

*The Feasibility Study of the Flood Control Project  
for the Lower Cagayan River  
in the Republic of the Philippines*

JAPAN INTERNATIONAL COOPERATION AGENCY

**Figure 3.1.1**  
**Project Location for 1987 Master Plan**

**Figure 3.1.2  
Implementation Schedule for Master Plan**

Item	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
<b>I. MULTIPURPOSE PROJECT</b>																			
1. Maling Project (Chico-Maling Irrigation and Flood Control)																			
2. Bifu Project (Flood Control, Hydropower and Subrogate of Magat Reservoir)																			
3. Matuno Project (Hydropower, Matuno Irrigation, MM Water Supply and Subrogate of Magat Reservoir)																			
4. Allmit Project (Hydropower, Compensation and Subrogate of Magat Reservoir)																			
<b>II. FLOOD CONTROL PROJECT</b>																			
1. Tuguegarao Dike																			
2. Magapit (Nassiping Left,MLL)																			
3. Bank Protection																			
4. Cabagan Dike																			
5. Magapit (Nassiping Right,MLR)																			
<b>III. IRRIGATION PROJECT</b>																			
1. Pincamasan FIS																			
2. Dabubu RIP																			
3. Lukutan IP																			
4. Solana IS																			
5. Geppal IP																			
6. Regan IP																			
7. Tuguegarao IP																			
8. Alcalá Amung West IP																			
9. Bagao IS (With Hydropower)																			
10. Dumnon FIS (With Hydropower)																			
11. Tamasai IS																			
12. Zinsakangan IEP (With Hydropower)																			
13. Magat O & M Improvement																			
<b>IV. HYDROPOWER (BY LHPPS Results)</b>																			
1. Ibulao																			
2. Tarudim																			
3. Didayon																			

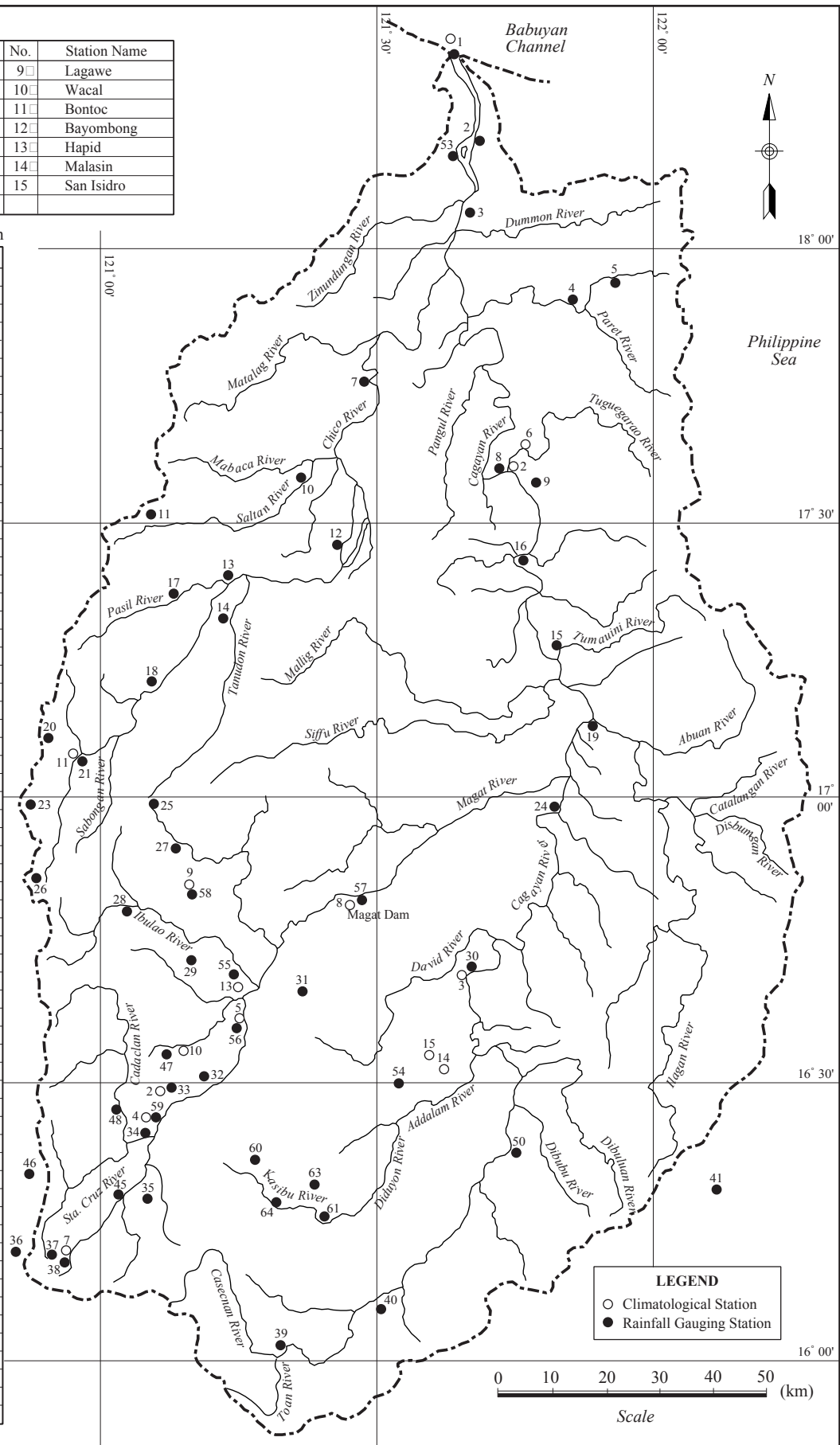
Item	1987	1988	1989	1990	1991	1992	1993	1994	1995
<b>I. MULTIPURPOSE PROJECT</b>									
1. Mallig Project		F/S		D/D			Construction		
2. Siffu Project		F/S		D/D			Construction		
3. Matuno Project					Review	D/D	Construction		(to 1997)
<b>II. FLOOD CONTROL PROJECT</b>									
1. Tuguegarao Dike		F/S		D/D			Construction		
2. Magapit (Nassiping Left, NLL)			F/S		D/D		Construction		
3. Bank Protection		D/D				D/D and Construction			
<b>III. IRRIGATION PROJECT</b>									
1. Pinacanauan RIS			D/D	Construct					
2. Dabubu RIP			D/D		Construction				
<b>IV. PILOT PROJECT FOR UPLAND DEVELOPMENT</b>									
1. Santor (Small Dam)		F/S	D/D		Construction				
2. Carmencita (Pond)		F/S	D/D		Construction				

**Climatological Station**

No.	Station Name	No.	Station Name
1	Aparri	9	Lagawe
2	Tuguegarao	10	Wacal
3	Echague	11	Bontoc
4	Santo Domingo	12	Bayombong
5	Baretbet	13	Hapid
6	Alimanao R.	14	Malasin
7	Consuelo	15	San Isidro
8	Baligatan		

**Rainfall Gauging Station**

No.	Station Name
1	Aparri
2	Lal-lo
3	Aggunetan
4	Bitag Grande
5	Imurung
6	Bauan
7	Tuao
8	Tuguegarao
9	Bagabba
10	Pinukupuk
11	Salegseg
12	Tomiangan
13	Naneng
14	Guilguila
15	Tumauni
16	Cabagan
17	Lubuagan
18	Basao
19	Ilagan
20	Banga-an
21	Bontoc
22	Barlig
23	Bauko
24	Reina Mercedes
25	Mt. Polis
26	Mt. Data
27	Namulditan
28	Lagawe
29	Nayon
30	Echague
31	Diadi
32	Solano
33	Bayombong
34	Barat
35	Dupax
36	Malico
37	Imugan
38	Consuelo
39	Gabong
40	Dakgan
41	Casiguran
42	Taan
43	Upper Casecanan
44	Aurora
45	Aritao
46	Kayapa
47	Wacal
48	Banti
49	Conwap
50	Dippadiw
51	Tabayong
52	Lias
53	San Francisco
54	Cabarroguis
55	Hapid. Lamut
56	Baretbet
57	Baligatan
58	Poblacion Lagawe
59	Sto Domingo
60	Kasibu
61	Kamamasi
62	Biyoy
63	Alayan
64	Packet



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**Figure 5.2.1**  
**Location of Meteorological Stations**

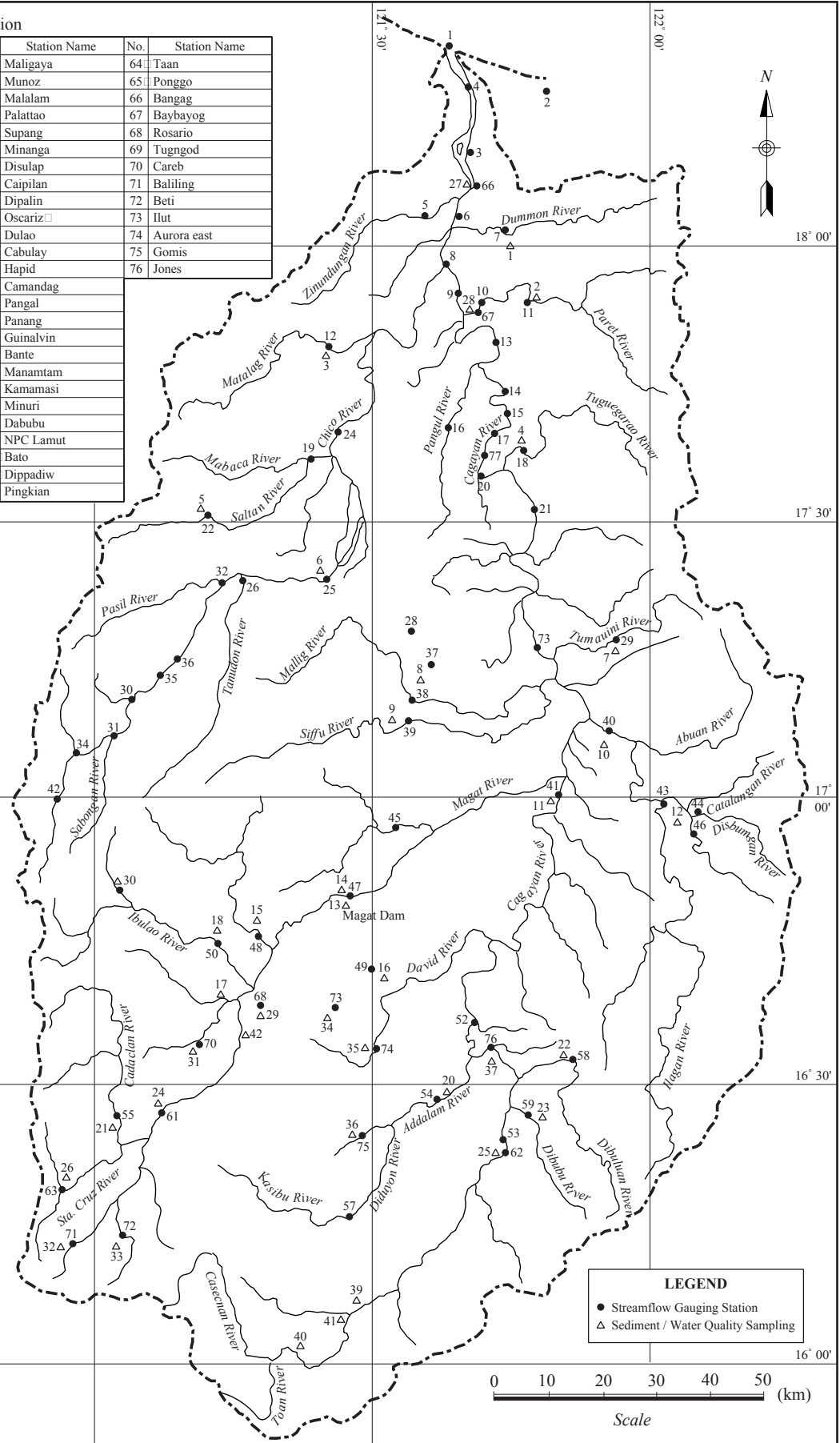
Streamflow Gauging Station

No.	Station Name	No.	Station Name	No.	Station Name
1	Aparri	38	Maligaya	64	Taan
2	Maddalero	39	Munoz	65	Ponggo
3	Catayaan	40	Malalam	66	Bangag
4	Centro, Camalaniugan	41	Palattao	67	Baybayog
5	Simay	42	Supang	68	Rosario
6	Poblacion, Gattaran	43	Minanga	69	Tugngod
7	Calaoagan	44	Disulap	70	Careb
8	Nossiping	45	Caipilan	71	Baliling
9	Tupang	46	Dipalin	72	Beti
10	Calantac	47	Oscariz	73	Ilut
11	Asassi	48	Dulao	74	Aurora east
12	Escolta	49	Cabulay	75	Gomis
13	Anguiray	50	Hapid	76	Jones

14	Centro, Iguig	51	Camandag
15	Bayo	52	Pangal
16	Pangul	53	Panang
17	Centro, Solana	54	Guinalvin
18	Larion Alto	55	Bante
19	Pinukpuk	56	Manamtam
20	Catagaman	57	Kamamasi
21	Namabbalan	58	Minuri
22	Liglig Gawaan	59	Dabubu
23	Naneng	60	NPC Lamut
24	Abbot	61	Bato
25	Pasonglao	62	Dippadiw
26	Baba-alan	63	Pingkian
27	Patoc		
28	Abut		
29	Antagan		
30	Ampawilen		
31	Anabel		
32	Tomiangan		
33	Pattacan		
34	Taed		
35	Basao		
36	Ambato		
37	Casile		

Sediment / Water Quality

No.	Station Name
1	Calaoagan
2	Asassi
3	Escolta
4	Larion Alto
5	Liglig Gawaan
6	Pasonglao
7	Antagan
8	Casile
9	Munoz
10	Malalam (Alinguigan)
11	Palattao
12	Minanga
13	Oscariz
14	Magat Damsite
15	Dulao
16	Cabulay
17	Lamut
18	Hapid (Tupaya)
19	Camandag
20	Guinalvin
21	Bante
22	Minuri
23	Dabubu
24	Bato
25	Dippadiw
26	Pingkian
27	Bangag
28	Baybayog
29	Rosario
30	Tugngod
31	Careb
32	Baliling
33	Beti
34	Ilut
35	Aurora East
36	Gamis
37	Jones
38	Maddela
39	Coneap
40	Gabong
41	Dakgan
42	Bagabag



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**Figure 5.2.2**  
**Location of Hydrological Stations**

Daily Data  
 Monthly Data

No.	Station	Item	Location		Elevation (meter asl)	Climatological Data Collected During Master Plan Study																															Additional Climatological Data Collected During Feasibility Study																
			Latitude	Longitude		1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
1	Aparri	Air Temperature	18-22-00	121-38-00	3	[Daily Data]																															[Daily Data]																
		Relative Humidity				[Daily Data]																															[Daily Data]																
		Wind				[Daily Data]																															[Daily Data]																
		Sunshine Hours				[Daily Data]																															[Daily Data]																
		Evaporation				[Daily Data]																															[Daily Data]																
		Atmospheric Pres				[Daily Data]																															[Daily Data]																
2	Tuguegarao	Air Temperature	17-39-00	121-45-00	62	[Daily Data]																															[Daily Data]																
		Relative Humidity				[Daily Data]																															[Daily Data]																
		Wind				[Daily Data]																															[Daily Data]																
		Sunshine Hours				[Daily Data]																															[Daily Data]																
		Evaporation				[Daily Data]																															[Daily Data]																
		Atmospheric Pres				[Daily Data]																															[Daily Data]																
3	Echague	Air Temperature	16-42-00	121-40-00	66	[Daily Data]																															[Daily Data]																
		Relative Humidity				[Daily Data]																															[Daily Data]																
		Wind				[Daily Data]																															[Daily Data]																
		Sunshine Hours				[Daily Data]																															[Daily Data]																
		Evaporation				[Daily Data]																															[Daily Data]																
		Atmospheric Pres				[Daily Data]																															[Daily Data]																
4	Santo Domingo	Air Temperature	16o 25'	121o 06'	320	[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																
5	Barelbet, Bagabag	Air Temperature	16o35'45"	121o17'10"		[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																
6	Alimano R, Tuguegarao	Air Temperature				[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																
7	Consuelo, Santa Fe	Air Temperature	16-10-00	120-57-00	600	[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																
8	Baligatan (Taliatic)	Air Temperature	16-48-00	121-27-00	200	[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																
9	Lagawe	Air Temperature	16-48-00	121-07-00	400	[Monthly Data]																															[Monthly Data]																
		Relative Humidity				[Monthly Data]																															[Monthly Data]																
		Wind				[Monthly Data]																															[Monthly Data]																
		Sunshine Hours				[Monthly Data]																															[Monthly Data]																
		Evaporation				[Monthly Data]																															[Monthly Data]																
		Atmospheric Pres				[Monthly Data]																															[Monthly Data]																

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**Figure 5.2.3**  
**List of Climatologic Stations (1/2)**

 Daily Data  
 Monthly Data

No.	Station	Item	Location		Elevation (meter asl)	Climatological Data Collected During Master Plan Study																																			Additional Climatological Data Collected During Feasibility Study												
			Latitude	Longitude		1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
10	Wacal	Rainfall																																																			
		Air Temperature																																																			
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
11	Bontoc	Air Temperature																																																			
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
12	Bayombong NVSIT	Air Temperature																																																			
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
13	Hapid	Air Temperature	16-42-00	121-15-00	280																																																
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
14	Malasin	Air Temperature																																																			
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
15	San Isidro	Air Temperature																																																			
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
16	APC Comp., Minanga Norte, Iguig, Cagayan	Air Temperature	17-46-20	121-44-10	18																																																
		Relative Humidity																																																			
		Wind																																																			
		Sunshine Hours																																																			
		Evaporation																																																			
		Atom. Pressure																																																			
17	San Felipe Ilagan, Isabela	Maximum Temp.																																																			
		Minimum Temp.																																																			
		Wind																																																			
		Relative Humidity																																																			
		Evaporation																																																			
		Atom. Pressure																																																			

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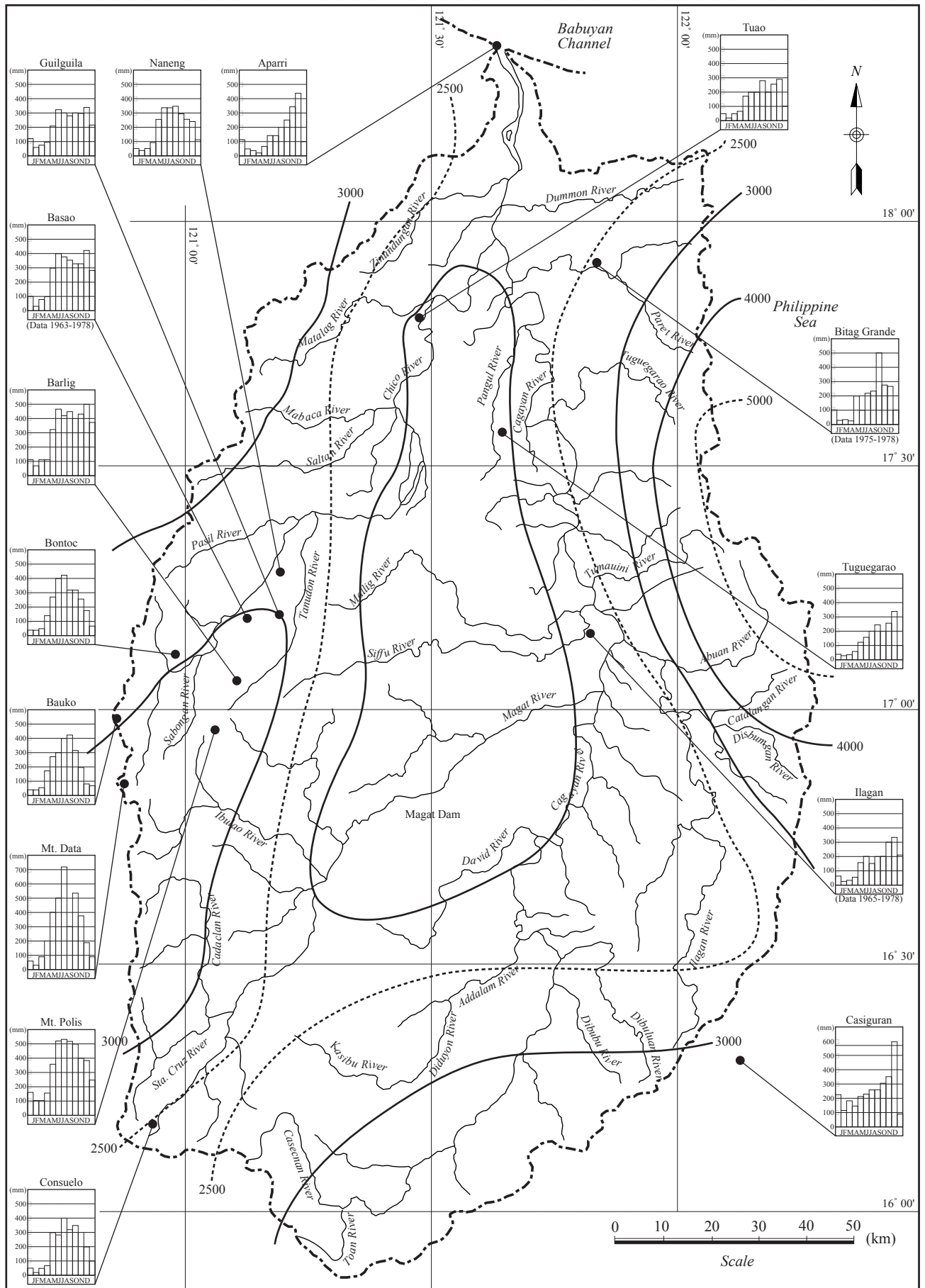
**Figure 5.2.3**  
**List of Climatologic Stations (2/2)**

**Figure 5.2.4**  
**List of Rainfall Gauging Stations (1/2)**

No.	Station	Location		Elev. (m. asl)	Data Collected During Master Plan Study																																				Additional Data Collected											Source	
		Latitude	Longitude		1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995		1996
1	Aparri	18-21'	121-39'	2	[Data collected]																																				[Data collected]											PAGASA Aparri/Ctral	
2	Lal-Lo	18-12'	121-40'	8	[Data collected]																																				[Data collected]											PAGASA Central	
3	Agunetan, Gattaran	18-04'	121-38'	10	[Data collected]																																				[Data collected]											PAGASA Central	
4	Bitag Grande	17-54'	121-51'		[Data collected]																																				[Data collected]												
5	Imurung	17-55'	121-56'		[Data collected]																																				[Data collected]												
6	Bauan, Panablanca	17-50'	121-43'	10	[Data collected]																																				[Data collected]												
7	Tuao	17-45'	121-28'	35	[Data collected]																																				[Data collected]											PAGASA Central	
8	Tuguegarao	17-37'	121-44'	19	[Data collected]																																				[Data collected]											PAGASA	
9	Bagabba, Paneblanca	17-37'	121-47'	20	[Data collected]																																				[Data collected]												
10	Pinukpuk	17-35'	121-22'	120	[Data collected]																																				[Data collected]												
11	Salegseg, Balbalan	17-31'	121-06'	1,120	[Data collected]																																				[Data collected]												
12	Tomiangan, Tabuk	17-26'	121-26'	380	[Data collected]																																				[Data collected]												
13	Naneng, Tabuk	17-24'	121-14'	418	[Data collected]																																				[Data collected]											PAGASA Central	
14	Guiguila, Tanudan	17-18'	121-14'	500	[Data collected]																																				[Data collected]												
15	Tumauini	17-17'	121-49'	30	[Data collected]																																				[Data collected]											PAGASA FFWS	
16	Cabagan	17-26'	121-46'		[Data collected]																																				[Data collected]												
17	Lubugan	17-22'	121-07'		[Data collected]																																				[Data collected]												
18	Basao, Tinglayan	17-14'	121-07'	600	[Data collected]																																				[Data collected]												
19	Ilagan	17-09'	121-53'	47	[Data collected]																																				[Data collected]											Pagasa Central	
20	Banga-An	17-07'	120-54'	1,600	[Data collected]																																				[Data collected]												
21	Bontoc	17-05'	120-58'	855	[Data collected]																																				[Data collected]												
22	Barlig	17-03'	121-06'	1,500	[Data collected]																																				[Data collected]												
23	Bauko	16-59'	120-52'	1,200	[Data collected]																																				[Data collected]												
24	Reina Mercedes	16-59'	121-50'	34	[Data collected]																																				[Data collected]												
25	Mt. Polis, Banague	16-58'	121-02'	1,900	[Data collected]																																				[Data collected]												
26	Mt. Data, Benguet	16-51'	120-52'	1,500	[Data collected]																																				[Data collected]												
27	Namulditan, Lagawe	16-51'	121-05'	900	[Data collected]																																				[Data collected]												
28	Lagawe	16-48'	121-04'	480	[Data collected]																																				[Data collected]												
29	Nayon, Lamut	16-43'	121-10'	320	[Data collected]																																				[Data collected]												
30	Echague	16-42'	121-40'	66	[Data collected]																																				[Data collected]												
31	Diadi	16-40'	121-22'	168	[Data collected]																																				[Data collected]												
32	Solano	16-31'	121-11'	255	[Data collected]																																				[Data collected]												
33	Bayombong	16-29'	121-09'	278	[Data collected]																																				[Data collected]												
34	Barat, Bambang	16-23'	121-06'	610	[Data collected]																																				[Data collected]												
35	Dupax	16-17'	121-05'	390	[Data collected]																																				[Data collected]												
36	Malica	16-11'	120-51'	1,250	[Data collected]																																				[Data collected]												
37	Imugan, Santa Fe	16-10'	120-55'	800	[Data collected]																																				[Data collected]												
38	Consuelo, Santa Fe	16-10'	120-57'	506	[Data collected]																																				[Data collected]											NIA	
39	Gabong	16-01'	121-21'		[Data collected]																																				[Data collected]												
40	Dakgan	16-05'	121-30'		[Data collected]																																				[Data collected]												
41	Casiguran	16-17'	122-07'	3	[Data collected]																																				[Data collected]												
42	Taan				[Data collected]																																				[Data collected]												
43	Upper Casecan				[Data collected]																																				[Data collected]												







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**Figure 5.2.5**  
**Isohyetal Map in the Cagayan River Basin**



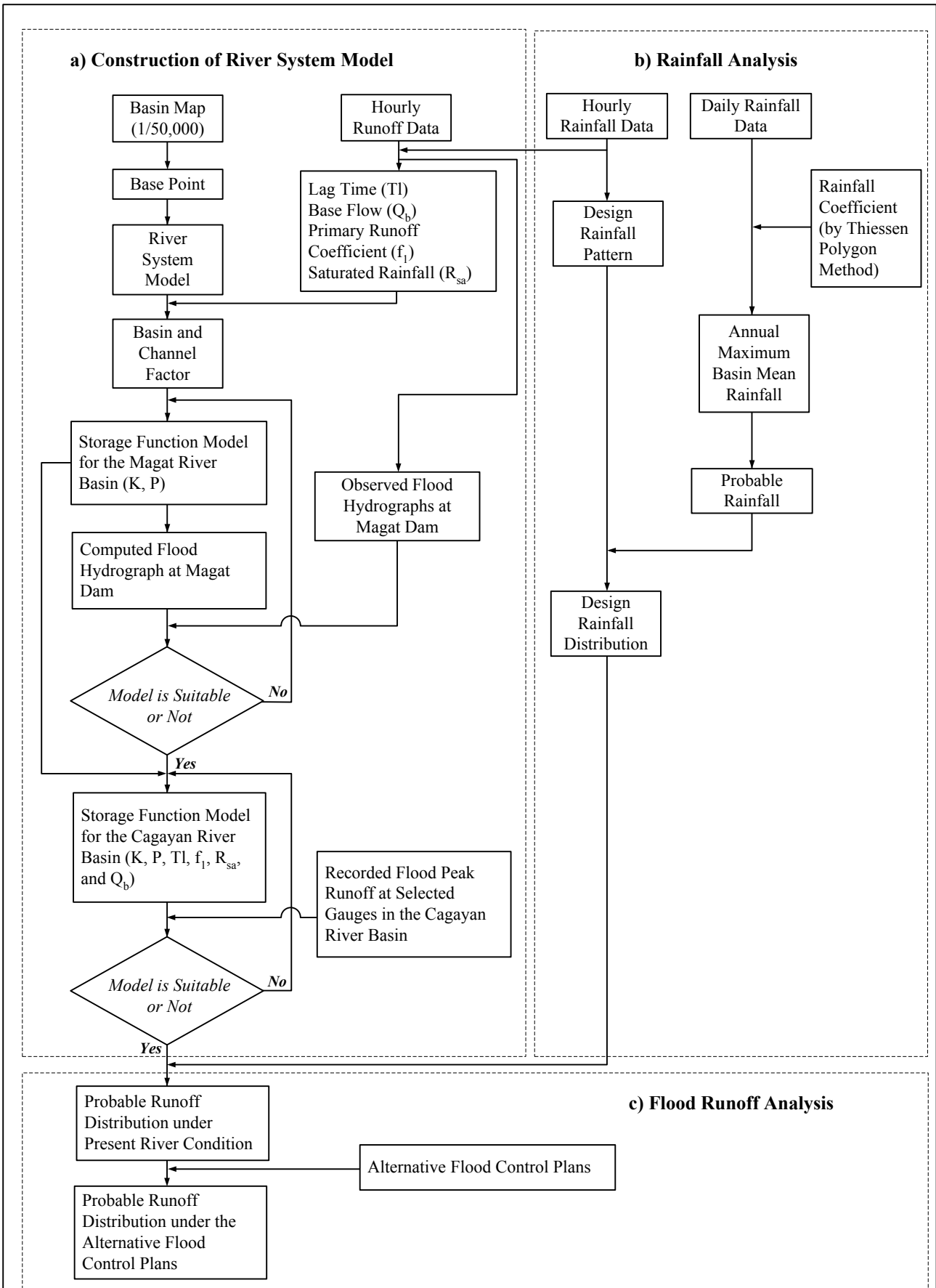


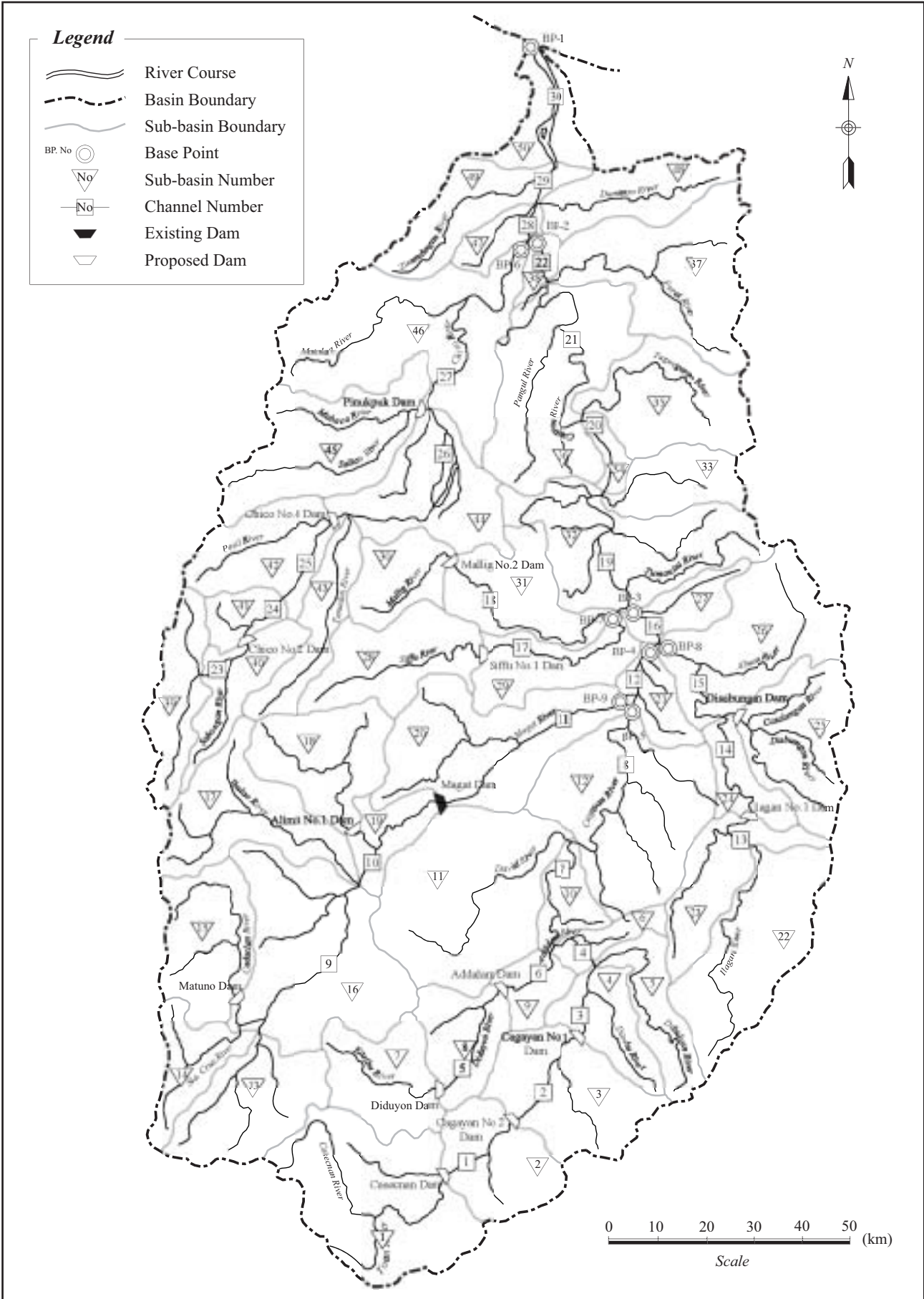
□ Sediment  
 ■ Water Quality

No.	Station	River	Location		Data Collected During Master Plan Study												Additional Data Collected											
			Latitude	Longitude																								
1	Calaogan, Dacquel	Dummon	18-03-00	121-43-00																								
2	Asassi, Baggao	Paret	17-55-00	121-47-00																								
3	Escolta, Rizal	Matalag	17-50-00	121-25-00																								
4	Larion Alto, Tuguegarao	Tuguegarao	17-38-00	121-46-00																								
5	Liglig Gawaan, Balbalan	Saltan	17-31-00	121-12-00																								
6	Pasonglao, Tabuk	Chico	17-24-00	121-25-00																								
7	Antagan, Tumauni	Tumauni	17-17-00	121-56-00																								
8	Casile, Mallig	Casile	17-13-00	121-36-00																								
9	Munoz, Roxas	Siffo	17-09-00	121-34-00																								
10	Malalam (Alinguigan)	Ilagan	17-08-00	121-54-00																								
11	Palattoo, Naguilian	Cagayan	17-01-00	121-50-00																								
12	Minanga, Sn Mariano	Ilagan	17-00-00	122-01-00																								
13	Oscariz, Sn Mateo	Magat	16-47-00	121-30-00																								
14	Magat Damsite	Magat																										
15	Dulao, Lagawe	Alimit	16-44-00	121-20-00																								
16	Cabulay, Santiago	Diadi	16-44-00	121-29-00																								
17	Lamut	Lamut																										
18	Hapid, Lamut (Tupaya)	Ibulao	16-43-00	121-15-00																								
19	Kamandag, Kiangnan	Cadaclan	16-36-00	121-03-00																								
20	Guinalvin, Aglipay	Addalam	16-29-00	121-39-00																								
21	Bante, Bambang	Matuno	16-27-00	121-04-00																								
22	Minuri, Jones	Dibuluan																										
23	Dabubu, Pequino	Dabubu	16-27-00	121-47-00																								
24	Bato, Bayombong	Magat	16-26-00	121-07-00																								
25	Dippadiw, Madella	Cagayan	16-23-00	121-44-00																								
26	Pingkian, Kavapa	Sta. Cruz	16-19-00	120-57-00																								
27	Bangag	Cagayan	18-07-00	121-41-00																								
28	Baybavog	Paret	17-54-00	121-41-00																								
29	Rosario	Rosario	16-39-00	121-18-00																								
30	Tunggod	Burnay	16-48-00	121-07-00																								
31	Careb	Lanog	16-34-00	121-12-00																								
32	Baliling	Sta. Fe	16-14-00	120-58-00																								
33	Beti	Marang	16-15-00	121-03-00																								
34	Ilut	Ilut	16-40-00	121-26-00																								
35	Aurora East	Ganano																										
36	Gamis	Dumatata	16-40-00	121-32-00																								
37	Jones	Cagayan	16-33-00	121-42-00																								
38	Madella, Quirino	Tabavong																										
39	Conwap	Cagayan																										
40	Gabong	Casecnan																										
41	Dakgan	Casecnan																										
42	Bagabag	Magat																										

Figure 5.2.7

List of Sediment and Water Quality Record



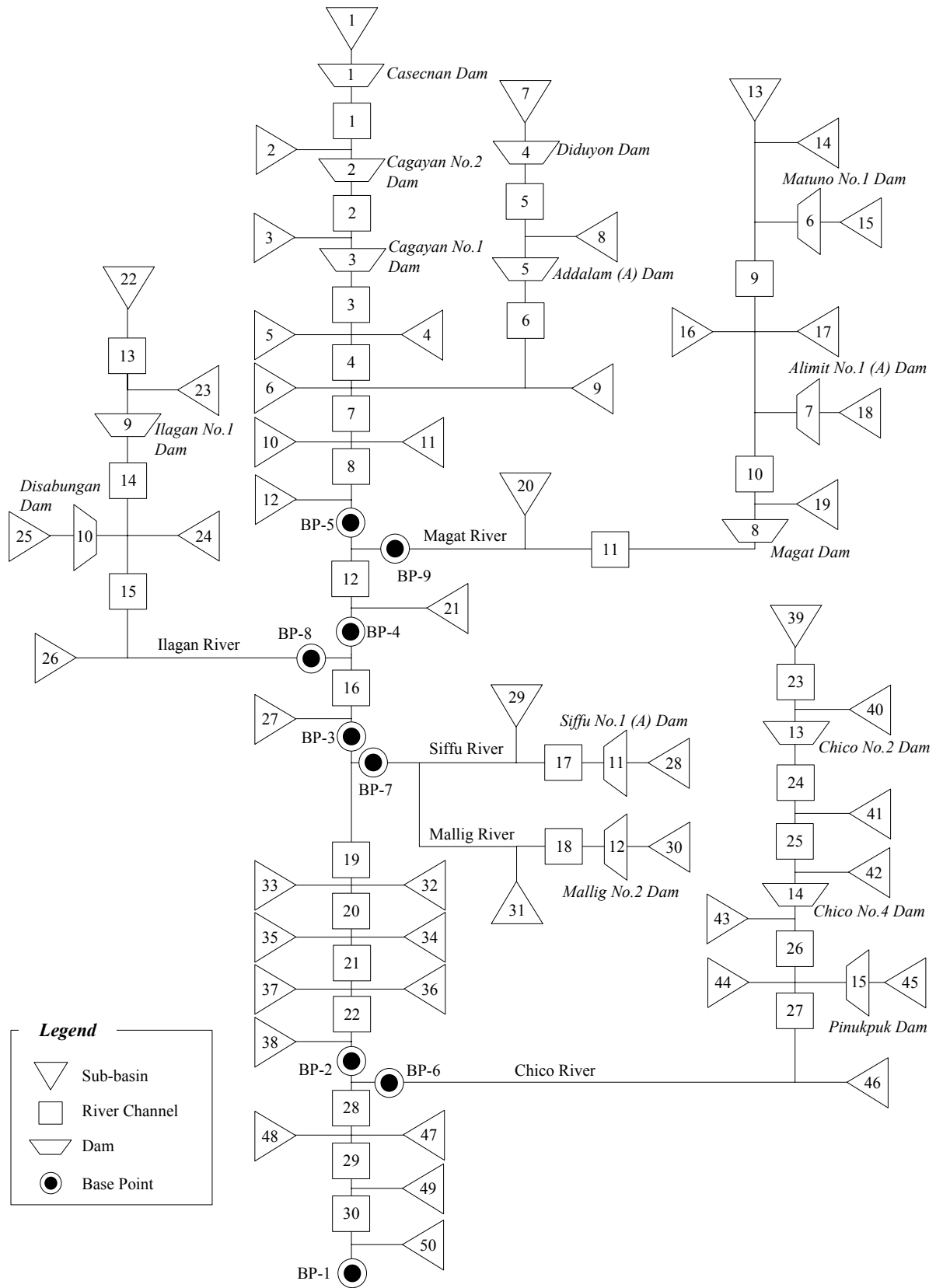


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**Figure 5.3.2**

**Basin Division in the Cagayan River System**



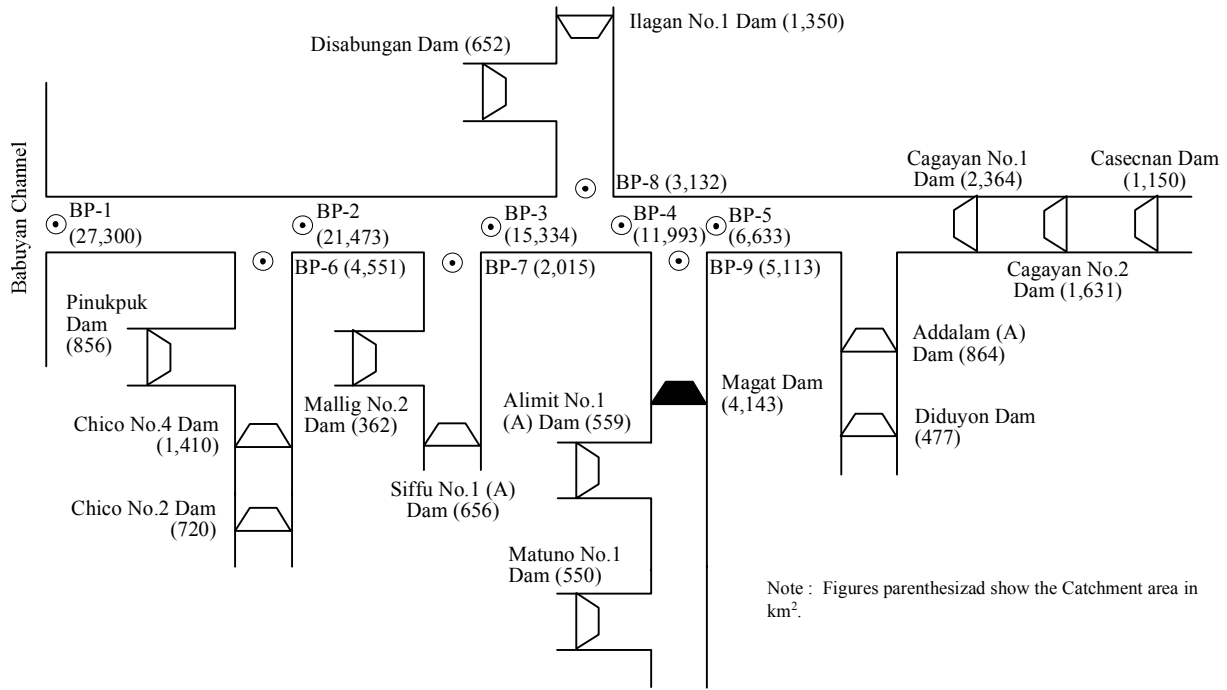
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**Figure 5.3.3**

**Cagayan River System Model for Flood  
Runoff Analysis**



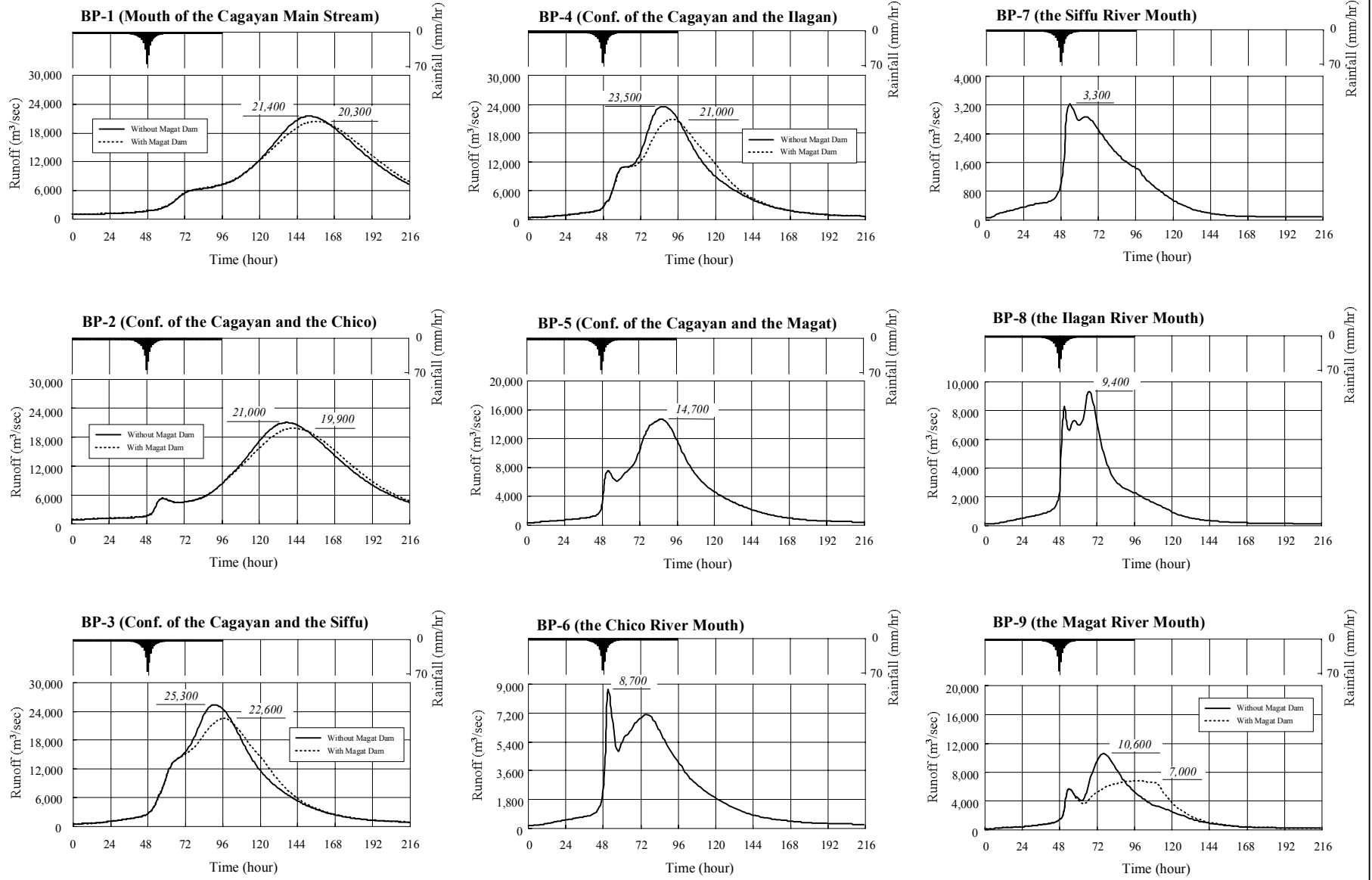


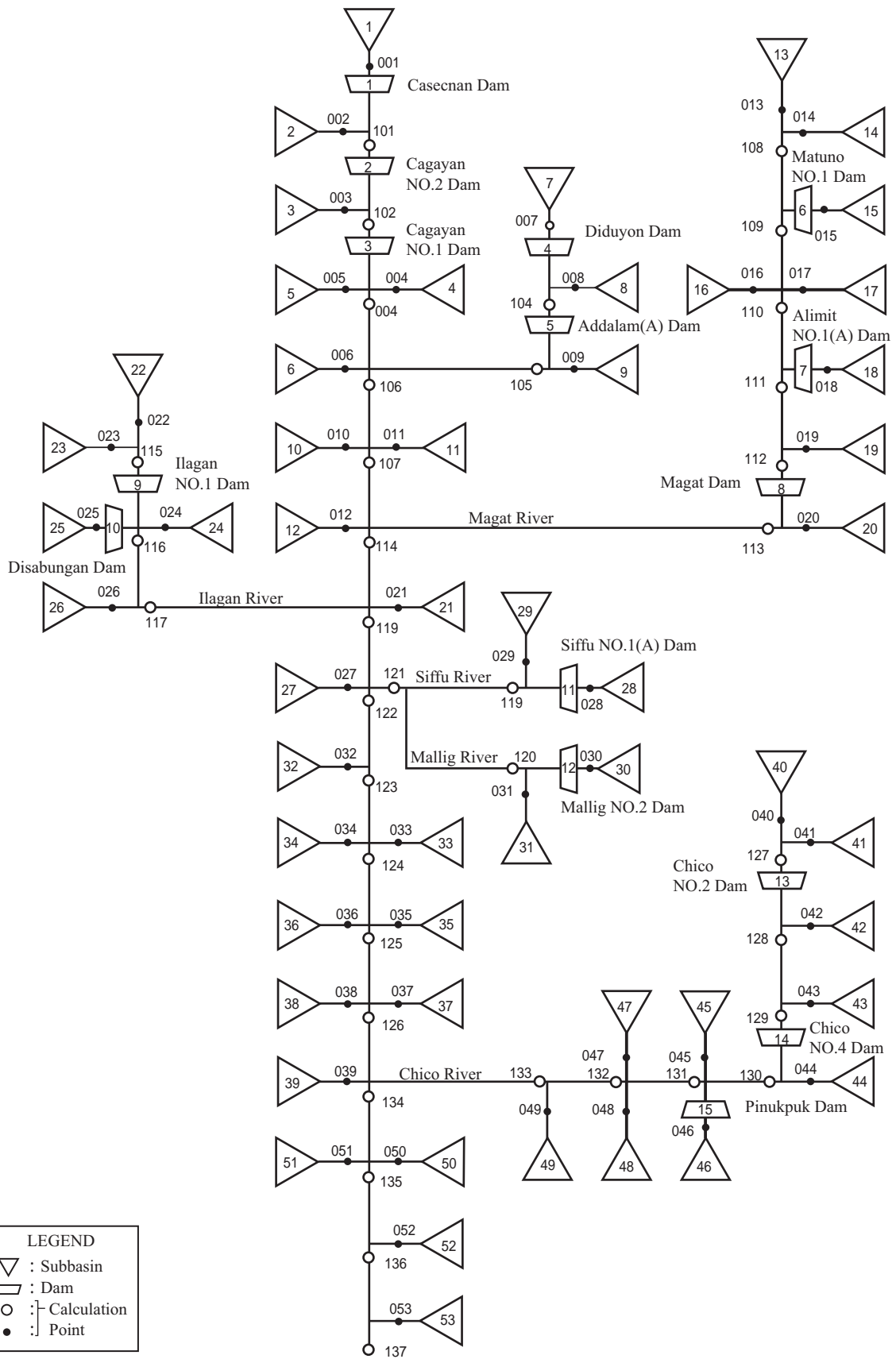
Unit : m<sup>3</sup>/sec

Base Point	1/2	1/5	1/10	1/25	1/50	1/100	1/200	1/1,000	1/10,000	
Probable Flood Peak ( 1-day)	Casecnan	3,600	5,800	7,500	9,700	14,500	20,700	26,000	42,000	72,800
	Cagayan No.2	3,800	5,800	7,300	9,200	13,500	19,400	24,000	38,000	65,900
	Cagayan No.1	2,500	4,500	6,200	8,500	12,500	17,200	22,000	34,000	59,400
	Diduyon	1,300	2,000	2,600	3,700	5,200	7,500	9,500	14,500	25,000
	Addalam (A)	600	1,300	1,900	2,900	4,200	5,650	7,500	13,000	24,550
	Matuno No.1	750	1,050	1,300	1,550	1,800	2,050	2,300	3,000	4,150
	Alimit No.1 (A)	450	700	850	1,100	1,350	1,650	2,000	3,200	5,750
	Magat	-	-	-	-	-	-	-	-	-
	Ilagan No.1	1,750	3,200	4,300	6,350	7,600	8,950	11,500	17,000	28,050
	Disabungan	1,050	1,900	2,700	3,800	5,400	7,600	9,200	14,000	24,750
	Siffu No.1 (A)	400	700	950	1,300	1,600	1,950	2,500	4,000	7,100
	Mallig No.2	300	400	600	800	950	1,100	1,400	2,200	3,950
	Chico No.2	850	1,350	1,750	2,300	2,850	3,550	4,000	5,300	9,250
Chico No.4	800	1,450	2,000	2,750	3,600	4,500	5,400	7,800	12,250	
Pinukpuk	700	1,200	1,600	2,200	2,700	3,150	4,000	6,300	10,700	
Without Magat Dam	Base Point No.1	6,200	9,900	12,000	15,700	18,100	21,400			
	Base Point No.2	5,800	9,400	11,500	15,300	17,700	21,000			
	Base Point No.3	6,100	10,300	12,900	17,700	20,900	25,300			
	Base Point No.4	5,400	9,300	11,600	16,200	19,300	23,500			
	Base Point No.5	3,300	5,900	7,200	10,100	12,500	14,700			
	Base Point No.6	2,000	3,000	3,800	5,200	7,500	8,700			
	Base Point No.7	1,200	1,600	2,000	2,700	3,000	3,300			
	Base Point No.8	2,000	3,400	4,700	6,700	7,600	9,400			
	Base Point No.9	2,700	4,500	6,000	7,200	9,500	10,600			
With Magat Dam	Base Point No.1	6,200	9,700	11,600	15,000	17,300	20,300			
	Base Point No.2	5,700	9,300	11,200	14,600	16,900	19,900			
	Base Point No.3	6,100	9,800	12,000	16,100	19,000	22,600			
	Base Point No.4	5,400	9,000	10,900	14,700	17,600	21,000			
	Base Point No.5	3,300	5,900	7,200	10,100	12,500	14,700			
	Base Point No.6	2,000	3,000	3,800	5,200	7,500	8,700			
	Base Point No.7	1,200	1,600	2,000	2,700	3,000	3,300			
	Base Point No.8	2,000	3,400	4,700	6,700	7,600	9,400			
	Base Point No.9	2,500	3,500	4,300	5,000	6,300	7,000			

**Figure 5.3.4**

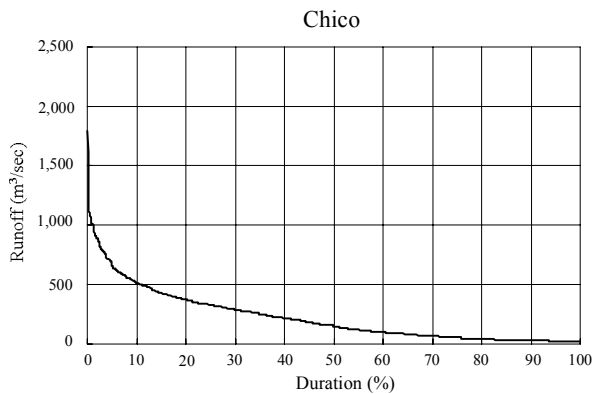
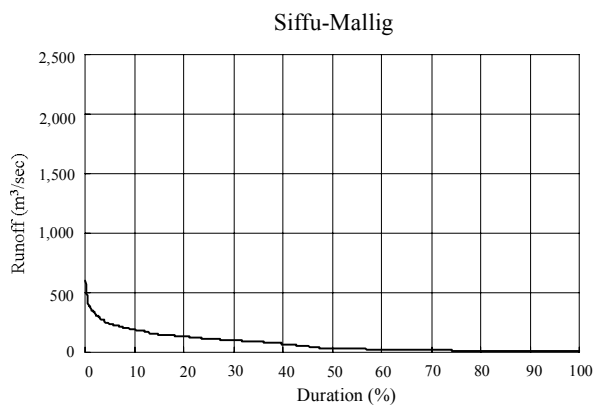
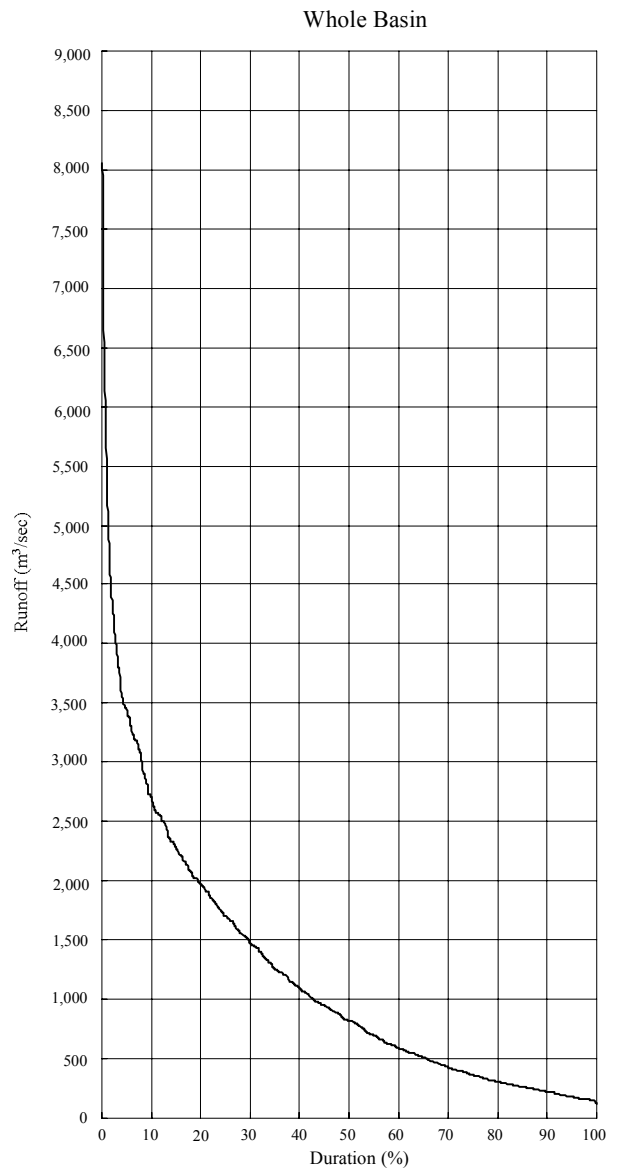
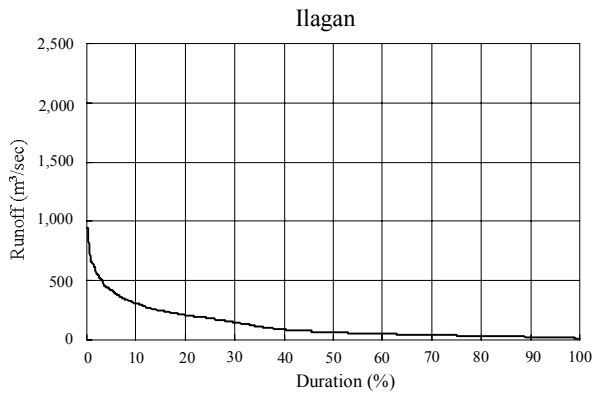
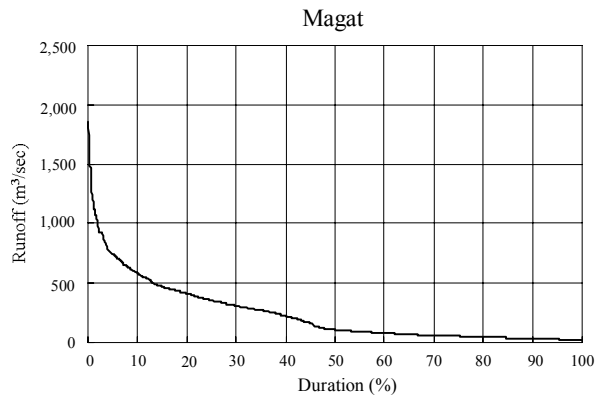
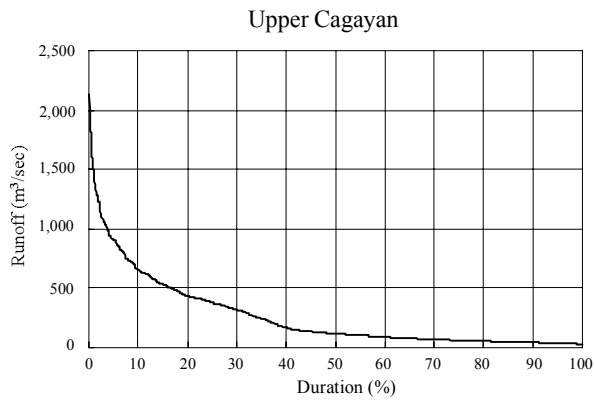
**Probability Distribution of Flood Peak Runoff by Return Period at Base Points**





**Figure 5.4.1**

**River System Model for Streamflow Analysis**

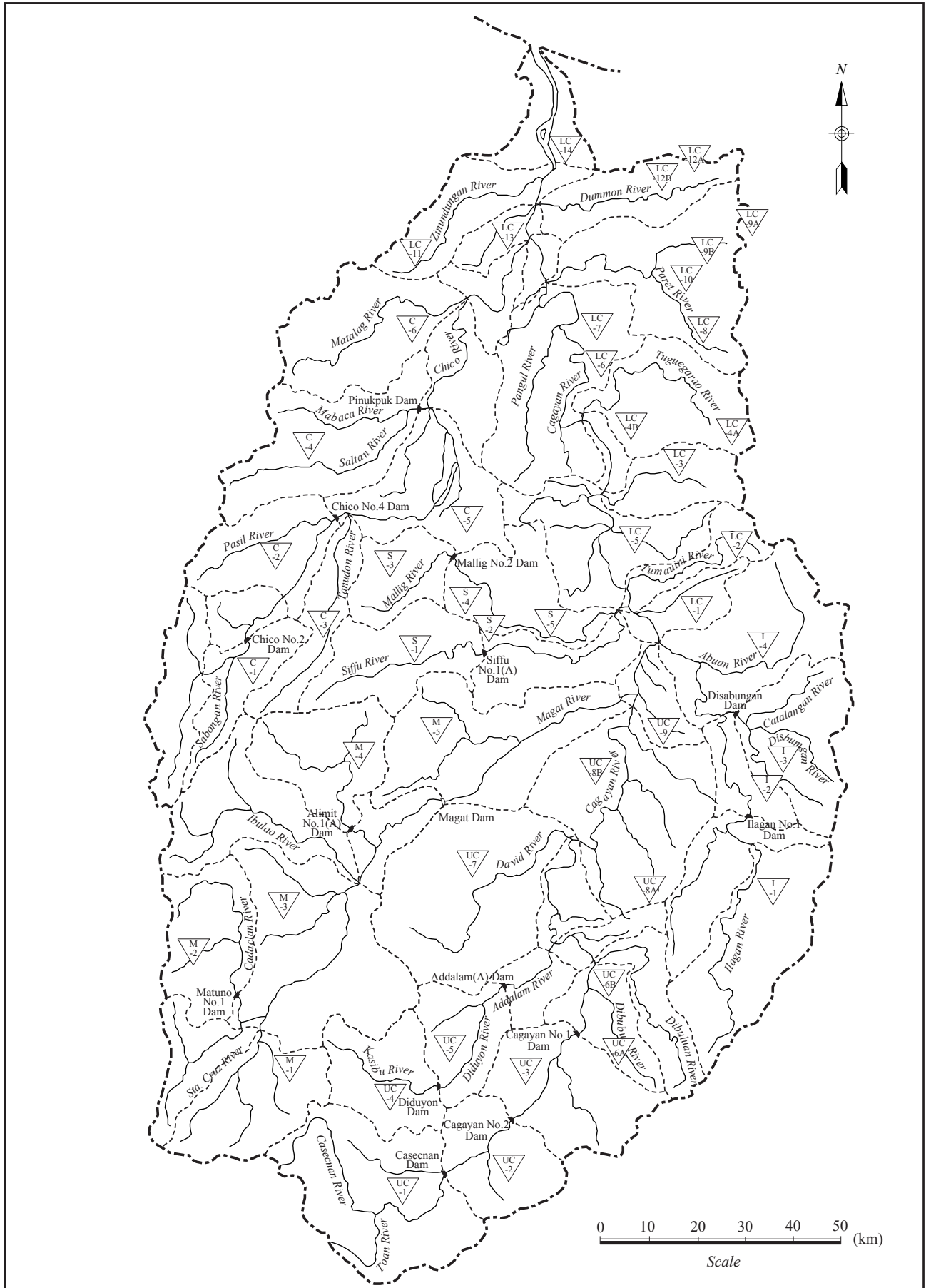


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**Figure 5.4.2**

**Duration Curve of Estimated 10-day Runoff  
(1963-1998)**

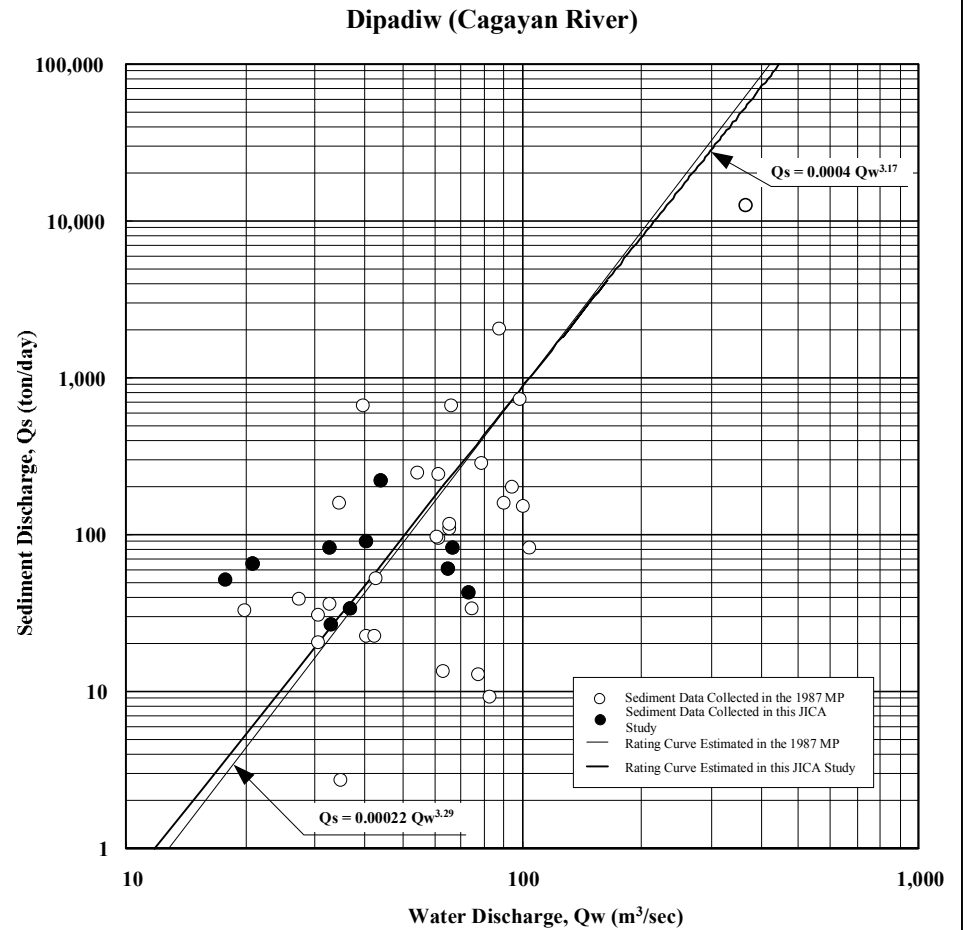
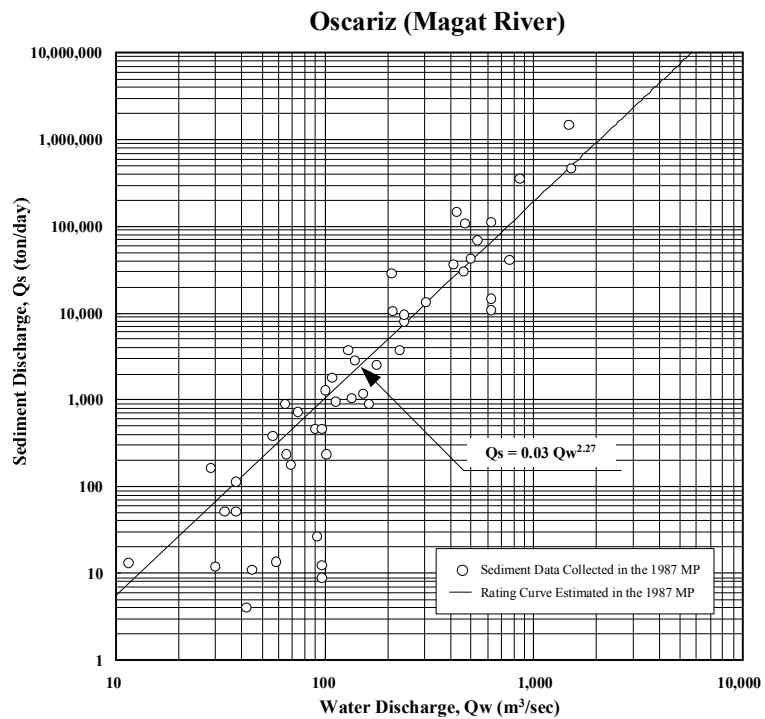
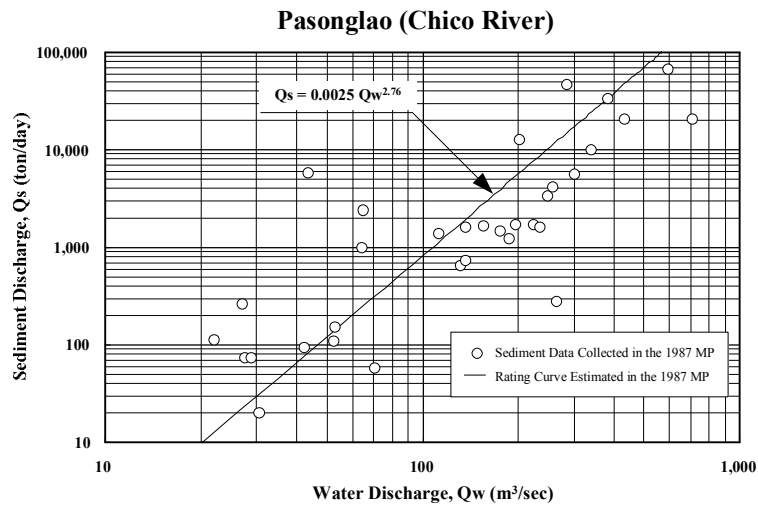


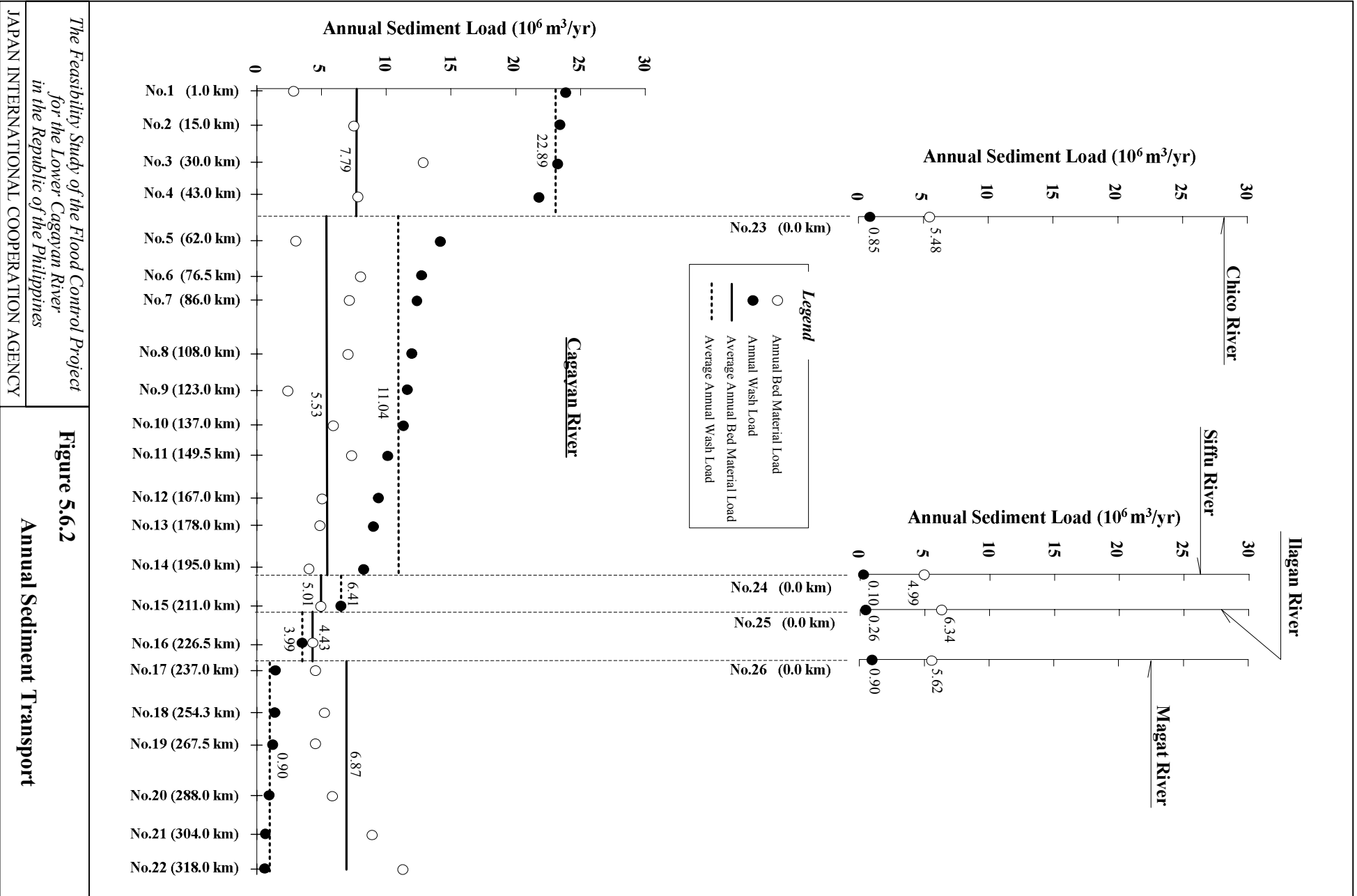
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**Figure 5.5.1**

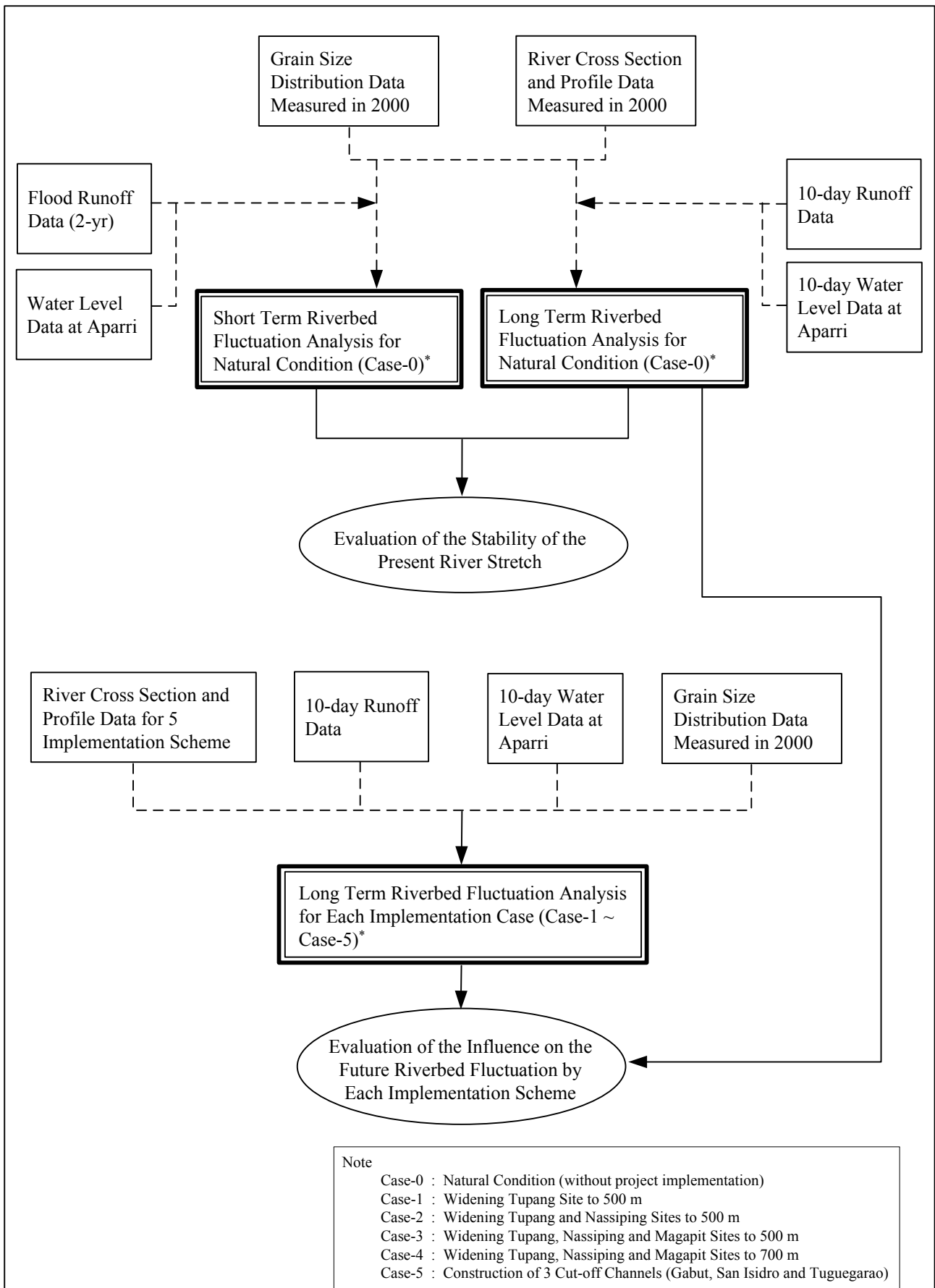
**Divided Subbasins for Water Balance Study**



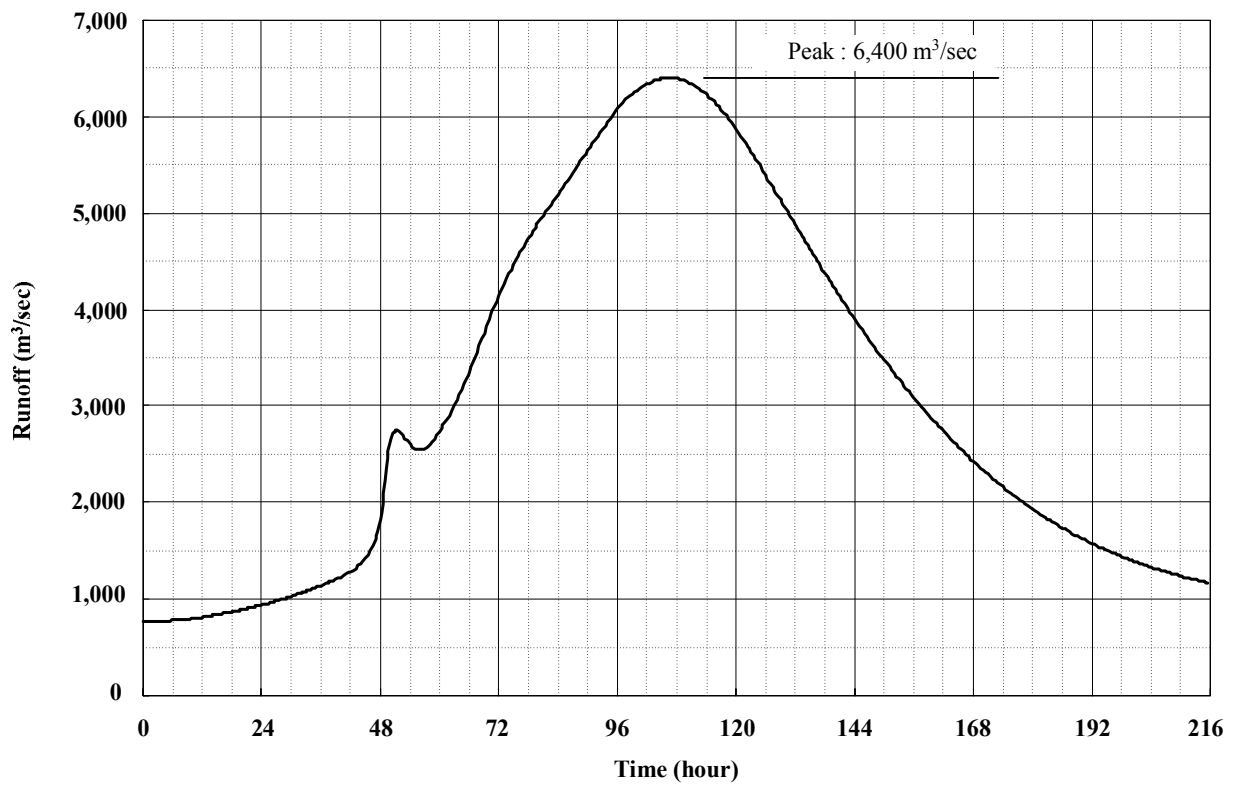


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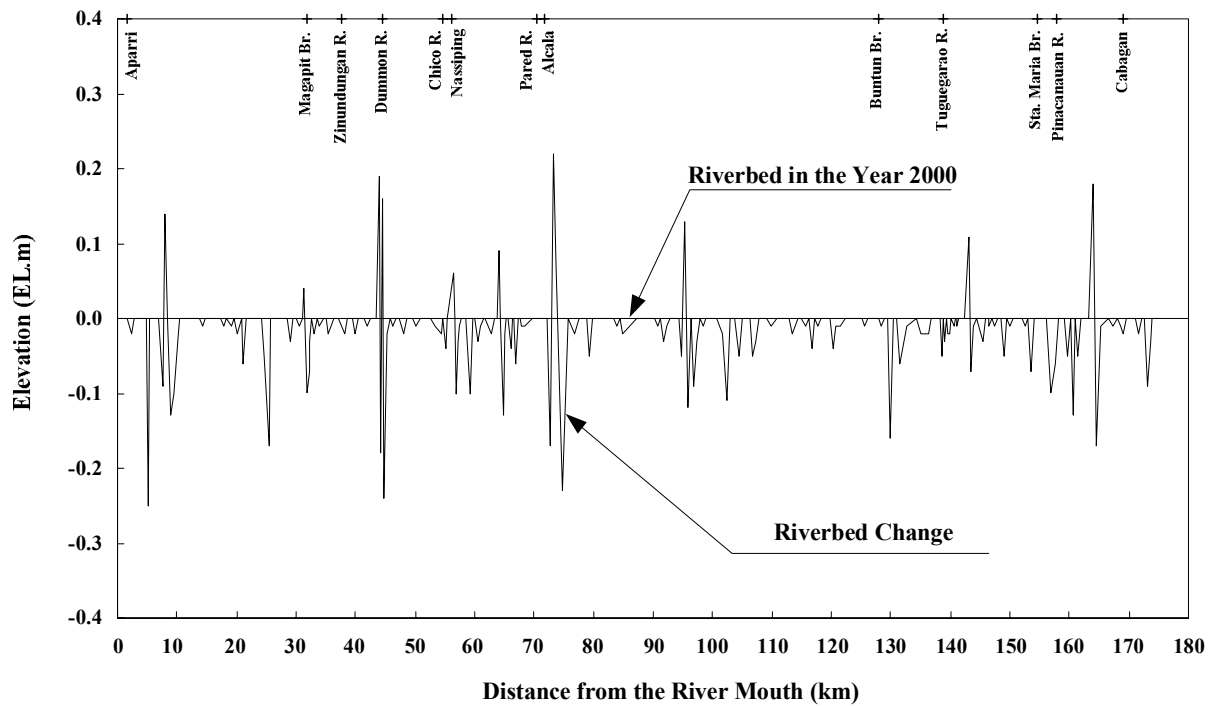
**Figure 5.6.2**  
**Annual Sediment Transport**



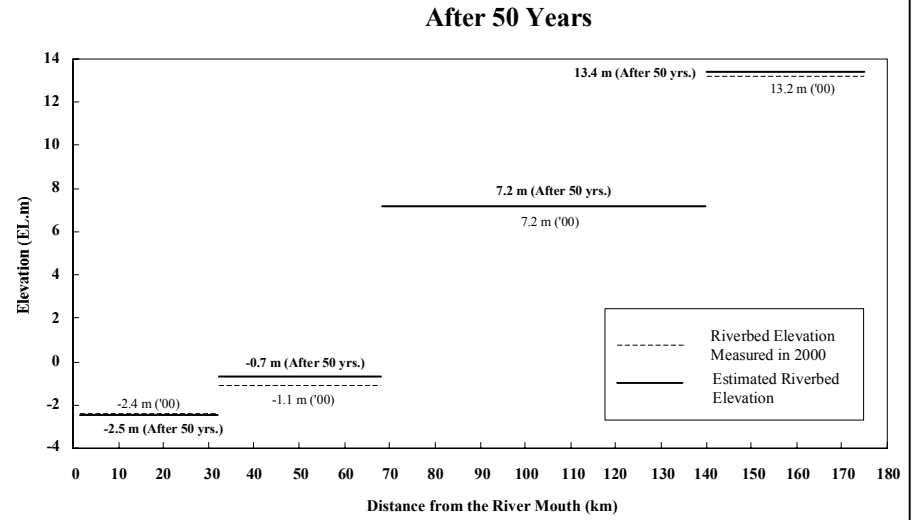
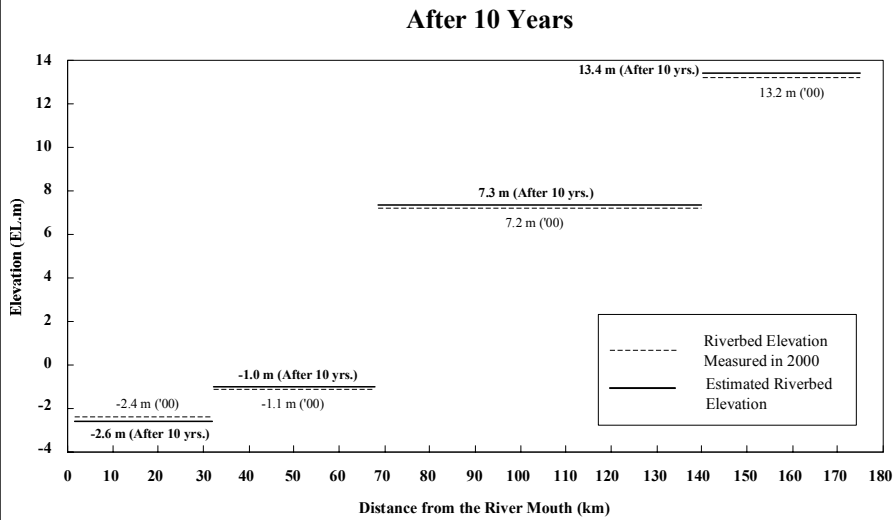
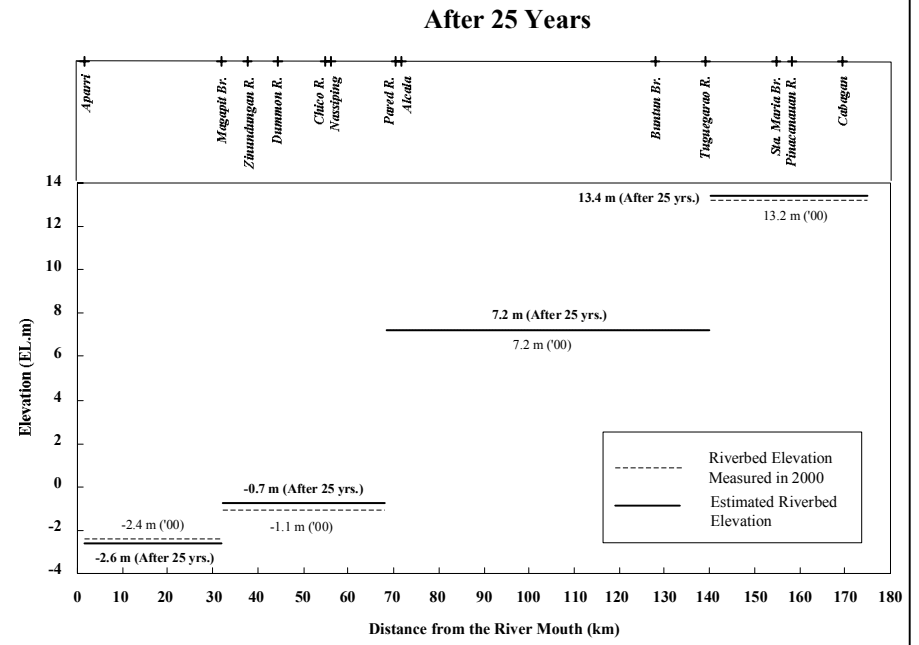
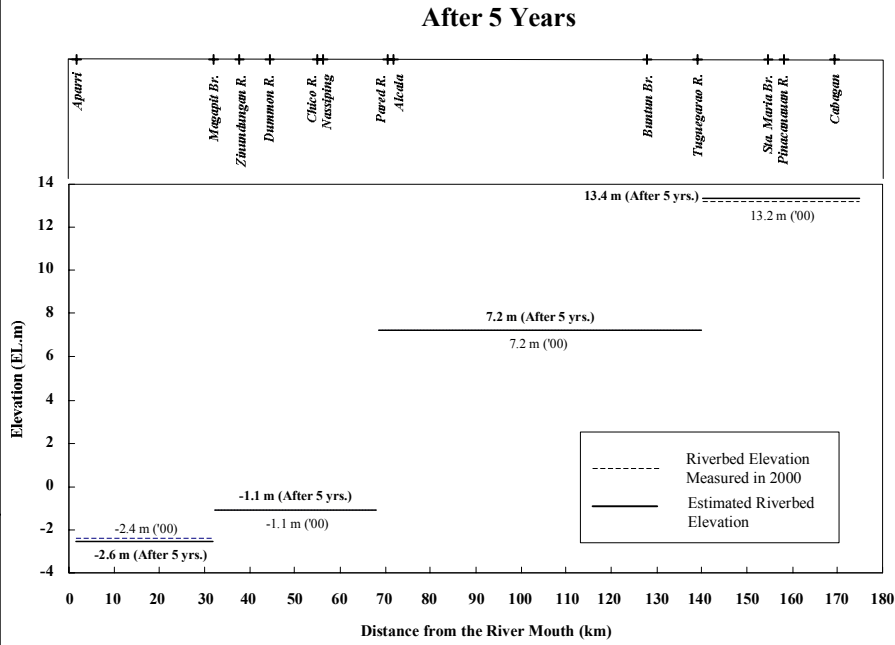


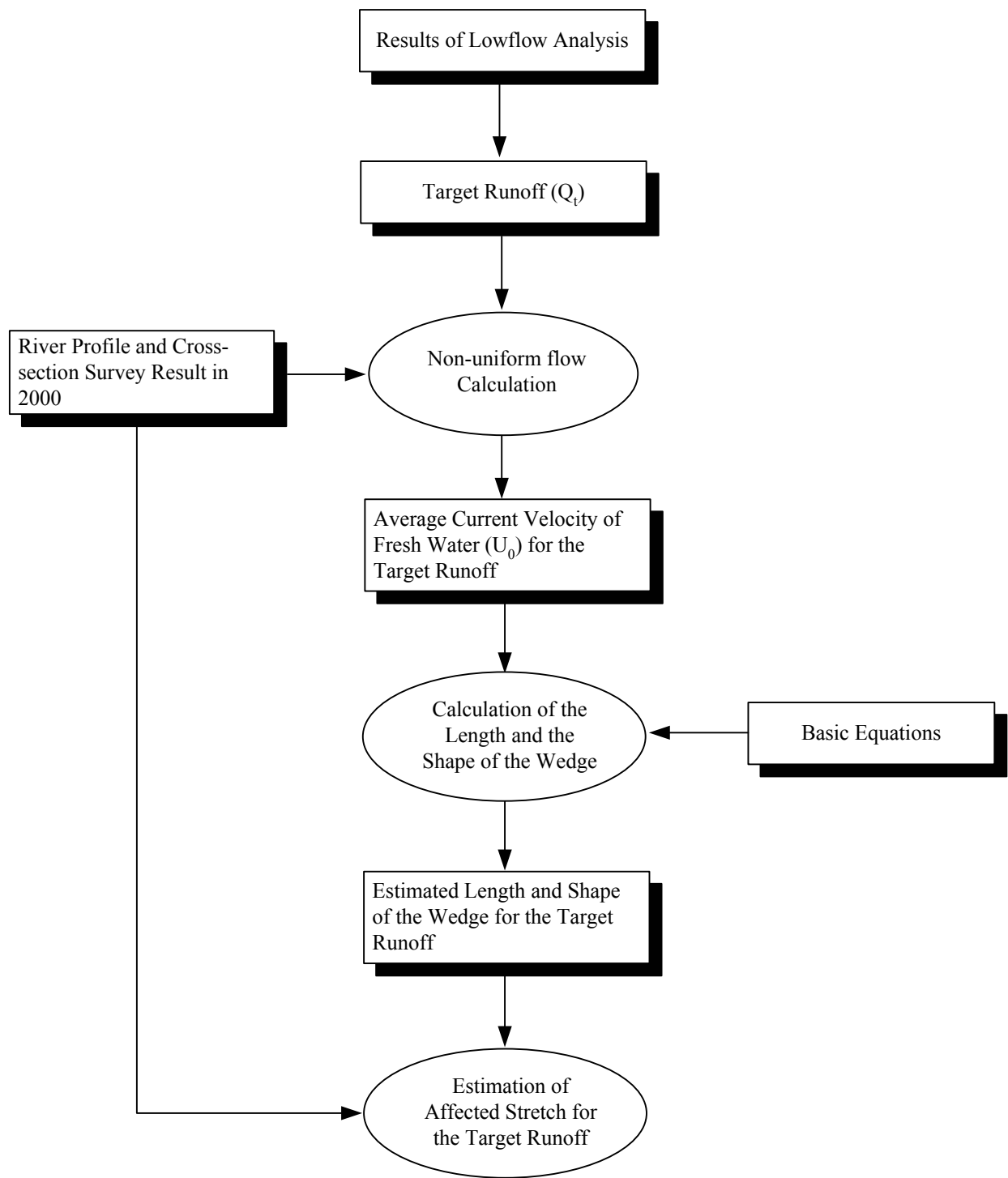


(1) Flood Hydrograph for Objective Stretch (2 yr Probable Flood)



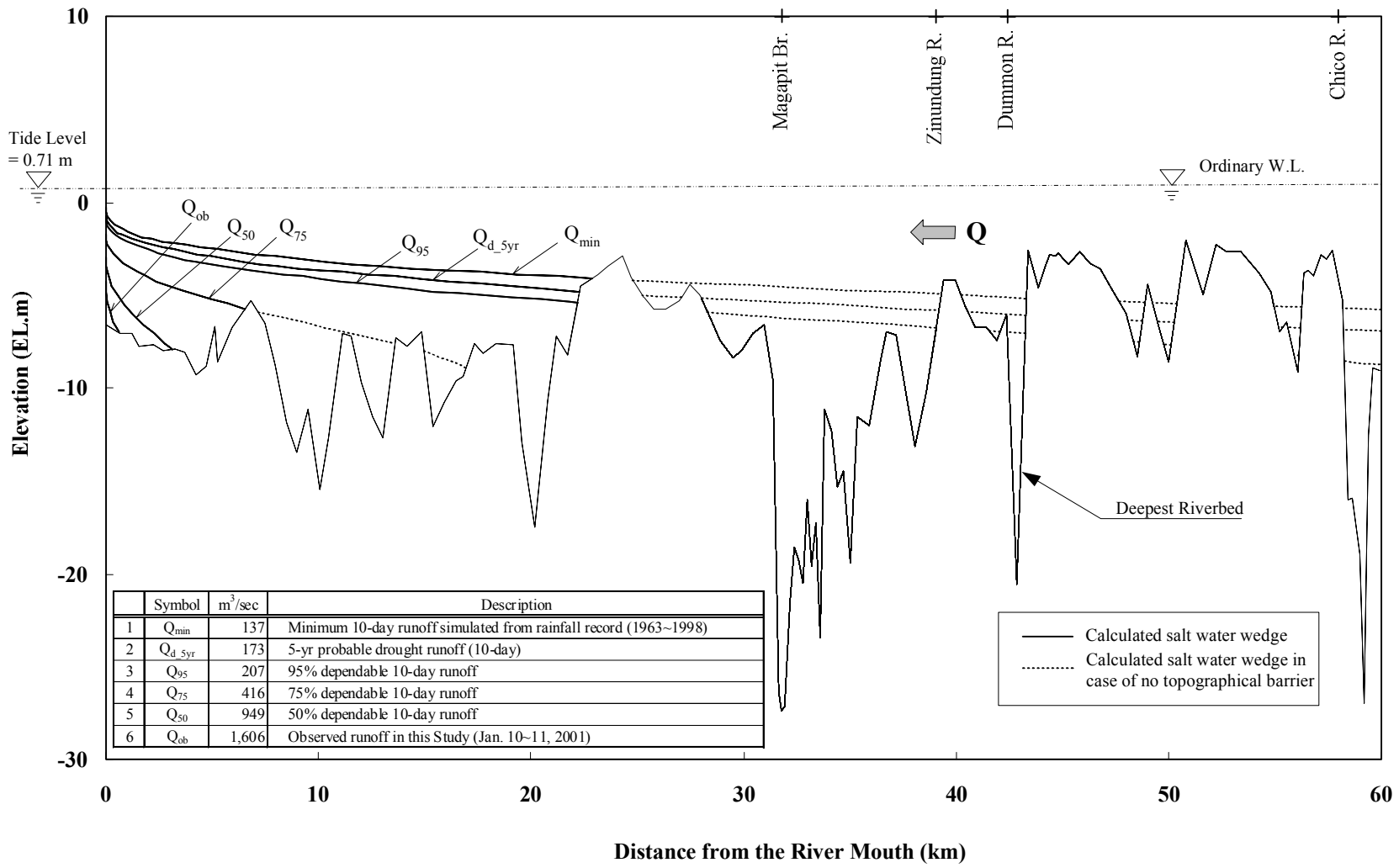
(2) Riverbed Change

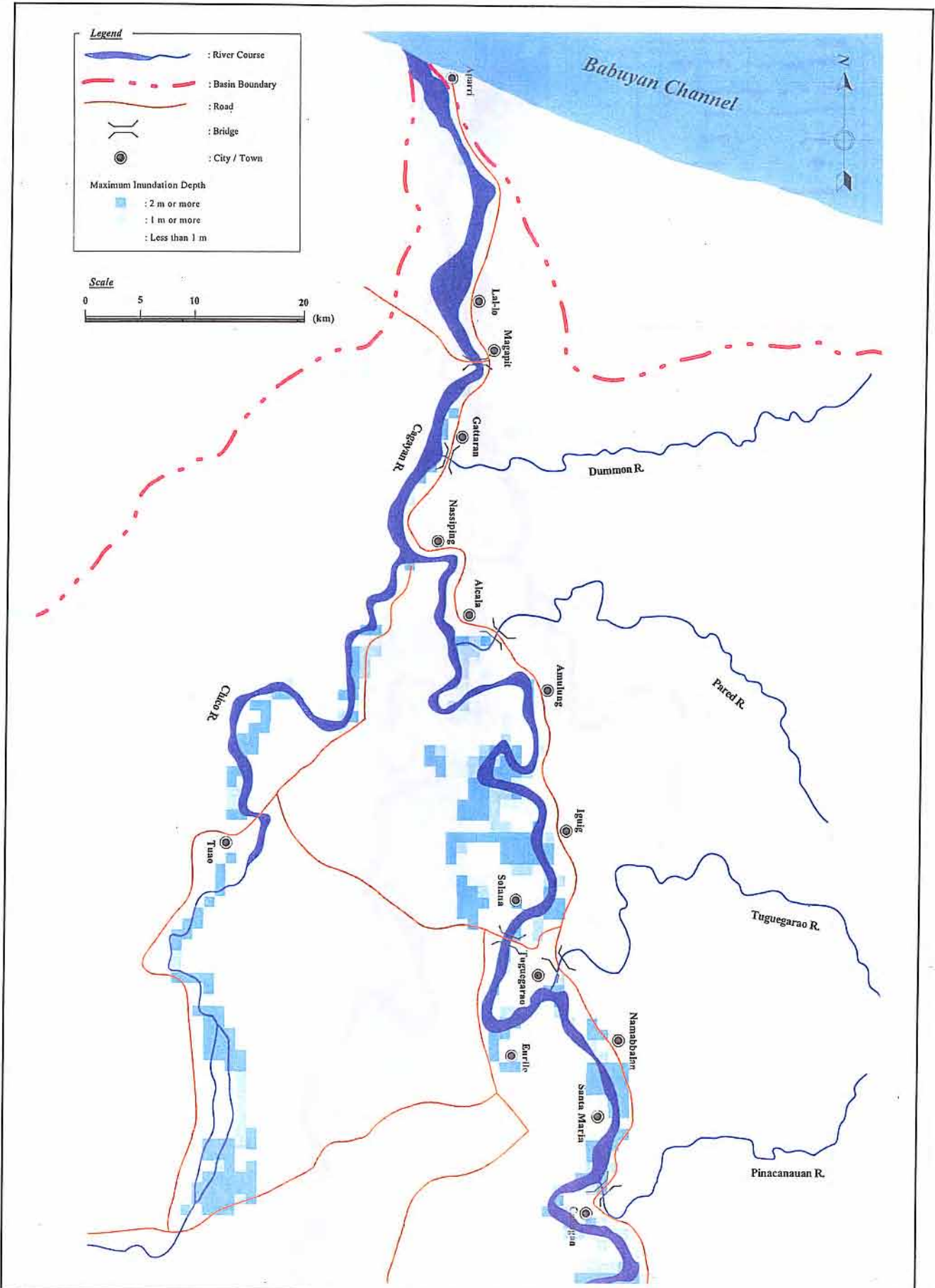




**Figure 5.8.1**

**General Flowchart of Saline Water  
Intrusion Analysis**

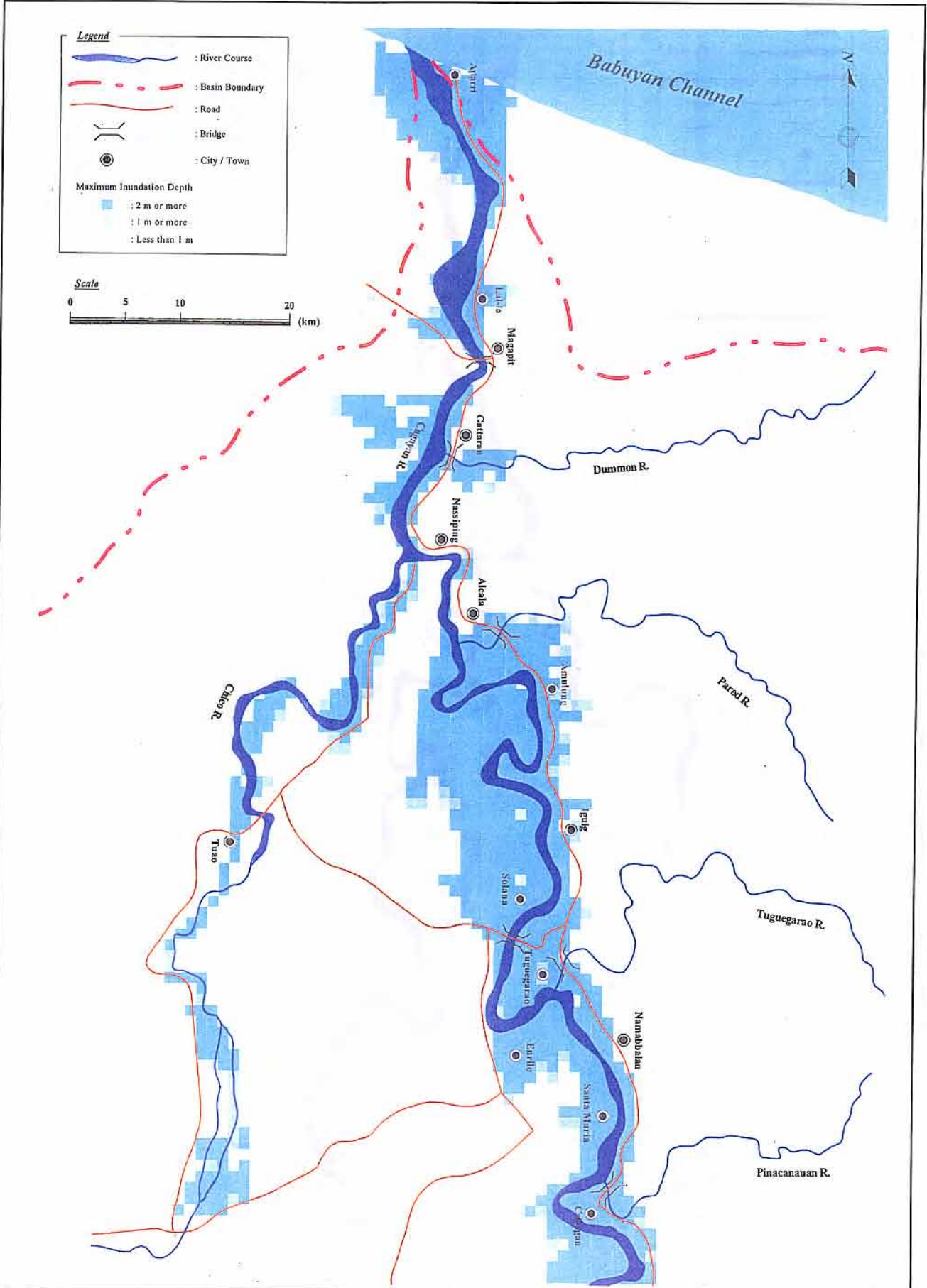




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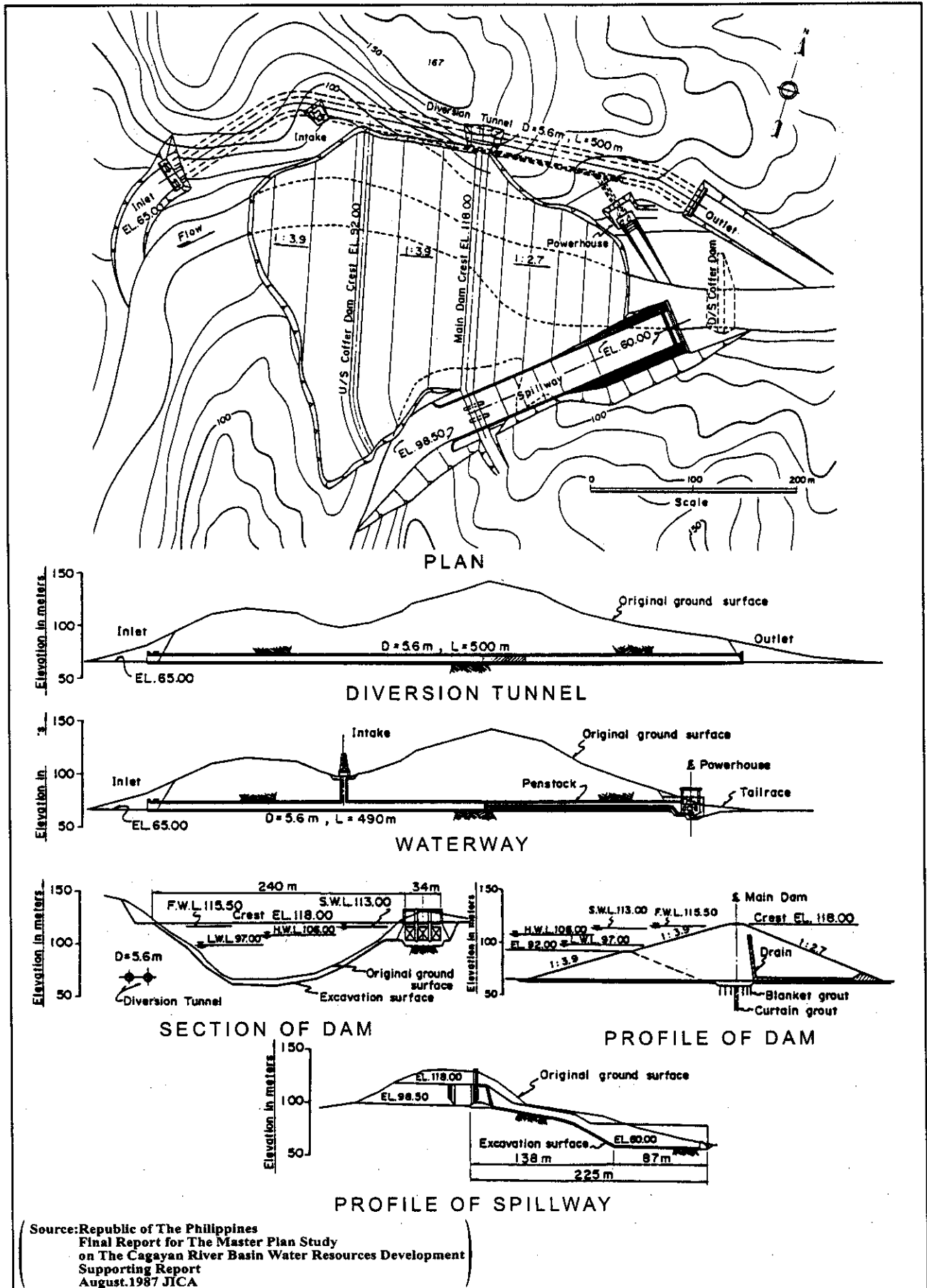
**Figure 5.9.1**  
**Simulated Maximum Inundation Depth**  
**(2-yr Probable Flood)**



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**Figure 5.9.2**  
**Simulated Maximum Inundation Depth**  
**(100-yr Probable Flood)**

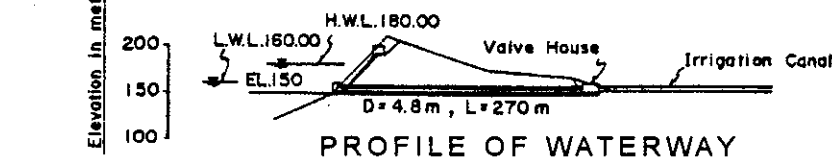
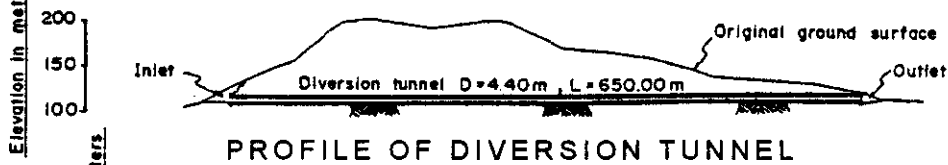
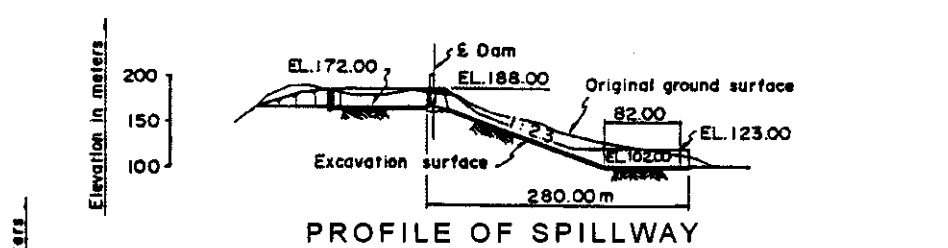
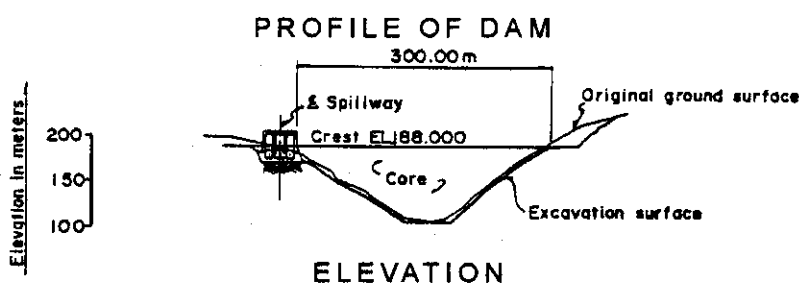
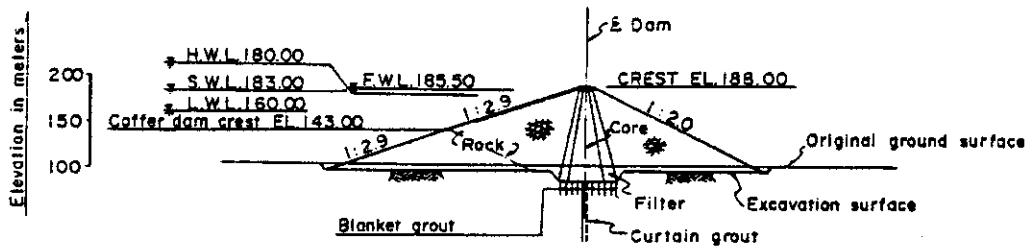
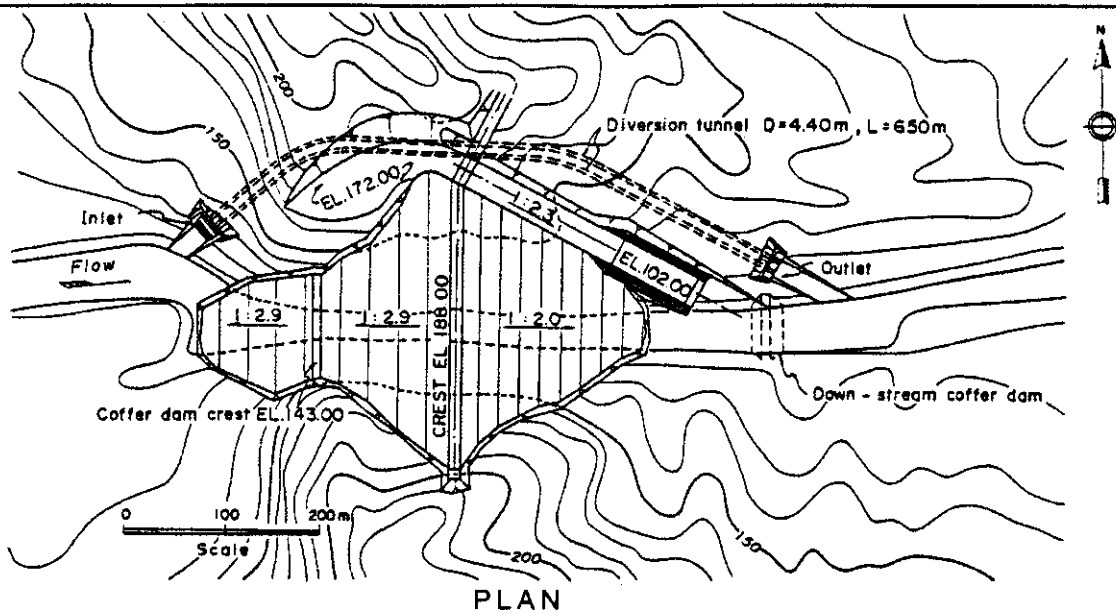


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Figure 6.1.1

Layout plan of Siffu No.1 Dam

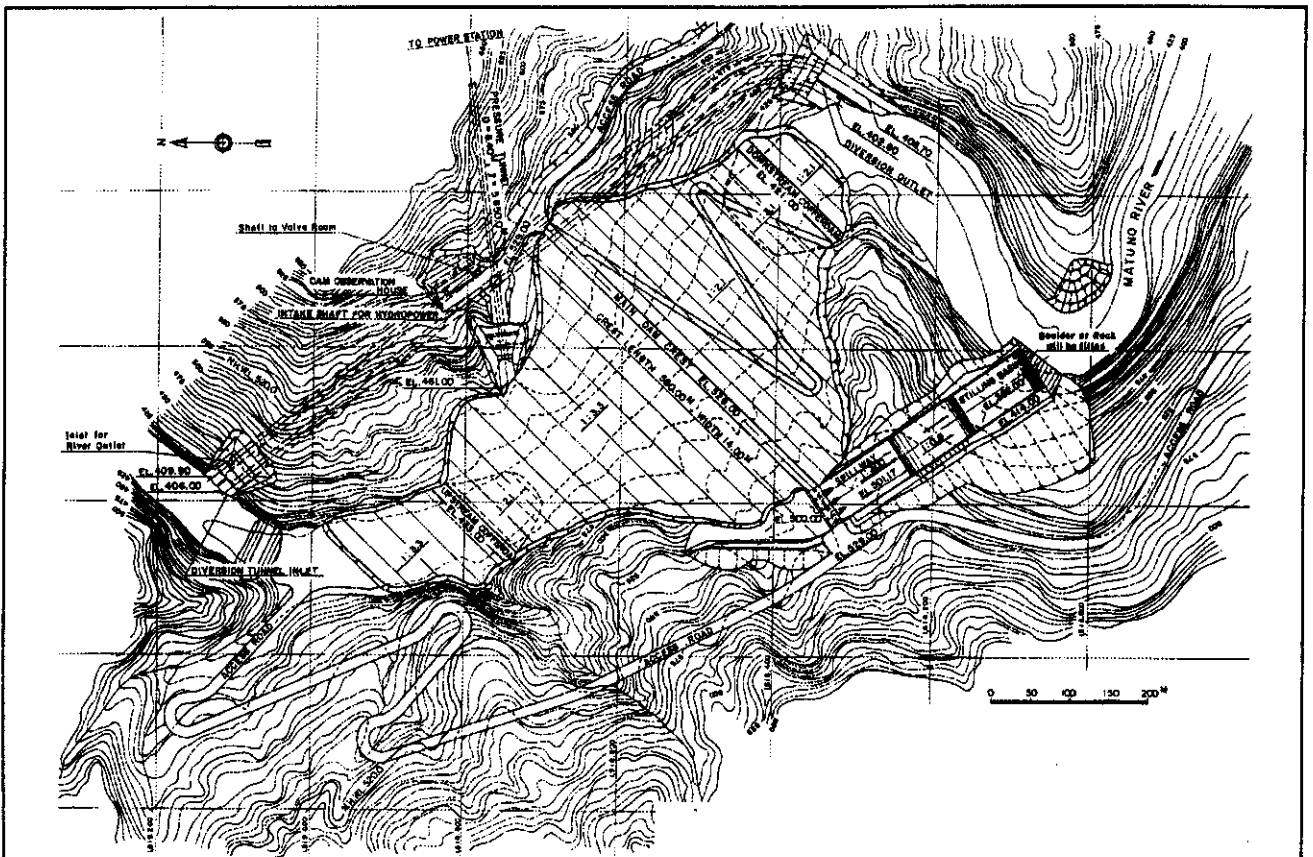


Source: Republic of The Philippines  
 Final Report for The Master Plan Study  
 on The Cagayan River Basin Water Resources Development  
 Supporting Report  
 August 1987 JICA

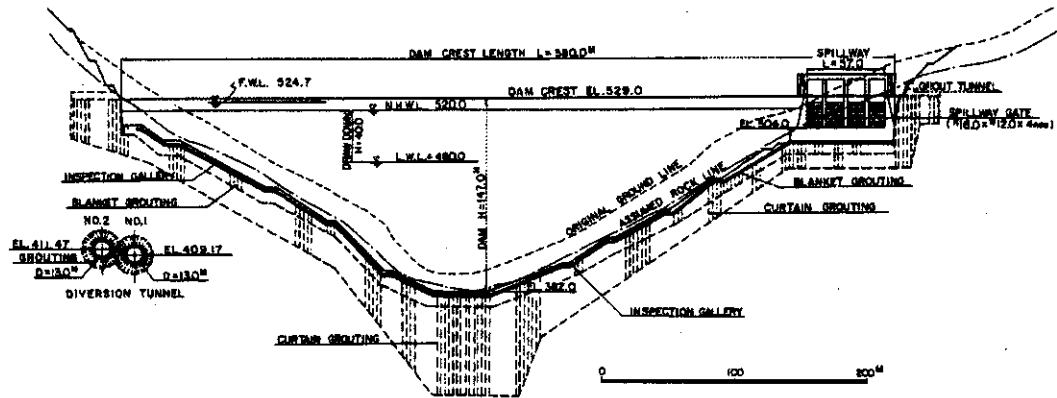
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Figure 6.1.2  
 Layout plan of Mallig No.2 Dam

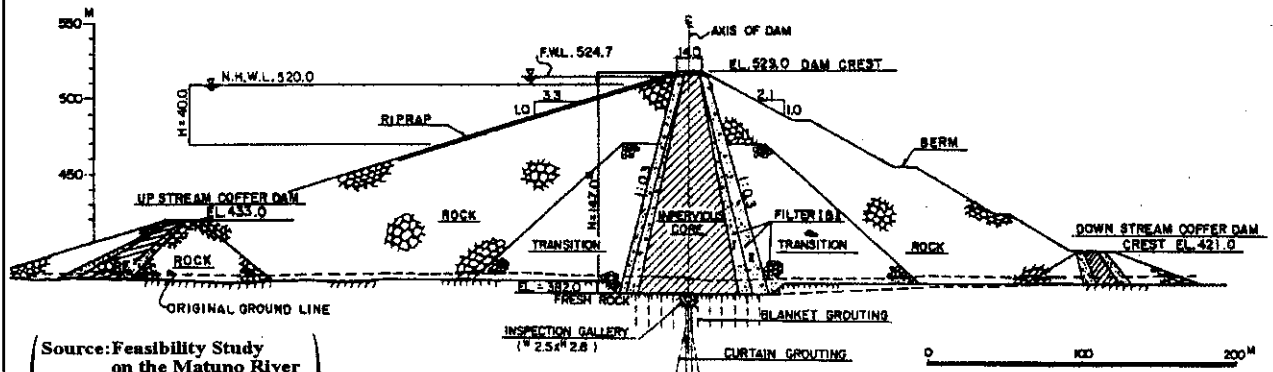




PLAN



PROFILE OF DAM



TYPICAL CROSS SECTION

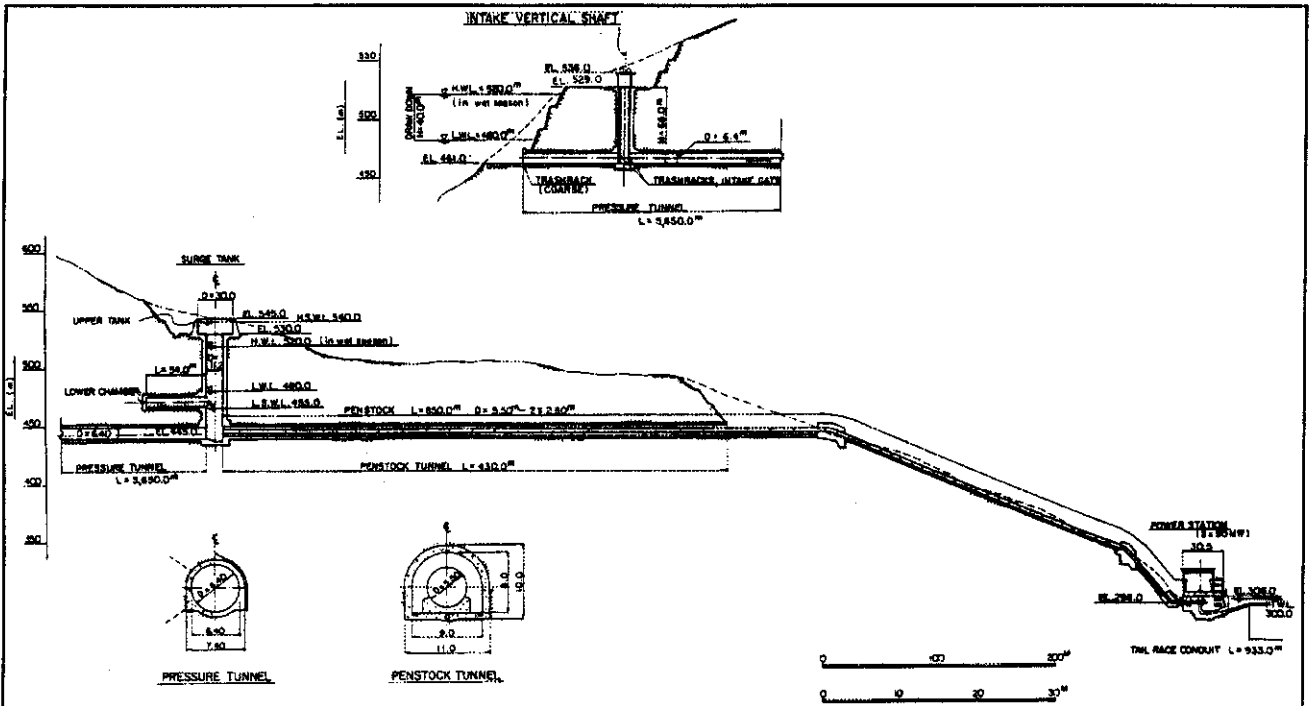
(Source: Feasibility Study on the Matuno River Development project Vol.4 Drawing February, 1984 JICA)

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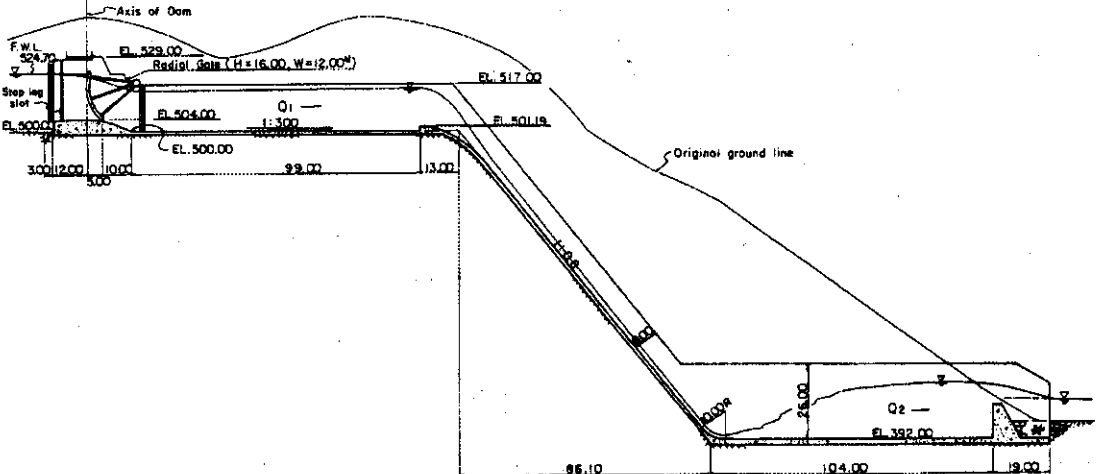
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Figure 6.1.3

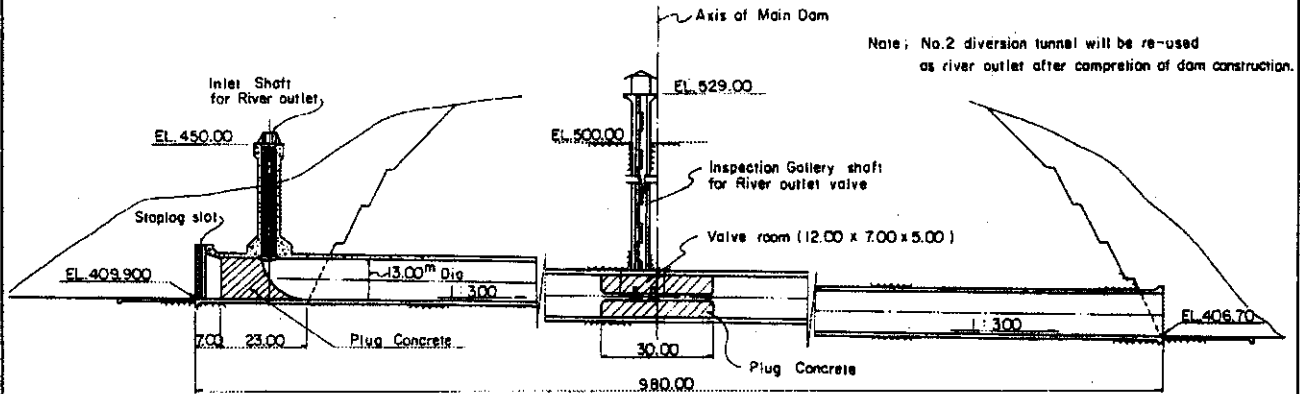
Layout plan of Matuno No.1 Dam (1/2)



LONGITUDINAL SECTION OF PRESSURE TUNNEL AND PENSTOCK



LONGITUDINAL SECTION OF SPILLWAY



LONGITUDINAL SECTION OF RIVER OUTLET

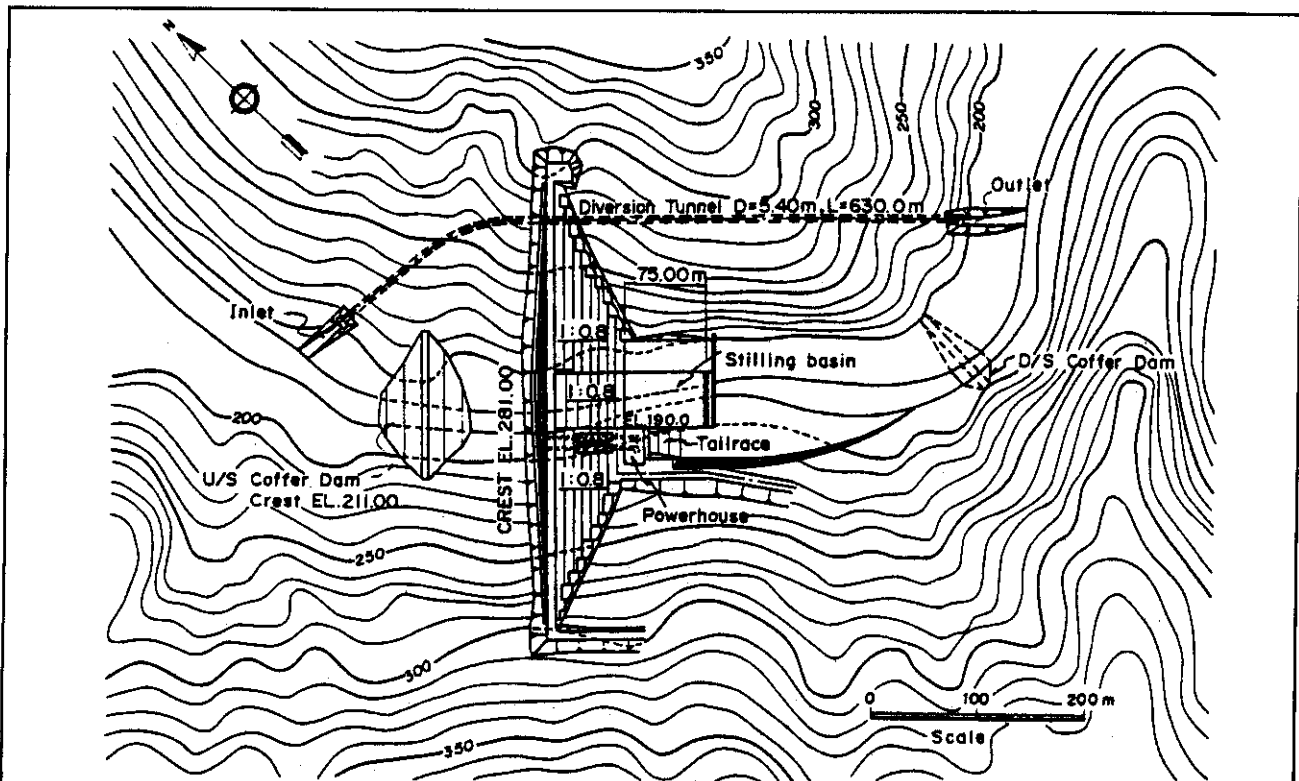
(Source: Feasibility Study on the Matuno River Development project Vol.4 Drawing February, 1984 JICA)

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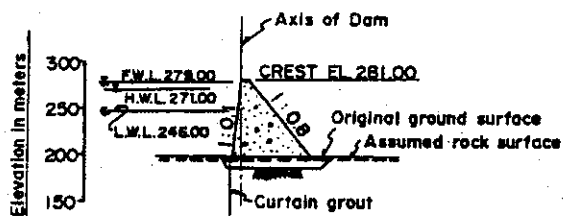
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Figure 6.1.3

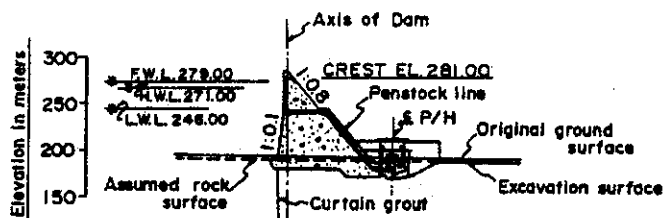
Layout plan of Matuno No.1 Dam (2/2)



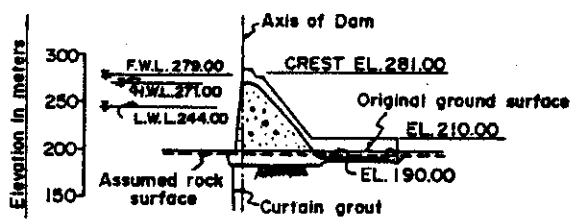
PLAN



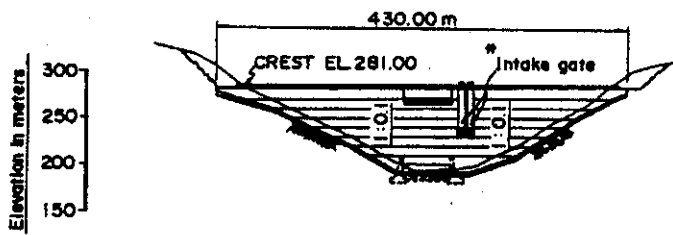
TYPICAL SECTION



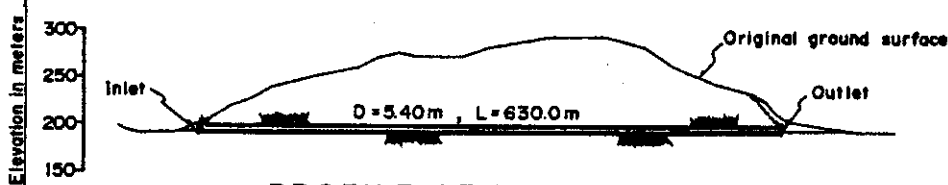
PROFILE OF POWER LINE



OVERFLOW SECTION



ELEVATION



PROFILE OF DIVERSION TUNNEL

Source: Republic of The Philippines  
 Final Report for The Master Plan Study  
 on The Cagayan River Basin Water Resources Development  
 Supporting Report  
 August, 1987 JICA

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Figure 6.1.4

Layout plan of Alimit No.1 Dam