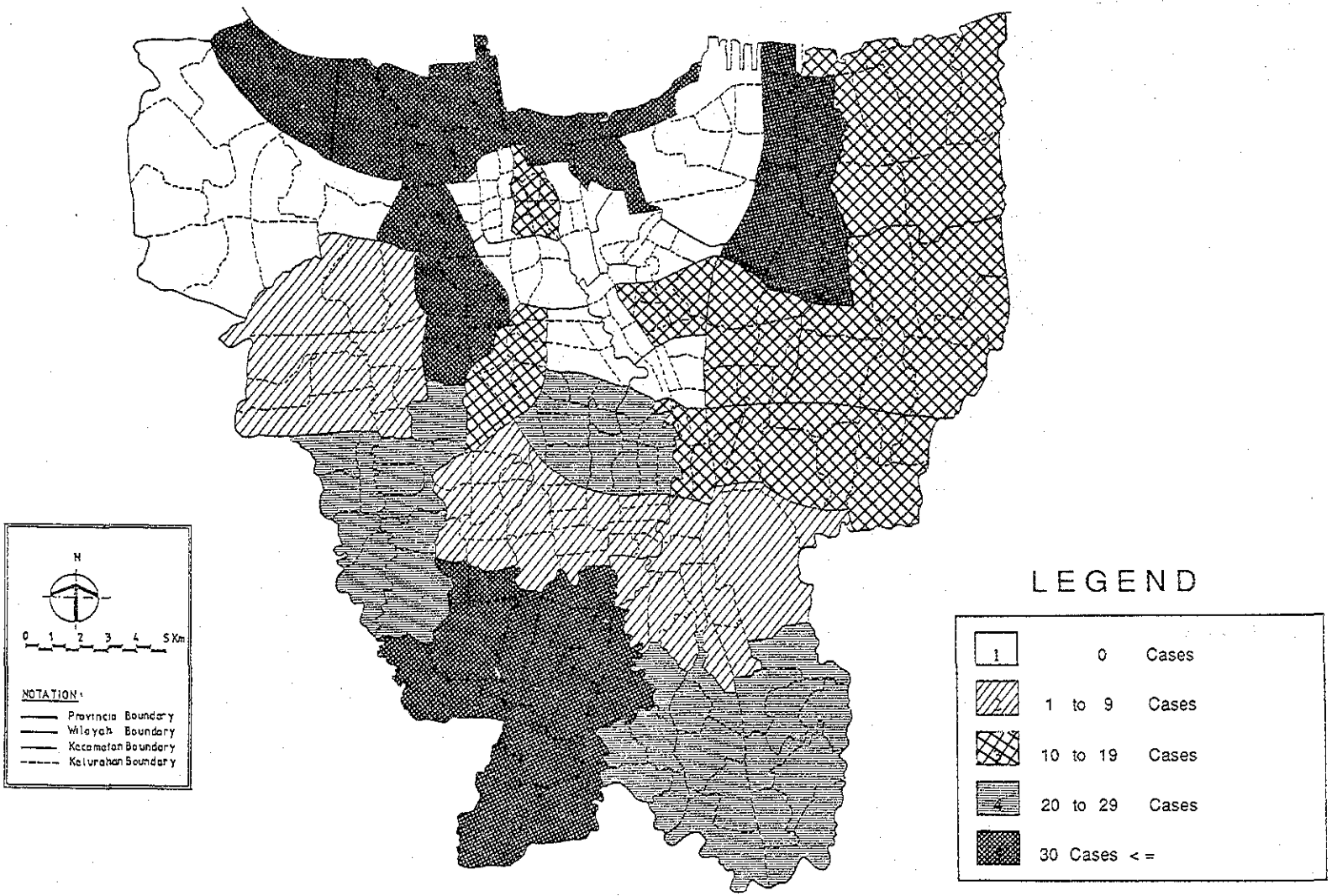

FIG. C.36 NUMBER OF INFANTILE MORTALITY CASES IN THE LAST THREE YEARS (PER 1,000 INFANTS)

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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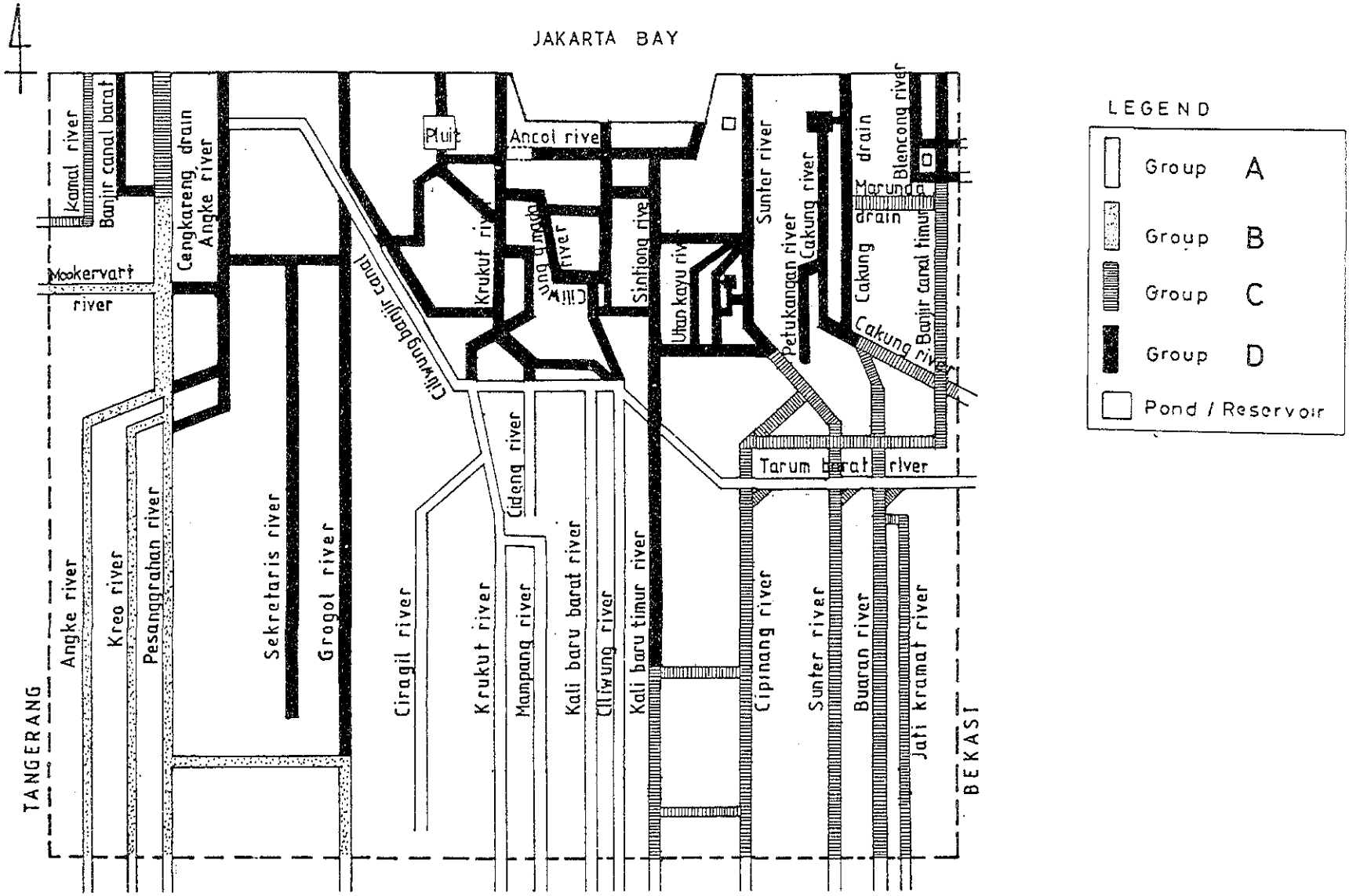

Source : DKI

FIG. C.37 CLASS DESIGNATION OF RIVER SECTIONS IN DKI JAKARTA

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APPENDIX D

POLLUTION LOAD GENERATION

APPENDIX D POLLUTION LOAD GENERATION

1. Water Consumption

1.1 General

Piped water service for the Study Area is provided by Jakarta Water Supply Company (PDAM). The Study Area is covered by 27 water service districts of PDAM, as shown in Fig. D.1. The existing piped water service area is also shown in Fig. D.1.

However, the existing piped water service is small. Major portion of the requirement in the Study Area is met by individual groundwater wells. The total piped water supply of the Study Area in October, 1989 was as follows.

Water Use	Nos.of Connection	Water Supply
Domestic	153,303	174,465 m^3/day
Commercial & Institutional	25,284	111,993
Industrial	568	8,072

While, no data on the existing individual groundwater supply is available.

Therefore, the existing water consumption was estimated by a questionnaire survey.

1.2 Domestic Water Consumption

1.2.3 Existing Water Consumption

The JICA Team carried out a sampling survey on the existing domestic water consumption for 2,515 households, with various water source of piped water, individual well and public toilet (MCK).

The water consumption varies according to household income level and also according to the type of water source.

The average unit water consumption by income class was estimated to be 192 lcd (liter per capita per day) for high class, 129 lcd for middle class and 105 lcd for low class. The Average unit water consumption of whole classes was 131 lcd.

The estimated average unit water consumption by class and by water source is shown in Table D.1.

Based on the above sampling survey data, the existing unit water consumptions of the Study Area are determined as follows.

High Class	:	190 lcd
Middle Class	:	130 lcd
Low Class	:	100 lcd

1.2.2 Future Water Consumption

A water supply master plan, targeting the year 2005 was prepared for this Study Area by JICA in March, 1985. The master plan will serve piped water to 10,496,000 people or 87% of the total population of this Study Area. The service area will be extended to 454 Km^2 or 70% of this Study Area. (See Fig. D.1).

In the water supply master plan, the unit domestic water consumption was assumed to be 60 lcd - 250 lcd, varying according to income level. The unit water consumption by income group was estimated as shown below for the people served by piped water.

Income Group	Unit Water Consumption (lcd)
I & II	60
III & IV	150
V	250

In the water supply master plan, the people's income level was classified into five (5) groups, based on monthly income per working person at 1980 price as shown below.

Monthly Income per Working Person

(Unit : Rp. 1980 price)

Group	I	0	-	25,000
Group	II	25,000	-	50,000
Group	III	50,000	-	75,000
Group	IV	75,000	-	100,000
Group	V	100,000	-	

The above income level classification can be converted into the income level classification of per capita monthly income by using the following conversion factors.

Nos. of working person of one family : 1.5 persons <1
One family size : 8 persons <1
Price deflator (1989/1980) : 2.079

Note : <1 ; Figures used in the water supply master plan.

The converted income level classification is shown below.

Per Capita Monthly Income

(Unit : Rp. 1989 prices)

Group	I & II	0	-	19,490
Group	III & IV	19,490	-	38,980
Group	V	38,980	-	

On the other hand, the income distribution of high class, middle class and low class determined by this Study are shown in Fig. D.2.

The converted income level of group I & II, group III & IV and group V in the water supply master plan agrees with the income level of low class, middle class and high class estimated in this Study respectively (See Fig. D.2).

Based on the above discussions, the future unit domestic water consumption of the Study Area in the year 2010 is assumed as follows.

High Class = 250 lcd
Middle Class = 150 lcd

Low Class = 100 lcd <1

Note <1 : The future unit water consumption of low class is assumed to be the same as the existing one although the future unit water consumption of group I & II in the water supply master plan is less than the existing one for low class of this Study.

The existing and future domestic water consumption of each Kelurahan can be obtained by multiplying the above per capita water consumption by its total population.

1.3 Commercial and Institutional Water Consumption

1.3.1 Existing Water Consumption

Commercial and institutional water consumption of an area can be estimated by multiplying its domestic water consumption by a certain ratio. This ratio varies mainly, depending on land use pattern of the area.

Average ratio between the commercial and institutional piped water consumption, and domestic piped water consumption of each service district of PDAM during the period of June to October, 1989 are shown in Table D.2. While, average ratio between the commercial and institutional land area and residential land area of each service district of PDAM are shown in Table D.3. There is a high correlation between both ratios as shown in Fig. D.3.

Based on the above analysis, the existing commercial and institutional water consumption by Kelurahan is estimated by the following formula.

Existing Commercial & Institutional Water Consumption by Kelurahan = Existing Domestic Water Consumption by Kelurahan x Existing Commercial & Institutional Water Consumption Ratio by Kelurahan.

where,

Existing Commercial & Institutional Ratio :

Y(%) = 0.757·X(%) + 2.0

X(%) = Existing Commercial & Institutional Land Area / Existing Domestic Land Area x 100

1.3.2 Future Water Consumption

The future commercial & Institutional water consumption by Kelurahan is estimated in the same manner as the existing one. The calculation formula is as follows.

Future Commercial & Institutional Water Consumption by Kelurahan = Future Domestic Water Consumption by Kelurahan x Future Commercial & Institutional Water Consumption Ratio by Kelurahan.

where,

Future Commercial & Institutional Ratio :

Y(%) = 0.757·X (%) + 2.0

X(%) = Future Commercial & Institutional Land Area/ Future Domestic Land Area x 100

1.4 Industrial Water Consumption

1.4.1 Existing Water Consumption

Data on the existing industrial water consumption, its water source and industrial product amount were obtained through a sampling questionnaire survey from 51 factories covering various kinds of industry.

The product amount, water consumption and unit water consumption (water consumption per product amount) by type of industry are shown in Table D.4. The water consumption by water source is also shown in this table.

The total product amount and water consumption of the 51 factories are 49,488.2 million Rp/year (1989 price) and 339.46 m^3/day, respectively. The unit water consumption of the 51 factories ranges

from 0.002 m^3/day/million Rp/year for manufacture of textile to 0.027 m^3/day/million Rp/year for manufacture of non-metallic mineral products, iron & steel and machinery and equipment with an average of 0.007 m^3/day/million Rp/year. Their water sources are groundwater of 51.4%, piped water of 18.3% and river water & others of 30.3%.

Based on the above survey results, the existing industrial unit water consumption of the Study Area is determined as follows.

Industrial Classification	Unit Water Consumption
1. Food, Beverages & Tobacco	0.010 m^3/d/million Rp/yr.
2. Textiles	0.002
3. Wood & Wood Products	0.003
4. Paper & Paper Products	0.003
5. Industrial Chemicals	0.010
6. Non-metallic Mineral Products	0.027
7. Iron & Steel Basic Industries	0.027
8. Fabricated Mineral Products, Machinery & Equipment	0.027
9. Other Industries	0.010

1.4.2 Future Water Consumption

The future industrial unit water consumption is assumed to be the same as the existing one.

The existing and future industrial water consumption of each Kelurahan can be obtained by multiplying the above unit water consumption by its total industrial product amount.

2. Unit Pollution Load Generation

2.1 General

The major wastewater source in the Study Area are of domestic, commercial and institutional, and industrial in origin.
Domestic wastewater covers toilet wastewater, and gray water from kitchen, bathing and laundry. In the Study Area, 74 % of the toilet wastes is treated by septic tank/leaching system, while the remaining 26% is discharged to the public waterways with no treatment. The gray water is also discharged with no treatment.

Only a few large commercial enterprises, institutions and industrial factories are provided with treatment plants to treat both toilet wastes and gray water.

2.2 Domestic Wastes

2.2.1 Sampling Observation of Pollution Load

The JICA Study Team conducted sampling observations of domestic pollution load in December, 1989 as there is no existing available data.
The observations were made for the following types of pollution loads.

- Pollution load of gray water from middle/high income class residence.
- Pollution load of gray water from low income class residence.
- Pollution load of toilet waste from residence.

(1) Pollution Load of Gray Water from Middle/High Income Class Residence.

Pollution load of domestic gray water including bathing, loundry and kitchen wastewater was observed in the three (3) housing estates : Tanah Abang, Klender and Pluit at one (1) site each. Monthly income of the houscholds in these housing estates ranges from Rp. 40,000 to Rp. 125,000 with an average

of Rp. 73,000 which falls between middle and high income classes (See Fig. D.2).

The location of the observed housing estates is shown in Fig. D.4.

The observation conditions are as follows.

Sampling Method	:	Consecutive sampling, at every 3 hour interval, for 24 hours
Observed Wastewater Quality Parameter	:	pH, BOD, COD, SS

The average observed wastewater quality and unit pollution load in terms of BOD are 182 mg/l and 23.2 gcd respectively. For details, see Table D.5.

(2) Pollution Load of Gray Water from Low Income Class Residence.

Pollution load of bathing and laundry wastewater from Public toilet was observed in three (3) Kampungs of Kel. Karet, Kel. Guntur and. Kel. Kebon Kacang. Pollution load of kitchen wastewater from residence in the same three (3) Kampungs was also observed.

The location of the observed Kampungs is shown in Fig. D.4.

The observation conditions are as follows.

Sampling Method	:	Consecutive sampling, at every 3 hour interval, for 24 hours.
Observed Wastewater Quality Parameter	:	pH, BOD, COD, SS

The average observed wastewater quality as BOD is 134 mg/l for laundry, 84 mg/l for bathing and 440 mg/l for kitchen

with an average of 185 mg/l for total gray water. The average observed unit pollution load (BOD) of total gray water is 14.9 gcd. For details, see Table D.6.

(3) Pollution Load of Toilet Waste

Pollution load of toilet waste was observed in two (2) public toilets located at Jl. Tanah Tinggi Timur and Jl. Tanah Tinggi Barat along Sentiong River, the locations of which are shown in Fig. D.4.

The Observation conditions are as follows.

Sampling Method : Continuous collection of wastewater until the collected volume be about 80 l

Observed Water Quality Parameter : BOD, COD, SS

The average observed results are 3.6 lcd for unit wastewater discharge, BOD 2,930 mg/l for wastewater quality and BOD 10.5 gcd for unit pollution load (ref. Table D.7 for details).

Regarding the above results on unit wastewater discharge and unit pollution load, the later could be considered to be representative even for domestic pollution load while the former is not. This is because, the quantity of toilet water use is very limited in case of public toilets in comparison to domestic toilets. Hence, as the representative value for unit wastewater discharge, the data observed at Klender housing estate of 23 lcd is adopted for this Study.

To summarize, the adopted values for this Study are as follows :

Unit wastewater discharge : 23 lcd

Unit pollution load /(as BOD) : 10.5 gcd

The corresponding wastewater quality of toilet waste is about 457 mg/l as BOD.

2.2.2 Unit Pollution Load

The existing and future 2010 year unit pollution load of gray water and toilet waste are estimated as shown below, based on the sampling observation results and water consumption estimates in the previous Section.

(Unit : BOD, gcd)

	Existing	Future
Gray water		
High Income Class	30.4	41.3
Middle Income Class	19.5	23.1
Low Income Class	14.2	14.2
Toilet Waste	10.5	10.5

In the above estimation, the future wastewater quality of gray water and toilet waste is assumed to be the same as that of the existing one. For details, see Table D.8.

The Average existing and future 2010 year unit pollution load of domestic waste covering gray water and toilet waste are estimated at BOD 27.9 gcd and BOD 33.4 gcd, respectively. In this estimation, the share of population by income class was assumed as follows.

	Existing	Future
High Class	4 %	15 %
Middle Class	49 %	49 %
Low Class	47 %	36 %

For details, see Table D.8.

2.3 Commercial and Institutional Wastes

The JICA Study Team conducted sampling observations for the wastewater quality of commercial wastes in the areas of Kota and

Pasar Baru in December, 1989. The observation result are shown in Table D.9

The existing wastewater quality of commercial waste is established to be BOD of 238 mg/l, based on the sampling observation results.

The existing wastewater quality of institutional waste is assumed to be the same as that of the domestic waste of middle income class (BOD 231 mg/l).

The weighted average wastewater quality of commercial and institutional wastes is established at BOD of 235 mg/l, based on the ratios of both existing water consumptions: 55% for commercial and 45% for institutional.

The future wastewater quality of both commercial and institutional wastes are assumed to be the same as the existing one.

2.4 Industrial Wastes

The existing wastewater quality records of industrial waste are available in DKI, Jakarta. The average COD of each industrial classification is shown in Table D.10.

These average COD values are converted into BOD value by using the correlation between COD and BOD which was established for each industrial classification based on sampling data of COD and BOD. The converted average BOD of each industrial classification is also shown in Table D.10.

The existing unit pollution load of industrial waste (daily BOD load per annual industrial product amount) is estimated based on the existing unit industrial wastewater discharge (=water consumption) and wastewater quality (BOD) as shown in Table D.11.

The unit pollution load by industrial classification is in the range of 0.38 (g/d/million Rp./year) as BOD for Textile and 18.0 (g/d/million Rp/year) as BOD for food, beverages and tobacco.

The future unit pollution load is assumed to be equivalent to the existing one.

3. Generated Pollution Load

3.1 Domestic Pollution Load

Existing and future domestic wastewater discharge and pollution load of each Kelurahan are obtained by multiplying the respective unit wastewater discharge equivalent to unit water consumption and unit pollution load estimated in Section 1.2 and 2.2 by the total population estimated in Appendix A.

Total domestic wastewater discharge and pollution load of the Study Area are estimated as shown below.

	Existing	Future
Wastewater discharge ($10^3 m^3/d$)	1,038	1,883
Pollution load (BOD. ton/d)	245	424

The break-down by Wilayah and by Kelurahan are shown in Table D.12, Table D.13 and Table D.14.

3.2 Commercial and Institutional Pollution Load

Existing and future commercial & institutional wastewater discharge and pollution load generation of each Kelurahan are obtained by multiplying the domestic wastewater discharge estimated in the above Section 3.1 by the commercial & institutional water consumption ratio estimated in Section 1.3.

Total commercial and institutional wastewater discharge and pollution load of the Study Area are estimated as shown below.

	Existing	Future
Wastewater discharge ($10^3 m^3/d$)	173	449
Pollution load (BOD. ton/d)	40	104

Its break-down by Wilayah and by Kelurahan are Shown in Table D.12, Table D.13 and Table D.14.

3.3 Industrial Pollution Load

(1) Existing and future industrial wastewater discharge and pollution load by industrial classification are obtained by multiplying the unit wastewater discharge equivalent to unit water consumption estimated in Section 1.4 and unit pollution load estimated in Section 2.4 by the total industrial product amount.

(2) The total industrial product amount of the Study Area in 1987 is estimated at Rp. 6.282 billion at 1989 price. Its break-down in each industrial classification is shown in Table D.15.

Total industrial product amount of the Project Area in 2010 is estimated at Rp. 16,182 billion on the assumption that it will increase at the same growth rate of GDP. This amount of Rp.16,182 billion is broken down into each industrial classification in proportion to the future industrial product amount of each industrial classsification which is projected individually at the respective growth rate in the past. The break-down is shown in Table D.15.

(3) Existing and future total industrial wastewater discharge and pollution load of the Study Area are estimated as shown below.

	Existing	Future
Wastewater discharge (m^3/d/ha)	105	257
Pollution load (BOD, ton/d)	49	119

Those are broken down into each Kelurahan in proportion to the respective existing and future industrial land areas.

Existing and future industrial wastewater discharge and pollution load by Wilayah are shown in Table D.12. Its break-down by Kelurahan is shown in Table D.13 and Table D.14.

3.4 Total Pollution Load

Existing and future wastewater discharge and pollution load of the total wastes in the Study Area are estimated as shown below.

	Existing	Future
Wastewater discharge ($10^3 m^3/d$)	1,316	2,588
Pollution load (BOD. ton/d)	334	647

The average daily wastewater discharge and pollution load of unit area in the Study Area are given below.

	Existing	Future
Specific Wastewater discharge ($m^3/d/ha$)	20.2	39.7
Specific Pollution load (BOD .kg/d/ha)	5.1	9.9

The existing and future specific wastewater discharge and pollution load by Wilayah and by Kelurahan are shown in Table D.12, Table D.13 and Table D.14. Their regional distributions by Kelurahan are shown in Fig. D.5 - Fig. D.8.

Table D.1 Existing Unit Domestic Water Consumption (Results of Sampling Survey)

Income Class/ Water Source	Nos. of Sample	Unit Water Consumption (lcd)
High Class		
Piped Water	179	212
Well	255	178
Total/Average	434	192
Middle Class		
Piped Water	393	143
Well	683	123
Public Toilet (MCK)	51	103
Total/Average	1,127	129
Low Class		
Piped Water	161	112
Well	545	108
Public Toilet (MCK)	299	96
Total/Average	1,055	105
Whole Class		
Total/Average	2,515	131

Note : Combined source of piped water and well is classified into the catagory of piped water.

Sorce : JICA

Table D.2 Commercial & Institutional Water Consumption Ratio to Domestic Water Consumption

(Unit : %)

No.	Service District	Jun	Jul	Aug	Sep	Oct	Ave
1	Gambir I, II	93.2	89.7	95.9	95.8	89.5	92.8
2	Senen	35.4	31.4	31.3	30.1	29.1	31.5
3	Kemayoran	20.9	15.6	15.2	15.2	15.9	16.6
4	Sawahbesar	67.8	66.8	67.8	64.2	65.4	66.4
5	Menteng	49.9	48.6	48.8	52.4	57.1	51.4
6	Cempaka Putih	8.4	8.5	7.6	9.6	9.0	8.6
7	Tanah Abang	23.7	23.7	23.6	22.5	22.7	23.2
8	Penjaringan I, II	13.5	14.0	14.0	14.7	14.1	14.1
9	Tg. Priok I, II	12.3	12.7	12.3	12.9	12.6	12.6
10	Koja II	21.3	17.5	14.5	15.4	12.9	16.3
11	Cilincing	-	10.4	11.2	10.7	6.8	9.8
12	Ceng/Gp/Kbj I, II	14.8		13.3	13.1	13.5	13.7
13	Tamansari	51.3	50.2	50.9	54.8	63.7	54.2
14	Tambora	24.6		33.3	23.3	23.3	26.1
15	Tebet	9.4	6.3	7.4	11.2	11.1	9.1
16	Setiabudi	12.0	15.6	14.5	5.7	6.2	10.8
17	Kebayoran Lama	6.1	7.2	8.4	7.9	7.9	7.5
18	Kebayoran Baru	33.9	34.2	32.6	33.8	29.7	32.8
19	Matraman/Kramat Jati	61.6	54.4	61.6	33.9	64.7	55.2
20	P. Gadung/Cakung	34.8	36.0	32.6	31.0	28.4	32.6
21	Jatinegara I, II	19.4	17.1		17.0	16.5	17.5

Note : Figures in parenthesis are excluded from average calculation
Data Sources : Piped water supply records of PDAM (June - Oct. 1989)

Table D.3 Land Use Area Ratio

No. Of Service District	Land Use Pattern (ha)					Ratio (%)
	Residential (1)	Commercial & Institutional (2)	Industrial	Others	Total	(2)/(1)
1	376	319	0	85	780	84.8
2	344	69	8	1	422	20.1
3	544	64	3	210	821	11.8
4	323	257	19	23	622	79.6
5	506	44	8	95	653	8.7
6	526	89	80	12	707	16.9
7	522	306	21	81	930	58.6
8	1,498	477	361	144	2480	31.8
9	1,730	246	226	310	2512	14.2
10	841	85	90	27	1043	10.1
11	227	10	2	8	247	4.4
12	1,430	318	105	30	1883	22.2
13	305	173	10	29	517	56.7
14	383	57	37	12	489	14.9
15	729	206	11	7	953	28.3
16	1,278	310	56	139	1783	24.3
17	1,874	649	125	105	2753	34.6
18	821	97	6	33	957	11.8
19	1,065.70	128.43	45.40	170.73	1,410.26	12.1
20	1,622.74	889.26	33.50	95.45	2,640.95	54.8
21	795.13	193.15	0.95	74.29	1,063.52	24.3

Source : JICA

Table D.4 Results of Sampling Questionnaire Survey

	Industrial Classification	Industrial Product Amount (million Rp/year)	Water Consumption by Source (m3/day)				Unit Water Consumption (m3/day/million Rp./year)
			Total	Groundwater	Piped water	River Water & Others	
1	Food. Beverages and Tobacco	7,792.7	78.00	41.50	34.50	2.00	0.010
2	Textile	28,400.0	61.00	57.57	3.43	-	0.002
3	Wood & Wood Products	300.0	0.75	0.75	-	-	0.003
4	Paper & Paper Products	314.0	0.80	0.80	-	-	0.003
5	Industrial Chemicals	6,044.7	60.00	60.00	-	-	0.010
6	Non-metallic Mineral Products						
7	Iron & Steel basic industries						
8	Fabricated Mineral Products,	4,200.0	115.25	-	15.25	100.00	0.270
	Machinery and Equipment						
9	Other Industries	2,476.8	23.66	13.66	9.0	1.0	0.010
	Total	49,488.2	339.46 (100.0)	174.28 (51.4)	62.2 (18.3)	103.0 (30.3)	0.007

Source : JICA

Table D.5 Observed Gray Water in Housing Estate

	Tanah Abang	Pluit	Klender	Total/Average
Observation Date	Dec. 3-4, 1989	Dec.2-3, 1989	Dec. 3-4, 1989	
Population	26	9	13	48
Water Consumption(m^3/d)	3,256	1,849	1,587	6,692
Unit Wastewater Discharge (lcd) <1	(125) 102	(205) 182	(122) 99	(151) 128
Wastewater Quality (BOD mg/l)	327	104	176	182
Unit Pollution Load (BOD, gcd)	33.4	18.9	17.4	23.2

◁ : 1) Figure in parenthesis is unit water consumption.

2) Figure outside parenthesis is unit wastewater discharge excluding 23 lcd of toilet waste.

Source : JICA

Table D.6 Observed Gray Water in Kampung

Water	Observation Site	Observation Date	Wastewater Quality (BOD mg.l)	Unit Wastewater Discharge (lcd)	Unit Pollution Load (BOD gcd)
Laundry	Kebon Kacang	Dec. 2-3, 1989	65◁1		
	Karet	Dec. 3-4, 1989	246		
	Guntur	Dec. 3-4, 1989	90		
	Average		134	20	2.7
Bathing	Kebon Kacang	Dec. 2-3, 1989	65◁1		
	Karet	Dec. 3-4, 1989	98		
	Guntur	Dec. 3-4, 1989	90		
	Average		84	40	3.4
Kitchen	Kebon Kacang	Dec. 2-3, 1989	520		
	Karet	Dec. 3-4, 1989	114		
	Guntur	Dec. 3-4, 1989	685		
	Average		440	20	8.8
Total			185	80	14.9

◁ : Wastewater quality of a mixture of laundry and bathing

Source : JICA

Table D.7 Observed Toilet Waste

Observation Site / Obsevation Item	Jl. Tanah Tinggi Timur		Jl. Tanah Tinggi Barat		Average
	(1)	(2)	(3)	(4)	
Date	July 16, '90	July 16, '90	July 16, '90	July 16, '90	-
No. of Users of Toilet	24	23	22	21	-
Discharged Wastewater Volume(l)	76	82	77	85	21
Wastewater Discharge (lcd)	3.2	3.6	3.5	4.0	3.6
Wastewater Quality (BOD, mg/l)	1,630	2,200	3,600	4,300	2,930
Unit Pollution Load (BOD, gcd)	5.2	7.9	12.6	17.9	10.5

Source : JICA

Table D.8 Estimated Unit Pollution Load of Domestic Waste

	Existing				Future			
	High Class	Middle Class	Low Class	Average	High Class	Middle Class	Low Class	Average
Gray Water								
Unit Wastewater Discharge (lcd)	167	107	77	95	227	127	77	124
Wastewater Quality (BOD, mg/l)	182	182	185	183	182	182	185	182
Unit Pollution Load (BOD, gcd)	30.4	19.5	14.2	17.4	41.3	23.1	14.2	22.6
Toilet Waste								
Unit Wastewater Discharge (lcd)		23				23		
Wastewater Quality (BOD, mg/l)		457				457		
Unit Pollution Load (BOD, gcd)		10.5				10.5		
Total								
Unit Wastewater Discharge (lcd)	190	130	100	118	250	150	100	147
Wastewater Quality (BOD, mg/l)	215	231	247	236	207	224	247	224
Unit Pollution Load (BOD, gcd)	40.9	30.0	24.7	27.9	51.8	33.6	24.7	33.4

Note : Average is obtained by assuming the following population share by class

	Existing	Future
High Class	4%	15%
Middle Class	49%	48%
Low Class	47%	36%

Table D.9 Observed Water Quality of Commercial Waste

Obesevation Site	Observation Time		Wastewater Quality (BOD, mg/l)
	Date	Time	
Kota	Dec.2-3, 1989	12:00	268
		18:00	403
		24:00	450
		6:00	112
Pasar Baru	Dec. 2-3, 1989	12:00	130
		18:00	247
		24:00	112
		6:00	179
Average			238

Source : JICA

Table D.10 Water Quality of Industrial Waste

Industrial Classification	Average wastewater Quality Records (COD, mg/l)	Nos. of Data	Estimated BOD (mg/l)	COD-BOD Correlation
Food, Beverage & Tobacco	3,070	13	1,800	Y = 0.506x + 280
Textile	420	11	190	Y = 0.449x + 1
Wood & Wood Products	200	8	140	Y = 0.550x + 25
Paper & Paper Products	1,930	7	960	Y = 0.776x - 535
Industrial Chemicals	1,500	25	760	Y = 0.580x - 110
Non-metallic Mineral Products Iron & Steel Basic Industries Fabricated Mineral Products, Machinery & Equipment	370	13	280	Y = 0.834x - 30
Other Industries	160	6	110	Y = 0.550x + 25

Source : "Gerakan Sungai Cilwung Bersih Proyek Kali Bersih DKI, Jakarta" 22. Aug. 1989
Diselenggarakan oleh Pusat Penelitian Sumber Daya Manusia dan Lingkungan Universitas Indonesia, Jakarta

Table D.11 Estimated Unit Pollution Load of Industrial Waste

Industrial Classification	Unit Wastewater Discharge (m3/d/million Rp./yr.)	Wastewater Quality (BOD. mg/l)	Unit Pollution Load (g/d/million Rp./yr.)
Food. Beverages and Tobacco	0.010	1800	18.00
Textile	0.002	190	0.38
Wood & Wood Products	0.003	140	0.42
Paper & Paper Products	0.003	960	2.88
Industrial Chemicals	0.010	760	7.60
Non-metallic Mineral Products	0.027	280	7.56
Iron & Steel Basic industries	0.027	280	7.56
Fabricated Mineral Products, Machinery and Equipment	0.027	280	7.56
Other Industries	0.010	110	1.10

Table D.12 Existing and Future Wastewater Discharge and Pollution Load by Wilayah

Waste / Wilayah		Wastewater Discharge (m3/d) Domestic		Comercial & Institutional		Industrial		Total	Specific Wastewater Discharge (m3/d/ha)
Existing	JAKARTA PUSAT	179,432	(78.0)	45,741	(19.9)	4,722	(2.1)	229,895	46.6
	UTARA	143,506	(68.6)	20,622	(9.9)	45,188	(21.6)	209,316	15.0
	BARAT	210,790	(79.2)	35,770	(13.4)	19,424	(7.3)	265,984	20.6
	SELATAN	247,350	(85.1)	35,146	(12.1)	8,015	(2.8)	290,511	19.9
	TIMUR	256,947	(80.2)	35,372	(11.0)	28,088	(8.8)	320,407	17.1
	TOTAL	1,038,025	(78.9)	172,651	(13.1)	105,437	(8.0)	1,316,113	20.2
Future	JAKARTA PUSAT	253,756	(67.0)	121,227	(32.0)	3,906	(1.0)	378,889	76.8
	UTARA	266,233	(57.6)	60,298	(13.1)	135,485	(29.3)	462,016	33.1
	BARAT	398,882	(76.6)	86,312	(16.6)	35,718	(6.9)	520,912	40.4
	SELATAN	468,354	(84.0)	87,205	(15.6)	2,328	(0.4)	557,887	38.2
	TIMUR	495,461	(74.1)	93,891	(14.0)	79,194	(11.8)	668,546	35.6
	TOTAL	1,882,686	(72.7)	448,933	(17.3)	256,631	(9.9)	2,588,250	39.7

Waste / Wilayah		Pollution Load (kg/d) Domestic		Comercial & Institutional		Industrial		Total	Specific Pollution Load (kg/d/ha)
Existing	JAKARTA PUSAT	42,431	(76.9)	10,568	(19.1)	2,192	(4.0)	55,191	11.2
	UTARA	34,159	(57.0)	4,763	(8.0)	20,970	(35.0)	59,892	4.3
	BARAT	49,827	(74.3)	8,264	(12.3)	9,017	(13.4)	67,108	5.2
	SELATAN	58,361	(83.1)	8,120	(11.6)	3,721	(5.3)	70,202	4.8
	TIMUR	60,486	(74.0)	8,173	(10.0)	13,037	(16.0)	81,696	4.4
	TOTAL	245,264	(73.4)	39,888	(12.0)	48,937	(14.6)	334,089	5.1
Future	JAKARTA PUSAT	57,216	(65.7)	28,004	(32.2)	1,806	(2.1)	87,026	17.6
	UTARA	60,604	(44.2)	13,929	(10.1)	62,615	(45.7)	137,148	9.8
	BARAT	89,917	(71.1)	19,937	(15.8)	16,505	(13.1)	126,359	9.8
	SELATAN	105,354	(83.2)	20,144	(15.9)	1,075	(0.9)	126,573	8.7
	TIMUR	111,121	(65.6)	21,687	(12.8)	36,599	(21.6)	169,407	9.0
	TOTAL	424,212	(65.7)	103,701	(16.0)	118,600	(18.3)	646,513	9.9

Table D.13(1) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d)				Specific Wastewater Discharge	Wastewater Discharge (Future : m3/d)				Specific Wastewater Discharge
	Domestic	Commer. & Institu.	Indust.	Total	(m3/d/ha)	Domestic	Commer. & Institu.	Indust.	Total	(m3/d/ha)
1101	3304	66	0	3370	(27)	4658	1380	0	6038	(48)
1102	5794	742	0	6536	(91)	7643	2081	0	9724	(135)
1103	3587	2218	0	5805	(52)	5070	5731	0	10801	(96)
1104	3890	752	0	4642	(35)	6138	1847	0	10985	(82)
1105	2615	2246	0	4861	(62)	3670	6325	0	9995	(128)
1106	670	1001	0	1671	(6)	3647	5449	0	9096	(35)
TOTAL	19860	7025	0	26885	(34)	30826	25813	0	56639	(73)
1201	6830	619	102	7551	(59)	8945	4852	0	13797	(107)
1202	5059	427	0	5486	(108)	6564	922	0	7486	(147)
1203	4425	89	0	4514	(82)	5786	1576	0	7362	(134)
1204	3097	11564	0	14661	(78)	4787	17875	0	22662	(120)
1205	3640	2004	543	6187	(31)	4501	2374	1815	8690	(44)
TOTAL	23051	14703	645	38399	(62)	30583	27599	1815	59997	(96)
1301	4115	2574	102	6791	(43)	8085	9342	0	17427	(111)
1302	3561	227	0	3788	(69)	4397	920	0	5317	(97)
1303	4134	83	0	4217	(37)	5106	580	0	5686	(50)
1304	4265	85	0	4350	(41)	5345	833	9	6178	(59)
1305	3858	77	0	3935	(43)	4911	557	0	5468	(60)
1306	4990	1233	0	6223	(59)	6212	1871	0	8083	(77)
1307	5673	113	0	5786	(63)	7079	1390	0	8469	(92)
1308	3023	536	0	3559	(35)	3756	776	276	4808	(47)
TOTAL	33619	4928	102	38649	(47)	44891	16269	276	61436	(75)
1401	1525	710	0	2235	(28)	1976	1178	0	3154	(39)
1402	2667	788	0	3455	(77)	3475	1385	0	4860	(108)
1403	2175	1026	0	3201	(35)	3082	1453	0	4535	(50)
1404	4589	577	204	5350	(75)	5924	1877	0	7801	(110)
1405	4581	595	0	5176	(73)	5938	3223	0	9161	(129)
1406	4462	464	68	4994	(79)	5503	1110	0	6613	(105)
TOTAL	19979	4160	272	24411	(58)	25898	10226	0	36124	(86)
1501	5368	107	0	5475	(88)	6712	591	0	7303	(118)
1502	5059	312	68	5439	(46)	6621	422	276	7319	(62)
1503	2648	53	68	2769	(103)	3317	503	0	3820	(141)
1504	2597	52	0	2649	(88)	3263	340	0	3603	(120)
1505	3342	862	917	5121	(41)	4553	1562	79	6194	(50)
1506	5984	2325	306	8615	(71)	8338	2914	0	11252	(92)
1507	4341	596	1358	6295	(28)	6749	1182	987	8918	(40)
TOTAL	29339	4307	2717	36383	(51)	39583	7514	1342	48439	(69)
1601	4249	782	0	5031	(61)	6183	4336	79	10598	(128)
1602	1406	50	0	1456	(10)	3461	1058	0	4519	(31)
1603	2279	780	34	3093	(38)	3768	5169	0	8937	(109)
1604	6107	587	0	6694	(27)	9738	923	0	10659	(44)
1605	4706	642	238	5586	(57)	7044	962	276	8282	(85)
TOTAL	18747	2841	272	21860	(33)	30192	12448	355	42995	(66)
1701	3671	544	34	4249	(58)	5353	3520	0	8873	(122)
1702	4532	91	238	4861	(68)	6438	1022	0	7460	(105)
1703	8189	164	0	8353	(66)	11586	1473	0	13059	(104)
1704	4879	1899	306	7084	(79)	7044	3912	0	10956	(122)
1705	6995	2897	68	9960	(65)	10466	4551	0	15017	(98)
1706	5238	301	68	5607	(35)	7995	2430	0	10425	(66)
1707	1333	1881	0	3214	(12)	2901	4450	118	7469	(29)
TOTAL	34837	7777	714	43328	(47)	51783	21358	118	73259	(79)
Wilayah	179432	45741	4722	229895	(47)	253756	121227	3906	378889	(77)

Table D.13(2) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)	Wastewater Discharge (Future : m3/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)
2201	427	9	2478	2914 (3)		3227	907	4854	8988 (9)	
2202	808	121	5805	6734 (7)		6404	767	7656	14827 (15)	
2203	7835	1500	2512	11847 (37)		11493	4429	2565	18487 (57)	
2204	9871	4226	4685	18782 (48)		14308	6977	8288	29573 (75)	
2205	4337	1484	0	5821 (8)		9231	4214	276	13721 (18)	
2206	7654	153	170	7977 (52)		9548	1998	0	11546 (75)	
2207	5713	341	0	6054 (23)		11871	895	0	12766 (49)	
2208	3672	231	4889	8792 (15)		6784	2666	8709	18159 (28)	
TOTAL	40317	8065	20539	68921 (15)		72866	22853	30348	126067 (28)	
2301	5274	1764	1901	8939 (13)		10487	1876	6946	19309 (28)	
2302	3583	72	0	3655 (13)		7268	1063	3157	11488 (41)	
2303	4327	87	2410	6824 (29)		8010	3351	5801	17162 (73)	
2304	7195	144	0	7339 (42)		10797	5228	0	16025 (93)	
2305	4144	83	577	4804 (9)		10629	3324	15155	29108 (53)	
2306	5679	871	2784	9334 (20)		9855	1595	4894	16144 (35)	
2307	6291	126	0	6417 (59)		8796	1162	0	9958 (91)	
TOTAL	36493	3147	7672	47312 (19)		65642	17599	35953	119194 (47)	
2401	5178	888	0	6066 (42)		7664	434	3118	11216 (77)	
2402	7826	272	0	8098 (51)		11267	1931	0	13198 (84)	
2403	4135	249	0	4384 (24)		6801	898	947	8646 (47)	
2404	1385	63	0	1448 (5)		4188	694	0	4882 (18)	
2405	8317	334	0	8651 (20)		11185	929	0	12114 (38)	
2406	7847	2317	3056	13220 (59)		12058	3379	2289	17726 (79)	
2407	2477	109	170	2756 (5)		7234	932	5920	14086 (27)	
2408	4647	943	4923	10513 (23)		9644	1353	789	11786 (26)	
2409	2453	359	0	2812 (4)		6538	615	6946	14099 (22)	
TOTAL	42265	5534	8149	55948 (19)		76579	11165	20009	107753 (37)	
2501	6661	355	68	7084 (29)		10932	637	6354	17923 (73)	
2502	2598	166	272	3036 (4)		7579	1114	12787	21480 (26)	
2503	7274	2269	1086	10629 (67)		10672	2780	1263	14715 (93)	
2504	3419	888	4278	8585 (27)		7247	2527	5920	15694 (50)	
2505	802	16	272	1090 (1)		3096	692	8288	12076 (15)	
2506	2139	151	2852	5142 (9)		5817	517	12432	18766 (33)	
2507	1538	31	0	1569 (1)		5803	414	2131	8348 (6)	
TOTAL	24431	3876	8828	37135 (9)		51146	8681	49175	109002 (27)	
Wilayah	143506	20622	45188	209316 (15)		266233	60298	135485	462016 (33)	
3101	3162	83	3463	6688 (11)		7646	359	9038	17043 (29)	
3102	1340	77	0	1417 (5)		2272	200	868	3340 (12)	
3103	4606	316	1052	5974 (8)		9007	842	3789	13638 (18)	
3104	1817	432	0	2249 (4)		5634	1340	0	6974 (12)	
3105	3623	165	2512	6300 (13)		7780	2361	3789	13930 (28)	
3106	4383	88	1290	5761 (11)		9150	1527	1539	12216 (22)	
3107	6933	578	340	7851 (11)		12721	1716	2368	16805 (23)	
3108	2742	290	883	3915 (15)		4933	1886	2171	8990 (34)	
3109	2312	450	1562	4324 (9)		6408	1246	3355	11009 (22)	
3110	3190	279	2207	5676 (12)		6885	632	4578	12095 (26)	
3111	5871	1163	611	7645 (15)		10147	2031	987	13165 (26)	
TOTAL	39979	3901	13920	57800 (10)		82583	14140	32482	129205 (22)	

Table D.13(3) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)	Wastewater Discharge (Future : m3/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)
3201	4383	817	0	5200	(43)	6157	1148	0	7305	(60)
3202	6420	1149	0	7569	(53)	8841	1651	434	10926	(76)
3203	8598	807	0	9405	(35)	12416	1459	276	14151	(52)
3204	7161	2811	0	9972	(53)	10145	3982	0	14127	(75)
3205	4939	1074	0	6013	(69)	6493	1412	0	7905	(91)
3206	7999	160	0	8159	(65)	10415	1270	0	11685	(93)
3207	3267	654	272	4193	(43)	4439	1092	0	5531	(57)
3208	7681	900	2207	10788	(46)	10559	1201	197	11957	(51)
3209	5659	881	0	6540	(31)	7930	1234	0	9164	(43)
3210	7084	1599	917	9600	(67)	9679	2217	395	12291	(85)
3211	3085	527	170	3782	(14)	5212	937	671	6820	(28)
TOTAL	66278	11379	3566	81221	(43)	92286	17603	1973	111862	(59)
3301	2972	2309	0	5281	(55)	4207	3269	0	7476	(78)
3302	2106	1428	0	3534	(69)	2859	1939	0	4798	(94)
3303	3145	618	0	3763	(102)	4133	1585	0	5718	(155)
3304	1715	197	0	1912	(50)	2246	830	0	3076	(81)
3305	3934	766	0	4700	(147)	5105	3108	0	8213	(257)
3306	3559	191	272	4022	(73)	4745	1702	0	6447	(117)
3307	3269	1538	0	4807	(71)	4432	2086	0	6518	(96)
3308	3452	2429	0	5881	(100)	4626	3255	0	7881	(134)
TOTAL	24152	9476	272	33900	(78)	32353	17774	0	50127	(115)
3401	4626	1806	136	6568	(84)	6115	1445	434	7994	(102)
3402	770	848	68	1686	(32)	1209	1218	0	2427	(46)
3403	2014	372	0	2386	(85)	2650	489	0	3139	(112)
3404	3926	231	170	4327	(94)	5111	917	0	6028	(131)
3405	4759	95	170	5024	(63)	6164	1310	197	7671	(96)
3406	4401	442	68	4911	(89)	5614	962	0	6576	(120)
3407	3826	77	68	3971	(124)	4921	788	0	5709	(178)
3408	5533	111	204	5848	(94)	7193	1451	0	8644	(139)
3409	3754	385	306	4445	(64)	5010	660	0	5670	(81)
3410	4207	84	68	4359	(136)	5257	371	0	5628	(176)
3411	2947	298	68	3313	(97)	3829	594	0	4423	(130)
TOTAL	40763	4749	1326	46838	(82)	53073	10205	631	63909	(112)
3501	3924	340	0	4264	(6)	18412	6102	0	24514	(36)
3502	6670	1157	204	8331	(13)	22169	4907	237	27613	(45)
3503	4869	899	136	5904	(15)	14404	2659	395	17458	(45)
3504	3403	363	0	3766	(7)	14898	1745	0	16643	(32)
3505	2122	499	0	2621	(9)	8276	1947	0	10223	(36)
3506	2521	279	0	2800	(6)	13236	1783	0	15019	(31)
3507	2283	242	0	2525	(5)	12984	1417	0	14401	(29)
3508	5352	568	0	5920	(19)	13780	1490	0	15270	(49)
3509	3674	456	0	4130	(26)	7466	1468	0	8934	(56)
3510	2176	604	0	2780	(19)	5880	1631	0	7511	(52)
3511	2626	558	0	3184	(20)	6782	1441	0	8223	(51)
TOTAL	39620	6265	340	46225	(11)	138587	26590	632	165809	(39)
Wilayah	210790	35770	19424	265984	(21)	398882	86312	35718	520912	(40)

Table D.13(4) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d)				Specific Wastewater Discharge	Wastewater Discharge (Future : m3/d)				Specific Wastewater Discharge
	Domestic	Commer. & Institu.	Indust.	Total	(m3/d/ha)	Domestic	Commer. & Institu.	Indust.	Total	(m3/d/ha)
4101	8430	2467	136	11033 (	13)	13856	4056	158	18070 (	70)
4102	4997	1111	136	6244 (	36)	8406	2092	79	10577 (	61)
4103	4005	992	68	5065 (	36)	6737	1669	79	8485 (	61)
4104	5909	1346	0	7255 (	56)	9089	2109	79	11277 (	87)
4105	6065	1595	0	7660 (	71)	8443	2299	118	10860 (	101)
4106	4470	719	0	5189 (	102)	5940	955	0	6895 (	135)
4107	5147	619	34	5800 (	61)	7211	1236	118	8565 (	90)
TOTAL	39023	8849	374	48246 (	51)	59682	14416	631	74729 (	605)
4201	1372	1163	0	2535 (	34)	2385	2022	0	4407 (	60)
4202	4200	844	0	5044 (	78)	5967	1324	0	7291 (	112)
4203	5226	907	238	6371 (	68)	7349	2287	0	9638 (	103)
4204	1849	230	713	2792 (	31)	3238	1168	0	4406 (	49)
4205	6067	719	340	7126 (	40)	9285	1640	0	10925 (	61)
4206	1573	342	407	2322 (	11)	4054	1664	0	5718 (	27)
4207	4074	390	0	4464 (	57)	6027	2187	0	8214 (	105)
4208	6506	807	0	7403 (	82)	9299	1360	0	10659 (	118)
TOTAL	30957	5402	1698	38057 (	43)	47604	13652	0	61256 (	69)
4301	2769	378	34	3181 (	32)	4344	2352	0	6696 (	68)
4302	3037	187	0	3224 (	41)	4609	1318	0	5925 (	76)
4303	6109	715	0	6824 (	42)	9326	1082	0	10408 (	64)
4304	2547	232	0	2779 (	26)	4290	514	0	4804 (	45)
4305	2834	236	136	3206 (	10)	7155	600	0	7755 (	24)
4306	2750	593	34	3377 (	27)	4731	1344	0	6075 (	49)
4307	3561	974	0	4535 (	18)	7488	2049	0	9537 (	37)
4308	4970	340	0	5310 (	26)	8326	969	0	9295 (	45)
4309	1630	836	0	2466 (	35)	2822	1447	0	4269 (	60)
4310	2604	52	0	2656 (	28)	4276	157	0	4433 (	47)
4311	1438	138	340	1916 (	35)	2440	972	0	3412 (	63)
TOTAL	34249	4681	544	39474 (	25)	59807	12802	0	72609 (	46)
4401	4232	725	0	4957 (	17)	8508	1469	79	10056 (	35)
4402	4025	564	0	4589 (	14)	6898	966	0	7864 (	23)
4403	2607	197	0	2804 (	5)	5990	465	0	6455 (	12)
4404	3355	282	0	3637 (	24)	4923	572	0	5495 (	38)
4405	3687	264	0	3951 (	7)	7427	907	0	8334 (	14)
4406	2786	427	340	3553 (	10)	5237	1220	592	7049 (	20)
4407	2743	85	102	2930 (	6)	5581	234	0	5815 (	12)
4408	4459	148	0	4607 (	17)	6646	220	0	6866 (	26)
4409	3251	297	0	3548 (	6)	6988	1033	0	8021 (	13)
4410	2668	82	0	2750 (	4)	6353	227	0	6580 (	10)
4411	2556	111	0	2667 (	10)	4426	300	0	4726 (	17)
4412	6159	343	0	6502 (	23)	10311	772	0	11083 (	38)
TOTAL	42528	3525	442	46495 (	10)	79288	8385	671	88344 (	18)
4501	4464	626	0	5090 (	33)	6587	3234	0	9821 (	64)
4502	1417	28	0	1445 (	21)	2602	146	0	2748 (	40)
4503	939	79	0	1018 (	7)	2910	765	0	3675 (	26)
4504	2334	248	0	2582 (	20)	4559	475	0	5034 (	38)
4505	2718	474	0	3192 (	26)	4898	855	0	5753 (	47)
4506	1013	20	0	1033 (	8)	2829	668	0	3497 (	28)
4507	2562	286	204	3052 (	35)	4236	543	0	4779 (	55)
4508	1719	151	0	1870 (	15)	3669	349	0	4018 (	32)
4509	6638	133	0	6771 (	50)	9718	936	0	10654 (	78)
4510	4562	333	0	4895 (	27)	7619	570	0	8189 (	45)
TOTAL	28166	2378	204	30918 (	21)	49627	8541	0	58168 (	40)

Table D.13(5) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)	Wastewater Discharge (Future : m3/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)
4601	6149	1459	577	8185 (25)		14441	3425	671	18537 (56)	
4602	6103	604	1052	7759 (27)		13420	1990	355	15765 (55)	
4603	4869	820	136	5825 (30)		10335	1940	0	12275 (63)	
4604	6296	722	34	7052 (39)		11305	1352	0	12657 (71)	
4605	6336	610	1290	8236 (12)		23026	2093	0	25119 (37)	
4606	3415	68	0	3483 (12)		10436	1337	0	11773 (39)	
4607	2356	47	0	2403 (11)		7218	1009	0	8227 (39)	
4608	3115	62	0	3177 (19)		7541	1023	0	8564 (50)	
4609	3264	902	0	4166 (20)		8357	2546	0	10903 (52)	
4610	4191	676	0	4867 (11)		15283	2934	0	18217 (40)	
4611	5510	1323	0	6833 (27)		12033	3072	0	15105 (59)	
TOTAL	51604	7293	3089	61986 (19)		133395	22721	1026	157142 (48)	
4701	2919	522	340	3781 (22)		5866	1449	0	7115 (41)	
4702	3103	172	102	3377 (14)		6789	616	0	7405 (31)	
4703	7776	1119	849	9744 (16)		13351	2302	0	15653 (26)	
4704	3008	339	0	3347 (8)		6493	716	0	7209 (16)	
4705	3817	866	373	5056 (14)		6652	1805	0	8257 (23)	
TOTAL	20623	3018	1664	25305 (14)		36951	6888	0	45639 (25)	
Wilayah	247350	35146	8015	290511 (20)		468354	87205	2328	557887 (38)	
5101	3262	235	0	3497 (44)		5353	1223	0	6576 (84)	
5102	3180	142	0	3322 (51)		5039	1047	0	6086 (93)	
5103	4692	94	0	4786 (84)		6792	630	0	7422 (130)	
5104	5370	366	0	5736 (55)		8366	1091	0	9457 (90)	
5105	5974	1103	0	7077 (105)		8575	1719	0	10294 (152)	
5106	5279	1182	0	6461 (58)		8218	1818	0	10036 (89)	
TOTAL	27757	3122	0	30879 (64)		42343	7528	0	49871 (103)	
5201	7163	1633	34	8830 (20)		11341	2942	947	15230 (35)	
5202	4968	821	0	5789 (28)		9584	1733	0	11317 (54)	
5203	6941	974	51	7966 (44)		11657	2169	513	14339 (80)	
5204	6233	1452	204	7889 (51)		10342	2343	0	12685 (82)	
5205	3484	557	340	4381 (23)		7701	1342	592	9635 (50)	
5206	3201	487	509	4197 (34)		5996	2843	1304	10143 (82)	
5207	7540	2202	0	9742 (36)		13913	4513	0	18426 (67)	
TOTAL	39530	8126	1138	48794 (31)		70534	17885	3356	91775 (58)	
5301	3985	860	0	4845 (101)		5831	1435	0	7266 (152)	
5302	2224	986	0	3210 (48)		3918	2821	0	6739 (100)	
5303	6952	1601	15	8568 (68)		10867	2566	0	13433 (107)	
5304	6693	1467	0	8160 (49)		11218	2472	0	13690 (82)	
5305	4849	986	17	5852 (67)		7576	2936	0	10512 (120)	
5306	7792	304	0	8096 (28)		13967	891	0	14858 (51)	
5307	5481	2094	0	7575 (66)		8453	3233	0	11686 (101)	
5308	6423	760	2041	9224 (18)		16807	1803	513	19123 (38)	
5309	7132	337	15	7514 (24)		14384	1835	276	16415 (53)	
5310	4757	95	41	4893 (11)		13571	1569	0	15140 (33)	
5311	4885	98	0	4983 (36)		8645	898	0	9543 (69)	
5312	3917	161	0	4078 (7)		14893	1242	0	16135 (28)	
5313	3385	1068	0	4453 (27)		6494	2050	0	8544 (53)	
5314	6297	126	0	6423 (65)		9885	1155	0	11040 (112)	
5315	3944	79	31	4054 (20)		7307	1210	0	8517 (41)	
TOTAL	78716	11022	2220	91958 (28)		153736	28116	789	182641 (55)	

Table D.13(6) Existing and Future Wastewater Discharge by Kelurahan

Kel. No.	Wastewater Discharge (Existing : m3/d) Domestic	Comner. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)	Wastewater Discharge (Future : m3/d) Domestic	Comner. & Institu.	Indust.	Total	Specific Wastewater Discharge (m3/d/ha)
5401	5904	1932	70	7906 (44)		10142	3456	39	13637 (76)	
5402	4486	799	125	5410 (21)		9881	1769	0	11650 (46)	
5403	5656	577	70	6303 (35)		8083	1633	0	9716 (54)	
5404	4195	203	122	4520 (30)		6759	2066	0	8825 (58)	
5405	4572	254	1279	6105 (27)		8655	1590	0	10245 (45)	
5406	5875	118	0	5993 (5)		15481	2571	237	18289 (14)	
5407	3793	139	68	4000 (16)		6183	328	0	6511 (26)	
5408	1850	77	204	2131 (13)		3200	158	0	3358 (20)	
5409	4012	84	0	4096 (22)		7565	704	0	8269 (45)	
5410	3493	200	51	3744 (18)		5624	378	0	6002 (30)	
5411	1675	57	102	1834 (9)		3281	209	0	3490 (18)	
5412	1332	188	0	1520 (8)		2784	905	0	3689 (20)	
TOTAL	46843	4828	2091	53562 (15)		87638	15767	276	103681 (30)	
5501	2887	491	0	3378 (9)		4754	837	0	5591 (15)	
5502	3149	102	95	3346 (13)		5472	422	395	6289 (24)	
5503	2619	52	282	2953 (14)		4090	1114	0	5204 (25)	
5504	806	365	0	1171 (3)		2599	1176	5628	9403 (26)	
5505	1023	179	0	1202 (4)		2397	559	0	2956 (9)	
5506	804	36	0	840 (3)		1915	184	0	2099 (6)	
5507	968	107	0	1075 (4)		2345	251	0	2596 (9)	
5508	4002	822	0	4824 (25)		6052	2934	3157	12143 (64)	
5509	4525	806	5003	10334 (25)		7971	1508	6314	15793 (37)	
5510	3096	100	1	3197 (13)		5071	707	0	5778 (24)	
5511	2078	42	0	2120 (11)		3658	207	0	3865 (20)	
5512	1985	89	0	2074 (7)		3571	368	0	3939 (14)	
5513	3818	380	452	4650 (15)		6294	664	1973	8931 (28)	
5514	2041	41	0	2082 (6)		3666	143	0	3809 (11)	
5515	1124	159	0	1283 (6)		2177	301	0	2478 (11)	
5516	951	209	0	1160 (3)		3034	686	0	3720 (9)	
5517	3951	177	0	4128 (9)		6868	810	1184	8862 (20)	
5518	833	228	0	1061 (3)		2682	2198	0	4880 (12)	
TOTAL	40660	4385	5833	50878 (9)		74616	15069	18651	108336 (19)	
5601	1859	708	6111	8678 (21)		4518	642	12590	17750 (43)	
5602	4789	945	4414	10148 (15)		14762	2019	16970	33751 (51)	
5603	4289	804	0	5093 (11)		11187	1338	5131	17656 (39)	
5604	3336	750	6281	10367 (17)		7556	1235	15905	24696 (40)	
5605	1486	341	0	1827 (4)		4338	629	3276	8243 (19)	
5606	4647	414	0	5061 (7)		13988	3276	316	17580 (26)	
5607	3035	127	0	3162 (3)		10245	387	1934	12566 (13)	
TOTAL	23441	4089	16806	44336 (10)		66594	9526	56122	132242 (31)	
Wilayah	256947	35372	28088	320407 (17)		495461	93891	79194	668546 (36)	
DKI TOTAL	1038025	172651	105437	1316113 (20)		1882686	448933	256631	2588250 (40)	

Table D.14(1) Existing and Future Pollution Load Generation by Kelurahan

Kel. No.	Pollution Load (Existing : Kg/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)	Pollution Load (Future : Kg/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)
1101	776	15	0	791	(6.3)	1043	319	0	1362	(10.8)
1102	1361	171	0	1532	(21.3)	1710	481	0	2191	(30.4)
1103	843	512	0	1355	(12.1)	1135	1324	0	2459	(22.0)
1104	922	174	0	1096	(8.2)	1389	1120	0	2509	(18.7)
1105	615	519	0	1134	(14.5)	821	1461	0	2282	(29.3)
1106	159	231	0	390	(1.5)	826	1259	0	2085	(8.1)
TOTAL	4676	1622	0	6298	(8.1)	6924	5964	0	12888	(16.5)
1201	1627	143	47	1817	(14.1)	2034	1121	0	3155	(24.5)
1202	1196	99	0	1295	(25.4)	1479	213	0	1692	(33.2)
1203	1046	21	0	1067	(19.4)	1304	364	0	1668	(30.3)
1204	733	2671	0	3404	(18.0)	1079	4129	0	5208	(27.6)
1205	866	463	252	1581	(8.0)	1023	548	839	2410	(12.2)
TOTAL	5468	3397	299	9164	(14.7)	6919	6375	839	14133	(22.7)
1301	979	595	47	1621	(10.3)	1836	2158	0	3994	(25.4)
1302	848	52	0	900	(16.4)	998	213	0	1211	(22.0)
1303	983	19	0	1002	(8.9)	1159	134	0	1293	(11.4)
1304	1012	20	0	1032	(9.8)	1209	192	0	1401	(13.3)
1305	915	18	0	933	(10.3)	1110	129	0	1239	(13.6)
1306	1183	285	0	1468	(14.0)	1405	432	0	1837	(17.5)
1307	1345	26	0	1371	(14.9)	1601	321	0	1922	(20.9)
1308	717	124	0	841	(8.2)	849	179	128	1156	(11.2)
TOTAL	7982	1139	47	9168	(11.2)	10167	3758	128	14053	(17.1)
1401	363	164	0	527	(6.5)	449	272	0	721	(8.9)
1402	635	182	0	817	(16.2)	790	320	0	1110	(24.7)
1403	518	237	0	755	(8.3)	701	336	0	1037	(11.4)
1404	1087	133	95	1315	(18.5)	1347	434	0	1781	(25.1)
1405	1090	137	0	1227	(17.3)	1350	745	0	2095	(29.5)
1406	1061	107	32	1200	(19.0)	1251	256	0	1507	(23.9)
TOTAL	4754	960	127	5841	(13.6)	5888	2363	0	8251	(19.6)
1501	1287	25	0	1312	(21.2)	1548	137	0	1685	(27.2)
1502	1214	72	32	1318	(11.1)	1521	97	128	1746	(14.7)
1503	636	12	32	680	(25.2)	762	116	0	878	(32.5)
1504	623	12	0	635	(21.2)	749	79	0	828	(27.6)
1505	802	199	425	1426	(11.4)	1046	361	36	1443	(11.5)
1506	1387	537	142	2066	(16.9)	1840	673	0	2513	(20.6)
1507	1006	138	630	1774	(8.0)	1490	273	456	2219	(10.0)
TOTAL	6955	995	1261	9211	(13.0)	8956	1736	620	11312	(16.0)
1601	996	181	0	1177	(14.2)	1381	1002	36	2419	(29.1)
1602	330	12	0	342	(2.3)	773	244	0	1017	(7.0)
1603	534	180	16	730	(8.9)	841	1194	0	2035	(24.8)
1604	1430	136	0	1566	(8.4)	2175	213	0	2388	(9.8)
1605	1102	148	110	1360	(13.8)	1574	222	128	1924	(19.6)
TOTAL	4392	657	126	5175	(7.9)	6744	2875	164	9783	(15.0)
1701	869	126	16	1011	(13.8)	1207	813	0	2020	(27.7)
1702	1072	21	110	1203	(16.9)	1452	236	0	1688	(23.8)
1703	1937	38	0	1975	(15.7)	2613	340	0	2953	(23.4)
1704	1144	439	142	1725	(19.2)	1574	904	0	2478	(27.5)
1705	1641	669	32	2342	(15.3)	2338	1051	0	3389	(22.2)
1706	1228	70	32	1330	(8.4)	1787	561	0	2348	(14.9)
1707	313	435	0	748	(2.9)	647	1028	55	1730	(6.7)
TOTAL	8204	1798	332	10334	(11.1)	11618	4933	55	16606	(17.9)
Wilayah	42431	10568	2192	55191	(11.2)	57216	28004	1806	87026	(17.6)

Table D.14(2) Existing and Future Pollution Load Generation by Kelurahan

Kel. No.	Pollution Load (Existing : Kg/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)	Pollution Load (Future : Kg/d) Domestic	Comer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)
2201	103	2	1150	1255	(1.2)	752	210	2243	3205	(3.0)
2202	195	28	2694	2917	(2.8)	1491	177	3538	5206	(5.2)
2203	1836	347	1166	3349	(10.4)	2567	1023	1186	4776	(14.8)
2204	2313	976	2174	5463	(13.8)	3196	1612	3830	8638	(21.9)
2205	1017	343	0	1360	(1.8)	2062	973	128	3163	(4.1)
2206	1819	35	79	1933	(12.6)	2166	462	0	2628	(17.2)
2207	1352	79	0	1431	(5.5)	2676	207	0	2883	(11.0)
2208	874	53	2269	3196	(5.5)	1538	616	3101	5255	(9.1)
TOTAL	9509	1863	9532	20904	(4.6)	16448	5280	14026	35754	(7.9)
2301	1265	407	882	2554	(3.6)	2409	433	3210	6052	(8.6)
2302	855	17	0	872	(3.1)	1654	246	1458	3358	(12.0)
2303	1031	20	1119	2170	(9.2)	1823	774	2681	5278	(22.4)
2304	1715	33	0	1748	(10.1)	2457	1208	0	3665	(21.2)
2305	989	19	268	1276	(2.3)	2424	768	7004	10196	(18.4)
2306	1363	201	1292	2856	(6.2)	2218	368	2282	4848	(10.6)
2307	1499	29	0	1528	(14.0)	2002	268	0	2270	(20.8)
TOTAL	8717	726	3561	13004	(5.2)	14987	4065	18616	35668	(14.2)
2401	1250	205	0	1455	(10.0)	1776	100	1441	3317	(22.9)
2402	1873	63	0	1936	(12.3)	2578	446	0	3024	(19.1)
2403	999	58	0	1057	(5.8)	1576	207	438	2221	(12.1)
2404	332	15	0	347	(1.3)	958	160	0	1118	(4.2)
2405	1512	77	0	1589	(4.8)	2560	215	0	2775	(8.4)
2406	1878	535	1418	3831	(17.0)	2759	781	1058	4598	(20.4)
2407	575	25	79	679	(1.3)	1597	215	2736	4548	(8.6)
2408	1081	218	2284	3583	(7.9)	2131	313	365	2809	(6.2)
2409	593	83	0	676	(1.1)	1515	142	3210	4867	(7.8)
TOTAL	10093	1279	3781	15153	(5.2)	17450	2579	9248	29277	(10.0)
2501	1593	82	32	1707	(6.9)	2496	147	2936	5579	(22.6)
2502	626	38	126	790	(1.0)	1754	257	5909	7920	(9.5)
2503	1729	524	504	2757	(17.3)	2422	642	584	3648	(22.9)
2504	813	205	1985	3003	(9.5)	1645	584	2736	4965	(15.7)
2505	193	4	126	323	(0.4)	717	160	3830	4707	(5.9)
2506	516	35	1323	1874	(3.3)	1344	119	5745	7208	(12.8)
2507	370	7	0	377	(0.4)	1341	96	985	2422	(2.3)
TOTAL	5840	895	4096	10831	(2.7)	11719	2005	22725	36449	(9.2)
Wilayah	34159	4763	20970	59892	(4.3)	60604	13929	62615	137148	(9.8)
3101	760	15	1607	2382	(4.0)	1755	83	4177	6015	(10.1)
3102	326	18	0	344	(1.2)	532	46	401	979	(3.5)
3103	1121	73	488	1682	(2.2)	2114	195	1751	4060	(5.2)
3104	444	100	0	544	(0.9)	1321	310	0	1631	(2.7)
3105	869	38	1166	2073	(4.2)	1786	545	1751	4082	(8.3)
3106	1052	20	599	1671	(3.1)	2098	353	711	3163	(5.8)
3107	1662	134	158	1954	(2.7)	2919	396	1094	4409	(6.1)
3108	650	67	410	1127	(4.3)	1115	436	1003	2554	(9.8)
3109	548	104	725	1377	(2.7)	1449	288	1550	3287	(6.5)
3110	757	64	1024	1845	(4.0)	1557	146	2116	3819	(8.2)
3111	1408	269	284	1961	(3.8)	2329	469	456	3254	(6.4)
TOTAL	9597	902	6461	16960	(3.0)	18976	3267	15010	37253	(6.5)

Table D.14(3) Existing and Future Pollution Load Generation by Kelurahan

Kel. No.	Pollution Load (Existing : Kg/d)				Specific Pollution Load	Pollution Load (Future : Kg/d)				Specific Pollution Load
	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)
3201	1026	189	0	1215	(10.0)	1373	265	0	1638	(13.4)
3202	1503	265	0	1768	(12.3)	1972	381	201	2554	(17.7)
3203	1997	186	0	2183	(8.1)	2745	337	128	3210	(11.9)
3204	1662	649	0	2311	(12.3)	2243	920	0	3163	(16.8)
3205	1171	248	0	1419	(16.3)	1471	326	0	1797	(20.7)
3206	1896	37	0	1933	(15.3)	2358	293	0	2651	(21.0)
3207	774	151	126	1051	(10.8)	1005	252	0	1257	(13.0)
3208	1822	208	1024	3054	(13.1)	2391	277	91	2759	(11.8)
3209	1342	204	0	1546	(7.3)	1796	285	0	2081	(9.9)
3210	1659	369	425	2453	(17.0)	2158	512	182	2852	(19.8)
3211	722	122	79	923	(3.5)	1162	216	310	1688	(6.5)
TOTAL	15574	2628	1654	19856	(10.5)	20674	4064	912	25650	(13.6)
3301	700	533	0	1233	(12.8)	944	755	0	1699	(17.7)
3302	497	330	0	827	(16.2)	642	448	0	1090	(21.4)
3303	741	143	0	884	(23.9)	928	366	0	1294	(35.0)
3304	404	46	0	450	(11.8)	505	192	0	697	(18.3)
3305	927	177	0	1104	(34.5)	1146	718	0	1864	(58.3)
3306	839	44	126	1009	(18.3)	1065	393	0	1458	(26.5)
3307	770	355	0	1125	(16.5)	996	482	0	1478	(21.7)
3308	814	561	0	1375	(23.3)	1038	752	0	1790	(30.3)
TOTAL	5692	2189	126	8007	(18.4)	7264	4106	0	11370	(26.1)
3401	1096	417	63	1576	(20.2)	1380	334	201	1915	(24.6)
3402	182	196	32	410	(7.7)	273	281	0	554	(10.5)
3403	477	86	0	563	(20.1)	598	113	0	711	(25.4)
3404	930	53	79	1062	(23.1)	1154	212	0	1366	(29.7)
3405	1138	22	79	1239	(15.5)	1408	303	91	1802	(22.5)
3406	1053	102	32	1187	(21.6)	1282	222	0	1504	(27.3)
3407	907	18	32	957	(29.9)	1111	182	0	1293	(40.4)
3408	1310	26	95	1431	(23.1)	1624	335	0	1959	(31.6)
3409	889	89	142	1120	(16.0)	1130	152	0	1282	(18.3)
3410	1006	19	32	1057	(33.0)	1200	86	0	1286	(40.2)
3411	698	69	32	799	(23.5)	865	137	0	1002	(29.5)
TOTAL	9686	1097	618	11401	(20.0)	12025	2357	292	14674	(25.7)
3501	924	79	0	1003	(1.5)	4130	1410	0	5540	(8.1)
3502	1571	337	95	2003	(3.2)	5053	1134	109	6296	(10.2)
3503	1148	208	63	1419	(3.7)	3239	614	182	4035	(10.5)
3504	793	84	0	877	(1.7)	3303	403	0	3706	(7.1)
3505	501	115	0	616	(2.2)	1862	450	0	2312	(8.1)
3506	595	64	0	659	(1.4)	2979	412	0	3391	(7.0)
3507	539	56	0	595	(1.2)	2923	327	0	3250	(6.6)
3508	1223	131	0	1354	(4.3)	3001	344	0	3345	(10.7)
3509	860	105	0	965	(6.0)	1665	339	0	2004	(12.5)
3510	510	140	0	650	(4.5)	1311	377	0	1688	(11.6)
3511	614	129	0	743	(4.6)	1512	333	0	1845	(11.4)
TOTAL	9278	1448	158	10884	(2.6)	30978	6143	291	37412	(8.8)
Wilayah	49827	8264	9017	67108	(5.2)	89917	19937	16505	126359	(9.8)

Table D.14(4) Existing and Future Pollution Load Generation by Kelurahan

Kel. No.	Pollution Load (Existing : Kg/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)	Pollution Load (Future : Kg/d) Domestic	Commer. & Institu.	Indust.	Total	Specific Pollution Load (Kg/d/ha)
4101	1966	570	63	2599	(10.1)	3076	837	73	4086	(15.8)
4102	1165	257	63	1485	(8.6)	1865	483	36	2384	(13.9)
4103	934	229	32	1195	(8.6)	1495	386	36	1917	(13.8)
4104	1378	311	0	1689	(13.0)	2018	487	36	2541	(19.5)
4105	1453	368	0	1821	(16.9)	1935	531	55	2521	(23.3)
4106	1071	166	0	1237	(24.3)	1362	221	0	1583	(31.0)
4107	1234	143	16	1393	(14.7)	1654	286	55	1995	(21.0)
TOTAL	9201	2044	174	11419	(12.0)	13405	3331	281	17027	(17.9)
4201	326	269	0	595	(8.0)	543	467	0	1010	(13.6)
4202	988	195	0	1183	(18.2)	1336	306	0	1642	(25.3)
4203	1245	210	110	1565	(16.6)	1673	528	0	2201	(23.4)
4204	437	53	331	821	(9.1)	731	270	0	1001	(11.1)
4205	1444	166	158	1768	(9.9)	2113	378	0	2492	(13.9)
4206	372	79	189	640	(3.0)	916	384	0	1300	(6.0)
4207	958	90	0	1048	(13.4)	1349	505	0	1854	(23.8)
4208	1551	186	0	1737	(19.3)	2081	314	0	2395	(26.6)
TOTAL	7321	1248	788	9357	(10.6)	10742	3153	0	13695	(15.7)
4301	654	87	16	757	(7.7)	976	543	0	1519	(15.5)
4302	719	43	0	762	(9.8)	1041	304	0	1345	(17.2)
4303	1440	165	0	1605	(9.9)	2096	250	0	2346	(14.5)
4304	603	54	0	657	(6.2)	969	119	0	1088	(10.3)
4305	669	55	83	787	(2.4)	1608	139	0	1747	(5.3)
4306	650	137	16	803	(6.5)	1066	310	0	1376	(11.1)
4307	837	225	0	1062	(4.1)	1676	473	0	2149	(8.3)
4308	1168	79	0	1247	(6.0)	1862	224	0	2086	(10.1)
4309	385	193	0	578	(8.1)	636	334	0	970	(13.7)
4310	615	12	0	627	(6.6)	964	36	0	1000	(10.5)
4311	337	32	158	527	(9.8)	545	225	0	770	(14.3)
TOTAL	8077	1082	253	9412	(5.9)	13439	2957	0	16396	(10.4)
4401	994	167	0	1161	(4.0)	1903	339	36	2278	(7.9)
4402	949	130	0	1079	(3.2)	1550	223	0	1773	(5.3)
4403	615	46	0	661	(1.3)	1347	107	0	1454	(2.8)
4404	796	65	0	861	(5.6)	1114	132	0	1246	(8.1)
4405	876	61	0	937	(1.6)	1683	210	0	1893	(3.3)
4406	662	99	158	919	(2.6)	1187	282	274	1743	(4.9)
4407	653	20	47	720	(1.5)	1269	54	0	1323	(2.7)
4408	1052	34	0	1086	(4.1)	1493	51	0	1544	(5.8)
4409	776	69	0	845	(1.4)	1593	239	0	1832	(3.0)
4410	635	19	0	654	(1.0)	1445	52	0	1497	(2.2)
4411	604	26	0	630	(2.3)	995	69	0	1064	(3.9)
4412	1446	79	0	1525	(5.3)	2306	178	0	2484	(8.6)
TOTAL	10058	815	205	11078	(2.3)	17885	1936	310	20131	(4.2)
4501	1085	145	0	1230	(8.0)	1541	747	0	2288	(15.0)
4502	329	6	0	335	(4.9)	576	34	0	610	(8.8)
4503	217	18	0	235	(1.7)	643	177	0	820	(5.9)
4504	541	57	0	598	(4.5)	1009	110	0	1119	(8.5)
4505	631	109	0	740	(6.0)	1084	198	0	1282	(10.4)
4506	235	5	0	240	(1.9)	626	154	0	780	(6.2)
4507	595	66	95	756	(8.7)	938	125	0	1063	(12.2)
4508	399	35	0	434	(3.4)	811	81	0	892	(7.0)
4509	1568	31	0	1599	(11.8)	2190	216	0	2406	(17.7)
4510	1079	77	0	1156	(6.3)	1717	132	0	1849	(10.1)
TOTAL	6679	549	95	7323	(5.7)	11135	1974	0	13109	(10.3)

Table D.14(5) Existing and Future Pollution Load Generation by Kelurahan

Kel. No.	Pollution Load (Existing : Kg/d)				Specific Pollution Load	Pollution Load (Future : Kg/d)				Specific Pollution Load
	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)
4601	1464	337	268	2069	(6.2)	3289	791	310	4390	(13.2)
4602	1453	140	488	2081	(7.3)	3057	460	164	3681	(12.9)
4603	1151	189	63	1403	(7.2)	2328	448	0	2776	(14.3)
4604	1500	167	16	1683	(9.4)	2574	312	0	2886	(16.1)
4605	1496	141	598	2236	(3.3)	5185	483	0	5668	(8.3)
4606	807	16	0	823	(2.8)	2352	309	0	2661	(8.9)
4607	553	11	0	564	(2.7)	1611	233	0	1844	(8.7)
4608	736	14	0	750	(4.4)	1699	236	0	1935	(11.3)
4609	766	208	0	974	(4.6)	1865	588	0	2453	(11.7)
4610	983	156	0	1139	(2.5)	3413	678	0	4091	(9.0)
4611	1313	306	0	1619	(6.3)	2740	710	0	3450	(13.4)
TOTAL	12222	1685	1434	15341	(4.7)	30113	5248	474	35835	(10.9)
4701	679	121	158	958	(5.5)	1255	335	0	1590	(9.1)
4702	722	40	47	809	(3.4)	1504	142	0	1646	(6.9)
4703	1812	258	394	2464	(4.1)	2961	532	0	3493	(5.8)
4704	701	78	0	779	(1.8)	1439	165	0	1604	(3.6)
4705	889	200	173	1262	(3.5)	1476	371	0	1847	(5.1)
TOTAL	4803	697	772	6272	(3.4)	8635	1545	0	10180	(5.6)
Wilayah	58361	8120	3721	70202	(4.8)	105354	20144	1075	126573	(8.7)
5101	768	54	0	822	(10.4)	1201	283	0	1484	(18.8)
5102	750	33	0	783	(12.0)	1131	242	0	1373	(21.0)
5103	1108	22	0	1130	(19.8)	1527	146	0	1673	(29.3)
5104	1268	85	0	1353	(12.9)	1881	252	0	2133	(20.4)
5105	1411	255	0	1666	(24.7)	1928	397	0	2325	(34.4)
5106	1245	273	0	1518	(13.5)	1848	420	0	2268	(20.2)
TOTAL	6550	722	0	7272	(15.0)	9516	1740	0	11256	(23.2)
5201	1663	377	16	2056	(4.7)	2512	680	438	3630	(8.3)
5202	1169	190	0	1359	(6.5)	2146	400	0	2546	(12.1)
5203	1634	225	24	1883	(10.5)	2612	501	237	3350	(18.6)
5204	1467	335	95	1897	(12.3)	2316	541	0	2857	(18.6)
5205	809	129	158	1096	(5.7)	1705	310	274	2289	(11.9)
5206	754	112	236	1102	(8.9)	1344	657	603	2604	(21.1)
5207	1774	509	0	2283	(8.3)	3117	1043	0	4160	(15.2)
TOTAL	9270	1877	529	11676	(7.4)	15752	4132	1552	21436	(13.6)
5301	936	199	0	1135	(23.7)	1304	331	0	1635	(34.2)
5302	522	228	0	750	(11.1)	877	652	0	1529	(22.7)
5303	1633	370	7	2010	(15.9)	2430	593	0	3023	(24.0)
5304	1573	339	0	1912	(11.4)	2508	571	0	3079	(18.4)
5305	1139	228	8	1375	(15.7)	1694	678	0	2372	(27.1)
5306	1843	70	0	1913	(6.6)	3151	206	0	3357	(11.6)
5307	1297	484	0	1781	(15.5)	1907	747	0	2654	(23.0)
5308	1491	176	947	2614	(5.2)	3710	416	237	4363	(8.7)
5309	1656	78	35	1769	(5.7)	3157	424	128	3709	(12.0)
5310	1105	22	19	1146	(2.5)	2990	362	0	3352	(7.4)
5311	1134	23	0	1157	(8.4)	1904	207	0	2111	(15.3)
5312	909	37	0	946	(1.7)	3280	287	0	3567	(6.2)
5313	800	247	0	1047	(6.4)	1464	474	0	1938	(11.9)
5314	1462	29	0	1491	(15.2)	2178	267	0	2445	(24.9)
5315	915	18	14	947	(4.6)	1609	280	0	1889	(9.2)
TOTAL	18415	2548	1030	21993	(6.6)	34163	6495	365	41023	(12.3)

Table D.14(6) Existing and Future Pollution Load Generation by Kelurahan

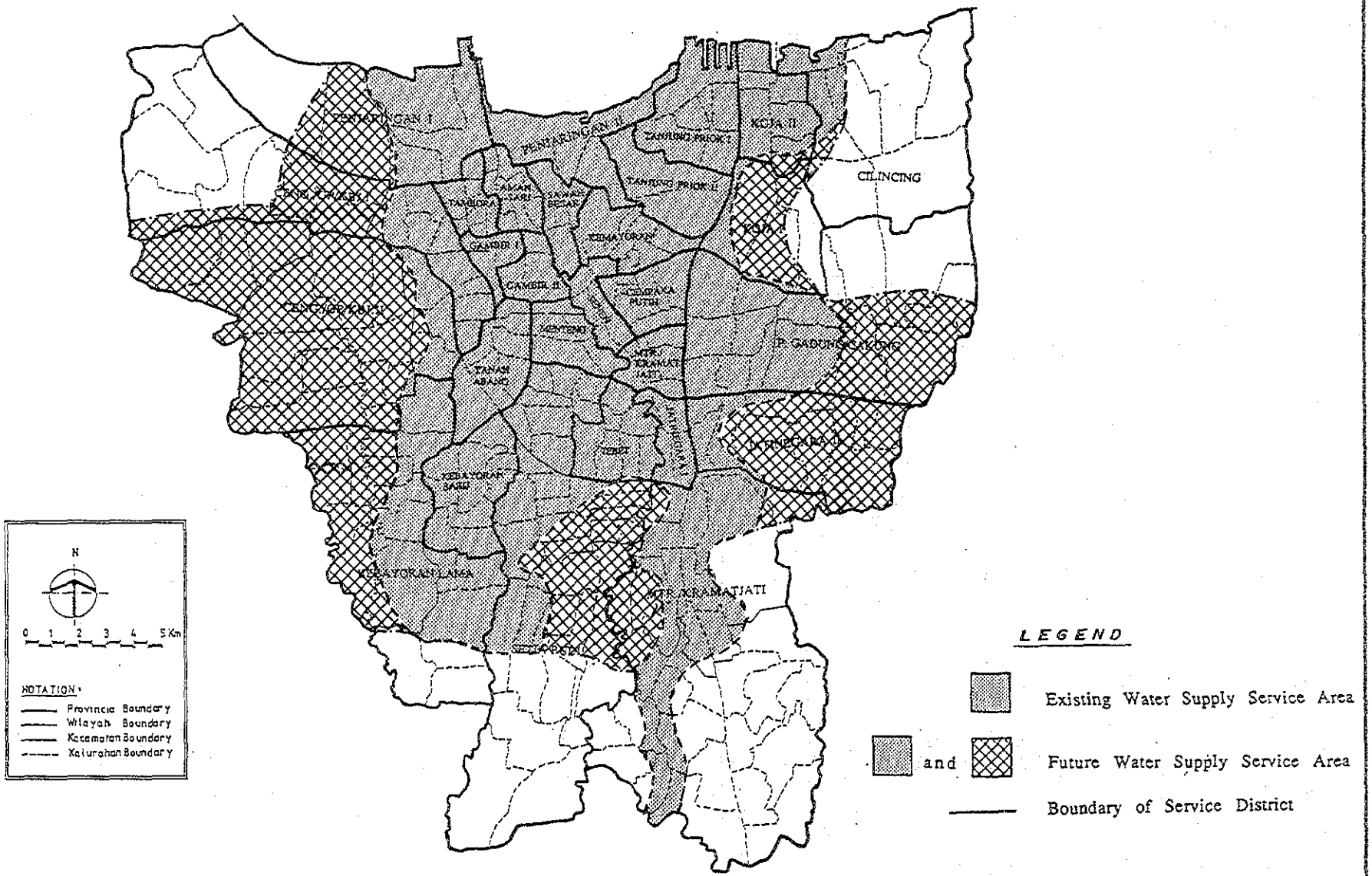
Kel. No.	Pollution Load (Existing : Kg/d)				Specific Pollution Load	Pollution Load (Future : Kg/d)				Specific Pollution Load
	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)	Domestic	Commer. & Institu.	Indust.	Total	(Kg/d/ha)
5401	1392	446	33	1871	(10.5)	2275	798	18	3091	(17.3)
5402	1048	185	58	1291	(5.1)	2192	409	0	2601	(10.3)
5403	1333	133	33	1499	(8.3)	1813	377	0	2190	(12.2)
5404	991	47	57	1095	(7.2)	1518	477	0	1995	(13.2)
5405	1077	59	593	1728	(7.5)	1941	367	0	2308	(10.1)
5406	1372	27	0	1399	(1.1)	3436	594	109	4139	(3.2)
5407	889	32	32	953	(3.7)	1378	76	0	1454	(5.7)
5408	434	18	95	547	(3.3)	713	36	0	749	(4.5)
5409	946	19	0	965	(5.2)	1699	163	0	1862	(10.1)
5410	819	46	24	889	(4.4)	1253	87	0	1340	(6.6)
5411	391	13	47	451	(2.3)	732	48	0	780	(3.9)
5412	311	43	0	354	(1.9)	621	209	0	830	(4.4)
TOTAL	11003	1068	972	13043	(3.7)	19571	3641	127	23339	(6.7)
5501	694	113	0	807	(2.2)	1092	193	0	1285	(3.5)
5502	743	24	44	811	(3.1)	1230	97	182	1509	(5.7)
5503	618	12	131	761	(3.6)	919	257	0	1176	(5.6)
5504	193	84	0	277	(0.8)	597	272	2601	3470	(9.6)
5505	247	41	0	288	(0.9)	551	129	0	680	(2.1)
5506	192	8	0	200	(0.6)	440	43	0	483	(1.5)
5507	230	25	0	255	(0.9)	533	58	0	591	(2.0)
5508	945	190	0	1135	(6.0)	1360	678	1459	3497	(18.3)
5509	1068	186	2322	3576	(8.5)	1792	348	2918	5058	(12.0)
5510	731	23	1	755	(3.2)	1140	163	0	1303	(5.5)
5511	490	10	0	500	(2.6)	822	48	0	870	(4.6)
5512	467	21	0	488	(1.7)	800	85	0	885	(3.1)
5513	899	88	210	1197	(3.8)	1410	153	912	2475	(7.8)
5514	486	9	0	495	(1.5)	834	33	0	867	(2.6)
5515	267	37	0	304	(1.4)	495	70	0	565	(2.6)
5516	227	48	0	275	(0.7)	690	158	0	848	(2.1)
5517	942	41	0	983	(2.2)	1561	187	547	2295	(5.1)
5518	199	53	0	252	(0.6)	610	508	0	1118	(2.7)
TOTAL	9638	1013	2708	13359	(2.4)	16676	3480	8619	28975	(5.2)
5601	449	164	2836	3449	(8.4)	1047	148	5818	7013	(17.1)
5602	1152	218	2048	3418	(5.2)	3408	466	7843	11717	(17.8)
5603	1020	186	0	1206	(2.7)	2538	309	2371	5218	(11.8)
5604	799	173	2914	3886	(6.3)	1732	285	7350	9367	(15.1)
5605	356	79	0	435	(1.0)	995	145	1514	2654	(6.0)
5606	1106	96	0	1202	(1.8)	3173	757	146	4076	(5.9)
5607	728	29	0	757	(0.8)	2350	89	894	3333	(3.4)
TOTAL	5610	945	7798	14353	(3.4)	15243	2199	25936	43378	(10.2)
Wilayah	60486	8173	13037	81696	(4.4)	111121	21687	36599	169407	(9.0)
DKI TOTAL	245264	39888	48937	334089	(5.1)	424212	103701	118600	646513	(9.9)

Table D.15 Existing and Future Industrial Product Amount

(1989 price)

Industrial Classification	Industrial Product (billion Rp./yr.)	
	Existing (1987)	Future (2010)
Food. Beverages and Tobacco	831	1,857
Textile	670	2,062
Wood & Wood Products	58	193
Paper & Paper Products	346	1,076
Industrial Chemicals	1,319	3,607
Non-metallic Mineral Products	332	1,069
Iron & Steel basic industries	202	306
Fabricated Mineral Products, Machinery and Equipment	2,454	5,695
Other Industries	71	317
Total	6,282	16,182

Source of Existing Industrial Product : Jakarta in Figures 1988

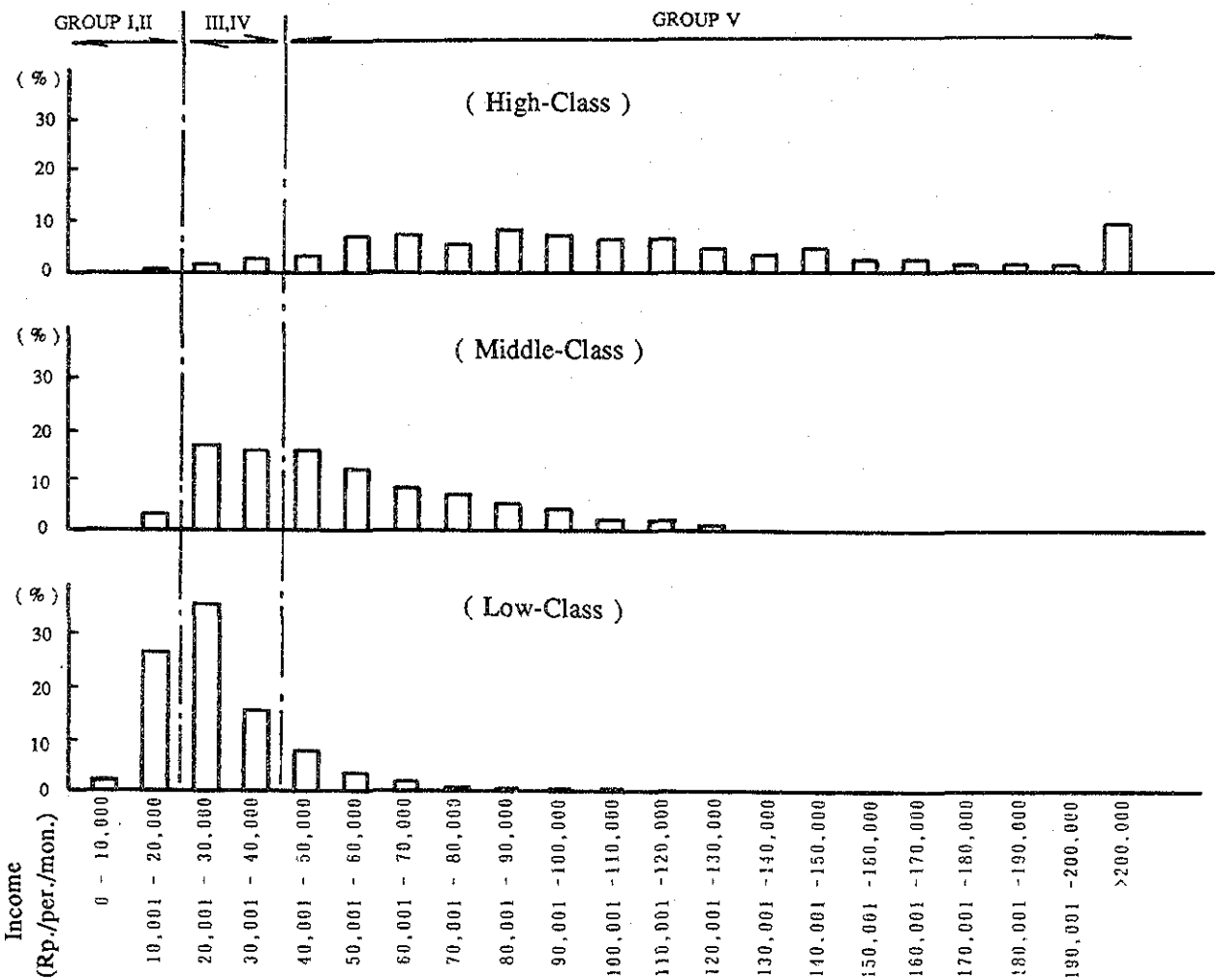


Source : PDAM

FIG. D.1 EXISTING AND FUTURE WATER SUPPLY SERVICE AREA AND SERVICE DISTRICTS OF PDAM

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

JICA A.D 1991



Source : JICA

FIG. D.2 INCOME DISTRIBUTION BY CLASS

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

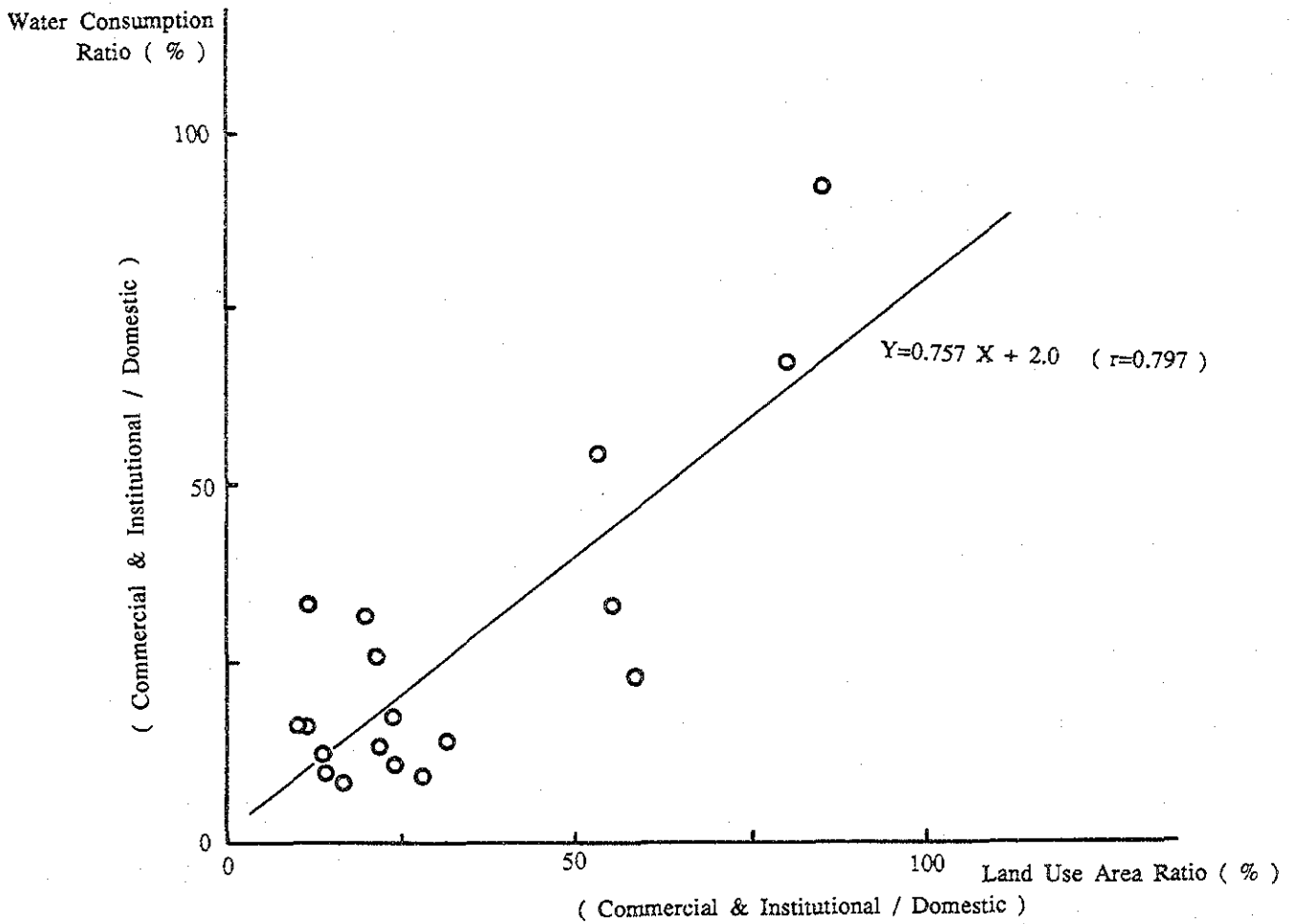


FIG. D.3	RELATION BETWEEN WATER CONSUMPTION AND LAND USE AREA RATIOS
THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA	

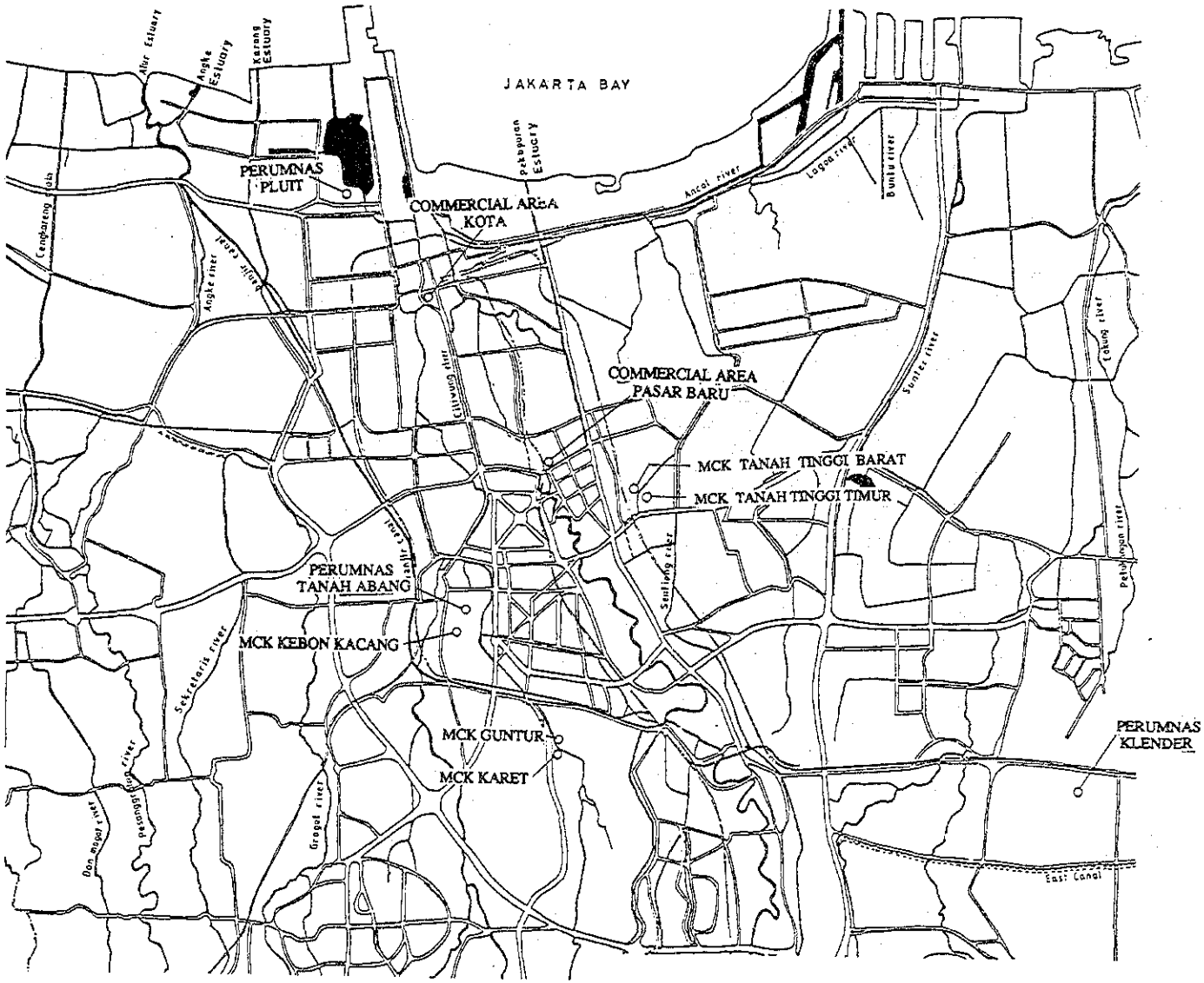
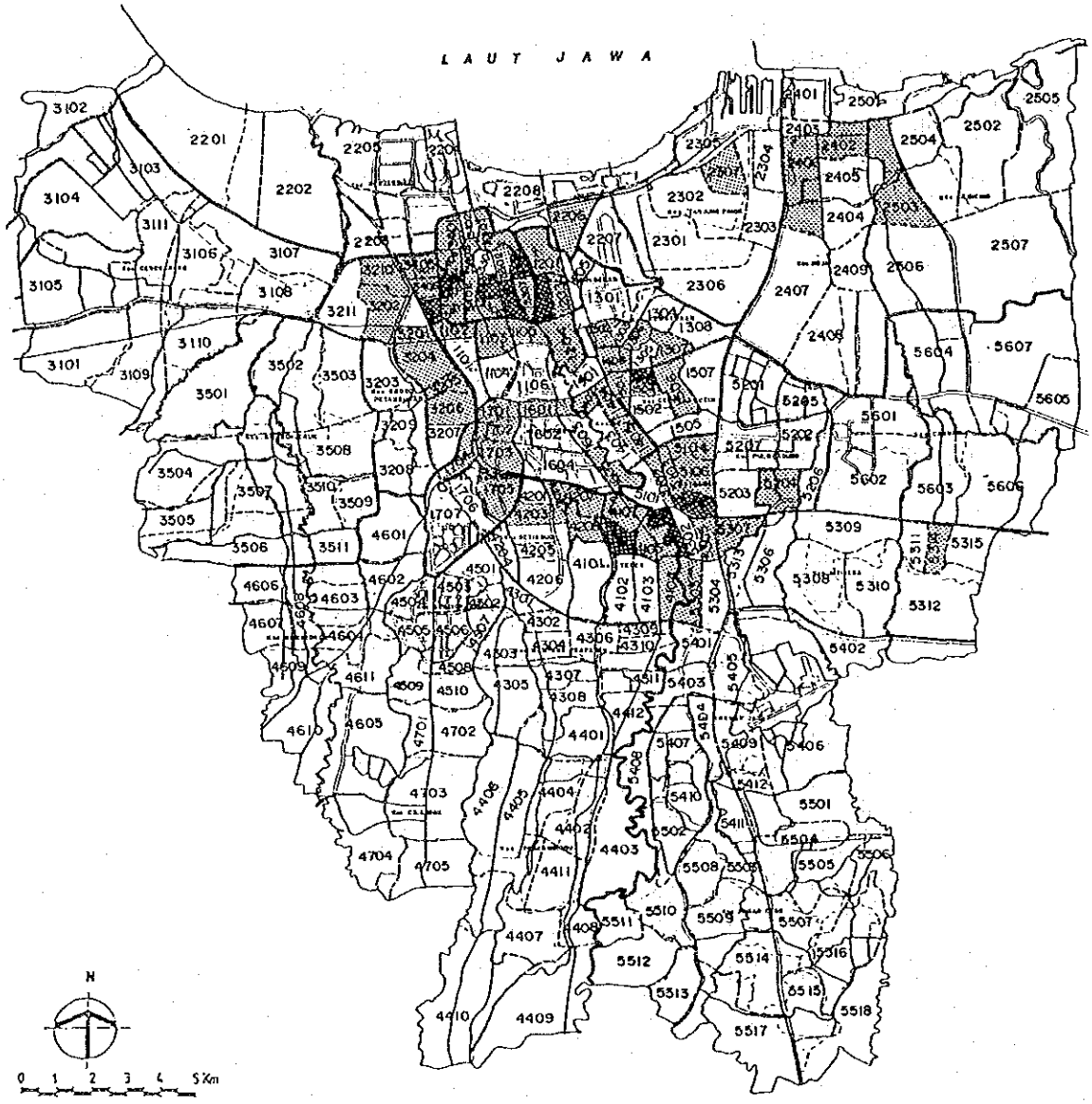


FIG. D.4	LOCATION OF SAMPLING OBSERVATION

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA



LEGEND

Wilayah Boundary

Kecamatan Boundary

Kelurahan Boundary

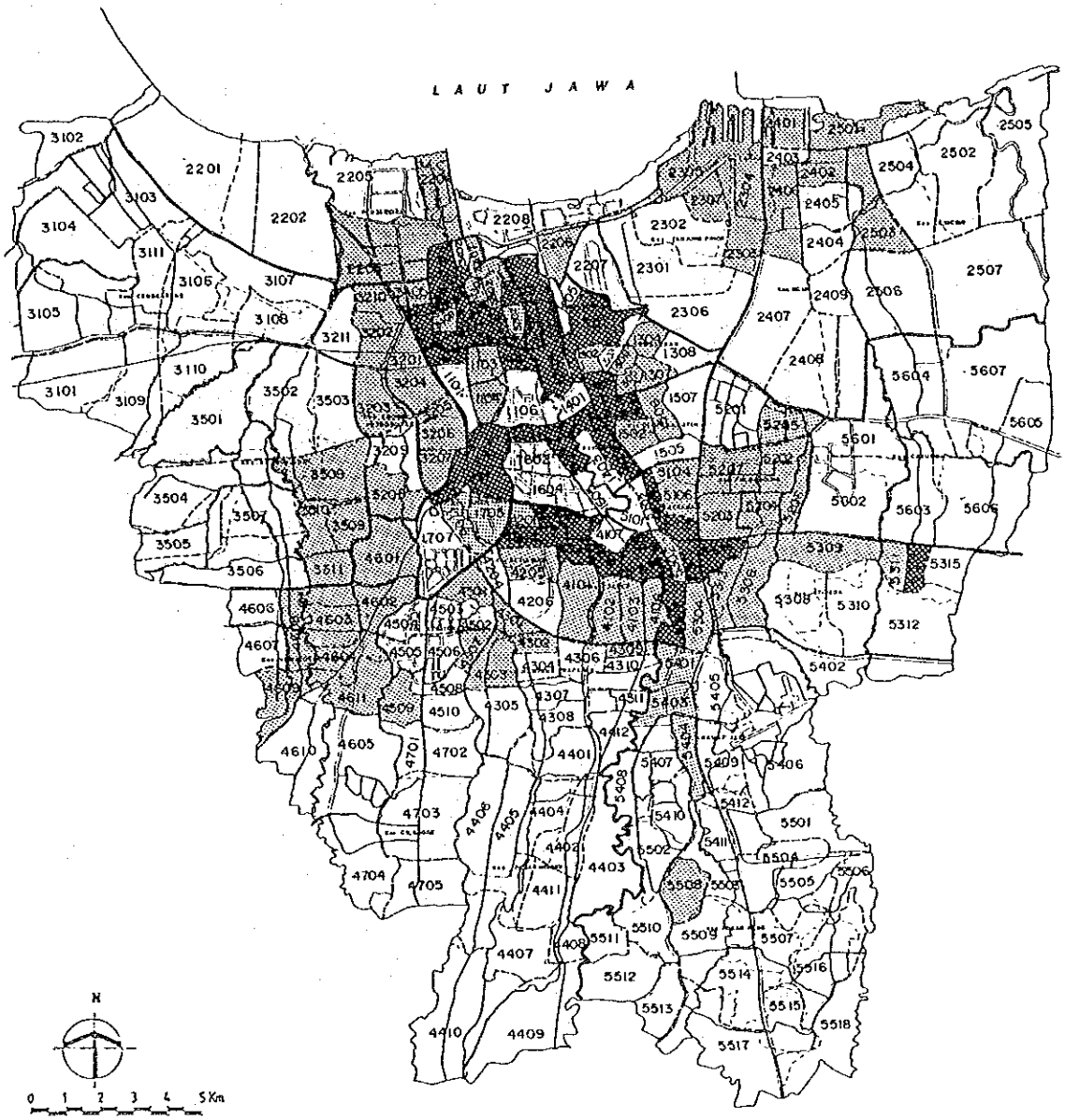
SPECIFIC WASTEWATER DISCHARGE

0 ~ 50 m³/d/ha

51~100 m³/d/ha

>101 m³/d/ha

FIG. D.5 REGIONAL DISTRIBUTION OF EXISTING SPECIFIC WASTEWATER DISCHARGE



LEGEND

Wilayah Boundary

Kecamatan Boundary

Kelurahan Boundary

SPECIFIC WASTEWATER DISCHARGE

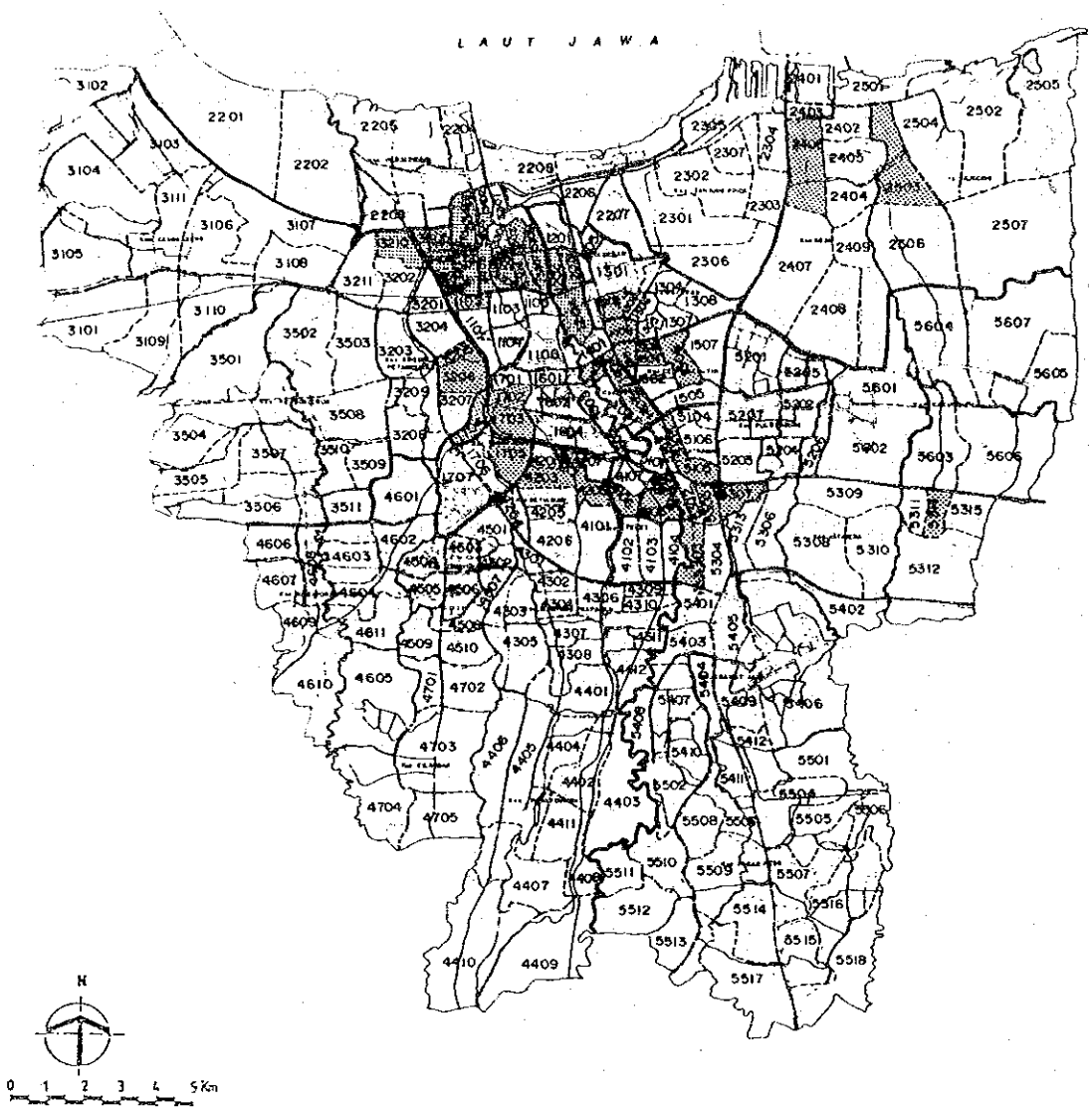
0 ～ 50 m³/d/ha

51～100 m³/d/ha

>101 m³/d/ha

FIG. D.6 REGIONAL DISTRIBUTION OF FUTURE SPECIFIC WASTEWATER DISCHARGE

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA



LEGEND

Wilayah Boundary

Kecamatan Boundary

Kelurahan Boundary

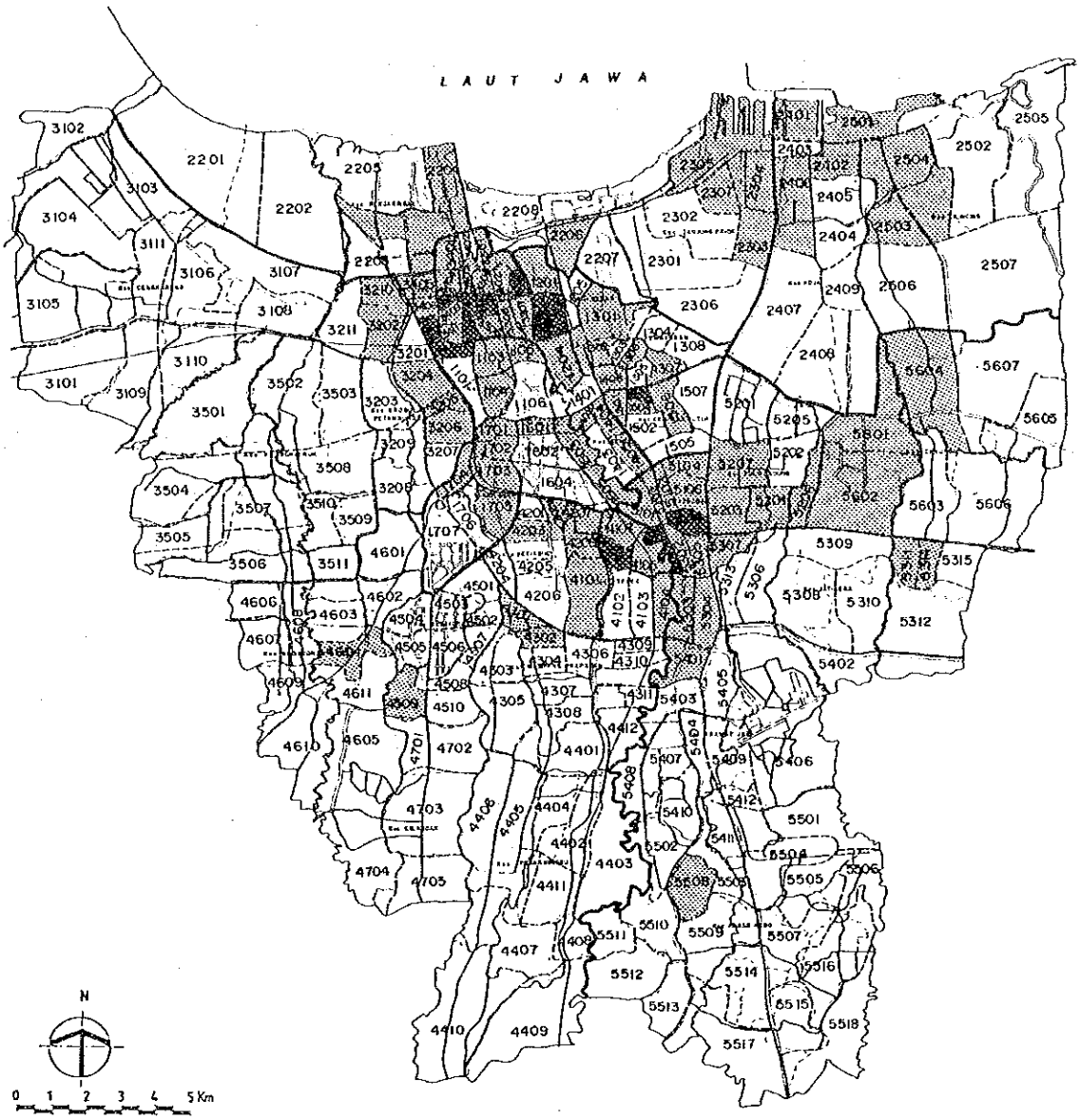
SPECIFIC POLLUTION LOAD

0～15.0 Kg/d/ha

15.1～30.0 Kg/d/ha

>30.0 Kg/d/ha

FIG. D.7 REGIONAL DISTRIBUTION OF EXISTING SPECIFIC POLLUTION LOAD



LEGEND

Wilayah Boundary

Kecamatan Boundary

Kelurahan Boundary

SPECIFIC POLLUTION LOAD

0～15.0 Kg/d/ha

15.1～30.0 Kg/d/ha

>30.0 Kg/d/ha

FIG. D.8 REGIONAL DISTRIBUTION OF FUTURE SPECIFIC POLLUTION LOAD

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

APPENDIX E

EXISTING URBAN DRAINAGE PROJECTS AND FACILITIES

APPENDIX E EXISTING URBAN DRAINAGE SYSTEM

1. General

The first major project in the recent history of flood control and urban drainage for the Study Area is the Banjir Canal (West Banjir Canal) completed in 1920. It is a flood canal of 16.5 km long (Manggarai-Muara) to divert the floods of the western part of Jakarta and has the capacity to cope with a 100-years flood.

In February, 1965, the Government established the Command Project of Flood Control (KOPRO BANJIR) under the responsibility of the Ministry of Public Works and Electric Power which was succeeded by the Jakarta Flood Control Project (J.F.C.P.) under the responsibility of the Directorate General of Water Resources Development, Ministry of Public Works in May 1972. Several major flood control and urban drainage projects were completed since 1965. Those are:

- Cengkareng flood-way (7 km) completed in 1983
- Cakung drain (10 km) completed in 1983
- 14 pumps stations with a total capacity of 114 m^3/s

A number of flood control and urban drainage projects are still on going, under construction or detailed design by the Jakarta Flood Control Project. The largest project among the on-going ones is the East Banjir Canal of 23.7 km long to divert the floods of the eastern part of Jakarta. It is planned to meet a 100-years flood.

2. Objective Channels for the Study

2.1 Demarcation of Flood Control and Urban Drainage Systems

Flood problems in urban areas are mitigated by urban drainage and urban flood control. Urban drainage comprises the evacuation of run-off from direct or local rainfall in an urban area into the nearest receiving water system (river, sea or lake). Typically, drainage pump stations are part of

the urban drainage system. Urban flood control concerns the receiving water system except sea, including infrastructures necessary to prevent the receiving water system from spilling over into the urban area.

Urban drainage and urban flood control are respectively under the jurisdictions of the Directorate General of Human Settlement (DGCK) and the Directorate General of Water Resources Development (DGWRD) with respect to the administration aspects at the central government level.

According to the Ministerial Decree No. 239 of May, 1987 and the Agreement between DGCK and DGWRD of December 1987, the demarcation of urban drainage and urban flood control activities, and the respective responsibilities are defined as follows.

(1) The urban drainage network comprises all water courses, natural or man-made, which have their origin in the urban area, down to the point where they leave the urban area.

(2) The natural or man-made water courses which are not covered by the above category belongs to urban flood control.

(3) With respect to development, and operation and maintenance,

- Urban drainage are under the responsibility of Local Government (TK.I or TK.II) with guidance of Central Government (DGCK).

- Urban flood control are under the responsibility of Central Government (DGWRD). Operation and maintenance could be handed over to Local Government (TK.I), with guidance of Central Government (DGWRD).

(4) Responsibilities concerning on-going projects will remain the same as long as the main function of the system is not classified.

(5) If there are urban drainage works under DGWRD, those works should be put under a separate part-project (Bagian Proyek) which is under the guidance of DGCK.

The water courses in the Study Area are classified into flood control river and urban drainage channel based on the above stipulations as shown in Fig. E.1.

2.2 Objective Channels for the Study

This Study will cover all the major urban drainage channels but will exclude the minor drainage channels. The flood control rivers will be excluded. Hence, flood damages due to the spill-over from the flood control rivers will not be taken into account in this Study.

The objective urban drainage channel networks consist of the main channels, tributaries and distributaries of 158 in total. The main channels of long drain length are divided into several sections in establishing the above channel networks. The objective urban drainage channels are shown in Fig. E.2.

Among them, a considerable number of channel sections are on-going, under detailed design or under construction by the Jakarta Flood Control Project Office (JFCP). The channel sections of on-going drainage improvements by JFCP are affixed by marks a,b,c,..... (Group I) and those sections where the design discharge has been proposed by JFCP (however, no structural plan has yet been proposed) are affixed by marks (A), (B), (C)..... (Group II). While, those sections where no drainage improvement plan has been proposed are affixed by marks (1), (2), (3),..... (Group III).

The channel sections by Group are listed in Table E.1, Table E.2 and Table E.3.

In this Study, urban drainage master plan will be prepared in accordance with the following policies.

(1) The design discharge proposed by JFCP for the channel sections of Group II will be followed. However, structural plan will be newly proposed.

(2) Urban drainage plan for the channel sections of Group III will be newly proposed.

(3) The urban drainage plans of the channel sections of Group I will be incorporated into the master plan of this Study.

3. Existing Urban Drainage Facilities and Related Structures

3.1 Pump Station and Weir

(1) Pump Station

In the Study Area, 14 pump stations are provided to drain local storm rainfall in the low-lying areas. Its total capacity is 114.15 m^3/s. The oldest pump station is the Pluit Pump Station with a capacity of 13.75 m^3/s constructed in 1967, while the latest one is the Cideng Pump Station of 40 m^3/s constructed in 1989.

The main features of the above existing pump stations are shown in Table E.4. Their locations are shown in Fig. E.3. Further, six (6) pump stations are on-going by the Jakarta Flood Control Office. They will drain the area of Lower Angke, Kemayoran Airport, Ancol, Sunter West, Sunter East II and Sunter East III. Its total capacity is 57.7 m^3/s.

The main features of the above on-going pump stations are also shown in Table E.4. Their locations are also shown in Fig. E.3.

(2) Weir

Thirty-three (33) gated weirs exist in the Study Area. They function mostly for flood control and urban drainage. Water supply, irrigation and flushing purposes are included in some gates.

Their main features and locations are shown in Table E.5 and Fig. E.4 respectively.

Further, six (6) gated weirs are on-going by JFCP in the East Banjir, Sunter River and Cakung River. Their functions are flood control and salinity intrusion prevention.

Their main features and locations are also shown in Table E.5 and Fig. E.4 respectively.

3.2 Bridge

Flood flows of the rivers and channels in the Study Area are obstructed at many sections by accumulated sediment deposits, bridges, encroached buildings, etc. Bridges with insufficient clearance are the largest obstacles in many rivers and channels of the Study Area.

The JICA Study Team carried out an inventory survey of all the existing bridges of 314 along the major urban drainage channels. The location of the surveyed bridges are shown in Fig. E.5.

The main features of the above existing bridges are shown in Table E.6. For details, refer to Data Book.

Their bridge lengths are in the range of 1.2 m and 59.0 m with an average of 13.6 m. The bridge clearances (height between river bed and bridge beam) range from 0.8 m to 10.5 m with an average of 2.4 m.

4. Existing Flow Capacity of Urban Drainage Channels

4.1 Channel Sections

The existing flow capacity of the 138 channel sections of Group II and Group III was estimated by using the following Uniform Flow Formula.

$$Q = {}^{1}/_{n}\ R^{2/3}\ I^{1/2}\ A$$

where,

n = Manning's roughness coefficient (0.025)

R = Hydraulic radius

I = Channel gradient

A = Bankful flow area

The flow capacity ranges from 2 m^3/s to 212 m^3/s with an average of 43 m^3/s. The estimated flow capacities of the respective channel sections Group II and Group III are shown in Table E.7 and Table E.8.

4.2 Bridge Crossings

The channel sections of Group II and Group III have bridge crossings at 313 locations. Some of these existing bridges interfere with free flood discharge either due to their narrow channel cross-sections or other structural obstructions.

The existing flow capacity of the channel sections at bridge crossings for Group II and Group III was also estimated by using the above Uniform Flow Formula.

The estimated flow capacities are shown in Table E.9.

5. Available Cross-sectional Survey Data of Urban Drainage Channel

Cross-sectional survey data are available for a considerable part of the objective channels of the Study in the Jakarta Flood Control Project Office and DKI. Such channels are :

Name of River and Channel	Approx. Distance (km)
Jembatan Dua	1.3
Pluit	1.1
Pakin	0.9
Jelangkeng	2.3
Besar	1.1
Angke	1.6
Duri	4.9

Name of River and Channel	Approx. Distance (km)
Cibubur	0.9
Jembatan Lima	0.6
Cideng (downstream)	3.4
Krukut	3.4
Ciliwung	8.8
Ciliwung Sahari	6.3
Ancol	4.0
West Pademangan	3.1
East Pademangan	5.0
Sentiong (downstream)	3.1
Sentiong (upstream)	4.1
East Baru	2.5
Grogol	7.8
Sal Pal Putih	0.8
Mampang	2.9
Cideng (upstream)	6.3
K. Bata	3.4
Sunter	16.7
Sunter Cipinang	4.4
Cakung drain	10.0
Cakung river	8.1
Buaran	6.3

The JICA Study Team conducted a supplementary cross-sectional survey for the selected urban drainage channels where no data was available during the period of beginning of November 1989 to middle of December 1989. The surveyed channels, and their survey distance are shown below.

	Name of River and Channel	Approx. Distance (km)
1.	Ancol Drain	2.0
2.	Kali Mati	1.4
3.	Rawamangun Drain	3.2
4. a.	Kayu Putih Barat Drain	3.0
b.	Kayu Putih Timur Drain	2.9
c.	Kayu Putih - Jl. Pemuda Drain	1.3
5.	Karang Drain	2.5

6.	Utan Kayu Drain	6.7
7.	Kali Baru Timur	11.2
8.	Kali Bata Barat	4.7
9.	Kali Baru Barat	11.3
10.	Tubagus Angke Drain	2.0
11.	Kali Sekretaris	10.7
12.	Kali Sepak	6.4
13.	Gresik - Surabaya	3.8
14.	Krukut	2.7
15.	Lagoa canal and Tiram	3.0
16.	Petukangan canal	3.2
	total approx.	82.0

Location of these urban drainage channels with available cross-sectional surveys is shown in Fig. E.5.

Table E.1 Channel Section of Group I

River No.	River Name	Basin Area (km2)	River Length (km)
a	Sepak	5.1	3.0
b	Secretaris	13.1	2.0
c	Grogol	-	4.0
d	Grogol	15.1	10.1
e	Grogol-Secretaris	15.6	1.0
f	Grogol-Secretaris	20.0	1.9
g	Lower Angke	35.2	2.0
h	Lower Angke	40.5	2.5
i	Grogol	7.3	5.9
j	Grogol	7.4	6.8
k	Gresik	-	-
l	Cideng	-	1.8
m	Cideng	-	1.5
n	Sianter	-	0.5
o	Duri	2.1	5.6
p	Krukut	3.5	3.5
q	Jelakang	-	0.8
r	Ciliwung	-	8.5
s	Ciliwung	-	2.5
t	Ciliwung	-	1.2
u	Ciliwung	-	2.0
v	Ciliwung Kota	0.7	1.4
w	Taman Sari	1.2	2.0
x	Ciliwung Kota	-	0.3
y	Beton	2.0	2.3
z	Ciliwung Kota	4.2	0.6
aa	Ciliwung Kota	5.8	1.0
ab	Pakin	6.5	0.5
ac	Opak	18.8	0.5
ad	Pademagan Barat	8.7	1.3
ae	Pademagan Barat	8.7	1.9
af	Pademangan Timur	8.7	3.2
ag	Cipinang	3.0	2.2
ah	Cipinang	1.6	1.5
ai	Sunter	4.6	2.4
aj	Sunter	11.9	1.4
ak	Sunter	-	4.0
al	Sunter	17.1	2.4
am	Sunter	-	0.6
an	Sunter	32.0	3.1
ao	Sunter	47.7	1.5
ap	Sunter	53.7	2.6
aq	Buarang	8.3	5.0
ar	Cakung	11.9	6.1
as	Petukangan	-	-
at	Cakung	34.3	-
au	Cakung	50.1	3.9
av	Marunda	9.2	6.4
aw	Cakung	71.5	5.9
ax	Cakung	-	-

Note: Basin Area: whole basin area upstream at objective channel section
River Length: length of objective channel section

Sources : JFCP, JICA

Table E.2 Channel Section of Group II

River No.	River Name	Basin Area (km2)	River Length (km)
A	Kali Sekretaris	-	8.4
B	Jatipulo Tomang	5.8	3.8
C	Angke		1.3
D	Gresik Surabaya	1.7	4.3
E	Cideng	0.7	1.4
F	Krukut	1.0	2.0
G	Cideng	-	1.4
H	Cideng	-	3.3
I	Jelangkeng	-	0.5
J	Cibubur	0.1	1.2
K	Angke	1.1	1.5
L	Angke	1.2	0.2
M	Jelangkeng	-	0.7
N	Jembatan Dua	0.2	0.6
O	Bandengan	0.9	1.5
P	Pluit	2.0	1.5
Q	Cideng	-	1.8
R	Ciliwung	-	4.3
S	Muara Karang	14.7	4.0
T	Sentiong	17.5	1.5
U	K. Item	-	2.5
V	Sentiong	-	1.7
W	Sunter C	-	3.9
X	Sentiong	-	2.0

Note : Basin Area : whole basin area upstream at objective channel section
River length : length of objective chanel section
Source : JFCP, JICA

Table E.3(1) Channel Section of Group III

River No.	River Name	Basin Area (km2)	River Length (km)
1-1	Kamal	16.4	7.4
1-2	Tanjungan	7.8	3.2
2-1	Kali Gede/Bor	5.6	4.8
2-2	Saluran Cengkareng	3.3	4.5
2-3	Padongkelan	5.2	1.1
3	Semanan	0.7	1.2
4	Krco	7.8	4.8
5	Ulujami	8.4	8.7
6	Sepak	17.8	10.9
7	Kembangan	2.4	2.0
8	Pesanggrahan bawah	0.4	1.0
9	Kedaung	0.3	0.6
10	Kedaung	2.1	2.2
11	Mookervart	0.4	1.5
12	Mookervart	2.7	2.9
13	Kedoya	1.6	2.0
14	Cilawe	2.2	2.3
15	Ciragil	6.4	3.1
16	Krukut	2.1	1.6
17	Mampang	2.7	3.4
18	Mampang	2.5	1.4
19	Mampang	25.5	10.5
20	Cideng Atas	5.1	3.8
21	Warung	0.8	1.1
22	Cideng	8.1	5.8
23	K.Baru Barat/PS. Minggu	2.4	19.6
24	Ciliwung	0.7	1.7
25	Rawa Bilai	1.2	2.5
26	K.Bata Timur	5.2	3.1
27	K.Bata	7.0	3.8
28	K.Bata	0.3	1.0
29	Bali Matraman	7.8	5.3
30	Goseng	2.8	1.2
31	Cijantung	4.3	2.7
32	Ciliwung	7.5	3.6
33	K.Baru Timur	1.5	12.7
34	Sentiong	1.4	4.0
35	Kali Baru Timur	7.9	18.9
36	Cipinang	1.9	1.2
37	Cipinang	1.3	2.0
38	Cipinang	4.5	3.5
39	Cipinang	2.2	1.7
40	Sunter	1.5	3.0

Table E.3(2) Channel Section of Group III

River No.	River Name	Basin Area (km2)	River Length (km)
41	Sunter	6.4	3.4
42	Sunter	9.9	7.2
43	Sunter	5.3	3.6
44	Salemba (1)	10.9	22.6
44	Salemba (2)	13.0	25.2
45	Kali Baru Senen	1.2	1.9
46	Mati	1.0	1.4
47	Lagoa	4.4	2.8
48	Koja	1.2	1.1
49	Kebon Bawang	1.8	2.0
50	Lagoa Timur	3.3	2.6
51	Lagoa	1.2	1.6
52	Lagoa Timur	4.9	3.3
53	Bambu	0.3	1.2
54	Lagoa Tenggiri	7.8	5.3
55	Utan Kayu	8.2	6.0
56	Rawa Badak	1.4	1.5
57	Utan Kayu	9.8	6.9
58	Cipinang	0.7	1.5
59	Rawamangun	1.6	3.2
60	Kayu Putih Utara	1.9	1.8
61	Pulo Nangka	1.5	2.8
62	Kayu Putih Selatan	2.0	3.5
63	Pulo Mas Barat	1.1	4.1
64	Pulo Gadung	5.5	4.5
65	Rawa Gatel	0.3	0.5
66	Pulo Gadung	6.5	6.1
67	Sukapura	0.3	0.8
68	Tugu Batu	7.3	6.8
69	Rawa Gatel	1.2	0.9
70	Kelapa Gading	2.1	2.0
71	Kelapa Nias	3.6	3.0
72	Tugu Batu	12.2	8.7
73	Rawa Badak	2.2	1.4
74	Rawa Badak	2.0	1.2
75	Pelumpang	5.7	2.2
76	Cakung Lama	11.7	7.9
77	Pandang	0.2	0.6
78	Cakung	3.8	5.2
79	Jati Bening	4.0	6.6
80	Jati Bening	0.9	1.1
81	Sal. Bekasi tengah	3.5	5.8

Note : Basin Area : whole basin area upstream at objective channel section
River length : length of objective channel section

Source : JICA

Table E.4 Name of Existing and On-Going Pumping Station

Existing Pumping Station

No.	Name of Station	Name of River/Drainage to be installed	Total Capacity (m3/sec)	Remarks (*1)
P1	Pluit	Pluit pond	13.75	Managed by K
P2	Pluit	- do -	16.0	Managed by K
P3	Muara Angke	Angke river	2.6	Managed by K
P4	Melati	Banjir Canal	6	Managed by K
P5	Setiabudi Barat	K. Cideng	5.35	Managed by K
P6	Setiabudi Timur	K. Cideng	3.3	Managed by K
P7	Waduk Grogol	Pesanggarahan Bawah	1.7	Managed by K
P8	Tomang Barat	Sekretaris River	4.0	Managed by K
P9	Cideng	West Banjir Canal	40.0	Managed by K
P10	Pulo Mas	K. Sunter	7.5	Managed by D
P11	Rawa Kepa	West Banjir Canal	8.0	Managed by K
P12	Pondok Bandung	- do -	2.6	Managed by D
P13	Istana	Ciliwung	0.75	Managed by K
P14	Mangga Dua	Cideng	2.6	Managed by K
		Sub Total	114.15	

On-Going Pumping Stations

P15	Lower Angke	Angke	8.0	Managed by K
P16	Kemayoran Airport Redevelopment	To be named	4.0	Managed by K
P17	Ancol	Sunter	15.0	Managed by K
P18	Sunter West	Lagoa	10.0	Managed by K
P19	Sunter East III	Sunter	15.5	Managed by K
P20	Sunter East II	Sunter	5.2	Managed by K
		Sub Total	57.70	
		TOTAL	171.85	

Note ; (*1) "K" means J.F.C.P. Management of these station will be transferred to DKI in the future.

"D" means DKI.

Source : JFCP, DKI

Table E.5 Existing and On-Going Gated Weirs

Existing Gated Weirs

No.	Name of Station	Name of River/ Channel to be installed	Pupose of Control for	Remarks (*1)
1	Cengkareng	Cengakreng	Flood	Managed by K
2	Maggarai 1	Ciliwung	Drainage	Managed by D
3	Karet	anjir Canal	Flood	Managed by D
3'	Karet II	- do -	Flushing	Managed by D
4	Katulampa	Pond	Drainage	Managed by K
5	Pondok Pinang	Pasanggarahan	- do -	Managed by K
6	Sunter Hulu	Sunter	- do -	Managed by K
7	Polor	Angke	Irrigation/ Drainage	Managed by K
8	Koneng	Pasanggarahan	- do -	Managed by K
9	Sewan	Mookervart	- do -	Managed by K
10	Tarum Barat to Saluran	Tarum Barat Canal	Water Supply/ Irrigation	Managed by K Managed by K
11	Pulo Gadung	Sunter	Flood	Managed by K
12	Sunter	- do -	- do -	Managed by K
13	Cakung	Cakung	- do -	Managed by K
14	Pasar Ikan	-	Drainage	Managed by D
15	Saringan Sampah Teluk Gong	Angke - do -	- do -	Managed by K
16	Syphon Pluit	Pluit Pond	Flood	Managed by K
17	Bendungan Jago	Jiung	- do -	Managed by K
18	Manggarai II	Ciliwung	Flood/Flushing	Managed by D
18'	Manggarai III	Surabaya Canal	Flushing	Managed by D
19	Tarum Barat II	Tarum Barat Canal		Managed by D
20	Capitol (Istiqlal)	Ciliwung	- do -	Managed by D
21	Tangi	- do -	- do -	Managed by D
22	Kali Duri	Duri	Flood	Managed by K
23	Kampung Gusti	Angke	Drainage	Managed by D
24	Jembatan Dua	Grogol	- do -	Managed by D
25	Jembatan Merah	Gunung Sahari	- do -	Managed by K
26	Pekapuran	- do -	Flood	Managed by K
27	Cideng	Cideng	- do -	Managed by K
28	Kyai Tapa	Ciliwung	- do -	Managed by K
29	Siantar	Duri	Flood	Managed by K
30	Syphon Cideng	Cideng	- do -	Managed by K
31	Syphon Teluk Gong	Angke	- do -	Managed by K
32	Saringan Sampah Gunung Sahari	Gunung Sahari	Drainage Flood	Managed by D Managed by K
33	Kali Item	Item	- do -	Managed by K

On-going Gated Weirs

34	Salinity Barries I	Sunter	Salinity Barries	Managed by K
35	Salinity Barries II	Cakung	- do -	Managed by K
36	Salinity Barries III	East Banjir Canal	- do -	Managed by K
37	Doversion Structure	- do -	Flood	Managed by K
38	Weir I	- do -	- do -	Managed by K
39	Weir II	- do -	- do -	Managed by K

Note ; (*1)
"K" mean J.F.C.P Management of thesee stations will be transferred to DKI in the future.
"D" means DKI

Source : JFCP, DKI

Table E.6(1) Main Features of Existing Bridge

Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
1	KAMAL	13.7	7.0	0.6	2.8	1	E
2	KEMBANGAN	37.2	6.3	1.2	5.6	1	E
3	KEMBANGAN	11.4	8.4	0.4	3.2	1	E
4	SEPAK	18.1	9.3	0.6	4.4	1	E
5	SEPAK	17.9	9.0	0.8	4.5	1	E
6	SEPAK	18.3	8.9	0.8	4.7	1	E
7	KREO	17.8	11.6	0.6	3.0	1	E
8	KREO	17.0	14.0	0.6	3.5	1	E
9	KREO	17.0	8.0	0.6	3.5	1	B
10	KREO	17.0	8.0	0.5	3.5	1	B
11	KREO	10.6	6.9	0.7	3.0	1	B
12	DAANMOGOOT	13.7	10.5	0.6	0.8	1	E
13	DAANMOGOOT	12.4	8.0	0.7	2.9	1	E
14	DAANMOGOOT	13.7	14.0	0.6	2.5	1	E
15	DAANMOGOOT	12.6	8.0	0.4	2.9	1	E
16	SEKRETARIS	14.5	6.3	0.5	3.5	1	Other
17	SEKRETARIS	6.0	9.0	1.1	1.3	1	E
18	SEKRETARIS	16.9	7.7	1.3	2.1	1	E
19	SEKRETARIS	4.2	5.1	0.3	1.8	1	Other
20	SEKRETARIS	7.2	6.3	0.4	1.7	1	B
21	SEKRETARIS	7.1	8.2	0.4	2.3	1	B
22	SEKRETARIS	7.0	8.2	0.4	2.1	1	B
23	SEKRETARIS	7.0	8.0	0.4	2.6	1	B
24	SEKRETARIS	7.3	8.1	0.5	1.8	1	B
25	SEKRETARIS	7.0	7.8	0.3	2.5	1	B
26	SEKRETARIS	7.0	7.8	0.3	2.6	1	B
27	SEKRETARIS	5.0	5.0	0.6	2.1	1	B
28	SEKRETARIS	7.9	4.0	0.1	1.4	1	B
29	SEKRETARIS	8.8	4.0	0.2	1.9	1	B
30	SEKRETARIS	6.1	9.3	1.0	2.1	1	E
31	SEKRETARIS	3.5	3.7	0.3	1.5	1	B
32	SEKRETARIS	3.0	3.7	0.6	1.5	1	B
33	SEKRETARIS	10.7	9.0	1.3	2.4	1	E
34	SEKRETARIS	12.7	18.0	1.5	5.8	1	E
35	MUARA KARANG	48.5	25.0	1.8	1.7	3	A
36	MUARA KARANG	49.5	25.0	1.8	1.2	3	A
37	MUARA KARANG	29.2	13.1	1.5	1.2	2	B
38	CILAWE	5.2	8.0	0.5	2.3	1	E
39	CILAWE	8.6	8.0	0.5	2.0	1	E
40	CILAWE	8.9	8.0	0.5	2.0	1	E
41	CILAWE	9.0	8.0	0.5	2.0	1	E
42	CILAWE	8.3	8.0	0.5	3.0	1	E
43	PLUIT	37.9	11.6	1.6	1.0	5	B
44	PLUIT	59.0	8.0	1.3	3.6	3	B
45	ANGKE	9.9	12.0	1.5	1.2	1	B
46	ANGKE	14.0	7.9	1.0	2.8	1	C
47	CIDENG	14.2	27.6	0.6	3.2	1	Other
48	CIDENG	19.3	9.8	0.4	3.2	5	Other
49	CIDENG	27.7	10.1	1.0	1.6	3	C
50	CIDENG	21.9	22.6	0.6	2.5	2	Other
51	CIDENG	8.6	7.6	0.3	1.8	1	Other
52	CIDENG	17.6	22.6	0.9	2.5	3	B
53	CIDENG	13.9	6.0	0.9	2.2	1	B
54	CIDENG	16.5	38.8	0.6	3.1	1	E
55	CIDENG	12.3	9.5	1.5	3.2	1	E
56	CIDENG	33.0	15.0	1.0	1.0	4	B
57	CIDENG	24.8	15.0	1.0	2.4	2	E
58	CIDENG	16.8	15.0	1.0	1.0	4	E
59	CIDENG	18.0	15.0	1.4	1.0	3	Other
60	CIDENG	14.7	15.0	1.5	3.0	5	E

Table E.6(2) Main Features of Existing Bridge

Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
61	CIDENG	31.8	10.0	1.4	2.2	4	E
62	CIDENG	15.1	7.4	1.5	2.7	1	E
63	CIDENG	17.2	9.1	1.2	3.0	1	B
64	CIDENG	16.2	26.4	0.4	3.5	1	B
65	CILIWUNG	12.4	10.0	0.9	2.9	1	E
66	CILIWUNG	31.8	21.0	1.4	1.7	1	Other
67	CILIWUNG GAJAHMADA	17.0	22.0	1.1	2.3	2	Other
68	CILIWUNG GAJAHMADA	12.7	11.1	1.2	2.1	1	B
69	CILIWUNG GAJAHMADA	12.5	14.6	1.4	2.4	1	E
70	KRUKUT	14.2	18.8	0.9	2.9	1	C
71	KRUKUT	32.0	18.8	0.8	7.2	1	C
72	CIRAGIL	10.0	8.0	0.9	2.4	1	E
73	CIRAGIL	11.0	5.3	0.7	2.0	1	E
74	CIRAGIL	9.9	6.0	0.8	2.1	1	E
75	CIRAGIL	10.1	6.3	0.7	2.2	1	E
76	CIRAGIL	10.0	6.0	0.6	2.1	1	E
77	MAMPANG	7.5	18.0	1.2	4.0	1	Other
78	MAMPANG	10.3	6.3	0.6	2.0	1	E
79	MAMPANG	7.7	5.5	0.5	1.5	1	E
80	MAMPANG	9.3	5.5	0.8	2.9	1	E
81	MAMPANG	9.1	18.0	1.2	2.2	1	E
82	MAMPANG	7.5	7.5	0.5	2.2	1	B
83	MAMPANG	4.0	12.6	0.5	2.1	1	Other
84	CIDENG	18.1	16.0	1.4	4.1	2	E
85	CIDENG	20.5	5.6	1.2	3.5	1	E
86	CIDENG	15.0	4.0	0.2	2.0	1	Other
87	CIDENG ATAS	4.5	3.9	0.7	2.1	1	Other
88	CIDENG ATAS	4.4	3.5	0.2	1.4	1	Other
89	KALIBARU BARAT/PS.MINGGU	5.5	16.0	0.5	2.2	1	Other
90	KALIBARU BARAT/PS.MINGGU	10.3	4.0	0.7	2.0	1	B
91	KALIBARU BARAT/PS.MINGGU	7.6	4.0	0.6	2.0	1	B
92	KALIBARU BARAT/PS.MINGGU	8.2	4.3	0.6	1.7	1	B
93	KALIBARU BARAT/PS.MINGGU	7.4	6.0	0.3	1.2	1	B
94	KALIBARU BARAT/PS.MINGGU	7.0	6.0	0.5	1.8	1	Other
95	KALIBARU BARAT/PS.MINGGU	3.0	4.0	0.5	2.9	1	Other
96	KALIBARU BARAT/PS.MINGGU	3.3	4.0	0.5	3.0	1	Other
97	KALIBARU BARAT/PS.MINGGU	5.9	9.0	0.6	3.5	1	Other
98	KALIBARU BARAT/PS.MINGGU	4.2	7.0	1.0	2.4	1	B
99	KALIBARU BARAT/PS.MINGGU	10.8	8.6	1.0	2.2	1	E
100	KALIBARU BARAT/PS.MINGGU	4.5	3.9	0.4	1.7	1	B
101	KALIBARU BARAT/PS.MINGGU	3.9	8.0	0.8	2.4	1	B
102	KALIBARU BARAT/PS.MINGGU	8.7	6.0	0.8	3.1	1	B
103	KALIBARU BARAT/PS.MINGGU	7.2	7.0	0.9	2.1	1	B
104	KALIBARU BARAT/PS.MINGGU	7.1	5.8	0.6	2.3	1	B
105	KALIBARU BARAT/PS.MINGGU	6.7	4.1	0.6	1.9	1	B
106	KALIBARU BARAT/PS.MINGGU	7.3	6.6	0.8	3.4	1	A
107	KALIBARU BARAT/PS.MINGGU	9.8	4.3	0.6	3.7	1	B
108	KALIBARU BARAT/PS.MINGGU	8.0	7.5	0.6	1.5	1	B
109	KALIBARU BARAT/PS.MINGGU	9.0	7.2	0.8	1.5	1	B
110	KALIBARU BARAT/PS.MINGGU	7.9	8.0	0.4	2.0	1	E
111	KALIBARU BARAT/PS.MINGGU	9.4	22.0	0.5	2.2	1	B
112	KALIBARU BARAT/PS.MINGGU	8.9	6.0	0.5	1.7	1	E
113	KALIBATA TIMUR	5.4	8.0	0.3	1.9	1	E
114	KALIBATA TIMUR	11.4	12.5	0.8	1.7	1	E
115	KALIBATA TIMUR	10.4	6.3	0.6	1.5	1	E
116	KALIBATA TIMUR	10.6	6.1	0.6	1.8	1	E
117	KALIBATA TIMUR	10.6	6.0	0.5	1.8	1	E
118	KALIBATA TIMUR	9.9	6.3	0.5	2.2	1	E
119	KALIBATA TIMUR	8.7	6.3	0.7	2.2	1	E
120	KALIBATA TIMUR	9.2	6.3	0.6	1.8	1	E

Table E.6(3) Main Features of Existing Bridge

Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
121	KALIBATA TIMUR	8.9	6.0	0.5	1.8	1	E
122	KALIBATA TIMUR	8.5	5.9	0.4	1.8	1	E
123	KALIBATA TIMUR	7.1	6.0	0.5	1.7	1	E
124	CIJANTUNG	11.5	8.0	0.5	5.1	1	E
125	GOSENG	11.0	8.0	0.7	2.5	1	B
126	SALEMBA	22.9	8.5	0.6	1.1	1	B
127	SALEMBA	21.4	17.5	0.6	2.9	2	E
128	SALEMBA	22.4	19.8	1.1	1.2	1	B
129	SALEMBA	4.8	15.0	0.5	2.0	1	B
130	SALEMBA	21.6	14.1	1.0	1.3	1	B
131	SALEMBA	23.1	12.4	0.5	1.2	3	B
132	SALEMBA	16.4	32.9	0.9	3.2	1	Other
133	SALEMBA	13.0	10.0	0.7	2.3	1	E
134	SALEMBA	12.3	10.0	0.7	2.7	1	E
135	SALEMBA	12.0	6.0	0.5	1.3	1	B
136	SALEMBA	12.0	8.0	0.5	1.3	1	B
137	SALEMBA	13.9	13.0	0.5	1.3	1	E
138	SALEMBA	12.5	30.0	0.7	2.7	1	Other
139	SALEMBA	6.0	49.5	0.8	1.5	1	Other
140	SALEMBA	10.2	8.2	1.3	0.8	1	E
141	SALEMBA	10.2	6.6	0.6	2.6	1	E
142	SALEMBA	8.8	8.8	0.7	3.5	1	E
143	SALEMBA	11.7	9.0	0.6	2.7	1	E
144	SALEMBA	13.1	22.8	0.7	2.2	1	E
145	KALIBARU TIMUR	10.0	9.6	0.5	3.0	1	E
146	KALIBARU TIMUR	6.5	7.6	0.6	2.2	1	E
147	KALIBARU TIMUR	7.7	9.6	0.4	2.5	1	E
148	KALIBARU TIMUR	6.8	6.1	0.5	4.0	1	E
149	KALIBARU TIMUR	7.0	5.9	0.3	2.5	1	E
150	KALIBARU TIMUR	15.9	7.4	1.0	2.4	1	E
151	KALIBARU TIMUR	8.3	7.8	0.4	2.2	1	E
152	KALIBARU TIMUR	10.1	9.6	0.5	2.5	1	E
153	KALIBARU TIMUR	11.5	7.1	0.7	2.1	1	E
154	KALIBARU TIMUR	4.7	4.4	0.5	4.2	1	E
155	KALIBARU TIMUR	11.9	6.1	0.7	1.7	1	E
156	KALIBARU TIMUR	9.3	7.2	0.6	2.8	1	E
157	KALIBARU TIMUR	10.1	9.7	0.7	2.2	1	E
158	KALIBARU TIMUR	6.5	8.1	0.6	2.5	1	E
159	KALIBARU	6.0	15.0	0.5	1.5	1	B
160	KALIBARU TIMUR	3.7	6.0	0.5	1.5	1	B
161	KALIBARU TIMUR	4.0	14.0	0.4	1.5	1	B
162	CIPINANG	15.9	9.7	1.2	4.4	1	E
163	CIPINANG	16.2	9.8	1.2	4.4	1	E
164	CIPINANG	15.6	8.0	0.5	2.6	1	E
165	CIPINANG	15.9	4.0	0.4	4.4	1	E
166	CIPINANG	3.0	4.1	0.2	2.6	1	Other
167	CIPINANG	5.5	6.0	0.7	1.8	1	Other
168	RAWAKERBAU	9.9	7.0	0.9	1.1	1	Other
169	RAWAKERBAU	6.5	7.7	0.6	1.8	1	Other
170	RAWAKERBAU	6.5	3.6	0.8	2.2	1	Other
171	UTANKAYU	23.2	4.3	0.6	2.5	4	Other
172	UTANKAYU	10.4	5.2	0.5	3.2	1	Other
173	UTANKAYU	10.5	9.3	1.1	1.2	1	B
174	UTANKAYU	9.6	9.7	0.3	1.4	1	Other
175	UTANKAYU	8.1	6.5	0.3	2.0	1	Other
176	UTANKAYU	10.2	5.2	0.3	1.9	1	E
177	LAGOA	3.5	5.2	0.3	1.5	2	A
178	LAGOA	11.6	5.4	0.4	1.5	4	B
179	ITEM	20.4	12.0	0.5	1.5	3	E
180	ITEM	13.2	5.0	0.2	2.0	3	B

Table E.6(4) Main Features of Existing Bridge

Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
181	KEBONBAWANG	37.1	6.0	0.8	1.3	4	B
182	KEBONBAWANG	10.2	6.3	0.8	2.8	1	B
183	KEBONBAWANG	4.2	6.1	0.9	3.0	1	E
184	KEBONBAWANG	5.1	3.9	0.6	2.0	1	E
185	KEBONBAWANG	5.4	7.6	0.6	1.5	1	E
186	KEBONBAWANG	5.1	8.2	0.6	1.5	1	E
187	KEBONBAWANG	5.6	7.0	0.5	1.5	1	E
188	KEBONBAWANG	6.3	4.0	0.5	1.5	1	E
189	KEBONBAWANG	6.9	4.0	0.5	1.3	1	E
190	KEBONBAWANG	5.7	4.0	0.5	1.3	1	E
191	KEBONBAWANG	6.0	4.0	0.5	1.2	1	E
192	KEBONBAWANG	6.0	4.0	0.5	1.2	1	E
193	KEBONBAWANG	6.0	4.0	0.5	1.2	1	E
194	KEBONBAWANG	6.0	4.1	0.4	1.3	1	E
195	RAWABADAK	4.5	12.0	0.7	1.5	1	B
196	RAWABADAK	4.5	6.0	0.8	1.5	1	B
197	ARTONIJOM	35.0	12.0	1.0	1.8	2	E
198	ARTONIJOM	25.0	8.0	0.8	1.4	3	E
199	PULOMAS UTARA	10.8	8.5	0.8	2.6	1	E
200	PULOMAS UTARA	12.0	8.0	0.8	2.5	1	E
201	KAYU PUTIH SELATAN	4.3	12.5	0.3	1.5	1	E
202	KAYU PUTIH SELATAN	3.4	3.2	0.3	1.5	1	E
203	PULOMAS UTARA	10.6	8.3	0.8	2.5	1	E
204	PULOMAS UTARA	15.8	8.5	0.8	2.1	1	E
205	KELAPA NIAS	8.0	16.0	0.8	3.0	1	A
206	KELAPA NIAS	15.7	8.5	0.7	1.2	1	E
207	KELAPA NIAS	7.0	22.5	0.6	2.0	1	A
208	PULO GADUNG	6.5	12.0	0.8	2.1	1	A
209	PULO GADUNG	7.2	11.5	0.4	1.2	1	C
210	PULO GADUNG	6.0	8.5	0.6	1.2	1	E
211	PULO GADUNG	4.5	8.5	0.6	1.1	1	E
212	PULO GADUNG	6.0	16.0	0.7	1.2	1	E
213	KAYU PUTIH SELATAN	6.5	18.6	0.6	2.1	1	E
214	KAYU PUTIH SELATAN	9.8	11.5	0.6	1.4	1	E
215	KAYU PUTIH SELATAN	9.6	8.2	0.9	1.5	1	E
216	KAYU PUTIH SELATAN	12.7	7.6	0.8	2.9	1	E
217	KAYU PUTIH UTARA	12.1	16.4	0.9	2.3	1	E
218	KAYU PUTIH UTARA	13.7	7.6	0.9	2.3	1	E
219	KAYU PUTIH UTARA	10.6	11.4	0.9	2.9	1	E
221	KAYU PUTIH UTARA	6.5	18.6	0.6	2.1	1	Other
222	CAKUNG	17.0	53.7	0.6	1.8	1	E
223	CAKUNG	16.2	7.5	0.5	1.0	1	B
224	CAKUNG	16.5	10.0	0.5	1.5	1	B
225	CAKUNG	13.4	9.1	0.7	1.7	1	B
226	CAKUNG LAMA	8.0	8.5	0.6	1.4	1	E
227	CAKUNG LAMA	12.6	18.0	0.9	1.2	1	E
228	MALANG	7.3	8.0	0.6	2.0	1	E
229	MALANG	6.3	7.5	0.5	1.1	1	E
230	MALANG	9.3	8.5	0.8	1.0	2	C
231	MALANG	1.2	5.0	0.4	2.5	1	C
232	MALANG	3.0	6.0	0.4	2.0	1	E
233	MALANG	1.8	3.5	0.4	2.5	1	C
234	MALANG	1.7	4.5	0.4	3.1	1	C
235	MALANG	10.0	6.0	0.5	1.5	1	E
236	SUNTER	5.4	5.5	0.6	2.5	1	Other
237	SUNTER	10.3	5.5	0.6	3.2	1	E
238	PETUKANGAN	13.0	24.0	0.7	2.0	1	E
239	SUNTER	9.0	9.5	0.3	3.5	1	Other
241	SEKRETARIS	20.0	9.8	1.2	1.8	1	E
242	SEKRETARIS	30.0	8.2	1.1	3.5	1	E

Table E.6(5) Main Features of Existing Bridge

Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
243	SEKRETARIS	30.0	8.1	1.1	3.5	1	E
244	SEKRETARIS	21.3	32.0	1.0	2.2	2	Other
245	GROGOL	48.5	7.9	1.3	5.9	5	C
246	GROGOL	25.0	14.7	1.3	3.7	1	B
247	GROGOL	25.0	15.0	1.5	3.0	1	B
248	GROGOL	25.0	14.7	1.5	5.1	1	B
249	GROGOL	20.5	18.0	1.7	3.0	1	Other
250	GROGOL	13.5	9.4	1.2	2.7	2	C
251	GROGOL	12.7	11.5	1.6	3.3	1	B
252	GROGOL	10.0	6.2	1.3	2.2	1	B
253	GROGOL	11.0	6.2	1.3	2.2	1	B
254	GROGOL	12.5	5.1	1.3	2.1	1	Other
255	GROGOL	17.8	5.4	1.4	2.3	1	E
256	GROGOL	18.8	5.0	1.4	2.3	1	E
257	GROGOL	13.5	13.4	1.5	2.1	1	E
258	GROGOL	17.0	16.5	0.8	3.8	1	E
259	GROGOL	16.0	15.5	0.9	3.8	1	E
260	GROGOL	15.8	14.0	0.8	3.6	1	E
261	GROGOL	9.0	6.0	0.9	2.5	1	B
262	GROGOL	11.7	7.0	1.0	2.9	1	B
263	GROGOL	10.1	14.0	0.5	2.7	1	E
264	GROGOL	10.5	6.0	0.9	1.9	1	B
265	GROGOL	18.6	9.0	1.0	3.3	2	B
266	GROGOL	9.4	6.1	0.7	3.6	1	B
267	GROGOL	12.0	8.9	1.4	3.3	1	E
268	GROGOL	7.8	9.3	0.6	5.5	1	B
269	KRUKUT	14.9	18.1	0.3	2.3	1	E
270	KRUKUT	12.7	22.5	0.6	2.3	1	Other
271	KRUKUT	12.8	24.7	0.7	2.1	1	Other
272	KRUKUT	10.1	30.0	0.7	2.5	1	Other
273	KRUKUT	10.1	60.0	0.7	2.4	1	Other
274	SUNTER	51.5	27.9	1.3	3.1	3	B
275	SUNTER	9.6	5.0	0.5	1.6	1	B
276	SUNTER	40.2	8.7	1.2	1.2	3	B
277	SUNTER	40.1	11.1	1.0	1.6	3	B
278	SUNTER	36.3	9.2	0.5	2.4	5	E
279	SUNTER	34.8	9.2	0.5	2.8	5	E
280	SUNTER	36.5	12.0	0.5	2.5	5	E
281	SUNTER	43.7	7.4	1.5	1.7	3	B
282	SUNTER	27.9	8.7	0.6	4.7	2	E
283	SUNTER	20.0	33.4	0.7	3.0	1	E
284	SUNTER	32.0	16.0	1.2	3.3	1	B
285	SUNTER	19.5	16.0	1.2	2.7	1	B
286	SUNTER	16.3	6.2	1.3	4.2	1	E
287	SUNTER	18.2	7.6	1.1	2.5	1	E
288	SUNTER	13.8	7.5	0.7	3.1	1	E
289	SUNTER	27.4	9.6	1.3	3.7	1	A
290	SUNTER	21.0	16.5	1.2	3.7	1	E
291	CIPINANG	21.0	15.6	1.1	3.5	1	Other
292	CIPINANG	21.5	8.1	1.2	3.2	1	E
293	CIPINANG	16.8	5.7	1.4	2.3	1	E
294	CIPINANG	15.4	5.2	0.6	2.2	1	E
295	CIPINANG	15.9	6.8	0.8	2.2	1	E
296	JELANGKENG	37.2	46.9	1.0	1.0	3	A
297	JELANGKENG	31.8	10.0	1.4	2.3	4	E
298	JELANGKENG	20.0	10.0	1.0	2.6	1	Other
299	EAST BARU CANAL	20.0	9.0	1.0	2.2	1	E
300	JEMBATAN LIMA	5.2	10.0	0.3	0.8	1	B
301	JEMBATAN LIMA	5.2	9.0	0.3	0.8	1	B
302	DURI	26.0	8.0	0.8	1.0	1	Other

Table E.6(6) Main Features of Existing Bridge

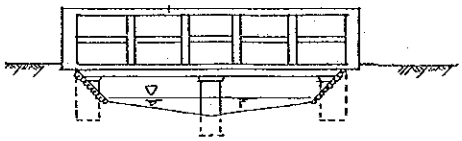
Bridge No.	River Name	Bridge Length (m)	Bridge Width (m)	Bridge Thickness (m)	Bridge Height (m)	Nos. of Span	Bridge Type
303	DURI	22.1	8.0	0.8	10.5	2	E
304	ANAK CILIWUNG	12.4	8.7	0.5	2.9	1	E
305	GAJAH MADA	9.4	25.0	0.9	1.9	1	E
306	GAJAH MADA	8.0	7.0	0.9	1.3	1	B
307	GAJAH MADA	5.2	7.5	1.0	0.9	1	Other
308	GAJAH MADA	7.5	7.6	1.0	0.9	1	B
309	GAJAH MADA	5.2	7.5	1.0	0.9	1	Other
310	SAHARI	13.4	36.6	1.1	1.4	1	A
311	CILIWUNG	29.4	10.0	0.6	3.1	1	Other
312	CILIWUNG	33.0	9.9	1.0	2.3	3	Other
313	CILIWUNG	9.3	13.3	0.6	1.2	1	Other
314	CILIWUNG	21.3	31.6	0.8	2.4	4	B
315	SAHARI	20.3	12.2	0.7	2.7	5	Other

Note (1) Bridge Thickness : Bridge Beam Height
(2) Bridge Height : Height form River Bed to Bridge Beam
(3) Bridge Type : Shown below

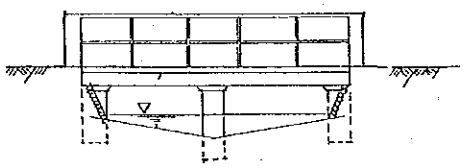
Source : JICA

Appendix-A

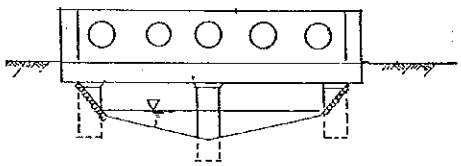
Type A : Concrete Bridge



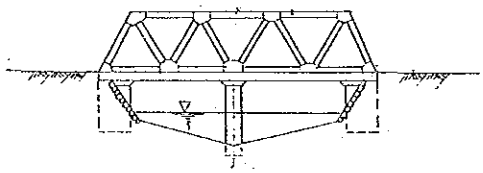
Type B : Iron Bridge



Type C : Concrete Bridge



Type D : Iron Bridge



Type E : Iron Bridge

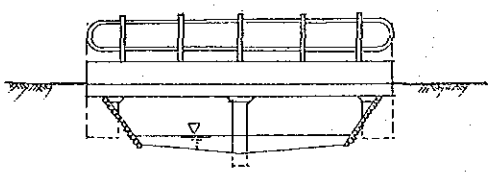


Table E.7 Existing Flow Capacity of Group II

River No.	River Name		River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
A	Kali Sekretaris	(1)	1 : 250	3.9	3.3	2.5	24
	- do -	(2)	1 : 900	3.1	2.8	1.3	4
	- do -	(3)	1 : 320	4.8	3.0	1.5	12
B	Jatipulo Tomang		1 : 1,700	4.0	3.0	1.5	5
	Kyai Tapa		1 : 5,000	7.5	6.4	2.6	14
C	Angke		1 : 4,000	15.0	10.5	4.0	61
D	Grcsik Surabaya		1 : 1,500	9.0	8.8	2.7	35
E	Cideng		1 : 1,300	12.0	11.0	2.5	47
F	Krukut		1 : 1,700	15.0	11.2	3.9	94
G	Cideng		1 : 5,000	18.0	9.4	3.7	52
H	Cideng		1 : 1,790	19.0	19.0	2.5	71
I	Jelangkeng		1 : 5,000	18.0	17.0	3.0	51
J	Cibubur		1 : 1,570	4.2	4.2	3.0	15
K	Angke		1 : 5,000	12.4	7.9	2.7	23
L	Angke		1 : 5,000	12.0	8.0	1.6	10
M	Jelangkeng		1 : 1,700	18.0	18.0	3.0	90
N	Jembatan Dua		1 : 5,000	10.0	7.0	2.5	17
O	Bandengan		1 : 190	8.0	6.0	2.0	16
P	Pluit		1 : 1,880	7.5	6.5	2.6	22
Q	Cideng		1 : 1,700	20.8	18.5	1.2	24
R	Ciliwung		1 : 5,000	15.0	8.3	3.8	45
S	Muara Karang		1 : 5,000	31.4	26.6	2.8	82
T	Sentiong		1 : 1,750	17.4	17.4	3.5	107
U	K. Item		1 : 5,000	10.9	7.8	1.8	12
V	Sentiong		1 : 5,000	17.0	16.0	3.0	48
W	Sunter C.		1 : 5,000	11.5	9.7	2.4	21
X	Sentiong		1 : 5,000	25.4	24.0	2.0	41

Table E.8(1) Existing Flow Capacity of Group III

River No.	River Name		River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
1-1	Kamal	(1)	1 : 1600	10.0	9.0	0.5	3
	- do -	(2)	1 : 3000	14.0	12.0	1.0	9
	- do -	(3)	1 : 3000	18.0	15.2	1.4	20
1-2	Tanjungan		1 : 3000	5.0	2.4	1.3	4
2-1	Kali Gede/Bor	(1)	1 : 2000	4.0	2.2	0.9	2
	- do -	(2)	1 : 2000	4.0	0.8	1.6	3
2-2	Saluran Cengkareng	(1)	1 : 2000	4.0	1.6	1.2	3
	- do -	(2)	1 : 2000	6.0	2.4	1.8	7
2-3	Padongkelan		1 : 2000	5.0	3.6	0.7	2
3	Semanan		1 : 2000	4.0	2.8	1.5	4
4	Kreo		1 : 1920	13.0	4.5	2.7	30
5	Ulujami	(1)	1 : 830	4.5	4.2	3.1	22
	- do -	(2)	1 : 1040	6.0	5.4	2.9	27
	- do -	(3)	1 : 830	8.0	6.5	3.4	51
6	Sepak		1 : 850	11.6	6.5	2.7	49
7	Pesanggrahan bawah		1 : 1110	2.1	1.9	1.1	2
8	Kedaung		1 : 2080	8.0	6.0	1.4	9
9	Kedaung		1 : 2080	12.0	10.0	3.0	46
10	Kedaung		1 : 2080	8.0	6.0	1.4	9
11	Mookervart		1 : 5000	30.0	21.0	4.5	147
12	Mookervart		1 : 5000	30.1	21.0	4.5	147
13	Kedoya		1 : 1250	12.4	7.9	2.7	47
14	Cilawe	(1)	1 : 2700	14.3	9.7	2.4	32
	- do -	(2)	1 : 200	4.5	3.6	1.5	16
15	Ciragil		1 : 420	6.2	4.5	3.3	46
16	Krukut		1 : 110	5.3	2.6	1.5	21
17	Mampang	(1)	1 : 380	7.7	6.4	2.7	53
	- do -	(2)	1 : 250	4.7	3.5	2.3	26
18	Mampang		1 : 280	4.7	3.0	2.3	23
19	Mampang	(1)	1 : 610	9.3	8.7	3.7	88
	- do -	(2)	1 : 300	8.0	7.1	2.0	43
	- do -	(3)	1 : 540	10.6	9.5	2.6	66
	- do -	(4)	1 : 810	8.8	7.6	4.2	80
20	Cideng Atas	(1)	1 : 350	4.5	4.0	1.6	14
	- do -	(2)	1 : 560	5.0	2.2	3.0	21
21	Warung		1 : 440	5.0	2.0	2.3	16
22	Cideng		1 : 580	12.0	8.0	3.0	78
23	K.Baru Barat/PS.Minggu	(1)	1 : 120	4.0	2.0	1.2	10
	- do -	(2)	1 : 150	4.0	2.0	1.3	10
	- do -	(3)	1 : 430	7.0	4.6	4.4	75
	- do -	(4)	1 : 660	7.9	7.9	3.1	55
	- do -	(5)	1 : 330	9.5	6.0	2.5	58
	- do -	(6)	1 : 270	8.0	5.0	2.7	58
24	Ciliwung		1 : 190	5.3	3.2	1.5	18
25	Rawa Bilai		1 : 380	8.0	4.0	2.0	28
26	K. Bata Timur	(1)	1 : 320	5.5	4.6	2.2	28
	- do -	(2)	1 : 550	14.2	6.8	2.7	71
27	K. Bata		1 : 550	10.2	7.0	2.1	40
28	K. Bata		1 : 550	11.8	8.8	3.4	100
29	Bali Matraman		1 : 380	6.0	5.0	4.5	74
30	Goseng		1 : 480	12.4	6.0	3.2	84
31	Cijantang		1 : 200	8.6	2.1	2.3	40
32	Ciliwung		1 : 180	8.0	4.0	2.8	67
33	K.Baru Timur	(1)	1 : 240	4.0	2.6	1.4	10
	- do -	(2)	1 : 330	4.0	2.5	1.5	9
	- do -	(3)	1 : 260	4.7	3.2	1.5	14
	- do -	(4)	1 : 400	14.5	10.9	1.9	63
	- do -	(5)	1 : 950	17.0	14.0	1.5	36

Table E.8(2) Existing Flow Capacity of Group III

River No.	River Name		River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
34	Sentiong		1 : 530	2.6	2.4	0.9	3
35	Kali Baru Timur	(1)	1 : 860	8.8	5.6	2.9	41
	- do -	(2)	1 : 1530	12.5	8.8	4.0	79
36	Cipinang		1 : 240	4.0	3.0	2.3	21
37	Cipinang		1 : 300	3.5	2.8	2.8	21
38	Cipinang		1 : 250	9.7	7.2	2.4	70
39	Cipinang		1 : 240	5.6	5.0	2.5	41
40	Sunter		1 : 240	10.3	10.0	3.2	132
41	Sunter		1 : 200	11.4	11.4	3.8	212
42	Sunter	(1)	1 : 320	10.0	8.0	3.2	101
	- do -	(2)	1 : 200	8.3	7.3	3.0	96
43	Sunter		1 : 360	5.9	5.5	2.7	41
44	Salemba	(1)	1 : 740	20.7	16.7	2.7	124
	- do -	(2)	1 : 1620	18.7	13.5	4.1	132
45	Kali Baru Senen		1 : 2380	9.0	8.5	2.0	18
46	Mati		1 : 1860	10.0	7.0	1.8	17
47	Lagoa		1 : 5000	13.5	13.0	2.7	32
48	Koja		1 : 5000	40.0	35.0	1.0	20
49	Kebon Bawang		1 : 5000	6.0	5.3	2.3	9
50	Lagoat Timur		1 : 5000	20.0	21.0	1.5	20
51	Lagoa		1 : 5000	50.0	45.0	3.0	156
52	Lagoat Timur		1 : 5000	14.1	13.0	2.0	21
53	Bambu		1 : 3700	5.5	5.5	1.5	5
54	Lagoat Tenggiri		1 : 5000	9.5	8.5	2.0	13
55	Utan Kayu	(1)	1 : 650	10.6	9.3	3.6	94
	- do -	(2)	1 : 4000	13.0	12.0	3.5	48
56	Rawa Badak		1 : 1300	6.0	6.0	2.0	15
57	Utan Kayu		1 : 630	15.0	13.0	4.0	171
58	Cipinang		1 : 600	4.5	3.7	1.3	8
59	Rawamangun		1 : 1040	6.4	5.0	2.4	21
60	Kayu Putih Utara		1 : 1200	14.7	9.3	2.8	61
61	Pulo Nangka		1 : 1870	11.9	9.7	2.0	26
62	Kayu Putih Selatan		1 : 1170	6.5	6.5	2.7	27
63	Pula Mas Barat		1 : 1110	4.0	3.5	2.2	10
64	Pulo Gadung		1 : 2250	7.2	7.2	5.5	56
65	Rawa Gate		1 : 5000	15.0	10.0	4.5	63
66	Pulo Gadung		1 : 5000	15.0	10.0	4.5	63
67	Sukapura		1 : 5000	7.0	5.5	5.5	32
68	Tugu Batu		1 : 5000	15.0	10.0	4.5	63
69	Rawa Gatel		1 : 5000	15.0	10.0	4.5	63
70	Kelapa Gadiung		1 : 5000	15.0	10.0	4.5	63
71	Kelapa Nias		1 : 5000	15.0	10.0	4.5	63
72	Tugu Batu		1 : 5000	8.5	6.0	2.3	12
73	Rawa Badak		1 : 5000	8.3	7.1	2.0	11
74	Rawa Badak		1 : 5000	8.2	7.2	2.1	11
75	Pelumpang		1 : 2000	5.6	5.0	1.8	9
76	Cakung Lama	(1)	1 : 1890	4.8	4.6	1.5	6
	- do -	(2)	1 : 5000	7.8	6.5	1.5	6
77	Pandang		1 : 5000	11.0	7.5	1.7	10
78	Cakung		1 : 5000	5.5	4.4	1.5	4
79	Jati Bening		1 : 5000	11.0	8.0	1.7	11
80	Jati Bening		1 : 5000	11.0	7.5	1.7	10
81	Sal. Bekasi tengah		1 : 5000	12.5	9.5	2.8	27

Table E.9(1) Existing Flow Capacity at Bridge Site

River No.	River Name	River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
1	KAMAL	1 : 2,500	13.7	8.7	2.8	21
2	KEMBANGAN	1 : 1,110	37.2	10.3	5.6	15
3	KEMBANGAN	1 : 1,110	11.4	7.2	3.2	14
4	SEPAK	1 : 850	18.1	10.4	4.4	18
5	SEPAK	1 : 850	17.9	10.0	4.5	22
6	SEPAK	1 : 850	18.3	10.0	4.7	22
7	KREO	1 : 1,920	17.8	16.5	3.0	28
8	KREO	1 : 1,920	17.0	15.0	3.5	22
9	KREO	1 : 1,920	17.0	15.0	3.5	22
10	KREO	1 : 1,920	17.0	15.0	3.5	22
11	KREO	1 : 1,920	10.6	6.5	3.0	23
12	DAANMOGOT	1 : 830	13.7	4.7	0.8	53
13	DAANMOGOT	1 : 1,040	12.4	4.2	2.9	26
14	DAANMOGOT	1 : 830	13.7	7.0	2.5	24
15	DAANMOGOT	1 : 830	12.6	4.0	2.9	20
16	SEKRETARIS	1 : 320	14.5	13.5	3.5	63
17	SEKRETARIS	1 : 320	6.0	4.7	1.3	53
18	SEKRETARIS	1 : 900	16.9	15.0	2.1	74
19	SEKRETARIS	1 : 900	4.2	4.0	1.8	18
20	SEKRETARIS	1 : 900	7.2	6.8	1.7	42
21	SEKRETARIS	1 : 900	7.1	6.5	2.3	35
22	SEKRETARIS	1 : 900	7.0	6.4	2.1	37
23	SEKRETARIS	1 : 900	7.0	6.4	2.6	33
24	SEKRETARIS	1 : 900	7.3	6.5	1.8	21
25	SEKRETARIS	1 : 900	7.0	5.6	2.5	14
26	SEKRETARIS	1 : 900	7.0	5.6	2.6	32
27	SEKRETARIS	1 : 900	5.0	3.2	2.1	27
28	SEKRETARIS	1 : 900	7.9	6.2	1.4	10
29	SEKRETARIS	1 : 900	8.8	4.7	1.9	10
30	SEKRETARIS	1 : 900	6.1	3.0	2.1	38
31	SEKRETARIS	1 : 250	3.5	3.0	1.5	27
32	SEKRETARIS	1 : 250	3.0	2.6	1.5	41
33	SEKRETARIS	1 : 250	10.7	8.5	2.4	36
34	SEKRETARIS	1 : 250	12.7	10.9	5.8	23
35	MUARA KARANG	1 : 5,000	48.5	25.3	1.7	55
36	MUARA KARANG	1 : 5,000	49.5	43.0	1.2	67
37	MUARA KARANG	1 : 5,000	29.2	26.6	1.2	73
38	CILAWE	1 : 2,700	5.2	5.2	2.3	28
39	CILAWE	1 : 200	8.6	6.0	2.0	27
40	CILAWE	1 : 200	8.9	8.0	2.0	30
41	CILAWE	1 : 200	9.0	7.4	2.0	28
42	CILAWE	1 : 200	8.3	8.3	3.0	28
43	PLUIT	1 : 1,880	37.9	33.0	1.0	73
44	PLUIT	1 : 1,880	59.0	43.5	3.6	27
45	ANGKE	1 : 4,000	9.9	7.9	1.2	54
46	ANGKE	1 : 4,000	14.0	12.0	2.8	54
47	CIDENG	1 : 1,700	14.2	14.2	3.2	27
48	CIDENG	1 : 1,700	19.3	9.1	3.2	29
49	CIDENG	1 : 1,700	27.7	20.9	1.6	30
50	CIDENG	1 : 1,700	21.9	21.9	2.5	29
51	CIDENG	1 : 1,700	8.6	17.6	1.8	36
52	CIDENG	1 : 1,700	17.6	15.0	2.5	28
53	CIDENG	1 : 1,700	13.9	12.2	2.2	30
54	CIDENG	1 : 1,700	16.5	9.4	3.1	18
55	CIDENG	1 : 1,700	12.3	8.5	3.2	54
56	CIDENG	1 : 1,700	33.0	20.0	1.0	89
57	CIDENG	1 : 1,700	24.8	20.6	2.4	33
58	CIDENG	1 : 1,700	16.8	15.6	1.0	60
59	CIDENG	1 : 1,700	18.0	10.0	1.0	34
60	CIDENG	1 : 1,700	14.7	14.7	3.0	47

Table E.9(2) Existing Flow Capacity at Bridge Site

River No.	River Name	River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
61	CIDENG	1 : 1,700	31.8	26.4	2.2	37
62	CIDENG	1 : 1,700	15.1	15.0	2.7	41
63	CIDENG	1 : 1,700	17.2	11.3	3.0	31
64	CIDENG	1 : 1,700	16.2	11.6	3.5	11
65	CILIWUNG	1 : 5,000	12.4	12.0	2.9	37
66	CILIWUNG	1 : 5,000	31.8	27.0	1.7	47
67	CILIWUNG GAJAH MADA	1 : 5,000	17.0	16.3	2.3	34
68	CILIWUNG GAJAH MADA	1 : 5,000	12.7	11.5	2.1	37
69	CILIWUNG GAJAH MADA	1 : 5,000	12.5	8.3	2.4	40
70	KRUKUT	1 : 1,700	14.2	11.2	2.9	35
71	KRUKUT	1 : 1,700	32.0	27.5	7.2	10
72	CIRAGIL	1 : 420	10.0	6.0	2.4	31
73	CIRAGIL	1 : 420	11.0	5.8	2.0	32
74	CIRAGIL	1 : 420	9.9	5.3	2.1	40
75	CIRAGIL	1 : 420	10.1	5.9	2.2	39
76	CIRAGIL	1 : 420	10.0	6.0	2.1	27
77	MAMPANG	1 : 810	7.5	7.5	4.0	28
78	MAMPANG	1 : 540	10.3	9.5	2.0	27
79	MAMPANG	1 : 540	7.7	7.1	1.5	30
80	MAMPANG	1 : 540	9.3	8.7	2.9	28
81	MAMPANG	1 : 300	9.1	5.1	2.2	28
82	MAMPANG	1 : 610	7.5	7.0	2.2	24
83	MAMPANG	1 : 250	4.0	3.0	2.1	15
84	CIDENG	1 : 580	18.1	3.0	4.1	31
85	CIDENG	1 : 580	20.5	10.5	3.5	42
86	CIDENG	1 : 580	15.0	11.0	2.0	31
87	CIDENG ATAS	1 : 560	4.5	3.0	2.1	28
88	CIDENG ATAS	1 : 560	4.4	4.0	1.4	14
89	KALIBARU BARAT/PS.MINGGU	1 : 270	5.5	4.1	2.2	32
90	KALIBARU BARAT/PS.MINGGU	1 : 270	10.3	10.3	2.0	27
91	KALIBARU BARAT/PS.MINGGU	1 : 270	7.6	6.4	2.0	24
92	KALIBARU BARAT/PS.MINGGU	1 : 270	8.2	6.5	1.7	26
93	KALIBARU BARAT/PS.MINGGU	1 : 270	7.4	6.0	1.2	20
94	KALIBARU BARAT/PS.MINGGU	1 : 270	7.0	5.8	1.8	22
95	KALIBARU BARAT/PS.MINGGU	1 : 270	3.0	3.0	2.9	11
96	KALIBARU BARAT/PS.MINGGU	1 : 270	3.3	3.3	3.0	11
97	KALIBARU BARAT/PS.MINGGU	1 : 330	5.9	6.6	3.5	14
98	KALIBARU BARAT/PS.MINGGU	1 : 330	4.2	3.5	2.4	24
99	KALIBARU BARAT/PS.MINGGU	1 : 330	10.8	6.6	2.2	36
100	KALIBARU BARAT/PS.MINGGU	1 : 330	4.5	3.4	1.7	16
101	KALIBARU BARAT/PS.MINGGU	1 : 330	3.9	3.0	2.4	19
102	KALIBARU BARAT/PS.MINGGU	1 : 330	8.7	8.2	3.1	23
103	KALIBARU BARAT/PS.MINGGU	1 : 330	7.2	7.2	2.1	33
104	KALIBARU BARAT/PS.MINGGU	1 : 330	7.1	7.1	2.3	24
105	KALIBARU BARAT/PS.MINGGU	1 : 330	6.7	6.7	1.9	26
106	KALIBARU BARAT/PS.MINGGU	1 : 660	7.3	7.3	3.4	19
107	KALIBARU BARAT/PS.MINGGU	1 : 660	9.8	9.8	3.7	19
108	KALIBARU BARAT/PS.MINGGU	1 : 660	8.0	8.0	1.5	33
109	KALIBARU BARAT/PS.MINGGU	1 : 660	9.0	9.0	1.5	44
110	KALIBARU BARAT/PS.MINGGU	1 : 660	7.9	7.9	2.0	16
111	KALIBARU BARAT/PS.MINGGU	1 : 660	9.4	9.4	2.2	19
112	KALIBARU BARAT/PS.MINGGU	1 : 660	8.9	8.9	1.7	27
113	KALIBATA TIMUR	1 : 320	5.4	4.6	1.9	12
114	KALIBATA TIMUR	1 : 320	11.4	6.8	1.7	39
115	KALIBATA TIMUR	1 : 320	10.4	7.3	1.5	32
116	KALIBATA TIMUR	1 : 320	10.6	6.3	1.8	30
117	KALIBATA TIMUR	1 : 320	10.6	6.7	1.8	25
118	KALIBATA TIMUR	1 : 320	9.9	4.7	2.2	22
119	KALIBATA TIMUR	1 : 320	8.7	8.7	2.2	28
120	KALIBATA TIMUR	1 : 320	9.2	5.6	1.8	30

Table E.9(3) Existing Flow Capacity at Bridge Site

River No.	River Name	River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
121	KALIBATA TIMUR	1 : 320	8.9	5.3	1.8	24
122	KALIBATA TIMUR	1 : 320	8.5	4.7	1.8	22
123	KALIBATA TIMUR	1 : 320	7.1	4.3	1.7	25
124	CIJANTUNG	1 : 200	11.5	2.1	5.1	14
125	GOSENG	1 : 480	11.0	6.0	2.5	28
126	SALEMBA	1 : 5,000	22.9	20.5	1.1	35
127	SALEMBA	1 : 1,750	21.4	17.0	2.9	19
128	SALEMBA	1 : 1,750	22.4	17.7	1.2	86
129	SALEMBA	1 : 1,620	4.8	4.0	2.0	22
130	SALEMBA	1 : 1,620	21.6	14.2	1.3	79
131	SALEMBA	1 : 1,620	23.1	20.2	1.2	79
132	SALEMBA	1 : 1,620	16.4	12.3	3.2	26
133	SALEMBA	1 : 1,620	13.0	11.7	2.3	13
134	SALEMBA	1 : 740	12.3	9.5	2.7	16
135	SALEMBA	1 : 740	12.0	10.0	1.3	31
136	SALEMBA	1 : 740	12.0	11.0	1.3	32
137	SALEMBA	1 : 740	13.9	11.0	1.3	35
138	SALEMBA	1 : 740	12.5	10.0	2.7	22
139	SALEMBA	1 : 740	6.0	5.0	1.5	38
140	SALEMBA	1 : 740	10.2	10.2	0.8	34
141	SALEMBA	1 : 740	10.2	10.2	2.6	20
142	SALEMBA	1 : 1,530	8.8	8.8	3.5	17
143	SALEMBA	1 : 1,530	11.7	3.6	2.7	31
144	SALEMBA	1 : 1,530	13.1	3.5	2.2	27
145	KALIBARU TIMUR	1 : 1,530	10.0	8.5	3.0	28
146	KALIBARU TIMUR	1 : 1,530	6.5	3.8	2.2	23
147	KALIBARU TIMUR	1 : 860	7.7	6.5	2.5	18
148	KALIBARU TIMUR	1 : 1,530	6.8	6.0	4.0	13
149	KALIBARU TIMUR	1 : 860	7.0	7.0	2.5	22
150	KALIBARU TIMUR	1 : 860	15.9	8.4	2.4	14
151	KALIBARU TIMUR	1 : 860	8.3	4.8	2.2	33
152	KALIBARU TIMUR	1 : 860	10.1	5.4	2.5	18
153	KALIBARU TIMUR	1 : 860	11.5	8.1	2.1	28
154	KALIBARU TIMUR	1 : 860	4.7	4.7	4.2	11
155	KALIBARU TIMUR	1 : 860	11.9	11.9	1.7	33
156	KALIBARU TIMUR	1 : 860	9.3	3.7	2.8	24
157	KALIBARU TIMUR	1 : 860	10.1	4.1	2.2	33
158	KALIBARU TIMUR	1 : 530	6.5	5.5	2.5	28
159	KALIBARU	1 : 2,380	6.0	5.0	1.5	23
160	KALIBARU TIMUR	1 : 2,380	3.7	3.7	1.5	34
161	KALIBARU TIMUR	1 : 2,380	4.0	4.0	1.5	26
162	CIPINANG	1 : 240	15.9	7.6	4.4	28
163	CIPINANG	1 : 240	16.2	4.3	4.4	29
164	CIPINANG	1 : 240	15.6	9.2	2.6	24
165	CIPINANG	1 : 300	15.9	4.9	4.4	12
166	CIPINANG	1 : 300	3.0	2.8	2.6	9
167	CIPINANG	1 : 240	5.5	5.0	1.8	29
168	RAWAKERBAU	1 : 1,300	9.9	8.6	1.1	44
169	RAWAKERBAU	1 : 1,300	6.5	5.2	1.8	24
170	RAWAKERBAU	1 : 1,300	6.5	5.1	2.2	25
171	UTAN KAYU	1 : 650	23.2	23.2	2.5	18
172	UTAN KAYU	1 : 650	10.4	9.3	3.2	13
173	UTAN KAYU	1 : 650	10.5	10.5	1.2	51
174	UTAN KAYU	1 : 650	9.6	9.2	1.4	21
175	UTAN KAYU	1 : 650	8.1	7.8	2.0	21
176	UTAN KAYU	1 : 650	10.2	8.0	1.9	15
177	LAGOA	1 : 5,000	3.5	3.5	1.5	25
178	LAGOA	1 : 5,000	11.6	10.0	1.5	31
179	ITEM	1 : 5,000	20.4	10.5	1.5	25
180	ITEM	1 : 5,000	13.2	11.5	2.0	13

Table E.9(4) Existing Flow Capacity at Bridge Site

River No.	River Name	River Gradient	Top Width (m)	Bottom Width (m)	River Height (m)	River Capacity (m3/s)
181	KEBON BAWANG	1 : 5,000	37.1	27.0	1.3	43
182	KEBON BAWANG	1 : 5,000	10.2	7.6	2.8	27
183	KEBON BAWANG	1 : 5,000	4.2	4.2	3.0	10
184	KEBON BAWANG	1 : 5,000	5.1	5.1	2.0	8
185	KEBON BAWANG	1 : 5,000	5.4	5.4	1.5	6
186	KEBON BAWANG	1 : 5,000	5.1	5.1	1.5	6
187	KEBON BAWANG	1 : 5,000	5.6	5.6	1.5	6
188	KEBON BAWANG	1 : 5,000	6.3	6.3	1.5	7
189	KEBON BAWANG	1 : 5,000	6.9	5.9	1.3	6
190	KEBON BAWANG	1 : 5,000	5.7	5.7	1.3	5
191	KEBON BAWANG	1 : 5,000	6.0	6.0	1.2	5
192	KEBON BAWANG	1 : 5,000	6.0	6.0	1.2	5
193	KEBON BAWANG	1 : 5,000	6.0	6.0	1.2	5
194	KEBON BAWANG	1 : 5,000	6.0	6.0	1.3	5
195	RAWABADAK	1 : 5,000	4.5	4.5	1.5	5
196	RAWABADAK	1 : 5,000	4.5	4.5	1.5	5
197	ARTONIJON	1 : 1,870	35.0	35.0	1.8	120
198	ARTONIJON	1 : 1,870	25.0	10.0	1.4	41
199	RAWAMANGUN	1 : 1,870	10.8	10.8	2.6	47
200	RAWAMANGUN	1 : 1,870	12.0	12.0	2.5	51
201	RAWAMANGUN	1 : 1,170	4.3	3.5	1.5	7
202	RAWAMANGUN	1 : 1,170	3.4	3.0	1.5	5
203	RAWAMANGUN	1 : 1,870	10.6	10.6	2.5	44
204	RAWAMANGUN	1 : 1,870	15.8	3.7	2.1	35
205	KELAPA NIAS	1 : 5,000	8.0	8.0	3.0	24
206	KELAPA NIAS	1 : 5,000	15.7	15.0	1.2	17
207	KELAPANIAS	1 : 5,000	7.0	6.5	2.0	12
208	PULOGADUNG	1 : 5,000	6.5	6.5	2.1	12
209	PULOGADUNG	1 : 2,250	7.2	7.2	1.2	9
210	PULOGADUNG	1 : 2,250	6.0	6.0	1.2	8
211	PULOGADUNG	1 : 2,250	4.5	4.5	1.1	5
212	PULOGADUNG	1 : 2,250	6.0	6.0	1.2	8
213	KAYUPUTIH SELATAN	1 : 1,170	6.5	6.5	2.1	23
214	KAYUPUTIH SELATAN	1 : 1,170	9.8	9.6	1.4	23
215	KAYUPUTIH SELATAN	1 : 1,170	9.6	9.3	1.5	28
216	KAYUPUTIH SELATAN	1 : 1,170	12.7	12.7	2.9	81
217	KAYUPUTIH UTARA	1 : 1,170	12.1	9.3	2.3	53
218	KAYUPUTIH UTARA	1 : 1,170	13.7	8.1	2.3	56
219	KAYUPUTIH UTARA	1 : 1,170	10.6	8.2	2.9	60
220	KAYUPUTIH UTARA	1 : 1,170	2.8	2.1	2.2	6
221	KAYUPUTIH UTARA	1 : 1,170	6.5	6.5	2.1	23
222	CAKUNG	1 : 5,000	17.0	14.6	1.8	28
223	CAKUNG	1 : 5,000	16.2	14.5	1.0	12
224	CAKUNG	1 : 5,000	16.5	13.2	1.5	20
225	CAKUNG	1 : 5,000	13.4	10.0	1.7	20
226	CAKUNG LAMA	1 : 5,000	8.0	8.0	1.4	9
227	CAKUNG LAMA	1 : 5,000	12.6	12.6	1.2	15
228	MALANG	1 : 5,000	7.3	6.4	2.0	12
229	MALANG	1 : 5,000	6.3	9.5	1.1	5
230	MALANG	1 : 5,000	9.3	8.3	1.0	8
231	MALANG	1 : 5,000	1.2	1.2	2.5	1
232	MALANG	1 : 5,000	3.0	3.0	2.0	4
233	MALANG	1 : 5,000	1.8	1.8	2.5	2
234	MALANG	1 : 5,000	1.7	1.7	3.1	3
235	MALANG	1 : 5,000	10.0	8.0	1.5	11
236	SUNTER	1 : 360	5.4	5.4	2.5	35
237	SUNTER	1 : 200	10.3	10.0	3.2	145
238	PETUKANGAN	1 : 1,890	13.0	10.5	2.0	38
239	SUNTER	1 : 240	9.0	4.8	3.5	94

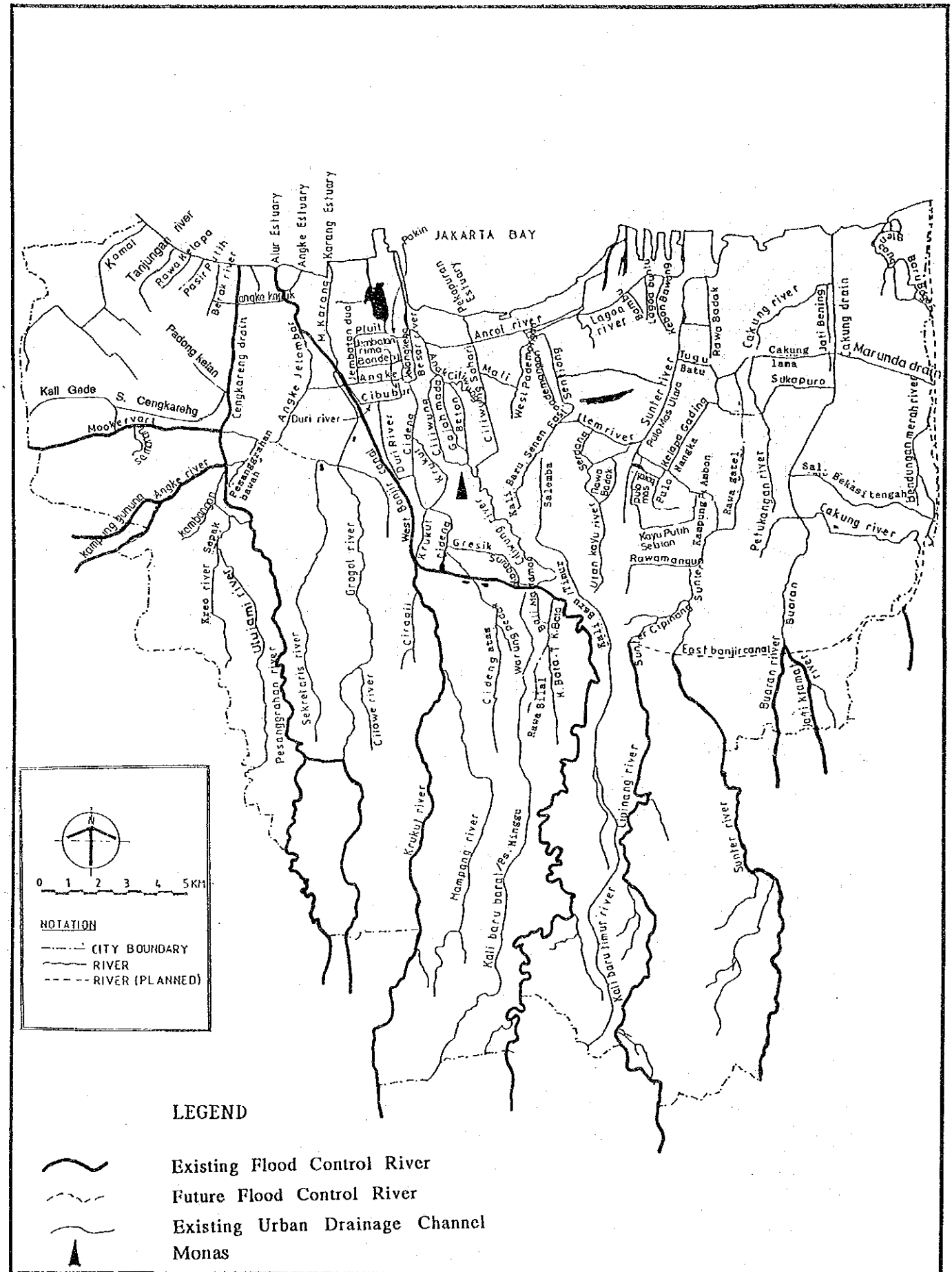


FIG. E.1 CLASSIFICATION OF WATER COURSES

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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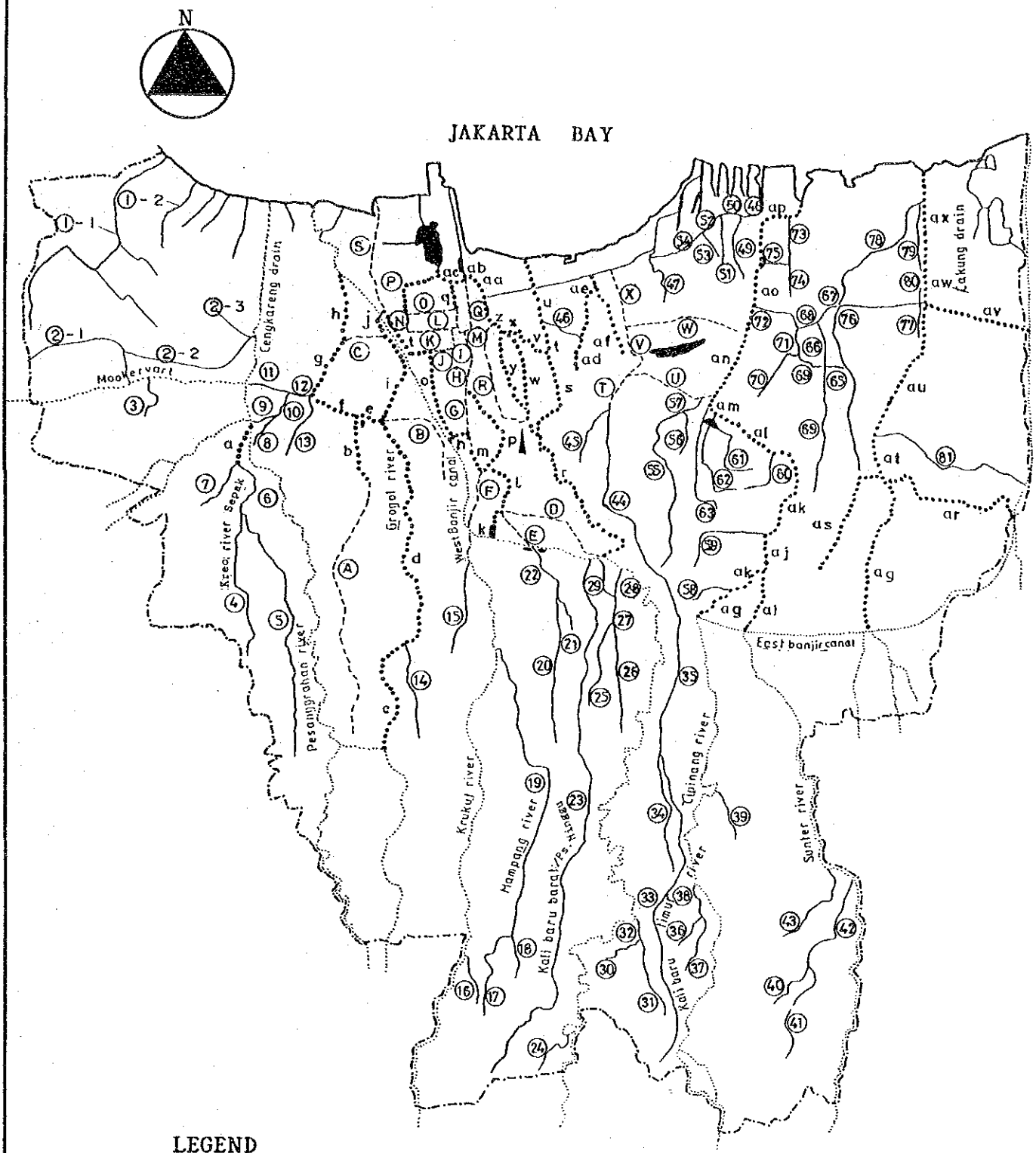
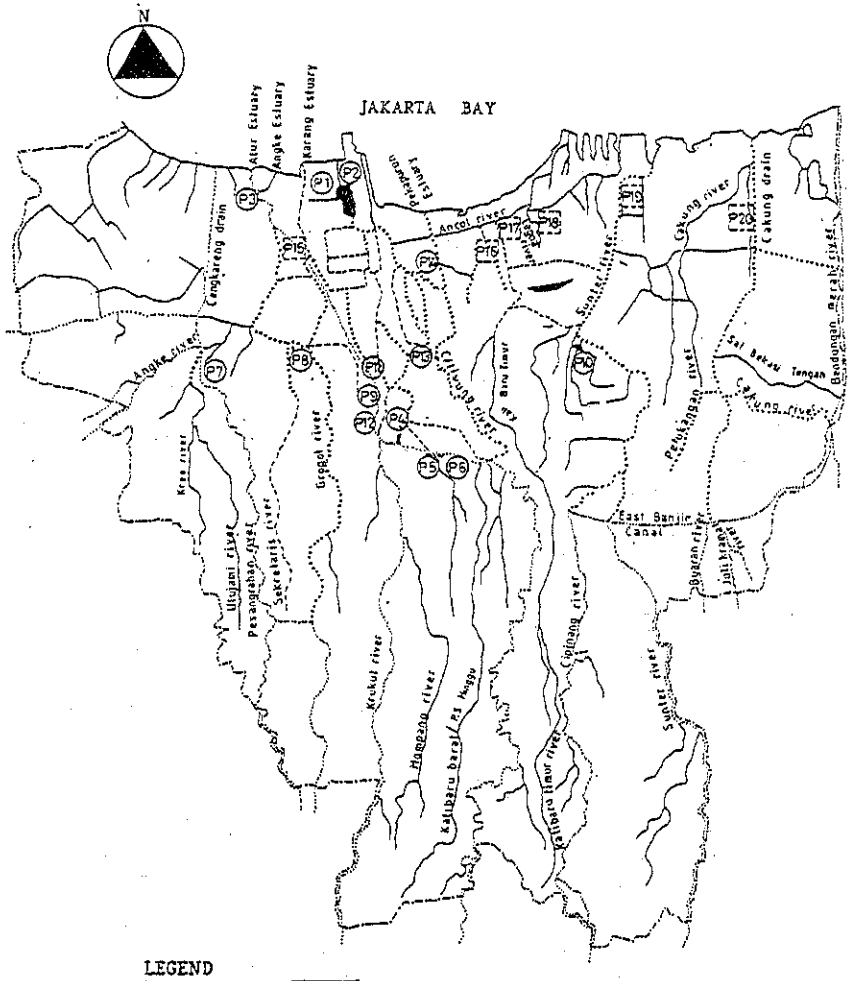


FIG. E.2 OBJECTIVE URBAN DRAINAGE CHANNELS

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA



LEGEND

- ——— : City Boundary
- ——— : Flood Control River
- ····· : Group I Urban Drainage
- ——— : Group II Urban Drainage
- ——— : Group III Urban Drainage
- : Monas

0 1 2 3 4 5 km

Name of Existing and On-Going Pumping Stations

Existing Pumping Station

No.	Name of Station	Name of River/Drainage to be installed	Total Capacity (m3/sec)	Remarks (*1)
P1	Pluit	Pluit pond	13.75	Managed by K
P2	Pluit	- do -	16.0	Managed by K
P3	Muara Angke	Angke river	2.6	Managed by K
P4	Melati	Banjir Canal	6	Managed by K
P5	Setiabudi Barat	K. Cideng	5.35	Managed by K
P6	Setiabudi Timur	K. Cideng	3.3	Managed by K
P7	Waduk Grogol	Pesanggarahan River	1.7	Managed by K
P8	Temang Barat	Sekretaris River	4.0	Managed by K
P9	Cideng	West Banjir Canal	40.0	Managed by K
P10	Pulo Mas	K. Sunter	7.5	Managed by D
P11	Rawa Kepa	West Banjir Canal	8.0	Managed by K
P12	Pondok Bandung	- do -	2.6	Managed by D
P13	Istana	Ciliwung	0.75	Managed by K
P14	Mangga Dua	Cideng	2.6	Managed by K
		Sub Total	114.15	

On-Going Pumping Stations

P15	Lower Angke	Angke	8.0	Managed by K
P16	Kemayoran Airport Redevelopment	To be named	4.0	Managed by K
P17	Ancol	Sunter	15.0	Managed by K
P18	Sunter West	Lagoa	10.0	Managed by K
P19	Sunter East III	Sunter	15.5	Managed by K
P20	Sunter East II	Sunter	5.2	Managed by K
		Sub Total	57.70	
		TOTAL	171.85	

Note : (*1) "K" means ··· J.F.C.P. Management of these station will be transferred to DKI in the future.

"D" means : DKI

(P1), (P2) --- (P14) Existing Pumping Station

P15, P16 --- P20 On-Going Pumping Station

FIG. E.3 LOCATION OF EXISTING AND ON-GOING PUMP STATIONS

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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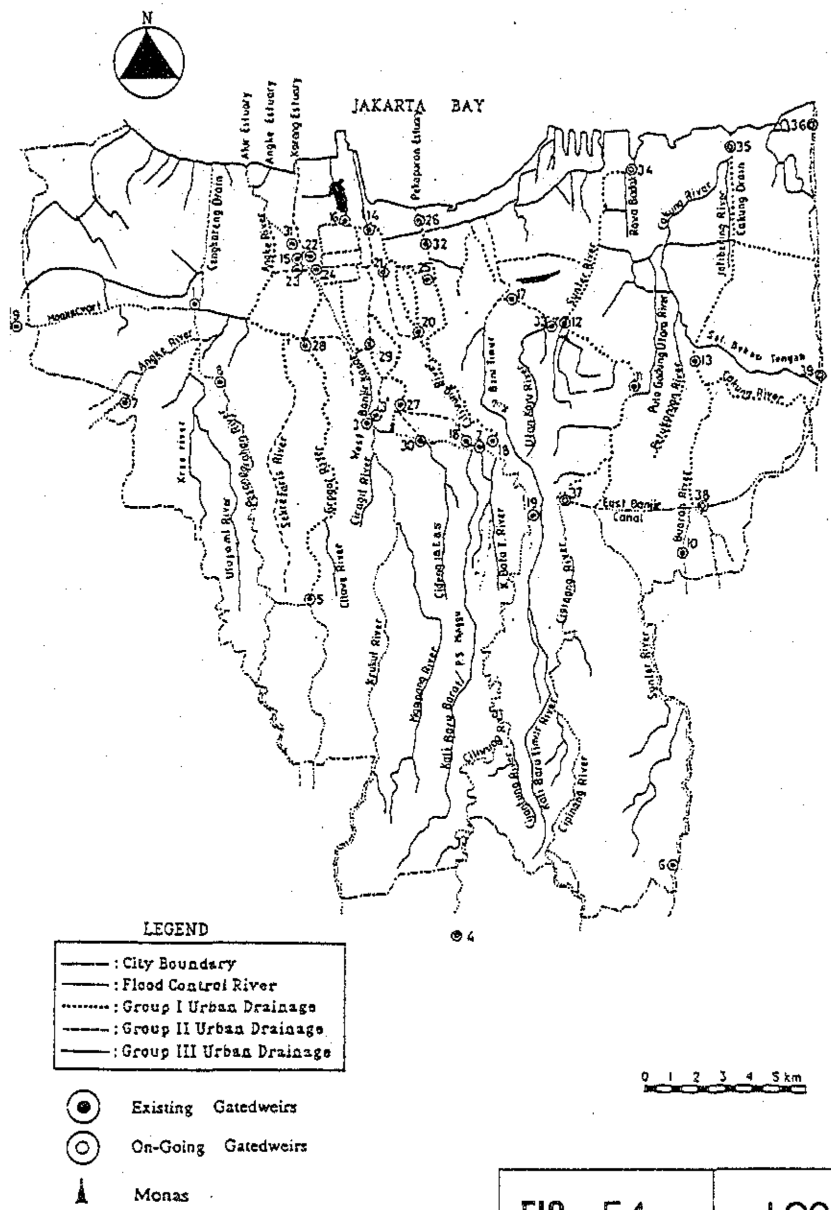

Name of Station and its Function

No.	Name of Station	Name of River/ Channel to be installed	Pupose of Control for	Remarks (*1)
1	Cengkareng	Cengkareng	Flood	Managed by K
2	Maggarai I	Ciliwung	Drainage	Managed by D
3	Karet	anjir Canal	Flood	Managed by D
3'	Karet II	- do -	Flushing	Managed by D
4	Katulampa	Pond	Drainage	Managed by K
5	Pondok Pinang	Pasanggarahan	- do -	Managed by K
6	Sunter Hulu	Sunter	- do -	Managed by K
7	Polor	Angke	Irrigation/ Drainage	Managed by K
8	Koneng	Pasanggarahan	- do -	Managed by K
9	Sewan	Mookervart	- do -	Managed by K
10	Tarum Barat to Saluran	Tarum Barat Canal	Water Supply/ Irrigation	Managed by K Managed by K
11	Pulo Gadung	Sunter	Flood	Managed by K
12	Sunter	- do -	- do -	Managed by K
13	Cakung	Cakung	- do -	Managed by K
14	Pasar Ikan	-	Drainage	Managed by D
15	Saringan Sampah Teluk Gong	Angke - do -	- do -	Managed by K
16	Syphon Pluit	Pluit Pond	Flood	Managed by K
17	Bendungan Jago	Jiung	- do -	Managed by K
18	Manggarai II	Ciliwung	Flood/Flushing	Managed by D
18'	Manggarai III	Surabaya Canal	Flushing	Managed by D
19	Tarum Barat II	Tarum Barat Canal		Managed by D
20	Capitol (Istiqlal)	Ciliwung	- do -	Managed by D
21	Tangi	- do -	- do -	Managed by D
22	Kali Duri	Duri	Flood	Managed by K
23	Kampung Gusti	Angke	Drainage	Managed by D
24	Jembatan Dua	Grogol	- do -	Managed by D
25	Jembatan Merah	Gunung Sahari	- do -	Managed by K
26	Pekapuran	- do -	Flood	Managed by K
27	Cideng	Cideng	- do -	Managed by K
28	Kyai Tapa	Ciliwung	- do -	Managed by K
29	Siantar	Duri	Flood	Managed by K
30	Syphon Cideng	Cideng	- do -	Managed by K
31	Syphon Teluk Gong	Angke	- do -	Managed by K
32	Saringan Sampah		Drainage	Managed by D
	Gunung Sahari	Gunung Sahari	Flood	Managed by K
33	Kali Item	Item	- do -	Managed by K
34	Salinity Barrier I	Sunter	Salinity Barrier	Managed by K
35	Salinity Barrier II	Cakung	- do -	Managed by K
36	Salinity Barrier III	East Banjir Canal	- do -	Managed by K
37	Doversion Structure	- do -	Flood	Managed by K
38	Weir I	- do -	- do -	Managed by K
39	Weir II	- do -	- do -	Managed by K

Note : (*1)
"K" means I.P.C.P Management of theses stations will be transferred to DKI in the future.
"D" means DKI

FIG. E.4 LOCATION OF EXISTING AND ON-GOING GATED WEIRS

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

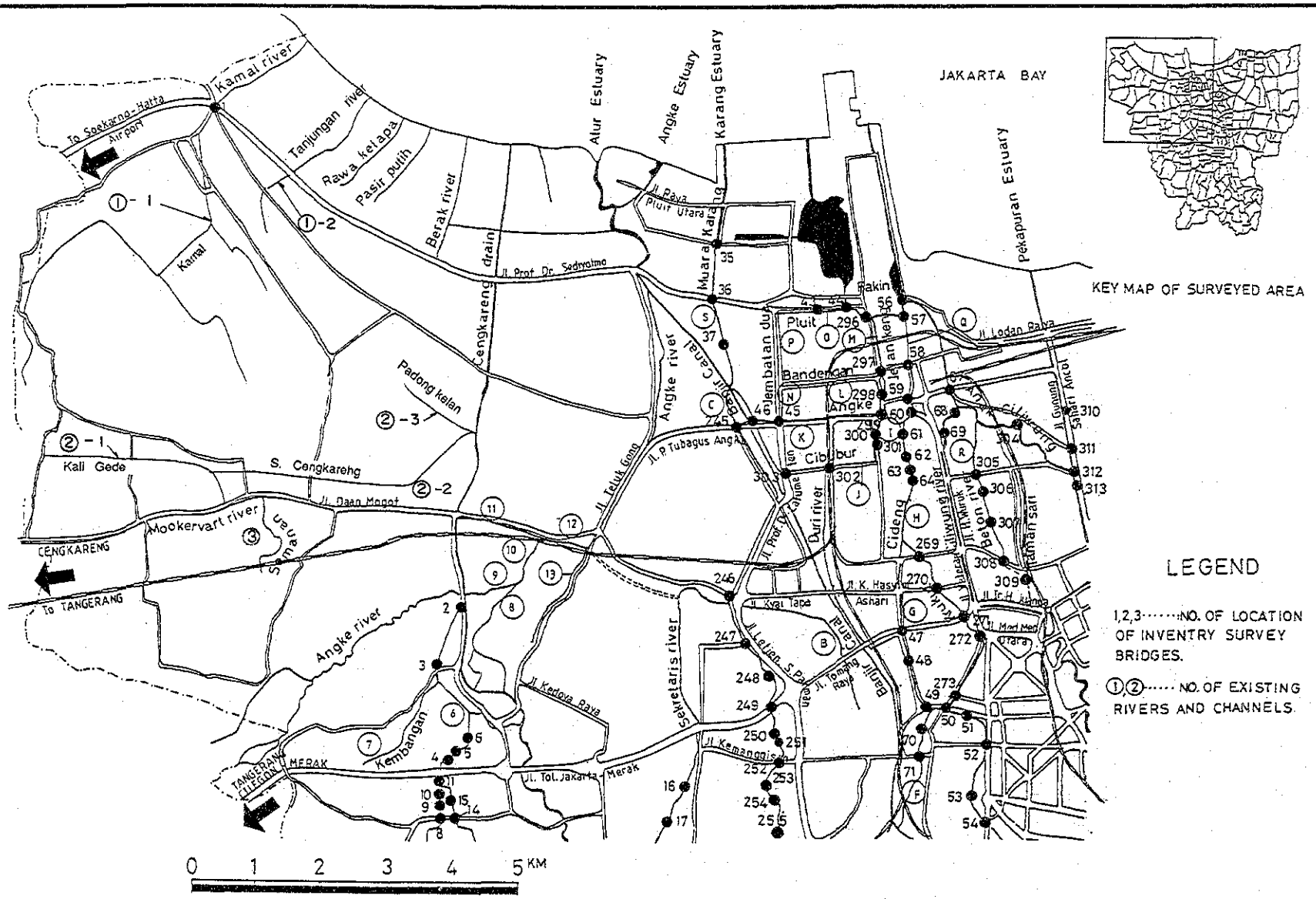

FIG. E.5(1) LOCATION OF EXISTING BRIDGES

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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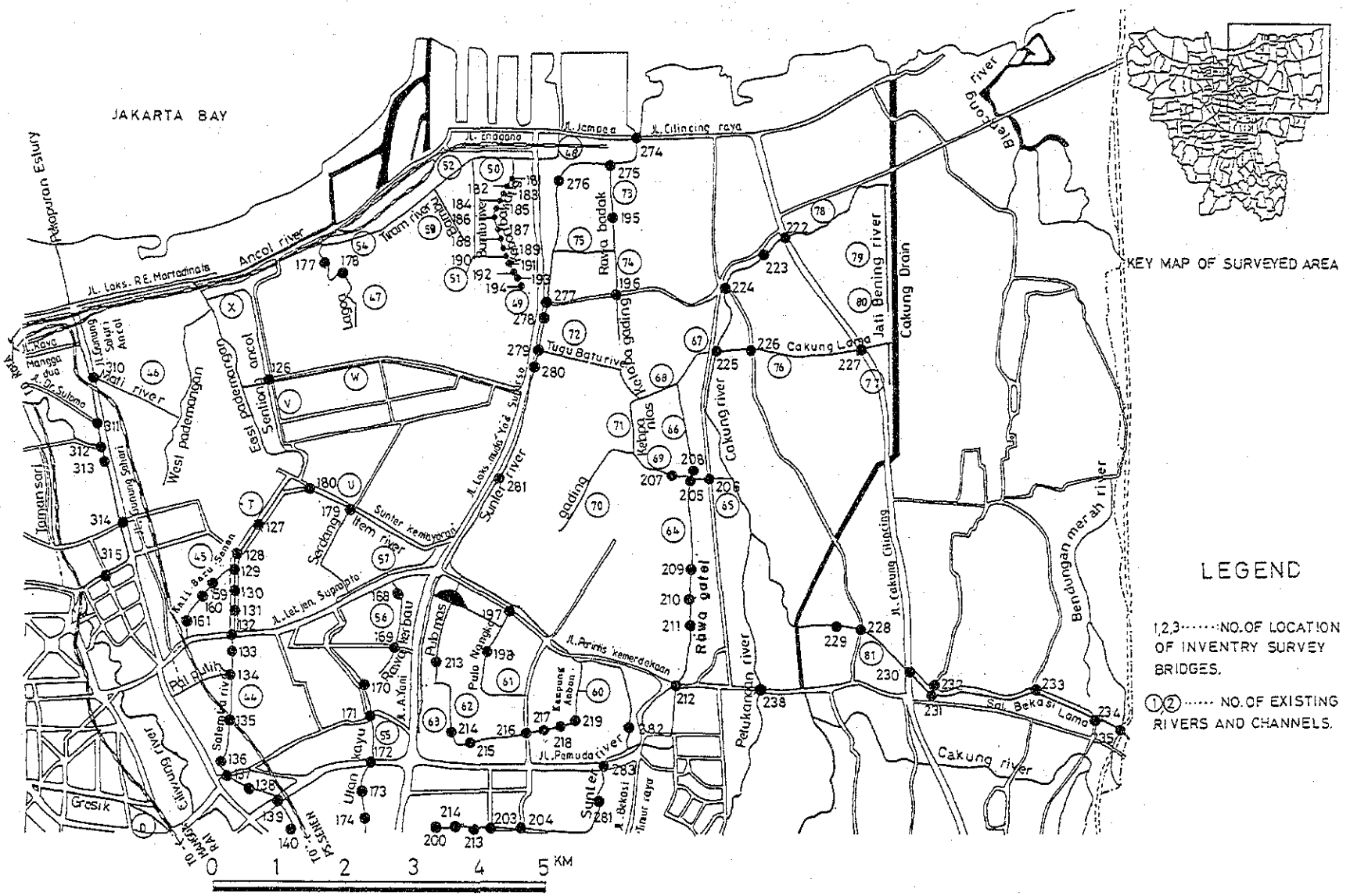

FIG. E.5(2) LOCATION OF EXISTING BRIDGES

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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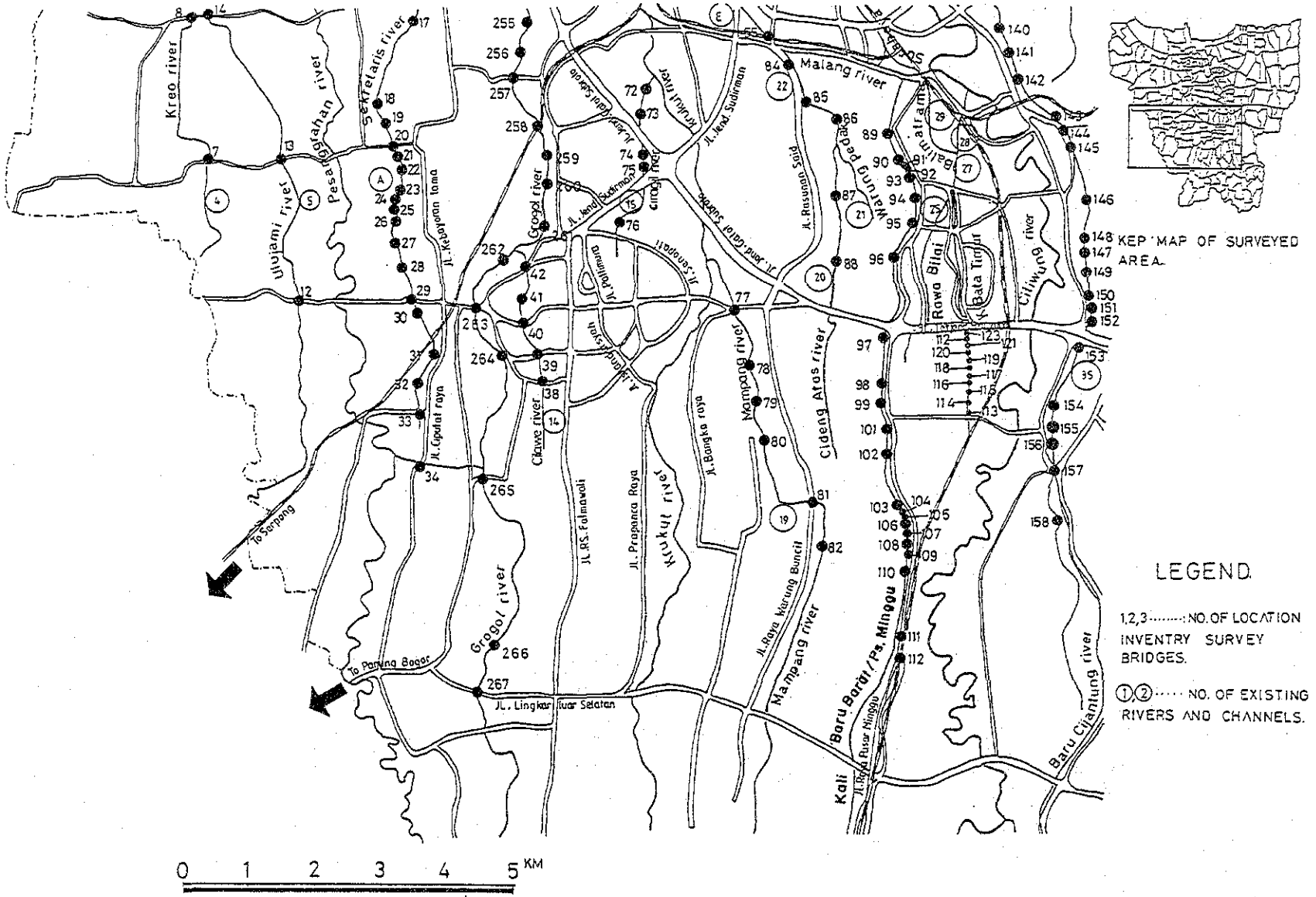

FIG. E.5(3) LOCATION OF EXISTING BRIDGES

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

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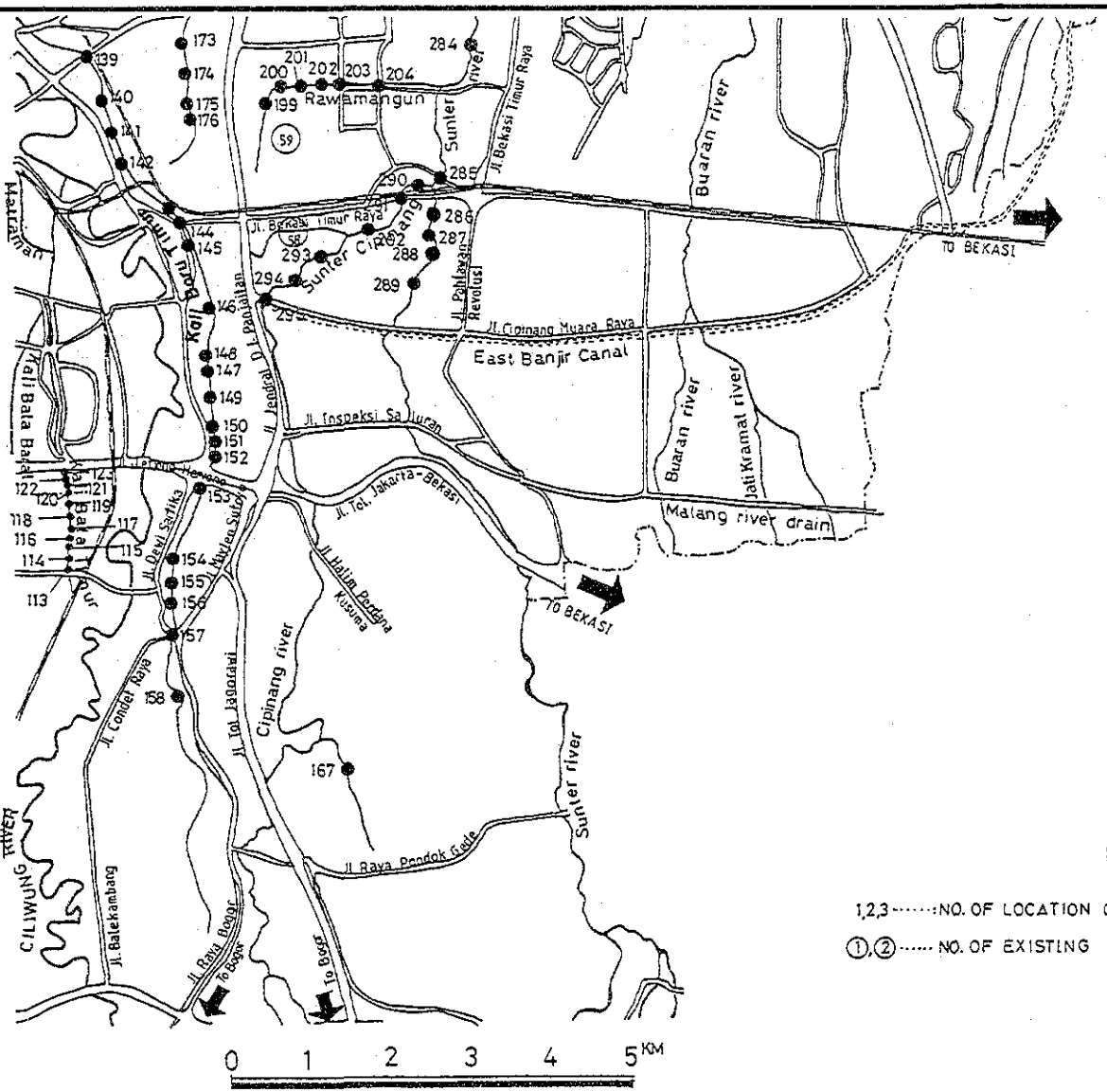

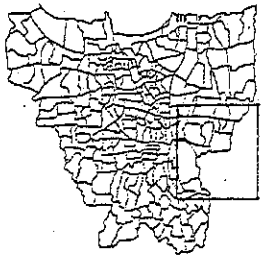

KEY MAP OF SURVEYED AREA

LEGEND

1,2,3 ·····: NO. OF LOCATION OF INVENTRY SURVEY BRIDGES

①,② ····· NO. OF EXISTING RIVERS AND CHANNELS

FIG. E.5(4) LOCATION OF EXISTING BRIDGES

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

JICA A.D 1991

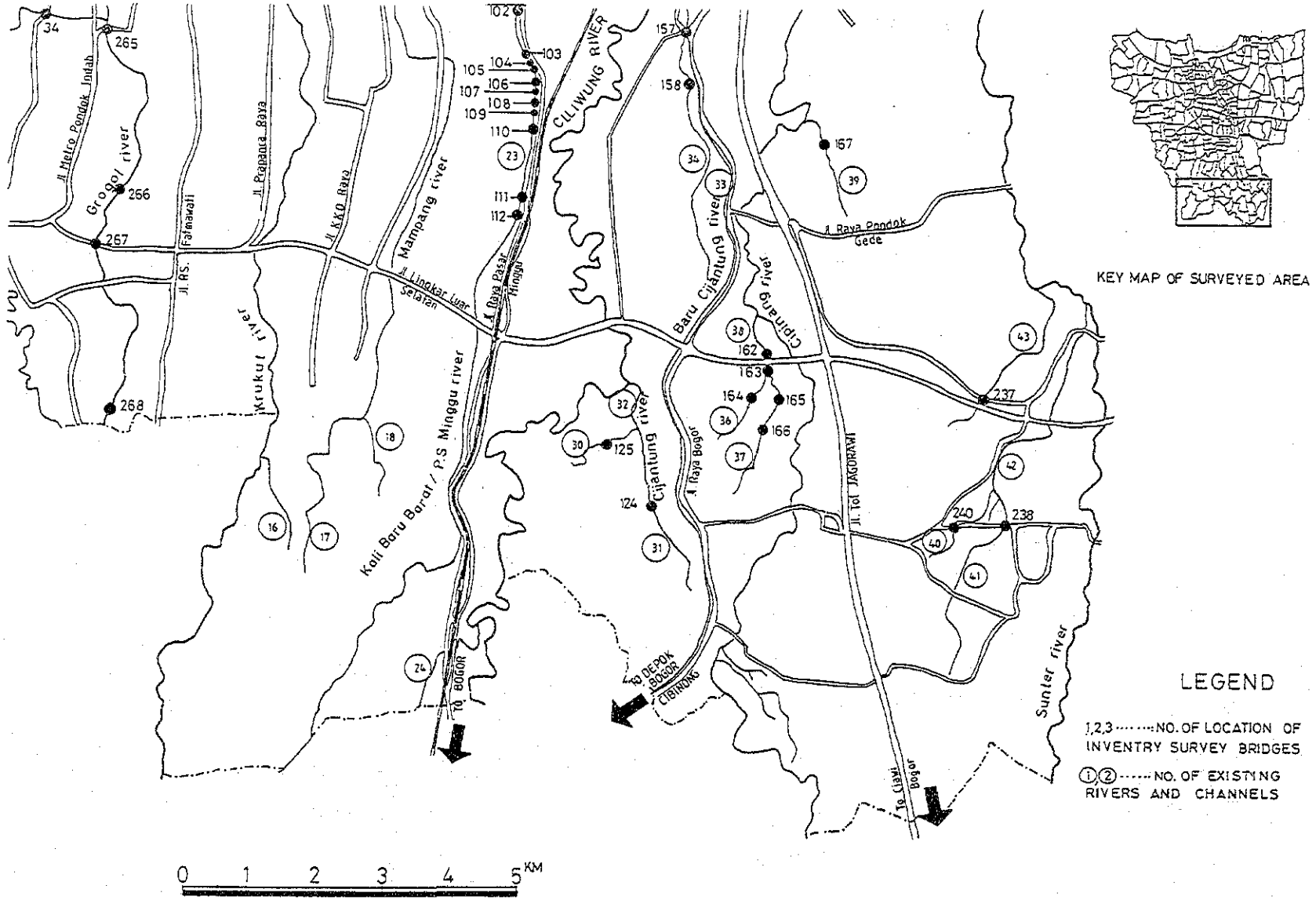

FIG. E.5(5) LOCATION OF EXISTING BRIDGES

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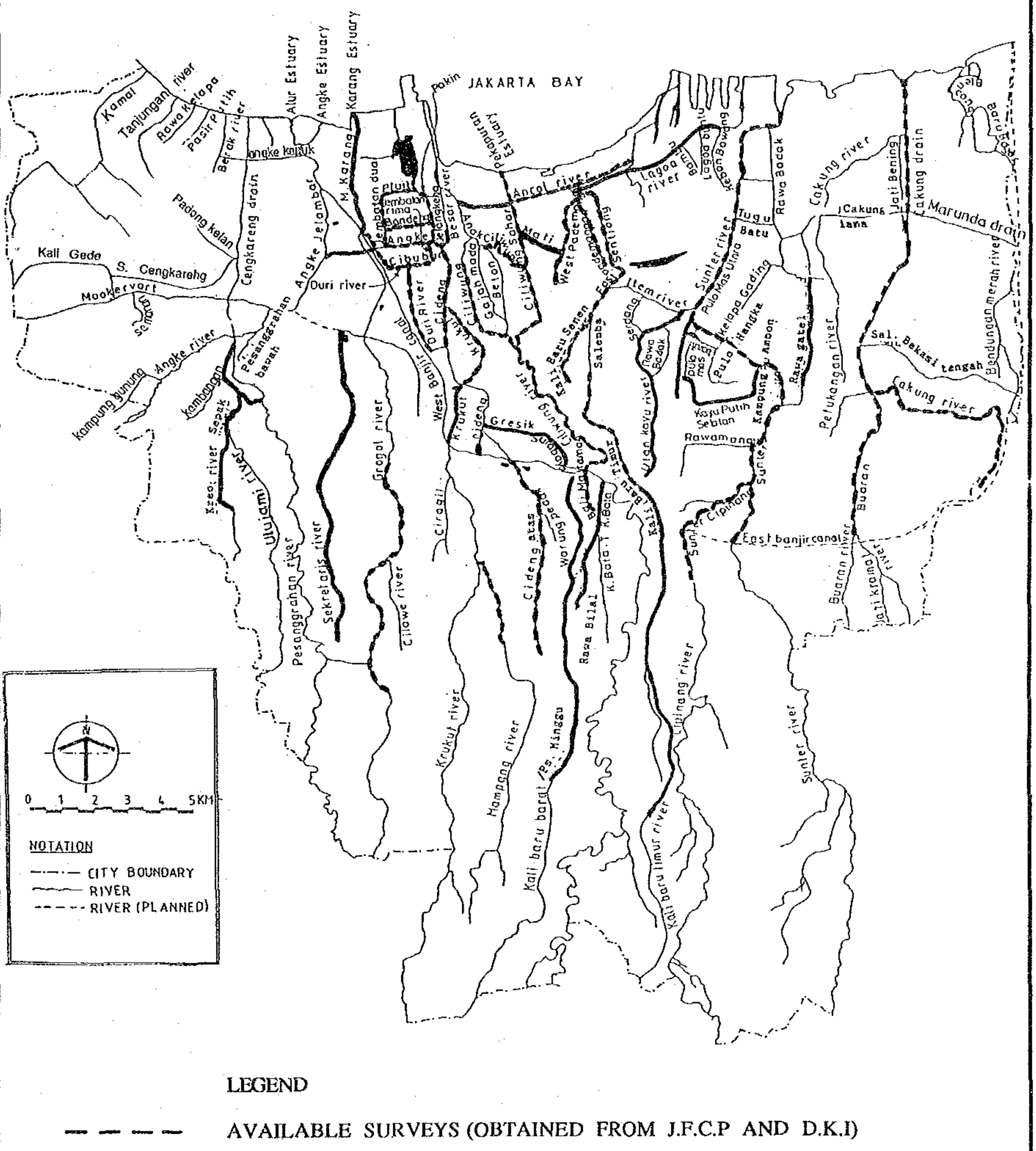
JICA A.D 1991



LEGEND

— — — — AVAILABLE SURVEYS (OBTAINED FROM J.F.C.P AND D.K.I)

——— SUPPLEMENTED SURVEYS (CONDUCTED BY JICA STUDY TEAM)

FIG. E.6 RIVER AND CHANNEL WITH AVAILABLE CROSS-SECTIONAL SURVEY

THE STUDY ON URBAN DRAINAGE AND WASTE WATER DISPOSAL PROJECT IN THE CITY OF JAKARTA

APPENDIX F

EXISTING SANITATION AND SEWERAGE PROJECTS AND FACILITIES

APPENDIX F EXISTING SANITATION AND SEWERAGE PROJECTS AND FACILITIES

1. Existing On-site Sanitation Facilities

1.1 Domestic On-site Sanitation Facilities

1.1.1. General

The existing domestic on-site sanitation facilities in the Study Area are used for the treatment of toilet waste only. The other domestic wastes from kitchen, bathing and laundry are directly discharged to the drains.

In this Study, the existing toilets are classified into three (3) types: (1) individual toilet with treatment, (2) individual toilet with no treatment, (3) public toilet. Individual toilet with treatment covers the one with septic tank (including both types with and without leaching system) or with leaching pit (including single and twin types). While, individual toilet with no treatment includes pit latrine and toilet discharging human waste directly into the neighbouring drain (Brandgang). Public toilet consists of a group of latrines attached with bathing and washing facilities and is provided with septic tank.

The JICA Study Team conducted a questionnaire survey for approximately 2,600 families to establish the existing conditions of the on-site sanitation facilities. Furthermore detailed survey was conducted to determine the existing distribution of public toilet in the Study Area.

1.1.2 Service Level

The existing population ratio in terms of service level of on-site sanitation facilities in each Kelurahan of the Study Area is provided in Table F.1. The corresponding summary of service level in each Kecamatan along with population density and people's income level is shown in Table F.2.

Population of 68% in the Study Area have individual toilets with treatment. Population of 16.6% use toilets with no treatment. Six (6) % of the population get the benefits of public toilet. The remaining 9.4% of the population are provided with no toilet facilities.

Fig.F.2 shows population percentage served by each type of on-site sanitation facilities in each Wilayah. Jakarta Timur (East Jakarta) has the highest service level with 79.3% of the population using toilets with treatment. Public toilet is most abundant in Jakarta Pusat (Central Jakarta) where 8.5% of the population is served with public toilet. In Jakarta Utara (North Jakarta), 17% of the population have no toilet facilities.

The service level of on-site sanitation facilities covering individual toilet with treatment and public toilet by Kecamatan is shown in Fig.F.3.

(1) The Kecamatans with a service level of less than 70% are the following 10 Kecamatans.

Jakarta Pusat: (Central Jakarta) Kec. Senen, Kec. Cempaka Putih, Kec.Menteng

Jakarta Utara: (North Jakarta) Kec. Penjaringan, Kec. Koja, Kec. Cilincing

Jakarta Barat: (West Jakarta) Kec. Cengkareng, Kec.Taman Sari

Jakarta Selatan: (South Jakarta) Kec. Tebet, Kec.Mampang Prapatan

These Kecamatans are mostly located in the northern low-lying flat areas.

The population density of the above 10 Kecamatans ranges from 43.5 person/ha to 463.5 person/ha with an average of 192.2 ha. The Kecamatans with a high population density of more than 250 person/ha include Kec. Senen, Kec. Cempaka Putih, Kec. Tambora and Kec. Tebet.

The population share of high and middle income groups of the above 10 Kecamatans is in the range of 34.9%-57.4% with an average of 47.6%.

(2) The Kecamatans with a service level of 70%-80% are the following eight (8) Kecamatans.

Jakarta Pusat:	Kec. Gambir, Kec. Sawah Besar, Kec.Kemayoran
Jakarta Utara:	Kec. Tanjung Priok
Jakarta Barat:	Kec. Taman Sari
Jakarta Selatan:	Kec. Pasar Minggu
Jakarta Timur:	Kec. Kramat Jati, Kec. Cakung

The population density of the above eight (8) Kecamatans ranges from 37.2 person/ha to 348.0 person/ha with an average of 164.3 person/ha. The Kecamatans with a high population density of more than 250 person/ha are Kec. Kemayoran and Kec. Taman Sari.

The population share of high and middle income groups ranges from 38.6 % to 62.2 % with an average of 50.8%.

(3) The Kecamatans with a service level of more than 80% are the following 11 Kecamatans

Jakarta Pusat	:	Kec. Tanah Abang
Jakarta Barat	:	Kec. Grogol Petamburan, Kec. Kebon Jeruk
Jakarta Selatan	:	Kec.Setia Budi, Kec.Kebayoran Baru, Kec. Kebayoran Lama, Kec. Cilandak
Jakarta Timur	:	Kec. Matraman, Kec. Pulo Gadung, Kec. Jatinegara, Kec. Pasar Rebo

These Kecamatans are mostly located in the fringes of the Study Area.

The population density of the above 11 Kecamatans ranges from 47.0 person/ha to 364.4 person/ha with an average of 164.9 person/ha. Only Kec. Matraman has a population density higher than 250 person/ha.

The population share of high and middle income groups of the above 11 Kecamatans range from 48.9% to 67.5% with an average of 57.1%.

1.1.3 Public Toilet

The JICA Study Team conducted a detailed survey of existing public toilet in the Study Area on a Kelurahan basis. Public toilet is a very practical means of providing basic sanitation facilities to low income Kampung communities with very high housing and population density, where individual facilities are physically impossible even with financial assistance.

The existing public toilets were constructed mainly by the following; Cleansing Department, Bappem, community organizations and recently by JSSP. The operation and maintenance of the public toilets are entrusted either to the Cleansing Department, local authority or local community.

All Kelurahans having public toilets along with their respective total number of public toilets, the population served, the average per capita service charge and the population density are given in Table F.3. The corresponding distribution of public toilets is illustrated in Fig. F.4.

Of the 256 Kelurahans in the Study Area 94 Kelurahan or 37% have public toilets. Most public toilets are concentrated in the high population centres of Central Jakarta and Tanjung Priok area, though there are some in the Western part of Jakarta as well. There are no public toilets in southern part of Jakarta and the fringes of the Study Area, with low population density.

Of the 94 Kelurahans with public toilet 77 or 82% have a population density greater than 200 person/ha. Furthermore, 58 Kelurahans or 62% have a population density greater than 300 person/ha.

The Kelurahans having very high distribution of public toilets (ref. Fig. F.4), with more than 20 numbers, are Utan Panjang and Tanah Tinggi of Jakarta Pusat, Koja Utara of Jakarta Utara and Kedaung Angke of Jakarta Barat.

1.2 On-site Sanitation Facilities of Commerce and Institution

Sampling questionnaire surveys were carried out by the JICA Study Team to obtain information on the existing status of on-site sanitation facilities for commerce and institutions in the Study Area. Commerce and institutions were classified into seven (7) categories : shops, factories, restaurants, hotels, hospitals, offices and schools. The number of samples was 200 for shops and factories, 150 for restaurants, 100 for hospitals, offices and schools, and 50 for hotels. Survey results are summarized in Table F.4(1) to F.4(5).

It was found out that 91.7% of shops use on-site sanitation facilities equipped with either septic tank/leaching pit or septic tank & soak away. 4.8% use no treatment facilities, and the remaining 3.5% utilize other types of package treatment facilities. The capacity of sanitation facilities varies according to the types of shops as shown in Table F.4(1). However, the average capacity per shop works out to 5.1 m^3. Average water consumption per shop per day is 1.5 m^3, of which 46.4% is used for toilet, 28.8% for cooking and the remaining 24.7% for other purposes. It was revealed that there is correlation between floor area and water consumption: a shop with the floor area of 500 m^2 consumes 2.25 m^3 of water on average per day (ref. Table F.5).

In case of factories surveyed, 81.5% use on-site sanitation facilities of either septic tank/leaching pit or septic tank & soak away. 10.0% have no treatment facilities and the remaining 8.5% make use of other package treatment facilities. The capacity of sanitation facilities varies in accordance with the classification of factories as shown in Table F.4(2). However, the average capacity per factory works out to 13.5 m^3. There is correlation between floor area and industrial water consumption : a factory with the floor area of 2,000 m^2 consumes 17.05 m^3 of water on average per day (ref. Table F.5).

As for restaurants and hotels, 89.7% of restaurants and 79.1% of hotels use either septic tank/leaching pit or septic tank & soak away. 7.1% of restaurants and 4.2% of hotels use no treatment facilities and 3.2% of restaurants and 16.7% of hotels use other types of on-site facilities. It is to be noted that the share of "other types" is comparatively high for hotels. It

is because large hotels equip themselves with advanced package treatment facilities. The average capacity of a sanitation facility for a restaurant is 4.7 m^3. In case of hotels there exists a wide range in capacity depending on the number of stars as shown in Table F.4(3). However, the average capacity per hotel works out to 23.3 m^3. Average water consumption per day for a restaurant is 3.1 m^3, and for a hotel it is 215.4 m^3. 41.0% of water for restaurants is used for toilet, 28.5% for cooking and 30.5% for other purposes, while 58.7% of water for hotels is used for toilet, 22.8% for cooking and 18.5% for other purposes. There is a correlation between floor area and water consumption (ref. Table F.5) : a restaurant with floor area of 500 m^2 consumes 5.73 m^3 of water on average per day, and a hotel with the same floor area consumes 107.48 m^3 per day.

94.9% of hospitals provide themselves with on-site sanitation facilities equipped with either septic tank/leaching pit or septic tank & soak away. None discharged wastewater with no treatment. The balance of 5.1% utilize some advanced form of package treatment facilities. The capacity of sanitation facilities varies according to the classifications of hospitals as shown in Table F.4(4). However, the average capacity per hospital turns out to be 13.2 m^3. A hospital consumes 48.5 m^3 of water on average per day, of which 49.6% is used for toilet, 25.1% for cooking and 25.3% for other purposes. A correlation is discerned between floor area and water consumption (ref. Table F.5) : a hospital with floor area of 500 m^2 consumes 24.07 m^3 of water on average per day.

Regarding offices and schools, 95.2% of offices and 98.1% of schools use either septic tank/leaching pit or septic tank & soak away. The latter figure is the highest among seven (7) categories of commerce and institutions. 2.9% of offices and 1.9% of schools have no treatment facilities. 1.9% of offices use other types of on-site package treatment facilities. The average capacity of a sanitation facility is 12.8 m^3 for an office and 11.0 m^3 for a school. On average 5.1 m^3 of water is consumed per day by an office, of which 59.8% is used for cooking and the remainder (40.2%) is used for toilet. On the other hand on average 4.1 m^3 of water is consumed per day by a school, out of which 53.4% finds its way to toilet, 22.4% to kitchen and the remaining 24.2% to other places. A correlation exists between floor area and water consumption : an office with a floor

area of 500 m^2 consumes 3.59 m^3 of water on average per day and a school with the same floor area consumes 3.33 m^3 per day (ref. Table F.5).

The simple average of user ratio of on-site sanitation facilities equipped with either septic tank/leaching pit or septic tank & soak away works out to be 90.0% across the seven (7) categories of commerce and institutions. Those with no treatment facilities works out to 4.4%. While, the remaining 5.6% opt for other on-site package treatment facilities.

The capacity of sanitation facilities across the seven (7) categories is calculated at 11.9 m^3 on the simple average basis.

It was clarified that there exists a correlation between floor area and water consumption for each category of commerce and institutions. Specifically *water consumption per floor area is higher for hotels, hospitals and* factories in comparison to others as shown in Table F.5.

1.3 Purification Efficiency of Existing On-site Sanitation Facilities

1.3.1 Domestic On-site Sanitation Facilities

The existing sanitation facilities in the Study Area is essentially on-site. The natural soil based treatment systems of septic tanks/leaching pits are the sole ones used for the treatment and disposal of domestic toilet wastes only. The domestic gray water, originating from washing, bathing and cooking, is discharged to surface ditches/drains with no treatment. It is to be noted that in principle a septic tank is intended for the treatment and disposal of both the toilet waste and gray water, and leaching pit for toilet waste. No such distinction is so far applied and traditionally both septic tank and leaching pit received only the toilet waste, and hence there is no functional difference in their usage.

If the leaching/infiltration capacity of the soil is assumed to be sufficient, a condition still valid basically in the southern fringes of the Study Area with low population density and deep groundwater table, the treatment efficiency of toilet waste will be 100%.

Even in this case as the gray water is discharged with no treatment, the overall treatment efficiency with respect to BOD removal is only about 40%.

This is evident from the existing unit pollution load generation, illustrated in section 2.2.2. of Appendix-D, given below.

Unit pollution load generation of gray water : 17.4 g.BOD/person/day
Unit pollution load generation of toilet waste : 10.5 g.BOD/person/day
Hence, removal efficiency with complete toilet waste treatment

$$= \frac{10.5}{(17.4 + 10.5)} \times 100$$

$$= 38\%$$

Accordingly, it could be concluded that in general, the treatment efficiency of the overall system is not 100%. The maximum efficiency of domestic on-site sanitation system will be about 40% only, as long as gray water is discharged with no treatment.

1.3.2 On-site Sanitation Facilities of Commerce and Institutions

JICA Study Team conducted a sampling survey of existing on-site sanitation facilities, i.e. the existing on-site wastewater treatment systems/package plants, in 18 number establishments of hotels, offices and commerce. These establishments of sampling survey are given in Table F.6.

Out of these 18 establishments, ten (10) treated their whole wastewater, both the wastewater from toilet and gray water from all other miscellaneous water use, in their individual treatment plants. While, the rest eight (8) establishments treated only their toilet waste and discharged the gray water untreated.

Table F.7 shows the separation of the 18 establishments according to the type of wastewater treated (wastewater of toilet and others and toilet waste only), the wastewater treatment method employed and the overall composition of the effluent sampled for water quality analysis.

It is to be noted that in case of No. 15 - No. 18, Hotel Menteng, Hotel Sofyan, Pertambangan and Pasar Pagi, the sampled effluent consisted of a mixture of septic tank effluent and other gray water.

The water quality parameters analyzed for the sampled effluent are COD_{Cr}, BOD_5, SS and FC (fecal coliform density). The results of water quality analysis are presented in Table F.8.

Based on this survey of on-site sanitation facilities/package treatment plants and the resultant effluent water quality analysis the following aspects are noted.

(1) Treatment System

Out of the ten (10) establishment that are designed to treat the whole wastewater, both toilet waste and others, eight (8) used extended aeration systems with only two (2), Indocement and Setiabudi II, using respectively rotating biological contactor (RBC) and septic tank with filter.

On the other hand the establishments that are designed to treat toilet wastewater only, which is not a recommended design practice for a commerce/institution, basically used septic tanks only except Pasar Pagi which used septic tank with filter (ref. Table F.7).

(2) Treated Effluent Quality

Treated effluent quality is assesed according to the type of treatment system as follows :

(i) Treatment plants treating the whole wastewater.

The effluent quality measured in the treatment plant of Hilton hotel was considered to be not representative as the treatment plant was under maintenance during sampling.

The effluent quality of the remaining nine (9) treatment systems are summarized below.

Treatment system	COD (mg/l)	BOD (mg/l)	FC (MPN/100ml)	SS (mg/l)
Extended Aeration -Range	(96-1520)	(53-880)	($23X10^3$-$93X10^6$)	(10-180)
-Average	300	193	$19X10^6$	54
RBC	122	78	$93X10^4$	40
Septic Tank with Filter	419	243	$46x10^6$	20

Though the average effluent BOD for treatment plants of extended aeration is high of 193 mg/l, it is primarily caused by the poor effluent quality of the two (2) plants, Glodok Plaza and Gajah Mada Plaza. If these two (2) data are disregarded the average water quality is comparatively better of 97 mg/l as BOD. Effluent of septic tank is of very poor quality with a BOD of 243 mg/l.

In all plants the fecal coliform density (FC) of the effluent is very high because disinfection is not generally practised, though the facility exist. This is understood to be due to high cost of chemicals for disinfection.

(ii) Effluent of Septic Tanks

All septic tanks, except one (1) Setiabudi-II, treated toilet waste only, though in four (4) cases the sampling was made possible only after the mixing of the effluent with untreated gray water.

Treatment system	COD (mg/l)	BOD (mg/l)	FC (MPN/100ml)	SS (mg/l)
Toilet Waste only - Range	(445-2140)	(249-1800)	($23X10^3$-$23X10^7$)	(17-460)
- Average	1490	1070	$95X10^6$	229
Toilet Waste and gray water - Range	(645-1040)	(486-940)	($23X10^4$-$23X10^6$)	(15-220)
- Average	884	691	$10X10^6$	83