

2-5-5 基準流量

本地点の計画は大規模貯水池によって河川流量の年間調整を行う計画である。したがって、貯水池の運用は月単位で考えることとする。出力および年間可能発生電力量のシミュレーションは長期間の資料を使うほど信頼性が向上して望ましいことであるが、降雨資料の十分でない現段階では、降雨から当該地点の流量を算出する流出解析が困難であることと、発電計画に最低限必要とされる資料（年数約10年間の実測流量）がこの川の下流測水所から得られるから、あえて長期間にわたる流量系列の合成は行わず、実測流量のみを計画に用いることとする。

前述のとおり、本調査がスタートするまで、ディドヨンダム地点における河川流量の観測記録はなかった。付近での河川流量観測所の名称と位置を表2-5-2に示す。この表に示すように、ディドヨン川下流の流量についてはダムサイト予定地の下流39km地点にあるアグリパイ測水所の記録があり、関連資料としてはディドヨン川（実質はアダラム川）が合流するカガヤン本川にあるもので、合流点から17.5kmの地点にあるパンガル測水所の記録である。いずれも日流量の定時観測記録であって、洪水時の波形についての記録はない。また、両測水所とも現在観測は中止されている。

両測水所の記録は、次の期間について得られている。

測水所名	観測開始	観測期間
アグリパイ測水所	1964年6月	10.5年
パンガル	1960年1月	12年

なお、この両者の記録の間には、良好な相関が認められ、一方の欠測値を他方から推算することが必ずしも困難ではない。2地点の相関関係を調べると次の様になる。

(i) 日流量による相関係数は

$r = 0.56$ で、データ数は $n = 2,702$ であり、Barvais-Pearson の一次式で表わすと、 $y = 0.08602x + 22.39873$ となる。

ここで y = アグリパイの流量、 x = パンガルの流量である。

(ii) 月平均流量による相関係数は、

$r = 0.895$ で、データ数は $n = 88$ であり、Barvais-Pearson の一次式で表わすと $y = 0.16544x - 0.19141$ となる。

両方とも $r > 0.5$ なので、相関は良好である。

ディドヨンでのフィージビリティスタディの過程で、河川流量観測所がダムサイト近くのカママシに設けられ、ダムサイト地点の流量を直接得ることが可能になった。観測所の名称と位

置は、表 2-5-3 に示す。

観測所名	： カママシ測水所
観測開始	： 1979年6月
観測方法	： 水位観測、および河水断面と流水速度の定期的観測

これら3つの観測所での記録から、図 2-5-21 に示す方法で16年間の記録をまとめると、ディドヨン貯水池への流入量を合理的に得ることが可能である。

表 3 ダムサイトにおける流量表を表 2-5-14 (i)~(iv) に示し、また流量図を図 2-5-22 (i)~(iv) に示す。

16年間における年間流水量表によって、年平均流入量は日平均 $30.8 \text{ m}^3/\text{s}$ で、最大流水量は年平均の 69%、最小流水量はその 41% を示す (図 2-5-23 参照)。

1969年と1963年の渇水は、貯水池計画に必然的に影響している。

表 3 ダムサイトにおける河川流量の種別を表 2-5-15 に示す。また、各年の流況曲線を図 2-5-24 に示し、最大年、最小年および平均を図 2-5-25 に示す。

年平均流水量 $30.8 \text{ m}^3/\text{sec}$ は年間約 10 億 m^3 の流量に相当するが、豊水量 (3ヵ月流量) $32.0 \text{ m}^3/\text{sec}$ に比べて渇水量 (355日流量) が $10.7 \text{ m}^3/\text{sec}$ という数字は、この河川の流況特性をよく現わしている。

表 3 ダムサイトで発電計画基準流量として表 2-5-16 に示す月平均流量を用い、貯水池の運用計算を行う。また、流量図と流量累加曲線図を図 2-5-26 に示す。

Table 2-5-14 (1) Daily Discharge at No. 3 Dam site.

(Unit: cms)

Year 1960

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	36.0	44.3	43.9	21.2	19.8	20.8	28.7	20.4	22.6	30.6	27.0	26.9
2	47.4	37.9	39.9	21.2	21.3	21.5	47.0	24.4	22.9	30.0	26.9	26.1
3	43.5	33.9	35.8	22.5	20.6	20.2	47.4	24.6	25.4	28.0	26.4	25.8
4	38.2	31.7	33.8	22.0	19.6	19.5	32.2	23.2	30.9	26.4	25.6	25.4
5	34.4	30.6	32.8	22.7	19.1	18.9	28.9	23.6	27.1	26.3	25.0	24.9
6	40.5	29.3	31.2	23.2	18.8	19.0	26.0	28.7	35.1	29.5	24.6	24.5
7	55.8	28.3	29.8	23.9	18.6	20.4	24.6	47.4	26.6	66.8	26.9	25.6
8	50.8	57.8	28.9	24.0	18.2	22.8	24.4	46.6	28.4	76.4	27.3	28.9
9	43.7	58.1	28.0	23.4	18.0	22.0	25.4	40.3	29.6	63.4	27.6	27.4
10	39.9	43.1	27.4	22.5	18.2	21.8	23.4	48.8	30.3	45.0	34.1	27.0
11	35.8	37.5	26.6	21.9	18.5	20.4	22.7	47.0	28.6	37.9	30.2	27.4
12	33.6	33.8	26.0	21.4	19.0	18.7	22.1	39.9	27.4	100.7	29.8	28.0
13	35.8	46.4	25.6	20.6	20.2	18.7	21.5	36.1	26.0	233.6	28.7	27.1
14	33.4	43.5	25.3	19.9	19.4	19.5	21.9	34.4	24.9	221.1	36.5	28.0
15	31.5	47.0	24.9	19.5	18.9	19.3	21.5	38.2	25.4	91.2	38.8	29.2
16	29.8	78.0	24.9	19.2	18.7	18.7	20.9	35.1	25.1	64.8	40.7	28.6
17	28.6	62.7	24.4	20.1	18.4	19.3	20.6	36.7	24.1	53.6	34.8	27.0
18	28.0	53.2	24.1	19.7	18.2	19.1	20.5	42.6	32.2	46.8	31.4	32.8
19	28.6	56.2	23.9	19.5	17.9	18.9	20.6	38.1	33.9	54.5	31.4	46.6
20	28.3	59.2	23.6	19.7	18.2	18.6	21.5	36.8	38.4	44.1	30.0	44.8
21	27.1	50.4	23.0	19.7	18.3	18.4	22.3	53.4	39.7	38.4	28.9	39.2
22	26.0	55.3	22.7	20.4	19.1	17.7	22.5	57.6	45.0	35.3	27.4	35.4
23	25.4	53.2	22.5	19.6	19.6	17.4	22.2	59.0	36.7	36.0	26.7	33.0
24	26.0	61.5	22.1	22.9	19.1	17.5	21.9	40.5	33.3	38.6	26.6	30.9
25	36.3	60.4	21.8	24.4	18.7	18.1	21.2	32.5	31.5	37.2	25.8	30.0
26	33.1	59.6	21.5	22.2	18.3	25.0	20.6	36.1	33.0	33.0	25.1	29.9
27	36.7	55.3	22.2	21.3	18.2	45.0	20.8	26.9	31.8	31.7	25.0	39.7
28	34.9	49.8	21.9	20.9	18.5	102.4	21.9	25.7	32.8	30.2	30.0	47.0
29	38.1	45.8	21.3	19.9	24.4	52.3	21.3	24.4	31.1	29.6	30.2	36.8
30	50.0		21.3	19.9	28.6	53.9	22.0	23.6	25.4	29.2	28.3	32.2
31	55.3		21.5		21.3		21.1	22.9		28.0		31.7

Table 2-5-14 (2) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1961

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	30.5	23.4	20.1	18.9	16.7	18.5	25.0	20.8	22.8	24.6	25.1	33.4
2	29.9	24.4	19.9	18.7	16.7	18.2	32.2	20.4	24.9	29.0	24.9	31.8
3	30.9	24.2	20.8	18.6	16.6	18.2	33.4	19.8	24.5	30.5	25.1	30.5
4	30.0	24.4	23.3	18.6	16.3	18.2	39.5	19.4	23.0	27.3	24.7	29.5
5	28.4	27.9	21.3	18.5	16.5	18.3	25.4	19.1	24.7	24.7	24.2	36.8
6	28.3	30.8	24.4	18.4	16.4	18.2	23.2	18.8	27.7	23.9	24.1	44.3
7	28.0	28.2	24.2	18.2	16.4	17.8	22.3	18.9	24.4	23.2	25.4	43.9
8	27.1	25.0	24.5	18.2	16.5	16.8	41.4	18.5	22.3	27.1	27.7	44.8
9	26.6	23.3	26.6	18.0	16.3	17.4	34.9	20.2	21.9	33.4	28.0	51.4
10	26.0	22.6	29.6	18.0	16.2	17.4	29.8	22.8	21.3	29.9	25.8	88.6
11	25.3	22.1	48.4	17.8	16.2	17.8	26.0	20.1	22.2	36.8	24.6	94.7
12	24.7	21.8	47.4	17.8	16.5	17.4	23.5	20.7	22.1	30.5	27.1	60.4
13	25.3	21.5	30.9	17.8	16.9	17.1	24.2	23.2	30.2	49.2	27.3	45.0
14	26.3	21.3	26.9	17.4	17.6	16.9	24.3	26.6	22.6	68.7	27.4	45.4
15	26.0	21.1	24.9	17.4	18.0	16.9	25.1	27.9	20.7	43.9	26.6	44.6
16	26.6	20.7	23.4	18.3	34.6	16.8	23.9	29.0	20.4	37.5	25.1	39.6
17	28.0	20.5	22.5	18.2	38.1	16.7	26.0	28.7	22.3	34.1	24.4	34.7
18	33.6	20.4	21.9	18.0	42.8	16.6	59.4	28.0	23.4	53.2	23.6	32.5
19	33.6	20.3	21.8	19.0	32.2	16.8	42.0	27.1	21.1	62.2	23.4	30.6
20	31.1	20.1	21.6	19.0	26.7	17.1	32.3	25.4	23.0	47.2	22.7	29.8
21	29.2	19.9	21.8	18.2	24.0	18.2	29.3	24.1	25.4	39.4	22.5	28.6
22	27.7	19.8	21.6	18.6	28.9	18.5	28.0	28.6	39.4	36.8	25.0	27.0
23	26.4	19.7	21.5	19.3	25.0	18.1	25.6	31.6	62.7	35.4	136.3	58.5
24	25.7	19.5	21.8	18.8	21.5	17.3	25.7	32.2	38.8	33.3	264.0	62.7
25	24.9	20.2	20.8	17.9	20.7	16.8	26.0	29.2	34.2	33.4	193.9	34.1
26	24.4	20.9	19.9	17.4	20.3	17.8	27.4	29.2	28.6	32.2	78.3	31.2
27	26.7	21.4	19.5	16.9	19.6	50.4	25.1	30.6	25.2	29.8	56.2	28.9
28	25.7	20.7	19.7	16.8	22.9	32.6	23.5	28.7	24.4	28.7	46.8	27.7
29	24.6		19.5	17.1	20.8	28.0	22.6	25.7	23.4	27.3	39.0	28.9
30	23.9		19.3	16.9	19.9	25.6	22.1	23.9	23.4	26.1	32.0	41.2
31	23.6		19.1		19.0		21.4	22.9		25.4		35.1

Table 2-5-14 (3) Daily Discharge at No.3 Dam site

(Unit: cms)

Year 1962

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	34.1	26.3	19.9	21.4	21.1	18.9	17.3	24.1	29.8	36.5	27.7	93.8
2	31.5	26.3	21.8	22.8	21.5	18.2	17.3	28.6	27.9	32.8	26.9	72.1
3	30.3	25.3	26.9	21.4	21.3	18.9	16.9	27.7	25.4	29.8	25.7	69.6
4	29.5	24.5	29.2	23.2	20.5	18.9	17.4	31.1	23.9	27.9	24.9	61.3
5	28.9	23.9	25.4	22.7	19.7	18.5	17.6	29.6	22.9	43.3	24.2	58.3
6	30.6	23.6	23.7	21.8	19.1	18.9	17.4	26.3	27.7	34.4	29.0	57.8
7	30.6	23.3	22.5	20.8	18.8	19.7	17.4	26.3	30.3	30.2	89.2	52.7
8	29.8	23.2	21.8	19.9	18.5	19.3	17.4	26.0	28.6	28.6	330.5	47.8
9	30.5	22.9	21.2	19.5	18.3	18.3	17.6	45.0	27.1	29.3	115.7	41.6
10	31.1	23.5	20.8	19.2	18.2	18.3	17.4	47.0	26.3	27.1	74.3	38.1
11	32.2	22.9	20.6	18.9	18.0	18.7	17.4	36.7	24.2	26.9	54.7	36.1
12	30.6	22.6	20.6	18.9	18.2	18.2	25.7	32.2	22.9	25.1	43.5	34.6
13	28.6	22.0	20.2	18.8	18.0	18.2	21.2	34.4	22.0	29.2	39.9	33.6
14	27.4	21.5	19.8	21.5	17.9	18.1	19.8	39.7	22.1	25.1	36.7	33.0
15	26.6	21.5	19.5	23.9	18.1	19.1	19.2	53.2	24.7	25.7	34.4	32.6
16	25.7	25.7	19.5	23.9	17.6	18.2	19.9	59.0	24.1	26.4	52.5	52.3
17	25.1	27.6	19.3	22.5	17.5	17.8	20.1	44.1	23.6	31.5	32.5	31.7
18	24.9	25.1	19.2	24.4	17.4	17.8	21.4	44.6	23.0	33.0	31.2	30.3
19	27.4	23.6	19.1	36.7	28.9	18.0	23.6	47.8	32.8	35.1	31.5	30.5
20	27.6	22.9	18.9	26.0	28.3	17.8	28.3	47.8	33.1	32.8	29.6	29.5
21	27.9	22.3	18.7	26.1	22.5	17.4	70.8	36.0	28.3	34.2	28.4	28.4
22	27.1	22.3	18.7	23.4	21.1	17.2	115.7	32.6	25.8	48.0	28.2	27.9
23	25.7	21.3	19.1	22.3	20.4	18.2	62.2	30.8	24.4	48.2	31.5	27.9
24	25.1	20.6	21.9	21.5	19.5	19.3	39.7	28.3	24.1	35.4	42.8	28.4
25	26.7	20.7	20.8	20.8	18.8	18.5	31.2	26.6	49.8	31.4	62.2	27.6
26	25.7	20.4	19.9	21.5	18.3	18.2	29.8	26.3	66.1	30.6	53.6	27.1
27	25.0	20.3	19.3	24.6	18.2	17.3	31.7	26.7	56.2	37.9	40.3	26.6
28	24.5	20.2	19.3	22.2	18.1	16.9	30.8	24.6	46.6	40.5	40.3	25.8
29	25.7		19.3	22.7	19.7	16.8	27.6	24.4	42.8	33.6	105.3	25.6
30	24.7		21.3	21.6	20.2	16.8	26.3	24.9	40.7	30.5	89.8	24.9
31	24.4		21.8		19.7		23.9	25.7		28.9		25.6

Table 2-5-14 (4) Daily Discharge at No.3 Dam site

(Unit: cms)

Year 1963

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	27.1	27.9	24.1	18.6	16.8	17.5	37.9	23.0	33.9	30.5	24.4	24.2
2	26.1	28.4	23.5	18.3	16.7	17.9	35.8	22.8	33.0	29.8	24.5	22.3
3	25.3	29.3	23.0	18.2	16.6	17.6	34.1	27.4	32.3	28.7	26.1	21.9
4	25.1	29.0	22.6	18.0	16.5	17.0	31.7	26.0	35.6	28.2	26.6	21.1
5	24.9	29.3	22.5	17.9	16.4	16.9	29.3	25.6	36.0	27.4	25.3	20.7
6	24.2	29.8	21.9	17.7	16.3	17.0	28.4	30.6	37.0	26.3	24.5	22.5
7	24.7	29.8	22.2	17.6	16.2	17.4	25.3	40.1	45.0	25.8	24.0	24.6
8	25.6	29.2	21.8	17.6	16.2	24.9	24.2	29.8	42.2	25.1	23.3	24.1
9	26.0	28.0	21.2	18.2	16.1	27.4	24.7	27.1	41.1	24.6	22.8	24.9
10	26.3	26.6	20.8	21.5	16.0	26.6	29.5	24.6	40.5	23.9	22.3	47.2
11	25.6	25.6	20.5	21.3	16.2	23.2	32.0	23.2	38.6	23.4	22.1	45.4
12	26.9	25.0	20.3	20.4	16.2	19.8	28.2	23.0	36.8	23.2	21.9	79.1
13	28.9	25.3	20.2	19.7	16.6	24.4	24.6	23.3	34.9	23.2	21.6	298.3
14	30.3	25.3	20.1	18.8	16.6	20.6	35.4	86.0	33.9	23.0	21.2	93.0
15	31.7	24.7	19.9	18.4	16.6	19.6	33.9	151.8	32.2	23.0	21.3	56.9
16	29.9	24.2	19.7	19.5	16.1	18.8	29.9	70.6	30.9	22.8	21.6	49.6
17	28.5	24.1	19.4	19.3	15.9	18.3	24.5	63.8	29.9	22.7	21.4	40.9
18	27.6	24.2	19.5	18.4	15.8	18.4	23.4	105.9	29.0	23.7	21.1	42.9
19	26.4	24.7	20.1	18.1	15.7	21.8	22.8	94.5	28.2	24.6	20.8	53.2
20	26.0	26.4	19.7	17.9	15.7	20.4	23.4	68.3	27.3	24.5	20.6	47.6
21	25.1	29.8	19.2	17.7	15.6	19.6	28.3	65.5	27.1	24.7	20.4	42.8
22	26.0	30.0	18.9	17.4	15.5	19.6	26.4	72.3	27.7	26.6	20.2	38.8
23	29.5	31.7	18.7	17.3	15.7	21.6	24.1	57.5	28.2	35.1	19.9	36.1
24	24.9	30.3	18.6	17.2	16.2	20.7	23.9	47.8	33.4	31.5	20.2	32.5
25	34.1	28.0	19.6	17.1	15.6	19.9	23.5	39.4	34.1	32.8	20.2	30.9
26	33.2	26.6	19.8	17.0	15.7	19.3	22.6	37.0	44.3	29.2	19.8	29.9
27	31.9	25.3	19.4	16.9	15.6	18.9	22.3	35.4	39.9	27.0	20.4	32.2
28	29.9	25.1	19.1	16.9	16.2	114.3	22.6	46.8	35.4	27.7	21.4	35.6
29	28.6		18.9	16.9	16.6	137.4	27.6	41.8	33.0	26.4	21.6	36.8
30	27.3		18.8	16.9	16.5	56.0	24.7	38.3	31.4	25.0	26.1	33.9
31	27.0		18.7		17.4		23.5	35.3		24.5		31.2

Table 2-5-14 (5) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1964

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	28.6	23.0	25.0	19.4	16.6	17.7	215.7	24.3	17.1	60.2	96.7	155.5
2	26.4	22.7	24.9	19.1	16.6	18.3	83.0	19.8	17.1	43.2	185.6	122.8
3	25.8	25.3	25.0	18.9	16.6	18.2	38.7	53.9	14.5	36.1	120.1	102.0
4	27.3	26.4	24.5	18.8	16.6	17.2	24.8	28.8	12.9	30.2	89.3	90.4
5	26.7	26.3	24.9	18.7	16.8	16.8	18.7	24.8	12.2	298.8	74.8	88.3
6	24.2	25.1	24.5	18.6	18.5	16.5	15.4	23.2	12.6	176.8	242.2	77.7
7	29.3	24.1	22.7	18.2	18.5	16.4	15.8	53.9	12.6	109.0	232.1	46.7
8	29.2	23.7	22.6	18.0	17.6	16.5	13.7	87.2	11.2	78.7	209.5	43.8
9	28.9	23.3	22.5	18.2	17.0	16.8	22.6	53.0	11.9	97.8	161.8	40.6
10	36.5	23.2	22.0	18.4	16.7	16.6	16.7	60.2	17.1	92.5	200.7	39.3
11	44.4	22.7	21.5	18.2	16.6	18.3	13.7	58.4	12.9	77.7	139.1	39.3
12	40.1	22.8	20.7	18.0	16.4	17.6	12.2	36.1	13.2	83.0	194.4	38.7
13	35.1	26.4	21.3	18.4	16.3	17.0	16.7	29.5	18.1	53.9	239.7	40.4
14	31.4	26.7	21.9	18.6	16.2	16.8	13.7	25.4	23.2	47.7	303.8	49.4
15	29.2	27.0	22.2	18.3	16.6	16.6	17.1	24.3	30.2	39.6	413.2	94.5
16	35.6	25.7	21.1	17.8	16.9	17.0	41.4	21.5	31.7	34.6	336.5	259.5
17	26.9	25.4	20.1	17.6	18.0	17.6	28.2	19.8	50.3	31.7	332.7	128.6
18	25.7	25.7	19.4	17.4	17.9	18.2	18.1	18.1	60.2	29.5	263.6	83.1
19	24.7	24.2	20.2	17.4	17.2	17.9	17.5	17.1	53.0	27.7	198.2	84.0
20	24.1	23.0	20.6	18.2	18.7	17.1	13.7	16.2	34.6	33.1	170.6	64.3
21	24.1	22.5	21.1	17.8	19.7	16.6	13.2	16.2	66.0	222.1	379.2	61.3
22	23.6	21.9	20.5	18.4	20.2	16.6	11.9	16.7	65.0	132.8	199.5	56.9
23	23.9	21.6	19.8	18.0	20.6	17.8	11.6	15.4	45.9	81.9	184.4	52.5
24	23.9	21.1	20.8	17.4	20.2	17.8	11.6	14.1	38.7	60.2	203.2	48.2
25	23.9	20.8	20.8	17.2	20.7	9.9	12.6	17.5	54.8	50.3	283.7	44.8
26	23.9	23.5	20.4	17.1	21.5	8.6	14.5	16.2	36.9	51.2	229.6	43.3
27	23.9	26.1	20.6	16.9	20.5	11.2	32.4	18.7	33.1	49.5	288.7	43.3
28	23.7	25.8	20.8	16.9	19.8	10.6	51.2	38.7	53.9	42.3	202.0	40.7
29	23.7	24.6	21.3	16.8	19.3	19.8	31.0	30.2	62.9	56.6	311.3	39.7
30	23.6		20.7	16.7	18.7	273.6	35.3	19.8	68.1	86.1	207.0	39.7
31	23.4		20.1		17.4		31.2	25.3		56.4		44.1

Table 2-5-14 (6) Daily Discharge at No. 3 Damsite

(Unit: cms)

Year 1965

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	43.7	33.1	25.4	17.5	22.0	13.2	13.2	13.4	52.1	20.9	20.9	62.9
2	40.7	41.4	24.3	16.7	15.4	12.6	71.3	22.6	45.0	65.0	20.3	73.4
3	36.1	34.6	23.7	16.7	14.1	13.7	22.0	14.5	40.5	43.2	19.8	55.7
4	32.3	40.5	24.8	16.7	19.2	13.2	18.1	13.2	37.8	34.6	18.7	45.0
5	30.8	60.2	23.2	15.8	15.8	15.0	16.7	12.6	34.6	31.7	26.5	45.0
6	29.6	54.8	22.0	15.8	14.1	13.2	15.8	12.6	36.1	30.2	21.5	36.9
7	29.6	48.6	20.9	15.0	13.2	12.6	15.0	12.6	53.9	28.2	36.9	38.7
8	29.2	48.6	23.7	15.0	15.0	12.6	15.8	12.6	33.1	54.4	109.0	34.6
9	29.2	45.0	26.5	14.1	13.7	13.2	15.0	12.6	22.6	34.6	81.9	31.7
10	29.0	43.2	26.5	14.5	12.6	18.7	15.0	11.9	26.0	40.5	57.5	28.8
11	28.9	41.4	26.5	14.1	13.7	14.1	58.4	11.6	26.5	30.2	45.0	27.7
12	28.6	39.6	24.3	14.1	12.6	12.6	24.3	11.9	103.1	26.5	30.2	26.5
13	28.4	37.8	23.2	13.2	13.2	11.9	27.1	10.9	59.3	25.4	30.2	41.4
14	50.3	33.1	22.0	13.2	13.7	12.6	71.3	15.4	33.1	24.3	28.8	37.8
15	46.8	30.2	20.9	12.6	15.0	14.1	52.1	26.5	26.5	22.6	25.4	30.2
16	53.9	29.5	21.5	16.7	14.1	13.2	39.6	29.5	23.7	22.0	24.3	27.7
17	75.6	30.2	20.9	15.8	13.7	13.2	35.3	53.9	33.1	19.8	23.2	30.2
18	137.9	27.1	20.9	15.0	14.1	12.6	33.1	31.7	48.6	19.2	22.0	114.0
19	96.7	31.7	20.9	14.1	13.2	11.9	27.1	23.2	53.9	43.2	39.6	50.3
20	87.2	31.7	19.8	24.8	12.6	11.6	24.3	19.8	37.8	36.9	26.5	43.2
21	62.9	30.2	19.8	12.9	11.9	11.2	29.5	16.7	52.1	34.6	23.7	35.3
22	51.2	28.8	19.2	33.1	11.2	11.9	17.5	43.2	43.2	33.9	22.0	31.7
23	58.4	27.7	19.8	27.7	11.2	15.0	16.7	26.0	28.8	31.7	31.0	29.5
24	45.0	28.8	18.7	26.5	10.6	15.0	15.8	24.3	29.5	30.2	53.9	27.7
25	31.7	29.5	18.7	16.7	11.9	13.2	20.3	23.2	48.6	28.8	81.9	27.7
26	81.9	28.8	18.1	15.0	12.6	12.6	15.8	20.9	27.7	26.5	36.1	42.3
27	45.0	27.7	18.7	15.0	11.9	11.9	15.8	22.0	26.5	24.3	67.1	48.6
28	25.4	26.5	23.2	14.1	11.9	11.9	15.0	22.0	24.3	24.3	60.2	41.4
29	19.8		21.5	13.2	11.9	11.6	14.1	20.9	23.2	23.2	45.9	55.3
30	13.2		18.7	11.2	11.6	12.6	15.0	23.7	22.0	22.0	36.9	41.4
31	11.9		17.5	11.2	11.2		14.1	81.9		21.5		36.1

Table 2-5-14 (7) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1966

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	55.7	17.5	12.9	12.6	11.2	25.4	13.2	20.9	16.7	12.6	31.7	213.3
2	44.1	17.1	12.6	11.9	11.2	24.3	12.6	27.7	15.8	12.2	25.4	218.3
3	37.8	16.7	11.9	11.2	10.6	21.5	11.9	25.4	57.5	11.9	22.6	386.8
4	31.0	16.2	11.9	10.6	10.6	19.8	13.2	24.3	20.9	11.9	20.9	282.4
5	31.7	15.8	12.6	10.6	11.2	30.2	11.2	31.0	16.7	12.6	19.8	169.3
6	30.2	15.4	12.2	9.9	12.6	20.9	11.2	40.5	15.8	13.2	19.2	173.1
7	28.8	16.7	12.2	9.9	12.2	20.9	14.1	52.1	15.4	19.8	18.7	124.0
8	27.7	24.3	12.9	9.4	11.2	28.2	14.1	57.5	15.0	23.2	17.1	110.2
9	26.5	26.5	10.9	9.4	11.2	30.2	15.0	49.5	15.0	19.2	15.8	92.5
10	24.8	23.7	10.3	9.7	12.6	19.8	15.0	55.7	15.0	16.2	28.8	96.7
11	24.3	19.2	9.9	9.9	14.1	23.7	15.8	46.8	14.5	15.0	31.7	57.5
12	22.6	16.7	9.4	9.9	12.2	19.8	22.0	33.9	15.8	14.5	28.2	24.3
13	22.0	17.1	10.9	9.7	11.2	17.1	17.5	28.2	17.1	14.1	25.4	71.3
14	21.5	15.8	11.9	9.4	10.6	15.8	19.8	29.5	16.7	14.5	22.6	71.3
15	20.9	15.0	12.2	9.4	10.6	15.0	16.7	26.0	15.8	14.5	20.9	81.9
16	20.3	15.8	11.9	9.4	9.9	15.0	19.2	24.3	15.8	56.6	23.2	77.7
17	19.8	15.0	11.2	9.4	23.2	15.8	22.0	22.0	16.2	46.8	22.0	72.4
18	17.5	15.0	10.6	9.1	11.2	14.1	16.7	20.9	16.7	37.8	24.3	67.1
19	16.7	14.1	10.6	9.4	23.2	14.1	33.1	20.3	15.8	29.5	31.0	67.1
20	16.2	14.1	10.6	9.4	69.2	19.8	37.8	18.7	15.0	25.4	28.2	65.0
21	24.3	14.1	10.9	9.4	58.4	17.5	23.2	17.5	14.1	39.6	607.3	62.0
22	25.4	13.7	10.3	9.1	12.6	18.1	19.8	17.1	13.2	32.4	464.0	83.0
23	20.9	13.2	10.3	8.9	53.9	16.7	23.2	16.2	12.9	29.5	361.6	77.7
24	18.7	15.4	9.9	8.9	86.1	14.1	30.2	17.1	12.6	27.5	301.3	62.9
25	18.1	15.4	9.7	9.7	90.4	15.0	24.3	23.7	15.8	27.1	19.3	37.8
26	17.5	13.7	9.7	9.9	256.0	27.7	19.8	41.4	14.5	23.7	88.3	33.1
27	17.1	13.7	10.3	9.4	230.9	17.1	17.5	26.0	13.2	22.0	188.2	110.2
28	26.0	12.9	16.2	9.4	89.3	15.4	31.0	19.8	13.7	20.3	359.1	168.0
29	18.7		18.1	9.4	52.1	15.0	26.5	20.9	13.2	20.3	262.3	234.7
30	18.7		12.9	9.1	33.1	13.7	23.7	18.7	13.2	39.6	168.0	205.8
31	18.1		14.1	28.8			27.1	17.5		31.0		149.2

Table 2-5-14 (8) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1967	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	101.0	30.2	19.2	13.2	10.6	9.9	9.7	12.9	13.2	41.4	20.3	37.7
2	57.5	28.8	18.7	13.2	10.6	9.7	9.4	12.2	15.0	29.5	18.7	37.7
3	106.4	26.5	17.8	13.2	10.3	9.4	11.2	11.9	18.7	33.9	20.9	46.3
4	107.7	35.3	16.7	12.6	10.3	9.1	9.7	13.2	20.9	30.2	332.7	41.5
5	86.1	30.2	16.7	12.6	9.9	9.9	9.4	11.9	25.4	45.9	602.4	36.4
6	70.3	27.1	20.9	12.2	9.9	9.7	9.4	11.2	25.4	28.2	284.9	48.7
7	67.1	25.4	25.4	11.9	9.9	9.7	9.1	12.6	32.4	92.5	180.1	39.2
8	52.1	24.3	33.1	11.9	9.9	11.2	8.9	32.4	24.3	37.8	104.3	38.4
9	50.3	23.7	27.7	16.2	9.7	14.1	10.6	21.5	36.1	27.7	105.3	37.0
10	53.9	23.2	23.7	12.6	9.7	11.2	10.9	27.7	34.6	56.6	82.0	40.0
11	46.8	24.3	20.9	12.2	10.3	9.9	9.4	20.9	26.0	45.0	70.0	99.0
12	42.3	25.4	19.8	11.9	9.9	9.7	8.6	15.0	24.3	39.6	67.2	87.3
13	46.8	26.5	20.3	11.9	9.9	9.4	8.6	13.2	31.7	34.6	64.4	43.1
14	51.2	24.3	18.7	11.6	9.7	9.4	8.6	15.0	25.4	45.0	62.6	49.5
15	88.3	23.2	17.5	11.2	9.7	9.1	8.3	14.5	24.3	36.9	66.3	43.9
16	112.7	22.0	17.1	11.2	11.2	9.1	8.3	14.1	23.7	49.5	65.4	44.7
17	80.8	24.3	16.7	11.9	11.9	8.9	8.3	52.1	34.6	124.0	72.8	46.3
18	71.3	23.7	16.2	12.6	12.9	8.9	8.3	20.9	51.2	68.1	67.2	42.3
19	61.1	20.9	15.8	11.9	11.6	8.6	13.2	39.6	34.6	52.1	62.6	38.4
20	53.9	23.2	15.8	11.6	11.9	8.3	25.4	31.7	25.4	39.6	68.1	35.7
21	61.1	21.5	15.4	11.2	10.6	11.2	14.5	23.2	22.0	34.6	68.1	34.4
22	74.5	20.9	15.0	16.2	10.3	9.4	14.5	17.1	46.8	35.3	51.9	34.4
23	59.3	19.8	17.1	12.9	9.9	9.4	14.1	15.8	30.2	32.4	52.7	31.8
24	51.2	19.2	17.5	11.9	9.7	11.2	14.1	16.7	54.8	28.2	52.7	30.6
25	45.0	18.7	15.4	16.7	11.2	10.6	15.8	18.1	28.8	25.4	51.9	37.0
26	40.5	18.1	15.0	12.2	10.6	9.9	14.1	33.1	67.1	24.3	51.9	37.0
27	36.9	17.5	14.1	11.9	9.9	9.7	20.3	22.0	234.7	23.2	37.7	40.0
28	34.6	17.5	15.0	11.6	9.7	9.4	20.3	19.2	107.7	22.0	45.5	36.4
29	31.7	17.5	13.7	11.2	16.7	9.4	26.5	17.1	59.3	23.2	46.3	34.4
30	30.2	10.9	13.2	10.9	11.2	8.9	22.0	15.0	41.4	22.0	43.1	33.1
31	34.6	13.2	13.2	9.9	9.9	15.8	15.8	14.1	22.0	22.0		37.7

Table 2-5-14 (9) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1968

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	50.3	21.6	13.9	8.3	15.9	33.1	25.8	15.1	20.0	23.2	20.0	28.8
2	44.3	21.6	13.5	8.3	15.1	33.1	18.7	16.8	18.7	21.0	18.7	28.8
3	42.3	20.5	13.5	7.9	14.3	37.0	16.8	30.0	17.7	23.2	18.7	25.4
4	39.2	19.1	12.7	8.7	13.9	22.6	23.8	25.3	20.5	30.6	17.7	17.1
5	40.8	18.7	12.7	9.5	13.9	37.0	20.5	20.5	21.0	25.8	17.7	16.2
6	44.7	18.2	12.3	8.7	13.1	35.1	18.2	18.7	18.7	45.0	17.3	15.0
7	40.8	18.2	11.9	9.5	13.1	35.1	20.5	17.7	18.7	24.2	17.7	15.0
8	36.4	18.2	11.9	9.5	12.3	25.3	20.5	18.2	17.7	20.5	17.7	15.4
9	42.3	17.7	11.5	9.5	12.3	46.3	18.2	18.7	16.8	19.6	17.5	15.0
10	47.9	17.3	20.5	9.5	11.5	26.4	16.8	20.5	16.3	18.7	19.6	15.0
11	46.3	17.7	20.0	9.5	12.7	27.0	16.3	20.0	19.6	17.7	23.2	14.5
12	40.0	17.3	15.1	9.5	13.5	23.2	15.9	17.7	21.6	17.7	21.6	14.5
13	37.7	16.8	13.5	9.5	12.7	20.0	17.3	17.7	22.6	18.7	21.6	13.7
14	36.4	19.6	12.3	9.5	12.3	18.7	16.3	19.6	49.5	19.6	18.7	12.9
15	33.1	17.3	11.5	9.5	12.7	17.7	15.9	20.5	42.3	23.7	19.6	14.5
16	31.8	16.8	11.5	9.5	13.9	16.8	16.3	20.5	31.8	33.1	21.6	15.8
17	31.8	16.3	19.1	9.5	13.1	15.9	15.9	24.7	27.0	30.0	20.5	17.5
18	30.6	15.9	15.9	9.5	12.3	17.3	15.5	34.4	23.7	31.2	19.6	15.8
19	28.2	15.1	12.3	9.5	26.4	17.7	15.1	28.2	22.6	24.7	18.7	14.1
20	27.0	14.7	11.5	9.5	15.9	22.1	15.1	37.7	20.5	23.2	20.5	13.7
21	26.4	14.7	11.1	9.1	16.3	17.7	20.5	31.2	21.0	22.1	23.2	13.7
22	25.3	14.7	11.1	9.1	13.5	18.7	20.5	27.0	20.5	21.0	21.6	13.7
23	24.7	15.1	10.7	9.1	15.1	22.6	24.2	21.6	22.6	20.8	22.6	13.7
24	24.2	15.5	10.3	9.5	13.9	19.6	19.1	18.7	18.7	17.8	23.7	15.4
25	23.2	15.5	10.3	10.3	28.8	17.7	17.7	19.6	17.7	19.6	26.4	14.5
26	22.6	15.5	9.1	9.9	19.1	17.7	16.8	17.7	16.8	18.7	26.4	14.1
27	22.1	15.5	9.1	9.9	16.3	17.3	18.2	16.8	16.3	18.7	25.3	13.2
28	21.6	14.7	9.1	9.9	15.2	16.8	16.8	18.7	26.4	17.7	27.0	12.9
29	33.1	14.3	9.1	22.1	14.3	21.0	16.8	20.5	30.0	18.7	47.1	12.9
30	28.2		9.1	16.3	31.8	24.7	15.9	20.5	28.2	18.7	199.5	12.9
31	22.6		8.3	36.4			15.9	20.5		18.7		12.9

Table 2-5-14 (10) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1969

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	12.6	12.6	9.1	8.9	4.1	3.8	2.0	8.3	14.1	10.7	24.7	59.8
2	12.6	12.2	9.1	8.1	4.1	3.8	2.0	6.7	8.9	11.1	23.7	69.1
3	12.6	12.6	9.1	7.3	4.1	4.1	2.2	4.6	8.6	10.3	22.6	81.1
4	12.6	11.9	8.6	7.0	4.1	4.1	2.2	5.7	9.1	10.3	21.6	80.2
5	12.6	12.2	8.6	6.7	4.1	6.7	2.0	5.7	9.9	15.1	19.6	82.0
6	12.6	12.2	8.6	6.2	4.0	5.7	5.2	5.2	31.0	13.9	25.8	126.5
7	13.7	11.9	8.6	6.2	4.6	6.2	8.1	5.2	86.1	12.7	27.0	52.7
8	20.9	11.6	8.6	6.2	4.1	5.7	6.7	5.2	31.2	30.6	26.4	47.9
9	22.6	11.6	8.6	6.2	3.8	5.2	5.7	5.2	20.5	28.2	22.6	63.5
10	27.1	11.6	8.6	6.7	3.8	4.6	5.2	5.7	16.8	24.7	21.6	101.1
11	19.8	10.9	8.1	6.5	3.8	4.1	4.4	4.9	14.7	20.0	24.2	144.5
12	17.1	10.9	8.1	6.2	3.8	3.6	3.8	4.6	13.9	18.2	25.8	118.0
13	17.1	10.9	8.1	5.7	3.8	3.6	3.6	4.9	13.1	21.0	22.6	87.3
14	18.7	10.6	8.1	5.7	3.8	3.6	3.6	4.9	12.3	21.0	21.6	104.3
15	17.5	10.6	7.5	5.2	4.1	3.6	3.6	4.9	12.3	17.3	20.5	85.2
16	17.5	10.6	7.5	5.2	5.4	3.6	3.6	4.6	12.3	16.3	18.7	69.1
17	34.5	10.6	7.5	5.2	4.9	4.9	3.3	4.6	11.9	17.3	17.7	61.7
18	15.8	9.9	9.1	5.2	4.4	3.6	5.7	4.6	11.5	53.5	17.7	55.2
19	15.8	9.9	8.3	5.2	6.5	3.3	4.4	4.6	11.5	31.2	25.8	65.4
20	15.0	9.9	7.8	4.6	5.4	3.3	4.1	4.6	11.5	64.4	44.7	73.7
21	14.5	9.7	7.5	4.6	6.0	3.3	4.6	6.7	11.9	53.5	74.6	65.4
22	14.1	9.7	7.3	4.6	7.0	3.0	5.7	6.0	13.5	45.5	61.7	75.6
23	14.5	9.7	7.0	4.6	7.5	3.0	4.9	3.8	12.7	39.2	40.0	61.7
24	14.1	9.7	7.0	4.6	5.7	3.0	9.1	6.2	14.3	33.1	167.0	51.1
25	14.1	9.7	6.7	4.4	4.9	3.0	8.3	5.7	12.7	9.5	133.9	43.9
26	14.1	9.7	6.7	4.4	4.6	2.8	6.5	5.7	11.9	25.8	181.3	37.0
27	13.7	9.7	6.7	4.4	4.4	2.2	6.5	5.2	11.1	24.7	101.1	37.7
28	13.7	9.7	6.7	4.4	4.4	2.2	12.9	4.9	11.1	22.6	63.5	40.8
29	12.9	9.7	6.7	4.4	4.4	2.2	9.7	4.9	11.1	22.6	52.7	43.1
30	12.9		6.7	4.1	4.1	2.0	9.7	4.9	10.7	33.1	54.2	46.3
31	12.6		6.7		3.8		9.4	5.2		28.2		83.1

Table 2-5-14 (11) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1970

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	52.7	20.5	16.3	12.7	18.5	11.1	12.7	11.9	17.3	52.7	146.7	80.2
2	49.5	20.5	17.7	12.7	15.9	15.5	12.3	10.7	16.8	37.0	124.4	254.8
3	58.9	20.5	16.3	12.7	14.3	19.1	11.9	10.3	16.3	58.9	104.3	110.6
4	60.7	20.0	15.5	12.7	13.5	23.7	7.3	10.3	15.1	51.1	89.4	89.4
5	52.7	19.6	15.5	15.5	12.7	21.0	7.3	10.3	14.7	58.0	77.4	77.4
6	51.9	21.6	16.8	14.3	13.9	19.6	11.5	12.3	15.1	59.8	72.8	68.1
7	53.5	21.0	15.9	13.5	13.9	22.6	11.5	14.3	13.5	56.1	76.5	59.8
8	51.9	18.2	15.5	12.7	13.9	21.6	11.5	15.5	14.2	38.4	97.9	44.7
9	52.7	20.0	15.9	12.7	13.5	19.6	11.1	13.5	12.7	34.4	119.1	54.2
10	44.7	18.2	15.9	12.7	13.1	19.6	11.1	15.1	16.3	35.1	108.5	54.0
11	58.9	20.0	15.1	12.7	12.7	18.7	11.1	18.7	50.3	40.0	86.3	47.9
12	47.1	19.1	14.7	12.3	13.1	19.6	11.9	37.0	116.7	70.0	120.1	69.1
13	41.5	19.1	14.3	12.3	15.5	20.1	13.9	25.3	118.0	97.9	90.5	57.0
14	38.4	18.7	14.3	11.9	15.9	29.1	15.1	19.6	43.0	545.5	79.3	56.1
15	37.0	18.2	13.9	11.9	16.8	18.2	13.9	20.5	34.4	248.5	71.8	27.0
16	35.7	17.7	13.9	11.9	13.5	17.7	12.7	25.8	31.2	218.3	135.0	21.0
17	35.1	17.3	13.5	11.9	13.5	16.8	11.5	27.6	38.4	133.9	137.1	102.1
18	33.7	17.3	13.5	11.9	13.5	16.8	10.7	21.6	35.7	101.1	122.3	108.5
19	32.4	16.8	13.5	11.9	13.9	19.1	9.9	18.2	30.0	79.3	327.7	96.9
20	31.2	16.3	13.5	11.9	14.3	17.1	9.9	16.8	27.6	65.4	372.9	90.5
21	28.2	16.3	13.5	13.5	13.9	15.1	9.5	17.3	25.3	55.2	136.0	80.2
22	28.8	16.3	13.1	15.1	12.7	16.8	11.9	28.2	23.7	51.1	111.7	74.6
23	27.0	16.3	13.1	17.7	12.3	18.1	11.1	22.6	22.6	86.3	95.8	69.1
24	26.4	15.9	13.1	14.7	11.9	17.7	9.5	19.6	21.6	61.7	108.5	59.8
25	25.8	15.5	13.9	13.1	11.5	15.9	9.1	21.0	23.2	57.0	100.0	56.1
26	24.7	16.3	13.5	14.3	11.9	15.1	8.7	31.8	27.6	58.0	87.3	55.2
27	23.7	15.9	13.5	15.1	12.7	14.3	8.7	36.4	25.3	82.0	76.5	54.2
28	23.2	15.9	13.1	14.7	13.5	13.5	8.3	25.8	23.2	82.0	94.7	52.7
29	22.6		12.7	17.3	13.5	13.1	8.7	20.5	22.1	86.3	92.6	51.1
30	22.1		12.7	17.7	12.7	13.1	15.5	19.1	45.5	113.8	79.3	50.3
31	20.5		12.7		12.3		15.5	19.1		211.7		49.5

Table 2-5-14(12)

Daily Discharge at No.3 Dam site

(Unit: cms)

Year 1971

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	65.4	21.0	20.0	38.4	22.1	33.7	30.3	41.5	264.0	51.1	38.4	142.4
2	92.6	21.0	19.6	37.7	23.2	47.1	26.4	37.0	50.3	40.8	32.4	121.2
3	95.8	20.5	19.1	34.4	24.7	40.8	24.7	25.8	52.7	23.2	36.4	102.1
4	165.8	21.0	18.7	31.8	28.8	35.1	29.4	28.2	48.7	31.2	37.0	82.0
5	58.9	27.6	20.0	28.2	25.3	31.8	35.1	24.2	41.5	209.5	34.4	78.3
6	55.2	28.2	19.6	30.0	28.2	28.6	28.2	23.2	47.1	144.5	35.1	67.2
7	47.1	28.8	17.7	29.4	33.1	29.4	45.5	24.7	30.6	86.3	33.1	147.9
8	43.1	29.4	17.7	25.3	27.0	30.6	37.0	23.7	31.8	69.1	35.7	70.0
9	39.2	31.2	17.3	30.0	28.2	30.0	35.7	23.2	37.0	60.7	44.7	92.6
10	43.1	28.8	16.8	30.6	35.1	28.8	60.7	22.6	40.8	613.9	91.6	144.5
11	40.8	28.2	16.8	28.8	36.4	27.0	35.1	21.6	36.4	334.0	225.9	243.5
12	37.0	27.0	42.3	27.0	58.9	31.8	79.3	21.0	34.4	242.2	84.2	140.3
13	33.7	27.6	81.1	32.4	70.0	31.8	55.2	20.5	30.6	213.3	59.8	93.7
14	30.6	23.7	178.9	30.6	43.9	32.4	58.0	21.0	38.4	152.7	47.9	75.6
15	28.8	22.8	120.1	26.4	72.8	37.0	57.0	21.0	30.6	133.9	40.8	69.1
16	28.2	21.6	79.3	25.3	62.6	59.8	60.7	20.5	33.7	120.1	35.7	60.7
17	27.0	22.6	65.4	28.8	53.5	68.1	35.2	20.0	27.6	93.7	31.2	67.2
18	27.0	30.0	53.5	28.2	55.2	40.8	109.6	19.6	23.2	81.1	82.0	79.3
19	26.4	51.9	45.5	24.2	47.1	36.4	78.3	18.2	20.5	69.1	195.2	90.5
20	25.3	45.5	42.3	25.3	68.1	34.4	58.0	17.7	19.6	60.7	85.2	78.3
21	24.2	32.4	39.2	23.7	64.4	32.4	44.7	17.7	14.3	52.7	139.2	68.1
22	23.2	30.0	34.4	27.0	67.2	29.4	35.1	17.3	43.1	60.7	74.6	101.1
23	22.6	27.6	33.1	27.6	36.4	28.2	33.7	17.3	24.2	68.1	87.3	90.5
24	22.1	25.3	35.7	27.0	31.2	28.2	43.1	17.3	23.7	79.3	243.5	73.7
25	21.6	23.7	33.7	27.6	28.2	31.2	37.7	17.3	24.2	86.3	486.9	62.6
26	21.0	22.6	32.4	25.8	28.2	28.2	35.7	16.3	20.0	73.7	213.3	52.7
27	22.6	21.0	30.6	24.2	30.6	30.0	31.2	16.3	26.4	67.2	165.8	47.9
28	23.7	20.5	33.1	23.7	34.4	28.2	28.2	16.3	37.7	61.7	125.4	40.8
29	28.8		32.4	21.6	57.0	35.7	27.0	15.9	47.1	57.0	111.1	35.1
30	26.4		34.4	22.1	28.8	51.9	27.0	15.9	35.1	43.9	126.5	31.2
31	23.2		37.0	28.2	28.2		30.0	15.9		39.2		61.5

Table 2-5-14(13) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1972

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	95.7	14.1	6.5	5.7	6.5	9.4	9.1	22.0	11.9	9.9	7.0	55.7
2	113.9	13.7	6.5	10.9	6.2	8.1	8.1	19.8	11.6	9.7	6.7	54.8
3	78.7	12.9	6.7	9.1	6.2	7.3	8.6	18.7	11.6	10.9	6.5	53.0
4	59.3	11.9	6.7	8.3	6.0	7.0	7.8	15.8	12.6	10.3	6.2	50.3
5	51.2	10.9	7.0	6.5	6.0	9.7	8.3	13.7	11.9	10.3	7.3	49.5
6	47.7	9.9	6.7	6.2	6.0	8.3	7.3	11.9	11.6	9.9	9.4	46.8
7	52.1	9.4	6.7	6.2	5.7	7.5	414.4	11.2	11.2	39.6	131.6	45.0
8	58.4	8.9	6.5	6.0	5.7	7.0	92.5	10.9	19.8	18.7	26.5	41.4
9	57.5	8.9	6.5	6.5	5.7	6.2	55.7	9.7	19.2	11.9	26.0	38.7
10	62.0	8.6	6.5	7.8	5.7	6.0	23.2	34.6	18.7	11.2	34.7	37.8
11	53.9	7.9	6.2	8.1	6.6	5.7	28.8	30.2	49.5	11.2	18.1	36.1
12	34.6	8.1	6.2	9.1	8.1	5.4	23.7	28.2	43.2	10.3	16.7	35.3
13	29.5	8.1	6.5	11.2	6.0	5.4	23.7	27.1	33.9	9.1	15.8	59.3
14	30.2	8.1	7.0	9.1	5.7	5.4	19.8	24.8	22.6	8.6	14.5	79.8
15	25.4	8.1	6.5	8.1	6.2	5.7	17.5	19.8	19.8	8.6	15.4	68.1
16	24.3	8.3	6.2	8.3	5.7	6.0	16.7	15.0	18.1	8.3	14.5	58.4
17	20.3	7.8	6.2	7.5	11.9	8.3	17.1	13.2	17.1	7.8	13.7	47.7
18	17.1	8.1	6.2	6.5	9.4	8.1	47.7	12.6	16.2	7.5	16.2	45.0
19	16.2	7.3	6.0	6.5	12.2	8.1	66.0	11.9	15.0	7.5	13.7	43.2
20	15.4	7.3	6.7	6.2	14.5	7.8	26.0	15.4	13.7	7.3	15.0	41.4
21	15.0	7.3	6.9	6.0	13.7	7.5	17.1	14.5	12.9	7.3	14.5	37.8
22	14.5	7.0	8.3	6.0	19.8	7.0	17.5	13.2	12.6	7.0	14.5	39.6
23	14.5	7.0	7.0	5.7	15.4	7.0	15.4	69.2	11.9	8.3	15.8	31.7
24	14.1	7.0	6.7	5.7	15.8	6.7	13.2	16.7	11.6	8.1	15.5	28.8
25	14.5	6.7	6.5	6.5	19.2	8.1	11.9	13.7	11.2	7.8	52.1	27.7
26	12.9	6.7	6.2	8.1	15.8	13.2	10.9	12.9	10.9	7.8	74.5	23.7
27	11.6	6.7	6.2	7.3	14.5	8.6	10.3	12.6	10.9	7.5	73.4	26.5
28	11.2	6.7	6.0	6.7	12.9	10.6	9.7	12.6	11.9	7.5	68.1	26.0
29	14.1	6.5	6.0	6.5	14.1	10.6	38.7	12.2	10.9	7.3	63.9	47.7
30	18.1		6.0	6.7	13.2	9.7	62.9	11.9	10.6	7.3	60.2	24.3
31	16.2		6.0		10.9		25.4	11.9		7.0		24.3

Table 2-5-14(14) Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1973

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	23.7	15.4	7.8	6.0	8.1	6.0	6.0	5.4	3.8	4.4	28.8	53.0
2	23.2	14.5	7.8	5.7	7.8	6.2	5.4	4.9	3.8	3.6	23.2	45.9
3	22.6	14.1	7.5	5.4	7.8	6.2	5.2	6.0	3.6	3.8	22.0	38.7
4	22.0	13.7	7.5	5.4	7.5	6.2	4.9	6.0	2.5	4.6	21.5	31.7
5	22.0	13.2	7.5	5.7	7.5	5.4	4.6	6.0	1.7	5.4	20.3	33.1
6	22.6	13.2	6.7	5.7	7.0	5.2	5.7	5.7	0.9	13.2	31.0	31.7
7	22.0	12.9	6.7	5.7	7.0	5.2	5.4	5.4	4.1	25.4	29.5	30.2
8	24.3	11.9	6.7	5.7	6.7	5.4	5.2	5.2	7.5	26.5	39.6	57.5
9	24.8	11.9	6.7	5.7	6.7	5.7	4.9	7.5	9.9	17.5	29.5	60.2
10	23.2	12.6	6.5	5.7	7.0	5.4	6.2	6.2	9.1	14.1	28.8	67.1
11	22.0	12.2	6.5	5.4	6.7	5.2	5.2	6.5	6.0	11.6	24.8	48.6
12	22.6	10.9	6.5	6.7	6.7	4.4	7.0	5.4	5.2	10.9	22.6	46.8
13	21.5	10.6	6.2	6.2	6.5	4.1	7.3	5.2	4.9	9.9	22.0	45.9
14	20.9	9.9	6.2	6.0	9.4	4.6	7.0	4.9	6.7	87.2	33.9	43.2
15	21.5	9.7	6.2	6.0	9.1	4.9	6.7	3.0	3.8	180.6	17.5	39.6
16	20.9	9.7	6.5	6.0	8.3	4.4	6.7	2.5	6.5	212.0	57.5	34.6
17	20.3	9.4	7.0	6.0	8.1	4.4	5.7	2.0	4.4	163.0	50.3	29.5
18	18.7	9.4	8.1	5.7	7.8	4.1	4.1	11.2	4.4	74.5	47.7	27.7
19	18.1	10.6	8.1	5.7	8.3	4.4	3.0	4.1	2.8	48.6	104.1	27.1
20	17.5	8.9	7.8	8.1	9.9	4.1	2.8	7.0	5.2	41.4	110.2	34.6
21	17.5	8.9	7.0	8.1	7.5	4.1	2.5	19.2	4.4	27.7	262.3	52.1
22	16.2	8.9	6.5	8.3	7.3	4.1	2.2	16.2	4.1	16.2	331.5	93.8
23	16.2	8.6	6.2	8.3	7.0	3.8	2.2	6.2	3.8	13.7	490.2	169.3
24	15.8	8.6	6.0	8.3	6.7	3.8	2.0	4.4	8.1	11.9	253.5	96.7
25	15.8	8.6	6.0	8.3	6.5	4.1	2.0	3.6	6.0	13.2	114.0	61.1
26	15.4	8.6	5.7	8.1	6.5	3.8	1.7	3.3	4.9	21.5	109.0	51.2
27	15.4	8.6	5.7	7.8	6.2	3.8	2.2	3.0	4.1	15.0	90.4	60.2
28	15.0	8.6	6.0	7.8	6.0	3.8	2.0	3.8	3.6	13.7	57.5	60.2
29	16.2	8.6	5.7	7.8	6.0	3.8	1.7	3.6	3.3	17.5	48.6	35.3
30	17.5	8.6	5.7	8.1	5.7	3.6	1.7	3.6	7.8	21.5	43.2	127.8
31	17.1		6.0		5.7	6.2	6.2	4.1		60.2		104.1

Table 2-5-14(15)

Daily Discharge at No. 3 Dam site

(Unit: cms)

Year 1974

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	91.4	11.2	11.6	3.6	7.3	3.8	12.6	14.1	12.6	14.5	38.7	129.1
2	76.6	10.6	4.6	4.1	6.7	3.8	12.2	13.7	12.2	14.1	62.9	105.2
3	69.2	9.9	9.7	4.6	6.2	3.8	11.9	13.2	11.9	14.1	126.7	99.9
4	56.6	9.7	8.3	4.4	5.4	3.6	11.6	13.2	11.2	13.7	139.1	93.5
5	57.5	9.4	7.8	4.4	5.2	3.6	11.2	13.2	10.3	13.2	134.1	87.2
6	51.2	9.1	7.5	4.1	4.9	3.3	11.2	12.9	9.9	13.2	127.8	77.7
7	41.4	9.1	7.3	4.1	4.4	3.0	10.9	18.1	9.9	12.9	120.3	59.3
8	42.3	8.9	7.0	3.8	4.1	3.0	11.9	16.7	9.7	12.9	110.2	55.7
9	40.5	8.6	6.5	3.6	3.8	2.8	11.9	16.2	9.7	12.6	300.0	11.5
10	36.9	8.3	6.2	3.6	3.8	264.8	12.2	15.8	9.4	12.2	180.6	49.5
11	34.6	9.4	6.0	3.6	3.6	439.3	12.2	15.0	9.1	20.3	89.3	25.4
12	33.1	9.9	6.0	3.3	3.6	180.6	11.9	14.5	10.3	31.0	67.1	117.8
13	32.4	9.4	5.7	3.3	4.1	105.2	11.6	14.1	14.5	25.3	63.9	115.2
14	31.0	9.1	5.7	3.3	3.8	40.5	11.2	18.7	43.2	22.6	61.1	114.0
15	34.6	8.9	5.4	3.0	3.6	31.0	10.9	18.7	36.9	24.3	153.0	111.5
16	26.0	8.6	5.4	3.6	3.3	20.9	10.6	16.7	31.0	27.7	89.3	175.6
17	25.4	8.6	5.4	3.8	3.3	12.2	10.3	25.4	25.4	406.9	47.7	155.5
18	24.8	8.3	5.2	3.6	3.0	11.2	15.0	26.0	21.5	186.9	46.8	153.0
19	22.0	8.3	5.2	3.3	3.0	10.9	15.0	22.0	20.3	58.4	49.5	150.4
20	19.8	8.1	4.9	3.3	2.8	10.6	53.9	19.8	19.2	40.5	53.9	149.2
21	18.7	8.1	4.9	3.0	2.8	10.3	45.0	17.1	18.7	37.8	62.0	184.4
22	17.1	7.8	4.9	3.0	2.5	9.9	26.5	15.8	18.1	34.6	60.2	183.1
23	16.2	7.5	4.6	2.8	2.5	9.9	18.7	14.1	17.5	33.9	56.6	163.0
24	16.7	7.0	4.6	2.8	2.2	9.7	17.1	13.7	17.1	33.9	53.0	161.8
25	17.5	6.7	4.4	2.8	2.2	9.4	16.2	13.2	16.7	33.1	48.6	160.5
26	16.2	6.5	4.1	2.5	3.6	9.4	15.8	12.9	16.2	33.1	45.9	159.2
27	15.8	8.9	4.1	2.5	4.6	9.1	15.4	12.6	15.8	32.4	42.3	154.2
28	15.8	11.9	4.1	3.3	3.3	8.9	15.4	12.2	15.8	47.7	39.6	150.4
29	15.4		3.8	3.0	3.3	8.9	15.0	13.2	15.4	40.5	215.8	147.9
30	13.7		3.8	3.0	4.4	8.6	14.5	12.9	15.0	43.2	155.5	144.2
31	11.9		3.6		4.1		14.1	12.6		57.5		141.6

Table 2-5-14(16) Daily Discharge at No.3 Dam site

(Unit: cms)

Year 1979

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	20.9	14.5	11.6	13.6	16.5	17.4	22.9	32.4	23.5	38.4	24.5	44.8
2	20.6	14.2	11.9	13.3	15.3	20.2	21.2	25.9	34.6	69.8	24.9	45.6
3	19.9	13.9	11.9	13.0	14.2	28.0	34.6	24.2	30.5	75.5	27.0	43.6
4	19.6	13.6	8.8	13.0	14.7	29.4	38.4	35.4	25.6	80.9	23.5	40.8
5	19.3	13.3	10.9	13.0	14.5	25.6	29.4	30.2	28.7	64.3	24.9	38.4
6	19.0	13.0	10.9	13.0	14.2	21.5	24.9	26.3	27.0	52.4	34.2	36.9
7	23.2	13.0	10.6	13.3	13.9	19.6	25.9	26.3	28.4	46.0	35.4	38.0
8	22.5	13.0	10.3	13.0	13.6	23.9	36.9	24.2	24.2	42.0	30.9	46.5
9	22.2	13.3	10.1	13.0	13.3	38.0	29.4	29.1	25.2	39.2	30.2	40.8
10	21.9	13.0	9.8	12.8	13.3	38.8	24.9	30.2	27.7	36.9	28.0	39.6
11	21.5	12.8	9.6	12.5	13.0	28.0	23.5	28.0	27.0	36.1	28.4	37.3
12	21.2	12.5	9.6	12.5	13.0	23.5	22.9	24.9	23.2	40.0	27.7	34.6
13	18.7	12.2	9.3	12.2	15.3	20.2	22.5	23.9	22.9	35.0	27.3	34.2
14	18.4	11.9	9.3	12.2	16.5	18.7	26.3	22.9	23.2	23.2	33.8	33.8
15	18.0	12.5	9.0	12.5	16.5	20.2	30.5	21.5	26.3	27.7	39.6	33.1
16	17.7	12.5	14.2	12.5	17.7	18.4	25.2	20.9	25.6	33.1	36.9	32.4
17	17.1	12.5	14.2	15.0	15.3	18.7	21.9	20.2	32.4	32.0	35.0	31.6
18	17.1	12.5	13.9	14.7	24.9	19.3	20.6	19.6	29.1	30.5	33.1	30.2
19	16.5	12.5	13.6	14.2	24.2	18.4	19.9	19.3	31.3	29.8	36.9	30.5
20	17.1	11.9	13.6	15.6	18.7	17.4	20.2	18.7	34.6	29.1	38.8	29.8
21	16.5	11.6	13.9	31.3	16.5	16.8	26.6	18.4	29.4	29.4	40.4	29.8
22	15.9	11.4	14.2	22.2	15.3	16.2	22.5	17.7	26.3	29.1	36.9	30.9
23	15.3	11.1	14.2	35.0	14.5	28.4	19.9	17.4	28.4	28.4	37.7	32.0
24	15.0	10.9	17.7	23.2	14.7	21.5	19.0	17.1	27.0	29.4	38.4	35.0
25	14.7	10.6	23.2	19.9	35.0	20.2	19.0	16.8	24.9	29.1	39.2	38.0
26	14.5	10.3	18.0	17.1	27.0	22.2	32.7	17.1	23.9	27.7	50.7	39.6
27	14.2	10.3	15.9	15.9	21.5	24.5	47.3	22.5	39.6	27.0	49.4	41.2
28	13.6	10.3	14.7	15.9	19.0	29.8	36.5	19.0	33.8	26.6	47.3	42.8
29	13.6		11.4	30.2	17.7	27.0	28.4	17.7	35.7	26.6	44.8	40.8
30	13.6		13.9	19.0	18.4	22.2	25.9	20.9	37.3	25.9	44.4	35.7
31	13.6		13.6	16.5	16.5		26.6	19.6		24.9		34.2

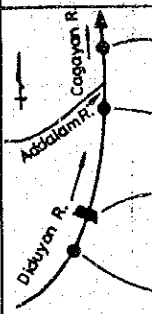
Table 2-5-15 Discharge Duration at No.3 Damsite

Year	Minimum Discharge (m ³ /sec.)	95-day Discharge (m ³ /sec.)	185-day Discharge (m ³ /sec.)	275-day Discharge (m ³ /sec.)	355-day Discharge (m ³ /sec.)	Minimum Discharge (m ³ /sec.)	Annual Mean Discharge (m ³ /sec.)
1960	233.56	35.78	27.14	21.88	18.33	17.53	32.0
1961	264.04	29.03	24.36	19.95	16.55	16.17	28.0
1962	330.51	30.49	25.14	20.27	17.44	16.78	29.4
1963	298.31	29.76	24.49	19.95	16.02	15.53	28.6
1964	413.16	43.31	23.74	17.97	12.24	9.13	49.8
1965	137.87	33.87	24.28	14.95	11.58	10.59	28.7
1966	607.33	27.52	17.53	13.23	9.39	8.87	37.0
1967	602.37	37.71	20.91	11.91	8.87	8.34	32.6
1968	199.47	22.10	17.73	14.69	9.13	8.34	20.2
1969	181.27	17.27	9.13	4.90	3.04	1.98	18.3
1970	545.54	49.49	18.66	13.50	9.92	7.28	38.8
1971	613.95	57.03	33.74	26.40	17.27	14.29	52.1
1972	414.41	18.09	11.25	7.28	5.69	5.42	19.2
1973	490.23	17.53	7.54	5.42	2.25	0.93	20.9
1974	439.29	33.15	12.90	6.22	2.78	2.25	34.0
1979	80.85	29.80	22.20	14.74	10.32	8.80	23.9
Average	365.76	32.00	20.05	14.58	10.68	9.51	30.8

Table 2-5-16 Monthly Riverflow at No.3 Dam site for 1960 ~ 1974 & 1979

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Mean
1960	36.534	48.204	26.528	21.311	19.476	24.866	24.503	35.981	30.179	56.057	29.253	31.223	384.115	22.010
1961	27.387	22.355	24.158	18.093	21.502	19.742	28.406	24.587	26.369	24.991	46.718	41.815	336.123	28.010
1962	27.922	23.066	20.970	22.501	19.786	18.213	28.394	34.123	30.914	32.574	55.235	39.134	352.832	29.403
1963	27.567	27.274	20.413	18.228	16.180	28.433	27.373	48.530	34.425	26.290	22.253	46.487	343.453	28.621
1964	27.796	24.165	21.752	17.985	18.099	24.635	29.477	29.814	33.071	76.488	223.107	71.081	597.472	49.789
1965	45.512	36.084	21.795	16.555	13.509	13.081	25.809	22.568	38.444	30.790	38.898	41.895	344.940	28.745
1966	24.630	16.413	11.676	9.778	41.996	19.380	19.951	28.743	16.650	23.702	109.895	120.853	443.667	36.972
1967	61.528	23.774	18.167	12.487	10.624	9.811	12.826	19.869	41.329	40.352	97.333	42.580	390.680	32.557
1968	33.730	17.028	12.442	10.014	16.179	24.042	18.121	21.781	22.853	22.694	27.687	15.752	242.293	20.191
1969	16.116	10.805	7.866	5.619	4.635	3.802	5.436	5.288	16.076	25.345	46.829	71.412	219.229	18.269
1970	38.485	18.203	14.397	13.534	13.701	17.709	11.149	19.892	31.242	97.619	118.110	71.683	465.724	38.810
1971	40.975	27.191	41.543	28.888	41.242	35.282	44.281	21.254	41.170	113.572	102.675	87.467	624.740	52.062
1972	35.492	8.618	6.516	7.302	10.038	7.714	37.255	18.318	16.814	10.052	28.937	42.759	229.810	19.151
1973	19.763	10.856	6.680	6.642	7.269	4.675	4.375	6.843	4.869	38.397	85.499	56.244	251.112	20.926
1974	32.985	8.856	5.751	3.440	3.923	41.738	15.934	15.749	16.816	45.325	95.377	122.145	408.039	34.003
1979	17.838	12.321	12.696	16.487	17.251	23.141	26.660	22.842	28.561	37.608	34.998	36.856	287.259	23.938
Total	514.260	335.213	273.320	228.064	275.410	316.264	359.950	375.182	429.782	711.856	1162.806	939.381	5921.488	493.457
Mean	32.141	20.951	17.083	14.254	17.213	19.767	22.497	23.449	26.861	44.491	72.675	58.711	370.093	30.841

Method of Obtaining Inflow to Diduyon Reservoir

Location	Site	C.A. (km ²)	Observation Period (Year)													Equation for Conversion			
			1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972		1973	1974	1979
	Pangal (BPW)	4,244	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	$y = ax + b$
	Aglipay (BPW)	721	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	$y = ax$
	Diduyon Damsite	477	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	$y = ax$
	Kamamasi (NPC)	462																●	

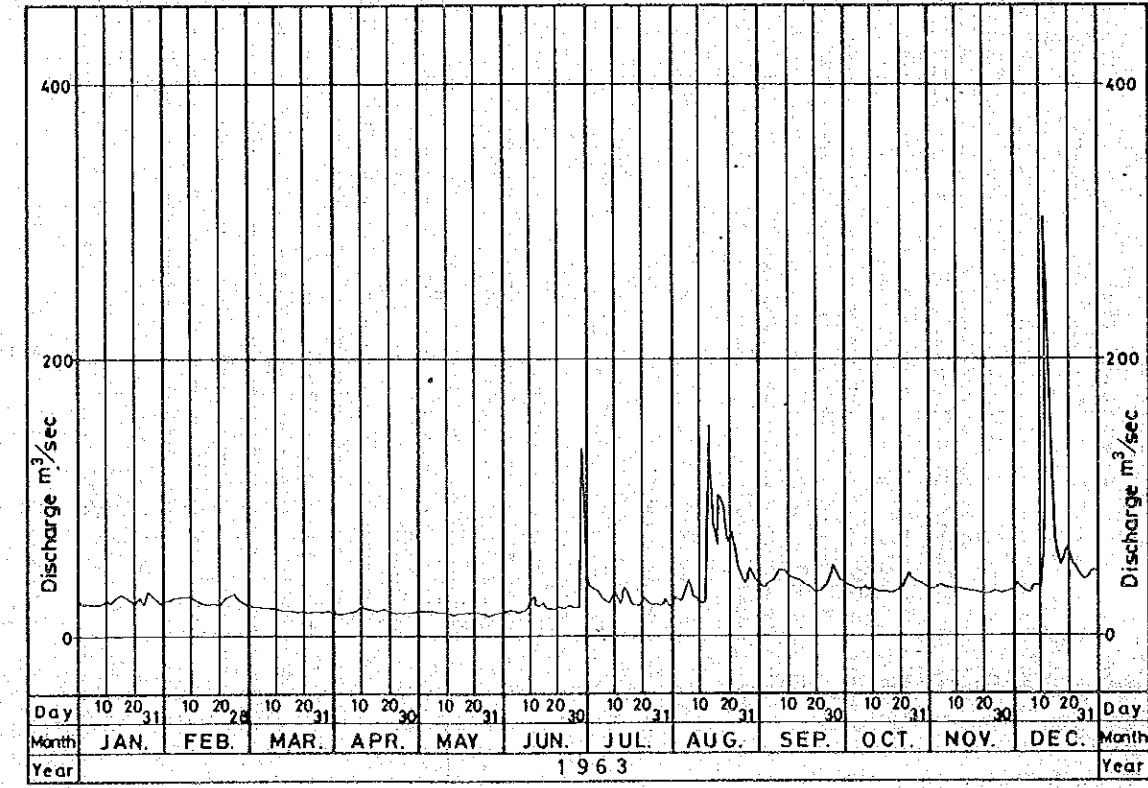
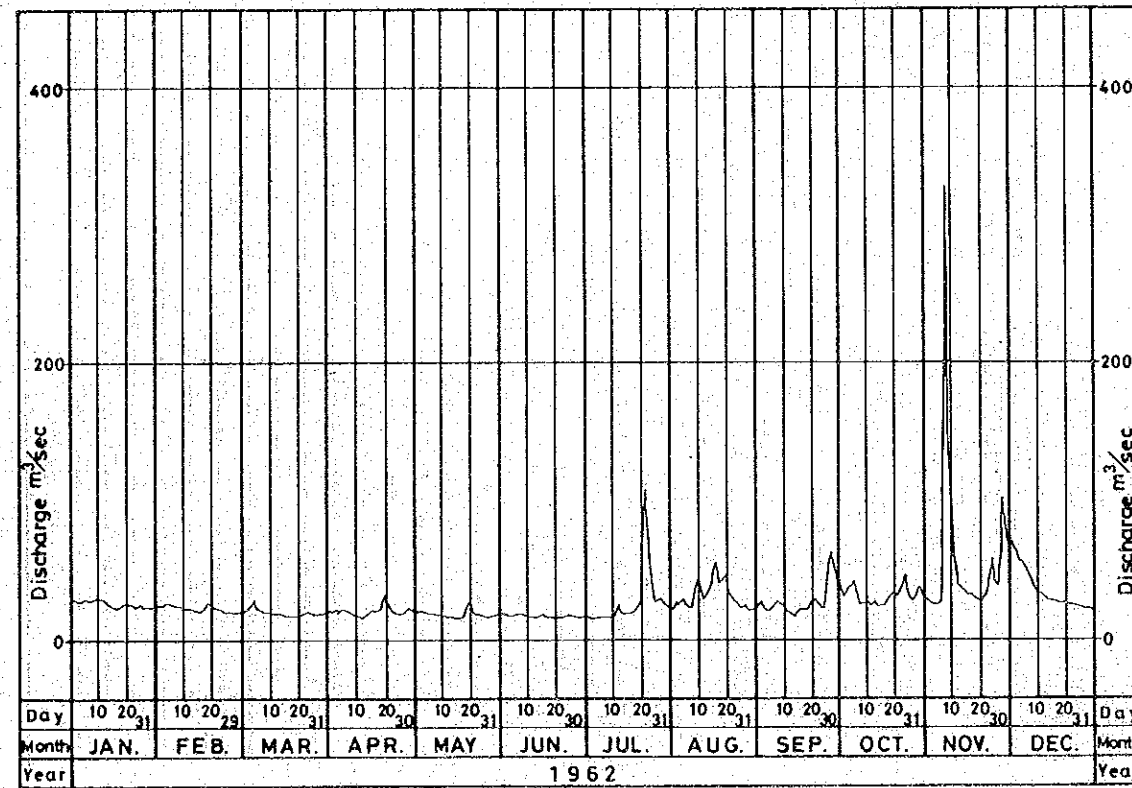
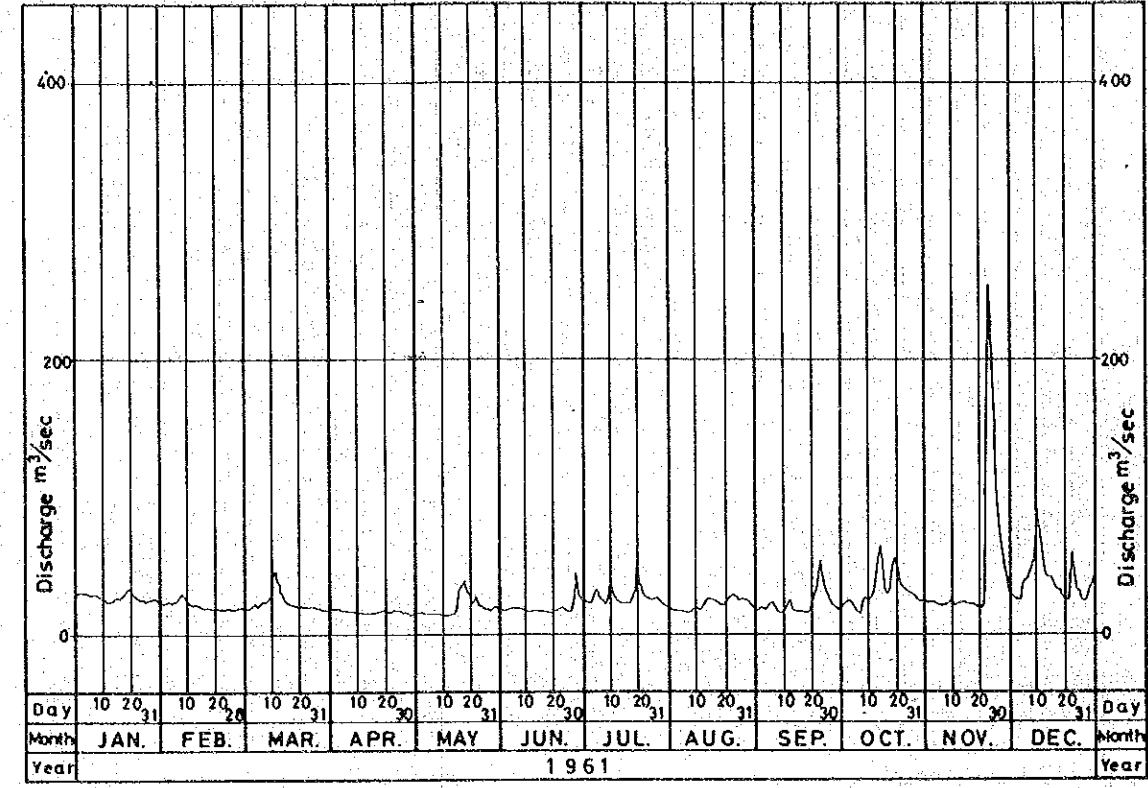
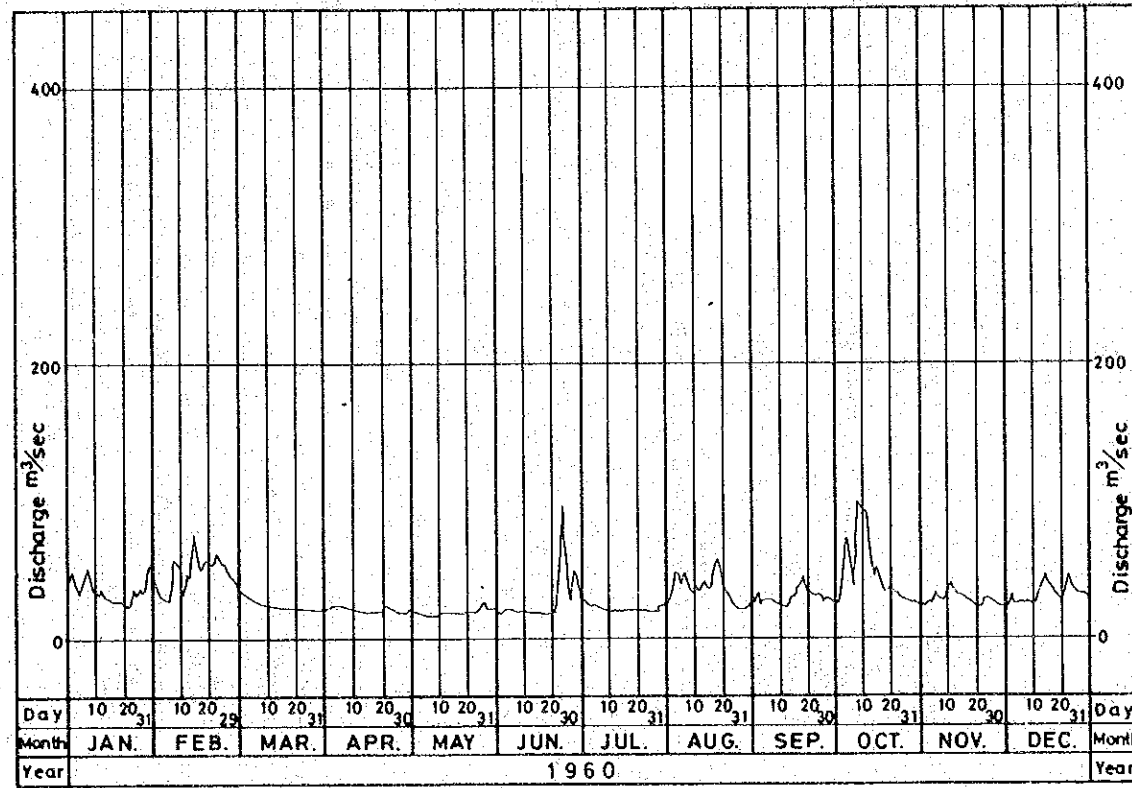
- Remarks:
- - Actually observed data
 - - Arithmetically computed Data
 - - Obtained inflow to reservoir
 - ↓ - Way of conversion

Diduyon Hydroelectric Project Upper Cagayan River Republic of the Philippines	
Japan International Cooperation Agency	
Method of Obtaining Inflow to Diduyon Reservoir	
October	1980 Fig. 2-5-21

Daily Discharge at No. 3 Damsite (1)

Station Name : No. 3 Damsite

Catchment Area : 477 km²



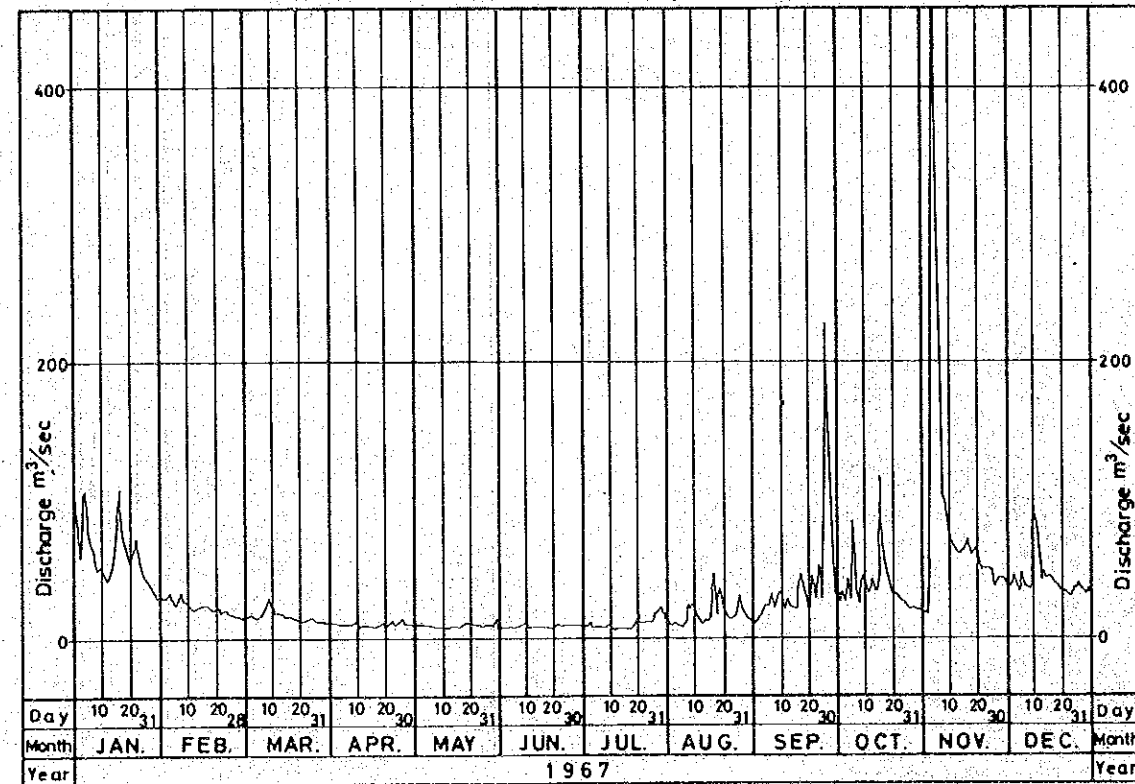
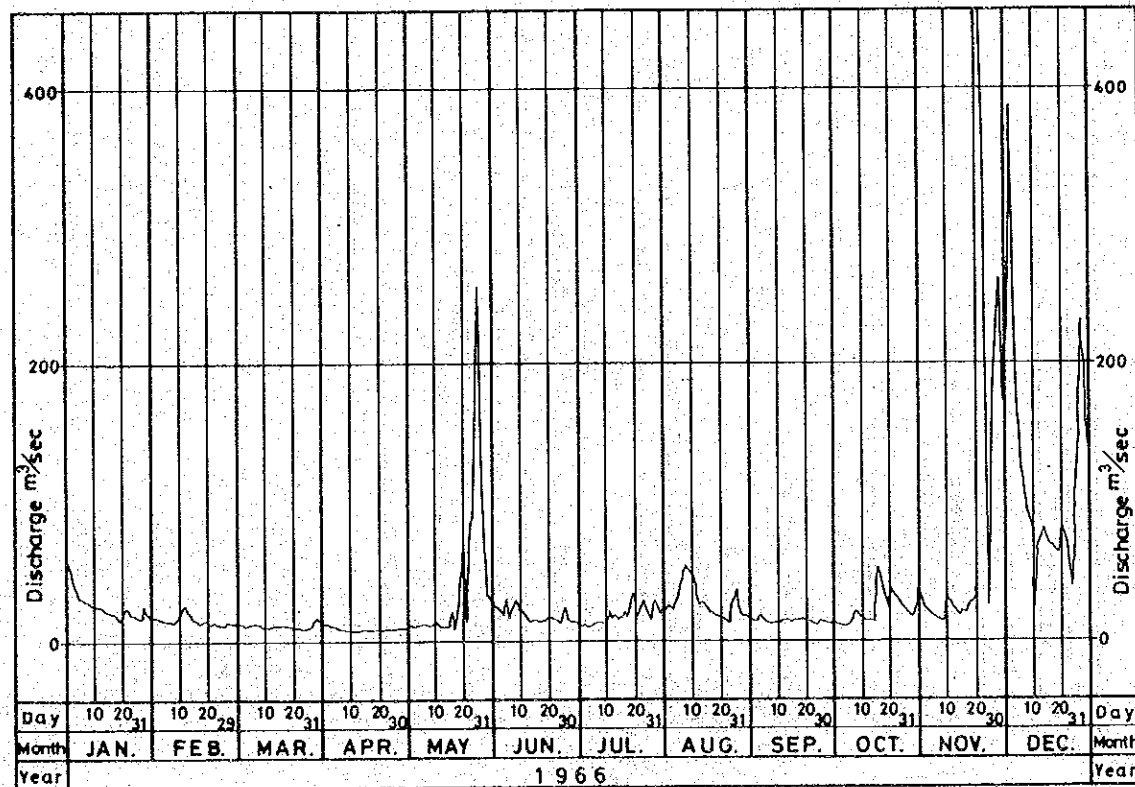
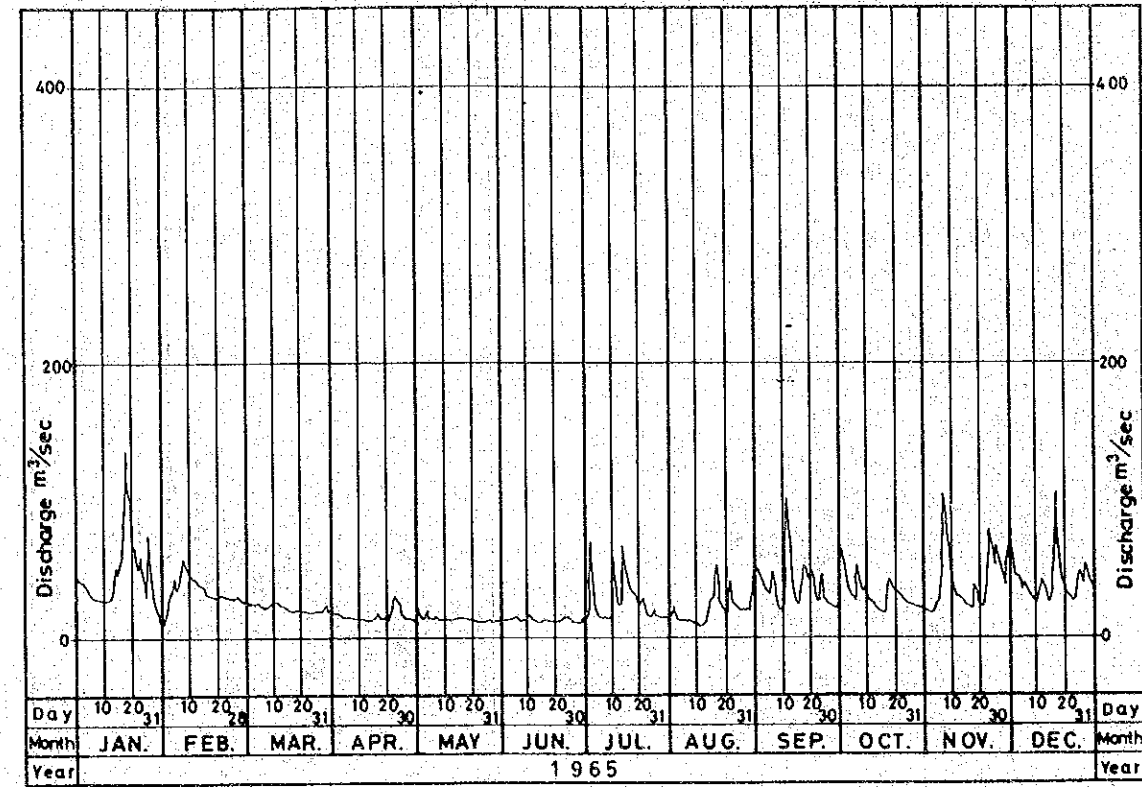
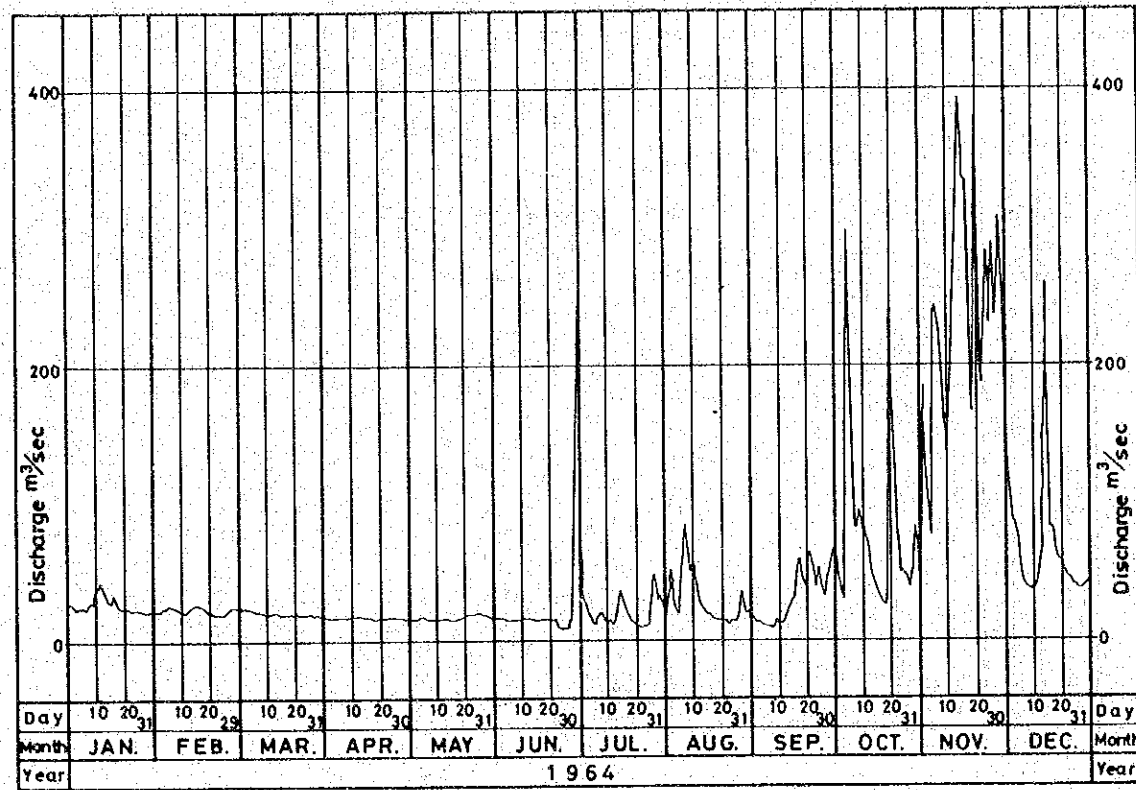
Diduyon Hydroelectric Project
 Upper Cagayan River
 Republic of the Philippines
 Japan International Cooperation Agency

Daily Discharge at
 No. 3 Damsite (1)

October 1980 Fig.2-5-22(1)

Daily Discharge at No. 3 Damsite (2)

Station Name : No. 3 Damsite
 Catchment Area : 477 km²

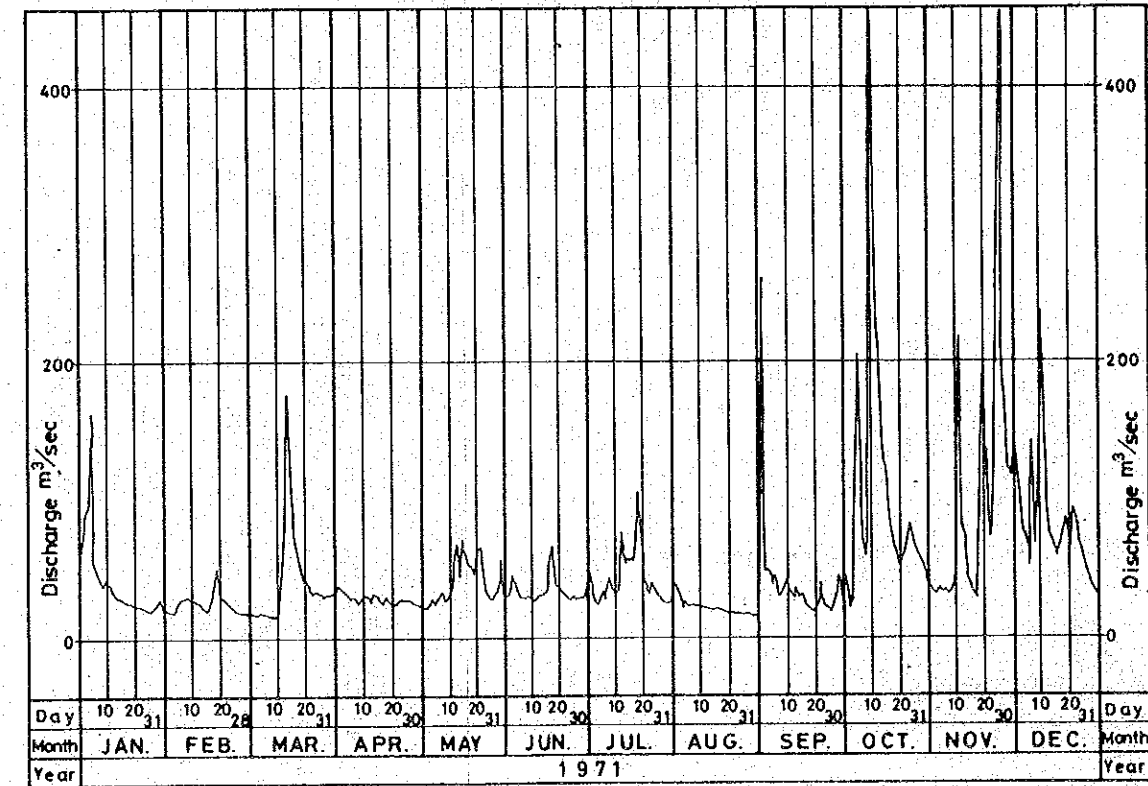
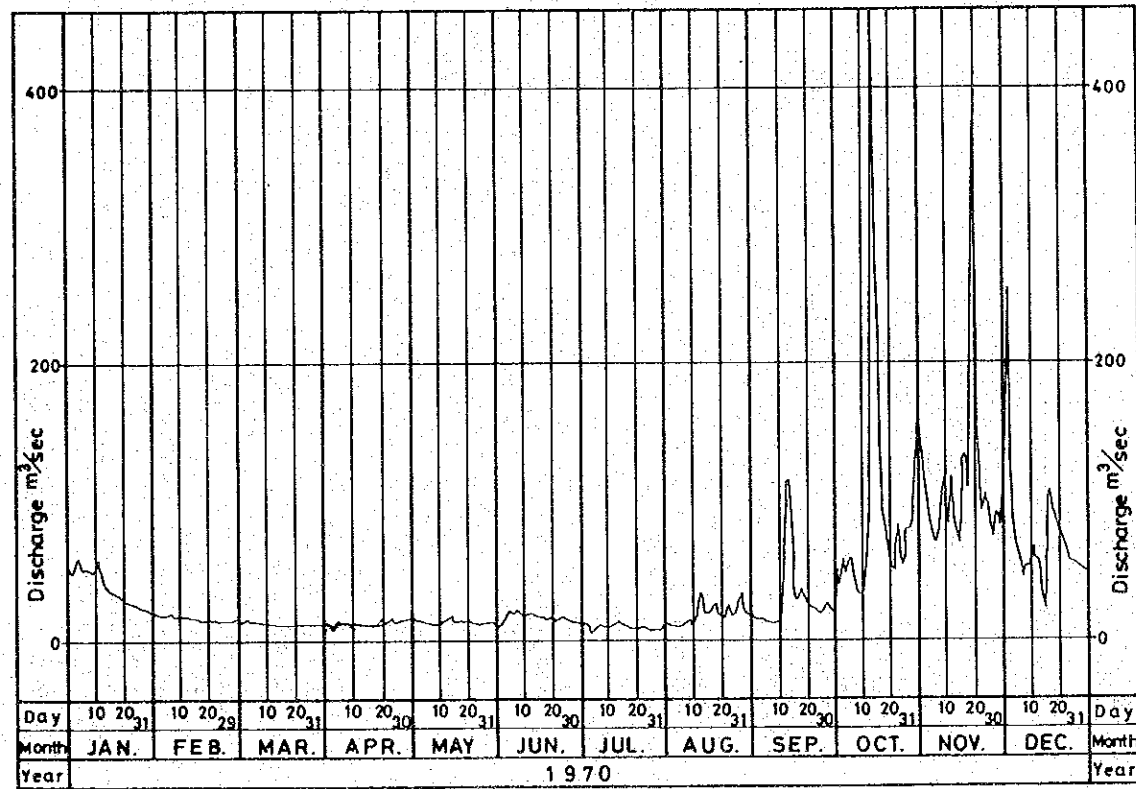
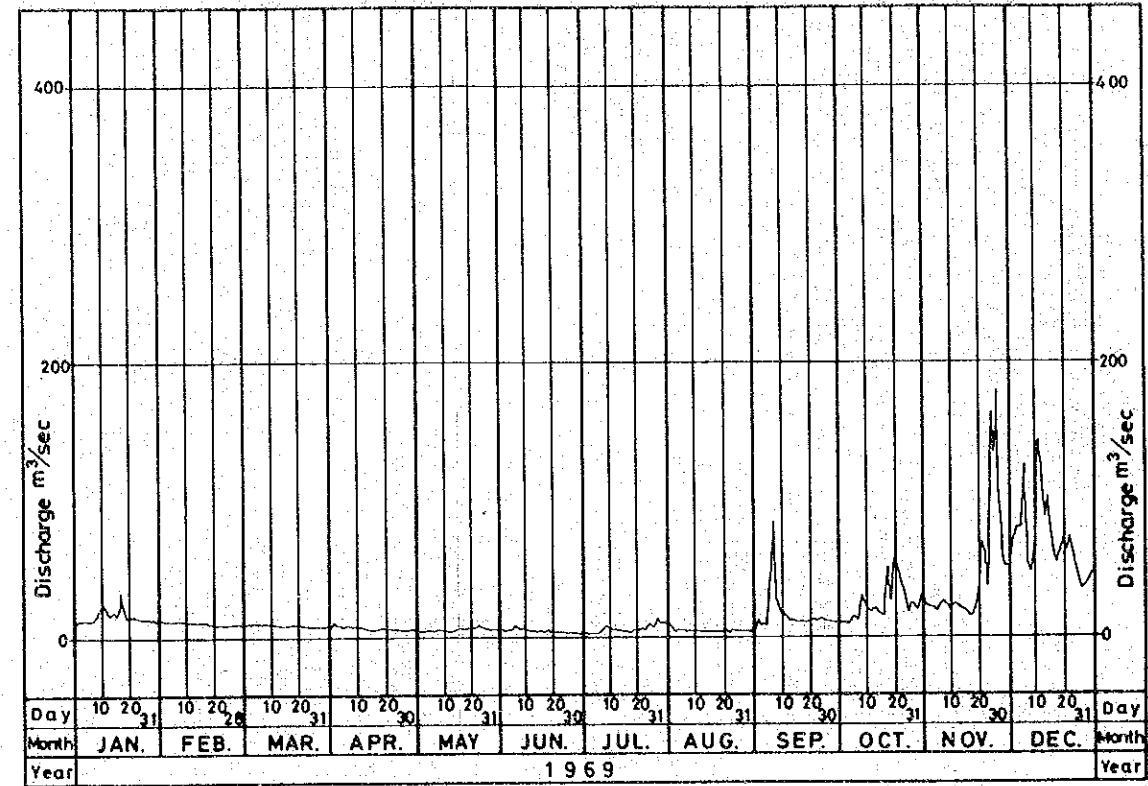
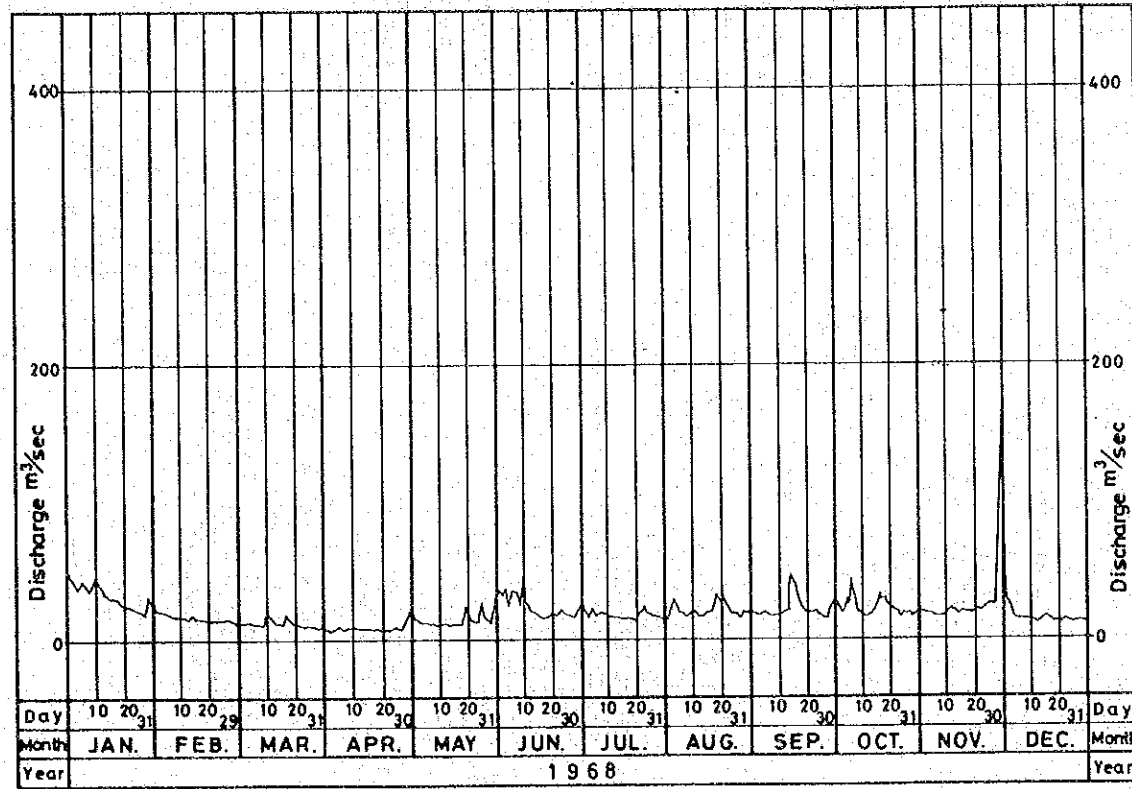


Diduyon Hydroelectric Project
 Upper Cagayan River
 Republic of the Philippines
 Japan International Cooperation Agency
 Daily Discharge at
 No. 3 Damsite (2)
 October 1980 Fig. 2-5-22(2)

Daily Discharge at No. 3 Damsite (3)

Station Name : No. 3 Damsite

Catchment Area : 477 km²



Diduyon Hydroelectric Project
 Upper Cagayan River
 Republic of the Philippines
 Japan International Cooperation Agency

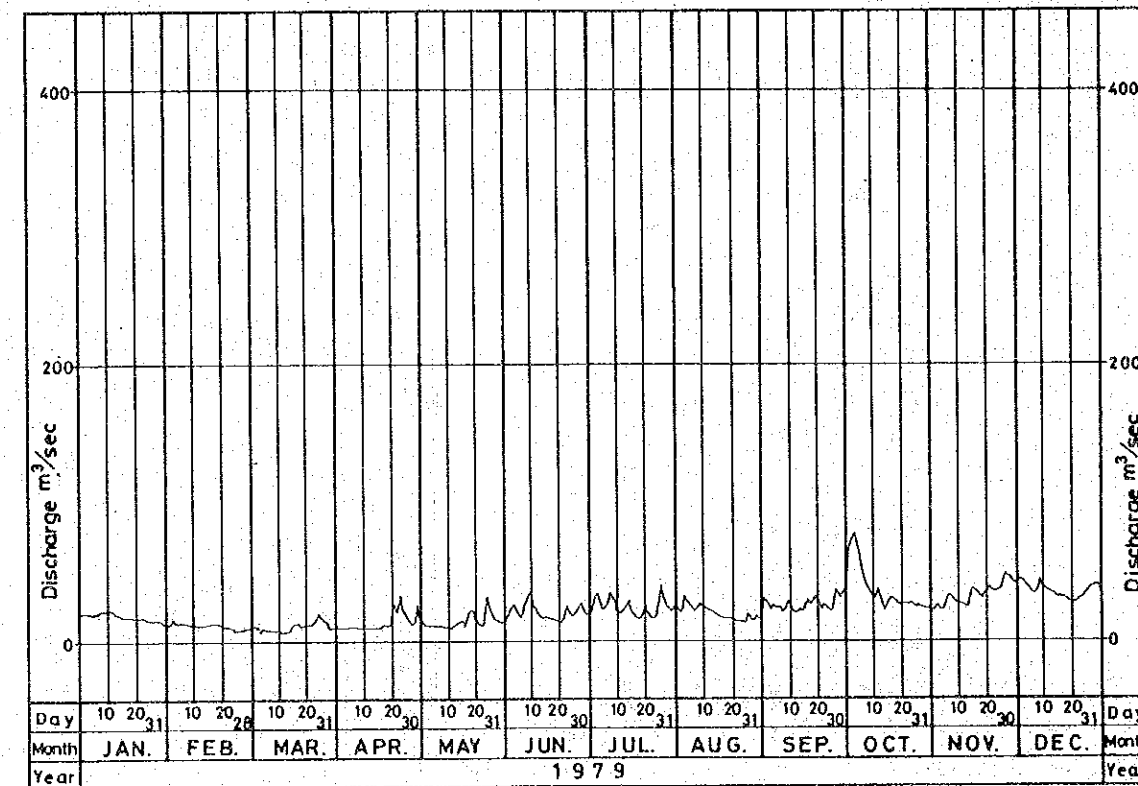
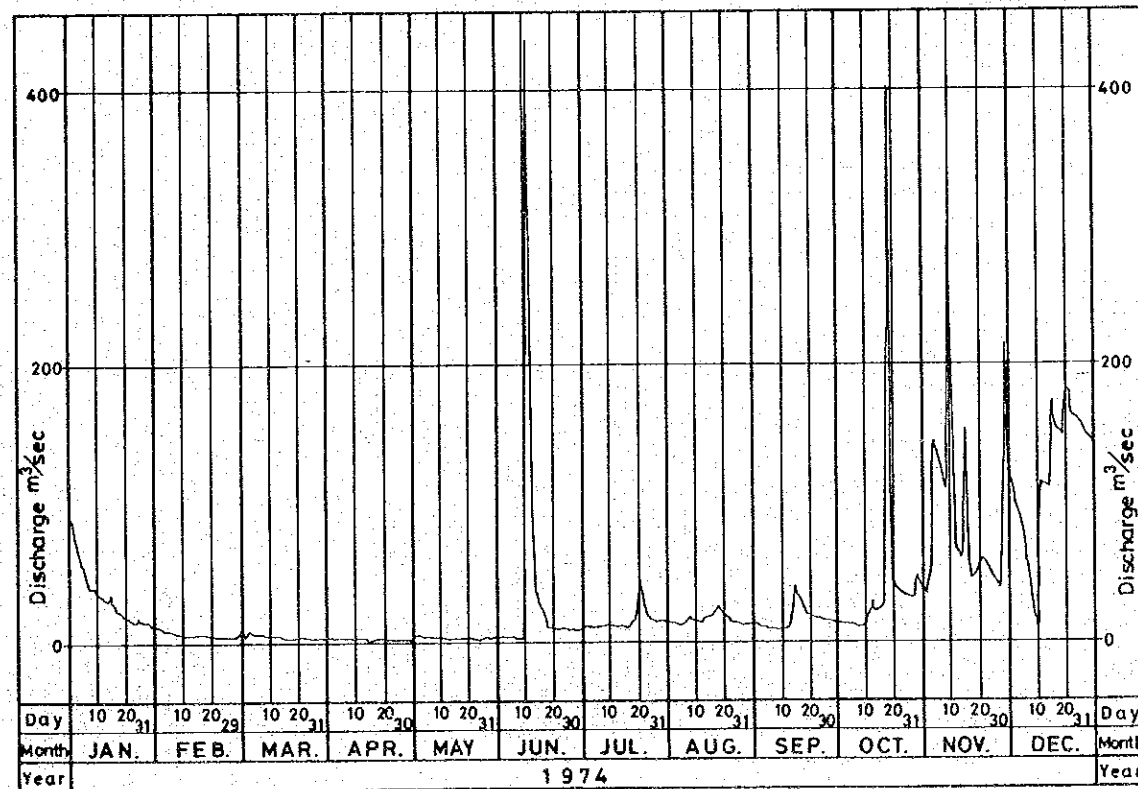
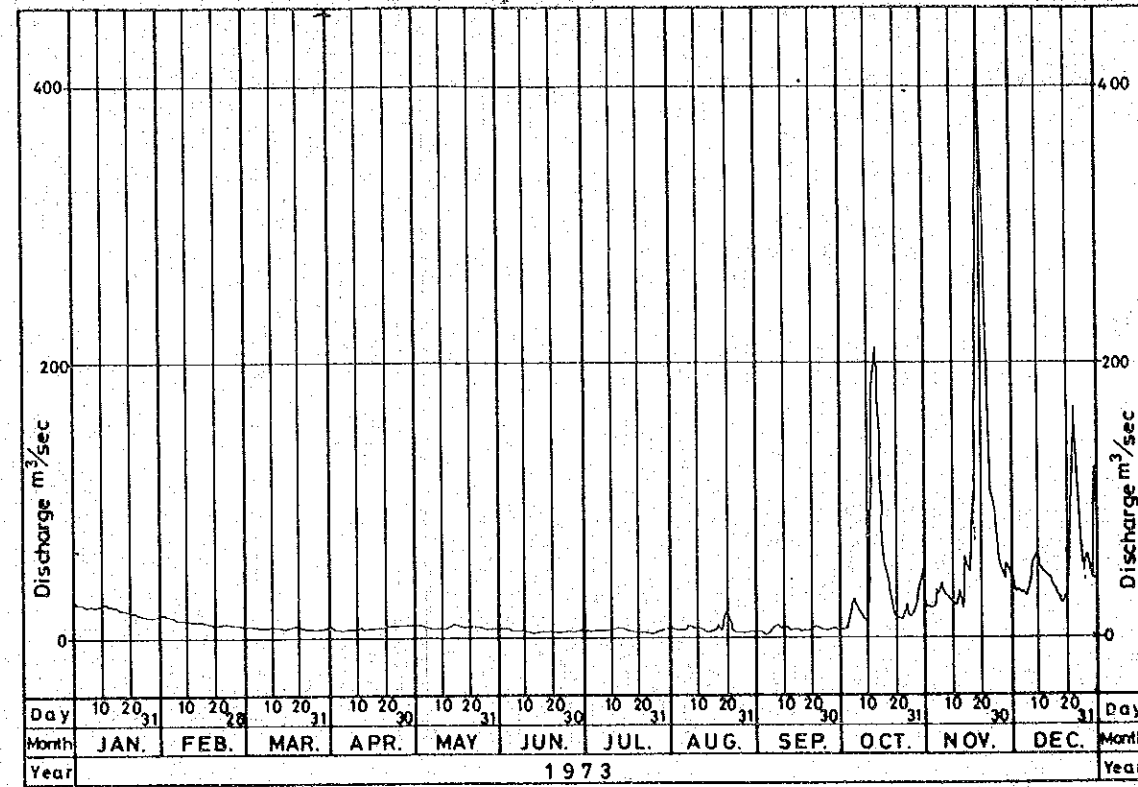
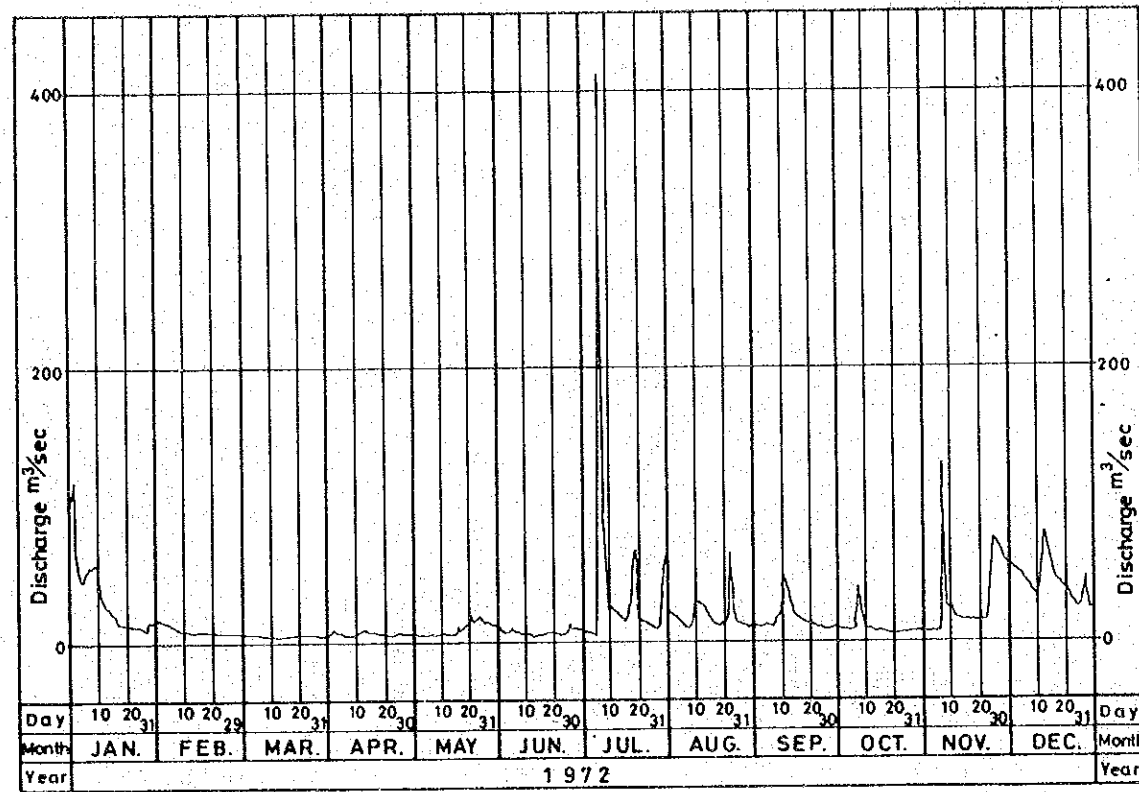
Daily Discharge at
 No. 3 Damsite (3)

October 1980 Fig.2-5-22(3)

Daily Discharge at No. 3 Damsite (4)

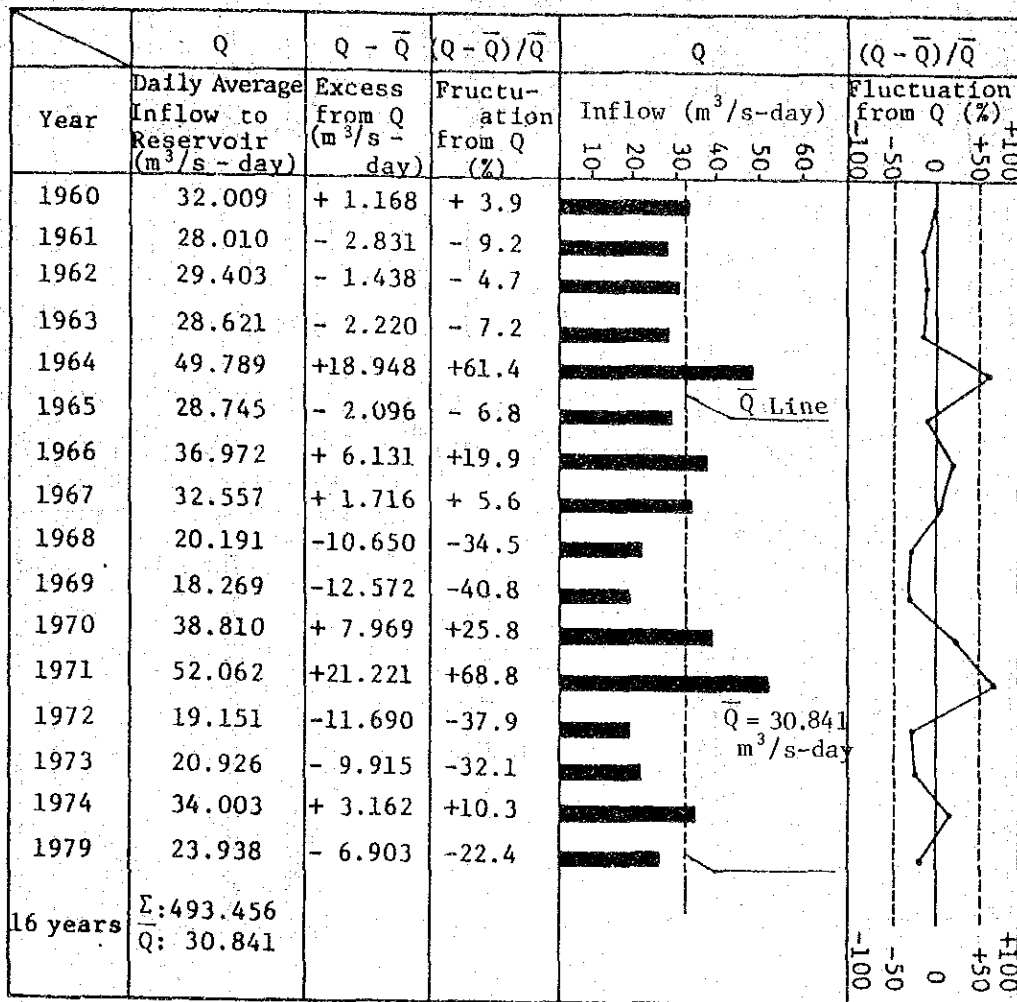
Station Name : No.3 Damsite

Catchment Area : 477 km²



Diduyon Hydroelectric Project
 Upper Cagayan River
 Republic of the Philippines
 Japan International Cooperation Agency
 Daily Discharge at
 No. 3 Damsite (4)
 October 1980 Fig.2-5-22(4)

Inflow to Diduyon Reservoir at Damsite



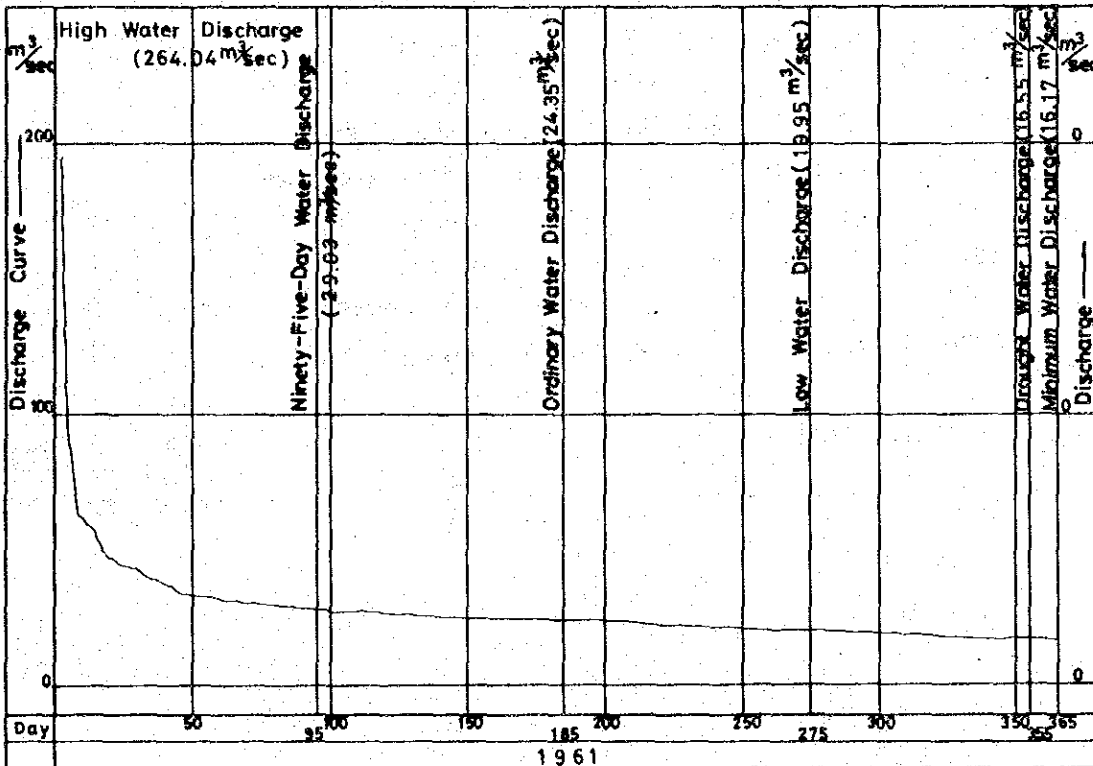
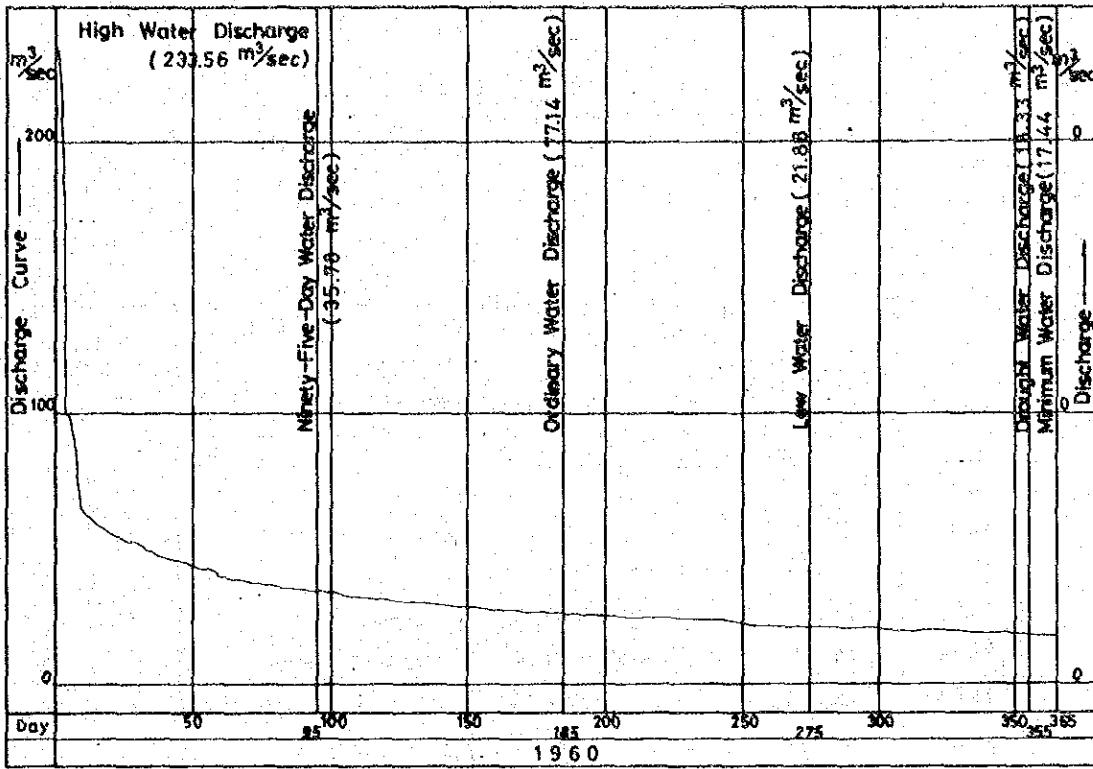
Diduyon Hydroelectric Project
 Upper Cagayan River
 Republic of the Philippines
 Japan International Cooperation Agency

Inflow to Diduyon Reservoir at
 Damsite

October 1980 Fig.2-5-23

Duration Curve at No.3 Damsite (1)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



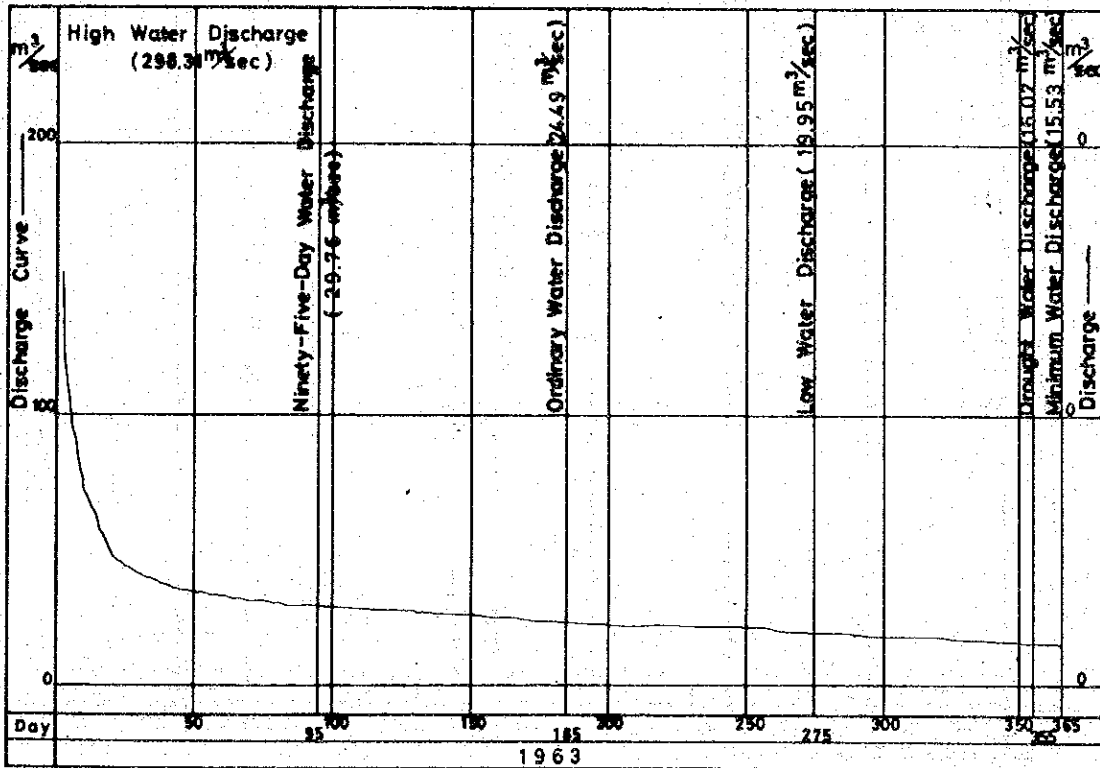
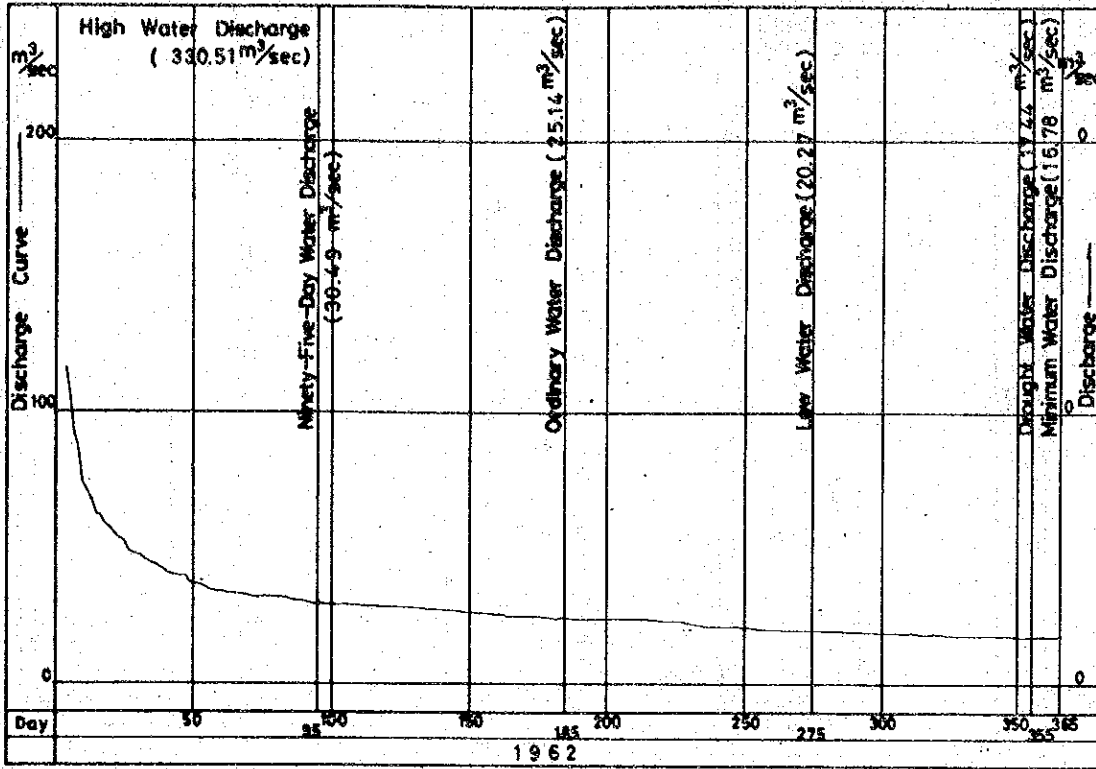
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 Republic of the Philippines
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Duration Curve at No.3 Damsite (1)

October 1980 Fig.2-5-24(1)

Duration Curve at No.3 Damsite (2)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



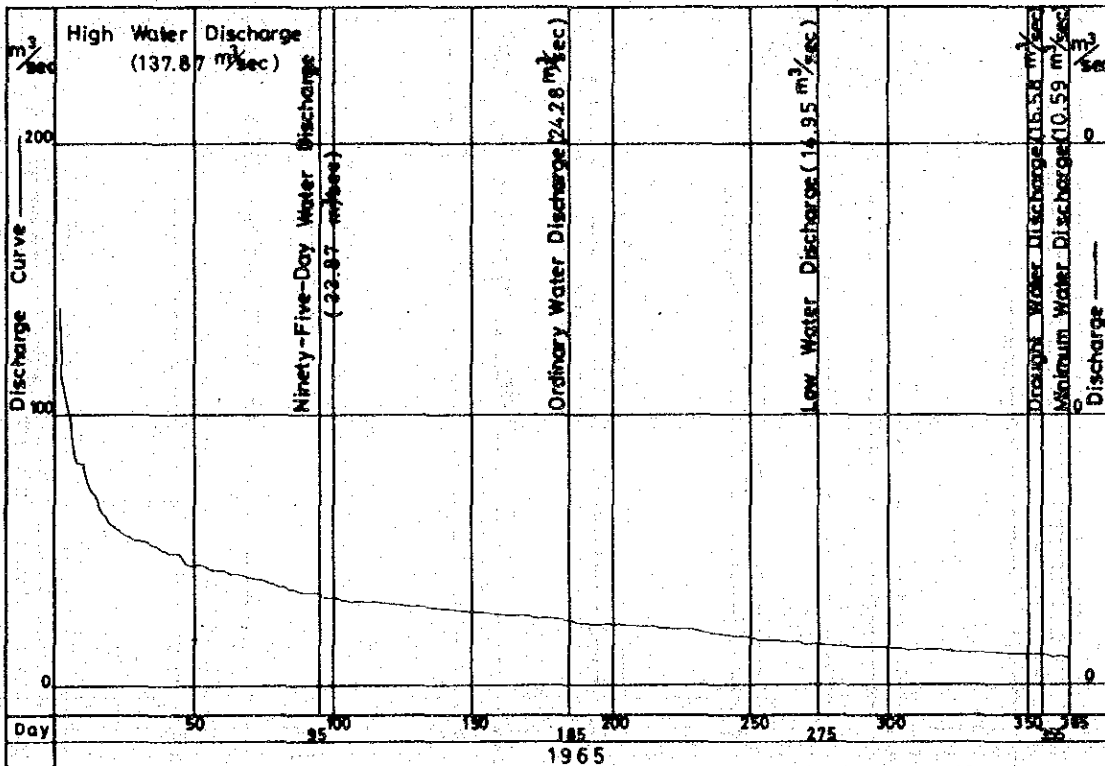
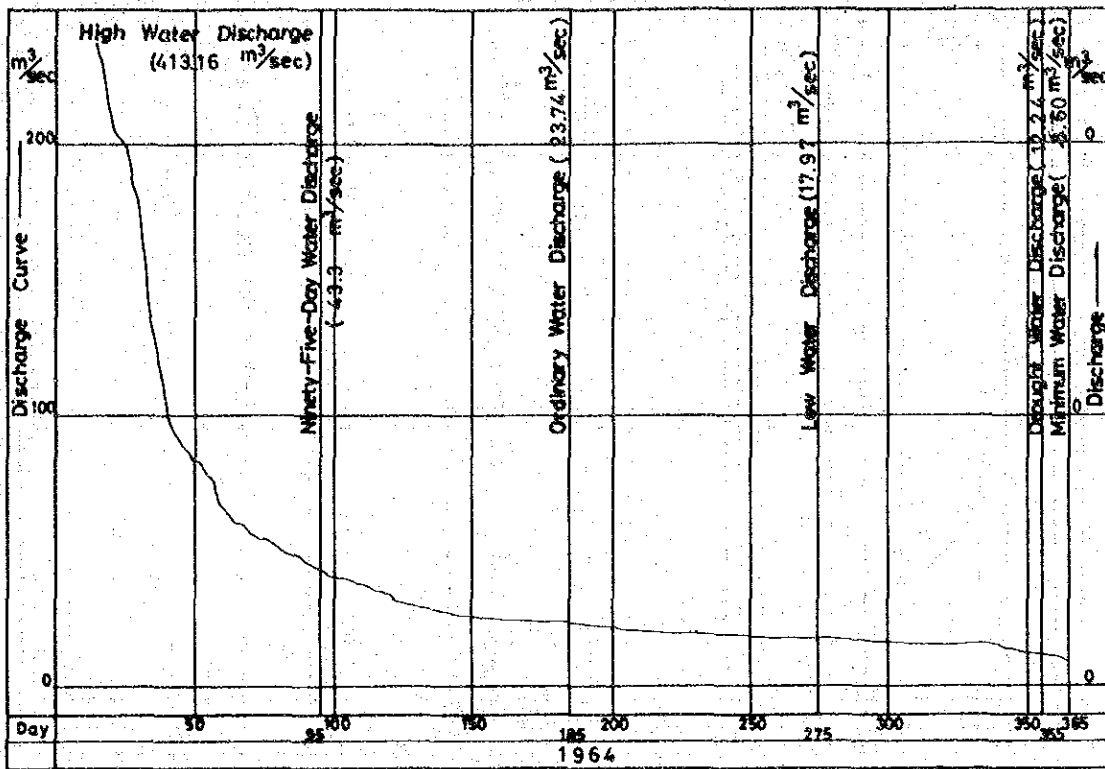
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Duration Curve at No.3 Damsite (2)

October 1980 Fig. 2-5-24(2)

Duration Curve at No.3 Damsite (3)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



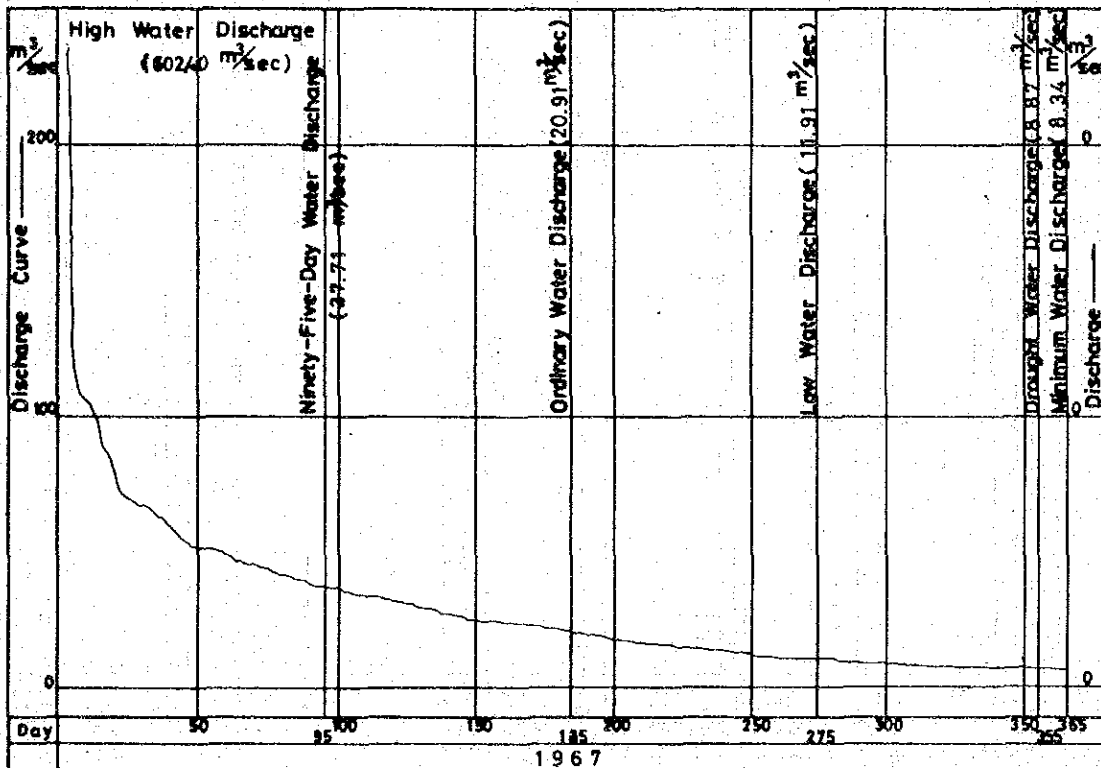
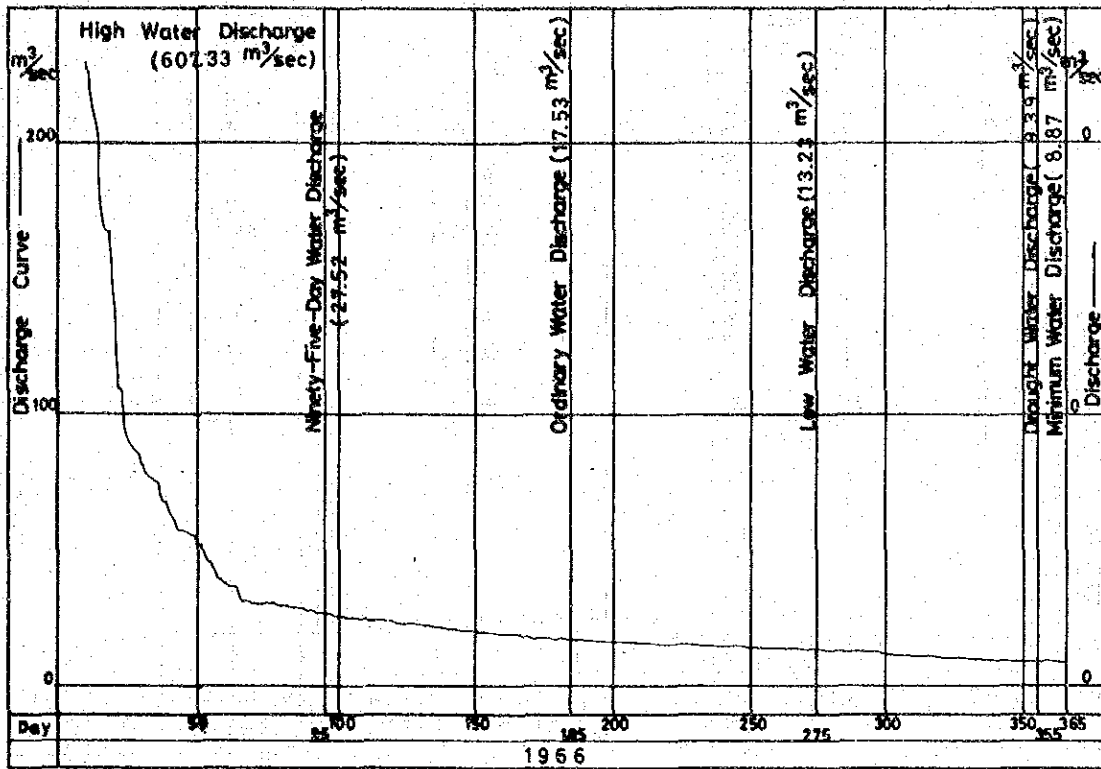
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Duration Curve at No.3 Damsite (3)

October 1980 Fig. 2-5-24(3)

Duration Curve at No.3 Damsite (4)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



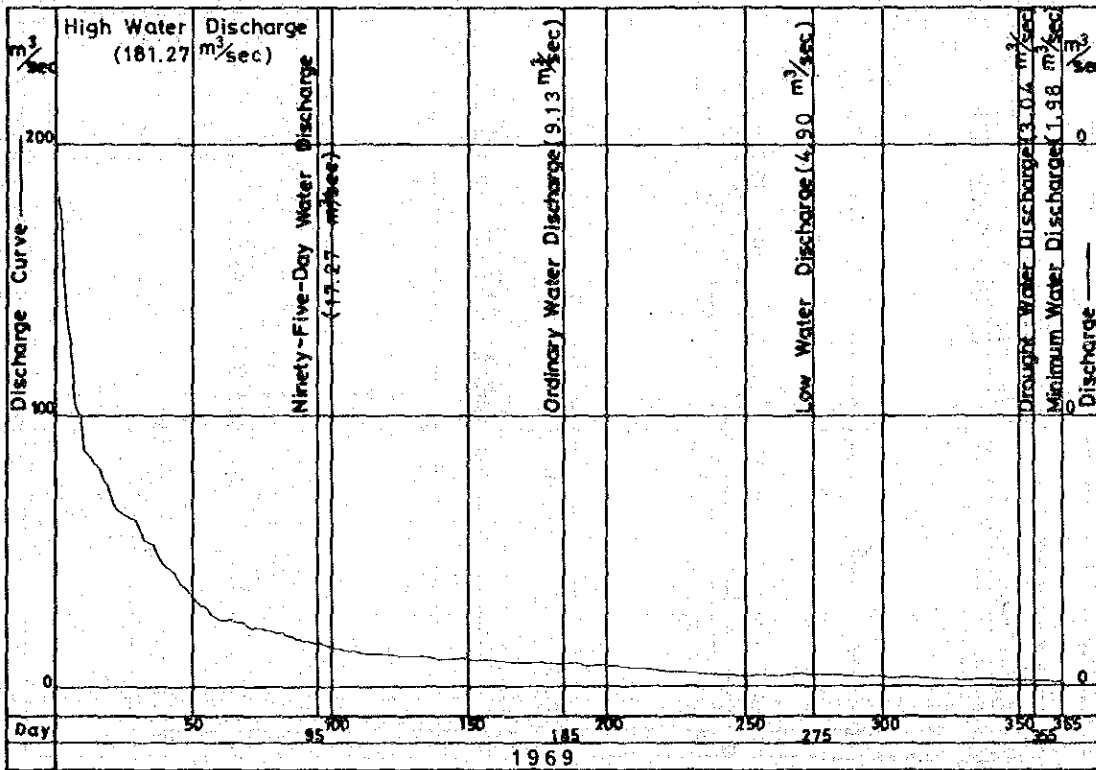
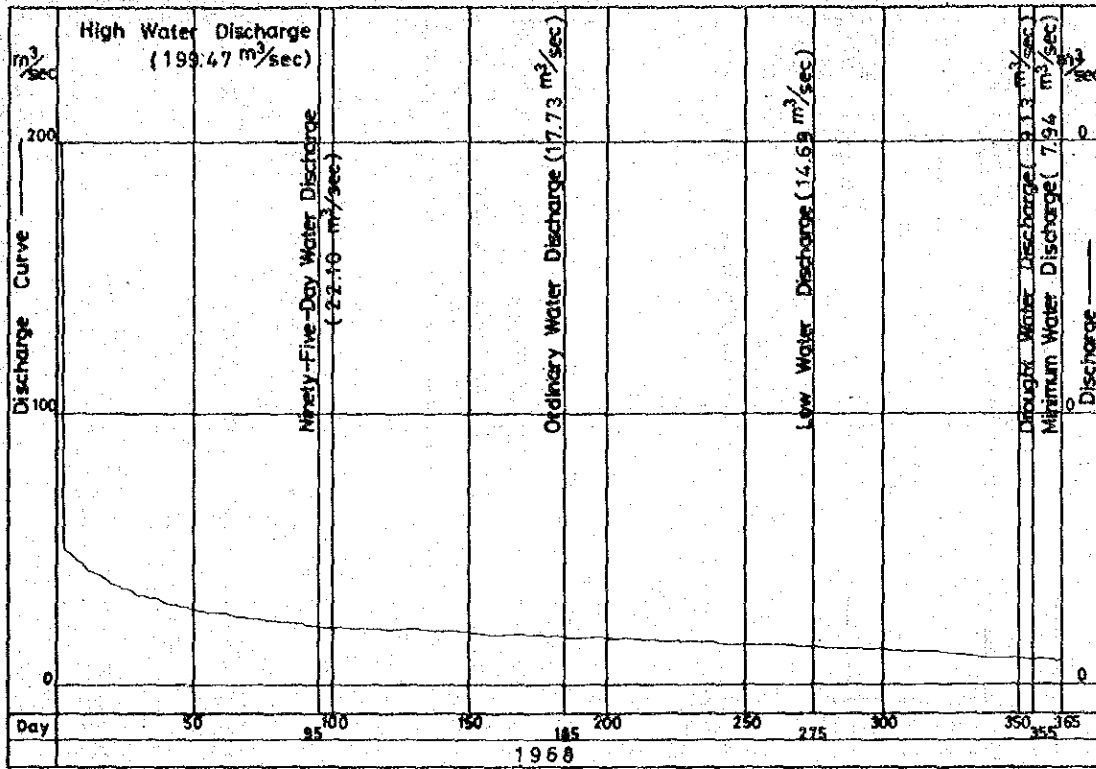
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Duration Curve at No.3 Damsite (4)

October 1980 Fig.2-5-24(4)

Duration Curve at No.3 Damsite (5)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



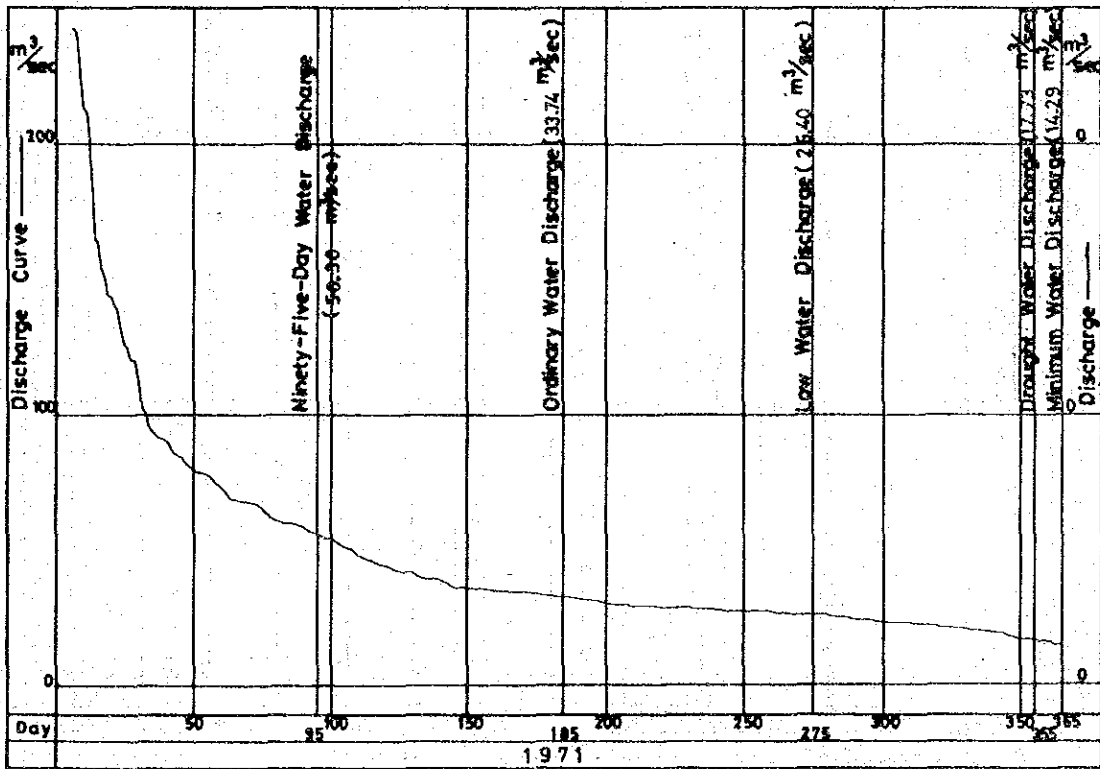
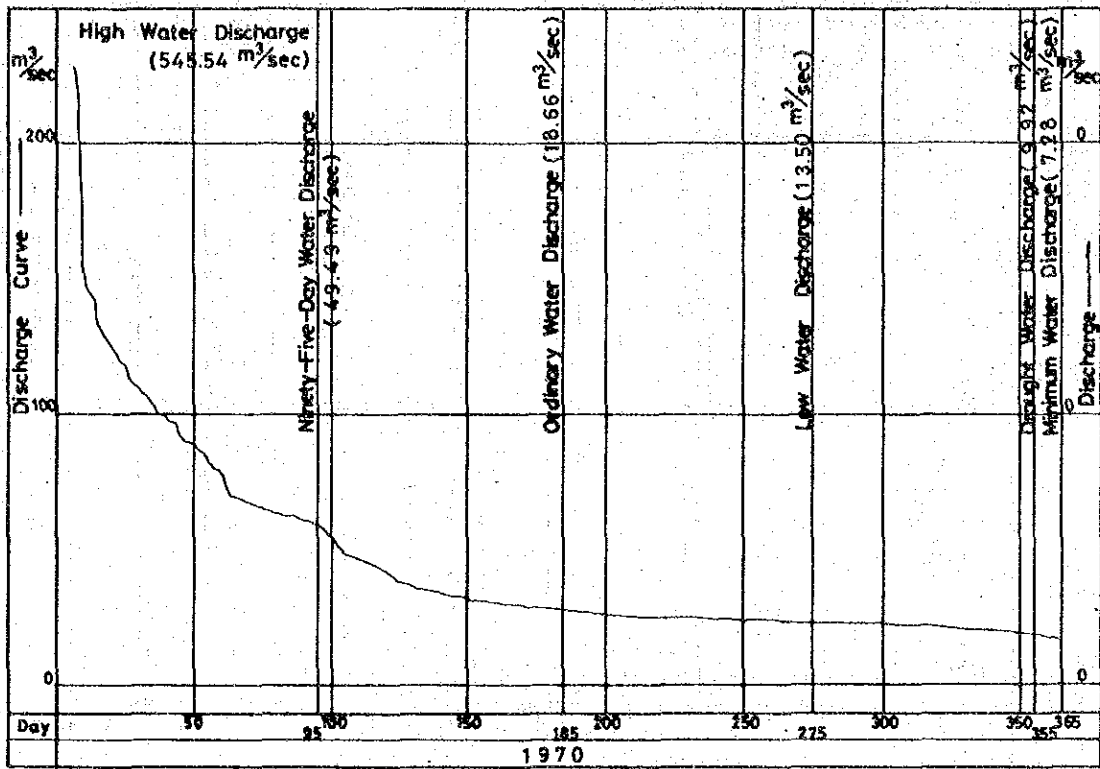
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Duration Curve at No.3 Damsite (5)

October 1980 Fig. 2-5-24(5)

Duration Curve at No.3 Damsite (6)

Station Name : No.3 Damsite
 Catchment Area : 477 km²



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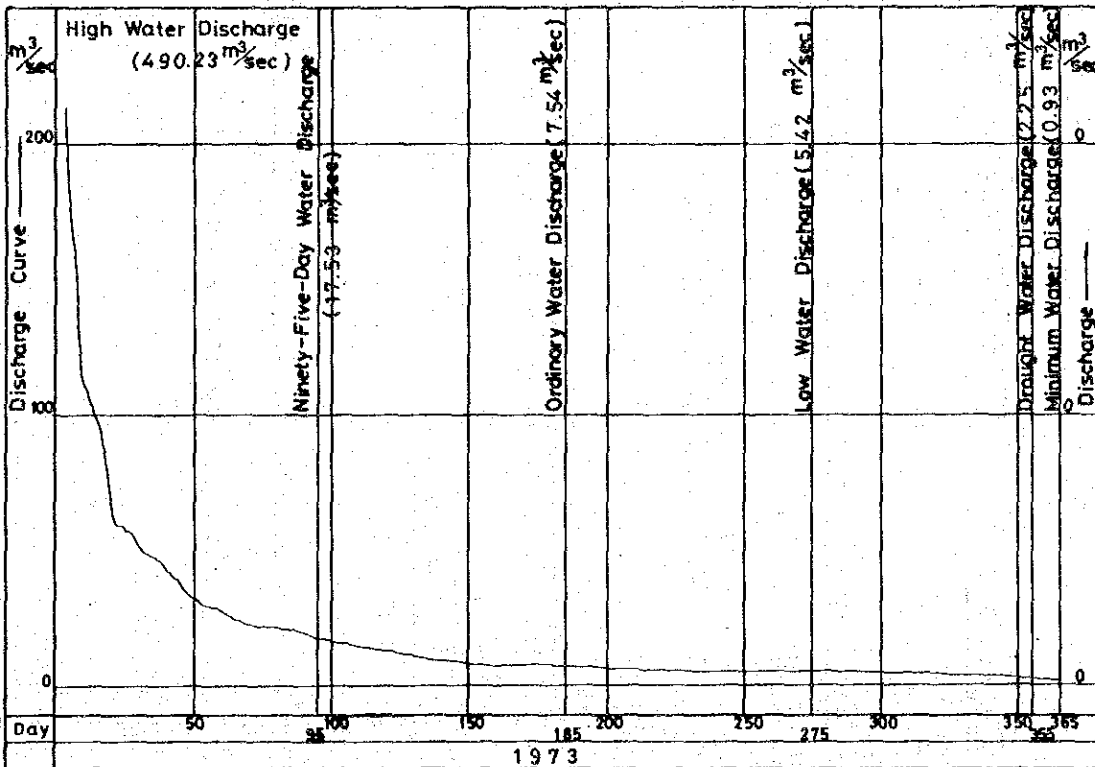
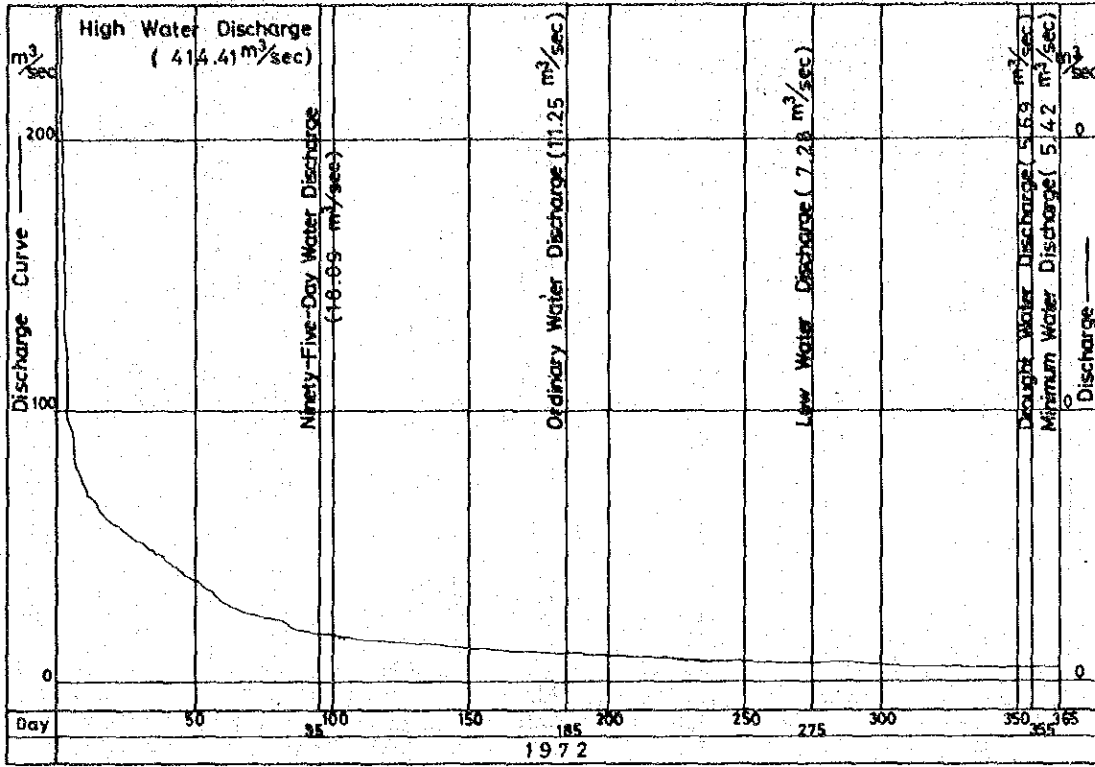
Japan International Cooperation Agency

Duration Curve at No.3 Damsite (6)

October 1980 Fig. 2-5-24(6)

Duration Curve at No.3 Damsite (7)

Station Name : No.3 Damsite
 Catchment Area 477 km²



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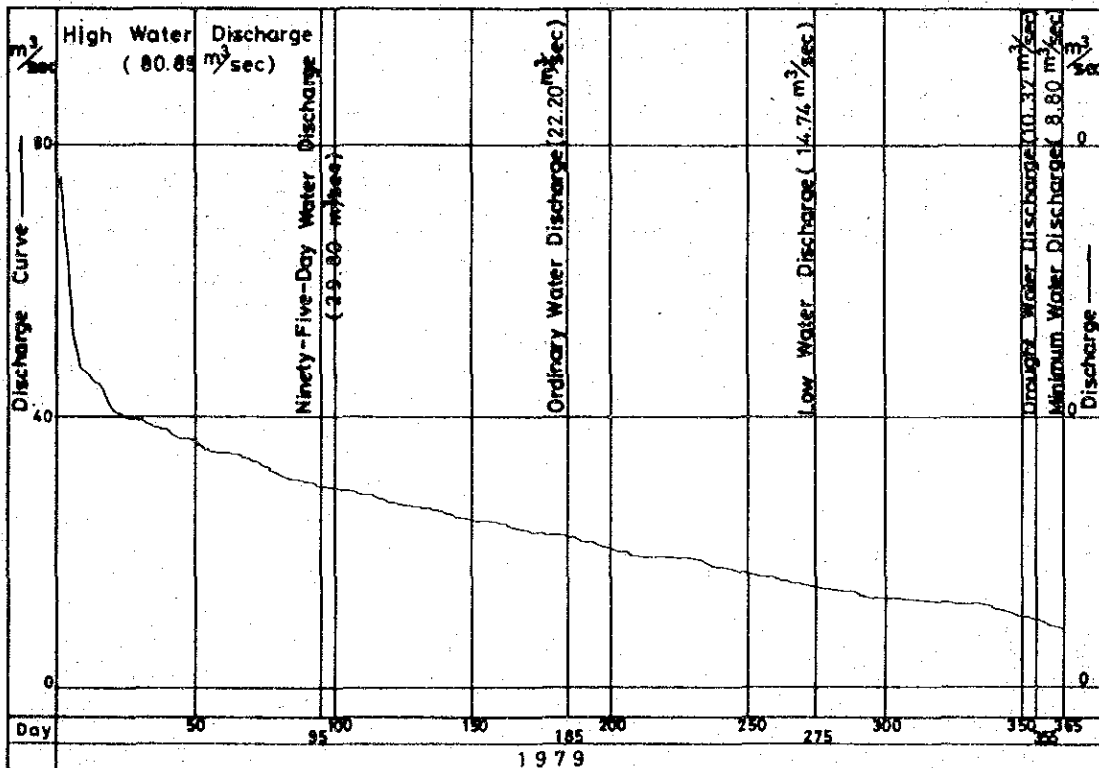
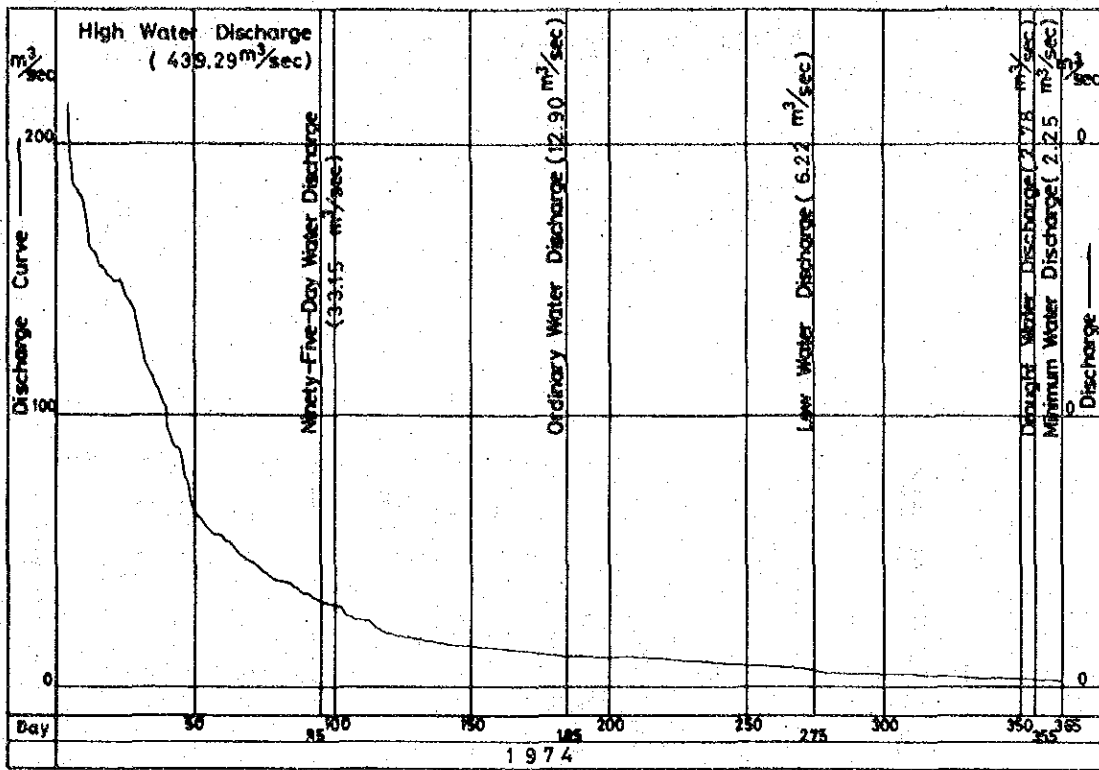
Duration Curve at No.3 Damsite (7)

October 1980 Fig.2-5-24(7)

Duration Curve at No.3 Damsite (8)

Station Name : No.3 Damsite

Catchment Area : 477 km²



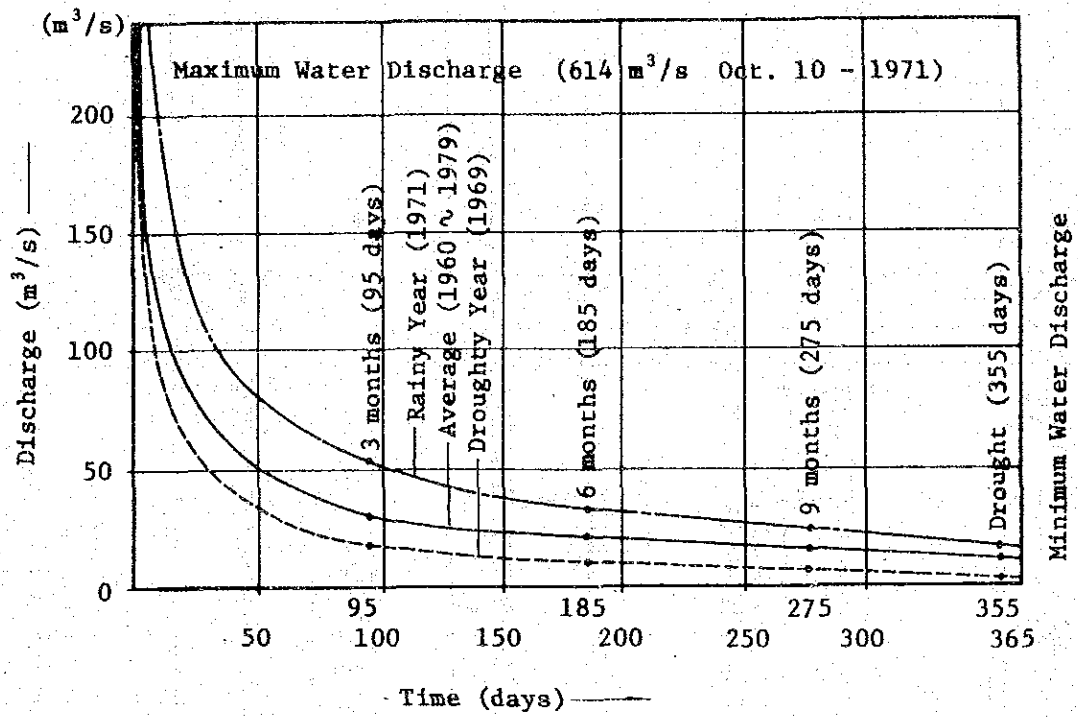
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Duration Curve at No.3 Damsite (8)

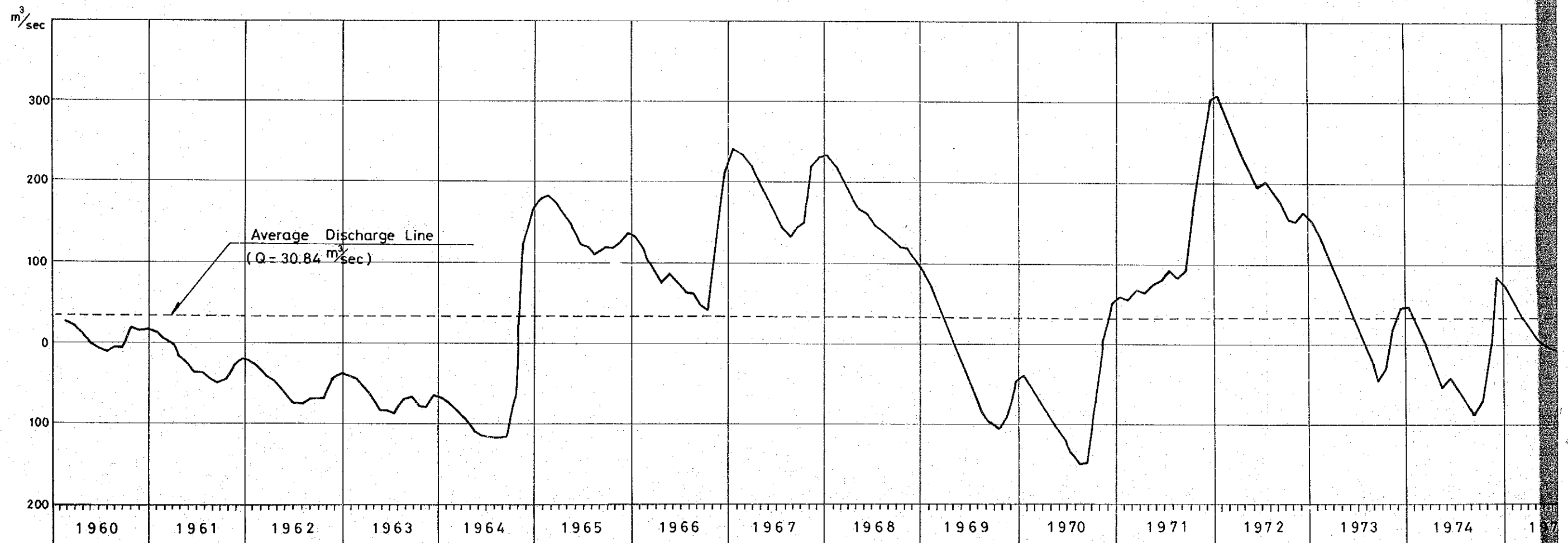
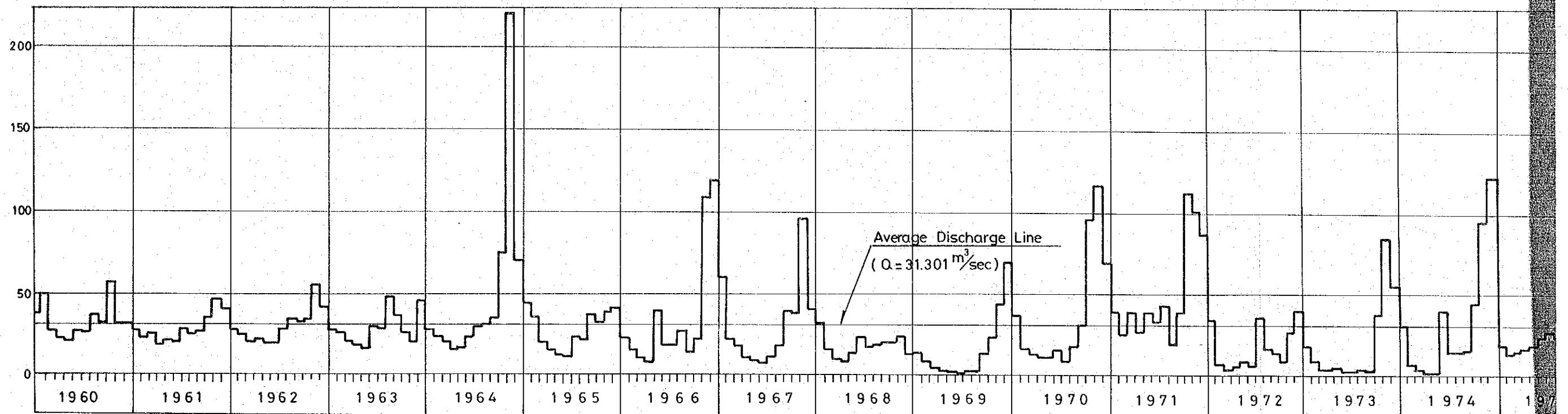
October 1980 Fig.2-5-24(8)

Discharge Duration Curve at No.3 Damsite

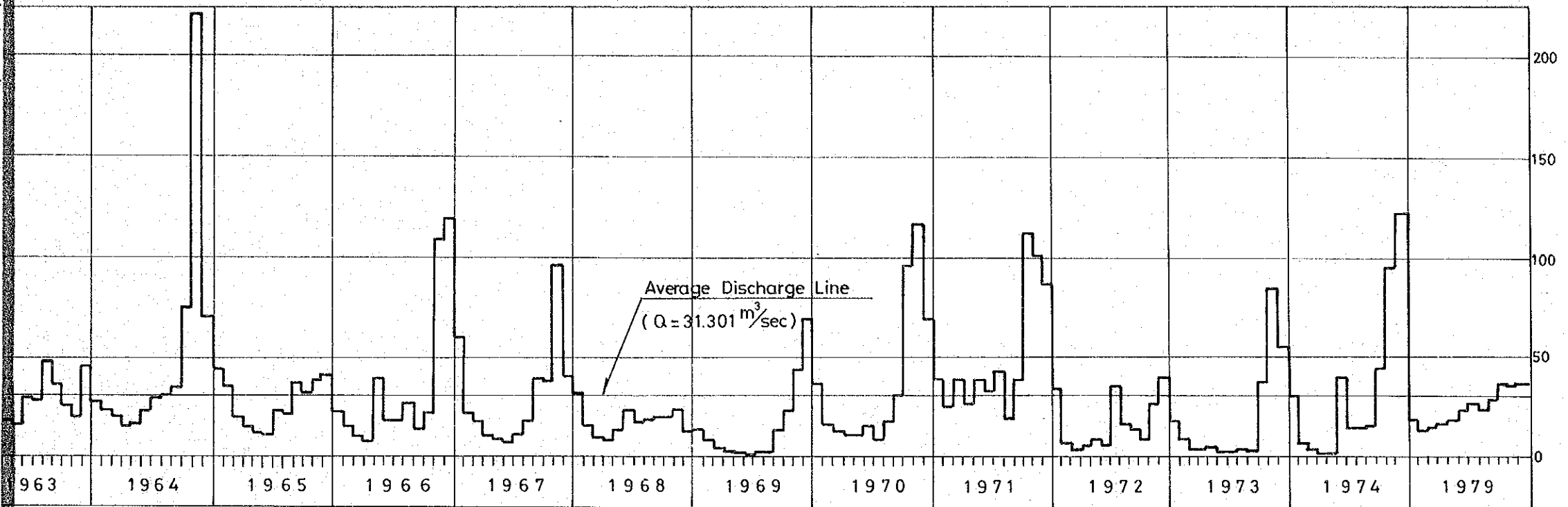


Diduyon Hydroelectric Project Upper Cagayan River Republic of the Philippines	
Japan International Cooperation Agency	
Discharge Duration Curve at No.3 Damsite	
October	1980 Fig.2-5-25

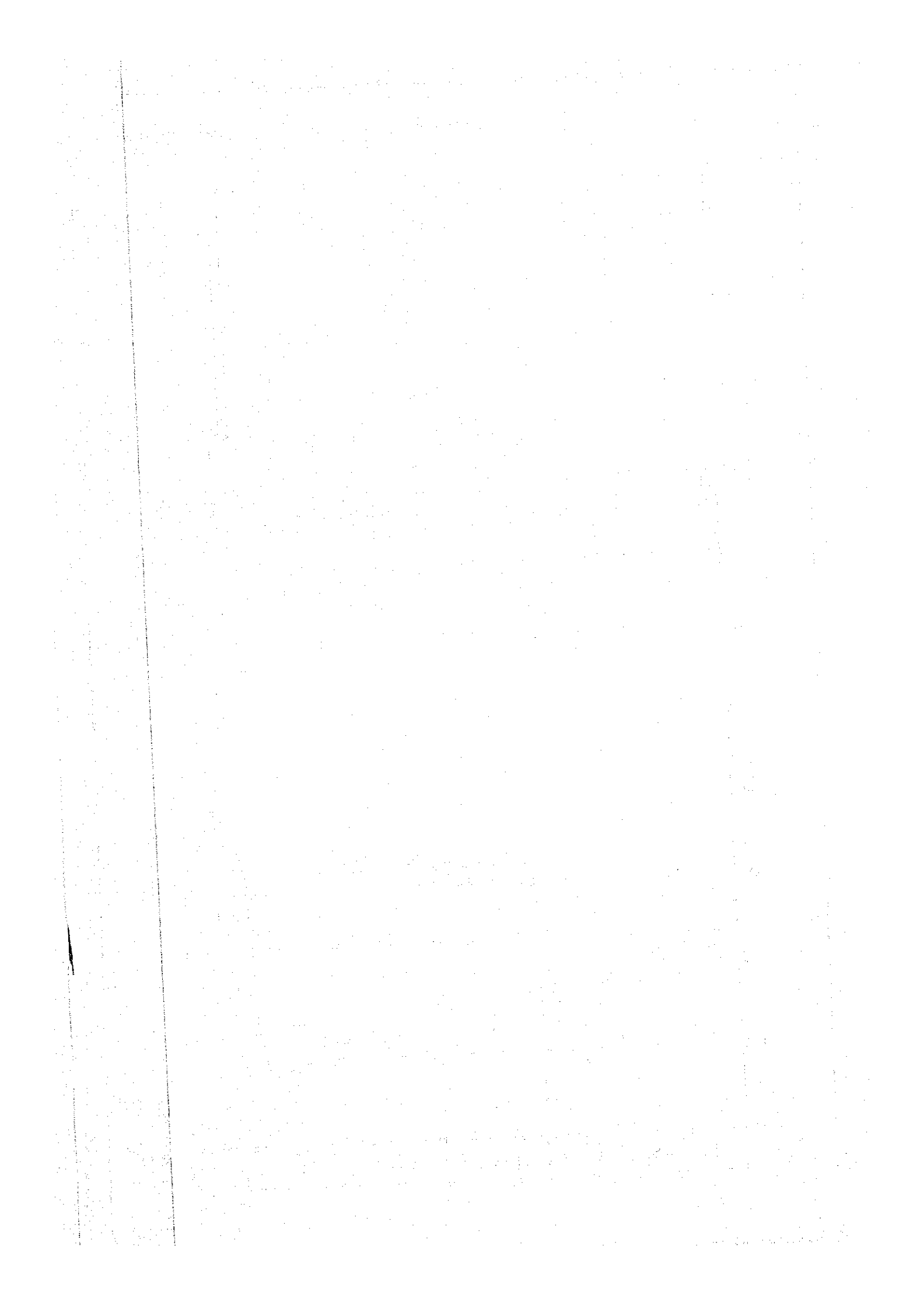
Monthly Discharge and Mass Curves at No.3 Damsite



Monthly Discharge and Mass Curves at No. 3 Damsite



Diduyon Hydroelectric Project	
Upper Cagayan River	
Republic of the Philippines	
Japan International Cooperation Agency	
Monthly Discharge and Mass Curves	
at No. 3 Damsite	
October	1980 Fig. 2-5-26



2-5-6 堆砂量

(1) 概要

計画における堆砂の多寡は、水力発電所が耐用年数期間を通じて計画どおりの機能を発揮・運用可能か否かを定める重要なファクターとなる。堆砂量の推定には、一般に計画地点における河床構成材料調査、浮流砂および掃流砂量の実測が必要であり、これにもとづいて堆砂レーティング・カーブを作成して年間流送土砂量を推定する。

本調査期間中に当計画地点で初めて流砂量の実測を行った。実測位置を図2-5-27に示す。

解析は

- (i) 実測分析結果を各種公式で水理学的に計算する方法
 - (ii) カガヤン川流域の近傍のアグノ川、パンパンガ川流域で得られた値を参照して経験的に推定を行う方法
- の2法によることとした。

(2) 堆砂量の検討

1) 実測値による堆砂量

流砂量推定のため、ディドヨン川に沿って河床砂礫の粒度分布を調査した分布結果を図2-5-28に示す。実測値は表2-5-17のとおりである。河床砂礫の粒径を用いて、従来種々の人によって提案された式から計算をした結果を図2-5-29に示す。

流砂量をLane-Kalinskeの公式で計算する。河川流量の変化は、ディドヨン川に3ダムサイトにおけるパラレル法流況表(表2-5-18)によって計算する。

流砂量 Q_s (m^3/s)と流量 Q (m^3/s)との関連は $Q_s = \alpha Q^\beta$ で表わされ、Lane-Kalinske公式により $\alpha = 1.003 \times 10^{-5}$ 、 $\beta = 1.5993$ が得られる。この式を適用すれば1年間の堆砂量は $V_1 = 0.11 \times 10^6 m^3$ となり、100年では $V_{100} = 11 \times 10^6 m^3$ となる。流域面積は $477 km^2$ に対し $1 km^2$ 当りの毎年比流砂量は $231 m^3/km^2/year$ (年間 $0.23 mm$ のerosion rate)となる。

2) カガヤン川流域の近傍における堆定法

表2-5-19は、上記2河川流域19カ地点での観測直から求めた年平均流砂量(m^3)と年平均流量(m^3/s)を示す。年平均流砂量 Q_s (m^3/s)と年平均流量 Q (m^3/s)との関連を $Q_s = \alpha Q^\beta$ で表わす。上記実測値から流砂量のほぼ上限値を結んだ値として図2-5-30に示す $\alpha = 2.0 \times 10^{-5}$ 、 $\beta = 1.8$ が得られる。この式を適用して堆砂量を求めると、

年平均流量 $Q = 30.84 \text{ m}^3/\text{s}$ (No.3ダムサイト、流域面積 477 km^2)に対する年流砂量 V_1 は、

$$\begin{aligned} V_1 &= 2 \times 10^{-5} \times (30.84)^{1.8} \times 365 \times 24 \times 60 \times 60 = 302164 \text{ m}^3/\text{year} \\ &= 0.303 \times 10^6 \text{ m}^3/\text{year} \end{aligned}$$

よって100年堆砂量は、

$$V_{100} = 31 \times 10^6 \text{ m}^3 \text{ となる。}$$

また、No.3ダムサイトにおける平行法による流況表(表2-5-18)から $Q_s = \alpha Q^\beta$ を用いて検討すると、年堆砂量は $V_1 = 0.528 \times 10^6 \text{ m}^3$ であり、100年堆砂量は $V_{100} = 53 \times 10^6 \text{ m}^3$ となる。

以上の結果から、安全側の数値 $V_{100} = 53 \times 10^6 \text{ m}^3$ を計画堆砂量として用いることにした。この値を流域面積 477 km^2 (No.3ダムサイト)に割りつけると $1.107 \text{ m}^3/\text{km}^2/\text{year}$ (年間 1.1 mm の erosion rate)となる。

3) 結果

上記の結果からNo.3ダムサイトに対して100年堆砂量を $V_{100} = 53 \times 10^6 \text{ m}^3$ とすると、計画堆砂高は、図2-5-31の貯水池水位容量曲線から $\text{EL}60.8 \text{ m}$ となる。計画LWLと堆砂面間の余裕は 12 m となる。

次に、No.2ダムサイトの100年堆砂量は、同様の方法によって $V_{100} = 50 \times 10^6 \text{ m}^3$ となり、この数値に対する計画堆砂高は $\text{EL}61.35 \text{ m}$ となる(図2-5-31)。

上記の堆砂は、全体的な貯水池内堆砂量推定法から求められたものである。実際の貯水池内堆砂は、堆砂現象が実際に進行した場合、全部がダムの死水領域にはならず、一部はダムの湛水池終端付近に堆積する事象が一般に観察されている。したがって、ダム建設後も貯水池の堆砂状態を十分に把握する必要がある。

Table 2-5-17 Observed Sediment Loads

Test Pit No. Depth, meters Location	TP - 3 0 - 0.80 Bivoy River			T - 5 0 - 0.80 Siguem River		
	Continuous Grading	Minus No.4 Sieve	Plus No.4 Sieve	Continuous Grading	Minus No.4 Sieve	Plus No.4 Sieve
1) Gradation Analysis						
Sieve Size						
6 inches	-			-		
4 "	100.0		100.0	100.0		100.0
2 "	91.8		86.3	74.4		65.9
1 1/2 "	84.1		73.6	64.4		52.7
1 inch	72.6		54.4	52.4		36.8
3/4 "	64.8		41.4	46.0		28.2
1/2 "	55.4		25.8	37.9		17.5
3/8 "	49.8		16.5	29.6		12.0
No. 4	39.9	100.0		24.7	100.0	
No. 8	31.2	78.1		17.3	69.9	
No. 16	22.1	55.3		10.1	41.0	
No. 50	13.9	34.8		5.7	23.1	
No. 300	5.6	14.1		2.7	11.1	
No. 100	2.1	5.2		1.3	5.3	
No. 200	0.5	1.4		0.7	2.8	
F. M.	-	3.13			3.50	
Percent Passing						
2) Composition, %						
Gravel	60.1%			75.3%		
Sand	39.9%			24.7%		
3) Unit Weight, pof						
a) Dry Loose		95.25	108.0		93.75	111.94
b) Dry Rodded		102.75	111.0		101.25	117.94
4) Specific Gravity Tests						
Sat. Sur. Dry cond.		2.59	2.68		2.59	2.70
		2.28	1.17		5.29	1.93
5) Absorption, %						
6) Abrasion Test						
% Wear			25.02			23.60
7) Void %						
a) Based on dry loose		38.93	32.31		39.90	33.99
b) Based on dry rodded		34.04	28.68		35.17	33.07

Table 2-5-18 DURATION CURVE (PARALLEL METHOD)

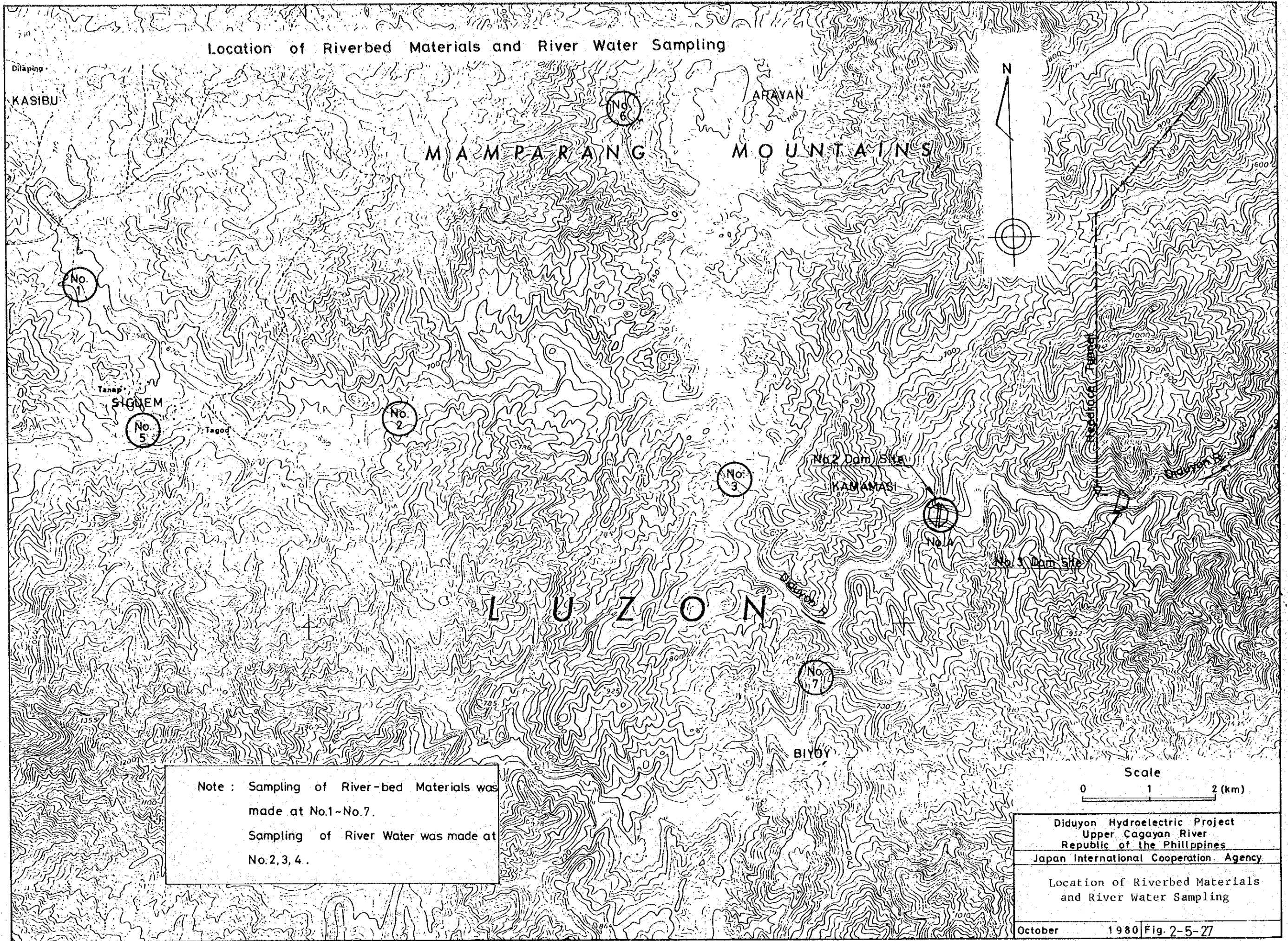
(Dam site No. 3)

1	365.76	62	41.07	123	25.95	184	20.10	245	16.33	306	13.22
2	249.69	63	40.78	124	25.67	185	20.05	246	16.27	307	13.14
3	200.67	64	40.34	125	25.50	186	20.05	247	16.20	308	13.06
4	176.63	65	39.76	126	25.42	187	19.96	248	16.16	309	13.03
5	160.32	66	39.55	127	25.37	188	19.89	249	16.05	310	13.02
6	142.56	67	39.30	128	25.22	189	19.81	250	16.00	311	12.98
7	136.84	68	38.95	129	25.05	190	19.72	251	15.97	312	12.91
8	126.06	69	38.56	130	24.94	191	19.61	252	15.84	313	12.87
9	120.83	70	38.25	131	24.80	192	19.56	253	15.79	314	12.82
10	116.04	71	38.00	132	24.65	193	19.56	254	15.73	315	12.82
11	113.22	72	37.73	133	24.53	194	19.52	255	15.68	316	12.80
12	109.58	73	37.44	134	24.37	195	19.41	256	15.67	317	12.77
13	104.99	74	37.08	135	24.21	196	19.39	257	15.62	318	12.75
14	102.59	75	36.84	136	24.10	197	19.29	258	15.61	319	12.72
15	99.00	76	36.63	137	24.04	198	19.22	259	15.51	320	12.67
16	95.69	77	36.33	138	24.00	199	19.11	260	15.42	321	12.59
17	93.35	78	36.06	139	23.85	200	19.06	261	15.35	322	12.56
18	91.67	79	35.75	140	23.54	201	19.01	262	15.30	323	12.50
19	89.24	80	35.44	141	23.45	202	18.90	263	15.27	324	12.40
20	86.39	81	35.34	142	23.34	203	18.84	264	15.22	325	12.35
21	83.28	82	34.94	143	23.18	204	18.80	265	15.15	326	12.34
22	81.51	83	34.63	144	23.11	205	18.70	266	15.09	327	12.28
23	80.66	84	34.39	145	23.06	206	18.63	267	15.02	328	12.24
24	78.64	85	34.24	146	22.85	207	18.56	268	14.99	329	12.23
25	77.35	86	34.07	147	22.72	208	18.48	269	14.93	330	12.20
26	75.99	87	33.83	148	22.72	209	18.44	270	14.92	331	12.13
27	74.71	88	33.41	149	22.62	210	18.34	271	14.84	332	12.08
28	74.13	89	33.17	150	22.53	211	18.32	272	14.75	333	12.07
29	72.09	90	32.92	151	22.52	212	18.23	273	14.71	334	12.02
30	70.66	91	32.72	152	22.34	213	18.20	274	14.66	335	12.00
31	68.79	92	32.50	153	22.31	214	18.17	275	14.58	336	11.97
32	67.19	93	32.33	154	22.21	215	18.12	276	14.55	337	11.88
33	65.21	94	32.18	155	22.19	216	17.95	277	14.53	338	11.81
34	63.61	95	32.00	156	21.94	217	17.91	278	14.52	339	11.74
35	62.84	96	31.79	157	21.84	218	17.89	279	14.42	340	11.70
36	61.94	97	31.47	158	21.82	219	17.82	280	14.37	341	11.62
37	61.13	98	31.16	159	21.78	220	17.73	281	14.33	342	11.56
38	59.44	99	30.93	160	21.73	221	17.70	282	14.28	343	11.50
39	58.39	100	30.78	161	21.62	222	17.60	283	14.22	344	11.43
40	57.02	101	30.52	162	21.60	223	17.54	284	14.17	345	11.35
41	55.89	102	30.08	163	21.56	224	17.53	285	14.14	346	11.28
42	55.21	103	29.73	164	21.48	225	17.47	286	14.11	347	11.24
43	54.09	104	29.43	165	21.43	226	17.44	287	14.05	348	11.13
44	53.38	105	29.27	166	21.36	227	17.39	288	13.98	349	11.07
45	52.54	106	29.11	167	21.27	228	17.36	289	13.94	350	11.01
46	51.39	107	29.00	168	21.19	229	17.31	290	13.90	351	10.99
47	50.61	108	28.70	169	21.18	230	17.17	291	13.86	352	10.87
48	49.85	109	28.63	170	21.09	231	17.12	292	13.80	353	10.81
49	49.17	110	28.47	171	21.01	232	16.99	293	13.75	354	10.76
50	48.45	111	28.23	172	20.94	233	16.96	294	13.68	355	10.68
51	47.89	112	27.98	173	20.91	234	16.94	295	13.67	356	10.65
52	47.52	113	27.71	174	20.82	235	16.87	296	13.66	357	10.49
53	47.08	114	27.48	175	20.75	236	16.83	297	13.58	358	10.46
54	46.29	115	27.45	176	20.70	237	16.74	298	13.57	359	10.35
55	45.84	116	27.29	177	20.60	238	16.69	299	13.56	360	10.28
56	45.24	117	27.16	178	20.53	239	16.65	300	13.48	361	10.18
57	44.37	118	26.91	179	20.46	240	16.60	301	13.45	362	10.08
58	43.48	119	26.71	180	20.41	241	16.55	302	13.33	363	9.99
59	43.04	120	26.54	181	20.33	242	16.44	303	13.31	364	9.76
60	42.61	121	26.29	182	20.22	243	16.37	304	13.24	365	9.51
61	41.94	122	26.21	183	20.16	244	16.35	305	13.24		

Table 2-5-19 Observed Values of Sediment Load

	Years Recorded	Drainage Area (km ²)	Annual Average Discharge (m ³ /sec.)	Average Annual Sediment Yield (10 ³ m ³)
1. Agno River, Adoay	1960 ~ 63	246	21.9	39
2. Ambuklao	1950 ~ 52	686	45.2	1,524
3. Agno River, San Manuel	59 ~ 63	1,225	30.0	2,963
4. Ambayoan, Pangasinan	60 ~ 63	281	20.2	143
5. Agno River, Rosales, Pangasinan	"	2,209	133.4	9,100
6. Agno River, Bayombong, Pangasinan	60 ~ 62	2,284	110.3	3,448
7. Bulsa River, Tarlac	61 ~ 62	405	24.0	107
8. Carranglan River, Nueva Ecija	60 ~ 62	258	9.9	28
9. Pantabangan, Nueva Ecija	61 ~ 63	253	15.3	93
10. Pampanga River, Nueva Ecija	60 ~ 62	828	48.2	591
11. Digmala River, Bongabon, Nueva Ecija	"	52	6.0	4
12. Coronel River, Bongabon, Nueva Ecija	60 ~ 63	705	48.0	467
13. Talavera River, San Jose, Nueva Ecija	"	261	12.7	52
14. Penaranda River, Nueva Ecija	53 ~ 61	512	19.6	32
15. Rio Chico, Sto. Rosario, Nueva Ecija	61	1,177	55.2	138
16. Madlum River, San Miguel, Bulacan	57 ~ 61	102	4.3	13
17. Pampanga, San Leonardo, Nueva Ecija	59 ~ 62	2,851	123.7	1,878
18. Pampanga River, Cabiao, Nueva Ecija	59 ~ 61	3,467	118.6	1,021
19. Angat River, Norzagaray	63	568	68.2	2,528

Location of Riverbed Materials and River Water Sampling



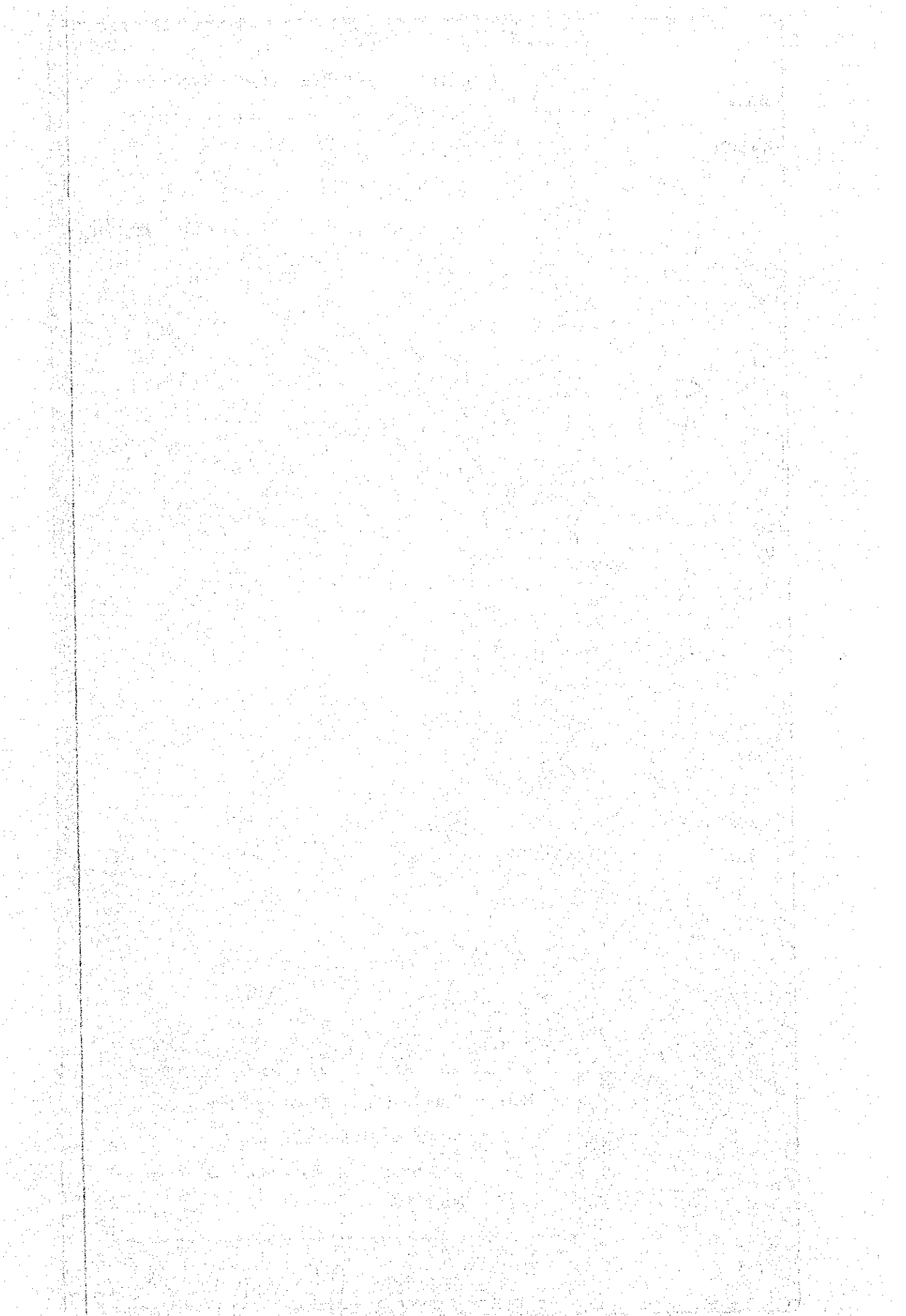
Note : Sampling of River-bed Materials was made at No.1~No.7.
 Sampling of River Water was made at No.2,3,4.

Scale
 0 1 2 (km)

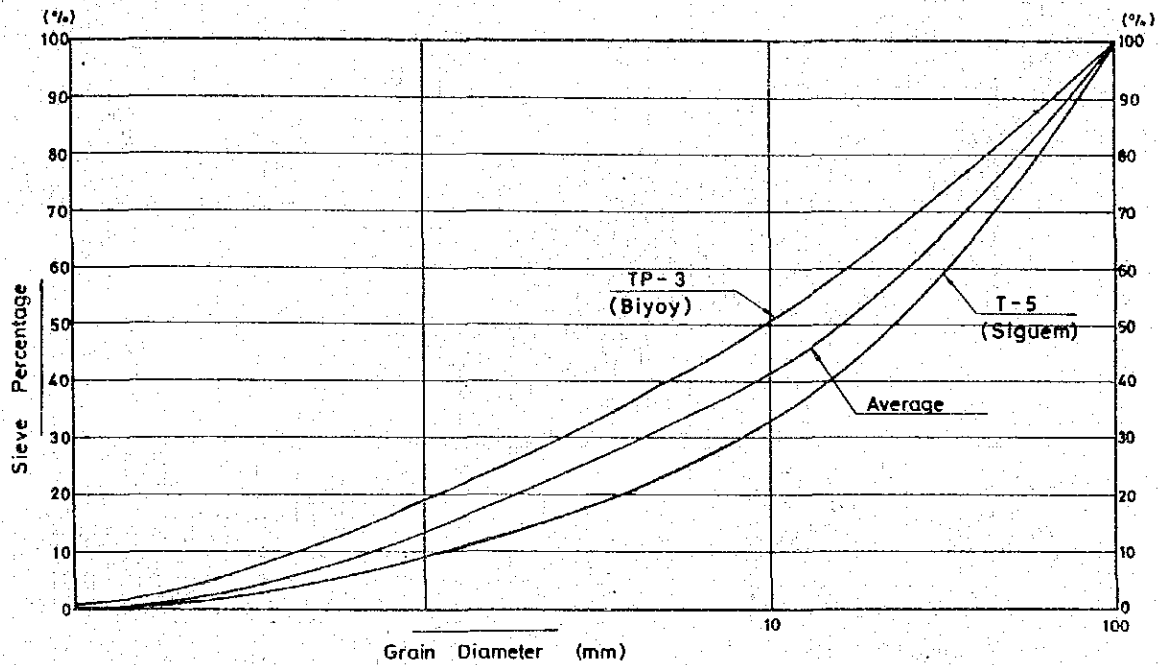
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 Upper Cagayan River
 Republic of the Philippines
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Location of Riverbed Materials
 and River Water Sampling

October 1980 Fig. 2-5-27

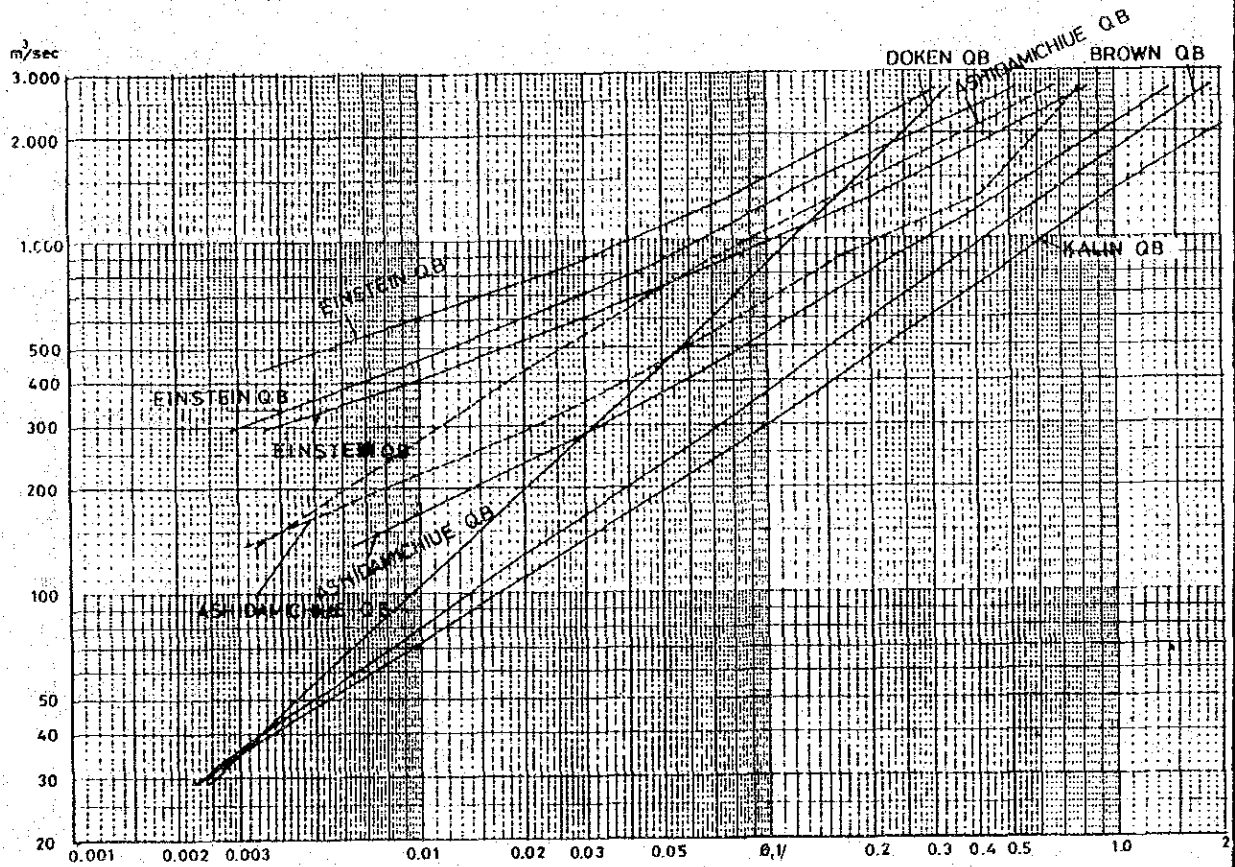


River Materials, Classified by Sieve Method



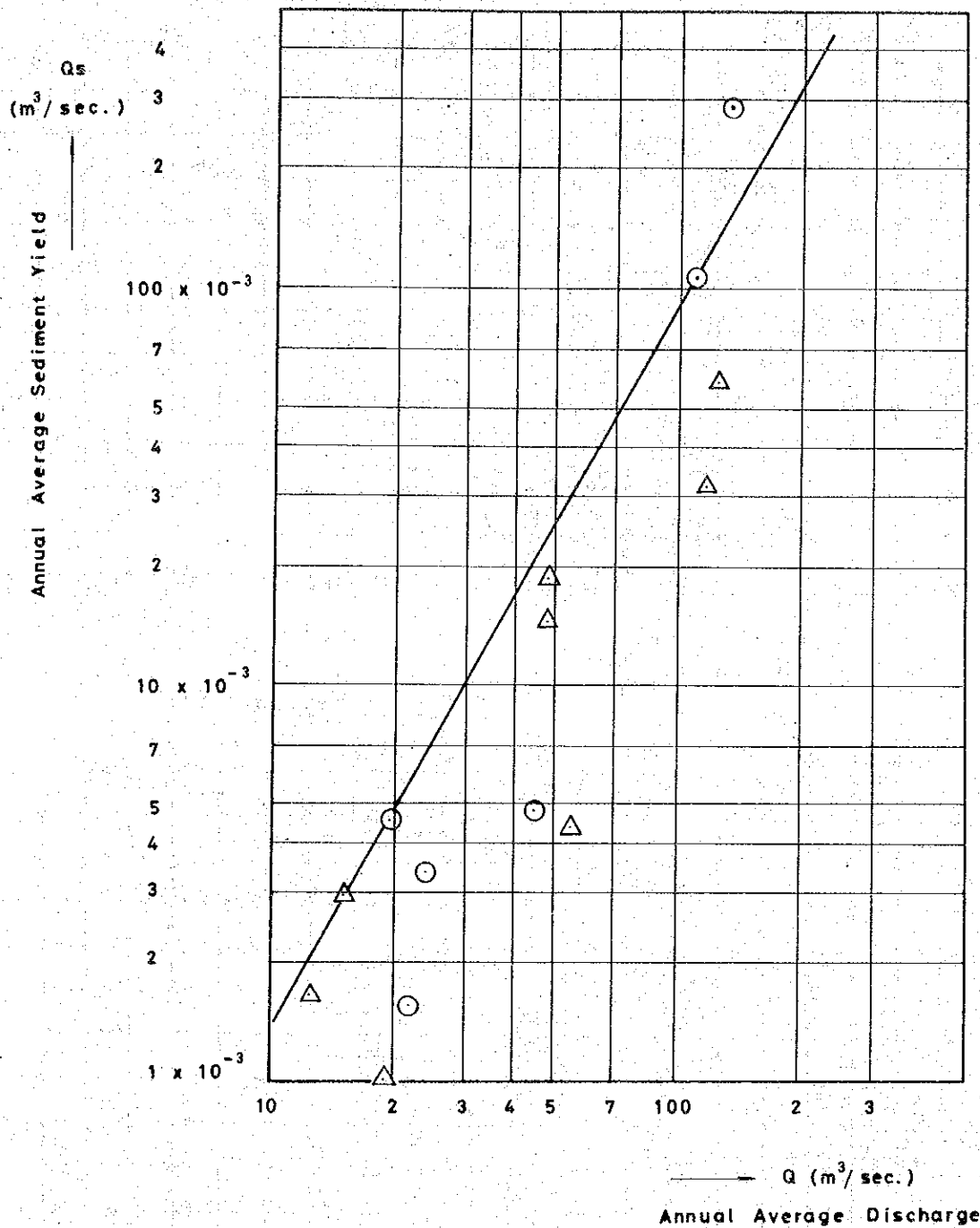
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River Materials, Classified by Sieve Method
October 1980 Fig. 2-5-28

Sediment Analysis from Riverbed Materials



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Sediment Analysis from Riverbed Materials	
October	1960 Fig. 2-5-29

Relation between Annual Sediment Yield
and Annual Average Discharge

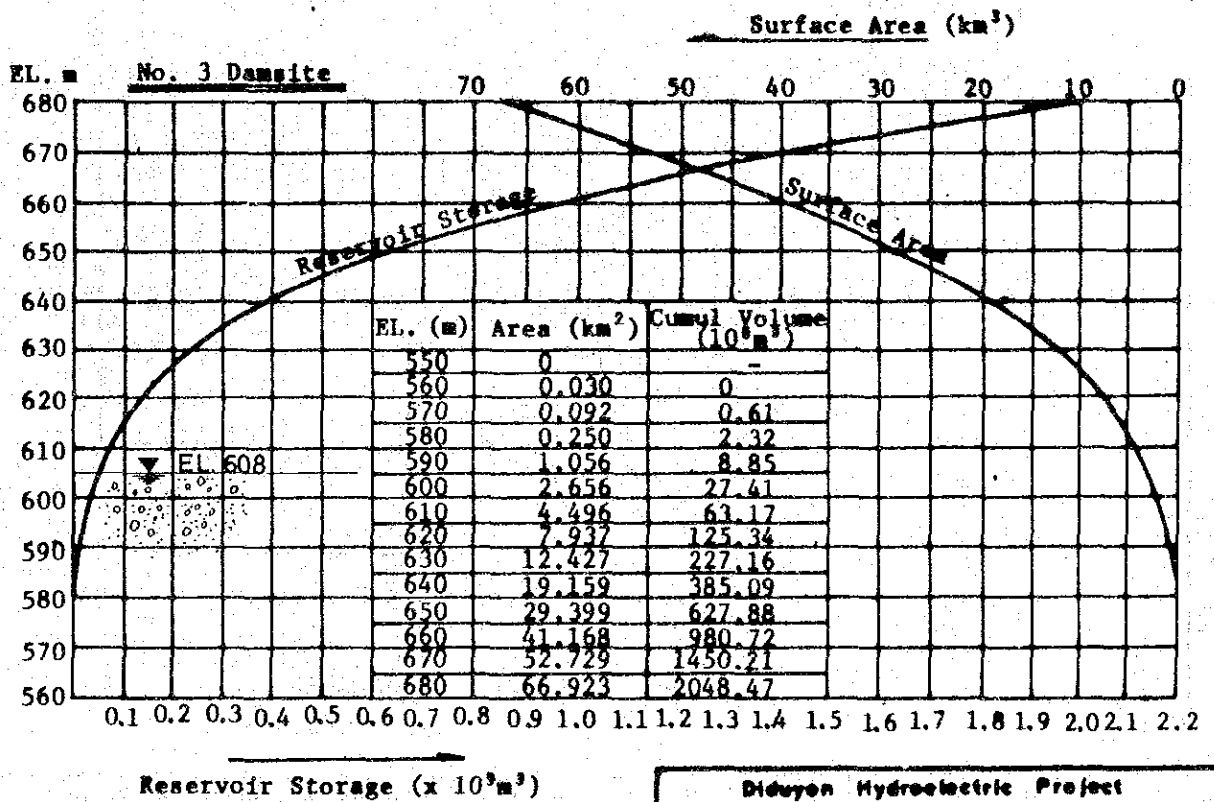
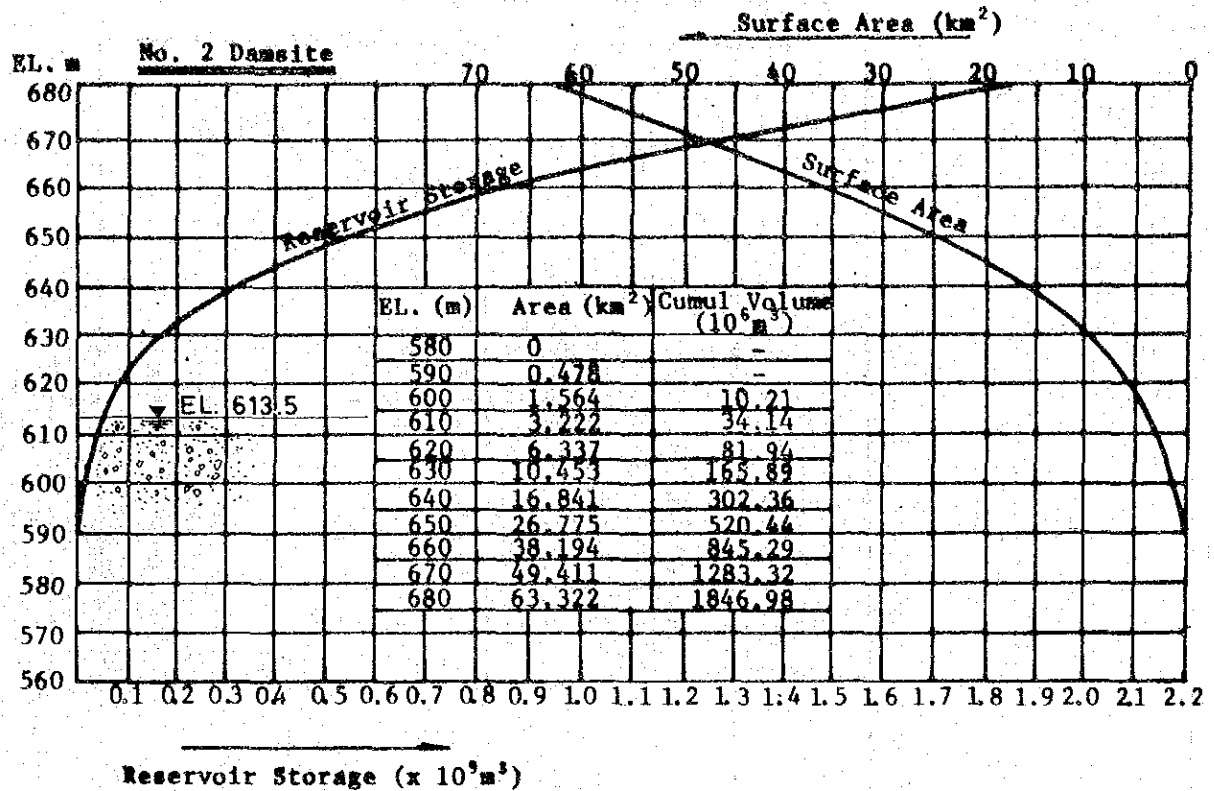


Source : Chico Report

June, 1973

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Relation between Annual Sediment Yield and Annual Average Discharge
October 1980 Fig. 2-5-30

Determined Sedimentation Level of Diduyon Reservoir



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Determined Sedimentation Level of Diduyon Reservoir
October 1980 Fig 2-5-31