

Table B3.17 Observed Mean Monthly Discharge at SGS 4F13 on the Tana Mainstream

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1962	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	136.7	147.4	135.0	-1.0
1963	125.3	65.9	86.1	1,269.7	1,988.5	674.5	257.5	153.3	71.6	66.6	580.9	1,138.7	542.6
1964	420.5	133.6	156.7	1,699.8	978.0	358.7	165.7	168.1	98.7	145.6	208.8	482.4	417.7
1965	254.2	108.4	-1.0	182.2	392.6	137.7	80.2	76.0	69.4	87.3	485.6	218.8	-1.0
1966	94.1	74.5	158.2	919.0	664.5	231.0	114.3	86.0	74.3	84.2	1,100.0	126.0	309.5
1967	78.3	59.6	55.1	149.1	795.8	292.9	183.2	135.4	117.0	110.6	593.2	334.4	243.0
1968	179.1	91.8	372.0	652.2	710.2	358.4	211.2	152.9	106.2	115.8	808.5	968.4	394.6
1969	236.4	164.8	190.5	159.8	353.9	158.6	128.8	122.3	109.1	109.3	185.4	131.8	171.1
1970	102.7	116.8	121.5	543.7	466.4	206.6	137.8	128.7	131.9	134.6	129.5	94.1	193.2
1971	72.2	54.0	51.3	436.8	585.5	175.8	123.5	134.5	126.9	124.8	155.5	94.9	178.5
1972	178.6	55.9	81.3	87.4	228.4	185.3	117.6	121.4	94.6	286.0	764.6	254.7	204.6
1973	164.6	141.3	76.9	174.6	189.4	166.2	120.6	123.1	108.5	113.4	169.7	115.7	138.5
1974	63.8	46.3	119.7	332.3	223.9	154.2	269.6	151.2	136.2	112.8	182.7	117.8	159.7
1975	104.3	83.6	51.0	287.0	223.3	135.9	143.1	136.1	105.2	120.0	143.3	109.0	136.9
1976	95.4	81.9	70.4	128.1	139.9	161.1	78.4	80.2	47.8	52.5	151.6	166.6	104.4
1977	120.6	115.1	97.4	634.6	769.8	243.5	134.8	90.6	125.2	91.4	641.1	249.2	276.0
1978	215.6	162.9	409.1	1,029.0	690.1	260.0	182.6	135.3	121.5	190.1	310.8	336.2	337.3
1979	198.4	289.4	256.9	532.0	607.9	512.3	321.0	230.5	132.9	107.3	324.7	136.1	303.5
1980	115.2	94.0	79.0	113.1	315.1	156.1	105.5	104.0	97.4	82.2	190.2	113.7	130.6
1981	119.4	97.8	163.1	300.3	497.4	291.0	212.6	179.5	124.3	171.4	168.2	121.0	204.5
1982	112.9	112.5	-1.0	-1.0	522.7	382.3	142.9	122.8	-1.0	333.6	551.8	428.0	-1.0
1983	166.7	118.7	116.2	195.9	425.8	176.2	142.0	112.0	112.5	124.9	142.5	176.2	168.0
1984	122.7	112.0	109.7	164.4	114.6	96.8	94.7	82.1	97.0	165.2	252.0	154.2	130.3
1985	119.5	141.0	134.8	300.0	238.0	173.4	147.7	129.2	124.9	119.8	-1.0	-1.0	-1.0
1986	123.7	122.1	111.0	249.4	210.6	179.0	149.0	125.6	101.9	110.4	244.5	156.9	156.9
1987	142.1	123.5	114.6	151.4	140.3	131.5	119.8	117.6	74.0	-1.0	95.9	86.9	-1.0
1988	116.0	107.9	110.0	577.6	361.1	154.2	123.0	114.1	90.3	234.5	444.8	350.1	231.7
1989	-1.0	-1.0	160.3	337.2	196.3	147.6	113.0	95.8	98.2	163.6	303.4	412.6	-1.0
1990	303.2	146.4	363.4	642.0	386.7	179.8	140.9	135.3	90.7	185.5	233.9	197.0	250.9
MEAN	153.5	111.8	146.8	453.8	479.2	231.5	152.2	126.6	103.3	138.6	346.8	264.5	226.0

Table B3.18 Observed Mean Monthly Discharge at SGS 4BE2 Head Capital on the Tana Mainstream

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1958	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	4.2	5.9	-1.0
1959	20.4	28.0	26.6	57.7	128.7	64.8	40.0	37.3	42.3	31.7	44.7	40.9	47.0
1960	29.4	26.1	30.5	74.3	87.3	46.5	34.6	28.4	30.0	42.2	79.5	37.2	45.5
1961	25.4	25.0	22.5	43.1	108.2	38.7	37.3	53.3	60.6	230.7	419.5	213.7	106.8
1962	124.5	55.6	43.8	69.3	206.6	70.0	45.4	40.6	41.7	47.7	48.6	49.5	70.5
1963	51.0	36.2	39.0	181.2	288.5	124.7	57.8	45.8	34.8	33.4	55.2	119.2	89.2
1964	61.3	34.4	39.2	218.0	295.1	79.2	47.6	54.9	40.4	50.2	60.9	81.8	88.8
1965	51.8	33.0	29.1	48.2	97.6	42.6	32.4	28.9	25.0	36.0	145.8	68.6	53.3
1966	37.2	30.4	41.1	186.7	148.4	71.7	45.5	36.1	33.2	31.8	107.0	39.1	67.3
1967	27.6	23.7	21.7	51.4	252.3	105.9	58.5	50.1	43.3	87.5	159.9	95.0	81.8
1968	43.4	44.7	89.0	182.4	203.8	124.1	67.9	53.7	34.1	43.6	139.2	169.8	99.7
1969	53.9	44.0	51.4	41.5	115.5	45.6	32.5	31.3	29.6	27.1	37.0	29.9	45.0
1970	34.4	29.1	35.0	142.9	143.1	70.6	41.8	36.3	31.8	36.0	38.8	22.9	53.3
1971	22.9	19.0	14.9	44.9	143.8	58.4	42.3	41.2	32.8	30.7	30.4	32.8	43.0
1972	30.2	41.9	25.3	25.7	85.0	77.9	38.9	34.5	29.2	72.1	175.5	77.0	59.3
1973	50.2	38.0	25.2	53.7	80.7	59.6	37.2	36.3	32.7	38.3	67.2	36.4	46.3
1974	23.2	18.2	20.4	92.4	74.4	60.1	75.5	46.6	42.2	35.6	59.6	34.8	48.7
1975	22.2	17.2	16.0	42.9	66.1	42.9	35.9	35.0	34.3	52.6	48.1	38.0	37.7
1976	25.4	20.9	19.4	36.2	60.8	40.2	34.5	-1.0	27.1	30.9	34.7	43.5	-1.0
1977	37.9	27.1	29.6	190.2	272.6	80.9	46.7	37.7	29.8	37.1	144.9	77.9	84.5
1978	55.7	43.5	106.8	282.6	208.0	68.1	47.4	39.7	34.8	48.0	73.1	61.3	89.2
1979	45.5	75.8	59.8	140.1	227.8	182.9	74.6	47.0	35.5	45.1	67.6	39.9	86.7
1980	27.0	24.1	24.2	43.4	127.9	58.7	45.1	39.6	33.6	36.9	123.2	70.0	54.5
1981	47.8	51.8	132.0	302.7	543.5	-1.0	8.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
MEAN	41.2	34.2	41.0	110.9	172.4	73.4	44.7	40.7	35.4	51.1	94.1	64.6	67.1

Note

-1.00 means that data are not available.

Table B3.21 Observed Mean Monthly Discharge at SGS 4DD1 on the Thiba River

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1947	-1.00	-1.00	13.95	33.69	126.13	92.00	54.02	-1.00	-1.00	21.46	22.28	13.18	-1.00
1948	8.80	6.23	6.30	22.15	30.67	29.19	20.58	18.93	14.67	21.55	22.84	16.35	18.21
1949	9.42	6.72	4.54	10.21	9.96	8.43	8.46	9.52	7.33	9.99	10.87	9.52	8.76
1950	8.03	8.54	9.88	49.84	38.59	30.00	24.78	30.51	30.88	18.41	18.95	15.46	23.68
1951	7.67	7.39	8.33	98.36	134.58	65.15	-1.00	32.81	21.00	29.50	44.38	38.71	-1.00
1952	24.08	15.21	9.53	14.69	46.49	26.81	17.26	19.93	21.39	24.70	19.37	15.70	21.30
1953	10.40	7.18	5.99	10.07	27.90	20.98	13.51	17.64	13.93	29.87	36.73	-1.00	-1.00
1954	-1.00	9.35	7.53	23.75	90.82	56.40	35.27	27.38	22.31	22.40	20.80	24.51	-1.00
1955	14.82	11.78	8.68	18.57	39.64	30.81	18.65	21.63	16.81	21.08	20.77	15.28	19.92
1956	20.48	13.87	10.04	40.21	72.79	48.89	30.44	26.61	21.42	24.26	20.62	14.92	28.75
1957	10.54	11.18	8.06	47.92	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
1958	-1.00	-1.00	12.61	21.77	67.68	60.06	35.72	24.40	15.69	13.94	16.91	12.06	-1.00
1959	8.46	7.99	6.68	18.84	40.49	22.58	18.36	16.24	18.03	12.96	14.90	12.42	16.54
1960	8.41	7.45	9.87	22.45	33.57	20.98	13.24	8.65	8.13	18.27	28.39	13.70	16.10
1961	6.73	4.89	7.76	18.07	29.84	13.85	21.47	19.04	34.43	142.38	267.17	82.51	54.09
1962	45.42	24.39	16.99	19.90	53.67	24.18	16.85	16.05	17.11	18.44	16.78	13.94	23.68
1963	12.52	9.18	10.11	77.29	125.03	52.42	27.01	16.21	13.45	10.56	15.19	25.94	33.03
1964	13.73	9.10	15.12	61.47	48.29	34.32	17.70	19.27	14.55	23.71	19.57	19.59	24.70
1965	15.66	10.75	9.49	19.21	19.71	18.74	9.83	13.12	8.04	15.06	35.58	24.42	16.64
1966	14.46	11.16	15.15	47.10	46.50	30.31	18.70	14.58	15.86	19.10	65.71	8.36	25.55
1967	8.44	8.65	7.72	20.73	185.49	85.79	31.13	24.94	26.21	41.69	63.49	26.11	44.44
1968	16.05	15.06	21.87	44.62	64.28	61.74	37.07	29.91	20.26	22.89	62.57	36.85	36.09
1969	25.44	32.68	20.70	27.35	22.27	16.59	11.31	13.01	17.41	15.94	13.00	14.32	19.06
1970	12.29	10.52	10.91	89.43	65.87	27.99	16.90	15.90	16.09	15.69	16.24	11.63	25.79
1971	9.43	6.97	5.76	18.70	38.53	24.99	19.38	17.19	13.13	11.49	10.65	9.93	15.57
1972	9.64	11.60	7.58	7.46	27.75	25.03	13.48	9.88	7.84	-1.00	-1.00	-1.00	-1.00
MEAN	13.95	11.16	10.43	33.99	59.46	37.13	22.13	19.30	17.33	25.22	36.82	20.67	25.69

Table B3.22 Observed Mean Monthly Discharge at SGS 4ED3 on the Tana Mainstream

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1951	33.51	-1.00	35.81	314.69	249.06	212.20	99.26	84.28	62.06	95.15	232.33	218.30	-1.00
1952	115.11	56.74	35.90	61.47	209.76	86.78	56.19	52.61	49.93	65.76	79.34	55.93	77.32
1953	33.46	21.15	21.72	39.28	123.00	71.63	39.92	42.64	35.78	75.16	87.68	74.79	55.77
1954	42.74	26.15	18.34	107.02	308.72	197.79	96.17	78.77	60.25	54.92	62.92	75.44	94.52
1955	37.64	35.07	25.77	51.74	99.70	68.90	44.13	50.26	49.66	61.46	65.54	63.59	54.56
1956	106.82	66.90	43.31	198.93	285.81	147.25	79.24	66.28	56.99	53.00	92.49	60.04	104.75
1957	41.39	39.72	33.50	123.24	365.30	184.71	86.03	66.13	55.23	58.50	101.24	99.72	104.97
1958	72.43	62.99	58.45	92.44	393.07	214.32	146.45	103.67	65.08	56.00	67.06	74.49	117.73
1959	52.99	34.55	31.51	69.67	197.68	113.21	65.66	60.33	66.64	45.09	70.77	62.84	72.81
1960	36.10	30.39	38.64	115.26	142.87	73.66	48.91	34.69	34.17	52.13	122.73	55.73	65.40
1961	29.26	23.30	22.51	61.20	162.63	57.58	58.13	73.92	96.66	372.16	1,129.78	-1.00	-1.00
1962	-1.00	89.41	81.53	117.89	369.12	128.58	86.74	72.48	73.88	83.66	79.18	84.05	-1.00
1963	83.06	54.17	60.12	330.47	577.32	246.79	114.60	85.91	56.55	48.47	96.48	213.63	164.66
1964	114.25	57.75	71.23	368.62	332.55	155.83	90.63	99.45	71.89	94.18	102.53	140.70	141.72
1965	92.21	53.31	41.85	90.17	187.50	88.17	54.85	44.40	35.31	55.38	228.30	120.54	91.10
1966	66.49	47.00	71.10	305.14	297.17	142.47	86.55	60.77	53.91	50.40	220.91	76.05	123.16
1967	42.07	31.15	29.02	74.62	492.72	211.62	127.95	99.85	94.14	156.96	274.47	171.21	151.32
1968	76.80	69.86	172.11	324.20	371.60	246.64	138.36	104.46	73.29	76.96	313.67	417.79	199.07
1969	112.48	89.22	103.13	72.20	204.55	84.30	52.43	62.09	54.76	43.33	68.85	47.02	82.95
1970	54.57	45.01	54.87	276.63	282.56	153.09	83.83	69.77	58.89	61.06	71.21	43.77	104.71
1971	32.33	21.68	18.16	96.45	288.28	129.69	86.97	78.18	54.96	45.73	47.24	54.45	79.96
1972	45.96	61.47	36.31	35.43	141.56	141.50	68.33	50.44	37.53	-1.00	-1.00	-1.00	-1.00
MEAN	62.94	48.52	51.13	151.22	276.47	143.49	82.33	70.06	58.98	81.21	172.13	110.51	109.33

Note

-1.00 means that the data are not available.

Table B3.23 Observed Mean Monthly Discharge at SGS 4EA7 on the Mutonga River

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1966	14.81	11.87	18.56	66.22	56.71	26.13	17.31	13.18	10.43	24.15	100.40	28.60	32.33
1967	16.62	10.80	8.28	29.09	126.40	41.71	25.79	18.44	16.48	40.01	104.04	80.99	43.44
1968	31.41	25.85	58.34	105.89	103.46	51.12	31.88	23.76	16.14	24.66	102.78	143.86	60.02
1969	43.18	31.18	42.24	29.30	58.78	30.92	19.07	15.47	11.17	14.71	32.83	24.89	29.50
1970	18.25	13.59	14.23	68.73	65.49	27.01	18.67	14.30	11.06	14.38	25.12	14.36	25.45
1971	9.03	5.38	4.12	28.59	48.17	26.55	17.56	12.98	9.29	8.82	18.99	19.41	17.47
1972	13.97	8.99	6.96	8.19	28.21	21.38	16.40	9.92	3.88	5.86	18.73	10.06	12.73
1973	26.14	15.98	9.15	21.25	25.32	19.20	10.58	9.94	7.31	10.86	31.23	17.49	17.01
1974	8.71	6.12	8.89	62.59	35.06	17.72	23.26	14.89	10.78	14.46	43.23	22.18	22.33
1975	13.42	6.86	4.54	25.90	25.87	16.84	13.11	10.07	7.39	15.98	32.57	15.45	15.68
1976	8.01	5.75	3.39	13.87	24.08	19.98	12.38	8.60	6.67	8.97	31.52	26.43	14.14
1977	19.00	12.29	13.12	61.82	75.22	63.49	21.09	12.01	8.14	8.94	58.22	42.36	32.98
1978	24.55	17.40	50.12	130.06	102.79	35.69	22.42	17.11	12.39	20.64	56.14	68.40	46.58
1979	53.46	64.34	34.38	72.42	96.49	51.74	26.26	16.35	11.21	15.01	69.14	28.37	44.70
1980	20.04	13.44	10.26	22.00	46.09	24.03	14.07	11.45	8.52	10.17	66.68	36.39	23.58
1981	17.36	12.36	26.96	100.21	79.27	45.21	25.34	17.60	13.95	16.22	39.61	29.14	35.30
1982	17.52	11.20	7.54	46.96	83.68	45.08	25.45	16.76	13.09	45.47	106.43	71.90	41.04
1983	33.72	17.69	9.81	46.36	13.14	17.79	19.32	13.49	9.81	17.72	42.21	31.81	22.71
1984	25.86	15.23	10.03	15.66	9.69	5.02	4.51	3.47	2.66	23.78	47.79	-1.00	-1.00
1985	20.84	16.60	18.01	60.43	77.32	34.94	24.60	15.44	11.97	16.49	36.05	29.34	30.22
1986	17.72	9.65	13.23	37.30	65.27	32.37	19.35	12.04	8.69	13.61	63.53	58.17	29.34
1987	25.22	14.39	9.48	16.49	23.16	25.72	16.03	11.76	7.51	6.46	37.64	16.63	17.52
1988	10.65	8.72	19.95	120.00	-1.00	25.03	18.77	14.28	12.28	31.33	63.12	65.82	-1.00
1989	53.02	21.42	23.17	43.23	39.60	28.34	19.79	13.13	12.11	62.34	134.16	92.34	45.32
1990	49.76	14.58	42.61	103.35	54.09	31.95	15.59	10.84	8.40	30.97	72.26	89.48	43.78
MEAN	23.69	15.64	18.69	53.44	56.81	30.60	19.14	13.49	10.05	20.08	57.38	44.33	30.32

Table B3.24 Observed Mean Monthly Discharge at SGS 4F19 on the Kazita River

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1966	9.49	9.63	11.95	60.26	-1.00	14.68	10.93	8.03	6.35	8.81	66.11	20.88	-1.00
1967	9.88	7.31	6.09	14.16	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
1968	-1.00	15.32	30.59	43.14	40.27	25.04	18.23	15.59	13.13	18.31	37.10	50.61	-1.00
1969	24.11	19.19	21.32	26.66	31.52	16.57	12.45	10.43	8.34	9.91	18.12	16.38	17.91
1970	10.83	9.48	9.62	25.16	13.21	10.24	8.44	7.17	6.61	6.38	12.01	7.91	10.57
1971	6.19	5.21	4.44	20.16	13.70	8.10	6.90	5.98	6.17	7.91	12.20	10.70	8.97
1972	7.04	6.24	7.98	7.91	18.22	9.76	6.81	4.65	4.05	21.32	42.43	21.97	13.21
1973	14.15	6.72	6.27	10.55	7.36	5.97	4.79	4.16	3.78	4.03	13.75	5.75	7.27
1974	3.80	3.37	9.33	24.54	13.64	9.18	6.81	5.42	4.42	4.47	18.37	20.31	10.32
1975	6.12	4.46	3.62	28.46	6.49	4.63	4.12	3.41	2.90	4.21	18.23	9.54	7.98
1976	6.15	4.87	2.84	7.60	7.34	6.21	4.32	3.74	2.54	3.12	7.99	14.69	5.95
1977	8.82	7.04	8.61	25.45	30.35	18.49	14.94	12.48	11.26	9.43	31.27	38.93	18.14
1978	23.44	16.45	54.36	70.85	42.48	24.03	15.54	11.70	9.95	26.20	25.08	38.29	29.94
1979	30.87	29.27	30.39	-1.00	37.64	20.00	14.11	11.43	8.66	8.82	27.01	12.86	-1.00
1980	8.95	7.94	6.48	10.07	11.14	7.65	6.18	5.47	5.40	5.31	20.81	12.49	8.97
1981	8.91	6.78	13.66	26.03	33.20	17.13	13.34	10.33	7.60	11.76	15.16	12.54	14.75
1982	11.47	9.82	7.70	18.79	23.71	14.99	10.87	34.54	7.47	18.58	34.49	32.17	18.79
1983	19.29	13.95	10.49	16.42	15.85	11.85	9.94	8.94	8.01	6.94	16.89	11.18	12.46
1984	10.43	6.28	5.19	6.02	5.60	3.62	3.54	3.48	3.33	19.25	35.29	27.23	10.78
1985	10.73	9.50	11.07	32.47	28.73	17.71	12.06	10.19	9.32	8.93	27.55	-1.00	-1.00
1986	9.41	7.76	7.74	23.18	20.32	15.27	11.87	9.39	8.45	7.82	31.56	18.00	14.22
1987	15.04	10.67	9.06	27.06	11.50	11.31	8.54	6.81	3.21	0.74	16.02	14.00	11.13
1988	9.41	4.97	8.20	45.34	21.82	16.86	9.48	9.55	6.37	18.25	37.42	36.77	18.69
1989	-1.00	-1.00	14.61	24.10	21.26	16.81	13.03	10.31	8.76	16.23	39.44	33.43	-1.00
1990	27.90	17.66	26.25	35.45	23.95	23.10	18.15	12.90	9.11	14.21	38.95	27.61	22.94
MEAN	12.71	9.97	13.11	26.24	20.84	13.72	10.23	9.42	6.88	10.87	26.80	21.49	15.20

Note

-1.00 means that the data are not available.

Table B3.25 (1) Estimated Evapotranspiration in Catchment Covered by Each Stream Gauging Station

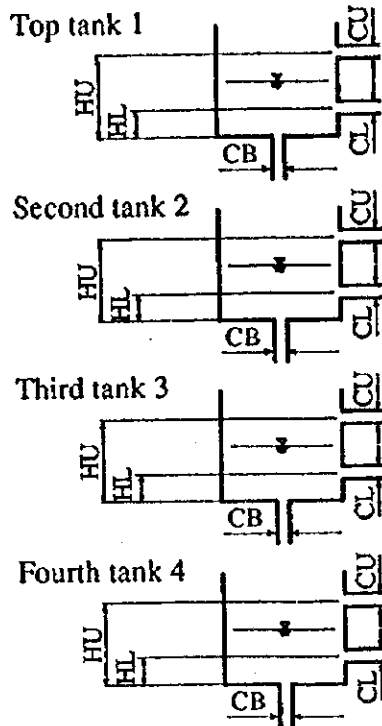
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Year	SGS 4BE2 (CA=3,672 km ²)				SGS 4CB4 (CA=316 km ²)				SGS 4CA2 (CA=518 km ²)				SGS 4DDI (CA=1,961 km ²)			
	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapota- nspiration (mm)	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapota- nspiration (mm)	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapota- nspiration (mm)	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapota- nspiration (mm)
1957	1598.9	-	-	-	1971.8	687.5	34.9	1284.3	1661.9	610.4	36.7	1051.5	1413.5	-	-	-
1958	1546.5	-	-	-	2203.9	977.6	44.4	1226.3	1715.0	724.9	42.3	990.1	1553.3	-	-	-
1959	1282.9	403.8	31.5	879.1	1426.0	424.9	29.8	1001.1	1256.4	353.7	28.2	902.7	1269.1	226.8	17.9	1042.3
1960	1107.9	391.5	35.3	716.4	1439.6	471.6	32.8	968.0	1430.3	388.3	27.1	1042.0	736.8	221.3	30.0	515.5
1961	2453.6	917.1	37.4	1536.5	2460.0	1095.8	44.5	1364.2	2246.8	952.3	42.4	1294.5	2244.1	741.7	33.1	1502.4
1962	1309.5	605.6	46.2	703.9	1808.6	889.2	49.2	919.4	1639.1	765.5	46.7	873.6	1338.0	324.7	24.3	1013.3
1963	1896.1	766.2	40.4	1129.9	2286.5	990.3	43.3	1296.2	1949.1	826.6	42.4	1122.5	1822.2	452.9	24.9	1369.3
1964	1720.7	764.3	44.4	956.4	2169.0	979.8	45.2	1189.2	1717.8	-	-	-	1543.8	339.6	22.0	1204.2
1965	1259.3	457.6	36.3	801.7	1666.4	644.5	38.7	1021.9	1542.7	523.1	33.9	1019.6	1259.7	228.2	18.1	1031.5
1966	1449.9	578.0	39.9	871.9	1879.4	748.1	39.8	1131.3	1590.9	646.3	40.6	944.6	1522.6	350.3	23.0	1172.3
1967	1885.4	702.4	37.3	1183.0	1952.8	764.1	39.1	1188.7	1610.3	543.7	33.8	1066.6	1805.2	609.3	33.8	1195.9
1968	1984.5	858.6	43.3	1125.9	2262.1	1086.2	48.0	1175.9	1863.9	875.6	47.0	988.3	2072.9	496.2	23.9	1576.7
1969	1189.3	386.8	32.5	802.5	1340.5	444.1	33.1	896.4	1156.7	339.7	29.4	817.0	1350.6	261.4	19.4	1089.2
1970	1393.0	474.6	34.1	918.4	1827.0	634.4	34.7	1192.6	1605.6	484.1	30.2	1121.5	1595.3	353.6	22.2	1241.7
1971	1164.6	369.7	31.7	794.9	1457.4	525.6	36.1	931.8	1430.4	372.1	26.0	1058.3	1225.2	213.4	17.4	1011.8
1972	1595.5	511.0	32.0	1084.5	1714.6	645.3	37.6	1069.3	1666.7	476.5	28.6	1190.2	1636.0	-	-	-
1973	1193.7	397.5	33.3	796.2	1282.4	411.9	32.1	870.5	1232.5	304.1	24.7	928.4	1182.8	-	-	-
1974	1311.0	417.8	31.9	893.2	1654.2	806.7	48.8	847.5	1478.0	473.8	32.1	1004.2	1150.7	-	-	-
1975	1143.5	324.0	28.3	819.5	1341.8	299.2	22.3	1042.6	1084.1	200.1	18.5	884.0	1179.8	-	-	-
1976	1071.9	-	-	-	1384.6	187.8	13.6	1196.8	1229.7	174.4	14.2	1055.3	1262.4	-	-	-
1977	1822.2	726.0	39.8	1096.2	2633.5	1096.5	41.6	1537.0	2280.8	794.5	34.8	1486.3	1872.9	-	-	-
1978	1719.5	765.8	44.5	953.7	2923.4	996.4	34.1	1927.0	1943.9	833.0	42.9	1110.9	1613.6	-	-	-
1979	1638.7	744.3	45.4	894.4	2384.1	972.9	40.8	1411.2	1740.2	729.6	41.9	1010.6	1664.6	-	-	-
1980	1179.7	469.5	39.8	710.2	1995.7	-	-	-	1985.5	434.5	21.9	1551.0	1351.4	-	-	-
1981	1532.2	-	-	-	1842.2	686.4	37.3	1155.8	1614.6	529.4	32.8	1085.2	1605.7	-	-	-
1982	1698.4	-	-	-	1936.0	852.1	44.0	1083.9	1617.7	633.9	39.2	983.8	1679.7	-	-	-
1983	1302.1	-	-	-	1519.5	425.1	28.0	1094.4	1409.5	379.4	26.9	1030.1	1351.4	-	-	-
1984	984.5	-	-	-	1104.0	257.7	23.3	846.3	1089.3	134.5	12.3	954.8	1077.4	-	-	-
1985	1403.2	-	-	-	1693.4	-	-	-	1405.0	400.7	28.5	1004.3	1377.2	-	-	-
1986	1430.4	-	-	-	1656.8	480.8	29.0	1176.0	1538.1	285.6	18.6	1252.5	1437.5	-	-	-
1987	1110.9	-	-	-	1183.0	-	-	-	1311.8	-	-	-	1283.8	-	-	-
1988	1755.3	-	-	-	2312.3	-	-	-	2685.2	-	-	-	2012.9	-	-	-
1989	1601.8	-	-	-	1913.2	1082.3	56.6	830.9	1797.4	538.3	29.9	1259.1	1613.9	-	-	-
1990	1493.2	-	-	-	1792.3	-	-	-	1546.0	-	-	-	1702.0	-	-	-
Mean	1,509.5	573.0	37.4	936.6	1842.8	709.131	38.5	1133.7	1593.7	524.3	32.9	1069.5	1522.0	370.7	24.4	1151.2

Table B3.25 (2) Estimated Evapotranspiration in Catchment Covered by Each Stream Gauging Station

Year	SGS 4ED3 (CA=9,520 km ²)				SGS 4EA7 (CA=1,880 km ²)				SGS 4F19 (CA=1,673 km ²)			
	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapotra- nspiration (mm)	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapotra- nspiration (mm)	Rainfall (mm)	Runoff Depth (mm)	Runoff Coeff. (%)	Evapotra- nspiration (mm)
1957	1411.2	348.4	24.7	1062.8	1719.3	-	-	-	1575.0	-	-	-
1958	1444.3	390.8	27.1	1053.5	1688.3	-	-	-	1354.4	-	-	-
1959	1138.8	241.7	21.2	897.1	1290.0	-	-	-	1160.5	-	-	-
1960	926.7	217.7	23.5	709.0	1219.0	-	-	-	1227.7	-	-	-
1961	2103.1	-	-	-	2594.4	-	-	-	2292.1	-	-	-
1962	1220.3	-	-	-	1385.7	-	-	-	1199.4	-	-	-
1963	1750.0	546.6	31.2	1203.4	1950.3	-	-	-	1752.5	-	-	-
1964	1492.1	471.7	31.6	1020.4	1711.1	-	-	-	1584.0	-	-	-
1965	1134.7	302.4	26.7	832.3	1269.7	-	-	-	1106.0	-	-	-
1966	1307.4	408.8	31.3	898.6	1710.7	542.3	31.7	1168.4	1719.2	-	-	-
1967	1613.3	502.3	31.1	1111.0	2136.3	728.7	34.1	1407.6	1940.9	-	-	-
1968	1842.7	662.6	36.0	1180.1	2328.6	1009.5	43.4	1319.1	2052.9	-	-	-
1969	1103.7	275.4	25.0	828.3	1478.3	494.9	33.5	983.4	1298.1	337.6	26.0	960.5
1970	1315.8	347.6	26.4	968.2	1327.6	426.8	32.1	900.8	973.6	199.1	20.4	774.5
1971	1101.2	265.4	24.1	835.8	1353.7	293.0	21.6	1060.7	1033.7	169.2	16.4	864.5
1972	1394.2	-	-	-	1752.5	214.1	12.2	1538.4	1361.2	249.6	18.3	1111.6
1973	1027.2	-	-	-	964.2	285.4	29.6	678.8	826.4	136.9	16.6	689.5
1974	1156.6	-	-	-	1364.5	374.6	27.5	989.9	1341.5	194.6	14.5	1146.9
1975	1034.5	-	-	-	1075.9	263.1	24.5	812.8	931.0	150.6	16.2	780.4
1976	1008.8	-	-	-	1280.4	237.9	18.6	1042.5	1017.3	112.6	11.1	904.7
1977	1723.4	-	-	-	1918.7	553.3	28.8	1365.4	1506.0	342.0	22.7	1164.0
1978	1600.9	-	-	-	2062.7	781.4	37.9	1281.3	1733.7	564.4	32.6	1169.3
1979	1522.8	-	-	-	1848.5	749.9	40.6	1098.6	1630.9	-	-	-
1980	1178.7	-	-	-	1342.8	396.6	29.5	946.2	1058.7	169.6	16.0	889.1
1981	1408.9	-	-	-	1635.9	592.1	36.2	1043.8	1350.0	278.0	20.6	1072.0
1982	1491.2	-	-	-	1799.8	688.4	38.2	1111.4	1474.4	354.1	24.0	1120.3
1983	1141.3	-	-	-	1356.0	381	28.1	975.0	993.3	234.9	23.6	758.4
1984	924.7	-	-	-	1174.0	-	-	-	1040.3	203.8	19.6	836.5
1985	1257.2	-	-	-	1477.5	506.9	34.3	970.6	1315.8	-	-	-
1986	1338.0	-	-	-	1523.2	492.1	32.3	1031.1	1314.0	268.1	20.4	1045.9
1987	1132.9	-	-	-	1072.5	293.9	27.4	778.6	871.0	209.8	24.1	661.2
1988	1720.6	-	-	-	2149.8	-	-	-	1822.3	353.4	19.4	1468.9
1989	1481.8	-	-	-	1762.6	760.2	43.1	1002.4	1530.4	-	-	-
1990	1481.3	-	-	-	1855.1	734.4	39.6	1120.7	1537.4	432.4	28.1	1105.0
Mean	1352.5	383.2	28.3	969.3	1583.8	513.1	32.4	1070.8	1236.0	261.1	21.1	974.9

Table B3.26 Tank Parameters for Gauged Subbasins



CU : Coefficient of upper hole
 CL : Coefficient of lower hole
 CB : Coefficient of bottom hole
 HU : Height of upper hole (mm)
 HL : Height of lower hole (mm)

Subbasin : 4CB4				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.2	0.1	0	0
CL	0.07	0.04	0.015	0.0003
CB	0.15	0.05	0.01	-
HU	20.0	5.0	0	0
HL	8.0	0	0	0

Subbasin : 4CA2				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.3	0.1	0	0
CL	0.06	0.04	0.02	0.0005
CB	0.20	0.07	0.03	-
HU	20.0	5.0	0	0
HL	10.0	2.0	0	0

Subbasin : 4DD1				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.2	0.1	0	0
CL	0.03	0.015	0.01	0.0008
CB	0.3	0.07	0.03	-
HU	20.0	5.0	0	0
HL	10.0	1.0	0	0

Subbasin : 4EA7				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.1	0.05	0	0
CL	0.1	0.06	0.02	0.0002
CB	0.3	0.07	0.03	-
HU	20.0	5.0	0	0
HL	10.0	2.0	0	0

Subbasin : 4BE2				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.3	0.1	0	0
CL	0.12	0.06	0.03	0.001
CB	0.30	0.07	0.03	-
HU	20.0	5.0	0	0
HL	10.0	1.0	0	0

Subbasin : 4F19				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.02	0	0	0
CL	0.1	0.008	0.002	0.0002
CB	0.1	0.02	0.001	-
HU	20.0	0	0	0
HL	4.0	1.0	0	0

Table B3.27 Estimated Mean Monthly Discharge for Subbasin 4BE2

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	27.23	18.70	16.26	80.12	226.44	104.37	35.96	21.71	17.96	24.84	63.52	66.34	58.62
1958	33.98	39.33	31.70	41.27	228.36	114.90	65.32	44.33	24.90	20.07	34.36	60.63	61.60
1959	49.96	28.04	26.44	56.44	128.65	64.78	39.96	37.30	42.32	31.33	44.65	40.94	49.23
1960	29.46	23.64	27.50	74.32	87.31	46.54	34.23	27.71	29.68	42.18	79.46	37.21	44.94
1961	25.39	24.77	22.10	42.33	108.17	38.69	37.28	53.28	60.57	229.86	316.82	213.68	114.41
1962	123.56	54.73	43.79	69.26	201.31	69.96	45.41	40.60	41.67	47.73	48.56	49.47	69.67
1963	50.99	36.19	39.03	190.14	293.56	124.66	57.83	45.77	34.77	33.40	55.16	119.20	90.06
1964	61.29	34.39	39.20	218.71	225.20	79.17	47.58	54.88	40.39	50.20	60.88	81.81	82.81
1965	51.77	32.98	29.11	48.24	97.55	42.62	32.40	28.89	25.04	36.03	145.79	68.61	53.25
1966	37.24	30.37	41.09	186.68	148.43	71.72	45.46	36.12	33.18	31.82	106.95	39.14	67.35
1967	27.56	23.65	21.73	51.38	270.79	105.93	58.48	50.10	43.34	87.53	159.87	95.04	82.95
1968	43.42	44.72	88.97	182.36	203.76	124.11	67.90	44.97	33.86	43.56	139.16	169.79	98.88
1969	53.87	44.00	51.40	41.50	115.54	45.60	32.49	31.33	29.64	27.11	37.04	29.93	44.95
1970	34.36	29.07	35.02	142.92	143.06	70.60	41.82	36.27	31.83	36.02	38.78	22.88	55.22
1971	22.93	18.97	14.86	44.90	143.76	58.39	42.31	41.23	32.80	30.68	30.42	32.77	42.84
1972	30.17	41.92	25.30	26.04	84.96	77.94	38.89	34.48	29.19	73.18	180.01	81.90	60.33
1973	49.49	37.69	26.25	61.82	87.43	61.49	37.04	35.30	31.70	37.70	66.46	39.98	47.70
1974	24.01	19.30	21.16	91.39	78.28	59.26	94.33	54.60	41.11	33.66	60.15	36.34	51.13
1975	22.94	18.24	17.78	46.02	75.16	49.84	35.52	34.35	33.09	46.98	48.87	38.08	38.91
1976	25.67	21.24	19.74	36.13	62.71	42.68	34.39	25.63	26.27	29.26	33.18	41.40	33.19
1977	37.58	26.70	28.43	187.58	268.45	85.22	45.30	36.18	28.49	35.32	145.48	83.61	84.03
1978	57.01	42.97	100.57	273.60	205.87	68.77	45.46	37.28	32.80	43.77	72.56	61.46	86.84
1979	44.87	76.74	60.93	131.04	219.48	184.52	72.64	44.74	34.09	42.09	69.64	41.12	85.16
1980	27.26	24.30	24.26	40.90	122.34	63.63	43.81	37.33	32.43	34.83	119.05	72.35	53.54
1981	36.56	26.27	49.49	181.86	211.25	95.41	39.48	28.71	25.64	38.33	64.71	44.68	70.55
1982	38.36	27.25	24.59	89.18	260.11	139.31	49.19	32.01	26.77	88.01	114.87	90.67	81.69
1983	45.25	30.91	27.17	66.87	210.44	83.46	43.54	30.84	26.87	26.32	52.52	36.19	56.70
1984	43.58	28.36	25.09	25.41	39.05	27.74	24.24	23.61	23.28	65.83	94.90	75.23	41.36
1985	36.76	27.75	29.30	136.02	207.57	91.50	41.47	29.49	24.77	23.93	54.73	40.91	62.02
1986	26.66	23.24	22.62	99.28	236.58	117.81	49.36	29.78	24.28	25.05	43.96	75.84	64.54
1987	40.40	26.30	22.89	59.43	79.52	94.06	44.13	33.22	28.73	22.87	44.53	57.38	46.12
1988	28.89	22.67	21.48	192.60	255.97	75.54	39.00	31.58	32.25	29.33	96.19	76.43	75.16
1989	52.75	34.26	25.75	63.13	124.80	65.36	32.67	24.64	22.83	40.50	117.91	126.83	60.95
1990	110.25	42.00	67.67	176.46	142.71	73.28	36.01	27.09	24.74	35.40	69.12	57.24	71.83
MEAN	42.69	31.81	34.37	101.63	164.55	79.97	45.03	36.04	31.51	45.43	91.48	67.91	64.37

Table B3.28 Estimated Mean Monthly Discharge for Subbasin 4CB4

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	2.18	2.10	1.47	7.03	30.19	12.88	4.91	3.61	2.52	2.23	5.53	7.56	6.85
1958	4.10	3.90	4.85	7.04	45.34	17.49	11.05	7.30	3.83	2.84	3.77	5.26	9.73
1959	4.32	1.71	1.47	3.48	13.94	8.10	3.53	2.75	2.66	1.82	3.14	3.95	4.24
1960	2.38	1.66	2.15	10.40	13.96	5.04	2.92	1.98	1.59	2.34	8.31	3.84	4.71
1961	1.72	1.27	1.06	2.37	7.97	3.09	2.67	3.01	4.30	13.55	60.90	27.64	10.80
1962	17.76	5.47	3.27	6.38	38.32	9.21	5.47	3.97	3.13	3.25	4.41	5.55	8.85
1963	5.44	3.71	3.04	21.00	36.19	16.32	5.82	4.02	2.68	2.13	4.46	13.42	9.85
1964	7.85	3.93	4.33	29.75	30.13	9.64	4.72	5.59	3.34	3.32	4.92	9.24	9.73
1965	4.99	2.80	2.14	6.52	17.46	7.54	3.78	2.64	1.79	2.00	16.98	7.62	6.36
1966	3.40	2.78	6.46	27.06	22.62	4.46	4.42	2.97	2.37	1.88	8.14	3.18	7.48
1967	1.65	1.10	0.90	2.68	25.87	13.16	6.56	4.70	3.84	5.67	16.57	9.83	7.71
1968	3.59	2.54	6.20	16.43	22.66	14.65	6.70	4.55	2.99	3.60	16.72	29.35	10.83
1969	5.72	4.42	4.72	3.77	13.78	6.00	3.58	3.12	2.19	1.71	2.33	1.89	4.44
1970	2.54	1.83	2.29	25.43	17.22	10.32	4.99	3.31	2.31	2.10	3.40	2.29	6.50
1971	1.97	0.83	0.99	5.36	27.69	9.03	4.74	3.83	2.61	1.59	1.60	2.45	5.22
1972	1.85	2.40	1.57	1.50	5.95	8.00	3.55	2.25	1.95	7.26	31.65	9.32	6.44
1973	5.18	3.72	1.98	5.13	8.14	7.32	4.55	2.52	2.15	2.18	4.39	3.07	4.19
1974	1.29	0.75	1.24	18.21	17.47	10.33	23.07	8.09	4.88	3.21	4.29	3.64	8.04
1975	2.51	1.26	0.50	2.26	6.15	4.83	3.95	2.99	2.18	2.79	3.50	2.88	2.98
1976	1.64	0.69	0.45	2.24	2.85	2.37	2.31	1.59	1.20	1.24	3.78	3.14	1.96
1977	2.37	1.65	2.02	27.78	41.71	11.86	6.77	5.32	2.61	1.92	18.41	10.82	11.10
1978	6.26	4.23	11.72	40.75	25.37	7.25	4.39	3.18	2.48	4.53	5.08	5.97	10.10
1979	5.18	14.09	7.30	17.78	36.38	21.97	6.24	3.48	2.45	4.25	7.42	4.40	10.91
1980	3.82	4.59	3.09	4.56	20.63	8.79	3.89	2.49	1.50	1.32	12.57	7.59	6.24
1981	3.74	2.41	4.53	16.40	28.67	9.13	4.37	2.75	2.19	2.56	3.90	4.30	7.08
1982	5.24	2.99	1.97	4.61	17.44	11.95	4.61	2.57	2.52	10.33	20.36	17.52	8.51
1983	5.24	3.36	1.94	3.95	12.90	5.66	4.30	2.74	2.06	3.78	3.76	3.24	4.41
1984	2.47	0.81	2.29	2.29	1.48	0.56	0.69	0.39	0.60	4.65	9.80	7.32	2.80
1985	2.48	2.65	2.59	19.38	21.69	7.10	3.58	2.79	1.61	1.96	3.45	2.63	5.99
1986	1.50	0.89	0.95	4.92	24.66	9.70	3.93	2.19	1.69	1.51	5.29	7.08	5.36
1987	3.05	1.58	1.02	4.44	8.16	8.28	3.57	2.28	1.50	1.11	3.49	4.31	3.57
1988	2.28	0.98	1.39	20.95	28.27	9.15	6.14	4.41	3.51	3.00	8.64	7.66	8.03
1989	7.09	6.14	4.61	12.40	30.24	10.34	5.04	3.92	3.29	4.60	13.29	13.27	9.52
1990	18.27	5.02	13.85	17.49	28.89	11.51	5.93	4.08	3.13	4.08	12.55	8.64	11.12
MEAN	4.44	2.95	3.25	11.82	21.48	9.21	5.20	3.46	2.52	3.42	9.91	7.64	7.11

Table B3.29 Estimated Mean Monthly Discharge for Subbasin 4CA2

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	3.41	3.82	3.27	9.68	41.57	20.95	8.86	5.93	4.33	4.39	6.46	7.01	9.97
1958	4.51	5.31	11.57	10.12	45.95	19.35	14.58	9.55	5.75	4.61	5.47	5.23	11.83
1959	3.85	2.87	3.11	5.69	18.06	10.21	5.32	4.18	3.91	3.14	4.19	4.94	5.79
1960	3.41	2.93	3.77	14.46	17.14	7.55	4.80	3.74	3.10	3.46	7.51	4.47	6.36
1961	3.02	2.59	2.26	3.47	11.47	5.78	4.58	4.70	6.18	18.31	89.54	35.84	15.65
1962	28.84	9.69	5.91	9.87	46.03	13.64	7.93	5.88	5.21	5.35	5.46	6.26	12.51
1963	6.33	5.35	5.40	32.88	54.37	18.42	8.00	5.68	4.09	3.48	5.05	13.72	13.56
1964	9.34	5.71	8.28	43.86	34.10	12.63	7.22	7.14	3.19	5.29	5.85	9.47	12.67
1965	6.69	4.55	3.39	8.37	26.04	11.06	6.73	4.65	3.23	3.92	16.24	8.01	8.57
1966	4.70	4.31	6.92	35.84	32.42	9.65	6.07	4.49	4.19	3.39	11.04	4.36	10.62
1967	2.92	2.36	2.05	5.16	28.17	14.50	8.59	5.87	5.10	7.26	13.90	11.45	8.94
1968	5.33	4.06	9.58	28.32	31.46	16.98	9.24	6.11	5.17	3.94	17.48	34.12	14.32
1969	7.74	6.17	5.26	4.25	14.34	7.88	4.98	3.97	3.42	3.27	3.14	2.38	5.57
1970	2.61	2.91	3.02	19.77	24.45	17.09	7.38	4.99	3.69	3.25	3.45	2.75	7.95
1971	2.30	2.05	1.64	4.82	21.08	12.94	7.62	5.56	4.26	3.66	3.32	3.74	6.08
1972	3.38	4.33	3.38	3.19	6.01	11.17	5.92	4.09	3.10	6.40	30.37	12.65	7.83
1973	7.09	5.12	3.48	5.77	6.64	7.72	5.18	3.94	3.19	3.01	4.90	3.96	5.00
1974	2.30	1.81	2.12	15.68	13.63	7.26	20.82	10.55	6.56	4.21	5.51	3.80	7.85
1975	2.89	2.02	1.92	3.73	4.76	4.03	3.41	3.31	2.95	3.51	3.63	3.08	3.27
1976	2.19	1.80	1.66	3.02	4.26	3.93	3.52	2.87	2.64	2.21	3.23	3.57	2.91
1977	2.51	2.10	2.62	18.29	56.25	14.88	8.48	6.71	4.83	3.47	22.78	15.29	13.18
1978	9.65	5.87	19.44	45.43	37.94	9.45	5.65	4.26	3.41	4.22	5.60	7.27	13.18
1979	6.05	13.31	9.07	25.71	32.13	30.61	9.87	5.45	3.74	3.06	4.71	2.72	12.20
1980	1.95	2.07	2.36	4.44	23.07	16.82	6.58	4.43	2.71	2.99	12.08	9.25	7.40
1981	4.72	2.85	3.12	22.00	32.61	11.32	5.66	4.69	3.23	3.29	4.70	5.01	8.60
1982	3.01	1.76	1.68	4.26	25.83	14.77	5.40	3.79	3.09	10.13	23.99	27.27	10.42
1983	6.72	4.23	2.47	5.32	24.69	7.63	6.55	4.31	2.91	3.55	4.76	3.87	6.42
1984	2.61	1.27	0.99	2.07	1.09	0.78	1.62	0.81	1.38	3.85	8.09	7.31	2.66
1985	2.30	1.96	2.21	17.52	30.48	9.10	4.06	3.00	2.03	1.90	2.53	1.77	6.57
1986	1.49	1.18	1.61	5.96	23.45	12.27	4.33	2.68	1.83	1.82	4.06	4.48	5.43
1987	2.77	1.68	1.74	5.81	10.35	13.36	4.87	2.89	1.75	1.58	5.58	7.00	4.95
1988	9.82	2.39	4.58	36.39	43.00	10.42	6.29	4.25	3.38	2.70	8.33	7.35	11.58
1989	6.27	6.49	5.13	10.71	28.70	11.23	4.89	3.44	3.31	4.76	9.21	12.40	8.88
1990	18.72	5.19	11.70	20.63	29.53	10.85	4.92	3.13	2.51	2.97	6.18	5.06	10.12
MEAN	5.63	3.89	4.61	14.49	25.91	11.95	6.76	4.74	3.63	4.31	10.83	8.73	8.79

Table B3.30 Estimated Mean Monthly Discharge for Subbasin 4DD1

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	10.54	11.18	8.05	47.92	55.79	20.26	8.64	7.10	6.68	7.91	32.55	32.65	20.77
1958	13.45	8.15	9.90	21.32	69.22	52.31	34.41	23.90	15.45	13.54	17.66	13.25	24.38
1959	8.90	8.05	6.73	18.12	42.79	22.62	18.11	16.24	17.72	12.66	14.68	12.79	16.62
1960	8.66	7.51	9.82	21.40	32.95	20.19	13.24	8.63	8.13	17.61	26.88	13.55	15.71
1961	6.73	4.89	7.76	17.72	30.09	13.85	21.47	19.04	34.43	141.49	254.16	82.51	52.85
1962	45.10	24.39	16.56	19.89	53.66	24.18	16.85	15.25	16.74	18.17	16.70	13.82	23.44
1963	12.44	9.22	10.11	75.06	125.03	52.42	27.01	16.20	13.45	10.55	15.94	25.93	32.78
1964	13.96	9.19	15.11	61.47	48.29	34.32	17.70	19.27	14.55	23.71	19.57	19.59	24.73
1965	15.65	10.88	9.49	19.21	19.71	18.73	9.83	13.12	8.04	14.94	35.58	24.42	16.63
1966	14.46	11.16	15.15	47.10	46.07	30.31	18.70	14.58	15.74	18.64	68.16	9.24	25.78
1967	8.44	8.78	7.72	20.44	186.31	85.79	31.13	24.93	26.21	41.69	61.88	26.11	44.12
1968	16.04	15.06	21.87	44.62	64.28	61.74	37.07	29.91	20.26	22.89	62.57	39.00	36.28
1969	25.44	32.68	20.51	27.03	22.27	16.59	11.46	13.01	17.41	15.94	15.51	14.32	19.35
1970	12.29	10.73	10.91	86.14	65.54	29.43	17.32	16.26	16.40	15.76	16.24	12.99	25.83
1971	9.43	6.97	5.76	18.70	38.53	24.99	19.38	17.35	13.54	12.29	11.46	11.02	15.79
1972	10.58	12.10	8.80	8.99	30.33	29.08	14.60	10.88	15.06	44.78	75.36	37.32	24.82
1973	19.30	16.64	15.77	29.35	41.39	29.95	17.96	16.17	15.62	15.64	26.47	22.27	22.21
1974	16.08	15.24	15.04	21.12	25.73	18.90	45.93	26.22	16.82	15.34	19.47	17.35	21.10
1975	14.94	14.60	14.46	43.61	52.35	28.11	16.65	17.40	15.22	14.38	16.53	16.28	22.04
1976	14.15	13.82	13.67	43.80	52.36	31.08	17.41	14.50	14.70	16.46	16.44	19.03	22.29
1977	14.41	13.33	13.17	61.27	95.32	34.78	17.05	14.72	13.87	14.56	65.14	42.19	33.32
1978	18.95	14.75	17.63	61.77	54.27	21.78	15.85	14.54	13.99	20.87	35.66	21.74	25.98
1979	16.54	23.89	17.88	40.11	73.12	69.23	24.86	16.45	14.98	14.33	34.37	21.16	30.58
1980	14.91	14.12	13.91	19.22	34.15	23.96	15.55	15.55	14.81	14.91	84.49	39.08	25.39
1981	17.45	14.71	24.30	86.38	87.21	37.87	18.28	15.70	14.92	17.29	22.84	19.69	31.39
1982	15.17	14.43	14.26	32.97	78.80	48.97	20.40	17.29	15.52	43.53	35.45	24.36	30.10
1983	17.10	15.22	14.73	33.15	94.15	36.04	18.95	16.13	15.29	15.80	24.68	16.92	26.51
1984	15.62	14.76	14.54	18.92	25.18	15.72	14.39	14.13	14.01	24.25	37.23	29.79	19.88
1985	17.74	15.24	15.84	50.98	63.41	31.56	17.38	15.25	14.48	14.20	17.42	17.07	24.21
1986	14.29	13.80	13.64	30.65	70.13	45.73	19.47	15.23	14.19	13.79	27.83	30.38	25.76
1987	17.19	14.35	13.65	29.45	46.61	39.48	19.40	26.89	21.61	14.65	22.34	20.89	23.88
1988	14.52	13.55	13.31	94.82	100.02	27.43	16.42	14.59	14.85	23.64	84.36	54.64	39.35
1989	32.94	17.70	15.21	36.41	48.59	27.92	16.72	14.86	14.40	25.79	54.54	39.16	28.69
1990	34.69	17.57	30.14	62.18	55.00	33.21	18.72	15.73	14.98	23.01	45.62	30.72	31.80
MEAN	16.41	13.78	13.98	39.74	59.67	33.49	19.66	16.64	15.71	22.79	41.64	25.62	26.60

Table B3.31 Estimated Mean Monthly Discharge for Subbasin 4EA7

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	16.57	5.94	3.39	19.31	58.92	24.67	8.08	3.89	2.76	4.57	37.09	52.10	19.77
1958	19.68	8.00	5.45	15.61	71.14	29.50	9.73	5.39	3.47	3.14	25.46	67.37	22.00
1959	30.55	11.44	7.43	9.98	39.68	16.66	6.45	4.02	3.50	3.47	28.84	43.71	17.14
1960	17.27	6.75	10.66	43.29	24.70	9.02	5.08	3.91	3.79	10.61	31.86	21.09	15.67
1961	11.02	5.45	4.24	32.78	46.51	17.16	7.16	4.65	4.09	74.34	241.71	119.55	47.39
1962	36.04	14.83	8.83	24.58	65.94	26.75	10.08	6.35	5.24	13.70	17.84	12.38	20.21
1963	7.82	5.75	5.45	45.01	82.51	32.19	12.43	7.31	5.67	5.47	37.00	63.76	25.86
1964	46.48	16.88	12.13	60.09	53.97	17.75	9.19	6.62	5.98	6.52	15.37	62.73	26.14
1965	34.51	13.28	8.04	16.22	39.33	16.73	8.57	6.60	6.27	7.43	57.77	33.37	20.68
1966	14.32	11.87	18.56	66.22	56.71	26.13	17.31	13.18	10.43	24.15	101.00	28.34	32.35
1967	16.53	10.35	8.12	28.04	129.25	41.27	23.47	17.73	16.19	40.01	104.04	81.67	43.06
1968	31.49	25.85	58.34	105.89	97.25	46.60	31.88	23.76	16.14	24.66	103.45	143.86	59.10
1969	43.18	31.18	42.24	29.30	58.78	29.43	18.34	15.47	11.17	14.71	32.83	24.89	29.29
1970	18.25	13.59	14.23	72.21	52.76	26.29	18.67	14.30	11.06	14.38	25.12	14.33	24.60
1971	9.03	5.38	4.12	28.59	48.17	26.55	17.26	12.98	9.29	8.89	18.99	19.41	17.39
1972	13.96	8.99	6.96	8.37	29.10	22.83	16.40	10.00	3.88	5.86	31.88	16.70	14.51
1973	25.93	15.83	9.40	20.07	25.26	18.57	10.60	9.90	7.67	10.84	30.42	18.67	16.93
1974	9.23	6.70	9.01	62.13	36.56	18.29	21.97	14.38	10.62	13.77	43.25	23.09	22.42
1975	13.44	7.70	5.73	25.85	28.53	18.15	13.00	10.09	7.71	14.78	32.63	16.73	16.20
1976	8.01	5.75	3.39	13.87	24.08	19.68	12.48	8.60	6.67	8.97	31.52	28.47	14.29
1977	19.50	12.36	13.12	61.82	75.22	58.77	20.94	12.01	8.14	8.94	58.22	42.36	32.62
1978	24.55	17.40	50.12	130.06	102.79	35.75	22.42	17.11	12.38	21.52	57.07	65.89	46.42
1979	51.38	62.66	33.76	68.65	92.02	49.48	24.56	15.89	11.23	14.94	68.03	28.37	43.41
1980	20.04	13.44	10.26	22.00	46.09	23.81	14.18	11.45	8.52	10.21	67.07	36.07	23.60
1981	17.72	12.40	27.77	96.69	79.27	45.21	25.34	17.60	13.95	16.22	39.61	29.14	35.08
1982	17.42	11.20	7.81	46.86	80.79	45.08	25.45	16.63	13.09	48.09	106.43	71.90	40.90
1983	33.33	17.44	10.22	42.18	69.53	27.53	18.70	13.39	10.38	15.96	43.68	32.57	27.91
1984	26.13	15.24	10.92	15.60	13.56	8.50	7.07	5.72	6.15	29.96	54.13	43.91	19.74
1985	21.44	16.55	18.52	60.54	75.69	35.13	23.54	15.22	12.07	16.09	34.65	30.69	30.01
1986	17.91	10.30	13.11	36.19	64.94	31.42	18.97	12.26	9.21	13.81	62.03	60.33	29.21
1987	26.06	14.90	10.18	18.39	24.26	25.03	15.88	11.96	8.20	7.46	37.02	20.81	18.35
1988	12.52	9.86	19.11	113.10	112.52	35.20	18.83	14.30	12.40	29.68	65.01	65.44	42.33
1989	51.53	21.63	22.24	42.72	40.46	28.15	19.21	13.21	12.26	51.06	126.70	88.81	43.17
1990	47.93	14.58	42.61	103.35	54.27	31.84	16.00	11.32	9.27	30.46	72.26	82.11	43.00
MEAN	23.85	14.16	15.75	46.63	58.84	28.39	16.15	11.39	8.79	18.37	57.06	46.78	28.85

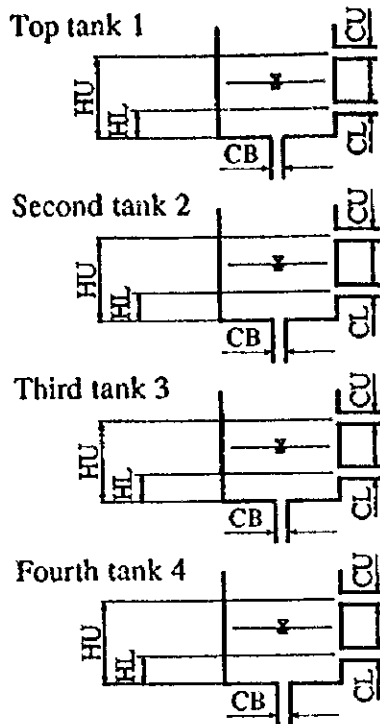
Table B3.32 Estimated Mean Monthly Discharge for Subbasin 4F19

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	11.04	7.42	6.70	9.24	27.83	11.37	7.25	6.42	5.83	6.62	32.13	37.73	14.13
1958	11.89	11.88	8.83	14.92	30.67	11.28	8.38	7.57	6.90	6.67	15.32	22.69	13.08
1959	12.31	9.34	7.38	8.02	22.48	9.50	7.16	6.49	6.04	5.82	16.14	28.59	11.61
1960	10.70	7.26	11.18	34.28	18.14	8.73	7.44	6.69	6.15	9.56	19.84	12.28	12.69
1961	8.64	6.50	5.87	19.82	22.56	9.20	6.78	6.04	5.52	36.91	120.72	50.36	24.91
1962	20.18	13.91	12.10	18.09	41.32	16.41	11.98	10.95	10.28	12.31	13.88	13.72	16.26
1963	10.91	9.75	9.44	24.80	42.26	15.57	11.37	10.30	9.54	9.12	27.34	45.15	18.80
1964	30.96	13.74	12.24	33.62	27.97	13.20	11.41	10.53	9.87	12.63	23.15	41.58	20.08
1965	23.61	13.93	11.52	15.66	18.34	11.10	9.92	9.28	8.86	13.06	32.84	17.16	15.44
1966	10.14	9.63	11.95	60.26	42.59	15.25	10.93	8.03	6.35	8.81	66.11	20.88	22.58
1967	9.88	7.31	6.09	14.83	65.68	22.29	12.87	11.30	10.32	18.60	58.02	43.78	23.41
1968	15.75	15.22	30.59	42.38	40.27	25.04	18.23	15.59	13.13	14.99	37.10	50.61	26.58
1969	24.11	19.19	21.32	26.67	31.52	16.57	12.45	10.43	8.34	9.91	18.12	16.38	17.92
1970	10.83	9.48	9.87	24.56	13.21	10.65	8.44	7.17	6.61	6.38	12.01	7.91	10.59
1971	6.19	5.21	4.44	20.16	13.70	8.10	6.90	5.98	6.17	7.90	12.20	10.70	8.97
1972	7.04	6.24	7.98	7.83	18.22	9.76	6.81	4.83	4.15	15.97	42.43	21.97	12.77
1973	13.72	6.72	6.27	10.55	7.54	6.06	4.90	4.29	4.01	4.19	13.07	7.03	7.36
1974	4.01	3.64	8.41	29.58	16.88	9.15	6.81	5.55	4.60	4.59	18.41	17.95	10.80
1975	6.35	4.71	4.03	25.37	8.84	5.83	4.37	3.77	3.24	4.22	18.25	9.83	8.23
1976	6.15	4.82	3.05	8.00	8.36	6.21	4.33	3.81	2.95	3.20	8.05	14.31	6.10
1977	9.10	6.71	8.61	25.45	29.88	17.01	14.94	12.48	10.79	8.57	31.27	38.93	17.81
1978	22.98	14.93	49.00	68.28	42.48	21.26	14.29	11.59	9.95	24.79	24.93	37.81	28.52
1979	30.87	29.27	30.02	27.12	37.80	19.35	13.53	11.33	8.66	8.82	28.12	12.86	21.48
1980	8.95	7.94	6.48	10.07	11.50	7.91	6.71	5.47	5.40	5.39	20.81	12.49	9.09
1981	8.94	6.78	13.65	26.03	33.39	17.13	13.34	10.33	7.60	11.76	16.07	12.54	14.80
1982	11.47	9.82	7.70	18.79	23.71	14.99	10.87	24.97	7.45	18.58	34.10	32.16	17.88
1983	18.94	13.43	10.00	14.50	21.87	11.60	9.64	8.60	7.82	6.87	16.06	11.18	12.54
1984	10.26	6.40	5.35	6.31	6.46	4.50	4.13	3.99	3.83	17.48	38.18	22.07	10.75
1985	9.64	8.54	9.73	31.55	30.10	15.25	10.60	9.28	8.34	8.20	16.09	19.15	14.71
1986	9.17	7.32	7.08	21.61	22.88	13.33	10.54	8.11	7.72	7.25	27.64	35.89	14.88
1987	14.17	9.57	8.40	21.01	12.13	10.01	7.85	6.49	4.24	2.91	13.74	14.89	10.45
1988	8.56	5.46	7.26	37.66	31.89	14.65	8.71	8.55	6.38	12.89	36.32	33.60	17.66
1989	23.20	10.15	12.48	23.31	21.02	14.91	11.44	9.51	8.31	13.28	38.84	35.33	18.48
1990	24.26	15.88	23.86	35.65	23.18	16.00	15.87	11.90	9.03	14.52	37.57	27.26	21.25
MEAN	13.67	9.94	11.73	24.00	25.49	12.92	9.74	8.75	7.19	10.96	28.97	24.61	15.67

Table B3.33

Tank Parameters for Catchment of SGS 4ED3 and Ungaged Subbasins Located Upstream of SGS 4ED3



CU : Coefficient of upper hole
 CL : Coefficient of lower hole
 CB : Coefficient of bottom hole
 HU : Height of upper hole (mm)
 HL : Height of lower hole (mm)

Subbasin : 4ED3				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : MASI-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : KAMB-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Table B3.34 Estimated Mean Monthly Discharge for Subbasin 4ED3

YEAR	(Unit: CMS)												
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	41.39	39.72	33.50	119.94	365.30	184.71	86.03	66.13	53.91	58.50	101.24	99.72	104.17
1958	72.42	62.99	58.46	92.44	389.72	214.32	146.44	102.55	65.08	55.97	67.06	79.22	117.22
1959	53.37	34.55	31.51	75.44	197.68	113.21	65.66	60.33	66.64	45.09	70.77	62.84	73.09
1960	36.10	30.39	38.64	116.19	142.88	73.66	48.91	34.70	34.17	52.13	113.90	55.73	64.95
1961	29.26	23.30	22.51	61.20	162.63	57.58	58.13	73.92	96.66	366.91	1068.73	636.69	221.46
1962	304.82	126.06	81.53	117.89	369.12	328.58	86.74	72.48	73.88	83.65	79.18	84.05	134.00
1963	83.06	54.17	60.12	330.47	577.32	246.79	114.60	85.96	56.55	48.47	96.48	213.63	163.97
1964	114.25	57.75	71.23	368.62	332.35	155.83	90.63	99.45	71.89	94.18	102.53	140.70	141.62
1965	92.21	53.31	41.85	90.17	187.50	88.17	54.85	44.40	33.31	55.38	228.30	120.54	91.00
1966	66.49	47.00	71.10	305.14	297.17	142.47	86.55	60.77	53.91	50.39	220.91	76.05	123.16
1967	42.07	31.15	29.02	76.52	492.72	211.61	127.95	99.85	94.14	156.96	274.47	171.21	150.64
1968	76.80	69.86	172.11	324.20	371.60	246.64	138.36	104.46	73.29	76.96	313.67	417.79	198.81
1969	112.48	89.22	103.13	72.20	204.55	84.30	52.43	62.09	54.76	43.33	68.84	47.02	82.86
1970	54.57	45.01	54.87	276.63	282.56	153.09	83.83	69.77	58.89	61.06	71.21	43.77	104.61
1971	32.33	21.68	18.16	96.45	289.17	129.69	86.97	78.18	54.96	45.73	47.24	54.45	79.58
1972	45.96	61.47	36.31	35.43	141.56	141.50	68.33	50.44	46.12	77.10	333.86	205.74	103.65
1973	89.36	70.55	62.85	90.18	178.41	100.51	64.44	57.02	51.38	46.29	63.11	65.66	78.31
1974	46.79	42.22	39.28	127.91	176.16	83.13	127.75	97.33	66.39	57.64	68.70	60.70	82.83
1975	47.39	42.31	38.98	82.63	154.59	104.43	58.72	52.26	47.88	43.21	45.39	51.94	64.14
1976	41.49	37.41	34.82	57.65	102.47	74.97	52.20	45.53	41.40	37.20	35.06	51.97	50.96
1977	46.10	38.03	35.12	255.11	502.70	216.76	95.82	77.34	67.78	57.91	230.14	255.40	156.52
1978	119.58	78.81	119.92	391.08	398.78	154.68	101.37	88.39	77.67	73.20	157.76	152.39	159.47
1979	94.65	128.46	104.61	228.76	364.46	345.73	154.01	106.27	92.93	80.52	136.76	99.09	161.35
1980	69.02	61.79	56.15	58.88	204.74	143.22	74.81	64.69	58.55	51.89	199.13	203.15	103.84
1981	81.55	63.26	80.25	356.91	404.19	211.53	102.56	85.72	75.09	65.64	78.78	77.76	140.27
1982	61.03	54.10	48.86	109.33	351.93	232.59	99.19	77.97	69.43	120.13	233.73	199.40	138.14
1983	97.33	74.07	65.47	85.43	348.07	161.83	84.55	71.69	64.35	56.91	56.41	52.37	101.54
1984	52.73	47.06	43.64	42.35	46.03	40.84	38.76	37.51	36.30	47.71	156.81	138.60	60.70
1985	67.99	54.44	50.49	227.90	379.52	168.14	86.52	72.89	63.98	54.87	58.11	60.65	112.13
1986	47.72	43.07	40.07	84.15	372.23	225.21	96.07	72.48	63.41	54.13	85.81	177.54	113.49
1987	86.82	59.35	52.20	86.11	190.92	180.58	91.73	68.70	62.61	54.78	91.08	101.90	93.90
1988	55.66	48.45	43.85	261.28	564.93	196.76	100.67	83.91	74.51	65.28	176.55	181.98	154.49
1989	139.40	89.80	71.97	136.15	285.62	157.19	87.63	74.77	66.36	60.87	161.81	232.03	130.30
1990	168.56	89.06	152.20	384.87	326.14	174.73	106.92	91.58	80.03	71.82	133.53	125.25	158.72
MEAN	78.55	57.94	60.73	165.44	298.70	157.21	88.83	73.28	63.24	72.70	159.68	141.09	118.11

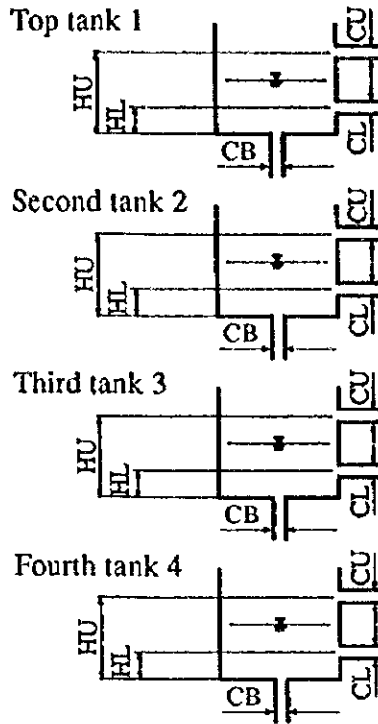
Table B3.35 Estimated Mean Monthly Discharge for Subbasin MASI-RL

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	2.50	1.64	0.94	2.65	33.54	18.50	5.83	3.97	2.57	1.58	2.08	4.15	6.66
1958	2.19	1.48	1.15	4.58	77.74	42.38	12.13	8.36	6.34	4.28	2.96	2.45	13.84
1959	2.14	1.93	1.72	1.70	6.88	6.18	2.89	1.96	1.36	1.11	2.32	8.29	3.21
1960	2.46	1.21	0.83	1.48	1.42	0.83	0.65	0.55	0.51	0.56	0.82	0.51	0.99
1961	0.44	0.41	0.39	3.77	5.28	2.07	1.09	0.59	0.44	8.45	128.13	106.70	21.48
1962	41.93	18.49	13.55	11.54	41.54	19.19	9.33	7.16	5.58	4.43	3.95	3.67	15.03
1963	3.41	3.18	2.91	15.94	54.49	42.24	13.60	9.08	7.08	5.11	12.36	51.38	18.40
1964	34.18	11.78	8.71	35.36	50.72	14.94	9.70	7.64	5.95	4.60	4.04	6.50	16.18
1965	5.62	4.11	3.30	4.02	8.97	4.32	3.09	2.49	2.22	1.98	3.43	4.06	3.97
1966	2.20	1.72	1.99	14.91	16.75	5.62	3.92	2.74	1.99	1.71	22.42	7.15	6.93
1967	2.91	1.85	1.51	1.79	69.47	41.84	11.19	7.64	5.77	4.25	11.37	7.97	13.96
1968	4.26	3.05	23.23	36.69	49.97	18.30	11.00	8.85	6.76	4.90	23.98	94.44	23.79
1969	24.22	11.48	10.85	8.39	16.65	8.54	5.89	4.79	4.10	3.73	4.46	5.70	9.07
1970	3.40	2.91	3.30	45.19	32.65	12.68	8.01	6.33	4.74	3.54	2.99	2.76	10.71
1971	2.52	2.29	2.04	8.40	47.64	17.60	7.09	5.34	3.80	2.68	2.27	2.18	8.65
1972	2.18	1.87	1.71	1.57	4.09	3.39	1.91	1.44	1.34	2.06	31.00	14.47	5.59
1973	5.57	4.27	2.95	4.50	7.86	2.77	1.93	1.64	1.47	1.32	1.33	1.20	3.07
1974	1.10	1.05	1.01	18.01	21.72	5.89	4.29	3.30	2.28	1.62	1.95	1.61	5.32
1975	1.27	1.10	0.94	8.89	13.05	3.80	2.28	1.48	1.09	0.95	1.16	1.30	3.11
1976	0.83	0.74	0.70	4.45	6.06	1.82	1.16	0.78	0.66	0.60	0.65	2.02	1.71
1977	1.04	0.62	0.53	46.92	71.43	19.58	8.98	6.72	4.66	3.01	25.06	31.18	18.31
1978	10.86	6.69	9.56	45.95	38.67	12.65	8.82	6.72	4.89	4.41	15.62	21.21	15.50
1979	8.94	10.89	13.38	42.38	44.52	21.02	11.57	9.14	6.97	5.12	21.79	10.74	17.21
1980	5.14	3.91	3.31	3.13	25.04	10.29	4.81	3.46	2.59	2.21	15.94	15.98	7.98
1981	4.75	3.03	9.65	78.98	48.29	19.63	10.59	8.13	5.84	4.10	3.52	3.20	16.64
1982	2.83	2.56	2.28	10.87	19.31	6.43	4.23	3.00	2.18	6.49	28.59	25.52	9.52
1983	9.11	5.94	4.32	8.50	29.46	7.25	4.31	3.09	2.39	2.10	1.89	1.78	6.68
1984	1.69	1.46	1.27	1.17	1.14	1.08	1.05	1.02	0.98	1.19	12.32	10.19	2.88
1985	4.33	3.38	2.38	37.78	51.84	12.83	7.44	5.51	3.76	2.58	2.31	2.07	11.35
1986	1.86	1.63	1.41	4.54	38.80	12.00	5.33	3.80	2.49	1.73	8.57	42.43	10.38
1987	14.14	6.40	4.70	10.56	34.13	19.32	9.56	6.89	5.49	4.06	20.30	14.82	12.53
1988	5.52	4.00	3.09	41.52	78.98	21.86	11.28	8.88	6.67	4.78	6.30	8.96	16.82
1989	14.04	7.24	5.29	27.01	46.50	16.48	9.02	7.04	5.23	3.94	10.81	21.31	14.49
1990	9.86	6.19	29.67	94.06	54.96	19.13	13.19	10.45	7.85	5.91	7.22	10.08	22.38
MEAN	7.04	4.13	5.13	20.21	33.81	13.90	6.68	5.00	3.77	3.27	13.06	16.12	11.01

Table B3.36 Estimated Mean Monthly Discharge for Subbasin KAMB-RL

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	0.00	0.00	0.00	0.00	0.26	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.03
1958	0.00	0.00	0.00	0.00	1.18	0.57	0.15	0.06	0.02	0.01	0.00	0.00	0.17
1959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	6.32	5.52	1.03
1962	1.26	0.74	0.50	0.31	0.26	0.19	0.14	0.12	0.10	0.08	0.06	0.04	0.32
1963	0.03	0.02	0.01	0.28	0.98	0.22	0.10	0.04	0.02	0.01	0.01	0.01	0.14
1964	0.01	0.00	0.00	0.17	0.35	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.05
1965	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09	0.23	0.11
1967	0.03	0.00	0.00	0.00	3.71	1.56	0.38	0.21	0.11	0.05	0.06	0.04	0.51
1968	0.02	0.01	0.00	0.05	0.23	0.07	0.03	0.01	0.00	0.00	0.47	3.05	0.33
1969	0.58	0.21	0.10	0.05	0.07	0.03	0.01	0.01	0.00	0.00	0.09	0.15	0.11
1970	0.01	0.00	0.00	0.13	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1971	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.15	0.03
1973	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1976	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	1.42	1.18	0.26	0.11	0.04	0.01	0.00	0.24	0.27	0.29
1978	0.11	0.04	0.02	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.05	0.45	0.06
1979	0.11	0.05	0.02	0.46	0.37	0.13	0.06	0.02	0.01	0.00	0.56	0.15	0.16
1980	0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1981	0.00	0.00	0.39	3.61	0.93	0.34	0.19	0.08	0.04	0.03	0.01	0.00	0.47
1982	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.01
1983	0.00	0.00	0.00	0.24	0.83	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.10
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03	0.00
1985	0.00	0.00	0.00	1.15	1.24	0.24	0.10	0.03	0.01	0.00	0.00	0.00	0.23
1986	0.00	0.00	0.00	0.03	0.50	0.09	0.01	0.00	0.00	0.00	0.00	0.07	0.06
1987	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.56	1.40	0.28	0.12	0.04	0.02	0.01	0.01	0.02	0.21
1989	0.05	0.00	0.04	0.11	0.22	0.07	0.02	0.00	0.00	0.01	0.15	0.39	0.09
1990	0.22	0.09	0.18	3.89	1.94	0.57	0.37	0.22	0.12	0.08	0.06	0.06	0.65
MEAN	0.07	0.03	0.04	0.37	0.47	0.14	0.05	0.03	0.01	0.02	0.28	0.31	0.15

Table B3.37 Tank Parameters for Subbasins Located Downstream of SGS 4ED3



CU : Coefficient of upper hole
 CL : Coefficient of lower hole
 CB : Coefficient of bottom hole
 HU : Height of upper hole (mm)
 HL : Height of lower hole (mm)

Subbasin : KIND-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : KIAM-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : MUTO-L				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.2	0.1	0	0
CL	0.03	0.015	0.01	0.0008
CB	0.3	0.07	0.03	-
HU	20.0	5.0	0	0
HL	10.0	1.0	0	0

Subbasin : MUTO-R				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.05	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : GITA-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Subbasin : GRAF-RL				
	Tank 1	Tnak 2	Tank 3	Tank 4
CU	0.03	0.005	0	0
CL	0.05	0.01	0.003	0.0005
CB	0.03	0.01	0.002	-
HU	50.0	15.0	0	0
HL	15.0	10.0	0	0

Table B3.38 Estimated Mean Monthly Discharge for Subbasin GITA-RL

YEAR													(Unit: CMS)
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.17	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.02
1959	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.13	0.02
1960	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	1.09	6.68	4.89	1.06
1962	1.19	0.71	0.52	0.39	1.11	0.43	0.25	0.18	0.15	0.13	0.11	0.09	0.44
1963	0.07	0.06	0.05	0.07	0.19	0.08	0.04	0.03	0.02	0.02	0.01	0.03	0.06
1964	0.03	0.01	0.01	0.17	0.93	0.17	0.07	0.03	0.02	0.01	0.01	0.24	0.14
1965	0.28	0.05	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.17	0.09
1967	0.03	0.00	0.00	0.02	0.46	0.19	0.05	0.01	0.00	0.00	0.20	0.23	0.10
1968	0.05	0.01	0.08	0.33	0.61	0.94	0.29	0.16	0.08	0.04	0.78	3.92	0.61
1969	0.81	0.32	0.21	0.13	0.18	0.08	0.06	0.05	0.03	0.02	0.49	1.13	0.29
1970	0.17	0.07	0.03	0.22	0.12	0.05	0.02	0.01	0.01	0.01	0.00	0.00	0.06
1971	0.00	0.00	0.00	0.07	0.92	0.19	0.06	0.02	0.01	0.00	0.00	0.00	0.11
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.07	0.02
1973	0.02	0.00	0.00	0.05	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1976	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	2.23	1.58	0.33	0.18	0.09	0.04	0.03	1.84	1.92	0.69
1978	0.64	0.31	0.22	0.16	0.12	0.07	0.06	0.04	0.03	0.02	0.08	0.39	0.18
1979	0.14	0.09	0.04	0.29	0.27	0.09	0.04	0.02	0.01	0.01	0.26	0.08	0.11
1980	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
1981	0.00	0.00	0.04	0.50	0.19	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.07
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.04	0.01
1983	0.01	0.00	0.00	0.03	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.12	0.03
1985	0.02	0.00	0.00	0.60	0.53	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.11
1986	0.00	0.00	0.00	0.14	0.65	0.13	0.04	0.01	0.00	0.00	0.00	0.11	0.09
1987	0.03	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.53	1.75	0.36	0.17	0.09	0.26	0.10	0.73	0.52	0.38
1989	0.23	0.15	0.08	0.16	0.75	0.26	0.12	0.07	0.04	0.76	6.50	3.62	1.06
1990	2.62	0.96	3.47	6.47	4.65	1.84	1.08	0.85	0.65	0.69	1.89	1.10	2.19
MEAN	0.19	0.08	0.14	0.37	0.45	0.16	0.08	0.05	0.04	0.09	0.62	0.55	0.23

Table B3.39 Estimated Mean Monthly Discharge for Subbasin KIND-RL

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.02
1960	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.95	5.64	4.25	0.91
1962	1.03	0.62	0.45	0.35	1.02	0.34	0.21	0.15	0.12	0.10	0.08	0.07	0.38
1963	0.05	0.04	0.04	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
1964	0.02	0.01	0.01	0.05	0.59	0.09	0.02	0.01	0.00	0.00	0.00	0.29	0.09
1965	0.39	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1966	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.11	0.06
1967	0.01	0.00	0.00	0.06	0.03	0.00	0.00	0.00	0.00	0.00	0.16	0.89	0.10
1968	0.12	0.03	0.02	0.21	0.36	1.00	0.23	0.10	0.04	0.02	0.75	3.70	0.55
1969	0.73	0.29	0.20	0.14	0.09	0.06	0.05	0.04	0.03	0.01	0.69	1.31	0.30
1970	0.20	0.09	0.04	0.14	0.09	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.05
1971	0.00	0.00	0.00	0.07	1.13	0.26	0.09	0.03	0.01	0.00	0.04	0.46	0.17
1972	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.01
1973	0.00	0.00	0.00	0.25	0.38	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.06
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.08	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1976	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	1.05	0.46	0.13	0.05	0.02	0.01	0.00	1.21	1.52	0.37
1978	0.49	0.24	0.17	0.11	0.08	0.05	0.04	0.02	0.02	0.01	0.02	0.37	0.14
1979	0.11	0.09	0.03	0.18	0.09	0.02	0.01	0.00	0.00	0.00	0.07	0.02	0.05
1980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.45	0.04
1983	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1984	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.33	0.15	0.04
1985	0.03	0.00	0.00	0.26	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1986	0.00	0.00	0.00	0.08	1.14	0.20	0.07	0.02	0.01	0.00	0.15	1.05	0.23
1987	0.25	0.10	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
1988	0.00	0.00	0.00	0.14	0.63	0.13	0.04	0.01	0.15	0.04	0.55	0.39	0.17
1989	0.18	0.10	0.05	0.07	0.31	0.12	0.05	0.02	0.01	0.60	5.35	3.80	0.89
1990	3.33	1.12	2.79	4.04	4.66	1.88	1.00	0.78	0.60	0.44	0.40	1.99	1.92
MEAN	0.21	0.08	0.11	0.22	0.34	0.13	0.06	0.04	0.03	0.06	0.48	0.62	0.20

Table B3.40 Estimated Mean Monthly Discharge for Subbasin KIAM-RL

(Unit: CMS)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	1.28	0.29	0.04	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.17	4.57	0.54
1958	0.93	0.12	0.01	0.12	2.49	0.55	0.06	0.00	0.00	0.00	0.00	0.02	0.36
1959	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	2.20	7.37	0.80
1960	1.24	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
1961	0.00	0.00	0.00	0.34	0.09	0.00	0.00	0.00	0.00	6.26	97.34	80.16	15.35
1962	18.57	10.60	7.80	6.07	12.01	4.85	3.13	2.32	1.99	1.71	1.45	1.23	5.98
1963	1.04	0.84	0.70	0.75	0.84	0.46	0.35	0.25	0.21	0.18	1.14	7.91	1.22
1964	6.39	2.27	1.14	2.33	6.56	1.56	0.68	0.41	0.28	0.16	0.14	1.99	1.99
1965	2.28	0.37	0.12	0.08	0.07	0.05	0.04	0.02	0.00	0.00	0.28	0.44	0.31
1966	0.02	0.00	0.02	0.51	0.63	0.09	0.00	0.00	0.00	0.00	24.89	6.00	2.68
1967	1.40	0.40	0.12	1.04	2.36	0.75	0.16	0.02	0.00	0.05	14.50	25.89	3.89
1968	4.89	2.35	1.93	15.95	19.18	6.73	3.93	2.63	1.53	1.00	17.23	75.98	12.78
1969	15.94	6.49	4.93	3.55	2.49	1.72	1.35	1.13	0.92	0.70	8.79	17.40	5.45
1970	2.79	1.28	0.88	10.31	4.66	1.73	0.86	0.49	0.34	0.21	0.17	0.14	1.99
1971	0.12	0.09	0.06	0.11	1.94	0.33	0.04	0.01	0.00	0.00	0.02	0.81	0.29
1972	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.19	5.32	1.05
1973	1.47	0.60	0.16	1.46	1.94	0.10	0.00	0.00	0.00	0.00	0.13	0.02	0.49
1974	0.00	0.00	0.00	2.35	0.98	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.29
1975	0.00	0.00	0.00	6.98	8.17	1.34	0.32	0.06	0.00	0.00	0.00	0.00	1.41
1976	0.00	0.00	0.00	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.03
1977	0.01	0.00	0.00	10.30	5.93	1.51	0.51	0.15	0.03	0.00	13.85	26.93	4.94
1978	9.41	4.08	3.06	2.62	2.94	1.38	0.85	0.67	0.49	0.34	0.64	6.16	2.72
1979	2.11	2.49	1.17	2.60	1.81	0.65	0.35	0.23	0.11	0.06	8.55	2.79	1.91
1980	0.46	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67	1.36	0.47
1981	0.14	0.01	0.92	12.11	4.13	1.48	0.55	0.19	0.05	0.00	0.00	0.00	1.63
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.38	9.33	0.82
1983	4.19	1.19	0.35	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49
1984	0.00	0.00	0.00	0.79	1.24	0.05	0.00	0.00	0.00	0.41	13.79	6.85	1.93
1985	2.10	0.94	0.33	2.60	2.50	0.51	0.14	0.03	0.00	0.00	0.00	0.00	0.76
1986	0.00	0.00	0.00	2.34	25.68	4.94	1.94	0.85	0.34	0.15	0.31	13.92	4.21
1987	4.03	1.27	0.40	0.15	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.50
1988	0.00	0.00	0.00	2.22	5.73	1.11	0.30	0.06	0.01	0.00	2.35	2.67	1.20
1989	2.84	1.05	0.37	7.85	7.25	2.34	1.12	0.45	0.23	2.42	33.50	44.44	8.66
1990	20.35	7.98	24.59	59.58	50.01	17.50	10.56	8.05	5.76	4.08	5.63	48.96	21.92
MEAN	3.06	1.32	1.45	4.57	5.05	1.53	0.80	0.53	0.36	0.52	7.60	11.73	3.21

Table B3.41 Estimated Mean Monthly Discharge for Subbasin MUTO-L

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	1.07	0.56	0.50	5.13	14.35	3.60	1.03	0.63	0.56	0.54	3.06	5.42	3.04
1958	1.98	0.72	0.55	3.79	19.48	6.34	1.56	0.87	0.71	0.67	7.30	7.46	4.29
1959	1.99	0.93	0.71	0.78	5.75	1.55	0.74	0.65	0.63	0.60	1.06	3.40	1.57
1960	1.09	0.58	0.76	4.05	1.85	0.64	0.50	0.47	0.44	1.96	4.62	1.32	1.52
1961	0.48	0.38	0.71	5.55	9.00	2.48	0.66	0.42	0.39	29.04	86.53	31.35	13.92
1962	5.18	2.14	1.88	3.30	13.31	4.44	1.78	1.49	1.28	2.09	2.69	1.40	3.42
1963	1.25	1.22	1.20	19.97	23.46	7.36	2.49	1.67	1.47	1.43	16.75	12.98	7.60
1964	4.83	2.13	3.92	23.62	15.85	3.85	2.23	1.86	1.80	1.78	1.78	5.06	5.73
1965	2.71	1.83	1.72	3.49	11.19	3.16	1.85	1.69	1.65	1.62	13.60	6.76	4.27
1966	2.26	1.70	2.65	22.49	10.31	2.83	1.92	1.72	1.67	2.05	26.55	5.41	6.80
1967	2.06	1.68	1.61	2.95	35.64	11.04	3.02	2.00	1.76	5.33	30.07	20.54	9.81
1968	4.12	2.99	13.28	15.40	17.30	4.57	2.65	2.23	2.13	2.11	21.27	44.48	11.04
1969	8.16	3.28	3.06	2.67	9.42	3.65	2.46	2.32	2.28	2.25	8.64	10.32	4.84
1970	3.09	2.39	4.64	33.44	14.81	3.92	2.68	2.38	2.32	2.27	2.61	2.29	6.40
1971	2.17	2.12	2.07	8.74	16.11	4.29	2.39	2.07	2.00	1.95	2.02	3.21	4.10
1972	2.00	1.82	1.76	1.71	3.25	2.46	1.68	1.58	1.53	3.47	11.47	5.34	3.17
1973	2.08	1.59	1.47	3.33	4.59	1.67	1.37	1.31	1.27	1.22	1.27	1.19	1.86
1974	1.10	1.05	1.01	6.16	5.85	1.59	1.04	0.96	0.92	0.88	1.88	1.23	1.97
1975	0.82	0.76	0.72	14.67	14.52	2.65	1.03	0.78	0.74	0.71	2.56	2.37	3.53
1976	0.77	0.63	0.59	1.83	1.57	0.60	0.52	0.49	0.46	0.43	0.40	0.63	0.74
1977	0.47	0.36	0.33	19.02	14.69	3.19	1.02	0.60	0.52	0.50	43.01	21.01	8.73
1978	5.88	2.10	4.09	27.26	23.38	4.19	1.87	1.38	1.29	6.54	23.63	15.78	9.78
1979	5.56	9.37	4.68	12.44	8.16	2.79	1.99	1.81	1.79	1.77	21.25	7.58	6.60
1980	2.39	1.89	1.82	1.79	1.77	1.75	1.72	1.69	1.66	1.62	17.55	6.35	3.50
1981	2.18	1.69	5.69	16.46	14.68	5.35	2.38	1.87	1.78	1.74	2.04	2.18	4.84
1982	1.69	1.63	1.58	14.14	8.88	2.83	1.81	1.61	1.56	17.70	18.18	4.72	6.36
1983	2.23	1.74	1.61	11.77	21.52	3.86	1.92	1.63	1.58	1.54	2.28	1.54	4.44
1984	1.44	1.40	1.35	2.57	3.82	1.43	1.23	1.18	1.13	5.38	8.26	3.91	2.76
1985	1.61	1.14	1.53	15.80	9.44	2.33	1.36	1.14	1.09	1.06	1.07	2.52	3.34
1986	1.16	0.96	0.91	2.18	8.94	2.21	1.05	0.87	0.83	0.79	3.66	16.83	3.37
1987	3.80	1.31	0.90	1.40	2.62	1.01	0.81	0.77	0.73	0.70	0.76	1.92	1.39
1988	0.79	0.62	0.58	24.78	25.57	3.81	1.32	0.85	0.78	2.01	14.48	11.79	7.28
1989	5.83	1.83	1.20	10.85	14.88	4.06	1.58	1.17	1.10	9.58	31.93	20.31	8.69
1990	8.13	2.62	14.10	30.88	19.44	5.50	2.63	2.05	1.92	7.23	21.43	11.31	10.60
MEAN	2.72	1.74	2.51	11.01	12.51	3.44	1.66	1.36	1.29	3.55	13.40	8.82	5.33

Table B3.42 Estimated Mean Monthly Discharge for Subbasin MUTO-R

YEAR	(Unit: CMS)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	0.03	0.00	0.00	0.06	0.98	0.15	0.01	0.00	0.00	0.00	0.11	3.07	0.37
1958	0.70	0.18	0.04	0.72	2.00	0.26	0.04	0.00	0.00	0.00	0.00	0.98	0.41
1959	0.24	0.02	0.00	0.01	0.20	0.04	0.00	0.00	0.00	0.00	0.02	0.15	0.06
1960	0.03	0.00	0.05	0.37	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
1961	0.00	0.00	0.00	0.52	0.19	0.01	0.00	0.00	0.00	0.32	22.83	24.35	4.02
1962	5.85	2.88	2.53	2.02	2.50	1.32	0.89	0.75	0.81	0.55	0.48	0.46	1.75
1963	0.40	0.34	0.30	1.59	1.98	0.50	0.27	0.19	0.15	0.11	1.94	6.94	1.23
1964	4.87	1.54	0.97	1.44	1.62	0.62	0.37	0.28	0.23	0.18	0.14	0.31	1.05
1965	0.17	0.09	0.07	0.15	0.09	0.06	0.05	0.05	0.04	0.04	3.76	5.25	0.82
1966	0.87	0.38	0.33	4.94	2.45	0.71	0.40	0.20	0.13	0.09	7.47	2.20	1.68
1967	0.59	0.26	0.11	0.10	1.57	0.74	0.25	0.10	0.05	0.04	5.64	9.53	1.58
1968	1.84	0.94	4.02	6.80	6.70	1.97	1.31	0.89	0.57	0.41	7.72	27.80	5.08
1969	6.17	2.55	1.96	1.49	1.09	0.78	0.60	0.53	0.46	0.39	1.35	2.28	1.64
1970	0.57	0.36	0.39	3.47	1.14	0.47	0.27	0.19	0.15	0.11	0.10	0.09	0.61
1971	0.09	0.08	0.07	0.10	0.17	0.06	0.05	0.05	0.04	0.04	0.03	0.77	0.13
1972	0.30	0.09	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	2.62	1.35	0.37
1973	0.34	0.11	0.03	0.26	0.28	0.01	0.00	0.00	0.00	0.00	0.24	0.06	0.11
1974	0.00	0.00	0.00	0.79	0.17	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.08
1975	0.00	0.00	0.00	0.46	0.88	0.11	0.01	0.00	0.00	0.00	0.58	0.57	0.22
1976	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.86	0.08
1977	0.21	0.03	0.00	7.34	5.45	1.11	0.60	0.29	0.14	0.08	4.28	12.50	2.67
1978	4.74	2.17	4.67	7.40	5.45	2.11	1.50	1.04	0.71	0.56	2.17	8.48	3.42
1979	4.02	5.97	2.21	2.28	2.70	1.39	1.00	0.71	0.57	0.50	3.55	1.41	2.19
1980	0.55	0.37	0.29	0.24	0.21	0.17	0.13	0.11	0.10	0.09	0.60	0.28	0.26
1981	0.10	0.08	0.52	5.38	1.39	0.55	0.28	0.14	0.10	0.07	0.14	0.10	0.74
1982	0.06	0.05	0.04	0.55	0.78	0.19	0.06	0.03	0.03	2.30	4.88	7.24	1.35
1983	3.19	1.32	0.84	0.52	0.74	0.28	0.20	0.16	0.11	0.07	0.04	0.03	0.63
1984	0.03	0.02	0.01	0.03	0.04	0.00	0.00	0.00	0.00	0.00	1.91	0.90	0.25
1985	0.22	0.05	0.01	0.30	0.23	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07
1986	0.00	0.00	0.00	0.95	7.35	1.27	0.50	0.22	0.09	0.04	1.50	10.10	1.84
1987	2.60	0.98	0.57	0.42	0.28	0.16	0.12	0.08	0.05	0.02	0.01	0.00	0.44
1988	0.00	0.00	0.00	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
1989	0.00	0.00	0.01	1.53	1.41	0.38	0.14	0.04	0.01	0.21	7.71	14.71	2.18
1990	3.79	1.72	1.34	9.85	5.19	1.75	1.20	0.82	0.56	0.48	1.01	2.98	2.56
MEAN	1.25	0.66	0.63	1.83	1.63	0.51	0.30	0.20	0.15	0.20	2.44	4.29	1.17

Table B3.43 Estimated Mean Monthly Discharge for Subbasin GRAF-RL

YEAR	(Unit: m ³ /sec)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	0.01	0.00	0.00	0.03	0.54	0.16	0.04	0.01	0.00	0.00	0.01	0.20	0.08
1958	0.05	0.00	0.00	0.28	0.89	0.16	0.05	0.01	0.00	0.00	0.00	0.49	0.16
1959	0.12	0.02	0.00	0.10	0.22	0.05	0.01	0.00	0.00	0.00	0.01	0.04	0.05
1960	0.01	0.00	0.01	0.11	0.09	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.02
1961	0.00	0.00	0.00	1.63	0.87	0.18	0.07	0.02	0.01	0.45	10.86	10.13	2.02
1962	2.30	1.20	0.99	0.76	0.86	0.50	0.35	0.27	0.24	0.22	0.20	0.19	0.67
1963	0.16	0.14	0.12	0.95	1.46	0.35	0.20	0.12	0.08	0.07	0.44	2.76	0.57
1964	1.55	0.50	0.32	1.18	1.42	0.35	0.21	0.13	0.10	0.08	0.07	0.07	0.50
1965	0.06	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.14	0.46	0.66	0.13
1966	0.15	0.06	0.04	3.06	3.77	0.78	0.43	0.28	0.16	0.10	1.90	0.51	0.94
1967	0.16	0.08	0.06	0.07	1.63	0.71	0.23	0.13	0.07	0.04	0.28	0.61	0.34
1968	0.14	0.05	0.04	7.74	7.66	1.57	0.85	0.63	0.42	0.26	3.90	18.25	3.46
1969	4.52	1.75	3.40	2.42	2.13	1.23	0.92	0.71	0.55	0.45	0.90	1.28	1.69
1970	0.50	0.39	0.50	4.14	1.70	0.64	0.48	0.35	0.27	0.23	0.22	0.19	0.80
1971	0.16	0.14	0.12	0.25	0.82	0.28	0.15	0.10	0.09	0.08	0.09	0.33	0.22
1972	0.10	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.05	0.05	0.91	0.37	0.16
1973	0.13	0.07	0.05	0.07	0.08	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.05
1974	0.03	0.02	0.02	0.44	0.18	0.05	0.02	0.02	0.01	0.01	0.03	0.02	0.07
1975	0.01	0.01	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.02	0.03	0.01
1976	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
1977	0.00	0.00	0.00	1.61	0.99	0.22	0.09	0.03	0.01	0.00	1.43	3.21	0.63
1978	1.32	0.64	2.13	4.90	4.66	1.29	0.84	0.62	0.43	0.38	2.25	4.39	1.99
1979	1.86	2.94	1.21	1.34	1.57	0.76	0.57	0.43	0.34	0.29	3.15	1.65	1.33
1980	0.65	0.43	0.29	0.32	0.33	0.20	0.17	0.14	0.12	0.10	0.27	0.15	0.26
1981	0.08	0.07	0.11	0.77	0.36	0.17	0.09	0.07	0.06	0.05	0.26	0.12	0.18
1982	0.06	0.05	0.04	0.05	0.56	0.12	0.05	0.04	0.04	0.90	1.71	0.89	0.38
1983	0.47	0.27	0.15	0.18	0.50	0.10	0.06	0.04	0.03	0.03	0.03	0.02	0.16
1984	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.01
1985	0.00	0.00	0.01	0.19	0.13	0.02	0.00	0.00	0.00	0.00	0.01	2.23	0.22
1986	0.55	0.15	0.05	0.46	1.38	0.27	0.11	0.04	0.02	0.01	0.04	0.85	0.33
1987	0.28	0.10	0.03	0.13	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.05
1988	0.00	0.00	0.00	0.19	0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
1989	0.00	0.00	0.00	0.36	0.19	0.05	0.01	0.00	0.00	0.00	1.11	2.85	0.38
1990	0.61	0.27	0.16	3.25	1.36	0.39	0.24	0.14	0.09	0.59	1.72	1.70	0.88
MEAN	0.47	0.28	0.29	1.09	1.07	0.32	0.19	0.13	0.10	0.13	0.95	1.60	0.55

Table B3.44 Estimated Mean Monthly Discharge at Mutonga Dam Site

YEAR	(Unit: m ³ /sec)												MEAN
	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	
1957	64.84	44.22	33.91	171.93	462.11	205.48	73.31	46.84	37.38	46.05	150.56	182.88	126.63
1958	81.52	67.18	65.21	104.57	563.07	283.74	149.05	99.77	60.45	49.15	96.98	162.66	148.61
1959	101.95	54.99	47.61	96.21	256.00	130.15	76.99	67.10	72.10	54.13	101.20	125.85	98.69
1960	66.02	44.49	55.56	169.78	179.42	89.81	61.42	47.00	47.25	78.72	159.45	82.00	90.08
1961	48.80	39.77	38.51	108.94	218.76	83.12	74.91	85.69	110.41	524.22	1,516.60	736.46	298.85
1962	326.32	145.29	105.60	153.97	477.00	174.48	101.47	84.18	82.01	97.28	101.79	94.44	161.99
1963	89.28	65.92	68.23	402.71	673.60	294.89	127.94	90.24	69.61	61.90	149.83	315.32	200.79
1964	189.26	87.85	93.80	477.04	468.31	174.81	99.49	103.75	75.71	95.76	112.71	197.23	181.31
1965	125.08	70.99	57.40	106.31	220.43	104.29	66.34	60.14	48.29	67.95	293.43	158.54	114.93
1966	79.48	64.28	93.17	405.77	336.40	151.52	98.20	76.01	69.70	83.74	379.28	105.52	161.92
1967	64.15	50.44	43.86	113.65	753.65	316.79	143.28	113.32	102.37	191.87	418.27	289.20	216.74
1968	115.17	101.60	227.52	453.65	513.75	297.66	172.22	124.17	89.53	107.14	411.57	669.50	273.57
1969	192.55	143.07	145.46	122.26	254.70	120.37	81.27	75.76	71.64	69.84	115.35	111.71	125.33
1970	80.28	65.23	74.73	439.35	356.57	172.62	102.03	84.53	72.85	77.66	92.85	60.55	139.94
1971	50.56	38.78	31.61	119.86	347.15	154.66	101.03	88.45	68.36	61.78	70.18	76.84	100.77
1972	64.58	73.54	49.52	51.38	163.70	154.87	82.94	64.77	56.05	143.02	401.98	184.59	124.25
1973	116.50	85.56	61.50	131.98	183.98	129.64	78.63	70.79	63.06	71.91	135.63	90.41	101.63
1974	55.11	45.91	50.60	235.84	200.39	121.64	211.46	118.10	83.19	72.69	136.51	87.06	118.21
1975	58.81	45.68	42.05	152.62	203.76	112.87	76.18	70.46	62.98	84.10	109.46	81.29	91.69
1976	53.32	44.67	40.20	105.51	153.92	102.16	71.79	54.45	52.60	59.17	89.24	99.26	77.19
1977	78.10	57.16	60.22	445.03	637.68	231.61	110.00	82.85	63.35	67.85	399.49	289.61	210.25
1978	148.55	100.86	221.26	635.17	496.91	163.46	106.90	86.24	72.50	106.79	218.19	215.18	214.33
1979	145.01	219.65	150.47	343.93	511.06	381.89	153.19	97.94	75.96	86.12	240.21	120.54	210.50
1980	76.54	64.77	59.32	96.27	273.34	149.22	90.66	76.52	64.32	68.20	333.03	188.31	128.38
1981	87.35	63.45	126.42	520.38	508.62	226.37	107.35	79.89	67.76	83.62	141.47	112.29	177.08
1982	83.78	61.87	54.21	203.45	491.94	269.54	111.16	76.93	64.77	226.78	353.26	279.02	189.73
1983	126.47	81.36	63.65	172.60	464.37	171.82	98.50	72.29	61.60	69.12	133.62	96.14	134.30
1984	93.59	63.33	56.49	68.86	86.62	55.87	50.29	47.05	47.53	135.53	241.02	185.71	94.32
1985	89.03	69.67	72.71	342.93	464.79	190.48	99.10	72.48	59.83	61.74	116.17	97.66	144.72
1986	64.86	52.01	54.25	187.24	502.83	237.78	105.02	67.91	54.95	58.69	157.36	262.64	150.46
1987	114.34	68.87	56.08	130.06	206.02	200.78	98.35	84.97	68.06	52.45	134.04	127.12	111.76
1988	74.34	54.07	63.54	527.68	653.87	185.28	99.90	79.06	74.26	95.28	286.96	235.87	202.51
1989	173.74	96.61	79.98	212.97	344.12	166.72	90.58	68.85	62.71	144.23	417.59	389.05	187.26
1990	278.16	105.03	242.11	588.89	451.25	208.86	111.62	84.59	72.08	114.82	243.37	260.25	230.09
MEAN	107.57	74.65	81.96	252.89	334.71	132.80	102.43	79.50	67.80	102.04	248.78	199.14	157.02

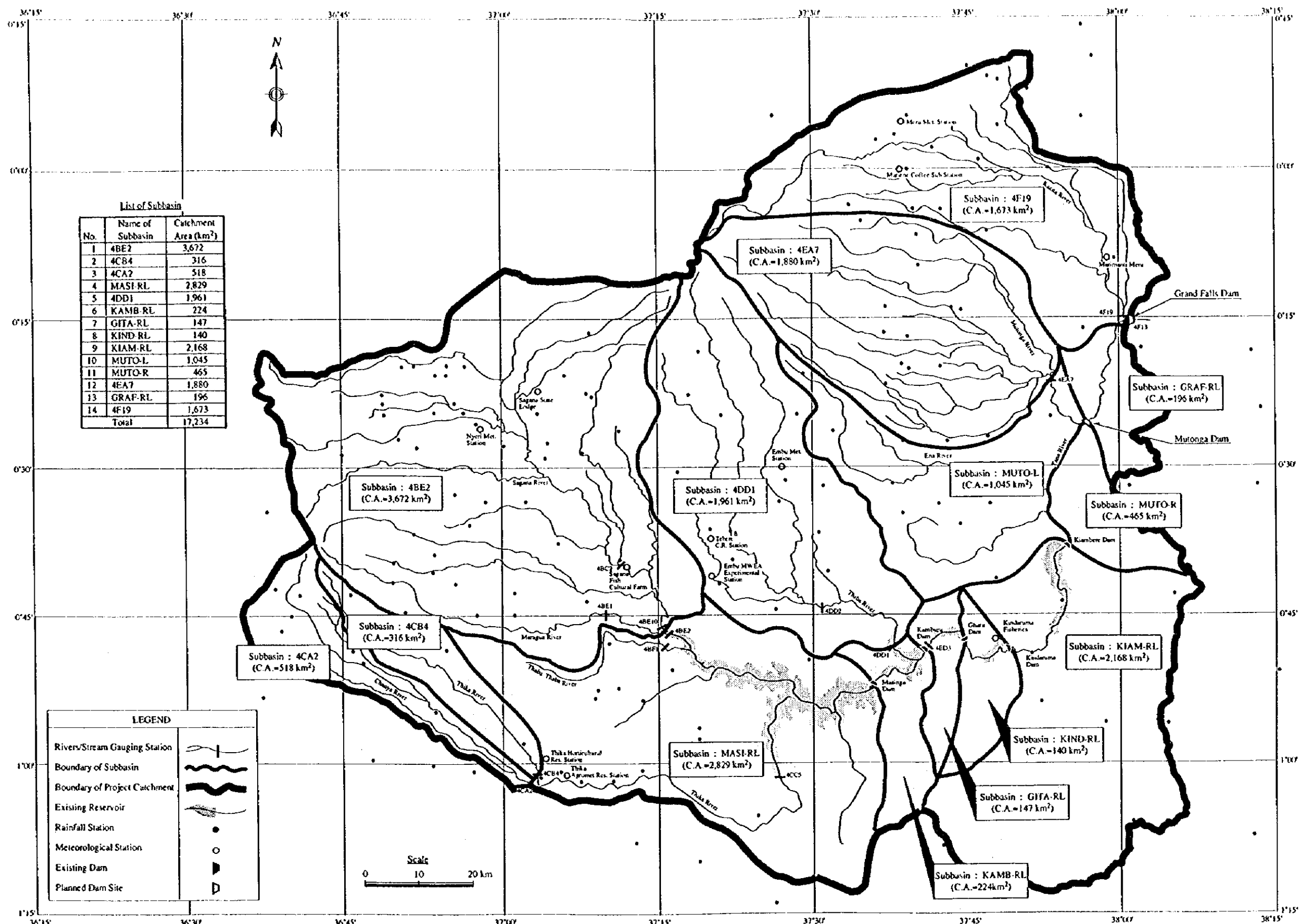
Table B3.45 Estimated Mean Monthly Discharge at Grand Falls Dam Site

(Unit: m³/sec)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	MEAN
1957	75.89	51.64	40.62	181.20	490.48	217.01	80.60	53.27	43.21	52.67	182.70	220.81	140.84
1958	93.45	79.06	74.04	119.77	594.64	295.18	157.48	107.36	67.36	55.82	112.30	183.84	161.86
1959	114.38	64.35	55.00	104.34	278.70	139.69	84.15	73.59	78.14	59.96	117.35	154.47	110.34
1960	76.73	51.75	66.75	204.17	197.65	98.55	68.86	53.69	53.40	88.28	179.30	94.28	102.78
1961	57.44	46.27	44.38	130.40	242.19	92.51	81.77	91.75	115.94	561.57	1,648.18	796.94	325.78
1962	348.80	160.40	118.70	172.82	519.19	191.39	113.80	95.40	92.53	109.81	115.87	108.35	178.92
1963	100.35	75.81	77.79	428.46	717.31	310.81	139.52	100.66	79.23	71.09	177.61	363.23	220.16
1964	221.77	102.08	106.36	511.84	497.70	188.36	111.12	114.42	85.69	108.48	135.92	238.89	201.89
1965	148.74	84.96	68.95	122.00	238.80	115.42	76.28	69.44	57.17	81.15	326.73	176.37	130.50
1966	89.77	73.97	105.17	469.08	382.75	167.55	109.57	84.32	76.21	92.65	447.30	126.91	185.44
1967	74.19	57.83	50.01	128.55	820.96	339.78	156.38	124.74	112.75	210.52	476.56	333.59	240.49
1968	131.05	116.87	258.16	503.16	561.67	324.27	191.30	140.38	103.07	122.39	452.57	738.36	303.60
1969	221.18	164.02	170.17	151.35	288.36	138.17	94.64	86.90	80.53	80.20	134.37	129.36	144.94
1970	91.61	75.10	85.10	468.05	371.48	183.91	110.95	92.04	79.73	84.27	105.08	68.65	151.33
1971	56.92	44.13	36.18	140.27	361.67	163.03	108.07	94.53	74.62	69.77	82.46	87.88	109.96
1972	71.73	79.86	57.57	59.29	181.98	164.70	89.81	69.65	60.26	159.03	445.32	206.93	137.18
1973	130.35	92.35	67.82	142.61	191.60	135.74	83.57	75.12	67.11	76.13	148.73	97.48	109.05
1974	59.15	49.57	59.03	265.86	217.46	130.84	218.29	123.67	87.80	77.29	154.96	105.04	129.08
1975	65.17	50.40	46.09	177.99	212.62	118.71	80.55	74.23	66.22	88.32	127.74	91.15	99.93
1976	59.47	49.49	43.25	113.51	162.29	108.37	76.13	58.26	55.55	62.37	97.29	113.58	83.30
1977	87.19	63.87	68.83	472.09	668.54	248.84	125.03	95.36	74.16	76.42	432.19	331.75	228.69
1978	172.84	116.43	272.39	708.35	544.06	186.01	122.04	98.45	82.88	131.95	245.37	257.38	244.85
1979	177.74	251.86	181.70	372.40	550.22	402.00	167.29	109.69	84.95	95.23	271.48	135.05	233.30
1980	86.14	73.14	66.09	106.66	285.17	157.33	97.54	82.13	69.84	73.69	354.11	200.95	137.73
1981	96.37	70.30	140.18	547.17	542.37	243.67	120.78	90.29	75.42	95.44	157.80	124.95	192.06
1982	95.31	71.73	61.95	222.28	516.21	284.65	122.08	101.94	72.26	246.26	389.07	312.07	207.98
1983	145.88	95.06	73.80	187.28	486.74	183.52	108.19	80.94	69.45	76.02	149.71	107.35	147.00
1984	103.87	69.75	61.85	75.18	93.09	60.38	54.43	51.06	51.37	153.02	279.21	207.78	105.08
1985	98.67	78.21	82.45	374.67	495.02	205.75	109.71	81.76	68.16	69.93	132.26	119.03	159.64
1986	74.58	59.47	61.38	209.31	527.08	251.38	115.67	76.06	62.69	65.95	185.06	299.38	165.67
1987	128.79	78.54	64.50	151.19	218.22	210.80	106.20	91.46	72.30	55.36	147.78	142.01	122.26
1988	82.90	59.54	70.80	565.54	685.84	199.93	108.60	87.61	80.64	108.17	323.27	269.48	220.19
1989	196.94	106.76	92.46	236.63	365.32	181.68	102.03	78.36	71.02	157.51	457.53	427.23	206.12
1990	303.02	121.19	266.14	627.79	475.79	225.25	127.73	96.63	81.20	129.93	282.65	289.21	252.21
MEAN	121.72	84.88	93.99	277.98	411.27	196.03	112.36	88.35	75.08	113.14	278.70	225.35	173.24

Table B3.46 Summary of Runoff Analysis Results

No.	Name of Subbasin or SGS	Name of River	Type of River Flow (Perennial or Seasonal)	Catchment Area (km ²)	Meteo-Hydrological Condition Clarified (1957-90)			Runoff Coefficient (%)
					Average Rainfall (mm/year)	Mean Runoff (m ³ /sec)	Mean Runoff (mm/year)	
(1)	4BE2	Tana Mainstream	Perennial	3,672.	1,477	64.37	554	37.5
(2)	4CB4	Thika	Perennial	316.	1,836	7.11	712	38.8
(3)	4CA2	Chanya	Perennial	518.	1,620	8.79	537	33.1
(4)	MASI-RL	Tana Mainstream	Perennial	2,829.	968	11.01	154	15.9
(5) Natural Inflow to Existing Masinga Reservoir: (5)=(1)+(2)+(3)+(4)				7,335.	1,306	91.28	392	30.0
(6)	KAMB-RL	Tana Mainstream	Seasonal	224.	704	0.15	22	3.1
(7)	4DD1	Thiba	Perennial	1,961.	1,494	26.60	429	28.7
(8) Natural Inflow to Existing Kamburu Reservoir : (8)=(5)+(6)+(7)				9,520.	1,331	118.03	391	29.4
(9)	SGS 4ED3	Tana Mainstream	Perennial	9,520.	1,351	118.11	392	29.0
(10)	GITA-RL	Tana Mainstream	Seasonal	147.	773	0.23	49	6.4
(11) Natural Inflow to Existing Gitaru Reservoir: (11)=(8)+(10)				9,667.	1,322	118.26	386	29.2
(12)	KIND-RL	Tana mainstream	Seasonal	140.	707	0.20	45	6.3
(13) Natural Inflow to Existing Kindarua Reservoir: (14)=(12)+(13)				9,807.	1,314	118.46	381	29.0
(14)	KIA-RL	Tana Mainstream	Seasonal	2,168.	767	3.21	47	6.1
(15) Natural Inflow to Existing Kiambere Reservoir: (15)=(13)+(14)				11,975.	1,215	121.67	320	26.4
(16)	4EA7	Mutonga	Perennial	1,880.	1,605	28.85	465	29.0
(17)	MUTO-L	Ena	Perennial	1,045.	1,063	5.33	161	15.2
(18)	MUTO-R	Tana-Right Bank	Seasonal	465.	803	1.17	80	10.0
(19) Natural Inflow to Planned Mutonga Reservoir: (19)=(16)+(17)+(18)				15,365.	1,240	157.02	322	26.0
(20)	4F19	Kazita	Perennial	1,673.	1,380	15.67	290	21.0
(21)	GRAF-RL	Tana Mainstream	Seasonal	196.	856	0.55	88	10.3
(22) Natural Inflow to Planned Grand Falls Reservoir: (22)=(19)+(20)+(21)				17,234.	1,249	173.24	317	25.4

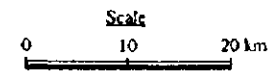


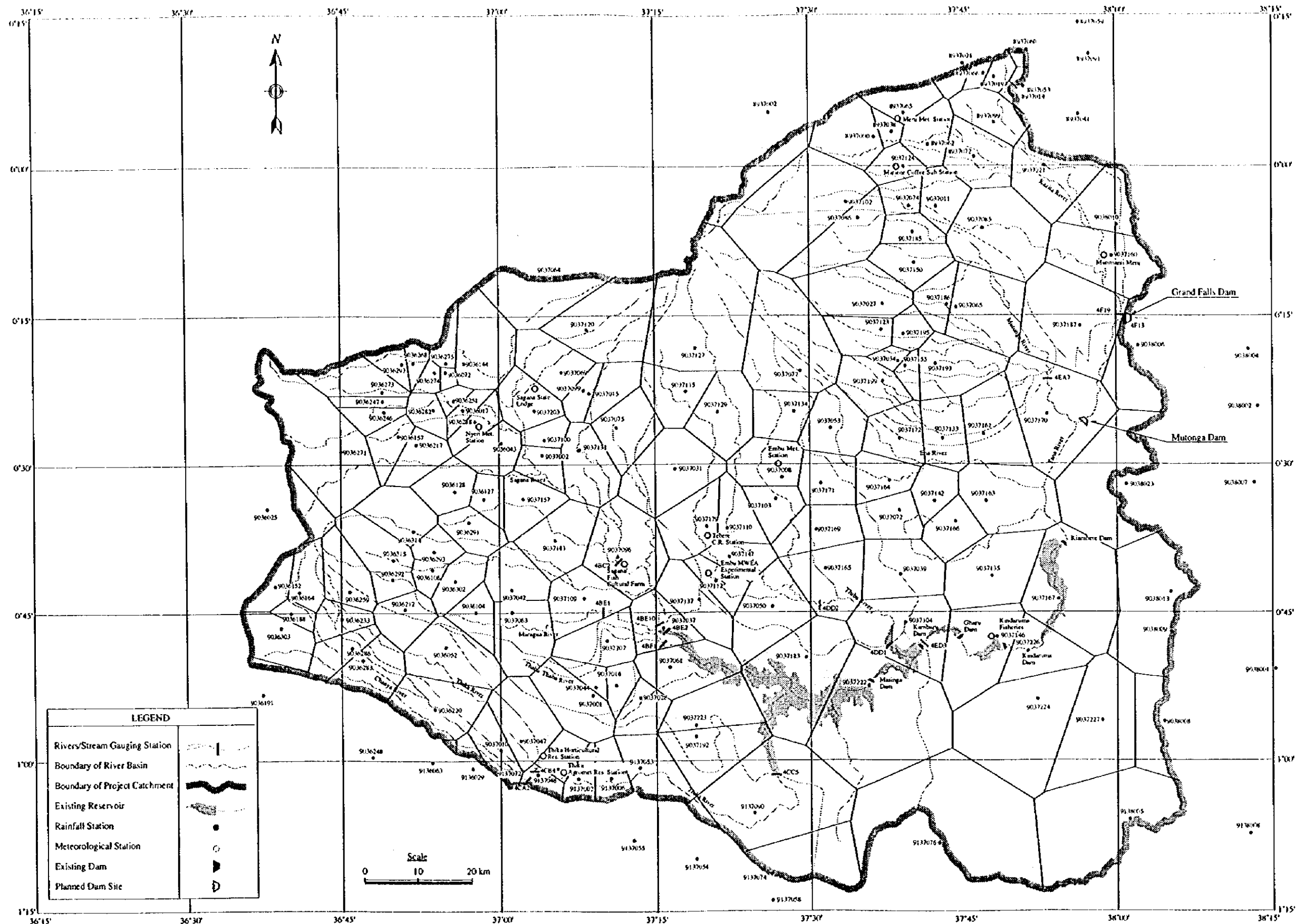
List of Subbasin

No.	Name of Subbasin	Catchment Area (km ²)
1	4BE2	3,672
2	4CB4	316
3	4CA2	518
4	MASI-RL	2,829
5	4DD1	1,961
6	KAMB-RL	224
7	GITA-RL	147
8	KIND-RL	140
9	KIAM-RL	2,168
10	MUTO-L	1,045
11	MUTO-R	465
12	4EA7	1,880
13	GRAF-RL	196
14	4F19	1,673
Total		17,234

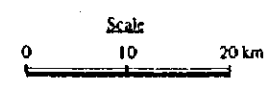
LEGEND

Rivers/Stream Gauging Station	
Boundary of Subbasin	
Boundary of Project Catchment	
Existing Reservoir	
Rainfall Station	
Meteorological Station	
Existing Dam	
Planned Dam Site	





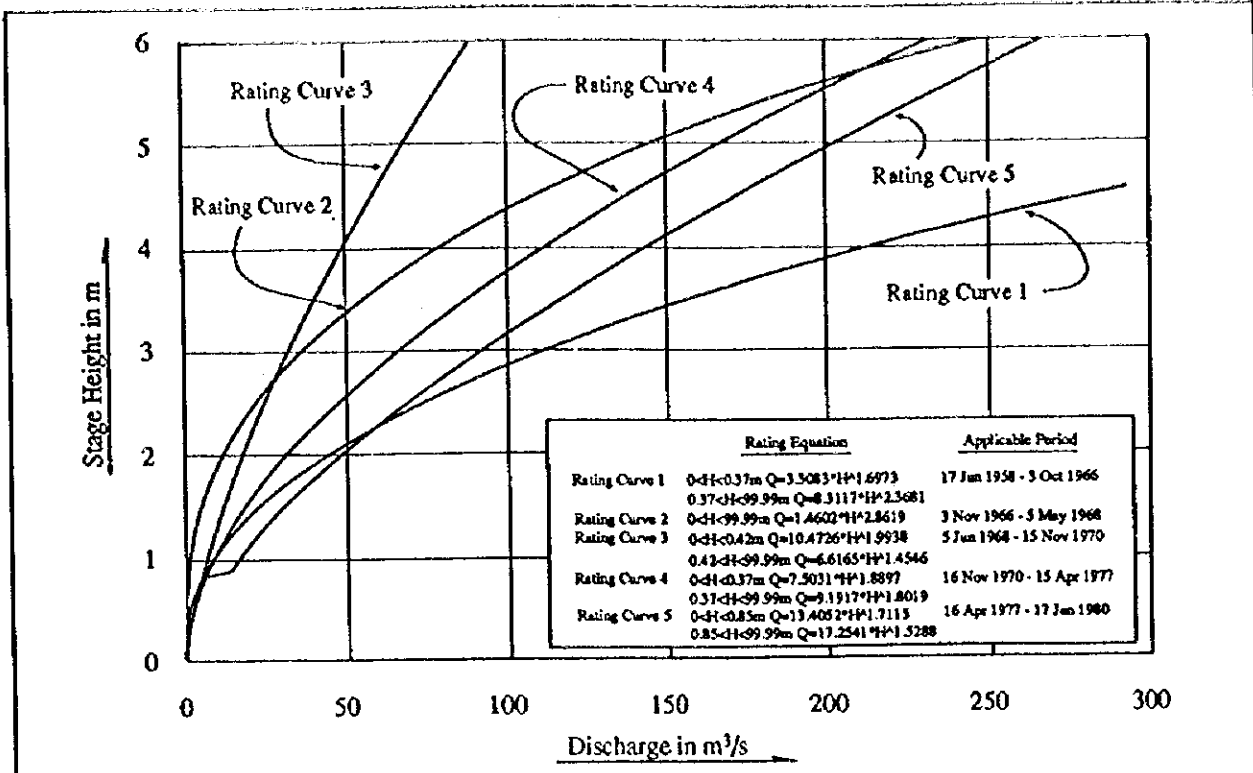
LEGEND	
Rivers/Stream Gauging Station	
Boundary of River Basin	
Boundary of Project Catchment	
Existing Reservoir	
Rainfall Station	
Meteorological Station	
Existing Dam	
Planned Dam Site	



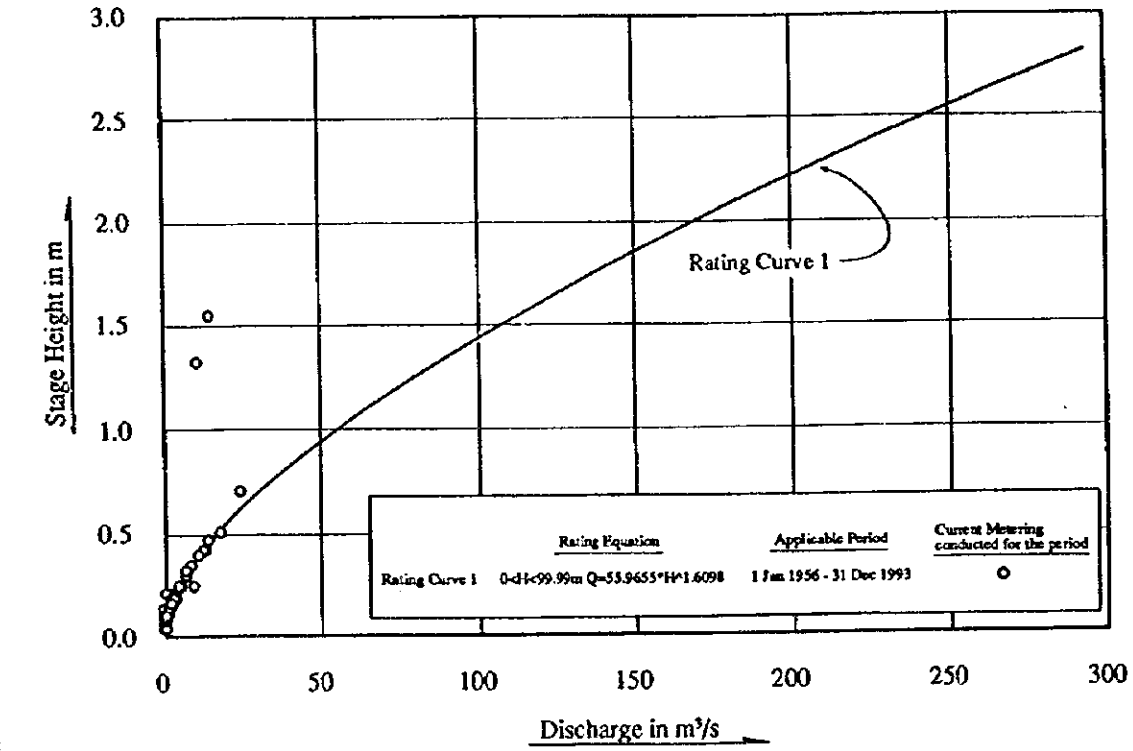
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Thiessen's Polygon for the Project Catchment

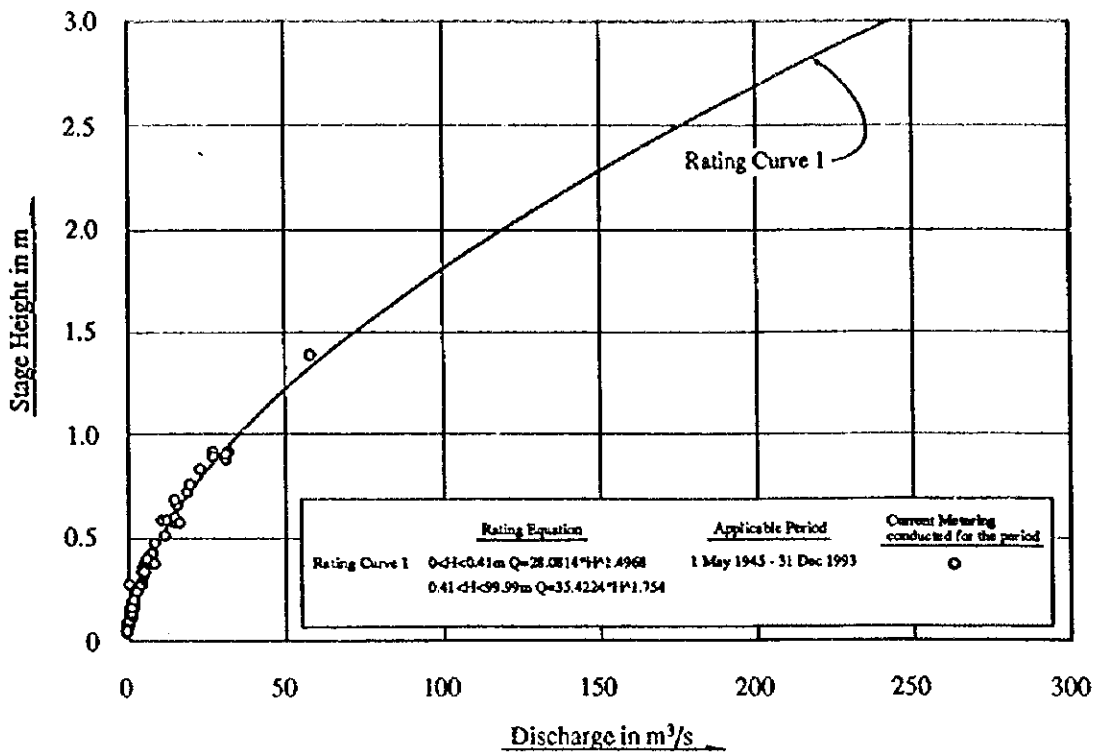
Fig. No.
 B3.2



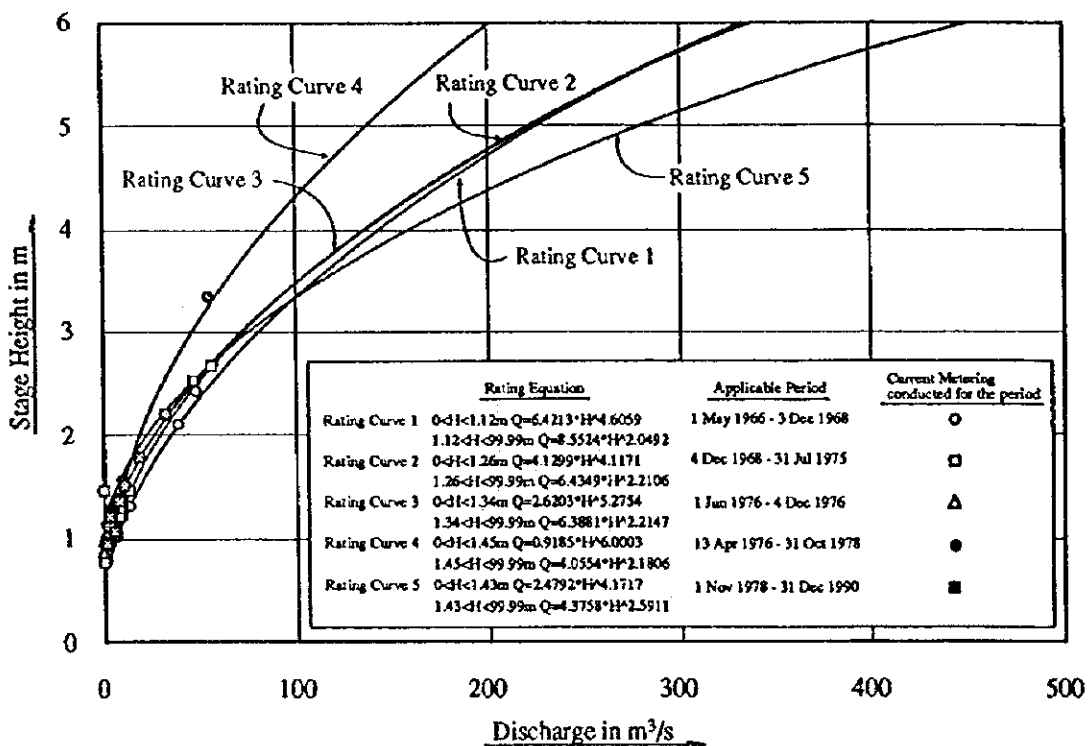
Stage-Discharge Rating Curve at 4BF1 on the Thaba Thaba River



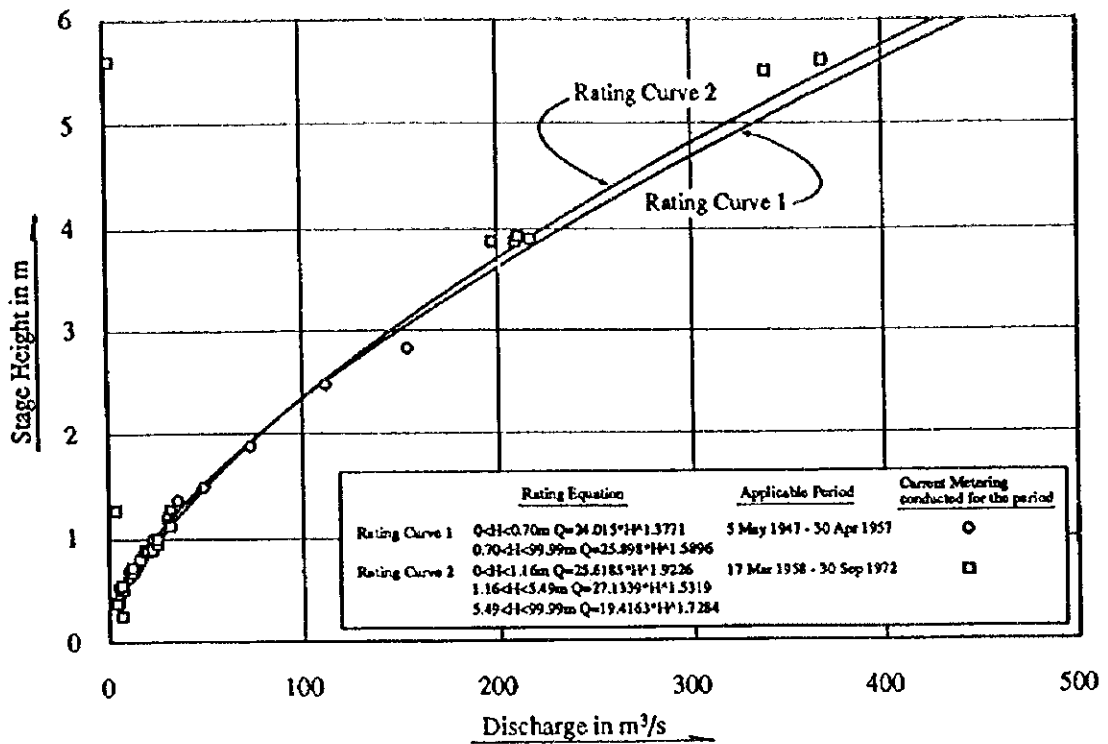
Stage-Discharge Rating Curve at 4CA2 on the Thika-Chanya River



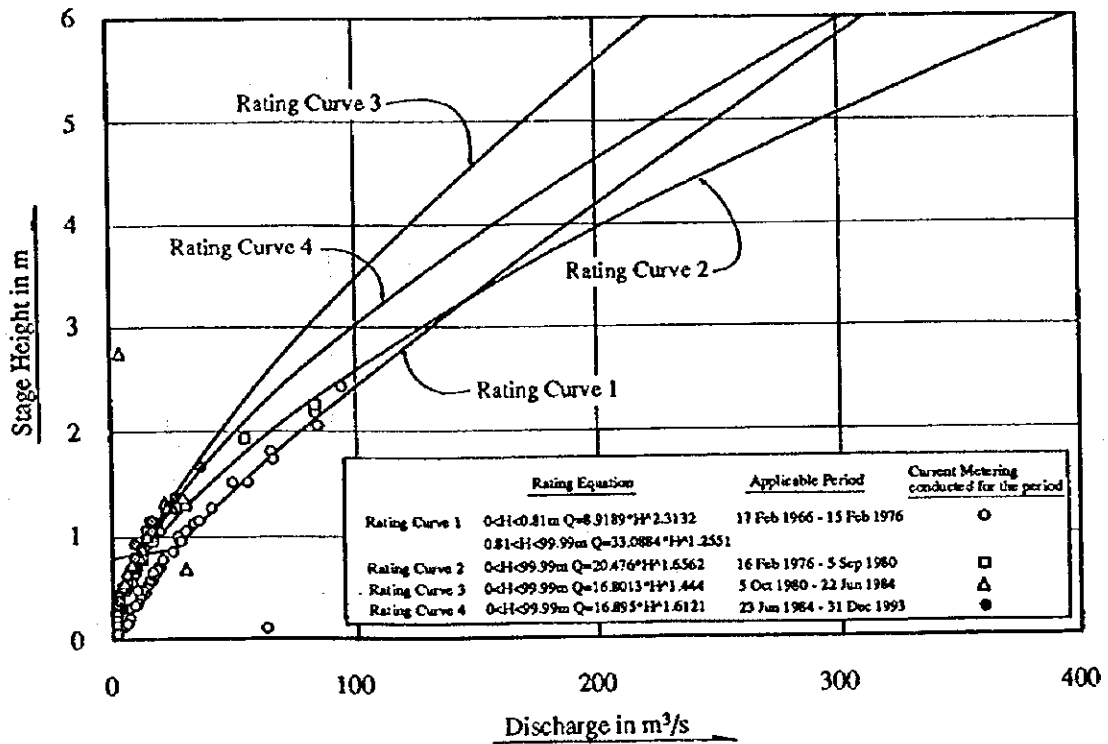
Stage-Discharge Rating Curve at 4CB4 on the Thika River



Stage-Discharge Rating Curve at 4CC5 on the Thika River

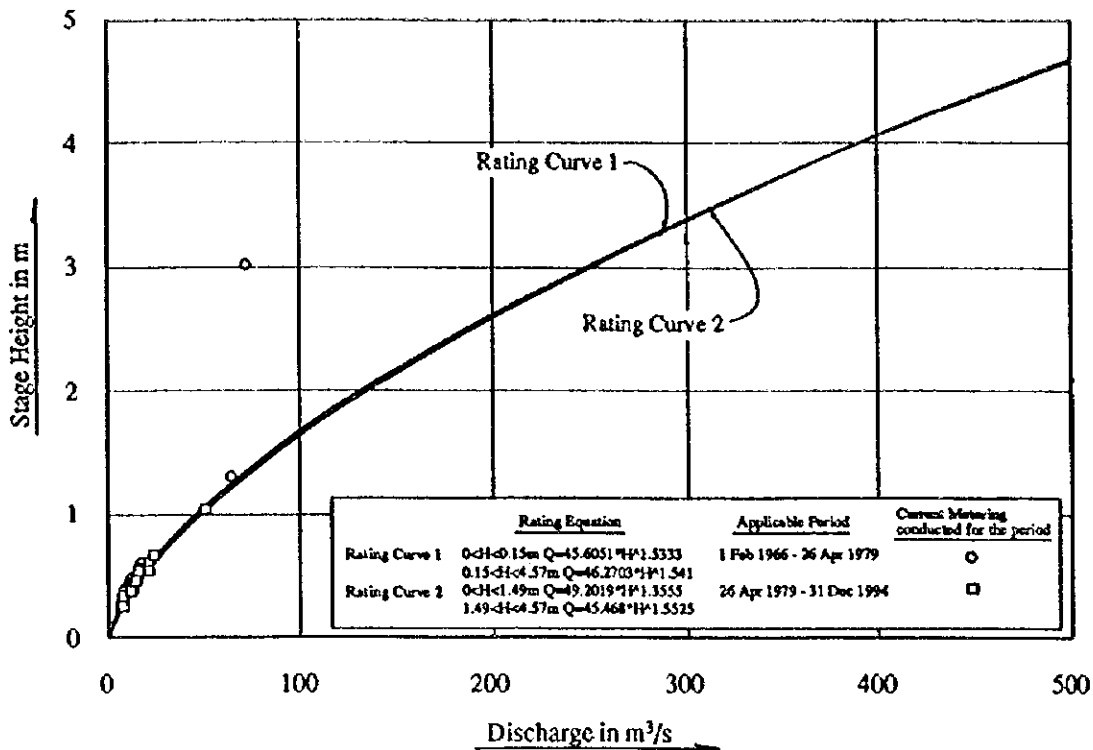


Stage-Discharge Rating Curve at 4DD1 on the Thiba River

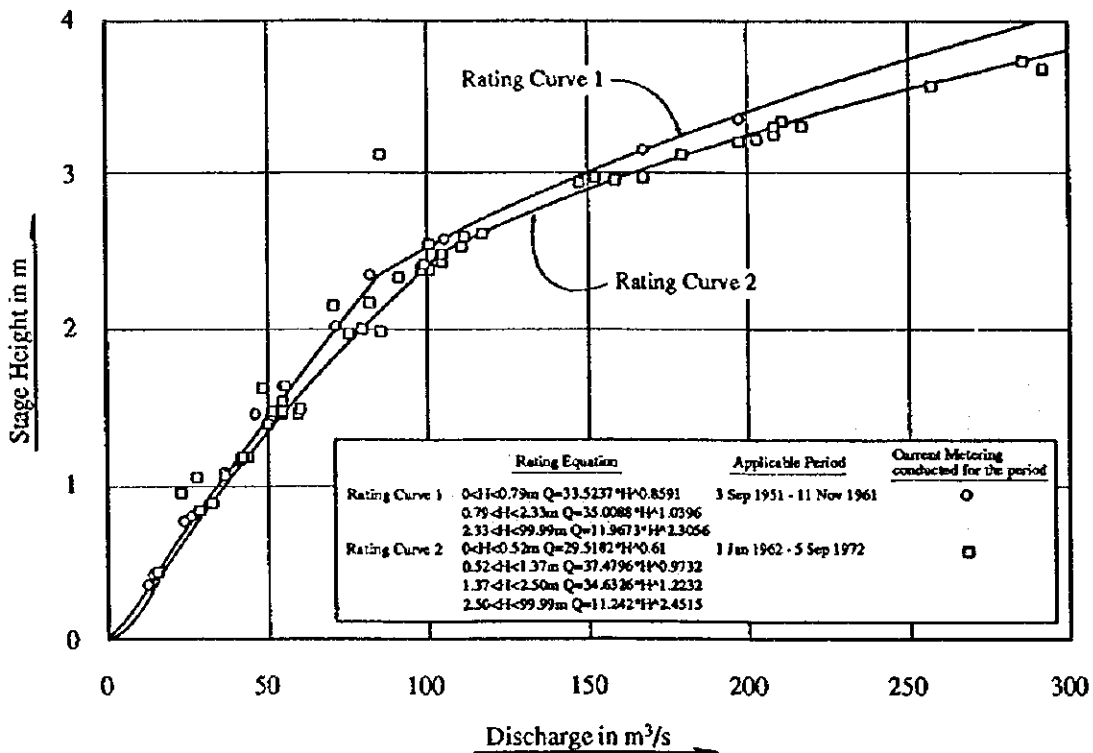


Stage-Discharge Rating Curve at 4DD2 on the Thiba River

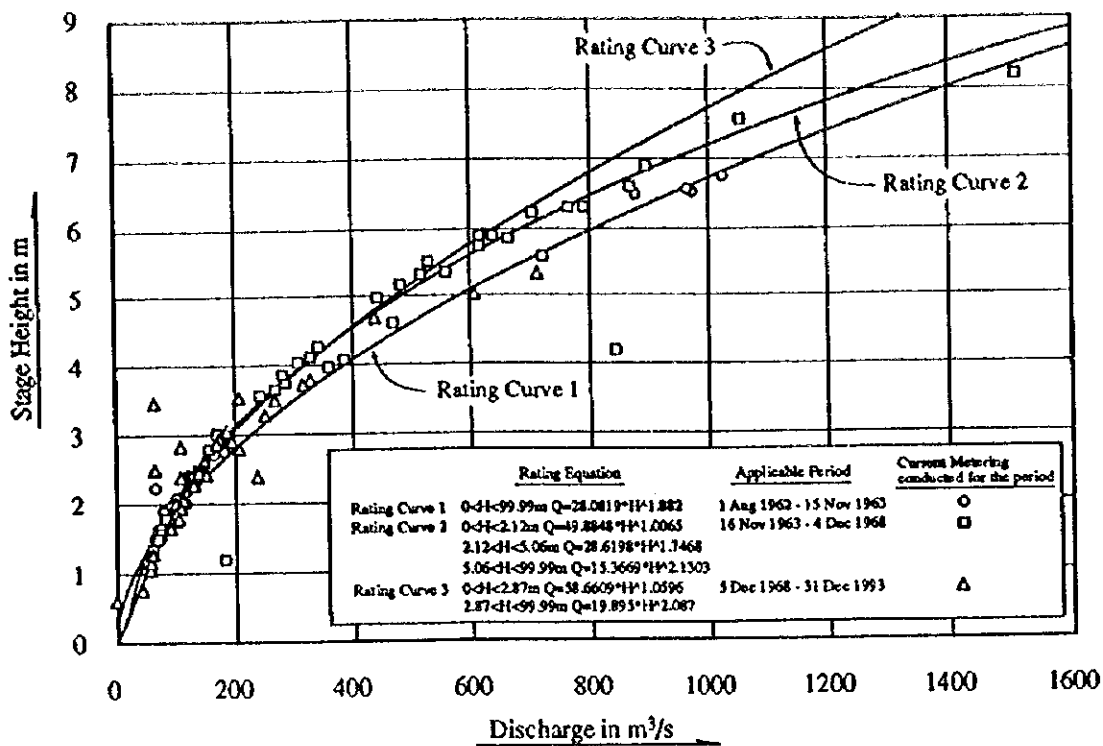
JAPAN INTERNATIONAL COOPERATION AGENCY	Stage-Discharge Rating Curves at SGS 4DD1 and 4DD2	Fig. No. B3.5
MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



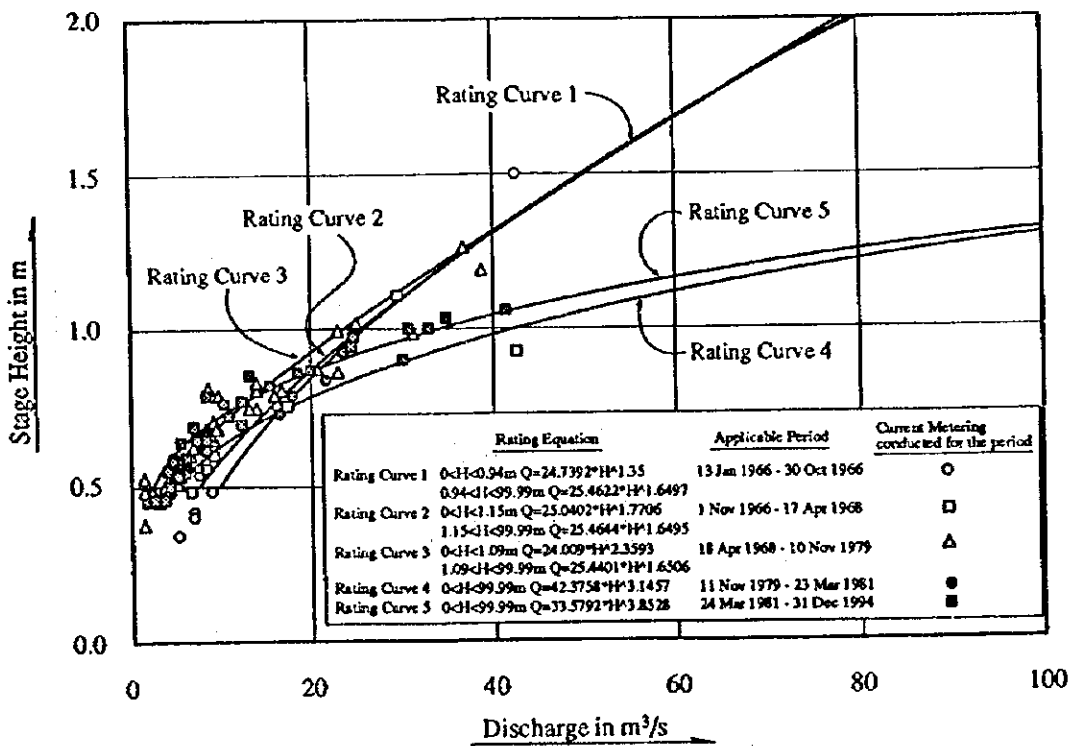
Stage-Discharge Rating Curve at 4EA7 on the Mutonga River



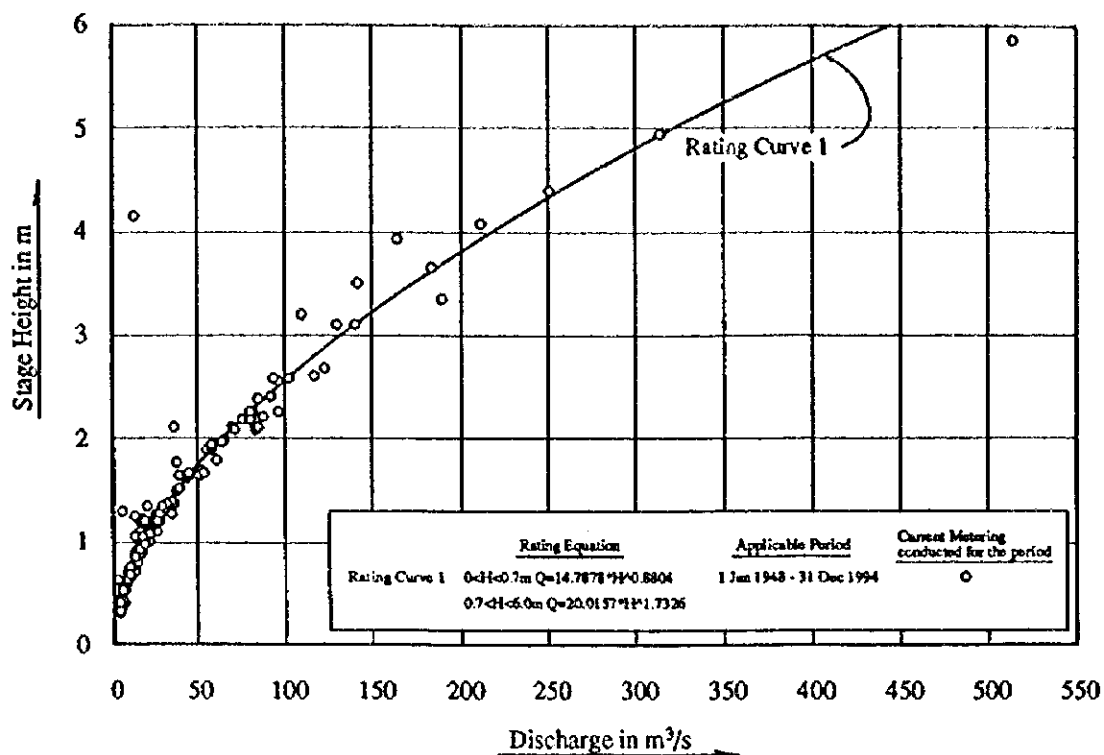
Stage-Discharge Rating Curve at 4ED3 on the Tana Main Stream



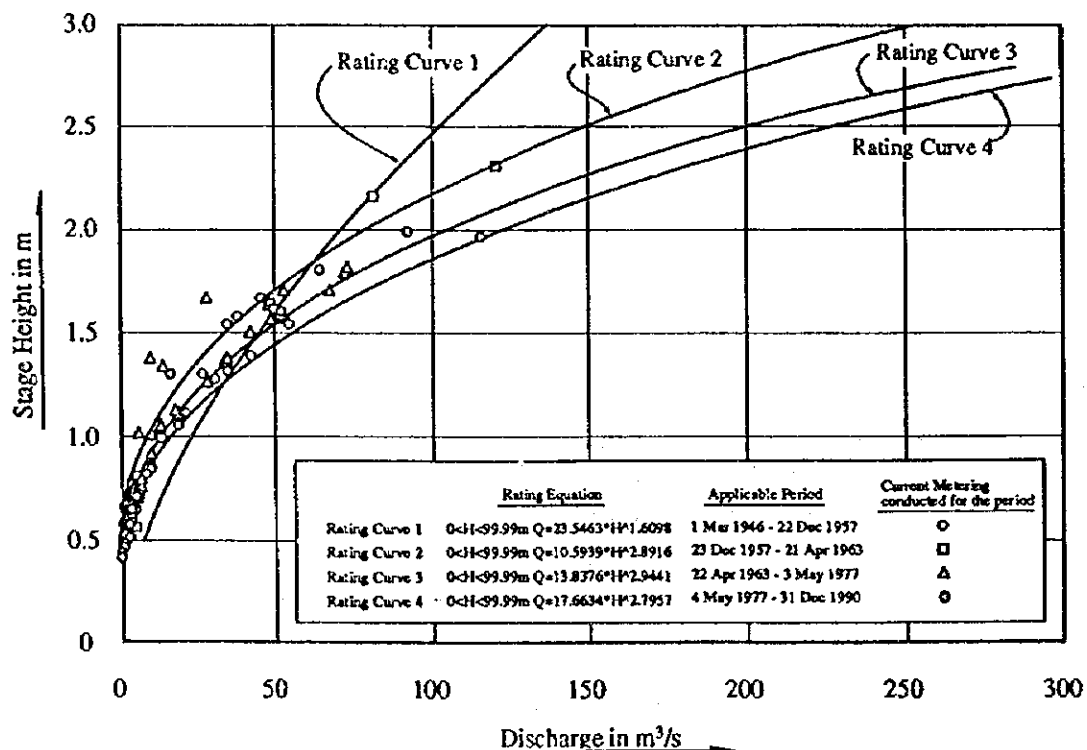
Stage-Discharge Rating Curve at 4F13 on the Tana Main Stream



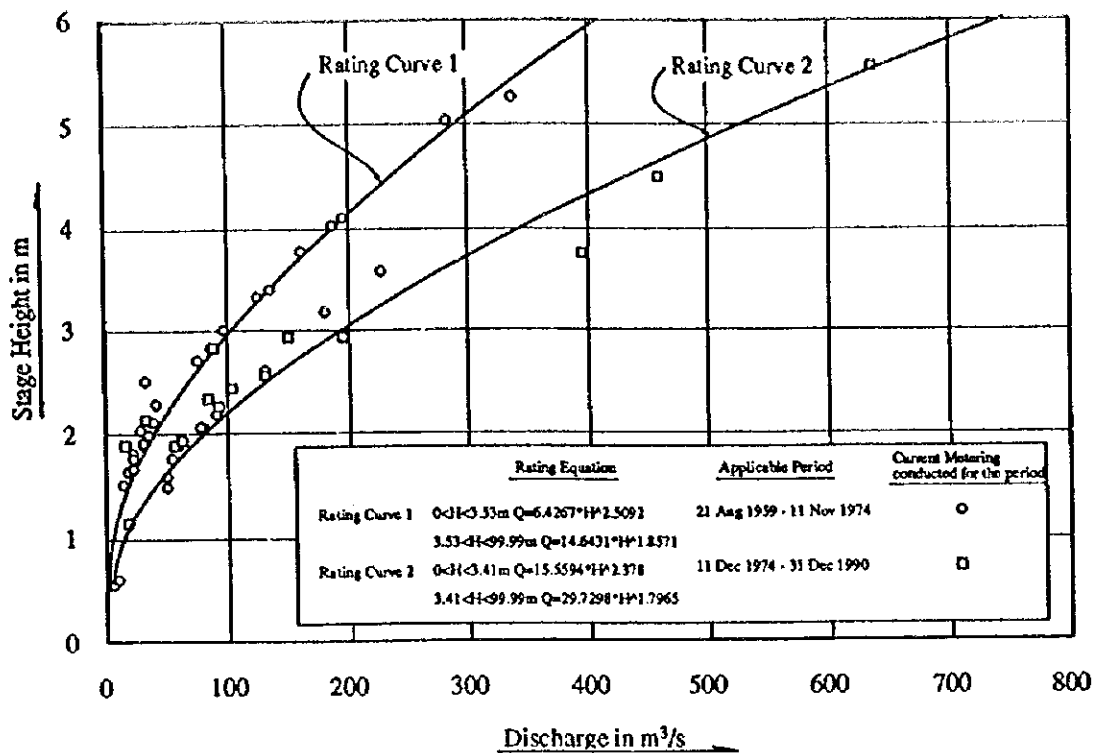
Stage-Discharge Rating Curve at 4F19 on the Kazita River



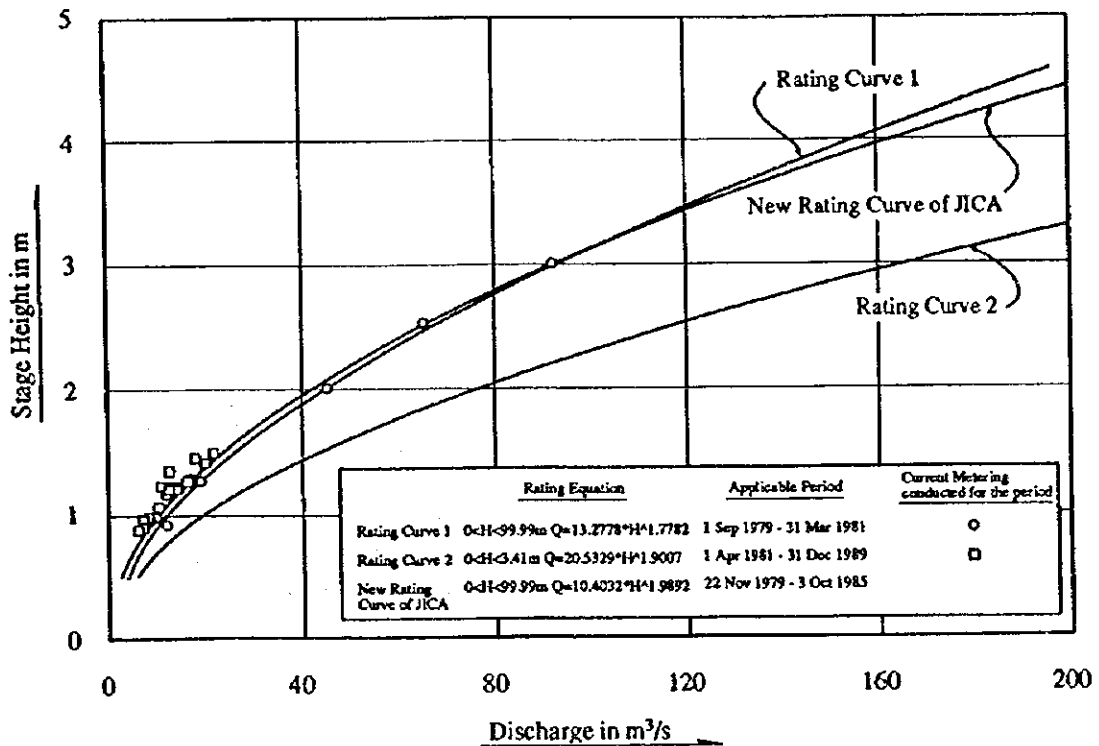
Stage-Discharge Rating Curve at 4BC2 on the Sagana-Ruarai River



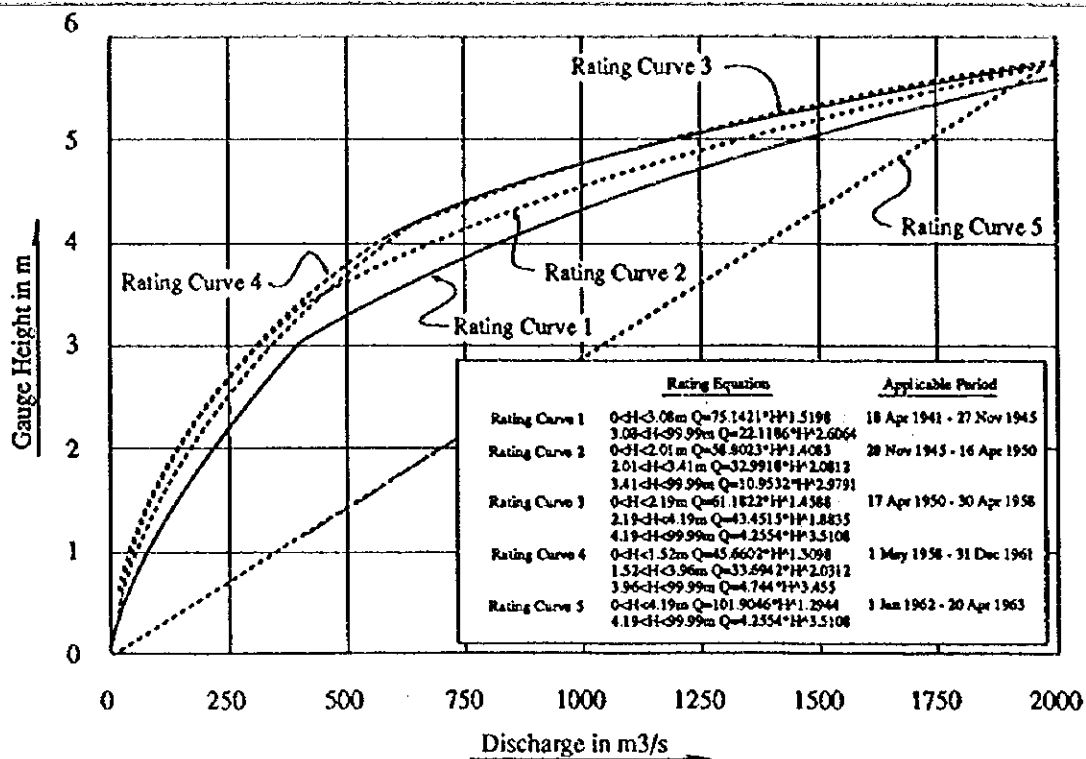
Stage-Discharge Rating Curve at 4BE1 on the Maragua River



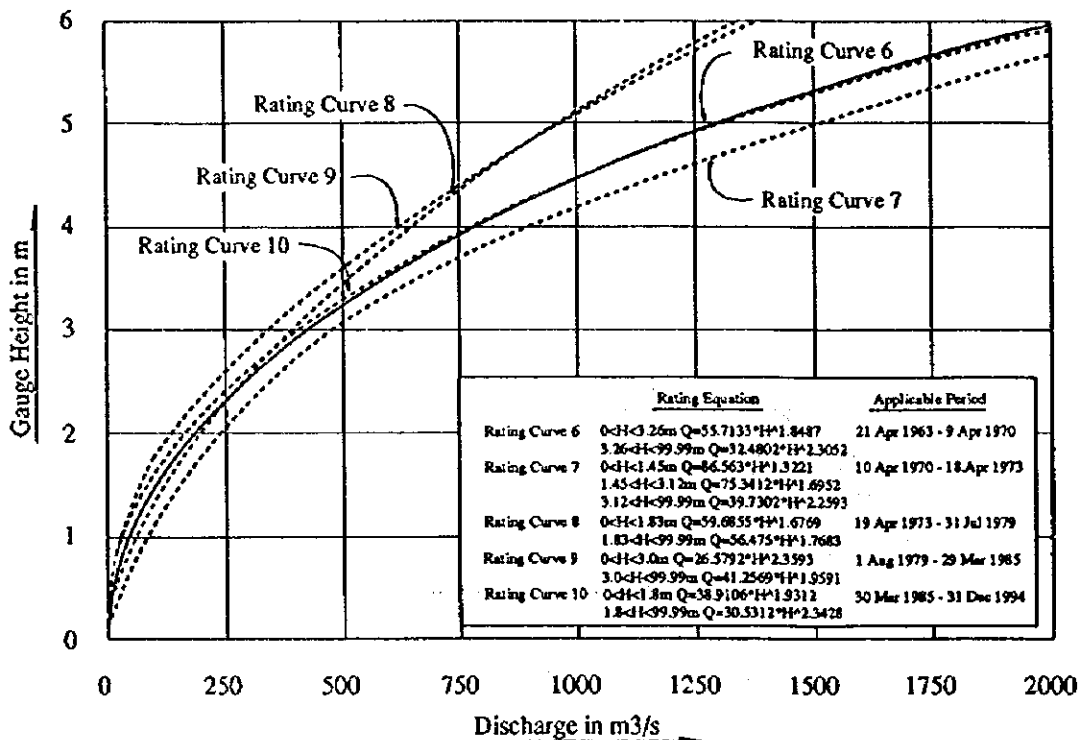
Stage-Discharge Rating Curve at 4BE2 on the Sagana/Mathioya River



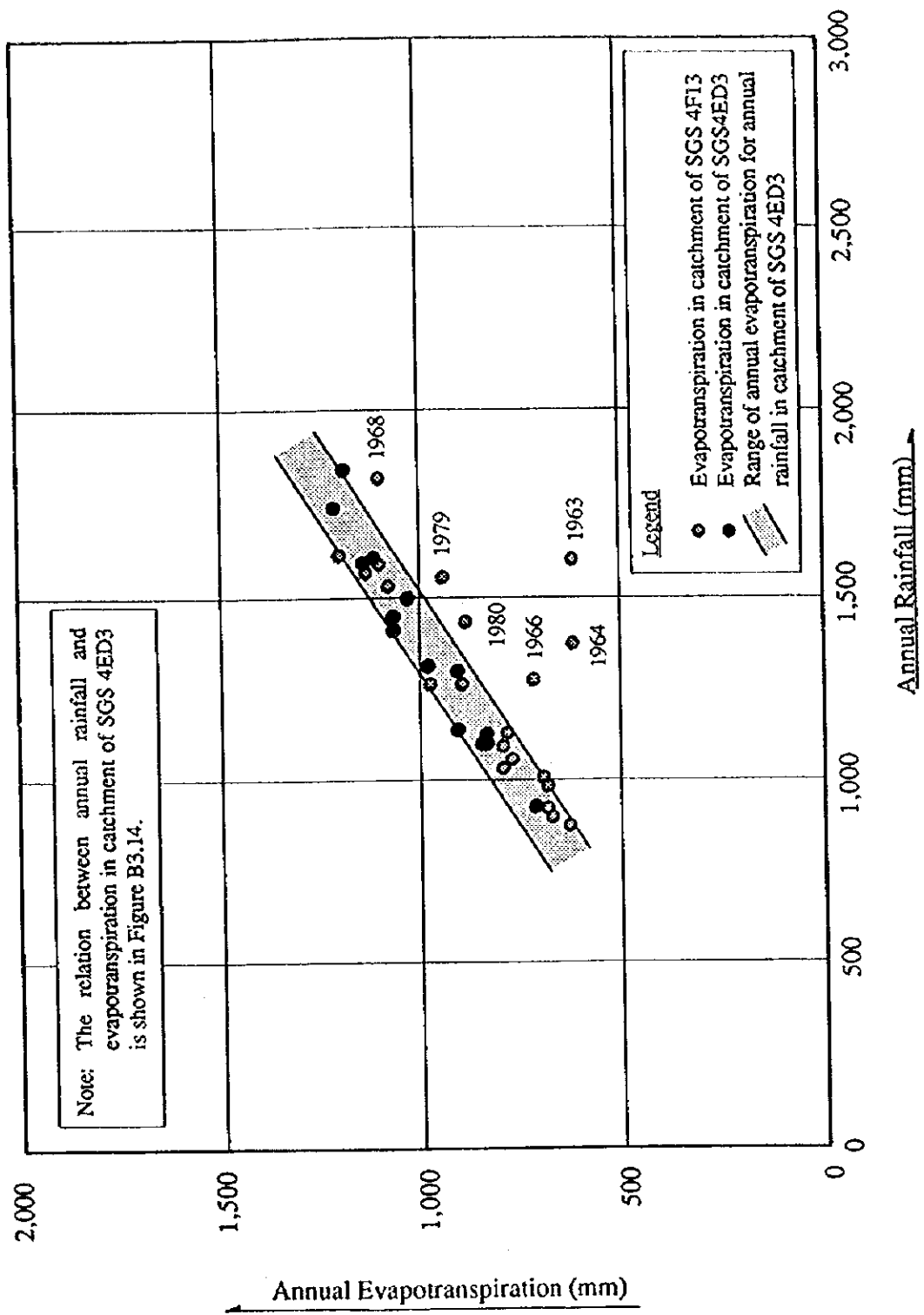
Stage-Discharge Rating Curve at 4BE10 on the Tana Rivewr



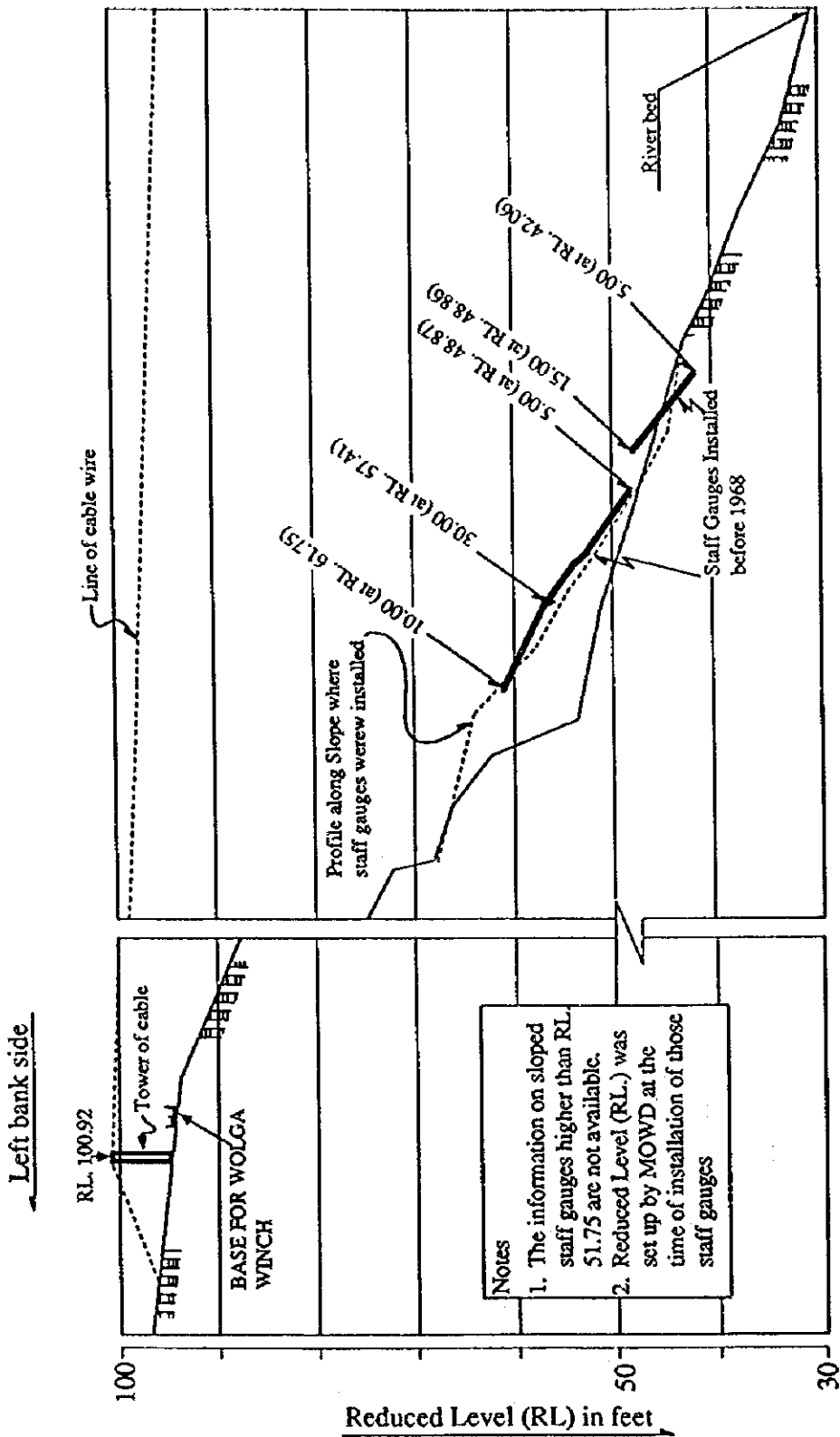
Stage-Discharge Rating Curve at 4G1 on the Tana Main Stream



Stage-Discharge Rating Curve at 4G1 on the Tana Main Stream



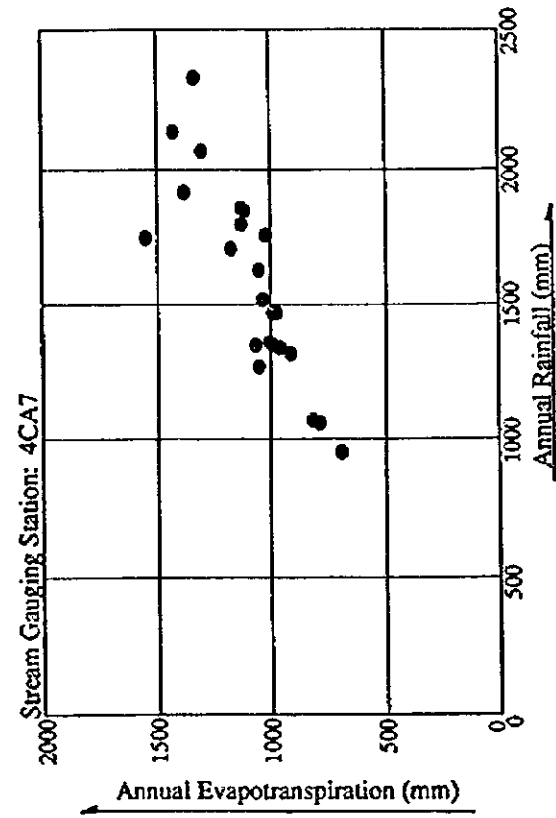
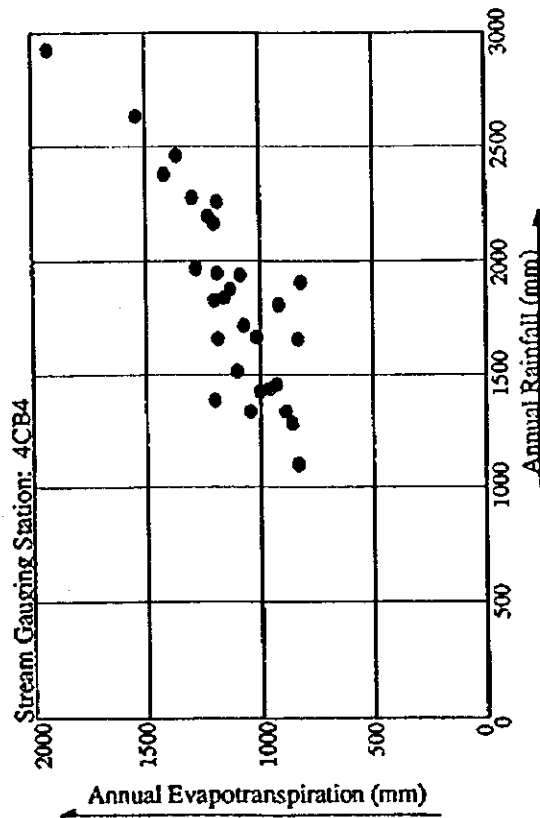
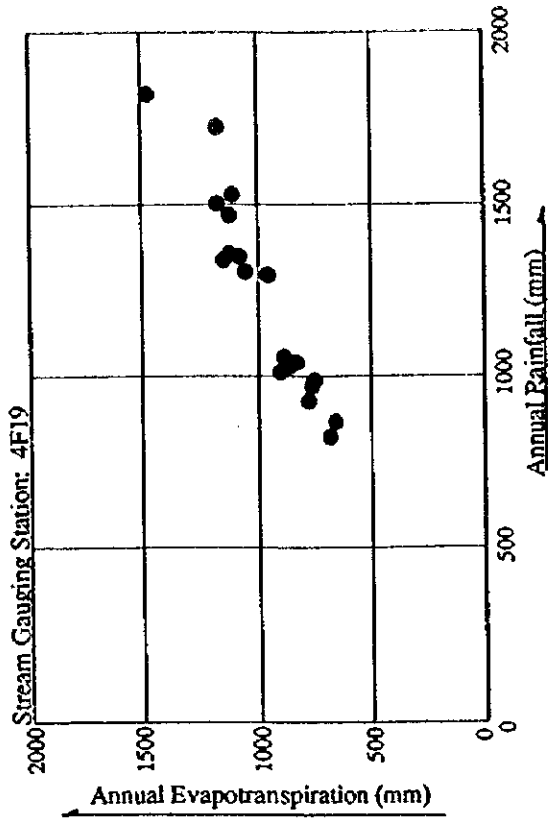
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Relation between Annual Rainfall and Evapotranspiration in Project Catchment (SGS 4F13)	Fig. No. B3.11



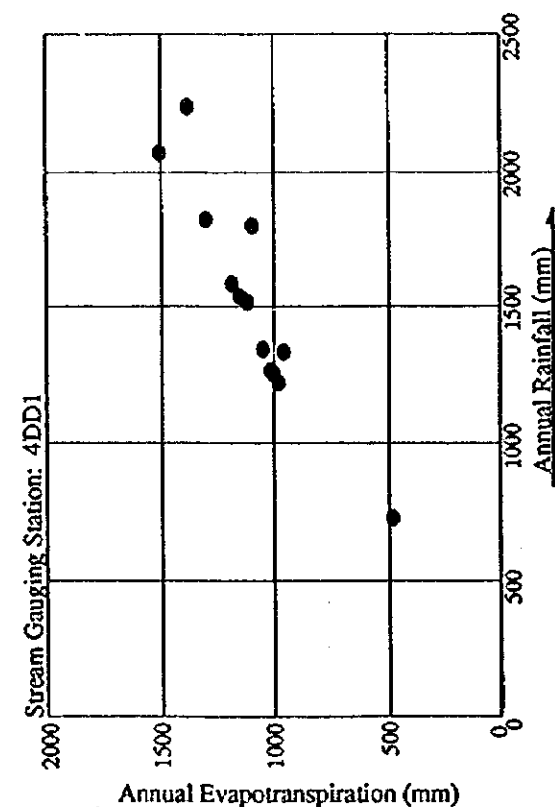
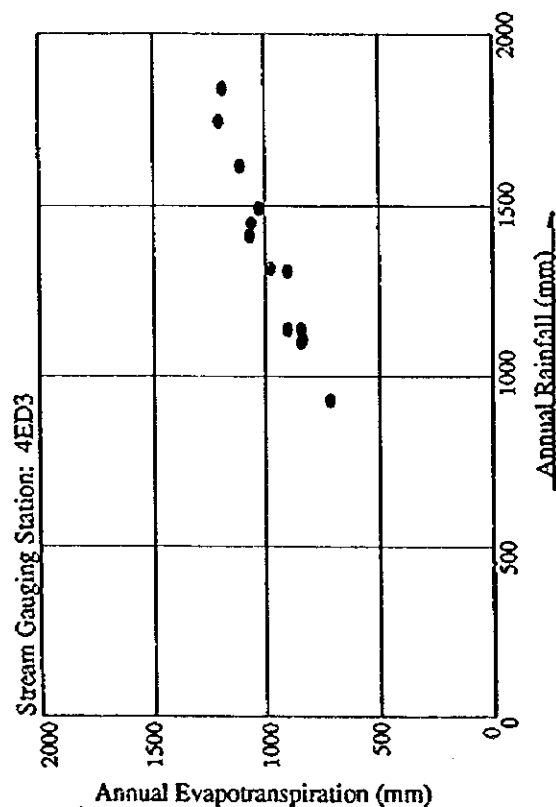
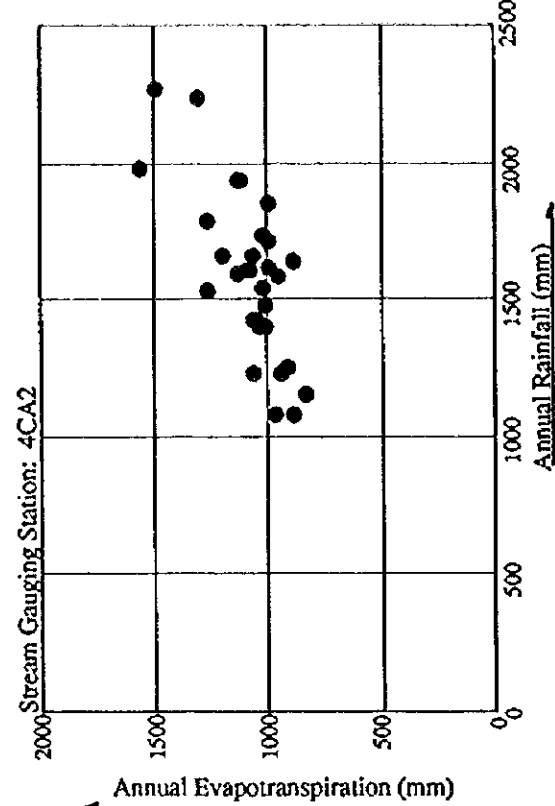
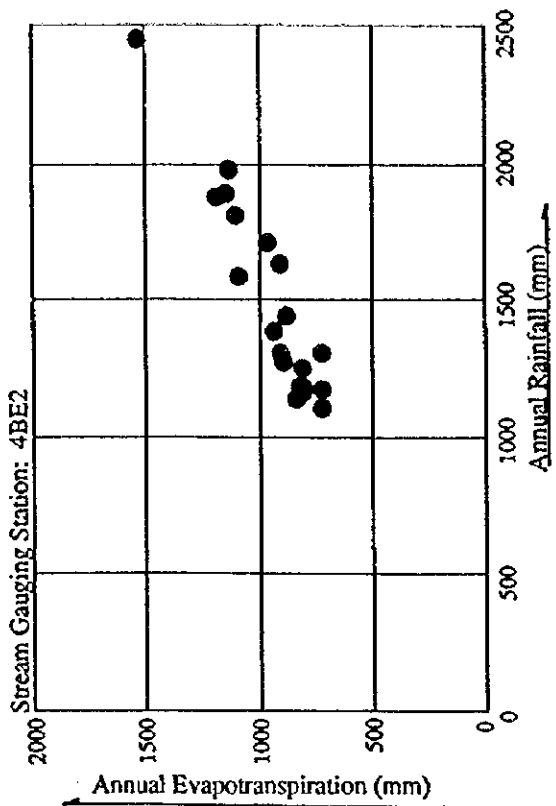
JAPAN INTERNATIONAL COOPERATION AGENCY
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Staff Gauges Installed at SGS 4F13
 before 1968

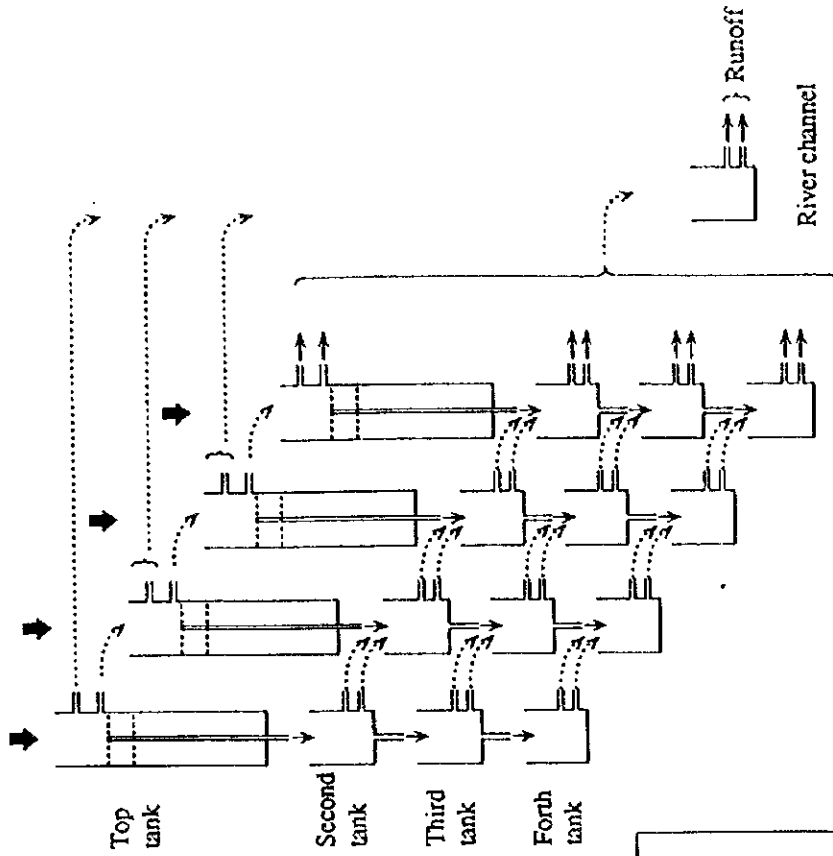
Fig. No.
 B3.12



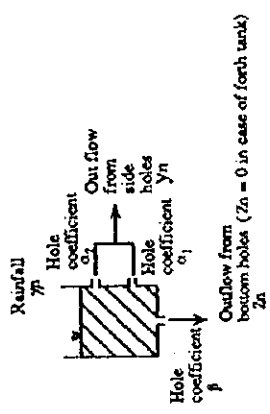
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Relation between Annual Rainfall and Evapotranspiration in Catchment of Each SGS	Fig. No.
		B3.13 (1)



JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Relation between Annual Rainfall and Evapotranspiration in Catchment of Each SGS	Fig. No.
		B3.13 (2)

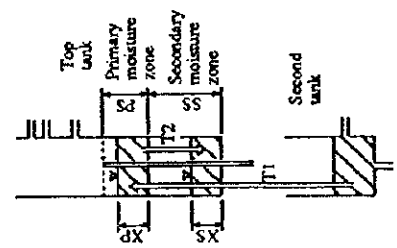


Structure of Composite Tank Model

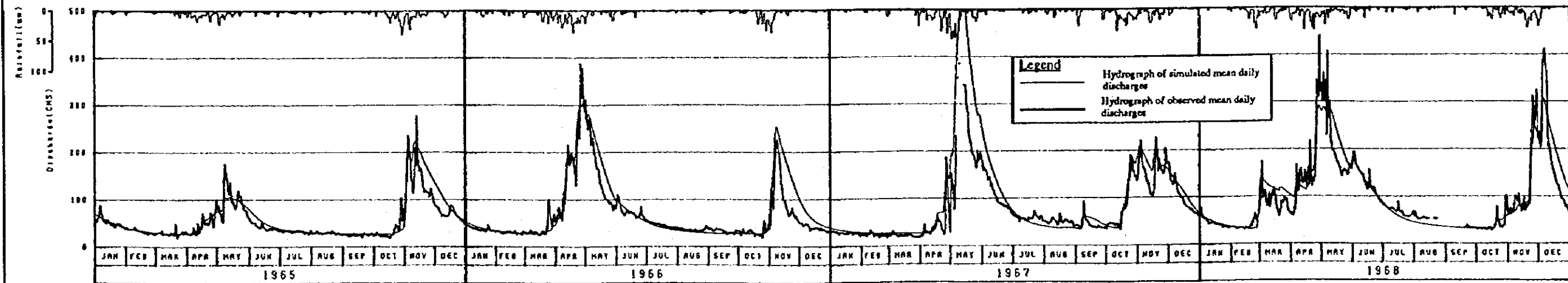
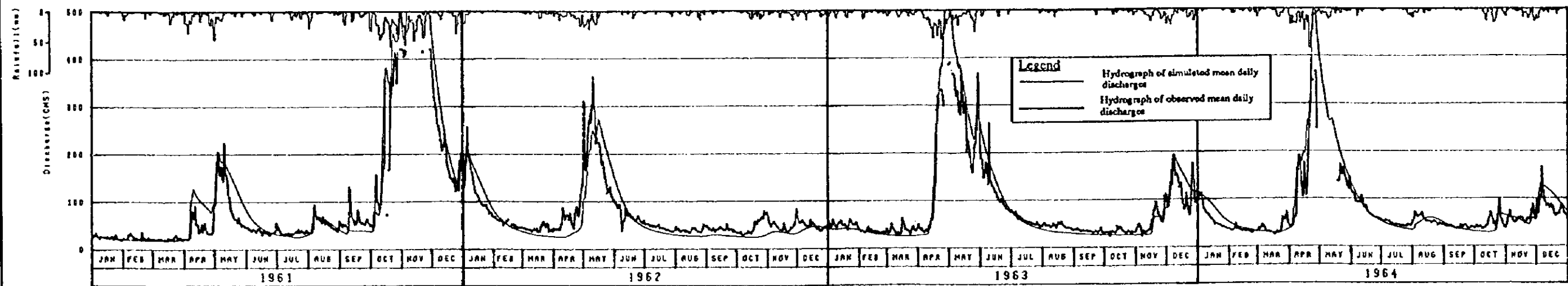
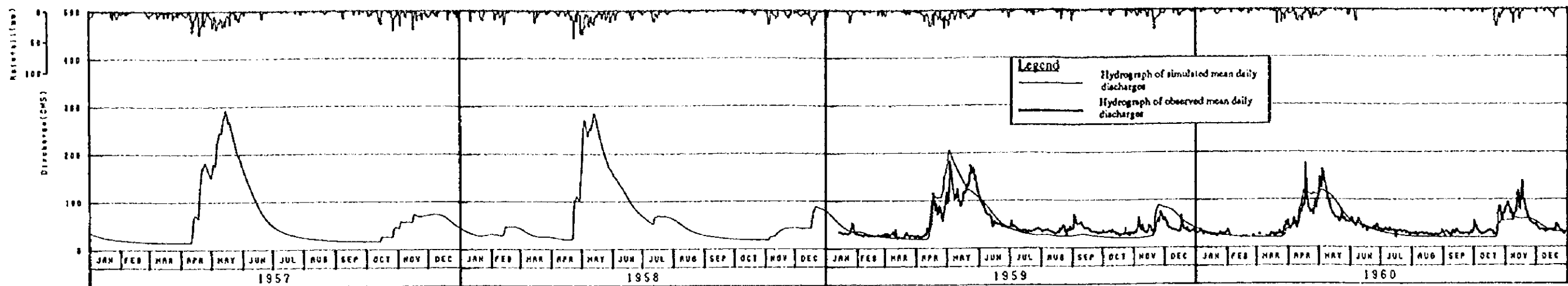


Tank model for Secondary to Forth Tanks

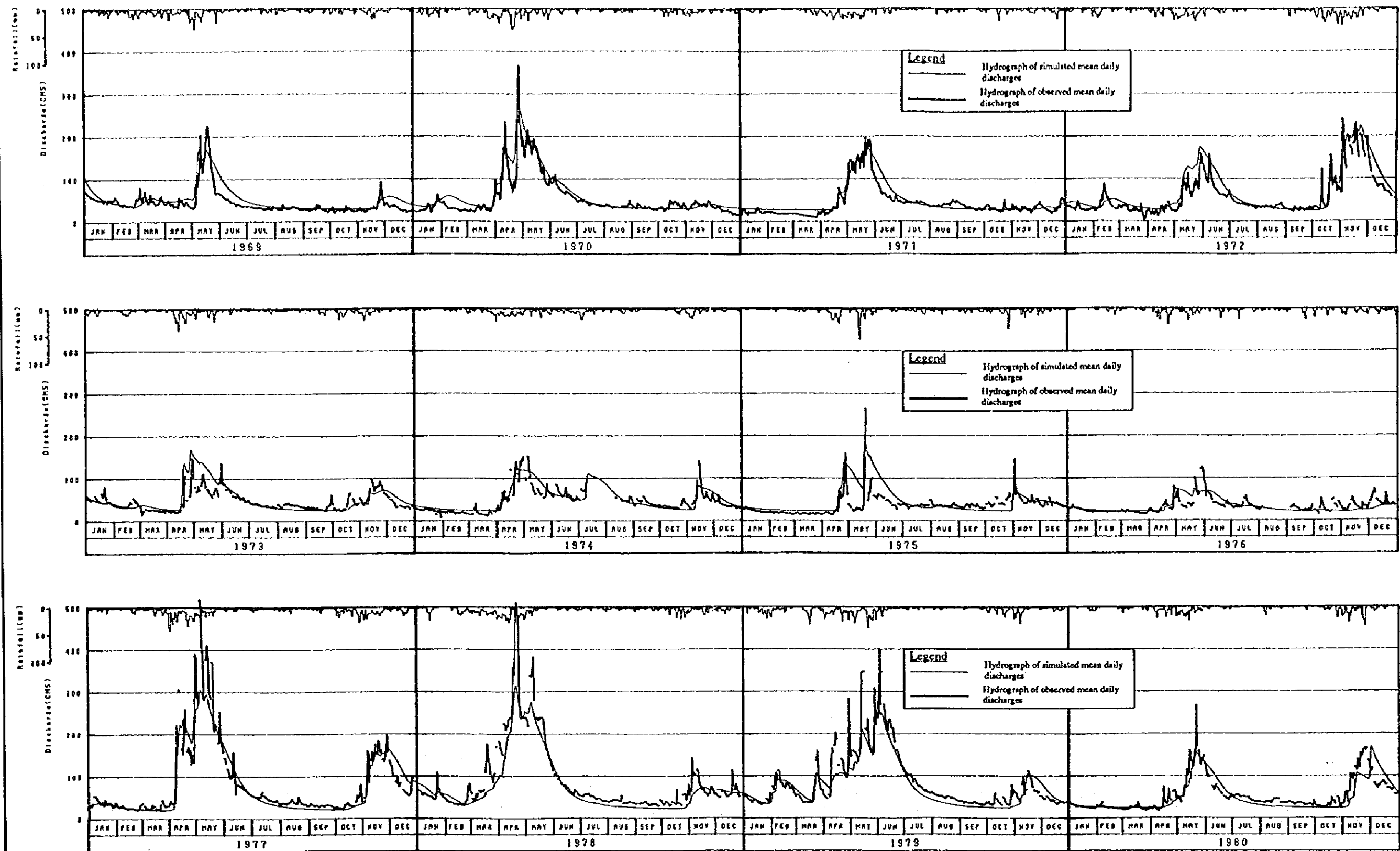
Parameters for Soil Moisture Model
 PS : Primary soil moisture capacity (=150 mm)
 SS : Secondary soil moisture capacity (=500 mm)
 XP : Primary soil moisture depth
 XS : Secondary soil moisture depth
 $T1$: Transfer by capillary action from lower tanks
 $T1 = TB \times (1 - \frac{XP}{PS})$; $TB = \text{constant}$
 $T2$: Transfer of moisture between primary and secondary zones
 $T2 = TC \times (\frac{XP}{PS} - \frac{XS}{SS})$; $TC = \text{constant}$



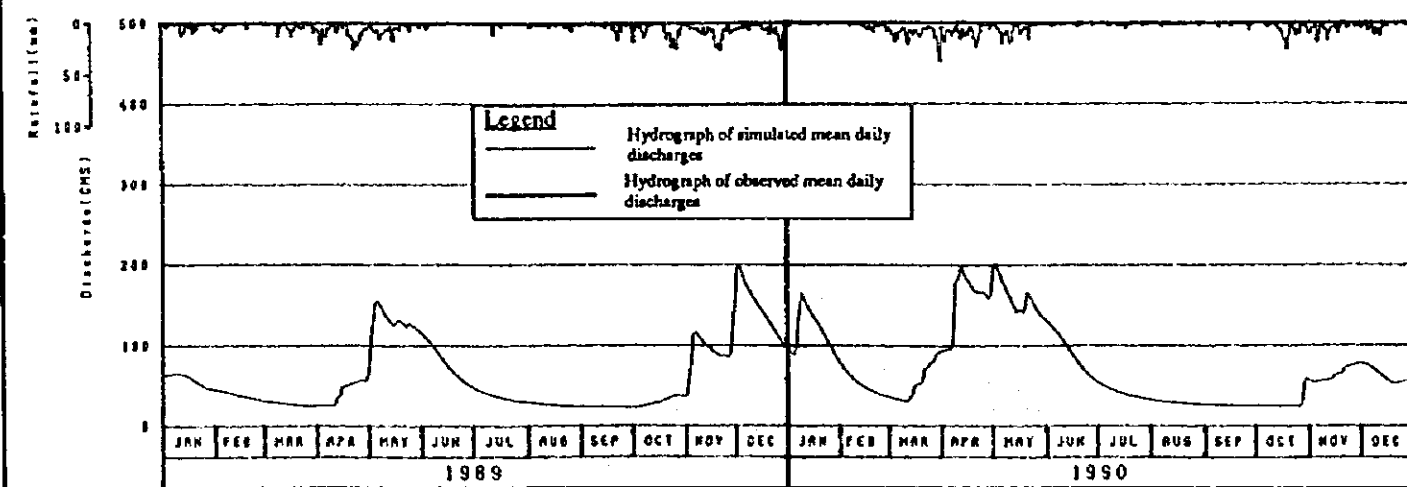
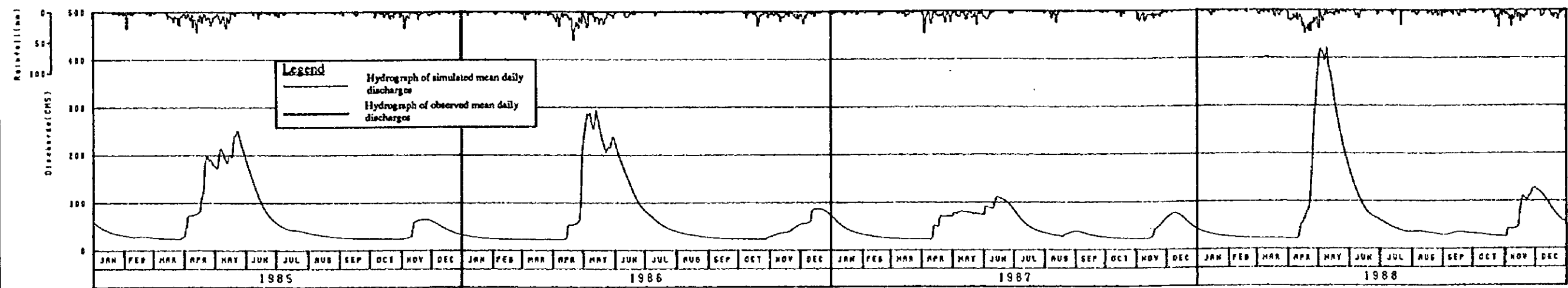
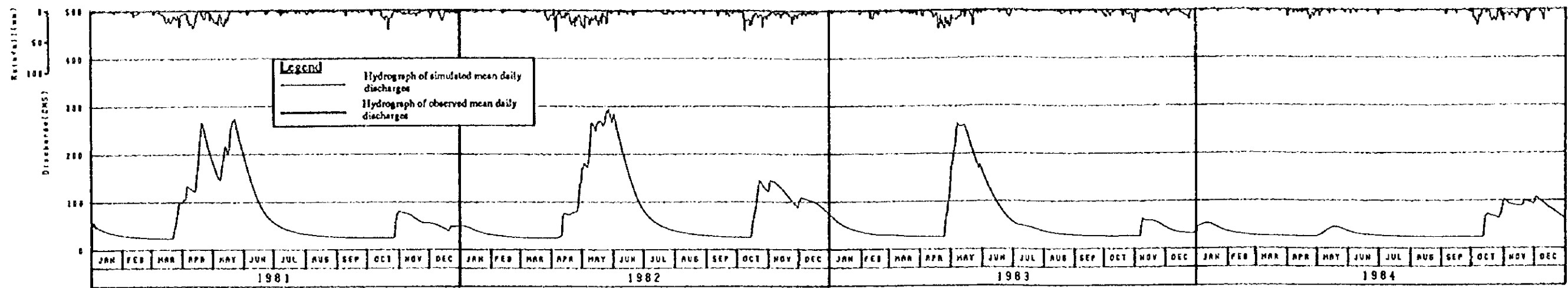
Soil Moisture Model for Top Tank



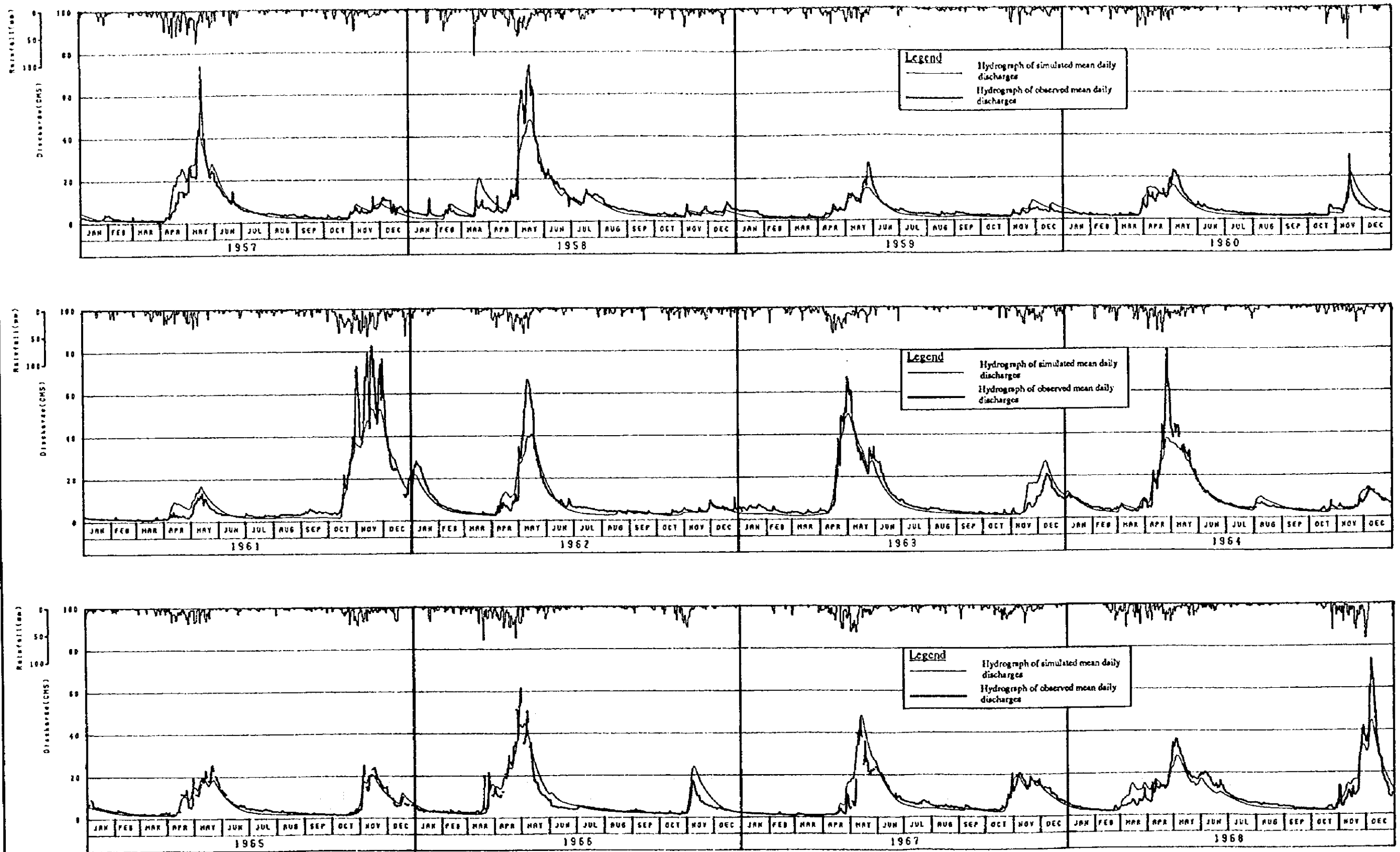
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4BE2	Fig. No. B3.15 (1)
MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



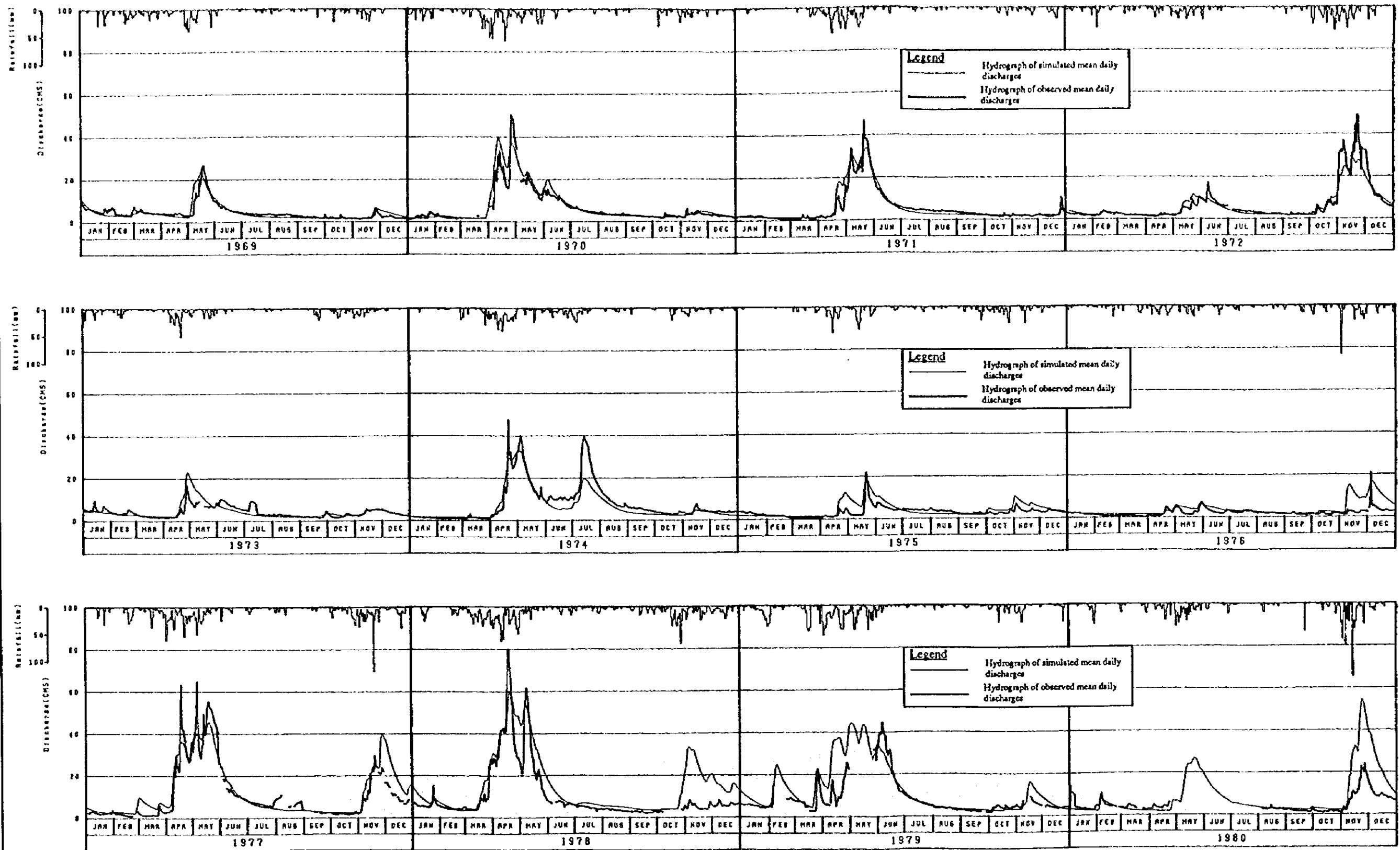
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4BE2	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.15 (2)



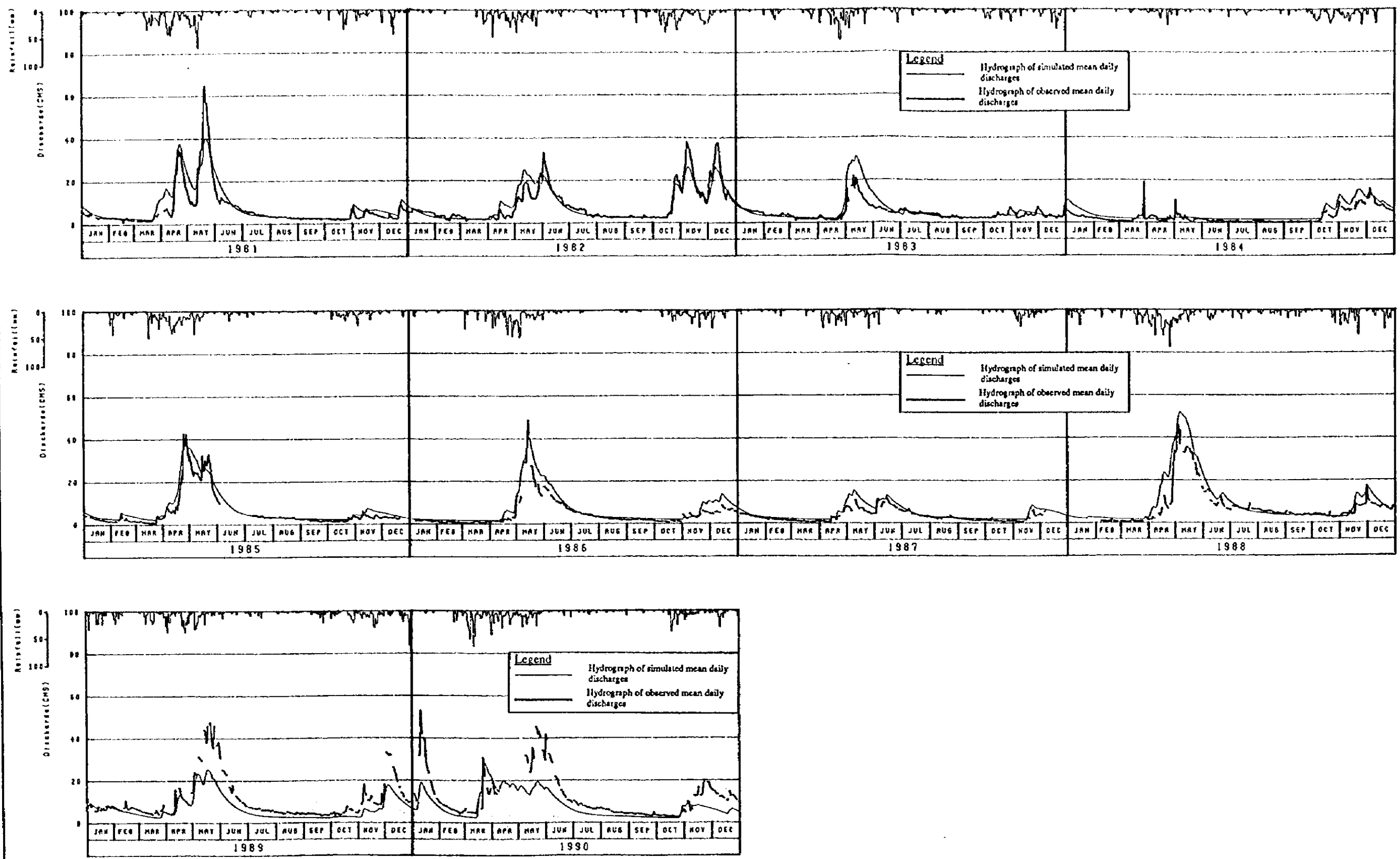
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4BE2	Fig. No. B3.15 (3)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



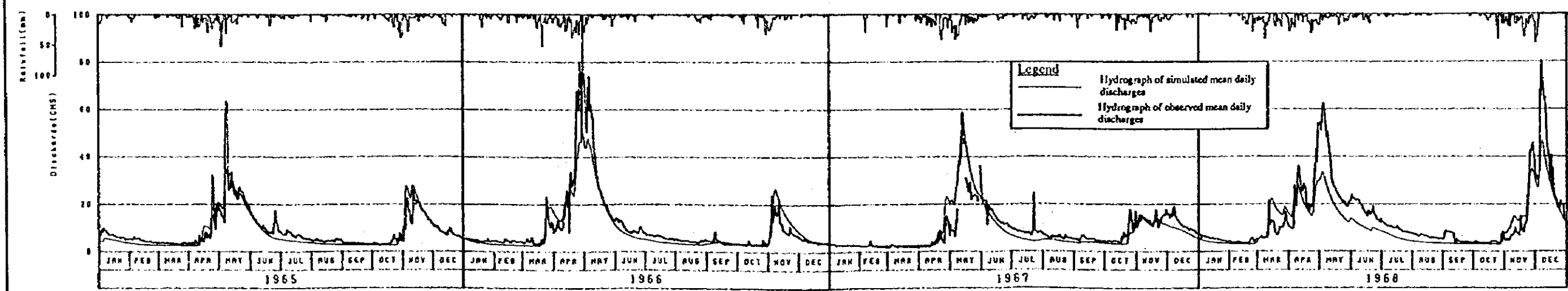
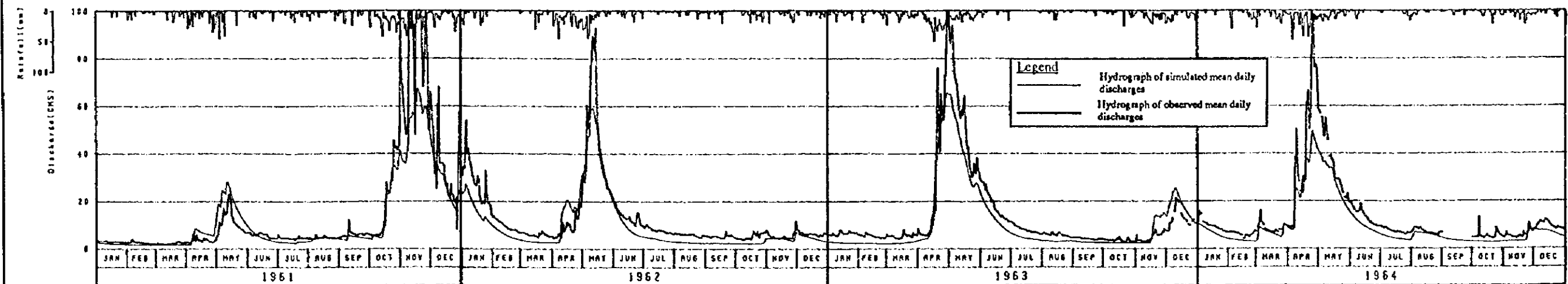
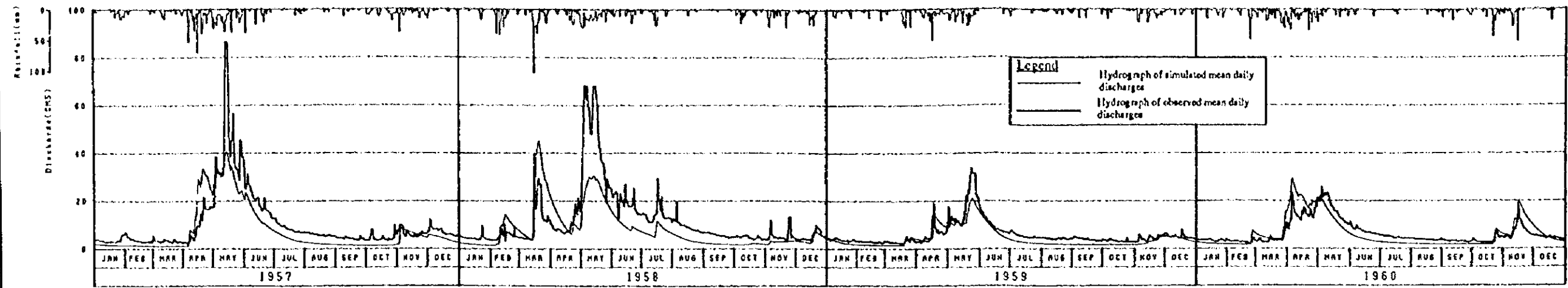
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CB4	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.16 (1)



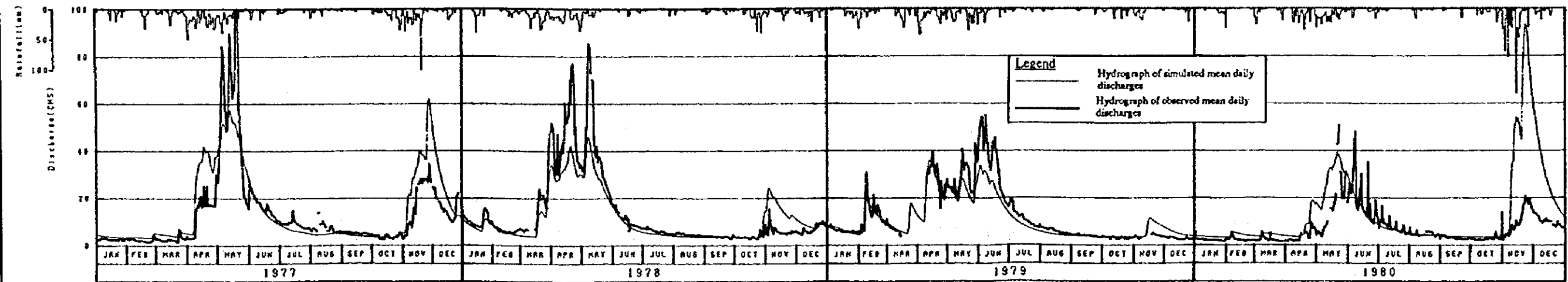
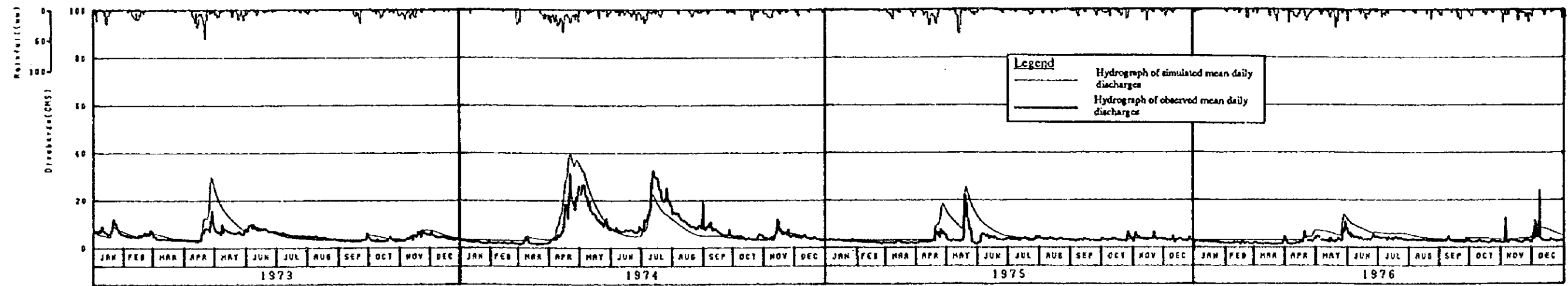
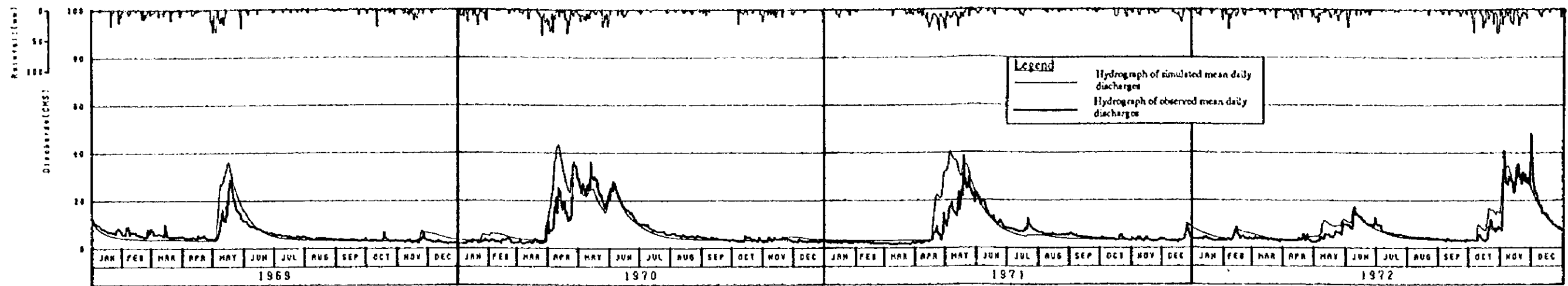
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CB4	Fig. No. B3.16 (2)



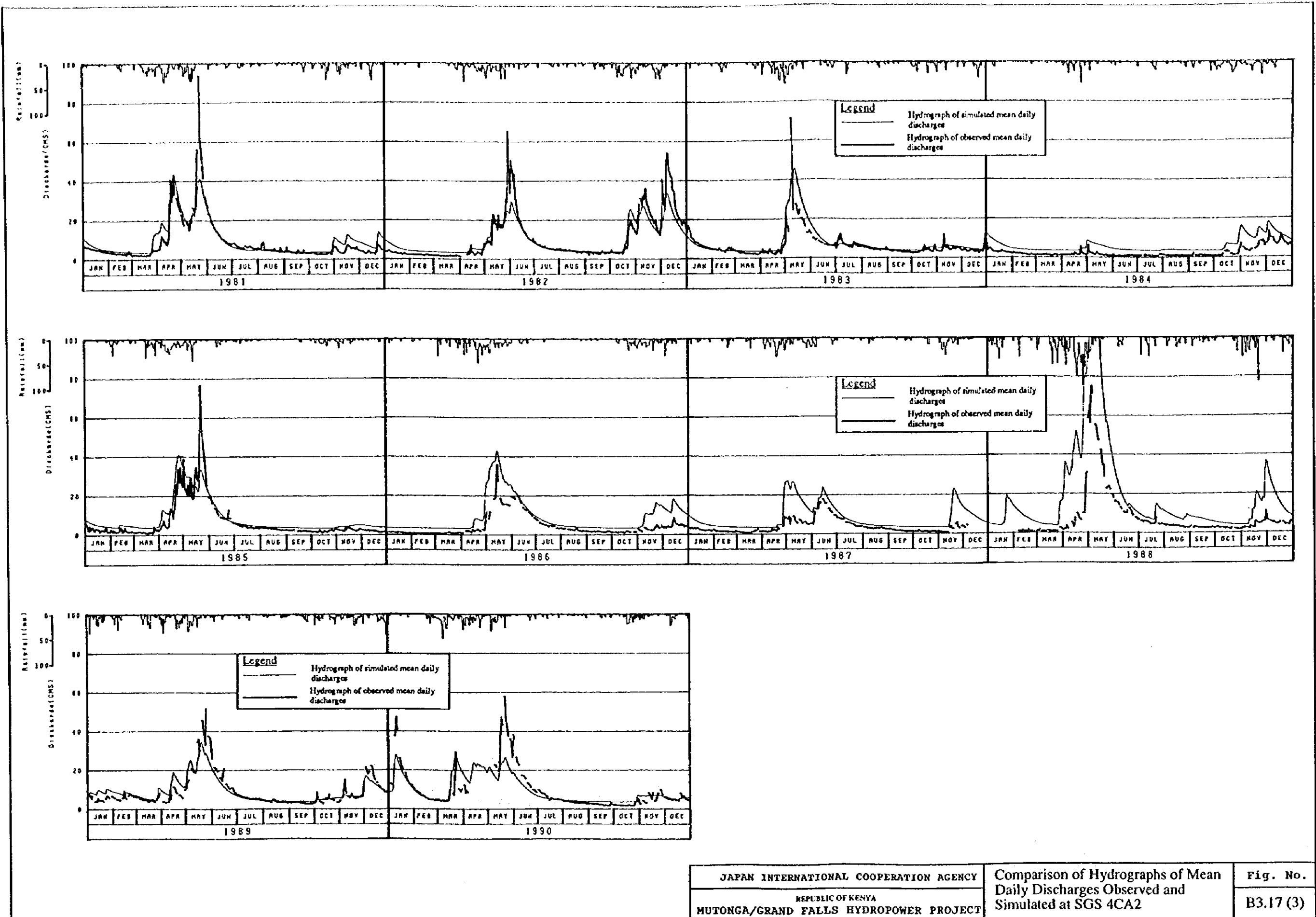
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CB4	Fig. No. B3.16(3)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



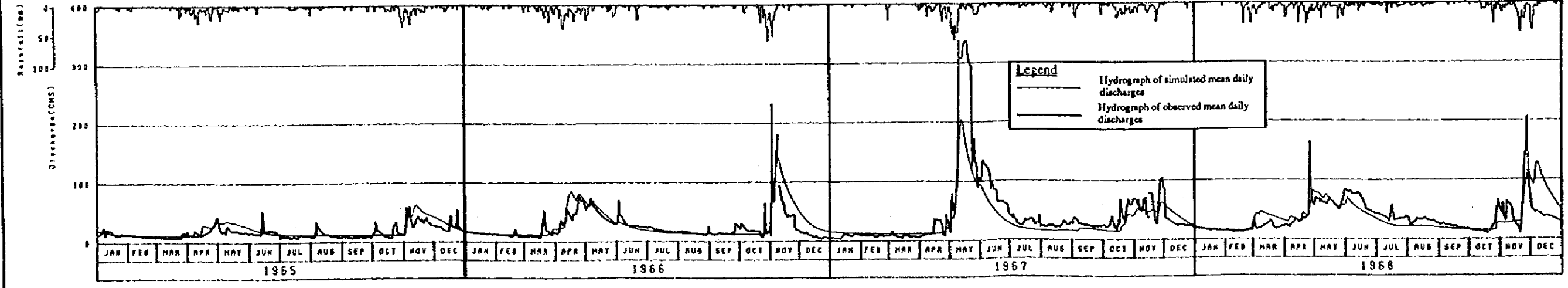
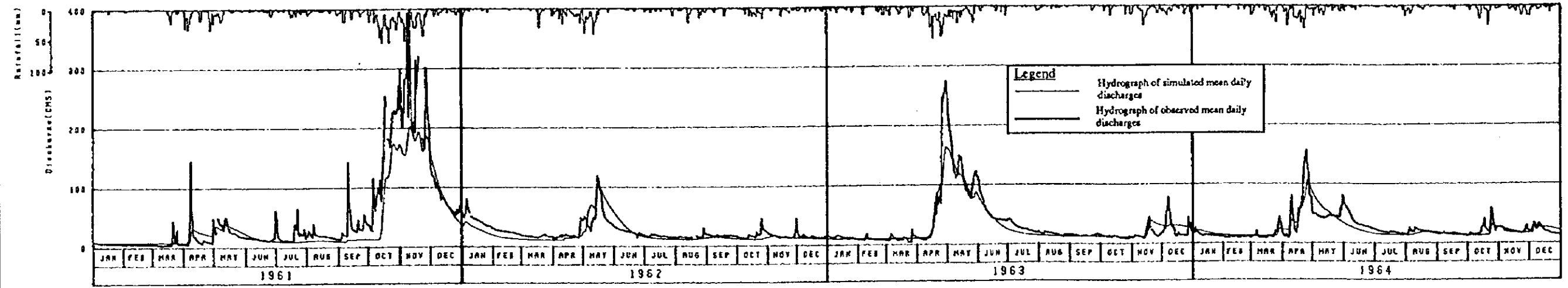
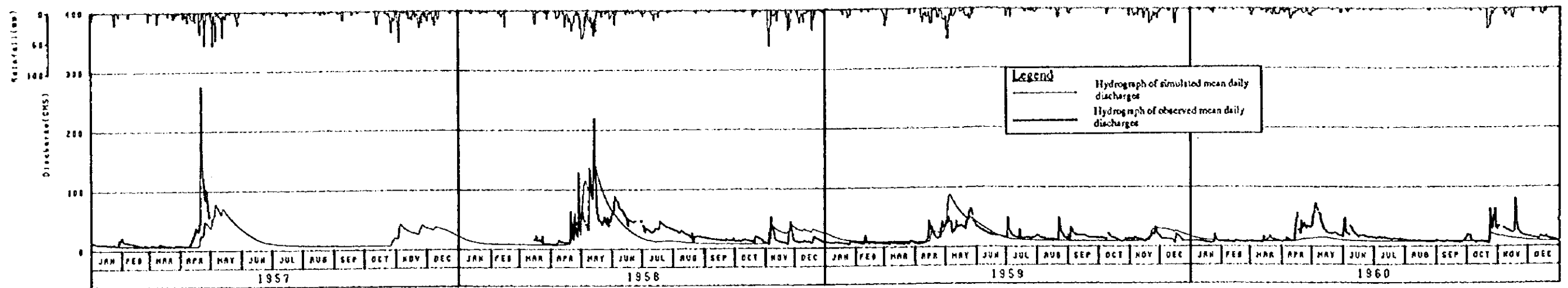
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CA2	Fig. No. B3.17 (1)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



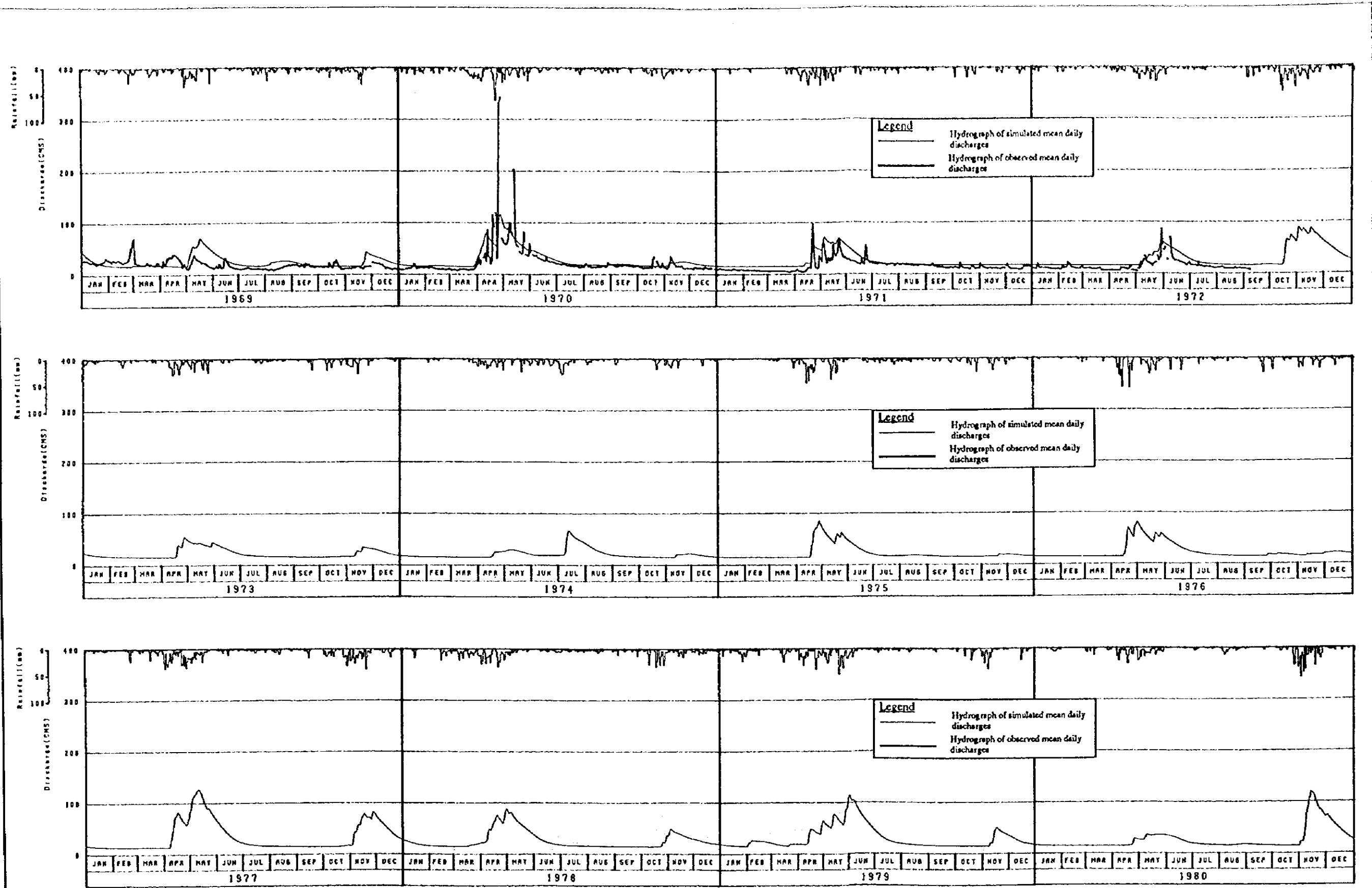
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CA2	Fig. No. B3.17 (2)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



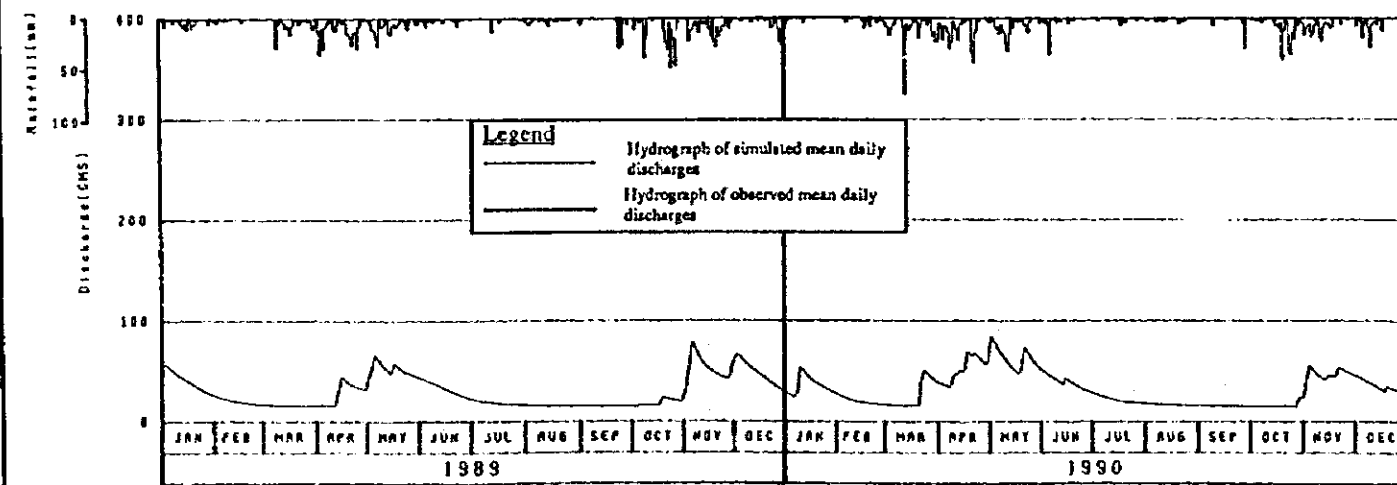
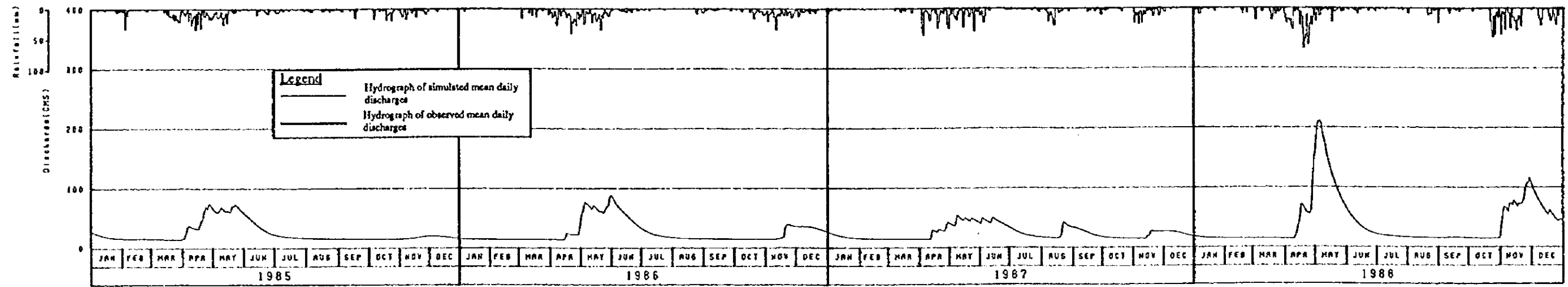
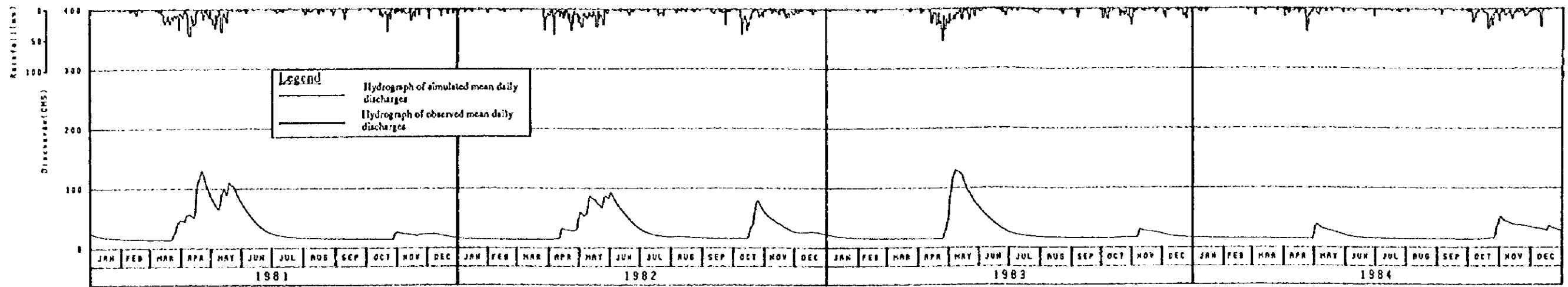
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4CA2	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.17 (3)



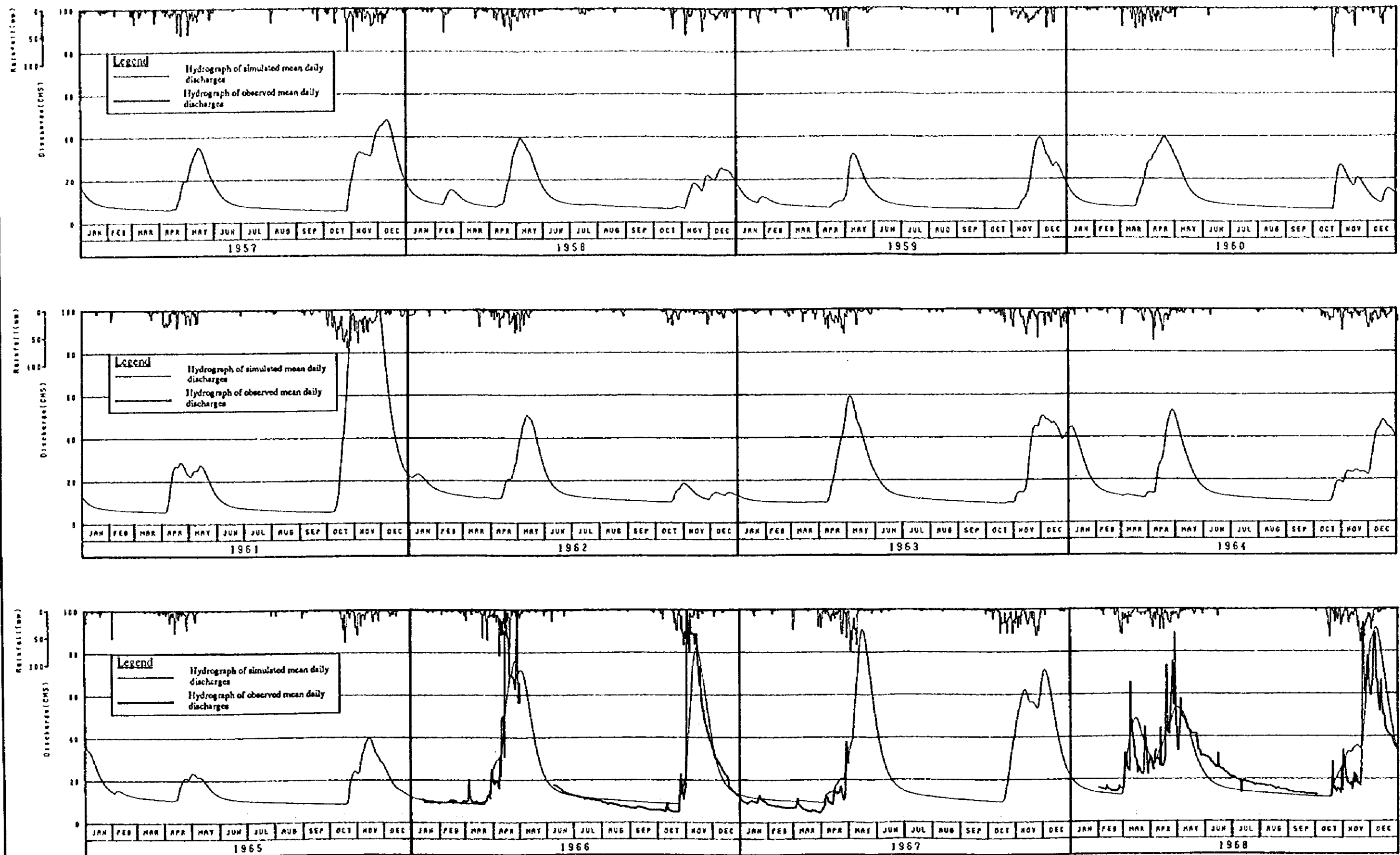
JAPAN INTERNATIONAL COOPERATION AGENCY REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4DD1	Fig. No. B3.18 (1)
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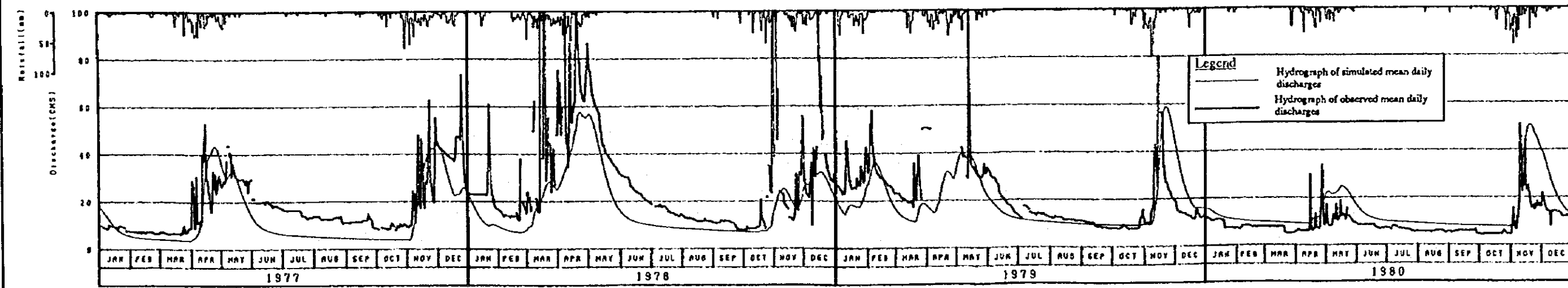
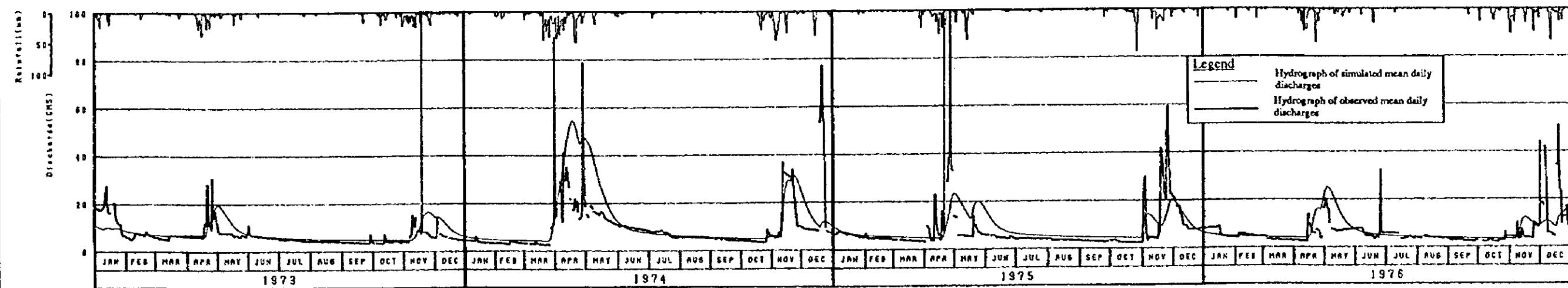
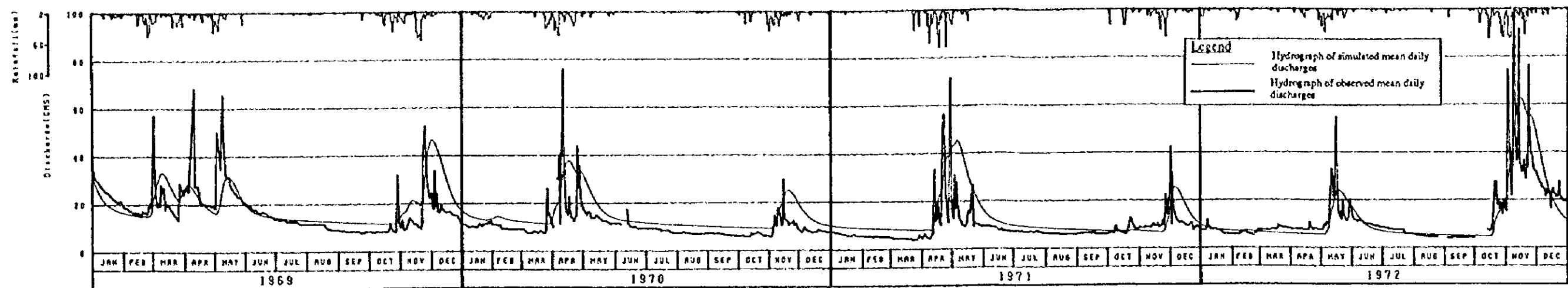
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4DD1	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.18 (2)



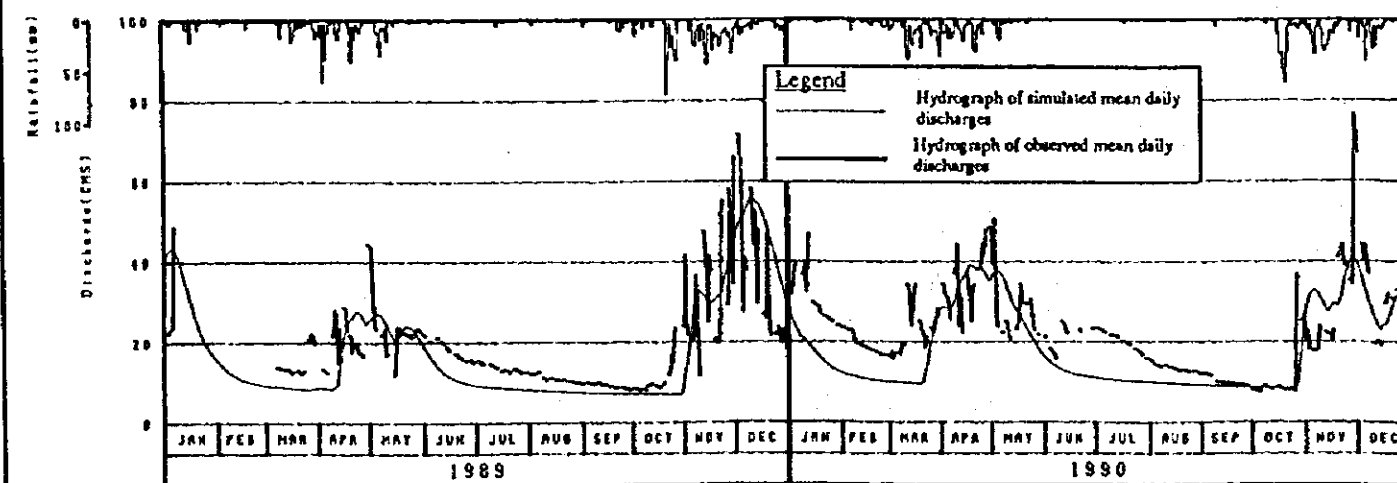
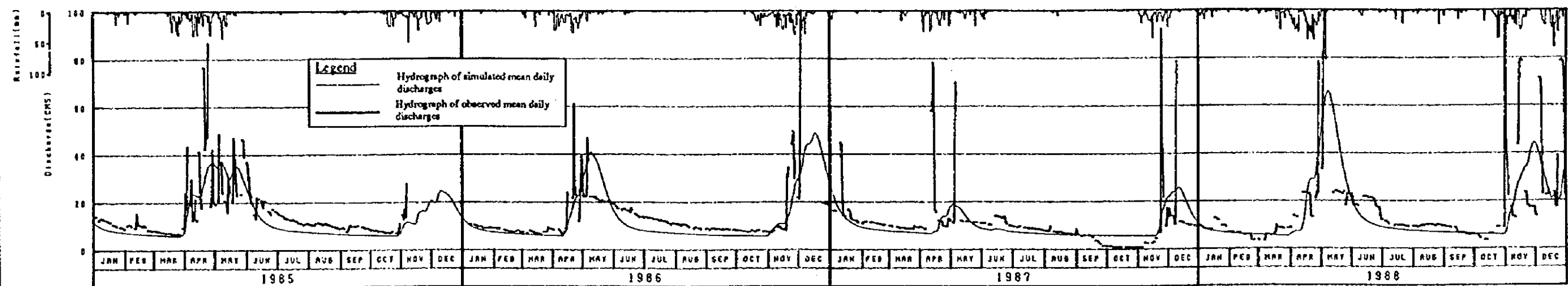
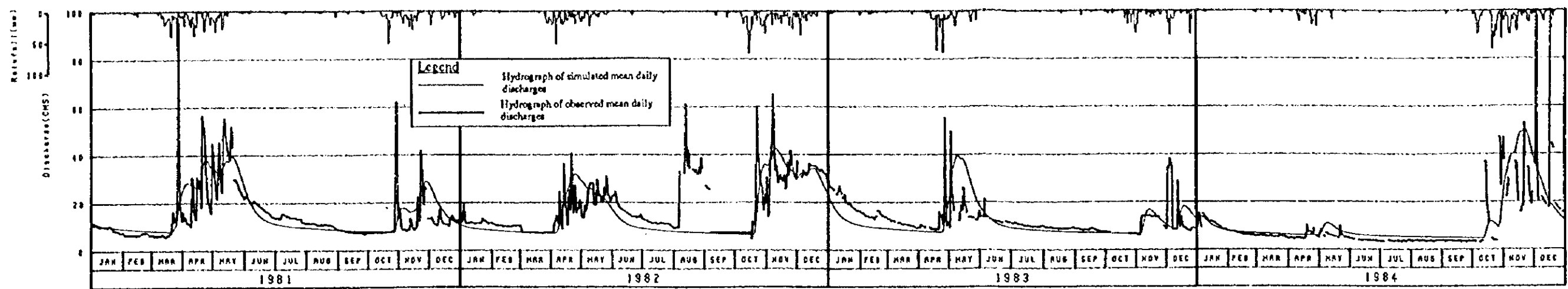
JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges Observed and Simulated at SGS 4DD1	Fig. No. B3.18 (3)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges at SGS 4ED3, Worked out by Means of Different Methods	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.19 (1)



JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges at SGS 4ED3, Worked out by Means of Different Methods	Fig. No. B3.19 (2)
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		



JAPAN INTERNATIONAL COOPERATION AGENCY	Comparison of Hydrographs of Mean Daily Discharges at SGS 4ED3, Worked out by Means of Different Methods	Fig. No.
REPUBLIC OF KENYA MUTONGA/GRAND FALLS HYDROPOWER PROJECT		B3.19 (3)