SECTOR VI

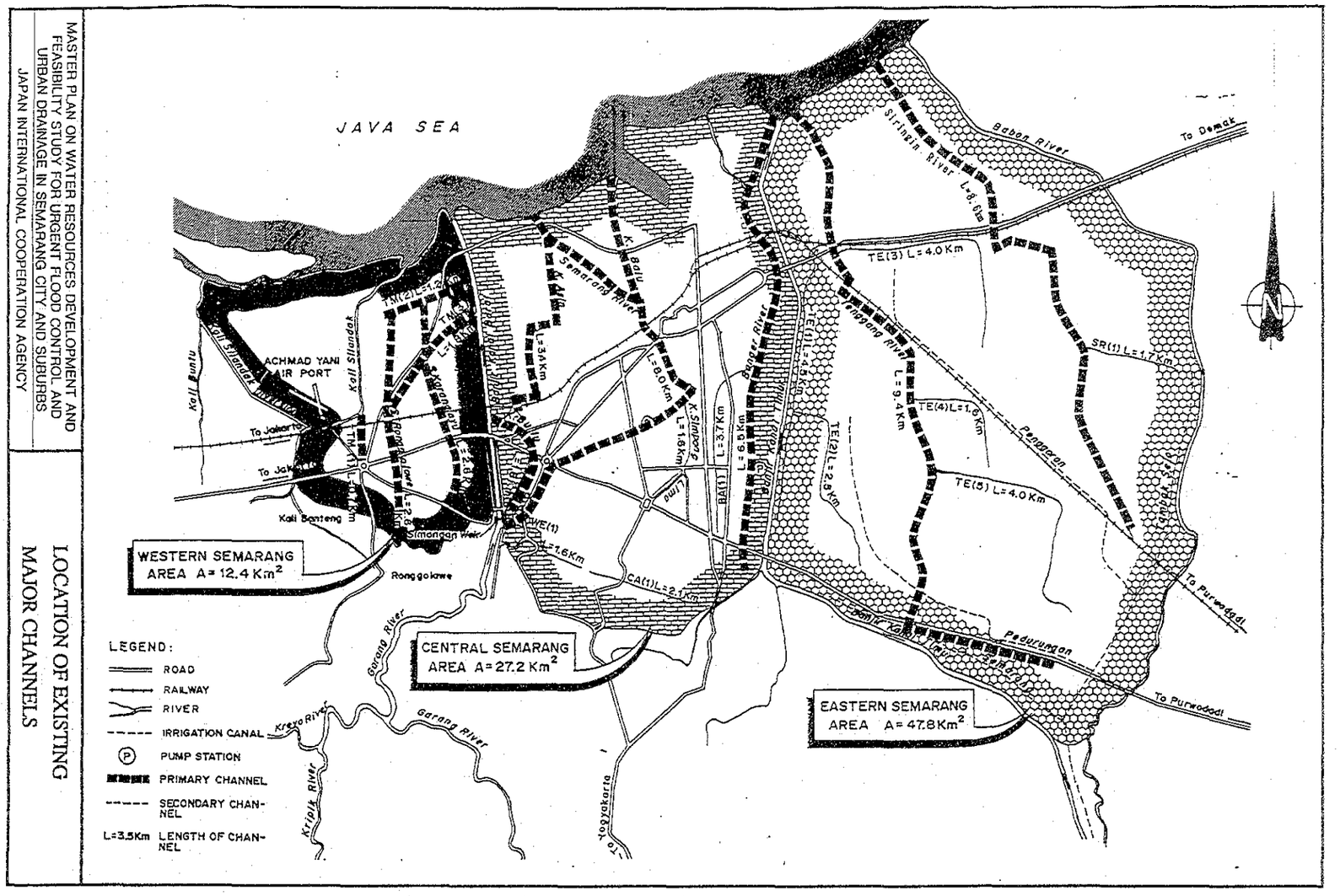
URBAN DRAINAGE PLAN

DATA BOOK
URBAN DRAINAGE PLAN

TABLE OF CONTENTS

I. HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS

1. SIRINGIN RIVER (TABLE I-1, FIG. I-1)
2. TENGGANG RIVER (TABLE I-2, FIG. I-2)
3. SEMARANG RIVER (TABLE I-3, FIG. I-3)
4. BANGER RIVER (TABLE I-4, FIG. I-4)
5. ASIN AND BULU RIVERS (TABLE I-5, FIGS. I-5 AND I-6)
6. KALANGAYU AND RONGGOLAWE RIVERS (TABLE I-6, FIGS. I-7 AND I-8)
7. TM-1, TM-2 AND TM-3 CHANNELS (TABLE I-7, FIGS. I-9 TO I-11)



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

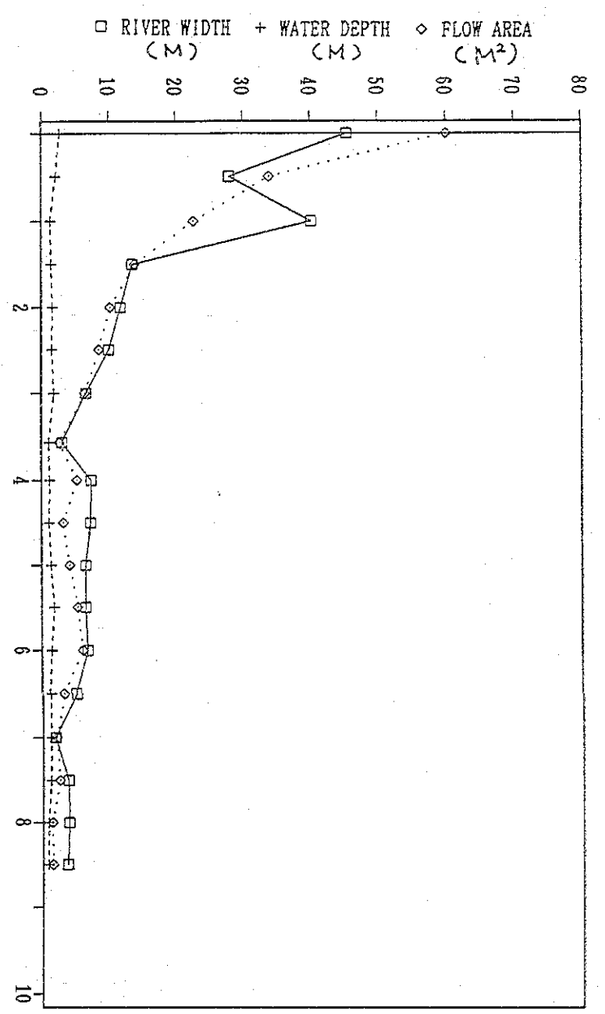
JAPAN INTERNATIONAL COOPERATION AGENCY

LOCATION OF EXISTING MAJOR CHANNELS

Table I-1 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS

(SIRINGIN RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	45.5	2.7	60.13	39.2	1.53	0.031	0.000360	0.81	48.7
	0.50	28.0	2.0	33.90	26.6	1.27	0.031	0.000360	0.72	24.4
	1.00	40.2	1.3	22.65	39.8	0.57	0.031	0.000360	0.42	9.5
	1.50	13.5	1.4	13.92	14.0	0.99	0.031	0.000360	0.61	8.5
	2.00	11.8	1.6	10.19	10.5	0.97	0.031	0.000360	0.60	6.1
	2.50	10.0	1.5	8.48	9.6	0.88	0.031	0.000360	0.56	4.7
	3.00	6.6	1.8	6.36	8.7	0.73	0.031	0.000360	0.50	3.2
	3.567	3.0	1.0	2.58	4.5	0.57	0.024	0.000513	0.65	1.7
	4.00	7.3	1.1	5.15	7.3	0.71	0.031	0.000513	0.58	3.0
	4.50	7.2	1.0	3.14	6.5	0.48	0.031	0.000513	0.45	1.4
	5.00	6.5	1.3	4.09	6.3	0.65	0.031	0.000513	0.55	2.2
	5.50	6.5	1.8	5.31	7.8	0.68	0.031	0.000513	0.56	3.0
	6.00	6.8	1.4	6.05	7.3	0.83	0.031	0.001110	0.95	5.7
	6.50	5.0	1.1	3.17	5.3	0.60	0.024	0.001110	0.99	3.1
	7.00	1.8	1.1	1.93	3.9	0.49	0.024	0.001110	0.86	1.7
	7.50	3.7	1.1	2.42	4.2	0.58	0.031	0.001110	0.75	1.8
	8.00	3.8	0.7	1.30	3.1	0.42	0.031	0.001110	0.60	0.8
	8.50	3.6	0.7	1.40	3.7	0.38	0.031	0.001110	0.56	0.8
	AVERAGE	10.5	1.2	10.11	10.4	0.67	0.027	0.000587	0.62	6.9



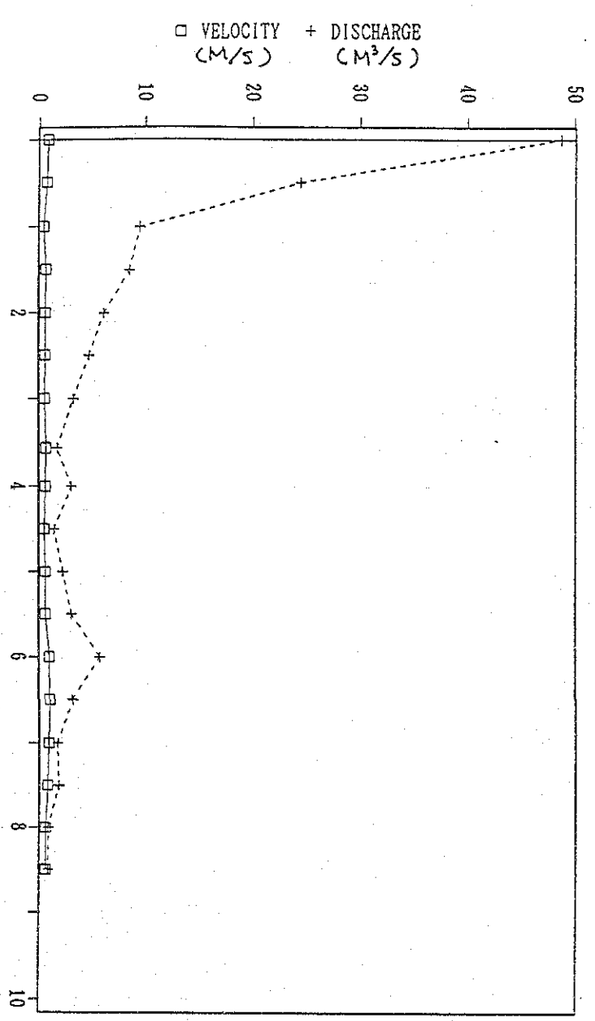
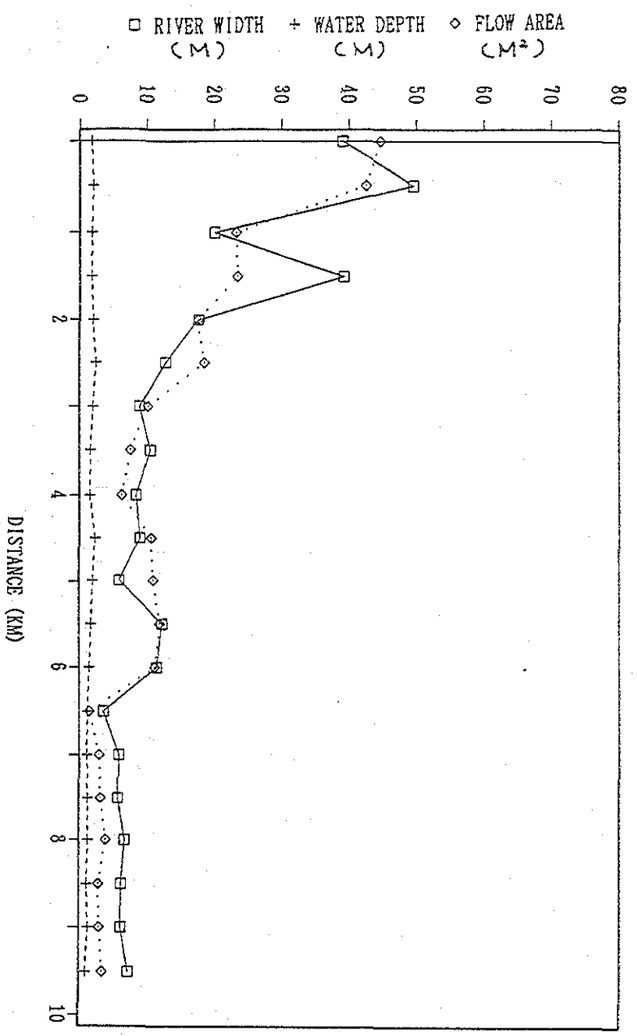


FIG. I-1 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (SIRINGIN RIVER)

Table I-2 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (TENGGANG RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	39.1	1.8	44.61	39.7	1.12	0.031	0.000140	0.41	18.3
	0.50	49.5	1.9	42.54	41.9	1.02	0.031	0.000140	0.39	16.6
	1.00	20.1	1.8	23.22	20.4	1.14	0.031	0.000140	0.42	9.8
	1.50	39.2	1.7	23.47	39.6	0.59	0.031	0.000140	0.27	6.3
	2.00	17.7	1.9	17.63	17.7	1.00	0.031	0.000140	0.38	6.7
	2.50	12.9	2.4	18.65	13.6	1.37	0.031	0.000500	0.89	16.6
	3.00	9.0	1.9	10.19	9.9	1.03	0.031	0.000500	0.74	7.5
	3.50	10.6	1.6	7.61	10.4	0.73	0.031	0.000500	0.58	4.4
	4.00	8.4	1.5	6.28	8.5	0.74	0.031	0.000500	0.59	3.7
	4.50	9.0	2.2	10.62	10.2	1.04	0.031	0.001330	1.21	12.9
	4.99	5.9	1.9	11.03	9.3	1.19	0.024	0.001330	1.71	18.9
	5.50	12.3	1.7	11.96	10.8	1.11	0.024	0.001330	1.63	19.5
	6.00	11.5	1.4	11.17	11.0	1.02	0.024	0.001570	1.67	18.7
	6.50	3.5	1.1	1.41	4.2	0.34	0.031	0.001570	0.62	0.9
	7.00	5.8	1.0	2.88	5.8	0.50	0.031	0.001570	0.81	2.3
	7.50	5.7	1.2	3.14	5.8	0.54	0.031	0.001570	0.85	2.7
	8.00	6.8	1.2	3.91	6.2	0.63	0.031	0.001570	0.94	3.7
	8.50	6.2	1.0	2.80	5.6	0.50	0.031	0.001570	0.81	2.3
	9.00	6.1	1.2	2.86	5.9	0.48	0.031	0.001570	0.78	2.2
	9.50	7.2	0.8	3.35	7.0	0.48	0.024	0.001570	1.01	3.4
	AVERAGE	14.3	1.6	12.97	14.2	0.83	0.030	0.000963	0.84	8.9



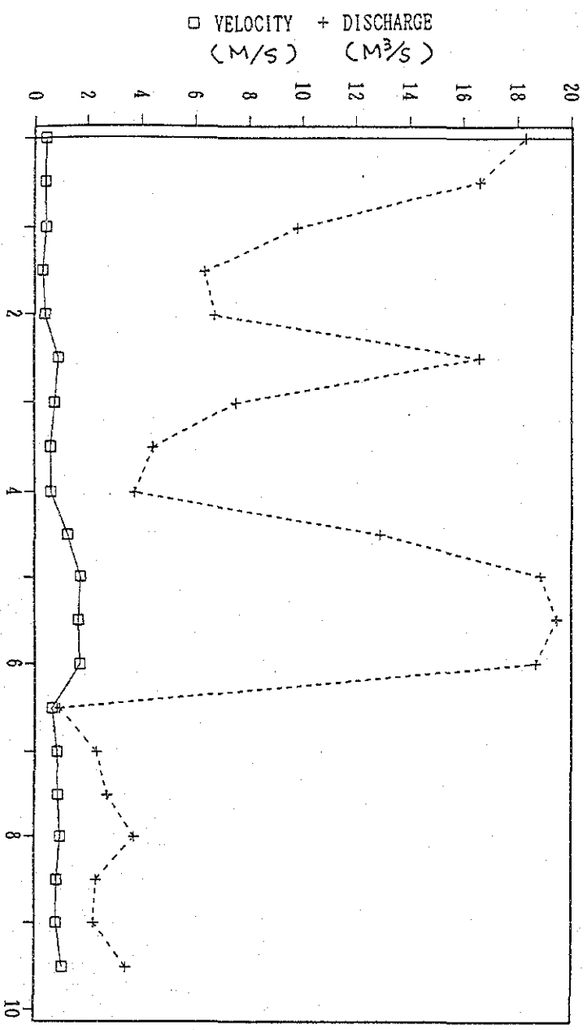


FIG. I-2 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(TENGGANG RIVER)

Table I-3 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(SEMARANG RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	52.0	1.9	44.86	46.3	0.97	0.031	0.000209	0.46	20.6
	0.31	66.0	2.1	63.10	56.7	1.11	0.031	0.000209	0.50	31.6
	0.50	48.0	1.6	47.79	40.7	1.17	0.031	0.000209	0.52	24.9
	1.00	37.5	2.1	44.57	33.9	1.31	0.031	0.000209	0.56	25.0
	1.26	20.0	1.8	28.48	21.7	1.31	0.024	0.000209	0.72	20.5
	1.50	34.5	2.2	47.14	30.6	1.54	0.031	0.000209	0.62	29.2
	1.74	19.0	1.9	27.65	21.2	1.30	0.024	0.000209	0.72	19.9
	2.00	34.0	1.9	40.53	29.9	1.36	0.031	0.000209	0.57	23.1
	2.36	19.0	1.6	12.03	11.8	1.02	0.024	0.000209	0.61	7.3
	2.50	25.5	2.1	39.73	27.9	1.42	0.024	0.000209	0.76	30.2
	2.85	24.0	1.5	29.20	36.1	0.81	0.024	0.000643	0.92	26.9
	3.11	22.6	1.5	21.51	24.7	0.87	0.024	0.000643	0.96	20.6
	3.45	19.7	0.8	10.66	20.3	0.53	0.024	0.000643	0.69	7.4
	3.93	18.0	1.6	22.90	20.5	1.12	0.024	0.000643	1.14	26.1
	4.34	18.1	1.6	25.12	20.6	1.22	0.024	0.000643	1.21	30.4
	4.47	10.8	1.8	16.99	13.5	1.26	0.024	0.000761	1.34	22.8
	5.00	12.7	1.7	19.86	15.4	1.29	0.024	0.000761	1.36	27.0
	5.51	9.0	1.7	14.55	12.0	1.21	0.024	0.000761	1.31	19.1
	5.97	4.3	1.4	4.83	9.4	0.51	0.020	0.000761	0.88	4.3
	6.39	7.9	0.7	4.91	8.7	0.56	0.024	0.000761	0.78	3.8
	6.87	2.2	1.6	3.37	5.2	0.65	0.024	0.000761	0.86	2.9
	6.87	5.7	1.6	7.87	8.2	0.96	0.024	0.000761	1.12	8.8
	AVERAGE	23.2	1.7	26.26	23.4	1.12	0.026	0.000483	0.85	19.7

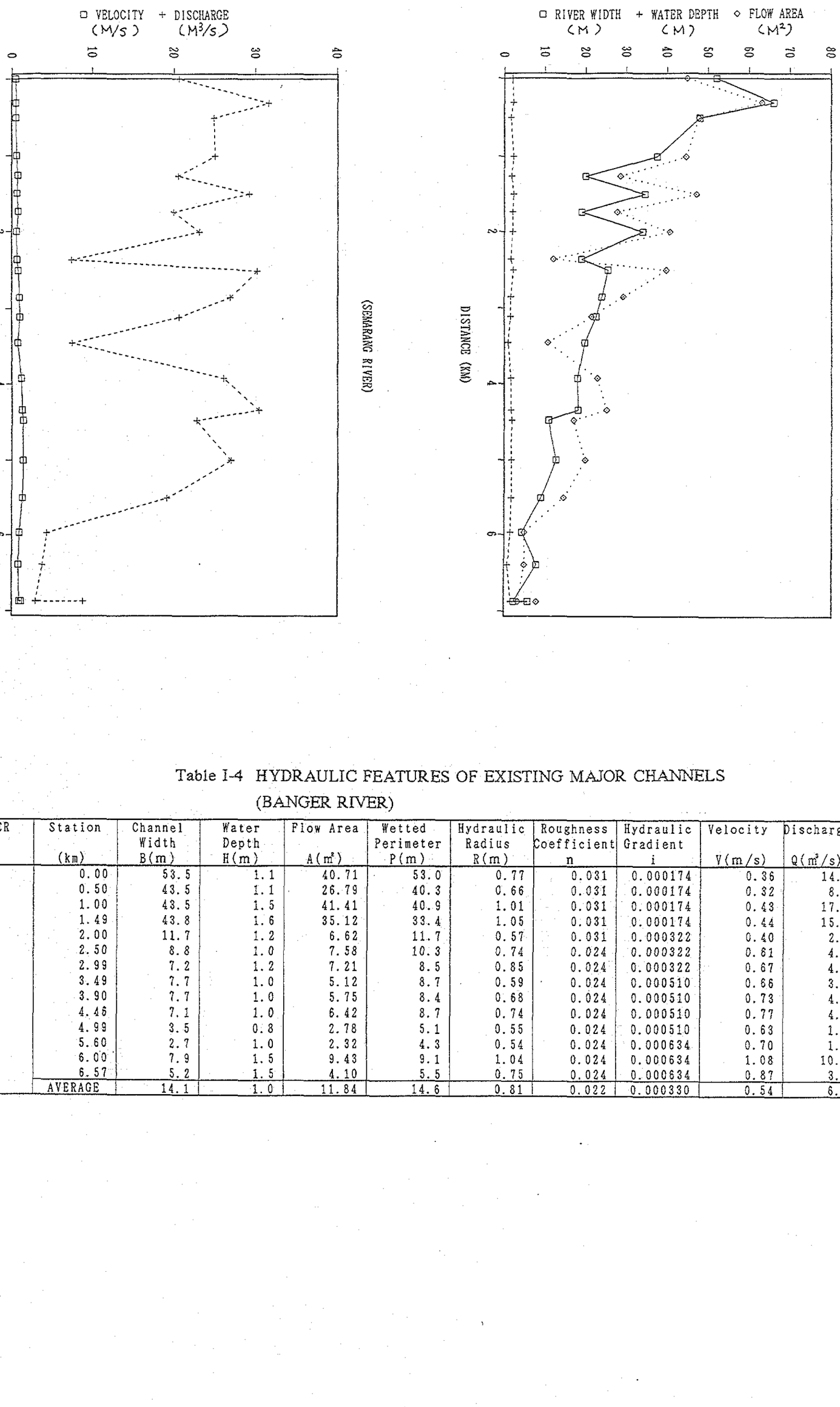
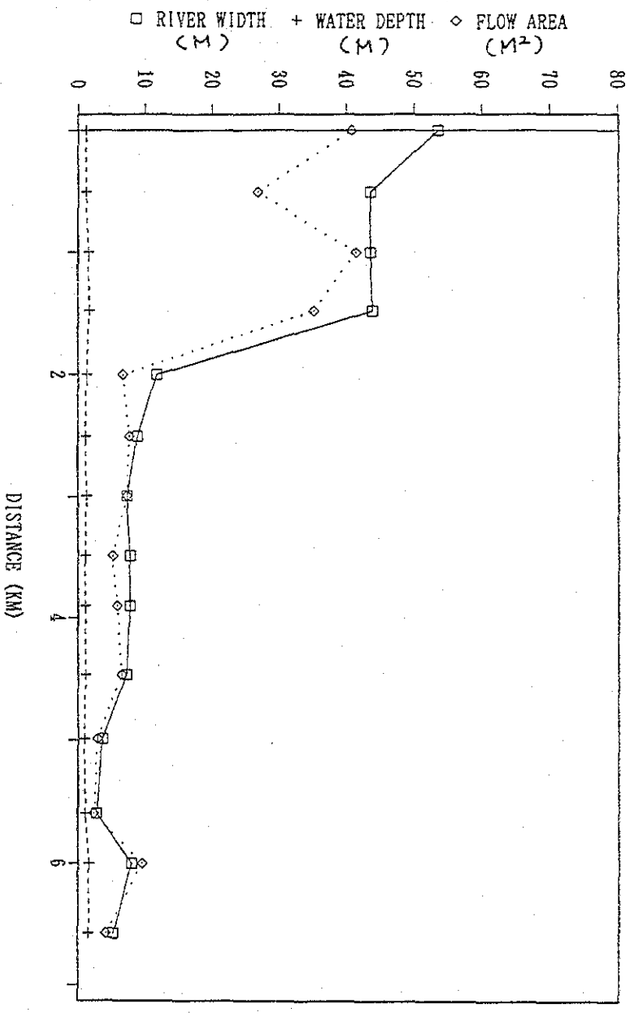


FIG. I-3 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (SEMARANG RIVER)

Table I-4 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (BANGER RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	53.5	1.1	40.71	53.0	0.77	0.031	0.000174	0.36	14.7
	0.50	43.5	1.1	26.79	40.3	0.66	0.031	0.000174	0.32	8.6
	1.00	43.5	1.5	41.41	40.9	1.01	0.031	0.000174	0.43	17.8
	1.49	43.8	1.6	35.12	33.4	1.05	0.031	0.000174	0.44	15.5
	2.00	11.7	1.2	6.62	11.7	0.57	0.031	0.000322	0.40	2.6
	2.50	8.8	1.0	7.58	10.3	0.74	0.024	0.000322	0.61	4.6
	2.99	7.2	1.2	7.21	8.5	0.85	0.024	0.000322	0.67	4.8
	3.49	7.7	1.0	5.12	8.7	0.59	0.024	0.000510	0.66	3.4
	3.90	7.7	1.0	5.75	8.4	0.68	0.024	0.000510	0.73	4.2
	4.46	7.1	1.0	6.42	8.7	0.74	0.024	0.000510	0.77	4.9
	4.99	3.5	0.8	2.78	5.1	0.55	0.024	0.000510	0.63	1.8
	5.60	2.7	1.0	2.32	4.3	0.54	0.024	0.000634	0.70	1.6
	6.00	7.9	1.5	9.43	9.1	1.04	0.024	0.000634	1.08	10.2
	6.57	5.2	1.5	4.10	5.5	0.75	0.024	0.000634	0.87	3.6
	AVERAGE	14.1	1.0	11.84	14.6	0.81	0.022	0.000330	0.54	6.1



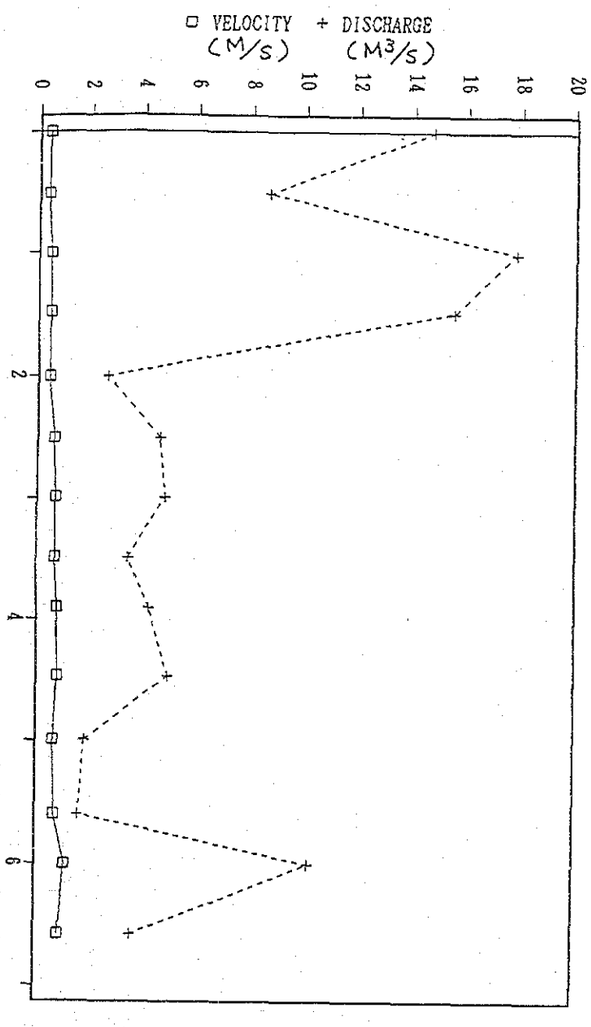
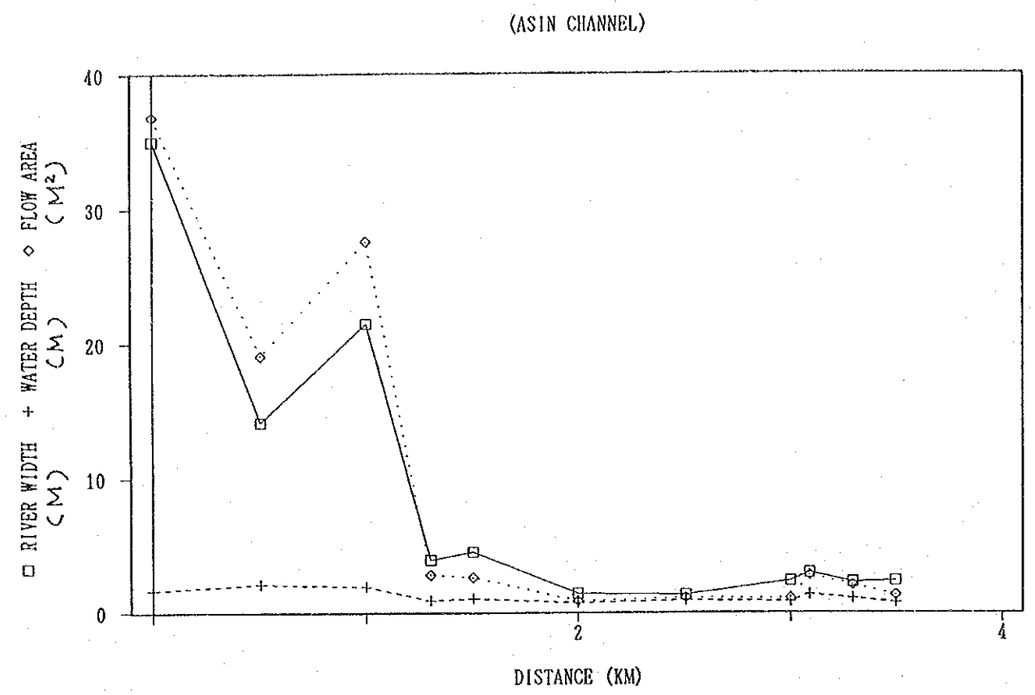


FIG. I-4 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(BANGER RIVER)

Table I-5 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(ASIN RIVER AND BULU RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m^2)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m^3/s)
	0.00	35.0	1.6	36.79	32.1	1.15	0.024	0.000550	1.07	39.4
	0.50	14.1	2.1	19.07	15.6	1.22	0.024	0.000550	1.12	21.4
	1.00	21.5	1.9	27.61	22.0	1.26	0.024	0.000550	1.14	31.5
	1.30	3.9	0.9	2.76	4.9	0.56	0.024	0.001250	1.00	2.8
	1.50	4.5	1.0	2.57	5.6	0.46	0.031	0.001250	0.68	1.7
	2.00	1.4	0.7	0.84	2.5	0.34	0.024	0.001250	0.72	0.6
	2.50	1.3	0.9	1.05	3.0	0.35	0.240	0.001250	0.07	0.1
	3.00	2.3	0.8	1.00	3.2	0.31	0.240	0.001250	0.07	0.1
	3.09	2.9	1.3	2.73	4.7	0.58	0.240	0.001250	0.10	0.3
	3.30	2.2	1.0	1.98	3.8	0.52	0.240	0.001250	0.10	0.2
	3.50	2.3	0.7	1.27	3.4	0.37	0.240	0.001250	0.08	0.1
	AVERAGE	8.3	1.2	8.88	9.2	0.65	0.123	0.001059	0.56	5.0
	0.00	3.5	1.9	4.52	6.6	0.68	0.024	0.003800	1.99	9.0
	0.00	2.0	1.3	2.39	6.8	0.35	0.020	0.003800	1.53	3.7
	0.34	4.7	1.8	6.58	7.0	0.94	0.024	0.003800	2.46	16.2
	0.34	2.8	0.7	1.59	7.4	0.21	0.020	0.003800	1.09	1.7
	0.50	2.8	1.1	2.49	4.2	0.59	0.024	0.003800	1.81	4.5
	0.54	2.9	0.9	2.23	4.4	0.51	0.024	0.003800	1.64	3.7
	0.81	2.0	0.9	1.65	3.6	0.46	0.024	0.003800	1.53	2.5
	1.00	2.5	0.6	1.10	3.3	0.33	0.024	0.000830	0.57	0.6
	1.50	1.8	0.6	1.00	2.8	0.36	0.024	0.000830	0.61	0.6
	1.73	4.1	2.1	7.64	11.4	0.67	0.024	0.000830	0.92	7.0
	AVERAGE	3.4	1.2	3.64	6.1	0.52	0.032	0.002741	1.34	4.9



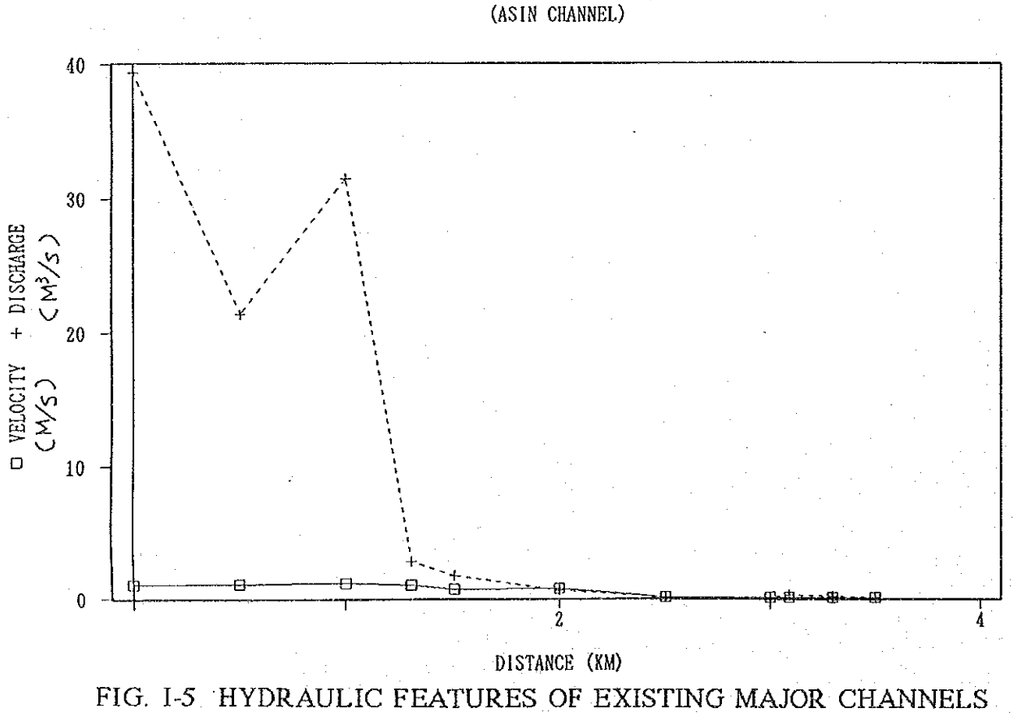
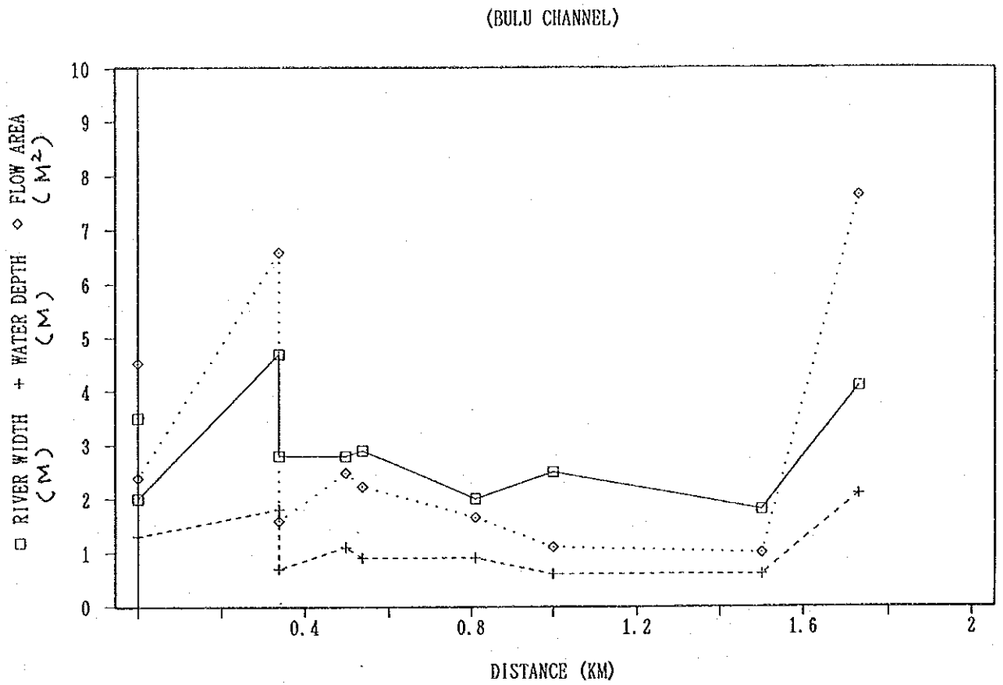


FIG. I-5 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (ASIN RIVER)



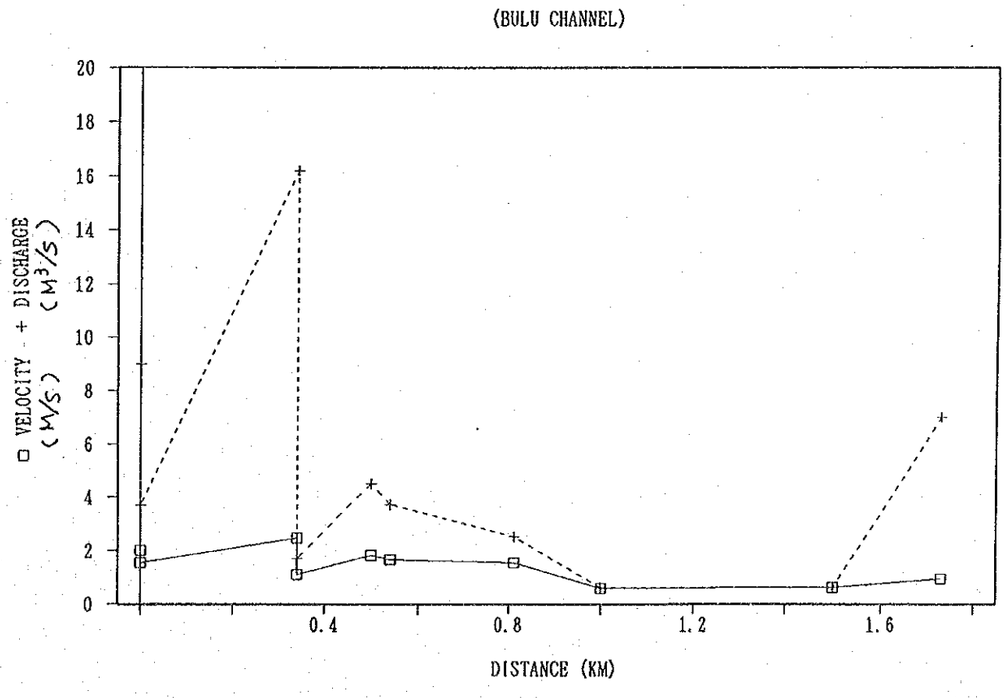


FIG. I-6 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (BULU RIVER)

Table I-6 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS

(KALANGAYU RIVER AND RONGGOLAWE RIVER)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	4.0	1.4	4.88	6.1	0.80	0.024	0.000500	0.80	3.9
	0.50	3.8	0.9	2.91	5.2	0.56	0.024	0.000500	0.63	1.8
	0.69	9.0	0.9	4.62	12.2	0.38	0.024	0.000500	0.49	2.3
	0.75	9.8	1.7	14.26	12.0	1.19	0.031	0.000500	0.81	11.6
	1.00	5.2	1.0	4.33	6.4	0.68	0.024	0.000500	0.72	3.1
	1.30	5.0	0.7	2.31	13.7	0.17	0.020	0.000500	0.34	0.8
	1.50	7.9	1.5	7.07	9.1	0.78	0.031	0.000500	0.61	4.3
	2.00	4.9	1.7	6.40	6.9	0.93	0.024	0.001440	1.51	9.7
	2.17	3.4	1.1	3.50	5.5	0.64	0.020	0.001440	1.41	4.9
	2.50	4.8	1.2	5.16	6.6	0.78	0.024	0.001440	1.34	6.9
	2.86	12.2	2.2	11.39	10.9	1.04	0.031	0.001440	1.26	14.4
	AVERAGE	6.4	1.3	6.1	8.6	0.72	0.025	0.000842	0.90	5.5
	0.00	4.8	1.5	5.48	6.5	0.84	0.024	0.000270	0.61	3.3
	0.54	4.8	1.3	5.44	6.6	0.82	0.024	0.000270	0.60	3.3
	1.00	3.3	1.0	3.06	4.9	0.62	0.024	0.000270	0.50	1.5
	1.50	7.5	1.6	8.00	8.4	0.95	0.024	0.000270	0.66	5.3
	1.78	5.1	1.2	4.75	11.6	0.41	0.020	0.000270	0.45	2.1
	2.00	7.0	1.6	8.70	8.8	0.99	0.024	0.000270	0.68	5.9
	2.26	11.5	2.1	20.10	18.8	1.07	0.024	0.000270	0.72	14.5
	2.50	4.7	1.8	6.60	6.8	0.97	0.024	0.004600	2.77	18.3
	2.76	4.9	2.6	11.50	9.1	1.26	0.024	0.004600	3.30	38.0
	AVERAGE	6.6	1.7	8.3	9.2	0.88	0.024	0.001216	1.13	9.4

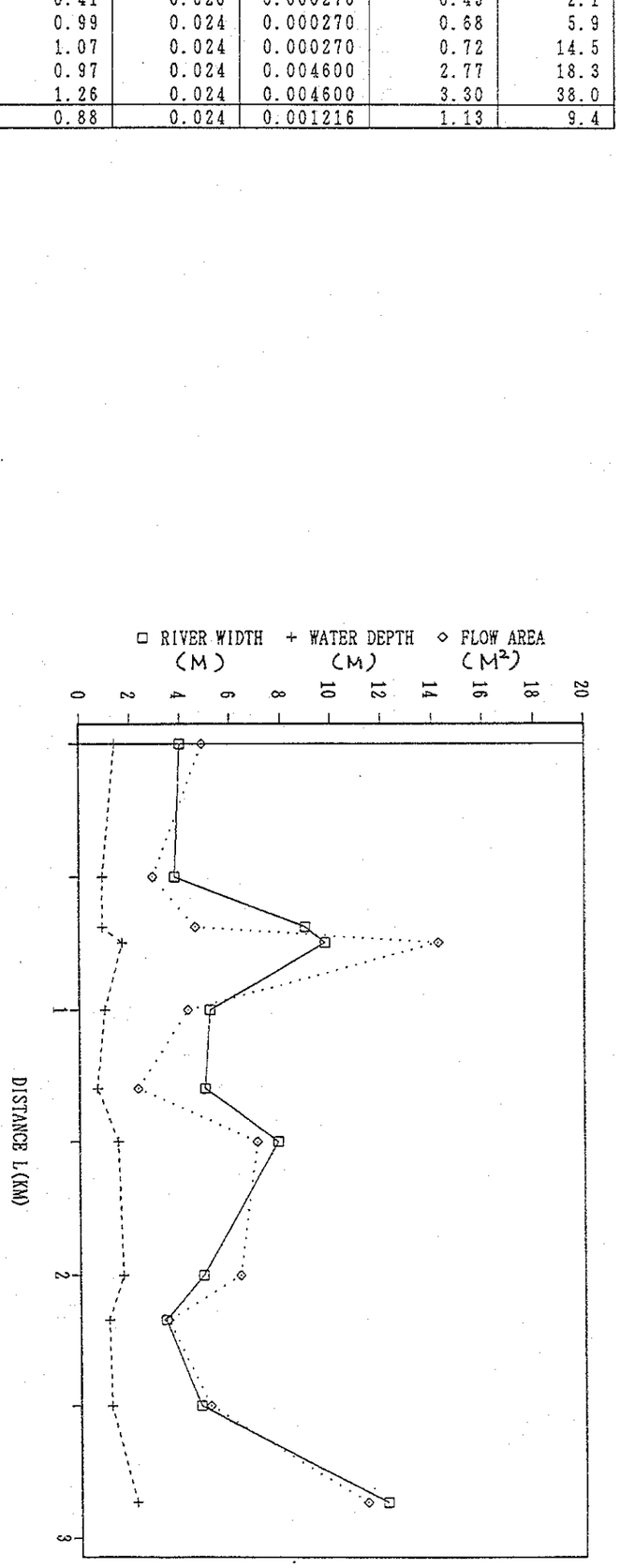
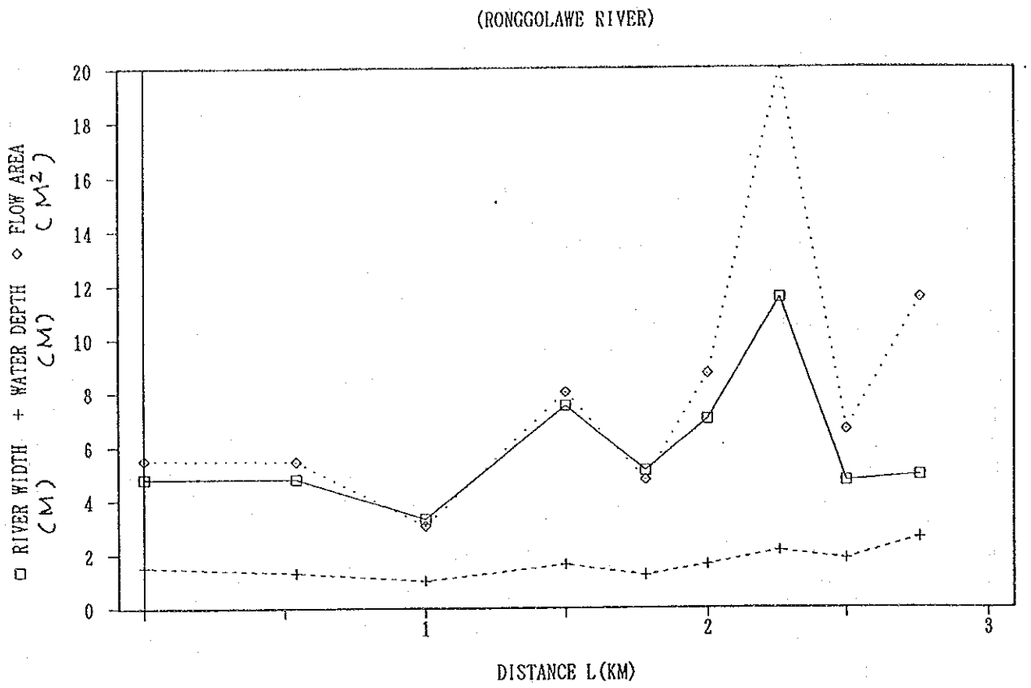


FIG. I-7 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (KALANGAYU RIVER)



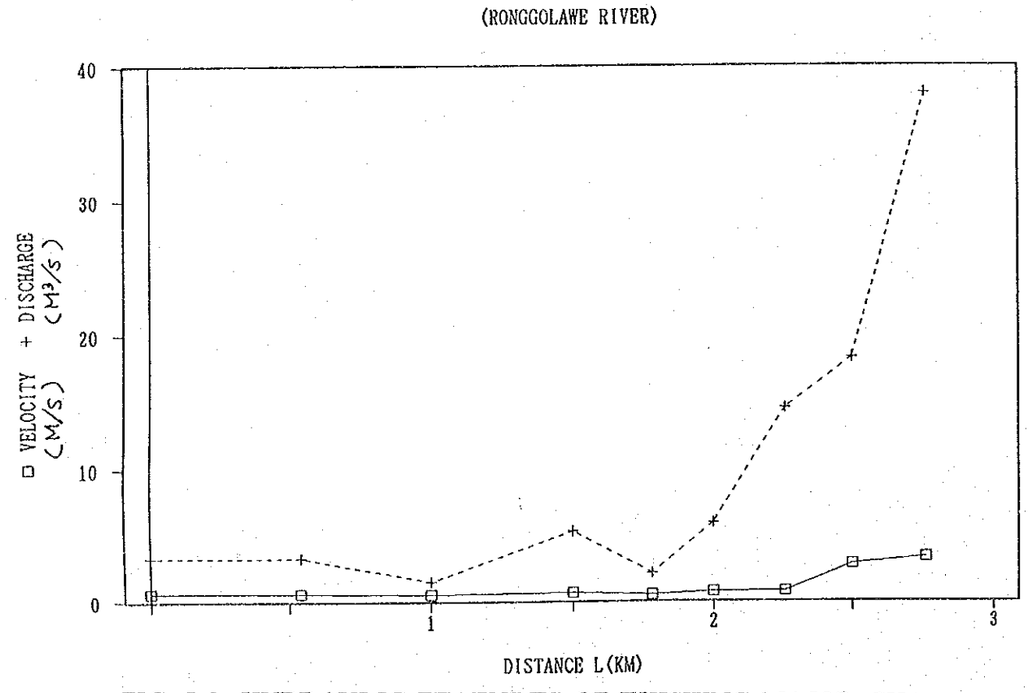
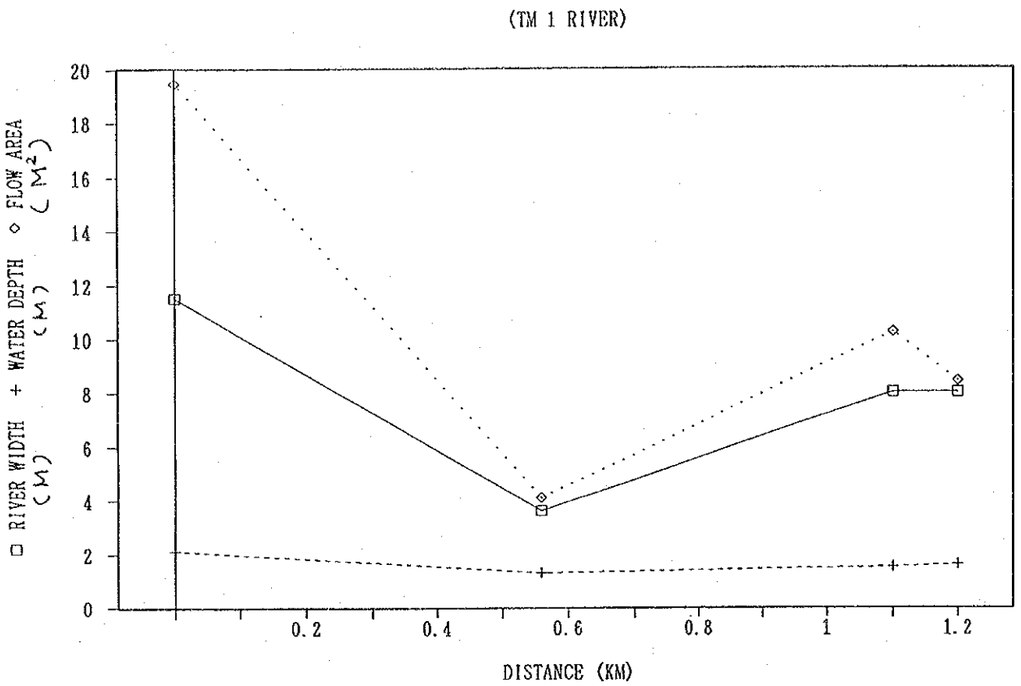


FIG. I-8 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (RONGGOLAWE RIVER)

Table I-7 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS (TM-1,TM-2 AND TM-3 CHANNELS)

RIVER	Station (km)	Channel Width B(m)	Water Depth H(m)	Flow Area A(m²)	Wetted Perimeter P(m)	Hydraulic Radius R(m)	Roughness Coefficient n	Hydraulic Gradient i	Velocity V(m/s)	Discharge Q(m³/s)
	0.00	11.5	2.1	19.46	14.3	1.36	0.024	0.000670	1.32	25.7
	0.56	3.6	1.3	4.09	8.0	0.51	0.024	0.000670	0.69	2.8
	1.10	8.0	1.5	10.22	9.9	1.03	0.024	0.000670	1.10	11.2
	1.20	8.0	1.6	8.42	8.6	0.98	0.024	0.000670	1.06	8.9
	AVERAGE	7.8	1.6	10.55	10.2	0.97	0.024	0.000670	1.04	11.0
	0.00	20.0	1.8	30.89	22.5	1.37	0.024	0.000310	0.90	27.8
	0.50	22.5	1.4	25.67	21.9	1.17	0.024	0.000310	0.81	20.8
	0.95	9.0	2.1	12.74	11.0	1.16	0.031	0.000310	0.63	8.0
	1.50	10.7	2.1	18.23	12.6	1.45	0.024	0.000310	0.94	17.1
	1.60	10.7	2.0	17.71	13.2	1.34	0.024	0.000310	0.89	15.8
	AVERAGE	13.2	1.9	18.59	14.7	1.28	0.026	0.000310	0.82	15.2
	0.00	7.2	1.9	6.15	7.4	0.83	0.031	0.002080	1.30	8.0
	0.50	5.5	1.4	3.96	5.5	0.72	0.031	0.002080	1.18	4.7
	0.77	6.5	0.9	5.68	8.1	0.70	0.024	0.002080	1.50	8.5
	0.77	5.9	0.9	5.17	10.8	0.48	0.024	0.002080	1.16	6.0
	AVERAGE	6.3	1.3	5.24	8.0	0.68	0.028	0.002080	1.29	6.7



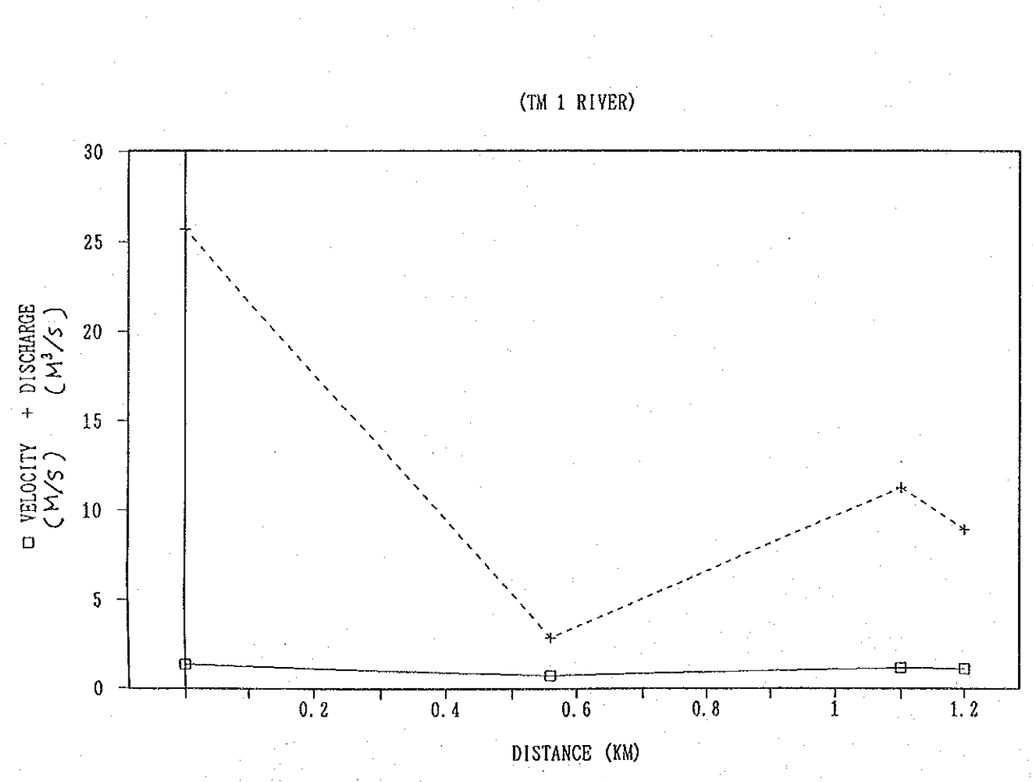
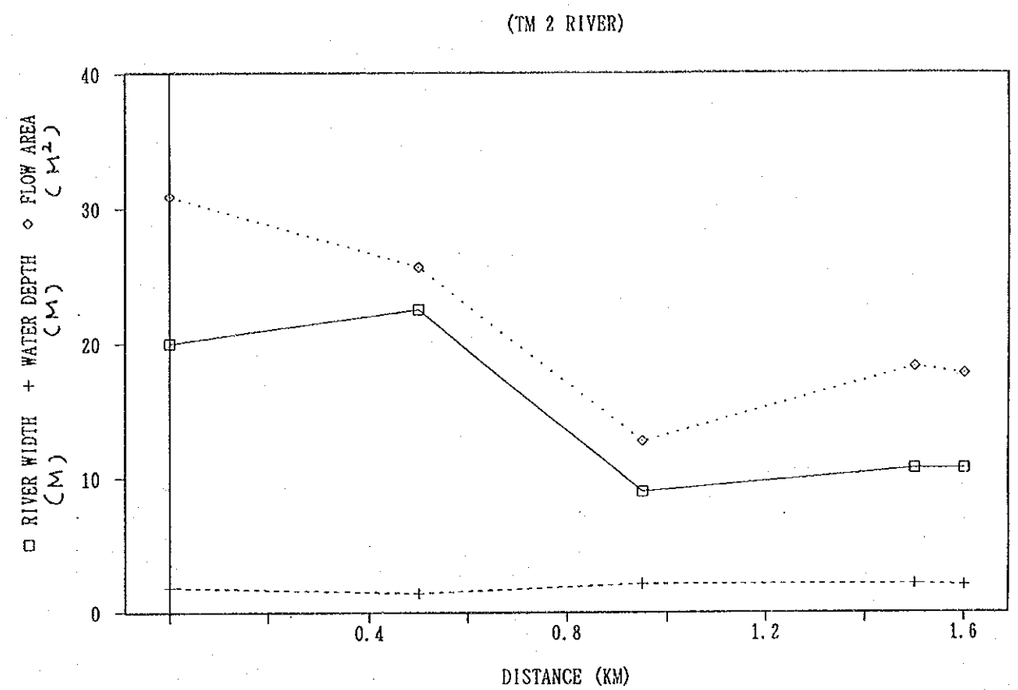


FIG. I-9 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(TM-1 CHANNEL)



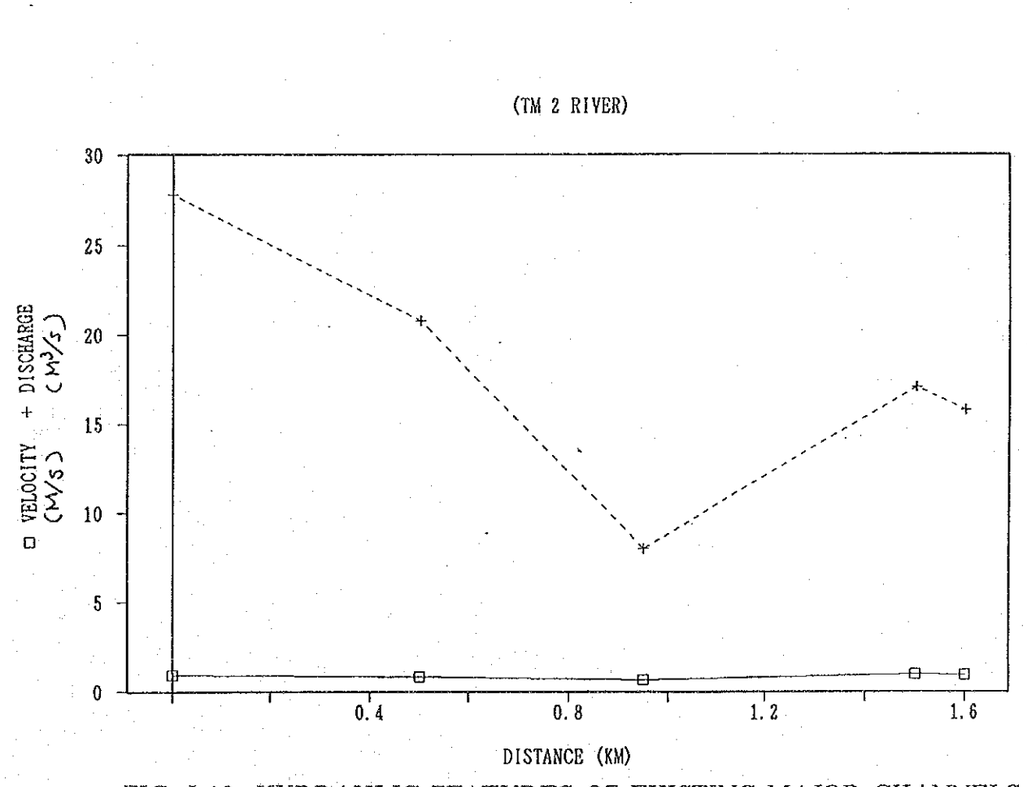
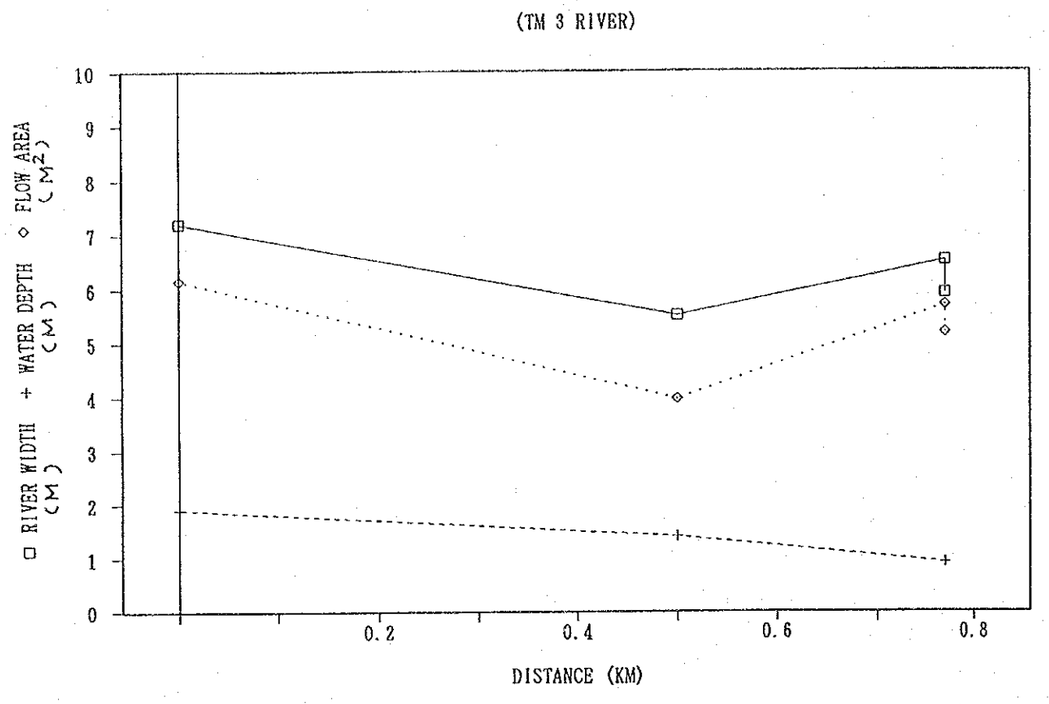


FIG. I-10 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(TM-2 CHANNEL)



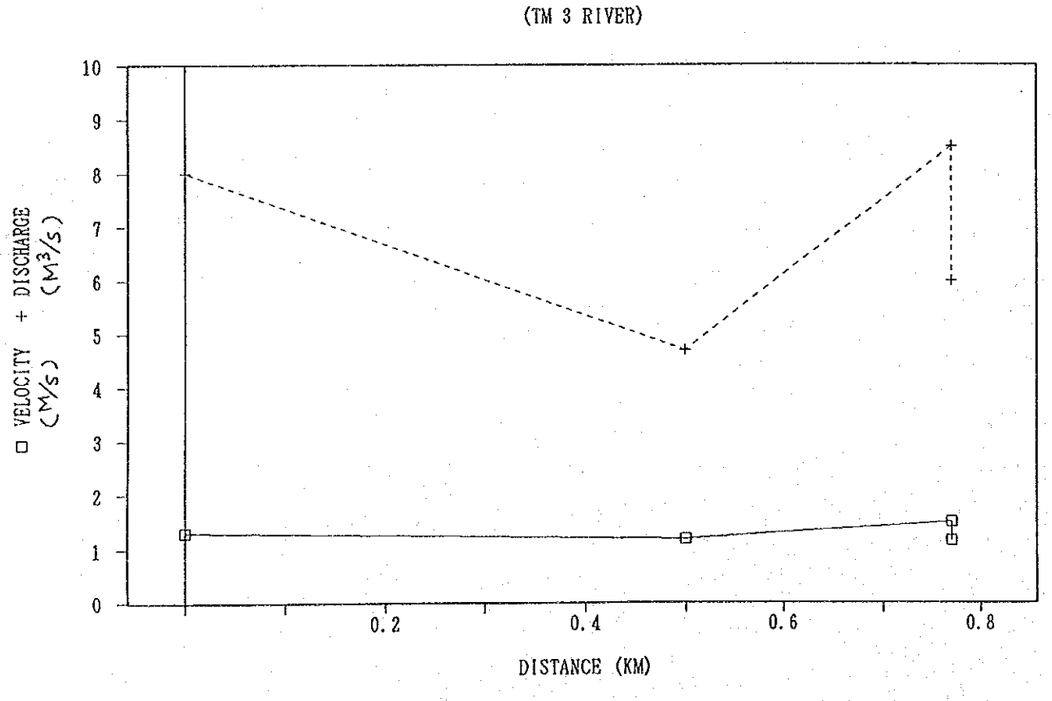


FIG. I-11 HYDRAULIC FEATURES OF EXISTING MAJOR CHANNELS
(TM-3 CHANNEL)

1. Siringin River

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

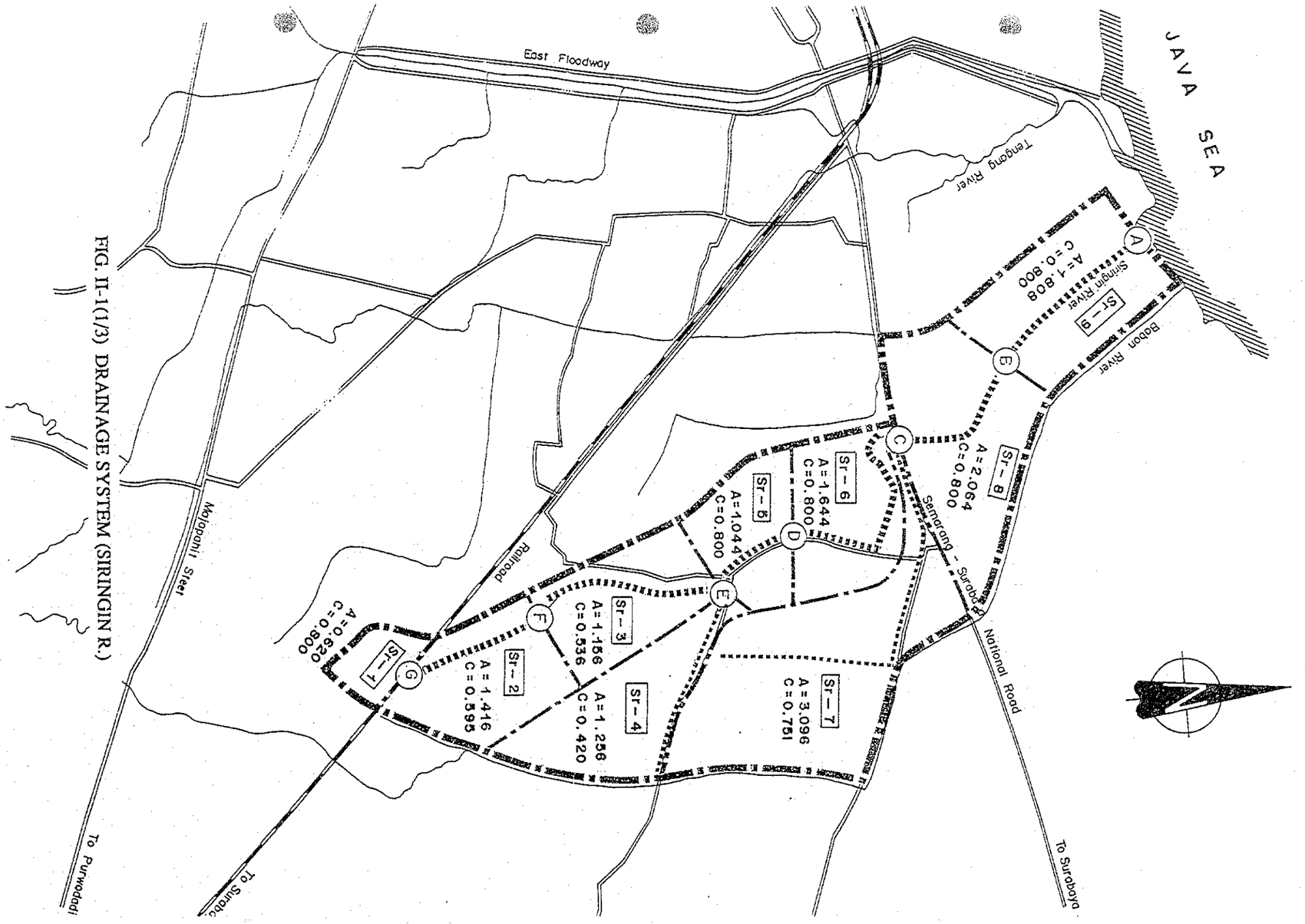


FIG. II-1(1/3) DRAINAGE SYSTEM (SIRINGIN R.)

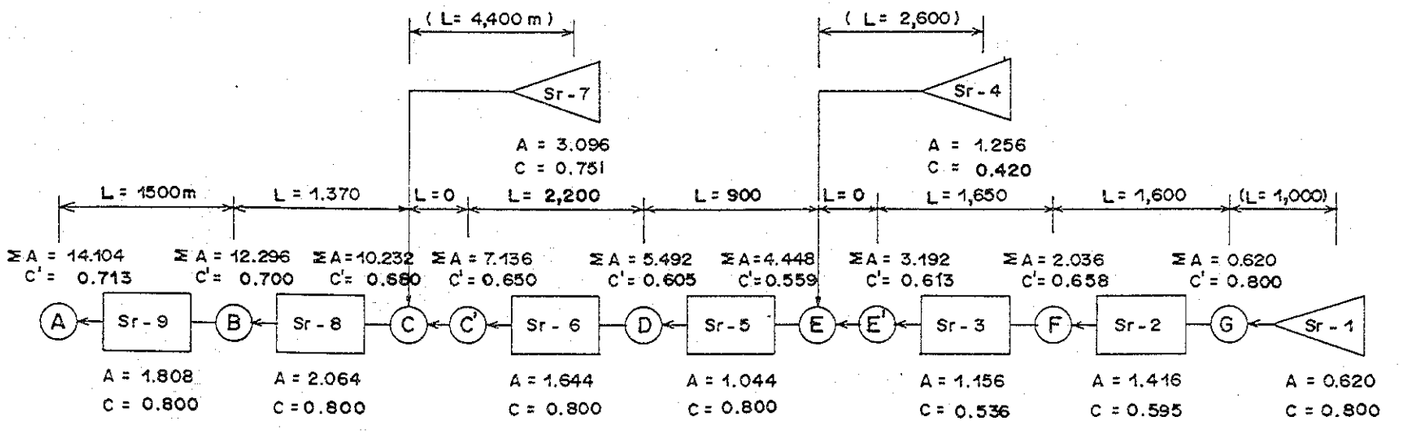


FIG. II-1(2/3) RUNN-OFF MODEL (SIRINGIN R.)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	1000	1000	1313	2050	2050
Residential Area	0.5	10.19	4.49	4.49	-5.4	2.95	2.95
Industrial & Harbor	0.8	0.73	0.6	0.6	0.74	0.76	0.76
Green Zone & Others	0.3						

A.Eastern Semarang Area 1.Sringin River

Proposed Land Use km2

Name of Basin	Sr-1	Sr-2	Sr-3	Sr-4	Sr-5	Sr-6	Sr-7	Sr-8	Sr-9
Business Area	0.620	0.539	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-
Residential Area	-	0.742	1.018	0.609	-	-	0.440	-	-
Industrial & Harbor	-	-	0.138	0.057	1.044	1.644	2.616	2.064	1.808
Green Zone & Others	-	0.135	-	0.590	-	-	0.040	-	-
Total Area	0.620	1.416	1.156	1.256	1.044	1.644	3.096	2.064	1.808
Run-off Coefficient	0.800	0.595	0.536	0.420	0.800	0.800	0.751	0.800	0.800
Length of River Cannal(m)	1,000	1,600	1,650	2,600	900	2,200	4,400	1,370	1,500

Calculation of Peak Discharge

Calculation Point	G	F	E'	E"	E	D	C'	C"	C	B	A
Business Area	0.620	1.159	1.159	-	1.159	1.159	1.159	-	1.159	1.159	1.159
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	-	0.000	0.000	0.000
Residential Area	-	0.742	1.760	0.609	2.370	2.370	2.370	0.440	2.809	2.809	2.809
Industrial & Harbor	-	0.000	0.138	0.057	0.194	1.238	2.882	2.616	5.498	7.562	9.370
Green Zone & Others	-	0.135	0.135	0.590	0.725	0.725	0.725	0.040	0.765	0.765	0.765
Total Area	0.620	2.036	3.192	1.256	4.448	5.492	7.136	3.096	10.232	12.296	14.104
Run-off Coefficient	0.800	0.658	0.613	0.420	0.559	0.605	0.650	0.751	0.680	0.700	0.713
Length of River Cannal(m)	1,000	1,600	1,650	2,600	-	900	2,200	4,400	-	1,370	1,500
Accumulated Length (m)	1,000	2,600	4,250	2,600	4,250	5,150	7,350	4,400	7,350	8,720	10,220
Proposed River Slope(%)	S	0.111%	0.111%	S	-	0.050%	0.050%	S	-	0.036%	0.036%
Proposed Velocity (m/s)	1.250	1.000	1.000	1.250	-	0.750	0.750	1.000	-	0.600	0.600
Flowing Time (min)	13.33	26.67	27.50	34.67	-	20.00	48.89	73.33	-	38.06	41.67
Duration Time (min)	28.33	55.00	82.50	49.67	82.50	102.50	151.39	88.33	151.39	189.44	231.11
Rainfall Intensity(mm/hr)	123.11	86.17	68.60	91.16	68.60	60.59	44.52	65.98	44.52	37.65	32.44
Reduction Factor	0.995	0.983	0.974	0.989	0.965	0.958	0.948	0.975	0.931	0.922	0.915
Peak Discharge(m3/s)	13.499	25.197	29.079	10.561	36.564	42.845	43.484	33.229	64.105	66.422	66.312
Specific Q (m3/s/km2)	21.772	12.376	9.110	8.408	8.220	7.801	6.094	10.733	6.265	5.402	4.702

TABLE II-1(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(SIRINGIN R.)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	967	967	1313	2600	2600
Residential Area	0.5	10.19	2.93	2.93	-5.4	7.2	7.2
Industrial & Harbor	0.8	0.73	0.57	0.57	0.74	0.78	0.78
Green Zone & Others	0.3						

A.Eastern Semarang Area 1.Sringin River

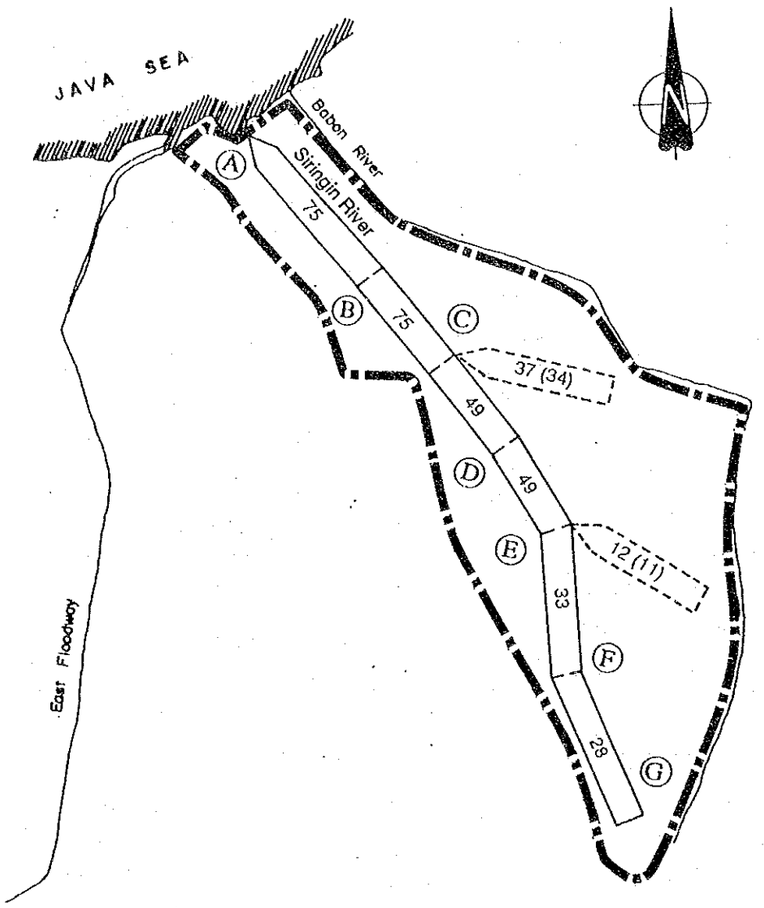
Proposed Land Use km2

Name of Basin	Sr-1	Sr-2	Sr-3	Sr-4	Sr-5	Sr-6	Sr-7	Sr-8	Sr-9
Business Area	0.620	0.539	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-
Residential Area	-	0.742	1.018	0.609	-	-	0.440	-	-
Industrial & Harbor	-	-	0.138	0.057	1.044	1.644	2.616	2.064	1.808
Green Zone & Others	-	0.135	-	0.590	-	-	0.040	-	-
Total Area	0.620	1.416	1.156	1.256	1.044	1.644	3.096	2.064	1.808
Run-off Coefficient	0.800	0.595	0.536	0.420	0.800	0.800	0.751	0.800	0.800
Length of River Cannal(m)	1,000	1,600	1,650	2,600	900	2,200	4,400	1,370	1,500

Calculation of Peak Discharge

Calculation Point	G	F	E'	E"	E	D	C'	C"	C	B	A
Business Area	0.620	1.159	1.159	-	1.159	1.159	1.159	-	1.159	1.159	1.159
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	-	0.000	0.000	0.000
Residential Area	-	0.742	1.760	0.609	2.370	2.370	2.370	0.440	2.809	2.809	2.809
Industrial & Harbor	-	0.000	0.138	0.057	0.194	1.238	2.882	2.616	5.498	7.562	9.370
Green Zone & Others	-	0.135	0.135	0.590	0.725	0.725	0.725	0.040	0.765	0.765	0.765
Total Area	0.620	2.036	3.192	1.256	4.448	5.492	7.136	3.096	10.232	12.296	14.104
Run-off Coefficient	0.800	0.658	0.613	0.420	0.559	0.605	0.650	0.751	0.680	0.700	0.713
Length of River Cannal(m)	1,000	1,600	1,650	2,600	-	900	2,200	4,400	-	1,370	1,500
Accumulated Length (m)	1,000	2,600	4,250	2,600	4,250	5,150	7,350	4,400	7,350	8,720	10,220
Proposed River Slope(%)	S	0.111%	0.111%	S	-	0.050%	0.050%	S	-	0.036%	0.036%
Proposed Velocity (m/s)	1.250	1.000	1.000	1.250	-	0.750	0.750	1.000	-	0.600	0.600
Flowing Time (min)	13.33	26.67	27.50	34.67	-	20.00	48.89	73.33	-	38.06	41.67
Duration Time (min)	28.33	55.00	82.50	49.67	82.50	102.50	151.39	88.33	151.39	189.44	231.11
Rainfall Intensity(mm/hr)	135.91	95.63	76.63	101.04	76.63	67.97	49.98	73.80	49.98	42.26	36.37
Reduction Factor	0.995	0.983	0.974	0.989	0.965	0.958	0.948	0.975	0.931	0.922	0.915
Peak Discharge(m3/s)	14.903	27.963	32.485	11.705	40.845	48.066	48.817	37.168	71.968	74.550	74.358
Specific Q (m3/s/km2)	24.037	13.734	10.177	9.319	9.183	8.752	6.841	12.005	7.034	6.063	5.272

TABLE II-1(2/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(SIRINGIN R.)



NOTE : 1. Unit of the figures is m3/s.

2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

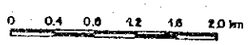


FIG. II-1(3/3) DISTRIBUTION OF DESIGN DISCHARGE(SIRINGIN R.)

2. Tenggang River

2-1 : (Alternative 1-A)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

FIG. II-2(1/3) DRAINAGE SYSTEM (TENGGANG R.,ALTER.1-A)

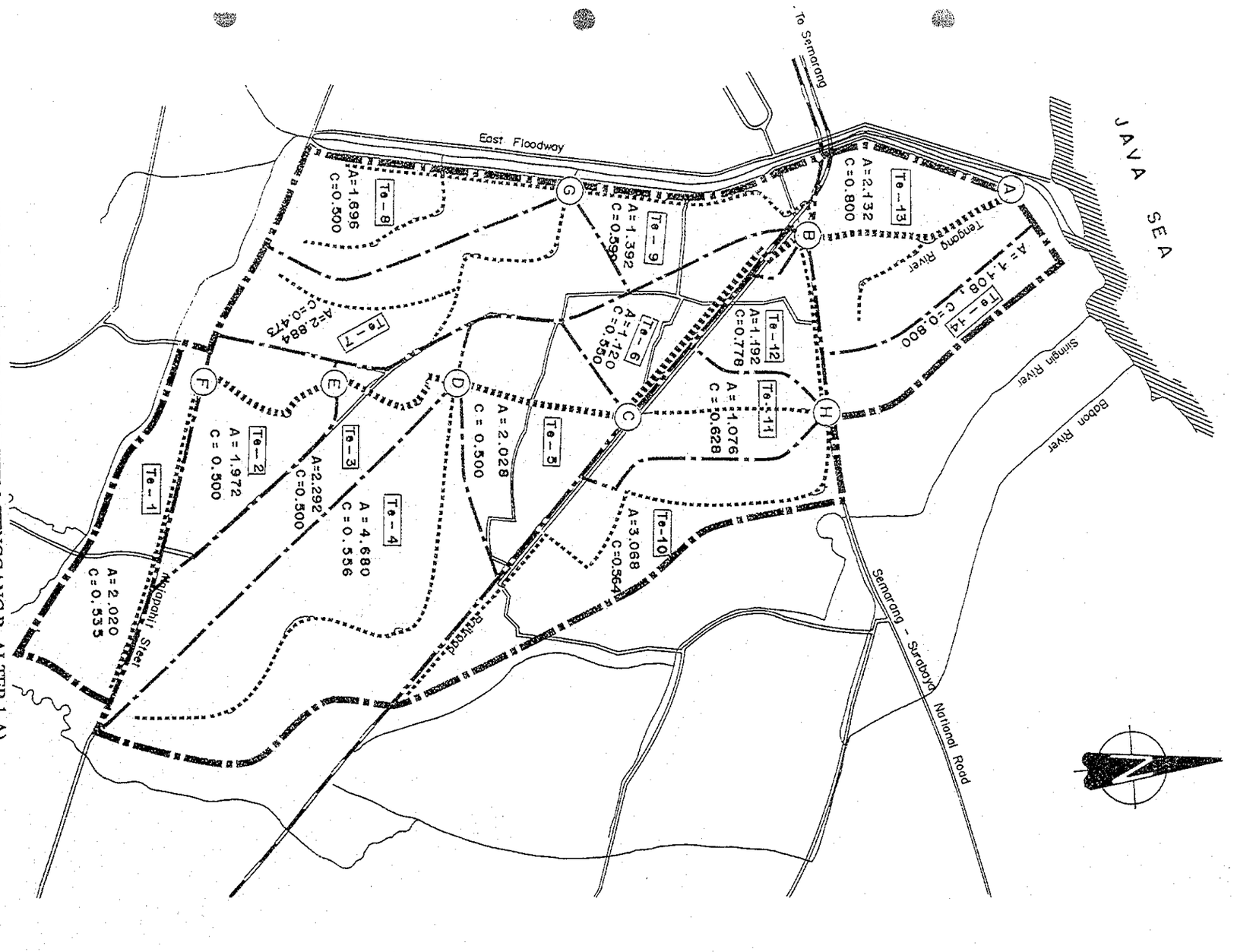
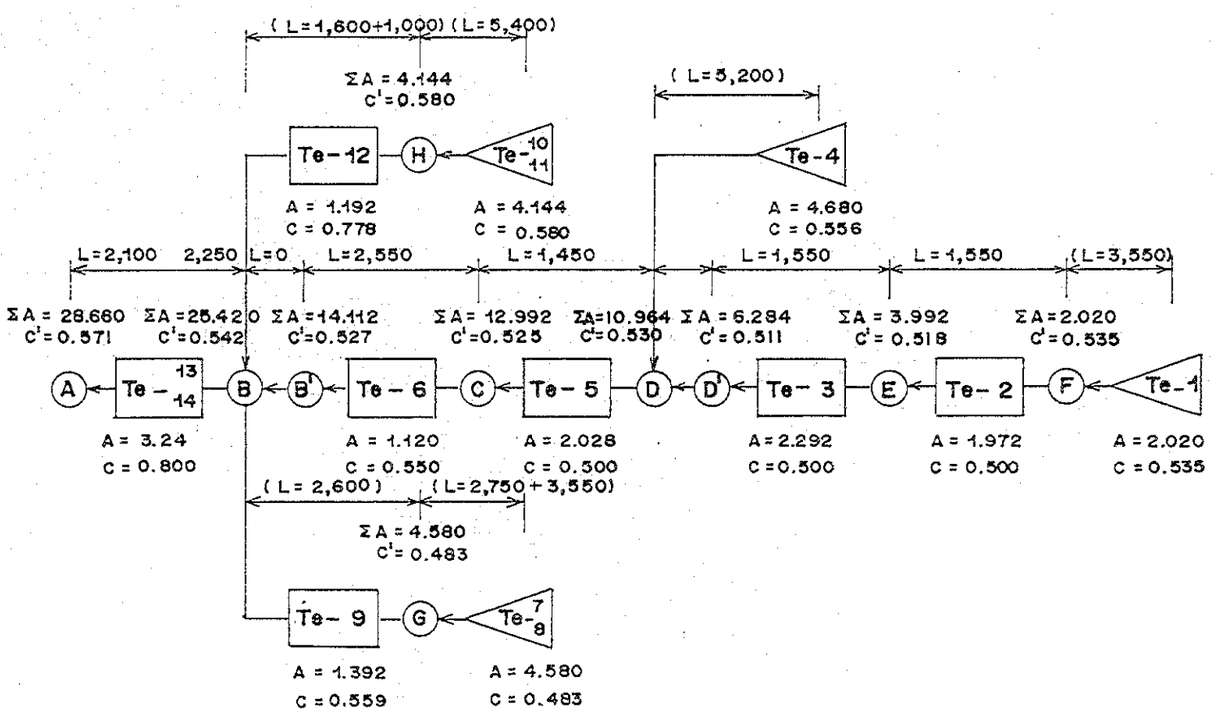


FIG. II-2(2/3) RUNN-OFF MODEL (TENGGANG R.,ALTER. 1-A)



Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8						
Residential Area	0.5	10.19	4.49	4.49	-5.4	2.95	2.95
Industrial & Harbor	0.8	0.73	0.6	0.6	0.74	0.76	0.76
Green Zone & Others	0.3						

A.Eastern Semarang Area 2.Tenggang River

Proposed Land Use km2

Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-A

Calculation Point	F	E	D'	D"	D	C	B'	G	B"	H	B"'	B	A	H-C
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	0.000	0.000	0.000	0.000	0.866	0.866	-
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.819	4.194	5.313	3.032	3.122	21.253	21.253	0.618
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.425	0.000	0.273	1.112	2.214	2.913	6.153	0.458
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	0.386	0.386	0.000	0.000	0.389	0.389	-
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.112	4.580	5.972	4.144	5.336	25.420	28.660	1.076
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.527	0.483	0.501	0.580	0.625	0.542	0.571	0.628
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,550	3,550	2,600	5,400	1,600	-	2,100	2,250
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,650	3,550	6,150	5,400	7,000	10,650	12,750	2,250
Proposed Reiver Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.050%	S	S	S	S	-	0.029%	0.012%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	0.750	1.250	1.250	1.000	1.000	-	0.600	1.000
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	56.67	47.33	34.67	90.00	26.67	-	58.33	37.50
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	184.50	62.33	97.00	105.00	131.67	184.50	242.83	52.50
Rainfall Intensity(mm/hr)	80.36	68.36	60.20	67.75	60.20	50.49	38.40	80.36	62.54	58.76	52.43	38.40	31.26	88.41
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.914	0.964	0.955	0.967	0.959	0.874	0.864	0.991
Peak Discharge(m3/s)	18.984	30.409	40.977	37.716	72.138	70.395	58.091	38.104	39.701	30.894	37.249	102.652	98.176	13.152
Specific Q (m3/s/km2)	9.398	7.617	6.521	8.059	6.580	5.418	4.116	8.320	6.648	7.455	6.981	4.038	3.426	12.223

TABLE II-2(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(TENGGANG R.,ALTER.1-A)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8						
Residential Area	0.5	10.19	2.93	2.93	-5.4	7.2	7.2
Industrial & Harbor	0.8	0.73	0.57	0.57	0.74	0.78	0.78
Green Zone & Others	0.3						

A.Eastern Semarang Area 2.Tenggang River

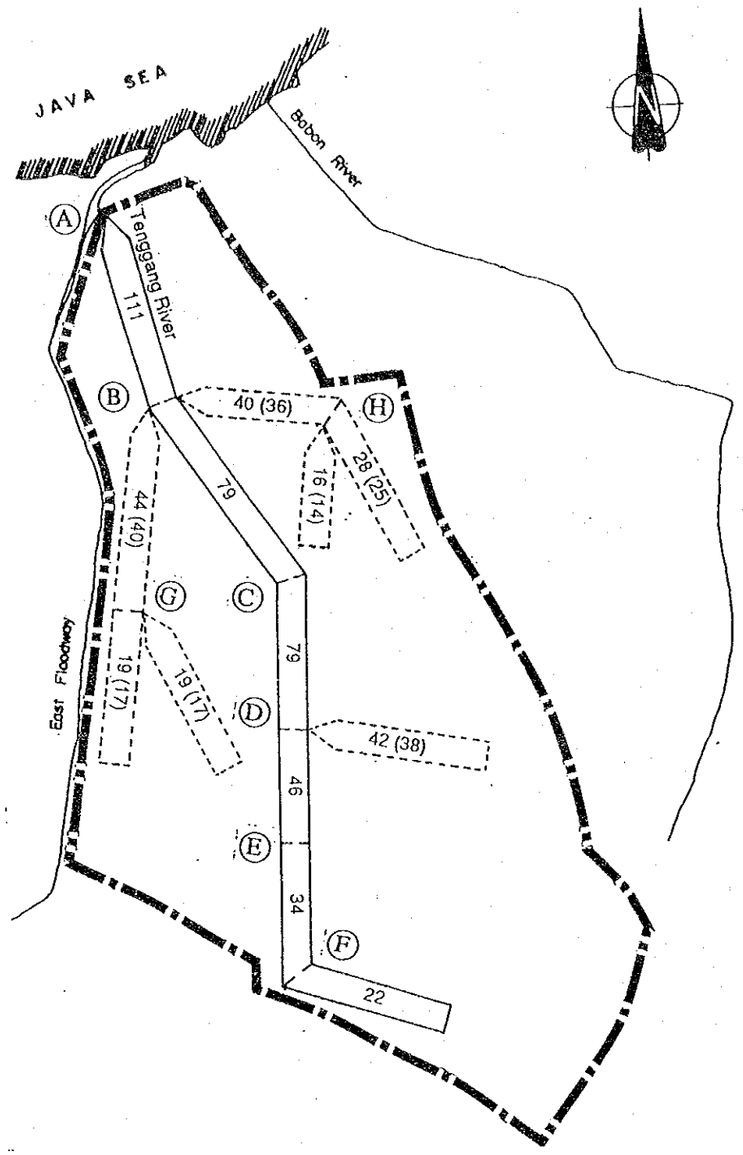
Proposed Land Use km2

Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-A

Calculation Point	F	E	D'	D"	D	C	B'	G	B"	H	B"'	B	A	H-C
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	0.000	0.000	0.000	0.000	0.866	0.866	-
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.819	4.194	5.313	3.032	3.122	21.253	21.253	0.618
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.425	0.000	0.273	1.112	2.214	2.913	6.153	0.458
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	0.386	0.386	0.000	0.000	0.389	0.389	-
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.112	4.580	5.972	4.144	5.336	25.420	28.660	1.076
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.527	0.483	0.501	0.580	0.625	0.542	0.571	0.628
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,550	3,550	2,600	5,400	1,600	-	2,100	2,250
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,650	3,550	6,150	5,400	7,000	10,650	12,750	2,250
Proposed Reiver Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.050%	S	S	S	S	-	0.029%	0.012%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	0.750	1.250	1.250	1.000	1.000	-	0.600	1.000
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	56.67	47.33	34.67	90.00	26.67	-	58.33	37.50
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	184.50	62.33	97.00	105.00	131.67	184.50	242.83	52.50
Rainfall Intensity(mm/hr)	89.34	76.38	67.55	75.71	67.55	56.65	43.11	89.34	70.08	67.07	59.14	43.11	35.04	98.06
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.914	0.964	0.955	0.967	0.959	0.874	0.864	0.991
Peak Discharge(m3/s)	21.106	33.973	45.981	42.149	80.949	78.995	65.204	42.364	44.490	34.676	42.016	115.222	110.054	14.587
Specific Q (m3/s/km2)	10.448	8.510	7.317	9.006	7.383	6.080	4.620	9.250	7.450	8.368	7.874	4.533	3.840	13.556

TABLE II-2(2/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(TENGGANG R.,ALTER.1-A)



NOTE : 1. Unit of the figures is m3/s.

2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

0 0.4 0.8 1.2 1.6 2.0 km

FIG. II-2(3/3) DISTRIBUTION OF DESIGN DISCHARGE(TENGGANG R.,ALTER.1-A)

2. Tenggang River

2-2 : (Alternative 1-B)

(1) Drainage System

(2) Run-off Medel

(3) Run-off Calculation

(4) Distribution of Design Discharge

FIG. II-3(1/3) DRAINAGE SYSTEM (TENGGANG R.,ALTER.1-B)

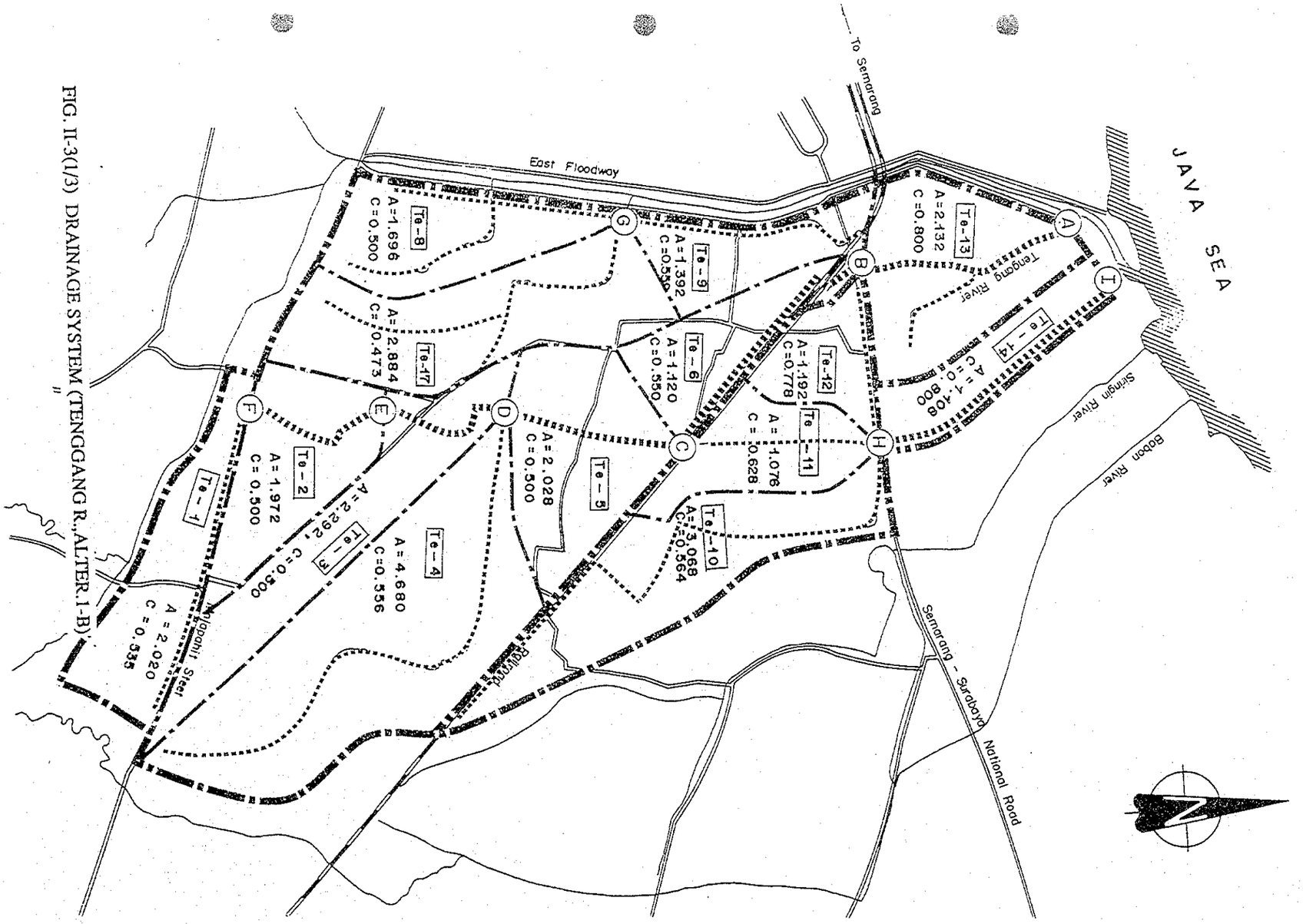
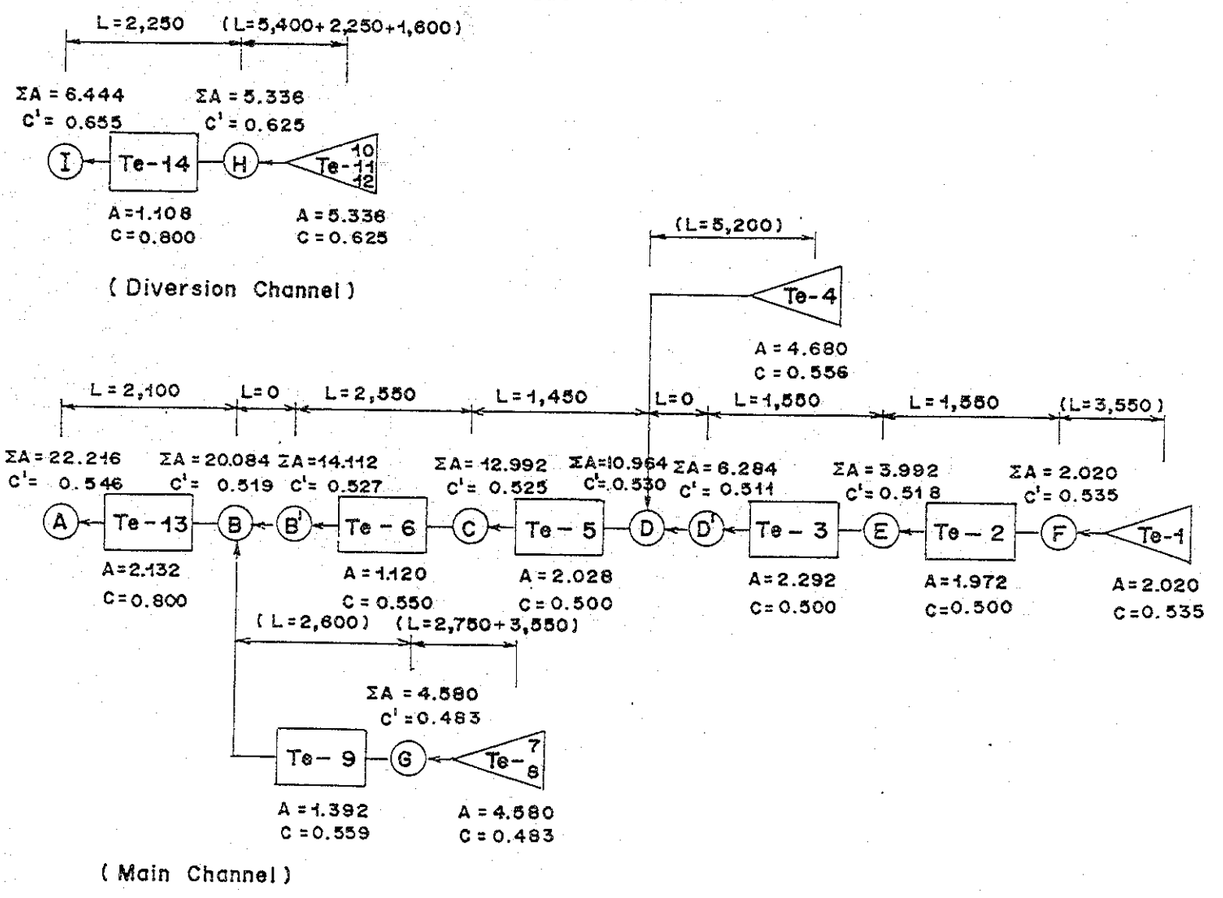


FIG. II-3(2/3) RUNN-OFF MODEL (TENGGANG R.,1-B)



Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	1000	1000	1313	2050	2050
Residential Area	0.5	10.19	4.49	4.49	-5.4	2.95	2.95
Industrial & Harbor	0.8	0.73	0.6	0.6	0.74	0.76	0.76
Green Zone & Others	0.3						

A.Eastern Semarang Area 2.Tenggang River

Proposed Land Use	km2													
Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-B

Calculation Point	F	E	D'	D"	D	C	B'	G	B"	B	A	H	I
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	0.000	0.000	0.866	0.866	0.000	0.000
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.819	4.194	5.313	18.131	18.131	3.122	3.122
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.425	0.000	0.273	0.698	2.830	2.214	3.322
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	0.386	0.386	0.389	0.389	0.000	0.000
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.112	4.580	5.972	20.084	22.216	5.336	6.444
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.527	0.483	0.501	0.519	0.546	0.625	0.655
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,550	3,550	2,600	-	2,100	5,400	2,250
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,650	3,550	6,150	10,650	12,750	5,400	7,650
Proposed River Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.050%	S	S	-	0.029%	S	0.043%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	0.750	1.250	1.250	-	0.600	1.250	0.750
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	56.67	47.33	34.67	-	58.33	72.00	50.00
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	184.50	62.33	97.00	184.50	242.83	87.00	137.00
Rainfall Intensity(mm/hr)	80.36	68.36	60.20	67.75	60.20	50.49	38.40	80.36	62.54	38.40	31.26	66.55	47.95
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.914	0.964	0.955	0.892	0.885	0.959	0.952
Peak Discharge(m3/s)	18.984	30.409	40.977	37.716	72.138	70.395	58.091	38.104	39.701	79.406	74.637	47.283	42.816
Specific Q (m3/s/km2)	9.398	7.617	6.521	8.059	6.580	5.418	4.116	8.320	6.648	3.954	3.360	8.861	6.644

TABLE II-3(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(TENGGANG R.,1-B)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	967	967	1313	2600	2600
Residential Area	0.5	10.19	2.93	2.93	-5.4	7.2	7.2
Industrial & Harbor	0.8	0.73	0.57	0.57	0.74	0.78	0.78
Green Zone & Others	0.3						

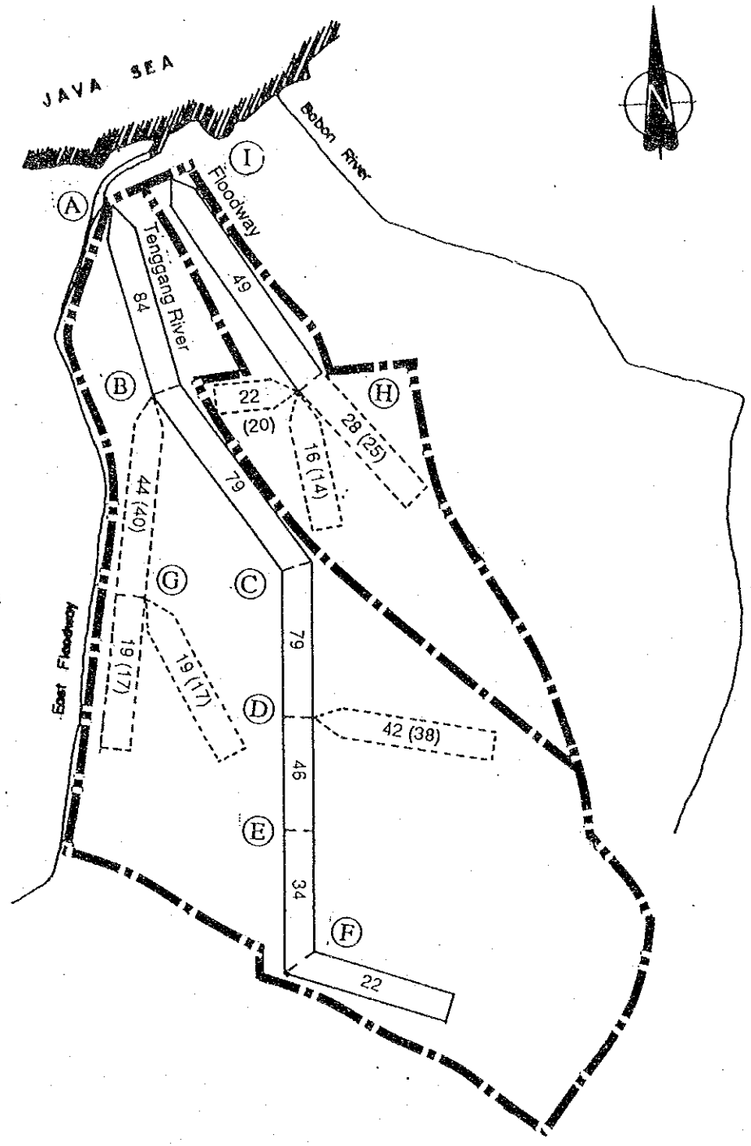
A.Eastern Semarang Area 2.Tenggang River

Proposed Land Use	km2													
Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-B

Calculation Point	F	E	D'	D"	D	C	B'	G	B"	B	A	H	I
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	0.000	0.000	0.866	0.866	0.000	0.000
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.819	4.194	5.313	18.131	18.131	3.122	3.122
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.425	0.000	0.273	0.698	2.830	2.214	3.322
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	0.386	0.386	0.389	0.389	0.000	0.000
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.112	4.580	5.972	20.084	22.216	5.336	6.444
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.527	0.483	0.501	0.519	0.546	0.625	0.655
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,550	3,550	2,600	-	2,100	5,400	2,250
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,650	3,550	6,150	10,650	12,750	5,400	7,650
Proposed River Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.050%	S	S	-	0.029%	S	0.043%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	0.750	1.250	1.250	-	0.600	1.250	0.750
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	56.67	47.33	34.67	-	58.33	72.00	50.00
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	184.50	62.33	97.00	184.50	242.83	87.00	137.00
Rainfall Intensity(mm/hr)	89.34	76.38	67.55	75.71	67.55	56.65	43.11	89.34	70.08	43.11	35.04	74.42	53.82
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.914	0.964	0.955	0.892	0.885	0.959	0.952
Peak Discharge(m3/s)	21.106	33.973	45.981	42.149	80.949	78.995	65.204	42.364	44.490	89.129	83.667	52.873	48.059
Specific Q (m3/s/km2)	10.448	8.510	7.317	9.006	7.383	6.080	4.620	9.250	7.450	4.438	3.766	9.909	7.458

TABLE II-3(2/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(TENGGANG R.,1-B)



NOTE : 1. Unit of the figures is m3/s.

2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-3(3/3) DISTRIBUTION OF DESIGN DISCHARGE(TENGGANG R.,1-B)

2. Tenggang River

2-3 : (Alternative 1-C)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

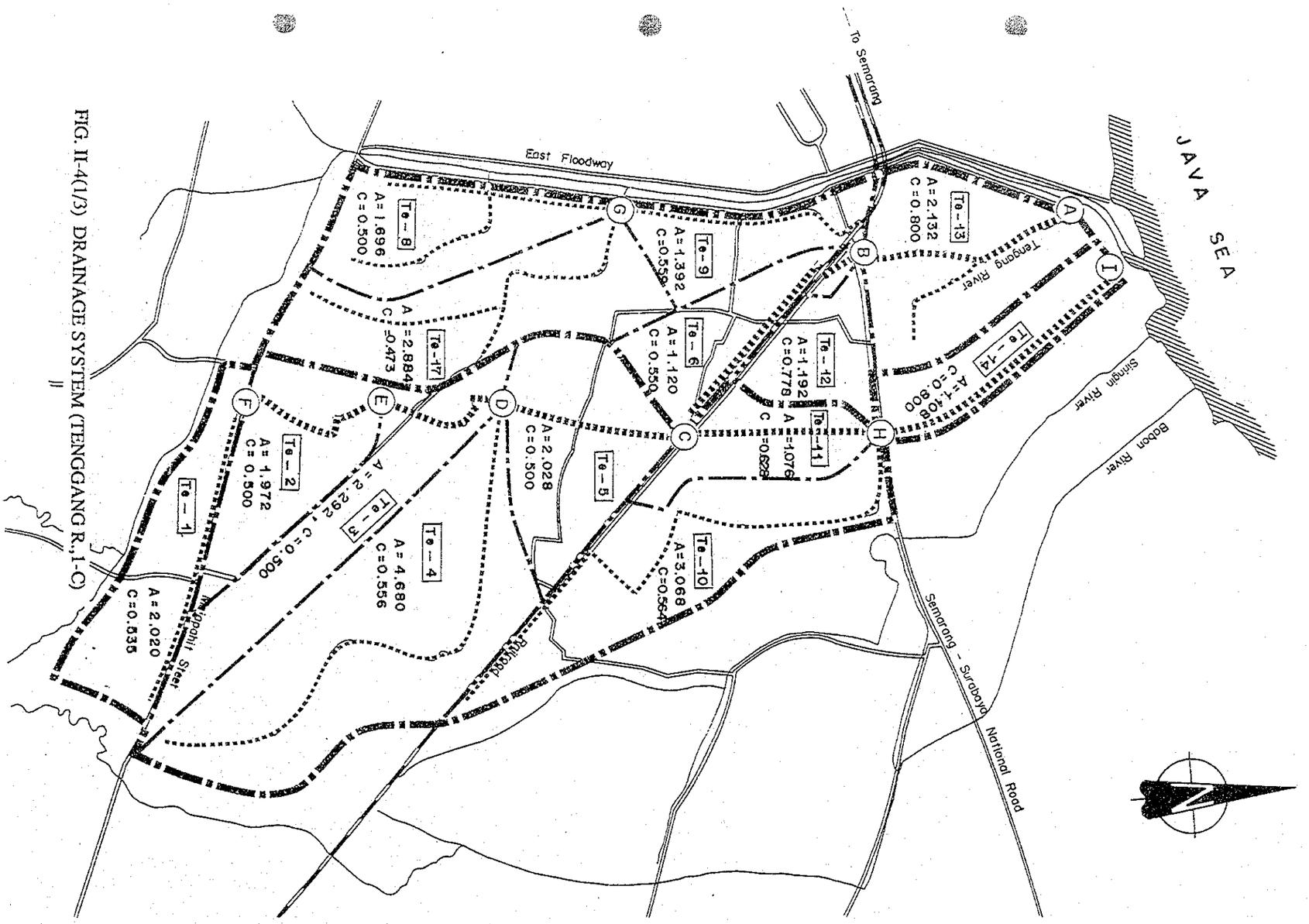
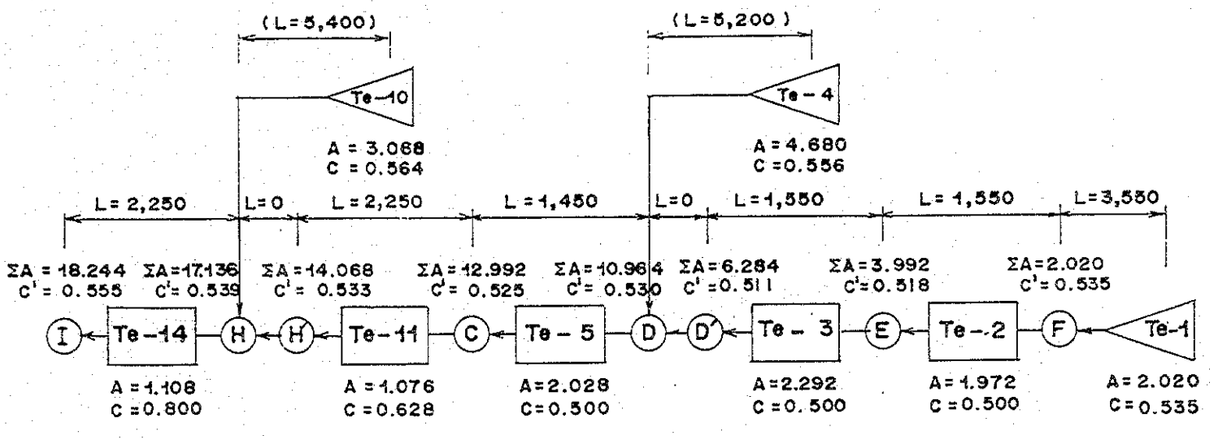


FIG. II-4(1/3) DRAINAGE SYSTEM (TENGGANG R.,1-C)



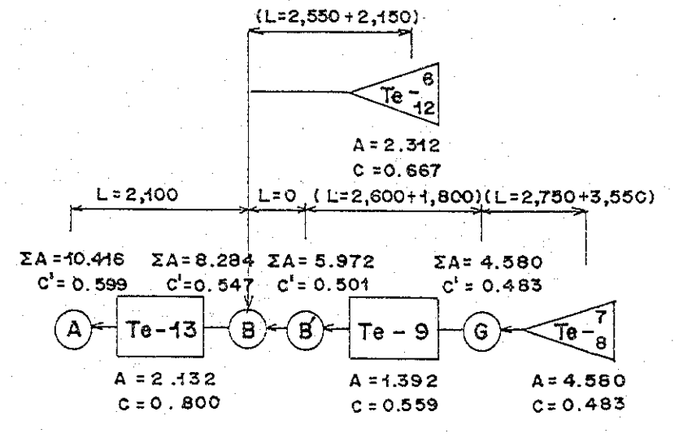


FIG. II-4(2/3) RUNN-OFF MODEL (TENGGANG R.,1-C)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	1000	1000	1313	2050	2050
Residential Area	0.5	10.19	4.49	4.49	-5.4	2.95	2.95
Industrial & Harbor	0.8	0.73	0.6	0.6	0.74	0.76	0.76
Green Zone & Others	0.3						

A.Eastern Semarang Area 2.Tenggang River

Proposed Land Use	km2													
Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-C

Calculation Point	F	E	D'	D"	D	C	H'	H"	H	I	G	B'	B"	B	A
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	-	0.866	0.866	0.000	0.000	0.000	0.000	0.000
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.503	2.415	14.918	14.918	4.194	5.313	1.022	6.335	6.335
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.697	0.653	1.350	2.458	0.000	0.273	1.290	1.562	3.694
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	-	0.002	0.002	0.386	0.386	0.000	0.386	0.386
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.068	3.068	17.136	18.244	4.580	5.972	2.312	8.284	10.416
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.533	0.564	0.539	0.555	0.483	0.501	0.667	0.547	0.599
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,250	5,400	-	2,250	3,550	2,600	2,550	-	2,100
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,350	5,400	10,350	12,600	3,550	6,150	2,550	6,150	8,250
Proposed River Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.120%	S	-	0.044%	S	S	S	-	0.029%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	1.250	1.250	-	0.750	1.250	1.250	1.250	-	0.600
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	30.00	72.00	-	50.00	47.33	34.67	34.00	-	58.33
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	157.83	87.00	157.83	207.83	62.33	97.00	49.00	120.11	178.44
Rainfall Intensity(mm/hr)	80.36	68.36	60.20	67.75	60.20	50.49	43.15	66.55	43.15	35.13	80.36	62.54	91.84	52.88	39.37
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.915	0.975	0.902	0.898	0.964	0.955	0.981	0.941	0.930
Peak Discharge(m3/s)	18.984	30.409	40.977	37.716	72.138	70.395	65.812	24.949	79.866	70.947	38.104	39.701	30.883	50.154	50.779
Specific Q (m3/s/km2)	9.398	7.617	6.521	8.059	6.580	5.418	4.678	8.132	4.661	3.889	8.320	6.648	13.357	6.054	4.875

TABLE II-4(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(TENGGANG R.,1-C)

Land Use	Run-off C	T<2hr			T>2hr		
		2-year	5-year	10-year	2-year	5-year	10-year
Business Area	0.8						
Neighborhood B.A.	0.8	1400	967	967	1313	2600	2600
Residential Area	0.5	10.19	2.93	2.93	-5.4	7.2	7.2
Industrial & Harbor	0.8	0.73	0.57	0.57	0.74	0.78	0.78
Green Zone & Others	0.3						

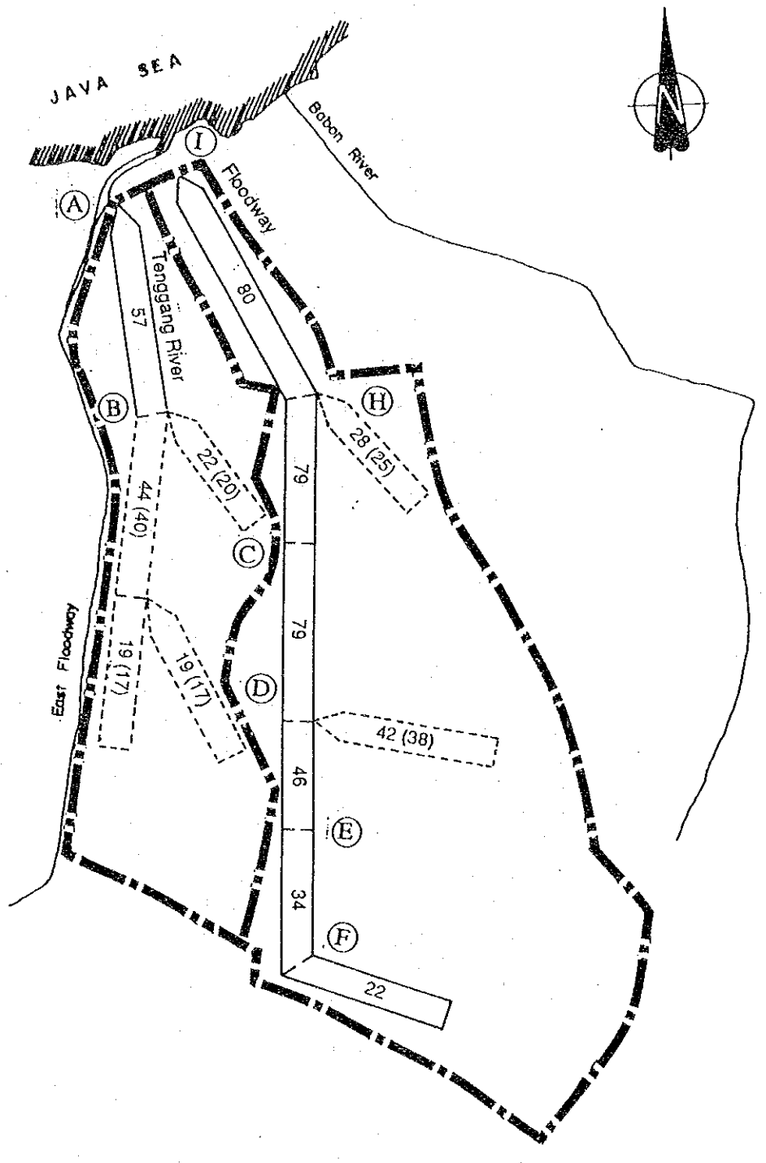
A.Eastern Semarang Area 2.Tenggang River

Proposed Land Use	km2													
Name of Basin	Te-1	Te-2	Te-3	Te-4	Te-5	Te-6	Te-7	Te-8	Te-9	Te-10	Te-11	Te-12	Te-13	Te-14
Business Area	-	-	-	0.866	-	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Area	1.782	1.972	2.290	3.814	2.028	0.933	2.498	1.696	1.119	2.415	0.618	0.089	-	-
Industrial & Harbor	0.238	-	-	-	-	0.187	-	-	0.273	0.653	0.458	1.103	2.132	1.108
Green Zone & Others	-	-	0.002	-	-	-	0.386	-	-	-	-	-	-	-
Total Area	2.020	1.972	2.292	4.680	2.028	1.120	2.884	1.696	1.392	3.068	1.076	1.192	2.132	1.108
Run-off Coefficient	0.535	0.500	0.500	0.556	0.500	0.550	0.473	0.500	0.559	0.564	0.628	0.778	0.800	0.800
Length of River Cannal	3,550	1,550	1,550	5,200	1,450	2,550	3,550	2,750	2,600	5,400	2,250	1,600	2,100	2,250

Calculation of Peak Discharge 2.Tenggang River Alternative 1-C

Calculation Point	F	E	D'	D"	D	C	H'	H"	H	I	G	B'	B"	B	A
Business Area	-	0.000	0.000	0.866	0.866	0.866	0.866	-	0.866	0.866	0.000	0.000	0.000	0.000	0.000
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residential Area	1.782	3.754	6.043	3.814	9.858	11.886	12.503	2.415	14.918	14.918	4.194	5.313	1.022	6.335	6.335
Industrial & Harbor	0.238	0.238	0.238	-	0.238	0.238	0.697	0.653	1.350	2.458	0.000	0.273	1.290	1.562	3.694
Green Zone & Others	-	0.000	0.002	-	0.002	0.002	0.002	-	0.002	0.002	0.386	0.386	0.000	0.386	0.386
Total Area	2.020	3.992	6.284	4.680	10.964	12.992	14.068	3.068	17.136	18.244	4.580	5.972	2.312	8.284	10.416
Run-off Coefficient	0.535	0.518	0.511	0.556	0.530	0.525	0.533	0.564	0.539	0.555	0.483	0.501	0.667	0.547	0.599
Length of River Cannal(m)	3,550	1,550	1,550	5,200	-	1,450	2,250	5,400	-	2,250	3,550	2,600	2,550	-	2,100
Accumulated Length (m)	3,550	5,100	6,650	5,200	6,650	8,100	10,350	5,400	10,350	12,600	3,550	6,150	2,550	6,150	8,250
Proposed River Slope (%)	S	0.154%	0.154%	S	-	0.133%	0.120%	S	-	0.044%	S	S	S	-	0.029%
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250	-	1.000	1.250	1.250	-	0.750	1.250	1.250	1.250	-	0.600
Flowing Time (min)	47.33	20.67	20.67	69.33	-	24.17	30.00	72.00	-	50.00	47.33	34.67	34.00	-	58.33
Duration Time (min)	62.33	83.00	103.67	84.33	103.67	127.83	157.83	87.00	157.83	207.83	62.33	97.00	49.00	120.11	178.44
Rainfall Intensity(mm/hr)	89.34	76.38	67.55	75.71	67.55	56.65	48.45	74.42	48.45	39.41	89.34	70.08	101.77	59.32	44.20
Reduction Factor	0.983	0.968	0.953	0.964	0.928	0.919	0.915	0.975	0.902	0.898	0.964	0.955	0.981	0.941	0.930
Peak Discharge(m3/s)	21.106	33.973	45.981	42.149	80.949	78.995	73.886	27.898	89.664	79.600	42.364	44.490	34.223	56.263	57.002
Specific Q (m3/s/km2)	10.448	8.510	7.317	9.006	7.383	6.080	5.252	9.093	5.233	4.363	9.250	7.450	14.802	6.792	5.473

TABLE II-4(2/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(TENGGANG R.,1-C)



NOTE : 1. Unit of the figures is m3/s.

2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-4(3/3) DISTRIBUTION OF DESIGN DISCHARGE(TENGGANG R.,1-C)

3. Semarang River

3-1 : (Alternative 2-A)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

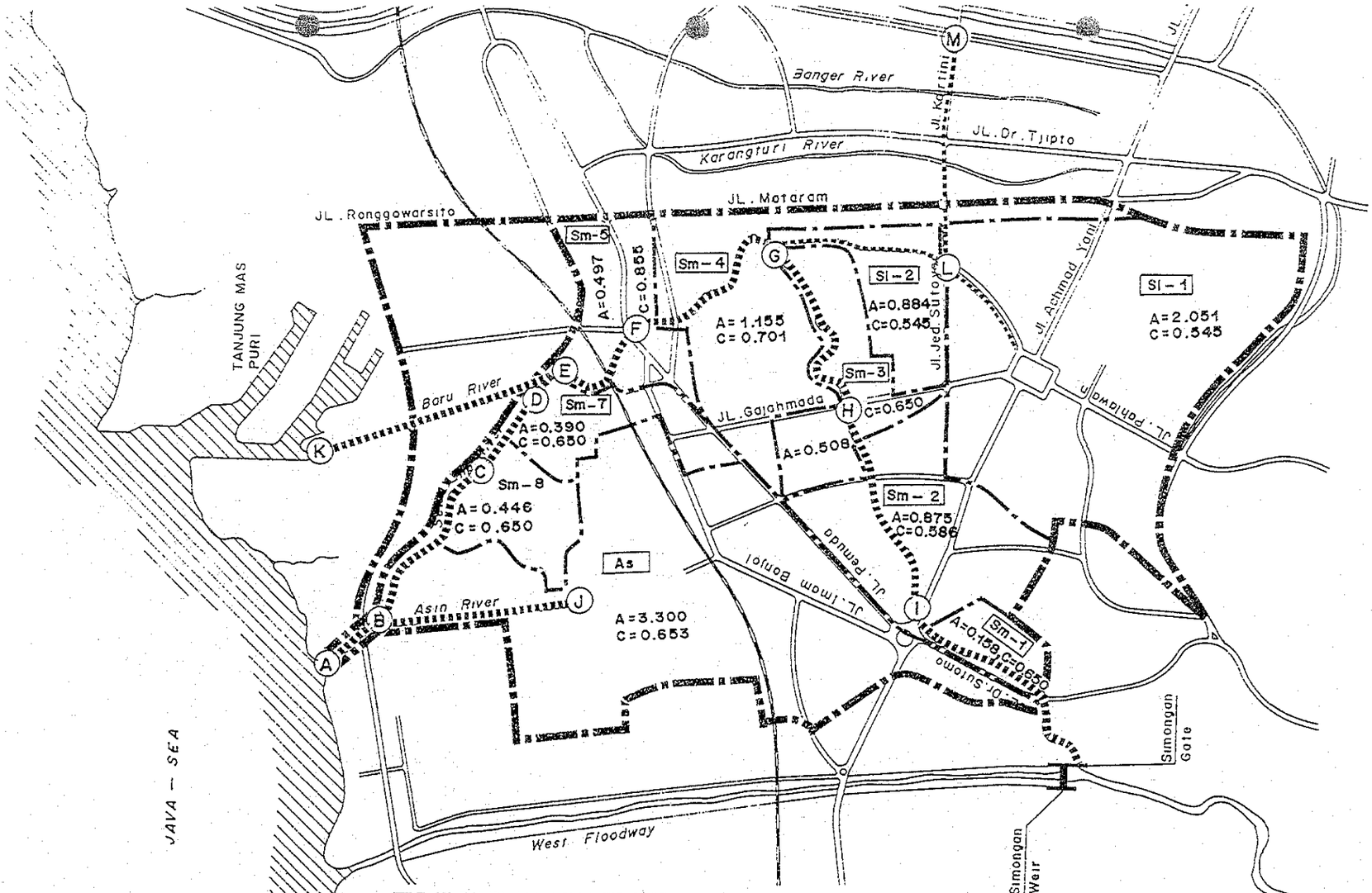


FIG. II-5(1/3) DRAINAGE SYSTEM (SEMARANG R.,ALTER. 2-A)

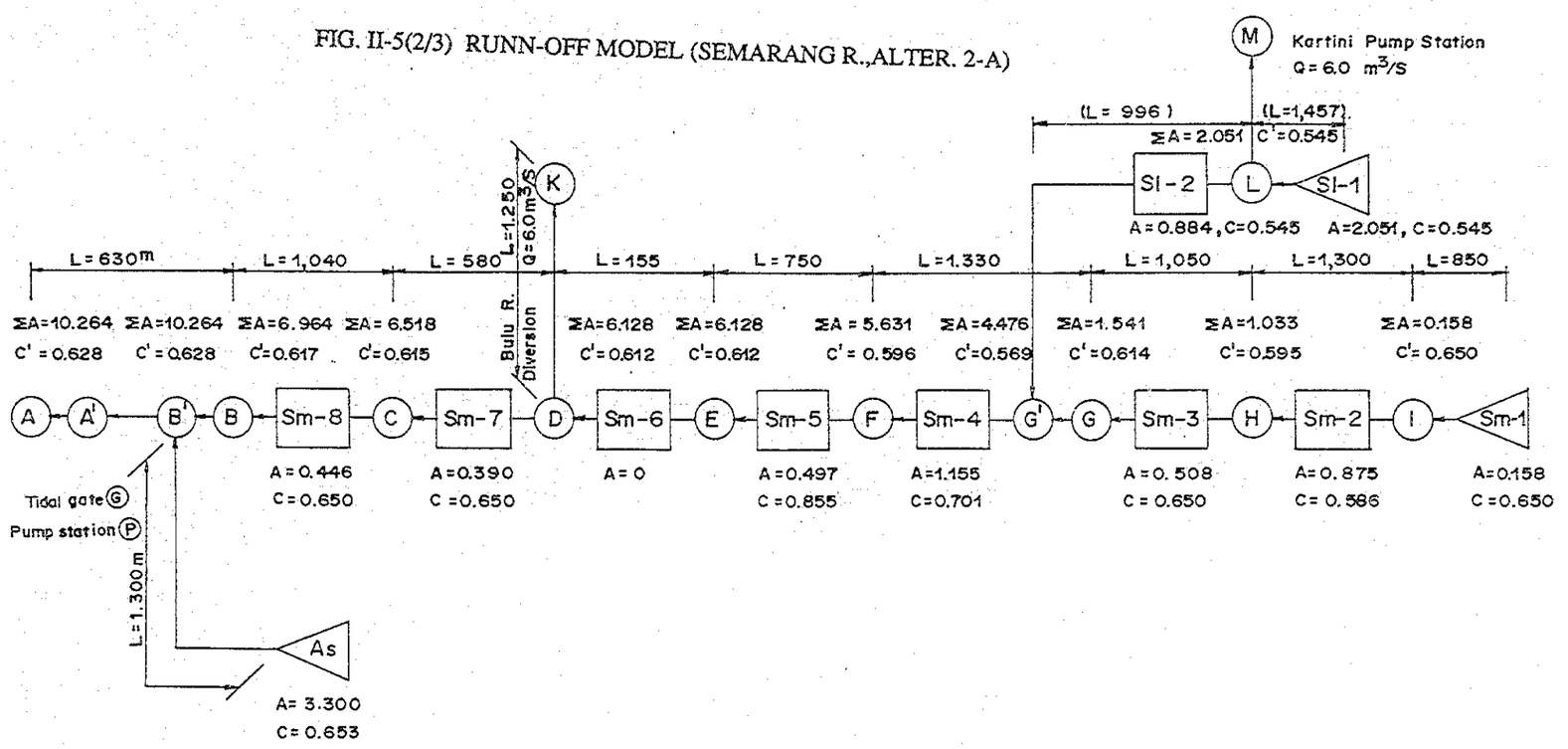


FIG. II-5(2/3) RUNN-OFF MODEL (SEMARANG R.,ALTER. 2-A)

TABLE II-5(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(SEMARANG R.,ALTER. 2-A)

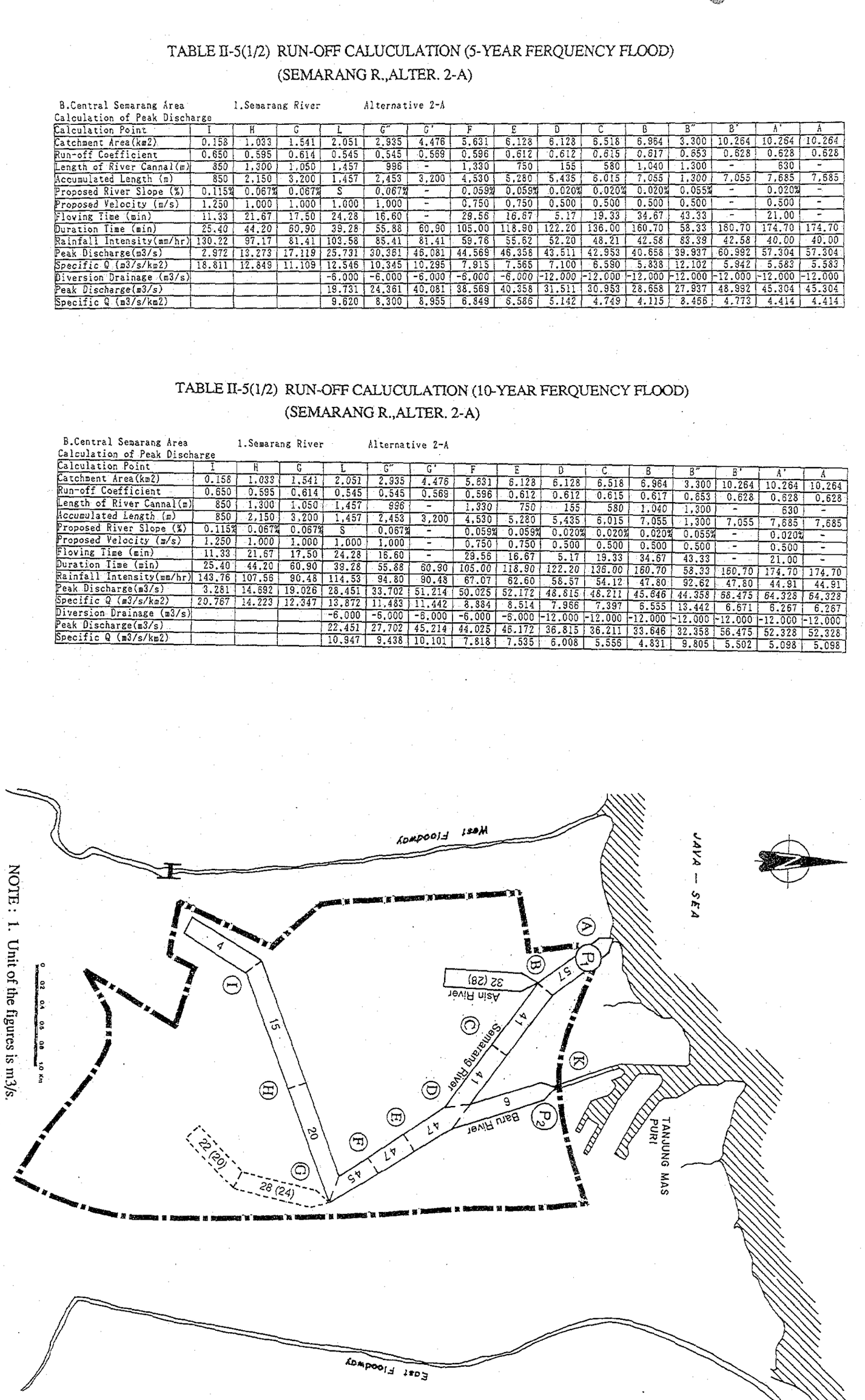
B.Central Semarang Area 1.Semarang River Alternative 2-A
Calculation of Peak Discharge

Calculation Point	I	H	G	L	G"	G'	F	E	D	C	B	B"	B'	A'	A
Catchment Area(km2)	0.158	1.033	1.541	2.051	2.935	4.476	5.631	6.128	6.128	6.518	6.964	3.300	10.264	10.264	10.264
Run-off Coefficient	0.650	0.595	0.614	0.545	0.545	0.569	0.596	0.612	0.612	0.615	0.617	0.653	0.628	0.628	0.628
Length of River Cannal(m)	850	1,300	1,050	1,457	996	-	1,330	750	155	580	1,040	1,300	-	630	-
Accumulated Length (m)	850	2,150	3,200	1,457	2,453	3,200	4,530	5,280	5,435	6,015	7,055	1,300	7,055	7,685	7,685
Proposed River Slope (%)	0.115%	0.067%	0.067%	S	0.067%	-	0.059%	0.059%	0.020%	0.020%	0.020%	0.055%	-	0.020%	-
Proposed Velocity (m/s)	1.250	1.000	1.000	1.000	1.000	-	0.750	0.750	0.500	0.500	0.500	0.500	-	0.500	-
Flowing Time (min)	11.33	21.67	17.50	24.28	16.60	-	29.56	16.67	5.17	19.33	34.67	43.33	-	21.00	-
Duration Time (min)	25.40	44.20	60.90	39.28	55.88	60.90	105.00	118.90	122.20	136.00	160.70	58.33	160.70	174.70	174.70
Rainfall Intensity(mm/hr)	130.22	97.17	81.41	103.58	85.41	81.41	59.76	55.62	52.20	48.21	42.58	83.39	42.58	40.00	40.00
Peak Discharge(m3/s)	2.972	13.273	17.119	25.731	30.361	46.081	44.569	46.358	43.511	42.953	40.658	39.937	60.992	57.304	57.304
Specific Q (m3/s/km2)	18.811	12.849	11.109	12.546	10.345	10.295	7.915	7.565	7.100	6.590	5.838	12.102	5.942	5.583	5.583
Diversion Drainage (m3/s)				-6.000	-6.000	-6.000	-6.000	-6.000	-12.000	-12.000	-12.000	-12.000	-12.000	-12.000	-12.000
Peak Discharge(m3/s)				19.731	24.361	40.081	38.569	40.358	31.511	30.953	28.658	27.937	48.992	45.304	45.304
Specific Q (m3/s/km2)				9.620	8.300	8.955	6.849	6.586	5.142	4.749	4.115	8.466	4.773	4.414	4.414

TABLE II-5(1/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(SEMARANG R.,ALTER. 2-A)

B.Central Semarang Area 1.Semarang River Alternative 2-A
Calculation of Peak Discharge

Calculation Point	I	H	G	L	G"	G'	F	E	D	C	B	B"	B'	A'	A
Catchment Area(km2)	0.158	1.033	1.541	2.051	2.935	4.476	5.631	6.128	6.128	6.518	6.964	3.300	10.264	10.264	10.264
Run-off Coefficient	0.650	0.595	0.614	0.545	0.545	0.569	0.596	0.612	0.612	0.615	0.617	0.653	0.628	0.628	0.628
Length of River Cannal(m)	850	1,300	1,050	1,457	996	-	1,330	750	155	580	1,040	1,300	-	630	-
Accumulated Length (m)	850	2,150	3,200	1,457	2,453	3,200	4,530	5,280	5,435	6,015	7,055	1,300	7,055	7,685	7,685
Proposed River Slope (%)	0.115%	0.067%	0.067%	S	0.067%	-	0.059%	0.059%	0.020%	0.020%	0.020%	0.055%	-	0.020%	-
Proposed Velocity (m/s)	1.250	1.000	1.000	1.000	1.000	-	0.750	0.750	0.500	0.500	0.500	0.500	-	0.500	-
Flowing Time (min)	11.33	21.67	17.50	24.28	16.60	-	29.56	16.67	5.17	19.33	34.67	43.33	-	21.00	-
Duration Time (min)	25.40	44.20	60.90	39.28	55.88	60.90	105.00	118.90	122.20	136.00	160.70	58.33	160.70	174.70	174.70
Rainfall Intensity(mm/hr)	143.76	107.56	90.48	114.53	94.80	90.48	67.07	62.60	58.57	54.12	47.80	92.62	47.80	44.91	44.91
Peak Discharge(m3/s)	3.281	14.692	19.026	28.451	33.702	51.214	50.025	52.172	48.815	48.211	45.646	44.358	68.475	64.328	64.328
Specific Q (m3/s/km2)	20.767	14.223	12.347	13.872	11.483	11.442	8.884	8.514	7.966	7.397	6.555	13.442	6.671	6.267	6.267
Diversion Drainage (m3/s)				-6.000	-6.000	-6.000	-6.000	-6.000	-12.000	-12.000	-12.000	-12.000	-12.000	-12.000	-12.000
Peak Discharge(m3/s)				22.451	27.702	45.214	44.025	46.172	36.815	36.211	33.646	32.358	56.475	52.328	52.328
Specific Q (m3/s/km2)				10.947	9.438	10.101	7.818	7.535	6.008	5.556	4.831	9.805	5.502	5.098	5.098



NOTE : 1. Unit of the figures is m3/s.
2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-5(3/3) DISTRIBUTION OF DESIGN DISCHARGE(SEMARANG R.,ALTER. 2-A)

3. Semarang River

3-2 : (Alternative 2-B)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

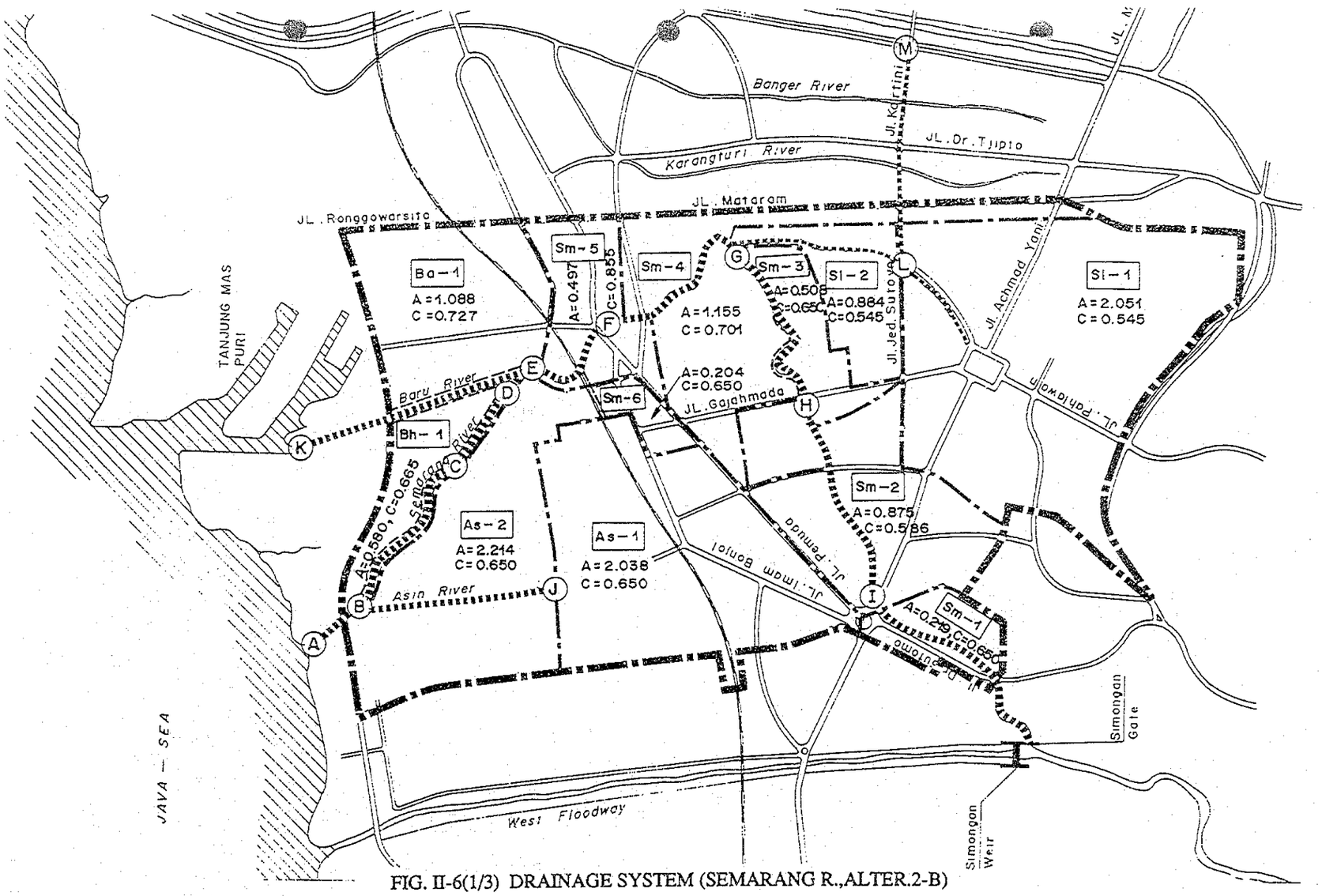


FIG. II-6(1/3) DRAINAGE SYSTEM (SEMARANG R.,ALTER.2-B)

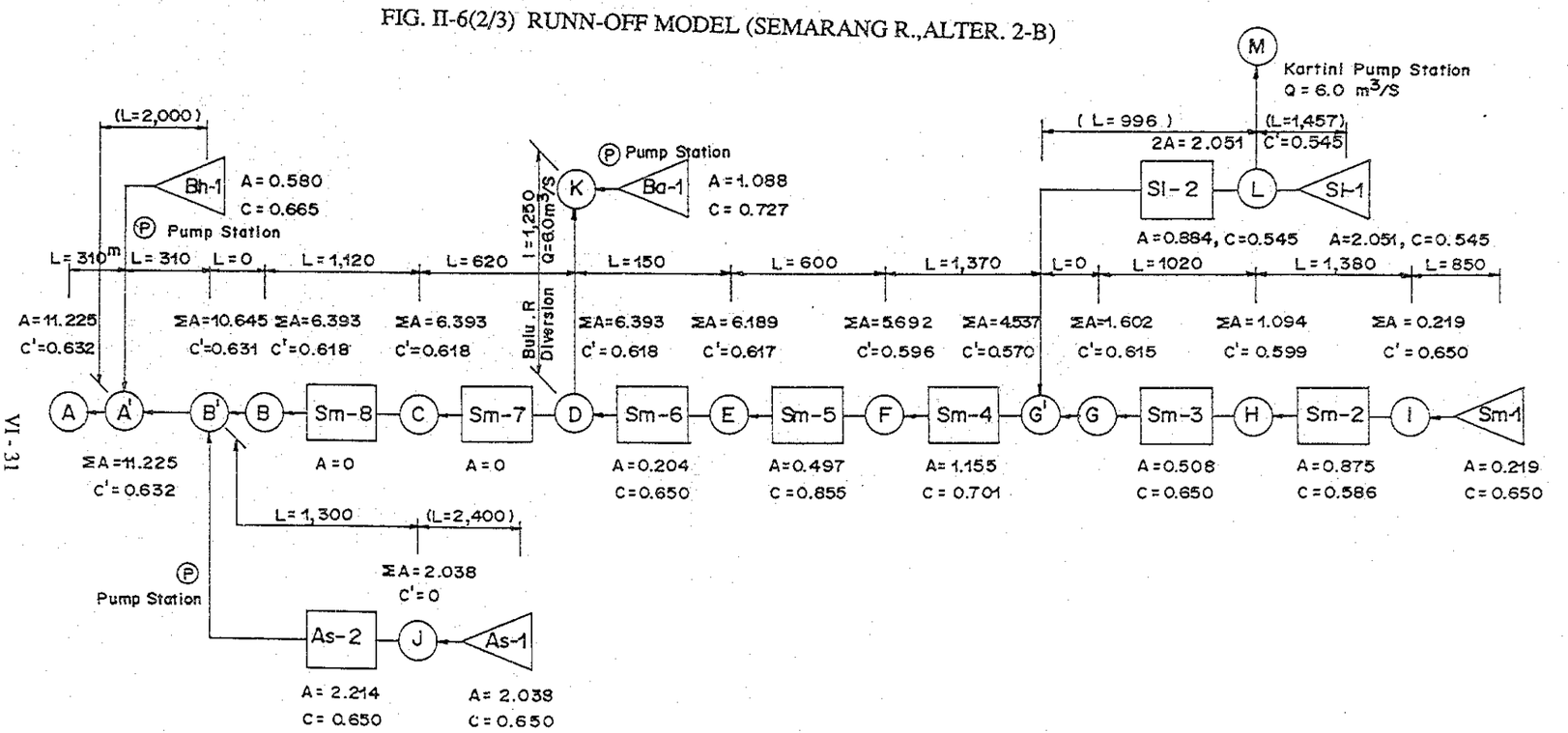


FIG. II-6(2/3) RUNN-OFF MODEL (SEMARANG R.,ALTER. 2-B)

TABLE II-6(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(SEMARANG R.,ALTER.2-B)

B.Central Semarang Area　　1.Semarang River　　Alternative 2-B

Calculation of Peak Discharge

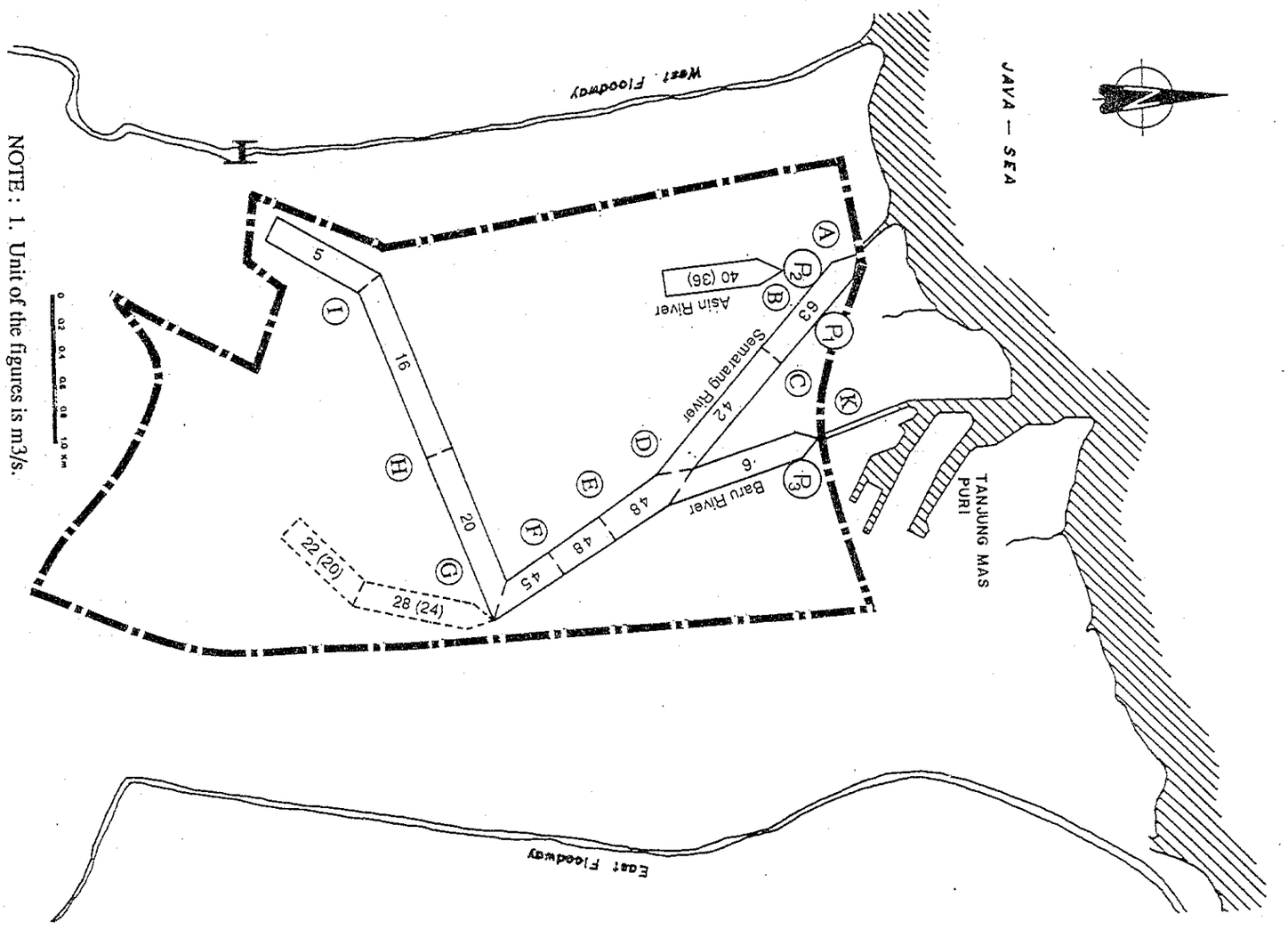
Calculation Point	I	H	G	L	G"	G'	F	E	D	C	B	J	B"	B'	A"	A'	A
Catchment Area(km2)	0.219	1.094	1.602	2.051	2.935	4.537	5.692	6.189	6.393	6.393	6.393	2.038	4.252	10.645	0.580	11.225	11.225
Run-off Coefficient	0.650	0.599	0.615	0.545	0.545	0.570	0.596	0.617	0.618	0.618	0.618	0.650	0.650	0.631	0.665	0.632	0.632
Length of River Cannal(m)	850	1,380	1,020	1,457	996	-	1,370	600	150	620	1,120	2,400	1,300	-	2,000	310	310
Accumulated Length (m)	850	2,230	3,250	1,457	2,453	3,250	4,620	5,220	5,370	5,990	7,110	2,400	3,700	7,110	2,000	7,420	7,730
Proposed River Slope (%)	S	0.067%	0.067%	S	0.067%	-	0.059%	0.059%	0.020%	0.020%	0.020%	S	0.055%	-	S	0.020%	0.020%
Proposed Velocity (m/s)	1.250	1.000	1.000	1.000	1.000	-	0.750	0.750	0.500	0.500	0.500	0.500	0.500	-	0.500	0.500	0.500
Flowing Time (min)	11.33	23.00	17.00	24.28	16.60	-	30.44	13.33	5.00	20.67	37.33	80.00	43.33	-	66.67	10.33	10.33
Duration Time (min)	25.40	44.00	60.90	39.28	55.88	60.90	105.00	118.90	122.20	136.00	160.70	95.00	138.33	160.70	81.67	164.37	174.70
Rainfall Intensity(mm/hr)	130.22	97.41	81.41	103.58	85.41	81.41	58.76	55.62	52.20	48.21	42.58	63.29	47.61	42.58	68.00	41.87	40.00
Peak Discharge(m3/s)	4.120	14.185	17.826	25.731	30.361	46.791	45.051	47.202	45.838	42.335	37.385	18.633	29.242	63.559	5.914	66.006	63.068
Specific Q (m3/s/km2)	18.811	12.968	11.127	12.546	10.345	10.313	7.915	7.627	7.170	6.622	5.848	9.143	6.877	5.971	10.197	5.880	5.619
Diversion Drainage (m3/s)				-6.000	-6.000	-6.000	-6.000	-6.000	-12.000	-12.000	-12.000			-12.000		-12.000	-12.000
Peak Discharge(m3/s)				19.731	24.361	40.791	39.051	41.202	33.838	30.335	25.385			51.559		54.006	51.068
Specific Q (m3/s/km2)				9.620	8.300	8.991	6.861	6.657	5.293	4.745	3.971			4.843		4.811	4.549

TABLE II-6(1/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(SEMARANG R.,ALTER.2-B)

B.Central Semarang Area　　1.Semarang River　　Alternative 2-B

Calculation of Peak Discharge

Calculation Point	I	H	G	L	G"	G'	F	E	D	C	B	J	B"	B'	A"	A'	A
Catchment Area(km2)	0.219	1.094	1.602	2.051	2.935	4.537	5.692	6.189	6.393	6.393	6.393	2.038	4.252	10.645	0.580	11.225	11.225
Run-off Coefficient	0.650	0.599	0.615	0.545	0.545	0.570	0.596	0.617	0.618	0.618	0.618	0.650	0.650	0.631	0.665	0.632	0.632
Length of River Cannal(m)	850	1,380	1,020	1,457	996	-	1,370	600	150	620	1,120	2,400	1,300	-	2,000	310	310
Accumulated Length (m)	850	2,230	3,250	1,457	2,453	3,250	4,620	5,220	5,370	5,990	7,110	2,400	3,700	7,110	2,000	7,420	7,730
Proposed River Slope (%)	S	0.067%	0.067%	S	0.067%	-	0.059%	0.059%	0.020%	0.020%	0.020%	S	0.055%	-	S	0.020%	0.020%
Proposed Velocity (m/s)	1.250	1.000	1.000	1.000	1.000	-	0.750	0.750	0.500	0.500	0.500	0.500	0.500	-	0.500	0.500	0.500
Flowing Time (min)	11.33	23.00	17.00	24.28	16.60	-	30.44	13.33	5.00	20.67	37.33	80.00	43.33	-	66.67	10.33	10.33
Duration Time (min)	25.40	44.00	60.90	39.28	55.88	60.90	105.00	118.90	122.20	136.00	160.70	95.00	138.33	160.70	81.67	164.37	174.70
Rainfall Intensity(mm/hr)	143.76	107.82	90.48	114.53	94.80	90.48	67.07	62.60	58.57	54.12	47.80	70.89	53.44	47.80	77.06	47.00	44.91
Peak Discharge(m3/s)	4.548	15.702	19.812	28.451	33.702	52.003	50.567	53.122	51.426	47.517	41.971	20.871	32.824	71.356	6.606	74.103	70.799
Specific Q (m3/s/km2)	20.767	14.353	12.367	13.872	11.483	11.462	8.884	8.583	8.044	7.433	6.565	10.241	7.720	6.703	11.389	6.602	6.307
Diversion Drainage (m3/s)				-6.000	-6.000	-6.000	-6.000	-6.000	-12.000	-12.000	-12.000			-12.000		-12.000	-12.000
Peak Discharge(m3/s)				22.451	27.702	46.003	44.567	47.122	39.426	35.517	29.971			59.356		62.103	58.799
Specific Q (m3/s/km2)				10.947	9.438	10.140	7.830	7.614	6.167	5.556	4.688			5.576		5.533	5.238



NOTE : 1. Unit of the figures is m3/s.

2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-6(3/3) DISTRIBUTION OF DESIGN DISCHARGE(SEMARANG R.,ALTER. 2-B)

4. Banger River

4-1 : (Alternative 3-A)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

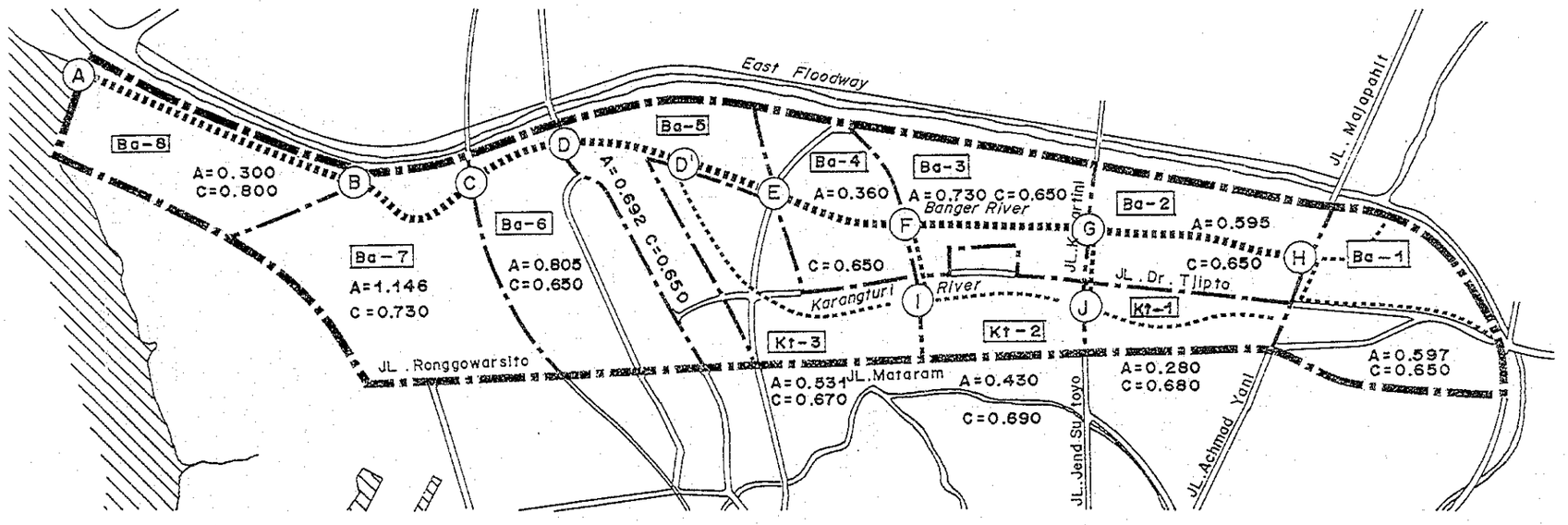


FIG. II-7(1/3) DRAINAGE SYSTEM (BANGER R.,ALTER.3-A)

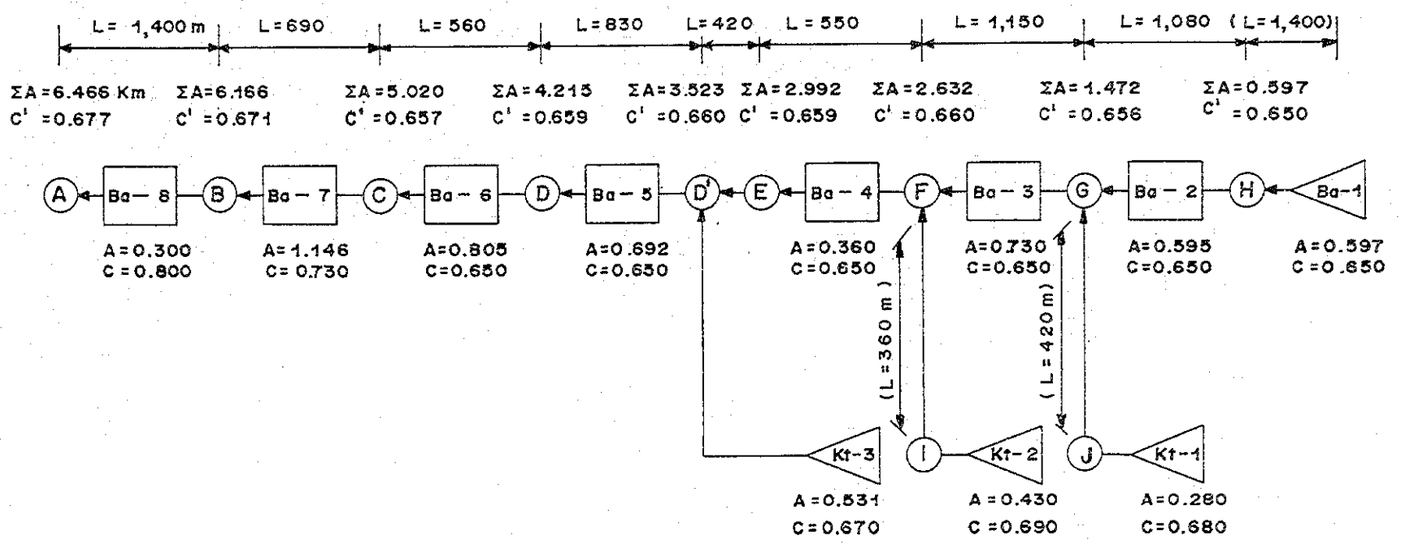


FIG. II-7(2/3) RUNN-OFF MODEL (BANGER R.,ALTER.3-A)

TABLE II-7(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(BANGER R.,ALTER.3-A)

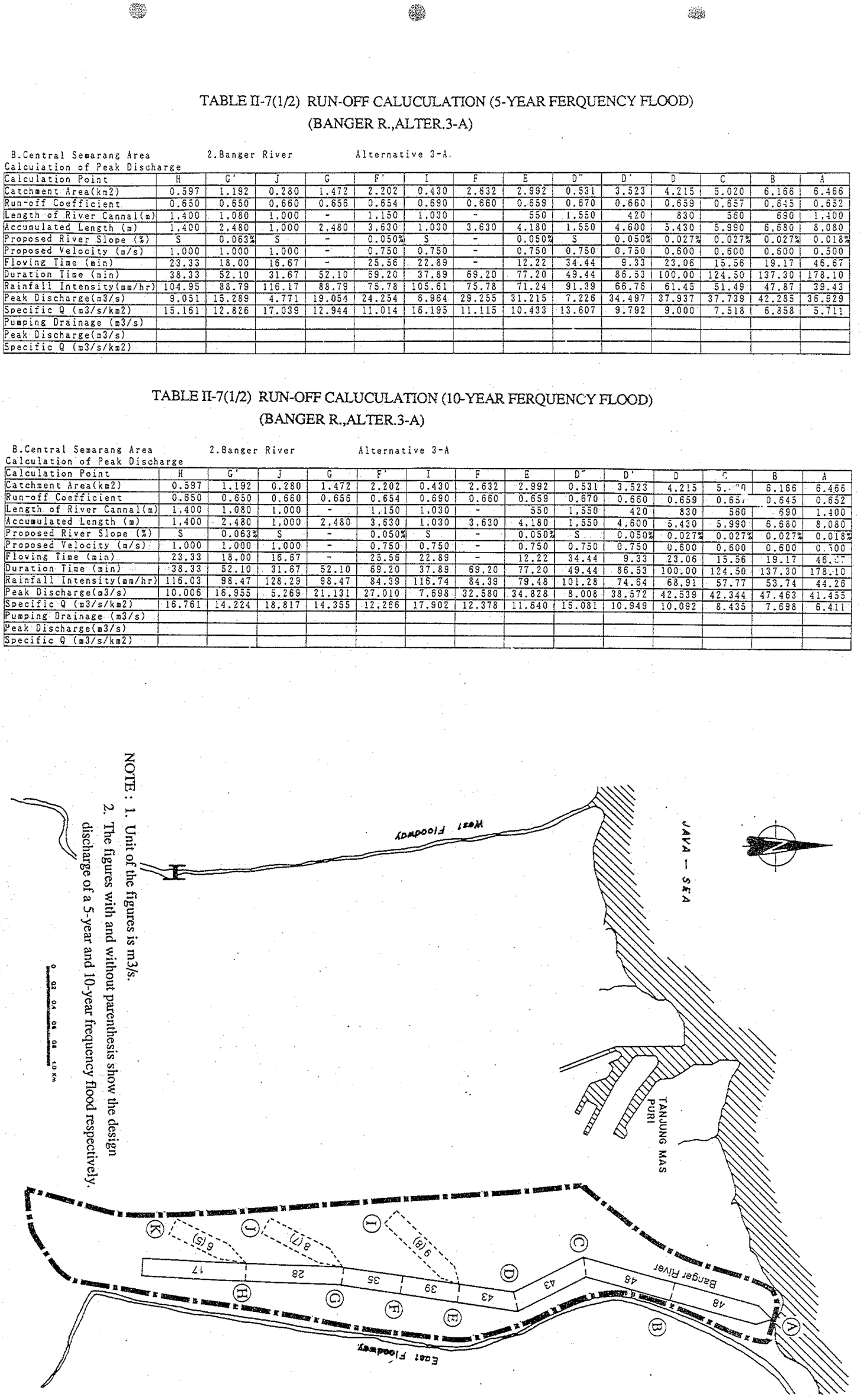
B.Central Semarang Area 2.Banger River Alternative 3-A.
Calculation of Peak Discharge

Calculation Point	H	G'	J	G	F'	I	F	E	D"	D'	D	C	B	A
Catchment Area(km2)	0.597	1.192	0.280	1.472	2.202	0.430	2.632	2.992	0.531	3.523	4.215	5.020	6.166	6.466
Run-off Coefficient	0.650	0.650	0.660	0.656	0.654	0.690	0.660	0.659	0.670	0.660	0.659	0.657	0.645	0.652
Length of River Cannal(m)	1,400	1,080	1,000	-	1,150	1,030	-	550	1,550	420	830	560	690	1,400
Accumulated Length (m)	1,400	2,480	1,000	2,480	3,630	1,030	3,630	4,180	1,550	4,600	5,430	5,990	6,680	8,080
Proposed River Slope (%)	S	0.063%	S	-	0.050%	S	-	0.050%	S	0.050%	0.027%	0.027%	0.027%	0.018%
Proposed Velocity (m/s)	1.000	1.000	1.000	-	0.750	0.750	-	0.750	0.750	0.750	0.600	0.600	0.600	0.500
Flowing Time (min)	23.33	18.00	16.67	-	25.56	22.89	-	12.22	34.44	9.33	23.06	15.56	19.17	46.67
Duration Time (min)	38.33	52.10	31.67	52.10	69.20	37.89	69.20	77.20	49.44	86.53	100.00	124.50	137.30	178.10
Rainfall Intensity(mm/hr)	104.95	88.79	116.17	88.79	75.78	105.61	75.78	71.24	91.39	66.76	61.45	51.49	47.87	39.43
Peak Discharge(m3/s)	9.051	15.289	4.771	19.054	24.254	6.964	29.255	31.215	7.226	34.497	37.937	37.739	42.285	36.929
Specific Q (m3/s/km2)	15.161	12.826	17.039	12.944	11.014	16.195	11.115	10.433	13.607	9.792	9.000	7.518	6.858	5.711
Pumping Drainage (m3/s)														
Peak Discharge(m3/s)														
Specific Q (m3/s/km2)														

TABLE II-7(1/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(BANGER R.,ALTER.3-A)

B.Central Semarang Area 2.Banger River Alternative 3-A
Calculation of Peak Discharge

Calculation Point	H	G'	J	G	F'	I	F	E	D"	D'	D	C	B	A
Catchment Area(km2)	0.597	1.192	0.280	1.472	2.202	0.430	2.632	2.992	0.531	3.523	4.215	5.020	6.166	6.466
Run-off Coefficient	0.650	0.650	0.660	0.656	0.654	0.690	0.660	0.659	0.670	0.660	0.659	0.657	0.645	0.652
Length of River Cannal(m)	1,400	1,080	1,000	-	1,150	1,030	-	550	1,550	420	830	560	690	1,400
Accumulated Length (m)	1,400	2,480	1,000	2,480	3,630	1,030	3,630	4,180	1,550	4,600	5,430	5,990	6,680	8,080
Proposed River Slope (%)	S	0.063%	S	-	0.050%	S	-	0.050%	S	0.050%	0.027%	0.027%	0.027%	0.018%
Proposed Velocity (m/s)	1.000	1.000	1.000	-	0.750	0.750	-	0.750	0.750	0.750	0.600	0.600	0.600	0.500
Flowing Time (min)	23.33	18.00	16.67	-	25.56	22.89	-	12.22	34.44	9.33	23.06	15.56	19.17	46.67
Duration Time (min)	38.33	52.10	31.67	52.10	69.20	37.89	69.20	77.20	49.44	86.53	100.00	124.50	137.30	178.10
Rainfall Intensity(mm/hr)	116.03	98.47	128.29	98.47	84.39	116.74	84.39	79.48	101.28	74.64	68.91	57.77	53.74	44.26
Peak Discharge(m3/s)	10.006	16.955	5.269	21.131	27.010	7.698	32.580	34.828	8.008	38.572	42.539	42.344	47.463	41.455
Specific Q (m3/s/km2)	16.761	14.224	18.817	14.355	12.266	17.902	12.378	11.640	15.081	10.949	10.092	8.435	7.698	6.411
Pumping Drainage (m3/s)														
Peak Discharge(m3/s)														
Specific Q (m3/s/km2)														



NOTE : 1. Unit of the figures is m3/s.
2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-7(3/3) DISTRIBUTION OF DESIGN DISCHARGE(BANGER R.,ALTER3-A)

4. Banger River

4-2 : (Alternative 3-B)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

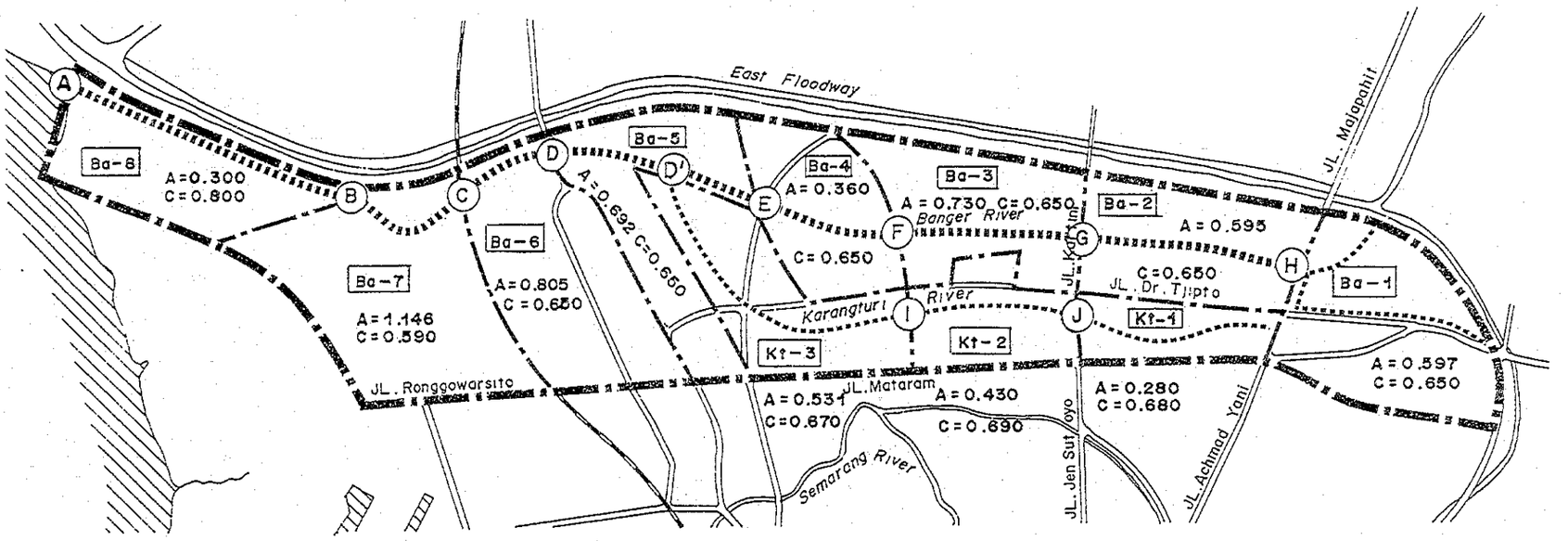


FIG. II-8(1/3) DRAINAGE SYSTEM (BANGER R.,ALTER.3-B)

LEGEND

Ba-1	=	Sub-drainage Area
Ba-2	=	River Channel
(A)	=	Calculation Point
A	=	Drainage Area (Km^2)
ΣA	=	Accumulated Drainage Area
C	=	Run off Coeficient
L	=	Length of River Channel (m)

FIG. II-8(2/3) RUNN-OFF MODEL (BANGER R.,ALTER.3-B)

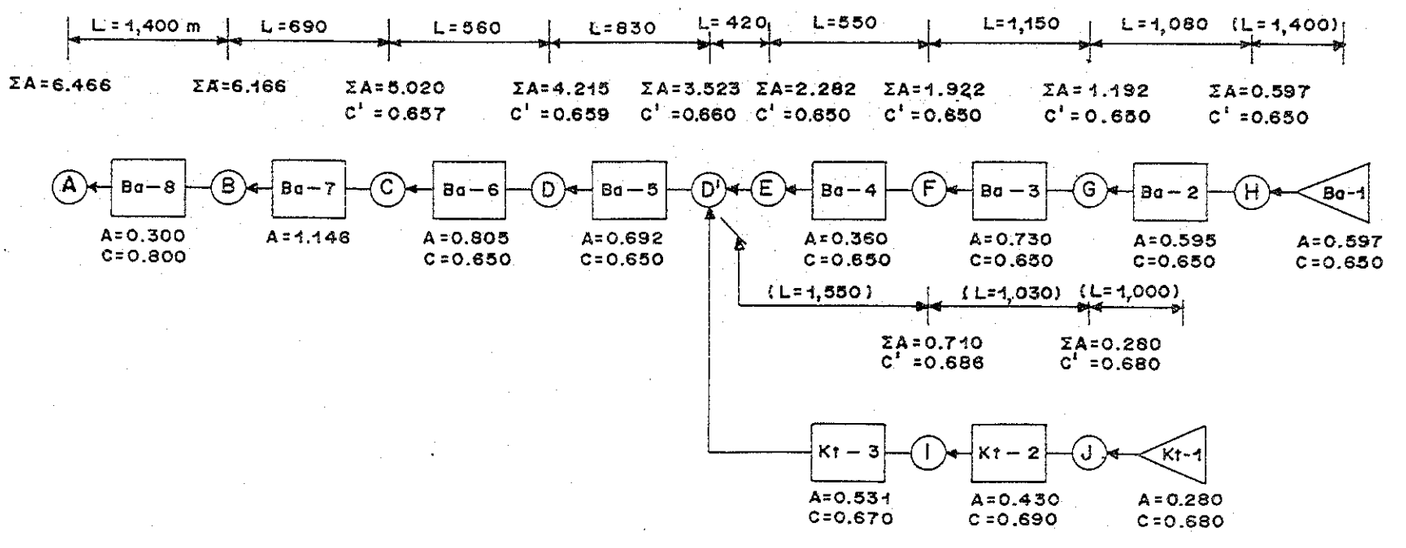


TABLE II-8(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(BANGER R.,ALTER.3-B)

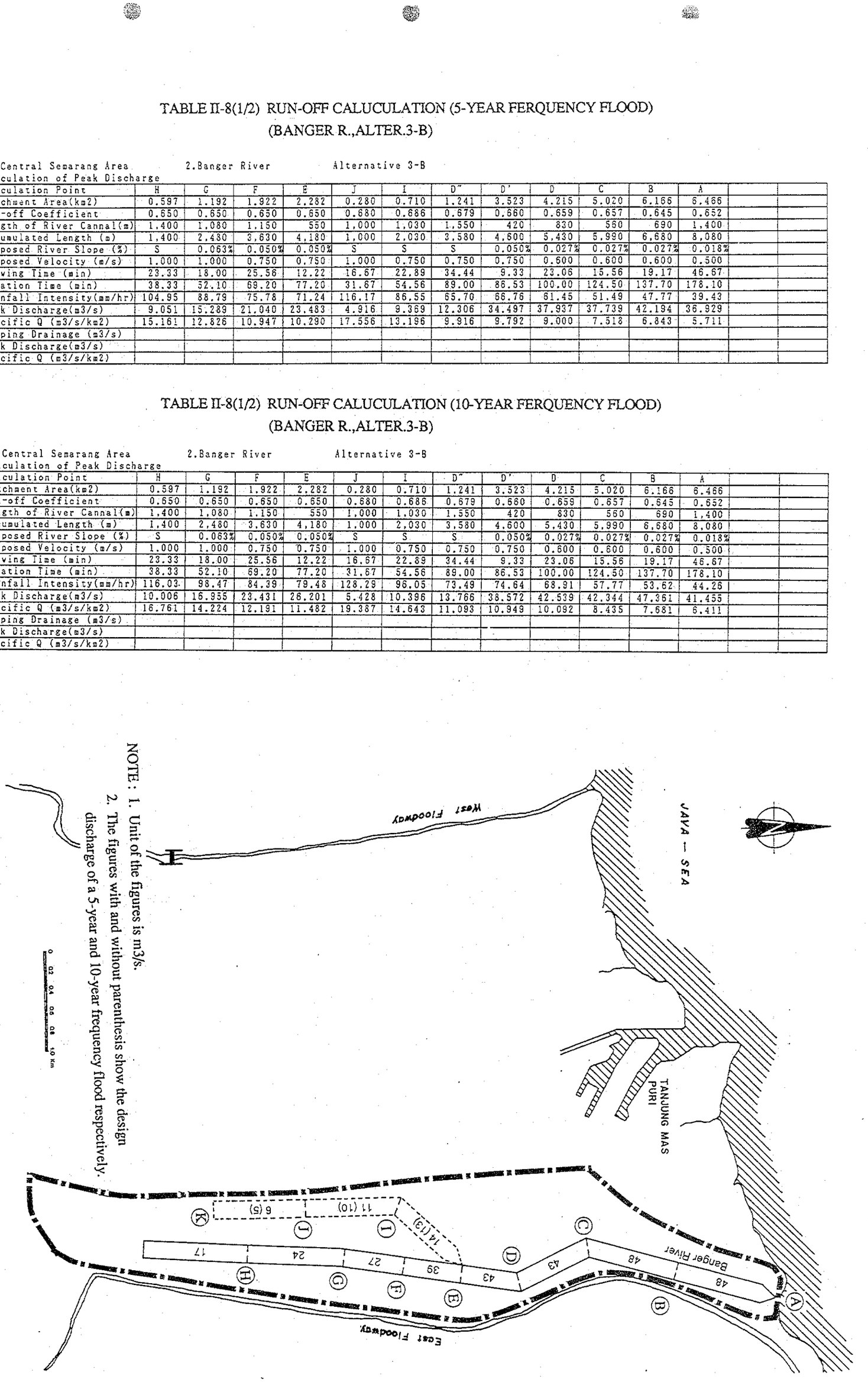
B.Central Semarang Area　　2.Banger River　　Alternative 3-B
Calculation of Peak Discharge

Calculation Point	H	G	F	E	J	I	D"	D'	D	C	B	A
Catchment Area(km2)	0.597	1.192	1.922	2.282	0.280	0.710	1.241	3.523	4.215	5.020	6.166	6.466
Run-off Coefficient	0.650	0.650	0.650	0.650	0.680	0.686	0.679	0.660	0.659	0.657	0.645	0.652
Length of River Cannal(m)	1,400	1,080	1,150	550	1,000	1,030	1,550	420	830	560	690	1,400
Accumulated Length (m)	1,400	2,480	3,630	4,180	1,000	2,030	3,580	4,600	5,430	5,990	6,680	8,080
Proposed River Slope (%)	S	0.063%	0.050%	0.050%	S	S	S	0.050%	0.027%	0.027%	0.027%	0.018%
Proposed Velocity (m/s)	1.000	1.000	0.750	0.750	1.000	0.750	0.750	0.750	0.600	0.600	0.600	0.500
Flowing Time (min)	23.33	18.00	25.56	12.22	16.67	22.89	34.44	9.33	23.06	15.56	19.17	46.67
Duration Time (min)	38.33	52.10	69.20	77.20	31.67	54.56	89.00	86.53	100.00	124.50	137.70	178.10
Rainfall Intensity(mm/hr)	104.95	88.79	75.78	71.24	116.17	86.55	65.70	66.76	61.45	51.49	47.77	39.43
Peak Discharge(m3/s)	9.051	15.289	21.040	23.483	4.916	9.369	12.306	34.497	37.937	37.739	42.194	36.929
Specific Q (m3/s/km2)	15.161	12.826	10.947	10.290	17.556	13.196	9.916	9.792	9.000	7.518	6.843	5.711
Pumping Drainage (m3/s)												
Peak Discharge(m3/s)												
Specific Q (m3/s/km2)												

TABLE II-8(1/2) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(BANGER R.,ALTER.3-B)

B.Central Semarang Area　　2.Banger River　　Alternative 3-B
Calculation of Peak Discharge

Calculation Point	H	G	F	E	J	I	D"	D'	D	C	B	A
Catchment Area(km2)	0.597	1.192	1.922	2.282	0.280	0.710	1.241	3.523	4.215	5.020	6.166	6.466
Run-off Coefficient	0.650	0.650	0.650	0.650	0.680	0.686	0.679	0.660	0.659	0.657	0.645	0.652
Length of River Cannal(m)	1,400	1,080	1,150	550	1,000	1,030	1,550	420	830	560	690	1,400
Accumulated Length (m)	1,400	2,480	3,630	4,180	1,000	2,030	3,580	4,600	5,430	5,990	6,680	8,080
Proposed River Slope (%)	S	0.063%	0.050%	0.050%	S	S	S	0.050%	0.027%	0.027%	0.027%	0.018%
Proposed Velocity (m/s)	1.000	1.000	0.750	0.750	1.000	0.750	0.750	0.750	0.600	0.600	0.600	0.500
Flowing Time (min)	23.33	18.00	25.56	12.22	16.67	22.89	34.44	9.33	23.06	15.56	19.17	46.67
Duration Time (min)	38.33	52.10	69.20	77.20	31.67	54.56	89.00	86.53	100.00	124.50	137.70	178.10
Rainfall Intensity(mm/hr)	116.03	98.47	84.39	79.48	128.29	96.05	73.49	74.64	68.91	57.77	53.62	44.26
Peak Discharge(m3/s)	10.006	16.955	23.431	26.201	5.428	10.396	13.766	38.572	42.539	42.344	47.361	41.455
Specific Q (m3/s/km2)	16.761	14.224	12.191	11.482	19.387	14.643	11.093	10.949	10.092	8.435	7.681	6.411
Pumping Drainage (m3/s)												
Peak Discharge(m3/s)												
Specific Q (m3/s/km2)												



NOTE : 1. Unit of the figures is m3/s.
2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II-8(3/3) DISTRIBUTION OF DESIGN DISCHARGE(BANGER R.,ALTER3-B)

5. Bulu River

(Alternative D-1, D-2)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

(5)

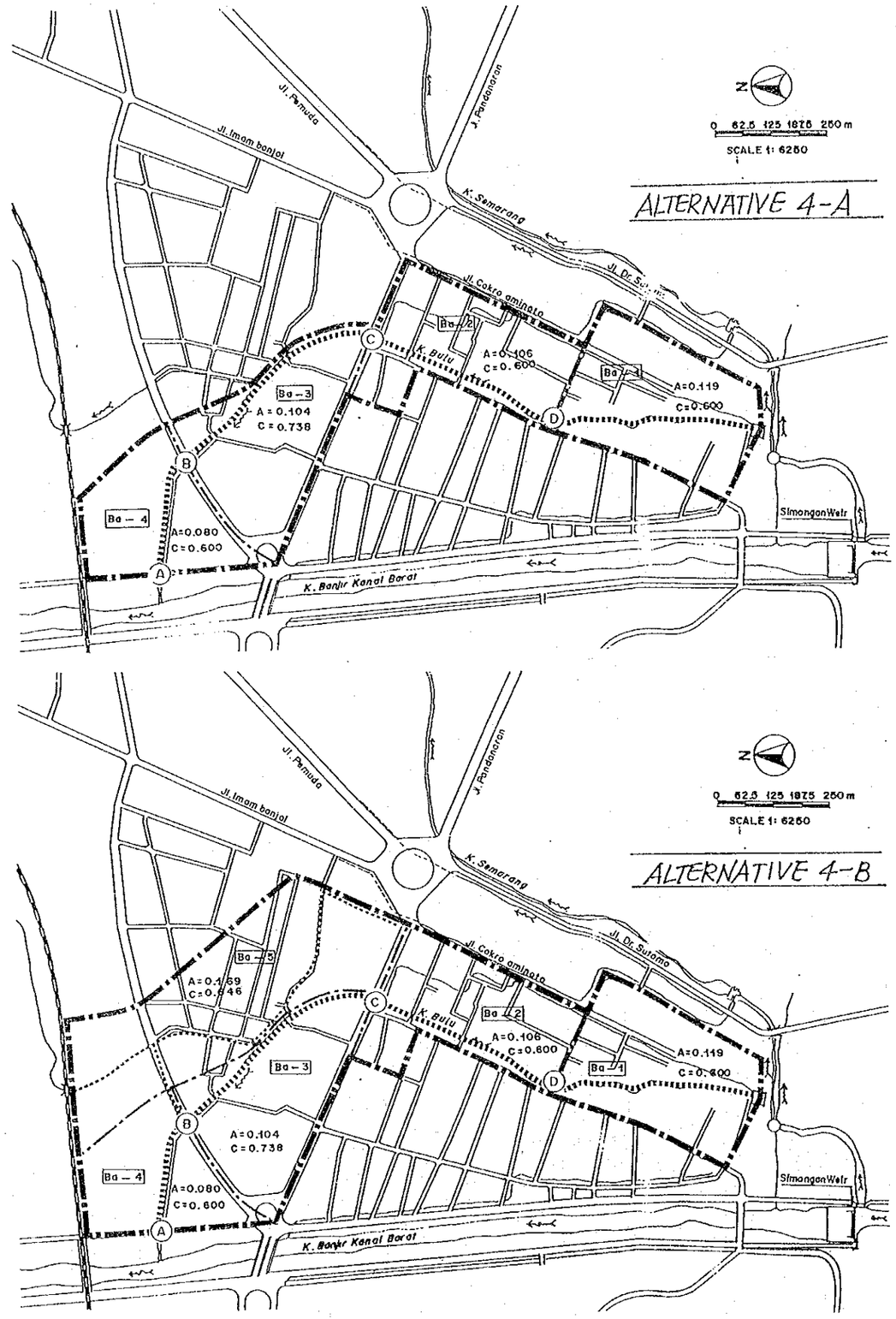
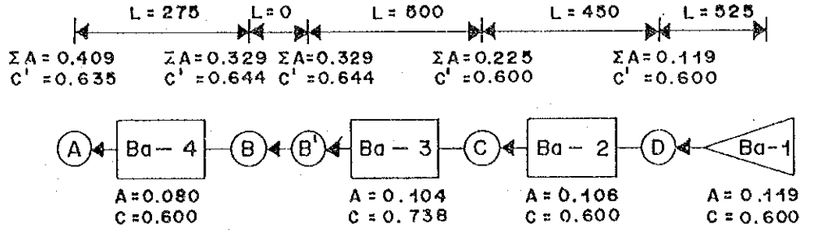


FIG. II-9(1/3) DRAINAGE SYSTEM (BULU R.)

PRESENT BULU DRAINAGE SYSTEM

(ALTERNATIVE 4-A)



PLANNING FOR BULU DRAINAGE SYSTEM

(ALTERNATIVE 4-B)

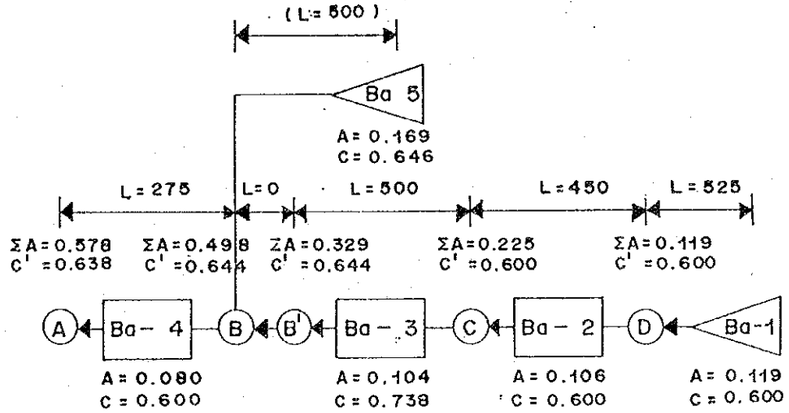


FIG. II-9(2/3) RUNN-OFF MODEL (BULU R.)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.6
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr 2-year	5-year	10-year	T>2hr 2-year
1400	1000	967	1313
10.19	4.49	2.93	-5.4
0.73	0.6	0.57	0.74

B.Sentral Semarang Area 4.Bulu River for 1/5 Alternative 4-A

Proposed Land Use km2

Name of Basin	Ba-1	Ba-2	Ba-3	Ba-4	Ba-5				
Business Area	-	-	0.072	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-
Residential Area	0.119	0.106	0.032	0.080	-	-	-	-	-
Industrial & Harbor	-	-	-	-	-	-	-	-	-
Green Zone & Others	-	-	-	-	-	-	-	-	-
Total Area	0.119	0.106	0.104	0.080					
Run-off Coefficient	0.600	0.600	0.738	0.600					
Length of River Cannal	525	450	500	275					

Calculation of Peak Discharge

Calculation Point	D	C	B',B	A					
Business Area	-	0.000	0.072	0.072					
Neighborhood B.A.	-	0.000	0.000	0.000					
Residential Area	0.119	0.225	0.257	0.337					
Industrial & Harbor	-	0.000	0.000	0.000					
Green Zone & Others	-	0.000	0.000	0.000					
Total Area	0.119	0.225	0.329	0.409					
Run-off Coefficient	0.600	0.600	0.644	0.635					
Length of River Cannal(m)	525	450	500	275					
Accumulated Length (m)	525	975	1,475	1,750					
Proposed River Slope (%)	0.222%	0.222%	0.222%	0.222%					
Proposed Velocity (m/s)	1.250	1.250	1.250	1.250					
Flowing Time (min)	7.00	6.00	6.67	3.67					
Duration Time (min)	22.00	28.00	34.67	38.33					
Rainfall Intensity(mm/hr)	140.01	123.87	110.74	104.95					
Reduction Factor	0.999	0.998	0.997	0.997					
Peak Discharge(m3/s)	2.219	3.709	5.198	6.039					
Specific Q (m3/s/km2)	18.650	16.485	15.799	14.764					

TABLE II-9(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(BULU R.,ALTER.4-A)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.6
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr 2-year	5-year	10-year	T>2hr 2-year
1400	1000	967	1313
10.19	4.49	2.93	-5.4
0.73	0.6	0.57	0.74

B.Sentral Semarang Area 4.Bulu River for 1/5 Alternative 4-B

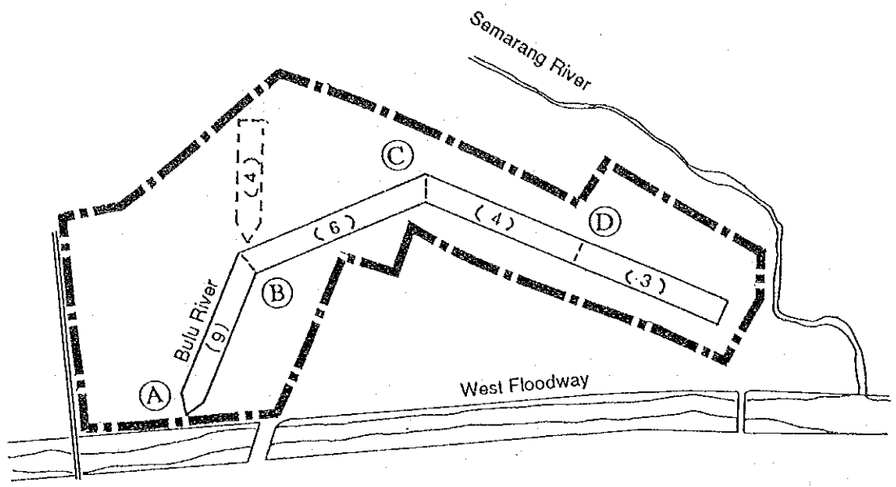
Proposed Land Use km2

Name of Basin	Ba-1	Ba-2	Ba-3	Ba-4	Ba-5				
Business Area	-	-	0.072	-	0.039	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-
Residential Area	0.119	0.106	0.032	0.080	0.130	-	-	-	-
Industrial & Harbor	-	-	-	-	-	-	-	-	-
Green Zone & Others	-	-	-	-	-	-	-	-	-
Total Area	0.119	0.106	0.104	0.080	0.169				
Run-off Coefficient	0.600	0.600	0.738	0.600	0.646				
Length of River Cannal	525	450	500	275	800				

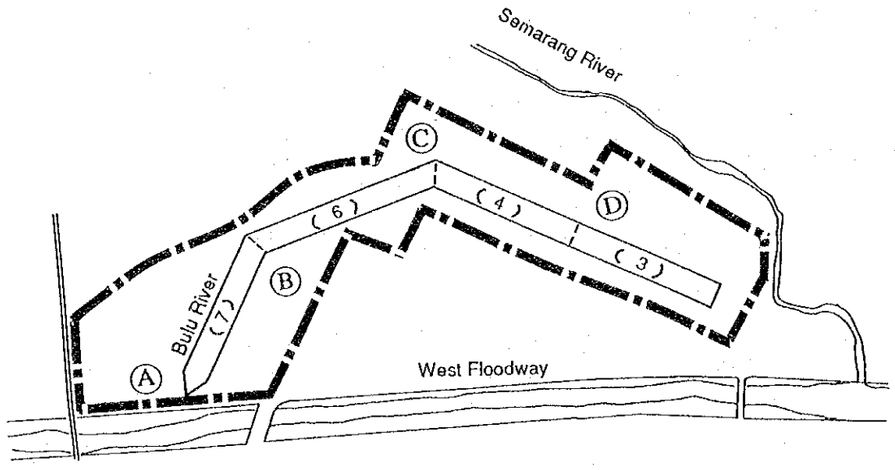
Calculation of Peak Discharge

Calculation Point	D	C	B'	B"	B	A			
Business Area	-	0.000	0.072	0.039	0.111	0.111			
Neighborhood B.A.	-	0.000	0.000	-	0.000	0.000			
Residential Area	0.119	0.225	0.257	0.130	0.387	0.467			
Industrial & Harbor	-	0.000	0.000	-	0.000	0.000			
Green Zone & Others	-	0.000	0.000	-	0.000	0.000			
Total Area	0.119	0.225	0.329	0.169	0.498	0.578			
Run-off Coefficient	0.600	0.600	0.644	0.646	0.644	0.638			
Length of River Cannal(m)	525	450	500	800	-	275			
Accumulated Length (m)	525	975	1,475	800	1,475	1,750			
Proposed River Slope (%)	0.222%	0.222%	0.222%	S	-	0.222%			
Proposed Velocity (m/s)	1.250	1.250	1.250	1.500	-	1.250			
Flowing Time (min)	7.00	6.00	6.67	8.89	-	3.67			
Duration Time (min)	22.00	28.00	34.67	23.89	34.67	38.33			
Rainfall Intensity(mm/hr)	140.01	123.87	110.74	134.34	110.74	104.95			
Reduction Factor	0.999	0.998	0.997	0.999	0.996	0.995			
Peak Discharge(m3/s)	2.219	3.709	5.198	3.254	7.865	8.563			
Specific Q (m3/s/km2)	18.650	16.485	15.799	19.253	15.794	14.815			

TABLE II-9(2/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(BULU R.,ALTER.4-B)



BULU RIVER (ALT. 4-B)



BULU RIVER (ALT. 4-A)

FIG. II-9(3/3) DISTRIBUTION OF DESIGN DISCHARGE(BULU R.)

6. Ronggolawe-Karangayu River, Tawany River, and Silandak Chemnel

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

(5)

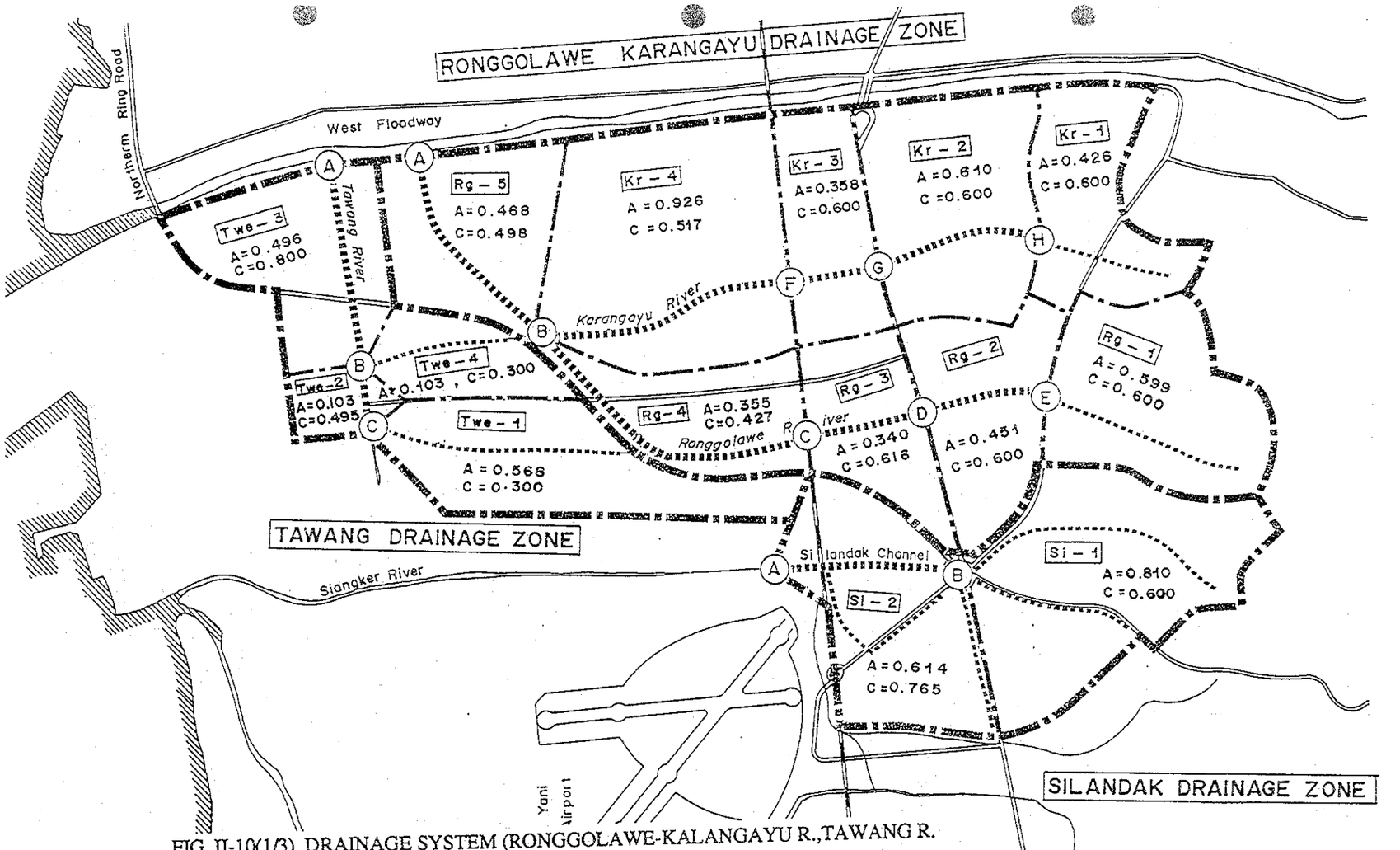
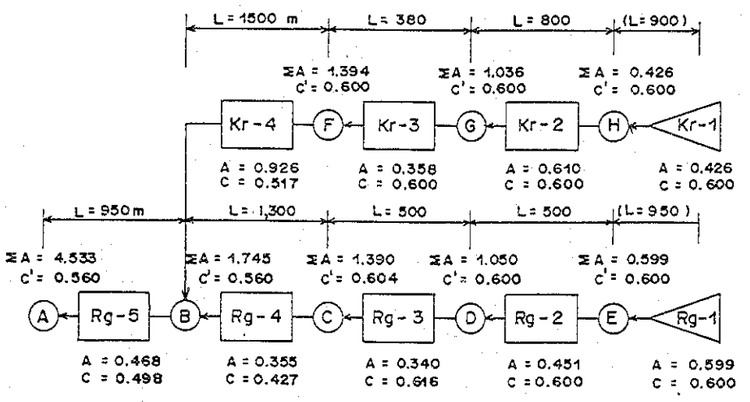
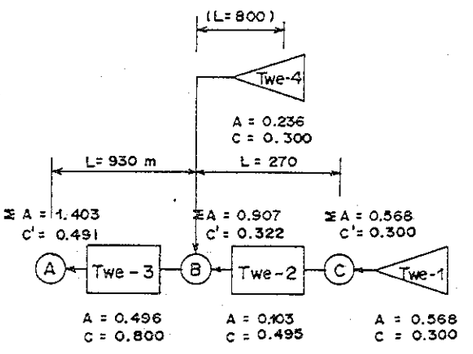


FIG. II-10(1/3) DRAINAGE SYSTEM (RONGGOLAWE-KALANGAYU R.,TAWANG R. AND SILANDAK CHANNEL)

RONGGOLAWE – KARANGAYU DRAINAGE SYSTEM



TAWANG DRAINAGE SYSTEM



SILANDAK DRAINAGE SYSTEM

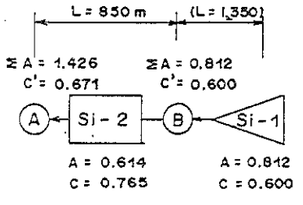


FIG. II-10(2/3) RUNN-OFF MODEL (RONGGOLAWE -KALANGAYU R.,TAWANG R. AND SILANDAK CHANNEL)

Land Use	Run-off C	T<2hr			T>2hr	
		2-year	5-year	10-year	2-year	5-year
Business Area	0.8					
Neighborhood B.A.	0.8	1400	1000	967	1313	2050
Residential Area	0.6	10.19	4.49	2.93	-5.4	2.95
Industrial & Harbor	0.8	0.73	0.6	0.57	0.74	0.76
Green Zone & Others	0.3					

C.Western Semarang Area 1.Ronggolawe,2.Karangayu

Proposed Land Use	km2								
Name of Basin	Rg-1	Rg-2	Rg-3	Rg-4	Rg-5	Kr-1	Kr-2	Kr-3	Kr-4
Business Area	-	-	-	-	-	-	-	-	-
Neighborhood B.A.	-	-	-	-	-	-	-	-	-
Residential Area	0.599	0.451	0.313	0.150	0.204	0.426	0.610	0.358	0.669
Industrial & Harbor	-	-	0.027	-	0.063	-	-	-	-
Green Zone & Others	-	-	-	0.205	0.202	-	-	-	0.257
Total Area	0.599	0.451	0.340	0.355	0.468	0.426	0.610	0.358	0.926
Run-off Coefficient	0.600	0.600	0.616	0.427	0.498	0.600	0.600	0.600	0.517
Length of River Cannal	950	500	500	1,300	950	900	800	380	1,500

Calculation of Peak Discharge

Calculation Point	E	D	C	B'	H	G	F	B"	B	A
Business Area	-	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000
Neighborhood B.A.	-	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000
Residential Area	0.599	1.050	1.363	1.513	0.426	1.036	1.394	2.063	3.576	3.779
Industrial & Harbor	-	0.000	0.027	0.027	-	0.000	0.000	0.000	0.027	0.090
Green Zone & Others	-	0.000	0.000	0.205	-	0.000	0.000	0.257	0.462	0.664
Total Area	0.599	1.050	1.390	1.745	0.426	1.036	1.394	2.320	4.065	4.533
Run-off Coefficient	0.600	0.600	0.604	0.568	0.600	0.600	0.600	0.567	0.567	0.560
Length of River Cannal(m)	950	500	500	1,300	900	800	380	1,500	-	950
Accumulated Length (m)	950	1,450	1,950	3,250	900	1,700	2,080	3,580	3,580	4,530
Proposed River Slope (%)	S	0.455%	0.455%	0.027%	S	0.167%	0.167%	0.020%	-	0.027%
Proposed Velocity (m/s)	1.500	1.500	1.500	0.600	1.500	1.250	1.250	0.500	-	0.600
Flowing Time (min)	10.56	5.56	5.56	36.11	10.00	10.67	5.07	50.00	-	26.39
Duration Time (min)	25.56	31.11	36.67	72.78	25.00	35.67	40.73	90.73	90.73	117.12
Rainfall Intensity(mm/hr)	129.82	117.25	107.48	73.65	131.28	109.08	101.57	64.98	64.98	56.11
Reduction Factor	0.995	0.991	0.988	0.985	0.996	0.991	0.988	0.981	0.968	0.965
Peak Discharge(m3/s)	10.316	16.270	19.815	15.981	7.430	14.936	18.657	18.617	32.216	30.531
Specific Q (m3/s/km2)	17.222	15.495	14.255	9.158	17.442	14.417	13.384	8.025	7.925	6.735

TABLE II-10(1/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(RRONGGOLAWE-KALANGAYU R.,TAWANG R. AND SILANDAK CHANNEL)

Land Use	Run-off C	T<2hr			T>2hr	
		2-year	5-year	10-year	2-year	5-year
Business Area	0.8					
Neighborhood B.A.	0.8	1400	1000	967	1313	2050
Residential Area	0.6	10.19	4.49	2.93	-5.4	2.95
Industrial & Harbor	0.8	0.73	0.6	0.57	0.74	0.76
Green Zone & Others	0.3					

C.Western Semarang Area 3.Tawang 4.Silandak

Proposed Land Use	km2									
Name of Basin	Twe-1	Twe-2	Twe-3	Twe-4			Si-1	Si-2		
Business Area	-	-	-	-			-	-		
Neighborhood B.A.	-	-	-	-			-	-		
Residential Area	-	-	-	-			0.810	0.107		
Industrial & Harbor	-	0.040	0.496	-			-	0.507		
Green Zone & Others	0.568	0.063	-	0.236			-	-		
Total Area	0.568	0.103	0.496	0.236			0.810	0.614		
Run-off Coefficient	0.300	0.495	0.800	0.300			0.600	0.765		
Length of River Cannal	1,000	270	930	800			1,350	850		

Calculation of Peak Discharge

Calculation Point	C	B'	B"	B	A		B	A		
Business Area	-	0.000	-	0.000	0.000		-	0.000		
Neighborhood B.A.	-	0.000	-	0.000	0.000		-	0.000		
Residential Area	-	0.000	-	0.000	0.000		0.810	0.917		
Industrial & Harbor	-	0.040	-	0.040	0.536		-	0.507		
Green Zone & Others	0.568	0.631	0.236	0.867	0.867		-	0.000		
Total Area	0.568	0.671	0.236	0.907	1.403		0.810	1.424		
Run-off Coefficient	0.300	0.330	0.300	0.322	0.491		0.600	0.671		
Length of River Cannal(m)	1,000	270	800	-	930		1,350	850		
Accumulated Length (m)	1,000	1,270	800	1,270	2,200		1,350	2,200		
Proposed River Slope (%)	S	0.067%	S	-	0.067%		S	0.100%		
Proposed Velocity (m/s)	1.500	1.000	1.500	-	1.000		1.500	1.250		
Flowing Time (min)	11.11	4.50	8.89	-	15.50		15.00	11.33		
Duration Time (min)	26.11	30.61	23.89	30.61	46.11		30.00	41.33		
Rainfall Intensity(mm/hr)	128.40	118.25	134.34	118.25	94.95		119.50	100.77		
Reduction Factor	0.995	0.994	0.998	0.992	0.988		0.993	0.988		
Peak Discharge(m3/s)	4.839	5.785	2.110	7.619	14.366		12.819	21.148		
Specific Q (m3/s/km2)	8.519	8.621	8.939	8.401	10.239		15.825	14.851		

TABLE II-10(2/2) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(RRONGGOLAWE-KALANGAYU R.,TAWANG R. AND SILANDAK CHANNEL)

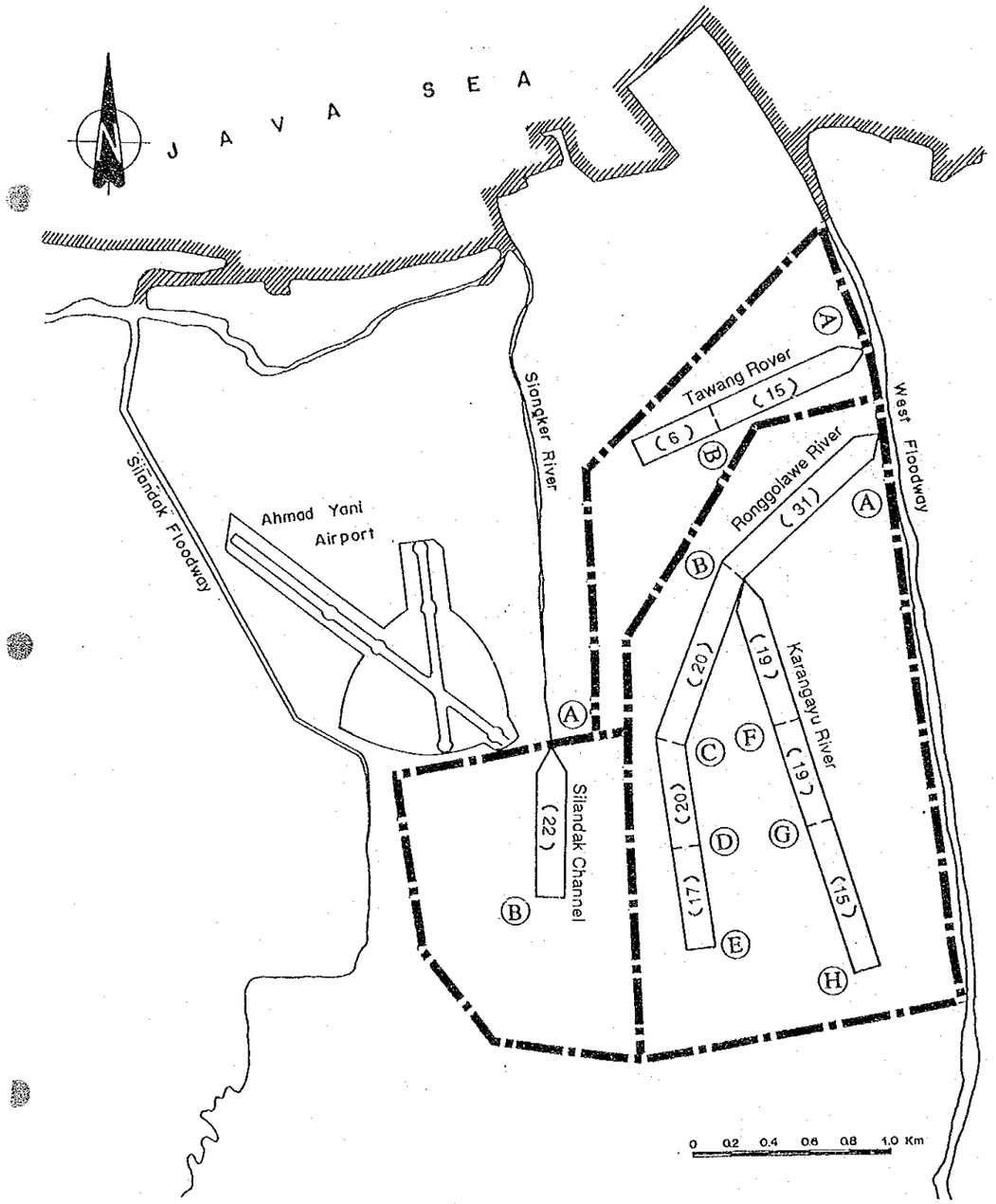


FIG. II-10(3/3) DISTRIBUTION OF DESIGN DISCHARGE(RONGGOLAWE-KALANGAYU R.,TAWANG R. AND SILANDAK CHANNEL)

7. 9 Chanels in Kec. Tugu Area

(Tambakhario Channel, Buntu River Jumbleng River, Tugurejo River, Tapak River, Boom Karanganyar River, Randugarut River, Mangkang Wetan River and Mangkang Kulon River)

(1) Drainage System

(2) Run-off Model

(3) Run-off Calculation

(4) Distribution of Design Discharge

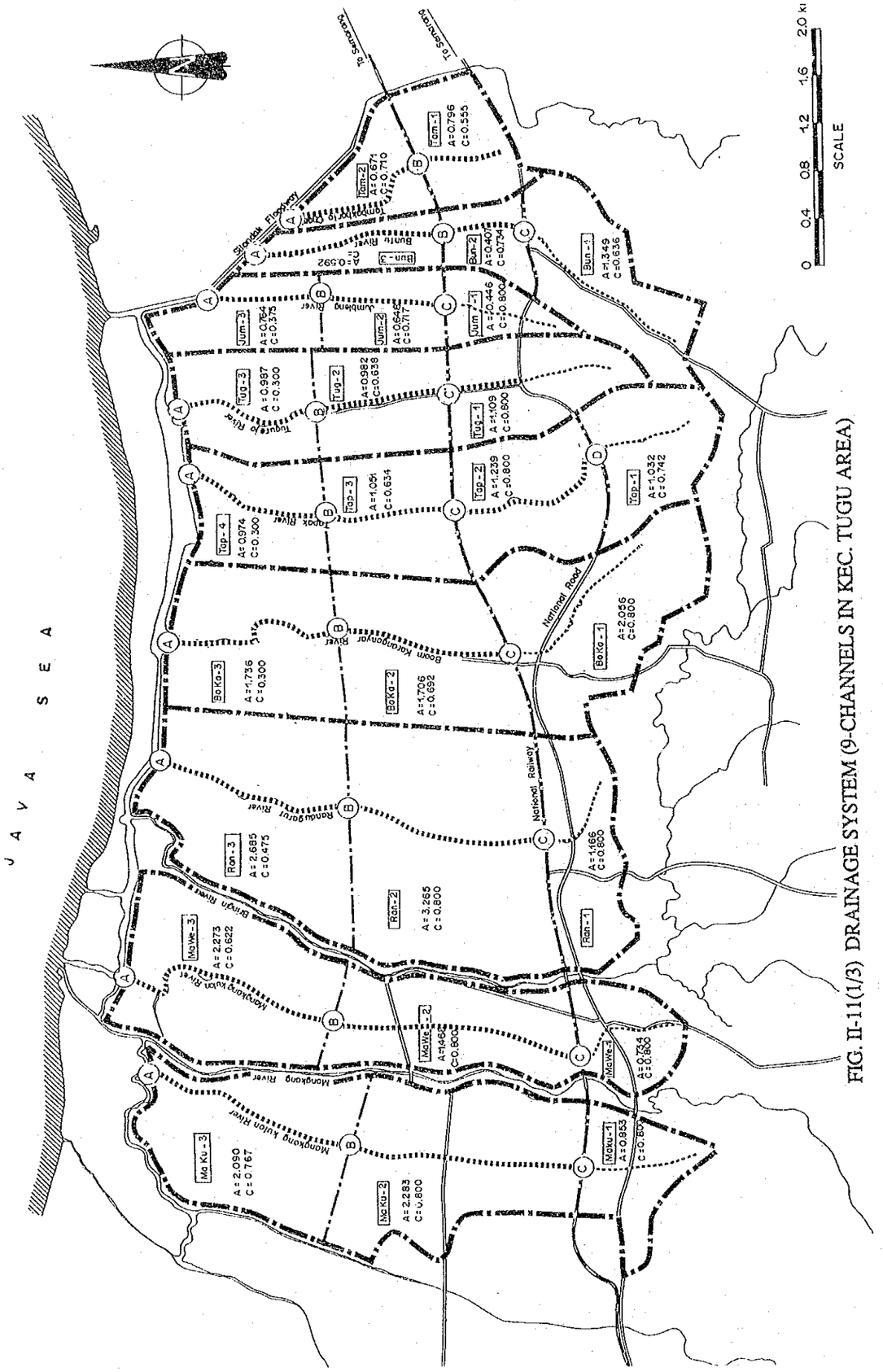
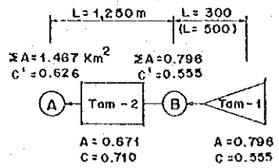
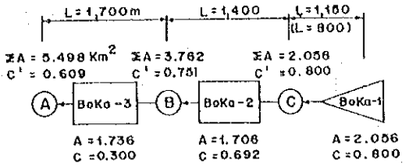


FIG. II-11(1/3) DRAINAGE SYSTEM (9-CHANNELS IN KEC. TUGU AREA)

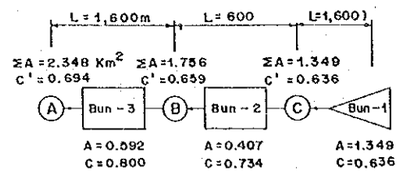
TAMBAKHARJO DRAINAGE SYSTEM



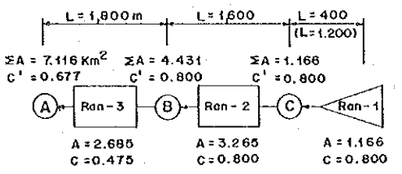
BOOMKARANGANYAR DRAINAGE SYSTEM



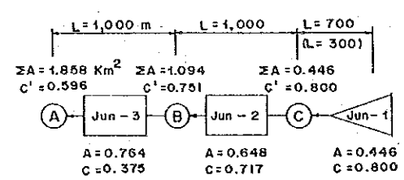
BUNTU DRAINAGE SYSTEM



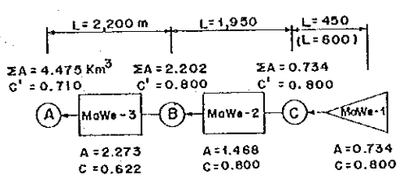
RANDUGARUT DRAINAGE SYSTEM



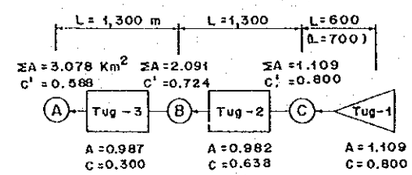
JUMBLENG DRAINAGE SYSTEM



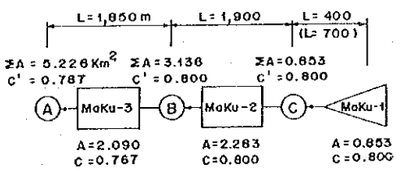
MANGKANG WETAN DRAINAGE SYSTEM



TUGUREJO DRAINAGE SYSTEM



MANGKANG KULON DRAINAGE SYSTEM



TAPAK DRAINAGE SYSTEM

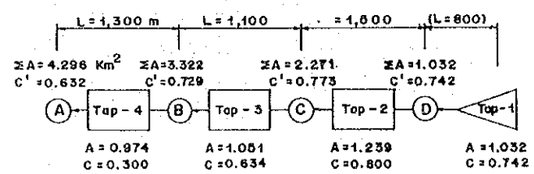


FIG. II11(2/3) RUNN-OFF MODEL (9-CHANNELS IN KEC. TUGU AREA)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.5
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr			T>2hr	
2-year	5-year	10-year	2-year	5-year
1400	1000	967	1313	2050
10.19	4.49	2.93	-5.4	2.95
0.73	0.6	0.57	0.74	0.76

D.Kec.Tugu — 1.Tambakharjo — 2.Buntu — 3.Jumbleng

Proposed Land Use — km2

Name of Basin	Tam-1	Tam-2		Bun-1	Bun-2	Bun-3		Jun-1	Jun-2	Jun-3
Business Area	-	-		0.534	-	-		0.074	-	-
Neighborhood B.A.	-	-		-	-	-		-	-	-
Residential Area	0.651	0.201		0.738	0.089	-		-	-	-
Industrial & Harbor	0.145	0.470		0.077	0.318	0.592		0.372	0.540	0.115
Green Zone & Others	-	-		-	-	-		-	0.108	0.649
Total Area	0.796	0.671		1.349	0.407	0.592		0.446	0.648	0.764
Run-off Coefficient	0.555	0.710		0.636	0.734	0.800		0.800	0.717	0.375
Length of River Cannal	300	1,250		1,600	600	1,600		700	1,000	1,000

Calculation of Peak Discharge

Calculation Point	B	A		C	B	A		C	B	A
Business Area	-	0.000		0.534	0.534	0.534		0.074	0.074	0.074
Neighborhood B.A.	-	0.000		-	0.000	0.000		-	0.000	0.000
Residential Area	0.651	0.852		0.738	0.827	0.827		-	0.000	0.000
Industrial & Harbor	0.145	0.615		0.077	0.395	0.987		0.372	0.911	1.026
Green Zone & Others	-	0.000		-	0.000	0.000		-	0.108	0.758
Total Area	0.796	1.467		1.349	1.756	2.348		0.446	1.094	1.858
Run-off Coefficient	0.555	0.626		0.636	0.659	0.694		0.800	0.751	0.596
Length of River Cannal(m)	300	1,250		1,600	600	1,600		700	1,000	1,000
Accumulated Length (m)	300	1,550		1,600	2,200	3,800		700	1,700	2,700
Proposed River Slope (%)	0.020%	0.020%		S	0.020%	0.020%		S	0.020%	0.020%
Proposed Velocity (m/s)	0.500	0.500		1.500	0.500	0.500		1.500	0.500	0.500
Flowing Time (min)	10.00	41.67		17.78	20.00	53.33		7.78	33.33	33.33
Duration Time (min)	25.00	66.67		32.78	52.78	106.11		22.78	56.11	89.44
Rainfall Intensity(mm/hr)	131.28	77.39		114.08	88.16	59.39		137.60	85.21	65.51
Reduction Factor	0.993	0.988		0.989	0.985	0.980		0.996	0.991	0.984
Peak Discharge(m3/s)	12.793	15.589		21.499	22.323	21.097		10.869	15.405	15.871
Specific Q (m3/s/km2)	16.071	10.627		15.937	12.713	8.985		24.371	14.082	8.542

TABLE II-11(1/5) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(9-CHANNELS IN KEC. TUGU AREA)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.5
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr			T>2hr	
2-year	5-year	10-year	2-year	5-year
1400	1000	967	1313	2050
10.19	4.49	2.93	-5.4	2.95
0.73	0.6	0.57	0.74	0.76

D.Kec.Tugu — 4.Tugurejo — 5.Tapak

Proposed Land Use — km2

Name of Basin	Tug-1	Tug-2	Tug-3		Tap-1	Tap-2	Tap-3	Tap-4		
Business Area	0.608	-	-		0.101	0.228	-	-		
Neighborhood B.A.	-	-	-		-	-	-	-		
Residential Area	-	-	-		0.201	-	-	-		
Industrial & Harbor	0.501	0.664	-		0.730	1.011	0.701	-		
Green Zone & Others	-	0.318	0.987		-	-	0.350	0.974		
Total Area	1.109	0.982	0.987		1.032	1.239	1.051	0.974		
Run-off Coefficient	0.800	0.638	0.300		0.742	0.800	0.634	0.300		
Length of River Cannal	600	1,300	1300		800	1,500	1100	1,300		

Calculation of Peak Discharge

Calculation Point	C	B	A		D	C	B	A		
Business Area	0.608	0.608	0.608		0.101	0.329	0.329	0.329		
Neighborhood B.A.	-	0.000	0.000		0.000	0.000	0.000	0.000		
Residential Area	-	0.000	0.000		0.201	0.201	0.201	0.201		
Industrial & Harbor	0.501	1.165	1.165		0.730	1.741	2.442	2.442		
Green Zone & Others	-	0.318	1.305		0.000	0.000	0.350	1.324		
Total Area	1.109	2.091	3.078		1.032	2.271	3.322	4.296		
Run-off Coefficient	0.800	0.724	0.588		0.742	0.773	0.729	0.632		
Length of River Cannal(m)	600	1,300	1,300		800	1,500	1,100	1,300		
Accumulated Length (m)	600	1,900	3,200		800	2,300	3,400	4,700		
Proposed River Slope (%)	0.020%	0.020%	0.020%		S	0.020%	0.020%	0.020%		
Proposed Velocity (m/s)	0.500	0.500	0.500		1.500	0.500	0.500	0.500		
Flowing Time (min)	20.00	43.33	43.33		8.89	50.00	36.67	43.33		
Duration Time (min)	35.00	78.33	121.67		23.89	73.89	110.56	153.89		
Rainfall Intensity(mm/hr)	110.18	70.65	54.89		134.34	73.03	58.01	43.98		
Reduction Factor	0.991	0.982	0.975		0.991	0.981	0.973	0.966		
Peak Discharge(m3/s)	21.520	23.347	21.522		22.646	27.963	30.386	25.628		
Specific Q (m3/s/km2)	19.405	11.165	6.992		21.944	12.313	9.147	5.966		

TABLE II-11(2/5) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(9-CHANNELS IN KEC. TUGU AREA)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.5
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr			T>2hr	
2-year	5-year	10-year	2-year	5-year
1400	1000	967	1313	2050
10.19	4.49	2.93	-5.4	2.95
0.73	0.6	0.57	0.74	0.76

D.Kec.Tugu — 6.Boomkaranganyar — 7.Randugarut

Proposed Land Use	km2									
Name of Basin	Boka-1	Boka-2	Boka-3		Ran-1	Ran-2	Ran-3			
Business Area	0.074	-	-		-	-	-			
Neighborhood B.A.	-	-	-		-	-	-			
Residential Area	-	-	-		-	-	-			
Industrial & Harbor	1.982	1.338	-		1.166	3.262	0.940			
Green Zone & Others	-	0.368	1.736		-	0.003	1.745			
Total Area	2.056	1.706	1.736		1.166	3.265	2.685			
Run-off Coefficient	0.800	0.692	0.300		0.800	0.800	0.475			
Length of River Cannal	1,150	1,400	1700		400	1,600	1800			

Calculation of Peak Discharge

Calculation Point	C	B	A		C	B	A			
Business Area	0.074	0.074	0.074		0.000	0.000	0.000			
Neighborhood B.A.	-	0.000	0.000		0.000	0.000	0.000			
Residential Area	-	0.000	0.000		0.000	0.000	0.000			
Industrial & Harbor	1.982	3.319	3.319		1.166	4.428	5.367			
Green Zone & Others	-	0.368	2.104		0.000	0.003	1.749			
Total Area	2.056	3.762	5.498		1.166	4.431	7.116			
Run-off Coefficient	0.800	0.751	0.609		0.800	0.800	0.677			
Length of River Cannal(m)	1,150	1,400	1,700		400	1,600	1,800			
Accumulated Length (m)	1,150	2,550	4,250		400	2,000	3,800			
Proposed River Slope (%)	S	0.020%	0.020%		S	0.020%	0.020%			
Proposed Velocity (m/s)	1.500	0.500	0.500		1.500	0.500	0.500			
Flowing Time (min)	12.78	46.67	56.67		4.44	53.33	60.00			
Duration Time (min)	27.78	74.44	131.11		19.44	72.78	132.78			
Rainfall Intensity(mm/hr)	137.31	81.08	55.60		164.46	82.09	55.09			
Reduction Factor	0.983	0.970	0.958		0.990	0.965	0.948			
Peak Discharge(m3/s)	49.317	49.374	39.624		33.756	62.395	55.941			
Specific Q (m3/s/km2)	23.987	13.124	7.207		28.950	14.081	7.861			

TABLE II-11(3/5) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(9-CHANNELS IN KEC. TUGU AREA)

Land Use	Run-off C
Business Area	0.8
Neighborhood B.A.	0.8
Residential Area	0.5
Industrial & Harbor	0.8
Green Zone & Others	0.3

T<2hr			T>2hr	
2-year	5-year	10-year	2-year	5-year
1400	1000	1000	1313	2050
10.19	4.49	4.49	-5.4	2.95
0.73	0.6	0.6	0.74	0.76

D.Kec.Tugu — 8.Mangkang Wetan — 9.Mangkang Kulon

Proposed Land Use	km2									
Name of Basin	MaWe-1	MaWe-2	MaWe-3		MaKu-1	MaKu-2	MaKu-3			
Business Area	-	-	-		-	-	-			
Neighborhood B.A.	-	-	-		-	-	-			
Residential Area	-	-	-		-	-	-			
Industrial & Harbor	0.734	1.468	1.464		0.853	2.283	1.952			
Green Zone & Others	-	-	0.809		-	-	0.138			
Total Area	0.734	1.468	2.273		0.853	2.283	2.090			
Run-off Coefficient	0.800	0.800	0.622		0.800	0.800	0.767			
Length of River Cannal	450	1,950	2200		400	1,900	1,850			

Calculation of Peak Discharge

Calculation Point	C	B	A		C	B	A			
Business Area	-	0.000	0.000		0.000	0.000	0.000			
Neighborhood B.A.	-	0.000	0.000		0.000	0.000	0.000			
Residential Area	-	0.000	0.000		0.000	0.000	0.000			
Industrial & Harbor	0.734	2.202	3.666		0.853	3.136	5.088			
Green Zone & Others	-	0.000	0.809		0.000	0.000	0.138			
Total Area	0.734	2.202	4.475		0.853	3.136	5.226			
Run-off Coefficient	0.800	0.800	0.710		0.800	0.800	0.787			
Length of River Cannal(m)	450	1,950	2,200		400	1,900	1,850			
Accumulated Length (m)	450	2,400	4,600		400	2,300	4,150			
Proposed River Slope (%)	S	0.020%	0.020%		S	0.020%	0.020%			
Propsed Velocity (m/s)	1.500	0.500	0.500		1.500	0.500	0.500			
Flowing Time (min)	5.00	65.00	73.33		4.44	63.33	61.67			
Duration Time (min)	20.00	85.00	158.33		19.44	82.78	144.44			
Rainfall Intensity(mm/hr)	146.76	67.44	43.05		148.79	68.47	46.10			
Peak Discharge(m3/s)	19.152	26.404	30.381		22.566	38.175	42.127			
Specific Q (m3/s/km2)	26.093	11.991	6.789		26.454	12.173	8.061			

TABLE II-11(4/5) RUN-OFF CALUCULATION (5-YEAR FERQUENCY FLOOD)
(9-CHANNELS IN KEC. TUGU AREA)

Land Use	Run-off C	T<2hr			T>2hr	
		2-year	5-year	10-year	2-year	5-year
Business Area	0.8	1400	967	967	1313	2600
Neighborhood B.A.	0.8	10.19	2.93	2.93	-5.4	7.2
Residential Area	0.5	0.73	0.57	0.57	0.74	0.78
Industrial & Harbor	0.8					
Green Zone & Others	0.3					

D.Kec.Tugu — 8.Mangkang Wetan — 9.Mangkang Kulon

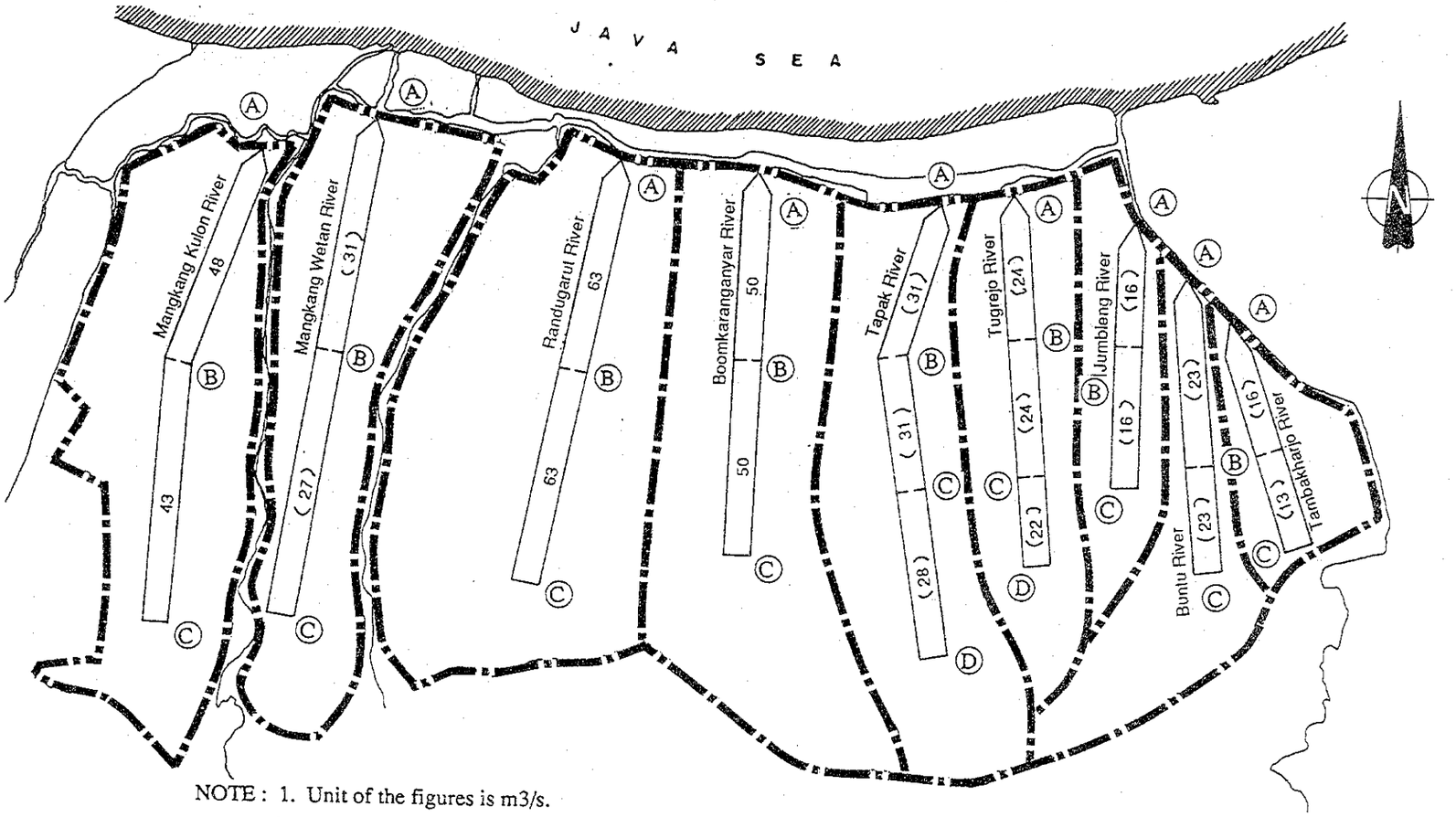
Proposed Land Use — km2

Name of Basin	MaWe-1	MaWe-2	MaWe-3		MaKu-1	MaKu-2	MaKu-3			
Business Area	-	-	-		-	-	-			
Neighborhood B.A.	-	-	-		-	-	-			
Residential Area	-	-	-		-	-	-			
Industrial & Harbor	0.734	1.468	1.464		0.853	2.283	1.952			
Green Zone & Others	-	-	0.809		-	-	0.138			
Total Area	0.734	1.468	2.273		0.853	2.283	2.090			
Run-off Coefficient	0.800	0.800	0.622		0.800	0.800	0.767			
Length of River Cannal	450	1,950	2200		400	1,900	1,850			

Calculation of Peak Discharge

Calculation Point	C	B	A		C	B	A			
Business Area	-	0.000	0.000		0.000	0.000	0.000			
Neighborhood B.A.	-	0.000	0.000		0.000	0.000	0.000			
Residential Area	-	0.000	0.000		0.000	0.000	0.000			
Industrial & Harbor	0.734	2.202	3.666		0.853	3.136	5.088			
Green Zone & Others	-	0.000	0.809		0.000	0.000	0.138			
Total Area	0.734	2.202	4.475		0.853	3.136	5.226			
Run-off Coefficient	0.800	0.800	0.710		0.800	0.800	0.787			
Length of River Cannal(m)	450	1,950	2,200		400	1,900	1,850			
Accumulated Length (m)	450	2,400	4,600		400	2,300	4,150			
Proposed River Slope (%)	S	0.020%	0.020%		S	0.020%	0.020%			
Propsed Velocity (m/s)	1.500	0.500	0.500		1.500	0.500	0.500			
Flowing Time (min)	5.00	65.00	73.33		4.44	63.33	61.67			
Duration Time (min)	20.00	85.00	158.33		19.44	82.78	144.44			
Rainfall Intensity(mm/hr)	162.18	75.38	48.33		164.46	76.49	51.75			
Peak Discharge(m3/s)	21.164	29.512	34.109		24.942	42.647	47.292			
Specific Q (m3/s/km2)	28.834	13.402	7.622		29.240	13.599	9.049			

TABLE II-11(5/5) RUN-OFF CALUCULATION (10-YEAR FERQUENCY FLOOD)
(9-CHANNELS IN KEC. TUGU AREA)



NOTE : 1. Unit of the figures is m3/s.
2. The figures with and without parenthesis show the design discharge of a 5-year and 10-year frequency flood respectively.

FIG. II11(3/3) DISTRIBUTION OF DESIGN DISCHARGE(9-CHANNELS IN KEC. TUGU AREA)

SECTOR X

RIPARIAN STRUCTURE DESIGN

Table 1 WORK QUANTITY OF PUMPING STATION

Item	Unit	Bandarharjo West P1 (Q=0.78m3/s)	Asin River Basin P2 (Q=5.70m3/s)	Bandarharjo East P3 (Q=2.00m3/s)
I. Civil Work				
1. Preparatory Works	L.S.	1	1	1
2. Excavation	m3	972	2,690	1,400
3. Embankment	m3	55	542	559
4. Backfilling	m3	522	1,173	623
5. Foundation Pile (ø0.5m)	m	512	990	776
6. Conc. Sheet Pile (L=4.0m)	m2	23	126	108
7. Reiforced Concrete	m3	414	1,027	680
8. Leveling Concrete	m3	20	57	36
9. Concrete Block (t=0.5m)	m2	-	160	100
10. Building Works	L.S.	1	1	1
11. Miscellaneous	L.S.	1	1	1
II. Mechanical & Electrical Works	L.S.	1	1	1

Table 2 WORK QUANTITY OF GATE STRUCTURE

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Baru River
I. Civil Work					
1. Preparatory Works	L.S.	1	1	1	1
2. Excavation	m3	389	776	544	212
3. Backfilling	m3	188	138	261	88
4. Foundation Pile (ø0.5m)	m	488	748	360	288
5. Conc. Sheet Pile (L=4.0m)	m2	52	189	66	66
6. Reiforced Concrete	m3	104	367	122	108
7. Leveling Concrete	m3	15	43	18	15
8. Concrete Block (t=0.5m)	m2	100	400	100	50
9. Miscellaneous	L.S.	1	1	1	1
II. Mechanical & Electrical Works	L.S.	1	1	1	1

Table 3 WORK QUANTITY OF RETARDING POND

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Remarks
1. Preparatory Works	L.S.	1	1	1	
2. Excavation	m3	20,160	75,660	15,200	
3. Drain Ditch	m	488	857	480	Table 9
4. Overflow Section	L.S.	1	1	1	Table 6
5. Revetment (Type-F)	m2	1,374	3,342	-	Table 8
6. Rtaining Wall	m	-	-	500	Table 10
7. Miscellaneous	L.S.	1	1	1	

Table 4 WORK QUANTITY OF ROAD BRIDGE

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	2440	
(2)	Back Filling	m3	2110	
(3)	Reinforced Concrete	m3	297	
(4)	PC Girder (l=20.0m)	p.c.	5	
(5)	PC Pile (ø0.5m)	m	480	
(6)	Pavement	m2	120	
(7)	Handrail	m	40	

Table 5 WORK QUANTITY OF OVERFLOW SECTION

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Remarks
1. Excavation	m3	237	505	135	
2. Revetment (Type-E)	m2	75	568	-	Table 8
3. Reinforced Concrete	m3	41	185	135	
4. Base Concrete	m3	7	31	66	
5. Gabion Mattress	m3	196	320	-	
6. Bar Screen	m	17	77	41	
7. Operation Bridge	m2	26	116	-	Table 11
8. RC Slab Bridge	m2	-	-	328	Table 12

Table 6 WORK QUANTITY OF OPEN CHANNEL

(for 10m)

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Semarang River	Baru River
1. Open Channel (Type-A)						
(1) Excavation	m3	-	-	-	326	-
(2) Embankment	m3	-	-	-	27	-
(3) Sodding	m2	-	-	-	28	-
2. Open Channel (Type-D)						
(1) Excavation	m3	198	300	210	483	227
(2) Back Filling	m3	134	206	143	294	143
(3) Stone Masonry	m3	63	94	67	113	92
(4) Log Pile	p.c.	40	40	40	40	40
(5) Base Concrete	m3	6	-	6	-	-
3. Open Channel (Type-F)						
(1) Excavation	m3	-	-	-	84	-
4. Open Channel (Type-G)						
(1) Excavation	m3	-	-	-	-	226
(2) Back Filling	m3	-	-	-	-	130
(3) Stone Masonry	m3	-	-	-	-	50
(4) Reinforced Concrete	m3	-	-	-	-	34
(5) Base Concrete	m3	-	-	-	-	16
(6) Concrete Sheet Pile	m2	-	-	-	-	40
(7) Log Pile	p.c.	-	-	-	-	40

Table 7 WORK QUANTITY OF REVETMENT

Revetment (Type D)

(for 100m2)

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	68	
(2)	Back Filling	m3	20	
(3)	Reinforced Concrete	m3	6	
(4)	Log Pile (ø0.2m)	p.c.	8	
(5)	Cobble Stone Pitching	m3	20	
(6)	Gravel	m3	21	

Revetment (Type E)

(for 100m2)

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	68	
(2)	Back Filling	m3	20	
(3)	Reinforced Concrete	m3	6	
(4)	Conc. Sheet Pile (t=0.2m)	m2	50	
(5)	Cobble Stone Pitching	m3	20	
(6)	Gravel	m3	21	

Revetment (Type F)

(for 100m2)

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	86	
(2)	Back Filling	m3	13	
(3)	Reinforced Concrete	m3	5	
(4)	Conc. Sheet Pile (t=0.2m)	m2	73	
(5)	Cobble Stone Pitching	m3	30	
(6)	Gravel	m3	38	

Table 8 WORK QUANTITY OF DRAIN DITCH

(for 100m)

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	161	
(2)	Back Filling	m3	63	
(3)	Stone Masonry	m3	44	
(4)	Leveling Concrete	m3	7	
(5)	Gravel	m3	7	

Table 9 WORK QUANTITY OF RETAINING WALL

(for 10m)

	Item	Unit	Quantity	Remarks
(1)	Excavation (common 2)	m3	140	
(2)	Back Filling	m3	86	
(3)	Stone Masonry	m3	54	
(4)	Conc. Sheet Pile (t=0.2m)	m2	40	
(5)	Log Pile (ø0.2m, l=4.0m)	p.c.	20	

Table 10 WORK QUANTITY OF OPERATION BRIDGE

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Remarks
1. Steel Girder (h=0.25m)	m	34	154	-	
2. Checked Steel Plate	m2	26	116	-	
3. Handrail (h=1.0m)	m	34	154	-	
4. Reinforced Concrete	m3	21	84	-	
5. Log Pile (ø0.2m)	p.c.	16	64	-	
6. Miscellaneous	L.S.	1	1	-	
7. Installation	L.S.	1	1	-	

Table 11 WORK QUANTITY OF RC SLAB BRIDGE

Item	Unit	Bandarharjo West	Asin River Basin	Bandarharjo East	Remarks
1. Reinforced Concrete	m3	-	-	205	
2. Log Pile (ø0.2m)	p.c.	-	-	216	
3. Handrail (h=1.0m)	m	-	-	82	

Table 12(1/2) DREDGING VOLUME OF CHANNEL IMPROVEMENT

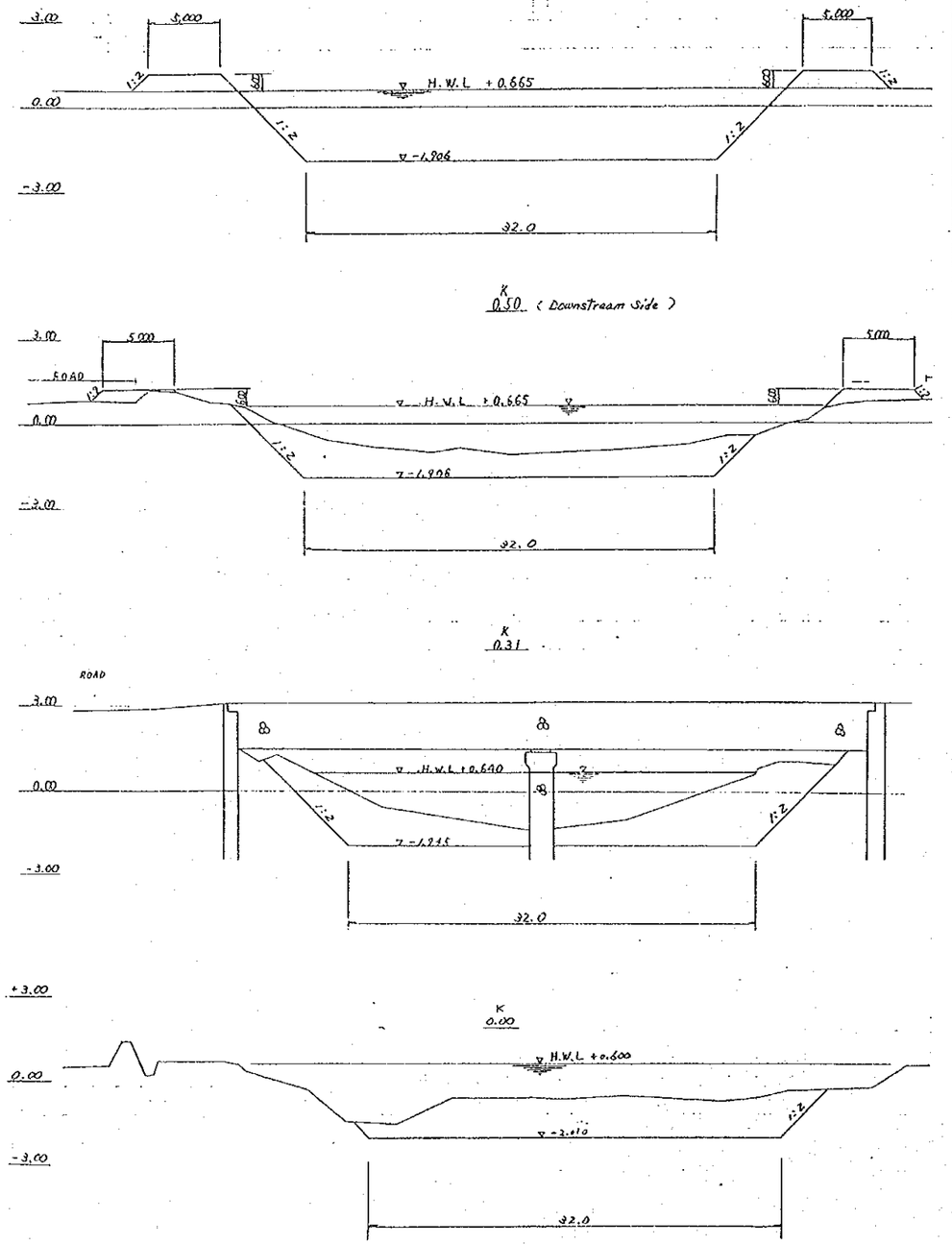
Semarang River

Station	Distance	Excavation			Filling			Sodding		
No.	(m)	Area(m²)	Ave.(m²)	Volume(m3)	Area(m²)	Avg(m²)	Volume(m3)	Slope(m)	Avg(m)	Area(m²)
-k0.10		36.4								
k0.00	100.0	36.4	36.4	3640.0	0.0	0.0	0.0	0.0	0.0	0.0
k0.31	310.0	45.0	40.7	12617.0	0.0	0.0	0.0	0.0	0.0	0.0
k0.50(D)	190.0	33.7	39.3	7467.0	4.0	2.0	380.0	3.2	1.6	304.0
k0.50(U)	0.0	87.7	60.7	0.0	7.4	5.7	0.0	5.7	4.4	0.0
k1.00(D)	500.0	59.5	73.6	36800.0	7.4	7.4	3700.0	6.0	5.8	2900.0
k1.00(U)	0.0	14.4	24.0	0.0	6.1	5.1	0.0	6.1	4.7	0.0
k1.26	260.0	17.1	15.8	4108.0	0.0	3.1	806.0	0.0	3.1	806.0
k1.50	240.0	7.4	12.2	2928.0	4.2	2.1	504.0	4.3	2.2	528.0
k1.74	240.0	13.0	10.2	2448.0	0.0	2.1	504.0	0.0	2.2	528.0
k2.00	260.0	19.8	16.4	4264.0	1.4	0.7	182.0	5.2	2.6	676.0
k2.36	360.0	13.0	16.4	5904.0	0.0	0.7	252.0	0.0	2.6	936.0
k2.50	140.0	10.1	11.5	1610.0	8.3	4.2	588.0	2.8	1.4	196.0
k2.85	350.0	13.7	11.9	4165.0	0.0	4.2	1470.0	0.0	1.4	490.0
k3.11	260.0	11.7	12.7	3302.0	0.0	0.0	0.0	0.0	0.0	0.0
k3.45	340.0	17.8	14.8	5032.0	0.0	0.0	0.0	0.0	0.0	0.0
k3.93	480.0	14.8	16.3	7824.0	0.0	0.0	0.0	0.0	0.0	0.0
k4.34	410.0	9.2	12.0	4920.0	0.0	0.0	0.0	0.0	0.0	0.0
k4.47	130.0	6.6	7.9	1027.0	0.0	0.0	0.0	0.0	0.0	0.0
k5.00	530.0	8.0	7.3	3869.0	0.0	0.0	0.0	0.0	0.0	0.0
k5.51	510.0	0.3	4.1	2091.0	0.0	0.0	0.0	0.0	0.0	0.0
k5.97	460.0	1.0	0.6	276.0	0.0	0.0	0.0	0.0	0.0	0.0
k6.39	420.0	8.6	4.8	2016.0	0.0	0.0	0.0	0.0	0.0	0.0
k6.88	490.0	5.7	7.2	3528.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	6880.0			119836.0			8386.0			7364.0

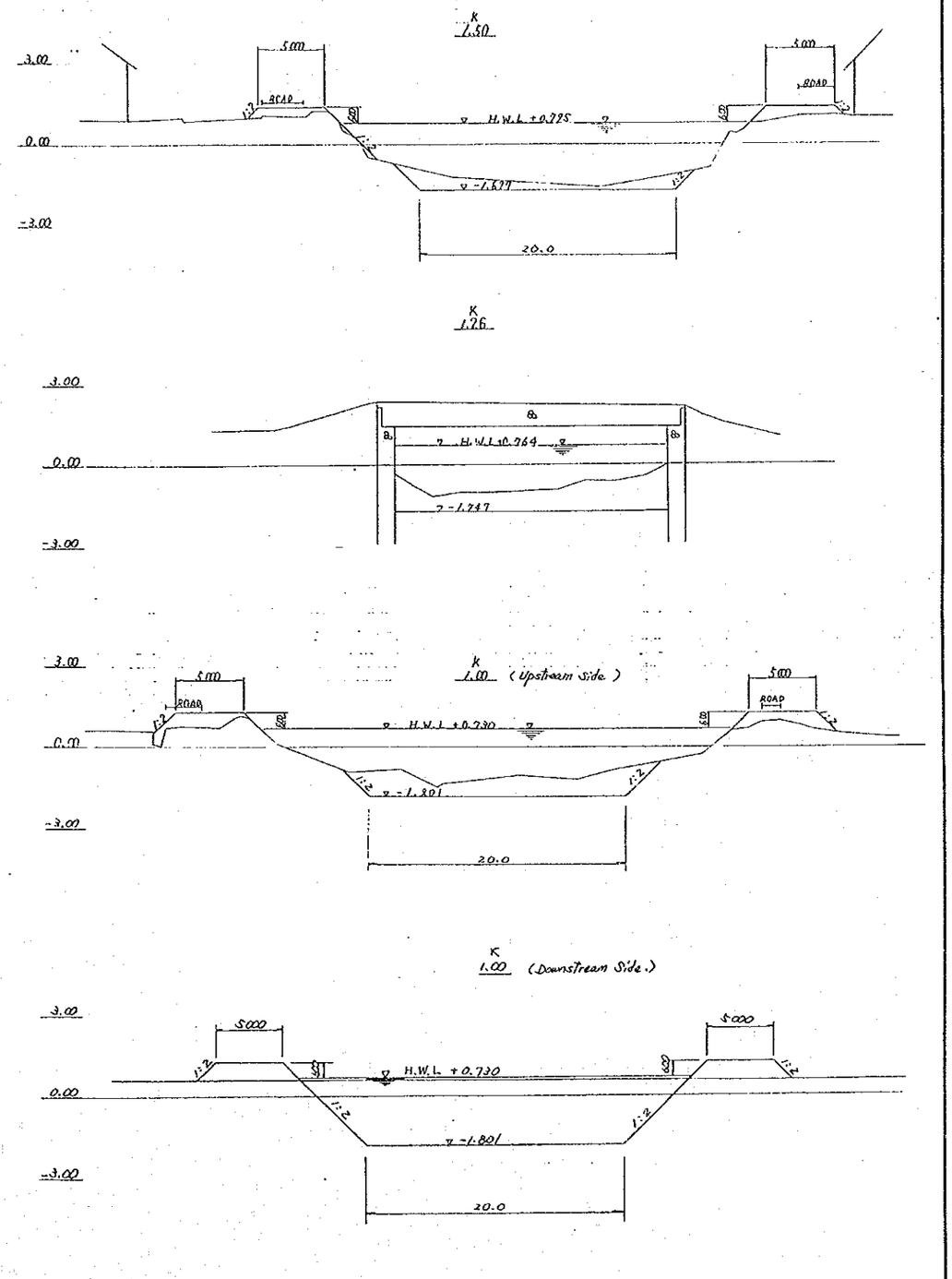
Table 12(2/2) DREDGING VOLUME OF CHANNEL IMPROVEMENT

Asin River

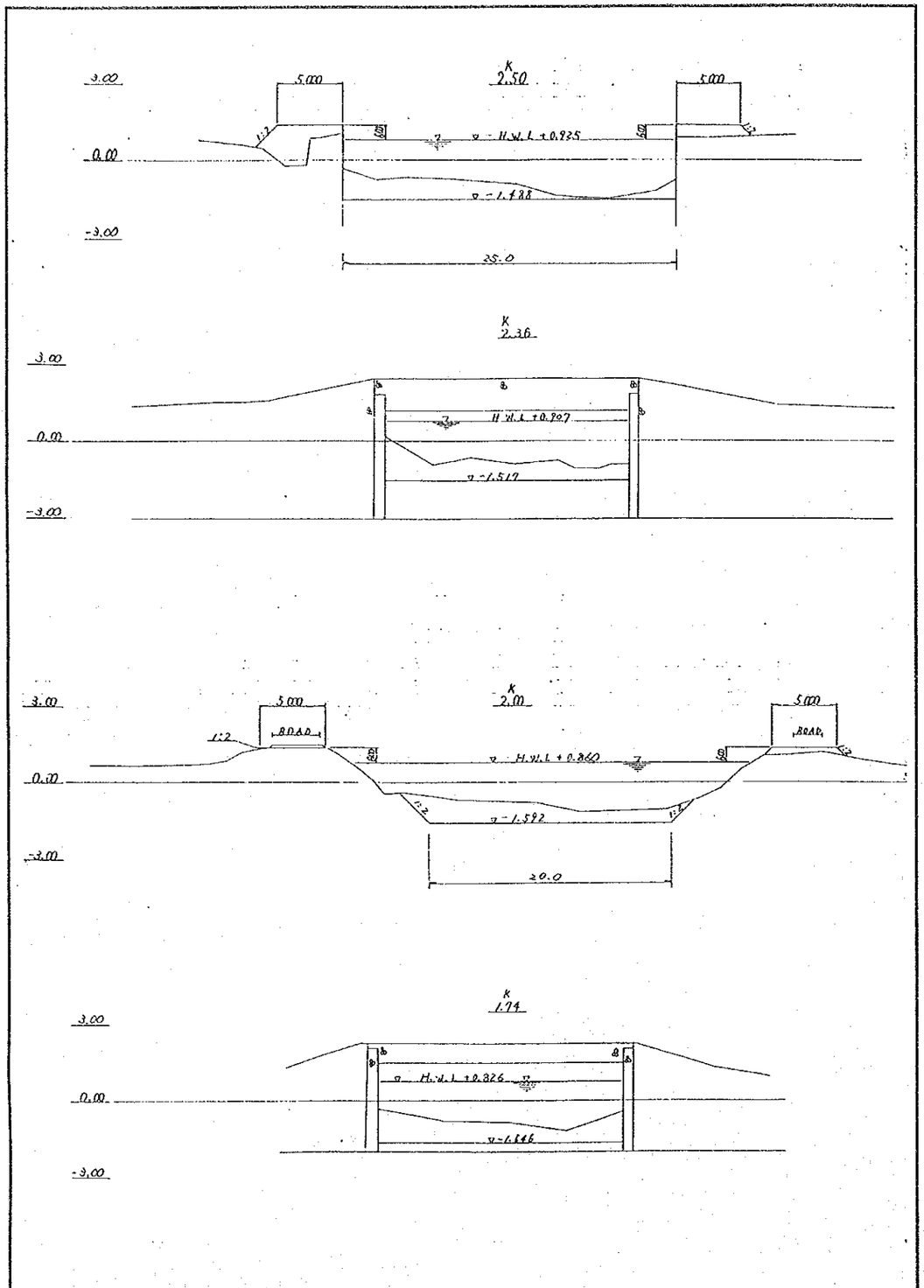
Station	Distance	Excavation			Filling			Sodding		
No.	(m)	Area(m²)	Ave.(m²)	Volume(m3)	Area(m²)	Avg(m²)	Volume(m3)	Slope(m)	Avg(m)	Area(m²)
k0.00		32.4			0.0					
k0.50	500.0	32.4	32.4	16200.0	0.0	0.0	0.0	0.0	0.0	0.0
k1.00	500.0	20.1	26.3	13150.0	0.0	0.0	0.0	0.0	0.0	0.0
k1.20	200.0	44.0	32.1	6420.0	0.0	0.0	0.0	0.0	0.0	0.0
k1.30	100.0	44.0	44.0	4400.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1300.0			40170.0			0.0			0.0



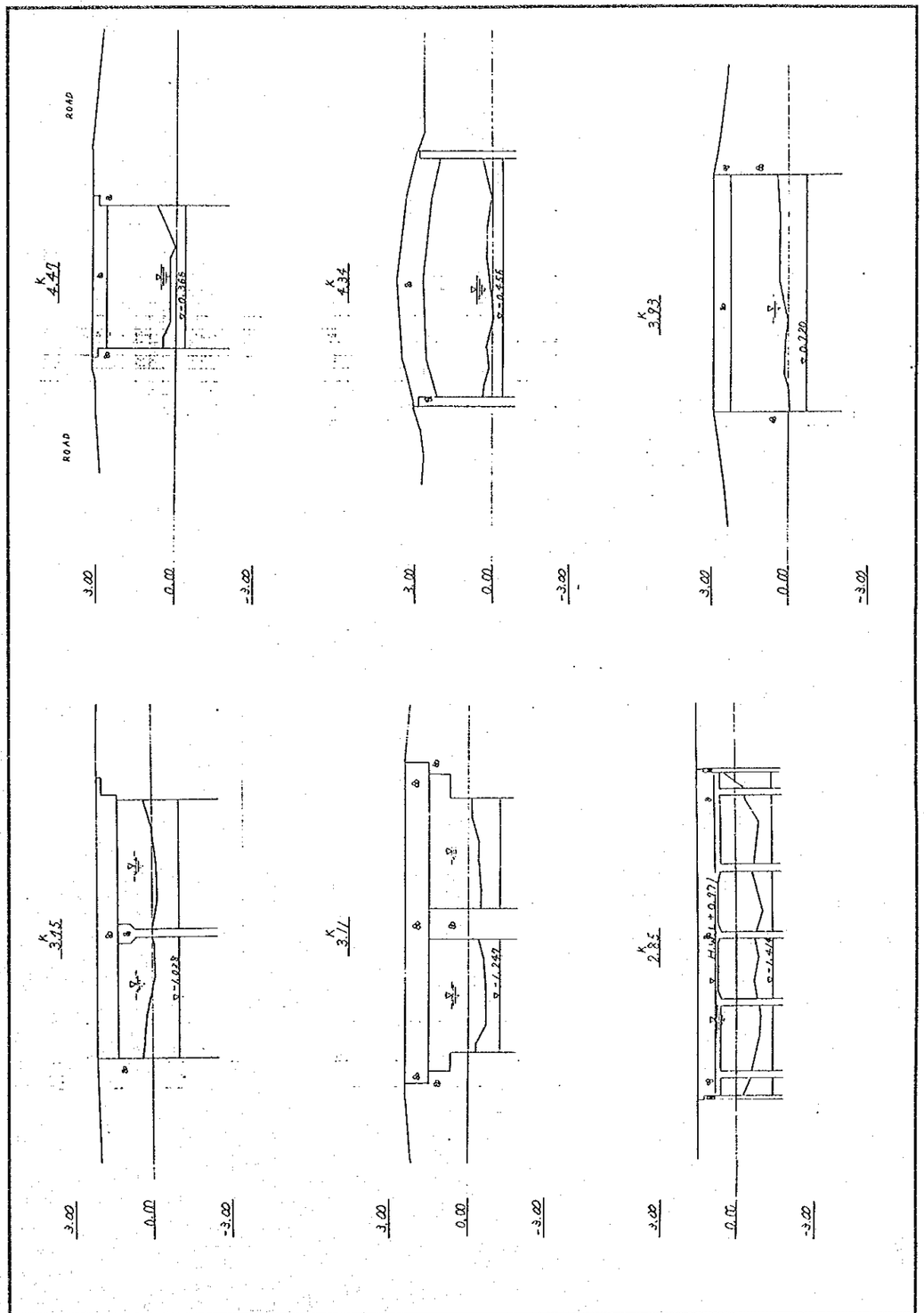
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig.1(1/5) CROSS SECTIONS OF SEMARANG RIVER



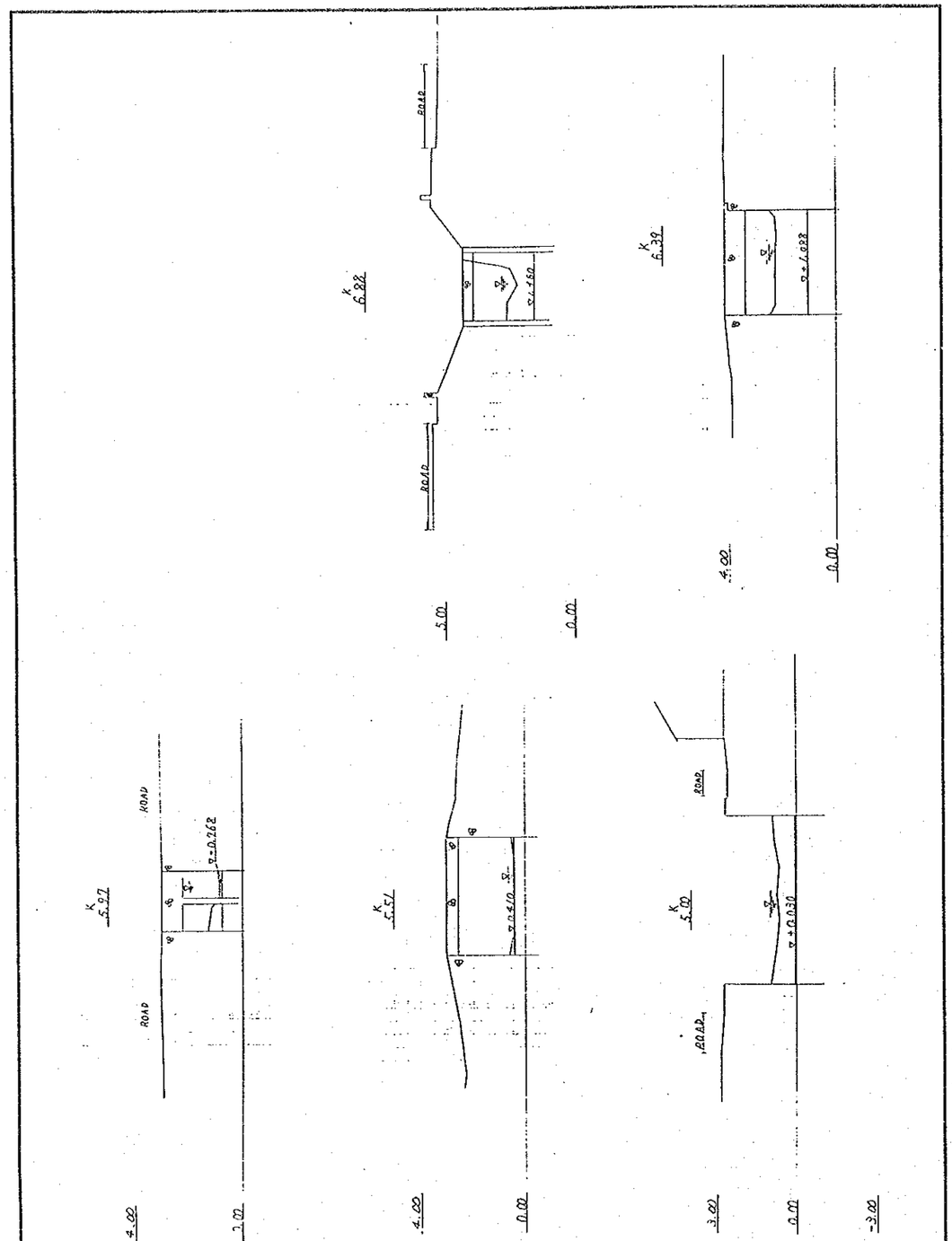
MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig.1(2/5) CROSS SECTIONS OF SEMARANG RIVER



MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig.1(3/5) CROSS SECTIONS OF SEMARANG RIVER

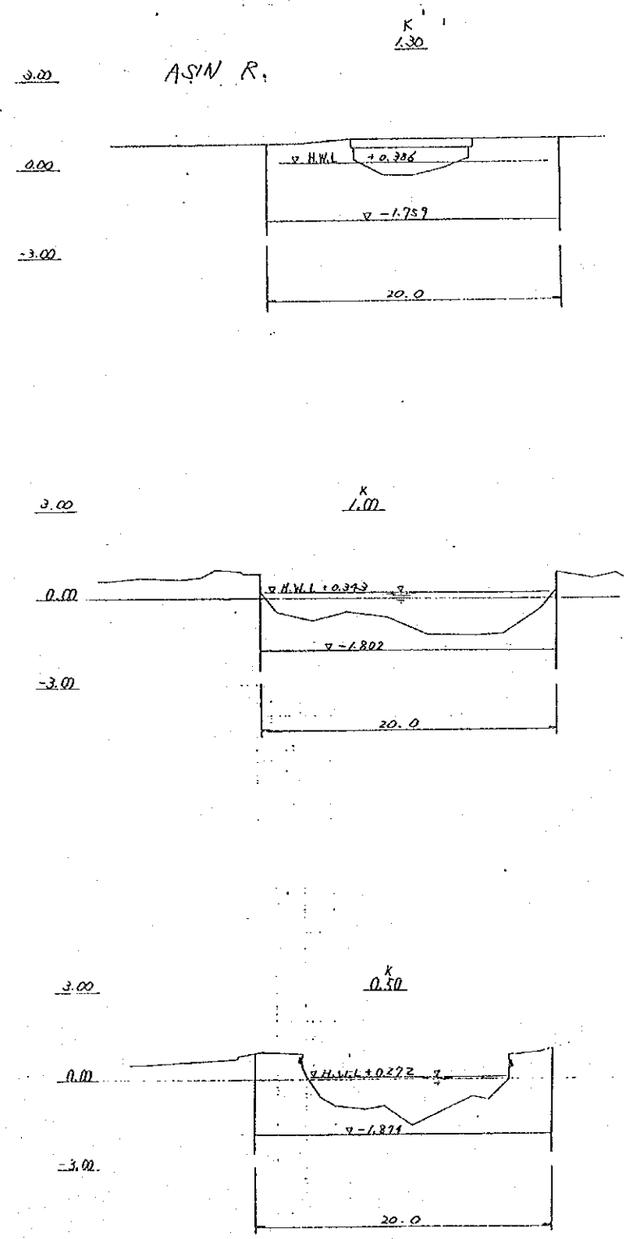


MASTER PLAN ON WATER RESOURCES DEVELOPMENT AND FEASIBILITY STUDY FOR URGENT FLOOD CONTROL AND URBAN DRAINAGE IN SEMARANG CITY AND SUBURBS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig.1(4/5) CROSS SECTIONS OF SEMARANG RIVER



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

Fig.1(5/5)
CROSS SECTIONS OF SEMARANG RIVER



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

Fig.2
CROSS SECTIONS OF ASIN RIVER