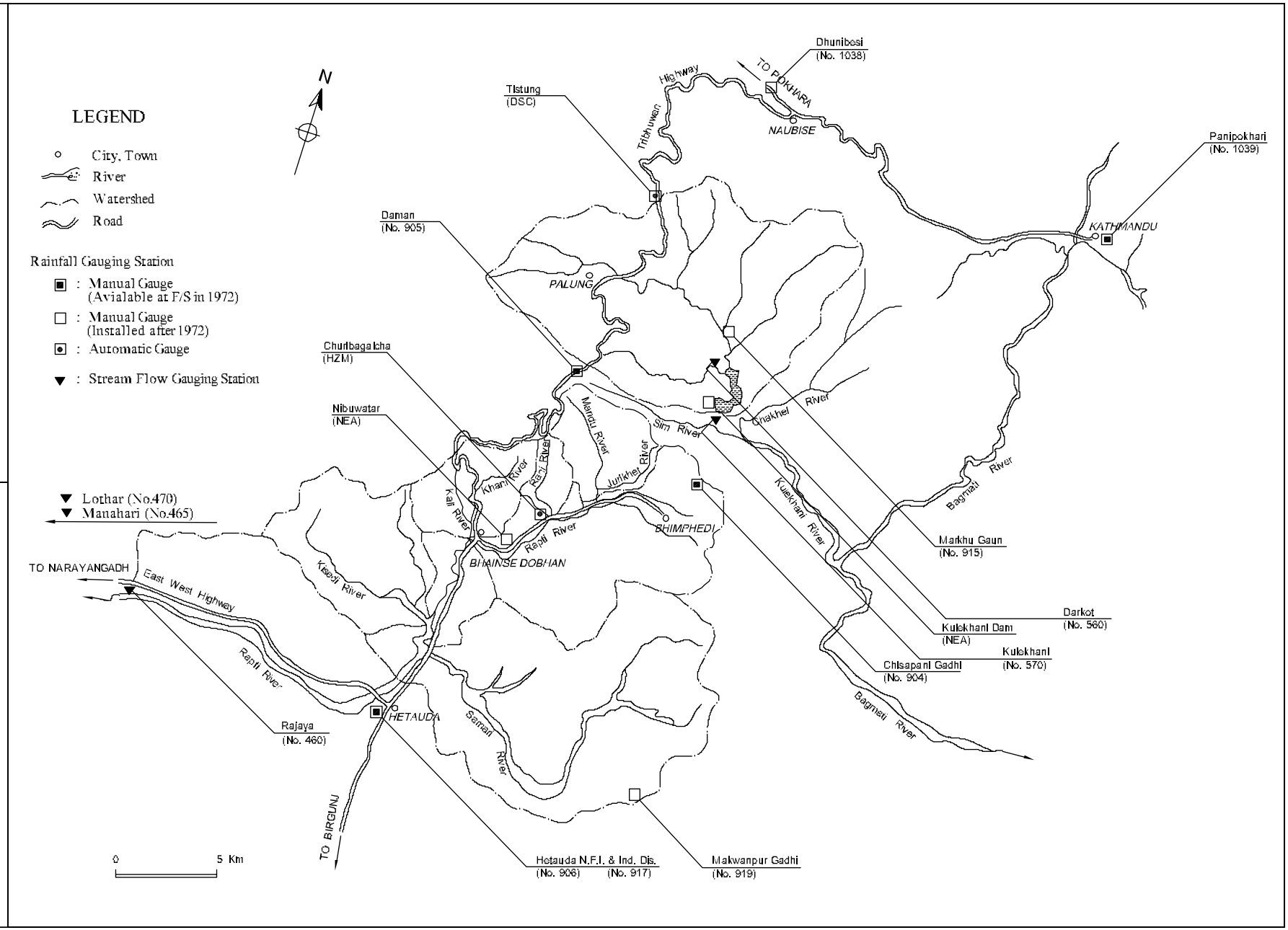
FIGURES

Chapter 3



THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT OF THE KULEKHANI III HYDROPOWER PROJECT IN THE KINGDOM OF NEPAL

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Figure 3.2.1

Location Map of Observatory Stations

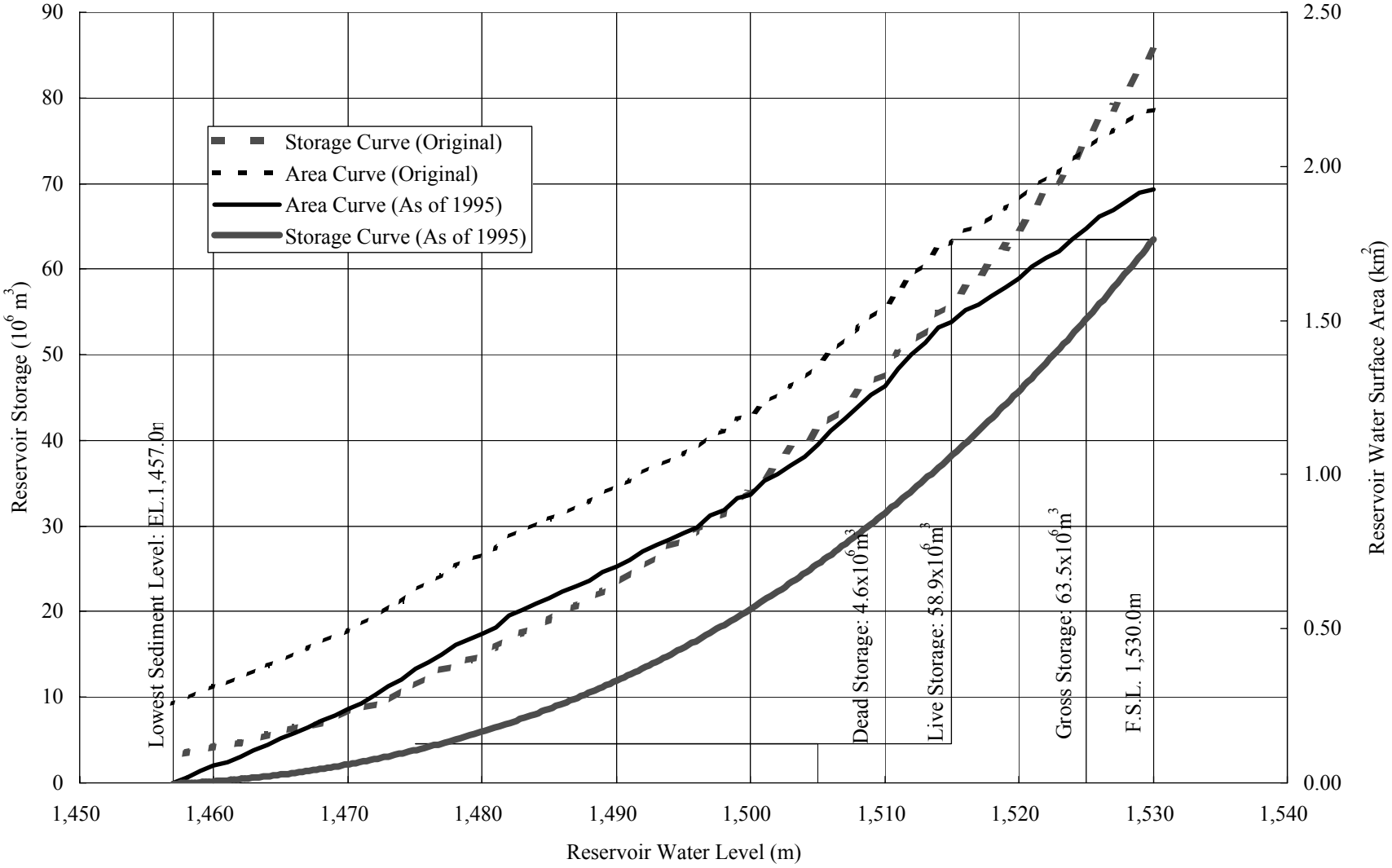


Figure 3.2.2 Original Storage Capacity Curve and Estimated Curve as of 1995 Source: Reference 6)

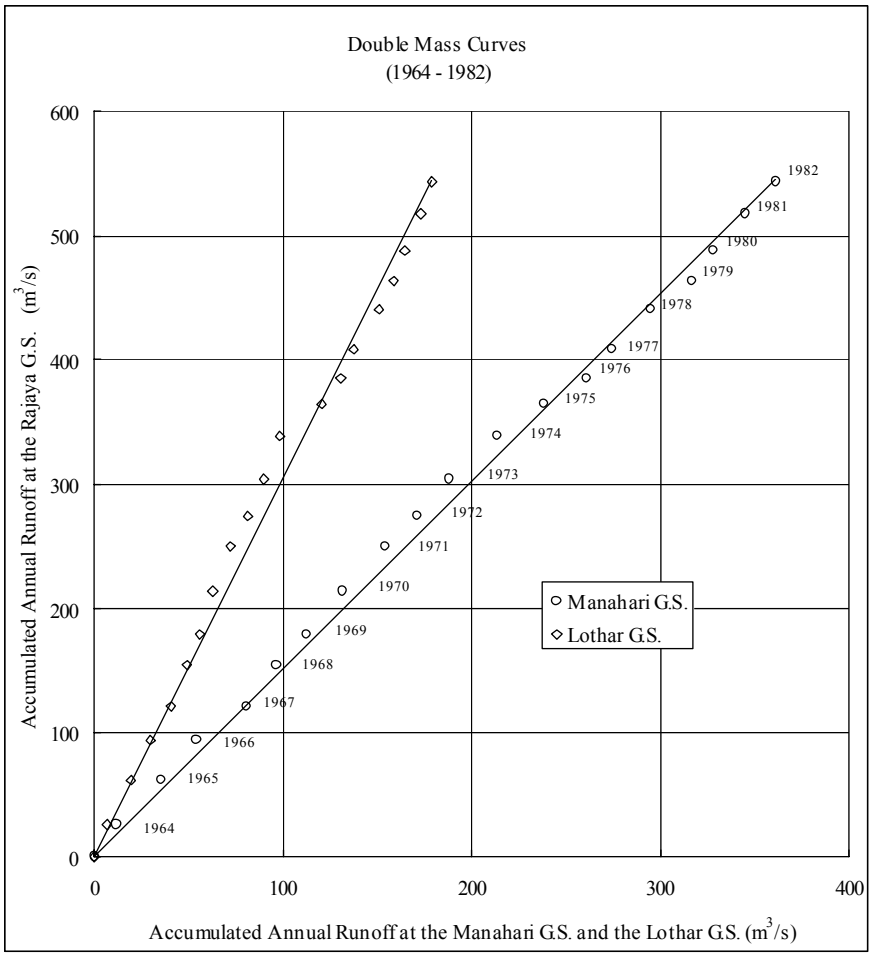


Figure 3.2.3 Consistency of Record at Rajaya G.S. (Double Mass Curve)

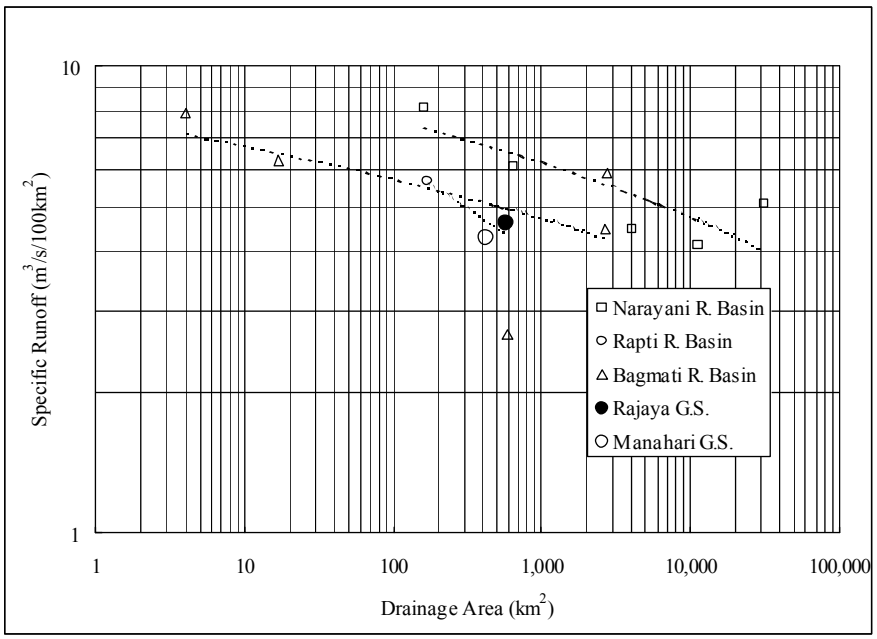


Figure 3.2.4 Comparison of Specific Runoff at Rajaya G.S. and Adjacent G.S.

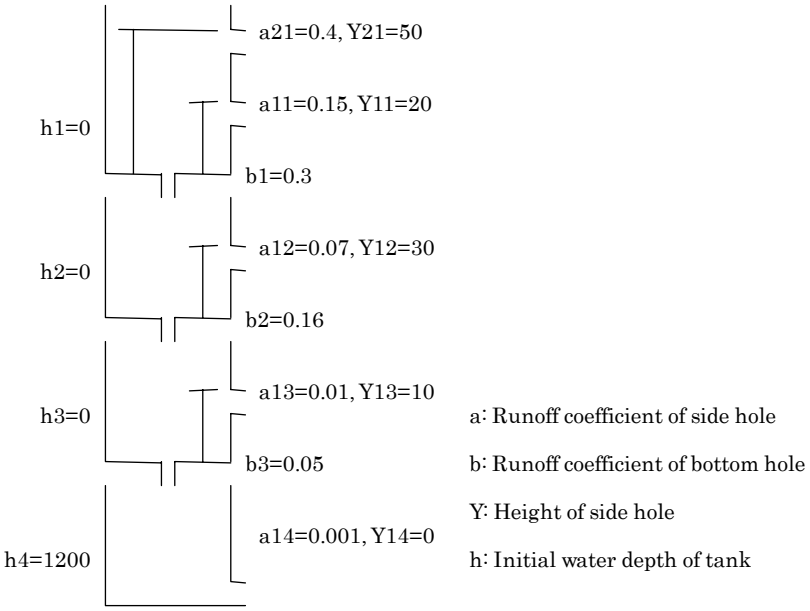


Figure 3.2.5 Tank Model

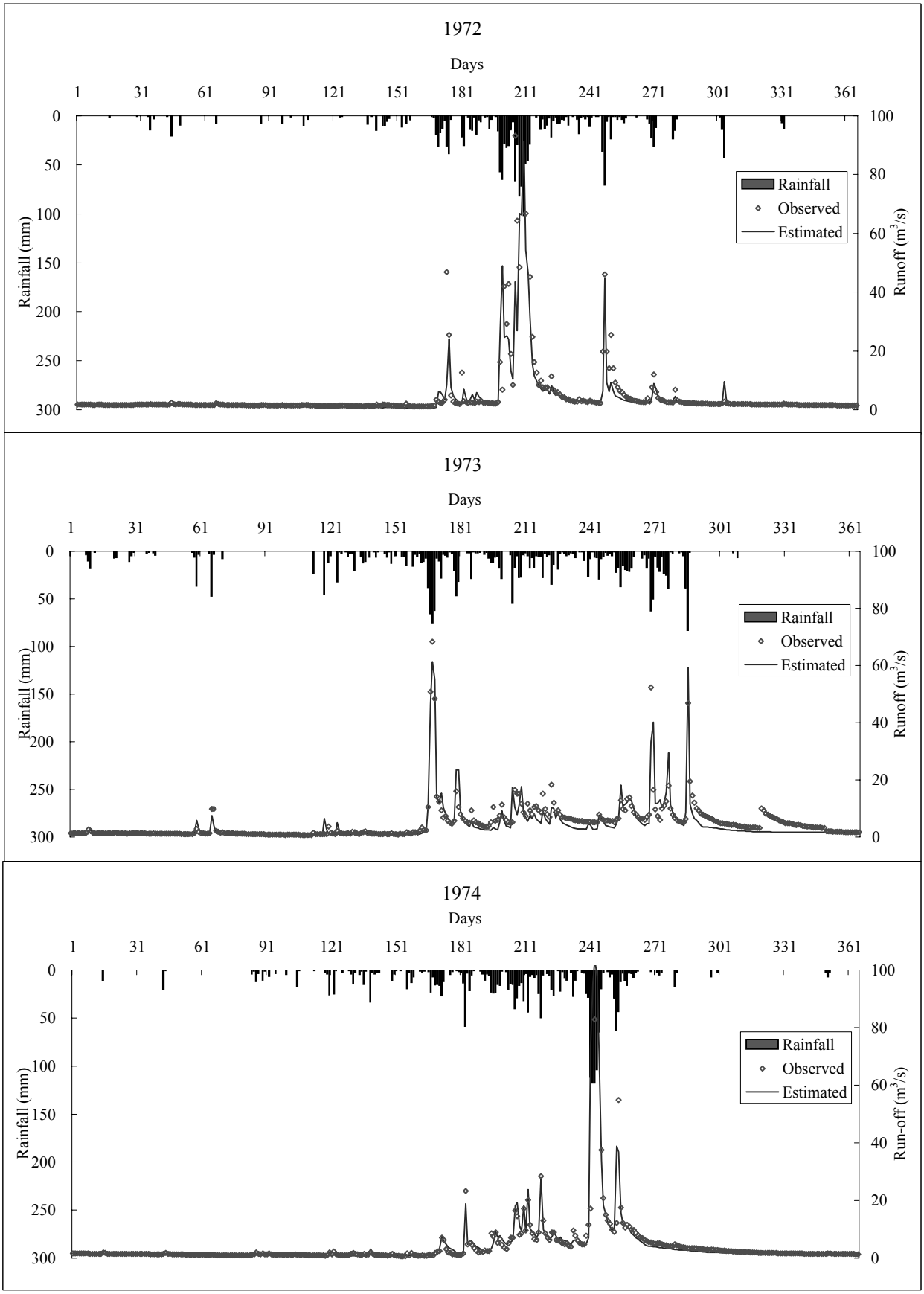


Figure 3.2.6 Estimated Runoff by Tank Model (1/2)

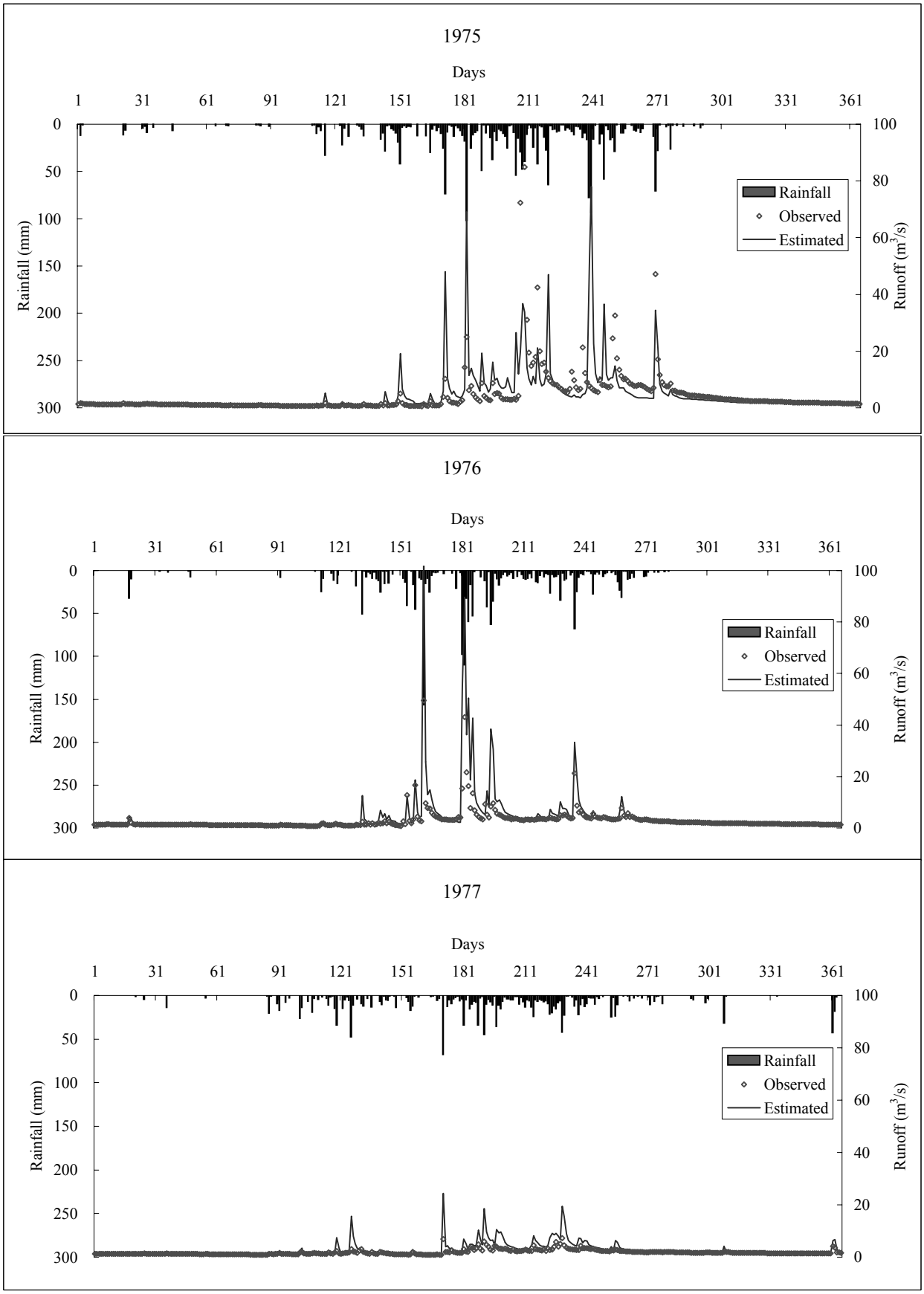


Figure 3.2.6 Estimated Runoff by Tank Model (2/2)

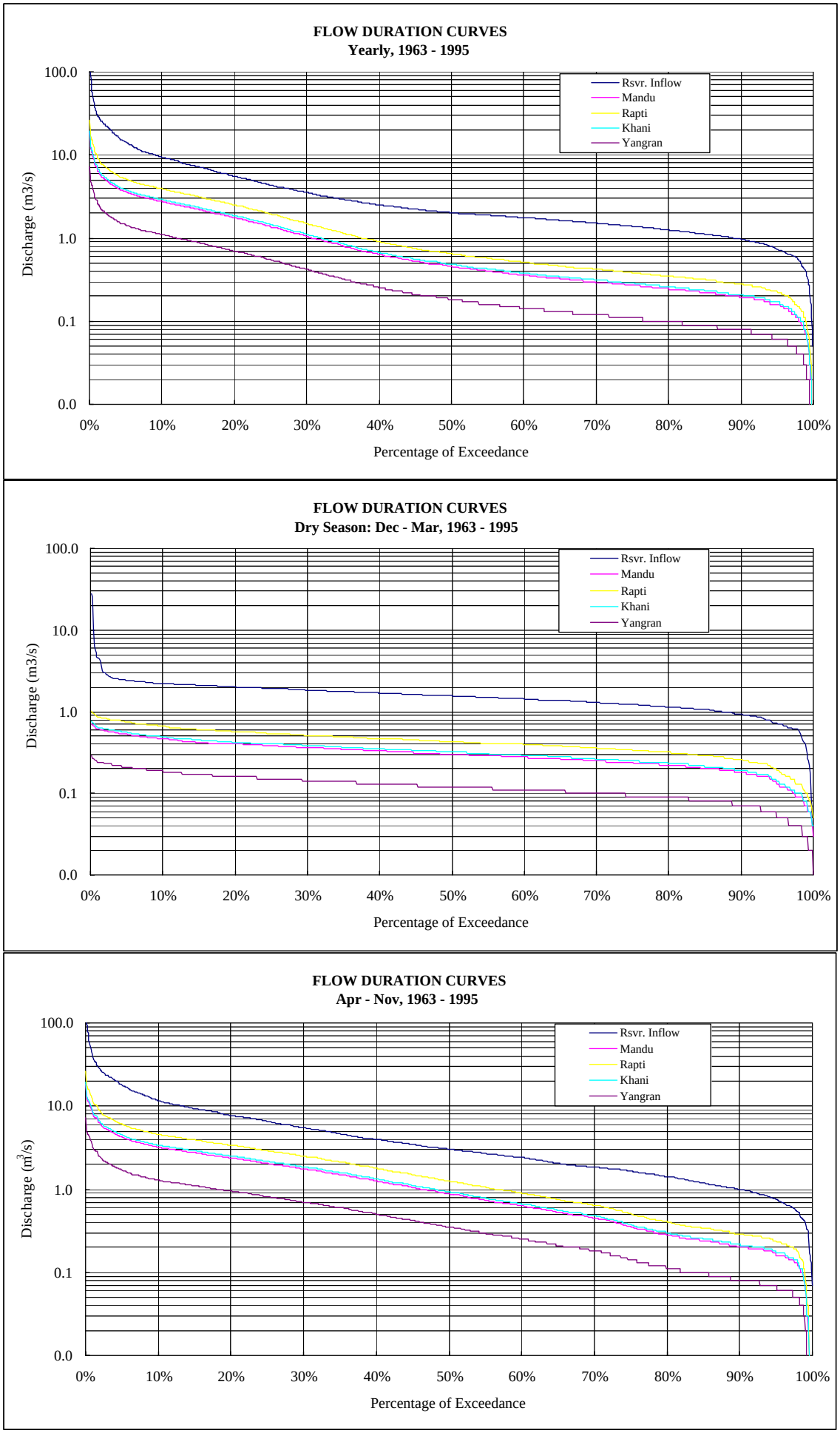
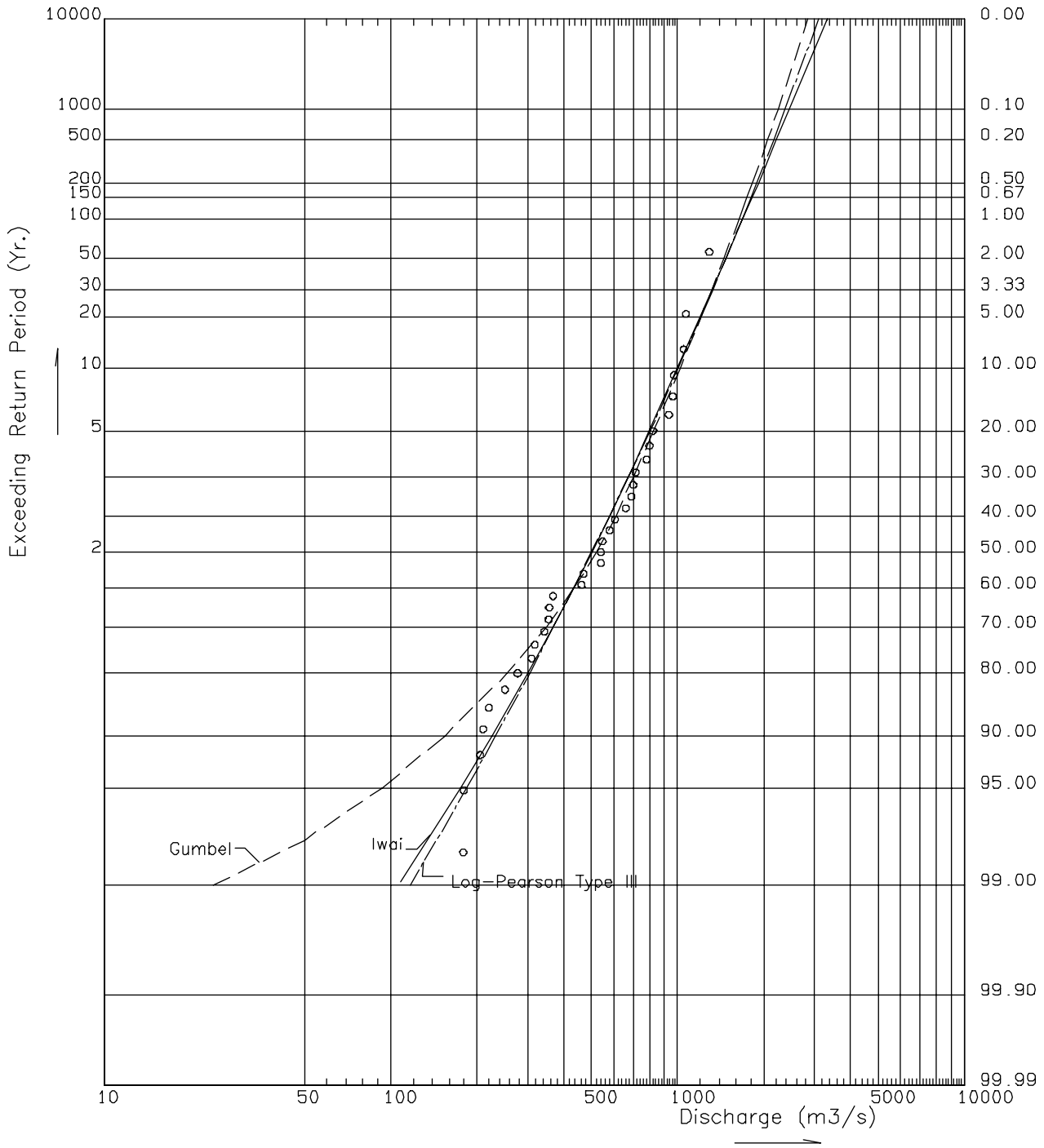


Figure 3.2.7 Duration Curves of Reservoir Inflow and Tributary Runoffs



THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT OF THE KULEKHANI III HYDROPOWER PROJECT	Figure 3.2.8 Frequency Curve of Annual Maximum Flood at Rajaya(1963-1995)
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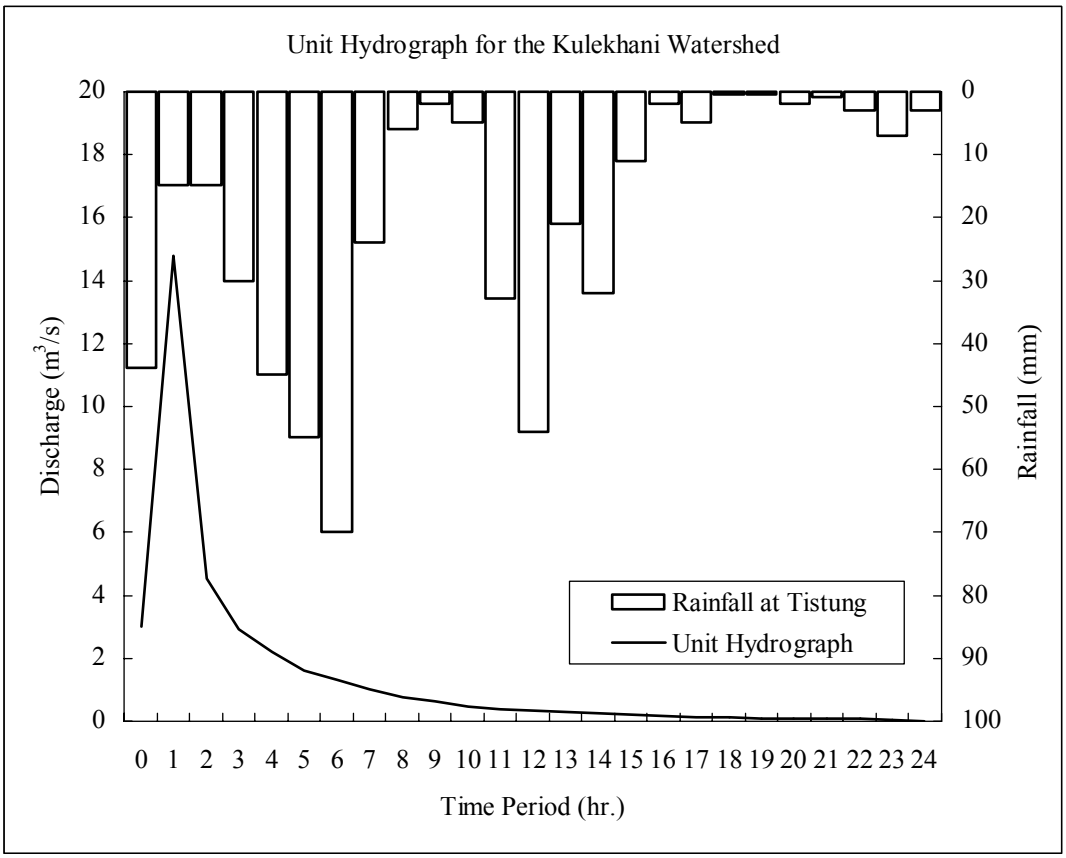

Figure 3.2.9 Unit-hydrograph and Hourly Rainfall Distribution at Tistung

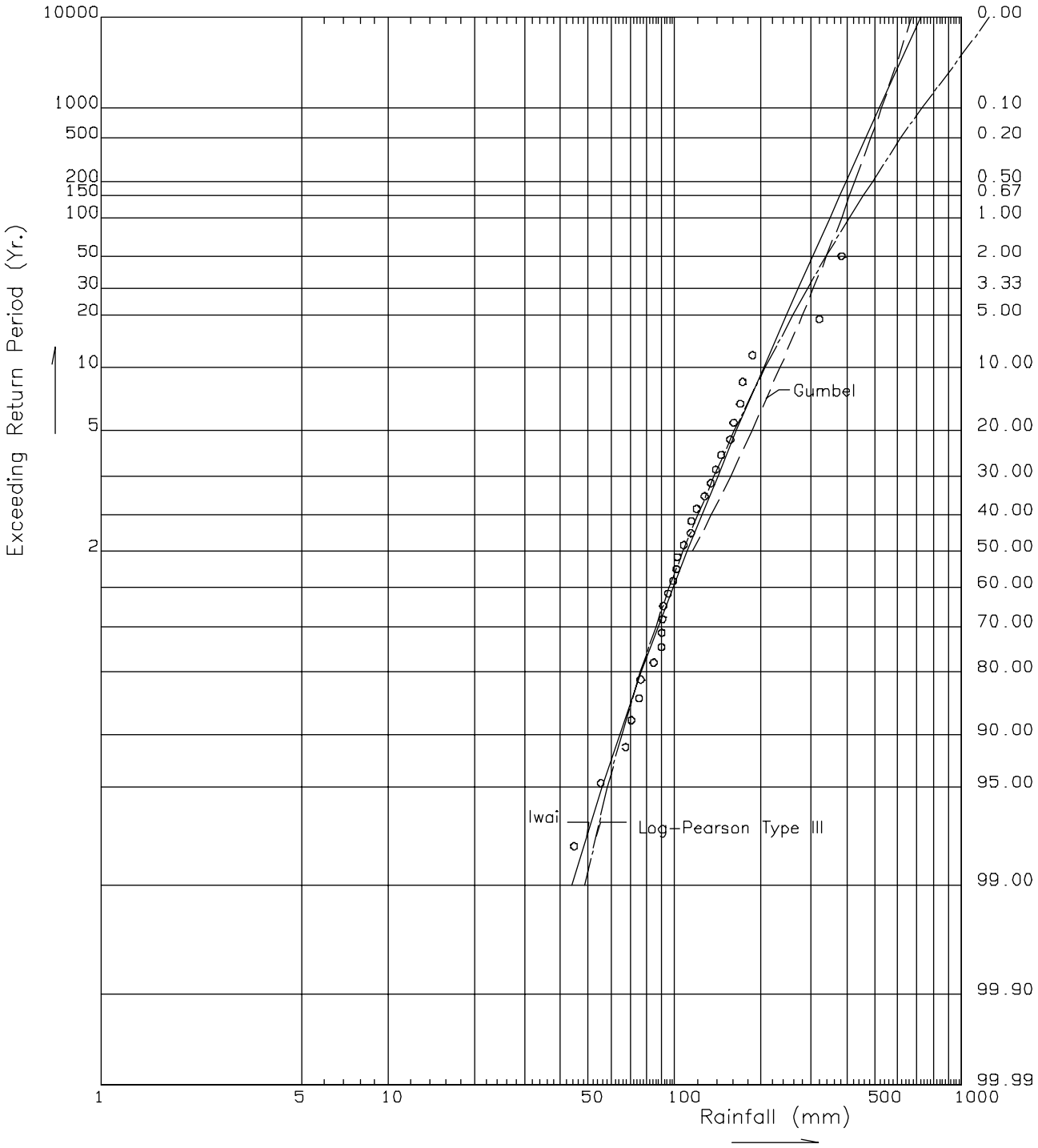

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Figure 3.2.10
Frequency Curve of Annual Maximum Rainfall in Kulekhani Reservoir Basin (1972-2000, 2002)

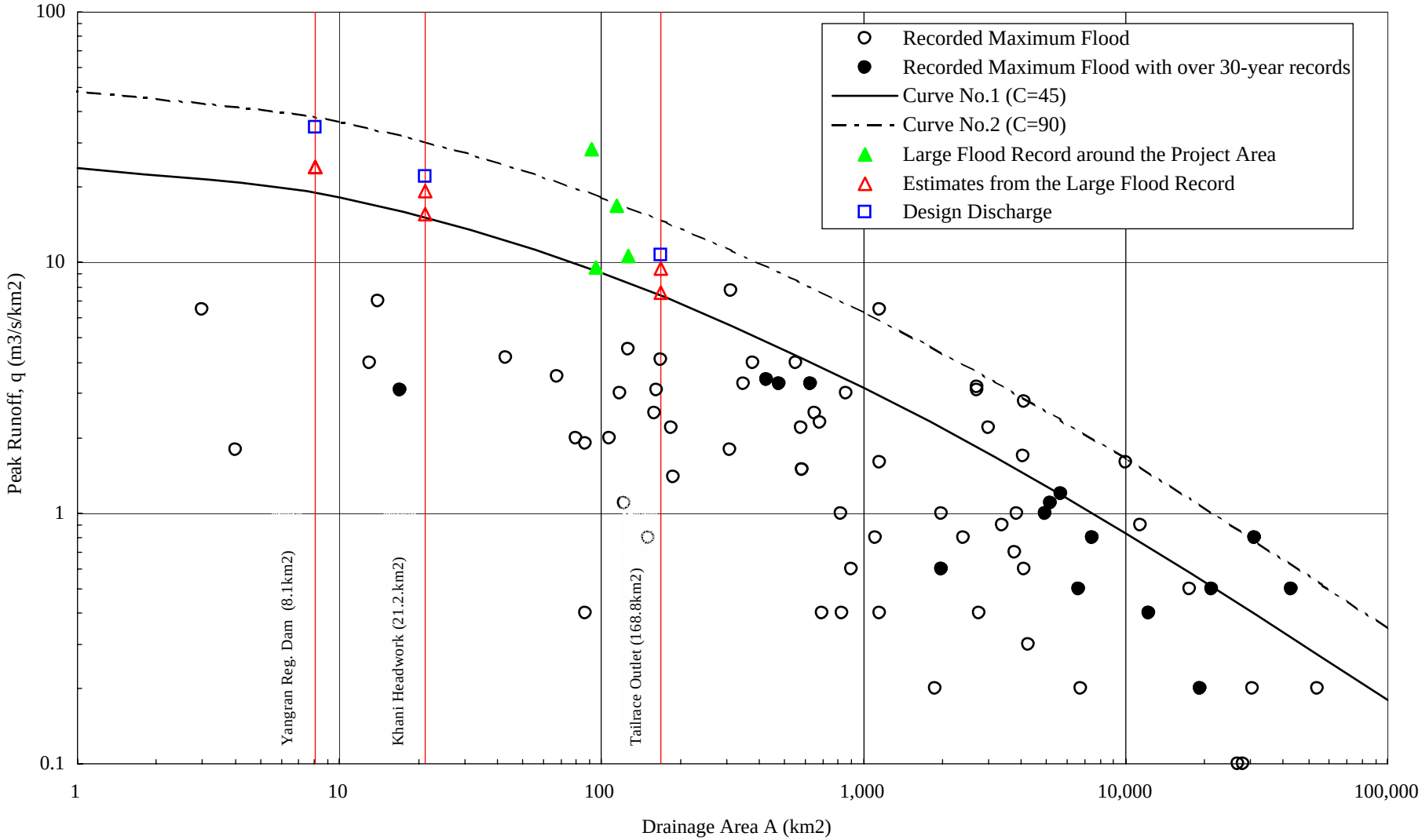
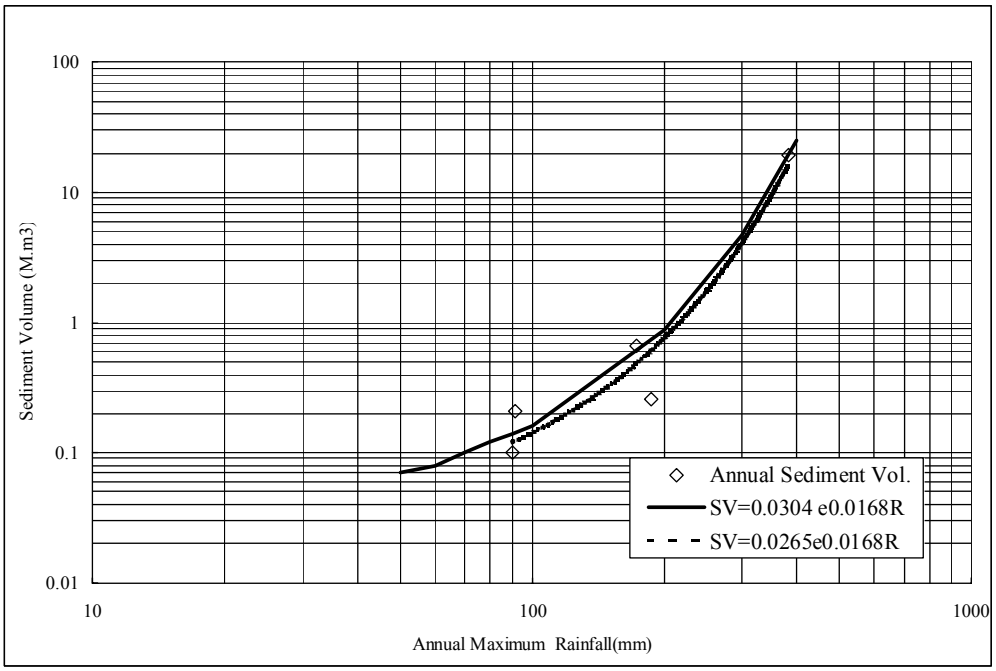


Figure 3.2.11 Recorded Maximum Floods in Nepal



Year	Annual Sediment Volume ($10^6 m^3$)	Annual Maximum Rainfall (mm)	Remarks
1993	19.60/* (4.80)	381.9	/* including 1994 and 1995
1994	(10.50)/*	75.2	/* included in 1993
1995	(4.30)/*	127.3	/* included in 1993
1996	0.10	90.2	
1997	0.21	91.4	
1998	-0.11/*	119.0	/* omitted
1999	0.66	172.6	
2000	0.26	186.7	

Figure 3.2.12 Relationship between Annual Maximum Rainfall and Sediment Volume

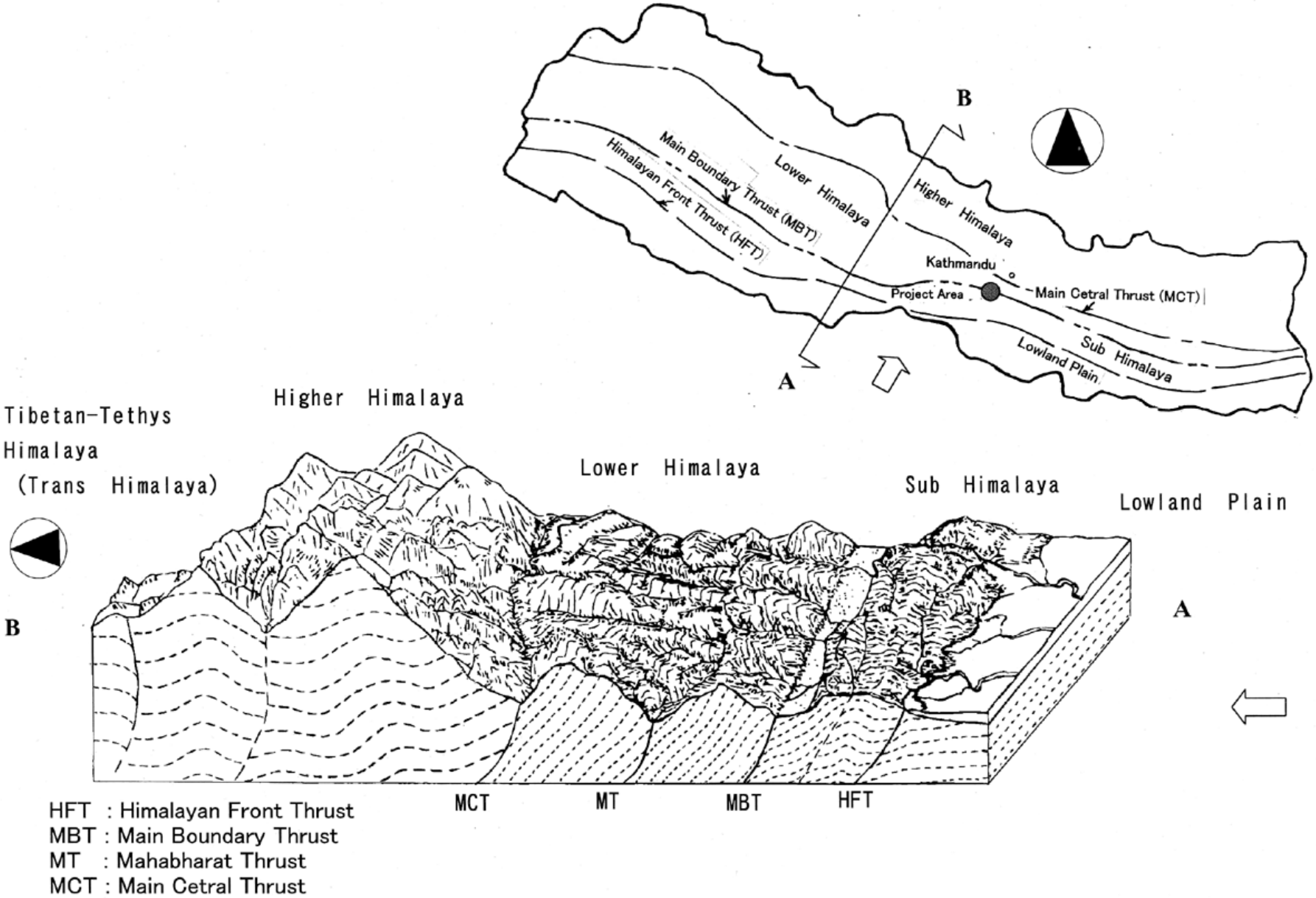


Figure 3.3.1
Schematic Feature of Geomorphology in Nepal

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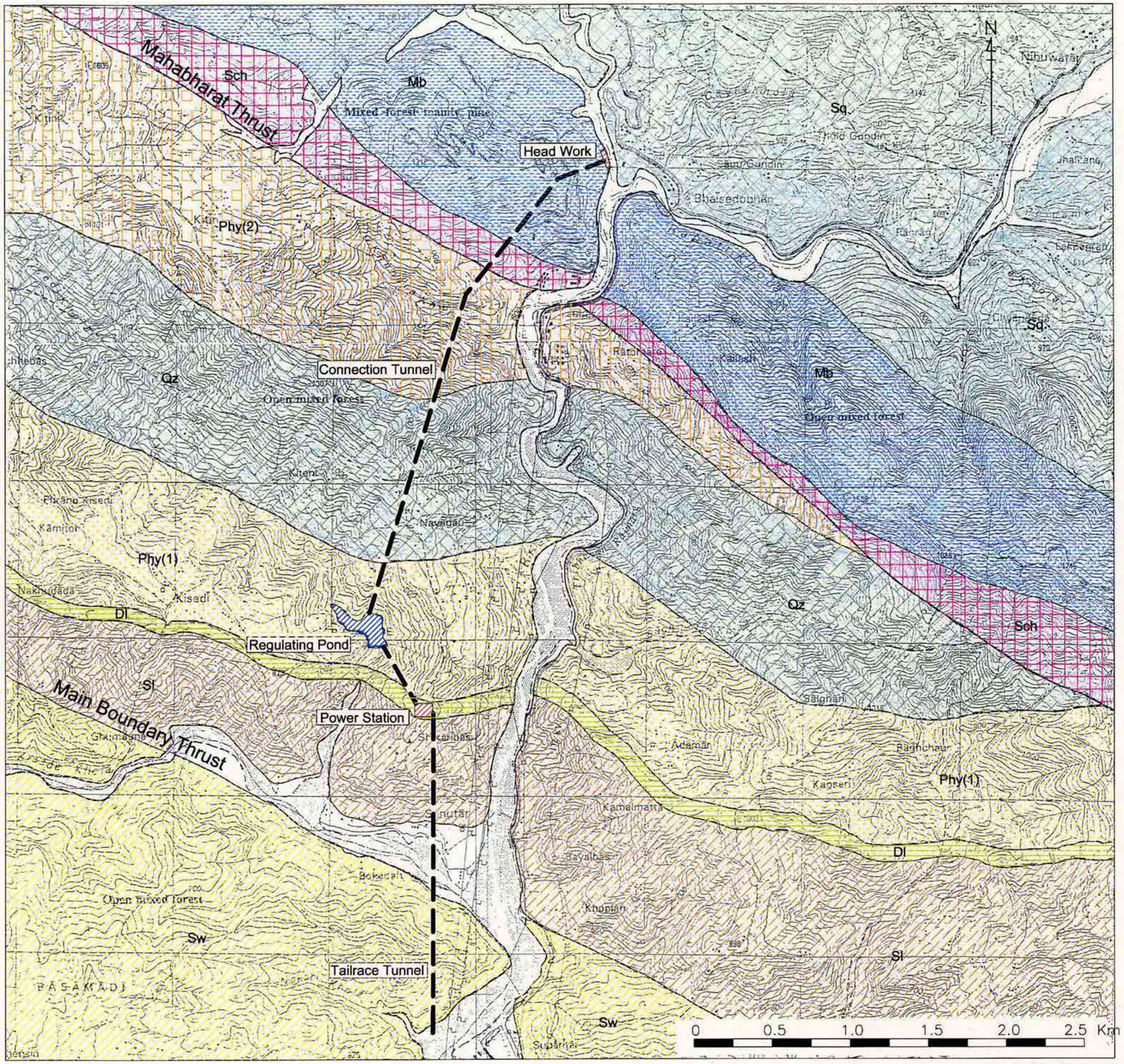

Stratigraphy and Engineering Geology of Rocks in Project Area

AGE	GROUP	FORMATION	SYMBOL	ROCK TYPE	GEOLOGY
Cenozoic	Recent Deposits		Rd	Riverbed deposits	Sand and gravels with bolders
			Ta	Talus and/or Terrace	Talus deposits and terrace deposits.
	Siwalik Group	(Uncomformity)			
			Sw	Conglomerate, Sandstone, Mudstone	Sandstone, mudstone, and small portions of conglomerates. Relatively soft and fractured near MBT.
		(Main Boundary Thrust)			
Paleozoic	Upper Nawakot Group	Robang Formation	Phy (2)	Phyllite (2)	Blue green slatic phyllites, generally chloritic. Intercalation of calcalious beds. Relatively compact in general.
			Qz	Quartzite	Quartzite. Intercalation of thin phyllite at some localities. Massive and compact in general.
			Phy (1)	Phyllite (1)	Blue green phyllites, generally chloritic. Relatively compact in general.
		Malekhu Formation	Dl	Siliceous Dolomite	Light-to-dark and greenish gray siliceous dolomites. Intercalation of thin crystalline limestone and calc-phyllites. Massive and relatively well bedded.
		Benighat Formation	Sl	Slate(Phyllitic)	Dark gray slates and phyllites together with black carbonaceous slate. Fractured and weathered near MBT.
		(Mahabharat Thrust)			
Pre-Cambrian	Bhimphedi Group	Kalitar Formation	Sq	Schist, Quarzite	Dark green to gray colored two mica and biotite schist with intercalation of quartzite and garnets. Strongly folded and fractured at places.
		Bhaise Dobhan Formation	Mb	Limestone	Coarse crystalline marble, limestone with intercalation of thin schist. Marble and limestone are massive and well bedded.
		Raduwa Formation	Sch	Schist	Coarse-crystalline, highly garnetiferous mica schist, gneissic schist. Some quartzites are also seen in this formation.

* Mahabharat Thrust (MT) :
  Considered as an extension of Main Central Thrust (MCT), which forms the boundary between Higher and Lower Himalayas. Movement of MCT appears to be 5cm/year in recent years. MT is said to be basement thrust of Kathmandu Nappe which includes Bhimphedi Grou

* Main Boundary Thrust (MBT) :
  This thrust forms the boundary between Lower and Sub Himalayas. Siwalik sandstone of folded and faulted Tertiary sedimetary rock have been overthrusted in the south of MBT.

THE UPGRADING FEASIBILITY STUDY ON THE DEVELOPMENT OF THE KULEKHANI III HYDROPOWER PROJECT IN THE KINGDOM OF NEPAL

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Figure 3.3.2
Geological Map of Project Area