FEASIBILITY STUDY FOR URBAN DRAINAGE PROJECT IN THE CITY OF JAKARTA

FINAL REPORT

VOLUME II

SUPPORTING REPORT

ANNEX-I

(No. 1 Meteorology and Hydrology
No. 2 Topographic Survey
No. 3 Geological Investigation)

DECEMBER 1991

NIPPON KOEI CO., LTD.
TOKYO, JAPAN

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS
REPUBLIC OF INDONESIA

THE DETAILED DESIGN FOR URBAN DRAINAGE PROJECT IN THE CITY OF JAKARTA

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THE DETAILED DESIGN
FOR
URBAN DRAINAGE PROJECT
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The cost estimate is based on the price level of June 1997 and the monthly mean exchange rates in June 1997. The monthly mean exchange rates in June 1997 are:

US$ 1.00 = ¥ 115.00 = Rp. 2,350

ABBREVIATIONS

(1) Local Terms

BAKOSURTANAL	Badan Koordinasi Survei dan Penetaan Nasional	:National Mapping Agencies
BAPPENAS	Badan Perencanaan Pembangunan National	:National Planning and Development Board
BPS	Biro Pusat Statistic	:Central Bureau of Statistics
BINA MARGA		:Directorate General of Road Development
CIPTA KARYA		:Directorate General of Human Settlements
DGWRD		:Directorate General of Water Resources Development
DINAS TATA KOTA		:Department of City Planning, DKI Jakarta
DKI Jakarta	Daerah Khusus Ibukota Jakarta	:Special Region of Capital City Jakarta
DPMA	Direktorat Penyelidikan Masalah Air	:Directorate of Hydraulic Engineering
DPU	Departmen Pekerjaan Umum	:Ministry of Public Works
DPU DKI Jakarta	Dinas Pekerjaan Umum DKI Jakarta	:Department of Public Works, DKI Jakarta
DPUP	Dinas Pekerjaan Umum Propinsi	:Provincial Department Office of Public Works
JABOTABEK		:Jakarta-Bogor-Tangerang-Bekasi
JASA MARGA		:Indonesia Highway Corporation
Kabupaten		:Regency
Kecamatan		:Sub-district
Kelurahan		:District
Kotamadya		:Municipal City
PELITA	Pembangunan Lima Tahun	:Five-Year Development
PERUM PERUMNAS		:National Urban Development Corporation

PMG	Pusat Meteorogi dan Geofisika	:Meteorological and Geophysical Center
P.P.	Priok Pile	
P.T.	Perusahaan Terbatas	: Private Estate Enterprise (Company Ltd.)
PWSCC	Proyek Pengembangan Wilayah Sungai Ciliwung-Cisadene	: Ciliwung-Cisadane River Basin Development Project Office
RKL		:Environmental Management Program
RPL		:Environmental Monitoring Program
REPELITA	Rencana Pembangunan Lima Tahun	:Five-Year Development Plan
TTG.	Tanda Tinggi Geodesi	

(2)International or Foreign Organization

GOI	:Government of the Republic of Indonesia
GOJ	:Government of Japan
IBRD	:International Bank for Reconstruction and Development
JICA	:Japan International Cooperation Agency
OECF	:Overseas Economic Cooperation Fund

(3) Foreign Terms

EIRR	:Economic Internal Rate of Return
FIRR	:Financial Internal Rate of Return
GDP	:Gross Domestic Product
GNP	:Gross National Product
GRP	:Gross Regional Product
PMF	:Probable Maximum Flood
NPV	:Net Present Value
O&M	:Operation and Maintenance
IEI	:Initial Environmental Evaluation
B/Q	:Bill of Quantities
TOR	:Terms of Reference

B/C	:Box Culvert
CAD	:Computer-aided Design
EIA	:Environmental Impact Assessment
ICB	:International Competitive Bidding
LCB	:Local Competitive Bidding
JIS	:Japan Industrial Standards
ASTM	:American Society for Testing and Materials

(4) Numerical Units

Length

mm	millimeter
cm	centimeter
m	meter
km	kilometer

Area

mm^2	square millimeter
cm^2	square centimeter
m^2	square meter
km^2	square kilometer
ha	hectare

Volume

cm^3	cubic meter
m^3	cubic meter
Ltr	liter

Weight

gr	gram
kg	kilogram
ton	metric ton

Time

sec	second
min	minute
hr	hour
yr	year

Others

%	percent
℃	degree centigrade
10^3	thousand
10^6	million
10^9	billion

Money

Exchange Rate

Rp.	Indonesian Rupiah	Official rate as of June, 1997
¥	Japanese yen	US$ 1= Rp 2,350 = ¥ 115
US$	US dollar	

No. 1

Meteorology and Hydrology

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1 General

In order to obtain the basis for design of the urban drainage project, meteorological data in and around the project area were collected. These collected data were analysed to clarify rainfall characteristics including elevation-rainfall relationship, regional rainfall characteristics and hourly rainfall characteristics, rainfall intensity-duration relationship and basin average rainfall intensity.

2 Meteorological Conditions in Project Area

2.1 Available Meteorological Data

The monthly mean, maximum and minimum air temperatures, relative humidity, monthly rainfall and wind velocity during 1986 to 1995 at Soekarno-Hatta international airport located at the western part of the project area are available. These data are listed in Table 1. The rainfall data necessary for the study on flood discharge analysis for drainage plan are stated in the following sections. Meteorological conditions in the project area based on these data are as follows:

2.2 Meteorological Conditions in Project Area

(1) Air temperature

Annual average of air temperature at the international airport located at southern part of the project area is in the range of 26℃ and 27℃ throughout a year. Extremely maximum and extremely minimum are 35.2℃ and 17.4℃ respectively in November and August.

(2) Relative humidity

Monthly mean relative humidity at the international airport ranges from 75% to 89% throughout a year. Monthly maximum and monthly minimum occur in February and September respectively.

(3) Surface wind

Wind speed is generally calm to 10 knots from 1 a.m. to 10 a.m. The wind speed becomes higher more than 10 knots at 11 a.m. to 3 p.m. After 3 p.m., the wind speed usually decreasing when weather is not bad.

(4) Rainfall

Annual rainfall from 1986 to 1995 at the international airport is around 1,800mm.The monthly maximum rainfall is 644mm in January and the monthly minimum is 1 mm in October. The highest frequency and lowest frequency of rainy day occur in January and September respectively.

3 Existing Rainfall Gauging Stations

Twelve rainfall gauging stations have been provided in and around the project area as shown in Fig.1, of which 3 gauging stations have automatic type gauges and others have manual type. Observation period at these gauging stations is illustrated in Fig. 2. Fig. 2 shows that there is no gauging stations having complete available data for their observation period. Out of these gauges, the name and observation period of the gauging stations which have automatic rainfall gauges are as follows:

Gauge Code	Name of Gauge	Available data period	Measurement period(years)
27	Jakarta-BMG	1958-1995	38(20)
30F	Tangerang Geofisika	1971-1976	6(5)
32C	Pondok Betung	1975-1995	21(9)

Note; figures in bracket means the period having more than 90% of measurement data

The above table shows that the period having more than 90 % of the oservation data is less than 10 years except for Jakarta-BMG, No 27.The rainfall gauging station which has enough data for making rainfall intensity curve is the only one, Jakarta-BMG No.27.

4 Rainfall Analyses

4.1 Rainfall Characteristics

4.1.1 Elevation - rainfall Relationship

In the Study on Comprehensive River Water Management Plan in JABOTABEK of 1996, the relationship between elevation and rainfall was examined covering a large area based on the collected daily rainfall records at 81 gauging stations as shown in Fig.3, which observed rainfall for more than 10 years. Rainfall

characteristics such as relationship among annual rainfall depth, annual rainy days and elevation, and relationship among annual mean daily rainfall depth, annual maximum rainfall depth and elevation have been analysed as shown in Figs.4 and.5, respectively. Fig. 4 shows that annual rainfall depth and annual rainy days are related to the elevation because the both graphs have a similar tendency that annual rainfall depth each increases with its elevation. Fig. 5 implies that annual mean daily rainfall and annual maximum daily rainfall have no relation with elevation.

4.1.2 Regional Rainfall Characteristics

In order to know the regional rainfall characteristics, average of monthly maximum and monthly mean of daily rainfall for 3 blocks comprising west, central and east Jakarta were compared. Divided blocks are shown in Fig.6. Comparisons of the average of monthly maximum daily rainfall and monthly mean daily rainfall in each block are given in Tables 2 and 3 respectively. For these comparisons, the data from 1980 to 1984 were applied since available data period coincides only in these periods. Result of the comparison is summarised below:

(Unit :mm/day)

	Average of monthly max.daily rainfall			Monthly mean daily rainfall		
	West block	Center block	East block	West block	Center block	East block
1980	47.4	51.9	42.5	19	20.9	14.6
1981	50.3	52.5	62.7	16.1	15.6	21.7
1982	36	28.5	45.9	13.8	11.3	17.3
1983	38.5	45.3	45.5	13.7	12.9	13.4
1984	59.2	63.5	52.4	18.7	16.1	17.4
Average	46.3	48.3	49.8	16.3	15.3	16.9

The above table shows that the difference in daily rainfall for both the monthly mean and average of monthly maximum basis is within several percents. It means that the daily rainfall in 3 blocks has similar peculiarity and there is no different regional rainfall characteristics in Jakarta area.

4.1.3 Hourly Rainfall Characteristics

The hourly rainfall data are available at 3 gauging stations of Jakarta- BMG No.27, Tangerang 30F and Pondok Betung 32C in and around of the project area.

Among these, 2 stations, Jakarta- BMG No.27 and Pondok Betung 30C have the data with the recent same observation period. In order to examine the hourly rainfall characteristics, monthly average of rainfall intensity and maximum of rainfall intensity for two stations are compared as shown in Tables 4 and 5 respectively and average values are illustrated in Fig.7. This figure shows that the hourly rainfall intensity for 1to 6 hours for both stations has similar characteristics with high intensity in 0 to one hour and recession after that. Average of the period having daily rainfall more than 50 mm/day for both gauging stations is compared as shown in Table 6. This table shows that the both stations have similar hourly rainfall intensity for its concentration and duration, and duration period and daily rainfall intensity is 9 hours and 128~139mm/day in maximum, 5 hours and 70~73mm/day on an average and 1~2 hours and 52mm/day in minimum.

4.2 Rainfall Intensity - Duration Relationship

The intensity - duration curves at the gauge, Jakarta- BMG No.27 are applied for the digital simulation of flood runoff in this study due to the following reasons:

(i) There is no different characteristic of daily rainfall due to the elevation or region as implied in Fig 5.

(ii) It has been proved that no difference in regional rainfall characteristics are identified among west, center and east blocks, and

(iii) The rainfall gauging station at Jakarta- BMG No.27 has the longest observation period among the available data and also has data enough for making the rainfall intensity curve.

The relationship between rainfall intensity and its duration of the gauging station, Jakarta- BMG No.27 had been established by NEDECO as mentioned in the master plan of 1973(APPENDIX B, Chapter 3). This relationship was examined incorporating the rainfall data during the period from 1991 to 1995. Comparison of two relationship is as follows:

(Unit:mm)

Dutation (min)	Return Period(year)							
	2		5		10		25	
	J	N	J	N	J	N	J	N
10	111	117	134	134	149	144	166	160
30	88	87	107	100	119	109	130	119
60	62	62	78	74	89	81	103	91
120	36	37	48	47	56	54	67	61
180	26	26	35	34	41	40	49	46

Note: J and N mean JICA and NEDECO respectively.

The above table shows that the difference of the rainfall intensity between by NEDECO and by this JICA study is within several percents. Thus, the relationship estimated in the master plan by NEDECO was applied for the hydrological analysis in this study.

The rainfall intensity - duration curves prepared based on the rainfall data are as follows:

i) For 2 - year frequency ;

$$r_p = \frac{10490}{t^{1/0.90} + 76.3} \quad \text{for } t \leq 180 \text{ min.}$$

$$r_p = \frac{12692}{t^{1/0.90} + 172.8} \quad \text{for } t > 180 \text{ min.}$$

ii) For 5 - year frequency ;

$$r_p = \frac{7946}{t^{1/1.00} + 48.8} \quad \text{for } t \leq 180 \text{ min.}$$

$$r_p = \frac{8756}{t^{1/1.00} + 93.5} \quad \text{for } t > 180 \text{ min.}$$

iii) For 10 - year frequency ;

$$r_p = \frac{8571}{t^{1/1.02} + 50.1} \quad \text{for } t \leq 180 \text{ min.}$$

$$r_p = \frac{8973}{t^{1/1.02} + 68.0} \qquad \text{for } t > 180 \text{ min.}$$

iv) For 25 - year frequency ;

$$r_p = \frac{6271}{t^{1/1.12} + 31.2} \qquad \text{for } t \leq 180 \text{ min.}$$

$$r_p = \frac{6090}{t^{1/1.12} + 31.5} \qquad \text{for } t > 180 \text{ min.}$$

where ,

rp = Point rainfall intensity (mm/hr)

t = Duration time (min.)

These relation ships are given in Fig 8.

4.3. Basin Rainfall Intensity

The basin rainfall intensity(r_a) was obtained by multiplying the point rainfall intensity by the rainfall reduction factors. The rainfall reduction factor varies according to the length of flood concentration time and the area of basin. The rainfall reduction factor estimated in the Master plan is as follows:

Concentration time(tr,hr)	Drainage Area(km^2)					
	0	5	10	30	50	70
1/6	1	0.95	0.91	0.81	0.74	0.69
1/2	1	0.95	0.92	0.83	0.77	0.73
1	1	0.96	0.93	0.86	0.81	0.76
2	1	0.96	0.94	0.88	0.82	0.79
3	1	0.96	0.94	0.88	0.83	0.79
4	1	0.96	0.94	0.88	0.83	0.79
5	1	0.97	0.94	0.88	0.84	0.8

5 Flood and Inundation

5.1 General

Since data showing location and extent of the inundation are not available, surveys on the inundation were made by interviews at the Kecamatan offices.

5.2 Habitual Inundation

The inundation tends to occur in lowland areas and the areas along the drainage channels. The areas in which the inundation is clustered are the area in Kamal, Tanjungan and the area along the Saluran Cengkareng drainage channel. Among these, the Kamal drainage area has the largest inundation area. Other major inundation areas are areas along the Gede/Bor drainage channel and Meruya (lowland) area.

The distribution of inundation areas in the Cengkareng west area and Meruya area is shown in Figs 9 and 10 respectively. The depth of the inundation ranges from 15cm to 100cm depending on the locations. The range of the duration of inundation is 1 to 7 hours. In the Tegal Alur and Kamal along the Kamal drainage channel, the range of the depth of inundation is 30cm to 100cm which is the deepest in the project area. In Meruya area, the depth of inundation sometimes reaches 75cm. The lowland, where majority of inundation occurs, has already been acquired by a private sector for housing development. It is presumed that the lowland functioned as water absorption will lose its ability to keep the water once the housing development begins and cause more inundation in downstream.

5.3 Rainfall and Inundation

To estimate the return period of the flood, the daily rainfall records for past 10 years at gauging stations in the project area: Cengkareng/Kapuk (Station No.26a) and Soekarno-Hatta International Airport were analysed. Based on the annual maximum daily rainfall data, a frequency curve of project area was derived for each station by Gumbel method as shown in Fig.11.

Since the data showing the relation among extent of the habitual inundation, inundation depth and duration are not available, return period of the flood which causes the inundation cannot be made clear. It is presumed that since the inundation takes place every year, daily rainfall which causes the inundation will be more than 50mm, according to the relationship between rainfall intensity and return period in

Fig 11.

6 Tidal Level

The tidal movement in the Java Sea at Jakarta on PP system had been analysed by Master Plan Study on drainage and flood control in Jakarta by NEDECO in 1973. It had been reported that the tidal movement is a single day with one high tide and low tide in 24 hours. While, the relationship between PP system and TTG system for datum level was clarified in the topographic survey in this study, and it was confirmed that elevation of PP system is 1.003m higher than that of TTG system. A series of the tidal movement presented by TTG system is as follows:

Tidal movement	PP system	TTG system
- Spring tide(high high water)	PP+1.15m	+0.15m
- Average high water(H.W)	PP+0.9m	-0.1m
- Neap tide high water	PP+0.8m	-0.2m
- Mean Sea Level(M,S,L)	PP+0.6m	-0.4m
- Neap tide low water	PP+0.4m	-0.6m
- Average low water(L,W)	PP+0.25m	-0.75m
- Spring tide(low low water)	PP+0.00m	-1.00m

Tables

Table 1 METEOROLOGICAL DATA (1/4) (TEMPRETURE)

Station: Jakarta, Seokarno-Hatta International Airport

Monthly Mean Temperature

(unit: Celcius degree)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Jan.	26.0	25.8	26.5	26.2	25.8	26.1	26.2	25.9	25.0	26.5	25.9	26.0
Feb.	26.1	25.8	26.5	25.4	26.4	25.9	26.3	25.9	26.2	26.2	26.0	26.1
Mar.	26.4	26.7	26.9	26.3	26.5	26.7	26.8	26.3	26.0	26.2	26.6	26.5
Apr.	26.9	27.0	27.3	26.8	27.3	26.7	26.8	26.5	26.6	27.0	27.0	26.9
May	27.1	27.2	27.3	26.8	27.0	27.0	27.1	27.0	26.4	27.3	27.1	27.0
Jun.	26.8	27.2	26.6	26.5	26.6	26.8	26.9	26.7	26.5	26.9	27.0	26.8
July	26.0	26.6	26.4	26.5	26.1	26.5	26.2	26.6	25.6	26.4	27.0	26.4
Aug.	25.7	26.2	26.4	26.5	26.2	26.2	26.3	26.5	25.8	26.6	26.8	26.3
Sep.	26.1	26.9	26.9	26.8	26.7	26.8	26.5	26.6	26.3	26.6	26.9	26.6
Oct.	26.7	27.9	26.9	29.0	27.5	27.4	26.3	27.0	27.4	27.0	-	27.3
Nov.	26.3	27.7	27.1	27.2	27.7	27.4	26.3	26.7	27.6	26.4	-	27.0
Dec.	26.8	26.8	25.9	26.4	26.5	26.6	26.2	26.6	27.1	26.3	-	26.5

Monthly Maximum Temperature

(unit: Celcius degree)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Max
Jan.	31.6	32.2	32.4	31.4	32.1	31.4	32.4	31.8	31.2	32.4	32.1	32.4
Feb.	32.6	32.0	32.4	30.2	32.8	31.4	33.5	31.6	32.0	32.0	31.0	33.5
Mar.	32.6	33.2	33.4	32.8	33.6	31.8	32.2	33.7	33.0	32.0	32.1	33.7
Apr.	33.4	32.8	33.5	34.2	34.5	33.4	33.4	33.2	32.4	33.2	34.8	34.8
May	33.4	34.2	33.3	32.2	34.9	33.4	33.0	33.2	32.8	33.2	33.1	34.9
Jun.	33.6	33.2	33.1	33.4	33.0	34.4	32.8	33.2	32.7	32.9	33.2	34.4
July	33.9	32.8	32.5	33.2	32.6	33.2	32.4	32.4	32.3	32.1	32.7	33.9
Aug.	32.6	33.6	33.2	32.6	32.2	33.2	32.1	33.0	33.0	33.2	32.8	33.6
Sep.	32.7	33.4	33.8	33.9	32.8	34.2	32.7	33.5	34.2	33.2	33.2	34.2
Oct.	33.2	35.2	34.2	34.2	34.0	34.9	33.0	33.2	35.0	33.1	-	35.2
Nov.	33.5	35.2	34.4	33.6	35.2	33.4	33.0	33.6	34.4	32.8	-	35.2
Dec.	32.8	33.5	33.5	31.8	32.5	33.6	33.2	33.0	33.6	33.4	-	33.6
Max.	33.9	35.2	34.4	34.2	35.2	34.9	33.5	33.7	35.0	33.4	34.8	35.2

Monthly Maximum Temperature

(unit: Celcius degree)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Min
Jan.	20.2	22.0	21.9	20.0	22.2	22.8	22.1	22.4	22.0	22.6	22.0	20.0
Feb.	21.6	21.6	22.4	22.0	22.6	22.8	22.0	22.0	21.6	22.4	21.4	21.4
Mar.	22.4	22.8	22.9	21.8	22.7	22.8	23.0	22.0	22.7	22.6	22.0	21.8
Apr.	22.3	22.9	21.0	22.4	22.8	22.6	22.9	22.1	22.6	22.8	22.7	21.0
May	20.5	22.6	23.2	22.0	22.5	22.3	22.4	22.4	21.0	22.2	22.1	20.5
Jun.	21.3	22.2	21.6	21.6	21.0	20.3	21.6	22.0	21.0	22.9	21.6	20.3
July	18.5	21.3	21.3	21.2	20.7	20.6	21.0	21.6	18.6	21.8	22.0	18.5
Aug.	18.5	19.9	21.4	21.2	21.8	21.2	21.5	21.4	17.4	21.4	21.7	17.4
Sep.	20.0	20.6	21.2	21.9	21.6	20.8	21.8	21.3	19.7	21.4	21.6	19.7
Oct.	21.4	22.4	22.4	22.2	22.0	21.4	22.5	22.0	21.2	22.8	-	21.2
Nov.	21.8	23.0	22.9	22.0	22.0	22.6	22.1	22.0	22.8	22.5	-	21.8
Dec.	22.2	22.0	21.0	22.4	22.4	22.3	21.7	22.2	22.6	22.3	-	21.0
Min	18.5	19.9	21.0	20.0	20.7	20.3	21.0	21.3	17.4	21.4	21.4	17.4

Table 1 METEOROLOGICAL DATA (2/4) (RERATIVE HUMIDITY)

Station: Jakarta, Seokarno-Hatta International Airport

Monthly Mean Rerative Humidity

(unit: %)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Jan.	88	87	86	87	88	88	88	88	88	87	86	87
Feb.	86	88	85	88	87	89	88	87	86	87	88	87
Mar.	85	84	85	84	86	87	87	83	87	87	85	85
Apr.	85	84	84	82	83	87	86	85	85	85	80	84
May	83	82	86	86	83	84	86	84	82	84	81	84
Jun.	83	81	83	83	83	93	83	84	80	85	79	83
July	82	79	80	81	83	80	82	81	78	83	79	81
Aug.	82	76	81	83	85	80	82	82	76	80	80	81
Sep.	83	76	78	80	82	77	83	79	75	80	80	79
Oct.	83	76	81	79	80	77	85	80	75	83	-	80
Nov.	84	77	81	80	80	83	83	83	79	85	-	82
Dec.	83	84	85	86	87	86	85	84	82	84	-	85

Monthly Maximum Rerative Humidity

(unit: %)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Max
Jan.	98	98	100	100	98	99	98	98	98	98	98	100
Feb.	98	98	98	100	98	98	98	98	99	98	99	100
Mar.	97	98	98	98	99	98	98	98	98	98	99	99
Apr.	98	98	98	98	100	98	98	98	98	97	98	100
May	98	98	98	99	98	99	98	100	98	98	97	100
Jun.	98	98	99	98	98	98	98	98	98	98	98	99
July	98	98	99	98	98	97	98	98	98	98	97	99
Aug.	98	97	98	98	98	99	98	98	97	97	98	99
Sep.	100	97	98	98	98	98	98	98	98	97	98	100
Oct.	98	97	98	98	98	97	99	98	98	97	-	99
Nov.	98	97	97	97	98	99	98	98	98	98	-	99
Dec.	98	98	98	98	99	98	99	97	98	97	-	99
Max.	100	98	100	100	100	99	99	100	99	98	99	100

Monthly Minimum Rerative Humidity

(unit: %)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Min
Jan.	64	62	53	63	64	65	67	66	59	60	57	53
Feb.	56	62	59	68	60	65	59	62	57	59	65	56
Mar.	58	58	55	58	63	63	54	54	57	58	57	54
Apr.	60	58	49	48	52	59	50	57	54	56	49	48
May	57	49	63	60	41	55	52	51	53	54	51	41
Jun.	53	50	49	49	53	49	51	54	51	58	56	49
July	46	43	47	45	54	47	50	52	39	50	44	39
Aug.	42	42	51	52	54	49	50	49	36	49	48	36
Sep.	55	44	48	43	51	47	55	41	40	45	52	40
Oct.	55	46	49	49	54	48	58	49	43	56	-	43
Nov.	53	40	50	52	51	50	55	53	52	59	-	40
Dec.	55	53	51	61	62	59	51	56	51	59	-	51
Min	42	40	47	43	41	47	50	41	36	45	44	36

Table 1 METEOROLOGICAL DATA (3/4) (PREVAILING WIND)

Station: Jakarta, Seokarno-Hatta International Airport

Monthly Mean Speed of Prevailing Wind

(unit: Knots, 1Knot=1,852m/h)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Jan.	6	5	4	4	5	7	5	6	7	6	7	6
Feb.	4	4	5	6	5	7	5	6	7	6	7	6
Mar.	5	4	5	8	6	5	5	5	5	6	5	5
Apr.	4	4	6	7	5	5	5	4	5	5	5	5
May	4	5	5	5	6	5	5	4	5	5	5	5
Jun.	4	4	5	6	5	5	6	5	5	5	5	5
July	4	4	5	6	5	6	6	5	5	5	5	5
Aug.	4	4	5	5	6	6	5	6	7	5	6	5
Sep.	4	5	6	5	6	6	5	5	5	5	5	5
Oct.	4	5	6	5	7	6	4	5	6	5	-	5
Nov.	5	5	5	7	6	5	4	5	5	5	-	5
Dec.	4	6	7	5	6	5	7	6	6	7	-	6

Monthly Maximum Speed of Prevailing Wind

(unit: Knots, 1Knot=1,852m/h)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Max
Jan.	18	18	18	28	38	42	50	54	60	52	46	60
Feb.	24	18	18	28	22	46	50	54	60	52	52	60
Mar.	24	16	28	42	32	50	34	44	44	42	38	50
Apr.	16	18	22	36	26	44	50	42	40	58	38	58
May	18	20	40	18	38	40	36	38	46	60	52	60
Jun.	25	20	22	28	20	49	36	42	40	46	38	49
July	18	16	22	26	36	28	44	36	38	46	42	46
Aug.	20	18	24	28	40	36	36	38	42	34	46	46
Sep.	20	18	24	24	40	26	44	38	34	42	44	44
Oct.	20	24	34	22	46	28	39	44	42	44	-	46
Nov.	28	22	28	26	52	38	46	52	40	56	-	56
Dec.	16	20	34	30	48	70	48	56	50	46	-	70
Max.	28	24	40	42	52	70	50	56	60	60	52	70

Direction of Prevailing Wind

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Jan.	NW	NW	NW	N	W	W	N	W	NW	W	N
Feb.	NW	NW	W	W	W	SW	N	W	NW	W	NW
Mar.	NW	NW	W	W	W	E	NE	N	W	W	NE
Apr.	NE	E	E	W	NE	W	NE	SW	N	E	NE
May	SE	S	SW	S	NE	E	NE	E	E	N	NE
Jun.	E	E	E	SW	SE	E	NE	E	NE	N	NE
July	E	E	E	E	S	E	E	E	NE	E	NE
Aug.	NE	E	S	N	NE	E	S	E	E	NE	NE
Sep.	NW	E	NE	N	S	E	SW	NE	NE	NE	NE
Oct.	NW	NE	SW	S	S	NE	W	NE	NE	NE	-
Nov.	W	W	W	W	SW	S	N	W	NE	SW	-
Dec.	NW	SW	W	N	W	SW	W	W	W	W	-

Table 1 METEOROLOGICAL DATA (4/4) (RAIN)

Station: Jakarta, Seokarno-Hatta International Airport

Monthly Rainfall

(unit: mm/month)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Jan.	503	644	371	209	533	349	398	494	392	403	346	422
Feb.	369	384	227	441	174	394	198	345	328	328	546	339
Mar.	195	104	106	155	73	197	255	88	341	198	116	166
Apr.	164	116	73	68	106	241	108	108	146	131	172	130
May	77	89	276	208	162	22	140	74	34	98	124	119
Jun.	23	13	67	41	57	30	78	54	40	112	57	52
July	93	68	17	51	124	-	35	41	-	115	74	69
Aug.	268	-	50	4	153	10	114	60	-	18	36	79
Sep.	124	5	17	64	57	-	88	36	-	48	105	60
Oct.	58	5	98	35	35	6	107	71	1	102	-	52
Nov.	114	81	52	35	29	91	131	102	102	244	-	98
Dec.	237	280	313	284	325	117	278	177	55	250	-	232
Total	2,225	-	1,667	1,595	1,828	-	1,930	1,650	-	2,047	-	1,818

Maximum Daily Rainfall

(unit: mm/day)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Max
Jan.	175	189	101	56	83	58	116	101	58	77	86	189
Feb.	133	118	47	71	36	98	50	136	85	50	107	136
Mar.	110	35	43	40	20	91	58	17	85	44	42	110
Apr.	46	45	27	15	27	58	48	25	31	35	55	58
May	58	55	57	78	56	15	41	37	21	39	55	78
Jun.	6	10	30	14	29	24	16	18	27	37	26	37
July	32	27	14	22	39	-	15	18	-	76	73	(76)
Aug.	77	-	22	2	43	10	67	39	-	18	15	(77)
Sep.	47	4	7	50	55	-	36	18	-	22	35	(55)
Oct.	26	5	23	23	19	6	25	50	1	38	-	(50)
Nov.	23	34	15	8	11	52	22	39	42	67	-	(67)
Dec.	79	71	87	86	77	28	108	39	16	80	-	(108)
Max	175	(189)	101	86	83	(98)	116	136	(85)	80	(107)	189

Rainy Days

(unit: days/month)

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Mean
Jan.	22	27	21	14	26	25	16	23	25	24	16	22
Feb.	14	22	12	25	15	21	16	14	16	23	24	18
Mar.	13	11	13	16	10	10	14	12	19	23	11	14
Apr.	12	12	6	12	12	13	8	13	14	13	14	12
May	4	5	13	13	13	4	11	7	3	9	8	8
Jun.	8	2	7	7	8	3	11	7	5	11	4	7
July	8	4	2	8	9	-	4	6	-	9	3	(6)
Aug.	9	-	9	3	12	1	7	7	-	3	7	(6)
Sep.	12	2	3	3	2	-	6	6	-	6	8	(5)
Oct.	8	1	11	7	5	1	17	7	2	10	-	7
Nov.	16	7	14	10	7	11	16	11	9	19	-	12
Dec.	9	16	19	20	21	15	16	15	12	14	-	16
Total	135	-	130	138	140	-	142	128	-	164	-	140

Table 2 AVERAGE OF MONTHLY MAXIMUM DAILY RAINFALL

Block		WEST BLOCK			CENTRE BLOCK			EAST BLOCK		
Year	Mon	02026A	02030H	02032C	2027	02028D	02033C	2026	02078A	02078E
1980	1	86.0	70.0	30.0	91.0	85.0	25.0	82.0	-	61.0
1980	2	76.0	57.0	46.0	51.0	73.0	48.0	74.0	-	61.0
1980	3	11.0	25.0	57.0	29.0	59.0	31.0	9.0	-	32.0
1980	4	31.0	50.0	88.0	39.0	53.0	57.0	34.0	-	24.0
1980	5	43.0	14.0	47.0	35.0	67.0	30.0	19.0	-	41.0
1980	6	20.0	50.0	35.0	5.0	6.0	32.0	15.0	-	17.0
1980	7	29.0	48.0	26.0	100.0	76.0	38.0	19.0	-	45.0
1980	8	70.0	70.0	61.0	49.0	-	27.0	50.0	-	78.0
1980	9	15.0	27.0	41.0	25.0	-	44.0	3.0	-	19.0
1980	10	49.0	65.0	40.0	33.0	-	60.0	35.0	-	55.0
1980	11	26.0	51.0	50.0	32.0	-	121.0	41.0	-	91.0
1980	12	50.0	105.0	48.0	67.0	-	122.0	-	-	72.0
Sub Ave.			47.4			51.9			42.5	
1981	1	67.0	73.0	61.0	86.0	77.0	60.0	60.0	0.0	136.0
1981	2	63.0	73.0	37.0	60.0	77.0	60.0	59.0	24.0	91.0
1981	3	40.0	69.0	54.0	85.0	78.0	56.0	44.0	75.0	79.0
1981	4	47.0	43.0	66.0	65.0	65.0	35.0	50.0	58.0	75.0
1981	5	28.0	25.0	44.0	24.0	64.0	30.0	51.0	24.0	40.0
1981	6	70.0	14.0	37.0	53.0	37.0	44.0	35.0	71.0	37.0
1981	7	22.0	32.0	64.0	48.0	54.0	42.0	79.0	91.0	51.0
1981	8	23.0	13.0	40.0	15.0	14.0	14.0	25.0	75.0	15.0
1981	9	55.0	26.0	55.0	18.0	16.0	40.0	26.0	23.0	38.0
1981	10	39.0	26.0	31.0	46.0	43.0	61.0	-	32.0	39.0
1981	11	66.0	40.0	22.0	63.0	40.0	43.0	-	116.0	77.0
1981	12	-	123.0	171.0	122.0	107.0	47.0	-	235.0	137.0
Sub Ave.			50.3			52.5			62.7	
1982	1	60.0	65.0	43.0	49.0	49.0	50.0	52.0	102.0	77.0
1982	2	53.0	51.0	-	56.0	42.0	38.0	76.0	105.0	48.0
1982	3	28.0	39.0	71.0	32.0	32.0	27.0	49.0	172.0	45.0
1982	4	19.0	43.0	32.0	11.0	27.0	13.0	10.0	105.0	84.0
1982	5	-	34.0	57.0	13.0	38.0	13.0	8.0	-	32.0
1982	6	-	42.0	38.0	48.0	20.0	67.0	61.0	-	105.0
1982	7	-	4.0	67.0	13.0	25.0	1.0	1.0	-	2.0
1982	8	0.0	0.0	-	37.0	2.0	36.0	30.0	-	0.0
1982	9	-	-	-	0.0	0.0	0.0	0.0	-	0.0
1982	10	32.0	-	-	48.0	42.0	-	8.0	-	10.0
1982	11	0.0	-	-	3.0	4.0	-	4.0	-	16.0
1982	12	14.0	-	-	63.0	40.0	-	-	-	37.0
Sub Ave.			36.0			28.5			45.9	
1983	1	71.0	-	38.0	86.0	71.0	60.0	172.0	58.0	67.0
1983	2	73.0	-	44.0	90.0	54.0	82.0	38.0	-	86.0
1983	3	96.0	-	-	87.0	82.0	97.0	-	-	103.0
1983	4	33.0	-	-	53.0	82.0	39.0	-	-	128.0
1983	5	112.0	-	58.0	41.0	43.0	28.0	19.0	86.0	76.0
1983	6	0.0	-	65.0	15.0	21.0	16.0	0.0	0.0	6.0
1983	7	21.0	20.0	20.0	45.0	28.0	21.0	23.0	25.0	13.0
1983	8	3.0	10.0	6.0	5.0	2.0	21.0	2.0	11.0	7.0
1983	9	0.0	-	0.0	0.0	0.0	4.0	0.0	-	0.0
1983	10	43.0	30.0	-	-	61.0	-	69.0	-	43.0
1983	11	56.0	13.0	-	-	47.0	-	43.0	-	24.0
1983	12	72.0	-	41.0	47.0	74.0	48.0	59.0	63.0	53.0
Sub Ave.			38.5			45.3			45.5	
1984	1	73.0	61.0	53.0	48.0	-	55.0	52.0	-	-
1984	2	65.0	-	54.0	70.0	-	37.0	66.0	-	-
1984	3	71.0	50.0	100.0	65.0	73.0	-	-	-	62.0
1984	4	-	-	-	49.0	-	-	-	-	-
1984	5	55.0	48.0	122.0	80.0	169.0	93.0	-	70.0	87.0
1984	6	-	-	-	-	-	-	-	-	-
1984	7	19.0	54.0	16.0	18.0	25.0	13.0	-	-	23.0
1984	8	93.0	67.0	32.0	-	77.0	-	-	-	7.0
1984	9	-	-	77.0	-	80.0	-	-	-	-
1984	10	33.0	-	-	-	-	-	-	-	-
1984	11	35.0	-	-	-	-	-	-	-	-
1984	12	-	-	-	-	-	-	-	-	-
Sub Ave.			59.2			63.5			52.4	
Tot Ave.			46.3			48.3			49.8	

Table 3 MONTHLY MEAN DAILY RAINFALL

Block		WEST BLOCK			CENTRE BLOCK			EAST BLOCK		
Year	Mon	02026A	02030H	02032C	2027	02028D	02033C	2026	02078A	02078E
1980	1	23.7	23.2	10.0	20.2	26.2	10.3	24.9	-	21.0
1980	2	29.1	31.2	12.4	18.0	27.7	19.6	24.2	-	18.0
1980	3	7.0	13.2	8.3	9.3	16.8	12.3	4.0	-	10.6
1980	4	12.4	29.5	22.2	7.1	15.2	9.5	15.4	-	9.1
1980	5	11.9	12.7	15.1	18.8	28.0	11.0	6.0	-	17.8
1980	6	13.2	18.6	10.8	3.0	5.5	17.7	15.0	-	8.7
1980	7	13.5	34.0	13.6	24.2	33.8	11.4	13.3	-	13.4
1980	8	38.8	27.4	25.0	24.3	-	17.4	12.3	-	24.8
1980	9	10.0	24.5	10.1	15.2	-	35.0	1.8	-	9.8
1980	10	36.3	21.7	14.1	15.3	-	33.2	11.1	-	20.5
1980	11	11.0	24.1	15.8	8.7	-	86.0	9.0	-	21.6
1980	12	17.2	29.5	14.1	15.8	-	51.3	-	-	23.6
Sub Ave.			19.0			20.9			14.6	
1981	1	24.2	31.5	16.7	21.8	23.2	19.7	16.7	0.0	31.9
1981	2	11.8	22.8	9.4	10.8	12.9	10.9	12.3	7.8	20.4
1981	3	15.8	29.7	14.1	21.1	22.8	11.6	11.2	19.6	18.2
1981	4	26.5	15.4	18.8	23.1	21.4	7.4	18.9	22.7	21.6
1981	5	9.2	12.9	13.6	8.3	13.3	11.1	13.8	17.2	26.6
1981	6	25.7	10.4	10.3	13.0	16.4	16.3	7.0	25.8	23.0
1981	7	9.8	13.4	11.7	8.8	10.6	30.3	19.2	40.3	12.1
1981	8	9.8	10.3	10.4	6.9	6.0	4.8	24.5	41.8	10.3
1981	9	13.1	10.6	19.4	8.1	9.3	10.5	7.5	8.5	16.2
1981	10	9.9	12.5	10.1	17.6	15.4	35.5	-	16.0	13.3
1981	11	20.1	17.5	4.9	13.2	11.3	15.3	-	27.3	18.7
1981	12	-	32.3	28.2	24.7	24.5	23.0	-	87.7	57.0
Sub Ave.			16.1			15.6			21.7	
1982	1	16.0	19.4	12.2	12.8	15.8	14.7	14.4	29.9	22.0
1982	2	17.1	24.2	-	13.6	16.7	10.6	19.5	31.6	18.8
1982	3	14.1	12.1	10.9	9.6	10.5	8.3	13.8	70.1	17.5
1982	4	7.4	12.9	10.9	5.3	14.7	4.4	5.2	40.7	24.5
1982	5	-	16.3	14.7	4.6	10.2	7.5	5.0	-	14.0
1982	6	-	32.0	14.5	20.6	11.2	22.7	16.6	-	51.7
1982	7	-	3.5	27.3	9.0	18.7	1.0	1.0	-	2.0
1982	8	0.0	0.0	-	37.0	2.0	13.7	30.0	-	0.0
1982	9	-	-	-	0.0	0.0	0.0	0.0	-	0.0
1982	10	32.0	-	-	24.5	23.0	-	8.0	-	6.5
1982	11	0.0	-	-	3.0	2.5	-	3.0	-	5.8
1982	12	5.7	-	-	15.0	8.9	-	-	-	16.4
Sub Ave.			13.8			11.3			17.3	
1983	1	28.4	-	12.3	21.0	19.3	19.8	36.4	19.6	25.0
1983	2	18.6	-	11.5	17.4	18.0	17.3	9.0	-	16.8
1983	3	29.5	-	-	20.4	21.1	21.6	-	-	41.1
1983	4	18.8	-	-	11.1	17.9	12.5	-	-	29.4
1983	5	28.5	-	15.4	10.4	9.8	7.9	5.3	16.7	20.2
1983	6	0.0	-	22.0	8.5	10.5	9.0	0.0	0.0	6.0
1983	7	17.0	16.0	9.5	17.0	15.0	6.7	9.0	15.7	5.6
1983	8	3.0	10.0	4.0	5.0	2.0	17.0	1.5	11.0	5.0
1983	9	0.0	-	0.0	0.0	0.0	4.0	0.0	-	0.0
1983	10	18.1	13.1	-	-	13.5	-	14.2	-	17.8
1983	11	14.3	6.6	-	-	13.6	-	8.4	-	10.3
1983	12	18.4	-	13.6	13.1	17.8	14.3	11.2	22.3	17.9
Sub Ave.			13.7			12.9			13.4	
1984	1	19.5	16.4	12.8	14.8	-	15.1	11.9	-	-
1984	2	23.6	-	11.9	15.6	-	11.9	16.5	-	-
1984	3	21.8	20.2	15.8	13.7	18.4	-	-	-	22.8
1984	4	-	-	-	12.5	-	-	-	-	-
1984	5	20.9	18.8	19.8	17.7	25.5	26.1	-	21.5	29.4
1984	6	-	-	-	-	-	-	-	-	-
1984	7	8.5	18.0	8.3	7.3	9.8	11.0	-	-	14.3
1984	8	37.3	27.0	16.3	-	25.7	-	-	-	5.2
1984	9	-	-	21.2	-	15.8	-	-	-	-
1984	10	21.7	-	-	-	-	-	-	-	-
1984	11	15.0	-	-	-	-	-	-	-	-
1984	12	-	-	-	-	-	-	-	-	-
Sub Ave.			18.7			16.1			17.4	
Tot Ave.			16.3			15.3			16.9	

Table 4 MONTHLY AVERAGE OF RAINFALL INTENSITY

Year	Mon	Pondok Betung			Jakarta-BMG		
		1hr	3hr	6hr	1hr	3hr	6hr
1991	JAN	7.5	3.0	1.6	8.2	3.5	1.9
	FEB	10.5	4.1	2.1	7.9	3.3	1.8
	MAR	17.8	8.2	4.8	8.2	4.4	2.6
	APR	5.8	2.2	1.1	7.8	3.6	1.9
	MAY	17.5	6.3	3.5	1.1	0.4	0.2
	JUN	4.2	1.7	0.9	1.5	0.5	0.3
	JUL	0.2	0.1	0.0	-	-	-
	AUG	0.2	0.1	0.0	-	-	-
	SEP	5.5	2.7	1.4	-	-	-
	OCT	2.6	0.9	0.6	-	-	-
	NOV	14.7	5.5	2.9	-	-	-
	DEC	6.7	2.8	1.4	-	-	-
Sub Ave.		7.8	3.1	1.7	5.8	2.6	1.4
1992	JAN	7.9	2.6	1.6	9.6	5.6	3.1
	FEB	10.7	4.2	2.3	14.6	5.1	2.7
	MAR	12.9	4.5	2.3	-	-	-
	APR	14.5	6.5	3.8	7.2	3.4	1.8
	MAY	13.3	4.9	2.5	10.9	5.1	2.9
	JUN	6.8	2.3	2.0	2.5	1.0	0.5
	JUL	8.4	2.8	1.5	8.3	2.8	1.5
	AUG	13.0	4.7	2.8	14.0	6.9	5.0
	SEP	15.1	5.7	2.9	6.7	2.4	1.2
	OCT	12.3	4.4	2.5	11.6	4.3	2.3
	NOV	11.3	4.0	2.2	8.8	3.4	2.1
	DEC	15.6	6.2	3.3	-	-	-
Sub Ave.		11.8	4.4	2.5	9.4	4.0	2.3
1993	JAN	8.1	3.3	1.8	-	-	-
	FEB	10.3	4.2	2.1	10.6	4.2	2.4
	MAR	7.2	2.9	1.5	-	-	-
	APR	13.9	5.3	2.7	-	-	-
	MAY	8.4	3.4	1.8	11.7	4.7	2.6
	JUN	5.4	2.0	1.0	6.3	3.0	1.5
	JUL	6.4	2.2	1.1	6.9	3.2	1.6
	AUG	5.9	2.4	1.3	9.7	4.1	2.6
	SEP	3.6	1.3	0.7	5.4	1.9	1.0
	OCT	6.9	2.3	1.3	5.4	2.9	1.8
	NOV	17.2	6.4	3.5	6.1	3.0	1.8
	DEC	6.6	2.9	1.3	-	-	-
Sub Ave.		8.3	3.2	1.7	7.8	3.4	1.9
1994	JAN	6.9	3.4	1.9	-	-	-
	FEB	13.6	5.5	2.9	-	-	-
	MAR	9.9	3.9	2.1	-	-	-
	APR	11.9	4.6	2.6	6.8	2.5	1.3
	MAY	8.5	3.0	1.5	18.6	9.8	5.2
	JUN	4.4	1.7	0.8	3.0	1.3	0.7
	JUL	0.0	0.0	0.0	1.8	1.1	0.9
	AUG	1.2	0.4	0.2	22.9	12.7	9.0
	SEP	8.5	2.8	1.4	5.4	2.0	1.0
	OCT	3.1	1.0	0.5	-	-	-
	NOV	10.8	4.3	2.2	-	-	-
	DEC	4.2	1.7	0.9	-	-	-
Sub Ave.		6.9	2.7	1.4	9.7	4.9	3.0
1995	JAN	8.0	3.7	2.1	-	-	-
	FEB	6.3	2.9	1.7	-	-	-
	MAR	9.3	3.5	1.8	-	-	-
	APR	8.1	3.0	1.5	6.7	3.9	2.0
	MAY	10.7	3.9	2.1	2.8	1.2	0.6
	JUN	12.6	5.4	3.3	12.9	5.9	3.2
	JUL	10.1	3.9	1.9	10.5	4.5	2.2
	AUG	0.0	0.0	0.0	1.8	0.6	0.3
	SEP	29.5	12.6	6.4	5.0	2.0	1.0
	OCT	10.6	4.1	2.2	8.1	3.9	2.1
	NOV	5.9	2.4	1.3	7.7	3.5	1.8
	DEC	4.9	2.2	1.3	-	-	-
Sub Ave.		9.7	4.0	2.1	6.9	3.2	1.7
Tot Ave.		8.9	3.5	1.9	7.9	3.6	2.1

Table 5 MAXIMUM OF RAINFALL INTENSITY (1/15)

1991(1/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	2.3	1.3	0.6	1.0	0.5	0.3
	2	8.6	2.9	1.4			
	3						
	4	6.2	2.4	1.2			
	5	2.4	0.8	0.4	1.3	0.5	0.3
	6	0.8	0.3	0.2	28.8	10.4	5.2
	7	8.9	3.0	1.5	3.2	1.9	1.0
	8	0.6	0.3	0.3	13.2	6.2	3.2
	9	63.6	23.5	11.8	5.8	2.1	1.3
	10	14.0	4.8	2.4	14.0	8.0	4.3
	11	6.0	4.0	2.4	2.5	0.8	0.4
	12	1.1	0.4	0.2	2.1	1.0	0.5
	13	0.2	0.1	0.1	63.2	24.4	13.0
	14	12.4	7.6	4.7	1.0	0.6	0.3
	15	0.9	0.4	0.2	21.7	10.6	5.3
	16	1.7	1.1	0.5			
	17	5.6	1.9	0.9	5.4	2.8	1.5
	18	7.0	2.6	1.3	0.2	0.1	0.0
	19	17.4	6.2	3.1			
	20				2.4	1.0	0.5
	21	0.6	0.2	0.1			
	22				1.0	0.3	0.2
	23	0.4	0.1	0.1	3.7	1.7	0.9
	24	6.1	2.7	1.6	0.2	0.1	0.0
	25	18.3	6.5	3.3			
	26	0.1	0.0	0.0	0.8	0.3	0.1
	27	0.3	0.1	0.1	0.7	0.2	0.1
	28	0.8	0.4	0.2	8.7	5.0	3.4
	29	1.0	0.8	0.4	2.7	1.3	1.3
	30	6.3	3.7	1.9	12.5	4.6	2.3
	31	16.7	5.6	2.8	0.4	0.1	0.1
Sub Ave.		7.5	3.0	1.6	8.2	3.5	1.9
FEB	1	8.1	2.7	1.4	3.3	1.3	1.2
	2	5.3	1.8	1.3	4.3	1.6	0.8
	3	1.8	1.0	0.5	3.3	2.0	1.6
	4	36.8	13.2	6.6	6.5	3.5	2.8
	5	10.9	6.3	3.4			
	6	24.6	8.3	4.1	12.3	4.9	2.5
	7	12.1	4.6	2.3			
	8	2.8	1.7	0.9	11.9	4.5	2.3
	9	39.0	13.1	6.6	0.3	0.2	0.1
	10	7.0	2.7	1.7	0.9	0.5	0.3
	11	1.0	0.7	0.5	2.2	0.9	0.5
	12	9.0	3.0	1.5			
	13						
	14	0.6	0.2	0.1			
	15	6.4	2.4	1.2			
	16	2.1	0.7	0.4	10.5	8.2	4.6
	17	9.6	9.0	5.5	2.5	1.6	0.8
	18	2.7	1.4	0.7	0.5	0.4	0.2
	19	5.8	2.9	1.4	10.0	3.3	1.7
	20	38.6	13.0	6.5	1.6	0.9	0.5
	21	4.6	2.5	1.2			
	22	0.4	0.1	0.1	9.5	3.3	2.4
	23	13.0	4.3	2.2	4.8	3.0	1.6
	24	6.2	2.7	1.5	8.6	2.9	1.5
	25	24.3	8.2	4.1	17.4	5.8	2.9
	26	0.4	0.2	0.1			
	27	0.6	0.2	0.1			
	28				40.0	13.3	6.7
Sub Ave.		10.5	4.1	2.1	7.9	3.3	1.8

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1						
	2						
	3						
	4						
	5				1.2	0.4	0.2
	6						
	7						
	8				6.2	2.1	1.0
	9	0.1	0.0	0.0	0.5	0.2	0.1
	10	0.1	0.0	0.0			
	11				9.9	3.7	1.9
	12	0.8	0.3	0.2			
	13						
	14						
	15				45.5	34.2	21.7
	16	38.0	16.0	13.3			
	17	41.6	14.0	7.0	5.3	2.1	1.1
	18	3.9	1.7	1.0	0.9	0.4	0.2
	19				6.9	2.5	1.3
	20	0.9	0.4	0.3	1.5	0.5	0.3
	21				2.7	1.7	1.4
	22	37.4	13.4	8.1			
	23				23.0	10.3	5.9
	24	43.4	36.0	19.6			
	25				0.8	0.3	0.1
	26	17.1	5.7	2.9	0.7	0.2	0.1
	27				7.0	2.3	1.2
	28	8.9	3.0	1.5			
	29				0.8	0.3	0.1
	30	21.9	7.3	3.8	20.0	11.1	5.8
	31				7.0	2.3	1.2
Sub Ave.		17.8	8.2	4.8	8.2	4.4	2.6
APR	1				3.6	1.5	0.8
	2	5.4	2.3	1.2	0.9	0.5	0.3
	3	2.8	1.0	0.6			
	4				1.4	0.7	0.4
	5	3.3	1.4	0.7			
	6	4.7	1.6	0.8			
	7	4.1	1.4	0.7	27.5	9.8	4.9
	8	0.1	0.0	0.0			
	9						
	10	1.2	0.4	0.2	3.1	1.0	0.5
	11	6.5	2.2	1.1			
	12	0.4	0.1	0.1			
	13				6.0	2.6	1.3
	14	11.1	3.7	1.9	1.4	0.5	0.3
	15	2.1	0.7	0.5	2.8	1.9	1.1
	16	2.6	1.3	0.8	7.0	4.6	2.7
	17	6.4	2.3	1.3	4.4	1.9	1.6
	18	1.5	1.1	0.7			
	19	0.5	0.2	0.1	1.0	0.3	0.2
	20						
	21	0.5	0.2	0.1	17.1	6.0	3.0
	22	9.5	3.4	1.7			
	23				36.8	20.5	10.5
	24	47.7	17.7	9.2	0.7	0.5	0.2
	25	5.2	2.0	1.0	3.8	1.3	0.7
	26	4.1	1.5	0.8			
	27						
	28						
	29						
	30	1.3	0.7	0.4			
Sub Ave.		5.8	2.2	1.1	7.8	3.6	1.9

Table 5 MAXIMUM OF RAINFALL INTENSITY (2/15)

1991(2/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	75.9	27.9	14.3	1.7	0.6	0.3
	2	19.2	6.5	3.3			
	3	6.0	2.0	1.0			
	4				0.9	0.3	0.2
	5	1.1	0.4	0.2			
	6						
	7	0.7	0.2	0.1			
	8						
	9				0.7	0.2	0.1
	10	32.3	11.0	7.5			
	11						
	12						
	13	3.2	1.8	1.2	1.0	0.3	0.2
	14	1.4	0.5	0.2			
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
Sub Ave.		17.5	6.3	3.5	1.1	0.4	0.2
FEB	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13	0.8	0.3	0.1			
	14	11.8	5.6	2.8			
	15	0.3	0.1	0.1			
	16						
	17	0.6	0.2	0.1	1.5	0.5	0.3
	18	7.3	2.4	1.2			
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
Sub Ave.		4.2	1.7	0.9	1.5	0.5	0.3

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1				-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14				-	-	-
	15				-	-	-
	16				-	-	-
	17	0.2	0.1	0.0	-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21				-	-	-
	22				-	-	-
	23	0.3	0.1	0.1	-	-	-
	24	0.2	0.1	0.0	-	-	-
	25				-	-	-
	26				-	-	-
	27				-	-	-
	28				-	-	-
	29				-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		0.2	0.1	0.0	-	-	-
APR	1				-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14				-	-	-
	15				-	-	-
	16				-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21				-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25				-	-	-
	26				-	-	-
	27	0.2	0.1	0.0	-	-	-
	28				-	-	-
	29				-	-	-
	30				-	-	-
Sub Ave.		0.2	0.1	0.0	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (3/15)

1991(3/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
SEP	1				-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5	10.6	6.2	3.1	-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14	0.7	0.2	0.1	-	-	-
	15				-	-	-
	16				-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21				-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25	5.2	1.7	0.9	-	-	-
	26				-	-	-
	27				-	-	-
	28				-	-	-
	29				-	-	-
	30				-	-	-
					-	-	-
Sub Ave.		5.5	2.7	1.4	-	-	-
OCT	1	0.2	0.1	0.0	-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14				-	-	-
	15				-	-	-
	16				-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20	1.4	0.5	0.2	-	-	-
	21	6.2	2.1	1.6	-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25				-	-	-
	26				-	-	-
	27				-	-	-
	28				-	-	-
	29				-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		2.6	0.9	0.6	-	-	-

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
NOV	1	16.4	5.5	2.8	-	-	-
	2				-	-	-
	3	1.3	0.4	0.2	-	-	-
	4	0.3	0.1	0.1	-	-	-
	5	30.9	18.0	9.9	-	-	-
	6	3.0	1.1	0.6	-	-	-
	7				-	-	-
	8	34.1	12.2	6.1	-	-	-
	9				-	-	-
	10	1.3	0.6	0.3	-	-	-
	11				-	-	-
	12	34.4	14.3	7.2	-	-	-
	13	1.9	1.1	0.8	-	-	-
	14	24.4	8.1	5.0	-	-	-
	15	2.8	0.9	0.5	-	-	-
	16	19.7	6.6	3.3	-	-	-
	17	8.2	2.7	1.4	-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21	25.7	8.6	4.3	-	-	-
	22	3.3	1.1	0.6	-	-	-
	23	22.2	7.4	3.8	-	-	-
	24	17.0	6.1	3.1	-	-	-
	25	3.4	2.2	1.1	-	-	-
	26				-	-	-
	27	4.0	1.3	0.7	-	-	-
	28	66.1	22.6	11.3	-	-	-
	29	1.8	0.6	0.3	-	-	-
	30	0.3	0.1	0.1	-	-	-
					-	-	-
Sub Ave.		14.7	5.5	2.9	-	-	-
DEC	1	0.3	0.1	0.1	-	-	-
	2	4.5	2.4	1.8	-	-	-
	3				-	-	-
	4	0.4	0.5	0.4	-	-	-
	5	1.2	0.5	0.3	-	-	-
	6	0.8	0.3	0.2	-	-	-
	7	10.9	4.3	2.1	-	-	-
	8	5.1	2.0	1.0	-	-	-
	9	1.1	0.5	0.3	-	-	-
	10	16.9	5.6	2.8	-	-	-
	11				-	-	-
	12	19.4	6.9	3.5	-	-	-
	13				-	-	-
	14				-	-	-
	15	2.2	0.7	0.4	-	-	-
	16	20.1	6.9	3.5	-	-	-
	17				-	-	-
	18	0.3	0.1	0.1	-	-	-
	19	0.4	0.1	0.1	-	-	-
	20	6.0	2.8	1.4	-	-	-
	21	2.7	1.2	0.6	-	-	-
	22		8.3	4.2	-	-	-
	23				-	-	-
	24	5.9	2.0	1.0	-	-	-
	25				-	-	-
	26	6.6	2.3	1.1	-	-	-
	27	6.6	2.8	1.4	-	-	-
	28	7.9	3.3	1.7	-	-	-
	29	21.4	7.1	3.6	-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		6.7	2.8	1.4	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (4/15)

1992(1/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	21.5	7.3	3.7			
	2				0.2	0.1	0.1
	3	1.0	0.3	0.2			
	4	1.0	0.3	0.2	2.4	1.3	0.7
	5	29.5		6.4			
	6						
	7				5.0	3.4	2.0
	8	26.5	9.0	4.5			
	9	8.7	5.2	2.6			
	10	0.4	0.2	0.1	20.0	12.1	7.6
	11	4.7	3.1	1.7	17.6	9.4	5.3
	12	18.0	6.2	3.3	14.1	8.5	4.3
	13	23.4	8.3	4.2	8.0	4.3	2.1
	14	4.4	1.8	0.9	25.8	13.6	6.8
	15	1.4	0.8	0.6	1.3	0.7	0.3
	16						
	17	0.3	0.1	0.1			
	18						
	19						
	20				11.5	8.2	4.1
	21	6.8	2.4	1.2	31.0	19.9	10.7
	22	5.5	2.3	1.3	5.8	3.8	2.1
	23	5.4	1.8	0.9	11.4	6.7	3.4
	24	2.0	0.7	0.4	4.7	2.1	1.6
	25	3.0	1.2	1.1	2.7	1.6	0.8
	26	0.6	0.3	0.2			
	27						
	28						
	29	1.2	0.4	0.2	0.6	0.3	0.2
	30	0.6	0.3	0.3			
	31				0.4	0.1	0.1
Sub Ave.		7.9	2.6	1.6	9.6	5.6	3.1
FEB	1	0.6	0.2	0.1			
	2	1.9	0.9	0.5			
	3	6.2	2.1	1.1			
	4				50.5	18.0	9.0
	5						
	6				14.9	5.0	3.4
	7	0.9	0.7	0.4	1.1	0.5	0.3
	8				30.7	10.4	5.2
	9	11.0	4.8	2.4	0.3	0.1	0.1
	10	24.0	9.7	7.4	11.6	3.9	1.9
	11	2.0	0.7	0.3			
	12				2.2	0.8	0.5
	13	3.3	1.1	0.6			
	14						
	15	0.5	0.3	0.2			
	16						
	17	0.2	0.1	0.0			
	18	11.6	3.9	2.0			
	19	3.2	1.1	0.6			
	20						
	21						
	22	25.2	8.4	4.2			
	23	15.7	6.5	3.3			
	24	5.8	3.9	2.1			
	25	4.0	1.4	0.8			
	26	12.4	8.9	4.7	3.3	1.1	0.6
	27	34.8	11.6	5.8	14.1	4.9	3.0
	28	11.5	3.8	1.9	2.3	1.8	1.0
		38.3	13.7	6.9	29.1	10.0	5.4
Sub Ave.		10.7	4.2	2.3	14.6	5.1	2.7

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1	38.6	12.9	6.5	-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7	46.5	17.5	8.8	-	-	-
	8				-	-	-
	9	13.9	4.8	2.4	-	-	-
	10	1.6	0.7	0.4	-	-	-
	11	37.5	13.8	7.4	-	-	-
	12	1.6	0.6	0.3	-	-	-
	13	1.5	0.6	0.3	-	-	-
	14	0.6	0.2	0.1	-	-	-
	15	12.0	4.0	2.0	-	-	-
	16	1.7	1.1	0.6	-	-	-
	17	1.2	0.5	0.2	-	-	-
	18				-	-	-
	19				-	-	-
	20	38.1	13.0	6.7	-	-	-
	21	8.3	2.8	1.4	-	-	-
	22	13.8	4.6	2.3	-	-	-
	23	4.7	1.6	0.8	-	-	-
	24	0.9	0.3	0.3	-	-	-
	25	33.7	11.2	5.6	-	-	-
	26	0.3	0.1	0.1	-	-	-
	27				-	-	-
	28				-	-	-
	29	0.1	0.0	0.0	-	-	-
	30	0.9	0.3	0.2	-	-	-
	31				-	-	-
Sub Ave.		12.9	4.5	2.3	-	-	-
APR	1	22.4	12.0	8.4	0.4	0.1	0.1
	2	0.2	0.1	0.0	2.0	1.9	1.2
	3	40.4	14.2	7.4			
	4				8.1	3.3	1.9
	5	2.5	0.8	0.4			
	6						
	7						
	8						
	9				0.8	0.4	0.2
	10						
	11				7.5	3.5	2.2
	12	27.6	9.3	4.9	1.3	0.6	0.4
	13	4.9	1.7	1.0			
	14						
	15	5.0	1.7	0.8			
	16	24.7	10.4	5.4			
	17	1.5	0.5	0.3			
	18	5.2	1.7	0.9			
	19	0.4	0.1	0.1			
	20				10.2	3.4	1.7
	21	6.0	2.1	1.1	18.5	7.2	3.9
	22	31.3	18.2	10.1			
	23	15.1	5.0	2.5	22.0	12.0	6.0
	24	40.0	29.7	19.3			
	25	0.4	0.1	0.1			
	26	15.6	5.4	2.7			
	27				4.5	1.5	0.8
	28	23.5	8.2	4.2	11.0	7.2	3.6
	29	18.4	7.6	6.3			
	30	5.1	1.8	0.9	0.5	0.2	0.1
Sub Ave.		14.5	6.5	3.8	7.2	3.4	1.8

Table 5 MAXIMUM OF RAINFALL INTENSITY (5/15)

1992(2/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr	Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1							MAR	1						
	2				0.5	0.2	0.1		2						
	3	14.2	7.8	3.9					3	0.5	0.2	0.1			
	4				11.3	7.0	3.5		4						
	5	5.0	2.6	1.3	0.4	0.1	0.1		5	3.6	1.2	0.6			
	6	3.5	1.2	1.0					6						
	7	4.3	1.4	0.7					7	0.3	0.1	0.1			
	8				11.5	5.6	3.2		8						
	9	16.1	6.2	3.6					9						
	10	1.6	0.5	0.3	30.0	15.5	8.9		10						
	11	15.6	5.2	2.7	2.4	0.9	0.6		11						
	12	1.5	0.6	0.3					12	0.7	0.2	0.1	8.3	2.8	1.5
	13				0.2	0.1	0.0		13	3.8	1.3	1.0			
	14	23.5	7.8	3.9	3.5	1.2	0.6		14						
	15	19.7	6.6	3.3	5.5	5.0	3.0		15						
	16	55.8	18.6	9.3					16						
	17	0.1	0.0	0.0					17						
	18								18						
	19								19						
	20								20						
	21	0.1	0.0	0.0					21						
	22	6.9	2.9	1.8	1.2	0.6	0.3		22						
	23	26.9	10.4	5.2					23						
	24								24						
	25								25						
	26				24.9	11.6	5.9		26						
	27	1.5	0.5	0.4					27						
	28								28						
	29	42.0	15.5	7.8					29						
	30				44.0	16.7	10.0		30	41.6	13.9	6.9			
	31	0.4	0.2	0.1	6.3	2.1	1.1		31						
Sub Ave.		13.3	4.9	2.5	10.9	5.1	2.9	Sub Ave.		8.4	2.8	1.5	8.3	2.8	1.5
FEB	1	6.5	2.9	1.6	8.6	2.9	1.4	APR	1						
	2	3.3	1.1	0.6	0.3	0.1	0.1		2						
	3				0.8	0.3	0.1		3						
	4								4				35.0	15.0	11.7
	5				0.4	0.1	0.1		5	10.6	3.6	1.9			
	6	4.5	1.5	0.8					6						
	7			10.3	0.7	0.2	0.1		7						
	8	0.2	0.1	0.0					8						
	9								9						
	10	2.8	1.1	0.5					10						
	11				1.0	0.4	0.2		11						
	12								12						
	13	33.0	11.0	5.5					13						
	14								14						
	15	9.8	3.3	1.6					15	0.6	0.2	0.1	0.4	0.1	0.1
	16								16	21.6	7.2	3.6			
	17								17						
	18								18						
	19								19						
	20								20	24.3	8.2	4.1			
	21								21				3.0	1.6	0.8
	22	1.4	0.5	0.2					22	5.6	2.0	1.0	30.0	20.3	15.9
	23								23	12.0	4.5	2.3			
	24	1.6	0.5	0.3					24				13.6	4.5	3.1
	25	4.5	1.5	0.8					25	33.2	11.7	9.7			
	26				7.3	3.5	1.8		26	8.2	3.0	2.3			
	27								27	14.3	5.4	3.0			
	28								28				15.5	6.5	3.5
					0.7	0.2	0.1		29	21.2	8.9	4.9			
									30	0.6	0.2	0.1			
										4.2	1.4	0.75	0.3	0.1	0.1
Sub Ave.		6.8	2.3	2.0	2.5	1.0	0.5	Sub Ave.		13.0	4.7	2.8	14.0	6.9	5.0

Table 5 MAXIMUM OF RAINFALL INTENSITY (6/15)

1992(3/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr	Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
SEP	1	0.5	0.2	0.1	10.7	3.6	1.8	NOV	1				35.3	14.5	12.3
	2	14.4	7.633	3.817	12.0	5.0	2.5		2	39.0	14.1	7.2			
	3	2.2	0.733	0.367	5.9	2.0	1.0		3	5.8	2.2	1.2			
	4								4						
	5				29.2	10.4	5.5		5						
	6	8.9	3.3	1.7					6	2.1	0.7	0.4			
	7	56.0	19.0	9.5	5.0	1.7	0.9		7				0.6	0.2	0.1
	8	18.7	8.5	4.2					8	9.5	3.5	1.8	5.0	2.4	1.2
	9								9	26.4	10.0	8.5	0.8	0.3	0.3
	10				1.1	0.4	0.2		10	28.7	10.0	5.4			
	11	36.9	12.3	6.2	3.8	1.3	0.6		11	1.0	0.4	0.2			
	12	10.7	3.9	2.0					12	4.5	1.5	0.8			
	13	0.3	0.1	0.1					13	31.3	10.4	5.3			
	14								14	0.2	0.1	0.0			
	15								15						
	16								16	6.5	2.2	1.1			
	17				1.8	0.8	0.5		17	1.6	0.8	0.5	6.7	2.2	1.1
	18	0.9	0.5	0.3					18	6.5	2.2	1.1	0.5	0.2	0.1
	19	11.7	4.3	2.1	0.2	0.1	0.0		19	16.1	5.4	2.7			
	20	0.4	0.1	0.1	0.3	0.2	0.1		20	36.0	12.1	6.1	26.8	8.9	4.6
	21	37.5	16.1	8.4					21	7.1	2.8	1.6	0.6	0.2	0.1
	22	9.7	3.3	1.6					22	0.8	0.3	0.2	1.6	0.8	0.4
	23				5.2	1.7	0.9		23	3.5	1.3	0.7	0.2	0.1	0.0
	24								24						
	25	40.5	14.2	7.1	1.6	0.8	0.7		25	2.4	0.8	0.4	0.6	2.0	0.1
	26	21.0	9.0	4.8					26	8.5	3.0	1.5			
	27	0.3	0.1	0.1					27						
	28	0.8	0.3	0.2					28						
	29								29	0.2	0.1	0.0	26.6	8.9	4.5
	30				9.7	3.2	1.6		30						
Sub Ave.		15.1	5.7	2.9	6.7	2.4	1.2	Sub Ave.		11.3	4.0	2.2	8.8	3.4	2.1
OCT	1	3.2	1.1	0.7	44.5	16.6	8.3	DEC	1	0.9	0.3	0.2	-	-	-
	2	31.2	10.8	6.6	26.3	9.6	5.0		2	9.0	4.8	2.9	-	-	-
	3	51.5	20.0	10.3	22.0	8.8	4.4		3	5.7	5.4	4.2	-	-	-
	4	27.1	10.6	5.5					4	16.0	5.5	2.8	-	-	-
	5	1.0	0.3	0.2					5				-	-	-
	6	2.1	0.7	0.4	4.7	2.0	1.0		6	1.3	0.6	0.3	-	-	-
	7	44.3	15.7	7.9	0.2	0.1	0.0		7				-	-	-
	8	30.3	10.5	5.3	38.0	14.9	7.5		8				-	-	-
	9	23.9	9.0	4.6	0.3	0.1	0.1		9				-	-	-
	10	0.5	0.2	0.1	0.2	0.1	0.1		10	0.9	0.3	0.2	-	-	-
	11								11	1.5	0.8	0.4	-	-	-
	12	5.8	1.9	1.0	11.7	4.1	2.0		12	50.3	17.8	8.9	-	-	-
	13	7.9	2.6	1.3	2.6	0.9	0.5		13	10.7	4.3	2.2	-	-	-
	14	0.5	0.2	0.1	0.3	0.2	0.1		14	5.0	2.7	1.6	-	-	-
	15			6.2					15	30.6	12.9	6.7	-	-	-
	16								16	1.1	0.9	0.5	-	-	-
	17								17				-	-	-
	18				44.0	14.7	9.7		18	20.0	6.7	3.3	-	-	-
	19	0.1	0.0	0.0	0.9	0.4	0.2		19				-	-	-
	20	4.6	2.0	1.0					20				-	-	-
	21	0.8	0.3	0.1	1.0	0.4	0.2		21	10.0	3.3	1.7	-	-	-
	22	0.9	0.3	0.2					22				-	-	-
	23								23				-	-	-
	24	7.6	2.5	1.3	0.5	0.2	0.1		24				-	-	-
	25	3.3	1.1	0.6					25	0.8	0.3	0.1	-	-	-
	26				13.0	4.3	2.2		26	26.2	13.2	6.6	-	-	-
	27				0.6	0.3	0.2		27				-	-	-
	28				9.8	3.3	1.7		28				-	-	-
	29	20.0	6.7	3.3	0.3	0.1	0.1		29	18.0	6.0	3.0	-	-	-
	30	0.1	0.1	0.1					30	73.5	26.6	13.3	-	-	-
	31	3.3	1.2	0.6					31				-	-	-
Sub Ave.		12.3	4.4	2.5	11.6	4.3	2.3	Sub Ave.		15.6	6.2	3.3	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (7/15)

1993(1/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	8.7	3.4	1.7	-	-	-
	2	22.5	9.6	5.5	-	-	-
	3	1.2	0.5	0.3	-	-	-
	4	0.2	0.1	0.1	-	-	-
	5	25.4	8.7	4.4	-	-	-
	6				-	-	-
	7	4.1	2.4	1.7	-	-	-
	8	5.1	4.2	2.5	-	-	-
	9	2.3	1.3	0.7	-	-	-
	10	8.9	4.1	2.6	-	-	-
	11	0.2	0.2	0.1	-	-	-
	12	1.0	0.4	0.2	-	-	-
	13	4.3	1.8	0.9	-	-	-
	14	5.8	1.9	1.0	-	-	-
	15				-	-	-
	16				-	-	-
	17	17.6	5.9	3.0	-	-	-
	18				-	-	-
	19	28.3	9.5	4.7	-	-	-
	20	16.0	6.6	3.3	-	-	-
	21				-	-	-
	22	0.4	0.2	0.1	-	-	-
	23	1.2	0.6	0.3	-	-	-
	24				-	-	-
	25	14.6	5.7	4.0	-	-	-
	26	7.8	3.8	2.1	-	-	-
	27	1.2	0.8	0.4	-	-	-
	28	6.1	2.0	1.0	-	-	-
	29	2.7	1.4	0.8	-	-	-
	30	7.0	2.7	1.4	-	-	-
	31	9.5	5.1	2.8	-	-	-
Sub Ave.		8.1	3.3	1.8	-	-	-
FEB	1	1.8	0.6	0.3			
	2	2.0	0.7	0.3			
	3	6.1	2.3	1.1			
	4	13.9	4.6	2.3	50.5	18.0	9.0
	5	18.1	6.1	3.0			
	6	26.0	8.7	4.3	14.9	5.0	3.4
	7	24.2	14.0	7.0	1.1	0.5	0.3
	8	30.9	14.1	7.6	30.7	11.2	5.7
	9	3.6	1.4	0.7	0.3	0.1	0.1
	10				11.6	3.9	1.9
	11	0.8	0.5	0.3			
	12	9.9	3.3	1.7	2.2	0.9	0.5
	13	9.7	4.3	2.2			
	14	0.5	0.2	0.1	0.7	0.4	0.2
	15						
	16						
	17						
	18	15.3	7.0	3.7	1.3	0.4	0.2
	19						
	20						
	21	27.9	9.7	4.8	8.5	2.8	1.4
	22	0.8	0.3	0.1	5.2	2.2	1.2
	23	0.3	0.1	0.1	11.5	5.1	4.6
	24	2.4	0.9	0.5	3.7	1.3	1.2
	25	2.0	0.7	0.3	17.5	9.0	4.5
	26				4.1	2.3	1.7
	27				14.1	7.0	3.7
	28				2.3	1.8	1.0
Sub Ave.		10.3	4.2	2.1	10.6	4.2	2.4

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1	0.1	0.0	0.0	-	-	-
	2	11.5	3.8	1.9	-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6	0.7	0.4	0.2	-	-	-
	7	10.7	3.7	1.8	-	-	-
	8				-	-	-
	9	9.3	3.1	1.6	-	-	-
	10				-	-	-
	11	0.3	0.2	0.1	-	-	-
	12	0.6	0.2	0.1	-	-	-
	13	1.7	0.6	0.3	-	-	-
	14				-	-	-
	15				-	-	-
	16				-	-	-
	17				-	-	-
	18				-	-	-
	19	7.7	2.6	1.3	-	-	-
	20	18.8	7.9	4.4	-	-	-
	21				-	-	-
	22	1.9	1.3	0.8	-	-	-
	23	4.5	1.8	0.9	-	-	-
	24	20.3	6.8	3.4	-	-	-
	25				-	-	-
	26	27.5	11.0	5.6	-	-	-
	27	1.7	0.7	0.4	-	-	-
	28				-	-	-
	29	3.1	2.0	1.2	-	-	-
	30		4.9	2.5	-	-	-
	31	1.5	0.7	0.4	-	-	-
Sub Ave.		7.2	2.9	1.5	-	-	-
APR	1	14.6	8.5	4.3	-	-	-
	2	3.3	1.1	0.6	-	-	-
	3	1.0	0.4	0.2	-	-	-
	4				-	-	-
	5				-	-	-
	6	30.9	10.5	5.3	-	-	-
	7	2.9	1.2	0.6	-	-	-
	8	7.5	2.6	1.3	-	-	-
	9	0.9	0.3	0.2	-	-	-
	10				-	-	-
	11				-	-	-
	12	0.5	0.2	0.1	-	-	-
	13				-	-	-
	14	0.6	0.2	0.1	-	-	-
	15	0.6	0.2	0.1	-	-	-
	16	4.4	1.5	0.7	-	-	-
	17				-	-	-
	18	1.9	0.6	0.5	-	-	-
	19	2.5	0.8	0.4	-	-	-
	20	1.4	0.8	0.4	-	-	-
	21				-	-	-
	22	81.9	34.1	17.1	-	-	-
	23	19.7	6.6	3.3	-	-	-
	24	60.1	20.2	10.2	-	-	-
	25	2.3	0.8	0.4	-	-	-
	26	2.5	0.8	0.4	-	-	-
	27	7.6	2.5	1.3	-	-	-
	28	2.5	1.4	0.7	-	-	-
	29				-	-	-
	30	55.3	21.1	10.5	-	-	-
					-	-	-
Sub Ave.		13.9	5.3	2.7	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (8/15)

1993(2/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	50.0	20.7	10.6	17.0	6.3	3.1
	2	9.3	3.3	2.9			
	3	0.3	0.1	0.1			
	4				20.4	6.8	3.4
	5				22.4	12.8	8.3
	6	1.3	0.8	0.4			
	7	10.7	4.4	2.2			
	8	0.3	0.2	0.1	0.4	0.2	0.1
	9	8.5	2.2	1.1	15.3	5.1	2.6
	10	18.4	7.8	3.9	9.7	3.2	1.6
	11	0.6	0.2	0.1			
	12	5.2	1.7	0.9			
	13				0.4	0.1	0.1
	14	2.8	1.0	0.5			
	15						
	16						
	17						
	18						
	19						
	20						
	21				1.7	0.6	0.3
	22	3.3	1.1	0.9	18.0	7.4	4.3
	23						
	24	0.4	0.1	0.1			
	25						
	26						
	27						
	28						
	29						
	30						
	31						
Sub Ave.		8.4	3.4	1.8	11.7	4.7	2.6
FEB	1						
	2				11.3	4.3	2.2
	3				30.0	19.6	9.8
	4	0.7	0.2	0.1	0.5	0.2	0.1
	5	23.2	7.8	3.9			
	6						
	7				2.0	0.9	0.5
	8	8.5	4.2	2.1	3.4	1.1	0.6
	9	0.3	0.1	0.1			
	10						
	11						
	12						
	13	0.8	0.3	0.2	2.3	1.6	1.0
	14						
	15				2.5	0.8	0.4
	16	0.1	0.0	0.0	2.3	1.0	0.5
	17	4.8	2.0	1.0	1.6	0.5	0.3
	18	7.0	2.3	1.2	18.3	6.2	3.1
	19				5.2	2.2	1.1
	20				1.6	0.5	0.3
	21						
	22						
	23						
	24						
	25	3.2	1.1	0.5			
	26						
	27						
	28						
					0.5	0.2	0.1
Sub Ave.		5.4	2.0	1.0	6.3	3.0	1.5

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1						
	2						
	3						
	4						
	5				8.5	3.7	1.8
	6	26.3	8.8	4.4			
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17	5.3	1.8	0.9			
	18						
	19						
	20						
	21				4.3	1.9	1.0
	22						
	23						
	24	5.9	2.0	1.0			
	25						
	26						
	27	0.5	0.2	0.1			
	28				12.3	6.2	3.1
	29	0.1	0.0	0.0			
	30						
	31	0.5	0.2	0.1	2.5	0.8	0.4
Sub Ave.		6.4	2.2	1.1	6.9	3.2	1.6
APR	1	1.1	0.4	0.2	21.2	10.8	8.3
	2	25.8	13.9	7.6			
	3						
	4	0.9	0.3	0.2	33.9	13.5	7.3
	5	10.4	3.6	1.8			
	6	0.1	0.0	0.0	10.0	3.3	1.7
	7	11.0	3.7	1.8			
	8						
	9						
	10						
	11	0.5	0.2	0.1			
	12				0.2	0.1	0.0
	13	10.8	4.5	2.3			
	14						
	15	5.2	1.7	0.9			
	16						
	17						
	18	5.0	1.7	0.9			
	19				1.2	0.4	0.2
	20	7.8	2.9	1.5			
	21						
	22						
	23						
	24						
	25						
	26	1.7	0.6	0.3	0.5	0.2	0.1
	27				0.9	0.7	0.4
	28	0.7	0.3	0.2			
	29						
	30	1.2	0.4	0.2			
Sub Ave.		5.9	2.4	1.3	9.7	4.1	2.6

Table 5 MAXIMUM OF RAINFALL INTENSITY (9/15)

1993(3/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
SEP	1						
	2						
	3	1.3	0.433	0.217			
	4						
	5						
	6						
	7						
	8	10.1	3.5	1.8			
	9	0.3	0.1	0.1			
	10						
	11						
	12	0.3	0.1	0.1			
	13						
	14				15.1	5.0	2.5
	15	0.7	0.2	0.1			
	16						
	17						
	18						
	19	5.6	1.9	0.9			
	20				7.2	2.4	1.4
	21	7.7	2.6	1.3	3.5	1.2	0.6
	22	4.7	1.6	0.8	0.6	0.2	0.1
	23	1.8	1.7	0.9			
	24						
	25						
	26						
	27						
	28						
	29				0.8	0.5	0.2
	30	3.1	1.3	0.7			
Sub Ave.		3.6	1.3	0.7	5.4	1.9	1.0
OCT	1						
	2				0.5	0.2	0.1
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11	0.1	0.0	0.0			
	12						
	13				0.1	0.0	0.0
	14	0.2	0.1	0.0	4.8	2.2	1.2
	15	3.8	1.3	0.6	23.8	15.6	10.0
	16	21.8	7.3	4.3			
	17						
	18						
	19				8.9	3.0	1.5
	20	2.0	0.7	0.4	1.2	0.8	0.5
	21						
	22						
	23				0.2	0.1	0.0
	24	0.4	0.2	0.1	3.7	1.6	0.8
	25	11.6	4.0	2.0			
	26						
	27						
	28						
	29	18.5	6.2	3.1			
	30						
	31	4.1	1.4	1.0			
Sub Ave.		6.9	2.3	1.3	5.4	2.9	1.8

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
NOV	1				7.0	4.3	4.4
	2				7.0	6.7	3.4
	3						
	4	34.9	11.6	5.8			
	5	1.1	0.8	0.5			
	6	0.4	0.2	0.1			
	7	12.0	4.0	2.0	1.0	0.3	0.2
	8				6.0	4.2	2.1
	9				6.0	3.3	2.7
	10						
	11	0.3	0.1	0.1			
	12						
	13	1.2	0.7	0.3			
	14	7.9	2.6	1.3			
	15	23.5	10.6	5.5			
	16	29.9	11.4	7.2			
	17	15.0	5.5	2.8	22.0	7.3	3.7
	18	11.6	4.0	2.0	6.0	2.0	1.0
	19	28.8	11.8	6.6			
	20	27.5	9.8	4.9	6.0	3.7	1.8
	21	1.0	0.3	0.2	2.0	0.7	0.3
	22	33.7	13.2	6.6	4.5	2.3	1.2
	23	0.1	0.0	0.0	4.4	1.5	0.7
	24	21.5	7.2	4.0			
	25	20.0	7.3	5.5	2.0	0.7	0.3
	26	61.8	22.0	11.0			
	27						
	28	30.4	10.2	5.1			
	29	9.2	3.3	1.7	6.0	2.3	1.2
	30	6.2	4.8	3.1			
Sub Ave.		17.2	6.4	3.5	6.1	3.0	1.8
DEC	1				-	-	-
	2	0.7	0.2	0.1	-	-	-
	3				-	-	-
	4	8.1	4.7	2.4	-	-	-
	5	1.4	0.5	0.2	-	-	-
	6				-	-	-
	7	11.0	3.7	1.8	-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12	3.1	1.0	0.5	-	-	-
	13	5.1	1.7	0.9	-	-	-
	14				-	-	-
	15				-	-	-
	16				-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21	8.1	4.4	2.2	-	-	-
	22	13.0	6.1	3.8	-	-	-
	23	24.0	8.7		-	-	-
	24	8.5	3.8	1.9	-	-	-
	25	10.4	5.7	3.1	-	-	-
	26	0.2	0.1	0.1	-	-	-
	27	0.3	0.1	0.1	-	-	-
	28				-	-	-
	29	1.8	0.7	0.4	-	-	-
	30	9.4	3.3	1.6	-	-	-
	31	1.2	1.0	0.5	-	-	-
Sub Ave.		6.6	2.9	1.3	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (10/15)

1994(1/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr	Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	0.4	0.1	0.1	-	-	-	MAR	1	11.1	5.0	2.7	-	-	-
	2	13.5	5.4	2.7	-	-	-		2	9.7	3.9	2.0	-	-	-
	3	4.7	2.0	1.0	-	-	-		3	0.1	0.0	0.0	-	-	-
	4				-	-	-		4	0.6	0.2	0.1	-	-	-
	5	17.6	5.9	3.0	-	-	-		5	5.0	2.3	1.2	-	-	-
	6	3.5	1.2	0.6	-	-	-		6	2.5	0.9	0.5	-	-	-
	7	11.6	3.9	2.5	-	-	-		7	1.2	0.4	0.2	-	-	-
	8	9.0	6.7	4.8	-	-	-		8	1.3	0.4	0.2	-	-	-
	9	0.9	0.5	0.3	-	-	-		9	3.7	2.0	1.3	-	-	-
	10	0.2	0.1	0.0	-	-	-		10	27.3	9.3	4.7	-	-	-
	11	0.2	0.1	0.0	-	-	-		11	6.1	3.5	1.8	-	-	-
	12				-	-	-		12	0.5	0.3	0.1	-	-	-
	13				-	-	-		13	40.1	13.9	7.0	-	-	-
	14	13.2	5.1	2.6	-	-	-		14	3.8	1.3	0.7	-	-	-
	15	1.6	0.6	0.4	-	-	-		15	15.4	5.1	2.6	-	-	-
	16	2.5	1.7	0.9	-	-	-		16	0.5	0.2	0.1	-	-	-
	17	0.4	0.2	0.1	-	-	-		17				-	-	-
	18	14.6	5.2	2.7	-	-	-		18				-	-	-
	19	2.0	0.7	0.4	-	-	-		19	1.4	0.5	0.2	-	-	-
	20	5.9	2.3	1.2	-	-	-		20	19.9	8.8	4.8	-	-	-
	21	3.0			-	-	-		21	30.8	10.3	5.1	-	-	-
	22	29.0	20.0	12.6	-	-	-		22	24.7	8.2	4.5	-	-	-
	23				-	-	-		23	19.4	11.1	7.3	-	-	-
	24	3.8	1.4	1.0	-	-	-		24	11.7	3.9	2.0	-	-	-
	25	9.5	6.8	3.6	-	-	-		25	0.7	0.2	0.1	-	-	-
	26	7.7	3.9	2.5	-	-	-		26	2.5	0.8	0.4	-	-	-
	27	10.0	6.2	3.2	-	-	-		27				-	-	-
	28	0.5	0.2	0.1	-	-	-		28	4.6	1.7	0.9	-	-	-
	29	1.6	0.5	0.3	-	-	-		29	22.7	10.8	5.6	-	-	-
	30	0.2	0.1	0.0	-	-	-		30	0.2	0.1	0.0	-	-	-
	31	19.0	7.1	3.6	-	-	-		31				-	-	-
Sub Ave.		6.9	3.4	1.9	-	-	-	Sub Ave.		9.9	3.9	2.1	-	-	-
FEB	1	8.8	7.1	3.6	-	-	-	APR	1	1.5	0.6	0.3			
	2				-	-	-		2	9.8	3.3	1.6	3.5	2.3	1.1
	3	1.9	1.0	0.5	-	-	-		3	2.3	0.8	0.4	34.4	12.1	6.1
	4	29.0	12.3	6.7	-	-	-		4	0.9	0.3	0.2			
	5				-	-	-		5	11.6	3.9	1.9	1.6	0.9	0.4
	6	3.4	1.4	0.7	-	-	-		6	0.3	0.1	0.1	0.1	0.0	0.0
	7				-	-	-		7						
	8	48.9	17.2	8.6	-	-	-		8						
	9	6.1	2.7	1.4	-	-	-		9						
	10	34.0	12.7	6.3	-	-	-		10	0.4	0.1	0.1			
	11				-	-	-		11						
	12				-	-	-		12						
	13	13.4	4.5	2.3	-	-	-		13				0.4	0.1	0.1
	14				-	-	-		14				19.9	6.6	3.3
	15	6.2	3.4	2.0	-	-	-		15	60.1	22.9	11.9	0.6	0.5	0.3
	16	0.8	0.3	0.2	-	-	-		16	8.3	3.0	1.5	19.8	6.6	3.3
	17				-	-	-		17	0.1	0.0	0.0	14.5	6.1	3.1
	18				-	-	-		18	15.8	5.3	3.8	0.8	0.3	0.1
	19	8.3	2.8	1.4	-	-	-		19	13.5	4.5	2.3	2.0	1.1	0.6
	20	0.6	0.3	0.2	-	-	-		20	3.7	3.2	1.7			
	21				-	-	-		21	24.7	9.6	7.1	1.6	0.5	0.3
	22				-	-	-		22	0.8	0.3	0.1	1.2	0.5	0.2
	23	0.2	0.1	0.0	-	-	-		23	60.2	25.5	14.9			
	24				-	-	-		24						
	25	24.5	8.3	4.2	-	-	-		25	7.5	2.5	1.3	0.3	0.1	0.1
	26	5.5	1.8	1.0	-	-	-		26	4.7	1.6	1.0	0.7	0.3	0.2
	27	30.5	12.7	8.3	-	-	-		27						
	28	9.6	5.1	2.6	-	-	-		28						
					-	-	-		29						
					-	-	-		30	0.5	0.2	0.2			
					-	-	-								
Sub Ave.		13.6	5.5	2.9	-	-	-	Sub Ave.		11.9	4.6	2.6	6.8	2.5	1.3

Table 5 MAXIMUM OF RAINFALL INTENSITY (11/15)

1994(2/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1						
	2						
	3						
	4						
	5	20.1	7.1	3.6			
	6	0.1	0.0	0.0	2.6	1.0	0.5
	7						
	8	0.7	0.2	0.2	29.5	14.8	7.8
	9	18.7	6.8	3.4	3.5	2.4	1.2
	10				51.6	28.6	15.2
	11	8.5	2.8	1.4			
	12						
	13						
	14						
	15	2.9	1.0	0.5			
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30				5.9	2.2	1.1
	31	8.7	2.9	1.5			
Sub Ave.		8.5	3.0	1.5	18.6	9.8	5.2
FEB	1						
	2				1.1	0.4	0.2
	3						
	4				5.6	2.2	1.1
	5	6.5	2.2	1.1			
	6						
	7	2.4	0.8	0.4	4.7	2.5	1.3
	8	2.1	0.7	0.4			
	9				0.5	0.2	0.1
	10						
	11						
	12						
	13						
	14						
	15						
	16	2.3	0.8	0.4			
	17	8.5	3.7	1.8			
	18						
	19						
	20	4.7	1.9	1.0			
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
Sub Ave.		4.4	1.7	0.8	3.0	1.3	0.7

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18				0.4	0.3	0.3
	19						
	20				2.2	2.1	1.8
	21						
	22						
	23						
	24						
	25						
	26				2.8	0.9	0.5
	27						
	28						
	29						
	30						
	31						
Sub Ave.		0.0	0.0	0.0	1.8	1.1	0.9
APR	1						
	2						
	3						
	4				22.9	12.7	9.0
	5	1.2	0.4	0.2			
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
Sub Ave.		1.2	0.4	0.2	22.9	12.7	9.0

Table 5 MAXIMUM OF RAINFALL INTENSITY (12/15)

1994(3/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
SEP	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11				0.5	0.2	0.1
	12						
	13						
	14						
	15						
	16						
	17						
	18	15.9	5.3	2.7			
	19						
	20	1.1	0.4	0.2	10.3	3.8	1.9
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
Sub Ave.		8.5	2.8	1.4	5.4	2.0	1.0
OCT	1				-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9	2.1	0.7	0.4	-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14	6.0	2.0	1.0	-	-	-
	15				-	-	-
	16	1.4	0.5	0.2	-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21				-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25				-	-	-
	26				-	-	-
	27				-	-	-
	28	3.0	1.0	0.5	-	-	-
	29				-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		3.1	1.0	0.5	-	-	-

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
NOV	1	1.4	0.5	0.2	-	-	-
	2	3.6	1.2	0.6	-	-	-
	3	11.6	4.6	2.7	-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7				-	-	-
	8				-	-	-
	9				-	-	-
	10				-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14				-	-	-
	15				-	-	-
	16	7.2	2.4	1.2	-	-	-
	17	0.4	0.2	0.1	-	-	-
	18	1.1	0.4	0.2	-	-	-
	19	47.2	17.0	8.5	-	-	-
	20				-	-	-
	21	17.1	6.5	3.3	-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25	3.5	1.4	0.7	-	-	-
	26				-	-	-
	27				-	-	-
	28	7.8	2.8	1.5	-	-	-
	29	1.0	0.3	0.2	-	-	-
	30	27.8	14.4	7.8	-	-	-
					-	-	-
Sub Ave.		10.8	4.3	2.2	-	-	-
DEC	1				-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6				-	-	-
	7	2.7	1.6	0.9	-	-	-
	8				-	-	-
	9	0.6	0.5	0.2	-	-	-
	10	0.5	0.2	0.1	-	-	-
	11				-	-	-
	12				-	-	-
	13				-	-	-
	14				-	-	-
	15	6.3	2.1	1.1	-	-	-
	16				-	-	-
	17	18.6	7.7	3.9	-	-	-
	18	1.2	0.4	0.2	-	-	-
	19				-	-	-
	20				-	-	-
	21	0.9	0.3	0.2	-	-	-
	22				-	-	-
	23				-	-	-
	24				-	-	-
	25				-	-	-
	26				-	-	-
	27				-	-	-
	28				-	-	-
	29				-	-	-
	30	2.9	1.1	0.5	-	-	-
	31				-	-	-
Sub Ave.		4.2	1.7	0.9	-	-	-

Table 5 MAXIMUM OF RAINFALL INTENSITY (13/15)

1995(1/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	0.1	0.0	0.0	-	-	-
	2				-	-	-
	3				-	-	-
	4				-	-	-
	5				-	-	-
	6	2.4	0.9	0.5	-	-	-
	7	2.4	1.7	1.0	-	-	-
	8				-	-	-
	9				-	-	-
	10	1.3	0.7	0.5	-	-	-
	11	0.4	0.1	0.1	-	-	-
	12	23.8	12.9	9.9	-	-	-
	13	0.7	0.5	0.3	-	-	-
	14				-	-	-
	15	5.4	2.0	1.0	-	-	-
	16			2.5	-	-	-
	17		6.8	3.8	-	-	-
	18	28.2	11.0	6.5	-	-	-
	19	0.6	0.3	0.1	-	-	-
	20	4.0	1.9	0.9	-	-	-
	21	5.8	3.9	2.5	-	-	-
	22	1.3	0.4	0.2	-	-	-
	23				-	-	-
	24	2.8	0.9	0.5	-	-	-
	25	26.3	9.1	4.6	-	-	-
	26	11.5	3.9	2.0	-	-	-
	27	0.3	0.1	0.1	-	-	-
	28	3.8	1.3	0.6	-	-	-
	29	1.7	0.7	0.3	-	-	-
	30	17.2	7.1	3.7	-	-	-
	31	28.8	14.4	7.2	-	-	-
Sub Ave.		8.0	3.7	2.1	-	-	-
FEB	1	5.6	2.8	1.4	-	-	-
	2	1.3	0.7	0.4	-	-	-
	3	7.1	4.7	2.5	-	-	-
	4	0.1	0.0	0.0	-	-	-
	5	10.9	4.9	2.7	-	-	-
	6				-	-	-
	7	20.5	6.8	3.4	-	-	-
	8	6.0	2.4	2.2	-	-	-
	9	14.5	5.5	5.3	-	-	-
	10	0.6	0.2	0.1	-	-	-
	11	0.4	0.1	0.1	-	-	-
	12	18.7	10.4	5.2	-	-	-
	13	22.8	11.3	6.5	-	-	-
	14	0.3	0.1	0.1	-	-	-
	15	0.3	0.1	0.1	-	-	-
	16	0.3	0.1	0.1	-	-	-
	17				-	-	-
	18				-	-	-
	19				-	-	-
	20				-	-	-
	21				-	-	-
	22				-	-	-
	23				-	-	-
	24	0.1	0.0	0.0	-	-	-
	25				-	-	-
	26	3.5	1.8	0.9	-	-	-
	27				-	-	-
	28	0.2	0.1	0.0	-	-	-
					-	-	-
					-	-	-
					-	-	-
Sub Ave.		6.3	2.9	1.7	-	-	-

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1				-	-	-
	2	34.9	11.6	5.8	-	-	-
	3	0.8	0.3	0.1	-	-	-
	4	12.8	4.9	2.5	-	-	-
	5	0.7	0.2	0.1	-	-	-
	6	8.9	3.0	1.8	-	-	-
	7				-	-	-
	8	0.6	0.2	0.1	-	-	-
	9				-	-	-
	10	4.0	1.3	0.7	-	-	-
	11	16.5	5.5	2.8	-	-	-
	12	11.2	3.7	1.9	-	-	-
	13	6.0	2.1	1.0	-	-	-
	14	11.5	6.3	3.3	-	-	-
	15	0.4	0.1	0.1	-	-	-
	16	16.5	6.2	3.2	-	-	-
	17	0.2	0.1	0.1	-	-	-
	18	0.3	0.1	0.1	-	-	-
	19				-	-	-
	20	0.1	0.0	0.0	-	-	-
	21	0.9	0.3	0.2	-	-	-
	22	3.6	1.8	1.3	-	-	-
	23	0.5	0.3	0.2	-	-	-
	24	0.2	0.1	0.0	-	-	-
	25	7.5	2.7	1.3	-	-	-
	26	54.2	22.7	11.4	-	-	-
	27	4.0	1.6	0.9	-	-	-
	28				-	-	-
	29	28.0	9.4	4.7	-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		9.3	3.5	1.8	-	-	-
APR	1	9.5	3.2	1.6	29.5	15.0	7.5
	2	1.1	0.4	0.2			
	3						
	4	12.3	4.9	2.5			
	5	7.0	3.0	1.5	0.6	0.3	0.2
	6				2.0	1.3	0.7
	7	10.0	3.3	1.7			
	8						
	9	1.2	0.4	0.2	2.0	0.7	0.3
	10						
	11						
	12	0.2	0.1	0.0	0.5	0.2	0.1
	13						
	14	0.3	0.1	0.1	2.7	1.0	0.5
	15	11.9	4.0	2.0			
	16						
	17				28.3	21.5	11.1
	18	23.5	8.6	4.3			
	19	0.6	0.4	0.2	4.8	2.2	1.4
	20	16.0	6.6	3.3	6.4	2.1	1.1
	21				2.5	1.5	0.8
	22	13.0	4.3	2.2			
	23						
	24	0.4	0.2	0.1			
	25						
	26						
	27						
	28				0.2	0.1	0.0
	29						
	30	15.0	5.0	2.5	1.0	0.5	0.2
Sub Ave.		8.1	3.0	1.5	6.7	3.9	2.0

Table 5 MAXIMUM OF RAINFALL INTENSITY (14/15)

1995(2/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
JAN	1	28.5	9.5	4.8	8.5	3.3	1.7
	2	4.1	2.8	1.4	2.7	1.4	0.9
	3	1.2	0.8	0.4	1.0	0.5	0.3
	4				6.2	3.9	2.6
	5	12.2	4.1	2.1			
	6				1.1	0.4	0.2
	7						
	8				0.9	0.3	0.2
	9	2.9	1.0	0.5			
	10	10.4	3.5	1.7	4.3	1.4	0.7
	11	23.0	7.7	4.2			
	12				0.5	0.2	0.1
	13	21.5	9.7	4.8	4.0	1.3	0.7
	14	13.0	4.3	2.2			
	15						
	16						
	17						
	18	3.7	1.5	0.8			
	19	18.3	6.2	4.7			
	20	1.1	0.4	0.2	1.2	0.5	0.4
	21	9.0	3.1	1.8			
	22				2.8	0.9	0.5
	23	9.8	3.3	1.7			
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31	1.1	0.4	0.2	0.3	0.1	0.1
Sub Ave.		10.7	3.9	2.1	2.8	1.2	0.6
FEB	1	7.5	2.5	1.3			
	2	0.2	0.1	0.0			
	3						
	4						
	5						
	6						
	7	5.2	1.7	0.9			
	8	8.7	6.0	3.0			
	9	21.0	9.1	4.6			
	10						
	11						
	12	3.5	1.2	0.6	22.9	12.1	6.1
	13						
	14						
	15						
	16						
	17	7.5	4.5	2.3	38.7	14.1	8.5
	18	70.0	29.2	15.4	14.7	5.1	2.7
	19	2.5	1.4	0.7	4.5	2.1	1.0
	20	6.0	3.0	2.1			
	21				1.8	0.9	0.5
	22				16.5	10.8	5.4
	23	39.4	14.9	14.4			
	24						
	25						
	26						
	27				3.4	1.9	1.2
	28	2.7	1.4	0.7	0.6	0.4	0.2
		0.6	0.2	0.2			
		1.1	1.0	0.6			
Sub Ave.		12.6	5.4	3.3	12.9	5.9	3.2

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
MAR	1						
	2						
	3						
	4				1.5	0.5	0.3
	5	1.7	0.6	0.3	24.9	9.4	4.7
	6	0.4	0.1	0.1			
	7				0.2	0.1	0.0
	8	6.5	2.3	1.2	13.5	8.3	4.2
	9	0.7	0.2	0.1			
	10				29.2	10.1	5.1
	11						
	12	1.3	0.5	0.3	0.7	0.4	0.3
	13	26.5	9.0	4.5			
	14						
	15						
	16						
	17						
	18						
	19				12.8	6.5	3.3
	20	39.0	16.7	8.4	0.8	0.3	0.1
	21	4.5	1.5	0.8			
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
Sub Ave.		10.1	3.9	1.9	10.5	4.5	2.2
APR	1						
	2				1.8	0.6	0.3
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
Sub Ave.		0.0	0.0	0.0	1.8	0.6	0.3

Table 5 MAXIMUM OF RAINFALL INTENSITY (15/15)

1995(3/3)

Unit : (mm/hr)

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
SEP	1						
	2						
	3						
	4	0.2	0.1	0.1			
	5	4.5	1.6	0.8			
	6						
	7	45.8	16.2	8.1			
	8						
	9	10.7	3.6	1.9			
	10				1.8	0.7	0.3
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24				12.2	4.6	2.3
	25	70.0	34.7	17.4	3.2	1.1	0.5
	26				3.5	2.0	1.0
	27	61.0	29.6	15.3			
	28	37.1	12.5	6.3	4.5	1.9	0.9
	29						
	30	6.8	2.3	1.2			
Sub Ave.		29.5	12.6	6.4	5.0	2.0	1.0
OCT	1	1.0	0.3	0.2			
	2						
	3				7.4	2.7	1.3
	4	2.0	0.7	0.3	1.6	1.0	0.5
	5	18.0	6.3	3.2			
	6						
	7	7.6	2.5	1.3			
	8	0.1	0.0	0.0			
	9				11.2	4.3	2.2
	10	5.8	2.1	1.0	17.5	10.8	7.3
	11	28.8	14.6	10.0			
	12						
	13						
	14						
	15	0.2	0.1	0.0			
	16	8.5	2.8	1.4	0.7	0.2	0.1
	17	5.5	1.8	0.9			
	18	15.9	5.3	2.7			
	19						
	20				21.0	7.0	3.5
	21				2.7	0.9	0.5
	22	0.7	0.2	0.1			
	23	31.5	12.8	6.5			
	24				21.4	14.0	7.0
	25	3.3	1.1	0.6			
	26	45.8	17.4	8.7			
	27						
	28				1.8	0.6	0.3
	29	3.5	1.2	0.6			
	30				0.3	0.1	0.1
	31	1.4	0.5	0.3	3.8	1.3	0.7
Sub Ave.		10.6	4.1	2.2	8.1	3.9	2.1

Mon	DAY	Pondok Betung 1hr	Pondok Betung 3hr	Pondok Betung 6hr	Jakarta-BMG 1hr	Jakarta-BMG 3hr	Jakarta-BMG 6hr
NOV	1	2.0	0.7	0.4			
	2	1.5	0.5	0.3			
	3	1.5	0.6	0.3			
	4				9.5	4.3	2.1
	5	5.4	1.8	0.9			
	6						
	7						
	8	4.0	2.0	1.0			
	9	0.8	0.3	0.2			
	10	3.8	1.8	0.9	1.9	0.6	0.3
	11	40.6	14.6	7.8	16.5	6.0	3.1
	12	5.8	2.5	1.3	28.5	14.8	7.7
	13	28.0	10.7	5.5			
	14				9.9	4.7	2.4
	15	10.0	3.9	2.0			
	16	0.1	0.1	0.0	3.4	1.5	1.0
	17	0.9	0.3	0.2	3.1	1.1	0.7
	18	6.5	2.5	1.3			
	19				28.0	10.3	5.1
	20	1.6	0.8	0.4			
	21						
	22	0.8	0.3	0.2	0.8	0.3	0.2
	23	3.7	1.3	0.7	0.1	0.0	0.0
	24	2.4	1.1	0.6	4.8	4.1	2.2
	25	7.3	5.7	3.0	0.4	0.1	0.1
	26	6.4	2.2	1.1	2.8	1.5	0.8
	27		3.6	1.8	5.8	3.3	1.7
	28	1.1	0.4	0.2	0.4	0.2	0.1
	29	1.7	0.7	0.4			
	30	0.4	0.1	0.1			
Sub Ave.		5.9	2.4	1.3	7.7	3.5	1.8
DEC	1	0.8	0.5	0.2	-	-	-
	2	0.6	0.2	0.1	-	-	-
	3	0.5	0.2	0.1	-	-	-
	4	0.2	0.1	0.0	-	-	-
	5				-	-	-
	6				-	-	-
	7	5.9	2.0	1.0	-	-	-
	8	4.5	2.2	1.3	-	-	-
	9	6.5	2.9	1.5	-	-	-
	10	5.0	1.7	0.8	-	-	-
	11	0.2	0.1	0.0	-	-	-
	12	1.7	0.6	0.3	-	-	-
	13	36.0	17.0	10.6	-	-	-
	14	8.4	3.8	2.1	-	-	-
	15	1.5	0.9	0.4	-	-	-
	16				-	-	-
	17				-	-	-
	18	3.5	1.7	0.9	-	-	-
	19				-	-	-
	20				-	-	-
	21	1.6	0.5	0.3	-	-	-
	22				-	-	-
	23				-	-	-
	24	2.0	0.7	0.3	-	-	-
	25				-	-	-
	26				-	-	-
	27				-	-	-
	28				-	-	-
	29				-	-	-
	30				-	-	-
	31				-	-	-
Sub Ave.		4.9	2.2	1.3	-	-	-

Table 6 DURATION PERIOD HAVING DAILY RAINFALL MORE THAN 50 MM/DAY

Year	(Jakarta - BMG) Month	Day	Continuous Period (hr)	Daily Rainfall (mm/day)	(Pondok Betung) Month	Day	Continuous Period (hr)	Daily Rainfall (mm/day)
1991	Jan	13	6	78.6	Jan	9	7	96.6
	Feb	-	-	-	Feb	-	-	-
	Mar	15	8	138.6	Mar	24	8	118.1
	Apr	23	4	63.0	Apr	24	7	55.4
	May	-	-	-	May	1	5	86.0
	Jun	-	-	-	Jun	-	-	-
	Jul	-	-	-	Jul	-	-	-
	Aug	-	-	-	Aug	-	-	-
	Sep	-	-	-	Sep	-	-	-
	Oct	-	-	-	Oct	-	-	-
	Nov	-	-	-	Nov	28	4	67.7
	Dec	-	-	-	Dec	-	-	-
1992	Jan	21	6	65.5	Jan	-	-	-
	Feb	28	4	60.0	Feb	27	2	52.0
	Mar	-	-	-	Mar	7	3	52.5
	Apr	-	-	-	Apr	24	9	128.9
	May	10	8	58.7	May	16	2	55.8
	Jun	-	-	-	Jun	7	1	62.0
	Jul	-	-	-	Jul	-	-	-
	Aug	4	3	70.0	Aug	25	7	61.4
	Sep	-	-	-	Sep	7	3	56.9
	Oct	18	2	58.4	Oct	3	6	51.9
	Nov	-	-	-	Nov	9	2	51.9
	Dec	1	4	74.4	Dec	30	4	79.7
1993	Jan	-	-	-	Jan	-	-	-
	Feb	-	-	-	Feb	8	6	88.8
	Mar	-	-	-	Mar	-	-	-
	Apr	-	-	-	Apr	30	3	63.2
	May	5	6	53.7	May	1	6	63.4
	Jun	3	3	58.8	Jun	-	-	-
	Jul	-	-	-	Jul	-	-	-
	Aug	1	9	52.0	Aug	2	9	59.2
	Sep	-	-	-	Sep	-	-	-
	Oct	15	4	59.9	Oct	-	-	-
	Nov	-	-	-	Nov	26	5	66.0
	Dec	-	-	-	Dec	-	-	-
1994	Jan	-	-	-	Jan	22	5	83.6
	Feb	-	-	-	Feb	8	3	51.6
	Mar	-	-	-	Mar	-	-	-
	Apr	-	-	-	Apr	23	7	89.2
	May	10	5	99.5	May	-	-	-
	Jun	-	-	-	Jun	-	-	-
	Jul	-	-	-	Jul	-	-	-
	Aug	4	6	54.2	Aug	-	-	-
	Sep	-	-	-	Sep	-	-	-
	Oct	-	-	-	Oct	-	-	-
	Nov	-	-	-	Nov	30	5	60.9
	Dec	-	-	-	Dec	-	-	-
1995	Jan	-	-	-	Jan	12	9	75.1
	Feb	-	-	-	Feb	-	-	-
	Mar	-	-	-	Mar	26	3	68.1
	Apr	17	4	66.5	Apr	-	-	-
	May	-	-	-	May	-	-	-
	Jun	17	3	75.7	Jun	18	6	125.3
	Jul	-	-	-	Jul	20	4	50.6
	Aug	-	-	-	Aug	-	-	-
	Sep	-	-	-	Sep	25	4	104.2
	Oct	-	-	-	Oct	11	11	69.0
	Nov	-	-	-	Nov	-	-	-
	Dec	-	-	-	Dec	13	7	91.9
		Max.	9.0	138.6		Max.	9.0	128.9
		Ave.	5.0	69.9		Ave.	5.1	73.0
		Min.	2.0	52.0		Min.	1.0	51.6

Figures

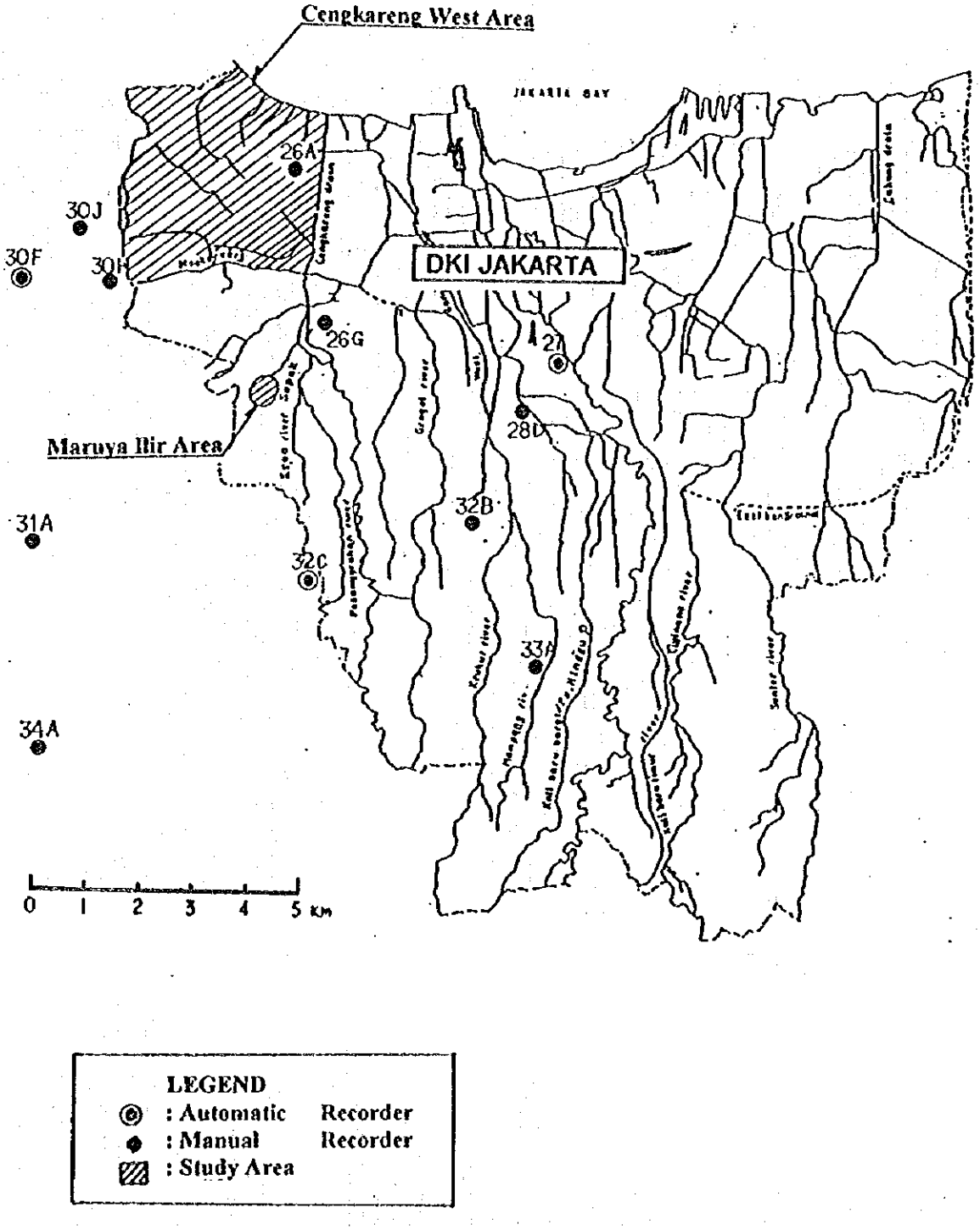


Fig. 1 Location Map of existing Rainfall Gauges around Project Area

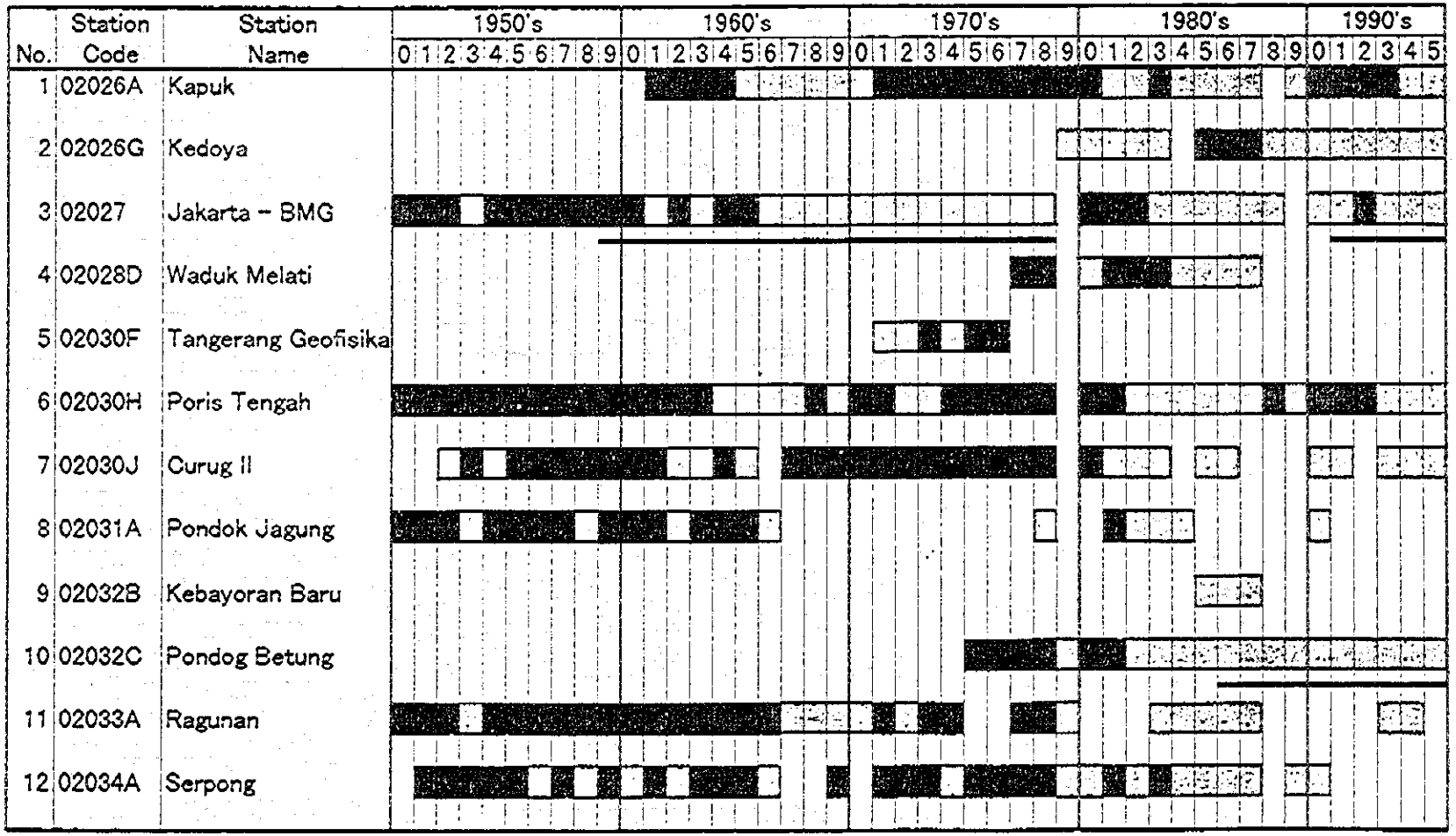


Fig. 2 Availability of Daily and Hourly Rainfall Data

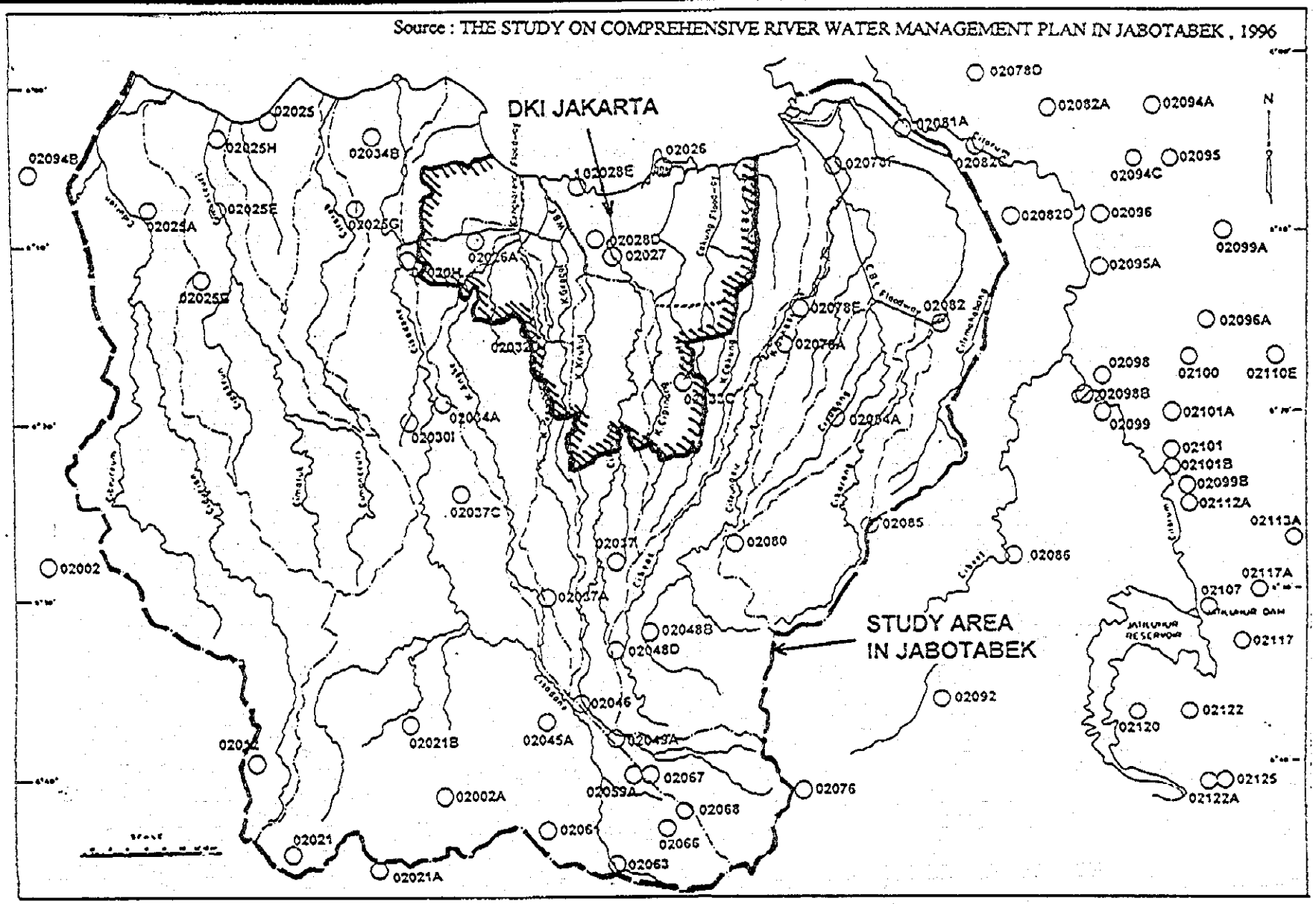
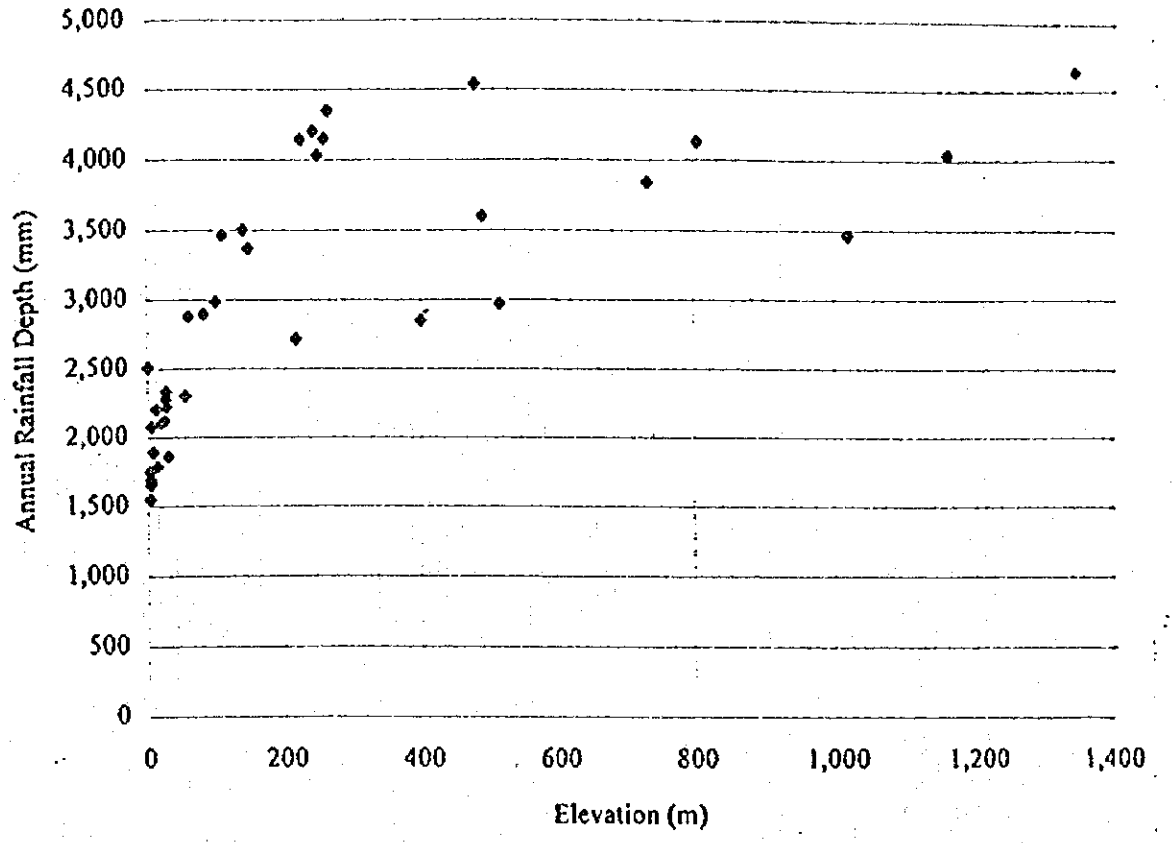
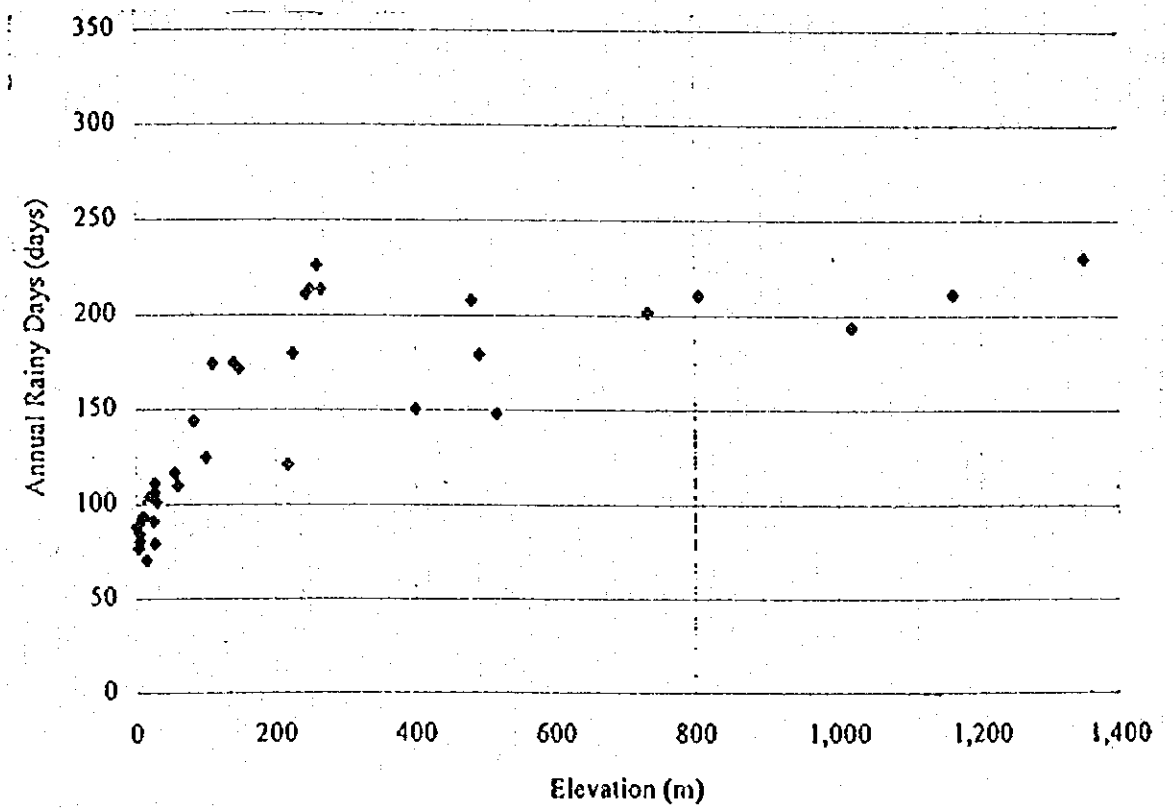


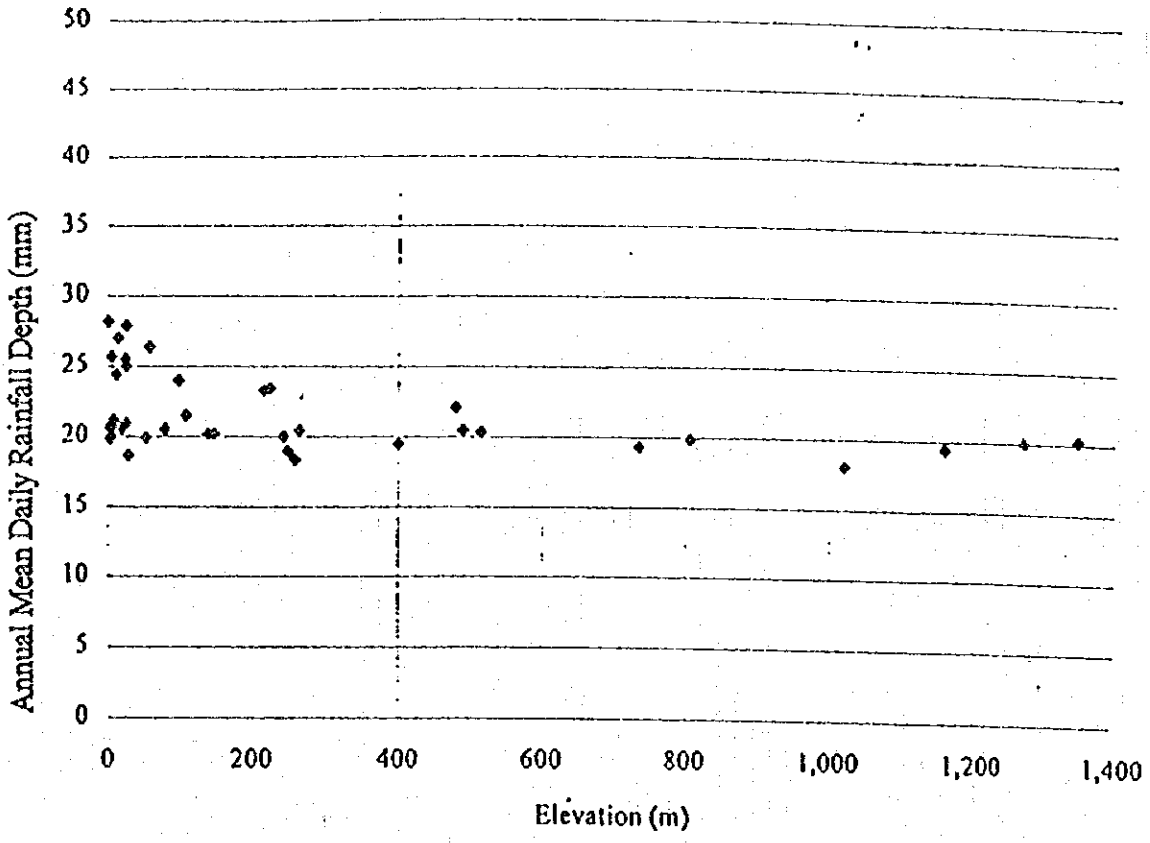
Fig. 3 Rain Gauges Applied for JABOTABEK Study

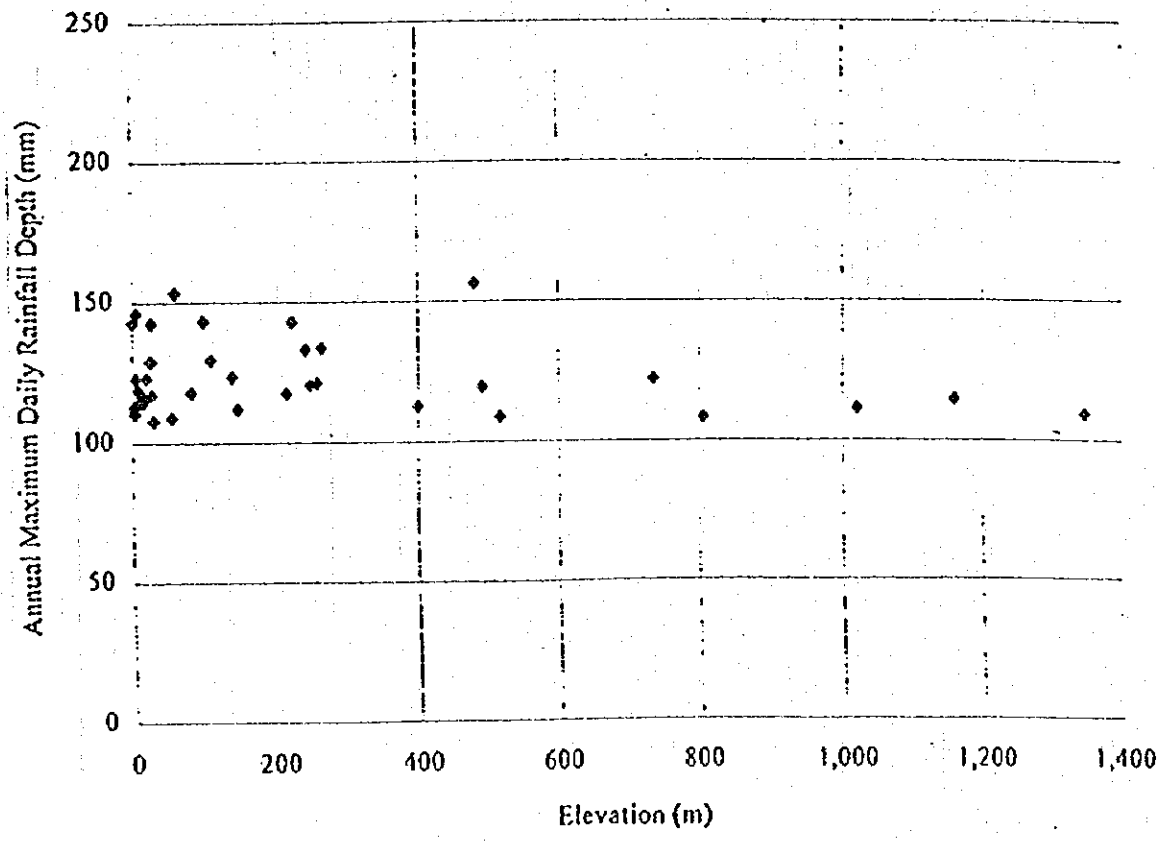




Source : THE STUDY ON COMPREHENSIVE RIVER WATER MANAGEMENT PLAN IN JABOTABEK , 1996

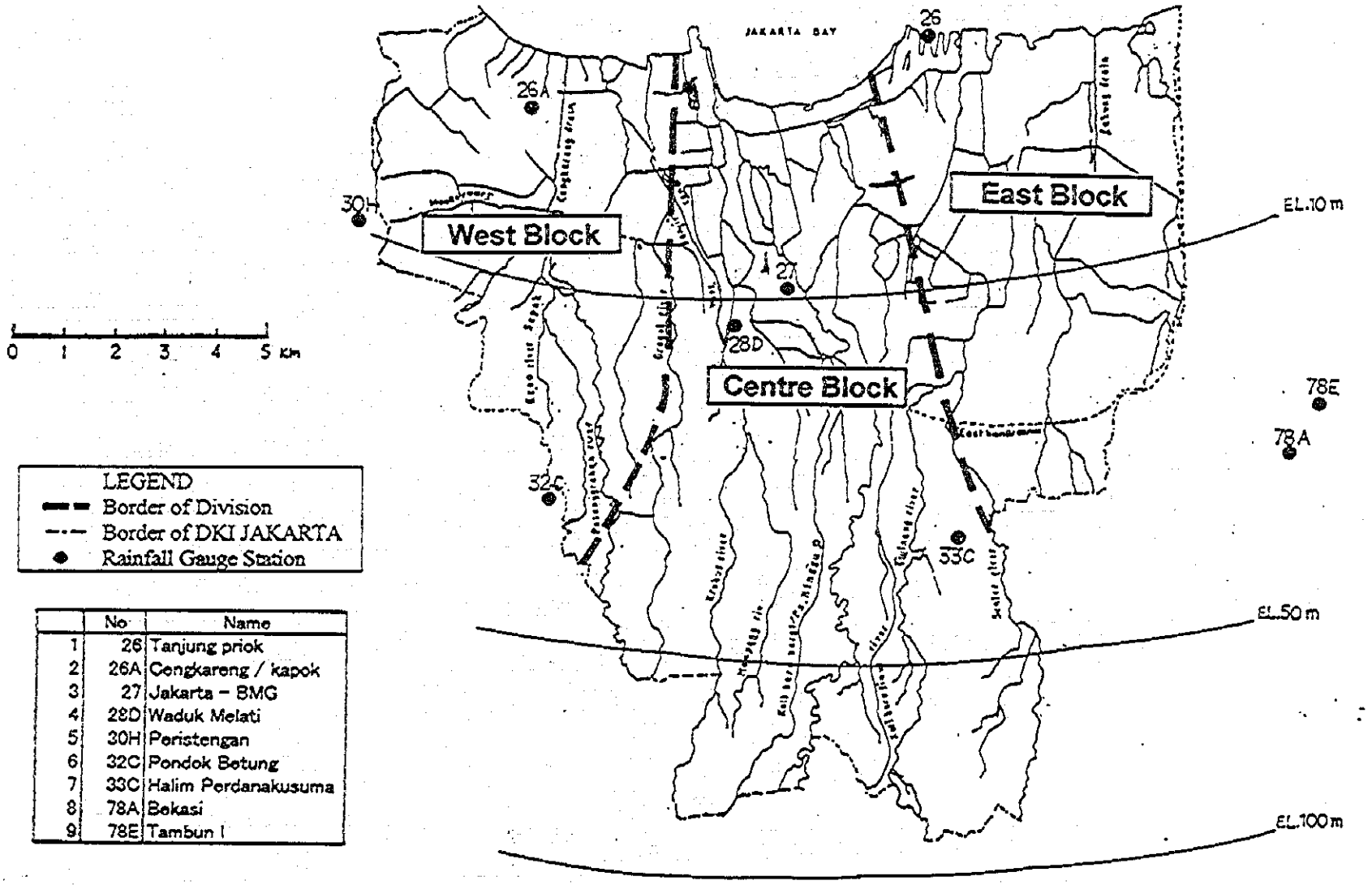
Fig. 4 Relationship among Annual Rainfall Depth, Annual Rainfall Day and Elevation





Source : THE STUDY ON COMPREHENSIVE RIVER WATER MANAGEMENT PLAN IN JABOTABEK , 1996

Fig. 5 Relationship among Daily Rainfall, Depth, Annual Maximum Rainfall Depth and Elevation



	No	Name
1	26	Tanjung priok
2	26A	Cengkareng / kapok
3	27	Jakarta – BMG
4	28D	Waduk Melati
5	30H	Peristengan
6	32C	Pondok Betung
7	33C	Halim Perdanakusuma
8	78A	Bekasi
9	78E	Tambun I

Fig. 6 Divided Three Blocks in Jakarta City Area

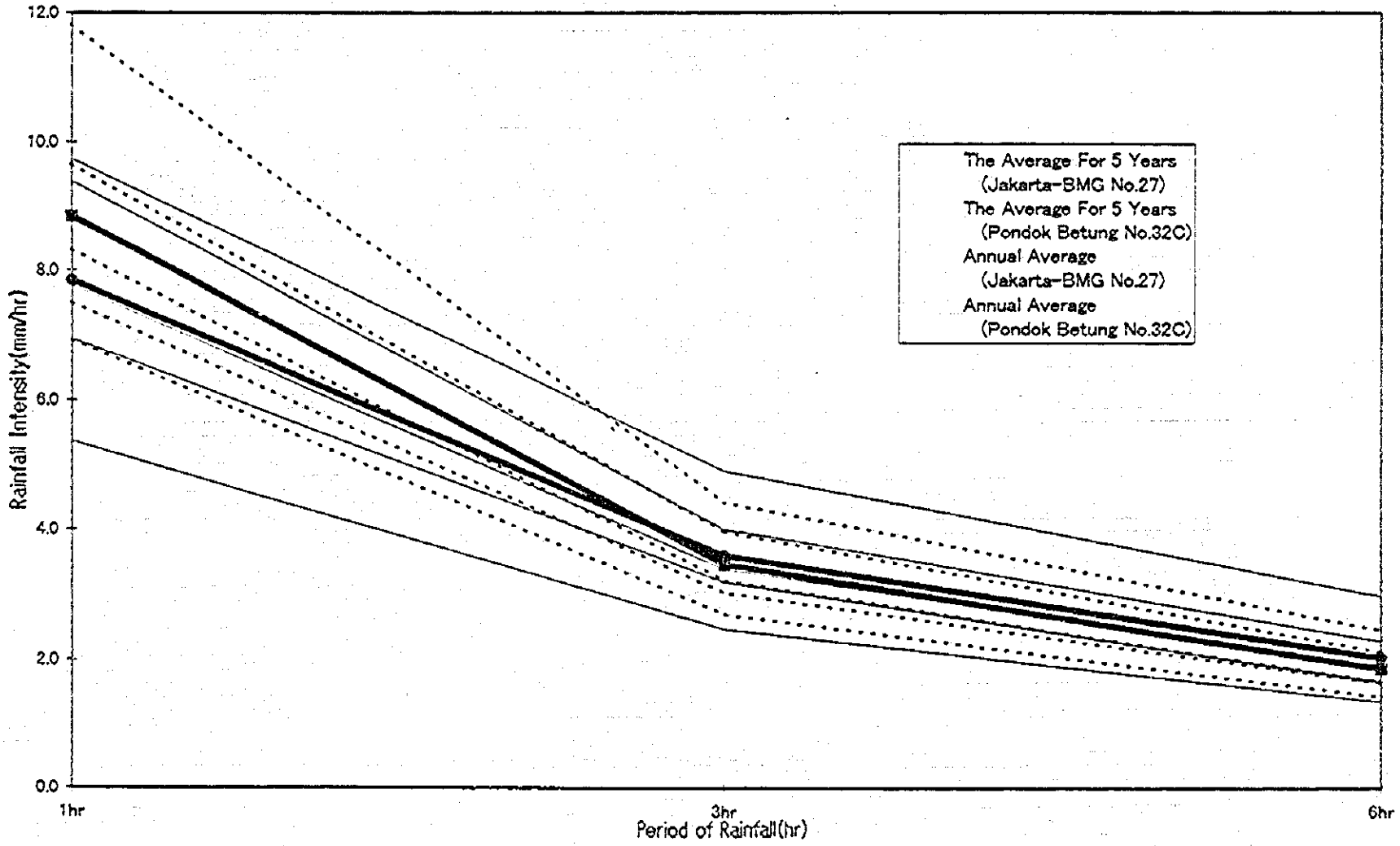


Fig. 7 Comparison of Rainfall Intensity for Two Gauges

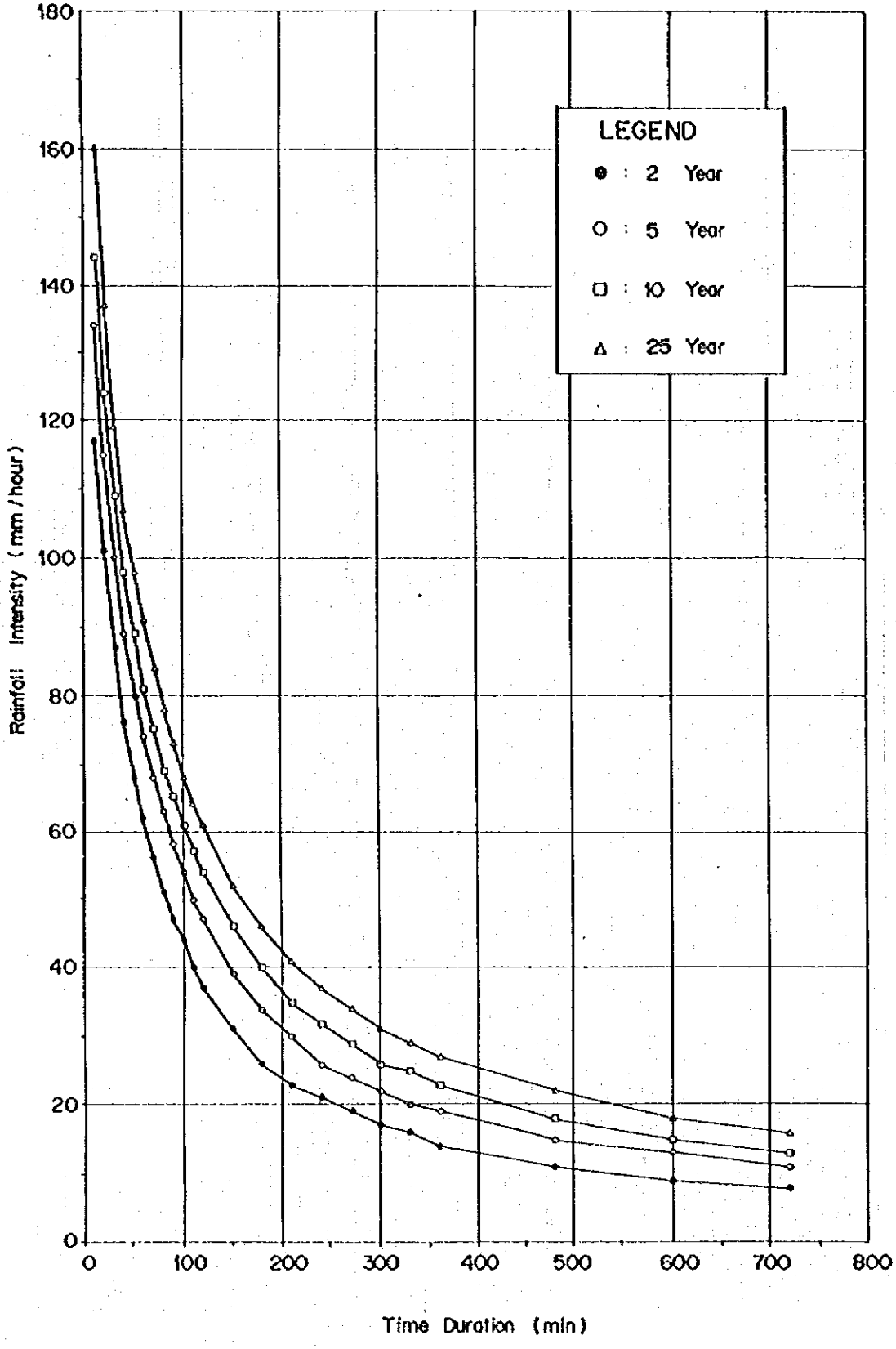


Fig. 8 Rainfall Intensity-Duration Curve

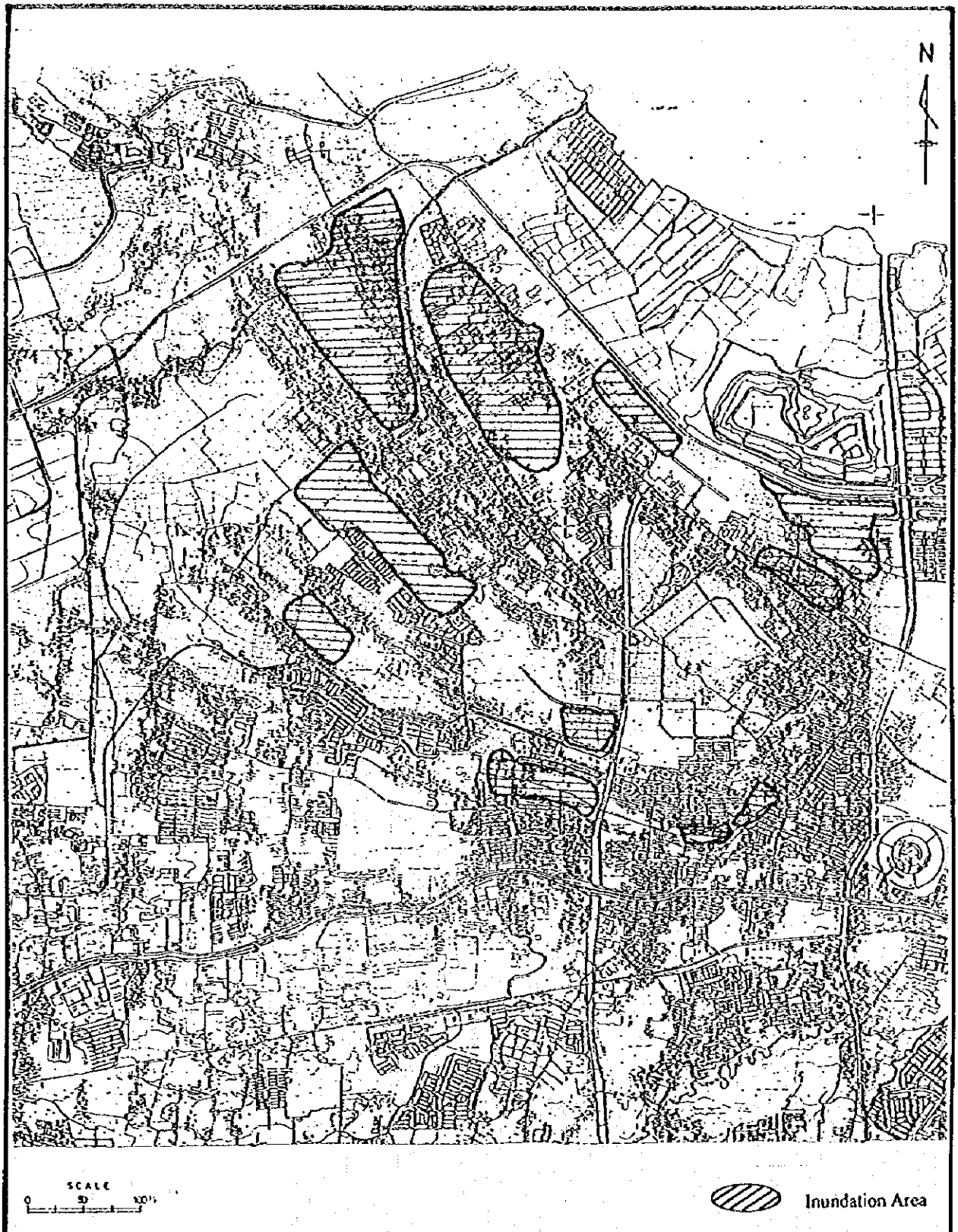


Fig. 9 Habitual Inundation Map(Cengkareng West Area)

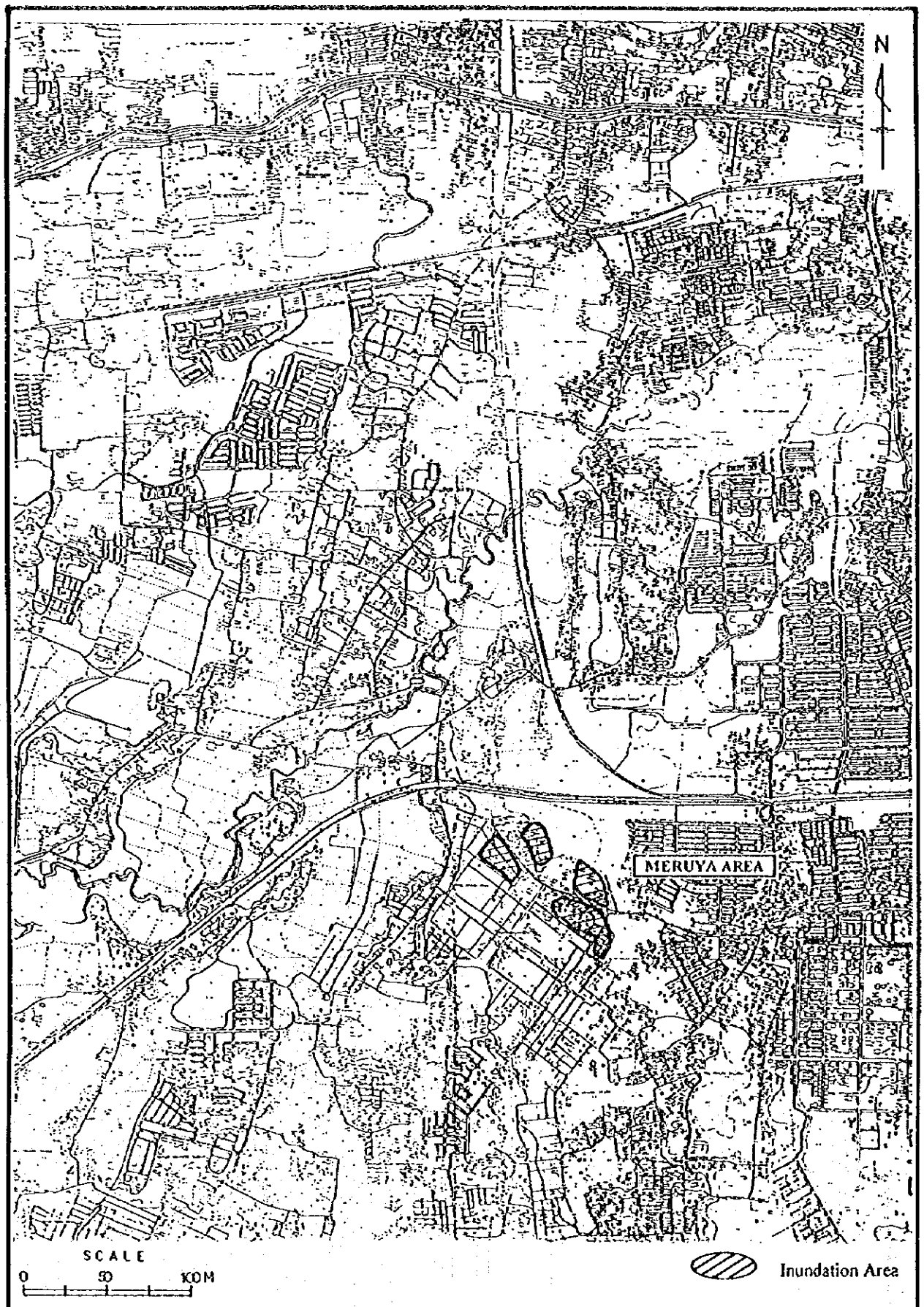


Fig. 10 Habitual Inundation Map(Meruya Area)

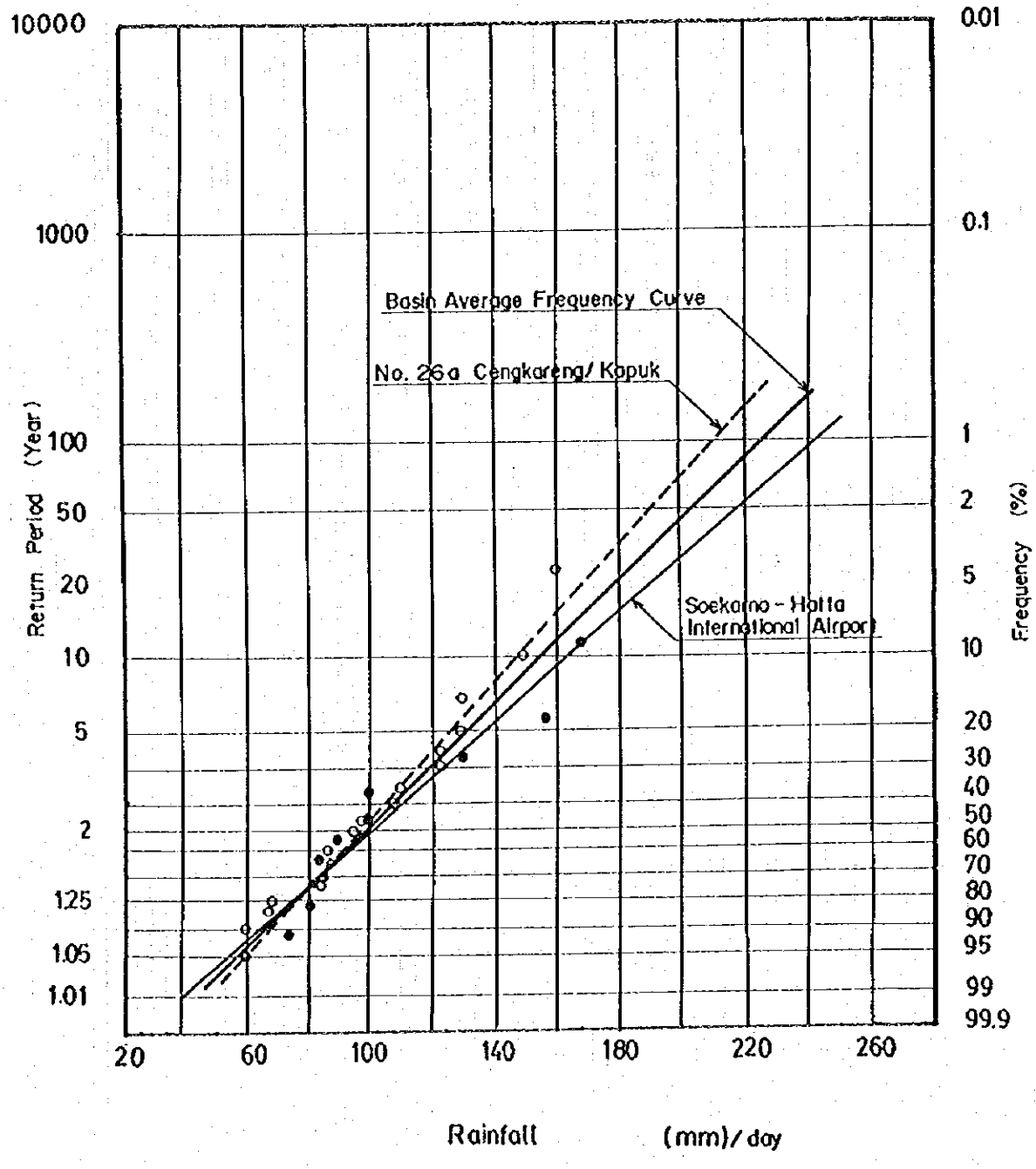


Fig. 11 Frequency Curve of Rainfall

No. 2

Topographic Survey

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1 Introduction

The survey works include longitudinal profile survey and cross section survey with an interval of 100m for the propose drainage channel alignment in the Cengkareng west and Meruya areas These survey works were executed by local survey contractor, PT.Atlas Deltasatya, under the supervision of the JICA Study Team from September 24,1996 to the end of November 1996.

Prior to the substantial survey works, the check levelling survey for the existing bench marks in and around the project areas was carried out based on the bench marks which have not been affected by land subsidence. In addition, the relationship of elevation between TTG and PP systems was examined and it was clarified that elevation of the bench marks for PP system is 1m higher than that of TTG system.

2 Collection of Data

2.1 Data Collected

The collected existing data necessary for this topographic survey work are as follows:

(a) Topographic maps at a scale of 1:5,000

- Project title	:	The Study for the Comprehensive River Water Management Plan in Jabotabek
- Copyright	:	JICA / Ministry of Public Works
- Date prepared	:	January 1996
- Collected sheets	:	20 sheets (copy)

(b) Topographic maps at a scale of 1:25,000

- Copyright	:	BAKOSURTANAL (Badan Koordinasi Survey dan Pemetaan National), National Mapping Agencies
- Date prepared	:	1990
- Collected sheets	:	4 sheets (copy)

(c) Map symbols/applications of the Ministry of Public Works

- Applied map scale	:	1:500 to 1:5,000

(d) Descriptions/record of TTG (Tanda Tinggi Geodesi) Bench Marks

- Copyright	:	BAKOSURTANAL(National Mapping

Agencies)

- Survey date : 1981/1982

(e) Descriptions/record of PP's(Peil Priok) Bench Marks in DKI Jakarta

- Copyright : Dinas Pemetaan dan Pengukuran Tanah
- Date of publication : 1995
- Survey date : 1978/1982, 1991, 1993

(f) Final report of levelling work in Jakarta (Proyek Perencanaan Sarana Drainage Kota Evaluasi dan Rehabilitasi Ketinggian Titik Tetap di Wilayah DKI Jakarta)

- Copyright : Dinas Pekerjaan Umum (DKI Jakarta)
- Date of publication : 1993/1994
- Survey date : 1993

(g) Report on ground level subsidence analysis

- Copyright : katan Surveyor Indonesia (Indonesian Surveyor Association)
- Date of issue : 1990 (VOL.8 No.1)

(h) Report on the operation and maintenance of tidal stations (Reporan Kegiatan Pengoperasian dan Pemeliharaan Stasiun Pasang Surut, Tahun Anggam 1995/1996)

- Copyright : BAKOSURTANAL (National Mapping Agencies)
- Date of issue : 1996

(i) Reports related to the Study on Comprehensive River Water Management Plan in Jabotabek (JICA)

2.2 Other Data

The data relate to the survey work are shown below:

(a) Topographic maps at a scale of 1:1,000

- Copyright : Dinas Pemetaandan Pengukuran Tanah (Mapping and Land Surveying Office)
- Date prepared : 1995/1996;currently ongoing mapping works

(b) Aerial photos at a scale of 1:5,000

- Copyrigh : Dinas Pemetaan dan Penguuran Tanah
- Date taken : 1994

3 Survey Datum and Work Volume

3.1 Survey Datum

The survey datum used was based on the following Indonesian standards:

(a) Horizontal coordinates system	:	Universal Transverse Mercator (UTM)
- Projection	:	Zone 48 on UTM Grid
- Scale factor	:	0.9996 on Central Meridian 105 East
- Ellipsoid	:	Bessel 1841
(b) Vertical system	:	Mean Sea Level (MSL) based on the Tanda Tinggi Geodesi"(TTG)
(c) Map symbols and legend	:	Standard of the Ministry of Public Works

3.2 Scope of Survey Works

The scope of the survey works is as follows:

(a) Levelling		
- Length of levelling routes	:	Approx.125km
- Reference bench marks	:	3 points
- Recovered/established bench marks	:	89 points
(b) Horizontal positioning		
- Reference GPS points	:	5 points
- New GPS points	:	21 points
(c) Longitudinal profile survey:		
- Cengkareng area	:	38.5km
- Menuya area	:	2.6km
Total	:	41.1km
(d) Cross section survey		
- Cengkareng west area	:	357 sections
- Menuya area	:	38 sections
Total	:	395 sections
(e) Topographic mapping		
- Cengkareng west area	:	1,377,000 m^2
- Menuya area	:	55,000 m^2
Total	:	1,432,000 m^2

4 Levelling Works

4.1 Preliminary Levelling

Preliminary levelling was conducted using digital levelling instruments (Leica NA-3000) after the field reconnaissance for existing bench marks and newly established bench marks. Preliminary levelling works were carried out to attain the following purposes:

(a) To select the bench marks that have not been influenced by land subsidence or other damage and have a sufficient accuracy for substantial levelling works,
(b) To check the relative accuracy of the TTG (MSL) and PP (LLW) existing bench mark systems and,
(c) To link the elevation to the new bench marks, the cross section posts and the necessary existing structures.

4.2 Selection of Bench Marks with High Accuracy

In order to select the bench marks which have not been affected by land subsidence and have a sufficient accuracy for check levelling works, check levelling survey was carried out on the route between TTG.281 and TTG.177 which were located in the southern part of the international airport for TTG.281 and at about 23 km south-east of the project area for TTG.177. The existing bench marks have been provided on the line connecting the bench marks, TTG.281 and TTG.177 as shown in Fig 1. The check levelling for these bench marks was performed and the differences of the elevations between the neighbouring bench marks were compared with that for the elevations of the existing bench marks as shown below:

Bench Mark	Length (m)	Relative Height(m) TTG, DH	Checked DH	Error (mm)	Differential accuracy (error/length)
TTG.281					
TTG.280	1.7	-2.162	-2.163	1	1/1,700,000
TTG.177	38	28.169	28.281	112	1/339,000
TTG.280	-	-	-	-	-
TTG.279	2.1	1.327	1.127	200	1/11,000
TTG.278	1.8	-5.764	-6.243	479	1/4,000
TTG.276	3.3	-1.399	-1.687	288	1/11,000
TTG.275	1.9	-1.734	-1.635	99	1/19,000
TTG.271	5.1	-1.525	-1.354	171	1/30,000
TTG.270A	1	0.914	1.28	366	1/3,000
TTG.260	3.4	-0.683	-0.896	213	1/16,000

Above table indicates that the relative height between TTG relative height and relative height by check survey in this time is 1mm between TTG.281 and TTG.280 and 112mm between TTG.280 and TTG.177, while a large errors occur in other seven existing bench marks. Considering these results, elevation of TTG bench marks, 281, 280 and 177 shows the correct values . Thus, it was determined to apply the elevation of these bench marks for check levelling for other bench marks. The elevation and survey date for these three bench marks are as follows:

Bench Mark	Elevation(m)	Survey Period
TTG.281	14.131	1981/1982
TTG.280(NWP.514)	11.969	1981/1982
TTG.177(HWP.60)	40.138	1981/1982

Note: NWP(Nauwkeurigheinds Waterpasing Punt) is old code name used by the Dutch.

Among these bench marks, TTG.177 was used for ground level subsidence analysis carried out in 1990.

4.3 Comparison of Elevation of the TTG and PP Systems

There are two different elevation systems used in Jakarta: the TTG (MSL) system used by the BAKOSURTANAL, and the PP system (LLW) used by the DKI Jakarta and other governmental authorities. To verify the correlation of these systems, the check levelling was carried out between existing bench marks TTG.177 and PP.407 which is located at about 6km south-west of TTG.177 and it has been reported

that the this bench mark is located at the geologically most stable place in south Jakarta. Result of the check levelling is as follows:

Bench Mark	TTG Elevation		PP	Relative
	G. EL*(1)	C. EL*(2)	Elevation	Height
TTG.177	40.138	-	41.141	1.003
PP.407	-	58.453	59.428	0.975

Note *(1) Elevation by BAKOSURTANAL in 1981/1982
*(2) Elevation surveyed in this study in Oct.1996
*(3) Elevation by DINAS PENGAIRAN TANAH since 1978/1982

The above table shows that the relative height between TTG.177 and PP.407 surveyed in this time is almost same as that for the past survey result and elevation of the bench mark for PP system is 1m higher than that of TTG system.

4.4 Established Bench Marks with Accurate Elevation

Based on the elevation of the selected three TTG bench marks, elevation of the following existing and newly established bench marks were measured. For revision of the elevation of the bench marks, the existing mark of TTG, PP, DKI, DTK, BM, PB, CF and others were used.

Newly established bench marks :	25 points
Existing bench marks :	64 points
Total	89 points

The location map of these bench marks is given in Fig.2 and revised elevations of the existing bench marks are shown in Table 1.

4.5 Accuracy and Adjustment of Levelling Results

The applied limit for the measurement of levelling accuracy is $10mm\sqrt{L}$ (L =km). The error of the loop levelling routes and/or error of the round trip routes were estimated within this limit. The preliminary levelling results were adjusted using the following:

- Software: STAR* LEV Least Squares Level Network Adjustment
- Copyright: Starplus Software Inc.

5 Horizontal Positioning Survey

The horizontal positioning works for the surveyed cross section points were carried out for the combined use of the GPS (Global Positioning System) receivers and the useful total station systems for the positioning of cross section posts and for topographic mapping.

The five (5) existing GPS points established for the topographic mapping works for the Comprehensive River Water Management Project in Jabotabek in 1995 were used as reference points.

Differential positioning was carried out using three (3) GPS receivers (Trimble 4000 SE). The softwares used for GPS computation were "GPSurvey" and "Trimnet" by the American company Trimble Navigation Inc. The survey instrument, Leica TC600 (from Switzerland) was used. The software used was "Wescom Digital Topo Mapping" from Australia.

The calculated coordinates(N-E) of the reference GPS points and the established GPS points are shown in Table 2.

6 Longitudinal Profile Survey

The longitudinal profile survey was carried out by direct levelling from bench marks.

The survey lines at the river mouth at Kamal and Tanjungan in Cengkareng west drainage channels were extended from approximately 1.75km -2.0km, from the river mouth to the offshore area.

Single positioning was carried out for the proposed survey lines using the portable GPS device, Garmin GPS 100, which records geographical coordinates (lat.-long.) at an interval of 250m.

The longitudinal profiles were prepared according to the following scale:

- Horizontal scale : 1:1,000
- Vertical scale : 1:200

The length of the longitudinal profiles are as follows:

Channels	Drainage Code	Length (km)
(Cengkareng west area)		
-Kamal	KM,KE,KH-C*,KM-C*,KC-C*,KS	13.8
-Tanjungan	TM,TB,TS	6
-New drainage	NM,NA	3.6
-Gede/Bor	GM,GA,GM-C*	4.4
-Saluran Cengkareng	CM	4.3
-Pedengkelan	PM-C*,PA-C*,PB-C*,PC-C*	6.4
(Meruya area)		
-Meruya	MM,MA	2.6
		41.1

Note: * These drainage are the check survey routes.

The Location map of longitudinal profile and cross section survey is shown in Fig 3.

7 Cross Section Survey

Based on the cross section posts, cross section surveys were conducted at an interval of approximately 100m along the proposed drainage channels and at an interval of approximately 200m for the drainage channels in private owned area for check survey.

The width and number of cross sections were determined as follows, based on the plan of the drainage channels and topographic conditions along the drainage channels.

Channel	Drainage Code	Number	Width(m)
a) Cengkareng west area			
-Kamal	KM	62	100,70,50
	KE	34	50
	KH-C	12	10
	KM-C	5	25
	KC-C	9	25
-Tanjungan	TM	37	100,50
	TB	18	80
-New channel	GM	17	50
	NA	12	50
-Gede/Bor	GM	17	50
	GA	13	50
	GM-C	10	20
-Saluran Cengkareng	CM	51	100,50
-Pedengkelan	PM-C	16	25
	PA-C	12	25
	PB-C	9	25
	PC-C	5	25
b) Meruya area			
-Meruya	MM	30	30,20
	MA	8	20
Total		395	

The cross section drawings were prepared according to the following scale:

- Horizontal scale : 1:100
- Vertical scale : 1:100

The location map of longitudinal profile and cross section survey is shown in Fig 3.

8 Topographic Mapping

The topographic maps for the proposed drainage routes were prepared by conducting ground surveys using total station systems, the offset method based on the cross section posts, and in combination with the supplemental survey using existing topographic maps. The proposed drainage routes were mapped and the number of sheets used is 37 sheets in total. The index of topographic maps is shown in Fig.4 .

The drawing specifications for the topographic maps were as follows:

- Mapping scale : 1:1,000

- Interval of contour line
  - Main contour : 1.0m
  - Supplemental contour : 0.5m
- Map symbols and others : The map symbols and legends used were based on the cartographic standards of the Ministry of Public Works

9 Final Results

The final results of the topographic survey received after the inspection of the Contractor were in accordance with the contract agreement.

1) Longitudinal profile survey	
- Longitudinal profiles	1 set
- Duplicate of longitudinal profile	1 set
- Blue prints	3 sets
- Calculation sheets	1 set
- Description of bench marks and control points	1 set
- Location map of bench mark and control points	1 set
- Measuring sheets	1 set
- 3.5" floppy disk of longitudinal profiles	1 set
2) Cross section survey	
- Cross sections	1 set
- Duplicate of cross sections	1 set
- Blue prints	3 sets
- Calculation sheets	1 set
- Location map of cross section posts	1 set
- Measuring sheets	1 set
- 3.5" floppy disk of cross sections	1 set
3) Topographic mapping	
- Topographic map sheets	1 set
- Duplicate of topographic map sheets	1 set
- Blue prints	3 sets
- Field data	1 set
4) Weekly progress report	1 copy
5) Final survey report	5 copies

Tables

Table 1 ELEVATION OF BENCH MARKS (1/2)

Bench Mark No.	Elevation (m)	Remarks
TTG.281	14.131	Reference point
TTG.280(NWP.514)	11.969	Reference point
TTG.177(NWP.60)	40.138	Reference point
TTG.279	13.090	Recovered point
TTG.278	6.841	Recovered point
TTG.276	5.144	Recovered point
TTG.275(PP.743)	3.503	Recovered point
TTG.271(PB.012)	2.137	Recovered point
TTG.270A	3.414	Recovered point
TTG.260(PP.809)	2.507	Recovered point
PP.101A	1.348	Recovered point
PP.103A	0.932	Recovered point
PP.107A	0.772	Recovered point
PP.1088B	11.566	Recovered point
PP.108A	1.124	Recovered point
PP.1110B	5.368	Recovered point
PP.1114B	2.910	Recovered point
PP.1271B	2.342	Recovered point
PP.1299B	3.014	Recovered point
PP.1302B	3.345	Recovered point
PP.316	0.012	Recovered point
PP.407	58.453	Recovered point
PP.701	1.881	Recovered point
PP.707	2.256	Recovered point
PP.716	3.132	Recovered point
PP.722A	2.947	Recovered point
PP.733B	5.250	Recovered point
PP.745A	4.153	Recovered point
PP.765	2.484	Recovered point
PP.767	3.097	Recovered point
PP.814B	4.031	Recovered point
PP.815B	3.304	Recovered point
PP.822	6.454	Recovered point
PP.823B	5.774	Recovered point
PP.824B	4.355	Recovered point
PP.845A	6.313	Recovered point
PP.876A	9.642	Recovered point
PP.1290B	3.146	Recovered point
PP.1291B	2.149	Recovered point
PP.1296B	3.282	Recovered point
PP.1300B	3.232	Recovered point
BATAS(TP)	5.550	Recovered point
DKI.1058	4.607	Recovered point
DKI.1082	4.219	Recovered point
DKI.1167	3.213	Recovered point
DKI.127	3.026	Recovered point
DKI.389	4.783	Recovered point

Table 1 ELEVATION OF BENCH MARKS (2/2)

DKI.521	5.959	Recovered point
DKI.535	1.034	Recovered point
DKI.580	4.333	Recovered point
DKI.671	4.474	Recovered point
DKI.701	3.515	Recovered point
DKI.704	2.472	Recovered point
DTK.094	3.350	Recovered point
DTK.258	0.403	Recovered point
DTK.372	8.489	Recovered point
DTK.384	10.064	Recovered point
DTK.960	3.118	Recovered point
CF.0	2.418	Recovered point
BM.01	1.703	Recovered point
BM.02	0.574	Recovered point
BM.06	3.204	Recovered point
BM.09	0.641	Recovered point
GPS.1005	1.968	Recovered point
GPS.1005A	3.577	Established point
GPS.2034	9.320	Established point
96001	1.574	Established point
96002	1.679	Established point
96003	2.178	Established point
96004	3.898	Established point
960041	4.194	Established point
96006	2.452	Established point
96007	1.547	Established point
96008	0.891	Established point
96009	1.348	Established point
96010	1.948	Established point
96011	0.013	Established point
96012(BATAS)	0.918	Recovered point
96014	2.074	Established point
96015	1.950	Established point
96016	1.933	Established point
96017	0.853	Established point
96018	3.270	Established point
96019	2.717	Established point
96020	1.846	Established point
96021(GPS.2030)	5.656	Established point
96022(GPS.2031)	4.074	Established point
96023	5.621	Established point
96024	7.037	Established point
96025	11.194	Established point
96026(HL.23)	1.906	Recovered point
96027(HW.2)	1.411	Recovered point

Table 2 Coordinates of GPS Points

Point No.	North(m)	East(m)	Height(m)*	Remarks
1002	9,319,222.72	688,525.64	3.54	Reference Point
1005	9,318,745.17	691,122.74	1.00	Reference Point
1006	9,322,254.90	694,141.55	0.62	Reference Point
1008	9,326,097.42	690,431.26	0.06	Reference Point
1011	9,312,998.14	699,713.56	9.63	Reference Point
2026	9,322,291.24	691,443.37	1.55	
2027	9,321,833.06	691,433.31	1.18	
2028	9,318,285.96	693,504.96	3.26	
2029	9,318,129.35	693,165.65	1.20	
2030	9,315,714.29	693,216.78	3.32	
2031	9,315,445.60	693,155.15	4.77	
2032	9,312,193.22	694,474.77	16.73	
2033	9,312,235.48	694,095.31	10.86	
2034	9,314,571.85	691,155.41	8.30	
2035	9,314,879.80	691,394.48	10.87	
2036	9,320,707.80	687,981.99	3.73	
2037	9,321,090.58	688,117.23	4.10	
2038	9,323,301.89	688,023.13	2.22	
2039	9,322,785.00	688,578.89	2.20	
1005A	9,319,235.24	691,098.80	1.63	
1006A	9,321,936.63	694,056.50	0.79	
1008A	9,325,962.77	690,175.47	0.10	
W1-1-1	9,323,208.91	691,590.29	-0.52	Recovered Point
W1-1-2	9,323,347.95	691,679.05	-0.31	Additional Point
W2-1R	9,314,855.14	691,763.67	9.15	Recovered Point
W2-2R	9,314,619.89	691,869.78	7.40	Recovered Point

Note: * Height of GPS points is indirect level to calculated using the earth ellipsoid (WGS-84).

Figures

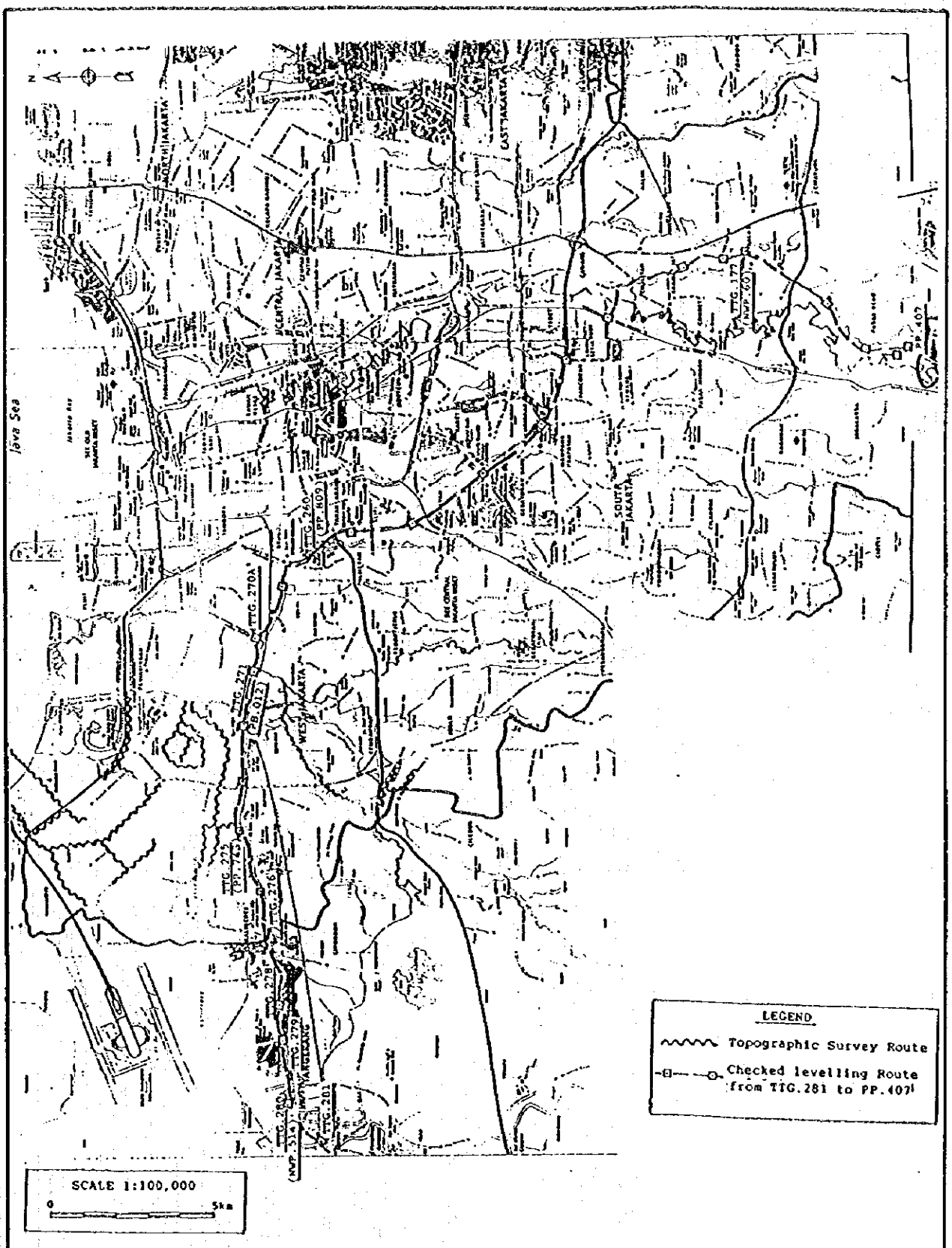

Fig. 1 Location Map of Topographic Survey Route and Checked Levelling Route

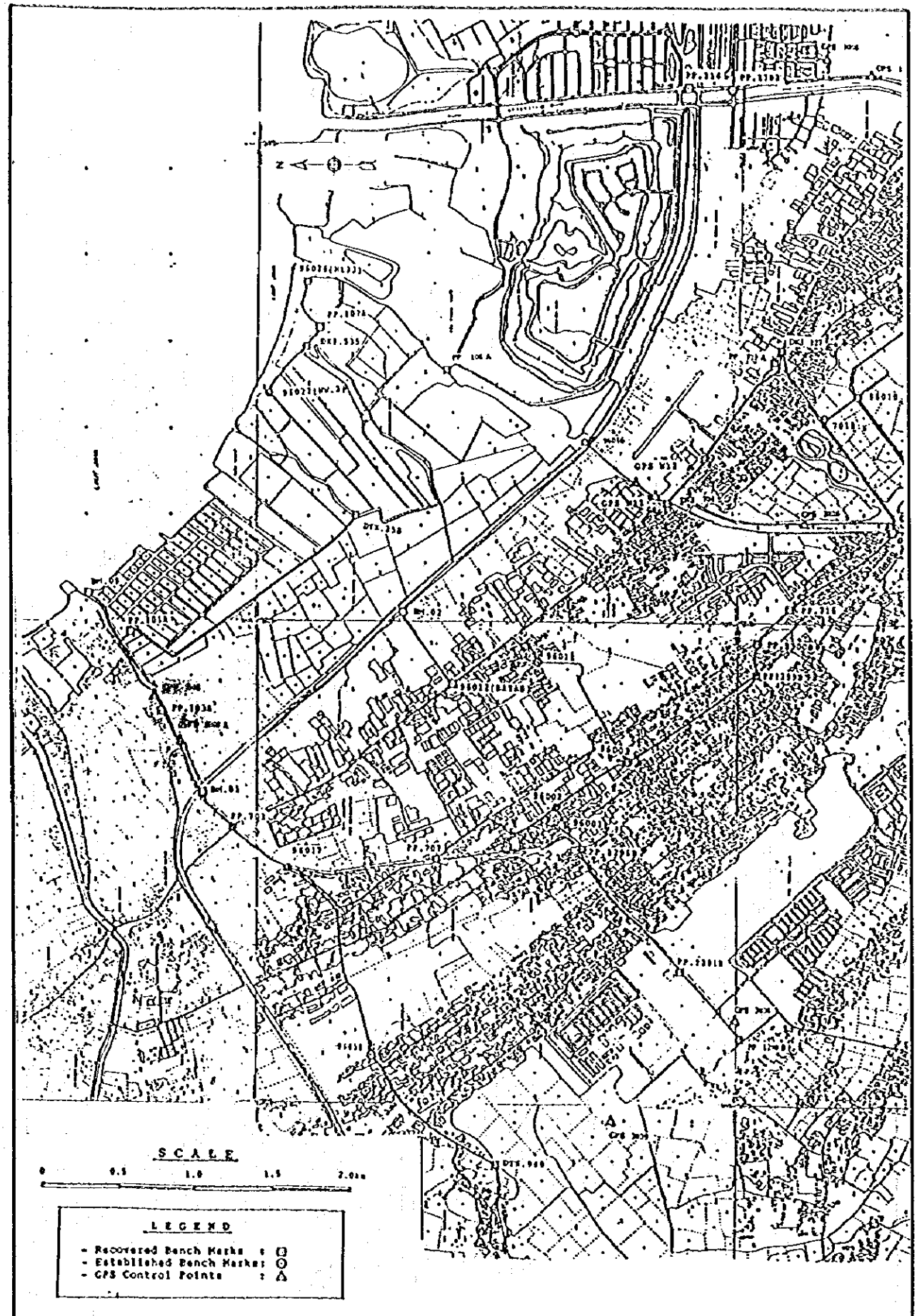

Fig. 2 Location Map of Bench Marks and GPS Control Points (1/3)

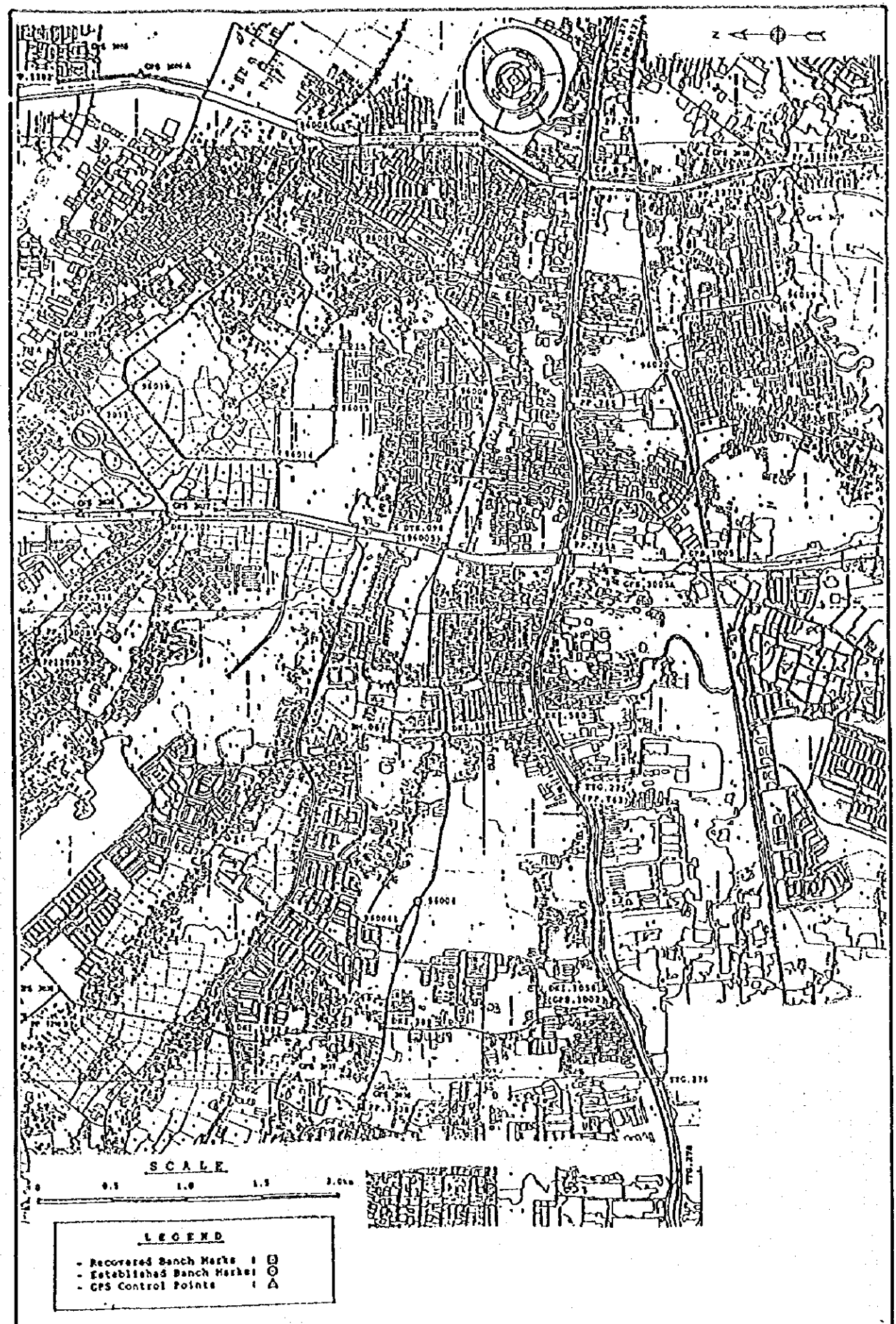

Fig. 2 Location Map of Bench Marks and GPS Control Points (2/3)

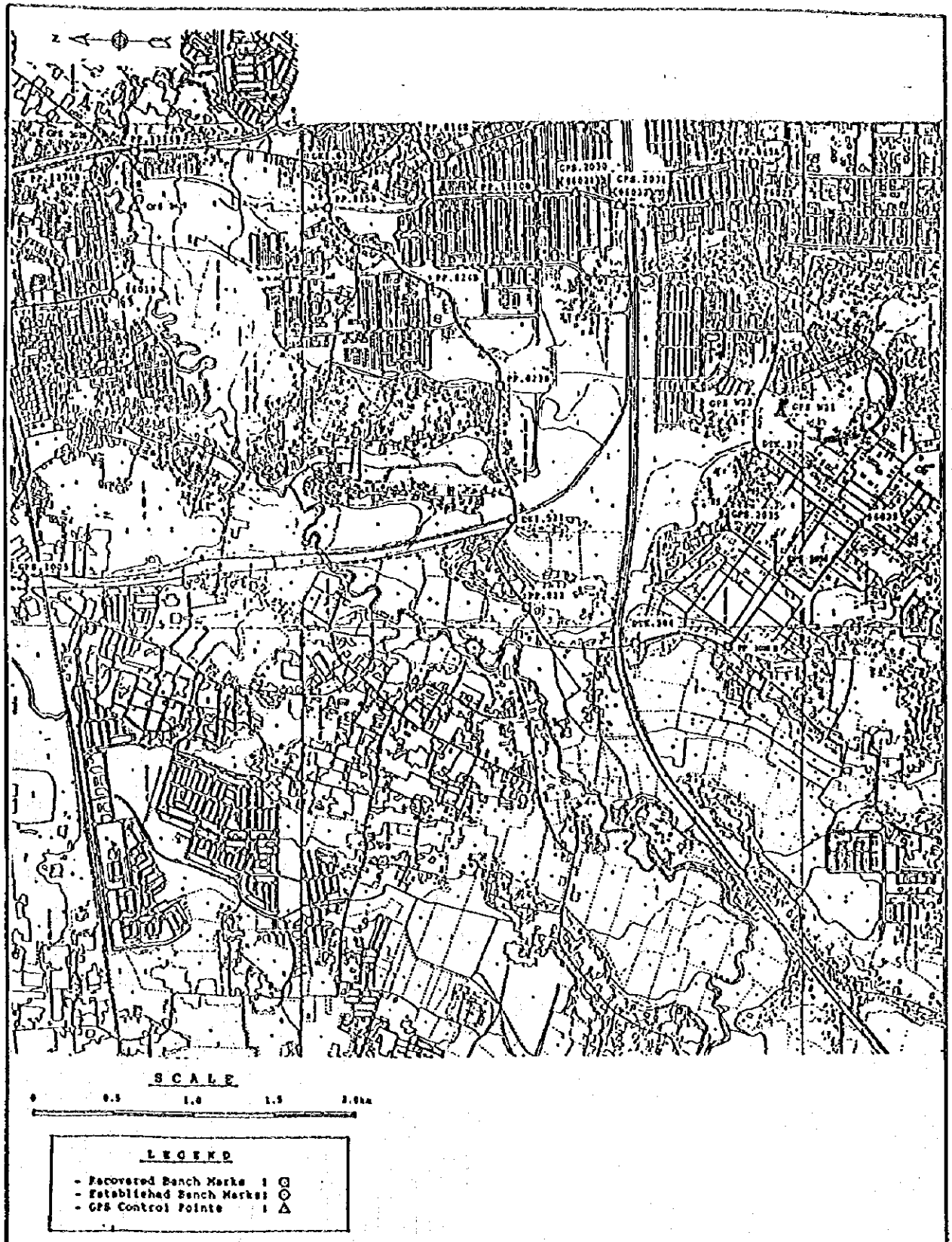

Fig. 2 Location Map of Bench Marks and GPS Control Points (3/3)

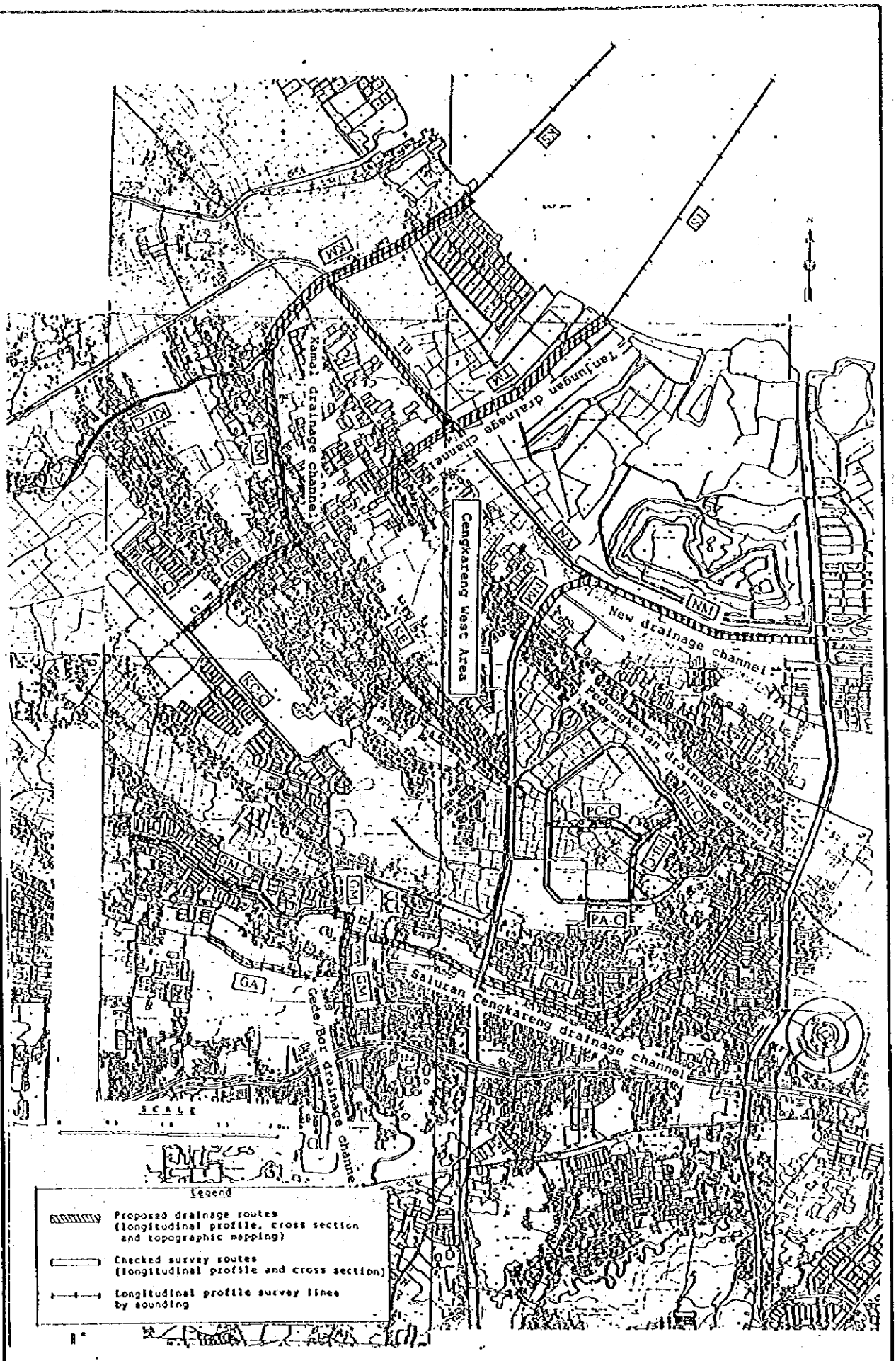

Fig. 3 Location Map of Longitudinal Profile and Cross Section Survey (1/2)

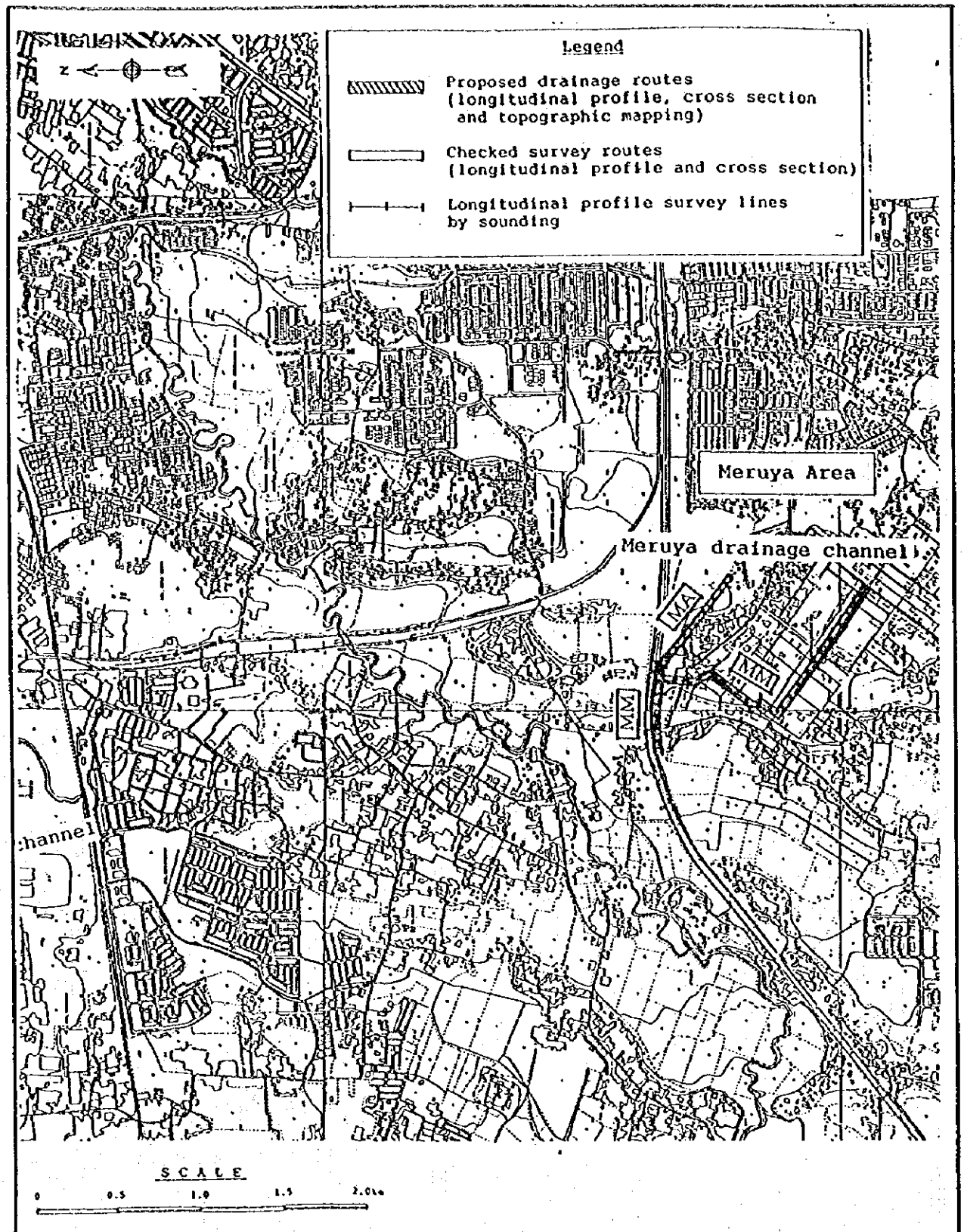

Fig. 3 Location Map of Longitudinal Profile and Cross Section Survey (2/2)

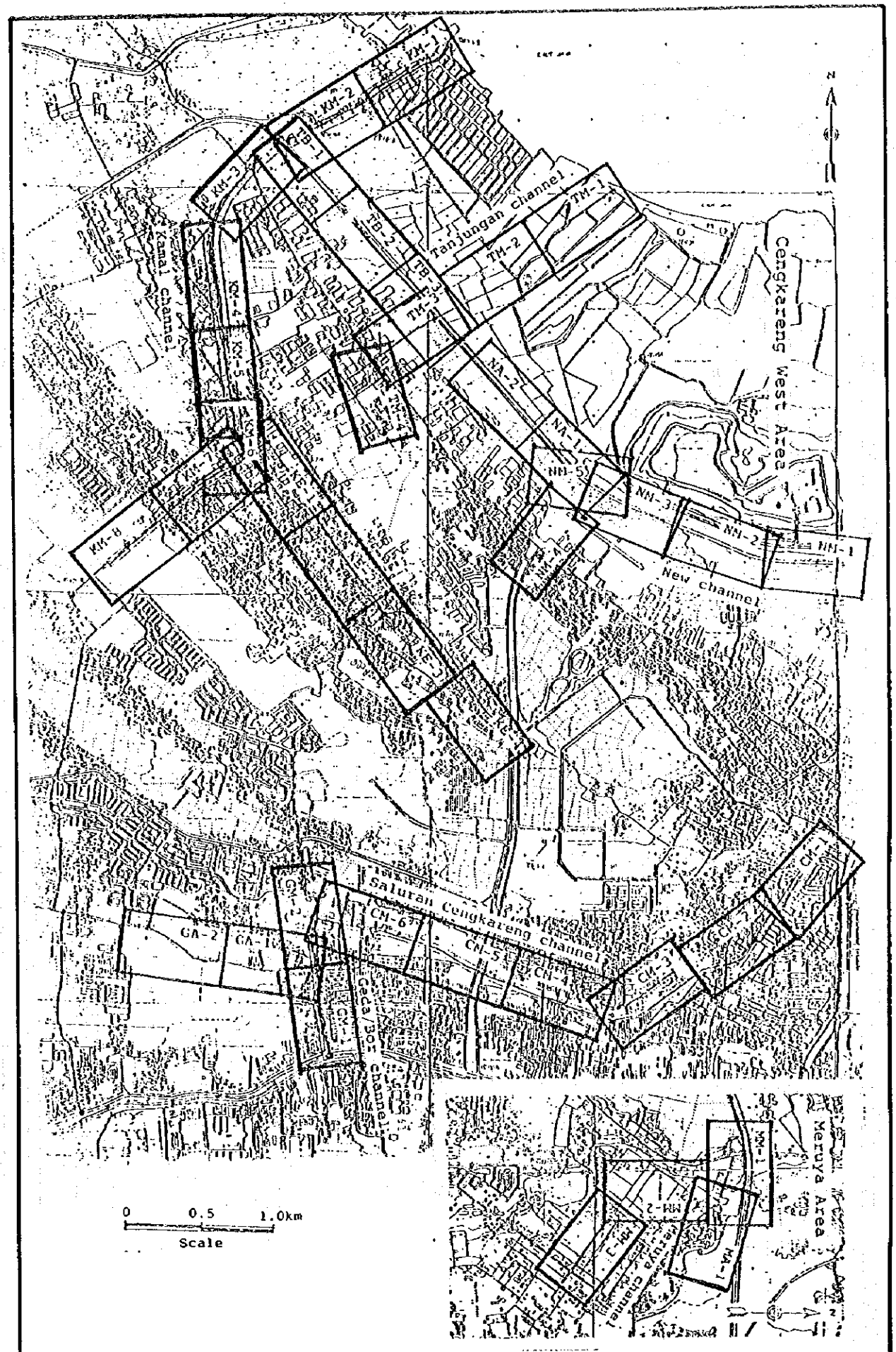

Fig. 4 Index of Topographic Map Sheets