HYDRO METEOROLOGICAL INSTITUTE OF MONTENEGRO
-Hydrology Division-

H y d r o l o g y A n a l y s i s

of profiles of small (mini, micro) hydro power plants (sHPPs) on tributaries of main watercourses in Montenegro

This analysis of hydrology was performed as a result of an agreement reached with Elektroprivreda Crne Gore A.D. Niksic in accordance with programe with Norwegian Directorate for Water and Energy (NVE), Oslo

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P o d g o r i c a, October – December, 2007

T e c h n i c a l R e p o r t

Introduction

The idea to implement development project for small, mini and micro Hydro Power Plants (sHPPs) in Montenegro existed in Elektroprivreda Crne Gore A.D. (EPCG A.D.) over few decades though activities implemented to date were mainly reduced to development of different studies. Around 70 studies of potential sHPPs were prepared in the period 1980 – 1986. Potential sites for construction of sHPPs on tributaries of rivers Tara, Ibar and Cehotina were not studied. According to a certain scale, small HPPs are defined as power plants up to 10 MW capacity, mini HPPs up to 2 MW and micro up to 500 KW.
Expert teams as well as other professional teams of Elektroprivreda identified 68 sHPPs with 226 MW total installed capacity and 630 GWh possible annual generation. It should be said that technical, energy and other characteristics of these sHPPs were not based on good hydrology data, therefore the suggested designs are open to question because of the same reasons. Namely, without precise, concrete and good hydrology parameters it is not possbile to state that designs suggested in studies are good, and they may be overrated or underrated.
This is primarily because their generation figures were based on average hydro potential estimated as 0.36 GWh/km^2 specific energy, which is equal to an average for former Yugoslavia and this is their main defficiency. These hydrology researches were undertaken in order to overcome this problem.

Namely, the occasion that representatives of Norwegian Directorate for Waters and Energy (NVE) who funded certain projects of Hydrometeorological Institute of Montenegro were staying in Montenegro was used to establish a direct and inofficial contact with NVE experts and in this way initial grounds were established for possible implementation of Project of Hydrology Researches for Construction of small Hydro Power Plants in Montenegro“.

Project Initiator:	Elektroprivreda Crne Gore A.D. Nikšić
Responsibility for Project Implementation:	Norwegian Directorate for Water and Energy (NVE), Oslo.
Partners in Project Implementation:	Elektroprivreda Crne Gore A.D. Nikšić. Hydro Meteorological Institute of Montenegro, Podgorica.
Manager of Implementation Work Group:	Svein Harsten, NVE (Main Coordinator) Miroslav Marković, M.Sc., EPCG A.D. (Coordinator)

Based on level of analysis already undertaken:

- First priority level; site aceptable in energy terms and hydrology investigations undertaken through direct measurements of water flows,
- Second priority level; site acceptable in energy terms, hydrology is not analysed,
- Third priority level; site unacceptable in energu terms and hydrology is not analysed.

In these hydrology investigations a strong accent was put on:

1. Analysis of existing information and information which was received relating to the program of activities i.e. hydrology and geology parameters for identification of hydrology potential. Establishment of a basis for geografical information system (GIS) for sites where hydrology of analysed tributaries was applied. Required hydrology measurements on certain sites, quality of water, position and designs of power plants, position of dam and quality of rocky ground, dimensions of water reservoir and generation performance, power generated (MW) and energy (MWh).

2. Clarification of issues relating to ecology, network access – for customers, access to sites and compliance with spatial plan of the Republic of Montenegro.

3. Assessment of economic parameters: in relation to planning costs, construction and operational costs, analysis of market opportunities, assessment in terms of generation of green (clean) energy, analysis of technical-economic limitations in operation and identification of expected profitability of analysed hydro power plants.

Objective of Norwegian partner was to establish extremely good general information base, preliminary designs and feasibility studies for certain profitable small hydro power plants and to participate in future public bidding process for designing and construction of those power plants (independently or as a JV with EPCG A.D.), being assured that required project documents would be prepared fully in accordance with relevant standards for analysis and designing which are applied in deregulated Norwegian hydro power market.

Directness and wish of Norwegian experts to bring some of their experience in development of hydro potential of small water courses through construction of sHPPs into this part of the world was warmly welcomed by Montenegrin experts who were involved in this sector (EPCG A.D. and HMZCG) and who then initiated certain activities in their organisations and in the Government of Montenegro, in order to enable successful implementation and completion of this Project.

Fifteen sites were included into the First Stage and hydrometric measurements were to be undertaken on these sites in order to obtain more reliable information about water flows in these watercourses as required for calculation of possible generation levels, whereof 6 belong to the catchment area of the river Piva and 9 belong to the catchment area of the river Lim. During 2006 and 2007 fifteen series of water flow measurements were undertaken on each of them.
Primarily, automatic gauging stations of a „Talimedija“ type were installed in hydrology shelters, which were build by HMZ. Transfer of data from stations to the center in Podgorica is performed by GSM (mobile technology), and data is presented and analysed in HYDRAS.
Through these measures we managed to have continuous transfer of real time data about water levels into the building of Hydro Meteorological Institute of Montenegro. This considerably contributed to having recorded change of water levels and to record low, medium and high waters in accordance with their duration, by applying hydrometric measurements.
Changes in water levels were recorded every 15 minutes so that average daily water levels are calculated as an average of 96 values, as recorded during 24 hours.
Power source is enabled through 1.5 V batteries, supplemented with small solar panels. Izvor energije su baterije od 1,5 V, uz dopune manjim solarnim panoima.

Implementation of these hydrology researches took about 15 months. Period of monitoring was different for different guaging stations as it depended on the date of installation of the gauging station and beginning of its operation.

The sequence of selected profiles with corresponding tributaries is as follows:

	Name of station	Watercourse	Catchment area (km^2)	Tributary level	Catchment area
1	Stabna	Vrbnica	28.1	I	
2	Ribnjak	Vrbnica	73.0	I	
3	Donja Bukovica	Bukovica	41.2	I	**Pive**
4	Timar	Bukovica	70.1	I	
5	Sirovac	Tušina	37.4	I	
6	Gornja Bijela	Bijela	24.9	I	
7	Lubnice	Jelovica	59.0	II	
8	Trepča	Trepačka Rijeka	32.5	I	
9	Kralje	Kraštica	26.6	I	
10	Velika	Velička Rijeka	12.4	I	
11	Murino	Murinska Rijeka	17.3	I	**Lima**
12	Babino Polje	Babinopoljska Rijeka	26.0	II	
13	Jara	Komarača	61.2	I	
14	Hoti	Trokutska Rijeka	19.6	II	
15	Donje Vusanje	Grlja	62.6	I	

B.Overview of parameters of hydrographic and physical-geographic characteristics of catchment areas

There indicators are reflecting spatial, topographical and relief position of selected sites, with parameters which are used as imput data for regional analysis of homogeneity of run-off regimes in catchment areas and implementation of same procedures for their analysis.

1. Catchment area ---------- F (km^2)
2. Length of watercourse ---------- L_t (km)
3. Length of catchment area ---------- L_s (km)
4. Perimeter of catchment area ---------- S (km)
5. Average width of catchment area ---------- $B = F/L_s$ (km)
6. Rectilinear distance river source - mouth --- L_i (km)
7. Rectilinear distance between brunt centre of the catchment and the river mouth - U_t (km)
8. Watershed spreading factor ---------- K_s
9. Elongation of catchment factor ---------- K_σ
10. Concentration of catchment factor ---------- K_c
11. Tortousnesness of flow factor ---------- K_l
12. Maximum head in the catchment area -------- H_{max} (m.a.s.l.)
13. Minimum head in the catchment area ------- H_{min}(m.a.s.l.)
14. Average head in the catchment area ------- I_{sr} (%)
15. Maximum head of slope of valley ---------- I_{max} (%)
16. Average altitude of the catchment area ------- H_{sr} (m.a.s.l.)
17. Average difference in altitude of the catchment area ---------- ΔH (m)
18. Levelled out head of watercourse ---------- I_t (%)
19. Maximum head of the watercourse ---------- I_{t1} (%)
20. Average maximum head of the watercourse -- I_{t2} (%)

In brief, we shall list neccessary assumptions used to obtain this information. Catchment area, lenght of watercourse, length of catchment area and perimeter of catchment area are straightforward.
Medium width of the catchment area is a parameter calculated by applying the following formula B = F/Ls and it represents a ratio between surface and lenght of catchment area.

Watershed spreading factor $Ks = \frac{S}{3.54\sqrt{F}}$ is a ratio between perimeter of of catchment area (S) and circumference of a circle with a same surface as the analysed catchment area (S_1)

$F = r^2 \pi \rightarrow r = \sqrt{F/\pi}$

$S_1 = 2r\pi = 2\sqrt{F/\pi} \times \pi = 2\sqrt{F\pi} = 3.54\sqrt{F}$

Elongation of catchment factor $K_\sigma = \frac{l^2_t}{F}$

Concentration of the catchment area factor is calculated based on the following formula $K_c = \frac{2F}{S \times U_t}$

Average head of the catchment area is also calculated by applying the following formula $I_s = \sum_{i=1}^{N} \frac{h_i}{\check{s}_i} \times \frac{f_i}{F}$

h_i - equidistance between contour lines
f_i - surface between two neighbouring contour lines
$\check{s}_i$ - average width of a strip of land between two contour lines

$\check{s}_i = \frac{f_i}{L_{sr}}$; $L_{sr} = \frac{L_{i-1} + L_i}{2}$; $L_{i-1}; L_i$ - lenght of contour lines

$$I_s = \frac{0.5h \times \sum_{1}^{n}(L_{i-1} + L_i)}{F}$$

Average altitude of the catchment area is calculated based on the following formula:

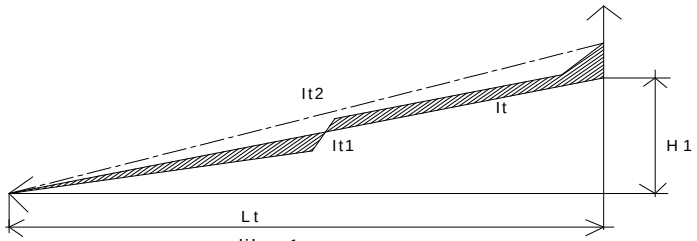
$$H_{sr} = \frac{f_1H_1 + f_2H_2 + ... + f_nH_n}{F}$$

$f_1, f_2 ..... f_n$ - surface of the catchment area encompassed between two contour lines,
$H_1, H_2 ----- H_n$ – average altitude between two neighbouring contour lines.

Average difference in altitudes in the catchment area $\Delta H = H_{sr} - H_p$

H_p – altutude of the mouth of the river or altitude of the profile for which difference in altitudes is calculated.

Overview of characteristic heads in the watercourse



slika 1.

$F_\Delta = \frac{L_t \times H_1}{2}$ from condition $F_\Delta = F \rightarrow H_1 = \frac{2F}{L_t}$

i.e. $I_t = \frac{H_1}{L_t} \times 100$ (%)

C. Water balance for selected measurement profiles

Selection of measurement profiles where hydrometric measurements on watercourses as required for construction of sHPPs were implemented, was performed by EPCG experts while only technicians from HMZ were present, therefore HMZ shall not assume any responsibility for adequacy of sites selected for measurements. By rule, measurement profiles were to be established on place of potential hydr power projects, and they were to be analysed first based on proper topografic grounds, and after conducting this analysis data should be applied on actual watercourse and then in this area sites for measurement places of future hydro power project shall be selected.

As this was not done, measurement profiled were primarily selected based on local conditions with respect to quantity of water flowing through river beds, and they are usually not identical with optimal locations of hydro power projects. One should be objective and admit that it is not always possible to establish a measurement profile on exact position of hydro power projects, because of number of reasons and one of reasons would be the fact that it simply did not exist, due to the flooding nature of watercourses, which are covered with considerable number of pebbles (approximatly of 0.5 to 1.5 tonnes). Typical example of this conditionality is a measurement profile „Gornja Bijela“, which has extremely high head with levelled out head of watercourse of unbelievable 77.3%. Also, this measurement profile is on the right bank, some 15 m downstream from the bridge (extemely unfavourable), upstream from the bridge a measurement profile simply doed not exist and because of numerous cascades and hydrometric measurements are possible, when there are high water levels, only by applying salt water methodology. With such big alluvium with big dimensions, in certain regimes of low and medium level waters, and with such high heads, it happens that the water flows though alluvium, and this flow can not be registered by hydrometric wing. Map of catchment areas belonging to tributaries with measurement profiles, in sequence from 1 to 6 in the catchment area of the river Piva and from 7 to 15 in the catchment area of the river

Lim is annexed on page 6 and is also given on Figure 2, in accordance with general direction Northwest – Southeast.

It should have perhaps been mentioned even before that authors of this document did not have any Terms of Reference specifying level and types of analysis, therefore they were left to their subjective judgement to decide the content of analysis as well as its scope.

As measurement periods and periods of analysis comprise part of 2006 and 2007, it is clear that those periods can not be the same for all stations, as the stations begun with measurements at different times depending on the date when they were equipped to do measurements. For stations in catchment area of the river Piva, the same date 28.08.2007 was adopted as a final date of analysis, while beginning dates were different, depending on the time when stations were enabled for operation:

	Water stream	Hydrology station	Beginning date	Final date	Number of days
1	Vrbnica	Stabna	22.04.2006.	28.08.2007.	494
2	Vrbnica	Ribnjak	15.04.2006.	28.08.2007.	501
3	Bukovica	Donja Bukovica	18.05.2006.	28.08.2007.	468
4	Bukovica	Timar	12.04.2006.	28.08.2007.	504
5	Tušina	Sirovac	12.04.2006.	28.08.2007.	504
6	Bijela	Gornja Bijela	21.07.2006.	28.08.2007.	404

This varying total number of days, which ranges between 404, i.e. less than 14 months, and 505, almost 17 months, caused a great dilema as to which number of days to use for duration curves, which is decisive for calculation of electricity generation, while we would first make optimal selection of installed flow and corresponding power, deciding whether potential small HPPs belong to micro, mini or small hydro power plants,which are all identified as (sHPPs). We had two possible options.
First, to reduce the total monitoring period to 365 days by adding up the months which were overlapped and by dividing them with two. In this way it was possible to calculate annual generation of electricity, which was Yugoslav and now Montenegrin standard.

The second option was to analyse the whole period, which would mean that we would not comply with standards.

There are differences in months where we have overlapping, these differences concern average annual water flows for a callendar year as well as flows for a whole period, with varying total number of days.
These differences are not always of equal natureunambiguous. The values are sometimes bigger in the case of 365 days balance and sometimes in the case of a complete period, and that is logical considering the available water volumes in the period.

Finally, after conducting all analyses we decided for the Option 1.

This was some general information about water balance for selected measuring profiles, and in the remainder of the document the results will be presented for each station seperatelly.

MAP OF CATCHMENT AREAS

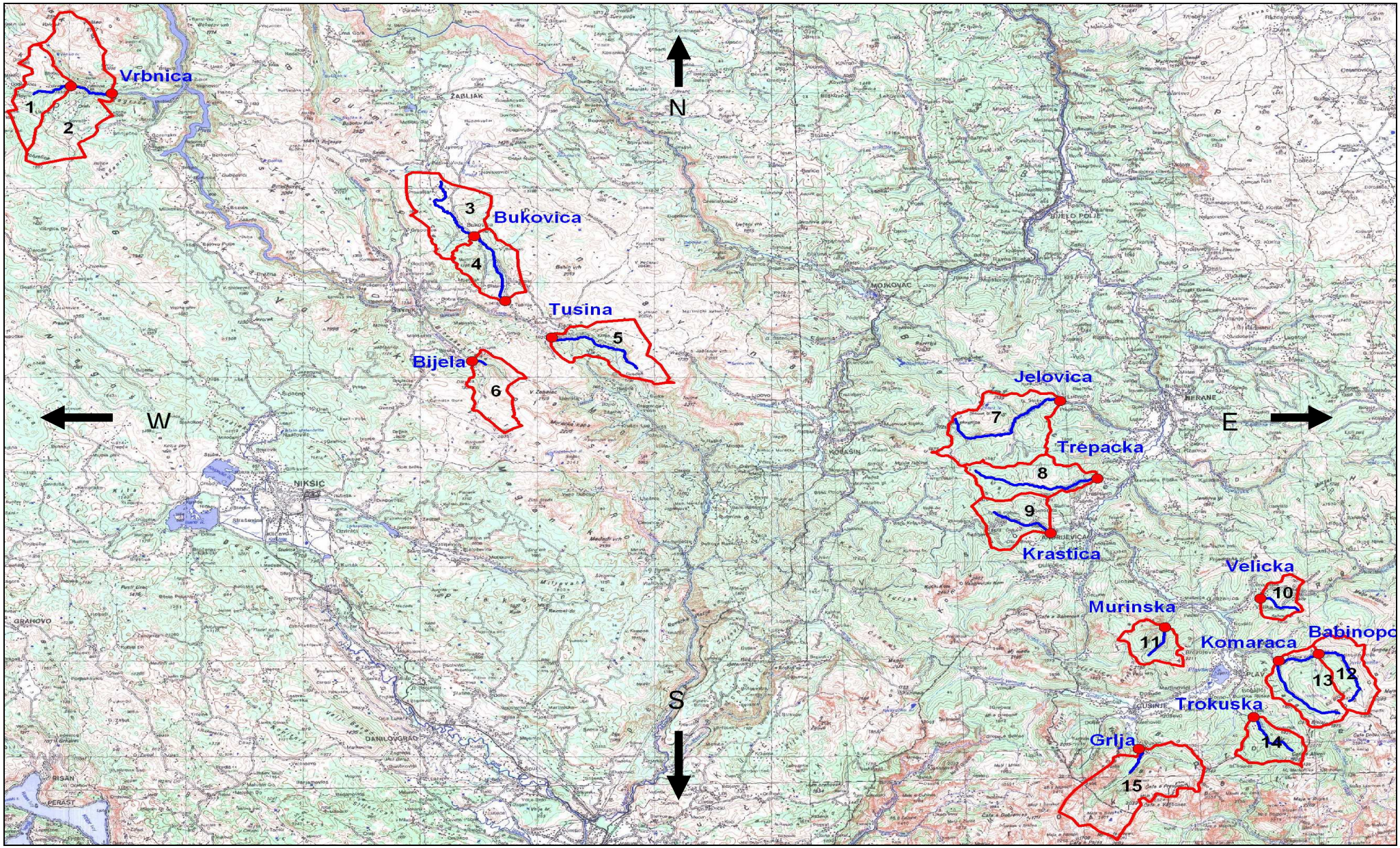


Figure 2

C1. WATERCOURSE: VRBNICA
HS: STABNA

Hydrometric measurements that were performed on this profile have not provided continuity of analyses as was the case on the remaining profiles. Choice of measurements relative to water level amplitude was unfavourable and therefore their results could not ensure that the usual methodology for construction of flow curve be applied based on which a water balance for this profile would have been made. Even 8 hydrometric measurements were made at extremely low water levels (with quite small change of water level amplitude) which had not made it possible for flow curve to bend in the upper part, but the resulting bending seemed too linear which was unnacceptable (Figure 3).

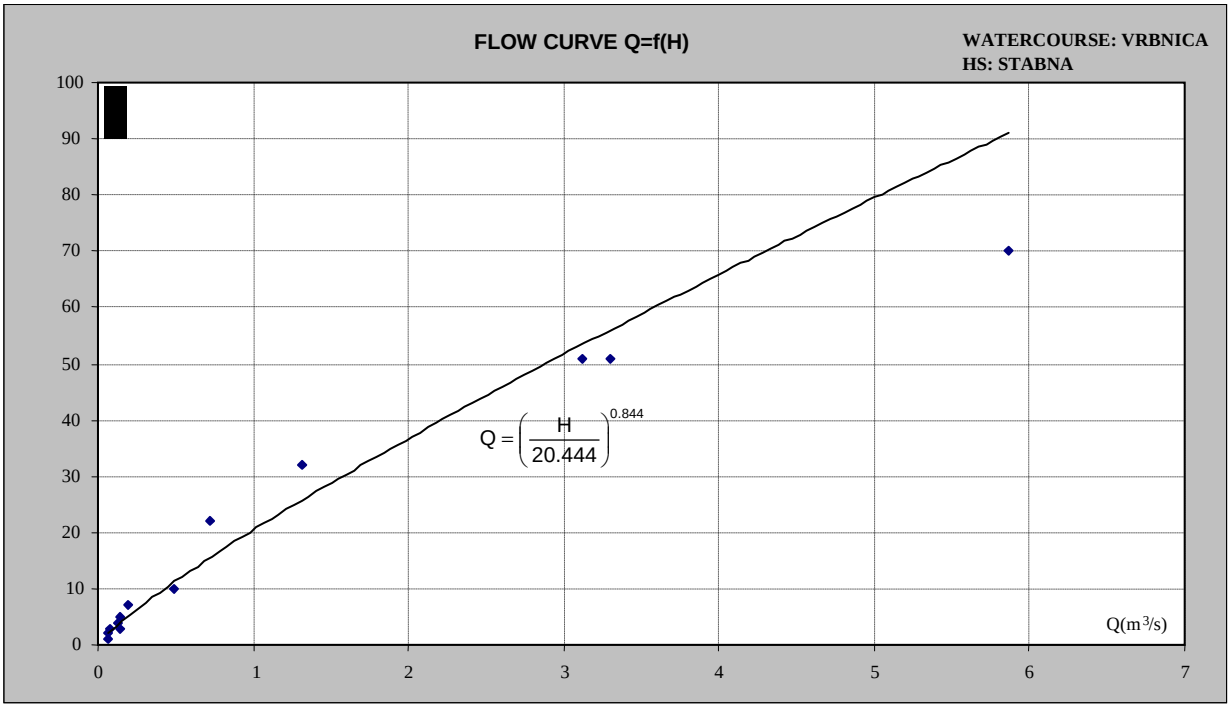


Figure 3

Functional dependance $Q = \left(\frac{H}{20.444}\right)^{0.844}$ did not give satisfactory results with respect to water balance and ths caused considerable uncertainces on the lower profile on Vrbnica – HS Ribnjak.
Low and meduim waters showed stable continuity, but resulting levels of high water levels were quite lower than expected. Besides, in almost (25-30)% of days water balances were distorted.
Because of all of this we decided to discount all measurements and to obtain the water balance for profile Stabna indirectly, i.e. through profile Ribnjak. By establishing a direct linear link between adeqaute measurement data, catchment areas, precipitation and meduim altitude of catchment areas we eatablished interdependances.

$Q_{STAB}=0.649Q_{RIB} - 0.02$ at $Q \leq 10$ m^3/s

$Q_{STAB}=0.408Q_{RIB}$ at $Q>10$ m^3/s

Based to the above described dependence in the measurement period 22.04.2006 - 28.08.2007 we got average flow for 494 days of 1.11 m^3/s, and a water balance reduced to a calendar year of 1.18 m^3/s, which shows a slight difference in water balances of just 70 l/s.
This is the furthest upstream profile on Vrbnica for which the catchment area is 28.1 km^2 , lenght of watershed is 29.4 km, maximum elevation of catchment area is 1985 m.a.s.l. and minimum is 920 m.a.s.l. Average head in the catchment area is 33.8%, average elevation of the cachment area is 1486 m.a.s.l. and levelled out head of watercourse of 9.88 (%).
Disposition of catchment area with all hydrographic and phisical-geographic parameters of the catchment area is given on the page 8.
Schematic longitudinal profile of watercourse (Figure 4) and hypsometric curve (Figure 5) are given on page 9. It could be seen from the hypsometric curve that elevation of the most part of catchment area is between 1300 and 1700 m.a.s.l., and this makes around 76% of the catchment area.

Annual overview of flow levels in one calendar year and for the part of 2006 and 2007 could be found on page 10. Hydrograph (Figure 6) is given on the page 11.
According to obtained water balance, minimum water flow is 40 l/s and maximum is 31.0 ^{3}/s. Absolute minimum peak is lower than medium daily flow for that day by 30%, and it amounted to 57 l/s. Ratio is different when it cames to extreme maximums, amounting at 31.0 m^3/s, which is almost 7 times higher than medium daily ofr that day. Thanks to new equipment, for the first time we obtained some information about ratio between peak water levels and average daily flow. It is well known that this ratio increases with smaller dimensions of catchment area, and to date their value used to be around 2.

Hydrographic and physical-geographic characteristics of the catchment area

1	Catchment area F	28.1	[km^2]
2	Length of watercourse L_t	3.81	[km]
3	Length of catchment area L_s	5.52	[km]
4	Perimeter of catchment area S	29.4	[km]
5	Average width of catchment area B=F/L_s	5.09	[km]
6	Rectilinear distance river source - mouth L_i	3.29	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.17	[km]
8	Watershed spreading factor K_s	1.57	[-]
9	Elongation of catchment factor K_σ	0.517	[-]
10	Concentration of catchment factor K_c	0.603	[-]
11	Tortousnesness of flow factor K_L	1.16	[-]
12	Maximum head in the catchment area H_{max}	1985	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	920	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	33.8	[%]
15	Maximum head of slope of valley I_{max}	50.9	[%]
16	Average altitude of the catchment area H_{sr}	1486	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	564	[m]
18	Levelled out head of watercourse I_t	9.88	[%]
19	Maximum head of the watercourse I_{t1}	161	[%]
20	Average maximum head of the watercourse I_{t2}	7.82	[%]

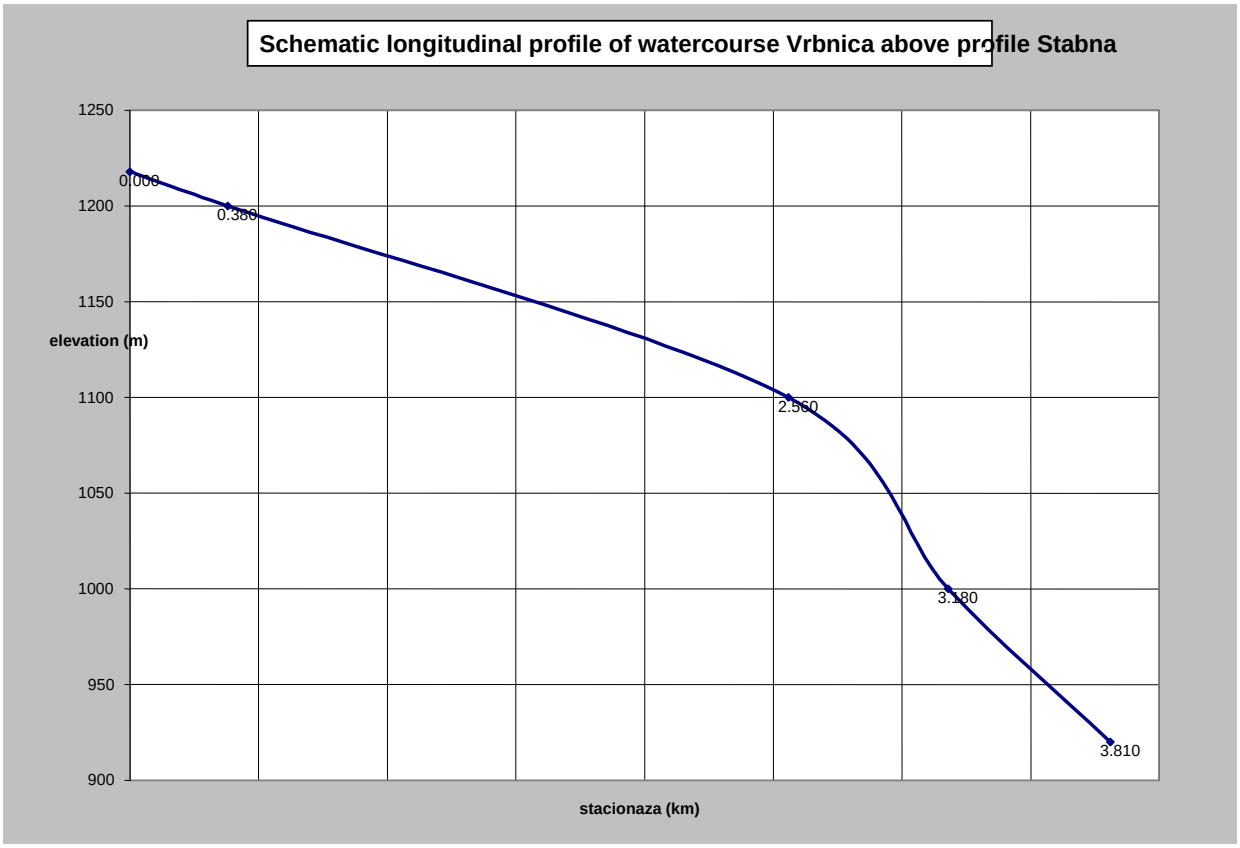


Figure 4

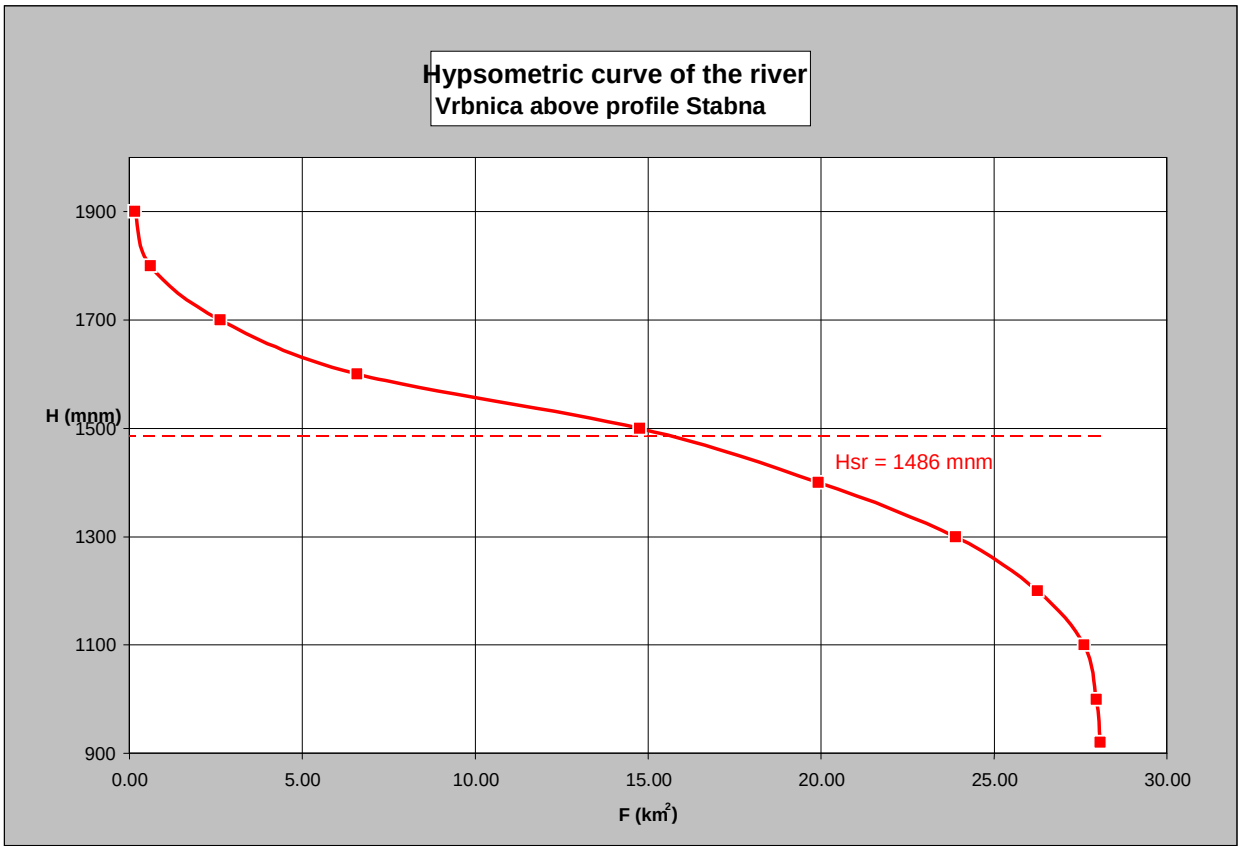


Figure 5

WATERCOURSE: VRBNICA
HS: STABNA

REVIEW OF ANNUAL FLOWS - 2006

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	***	3.930	0.755	0.256	0.057	0.693	0.176	0.256	0.581
2	***	3.663	0.755	0.256	0.057	0.482	0.154	0.287	0.529
3	***	3.663	0.755	0.256	0.057	0.356	0.134	0.287	0.482
4	***	3.412	0.755	0.227	0.057	0.287	0.134	0.287	0.437
5	***	3.174	0.693	0.256	0.070	0.227	0.890	0.287	0.395
6	***	2.737	0.635	0.256	0.057	0.201	1.503	0.256	0.356
7	***	2.349	0.755	0.256	0.057	0.154	1.042	0.287	0.356
8	***	2.005	0.964	0.256	0.057	0.134	0.755	0.287	0.320
9	***	1.849	0.890	0.256	0.057	0.134	0.581	0.320	0.529
10	***	2.949	0.821	0.256	0.070	0.099	0.482	0.395	3.412
11	***	2.537	0.890	0.256	0.057	0.083	0.395	0.227	1.842
12	***	2.349	0.821	0.227	0.057	0.070	0.356	0.134	1.401
13	***	2.349	0.755	0.227	0.154	0.057	0.320	0.154	1.125
14	***	2.171	0.693	0.201	0.635	0.057	0.287	0.134	0.890
15	***	2.171	0.635	0.176	0.287	0.057	0.256	0.134	0.821
16	***	2.171	0.635	0.176	0.176	0.070	0.227	0.154	0.755
17	***	2.171	0.581	0.154	0.115	0.176	0.201	0.154	0.448
18	***	2.171	0.529	0.154	0.083	0.755	0.201	0.154	4.462
19	***	2.171	0.529	0.134	0.057	1.401	0.176	0.154	4.462
20	***	2.005	0.529	0.099	0.057	1.212	0.154	0.154	3.174
21	***	2.005	0.482	0.083	0.057	0.890	0.154	0.176	2.005
22	4.19	1.967	0.482	0.083	0.057	0.693	0.134	2.171	1.611
23	6.24	1.842	0.437	0.083	0.046	0.529	0.115	4.821	1.304
24	6.24	1.724	0.395	0.070	0.046	0.437	0.115	2.171	1.125
25	5.85	1.611	0.320	0.070	0.070	0.356	0.099	1.436	1.042
26	5.85	1.401	0.320	0.083	0.320	0.320	0.083	1.304	0.890
27	5.49	1.125	0.287	0.070	0.320	0.287	0.070	1.212	0.755
28	4.81	0.964	0.287	0.070	0.320	0.256	0.070	0.964	0.693
29	4.20	0.964	0.256	0.083	0.287	0.227	0.070	0.821	0.635
30	3.92	0.964	0.256	0.099	0.821	0.201	0.099	0.693	0.635
31		0.964		0.070	1.125		0.227		0.581
DEK1	0.0	2.973	0.778	0.253	0.060	0.277	0.585	0.295	0.740
DEK2	0.0	2.227	0.660	0.180	0.168	0.394	0.257	0.155	1.938
DEK3	4.68	1.41	0.352	0.078	0.315	0.420	0.112	1.58	1.03
MIN	3.17	0.82	0.26	0.06	0.05	0.06	0.06	0.12	0.32
DAT	30	30	28	29	20	12	28	12	7
SRED	1.56	2.178	0.597	0.168	0.185	0.363	0.312	0.676	1.228
MAX	4.19	4.82	1.06	0.28	1.79	3.66	2.35	19.3	31.0
DAT	22	1	8	1	30	18	5	22	18

MIN = 0.05 | Qsr = 0.874 | MAX= 31.0
DAT: 20. 08 | DAT: 18. 12

REVIEW OF ANNUAL FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0.581	1.04	1.72	4.51	1.04	1.042	0.227	0.057
2	1.503	0.964	1.97	4.51	0.890	0.821	0.227	0.057
3	1.724	0.890	2.95	4.21	0.890	0.755	0.227	0.057
4	1.212	0.821	4.21	3.93	1.30	1.212	0.227	0.057
5	1.042	0.693	3.41	4.51	1.72	1.125	0.227	0.070
6	0.890	0.635	2.74	3.93	1.61	0.890	0.201	0.070
7	0.755	0.693	2.54	3.41	1.30	0.821	0.201	0.070
8	0.693	0.964	2.00	3.41	1.04	0.755	0.201	0.057
9	0.635	1.84	1.97	2.95	0.964	0.693	0.154	0.057
10	0.635	2.17	2.00	2.95	0.821	0.635	0.115	0.057
11	0.581	2.74	1.84	2.95	0.755	0.635	0.154	0.070
12	0.693	2.74	1.50	2.95	0.693	0.821	0.154	0.057
13	0.755	5.86	1.40	2.95	0.635	0.890	0.115	0.057
14	0.755	3.41	1.40	2.95	0.581	0.821	0.099	0.057
15	0.755	2.35	1.61	2.74	0.529	0.890	0.099	0.057
16	0.693	1.84	1.72	2.74	0.482	0.890	0.099	0.057
17	0.693	1.61	1.72	2.35	0.482	0.821	0.099	0.057
18	0.693	1.40	1.72	2.00	0.437	0.693	0.099	0.057
19	1.21	1.40	1.72	2.00	0.395	0.581	0.070	0.057
20	1.50	1.50	2.17	1.84	0.395	0.529	0.057	0.057
21	1.50	1.61	1.84	1.84	0.356	0.482	0.057	0.057
22	1.40	1.72	1.61	1.72	0.356	0.437	0.057	0.057
23	3.98	1.97	1.40	1.72	0.356	0.395	0.057	0.057
24	10.9	1.84	1.40	1.61	0.320	0.356	0.057	0.057
25	6.25	1.72	1.40	1.61	0.320	0.356	0.057	0.057
26	3.41	1.97	1.97	1.50	0.356	0.320	0.057	0.057
27	2.35	2.35	2.17	1.40	0.356	0.320	0.057	0.057
28	1.84	1.97	2.17	1.30	0.356	0.320	0.057	0.057
29	1.61		2.17	1.12	0.482	0.287	0.057	***
30	1.30		2.95	1.12	1.125	0.256	0.057	***
31	1.12		4.21		1.304		0.057	***
DEK1	0.967	1.072	2.551	3.831	1.159	0.875	0.201	0.061
DEK2	0.833	2.49	1.68	2.55	0.538	0.757	0.104	0.058
DEK3	3.24	1.89	2.12	1.50	0.517	0.353	0.057	0.057
MIN	0.526	0.579	1.24	0.980	0.278	0.218	0.051	0.040
DAT	1	6	24	30	24	30	19	9
SRED	1.73	1.81	2.12	2.63	0.731	0.662	0.119	0.059
MAX	20.2	8.84	6.25	5.86	2.06	1.34	0.28	0.06
DAT	24	13	31	1	4	4	11	4

MIN = 0.04 | Qsr = 1.236 | MAX= 20.2
DAT: 9. 08 | DAT: 24. 1

REVIEW OF FLOWS

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	4.51	2.49	0.899	0.241	0.057	0.693	0.176	0.256	0.581	0.581	1.04	1.72
2	4.51	2.28	0.788	0.241	0.057	0.482	0.154	0.287	0.529	1.50	0.96	1.97
3	4.21	2.28	0.755	0.241	0.057	0.356	0.134	0.287	0.482	1.72	0.89	2.95
4	3.93	2.36	0.984	0.227	0.057	0.287	0.134	0.287	0.437	1.21	0.82	4.21
5	4.51	2.45	0.909	0.241	0.070	0.227	0.890	0.287	0.395	1.04	0.69	3.41
6	3.93	2.17	0.763	0.228	0.063	0.201	1.503	0.256	0.356	0.890	0.64	2.74
7	3.41	1.83	0.788	0.228	0.063	0.154	1.042	0.287	0.356	0.755	0.69	2.54
8	3.41	1.52	0.860	0.228	0.057	0.134	0.755	0.287	0.320	0.693	0.96	2.00
9	2.95	1.41	0.792	0.205	0.057	0.134	0.581	0.320	0.529	0.635	1.84	1.97
10	2.95	1.88	0.728	0.186	0.063	0.099	0.482	0.395	3.41	0.635	2.17	2.00
11	2.95	1.65	0.763	0.205	0.063	0.083	0.395	0.227	1.84	0.581	2.74	1.84
12	2.95	1.52	0.821	0.191	0.057	0.070	0.356	0.134	1.40	0.693	2.74	1.50
13	2.95	1.49	0.823	0.171	0.106	0.057	0.320	0.154	1.12	0.755	5.86	1.40
14	2.95	1.38	0.757	0.150	0.346	0.057	0.287	0.134	0.890	0.755	3.41	1.40
15	2.74	1.35	0.763	0.137	0.172	0.057	0.256	0.134	0.821	0.755	2.35	1.61
16	2.74	1.33	0.763	0.137	0.117	0.070	0.227	0.154	0.755	0.693	1.84	1.72
17	2.35	1.33	0.701	0.126	0.086	0.176	0.201	0.154	0.448	0.693	1.61	1.72
18	2.00	1.30	0.611	0.126	0.070	0.755	0.201	0.154	4.46	0.693	1.40	1.72
19	2.00	1.28	0.555	0.102	0.057	1.401	0.176	0.154	4.46	1.21	1.40	1.72
20	1.84	1.20	0.529	0.078	0.057	1.212	0.154	0.154	3.174	1.50	1.50	2.17
21	1.84	1.18	0.482	0.070	0.057	0.890	0.154	0.176	2.005	1.50	1.61	1.84
22	2.96	1.16	0.459	0.070	0.057	0.693	0.134	2.17	1.611	1.40	1.72	1.61
23	3.98	1.10	0.416	0.070	0.052	0.529	0.115	4.82	1.304	3.98	1.97	1.40
24	3.92	1.02	0.376	0.063	0.052	0.437	0.115	2.17	1.125	10.9	1.84	1.40
25	3.73	0.97	0.338	0.063	0.063	0.356	0.099	1.44	1.042	6.25	1.72	1.40
26	3.68	0.88	0.320	0.070	0.189	0.320	0.083	1.30	0.890	3.41	1.97	1.97
27	3.45	0.74	0.303	0.063	0.189	0.287	0.070	1.21	0.755	2.35	2.35	2.17
28	3.06	0.66	0.303	0.063	0.189	0.256	0.070	0.964	0.693	1.84	1.97	2.17
29	2.66	0.72	0.271	0.070	0.287	0.227	0.070	0.821	0.635	1.61		2.17
30	2.52	1.04	0.256	0.078	0.821	0.201	0.099	0.693	0.635	1.30		2.95
31		1.13		0.063	1.12		0.227		0.581	1.12		4.21
DEK1	3.83	2.07	0.826	0.227	0.060	0.277	0.585	0.295	0.740	0.967	1.07	2.55
DEK2	2.55	1.38	0.708	0.142	0.113	0.394	0.257	0.155	1.94	0.833	2.49	1.68
DEK3	3.18	0.948	0.352	0.068	0.280	0.420	0.112	1.58	1.03	3.24	1.89	2.12
MIN	0.980	0.278	0.218	0.051	0.040	0.057	0.057	0.115	0.320	0.526	0.579	1.24
DAT	30	24	30	19	9	12	28	12	7	1	6	24
SRED	3.19	1.45	0.629	0.143	0.155	0.363	0.312	0.676	1.23	1.73	1.81	2.12
MAX	5.86	4.82	1.34	0.278	1.79	3.66	2.35	19.3	31.0	20.2	8.84	6.25
DAT	1	1	4	1	30	18	5	22	18	24	13	31

MIN = 0.04 | Qsr = 1.144 | MAX= 31.0
DAT: 9. 08 | DAT: 18. 12

AVERAGE VALUE FOR 494 DAYS IS Q=1.05 m3/s

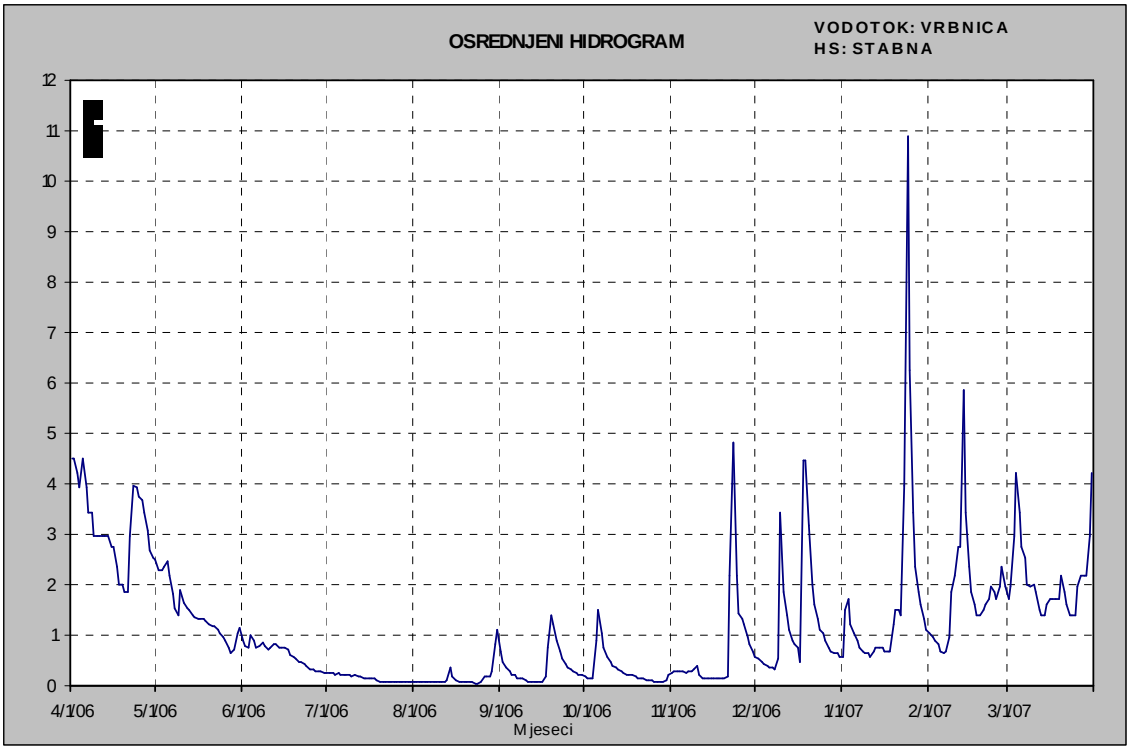


Figure 6

According to a duration curve (Figure 7) average annual water flow or flows bigger than average annual flow last for about 40% of time i.e. 146 days which makes this water stream extremely good for hydro power developments.

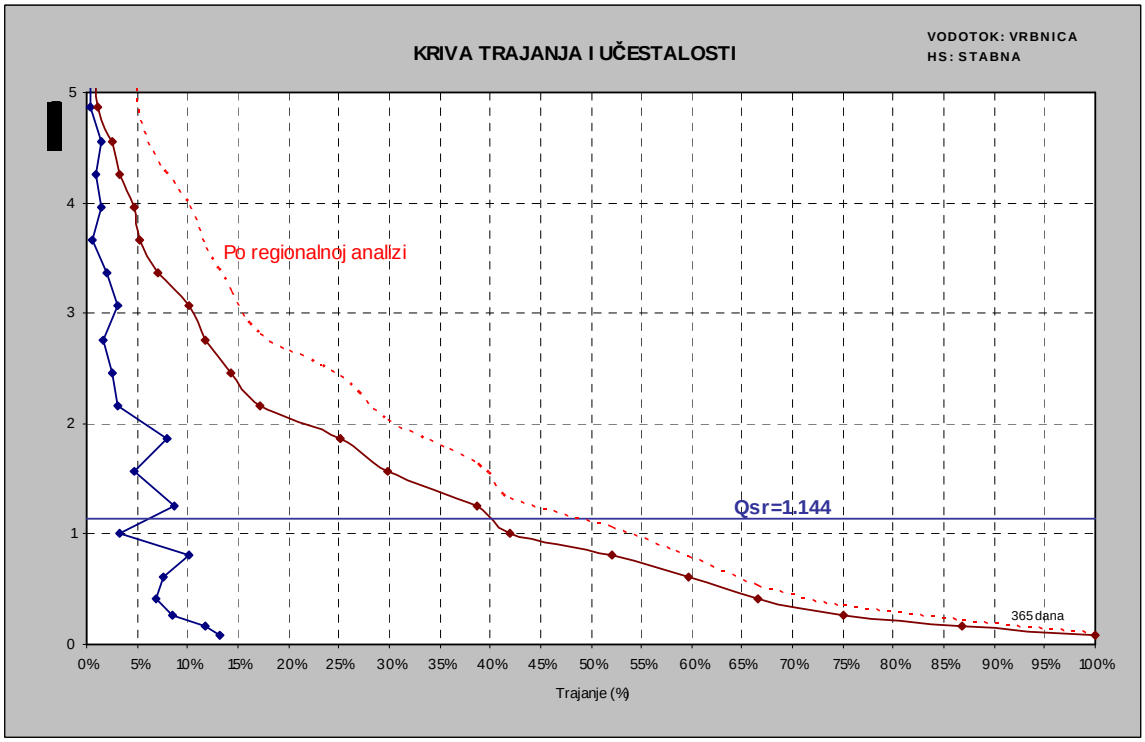


Figure 7

Other characteristic values, according to duration curve are as follows:

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	3.23	2.09	1.55	1.144	0.86	0.591	0.341	0.205	0.139

Such a considerable duration of average annual flow and all flows greater than the average annual flow requires a as high as possible ratio Q_{ins}/Q_{sr} to be selected for this type of derivation, according to our rough estimate even as high as 1.8, which is a choice of smaller energy-economic analyses.

C2. WATER STREAM: VRBNICA
HS: RIBNJAK

Catchment area of this profile is 73.0 km^2 , length of watershed 38.5 km, maximum elevation in the catchment area is up to 2016 m.a.s.l. and minimum is 683 m.a.s.l. Medium head of the catchment area is 34.9% and average elevation in the catchment area is 1381 m.a.s.l. and Levelled out head of watercourse 6.37%.

Hydrographic and physical-geographic characteristics of the catchment area

1	Catchment area F	73.0	[km^2]
2	Length of watercourse L_t	7.90	[km]
3	Length of catchment area L_s	9.16	[km]
4	Perimeter of catchment area S	38.5	[km]
5	Average width of catchment area $B=F/L_s$	7.97	[km]
6	Rectilinear distance river source - mouth L_i	6.67	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	4.24	[km]
8	Watershed spreading factor K_s	1.27	[-]
9	Elongation of catchment factor K_σ	0.855	[-]
10	Concentration of catchment factor K_c	0.894	[-]
11	Tortousnesness of flow factor K_L	1.18	[-]
12	Maximum head in the catchment area H_{max}	2016	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	683	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	34.9	[%]
15	Maximum head of slope of valley I_{max}	50.3	[%]
16	Average altitude of the catchment area H_{sr}	1381	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	692	[m]
18	Levelled out head of watercourse I_t	6.37	[%]
19	Maximum head of the watercourse I_{t1}	161	[%]
20	Average maximum head of the watercourse I_{t2}	6.77	[%]

Schematic longitudinal profile of watercourse (Figure 8) and hypsometric curve (Figure 9) are given on page 13.

It can be seen that altitude in the majour part of the catchment area is between 850 and 1650 m.a.s.l. which according to hypsometric curve represents 82%.

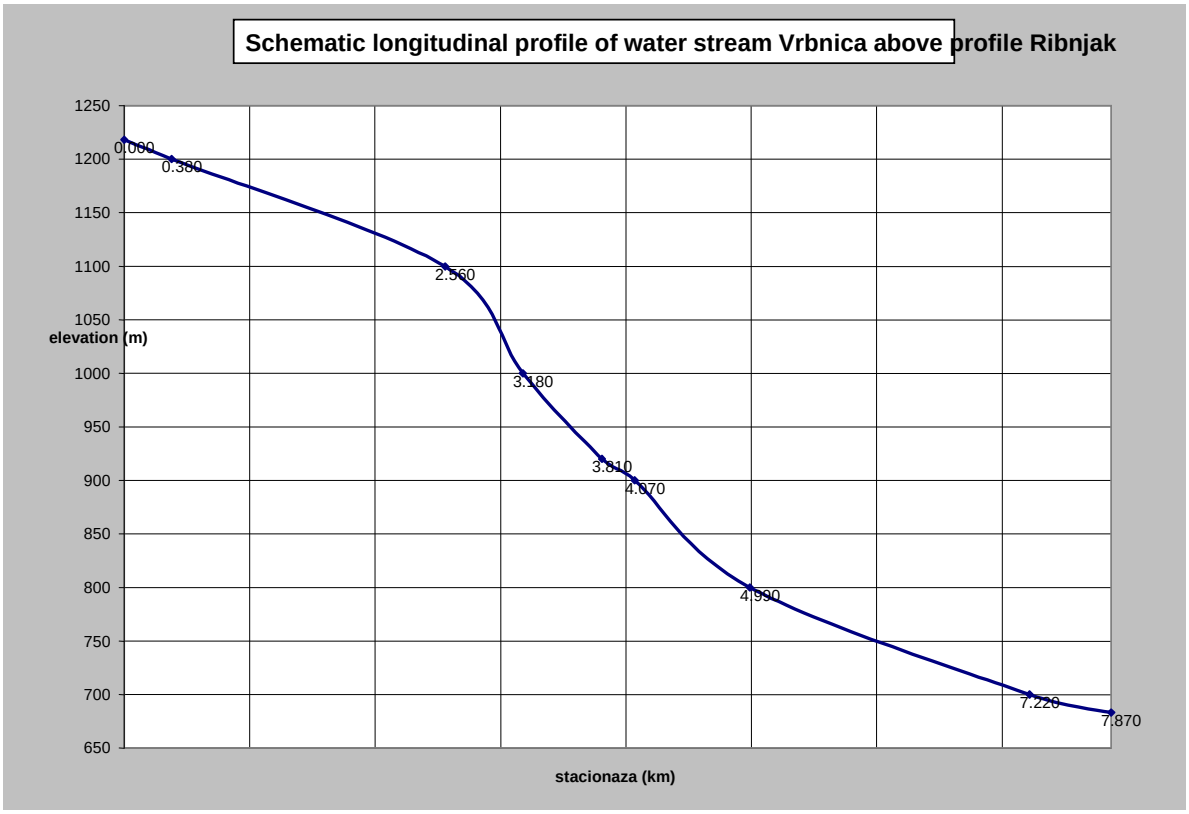


Figure 8

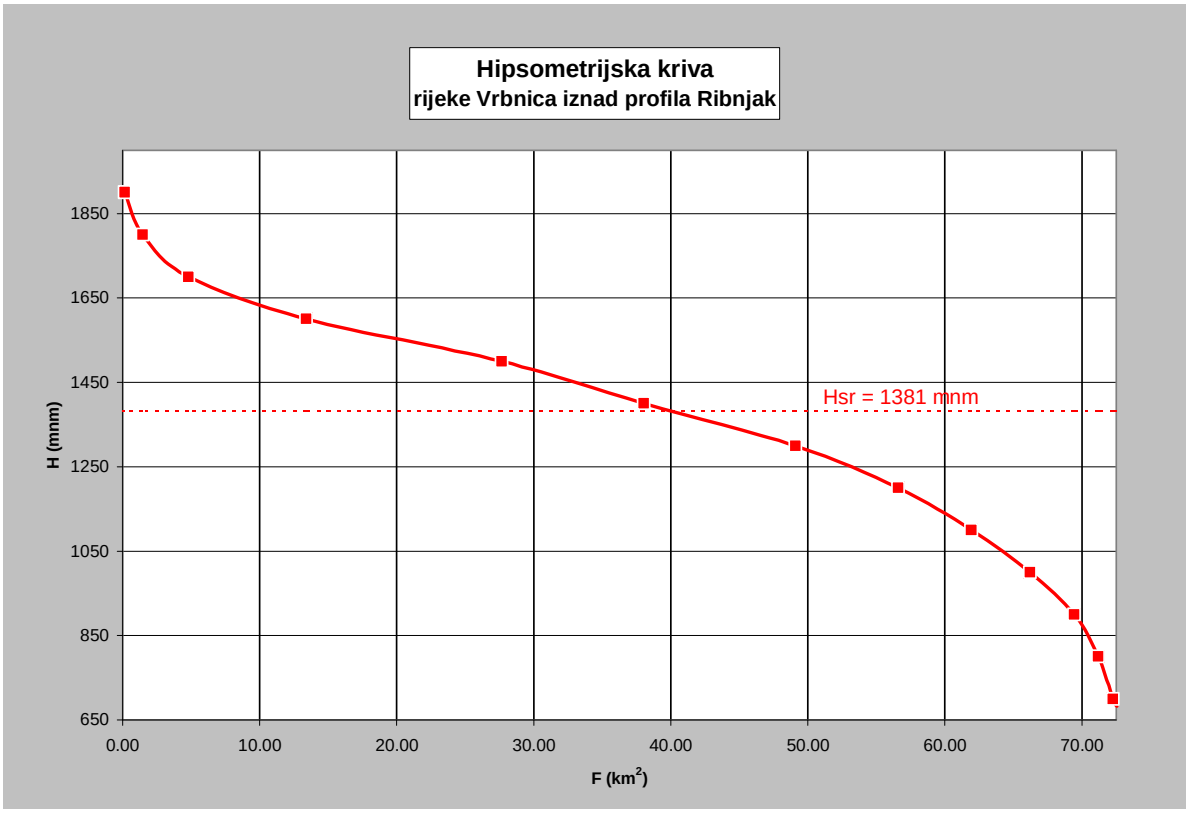


Figure 9

According to usual procedure to apply a function for water levels lower than 60 cm resulting correlation was established $Q_1 = \left(\frac{H_1}{43.892}\right)^{3.782}$, i.e. for water levels greater than 60 cm $Q_2 = \left(\frac{H_2}{47.29}\right)^{4.78}$ based on which balance of flows was generated.

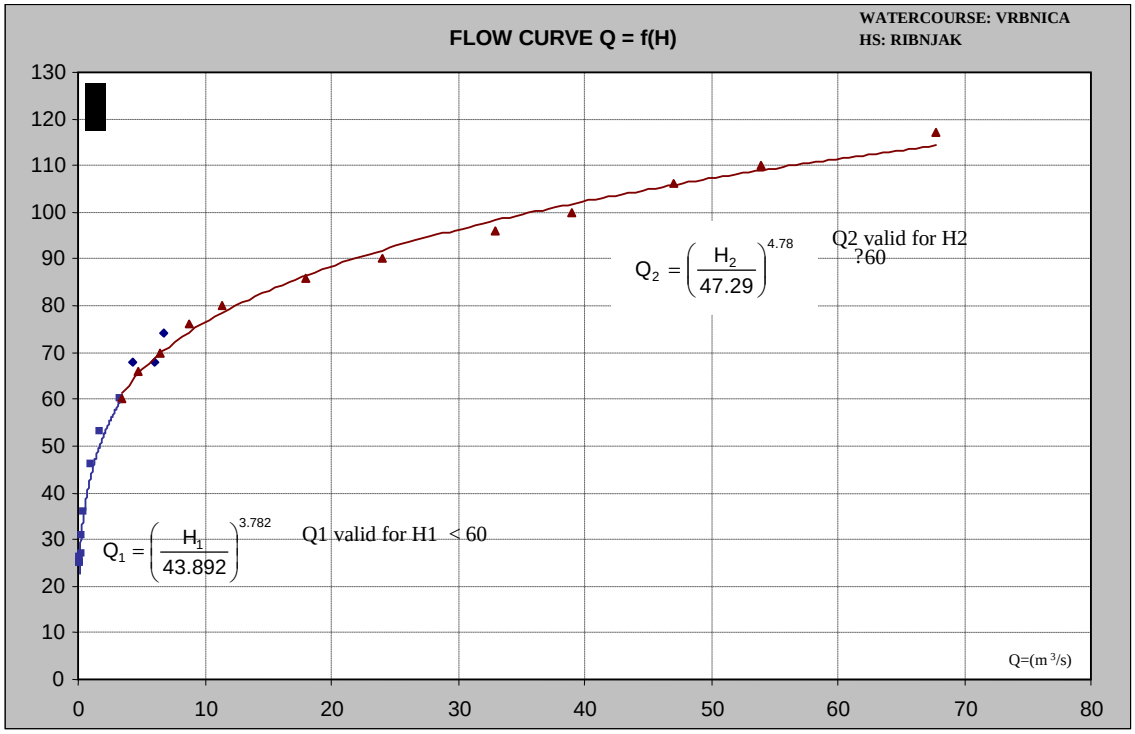


Figure 10

Annual flow values for part of 2006 and 2007 as well as annual value for a calendar year are given on page 15. Hydrograph is given on the Figure 11.

Average annual flow for calendar year amounts to 1.92 m^3/s, and for a 501 day period it amounts to 1.82 m^3/s.

Minimal volume of water peak is 90 l/s and it is lower by 25% than the average daily volume for that day of 119 l/s. Maximum water volume peak is 76 m^3/s and is 7 times higher than average daily water volume for that that, which is extremely high.

Months with highest water levels are March and April and the driest months are July and August. High water level peaks were experienced already in November and December 2006 and January 2007. This confirms a rule that extreme maximums happen in early springs and late autumn and extreme minimums happen in the beggining of summer and in the beginning of winter.

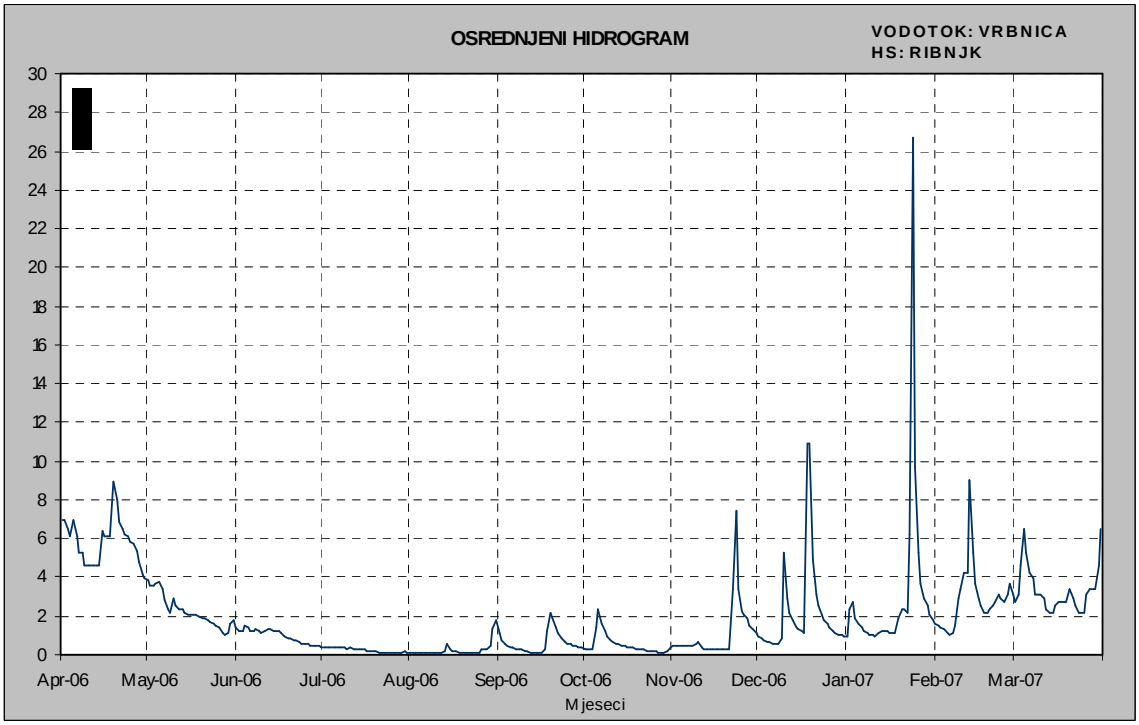


Figure 11

WATERCOURSE: VRBNICA
HS: RIBNJAK

REVIEW OF ANNUAL FLOWS - 2006

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	***	6.0	1.19	0.42	0.11	1.09	0.30	0.42	0.92
2	***	5.6	1.19	0.42	0.11	0.77	0.26	0.47	0.84
3	***	5.6	1.19	0.42	0.11	0.58	0.23	0.47	0.77
4	***	5.2	1.19	0.38	0.11	0.47	0.23	0.47	0.70
5	***	4.9	1.10	0.42	0.13	0.38	1.40	0.47	0.64
6	***	4.2	1.01	0.42	0.11	0.34	2.34	0.42	0.58
7	***	3.6	1.19	0.42	0.11	0.26	1.63	0.47	0.58
8	***	3.1	1.52	0.42	0.11	0.23	1.19	0.47	0.52
9	***	2.8	1.40	0.42	0.11	0.23	0.92	0.52	0.84
10	***	4.5	1.30	0.42	0.13	0.18	0.77	0.64	5.29
11	***	3.9	1.40	0.42	0.11	0.15	0.64	0.38	2.87
12	***	3.6	1.30	0.38	0.11	0.13	0.58	0.23	2.19
13	***	3.6	1.19	0.38	0.26	0.11	0.52	0.26	1.76
14	***	3.3	1.10	0.34	1.00	0.11	0.47	0.23	1.40
15	8.5	3.3	1.01	0.30	0.47	0.11	0.42	0.23	1.30
16	7.9	3.3	1.01	0.30	0.30	0.13	0.38	0.26	1.19
17	8.5	3.3	0.92	0.26	0.20	0.30	0.34	0.26	1.10
18	9.0	3.3	0.84	0.26	0.15	1.19	0.34	0.26	10.9
19	14.	3.3	0.84	0.23	0.11	2.19	0.30	0.26	10.9
20	13.	3.1	0.84	0.18	0.11	1.90	0.26	0.26	4.92
21	10.	3.1	0.77	0.15	0.11	1.40	0.26	0.30	3.12
22	10.	3.0	0.77	0.15	0.11	1.10	0.23	3.38	2.51
23	9.6	2.8	0.70	0.15	0.10	0.84	0.20	7.46	2.04
24	9.6	2.6	0.64	0.13	0.10	0.70	0.20	3.38	1.76
25	9.0	2.5	0.52	0.13	0.13	0.58	0.18	2.24	1.64
26	9.0	2.1	0.52	0.15	0.52	0.52	0.15	2.04	1.40
27	8.5	1.7	0.47	0.13	0.52	0.47	0.13	1.90	1.19
28	7.4	1.5	0.47	0.13	0.52	0.42	0.13	1.52	1.10
29	6.5	1.5	0.42	0.15	0.47	0.38	0.13	1.30	1.01
30	6.0	1.5	0.42	0.18	1.30	0.34	0.18	1.10	1.01
31		1.5		0.13	1.76		0.38		0.92
DEK	0	4.6	1.23	0.42	0.12	0.45	0.93	0.48	1.17
DEK	6.1	3.4	1.05	0.30	0.29	0.63	0.42	0.27	3.86
DEK	8.7	2.2	0.57	0.15	0.51	0.67	0.20	2.46	1.61
MIN	4.9	1.3	0.42	0.11	0.10	0.11	0.11	0.20	0.52
DAT	30	30	28	29	20	12	28	12	7
SRE	5.0	3.4	0.95	0.28	0.31	0.59	0.51	1.1	2.2
MAX	21.	7.5	1.7	0.46	2.8	5.7	3.6	47.4	76.0
DAT	19	1	8	1	30	18	5	22	18

MIN = 0.102 DAT: 20. 08 | Qsr = 1.67 | MAX= 76.0 DAT: 18. 12

REVIEW OF ANNUAL FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0.92	1.64	2.69	6.98	1.64	1.64	0.38	0.11
2	2.35	1.52	3.06	6.98	1.40	1.30	0.38	0.11
3	2.69	1.40	4.57	6.52	1.40	1.19	0.38	0.11
4	1.90	1.30	6.52	6.09	2.04	1.90	0.38	0.11
5	1.64	1.10	5.29	6.98	2.69	1.76	0.38	0.13
6	1.40	1.01	4.25	6.09	2.51	1.40	0.34	0.13
7	1.19	1.10	3.94	5.29	2.04	1.30	0.34	0.13
8	1.10	1.52	3.12	5.29	1.64	1.19	0.34	0.11
9	1.01	2.87	3.06	4.57	1.52	1.10	0.26	0.11
10	1.01	3.38	3.12	4.57	1.30	1.01	0.20	0.11
11	0.93	4.25	2.87	4.57	1.19	1.01	0.26	0.13
12	1.10	4.25	2.35	4.57	1.10	1.30	0.26	0.11
13	1.19	9.07	2.19	4.57	1.01	1.40	0.20	0.11
14	1.19	5.29	2.19	4.57	0.92	1.30	0.18	0.11
15	1.19	3.65	2.51	4.25	0.84	1.40	0.18	0.11
16	1.10	2.87	2.69	4.25	0.77	1.40	0.18	0.11
17	1.10	2.51	2.69	3.65	0.77	1.30	0.18	0.11
18	1.10	2.19	2.69	3.12	0.70	1.09	0.18	0.11
19	1.90	2.19	2.69	3.12	0.64	0.92	0.13	0.11
20	2.35	2.35	3.38	2.87	0.64	0.84	0.11	0.11
21	2.35	2.51	2.87	2.87	0.58	0.77	0.11	0.11
22	2.19	2.69	2.51	2.69	0.58	0.70	0.11	0.11
23	6.17	3.06	2.19	2.69	0.58	0.64	0.11	0.11
24	26.6	2.87	2.19	2.51	0.52	0.58	0.11	0.11
25	9.66	2.69	2.19	2.51	0.52	0.58	0.11	0.11
26	5.29	3.06	3.06	2.35	0.58	0.52	0.11	0.11
27	3.65	3.65	3.38	2.19	0.58	0.52	0.11	0.11
28	2.87	3.06	3.38	2.04	0.58	0.52	0.11	0.11
29	2.51		3.38	1.76	0.77	0.47	0.11	***
30	2.04		4.57	1.76	1.76	0.42	0.11	***
31	1.76		6.52		2.04		0.11	***
DEK	1.52	1.68	3.96	5.93	1.81	1.37	0.34	0.12
DEK	1.31	3.86	2.62	3.95	0.86	1.19	0.19	0.12
DEK	5.92	2.94	3.29	2.33	0.82	0.57	0.11	0.09
MIN	0.84	0.92	1.94	1.54	0.45	0.36	0.10	0.09
DAT	1	6	24	30	24	30	19	9
SRE	3.01	2.82	3.29	4.07	1.15	1.05	0.21	0.12
MAX	45.6	21.7	9.66	9.07	3.20	2.10	0.46	0.13
DAT	24	13	31	1	4	4	11	4

MIN = 0.09 DAT: 9. 08 | Qsr = 1.98 | MAX= 45.6 DAT: 24. 1

REVIEW OF FLOWS

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	6.9	3.86	1.42	0.40	0.11	1.10	0.30	0.42	0.92	0.92	1.64	2.69
2	6.9	3.54	1.24	0.40	0.11	0.77	0.26	0.47	0.84	2.35	1.52	3.06
3	6.5	3.54	1.19	0.40	0.11	0.58	0.23	0.47	0.77	2.69	1.40	4.57
4	6.0	3.66	1.55	0.38	0.11	0.47	0.23	0.47	0.70	1.90	1.30	6.52
5	6.9	3.80	1.43	0.40	0.13	0.38	1.40	0.47	0.64	1.64	1.10	5.29
6	6.0	3.38	1.21	0.38	0.12	0.34	2.34	0.42	0.58	1.40	1.01	4.25
7	5.2	2.85	1.24	0.38	0.12	0.26	1.63	0.47	0.58	1.19	1.10	3.94
8	5.2	2.38	1.36	0.38	0.11	0.23	1.19	0.47	0.52	1.10	1.52	3.12
9	4.5	2.20	1.25	0.34	0.11	0.23	0.92	0.52	0.84	1.01	2.87	3.06
10	4.5	2.93	1.15	0.31	0.12	0.18	0.77	0.64	5.29	1.01	3.38	3.12
11	4.5	2.57	1.21	0.34	0.12	0.15	0.64	0.38	2.87	0.93	4.25	2.87
12	4.5	2.37	1.30	0.32	0.11	0.13	0.58	0.23	2.19	1.10	4.25	2.35
13	4.5	2.33	1.30	0.29	0.19	0.11	0.52	0.26	1.76	1.19	9.07	2.19
14	4.5	2.15	1.20	0.26	0.56	0.11	0.47	0.23	1.40	1.19	5.29	2.19
15	6.3	2.11	1.21	0.24	0.29	0.11	0.42	0.23	1.30	1.19	3.65	2.51
16	6.1	2.07	1.21	0.24	0.21	0.13	0.38	0.26	1.19	1.10	2.87	2.69
17	6.0	2.07	1.11	0.22	0.16	0.30	0.34	0.26	1.10	1.10	2.51	2.69
18	6.0	2.04	0.97	0.22	0.13	1.19	0.34	0.26	10.9	1.10	2.19	2.69
19	8.9	2.01	0.88	0.18	0.11	2.19	0.30	0.26	10.9	1.90	2.19	2.69
20	7.9	1.88	0.84	0.15	0.11	1.90	0.26	0.26	4.92	2.35	2.35	3.38
21	6.9	1.85	0.77	0.13	0.11	1.40	0.26	0.30	3.12	2.35	2.51	2.87
22	6.4	1.82	0.73	0.13	0.11	1.10	0.23	3.38	2.51	2.19	2.69	2.51
23	6.1	1.72	0.67	0.13	0.11	0.84	0.20	7.46	2.04	6.17	3.06	2.19
24	6.0	1.61	0.61	0.12	0.11	0.70	0.20	3.38	1.76	26.6	2.87	2.19
25	5.7	1.52	0.55	0.12	0.12	0.58	0.18	2.24	1.64	9.66	2.69	2.19
26	5.7	1.38	0.52	0.13	0.32	0.52	0.15	2.04	1.40	5.29	3.06	3.06
27	5.3	1.17	0.49	0.12	0.32	0.47	0.13	1.90	1.19	3.65	3.65	3.38
28	4.7	1.05	0.49	0.12	0.32	0.42	0.13	1.52	1.10	2.87	3.06	3.38
29	4.1	1.14	0.44	0.13	0.47	0.38	0.13	1.30	1.01	2.51		3.38
30	3.9	1.64	0.42	0.15	1.30	0.34	0.18	1.10	1.01	2.04		4.57
31		1.78		0.12	1.76		0.38		0.93	1.76		6.52
DEK1	5.9	3.2	1.3	0.38	0.12	0.45	0.93	0.48	1.2	1.5	1.7	4.0
DEK2	6.0	2.2	1.1	0.25	0.20	0.63	0.42	0.27	3.9	1.3	3.9	2.6
DEK3	5.5	1.5	0.57	0.13	0.46	0.67	0.20	2.5	1.6	5.9	2.9	3.3
MIN	1.5	0.45	0.36	0.10	0.09	0.12	0.11	0.20	0.52	0.84	0.92	1.94
DAT	30	24	30	19	9	12	28	12	7	1	6	24
SRED	5.8	2.3	1.0	0.25	0.27	0.59	0.51	1.1	2.2	3.0	2.8	3.3
MAX	21.	7.45	1.66	0.45	2.79	5.67	3.65	47.3	76.0	49.6	21.7	9.66
DAT	19	1	8	1	30	18	5	22	18	24	13	31

MIN = 0.09 DAT: 9. 08 | Qsr = 1.92 | MAX= 76.0 DAT: 18. 12

AVERAGE VALUE FOR 501 DAY IS Q=1.82 m3/s

Average annual flow of 1.92 m^3/s or greater flows last for 38% annually, i.e. 139 days. Duration and frequency curve is given on Figure 12.

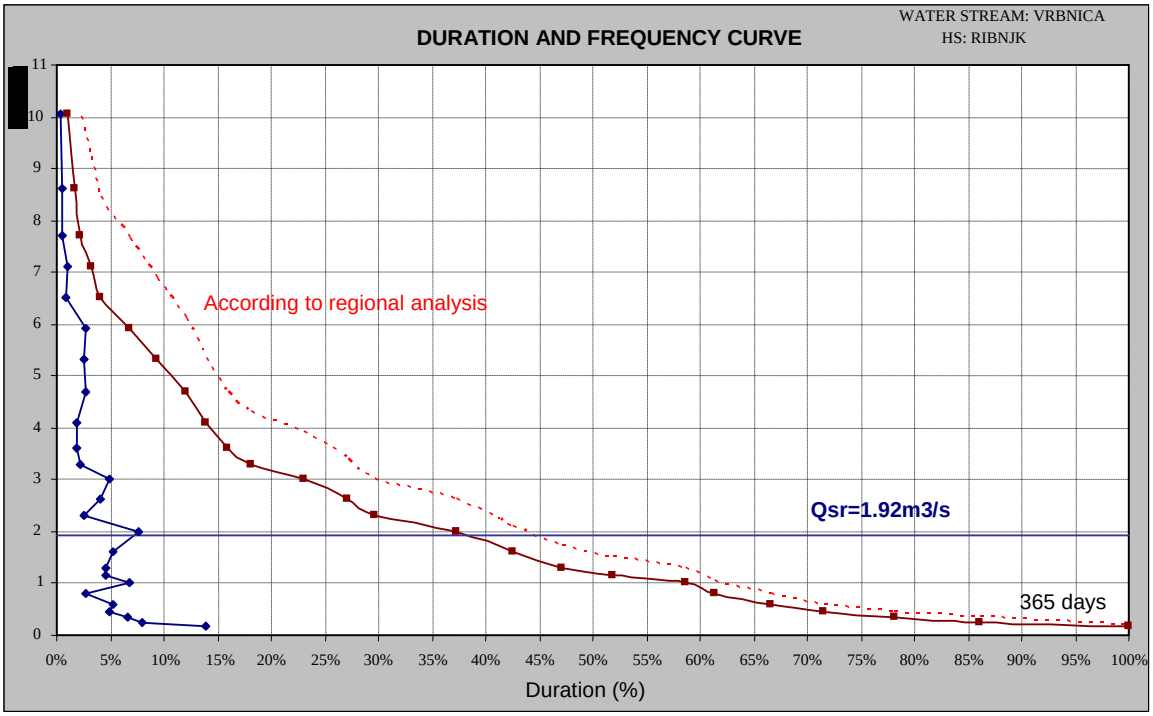


Figure 12

Other characteristic durations, according to duration curve are as follows:

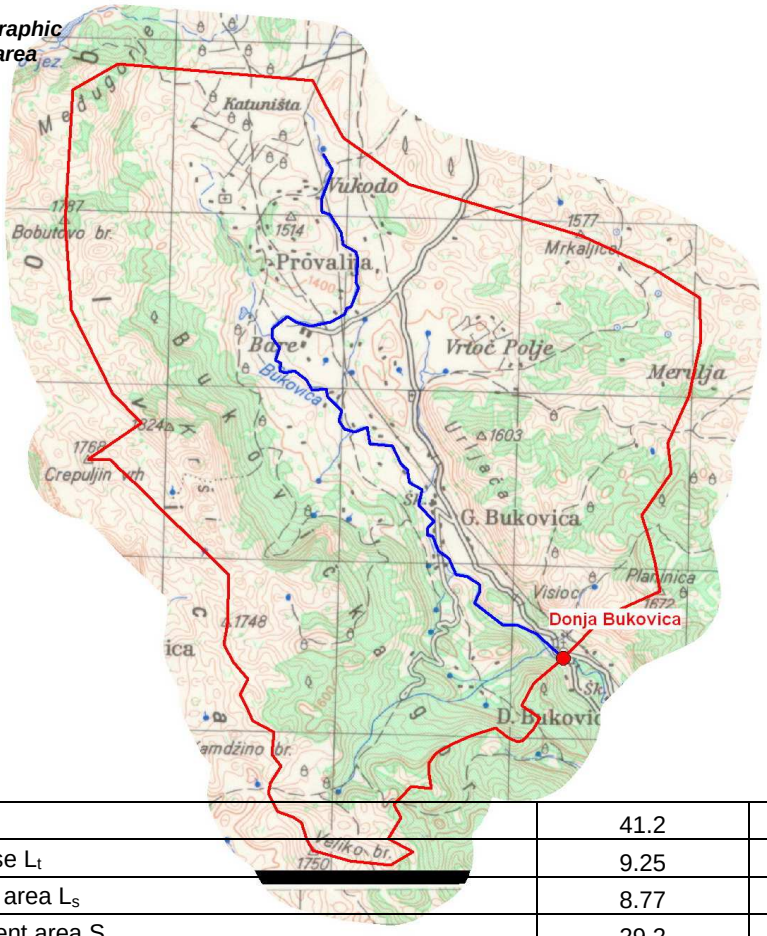
Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	5.25	3.21	2.29	1.875	1.21	0.917	0.458	0.333	0.242

C.3. WATERCOURSE: BUKOVICA
HS: DONJA BUKOVICA

This is the furthest upstream profile on Bukovica whose catchment area is 41.2 km^2, lenght of watershed 29.2 km, maximu elevation in the catchment area is 1824 m.a.s.l, minimum 1250 m.a.s.l., average head in the catchment area is 27,4 %, average elevation in the catchment area is 1560 m.a.s.l. and levelled out head of watercourse 1.83 %.

Disposition of the catchment area is given with all hydrographic and physical-geographic characteristics of a catchment area. Schematic longitudinal profile of the flow (Figure 13) and hypsometric curve (Figure 14) are given on the page 18.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	41.2	[km^2]
2	Length of watercourse L_t	9.25	[km]
3	Length of catchment area L_s	8.77	[km]
4	Perimeter of catchment area S	29.2	[km]
5	Average width of catchment area $B=F/L_s$	4.70	[km]
6	Rectilinear distance river source - mouth L_i	6.46	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.42	[km]
8	Watershed spreading factor K_s	1.29	[-]
9	Elongation of catchment factor K_σ	2.08	[-]
10	Concentration of catchment factor K_c	0.825	[-]
11	Tortousnesness of flow factor K_L	1.43	[-]
12	Maximum head in the catchment area H_{max}	1824	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	1250	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	27.4	[%]
15	Maximum head of slope of valley I_{max}	28.6	[%]
16	Average altitude of the catchment area H_{sr}	1560	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	259	[m]
18	Levelled out head of watercourse I_t	1.83	[%]
19	Maximum head of the watercourse I_{t1}	5.81	[%]
20	Average maximum head of the watercourse I_{t2}	2.27	[%]

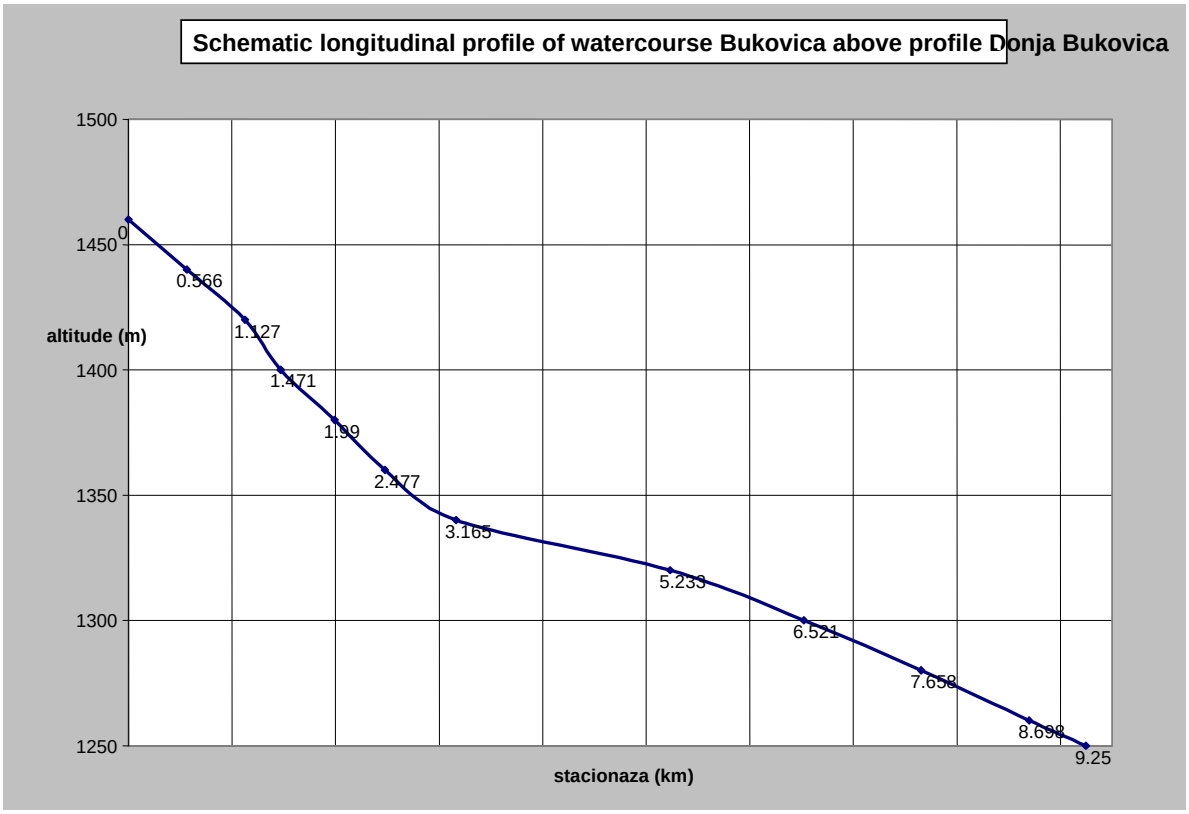


Figure 13

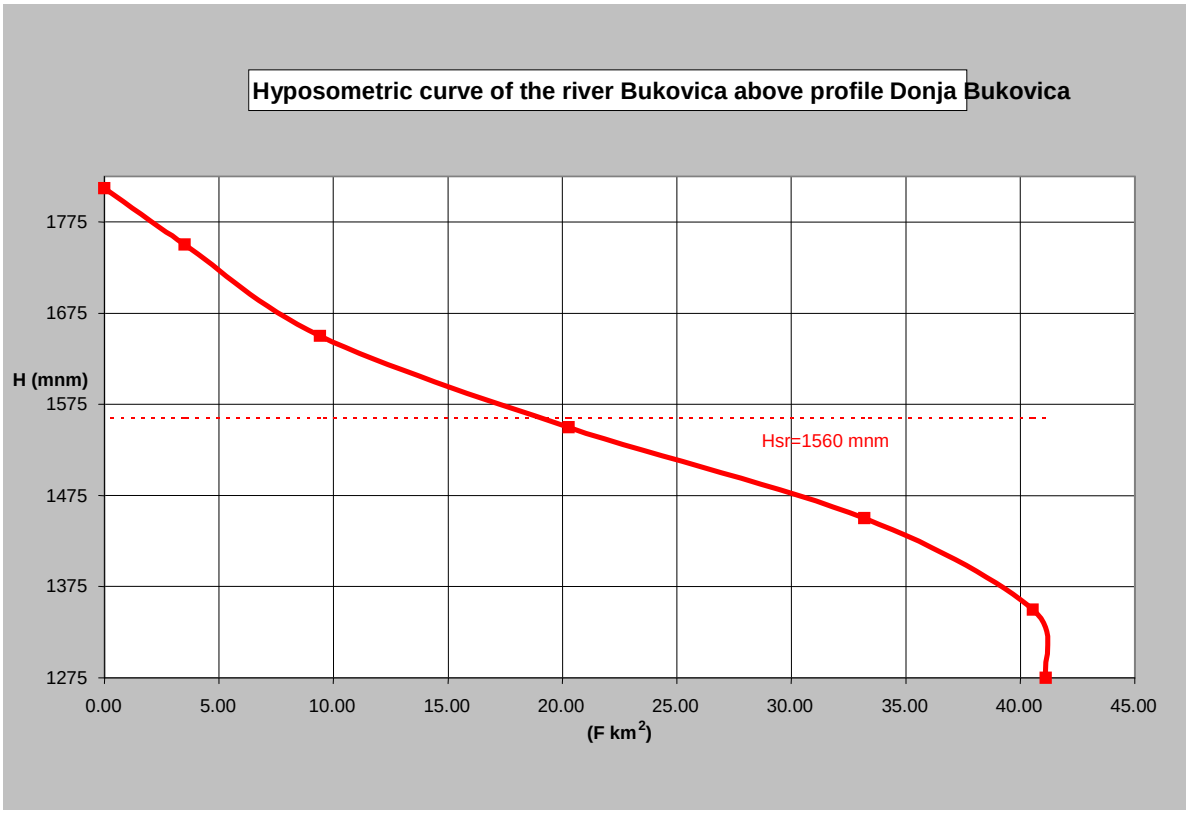


Figure 14

Flow curve (Fig.15) is interpolated from all 15 hydrometric measurements of fow, and extrapolated through flows that are set on extrapolated part in accordance with a bend on the lower part, as well as based on estimated maximum flow in accordance with parameters of catchment area.

In this way we got two correlations for the lower part of watercourse $Q_1 = \left(\frac{H_1}{65.574}\right)^{4.078}$ and for upper part above water level of 100 $Q_2 = \left(\frac{H_2}{71.998}\right)^{5.149}$

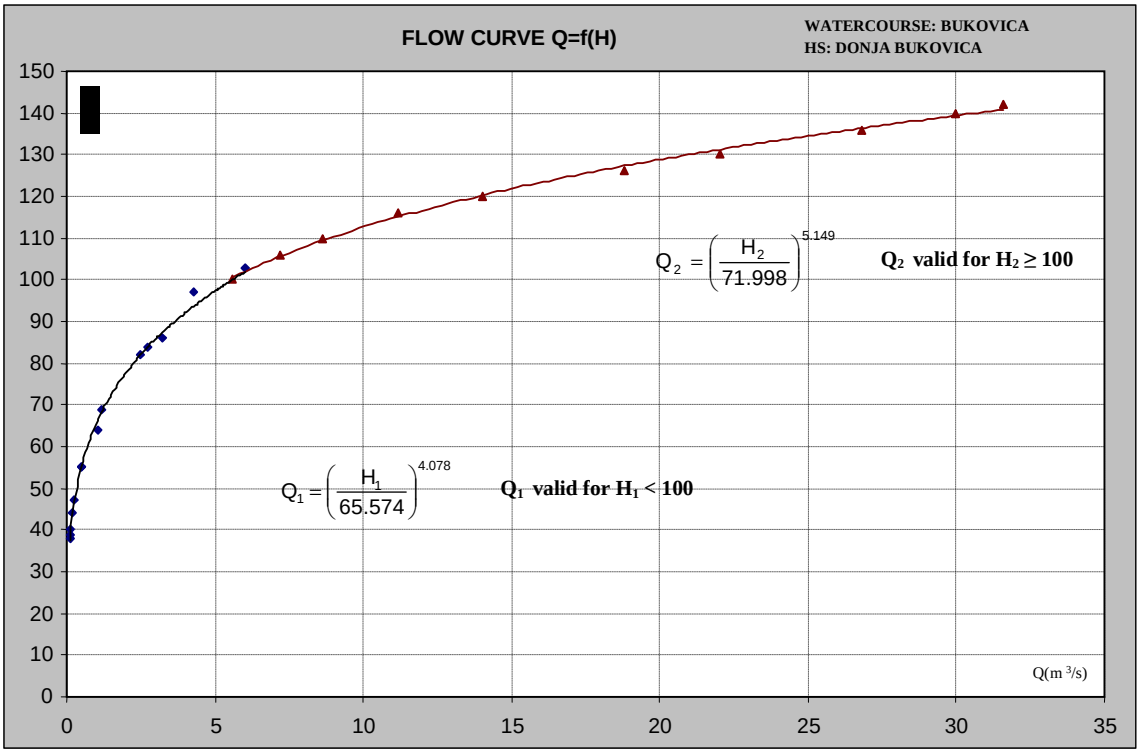


Figure 15

The extent in which the flow curve is covered with hydrometrical measurements of water level amplitude, in relation to the maximum water level peak is 74%.

Annual overview of flows for a 12 month calendar year, as well as annual overviews of flows for a part of 2006 and 2007 of 15.5 months, specifically for 468 days, can be found on page 20. Hydrograph is given on the page 21, Figure 16.

Average annual flow for average calendar year amounts at 1.06 m^3/s and it is bigger than the average flow for the 468 days balance by 83 l/s, which amounts at 0.975 m^3/s.
For the downstream station „Timar“ situation was quite contrary compared to the first example. In this case average flow was bigger in case of 504 day balance, and this is one additional confirmation that selection of calendar year for further analyses was good.

The month with highest water levels was January with average monthly flow of 1.76 m^3/s, and the driest was October with 0.245 m^3/s. Absolute maximum of 33.0 m^3/s is higher than average daily flow for the same day by 101 %, amounting to 16,4 m^3/s.

Absolute minimum according to peak extreme of 97 l/s, is by 38% lower than daily average from August 2007 amounting 156 l/s.

WATER COURSE: BUKOVICA
HS: DONJA BUKOVICA

REVIEW OF FLOWS - 2006

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	***	1.637	0.650	0.179	0.696	0.305	0.196	0.606
2	***	1.825	0.606	0.179	0.525	0.280	0.236	0.565
3	***	1.729	0.565	0.179	0.453	0.280	0.236	0.525
4	***	1.729	0.565	0.179	0.359	0.257	0.236	0.488
5	***	1.729	0.525	0.196	0.305	0.280	0.236	0.453
6	***	1.637	0.488	0.196	0.280	0.280	0.215	0.388
7	***	1.825	0.453	0.196	0.257	0.280	0.215	0.388
8	***	2.138	0.488	0.196	0.236	0.305	0.236	0.359
9	***	1.925	0.488	0.196	0.236	0.305	0.280	0.565
10	***	1.925	0.420	0.257	0.215	0.280	0.331	2.615
11	***	2.029	0.388	0.453	0.215	0.280	0.359	1.729
12	***	1.925	0.331	0.331	0.196	0.257	0.331	1.305
13	***	1.729	0.331	0.420	0.196	0.257	0.331	1.092
14	***	1.549	0.305	1.160	0.196	0.257	0.305	0.906
15	***	1.383	0.280	0.650	0.179	0.236	0.305	0.796
16	***	1.305	0.257	0.488	0.179	0.236	0.305	0.745
17	***	1.231	0.257	0.388	0.257	0.236	0.359	0.696
18	3.476	1.231	0.236	0.331	0.745	0.236	0.359	3.638
19	3.319	1.160	0.236	0.280	1.825	0.236	0.388	6.821
20	3.476	1.092	0.215	0.236	1.160	0.236	0.388	3.168
21	3.476	1.092	0.215	0.215	0.965	0.236	0.420	2.367
22	3.168	1.027	0.196	0.215	0.796	0.215	2.138	1.825
23	3.022	1.027	0.196	0.196	0.650	0.215	5.148	1.464
24	2.881	1.027	0.196	0.196	0.565	0.215	2.488	1.160
25	2.745	0.965	0.196	0.196	0.525	0.196	1.637	1.027
26	2.488	0.906	0.179	0.280	0.453	0.196	1.231	0.906
27	2.138	0.796	0.179	0.280	0.420	0.196	1.027	0.849
28	1.925	0.745	0.196	0.331	0.388	0.196	0.906	0.849
29	1.925	0.696	0.215	0.388	0.359	0.196	0.745	0.745
30	1.925	0.650	0.215	0.965	0.331	0.215	0.650	0.606
31	1.825		0.196	1.092		0.196		0.565
D.1	0	1.810	0.525	0.196	0.356	0.285	0.242	0.695
D.2	1.027	1.463	0.284	0.474	0.515	0.246	0.343	2.089
D. 3	2.502	0.893	0.198	0.396	0.545	0.207	1.639	1.124
MIN	1.729	0.650	0.179	0.163	0.179	0.179	0.196	0.359
DAT	31	29	24	3	13	27	1	7
SR	1.219	1.389	0.331	0.356	0.472	0.245	0.741	1.297
MAX	3.805	2.138	0.849	1.464	2.615	0.305	7.692	25.46
DAT	19	8	8	30	18	1	23	18

MIN = 0.163 | SR = 0.811 | MAX = 25.46
DAT: 3.08 | DAT: 18. 12

REVIEW OF FLOWS - 2007

	`JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0.525	0.906	1.160	1.925	1.383	1.027	0.280	0.133
2	1.231	0.849	2.250	2.250	1.305	0.849	0.257	0.133
3	1.383	0.745	3.022	2.488	1.305	0.745	0.236	0.133
4	1.092	0.650	3.805	2.615	1.729	0.696	0.236	0.133
5	0.906	0.650	2.745	3.168	1.825	0.696	0.236	0.133
6	0.745	0.606	2.138	2.615	1.729	0.696	0.236	0.133
7	0.650	0.525	1.825	2.745	1.729	0.745	0.215	0.133
8	0.606	0.650	1.549	2.881	1.729	0.906	0.215	0.133
9	0.525	1.729	1.549	2.745	1.637	1.092	0.196	0.133
10	0.488	2.138	1.549	2.745	1.549	0.906	0.196	0.133
11	0.488	2.488	1.305	2.745	1.464	0.849	0.215	0.133
12	0.525	2.488	1.092	2.615	1.383	0.965	0.196	0.133
13	0.488	4.343	1.027	2.488	1.305	1.160	0.196	0.133
14	0.488	2.881	0.906	2.488	1.160	0.965	0.179	0.133
15	0.488	1.825	0.965	2.367	1.027	0.849	0.179	0.133
16	0.488	1.383	1.092	2.250	0.965	0.849	0.179	0.133
17	0.453	1.092	1.092	2.138	0.906	1.383	0.163	0.133
18	0.525	0.906	1.160	2.029	0.849	0.906	0.163	0.133
19	1.160	0.849	1.160	2.029	0.796	0.745	0.147	0.133
20	1.549	0.906	1.637	1.925	0.745	0.650	0.147	0.133
21	1.549	0.965	1.383	1.925	0.696	0.565	0.147	0.133
22	1.825	1.027	1.160	1.925	0.650	0.525	0.147	0.133
23	4.158	1.092	1.027	1.825	0.606	0.453	0.147	0.133
24	16.43	1.027	0.906	1.825	0.606	0.420	0.133	0.133
25	4.733	0.965	0.796	1.825	0.606	0.388	0.133	0.133
26	3.022	1.925	0.849	1.729	0.565	0.359	0.133	0.133
27	2.367	2.138	0.906	1.729	0.525	0.331	0.133	0.133
28	1.825	1.464	0.906	1.549	0.565	0.305	0.133	0.133
29	1.549		0.906	1.549	0.965	0.305	0.133	***
30	1.231		1.305	1.464	1.549	0.305	0.133	***
31	1.092		1.825		1.231		0.133	***
D. 1	0.815	0.945	2.159	2.618	1.592	0.836	0.230	0.133
D. 2	0.665	1.916	1.143	2.308	1.060	0.932	0.176	0.133
D.3	3.617	1.325	1.088	1.735	0.779	0.395	0.137	0.097
MIN	0.453	0.525	0.796	1.464	0.525	0.280	0.120	0.097
DAT	16	6	25	29	27	29	27	1
SR	1.761	1.4	1.451	2.22	1.132	0.721	0.18	0.12
MAX	33.0	6.321	4.535	3.319	2.029	1.825	0.305	0.133
DAT	24	13	4	5	4	17	1	1

MIN = 0.097 | SR = 1.13 | MAX = 33.0
DAT: 1.08 | DAT: 24. 01

REVIEW OF ANNUAL FLOWS

	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
1	1.383	1.332	0.465	0.156	0.696	0.305	0.196	0.606	0.525	0.906	1.160	1.925
2	1.305	1.337	0.432	0.156	0.525	0.280	0.236	0.565	1.231	0.849	2.250	2.250
3	1.305	1.237	0.400	0.156	0.453	0.280	0.236	0.525	1.383	0.745	3.022	2.488
4	1.729	1.213	0.400	0.156	0.359	0.257	0.236	0.488	1.092	0.650	3.805	2.615
5	1.825	1.213	0.380	0.165	0.305	0.280	0.236	0.453	0.906	0.650	2.745	3.168
6	1.729	1.167	0.362	0.165	0.280	0.280	0.215	0.388	0.745	0.606	2.138	2.615
7	1.729	1.285	0.334	0.165	0.257	0.280	0.215	0.388	0.650	0.525	1.825	2.745
8	1.729	1.522	0.352	0.165	0.236	0.305	0.236	0.359	0.606	0.650	1.549	2.881
9	1.637	1.509	0.342	0.165	0.236	0.305	0.280	0.565	0.525	1.729	1.549	2.745
10	1.549	1.415	0.308	0.195	0.215	0.280	0.331	2.615	0.488	2.138	1.549	2.745
11	1.464	1.439	0.302	0.293	0.215	0.280	0.359	1.729	0.488	2.488	1.305	2.745
12	1.383	1.445	0.264	0.232	0.196	0.257	0.331	1.305	0.525	2.488	1.092	2.615
13	1.305	1.445	0.264	0.276	0.196	0.257	0.331	1.092	0.488	4.343	1.027	2.488
14	1.160	1.257	0.242	0.646	0.196	0.257	0.305	0.906	0.488	2.881	0.906	2.488
15	1.027	1.116	0.230	0.392	0.179	0.236	0.305	0.796	0.488	1.825	0.965	2.367
16	0.965	1.077	0.218	0.311	0.179	0.236	0.305	0.745	0.488	1.383	1.092	2.250
17	0.906	1.307	0.210	0.261	0.257	0.236	0.359	0.696	0.453	1.092	1.092	2.138
18	2.162	1.068	0.199	0.232	0.745	0.236	0.359	3.638	0.525	0.906	1.160	2.029
19	2.057	0.952	0.191	0.207	1.825	0.236	0.388	6.821	1.160	0.849	1.160	2.029
20	2.110	0.871	0.181	0.184	1.160	0.236	0.388	3.168	1.549	0.906	1.637	1.925
21	2.086	0.828	0.181	0.174	0.965	0.236	0.420	2.367	1.549	0.965	1.383	1.925
22	1.909	0.776	0.172	0.174	0.796	0.215	2.138	1.825	1.825	1.027	1.160	1.925
23	1.814	0.740	0.172	0.165	0.650	0.215	5.148	1.464	4.158	1.092	1.027	1.825
24	1.744	0.723	0.165	0.165	0.565	0.215	2.488	1.160	16.43	1.027	0.906	1.825
25	1.676	0.677	0.165	0.165	0.525	0.196	1.637	1.027	4.733	0.965	0.796	1.825
26	1.527	0.632	0.156	0.207	0.453	0.196	1.231	0.906	3.022	1.925	0.849	1.729
27	1.331	0.563	0.156	0.207	0.420	0.196	1.027	0.849	2.367	2.138	0.906	1.729
28	1.245	0.525	0.165	0.232	0.388	0.196	0.906	0.849	1.825	1.464	0.906	1.549
29	1.445	0.500	0.174	0.388	0.359	0.196	0.745	0.745	1.549		0.906	1.549
30	1.737	0.477	0.174	0.965	0.331	0.215	0.650	0.606	1.231		1.305	1.464
31	1.528		0.165	1.092		0.196		0.565	1.092		1.825	
D.1	1.592	1.323	0.378	0.164	0.356	0.285	0.242	0.695	0.815	0.945	2.159	2.618
D. 2	1.454	1.198	0.230	0.303	0.515	0.246	0.343	2.089	0.665	1.916	1.143	2.308
D. 3	1.640	0.644	0.168	0.358	0.545	0.207	1.639	1.124	3.617	1.325	1.088	1.735
MIN	0.525	0.280	0.120	0.097	0.179	0.179	0.196	0.359	0.453	0.525	0.796	1.464
DAT	27	29	27	1	13	27	1	7	16	6	25	29
SR	1.565	1.055	0.256	0.278	0.472	0.245	0.741	1.297	1.761	1.400	1.451	2.220
MAX	3.81	2.14	0.85	1.46	2.61	0.30	7.69	25.46	33.03	6.32	4.53	3.32
DAT	19	8	8	30	18	1	23	18	24	13	4	5

MIN = 0.097 | SR = 1.06 | MAX = 33.0
DAT: 1.08 | DAT: 24. 01

Qsr FOR 468 DAYS Q= 0.975m3/s

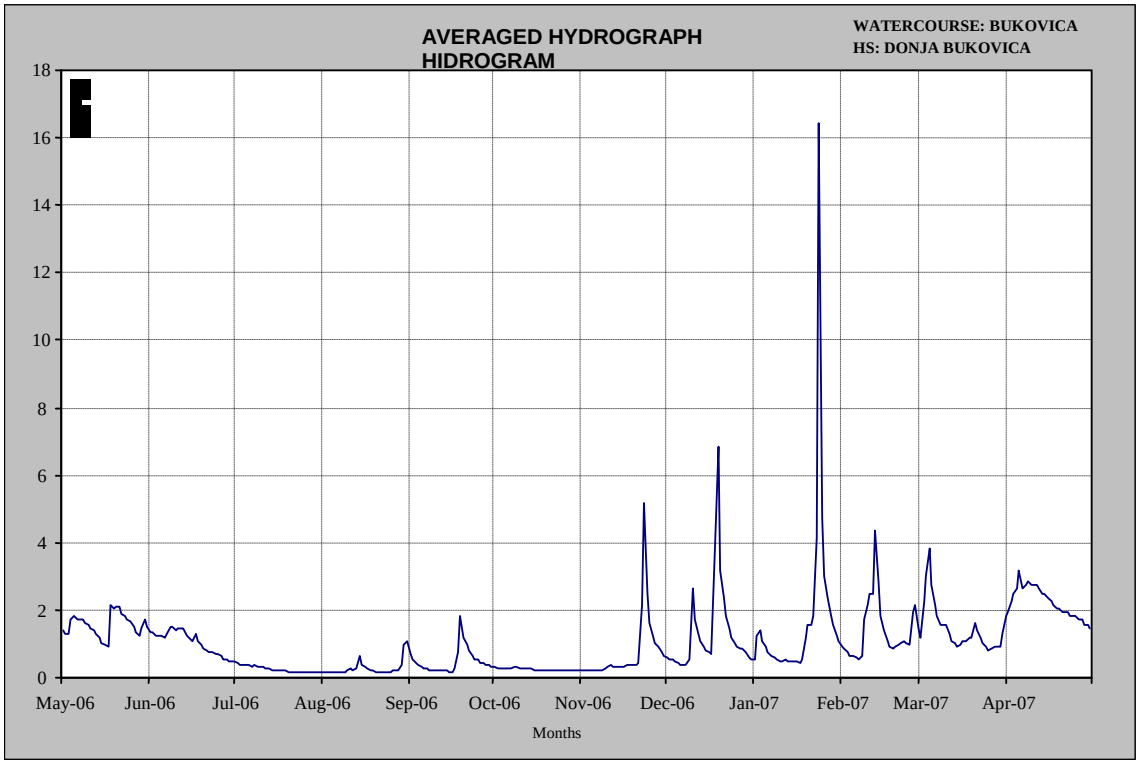


Figure 16

Annual duration curve presented on Figure 17 shows that average annual flow of 1.06 m^3/s and all flows bigger than it last for 163 days or 44.6%.

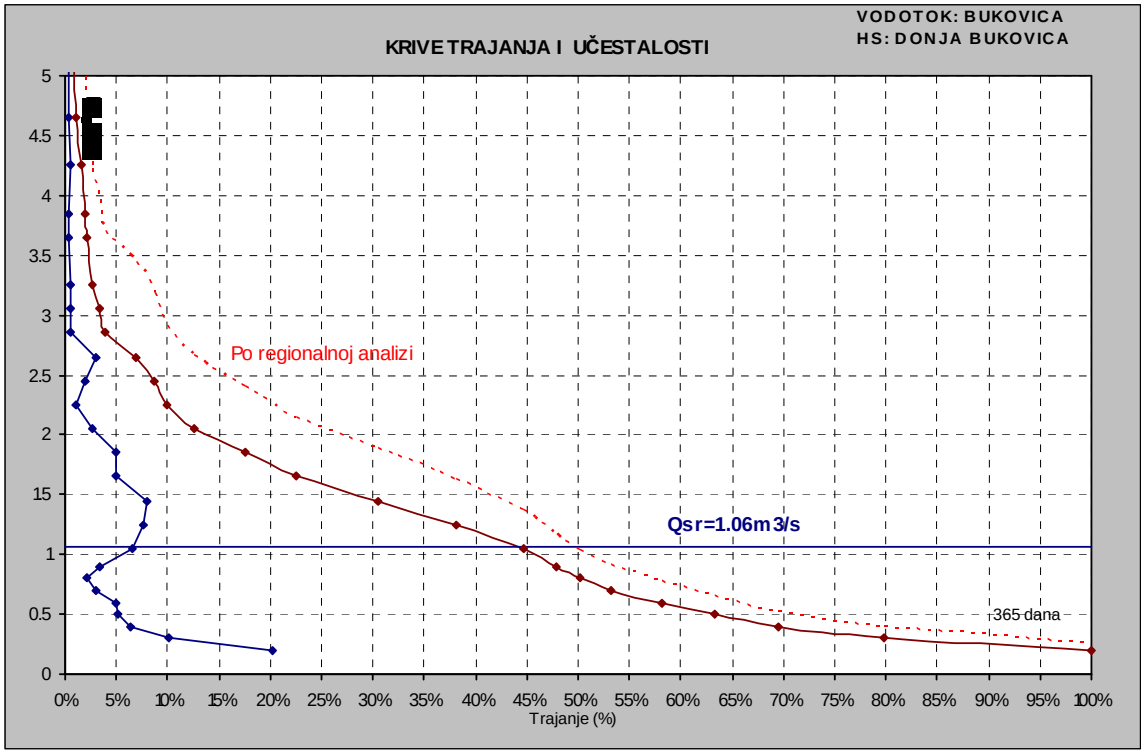


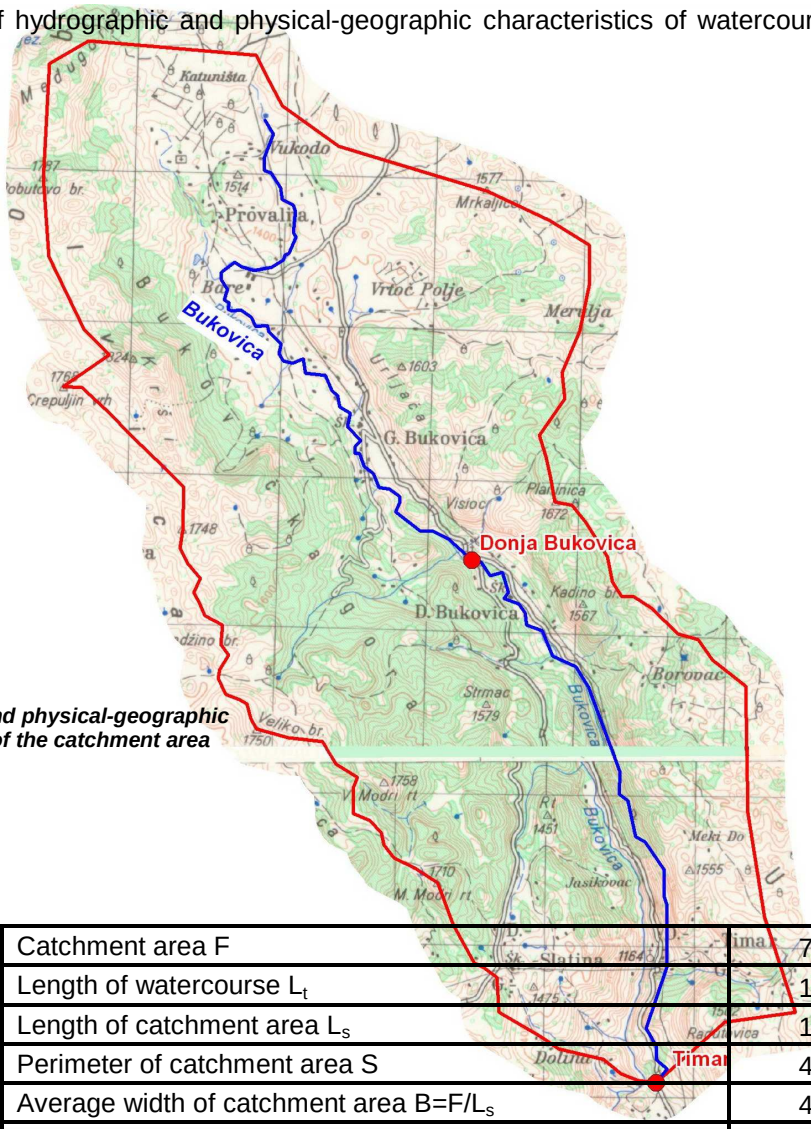
Figure 17

Accordingo to the same curve other characteristic flows are as follows:

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	2.23	1.74	1.44	1.18	0.788	0.558	0.385	0.277	0.235

C.4. WATERCOURSE: BUKOVICA
HS: TIMAR

Parameters of hydrographic and physical-geographic characteristics of watercourses are given on the folowing Figure



Hydrographic and physical-geographic characteristics of the catchment area

1	Catchment area F	70.1	[km^2]
2	Length of watercourse L_t	17.6	[km]
3	Length of catchment area L_s	16.2	[km]
4	Perimeter of catchment area S	40.7	[km]
5	Average width of catchment area B=F/L_s	4.32	[km]
6	Rectilinear distance river source - mouth L_i	7.92	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.42	[km]
8	Watershed spreading factor K_s	1.37	[-]
9	Elongation of catchment factor K_σ	4.419	[-]
10	Concentration of catchment factor K_c	1.007	[-]
11	Tortousnesness of flow factor K_L	2.22	[-]
12	Maximum head in the catchment area H_{max}	1824	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	1065	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	19.5	[%]
15	Maximum head of slope of valley I_{max}	28.6	[%]
16	Average altitude of the catchment area H_{sr}	1480	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	415	[m]
18	Levelled out head of watercourse I_t	2.13	[%]
19	Maximum head of the watercourse I_{t1}	5.81	[%]
20	Average maximum head of the watercourse I_{t2}	2.24	[%]

Schematic longitudinal profile of watercourse in stages from the river mouth to the source, where contour lines intersect the watercourse (Figure 18) as well as hypsometric curve (Figure 19) are given on page 23.

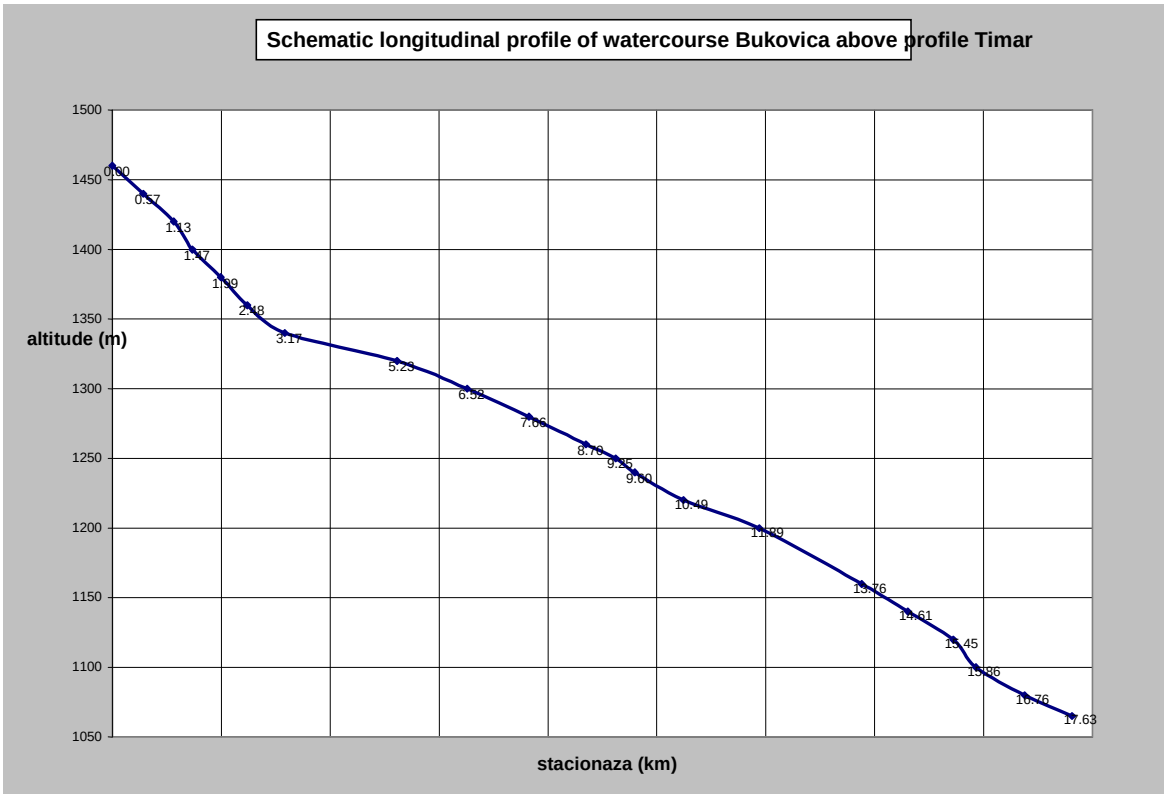


Figure 18

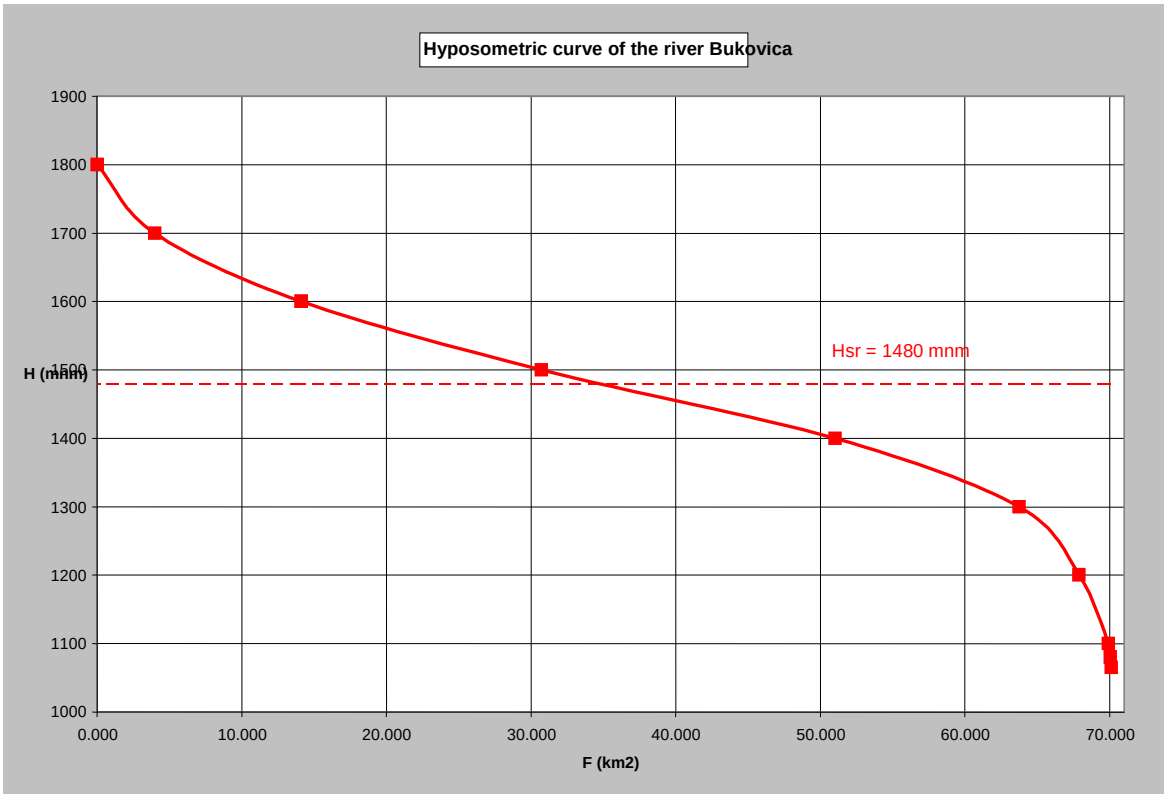


Figure 19

Lenght of watershead is 40.7 km, catchment area is 70.1 km^2, average head in the catchment area is 19.5%, maximum elevation in the catchment area is 1824 m.a.s.l., and minimum elevation is 1065 m.a.s.l., average elevation in the catchment area is 1480 m.a.s.l. and levelled out head of watercourse 2.13%, as the upper reaches of the catchment area of the Bukovica river, comprising source of Bukovica river, belong to the part of the river that goes through the plain.

Flow curve, with indicated flow measurements is presented on the Figure 20.

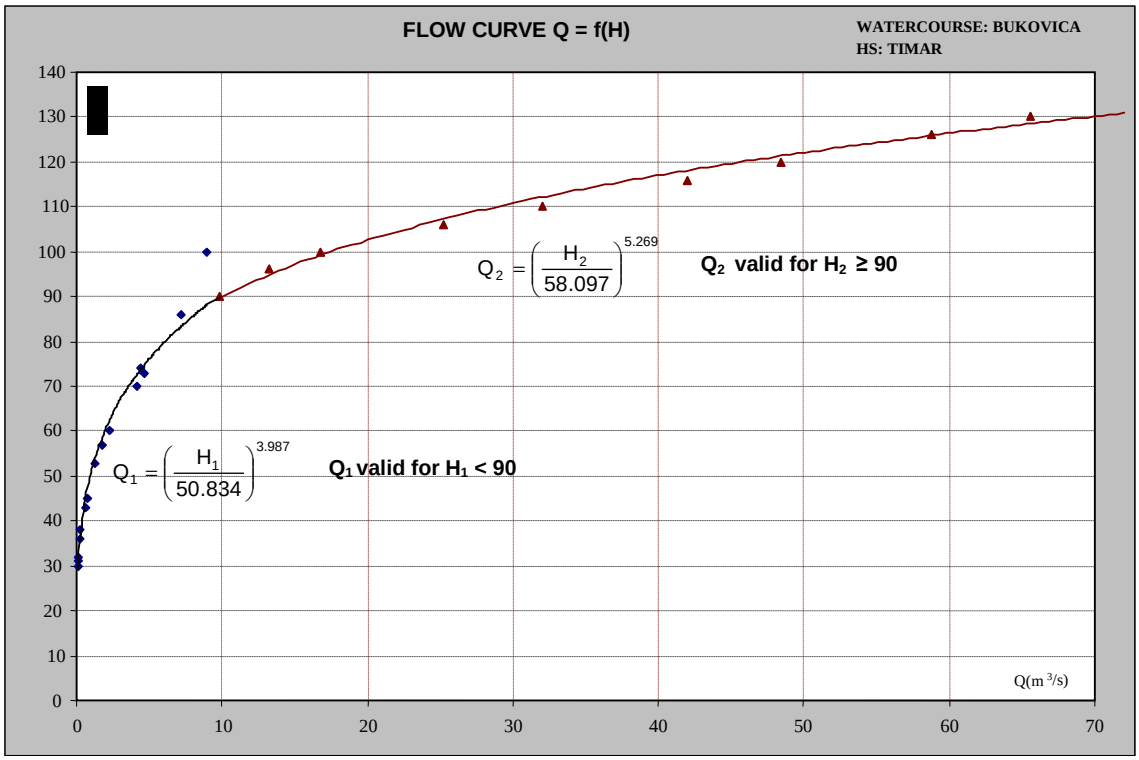


Figure 20

Out od 15 hydrometrical flow measurements presented on this Figure, only the highest one and decisive at water level 100 was discarded as it would significantly reduce water flow, as clearly visible on the Figure 20. Extrapolation of the flow curve was done based on experience, on the basis of its bend n the lower part. Flow curve is covered with measurements of water level amplitude in relation to maximum peak is 71%.
The Program is not performing extrapolation, but only interpolation of flow curve, fictively setting measuring ranges taken from curve we extrapolated ourselves. With this we managed to have the curve H-Q going mostly through points we set (based on lowest square deviations methodology). Compared to the clasical procedure of setting parameters for flow curve, which is somewhat more pecise, but is on the other hand longer and time consuming, this is much faster and quite satisfactory method.

This shows that up to 90 cm water level correlation was $Q_1 = \left(\frac{H_1}{50.834}\right)^{3.987}$, and above 90 cm water level it was $Q_2 = \left(\frac{H_2}{58.097}\right)^{5.269}$, as on Figure 20.

Tabelar overview of average daily, ten days, monthly and annual flows is given on the page 25 and hydrograph of run-offs (Figure 21) is presented on the page 26.
It can be noted that average flow for several months (for almost 16.5 months, i.e 504 days is 1.66 m^3/sec, while aveage annual flow for a peiod reduced to one calendar year is 1.61 m^3/sec. In terms of balance this is quite acceptable difference, amounting at just 50 lit/sec.

Month with geatest water volumes was also Apil, with average monthly flow of 4.81 m^3/sec, and the diest month is July with 0.3 m^3/sec, while absolute minimum of 0.122 m^3/sec was recorded in August of year 2007.

Absolute high water level peak of 81.7 m^3/sec from January 2007 was 2.24 times higher than average daily flow for that day of 36.5 m^3/sec.

Absolute minimum level peak of 0.122 l/sec is 59% lower than average daily level from July of 2007 of 0.295 l /sec.

WATERCOURSE:BUKOVICA
HS: TIMAR

REVIEW OF FLOWS - 2006

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	***	5.80	2.07	0.671	0.226	0.731	0.348	0.226	0.671
2	***	5.80	2.35	0.615	0.226	0.562	0.313	0.253	0.615
3	***	6.10	2.21	0.562	0.226	0.513	0.313	0.253	0.562
4	***	5.51	2.21	0.562	0.226	0.424	0.282	0.253	0.562
5	***	4.97	2.21	0.513	0.313	0.385	0.385	0.253	0.513
6	***	4.47	2.07	0.513	0.253	0.348	0.348	0.226	0.467
7	***	4.01	2.35	0.513	0.282	0.313	0.348	0.253	0.424
8	***	3.58	2.83	0.562	0.253	0.313	0.348	0.253	0.424
9	***	3.58	2.51	0.562	0.253	0.282	0.348	0.282	0.513
10	***	7.06	2.51	0.467	0.282	0.282	0.313	0.348	2.51
11	***	6.10	2.66	0.424	0.513	0.253	0.313	0.348	1.81
12	15.7	4.97	2.51	0.424	0.424	0.253	0.313	0.348	1.37
13	9.33	4.71	2.21	0.385	0.513	0.253	0.282	0.348	1.09
14	6.41	4.47	1.94	0.348	1.27	0.253	0.282	0.313	0.936
15	6.10	4.47	1.69	0.348	0.731	0.226	0.282	0.313	0.864
16	7.77	4.47	1.58	0.313	0.562	0.226	0.253	0.313	0.796
17	8.92	4.71	1.47	0.313	0.467	0.282	0.253	0.348	0.731
18	8.52	4.97	1.47	0.313	0.385	0.615	0.253	0.348	4.01
19	10.6	4.71	1.37	0.282	0.348	1.937	0.253	0.385	10.2
20	10.0	4.97	1.27	0.282	0.313	1.181	0.253	0.385	4.23
21	9.33	4.97	1.27	0.253	0.282	0.936	0.253	0.385	2.83
22	8.92	4.47	1.18	0.253	0.282	0.796	0.253	1.69	2.21
23	9.33	4.23	1.18	0.253	0.253	0.671	0.253	6.10	1.69
24	9.33	4.01	1.18	0.253	0.253	0.562	0.226	2.83	0.824
25	9.33	3.79	1.09	0.253	0.253	0.513	0.226	1.94	1.37
26	8.92	3.38	1.01	0.253	0.348	0.467	0.226	1.37	1.37
27	8.92	2.83	0.864	0.226	0.348	0.424	0.226	1.09	1.37
28	7.77	2.51	0.796	0.226	0.385	0.424	0.201	0.936	1.37
29	6.73	2.51	0.731	0.282	0.424	0.385	0.201	0.864	1.37
30	6.10	2.51	0.671	0.282	0.864	0.348	0.253	0.731	1.37
31		2.35		0.253	1.18		0.226		1.37
D.1	0	5.09	2.33	0.554	0.254	0.415	0.334	0.260	0.726
D.2	8.34	4.86	1.82	0.343	0.553	0.548	0.274	0.345	2.60
D.3	8.47	3.41	0.999	0.253	0.443	0.553	0.231	1.79	1.56
MIN	5.24	2.21	0.67	0.23	0.23	0.23	0.2	0.23	0.42
DAT	19	31	29	24	1	13	27	1	6
SR	5.6	4.42	1.72	0.38	0.42	0.51	0.28	0.8	1.63
MAX	18.4	8.52	2.83	0.86	1.58	2.51	0.56	8.52	45.7
DAT	13	10	8	8	14	18	5	23	18

MIN = 0.201 **DAT: 27. 10** | **SR = 1.82** | **MAX = 45.7** **DAT: 18. 12**

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	1.37	1.18	1.58	2.83	1.47	1.181	0.348	0.158
2	1.69	1.01	2.66	3.19	1.37	1.013	0.348	0.158
3	1.81	0.936	3.79	3.38	1.37	0.864	0.313	0.139
4	1.27	0.796	4.97	3.58	1.81	0.796	0.313	0.158
5	1.09	0.796	3.79	4.47	1.94	0.796	0.313	0.158
6	0.936	0.731	2.83	3.58	1.81	0.796	0.282	0.158
7	0.796	0.671	2.35	3.58	1.81	0.864	0.282	0.158
8	0.731	1.01	2.07	3.79	1.81	1.01	0.253	0.139
9	0.671	2.83	1.94	3.58	1.69	1.27	0.253	0.139
10	0.671	3.38	1.94	3.38	1.58	1.09	0.253	0.139
11	0.615	3.79	1.58	3.38	1.47	1.47	0.282	0.158
12	0.671	3.79	1.37	3.19	1.37	1.94	0.253	0.139
13	0.615	6.10	1.27	3.01	1.27	1.81	0.226	0.139
14	0.615	4.47	1.09	3.01	1.18	1.47	0.226	0.139
15	0.615	2.83	1.09	2.83	1.01	1.27	0.226	0.122
16	0.562	2.07	1.27	2.66	0.936	1.09	0.201	0.122
17	0.562	1.69	1.27	2.51	0.936	1.69	0.201	0.122
18	0.615	1.37	1.27	2.35	0.864	1.09	0.201	0.122
19	1.18	1.27	1.27	2.35	0.796	0.936	0.179	0.122
20	1.69	1.27	1.81	2.21	0.731	0.796	0.179	0.122
21	1.69	1.37	1.58	2.07	0.731	0.731	0.179	0.122
22	1.94	1.47	1.37	2.07	0.671	0.615	0.179	0.122
23	4.71	1.47	1.18	2.07	0.615	0.562	0.179	0.122
24	36.5	1.47	1.09	1.94	0.671	0.513	0.179	0.122
25	7.41	1.37	1.01	1.94	0.671	0.467	0.158	0.122
26	4.23	2.21	1.09	1.94	0.615	0.467	0.158	0.122
27	3.19	2.83	1.27	1.81	0.562	0.424	0.158	0.122
28	2.35	1.94	1.37	1.69	0.562	0.385	0.158	0.122
29	1.94	***	1.47	1.58	1.01	0.385	0.158	***
30	1.58	***	2.07	1.58	1.81	0.385	0.158	***
31	1.37	***	2.66		1.47		0.158	***
D.1	1.10	1.34	2.79	3.54	1.67	0.969	0.296	0.150
D.2	0.774	2.87	1.33	2.75	1.06	1.36	0.217	0.131
D.3	6.08	1.77	1.47	1.87	0.854	0.493	0.165	0.089
MIN	0.56	0.67	0.94	1.47	0.56	0.35	0.16	0.12
DAT	16	6	25	29	26	29	23	17
SR	2.76	2.00	1.85	2.72	1.18	0.94	0.22	0.14
MAX	81.7	9.33	6.10	4.71	2.07	2.83	0.38	0.18
DAT	24	13	4	5	4	11	1	1

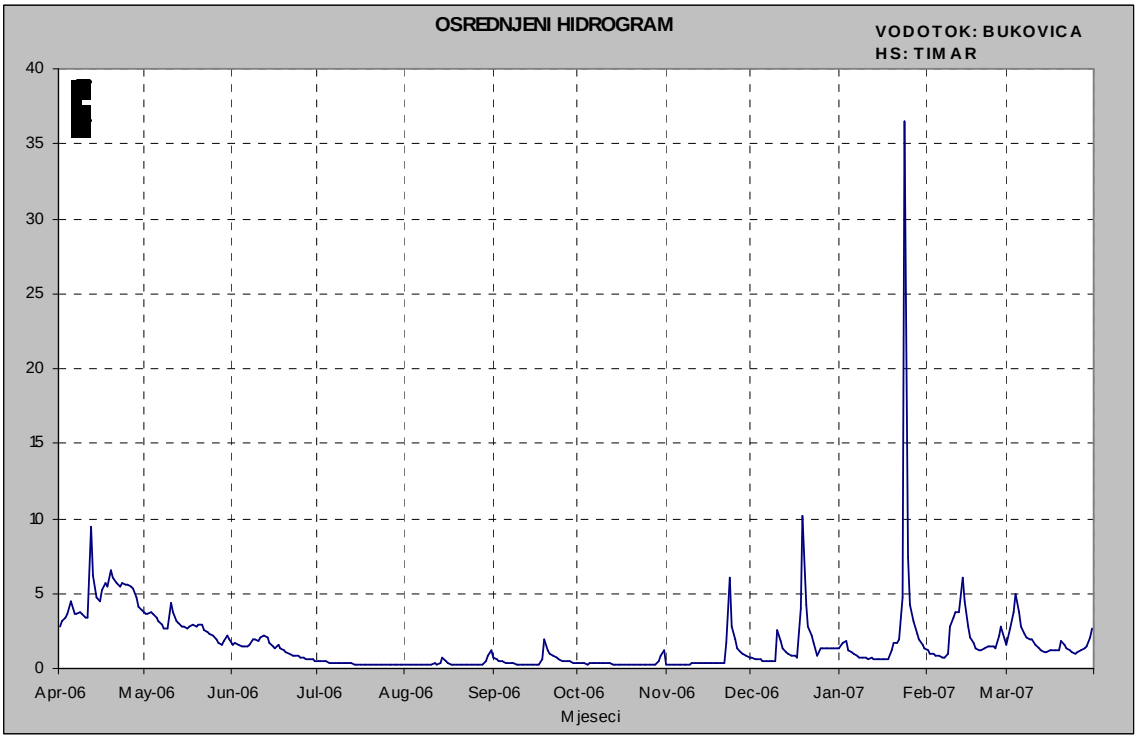
MIN = 0.122 **DAT: 17. 08** | **SR = 1.49** | **MAX = 81.7** **DAT: 24. 01**

REVIEW OF ANNUAL FLOWS

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	2.83	3.64	1.62	0.510	0.192	0.731	0.348	0.226	0.671	1.37	1.18	1.58
2	3.19	3.58	1.68	0.481	0.192	0.562	0.313	0.253	0.615	1.69	1.01	2.66
3	3.38	3.73	1.54	0.438	0.182	0.513	0.313	0.253	0.562	1.81	0.936	3.79
4	3.58	3.66	1.50	0.438	0.192	0.424	0.282	0.253	0.562	1.27	0.796	4.97
5	4.47	3.45	1.50	0.413	0.236	0.385	0.385	0.253	0.513	1.09	0.796	3.79
6	3.58	3.14	1.43	0.397	0.205	0.348	0.348	0.226	0.467	0.936	0.731	2.83
7	3.58	2.91	1.61	0.397	0.220	0.313	0.348	0.253	0.424	0.796	0.671	2.35
8	3.79	2.70	1.92	0.407	0.196	0.313	0.348	0.253	0.424	0.731	1.01	2.07
9	3.58	2.64	1.89	0.407	0.196	0.282	0.348	0.282	0.513	0.671	2.83	1.94
10	3.38	4.32	1.80	0.360	0.210	0.282	0.313	0.348	2.51	0.671	3.38	1.94
11	3.38	3.78	2.07	0.353	0.336	0.253	0.313	0.348	1.81	0.615	3.79	1.58
12	9.45	3.17	2.22	0.338	0.282	0.253	0.313	0.348	1.37	0.671	3.79	1.37
13	6.17	2.99	2.01	0.305	0.326	0.253	0.282	0.348	1.09	0.615	6.10	1.27
14	4.71	2.83	1.70	0.287	0.706	0.253	0.282	0.313	0.936	0.615	4.47	1.09
15	4.47	2.74	1.48	0.287	0.427	0.226	0.282	0.313	0.864	0.615	2.83	1.09
16	5.22	2.70	1.34	0.257	0.342	0.226	0.253	0.313	0.796	0.562	2.07	1.27
17	5.71	2.83	1.58	0.257	0.295	0.282	0.253	0.348	0.731	0.562	1.69	1.27
18	5.44	2.92	1.28	0.257	0.253	0.615	0.253	0.348	4.01	0.615	1.37	1.27
19	6.49	2.76	1.15	0.230	0.235	1.94	0.253	0.385	10.2	1.18	1.27	1.27
20	6.12	2.85	1.03	0.230	0.218	1.18	0.253	0.385	4.23	1.69	1.27	1.81
21	5.70	2.85	1.00	0.216	0.202	0.936	0.253	0.385	2.83	1.69	1.37	1.58
22	5.49	2.57	0.898	0.216	0.202	0.796	0.253	1.69	2.21	1.94	1.47	1.37
23	5.70	2.42	0.872	0.216	0.187	0.671	0.253	6.10	1.69	4.71	1.47	1.18
24	5.63	2.34	0.847	0.216	0.187	0.562	0.226	2.83	0.82	36.5	1.47	1.09
25	5.63	2.23	0.781	0.205	0.187	0.513	0.226	1.94	1.37	7.41	1.37	1.01
26	5.43	2.00	0.740	0.205	0.235	0.467	0.226	1.37	1.37	4.23	2.21	1.09
27	5.36	1.70	0.644	0.192	0.235	0.424	0.226	1.09	1.37	3.19	2.83	1.27
28	4.73	1.53	0.590	0.192	0.253	0.424	0.201	0.936	1.37	2.35	1.94	1.37
29	4.15	1.76	0.558	0.220	0.424	0.385	0.424	0.864	1.37	1.94	***	1.47
30	3.84	2.16	0.528	0.220	0.864	0.348	0.864	0.731	1.37	1.58	***	2.07
31		1.91		0.205	1.18		1.18		1.37	1.37	***	2.66
D.1	3.537	3.38	1.65	0.425	0.202	0.415	0.334	0.260	0.726	1.10	1.34	2.79
D.2	5.716	2.96	1.59	0.280	0.342	0.548	0.274	0.345	2.60	0.774	2.87	1.33
D.3	5.167	2.13	0.746	0.209	0.378	0.553	0.394	1.79	1.56	6.08	1.77	1.47
MIN	1.47	0.56	0.35	0.16	0.12	0.23	0.2	0.23	0.42	0.56	0.67	0.94
DAT	29	26	29	23	17	13	27	1	6	16	25	29
SR	4.81	2.80	1.33	0.3	0.31	0.51	0.34	0.8	1.63	2.76	2.00	1.85
MAX	18.42	8.52	2.83	0.86	1.58	2.51	0.56	8.52	45.69	81.71	9.33	6.10
DAT	13	10	8	8	14	18	5	23	18	24	13	4

MIN = 0.122 **DAT: 17. 08** | **SR = 1.61** | **MAX = 81.7** **DAT: 24. 01**

AVERAGE VALUE FOR 504 DAYS IS Q=1.66 m^3/S



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Duration curve is presented on the figure 22 where it could be seen that the average annual flow of 1.61 m^3/sec and all flows bigger than this one last for 142 day, i.e. 39%.

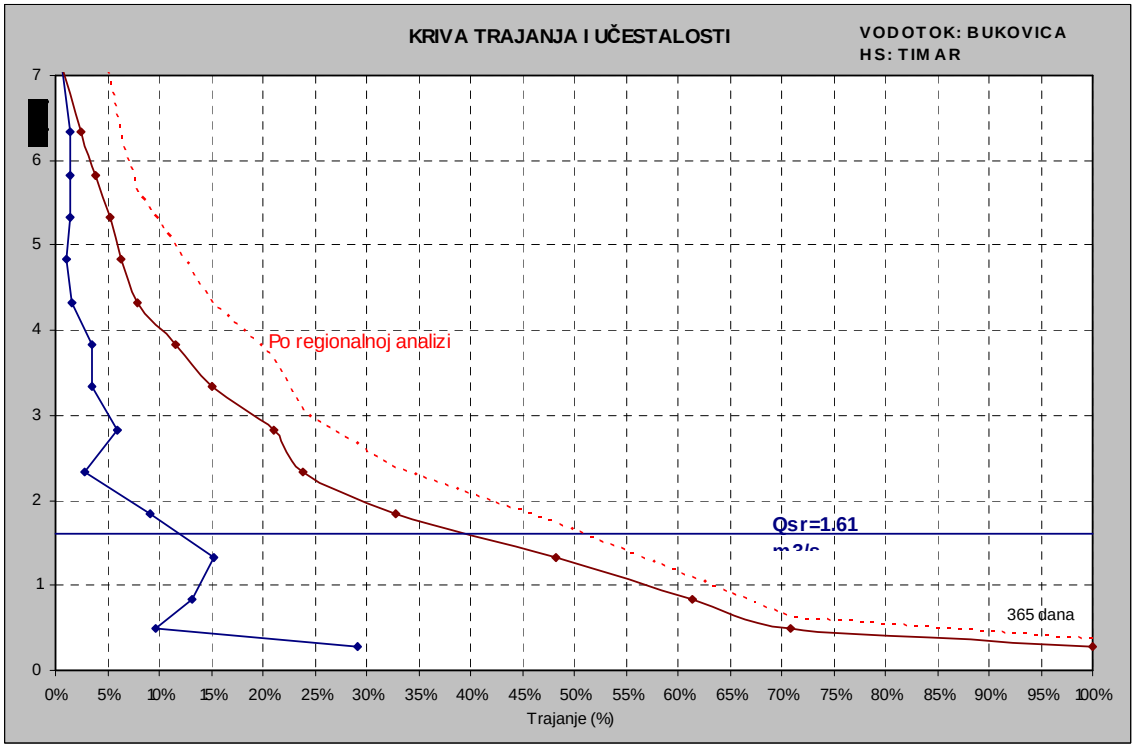


Figure 22

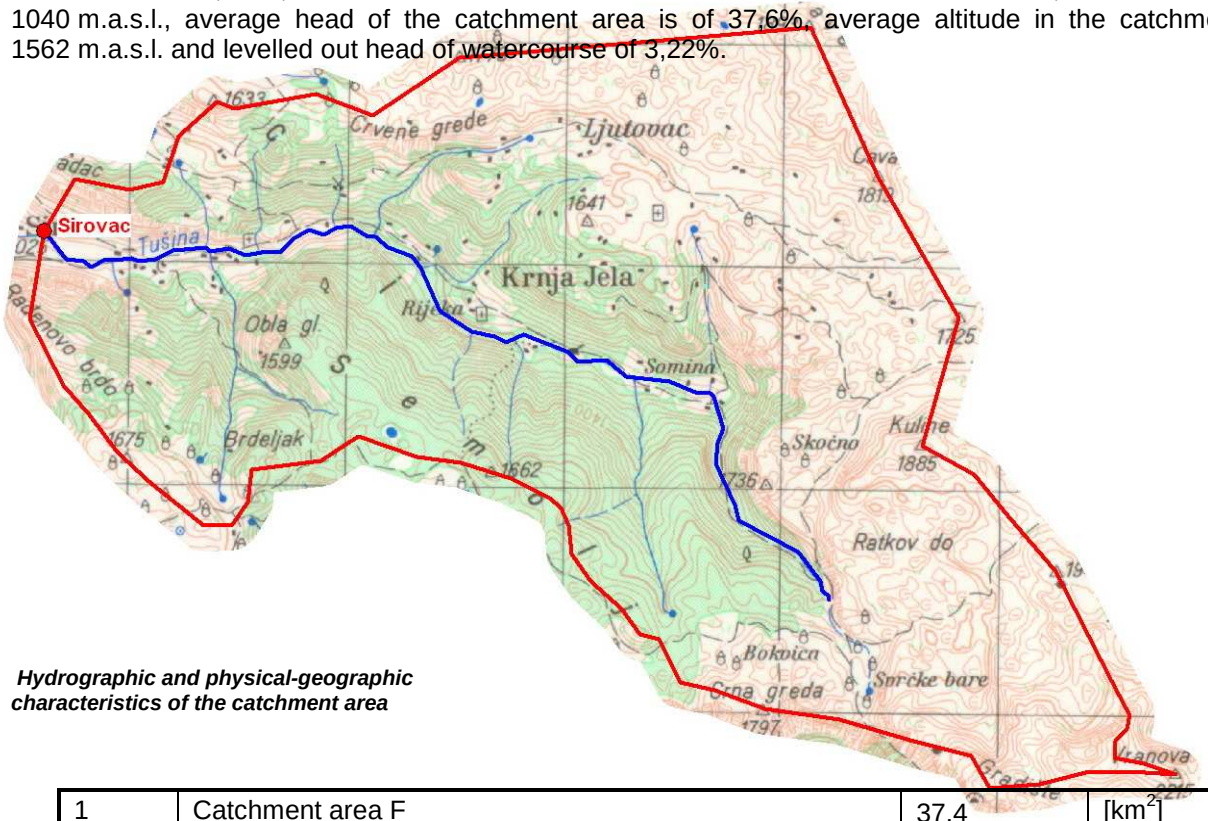
Pursuant to frequency curve other characteristic flows are as follows:

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	4.09	2.92	1.92	1.58	1.25	0.833	0.50	0.375	0.333

C.5. WATERCOURSE: TUŠINA
HS: SIROVAC

This hydro station has been operational for around three years as a part of basic network of stations belonging to the HMZ , but unfortunatelly its data has not yet been szstemized and processed so that they could be compared to this specific hidrometric measurments.

From the disposition of the river cachment and the table containing hiyrographic and physical-geographic characteristics of the catchment area, it can be seen that the catchment area is 37,4 km2, the lenght of the watershed is 30,3 km, maximum elevation in the catchment area is 2215 m.a.s.l., minimum elevation is 1040 m.a.s.l., average head of the catchment area is of 37,6%, average altitude in the catchment area is 1562 m.a.s.l. and levelled out head of watercourse of 3,22%.



Hydrographic and physical-geographic characteristics of the catchment area

1	Catchment area F	37.4	[km^2]
2	Length of watercourse L_t	9.44	[km]
3	Length of catchment area L_s	12.7	[km]
4	Perimeter of catchment area S	30.3	[km]
5	Average width of catchment area $B=F/L_s$	2.94	[km]
6	Rectilinear distance river source - mouth L_i	7.94	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	5.07	[km]
8	Watershed spreading factor K_s	1.40	[-]
9	Elongation of catchment factor K_σ	2.38	[-]
10	Concentration of catchment factor K_c	0.487	[-]
11	Tortousnesness of flow factor K_L	1.19	[-]
12	Maximum head in the catchment area H_{max}	2215	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	1040	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	37.6	[%]
15	Maximum head of slope of valley I_{max}	38.3	[%]
16	Average altitude of the catchment area H_{sr}	1562	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	518	[m]
18	Levelled out head of watercourse I_t	3.22	[%]
19	Maximum head of the watercourse I_{t1}	17.8	[%]
20	Average maximum head of the watercourse I_{t2}	5.51	[%]

Schematic longitudinal profile of watercourse (figure 23) and hypsometric curve (figure 24) are given on page 28. On the Hypsograph curve it is visible that elevation of the most part of the catchment area is between 1400 and 1800 m.a.s.l. and that it represents 66.7% of the catchment area.

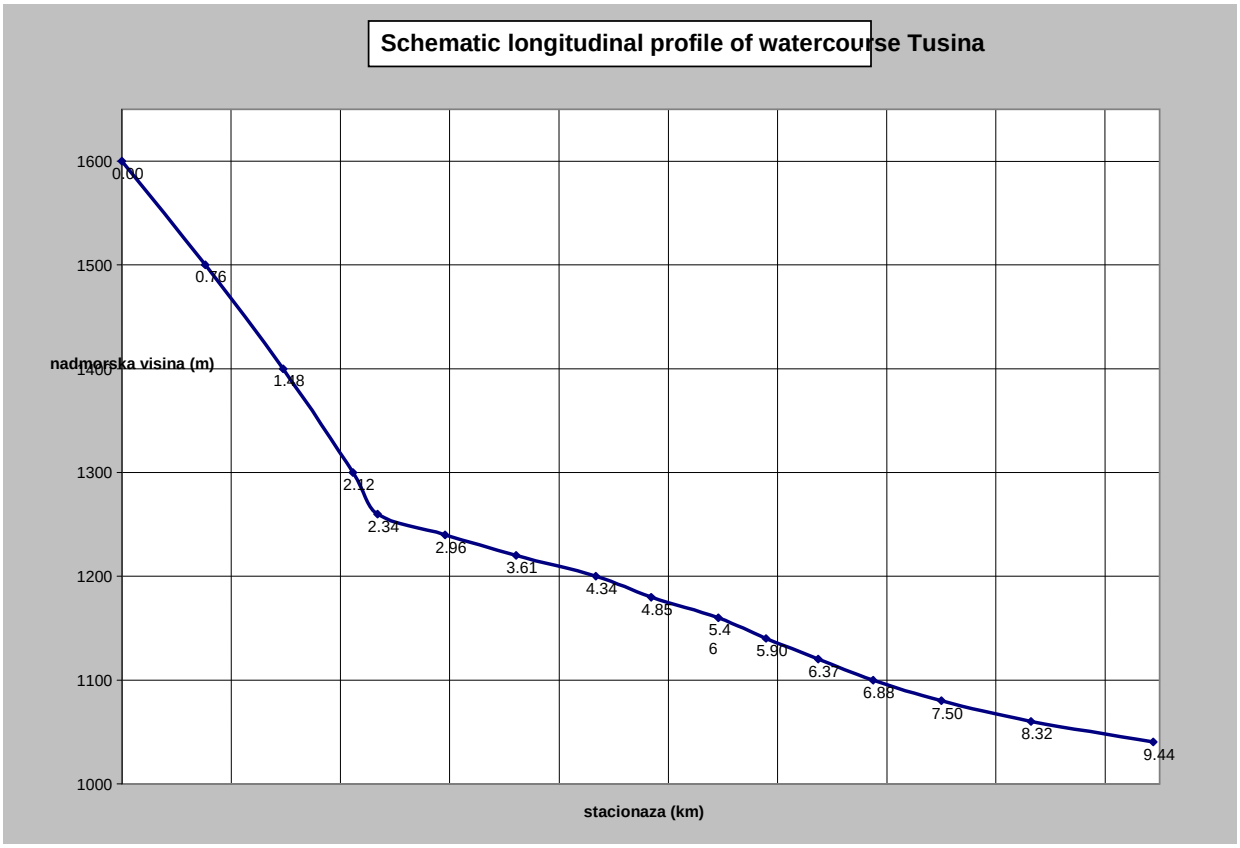


Figure 23

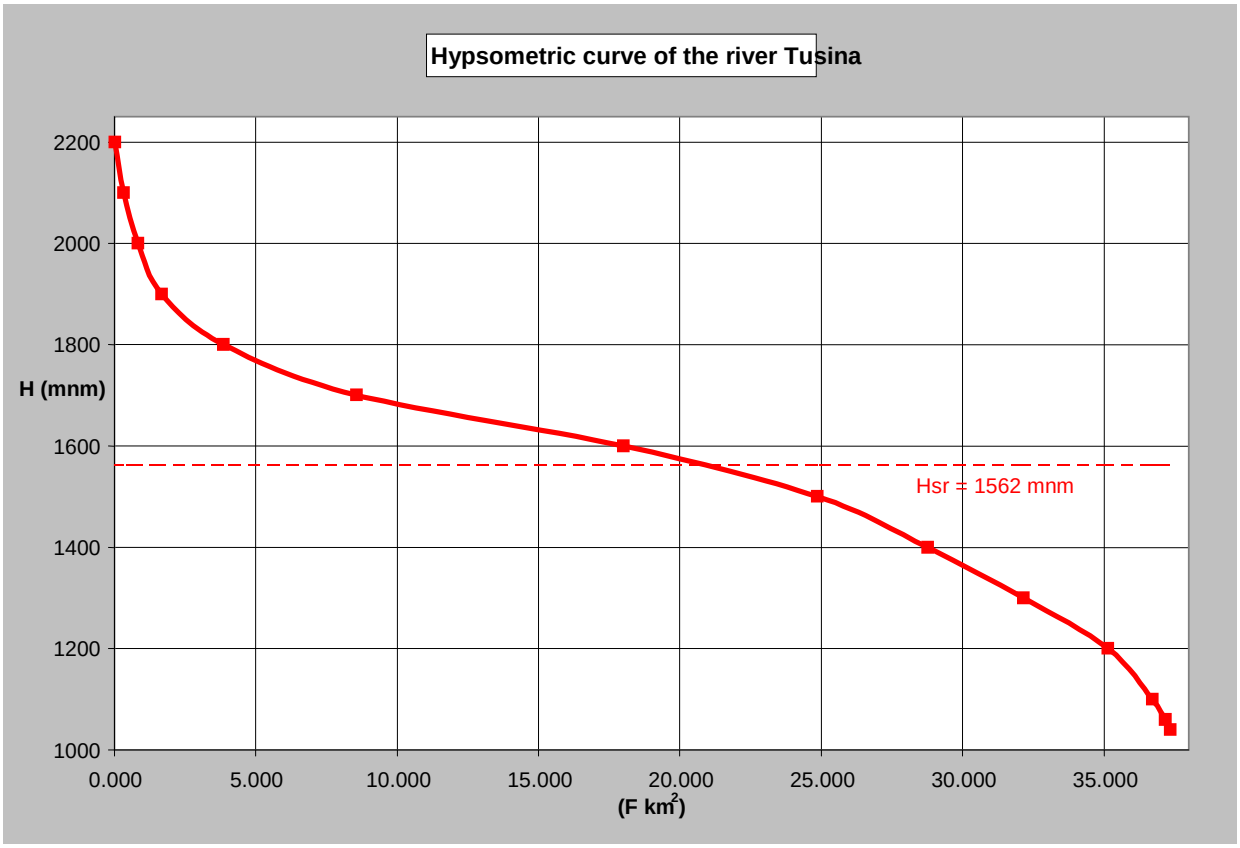


Figure 24

Flow curve is interpolated from all available measurements, while the measurement at the time of maximum water level of 96 cm is on the edge of being discarded – or accepted.

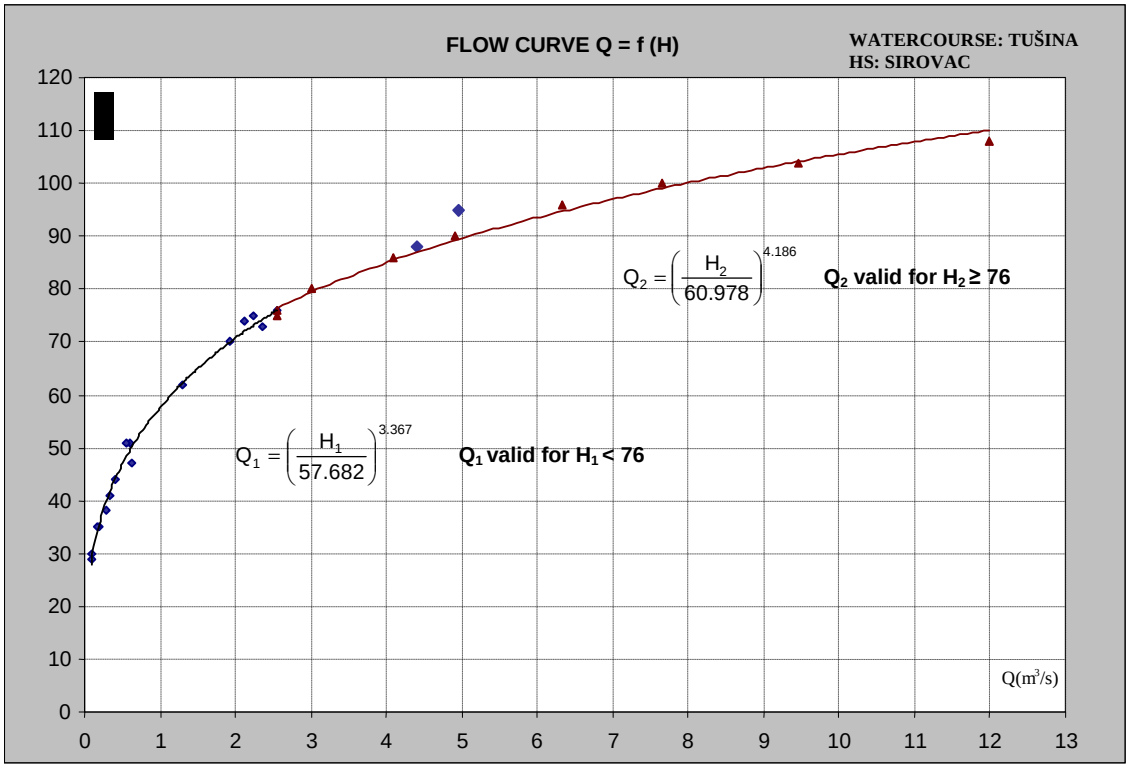


Figure 25

The curve is extrapolated based on experience in accordance with bend on its lower part as well as based on a visual image of the profile, which was not monitored as a whole, outside of part which is under water.

Two dependances are obtained, for lower part H<76 cm $Q_1 = \left(\frac{H_1}{57.682}\right)^{3.367}$, i.e. for upper extrapolated part H≥76 $Q_2 = \left(\frac{H_2}{60.978}\right)^{4.186}$ (slika 25).

The coverage of the flow curve with hydrometric measurements according to the amplitude of water level in relation to peak of maximum water level is 57%. The annual rewiev of flows for parts of 2006 and 2007., as well as for the 12-month period is given at the page 30 together with average annual flow of 0.996 m3/s and it is bigger by 91 l/s then the flow available for the entire period of 504 days which amounted for 1.087m3/s

The months with the biggest quantities of water were April and May of 2006 with 3.54 m3/sec for April, i.e. 3,78 m3/sec average monthly flow for May, whilst the driest month was October of 2006 with 150 l/s and August of 2007 with 103 l/s.

The absolute maximum from January of 2007 of 10.9 m3/s is by 56% larger then daily average of 6.98m3/s.
The absolute minimum of 60 l/s from September 2006 is by 130% lower then daily average minimum of 138 l/s.

Maximum flow peaks are visible in June 2006 and January 2007, and minimum flow peaks exist during September, October and November 2006.

Hydrograph of run-offs is given on the page 31 (Figure26).

WATERCOURSE:TUŠINA

HS: SIROVAC

REVIEW OF FLOWS - 2006

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	***	5.10	1.35	0.539	0.169	0.186	0.153	0.124	0.344
2	***	4.87	1.57	0.539	0.169	0.169	0.153	0.138	0.317
3	***	4.87	1.42	0.539	0.153	0.169	0.153	0.124	0.292
4	***	4.64	1.42	0.502	0.153	0.153	0.153	0.124	0.292
5	***	4.22	1.50	0.467	0.186	0.153	0.169	0.124	0.268
6	***	3.82	1.35	0.402	0.186	0.153	0.186	0.124	0.245
7	***	3.46	1.66	0.245	0.169	0.138	0.204	0.124	0.245
8	***	3.12	1.83	0.245	0.169	0.138	0.186	0.124	0.224
9	***	3.28	1.66	0.245	0.169	0.138	0.186	0.138	0.292
10	***	5.85	1.50	0.224	0.186	0.138	0.169	0.138	1.495
11	***	5.34	1.57	0.224	0.186	0.138	0.169	0.153	0.905
12	6.68	4.64	1.50	0.224	0.186	0.138	0.169	0.153	0.705
13	5.34	4.43	1.35	0.224	0.372	0.138	0.153	0.138	0.618
14	4.02	4.64	1.28	0.204	0.618	0.138	0.153	0.138	0.539
15	3.46	4.43	1.21	0.204	0.372	0.124	0.153	0.138	0.467
16	4.02	4.43	1.14	0.204	0.292	0.124	0.153	0.138	0.433
17	4.87	4.64	1.08	0.204	0.245	0.224	0.138	0.138	0.402
18	5.34	4.64	0.961	0.186	0.224	0.402	0.138	0.138	1.574
19	6.12	4.43	0.905	0.186	0.204	0.539	0.138	0.138	3.820
20	6.12	4.43	0.905	0.186	0.186	0.344	0.138	0.138	1.919
21	5.59	4.22	0.852	0.186	0.186	0.292	0.138	0.153	1.419
22	5.59	3.46	0.801	0.169	0.169	0.245	0.138	0.961	1.079
23	6.12	3.12	0.752	0.169	0.169	0.224	0.138	2.514	0.905
24	6.40	3.12	0.752	0.169	0.169	0.204	0.138	1.275	0.752
25	6.40	2.66	0.705	0.169	0.153	0.186	0.138	0.852	0.705
26	6.68	2.21	0.661	0.169	0.169	0.186	0.124	0.661	0.661
27	6.68	2.01	0.618	0.169	0.153	0.186	0.124	0.539	0.577
28	6.12	1.92	0.618	0.186	0.169	0.169	0.124	0.467	0.539
29	5.59	1.83	0.577	0.204	0.169	0.169	0.124	0.402	0.502
30	5.10	1.74	0.539	0.186	0.186	0.169	0.138	0.372	0.467
31		1.50		0.186	0.186		0.124		0.433
D.1	0	4.32	1.52	0.395	0.171	0.153	0.171	0.128	0.401
D.2	4.60	4.61	1.19	0.205	0.289	0.231	0.150	0.141	1.138
D.3	6.03	2.52	0.687	0.177	0.169	0.203	0.132	0.819	0.761
MIN	3.28	1.35	0.37	0.077	0.077	0.059	0.059	0.059	0.124
DAT	15	31	30	24	2	12	25	1	8
SR	3.54	3.78	1.13	0.257	0.209	0.196	0.150	0.363	0.756
MAX	7.60	6.98	2.21	0.58	1.02	0.71	0.22	4.02	7.93
DAT	26	10	7	1	13	18	5	23	18

MIN = 0.059 DAT: 12. 09 | SR = 1.20 | MAX = 7.93 DAT: 18. 12

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0.402	0.905	1.35	2.11	1.28	0.618	0.344	0.138
2	0.577	0.801	1.57	2.21	1.14	0.539	0.317	0.111
3	0.661	0.752	1.92	2.31	1.21	0.539	0.317	0.111
4	0.618	0.752	2.21	2.31	1.50	0.577	0.292	0.111
5	0.577	0.705	1.92	2.51	1.57	0.705	0.317	0.111
6	0.539	0.661	1.57	2.21	1.83	0.752	0.292	0.111
7	0.502	0.661	1.50	2.11	1.57	1.019	0.268	0.111
8	0.467	0.752	1.35	2.21	1.28	1.574	0.268	0.111
9	0.467	1.21	1.35	2.21	1.14	1.142	0.245	0.111
10	0.433	1.66	1.35	2.21	1.02	1.142	0.245	0.111
11	0.433	1.83	1.28	2.42	0.961	1.919	0.245	0.111
12	0.433	1.83	1.14	2.42	0.852	1.740	0.245	0.111
13	0.402	2.51	1.02	2.42	0.752	1.419	0.224	0.111
14	0.402	2.51	0.961	2.51	0.705	1.207	0.224	0.111
15	0.402	2.01	0.961	2.66	0.661	1.079	0.204	0.099
16	0.372	1.66	0.961	2.51	0.618	0.961	0.204	0.099
17	0.372	1.42	0.961	2.21	0.577	0.852	0.204	0.099
18	0.372	1.21	1.02	2.11	0.577	0.752	0.186	0.099
19	0.467	1.14	1.08	2.21	0.539	0.661	0.186	0.099
20	0.618	1.14	1.83	2.11	0.502	0.618	0.186	0.099
21	0.661	1.08	1.66	2.11	0.467	0.577	0.186	0.099
22	0.661	1.08	1.42	2.11	0.467	0.539	0.186	0.099
23	1.50	1.14	1.28	2.11	0.433	0.502	0.169	0.088
24	6.98	1.08	1.14	2.01	0.433	0.467	0.169	0.088
25	3.12	1.08	1.14	2.01	0.433	0.433	0.169	0.088
26	2.11	1.42	1.28	1.83	0.402	0.433	0.169	0.088
27	1.74	1.74	1.35	1.66	0.402	0.402	0.169	0.088
28	1.42	1.50	1.42	1.42	0.433	0.372	0.169	0.088
29	1.28		1.50	1.35	0.661	0.372	0.153	***
30	1.08		1.83	1.42	0.752	0.372	0.153	***
31	0.961		2.11		0.661		0.153	***
D.1	0.524	0.885	1.61	2.24	1.35	0.861	0.290	0.113
D.2	0.427	1.73	1.12	2.36	0.674	1.121	0.211	0.104
D.3	1.95	1.26	1.46	1.80	0.504	0.447	0.167	0.090
MIN	0.372	0.618	0.961	1.21	0.37	0.34	0.15	0.088
DAT	15	6	14	29	27	29	26	21
SR	1.0	1.29	1.40	2.13	0.833	0.809	0.221	0.103
MAX	10.94	3.12	2.42	3.12	2.01	2.21	0.37	0.15
DAT	24	13	4	15	6	10	1	1

MIN = 0.088 DAT: 23. 08 | SR = 0.977 | MAX = 10.9 DAT: 24. 01

REVIEW OF ANNUAL FLOWS

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1	2.11	3.19	0.982	0.441	0.153	0.186	0.153	0.124	0.344	0.402	0.905	1.35
2	2.21	3.01	1.06	0.428	0.140	0.169	0.153	0.138	0.317	0.577	0.801	1.57
3	2.31	3.04	0.979	0.428	0.132	0.169	0.153	0.124	0.292	0.661	0.752	1.92
4	2.31	3.07	0.998	0.397	0.132	0.153	0.153	0.124	0.292	0.618	0.752	2.21
5	2.51	2.90	1.10	0.392	0.148	0.153	0.169	0.124	0.268	0.577	0.705	1.92
6	2.21	2.82	1.05	0.347	0.148	0.153	0.186	0.124	0.245	0.539	0.661	1.57
7	2.11	2.51	1.34	0.257	0.140	0.138	0.204	0.124	0.245	0.502	0.661	1.50
8	2.21	2.20	1.70	0.257	0.140	0.138	0.186	0.124	0.224	0.467	0.752	1.35
9	2.21	2.21	1.40	0.245	0.140	0.138	0.186	0.138	0.292	0.467	1.21	1.35
10	2.21	3.44	1.32	0.235	0.148	0.138	0.169	0.138	1.495	0.433	1.66	1.35
11	2.42	3.15	1.75	0.235	0.148	0.138	0.169	0.153	0.905	0.433	1.83	1.28
12	3.53	2.75	1.62	0.235	0.148	0.138	0.169	0.153	0.705	0.433	1.83	1.14
13	3.93	2.59	1.38	0.224	0.241	0.138	0.153	0.138	0.618	0.402	2.51	1.02
14	3.34	2.67	1.24	0.214	0.364	0.138	0.153	0.138	0.539	0.402	2.51	0.961
15	2.98	2.54	1.14	0.204	0.235	0.124	0.153	0.138	0.467	0.402	2.01	0.961
16	3.11	2.52	1.05	0.204	0.195	0.124	0.153	0.138	0.433	0.372	1.66	0.961
17	3.49	2.61	0.965	0.204	0.172	0.224	0.138	0.138	0.402	0.372	1.42	0.961
18	3.78	2.61	0.856	0.186	0.161	0.402	0.138	0.138	1.57	0.372	1.21	1.02
19	4.11	2.48	0.783	0.186	0.152	0.539	0.138	0.138	3.82	0.467	1.14	1.08
20	4.11	2.46	0.762	0.186	0.142	0.344	0.138	0.138	1.92	0.618	1.14	1.83
21	3.85	2.34	0.715	0.186	0.142	0.292	0.138	0.153	1.42	0.661	1.08	1.66
22	3.85	1.96	0.670	0.177	0.134	0.245	0.138	0.961	1.08	0.661	1.08	1.42
23	4.07	1.77	0.627	0.169	0.128	0.224	0.138	2.513	0.905	1.50	1.14	1.28
24	4.20	1.77	0.609	0.169	0.128	0.204	0.138	1.275	0.752	6.98	1.08	1.14
25	4.11	1.54	0.569	0.169	0.120	0.186	0.138	0.852	0.705	3.12	1.08	1.14
26	4.17	1.31	0.547	0.169	0.128	0.186	0.124	0.661	0.661	2.11	1.42	1.28
27	4.05	1.21	0.510	0.169	0.120	0.186	0.124	0.539	0.577	1.74	1.74	1.35
28	3.73	1.18	0.495	0.177	0.128	0.169	0.124	0.467	0.539	1.42	1.50	1.42
29	3.51	1.24	0.475	0.179	0.169	0.169	0.124	0.402	0.502	1.28		1.50
30	2.55	1.25	0.455	0.169	0.186	0.169	0.138	0.372	0.467	1.08		1.83
31		1.08		0.169	0.186		0.124		0.433	0.961		2.11
D.1	2.24	2.84	1.19	0.342	0.142	0.153	0.171	0.128	0.401	0.524	0.885	1.61
D.2	3.48	2.64	1.15	0.208	0.196	0.231	0.150	0.141	1.14	0.427	1.73	1.12
D.3	3.81	1.51	0.567	0.173	0.138	0.203	0.131	0.819	0.731	1.95	1.26	1.46
MIN	1.21	0.37	0.34	0.077	0.077	0.059	0.059	0.059	0.12	0.372	0.618	0.961
DAT	29	27	29	24	2	12	25	1	8	15	6	14
SR	3.18	2.30	0.971	0.239	0.160	0.196	0.150	0.363	0.756	1.00	1.29	1.40
MAX	7.60	6.98	2.21	0.58	1.02	0.71	0.22	4.02	8	10.9	3.12	2.42
DAT	26	10	7	1	13	18	5	23	18	24	13	4

MIN = 0.059 DAT: 12. 09 | SR = 0.996 | MAX = 10.9 DAT: 24. 01

AVERAGE VALUE FOR 507 DAYS IS Q = 1.087 m3/s

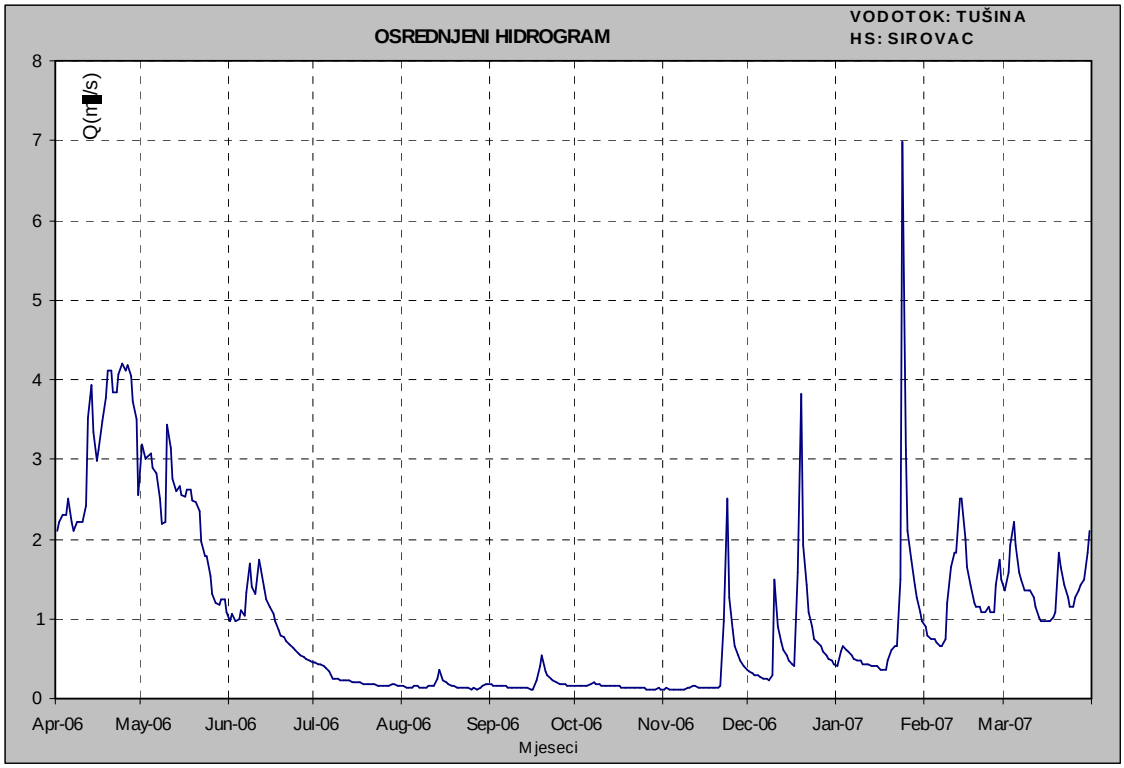


Figure 26.

Duration curve is given on the Figure 27, where it can be seen that average annual flow of 0.996 m^3/s on average lasts some 40% i.e. 146 days

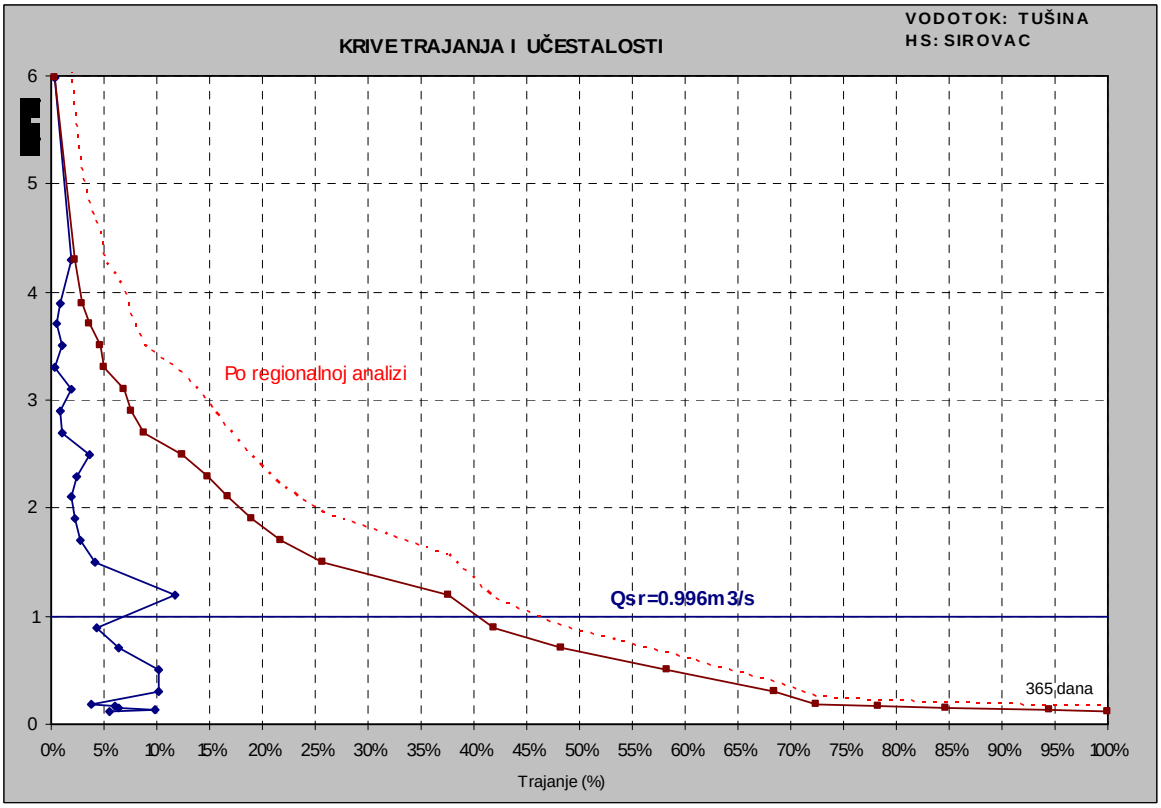


Figure 27

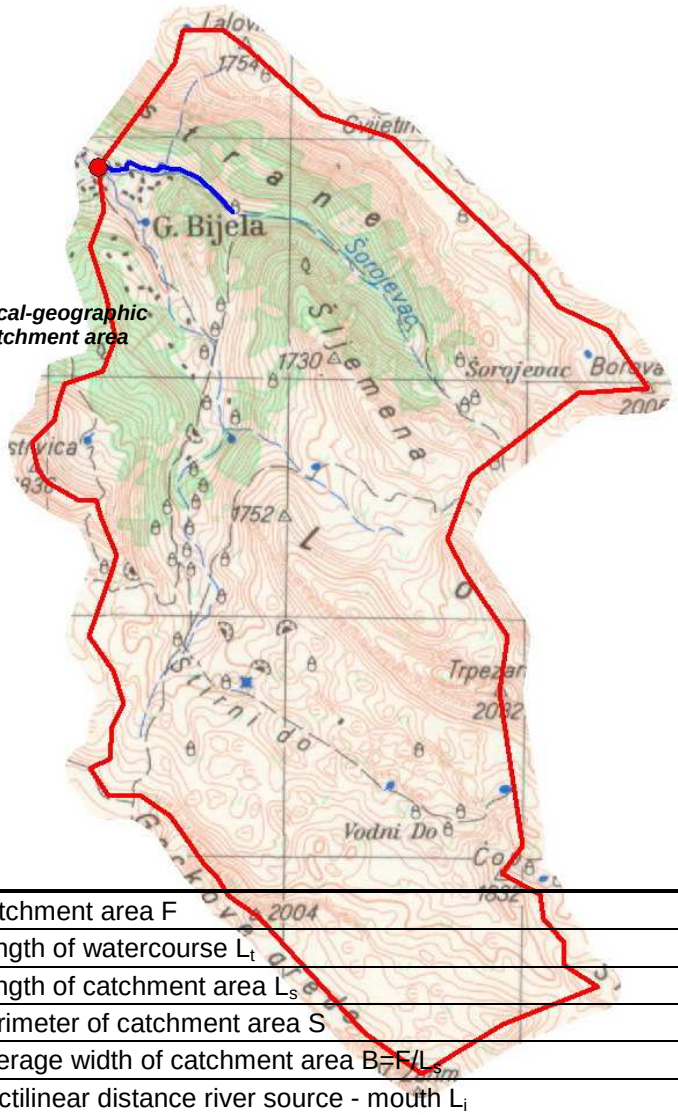
Other characteristic flows area as follows:

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	2.66	1.86	1.43	1.09	0.714	0.476	0.286	0.190	0.142

C.6. WATERCOURSE: BIJELA
HS: GORNJA BIJELA

This hydrometric profile is situated downstream from the bridge at the village with the same name. At that site the watercourse has a big head and the river bed is full of large alluvium.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	24.9	[km^2]
2	Length of watercourse L_t	1.35	[km]
3	Length of catchment area L_s	9.31	[km]
4	Perimeter of catchment area S	24.7	[km]
5	Average width of catchment area $B=F/L_s$	2.67	[km]
6	Rectilinear distance river source - mouth L_i	1.19	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.51	[km]
8	Watershed spreading factor K_s	1.40	[-]
9	Elongation of catchment factor K_σ	0.073	[-]
10	Concentration of catchment factor K_c	0.573	[-]
11	Tortousnesness of flow factor K_L	1.13	[-]
12	Maximum head in the catchment area H_{max}	2036	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	1050	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	47.5	[%]
15	Maximum head of slope of valley I_{max}	65.4	[%]
16	Average altitude of the catchment area H_{sr}	1620	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	569	[m]
18	Levelled out head of watercourse I_t	77.3	[%]
19	Maximum head of the watercourse I_{t1}	130	[%]
20	Average maximum head of the watercourse I_{t2}	69.3	[%]

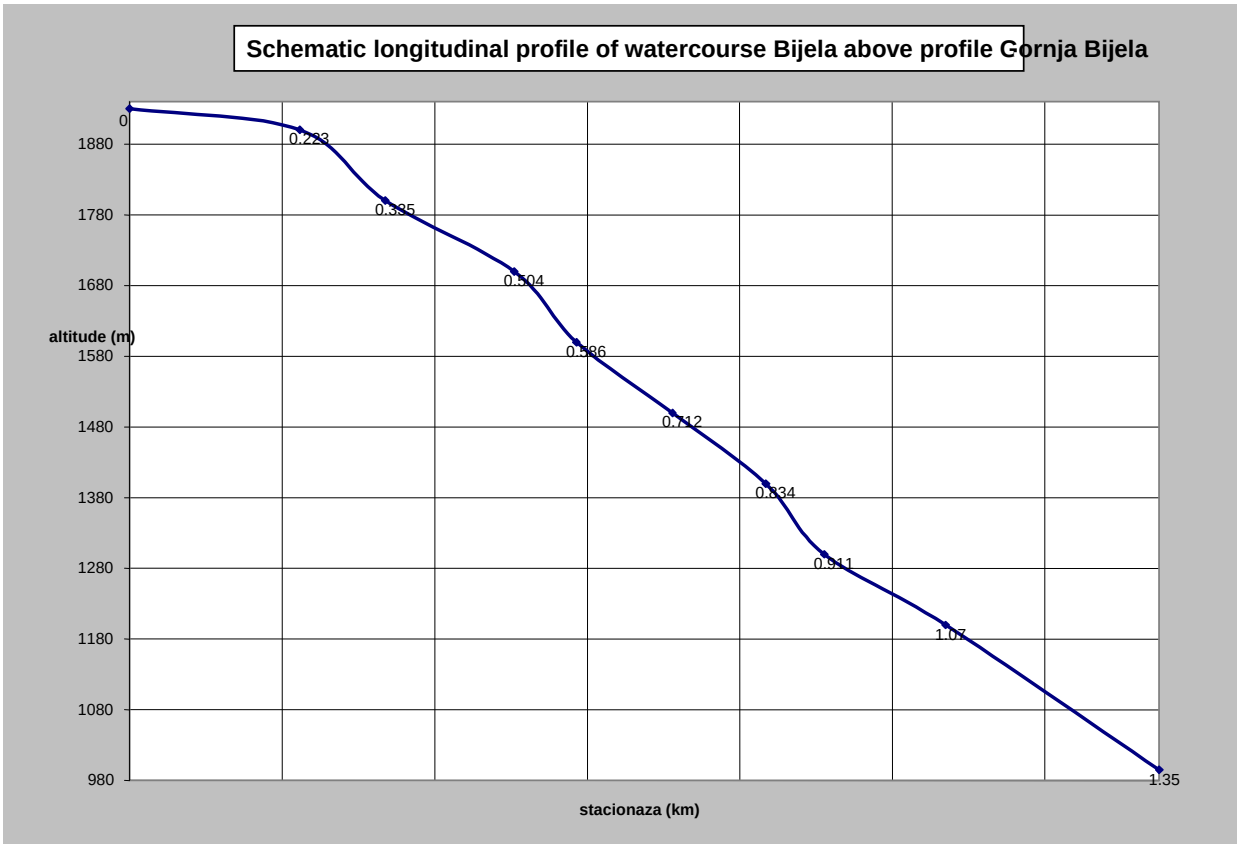

Schematic longitudinal profile of watercourse Bijela above profile Gornja Bijela
altitude (m)
1880
1780
1680
1580
1480
1380
1280
1180
1080
980
0
0.223
0.335
0.504
0.586
0.712
0.834
0.911
1.07
1.35
stacionaza (km)

Figure 28

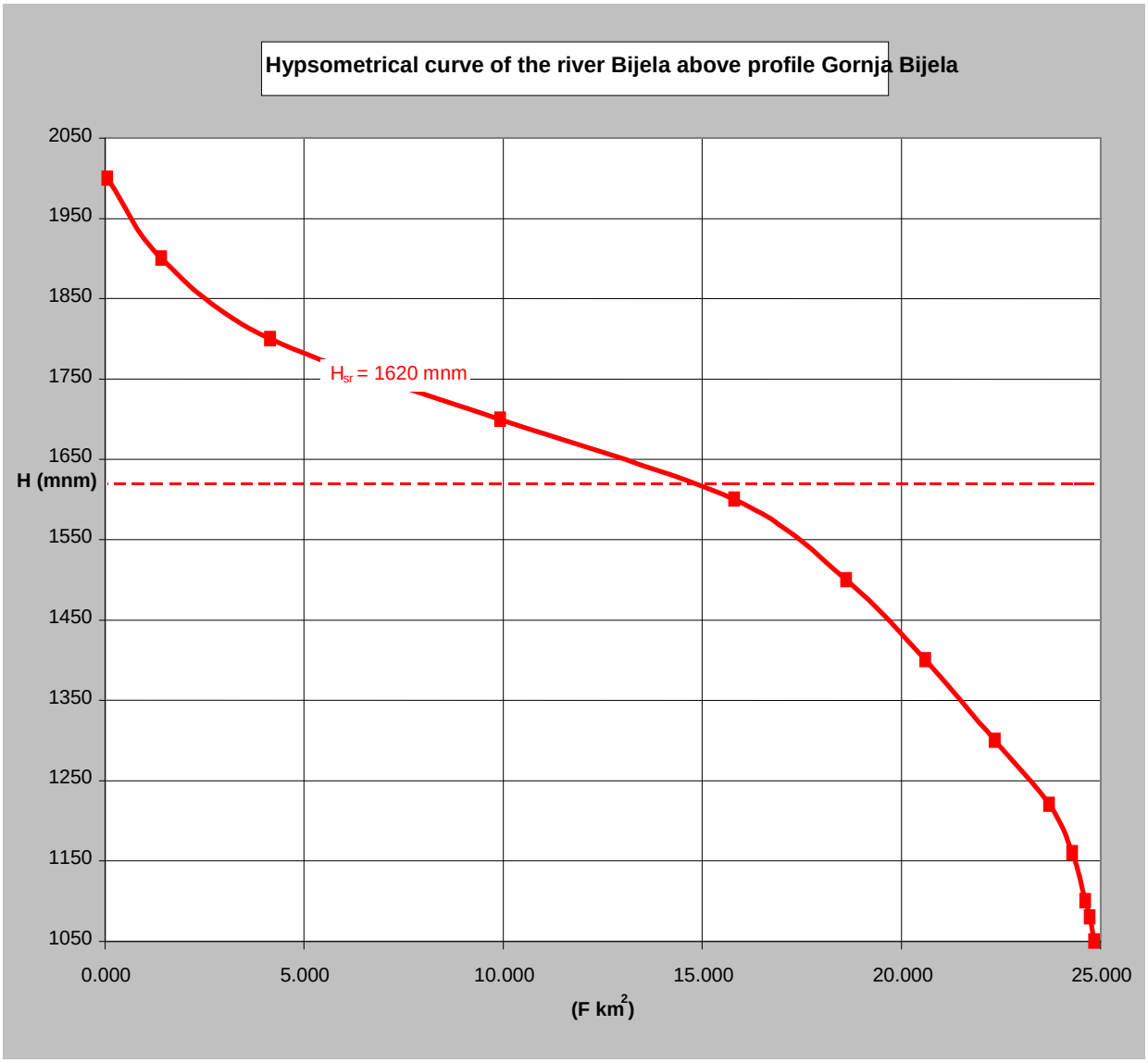


Figure 29

The schematic review of the catchment area with tabular overview of hydrographic and physical-geographic parameters are given on the page 32. The longitudinal profile of the watercourse (Figure 28) and hypsometric curve of the catchment area (Figure 29) are given on the page 33.

Catchment area is 24.9 km^2, length of watershed is 24.7 km, maximum altitude of the catchment area is 2036 m.a.s.l., whilst minimum altitude is 1050 m.a.s.l., with average head of the catchment area of 47.5%, average altitude of the catchment area of 1620 m.a.s.l. levelled out head of watercourse of 77.3%, which is by far the biggest.

Flow curve for water levels H<50cm is $Q_1 = \left(\frac{H_1}{40.426}\right)^{3.902}$ and for water levels H≥50cm $Q_2 = \left(\frac{H}{40.128}\right)^{3.858}$ (Figure 30).

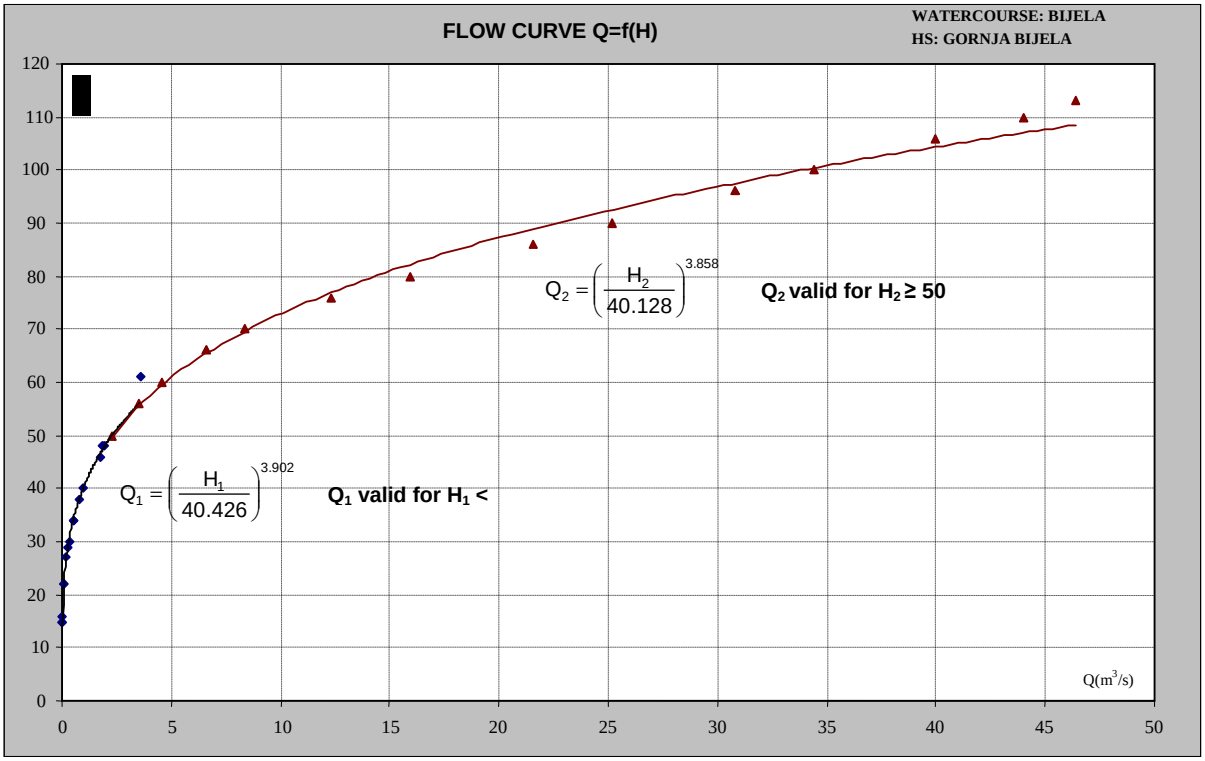


Figure 30

All the hydrometric measurements were accepted for this particular profile. This watercourse has completely different water regime from all the others. The flows are very irregular and the average annual flow and all other flows bigger than it last only 25%.

Annual flow data is given on the page 35, whilst the hydrograph of the run-offs (Figure 31) is given on the page 36.

The flow balance for the calendar year of 1.34 m3/s is by 120 l/s bigger than the flow for the entire period of 404 days of 1.224 m3/s.

The peak of high water level from January 2007 of 54.3 m3/s is two times bigger than the average daily flow for that day of 26.7 m3/s.

The minimum peak amounting to only 27 l/s from August of 2007 is 2.7 times lower than average daily flow for that day.

The months with highest water levels are April and May whilst the driest months are July and August of 2007.

WATERCOURSE:
HS: GORNJA BIJELA

REVIEW OFFLOWS - 2006

	JUL	AUG	SEP	OCT	NOV	DEC
1	***	0.111	0.453	0.179	0.064	0.402
2	***	0.111	0.274	0.153	0.064	0.355
3	***	0.111	0.239	0.153	0.064	0.312
4	***	0.111	0.179	0.131	0.064	0.274
5	***	0.312	0.153	0.402	0.064	0.239
6	***	0.239	0.131	1.161	0.064	0.207
7	***	0.179	0.131	0.708	0.064	0.207
8	***	0.153	0.111	0.509	0.078	0.207
9	***	0.131	0.093	0.402	0.093	0.509
10	***	0.131	0.093	0.312	0.111	10.602
11	***	0.312	0.078	0.274	0.153	3.144
12	***	0.207	0.078	0.239	0.179	1.392
13	***	0.636	0.064	0.207	0.153	0.869
14	***	3.375	0.064	0.179	0.153	0.708
15	***	0.785	0.053	0.153	0.153	0.570
16	***	0.453	0.053	0.153	0.179	0.570
17	***	0.355	0.239	0.131	0.207	0.509
18	***	0.274	1.392	0.131	0.207	4.499
19	***	0.207	2.292	0.111	0.207	15.494
20	***	0.179	0.869	0.093	0.207	3.185
21	0.153	0.179	0.570	0.093	0.239	1.655
22	0.153	0.153	0.402	0.078	6.429	1.161
23	0.153	0.131	0.312	0.078	11.751	0.869
24	0.131	0.131	0.274	0.078	2.718	0.869
25	0.153	0.111	0.239	0.064	1.392	0.869
26	0.312	0.111	0.207	0.064	0.960	0.869
27	0.179	0.093	0.179	0.064	0.708	0.869
28	0.153	0.111	0.179	0.064	0.636	0.869
29	0.131	0.093	0.239	0.078	0.509	0.869
30	0.131	0.207	0.207	0.078	0.453	0.869
31	0.131	0.785		0.078		0.869
D1	0.000	0.159	0.186	0.411	0.073	1.331
D.2	0.000	0.678	0.518	0.167	0.180	3.094
D.3	0.162	0.191	0.281	0.074	2.579	0.967
MIN	0.131	0.093	0.053	0.064	0.053	0.179
DAT	23	3	15	25	5	7
SR	0.057	0.338	0.328	0.213	0.944	1.771
MAX	0.509	5.698	3.375	1.306	21.610	45.6
DAT	26	14	19	6	22	18

MIN = 0.053 | **Qsr=0.682** | **MAX = 45.6**
DAT: 15.09 | **DAT: 18.12**

REVIEW OF FLOWS - 2007 god

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
1	0.869	0.570	0.636	1.655	4.721	1.161	0.355	0.034
2	0.708	0.509	1.392	1.800	3.144	0.869	0.207	0.034
3	0.708	0.453	2.671	2.118	4.142	0.636	0.179	0.034
4	0.570	0.402	3.566	1.954	11.751	0.570	0.153	0.034
5	0.453	0.355	2.476	2.118	16.509	0.708	0.153	0.034
6	0.402	0.355	1.655	1.800	18.932	0.960	0.153	0.034
7	0.402	0.312	1.392	2.118	10.602	1.954	0.131	0.034
8	0.402	0.509	1.161	2.925	6.055	3.324	0.131	0.034
9	0.312	1.057	1.161	3.144	4.721	1.954	0.111	0.034
10	0.274	1.161	1.519	3.618	4.721	1.161	0.111	0.034
11	0.274	1.161	1.057	3.618	4.142	0.869	0.111	0.034
12	0.274	1.057	0.785	4.424	3.618	0.869	0.093	0.034
13	0.274	1.800	0.785	4.721	3.873	0.708	0.093	0.034
14	0.274	1.655	0.708	5.357	2.522	0.636	0.078	0.034
15	0.274	1.057	0.785	5.698	1.954	0.509	0.078	0.034
16	0.274	0.785	1.057	6.429	1.800	0.453	0.064	0.034
17	0.239	0.636	1.161	4.721	1.272	0.402	0.064	0.034
18	0.312	0.570	1.392	3.873	0.960	0.355	0.064	0.034
19	0.636	0.509	1.392	5.032	0.869	0.312	0.053	0.034
20	0.869	0.509	1.655	4.424	0.869	0.274	0.053	0.034
21	0.960	0.570	1.392	5.357	1.057	0.274	0.053	0.034
22	1.161	0.570	0.960	5.357	1.161	0.239	0.043	0.034
23	5.357	0.570	0.785	5.698	0.960	0.207	0.043	0.034
24	26.68	0.636	0.708	5.357	0.869	0.207	0.043	0.034
25	5.032	0.570	0.636	6.055	0.785	0.179	0.043	0.034
26	2.118	0.708	0.636	6.429	0.636	0.179	0.043	0.034
27	1.392	0.960	0.636	6.055	0.708	0.179	0.034	0.034
28	1.057	0.785	0.636	4.142	0.708	0.153	0.034	0.034
29	0.869		0.636	4.142	2.336	0.153	0.034	***
30	0.708		0.785	4.424	2.336	0.207	0.034	***
31	0.636		1.392		1.519		0.034	***
D1	0.510	0.568	1.763	2.325	8.530	1.330	0.168	0.034
D.2	0.370	0.974	1.078	4.830	2.188	0.539	0.075	0.034
D.3	4.179	0.671	0.837	5.302	1.189	0.198	0.040	0.025
MIN	0.239	0.312	0.570	1.519	0.509	0.153	0.034	0.027
DAT	17	6	25	1	26	28	26	26
SR	1.767	0.742	1.213	4.152	3.879	0.689	0.093	0.031
MAX	54.3	2.522	4.721	8.556	22.56	4.142	0.453	0.027
DAT	24	13	4	16	6	8	1	1

MIN = 0.027 | **SR = 1.599** | **MAX = 54.3**
DAT: 26.08 | **DAT: 24.01**

REVIEW OF ANNUAL FLOWS

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1	0.355	0.072	0.453	0.179	0.064	0.402	0.869	0.570	0.636	1.655	4.721	1.161
2	0.207	0.072	0.274	0.153	0.064	0.355	0.708	0.509	1.392	1.800	3.144	0.869
3	0.179	0.072	0.239	0.153	0.064	0.312	0.708	0.453	2.671	2.118	4.142	0.636
4	0.153	0.072	0.179	0.131	0.064	0.274	0.570	0.402	3.566	1.954	11.751	0.570
5	0.153	0.173	0.153	0.402	0.064	0.239	0.453	0.355	2.476	2.118	16.509	0.708
6	0.153	0.136	0.131	1.161	0.064	0.207	0.402	0.355	1.655	1.800	18.932	0.960
7	0.131	0.106	0.131	0.708	0.064	0.207	0.402	0.312	1.392	2.118	10.602	1.954
8	0.131	0.094	0.111	0.509	0.078	0.207	0.402	0.509	1.161	2.925	6.055	3.324
9	0.111	0.082	0.093	0.402	0.093	0.509	0.312	1.057	1.161	3.144	4.721	1.954
10	0.111	0.082	0.093	0.312	0.111	10.602	0.274	1.161	1.519	3.618	4.721	1.161
11	0.111	0.173	0.078	0.274	0.153	3.144	0.274	1.161	1.057	3.618	4.142	0.869
12	0.093	0.121	0.078	0.239	0.179	1.392	0.274	1.057	0.785	4.424	3.618	0.869
13	0.093	0.335	0.064	0.207	0.153	0.869	0.274	1.800	0.785	4.721	3.873	0.708
14	0.078	1.704	0.064	0.179	0.153	0.708	0.274	1.655	0.708	5.357	2.522	0.636
15	0.078	0.410	0.053	0.153	0.153	0.570	0.274	1.057	0.785	5.698	1.954	0.509
16	0.064	0.244	0.053	0.153	0.179	0.570	0.274	0.785	1.057	6.429	1.800	0.453
17	0.064	0.194	0.239	0.131	0.207	0.509	0.239	0.636	1.161	4.721	1.272	0.402
18	0.064	0.154	1.392	0.131	0.207	4.499	0.312	0.570	1.392	3.873	0.960	0.355
19	0.053	0.121	2.292	0.111	0.207	15.494	0.636	0.509	1.392	5.032	0.869	0.312
20	0.053	0.106	0.869	0.093	0.207	3.185	0.869	0.509	1.655	4.424	0.869	0.274
21	0.103	0.106	0.570	0.093	0.239	1.655	0.960	0.570	1.392	5.357	1.057	0.274
22	0.098	0.094	0.402	0.078	6.429	1.161	1.161	0.570	0.960	5.357	1.161	0.239
23	0.098	0.082	0.312	0.078	11.751	0.869	5.357	0.570	0.785	5.698	0.960	0.207
24	0.087	0.082	0.274	0.078	2.718	0.869	26.68	0.636	0.708	5.357	0.869	0.207
25	0.098	0.072	0.239	0.064	1.392	0.869	5.032	0.570	0.636	6.055	0.785	0.179
26	0.177	0.072	0.207	0.064	0.960	0.869	2.118	0.708	0.636	6.429	0.636	0.179
27	0.106	0.064	0.179	0.064	0.708	0.869	1.392	0.960	0.636	6.055	0.708	0.179
28	0.094	0.072	0.179	0.064	0.636	0.869	1.057	0.785	0.636	4.142	0.708	0.153
29	0.082	0.093	0.239	0.078	0.509	0.869	0.869		0.636	4.142	2.336	0.153
30	0.082	0.207	0.207	0.078	0.453	0.869	0.708		0.785	4.424	2.336	0.207
31	0.082	0.785		0.078		0.869	0.636		1.392		1.519	
D1	0.168	0.096	0.186	0.411	0.073	1.331	0.510	0.568	1.763	2.325	8.530	1.330
D.2	0.075	0.356	0.518	0.167	0.180	3.094	0.370	0.974	1.078	4.830	2.188	0.539
D.3	0.101	0.157	0.281	0.074	2.579	0.967	4.179	0.671	0.837	5.302	1.189	0.198
MIN	0.034	0.027	0.053	0.064	0.053	0.179	0.239	0.312	0.570	1.519	0.509	0.153
DAT	26	26	15	25	5	7	17	6	25	1	26	28
SR	0.114	0.202	0.328	0.213	0.944	1.771	1.767	0.742	1.213	4.152	3.879	0.689
MAX	0.509	5.698	3.375	1.306	21.610	45.589	54.29	2.522	4.721	8.556	22.56	4.142
DAT	26	14	19	6	22	18	24	13	4	16	6	8

MIN = 0.027 | **Qsr = 1.337** | **MAX = 54.3**
DAT: 26.08 | **DAT: 24. 01**

Qsr FOR 404 DAYS Q= 1.224m3/s

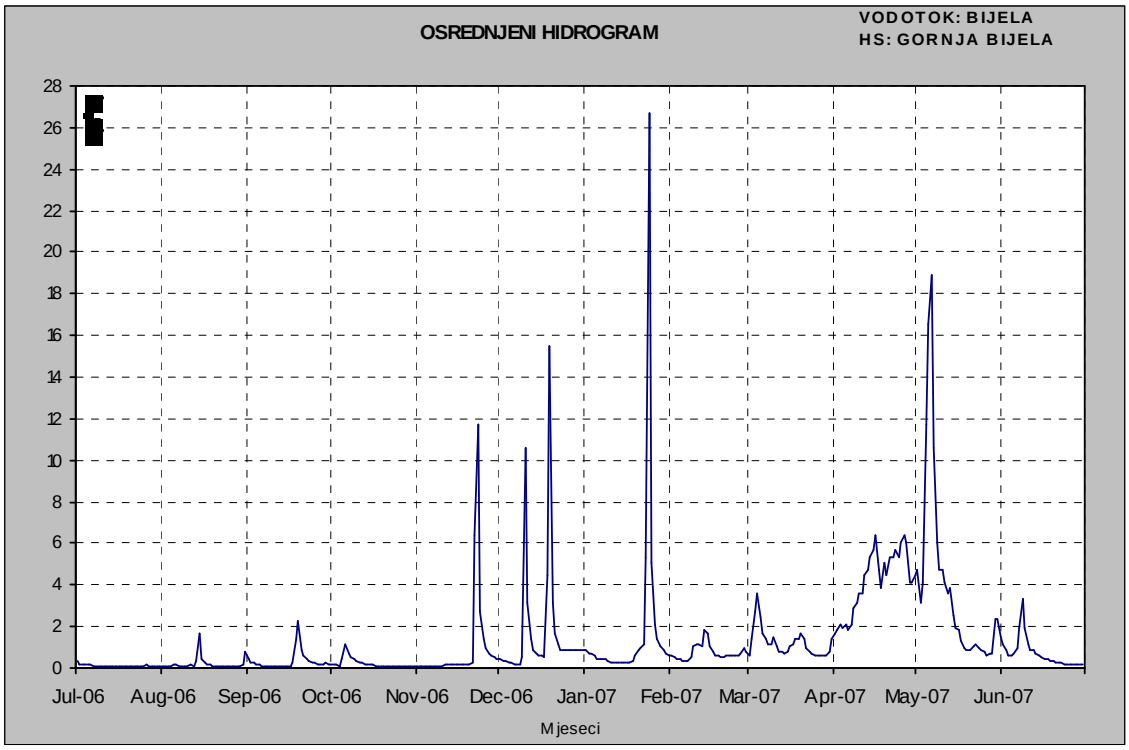


Figure 31

The duration curve is given on the Figure 32. Considering that the average annual flow and all bigger flows last for at least 25% or 91 days, from all measure profiles in the catchment area of the river Piva, it suggests at lowest ratio Qins/Qsr ,unless other economic-energy parameters suggest otherwise.

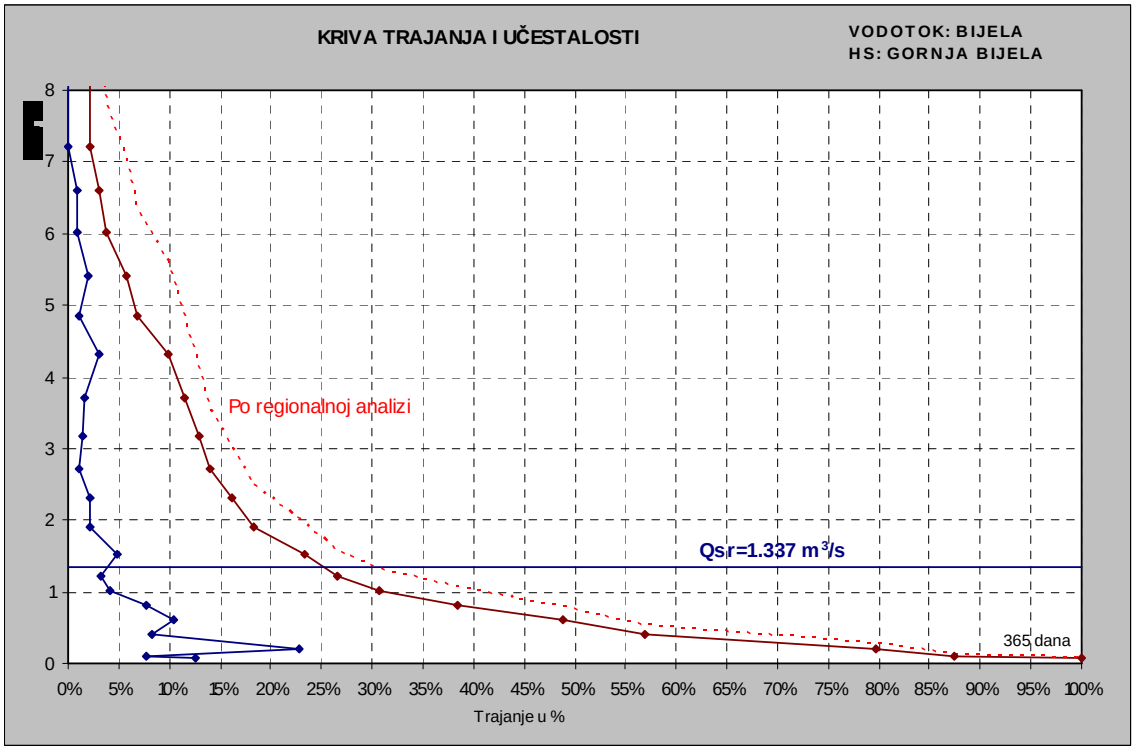


Figure 32

Other characteristic durations area as follows

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	4.35	1.77	1.09	0.761	0.609	0.380	0.326	0.196	0.097

D. Minour regional analysis

This analysis begins with comparison of specific run-off module lit/sec km^2 for low, average and high water levels, and run-off factors on the level of average water levels.

Vodotok	Profil	F(km^2)	Q_{max}	q_{max}	Q_{sr}	q_{sr}	Q_{min}	q_{min}	P(mm)	Run-off factor
Vrbnica	Stabna	28.1	31.0	1103	1.14	40.6	0.040	1.42	1338	0.955
Vrbnica	Ribnjak	73.0	76.0	1041	1.92	26.3	0.090	1.23	1330	0.622
Bukovica	Donja Bukovica	41.2	33.0	801	1.06	25.7	0.097	2.35	1094	0.740
Bukovica	Timar	70.1	81.7	1165	1.61	23.0	0.122	1.74	1050	0.689
Tušina	Sirovac	37.4	10.9	291	0.996	26.6	0.059	1.58	993	0.845
Bijela	Gornja Bijela	24.9	54.3	2181	1.34	53.8	0.027	1.08	1342	1.26

Concerning high water levels it can be stated that in most of cases they were correctly determined, and at the same time they were underrated for Sirovac and overrated in the case of Bijela. It might be possible that catchment areas values would also need to be corrected, but this is of minor importance for this type of analysis.

Concerning average water levels, run-off factors are to high in the case of Vrbnica – profile Stabna and in the case of Bijela - profile Gornja Bijela, indicating presence of limestone formations in the catchment area.

The modules for the specific fun-offs in the case of low waters are acceptable. Generally speaking, the thesis about homogeneity of data for the measurement profiles within the catchment area of the river Piva could be accepted.

Finally, we shall attempt to estimate available water levels in the analysed period based on rainfall (for parts of 2006 and 2007), considering previous 26 period (rainfall data series for number of years,1980-2005). Based on the data from three meteorologic stations in the catchment area of the Piva it can be stated that the rainfalls are lower in analysed period compared to the previous period comprising number of years. At the station Shavnik the rainfall is 19% lower in years 2006 and 2007 compared to the previous periods. According to data from station Gornja Bukovica the rainfall is 26% lower in the analysed period, whilst the station Boan recorded 45% lower rainfalls compared to previous benchmark period. The average rainfall deficit for all three stations is 30%.

If one takes a look at the monthly rainfall deficit for each station separately, for the station Savnik it is 84% in October, in Donja Bukovica 85% also in October, whilst Boan station recorded even 91% lower rainfall in April, and what is particularly evident is that all these lower rainfalls are experienced in months that have the highest water levels – April and October.
If those obtained water balances (based on data from these three meteorologic stations) were to be made compliant with average values for number of years than they should be increased by 30 % with the following effects:

E. Corrected values applied to a period comprsing several years

E.1 Watercourse: Vrbnica
HS: Stabna

	APR	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART
DEK1	4.98	2.69	1.07	0.295	0.078	0.360	0.760	0.384	0.962	1.26	1.39	3.32
DEK2	3.32	1.79	0.920	0.185	0.147	0.512	0.334	0.202	2.52	1.08	3.24	2.18
DEK3	4.13	1.23	0.458	0.088	0.364	0.546	0.146	2.05	1.34	4.21	2.46	2.76
minQ	1.27	0.361	0.283	0.066	0.052	0.074	0.074	0.150	0.416	0.684	0.753	1.61
Qsr	4.15	1.88	0.818	0.186	0.202	0.472	0.406	0.879	1.60	2.25	2.35	2.76
Qmax	7.62	6.27	1.74	0.361	2.33	4.76	3.06	25.1	40.3	26.3	11.5	8.16
	Qmin=0.052				Qsr=1.49				Qmax=40.3			

E.2 Watercourse: Vrbnica
HS: Ribnjak

	APR	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART
DEK1	7.67	4.16	1.69	0.494	0.161	0.594	1.261	0.630	1.56	1.95	2.21	5.20
DEK2	7.80	2.86	1.43	0.325	0.267	0.829	0.555	0.351	5.07	1.69	5.07	3.38
DEK3	7.15	1.95	0.746	0.176	0.601	0.880	0.266	3.25	2.08	7.67	3.77	4.29
minQ	2.00	0.597	0.476	0.142	0.121	0.156	0.155	0.272	0.681	1.09	1.20	2.53
Qsr	7.54	2.99	1.30	0.326	0.351	0.776	0.664	1.43	2.86	3.90	3.64	4.29
Qmax	28.2	9.70	2.17	0.597	3.63	7.39	4.74	61.6	98.8	64.5	28.2	12.6
	Qmin=0.117				Qsr=2.50				Qmax=98.8			

E.3 Watercourse: Bukovica
HS: Donja Bukovica

	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APR
DEK1	2.07	1.72	0.491	0.213	0.463	0.371	0.315	0.904	1.06	1.23	2.81	3.40
DEK2	1.89	1.56	0.299	0.394	0.670	0.320	0.446	2.72	0.864	2.49	1.49	3.00
DEK3	2.13	0.837	0.218	0.465	0.708	0.269	2.13	1.46	4.70	1.72	1.41	2.26
minQ	0.683	0.364	0.156	0.126	0.233	0.233	0.255	0.467	0.589	0.683	1.03	1.90
Qsr	2.03	1.37	0.333	0.361	0.614	0.319	0.963	1.69	2.29	1.82	1.89	2.89
Qmax	4.95	2.78	1.11	1.90	3.39	0.390	10.0	33.1	42.9	8.22	5.89	4.32
	Qmin=0.126				Qsr=1.38				Qmax=42.9			

E.4 Watercourse: Bukovica
HS: Timar

	APR	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART
DEK1	4.60	4.39	2.14	0.553	0.263	0.540	0.434	0.338	0.944	1.43	1.74	3.63
DEK2	7.43	3.85	2.07	0.364	0.445	0.712	0.356	0.449	3.38	1.01	3.73	1.73
DEK3	6.72	2.77	0.970	0.272	0.491	0.719	0.512	2.33	2.03	7.90	2.30	1.91
minQ	1.91	0.728	0.455	0.208	0.156	0.299	0.260	0.299	0.546	0.728	0.871	1.22
Qsr	6.25	3.64	1.73	0.390	0.403	0.663	0.442	1.04	2.12	3.53	2.60	2.41
Qmax	23.9	11.1	3.68	1.12	2.05	3.26	0.728	11.1	59.4	106	12.1	7.93
	Qmin=0.159				Qsr=2.09				Qmax=106			

E.5 Watercourse: Tušina
HS: Sirovac

	APR	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART
DEK1	2.91	3.69	1.55	0.445	0.185	0.199	0.222	0.166	0.521	0.681	1.150	2.09
DEK2	4.52	3.43	1.50	0.270	0.255	0.300	0.195	0.183	1.48	0.555	2.25	1.46
DEK3	4.95	1.96	0.737	0.225	0.179	0.264	0.170	1.06	0.950	2.54	1.64	1.90
minQ	1.57	0.481	0.442	0.100	0.110	0.077	0.077	0.077	0.156	0.484	0.803	1.25
Qsr	4.13	2.99	1.26	0.311	0.208	0.255	0.195	0.472	0.983	1.30	1.68	1.82
Qmax	9.88	9.07	2.87	0.754	1.33	0.923	0.286	5.23	10.4	14.2	4.06	3.15
	Qmin=0.077				Qsr=1.29				Qmax=14.2			

E.6 Watercourse: Bijela
HS: Gornja Bijela

	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APR	MAJ	JUN
DEK1	0.218	0.125	0.242	0.534	0.095	1.73	0.663	0.738	2.29	3.02	11.1	0.173
DEK2	0.098	0.463	0.673	0.217	0.234	4.02	0.481	1.27	1.40	6.28	2.84	0.701
DEK3	0.131	0.204	0.365	0.096	3.35	1.26	5.43	0.872	1.09	6.89	1.55	0.257
minQ	0.044	0.035	0.070	0.083	0.069	0.233	0.311	0.406	0.741	1.97	0.661	0.199
Qsr	0.148	0.262	0.426	0.277	1.23	2.30	2.30	0.965	1.58	5.40	5.04	0.896
Qmax	0.662	7.41	4.39	1.70	28.1	59.3	70.6	3.28	6.14	11.1	29.3	5.38
	Qmin=0.035				Qsr=1.74				Qmax=70.6			

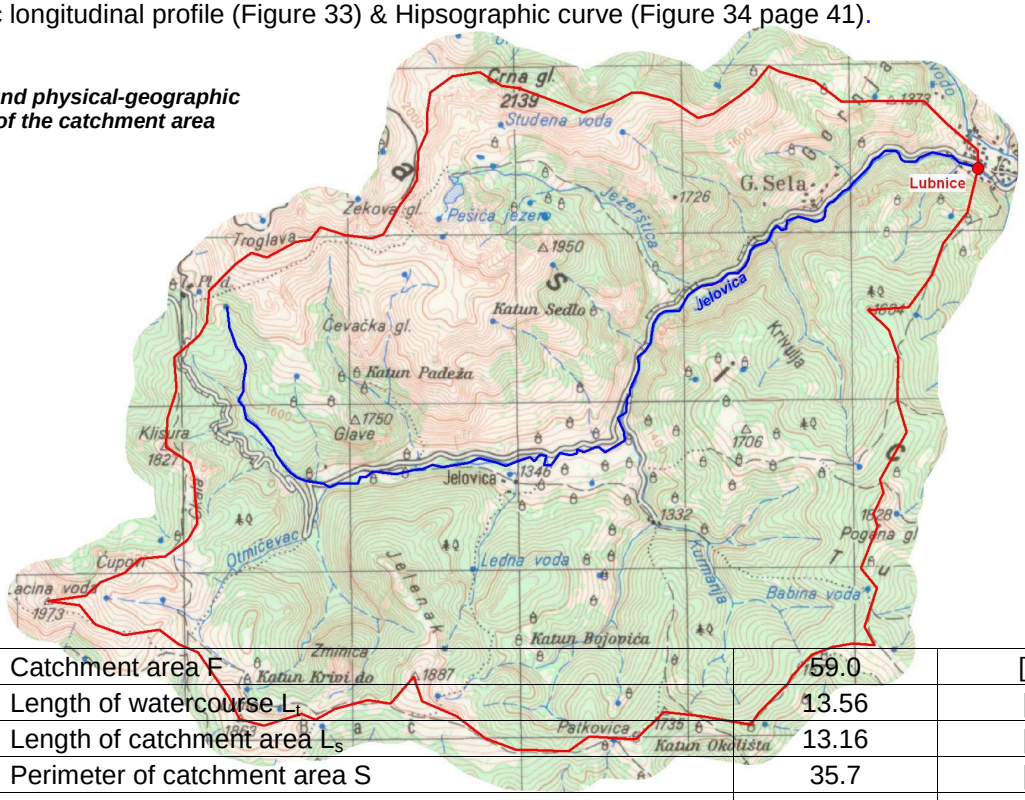
F1. WATERCOURSE: JELOVICA
HS: LUBNICE

Since we made an introduction under section C, which is valid for the entire report, we shall not elaborate on it further, but we shall only list the most neccessary details in order to have the same approach applied in the report., i.e. the description of analysis conducted for the profiles of sHPPs in the catchment area of the river Lim. The concept remains the same and the sequence continues in accordance with the established scheme.

The first profile in the catchment area of the river Lim are Lubice and the watercourse Jelovica is tributary of the river Beranska Bistrica which is the the first line tributary to the river Lim, as presented in the table on page no.2. What should be mentioned is that downstream on the Beranska Bistrica in profile "Praćevac" there used to exist a hydrology station which was controlled by ENERGOPROJEKT from Belgrade, i.e. ENERGOPROJECT's daughter company HIDROINŽENJERING, and it had series of water level and flow data. If this data had been awailable to us, they would have been important for assessment of validity of this site, that could have been based on data from more extensive period.

According to hypsographic curve altitude of the most part of the catchment area is between 1380 and 1480 m.a.s.l. or 67%. The catchment area up to this measuring profile is 59.0 km^2 , with watershed lenght of 35.7 km, with maximum altitude of the catchment area of 2139 m.a.s.l., minimum altitude of 990 m.a.s.l. and average altitude of 1595 m.a.s.l. and levelled out head of watercourse of 4.40%, as may be seen in an annex on the page 41, schematic longitudinal profile (Figure 33) & Hipsographic curve (Figure 34 page 41).

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	59.0	[km^2]
2	Length of watercourse L_t	13.56	[km]
3	Length of catchment area L_s	13.16	[km]
4	Perimeter of catchment area S	35.7	[km]
5	Average width of catchment area B=F/L_s	4.48	[km]
6	Rectilinear distance river source - mouth L_i	9.13	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	5.85	[km]
8	Watershed spreading factor K_s	1.31	[-]
9	Elongation of catchment factor K_σ	3.12	[-]
10	Concentration of catchment factor K_c	0.565	[-]
11	Tortousnesness of flow factor K_L	1.49	[-]
12	Maximum head in the catchment area H_{max}	2139	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	990	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	37.4	[%]
15	Maximum head of slope of valley I_{max}	42.4	[%]
16	Average altitude of the catchment area H_{sr}	1595	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	605	[m]
18	Levelled out head of watercourse I_t	4.4	[%]
19	Maximum head of the watercourse I_{t1}	24.5	[%]
20	Average maximum head of the watercourse I_{t2}	5.9	[%]

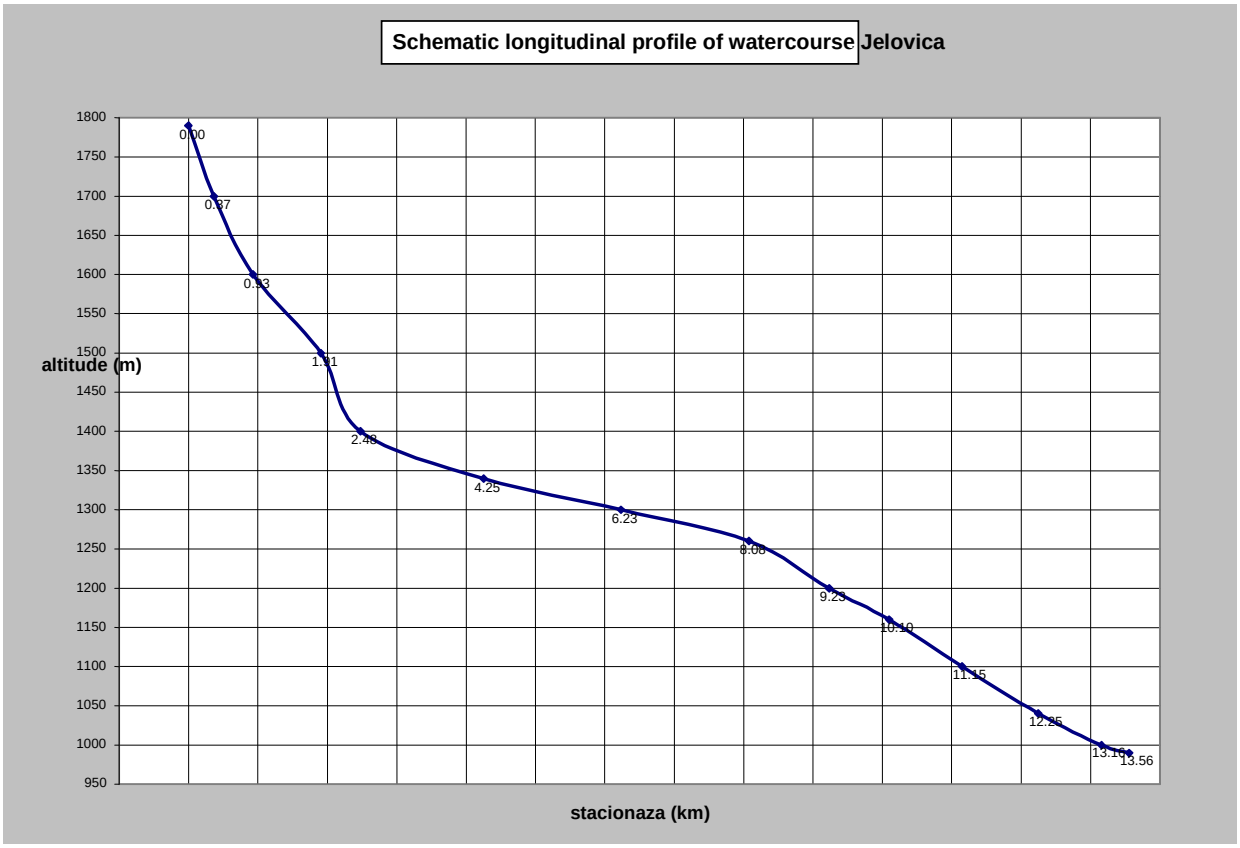


Figure 33

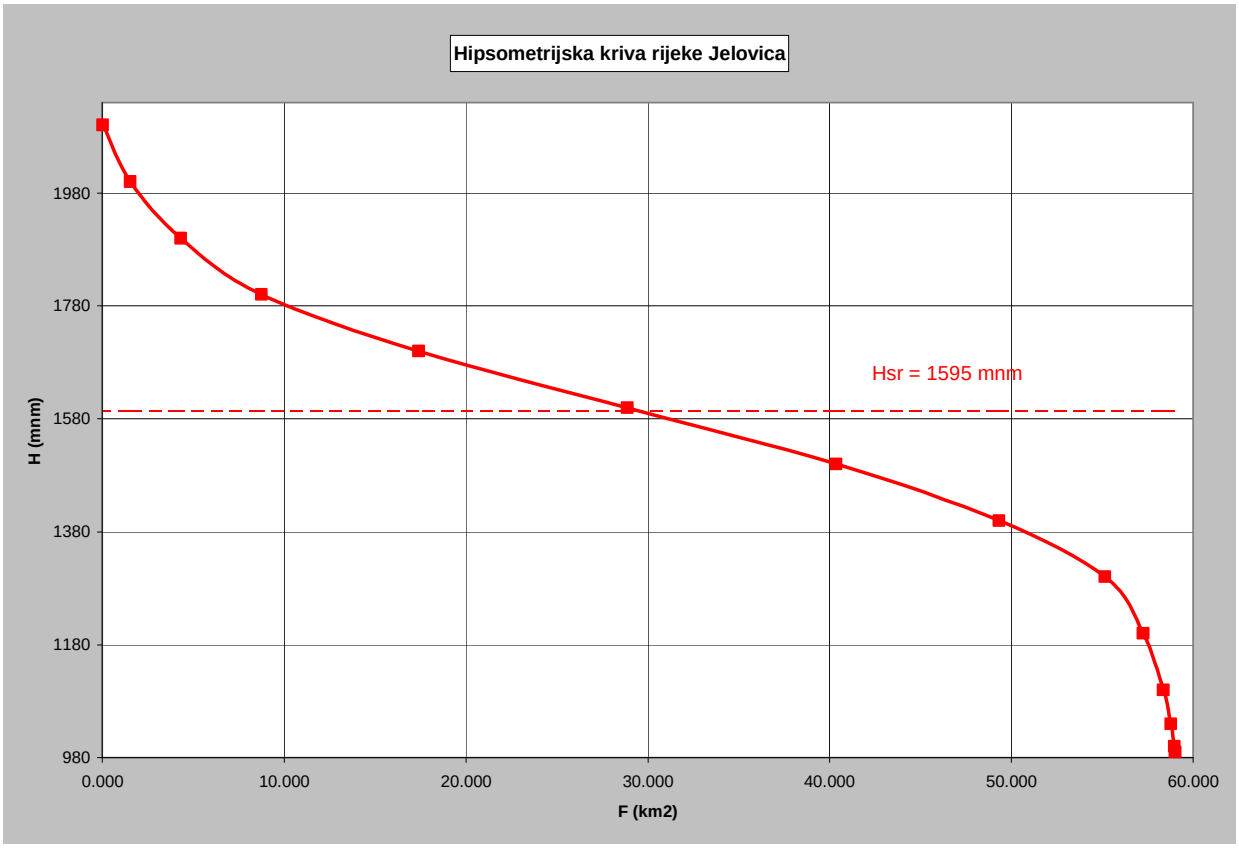


Figure 34

Flow curve is developed with correlations $Q_1 = e^{\frac{H_1 - 8.466}{4.625}}$ for water levels lower than 0 H<0 and $Q_2 = e^{\frac{H_2 - 26.04}{13.22}}$ for water levels ≥0 (sl.35).

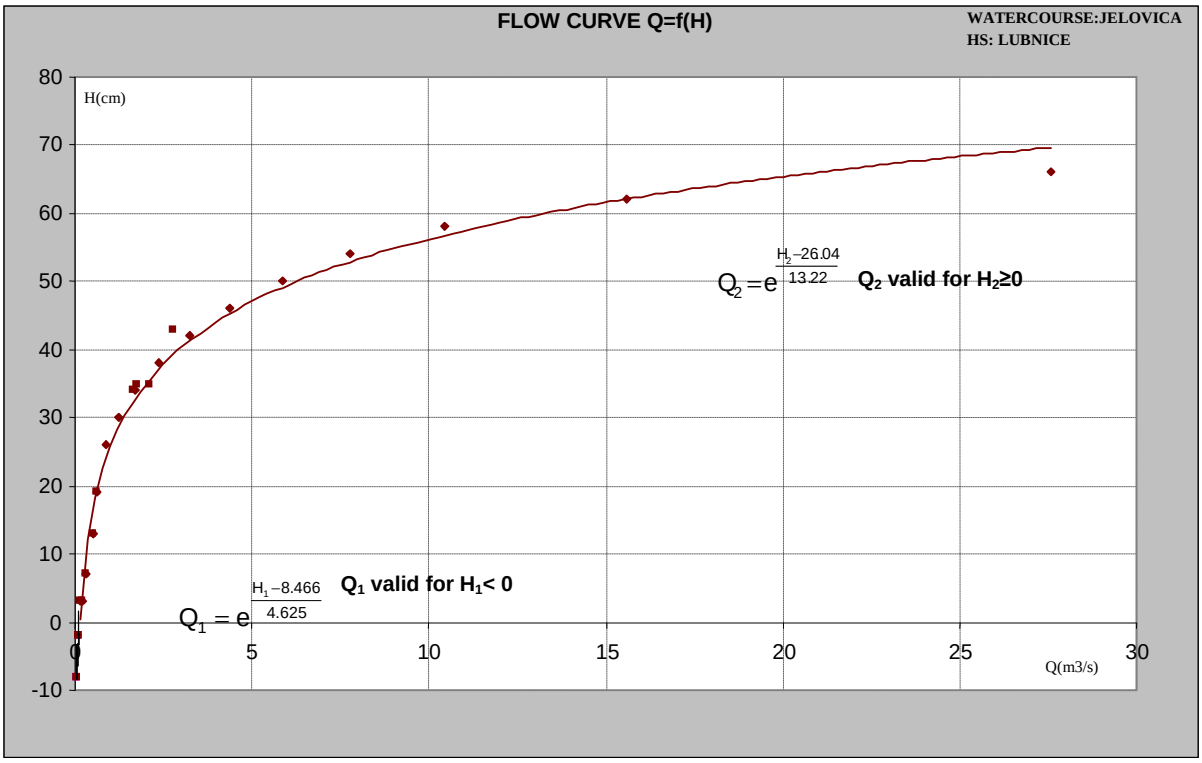


Figure 35

Partial balance for years 2006 and 2007 as well as for a 12 month calendar year was compiled based to the above given conditionalities. It should also be mentioned that the entire analysed period was May the 5th 2006 – October the 21th 2007. (in total 534 days). Partial balances for the year 2006 were 1.59 m^3/s and for 2007 0.898 m^3/s, brought down to a calendar year of 1.19 m^3/s.
The disbalance has been somewhat bigger, but for this tipe of analysis it is of a lower significance, hence we have not looked into it in detail. The months with highest water levels are April and May and the driest months are August and September, i.e. in late spring months are characterised wih maximum water levels whereas the late summer months and begining of autmn are characterised with minimum water levels. Periods of ten days with highest water levels are the second and third ten days in May and the driest are the last 10 days of August as well as the first 10 days of September. The table with calculated water balances is given on the p.43.

Maximum flow of 20.6 m^3/s was registred in May of 2006 and was 2.76 times higher than average daily flow for that day whereas the extreme minimum was 0.071 m^3/s and was1.42 times lower than the average daily flow for taht day in August of 2007. The main flow direction is Southwest - Northeast.

The flow duration hidrograph is given on the Figure 36. p.44.

The flow duration curve on an annual level is presented on the Figure 37 page 44, with the annual average flow duration of 1.19 m^3/s and duration of this flow and higher flows was about 33% , i.e. 120 days. Remaining characteristic flows according to duration curve are as follows:

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	3.203	2.05	1.29	0.945	0.609	0.469	0.234	0.195	0.164

WATERCOURSE: JELOVICA
HS: LUBNICE

REVIEW OF FLOWS - 2006

	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1		3.101	0.683	0.204	0.189	0.150	0.150	0.373
2		3.344	0.737	0.175	0.189	0.150	0.162	0.346
3		2.471	0.737	0.175	0.175	0.150	0.175	0.321
4		2.291	0.633	0.175	0.162	0.150	0.175	0.321
5	12.100	1.969	0.544	0.402	0.162	0.175	0.175	0.321
6	10.401	1.693	0.505	0.220	0.162	0.237	0.175	0.297
7	8.941	2.124	0.434	0.204	0.150	0.175	0.189	0.276
8	6.606	2.471	0.434	0.204	0.150	0.204	0.189	0.276
9	6.125	2.291	0.434	0.220	0.150	0.237	0.189	0.276
10	9.643	2.291	0.434	0.402	0.150	0.189	0.237	0.505
11	9.643	2.291	0.402	0.346	0.139	0.175	0.204	0.402
12	9.643	2.124	0.346	0.255	0.139	0.162	0.189	0.373
13	9.643	2.291	0.346	0.297	0.139	0.162	0.204	0.346
14	10.401	2.124	0.321	0.346	0.150	0.162	0.189	0.346
15	11.218	2.124	0.346	0.276	0.139	0.150	0.189	0.321
16	11.218	1.969	0.321	0.237	0.139	0.162	0.204	0.346
17	14.08	2.291	0.297	0.220	0.189	0.162	0.204	0.346
18	16.38	2.291	0.297	0.204	0.162	0.162	0.204	0.737
19	16.38	2.124	0.276	0.204	0.162	0.175	0.204	1.693
20	16.38	1.826	0.237	0.189	0.175	0.175	0.204	1.251
21	17.66	1.693	0.220	0.175	0.175	0.175	0.220	0.997
22	15.182	1.570	0.220	0.175	0.162	0.189	0.924	0.795
23	12.100	1.455	0.204	0.175	0.162	0.189	1.251	0.633
24	10.401	1.349	0.204	0.150	0.150	0.189	0.795	0.544
25	8.941	1.160	0.204	0.150	0.150	0.175	0.633	0.505
26	6.606	1.075	0.220	0.162	0.150	0.175	0.544	0.505
27	5.265	0.924	0.204	0.162	0.175	0.175	0.505	0.468
28	4.526	0.795	0.204	0.220	0.237	0.175	0.468	0.468
29	4.526	0.737	0.276	0.189	0.175	0.175	0.402	0.468
30	4.196	0.683	0.297	0.276	0.162	0.220	0.402	0.468
31	3.891		0.220	0.220		0.150		0.468
DEK1	5.380	2.405	0.557	0.238	0.164	0.182	0.182	0.331
DEK2	12.50	2.146	0.319	0.257	0.154	0.165	0.199	0.616
DEK3	8.481	1.144	0.224	0.187	0.170	0.181	0.614	0.574
MIN	3.101	0.587	0.189	0.139	0.129	0.139	0.150	0.255
DAT	31	28	23	24	12	3	1	9
SRED	8.780	1.898	0.362	0.226	0.163	0.176	0.332	0.509
MAX	20.5	7.126	2.291	2.124	0.346	0.373	3.101	2.665
DAT	17	17	2	5	28	30	22	18

MIN = 0.129
DAT: 12. 09

SR =1.591

MAX = 20.5
DAT: 17. 06

WATERCOURSE: JELOVICA
HS: LUBNICE

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.434	0.857	0.997	1.455	1.826	0.857	0.346	0.084	0.035	0.129
2	0.683	0.737	1.826	1.826	1.693	0.737	0.321	0.084	0.035	0.129
3	0.633	0.683	3.101	2.124	1.570	0.924	0.276	0.084	0.035	0.129
4	0.544	0.633	4.526	2.124	1.826	1.160	0.276	0.084	0.044	0.120
5	0.505	0.587	3.891	2.471	1.826	1.455	0.346	0.084	0.904	0.120
6	0.468	0.587	3.101	2.124	1.969	1.455	0.276	0.129	0.199	0.120
7	0.434	0.544	2.665	2.124	2.291	1.693	0.255	0.104	0.129	0.175
8	0.402	0.683	2.291	2.291	1.969	1.969	0.237	0.104	0.104	0.175
9	0.402	0.857	2.124	2.471	1.826	1.826	0.220	0.084	0.084	0.150
10	0.373	1.075	1.969	2.665	1.570	1.693	0.204	0.084	0.104	0.150
11	0.373	1.075	1.693	2.665	1.349	1.570	0.220	0.084	0.297	0.189
12	0.402	1.251	1.570	3.101	1.251	1.570	0.220	0.104	0.276	0.175
13	0.402	1.969	1.349	3.344	1.075	1.251	0.220	0.104	0.175	0.204
14	0.373	1.969	1.251	3.607	0.924	1.251	0.204	0.104	0.150	0.175
15	0.373	1.455	1.160	3.891	0.857	1.075	0.175	0.068	0.139	0.162
16	0.373	1.251	1.075	3.891	0.795	1.075	0.175	0.044	0.139	0.162
17	0.373	1.075	1.075	3.344	0.737	0.924	0.162	0.035	0.129	0.162
18	0.434	0.924	1.075	3.101	0.924	0.795	0.162	0.035	0.129	0.150
19	0.544	0.924	1.160	3.101	0.857	0.737	0.150	0.035	0.189	0.189
20	0.544	0.857	1.251	2.875	0.737	0.633	0.139	0.035	0.175	0.162
21	0.544	0.857	1.251	2.875	0.857	0.587	0.129	0.028	0.150	0.162
22	0.633	0.924	1.160	2.875	0.924	0.544	0.104	0.028	0.139	0.162
23	1.075	0.997	1.075	2.875	0.857	0.505	0.104	0.023	0.139	0.162
24	3.101	0.924	0.997	2.875	0.795	0.468	0.129	0.023	0.129	***
25	2.471	0.924	0.924	2.875	0.737	0.468	0.104	0.028	0.129	***
26	1.969	0.997	0.924	2.665	0.737	0.434	0.129	0.028	0.150	***
27	1.570	1.075	0.924	2.291	0.683	0.402	0.129	0.028	0.162	***
28	1.251	0.997	0.924	2.124	0.683	0.373	0.129	0.028	0.139	***
29	1.160		0.997	1.969	0.857	0.373	0.104	0.028	0.150	***
30	1.075		1.251	1.969	0.924	0.373	0.104	0.028	0.139	***
31	0.924		1.455		0.924		0.084	0.028		***
DEK1	0.488	0.724	2.649	2.168	1.837	1.377	0.275	0.092	0.167	0.140
DEK2	0.419	1.275	1.266	3.292	0.951	1.088	0.183	0.065	0.180	0.173
DEK3	1.434	0.962	1.080	2.539	0.816	0.453	0.114	0.027	0.143	0.044
MIN	0.346	0.544	0.857	1.251	0.633	0.321	0.111	0.071	0.076	0.120
DAT	17	5	25	1	27	30	22	22	1	2
SRED	0.801	0.989	1.646	2.666	1.189	0.973	0.188	0.060	0.163	0.117
MAX	4.526	2.471	5.68	4.53	3.101	3.101	0.633	0.150	4.882	5.27
DAT	24	13	4	15	7	3	5	6	11	28

MIN = 0.071
DAT: 22. 08

SR = 0.898

MAX =5.68
DAT: 4. 03

WATERCOURSEK: JELOVICA
HS: LUBNICE

REVIEW OF FLOWS

	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	A
1	1.826	1.979	0.514	0.144	0.112	0.140	0.150	0.373	0.434	0.857	0.997	1
2	1.693	2.040	0.529	0.129	0.112	0.140	0.162	0.346	0.683	0.737	1.826	1
3	1.570	1.698	0.506	0.129	0.105	0.140	0.175	0.321	0.633	0.683	3.101	2
4	1.826	1.725	0.454	0.129	0.103	0.135	0.175	0.321	0.544	0.633	4.526	2
5	6.963	1.712	0.445	0.243	0.533	0.147	0.175	0.321	0.505	0.587	3.891	2
6	6.185	1.574	0.390	0.174	0.181	0.178	0.175	0.297	0.468	0.587	3.101	2
7	5.616	1.909	0.345	0.154	0.140	0.175	0.189	0.276	0.434	0.544	2.665	2
8	4.288	2.220	0.335	0.154	0.127	0.189	0.189	0.276	0.402	0.683	2.291	2
9	3.976	2.059	0.327	0.152	0.117	0.194	0.189	0.276	0.402	0.857	2.124	2
10	5.606	1.992	0.319	0.243	0.127	0.170	0.237	0.505	0.373	1.075	1.969	2
11	5.496	1.930	0.311	0.215	0.218	0.182	0.204	0.402	0.373	1.075	1.693	2
12	5.447	1.847	0.283	0.180	0.208	0.169	0.189	0.373	0.402	1.251	1.570	3
13	5.359	1.771	0.283	0.201	0.157	0.183	0.204	0.346	0.402	1.969	1.349	3
14	5.663	1.688	0.262	0.225	0.150	0.169	0.189	0.346	0.373	1.969	1.251	3
15	6.038	1.600	0.260	0.172	0.139	0.156	0.189	0.321	0.373	1.455	1.160	3
16	6.006	1.522	0.248	0.140	0.139	0.162	0.204	0.346	0.373	1.251	1.075	3
17	7.406	1.608	0.230	0.127	0.159	0.162	0.204	0.346	0.373	1.075	1.075	3
18	8.650	1.543	0.230	0.119	0.146	0.156	0.204	0.737	0.434	0.924	1.075	3
19	8.616	1.430	0.213	0.119	0.176	0.182	0.204	1.693	0.544	0.924	1.160	3
20	8.556	1.230	0.188	0.112	0.175	0.169	0.204	1.251	0.544	0.857	1.251	2
21	9.259	1.140	0.174	0.102	0.163	0.169	0.220	0.997	0.544	0.857	1.251	2
22	8.053	1.057	0.162	0.102	0.151	0.189	0.924	0.795	0.633	0.924	1.160	2
23	6.478	0.980	0.154	0.099	0.151	0.189	1.251	0.633	1.075	0.997	1.075	2
24	5.598	0.909	0.166	0.087	0.140	0.189	0.795	0.544	3.101	0.924	0.997	2
25	4.839	0.814	0.154	0.089	0.140	0.175	0.633	0.505	2.471	0.924	0.924	2
26	3.672	0.755	0.174	0.095	0.150	0.175	0.544	0.505	1.969	0.997	0.924	2
27	2.974	0.663	0.166	0.095	0.169	0.175	0.505	0.468	1.570	1.075	0.924	2
28	2.604	0.584	0.166	0.124	0.188	0.175	0.468	0.468	1.251	0.997	0.924	2
29	2.691	0.555	0.190	0.109	0.163	0.175	0.402	0.468	1.160		0.997	1
30	2.560	0.528	0.201	0.152	0.151	0.220	0.402	0.468	1.075		1.251	1
31	2.407		0.152	0.124		0.150		0.468	0.924		1.455	
DEK1	3.955	1.891	0.416	0.165	0.166	0.161	0.182	0.331	0.488	0.724	2.649	2
DEK2	6.724	1.617	0.251	0.161	0.167	0.169	0.199	0.616	0.419	1.275	1.266	3
DEK3	4.649	0.798	0.169	0.107	0.157	0.180	0.614	0.574	1.434	0.962	1.080	2
MIN	0.633	0.321	0.111	0.071	0.076	0.120	0.150	0.255	0.346	0.544	0.857	1
DAT	27	30	22	22	1	2	1	9	17	5	25	1
SRED	5.094	1.435	0.275	0.143	0.163	0.170	0.332	0.509	0.801	0.989	1.646	2
MAX	20.55	7.126	2.291	2.124	4.882	5.265	3.101	2.67	4.526	2.471	5.679	4
DAT	17	17	2	5	11	28	22	18	24	13	4	1

MIN = 0.071
DAT: 22. 08

SR = 1.187

MAX = 20.5
DAT: 17.

AVERAGE VALUE FOR 545 DAYS IS Q =1.209 m^3/s

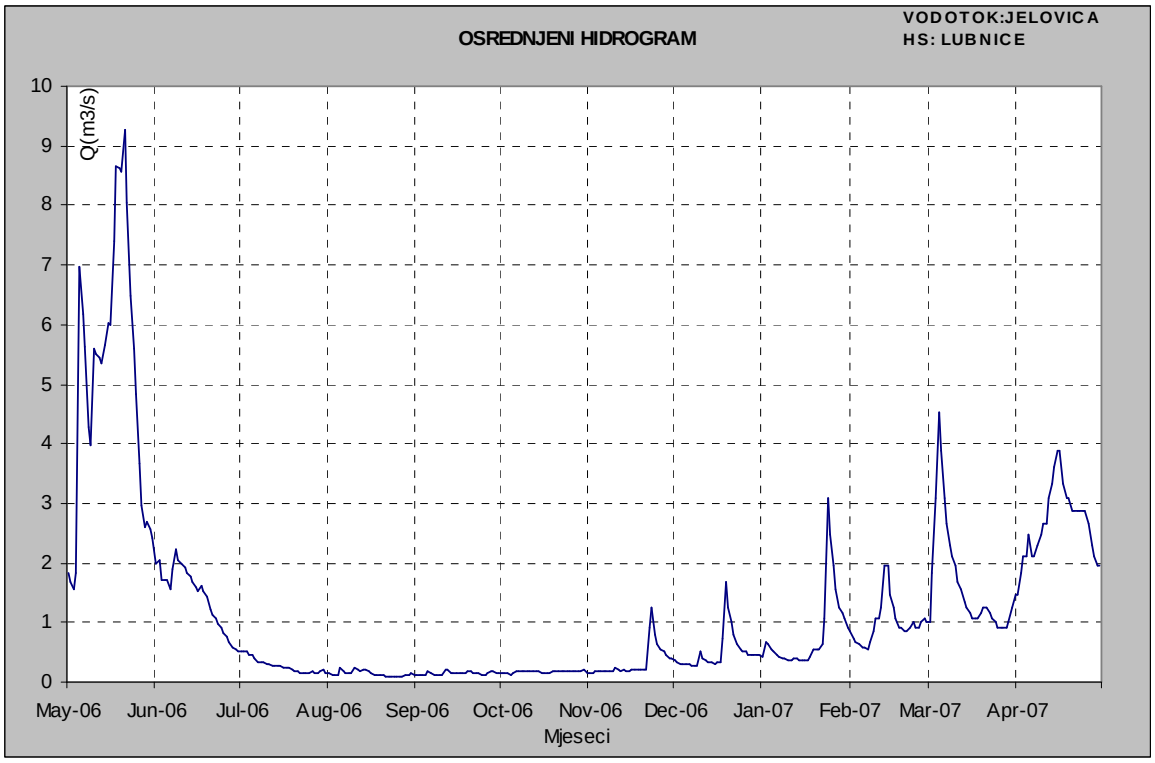


Figure 36

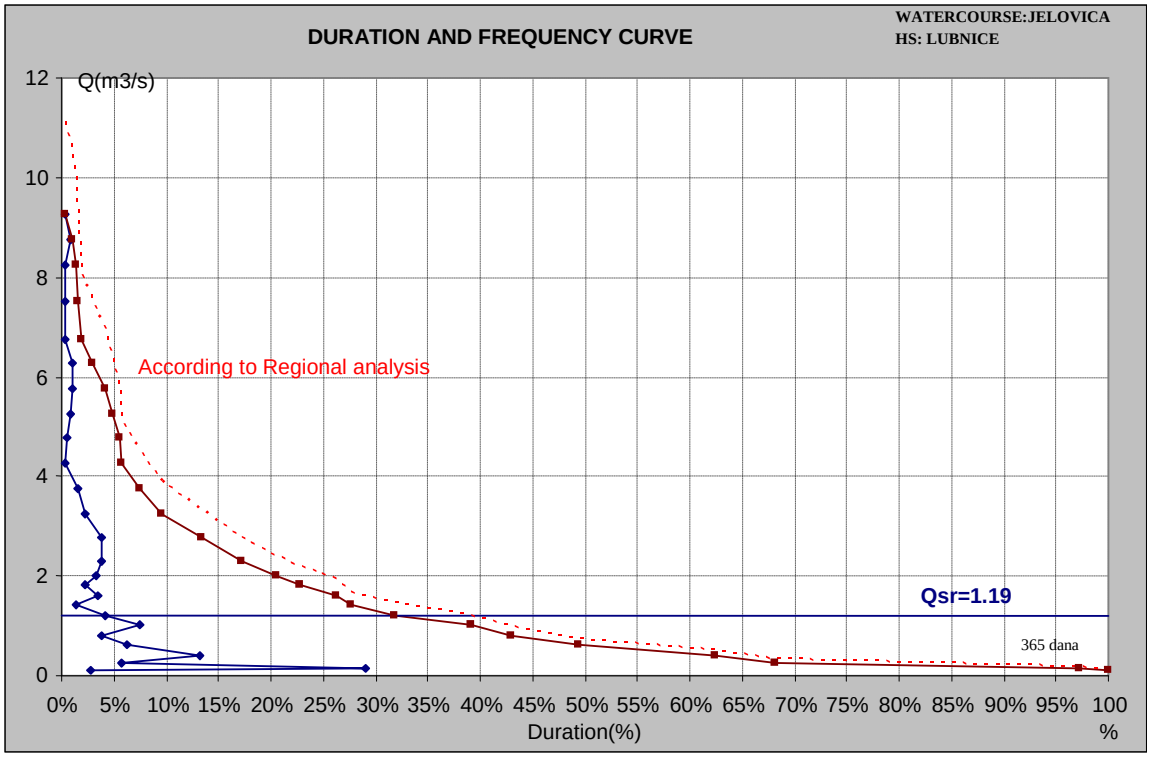
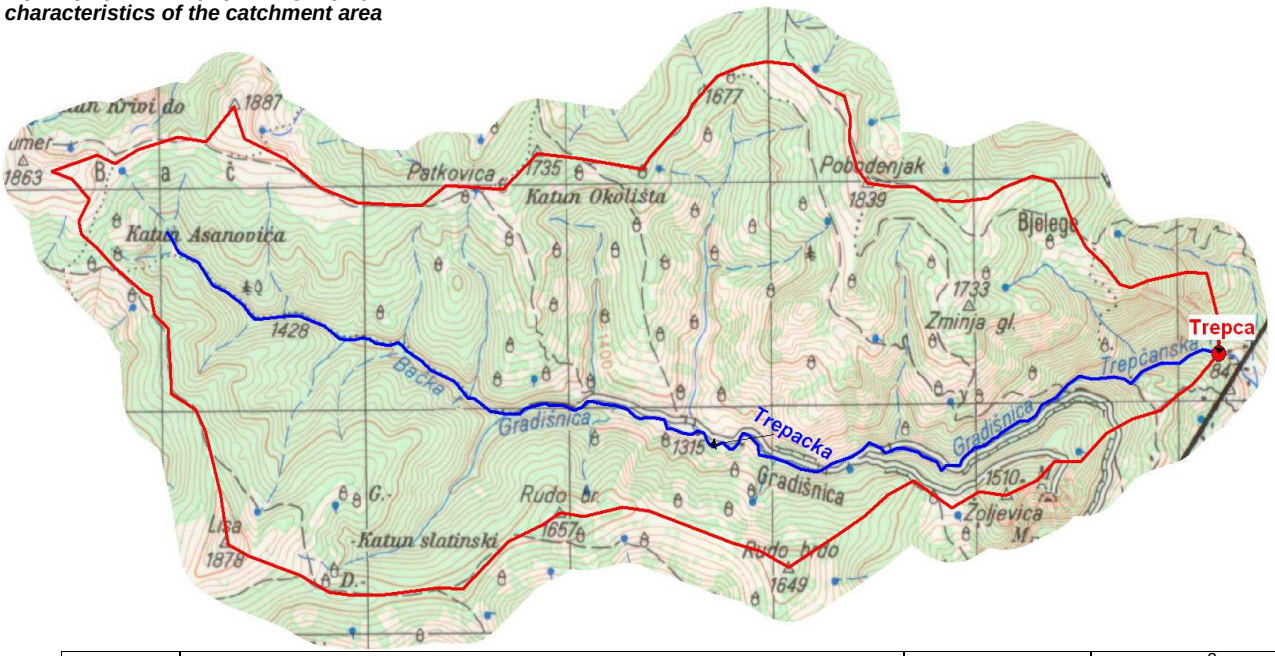


Figure 37

F2. WATERCOURSE: TREPAČKA RIJEKA
HS: TREPČA

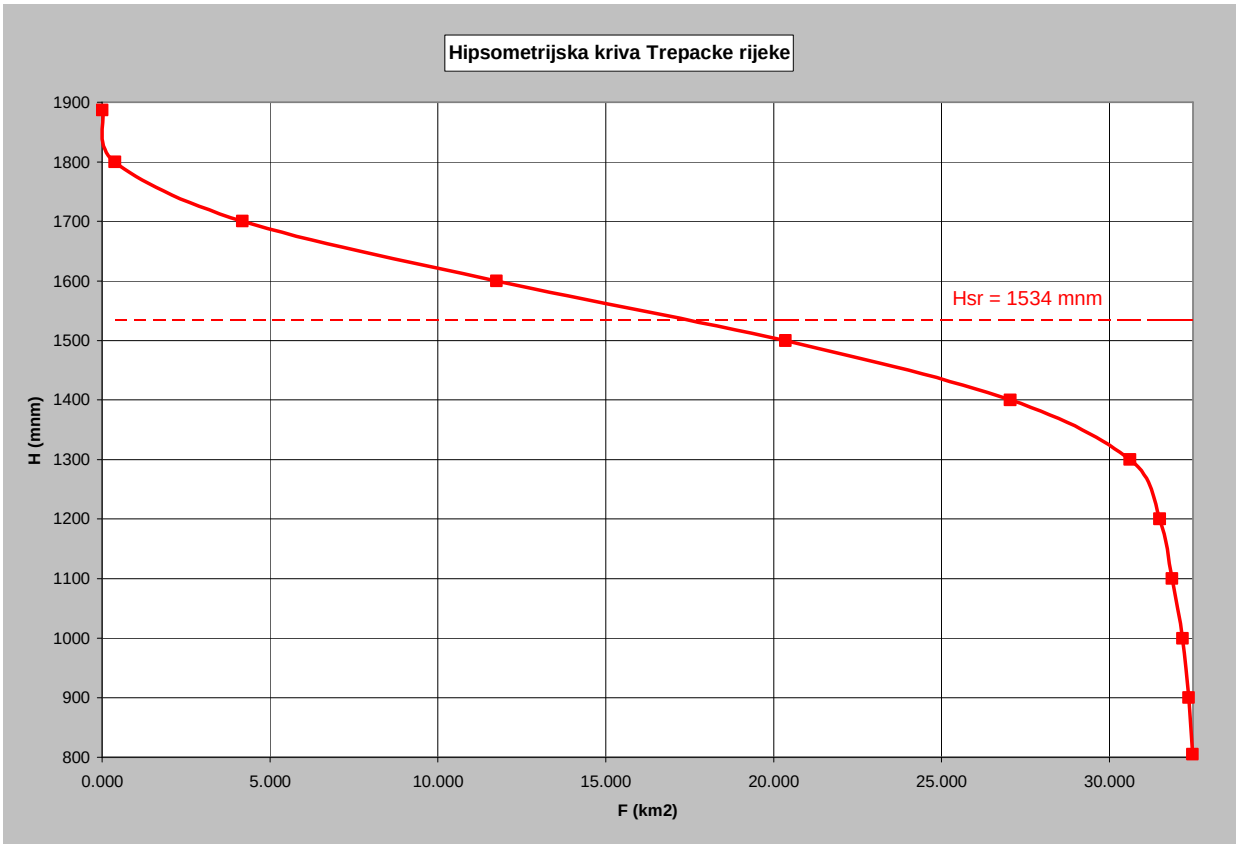
The main streching direction of this watrecourse is West-East. The catchment area is 32.5 km^2, lenght of watershed is 29.7 km, maximum altitude of the catchment area is 1887 m.a.s.l. whereas minimum altitude is 1887 m.a.s.l. The average head of the catchment area is 42.2% and average altitude of the catchment area is 1535 m.a.s.l. Other hydrographic and physical-geographic parameters of the catchment area are presented in the table that follows.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	32.5	[km^2]
2	Length of watercourse L_t	12.1	[km]
3	Length of catchment area L_s	12.2	[km]
4	Perimeter of catchment area S	29.7	[km]
5	Average width of catchment area $B=F/L_s$	2.67	[km]
6	Rectilinear distance river source - mouth L_i	10.41	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	5.76	[km]
8	Watershed spreading factor K_s	1.47	[-]
9	Elongation of catchment factor K_σ	4.50	[-]
10	Concentration of catchment factor K_c	0.380	[-]
11	Tortousnesness of flow factor K_L	1.16	[-]
12	Maximum head in the catchment area H_{max}	1887	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	805	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	42.2	[%]
15	Maximum head of slope of valley I_{max}	64.7	[%]
16	Average altitude of the catchment area H_{sr}	1534	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	729	[m]
18	Levelled out head of watercourse I_t	8.03	[%]
19	Maximum head of the watercourse I_{t1}	35.7	[%]
20	Average maximum head of the watercourse I_{t2}	6.41	[%]

According to hypsometric curve on Figure 38, page 46, altitude of the most part of the catchment area is between 1300 and 1800 m.a.s.l. i.e 92% of occurrence.
Schematic longitudinal profile of the watercourse of 12.1 km length is given on the Figure 39 page 46.



slika 38

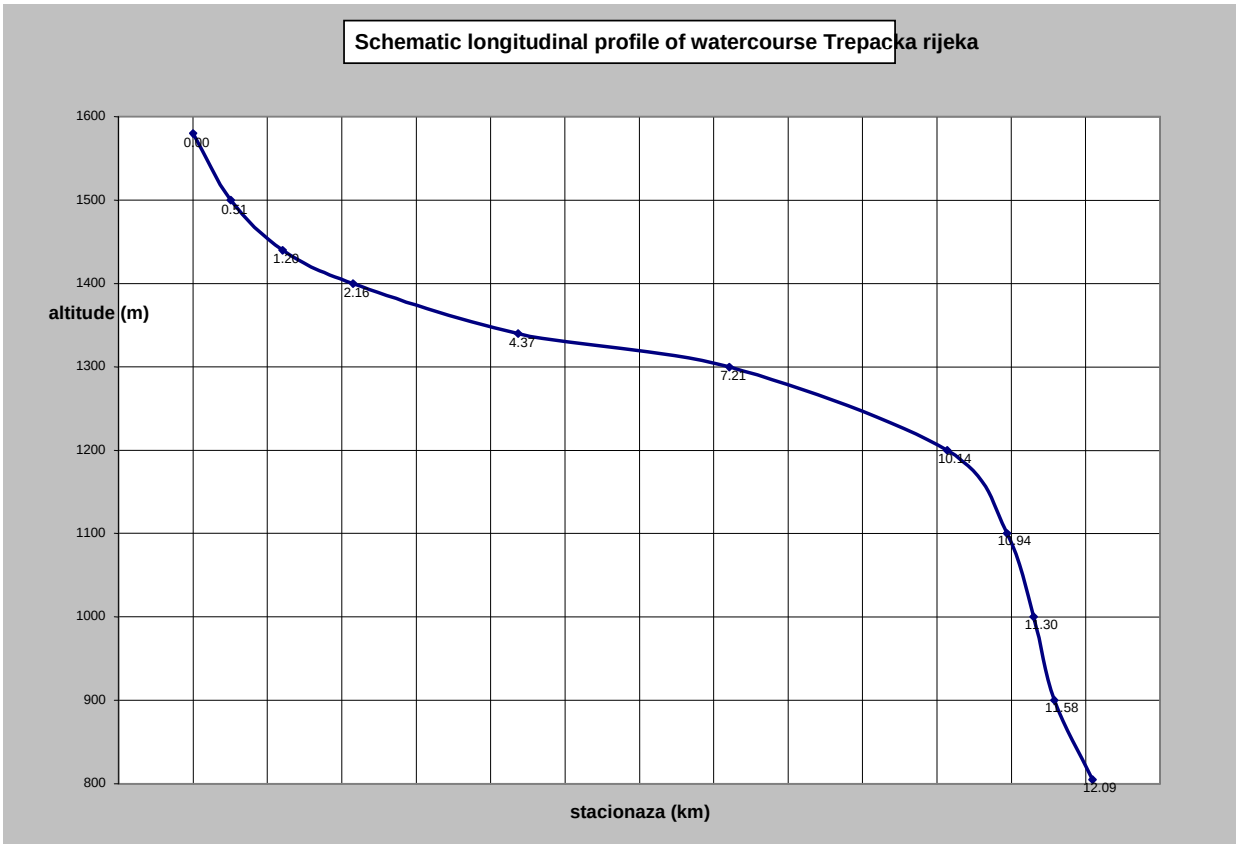


Figure 39

Flow curve (Figure 40) is function with $Q1=\left(\frac{H_1}{60.274}\right)^{3.92}$ for $H_1<$ 42 and $Q_2=\left(\frac{H_2}{53.463}\right)^{6.12}$ for $H_2 \geq 42$. Months with greatest water volumes are March and April, and the driest months are August and October. Periods of ten days with greatest water volumes are first and second ten days of April, and driest are second and third ten days of October.

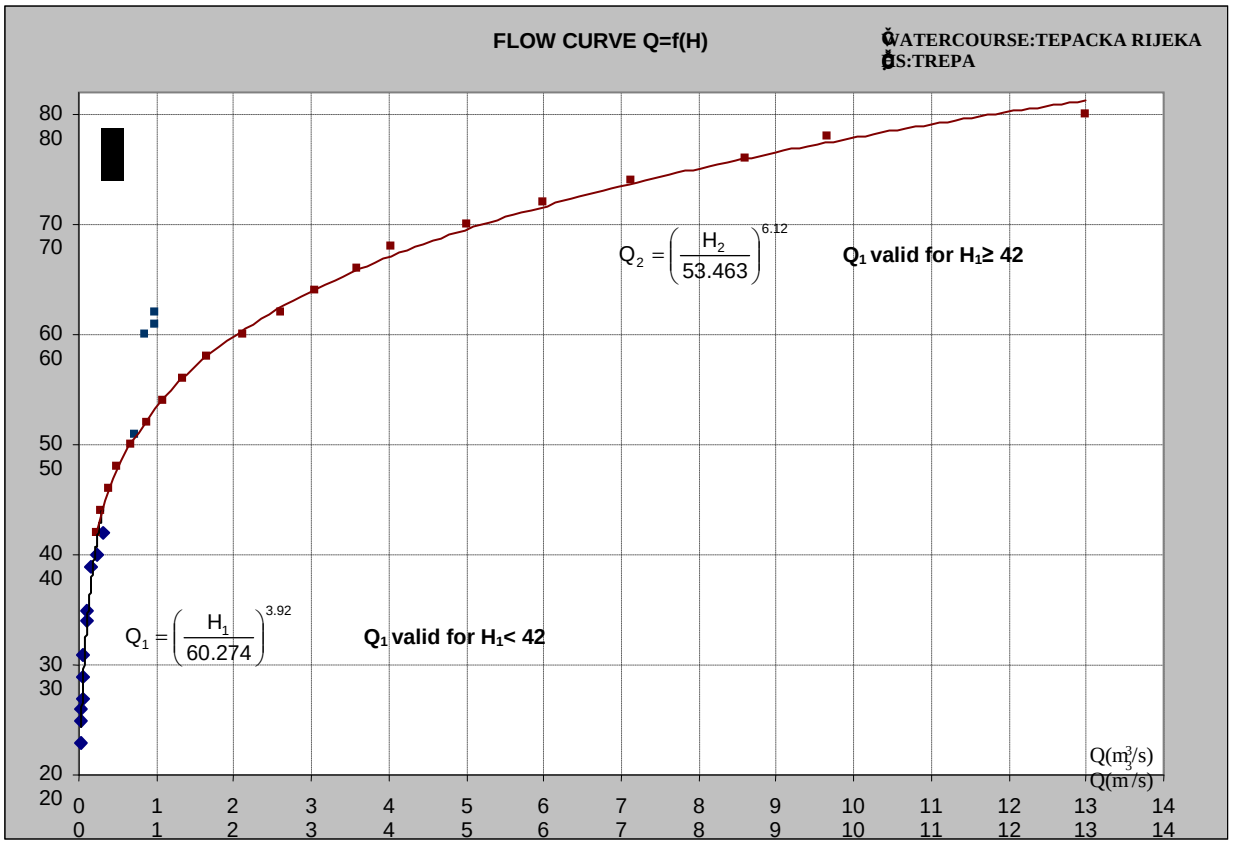


Fig.39

The months with the largest quantity of waters are March and April, while the months with the lowest quantity of water are August and October. Ten day periods with the largest quantity of water are the first and the second one in April, while the ten day periods with the lowest quantity of water are the second and the third one in October. Average annual flow for calendar year is 0.694 m^3/s. Considering outstanding heads this watercourse is classifed as the first ranked priority.
Extreme maximum value of 11.8 m^3/s is 91 times higher than average daily flow for that day, which we consider as a kind of systematic error that could not be identified at this point without detailed review of analysed material. Annual flows for whole period and for calendar year are presented on the page 48.
Extreme minimum value is only 23 l/s and is 2.9 times lower than average daily flow for that day.

According to data from permanent hydrologic station, which is situated only couple of hundred meters downstream and was monitored for the last ten years, average flow for the several years amounting to 1.3 m^3/s is 87% higher than the one here obtained, which is probably exaggerated. However, we shall have better information about this issue after comparing this data with rainfall from the Regional analysis.

Hydrogram of runoffs (figure 41) as well as curve of duration (figure 42) are presented on the page 49.
Average annual flow and all values of flows above it had duration of around 35% or 128 days, which recommend this watercourse as attractive for construction of small power plants. Other characteristic flows according to duration curve are presented in the following table.

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	2.12	1.19	0.846	0.577	0.269	0.231	0.173	0.078	0.057

WATERCOURSE: TREPAČKA RIJEKA
HS: TREPČA

REVIEW OF FLOWS - 2006

	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1.828	0.228	0.084	0.119	0.074	0.094	0.133
2	3.007	0.228	0.074	0.106	0.074	0.094	0.106
3	1.828	0.264	0.074	0.094	0.065	0.106	0.119
4	1.646	0.228	0.074	0.094	0.050	0.106	0.133
5	1.328	0.228	0.304	0.094	0.084	0.119	0.133
6	1.189	0.200	0.119	0.065	0.133	0.119	0.119
7	1.828	0.181	0.106	0.050	0.065	0.133	0.106
8	2.241	0.200	0.106	0.043	0.094	0.148	0.106
9	1.828	0.200	0.106	0.043	0.094	0.148	0.119
10	1.646	0.181	0.200	0.050	0.065	0.200	0.304
11	1.828	0.164	0.164	0.057	0.057	0.148	0.181
12	1.480	0.164	0.119	0.057	0.057	0.119	0.181
13	1.480	0.148	0.148	0.065	0.050	0.133	0.148
14	1.328	0.148	0.181	0.074	0.050	0.119	0.119
15	1.328	0.148	0.119	0.065	0.050	0.133	0.106
16	1.063	0.133	0.106	0.065	0.050	0.119	0.119
17	1.063	0.133	0.106	0.119	0.050	0.074	0.089
18	1.189	0.119	0.094	0.094	0.050	0.065	0.455
19	0.948	0.106	0.094	0.094	0.050	0.065	0.844
20	0.749	0.106	0.094	0.106	0.050	0.065	0.517
21	0.749	0.106	0.084	0.119	0.050	0.065	0.398
22	0.664	0.106	0.084	0.094	0.057	0.844	0.304
23	0.749	0.106	0.084	0.094	0.057	0.948	0.181
24	0.664	0.106	0.084	0.084	0.050	0.398	0.148
25	0.587	0.106	0.074	0.074	0.050	0.264	0.200
26	0.517	0.106	0.119	0.074	0.057	0.221	0.221
27	0.455	0.094	0.106	0.084	0.057	0.181	0.148
28	0.348	0.084	0.181	0.133	0.065	0.164	0.133
29	0.228	0.084	0.133	0.094	0.065	0.148	0.133
30	0.228	0.094	0.200	0.084	0.148	0.133	0.148
31		0.084	0.148		0.063		0.148
DEK1	1.837	0.214	0.125	0.076	0.080	0.127	0.138
DEK2	1.246	0.137	0.123	0.080	0.051	0.104	0.276
DEK3	0.519	0.098	0.118	0.093	0.065	0.337	0.196
MIN	0.221	0.074	0.065	0.037	0.043	0.065	0.084
DAT	29	29	2	8	4	2	2
SRED	1.201	0.148	0.121	0.083	0.065	0.189	0.203
MAX	5.204	0.304	5.204	0.181	0.304	5.676	2.026
DAT	2	3	5	17	30	22	18

MIN = 0.037
DAT: 8. 09

SR = 0.283

MAX = 5.68
DAT: 22. 11

WATERCOURSE: TREPAČKA RIJEKA
HS: TREPČA

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.148	0.587	1.063	2.241	1.328	0.455	0.228	0.043	0.032	0.057
2	0.304	0.517	1.828	2.476	1.063	0.398	0.200	0.043	0.037	0.074
3	0.304	0.348	2.476	2.731	1.063	0.664	0.181	0.043	0.027	0.065
4	0.221	0.517	4.358	3.007	1.189	0.948	0.164	0.043	0.027	0.065
5	0.221	0.455	3.630	3.306	0.844	1.189	0.200	0.043	0.181	0.065
6	0.200	0.348	3.306	3.007	0.749	1.189	0.164	0.057	0.074	0.065
7	0.181	0.587	3.007	3.007	0.948	1.328	0.148	0.057	0.084	0.133
8	0.181	0.517	2.731	3.007	0.749	1.646	0.133	0.050	0.074	0.106
9	0.181	0.587	2.476	3.306	0.664	1.189	0.119	0.043	0.065	0.074
10	0.164	0.664	2.241	3.630	0.664	0.948	0.119	0.057	0.074	0.084
11	0.181	0.749	2.026	3.980	0.587	0.948	0.119	0.057	0.200	0.106
12	0.221	0.948	1.646	4.358	0.455	1.189	0.119	0.065	0.266	0.084
13	0.200	1.646	1.480	4.358	0.348	0.948	0.106	0.057	0.148	0.119
14	0.181	1.646	1.328	4.765	0.304	1.189	0.106	0.057	0.133	0.084
15	0.181	1.189	1.189	4.358	0.264	0.948	0.106	0.057	0.084	0.065
16	0.133	1.063	1.063	4.358	0.264	0.844	0.106	0.050	0.084	0.057
17	0.181	0.844	1.063	3.980	0.264	0.749	0.094	0.043	0.074	0.057
18	0.228	0.749	0.948	3.306	0.587	0.664	0.084	0.043	0.074	0.050
19	0.348	0.749	0.948	3.306	0.455	0.587	0.094	0.043	0.106	0.094
20	0.348	0.844	1.063	2.731	0.304	0.517	0.094	0.037	0.106	0.084
21	0.304	0.844	1.646	2.731	0.455	0.455	0.084	0.032	0.084	0.065
22	0.348	0.844	1.480	2.476	0.749	0.398	0.084	0.043	0.074	0.106
23	0.587	0.948	1.480	2.476	0.587	0.348	0.027	0.037	0.065	0.119
24	2.241	0.844	1.189	2.241	0.517	0.348	0.027	0.032	0.057	
25	1.646	0.844	1.189	2.241	0.517	0.304	0.032	0.027	0.057	
26	1.063	1.063	1.189	1.828	0.517	0.304	0.043	0.027	0.065	
27	0.948	1.189	1.189	1.646	0.398	0.264	0.057	0.027	0.074	
28	0.664	0.948	1.328	1.328	0.455	0.264	0.057	0.027	0.065	
29	0.749		1.480	1.189	0.587	0.228	0.050	0.032	0.074	
30	0.749		2.026	1.328	0.587	0.228	0.050	0.032	0.057	
31	0.587		2.476		0.517		0.043	0.027		
DEK1	0.211	0.513	2.712	2.972	0.926	0.996	0.166	0.048	0.067	0.079
DEK2	0.220	1.043	1.276	3.950	0.383	0.858	0.103	0.051	0.127	0.080
DEK3	0.899	0.941	1.516	1.949	0.535	0.314	0.050	0.031	0.067	0.026
MIN	0.084	0.200	0.664	1.063	0.228	0.221	0.023	0.023	0.023	0.043
DAT	16	3	20	29	15	30	23	24	4	18
SRED	0.458	0.824	1.824	2.957	0.612	0.723	0.104	0.043	0.087	0.064
MAX	4.358	2.476	5.676	5.204	2.476	4.765	0.517	0.089	11.78	0.664
DAT	24	13	4	14	1	3	5	7	11	7

MIN = 0.023
DAT: 23. 07

SR = 0.785

MAX = 11.78
DAT: 11. 09

WATERCOURSE: TREPAČKA RIJEKA
HS: TREPČA

REVIEW OF FLOWS

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	1.141	0.228	0.063	0.075	0.065	0.094	0.133	0.148	0.587	1.063	2.241	1.328
2	1.703	0.214	0.058	0.072	0.074	0.094	0.106	0.304	0.517	1.828	2.476	1.063
3	1.246	0.223	0.058	0.061	0.065	0.106	0.119	0.304	0.348	2.476	2.731	1.063
4	1.297	0.196	0.058	0.061	0.057	0.106	0.133	0.221	0.517	4.358	3.007	1.189
5	1.259	0.214	0.173	0.138	0.074	0.119	0.133	0.221	0.455	3.630	3.306	0.844
6	1.189	0.182	0.088	0.069	0.099	0.119	0.119	0.200	0.348	3.306	3.007	0.749
7	1.578	0.165	0.081	0.067	0.099	0.133	0.106	0.181	0.587	3.007	3.007	0.948
8	1.944	0.167	0.078	0.058	0.100	0.148	0.106	0.181	0.517	2.731	3.007	0.749
9	1.509	0.160	0.074	0.054	0.084	0.148	0.119	0.181	0.587	2.476	3.306	0.664
10	1.297	0.150	0.129	0.062	0.074	0.200	0.304	0.164	0.664	2.241	3.630	0.664
11	1.388	0.141	0.110	0.129	0.081	0.148	0.181	0.181	0.749	2.026	3.980	0.587
12	1.335	0.141	0.092	0.161	0.070	0.119	0.181	0.221	0.948	1.646	4.358	0.455
13	1.214	0.127	0.102	0.106	0.084	0.133	0.148	0.200	1.646	1.480	4.358	0.348
14	1.259	0.127	0.119	0.103	0.067	0.119	0.119	0.181	1.646	1.328	4.765	0.304
15	1.138	0.127	0.088	0.074	0.057	0.133	0.106	0.181	1.189	1.189	4.358	0.264
16	0.953	0.119	0.078	0.074	0.053	0.119	0.119	0.133	1.063	1.063	4.358	0.264
17	0.906	0.113	0.074	0.096	0.053	0.074	0.089	0.181	0.844	1.063	3.980	0.264
18	0.927	0.101	0.069	0.084	0.050	0.065	0.455	0.228	0.749	0.948	3.306	0.587
19	0.767	0.100	0.069	0.100	0.072	0.065	0.844	0.348	0.749	0.948	3.306	0.455
20	0.633	0.100	0.066	0.106	0.067	0.065	0.517	0.348	0.844	1.063	2.731	0.304
21	0.602	0.095	0.058	0.101	0.057	0.065	0.398	0.304	0.844	1.646	2.731	0.455
22	0.531	0.095	0.063	0.084	0.081	0.844	0.304	0.348	0.844	1.480	2.476	0.749
23	0.549	0.067	0.060	0.080	0.088	0.948	0.181	0.587	0.948	1.480	2.476	0.587
24	0.506	0.067	0.058	0.070	0.050	0.398	0.148	2.241	0.844	1.189	2.241	0.517
25	0.445	0.069	0.050	0.065	0.050	0.264	0.200	1.646	0.844	1.189	2.241	0.517
26	0.410	0.074	0.073	0.069	0.057	0.221	0.221	1.063	1.063	1.189	1.828	0.517
27	0.359	0.076	0.067	0.079	0.057	0.181	0.148	0.948	1.189	1.189	1.646	0.398
28	0.306	0.070	0.104	0.099	0.065	0.164	0.133	0.664	0.948	1.328	1.328	0.455
29	0.228	0.067	0.082	0.084	0.065	0.148	0.133	0.749		1.480	1.189	0.587
30	0.228	0.072	0.116	0.070	0.148	0.133	0.148	0.749		2.026	1.328	0.587
31		0.063	0.087		0.063		0.148	0.587		2.476		0.517
DEK1	1.416	0.190	0.086	0.072	0.079	0.127	0.138	0.211	0.513	2.712	2.972	0.926
DEK2	1.052	0.120	0.087	0.103	0.065	0.104	0.276	0.220	1.043	1.276	3.950	0.383
DEK3	0.417	0.074	0.074	0.080	0.071	0.337	0.196	0.899	0.941	1.516	1.949	0.535
MIN	0.221	0.023	0.023	0.023	0.043	0.065	0.084	0.084	0.200	0.664	1.063	0.228
DAT	30	23	24	4	18	2	2	16	3	20	29	15
SRED	0.962	0.126	0.082	0.085	0.072	0.189	0.203	0.458	0.824	1.824	2.957	0.612
MAX	5.204	0.517	5.204	11.782	0.664	5.676	2.026	4.358	2.476	5.676	5.204	2.476
DAT	2	5	5	11	7	22	18	24	13	4	14	1

MIN = 0.023
DAT: 23. 07

SR = 0.695

MAX = 11.78
DAT: 11. 09

AVERAGE VALUE FOR 510 DAYS IS Q = 0.574 m^3/s

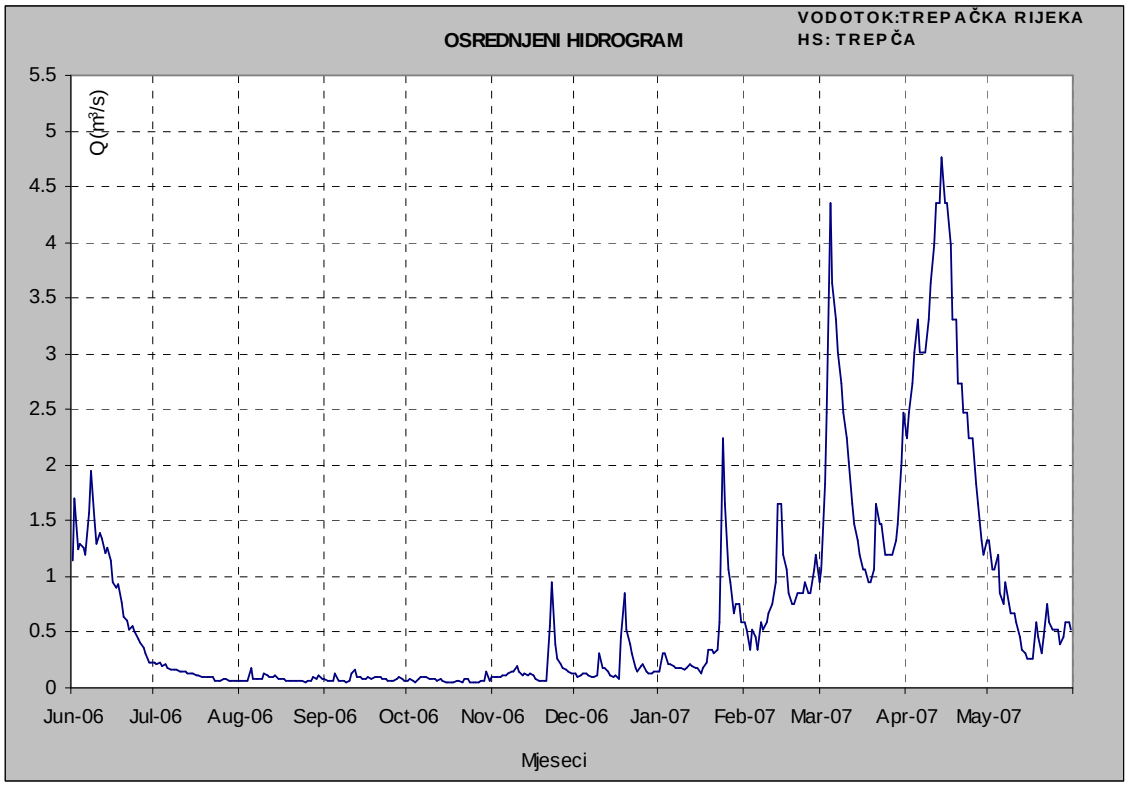


Figure 41

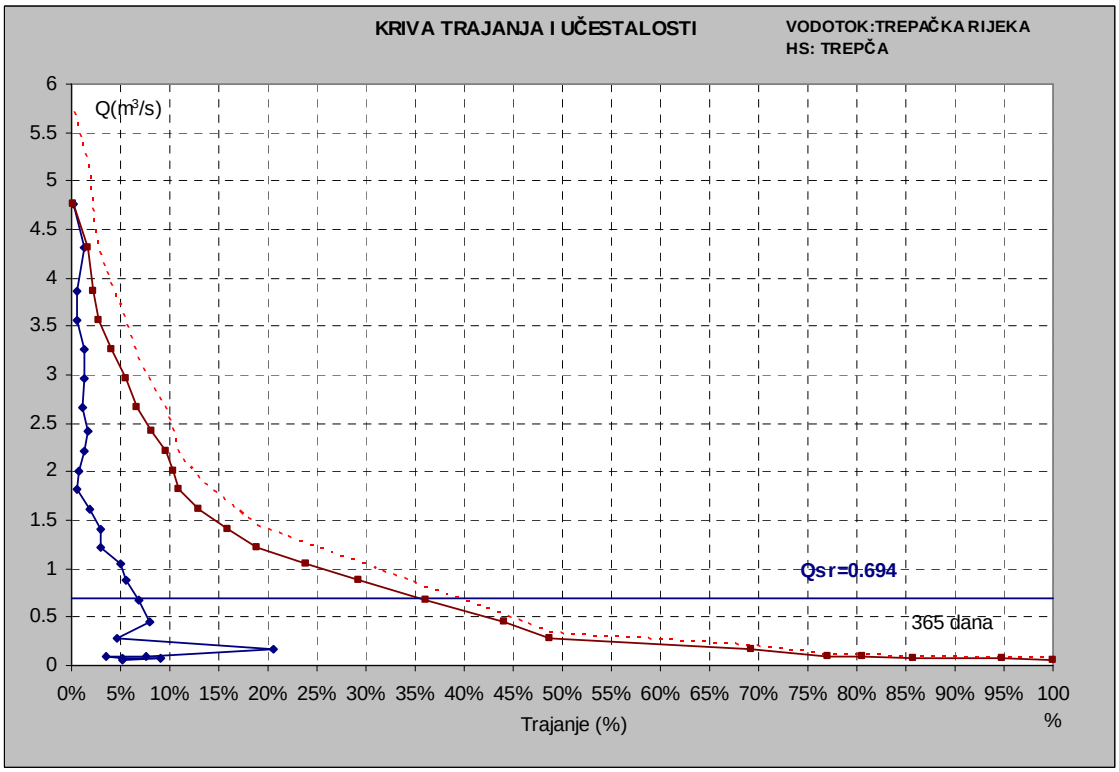
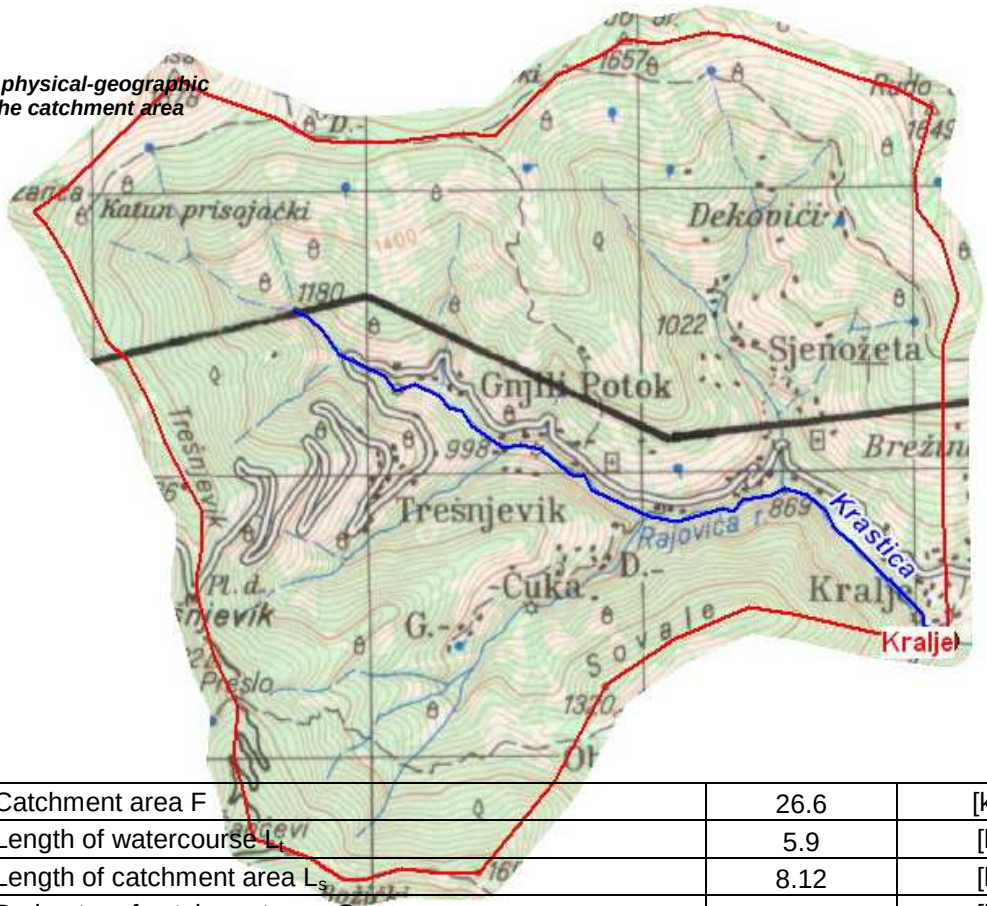


Figure 42

F3. WATERCOURSE: KRAŠTICA
HS: KRALJE

General flow direction of this river is Northwest – Southeast. This is the right tributary of the river Lim with catchment area of 26.6 km^2, lenght of watershed is 22.2 km, maximum elevation in the catchment area is 1878 m.a.s.l and minimum elevation is 806 m.a.s.l. Average head in the catchment area is 44.4% and levelled out head of watercourse 5.03%. Elevation of the most part of the catchment area is between 1000 and1600 m.a.s.l , with around 85% of total catshment area. Other hydrographic and physical-geographic characteristics are presented in Table that follows. Schematic longitudinal profile of the watercourse (Figure 4) could be found on page 5.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	26.6	[km^2]
2	Length of watercourse L_t	5.9	[km]
3	Length of catchment area L_s	8.12	[km]
4	Perimeter of catchment area S	22.2	[km]
5	Average width of catchment area B=F/L_s	3.28	[km]
6	Rectilinear distance river source - mouth L_i	5.33	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.36	[km]
8	Watershed spreading factor K_s	1.216	[-]
9	Elongation of catchment factor K_σ	1.309	[-]
10	Concentration of catchment factor K_c	0.713	[-]
11	Tortousnesness of flow factor K_L	1.11	[-]
12	Maximum head in the catchment area H_{max}	1878	[m.a.s.l.]
13	Mimimum altitude in the catchment area H_{min}	806	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	44.4	[%]
15	Maximum head of slope of valley I_{max}	56.4	[%]
16	Average altitude in the catchment area H_{sr}	1312	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	506	[m]
18	Levelled out head of watercourse I_t	5.03	[%]
19	Maximum head of the watercourse I_{t1}	13.9	[%]
20	Average maximum head of the watercourse I_{t2}	6.51	[%]

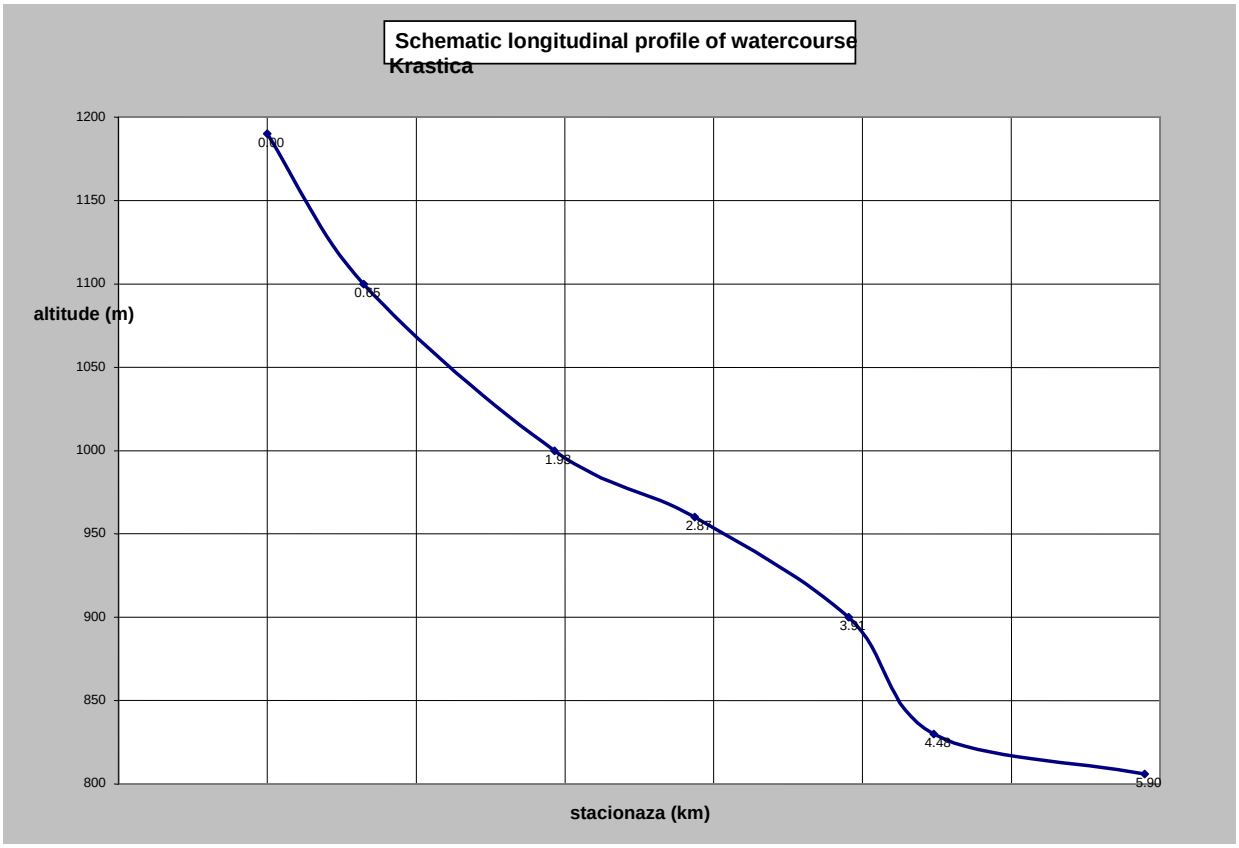


Figure 43

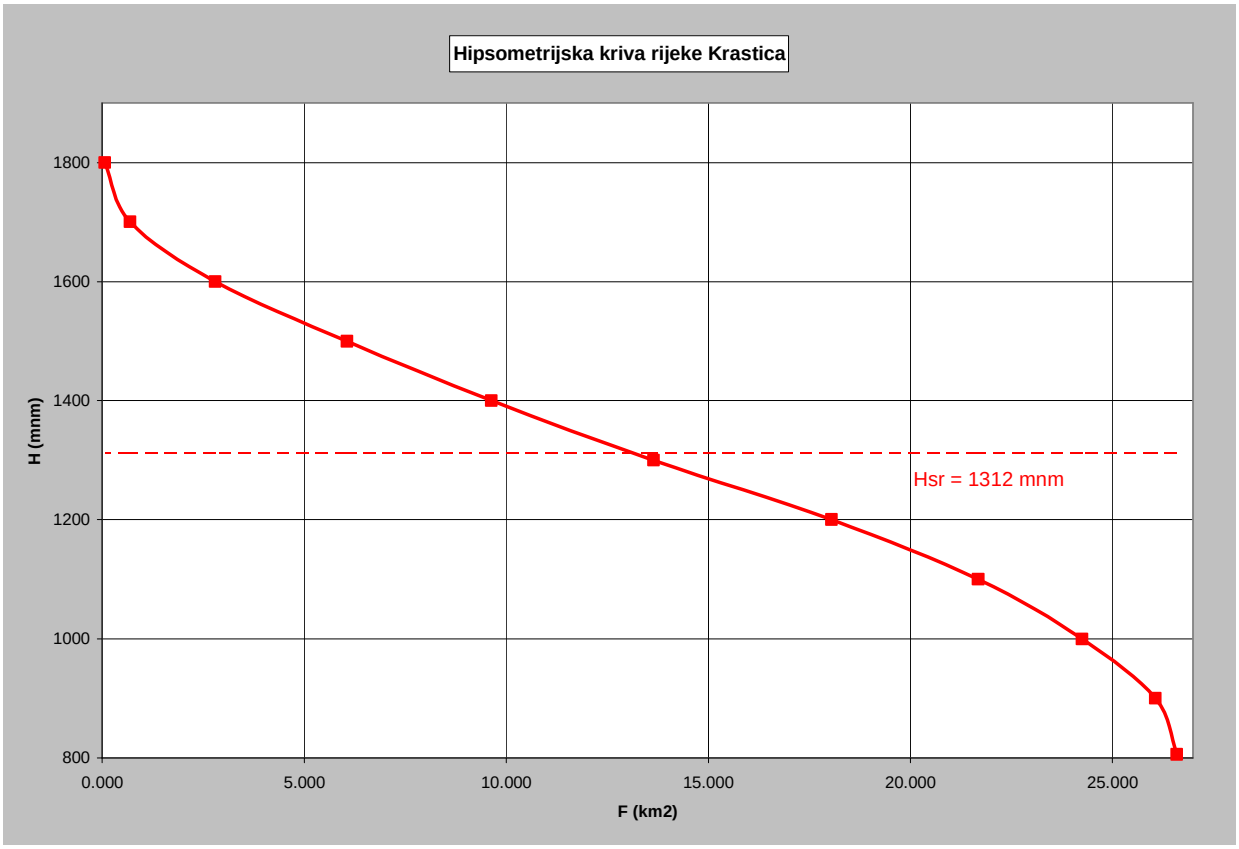


Figure 44

Flow curve is a function with $Q_1 = \left(\frac{H_1}{51.768}\right)^{5.537}$ for water levels up to 40 cm, and for water levels above 40cm $Q_2 = \left(\frac{H_2}{48.54}\right)^{8.606}$, based on which a flow balance was established, i.e. partial balances for years 2006 and 2007 as well as one single balance for calendar year period of 0.757 m^3/s (Figure 45).

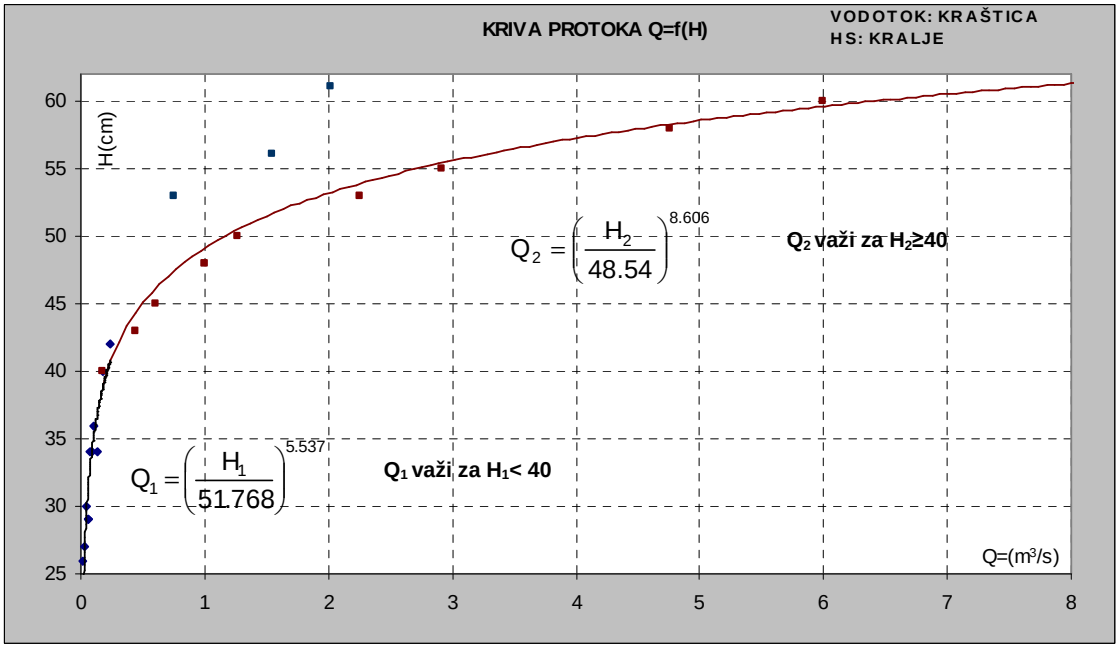


Figure 45

Overviews of flows are presented on the page 53. The months with the largest quantity of waters are March and April, while the months with the lowest quantity of water are August and September. Extreme maximum value of 8.22 m^3/s is only 15% higher than average daily flow for that day. Extreme minimum value of 22 l/s is 3.9 times lower than average daily flow for that day. Total number of days with data for this measuring profile was 510 days for period 01.06.2006. - 23.10.2007.

Hydrogram of runoffs (figure 46), as well as curve of duration and frequency (figure 47), are presented on the page 54. According to duration curve, average annual flow and all flows above it during the year last around 32% or 117 days, which deserves every respect. Other characteristic flows according to duration curve are presented in the following table.

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	2.52	1.61	0.839	0.452	0.387	0.323	0.252	0.135	0.129

WATERCOURSE: KRAŠTICA

HS: KRALJE

REVIEW OF WATER DLOWS - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1	1.809	0.352	0.114	0.156	0.114	0.114	0.208
2	2.503	0.352	0.098	0.156	0.114	0.156	0.208
3	1.530	0.352	0.083	0.134	0.114	0.156	0.208
4	1.530	0.352	0.070	0.134	0.114	0.156	0.181
5	1.291	0.288	0.181	0.114	0.134	0.156	0.181
6	1.085	0.288	0.114	0.114	0.208	0.156	0.181
7	1.530	0.234	0.098	0.114	0.156	0.208	0.181
8	1.809	0.234	0.098	0.114	0.156	0.208	0.181
9	1.530	0.234	0.098	0.114	0.156	0.208	0.181
10	1.291	0.234	0.134	0.114	0.156	0.234	0.189
11	1.530	0.234	0.156	0.098	0.134	0.208	0.189
12	1.291	0.234	0.134	0.098	0.134	0.181	0.189
13	1.291	0.234	0.134	0.098	0.114	0.208	0.189
14	1.291	0.189	0.156	0.098	0.098	0.181	0.208
15	1.085	0.189	0.114	0.098	0.098	0.181	0.208
16	1.085	0.189	0.098	0.098	0.098	0.181	0.208
17	0.908	0.181	0.098	0.134	0.098	0.156	0.208
18	0.908	0.156	0.098	0.134	0.098	0.156	0.430
19	0.908	0.156	0.083	0.134	0.098	0.156	0.758
20	0.758	0.156	0.083	0.134	0.098	0.156	0.521
21	0.630	0.156	0.083	0.134	0.098	0.156	0.352
22	0.630	0.134	0.070	0.134	0.098	0.430	0.352
23	0.630	0.114	0.070	0.134	0.114	1.291	0.288
24	0.521	0.098	0.070	0.114	0.114	0.430	0.234
25	0.521	0.098	0.070	0.114	0.114	0.288	0.234
26	0.521	0.114	0.083	0.114	0.114	0.234	0.234
27	0.521	0.098	0.083	0.114	0.114	0.234	0.189
28	0.430	0.098	0.134	0.156	0.114	0.189	0.189
29	0.430	0.098	0.134	0.134	0.114	0.189	0.189
30	0.352	0.114	0.208	0.134	0.134	0.208	0.189
31		0.098	0.181		0.134		0.189
DEK1	1.591	0.292	0.109	0.127	0.142	0.175	0.190
DEK2	1.105	0.192	0.115	0.112	0.106	0.176	0.311
DEK3	0.519	0.111	0.108	0.128	0.115	0.365	0.240
MIN	0.288	0.083	0.070	0.098	0.098	0.114	0.156
DAT	30	24	3	9	4	1	9
SRED	1.072	0.195	0.110	0.122	0.121	0.239	0.247
MAX	3.986	0.430	1.291	0.181	0.189	8.218	1.291
DAT	2	3	5	1	6	22	18

MIN = 0.070 DAT: 3. 08

SR = 0.298

MAX = 8.218 DAT: 22. 11

WATERCOURSE: KRAŠTICA

HS: KRALJE

REVIEW OF WATER DLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.189	0.758	1.530	7.145	0.758	0.352	0.208	0.058	0.022	0.058
2	0.430	0.630	1.530	7.145	0.630	0.288	0.181	0.049	0.027	0.058
3	0.430	0.630	1.809	7.145	0.630	0.430	0.208	0.033	0.027	0.058
4	0.352	0.630	2.503	6.197	0.758	0.630	0.181	0.033	0.027	0.058
5	0.288	0.630	2.503	6.197	0.630	0.758	0.208	0.040	0.070	0.049
6	0.288	0.630	2.503	5.363	0.521	0.758	0.208	0.049	0.070	0.049
7	0.288	0.630	2.503	3.986	0.630	0.758	0.181	0.049	0.070	0.070
8	0.234	0.758	2.503	3.986	0.521	0.908	0.181	0.049	0.070	0.098
9	0.234	0.908	2.131	3.422	0.521	0.758	0.156	0.040	0.058	0.083
10	0.234	1.085	2.131	3.422	0.430	0.758	0.134	0.040	0.058	0.083
11	0.234	1.085	1.809	2.931	0.430	0.630	0.114	0.040	0.114	0.083
12	0.288	1.291	1.809	2.931	0.352	0.630	0.114	0.040	0.114	0.083
13	0.288	2.503	1.530	2.503	0.352	0.758	0.114	0.040	0.098	0.098
14	0.234	2.931	1.530	2.131	0.288	0.630	0.114	0.040	0.098	0.098
15	0.234	2.503	1.291	2.131	0.288	0.630	0.098	0.040	0.070	0.083
16	0.234	2.503	1.291	2.131	0.234	0.521	0.083	0.040	0.058	0.083
17	0.234	2.131	1.085	1.809	0.189	0.521	0.083	0.033	0.058	0.070
18	0.234	1.809	1.085	1.530	0.288	0.430	0.083	0.033	0.058	0.070
19	0.288	1.809	1.085	1.530	0.352	0.352	0.070	0.033	0.070	0.098
20	0.288	1.809	1.530	1.291	0.288	0.288	0.070	0.033	0.083	0.098
21	0.288	1.530	1.809	1.291	0.288	0.288	0.083	0.033	0.070	0.083
22	0.288	1.530	1.530	1.291	0.352	0.234	0.083	0.027	0.070	0.098
23	0.352	1.530	1.530	1.085	0.352	0.189	0.083	0.027	0.070	0.098
24	2.931	1.291	1.530	1.085	0.288	0.189	0.083	0.022	0.058	
25	2.503	1.291	1.809	1.085	0.352	0.189	0.070	0.022	0.049	
26	1.809	1.530	2.131	0.908	0.288	0.208	0.070	0.022	0.049	
27	1.530	1.809	2.503	0.908	0.234	0.208	0.070	0.022	0.058	
28	1.085	1.530	3.422	0.758	0.234	0.208	0.070	0.022	0.070	
29	1.085		3.986	0.758	0.288	0.181	0.070	0.022	0.058	
30	0.908		6.197	0.758	0.352	0.181	0.070	0.022	0.058	
31	0.758		7.145		0.352		0.070	0.022		
DEK1	0.297	0.729	2.164	5.401	0.603	0.640	0.185	0.044	0.050	0.066
DEK2	0.255	2.037	1.404	2.092	0.306	0.539	0.094	0.038	0.082	0.086
DEK3	1.230	1.505	3.054	0.992	0.307	0.208	0.074	0.024	0.061	0.025
MIN	0.208	0.630	0.908	0.630	0.189	0.181	0.058	0.022	0.022	0.049
DAT	24	13	31	1	7	3	5	1	11	28
SRED	0.615	1.418	2.235	2.828	0.402	0.462	0.116	0.035	0.064	0.058
MAX	5.363	3.422	8.218	8.218	1.085	2.131	0.234	0.070	1.085	6.197
DAT	24	13	31	1	7	3	5	1	11	28

MIN = 0.022 DAT: 01. 08

SR = 0.837

MAX = 8.218 DAT: 1. 04

WATERCOURSE: KRAŠTICA

HS: KRALJE

REVIEW OF WATER DLOWS

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	1.081	0.280	0.086	0.089	0.086	0.114	0.208	0.189	0.758	1.530	7.145	0.758
2	1.395	0.266	0.073	0.091	0.086	0.156	0.208	0.430	0.630	1.530	7.145	0.630
3	0.980	0.280	0.058	0.081	0.086	0.156	0.208	0.430	0.630	1.809	7.145	0.630
4	1.080	0.266	0.051	0.081	0.086	0.156	0.181	0.352	0.630	2.503	6.197	0.758
5	1.024	0.248	0.110	0.092	0.091	0.156	0.181	0.288	0.630	2.503	6.197	0.630
6	0.921	0.248	0.082	0.092	0.129	0.156	0.181	0.288	0.630	2.503	5.363	0.521
7	1.144	0.207	0.073	0.092	0.113	0.208	0.181	0.288	0.630	2.503	3.986	0.630
8	1.358	0.207	0.073	0.092	0.127	0.208	0.181	0.234	0.758	2.503	3.986	0.521
9	1.144	0.195	0.069	0.086	0.119	0.208	0.181	0.234	0.908	2.131	3.422	0.521
10	1.024	0.184	0.087	0.086	0.119	0.234	0.189	0.234	1.085	2.131	3.422	0.430
11	1.080	0.174	0.098	0.106	0.108	0.208	0.189	0.234	1.085	1.809	2.931	0.430
12	0.960	0.174	0.087	0.106	0.108	0.181	0.189	0.288	1.291	1.809	2.931	0.352
13	1.024	0.174	0.087	0.098	0.106	0.208	0.189	0.288	2.503	1.530	2.503	0.352
14	0.960	0.152	0.098	0.098	0.098	0.181	0.208	0.234	2.931	1.530	2.131	0.288
15	0.857	0.143	0.077	0.084	0.090	0.181	0.208	0.234	2.503	1.291	2.131	0.288
16	0.803	0.136	0.069	0.078	0.090	0.181	0.208	0.234	2.503	1.291	2.131	0.234
17	0.715	0.132	0.065	0.096	0.084	0.156	0.208	0.234	2.131	1.085	1.809	0.189
18	0.669	0.119	0.065	0.096	0.084	0.156	0.430	0.234	1.809	1.085	1.530	0.288
19	0.630	0.113	0.058	0.102	0.098	0.156	0.758	0.288	1.809	1.085	1.530	0.352
20	0.523	0.113	0.058	0.108	0.098	0.156	0.521	0.288	1.809	1.530	1.291	0.288
21	0.459	0.119	0.058	0.102	0.090	0.156	0.352	0.288	1.530	1.809	1.291	0.288
22	0.432	0.108	0.048	0.102	0.098	0.430	0.352	0.288	1.530	1.530	1.291	0.352
23	0.409	0.099	0.048	0.102	0.106	1.291	0.288	0.352	1.530	1.530	1.085	0.352
24	0.355	0.090	0.046	0.086	0.114	0.430	0.234	2.931	1.291	1.530	1.085	0.288
25	0.355	0.084	0.046	0.082	0.114	0.288	0.234	2.503	1.291	1.809	1.085	0.352
26	0.365	0.092	0.052	0.082	0.114	0.234	0.234	1.809	1.530	2.131	0.908	0.288
27	0.365	0.084	0.052	0.086	0.114	0.234	0.189	1.530	1.809	2.503	0.908	0.234
28	0.319	0.084	0.078	0.113	0.114	0.189	0.189	1.085	1.530	3.422	0.758	0.234
29	0.305	0.084	0.078	0.096	0.114	0.189	0.189	1.085		3.986	0.758	0.288
30	0.266	0.092	0.115	0.096	0.134	0.208	0.189	0.908		6.197	0.758	0.352
31		0.084	0.101		0.134		0.189	0.758		7.145		0.352
DEK1	1.115	0.238	0.076	0.088	0.104	0.175	0.190	0.297	0.729	2.164	5.401	0.603
DEK2	0.822	0.143	0.076	0.097	0.096	0.176	0.311	0.255	2.037	1.404	2.092	0.306
DEK3	0.363	0.093	0.066	0.095	0.113	0.365	0.240	1.230	1.505	3.054	0.992	0.307
MIN	0.181	0.058	0.022	0.022	0.049	0.114	0.156	0.208	0.630	0.908	0.630	0.189
DAT	3	5	1	11	28	1	9	24	13	31	1	7
SRED	0.767	0.156	0.073	0.093	0.105	0.239	0.247	0.615	1.418	2.235	2.828	0.402
MAX	3.986	0.430	1.291	1.085	6.197	8.218	1.291	5.363	3.422	8.218	8.218	1.085
DAT	2	3	5	11	28	22	18	24	13	31	1	7

MIN = 0.022 DAT: 01. 08

SR = 0.757

MAX = 8.218 DAT: 1. 04

AVERAGE VALUE FOR 510 DAYS IS Q = 0.611 m^3/s

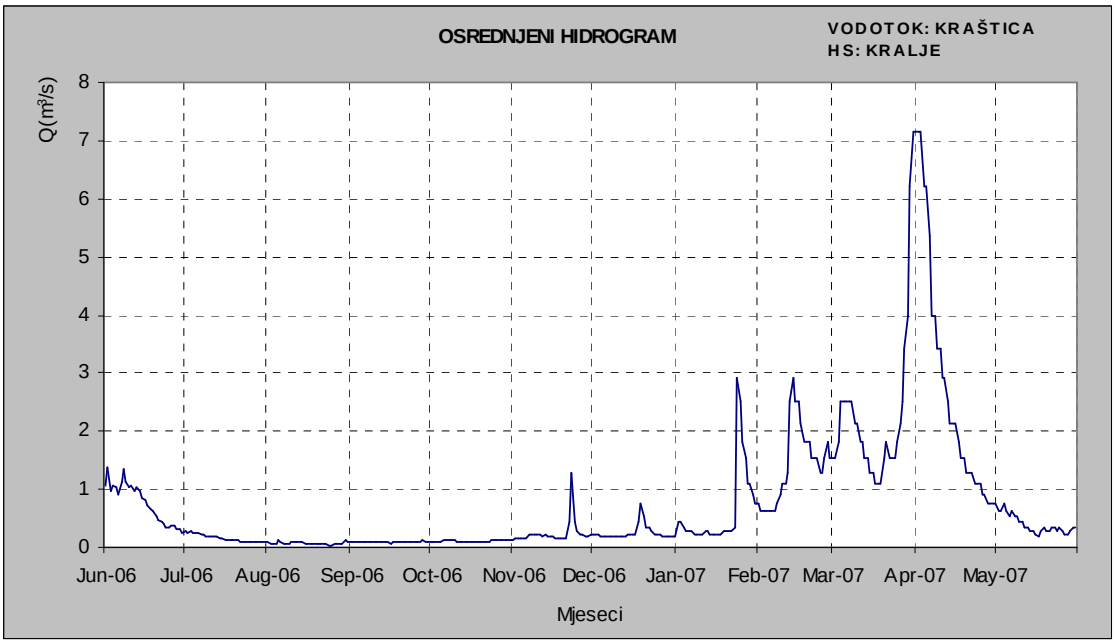


Figure 46

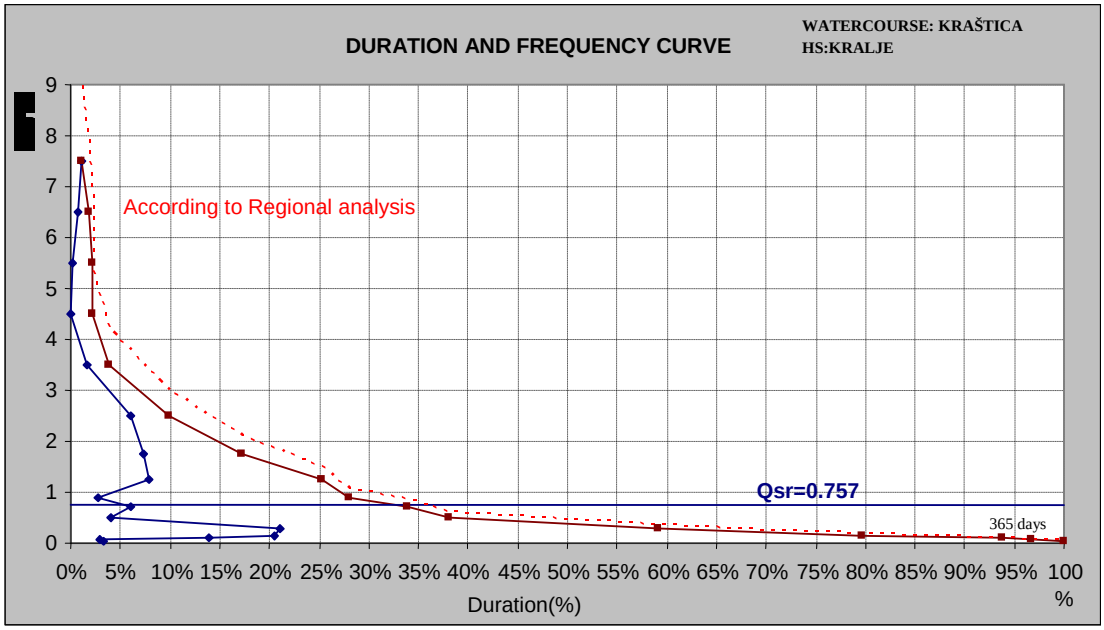
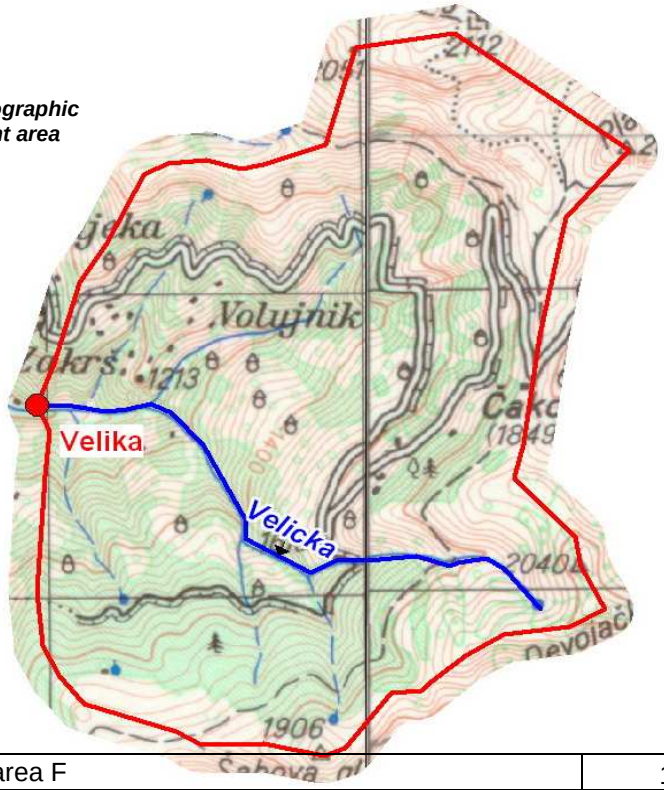


Figure 47

F.4. WATERCOURSE: VELIČKA RIJEKA
HS: VELIKA

Velička Rijeka is right tributary of the river Lim of the first level, with general flow direction is East – West. Catchment area up to this measurement profile is 12.4 km^2, with watershed od length of 14.8 km. Maximium altitude in the catchment area is 2112 m.a.s.l. and minimum altitude is 995 m.a.s.l. Aveage head of the catchment area is 46.4% and levelled out head of the watercourse is 22.2%.
This and other hydrographic and physical-geographic characteristics of the catchment area are given in table that follows.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	12.4	[km^2]
2	Length of watercourse L_t	3.98	[km]
3	Length of catchment area L_s	4.1	[km]
4	Perimeter of catchment area S	14.8	[km]
5	Average width of catchment area B=F/L_s	3.02	[km]
6	Rectilinear distance river source - mouth L_i	3.48	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	1.75	[km]
8	Watershed spreading factor K_s	1.19	[-]
9	Elongation of catchment factor K_σ	1.28	[-]
10	Concentration of catchment factor K_c	0.958	[-]
11	Tortousnesness of flow factor K_L	1.14	[-]
12	Maximum head in the catchment area H_{max}	2112	[m.a.s.l.]
13	Minimum head in the catchment area H_{min}	995	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	46.4	[%]
15	Maximum head of slope of valley I_{max}	41.5	[%]
16	Average altitude of the catchment area H_{sr}	1591	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	596	[m]
18	Levelled out head of watercourse I_t	22.2	[%]
19	Maximum head of the watercourse I_{t1}	46.3	[%]
20	Average maximum head of the watercourse I_{t2}	23.5	[%]

Schematic overview of the longitudinal profile of the watercorse (Figure 48) and hypsograph curve (Figure 49) are given on page 56.

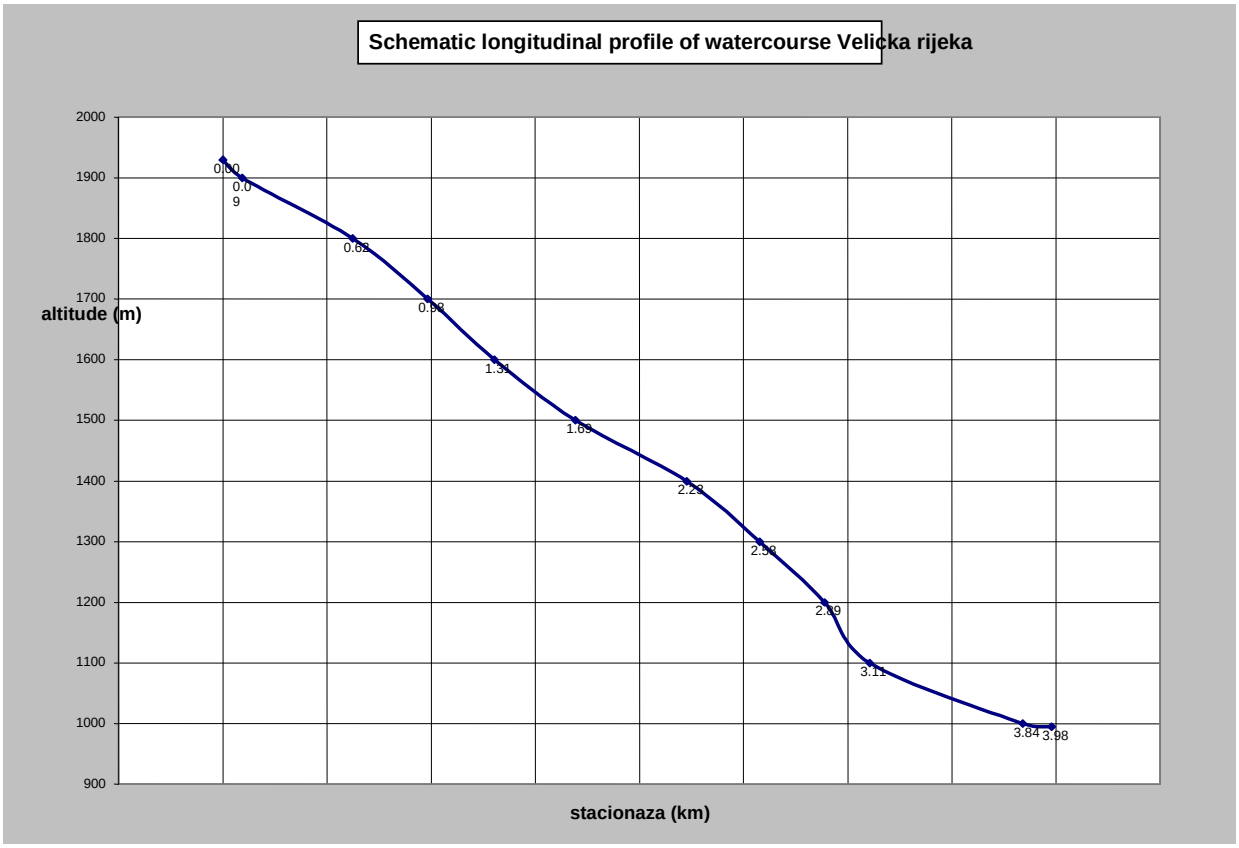


Figure 48

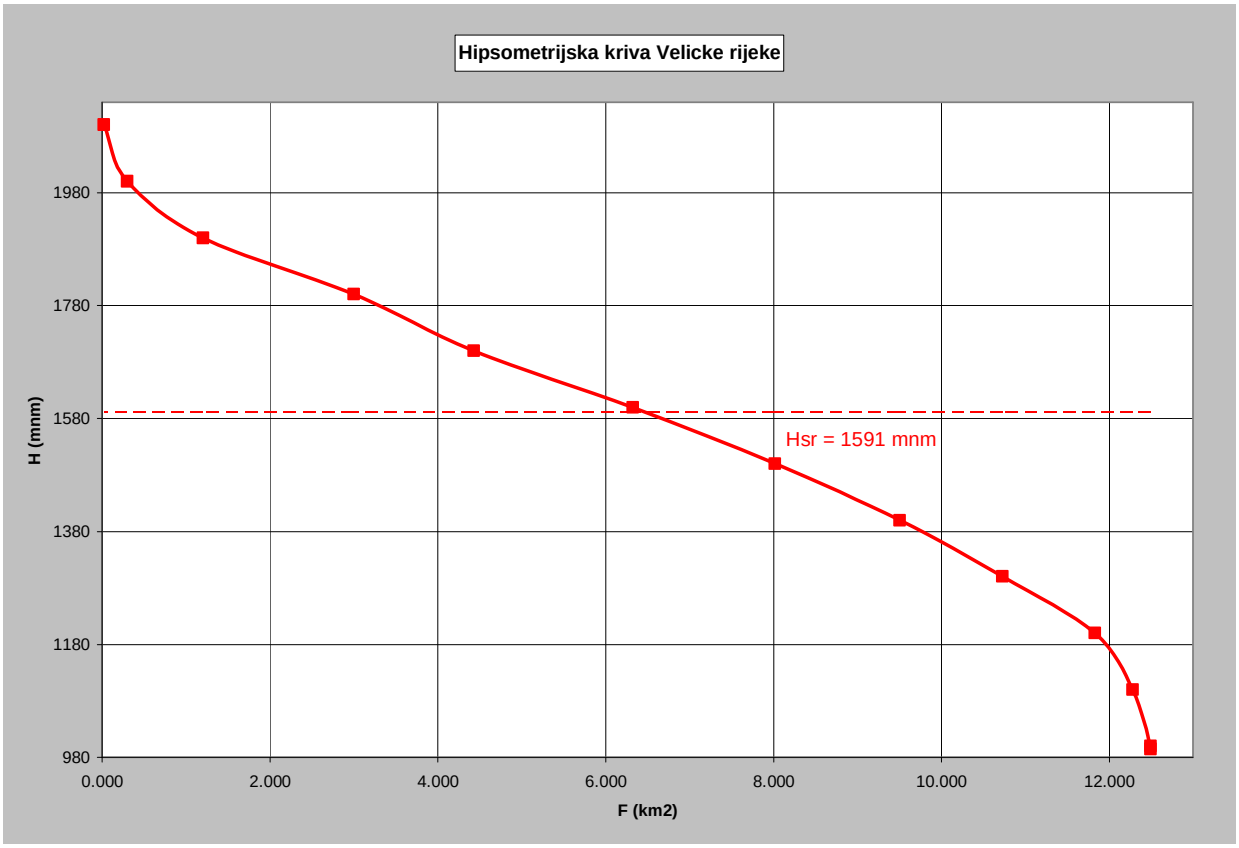
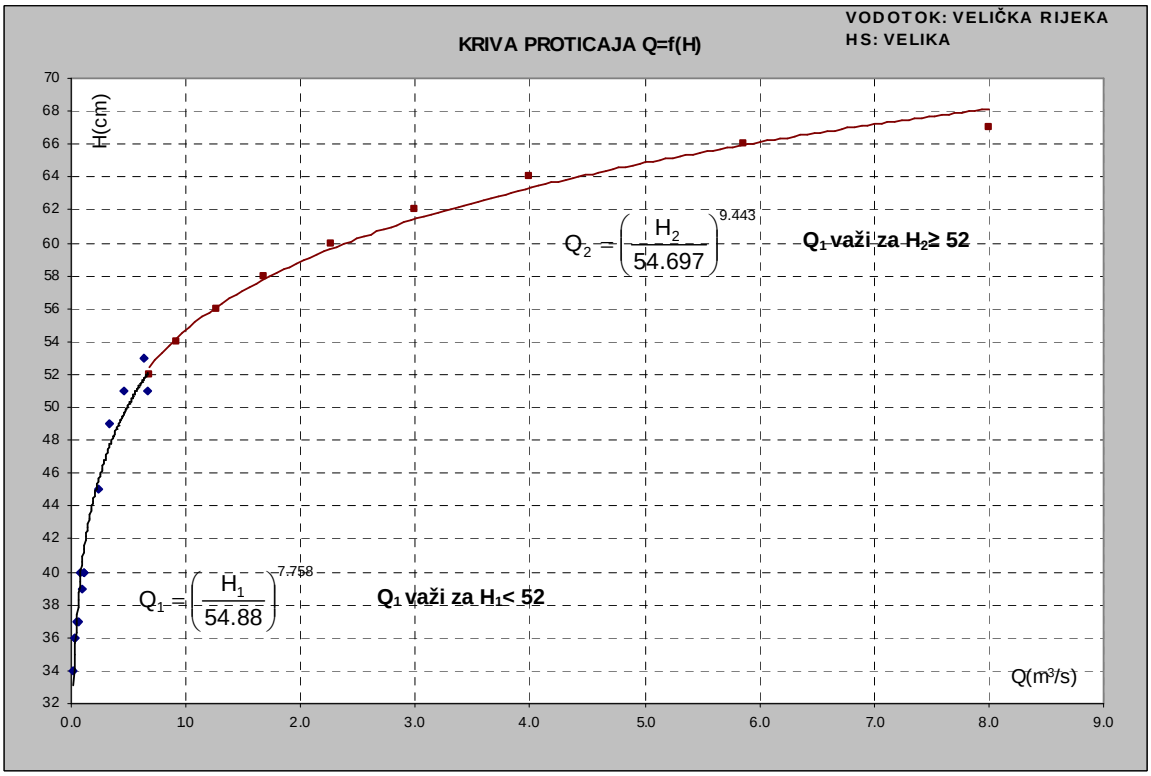


Figure 49

Flow curve is a function (Figure50), and all hypsometric measurements were respected. Up to water level 52 correlation is $Q_1 = \left(\frac{H_1}{54.88}\right)^{7.758}$ and above it it is $Q_2 = \left(\frac{H_2}{54.697}\right)^{9.443}$.



slika 50

The months with the largest quantity of waters are March and April, while the months with the lowest quantity of water are September and October. Maximum flow of 1.74 m^3/s was 2.34 times higher than medium one for that day. Minimum flow of 24 l/s from August 2007 was 1.96 times lower than medium daily flow for that day.
Overview of stream flows for total period of analysis from 01.06.2006 to 23.10.2007, as well as for calendar year, are presented on the page 58.
Average annual flow of 0.277 m^3/s is the smallest of all profiles analysed in this report.

Hydrograph of runoffs (figure 46), as well as curve of duration and frequency (figure 47), are presented on the page 54.

According to duration curve for calendar period reduced to a year, average duration is around 38% per annum or 139 days, so according to this parameter this profile we also consider as one of very attractive for hydropower development.

Other characteristic duations are as follows:

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	0.745	0.529	0.353	0.247	0.188	0.144	0.106	0.094	0.082

WATERCOURSE: VELIČKA RIJEKA

HS: VELIKA

REVIEW OF FLOWS - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1	1.249	0.180	0.151	0.086	0.058	0.151	0.151
2	1.249	0.254	0.151	0.071	0.058	0.180	0.125
3	0.886	0.300	0.151	0.071	0.058	0.151	0.125
4	0.886	0.254	0.125	0.071	0.058	0.151	0.125
5	0.743	0.214	0.180	0.071	0.058	0.151	0.125
6	0.620	0.254	0.214	0.071	0.086	0.151	0.125
7	0.620	0.214	0.180	0.071	0.071	0.151	0.125
8	0.743	0.214	0.180	0.071	0.086	0.180	0.104
9	0.743	0.254	0.151	0.071	0.125	0.180	0.086
10	0.743	0.254	0.180	0.071	0.104	0.214	0.086
11	0.743	0.254	0.214	0.071	0.086	0.214	0.086
12	0.743	0.353	0.214	0.058	0.086	0.125	0.086
13	0.743	0.353	0.214	0.058	0.071	0.086	0.086
14	0.620	0.415	0.214	0.058	0.071	0.086	0.071
15	0.620	0.415	0.180	0.058	0.071	0.086	0.071
16	0.566	0.353	0.180	0.071	0.071	0.086	0.071
17	0.566	0.353	0.125	0.071	0.086	0.086	0.071
18	0.485	0.254	0.071	0.071	0.104	0.086	0.086
19	0.485	0.180	0.071	0.071	0.104	0.086	0.104
20	0.415	0.151	0.071	0.086	0.104	0.086	0.086
21	0.415	0.180	0.071	0.086	0.104	0.086	0.086
22	0.353	0.180	0.071	0.071	0.104	0.214	0.086
23	0.353	0.151	0.071	0.071	0.125	0.353	0.086
24	0.353	0.151	0.086	0.058	0.125	0.254	0.086
25	0.415	0.180	0.071	0.058	0.125	0.214	0.086
26	0.415	0.125	0.071	0.058	0.125	0.180	0.086
27	0.353	0.125	0.071	0.058	0.125	0.180	0.086
28	0.300	0.151	0.071	0.071	0.125	0.151	0.071
29	0.254	0.151	0.071	0.071	0.125	0.151	0.086
30	0.214	0.151	0.071	0.058	0.214	0.125	0.104
31		0.151	0.071		0.180		0.071
DEK1	0.848	0.239	0.166	0.072	0.076	0.166	0.118
DEK2	0.598	0.308	0.155	0.067	0.085	0.103	0.082
DEK3	0.723	0.274	0.161	0.070	0.081	0.134	0.100
MIN	0.180	0.104	0.058	0.047	0.047	0.071	0.071
DAT	30	26	25	12	5	21	9
SRED	6.470	5.385	5.108	2.451	1.058	4.295	1.874
MAX	1.476	0.415	0.254	0.126	0.300	0.743	0.151
DAT	5	2	12	5	20	30	22

MIN = 0.047 DAT: 12. 09 | SR = 0.195 | MAX = 1.476 DAT: 5. 06

WATERCOURSE: ELIČKA RIJEKA

HS: VELIKA

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.071	0.151	0.300	1.016	0.620	0.353	0.180	0.104	0.038	0.058
2	0.086	0.151	0.300	1.054	0.566	0.353	0.151	0.071	0.047	0.058
3	0.104	0.125	0.353	0.886	0.566	0.415	0.151	0.038	0.038	0.058
4	0.086	0.125	0.566	0.743	0.566	0.485	0.151	0.038	0.038	0.058
5	0.086	0.125	0.566	0.886	0.566	0.620	0.180	0.038	0.086	0.058
6	0.086	0.104	0.566	0.743	0.620	0.620	0.151	0.047	0.086	0.058
7	0.071	0.104	0.566	0.743	0.886	0.620	0.151	0.047	0.086	0.071
8	0.071	0.104	0.566	0.743	0.620	0.743	0.125	0.058	0.058	0.071
9	0.071	0.104	0.566	0.743	0.566	0.620	0.104	0.047	0.071	0.071
10	0.071	0.125	0.566	0.743	0.485	0.620	0.125	0.058	0.058	0.071
11	0.071	0.151	0.566	0.886	0.415	0.566	0.125	0.058	0.071	0.071
12	0.071	0.151	0.485	1.054	0.353	0.485	0.125	0.047	0.071	0.071
13	0.071	0.254	0.485	1.054	0.353	0.485	0.125	0.047	0.071	0.071
14	0.071	0.300	0.415	1.249	0.353	0.415	0.125	0.047	0.058	0.086
15	0.071	0.300	0.415	1.476	0.300	0.415	0.104	0.047	0.058	0.086
16	0.071	0.254	0.415	1.249	0.300	0.353	0.125	0.047	0.058	0.071
17	0.071	0.254	0.353	1.054	0.254	0.353	0.125	0.038	0.058	0.071
18	0.071	0.254	0.353	0.886	0.300	0.300	0.125	0.038	0.047	0.071
19	0.071	0.254	0.415	0.886	0.300	0.254	0.104	0.038	0.058	0.071
20	0.071	0.254	0.485	0.743	0.300	0.254	0.104	0.038	0.058	0.071
21	0.071	0.254	0.657	0.743	0.300	0.254	0.104	0.038	0.058	0.071
22	0.086	0.300	0.485	0.743	0.353	0.214	0.104	0.038	0.058	0.071
23	0.104	0.300	0.485	0.743	0.485	0.180	0.104	0.038	0.058	0.071
24	0.353	0.300	0.485	0.743	0.485	0.180	0.104	0.038	0.058	
25	0.353	0.300	0.485	0.886	0.415	0.151	0.104	0.038	0.058	
26	0.254	0.300	0.485	0.743	0.415	0.151	0.104	0.030	0.058	
27	0.214	0.353	0.485	0.743	0.415	0.151	0.104	0.038	0.058	
28	0.180	0.300	0.566	0.743	0.415	0.180	0.104	0.038	0.058	
29	0.180		0.743	0.743	0.415	0.180	0.104	0.030	0.058	
30	0.180		0.886	0.620	0.415	0.180	0.104	0.024	0.058	
31	0.151		1.054		0.415		0.104	0.030		
DEK1	0.080	0.122	0.491	0.830	0.606	0.545	0.147	0.054	0.060	0.063
DEK2	0.071	0.243	0.439	1.054	0.323	0.388	0.119	0.044	0.060	0.074
DEK3	0.193	0.301	0.620	0.745	0.411	0.182	0.104	0.035	0.058	0.021
MIN	0.071	0.104	0.300	0.566	0.254	0.126	0.104	0.024	0.031	0.058
DAT	1	6	1	3	16	24	8	30	1	1
SRED	0.117	0.216	0.520	0.876	0.446	0.372	0.123	0.044	0.060	0.051
MAX	0.566	0.415	1.249	1.739	1.739	1.053	0.180	0.104	0.104	0.104
DAT	24	27	30	15	6	3	1	1	1	14

MIN = 0.024 DAT: 30. 08 | SR = 0.289 | MAX = 1.739 DAT: 6. 04

AVERAGE VALUE FOR 510 DAYS IS Q = 0.250 m³/s

WATERCOURSE: VELIČKA RIJEKA

HS: VELIKA

REVIEW OF FLOWS

	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	0.801	0.180	0.127	0.062	0.058	0.151	0.151	0.071	0.151	0.300	1.016	0.620
2	0.801	0.202	0.111	0.059	0.058	0.180	0.125	0.086	0.151	0.300	1.054	0.566
3	0.650	0.225	0.094	0.054	0.058	0.151	0.125	0.104	0.125	0.353	0.886	0.566
4	0.685	0.202	0.082	0.054	0.058	0.151	0.125	0.086	0.125	0.566	0.743	0.566
5	0.681	0.197	0.109	0.078	0.058	0.151	0.125	0.086	0.125	0.566	0.886	0.566
6	0.620	0.202	0.131	0.078	0.072	0.151	0.125	0.086	0.104	0.566	0.743	0.620
7	0.620	0.182	0.113	0.078	0.071	0.151	0.125	0.071	0.104	0.566	0.743	0.886
8	0.743	0.170	0.119	0.064	0.078	0.180	0.104	0.071	0.104	0.566	0.743	0.620
9	0.681	0.179	0.099	0.071	0.098	0.180	0.086	0.071	0.104	0.566	0.743	0.566
10	0.681	0.190	0.119	0.064	0.087	0.214	0.086	0.071	0.125	0.566	0.743	0.485
11	0.654	0.190	0.136	0.071	0.078	0.214	0.086	0.071	0.151	0.566	0.886	0.415
12	0.614	0.239	0.131	0.064	0.078	0.125	0.086	0.071	0.151	0.485	1.054	0.353
13	0.614	0.239	0.131	0.064	0.071	0.086	0.086	0.071	0.254	0.485	1.054	0.353
14	0.517	0.270	0.131	0.058	0.078	0.086	0.071	0.071	0.300	0.415	1.249	0.353
15	0.517	0.259	0.113	0.058	0.078	0.086	0.071	0.071	0.300	0.415	1.476	0.300
16	0.459	0.239	0.113	0.064	0.071	0.086	0.071	0.071	0.254	0.415	1.249	0.300
17	0.459	0.239	0.082	0.064	0.078	0.086	0.071	0.071	0.254	0.353	1.054	0.254
18	0.393	0.190	0.054	0.059	0.087	0.086	0.086	0.071	0.254	0.353	0.886	0.300
19	0.369	0.142	0.054	0.064	0.087	0.086	0.104	0.071	0.254	0.415	0.886	0.300
20	0.334	0.127	0.054	0.072	0.087	0.086	0.086	0.071	0.254	0.485	0.743	0.300
21	0.334	0.142	0.054	0.072	0.087	0.086	0.086	0.071	0.254	0.657	0.743	0.300
22	0.284	0.142	0.054	0.064	0.087	0.214	0.086	0.086	0.300	0.485	0.743	0.353
23	0.267	0.127	0.054	0.064	0.098	0.353	0.086	0.104	0.300	0.485	0.743	0.485
24	0.267	0.127	0.062	0.058	0.125	0.254	0.086	0.353	0.300	0.485	0.743	0.485
25	0.283	0.142	0.054	0.058	0.125	0.214	0.086	0.353	0.300	0.485	0.886	0.415
26	0.283	0.115	0.051	0.058	0.125	0.180	0.086	0.254	0.300	0.485	0.743	0.415
27	0.252	0.115	0.054	0.058	0.125	0.180	0.086	0.214	0.353	0.485	0.743	0.415
28	0.240	0.127	0.054	0.064	0.125	0.151	0.071	0.180	0.300	0.566	0.743	0.415
29	0.217	0.127	0.051	0.064	0.125	0.151	0.086	0.180		0.743	0.743	0.415
30	0.197	0.127	0.047	0.058	0.214	0.125	0.104	0.180		0.886	0.620	0.415
31		0.127	0.051		0.180		0.071	0.151		1.054		0.415
DEK1	0.697	0.193	0.110	0.066	0.069	0.166	0.118	0.080	0.122	0.491	0.830	0.606
DEK2	0.493	0.214	0.100	0.064	0.079	0.103	0.082	0.071	0.243	0.439	1.054	0.323
DEK3	0.262	0.129	0.053	0.062	0.129	0.191	0.085	0.193	0.301	0.620	0.745	0.411
MIN	0.180	0.104	0.024	0.031	0.047	0.071	0.071	0.071	0.104	0.300	0.566	0.254
DAT	30	26	30	1	5	21	9	1	6	1	3	16
SRED	0.484	0.177	0.087	0.064	0.094	0.153	0.094	0.117	0.216	0.520	0.876	0.446
MAX	1.476	0.415	0.254	0.126	0.300	0.743	0.151	0.566	0.415	1.249	1.739	1.739
DAT	5	2	12	5	20	30	22	24	27	30	15	6

MIN = 0.024 DAT: 30. 08 | SR = 0.277 | MAX = 1.739 DAT: 6. 04

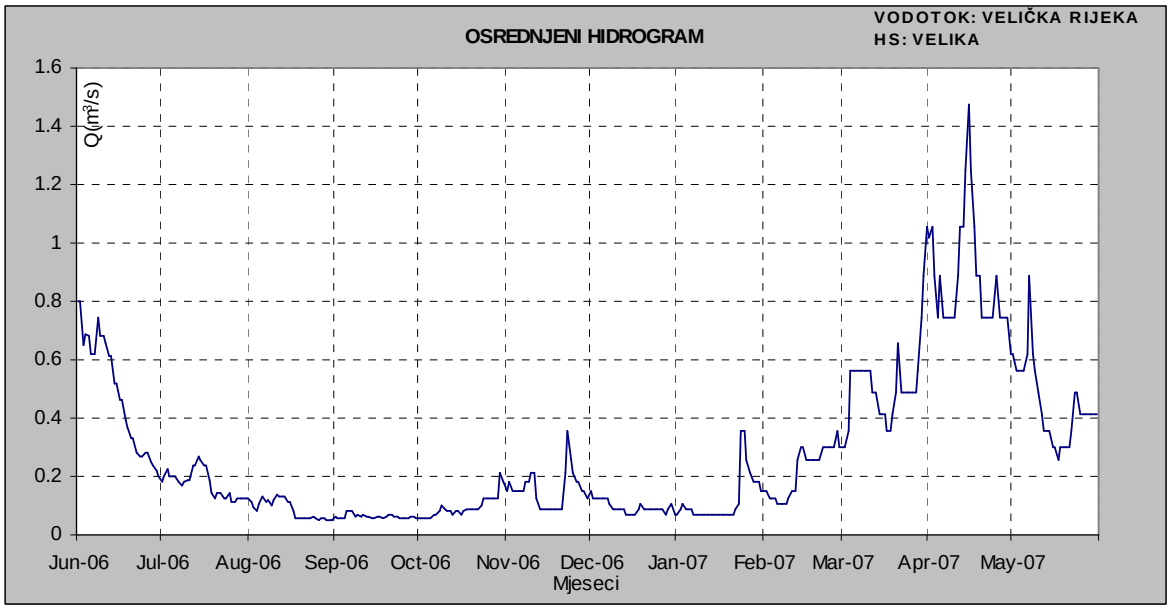


Figure 51

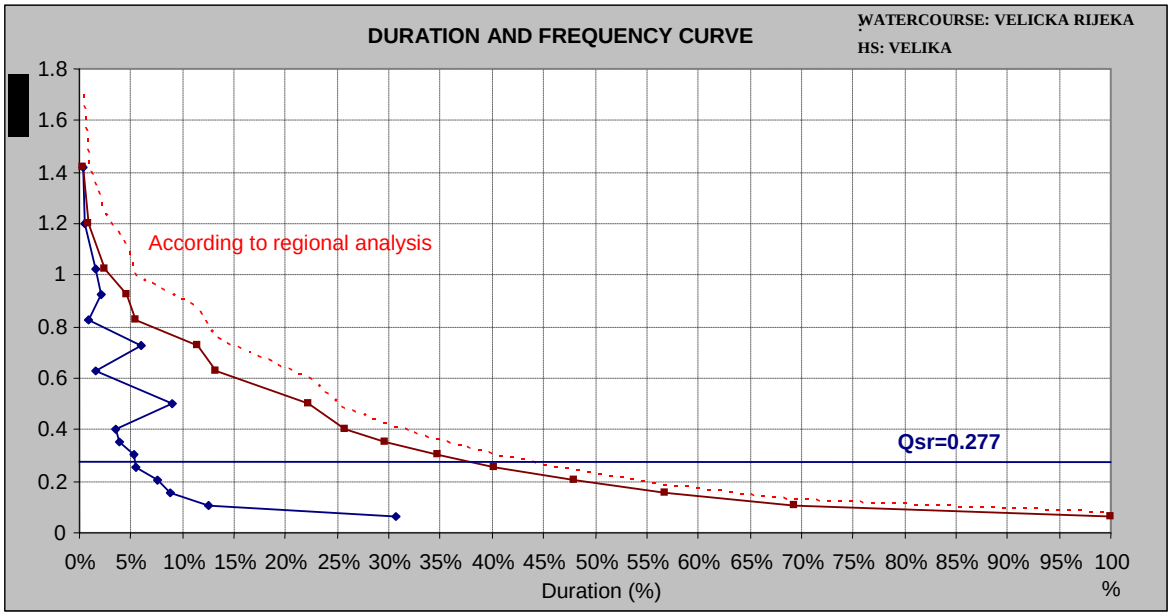
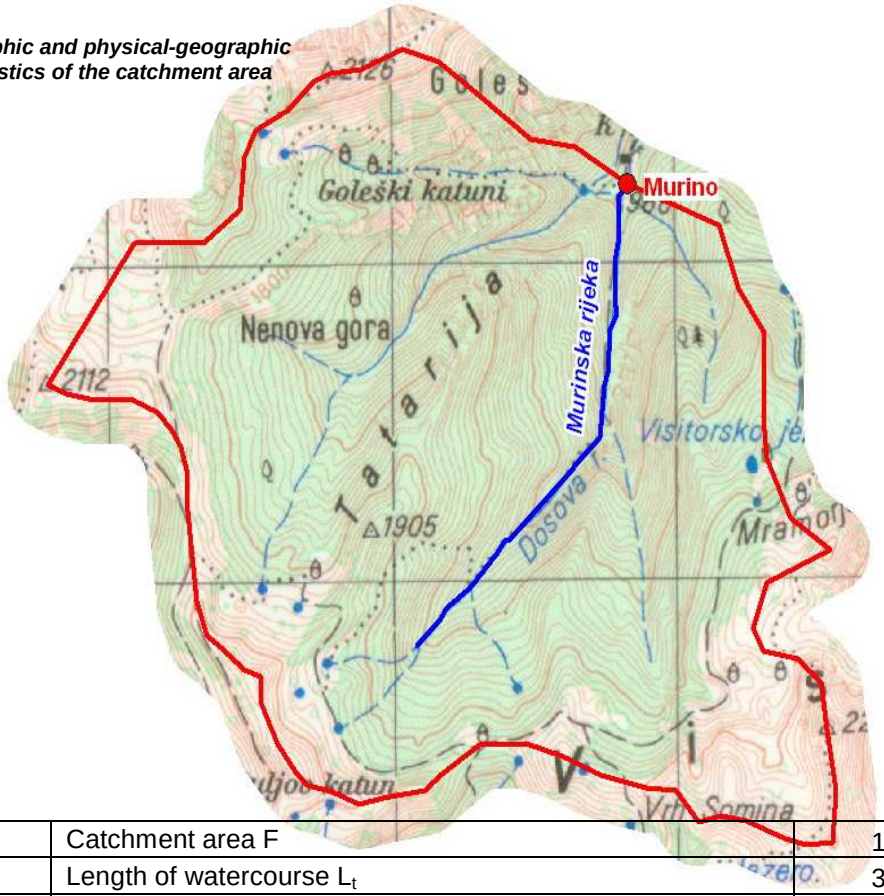


Figure 52

F.5. WATERCOURSE: MURINSKA RIJEKA
HS: MURINO

Murino River is the left tibutary of the river Lim, with general direction of flow in source part Southwest - Northeast and South- North at river's mouth. The length of the watercourse is 3.51 km and the length of the watershed is 18.5 km, which means that the catchment area of the river is rather dispersed. Maximum elevation in the catchment area is 2.211 m.a.s.l while minimum altitude is 960 m.a.s.l. Average head of the catchment area is 45.8% and levelled out head of watercourse is 17%. The table below presents both hydrographic and physical-geographic parameters of the catchment area.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	17.3	[km^2]
2	Length of watercourse L_t	3.51	[km]
3	Length of catchment area L_s	4.7	[km]
4	Perimeter of catchment area S	18.5	[km]
5	Average width of catchment area B=F/L_s	3.67	[km]
6	Rectilinear distance river source - mouth L_i	3.27	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	1.97	[km]
8	Watershed spreading factor K_s	1.26	[-]
9	Elongation of catchment factor K_σ	0.713	[-]
10	Concentration of catchment factor K_c	0.948	[-]
11	Tortousnesness of flow factor K_L	1.07	[-]
12	Maximum altitude in the catchment area H_{max}	2211	[m.a.s.l.]
13	Minimum altitude in the catchment area H_{min}	960	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	45.8	[%]
15	Maximum head of slope of valley I_{max}	53.4	[%]
16	Average altitude of the catchment area H_{sr}	1691	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	731	[m]
18	Levelled out head of watercourse I_t	17.0	[%]
19	Maximum head of the watercourse I_{t1}	48.1	[%]
20	Average maximum head of the watercourse I_{t2}	18.9	[%]

On the page 61 are presented schematic longitudinal profile of the watercourse (figure 53) and hypsometric curve (figure 54). According to hypsometric curve ltitude of the largest part of the catchment area is between 1.100 and 1.900 m.a.s.l, which makes around 45.8% of total catchment area.

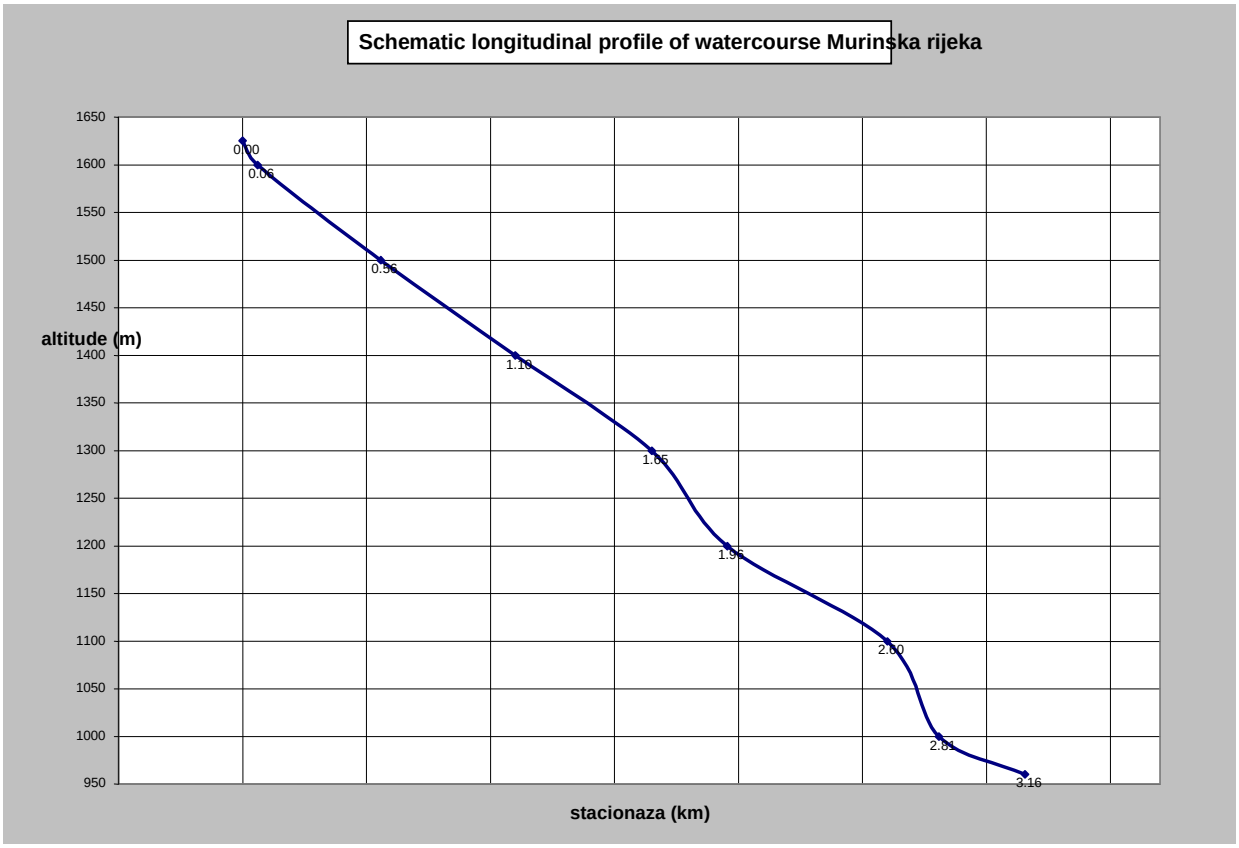


Figure 53

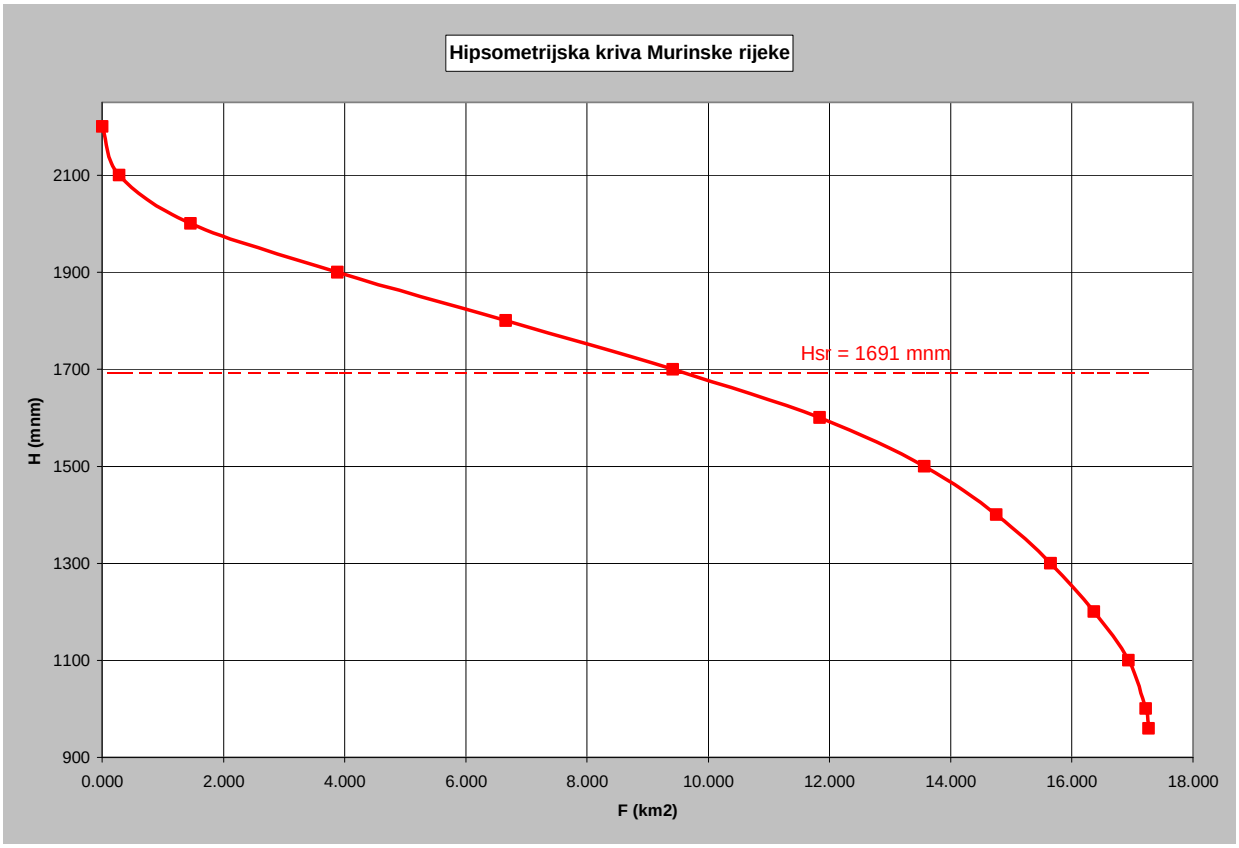


Figure 54

Flow curve (sl.55) is an exponential curve with equation $Q_1 = e^{\frac{H_1 - 32.055}{9.254}}$ applied up to the water level 28, and above this level the following is applied $Q_2 = e^{\frac{H_2 - 34.319}{11.941}}$.

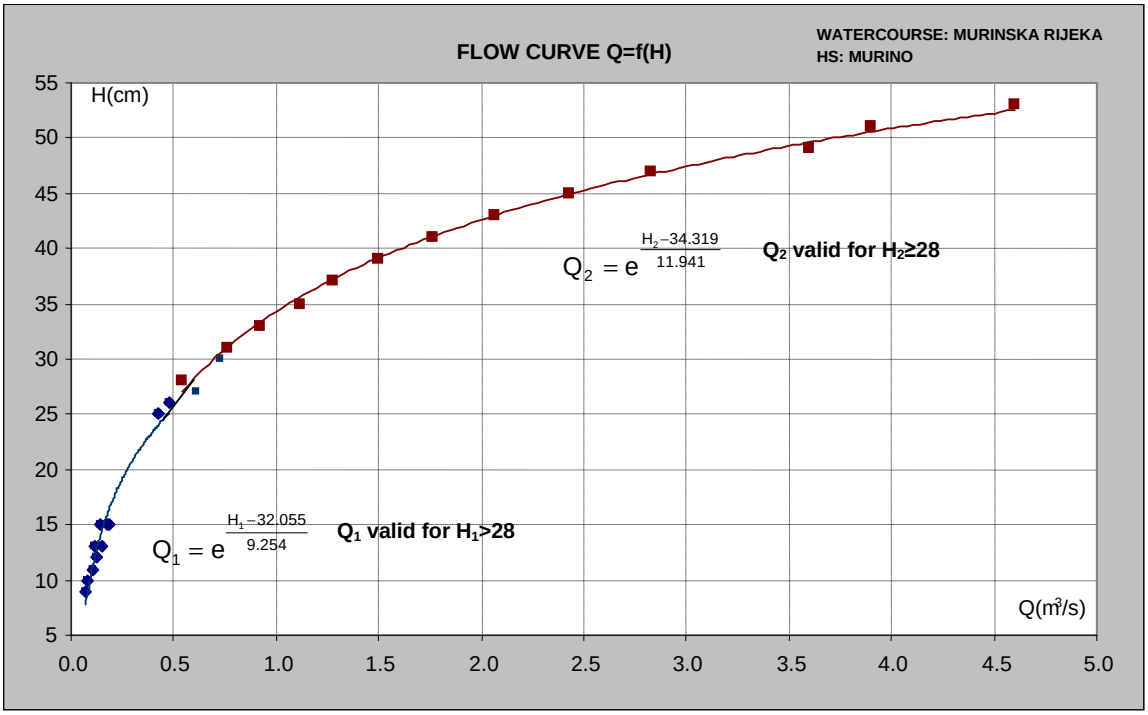


Figure 55

Overview of the flow both for whole period of analysis and for calendar year is shown on the page 63.

Maximum flow of 3.42 m^3/s from June 2007 was 3 times higher than average daily flow for that day while absolute minimum of 83 l/s from August 2007 was 1.27 times lower than average daily flow for that day. The months with the largest quantity of water were April and May 2007, while the months with the lowest quantity of water were August and September 2007.

Hydrograph of runoff (figure 56) as well as curve of duration and frequency (diagram 57) are shown on the page 64. Average annual flow and all flows above it had duration of 33% or 120 days per year. Other characteristic durations of the flow are presented in the following table.

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	1.5	0.905	0.548	0.357	0.262	0.214	0.167	0.143	0.119

WATERCOURSE: MURINSKA RIJEKA
HS: MURINO

REVIEW OF FLOWS - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1	2.446	2.446	0.176	0.128	0.115	0.128	0.176
2	2.446	2.446	0.176	0.128	0.115	0.128	0.176
3	2.069	2.250	0.158	0.128	0.128	0.128	0.176
4	1.903	2.069	0.158	0.115	0.128	0.128	0.158
5	1.750	1.609	0.272	0.115	0.142	0.128	0.158
6	1.609	1.151	0.176	0.115	0.176	0.128	0.158
7	1.609	0.757	0.176	0.115	0.158	0.128	0.158
8	1.750	0.579	0.158	0.115	0.158	0.128	0.142
9	1.750	0.376	0.158	0.103	0.176	0.128	0.142
10	1.750	0.376	0.176	0.103	0.158	0.142	0.219
11	1.750	0.337	0.219	0.103	0.158	0.128	0.197
12	1.750	0.303	0.176	0.103	0.158	0.115	0.176
13	1.750	0.303	0.176	0.103	0.158	0.115	0.176
14	1.609	0.303	0.176	0.103	0.142	0.115	0.158
15	1.609	0.272	0.158	0.103	0.142	0.115	0.158
16	1.480	0.272	0.158	0.103	0.142	0.128	0.158
17	1.480	0.272	0.142	0.115	0.142	0.128	0.158
18	1.480	0.244	0.128	0.115	0.142	0.128	0.219
19	1.361	0.244	0.128	0.128	0.142	0.128	0.272
20	1.361	0.244	0.128	0.115	0.142	0.128	0.244
21	1.361	0.219	0.128	0.128	0.142	0.128	0.244
22	1.252	0.219	0.128	0.128	0.128	0.467	0.244
23	1.252	0.219	0.115	0.115	0.142	0.757	0.219
24	1.252	0.197	0.115	0.115	0.128	0.467	0.197
25	1.361	0.197	0.115	0.115	0.128	0.337	0.197
26	1.480	0.197	0.158	0.103	0.128	0.272	0.197
27	1.609	0.197	0.128	0.115	0.128	0.244	0.176
28	1.750	0.176	0.158	0.128	0.128	0.219	0.176
29	1.903	0.176	0.128	0.128	0.128	0.197	0.176
30	2.069	0.176	0.142	0.128	0.158	0.197	0.158
31		0.176	0.142		0.142		0.158
DEK1	1.908	1.406	0.179	0.116	0.145	0.129	0.167
DEK2	1.563	0.279	0.159	0.109	0.147	0.122	0.192
DEK3	1.529	0.195	0.132	0.120	0.134	0.328	0.195
MIN	1.059	0.176	0.115	0.103	0.115	0.115	0.142
DAT	28	20	9	1	11	7	1
SRED	1.667	0.613	0.156	0.115	0.142	0.193	0.185
MAX	2.892	0.419	0.520	0.142	0.197	1.151	0.303
DAT	1	9	5	1	6	23	19

MIN = 0.103 DAT: 1. 09 | SR = 0.436 | MAX = 2.892 DAT: 1. 06

WATERCOURSE: MURINSKA RIJEKA
HS: MURINO

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.158	0.244	0.303	0.467	1.480	0.641	0.244	0.115	0.083	0.103
2	0.197	0.219	0.419	0.467	1.480	0.589	0.244	0.115	0.092	0.103
3	0.219	0.219	0.645	0.520	1.361	0.641	0.219	0.115	0.092	0.103
4	0.176	0.197	0.892	0.520	1.750	0.641	0.219	0.115	0.083	0.103
5	0.176	0.197	0.892	0.520	2.069	0.641	0.219	0.115	0.128	0.103
6	0.158	0.197	0.719	0.467	2.892	0.641	0.197	0.128	0.128	0.103
7	0.158	0.197	0.645	0.467	2.892	0.696	0.197	0.128	0.128	0.115
8	0.158	0.197	0.645	0.520	2.446	0.696	0.197	0.115	0.103	0.115
9	0.158	0.219	0.579	0.520	2.250	0.641	0.176	0.115	0.115	0.115
10	0.158	0.244	0.579	0.579	2.069	0.641	0.176	0.115	0.103	0.115
11	0.142	0.244	0.520	0.641	1.903	0.641	0.176	0.115	0.115	0.115
12	0.142	0.272	0.467	0.696	1.903	0.641	0.176	0.115	0.115	0.115
13	0.142	0.467	0.419	0.823	1.750	0.589	0.176	0.103	0.115	0.128
14	0.142	0.520	0.419	0.974	1.750	0.589	0.158	0.103	0.103	0.128
15	0.142	0.419	0.376	1.151	1.609	0.579	0.158	0.103	0.103	0.128
16	0.142	0.337	0.376	1.151	1.480	0.520	0.158	0.103	0.103	0.115
17	0.142	0.303	0.337	1.059	1.361	0.520	0.142	0.103	0.103	0.115
18	0.142	0.272	0.337	0.974	1.252	0.467	0.142	0.103	0.092	0.115
19	0.158	0.272	0.376	0.974	1.059	0.419	0.142	0.115	0.103	0.115
20	0.158	0.272	0.419	0.974	0.895	0.419	0.142	0.103	0.103	0.115
21	0.142	0.272	0.419	1.059	0.895	0.376	0.142	0.103	0.103	0.115
22	0.158	0.272	0.376	1.151	1.059	0.337	0.142	0.092	0.103	0.115
23	0.176	0.272	0.376	1.361	1.252	0.337	0.128	0.092	0.103	0.115
24	0.719	0.272	0.337	1.480	1.151	0.303	0.128	0.092	0.103	
25	0.520	0.272	0.337	1.609	0.974	0.303	0.128	0.092	0.103	
26	0.419	0.303	0.337	1.609	0.895	0.272	0.128	0.092	0.103	
27	0.337	0.337	0.337	1.480	0.823	0.272	0.128	0.092	0.103	
28	0.303	0.303	0.376	1.480	0.823	0.272	0.115	0.092	0.103	
29	0.272		0.376	1.361	0.823	0.244	0.115	0.083	0.103	
30	0.244		0.467	1.480	0.757	0.244	0.115	0.083	0.103	
31	0.244		0.520		0.696		0.115	0.083		
DEK1	0.172	0.213	0.632	0.504	2.069	0.647	0.209	0.117	0.105	0.107
DEK2	0.145	0.338	0.405	0.942	1.496	0.538	0.157	0.106	0.105	0.118
DEK3	0.321	0.288	0.387	1.407	0.923	0.296	0.125	0.091	0.103	0.031
MIN	0.142	0.176	0.303	0.467	0.696	0.244	0.115	0.083	0.083	0.092
DAT	10	6	1	1	30	28	27	29	1	4
SRED	0.216	0.279	0.472	0.951	1.477	0.494	0.163	0.104	0.104	0.084
MAX	0.757	0.589	0.823	1.750	3.419	0.895	0.272	0.128	0.158	0.158
DAT	24	13	4	24	6	3	1	6	5	14

MIN = 0.083 DAT: 29. 08 | SR = 0.447 | MAX = 3.419 DAT: 6. 06

WATERCOURSE: MURINSKA RIJEKA
HS: MURINO

REVIEW OF FLOWS

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	1.543	1.345	0.145	0.105	0.109	0.128	0.176	0.158	0.244	0.303	0.467	1.480
2	1.518	1.345	0.145	0.110	0.109	0.128	0.176	0.197	0.219	0.419	0.467	1.480
3	1.355	1.234	0.136	0.110	0.115	0.128	0.176	0.219	0.219	0.645	0.520	1.361
4	1.272	1.144	0.136	0.099	0.115	0.128	0.158	0.176	0.197	0.892	0.520	1.750
5	1.195	0.914	0.193	0.121	0.122	0.128	0.158	0.176	0.197	0.892	0.520	2.069
6	1.125	0.674	0.152	0.121	0.140	0.128	0.158	0.158	0.197	0.719	0.467	2.892
7	1.153	0.477	0.152	0.121	0.136	0.128	0.158	0.158	0.197	0.645	0.467	2.892
8	1.223	0.388	0.136	0.109	0.136	0.128	0.142	0.158	0.197	0.645	0.520	2.446
9	1.195	0.276	0.136	0.109	0.145	0.128	0.142	0.158	0.219	0.579	0.520	2.250
10	1.195	0.276	0.145	0.103	0.136	0.142	0.219	0.158	0.244	0.579	0.579	2.069
11	1.195	0.257	0.167	0.109	0.136	0.128	0.197	0.142	0.244	0.520	0.719	1.903
12	1.195	0.240	0.145	0.109	0.136	0.115	0.176	0.142	0.272	0.467	0.801	1.903
13	1.169	0.240	0.140	0.109	0.143	0.115	0.176	0.142	0.467	0.419	0.823	1.750
14	1.099	0.231	0.140	0.103	0.135	0.115	0.158	0.142	0.520	0.419	0.974	1.750
15	1.094	0.215	0.131	0.103	0.135	0.115	0.158	0.142	0.419	0.376	1.151	1.609
16	1.000	0.215	0.131	0.103	0.128	0.128	0.158	0.142	0.337	0.376	1.151	1.480
17	1.000	0.207	0.122	0.109	0.128	0.128	0.158	0.142	0.303	0.337	1.059	1.361
18	0.973	0.193	0.115	0.103	0.128	0.128	0.219	0.142	0.272	0.337	0.974	1.252
19	0.890	0.193	0.121	0.115	0.128	0.128	0.272	0.158	0.272	0.376	0.974	1.059
20	0.890	0.193	0.115	0.109	0.128	0.128	0.244	0.158	0.272	0.419	0.974	0.895
21	0.868	0.181	0.115	0.115	0.128	0.128	0.244	0.142	0.272	0.419	1.059	0.895
22	0.795	0.181	0.110	0.115	0.121	0.467	0.244	0.158	0.272	0.376	1.151	1.059
23	0.795	0.173	0.103	0.109	0.128	0.757	0.219	0.176	0.272	0.376	1.361	1.252
24	0.777	0.162	0.103	0.109	0.128	0.467	0.197	0.719	0.272	0.337	1.480	1.151
25	0.832	0.162	0.103	0.109	0.128	0.337	0.197	0.520	0.272	0.337	1.609	0.974
26	0.876	0.162	0.125	0.103	0.128	0.272	0.197	0.419	0.303	0.337	1.609	0.895
27	0.941	0.162	0.110	0.109	0.128	0.244	0.176	0.337	0.337	0.337	1.480	0.823
28	1.011	0.145	0.125	0.115	0.128	0.219	0.176	0.303	0.303	0.376	1.480	0.823
29	1.073	0.145	0.105	0.115	0.128	0.197	0.176	0.272		0.376	1.361	0.823
30	1.156	0.145	0.112	0.115	0.158	0.197	0.158	0.244		0.467	1.480	0.757
31		0.145	0.112		0.142		0.158	0.244		0.520		0.696
DEK1	1.277	0.807	0.148	0.111	0.126	0.129	0.167	0.172	0.213	0.632	0.504	2.069
DEK2	1.051	0.218	0.133	0.107	0.133	0.122	0.192	0.145	0.338	0.405	0.960	1.496
DEK3	0.912	0.160	0.111	0.111	0.131	0.328	0.195	0.321	0.288	0.387	1.407	0.923
MIN	0.244	0.115	0.083	0.083	0.092	0.115	0.142	0.142	0.176	0.303	0.467	0.801
DAT	28	27	29	1	4	7	1	10	6	1	1	30
SRED	1.080	0.388	0.130	0.110	0.130	0.193	0.185	0.216	0.279	0.472	0.957	1.477
MAX	2.892	0.419	0.520	0.158	0.197	1.151	0.303	0.757	0.589	0.823	1.750	3.419
DAT	1	9	5	5	6	23	19	24	13	4	24	6

MIN = 0.083 DAT: 29. 08 | SR = 0.468 | MAX = 3.419 DAT: 6. 06

AVERAGE VALUE FOR 374 DAYS IS Q = 0.443 m^3/s

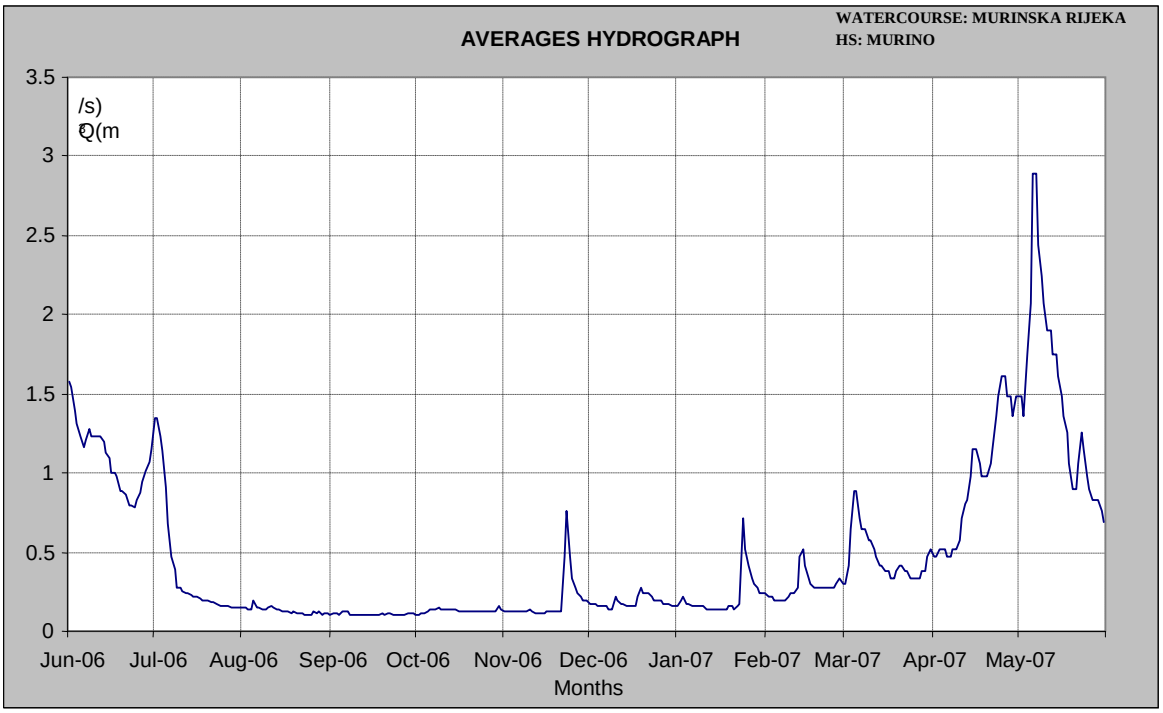


Figure 56

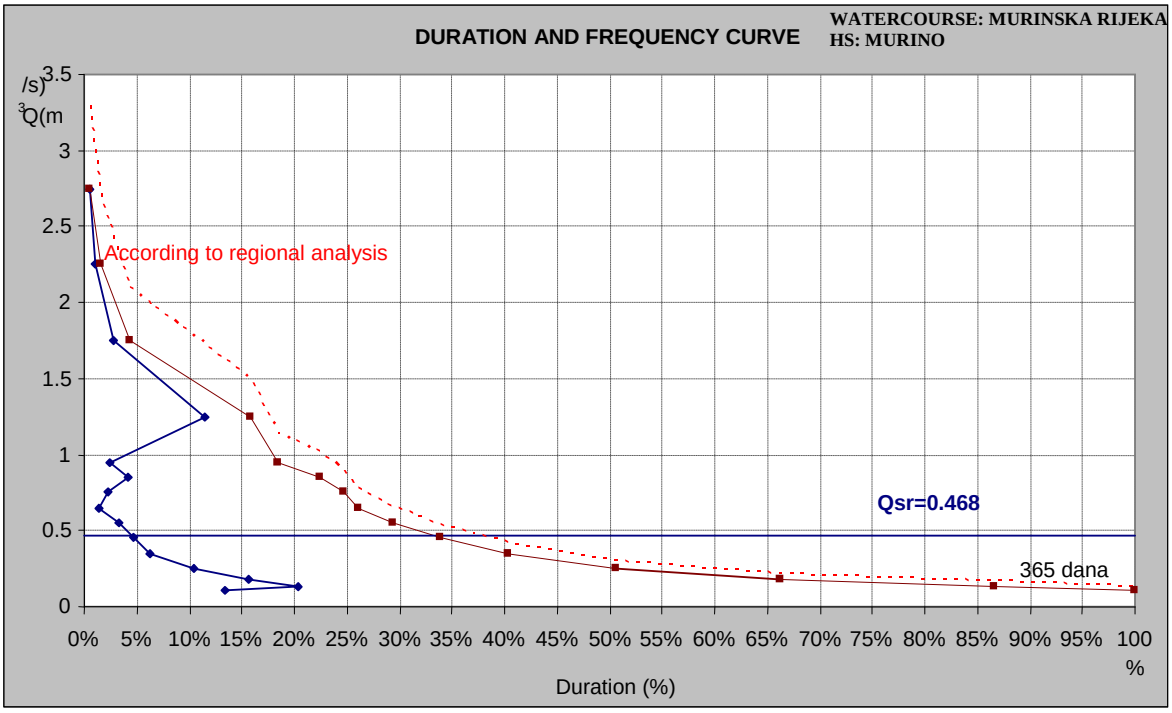


Figure 57

F.6. WATERCOURSE: BABINOPOLJSKA RIJEKA
HS: BABINO POLJE

This is tributary of Komarca river, which means that it is second level tributary of the river Lim. General direction of the flow in its spring part is Southwest-Northeast, in mid part South-North and in the lower part East-West. The length of the watercourse is 8.03 km, catchment area is 26.0 km, length of the watershed 23.7 km, maximum elevation in the catchment area is 2.426 m.a.s.l., minimum altitude 1410 m.a.s.l. and average head is 2.63%, average altitude 1.894 m.a.s.l and levelled out head of watercourse 5.56%. These and other parameters of the catchment area are shown in the following table.

Hydrographic and physical-geographic characteristics of the catchment area

1	Catchment area F	26.0	[km^2]
2	Length of watercourse L_t	8.03	[km]
3	Length of catchment area L_s	8.7	[km]
4	Perimeter of catchment area S	23.7	[km]
5	Average width of catchment area $B=F/L_s$	2.99	[km]
6	Rectilinear distance river source - mouth L_i	5.63	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.01	[km]
8	Watershed spreading factor K_s	1.31	[-]
9	Elongation of catchment factor K_σ	2.48	[-]
10	Concentration of catchment factor K_c	0.731	[-]
11	Tortousnesness of flow factor K_L	1.43	[-]
12	Maximum altitude in the catchment area H_{max}	2426	[m.a.s.l.]
13	Minimum altitude in the catchment area H_{min}	1410	[m.a.s.l.]
14	Average head in the catchment area I_{sr}	2.63	[%]
15	Maximum head of slope of valley I_{max}	55.9	[%]
16	Average altitude of the catchment area H_{sr}	1894	[m.a.s.l.]
17	Average difference in altitude of the catchment area ΔH	484	[m]
18	Levelled out head of watercourse I_t	5.56	[%]
19	Maximum head of the watercourse I_{t1}	36.5	[%]
20	Average maximum head of the watercourse I_{t2}	7.56	[%]

Longitudinal profile of the watercourse (figure 58) and hypsometric curve (figure 59) are shown on the page 66. By observing hypsometric curve it could be seen that elevation of the largest part of catchment area is between 1.600 and 2.200 m.a.sl. and amounts to 83%.

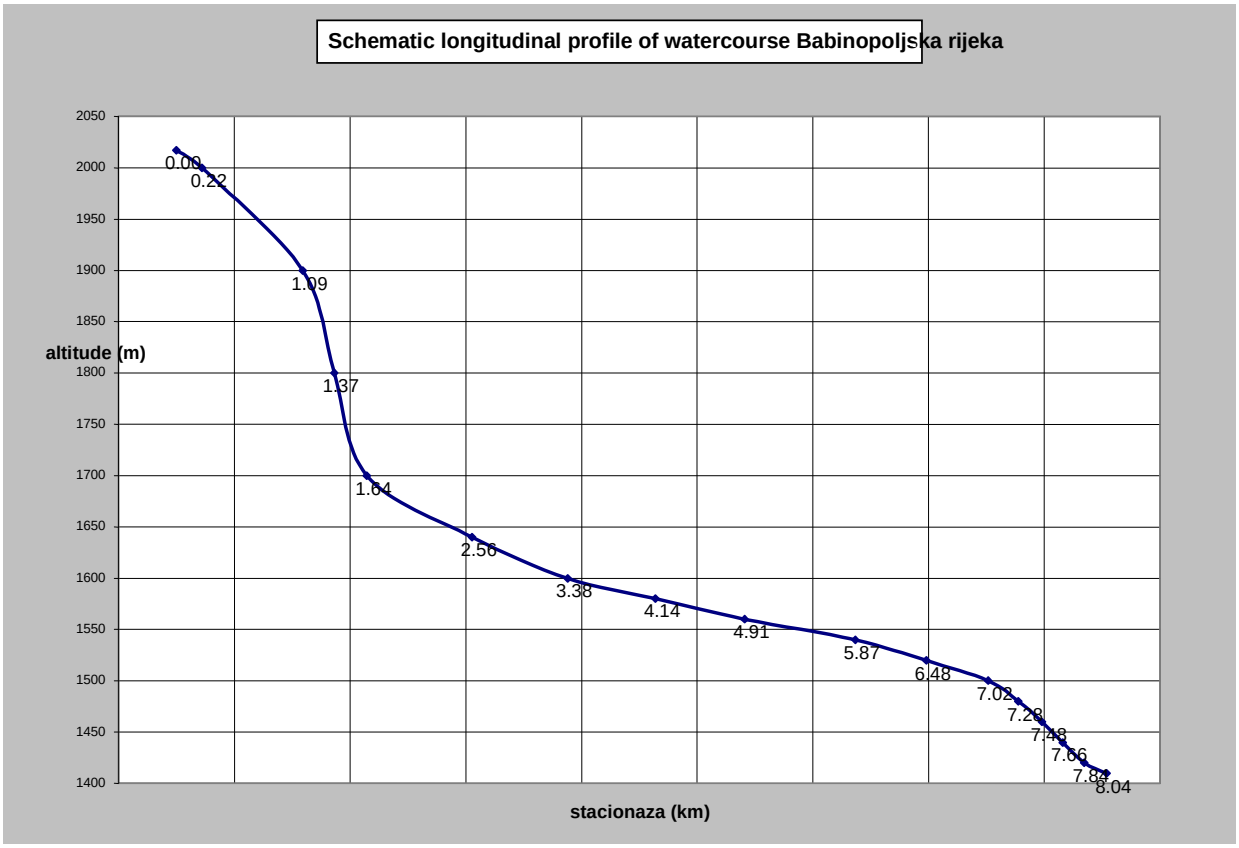


Figure 58

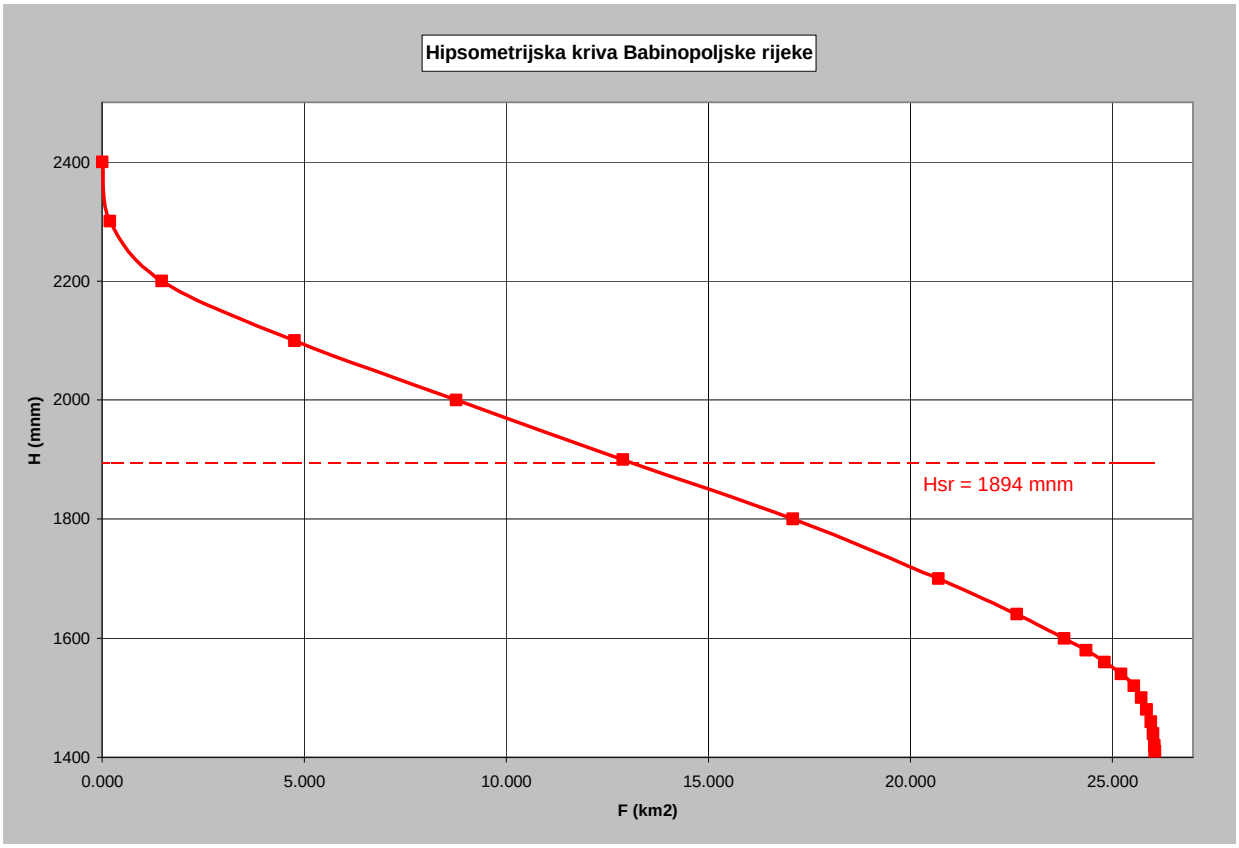


Figure 59

Flow curve (Figure 60) is a function for which maximum measurement is rejected. For water levels lower than 60 cm the curve $Q_1 = \left(\frac{H_1}{67.897}\right)^{6.341}$ is applied and for water levels higher than 60 cm the following is applied $Q_2 = \left(\frac{H_2}{64.705}\right)^{9.709}$

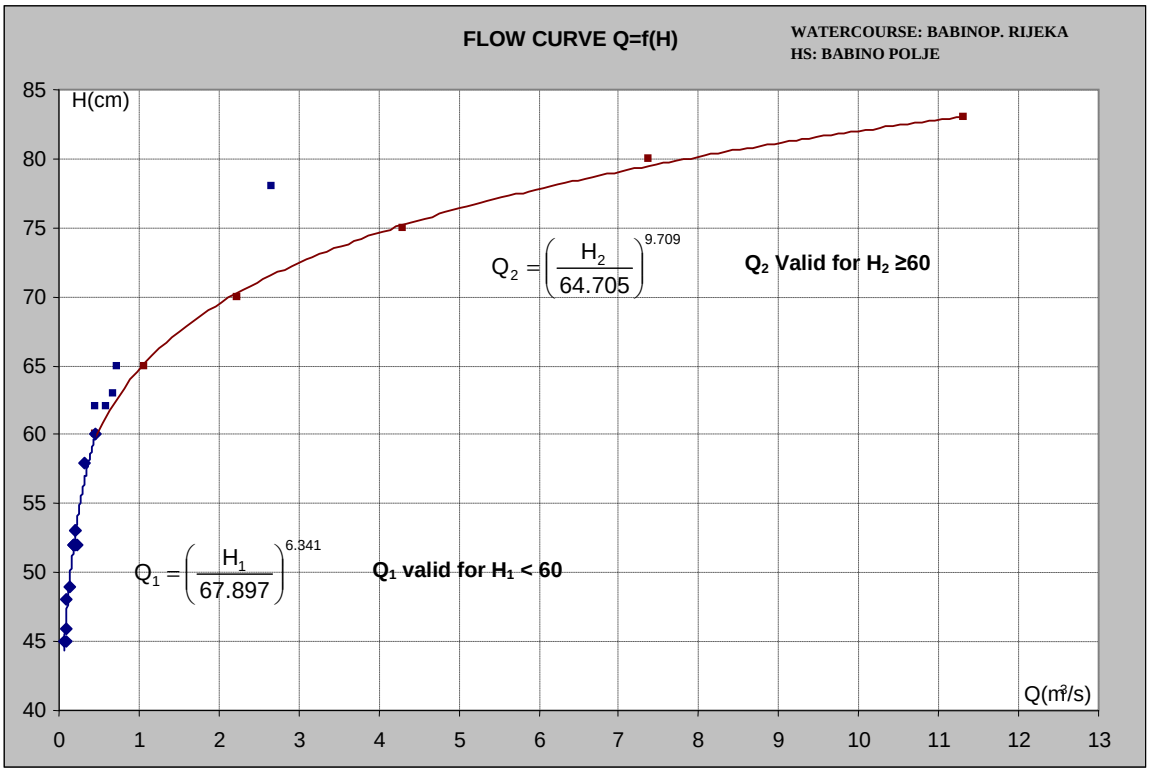


Figure 60

A balance for overall analysed period and for calendar year is prepared based on these curves. Overview of those flows is presented on the page 68.
The months with the biggest volumes of water were May and June 2007, while the driest months were July and August 2007. Absolute maximum of 11.2 m^3/s from June 2007 was 3.47 times higher than average daily flow for that day, while absolute minimum of 64 l/s from July 2007 was 1.70 times lower than average daily flow for that same day.

Hydrograph of runoff (Figure 61) as well as duration and frequency curve (Figure 62) are shown on the page 69.
According to duration curve, average annual flow and all flows bigger than it lasted only 21% i.e. 77 days. Other characteristic durations from flow curve are presented in the following table.

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	2.85	1	0.462	0.308	0.269	0.251	0.231	0.192	0.154

WATERCOURSE: BABINOPOLJSKA RIJEKA

HS: BABINO POLJE

REVIEW OF FLOWS - 2006

	JUL	AUG	SEP	OCT	NOV	DEC
1		0.163	0.163	0.184	0.184	0.295
2		0.163	0.144	0.184	0.184	0.295
3		0.144	0.144	0.163	0.184	0.263
4		0.144	0.126	0.163	0.184	0.263
5		0.410	0.126	0.208	0.208	0.263
6		0.263	0.126	0.368	0.208	0.234
7		0.234	0.097	0.295	0.234	0.234
8	0.410	0.208	0.097	0.368	0.234	0.234
9	0.368	0.184	0.085	0.899	0.234	0.234
10	0.368	0.263	0.097	0.564	0.234	0.330
11	0.330	0.330	0.097	0.410	0.234	0.295
12	0.330	0.263	0.097	0.368	0.208	0.263
13	0.295	0.263	0.085	0.330	0.208	0.263
14	0.295	0.263	0.085	0.295	0.234	0.263
15	0.295	0.234	0.097	0.295	0.234	0.263
16	0.263	0.208	0.097	0.295	0.234	0.234
17	0.263	0.184	0.111	0.263	0.234	0.234
18	0.208	0.163	0.144	0.263	0.234	0.295
19	0.208	0.144	0.144	0.234	0.234	0.295
20	0.184	0.126	0.163	0.234	0.234	0.295
21	0.184	0.144	0.184	0.234	0.234	0.263
22	0.184	0.126	0.163	0.234	0.507	0.263
23	0.163	0.126	0.163	0.208	0.622	0.263
24	0.144	0.126	0.144	0.208	0.457	0.263
25	0.144	0.144	0.144	0.208	0.410	0.263
26	0.184	0.208	0.144	0.184	0.368	0.263
27	0.208	0.163	0.208	0.184	0.330	0.263
28	0.184	0.184	0.295	0.184	0.330	0.263
29	0.184	0.163	0.234	0.184	0.330	0.263
30	0.208	0.163	0.208	0.234	0.295	0.263
31	0.184	0.163		0.208		0.263
DEK1	0.115	0.218	0.121	0.340	0.209	0.265
DEK2	0.276	0.222	0.111	0.323	0.229	0.275
DEK3	0.179	0.156	0.189	0.206	0.388	0.263
MIN	0.111	0.111	0.074	0.163	0.184	0.234
DAT	24	3	13	3	1	4
SR	0.187	0.196	0.140	0.279	0.275	0.266
MAX	0.410	2.463	0.292	1.403	2.821	0.480
DAT	9	5	27	9	22	10

MIN = 0.111 DAT: 24. 06 | SR = 0.239 | MAX = 2.821 DAT: 22. 11

WATERCOURSE: BABINOPOLJSKA RIJEKA

HS: BABINO POLJE

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OKT
1	0.234	0.234	0.295	0.564	4.193	1.403	0.263	0.085	0.085	0.144
2	0.184	0.208	0.330	0.661	4.193	1.045	0.263	0.074	0.085	0.126
3	0.184	0.184	0.408	0.772	3.681	1.212	0.234	0.074	0.085	0.111
4	0.184	0.163	0.661	0.899	4.769	1.212	0.208	0.074	0.074	0.111
5	0.163	0.163	0.564	0.899	6.945	3.226	0.208	0.085	0.330	0.111
6	0.163	0.163	0.564	0.899	9.973	3.226	0.234	0.184	0.263	0.126
7	0.163	0.163	0.564	1.045	7.847	2.463	0.208	0.184	0.234	0.126
8	0.163	0.184	0.661	1.212	6.137	3.681	0.184	0.144	0.208	0.126
9	0.163	0.184	0.661	1.403	5.414	2.821	0.184	0.111	0.184	0.126
10	0.163	0.184	0.564	1.866	5.414	2.463	0.163	0.111	0.184	0.144
11	0.163	0.208	0.564	2.146	5.414	1.866	0.163	0.097	0.184	0.295
12	0.163	0.234	0.480	2.463	4.769	1.620	0.163	0.097	0.234	0.295
13	0.163	0.263	0.410	3.226	4.193	1.403	0.163	0.097	0.184	0.368
14	0.163	0.263	0.410	4.193	4.193	1.212	0.163	0.097	0.144	0.295
15	0.163	0.263	0.410	4.193	3.681	1.045	0.163	0.085	0.126	0.263
16	0.163	0.263	0.410	3.681	2.821	0.899	0.144	0.085	0.126	0.263
17	0.163	0.234	0.480	2.821	2.463	0.772	0.126	0.085	0.126	0.234
18	0.163	0.234	0.480	2.821	2.146	0.661	0.126	0.234	0.111	0.208
19	0.163	0.234	0.564	3.226	1.866	0.564	0.126	0.263	0.126	0.234
20	0.184	0.234	0.564	2.821	2.146	0.480	0.097	0.163	0.144	0.208
21	0.184	0.263	0.564	3.226	2.463	0.368	0.097	0.126	0.126	0.208
22	0.184	0.295	0.480	3.681	2.463	0.368	0.111	0.126	0.126	0.330
23	0.208	0.295	0.480	4.193	2.146	0.368	0.097	0.126	0.126	0.295
24	0.368	0.295	0.410	4.193	2.146	0.368	0.074	0.085	0.111	
25	0.295	0.295	0.368	4.769	1.620	0.295	0.074	0.097	0.111	
26	0.295	0.295	0.368	4.193	1.866	0.263	0.074	0.097	0.111	
27	0.263	0.295	0.368	3.681	1.620	0.234	0.074	0.085	0.126	
28	0.263	0.295	0.330	3.681	1.620	0.234	0.074	0.085	0.163	
29	0.263		0.368	3.681	2.146	0.234	0.074	0.074	0.163	
30	0.234		0.480	4.193	1.866	0.263	0.074	0.074	0.144	
31	0.234		0.564		1.620		0.074	0.074		
DEK1	0.176	0.183	0.527	1.022	5.857	2.275	0.215	0.112	0.173	0.125
DEK2	0.165	0.243	0.478	3.159	3.369	1.052	0.143	0.130	0.151	0.266
DEK3	0.254	0.291	0.435	3.949	1.961	0.300	0.081	0.095	0.131	0.076
MIN	0.144	0.144	0.295	0.480	1.403	0.207	0.064	0.064	0.064	0.097
DAT	17	7	1	1	28	25	24	29	4	3
SRED	0.200	0.235	0.478	2.710	3.672	1.209	0.144	0.112	0.152	0.153
MAX	0.564	0.330	0.772	6.137	11.218	6.137	0.295	7.847	0.480	0.410
DAT	24	13	4	24	6	8	1	18	5	11

MIN = 0.064 DAT: 24. 07 | SR = 0.933 | MAX = 11.22 DAT: 6. 06

WATERCOURSE: BABINOPOLJSKA RIJEKA

HS: BABINO POLJE

REVIEW OF FLOWS

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1	0.263	0.124	0.124	0.164	0.184	0.295	0.234	0.234	0.295	0.564	4.193	1.403
2	0.263	0.118	0.114	0.155	0.184	0.295	0.184	0.208	0.330	0.661	4.193	1.045
3	0.234	0.109	0.114	0.137	0.184	0.263	0.184	0.184	0.408	0.772	3.681	1.212
4	0.208	0.109	0.100	0.137	0.184	0.263	0.184	0.163	0.661	0.899	4.769	1.212
5	0.208	0.248	0.228	0.159	0.208	0.263	0.163	0.163	0.564	0.899	6.945	3.226
6	0.234	0.224	0.195	0.247	0.208	0.234	0.163	0.163	0.564	0.899	9.973	3.226
7	0.208	0.209	0.166	0.211	0.234	0.234	0.163	0.163	0.564	1.045	7.847	2.463
8	0.297	0.176	0.153	0.247	0.234	0.234	0.163	0.184	0.661	1.212	6.137	3.681
9	0.276	0.148	0.135	0.513	0.234	0.234	0.163	0.184	0.661	1.403	5.414	2.821
10	0.266	0.187	0.141	0.354	0.234	0.330	0.163	0.184	0.564	1.866	5.414	2.463
11	0.246	0.213	0.141	0.353	0.234	0.295	0.163	0.208	0.564	2.146	5.414	1.866
12	0.246	0.180	0.166	0.332	0.208	0.263	0.163	0.234	0.480	2.463	4.769	1.620
13	0.229	0.180	0.135	0.349	0.208	0.263	0.163	0.263	0.410	3.226	4.193	1.403
14	0.229	0.180	0.114	0.295	0.234	0.263	0.163	0.263	0.410	4.193	4.193	1.212
15	0.229	0.159	0.112	0.279	0.234	0.263	0.163	0.263	0.410	4.193	3.681	1.045
16	0.203	0.146	0.112	0.279	0.234	0.234	0.163	0.263	0.410	3.681	2.821	0.899
17	0.195	0.135	0.119	0.249	0.234	0.234	0.163	0.234	0.480	2.821	2.463	0.772
18	0.167	0.199	0.127	0.235	0.234	0.295	0.163	0.234	0.480	2.821	2.146	0.661
19	0.167	0.203	0.135	0.234	0.234	0.295	0.163	0.234	0.564	3.226	1.866	0.564
20	0.141	0.145	0.153	0.221	0.234	0.295	0.184	0.234	0.564	2.821	2.146	0.480
21	0.141	0.135	0.155	0.221	0.234	0.263	0.184	0.263	0.564	3.226	2.463	0.368
22	0.148	0.126	0.145	0.282	0.507	0.263	0.184	0.295	0.480	3.681	2.463	0.368
23	0.130	0.126	0.145	0.251	0.622	0.263	0.208	0.295	0.480	4.193	2.146	0.368
24	0.109	0.106	0.127	0.208	0.457	0.263	0.368	0.295	0.410	4.193	2.146	0.368
25	0.109	0.120	0.127	0.208	0.410	0.263	0.295	0.295	0.368	4.769	1.620	0.295
26	0.129	0.153	0.127	0.184	0.368	0.263	0.295	0.295	0.368	4.193	1.866	0.263
27	0.141	0.124	0.167	0.184	0.330	0.263	0.263	0.295	0.368	3.681	1.620	0.234
28	0.129	0.135	0.229	0.184	0.330	0.263	0.263	0.295	0.330	3.681	1.620	0.234
29	0.129	0.118	0.199	0.184	0.330	0.263	0.263		0.368	3.681	2.146	0.234
30	0.141	0.118	0.176	0.234	0.295	0.263	0.234		0.480	4.193	1.866	0.263
31	0.129	0.118		0.208		0.263	0.234		0.564		1.620	
DEK1	0.246	0.165	0.147	0.232	0.209	0.265	0.176	0.183	0.527	1.022	5.857	2.275
DEK2	0.205	0.174	0.131	0.283	0.229	0.270	0.165	0.243	0.478	3.159	3.369	1.052
DEK3	0.130	0.125	0.160	0.214	0.388	0.263	0.254	0.291	0.435	3.949	1.961	0.300
MIN	0.064	0.064	0.064	0.097	0.184	0.234	0.144	0.144	0.295	0.480	1.403	0.207
DAT	24	29	4	3	1	4	17	7	1	1	28	25
SRED	0.192	0.154	0.146	0.242	0.275	0.266	0.200	0.235	0.478	2.710	3.672	1.209
MAX	0.410	7.847	0.480	1.403	2.821	0.480	0.564	0.330	0.772	6.137	11.218	6.137
DAT	9	18	5	9	22	10	24	13	4	24	6	8

MIN = 0.064 DAT: 24. 07 | SR = 0.817 | MAX = 11.22 DAT: 6. 06

AVERAGE VALUE FOR 473 DAYS IS Q = 0.671 m^3/s

Figure 61

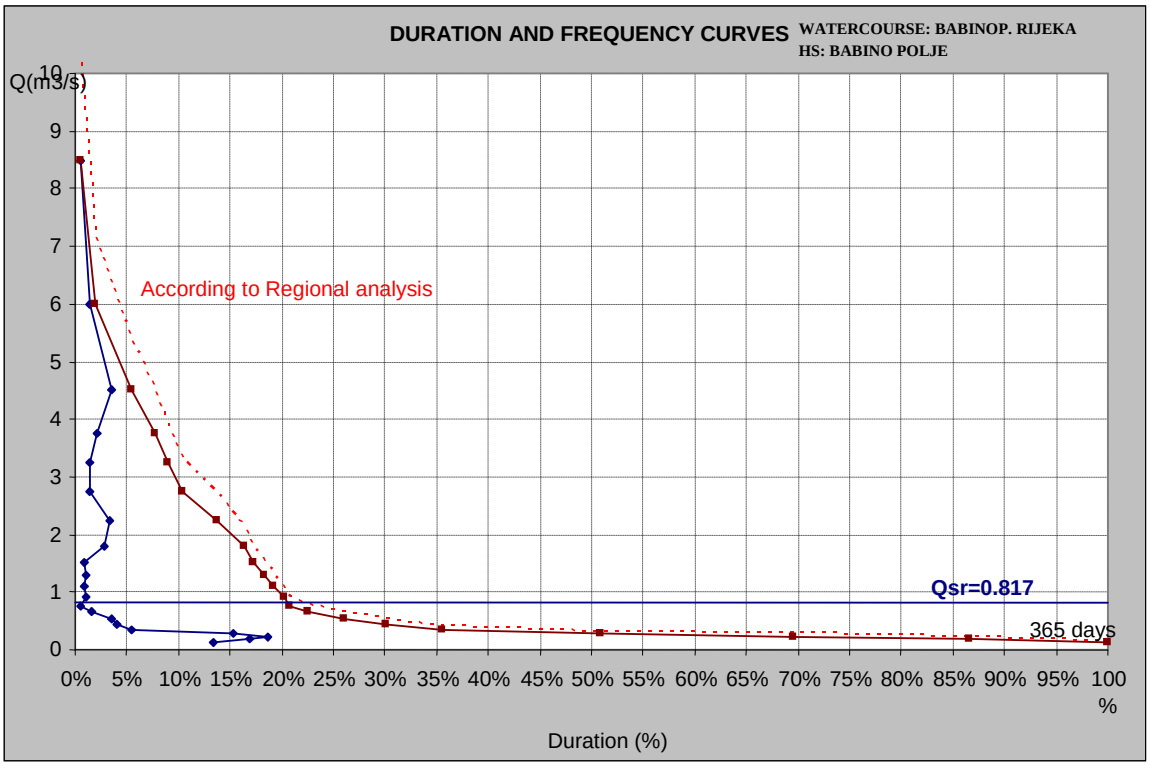
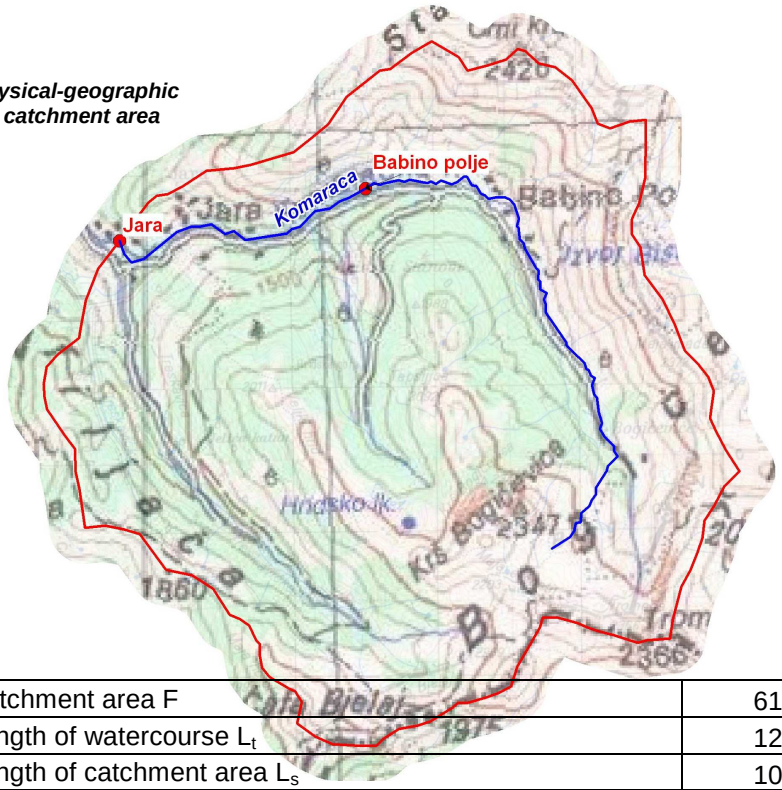


Figure 62

F.7. WATERCOURSE: KOMARAČA
HS: JARA

The length of this watercourse is 12.2 km, catchment area 61.2 km^2, maximum elevation in the catchment area is 2.426 m.a.s.l., minimum altitude is 1.059 m.a.s.l. Average head of the catchment area is 42.9%, average altitude in the catchment area is 1.788 m.a.sl. and levelled out head of watercourse is 7.05%. These and other parameters of the catchment area are shown in the following table.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	61.2	[km^2]
2	Length of watercourse L_t	12.2	[km]
3	Length of catchment area L_s	10.1	[km]
4	Perimeter of catchment area S	32.2	[km]
5	Average width of catchment area $B=F/L_s$	6.06	[km]
6	Rectilinear distance river source - mouth L_i	7.39	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	4.34	[km]
8	Watershed spreading factor K_s	1.163	[-]
9	Elongation of catchment factor K_σ	2.424	[-]
10	Concentration of catchment factor K_c	0.876	[-]
11	Tortousnesness of flow factor K_L	1.65	[-]
12	Maximum altitude in the catchment area H_{max}	2426	[m n. m.]
13	Minimum altitude in the catchment area H_{min}	1059	[m n. m.]
14	Average head in the catchment area I_{sr}	42.9	[%]
15	Maximum head of slope of valley I_{max}	55.9	[%]
16	Average altitude of the catchment area H_{sr}	1788	[m n. m.]
17	Average difference in altitude of the catchment area ΔH	729	[m]
18	Levelled out head of watercourse I_t	7.05	[%]
19	Maximum head of the watercourse I_{t1}	36.5	[%]
20	Average maximum head of the watercourse I_{t2}	7.87	[%]

Longitudinal profile of the watercourse (figure 63) and hypsometric curve (figure 64) are shown on the page 71. By observing hypsometric curve, it could be seen that elevation of the largest part of catchment area is between 1.600 and 2.200 m.as.l. and amounts to 87%.

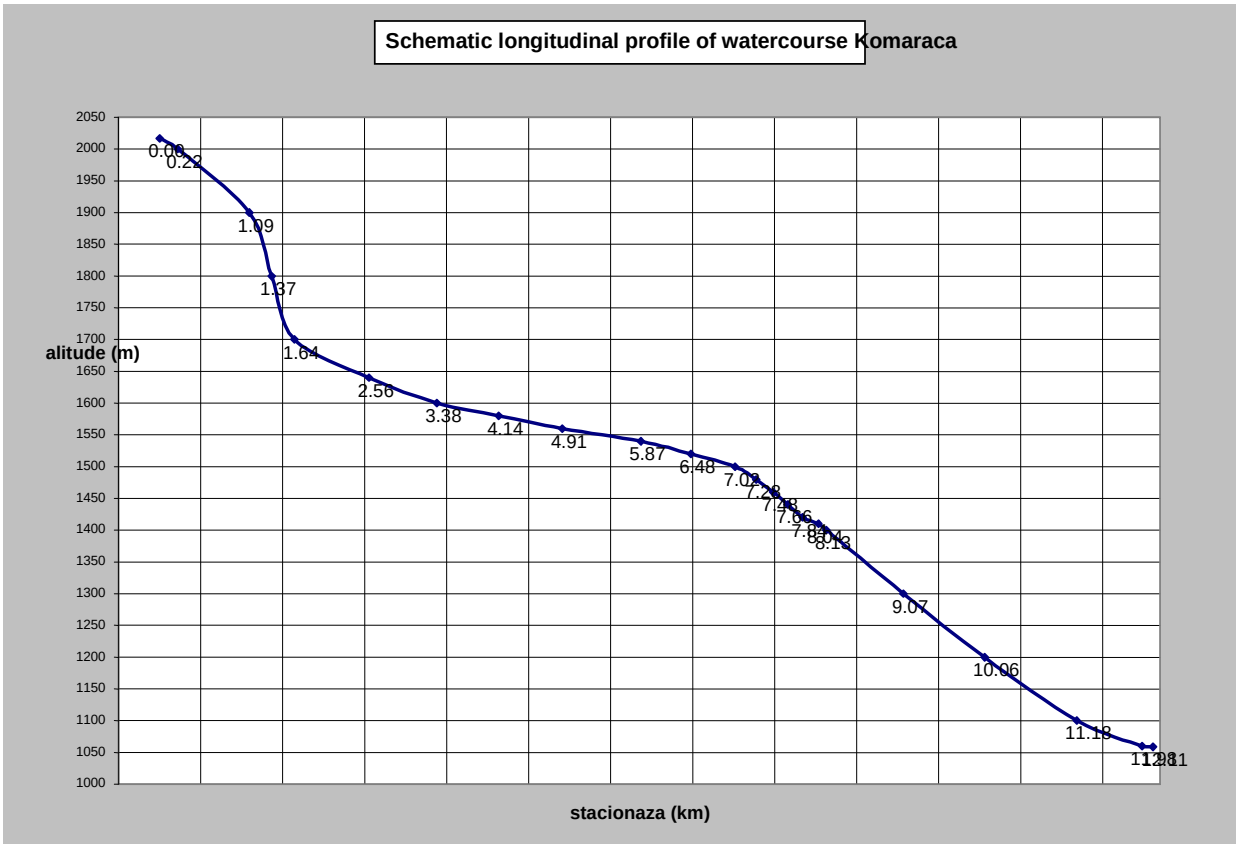


Figure 61

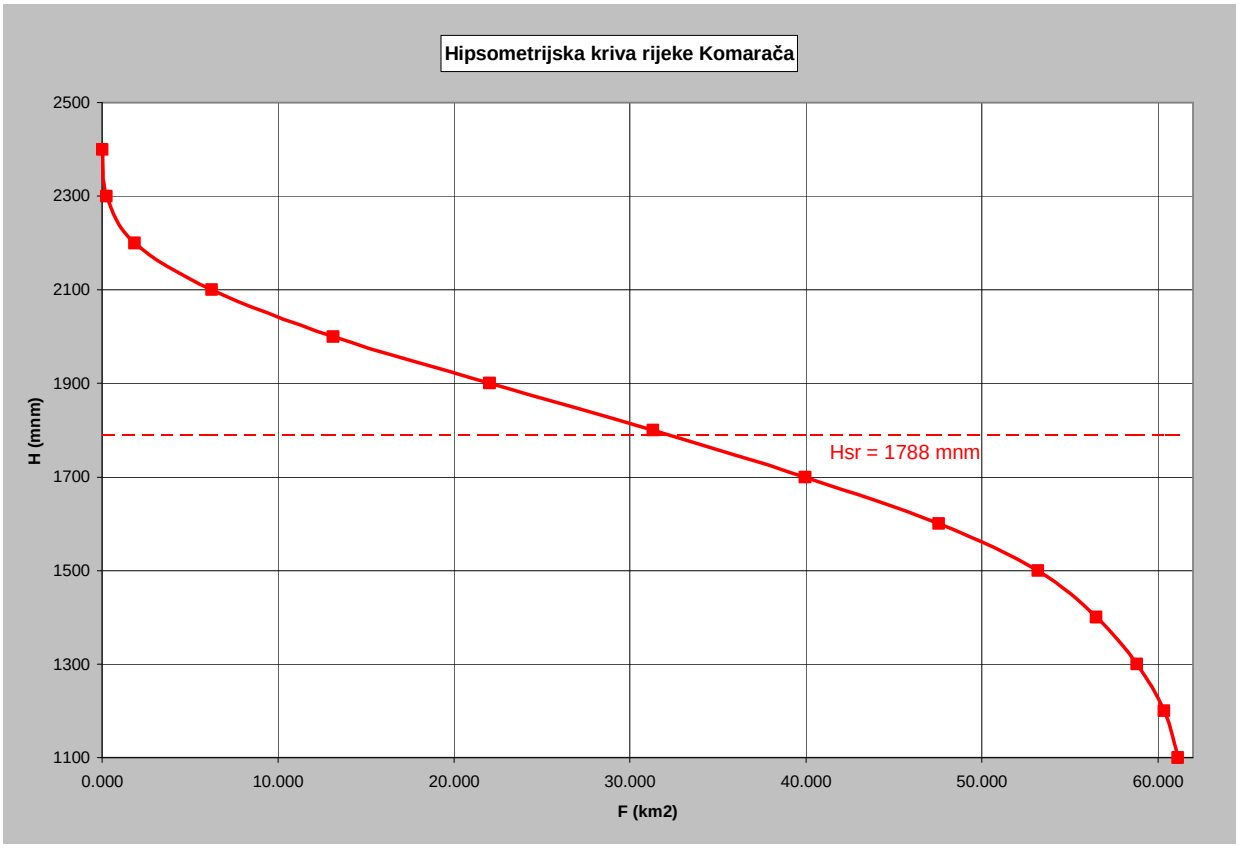


Figure 62

When compiling curve of the flow (figure 65) three measurements of large waters are rejected as non-acceptable. This curve is function, which for stand pipes under 50 cm has following correlation $Q_1 = \left(\frac{H_1}{49.142}\right)^{3.175}$ and for larger $Q_2 = \left(\frac{H_2}{47.554}\right)^{5.187}$. Balances is made based on these correlations, both for overall observation period and calendar year, and are presented on the page 73.

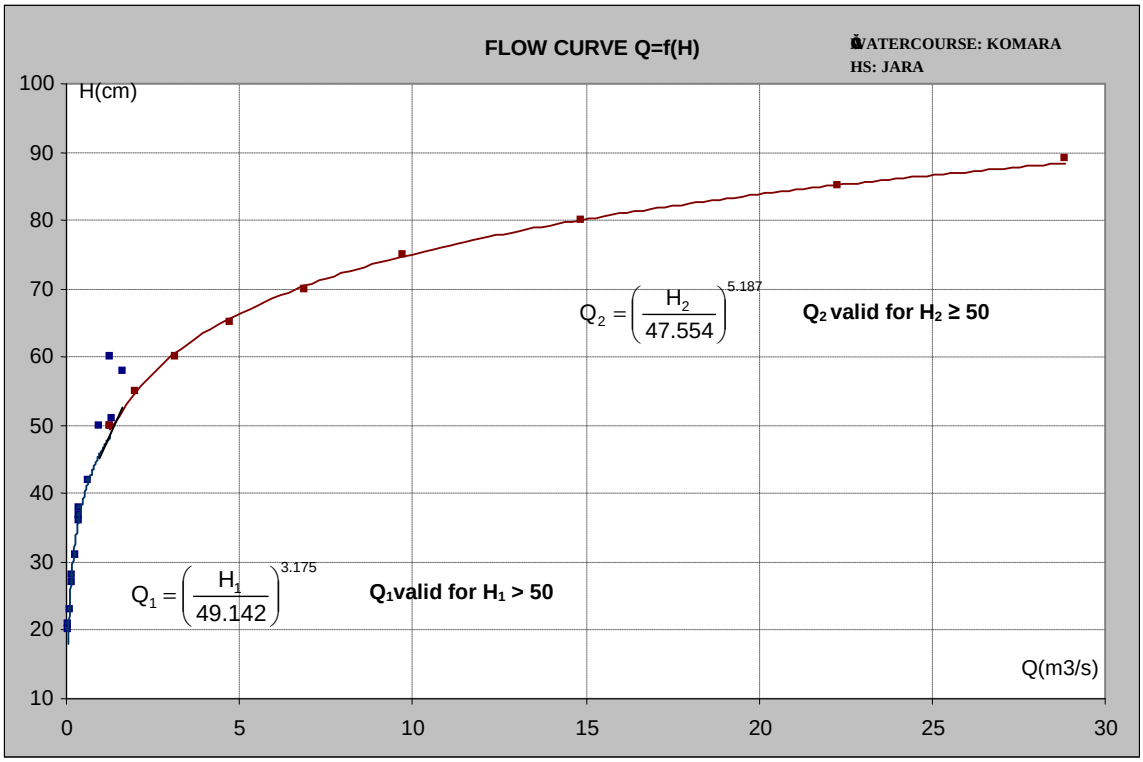


Figure 65

The months with the largest quantity of water were April and May 2007, while the months with the lowest quantity of water were August and September 2007. Absolute maximum of 25.8 m^3/s from November 2006 was 7 times higher than average daily flow for that day, while absolute minimum of 14 l/s from July 2007 was 4.1 times lower than average daily flow for that day.

Hydrograph of runoff (figure 66) as well as curve of duration and frequency (diagram 67) are shown on the page 74.

Average annual flow of 2.14 m^3/s and all flows above it lasted around 31% or 133 days. Other characteristic durations from flow curve are presented in the following table.

Duration	10%	20%	30%	40%	50%	60%	70%	80%	90%
Flow Q(m^3/s)	7.65	4.47	2.35	1.18	0.941	0.765	0.588	0.471	0.353

WATERCOURSE: KOMARAČA

HS: JARA

REVIEW OF WATERCOURSES - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1		2.127	0.282	0.372	0.372	0.372	0.654
2		2.127	0.282	0.340	0.340	0.406	0.607
3		2.801	0.232	0.340	0.340	0.406	0.607
4		1.934	0.232	0.311	0.311	0.406	0.563
5		1.437	1.297	0.311	0.480	0.406	0.563
6		0.991	0.563	0.282	0.928	0.406	0.520
7		0.868	0.442	0.256	0.654	0.442	0.520
8		0.868	0.406	0.232	0.756	0.480	0.520
9		0.811	0.372	0.232	1.514	0.480	0.520
10		0.756	0.654	0.232	0.991	0.520	1.056
11		0.704	0.811	0.232	0.811	0.480	0.756
12		0.607	0.563	0.209	0.704	0.442	0.704
13		0.563	0.520	0.187	0.654	0.442	0.607
14		0.520	0.654	0.187	0.607	0.442	0.607
15	17.98	0.520	0.563	0.187	0.563	0.480	0.607
16	16.88	0.520	0.480	0.187	0.520	0.520	0.563
17	15.84	0.442	0.442	0.256	0.520	0.520	0.520
18	14.9	0.372	0.406	0.311	0.480	0.480	0.928
19	13.02	0.340	0.311	0.311	0.442	0.480	1.125
20	12.2	0.282	0.311	0.340	0.406	0.520	0.868
21	10.63	0.282	0.340	0.372	0.406	0.520	0.811
22	7.997	0.256	0.340	0.340	0.442	3.639	0.756
23	6.895	0.256	0.311	0.340	0.442	5.475	0.756
24	5.475	0.232	0.282	0.311	0.442	2.335	0.756
25	4.301	0.256	0.311	0.282	0.406	1.437	0.756
26	3.639	0.311	0.520	0.311	0.372	0.991	0.756
27	3.340	0.311	0.372	0.372	0.372	0.928	0.756
28	2.801	0.282	0.442	0.563	0.340	0.811	0.811
29	2.559	0.340	0.372	0.480	0.340	0.756	0.811
30	2.335	0.340	0.406	0.406	0.480	0.704	0.756
31		0.340	0.372		0.372		0.756
DEK1	0.000	1.472	0.476	0.291	0.669	0.433	0.613
DEK2	9.080	0.487	0.506	0.241	0.571	0.481	0.729
DEK3	4.997	0.292	0.370	0.378	0.401	1.760	0.771
MIN	1.755	0.187	0.209	0.168	0.282	0.340	0.480
DAT	30	24	3	13	4	1	8
SRED	4.690	0.735	0.448	0.303	0.542	0.891	0.706
MAX	19.1	5.06	13.91	0.65	4.30	25.8	2.80
DAT	16	1	5	28	9	22	10

MIN = 0.168 DAT: 13. 09

SR = 1.26

MAX = 25.8 DAT: 22. 11

WATERCOURSE: KOMARAČA

HS: JARA

REVIEW OF WATERCOURSES - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.756	0.607	0.991	3.340	8.598	3.959	0.646	0.105	0.090	0.209
2	0.654	0.607	1.437	3.639	8.598	3.639	0.646	0.079	0.103	0.187
3	0.563	0.607	1.934	3.340	7.429	3.639	0.552	0.079	0.090	0.168
4	0.563	0.563	3.639	3.790	7.997	3.959	0.467	0.079	0.090	0.168
5	0.563	0.520	3.061	3.340	10.6	6.392	0.467	0.105	0.520	0.168
6	0.563	0.520	2.801	3.639	13.9	6.895	0.552	0.392	0.340	0.168
7	0.563	0.520	2.801	4.301	11.4	4.668	0.467	0.232	0.282	0.209
8	0.520	0.563	2.801	5.058	10.6	5.058	0.392	0.117	0.232	0.209
9	0.442	0.563	2.801	5.058	9.911	4.668	0.392	0.090	0.256	0.209
10	0.442	0.563	2.801	5.475	9.911	4.301	0.326	0.078	0.209	0.232
11	0.442	0.654	2.335	6.392	9.911	3.639	0.326	0.078	0.256	0.406
12	0.442	0.704	1.934	6.895	9.236	3.340	0.326	0.078	0.311	0.372
13	0.442	1.297	1.755	7.997	9.236	3.340	0.326	0.067	0.256	0.480
14	0.406	1.297	1.590	9.236	7.997	3.959	0.326	0.067	0.232	0.372
15	0.406	0.868	1.590	9.236	7.429	3.639	0.326	0.067	0.209	0.311
16	0.406	0.868	1.437	7.997	6.895	3.790	0.268	0.067	0.209	0.311
17	0.406	0.756	1.590	6.895	5.919	3.172	0.217	0.067	0.209	0.311
18	0.406	0.704	1.934	6.895	5.919	2.638	0.217	0.282	0.209	0.311
19	0.480	0.704	2.127	7.997	5.475	2.179	0.217	0.340	0.232	0.311
20	0.520	0.756	2.801	7.429	5.475	1.787	0.136	0.209	0.232	0.311
21	0.520	0.868	2.801	7.429	5.919	0.993	0.136	0.168	0.209	0.282
22	0.520	0.928	2.335	7.997	6.392	0.993	0.173	0.149	0.187	0.442
23	0.654	0.928	2.127	8.598	5.919	0.993	0.136	0.149	0.187	0.442
24	1.692	0.928	1.755	8.598	5.919	0.993	0.079	0.132	0.168	
25	1.125	0.928	1.755	9.911	5.058	0.750	0.079	0.117	0.187	
26	0.991	0.991	1.590	9.236	5.475	0.646	0.079	0.117	0.187	
27	0.868	1.056	1.590	7.997	5.058	0.552	0.079	0.090	0.209	
28	0.811	0.991	1.590	7.997	5.058	0.552	0.079	0.090	0.232	
29	0.756		1.934	7.997	5.475	0.552	0.079	0.078	0.256	
30	0.704		3.061	8.598	4.668	0.646	0.079	0.078	0.209	
31	0.654		3.639		4.301		0.079	0.078		
DEK1	0.563	0.563	2.507	4.098	9.899	4.718	0.491	0.135	0.221	0.192
DEK2	0.436	0.861	1.909	7.697	7.349	3.148	0.269	0.132	0.235	0.349
DEK3	0.845	0.952	2.198	8.436	5.386	0.767	0.098	0.113	0.203	0.106
MIN	0.372	0.480	0.928	2.801	3.340	0.406	0.041	0.067	0.078	0.168
DAT	11	7	1	1	31	27	25	9	1	2
SRED	0.622	0.781	2.204	6.744	7.475	2.878	0.280	0.127	0.220	0.212
MAX	5.919	1.934	4.668	10.63	15.84	10.63	0.991	14.9	0.756	0.607
DAT	24	13	4	25	6	6	1	18	5	13

MIN = 0.041 DAT: 25. 07

SR = 2.215

MAX = 10.63 DAT: 25. 04

WATERCOURSE: KOMARAČA

HS: JARA

REVIEW OF WATERCOURSES

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	3.959	1.386	0.194	0.231	0.290	0.372	0.654	0.756	0.607	0.991	3.340	8.598
2	3.639	1.386	0.181	0.222	0.264	0.406	0.607	0.654	0.607	1.437	3.639	8.598
3	3.639	1.676	0.155	0.215	0.254	0.406	0.607	0.563	0.607	1.934	3.340	7.429
4	3.959	1.200	0.155	0.200	0.239	0.406	0.563	0.563	0.563	3.639	3.790	7.997
5	6.392	0.952	0.701	0.415	0.324	0.406	0.563	0.563	0.520	3.061	3.340	10.6
6	6.895	0.771	0.477	0.311	0.548	0.406	0.520	0.563	0.520	2.801	3.639	13.9
7	4.668	0.668	0.337	0.269	0.432	0.442	0.520	0.563	0.520	2.801	4.301	11.4
8	5.058	0.630	0.262	0.232	0.482	0.480	0.520	0.520	0.563	2.801	5.058	10.6
9	4.668	0.602	0.231	0.244	0.861	0.480	0.520	0.442	0.563	2.801	5.058	9.911
10	4.301	0.541	0.366	0.220	0.611	0.520	1.056	0.442	0.563	2.801	5.475	9.911
11	3.639	0.515	0.444	0.244	0.608	0.480	0.756	0.442	0.654	2.335	6.392	9.911
12	3.340	0.467	0.320	0.260	0.538	0.442	0.704	0.442	0.704	1.934	6.895	9.236
13	3.340	0.444	0.294	0.222	0.567	0.442	0.607	0.442	1.297	1.755	7.997	9.236
14	3.959	0.423	0.361	0.209	0.490	0.442	0.607	0.406	1.297	1.590	9.236	7.997
15	10.81	0.423	0.315	0.198	0.437	0.480	0.607	0.406	0.868	1.590	9.236	7.429
16	10.34	0.394	0.274	0.198	0.415	0.520	0.563	0.406	0.868	1.437	7.997	6.895
17	9.506	0.330	0.255	0.232	0.415	0.520	0.520	0.406	0.756	1.590	6.895	5.919
18	8.745	0.295	0.344	0.260	0.395	0.480	0.928	0.406	0.704	1.934	6.895	5.919
19	7.601	0.279	0.325	0.271	0.376	0.480	1.125	0.480	0.704	2.127	7.997	5.475
20	6.984	0.209	0.260	0.286	0.358	0.520	0.868	0.520	0.756	2.801	7.429	5.475
21	5.810	0.209	0.254	0.290	0.344	0.520	0.811	0.520	0.868	2.801	7.429	5.919
22	4.495	0.215	0.245	0.264	0.442	3.639	0.756	0.520	0.928	2.335	7.997	6.392
23	3.944	0.196	0.230	0.264	0.442	5.475	0.756	0.654	0.928	2.127	8.598	5.919
24	3.234	0.155	0.207	0.239	0.442	2.335	0.756	1.692	0.928	1.755	8.598	5.919
25	2.526	0.168	0.214	0.235	0.406	1.437	0.756	1.125	0.928	1.755	9.911	5.058
26	2.142	0.195	0.319	0.249	0.372	0.991	0.756	0.991	0.991	1.590	9.236	5.475
27	1.946	0.195	0.231	0.290	0.372	0.928	0.756	0.868	1.056	1.590	7.997	5.058
28	1.676	0.181	0.266	0.397	0.340	0.811	0.811	0.811	0.991	1.590	7.997	5.058
29	1.556	0.210	0.225	0.368	0.340	0.756	0.811	0.756		1.934	7.997	5.475
30	1.490	0.210	0.242	0.307	0.480	0.704	0.756	0.704		3.061	8.598	4.668
31		0.210	0.225		0.372		0.756	0.654		3.639		4.301
DEK1	4.718	0.981	0.306	0.256	0.431	0.433	0.613	0.563	0.563	2.507	4.098	9.899
DEK2	6.826	0.378	0.319	0.238	0.460	0.481	0.729	0.436	0.861	1.909	7.697	7.349
DEK3	2.882	0.195	0.242	0.290	0.396	1.760	0.771	0.845	0.952	2.198	8.436	5.386
MIN	0.406	0.041	0.067	0.078	0.168	0.340	0.480	0.372	0.480	0.928	2.801	3.340
DAT	27	25	9	1	2	1	8	11	7	1	1	31
SRED	3.780	0.508	0.287	0.261	0.428	0.891	0.706	0.622	0.781	2.204	6.744	7.475
MAX	19.1	5.058	14.9	0.756	4.301	25.82	2.801	5.919	1.934	4.668	10.63	15.84
DAT	16	1	18	5	9	22	10	24	13	4	25	6

MIN = 0.041 DAT: 25. 07

SR = 2.14

MAX = 25.8 DAT: 22. 11

AVERAGE VALUE FOR 496 DAYS IS Q = 2.14 m^3/s

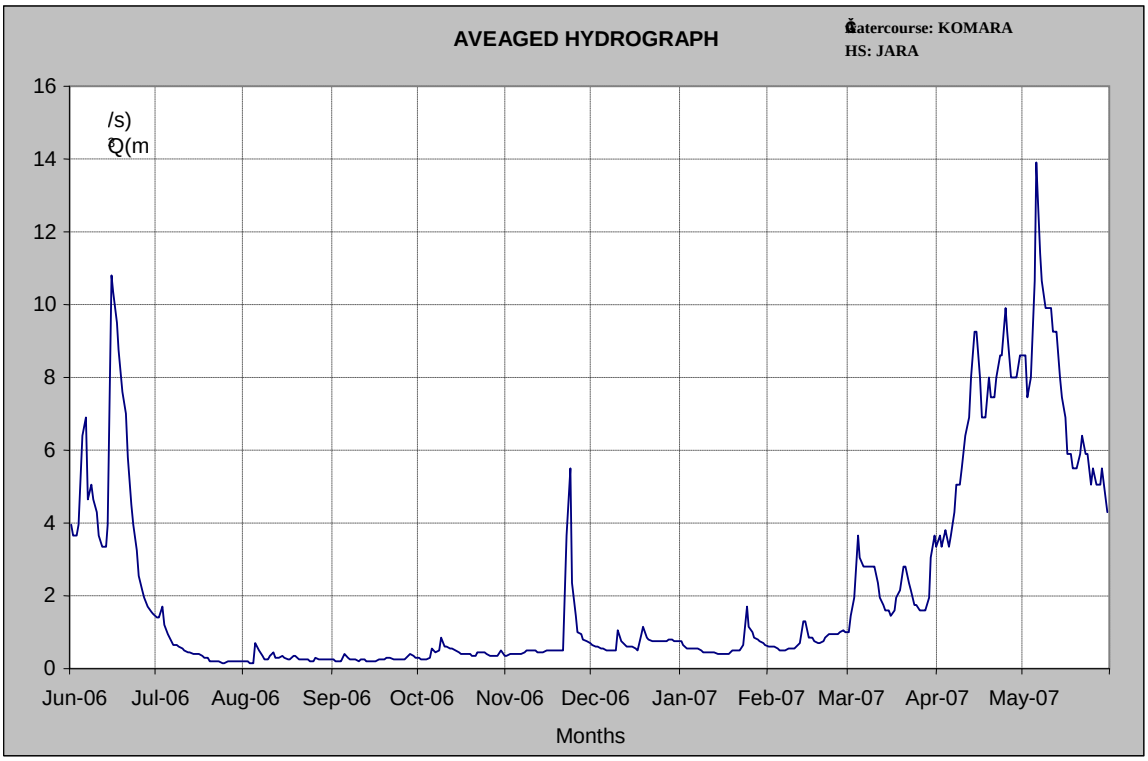


Figure 66

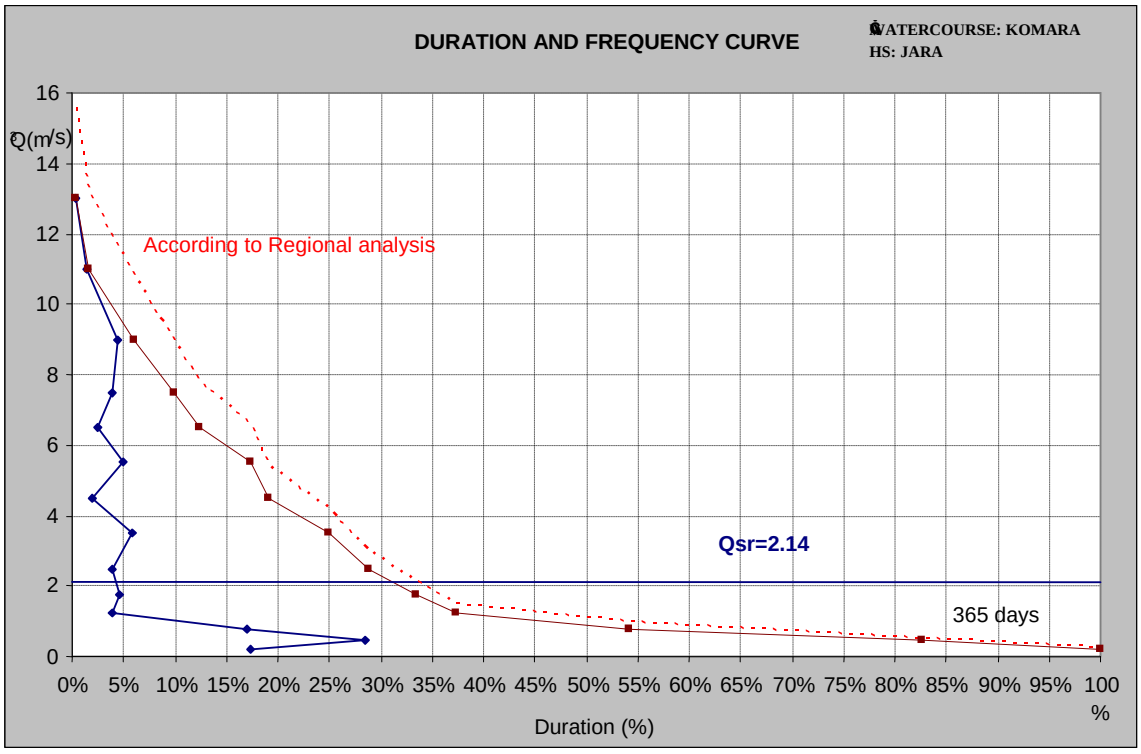
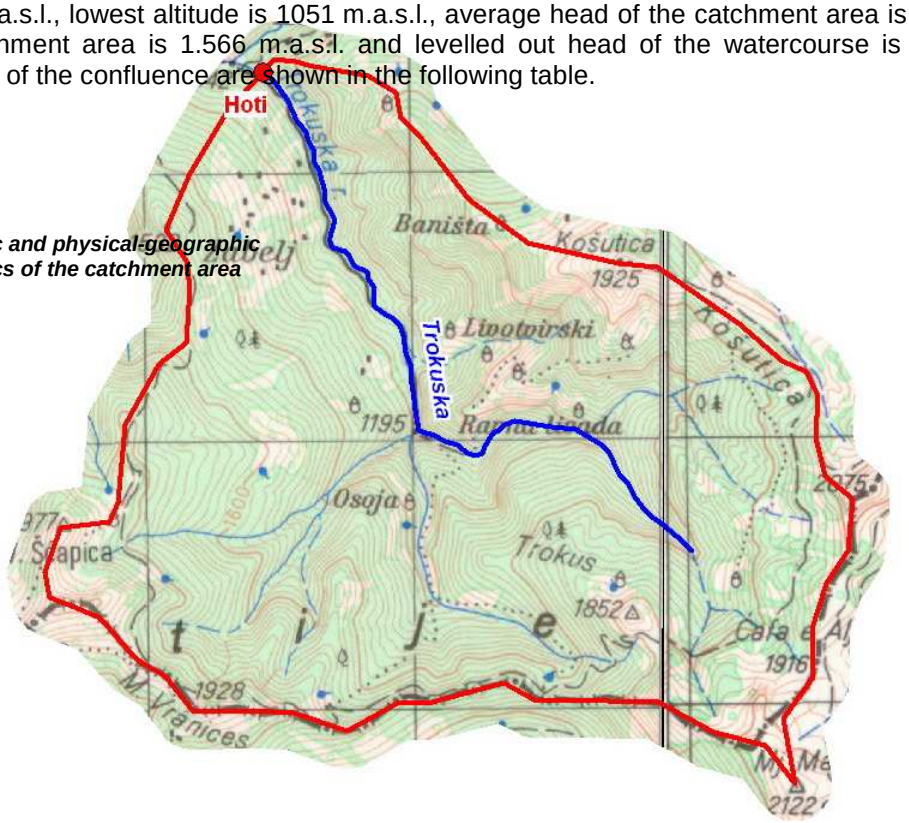


Figure 67

F.8. WATERCOURSE: TROKUTSKA RIJEKA
HS: HOTI

General direction of this watercourse flow is Southeast-Northwest. The length of the watercourse is 5.76 km, catchment are is 19.6 km^2 and the length of the watershed is 19.3 km. The highest elevation in the catchment area is 2.122 m.a.s.l., lowest altitude is 1051 m.a.s.l., average head of the catchment area is 41.55%, average altitude in the catchment area is 1.566 m.a.s.l. and levelled out head of the watercourse is 6.20%. These and other parameters of the confluence are shown in the following table.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	19.6	[km^2]
2	Length of watercourse L_t	5.76	[km]
3	Length of catchment area L_s	7.18	[km]
4	Perimeter of catchment area S	19.3	[km]
5	Average width of catchment area $B=F/L_s$	2.73	[km]
6	Rectilinear distance river source - mouth L_i	4.81	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.07	[km]
8	Watershed spreading factor K_s	1.23	[-]
9	Elongation of catchment factor K_σ	1.69	[-]
10	Concentration of catchment factor K_c	0.661	[-]
11	Tortousnesness of flow factor K_L	1.20	[-]
12	Maximum altitude in the catchment area H_{max}	2122	[m n. m.]
13	Minimum altitude in the catchment area H_{min}	1051	[m n. m.]
14	Average head in the catchment area I_{sr}	41.5	[%]
15	Maximum head of slope of valley I_{max}	42.1	[%]
16	Average altitude of the catchment area H_{sr}	1566	[m n. m.]
17	Average difference in altitude of the catchment area ΔH	515	[m]
18	Levelled out head of watercourse I_t	6.20	[%]
19	Maximum head of the watercourse I_{t1}	18.1	[%]
20	Average maximum head of the watercourse I_{t2}	9.19	[%]

Longitudinal profile of the watercourse (figure 68) and hypsometric curve (figure 69) are shown on the page 76. From the hypsometric curve it could be seen that elevation of the largest part of catchment area is between 1.250 and 1.850 m.a.sl. and amounts to around 80%.

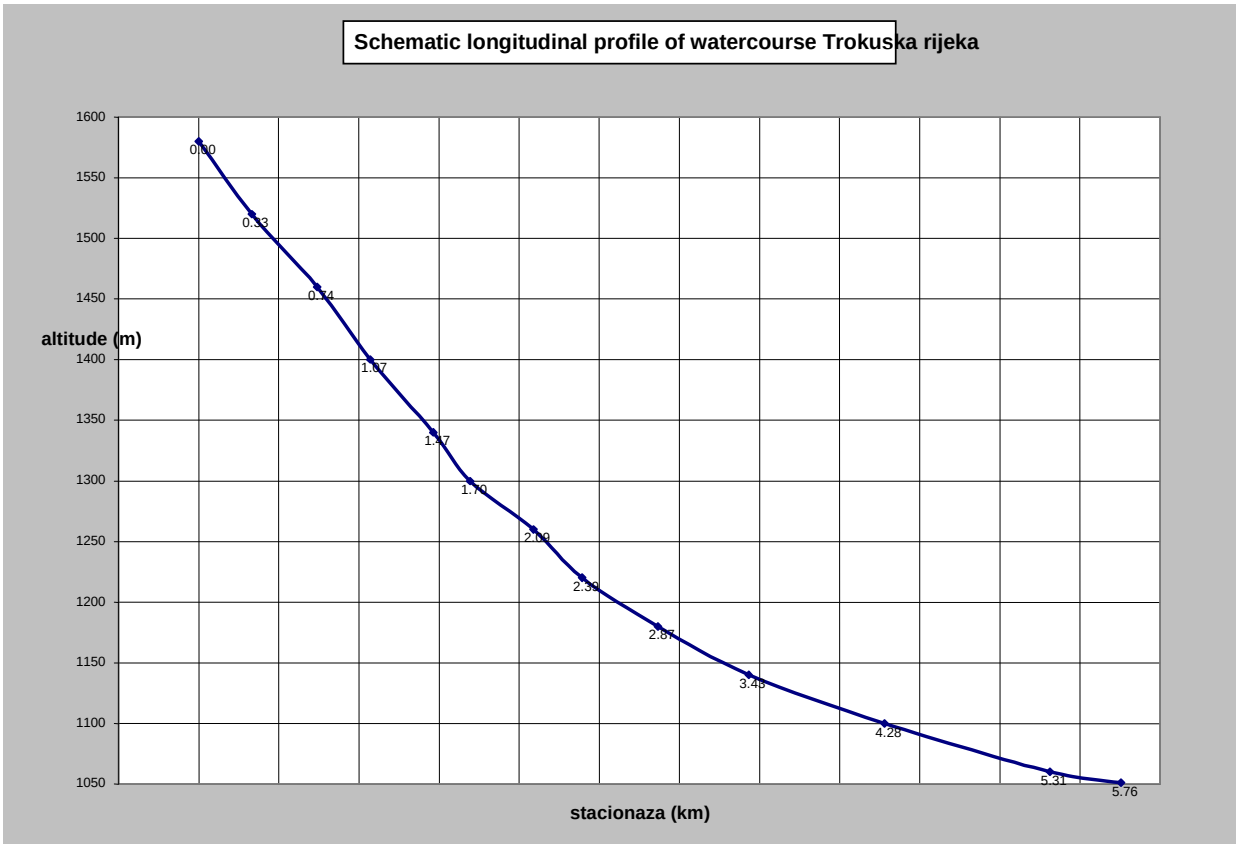


Figure 68

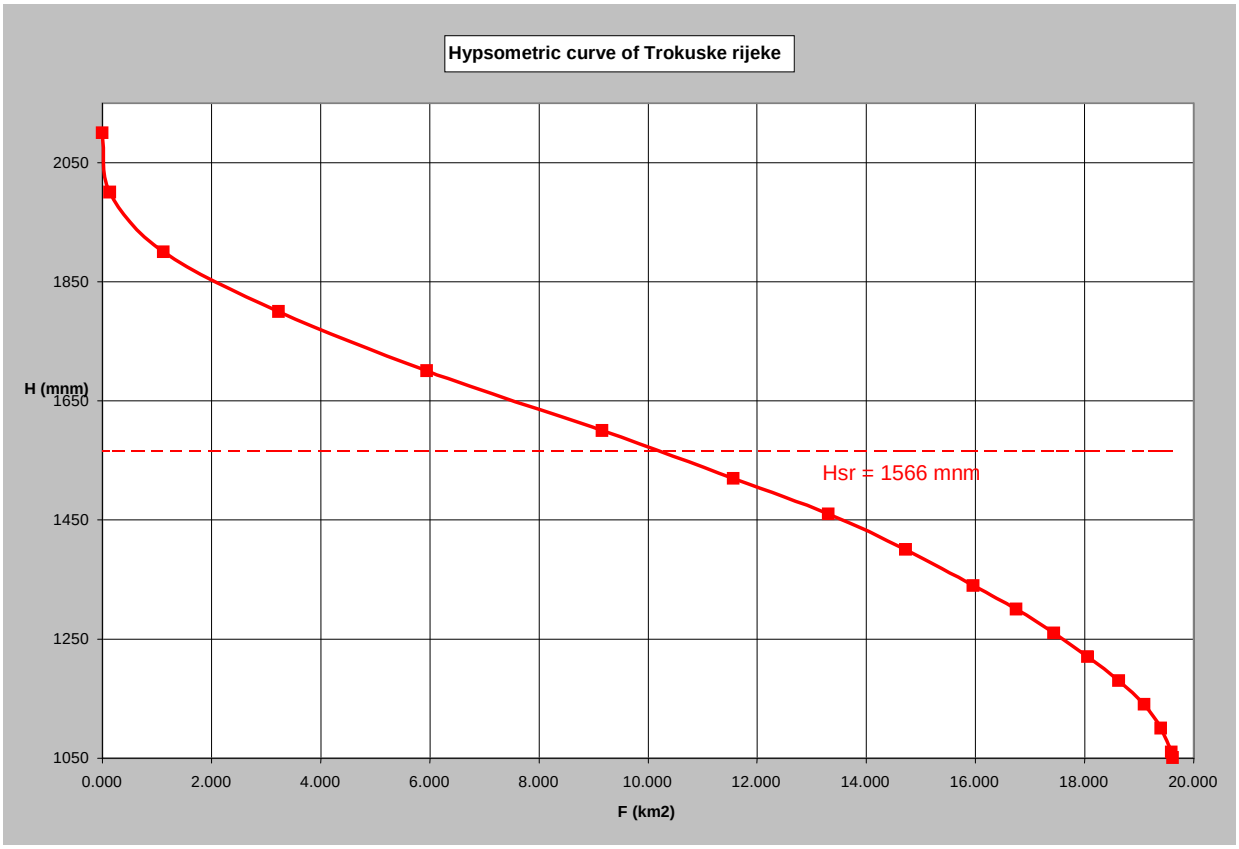


Figure 69

Flow curve (figure 70) is a unique function. For the water levels under 65 cm it is $Q_1 = \left(\frac{H_1}{66.551}\right)^{4.943}$ and for those who are above or equal to 65 cm $Q_2 = \left(\frac{H_2}{66.095}\right)^{7.806}$. Based on these curves a balance is compiled and presented on the page 78.

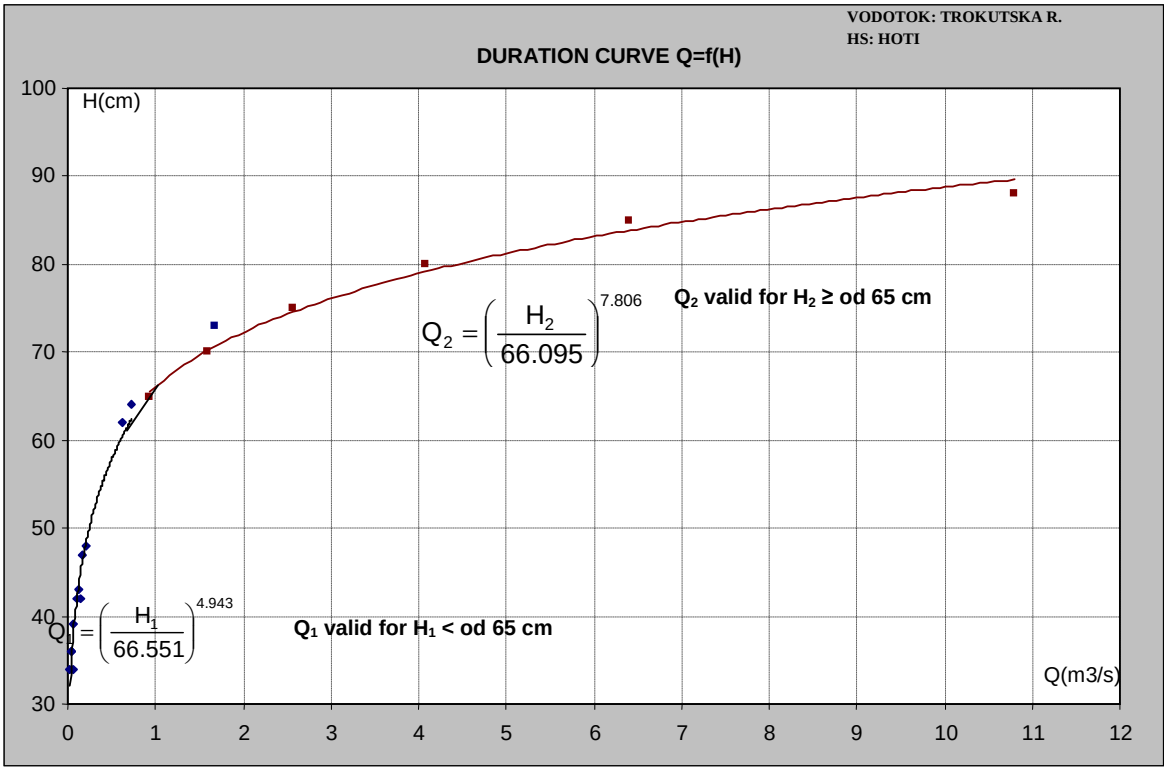


Figure 70

The months with the largest quantity of water were April and May 2007, while the months with the lowest quantity of water were September and October 2007. Absolute maximum of 9.34 m^3/s from November 2006 was around 8.33 times higher than average daily flow for that day, while absolute minimum of 36 l/s was 1.83 times lower than average daily flow for that day.

Hydrogram of runoff (figure 71) as well as curve of duration and frequency (diagram 72) are shown on the page 79. According to duration curve, average annual flow and all flows above it lasted around 35% or 128 days. Other characteristic durations of flow duration are presented in the following table.

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	1.21	0.735	0.565	0.412	0.265	0.209	0.162	0.118	0.088

WATERCOURSE: TROKUTSKA

HS: HOTI

REVIEW OF FLOWS - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1		0.243	0.115	0.091	0.081	0.081	0.220
2		0.220	0.103	0.091	0.081	0.103	0.199
3		0.243	0.103	0.081	0.081	0.103	0.199
4		0.220	0.115	0.081	0.071	0.091	0.199
5		0.199	0.325	0.081	0.103	0.091	0.199
6		0.179	0.161	0.081	0.199	0.103	0.179
7		0.179	0.129	0.071	0.129	0.103	0.179
8		0.161	0.129	0.071	0.145	0.115	0.161
9		0.179	0.115	0.071	0.179	0.115	0.179
10		0.161	0.199	0.071	0.129	0.145	0.325
11		0.161	0.220	0.071	0.115	0.115	0.220
12		0.145	0.161	0.071	0.115	0.115	0.199
13		0.145	0.161	0.063	0.103	0.115	0.199
14		0.145	0.161	0.063	0.103	0.103	0.179
15		0.145	0.129	0.063	0.091	0.115	0.179
16	0.824	0.145	0.129	0.063	0.091	0.145	0.179
17	0.824	0.129	0.115	0.103	0.091	0.129	0.179
18	0.763	0.103	0.115	0.115	0.091	0.129	0.356
19	0.705	0.103	0.103	0.115	0.091	0.129	0.426
20	0.650	0.091	0.103	0.103	0.081	0.129	0.356
21	0.551	0.091	0.091	0.091	0.081	0.129	0.295
22	0.465	0.091	0.103	0.091	0.091	1.112	0.295
23	0.426	0.091	0.091	0.091	0.091	1.248	0.243
24	0.465	0.091	0.091	0.081	0.081	0.599	0.243
25	0.390	0.103	0.081	0.081	0.081	0.426	0.243
26	0.325	0.103	0.179	0.081	0.081	0.356	0.243
27	0.295	0.103	0.115	0.103	0.081	0.295	0.199
28	0.268	0.091	0.129	0.115	0.081	0.268	0.199
29	0.243	0.199	0.103	0.103	0.081	0.243	0.199
30	0.220	0.220	0.103	0.091	0.115	0.243	0.199
31		0.161	0.103		0.091		0.199
DEK1	0.000	0.199	0.150	0.079	0.120	0.105	0.204
DEK2	0.377	0.131	0.140	0.083	0.097	0.123	0.247
DEK3	0.365	0.122	0.108	0.093	0.087	0.492	0.233
MIN	0.199	0.081	0.081	0.063	0.071	0.081	0.161
DAT	30	23	24	12	4	1	7
SRED	0.247	0.150	0.132	0.085	0.101	0.240	0.228
MAX	0.878	2.682	1.112	0.243	0.356	9.341	0.470
DAT	17	29	5	17	6	22	10

MIN = 0.063 DAT: 12. 09 | SR = 0.181 | MAX = 9.341 DAT: 22. 11

WATERCOURSE: TROKUTSKA

HS: HOTI

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.199	0.325	0.650	0.878	1.749	0.356	0.161	0.055	0.048	0.071
2	0.295	0.325	0.705	0.989	1.749	0.325	0.145	0.055	0.055	0.063
3	0.268	0.295	0.824	0.989	1.565	0.390	0.145	0.048	0.048	0.055
4	0.243	0.268	1.112	0.989	1.749	0.426	0.129	0.048	0.055	0.055
5	0.220	0.268	0.989	0.989	2.172	0.599	0.129	0.055	0.199	0.055
6	0.220	0.268	0.878	0.989	3.294	0.551	0.129	0.115	0.103	0.055
7	0.199	0.268	0.824	0.989	2.974	0.465	0.115	0.071	0.091	0.071
8	0.199	0.356	0.878	0.989	2.415	0.824	0.115	0.063	0.071	0.081
9	0.199	0.390	0.878	1.112	1.950	0.705	0.115	0.063	0.071	0.071
10	0.199	0.465	0.824	1.248	1.749	0.650	0.103	0.063	0.071	0.071
11	0.199	0.507	0.763	1.399	1.565	0.599	0.103	0.055	0.081	0.129
12	0.199	0.507	0.705	1.565	1.399	0.650	0.091	0.055	0.091	0.103
13	0.199	0.878	0.650	1.749	1.248	0.551	0.091	0.055	0.071	0.115
14	0.199	0.878	0.650	2.415	1.112	0.551	0.091	0.048	0.063	0.091
15	0.179	0.705	0.599	2.682	0.989	0.465	0.091	0.048	0.063	0.081
16	0.179	0.599	0.551	2.682	0.824	0.426	0.081	0.048	0.055	0.071
17	0.179	0.551	0.551	2.172	0.763	0.390	0.071	0.048	0.055	0.071
18	0.179	0.465	0.551	1.950	0.763	0.356	0.071	0.048	0.055	0.063
19	0.199	0.465	0.551	1.950	0.599	0.325	0.071	0.048	0.063	0.071
20	0.220	0.507	0.824	1.950	0.551	0.295	0.071	0.042	0.071	0.071
21	0.199	0.551	0.960	2.172	0.551	0.268	0.063	0.042	0.063	0.063
22	0.199	0.551	0.824	2.415	0.551	0.243	0.063	0.036	0.063	0.081
23	0.268	0.551	0.763	2.682	0.507	0.243	0.063	0.036	0.055	0.081
24	1.112	0.551	0.705	3.294	0.465	0.220	0.055	0.042	0.055	
25	0.705	0.507	0.705	4.024	0.426	0.199	0.048	0.042	0.055	
26	0.551	0.599	0.705	3.294	0.465	0.179	0.055	0.042	0.063	
27	0.507	0.763	0.705	2.682	0.390	0.179	0.055	0.042	0.081	
28	0.426	0.650	0.763	2.172	0.426	0.161	0.055	0.036	0.103	
29	0.390		0.763	1.950	0.599	0.161	0.055	0.036	0.103	
30	0.356		0.878	1.950	0.465	0.161	0.055	0.036	0.071	
31	0.356		0.878		0.390		0.055	0.036		
DEK1	0.224	0.323	0.856	1.016	2.137	0.529	0.129	0.064	0.081	0.065
DEK2	0.193	0.606	0.640	2.052	0.981	0.461	0.083	0.049	0.067	0.087
DEK3	0.461	0.591	0.786	2.664	0.476	0.202	0.056	0.039	0.071	0.020
MIN	0.179	0.243	0.507	0.824	0.356	0.161	0.048	0.036	0.036	0.055
DAT	1	5	19	1	27	26	24	21	1	3
SRED	0.298	0.500	0.761	1.910	1.175	0.397	0.088	0.050	0.073	0.056
MAX	1.950	1.565	1.399	5.383	3.643	1.950	0.161	0.145	0.268	0.161
DAT	24	13	20	24	6	8	1	6	5	11

MIN = 0.036 DAT: 21. 08 | SR = 0.543 | MAX = 5.383 DAT: 24. 04

WATERCOURSE: TROKUTSKA

HS: HOTI

REVIEW OF FLOWS

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	0.356	0.202	0.085	0.070	0.076	0.081	0.220	0.199	0.325	0.650	0.878	1.749
2	0.325	0.182	0.079	0.073	0.072	0.103	0.199	0.295	0.325	0.705	0.989	1.749
3	0.390	0.194	0.075	0.064	0.068	0.103	0.199	0.268	0.295	0.824	0.989	1.565
4	0.426	0.175	0.082	0.068	0.063	0.091	0.199	0.243	0.268	1.112	0.989	1.749
5	0.599	0.164	0.190	0.140	0.079	0.091	0.199	0.220	0.268	0.989	0.989	2.172
6	0.551	0.154	0.138	0.092	0.127	0.103	0.179	0.220	0.268	0.878	0.989	3.294
7	0.465	0.147	0.100	0.081	0.100	0.103	0.179	0.199	0.268	0.824	0.989	2.974
8	0.824	0.138	0.096	0.071	0.113	0.115	0.161	0.199	0.356	0.890	0.989	2.415
9	0.705	0.147	0.089	0.071	0.125	0.115	0.179	0.199	0.390	0.878	1.112	1.950
10	0.650	0.132	0.131	0.071	0.100	0.145	0.325	0.199	0.465	0.824	1.248	1.749
11	0.599	0.132	0.138	0.076	0.122	0.115	0.220	0.199	0.507	0.763	1.399	1.565
12	0.650	0.118	0.108	0.081	0.109	0.115	0.199	0.199	0.507	0.705	1.565	1.399
13	0.551	0.118	0.108	0.067	0.109	0.115	0.199	0.199	0.878	0.650	1.749	1.248
14	0.551	0.118	0.105	0.063	0.097	0.103	0.179	0.199	0.878	0.650	2.415	1.112
15	0.465	0.118	0.089	0.063	0.086	0.115	0.179	0.179	0.705	0.599	2.682	0.989
16	0.625	0.113	0.089	0.059	0.081	0.145	0.179	0.179	0.599	0.551	2.682	0.824
17	0.607	0.100	0.082	0.079	0.081	0.129	0.179	0.179	0.551	0.551	2.172	0.763
18	0.559	0.087	0.082	0.085	0.077	0.129	0.356	0.179	0.465	0.551	1.950	0.763
19	0.515	0.087	0.075	0.089	0.081	0.129	0.426	0.199	0.465	0.551	1.950	0.599
20	0.473	0.081	0.072	0.087	0.076	0.129	0.356	0.220	0.507	0.824	1.950	0.551
21	0.410	0.077	0.066	0.077	0.072	0.129	0.295	0.199	0.551	0.960	2.172	0.551
22	0.354	0.077	0.069	0.077	0.086	1.112	0.295	0.199	0.551	0.824	2.415	0.551
23	0.335	0.077	0.064	0.073	0.086	1.248	0.243	0.268	0.551	0.763	2.682	0.507
24	0.343	0.073	0.066	0.068	0.081	0.599	0.243	1.112	0.551	0.705	3.294	0.465
25	0.294	0.075	0.061	0.068	0.081	0.426	0.243	0.705	0.507	0.705	4.024	0.426
26	0.252	0.079	0.110	0.072	0.081	0.356	0.243	0.551	0.599	0.705	3.294	0.465
27	0.237	0.079	0.079	0.092	0.081	0.295	0.199	0.507	0.763	0.705	2.682	0.390
28	0.215	0.073	0.083	0.109	0.081	0.268	0.199	0.426	0.650	0.763	2.172	0.426
29	0.202	0.127	0.069	0.103	0.081	0.243	0.199	0.390		0.763	1.950	0.599
30	0.191	0.138	0.069	0.081	0.115	0.243	0.199	0.356		0.878	1.950	0.465
31		0.108	0.069		0.091		0.199	0.356		0.878		0.390
DEK1	0.529	0.164	0.107	0.080	0.092	0.105	0.204	0.224	0.323	0.857	1.016	2.137
DEK2	0.560	0.107	0.095	0.075	0.092	0.123	0.247	0.193	0.606	0.640	2.052	0.981
DEK3	0.283	0.089	0.073	0.082	0.085	0.492	0.233	0.461	0.591	0.786	2.664	0.476
MIN	0.161	0.048	0.036	0.036	0.055	0.081	0.161	0.179	0.243	0.507	0.824	0.356
DAT	26	24	21	1	3	1	7	1	5	19	1	27
SRED	0.457	0.119	0.091	0.079	0.090	0.240	0.228	0.298	0.500	0.762	1.910	1.175
MAX	1.950	2.682	1.112	0.268	0.356	9.341	0.470	1.950	1.565	1.399	5.383	3.643
DAT	8	29	5	5	6	22	10	24	13	20	24	6

MIN = 0.036 DAT: 21. 08 | SR = 0.494 | MAX = 9.341 DAT: 22. 11

AVERAGE VALUE FOR 495 DAYS IS Q = 0.400 m^3/s

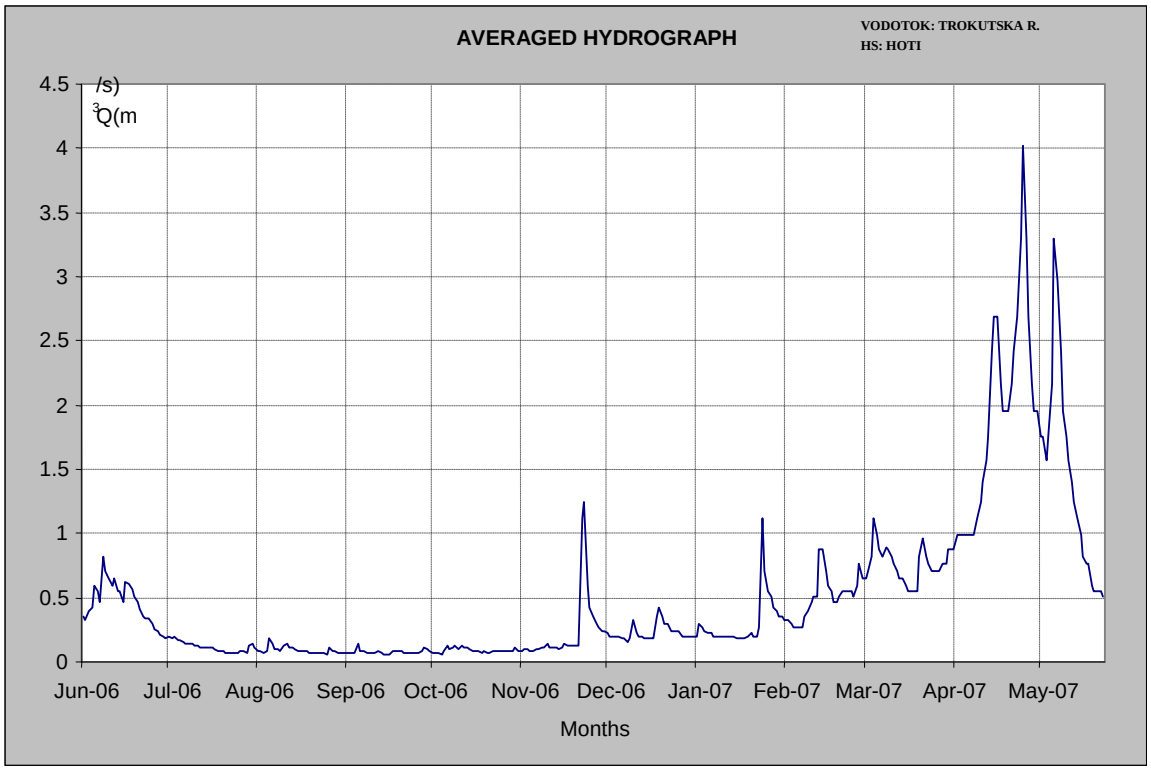


Figure 71

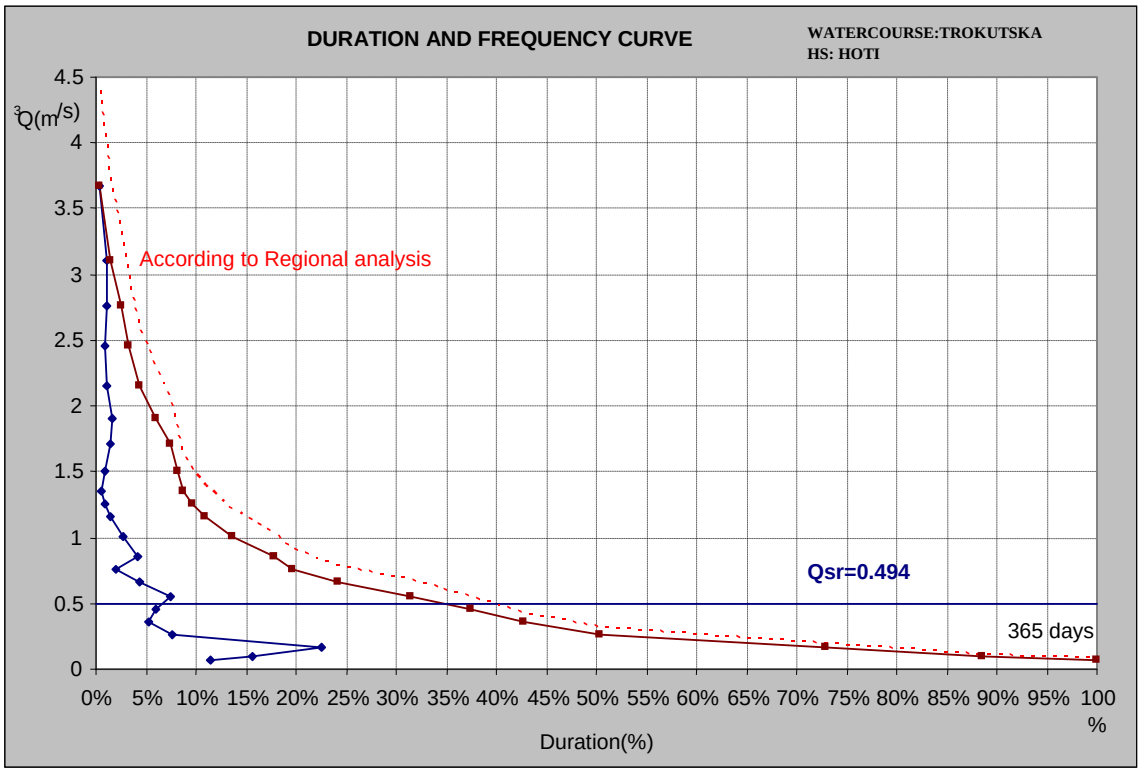
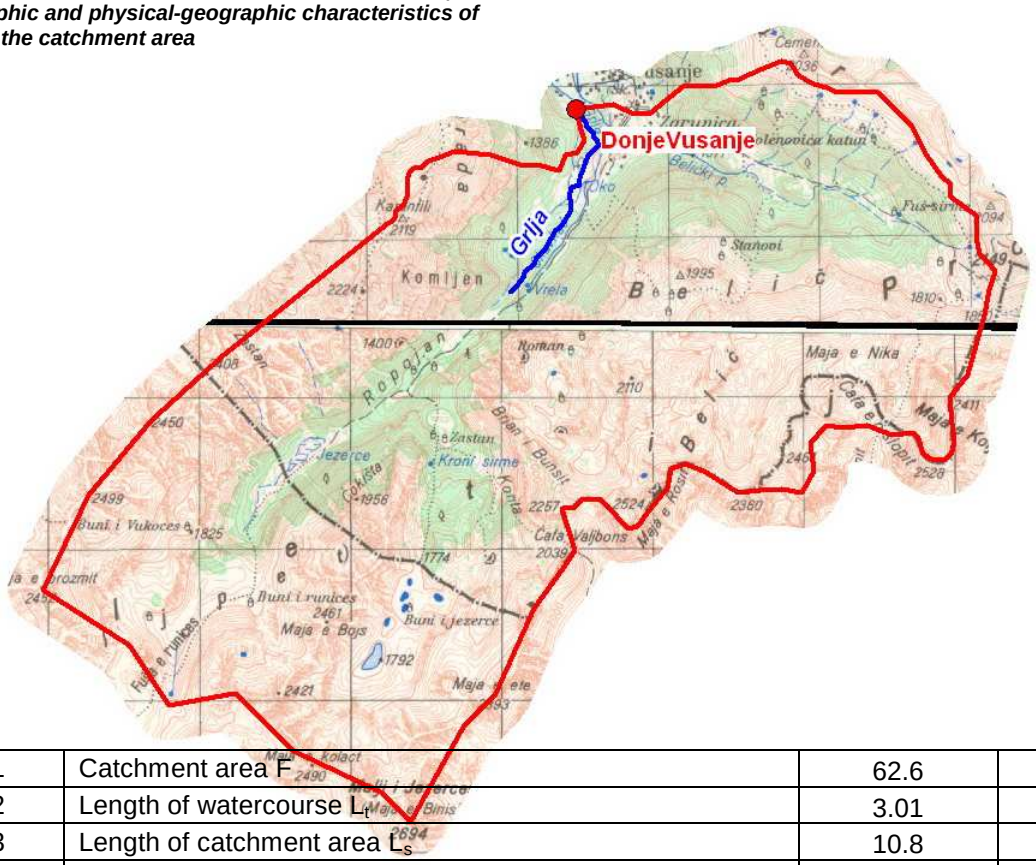


Figure 72

F.9. WATERCOURSE: GRLJA
HS: DONJE VUSANJE

General direction of this watercourse, as a third grade tributary of the river Lim, is South-North. The length of the watercourse is 3.01 km, catchment area 62.6 km^2 and the length of the watershed is 38.3 km. The highest elevation point of the catchment area is 2.694 m.a.s.l., while the lowest elevation is 950 m.a.s.l. Average head of the catchment area is 55.9 m.a.s.l., average altitude of the catchment area is 1.798 m.a.s.l. and levelled out head of the watercourse is 3.77%. These and other parameters of the catchment area are shown in the following table.

Hydrographic and physical-geographic characteristics of the catchment area



1	Catchment area F	62.6	[km^2]
2	Length of watercourse L_t	3.01	[km]
3	Length of catchment area L_s	10.8	[km]
4	Perimeter of catchment area S	38.3	[km]
5	Average width of catchment area $B=F/L_s$	5.80	[km]
6	Rectilinear distance river source - mouth L_i	2.58	[km]
7	Rectilinear distance between brunt centre of the catchment and the river mouth U_t	3.96	[km]
8	Watershed spreading factor K_s	1.37	[-]
9	Elongation of catchment factor K_σ	0.145	[-]
10	Concentration of catchment factor K_c	0.825	[-]
11	Tortousnesness of flow factor K_L	1.17	[-]
12	Maximum altitude in the catchment area H_{max}	2694	[m.a.s.l..]
13	Minimum altitude in the catchment area H_{min}	950	[m.a.s.l..]
14	Average head in the catchment area I_{sr}	55.9	[%]
15	Maximum head of slope of valley I_{max}	54.2	[%]
16	Average altitude of the catchment area H_{sr}	1798	[m.a.s.l..]
17	Average difference in altitude of the catchment area ΔH	848	[m]
18	Levelled out head of watercourse I_t	3.77	[%]
19	Maximum head of the watercourse I_{t1}	20.0	[%]
20	Average maximum head of the watercourse I_{t2}	4.65	[%]

Longitudinal profile of the watercourse (figure 73) and hypsometric curve (figure 74) are shown on the page 81. From the hypsometric curve it could be seen that elevation of the largest part of the catchment area is between 1.110 and 2.100 m.a.s.l and amounts to around 82%.

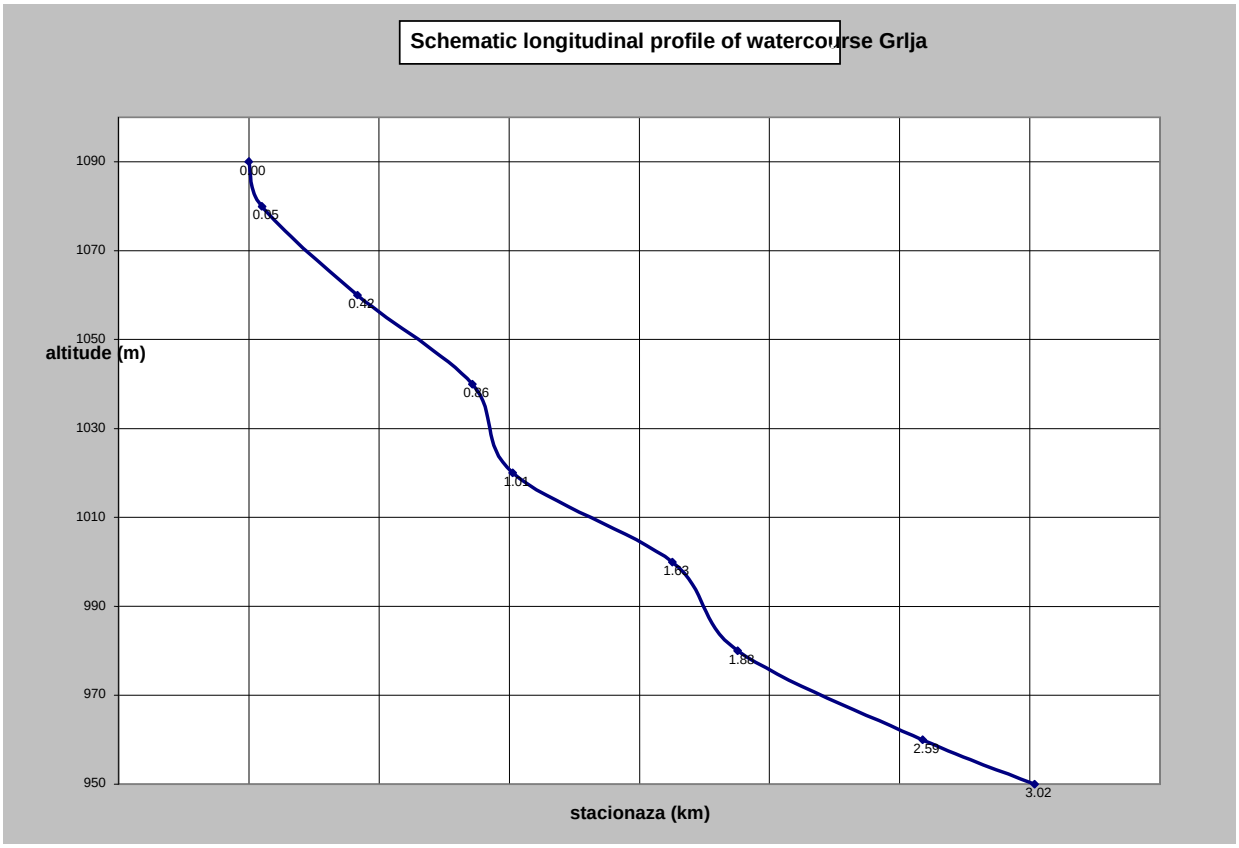


Figure 73

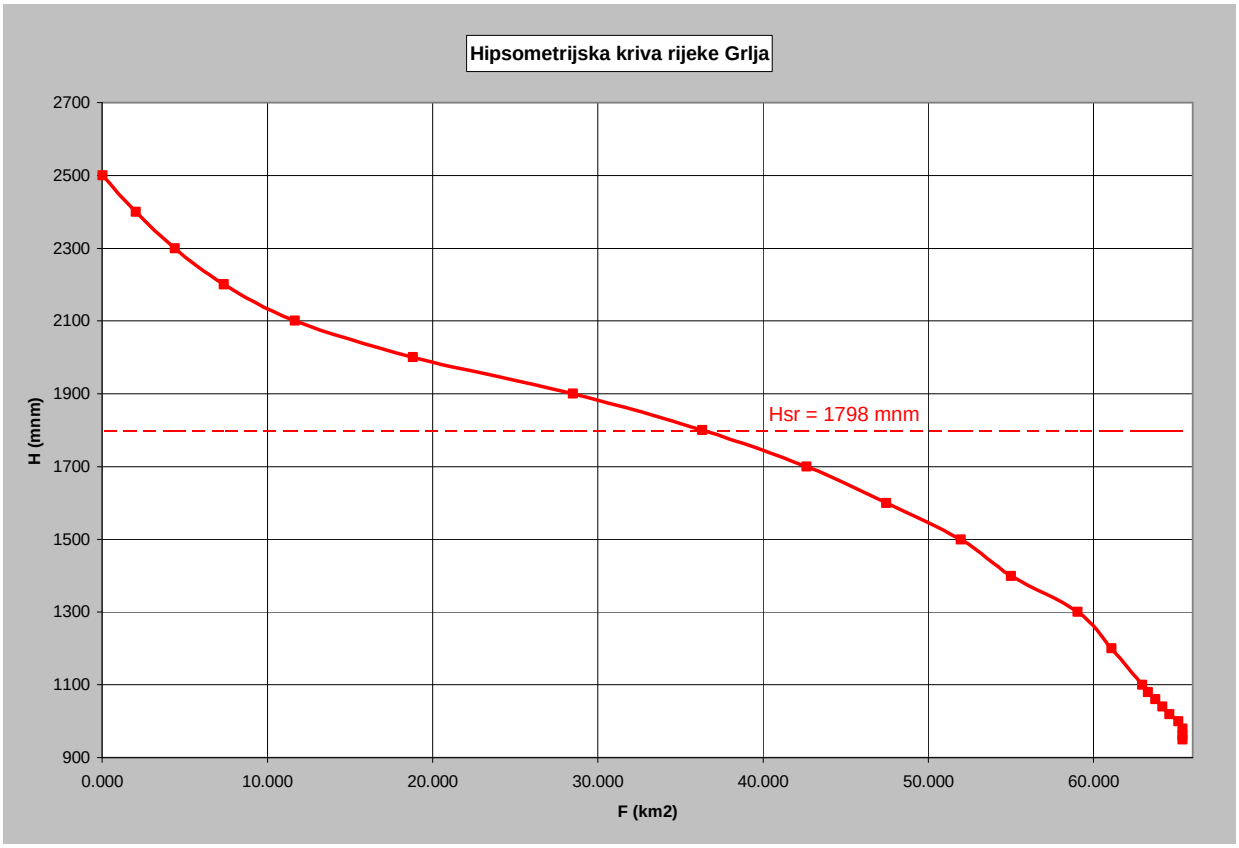


Figure 74

Flow curve (figure 75) is unique function with dependencies $Q_1 = \left(\frac{H_1}{35.723}\right)^{2.664}$ for the water level up to 75 cm, while for all those above this one it is exponential function $Q_2 = e^{\frac{H_2 - 30.953}{22.73}}$.

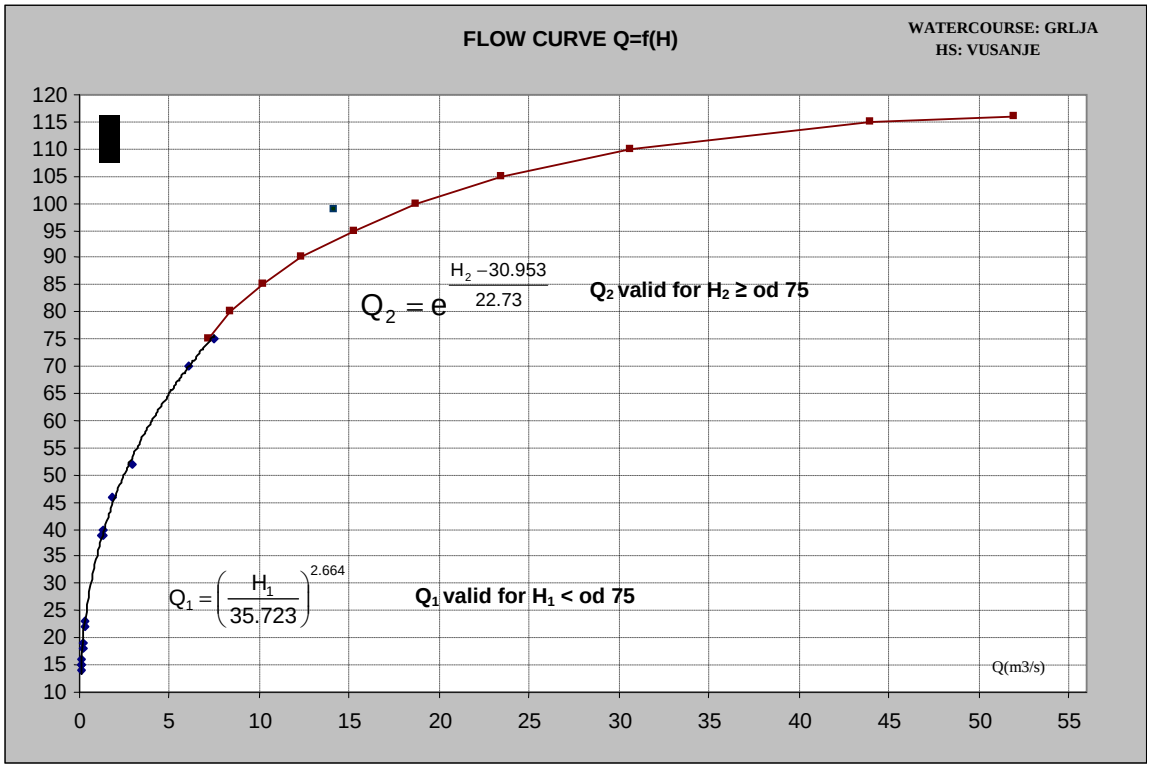


Figure 75

A balance for overall analysed period as well as for the calendar year is prepared based on these correlations. Overview of those flows is presented on the page 83.
The months with the biggest quantity of water were May and June 2007, while the months with the lowest quantity of water were June and August 2007. Absolute maximum of 42.2 m^3/s from May was 38.1 times higher than average daily flow for that day, which is absolute maximum in terms of minimum values.

Hydrogram of runoff (figure 76) as well as duration curve (figure 77) are shown on the page 84. Medium annual flow of 2.92 m^3/s lasts around 28% or 102 days in a year. Other characteristic durations of flow duration are presented in the following table.

Duration	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
Flow Q(m^3/s)	8.46	4.77	2.62	1.38	1.05	0.908	0.754	0.615	0.385

WATERCOURSE: GRLJA
HS: DONJE VUSANJE

REVIEW OF FLOWS - 2006

	JUN	JUL	AVG	SEP	OKT	NOV	DEC
1		22.8	2.719	1.179	0.685	0.386	0.347
2		14.69	3.006	1.021	0.628	0.386	0.309
3		11.785	3.312	0.947	0.574	0.347	0.309
4		10.33	6.002	1.021	0.810	0.347	0.275
5		8.287	4.727	1.021	1.639	0.386	0.243
6		7.589	3.312	0.947	1.443	0.386	0.213
7		6.650	2.582	0.877	1.098	0.347	0.186
8		6.470	2.197	0.810	1.021	0.347	0.186
9		6.470	2.449	0.746	0.877	0.275	0.810
10		6.470	3.806	0.685	0.746	0.186	0.685
11		6.233	3.157	0.628	0.628	0.161	0.574
12		5.776	3.157	0.628	0.574	0.118	0.474
13		5.776	4.727	0.628	0.574	0.082	0.386
14		5.776	3.312	0.628	0.523	0.082	0.347
15	11.785	5.776	2.582	0.574	0.523	0.082	0.347
16	15.35	5.131	2.197	1.179	0.523	0.082	0.309
17	18.30	4.533	2.077	3.312	0.523	0.082	0.746
18	23.8	4.533	2.077	2.860	0.523	0.082	2.860
19	26.0	4.533	1.961	1.961	0.523	0.082	1.639
20	32.4	4.533	1.850	1.352	0.474	0.082	1.098
21	37.011	4.533	1.639	1.098	0.474	0.810	0.877
22	33.9	4.344	1.352	0.947	0.474	2.860	0.746
23	32.4	4.160	1.263	0.810	0.474	1.352	0.685
24	29.7	3.637	1.179	0.685	0.474	1.021	0.628
25	27.20	3.637	1.742	0.628	0.429	0.810	0.628
26	24.9	3.981	1.539	0.947	0.429	0.685	0.523
27	26.0	3.806	1.443	1.179	0.429	0.628	0.523
28	24.9	3.472	1.352	1.179	0.429	0.523	0.523
29	24.9	3.806	1.850	0.947	0.429	0.474	0.523
30	26.0	3.806	1.850	0.947	0.429	0.474	0.523
31		3.806	2.197		0.347		0.523
DEK1	0.000	10.154	3.411	0.925	0.952	0.339	0.356
DEK2	11.610	5.370	2.809	1.312	0.557	0.102	0.861
DEK3	28.70	3.908	1.582	0.937	0.438	0.964	0.609
MIN	10.79	3.006	1.098	0.574	0.213	0.082	0.186
DAT	15	30	25	13	31	14	8
SRED	25.92	6.359	2.536	1.079	0.636	0.466	0.614
MAX	40.4	27.2	7.26	4.73	2.20	3.981	3.312
DAT	20	1	5	18	6	22	19

MIN = 0.082
DAT: 14. 11

SR = 3.878

MAX = 40.4
DAT: 20. 06

WATERCOURSE: GRLJA
HS: DONJE VUSANJE

REVIEW OF FLOWS - 2007

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1	0.523	0.386	0.523	0.947	4.927	6.712	1.098	0.243	0.099	0.877
2	0.685	0.347	0.574	1.179	4.533	5.776	1.098	0.213	0.118	0.628
3	0.628	0.309	1.021	1.352	4.727	5.556	1.098	0.186	0.099	0.523
4	0.574	0.275	1.639	1.443	6.944	5.341	1.021	0.186	0.118	0.429
5	0.523	0.275	1.539	1.352	19.96	5.556	1.098	0.161	0.138	0.347
6	0.523	0.275	1.179	1.179	38.61	5.341	0.947	0.138	0.118	0.309
7	0.474	0.243	1.098	1.443	31.0	5.131	0.810	0.118	0.118	0.386
8	0.429	0.243	1.098	1.639	18.28	5.776	0.810	0.099	0.138	0.746
9	0.386	0.243	1.021	1.850	13.43	6.002	0.810	0.099	0.161	0.574
10	0.347	0.347	1.098	2.321	13.43	5.341	0.746	0.099	0.186	0.685
11	0.243	0.429	0.947	2.719	13.43	4.727	0.685	0.099	0.347	2.860
12	0.161	0.429	0.810	2.860	14.04	4.533	0.628	0.099	0.877	2.449
13	0.161	0.685	0.746	3.312	14.04	4.344	0.523	0.099	0.386	1.639
14	0.161	0.810	0.685	3.806	15.33	4.160	0.523	0.099	0.275	1.263
15	0.138	0.685	0.628	4.160	14.67	3.806	0.523	0.082	0.213	0.877
16	0.138	0.574	0.628	4.160	13.43	3.806	0.523	0.082	0.161	0.685
17	0.138	0.474	0.746	3.472	10.317	3.472	0.523	0.082	0.138	0.574
18	0.138	0.429	0.877	2.860	6.944	3.312	0.523	0.082	0.138	0.474
19	0.138	0.386	0.947	3.312	5.556	3.472	0.523	0.082	0.118	0.386
20	0.138	0.386	0.947	3.472	4.927	3.312	0.474	0.082	0.118	0.347
21	0.138	0.386	0.877	3.981	5.341	3.006	0.429	0.082	0.118	0.309
22	0.213	0.429	0.746	4.533	6.712	3.006	0.474	0.082	0.099	0.309
23	0.429	0.429	0.685	4.533	8.652	2.860	0.523	0.068	0.099	0.275
24	0.746	0.429	0.628	5.131	9.873	2.719	0.523	0.068	0.099	
25	1.098	0.429	0.628	6.233	8.280	2.449	0.474	0.055	0.082	
26	0.877	0.474	0.628	5.556	7.256	2.197	0.429	0.055	0.099	
27	0.685	0.628	0.628	4.927	6.359	1.961	0.386	0.043	0.810	
28	0.574	0.574	0.685	4.533	8.280	1.639	0.347	0.043	1.961	
29	0.523		0.685	4.533	31.0	1.263	0.275	0.055	3.806	
30	0.429		0.810	4.927	19.100	1.098	0.243	0.055	1.539	
31	0.386		0.877		9.873		0.275	0.043		
DEK1	0.509	0.294	1.079	1.470	15.58	5.653	0.953	0.154	0.129	0.550
DEK2	0.156	0.529	0.796	3.413	11.268	3.895	0.545	0.089	0.277	1.155
DEK3	0.554	0.472	0.716	4.889	10.97	2.220	0.398	0.059	0.871	0.089
MIN	0.138	0.243	0.523	0.877	4.160	1.021	0.213	0.025	0.068	0.275
DAT	15	6	1	1	2	30	30	31	5	7
SRED	0.411	0.429	0.859	3.257	12.56	3.923	0.624	0.099	0.426	0.579
MAX	1.263	1.021	1.961	6.470	42.2	7.582	1.263	0.275	5.556	3.157
DAT	25	13	4	25	6	1	1	1	28	11

MIN = 0.025
DAT: 31. 08

SR = 0.239

MAX =42.2
DAT: 6. 05

WATERCOURSE: GRLJA
HS: DONJE VUSANJE

REVIEW OF FLOWS

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	6.712	11.953	1.481	0.639	0.781	0.386	0.347	0.523	0.386	0.523	0.947	4.927
2	5.776	7.892	1.610	0.569	0.628	0.386	0.309	0.685	0.347	0.574	1.179	4.533
3	5.556	6.442	1.749	0.523	0.548	0.347	0.309	0.628	0.309	1.021	1.352	4.727
4	5.341	5.674	3.094	0.569	0.619	0.347	0.275	0.574	0.275	1.639	1.443	6.944
5	5.556	4.693	2.444	0.580	0.993	0.386	0.243	0.523	0.275	1.539	1.352	19.96
6	5.341	4.268	1.725	0.532	0.876	0.386	0.213	0.523	0.275	1.179	1.179	38.61
7	5.131	3.730	1.350	0.497	0.742	0.347	0.186	0.474	0.243	1.098	1.443	31.0
8	5.776	3.640	1.148	0.474	0.883	0.347	0.186	0.429	0.243	1.098	1.639	18.28
9	6.002	3.640	1.274	0.453	0.725	0.275	0.810	0.386	0.243	1.021	1.850	13.43
10	5.341	3.608	1.953	0.436	0.716	0.186	0.685	0.347	0.347	1.098	2.321	13.43
11	4.727	3.459	1.628	0.487	1.744	0.161	0.574	0.243	0.429	0.947	2.719	13.43
12	4.533	3.202	1.628	0.752	1.511	0.118	0.474	0.161	0.429	0.810	2.860	14.04
13	4.344	3.149	2.413	0.507	1.106	0.082	0.386	0.161	0.685	0.746	3.312	14.04
14	4.160	3.149	1.706	0.451	0.893	0.082	0.347	0.161	0.810	0.685	3.806	15.33
15	7.796	3.149	1.332	0.394	0.700	0.082	0.347	0.138	0.685	0.628	4.160	14.67
16	9.577	2.827	1.140	0.670	0.604	0.082	0.309	0.138	0.574	0.628	4.160	13.43
17	10.89	2.528	1.080	1.725	0.548	0.082	0.746	0.138	0.474	0.746	3.472	10.317
18	13.57	2.528	1.080	1.499	0.498	0.082	2.860	0.138	0.429	0.877	2.860	6.944
19	14.75	2.528	1.022	1.039	0.455	0.082	1.639	0.138	0.386	0.947	3.312	5.556
20	17.87	2.504	0.966	0.735	0.410	0.082	1.098	0.138	0.386	0.947	3.472	4.927
21	20.0	2.481	0.861	0.608	0.392	0.810	0.877	0.138	0.386	0.877	3.981	5.341
22	18.45	2.409	0.717	0.523	0.392	2.860	0.746	0.213	0.429	0.746	4.533	6.712
23	17.65	2.341	0.666	0.454	0.375	1.352	0.685	0.429	0.429	0.685	4.533	8.652
24	16.21	2.080	0.623	0.392	0.474	1.021	0.628	0.746	0.429	0.628	5.131	9.873
25	14.82	2.056	0.898	0.355	0.429	0.810	0.628	1.098	0.429	0.628	6.233	8.280
26	13.55	2.205	0.797	0.523	0.429	0.685	0.523	0.877	0.474	0.628	5.556	7.256
27	13.99	2.096	0.743	0.994	0.429	0.628	0.523	0.685	0.628	0.628	4.927	6.359
28	13.27	1.909	0.697	1.570	0.429	0.523	0.523	0.574	0.574	0.685	4.533	8.280
29	13.08	2.041	0.952	2.377	0.429	0.474	0.523	0.523		0.685	4.533	31.0
30	13.56	2.025	0.952	1.243	0.429	0.474	0.523	0.429		0.810	4.927	19.100
31		2.041	1.120		0.347		0.523	0.386		0.877		9.873
DEK1	5.653	5.554	1.783	0.527	0.751	0.339	0.356	0.509	0.294	1.079	1.470	15.58
DEK2	9.222	2.902	1.399	0.826	0.847	0.094	0.878	0.156	0.529	0.796	3.413	11.27
DEK3	15.46	2.153	0.821	0.904	0.414	0.964	0.609	0.554	0.472	0.716	4.889	10.97
MIN	1.021	0.213	0.025	0.068	0.275	0.082	0.186	0.138	0.243	0.523	0.877	4.160
DAT	30	30	31	5	7	14	8	15	6	1	1	2
SRED	10.112	3.492	1.318	0.752	0.662	0.466	0.614	0.411	0.429	0.859	3.257	12.56
MAX	40.42	27.20	7.262	5.556	3.157	3.981	3.312	1.263	1.021	1.961	6.470	42.17
DAT	20	1	5	28	11	22	19	25	13	4	25	6

MIN = 0.025
DAT: 31. 08

SR = 2.923

MAX =42.2
DAT: 6. 05

AVERAGE VALUE FOR 496 DAYS IS Q = 2.993m³/s

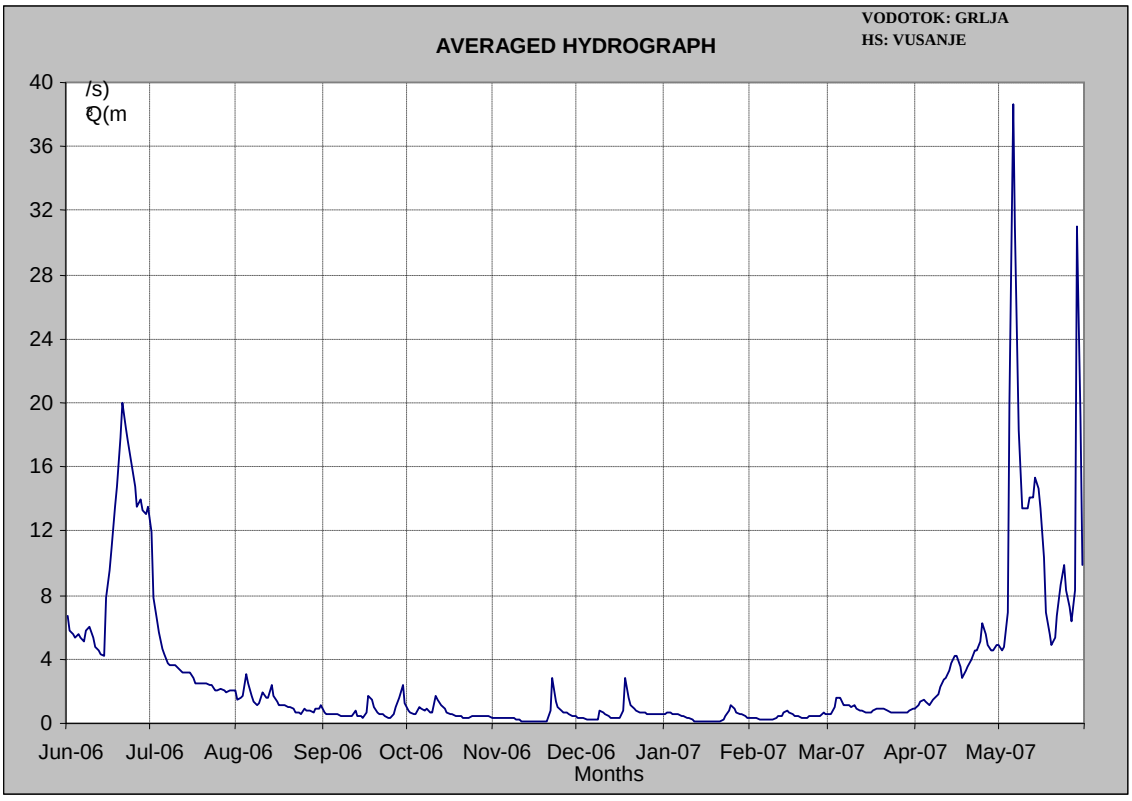


Figure 76

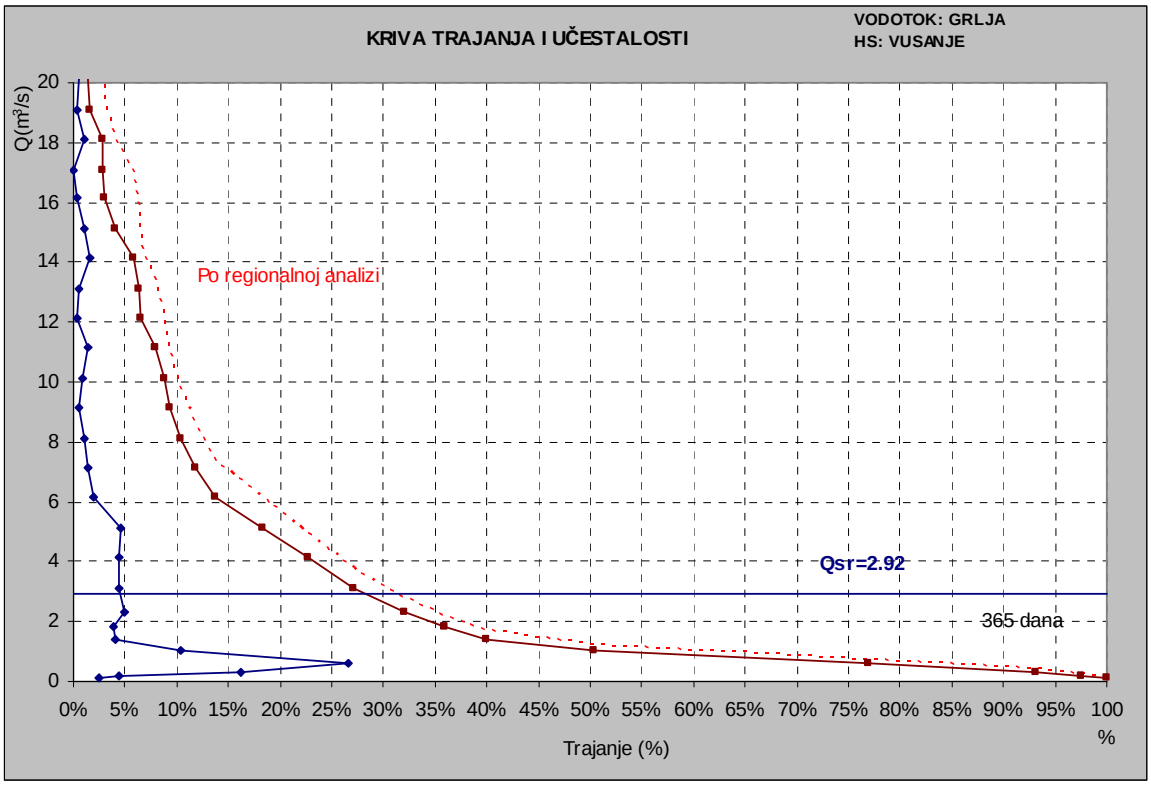


Figure 77

G. Broad regional analysis for tributaries in the catchment area of the river Lim

As well as in Piva case, this analysis begins by comparing specific modules of runoffs l/s.km^2 for large, medium and small waters.

Watercourse	Profile	F(km^2)	Q_{max}	q_{max}	Q_{sr}	q_{sr}	Q_{min}	q_{min}	P(mm)	Run-off factor
Jelovica	Lubnice	59.0	20.5	347.5	1.19	58.0	0.071	1.20	1185	0.536
Trepačka Rijeka	Trepča	32.5	11.8	363.0	0.695	21.4	0.023	0.708	1185	0.568
Kraštica	Kralje	26.6	8.22	309.0	0.757	28.5	0.022	0.827	1431	0.628
Velička Rijeka	Velika	12.4	1.74	140.3	0.277	22.3	0.024	1.94	1176	0.598
Murinska Rijeka	Murino	17.3	3.42	197.7	0.468	27.0	0.083	4.80	1189	0.717
Babinopoljska Rijeka	Babino Polje	26.0	11.2	430.8	0.817	31.4	0.064	2.46	1176	0.842
Komarača	Jara	61.2	25.8	421.6	2.14	35.0	0.041	0.670	1176	0.937
Trokutska Rijeka	Hoti	19.6	9.34	476.5	0.494	25.2	0.036	1.84	1176	0.675
Grlja	Donje Vusanje	62.6	42.2	674.1	2.92	46.6	0.025	0.40	1176	1.25

With regard to large waters, an analysis has mostly shown balance. It could be stated that for Velicka and Murinska River they are in decrease, while for Grlja these waters show certain increase. Eventual correction of catchment areas as well as of overall rainfall could bring certain improvement, but for our level of analysis that is not such important.

With regard to medium waters, we have mostly correct modules of specific runoff, which are perhaps in certain excess for Jelovica and Grlja that cannot be stated with certainty because of heterogeneous nature of hydrological conditions in their catchment areas. Analysis of specific runoffs modules for the small water indicates certain level of increase for Murinska and Babinopoljska River, which is once again difficult to confirm without additional analysis, which would be out of scope of our report.

Finally, runoff ratios for medium waters have shown the best harmonization, which is rather expected. However, certain increase for Grlja and Komaraca can be noticed, where catchment areas and rainfall figures could probably need certain corrections. Due to lack of appropriate maps of contours, we are not able to elaborate this with more preciseness.

Analysis of rainfall for meteorological stations Berane and Plav, and rainfall stations Konjuhe and Murino, has shown deficits for period May 2006 – October 2007 (22% for Berane, 23% for Plav, 46% for Konjuhe), which gives average value of 42%, which we, however, consider exaggerated.
We shall be on a rather safe side if we apply deficits of humidity registered in measurements from analysed period, considering also to period of previous 26 years (1980 – 2006), to the flows in Piva catchment area, aounting at 20%, which needs to be taken into consideration knowing that we made correction of flows on duration curves by 30%, i.e. correction of 30% in Lim catchment area, which we, however, consider exaggerated.

At the end of this report, we need to say that Slavica Micev and Nada Rudan, graduated meteorologists, performed analyses of rainfall for the purpose of this report, while a team of technicians leaded by Novak Darmanovic and Caslav Maskovic performed hydrometric measurements.

Finally, we propose that at least 40% of these measuring profiles require further hydrological follow up. According to our judgment, these would be Ribnjak, Timar, Bijela and Tusina in Piva catchment area, and Jelovica, Krastica, Komaraca and Grlja in Lima catchment area.

H. Corrected values reduced to period of several years

H.1. Watercourse: Jelovica
HS: Lubnice

	MAJ	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL
DEK1	4.75	2.27	0.500	0.198	0.199	0.193	0.218	0.397	0.586	0.869	3.18	2.60
DEK2	8.06	1.94	0.301	0.193	0.200	0.202	0.239	0.739	0.503	1.53	1.52	3.95
DEK3	7.79	0.958	0.203	0.128	0.188	0.216	0.737	0.689	1.72	1.15	1.30	3.05
minQ	0.760	0.385	0.133	0.085	0.091	0.144	0.180	0.306	0.415	0.653	1.03	1.50
Qsr	6.11	1.73	0.330	0.172	0.194	0.204	0.398	0.611	0.961	1.19	1.97	3.20
Qmax	24.7	8.55	2.75	2.55	5.86	6.32	1.50	2.03	5.43	2.97	6.81	5.43
	Qmin=0.085				Qsr=1.42				Qmax=24.6			

H.2 Watercourse: Trepačka Rijeka
HS: Trepča

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	1.70	0.228	0.103	0.086	0.095	0.152	0.166	0.253	0.616	3.25	3.57	1.11
DEK2	1.26	0.144	0.104	0.124	0.078	0.125	0.331	0.264	1.25	1.53	4.74	0.460
DEK3	0.500	0.089	0.089	0.096	0.085	0.404	0.235	1.08	1.13	1.82	2.34	0.642
minQ	0.265	0.028	0.028	0.028	0.052	0.078	0.101	0.100	0.240	0.797	1.276	0.274
Qsr	1.15	0.151	0.098	0.102	0.086	0.223	0.244	0.550	0.989	2.19	3.55	0.734
Qmax	6.24	0.620	6.24	14.1	0.800	6.81	2.43	5.23	2.97	6.81	6.24	2.97
	Qmin=0.028				Qsr=0.834				Qmax=14.1			

H.3 Watercourse: Kraštica
HS: Kralje

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	1.34	0.286	0.091	0.106	0.125	0.210	0.228	0.356	0.874	2.60	6.48	0.724
DEK2	0.986	0.172	0.091	0.116	0.115	0.211	0.373	0.306	2.44	1.68	2.51	0.367
DEK3	0.436	1.112	0.079	0.114	0.136	0.438	0.288	1.48	1.81	3.66	1.19	0.368
minQ	0.217	0.070	0.026	0.026	0.059	0.137	0.187	0.250	0.756	1.09	0.756	0.227
Qsr	0.920	0.187	0.088	0.112	0.126	0.287	0.296	0.738	1.70	2.68	3.39	0.482
Qmax	4.78	0.516	1.55	1.30	7.44	9.86	1.55	6.44	4.11	9.86	9.86	1.30
	Qmin=0.026				Qsr=0.908				Qmax=9.86			

H.4. Watercourse: Velička Rijeka
HS: Velika

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	0.836	0.232	0.132	0.079	0.083	0.199	0.142	0.096	0.146	0.589	0.996	0.792
DEK2	0.592	0.257	0.120	0.077	0.095	0.124	0.098	0.085	0.292	0.527	1.265	0.388
DEK3	0.314	0.155	0.064	0.074	0.155	0.229	0.102	0.232	0.361	0.744	0.894	0.493
minQ	0.216	0.125	0.029	0.037	0.056	0.085	0.085	0.085	0.125	0.360	0.679	0.305
Qsr	0.581	0.212	0.104	0.077	0.113	0.184	0.113	0.140	0.259	0.624	1.05	0.535
Qmax	1.77	0.498	0.305	0.151	0.360	0.892	0.181	0.679	0.498	1.50	2.09	2.09
	Qmin=0.029				Qsr=0.332				Qmax=2.09			

H.5 Watercourse: Murinska Rijeka
HS: Murino

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	1.53	0.968	0.178	0.133	0.151	0.155	0.200	0.206	0.256	0.758	0.605	2.48
DEK2	1.26	0.262	0.160	0.128	0.160	0.146	0.230	0.174	0.406	0.486	1.15	1.79
DEK3	1.09	0.192	0.133	0.133	0.157	0.394	0.234	0.385	0.346	0.464	1.69	1.11
minQ	0.293	0.138	0.100	0.100	0.110	0.138	0.170	0.170	0.211	0.364	0.560	0.961
Qsr	1.30	0.466	0.156	0.132	0.156	0.232	0.222	0.259	0.335	0.566	1.15	1.77
Qmax	3.47	0.503	0.624	0.190	0.236	1.38	0.364	1.07	0.774	1.19	3.15	7.49
	Qmin=0.100				Qsr=0.562				Qmax=4.103			

H.6. Watercourse: Babinopoljska Rijeka
HS: Babino Polje

	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ	JUN
DEK1	0.295	0.198	0.176	0.278	0.251	0.318	0.211	0.220	0.632	1.23	7.03	2.73
DEK2	0.246	0.209	0.158	0.340	0.275	0.324	0.198	0.292	0.574	3.79	4.04	1.26
DEK3	0.156	0.150	0.192	0.257	0.466	0.316	0.305	0.349	0.522	4.74	2.35	0.360
minQ	0.077	0.077	0.077	0.116	0.221	0.280	0.173	0.173	0.354	0.576	1.68	0.248
Qsr	0.230	0.185	0.175	0.290	0.330	0.319	0.240	0.282	0.574	3.25	4.41	1.45
Qmax	0.492	9.42	0.576	1.68	3.38	0.576	0.677	0.396	0.926	7.36	13.5	7.36
	Qmin=0.077				Qsr=0.980				Qmax=13.5			

H.7. Watercourse: Komarača
HS: Jara

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	5.66	1.18	0.367	0.307	0.517	0.520	0.736	0.676	0.676	3.01	4.92	11.9
DEK2	8.19	0.454	0.383	0.286	0.552	0.577	0.875	0.523	1.03	2.91	9.24	8.82
DEK3	3.46	0.234	0.290	0.348	0.475	2.11	0.925	1.01	1.14	2.64	10.1	6.46
minQ	0.487	0.049	0.080	0.094	0.202	0.408	0.576	0.446	0.576	1.11	3.36	4.01
Qsr	4.54	0.610	0.344	0.313	0.514	1.07	0.847	0.746	0.937	2.64	8.09	8.97
Qmax	22.9	6.07	17.9	0.907	5.16	31.0	3.36	7.10	2.32	5.60	12.8	19.0
	Qmin=0.049				Qsr=2.57				Qmax=31.0			

H.8. Watercourse: Trokutska Rijeka
HS: Hoti

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	0.635	0.197	0.128	0.096	0.110	0.126	0.245	0.269	0.388	1.03	1.22	2.56
DEK2	0.672	0.128	0.114	0.090	0.110	0.148	0.296	0.232	0.792	0.768	2.46	1.18
DEK3	0.340	0.107	0.088	0.098	0.102	0.590	0.280	0.553	0.709	0.943	3.20	0.571
minQ	0.193	0.058	0.043	0.043	0.066	0.097	0.193	0.215	0.292	0.608	0.989	0.427
Qsr	0.548	0.143	0.109	0.095	0.108	0.288	0.274	0.358	0.600	0.914	2.29	1.41
Qmax	2.34	3.22	1.33	0.322	0.427	11.2	0.564	2.34	1.88	1.68	6.46	4.37
	Qmin=0.043				Qsr=0.593				Qmax=11.2			

H.9. Watercourse: Grlja
HS: Donje Vusanje

	JUN	JUL	AVG	SEP	OKT	NOV	DEC	JAN	FEB	MART	APRIL	MAJ
DEK1	6.78	6.65	2.14	0.632	0.901	0.407	0.427	0.611	0.353	1.29	1.76	18.7
DEK2	11.1	3.48	1.68	0.991	1.02	0.133	1.05	0.187	0.635	0.955	4.10	13.5
DEK3	18.6	2.58	0.985	1.08	0.497	1.16	0.731	0.665	0.566	0.859	5.87	13.2
minQ	1.22	0.256	0.030	0.082	0.330	0.098	0.223	0.166	0.292	0.628	1.05	4.99
Qsr	12.1	4.19	1.58	0.902	0.794	0.559	0.737	0.493	0.515	1.03	3.91	15.1
Qmax	48.5	32.6	8.71	6.67	3.79	4.78	3.97	1.52	1.23	2.35	7.76	50.6
	Qmin=0.03				Qsr=3.51				Qmax=50.6			

I. Review of potential mistake evaluation

Inspired with mistake theory from geodesy, we shall try to implement (only for information purpose) the same principle in this report.
Overall error with processes containing accidental (stochastic) component, consists of at least three components:
- subjective mistake of those who performed analysis
- probable error of an instrument
- estimated error of flow curve

Let us be optimistic and suppose that in this case we adopt subjective error D_{obr} of those who performed analysis of 8%, error of an instrument measuring water level D_{ins} of 2%, error of hydrometric wing $D_{ins.k}$ of 10% and error of flow curve of 15% (in some cases that error might go up to 25-30% for hydrometric measurements of flow from immediate past). In this case, total error would be sum of all three mentioned errors based on a formula:

$$\Delta = \sqrt{\Delta^2_{obr} + \Delta^2_{ins} + \Delta_{krp}{}^2}$$

$\Delta = \sqrt{0.08^2 + 0.12^2 + 0.15^2} = \sqrt{0.0433}$ =0.21, therefore, at the end we get resulting error of 21%, so that possible range of quantitative data acceptability could be:

$Q\text{-}0.21DQ < DQ \leq Q + 0.21DQ$

J. Proposals ans Conclusions

1. Validity of this analysis is directly correlated with executed hydrometric measurements which, it was noticed, were not of a same quality for every measurement profile, especially due to wrong choice in terms of changes in water levels amplitude. At the same time, we need to note that for Montenegrin torrent flows it is difficult to perform more appropriate measurements in periods of higher water levels due to increased velocity of flows. Generally, the same applies for measurements of low waters for the reason of frequent distorsions of transversal profiles, as well as of rapid changes of roughness ratios.

2. During construction of flow curves, while considering measurements as they are, there was high probability of „drifting away“, primarily by obtaining reduced flow levels and underestimated large waters, which would be absolutely unacceptable. Usual methods used for their extrapolation (Stevens, Felikanov, Frudeux's number, surface parameters of measuring surfaces F = f (H) and measured speeds v = v (H)), all this in function of modification of water level by amplitude of occurrence, have not been proved very successful, based on very long experience of the authors of this report. We consider that introduction of functional dependencies in domain of interpolation of flows curves through measuring data, and set values – assigned in advanced for domain of extrapolation, in accordance with experience, according to curvature from the lower part (which is much less questionable) is much closer to reality.
   It happened that some of the measurements were rejected for all profiles (mostly for larger waters). At this point, we need to mention that all 15 measurements were rejected for Vrbnica (profile „Stabna“). That is not very disturbing, as profile „Ribnjak“ is situated somewhat downstream, so everything was done in correlation with that profile (point C_1.) of the main report. Primary reason for this is incredibly same quantity of measurements on both profiles, which differ only for 2 – 5 lit/sec, which is absolutely not viable. Knowing that area of "Stabna" catchment area is 28,1 km^2, and for "Ribnjak" 73,0 km^2, the measurements must differ in much greater extent. Ultimately, balance is different: average annual flow in calendar year in "Stabna" case amounts to 1.14 m^3/sec., while for "Ribnjak" amounts to 1,92 m^3/sec. Number of rejected measurements for other profiles was between one and four.

3. We had a great dilemma with regard to selection of period to be analysed, which is conditioned with beginning of measurements that were commencing in certain station only when it was enabled for that in construction sense. Besides, these periods could not have been the same, which is, we hope, understandable. Without any kind of help from coordinators we have decided for calendar year of 365 days, i.e. 12 months. That is a usual procedure, as calculation of annual generation – i.e. energy – also represents standard procedure. After all, we explained this earlier in this text, when talking about duration curves.

4. We also provided numerous parameters of hydrographic and physical-geographic characteristics for all catchments areas (15 of them), achieving mechanographic level of analysis, which is significant novelty.

5. Nevertheless, our greatest dilemma was related to estimation of dryness of treated period. According to some reports, the World Meteorological Organization has estimated that 2007 was the driest year in the last 100 years. Before, that record was held by 1990 and 1993 (according to for us available data). When trying to implement this correction in our report, we had problems because of inadequate maps of contours, so we adopted only average value from several rainfall and climatic stations. That correction was 30% in Piva basin, and 20% in Lim basin. Now we realize that we would have been on the safe side if we had applied 15% for Piva basin and 10% for Lim basin, so we suggest usage of these new values in continuation of our report.

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