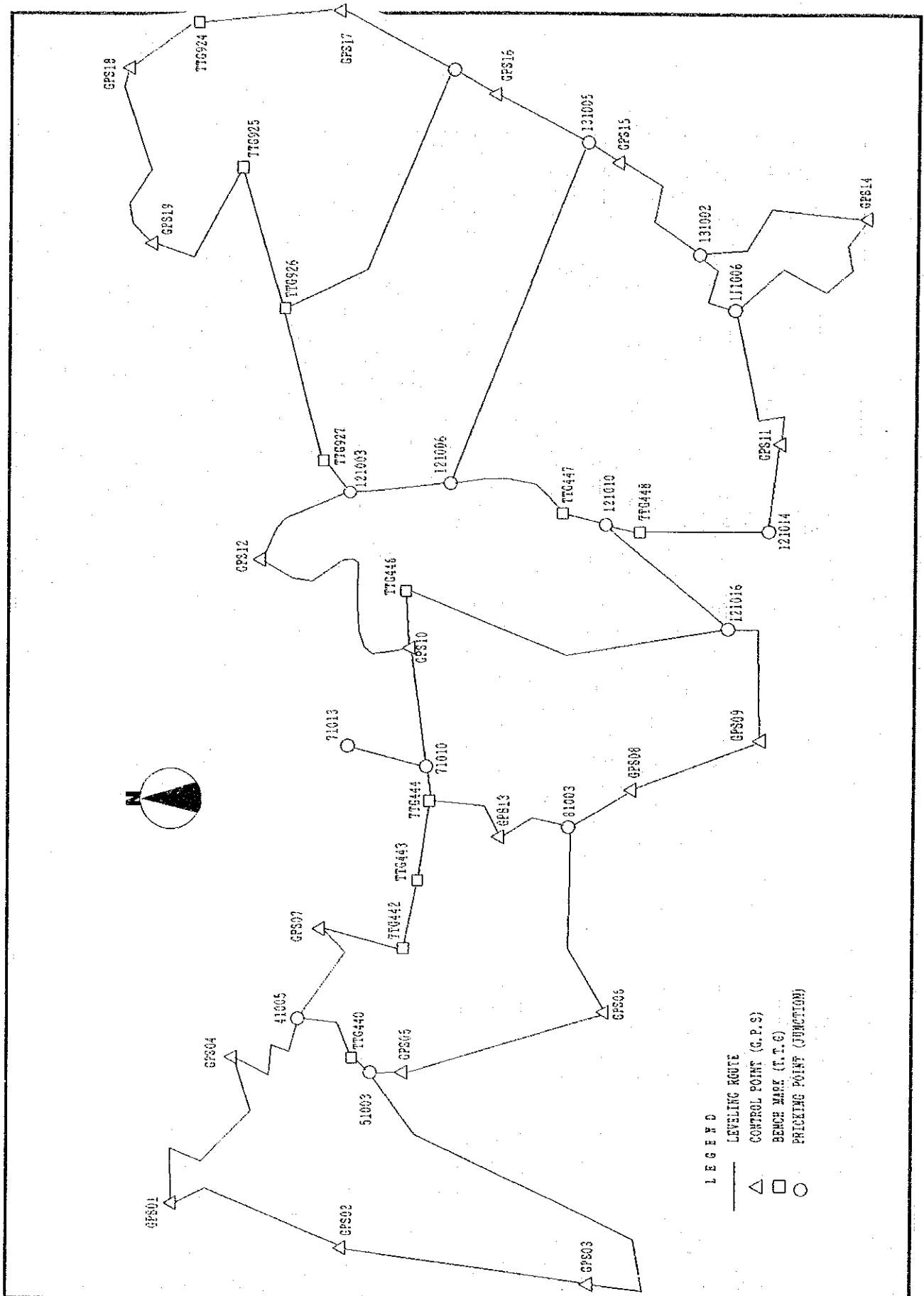
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XV. 2.1
 GENERAL LOCATION MAP



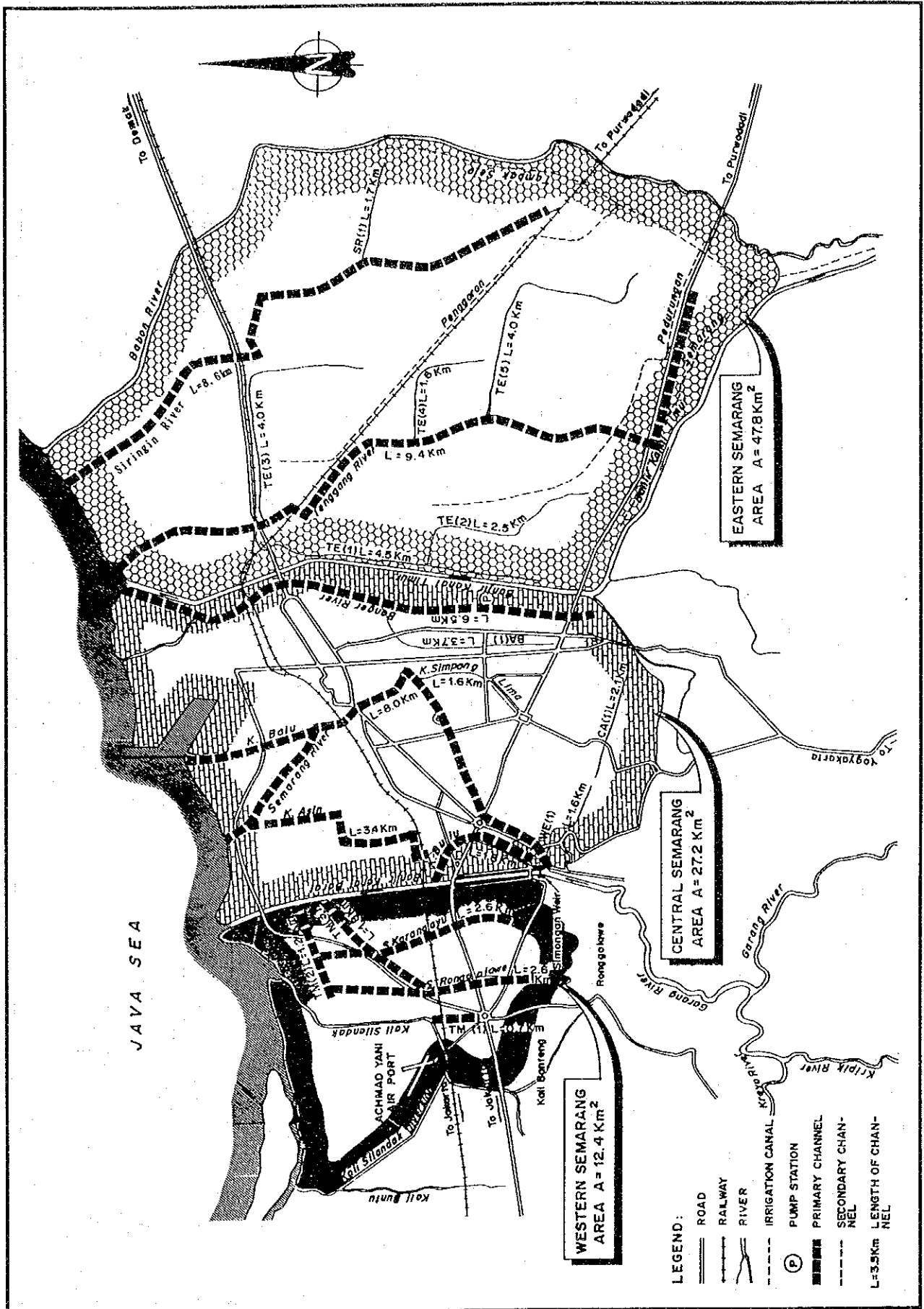
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XV. 2. 2 OUTLINE OF MAPPING OF
 THE STUDY AREA ON SCALE 1:10, 000



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

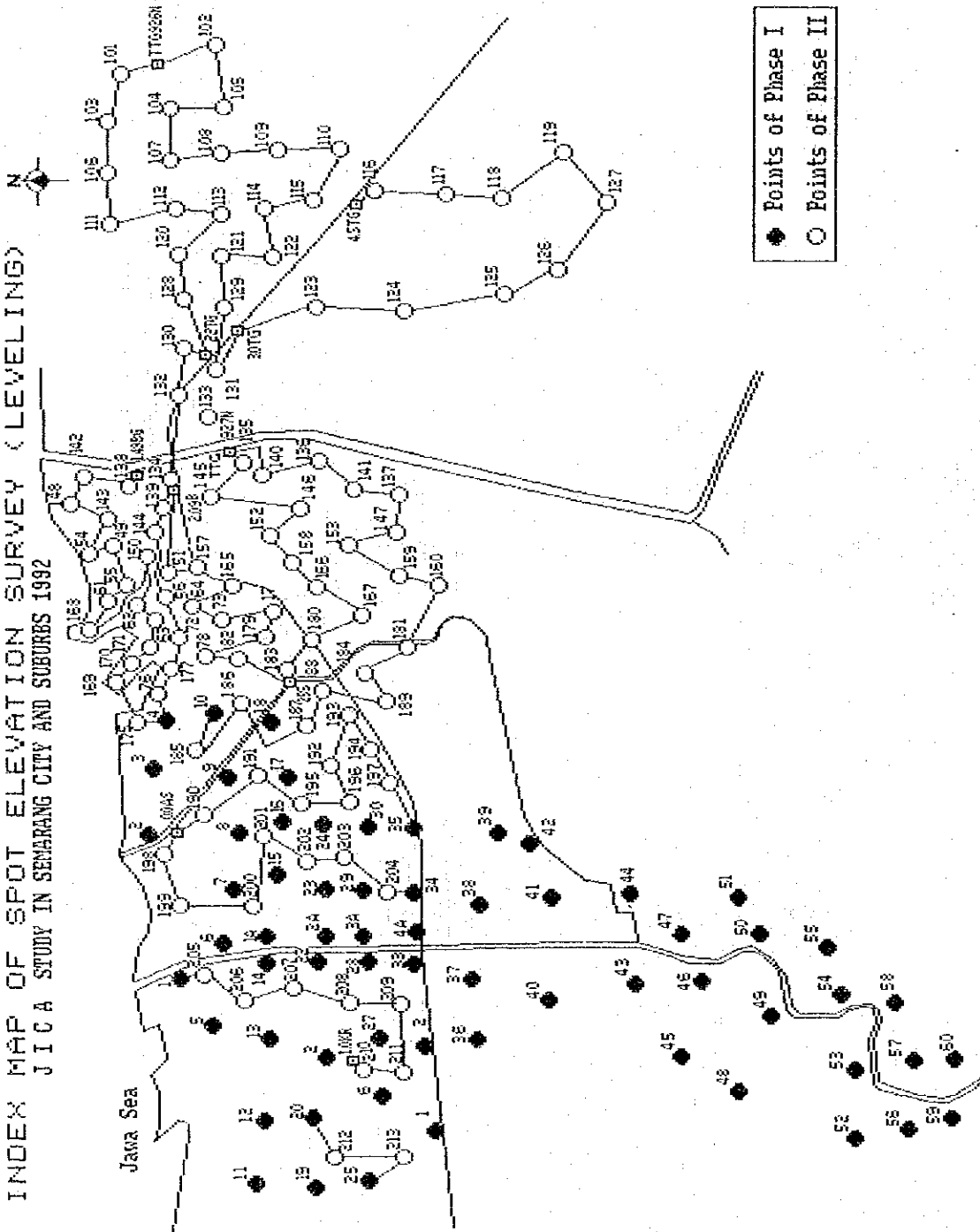
Fig. XV. 2. 3 GROUND CONTROL WORK
 OF MAPPING OF THE STUDY AREA
 ON SCALE 1:10, 000



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

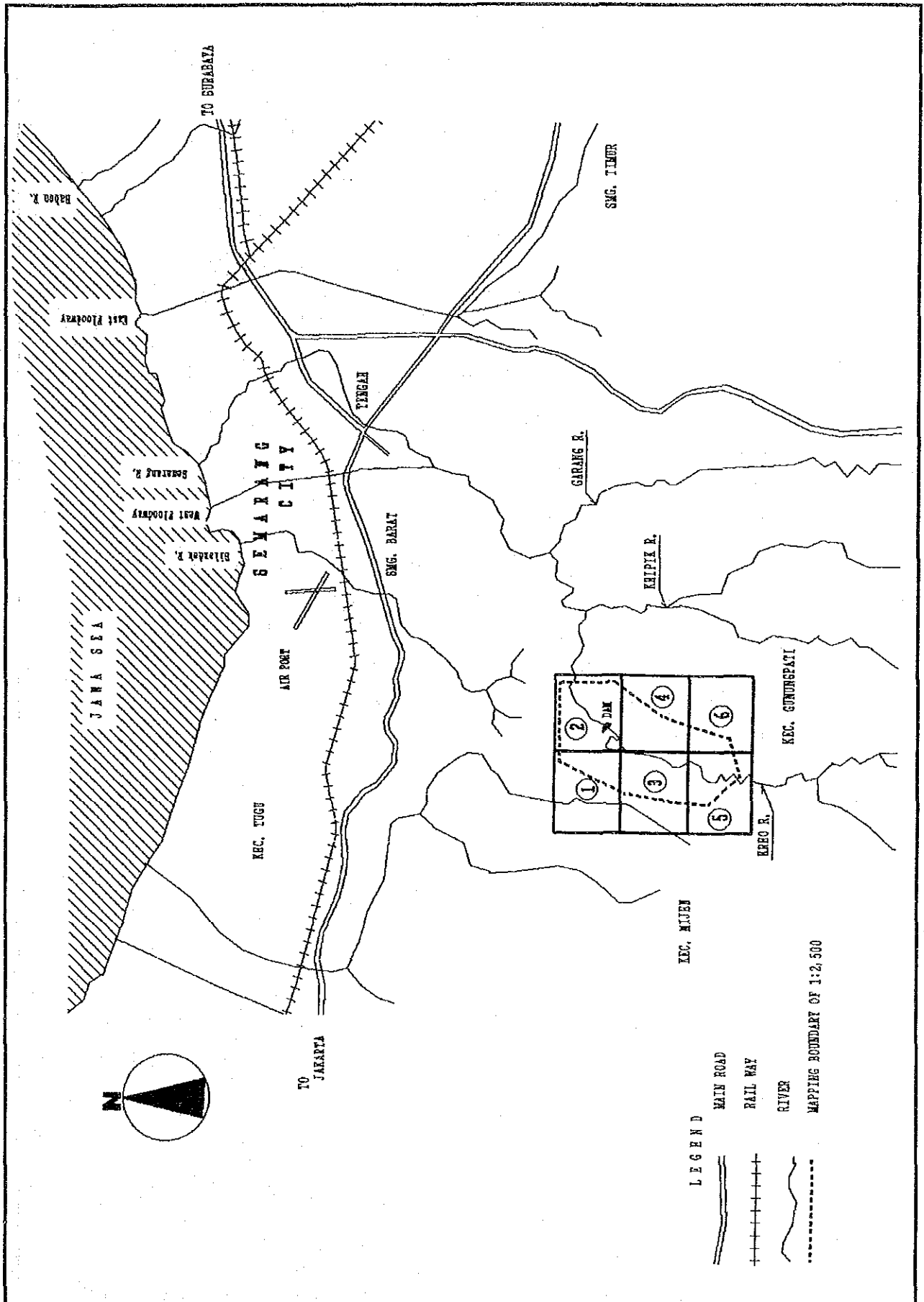
Fig.XV.2.4 LOCATION MAP OF DRAINAGE CHANNELS SURVEYED

INDEX MAP OF SPOT ELEVATION SURVEY (LEVELING)
 JICA STUDY IN SEMARANG CITY AND SUBURBS 1992



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

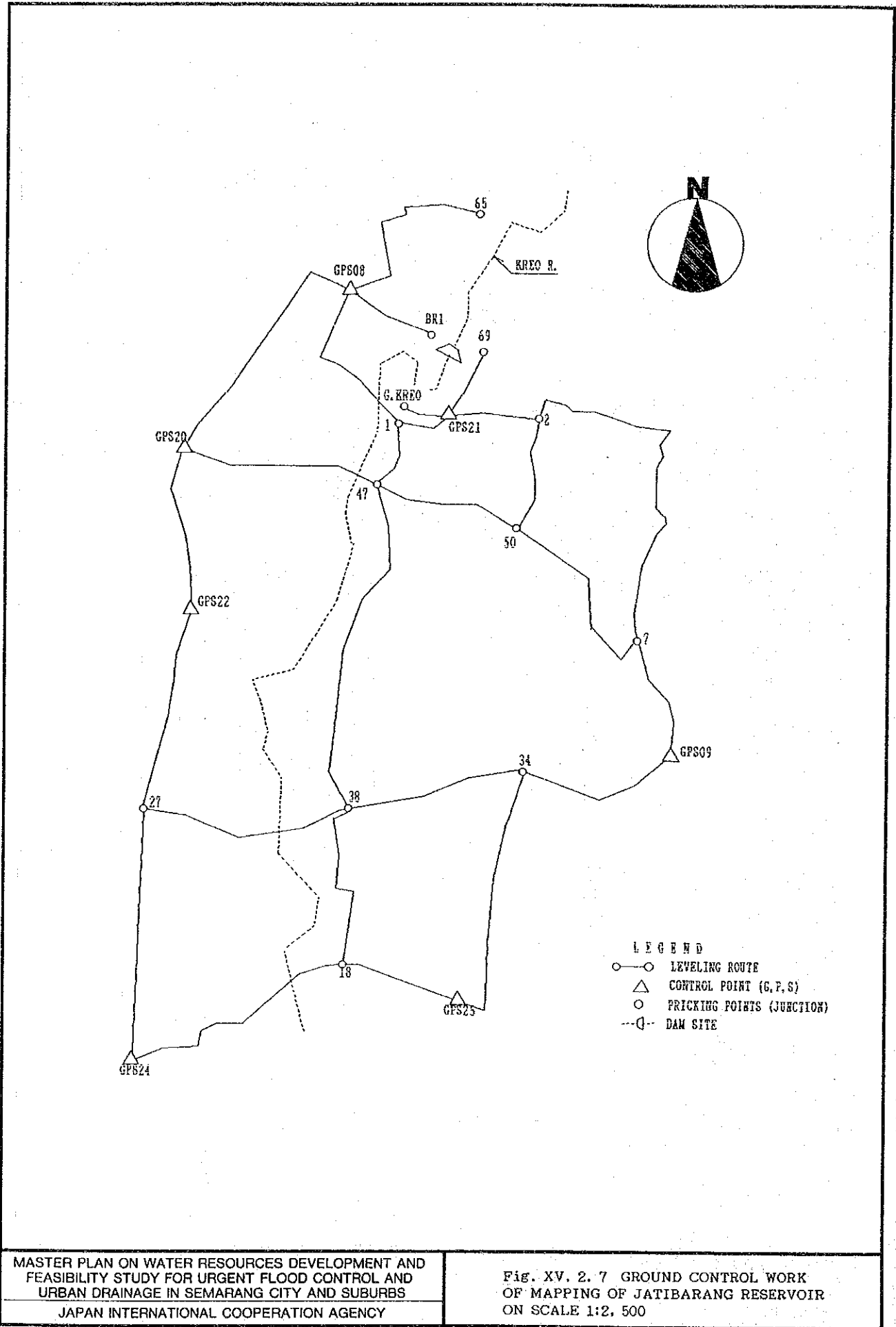
Fig. XV. 2. 5 LOCATION MAP OF SPOT
 ELEVATION SURVEY



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS

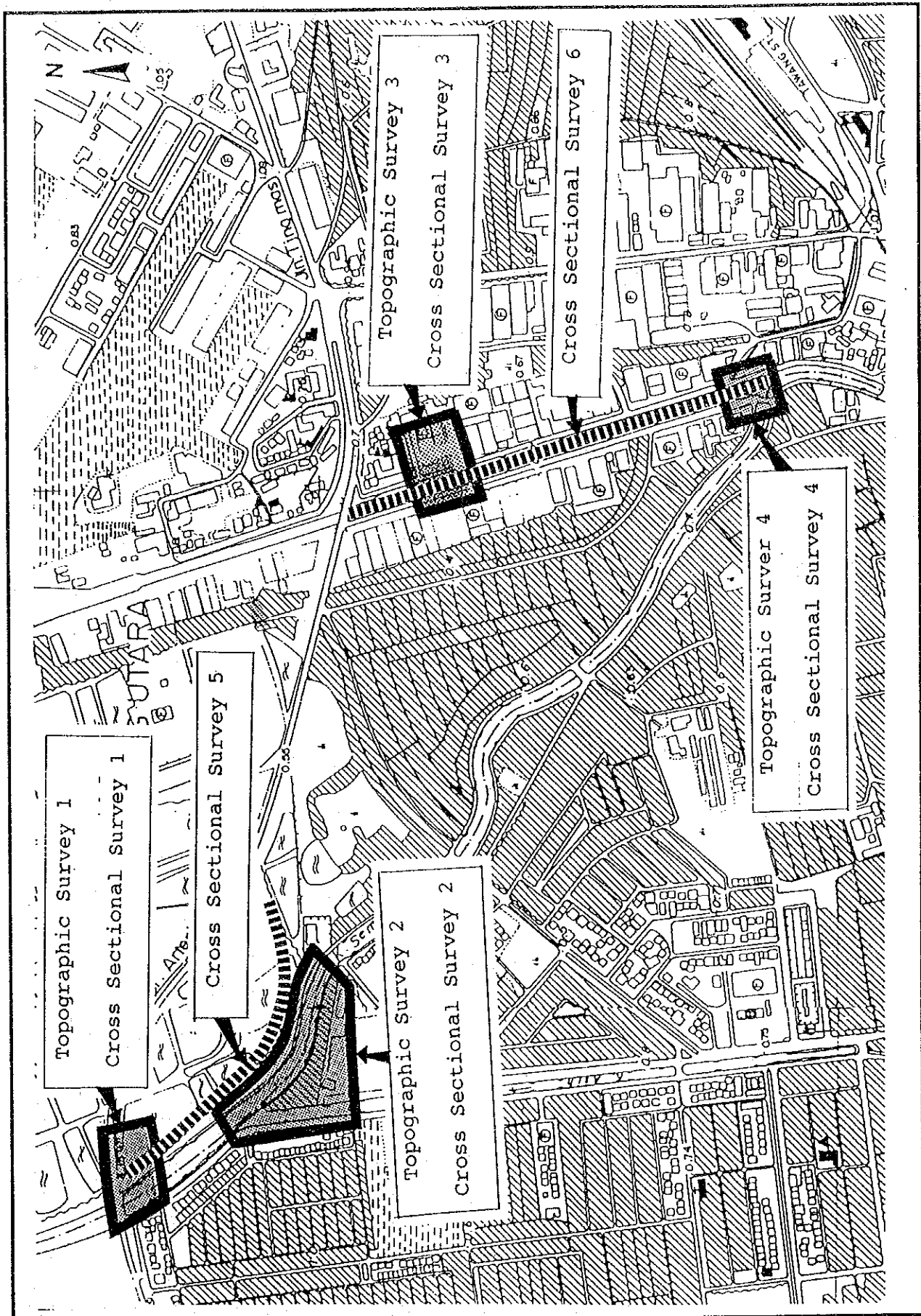
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XV. 2. 6 OUTLINE OF MAPPING
OF JATIBARANG RESERVOIR
ON SCALE 1:2, 500



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XV. 2. 7 GROUND CONTROL WORK
 OF MAPPING OF JATIBARANG RESERVOIR
 ON SCALE 1:2, 500



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
 FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
 URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
 JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XV. 2. 8 LOCATION MAP OF
 GROUND SURVEY FOR URBAN DRAINAGE

**XVI ORGANIZATION FOR OPERATION
AND MAINTENANCE**

XVI ORGANIZATION FOR OPERATION AND MAINTENANCE

TABLE OF CONTENTS

	<u>Page</u>
CHAPTER 1 INTRODUCTION.....	XVI-1
1.1 Basic Concept.....	XVI-1
1.2 Outline of Proposed Organization for Flood Control and Water Resources Development Facilities....	XVI-2
1.3 Outline of Proposed Organization for Urban Drainage Facilities.....	XVI-3
CHAPTER 2 ORGANIZATION IN CENTRAL LEVEL.....	XVI-5
2.1 Technical Management Unit.....	XVI-5
2.2 Coordinating Unit.....	XVI-6
2.3 Administrative Unit.....	XVI-6
CHAPTER 3 ORGANIZATION IN PROVINCIAL LEVEL....	XVI-7
3.1 Administrative Unit.....	XVI-7
3.2 Coordinating Unit.....	XVI-7
3.3 Technical Management Unit.....	XVI-7
3.4 Water Users Association.....	XVI-8
CHAPTER 4 ORGANIZATION IN BASIN-WIDE MANAGEMENT LEVEL.....	XVI-9
4.1 Basin-wide Execution Unit.....	XVI-9
4.2 Coordinating Unit.....	XVI-10
CHAPTER 5 ORGANIZATION IN DISTRICT LEVEL.....	XVI-12
5.1 District Execution Unit.....	XVI-12
5.2 District Water User Group.....	XVI-13

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>	<u>Page</u>
XVI.1.1	Organization for Operation and Maintenance of Flood Control and Water Resources Development Works...	XVI-14
XVI.1.2	Organization for Operation and Maintenance of Urban Drainage Facilities.....	XVI-15

CHAPTER 1 INTRODUCTION

1.1 Basic Concept

The ministerial law on government organization states that responsibilities on operation/maintenance of public works facilities should be decentralized and entrusted to related provincial government agencies (refer to Law No. 5 on Regional Government Administration). In accordance with this law, future operation/maintenance works will be transferred gradually from central government agencies to local government agencies.

In line with the decentralization policy, an institutional setup for all-inclusive water resources management works was proposed in Java Irrigation Improvement and Water Resources Management Project (JIWMP) in January 1993. Previously, operation/maintenance for public works facilities has been executed under the hierarchy classified into the central level, the provincial level and the district level. In addition to these existing organization levels, the basin-wide management level was newly proposed by the JIWMP to have an integrated approach to basin-wide water management works. The territorial jurisdiction of the basin-wide management level is placed within the watershed boundary (called "SWS" in the Indonesian term), so that it does not necessarily coincide with the existing administrative boundary.

Correspondingly, the hierarchy of the institutional setup proposed by JIWMP is classified into the central level, the provincial level, the basin-wide management level, and the district level. In this hierarchy, emphasized are the roles of the basin-wide

management level and/or the district level to promote the decentralization process.

The basic concept of the institutional setup proposed by JIWMP is believed to be suitable to formulate the operation/maintenance master plan in the present study. Furthermore, the particular names/abbreviations for the organizational units introduced in the JIWMP are commonly used by Indonesian government agencies, so that they are also adopted in this study.

1.2 Outline of Proposed Organization for Flood Control and Water Resources Development Facilities

The organization for operation/maintenance of flood control and water resources development facilities is proposed in this study, as shown in Fig.XVI.1.1. In this organization, each of the organization hierarchy levels will undertake the following roles in general:

- (1) The central level will set up the national regulations specifying the technical and/or administrative standards for operation/maintenance of objective facilities.
- (2) The provincial level will undertake the overall supervisory and coordination tasks for the objective operation/maintenance works.
- (3) The basin-wide management level will execute the operation/maintenance for major facilities such as dams, weirs, and river channels which have strategic importance in the basin and/or require highly developed technology.

- (4) The district level will execute the operation/maintenance for minor facilities other than the objects of the above basin-wide management level.

In the Master Plan, the proposed basin-wide management level will have an integrated approach on operation/maintenance for the six (6) objective river basins, namely, Blorong, Bringin, Silandak, West Floodway/Garang, East Floodway and Babon. In addition to these river basins, the service area of the Jratunseluna Project will be included. Thus, the basin-wide management level will have a single management body for the six (6) river basins and the objective river basins of Jratunseluna Project. All dam reservoirs, weirs on the main stream and river channels located in the above river basins will then be operated and maintained in the basin-wide management level.

As for the district level, five (5) districts will be involved in the organization for operation/maintenance, namely, Kabupaten Kendal, Kotamadya Semarang, Kabupaten Semarang, Kabupaten Demak and Kabupaten Grobogan. All minor flood control and water resources development facilities installed in these districts will be operated and maintained by each district government office.

1.3 Outline of Proposed Organization for Urban Drainage Facilities

The organization for operation/maintenance of urban drainage facilities is proposed, as shown in Fig. XVI.1.2. The service area for the proposed urban drainage facilities is located within the administrative boundary of Kotamadya Semarang;

therefore, the basin-wide management level is no longer required for the operation/maintenance of urban drainage facilities. In view of the exclusion of the basin-wide management level, the district office of Kotamadya Semarang will execute all operation/maintenance work for urban drainage facilities.

CHAPTER 2 ORGANIZATION IN CENTRAL LEVEL

The organization in the central level will be composed of three (3) units, namely, the technical management unit, the coordinating unit and the administrative unit. The specific roles and government agencies involved into these units are described below.

2.1 Technical Management Unit

This unit will prepare the nation-wide technical criteria and carry out the technical guidance for operation/maintenance. The ministry in charge will be the Ministry of Public Works (MPW) and the following directorates/committee will take partial charge of technical management works, as follows:

- (1) The Directorate of Rivers, DGWRD will take charge of the preparation of criteria and technical guidance related to flood control and water resources development facilities;
- (2) The Dam Safety Commission which was established recently as an extra-departmental body of MPW will carry out general supervision on dam safety; and
- (3) The Directorate of Environment Sanitation (PLP), DGCK will take charge of the preparation of criteria and technical guidance related to urban drainage facilities.

2.2 Coordinating Unit

A new National Water Council (NWC) is proposed as the central government coordinating unit. The NWC will be composed of representatives from relevant ministries and will resolve potential conflicts among the ministries.

2.3 Administrative Unit

The present Ministry of Home Affairs (MHA) will undertake the integrated supervision of administration to be carried out by each provincial government in Indonesia.

CHAPTER 3 ORGANIZATION IN PROVINCIAL LEVEL

The organization in the provincial level will be composed of four (4) units, namely, the administrative unit, the coordinating unit, the technical management unit, and the water users associations. The specific roles and government agencies to be involved in these units are described below.

3.1 Administrative Unit

The Central Jawa Provincial Government (Jawa Tengah) will be designated as the provincial leading supervisor and coordinator for all activities related to operation/maintenance. This designation of the Provincial Government will entail approval of annual operation/maintenance plans (including the implementation plan and the budgetary allocation plan), evaluation of performance, and licensing/authorization for surface and ground water use.

3.2 Coordinating Unit

The competent provincial authority of the Ministry of Public Works (Kanwil) will be assigned, as a substructure of the MPW, to the Central Jawa Province and will undertake the role of coordination of technical guidance provided from the central level to the provincial level.

3.3 Technical Management Unit

The Provincial Office for Public Works (DPUP) will undertake technical supervision on the execution of

operation/maintenance based on the technical guidance provided from the central level.

3.4 Water Users Association

The Water Resources Committee (WRC) will be formed out of the existing provincial irrigation committee and expanded to a larger user committee accommodating all provincial water user groups such as the State Electricity Corporation (PLN) and the Water Supply Public Corporation (PAM). The WRC will undertake coordination and supervisory work on the annual water use of each water user group at the provincial level. Thus, the role of WRC is related solely to water resources development facilities but not to the flood control and urban drainage facilities.

CHAPTER 4 ORGANIZATION IN BASIN-WIDE MANAGEMENT LEVEL

As mentioned in Section 1.2, the organization in the basin-wide management level will undertake an integrated approach to the basin-wide implementation of operation/maintenance for flood control and water resources development facilities within the subject watershed boundary. The subject watershed boundary (SWS) is herein defined to cover the six (6) objective river basins (Blorong, Bringin, Silandak, West Floodway/Garang, East Floodway and Babon) and the Jratunseluna service area.

The organization in the basin-wide management level will be composed of two (2) units, namely, the Basin-Wide Execution Unit ("UPT SWS" in the Indonesian term) and the Coordination Unit (SWS Board) for the basin-wide operation/maintenance. The details of these units are described below.

4.1 Basin-Wide Execution Unit

Among the objective facilities in the Master Plan, flood control and water resources development facilities will be operated and maintained by the basin-wide execution unit (UPT SWS). The major roles of the UPT SWS are as enumerated below.

- (1) To carry out periodical inspection and maintenance work on the objective facilities;
- (2) To prepare the annual water allocation plan based on the annual water use requested by the Provincial Water Users Association and to monitor conflicts associated with the annual water allocation plan;

- (3) To operate the water resources development facilities such as dam reservoirs, water conveyance canals, and weirs on main streams in accordance with the water allocation plan;
- (4) To operate flood control facilities such as dam reservoirs and weirs on main streams, and issue flood warning as required; and
- (5) To determine water service charges such as the irrigation service fee, the Water Supply Public Corporation (PAM) charge, the hydropower supply charge, and the water pollution charge for industry, all of which could contribute to the necessary financial resources for the activities of the UPT SWS as well as the SWS Board mentioned below.

It is herein noted that as for the operation/maintenance of drainage facilities, the necessary activities will be limited within the district of Kotamadya Semarang and, therefore, the District Office for Public Works (DPUL) will take over all the responsibilities of the UPT SWS.

4.2 Coordinating Unit

The basin-wide coordinating unit (SWS Board) is proposed to resolve and coordinate potential conflicts between the annual water allocation plan prepared/monitored by the UPT SWS and the water demand required from the water user groups. Thus, the SWS Board will coordinate matters related solely to the operation/maintenance of water resource development facilities.

The members of the SWS Board will be composed of representatives of the districts, the water user groups, and the relevant provincial government offices.

CHAPTER 5 ORGANIZATION IN DISTRICT LEVEL

The organization in the district level will be composed of the district execution unit and the district water user groups. The details of these components are described below.

5.1 District Execution Unit

The existing District Office for Public Works (DPUK) will be responsible for the operation/maintenance of the following facilities:

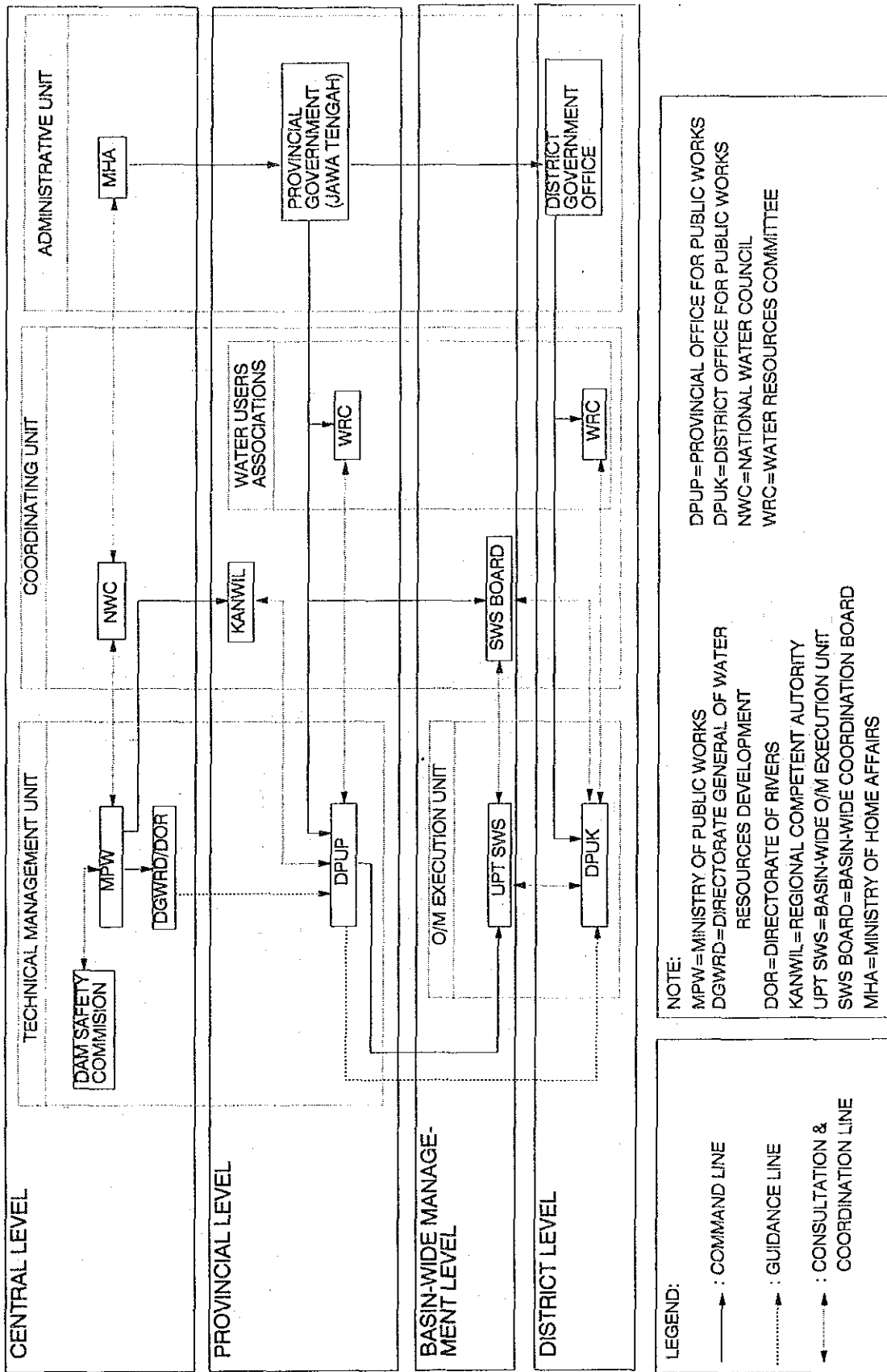
- (1) Minor facilities installed within the administrative boundary of each district for flood control and water resources development such as flap gates/culverts installed along rivers and secondary/tertiary water distribution pipes; and
- (2) All urban drainage facilities including drainage pumps, retarding ponds, and primary, secondary and tertiary drainage channels.

The operation/maintenance for item (1) above will be based on consultations with the basin-wide execution unit (UPT SWS) and executed by the five (5) district offices for public works in Kabupaten Kendal, Kotamadya Semarang, Kabupaten Demak and Kabupaten Grobogan, respectively. As for the urban drainage facilities in item (2), the operation/maintenance will be executed solely by the District Office for Public Works in Kotamadya Semarang.

5.2 District Water User Group

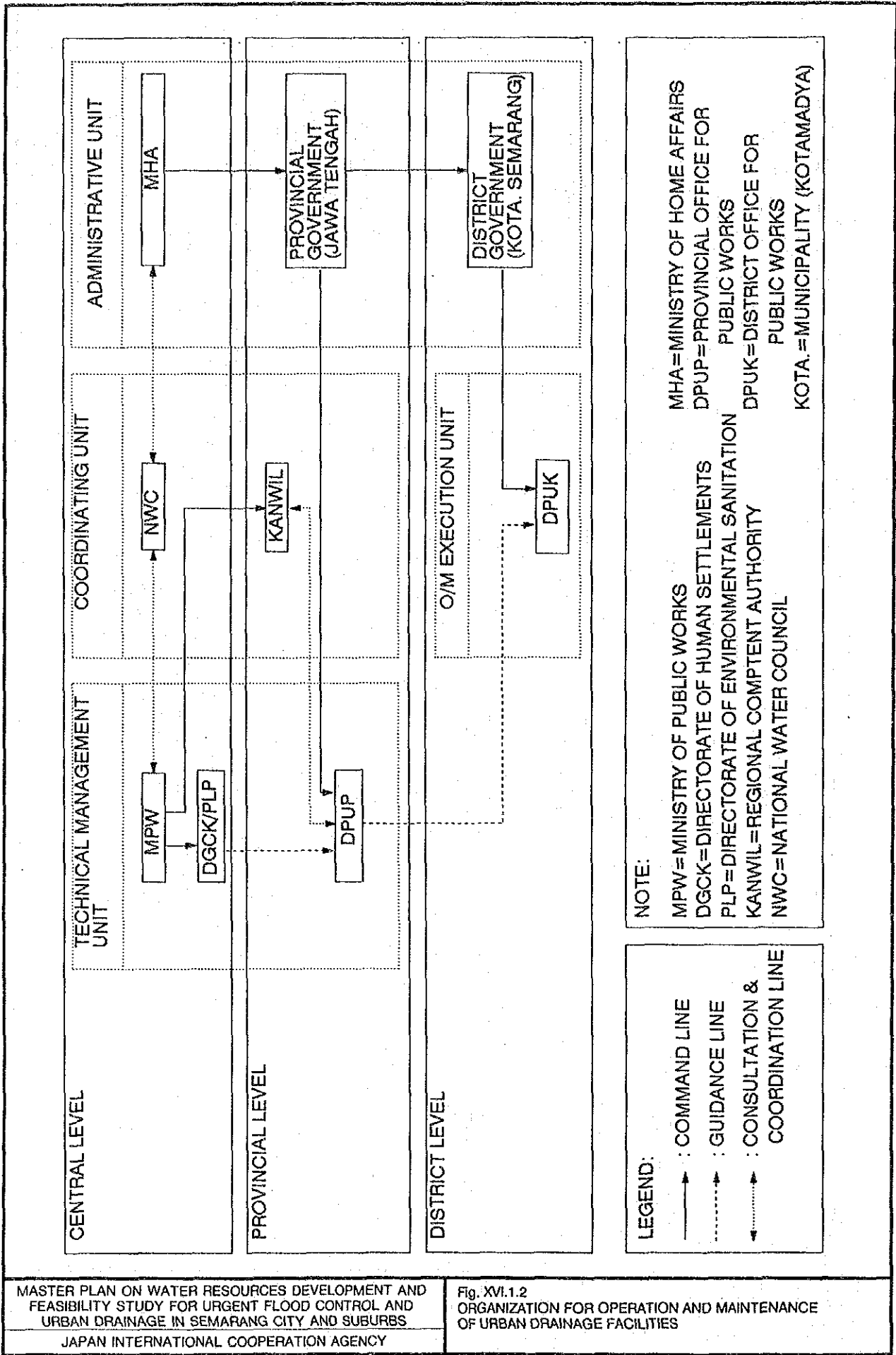
The Water Resources Committee (WRC) will be formed out of the existing district irrigation committee and expanded to a larger user committee accommodating representatives from all end water users. The WRC will prepare the annual water use plan based on coordination among the end users, and submit the annual plan to the Provincial WRC.

FIGURES



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND
FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND
URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XVI.1.1
ORGANIZATION FOR OPERATION AND MAINTENANCE
OF FLOOD CONTROL AND WATER RESOURCES
DEVELOPMENT WORKS



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. XVI.1.2 ORGANIZATION FOR OPERATION AND MAINTENANCE OF URBAN DRAINAGE FACILITIES

JICA