

Figure-III-4.10 General plan flood prevention project for Badung River

4.3.2 Mati River

(1) Flow Capacity of Current Condition

1) Calculation Method and Conditions

Based on the topographic survey results, current river flow capacity was calculated by using non-uniform flow method. The conditions for calculation are shown in Table-III-4.5.

Table-III-4.5 Calculation Method and Conditions

Items		Conditions, Contents	Remarks
Calculation	Method	Non-uniform Flow	
Calculation Condition	Section	River Mouth (Downstream) ~Umadui Weir (Upstream)	
	Coefficient of Roughness	n=0.025	Refer to PU existing plan
	Evaluation	Top of the Bank with No Freeboard	
	Cross Section	Topographic Survey Result	

2) Calculation of River Flow Capacity

The result of river flow calculation is shown in Figure-III-4.11. According to this result, minimum flow capacity of current river flow is estimated from 100m³/sec to 130m³/sec, except some section with showing less than 100m³/sec..

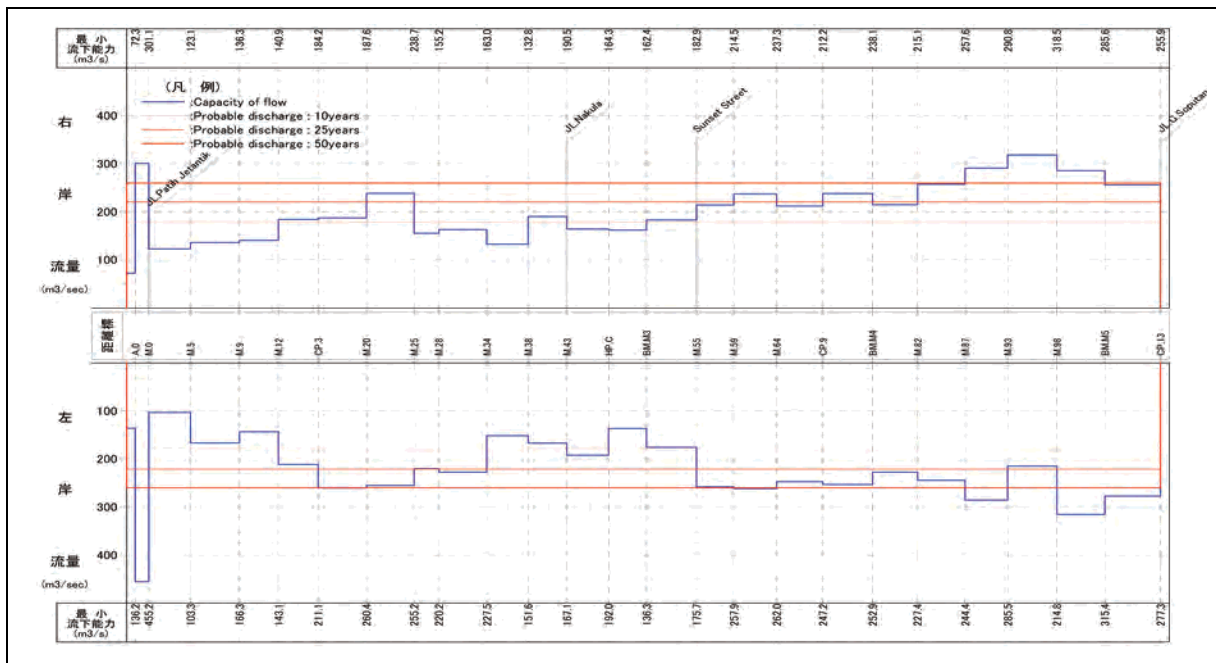


Figure-III-4.11 Calculation Result for Current River Flow Capacity (Mati River)

(2) Design Flood Calculation for Mati River

1) Run-off Calculation Method

As applied for Badung River, Rational formula method was adopted for the Mati River runoff calculation. Taking into consideration of the calculation for retarding basin shown in existing flood control plan prepared by Indonesian Government, design hydrograph was made from rainfall intensity formula and rainfall intensity within arrival time of flood (tc), co-efficient of run-off (f) and river basin. Peak flow shall be calculated by combining each runoff calculation result. For Mati River, backward intensity type hyetograph as shown in top right of Figure-III-4.12 was adopted for the design hyetograph.

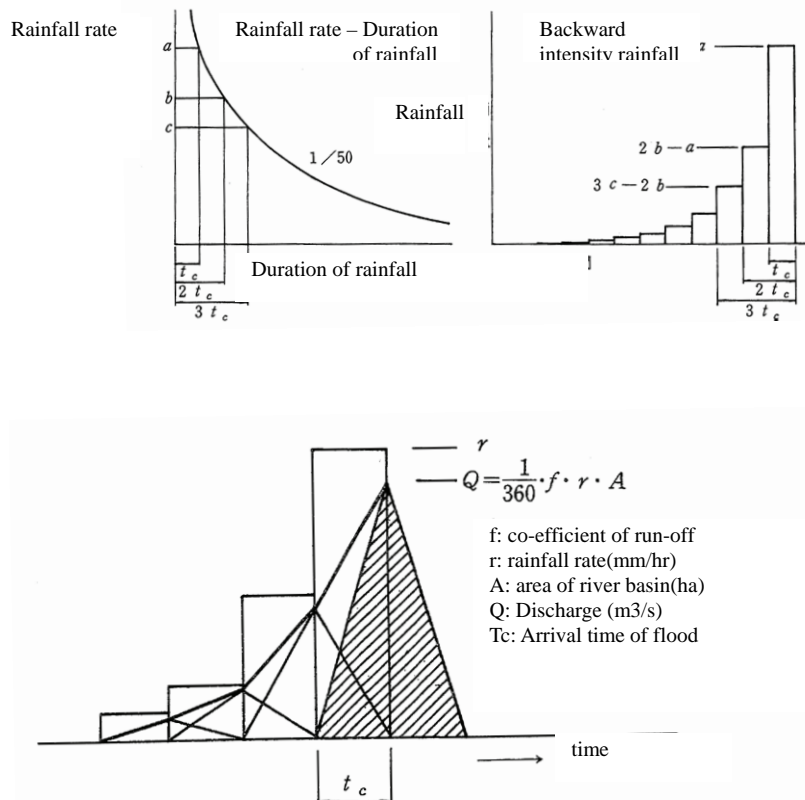


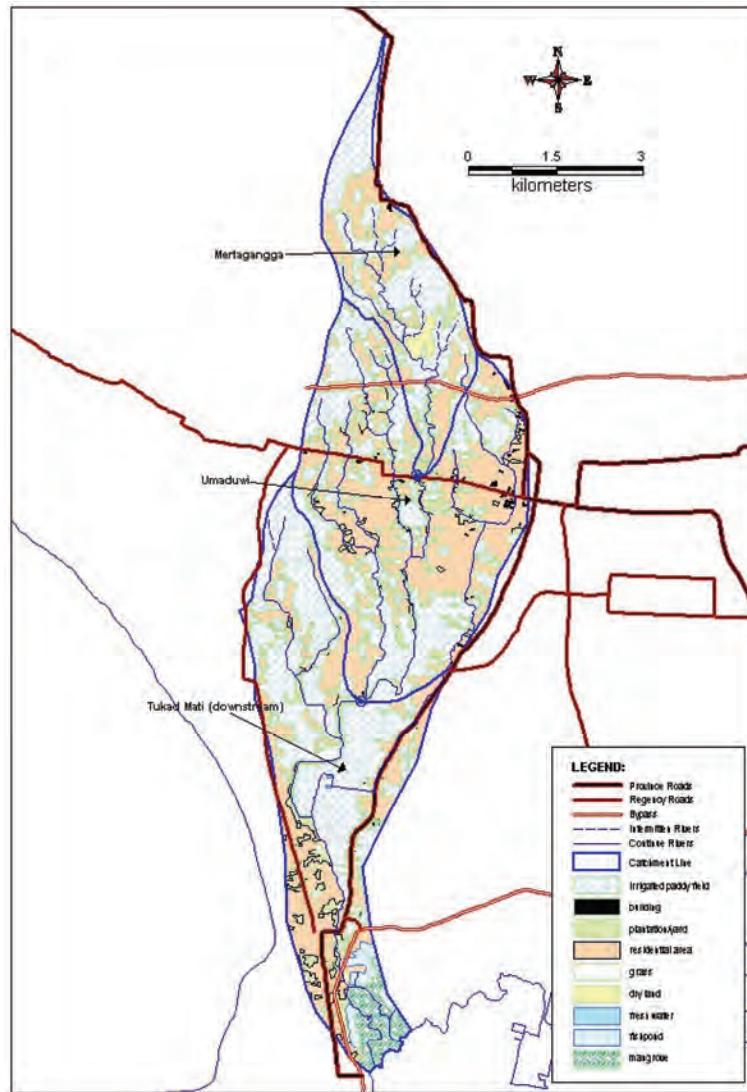
Figure-III-4.12 Hydrograph Calculation Method by Combined Rational Formula

2) Watershed Division and Specifications

Watershed division for the runoff model of Mati River basin is shown in Figure-III-4.13. Land use condition for each divided area is as shown in Table-III-4.6.

Table-III-4.6 Watershed Division and Specifications for Mati River

Item	Land Use	1		2				3				4			
		JL.GATO SUBUROTO		JL.GUNUN,SOPUTAN				Before confluence of Tukad Tube				Tukad Mati			
		a	(%)	b	(%)	c=a+b	(%)	d	(%)	e=c+d	(%)	f	(%)	g=e+f	(%)
High density city area	building	0.01	0.1	0.09	0.5	0.10	0.4	0.03	0.6	0.13	0.4	0.06	0.7	0.19	0.5
General city area	residential area	2.58	34.2	9.21	52.4	11.79	47.0	1.82	38.6	13.61	45.6	3.32	38.7	16.93	44.1
Paddy field	irrigated paddy field	4.51	59.7	7.47	42.5	11.98	47.7	2.47	52.4	14.45	48.5	4.49	52.3	18.94	49.3
A field and a land	bare land														
	bushes														
	dry land	0.24	3.2			0.24	1.0	0.01	0.3	0.25	0.8	0.02	0.3	0.27	0.7
	grass			0.06	0.3	0.06	0.2	0.04	0.8	0.10	0.3	0.07	0.8	0.17	0.4
	plantation/yard	0.21	2.8	0.73	4.2	0.94	3.7	0.34	7.2	1.28	4.3	0.62	7.2	1.90	4.9
Mountain land	forest														
	Σ Ai	7.6	100.0	17.6	100.0	25.1	100.0	4.7	100.0	29.8	100.0	8.6	100.0	38.4	100.0



*Total watershed area 38.4km² was set referring to report “PENGUKURAN PERENCANA TEKNIS TUKAD SUNGI DAN TUKAD MATI KAB.BADUNG/KODYA DENPASAR, 1997/1998 “

Figure-III-4.13 Watershed Division for Mati River Basin

3) Run-off Calculation

Result of run-off calculation for Mati River is as shown in Figure-III-4.14.

		JL.GATO SUBUROTO	JL.GUNUNG AGUNG	JL.GUNUNG SOPUTAN	TK.TEBE	By Pass
Existing	5years	69.4	131.9	143.3	147.5	
	10years	83.9	159.4	173.1	178.3	
	20years	99.0	188.2	204.4	210.4	
	25years	103.9	197.5	214.5	220.9	
	30years	108.9	206.8	224.7	231.3	
	50years	122.4	232.5	252.5	260.0	
100years	142.9	271.5	294.9	303.7		
→		→	→			
Future	5years	70.3	133.5	145.0	151.1	
	10years	84.9	161.3	175.2	182.6	
	20years	100.2	190.4	206.8	215.5	
	25years	105.2	199.9	217.1	226.2	
	30year	110.2	209.3	227.3	236.9	
	50years	123.8	235.3	255.5	266.3	
100years	144.6	274.7	298.4	311.0		

Figure-III-4.14 Discharge for Each Return Period at Base Point in Mati River

Table-III-4.7 List of Discharge for Each Return Period

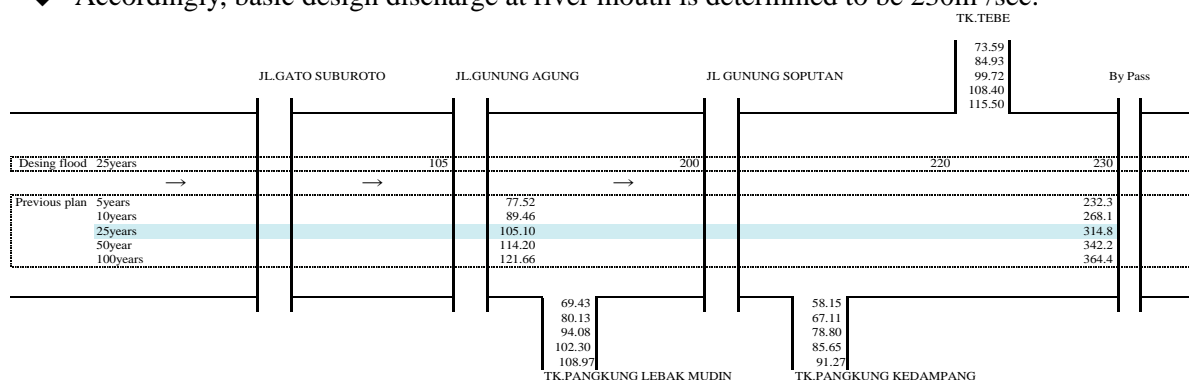
Return period	Site	Catchment area (km ²)	Stream length (km)	Runoff coefficient		Arrival time of food (min)	R24 (mm)	Rainfall rate (mm/hr)	Probable discharge		
				Existing	Future				Existing (m ³ /s)	Future (m ³ /s)	Rate of increase (%)
1/5	1	7.6	5.6	0.83	0.84	30	72.0	39.62	69.43	70.27	
	2	25.1	10.5	0.84	0.85	70	72.0	22.52	131.91	133.48	
	3	29.8	11.9	0.84	0.85	80	72.0	20.60	143.27	144.98	
	4	38.4	15.1	0.83	0.85	110	72.0	16.66	147.53	151.08	
1/10	1	7.6	5.6	0.83	0.84	30	87.0	47.88	83.89	84.90	
	2	25.1	10.5	0.84	0.85	70	87.0	27.22	159.39	161.29	
	3	29.8	11.9	0.84	0.85	80	87.0	24.90	173.12	175.18	
	4	38.4	15.1	0.83	0.85	110	87.0	20.14	178.26	182.56	
1/20	1	7.6	5.6	0.83	0.84	30	102.7	56.52	99.03	100.23	
	2	25.1	10.5	0.84	0.85	70	102.7	32.13	188.16	190.40	
	3	29.8	11.9	0.84	0.85	80	102.7	29.39	204.36	206.80	
	4	38.4	15.1	0.83	0.85	110	102.7	23.77	210.43	215.50	
1/25	1	7.6	5.6	0.83	0.84	30	107.8	59.32	103.95	105.20	1.2
	2	25.1	10.5	0.84	0.85	70	107.8	33.72	197.50	199.85	1.2
	3	29.8	11.9	0.84	0.85	80	107.8	30.85	214.51	217.06	1.2
	4	38.4	15.1	0.83	0.85	110	107.8	24.95	220.88	226.20	2.4
1/30	1	7.6	5.6	0.83	0.84	30	112.9	62.13	108.87	110.18	
	2	25.1	10.5	0.84	0.85	70	112.9	35.32	206.84	209.31	
	3	29.8	11.9	0.84	0.85	80	112.9	32.31	224.66	227.33	
	4	38.4	15.1	0.83	0.85	110	112.9	26.13	231.33	236.91	
1/50	1	7.6	5.6	0.83	0.84	30	126.9	69.84	122.37	123.84	
	2	25.1	10.5	0.84	0.85	70	126.9	39.70	232.49	235.26	
	3	29.8	11.9	0.84	0.85	80	126.9	36.32	252.52	255.52	
	4	38.4	15.1	0.83	0.85	110	126.9	29.37	260.02	266.28	
1/100	1	7.6	5.6	0.83	0.84	30	148.2	81.56	142.91	144.63	
	2	25.1	10.5	0.84	0.85	70	148.2	46.36	271.52	274.75	
	3	29.8	11.9	0.84	0.85	80	148.2	42.41	294.90	298.41	
	4	38.4	15.1	0.83	0.85	110	148.2	34.30	303.66	310.98	

From the Table-III-4.7, discharge with 25 years return period at river mouth is 220.9m³/sec on the basis of current land use condition, and 226.2m³/sec with increasing 5.3m³/sec due to developing ratio with 80% of urbanization for watershed area.

4) Basic Design Flood for Mati River

Based on the calculation result as shown in Figure-III-4.15, basic design flood for Mati River should be determined to 230m³/sec. Comment for the calculation results for basic design flood is summarized as follows:

- ◆ Basic design discharge for urbanization of 80 % shall be 226.2m³/sec.
- ◆ Calculation result 220.9 m³/sec for current land use was very different compared with the existing design discharge 314.8m³/sec formulated by Indonesian Government. Comparing specific discharge per km² between them, existing specific discharge 8.2m³/sec/km² is about 1.4 times against JICA TEAM calculation 5.8m³/sec/km². Specific discharge for Badung River is 6.2m³/sec/km². From this point of view, planned existing discharge is seemed to be an over-estimated value.
- ◆ Accordingly, basic design discharge at river mouth is determined to be 230m³/sec.



*Previous Plan : PENGUKURAN DAN PERENCANAAN TEKNIS TUKAD SUNGI DAN TUKAD MATI KAB.BADUNG/KODYA DENPASAR ,1997/1998

Figure-III-4.15 Distribution of Basic Design Discharge (Mati River)