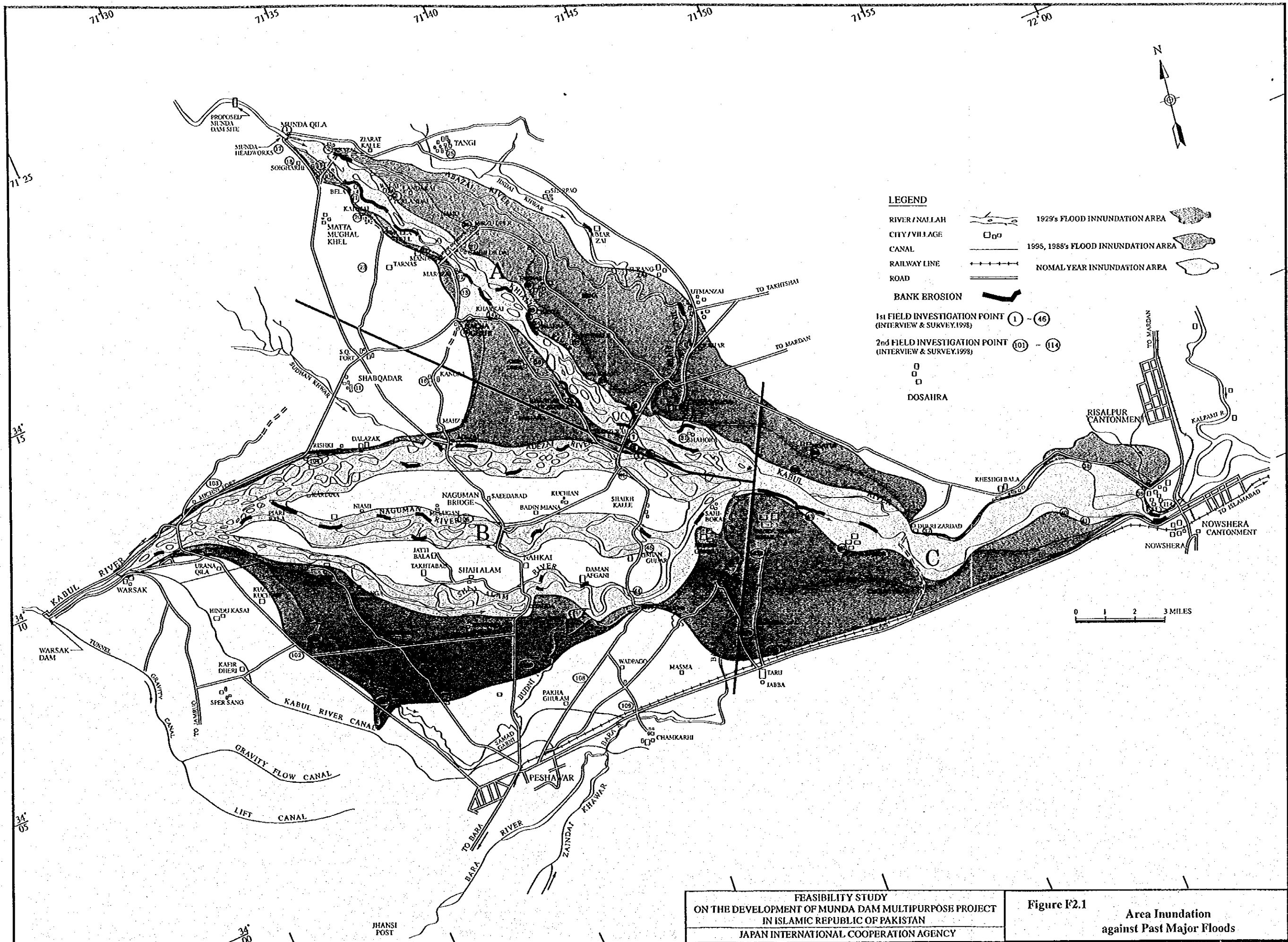
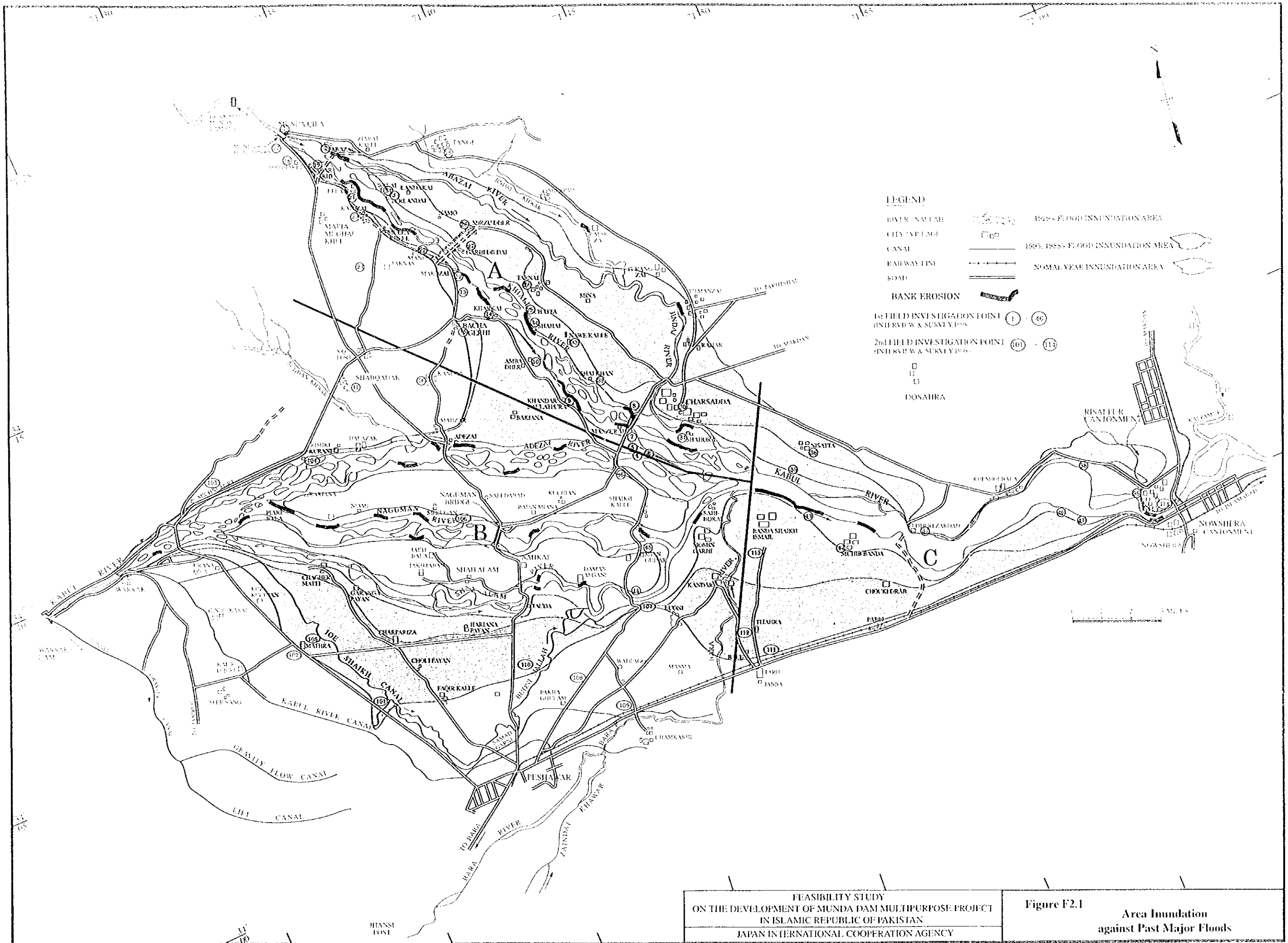
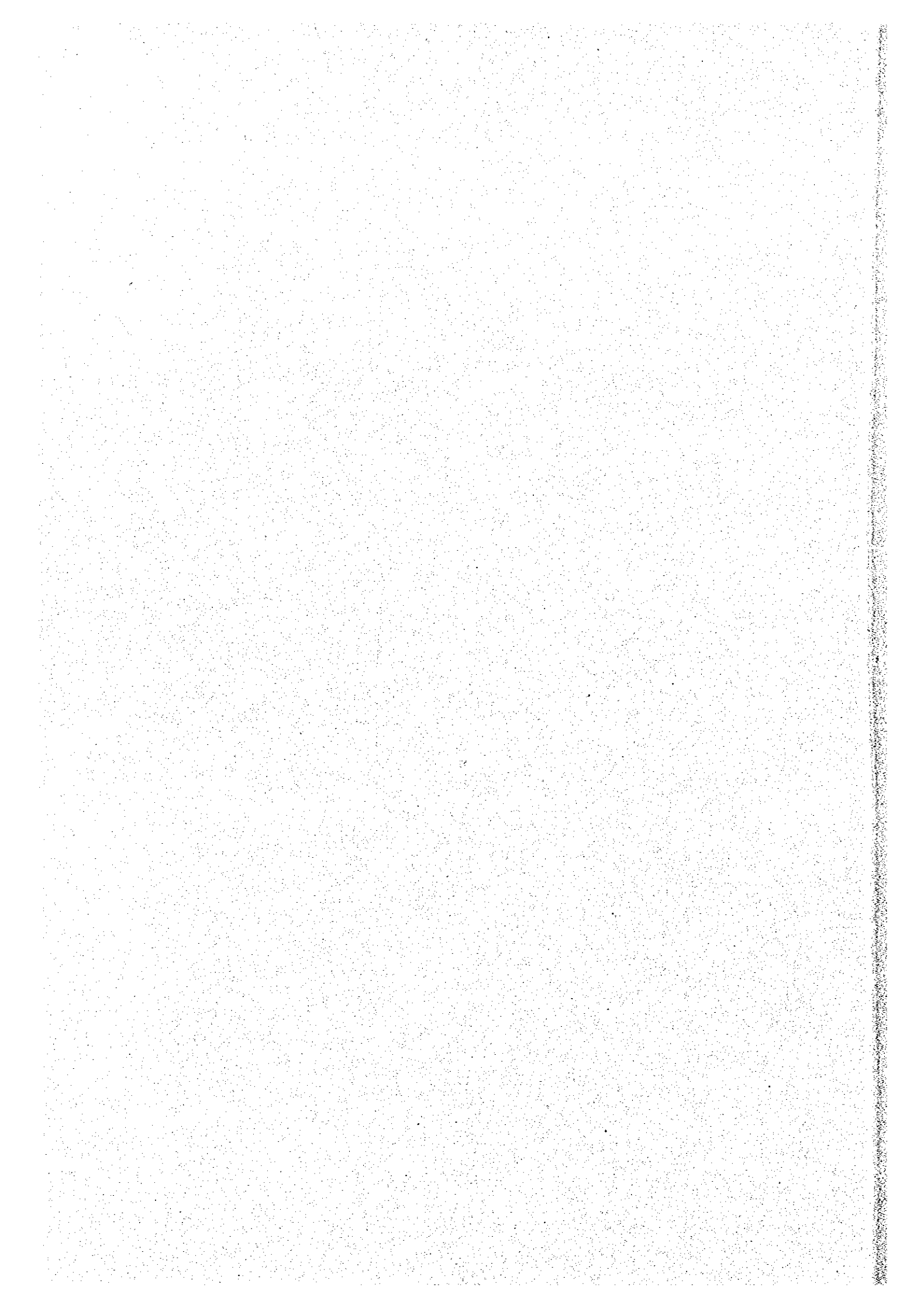


FIGURES







**DISCHARGE - INUNDATION AREA OF SWAT RIVER AND KABUL RIVER
(DOWNSTREAM OF MUNDA HEADWORKS AND WARSAK UPTO NOWSHERA)**

		(km ²)			
River	Stretch	Historical (Maximum) class Flood 1929/8/28	Midium class Flood (ex.1995/7/25)	Low (Nomal year) class Floods (ex.1989/7/31)	
A	Swat	From MUNDA H/W to Swat-Kabul confluence	188.75	95.75	57.50
B-1	Kabul	Kabul River from Warsak Dam to Influence line of Swat River backwater	227.25	149.50	72.00
B-2	Kabul	Kabul River from Influence line of Swat River backwater to confluence	112.50	97.25	50.75
C	Kabul	From Swat-Kabul confluence to Nowshera	169.25	105.75	64.00
		Total inundation area	697.75	448.25	244.25

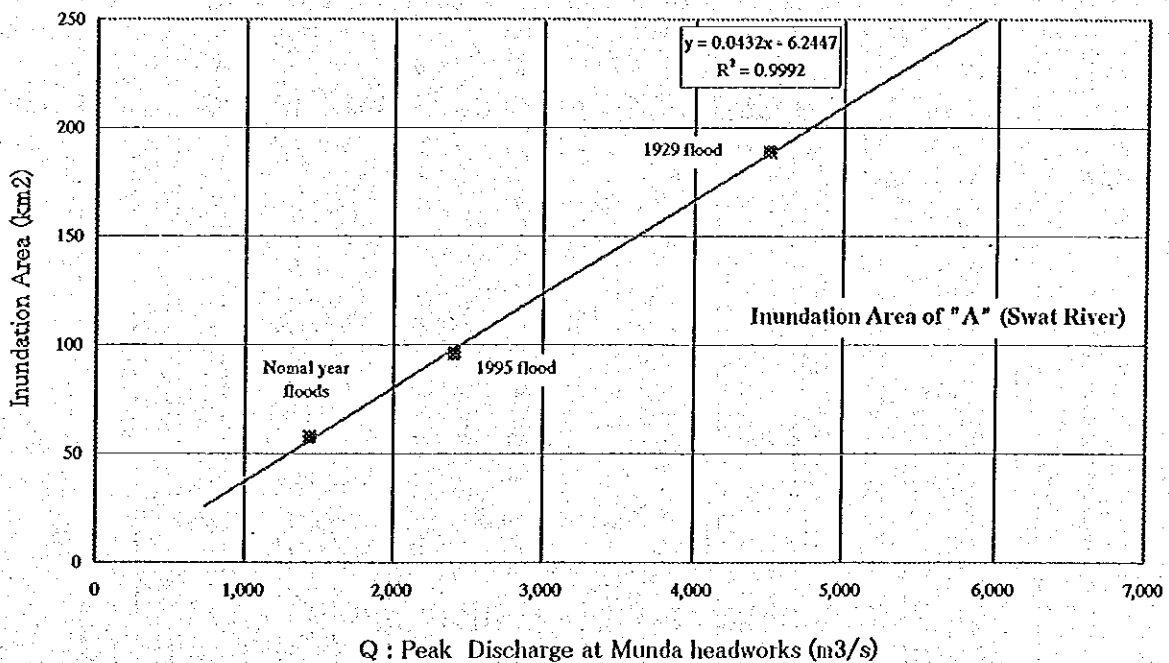
		Station	Peak discharge (m ³ /s)		
A	Swat	at Munda H/W (Swat River)	⁽¹⁾ 4,500	⁽¹⁾ 2,413	⁽¹⁾ 1,441
B	Kabul	at Warsak (Kabul River)	⁽⁴⁾ 3,471	⁽⁴⁾ 1,861	⁽⁴⁾ 1,183
C	Kabul	at Nowshera (Kabul River)	⁽⁵⁾ 7,531	⁽⁵⁾ 4,039	⁽⁵⁾ 2,478

*1) Source : Irrigation Dept. NWFP., Q from observed water level at Munda Headworks.

*2)&3) Source : WAPDA.

*4) : estimated by using 19995 Flood Discharge at MundaHW and Warsak (=1861*4500/2413)

*5) : estimated by using 19995 Flood Discharge at MundaHW and Nowshera (=4039*4500/2413)



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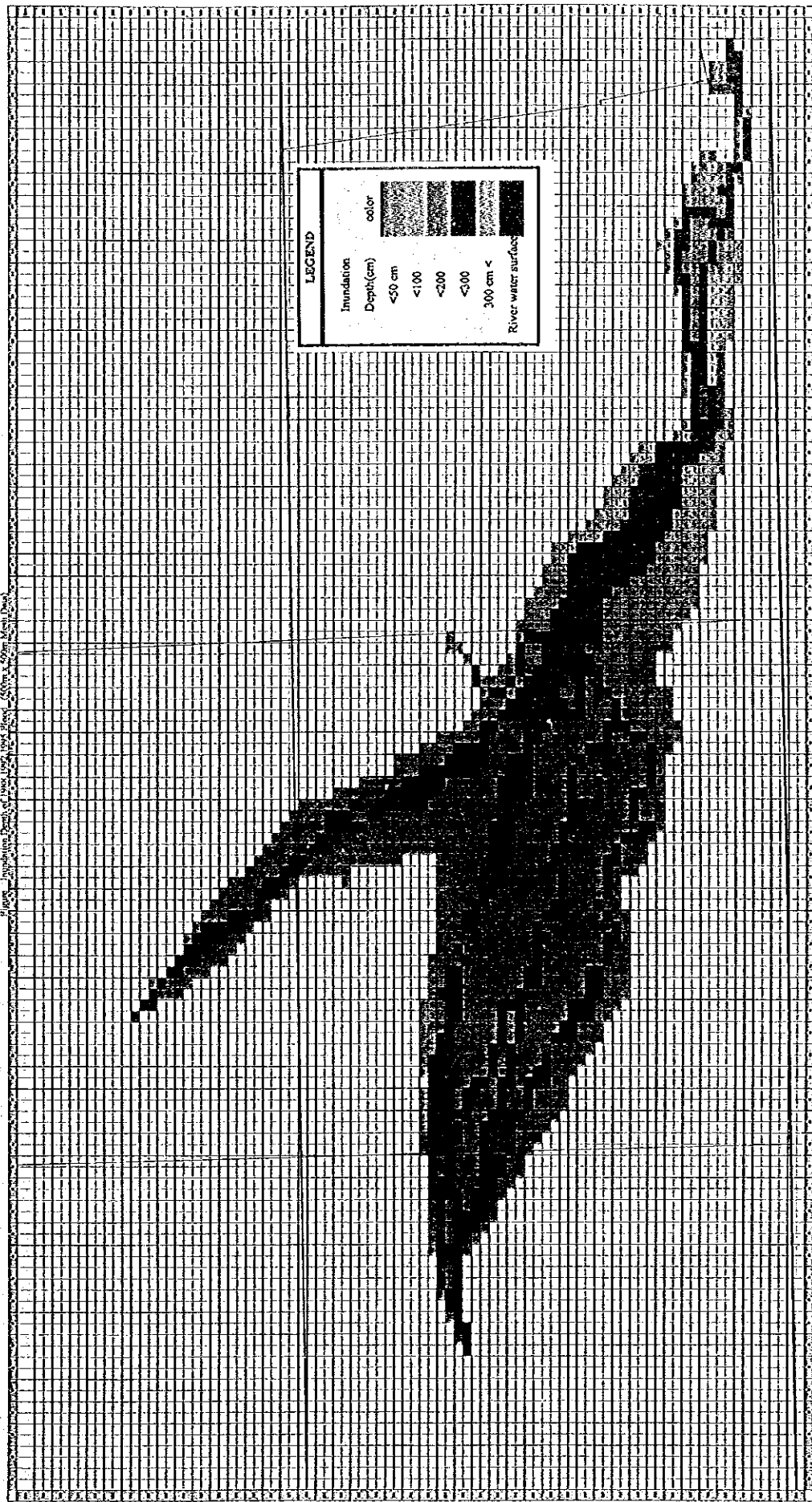
Figure F2.2

Discharge - Inundation Curve
(from Munda H/W to Swat/Kabul Confluence)



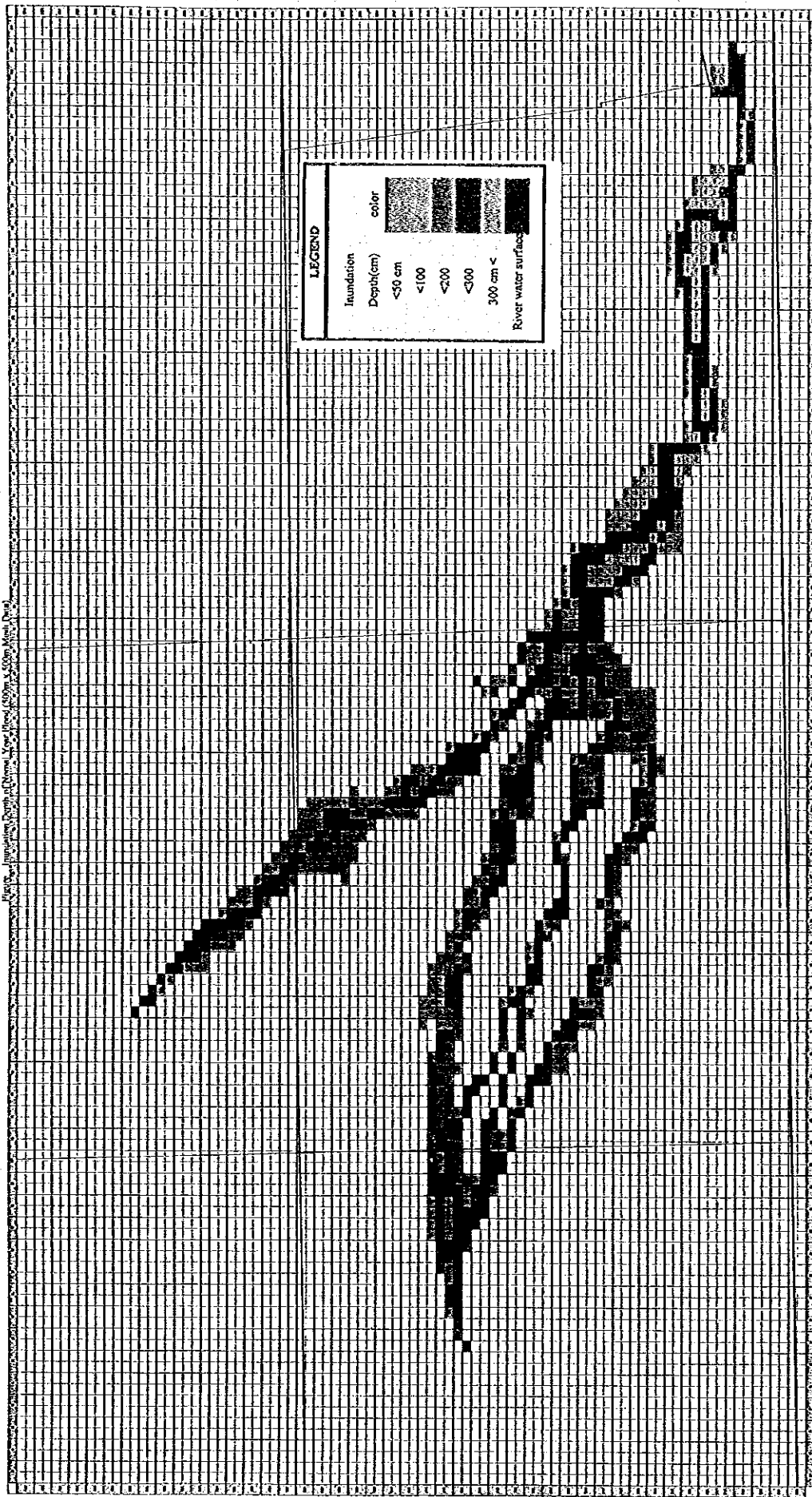
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Figure F2.3
 Inundation Area Map of 1929 Flood
 (500 x 500 m mesh)



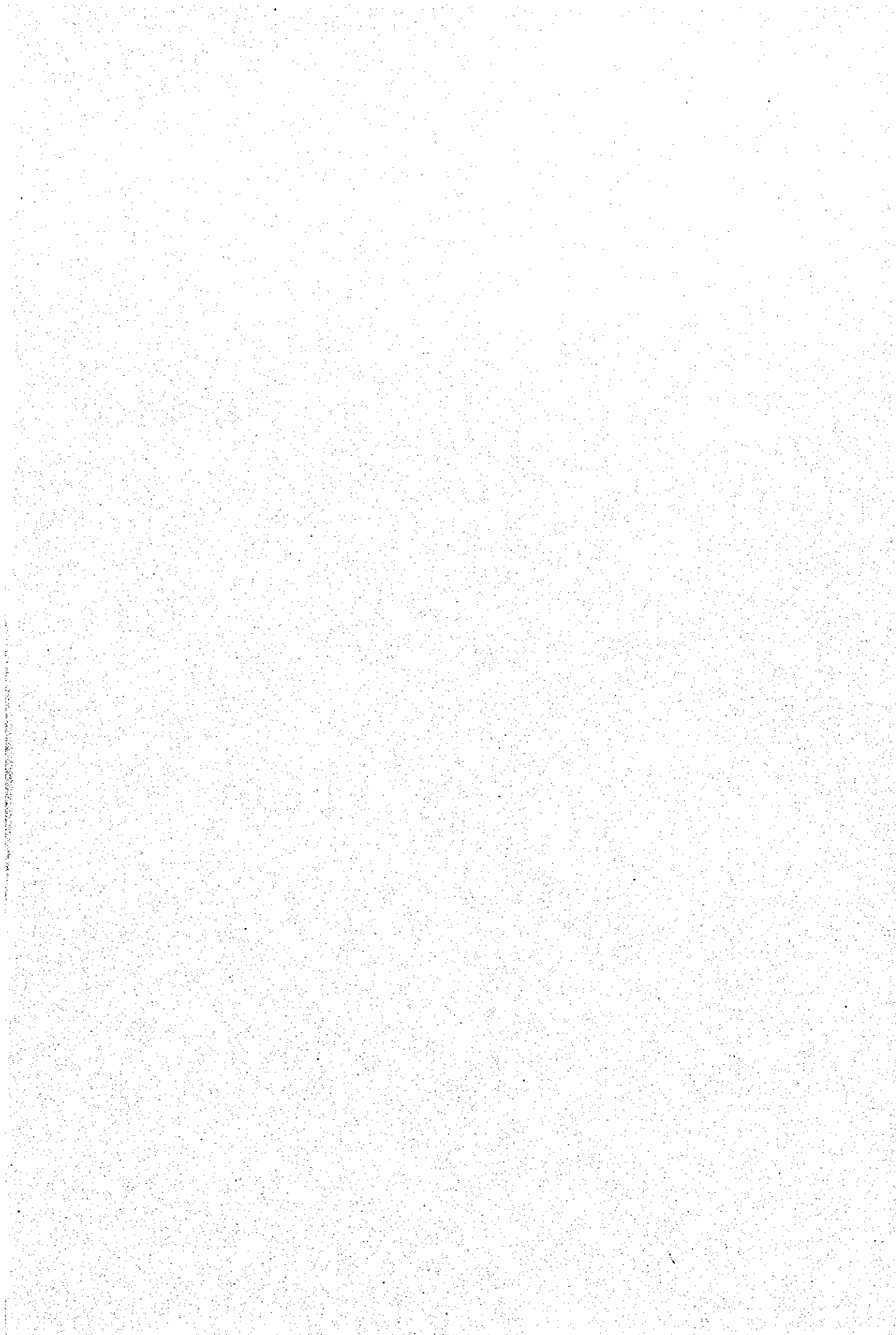
FEASIBILITY STUDY
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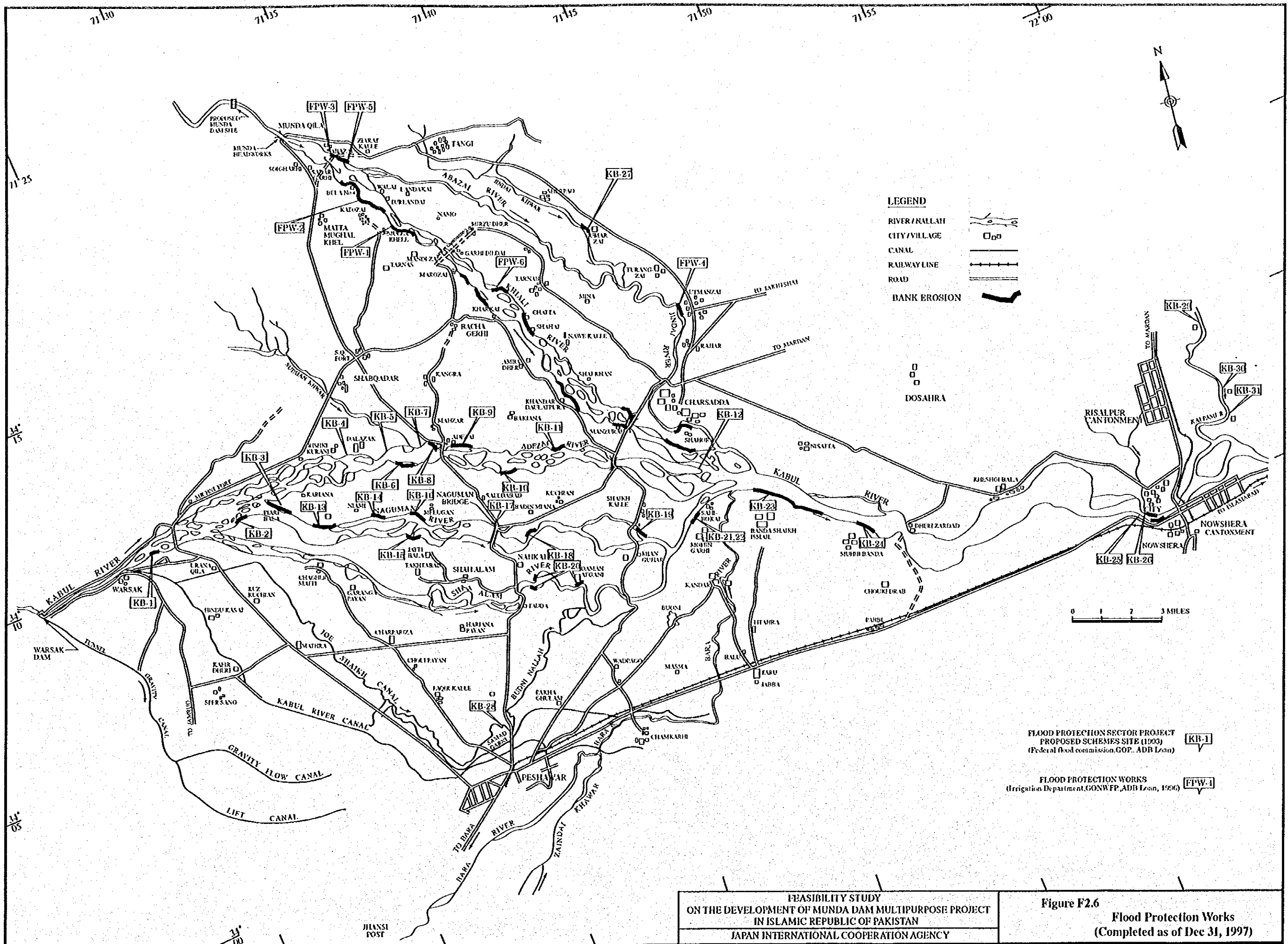
Figure P2.4
 Inundation Area Map of 1995 Flood
 (500 x 500 m mesh)



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Figure F2.5
 Inundation Area Map of Normal Year Flood
 (500 x 500 m mesh)





LEGEND

RIVER/NALLAH

CITY/VILLAGE

CANAL

RAILWAY LINE

ROAD

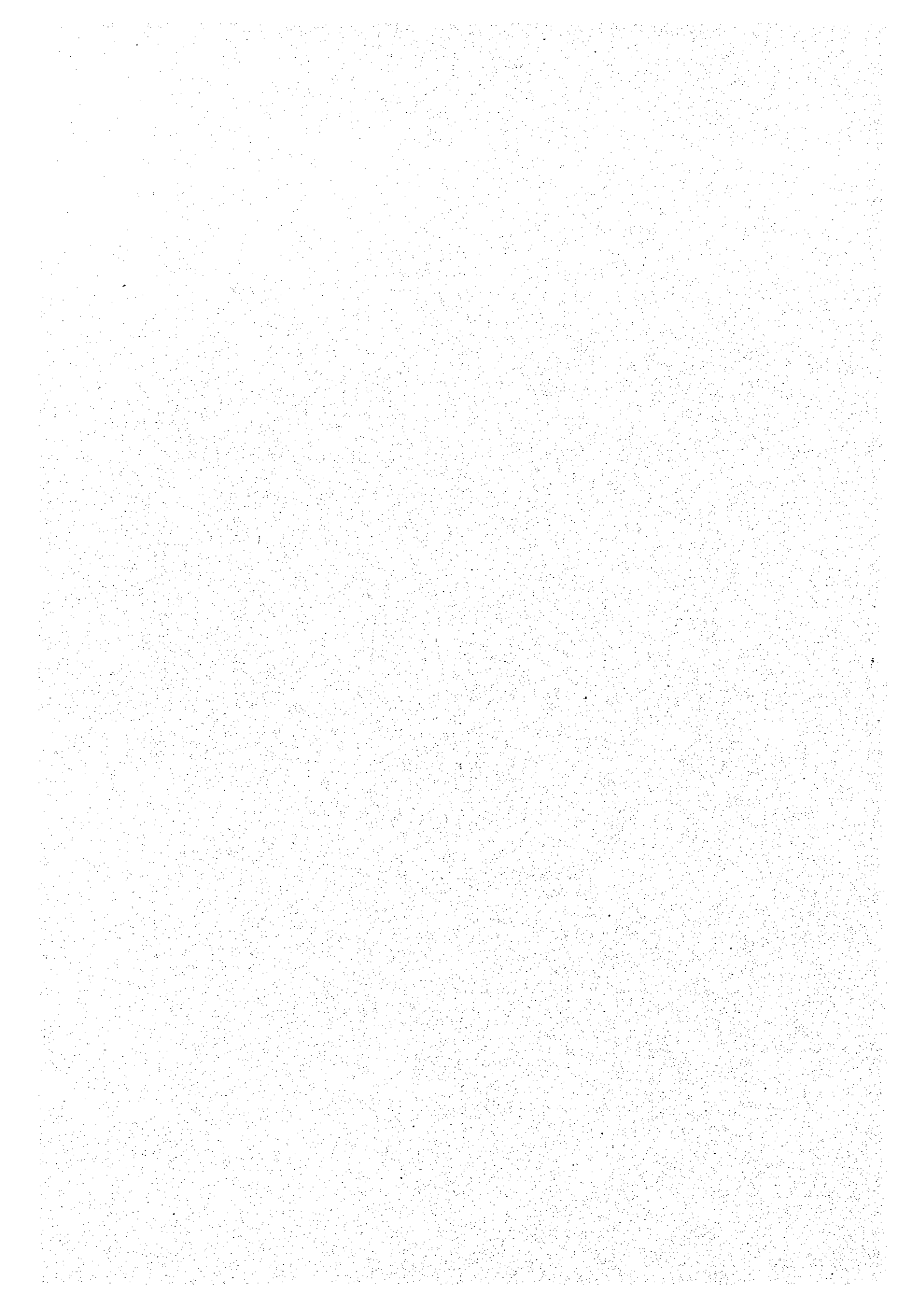
BANK EROSION

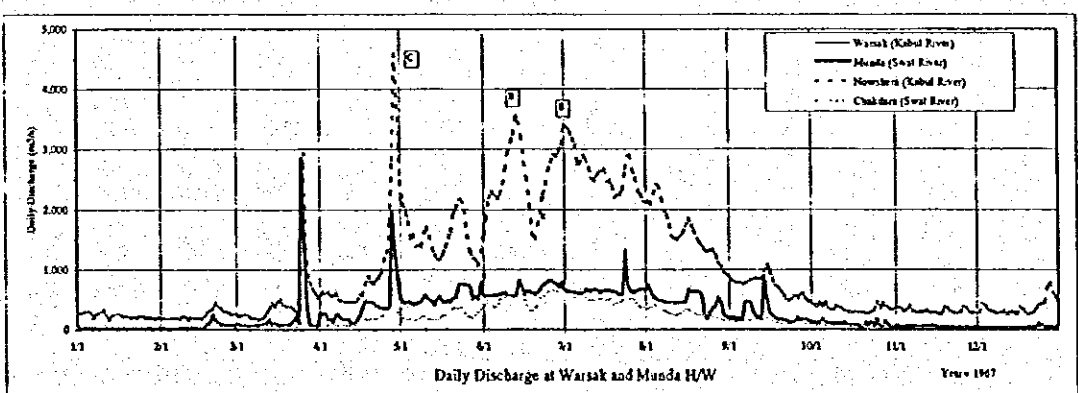
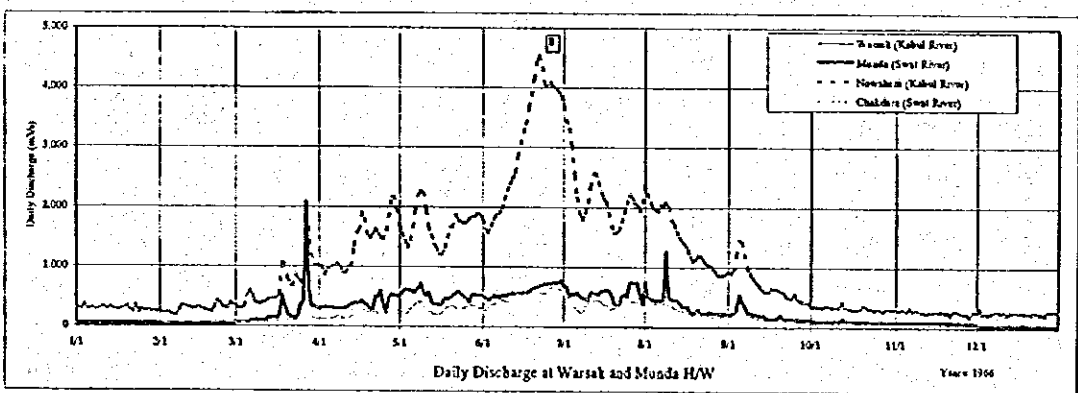
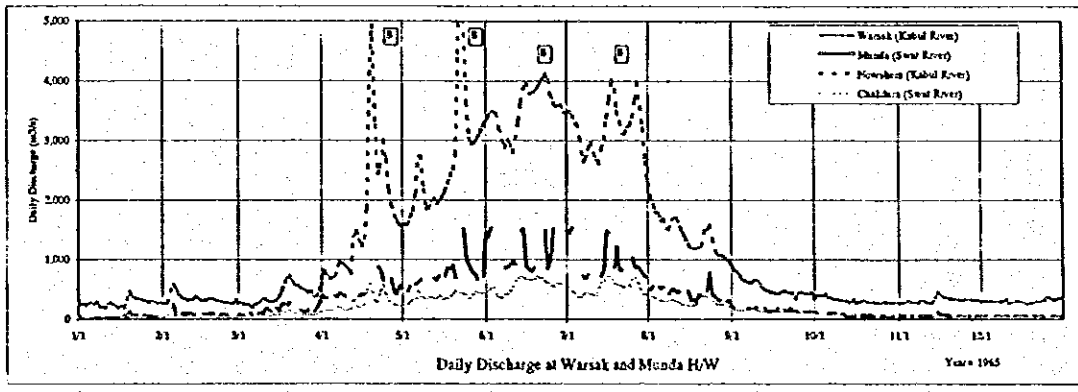
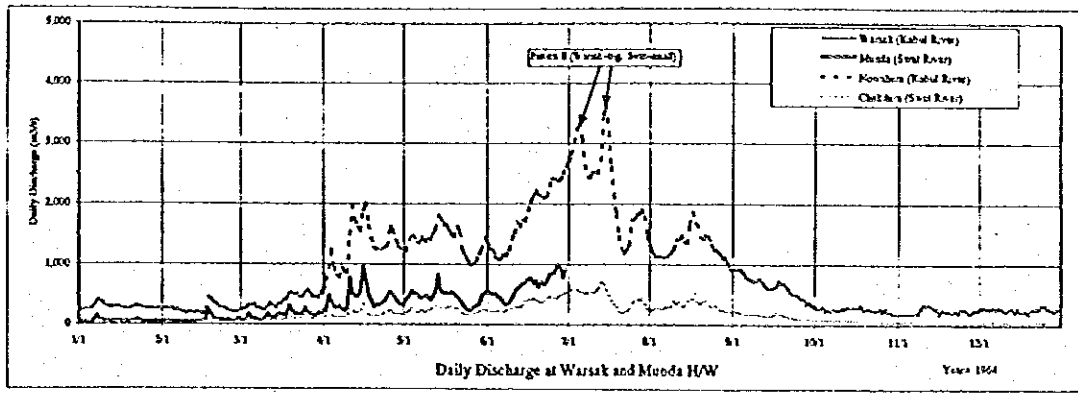
FLOOD PROTECTION SECTOR PROJECT
 PROPOSED SCHEMES SITE (1993)
 (Federal Flood Commission, GOP, ADB Loan)

FLOOD PROTECTION WORKS
 (Irrigation Department, GONWFP, ADB Loan, 1996)

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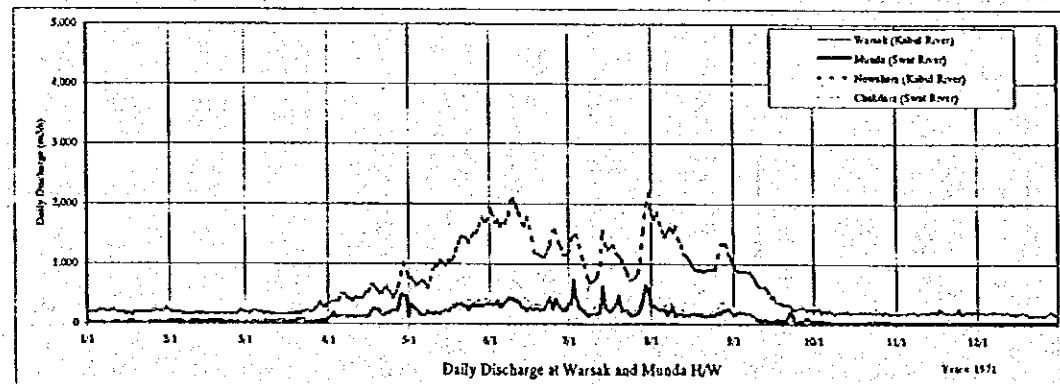
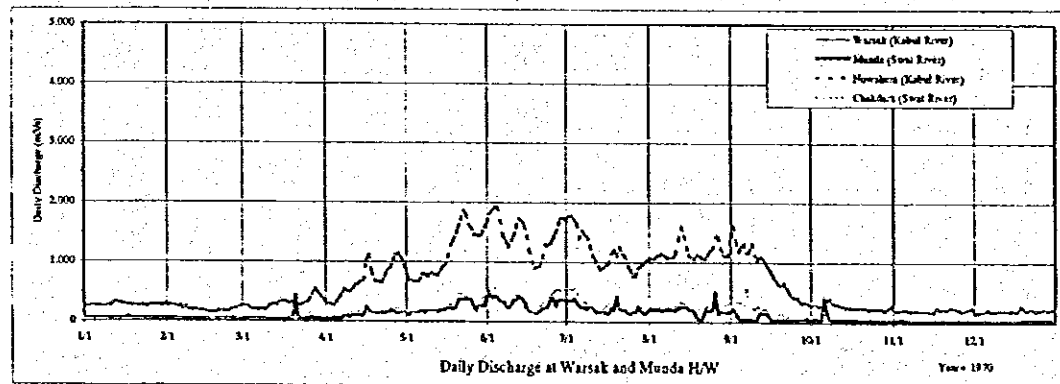
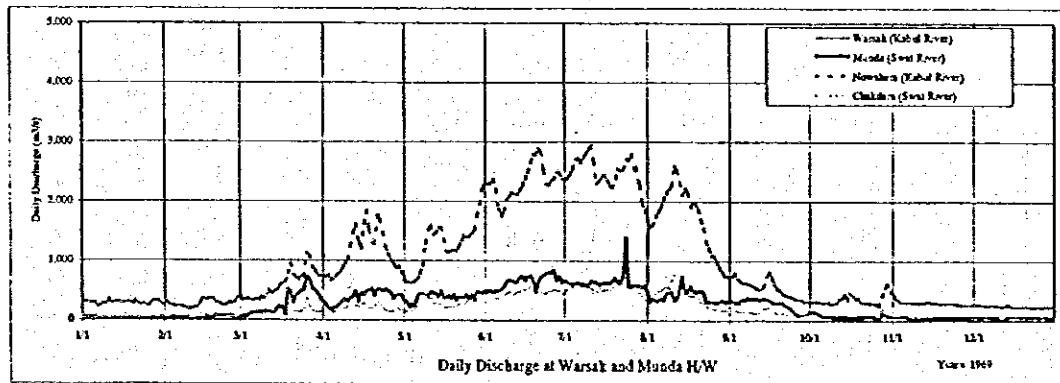
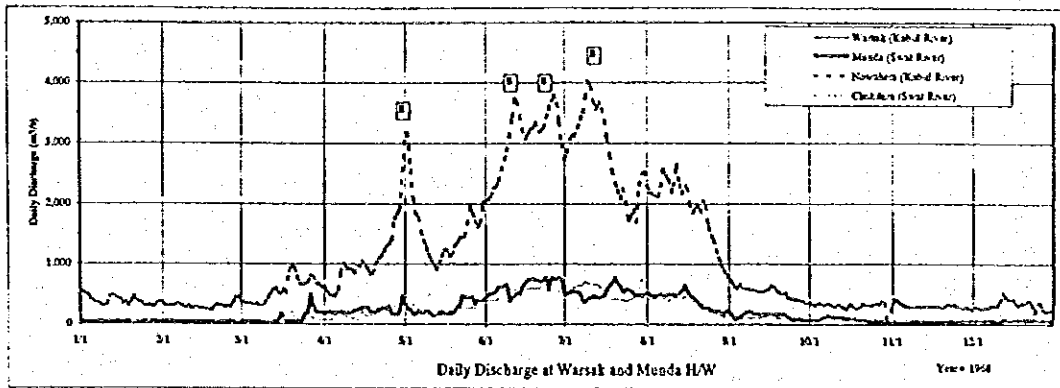
Figure F2.6
 Flood Protection Works
 (Completed as of Dec 31, 1997)





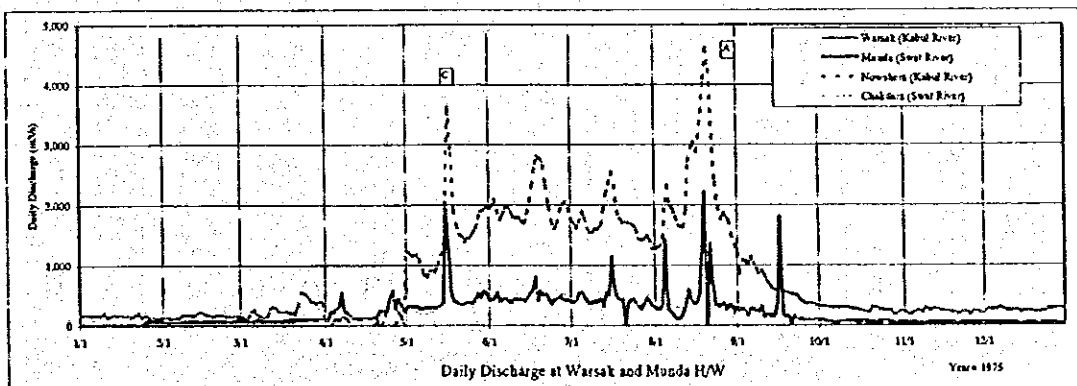
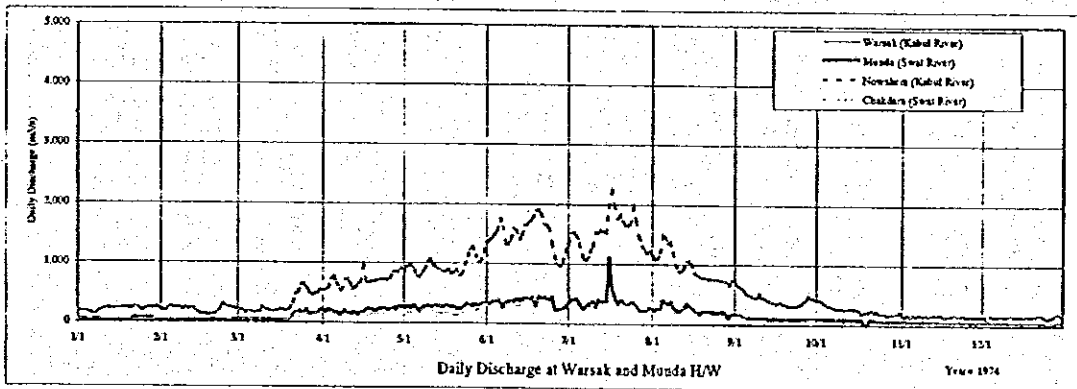
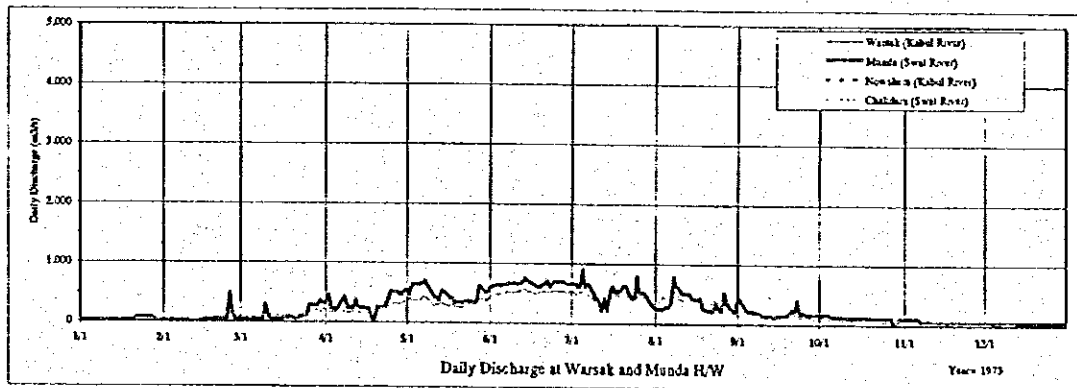
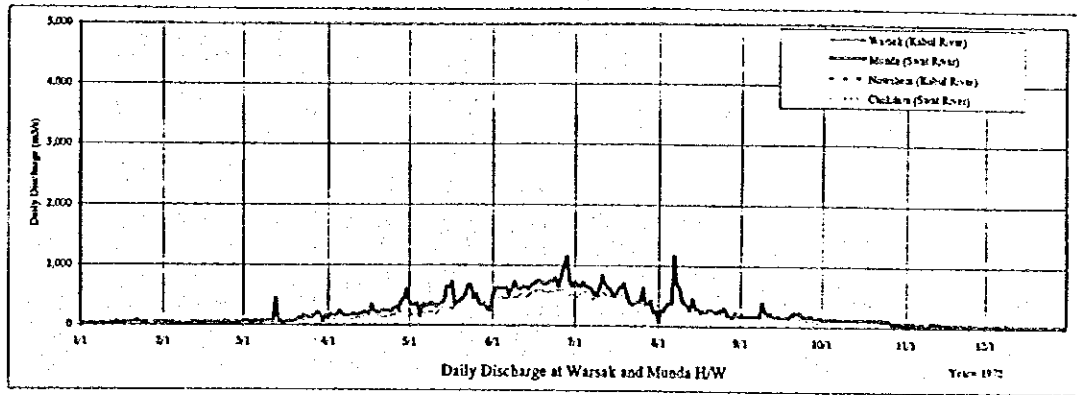
FEASIBILITY STUDY
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Figure F3.1
 Flood Hydrograph Type of Swat/Kabul River Flood
 1964-1967 (Over 3,200 m³/s at Nowshera Discharge)



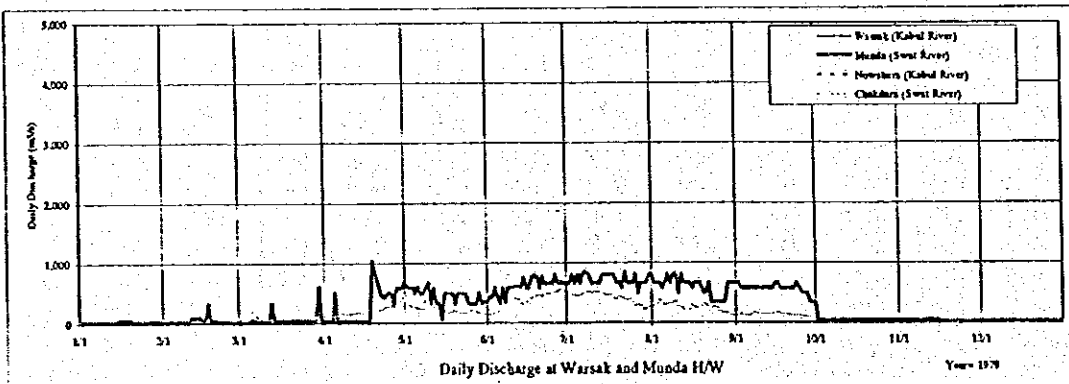
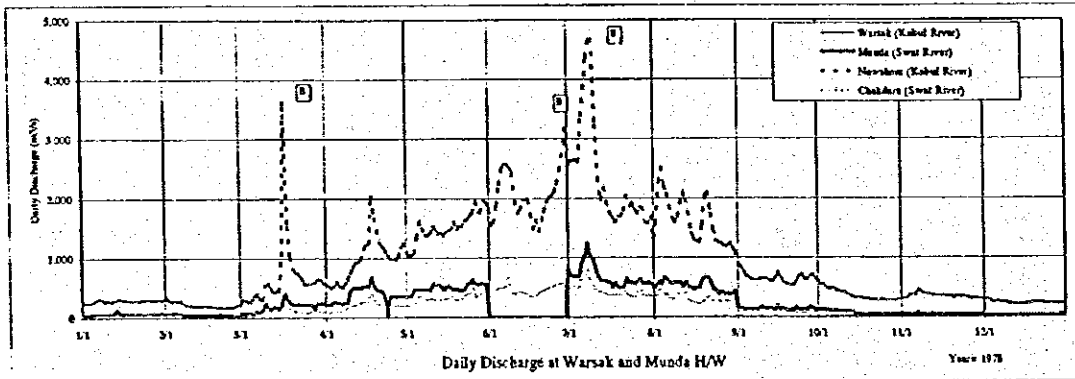
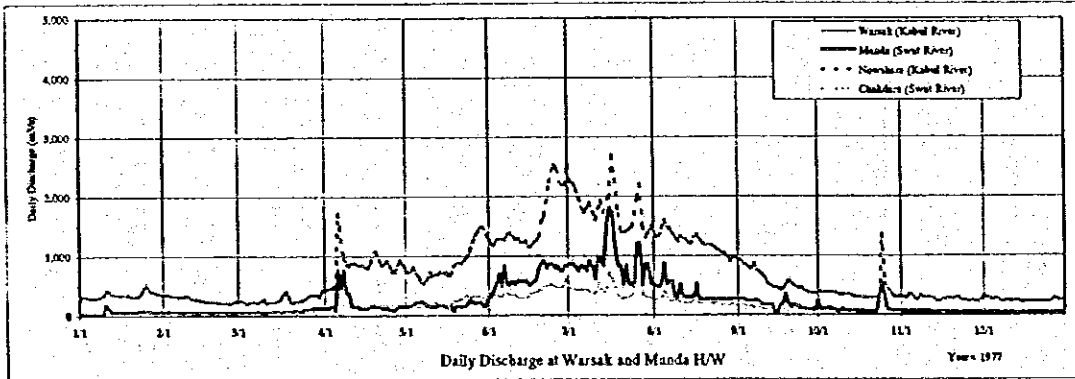
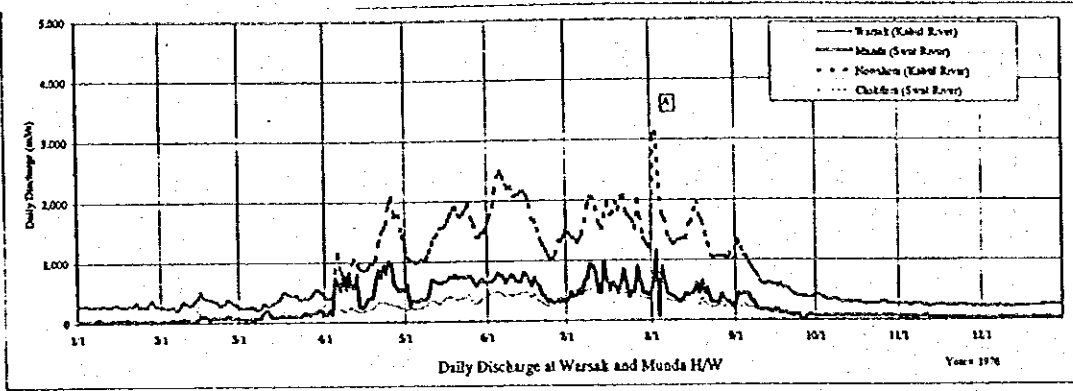
FEASIBILITY STUDY
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Figure F3.2
Flood Hydrograph Type of Swat/Kabul River Flood
1968-1971 (Over 3,200 m³/s at Nowshera Discharge)



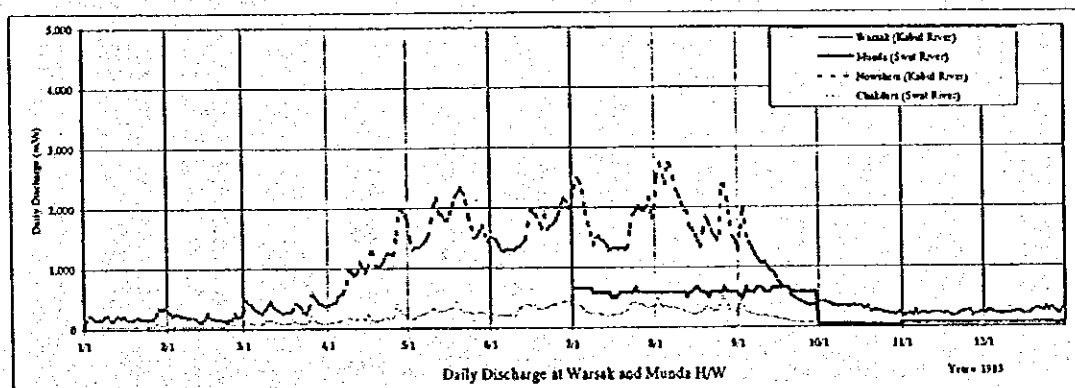
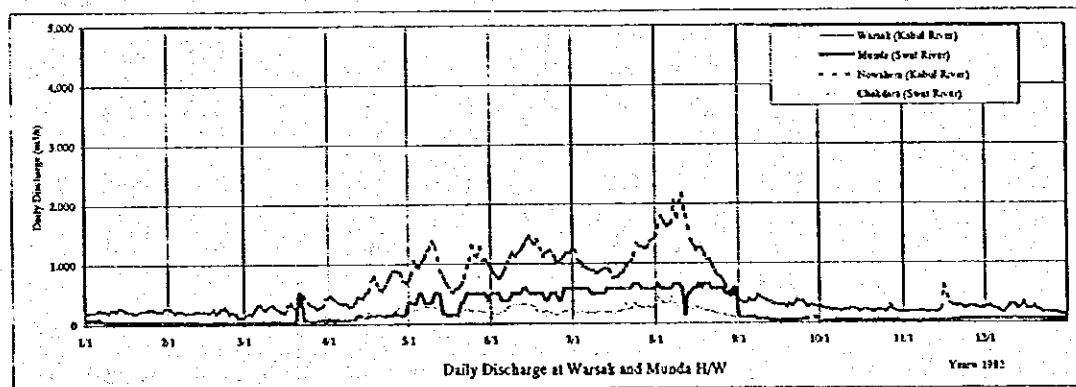
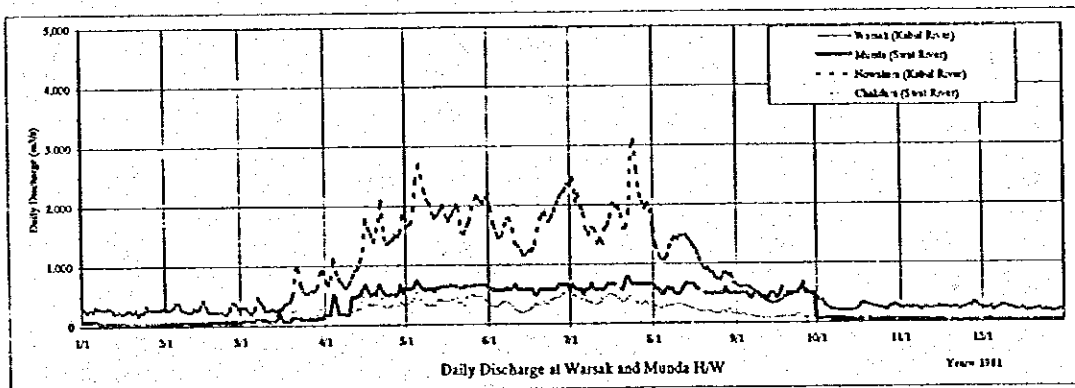
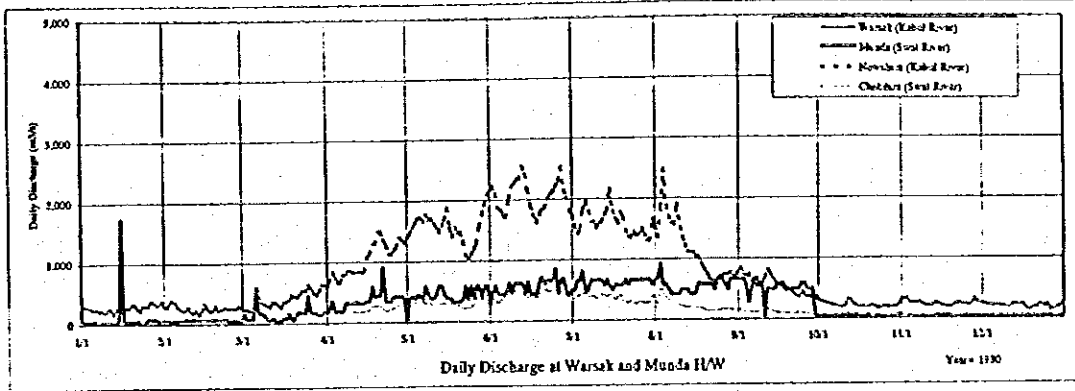
FEASIBILITY STUDY
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Figure F3.3
 Flood Hydrograph Type of Swat/Kabul River Flood
 1972~1975 (Over 3,200 m³/s at Nowshera Discharge)



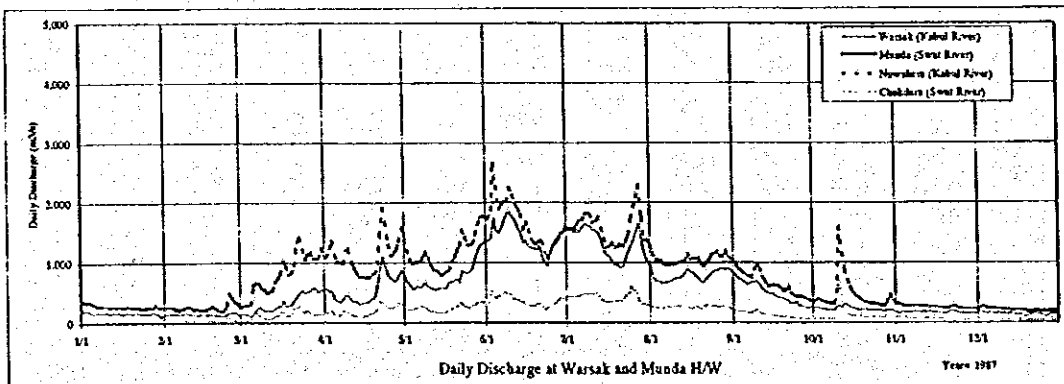
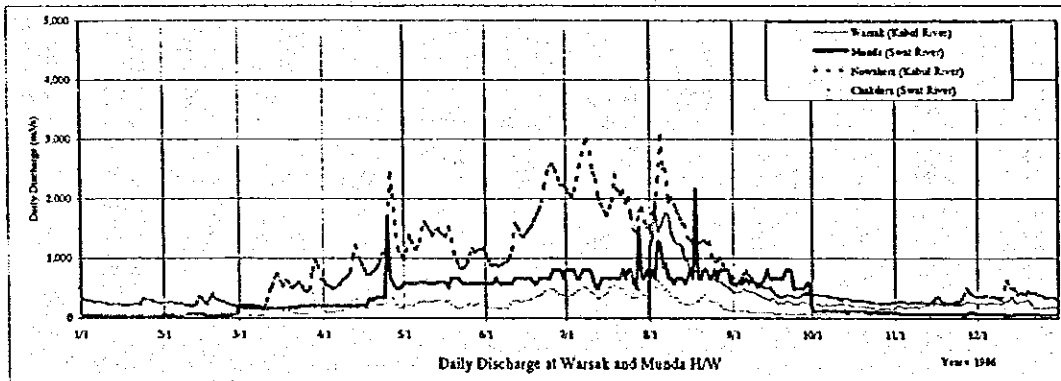
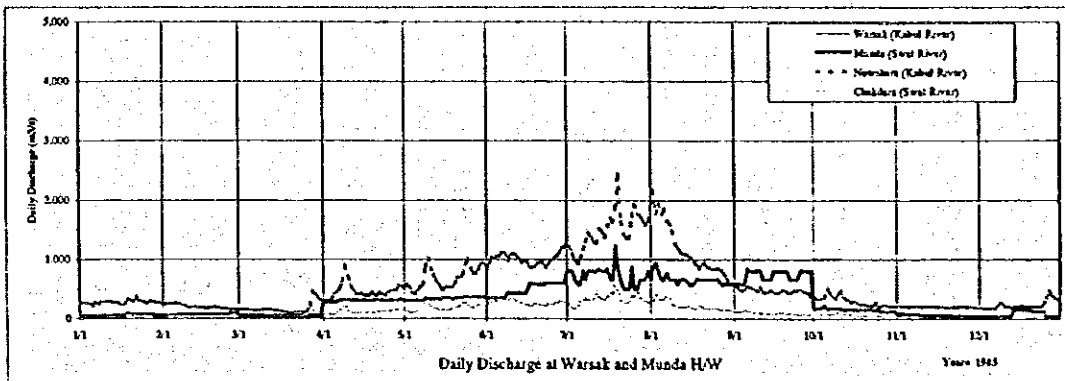
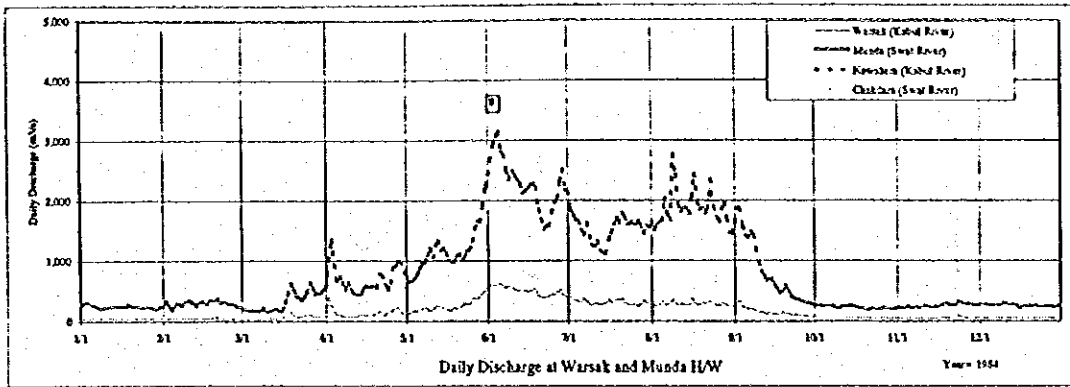
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Figure F3.4
Flood Hydrograph Type of Swat/Kabul River Flood
1976-1979 (Over 3,200 m³/s at Nowshera Discharge)



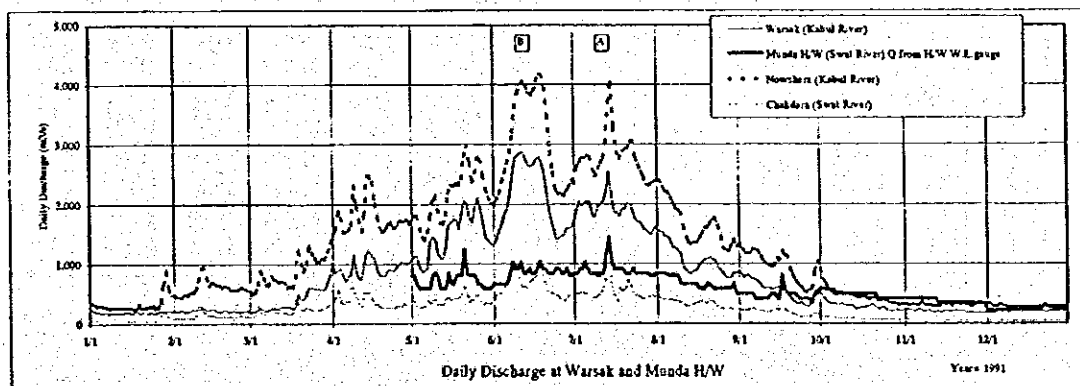
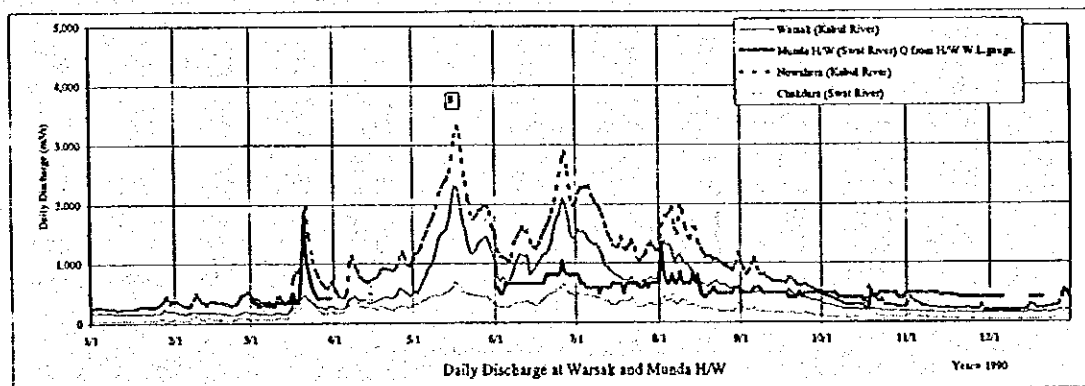
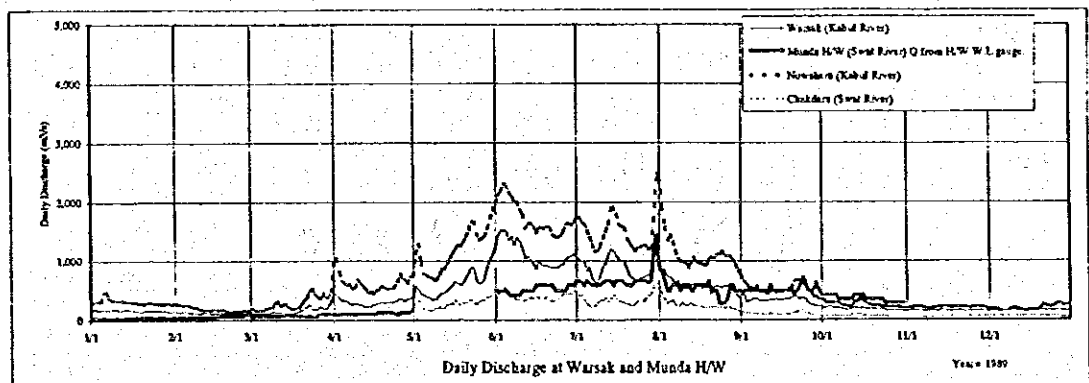
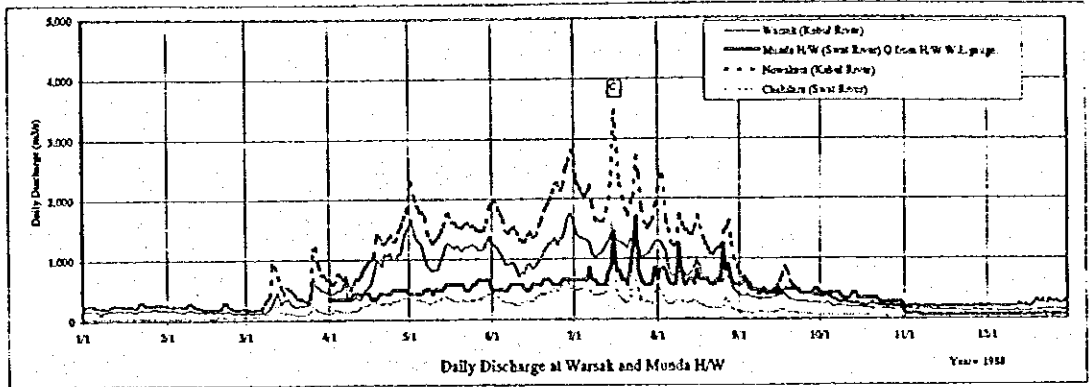
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Figure F3.5
Flood Hydrograph Type of Swat/Kabul River Flood
1980-1983 (Over 3,200 m³/s at Nowshera Discharge)



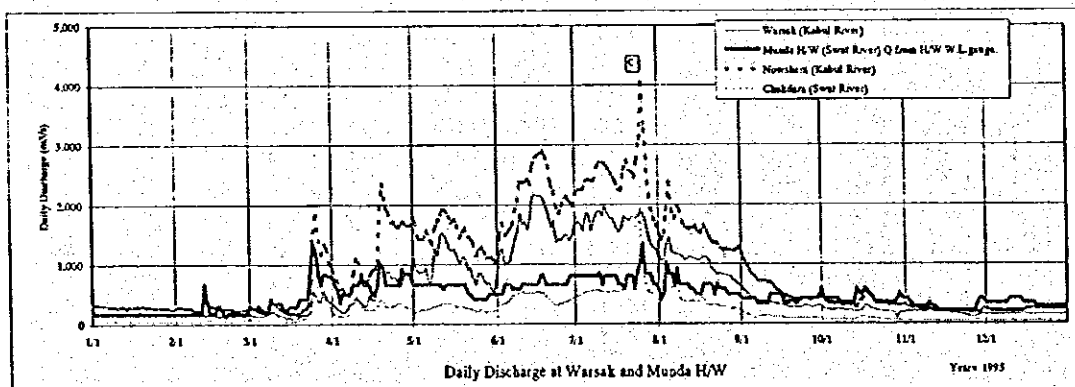
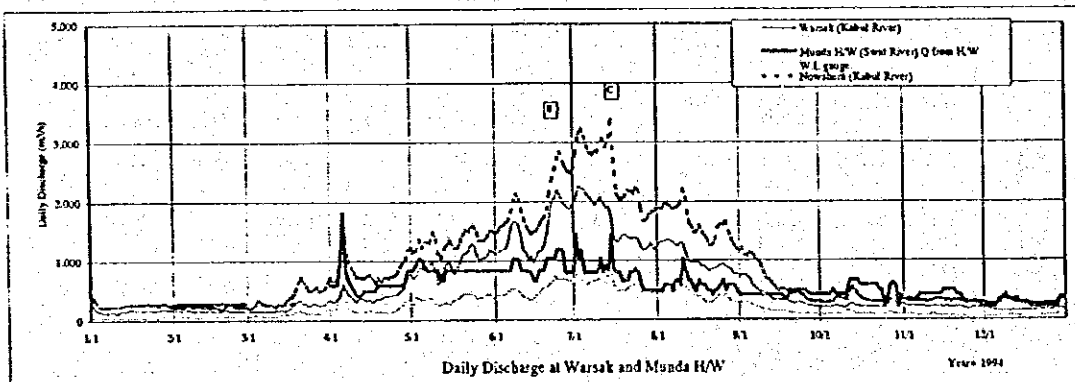
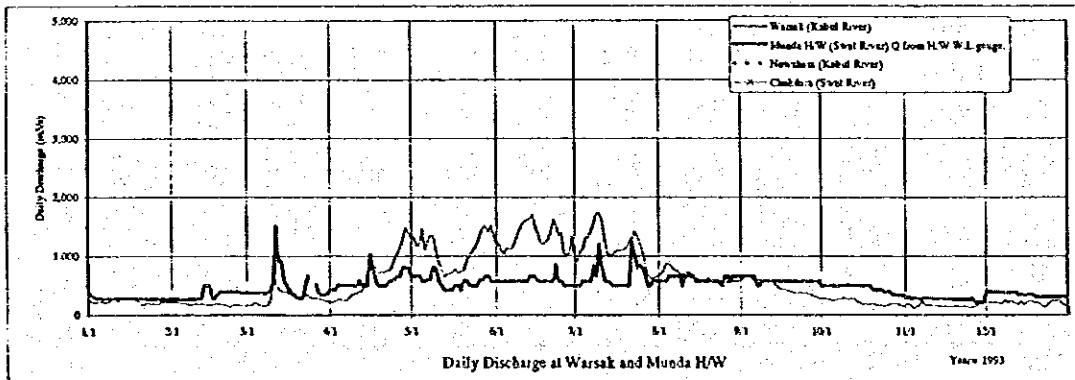
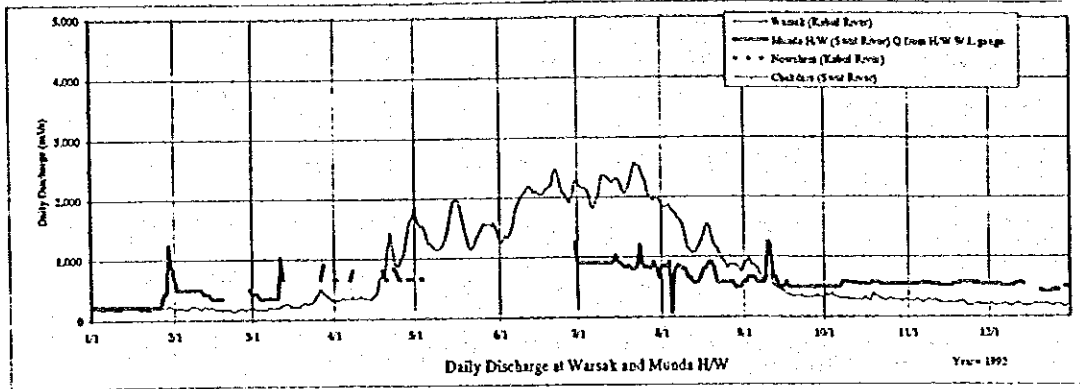
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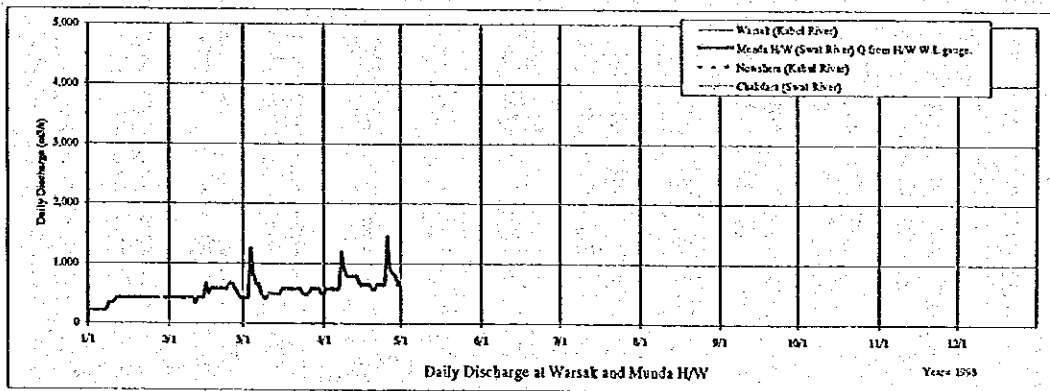
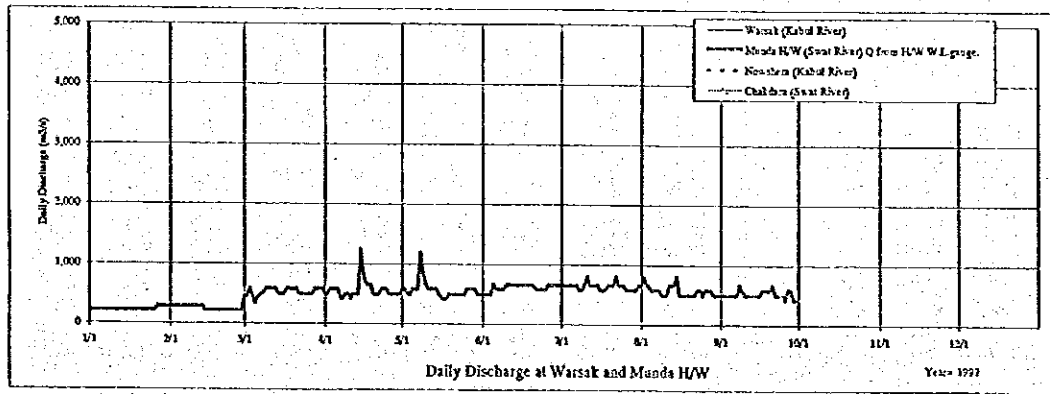
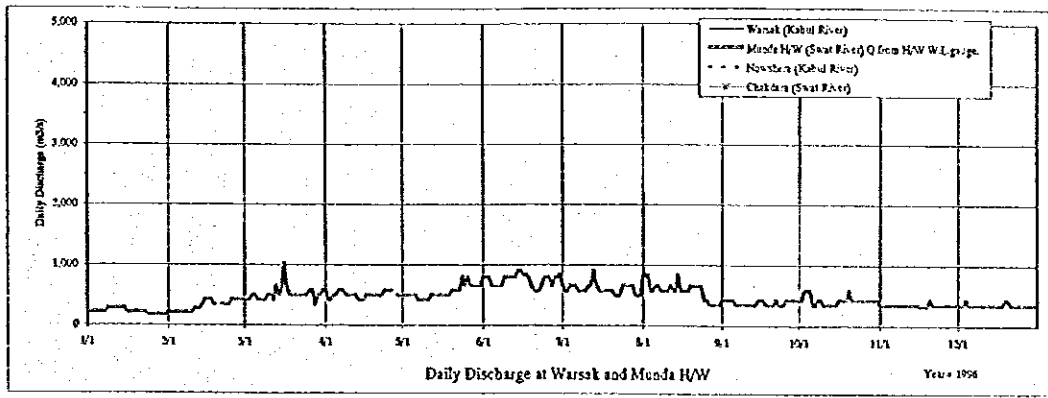
Figure F3.6
Flood Hydrograph Type of Swat/Kabul River Flood
1984-1987 (Over 3,200 m³/s at Nowshera Discharge)

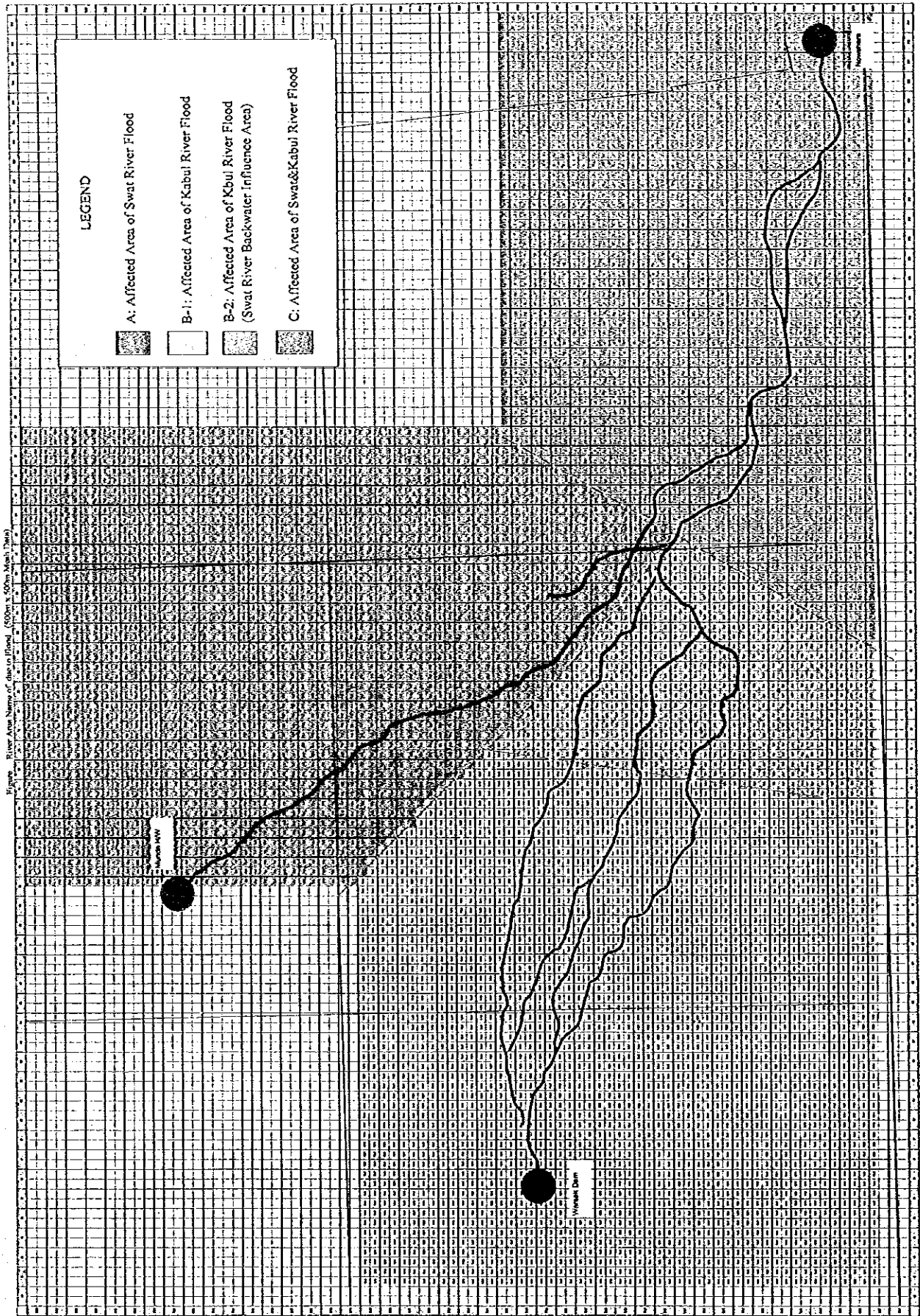


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Figure F3.7
 Flood Hydrograph Type of Swat/Kabul River Flood
 1988-1991 (Over 3,200 m³/s at Nowshera Discharge)

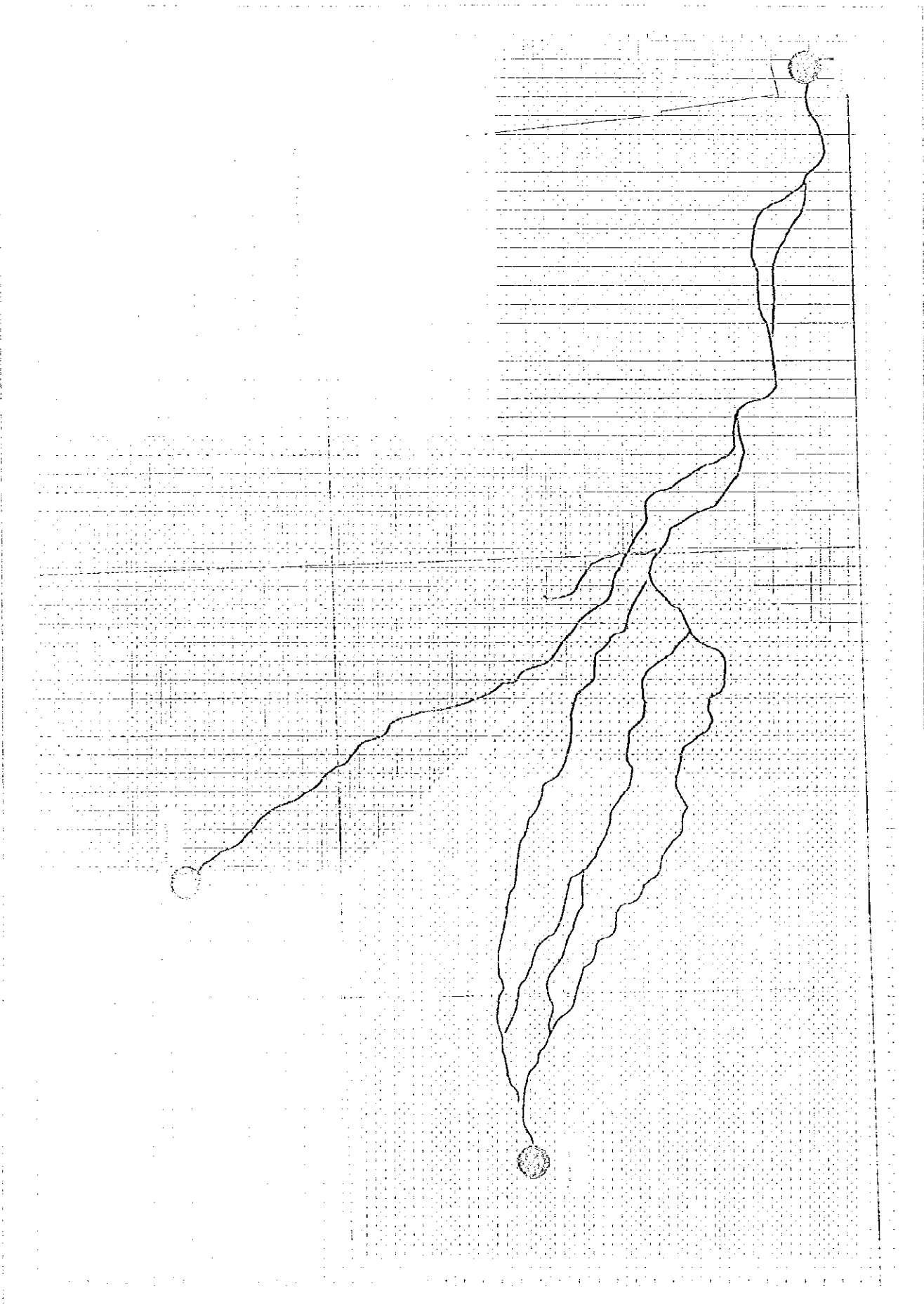






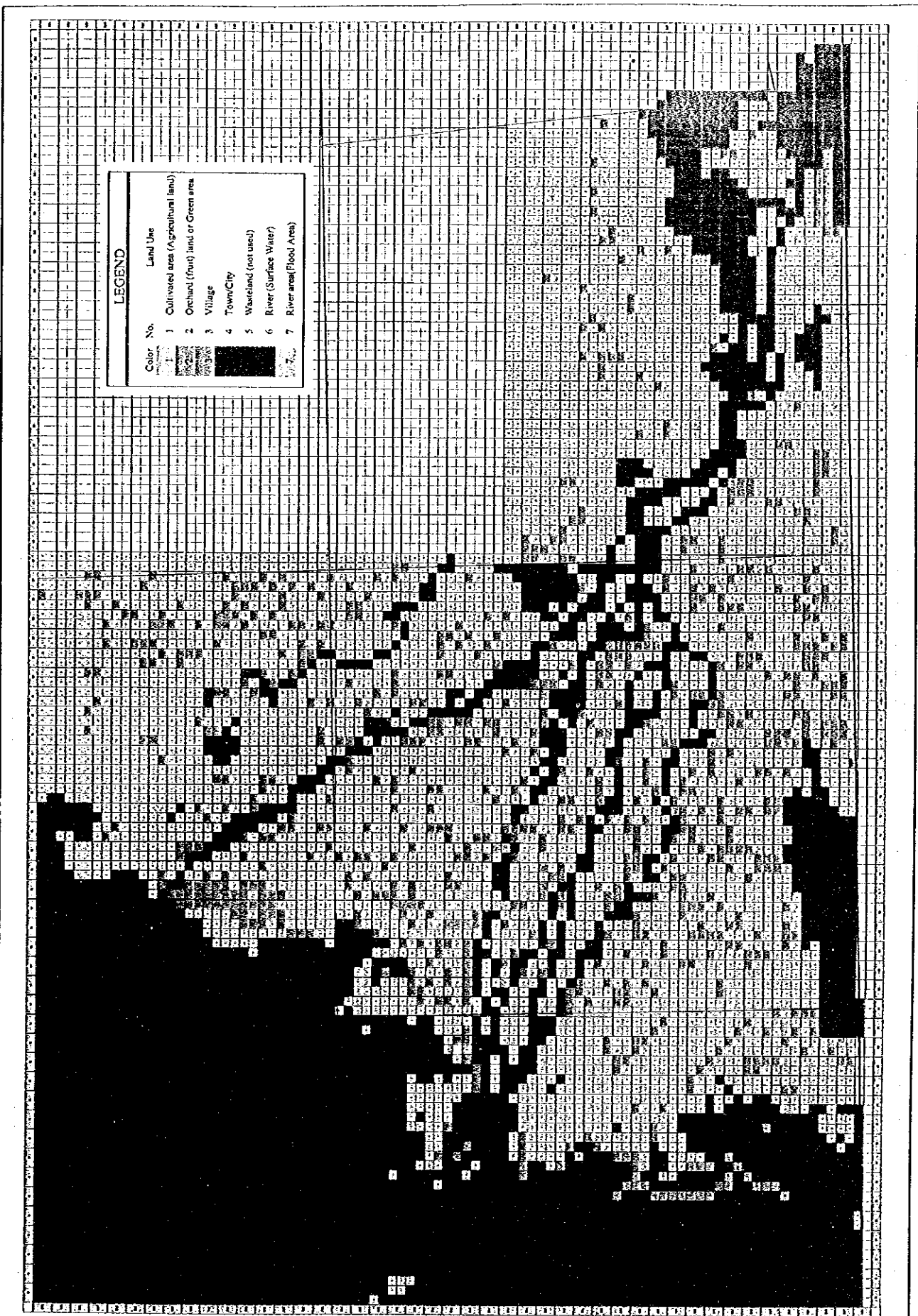
FEASIBILITY STUDY
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Figure F4.1
 Flood Affected Area of Swat/Kabul River Flood
 (500×500 m mesh)



FEASIBILITY STUDY
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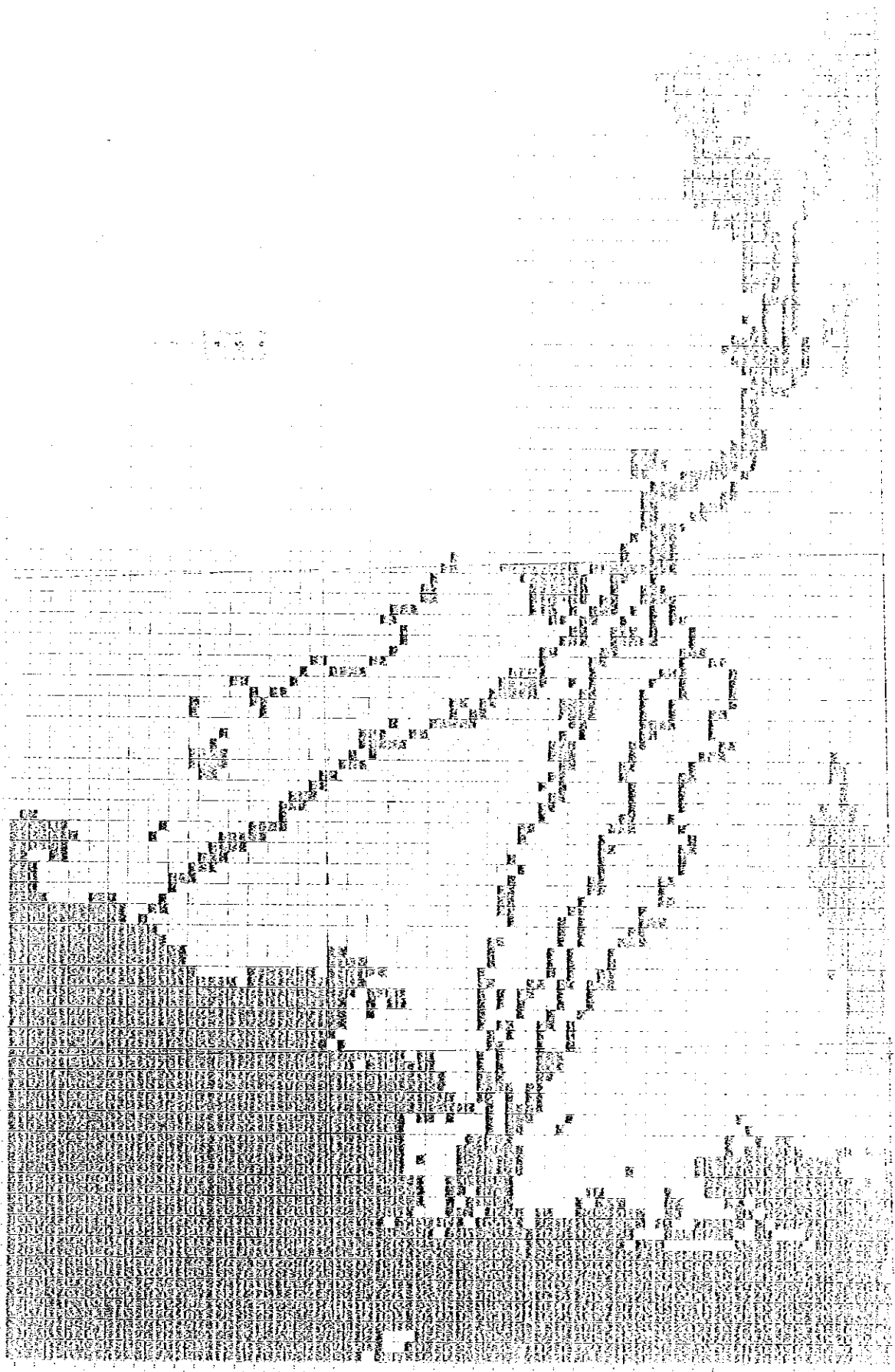
Figure F-4.1
 Flood Affected Area of Swat-Kabul River Flood
 (500 x 500 m mesh)



FEASIBILITY STUDY
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Figure F6.1

Land Use Mesh Map
 (500 x 500 m mesh)

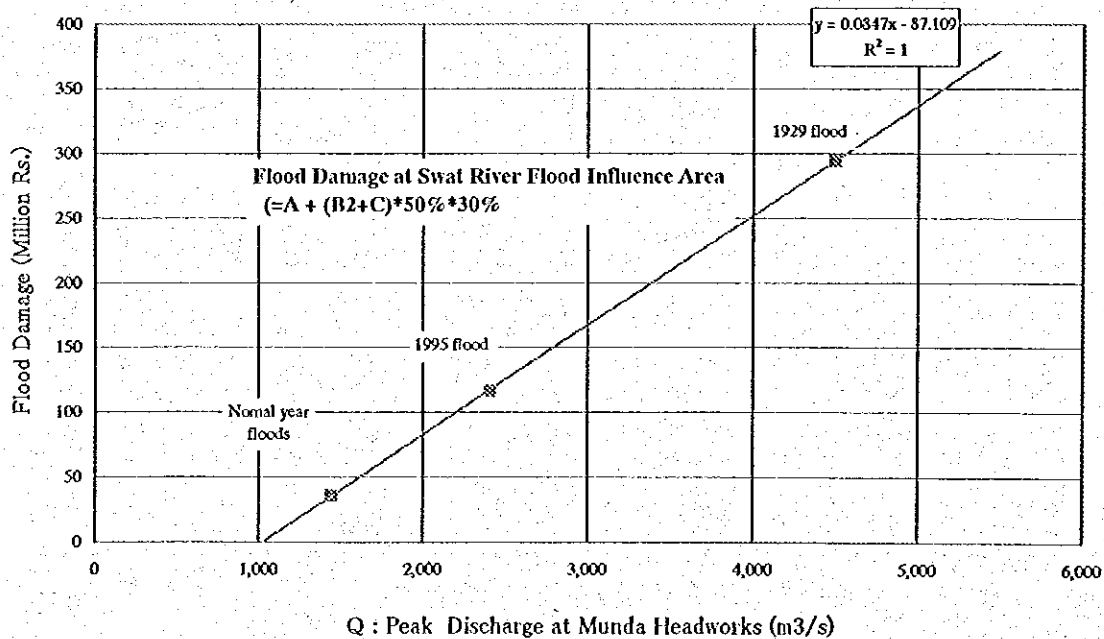


DISCHARGE and FLOOD DAMAGE RELATION OF SWAT RIVER FLOOD PLAIN

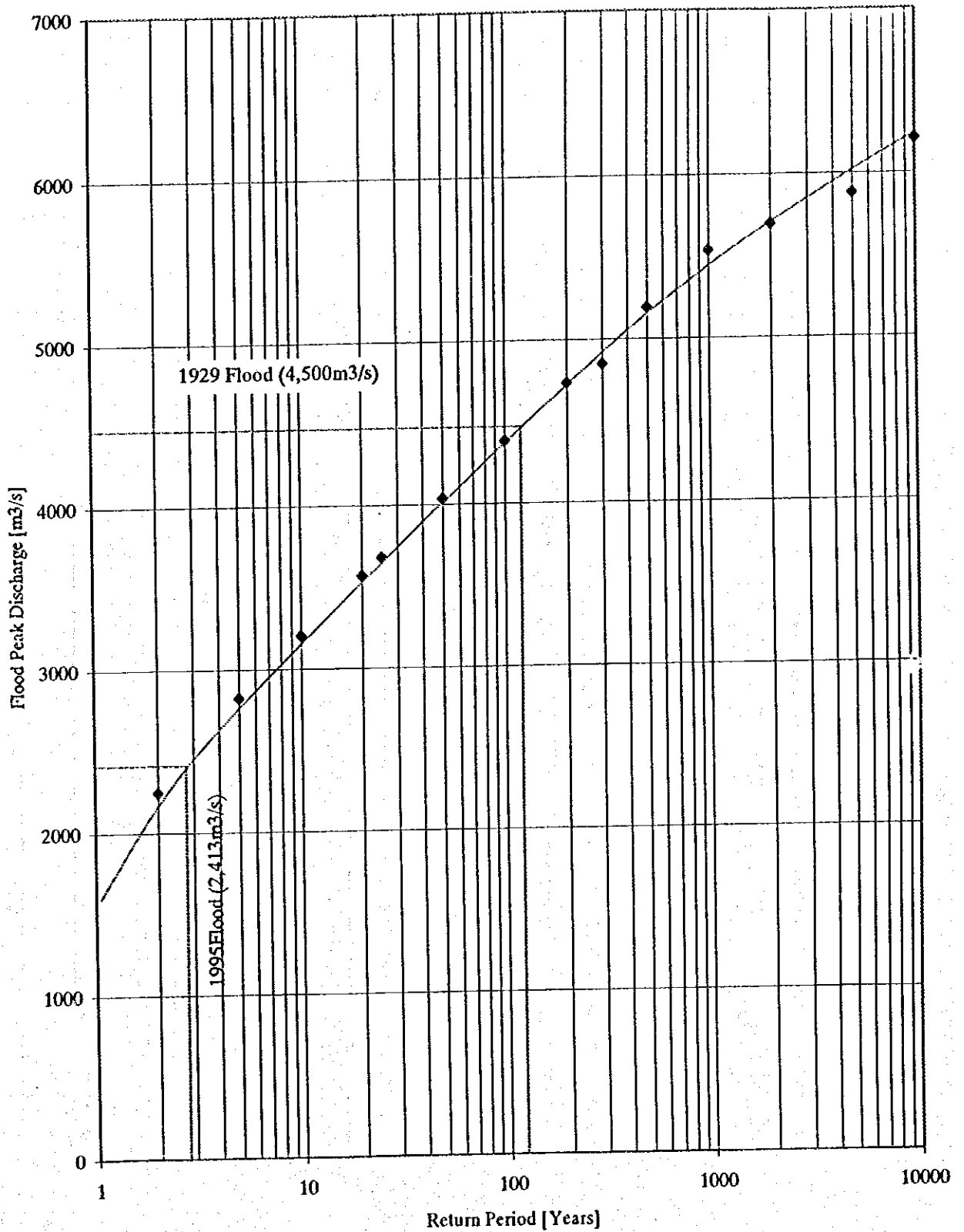
	River	Stretch	Flood Damage (Million Rs.)		
			Historical (Maximum) class Flood 1929/8/28	Midium class Flood (ex.1995/7/25)	Low class (Nomal year) Floods (ex.1989/7/31)
A	Swat	From MUNDA H/W to Swat-Kabul confluence	483.68	217.80	82.23
B1	Kabul	Kabul River from Warsak Dam to Influence line of Swat river backwater	789.66	456.57	86.04
B2	Kabul	Kabul River from Influence line of Swat river backwater to confluence	376.92	298.82	65.91
C	Kabul	Kabul River from Swat&Kabul confluence to Nowshera	294.31	116.54	35.53
Total Flood Damage (A+B1+B2+C)			1,944.56	1,089.72	269.70
Flood Damage at Swat River Flood Influence Area (=A+(B2+C)*0.5*0.3)			584.36	280.10	97.44

	Station	Peak discharge (m ³ /s)		
A	Swat at Munda H/W (Swat River)	4,500 ⁱⁱⁱ⁾	2,413 ⁱⁱ⁾	1,441 ⁱ⁾

*1) Source : Irrigation Dept. NWF.P., Q from observed water level at Munda Headworks.



FLOOD FREQUENCY AT MUNDA DAM SITE



FEASIBILITY STUDY
ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT
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Figure F7.2

Flood Frequency at Munda Dam Site

Restricted WL [El.m]= 576.0

Case No.	Flood Control Volume [x10 ⁶ m ³]	Total Annual Average Damage [x10 ⁶ Rs.]	Flood Control Benefit [x10 ⁶ Rs.]	Flood Control Benefit [x10 ⁶ US.\$]
1	0	48.223		
2	1	45.743	2.481	0.050
3	10	33.518	14.705	0.294
4	20	23.557	24.666	0.493
5	50	8.743	39.480	0.790
6	75	4.338	43.885	0.878
7	100	2.246	45.977	0.920
8	150	0.634	47.589	0.952
9	200	0.214	48.009	0.960
10	250	0.084	48.139	0.963
11	300	0.046	48.177	0.964

US \$1.0 (1999 price) = Rs.50.00

