

1.3 Discharge

Table 1.15 ANNUAL MAXIMUM DISCHARGE AT SIMONGAN WEIR

Year	Date	Data max. H (m)	Head h=H-5.6 (m)	Center Portion Q1 (m ³ /s) =1.57*64.6m*h ^{1.5}	Side Portion Q2 (m ³ /s) =1.8*10.4m*h ^{1.5}	Discharge Q=Q1+Q2 (m ³ /s)
1961		7.9	2.3	353.8	65.3	419
1962		7.3	1.7	224.8	41.5	266
1963		9.4	3.8	751.3	138.7	890
1964		6.9	1.3	150.3	27.7	178
1965		7.4	1.8	244.9	45.2	290
1966		x	x	x	x	x
1967		x	x	x	x	x
1968		6.6	1.0	101.4	18.7	120
1969		7.1	1.5	186.3	34.4	221
1970		7.0	1.4	168.0	31.0	199
1971		7.0	1.4	168.0	31.0	199
1972		6.9	1.3	150.3	27.7	178
1973		6.9	1.3	150.3	27.7	178
1974		7.8	2.2	331.0	61.1	392
1975		6.9	1.3	150.3	27.7	178
1976		7.9	2.3	353.8	65.3	419
1977		7.5	1.9	265.6	49.0	315
1978		7.5	1.9	265.6	49.0	315
1979		7.2	1.6	205.3	37.9	243
1980		6.7	1.1	117.0	21.6	139
1981		8.1	2.5	400.9	74.0	475
1982		7.7	2.1	308.6	57.0	366
1983		7.4	1.8	244.9	45.2	290
1984		7.3	1.7	224.8	41.5	266
1985		8.2	2.6	425.2	78.5	504
1986		7.4	1.8	244.9	45.2	290
1987	Dec.21	7.70	2.1	308.6	57.0	366
1988	Mar.25	7.80	2.2	331.0	61.1	392
1989	Feb.05	7.60	2.0	286.9	52.9	340
1990	Jan.26	9.40	3.8	751.3	138.7	890
1991	Jan.09	8.25	2.7	437.5	80.8	518
1992	Jan.09	8.05	2.5	388.9	71.8	461
1993	Jan.30	9.10	3.5	664.1	122.6	787
1994	Mar.11	7.50	1.9	265.6	49.0	315
1995	Nov.29	7.65	2.1	297.7	54.9	353
1996	Dec.02	7.90	2.3	353.8	65.3	419

Note : Max. H means annual maximum water level by watching at site.

Water level data were given by RANTING DINAS (DOLOG PENGGARON)

Gates at side portions are closed even at flood time.

Table 1.16 PROBABLE PEAK DISCHARGE AT SIMONGAN

Return Period T (year)	Gumbel Variable Y	Probable Discharge (m ³ /s)	
		N=36 (1961-1996) Up-dated	N=30 (1961-1990) by Feasibility Study in 1993
2	0.36651	330	350
3	0.90273	416	
5	1.49994	512	520
8	2.01342	595	
10	2.25037	633	630
20	2.97020	748	740
25	3.19853	785	770
30	3.38429	815	800
40	3.67625	862	840
50	3.90194	898	880
60	4.08596	927	
80	4.37574	974	940
100	4.60015	1010	980
150	5.00730	1075	1,040
200	5.29581	1122	1,080

Note: $X = X_0 + Y*(1/a)$

$X_0 = 271.20$ $1/a = 160.60$

Table 1.17 PROBABLE PEAK DISCHARGE AND DESIGN DISCHARGE

(by Storage Function Method)

Return Period year	Design Storm		Area Reduction Factor	Peak Discharge at Simongan	
	Peak mm/hr	Total mm/day		Probable Discharge m3/s	After Dam Control m3/s
5	70.5	180.7	0.667	512	399
10	83.6	214.3	0.697	633	493
25	100.1	256.7	0.723	785	612
50	112.4	288.2	0.738	898	700
100	124.6	319.4	0.750	1,010	788

Table 1.18 MONTHLY DISCHARGE OBSERVED IN GARANG RIVER SYSTEM

Unit : m³/s

Panjangan Station in Garang River (A=192.6km ²)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1987	23.11	29.72	24.66	12.05	6.38	5.05	3.49	2.46	1.88	2.08	3.82	8.91	10.19
1988	16.21	20.73	22.69	10.68	6.66	2.95	2.53	1.70	1.75	3.51	4.17	11.42	8.73
1989	9.86	49.14	16.50	10.65	9.44	10.19	3.92	3.03	1.88	4.06	7.39	15.20	11.51
1990	40.18	14.76	12.71	7.77	7.07	5.22	3.55	3.05	2.15	1.67	2.63	13.52	9.54
1991	18.50	22.22	17.18	18.73	6.32	3.30	2.73	1.44	1.36	1.29	5.75	9.57	8.94
1992	9.97	11.79	12.07	14.13	9.62	7.18	5.34	6.27	6.50	6.65	5.11	14.77	9.11
1993	27.47	38.99	22.74	21.12	5.26	6.07	2.76	3.29	3.07	2.71	2.27	4.17	11.47
1994	15.14	12.38	27.17	16.31	7.23	3.88	2.98	2.26	1.64	3.03	3.51	4.49	8.32
1995	13.68	13.69	15.68	8.30	8.04	6.92	2.91	2.89	1.33	1.66	12.62	15.11	8.54
1996	14.95	28.09	21.55	10.93	7.18	5.22	2.79	3.07	3.01	5.58	10.67	16.37	10.73
Average	18.91	24.15	19.30	13.07	7.32	5.60	3.30	2.95	2.46	3.22	5.79	11.35	9.71

Unit : m³/s

Patemon Station in Garang River Upstream (A=75.0km ²)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1992	X	X	2.60	4.13	2.83	1.87	1.11	1.87	1.70	1.64	2.18	3.19	2.30
1993	11.00	8.28	5.70	5.18	2.04	2.53	1.18	0.94	0.91	0.88	1.31	2.11	3.48
1994	9.51	4.54	10.10	7.03	2.05	1.04	0.81	0.60	0.34	0.25	0.39	1.62	3.19
1995	4.40	7.19	8.28	8.97	6.03	8.39	3.43	0.82	0.79	1.09	3.92	4.79	4.81
1996	4.09	8.06	12.30	6.20	3.53	2.24	1.59	1.64	1.28	1.66	3.36	8.74	4.55
Average	7.25	7.02	7.80	6.30	3.30	3.21	1.62	1.17	1.00	1.10	2.23	4.09	3.67

Unit : m³/s

Kalipancur Station in Kreo River (A=66.1km ²)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1992	X	X	6.74	6.79	4.40	2.71	1.14	2.13	1.91	1.88	2.09	7.65	3.66
1993	16.71	13.74	9.19	10.54	5.38	8.26	7.17	7.59	6.79	5.97	4.91	4.50	8.36
1994	14.25	8.39	15.50	9.63	3.03	0.81	0.74	0.56	0.55	0.60	0.98	2.20	4.76
1995	2.75	2.94	4.92	3.38	2.88	4.27	2.60	2.04	0.97	0.92	2.92	9.41	3.34
1996	6.59	10.51	10.52	6.37	4.83	3.16	0.71	0.92	0.79	1.33	2.25	3.22	4.24
Average	10.08	8.90	9.37	7.34	4.10	3.84	2.47	2.65	2.20	2.14	2.63	5.40	4.87

Table 1.19 FLOW REGIME AND BALANCE IN OBSERVED DAILY DISCHARGE RECORDS

Year	Days	Flow Regime										Annual Run-off (1) mm	No.65c Rainfall (2) mm	Annual Rainfall (mm) (2)*0.99	Annual Loss (3)-(1) mm	Run-off Ratio (%)
		Max (m3/s)	25% (m3/s)	50% (m3/s)	75% (m3/s)	95% (m3/s)	99% (m3/s)	Min (m3/s)	Mean (m3/s)							
1987	365	99.20	11.10	5.35	2.62	1.77	1.64	1.50	10.19	1.668	3.057	3,026	1,358	55		
1988	366	123.00	11.00	4.80	2.11	1.48	1.36	0.64	8.73	1,433	2,538	2,513	1,080	57		
1989	365	187.00	12.50	8.51	3.41	1.82	1.57	1.28	11.51	1,885	3,441	3,407	1,522	55		
1990	365	201.00	9.72	6.02	2.50	1.40	1.30	1.30	9.54	1,562	2,713	2,686	1,124	58		
1991	365	63.60	14.00	4.62	1.80	1.14	1.02	1.02	8.94	1,464	2,574	2,548	1,084	57		
1992	366	32.50	11.20	7.40	5.30	4.00	3.50	3.50	9.11	1,496	3,050	3,020	1,524	50		
1993	365	309.00	12.30	3.72	2.77	2.13	1.45	1.45	11.47	1,878	2,468	2,443	565	77		
1994	365	115.00	10.80	4.25	2.75	1.62	1.40	1.18	8.32	1,362	2,642	2,616	1,254	52		
1995	365	45.40	10.80	6.80	2.75	1.18	0.52	0.52	8.54	1,398	2,723	2,696	1,298	52		
1996	366	53.80	15.00	7.40	3.25	2.50	2.28	2.06	10.73	1,762	2,789	2,761	999	64		
Average		122.95	11.84	5.87	2.93	1.90	1.60	1.45	9.71	1,591	2,800	2,772	1,181	58		
Q/100km2		63.84	6.15	3.05	1.52	0.99	0.83	0.75	5.04							

(1)=Mean*Days*86.4/A

Patemon Station in Garang River Upstream (A=75.0km2)

1992	366	22.50	2.37	1.50	1.22	1.10	0.95	0.74	2.30	970	3,050	3,142	2,172	31
1993	365	106.00	4.27	1.44	0.98	0.75	0.71	0.63	3.48	1,463	2,468	2,542	1,079	58
1994	365	50.50	4.40	1.01	0.53	0.23	0.21	0.21	3.19	1,341	2,642	2,721	1,380	49
1995	365	21.50	7.12	4.62	1.07	0.74	0.71	0.65	4.81	2,023	2,723	2,805	782	72
1996	366	28.80	6.30	3.10	1.46	1.22	1.14	1.10	4.55	1,918	2,789	2,873	955	67
Average		45.86	4.89	2.33	1.05	0.81	0.74	0.67	3.67	1,543	2,734	2,816	1,273	55
Q/100km2		61.15	6.52	3.11	1.40	1.08	0.99	0.89	4.89					

(2)*1.03

Kalipancur Station in Kreo River (A=66.1km2)

1992	366	16.70	5.00	2.82	1.17	0.95	0.95	0.87	3.66	1,751	3,050	3,050	1,299	57
1993	365	134.00	8.40	6.80	5.00	3.82	3.40	3.00	8.36	3,989	2,468	2,468	-1,521	162
1994	365	40.00	8.00	1.25	0.65	0.50	0.42	0.30	4.76	2,271	2,642	2,642	371	86
1995	365	21.90	4.20	2.30	1.17	0.87	0.72	0.40	3.34	1,593	2,723	2,723	1,130	59
1996	366	17.30	6.50	3.20	0.95	0.65	0.50	0.47	4.24	2,028	2,789	2,789	761	73
Average		45.98	6.42	3.27	1.79	1.36	1.20	1.01	4.87	2,326	2,734	2,734	408	87
Q/100km2		69.56	9.71	4.95	2.70	2.05	1.81	1.52	7.37					

(2)*1.00

Table 1.20(1/3) 5-DAYS DISCHARGE AT PANJANGAN IN GARANG RIVER

by Tank Model (A=192.6 km ²)							Unit: m ³ /s						
Year	1-5	5-10	10-15	15-20	20-25	25-31	Year	1-5	5-10	10-15	15-20	20-25	25-31
1967							1972						
Jan	30.217	20.746	8.392	12.758	9.472	9.883	Jan	21.397	23.726	65.685	46.327	13.007	10.310
Feb	30.350	84.102	19.676	9.312	6.770	9.807	Feb	7.569	6.013	7.138	8.358	26.087	32.360
Mar	6.745	14.682	17.950	11.106	14.289	18.566	Mar	19.012	29.806	17.643	23.143	27.982	28.253
Apr	37.578	14.250	16.112	12.420	15.906	26.187	Apr	12.136	8.570	7.576	6.981	7.045	6.857
May	9.969	7.144	15.138	6.989	6.313	5.682	May	6.516	15.654	11.131	7.753	6.618	6.014
Jun	5.454	5.248	5.047	4.850	4.658	4.469	Jun	5.667	5.465	5.268	5.075	4.886	4.946
Jul	4.281	4.093	3.909	3.729	3.553	3.364	Jul	4.742	4.442	4.259	4.080	3.904	3.716
Aug	3.174	3.003	2.835	2.670	2.509	2.336	Aug	3.527	3.356	3.189	3.025	2.864	2.692
Sep	2.158	1.993	1.832	1.673	1.519	1.367	Sep	2.514	2.350	2.189	2.031	1.877	1.725
Oct	1.222	1.081	1.005	1.241	0.973	0.946	Oct	1.580	1.453	1.414	1.388	1.362	1.334
Nov	0.940	0.933	5.733	1.720	0.988	4.192	Nov	1.308	1.287	4.988	11.525	5.059	3.613
Dec	4.033	9.637	25.054	11.790	7.462	17.417	Dec	6.942	2.945	4.826	3.481	11.871	10.380
1968							1973						
Jan	13.014	28.203	27.247	21.047	43.111	16.958	Jan	6.710	49.657	35.171	29.428	8.645	4.998
Feb	7.852	12.068	6.758	18.061	26.394	14.315	Feb	9.962	15.916	10.591	5.761	4.467	3.973
Mar	8.218	5.406	5.587	8.289	17.273	40.455	Mar	6.379	10.960	9.805	8.981	11.778	9.618
Apr	49.662	50.193	12.233	7.807	5.701	5.181	Apr	6.731	6.205	4.979	15.312	6.332	12.222
May	7.337	5.359	16.473	10.146	6.918	9.626	May	5.683	4.579	5.882	10.438	9.520	7.519
Jun	9.024	6.173	13.542	9.860	16.667	12.693	Jun	5.837	6.114	7.123	4.645	4.651	4.063
Jul	7.222	5.912	11.040	8.724	9.399	8.932	Jul	3.721	3.549	24.349	7.157	4.274	3.431
Aug	6.009	7.638	5.311	7.881	6.866	6.529	Aug	3.244	3.075	2.909	2.746	2.587	2.826
Sep	4.535	4.293	4.414	5.802	6.159	4.275	Sep	3.736	2.868	2.820	2.581	5.453	3.756
Oct	3.905	3.779	3.642	3.439	3.251	3.627	Oct	2.427	16.235	4.370	3.347	3.047	13.512
Nov	5.915	13.037	6.813	4.446	7.127	7.503	Nov	17.673	16.731	27.189	10.407	5.602	8.826
Dec	8.735	5.148	6.174	9.226	38.200	12.466	Dec	9.285	15.931	10.964	16.231	7.164	10.125
1969							1974						
Jan	6.445	11.996	10.636	25.478	32.387	17.748	Jan	9.631	6.288	42.923	42.462	15.573	11.128
Feb	27.542	15.574	13.276	54.026	51.037	24.727	Feb	15.871	9.654	8.633	11.706	18.262	10.824
Mar	33.866	15.371	13.134	33.854	37.036	50.550	Mar	15.458	26.761	21.155	40.081	43.457	16.588
Apr	80.459	21.614	42.584	20.174	53.628	20.367	Apr	13.483	31.876	20.748	9.421	7.224	10.493
May	11.654	9.056	9.483	7.847	7.534	7.267	May	10.774	24.309	10.370	7.659	6.332	6.054
Jun	7.003	18.622	7.956	6.734	6.470	6.245	Jun	5.822	5.613	5.410	5.239	5.074	4.903
Jul	6.020	6.722	5.955	6.321	6.111	5.257	Jul	4.733	4.541	5.411	4.364	4.138	4.037
Aug	5.026	4.817	4.613	4.413	4.217	4.007	Aug	3.858	3.677	4.588	3.479	3.437	4.231
Sep	3.793	3.596	3.403	3.214	3.243	2.950	Sep	4.430	7.949	5.113	3.263	2.991	2.813
Oct	5.196	7.143	3.291	2.722	6.772	5.291	Oct	4.191	11.946	23.456	9.644	17.621	6.028
Nov	8.009	12.246	10.825	5.086	4.025	3.628	Nov	5.820	4.149	3.860	3.108	14.790	10.845
Dec	2.971	15.984	6.072	24.911	21.053	14.484	Dec	4.941	9.223	12.710	28.855	20.569	15.039
1970							1975						
Jan	7.722	8.775	21.757	15.698	37.799	14.152	Jan	13.338	7.380	5.741	11.922	31.755	15.800
Feb	16.910	11.902	10.937	22.832	9.903	9.413	Feb	11.632	15.074	11.635	14.843	10.901	7.867
Mar	8.222	16.741	21.480	20.802	24.527	14.985	Mar	9.610	32.423	15.858	17.491	16.086	34.963
Apr	19.788	15.642	11.334	9.421	23.614	11.621	Apr	17.954	12.525	8.287	18.173	16.469	22.374
May	7.868	13.365	8.143	12.252	13.907	9.230	May	10.423	18.617	9.008	8.589	8.512	12.048
Jun	17.735	7.876	6.240	9.712	8.662	6.853	Jun	7.102	6.171	5.865	5.682	5.447	5.764
Jul	5.648	5.393	5.185	10.907	12.567	10.077	Jul	5.495	5.016	4.818	4.624	4.435	4.231
Aug	5.945	4.879	4.675	4.475	4.280	4.070	Aug	4.028	3.844	3.663	3.508	3.347	3.549
Sep	3.855	6.771	9.300	5.432	4.200	3.537	Sep	5.345	5.647	16.171	5.818	4.961	5.645
Oct	3.701	3.428	3.118	2.941	14.139	4.032	Oct	5.338	8.164	9.652	4.601	4.548	10.506
Nov	9.003	10.039	7.285	11.327	16.707	14.332	Nov	11.075	7.481	10.943	20.063	16.700	22.252
Dec	19.982	65.348	17.448	10.345	18.770	41.304	Dec	21.029	8.797	6.373	7.426	14.468	9.770
1971							1976						
Jan	19.791	20.875	26.203	48.728	21.626	62.317	Jan	40.029	30.030	23.932	16.529	96.741	33.956
Feb	18.267	26.393	37.750	17.895	27.865	32.505	Feb	15.048	15.604	13.591	18.595	38.903	27.148
Mar	22.004	25.461	37.930	14.267	12.949	18.543	Mar	38.088	23.533	55.371	44.809	20.458	11.777
Apr	24.181	21.450	31.522	26.411	20.009	10.711	Apr	9.690	8.433	7.620	7.892	7.711	7.918
May	10.913	30.705	16.234	9.914	8.122	7.857	May	7.021	6.860	6.687	6.450	6.236	6.005
Jun	10.809	28.052	13.164	8.737	15.680	12.464	Jun	5.777	5.817	6.735	5.391	5.171	4.979
Jul	8.324	7.430	7.197	6.817	6.583	6.330	Jul	4.787	4.596	4.409	4.226	4.047	3.861
Aug	6.079	5.853	5.632	5.415	5.203	4.976	Aug	3.680	3.505	3.334	3.166	3.002	2.901
Sep	4.744	4.643	4.439	6.491	4.557	4.041	Sep	2.747	2.577	2.410	2.247	2.087	1.931
Oct	8.146	5.203	8.580	8.443	10.237	8.387	Oct	1.780	1.733	1.594	2.175	1.627	1.406
Nov	4.591	6.926	10.858	21.747	19.294	8.602	Nov	1.566	1.526	1.846	14.166	11.475	8.986
Dec	15.054	11.578	14.420	9.405	9.548	7.364	Dec	3.966	7.685	13.560	6.660	4.870	4.173

Table 1.20(2/3) 5-DAYS DISCHARGE AT PANJANGAN IN GARANG RIVER

by Tank Model (A=192.6 km ²)							Unit: m ³ /s						
Year	1-5	5-10	10-15	15-20	20-25	25-31	Year	1-5	5-10	10-15	15-20	20-25	25-31
1977							1982						
Jan	9.586	7.942	7.306	29.846	15.707	19.312	Jan	4.068	8.194	6.012	27.796	8.646	13.677
Feb	12.146	13.239	6.414	5.496	6.565	40.436	Feb	14.241	9.736	14.563	10.275	9.144	5.535
Mar	29.005	47.121	15.455	26.245	23.196	16.121	Mar	22.604	37.975	26.588	24.961	15.142	20.317
Apr	7.829	6.670	10.454	8.086	17.461	8.323	Apr	44.064	29.939	21.869	8.638	8.363	18.988
May	5.810	4.884	4.701	4.522	8.834	15.372	May	8.888	6.040	5.023	4.830	4.643	4.411
Jun	13.023	12.316	8.561	5.520	4.490	4.311	Jun	4.242	4.062	3.886	3.714	3.516	3.381
Jul	4.131	3.952	3.777	3.605	3.437	3.257	Jul	3.215	3.050	2.889	2.730	2.575	2.409
Aug	3.076	2.912	2.751	2.594	2.440	2.274	Aug	2.241	2.090	1.941	1.795	1.652	1.499
Sep	2.103	1.945	1.789	1.638	1.489	1.346	Sep	1.340	1.192	1.053	1.001	0.975	0.949
Oct	1.286	1.260	1.235	1.209	1.183	1.156	Oct	0.924	0.899	0.875	0.850	0.825	0.799
Nov	5.645	5.451	2.219	3.156	1.609	1.328	Nov	10.506	2.354	1.174	1.239	0.869	0.823
Dec	13.924	8.459	4.243	4.606	8.579	29.116	Dec	1.075	5.598	7.451	4.805	1.930	7.285
1978							1983						
Jan	47.722	14.487	19.136	25.221	35.694	33.829	Jan	20.303	17.622	20.027	22.114	8.553	5.334
Feb	22.264	30.208	33.380	13.618	19.541	11.589	Feb	9.514	7.317	4.669	9.216	4.035	8.279
Mar	10.075	7.130	11.837	18.959	38.403	23.474	Mar	8.812	6.458	18.834	5.546	3.888	3.132
Apr	8.767	7.076	8.880	6.412	5.725	5.204	Apr	5.459	5.582	14.018	16.583	12.491	5.318
May	5.084	4.880	6.372	7.308	7.091	4.969	May	12.331	14.735	18.662	9.943	7.198	7.017
Jun	4.569	5.180	4.464	6.134	4.564	4.948	Jun	4.792	3.742	3.539	3.353	3.187	3.024
Jul	4.778	4.461	7.637	4.530	3.867	3.688	Jul	2.861	2.699	2.540	2.383	2.231	2.067
Aug	4.078	3.646	3.334	3.203	3.030	2.848	Aug	1.902	1.752	1.606	1.462	1.322	1.171
Sep	9.279	7.370	6.574	4.658	4.469	2.996	Sep	1.014	0.868	0.759	0.731	0.706	0.681
Oct	5.219	6.698	3.470	3.761	3.587	2.616	Oct	7.310	2.890	0.896	7.252	15.301	14.880
Nov	3.922	3.736	2.921	4.800	3.944	3.165	Nov	4.484	2.092	1.298	1.104	5.727	36.950
Dec	3.873	11.862	9.222	5.768	7.692	6.249	Dec	16.337	4.698	4.795	2.409	1.602	3.480
1979							1984						
Jan	23.404	47.044	33.077	18.147	9.394	13.393	Jan	5.887	8.378	3.630	2.831	8.845	5.662
Feb	31.522	43.138	17.150	21.880	32.775	14.208	Feb	22.870	20.025	28.346	24.439	11.082	6.397
Mar	9.501	17.370	23.338	33.669	15.225	11.723	Mar	18.045	24.483	7.305	5.647	4.399	3.474
Apr	10.589	27.756	44.436	18.063	18.855	11.263	Apr	3.238	3.438	5.905	4.490	3.683	3.404
May	9.243	15.693	12.163	9.530	14.462	8.750	May	3.045	2.874	2.760	2.647	3.372	2.635
Jun	12.924	15.676	8.750	6.770	6.184	5.967	Jun	2.380	2.853	7.442	3.007	2.162	2.020
Jul	5.750	5.535	6.276	5.391	5.068	4.969	Jul	3.618	1.960	1.804	3.028	1.928	1.685
Aug	4.757	5.072	4.449	4.254	4.063	3.859	Aug	1.514	1.502	1.402	1.192	1.056	1.568
Sep	3.649	3.457	4.355	3.474	3.098	6.899	Sep	5.640	20.467	11.767	21.448	12.871	4.219
Oct	10.009	5.410	3.392	2.950	2.853	3.141	Oct	2.858	2.336	1.770	1.616	1.909	1.686
Nov	5.566	6.144	5.302	3.018	3.008	15.938	Nov	2.101	1.911	4.747	3.638	4.191	10.383
Dec	6.530	7.210	4.007	3.168	3.480	6.803	Dec	17.618	10.438	11.748	8.118	8.595	13.752
1980							1985						
Jan	8.791	7.234	19.980	14.141	105.25	23.267	Jan	6.500	4.693	3.737	2.899	2.800	2.516
Feb	9.430	17.905	15.130	14.249	13.978	9.079	Feb	2.356	2.244	6.594	5.115	25.695	9.594
Mar	6.732	8.800	7.773	24.110	15.723	15.202	Mar	7.991	8.062	4.518	4.301	4.998	3.706
Apr	9.479	10.304	10.217	29.126	18.018	16.135	Apr	3.230	3.087	3.558	9.831	14.482	6.712
May	18.699	10.897	7.120	5.653	5.363	22.773	May	3.684	2.885	2.698	2.828	2.446	2.288
Jun	9.046	6.147	5.201	5.005	4.814	4.626	Jun	2.131	1.989	1.850	1.714	1.581	1.451
Jul	4.438	4.251	4.068	3.890	3.714	6.518	Jul	1.608	1.365	1.567	1.149	5.027	1.683
Aug	6.803	7.567	14.109	5.237	3.699	3.390	Aug	2.207	1.379	0.998	0.865	0.784	1.972
Sep	3.192	3.009	4.718	2.974	2.686	2.514	Sep	6.607	5.338	1.661	0.829	0.686	0.640
Oct	2.349	2.188	2.053	1.904	3.290	16.340	Oct	0.613	0.589	1.013	0.822	9.693	9.260
Nov	17.408	6.234	14.110	5.288	8.208	22.050	Nov	8.246	3.954	4.292	4.424	2.359	9.971
Dec	22.048	23.960	11.479	7.462	52.725	17.407	Dec	28.093	8.130	3.786	2.131	4.805	14.546
1981							1986						
Jan	9.558	13.085	23.766	12.916	10.973	16.597	Jan	8.083	10.428	19.642	38.780	20.007	25.456
Feb	27.463	8.907	15.392	15.071	13.861	22.614	Feb	15.278	6.604	4.929	14.522	12.160	9.508
Mar	9.426	8.350	11.222	6.954	5.470	5.021	Mar	14.620	70.306	13.999	19.466	13.280	12.373
Apr	4.825	4.649	4.477	4.308	4.143	3.982	Apr	14.144	11.831	11.961	9.924	6.137	4.805
May	6.859	13.889	6.700	8.002	5.954	4.171	May	4.533	4.345	7.107	4.816	4.198	4.076
Jun	3.792	3.625	3.642	3.391	6.121	9.434	Jun	4.548	3.991	6.735	11.691	10.924	6.245
Jul	4.723	7.059	4.382	19.889	5.046	3.998	Jul	4.778	3.708	3.530	3.422	3.233	3.721
Aug	3.427	3.197	3.029	2.864	2.703	2.530	Aug	3.150	5.362	3.104	2.796	4.645	4.856
Sep	2.351	2.186	2.024	1.866	1.711	1.559	Sep	2.583	2.618	3.846	2.979	3.907	2.580
Oct	1.413	1.273	1.206	1.181	1.155	1.128	Oct	2.201	2.038	3.611	1.958	1.761	4.888
Nov	1.102	1.081	1.061	1.040	1.059	4.039	Nov	5.060	7.249	3.787	2.783	1.839	2.977
Dec	9.031	11.583	8.071	19.455	11.823	13.038	Dec	1.846	1.615	5.770	3.505	3.719	10.964

Table 1.20(3/3) 5-DAYS DISCHARGE AT PANJANGAN IN GARANG RIVER

by Observation (A=192.6 km²) Unit: m³/s

Year	1-5	5-10	10-15	15-20	20-25	25-31	Year	1-5	5-10	10-15	15-20	20-25	25-31
1987							1992						
Jan	7.528	7.856	23.920	45.620	24.620	28.133	Jan	6.440	12.980	12.720	7.360	10.380	9.967
Feb	10.902	29.680	40.820	31.640	37.860	25.867	Feb	13.840	10.820	9.400	14.480	12.420	9.250
Mar	34.160	21.680	11.480	16.340	29.020	33.533	Mar	9.780	13.580	14.560	17.440	9.440	8.367
Apr	9.954	17.996	19.200	8.650	9.514	6.992	Apr	16.160	12.800	21.240	10.720	12.400	11.440
May	7.300	7.842	6.436	6.458	4.752	5.665	May	7.340	8.440	10.960	7.520	7.380	15.000
Jun	6.578	6.854	4.430	4.020	3.814	4.596	Jun	11.220	10.480	6.500	5.180	5.060	4.620
Jul	4.206	3.356	3.150	3.672	3.218	3.342	Jul	5.420	5.480	6.440	5.310	4.750	4.750
Aug	2.762	2.700	2.490	2.310	2.284	2.245	Aug	5.260	4.450	5.300	3.700	9.680	8.750
Sep	1.798	1.962	1.988	1.798	1.718	2.018	Sep	7.240	9.100	8.240	5.600	4.420	4.400
Oct	2.212	1.910	1.826	2.898	1.962	1.728	Oct	7.900	10.160	5.080	5.910	5.840	5.300
Nov	1.772	3.078	2.230	3.276	5.120	7.436	Nov	4.990	6.620	3.550	3.900	5.910	5.690
Dec	6.550	7.198	7.714	10.756	14.828	6.822	Dec	21.680	17.500	24.820	12.800	8.000	5.658
1988							1993						
Jan	9.120	11.512	11.380	16.000	34.304	15.135	Jan	4.326	5.758	5.366	4.800	25.700	103.64
Feb	21.760	30.200	22.580	20.880	17.616	9.030	Feb	49.780	44.780	39.600	32.580	35.820	26.300
Mar	11.788	13.668	11.702	18.408	25.300	49.833	Mar	24.100	29.260	19.980	17.320	19.220	25.933
Apr	13.030	16.718	12.468	8.858	6.862	6.122	Apr	16.164	32.700	35.060	17.720	17.522	7.556
May	7.968	10.902	5.518	5.866	5.480	4.643	May	9.184	6.068	5.852	3.812	3.434	3.548
Jun	2.376	2.378	3.502	4.362	2.484	2.606	Jun	3.436	9.538	8.486	7.864	3.858	3.250
Jul	3.440	3.142	2.304	2.460	2.066	1.917	Jul	3.672	2.834	2.834	2.418	2.496	2.370
Aug	1.816	1.984	1.872	1.496	1.526	1.530	Aug	3.500	3.350	3.300	3.500	3.400	2.792
Sep	1.408	1.994	2.294	1.880	1.490	1.452	Sep	2.750	3.940	2.600	2.750	3.350	3.050
Oct	1.732	1.564	4.340	3.328	2.184	7.198	Oct	3.250	2.900	3.050	2.368	2.456	2.317
Nov	3.256	2.380	4.316	4.286	3.920	6.856	Nov	1.602	1.450	1.730	3.688	2.880	2.258
Dec	8.876	15.086	16.840	11.482	12.968	4.605	Dec	4.566	4.378	2.802	3.982	5.238	4.057
1989							1994						
Jan	10.336	12.436	7.122	8.154	10.516	10.460	Jan	7.680	12.800	21.680	22.020	13.120	13.800
Feb	52.940	54.660	25.900	38.480	86.740	27.400	Feb	12.000	14.160	14.480	9.320	12.800	10.933
Mar	29.880	17.060	11.084	9.994	17.280	14.183	Mar	11.120	27.560	24.840	11.160	55.840	31.617
Apr	9.076	11.500	6.380	9.904	13.588	13.480	Apr	16.240	14.280	20.500	18.800	17.300	10.720
May	8.822	9.504	8.816	16.320	4.412	8.903	May	10.400	8.800	8.580	5.900	5.600	4.600
Jun	13.420	8.782	9.518	12.160	10.902	6.354	Jun	4.450	4.350	3.650	3.650	3.700	3.500
Jul	3.852	7.534	4.922	2.334	2.744	2.552	Jul	3.450	3.250	3.050	2.900	2.750	2.583
Aug	4.242	3.894	2.976	2.726	2.290	2.195	Aug	2.600	2.650	2.456	2.236	1.972	1.730
Sep	2.134	1.834	1.706	1.484	1.864	2.232	Sep	1.664	1.796	1.620	1.620	1.620	1.512
Oct	4.192	2.816	2.080	4.760	4.098	6.032	Oct	1.356	2.192	2.500	3.650	4.150	4.133
Nov	3.014	2.898	8.076	11.480	6.984	11.906	Nov	5.050	3.350	3.050	2.550	2.750	4.340
Dec	17.420	11.648	13.060	22.718	8.316	17.555	Dec	3.072	8.290	4.452	2.706	5.560	3.150
1990							1995						
Jan	12.966	22.360	13.520	41.320	53.160	88.150	Jan	4.900	8.080	15.440	7.400	17.440	26.317
Feb	34.980	14.080	10.736	9.370	6.816	11.103	Feb	12.820	11.680	21.480	12.600	12.160	9.867
Mar	13.870	11.290	9.344	24.228	8.560	9.613	Mar	13.520	16.720	10.800	20.880	19.040	13.533
Apr	7.056	8.520	7.522	6.734	8.000	8.792	Apr	10.160	9.600	8.960	7.980	6.800	6.320
May	7.426	5.394	6.112	8.486	7.148	7.705	May	6.140	6.920	15.840	7.440	6.040	6.225
Jun	6.340	4.044	3.846	4.648	6.754	5.692	Jun	5.530	6.140	9.900	7.800	6.700	5.420
Jul	5.774	3.998	3.220	2.780	3.214	2.500	Jul	4.700	4.250	3.300	2.154	1.136	2.105
Aug	3.224	2.668	4.956	2.584	2.474	2.500	Aug	3.250	3.500	3.150	2.850	2.550	2.170
Sep	1.836	2.446	2.136	1.720	2.500	2.276	Sep	1.796	1.620	0.916	0.520	0.872	2.280
Oct	1.804	1.560	1.460	1.508	1.320	2.250	Oct	2.456	1.928	1.400	1.356	1.400	1.473
Nov	2.566	1.300	1.708	2.538	3.264	4.404	Nov	1.846	7.080	10.290	11.040	18.240	27.240
Dec	14.268	10.530	13.440	10.712	19.020	13.197	Dec	11.180	10.400	18.140	15.200	21.120	14.700
1991							1996						
Jan	22.860	27.820	8.092	13.590	15.700	22.183	Jan	13.680	16.800	10.080	14.320	17.640	16.817
Feb	18.600	18.740	28.760	21.800	27.920	14.367	Feb	20.800	27.260	32.820	31.040	20.720	37.850
Mar	15.600	19.140	20.500	19.720	13.580	15.000	Mar	29.980	32.700	27.160	14.480	16.720	10.467
Apr	26.260	14.910	14.320	14.440	27.420	15.040	Apr	8.980	9.260	10.800	16.920	11.920	7.680
May	12.350	6.964	6.442	5.530	3.712	3.483	May	8.360	7.220	6.740	7.360	6.710	6.750
Jun	3.128	3.098	3.386	3.648	3.516	3.034	Jun	5.250	6.090	5.400	4.870	4.754	4.970
Jul	3.192	3.004	2.990	2.790	2.370	2.175	Jul	3.100	3.100	2.706	2.476	2.650	2.708
Aug	1.800	1.542	1.356	1.380	1.308	1.260	Aug	2.750	3.562	2.956	3.000	3.056	3.083
Sep	1.806	1.332	1.500	1.212	1.236	1.092	Sep	2.650	3.860	3.050	2.950	3.000	2.568
Oct	1.068	1.236	1.236	1.380	1.434	1.345	Oct	2.236	4.238	3.450	3.750	3.350	14.667
Nov	2.226	3.084	7.598	5.538	8.818	7.244	Nov	9.170	13.480	7.280	7.180	20.800	6.130
Dec	12.144	9.184	9.622	5.534	7.518	12.760	Dec	16.480	21.460	22.660	11.920	11.200	14.833

Table 1.21 SUMMARY RECORD OF INTAKE DISCHARGE FOR MAINTENANCE

Unit : m³/s

Year	to Semarang River		to Left Channel		(Overflow to Floodway)	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
1987	0.306	0.306	0.102	0.102	58.6	0.0
1988	0.306	0.306	0.102	0.102	35.4	0.0
1990	0.412	0.306	0.200	0.102	3.2	0.0
1991	0.948	0.204	0.204	0.102	5.8	0.0
1992	0.640	0.153	0.209	0.054	35.3	0.0
1993	0.640	0.209	0.209	0.102	165.6	0.0
1994	0.880	0.107	0.209	0.054	10.5	0.0
1995	0.760	0.320	0.209	0.051	10.5	0.0
1996	0.760	0.410	0.209	0.153	8.9	0.0
1997	0.640	0.410	0.209	0.102	10.5	0.0
Average	0.629	0.273	0.186	0.092	34.4	0.0
Maximum	0.948	0.410	0.209	0.153	165.6	0.0

Note : Data by RANTING DINAS (Dolog Penggaron)

Missing Totally in 1989

Table 1.22 MONTHLY RECORDS OF INTAKE DISCHARGE FOR MAINTENANCE

Unit: m³/s

Year	Semarang River		Left Channel		(Overflow)		Year	Semarang River		Left Channel		(Overflow)			
	Month	Max.	Min.	Max.	Min.	Max.		Min.	Month	Max.	Min.	Max.	Min.		
1987	Jan	0.306	0.306	0.102	0.102	58.6	8.9	1987	Jan	0.640	(0.000)	0.209	(0.000)	165.6	0.0
	Feb	0.306	0.306	0.102	0.102	35.4	8.9		Feb	0.640	0.209			35.4	1.1
	Mar	0.306	0.306	0.102	0.102	12.5	3.2		Mar	0.640	0.425	0.209	0.209	8.9	0.0
	Apr			0.102	0.102	8.9	1.2		Apr	0.640	0.425	0.209	0.209	8.9	1.2
	May	0.306	0.306	0.102	0.102	12.5	3.2		May	0.640	0.425	0.209	0.209	5.8	0.0
	Jun	0.306	0.306	0.102	0.102	8.9	3.2		Jun	0.640	0.425	0.209	0.209	8.9	0.0
	Jul	0.306	0.306	0.102	0.102	8.9	1.2		Jul	0.530	0.316	0.209	0.102	3.2	0.0
	Aug	0.306	0.306	0.102	0.102	1.2	1.2		Aug	0.530	0.316	0.209	0.102	1.4	0.0
	Sep	0.306	0.306	0.102	0.102	1.2	0.0		Sep	0.640	0.425	0.209	0.153	1.4	0.0
	Oct	0.306	0.306	0.102	0.102	3.2	0.0		Oct	0.640	0.425	0.209	0.153	0.0	0.0
	Nov	0.306	0.306	0.102	0.102	12.5	1.2		Nov	0.640	0.530	0.209	0.209	3.7	0.0
	Dec	0.306	0.306	0.102	0.102	5.8	3.2		Dec	0.640	0.530	0.209	0.209	1.4	0.0
1988	Jan	0.306	0.306	0.102	0.102	35.4	3.2	1988	Jan	0.640	0.530	0.209	0.209	10.5	0.0
	Feb	0.306	0.306	0.102	0.102	35.4	3.2		Feb	0.640	0.530	0.209	0.153	6.7	1.4
	Mar	0.306	0.306	0.102	0.102	12.5	3.2		Mar	0.760	0.640	0.209	0.209	10.5	0.0
	Apr	0.306	0.306	0.102	0.102	8.9	1.2		Apr	0.880	0.640	0.209	0.209	10.5	0.0
	May	0.306	0.306	0.102	0.102	8.9	3.2		May	0.880	0.640	0.209	0.209	3.7	0.0
	Jun	0.306	0.306	0.102	0.102	3.2	0.0		Jun	0.760	0.640	0.209	0.209	1.4	0.0
	Jul	0.306	0.306	0.102	0.102	3.2	1.2		Jul	0.760	0.425	0.209	0.209	0.0	0.0
	Aug	0.306	0.306	0.102	0.102	0.0	0.0		Aug	0.425	0.209	0.209	0.102	0.0	0.0
	Sep			0.102	0.102	0.0	0.0		Sep	0.209	0.107	0.102	0.054	0.0	0.0
	Oct			0.102	0.102	3.2	1.2		Oct	0.425	0.153	0.102	0.054	1.4	0.0
	Nov			0.102	0.102	3.2	1.2		Nov	0.530	0.425	0.153	0.102	1.4	0.0
	Dec			0.102	0.102	5.8	1.2		Dec	0.760	0.425	0.209	0.153	3.7	0.0
1990	Jan							1990	Jan	0.640	0.530	0.209	0.209	3.7	1.4
	Feb								Feb	0.640	0.530	0.209	0.209	6.7	1.4
	Mar								Mar	0.760	0.640	0.209	0.209	3.7	1.4
	Apr								Apr	0.760	0.640	0.209	0.209	6.7	1.4
	May	0.306	0.306	0.102	0.102	3.2	1.2		May	0.760	0.640	0.209	0.209	10.5	0.0
	Jun			0.200	0.102	3.2	1.2		Jun	0.760	0.640	0.209	0.209	6.7	1.4
	Jul			0.153	0.102	1.2	0.0		Jul	0.640	0.410	0.209	0.102	1.4	0.0
	Aug								Aug	0.410	0.320	0.102	0.051	0.0	0.0
	Sep	0.412	0.306	0.153	0.102	3.2	1.2		Sep	0.410	0.320	0.102	0.102	0.0	0.0
	Oct								Oct	0.640	0.320	0.102	0.102	0.0	0.0
	Nov								Nov	0.760	0.640	0.153	0.102	8.9	0.0
	Dec								Dec	0.760	0.640	0.209	0.153	8.9	3.2
1991	Jan	0.412	0.306	0.153	0.102	5.8	3.2	1991	Jan	0.760	0.640	0.209	0.153	8.9	3.2
	Feb	0.412	0.306	0.204	0.153	5.8	3.2		Feb	0.760	0.410	0.209	(0.000)	8.9	0.0
	Mar	0.412	0.306	0.153	0.102	5.8	0.0		Mar	0.760	0.640	0.209	0.209	5.8	1.2
	Apr	0.412	0.306	0.153	0.102	3.2	1.2		Apr	0.760	0.640	0.209	0.209	3.2	0.0
	May	0.412	0.306	0.153	0.102	3.2	1.2		May	0.760	0.530	0.209	0.209	1.2	0.0
	Jun	0.948	0.306			3.2	1.2		Jun	0.760	0.640	0.209	0.209	1.2	0.0
	Jul	0.412	0.306	0.153	0.102	5.8	0.0		Jul						
	Aug	0.412	0.306	0.153	0.102	3.2	1.2		Aug						
	Sep	0.412	0.306	0.153	0.102	0.0	0.0		Sep						
	Oct	0.412	0.204	0.153	0.102	1.2	0.0		Oct						
	Nov	0.412	0.306	0.153	0.102	3.2	1.2		Nov						
	Dec	0.412	0.306	0.153	0.102	3.2	1.2		Dec						
1992	Jan	0.412	0.306	0.204	0.102	5.8	1.2	1992	Jan	0.640	(0.000)	0.209	0.102	10.5	3.7
	Feb	0.412	0.306	0.153	0.102	3.2	1.2		Feb						
	Mar	0.412	0.306	0.153	0.102	3.2	1.2		Mar						
	Apr	0.412	0.306	0.153	0.102	3.2	1.2		Apr	0.640	0.640	0.209	0.209	3.2	0.0
	May	0.412	0.306	0.153	0.102	3.2	1.2		May	0.640	(0.000)	0.209	0.102	5.8	1.2
	Jun	0.412	0.204	0.153	0.102	3.2	1.1		Jun	0.640	0.460	0.209	0.209	3.7	1.2
	Jul	0.209	0.153	0.153	0.054	1.2	0.0		Jul	0.640	0.410	0.209	0.209	3.7	0.0
	Aug	0.316	0.153	0.153	0.054	35.3	0.0		Aug	0.640	0.410	0.209	0.102	1.2	0.0
	Sep	0.425	0.209	0.153	0.153	1.1	0.0		Sep	0.640	0.410	0.209	0.153	0.0	0.0
	Oct	(3.660)	0.316	0.153	0.153	3.2	0.0		Oct						
	Nov	0.640	0.425	0.153	0.153	3.2	0.0		Nov						
	Dec	0.640	0.306	0.209	0.102	3.2	0.0		Dec						

Note: Data by RANTING DINAS (Dolog Penggaron).

() means Unusual Operation

Table 1.23 (1/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1987

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	7.99	9.82	65.70	10.20	7.99	4.89	5.58	2.80	1.77	2.62	1.77	4.02
2	6.27	9.19	29.00	9.49	5.12	7.99	4.43	2.97	1.77	2.18	1.64	4.89
3	6.80	11.50	34.00	9.49	8.29	7.10	3.85	2.80	1.77	2.18	1.64	5.35
4	8.59	11.50	22.40	9.49	7.70	7.10	3.67	2.62	1.91	2.04	2.04	7.99
5	7.99	12.50	19.70	11.10	7.40	5.81	3.50	2.62	1.77	2.04	1.77	10.50
6	5.81	43.00	17.80	9.19	4.43	6.27	3.32	2.62	1.91	1.91	2.04	7.99
7	4.89	31.00	24.00	9.49	4.89	10.80	3.32	2.45	1.91	1.91	3.15	7.10
8	9.19	33.50	17.40	21.30	10.80	6.04	3.50	2.31	2.04	1.91	3.15	7.99
9	8.59	22.80	29.50	26.00	10.20	5.58	3.32	3.32	2.04	1.91	4.43	5.81
10	10.80	18.10	19.70	24.00	8.89	5.58	3.32	2.80	1.91	1.91	2.62	7.10
11	20.50	32.50	13.80	26.50	5.81	4.89	3.15	2.62	2.04	2.04	2.31	10.50
12	23.60	28.00	11.80	27.00	6.80	4.66	3.15	2.62	2.04	1.91	2.45	8.59
13	25.00	35.80	10.80	15.90	6.27	4.20	3.15	2.45	2.04	1.77	2.31	6.80
14	22.00	44.20	10.50	12.80	6.50	4.20	3.15	2.45	1.91	1.77	2.04	5.58
15	28.50	63.60	10.50	13.80	6.80	4.20	3.15	2.31	1.91	1.64	2.04	7.10
16	35.80	53.80	10.50	9.49	8.59	4.02	3.15	2.31	1.91	1.77	2.04	7.99
17	41.20	39.40	12.80	7.99	6.27	4.02	4.89	2.31	1.77	2.18	2.97	12.10
18	46.20	15.50	12.80	7.99	5.81	4.02	3.85	2.31	1.77	5.12	3.50	13.10
19	51.70	15.50	23.60	8.59	5.81	4.02	3.32	2.31	1.77	2.97	3.67	11.10
20	53.20	34.00	22.00	9.19	5.81	4.02	3.15	2.31	1.77	2.45	4.20	9.49
21	17.00	33.50	29.50	9.82	5.81	3.85	3.15	2.31	1.77	2.18	4.89	23.60
22	29.50	46.00	38.20	13.50	4.89	3.85	3.32	2.31	1.77	2.04	4.66	25.00
23	40.60	41.20	34.60	11.80	4.43	3.85	3.32	2.31	1.77	1.91	5.35	12.10
24	20.10	31.00	25.00	7.10	4.43	3.67	3.15	2.31	1.64	1.91	5.35	7.40
25	15.90	37.60	17.80	5.35	4.20	3.85	3.15	2.18	1.64	1.77	5.35	6.04
26	43.00	20.10	15.90	6.50	4.20	6.50	4.66	2.45	1.91	1.64	6.80	8.59
27	39.40	24.00	41.20	7.40	5.12	5.12	3.50	2.31	2.45	1.64	11.80	7.70
28	17.00	33.50	99.20	7.99	5.12	4.02	3.15	2.31	1.91	1.50	9.49	5.35
29	15.90	0.00	22.00	6.80	7.40	3.67	2.97	2.31	1.91	1.64	4.43	4.43
30	33.00	0.00	12.10	6.27	6.80	3.67	2.97	2.18	1.91	2.04	4.66	4.66
31	20.50	0.00	10.80	0.00	5.35	0.00	2.80	1.91	0.00	1.91	0.00	10.20

Table 1.23 (2/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1988

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	4.37	13.50	5.45	14.50	5.93	2.43	3.22	1.77	1.41	1.28	3.67	13.80
2	4.21	13.30	9.39	19.30	5.23	2.37	2.80	1.75	1.38	1.88	2.91	10.30
3	21.80	11.60	10.50	12.00	5.07	2.38	2.71	1.83	1.38	1.72	3.63	7.25
4	9.83	35.80	19.10	8.55	5.81	2.45	5.25	1.82	1.39	2.13	3.66	4.27
5	5.39	34.60	14.50	10.80	17.80	2.25	3.22	1.91	1.48	1.65	2.41	8.76
6	6.70	35.40	9.92	26.10	9.77	2.07	3.10	1.95	2.66	1.53	2.11	7.31
7	20.30	17.90	13.00	16.00	19.20	2.22	4.13	2.00	2.00	1.50	1.78	3.92
8	14.40	11.00	9.32	9.89	11.70	2.40	3.20	2.03	1.63	1.53	2.75	15.90
9	8.63	39.40	19.60	14.50	7.40	2.51	2.71	2.00	1.91	1.59	3.16	30.00
10	7.53	47.30	16.50	17.10	6.44	2.69	2.57	1.94	1.77	1.67	2.10	18.30
11	6.81	34.50	11.40	10.70	4.05	3.55	2.41	1.91	3.00	2.17	3.54	16.40
12	12.70	24.50	13.30	9.02	2.89	3.12	2.28	1.90	2.93	3.49	6.43	20.00
13	15.00	19.30	13.90	7.92	4.60	3.31	2.49	1.90	2.15	3.53	4.65	19.20
14	12.80	19.60	11.10	15.20	6.58	3.54	2.07	1.88	1.84	7.06	3.79	17.40
15	9.59	15.00	8.81	19.50	9.47	3.99	2.27	1.77	1.55	5.45	3.17	11.20
16	24.70	26.60	7.14	10.50	6.26	4.80	3.15	1.62	1.69	3.61	4.50	8.04
17	16.50	25.80	19.10	10.70	5.88	4.39	2.62	1.59	2.54	5.79	7.35	9.77
18	11.00	20.30	27.80	7.36	5.99	4.23	2.29	1.41	1.95	3.04	4.82	10.10
19	16.60	21.30	21.80	7.23	5.68	4.21	2.11	1.42	1.64	2.22	2.63	12.20
20	11.20	10.40	16.20	8.50	5.52	4.18	2.13	1.44	1.58	1.98	2.13	17.30
21	12.90	9.08	12.50	9.28	4.88	4.10	2.10	1.55	1.54	1.84	2.92	24.00
22	12.60	20.90	11.10	7.10	5.10	3.63	2.11	1.52	1.57	2.18	4.89	18.40
23	6.82	36.20	28.00	6.56	5.59	1.92	2.01	1.49	1.52	2.84	3.40	10.20
24	47.90	9.20	15.90	6.03	5.82	1.39	2.04	1.49	1.43	2.20	3.21	8.14
25	91.30	12.70	59.00	5.34	6.01	1.38	2.07	1.58	1.39	1.86	5.18	4.10
26	9.51	10.6	23.00	4.70	6.09	1.16	1.98	1.57	1.37	3.20	9.22	1.89
27	16.90	10.20	74.80	4.61	5.62	2.79	1.88	1.60	1.36	2.49	8.61	10.70
28	14.70	9.32	54.80	5.72	5.05	2.92	1.91	1.58	1.78	2.10	3.89	4.82
29	22.60	6.00	12.10	8.21	4.50	3.05	1.88	1.49	1.40	7.20	3.47	7.77
30	16.30	0.00	17.30	7.37	3.91	3.11	1.84	1.49	1.35	13.40	9.09	0.64
31	10.80	0.00	17.00	0.00	2.69	0.00	2.01	1.45	0.00	14.80	0.00	1.81

Table 1.23 (3/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1989

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	7.99	21.30	29.00	7.00	10.10	8.33	4.36	4.58	2.19	2.50	3.65	20.70
2	12.50	18.90	34.00	5.70	9.25	18.10	4.11	3.58	2.18	4.97	3.19	21.40
3	12.10	17.80	40.60	15.20	8.49	18.60	3.80	3.31	2.18	7.28	2.69	17.70
4	10.80	19.70	21.30	9.19	8.17	12.30	3.58	4.58	2.15	3.16	2.79	15.60
5	8.29	87.00	24.50	8.29	8.10	9.77	3.41	5.16	1.97	3.05	2.75	11.70
6	9.19	23.00	15.20	12.80	9.82	9.22	3.18	4.77	1.84	3.12	2.36	10.70
7	8.89	52.60	20.10	15.20	9.98	8.70	3.50	4.77	1.85	3.15	2.13	8.59
8	26.50	60.10	21.30	10.80	9.73	8.45	11.70	3.45	1.84	3.22	2.21	9.45
9	10.20	20.20	16.20	9.81	9.23	8.35	10.30	3.34	1.82	2.72	3.96	16.10
10	7.40	17.40	12.50	8.89	8.76	9.19	8.99	3.14	1.82	1.87	3.83	13.40
11	6.80	24.50	10.50	8.89	8.68	10.20	8.38	3.18	1.85	1.73	2.23	10.60
12	9.49	24.50	13.50	6.04	8.60	10.90	5.62	3.15	1.84	1.65	2.49	10.10
13	7.70	23.60	11.10	5.58	8.46	8.91	3.80	3.06	1.71	1.61	3.56	13.20
14	6.04	38.80	9.82	6.06	8.24	8.56	3.23	2.88	1.63	1.57	13.20	17.50
15	5.58	18.10	10.50	5.33	10.10	9.02	2.93	2.61	1.50	3.84	18.90	13.90
16	6.04	31.50	11.50	7.16	12.90	9.17	2.69	2.62	1.39	3.71	16.10	16.40
17	6.04	60.20	9.49	17.20	15.70	9.34	2.49	2.57	1.28	2.61	15.00	11.00
18	12.10	52.00	8.59	11.00	13.30	9.66	2.32	2.55	1.33	4.90	13.80	9.99
19	8.89	33.50	8.59	8.46	25.20	9.23	2.14	2.66	1.62	4.80	7.14	39.30
20	7.70	15.20	11.80	5.70	14.50	23.40	2.03	3.23	1.80	7.78	5.36	36.90
21	6.04	40.60	13.50	7.16	4.74	14.90	1.89	2.53	1.77	3.67	4.98	7.77
22	6.27	87.00	27.00	7.38	4.33	12.70	2.09	2.25	1.82	5.22	5.26	10.60
23	6.27	20.00	25.50	12.00	4.20	9.89	2.38	2.24	1.87	4.38	6.34	7.06
24	6.50	68.70	10.20	21.90	4.27	8.71	3.07	2.23	1.93	3.05	9.38	8.39
25	27.50	17.40	10.20	19.50	4.52	8.31	4.29	2.20	1.93	4.17	8.96	7.76
26	12.80	15.20	7.10	12.50	7.82	7.86	3.68	2.18	1.81	3.93	9.99	13.10
27	6.27	43.00	18.80	10.10	11.50	7.27	3.74	2.14	1.72	3.54	8.14	11.20
28	10.80	24.00	19.20	14.90	8.93	6.50	1.80	2.17	1.83	7.91	13.10	11.30
29	11.50	0.00	9.70	17.50	8.59	5.37	1.77	2.27	3.80	10.90	12.80	9.63
30	8.89	0.00	13.40	12.40	8.27	4.77	1.69	2.22	2.00	6.07	15.50	33.10
31	12.50	0.00	16.90	0.00	8.31	0.00	2.63	2.19	0.00	3.84	0.00	27.00

Table 1.23 (4/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1990

day	month											
	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	17.30	61.10	21.60	6.94	5.79	7.69	4.15	2.36	1.94	2.08	1.70	3.96
2	12.30	45.30	12.60	6.94	7.69	6.71	7.40	2.36	1.80	1.94	2.08	3.58
3	9.43	29.60	16.30	7.98	7.98	7.17	7.69	2.78	1.80	1.80	6.25	11.30
4	10.60	21.60	8.85	6.48	8.27	5.79	4.72	5.56	1.70	1.60	1.50	14.90
5	15.20	17.30	10.00	6.94	7.40	4.34	4.91	3.06	1.94	1.60	1.30	37.60
6	46.60	14.50	8.85	7.17	7.17	5.33	5.10	3.06	1.94	1.60	1.30	12.90
7	14.50	12.90	10.00	13.50	3.96	3.96	4.53	2.64	1.94	1.60	1.30	9.72
8	10.60	15.90	10.90	9.43	5.10	3.77	3.58	2.78	2.08	1.60	1.30	9.43
9	22.40	15.20	14.20	6.02	4.72	3.77	3.20	2.50	2.50	1.50	1.30	7.40
10	17.70	11.90	12.50	6.48	6.02	3.39	3.58	2.36	3.77	1.50	1.30	13.20
11	15.20	9.43	9.43	5.56	6.25	3.39	3.20	2.90	2.50	1.50	1.30	14.50
12	17.00	8.85	7.40	5.10	6.25	3.96	3.06	4.34	2.08	1.50	2.50	17.00
13	11.60	14.50	10.90	6.48	6.94	3.96	3.06	7.17	2.22	1.50	1.94	13.50
14	10.90	10.00	11.30	12.20	5.56	3.96	3.58	7.17	1.94	1.50	1.40	11.30
15	12.90	10.90	7.69	8.27	5.56	3.96	3.20	3.20	1.94	1.30	1.40	10.90
16	10.60	9.43	9.14	5.79	6.48	3.96	2.78	3.06	1.80	1.30	1.70	9.72
17	23.90	9.14	13.50	7.17	10.90	3.96	3.06	2.64	1.70	1.94	2.64	12.50
18	25.60	9.43	74.40	6.48	10.30	3.77	2.64	2.64	1.70	1.50	2.50	10.90
19	25.50	10.00	13.50	6.25	6.48	4.15	2.78	2.36	1.70	1.40	2.08	11.30
20	121.00	8.85	10.60	7.98	8.27	7.40	2.64	2.22	1.70	1.40	3.77	9.14
21	107.00	8.85	9.72	7.17	7.69	6.25	2.64	2.08	2.08	1.40	2.36	14.50
22	61.50	6.02	9.14	6.48	7.69	6.02	2.78	2.08	2.50	1.30	2.78	19.10
23	41.20	5.56	8.85	8.27	7.17	4.72	3.58	2.08	3.06	1.30	2.50	22.80
24	24.30	6.94	7.69	6.48	6.71	10.30	4.15	3.77	2.36	1.30	3.58	22.80
25	31.80	6.71	7.40	11.60	6.48	6.48	2.92	2.36	2.50	1.30	5.10	15.90
26	201.00	8.27	7.98	9.14	5.79	5.56	2.78	3.06	3.06	1.40	6.94	14.50
27	81.60	9.14	18.70	7.40	5.33	6.48	2.64	2.92	2.22	1.40	4.91	14.20
28	62.20	15.90	9.72	12.20	8.56	7.17	2.50	2.36	1.80	1.70	3.58	10.30
29	61.60	0.00	7.40	9.43	9.72	4.91	2.22	2.22	2.08	2.50	3.20	7.98
30	61.30	0.00	6.94	5.79	8.85	4.34	2.50	2.36	2.22	2.92	3.39	10.60
31	61.20	0.00	6.94	0.00	7.98	0.00	2.36	2.08	0.00	3.58	0.00	21.60

Table 1.23 (5/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1991

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	31.30	25.00	15.50	28.50	19.00	3.32	3.00	1.80	1.38	1.02	1.14	4.30
2	22.00	18.50	14.50	26.00	17.50	3.32	3.00	1.80	2.25	1.02	1.14	5.92
3	13.50	15.00	19.00	20.80	9.50	3.00	3.32	1.80	1.95	1.14	1.80	12.60
4	25.50	18.00	15.00	27.00	8.20	3.00	3.32	1.80	1.80	1.14	2.10	24.40
5	22.00	16.50	14.00	29.00	7.55	3.00	3.32	1.80	1.65	1.02	4.95	13.50
6	16.00	16.50	14.50	21.40	7.22	2.85	3.32	1.65	1.50	1.26	2.70	9.95
7	14.50	17.00	13.50	20.20	6.25	3.32	3.00	1.65	1.26	1.26	2.40	10.40
8	16.50	18.00	22.60	9.95	6.25	3.32	3.00	1.65	1.26	1.26	2.70	9.50
9	53.40	21.40	30.60	10.40	7.55	3.00	2.85	1.38	1.26	1.26	3.32	9.17
10	38.70	20.80	14.50	12.60	7.55	3.00	2.85	1.38	1.38	1.14	4.30	6.90
11	9.50	22.00	18.50	13.30	7.87	3.32	2.85	1.26	1.50	1.26	3.00	20.20
12	7.87	58.80	21.40	10.80	6.25	3.32	2.70	1.38	1.50	1.02	11.70	9.50
13	6.57	23.80	17.50	14.50	6.25	3.32	4.30	1.38	1.50	1.02	7.22	6.57
14	6.57	20.20	19.60	18.50	5.92	3.32	2.55	1.38	1.50	1.38	5.27	5.92
15	9.95	19.00	25.50	14.50	5.92	3.65	2.55	1.38	1.50	1.50	10.80	5.92
16	9.95	27.50	16.60	18.50	5.92	3.97	2.55	1.38	1.26	1.38	14.00	5.92
17	20.80	17.50	15.00	14.00	5.92	3.65	2.85	1.38	1.14	1.26	2.70	3.65
18	9.50	29.00	15.50	14.00	5.92	3.65	2.85	1.38	1.14	1.26	3.32	4.30
19	16.00	19.00	29.50	12.20	5.27	3.65	2.85	1.38	1.26	1.50	5.27	5.60
20	11.70	16.00	22.00	13.50	4.62	3.32	2.85	1.38	1.26	1.50	2.40	8.20
21	23.80	16.50	12.20	63.60	3.97	3.32	2.55	1.26	1.26	1.38	5.60	5.60
22	19.00	27.50	16.00	16.00	3.97	4.30	2.40	1.26	1.26	1.38	12.60	4.62
23	11.30	26.00	14.00	22.60	3.65	3.32	2.40	1.26	1.26	1.38	9.17	3.97
24	12.20	46.40	13.10	23.20	3.65	3.32	2.25	1.38	1.26	1.38	5.92	16.50
25	12.20	23.20	12.60	11.70	3.32	3.32	2.25	1.38	1.14	1.65	10.80	6.90
26	14.00	14.50	13.10	15.50	3.65	3.32	2.25	1.26	1.02	1.65	10.40	38.70
27	11.30	13.10	14.50	16.50	3.97	3.00	2.40	1.26	1.02	1.50	11.30	9.95
28	33.90	15.50	13.50	12.20	3.32	3.00	2.40	1.26	1.14	1.38	4.30	8.85
29	27.00	0.00	13.10	17.50	3.32	3.00	2.10	1.26	1.14	1.26	4.62	6.57
30	25.50	0.00	15.00	13.50	3.32	2.85	1.95	1.26	1.14	1.14	5.60	5.92
31	21.40	0.00	20.80	0.00	3.32	0.00	1.95	1.26	1.00	1.14	0.00	6.57

Table 1.23 (6/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1992

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	7.10	8.80	13.60	14.40	7.40	16.00	5.30	4.75	7.70	5.60	6.20	8.80
2	7.10	10.00	11.20	21.60	7.40	14.00	6.20	4.75	6.20	10.00	4.75	14.00
3	5.90	11.20	9.60	15.60	7.40	9.60	5.30	6.80	8.40	7.70	4.75	28.50
4	5.90	21.20	7.70	16.00	6.50	8.80	5.00	5.00	7.10	5.00	4.75	31.50
5	6.20	18.00	6.80	13.20	8.00	7.70	5.30	5.00	6.80	11.20	4.50	25.60
6	5.30	14.40	7.10	10.40	7.40	11.20	5.00	4.75	14.80	8.40	4.25	20.00
7	8.00	10.40	10.80	9.60	8.40	13.60	5.30	4.75	8.40	8.00	4.00	19.60
8	8.80	12.00	14.00	8.80	8.00	9.60	5.60	4.75	5.90	12.80	3.75	19.60
9	26.00	9.60	19.60	20.80	8.00	9.20	5.60	4.00	8.40	10.80	3.50	7.10
10	16.80	7.70	16.40	14.40	10.40	8.80	5.90	4.00	8.00	10.80	17.60	21.20
11	13.60	7.10	14.00	19.20	8.40	7.70	6.20	6.50	6.80	4.00	3.50	24.00
12	10.00	7.10	14.00	30.80	8.40	6.80	6.80	6.50	14.00	4.25	3.50	32.50
13	12.00	9.20	18.80	18.20	9.60	6.50	6.80	6.50	7.70	4.25	3.50	23.20
14	17.20	11.20	14.40	20.80	10.80	5.90	6.20	3.50	7.10	8.40	3.50	18.00
15	10.80	12.40	11.60	17.20	17.60	5.60	6.20	3.50	5.60	4.50	3.75	26.40
16	8.00	10.40	19.60	13.60	9.20	5.30	5.90	3.50	5.60	4.75	3.75	18.00
17	6.80	12.00	15.20	11.20	7.70	5.00	5.60	4.00	5.60	7.70	3.75	14.00
18	7.10	13.60	18.80	10.40	7.10	5.30	5.30	4.00	5.60	5.60	4.00	14.40
19	6.50	16.80	17.60	9.60	7.10	5.00	5.00	3.50	5.60	5.90	4.00	9.20
20	8.40	19.60	16.00	8.80	6.50	5.30	4.75	3.50	5.60	5.60	4.00	8.40
21	8.80	21.20	12.00	12.80	6.80	5.30	4.75	3.50	5.60	5.30	4.50	8.40
22	14.40	14.80	9.20	14.80	8.80	5.00	4.75	6.50	4.50	5.00	4.50	6.80
23	13.20	10.00	8.00	12.00	6.50	5.00	4.75	23.20	4.00	5.30	4.25	6.80
24	8.40	8.40	8.40	10.80	7.10	5.00	4.75	8.40	4.00	6.50	7.10	8.00
25	7.10	7.70	9.60	11.60	7.70	5.00	4.75	6.80	4.00	7.10	9.20	10.00
26	6.50	7.10	8.40	15.60	20.80	5.00	4.75	10.00	4.25	5.00	4.00	5.90
27	5.60	7.10	7.70	11.60	15.60	4.75	4.75	9.20	4.25	5.30	3.75	4.75
28	5.30	8.40	7.40	11.20	11.20	4.75	4.75	5.30	4.50	5.00	3.50	5.60
29	22.80	14.40	8.00	10.40	17.20	4.30	4.75	6.20	4.50	5.30	8.00	6.20
30	12.80	0.00	7.10	8.40	15.20	4.30	4.75	6.20	4.50	5.90	9.20	5.90
31	6.80	0.00	11.60	0.00	10.00	0.00	4.75	15.60	0.00	5.30	0.00	5.60

Table 1.23 (7/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1993

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	3.48	70.40	31.20	15.90	7.16	3.48	3.25	3.50	2.75	3.25	2.21	5.60
2	4.19	52.00	26.80	20.80	14.60	3.25	3.25	3.50	2.75	3.25	1.45	5.60
3	5.12	42.00	23.60	22.90	6.64	3.25	3.25	3.50	2.75	3.25	1.45	5.13
4	3.95	42.50	20.10	11.40	7.42	3.25	4.89	3.50	2.75	3.25	1.45	3.25
5	4.89	42.00	18.80	9.82	10.10	3.95	3.72	3.50	2.75	3.25	1.45	3.25
6	4.89	57.10	25.90	18.80	6.38	6.12	2.77	3.50	3.00	3.25	1.45	2.61
7	4.19	50.80	31.80	50.00	6.12	5.36	3.09	3.50	3.75	3.00	1.45	3.27
8	5.13	39.50	28.40	42.00	5.86	12.20	2.77	3.25	4.00	2.75	1.45	7.16
9	7.16	40.00	28.40	28.40	5.60	14.60	2.77	3.25	6.20	2.75	1.45	5.13
10	7.42	36.50	31.80	24.30	6.38	9.41	2.77	3.25	2.75	2.75	1.45	3.72
11	7.65	39.50	30.10	22.10	6.12	10.20	2.77	3.25	2.75	2.50	1.45	2.93
12	6.38	37.50	19.50	20.00	9.41	13.80	2.93	3.25	2.75	2.75	1.55	2.77
13	5.13	38.00	22.20	39.20	4.89	5.60	2.93	3.25	2.50	4.25	1.55	2.77
14	4.19	43.00	14.30	52.00	4.42	4.89	2.77	3.25	2.50	3.25	1.65	2.77
15	3.48	40.00	13.80	42.00	4.42	7.94	2.77	3.50	2.50	2.50	2.45	2.77
16	4.89	34.50	12.30	25.00	4.19	8.60	2.61	3.50	2.50	2.50	2.45	2.77
17	5.60	30.50	13.30	14.60	3.95	7.94	2.61	3.50	3.00	2.50	3.00	3.25
18	4.19	30.10	12.30	12.20	3.72	7.68	2.45	3.50	2.75	2.28	6.12	3.25
19	4.19	26.80	25.10	20.80	3.72	7.94	2.29	3.50	2.75	2.28	4.42	3.48
20	5.13	41.00	23.60	16.00	3.48	7.16	2.13	3.50	2.75	2.28	2.45	7.16
21	18.80	40.00	18.80	11.80	3.48	4.19	2.45	3.50	4.50	2.28	2.13	5.60
22	21.50	34.50	24.30	13.80	3.48	3.95	3.48	3.50	3.25	2.50	3.09	4.66
23	29.30	30.90	25.90	39.20	3.48	3.95	2.29	3.50	3.00	2.50	3.48	5.86
24	40.10	39.20	12.80	13.80	3.48	3.72	2.13	3.25	3.00	2.50	3.25	6.12
25	18.80	34.50	14.30	9.01	3.25	3.48	2.13	3.25	3.00	2.50	2.45	3.95
26	11.00	25.10	24.30	7.94	3.09	3.25	2.61	3.25	3.00	2.28	2.13	3.09
27	9.41	25.90	28.40	6.90	3.09	3.25	2.45	3.00	2.75	2.28	2.77	2.93
28	36.40	27.90	46.00	7.94	3.72	3.25	2.29	2.25	3.00	2.28	2.77	5.60
29	92.00	0.00	22.20	8.10	4.19	3.25	2.29	2.75	3.25	2.28	1.97	6.38
30	309.00	0.00	15.90	6.90	3.72	3.25	2.29	2.75	3.25	2.28	1.65	3.25
31	164.00	0.00	18.80	0.00	3.48	0.00	2.29	2.75	0.00	2.50	0.00	3.09

Table 1.23 (8/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1994

day	month											
	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	11.20	10.40	9.20	16.00	9.60	4.50	3.50	2.50	1.62	1.40	3.50	5.30
2	8.00	11.60	9.20	14.00	9.60	4.25	3.50	2.50	1.62	1.18	3.50	2.75
3	6.20	15.20	8.40	17.20	10.00	4.50	3.50	2.50	1.62	1.18	4.25	2.50
4	5.90	13.20	9.20	20.80	12.40	4.50	3.50	2.75	1.62	1.40	8.40	2.75
5	7.10	9.60	19.60	13.20	10.40	4.50	3.25	2.75	1.84	1.62	5.60	2.06
6	7.10	10.00	30.50	11.60	9.20	4.50	3.25	2.75	1.84	1.84	4.75	4.25
7	6.50	17.60	34.50	11.20	9.20	4.25	3.25	2.75	1.84	2.06	3.00	6.80
8	12.00	11.60	26.00	13.00	8.00	4.50	3.25	2.75	1.84	2.28	3.00	5.60
9	17.60	14.80	19.60	16.00	9.20	4.25	3.25	2.50	1.84	2.28	3.00	12.00
10	20.80	16.80	27.20	19.60	8.40	4.25	3.25	2.50	1.62	2.50	3.00	12.80
11	14.80	10.40	42.90	10.80	10.80	3.75	3.25	2.50	1.62	2.50	3.00	7.40
12	14.80	18.00	27.60	16.00	9.60	3.75	3.00	2.50	1.62	2.50	2.75	3.95
13	21.60	18.40	20.00	18.00	7.70	4.00	3.00	2.50	1.62	2.50	3.25	3.25
14	25.20	15.20	22.40	36.50	7.70	3.50	3.00	2.50	1.62	2.50	2.50	2.77
15	32.00	10.40	11.30	21.20	7.10	3.25	3.00	2.28	1.62	2.50	3.75	4.89
16	27.60	8.80	14.80	26.80	6.20	3.50	3.00	2.28	1.62	2.50	2.50	3.09
17	19.60	8.40	10.80	20.40	5.90	3.50	3.00	2.28	1.62	2.50	2.50	1.65
18	28.50	7.40	12.40	16.00	5.90	3.50	3.00	2.28	1.62	4.75	2.50	1.35
19	23.60	10.80	9.20	14.80	5.90	3.75	2.75	2.28	1.62	4.25	2.50	4.19
20	10.80	11.20	8.60	16.00	5.60	4.00	2.75	2.06	1.62	4.25	2.75	3.25
21	9.20	15.60	10.00	28.50	5.90	3.75	2.75	2.06	1.62	4.25	2.50	8.20
22	11.60	15.20	15.00	19.20	5.90	3.75	2.75	2.06	1.62	4.25	2.50	9.01
23	11.60	16.00	54.40	14.00	5.60	3.75	2.75	2.06	1.62	4.25	2.75	4.89
24	10.80	9.20	44.80	13.20	5.60	3.75	2.75	1.84	1.62	4.00	3.00	2.93
25	22.40	8.00	55.00	11.60	5.00	3.50	2.75	1.84	1.62	4.00	3.00	2.77
26	14.40	8.40	59.20	11.60	4.25	3.50	2.75	1.84	1.62	4.00	2.50	2.77
27	10.00	15.60	37.00	11.60	4.25	3.50	2.75	1.84	1.40	3.75	2.50	2.77
28	10.80	8.80	31.50	10.40	4.25	3.50	2.50	1.84	1.96	4.25	5.60	2.93
29	13.20	0.00	24.40	10.00	4.50	3.50	2.50	1.62	1.18	5.30	4.00	2.77
30	19.60	0.00	19.60	10.00	5.60	3.50	2.50	1.62	1.40	3.75	7.10	2.77
31	14.80	0.00	18.00	0.00	4.75	0.00	2.50	1.62	0.00	3.75	0.00	4.89

Table 1.23 (9/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1995

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	5.00	12.00	11.60	9.20	7.10	7.40	5.00	3.00	1.84	2.50	1.18	10.00
2	4.50	7.70	13.20	10.40	6.20	6.50	5.00	3.00	1.84	2.50	1.40	7.40
3	5.60	12.80	12.80	10.40	5.60	4.75	5.00	3.25	1.84	2.50	2.28	10.40
4	5.90	15.60	20.00	10.40	5.90	4.50	4.25	3.50	1.62	2.50	1.62	7.70
5	3.50	16.00	10.00	10.40	5.90	4.50	4.25	3.50	1.84	2.28	2.75	20.40
6	4.00	10.40	11.20	10.00	5.60	10.40	5.00	3.50	1.84	2.28	2.75	16.00
7	8.40	9.20	14.00	9.60	5.60	5.00	5.00	3.50	1.62	2.28	4.25	9.60
8	13.20	10.40	27.60	9.60	5.60	5.00	4.00	3.50	1.62	2.28	11.60	8.80
9	9.20	8.40	18.40	9.60	10.40	5.00	3.75	3.50	1.62	1.40	8.80	9.60
10	5.60	20.00	12.40	9.20	7.40	5.30	3.50	3.50	1.40	1.40	8.00	8.00
11	16.40	26.80	12.40	9.20	27.60	5.60	3.75	3.25	1.18	1.40	8.40	5.30
12	19.60	17.20	8.00	9.20	23.60	4.75	3.50	3.25	0.96	1.40	12.80	10.80
13	14.00	22.00	8.00	8.80	13.20	4.75	3.50	3.25	0.96	1.40	6.50	39.00
14	12.40	29.00	9.60	8.80	8.00	21.20	3.00	3.00	0.74	1.40	3.75	17.60
15	14.80	12.40	16.00	8.80	6.80	13.20	2.75	3.00	0.74	1.40	20.00	18.00
16	5.00	10.40	22.80	8.40	6.80	8.00	2.50	3.00	0.52	1.40	9.60	16.40
17	4.50	8.80	24.40	8.40	6.80	7.70	2.06	3.00	0.52	1.40	6.80	22.00
18	5.90	7.40	18.00	8.00	8.80	8.00	2.75	2.75	0.52	1.40	7.70	12.00
19	9.60	10.40	14.40	7.70	8.00	8.20	1.84	2.75	0.52	1.40	7.10	10.00
20	12.00	26.00	24.80	7.40	6.80	7.10	1.62	2.75	0.52	1.18	24.00	15.60
21	16.80	22.80	18.00	7.40	5.70	8.00	1.62	2.75	0.52	1.18	18.00	18.80
22	19.20	9.20	26.00	7.10	7.40	9.60	1.40	2.50	0.52	1.18	9.60	21.20
23	16.40	8.40	26.00	6.80	6.20	5.30	0.96	2.50	0.52	1.40	14.00	22.00
24	15.60	10.80	14.80	6.50	5.60	5.00	0.74	2.50	0.52	1.62	27.20	27.20
25	19.20	9.60	10.40	6.20	5.30	5.60	0.96	2.50	2.28	1.62	22.40	16.40
26	18.80	9.20	11.20	5.90	4.75	5.90	1.40	2.28	2.28	1.62	12.00	31.50
27	21.20	10.40	10.80	5.90	4.50	5.30	1.62	2.28	2.28	1.62	45.40	21.20
28	41.50	10.00	25.60	5.90	4.00	5.30	2.08	2.28	2.28	1.40	16.40	12.40
29	32.00	0.00	14.00	5.90	4.50	5.30	2.28	2.06	2.28	1.40	44.80	9.20
30	24.00	0.00	10.40	8.00	8.40	5.30	2.50	2.06	2.28	1.40	17.60	7.10
31	20.40	0.00	9.20	0.00	11.20	0.00	2.75	2.06	0.00	1.40	0.00	6.80

Table 1.23 (10/10) Daily Q(m³/s) observed in Garang River(192.6km²) in 1996

month day	jan.	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
1	12.80	21.60	36.50	7.70	6.30	5.90	3.25	2.75	2.75	2.06	7.10	10.80
2	16.80	17.20	26.40	9.60	7.10	5.30	3.00	2.75	2.75	2.06	25.20	26.80
3	14.00	20.80	29.00	10.00	12.40	5.30	3.00	2.75	2.75	2.50	5.30	24.40
4	12.40	27.60	30.00	9.60	8.00	5.00	3.00	2.75	2.50	2.50	4.00	8.80
5	12.40	16.80	28.00	8.00	8.00	4.75	3.25	2.75	2.50	2.06	4.25	11.60
6	12.00	21.20	49.00	7.70	8.00	4.75	3.25	2.75	2.75	2.29	11.60	18.40
7	16.80	16.80	34.50	7.70	7.70	5.00	3.25	2.50	2.75	4.50	8.80	23.30
8	35.00	26.80	29.00	7.70	6.80	7.10	3.25	3.50	2.75	5.90	10.00	27.60
9	10.60	30.50	29.00	11.60	6.80	5.90	3.00	2.06	4.25	4.25	21.00	18.80
10	9.60	41.00	22.00	11.60	6.80	7.70	2.75	7.00	6.80	4.25	16.00	19.20
11	12.00	28.00	20.00	9.60	6.80	7.70	2.75	3.75	3.25	3.75	10.00	34.50
12	10.80	28.00	20.40	10.40	6.50	4.75	2.28	2.28	3.00	3.75	5.30	19.20
13	8.40	37.50	22.00	10.00	7.10	4.50	3.25	2.75	3.00	3.50	4.50	22.40
14	8.80	47.00	46.60	12.40	6.80	5.30	2.50	3.00	3.00	3.25	6.20	22.80
15	10.40	23.60	26.80	11.60	6.50	4.75	2.75	3.00	3.00	3.00	10.40	14.40
16	10.80	27.60	16.00	19.60	8.40	4.75	2.50	3.00	3.00	3.75	9.60	8.80
17	10.80	20.40	14.40	17.60	7.10	5.60	2.50	3.00	2.75	3.75	5.30	8.40
18	11.60	17.20	13.20	14.80	6.50	4.50	2.38	3.00	3.00	3.75	8.00	20.00
19	22.80	38.00	14.40	15.00	7.70	4.75	2.50	3.00	3.00	3.25	7.40	13.20
20	15.60	52.00	14.40	17.60	7.10	4.75	2.50	3.00	3.00	4.25	5.60	9.20
21	23.20	25.60	14.40	14.40	6.50	4.52	2.50	3.00	3.00	2.75	24.80	10.00
22	12.80	18.40	19.60	14.00	6.50	4.50	2.50	3.25	3.00	3.25	21.20	16.00
23	13.80	17.60	16.40	11.20	6.20	4.75	2.75	4.00	3.00	2.75	24.80	10.00
24	15.60	16.80	16.00	10.80	4.75	5.00	2.75	2.28	3.00	3.75	18.80	8.00
25	22.80	25.20	17.20	9.20	9.60	5.00	2.75	2.75	3.00	4.25	14.40	12.00
26	18.80	53.80	14.00	8.80	10.40	5.00	2.75	3.00	3.00	18.00	9.60	12.00
27	18.80	30.60	11.60	8.00	6.50	5.00	3.00	3.00	3.00	6.20	5.90	8.80
28	16.00	24.00	12.00	8.00	5.90	5.30	2.50	3.00	2.28	25.20	4.75	12.20
29	12.40	43.00	9.20	7.40	5.90	5.30	2.50	3.25	2.28	23.20	4.50	15.20
30	14.40	0.00	8.00	6.20	5.90	4.25	2.75	3.25	2.28	7.40	5.90	22.80
31	20.50	0.00	8.00	0.00	5.90	0.00	2.75	3.00	0.00	8.00	0.00	18.00

1.4 Results of Flood Analysis

Table 1.24 PARAMETERS ESTIMATED BY FLOOD ANALYSIS

Flood	by Storage Function Method			
	K	P	TL(hr)	F
1987 Dec. 21	2.33	1.0	2	0.241
1990 Jan. 25	1.78	1.0	2	0.630
1993 Jan. 29	1.03	1.0	2	0.583
1994 Mar. 11	1.52	1.0	2	0.283
1995 Nov. 29	2.64	1.0	1	0.408
Average	1.9	1.0	2	0.43

Note : Constant P should be equal or less than 1.0

Table 1.25 PARAMETERS IN STORAGE FUNCTION METHOD

(for Basin Unit)

Sub Basin	A (km ²)	K	P	TL (hr)	F1	Qb (m ³ /s)	Rsa (mm)
B - 1	73.5	1.9	1.0	2.0	0.43	3.7	300
B - 2	15.1	1.9	1.0	2.0	0.43	0.8	300
B - 3	36.6	1.9	1.0	2.0	0.43	1.8	300
B - 4	45.7	1.9	1.0	2.0	0.43	2.3	300
B - 5	7.3	1.9	1.0	2.0	0.43	0.4	300
B - 6	14.4	1.9	1.0	2.0	0.43	0.7	300
B - 7	11.4	1.9	1.0	2.0	0.43	0.6	300
Total	204.0						

Note : Qb = 0.05m³/s/km²

(for Channel Unit)

River Channel	K	P	TL (hr)	Length L(km)	Bed Slope I
C - 1	-	-	0.055	9.0	0.01429
C - 2	-	-	0.019	4.0	0.02500
C - 3	-	-	0.036	5.5	0.01250
C - 4	-	-	0.078	4.0	0.00143

Note: TL = 0.000736*L*I^{-0.5}

Table 1.26 THIESSEN COEFFICIENT AND BASIN RAINFALL

Station	Average Rainfall in 1971 - 1990 (mm/year)	Thiessen Coefficient		
		Catchment Area		
		Panjang	Patemon	Kalipancur
No.59	2,365	0.16	0.12	0.00
No.44	2,563	0.16	0.45	0.00
No.39	3,380	0.14	0.26	0.12
No.65c	2,791	0.54	0.17	0.88
Total		1.00	1.00	1.00
Basin Rainfall		2,769	2,790	2,862
Basin Rainfall / No.65c		0.99	1.00	1.03

Table 1.27 MONTHLY EVAPORATION IN TANK MODEL

Month	Pan Evaporation (1) mm/day	Annual Loss mm/year	Evaporation in Tank Model (1)*0.734 mm/day
Jan.	3.3		2.42
Feb.	3.7		2.72
Mar.	3.8		2.79
Apr.	4.0		2.94
May	4.3		3.16
Jun.	4.5		3.30
Jul.	4.8		3.52
Aug.	5.1		3.74
Sep.	5.7		4.18
Oct.	5.5		4.04
Nov.	4.4		3.23
Dec.	3.8		2.79
Total(mm/yr)	1,610	1,181	1,181

Note : (Annual Loss) / (Annual Pan Evaporation) = 0.734

Table 1.28 COMPARISON OF FLOW REGIME BETWEEN TANK-MODEL AND OBSERVATION

Panjangan Station (A=192.6km²)

Kind of Data	Year	Flow Regime								Annual Loss (mm)
		Max (m ³ /s)	25% (m ³ /s)	50% (m ³ /s)	75% (m ³ /s)	95% (m ³ /s)	99% (m ³ /s)	Min (m ³ /s)	Mean (m ³ /s)	
by Tank Model	1987	115.41	11.68	4.41	2.02	0.61	0.56	0.54	10.82	1,254
	1988	100.65	14.64	6.69	3.44	1.81	1.51	1.39	12.54	1,444
	1989	86.57	15.10	9.11	5.11	3.19	3.00	2.83	12.56	1,350
	1990	126.40	10.58	5.97	3.43	1.73	1.42	1.33	9.62	1,111
	1991	81.09	11.61	5.37	2.98	1.02	0.95	0.93	9.54	986
	1992	72.02	10.93	6.33	4.19	2.97	2.80	2.68	9.75	1,419
	1993	178.31	8.85	5.15	3.05	1.63	1.42	1.35	8.98	973
	1994	68.13	11.07	4.72	2.38	0.96	0.89	0.88	8.85	1,167
	1995	51.15	10.99	5.47	2.99	1.34	1.10	1.03	8.53	1,299
	1996	67.42	10.93	5.23	3.30	1.95	1.68	1.64	9.05	1,275
Average		94.72	11.64	5.85	3.29	1.72	1.53	1.46	10.02	1,228
by Observation	1987	99.20	11.10	5.35	2.62	1.77	1.64	1.50	10.19	1,358
	1988	123.00	11.00	4.80	2.11	1.48	1.36	0.64	8.73	1,080
	1989	187.00	12.50	8.31	3.41	1.82	1.57	1.28	11.51	1,522
	1990	201.00	9.72	6.02	2.50	1.40	1.30	1.30	9.54	1,124
	1991	63.60	14.00	4.62	1.80	1.14	1.02	1.02	8.94	1,084
	1992	32.50	11.20	7.40	5.30	4.00	3.50	3.50	9.11	1,524
	1993	309.00	12.30	3.72	2.77	2.13	1.45	1.45	11.47	565
	1994	115.00	10.80	4.25	2.75	1.62	1.40	1.18	8.32	1,254
	1995	45.40	10.80	6.80	2.75	1.18	0.52	0.52	8.54	1,298
	1996	53.80	15.00	7.40	3.25	2.50	2.28	2.06	10.73	999
Average		122.95	11.84	5.87	2.93	1.90	1.60	1.45	9.71	1,181

Table 1.29 FLOW REGIME FOR 30 YEARS AT SIMONGAN WEIR

(Catchment Area at Simongan Weir A=204.0km²)

Year	Days	Flow Regime										Annual			Annual Loss (3)-(1) mm	
		Max (m ³ /s)	25% (m ³ /s)	50% (m ³ /s)	75% (m ³ /s)	95% (m ³ /s)	99% (m ³ /s)	Min (m ³ /s)	Mean (m ³ /s)	Run-off (1) mm	No.65c Rainfall (2) mm	Annual Rainfall(mm) (2)*0.99				
by Tank Model (= Discharge at Panjang * 204.0km ² /192.6km ²)														(1)=Mean*Days*86.4/A		
1967	365	198.71	11.81	5.87	2.60	1.03	0.96	0.95	10.04	1.552	2,504	2,479	927			
1968	366	115.98	12.94	7.82	5.38	3.89	3.57	3.21	12.43	1,928	3,492	3,457	1,529			
1969	365	131.38	17.43	8.06	5.02	3.20	2.88	2.78	15.58	2,409	3,725	3,688	1,279			
1970	365	128.67	15.20	9.76	5.75	3.59	3.08	3.00	13.18	2,037	3,567	3,531	1,494			
1971	365	83.45	18.58	11.10	6.97	4.80	4.24	4.11	15.98	2,471	3,722	3,685	1,214			
1972	366	144.85	10.21	5.75	3.07	1.44	1.37	1.35	9.95	1,542	2,217	2,195	653			
1973	365	110.44	10.97	6.41	4.16	2.71	2.43	2.37	9.63	1,488	2,951	2,921	1,433			
1974	365	89.68	14.35	7.49	4.89	3.33	2.90	2.80	12.33	1,906	3,205	3,173	1,267			
1975	365	82.36	14.45	8.24	5.72	3.80	3.51	3.37	11.49	1,777	3,105	3,074	1,297			
1976	366	148.87	12.78	6.21	3.36	1.65	1.45	1.44	12.21	1,893	2,753	2,725	832			
1977	365	83.46	10.23	5.07	2.75	1.31	1.23	1.21	9.11	1,408	2,497	2,472	1,064			
1978	365	81.98	10.81	5.57	4.12	2.96	2.65	2.60	10.33	1,596	2,856	2,827	1,231			
1979	365	99.12	14.98	8.26	4.59	3.06	2.85	2.78	12.48	1,929	3,206	3,174	1,245			
1980	366	262.16	14.14	8.04	4.62	2.46	2.01	1.92	12.70	1,969	3,387	3,353	1,384			
1981	365	55.94	9.35	4.79	2.76	1.15	1.10	1.08	7.30	1,128	1,871	1,852	724			
1982	365	112.35	8.81	3.97	1.60	0.89	0.83	0.80	8.13	1,258	2,152	2,130	872			
1983	365	72.34	9.14	4.14	2.11	0.78	0.72	0.70	7.27	1,123	2,265	2,242	1,119			
1984	366	53.07	8.57	3.58	2.29	1.45	1.09	0.97	7.03	1,090	2,495	2,470	1,380			
1985	365	72.24	5.17	2.86	1.75	0.70	0.61	0.59	4.83	747	1,784	1,766	1,019			
1986	365	107.95	10.15	4.83	3.18	1.94	1.72	1.61	8.75	1,352	2,614	2,588	1,236			
by Observation (= Discharge at Panjang * 204.0km ² /192.6km ²)																
1987	365	105.07	11.76	5.67	2.78	1.87	1.74	1.59	10.79	1,668	3,057	3,026	1,358			
1988	366	130.28	11.65	5.08	2.23	1.57	1.44	0.68	9.25	1,433	3,538	3,503	2,070			
1989	365	198.07	13.24	8.80	5.61	1.93	1.66	1.36	12.19	1,885	3,441	3,407	1,522			
1990	365	212.90	10.30	6.38	2.65	1.48	1.38	1.38	10.10	1,562	2,713	2,686	1,124			
1991	365	67.36	14.83	4.89	1.91	1.21	1.08	1.08	9.47	1,464	2,574	2,548	1,084			
1992	366	34.42	11.86	7.84	5.61	4.24	3.71	3.71	9.65	1,496	3,050	3,020	1,524			
1993	365	327.29	13.03	3.94	2.93	2.26	1.54	1.54	12.15	1,878	2,468	2,443	565			
1994	365	121.81	11.44	4.50	2.91	1.72	1.48	1.25	8.81	1,362	2,642	2,616	1,254			
1995	365	48.09	11.44	7.20	2.91	1.25	0.55	0.55	9.05	1,398	2,723	2,696	1,298			
1996	366	56.98	15.89	7.84	3.44	2.65	2.41	2.18	11.37	1,762	2,789	2,761	999			
Average (30 years)		117.91	12.18	6.35	3.59	2.21	1.93	1.83	10.45	1,617	2,845	2,817	1,200			

1.5 Tidal Level

Table 1.30 MAXIMUM AND MINIMUM VALUE OF TIDAL LEVEL IN THE PERIOD FROM APRIL TO AUGUST 1997

Date	April, 1997		May, 1997		Jun, 1997		July, 1997		August, 1997	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1	176	118	184	100	189	106	162	114	174	118
2	174	105	182	94	184	109	162	106	178	124
3	170	99	188	96	174	112	164	112	182	122
4	176	95	176	100	168	110	156	105	180	120
5	170	105	166	107	172	116	162	110	176	123
6	174	96	160	110	177	126	169	117	166	121
7	164	109	162	121	180	129	178	116	162	-
8	160	114	152	117	180	121	182	124	158	120
9	135	115	160	123	181	120	174	113	170	114
10	143	116	166	128	184	116	176	115	166	117
11	141	112	171	120	183	118	169	108	178	105
12	154	110	168	116	177	112	176	123	174	107
13	166	107	178	103	184	111	167	108	180	99
14	164	82	179	100	182	113	172	122	170	91
15	168	77	180	100	182	112	168	118	173	104
16	167	102	175	100	177	124	164	115	102	102
17	160	94	169	100	174	120	158	112	164	108
18	156	91	165	96	178	120	158	108	160	116
19	160	94	164	105	173	119	155	108	153	112
20	161	111	153	104	172	117	170	109	149	116
21	159	122	157	110	174	116	165	102	142	115
22	159	122	153	111	175	118	168	111	152	114
23	154	132	160	115	188	117	169	112	159	119
24	154	125	167	110	187	124	170	112	165	111
25	152	126	173	120	190	120	170	115	166	122
26	164	126	174	116	188	119	177	112	164	116
27	169	129	178	122	192	113	170	120	171	117
28	179	123	182	108	179	112	185	116	167	112
29	188	118	187	108	176	119	-	-	169	116
30	179	102	186	104	-	-	-	-	172	113
31	-	-	194	104	-	-	-	-	170	119
Average	163	109	171	109	180	117	168	113	165	114
Max. Value	188	-	194	-	192	-	185	-	182	-
Min. Value	-	77	-	94	-	106	-	102	-	91

Unit: cm

Mean High Water Level = 188.20 / 100 = 1.641 (TTG)

Mean Low Water Level = 94.00 / 100 = -0.701 (TTG)

Mean Sea Level = 144.00 / 100 = -0.201 (TTG)

Note: The Datum difference between TTG and BPP is 1.641 m.

Table 1.31(1/4) TIDAL DATA ** APRIL 1997 **

Unit : cm

TIME DATE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Aver.	Max.	Nin.	Difference	
1	121	123	132	141	146	146	146	146	144	139	138	138	140	150	162	171	176	176	172	168	154	140	127	118	146	176	118	58	
2	117	121	127	139	145	146	146	144	140	134	130	130	130	139	150	163	172	174	169	162	150	134	119	105	141	174	105	69	
3	99	98	105	116	124	133	136	135	130	124	118	116	118	126	136	148	161	169	170	167	157	143	127	111	132	170	98	72	
4	98	95	98	110	114	124	134	138	135	132	127	121	121	127	137	150	164	172	176	176	172	161	146	130	136	176	95	81	
5	116	106	105	97	117	126	133	139	140	140	134	123	120	124	132	142	154	163	169	170	169	161	147	132	136	170	97	73	
6	116	104	96	109	104	112	120	129	134	138	137	132	126	123	130	139	148	160	166	171	174	172	164	150	136	174	96	78	
7	137	123	114	116	109	114	123	128	130	131	133	130	125	124	126	131	140	150	157	162	164	164	159	152	135	164	109	55	
8	142	131	122	122	114	118	126	131	136	139	138	138	138	136	136	136	141	147	153	158	160	160	157	154	139	160	114	46	
9	148	139	129	118	116	115	118	123	127	128	131	131	130	128	126	127	128	130	130	134	135	133	130	130	129	148	115	33	
10	125	122	120	126	118	116	118	120	124	130	131	136	140	140	143	143	144	143	139	138	140	140	133	128	132	144	116	28	
11	129	130	129	118	126	126	124	124	127	124	126	130	136	138	141	141	141	139	133	126	121	114	114	112	128	141	112	29	
12	110	114	115	124	121	123	126	128	127	125	130	132	138	144	148	152	154	152	145	136	126	118	112	110	130	154	110	44	
13	109	111	116	122	127	129	132	133	122	130	130	133	140	148	158	164	166	162	154	144	132	120	110	107	133	166	107	59	
14	105	106	112	94	128	133	138	140	140	138	138	140	140	141	148	157	164	160	148	132	118	104	93	82	129	164	82	82	
15	77	79	86	112	104	109	112	114	116	116	112	115	122	132	144	155	165	168	168	160	148	134	120	106	124	168	77	91	
16	102	102	104	102	122	133	138	140	141	137	134	132	132	138	147	157	164	167	166	162	152	138	124	110	135	167	102	65	
17	98	94	96	97	110	120	128	134	134	130	126	126	128	128	142	149	156	160	160	155	148	136	124	110	129	160	94	66	
18	100	93	91	97	104	111	120	127	132	132	128	125	124	128	135	144	152	156	156	154	146	137	135	122	127	156	91	65	
19	101	95	94	112	104	110	118	124	127	128	125	123	123	127	135	144	152	158	160	159	154	147	137	126	128	160	94	66	
20	118	111	111	124	116	122	128	133	135	136	135	130	130	134	141	146	152	157	160	161	160	155	148	139	137	161	111	50	
21	132	126	122	126	127	130	132	136	142	144	143	138	138	136	140	147	153	158	159	156	152	147	140	134	140	159	122	37	
22	127	122	122	154	130	133	138	143	147	147	146	144	142	146	153	157	159	159	159	156	150	146	144	142	144	159	122	37	
23	143	149	153	126	152	150	148	145	145	147	147	144	142	144	146	148	149	152	153	152	151	144	138	132	146	153	126	27	
24	127	126	125	130	130	136	142	145	150	150	152	150	151	152	152	154	154	154	154	154	150	144	138	135	144	154	125	29	
25	132	128	128	134	138	141	144	146	149	150	150	150	151	151	152	151	149	146	142	140	138	133	128	126	141	152	126	26	
26	126	126	126	128	134	138	142	144	144	148	152	154	158	160	162	164	163	163	160	156	152	147	142	136	145	164	126	38	
27	129	129	129	132	132	134	136	138	140	144	146	150	154	159	164	168	169	168	163	156	150	144	138	132	146	169	129	40	
28	130	130	131	133	133	135	136	138	141	142	144	152	152	161	170	176	179	176	168	159	146	135	129	123	147	179	123	56	
29	123	129	134	146	146	146	149	150	151	148	152	158	167	176	183	186	188	184	174	163	148	134	126	118	153	188	118	70	
30	114	110	121	133	133	137	137	136	134	131	131	134	142	151	162	171	177	179	173	164	144	124	110	102	140	179	102	77	
Average																									137	164	109	55	
Max.																										188			
Nin.																												77	

Table 1.51(2/4) TIDAL DATA ** MAY 1997 **

DATE	TIME	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Aver.	Max.	Min.	Difference
1	100	102	109	120	132	141	142	142	139	134	133	133	138	150	165	175	184	184	178	168	154	134	114	100	140	184	100	84	
2	94	96	103	112	123	134	143	144	142	138	135	135	135	142	153	164	175	182	182	176	165	149	130	113	140	182	94	88	
3	100	96	102	110	120	132	143	149	150	146	142	140	143	146	155	166	175	184	188	184	176	163	147	129	145	188	96	92	
4	112	102	100	103	116	126	135	143	142	140	138	138	138	142	149	157	165	172	176	176	172	163	152	139	141	176	100	76	
5	126	113	107	108	114	122	131	140	146	148	146	143	140	141	144	142	154	160	164	166	164	158	150	141	140	166	107	59	
6	130	120	112	110	113	118	126	133	140	145	148	146	146	144	142	145	148	151	154	157	160	159	152	146	140	160	110	50	
7	139	131	125	122	121	125	131	138	146	152	148	148	146	144	142	145	148	151	154	157	160	150	144	138	144	162	121	41	
8	132	125	120	117	117	120	124	128	134	139	143	146	149	151	152	152	150	148	145	142	140	136	133	130	136	152	117	35	
9	128	126	124	123	124	126	129	132	135	140	144	148	152	156	160	165	166	166	164	162	157	152	145	137	132	145	166	128	37
10	130	128	128	128	130	132	134	136	139	142	145	149	153	158	162	165	166	166	164	162	158	148	136	127	120	147	171	128	38
11	130	130	130	131	133	136	140	142	145	148	150	154	158	163	167	170	171	170	166	158	148	136	127	120	147	171	171	120	51
12	116	116	120	123	126	131	138	140	140	141	143	146	149	154	161	165	168	168	163	154	143	133	123	116	141	168	116	52	
13	112	112	114	122	126	135	142	147	150	152	154	155	159	163	168	173	176	178	175	170	158	118	106	103	145	178	103	75	
14	105	111	123	133	139	145	150	152	152	149	150	152	157	166	171	174	179	172	162	149	132	114	104	100	143	179	100	79	
15	100	105	117	128	142	150	150	152	152	152	154	152	156	166	176	180	179	176	169	158	144	125	112	105	146	180	100	80	
16	100	107	112	126	139	150	156	154	154	152	150	150	150	154	160	166	173	175	175	170	159	143	127	113	102	175	100	75	
17	100	100	106	118	132	144	150	150	149	146	144	144	146	151	159	164	169	165	161	154	146	128	113	104	139	169	100	69	
18	96	98	103	112	123	133	143	147	147	144	139	142	142	146	152	156	164	165	162	156	146	136	122	110	137	165	96	69	
19	105	107	114	123	134	147	154	159	156	152	145	142	145	145	151	155	161	164	163	162	153	140	127	116	106	140	105	59	
20	104	101	110	117	123	140	145	150	153	150	149	145	147	150	151	151	152	152	151	146	140	133	123	116	138	153	101	52	
21	110	108	114	123	131	140	148	157	156	156	152	149	150	150	155	155	155	152	151	149	144	138	131	123	116	140	108	49	
22	111	112	115	120	128	134	143	149	152	153	159	152	151	150	150	151	150	147	144	143	138	130	126	122	139	159	111	48	
23	117	115	116	122	128	137	146	154	158	160	160	156	153	152	152	149	146	144	141	137	134	127	118	115	139	160	115	45	
24	112	110	112	118	125	132	140	151	158	164	169	173	176	187	187	184	164	164	160	156	152	148	137	130	127	145	167	110	57
25	126	122	121	122	128	136	147	156	164	169	173	176	174	171	170	168	165	159	152	144	137	130	124	120	148	176	120	56	
26	119	119	116	116	119	126	135	144	152	157	163	169	171	173	174	174	172	167	160	152	145	140	133	130	147	174	116	58	
27	130	131	132	130	130	134	140	147	154	159	164	168	173	177	178	178	178	178	174	166	151	138	129	124	122	150	178	122	56
28	122	126	132	133	133	135	140	147	152	157	162	166	171	177	180	182	182	180	170	150	132	119	111	108	149	182	108	74	
29	112	117	123	129	134	136	140	144	146	148	150	156	165	176	184	187	186	183	174	161	146	130	117	108	148	187	108	79	
30	105	112	118	127	138	142	144	144	148	150	153	156	162	169	178	184	186	186	180	170	156	132	114	104	149	186	104	82	
31	104	110	120	136	141	150	154	154	156	158	160	161	167	173	182	190	194	192	186	178	163	145	128	113	155	194	104	90	
Aver.																										143	172	108	63
Max.																										194			
Min.																													94

Unit: cm

Table 1.31(3/4) TIDAL DATA ** JUN 1997 **

Unit : cm

DATE	TIME	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Aver.	Max.	Min.	Difference	
1	106	112	119	129	141	154	163	165	170	174	174	181	186	189	187	179	167	150	133	119	155	189	106	83						
2	109	108	115	125	138	150	161	170	174	174	181	186	189	187	184	180	171	158	142	126	155	184	108	76						
3	116	112	117	122	134	149	162	170	174	174	181	186	189	187	184	180	171	158	142	126	155	184	108	76						
4	118	110	112	117	125	137	150	161	168	169	172	177	181	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	
5	125	117	116	119	126	136	145	154	164	170	172	177	181	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	
6	134	128	126	128	132	140	148	155	164	170	172	177	181	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	
7	134	130	129	129	134	141	147	154	162	167	173	178	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	
8	128	126	124	125	130	138	147	154	160	166	170	175	177	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	
9	121	123	124	126	130	138	145	154	162	168	174	179	181	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	182	
10	116	118	121	124	130	137	147	156	162	167	170	174	179	182	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	
11	118	120	124	128	137	144	152	158	161	165	168	172	176	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	
12	112	112	118	124	130	135	141	147	152	156	160	164	168	170	175	178	182	180	175	165	153	143	132	125	121	152	180	121	59	
13	111	114	120	128	136	144	152	157	162	164	165	168	170	175	178	182	180	175	165	153	143	132	125	120	152	182	120	62		
14	113	115	121	128	137	147	154	159	162	165	166	168	170	175	178	182	180	175	165	153	143	132	125	120	153	184	116	68		
15	112	114	118	124	132	143	152	159	163	164	166	167	168	170	174	179	182	180	176	161	148	135	125	118	152	183	118	65		
16	124	124	124	130	141	151	161	168	170	168	168	169	171	174	176	177	177	177	177	177	177	177	177	177	177	177	177	177	177	
17	121	120	124	130	141	153	164	172	174	170	165	160	159	159	162	165	168	168	166	160	154	146	135	126	156	177	124	53		
18	120	121	126	134	144	157	168	176	178	175	170	167	164	164	165	166	166	166	166	166	166	166	166	166	166	166	166	166	166	
19	119	120	125	132	143	152	162	168	173	172	168	165	161	159	158	157	157	156	154	151	145	138	130	123	150	173	119	54		
20	117	116	120	128	136	146	156	164	170	172	172	170	168	165	164	160	158	155	152	148	144	138	131	125	149	172	116	56		
21	119	116	116	121	128	136	147	157	164	172	174	175	176	175	172	170	167	162	156	150	146	140	134	128	149	174	116	58		
22	124	120	118	123	131	140	149	157	164	171	175	176	175	172	170	167	162	156	150	146	140	134	128	124	149	176	118	58		
23	121	118	117	120	128	140	150	158	165	173	180	185	188	186	186	182	176	169	161	155	149	142	136	131	155	188	117	71		
24	130	128	126	124	126	132	142	151	158	164	172	180	184	187	185	180	174	168	158	149	145	140	134	130	153	187	124	63		
25	130	130	130	130	132	136	144	150	157	164	170	176	184	188	190	190	186	178	168	156	145	140	134	125	120	165	190	120	70	
26	119	120	122	125	126	128	137	145	151	155	162	169	176	184	187	188	185	180	172	160	147	135	128	127	151	188	119	69		
27	126	128	134	139	143	147	165	162	168	172	174	176	179	185	190	192	190	186	178	163	147	130	118	113	159	192	113	79		
28	112	115	119	126	133	138	141	143	149	152	152	156	162	167	171	174	179	178	173	165	152	136	124	118	147	179	112	67		
29	119	120	126	140	150	157	162	164	161	162	156	154	153	160	166	172	174	176							154	176	119	57		
30																														
Average																										152	180	117	63	
Max.																											192			
Min.																												106		

Table 1.31(4/4) TIDAL DATA ** JULY, AUGUST 1997 **

	September			August			July		
	Max	Min	Differ.	Max	Min	Differ.	Max	Min	Differ.
1	163	128		174	118	56	162	114	48
2	172	122		176	124	54	162	106	56
3	163	116		182	122	60	164	112	52
4	174	122		180	120	60	156	105	51
5				176	123	53	162	110	52
6				166	121	45	169	117	52
7				162	-	-	178	116	62
8				158	120	38	182	124	58
9				170	114	56	174	113	61
10				166	117	49	176	115	61
11				178	105	73	169	108	61
12				174	107	67	176	123	53
13				180	99	81	167	108	59
14				170	91	79	172	122	50
15				173	104	69	168	118	50
16				102	102	0	164	115	49
17				164	108	56	158	112	46
18				160	116	44	158	108	50
19				153	112	41	155	108	47
20				149	116	33	170	109	61
21				142	115	27	165	102	63
22				152	114	38	168	111	57
23				159	119	40	169	112	57
24				165	111	54	170	112	58
25				166	122	44	170	115	55
26				164	116	48	177	112	65
27				171	117	54	170	120	50
28				167	112	55	185	116	69
29				169	116	53	-	-	-
30				172	113	59	-	-	-
31				170	119	51	-	-	-
32				162	114	48	-	-	-
Aver.				165	114	51	168	113	55
Max.				182			185		
Min.					91			102	

1.6 Other Data

Table 1.32 CALCULATION PROCEDURE FOR WATER USE SIMULATION

Symbol	Unit	Meaning	Equation to Calculate
Qpa	m ³ /s	Natural Discharge at Panjangan	20 years by Tank-Model, 10 years by Observation
Q1	m ³ /s	Inflow at Dam Site	$Q1 = Qpa * (53.0km^2/192.6km^2)$
C1	m ³ /s	Maintenance Flow at Dam Site	$C1 = 1.0m^3/s * (53.0km^2/204.0km^2)$ $= 0.26 m^3/s$
B1	m ³ /s	Flow Required at Dam Site	$B1 = C1$
E1	m ³ /s	Balance at Dam Site	$E1 = Q1 - B1$
Y1	m ³ /s	Surplus at Dam Site	if $E1 \geq 0$ then $Y1 = E1$: $H1 = 0$
H1	m ³ /s	Deficit at Dam Site	if $E1 < 0$ then $Y1 = 0$: $H1 = E1$
Q2	m ³ /s	Natural Discharge at Simongan	$Q2 = Y1 + C1 + Qpa * (151.0km^2/192.6)$
C2	m ³ /s	Maintenance Flow at Simongan	$C2 = 0.50m^3/s + 0.15m^3/s = 0.65 m^3/s$
L2	m ³ /s	Existing Intake Flow	$L2 = 0.58 m^3/s$
SS	m ³ /s	New Intake Flow	
B2	m ³ /s	Flow Required at Simongan	$B2 = C2 + L2 + SS$
E2	m ³ /s	Balance at Simongan	$E2 = Q2 - B2$
Y2	m ³ /s	Surplus at Simongan	if $E2 \geq 0$ then $Y2 = E2$: $H2 = 0$
H2	m ³ /s	Deficit at Simongan	if $E2 < 0$ then $Y2 = 0$: $H2 = E2$
Yt		Surplus Flow for Both Site	Smaller of Y1 and Y2
Ht	m ³ /s	Total Deficit Flow	$Ht = H1 + H2$
V	m ³	Dam Vacant Volume	$V = V' + (Ht - Yt) * 86,400 * Days$ if $V < 0$ then $V = 0$ V' means V at Former Step
Dq	m ³ /s	Dam Operational Flow	$Dq = (V - V') / 86,400 / Days$
D1	m ³ /s	Outflow at Dam	$D1 = Q1 + Dq$
D2	m ³ /s	Dicharge at Simongan after Dam Operation	$D2 = D1 + Qpa * (151.0km^2/192.6km^2)$

Note : basically Days = 5 except end of month where Days = 3 to 6

Table 1.33 CALCULATION PROCEDURE FOR WATER USE SIMULATION

Water Sources	Construction Year	Design Capacity (l/s)	Production Capacity (l/s)
Garang River		980	901
WTP Kaligarang-1	1965	500	445
WTP Kaligarang-2	1982	80	56
WTP Kaligarang-3	1995	250	250
WTP Kaligarang-4	1995	150	150
Babon River			
WTP Pucanggading	1995	50	50
Spring around Mt. Ungaran	1911 -	300	258
Deep Well in the city area	1911 -	117	46
around Mt. Ungaran	1982 -	700	598
Total		2,147	1,853

Source : PDAM of Kotamadya Semarang, REPORT "SFPC Final Project Preparation" in 1996

Note : WTP stands for Water Treatment Plant

Table 1.34 WATER USE DATA IN SEMARANG CITY

No.	Item	Unit	Calendar Year					
			1985	1987	1989	1991	1993	1995
(1)	Total Water Supplied	m ³	25,892,450	25,954,887	26,020,247	32,978,734	40,250,845	41,155,567
(2)	Metered Water	m ³	13,390,950	12,555,822	13,272,419	17,784,821	23,740,957	25,532,633
(3)	Uncounted Water ((1)-(2))/(1)	%	48.28	51.62	48.99	46.07	41.02	37.96
(4)	Total Population	Person	1,106,067	1,112,175	1,126,265	1,154,536	1,177,562	1,232,931
(5)	Number of Customers	Nos.	31,180	32,459	35,418	56,021	65,838	82,444
(6)	Population supplied Water (5)*5	Person	155,900	162,295	177,090	280,105	329,190	412,220
(7)	Service Ratio (6)/(4)	%	14.09	14.59	15.72	24.26	27.96	33.43
(8)	Usage per Capita (2)/(6)/365	l/day	235	212	205	174	198	170

Source : PDAM of Kotamadya Semarang, REPORT "SFPC Final Project Preparation" in 1996

Total population in this table was Semarang City only, excluding proposed new service area in Kendal & Sayung(Demak)

Table 1.35 CALCULATION PROCEDURE FOR WATER USE SIMULATION

Water Use		Unit	Year				
			1995	2000	2005	2010	2015
Eastern Area							
Domestic Water Demand		m3/s	0.288	0.426	0.643	0.792	0.917
Population		Person	350,405	369,923	390,528	412,281	435,245
Service Ratio		%	50	70	90	100	100
Ratio (House C. : Public H.)		%	80 : 20	80 : 20	80 : 20	80 : 20	80 : 20
Unit Consumption for House C.		l/c/d	170	170	190	200	220
Unit Consumption for Public H.		l/c/d	30	30	30	30	30
Water Demand for House Connection		m3/s	0.276	0.408	0.618	0.763	0.887
Water Demand for Public Hydrant		m3/s	0.012	0.018	0.024	0.029	0.030
Non-Domestic Water Demand		m3/s	0.238	0.698	1.409	1.922	2.055
Industrial Area		ha	610	1,220	1,857	2,580	2,720
Service Ratio		%	30	60	85	85	85
Unit Consumption for Industrial Use		l/s/ha	0.75	0.75	0.75	0.75	0.75
Industrial Water Demand		m3/s	0.137	0.549	1.184	1.645	1.734
Commercial Water Demand (Dom. *35%)		m3/s	0.101	0.149	0.225	0.277	0.321
Losses of Water		%	38	27	25	25	25
Table 1.34		m3/s	0.848	1.539	2.735	3.619	3.962
Raw Water Demand (Clean * 1.25)		m3/s	1.060	1.924	3.419	4.524	4.953
Western Area							
Domestic Water Demand		m3/s	0.625	0.924	1.395	1.719	1.990
Population		Person	760,504	802,865	847,585	894,797	944,638
Service Ratio		%	50	70	90	100	100
Ratio (House C. : Public H.)		%	80 : 20	80 : 20	80 : 20	80 : 20	80 : 20
Unit Consumption for House C.		l/c/d	170	170	190	200	220
Unit Consumption for Public H.		l/c/d	30	30	30	30	30
Water Demand for House Connection		m3/s	0.599	0.885	1.342	1.657	1.924
Water Demand for Public Hydrant		m3/s	0.026	0.039	0.053	0.062	0.066
Non-Domestic Water Demand		m3/s	0.340	0.725	1.256	1.512	1.749
Industrial Area		ha	541	892	1,205	1,428	1,651
Service Ratio		%	30	60	85	85	85
Unit Consumption for Industrial Use		l/s/ha	0.75	0.75	0.75	0.75	0.75
Industrial Water Demand		m3/s	0.122	0.401	0.768	0.910	1.053
Commercial Water Demand (Dom. *35%)		m3/s	0.219	0.323	0.488	0.602	0.696
Losses of Water		%	38	27	25	25	25
Clean Water Demand ((D.+N.D)/(1-Loss))		m3/s	1.557	2.258	3.535	4.308	4.985
Raw Water Demand (Clean * 1.25)		m3/s	1.946	2.823	4.419	5.385	6.231
Upper Area							
Domestic Water Demand		m3/s	0.112	0.213	0.322	0.397	0.460
Population		Person	175,622	185,404	195,732	206,634	218,144
Service Ratio		%	50	70	90	100	100
Ratio (House C. : Public H.)		%	80 : 20	80 : 20	80 : 20	80 : 20	80 : 20
Unit Consumption for House C.		l/c/d	130	170	190	200	220
Unit Consumption for Public H.		l/c/d	30	30	30	30	30
Water Demand for House Connection		m3/s	0.106	0.204	0.310	0.383	0.444
Water Demand for Public Hydrant		m3/s	0.006	0.009	0.012	0.014	0.015
Non-Domestic Water Demand		m3/s					
Commercial Water Demand (Dom. *35%)		m3/s	0.039	0.075	0.113	0.139	0.161
Losses of Water		%	38	27	25	25	25
Clean Water Demand ((D.+N.D)/(1-Loss))		m3/s	0.243	0.394	0.580	0.715	0.827
Raw Water Demand (Clean * 1.25)		m3/s	0.304	0.493	0.725	0.893	1.034
Total		m3/s	3.310	5.240	8.563	10.802	12.218

Population in this table includes proposed new service area in Kendal & Sayung(Demak)

Population growth per year is supposed as 1.09 % based on the data of 1985 to 1995

Source : REPORT "SFCP Final Project Preparation" in 1996

Table 1.36 PROPOSED WATER SOURCES FOR SEMARANG CITY WATER SUPPLIES

No.	Water Source	Capacity (m ³ /s)	Cumulative (m ³ /s)	Year	Remarks
(a)	Existing	1.532	1.532	1996	Garang 0.580(F/S in 1993) + Others 0.952 = 1.532 m ³ /s
(b)	(Existing)	(1.853)		(1996)	Garang 0.901 + Others 0.952 = 1.853 m ³ /s
1	Water transfer from Klambu to Kudu	2.500	4.032	1998	Under Construction
2	Jatibarang Reservoir	1.460	5.492	2003	Proposed by JICA
3	Dolok Reservoir	0.750	6.242	2003	1.460-(1.853-1.532)= 1.139 m ³ /s from (b)
4	Tuntang Jragung Regulation Tunnel	1.750	7.992	2003	
5	Mundingan Reservoir	1.020	9.012	2005	Proposed by JICA
6	Interbasin Transfer	0.680	9.692	2005	Proposed by JICA
7	Kedung Suren Reservoir	1.700	11.392	2009	Proposed by JICA
8	Babon Reservoir	1.300	12.692	2011	Proposed by JICA
	Total		12.692		

Note : Modified from REPORT "SFCP Final Project Preparation" in 1996

"Others" consists of Babon River, Springs and Deep Wells (refer to Table 4.1.30)

Table 1.34

Table 1.37 EVAPORATION VOLUME TO INCREASE FROM RESERVOIR IN DROUGHT TIME

No.	Item	Value	Unit	Remarks
(1)	Pan Evaporation (= Reservoir Evaporation)	1,610	mm/yr	by BMG-Semarang
(2)	Evaporation from Basin	1,200	mm/yr	Average in 30 years
(3)	Evaporation to increase from Reservoir	410	mm/yr	(3)=(1)-(2)
(4)		1.12	mm/day	(4)=(3)/365
(5)	Storage Area at Normal Water Level	1,006	1000m ²	N.W.L.= EL.148.6 m
(6)	Storage Area at Low Water Level	631	1000m ²	L.W.L.= EL.135.7 m
(7)	Average Storage Area	819	1000m ²	(7)=((5)+(6))/2
(8)	Reservoir Supply Days in Drought Year	108	days	in 1991, 3rd / 30years
(9)	Evaporation Volume to increase from Reservoir in Drought Time	99,000	m ³	(9)=(4)*(7)*(8)

