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APPENDIX A SIMULATION OF INDIVIDUAL PROJECTS.

This appendix contains details on the simulation of the performance of the planned reservoirs and power plants in Río San Juan; including Arroyo San Pedro and Arroyo Limon; Río Mijo, Río Yaque del Sur, and Río del Medio (Río Grande). The general assumptions for the simulations are given in the main report, and in the working paper "Some initial hydrological analyses". The latter report also contains some sensitivity analyses.

The simulations are based upon 20 year series of daily runoff, more specific the period 1964 to 1983. Details on the construction of the runoff series are given in the main report.

A.1. Rio San Juan projects.

A.1.1. Hondo Valle.

A.1.1.1. Fixed reservoir capacity.

The operation of the Hondo Valle power plant is simulated by these parameters

Reservoir:

max operation level: 1084 m asl, 8.2 hm^3
min operation level: 1065 m asl, 2.4 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

75 m crest length at 1084 m asl, giving a capacity of
1085 m: 150 m^3/s
1086 m: 450 m^3/s

Power plant:

8 m^3/s capacity

88 % total efficiency

hydraulic loss: 10 m

tailwater: 900 m asl

maximum net production: 12 MW

Operation rule:

Oct 16 to May 14:

Run	24	hours	at	reservoir	above	1084
"	12	"	"	"	"	1082
"	10	"	"	"	"	1075
"	8	"	"	"	"	1070
"	6	"	"	"	"	1065 if possible

May 15 to Oct 14:

Run	24	hours	at	reservoir	above	1080
"	12	"	"	"	"	1075
"	10	"	"	"	"	1070
"	6	"	"	"	"	1065 if possible

The results of these simulations are:

Average annual production:	46.5 GWh
Median " "	47 GWh
Best year (1979)	65 "
Second poorest year (1967)	33 "
Poorest year (1977):	32 "

Days	with	6	hours	production	or	more:	91 %
"	"	8	"	"	"	"	70 %
"	"	10	"	"	"	"	49 %
"	"	12	"	"	"	"	35 %
"	"	24	"	"	"	"	15 %

Firm power production (6 hour running time):

Average annual production:	24.5 GWh
Median "	25.0 "
Third poorest year (1977)	22.5 "
Second poorest year (1973)	22.0 "
Poorest year (1968)	21.9 "

The delivery percentage of 6 hours or more can be increased to 98 % by omitting the 8 and 10 hour production levels.

A.1.1.2. Effects of varying the reservoir capacity.

The Hondo Valle system has been simulated for varying reservoir capacities and matching plant installations for 95 % delivery safety on a six hours daily running time scheme. The operation rule is designed to give maximum delivery time of 6 hour production, only increasing to 12 and 24 hour running time to reduce spilling and flood risk in wet season. 95 % delivery safety corresponds to on the average 18 days annually with empty reservoir and less than 6 hour production time.

The delivery percentage is very dependent on the normal running time. Increasing the running time to seven hours reduces the delivery safety to 87 %, and an increase to eight hours running time results in a reduction to 79 % delivery for the 1084 m asl, 9 m^3/s alternative.

Alternative 1:

Hondo Valle spillway level at 1084 m asl, 8.2 hm^3 total reservoir capacity, and the power plant installation to 9 m^3/s, results in these production statistics:

Average annual production:	47.1 GWh
Median " "	47 GWh
Best year (1979)	69 "
Second poorest year (1967)	33 "
Poorest year (1977):	33 "

Days with 6 hours production or more:	95 %
" " 12 " " " "	44 %
" " 24 " " " "	11 %

Firm power production (6 hour running time):

Average annual production:	27.8 GWh
Median "	28.3 "
Third poorest year (1977)	24.8 "
Second poorest year (1973)	24.7 "
Poorest year (1968)	24.4 "

The operation rule applied is:

Oct 16 to May 14:

Run 24 hours at reservoir above 1084

" 12 " " " " 1082

" 6 " " " " 1065 if possible

May 15 to Oct 15:

Run 24 hours at reservoir above 1080

" 12 " " " " 1075

" 6 " " " " 1065 if possible

Alternative 2:

Hondo Valle spillway level at 1080 m asl, 6.5 hm^3 total reservoir capacity, and the power plant installation to 8 m^3/s, results in these production statistics:

Average annual production:	46 GWh
Median " "	46 "
Best year (1979)	65 "
Second poorest year (1967)	32 "
Poorest year (1977):	32 "

Days with 6 hours production or more:	96 %
" " 12 " " " "	51 %
" " 24 " " " "	16 %

The operation rule applied is:

Oct 20 to May 14:

Run 24 hours at reservoir above 1080

" 12 " " " " 1078

" 6 " " " " 1065 if possible

May 15 to Oct 20:

Run 24 hours at reservoir above 1075

" 12 " " " " 1070

" 6 " " " " 1065 if possible

Alternative 3:

Hondo Valle spillway level at 1090 m asl, 11.2 hm^3 total reservoir capacity and the power plant installation to 10 m^3/s, results in these production statistics:

Average annual production:	49 GWh
Median " "	48 "
Best year (1979)	73 "
Second poorest year (1967)	34 "
Poorest year (1977):	33 "

Days with 6 hours production or more:	95 %
" " 12 " " " "	36 %
" " 24 " " " "	8 %

The operation rule applied is:

Oct 1 to May 14:

Run 24 hours at reservoir above 1090

" 12 " " " " 1088

" 6 " " " " 1065 if possible

May 15 to Sep 30:

Run 24 hours at reservoir above 1085

" 12 " " " " 1080

" 6 " " " " 1065 if possible

A.1.2. La Hilguera.

A.1.2.1. Fixed reservoir capacity.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 900 m asl, 2.3 hm^3
min operation level: 897 m asl, 2.0 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

75 m crest length at 900 m asl, giving a capacity of
901 m: 150 m^3/s
902 m: 450 m^3/s

Power plant:

88 % total efficiency
hydraulic loss: 12 m
tailwater: 710 m asl

The operation rule applied is:

All year:
Run 24 hours at reservoir above 900
" 18 " " " " 899.8
" 12 " " " " 899
" 6 " " " " 897 if possible

Upstream regulation:

Hondo Valle reservoir with maximum level at 1084 m asl, 9 m^3/s installed capacity, and operation rule as given above (alternative 1).

Power plant capacity:

The local inflow can be regarded as more or less unregulated, and as emphasis is given to 6 hours running time, 90-95 % delivery safety, the installation at La Hilguera should be set to the installation of Hondo Valle plus four times the 95 percentile of the local inflow. This percentile

is 1.6 m^3/s at Jaquime, corresponding to 0.26 m^3/s for the 36 km2 local catchment area. The plant capacity at La Hilguera is hence set to 10 m^3/s.

Simulation results:

Average annual production:	56.1 GWh
Median " "	56 GWh
Best year (1979)	75 "
Second poorest year (1967)	42 "
Poorest year (1977):	41 "

Days with 6 hours production or more:	95 %
" " 12 " " " "	37 %
" " 18 " " " "	22 %
" " 24 " " " "	17 %

Of a total inflow of 146 hm^3, 12 hm^3 is spilled.

Firm power production (6 hour running time):

Average annual production:	32.6 GWh
Median "	33.3 "
Third poorest year (1973)	30.7 "
Second poorest year (1977)	29.8 "
Poorest year (1968)	29.2 "

In practice, the most effective operation rule for La Hilguera will be to run in series with Hondo Valle, only adjusting the running time to keep the reservoir at the appropriate level.

A.1.2.2. Effects of varying the reservoir capacity.

By increasing the La Hilguera reservoir, the spill will be somewhat reduced, and as the local inflow can regulated to a higher degree, allowing a higher plant installation.

An upper regulation level of 905 m in La Hilguera reservoir has been simulated, giving an effective storage capacity of 1 hm^3.

The operation rule applied is:

Run	24	hours	at	reservoir	above	905
"	18	"	"	"	"	904.5
"	12	"	"	"	"	904
"	6	"	"	"	"	897 if possible

The plant capacity is increased to 11 m^3/s, giving these production levels:

Days	with	6	hours	production	or	more:	94 %
"	"	12	"	"	"	"	44 %
"	"	18	"	"	"	"	12 %
"	"	24	"	"	"	"	8 %

The spill is reduced to 7 hm^3. The average production increases to 59.4 GWh, but due to head loss, the production at Hondo Valle is reduced to 45.7 GWh. The total increase is hence about 2 GWh, mainly in the wet years.

A.1.3. Los Jaiminez.

A.1.3.1. Fixed reservoir capacity.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 710 m asl, 1.3 hm^3
min operation level: 708 m asl, 1.1 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

65 m crest length at 710 m asl, giving a capacity of
711 m: 130 m^3/s
712 m: 390 m^3/s

Power plant:

88 % total efficiency
hydraulic loss: 3 m
tailwater: 645 m asl

The operation rule applied is:

All year:

Run	24	hours	at	reservoir	above	710
"	18	"	"	"	"	709.8
"	12	"	"	"	"	709.5
"	6	"	"	"	"	708 if possible

Upstream regulation:

Hondo Valle reservoir with maximum level at 1084 m asl, 9 m^3/s installed capacity, and operation rule as given above (alternative 1). La Hilguera with maximum level at 900 m asl, 10 m^3/s installed capacity.

Power plant capacity:

The local inflow can be regarded as more or less unregulated, and applying the same argument as for La Hilguera, the plant capacity should be set to the installation of Hondo Valle plus four times the 95 percentile of the local inflow. This percentile is 1.6 m^3/s at Jaquimé, corresponding to 0.22 m^3/s for from the local catchment area. The plant capacity at Los Jaiminez is accordingly set to 11 m^3/s.

Simulation results:

Average annual production:	21.6 GWh
Median " "	22 GWh
Best year (1979)	29 "
Second poorest year (1967)	17 "
Poorest year (1977):	16 "

Days with 6 hours production or more:	95 %
" " 12 " " " "	39 %
" " 18 " " " "	25 %
" " 24 " " " "	16 %

Firm power production (6 hour running time):

Average annual production:	12.4 GWh
Median "	12.7 "
Third poorest year (1977)	11.8 "
Second poorest year (1973)	11.4 "
Poorest year (1968)	11.1 "

Of a total inflow of 202 hm^3, 12 hm^3 is spilled at La Hilguera and 41 hm^3 at Los Jaiminez. The high spilled volume at Los Jaiminez (more than 70 % of the local inflow) is a result of unfavorable flow distribution and very low reservoir volume. In practical operation the spill can probably be reduced somewhat, but this requires very alert adjustment of operation plans, as the active regulation volume, 0.2 hm^3 is filled by a flow of 3 m^3/s in 18 hours.

A.1.3.2. Effects of varying the reservoir capacity.

By increasing the Los Jaiminez reservoir, the spill will be somewhat reduced, and as the local inflow can regulated to a higher degree, allowing a higher plant installation.

An upper regulation level of 715 m in Los Jaiminez reservoir has been simulated, giving an effective storage capacity of 1 hm^3. The operation rule applied is:

Run	24	hours	at	reservoir	above	715
"	18	"	"	"	"	714.5
"	12	"	"	"	"	714
"	6	"	"	"	"	708 if possible

The plant capacity is increased to 12 m^3/s, giving these production levels:

Days	with	6	hours	production	or	more:	93 %
"	"	12	"	"	"	"	34 %
"	"	18	"	"	"	"	28 %
"	"	24	"	"	"	"	23 %

Note that the delivery safety is down to 93 %, as the local inflow matches an installation increase of 0.9 (0.22*4), not 1 m^3/s from La Hilguera to Los Jaiminez. The production increases to:

Average annual production:	25.8 GWh
Median " "	26 GWh
Best year (1979)	35 "
Second poorest year (1967)	19 "
Poorest year (1977)	18 "

The spill is reduced to 23 hm^3. The average production increases to 25.8 GWh, but due to head loss, the production at La Hilguera is reduced to 54.5 GWh. The total increase is thus about 2.5 GWh, and the dry year production is up with about 1.5 GWh.

A.1.4. Final simulations.

The simulations below are based on updated reservoir curves for the Río San Juan projects, and the operation rules are modifyed somewhat by the introduction of a third tapping period, Oct 16 to Nov 30, to ensure reservoir topping in December.

A.1.4.1. Hondo Valle.

The operation of the Hondo Valle power plant is simulated by these parameters

Reservoir:

max operation level: 1082 m asl, 9.4 hm^3
min operation level: 1065 m asl, 3.0 hm^3

Spillway:

75 m crest length at 1082 m asl, giving a capacity of
1083 m: 150 m^3/s
1084 m: 450 m^3/s

Power plant:

9 m^3/s capacity
88 % total efficiency
hydraulic loss: 9 m
tailwater: 900 m asl
maximum net production: 13.4 MW

Operation rule:

Nov 11 to May 15:
Run 24 hours at reservoir above 1082
" 12 " " " " 1081.9
" 8 " " " " 1081.8
" 6 " " " " 1065 if possible
May 16 to Oct 15:
Run 24 hours at reservoir above 1078
" 12 " " " " 1073
" 6 " " " " 1065 if possible

Oct 16 to Nov 10:

Run 24 hours at reservoir above 1082

" 12 " " " " 1080

" 6 " " " " 1065 if possible

The results of these simulations are:

Average annual production:	47.3 GWh
Median " "	48 GWh
Best year (1979)	69 "
Second poorest year (1967)	33 "
Poorest year (1977):	33 "

Days with 6 hours production or more:	95 %
" " 8 " " " "	45 %
" " 12 " " " "	38 %
" " 24 " " " "	10 %

Firm power production (6 hour running time):

Average annual production:	28.0 GWh
Median "	28.6 "
Third poorest year (1977)	25.4 "
Second poorest year (1968)	25.4 "
Poorest year (1973)	25.0 "

A.1.4.2. La Hilguera.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 900 m asl, 1.2 hm^3

min operation level: 895 m asl, 0.7 hm^3

Spillway:

75 m crest length at 900 m asl, giving a capacity of

901 m: 150 m^3/s

902 m: 450 m^3/s

Power plant:

10 m^3/s capacity

88 % total efficiency

hydraulic loss: 11 m

tailwater: 715 m asl

maximum net production: 15.0 MW

The operation rule applied is:

All year:

Run	24	hours	at	reservoir	above	900
"	18	"	"	"	"	899.8
"	12	"	"	"	"	899
"	8	"	"	"	"	898
"	6	"	"	"	"	895 if possible

Upstream regulation:

Hondo Valle reservoir with maximum level at 1082 m asl, 9 m^3/s installed capacity, and operation rule as given above.

Simulation results:

Average annual production:	54.7 GWh
Median " "	55 GWh
Best year (1979)	72 "
Second poorest year (1967)	41 "
Poorest year (1977):	40 "

Days	with	6	hours	production	or	more:	96 %
"	"	8	"	"	"	"	50 %
"	"	12	"	"	"	"	31 %
"	"	24	"	"	"	"	17 %

Firm power production (6 hour running time):

Average annual production:	32.0 GWh
Median "	32.6 "
Third poorest year (1977)	30.4 "
Second poorest year (1968)	29.7 "
Poorest year (1973)	29.2 "

A.1.4.3. Los Jaiminez.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 715 m asl, 1.4 hm^3

min operation level: 713 m asl, 1.1 hm^3

Spillway:

65 m crest length at 715 m asl, giving a capacity of

716 m: 130 m^3/s

717 m: 390 m^3/s

Power plant:

11 m^3/s capacity

88 % total efficiency

hydraulic loss: 4 m

tailwater: 644 m asl

maximum net production: 6.4 MW

The operation rule applied is:

All year:

Run	24	hours	at	reservoir	above	715
"	18	"	"	"	"	714.8
"	12	"	"	"	"	713.5
"	8	"	"	"	"	714
"	6	"	"	"	"	713 if possible

Upstream regulation:

Hondo Valle reservoir with maximum level at 1082 m asl, 9 m^3/s installed capacity, and operation rule as given above. La Hilguera with maximum level at 900 m asl, 10 m^3/s installed capacity.

Simulation results:

Average annual production:	23.8 GWh
Median " "	24 GWh
Best year (1979)	31 "
Second poorest year (1967)	19 "
Poorest year (1977):	18 "

Days	with	6	hours	production	or	more:	95 %
"	"	8	"	"	"	"	58 %
"	"	12	"	"	"	"	43 %
"	"	24	"	"	"	"	16 %

Firm power production (6 hour running time):

Average annual production:	12.9	GWh
Median "	13.2	"
Third poorest year (1977)	12.7	"
Second poorest year (1968)	12.1	"
Poorest year (1973)	11.5	"

A.2. Arroyo Limón/Arroyo San Pedro projects.

A.2.1. Los Guanos.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 1455 m asl, 2.9 hm^3

min operation level: 1440 m asl, 0.7 hm^3

Spillway:

50 m crest length at 1455 m asl, giving a capacity of

1456 m: 100 m^3/s

1457 m: 300 m^3/s

Power plant:

Capacity: 2.6 m^3/s

88 % total efficiency

hydraulic loss: 12 m

tailwater: 990 m asl

maximum net production: 10.2 MW

Operation rule:

Oct 16 to May 14:

Run 24 hours at reservoir above 1455

" 12 " " " " 1454

" 6 " " " " 1440 if possible

May 15 to Oct 14:

Run 24 hours at reservoir above 1452

" 12 " " " " 1448

" 6 " " " " 1440 if possible

Simulation results:

Average annual production:	34.5 GWh
Median " "	35 GWh
Best year (1979)	51 "
Second poorest year (1967)	24 "
Poorest year (1977):	24 "

Days with 6 hours production or more:	95 %
" " 12 " " " "	40 %
" " 24 " " " "	9 %

Firm power production (6 hour running time):

Average annual production:	21.6 GWh
Median "	22.3 "
Third poorest year (1968)	19.8 "
Second poorest year (1977)	19.6 "
Poorest year (1973)	19.3 "

A.2.2. San Pedro + Las Avispas.

The operation of the power plant is simulated by these parameters:

Reservoir:

max operation level: 990 m asl, 11.0 hm^3
min operation level: 975 m asl, 4.2 hm^3

Spillway:

75 m total crest length at 990 m asl, capacity at
991 m: 150 m^3/s
992 m: 450 m^3/s

Power plant:

Capacity: 6.5 m^3/s
88 % total efficiency
hydraulic loss: 5 m
tailwater: 650 m asl
maximum net production: 18.8 MW

Operation rule:

Oct 16 to May 14:

Run 24 hours at reservoir above 990

" 6 " " " " 975 if possible

May 15 to Oct 14:

Run 24 hours at reservoir above 989

" 12 " " " " 986

" 6 " " " " 975 if possible

Simulation results:

Average annual production:	56.8 GWh
Median " "	58 GWh
Best year (1979)	85 "
Second poorest year (1967)	42 "
Poorest year (1977):	39 "

Days with 6 hours production or more:	96 %
" " 18 " " " "	26 %
" " 24 " " " "	7 %

Firm power production (6 hour running time):

Average annual production:	40.0 GWh
Median "	40.8 "
Third poorest year (1973)	36.9 "
Second poorest year (1977)	36.8 "
Poorest year (1968)	36.3 "

A.3. Río Mijo projects.

4.3.1. Del Pino.

The operation of the Del Pino power plant is simulated by these parameters:

Reservoir:

max operation level: 775 m asl, 4.5 hm^3
min operation level: 760 m asl, 1.7 hm^3
volume curve as in prefeasibility study, volume 2;
altitudes reduced by 27 m.

Spillway:

100 m crest length at 860 m asl, giving a capacity of
776 m: 200 m^3/s
778 m: 1200 m^3/s

Power plant:

7 m^3/s capacity
88 % total efficiency
hydraulic loss: 8 m
tailwater: 567 m asl
maximum net production: 12.1 MW

Operation rule:

Oct 16 to May 14:
Run 24 hours at reservoir above 775
" 12 " " " " 774
" 6 " " " " 760 if possible
May 15 to Oct 14:
Run 24 hours at reservoir above 770
" 12 " " " " 765
" 6 " " " " 760 if possible

The results of these simulations are:

Average annual production:	47.9 GWh
Median " "	50 GWh
Best year (1979)	67 "
Second poorest year (1976)	32 "
Poorest year (1967):	30 "

Days with 6 hours production or more:	90 %
" " 12 " " " "	50 %
" " 24 " " " "	20 %

Firm power production (6 hour running time):

Average annual production:	24.7 GWh
Median "	24.8 "
Third poorest year (1976)	23.5 "
Second poorest year (1977)	23.2 "
Poorest year (1968)	21.7 "

The reservoir is only 2.5 per cent of average annual yield, and this, together with a relatively steep duration curve, results in higher spills and less dry year production, compared to the other projects. In the simulation above, the average spill is 10 hm^3 of an annual yield of 110 hm^3. We have made an additional simulation with maximum regulation level 780 m asl, which gives an effective reservoir volume of 3.9 hm^3, 3.5 per cent of annual yield. The installation is increased to 7.5 m^3/s, 13.3 Mw.

The results of these simulations are:

Average annual production:	49.7 GWh
Median " "	52 GWh
Best year (1979)	72 "
Second poorest year (1976)	33 "
Poorest year (1967):	31 "

Days with 6 hours production or more:	91 %
" " 12 " " " "	45 %
" " 24 " " " "	16 %

Firm power production (6 hour running time):

Average annual production:	27.2 GWh
Median "	27.4 "
Third poorest year (1976)	25.8 "
Second poorest year (1977)	25.4 "
Poorest year (1968)	23.6 "

The spill is reduced to 8 hm^3.

A.4. Río Yaque del Sur projects.

A.4.1. Boca dos Ríos.

The operation of the Boca dos Ríos power plant is simulated by these parameters:

Reservoir:

max operation level: 860 m asl, 9.4 hm^3
min operation level: 850 m asl, 6.1 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

100 m crest length at 860 m asl, giving a capacity of
861 m: 200 m^3/s
863 m: 1200 m^3/s

Power plant:

12 m^3/s capacity
88 % total efficiency
hydraulic loss: 6 m
tailwater: 682 m asl
maximum net production: 17.7 MW

Operation rule:

Oct 16 to May 14:
Run 24 hours at reservoir above 860
" 12 " " " " 859.5
" 6 " " " " 850 if possible
May 15 to Oct 14:
Run 24 hours at reservoir above 859
" 12 " " " " 855
" 6 " " " " 850 if possible

The results of these simulations are:

Average annual production:	63.2 GWh
Median " "	64 GWh
Best year (1979)	91 "
Second poorest year (1976)	45 "
Poorest year (1967):	42 "

Days	with	6	hours	production	or	more:	90 %
"	"	12	"	"	"	"	43 %
"	"	24	"	"	"	"	12 %

Reducing the installed capacity to 11 m^3/s will raise the 6 hour delivery safety to above 95 %.

Firm power production (6 hour running time):

Average annual production:	37.2 GWh
Median "	37.6 "
Third poorest year (1976)	35.9 "
Second poorest year (1977)	35.5 "
Poorest year (1968)	33.9 "

A.4.2. El Picacho.

The El Picacho project is only simulated as operating in series with the Boca dos Ríos project. The operation of El Picacho as a single project can easily be induced from the Boca dos Ríos results.

These parameters have been used for the simulations:

Reservoir:

max operation level: 682 m asl, 10.8 hm^3
min operation level: 673 m asl, 6.6 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

120 m crest length at 682, giving a capacity of
683 m: 240 m^3/s
685 m: 1400 m^3/s

Power plant:

15 m^3/s capacity
88 % total efficiency
hydraulic loss: 5 m
tailwater: 560 m asl
maximum net production: 13.7 MW

Operation rule:

Oct 16 to May 14:

Run 24 hours at reservoir above 682

" 6 " " " " 673 if possible

May 15 to Oct 14:

Run 24 hours at reservoir above 682

" 12 " " " " 678

" 6 " " " " 673 if possible

The results of these simulations are:

Average annual production:	51.2 GWh
Median " "	52 GWh
Best year (1979)	76 "
Second poorest year (1976)	36 "
Poorest year (1967):	34 "

Days with 6 hours production or more:	92 %
" " 12 " " " "	30 %
" " 24 " " " "	11 %

Firm power production (6 hour running time):

Average annual production:	31.6 GWh
Median "	31.7 "
Third poorest year (1976)	30.5 "
Second poorest year (1977)	29.8 "
Poorest year (1968)	28.7 "

A.5. Río del Medio projects.

A.5.1. Palomino.

The operation of the Palomino power plant is simulated by these parameters

Reservoir:

max operation level: 569 m asl, 19.8 hm^3
min operation level: 563 m asl, 13.6 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

100 m crest length at 569 m asl, giving a capacity of
570 m: 200 m^3/s
572 m: 1200 m^3/s

Power plant:

14 m^3/s capacity
88 % total efficiency
hydraulic loss: 4 m
tailwater: 470 m asl
maximum net production: 11.5 MW

Operation rule:

Oct 16 to May 14:
Run 24 hours at reservoir above 569
" 12 " " " " 568.8
" 6 " " " " 563 if possible
May 15 to Oct 14:
Run 24 hours at reservoir above 567
" 12 " " " " 565
" 6 " " " " 563 if possible

The results of these simulations are:

Average annual production:	40.3 GWh
Median " "	41 GWh
Best year (1979)	60 "
Second poorest year (1967)	28 "
Poorest year (1977):	25 "

Days with 6 hours production or more:							92 %
"	"	12	"	"	"	"	41 %
"	"	24	"	"	"	"	12 %

Firm power production (6 hour running time):

Average annual production:	23.8	GWh
Median "	24.4	"
Third poorest year (1973)	22.6	"
Second poorest year (1968)	21.4	"
Poorest year (1977)	17.1	"

A.5.2. Mogote.

The Mogote project is only simulated as operating in series with the Palomino project. The operation of Mogote as a single project can easily be induced from the Palomino results.

These parameters have been used for the simulations:

Reservoir:

max operation level: 470 m asl, 22.8 hm^3
min operation level: 464 m asl, 15.1 hm^3
volume curve as in prefeasibility study, volume 2

Spillway:

100 m crest length at 470 m asl, giving a capacity of
471 m: 200 m^3/s
473 m: 1200 m^3/s

Power plant:

17 m^3/s capacity
88 % total efficiency
hydraulic loss: 4 m
tailwater: 405 m asl
maximum net production: 8.9 MW

Operation rule:

Oct 16 to May 14:

Run 24 hours at reservoir above 470

" 6 " " " " 464 if possible

May 15 to Oct 14:

Run 24 hours at reservoir above 468

" 12 " " " " 466

" 6 " " " " 464 if possible

The results of these simulations are:

Average annual production:	28.6 GWh
Median " "	29 GWh
Best year (1979)	44 "
Second poorest year (1967)	20 "
Poorest year (1977):	17 "

Days with 6 hours production or more:	92 %
" " 12 " " " "	30 %
" " 24 " " " "	11 %

Firm power production (6 hour running time):

Average annual production:	18.4 GWh
Median "	18.7 "
Third poorest year (1973)	17.5 "
Second poorest year (1968)	16.1 "
Poorest year (1977)	13.3 "

A.6. Yaque del Sur transferred to Río del Medio.

If El Picacho is transferred to Palomino through a 10 km tunnel, the tailwater will be raised from 560 to 569 m asl, and the hydraulic losses will increase from 5 to 20 m. Approximately 156 m of head will be gained through Palomino and Mogote power plants, hence the net head gain will be 132 m. With tailwater at La Laguna in Río Yaque del Sur, the net head of El Picacho is 103 m.

If the installations of Palomino and Mogote is increased with 15 m^3/s to handle the transferred water, the delivery

safety of the system will not be altered. We can estimate the production in El Picacho and the additional production in Rio del Medio by multiplying the productions of El Picacho by (132+103)/103 = 2.28:

	El Picacho to La Laguna	El Picacho to Palomino
Average annual production:	51.2 GWh	116.7 GWh
Median " "	52 "	119 "
Best year (1979)	76 "	173 "
Second poorest year (1976)	36 "	82 "
Poorest year (1967):	34 "	78 "
Firm power production (6 hour running time):		
Average annual production:	31.6 GWh	72.0 Gwh
Median "	31.7 "	72.3 "
Third poorest year (1976)	30.5 "	69.5 "
Second poorest year (1977)	29.8 "	67.9 "
Poorest year (1968)	28.7 "	65.4 "

In addition, some spill power (24 hour running time) might be gained due to the increased installations in Palomino and Mogote.

APPENDIX B MONTHLY DATA OF RUNOFF SERIES.

This appendix contains the runoff series of the basic runoff series, as they have been used for constructing extended series. Data periods excluded during the quality control are left out. Incomplete months are referenced as missing in the tables, but are used to extend and complete series.

B.1. Observed data.

B.1.1. Jaquimé streamflow.

JAQUIME
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO SAN JUAN

CATCHMENT AREA 219 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	2.8	2.3	3.3	3.2	4.7	3.8	-	9.4	10.3	-	3.5	-
1965	2.8	2.3	2.4	2.1	4.9	4.7	6.1	11.3	8.6	8.6	6.2	4.7	5.46
1966	4.0	3.4	3.1	3.3	6.8	7.2	-	9.0	7.2	7.1	6.2	4.4	-
1967	3.4	3.1	2.7	2.6	2.6	3.3	3.1	4.5	4.5	4.7	3.5	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	-	-	-	-	-	-	-	-	-	-	9.5	5.8	-
1976	3.5	2.6	2.2	2.4	2.3	3.3	3.9	5.5	8.4	9.7	4.5	3.2	4.35
1977	2.5	2.1	1.7	2.1	2.4	1.9	2.3	3.0	5.5	7.1	8.0	3.9	3.59
1978	3.2	2.3	2.0	3.1	4.1	-	9.0	8.5	10.0	-	6.7	3.9	-
1979	2.9	2.4	2.2	2.5	8.8	10.6	8.8	10.5	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	7.3	7.4	8.7	8.5	5.4	3.7	-
1983	2.9	2.3	2.0	2.0	4.2	3.4	5.3	6.4	5.7	6.8	5.7	3.3	4.24
MEAN	3.1	2.6	2.3	2.6	4.4	4.9	5.5	7.4	7.6	7.8	6.2	4.0	4.41
MAX	4.0	3.4	3.1	3.3	8.8	10.6	9.0	11.3	10.0	10.3	9.5	5.8	5.46
MIN	2.5	2.1	1.7	2.0	2.3	1.9	2.3	3.0	4.5	4.7	3.5	3.2	3.59

B.1.2. Paso de Lima streamflow.

PASO DE LIMA
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO SAN JUAN

CATCHMENT AREA 332 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	-	-	-	-	-	-	-	12.5	14.9	12.2	19.7	8.3	-
1976	5.0	4.0	3.3	3.8	3.5	4.8	5.2	8.1	14.1	17.4	6.9	5.2	6.84
1977	4.0	2.8	2.1	2.8	3.8	2.8	3.5	5.6	9.0	11.0	11.8	6.4	5.51
1978	4.7	3.4	3.3	5.5	7.3	13.5	11.8	10.8	14.9	19.7	9.6	5.6	9.24
1979	4.2	3.6	3.7	3.8	14.4	22.5	14.2	15.5	-	26.4	16.2	7.8	-
1980	5.5	4.4	3.7	4.9	-	-	-	-	16.3	-	-	5.9	-
1981	4.5	4.0	2.8	3.2	-	-	-	-	-	-	10.3	6.8	-
1982	5.5	5.7	3.7	5.3	-	12.4	9.4	10.0	11.4	8.9	8.5	4.3	-
1983	3.8	3.8	2.7	2.7	9.2	5.7	8.7	9.5	9.3	11.7	9.5	-	-
MEAN	4.6	4.0	3.2	4.0	7.6	10.3	8.8	10.3	12.8	15.3	11.6	6.3	7.20
MAX	5.5	5.7	3.7	5.5	14.4	22.5	14.2	15.5	16.3	26.4	19.7	8.3	9.24
MIN	3.8	2.8	2.1	2.7	3.5	2.8	3.5	5.6	9.0	8.9	6.9	4.3	5.51

B.1.3. Arroyo Limon streamflow.

ARROYO LIMON
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: ARROYO LIMON

CATCHMENT AREA 96.0 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	1.4	1.9	1.7	-	3.6	-	2.7	1.9	-
1965	1.5	1.4	-	1.2	-	2.3	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	-	-
1983	1.1	-	-	.9	1.1	1.2	2.1	2.1	2.1	2.1	1.7	1.1	-
MEAN	1.3	1.4	-	1.0	1.3	1.8	1.9	2.1	2.8	2.1	2.2	1.5	-
MAX	1.5	1.4	-	1.2	1.4	2.3	2.1	2.1	3.6	2.1	2.7	1.9	-
MIN	1.1	1.4	-	.9	1.1	1.2	1.7	2.1	2.1	2.1	1.7	1.1	-

B.1.4. Sabaneta streamflow.

SABANETA
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO SAN JUAN

CATCHMENT AREA 463 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	4.5	4.6	4.7	4.8	4.9	7.1	7.7	8.6	5.4	3.7	-
1968	3.1	3.0	2.7	2.3	5.2	9.6	-	14.1	19.4	12.3	13.6	8.4	-
1969	5.7	4.5	3.9	4.4	9.2	6.5	9.0	7.2	-	-	9.3	6.5	-
1970	-	6.0	3.8	2.8	7.5	12.3	12.2	10.2	23.2	17.3	9.5	6.8	-
1971	-	-	-	-	8.8	-	13.7	14.4	16.6	19.3	-	8.5	-
1972	7.0	6.3	6.1	6.2	7.0	15.4	12.7	13.4	21.1	17.7	6.4	5.3	10.44
1973	4.5	3.1	2.0	1.8	4.9	8.7	9.1	13.1	18.5	19.4	11.0	9.8	8.91
1974	6.5	5.0	5.6	4.6	6.0	5.7	5.7	6.1	17.9	19.2	13.0	9.6	8.80
1975	5.9	4.4	4.1	3.6	4.1	5.1	3.1	7.5	11.1	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	4.4	6.0	5.2	-	7.3	13.4	12.1	10.2	6.8	-
1978	5.5	4.1	3.5	6.8	-	-	-	-	-	-	12.8	7.7	-
1979	5.4	5.0	5.2	5.9	-	-	19.3	-	-	-	-	-	-
1980	-	-	5.3	5.7	-	-	-	-	-	-	-	-	-
MEAN	5.4	4.6	4.2	4.4	6.3	8.1	10.0	10.0	16.6	15.7	10.1	7.3	9.38
MAX	7.0	6.3	6.1	6.8	9.2	15.4	19.3	14.4	23.2	19.4	13.6	9.8	10.44
MIN	3.1	3.0	2.0	1.8	4.1	4.8	3.1	6.1	7.7	8.6	5.4	3.7	8.80

B.1.5. Guazumal streamflow.

GUAZUMAL
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO SAN JUAN

CATCHMENT AREA 613 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	5.4	3.6	2.4	6.8	8.5	7.5	-
1956	5.8	4.8	4.0	4.2	10.3	10.3	9.3	9.6	10.8	11.9	14.5	8.1	8.71
1957	5.5	4.3	3.8	3.2	4.5	8.5	6.6	10.5	12.5	11.7	6.8	5.9	7.05
1958	5.7	3.8	2.8	3.0	9.3	23.8	19.8	17.0	20.8	15.3	8.9	6.3	11.46
1959	4.4	3.2	2.8	4.9	10.7	6.5	9.0	9.6	19.8	12.0	15.1	11.9	9.22
1960	6.3	4.9	10.0	19.3	21.5	27.3	31.9	29.6	21.0	21.6	17.0	19.5	19.28
1961	9.3	6.9	6.6	4.9	13.6	19.4	20.7	17.9	17.1	27.7	23.0	14.4	15.23
1962	8.8	5.5	4.1	5.1	8.1	18.4	15.2	-	17.0	16.2	15.6	8.2	-
1963	5.7	4.2	3.5	8.1	12.4	12.6	13.4	21.1	-	-	17.0	10.5	-
1964	6.4	4.3	3.1	4.5	4.6	9.1	10.1	17.8	19.5	26.1	12.7	7.3	10.53
1965	5.1	4.0	3.2	3.0	10.9	-	-	27.8	23.2	24.3	15.5	10.9	-
1966	8.4	6.1	5.5	6.4	11.5	12.4	17.4	14.4	11.3	13.7	12.8	8.1	10.74
1967	5.7	4.7	3.7	3.6	3.5	4.8	4.2	7.0	6.5	8.4	5.7	3.9	5.18
1968	3.1	2.8	2.5	2.2	4.0	8.7	10.6	17.9	21.5	12.3	13.4	9.2	9.09
1969	5.8	4.3	3.6	4.8	11.8	7.2	14.5	11.3	16.9	14.2	10.2	7.6	9.42
1970	5.6	4.3	2.9	2.5	11.4	20.9	14.5	13.0	31.2	20.1	11.6	7.9	12.22
1971	5.2	4.1	3.4	3.8	5.5	8.3	12.2	14.9	17.6	20.1	15.8	9.0	10.09
1972	6.4	5.1	6.3	5.6	7.3	16.2	15.6	13.3	18.2	22.7	11.1	7.8	11.37
1973	4.8	3.5	3.1	2.4	4.6	11.0	8.4	12.5	16.7	20.2	9.3	6.9	8.69
1974	6.6	5.3	8.1	5.4	5.3	5.5	4.9	5.6	23.2	21.4	10.1	8.4	9.19
1975	4.7	4.0	3.5	3.9	5.7	4.8	7.1	14.2	18.5	13.8	27.3	9.8	9.81
1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	2.8	2.2	1.3	3.2	8.6	3.2	4.5	6.7	14.2	11.2	12.2	4.7	6.30
1978	3.4	2.4	2.2	7.5	10.6	19.5	15.5	15.5	18.6	24.6	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	5.7	4.3	4.1	5.1	8.9	12.3	12.3	14.1	17.2	17.1	13.4	8.8	10.20
MAX	9.3	6.9	10.0	19.3	21.5	27.3	31.9	29.6	31.2	27.7	27.3	19.5	19.28
MIN	2.8	2.2	1.3	2.2	3.5	3.2	4.2	3.6	2.4	6.8	5.7	3.9	5.18

B.1.6. El Popote streamflow.

EL POPOTE
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO MIJO

CATCHMENT AREA 120 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	3.1	2.9	2.9	7.6	11.4	9.2	6.9	9.5	4.6	2.3	-	-
1983	2.0	1.7	1.5	1.5	2.9	3.4	2.9	6.0	7.3	4.2	3.0	2.1	3.27
MEAN	2.0	2.4	2.2	2.2	5.3	7.4	6.0	6.5	8.4	4.4	2.6	2.1	3.27
MAX	2.0	3.1	2.9	2.9	7.6	11.4	9.2	6.9	9.5	4.6	3.0	2.1	3.27
MIN	2.0	1.7	1.5	1.5	2.9	3.4	2.9	6.0	7.3	4.2	2.3	2.1	3.27

B.1.7. El Cacheo streamflow.

EL CACHEO
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO MIJO

CATCHMENT AREA 158 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	3.8	3.2	3.6	3.5	6.5	5.6	4.4	6.8	6.6	8.9	8.9	3.8	5.51
1957	2.6	2.2	1.8	2.1	2.6	4.3	3.7	5.8	4.6	4.1	2.7	2.8	3.33
1958	3.0	2.0	1.5	2.5	7.2	17.4	8.5	7.4	-	-	-	-	-
1959	2.0	1.7	1.5	3.2	11.7	6.1	6.2	7.0	8.4	4.7	9.1	7.0	5.78
1960	3.4	2.9	4.2	9.7	10.5	12.4	18.0	12.0	6.4	9.8	7.3	6.2	8.65
1961	3.3	2.8	2.5	2.2	6.5	20.0	9.6	7.3	5.5	9.3	8.8	4.8	6.94
1962	2.9	2.4	1.9	2.0	3.3	7.1	5.1	10.2	9.1	9.6	7.4	3.4	5.42
1963	2.6	2.0	1.8	1.8	5.1	5.7	7.8	10.2	11.4	14.9	8.4	4.4	6.40
1964	2.8	2.2	1.7	2.3	1.5	4.0	3.9	5.0	9.4	13.1	5.1	3.0	4.57
1965	2.2	1.6	1.3	1.1	3.9	-	-	-	8.8	8.9	6.7	3.0	-
1966	2.2	1.5	1.4	2.2	7.6	7.3	7.8	6.5	5.3	9.4	7.4	3.8	5.27
1967	2.4	1.9	1.5	1.5	2.4	4.3	1.9	3.7	4.1	4.4	2.5	2.0	2.76
1968	1.5	1.3	1.2	1.0	2.9	-	6.7	5.6	8.0	4.6	4.1	2.4	-
1969	1.9	1.7	1.5	2.1	5.7	4.5	6.7	6.5	10.3	8.4	5.6	3.3	4.93
1970	2.2	1.7	1.3	1.1	3.6	7.1	4.8	6.1	17.2	9.9	5.4	3.1	5.36
1971	2.4	1.9	1.7	2.0	2.8	4.9	7.2	5.5	8.2	10.1	5.5	3.4	4.71
1972	2.8	2.3	3.6	2.8	5.4	8.8	5.4	4.4	9.1	6.9	4.0	2.8	4.91
1973	2.3	1.9	1.9	1.4	2.2	5.2	4.4	6.3	7.6	9.8	4.8	3.2	4.31
1974	2.4	2.2	2.5	2.0	3.8	5.3	2.2	1.9	7.2	9.4	5.0	3.7	4.02
1975	2.2	1.7	1.4	1.1	3.7	3.6	3.6	4.7	10.3	5.6	8.3	3.7	4.20
1976	2.3	1.8	1.4	1.4	1.3	3.6	2.2	3.4	4.0	7.3	3.6	3.1	3.02
1977	2.0	1.5	1.2	1.2	2.6	2.2	3.3	6.3	8.0	6.1	7.8	3.4	3.86
1978	2.3	1.6	2.0	6.8	7.0	11.4	7.7	5.9	5.9	5.7	3.8	2.9	5.30
1979	2.3	1.9	1.9	1.7	8.8	13.5	9.5	10.1	24.5	13.1	8.6	4.5	8.42
1980	3.4	2.8	2.5	3.2	4.8	6.7	5.7	7.4	9.8	9.6	4.7	3.1	5.35
1981	2.5	2.1	1.7	2.0	13.3	12.0	13.8	11.2	7.6	7.8	5.1	3.6	6.97
1982	3.5	3.4	2.1	2.3	7.5	9.0	6.2	6.4	8.5	4.8	3.7	2.5	5.03
1983	1.9	1.7	1.5	1.4	3.4	4.8	3.2	4.8	6.3	5.8	4.0	2.4	3.48
MEAN	2.5	2.1	1.9	2.4	5.3	7.6	6.3	6.6	8.6	8.2	5.9	3.5	5.14
MAX	3.8	3.4	4.2	9.7	13.3	20.0	18.0	12.0	24.5	14.9	9.1	7.0	8.65
MIN	1.5	1.3	1.2	1.0	1.3	2.2	1.9	1.9	4.0	4.1	2.5	2.0	2.76

B.1.8. El Aguacate streamflow.

EL AGUACATE
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO YAQUE DEL SUR

CATCHMENT AREA 311 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	-	-	-	-	-	-	-	-	-	5.5	-
1983	4.4	3.5	3.0	3.0	5.3	-	5.7	6.8	7.2	6.8	5.6	3.7	-
1984	3.5	3.8	-	-	-	-	-	-	-	-	-	-	-
MEAN	3.9	3.6	3.0	3.0	5.3	-	5.7	6.8	7.2	6.8	5.6	4.6	-
MAX	4.4	3.8	3.0	3.0	5.3	-	5.7	6.8	7.2	6.8	5.6	5.5	-
MIN	3.5	3.5	3.0	3.0	5.3	-	5.7	6.8	7.2	6.8	5.6	3.7	-

B.1.8. El Palmar streamflow.

EL PALMAR
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO YAQUE DEL SUR

CATCHMENT AREA 329 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1971	-	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-	-
1973	-	-	-	-	-	-	-	-	-	-	-	-	-
1974	-	-	-	-	-	-	-	-	-	-	-	-	-
1975	-	-	-	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	-	-	-	-	-	-	-
1977	-	-	-	-	-	-	-	-	-	-	-	-	-
1978	-	-	-	-	-	-	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	7.5	18.6	18.9	6.8	3.1	-
1981	2.6	2.2	1.9	2.2	17.6	16.5	19.8	13.3	9.1	13.7	9.3	6.4	9.65
1982	5.1	4.7	3.3	3.2	11.6	14.1	11.2	8.4	10.3	10.5	8.4	-	-
1983	6.3	5.6	5.4	-	-	-	-	-	-	-	-	-	-
MEAN	4.7	4.2	3.5	2.7	14.6	15.3	15.5	9.7	12.6	14.4	8.2	4.8	9.65
MAX	6.3	5.6	5.4	3.2	17.6	16.5	19.8	13.3	18.6	18.9	9.3	6.4	9.65
MIN	2.6	2.2	1.9	2.2	11.6	14.1	11.2	7.5	9.1	10.5	6.8	3.1	9.65

B.1.10. Boca de los Rios streamflow.

BOCA DE LOS RIOS
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO YAQUE DEL SUR

CATCHMENT AREA 392 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	5.9	6.1	5.4	4.4	9.1	10.6	7.7	7.3	7.2	10.5	14.2	5.5	7.88
1957	3.8	3.9	3.3	4.1	5.0	7.2	7.1	6.6	8.7	10.5	6.9	6.5	6.18
1958	9.2	4.8	3.9	4.9	12.5	22.3	10.6	8.5	12.6	8.5	6.4	5.5	9.20
1959	-	-	-	-	-	6.3	9.3	8.4	14.5	8.7	6.4	5.5	-
1960	3.7	3.9	6.2	19.5	10.8	22.4	-	20.9	15.1	16.3	10.7	10.1	-
1961	5.9	4.6	-	3.3	7.7	15.3	12.3	6.7	7.2	8.5	7.2	5.1	-
1962	5.0	3.9	3.6	5.4	6.9	12.0	7.9	5.6	-	10.1	9.5	5.2	-
1963	4.3	2.8	2.3	3.2	9.0	4.8	2.9	7.7	-	-	9.6	6.5	-
1964	4.9	3.3	2.9	4.1	2.8	6.3	4.7	6.4	9.0	10.5	6.3	5.2	5.60
1965	3.8	2.7	2.1	1.8	8.2	7.5	7.0	8.3	8.5	8.1	-	6.1	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	5.2	4.0	3.7	5.6	8.0	11.5	7.7	8.6	10.4	10.2	8.6	6.1	7.21
MAX	9.2	6.1	6.2	19.5	12.5	22.4	12.3	20.9	15.1	16.3	14.2	10.1	9.20
MIN	3.7	2.7	2.1	1.8	2.8	4.8	2.9	5.6	7.2	8.1	6.3	5.1	5.60

B.1.11. Palomino streamflow series.

PALOMINO
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO DEL MEDIO

CATCHMENT AREA 596 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1981	-	-	-	-	-	-	-	-	-	-	-	-	-
1982	-	-	3.5	3.6	9.1	11.7	6.9	6.3	6.8	7.0	6.2	5.5	-
1983	4.3	3.7	-	-	7.2	8.3	-	7.4	7.1	7.6	5.2	2.8	-
MEAN	4.3	3.7	3.5	3.6	8.2	10.0	6.9	6.9	6.9	7.3	5.7	4.2	-
MAX	4.3	3.7	3.5	3.6	9.1	11.7	6.9	7.4	7.1	7.6	6.2	5.5	-
MIN	4.3	3.7	3.5	3.6	7.2	8.3	6.9	6.3	6.8	7.0	5.2	2.8	-

B.1.12. Bohechio streamflow series.

BOHECHIO
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO DEL MEDIO

CATCHMENT AREA 661 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1971	-	-	-	-	-	-	-	-	-	-	5.3	4.3	-
1972	3.7	3.0	4.9	3.8	8.5	18.4	11.4	11.5	14.1	15.5	9.1	6.4	9.28
1973	3.7	3.2	2.9	2.9	3.6	9.9	-	8.4	-	-	9.5	6.4	-
1974	5.3	4.4	4.4	3.2	5.8	9.6	4.5	5.6	10.0	17.4	10.8	8.8	7.54
1975	5.9	4.8	4.4	3.4	5.8	6.1	5.3	5.6	10.0	7.5	15.7	13.7	7.41
1976	5.3	4.6	3.3	3.6	4.3	5.2	6.2	7.8	13.3	14.9	5.2	3.9	6.53
1977	2.6	2.2	1.9	2.1	4.8	2.5	1.6	2.1	8.2	10.3	16.0	6.4	5.10
1978	4.0	3.1	2.6	8.4	12.0	15.0	11.9	11.0	13.3	22.7	-	-	-
1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	4.3	3.6	3.5	3.9	6.4	9.5	6.8	7.4	11.5	14.7	10.2	7.1	7.17
MAX	5.9	4.8	4.9	8.4	12.0	18.4	11.9	11.5	14.1	22.7	16.0	13.7	9.28
MIN	2.6	2.2	1.9	2.1	3.6	2.5	1.6	2.1	8.2	7.5	5.2	3.9	5.10

B.1.13. Rio del Medio en Sabana Yegua streamflow series.

SABANA YEGUA/DEL MEDIO
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO DEL MEDIO

CATCHMENT AREA 684 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	6.2	6.9	5.5	4.3	6.4	7.3	5.1	4.5	5.0	5.9	9.6	6.4	6.12
1957	4.3	3.8	2.3	2.0	3.4	7.3	6.4	5.1	5.9	-	-	5.0	-
1958	10.2	3.6	2.6	2.2	9.6	18.7	7.1	6.7	16.0	9.8	6.4	5.3	8.24
1959	3.5	2.4	2.4	4.1	4.4	9.0	10.9	8.1	10.8	-	15.7	7.9	-
1960	3.6	4.3	6.7	-	-	17.3	14.2	11.8	8.4	13.9	11.2	8.9	-
1961	4.3	4.4	5.1	2.8	9.1	15.7	7.9	9.3	9.0	13.8	11.5	-	-
1962	3.9	2.9	2.2	5.1	12.5	21.8	7.9	6.6	9.2	10.0	7.9	2.7	7.77
1963	3.0	2.9	3.0	2.6	15.3	12.1	5.9	9.5	25.6	-	16.9	10.6	-
1964	-	-	2.8	3.5	3.1	6.9	4.2	5.3	10.8	10.7	6.5	5.1	-
1965	3.7	2.6	2.3	2.2	-	11.5	9.2	10.0	10.4	10.4	8.9	5.6	-
1966	4.7	3.3	3.4	3.9	7.0	7.6	11.9	6.5	6.1	11.0	-	-	-
1967	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	4.7	3.7	3.5	3.3	7.9	12.3	8.2	7.6	10.7	10.7	10.5	6.4	7.38
MAX	10.2	6.9	6.7	5.1	15.3	21.8	14.2	11.8	25.6	13.9	16.9	10.6	8.24
MIN	3.0	2.4	2.2	2.0	3.1	6.9	4.2	4.5	5.0	5.9	6.4	2.7	6.12

B.1.14. El Puente streamflow series.

EL PUENTE
MAIN RIVER: YAQUE DEL SUR

CATCHMENT AREA 1691 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	27.0	16.4	12.1	26.7	29.3	19.0	-	14.1	-	35.7	18.7	-
1957	15.6	12.8	7.5	7.2	11.3	20.4	15.0	14.3	16.0	25.2	15.9	14.5	14.70
1958	22.4	11.6	8.6	6.1	34.6	65.3	32.0	24.6	48.5	33.5	18.3	14.2	26.73
1959	10.9	8.2	7.7	12.1	20.3	23.9	19.2	19.0	27.5	22.7	36.5	24.3	19.43
1960	14.1	12.7	17.2	39.8	40.0	52.7	41.9	42.2	33.5	44.4	30.3	-	-
1961	16.3	13.8	13.4	11.8	17.6	37.8	26.7	20.6	23.3	44.2	33.0	25.7	23.78
1962	14.1	-	9.1	15.4	28.4	52.8	24.7	23.2	32.3	37.4	34.1	15.7	-
1963	11.6	8.7	8.3	12.7	37.8	33.1	21.4	27.0	66.4	-	56.4	31.3	-
1964	19.6	14.6	9.5	13.0	-	20.0	13.2	17.4	30.5	41.3	19.7	13.6	-
1965	-	7.7	6.4	-	-	35.2	14.6	-	20.1	-	23.7	15.2	-
1966	13.2	8.9	8.2	7.6	-	15.4	24.5	22.1	21.0	-	-	-	-
1967	18.9	16.9	11.4	9.9	10.3	15.7	10.7	13.7	16.7	16.2	15.1	10.1	13.81
1968	8.0	7.2	5.9	4.4	16.8	36.3	27.7	17.0	31.6	21.5	26.9	23.7	19.00
1969	13.5	9.7	8.1	14.3	29.8	20.1	27.0	20.5	42.5	46.8	34.9	20.4	24.09
1970	12.3	9.6	6.9	5.7	-	33.4	18.4	25.7	-	38.4	32.9	22.9	-
1971	13.4	-	-	12.0	17.9	-	-	14.7	29.2	32.5	22.8	15.1	-
1972	11.2	8.9	16.2	11.0	29.1	50.4	32.3	31.4	35.6	35.8	24.0	18.8	25.52
1973	13.0	-	8.4	5.7	8.2	22.1	20.0	19.5	27.3	44.4	23.1	16.3	-
1974	9.1	8.3	9.0	8.1	13.1	15.8	8.9	13.3	25.5	28.4	19.1	15.7	14.59
1975	10.3	8.6	7.2	6.1	9.1	9.4	9.7	11.1	24.1	20.6	41.8	-	-
1976	-	10.6	8.8	9.0	9.9	11.3	10.0	11.9	17.5	25.9	12.8	10.2	-
1977	5.4	4.6	3.9	5.0	10.1	6.2	5.3	7.4	18.2	21.0	26.0	15.0	10.75
1978	11.0	6.1	5.2	16.7	21.3	25.8	28.7	24.5	31.6	38.9	20.5	11.3	20.26
1979	-	-	-	-	-	-	-	-	-	-	-	-	-
1980	-	-	-	-	-	-	-	-	-	-	-	-	-
MEAN	13.2	10.8	9.2	11.2	20.6	28.7	20.5	20.1	28.8	32.6	27.4	17.6	19.33
MAX	22.4	27.0	17.2	39.8	40.0	65.3	41.9	42.2	66.4	46.8	56.4	31.3	26.73
MIN	5.4	4.6	3.9	4.4	8.2	6.2	5.3	7.4	14.1	16.2	12.8	10.1	10.75

B.2. Extended series.

B.2.1. Jaquimé extended series.

JAQUIME EXTENDED
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO SAN JUAN

CATCHMENT AREA 219 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	3.6	2.8	2.3	3.3	3.2	4.7	3.8	8.0	9.4	10.3	5.8	3.5	5.13
1965	2.8	2.3	2.4	2.1	4.9	4.7	6.1	11.3	8.6	8.6	6.2	4.7	5.46
1966	4.0	3.4	3.1	3.3	6.8	7.2	8.1	9.0	7.2	7.1	6.2	4.4	5.88
1967	3.4	3.1	2.7	2.6	2.6	3.3	3.1	4.5	4.5	4.7	3.5	4.2	3.56
1968	1.6	1.5	1.4	1.2	2.7	5.0	5.1	7.3	10.1	6.4	7.1	4.3	4.51
1969	2.9	2.3	2.0	2.3	4.8	3.4	4.6	3.7	6.5	6.5	4.8	3.3	3.99
1970	3.0	3.1	2.0	1.4	3.9	6.4	6.3	5.3	12.1	9.0	4.9	3.5	5.12
1971	1.9	2.4	1.9	2.0	4.6	4.5	7.1	7.4	8.6	10.0	7.8	4.4	5.27
1972	3.6	3.3	3.1	3.2	3.6	8.0	6.6	6.9	11.0	9.2	3.3	2.8	5.43
1973	2.3	1.6	1.0	.9	2.5	4.5	4.7	6.8	9.6	10.1	5.7	5.1	4.63
1974	3.4	2.6	2.9	2.4	3.1	2.9	3.0	3.2	9.3	10.0	6.7	4.9	4.58
1975	3.0	2.2	2.1	1.8	2.1	2.6	1.6	3.9	5.7	7.8	9.5	5.8	4.06
1976	3.5	2.6	2.2	2.4	2.3	3.3	3.9	5.5	8.4	9.7	4.5	3.2	4.35
1977	2.5	2.1	1.7	2.1	2.4	1.9	2.3	3.0	5.5	7.1	8.0	3.9	3.59
1978	3.2	2.3	2.0	3.1	4.1	9.1	9.0	8.5	10.0	12.6	6.7	3.9	6.27
1979	2.9	2.4	2.2	2.5	8.8	10.6	8.8	10.5	20.0	17.4	10.7	5.1	8.56
1980	3.6	2.9	2.4	3.2	5.3	7.3	6.5	7.0	10.8	10.5	5.9	3.9	5.84
1981	2.9	2.6	1.8	2.1	16.6	14.3	11.3	6.5	5.8	8.2	6.8	4.5	7.03
1982	3.6	3.8	2.5	3.5	10.4	8.4	7.3	7.4	8.7	8.5	5.4	3.7	6.15
1983	2.9	2.3	2.0	2.0	4.2	3.4	5.3	6.4	5.7	6.8	5.7	3.3	4.24
MEAN	3.0	2.6	2.2	2.4	4.9	5.8	5.7	6.6	8.9	9.0	6.3	4.1	5.18
MAX	4.0	3.8	3.1	3.5	16.6	14.3	11.3	11.3	20.0	17.4	10.7	5.8	8.56
MIN	1.6	1.5	1.0	.9	2.1	1.9	1.6	3.0	4.5	4.7	3.3	2.8	3.56

B.2.2. Arroyo los Gajitos extended series.

ARROYO LOS GAJITOS SYNTHETIC SERIES
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: ARROYO LOS GAJITOS

CATCHMENT AREA 76 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	.9	.5	.4	.8	.7	1.6	1.1	3.1	4.0	4.4	2.1	.8	1.75
1965	.5	.4	.4	.3	1.6	1.4	2.3	4.8	3.7	3.7	2.3	1.4	1.95
1966	1.0	.8	.7	.7	2.5	2.9	3.3	3.8	2.8	2.9	2.3	1.2	2.13
1967	.7	.6	.5	.5	.5	.8	.7	1.3	1.3	1.4	.8	1.1	.90
1968	.2	.2	.1	.1	.5	1.6	1.6	2.9	4.3	2.4	2.8	1.2	1.54
1969	.6	.4	.3	.4	1.5	.8	1.3	.9	2.5	2.5	1.5	.7	1.16
1970	.6	.7	.3	.2	1.1	2.3	2.3	1.7	5.2	3.8	1.5	.8	1.77
1971	.3	.4	.2	.3	1.4	1.3	2.8	3.0	3.7	4.3	3.3	1.2	1.90
1972	.8	.7	.7	.7	.9	3.0	2.5	2.7	4.6	3.8	.7	.5	1.85
1973	.4	.2	.1	.1	.5	1.4	1.4	2.7	4.1	4.3	2.0	1.6	1.62
1974	.8	.5	.6	.4	.7	.6	.6	.7	3.7	4.3	2.6	1.5	1.47
1975	.6	.4	.3	.2	.4	.6	.2	1.1	2.0	3.2	4.0	2.0	1.30
1976	.8	.5	.3	.4	.4	.8	1.1	1.8	3.3	4.1	1.3	.7	1.34
1977	.4	.3	.2	.3	.5	.3	.4	.6	1.9	2.8	3.3	1.0	1.05
1978	.7	.4	.3	.7	1.3	3.8	3.8	3.6	4.2	5.4	2.6	1.0	2.38
1979	.6	.4	.3	.5	3.6	4.6	3.8	4.5	8.7	7.5	4.5	1.6	3.45
1980	.8	.6	.4	.7	1.9	2.8	2.4	2.7	4.6	4.5	2.1	1.0	2.09
1981	.6	.5	.2	.4	7.1	6.2	4.9	2.5	2.0	3.5	2.6	1.3	2.70
1982	.9	1.0	.4	.9	4.3	3.4	2.9	2.9	3.5	3.6	1.8	.9	2.24
1983	.6	.4	.3	.3	1.3	.8	1.8	2.4	2.0	2.6	2.0	.7	1.31
MEAN	.6	.5	.4	.5	1.6	2.1	2.1	2.5	3.6	3.8	2.3	1.1	1.80
MAX	1.0	1.0	.7	.9	7.1	6.2	4.9	4.8	8.7	7.5	4.5	2.0	3.45
MIN	.2	.2	.1	.1	.4	.3	.2	.6	1.3	1.4	.7	.5	.90

B.2.3. El Cacheo extended series.

EL CACHEO EXTENDED
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO MIJO

CATCHMENT AREA 158 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	2.8	2.2	1.7	2.3	1.5	4.0	3.9	5.0	9.4	13.1	5.1	3.0	4.57
1965	2.2	1.6	1.3	1.1	3.9	4.7	5.5	8.9	8.8	8.9	6.7	3.0	4.80
1966	2.2	1.5	1.4	2.2	7.6	7.3	7.8	6.5	5.3	9.4	7.4	3.8	5.27
1967	2.4	1.9	1.5	1.5	2.4	4.3	1.9	3.7	4.1	4.4	2.5	2.0	2.76
1968	1.5	1.3	1.2	1.0	2.9	9.2	6.7	5.6	8.0	4.6	4.1	2.4	4.09
1969	1.9	1.7	1.5	2.1	5.7	4.5	6.7	6.5	10.3	8.4	5.6	3.3	4.93
1970	2.2	1.8	1.4	1.2	3.6	7.1	4.8	6.1	17.2	9.9	5.4	3.1	5.37
1971	2.4	1.9	1.7	2.0	2.8	4.9	7.2	5.5	8.2	10.1	5.5	3.4	4.71
1972	2.8	2.3	3.6	2.8	5.4	8.8	5.4	4.4	9.1	6.9	4.0	2.8	4.91
1973	2.3	1.9	1.9	1.4	2.2	5.2	4.4	6.8	8.3	10.8	4.8	3.2	4.49
1974	2.4	2.2	2.5	2.0	3.8	5.3	2.2	1.9	7.2	9.4	5.0	3.7	4.02
1975	2.2	1.7	1.5	1.2	4.1	3.6	3.6	4.7	13.3	5.6	8.6	3.7	4.53
1976	2.3	1.8	1.5	1.5	1.3	3.6	2.2	3.4	4.0	7.3	3.6	3.1	3.03
1977	2.0	1.6	1.3	1.3	2.6	2.2	3.3	6.3	8.7	6.1	7.8	3.4	3.94
1978	2.3	1.6	2.0	8.0	9.1	11.7	7.7	5.9	5.9	5.7	3.8	2.9	5.59
1979	2.3	2.0	1.9	1.7	9.5	14.5	9.5	10.1	24.5	13.1	8.6	4.5	8.58
1980	3.4	2.8	2.5	3.2	4.8	6.7	6.0	7.7	10.6	11.0	4.8	3.2	5.62
1981	2.6	2.2	1.8	2.2	15.8	13.1	10.3	5.9	5.3	7.3	4.9	3.6	6.33
1982	3.3	3.3	2.0	2.2	7.4	8.9	6.0	6.2	7.6	4.4	3.5	2.6	4.84
1983	2.6	2.1	1.8	1.9	3.9	3.1	4.8	5.8	5.2	6.2	5.2	3.0	3.85
MEAN	2.4	2.0	1.8	2.1	5.0	6.6	5.5	5.9	9.0	8.1	5.3	3.2	4.81
MAX	3.4	3.3	3.6	8.0	15.8	14.5	10.3	10.1	24.5	13.1	8.6	4.5	8.58
MIN	1.5	1.3	1.2	1.0	1.3	2.2	1.9	1.9	4.0	4.4	2.5	2.0	2.76

B.2.3. El Aguacate extended series.

EL AGUACATE EXTENDED
MAIN RIVER: YAQUE DEL SUR

CATCHMENT AREA 311 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	4.1	3.4	2.9	3.5	2.7	5.5	5.3	6.5	11.3	15.4	6.6	4.4	6.03
1965	3.5	2.8	2.5	2.3	5.3	6.2	7.1	10.8	10.7	10.8	8.4	4.3	6.28
1966	3.4	2.7	2.6	3.4	9.4	9.1	9.6	8.1	6.9	11.3	9.1	5.2	6.80
1967	3.7	3.1	2.7	2.6	3.6	5.7	3.1	5.1	5.5	5.8	3.8	3.2	4.03
1968	2.7	2.4	2.3	2.1	4.2	11.1	8.4	7.2	9.8	6.1	5.5	3.7	5.50
1969	3.1	2.9	2.7	3.3	7.3	6.0	8.4	8.1	12.4	10.3	7.1	4.7	6.42
1970	3.4	2.9	2.5	2.4	5.0	8.8	6.3	7.7	20.0	11.9	7.0	4.5	6.91
1971	3.6	3.1	2.9	3.2	4.1	6.4	9.0	7.1	10.0	12.1	7.0	4.8	6.18
1972	4.1	3.5	4.9	4.1	6.9	10.7	6.9	5.9	11.1	8.6	5.4	4.1	6.40
1973	3.5	3.1	3.1	2.6	3.4	6.7	5.9	8.5	10.1	12.9	6.3	4.5	5.94
1974	3.7	3.4	3.8	3.2	5.1	6.8	3.4	3.1	8.9	11.4	6.5	5.1	5.42
1975	3.4	2.9	2.7	2.4	5.5	5.0	4.9	6.1	15.6	7.2	10.5	5.1	5.99
1976	3.6	3.0	2.6	2.7	2.5	5.0	3.4	4.8	5.4	9.1	4.9	4.4	4.34
1977	3.2	2.7	2.4	2.4	3.9	3.4	4.6	7.9	10.6	7.8	9.6	4.8	5.33
1978	3.5	2.8	3.3	9.8	11.0	13.9	9.4	7.5	7.4	7.2	5.2	4.1	7.15
1979	3.5	3.2	3.1	2.9	11.5	16.9	11.4	12.2	27.9	15.5	10.5	5.9	10.44
1980	4.8	4.1	3.7	4.5	6.3	8.4	7.6	9.5	12.6	13.2	6.3	4.5	7.18
1981	3.8	3.4	3.0	3.4	18.4	15.4	12.4	7.5	6.8	9.1	6.4	5.0	7.96
1982	4.7	4.7	3.2	3.4	9.1	10.8	7.6	7.9	9.4	5.9	5.7	5.5	6.53
1983	4.4	3.5	3.0	3.0	5.3	4.4	5.7	6.8	7.2	6.8	5.6	3.7	4.99
MEAN	3.7	3.2	3.0	3.4	6.5	8.3	7.0	7.4	11.0	9.9	6.9	4.6	6.29
MAX	4.8	4.7	4.9	9.8	18.4	16.9	12.4	12.2	27.9	15.5	10.5	5.9	10.44
MIN	2.7	2.4	2.3	2.1	2.5	3.4	3.1	3.1	5.4	5.8	3.8	3.2	4.03

B.2.5. Palomino extended series.

PALOMINO EXTENDED
MAIN RIVER: YAQUE DEL SUR TRIBUTARY: RIO DEL MEDIO

CATCHMENT AREA 596 KM2

DISCHARGE, M3/S

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT	NOV	DES	YEAR
1961	-	-	-	-	-	-	-	-	-	-	-	-	-
1962	-	-	-	-	-	-	-	-	-	-	-	-	-
1963	-	-	-	-	-	-	-	-	-	-	-	-	-
1964	6.0	4.1	2.7	3.3	2.9	6.3	3.9	4.9	9.6	9.6	5.9	4.7	5.37
1965	3.5	2.5	2.2	2.2	8.7	10.2	8.3	8.9	9.3	9.3	8.0	5.1	6.58
1966	4.3	3.1	3.2	3.6	6.3	6.9	10.6	5.9	5.5	9.8	7.6	6.9	6.23
1967	5.8	5.2	3.6	3.2	3.3	4.9	3.4	4.3	5.2	5.0	4.7	3.2	4.34
1968	2.6	2.4	2.0	1.5	5.2	11.0	8.4	5.3	9.6	6.6	8.2	7.2	5.88
1969	4.2	3.1	2.6	4.5	9.0	6.2	8.2	6.3	12.8	14.1	10.6	6.3	7.38
1970	3.9	3.1	2.3	1.9	4.8	10.1	5.7	7.8	13.8	11.6	10.0	7.0	6.87
1971	4.0	3.2	2.3	3.6	5.3	4.6	5.0	4.4	8.7	7.4	4.3	3.5	4.74
1972	3.0	2.4	4.0	3.1	6.9	14.9	9.3	9.3	11.4	12.6	7.3	5.2	7.52
1973	3.0	2.6	2.3	2.3	2.9	8.0	6.0	6.8	12.1	13.7	7.7	5.2	6.11
1974	4.2	3.6	3.6	2.6	4.7	7.8	3.7	4.5	8.1	14.1	8.7	7.1	6.10
1975	4.8	3.9	3.6	2.7	4.7	4.9	4.3	4.5	8.1	6.1	12.7	11.1	6.00
1976	4.3	3.7	2.6	2.9	3.5	4.2	5.1	6.3	10.8	12.1	4.2	3.1	5.28
1977	2.1	1.8	1.5	1.7	3.9	2.0	1.3	1.7	6.6	8.4	12.9	5.1	4.13
1978	3.2	2.5	2.1	6.8	9.7	12.2	9.6	8.9	10.7	18.4	6.1	3.4	7.86
1979	3.2	2.8	2.7	2.4	13.3	20.1	13.2	14.1	34.0	18.3	12.0	6.3	11.92
1980	4.8	4.0	3.4	4.4	6.7	9.3	8.3	10.8	14.7	15.4	6.7	4.4	7.81
1981	3.6	3.1	2.5	3.1	22.0	18.2	14.4	8.3	7.4	10.2	6.8	5.1	8.80
1982	4.7	4.6	3.5	3.6	9.1	11.7	6.9	6.3	6.8	7.0	6.2	5.5	6.37
1983	4.3	3.7	2.5	4.8	7.2	8.3	7.3	7.4	7.1	7.6	5.2	2.8	5.74
MEAN	4.0	3.3	2.8	3.2	7.0	9.1	7.1	6.8	10.6	10.8	7.8	5.4	6.55
MAX	6.0	5.2	4.0	6.8	22.0	20.1	14.4	14.1	34.0	18.4	12.9	11.1	11.92
MIN	2.1	1.8	1.5	1.5	2.9	2.0	1.3	1.7	5.2	5.0	4.2	2.8	4.13

APPENDIX C EXTENDED SERIES: DURATION AND STORAGE/YIELD CURVES

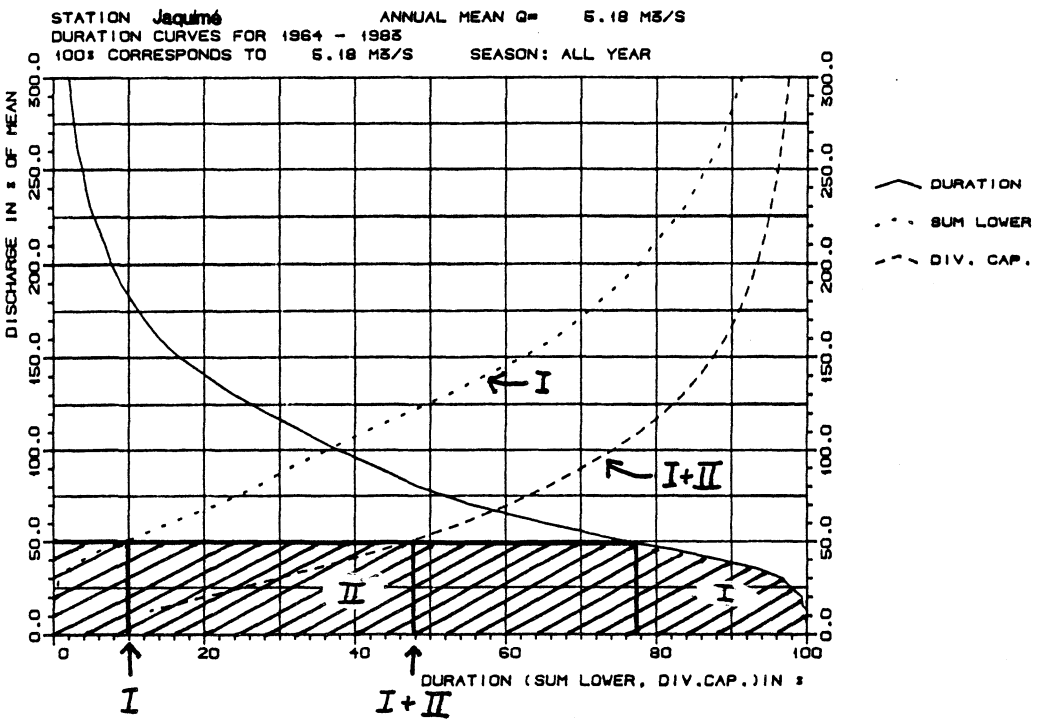
The duration curves are given as exceedance durations of normalized flow variate, ie flow in percentage of mean. Also displayed are two integral curves,

SUM LOWER: relative volume of flows less than spesified discharge variate

DIV.CAP: relative volume diverted by a diversion structure of spesified capacity.

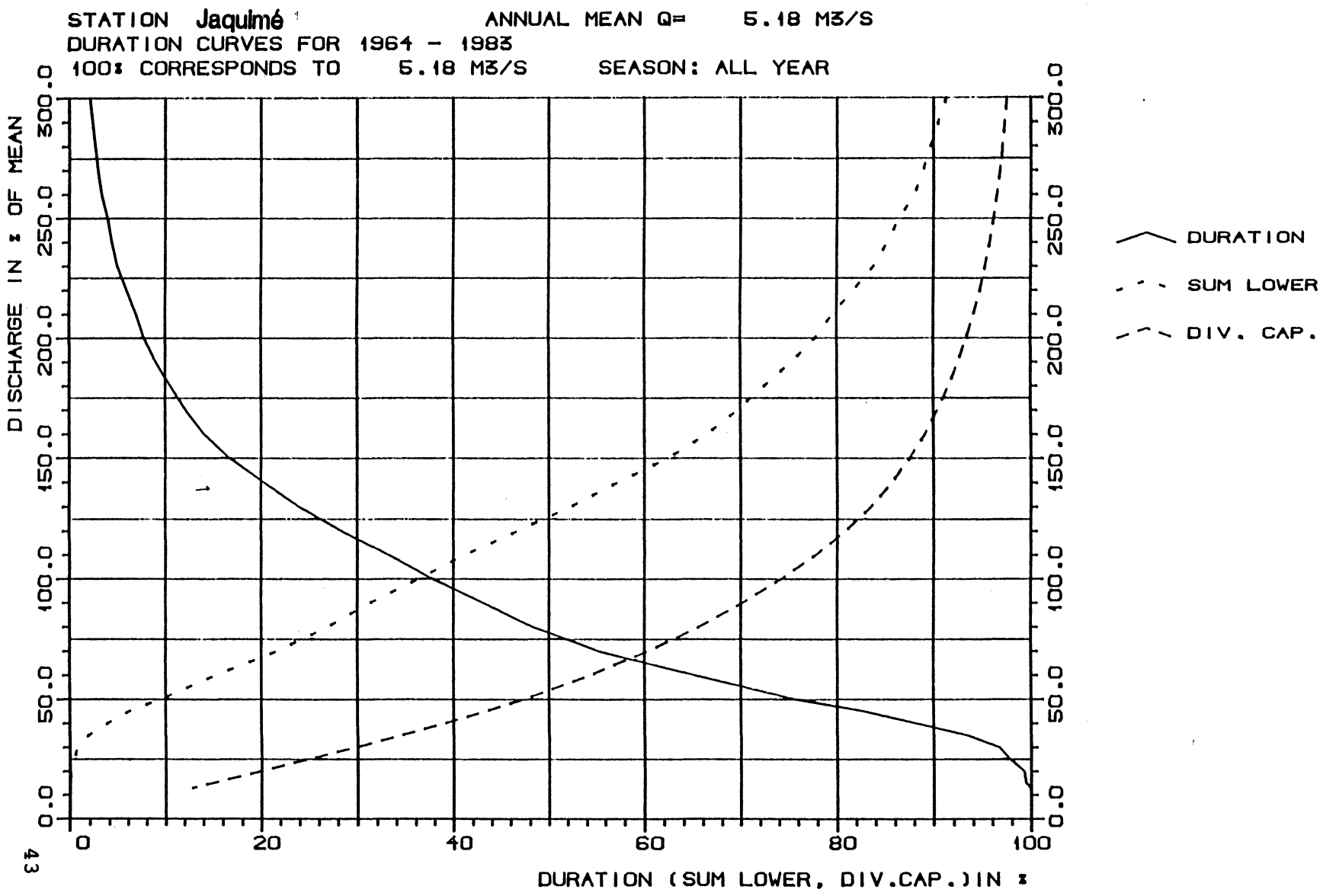
The construction of the integral curves is illustrated by the definition sketch below.

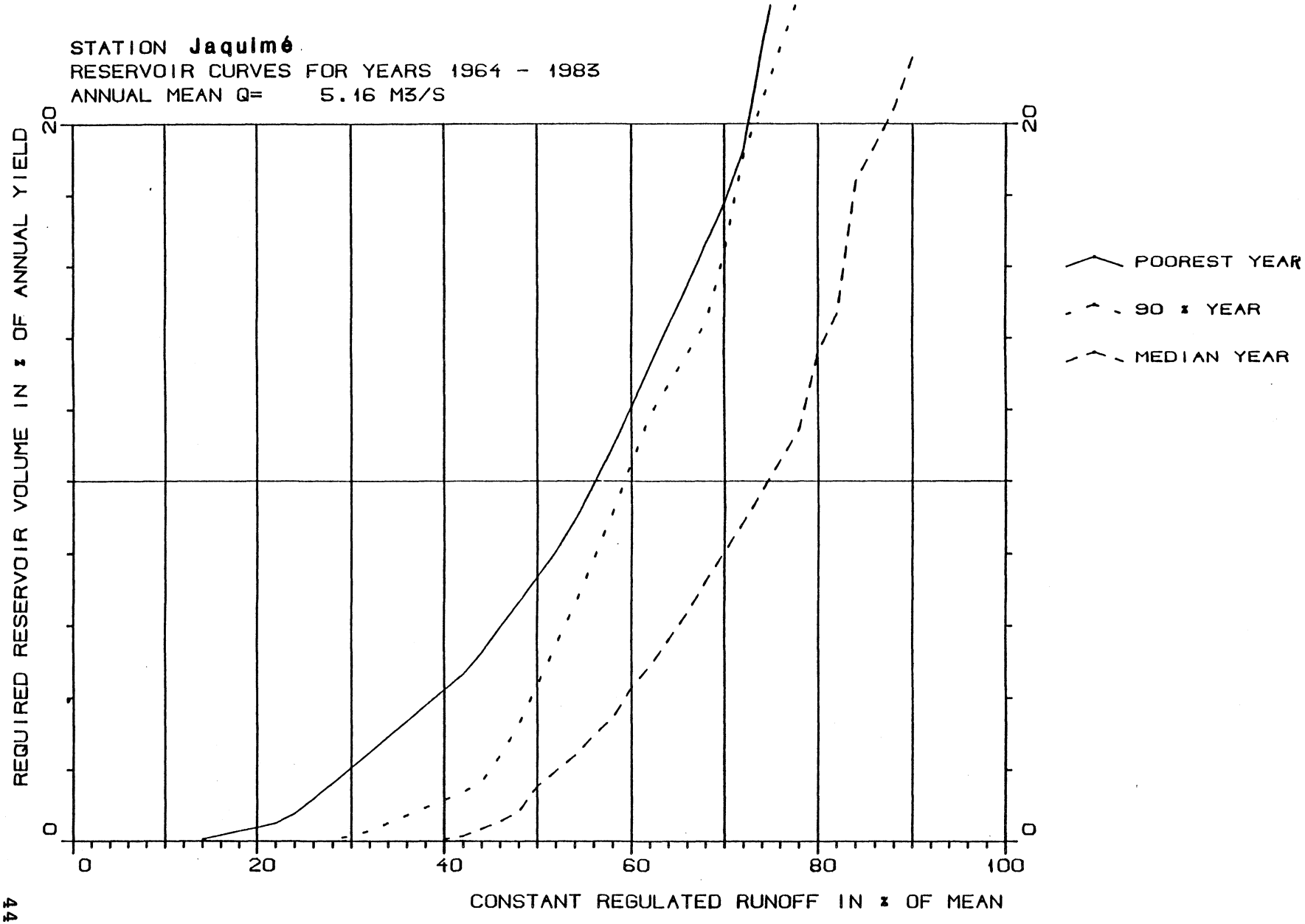
The storage yield curves specify the storage needed (relative to annual yield) to support a given constant regulated flow throughout the year. The storage curve is given for worst (driest) year, third worst year and median year. The storage specified by the third worst year would give deficit in approximately one in ten years, and the storage specified by the median year curve would give deficit in half of the years.



C.1. Jaquime extended series.

C.1.1. Duration curve.

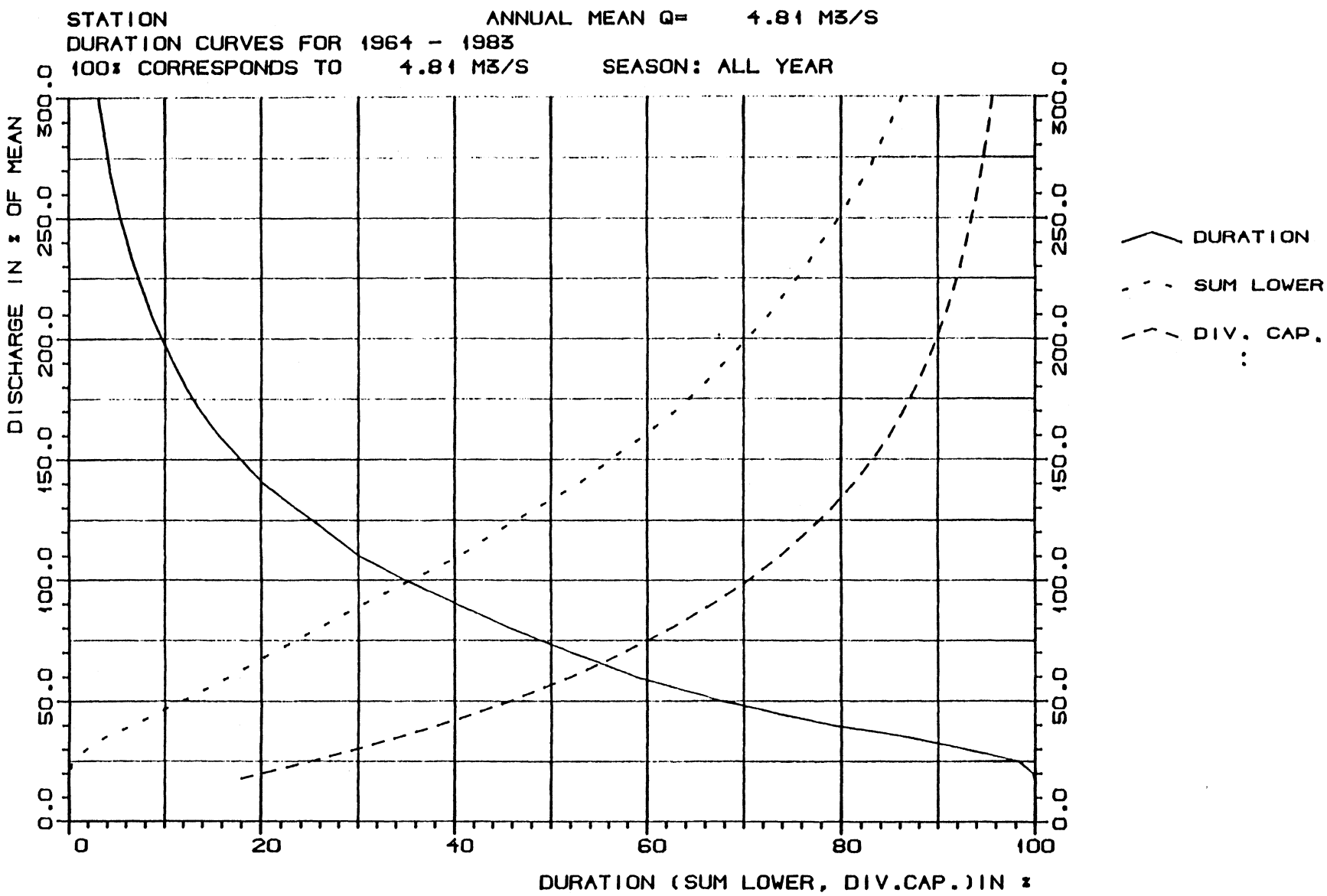




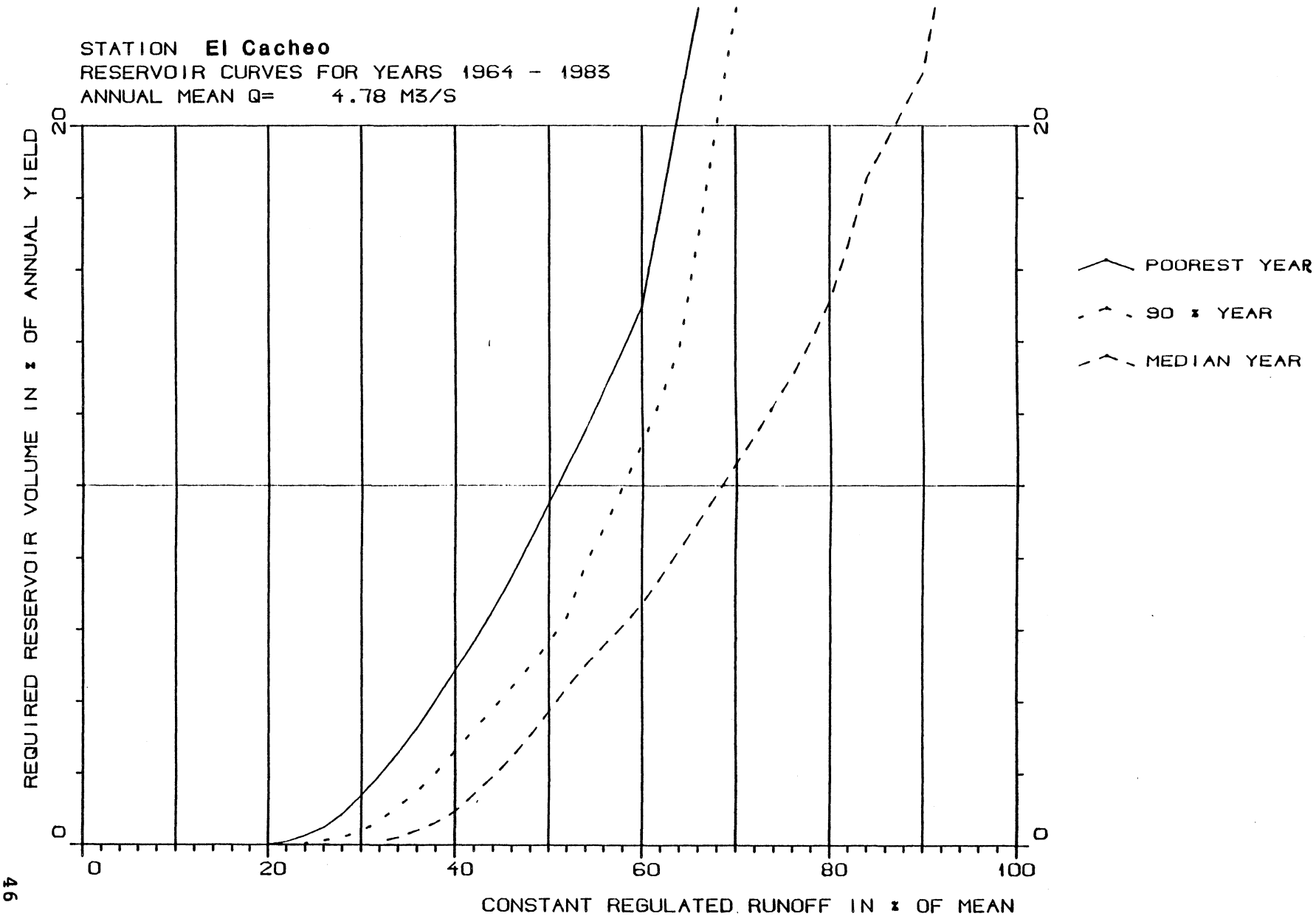
C.1.2. Storage/yield curves.

C.2. El Cacheo extended series.

C.2.1. Duration curve.

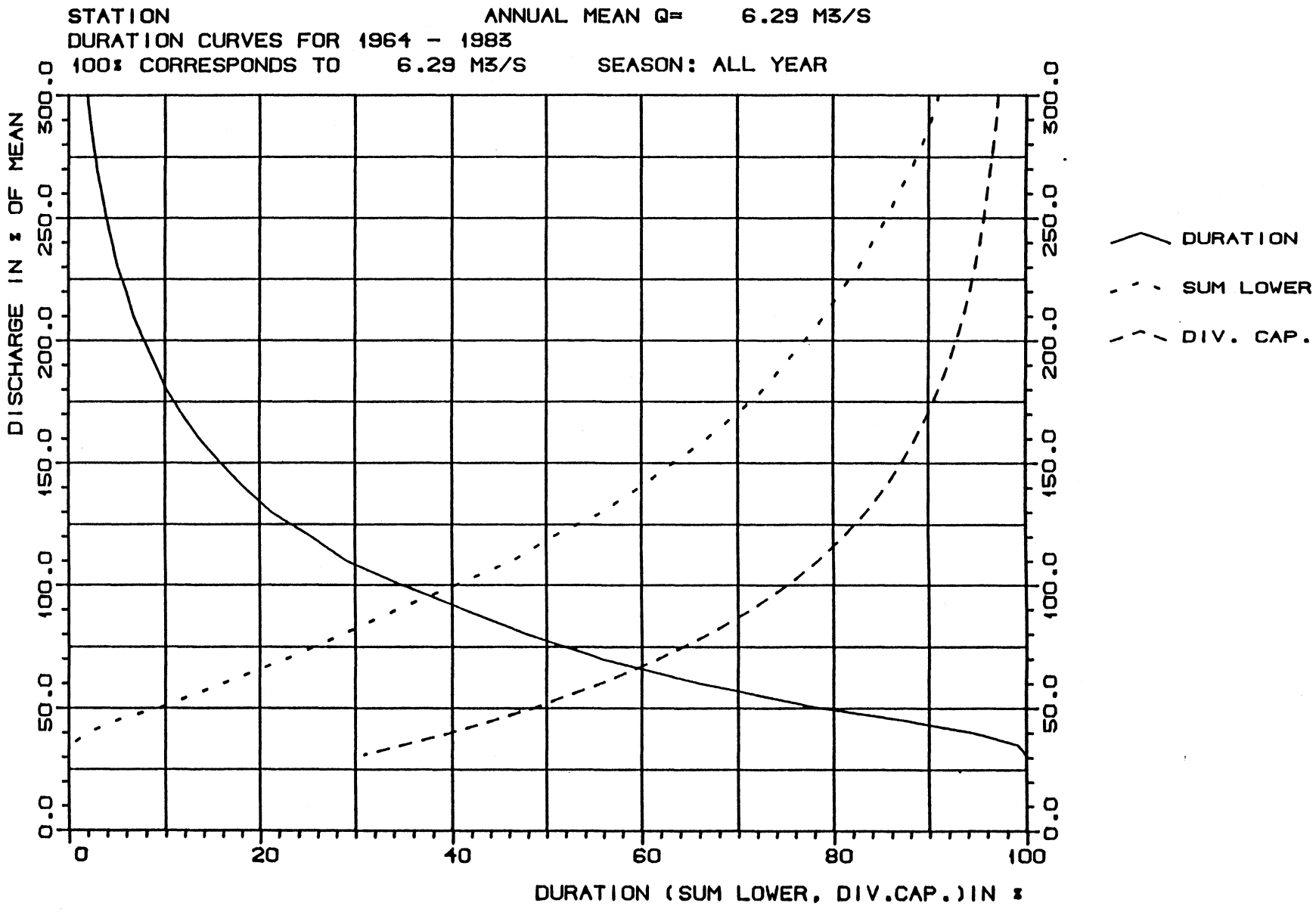


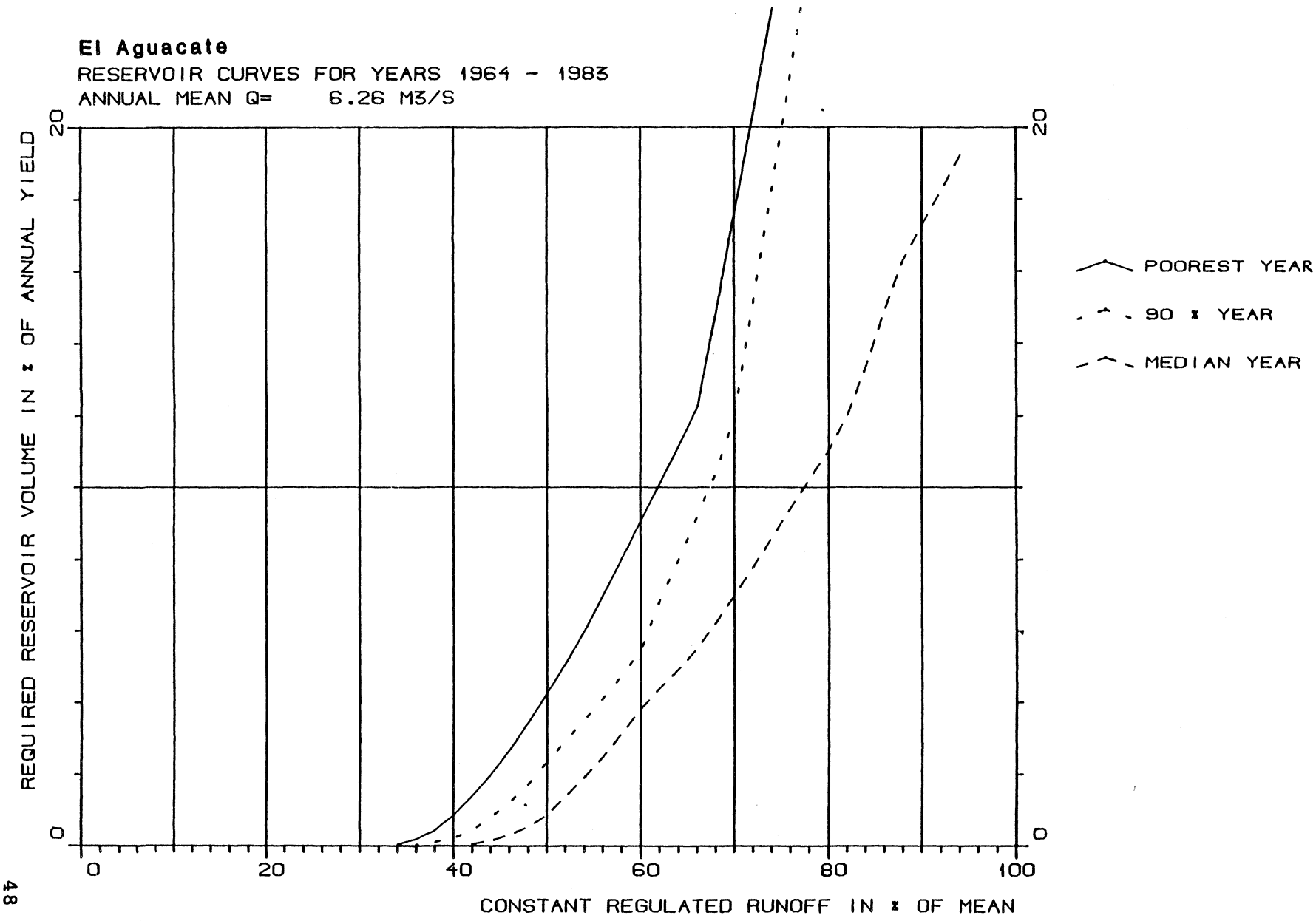
C.2.2. Storage/yield curves.



C.3. El Aguacate extended series.

C.3.1. Duration curve.

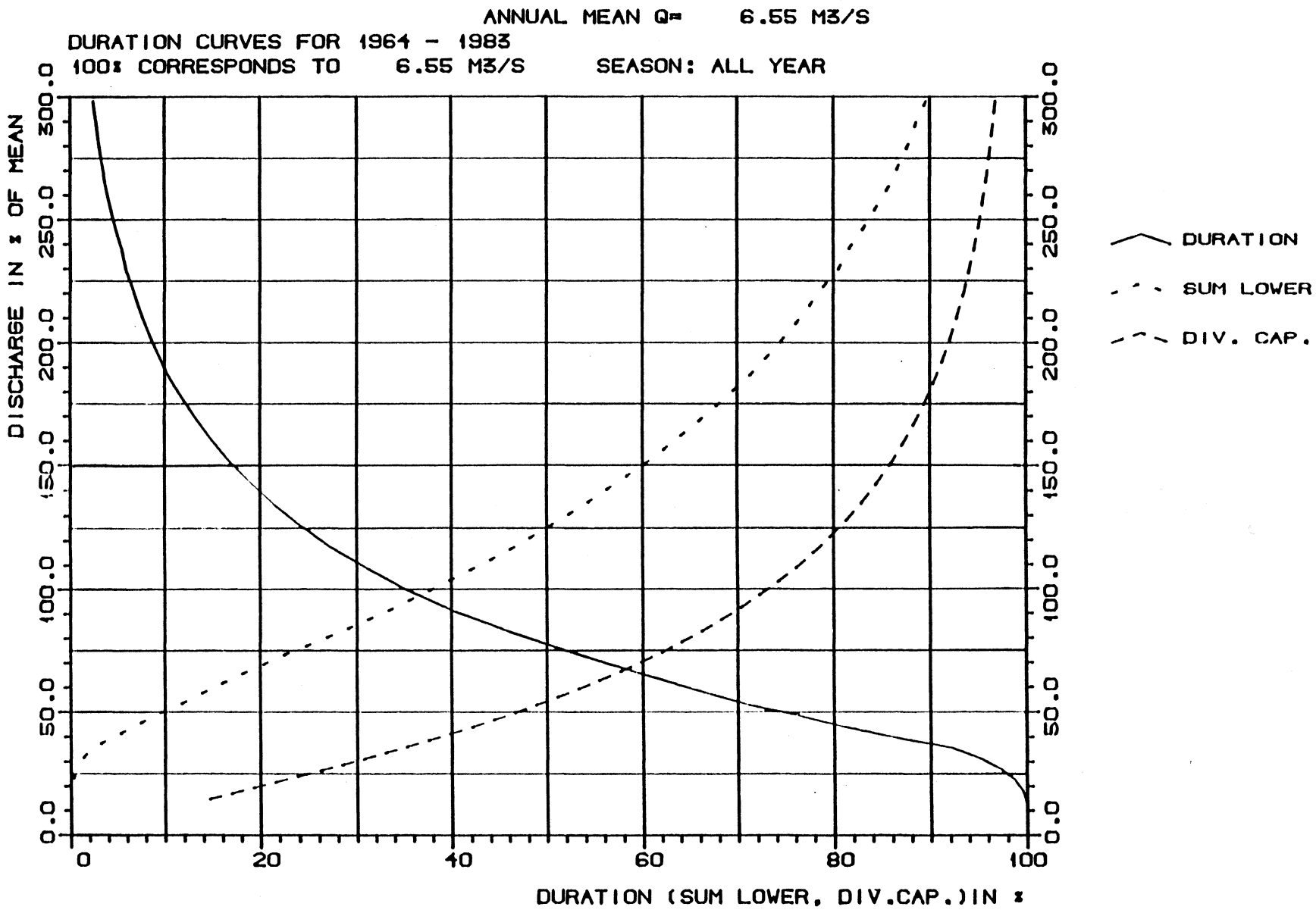




C.3.2. Storage/yield curves.

C.4. Palomino extended series.

C.4.1. Duration curve.



C.4.2. Storage/yield curves.