Fig.I.2-1 Period of Record at Stream Gaging Stations

Station NO.	Location of Station	Period of Record
S1	Tumalalud, Mambusao	
S2	Rallano, Maayon	
S3	Sto. Niño, Cuartero	
S4	Mambusao Weir and Canal	
S5	Aglinab, Tapaz	
S6	Sto. Niño, Cuartero (New)	
S7	Panitan	
S8	Dumalag	
S9	Dumarao	
S10	Salocon	
S11	Pontevedra	
S12	Sigma	

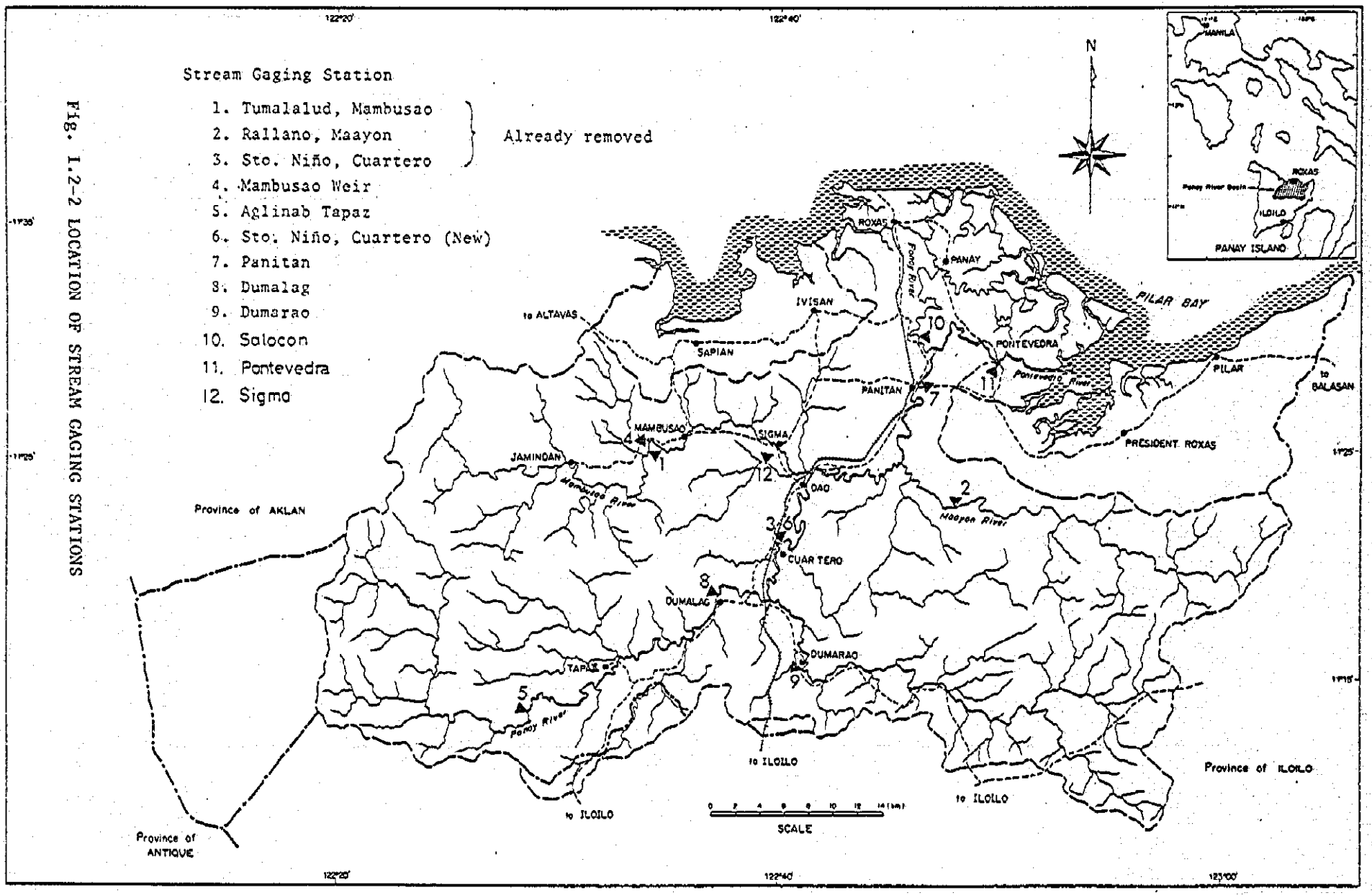


Fig. I.2-2 LOCATION OF STREAM GAGING STATIONS

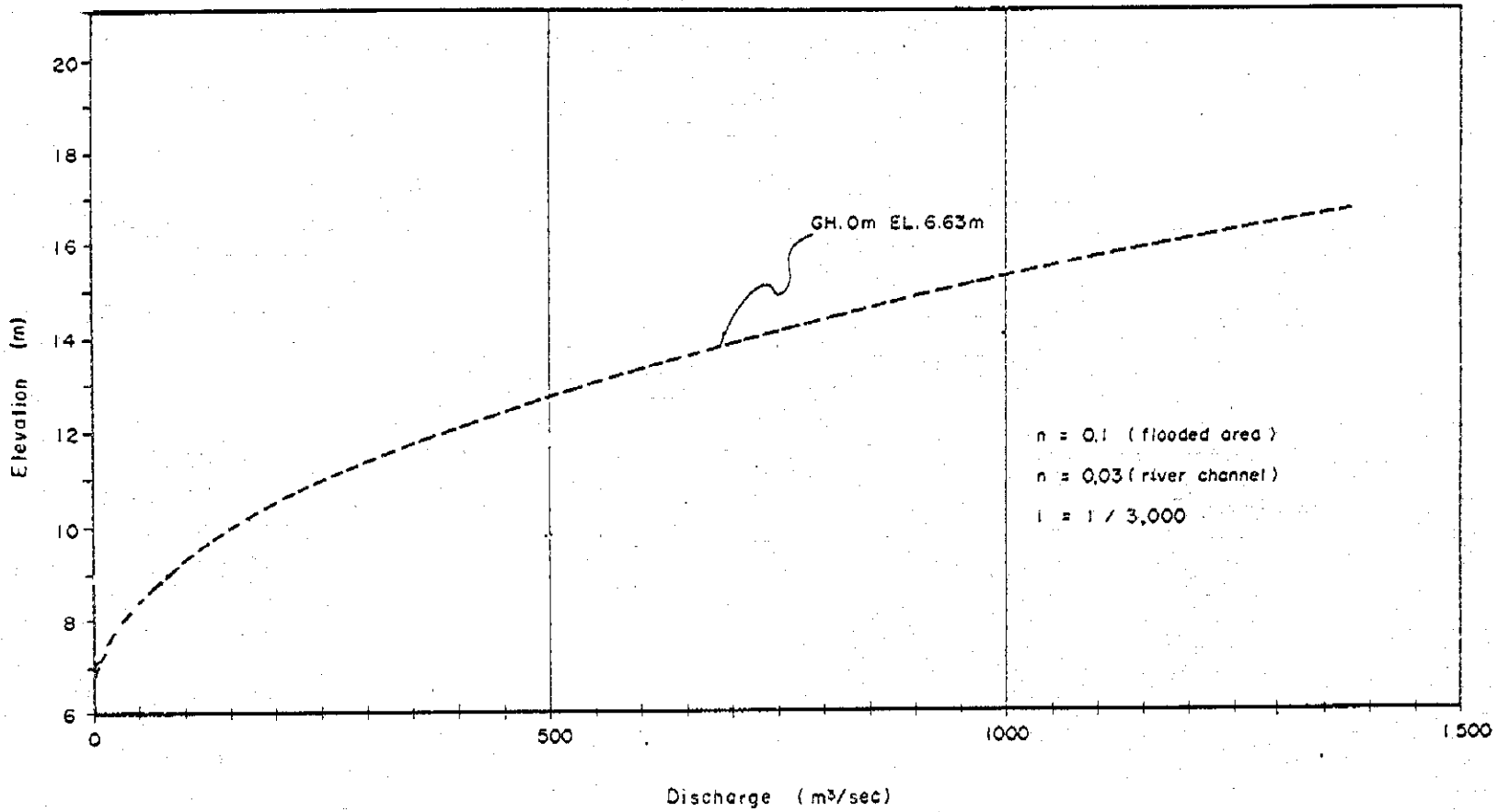
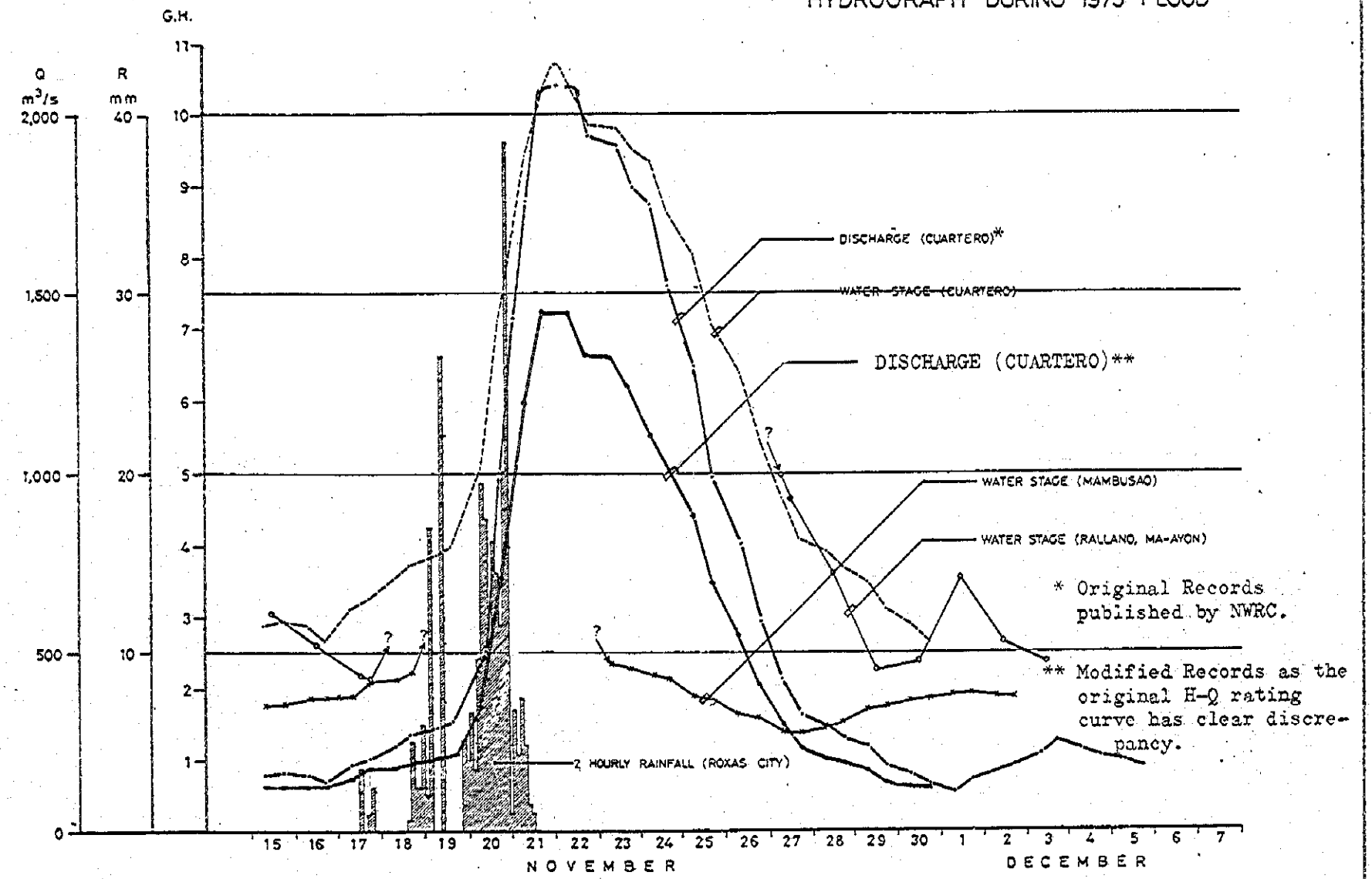


Fig. I. 2 - 3 RATING CURVE AT CUARTERO GAGLNG STATION

Fig. I.2-4
HYDROGRAPH DURING 1973 FLOOD



* Original Records published by NWRC.

** Modified Records as the original H-Q rating curve has clear discrepancy.

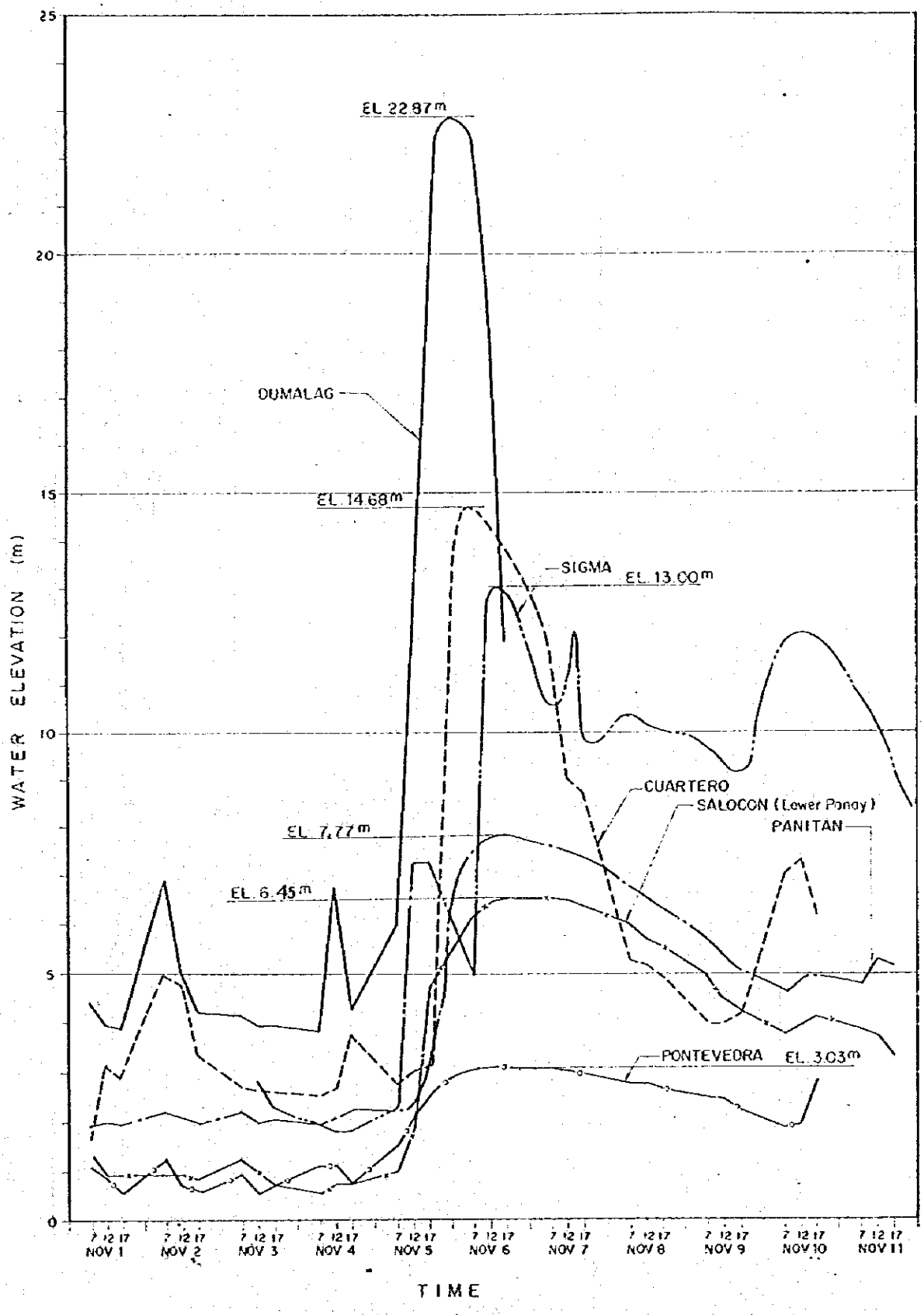


Fig. 1.2-5 WATER STAGE HYDROGRAPH AT GAGING STATION AT THE TIME OF NOV. 1984 FLOOD

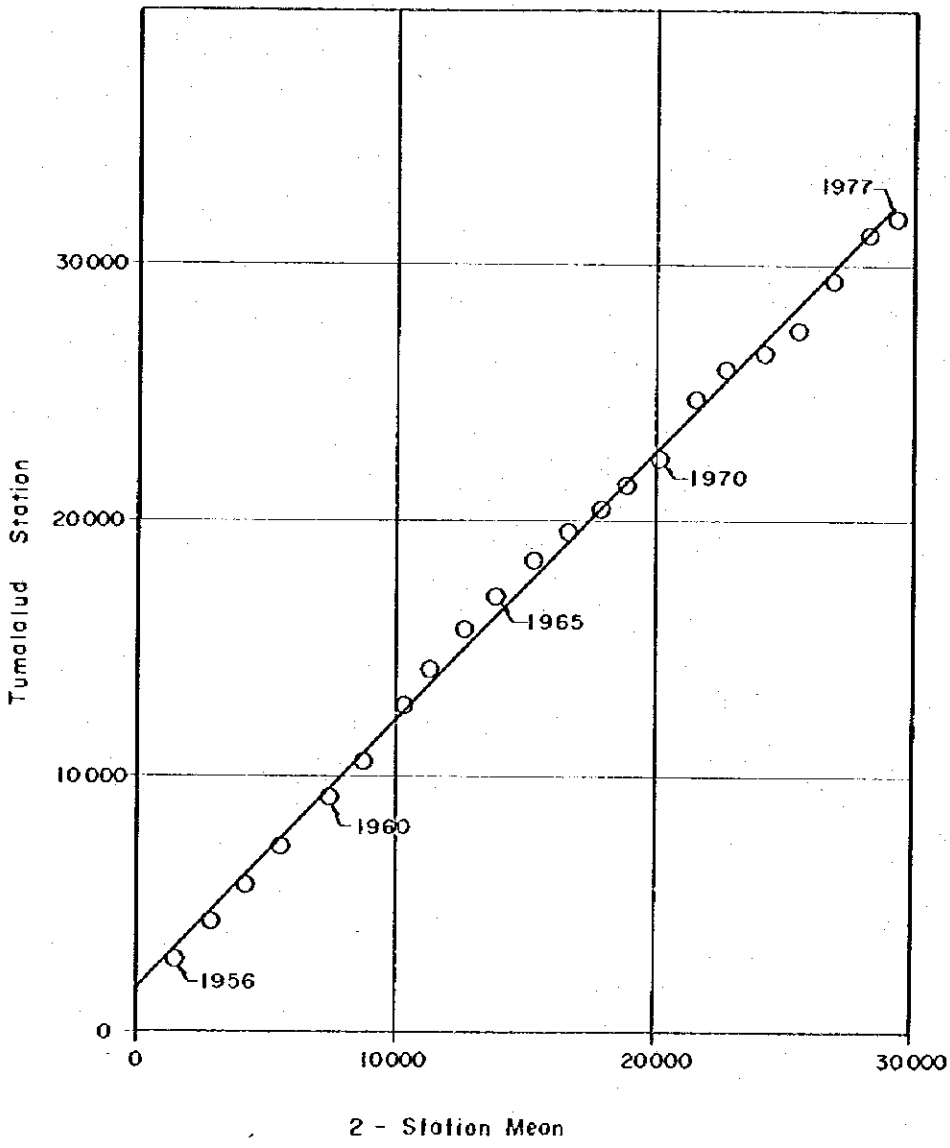


Fig.12-6 DOUBLE MASS CURVE OF ANNUAL RUNOFF DEPTH (1)

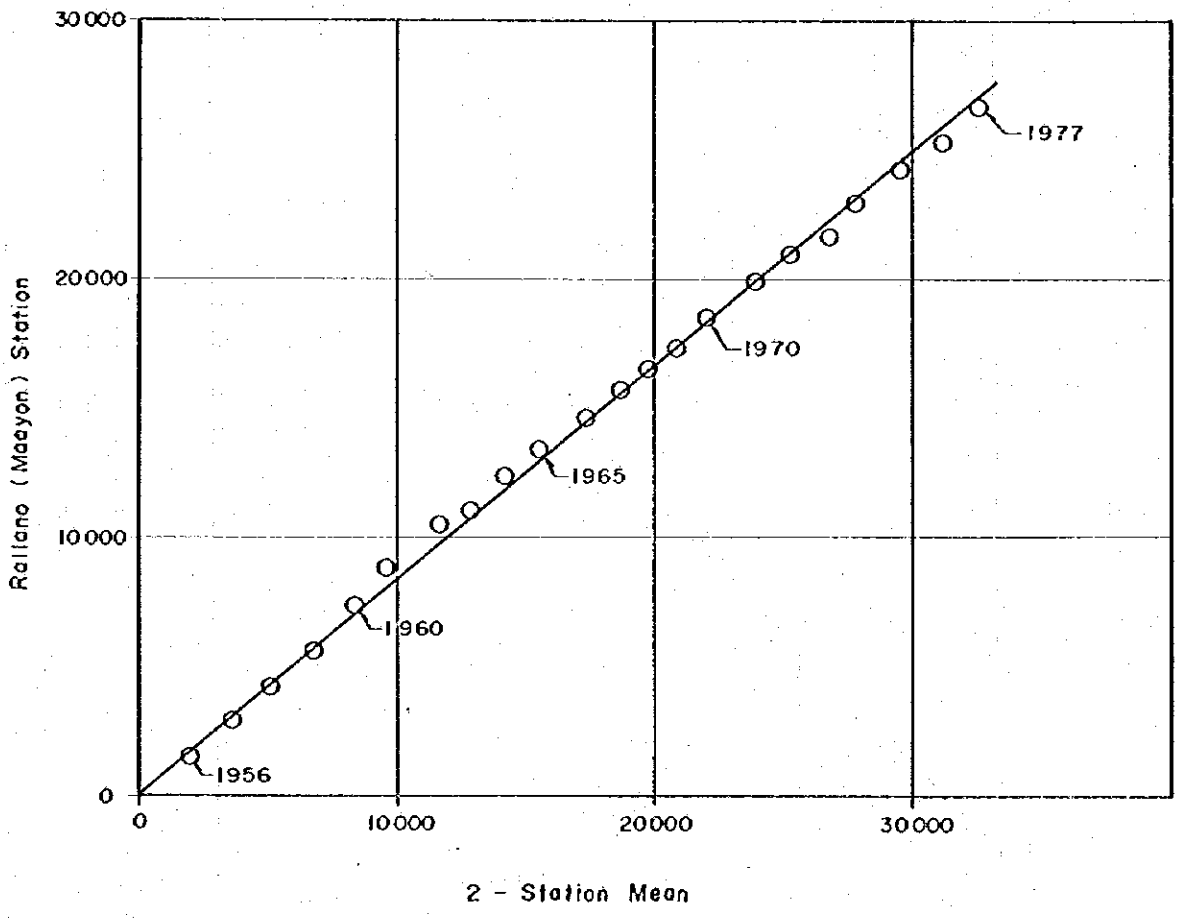


Fig. I 2-7 DOUBLE MASS CURVE OF ANNUAL RUNOFF DEPTH (2)

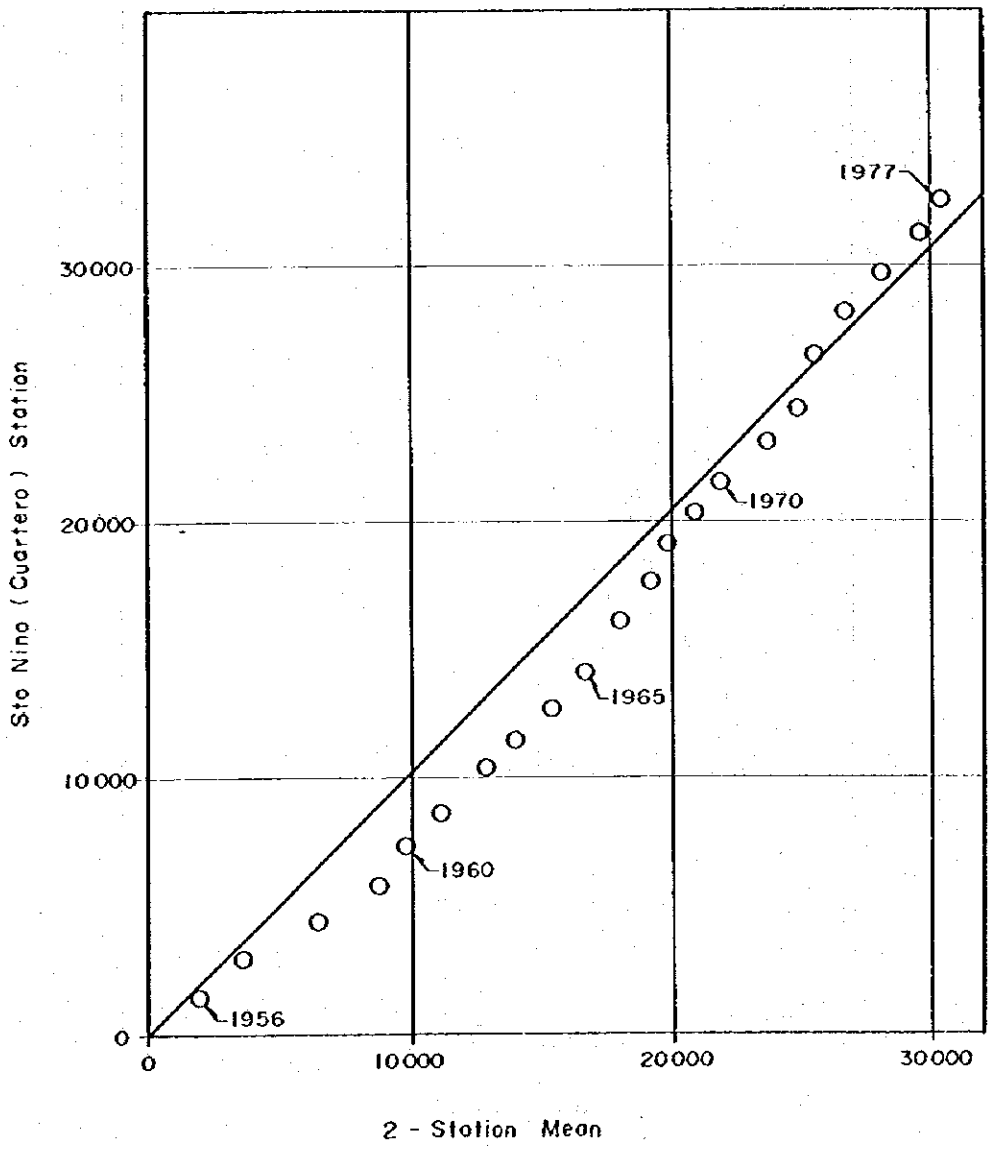


Fig.1.2-8 DOUBLE MASS CURVE OF ANNUAL RUNOFF DEPTH (3)

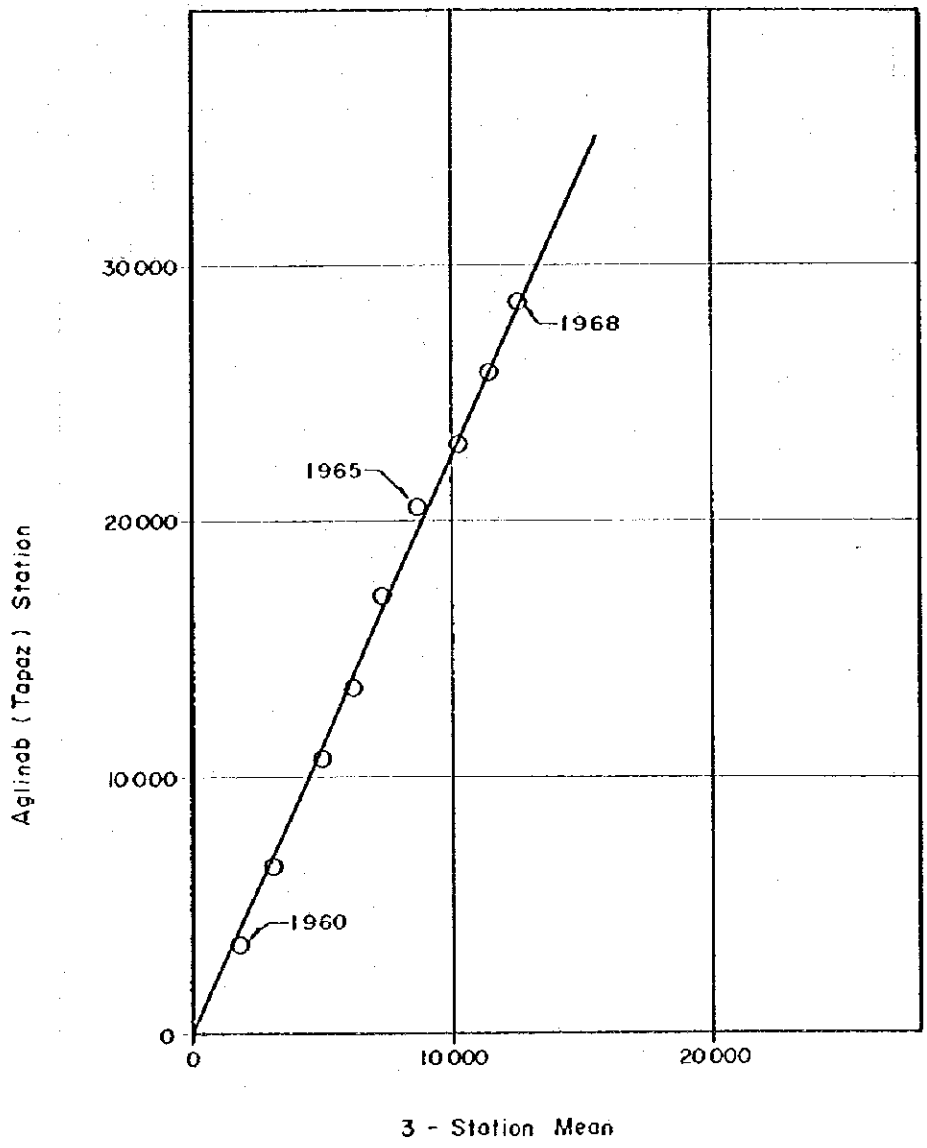


Fig.12-9 DOUBLE MASS CURVE OF ANNUAL RUNOFF DEPTH (4)

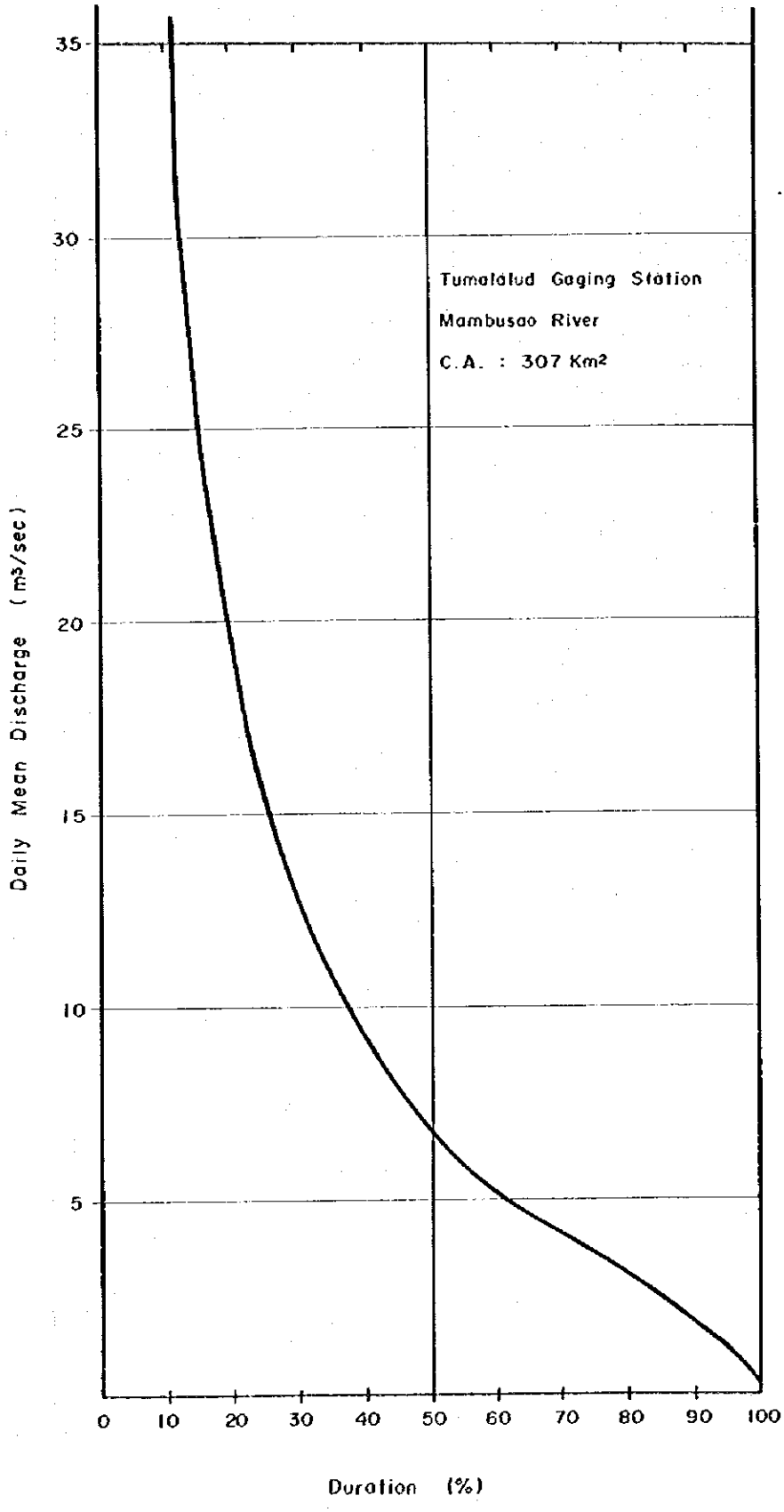


Fig. I.2-10 DURATION CURVE AT TUMALALUD (MAMBUSAO)

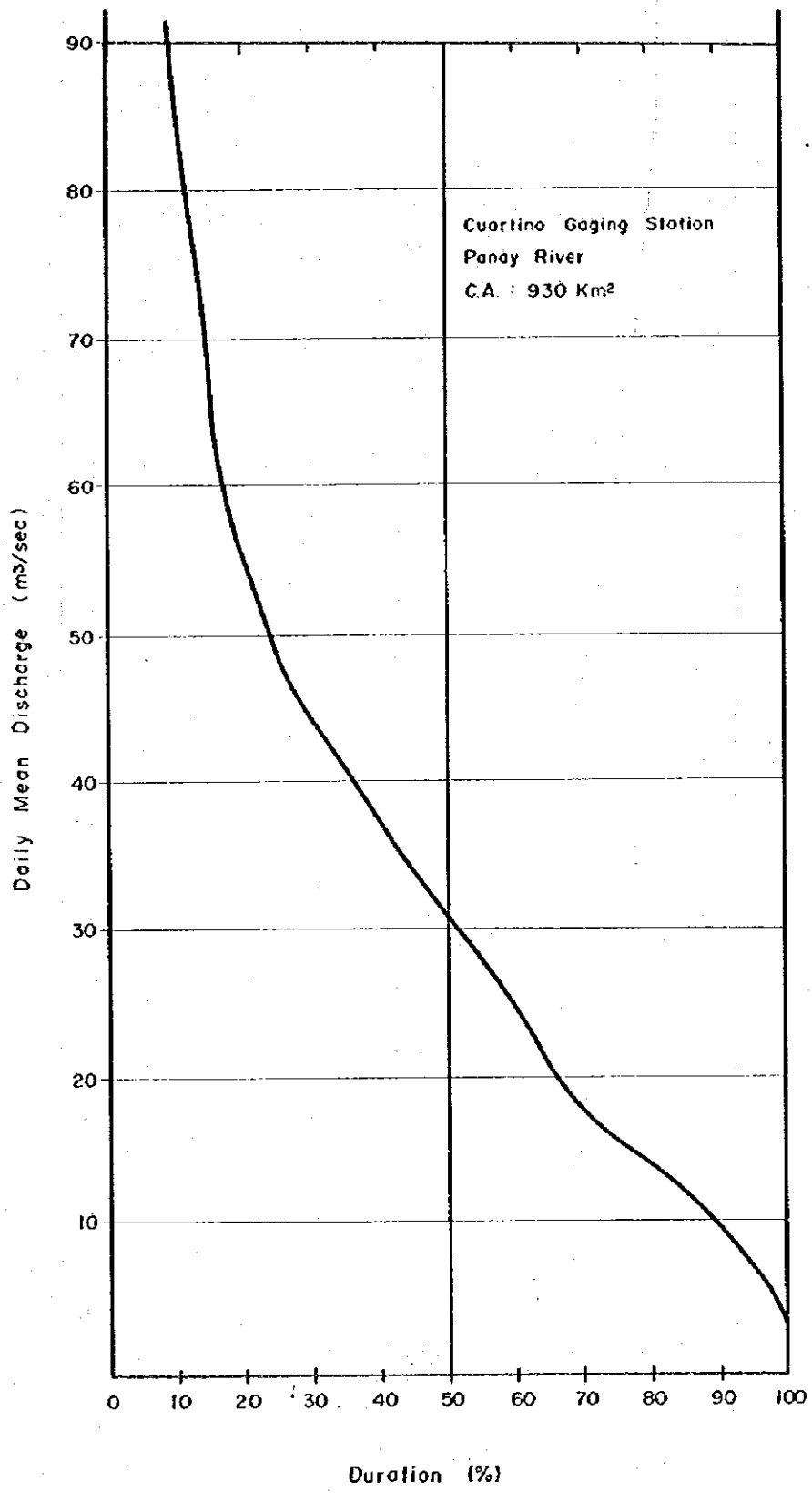


Fig. 1.2 - 11 DURATION CURVE AT CUARTERO

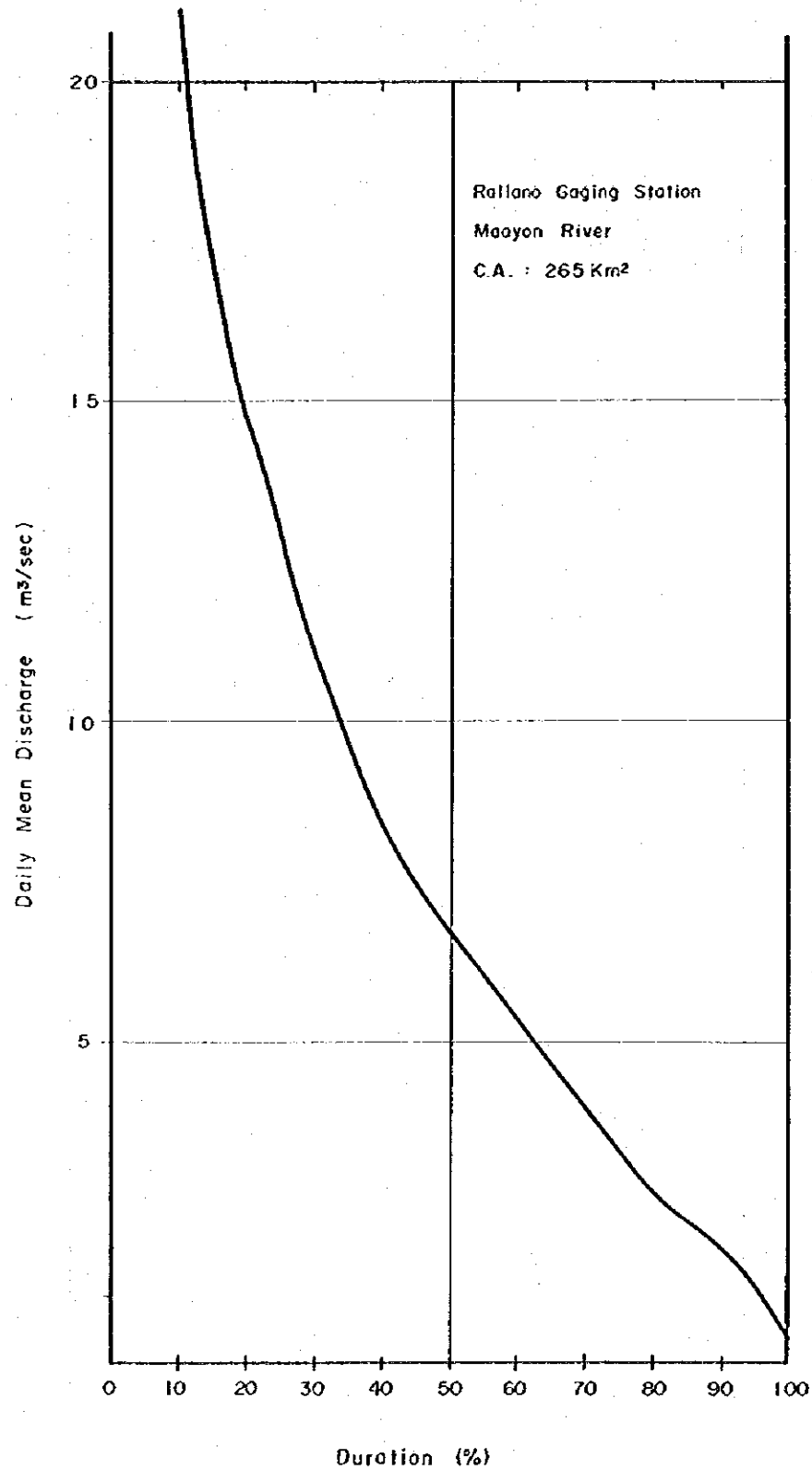


Fig. 1.2 - 12 DURATION CURVE AT RALLANO (MAAYON)

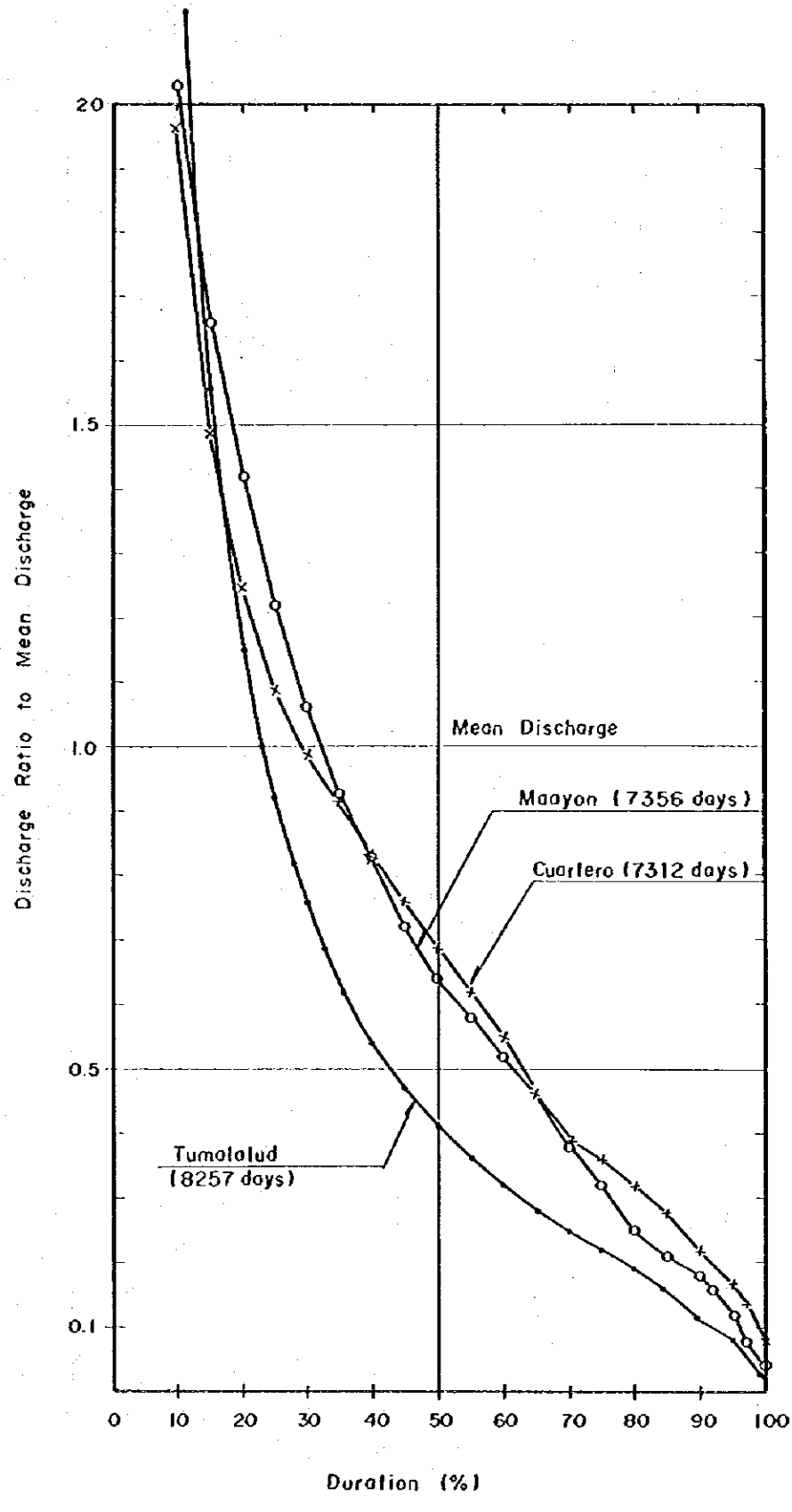
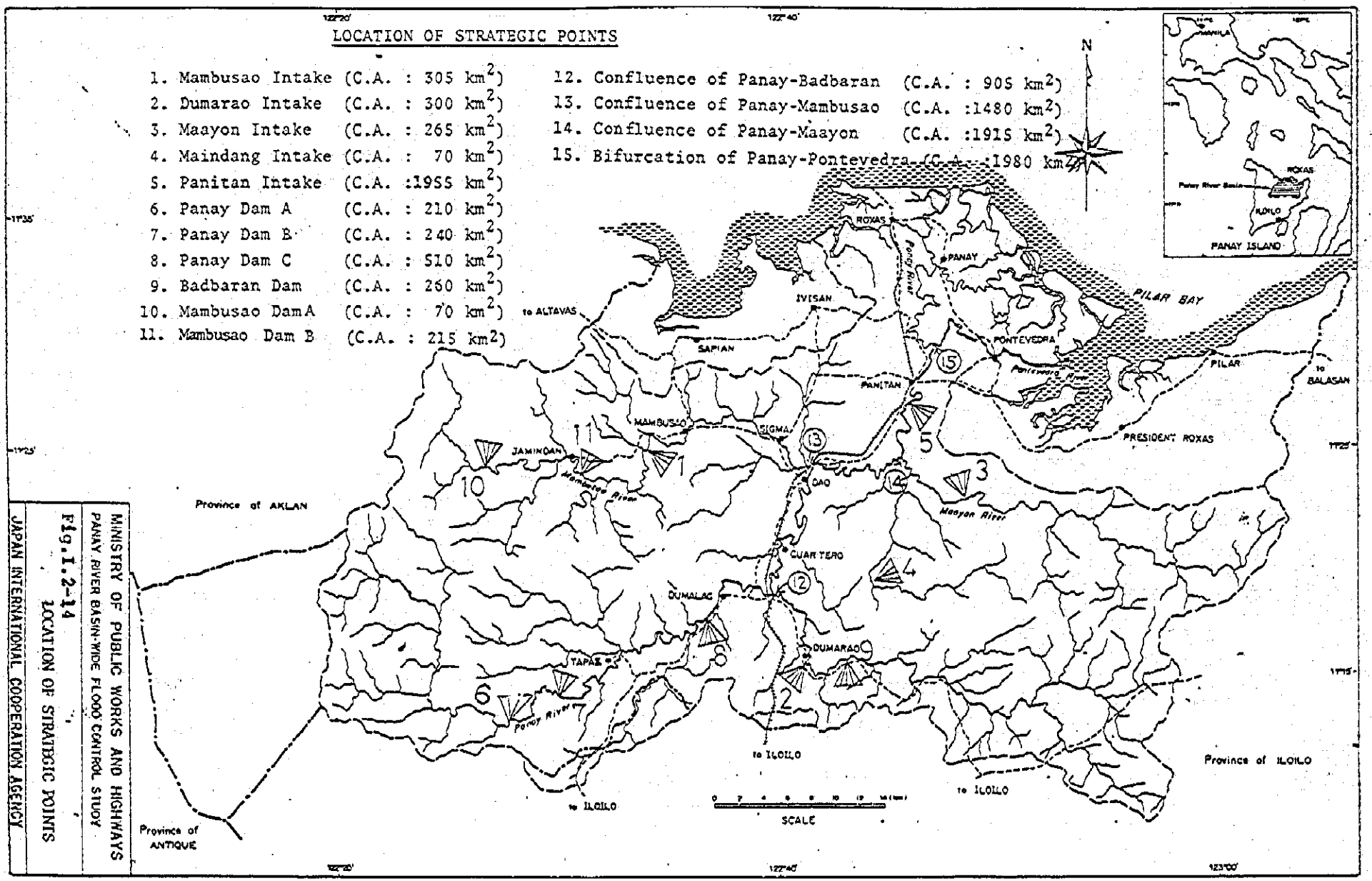


Fig.I.2 - 13 DIMENSIONLESS DURATION CURVES



MINISTRY OF PUBLIC WORKS AND HIGHWAYS
PANAY RIVER BASIN-WIDE FLOOD CONTROL STUDY

Fig.I.2-14
LOCATION OF STRATEGIC POINTS

JAPAN INTERNATIONAL COOPERATION AGENCY

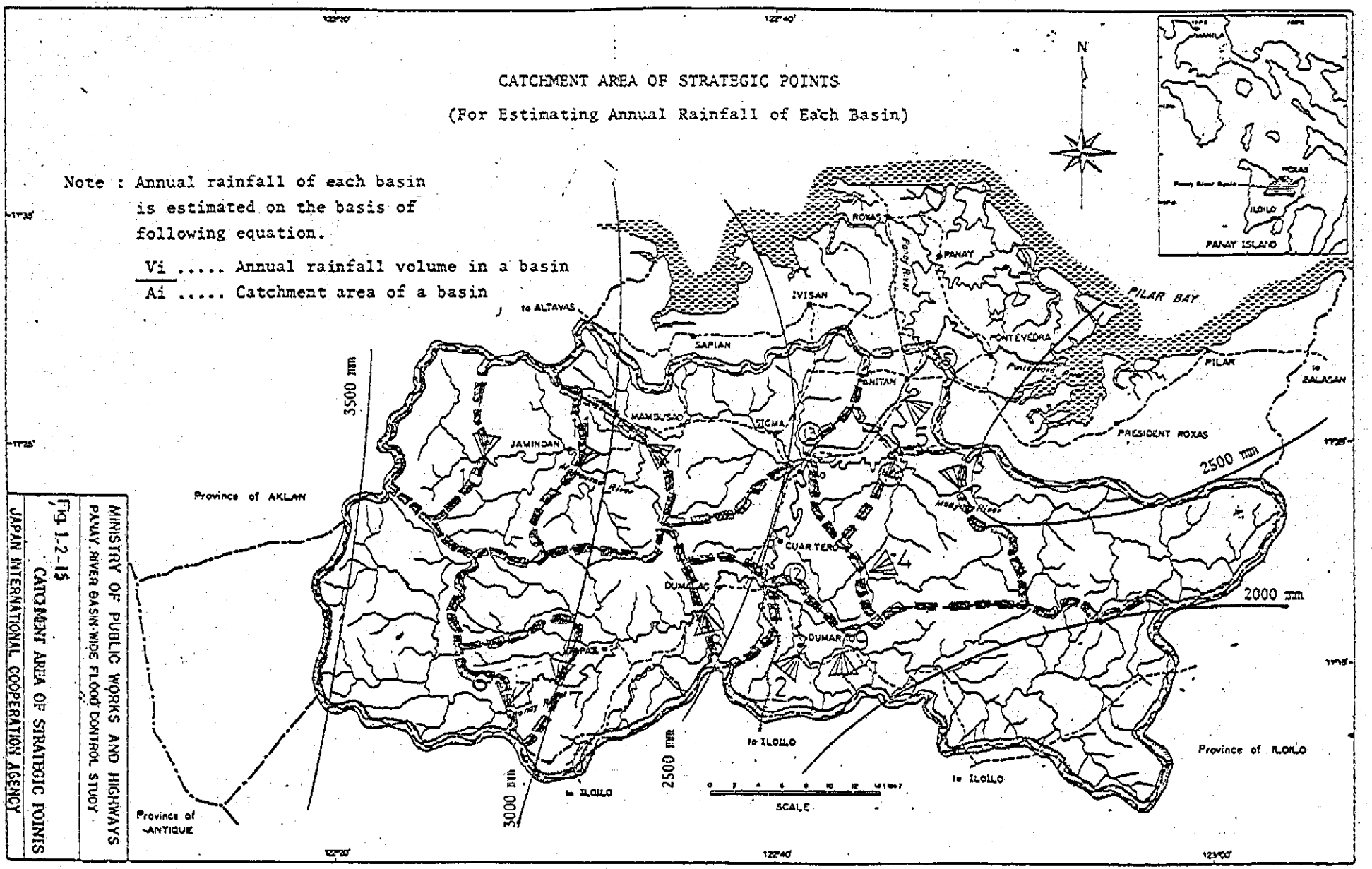


Fig. I.2-15 CATCHMENT AREA OF STRATEGIC POINTS

MINISTRY OF PUBLIC WORKS AND HIGHWAYS
PANAY RIVER BASIN-WIDE FLOOD CONTROL STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

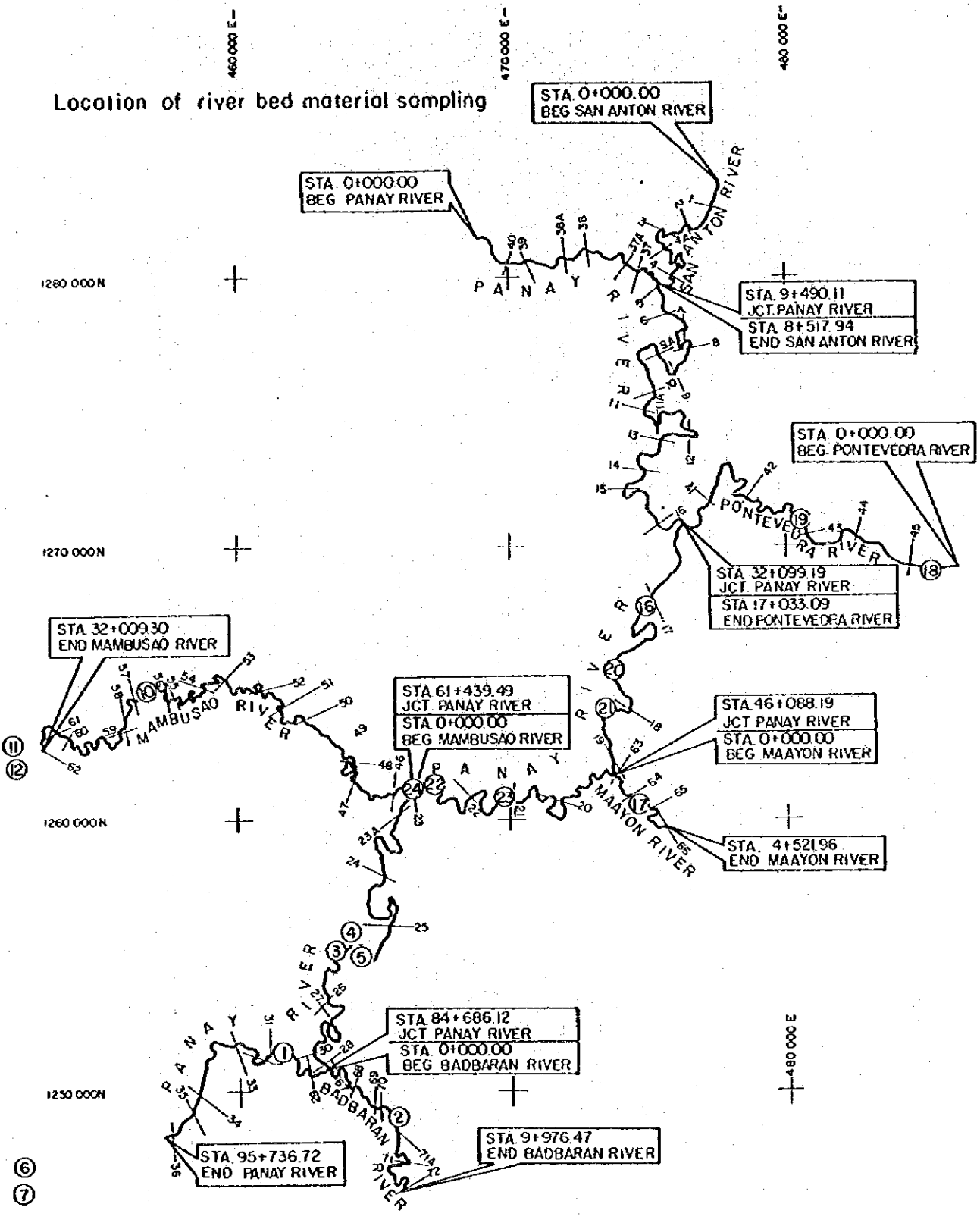


Fig. 12-16 Location Map of Sampling River bed Materials

Jalaur River

Pototan ⑬⑭ Dingle ⑨ Possi⑧ Colinog ⑮

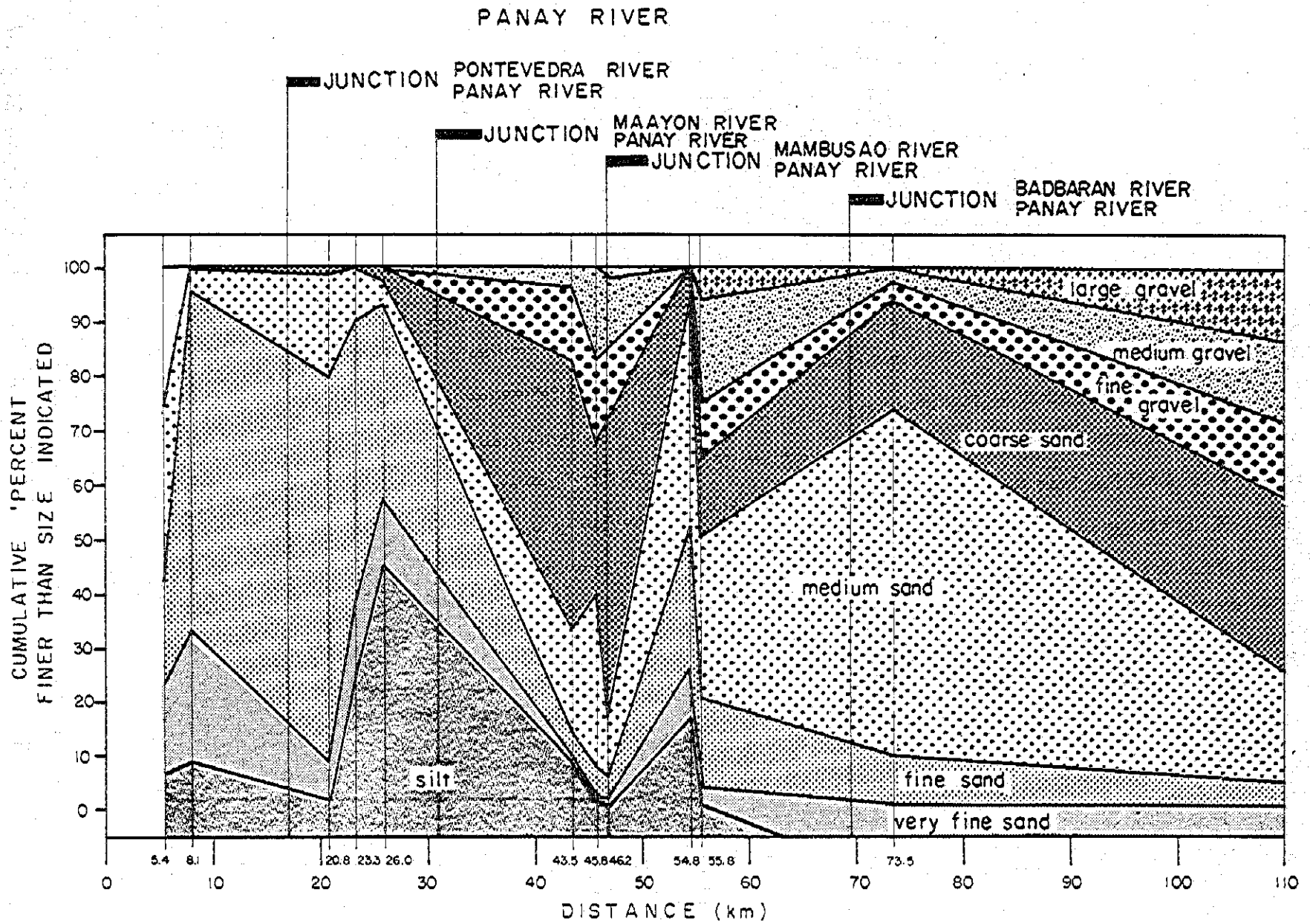


Fig. I 2-17 Variation Material Composition in each River Course (I)

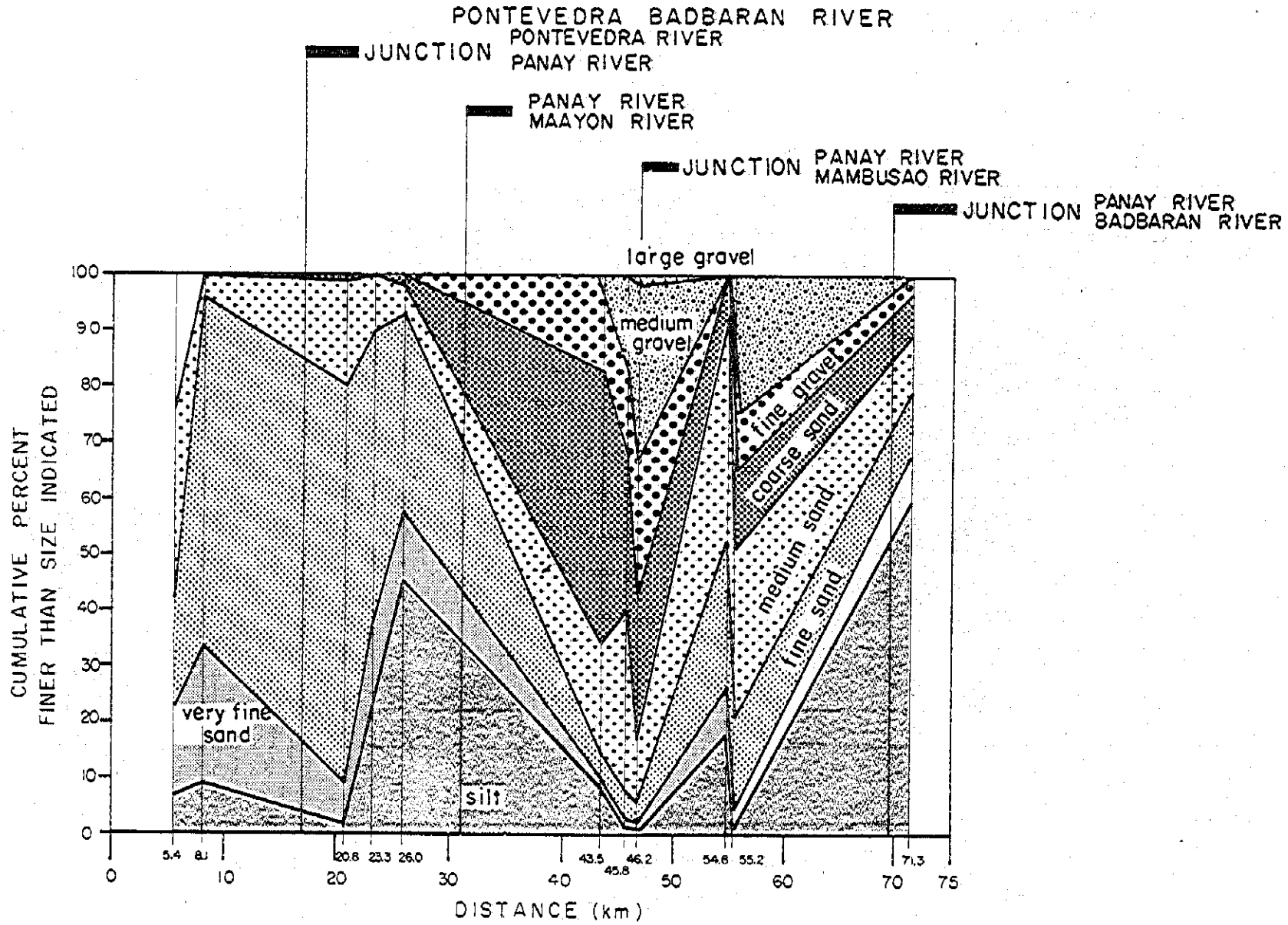


Fig. I 2-17 Variation Material Composition in each River Course (2)

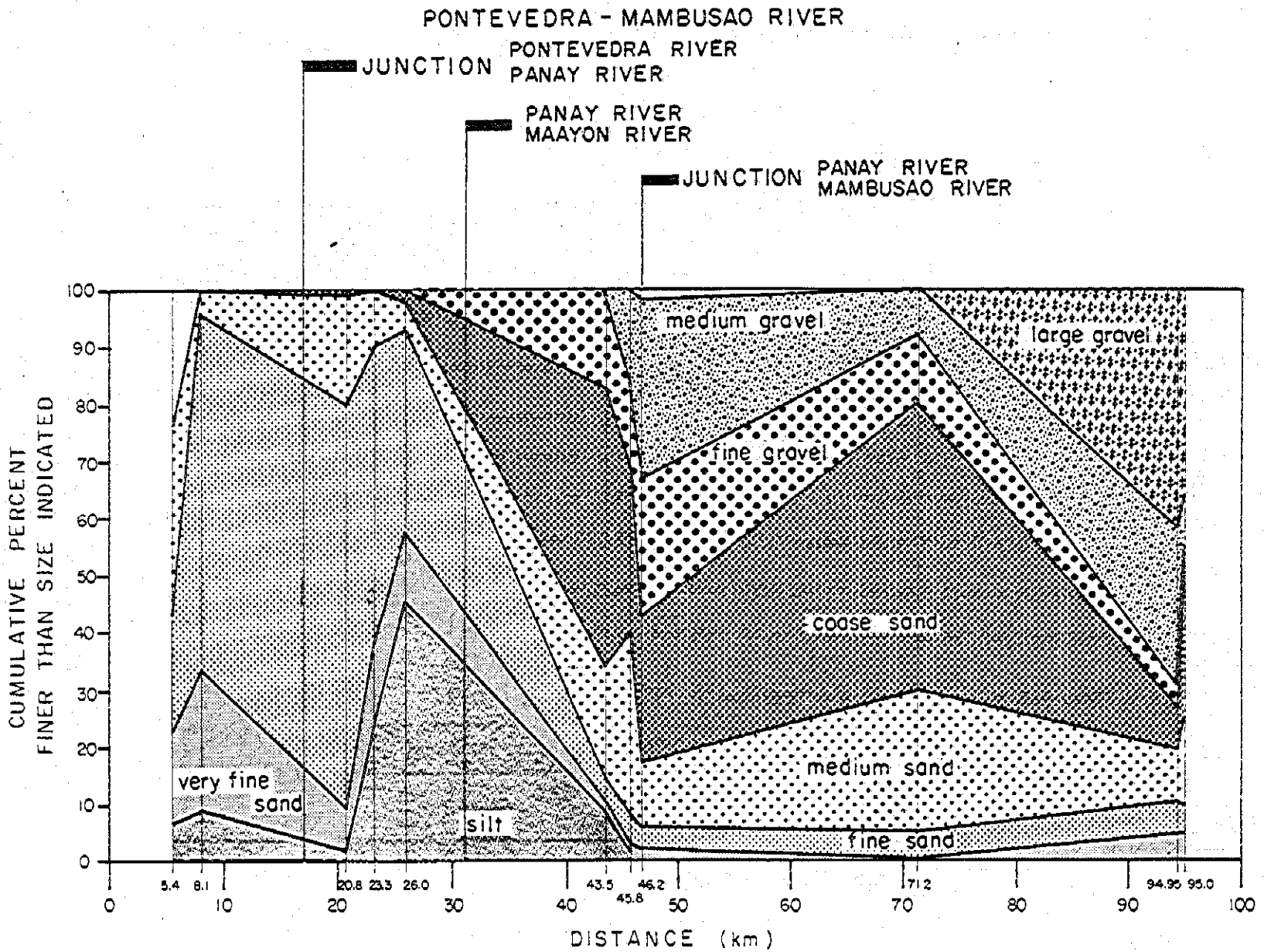


Fig. I 2-17 Variation Material Composition in each River Course (3)

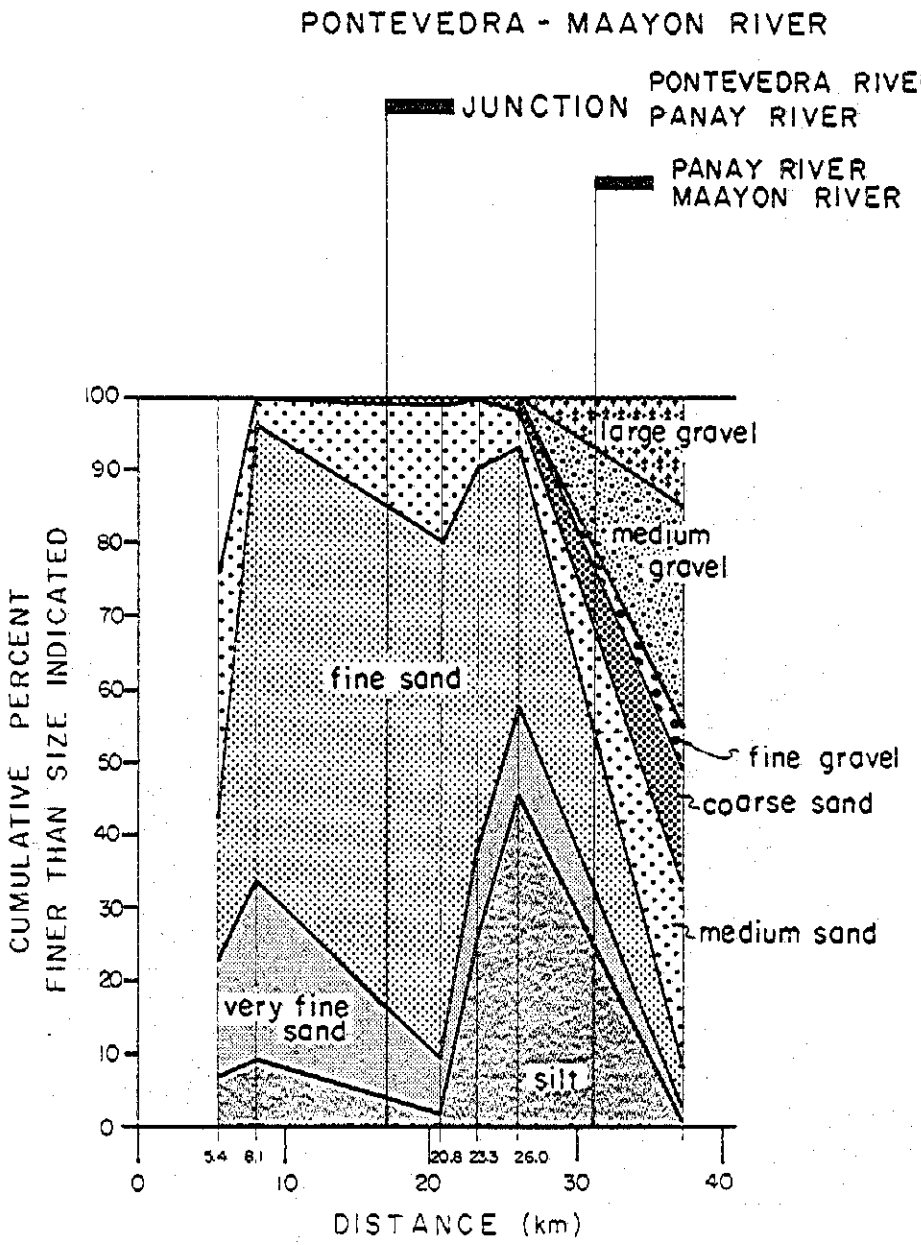
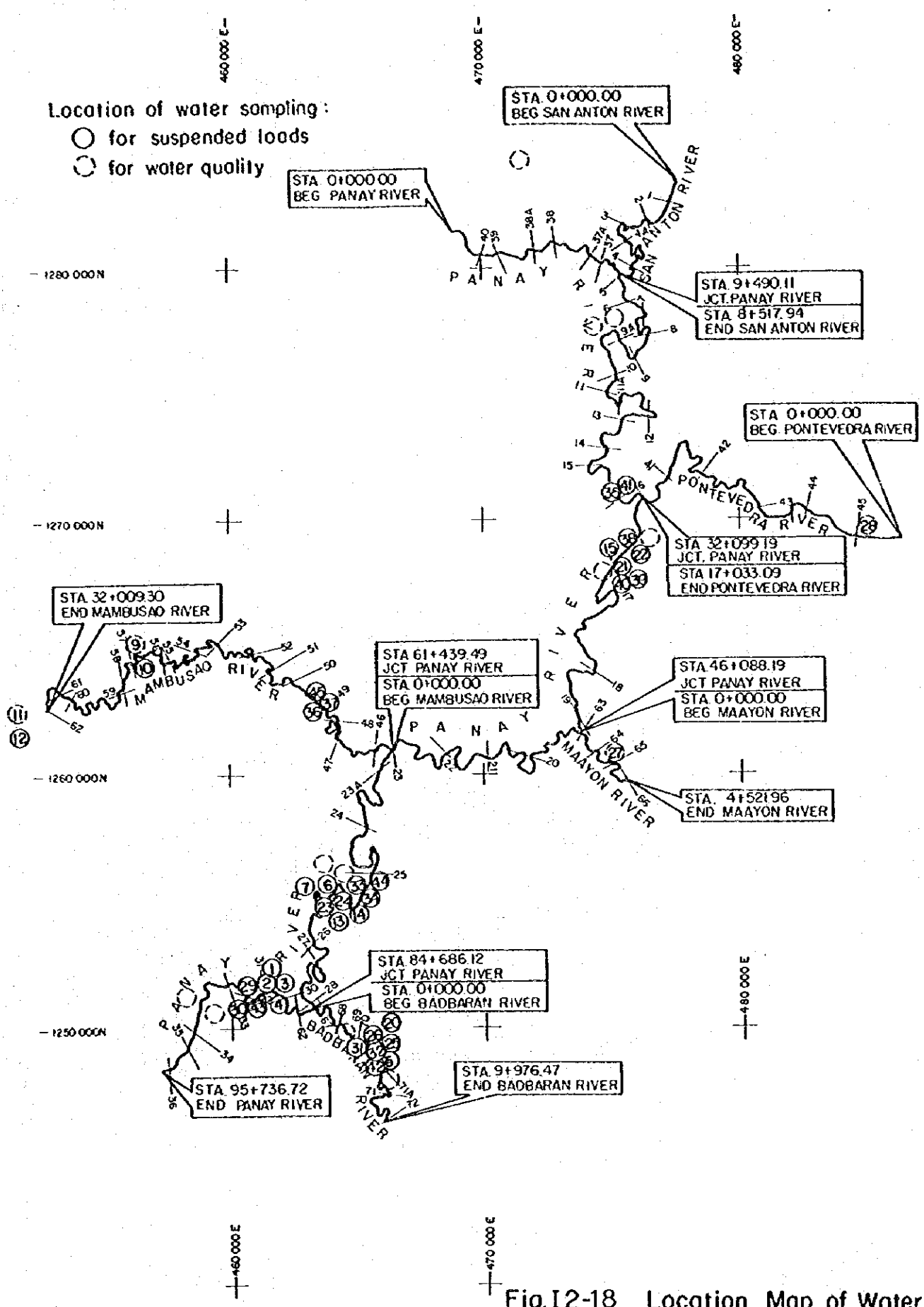


Fig. I 2-17 Variation Material Composition in each River Course (4)



Jalaur River

Pototan ⑧ ⑯ Possi ⑱

Dingle ⑰ Calinog ⑲

Fig. I2-18 Location Map of Water Sampling for Suspended Material and Water Quality

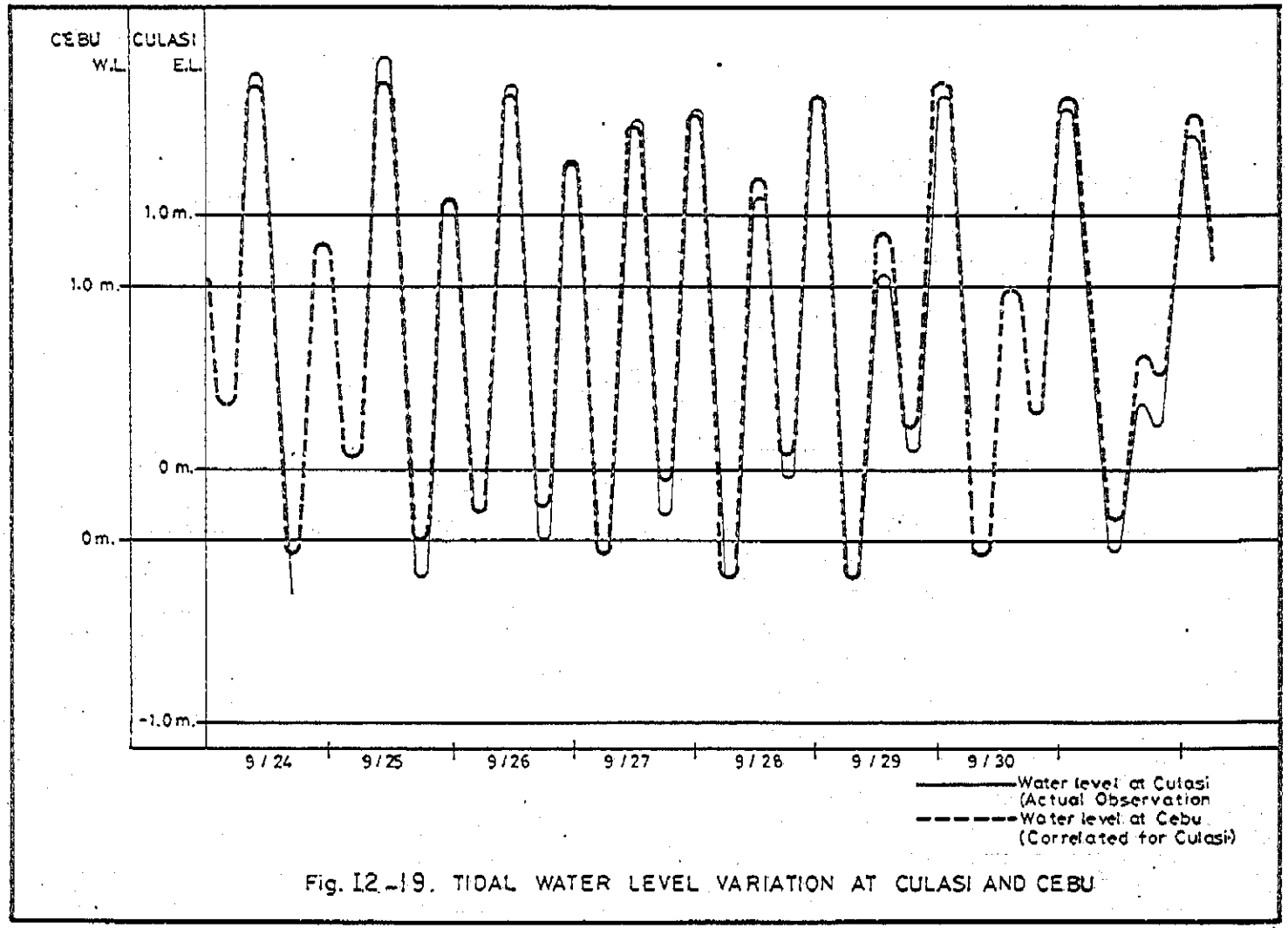


Fig. I2-19. TIDAL WATER LEVEL VARIATION AT CULASI AND CEBU

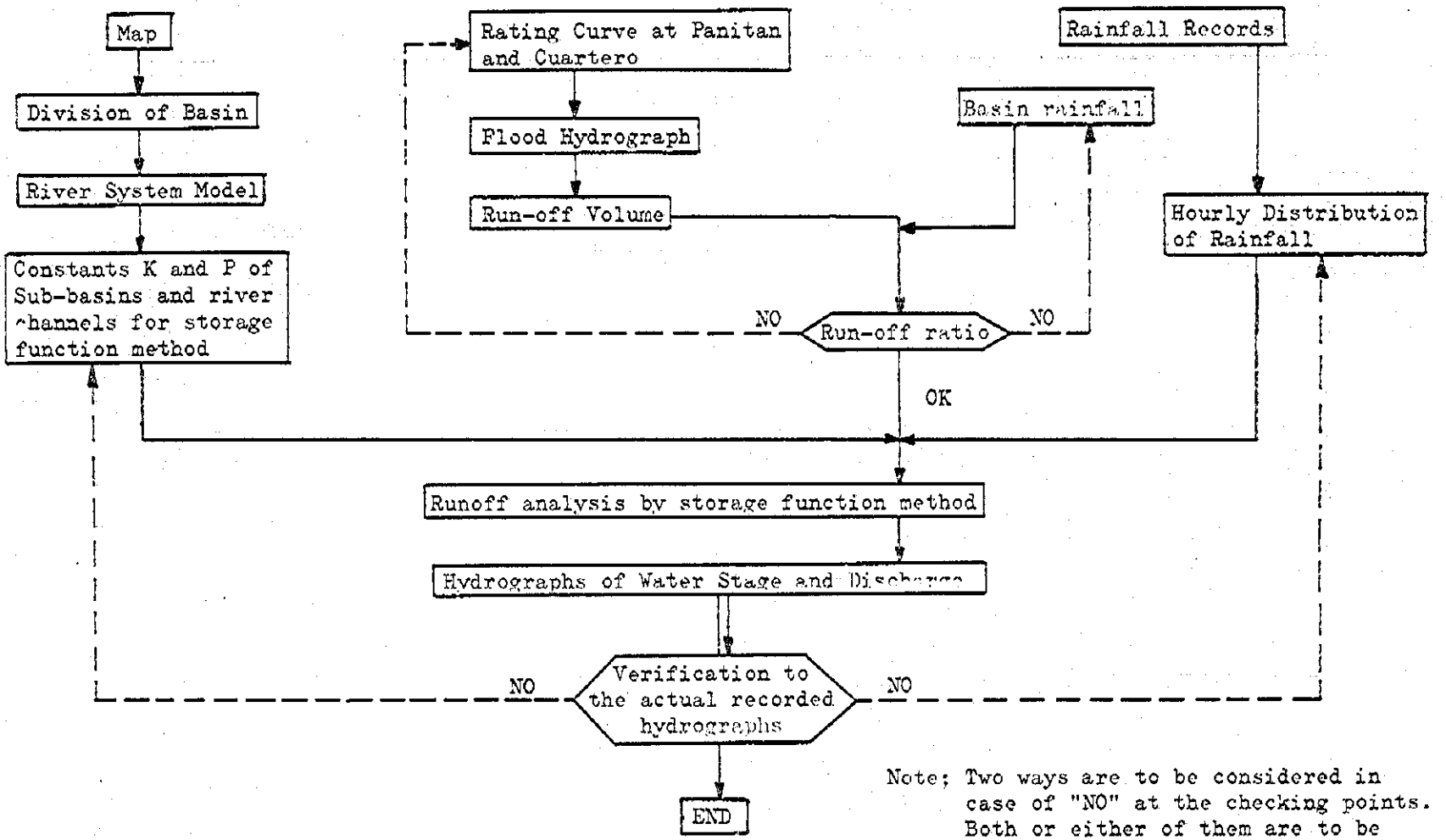


Fig. I.3-1 Flow Chart of Flood Analysis in Present River Condition

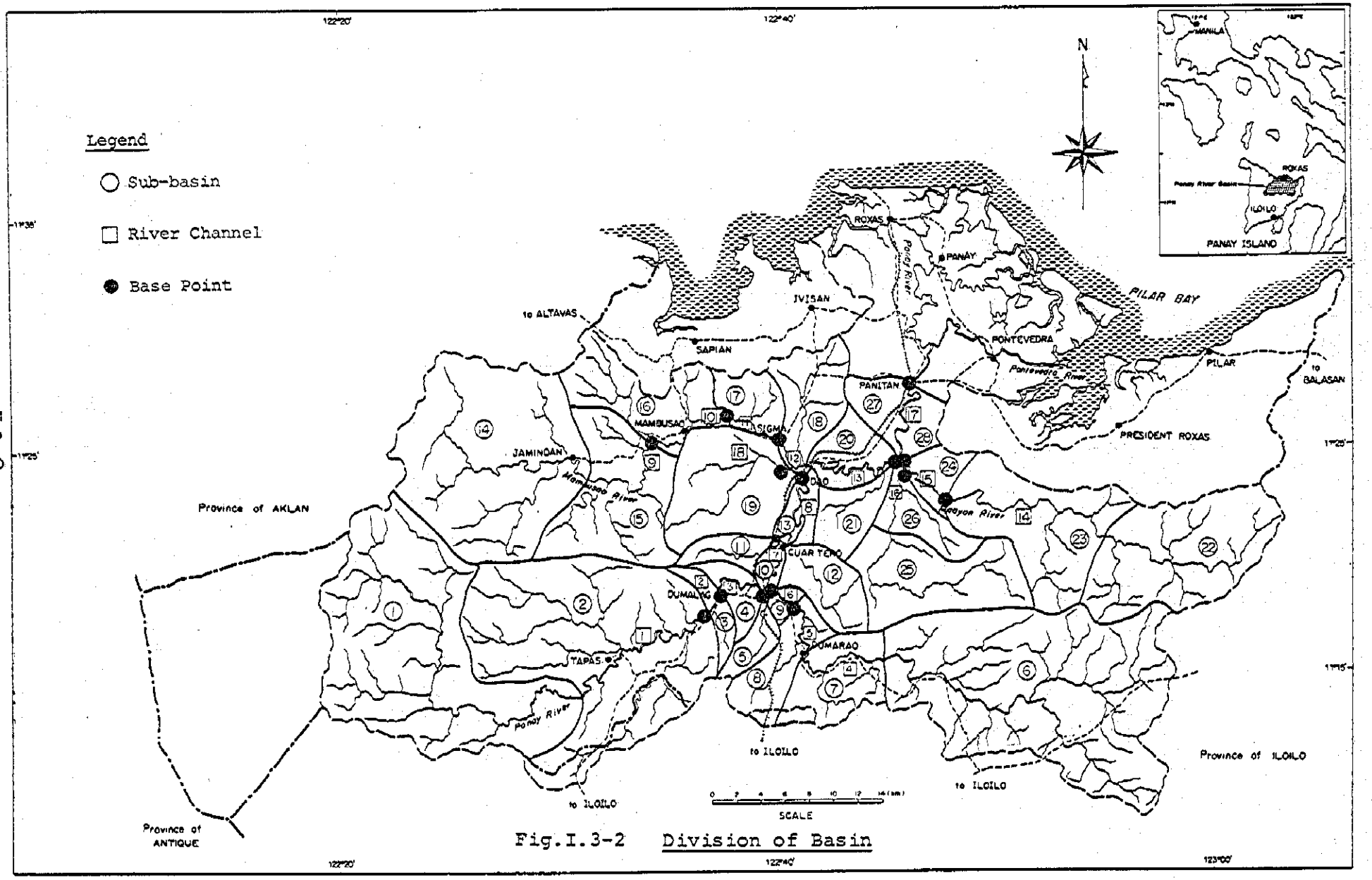


Fig.I.3-2 Division of Basin

F3-2

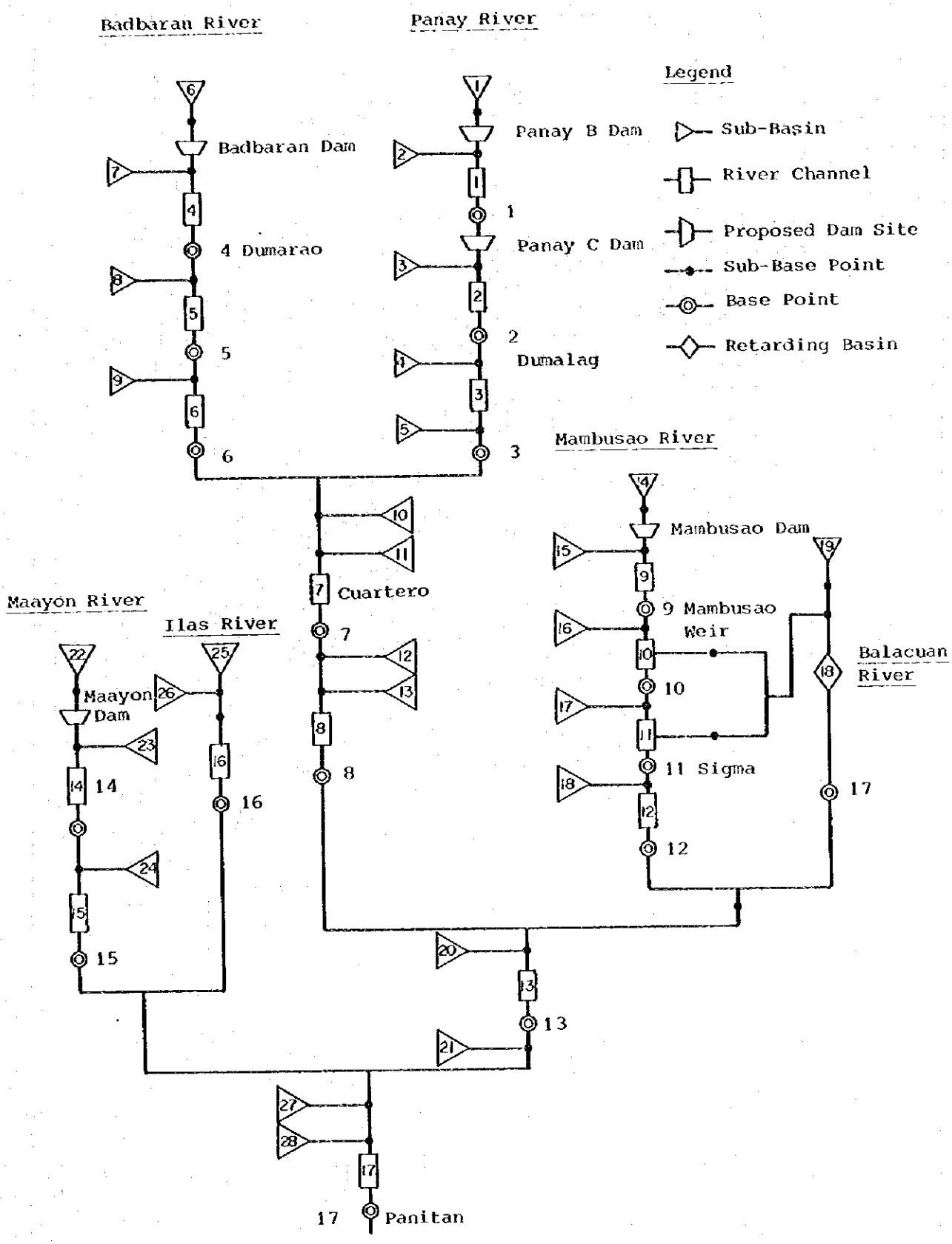


Fig.I.3-3 River System Model

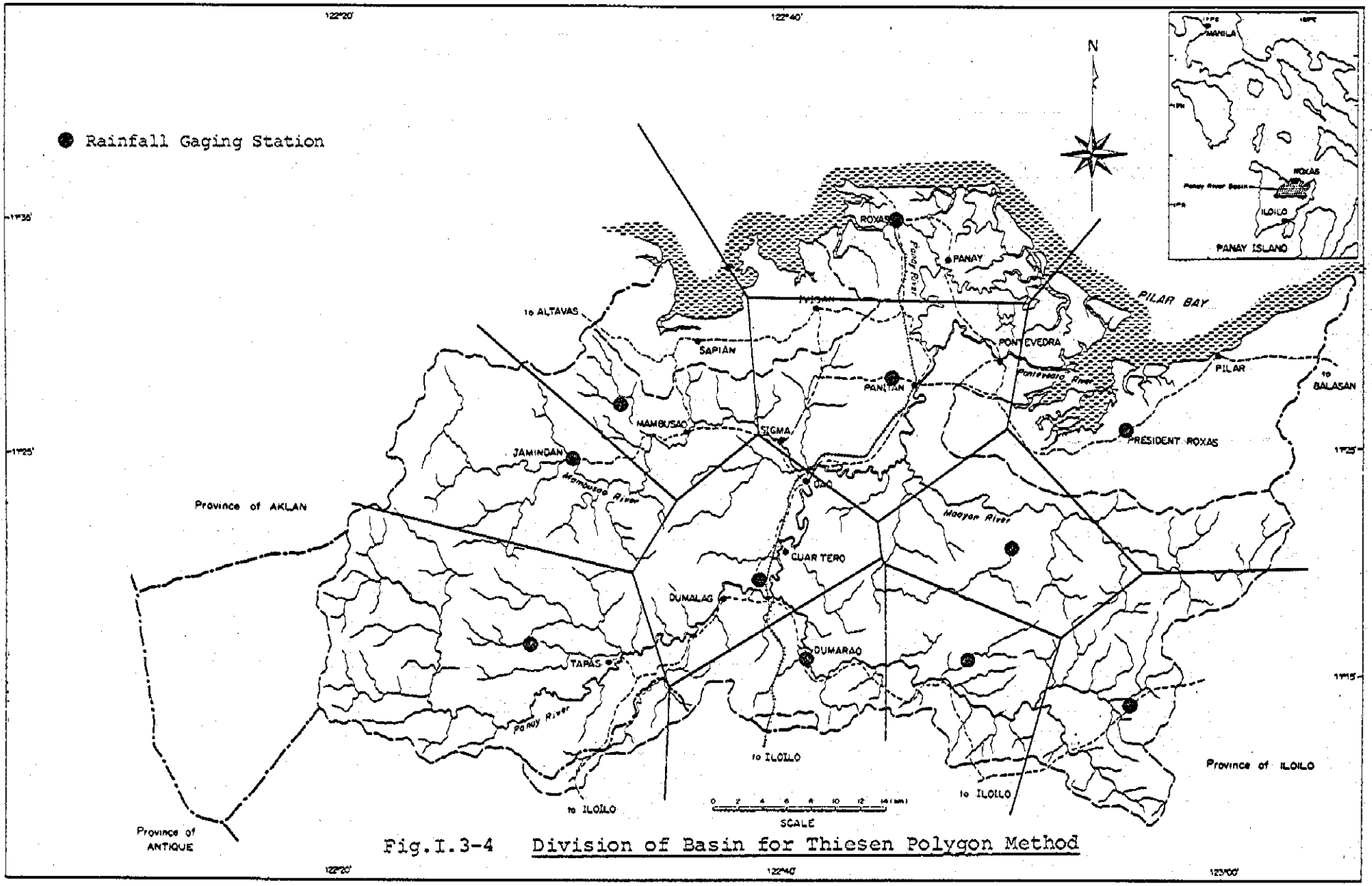


Fig.I.3-4 Division of Basin for Thiesen Polygon Method

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov. 3		0.0	0.0
4		0.0	0.0
5	~ 8:00 AM	43.0	43.0
	~ 5:00 PM	72.5	115.5
6		0.0	115.5

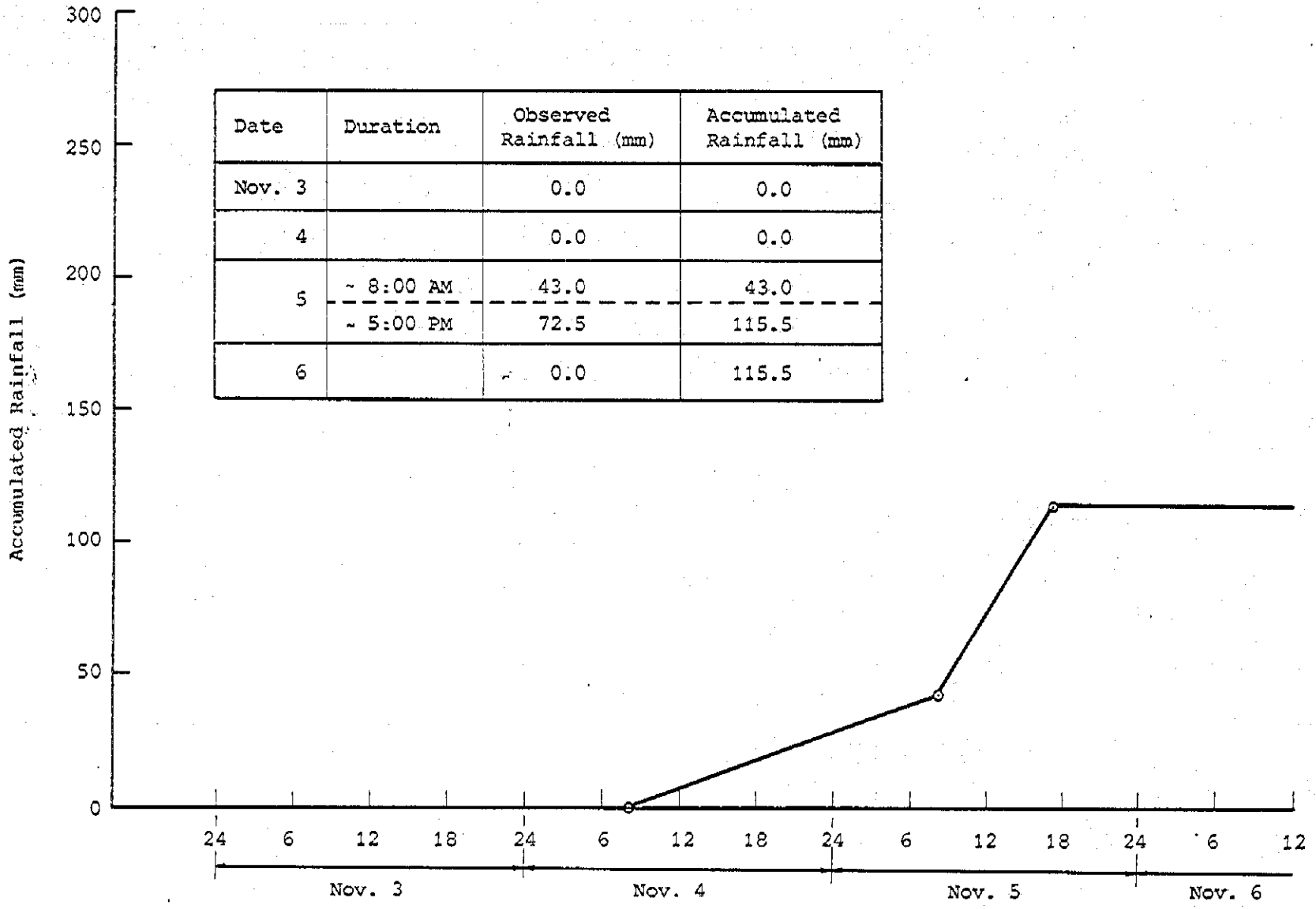


Fig.I.3-5 Accumulated Rainfall Curve, Station : Astorga

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov.3	~ 5:00AM	30.0	0.0
4	~ 5:00AM	24.0	24.0
	~ 5:00AM	52.5	76.5
	~12:00AM	86.0	162.5
	~ 5:00PM	54.0	216.5
6	~ 5:00AM	50.0	266.5

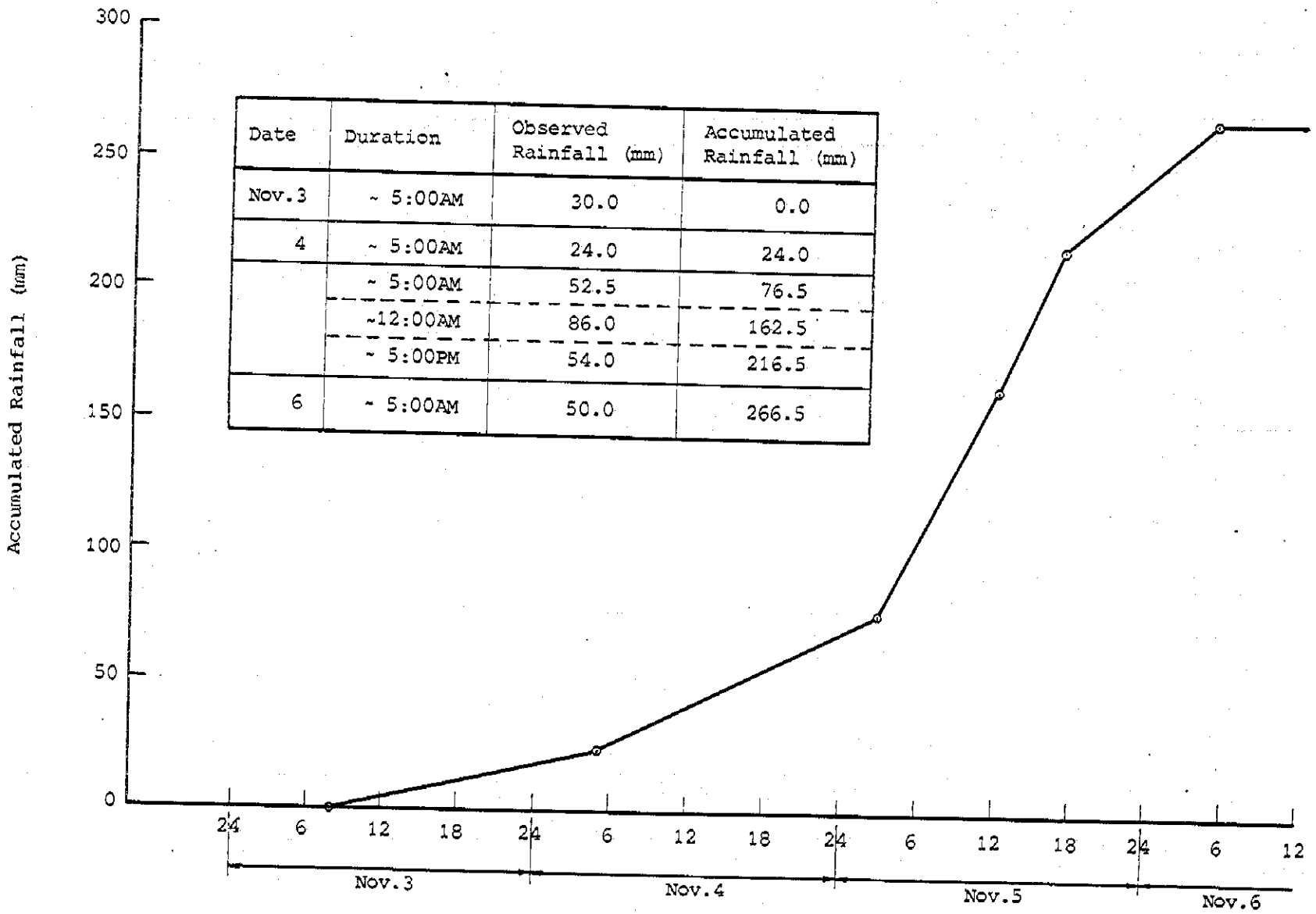


Fig.I.3-6 Accumulated Rainfall Curve, Station: Brgy. Roxas, Tapaz

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov.3	~ 7:00AM	0.0	0.0
4	~ 7:00AM	10.0	10.0
5	~ 7:00AM	0.9	10.9
6	~ 7:00AM	120.2	141.1

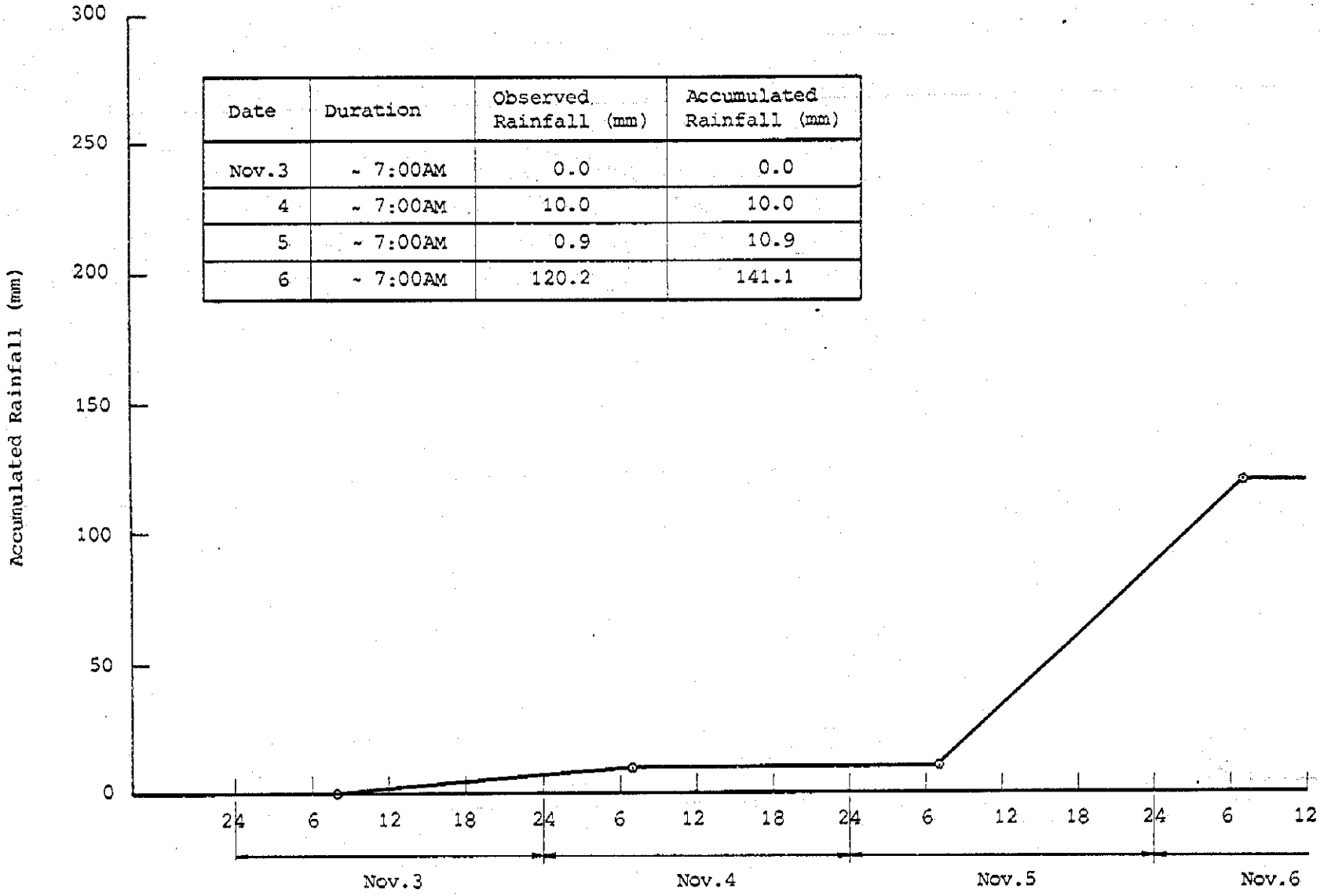


Fig.I-3-7 Accumulated Rainfall Curve, Station: NIA Mambusao

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov.3	~ 8:00AM	3.6	0.0
4	~ 8:00AM	28.8	28.8
	~ 2:00PM	0.6	29.4
5	~ 8:00AM	26.0	55.4
	~ 2:00PM	132.8	188.2
6	~ 8:00AM	75.2	263.4

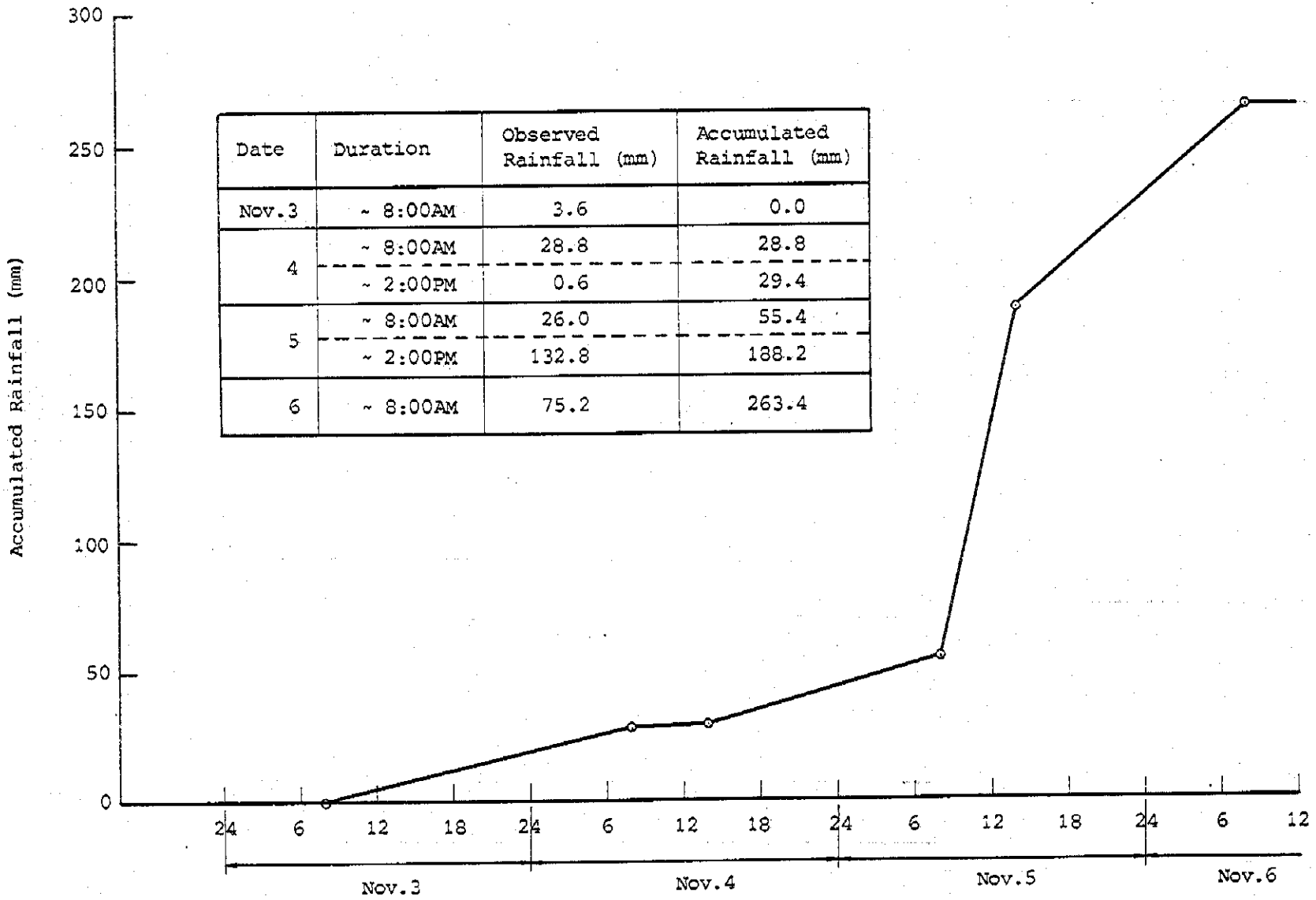


Fig.I.3-8 Accumulated Rainfall Curve, Station: Matec Mambusao

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov. 3		0.0	0.0
4	~ 5:00 AM	32.0	32.0
	~ 5:00 PM	38.0	70.0
5	~ 8:00 AM	45.0	115.0
	~ 5:00 PM	75.5	190.5
6		0.0	190.5

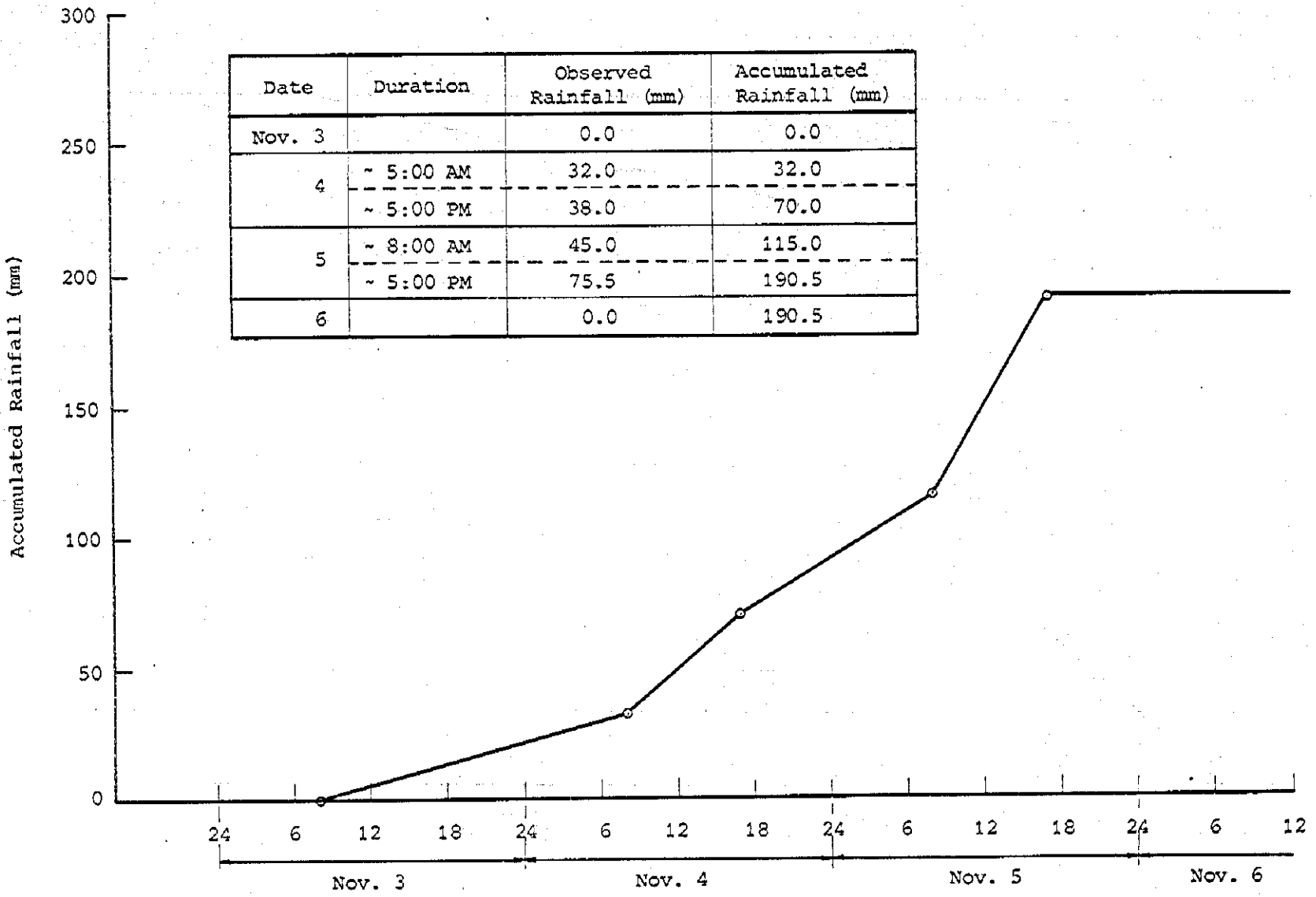


Fig.I.3-9 Accumulated Rainfall Curve, Station : Villaflores

Date	Duration	Observed Rainfall (mm)	Accumulated Rainfall (mm)
Nov.3		0.0	0.0
4	~ 8:00AM	0.0	0.0
	~ 5:00AM	0.0	0.0
5	~ 8:00AM	78.0	78.0
	~10:00AM	35.0	113.0
	~12:00AM	37.0	150.0
	~ 2:00PM	46.2	196.2
	~ 4:00PM	18.4	214.6
	~ 6:00PM	12.4	227.0
6	~ 8:00AM	40.2	267.2

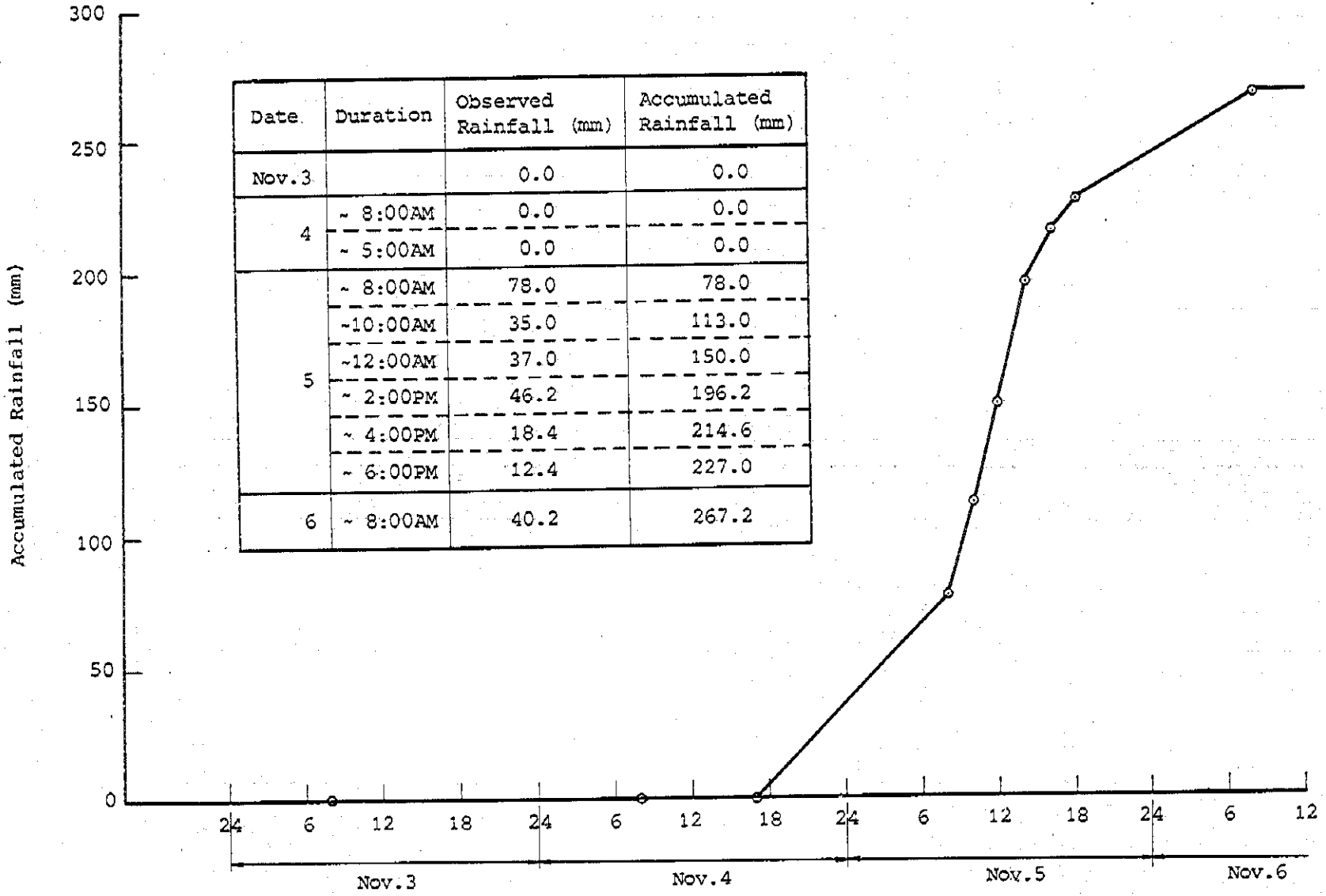


Fig. I.3-10 Accumulated Rainfall Curve, Station : Jamindan

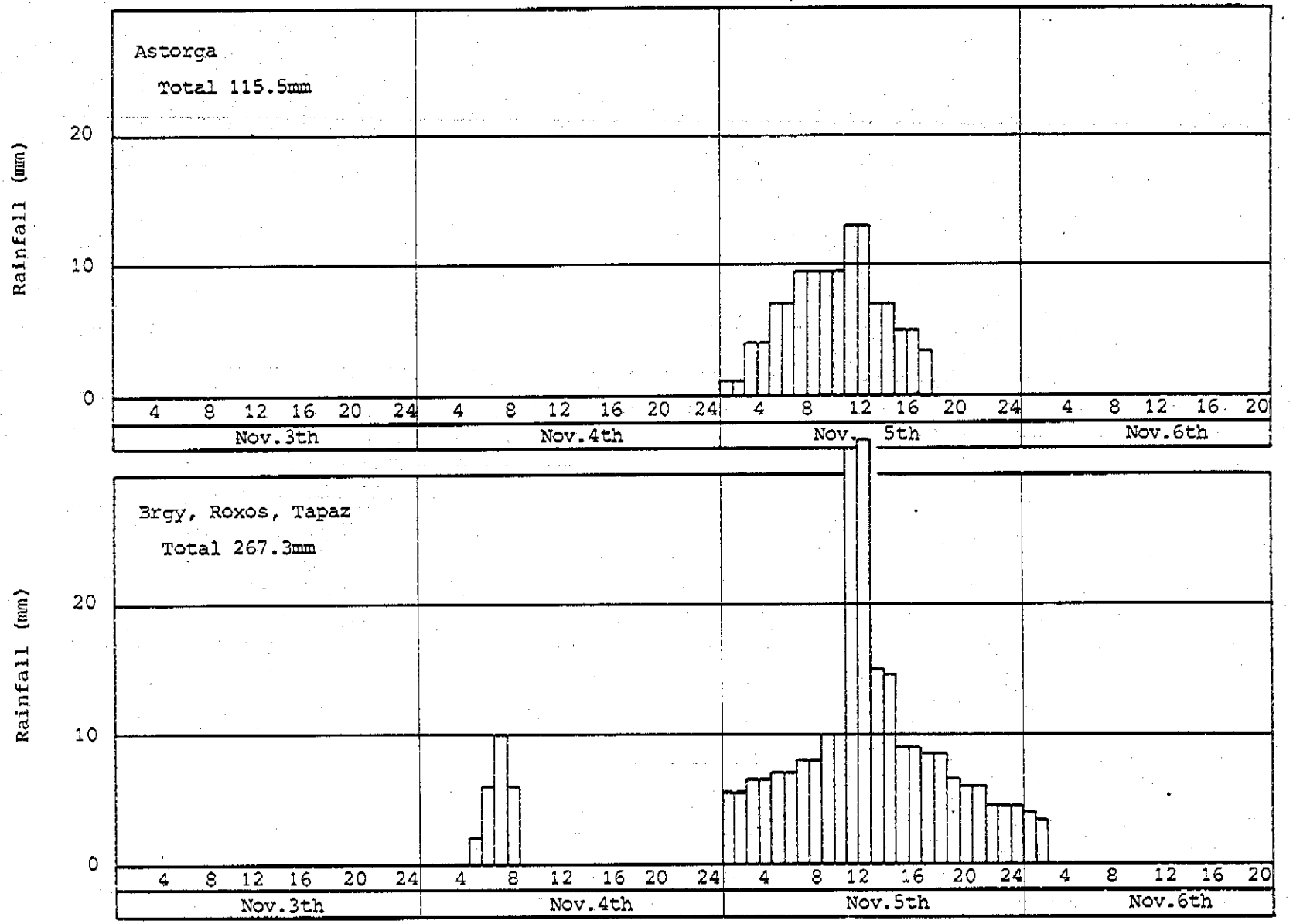


Fig.I.3-11 Hourly Rainfall Distribusion (1)

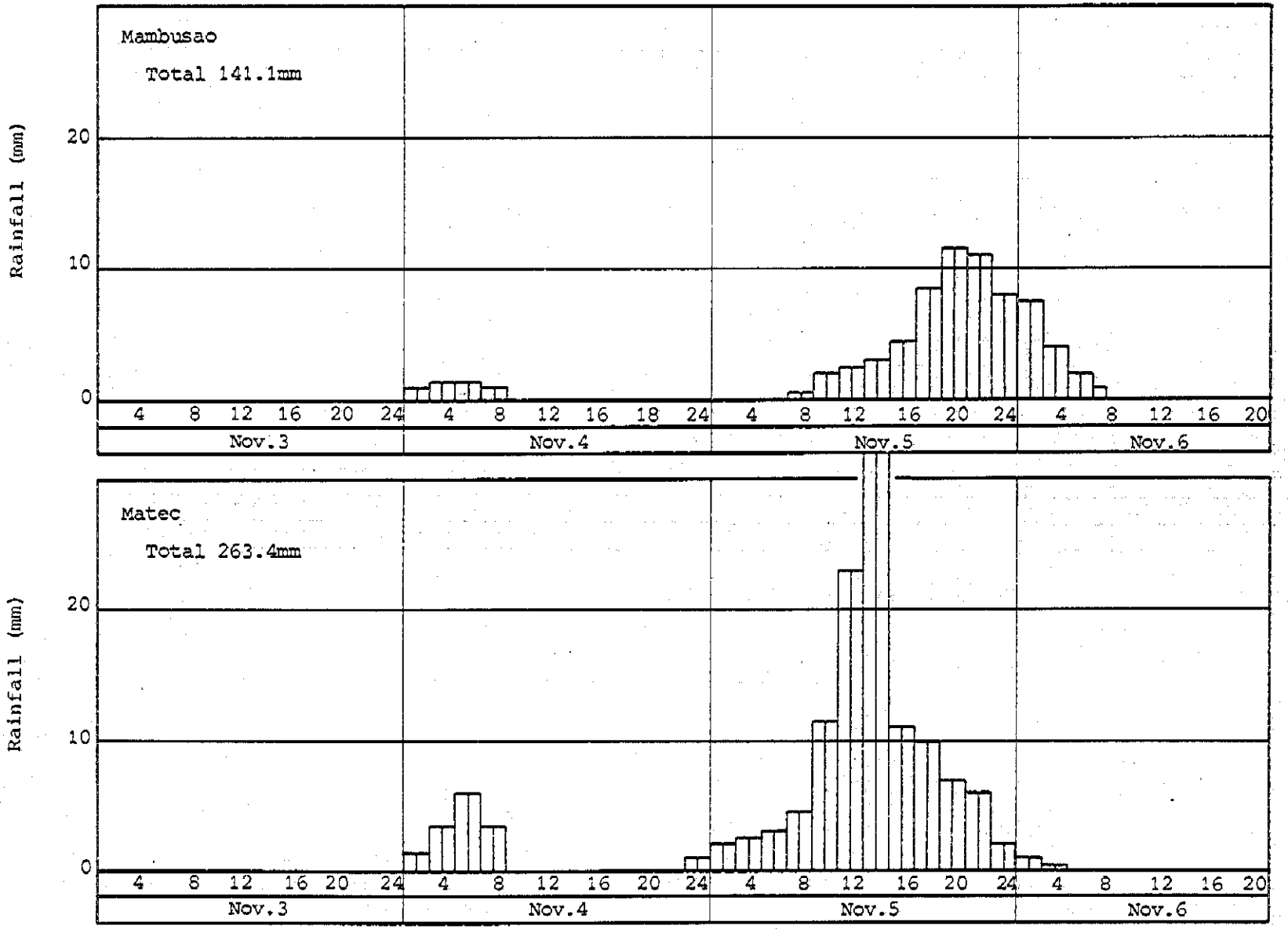


Fig.I.3-12 Hourly Rainfall Distribution (2)

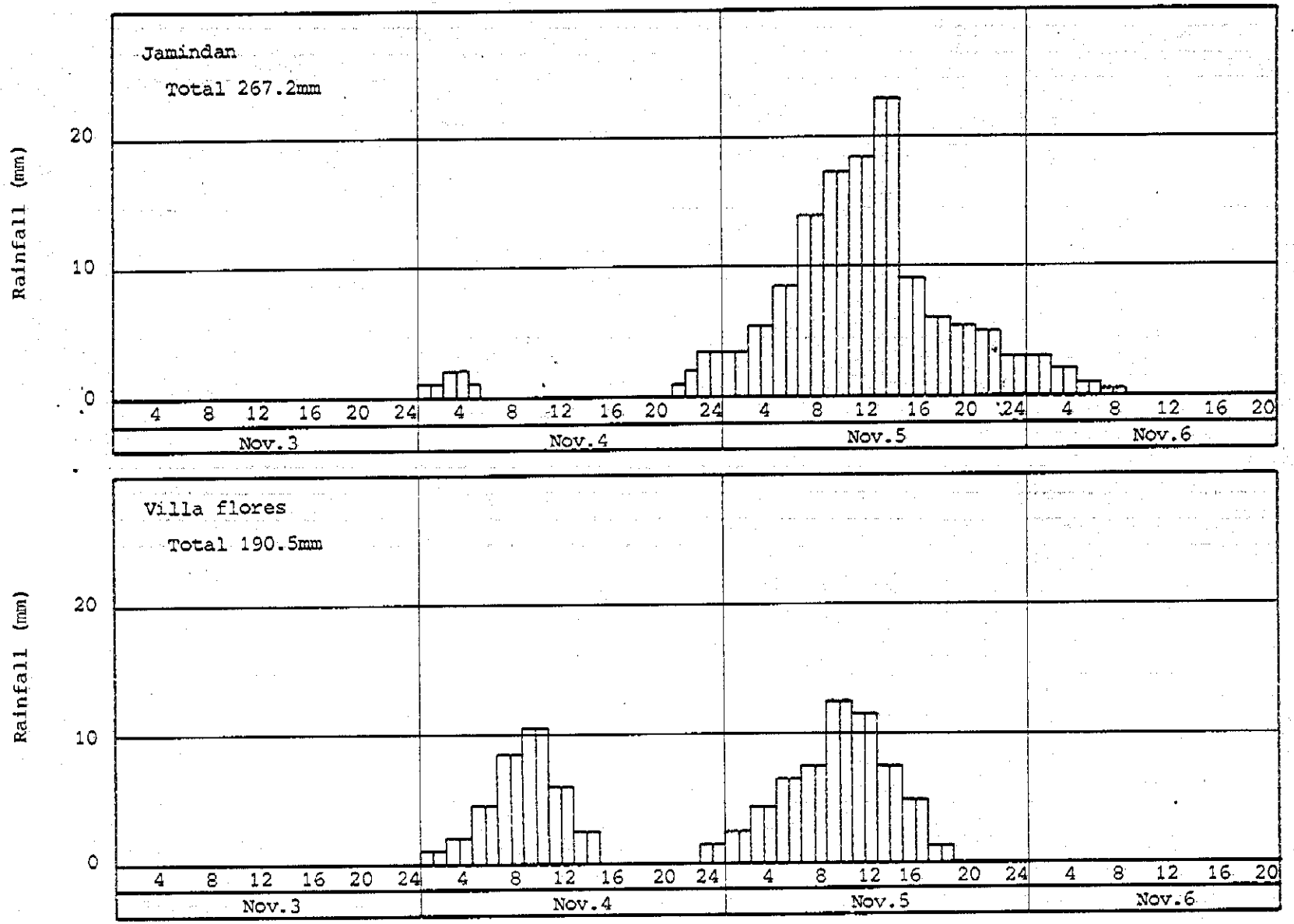


Fig.I.3-13 Hourly Rainfall Distribution (3)

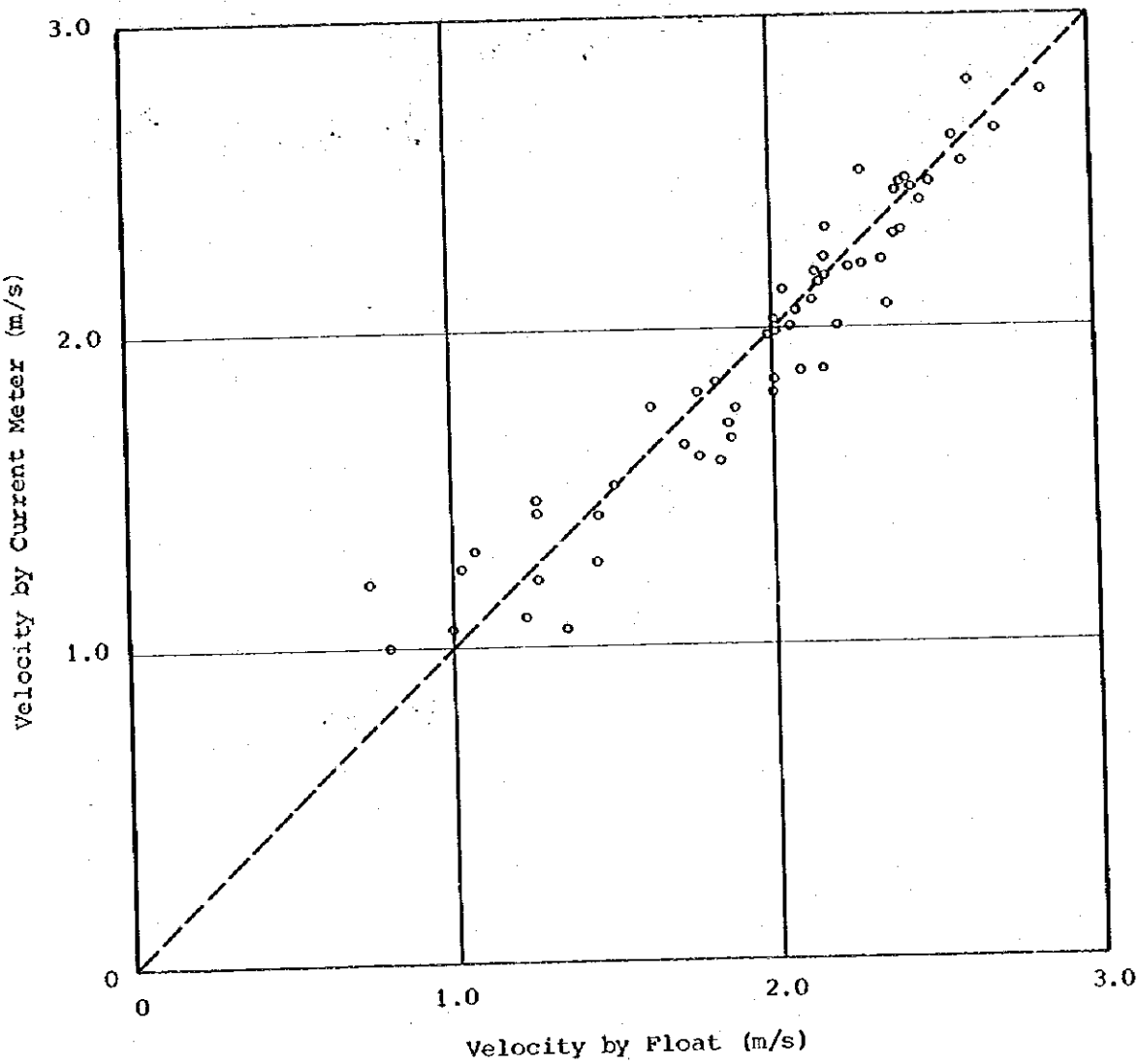


Fig.I.3-14 Comparison of Velocity by Current Meter and Float

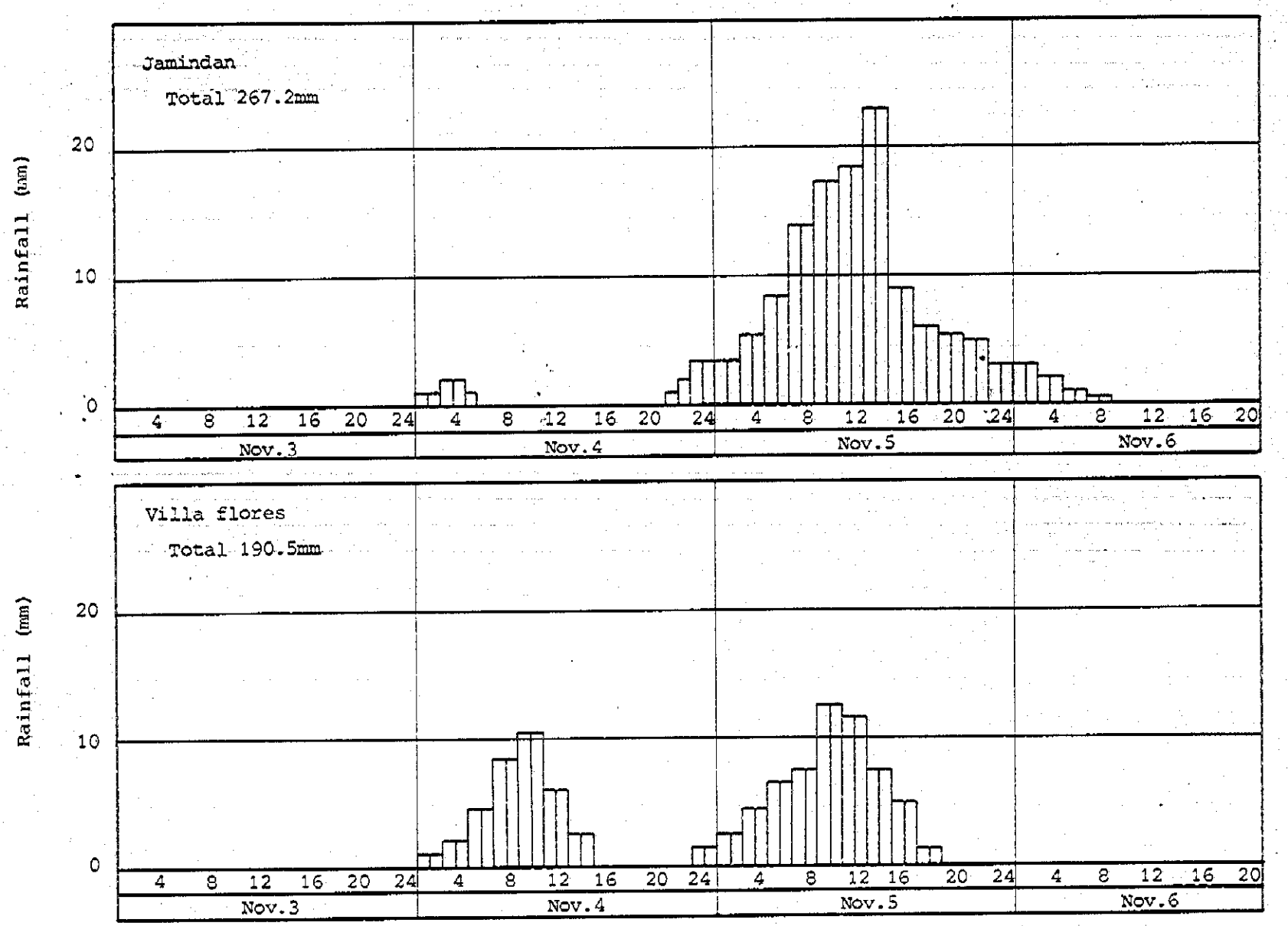


Fig.I.3-13 Hourly Rainfall Distribution (3)

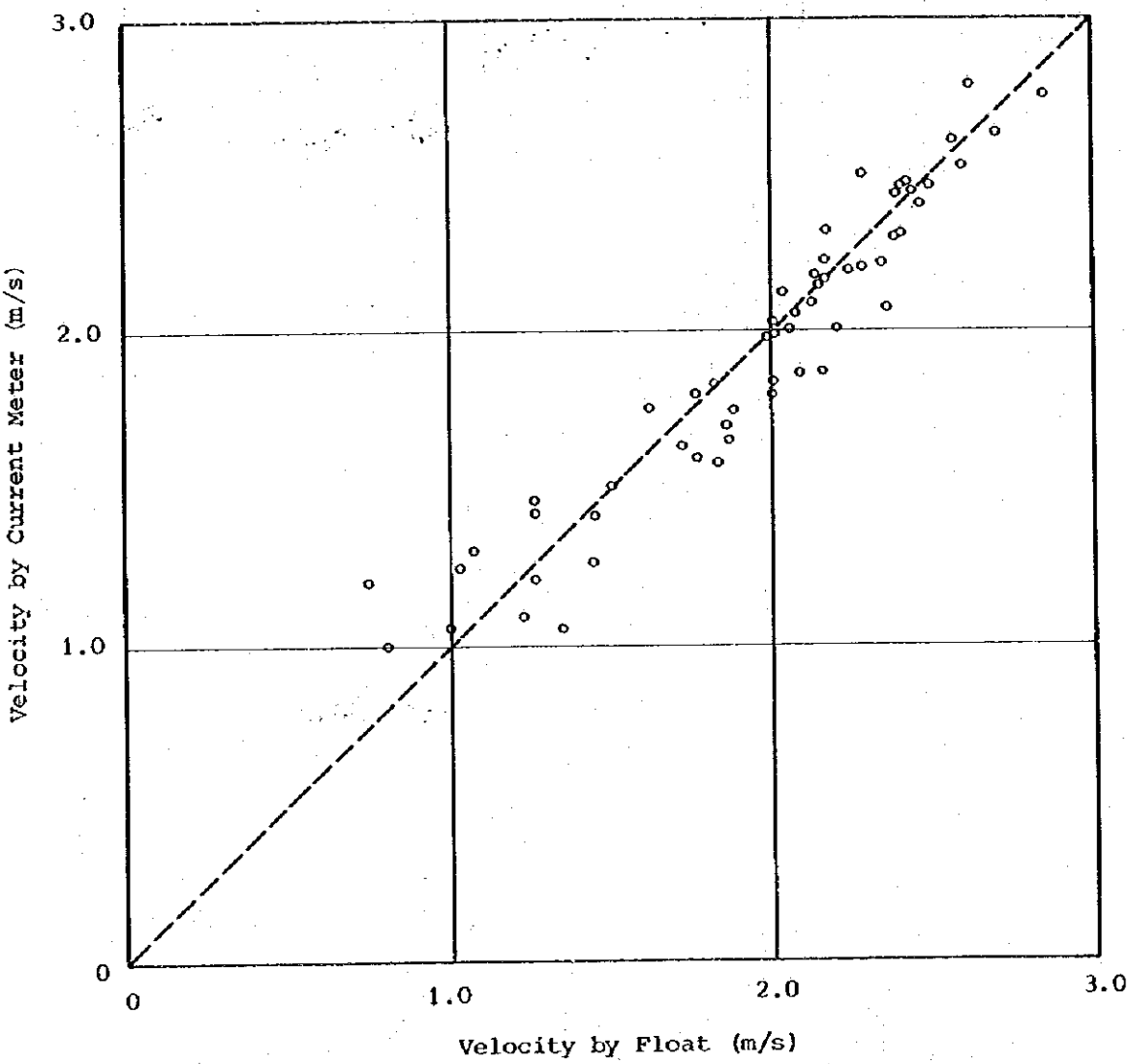


Fig.I.3-14 Comparison of Velocity by Current Meter and Float

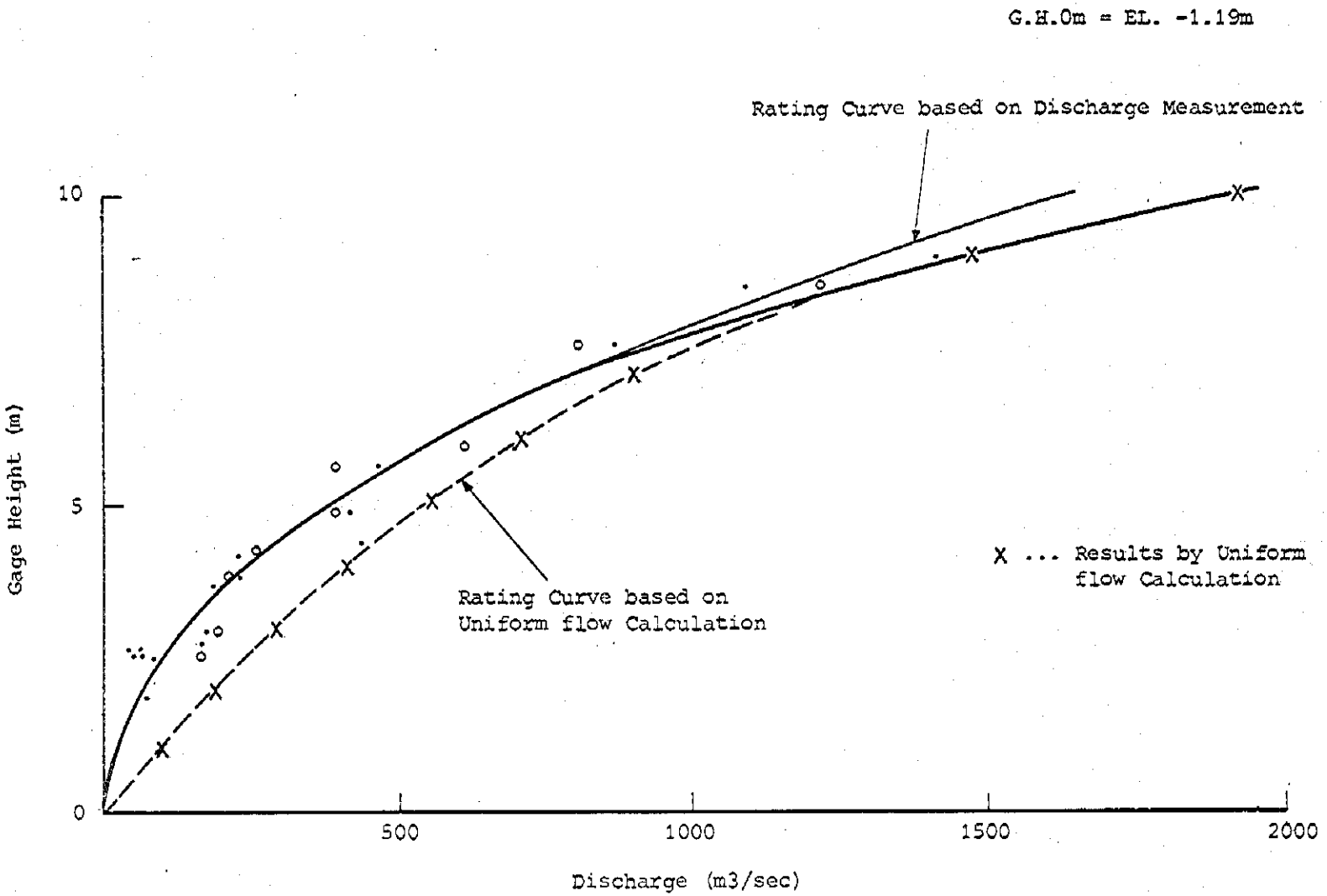


Fig.I-3-15 Rating Curve at Panitan Gaging Station

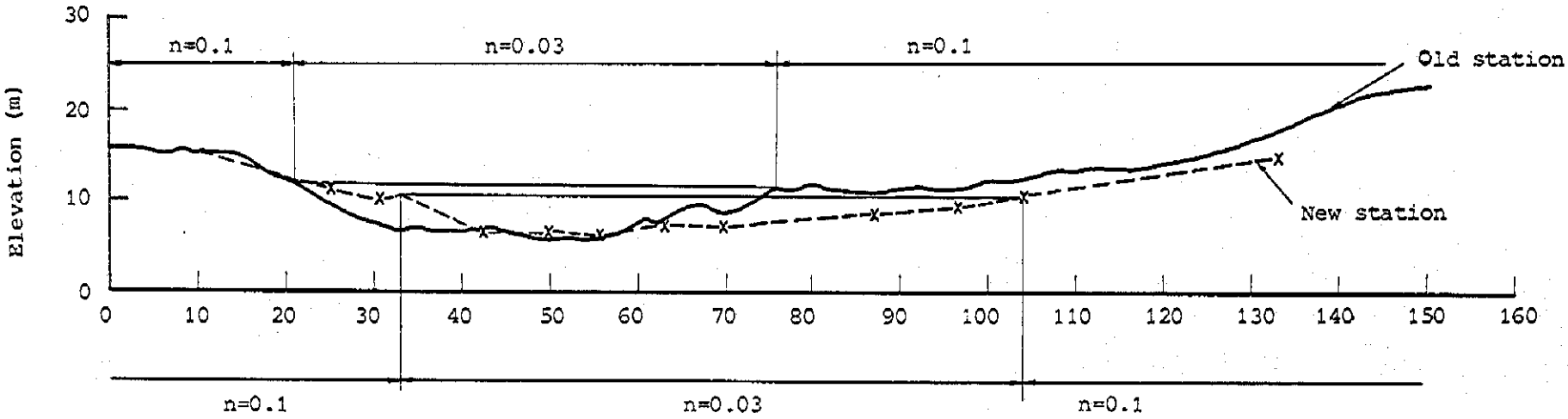


Fig.I.3-16 Cross Section of Cuartero Gauging Station

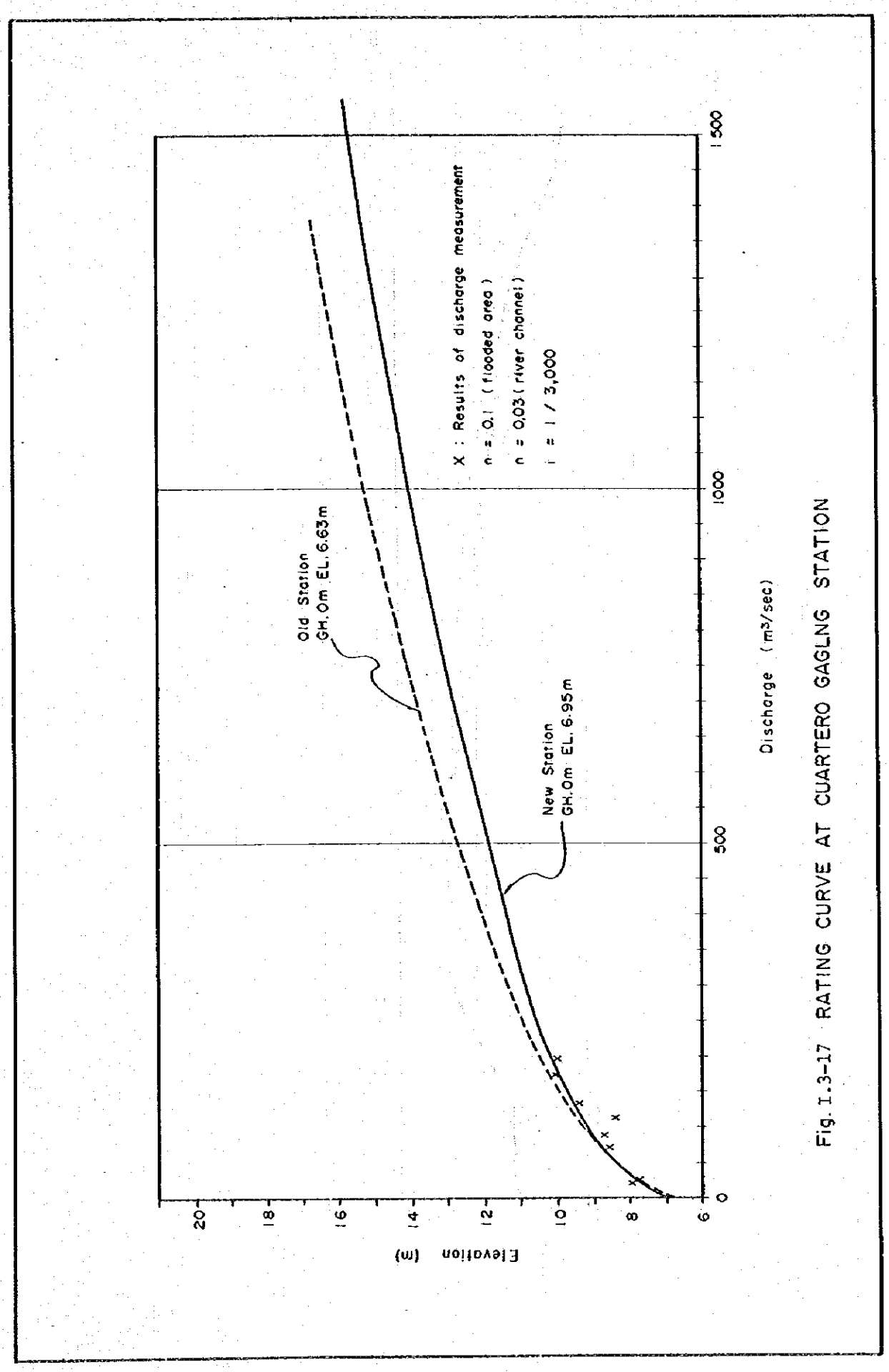
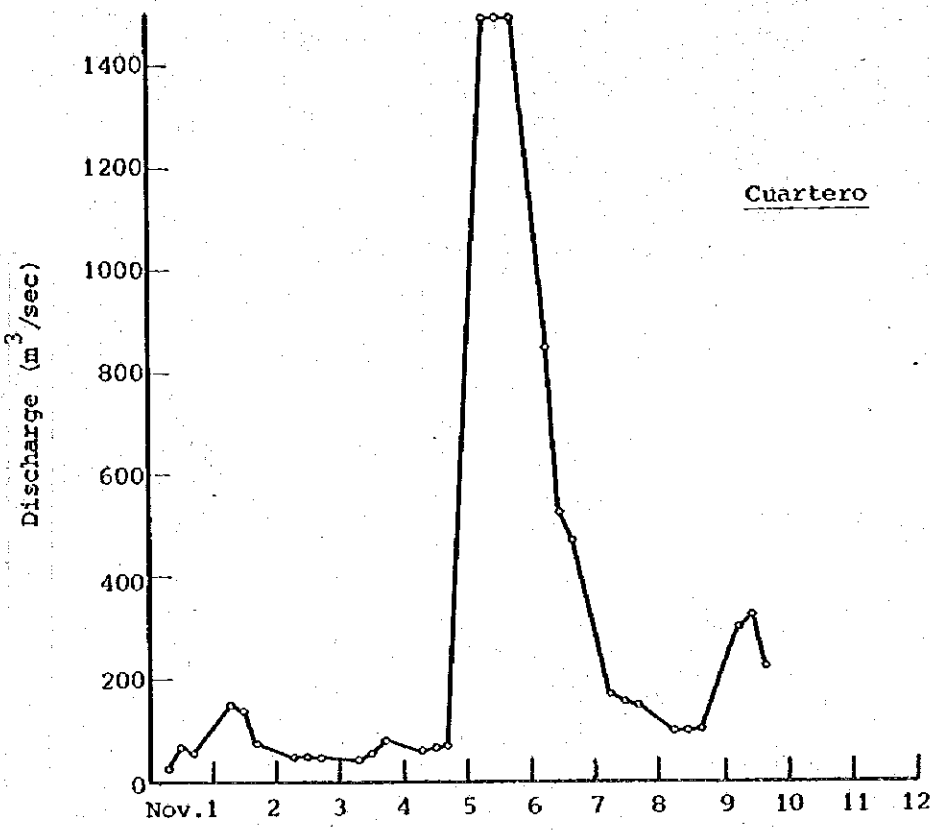


Fig. I.3-17 RATING CURVE AT CUARTERO GAGLNG STATION



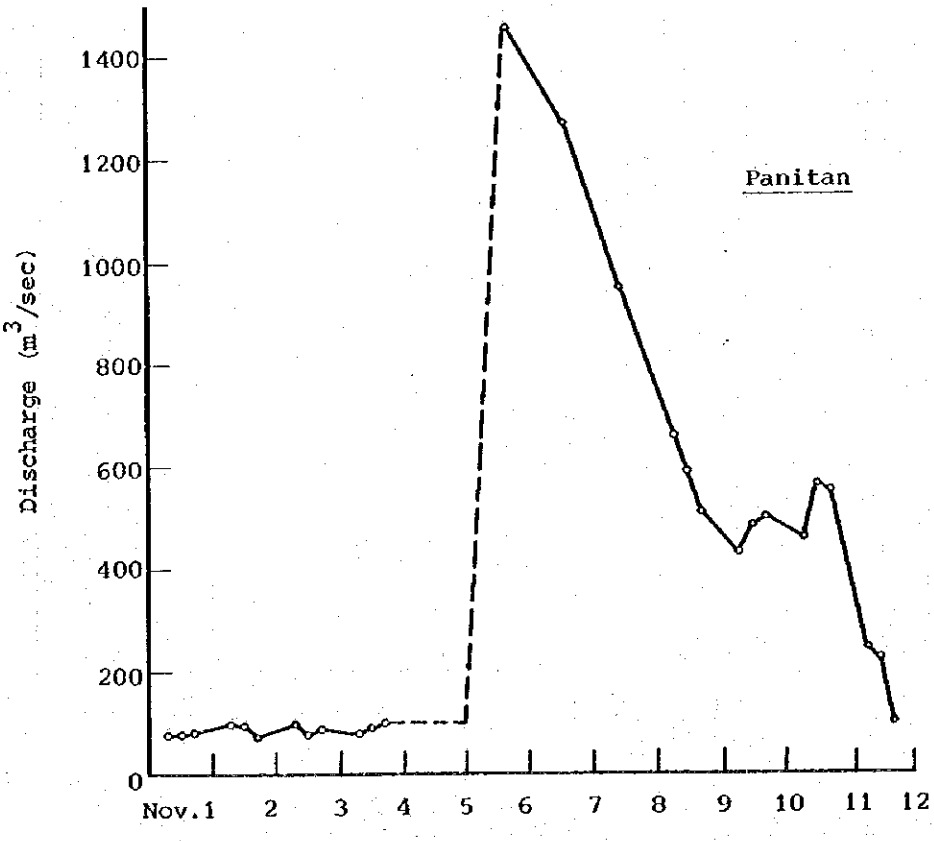


Fig.I.3-18 Flood Hydrograph at Cuartero and Panitan at the time of "Undang" Flood

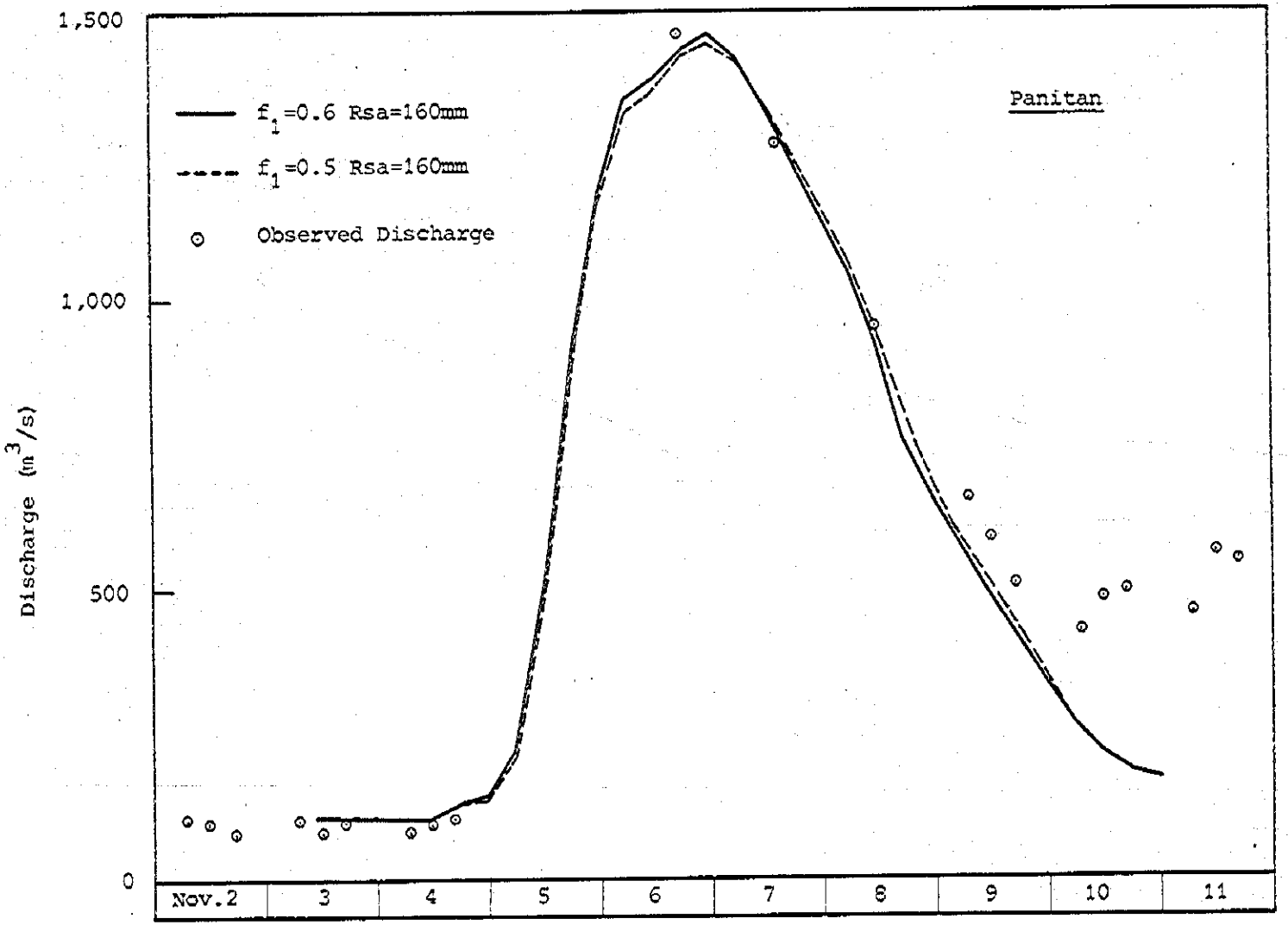


Fig.I.3-19 Simulated Flood Hydrograph at Panitan during "UNDANG" Flood

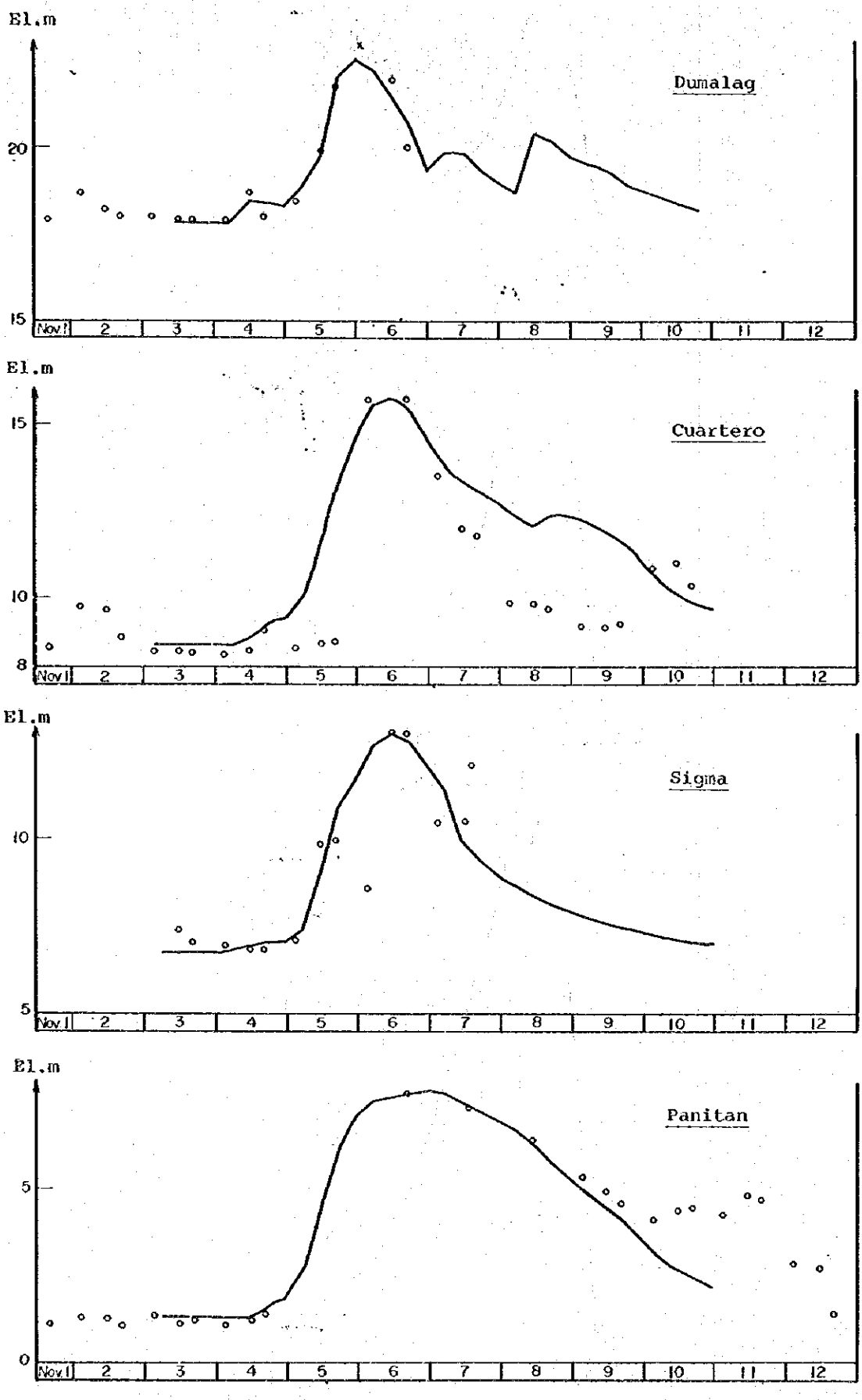


Fig.I.3-20 Simulated Water Stage Hydrographs at Dumalag, Cuartero, Signa, and Panitan During "Undang" Flood

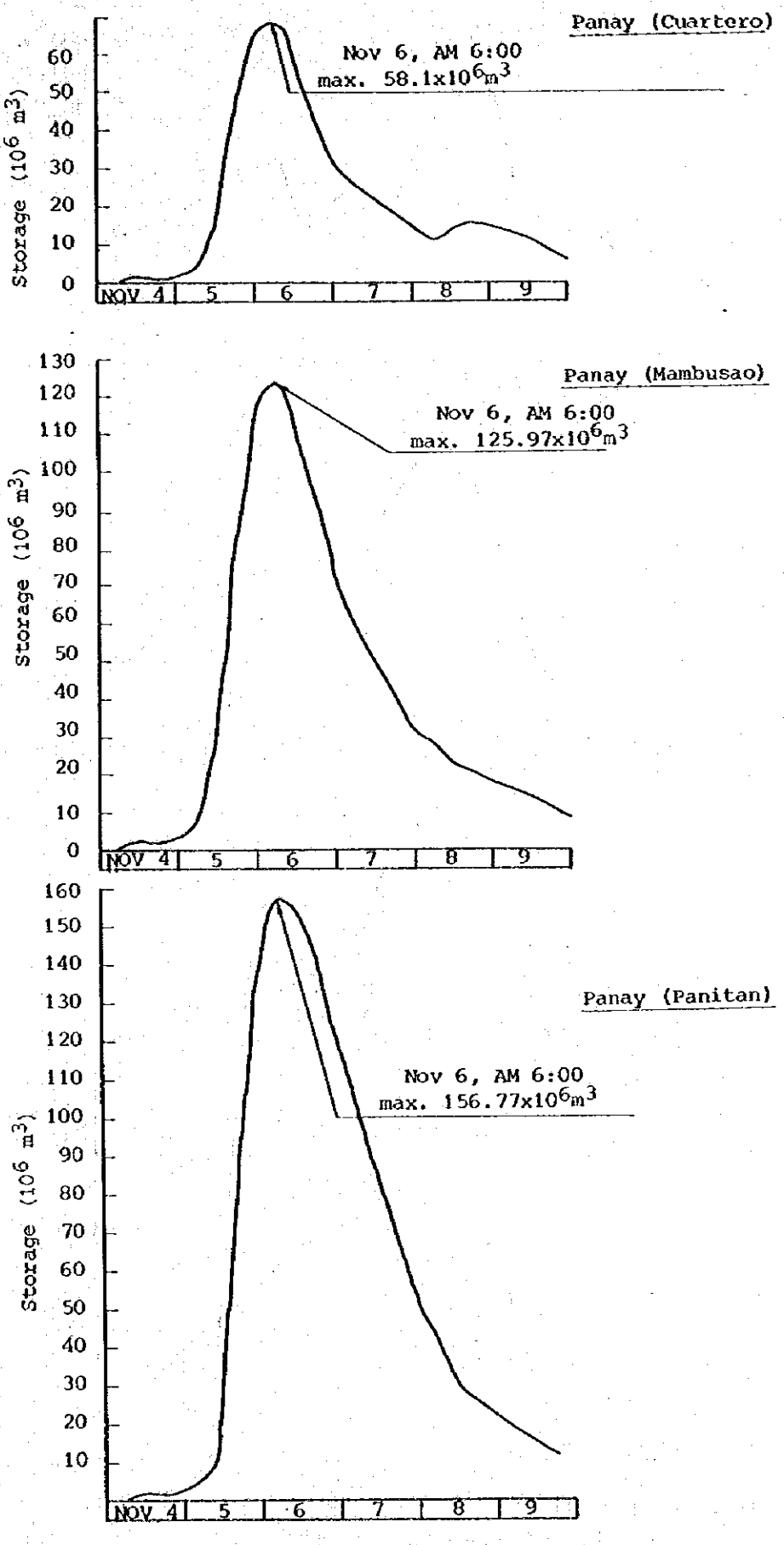


Fig.1.3-21 Flood Storage Volume Hydrograph during "Undang" Flood (1)

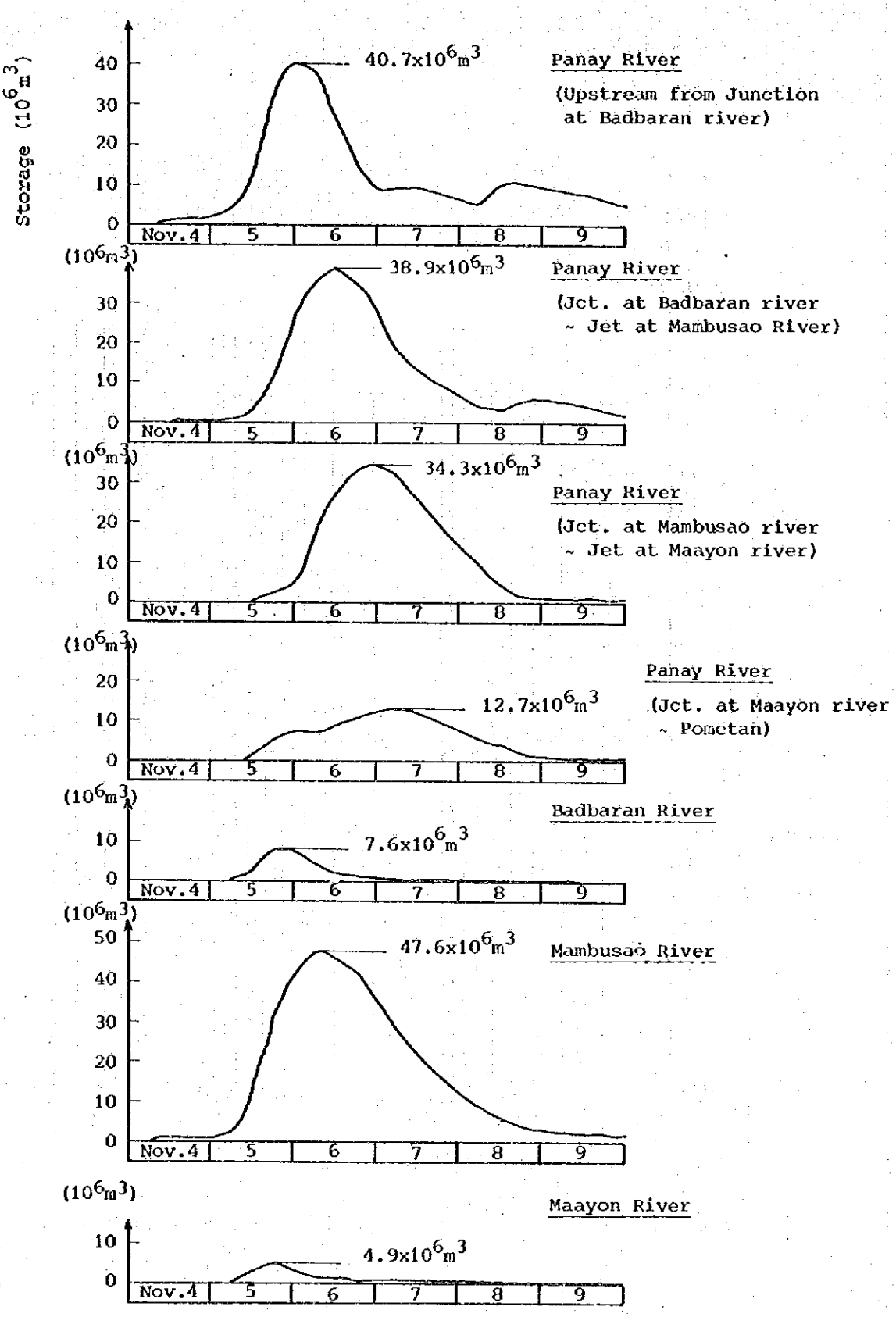


Fig.I.3-22 Flood Storage Volume Hydrograph During Undang Flood (2)

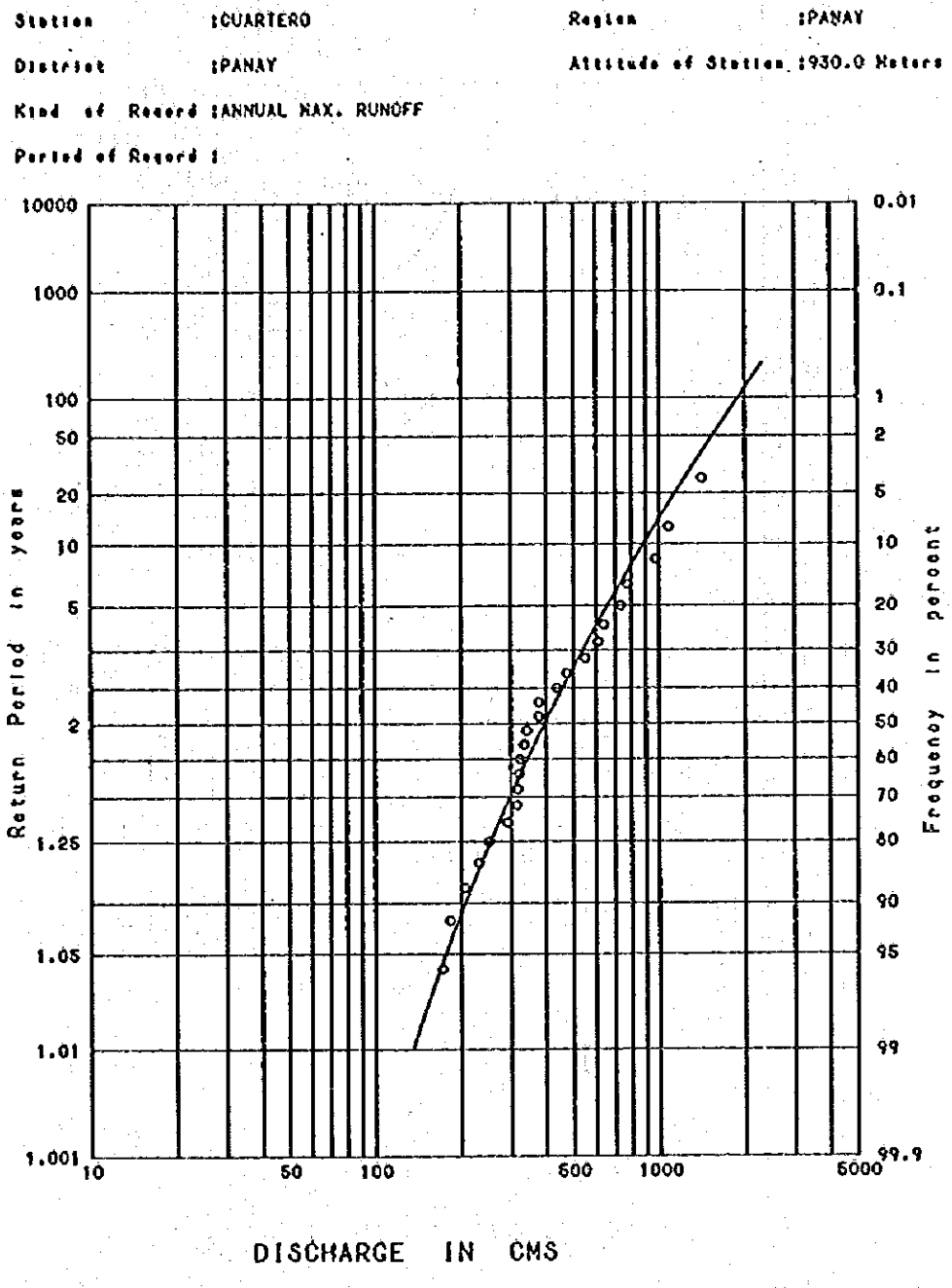


Fig. I.3-23 Frequency Curve of Discharge at Cuartero

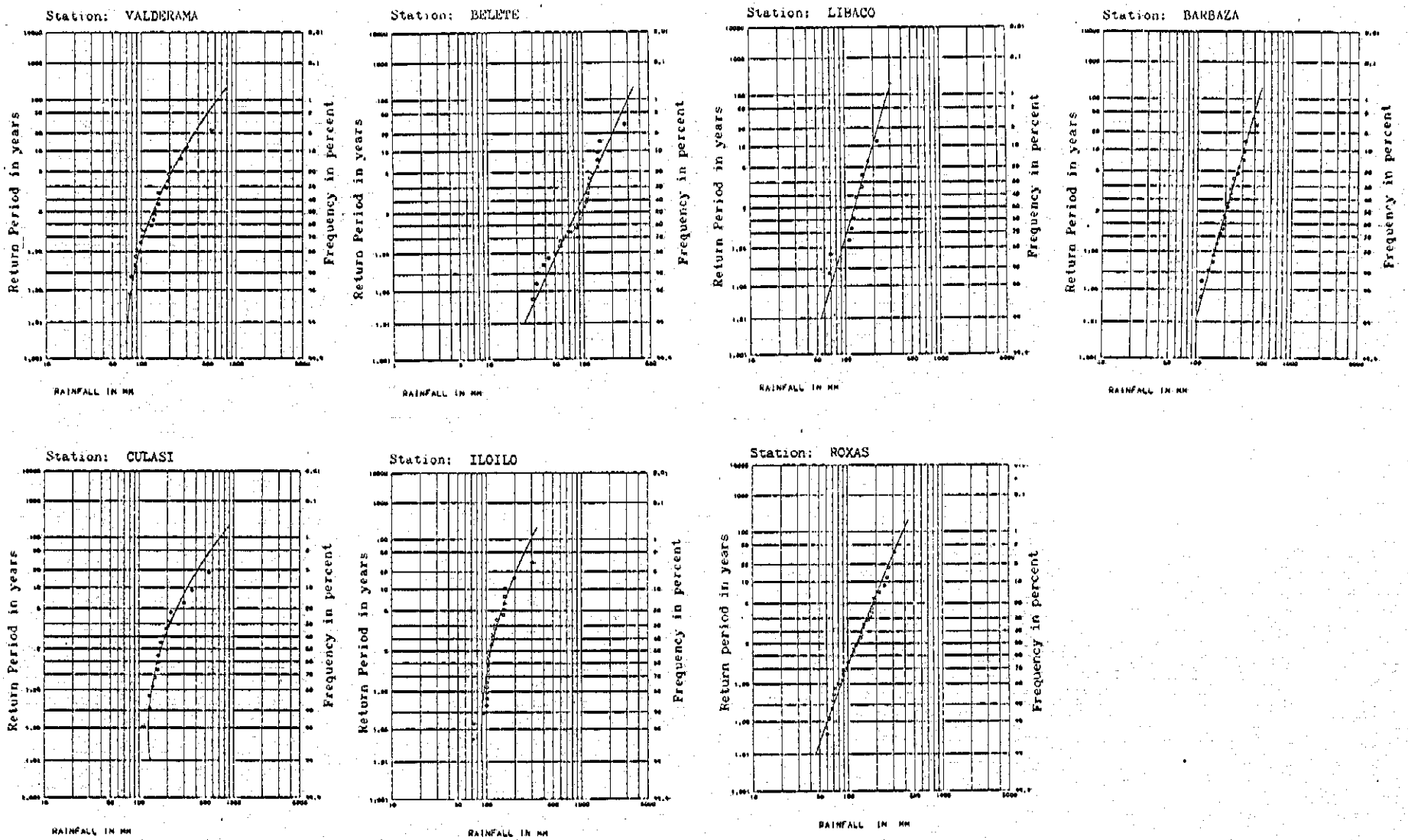


Fig.I.3-24 Frequency Curve of Annual Maximum 1-Day Rainfall

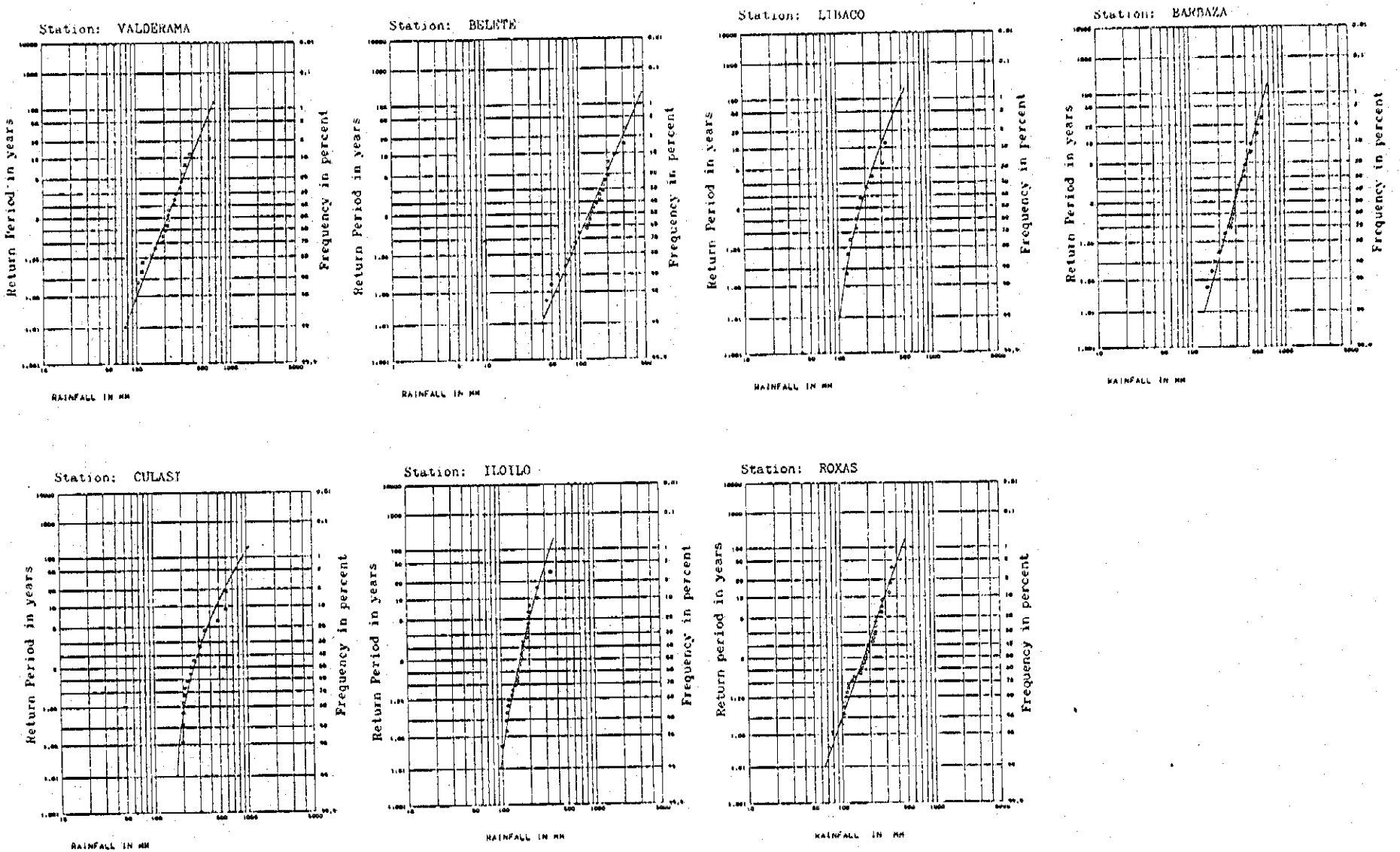


Fig.I.3-25 Frequency Curve of Annual Maximum 2-Day Rainfall

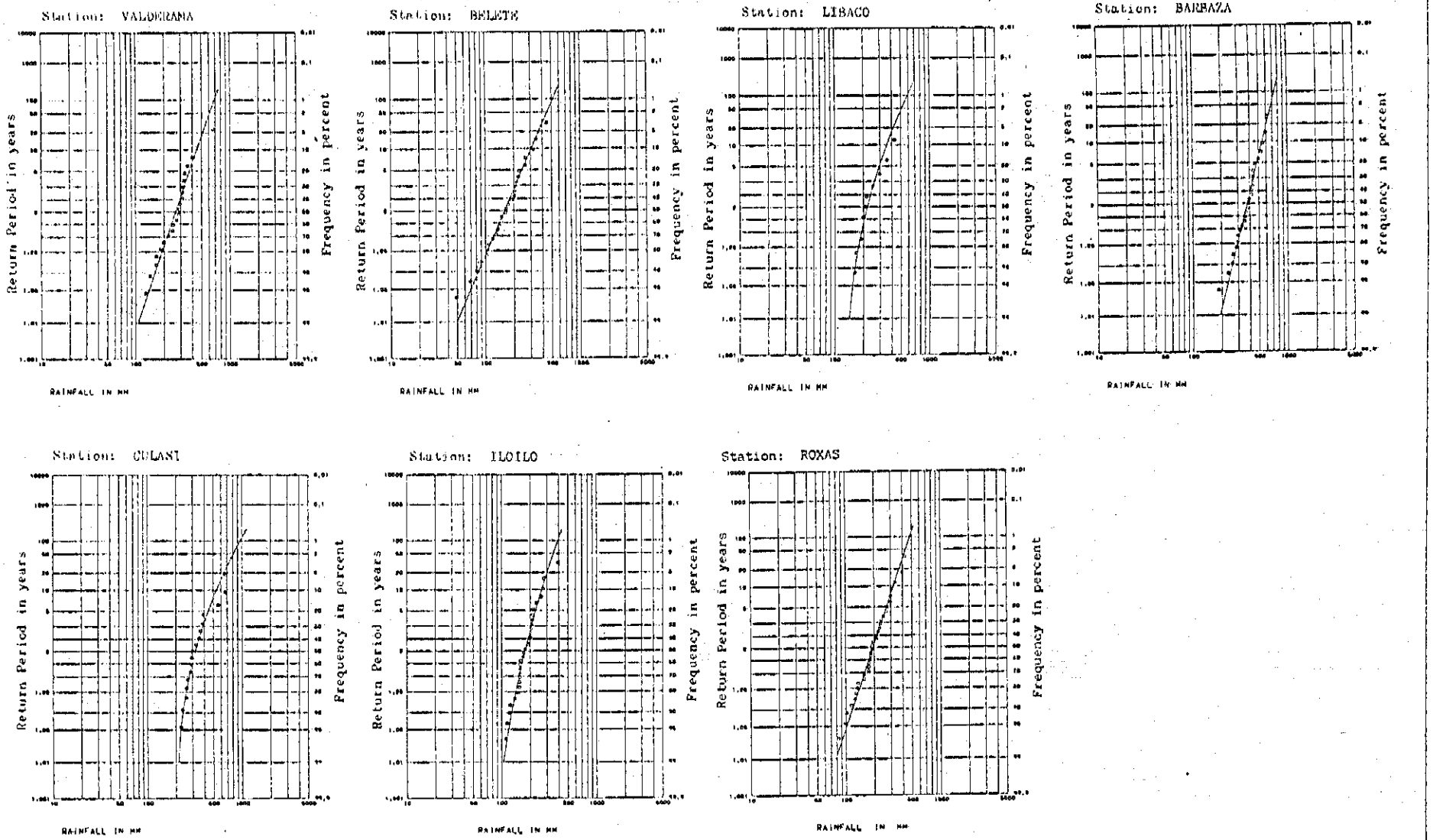


Fig.I.3-26 Frequency Curve of Annual Maximum 3-Day Rainfall

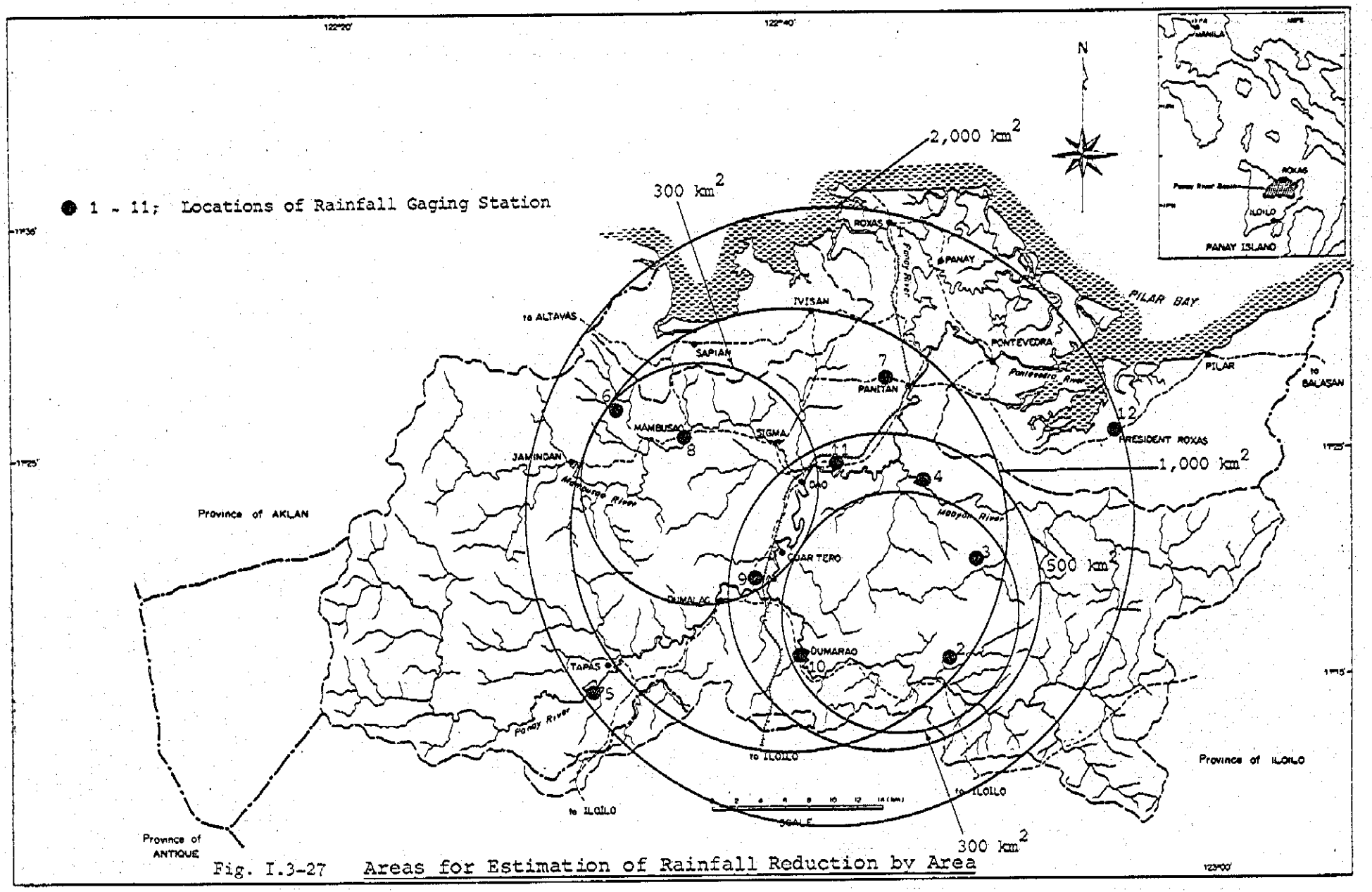


Fig. I.3-27 Areas for Estimation of Rainfall Reduction by Area

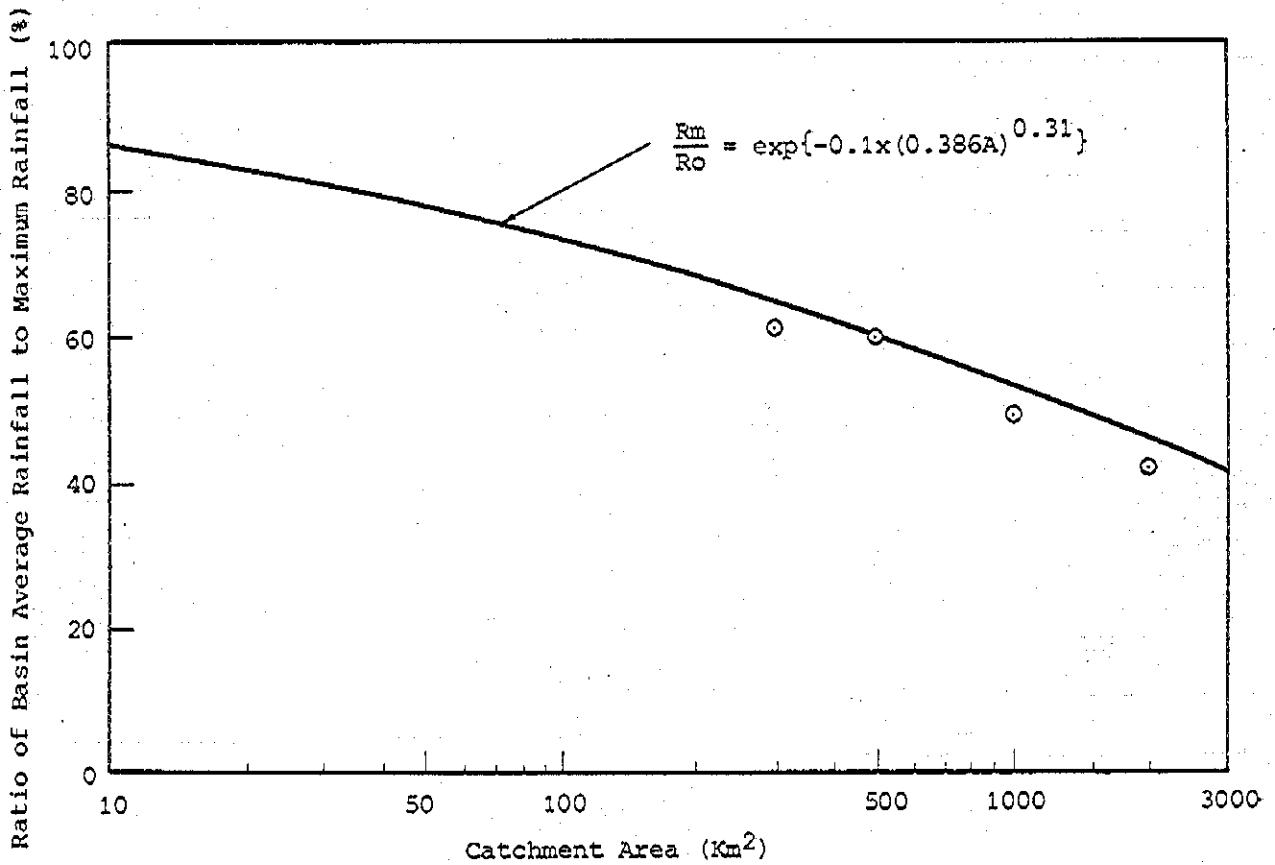
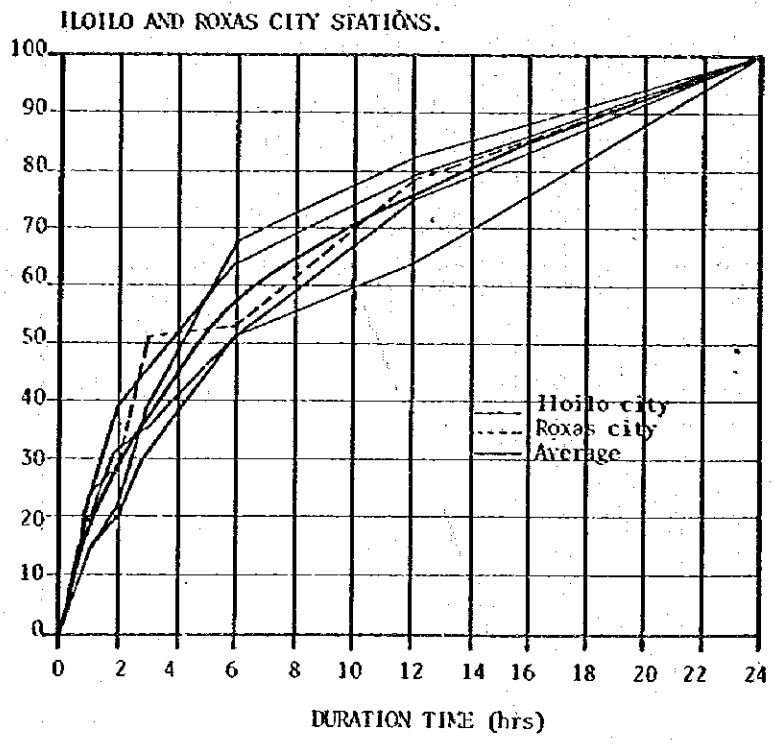


Fig. I.3-28 Depth Area Relation of Basin Rainfall



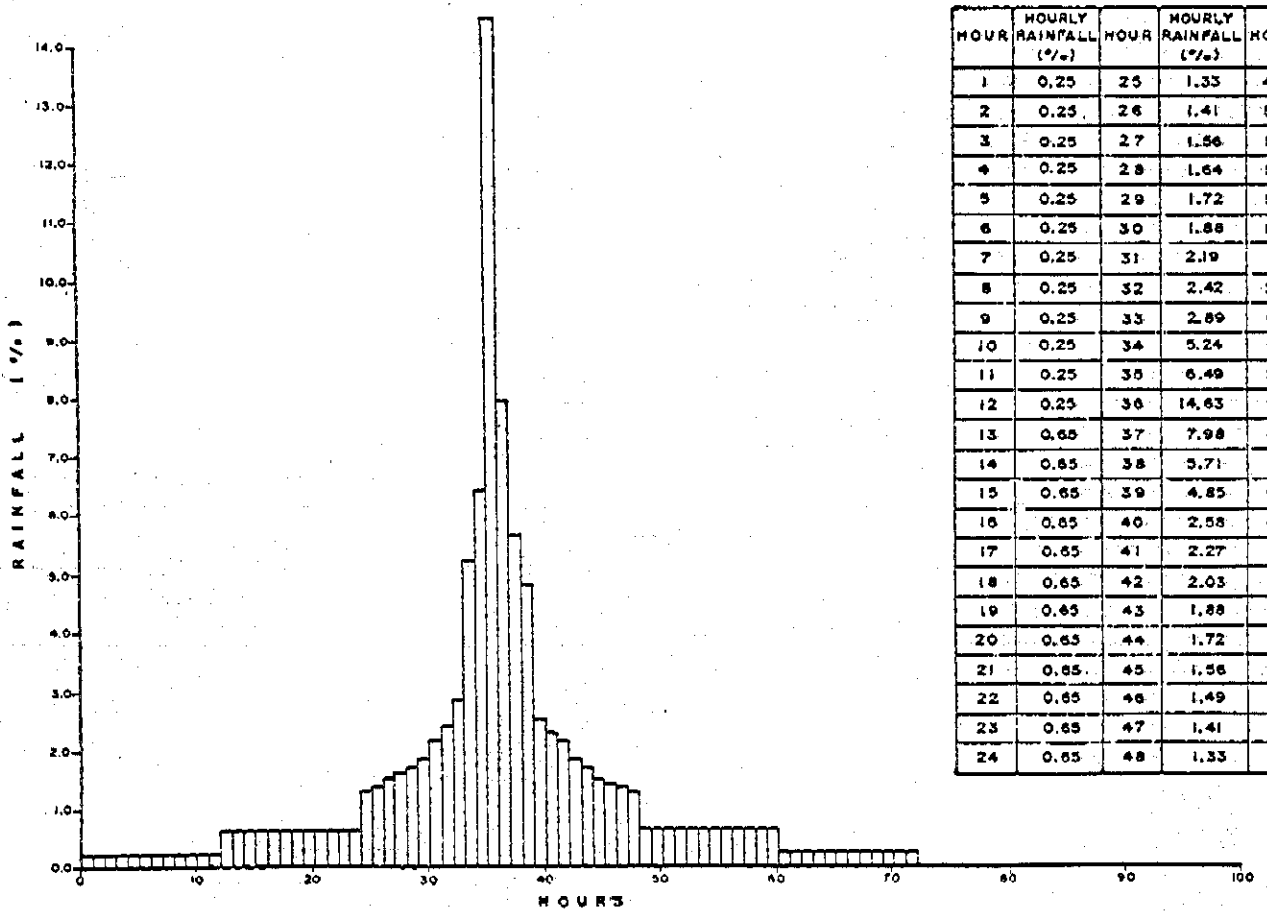
AVERAGE

DURATION TIME (hrs)	Rt/Rd (%)	DURATION TIME (hrs)	Rt/Rd (%)	DURATION TIME (hrs)	Rt/Rd (%)
1	18.7	9	67.5	17	87.1
2	28.9	10	70.4	18	89.1
3	37.2	11	73.2	19	91.1
4	44.5	12	75.8	20	93.0
5	51.2	13	78.2	21	94.8
6	57.4	14	80.6	22	96.6
7	61.1	15	82.9	23	98.3
8	64.4	16	85.0	24	100.0

Note:

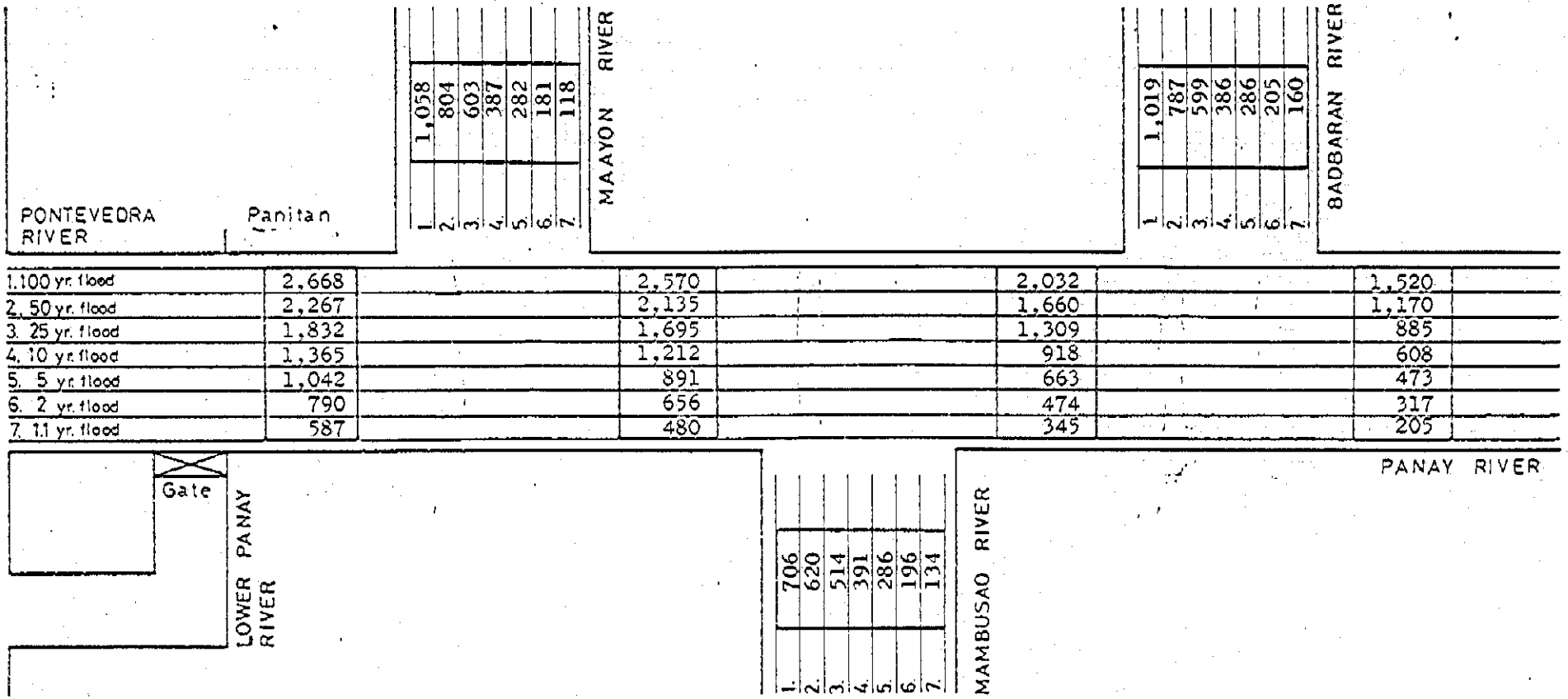
1. Hourly rainfall records of which daily rainfall was larger than 150 mm. during the years from 1950 to 1977 are used.
2. Rt, Rd: Rainfall at duration (t) and daily rainfall.

Fig. I.3-29 Rainfall Intensity-Duration Curve



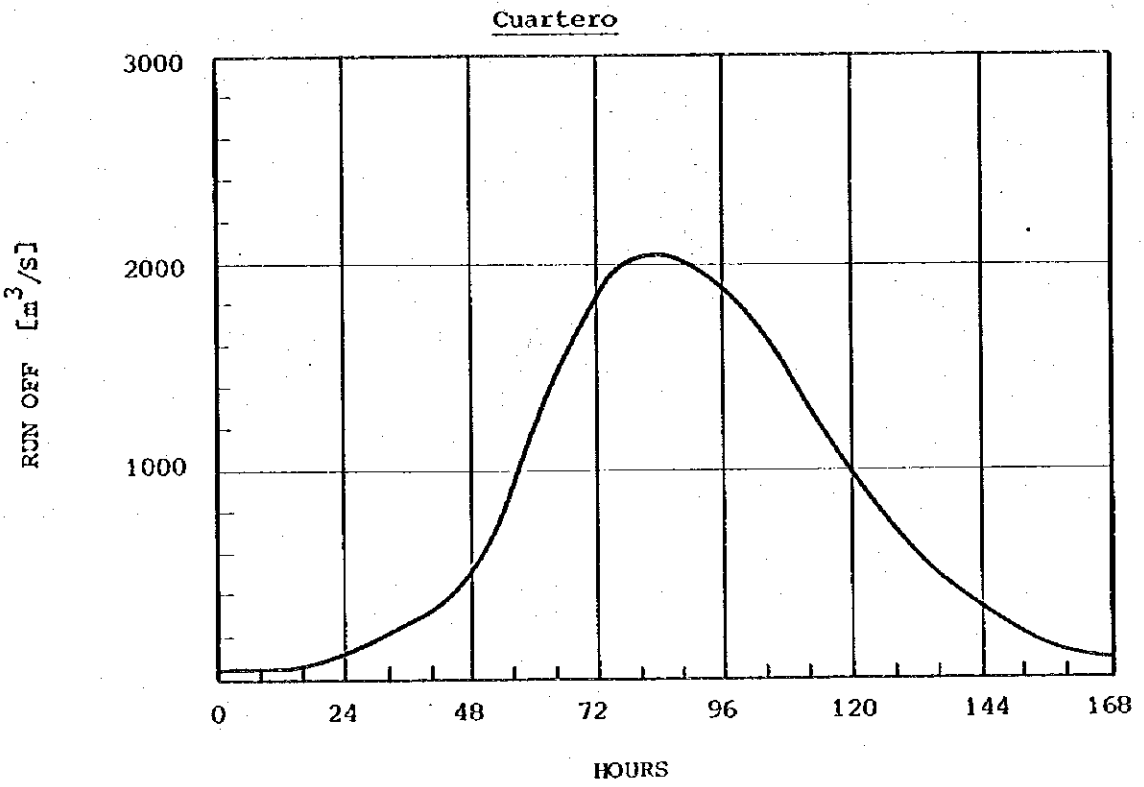
HOUR	HOURLY RAINFALL (%)	HOUR	HOURLY RAINFALL (%)	HOUR	HOURLY RAINFALL (%)
1	0.25	25	1.33	49	0.65
2	0.25	26	1.41	50	0.65
3	0.25	27	1.56	51	0.65
4	0.25	28	1.64	52	0.65
5	0.25	29	1.72	53	0.65
6	0.25	30	1.88	54	0.65
7	0.25	31	2.19	55	0.65
8	0.25	32	2.42	56	0.65
9	0.25	33	2.89	57	0.65
10	0.25	34	5.24	58	0.65
11	0.25	35	6.49	59	0.65
12	0.25	36	14.63	60	0.65
13	0.65	37	7.98	61	0.25
14	0.65	38	5.71	62	0.25
15	0.65	39	4.85	63	0.25
16	0.65	40	2.58	64	0.25
17	0.65	41	2.27	65	0.25
18	0.65	42	2.03	66	0.25
19	0.65	43	1.88	67	0.25
20	0.65	44	1.72	68	0.25
21	0.65	45	1.56	69	0.25
22	0.65	46	1.49	70	0.25
23	0.65	47	1.41	71	0.25
24	0.65	48	1.33	72	0.25

Fig. I.3-30 Hourly Rainfall Distribution



1. 100 yr. flood	2,668		2,570		2,032		1,520	
2. 50 yr. flood	2,267		2,135		1,660		1,170	
3. 25 yr. flood	1,832		1,695		1,309		885	
4. 10 yr. flood	1,365		1,212		918		608	
5. 5 yr. flood	1,042		891		663		473	
6. 2 yr. flood	790		656		474		317	
7. 1.1 yr. flood	587		480		345		205	

Fig. I.3-31 Flood Flow Distribution for Present River Condition
(Probability of Basin Rainfall at Panitan)



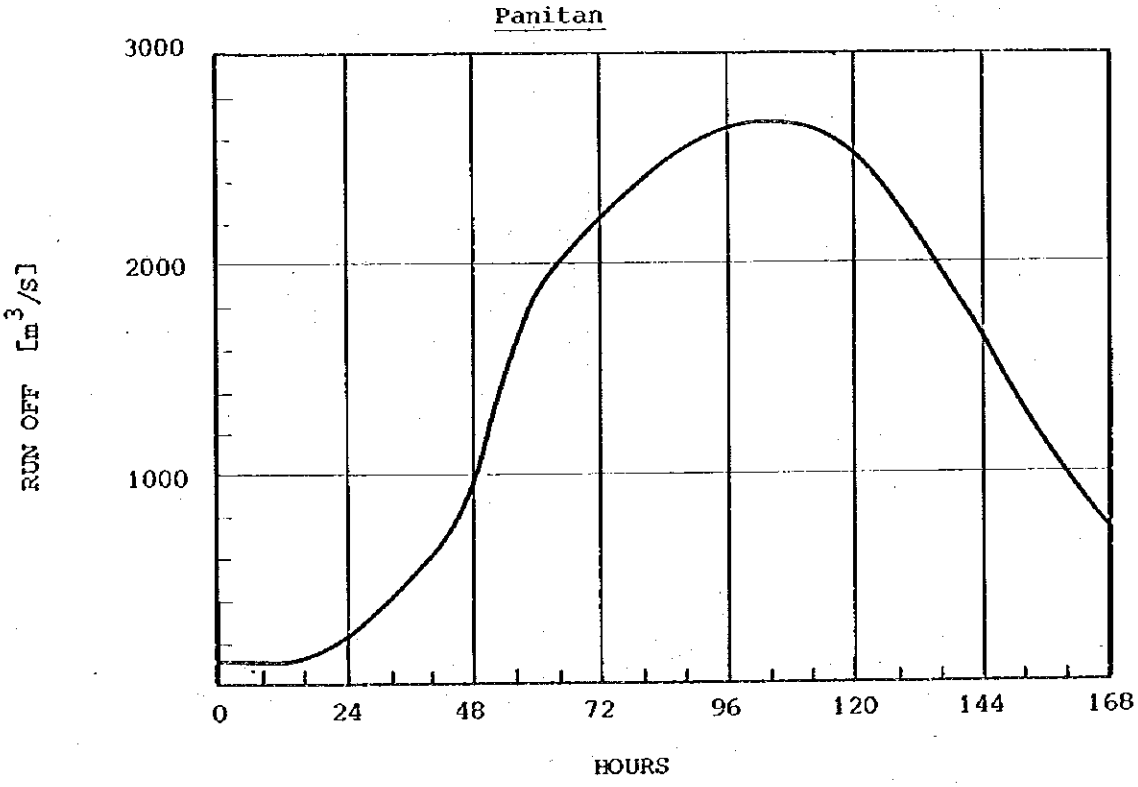


Fig. I.3-32 Hydrograph of 100 year Flood Under Present River Condition

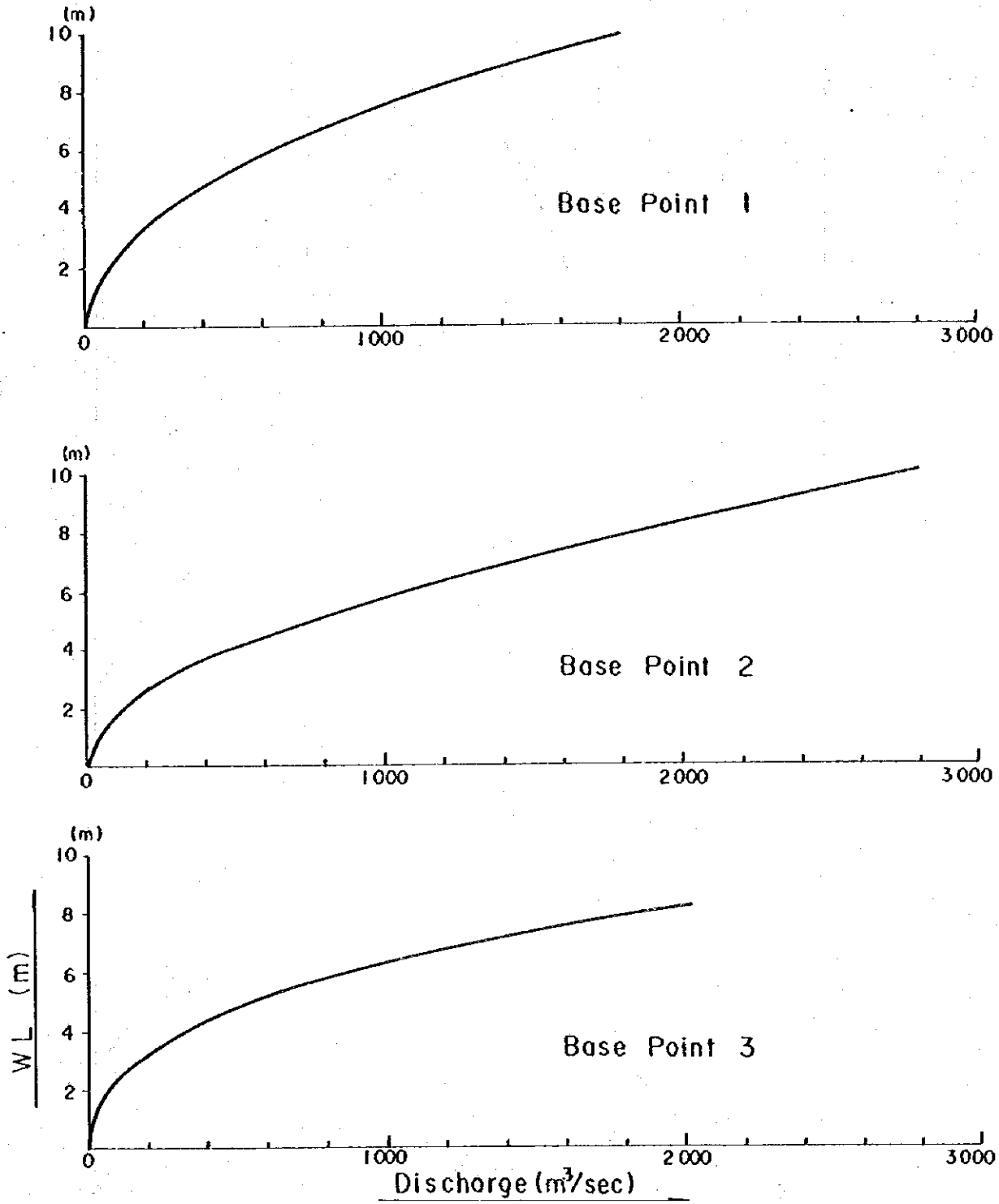


Fig I. 3-33

Rating Curve at Base Point Under Present River Condition (1)

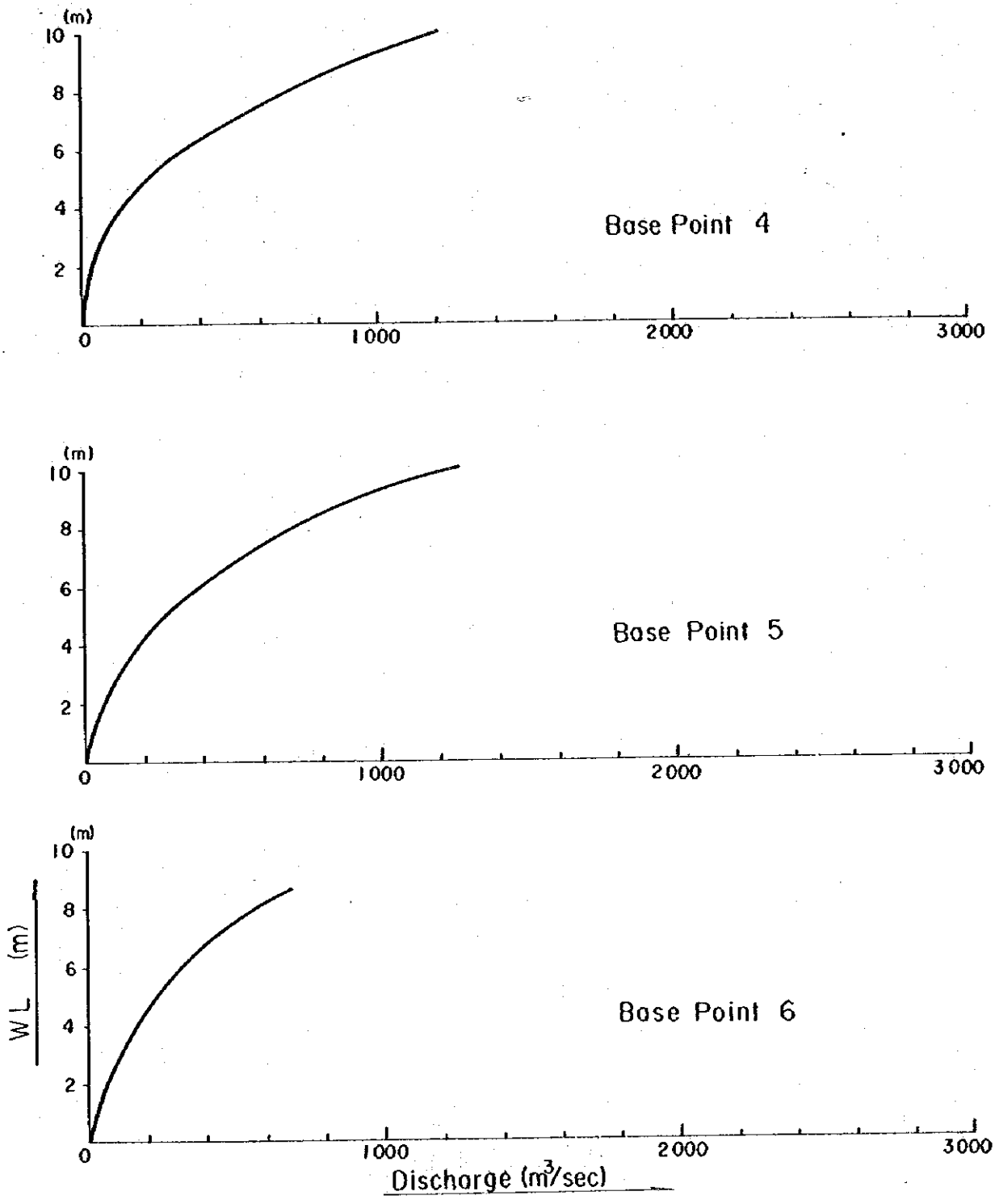


Fig 1.3-33

Rating Curve at Base Point Under Present River Condition (2)

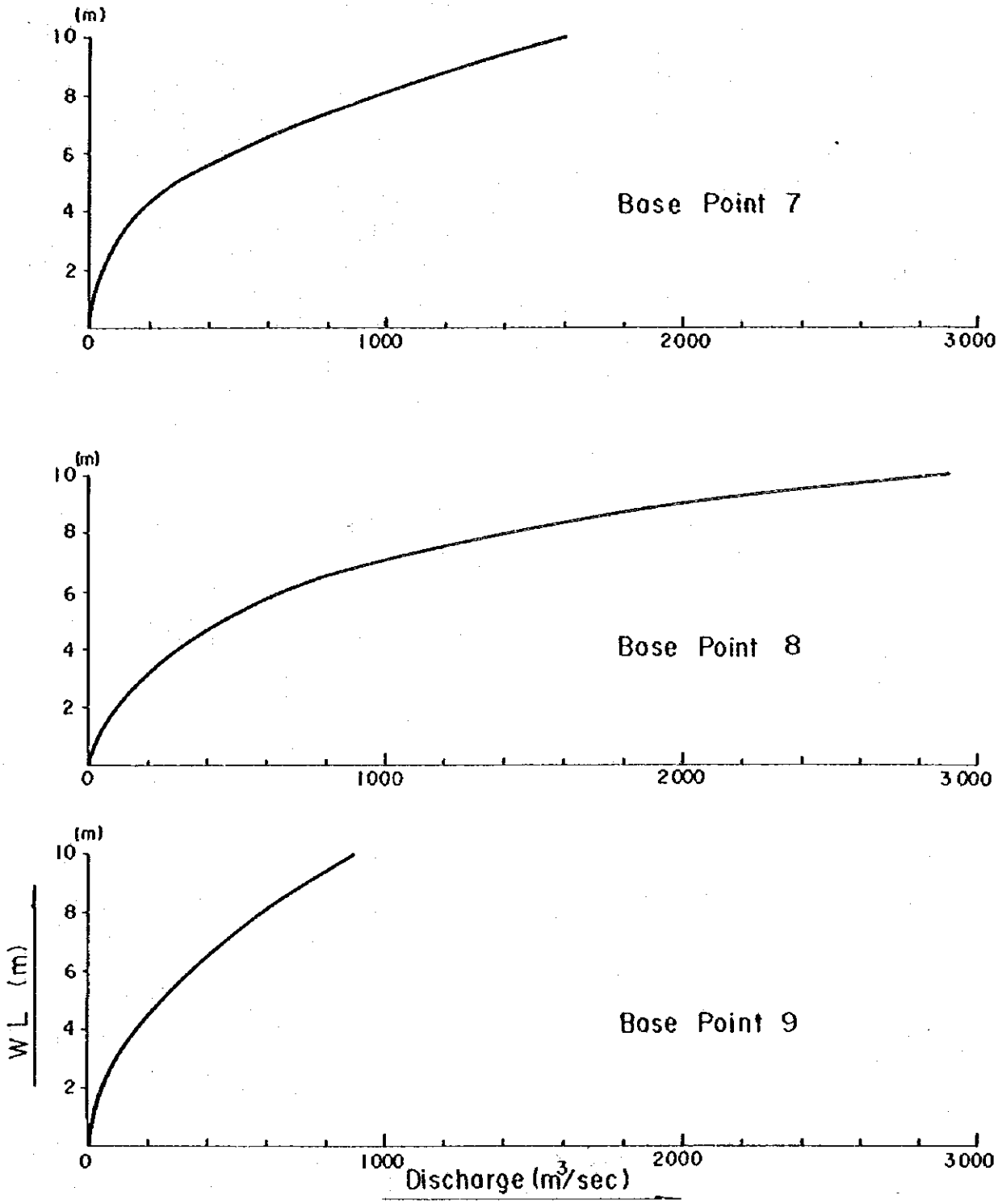


Fig I. 3-33

Rating Curve at Base Point Under Present River Condition (3)

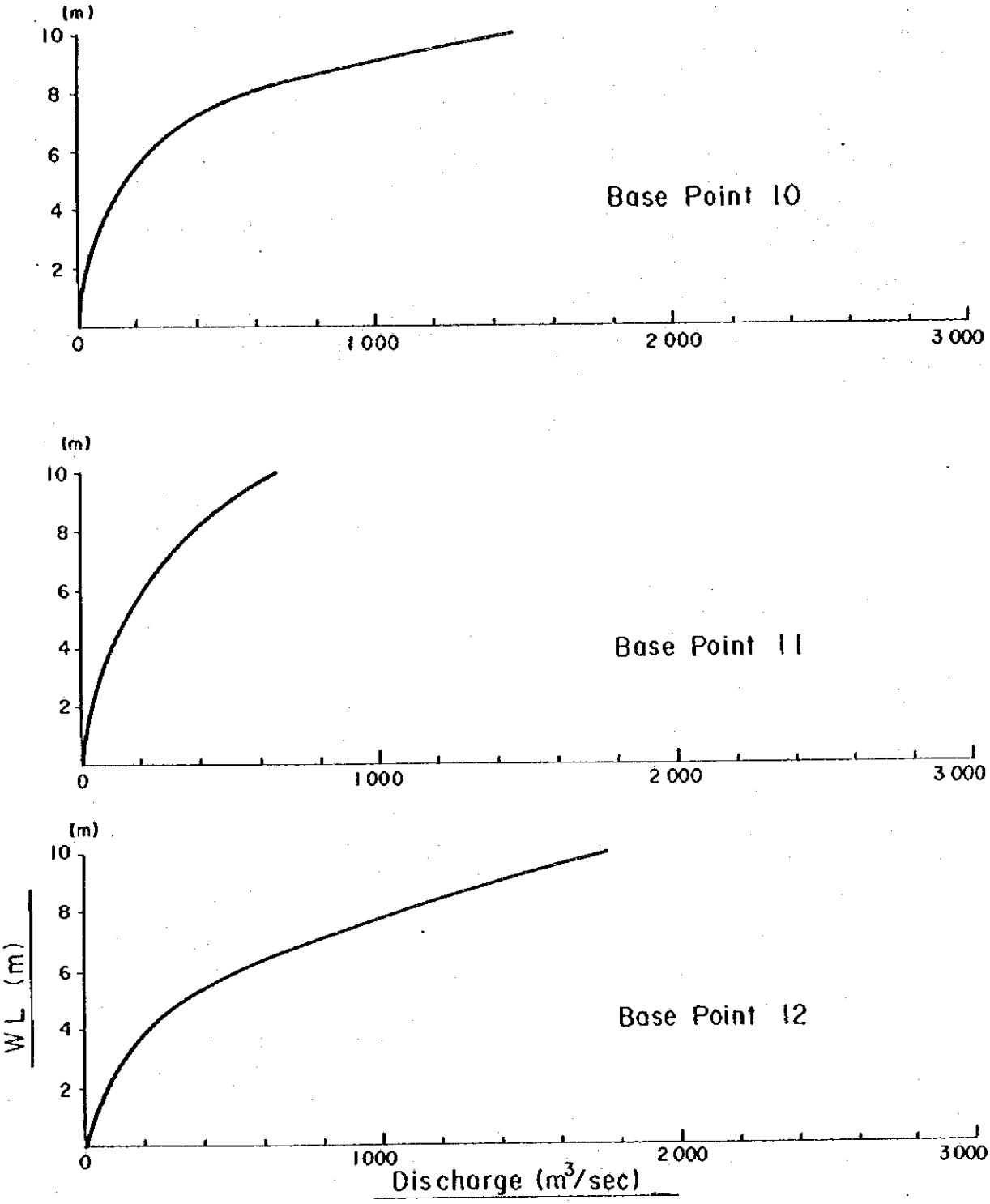


Fig I.3-33
Rating Curve at Base Point Under Present River Condition (4)

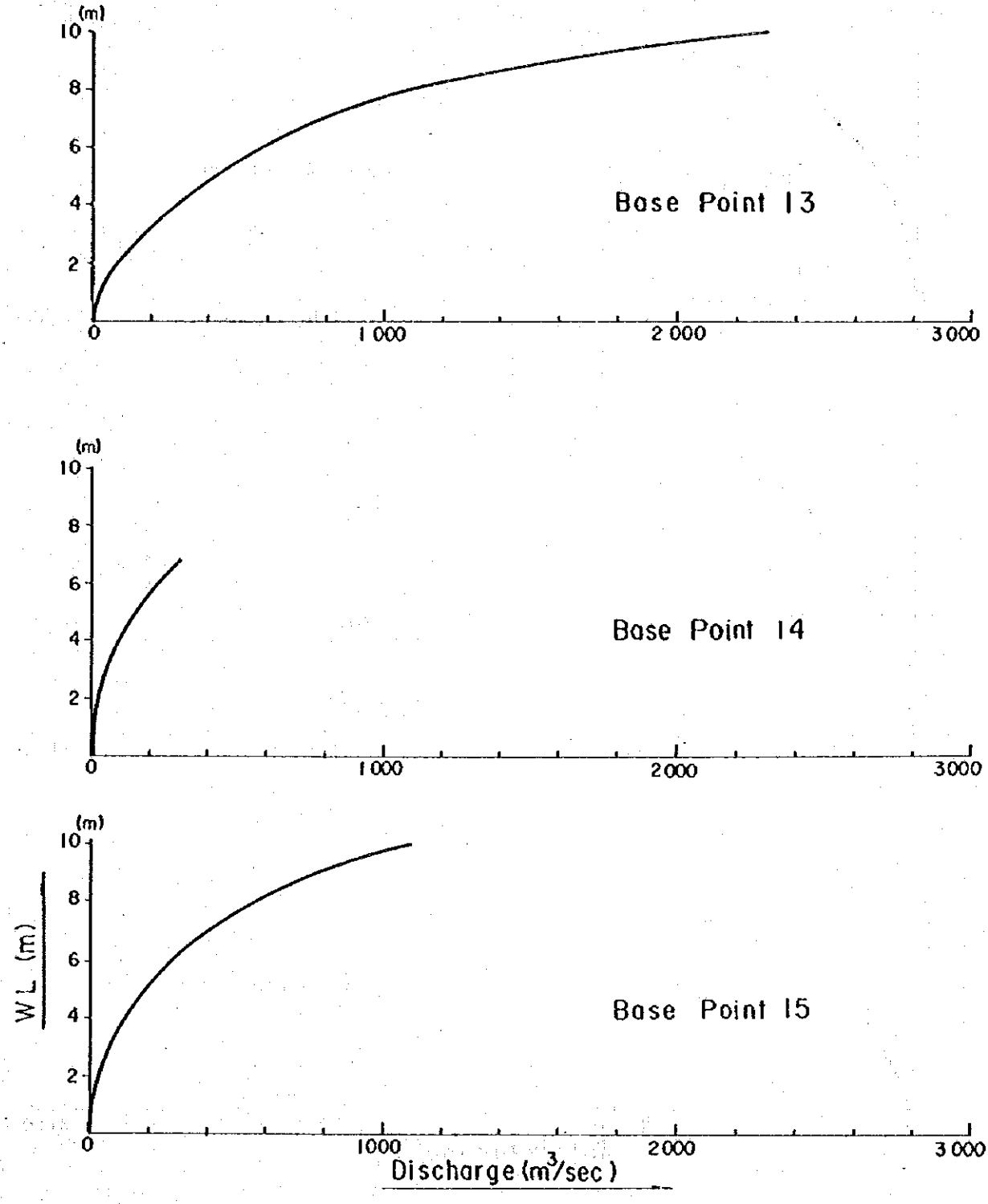


Fig I. 3-33

Rating Curve at Base Point Under Present River Condition (5)

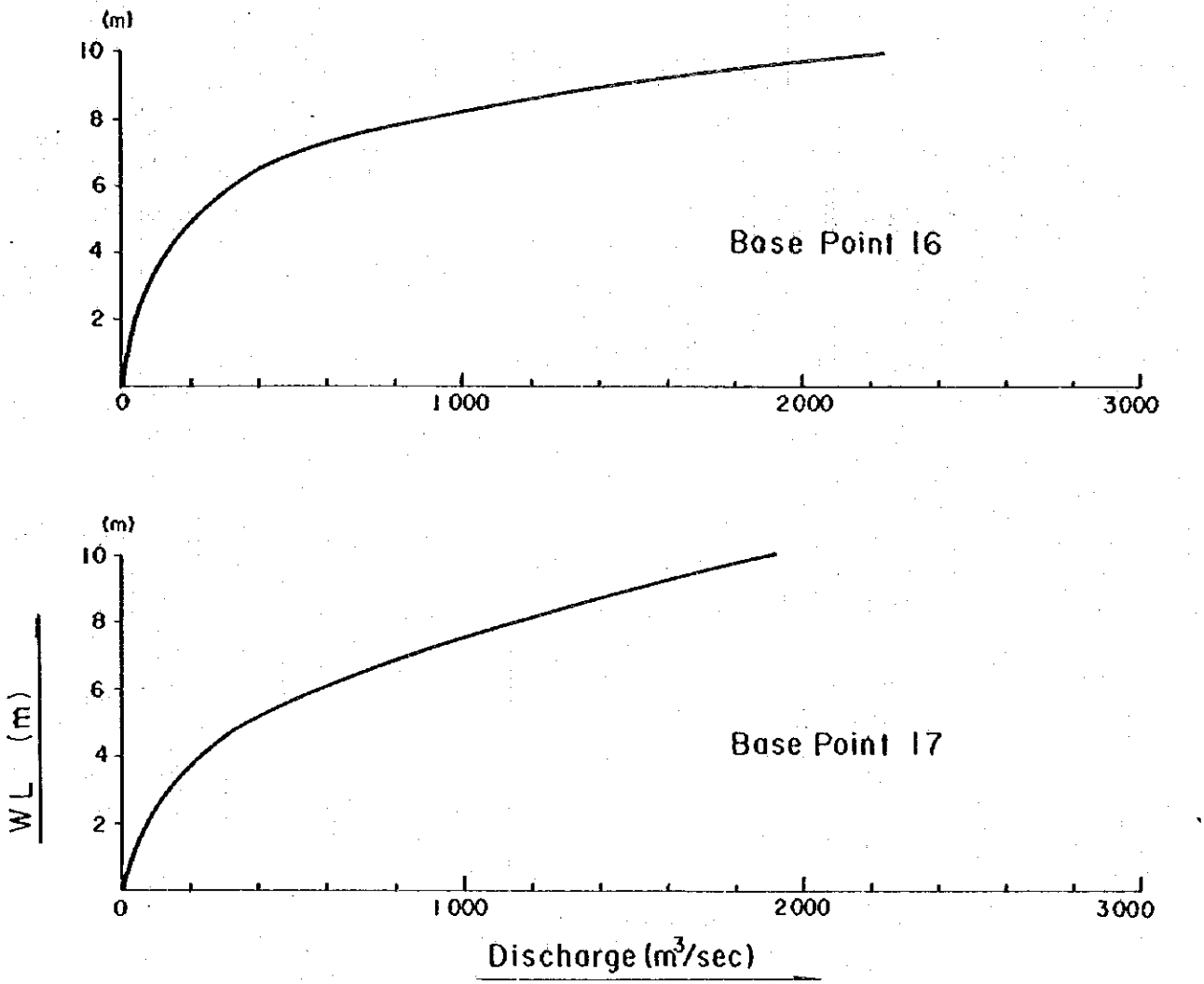


Fig 1.3-33

Rating Curve at Base Point Under Present River Condition (6)

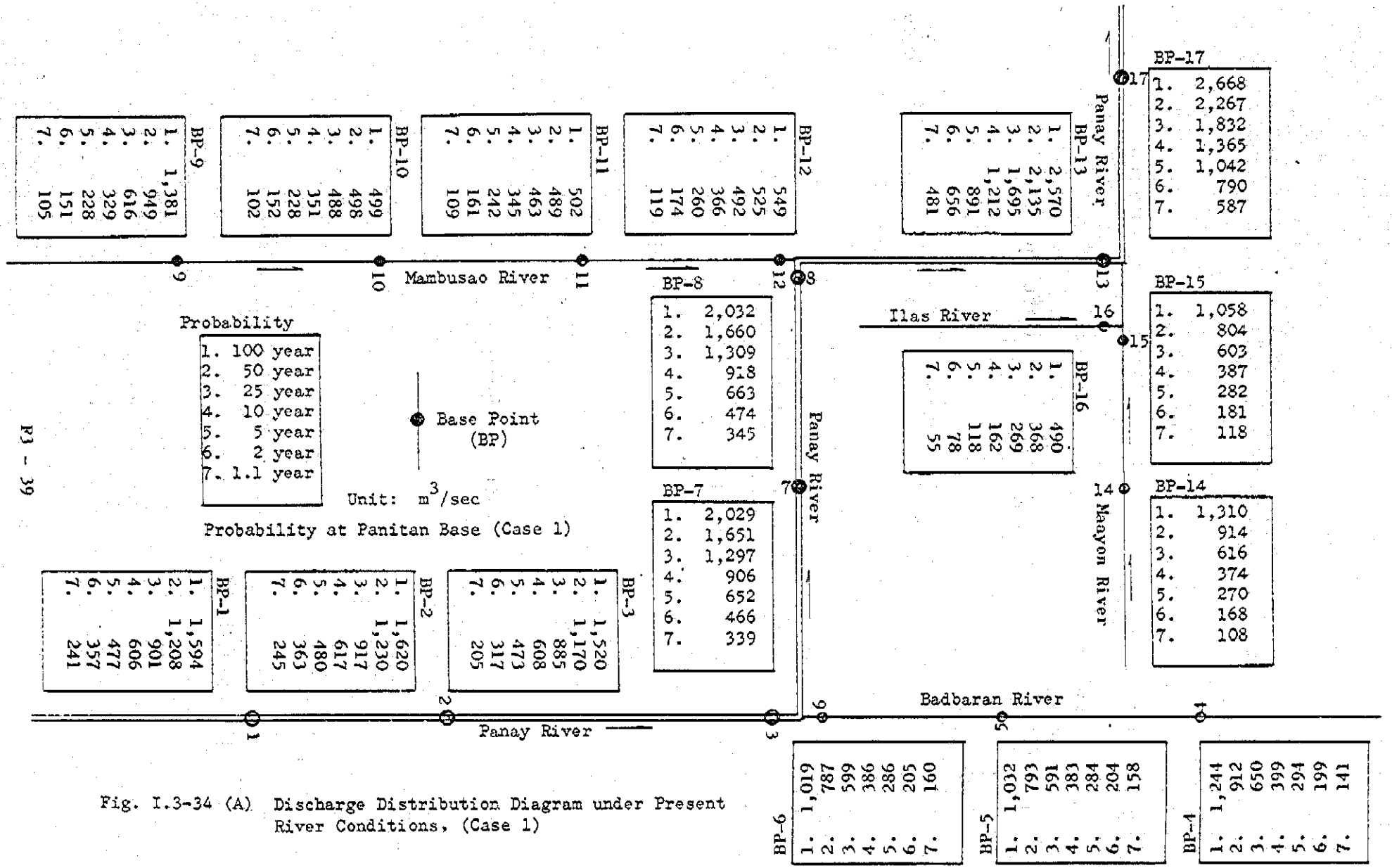


Fig. I.3-34 (A) Discharge Distribution Diagram under Present River Conditions, (Case 1)

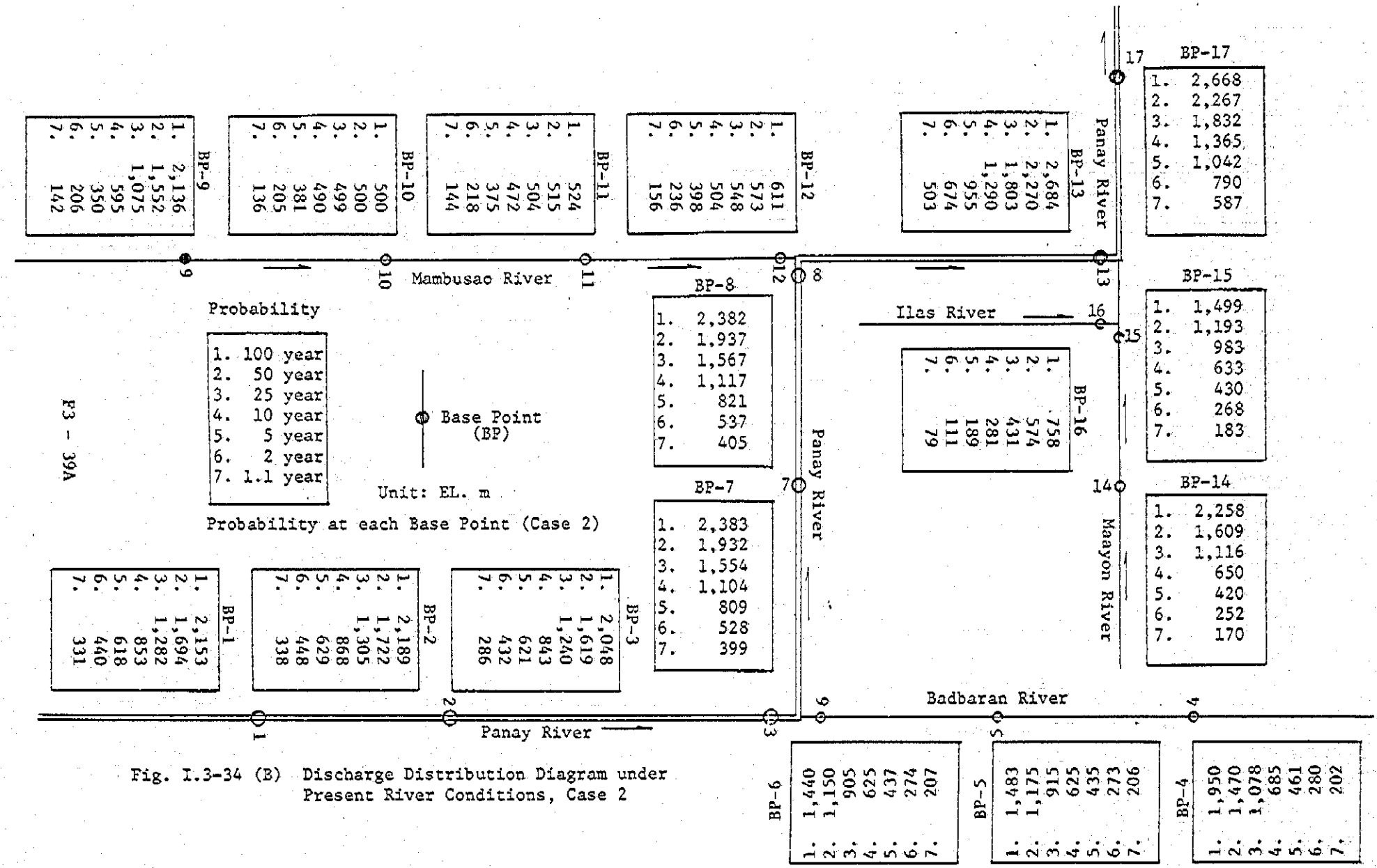


Fig. I.3-34 (B) Discharge Distribution Diagram under Present River Conditions, Case 2

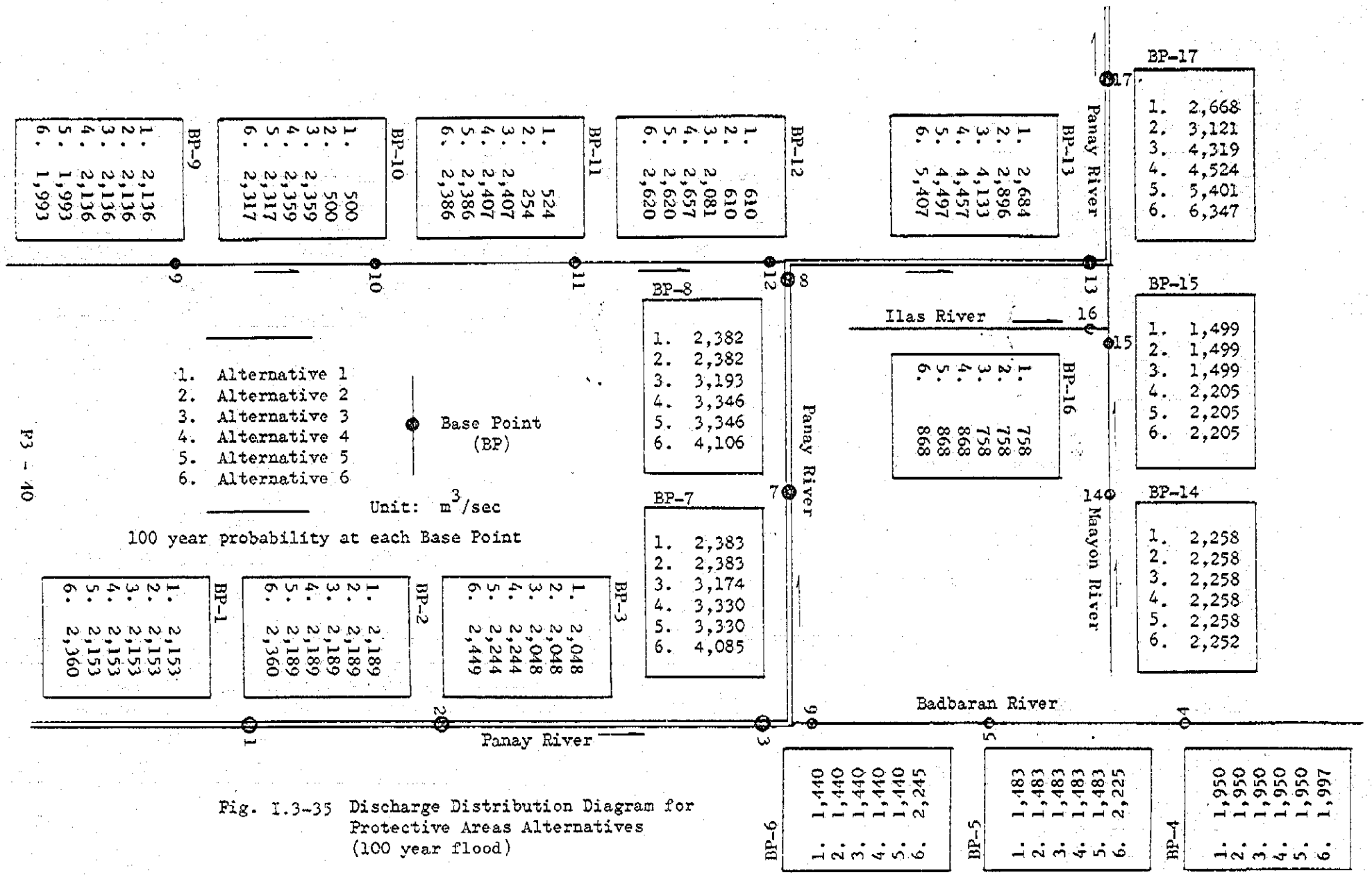


Fig. I.3-35 Discharge Distribution Diagram for Protective Areas Alternatives (100 year flood)

Fig. I.3-36 Discharge Distribution Diagram for Dam Plans Under Present River Condition (1), Panay B Dam

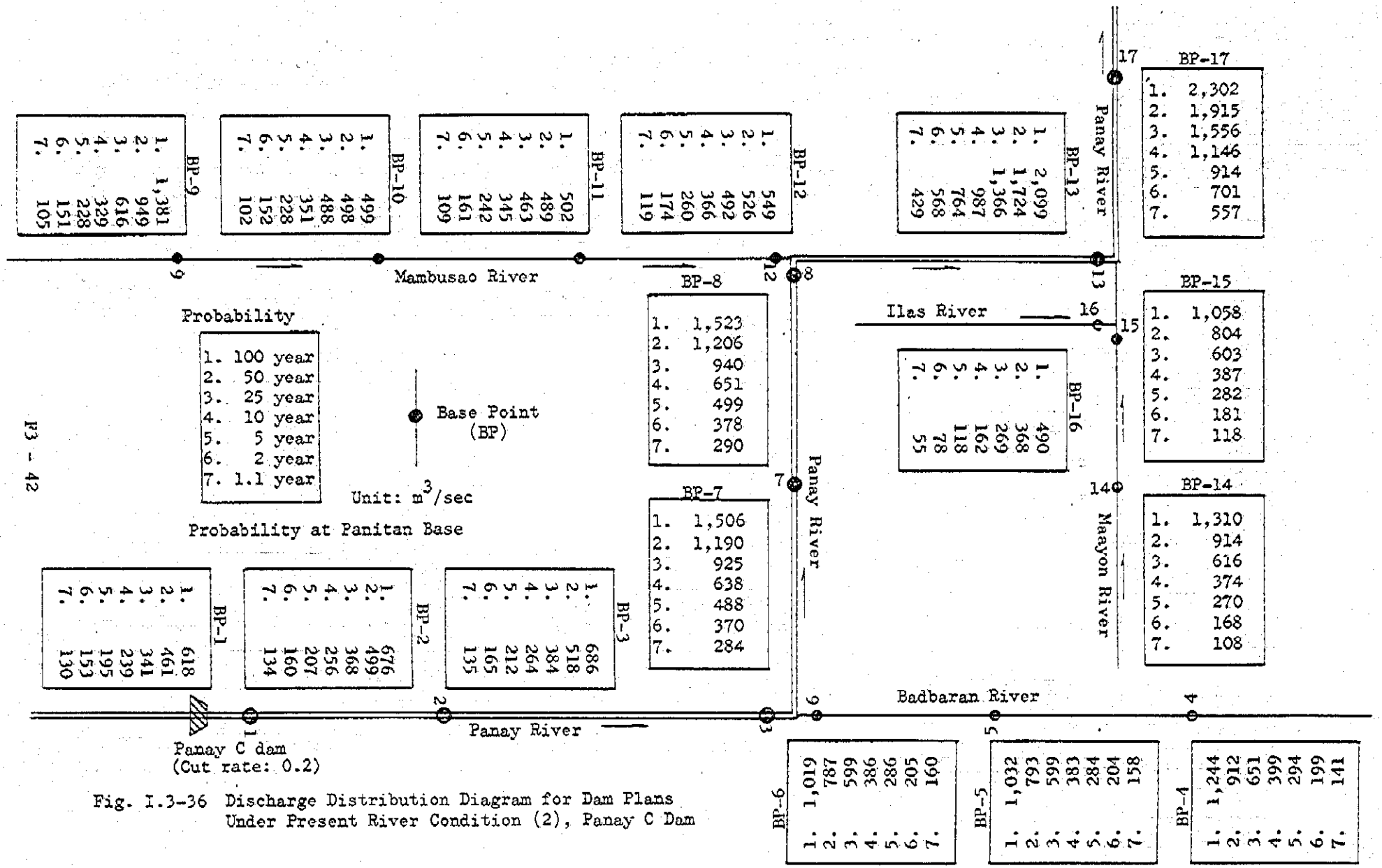


Fig. I.3-36 Discharge Distribution Diagram for Dam Plans Under Present River Condition (2), Panay C Dam

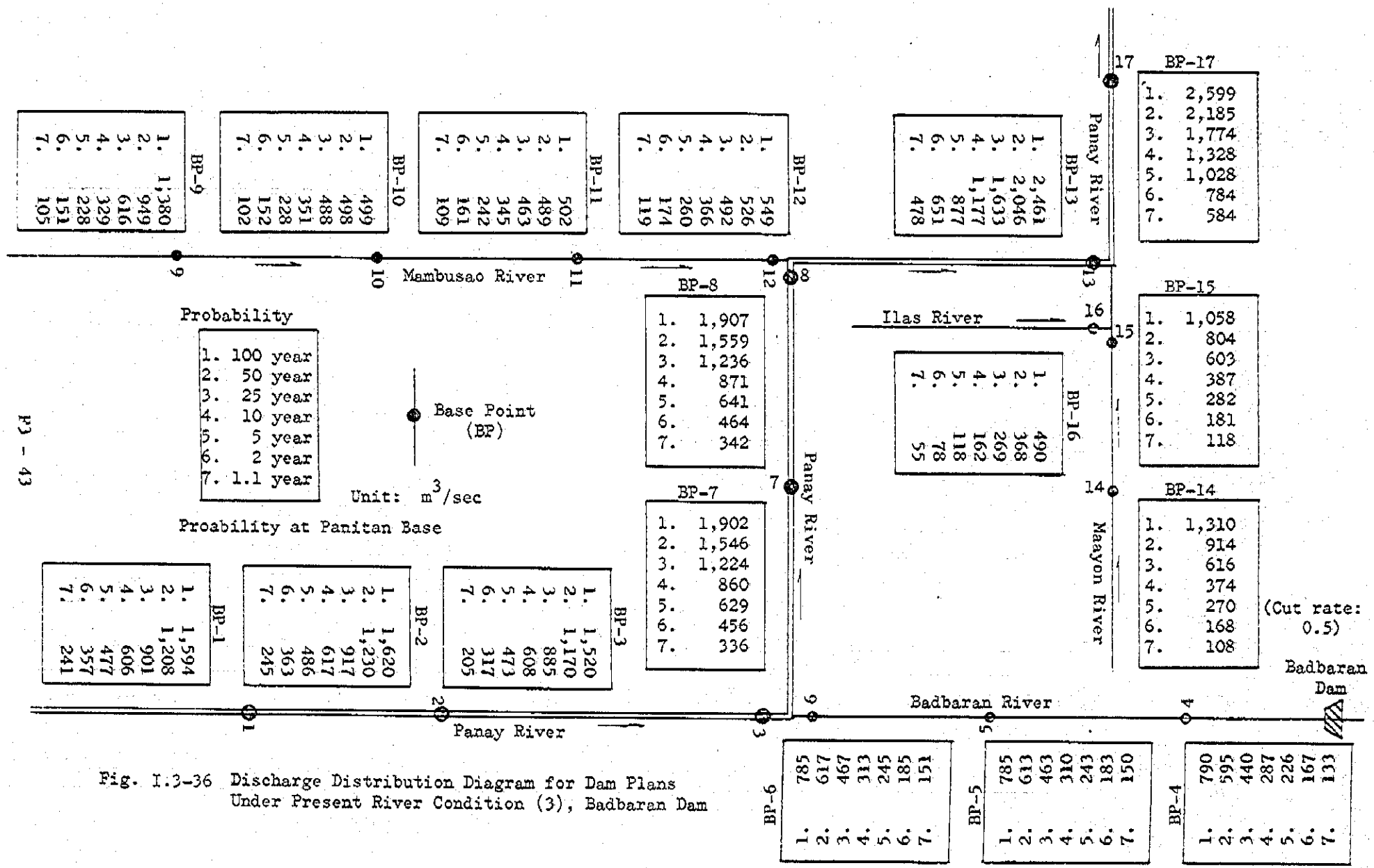


Fig. I.3-36 Discharge Distribution Diagram for Dam Plans Under Present River Condition (3), Badbaran Dam

Fig. I.3-36 Discharge Distribution Diagram for Dam Plans
Under Present River Condition (4), Mambusao Dam

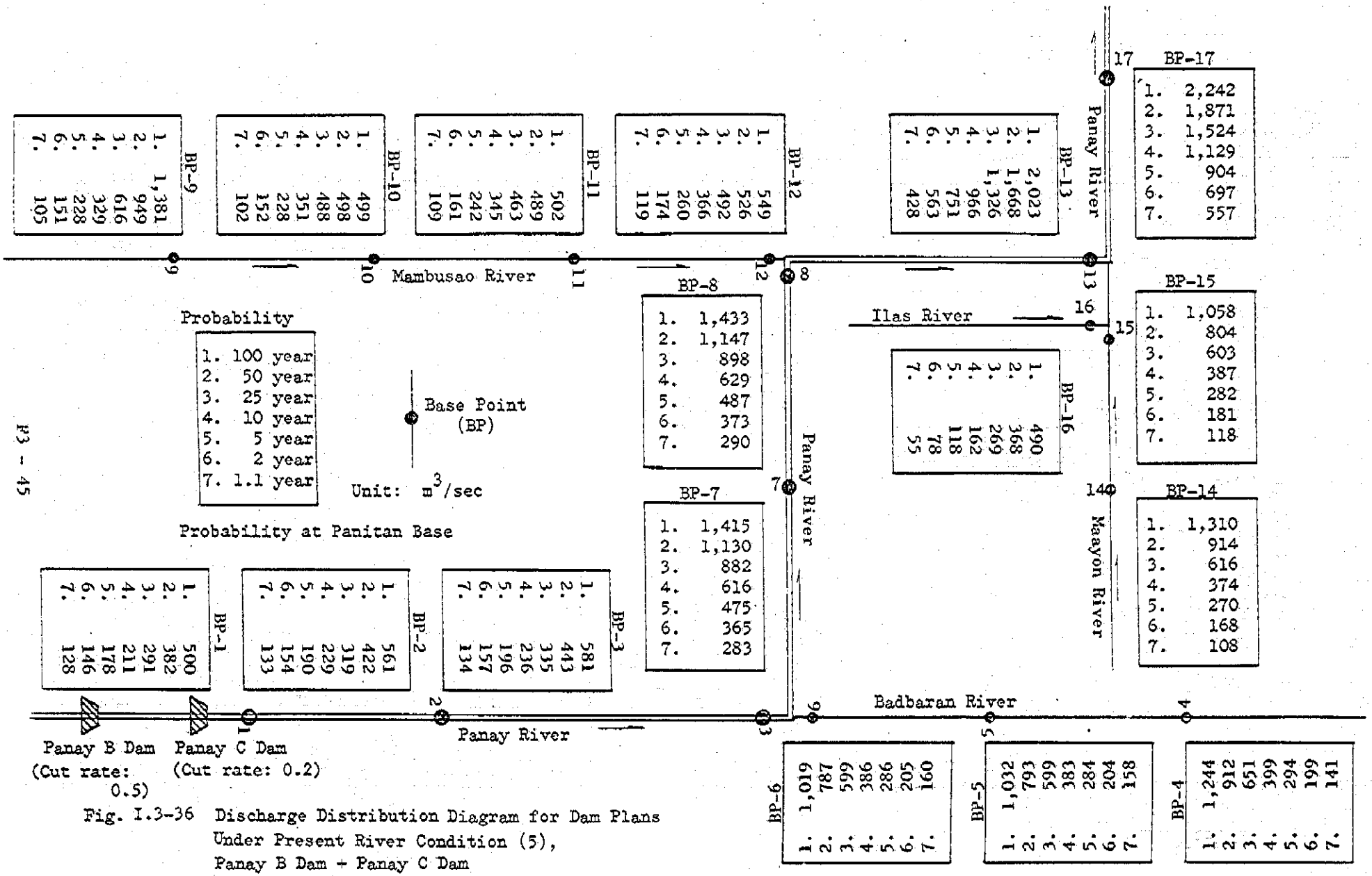


Fig. I.3-36 Discharge Distribution Diagram for Dam Plans Under Present River Condition (5), Panay B Dam + Panay C Dam

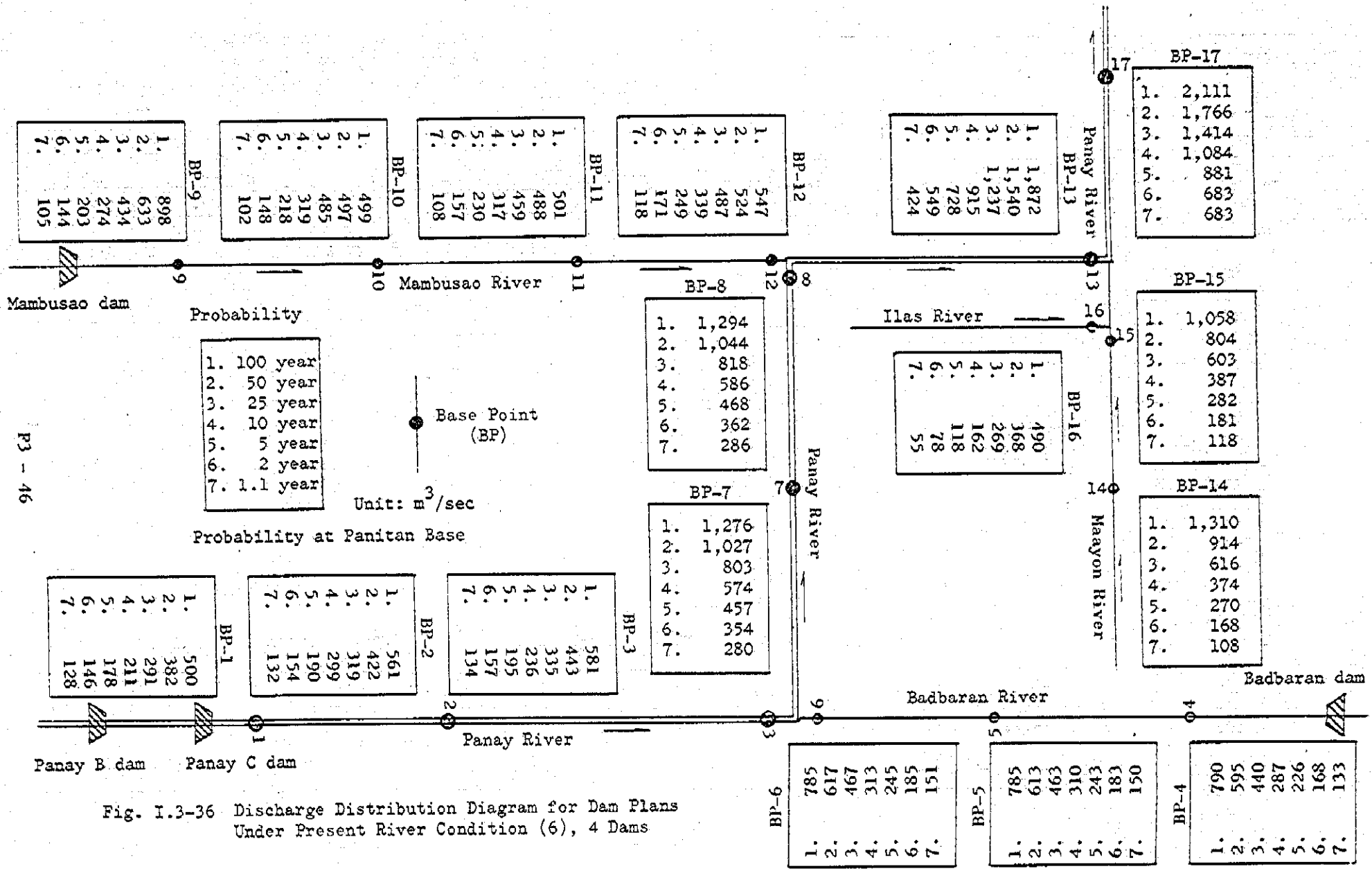


Fig. I.3-36 Discharge Distribution Diagram for Dam Plans Under Present River Condition (6), 4 Dams

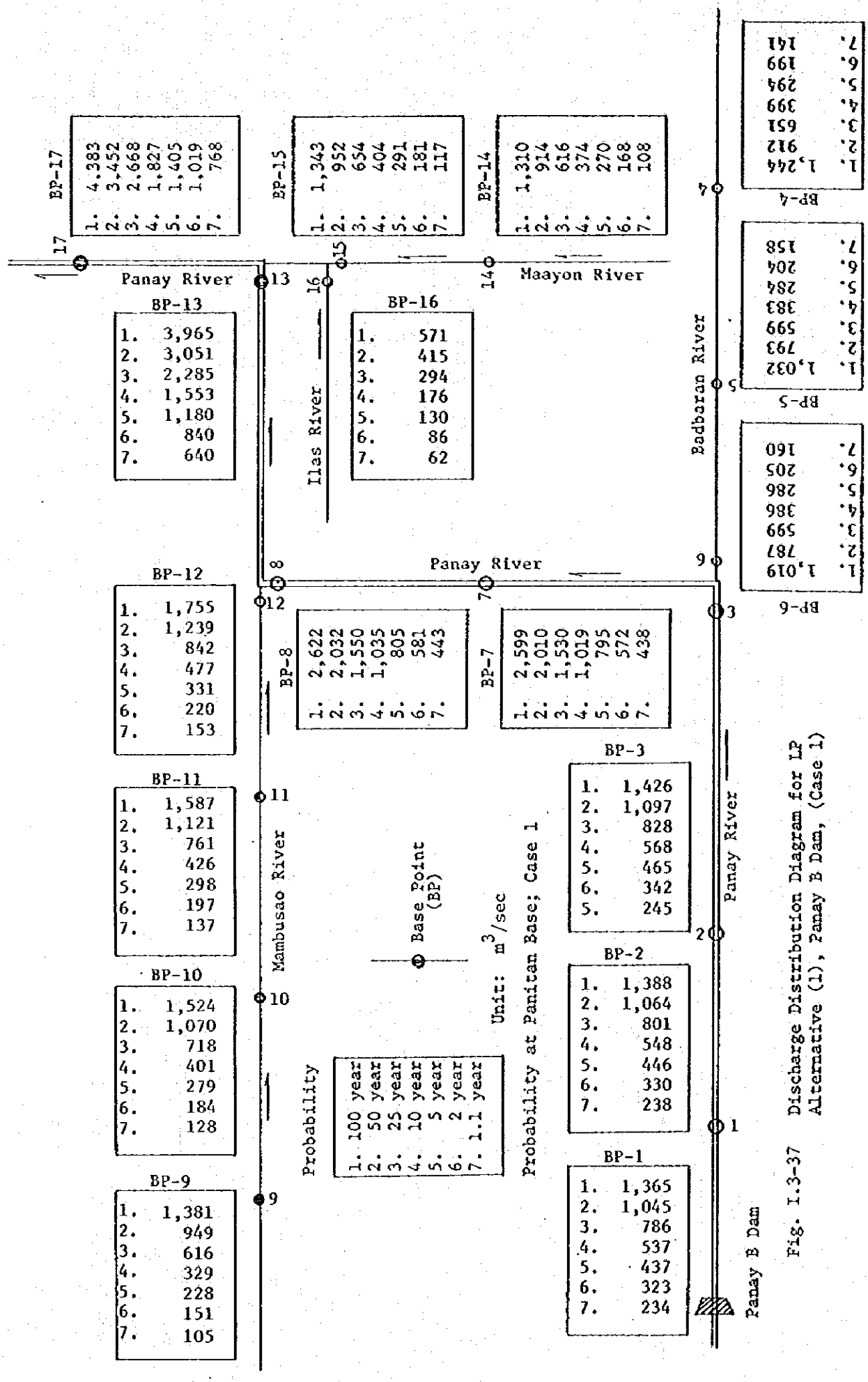


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (1), Panay B Dam, (Case 1)

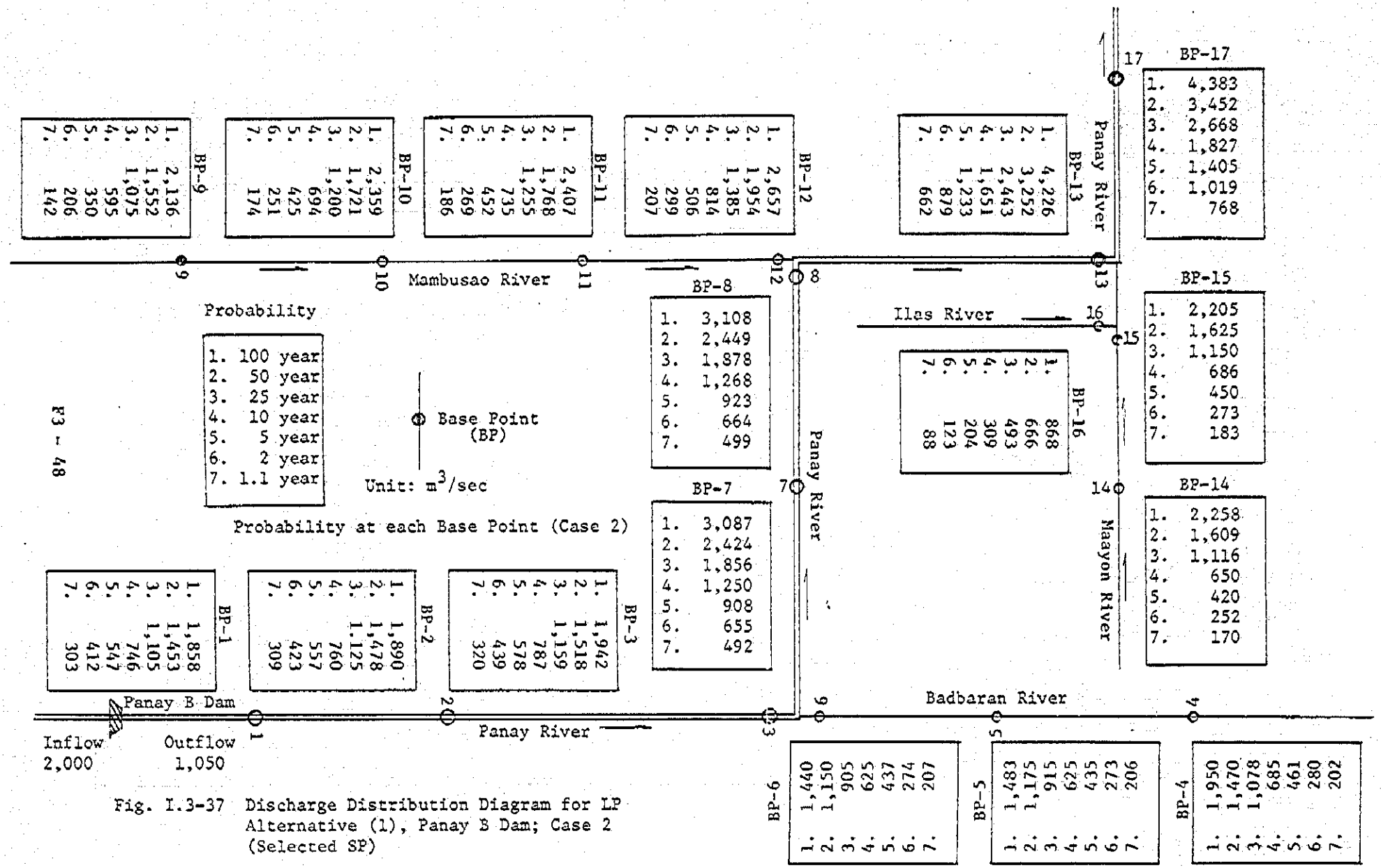


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (1), Panay B Dam; Case 2 (Selected SP)

Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (2), Panay C dam, (Case 1)

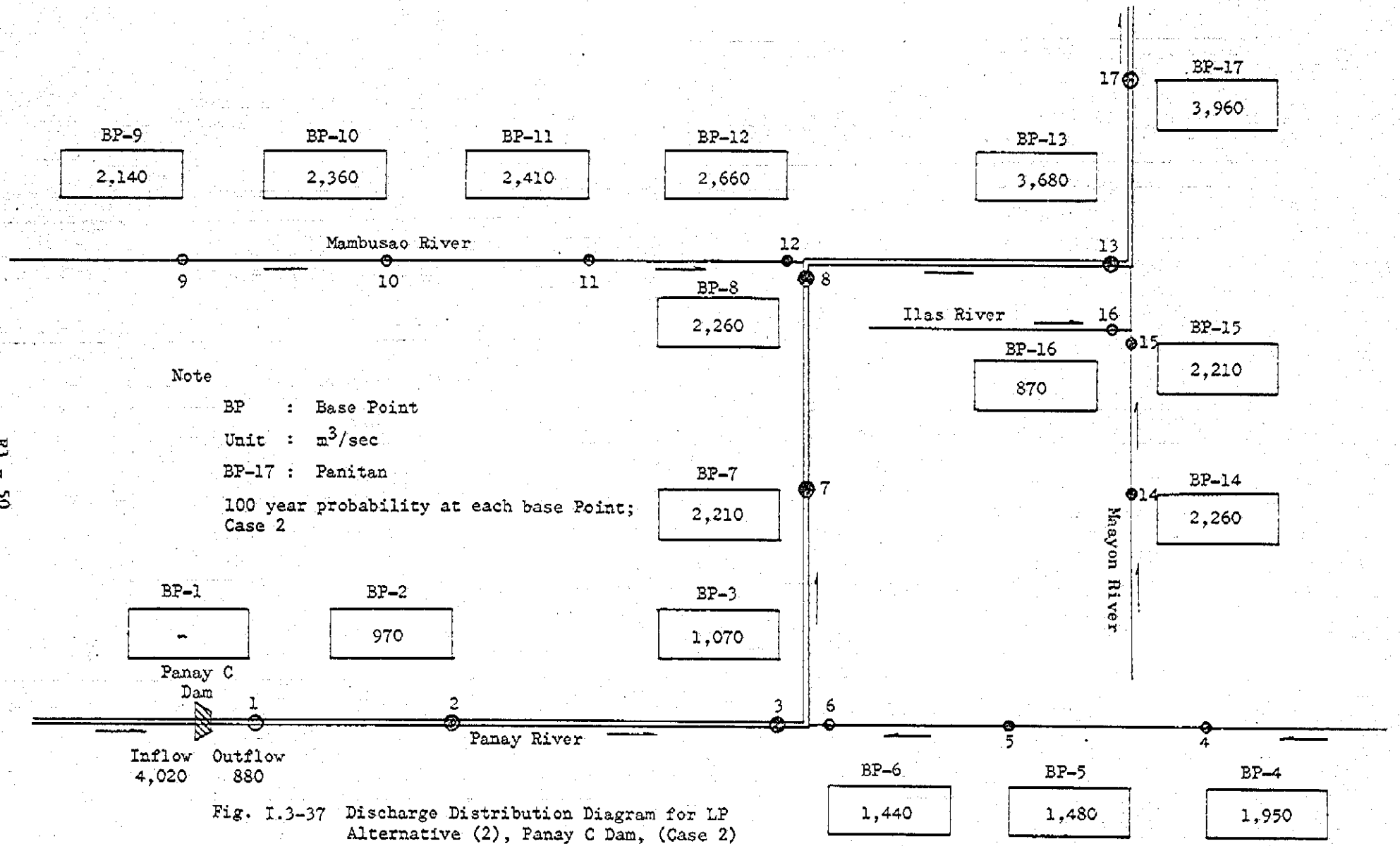
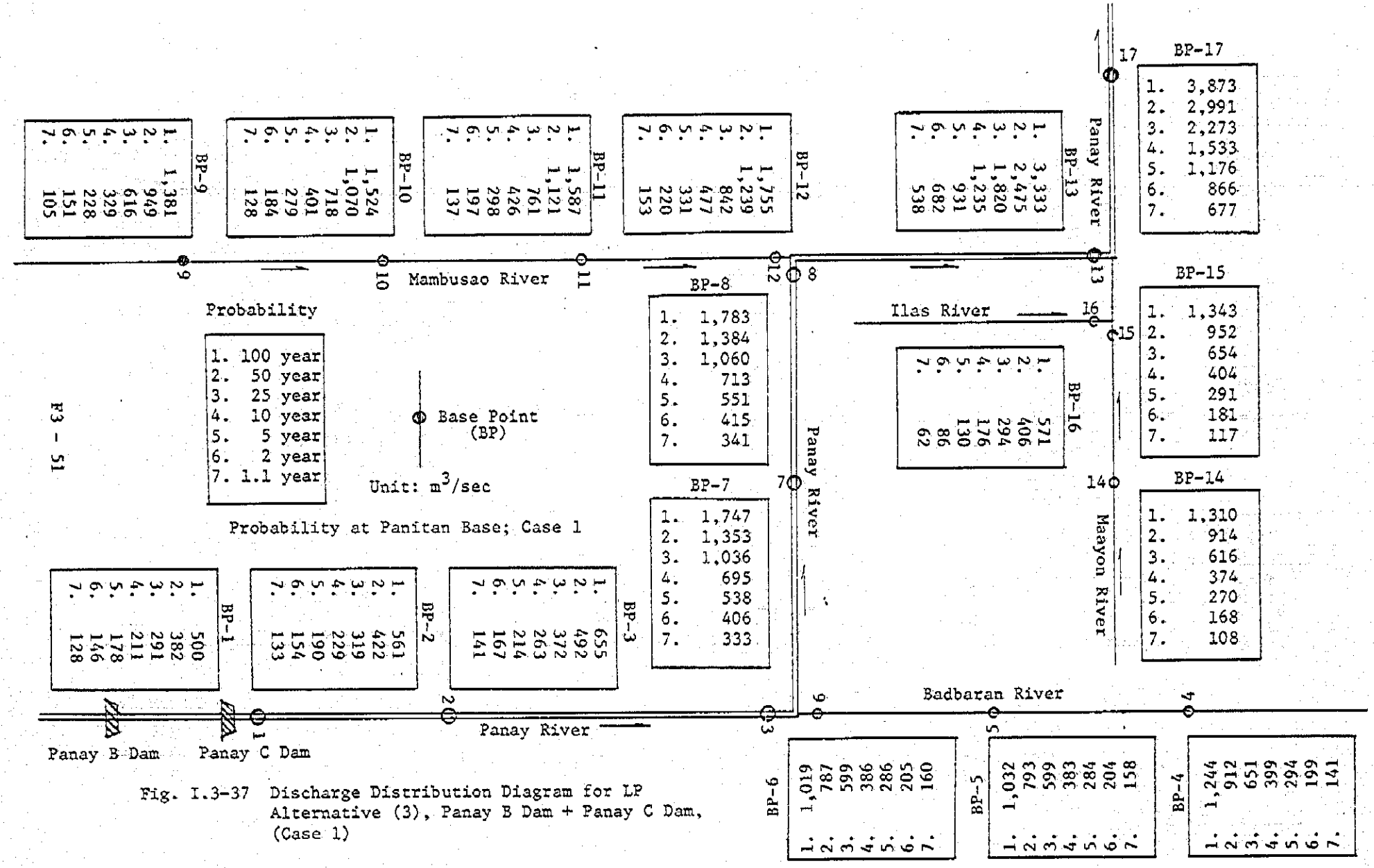


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (2), Panay C Dam, (Case 2)



Probability at Panitan Base; Case 1

Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (3), Panay B Dam + Panay C Dam, (Case 1)

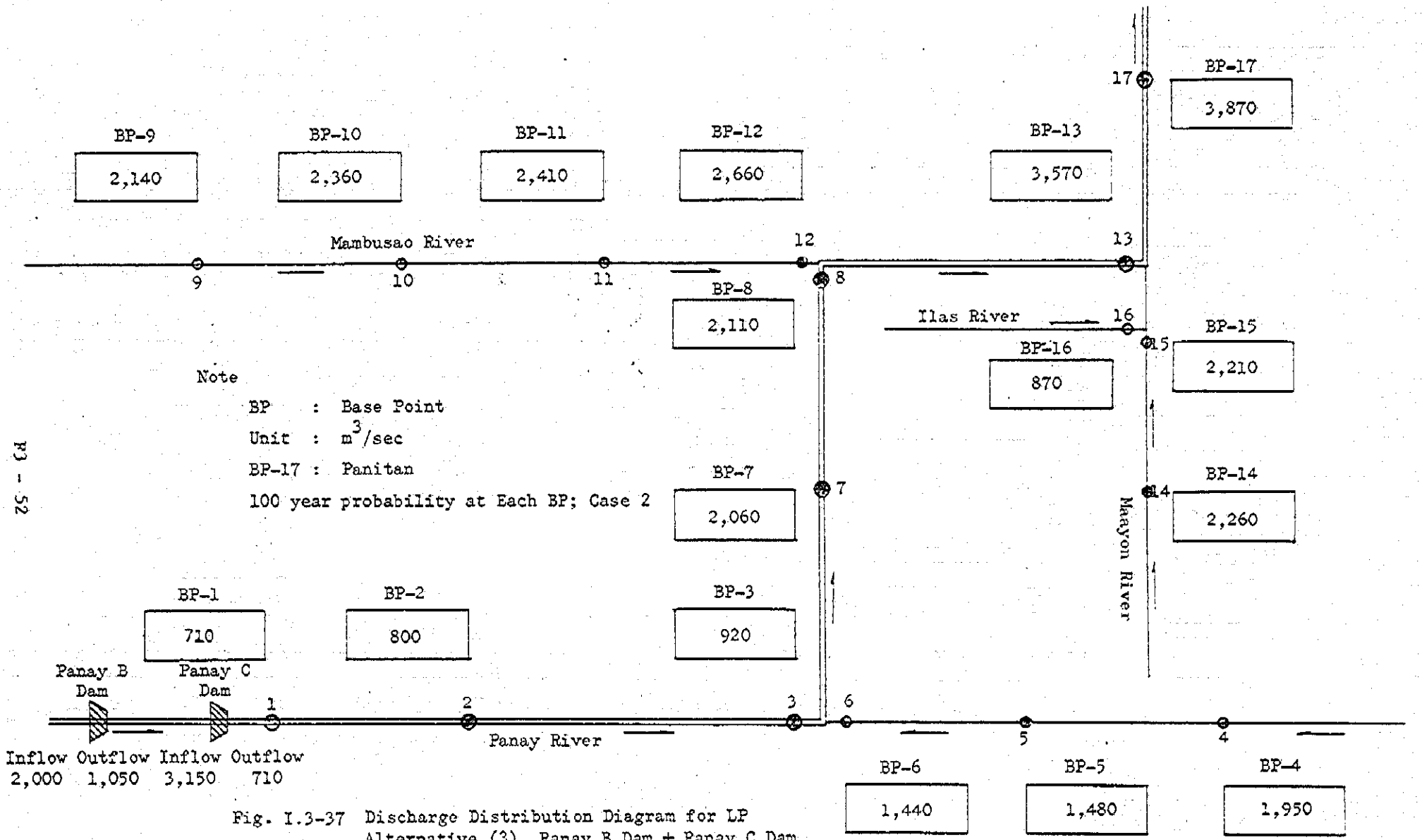


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (3), Panay B Dam + Panay C Dam, (Case 2)

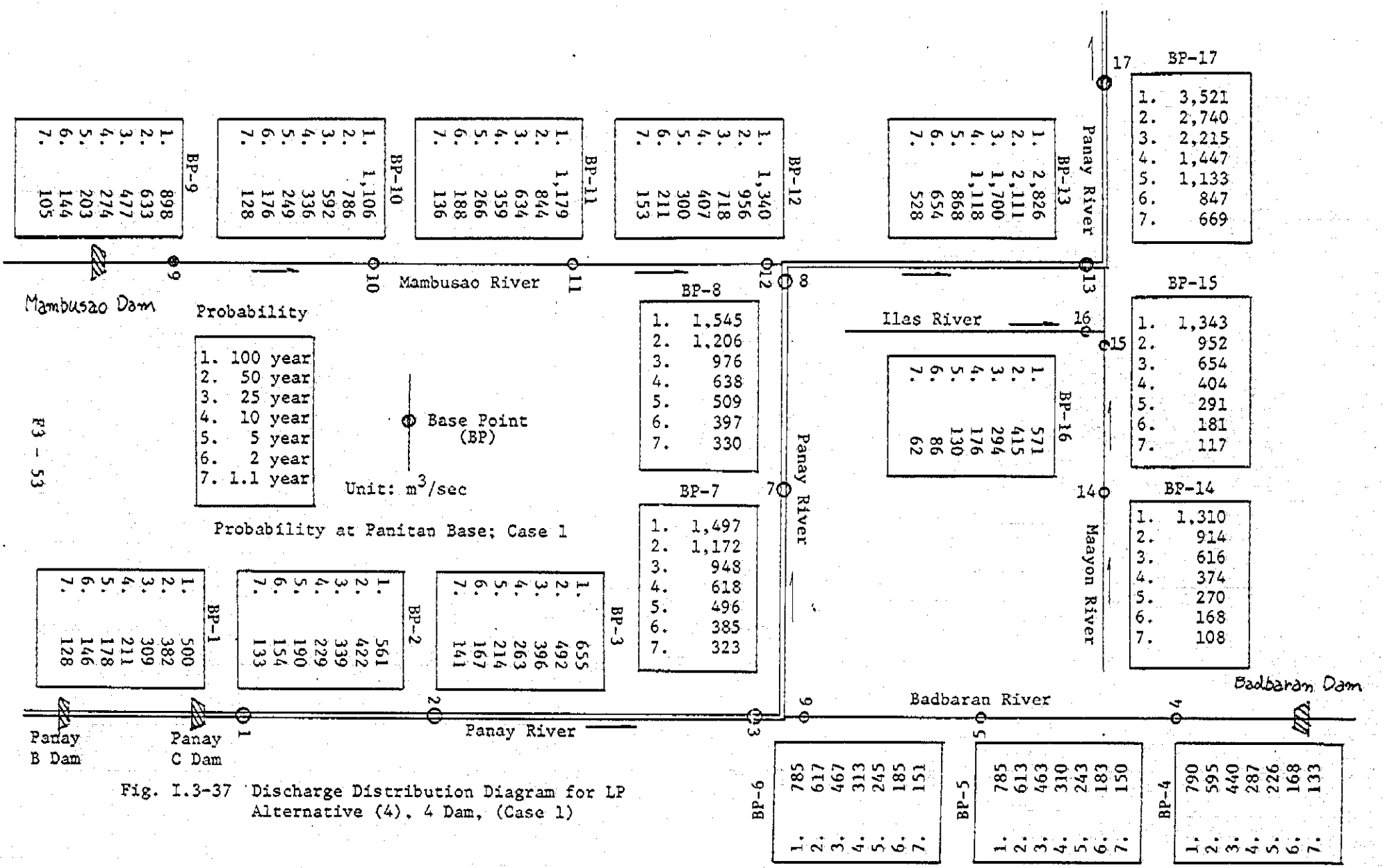


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (4), 4 Dam, (Case 1)

Probability at Panitan Base: Case 1

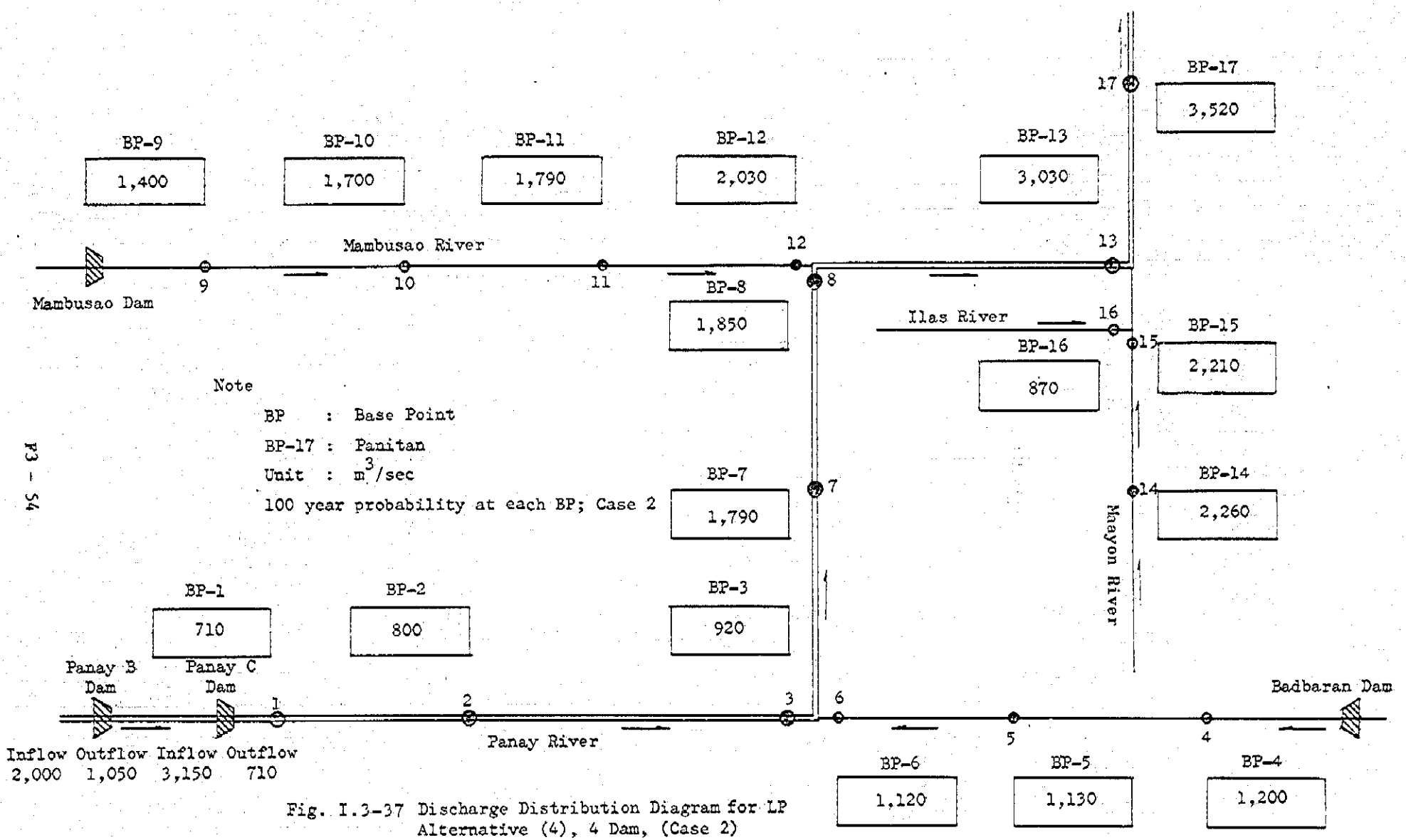


Fig. I.3-37 Discharge Distribution Diagram for LP Alternative (4), 4 Dam, (Case 2)

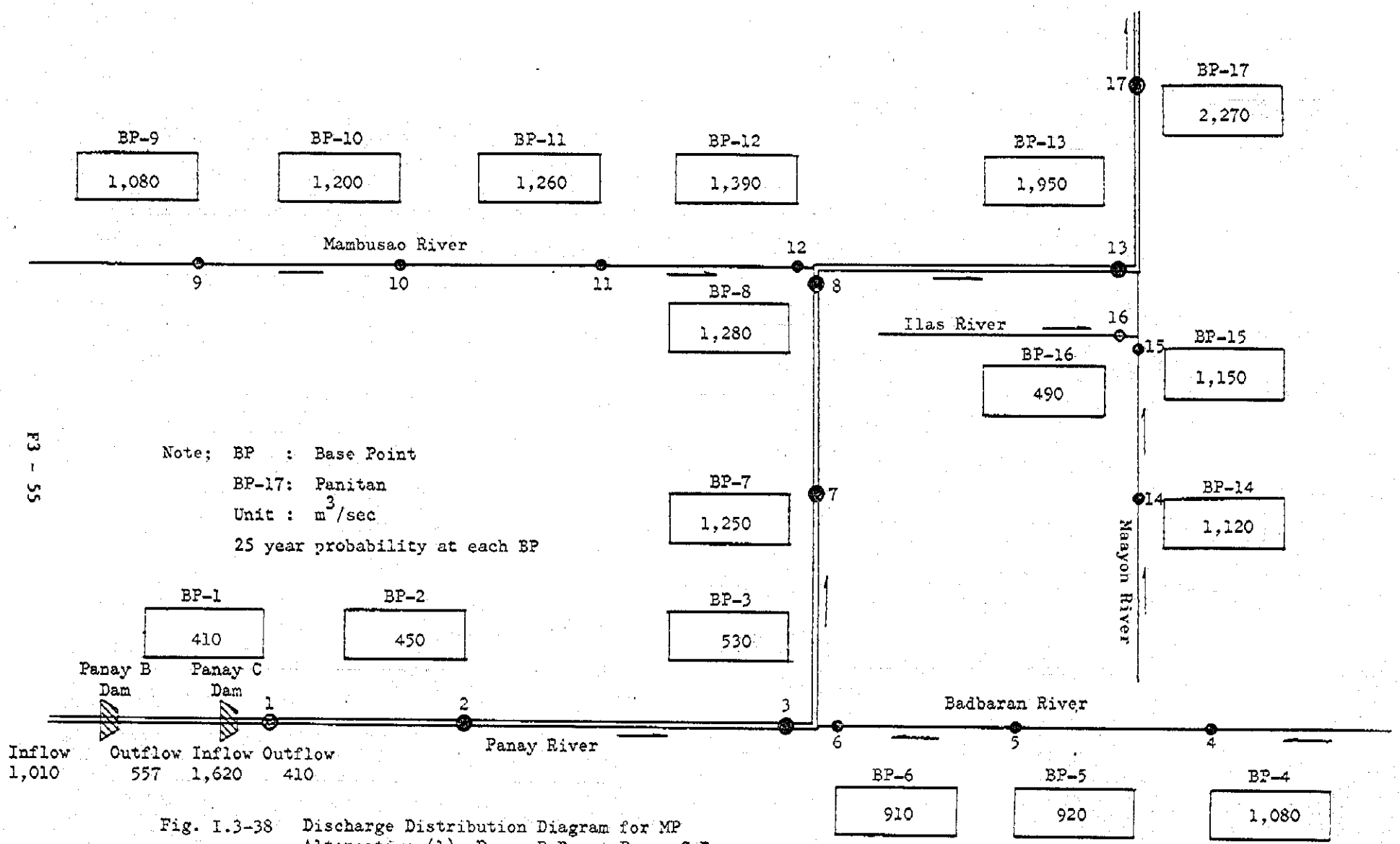


Fig. I.3-38 Discharge Distribution Diagram for MP Alternative (1), Panay B Dam + Panay C Dam

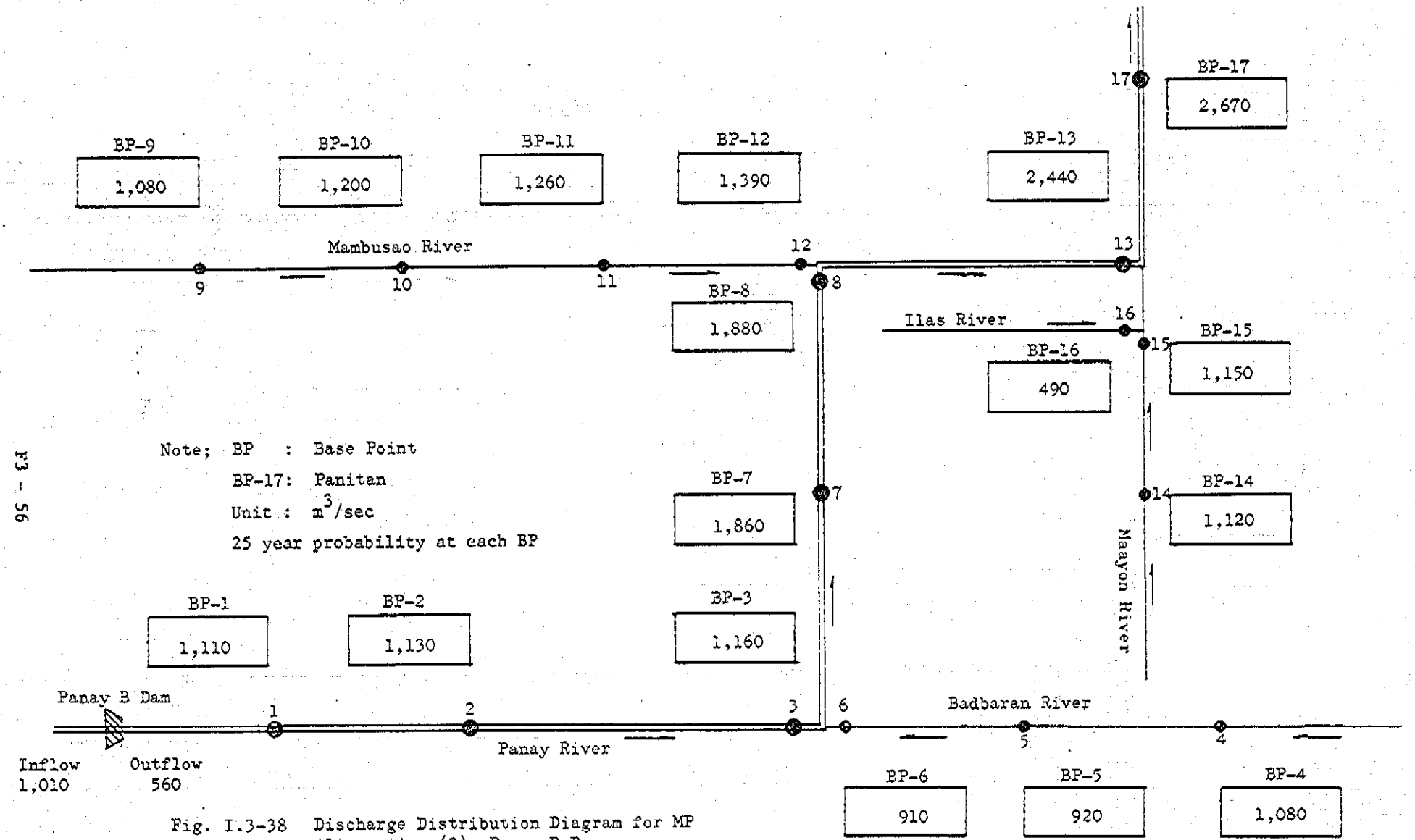


Fig. I.3-38 Discharge Distribution Diagram for MP Alternative (2), Panay B Dam

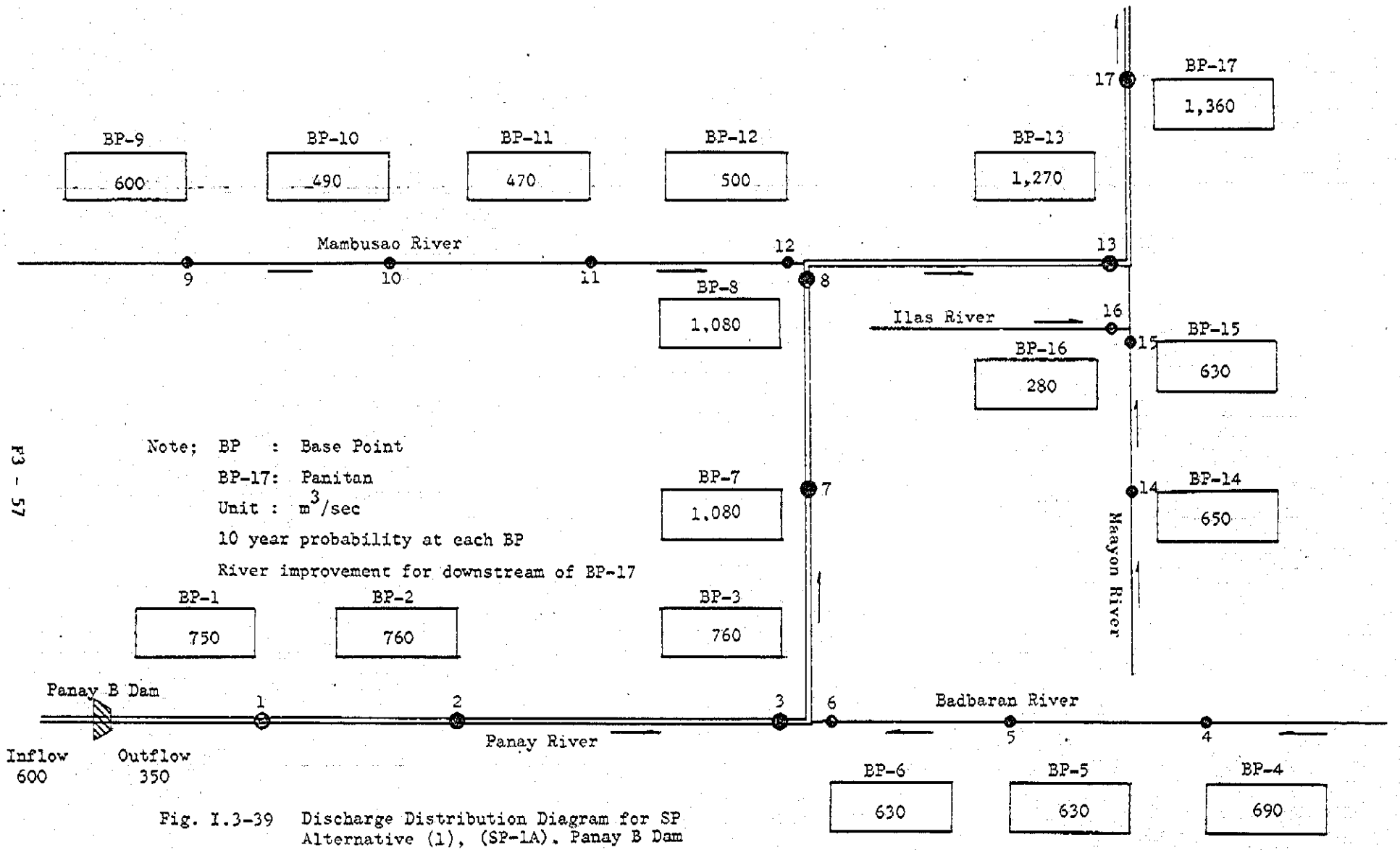


Fig. I.3-39 Discharge Distribution Diagram for SP Alternative (1), (SP-1A), Panay B Dam

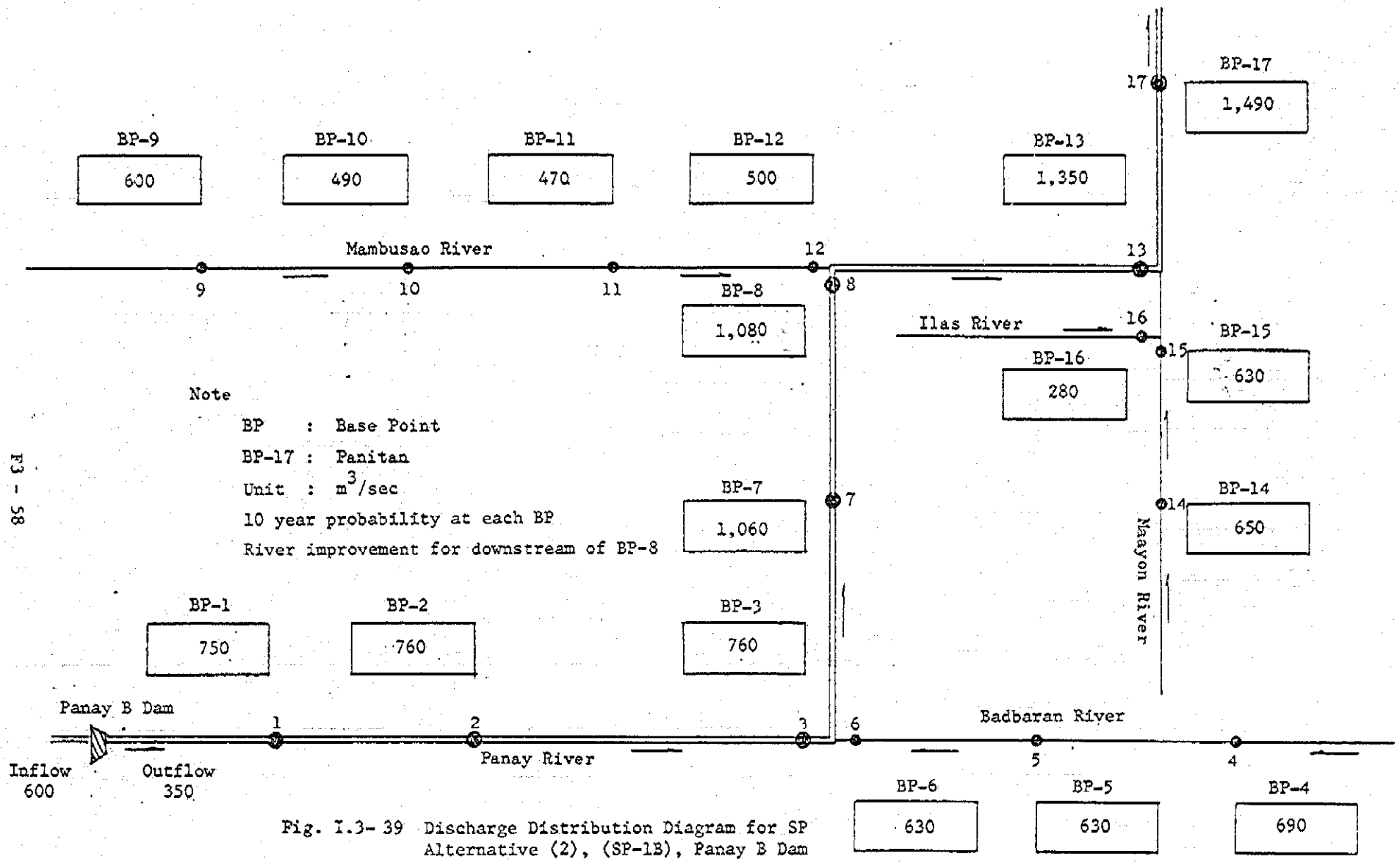


Fig. I.3-39 Discharge Distribution Diagram for SP Alternative (2), (SP-1B), Panay B Dam

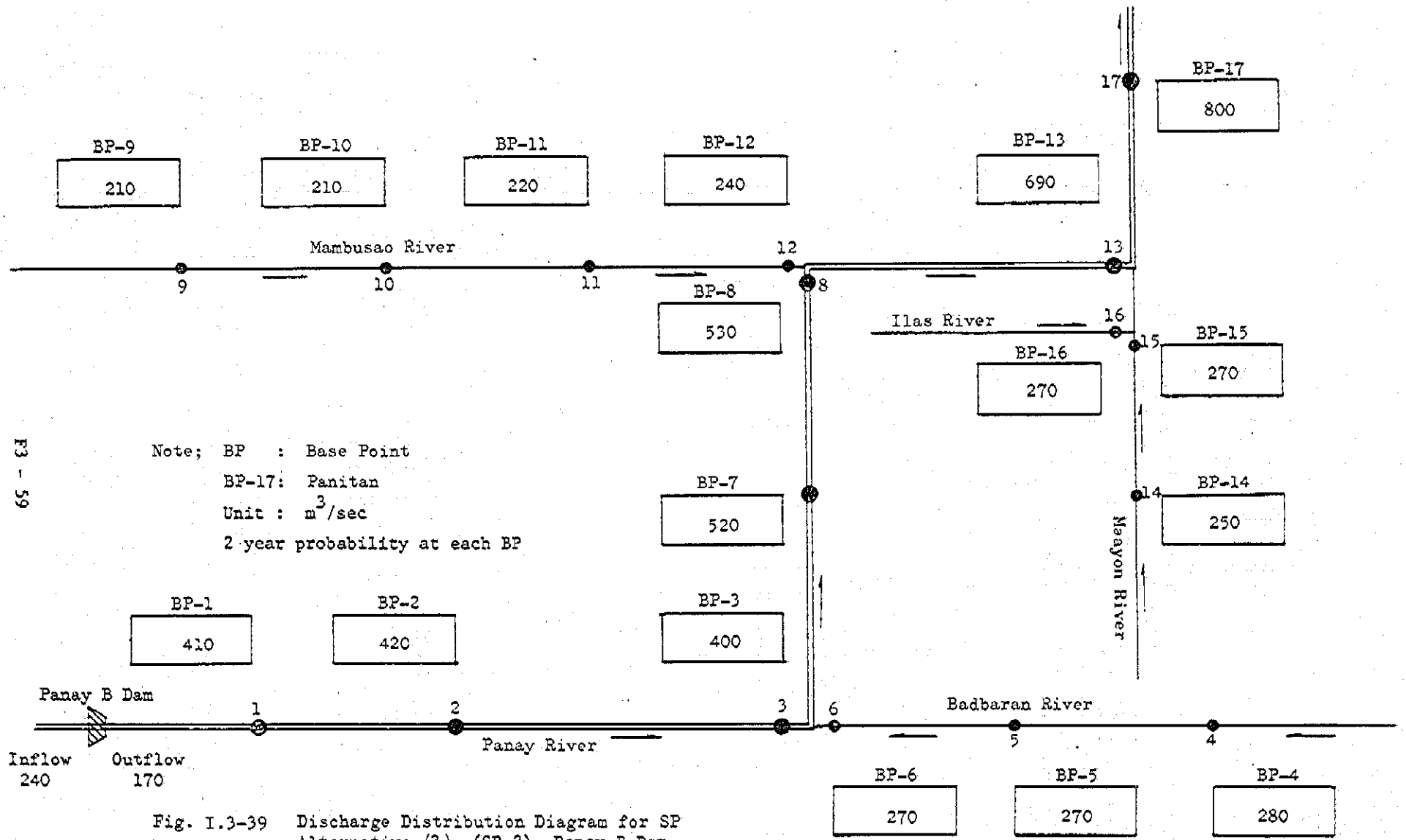


Fig. I.3-39 Discharge Distribution Diagram for SP Alternative (3), (SP-2), Panay B Dam

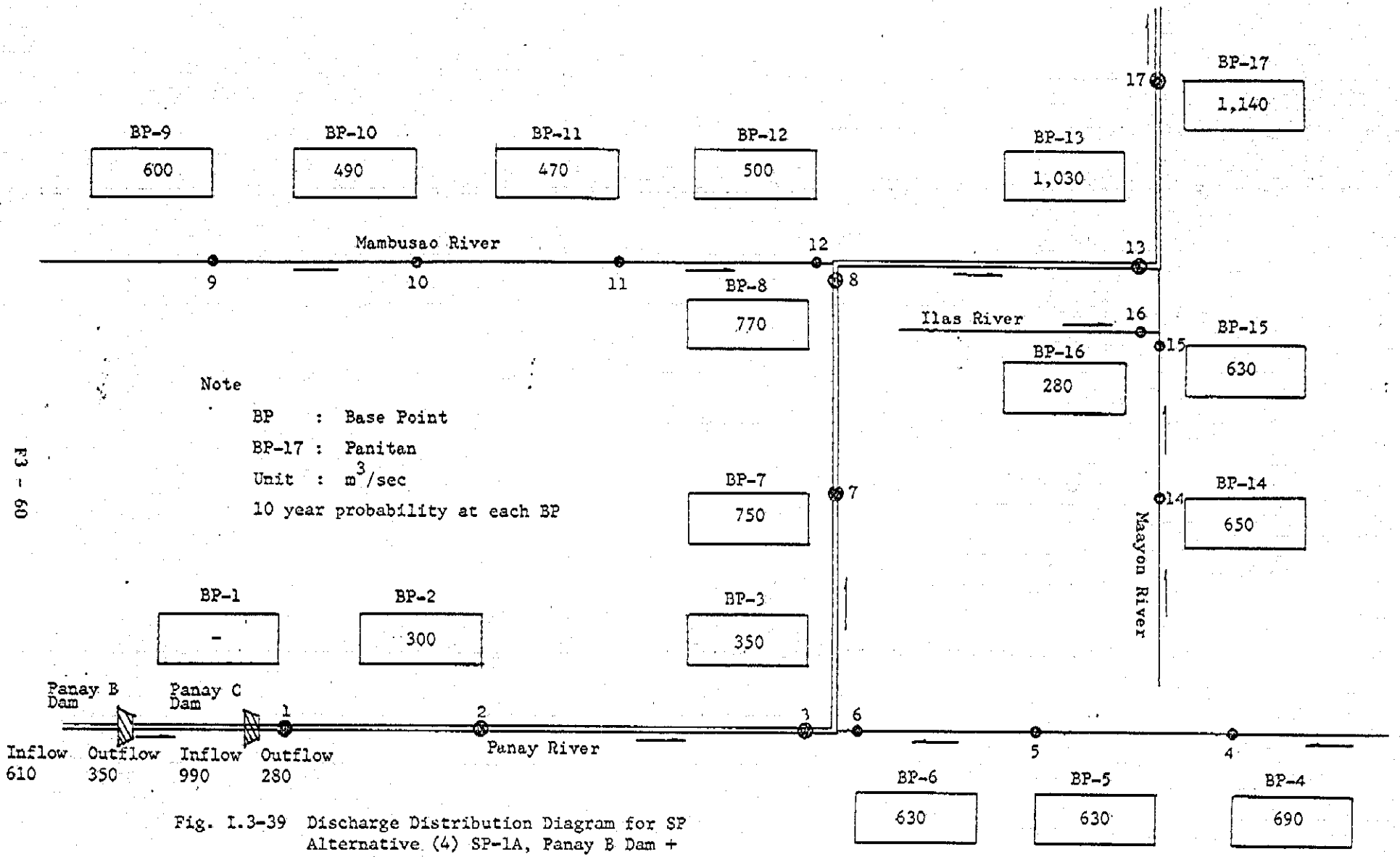


Fig. I.3-39 Discharge Distribution Diagram for SP Alternative (4) SP-1A, Panay B Dam + Panay C Dam

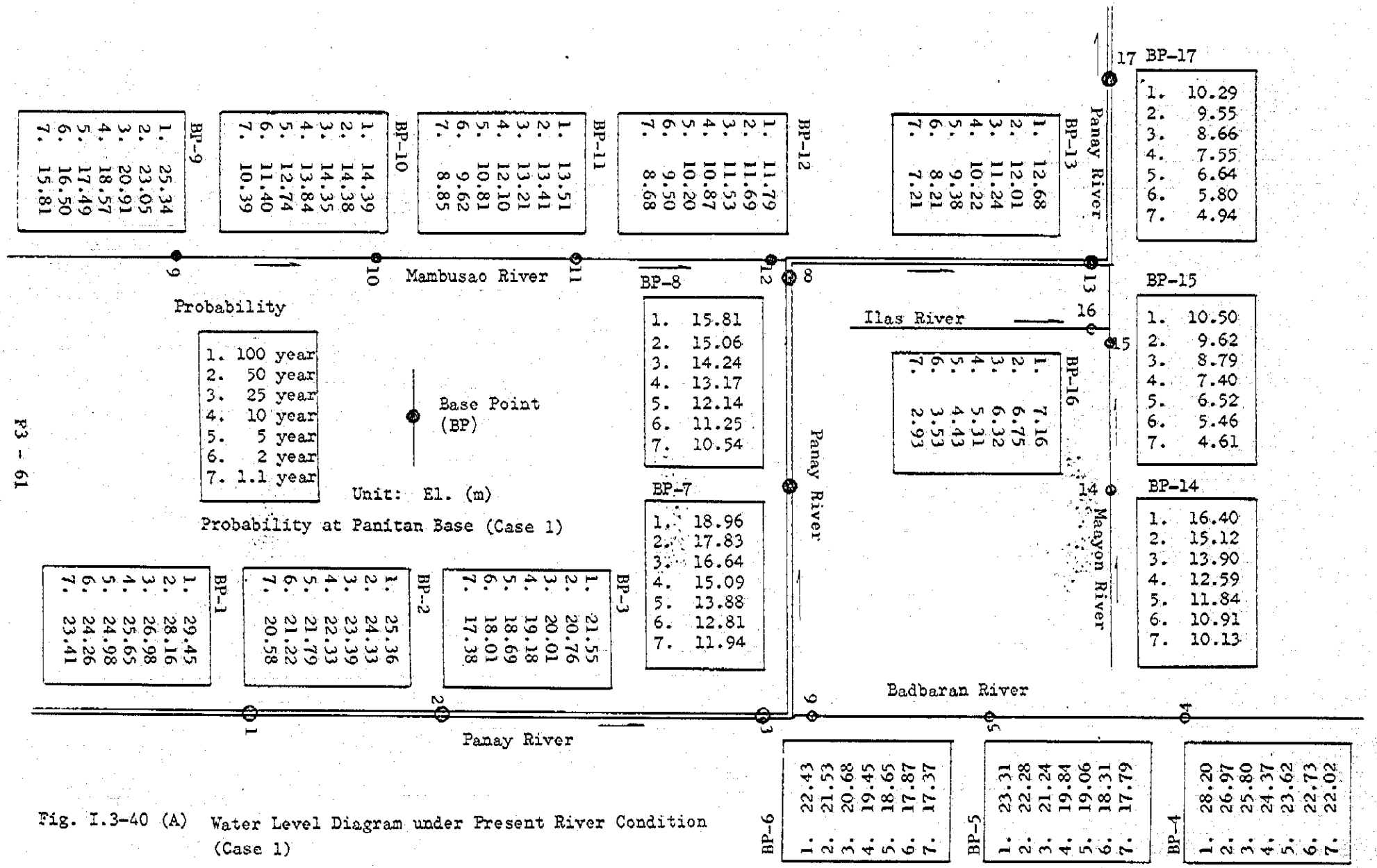


Fig. I.3-40 (A) Water Level Diagram under Present River Condition (Case 1)

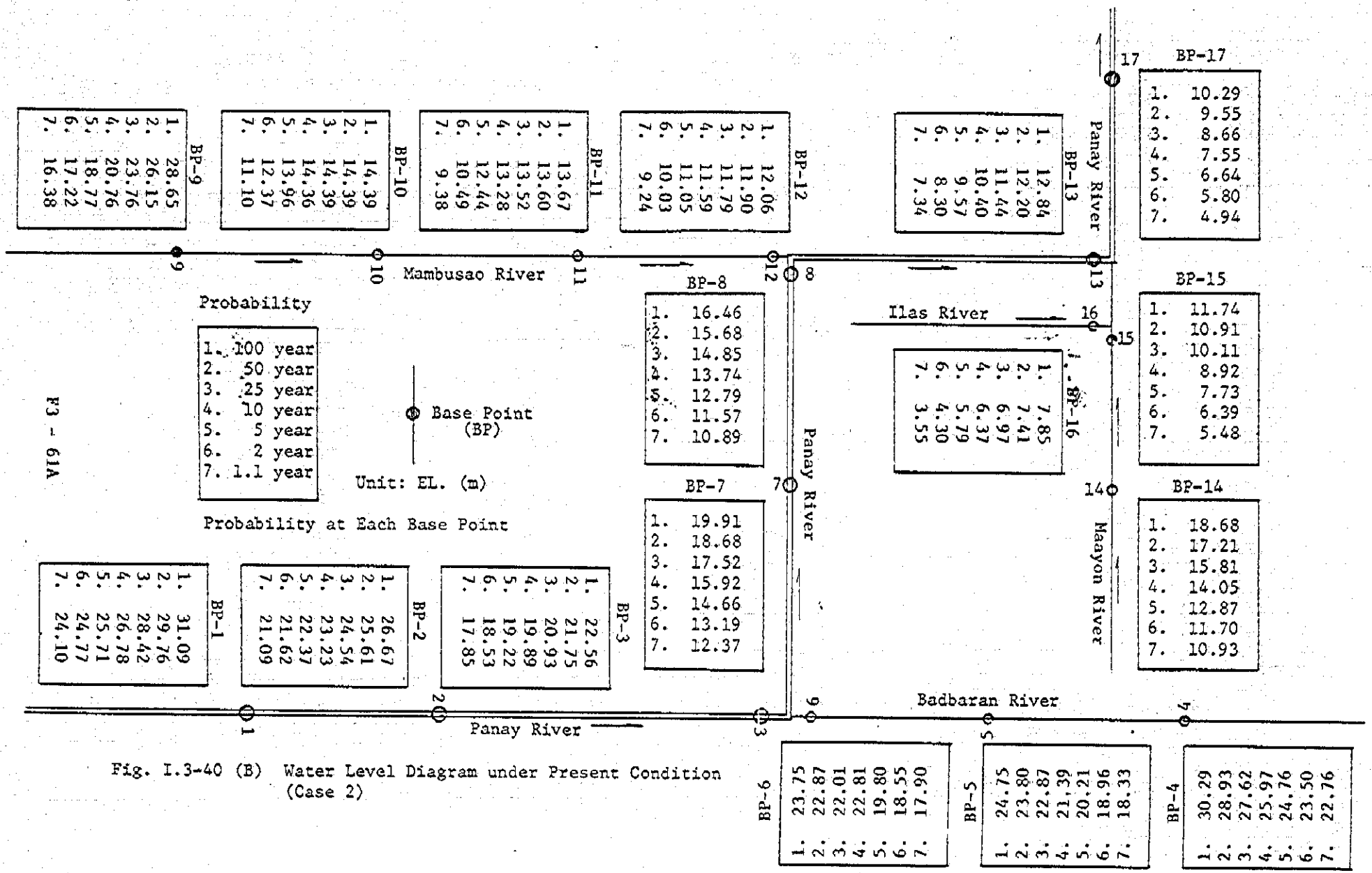


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Fig. I.3-40 (B) Water Level Diagram under Present Condition (Case 2)

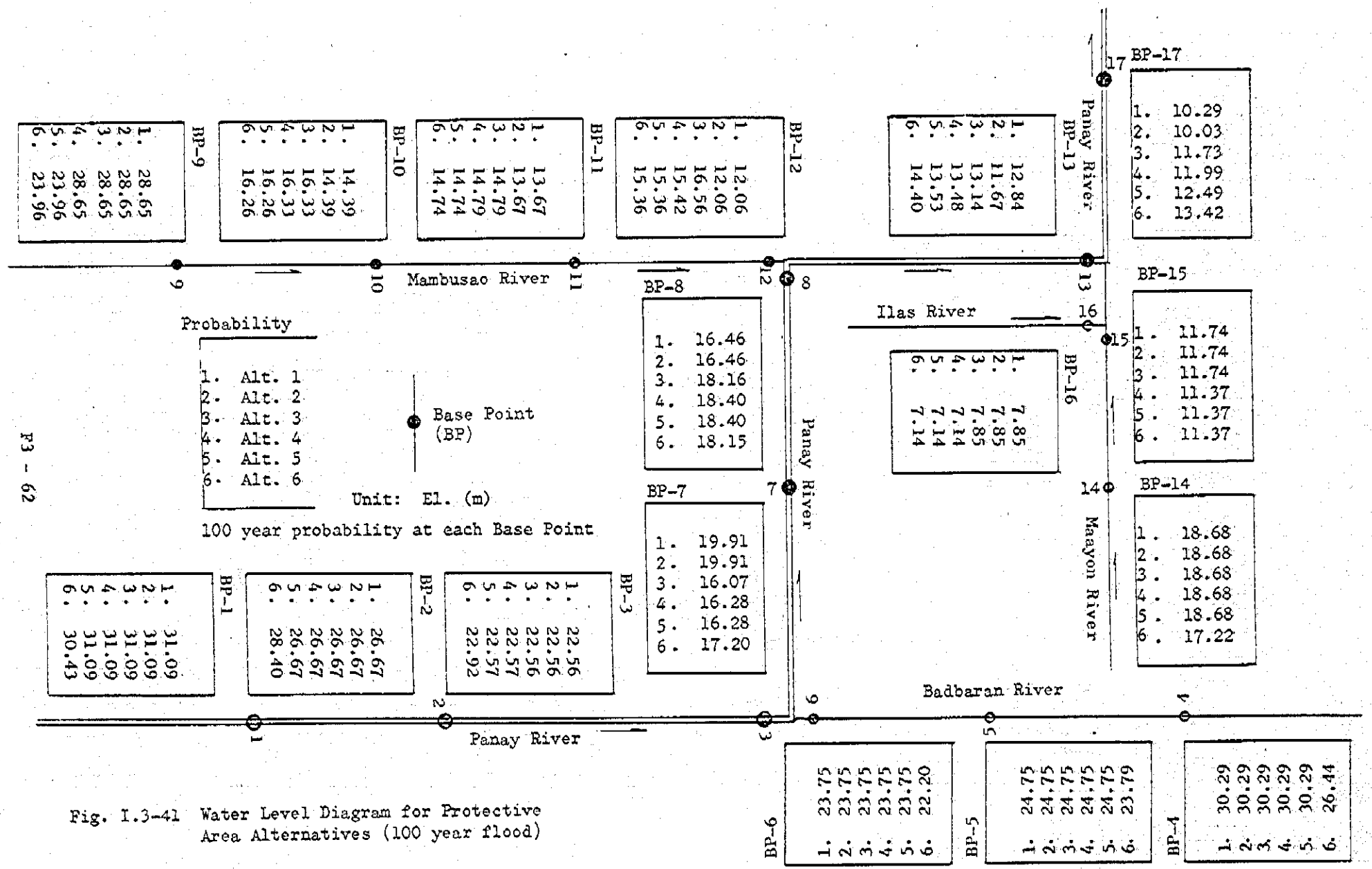


Fig. I.3-41 Water Level Diagram for Protective Area Alternatives (100 year flood)

Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (1), Panay B Dam

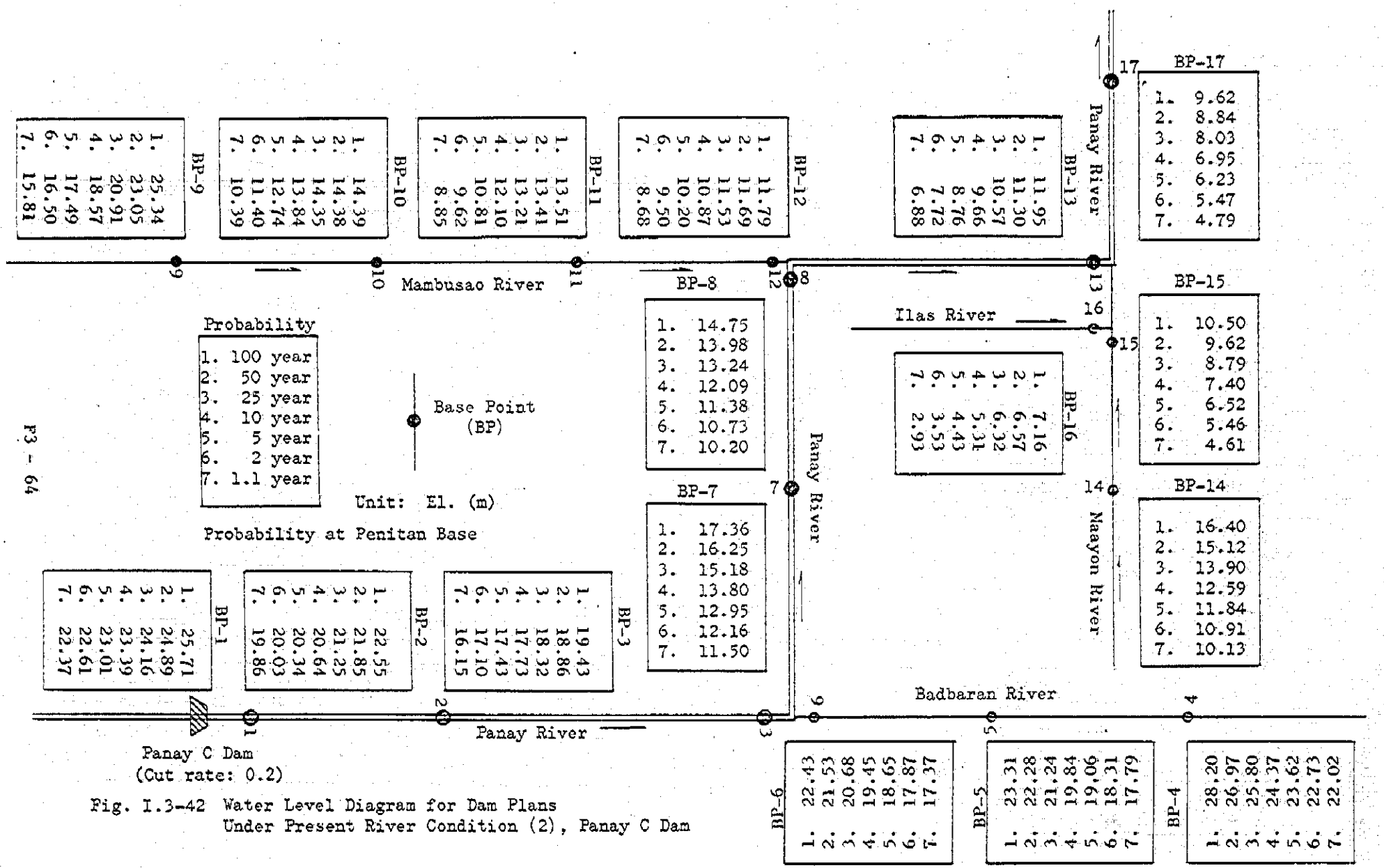


Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (2), Panay C Dam

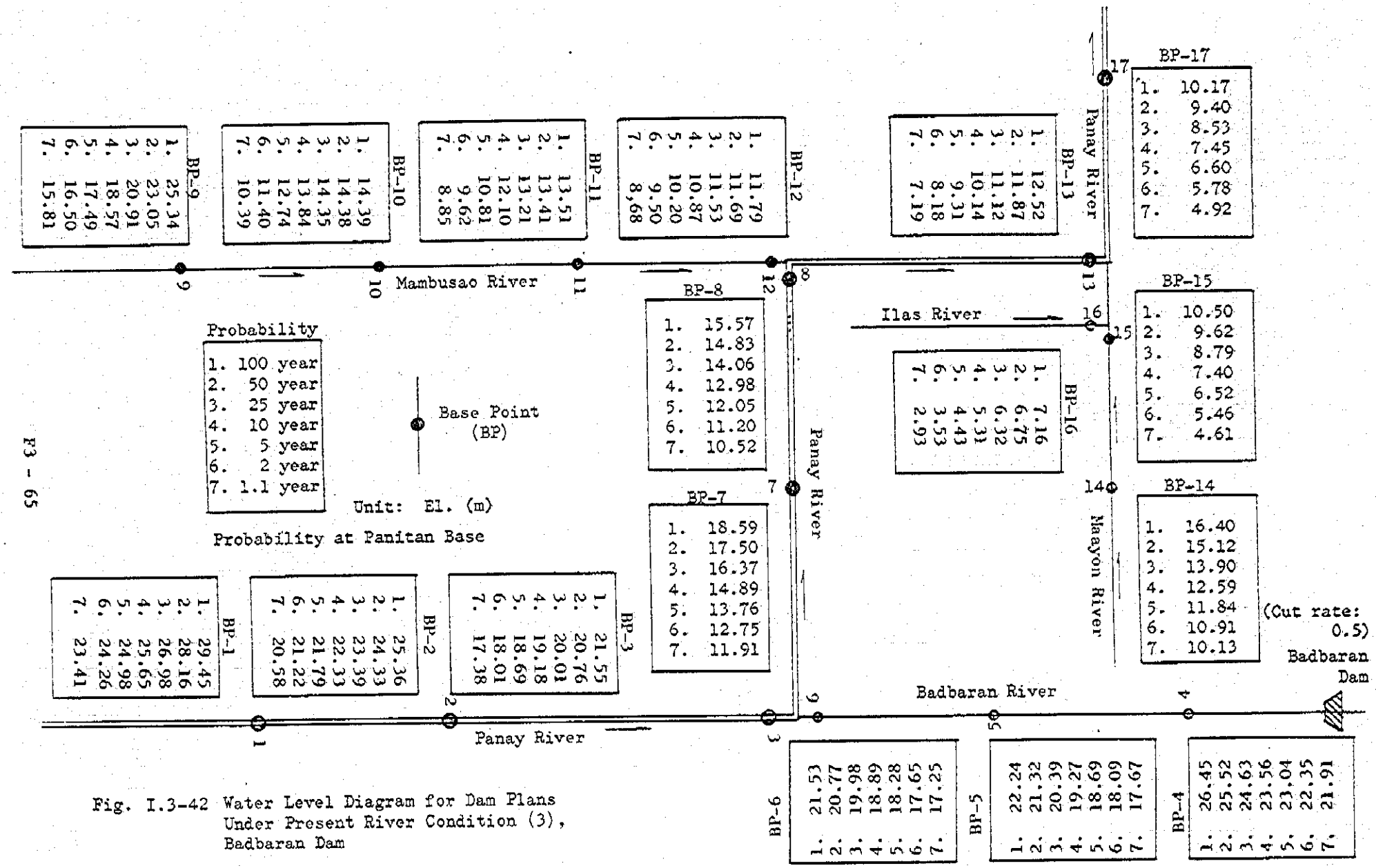


Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (3), Badbaran Dam

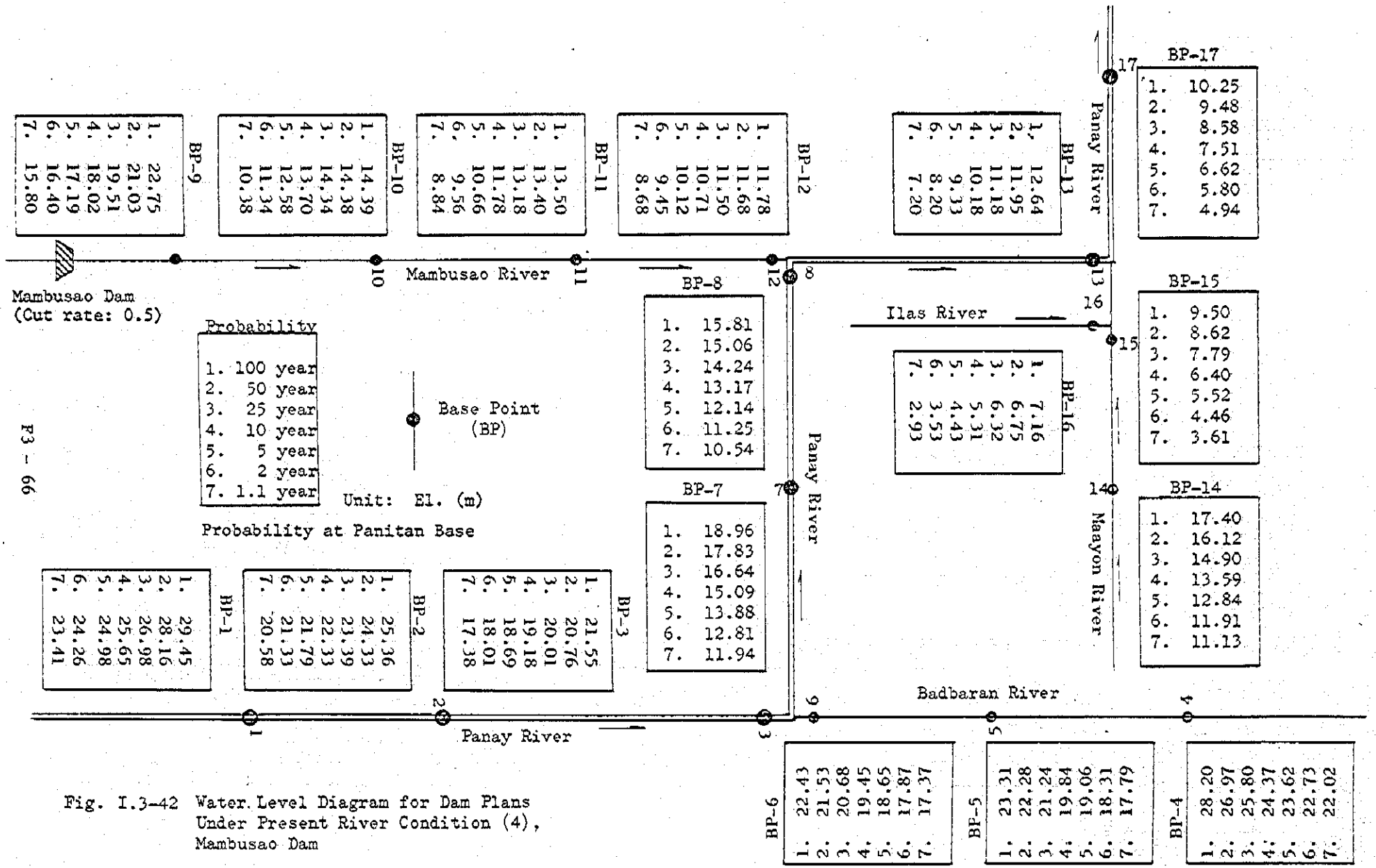


Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (4), Mambusao Dam

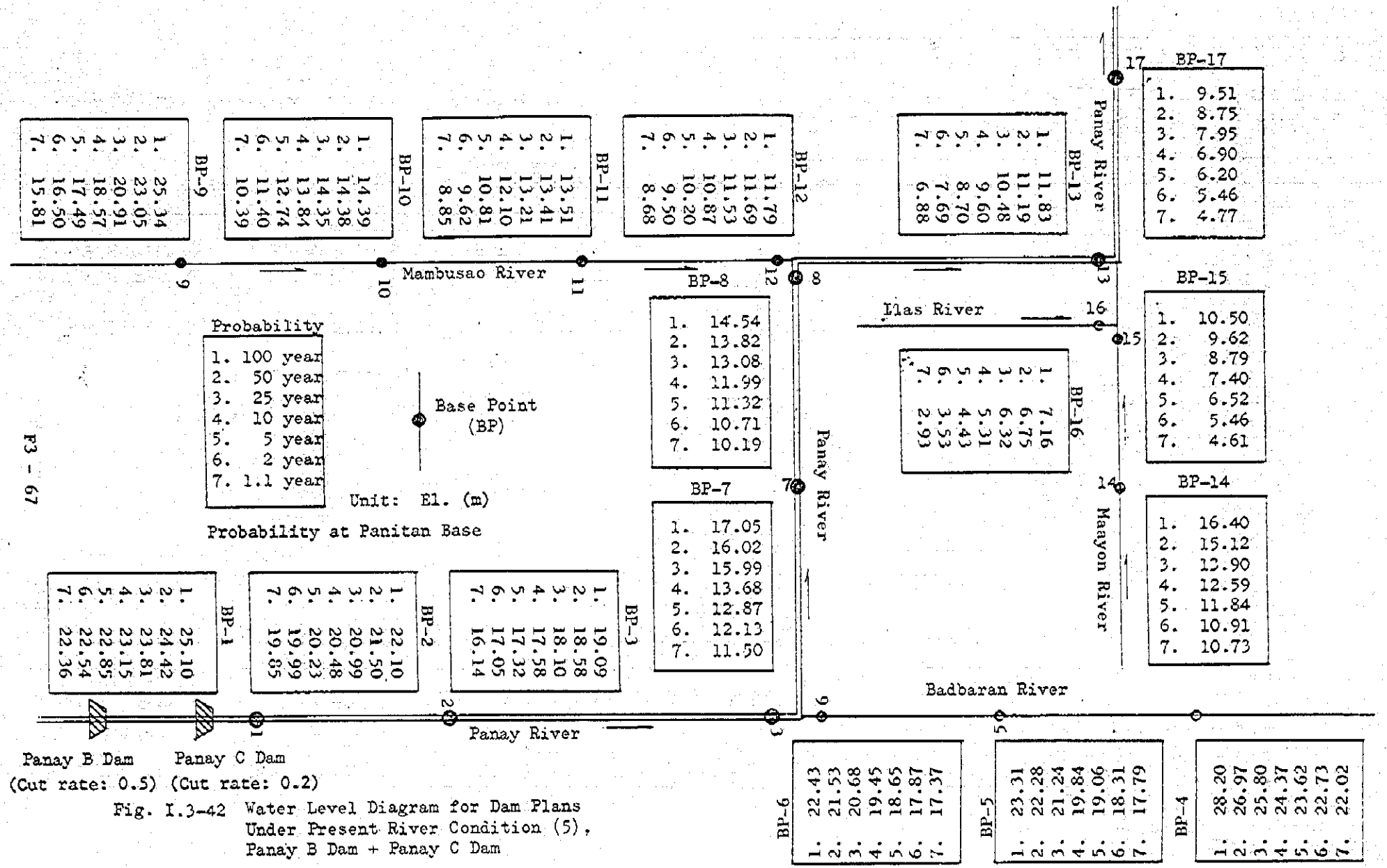


Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (5), Panay B Dam + Panay C Dam

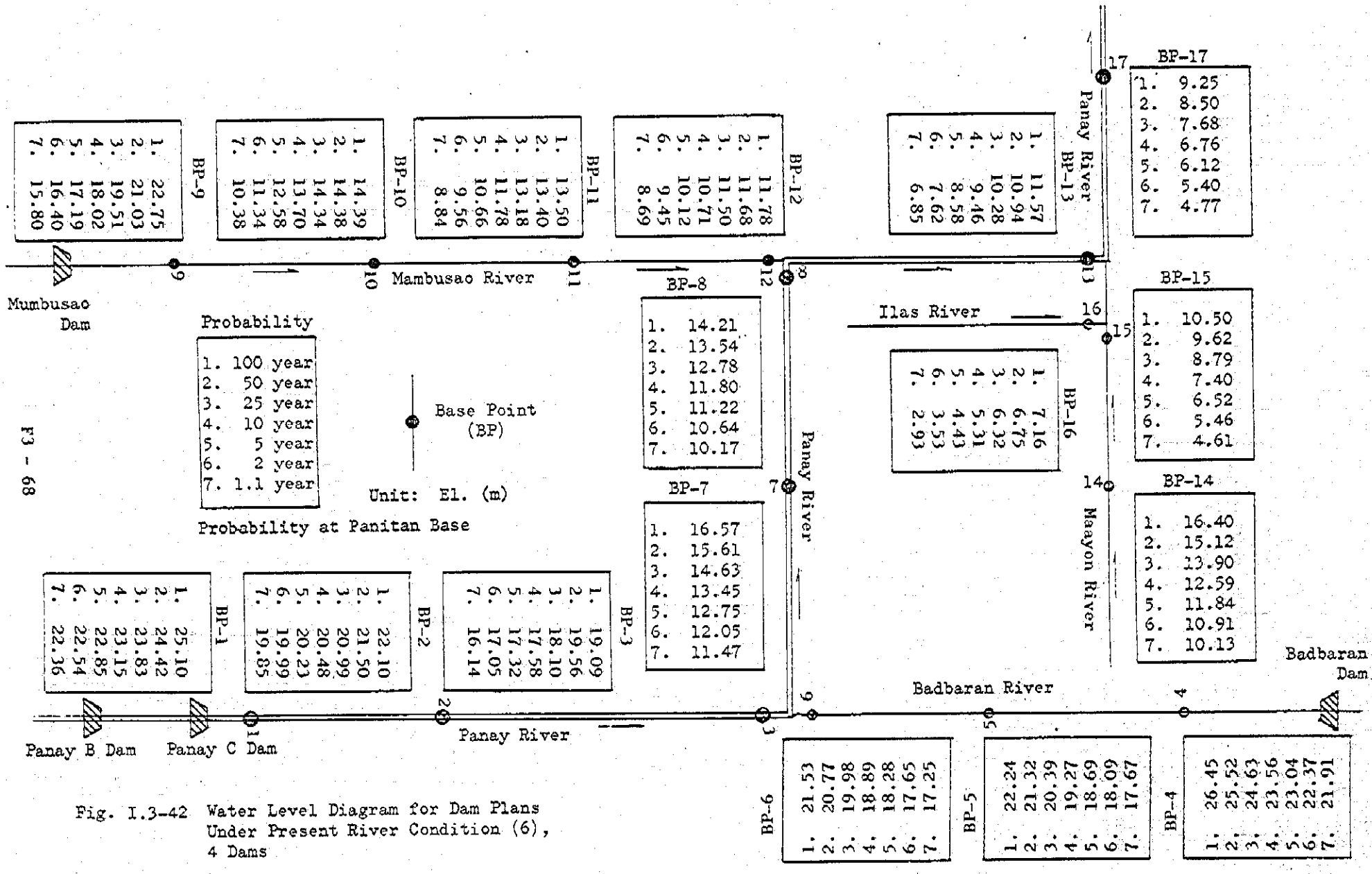


Fig. I.3-42 Water Level Diagram for Dam Plans Under Present River Condition (6), 4 Dams

Fig. I.3-43 Water Level Diagram for LP Alternative (1), Panay B dam, Case 1

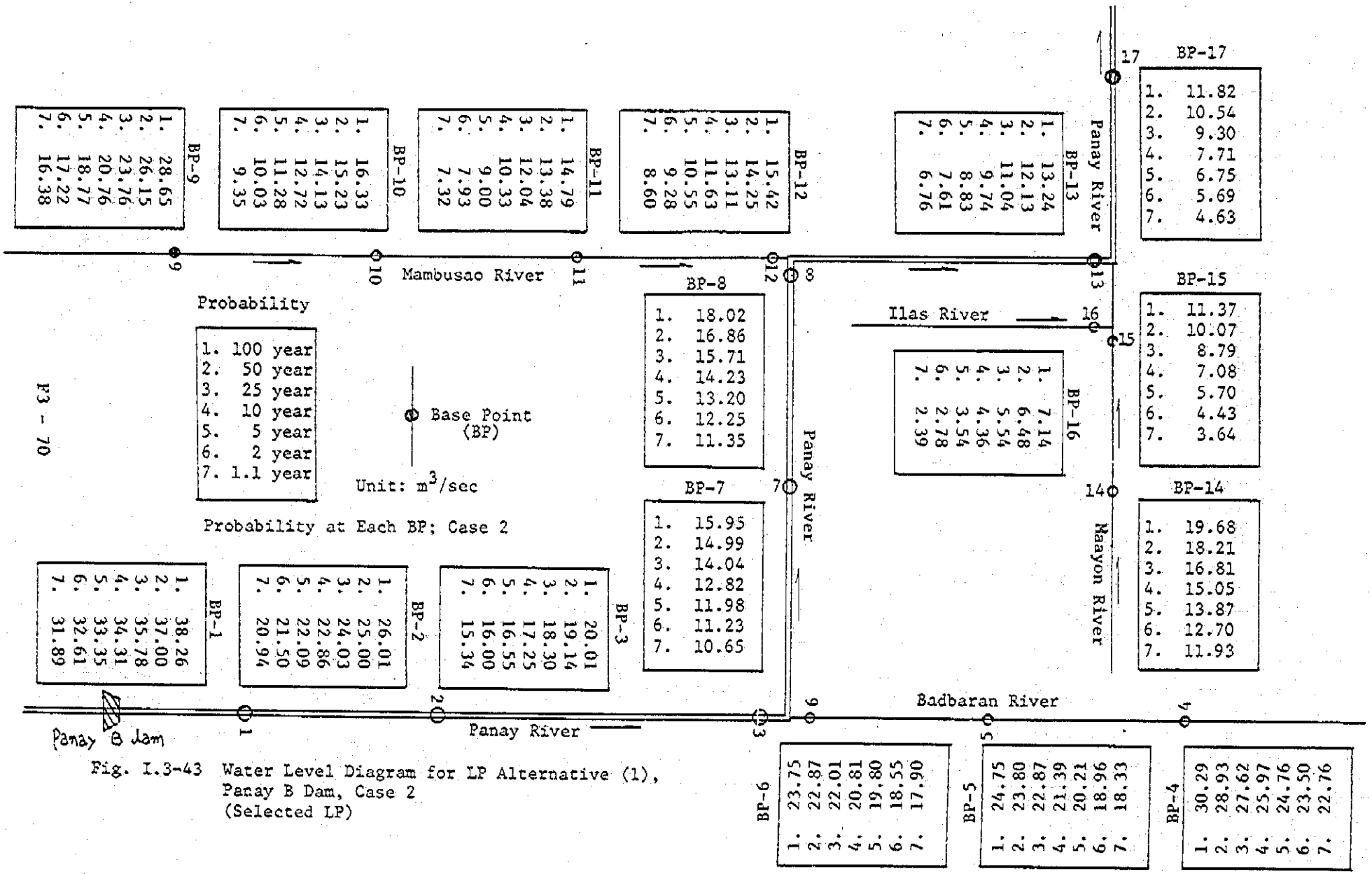


Fig. I.3-43 Water Level Diagram for LP Alternative (1), Panay B Dam, Case 2 (Selected LP)

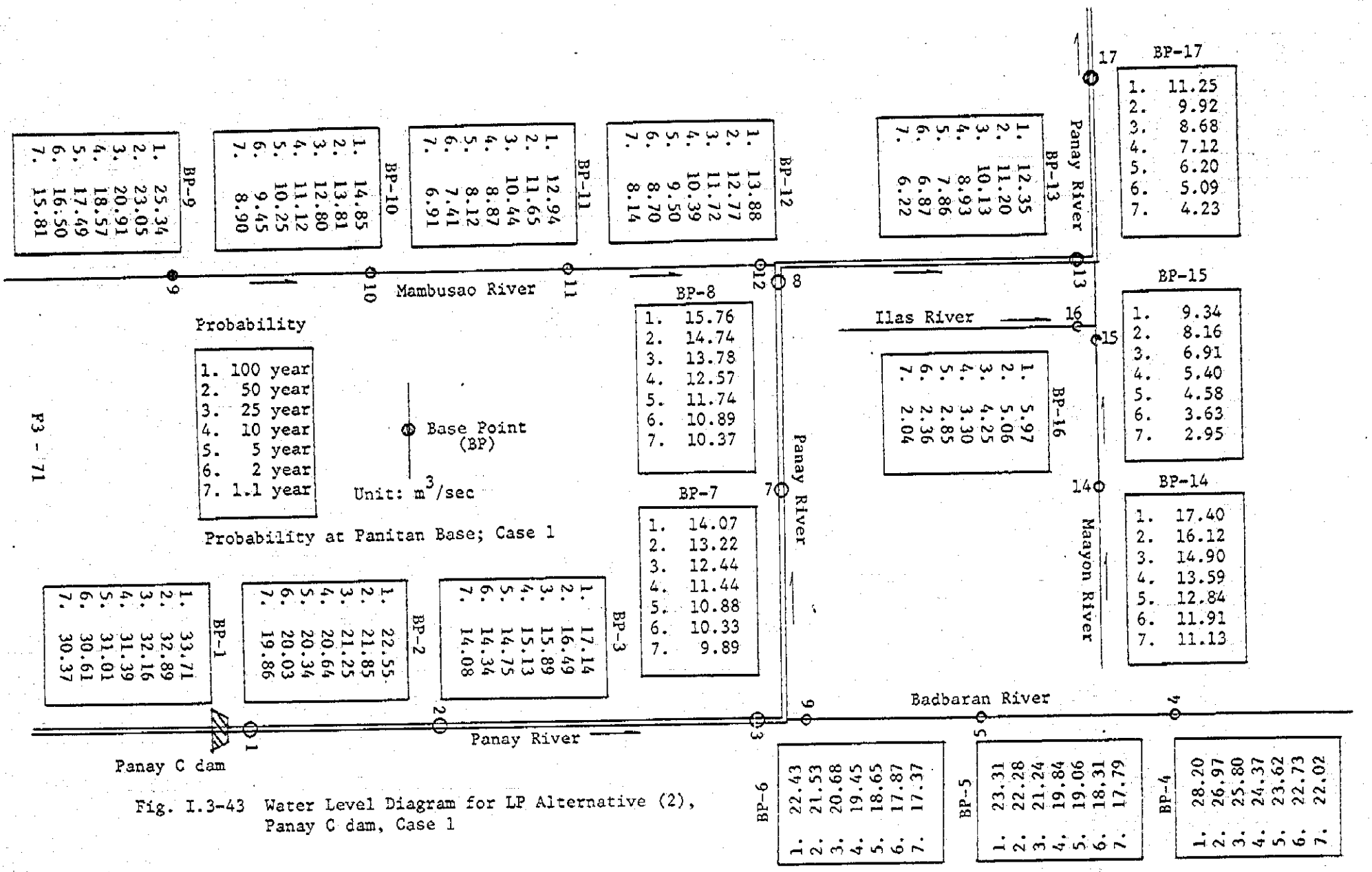


Fig. I.3-43 Water Level Diagram for LP Alternative (2), Panay C dam, Case 1

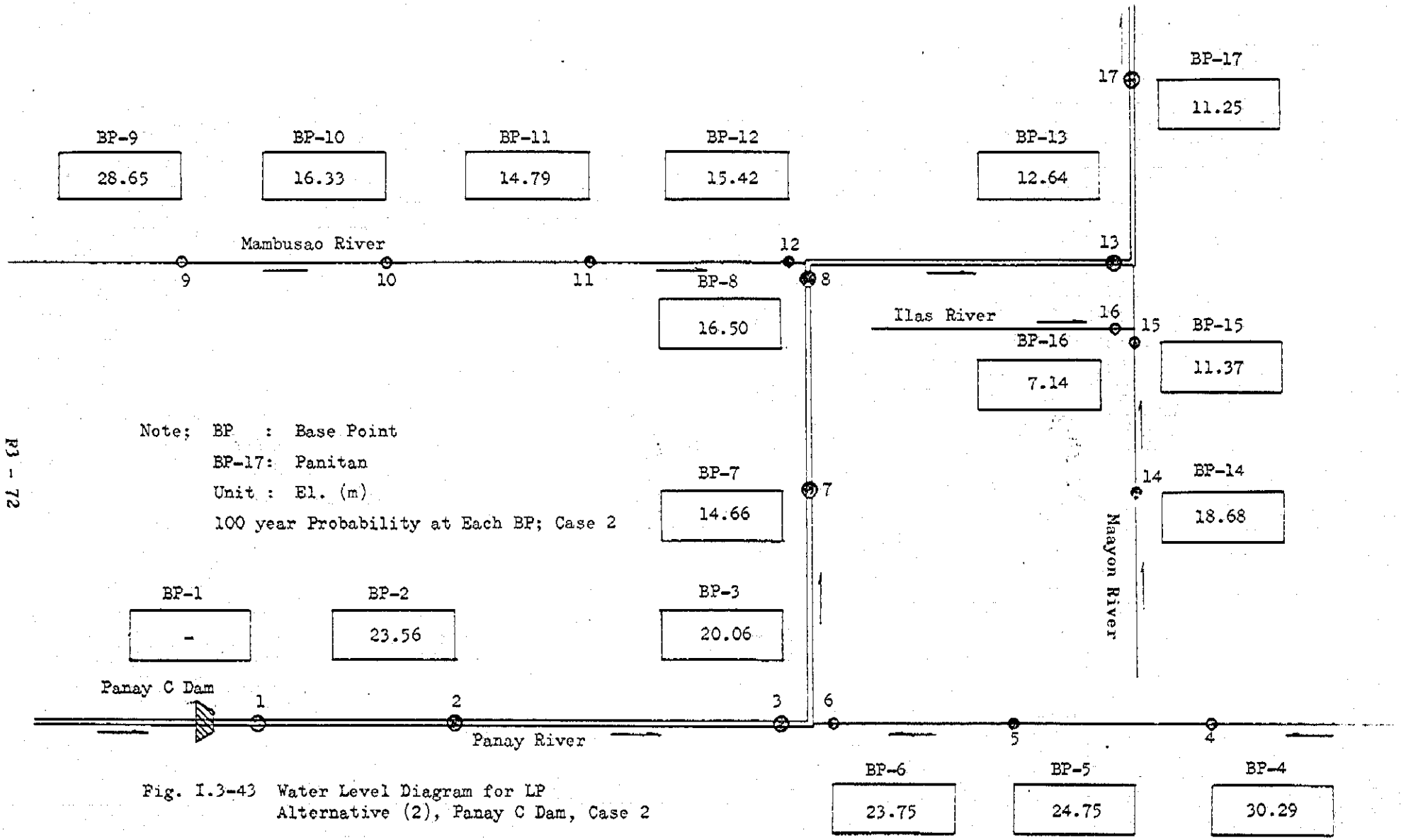


Fig. I.3-43 Water Level Diagram for LP Alternative (2), Panay C Dam, Case 2

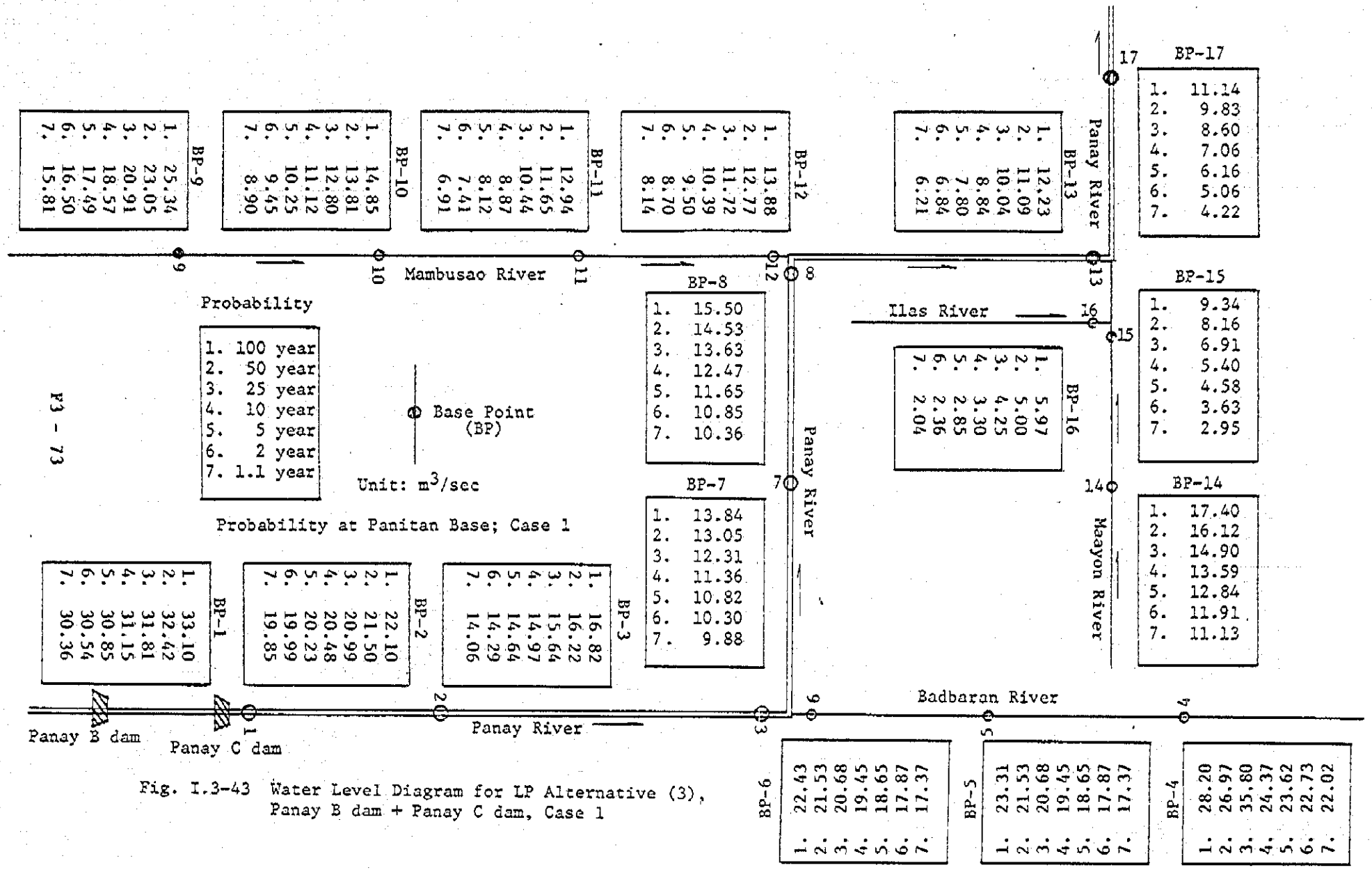


Fig. I.3-43 Water Level Diagram for LP Alternative (3), Panay B dam + Panay C dam, Case 1

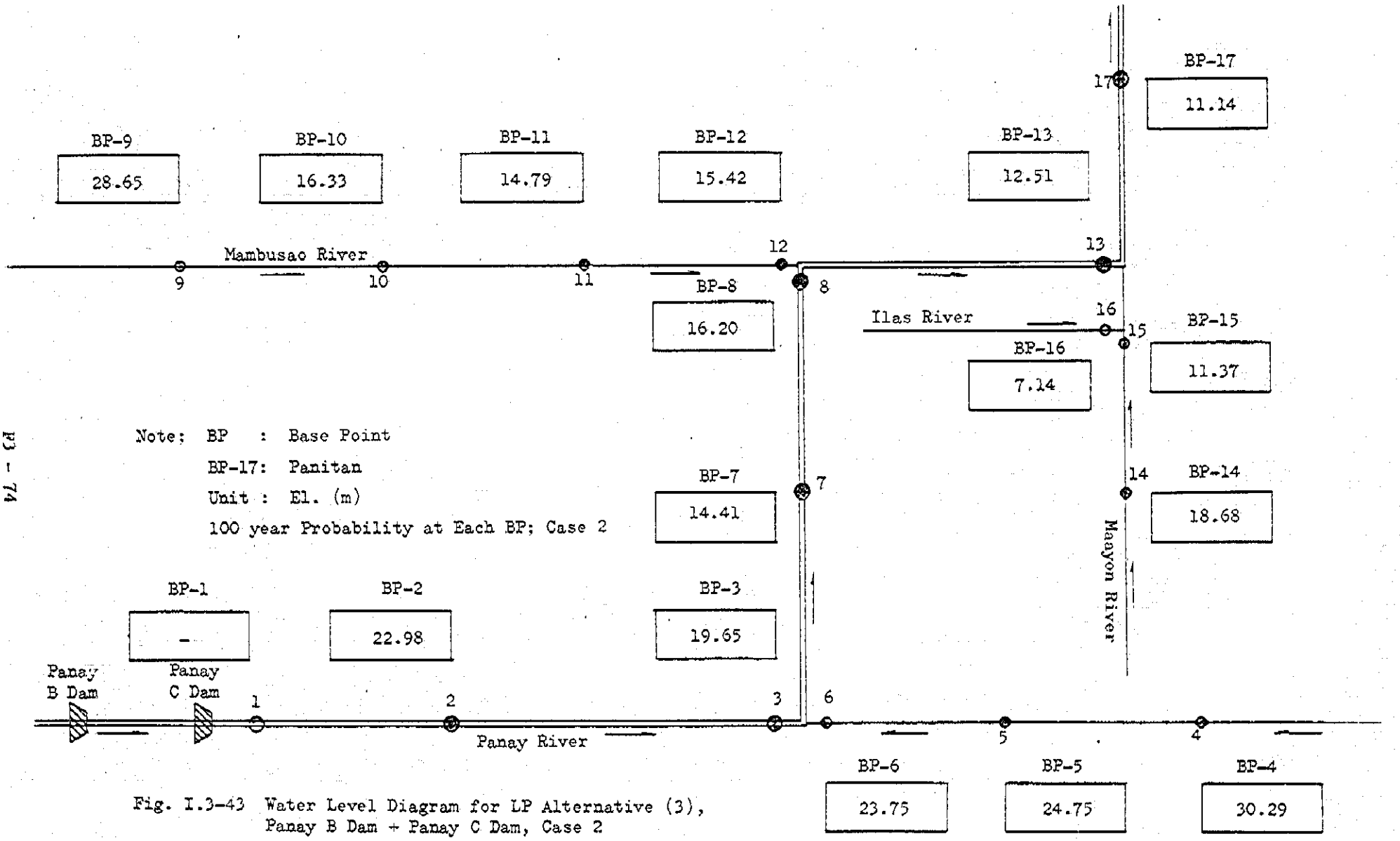
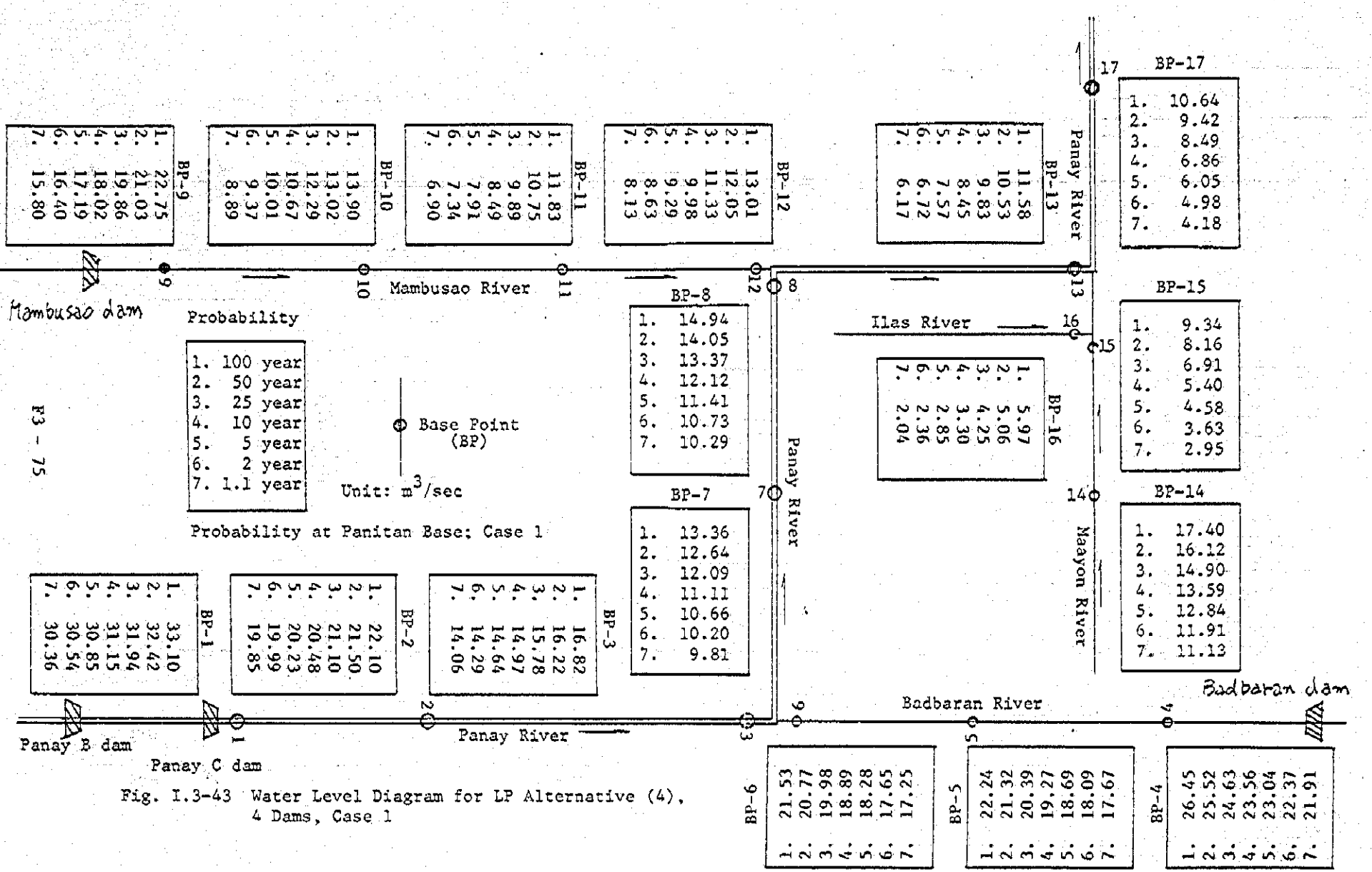


Fig. I.3-43 Water Level Diagram for LP Alternative (3), Panay B Dam + Panay C Dam, Case 2



Probability at Panitan Base: Case 1

Fig. I.3-43 Water Level Diagram for LP Alternative (4), 4 Dams, Case 1

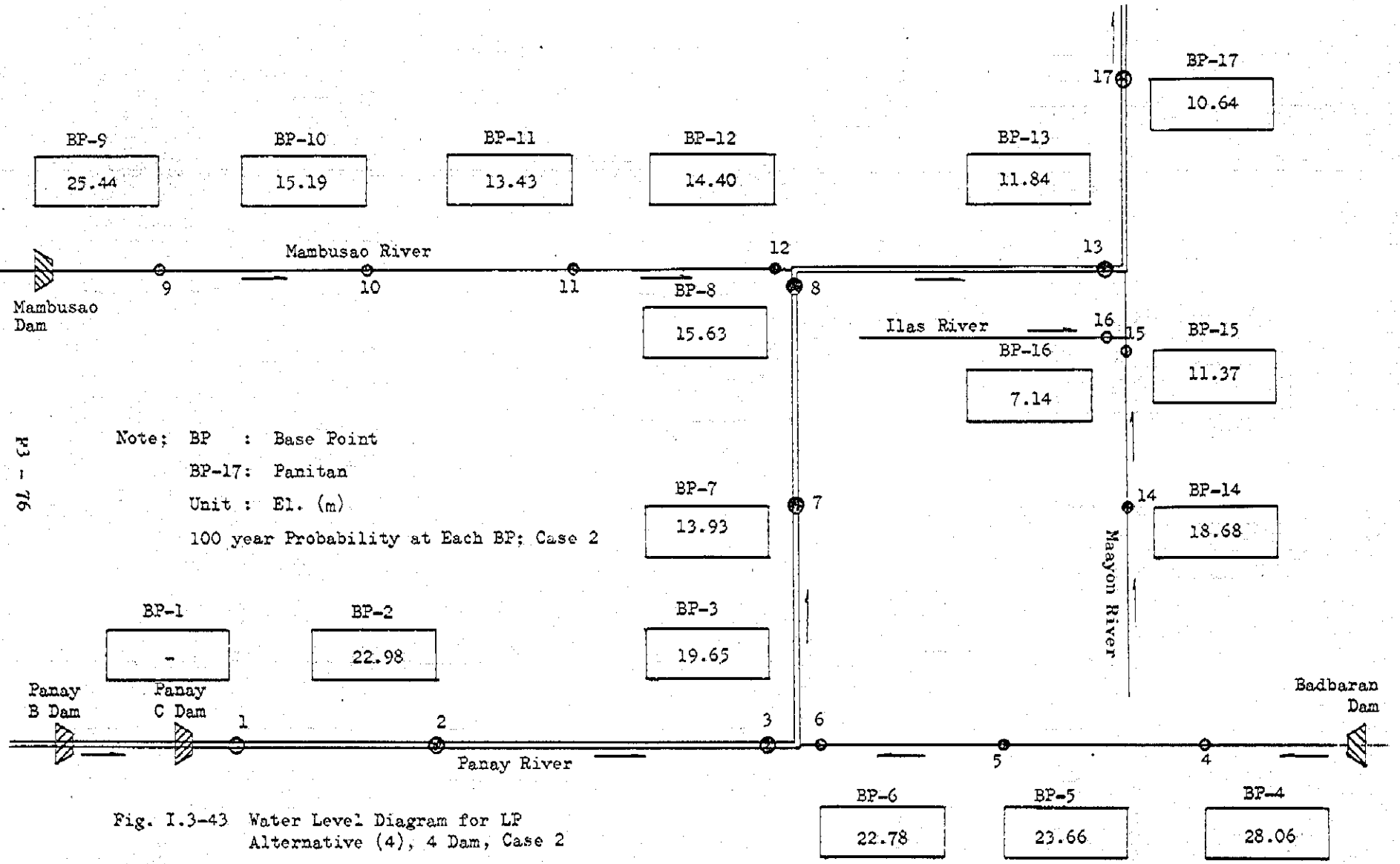


Fig. I.3-43 Water Level Diagram for LP Alternative (4), 4 Dam, Case 2

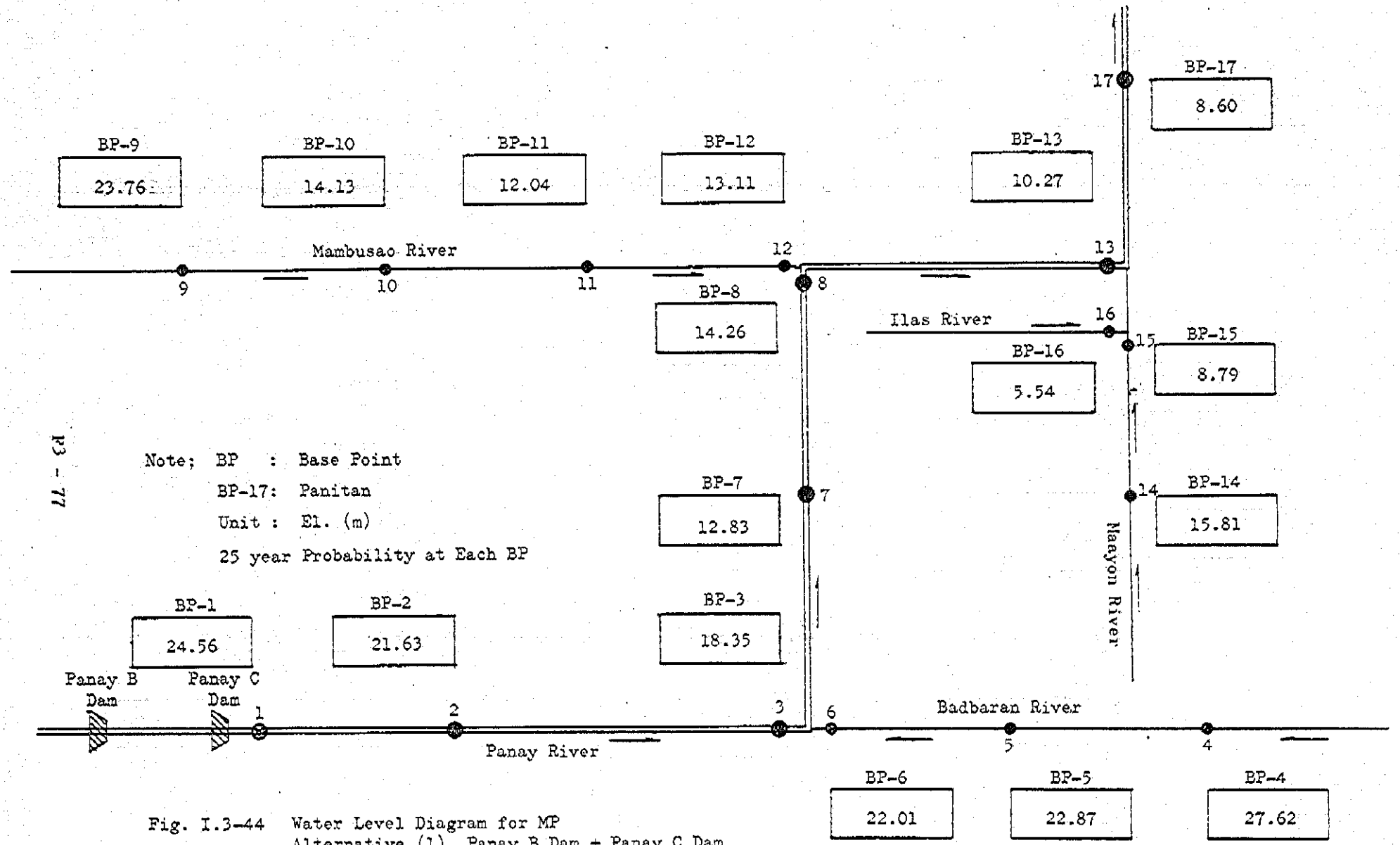


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Fig. I.3-44 Water Level Diagram for MP
Alternative (1), Panay B Dam + Panay C Dam

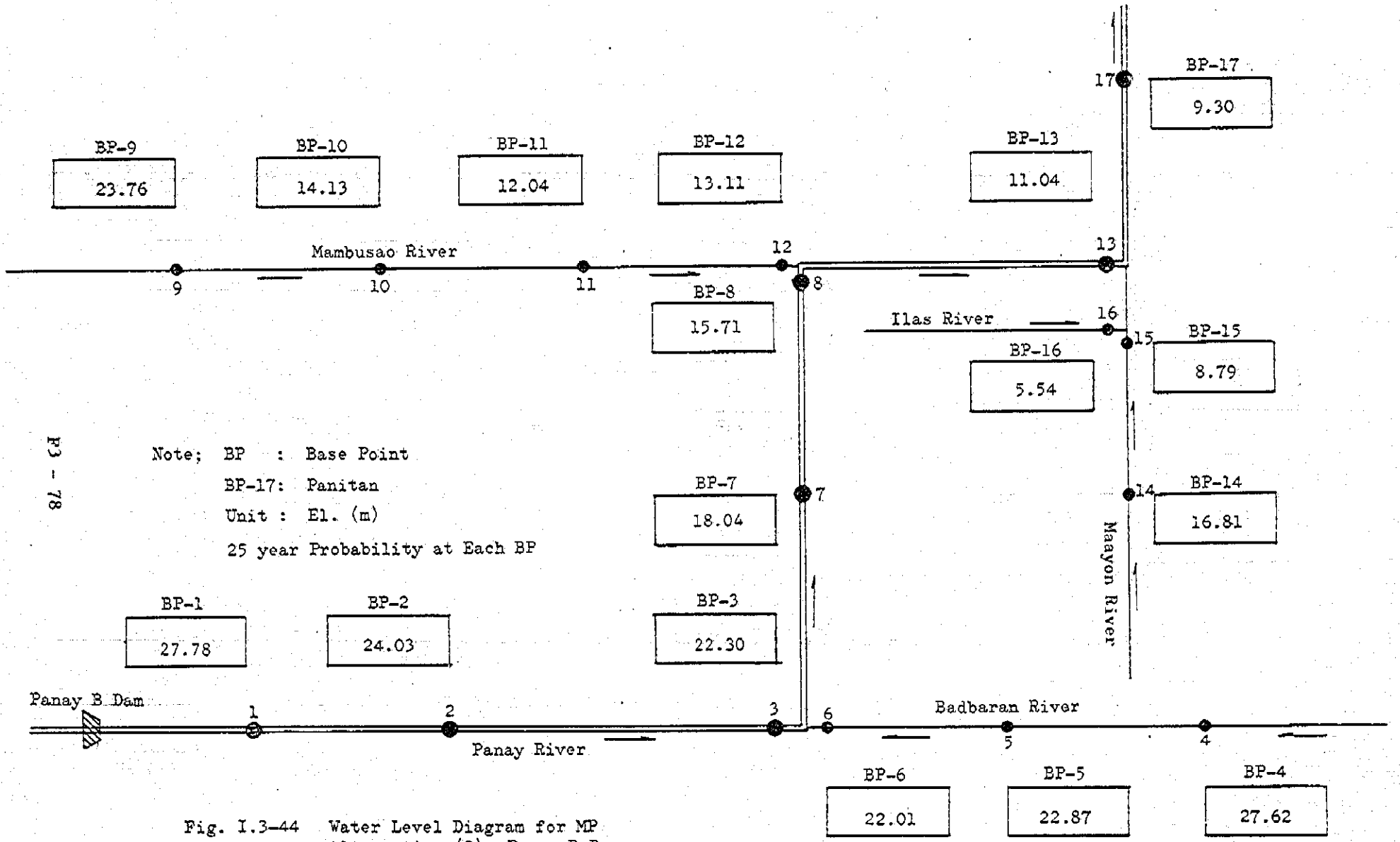


Fig. I.3-44 Water Level Diagram for MP Alternative (2), Panay B Dam

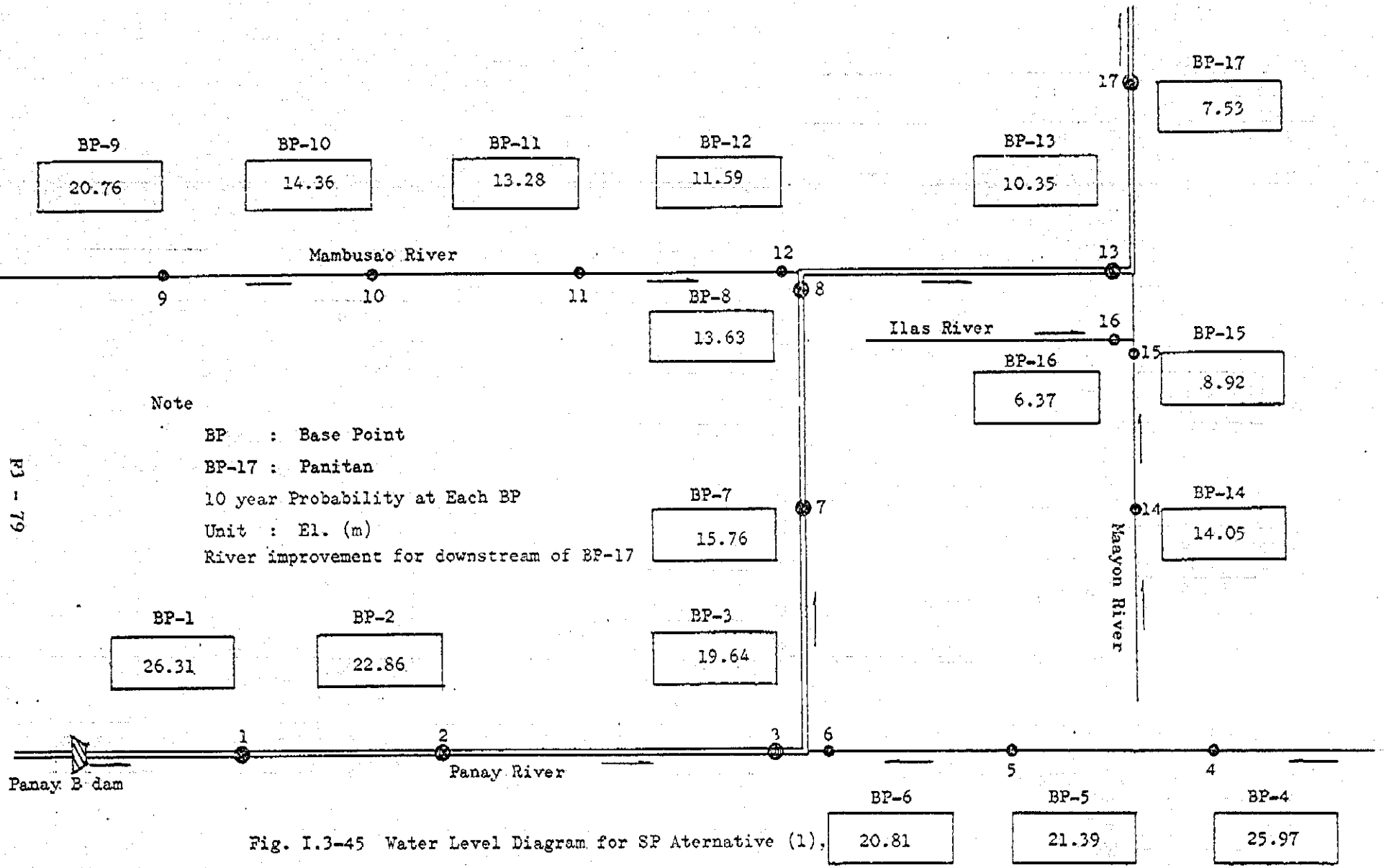


Fig. I.3-45 Water Level Diagram for SP Aternative (1), SP-1A, Panay B dam

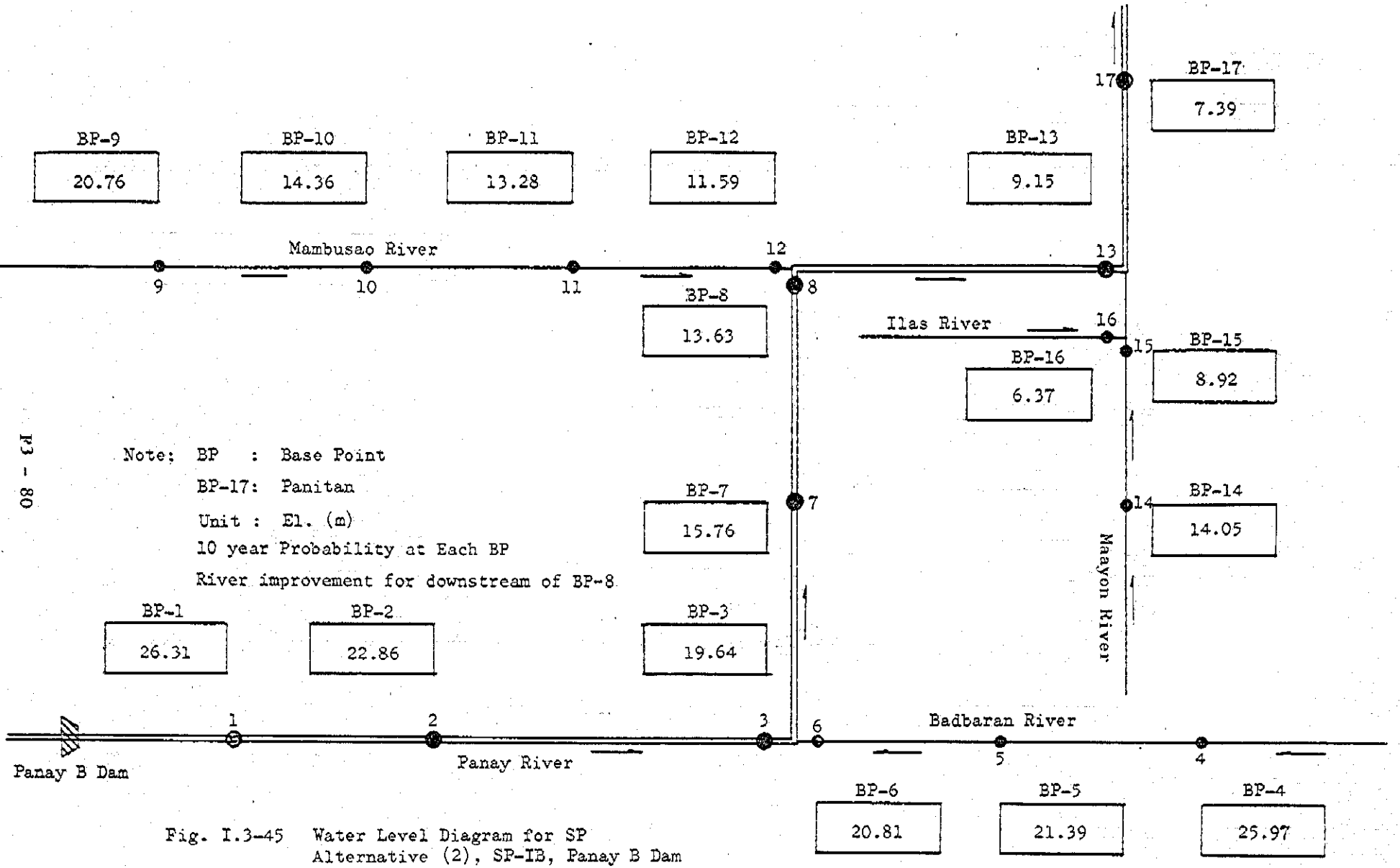


Fig. I.3-45 Water Level Diagram for SP Alternative (2), SP-IB, Panay B Dam

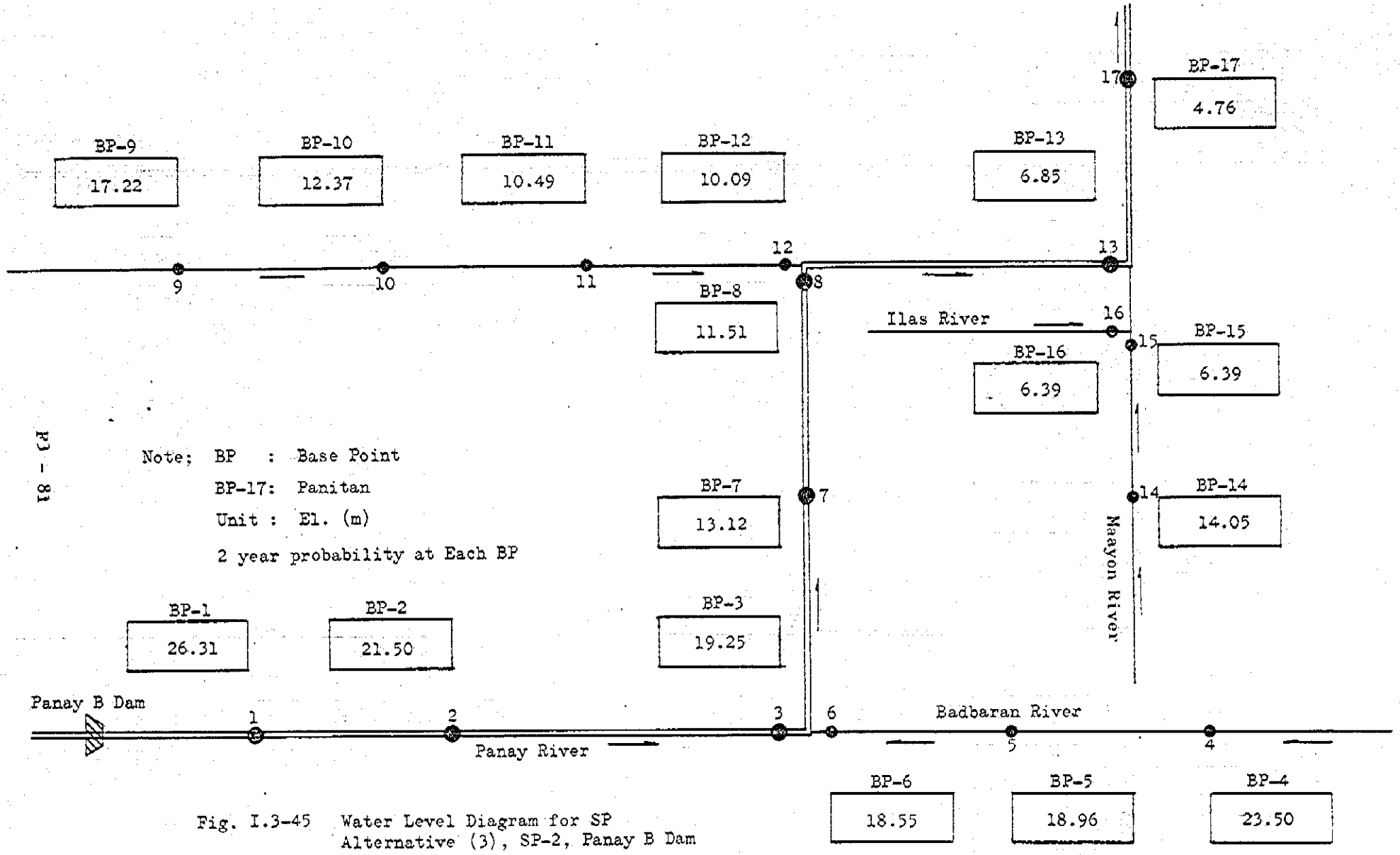


Fig. I.3-45 Water Level Diagram for SP Alternative (3), SP-2, Panay B Dam

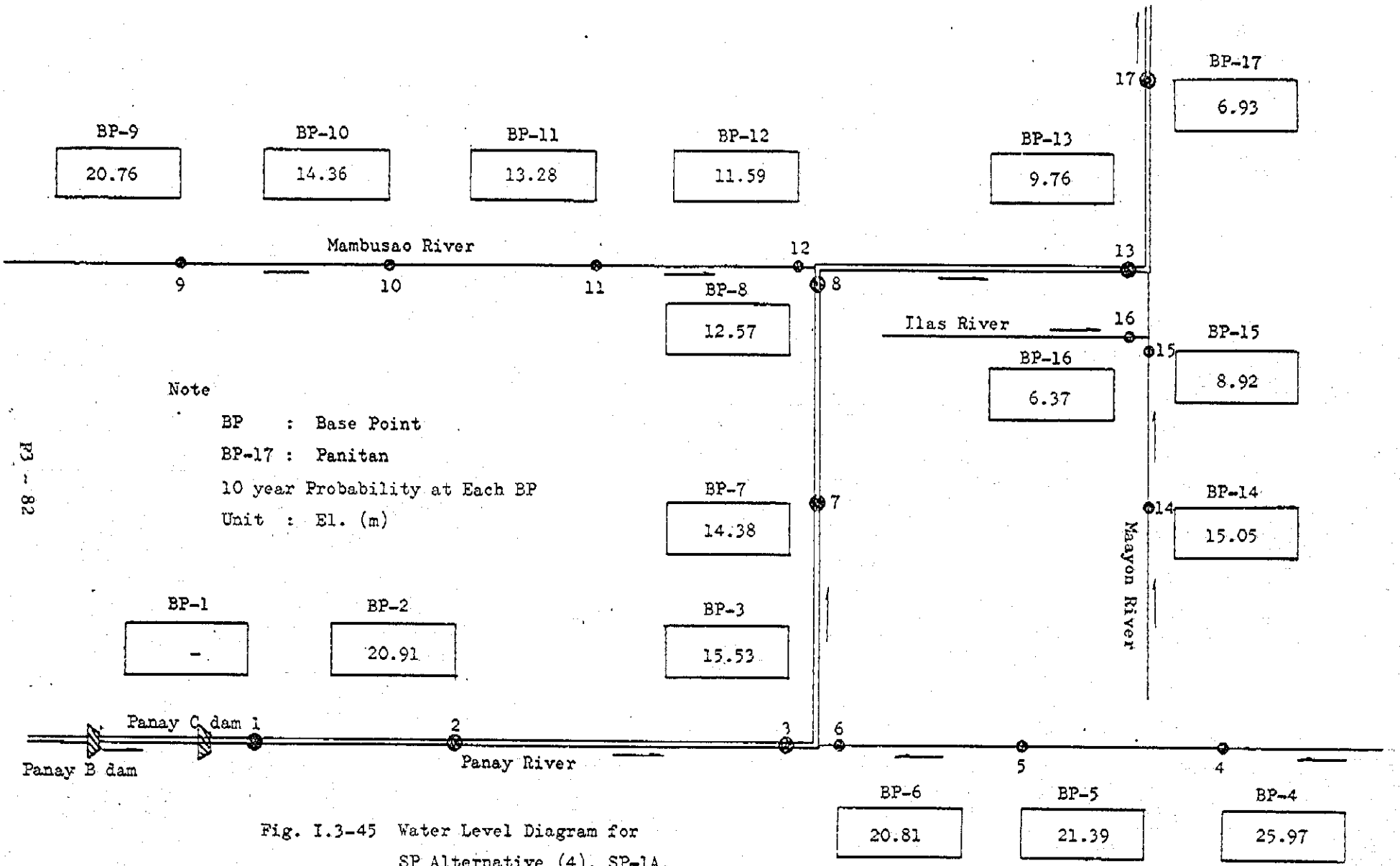


Fig. I.3-45 Water Level Diagram for SP Alternative (4), SP-1A, Panay B dam + Panay C dam

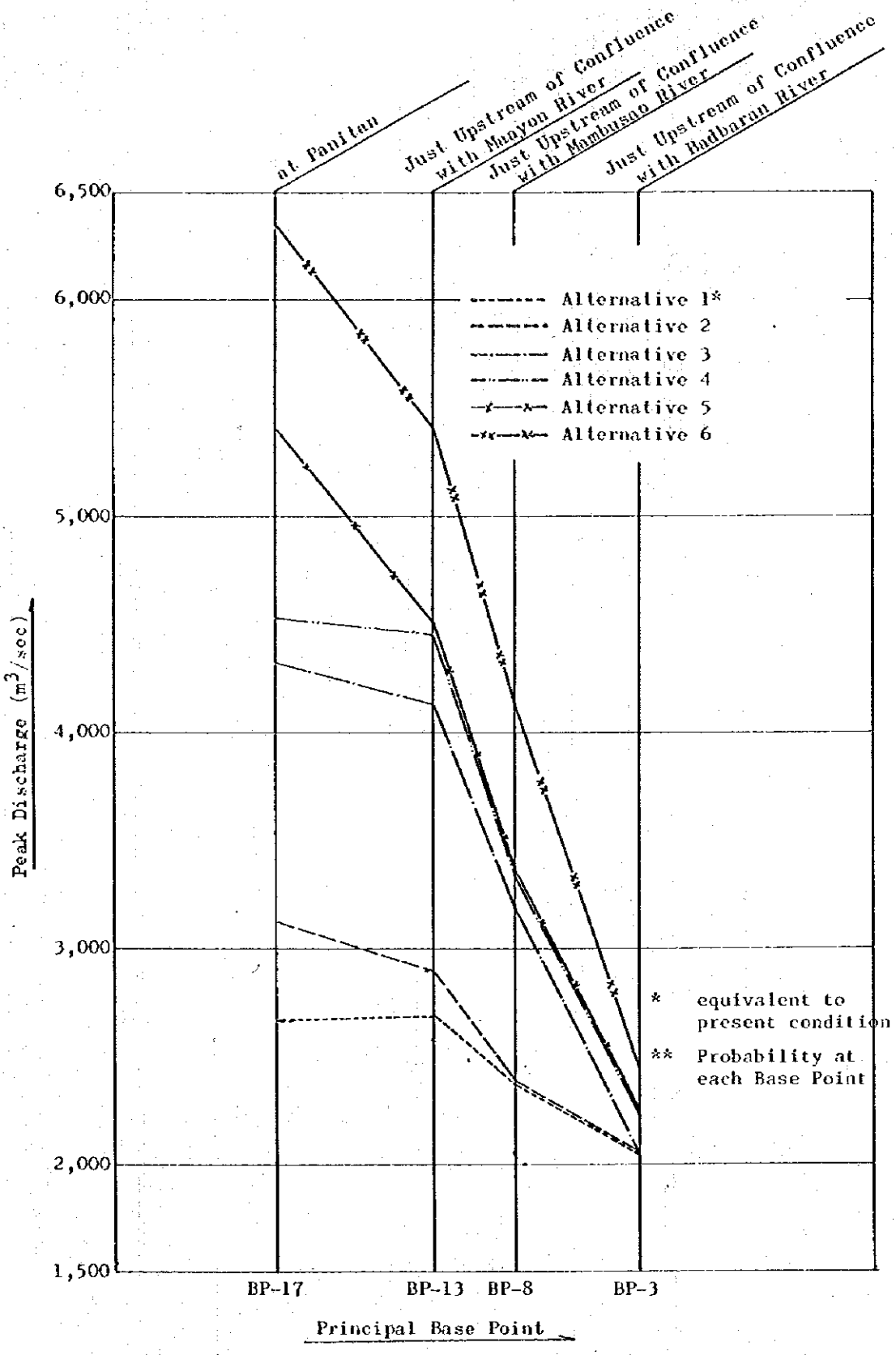


Fig. I.3-46 Peak Discharge at Base Points for Protective Areas Alternatives (100 year flood)**

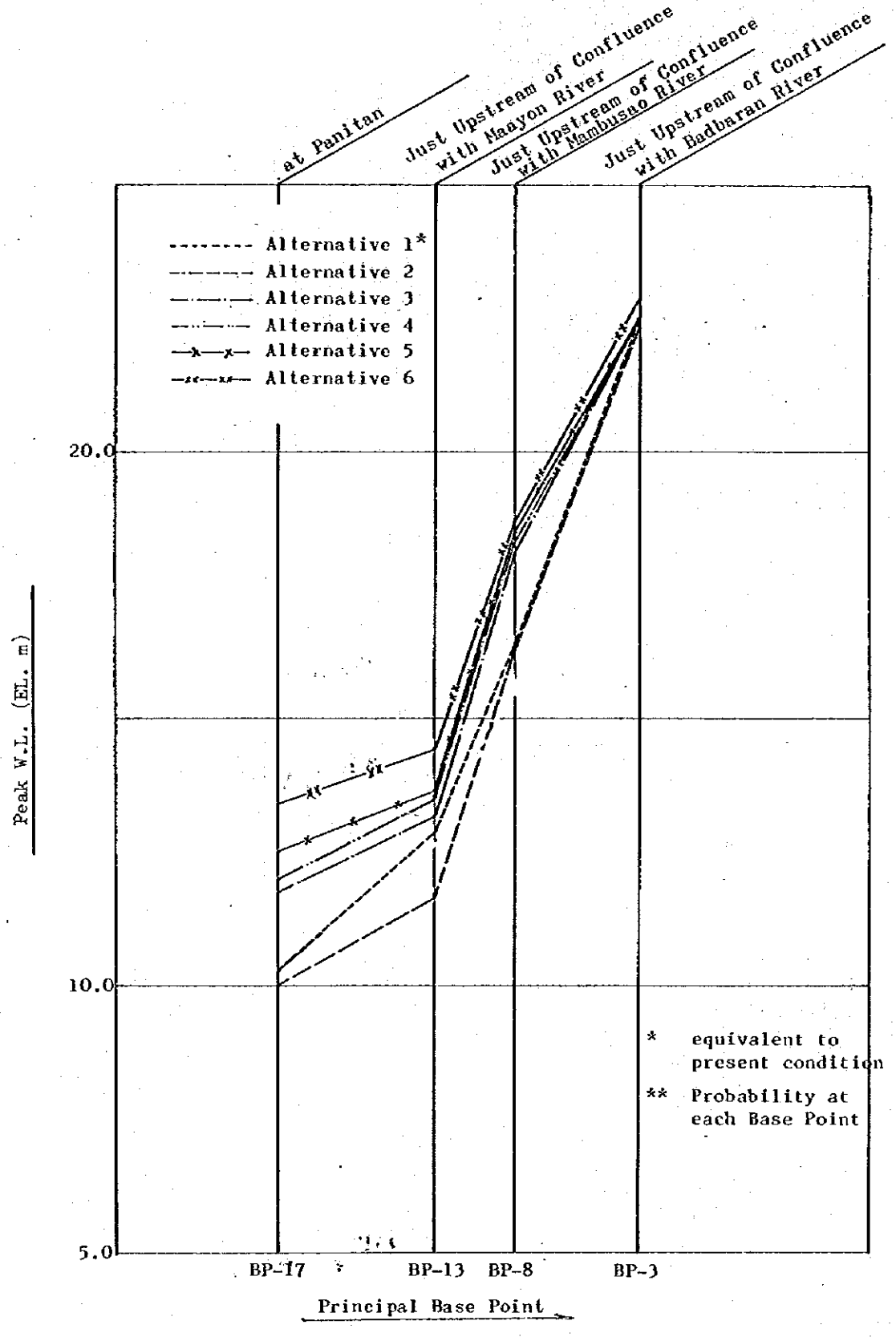
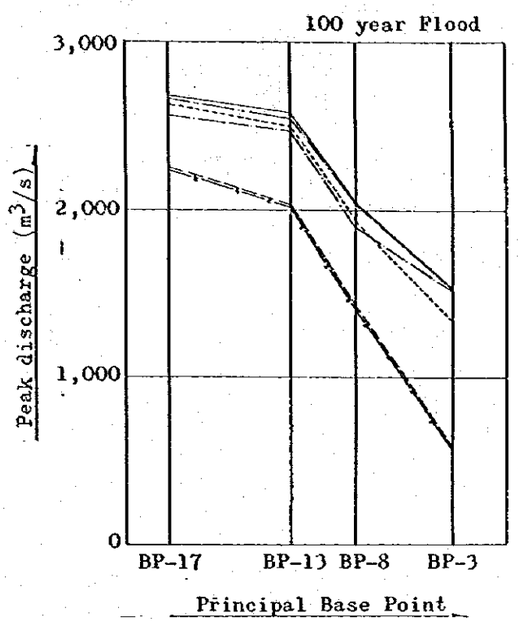
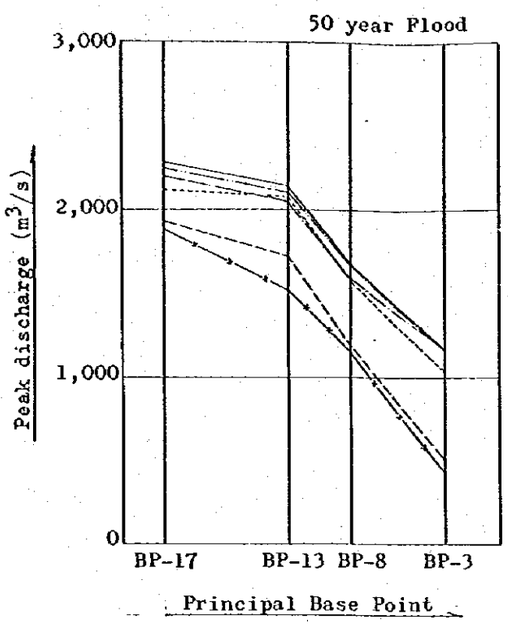
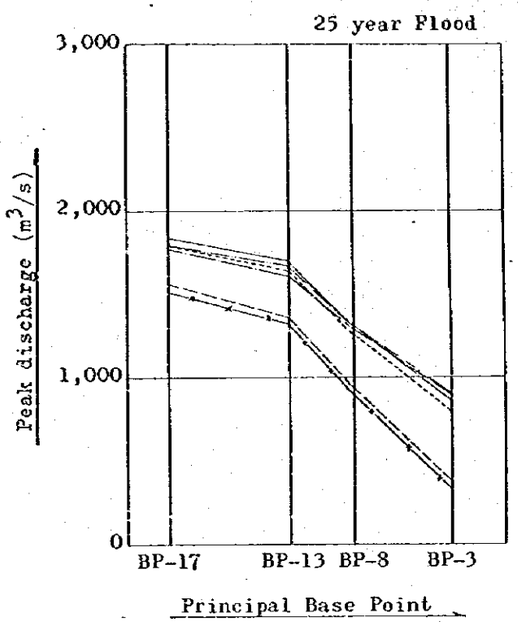
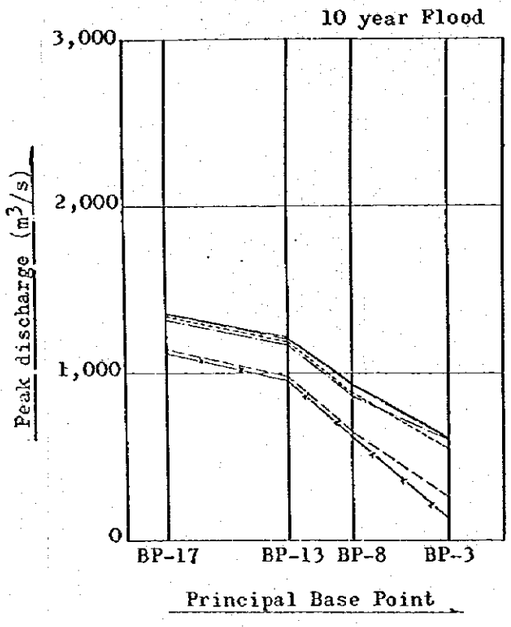


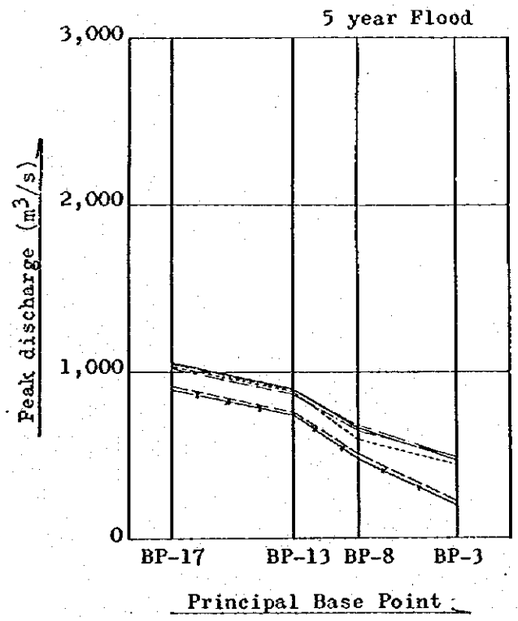
Fig. I.3-47 Peak Water Level at Base Points for Protective Areas Alternatives (100 year flood) **

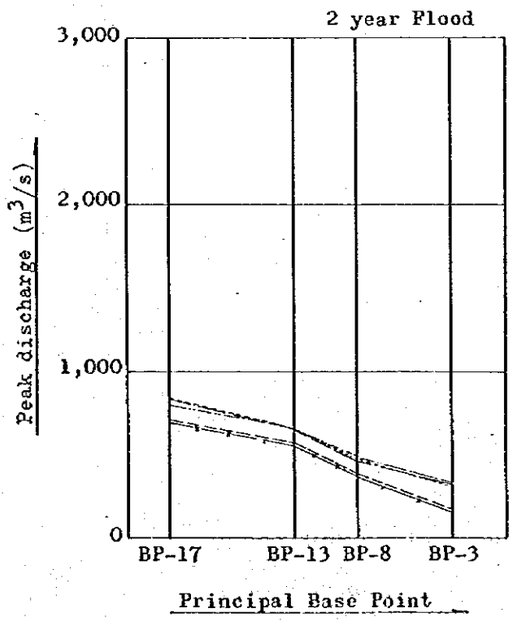










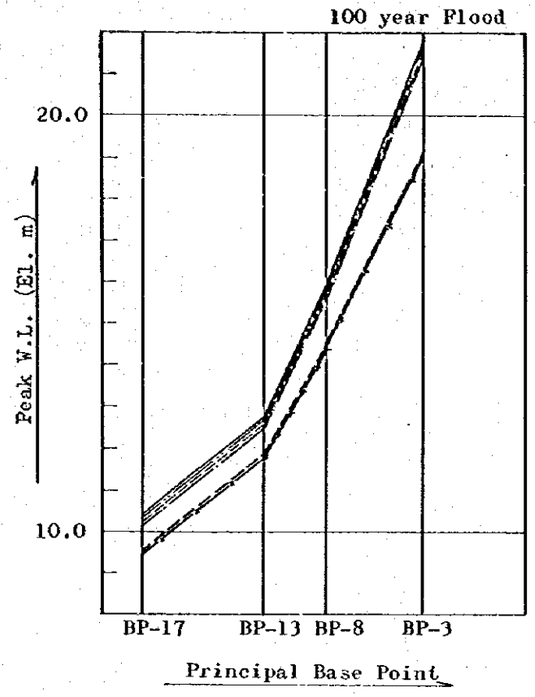


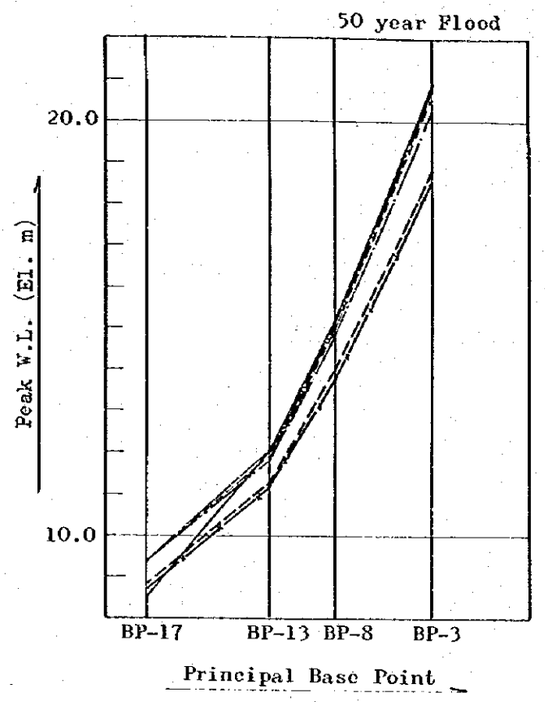
LEGEND

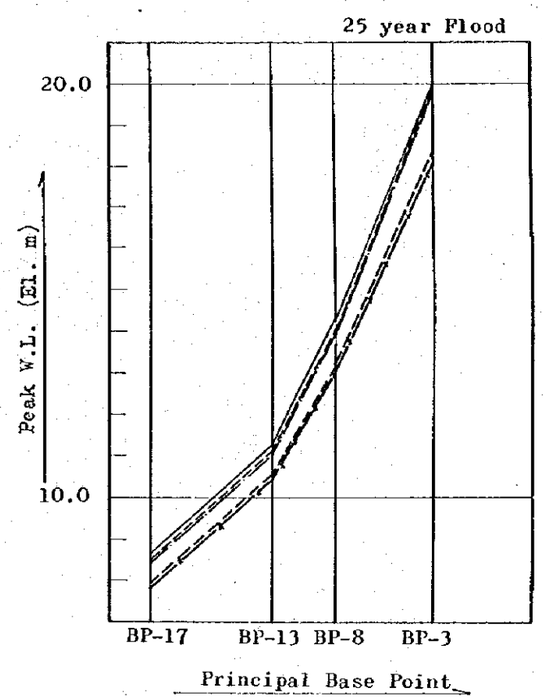
————	Present
- - - - - -	Panay B dam
— — — — —	Panay C dam
——·——·——	Badbaran dam
——··——··——	Mambusao dam
——×——×——	Panay B dam + Panay C dam
BP-17	At Panitan
BP-13	Just Upstream of Confluence with Maayon River
BP-8	Just Upstream of Confluence with Mambusao River
BP-3	Just Upstream of Confluence with Badbaran River

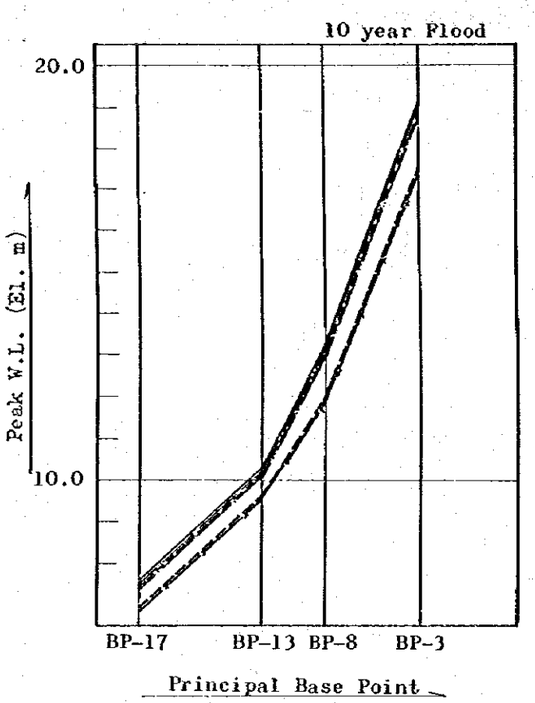
Note: Probability at Panitan Base

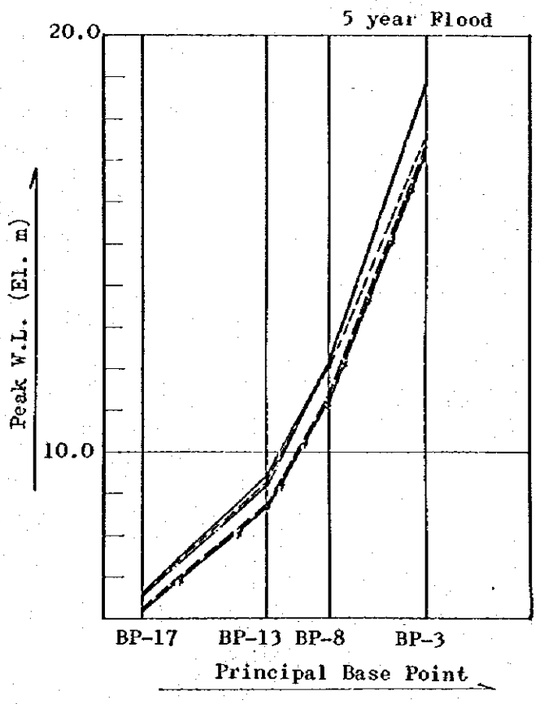
Fig. I.3-48 Peak Discharge at Principal Base Points of Dam Alternatives (Under the present river condition)

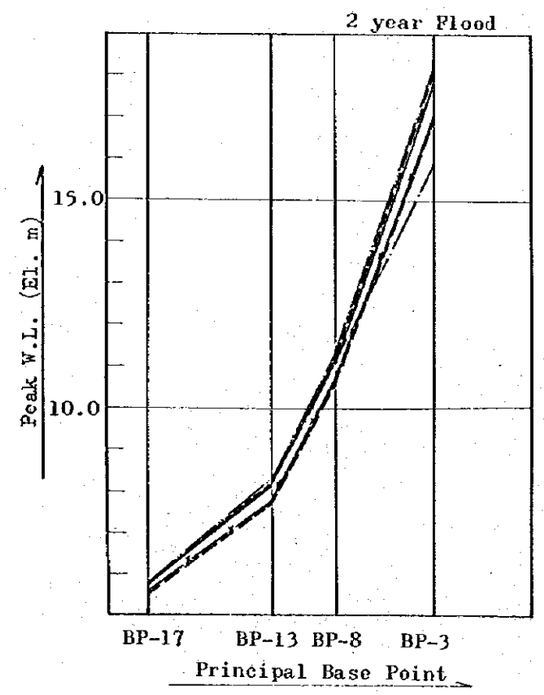












LEGEND

———	Present
- - - - - -	Panay B dam
– – – – – –	Panay C dam
—·—·—·—	Badbaran dam
—··—··—··—	Mambusao dam
—×—×—	Panay B dam + Panay C dam
BP-17	At Panitan
BP-13	Just Upstream of Confluence with Maayon River
BP-8	Just Upstream of Confluence with Mambusao River
BP-3	Just Upstream of Confluence with Badbaran River

Note; Probability at Panitan Base

Fig. I.3-49 Peak Water Level at Principal Base Points of Dam Alternatives (Under the present river condition)

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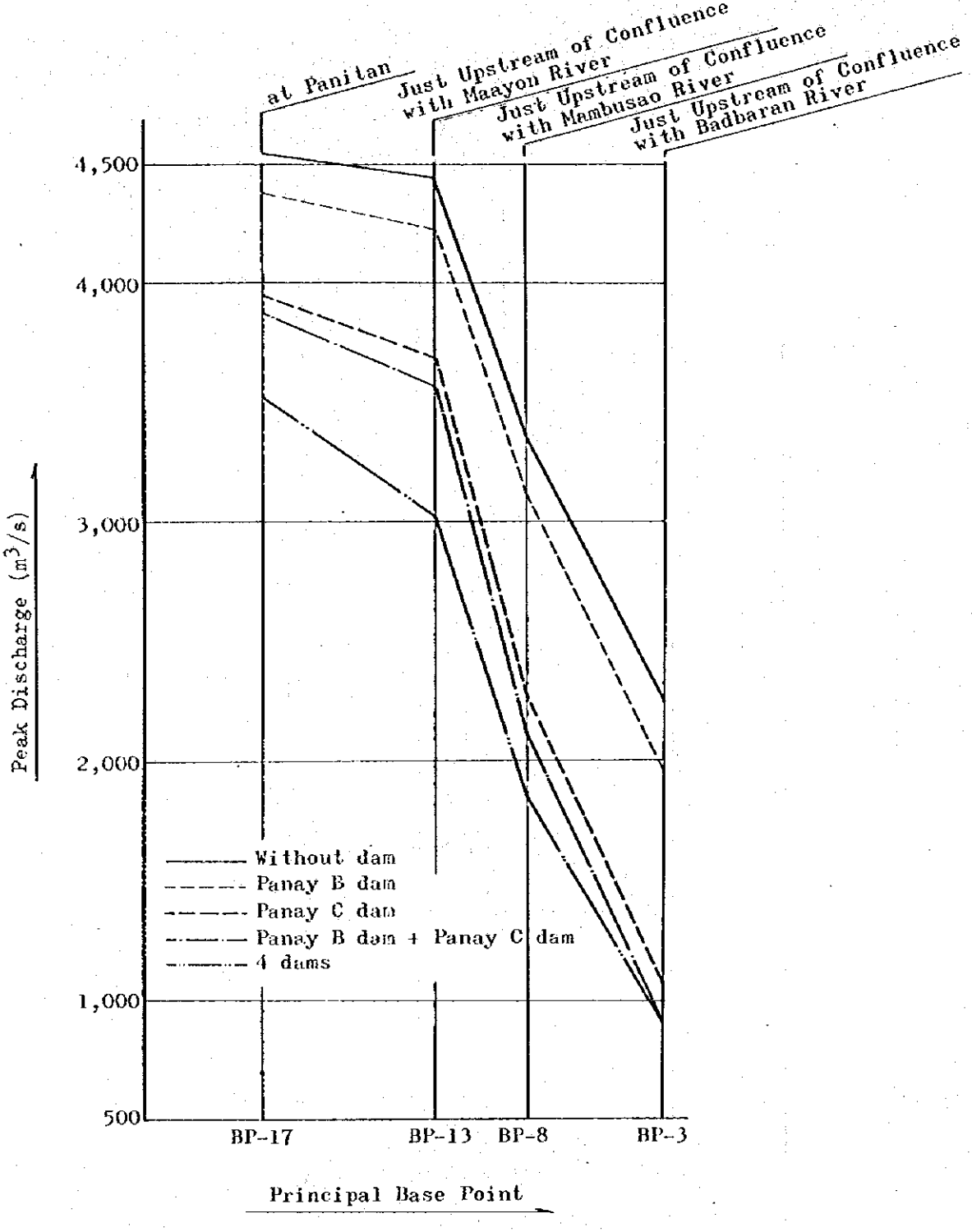

Fig. I.3-50 Peak Discharge at Principal Base Points along Panay River in LP Alternatives with Dam(s) (100 year flood)*

* Probability at Each Base Point

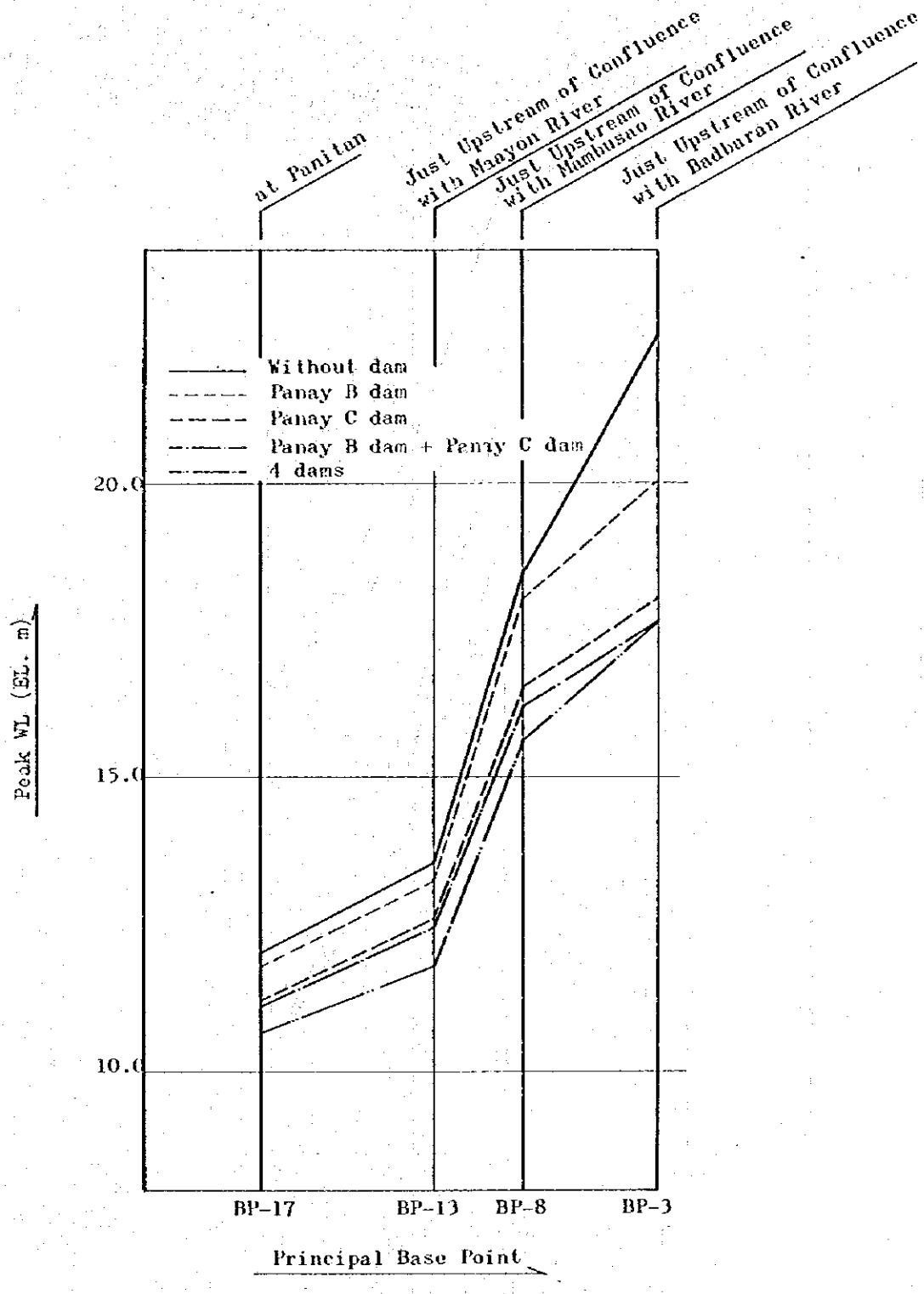

Fig. I.3-51 Peak Water Level at the Principal Base Points along the Panay River in LP Alternatives with Dam(s) (100 year flood)*

* Probability at Each Base Point

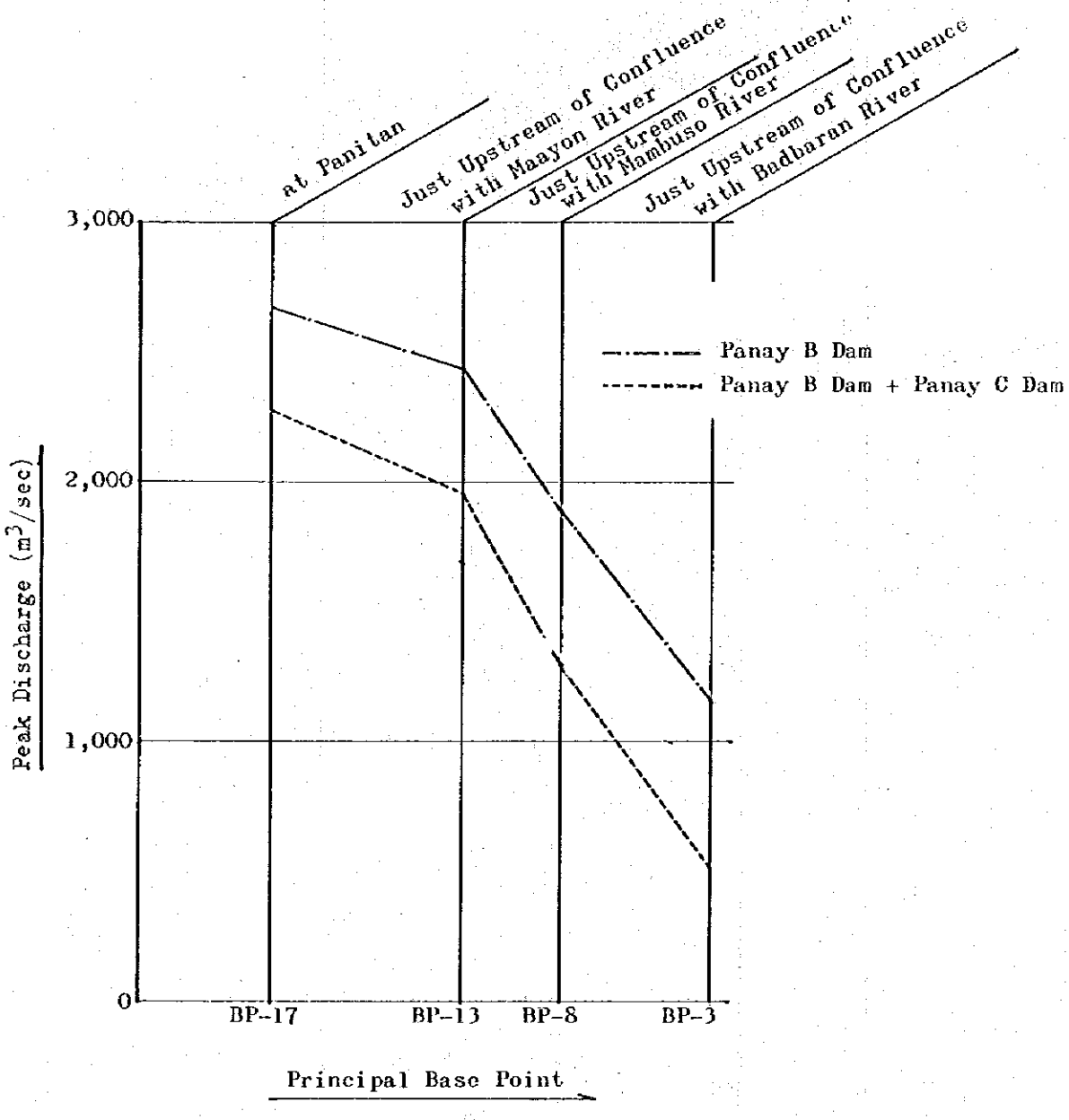

Fig. I.3-52 Peak Discharge at Base Points for MP (25 year flood)*

* Probability at Each Base Point

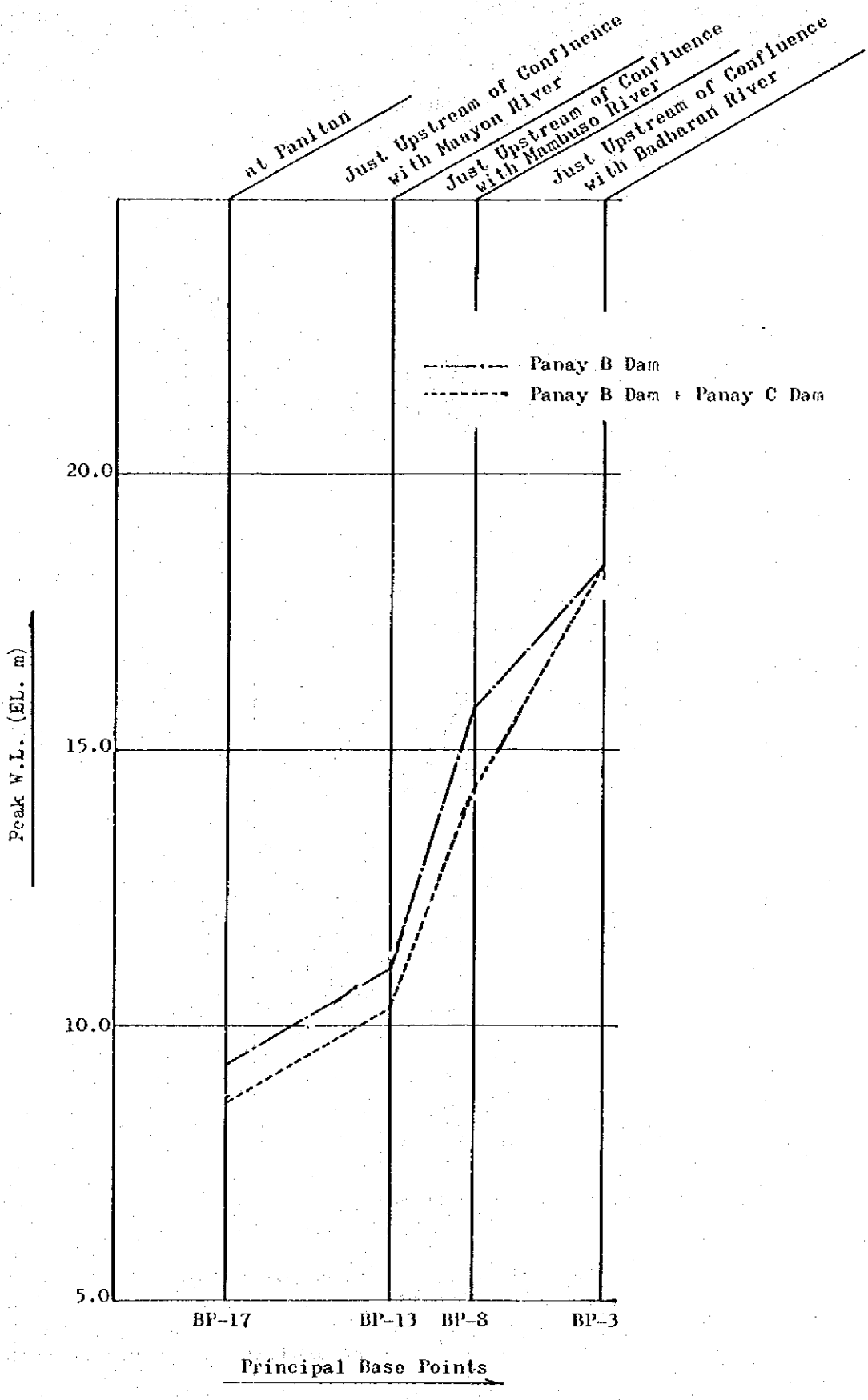

Fig. I.3-53 Peak Water Level at Base Points for MP (25 year flood)*

* Probability at Each Base Point

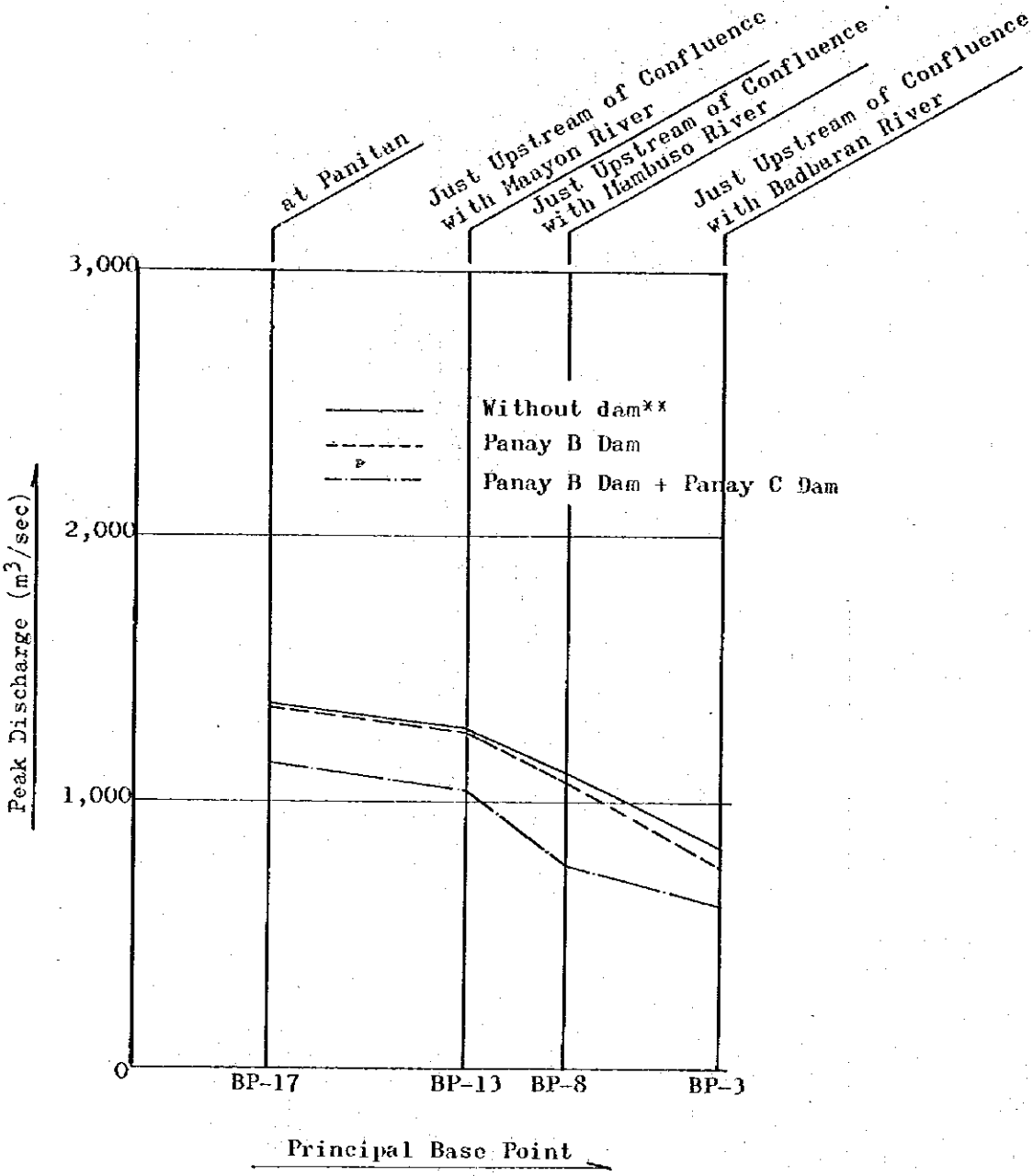

Fig. I.3-54 Peak Discharge at Base Points for SP (10 year flood)*

* Probability at Each Base Point

** Equivalent to Present Condition

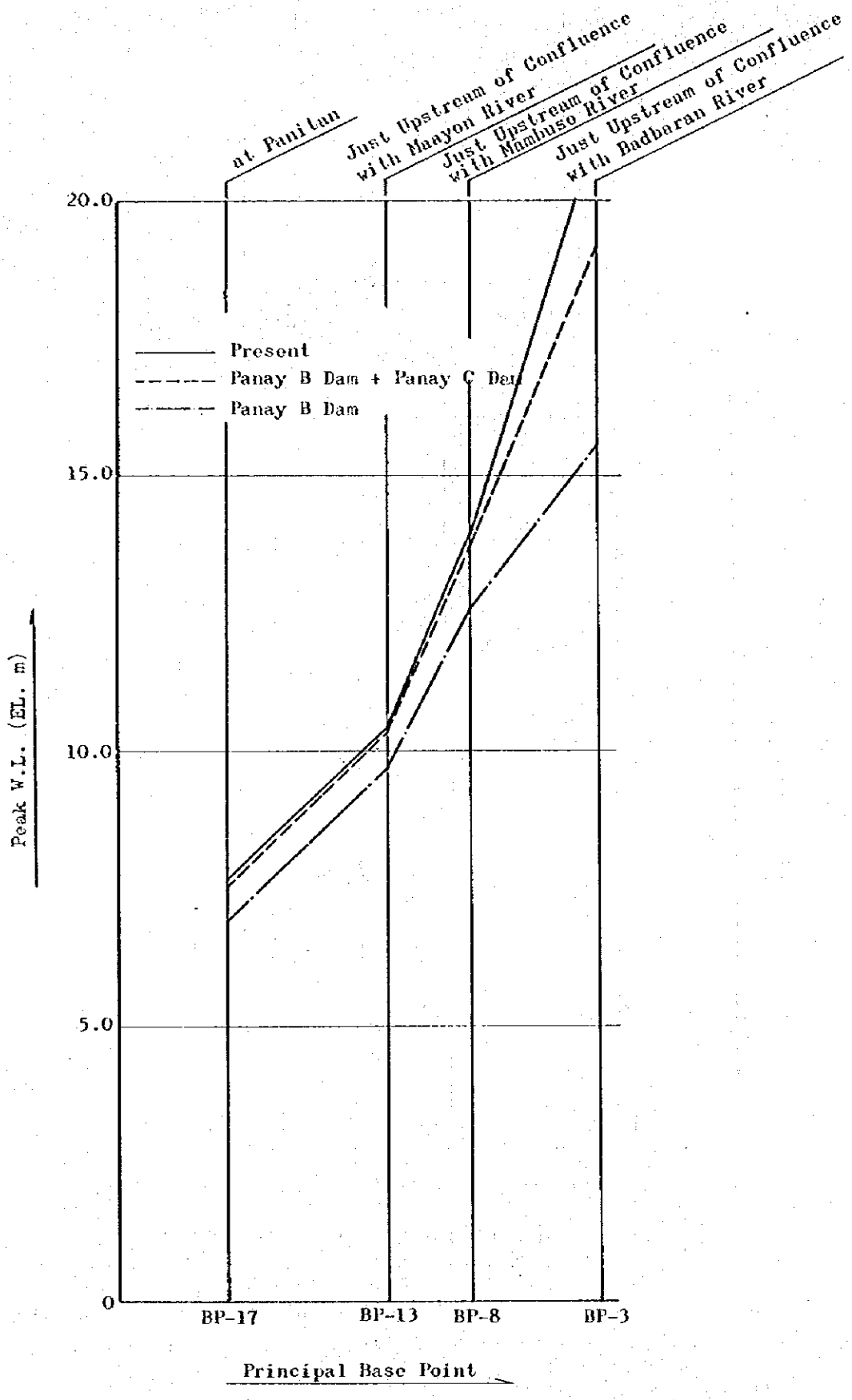

Fig. I.3-55 Peak Water Level at Base Points for SP (10 year flood)*

* Probability at Each Base Point

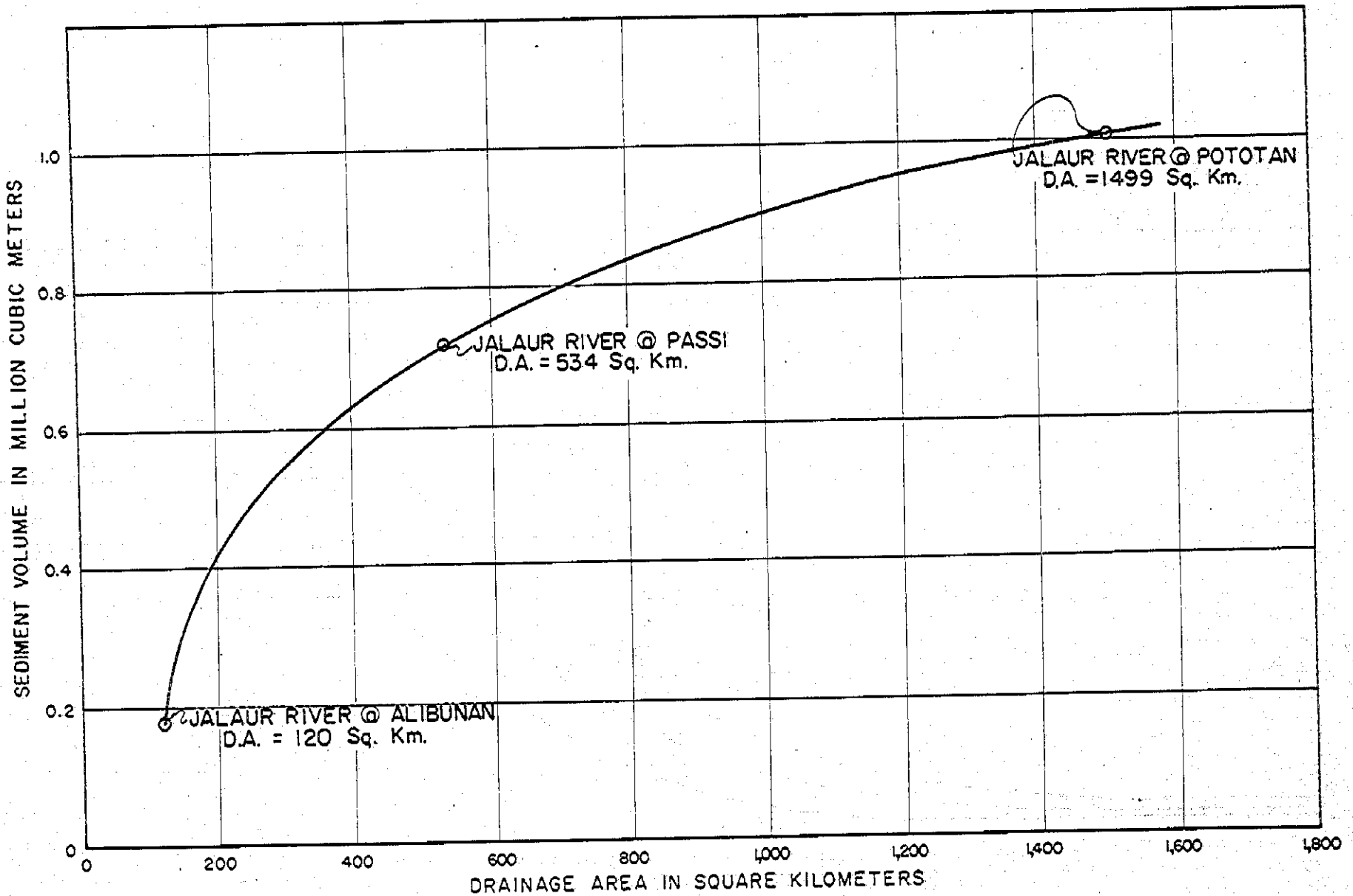

Fig. I.4-1 Jalaur River, Rating Curve of Sediment Yield and Drainage Area

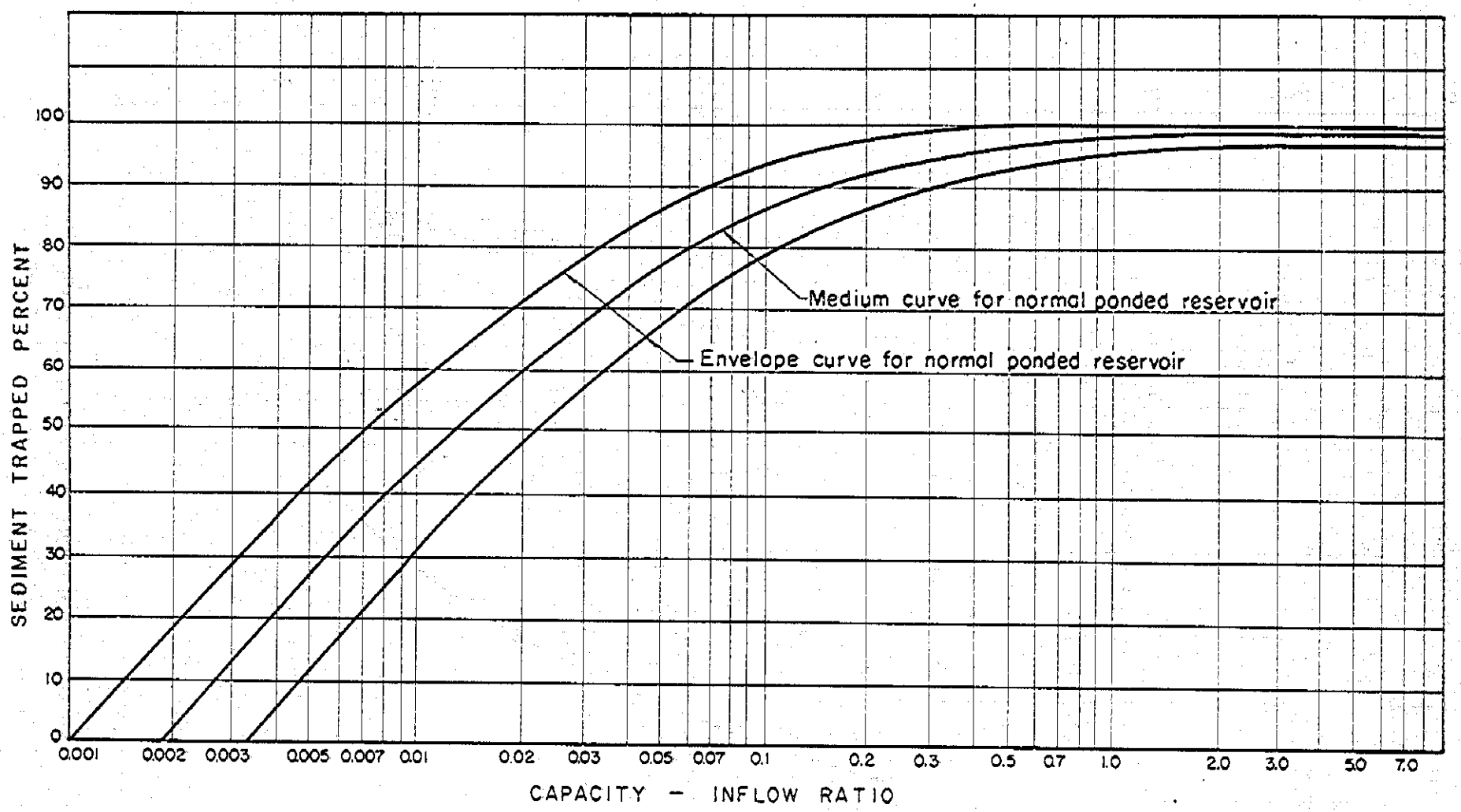

Fig. I.4-2 Gunnar Brune Curve