PN-ACQ-080

DANUBE TRANSBOUNDARY POLLUTION REDUCTION PROJECT

FINAL REPORT

I. MONITORING STATIONS
II. ACQUISITION OF LAB EQUIPMENT
III. THE MAROS AQUIFER

BUDAPEST, AUGUST, 2000

Vituki INKOSTAKIM

Final Report

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Cooperating subcontractors

VITUKI Innosystem Ltd. / Budapest / coordinator: dr. Pál Benedek

Controlsoft Ltd. / Veszprém

B & K Bt. / Budapest (lab equipment)

Second tied subcontractors

* Construction works (VITUKI Innosystem)

MARAG Ltd. / Debrecen

KUREK Bt. / Encs

* Instrumentation (Controlsoft)

  Aquacontrol Ltd.

* Plans for licensing of the stations (VITUKI Innosystem)

  Saviterv Ltd./Miskolc

  FETIVIZ Ltd./Nyíregyháza

  MARAG Ltd./Debrecen

* Maros Aquifer investigation (VITUKI Innosystem)

  VITUKI Plc.

Summary

This project consisted of 3 parts: Monitoring Stations, Lab equipment and Maros Aquifer study. Summarizing the Final Report this sequence is followed.

I. Monitoring Stations

The US AID contracted with M&E for establishing 7 stations on the Slovak-Hungarian and Romanian-Hungarian transboundary rivers. Out of these 7 stations 5 were awarded to VITUKI Innosystem in the scope of this subcontract. The work started in 1996, preliminary and detailed planning was carried out by VITUKI Innosystem with invitation of the interested Water Directorates (W.D.), their civil engineering companies, resp. This idea was supported by the fact that without the W.D.,s consent nothing can be built in the river bed or on the river bank, further that the W.D. is responsible for protecting the rivers against accidental pollution on the basis of the alarm issued by the Environmental Inspectorate and in case of automatic monitoring stations by electronic means.

The plans of the 5 stations included civil works supported financially by the Ministry of Environment with the installation with equipment, telecommunication units, resp. financed by US AID. Further as to the rivers concerned the pollution history, the water users menaced by pollution and the adopted protection measures were also reviewed.

In 1998 the Ministry of Environment decided that 3 stations should be constructed only: on the Hernád/Hornad, Szamos/Somes and Berettyó/Barcau rivers. Further the Ministry requested from US AID the supply of lab equipment to the 4 Inspectorates concerned in the original 7 stations and the supply of a maintenance car to the operation of the stations of Hernádszurdok, Csenger and Pocsaj. VITUKI Innosystem prepared the tender documents of the civil works and M&E did the same to the installation of equipment and telecommunication. To the latter the subcontractor of Controlsoft was selected. The 3 stations were finished by the end of 1999 and the lab equipment was duly supplied, as well. After the trial operation the stations were taken over by the 3 Inspectorates concerned and now they are operated by them as their ownership.

Practically the 3 stations are constructed and installed in a uniform pattern with the same water intake systems and with the same set of equipment. The stations theoretically are incorporated into the Danube Accidental Emergency Warning System established by the Danube countries and coordinated by its center in Vienna. This System has so called PIAC-Centers in each riparian country the one for Hungary has the number of 05 and is situated in the VITUKI Plc., Budapest. Sorry to say the telecom-system of the 3 stations have not yet been connected to PIAC-05 by electronic means. This is, however, foreseen in no time by the Ministry of Environment.

In March 2000 the US AID trusted M&E and VITUKI Innosystem for organizing a workshop on the experience of the monitoring of transboundary rivers. The Workshop was held in Miskolc (with the help of the local Inspectorate) and the participants (Vienna PIAC-Coordinators, Hungarian, Slovak and Romanian experts) visited the Hernádszurdok station.

Maps and Annexes are attached to this part of the project as listed at the end of the Content.

II. Lab-equipment procurement

M&E trusted VITUKI Innosystem with the task of tendering the equipments required by the 5 Inspectorates of Miskolc, Nyíregyháza, Debrecen, Gyula and Szeged. The list of the equipment supplied can be found as the Annex of Chapter II.

III. Maros Aquifer Investigation

There is a more detailed summary attached to the Final Report of this part of the project. Hereby some excerpts from that are presented only.

Maros Aquifer investigations intend the protection of the aquifer shared by the countries Hungary and Romania. This implements the following tasks:

- summarizing the previous studies done on the Maros aquifer.
- determining the primary sources of pollution in Romania and Hungary, further the water users and their locations in Hungary,

- preparing a model of the Maros aquifer showing the current conditions of quality and quantity of withdrawals,
- carrying out additional analytical measurements for organic micropollutants in water samples taken from selected wells at or nearby potential contaminant sources located within recharge areas directly contributory to the underlying Maros aquifer,
- simulating the anticipated changes in the aquifer water quality with various conditions,
- developing a formal protection program for the Maros aquifer.

The Preliminary Report dealt with the first three issues listed above. The report compiled the available information on geology, hydrogeology, water supply, pollution sources, water quality of ground water and river water of the study area. A regional hydraulic model of the Maros aquifer was developed. The numerical model was based on Processing Modflow for Windows software.

In the final phase of the project the Romanian consulting company PROED S.A. (contracted by M&E) provided the report "Additional services concerning the sampling and analysis of ground water. Documentation including required data from Mures alluvial cone" - under subcontract to M&E. The PROED report included the analytical results of the additional water quality measurements in the Romanian part of the study area, and provided information on land use, geology, hydrogeology, water abstraction etc. - contributing to the improvement of the Maros aquifer hydraulic model.

The additional water quality measurements were intended for organic chemical constituents, data for which were lacking.

In Hungary the sampling sites were selected dominantly in areas with downward flow. The water samples were taken from the upper part of the shallow (phreatic) ground water.

The measured concentrations of the analyzed organic micropollutants were compared with the limit values of the 98/83 EC Directive (water intended for human consumption) because Hungary and Romania intend to harmonize the environmental legislation with the requirements of the European Union. The measurements indicated moderate pollution effect

of the agricultural pesticides application in the region. The other types of analyzed organic micropollutants (volatile and semi-volatile aromatics, volatile chlorinated hydrocarbons) were found typically in insignificant concentrations, except in the case of benzene, but a part of the results of benzene analysis seems to be unreliable.

The formal protection program for the Maros aquifer is based on the principle of allowing activities in the surface and subsurface safety zones which do not affect the quality and quantity of the sources of supply developed already, or designated for future development and do not interfere with the process of abstraction. The limitations imposed on the use of surface and subsurface safety zones have been specified depending on the land use type.

Budapest, July 2000

Dr. Veronika Major
Executive Director

Dr. Pál Benedek
Project coordinator

I. MONITORING STATIONS

Introduction

This US AID supported Project aims at the prevention or reduction of accidental pollution in 3 Danube sub-basins. Being of transboundary character it has project components in Slovakia and Romania adjacent to the borders. The main goal of the project in the Hungarian territory is the establishment of water quality monitoring stations on the transboundary rivers. The project started in 1996 after signing the Letter of Understanding by the US AID and the Government of Hungary.

The river Hernád has its origin in Slovakia and almost the entire catchment area is there. The Szamos and Berettyó originate in Romania and in case of both rivers about 90 percent of the catchment is in the Transsylvanian part of Romania. The recipient of the 3 rivers is the Tisza, originating in the Ukraine part of the Carpathian mountain range and it has its confluence with the Danube in the Serbian Danube Section of Yugoslavia.

The monitoring system is a consistent part of the Danube Accidental Emergency Warning System which is outlined lower. The short description of the 3 monitoring stations can be found supported by maps and schemes in the Chapters No. 4 and 6.

The Emergency Action Plan (see Chapter 5) itself – in principle - is common in the entire area of Hungary, this way presenting this Plan – more or less - is adaptable to all the transboundary rivers. The special plans for actions – at the 3 rivers concerned - are pointed out in the Annexes.

Hungary has bilateral agreements in the field of water management with all his neighbors (all of them are upstream countries with exception of the present Yugoslavia, especially Serbia). In Chapter 2 the early warning problems of accidental pollution originating in Slovakia or Romania are outlined, as a part of the bilateral agreements.

The execution of the project is administered by the Metcalf and Eddy Intl. Inc. Co. as the contractor and by its two Hungarian subcontractors VITUKI Innosystem Ltd. and Controlsoft Ltd.

1. Previous projects of similar character and the Danube Accidental Emergency Warning System (DAEWS)

1972-

Pilot zones for water quality management in Hungary, UNDP/WHO Project

There were three District Water Authorities (DWA) which were affected by the Project activities for the two Pilot Zones: for Pilot Zone I (Sajó) the North-Hungarian District Water Authority, with headquarters at Miskolc, and for Pilot Zone II (Danube) the North-Transdanubian, at Győr, and the Central Danube Valley in Budapest. (See Map No.1).

Among the others, objective of the project was the development of the required monitoring by establishing 2 water quality monitoring stations (on the Sajó and on the Danube) and collection of data on water quality, as the basis for a water quality improvement programme.

As both Pilot zones are situated in drainage basins shared by two countries, problems in connection with inter-country co-ordination of water quality management programmes were also studied.

1992-95

Pre-investment studies were executed among the others in the area of the Tisza subcatchments supported from US AID and PHARE resources. These were

- WASH-project (US AID assisted) on the Hernád/Hornad river in Hungary and Czechoslovakia
- CARL BRO (PHARE) prepared a project on the Bodrog river (CSFR, Ukraine, Hungary)
- Lahmeyer International (PHARE) elaborated the East Tisza (Körös) project (Hungary, Romania)

1995

VITUKI Plc. prepared a PHARE project: Development of surface water monitoring based on the EU practice in Hungary. Implementation of Phase 1: Present status and preconditions for development of the monitoring system.

All of these projects (mostly the last one in 1995) were regarded by US AID in 1995/96 as a background to the present international project of Transboundary Pollution Prevention.

Objectives of the Danube Accidental Emergency Warning System

The objective of the Danube Accidental Emergency Warning System (DAEWS) is to provide immediate information about sudden changes in water characteristic, with special attention to transboundary impacts. The System was established by the Vienna Danube Program Coordination Unit (DPC) in 1997.

The Danube basin presents a complicated set of circumstances. It contains many major tributaries, which in turn involve countries through which the Danube itself does not pass.

The Danube AEWS consists of three basic elements (excerpts from Pintér, 1999):

- the National Centres established in each riparian country, called Principal International Alert Centres (PIACs),
- the international communication system between the PIACs, and
- the supporting institutional background in each country.

At present nine riparian countries are co-operating in the DAEWS and the location of their PIACs are as follows:

PIAC-01: Passau, Germany,
PIAC-02: Tulln, Austria,
PIAC-03: Brno, Czech Republic,
PIAC-04: Bratislava, Slovakia,
PIAC-05: Budapest, Hungary,
PIAC-06: Ljubljana, Slovenia,
PIAC-07: Zagreb, Croatia.
PIAC-08: Bucharest, Romania.
PIAC-09: Sofia, Bulgaria

The establishment of three other PIACs is under preparation. Two PIACs (Uzgorod and Ismail) will serve the system in Ukraine and Moldova will have the PIAC in Kishinev.

Satellite-based communication network was established to ensure fast and reliable international information exchange between the PIACs, utilizing the services of the INMARSAT-C system. The local communication within a country is carried out by the existing (but upgraded) communication networks.

In the **Hungarian PIAC-05** the communication (CU) and Expert Unit (EU) is situated in the Water Resources Research Centre VITUKI Plc. The Hydrological Forecasting Centre (simultaneously in VITUKI Plc.) carries out the tasks of the Communication Unit, which is dealing with flood forecasting operations and maintaining all day duty. The Expert Unit works at the Institute for Water Pollution Control, where the Central Water Quality Laboratory can assist this activity with high level analytical instrumentation. The main task of this Unit is to assess the transboundary effects or impacts of a reported accidental pollution and this activity is supported by the tools of data-bank on dangerous chemical substances, and the Danube Basin Alarm Model. The Decision-Making Unit (DU) is in the Ministry of Environment where the Department of Environmental Safety has this responsibility, licensed with authority to make decisions on major domestic, or international warnings. There is an on-line computer system to support the activities of the three Units in case of emergency situations with direct access to the national hydrological and water quality data banks. The supporting local Authorities responsible for the detection, determination of pollution incidents and control measures on field level are the District Environmental Protection Inspectorates (KF), and Water Authorities (VIZIG).

To ensure the right information flow between the local Authorities and the PIAC-05, the standard message forms were introduced in practice nation-wide in Hungary to provide field information for the DAEWS system.

Expert Unit of the PIACs have the following tools for the assessment of possible transboundary impact of an accidental river pollution incident:

- **Data-bank of dangerous chemicals**, including about 15 thousand chemicals, more than 200 thousand material names, and provides data on identification, nature of hazards, emergency response measures, characteristics on toxicology and ecology. Data-bank is updated annually.
- **Danube Basin Alarm Model**, which was developed in 1997 following the concept of the Rhine Alarm Model, and which is capable to simulate the propagation of a polluted water body along the Danube and its tributaries in the River Basin. Assessment of the time of travel and maximum concentrations of the polluted plume can be predicted for given sections of the river system. Following the final testing activities the model-system was distributed to the PIACs of the DAEWS in January 1999.

The 3 monitoring stations described in the followings have been established within the above DAEWS – Framework in the Tisza river sub-basin which spreads to 3 neighboring countries: Hungary, Slovakia and Romania.

Reference:

György G. Pintér (1999): The Danube Accident Emergency Warning System. Wat.Sci.Tech. Vol. 40, No. 10, pp.27-33.

2. Legal background in Hungary

The administration

In Hungary the tasks of water management and its administration is allocated in two ministries:

The **Ministry of Environment** administers the quality aspects of surface and subsurface waters through the **General** and **District Environmental Inspectorates**.

The **Ministry of Transport and Water Management** administers the quantitative aspects of water management through the **General** and **District Water Directorates**.

Table 2.1 presents the block diagram of preventive and protective measures of the Administration in case of accidental pollution of rivers. The table - simultaneously - indicates the structural system of the two Ministries mentioned above.

Hungary has bilateral agreements with its neighbors in the water field which are legal instruments of paramount importance for the country being of typical downstream character: 98 p.c. of its surface water resources originate beyond the national borders.

Bilateral agreements in the field of water management

Slovak-Hungarian Relation

The Transboundary Water Agreement in force since 1978 regulated the activities in case of the transboundary accidental pollution. It was decided in 1995 that the updating of the Agreement will start in 2000.

As to the "Regulation of activities in case of Accidental Pollution in the Slovak-Hungarian common water courses", which is valid at present was accepted in 1995. Major items of the Regulation is as follows: Objectives and Legal Basis of the Regulation; Definition of Accidental Pollution Events; Exchange of Information; Evaluation of Risks occurred; Preparation of Damage Elimination Plans; Early Warning Systems; Subsequent Investigation of Accidental Pollution.

Romanian-Hungarian Relation

The presently valid Bilateral Agreement (being in force since 1986) is outdated in respect of water quality management. Consultations are conducted on new Agreement.

Modification of the Regulation related to water quality investigations and accidental pollution was effectuated in 1993. At that time the definition of accidental pollution was outlined as threefold of 90 percent duration value calculated from data collected between 1987-1991 or the occurrence of 3 mg/l of dissolved oxygen. This definition could not have been practically adopted neither in respect of the narrow range of defined characteristics, nor in respect of the limit values. Now consultation is under way for redefining the regulation.

The major elements of the planned new regulation are the same as listed above in the Slovak-Hungarian Relation.

International Agreements used in preparing the Regulations

1. Code of Conduct on Accidental Pollution of Transboundary Inland Water (ECE 1990 and UN 1990)
2. Egyezmény az ipari balesetek országhatáron túli hatásairól (Helsinki, 1992). In Hungarian, only.
3. Convention on the Law the Non-navigational Uses of International Watercourses (New York, 1997)

EU Directives

The current EU regulation highlights the following tasks: requirements of the quality of certain surface waters, quality monitoring of surface waters and providing data, protection against some hazardous materials released into the environment, requirements of communal drinking water supply and requirements of drinking water quality. The EU Commission has been finalized its draft of *Water Framework Directive* on the water management policy of the EU. This Directive regulates comprehensively the surface and ground water management and protection [1].

Most of the EU regulations and directives in the water field prescribe the monitoring of surface waters as a compulsory action of the member states. This requirement has been built into the national and regional monitoring network of the EU countries [2].

Hungary being a candidate of the EU membership the adoption of above regulations are binding for the Government.

[1] Water Quality Framework Directive COM (97)49 (Proposal)

[2] COUNCIL DIRECTIVE 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control.

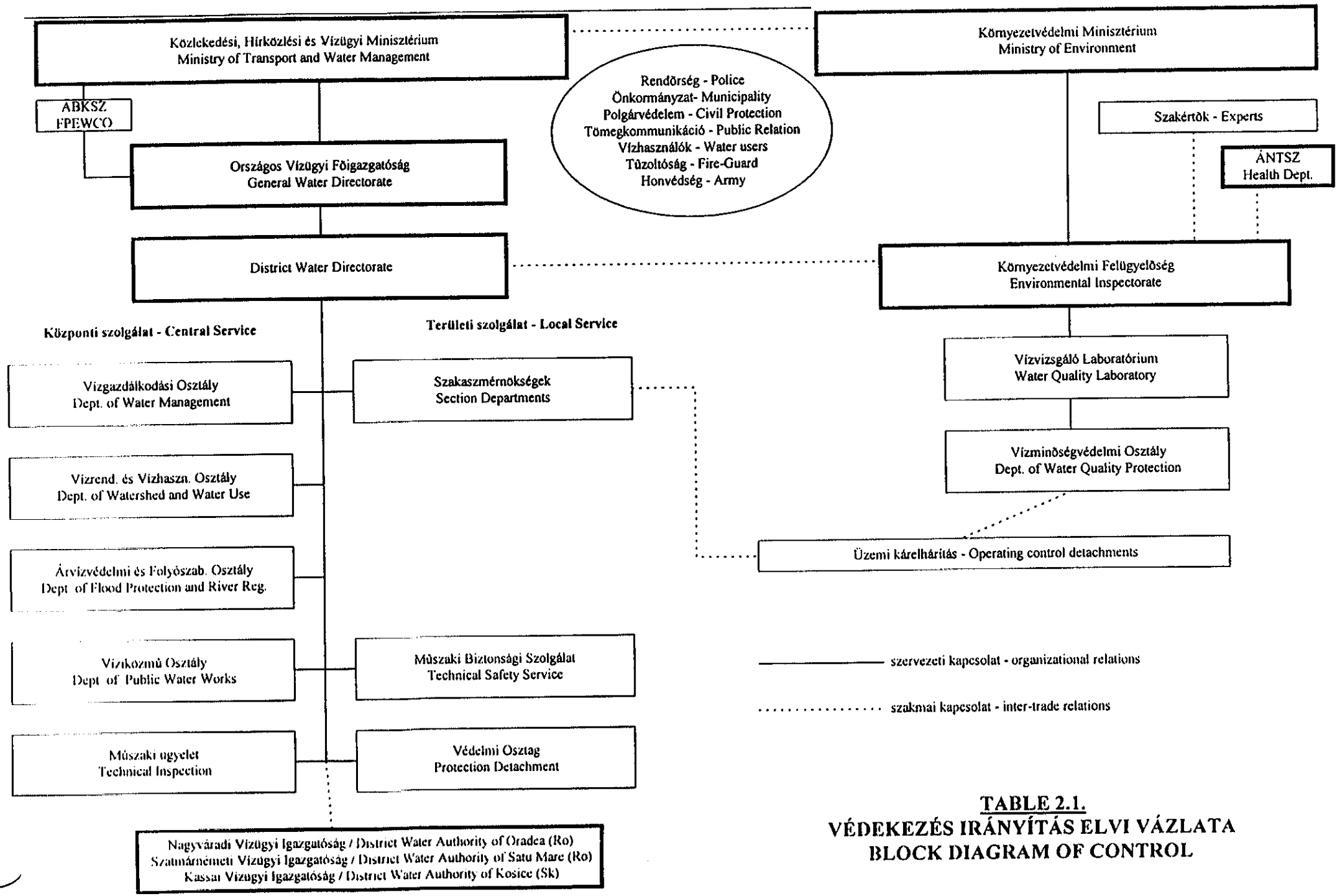


TABLE 2.1.
VÉDEKEZÉS IRÁNYÍTÁS ELVI VÁZLATA
BLOCK DIAGRAM OF CONTROL

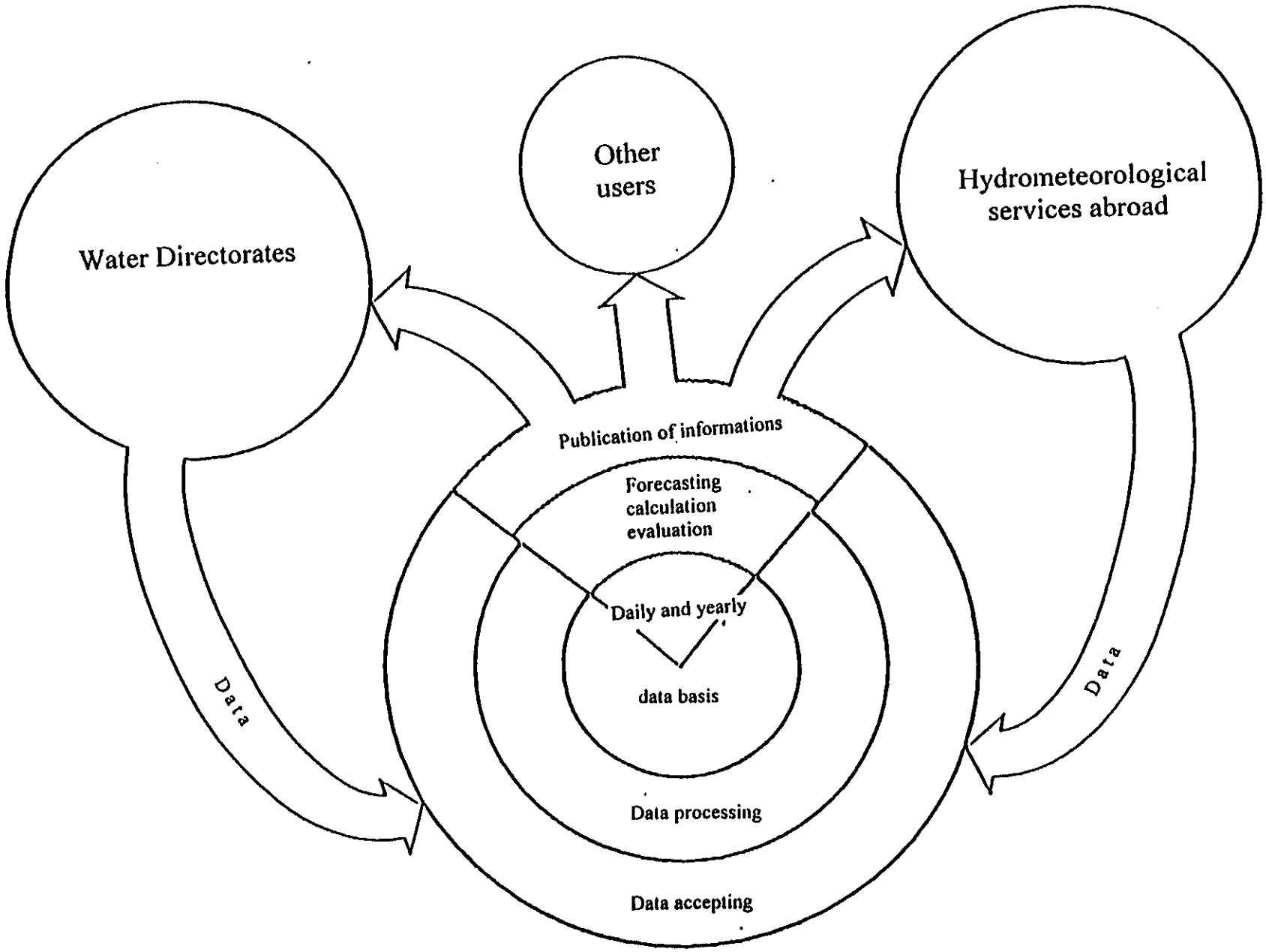
15a

3. Structure of hydrological data acquisition

With reference to the "Structure of Administration" in Chapter 2, it is obvious that for the hydrological data management the 12 Water Directorates are responsible with supervision of the General Water Directorate. In Chapter 1 in connection with the structure of DAEWS it was pointed out that the station of PIAC-05 is situated in VITUKI Plc., Budapest. Now it will be given a short information on the National Water Forecasting Service, which joins to PIAC-05 in the Hydrological Institute of VITUKI. This Service was established in 1892 and it was incorporated into the Ministry of Agriculture. At present the host of the Service that is the VITUKI Plc. is supervised by the Ministry of Transport and Water Management.

Figure 3.1. shows the data flow system with which the Service is operating. The most important task of the Service is the hydrological forecasting to which (as seen on the Figure) the Water Directorates forward the data as measured in the monitoring stations at the border sections of the rivers. In our case the station on the Hernád river is situated in Hidasnémeti abt 3 km upstream of the Hernádszurdok water quality monitoring station and at the Szamos and Berettyó rivers the hydrological and water quality measuring equipments and data transfer systems are in the same buildings.

Beyond the data collection the Water Directorates are vested with the responsibility of the protection actions against flood and against accidental pollution. This will be outlines in Chapter 5.



16a

Fig. 3.1. Scheme of the international and national hydrological data flow

4. Planning procedure of the monitoring stations

4.1. Preleiminary design of the 5 Monitoring Stations on the Hungarian border Sections of the rivers Hernád, Szamos, Berettyó, Maros and on the Eastern Main Canal at the sluice gate entering from the river Tisza

On the basis of the instruction note of Metcalf & Eddy International Inc. (M&E fax of 14 January 1997) the Subcontractor Team of VITUKI Innosystem Environmental Management Ltd. (V-Inno) prepared the Preliminary Design of the Monitoring Stations addressed as Deliverable No. 2 by M&E. (2 more stations on the Körös rivers were subcontracted by M&E with VIZINTER Ltd.). The site of the 5 stations and seat of the Inspectorates concerned are illustrated on Map No.1.

The Preliminary Design consists of the following items separately for the 5 Monitoring Stations

1. List of Equipment for Water Quality Monitoring and Telecommunication with approximative Cost Estimation.
2. List of estimated Expenditures for Construction Works, and for the Laboratory Activities by the Environmental Inspectorates.
3. Plans of the Monitoring Stations with Maps and Descriptions of the existing situations.
4. Pollution history of the rivers, water users and protection system.

On the basis of on site investigations, gathering information on past accidental pollutions, and local consultations with the interested Environmental Inspectorates and Water Directorates conducted by V-Inno, the Team leader recommended to the Ministry of Environment and Regional Planning (MERP, since 1998 the Regional Planning was dislocated to other Ministry, so, at present ME) to hold a meeting with the participation of all the interested parties aiming at the final decision on the establishment of the monitoring stations. This meeting was held on February 5, 1997 in the premises of MERP. The installation of the monitoring equipment on the rivers Szamos, Berettyó and Maros at Csenger, Pocsaj and Makó was decided in the existing water gauge premises of the Water Directorates (Nyíregyháza, Debrecen, Szeged) further that on the Eastern Main Canal in the sluice gate premises of the Debrecen Water Directorate and finally, that on the river Hernád in the

existing (partly abandoned) monitoring building of the Miskolc Environmental Inspectorate at Hernádszurdok. The problems of telecommunication was partly solved by this decision, as well. The list of equipment in the different stations was fixed up at the above meeting, however, some later modification was necessary on the basis of financial considerations. (See in Chapter 4.2.)

The furnishing plans of the facilities were consulted later once again with all the interested parties, that is with the 4 Inspectorates and 4 Water Directorates. With their contribution preliminary cost estimates of construction and installation were prepared and submitted to both the contractor M&E and to the Ministry of Environment. It was decided that the construction works (civil works) together with the telemetric connections will be financed by the Ministry and the installation of equipment and data transmittal facilities will be financed by M&E company from US AID resources. The preliminary plans were finished in April 1997 and submitted to M&E and the Ministry for approval.

The guidelines determined to the preliminary planning procedure were, as follows

Functions of the monitoring stations

The basic function of the monitoring stations is to measure automatically selected water quality parameters and to forward the measured data (via normal telephone line or mobile network GSM) to the Regional Telemetry Centres (RTCs) to be established at the Environmental Inspectorates and Water Directorates.

Communication of the telemetry system

The WQMSs communicate directly with the PCs located at the locally concerned RTC.
Exchange of data with the district water authorities is performed by the PCs located there.

General aspects of the establishment of monitoring stations

The stations must be able to operate automatically , without the presence of the operator. Local manual control and remote control by the telemetry centres must be made possible. Rapid and simple maintenance shall be secured for the WQMSs. Equipment needing maintenance must be provided by swift-release connectors.

In addition to the water quality parameters the data collection system should be available for measuring and storing parameters which are needed for controlling the appropriate operation of the system.

General aspects of the softwares to be used

Use of PC controlled measuring and data collection system is suggested, since there is no need for adhering to the communication system of the water sector and the use of PCs will not impose extra costs, as compared to the PLC based local control. PCs on the other hand would allow the establishment of a user-friendly software environment.

The software MS Excel is used in the Hungarian state administration (and thus in the environmental inspectorates) practically as a standard. This software is known to all professionals who might be involved in this programme. Consequently it was suggested the use of MS Excel as the basic software both in WQMSs and RTCs (the macro-programming facilities of Excel will secure its. use as a data collector software). The use of MS Excel is especially important for the analysis and presentation of data collected at the RTCs, offering maximum working environment for the users.

The structural system of the monitoring stations is attached as **Annex A.1.**

4.2. Detailed planning of 3 stations

On the basis of the Preliminary Plans after their approval by both M&E and the Ministry VITUKI Innosystem prepared the final plans of the 5 stations. Though 5 stations were planned, the Ministry agreed with US AID and M&E that - at present - only 3 stations on the Hernád, Szamos and Berettyó rivers will be constructed. Consequently in the followings this report is restricted to the plans of 3 stations only. The catchment areas of the rivers are roughly illustrated by the **Maps of 2-5**. The situation of the stations are presented in the **Maps of 6-8.**

To the construction part of the plans the consulting firms of the Water Directorates were invited by VITUKI Innosystem, since any object built into the riverbed must be approved by the Directorates.

The detailed plans - after their approval - served to the tender invitation documents. There were two different tenders. One for the construction (civil) works, presented by VITUKI Innosystem to the Ministry for approval and for tendering procedure and an other for the installation of the stations, issued by M&E.

The detailed plans contained the emergency action plan and the list of water users downstream from the stations. These are illustrated in **Maps 9-11**. The action plan can be seen in Chapter 5.

The set of equipments were decided on the basis of both the accidental and average pollution pattern of the rivers, however, financial constrains limited the list, e.g. biological monitoring, heavy metal sensors, etc.

As to the water quality monitoring in all 3 stations the system of measurement (water intake construction), the parameters to be observed (the set of equipment as seen in **Table 4. 1.**) are uniformly planned and constructed.

As to the concept of the structural build-up of the 3 stations was the same as given in Chapter 4.1. (Preliminary Planning). In **Hernádszurdok** the presently applied mobile radio-telephone will be substituted by connection to the national network (MATÁV).

The water intake construction (see **Fig. 4.1**) consists of a standpipe erected in the riverbed supplied with slots through which the river water communicates within the pipe to a floating disc on the water surface and to a second, lower situated other disc. Both discs are connected to independent flexible hoses and these are laid in protective pipe in the river bottom and in the soil to the monitor building. There is permanent (regular) flow-through to the sensors of the equipments and to the automatic sampler. When there is an oil slick on the river water surface the sensor of the TOC-measuring equipment observes it and the transmission units sends the alarm to the Inspectorate. The other water quality parameters are measured in the water samples forwarded through the second hose connected to the lower disc within the stand-pipe and the system of observing and transmitting anomalies are the same as above. The automatic sampler provides composite water samples for analysis in the central lab of the Inspectorate. The set of

analyzed parameters are fixed in the national decree of operation. The emergency overall guidelines are also uniform in the 3 areas concerned and they are detailed in Chapter 5.

Within the Inspectorate the computer is interconnected with the same unit in the Water Directorate. Alarm is released in the manner described in the attached general rules of protection. The computer of the Inspectorate has connection to the PIAC-Center in Budapest as well and the further procedure is described in the previous chapter related to the operation of DAEWS.

In the **Annex A.2**. the 3 monitoring stations with their catchment and pollution sources are separately dealt with.

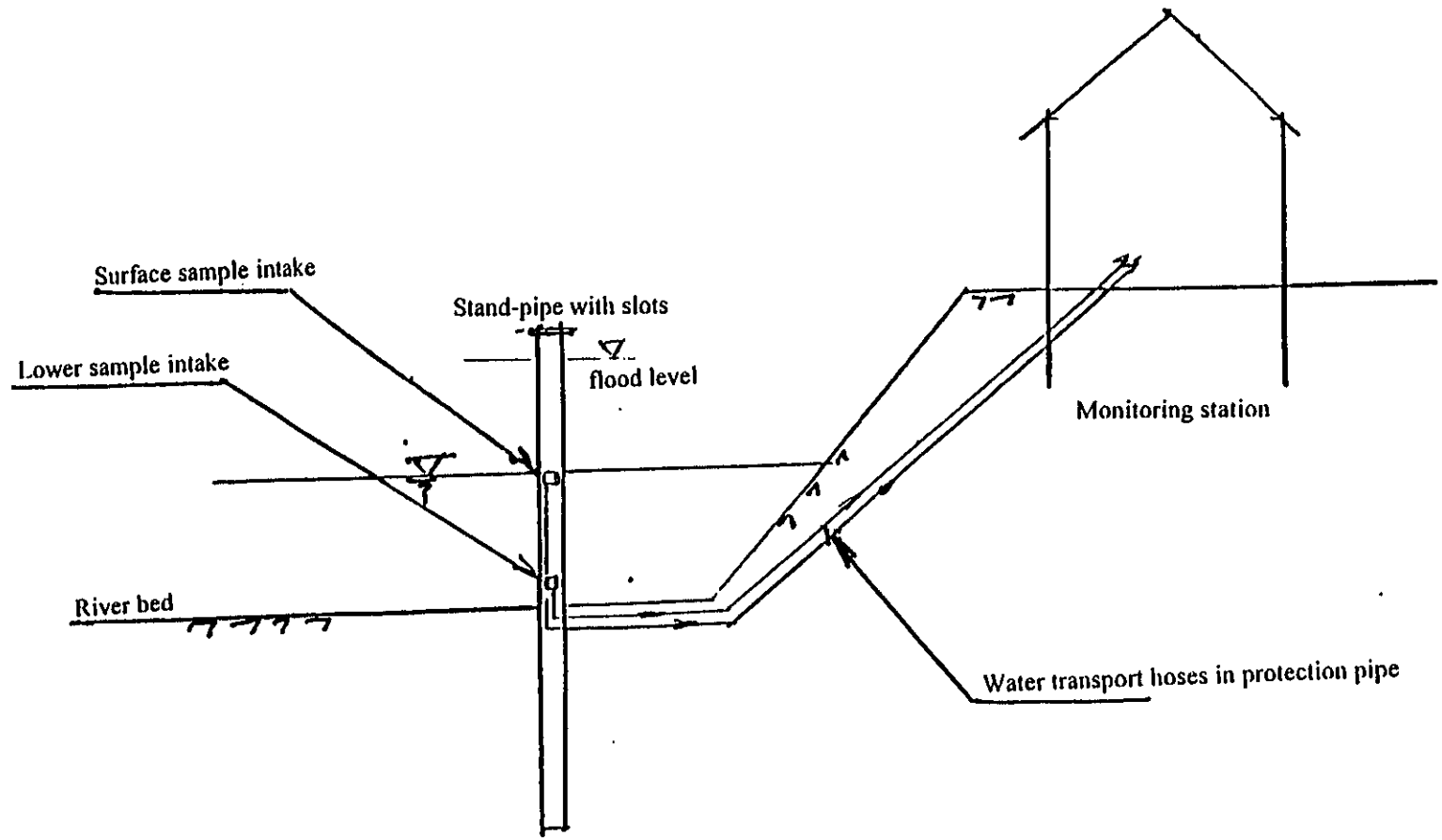
Table 4.1.

Water Quality Parameters uniformly measured in the 3 stations									
	Temperature	**pH**	**Dissolved oxygen**	**Conductivity**	**Turbidity**	**Ammonium**	**TOC**	**Surface Oil**	**Chlorophyll-a**
Item	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Operational principle of the instrument					light backscattering	photometry	UV promoted oxidation	TOC measuring of the surface sample	Fluorometry*
Unit	°C		mg/l	µS/cm	NTU	mg/l	mg/l		µg/l
Range	0-50	0-14	0-20	0-2000	0-500	0-10	0-20		from 0.1
Manufacturer	KM 200 Sensortechnik					APP 5003 ME Grisard	PROTOC 200 PPM	same as TOC	1 Hz Fluorometer BBE Moldaenke
Other Equipment	Automatic sampler with cooler								

* The measuring of the photosynthetic activity yields possibility to the toxicity characterization. When the normal activity value decreases toxic effect can be supposed.

2/2

Fig. 4.1. Typical water intake system of 3 monitoring station



5. Emergency Warning and Action Plan

Present document has also utilized the similar one prepared by VÍZ-INTER company for the Rapid-Körös.

The action plan is based upon the governmental regulations (see in the text) and generally adopted by all authorities concerned in case of water quality emergency. As it can be seen abatement of hazardous water pollution requires a close cooperation of the Water Directorates and Environmental Protectorates, though, the effective protective activities are vested to the Directorates. Minor deviations from this action plan might occur in special situations, for example in extreme hydrological conditions, when flood protection coincides with abating water pollution.

Extraordinary pollution

From the point of view of water quality, the events are considered extraordinary, during which any of the measured or observed water quality parameters surpasses the limit value, pre-established for degree no.1 of emergency actions. Hence for the identification of extraordinary pollution, a **qualification system** and a **measuring and monitoring system** have been established.

Elaborating the qualification system of extraordinary pollution, first, the presently prevailing practice of the **watching service**, second, the continuous measuring capabilities of the planned **monitoring station** have to be taken into account.

The **watching service** can indicate the extraordinary situations on the basis of visually perceptible phenomena as foaming, change of color, pungent odor, floating animal carcasses, fish "piping" etc.

In this relation the following limit values are accepted by the present practice:

- 5 % of the water surface is covered by a foamy matter or of unusual color,
- on a surface of 100 m^2 one or two fish carcasses can be observed,

- fish shoals are "piping".

The **monitoring stations** measure besides of the basic parameters, TOC, ammonium and Chlorophyll-a. The TOC equipment has a dual task, it is used for measurement of organic pollution and in case of surface oil slick it observes oil, as well. The Chlorophyll-a detecting equipment is sensing toxic effects, as well. The stations are equipped with automatic sampling device, collecting regularly the composite samples specific parameters are determined in the lab of the Inspectorates. At the beginning, it is advisable to connect the degree of alert to the data of the presently prevalent standard, which are the following:

- dissolved oxygen below 3 mg/l,
- pH value below 5.5 and above 9.5,
- conductivity above 2000 µS/cm.

As for the oil coverage of the surface, it is suggested to define the degree of alert No. I. with 5 % of the water surface. Precise determination of the alert limit values will be elaborated during he so called "intensive maintenance" period carying out jointly by the Inspectorates and Controlsoft the subcontractor of the installation. By the way according to the prevalent governmental regulations of No. 132/1997 (VII.24.) Korm. the determination of the parameters to be used for qualifying extraordinary pollution is the task of the Environmental Inspectorates, jointly with the District Water Directorates and the Institute for the State Medical Officer's Service (ÁNTSZ, SMOS).

Regarding the above mentioned governmental regulations observation and signaling of extraordinary pollution arriving on the river, is partly the task of the existing **watching service**, operated by the District Water Directorate and partly of the planned **monitoring station** operated by the Environmental Inspectorate.

The **watching service** is being carried out by the levee – and canal rangers of the Section Departments of District Water Directorates.

The **monitoring stations** are installed at about 3-6 km downstream of the border sections of the rivers. The sites can be seen in the descriptions of the actual stations (attached).

Mobilization and information

After having observed and qualified an extraordinary pollution, the Water Directorates and the Environmental Inspectorates carry out their tasks of mobilization and information on the basis of the relevant international agreement and of their own regulations.

The block diagram of the coordinated control of the activities necessary in the case of an extraordinary pollution arriving on the river is illustrated in **Table 2.1.** (see Chapter 2). Information about the directing centres is tabulated in **Annex A.3** with those of the institutions to be informed.

When finishing the construction of the 3 stations a Workshop was organized on the Denfense Actions in Miskolc as given in **Annex A.4**.

6. Execution of the Monitoring Project

6.1. Civil engineering works

On the basis of the tender procedure to which the Ministry decided a limit sum of HUF 25000000 the construction firms were selected, as follows:

Hernádszurdok: Kurek Bt., Encs, with Saviterv Ltd., Miskolc

Csenger and Pocsaj: MARAG Ltd., Debrecen.

Before end of summer 1999 all civil works had been finished under the supervision of VITUKI Innosystem Ltd. To the site inspections the representatives of the 3 Inspectorates and Water Directorates were always invited and they really participated. Consequently the take-over of the civil works were registered properly to which the Ministry assisted, as well.

6.2. Installation of the equipment and telecommunication

Metcalf & Eddy invited 3 Hungarian firms to the tender document of the installation of the stations. Controlsoft Ltd./Veszprém was selected to the subcontract of USD 468000 on the basis of the bids. Controlsoft cooperated with Aquacontrol Ltd./Budapest. They were the

installator of the Zala river station, so, they had good experience in the execution of the works. Once again the supervision was similarly organized as to the civil works. The installation was finished before the end of 1999, the take-over procedure of the works were finished in January 2000 and now the stations are registered as the propriety of the Inspectorates concerned. Exactly: in case of Hernádszurdok the Miskolc Inspectorate is the solely proprietor, while in case of Csenger the Nyíregyháza Inspectorate is co-owner with the Water Directorate that means that the equipments belong to the Inspectorate. The case is similar at Pocsaj station where the two agencies of Debrecen share the ownership.

6.3. Trial operation of the 3 monitoring stations

The trial operation started in late 1999 by the subcontractor of Controlsoft (Aquacontrol) and the last phase was finished at the end of March at which date all of the 3 stations were taken over by the Inspectorates. Since that time a so called "intensive maintenance" period is carried on by the subcontractor together with the personnel of the Inspectorates.

The **attached diagrams** represent typical operating data from each stations, however, since the start of operation no accidental pollution has happened. When the infamous cyanide pollution happened on the Szamos in early 2000 the Csenger station operation just started and no data was registered yet.

Diagrams:

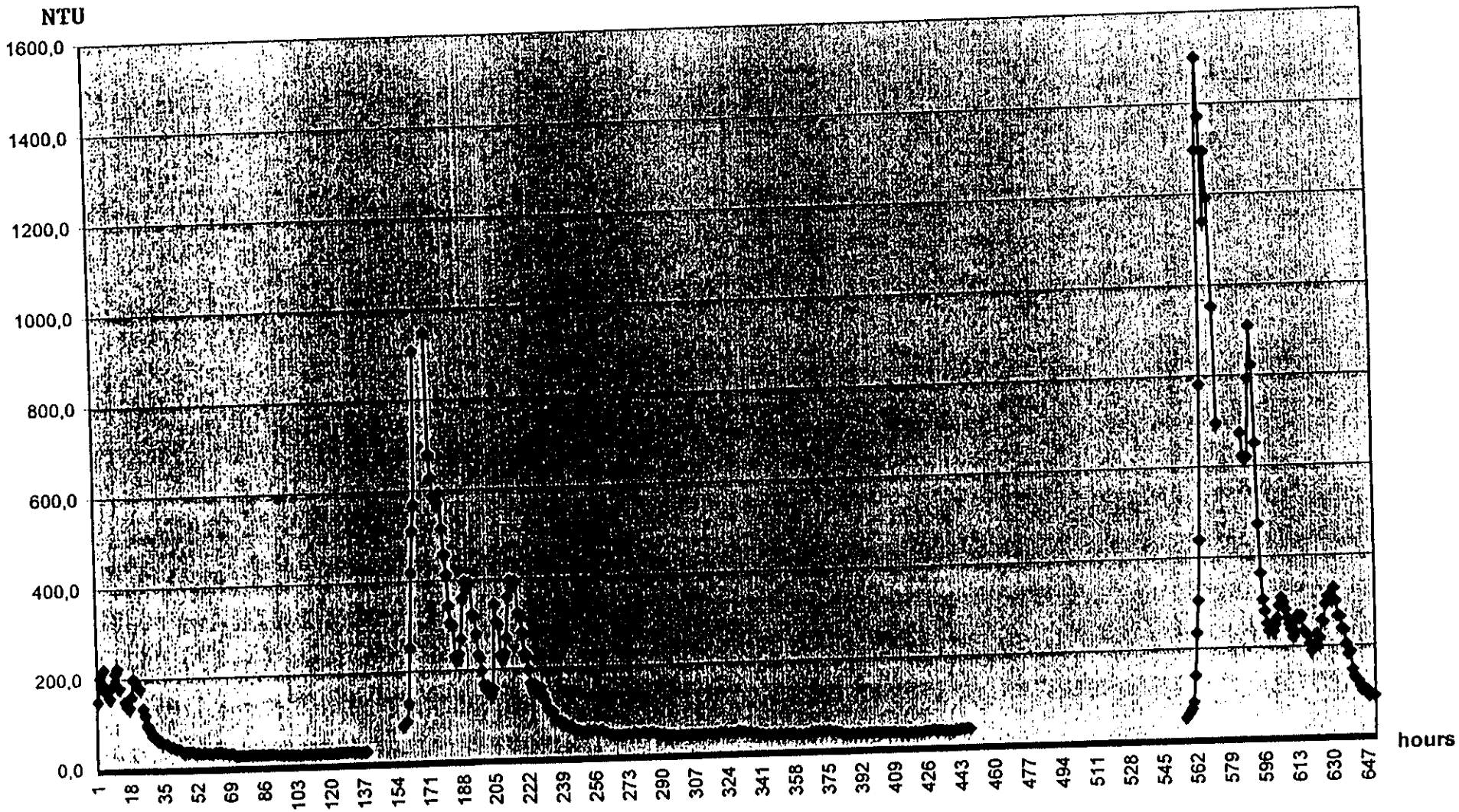
6.1. Turbidity (NTU) in Hernad river, May 5- June 19, 2000

6.2. Clorophyll-a concentration (μg/l) in Hernad river, May 5- June 11, 2000

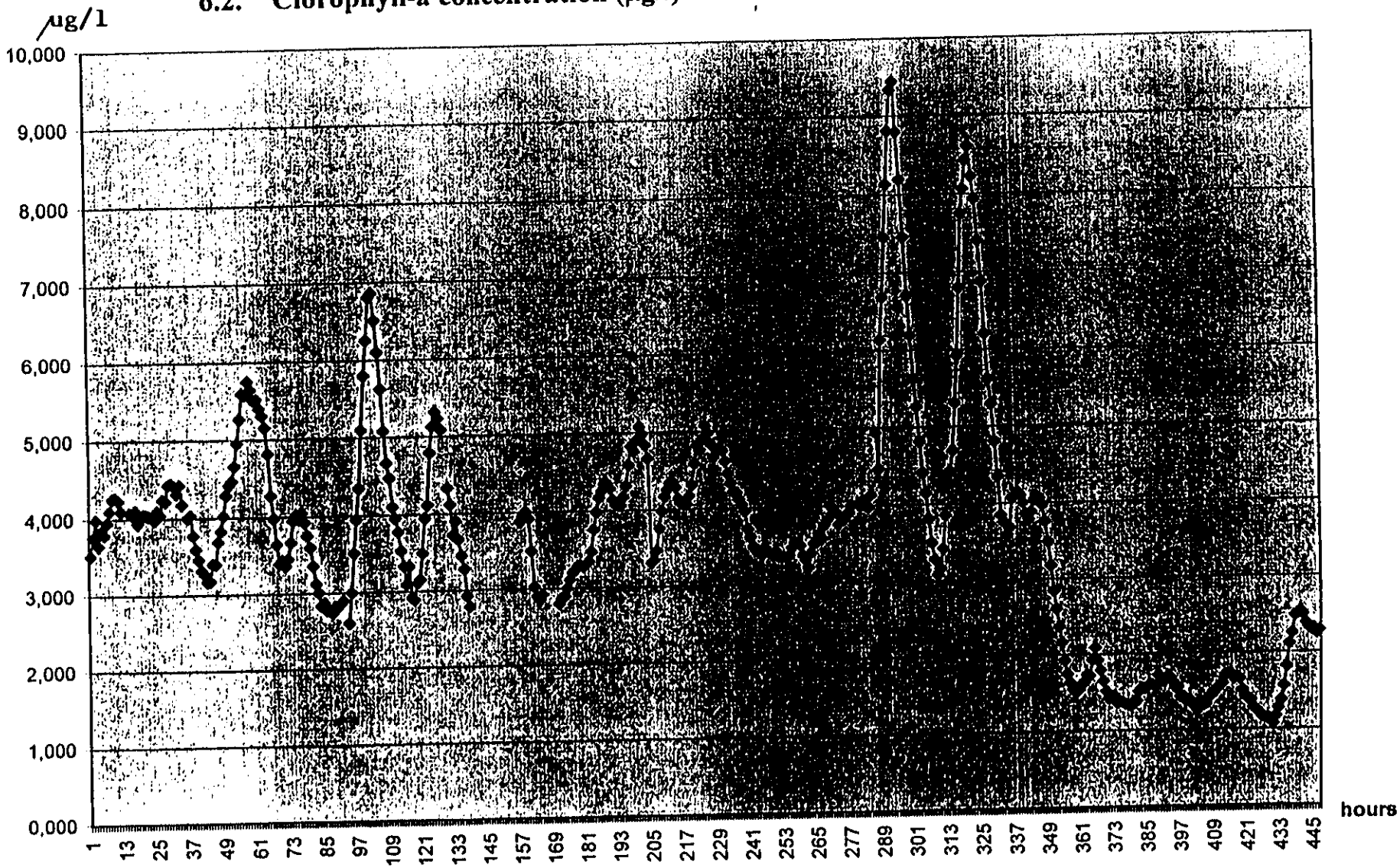
6.3. TOC from the surface oil and subsurface samples in Szamos river, May 30, 2000

6.4. Turbidity (NTU) in Berettyó river, May 17- June 18, 2000

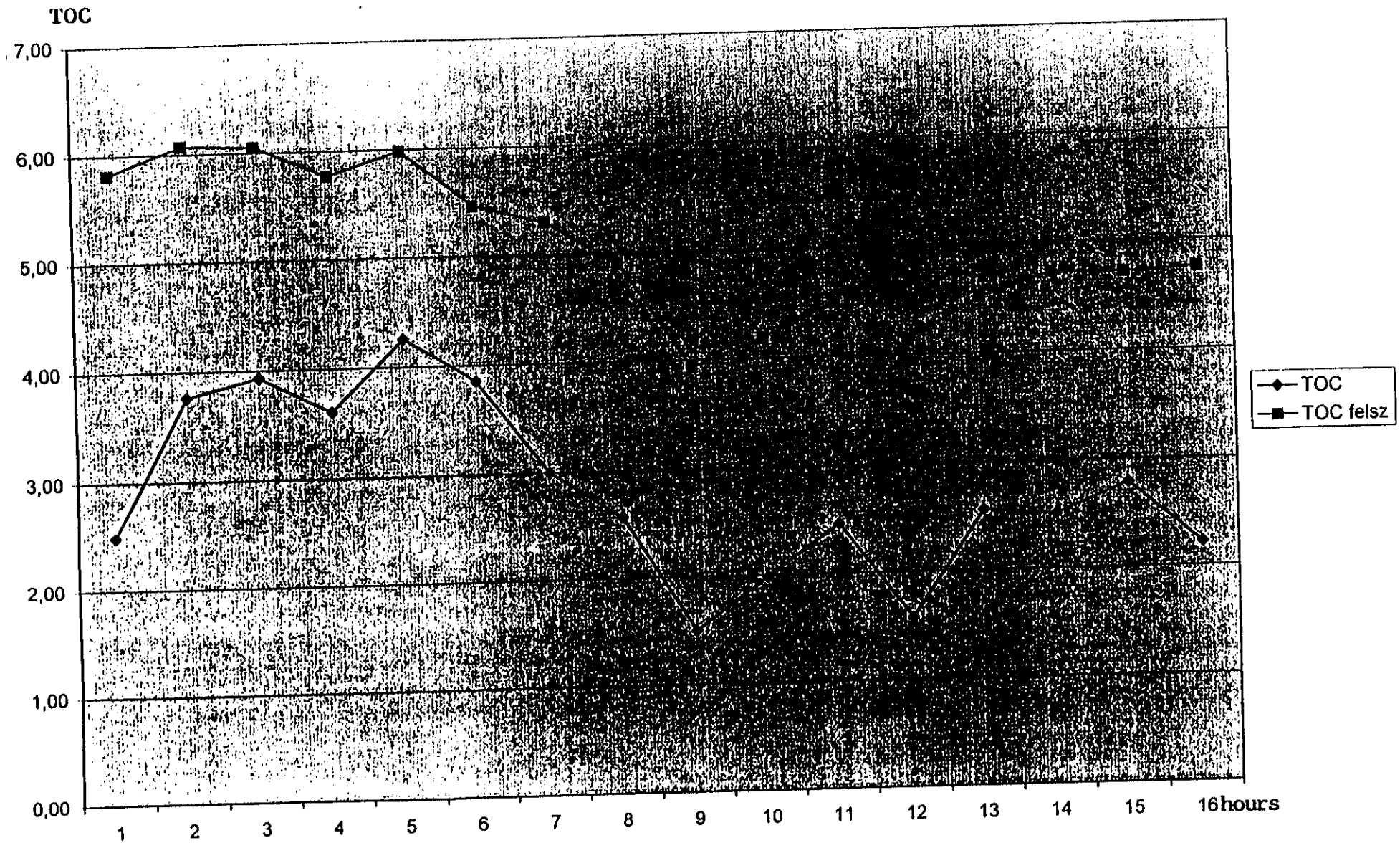
6.1. Turbidity (NTU) in Hernad river, May 5- June 19, 2000



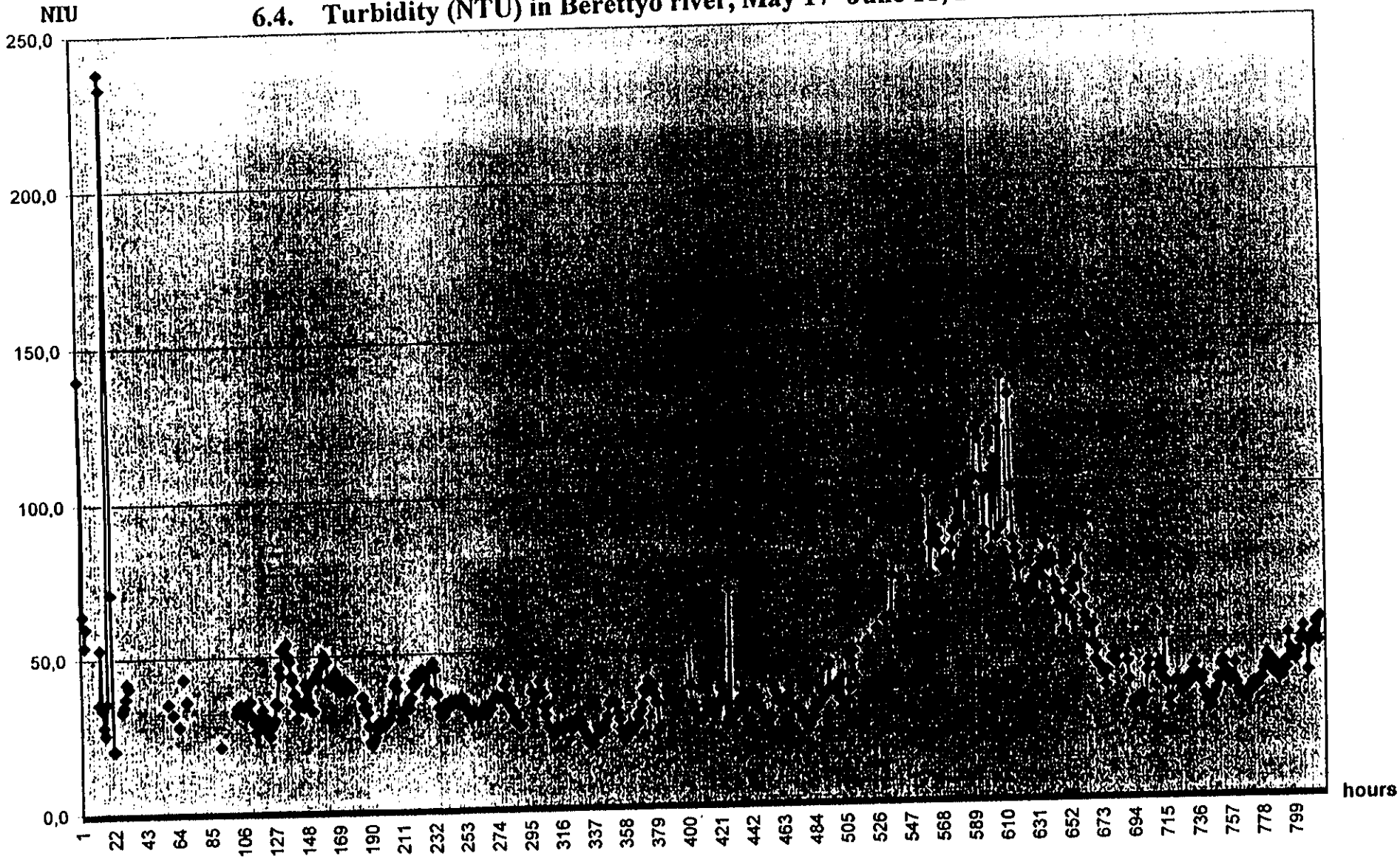
6.2. Clorophyll-a concentration (μg/l) in Hernad river, May 5- June 11, 2000



6.3. TOC from the surface oil and subsurface samples in Szamos river, May 30, 2000



6.4. Turbidity (NTU) in Berettyó river, May 17- June 18, 2000



II. ACQUISITION OF LAB EQUIPMENT

According to the agreement (modified the original LOU of 1996) between the US AID and the Ministry of Environment in June 1998 instead of financing the 4 formerly planned monitoring stations (Eastern Main Canal, Maros and 2 other on the Körös rivers) laboratory equipment should be procured for the 5 Inspectorates of Miskolc, Nyíregyháza, Debrecen, Gyula and Szeged (concerned in the original plans). Further a maintenance vehicle was requested by the Ministry. The latter - financed by US AID is being transported to the Miskolc Inspectorate appointed by the Ministry as being responsible for the maintenance of all the 3 stations in June 2000.

VITUKI Innosystem was requested by M&E to collect the lab equipment requirements if the Inspectorates observing the financial limit conditions. Further VITUKI Innosystem was instructed to invite tenderers for supplying the equipments agreed upon.

VITUKI Innosystem invited 3 companies in November 1998 such as B&K Bt, CHEMOTRON Inc. and UNICAM Ltd. The most acceptable offer was produced by B&K and M&E ordered the previously agreed list of equipments instructing the company for transporting those to the 5 Inspectorates and conducting training course for the lab personals. The total cost was USD 112,041.

The list of the lab equipment duly supplied by B&K with the necessary training is attached.

List of lab equipment supplied by B&K company to the Inspectorates with specification

Inspectorate Lab Gyula

1. 200530-1/a
   Portable automatic sampler: WTW PB13
2. 200530-1/b
   Exicator: SELECTA Oven DigitHeat 2001244
3. 200530-1/c
   Cathode lamps to AAS: Ni, Ca, As and Al uncoded
4. 200530-1/d
   Cuvette for AAS
5. 200530-1/e
   Grinder: IKA M20 Universal Mill
6. 200530-1/f
   Counter balance: MARK 3000
7. 200530-1/g
   Homogenisator: IKA T25 Ultra Turax
8. 200530-1/h
   Heating plate: SELECTA 6157100
9. 200530-1/i
   Incubator: SELECTA Medilow S

Inspectorate Lab Nyíregyháza

1. 200530-2/a
   Gas Chromatograph with NPD detector, with one injector (without software and PC)
   Type: HP 6890

Inspectorate Lab Miskolc

1. 200530-3/a
   Air compressor to AAS: UNICAM 942339334225
2. 200530-3/b
   Water treatment unit: ELGA Maxima Anal
3. 200530-3/c
   Autosampler to HP gaschromatograph
4. 200530-3/d
   Portable equipment with 4 parameters (pH, mV, O_2 and conductivity: WTW MultiLine F/SET-3
5. 200530-3/e
   Heating plate: SELECTA 6157100

Inspectorate Lab Debrecen

1. 200530-4/a
   Water treatment unit: FLGA Maxima Anal

2. 200530-4/b
   Ultrafilter equipment: Schleicher & Schuell AS600/2
3. 200530-4/c
   Turbidity measurement unit: WTW Turb 55 IR
4. 200530-4/d
   Portable automatic sampler: WTW PB13
5. 200530-4/e
   Cathode lamps to AAS: Hg, As, Pb, B, Co, Mo, Se and Cd coded

Inspectorate Lab Szeged

1. 200530-5/a and 200530-5/b
   VP90 Continuous Flow Vapour System
   HS90 Mercury High Sensitivity Kit
   Mercury Coded Hollow Cathode lamp
   100 mm Slot Burner
2. 200530-5/c
   Homogenisator: IKA T25 Ultra Turax
3. 200530-5/d
   Grinder: IKA M 20 Universal Mill
4. 200530-5/e
   Incubator: SELECTA Medilow S
5. 200530-5/f
   Centrifuge, sample quantity 6x50 ml: Hermle Z 200 A

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Map No. 5. Slovakian part of the Hernád/Hornad catchment
Map No. 6. General layout map of the Hernádszurdok monitoring station
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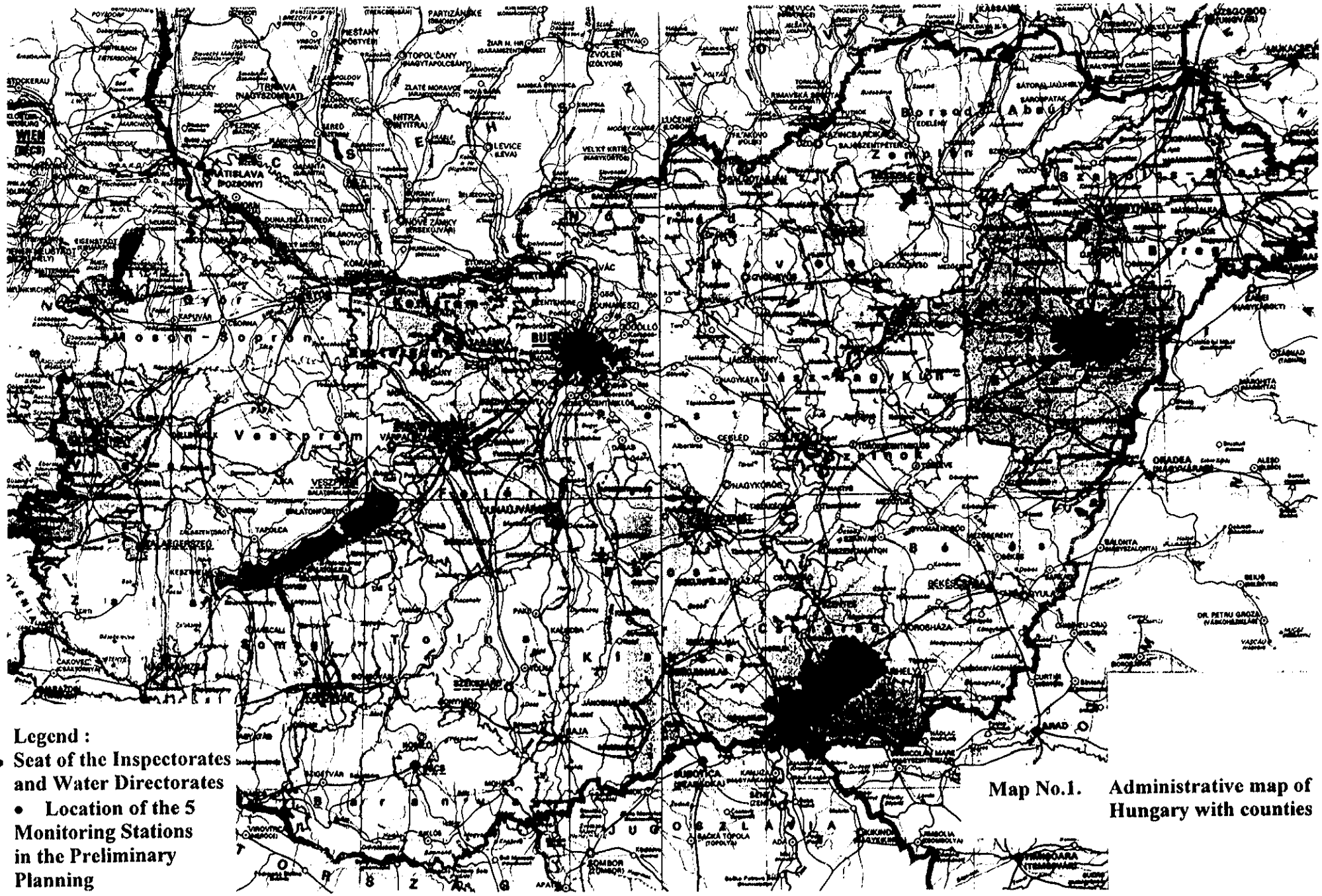
Map No. 8. General layout map of the Pocsaj monitoring station
Map No. 9. Water uses on the Hernád river
Map No. 10. Water uses on the Szamos river
Map No. 11. Water uses on the Upper Tisza river section
Map No. 12. Water uses on the Berettyó river



Map No.1. Administrative map of Hungary with counties

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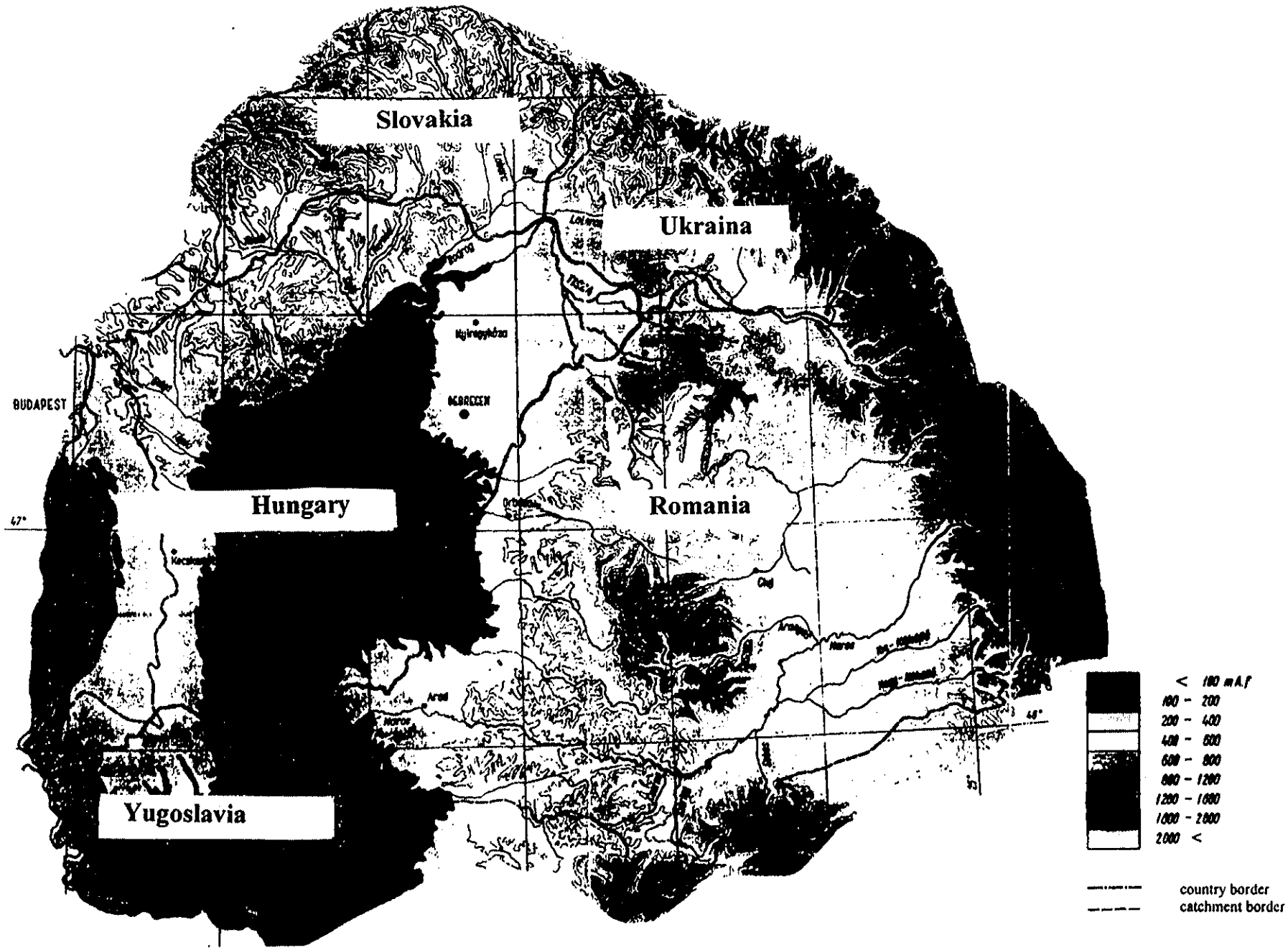
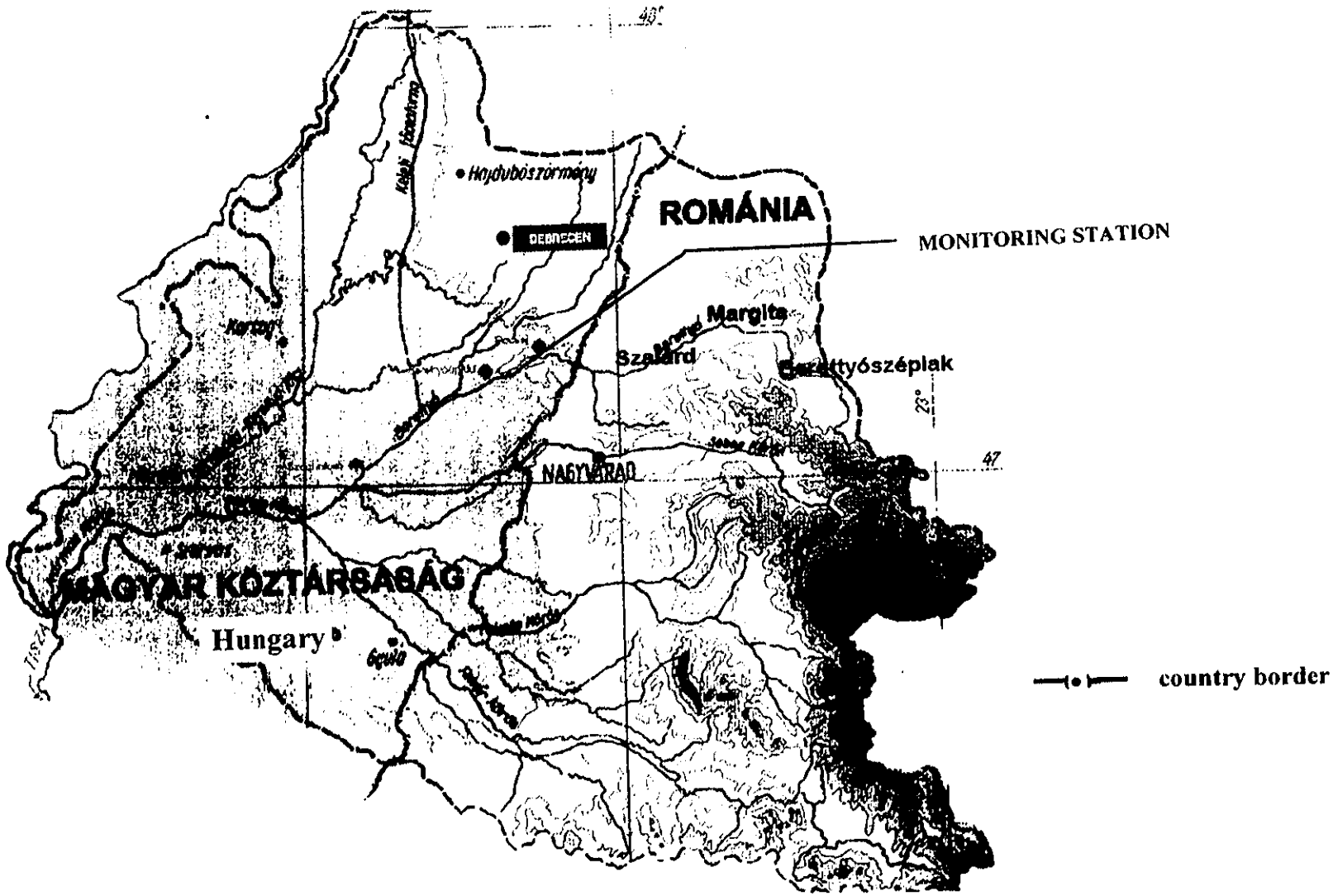
Map No. 2. Watershed area of the Tisza river

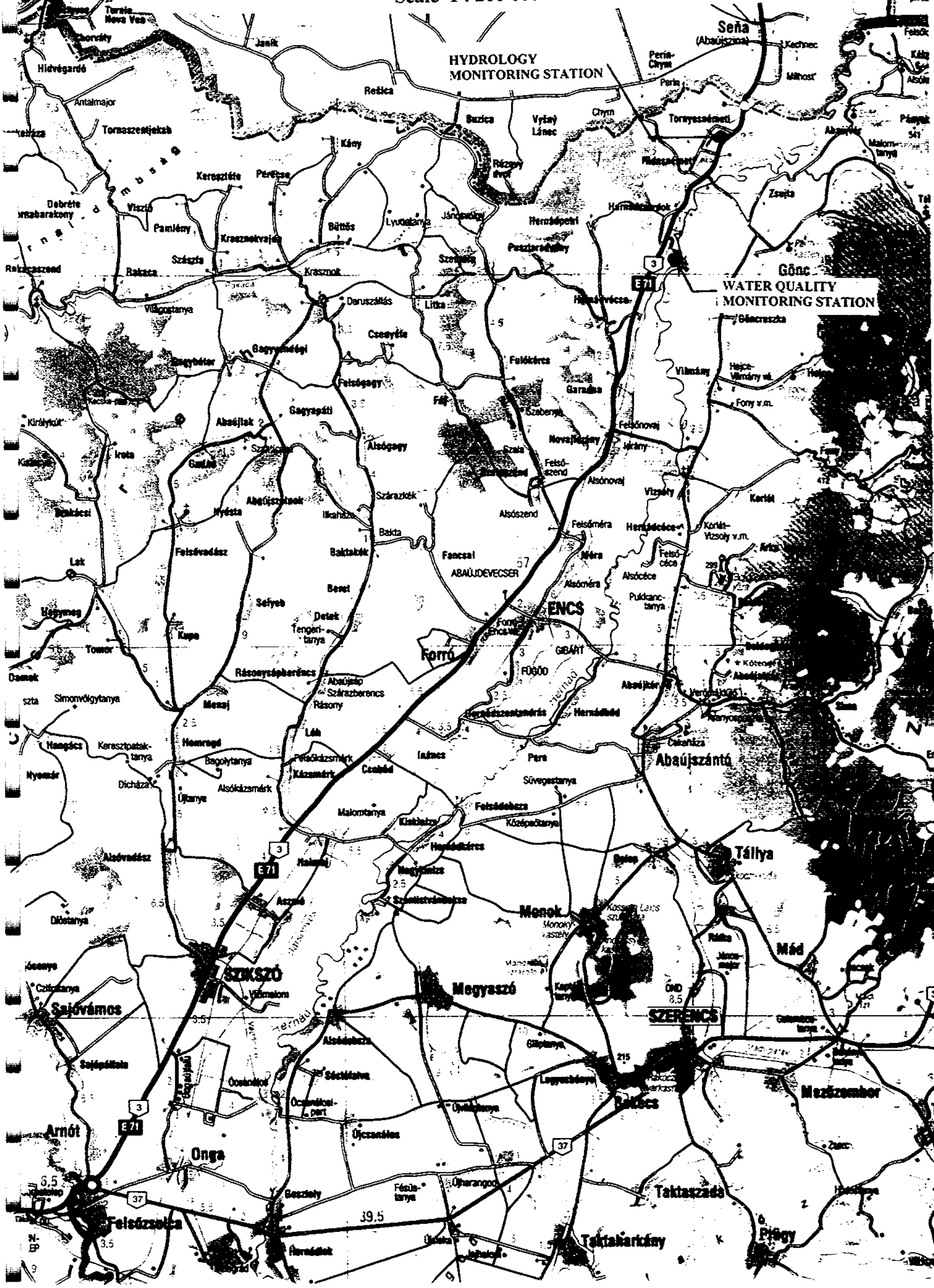


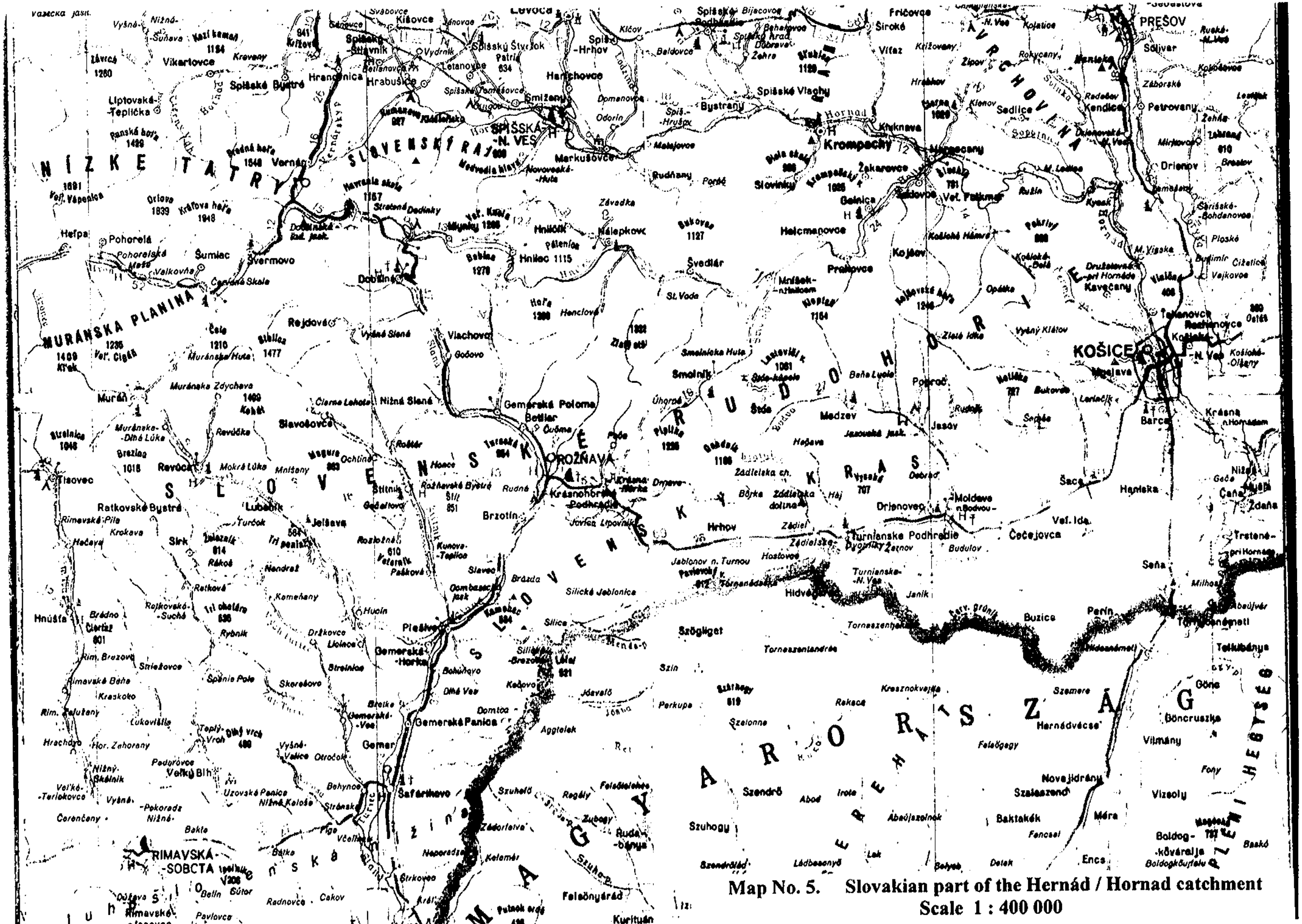
Map No. 3. Watershed area of the Berettyó river



Map No. 4. Hungarian part of the catchment area of the Hernád river

Scale 1 : 200 000

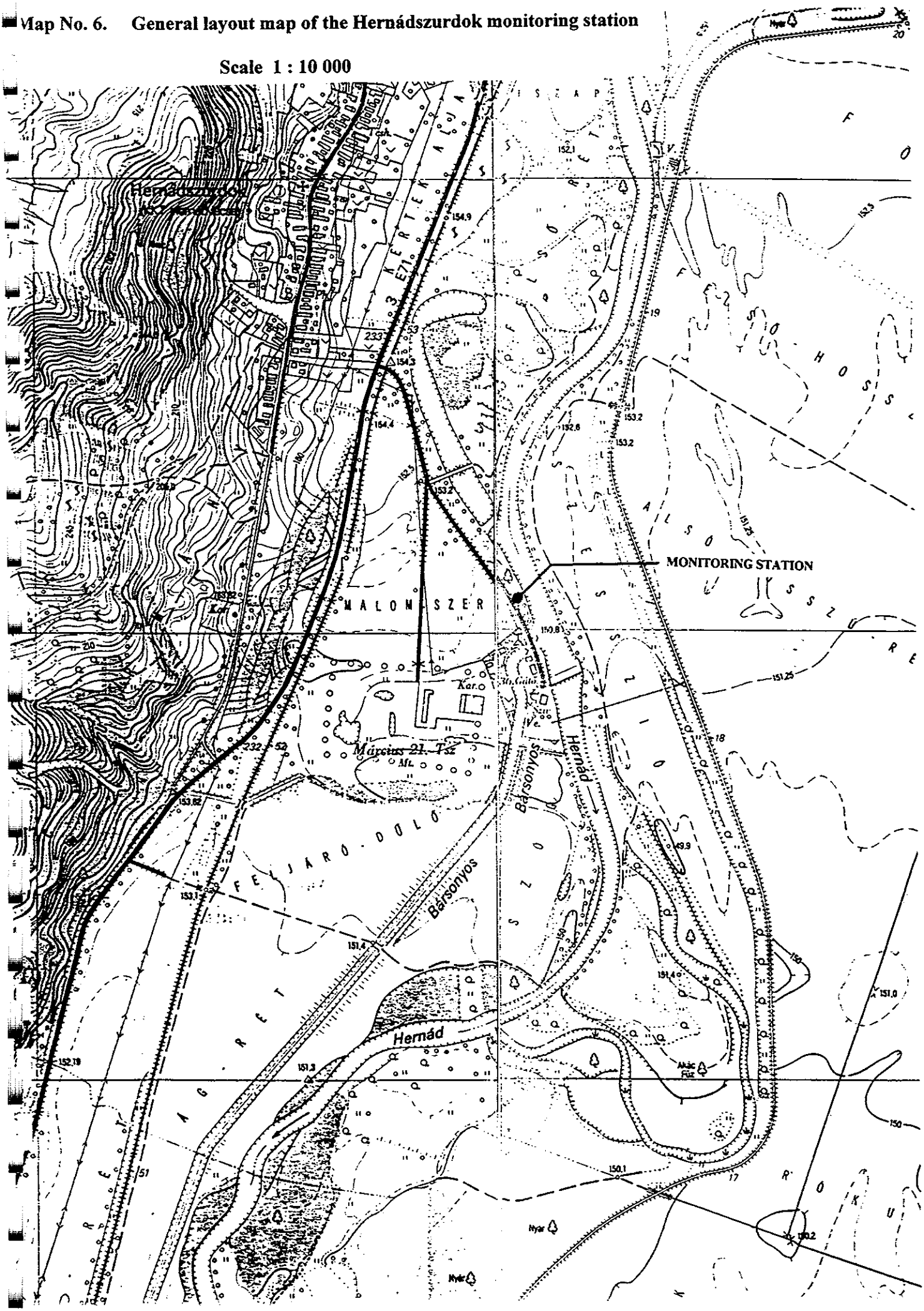


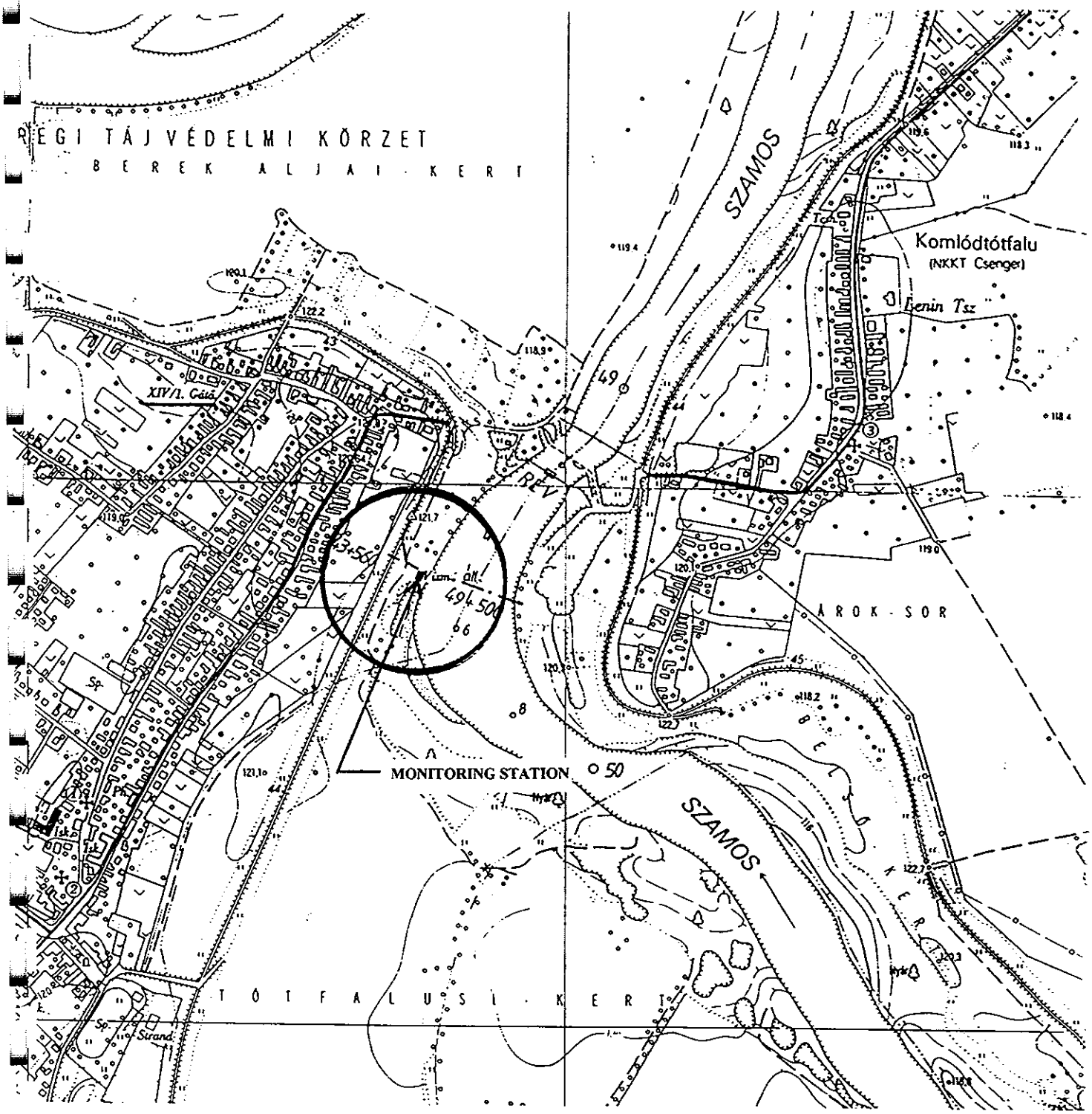


Map No. 5. Slovakian part of the Hernád / Hornad catchment
Scale 1 : 400 000

Map No. 6. General layout map of the Hernádszurdok monitoring station

Scale 1 : 10 000



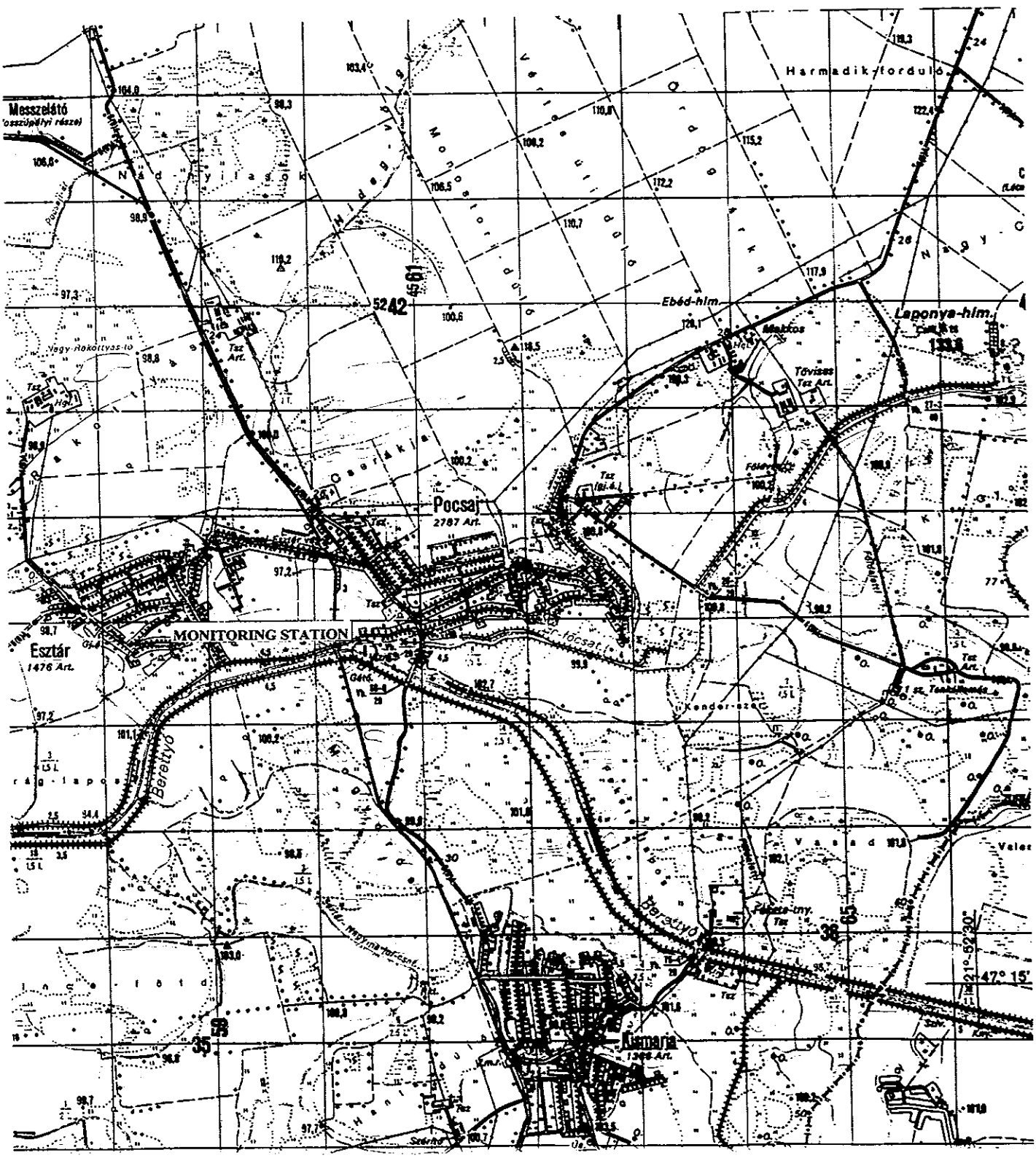


Map No. 7. General layout map of the Csenger monitoring station

Scale 1 : 10 000

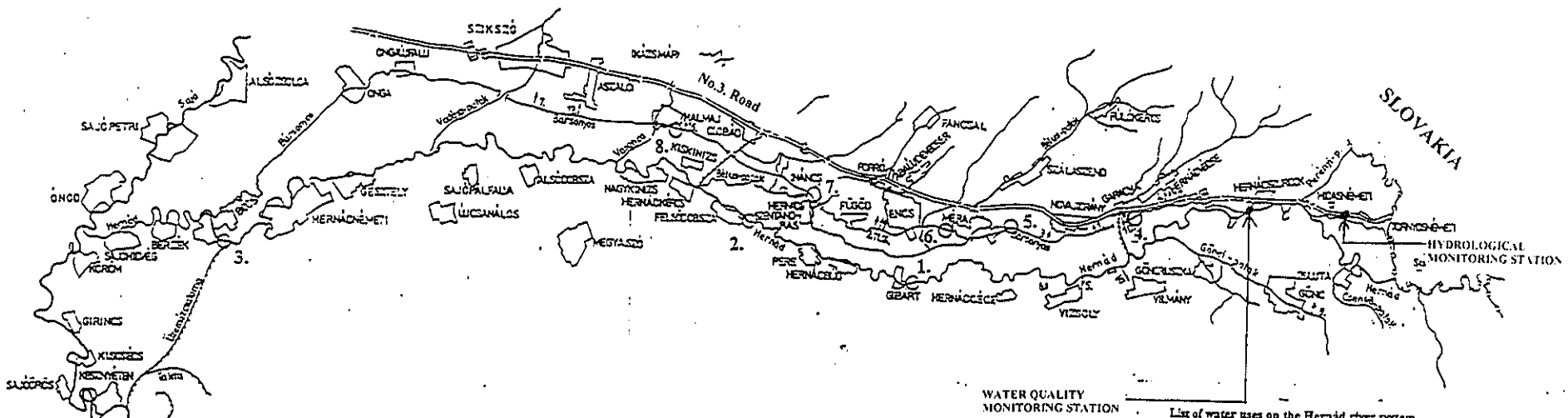
Map No. 8. General layout map of the Pocsaj monitoring station

Scale 1 : 50 000



Map No. 9. Water uses on the Hernád river

Scale : 1 : 200 000



Irrigation system in Hernád-Valley

Name of the licensee power

1. Mg.szöv. Novajidrány
2. Kamarád Szolg.Sz. Encs
3. Agrár Fruit Novajidrány
4. Brokkoli Bt. Hernádvecse
5. Lenin Szöv. Vizsoly
6. Szegedi Lj-ei Vizsoly
7. Béke Sz. Szikszó
8. Kossuth Sz. Gönc
9. Szalóczyné H.L.
10. Abrahámovicsné Garadna
11. Bóna Bertalan Encs
12. Bucsics József H.vécse
13. Újkistermelő Asz.Aszaló
14. Bucsics István Encs
15. Mondrócza Gy. Vilmány
16. Hegyesiné István Halmaj

LEGENDS

Hydraulic power stations O

Irrigation systems →

List of water uses on the Hernád river system

Power stations

on the river Hernád:

1. Gilbárt, river km 66,18 (1903)
2. Felsődobsza, river km 54,6 (1906-1912)
3. Bóes/Kassayéten, river km 13,555 (1938-1946)

on Channel Bársonyos:

4. Hernádvécse, river km 66,311 (from 1958)
5. Felső-Méra, river km 57,347 (from 1959)
6. Alsó-Méra, river km 55,185 (from 1959)
7. Forró, river km 45,185 (from 1961)
8. Halmaj, river km 35,532 (from 1997)

Agricultural water uses are indicated on the map (see Legends)

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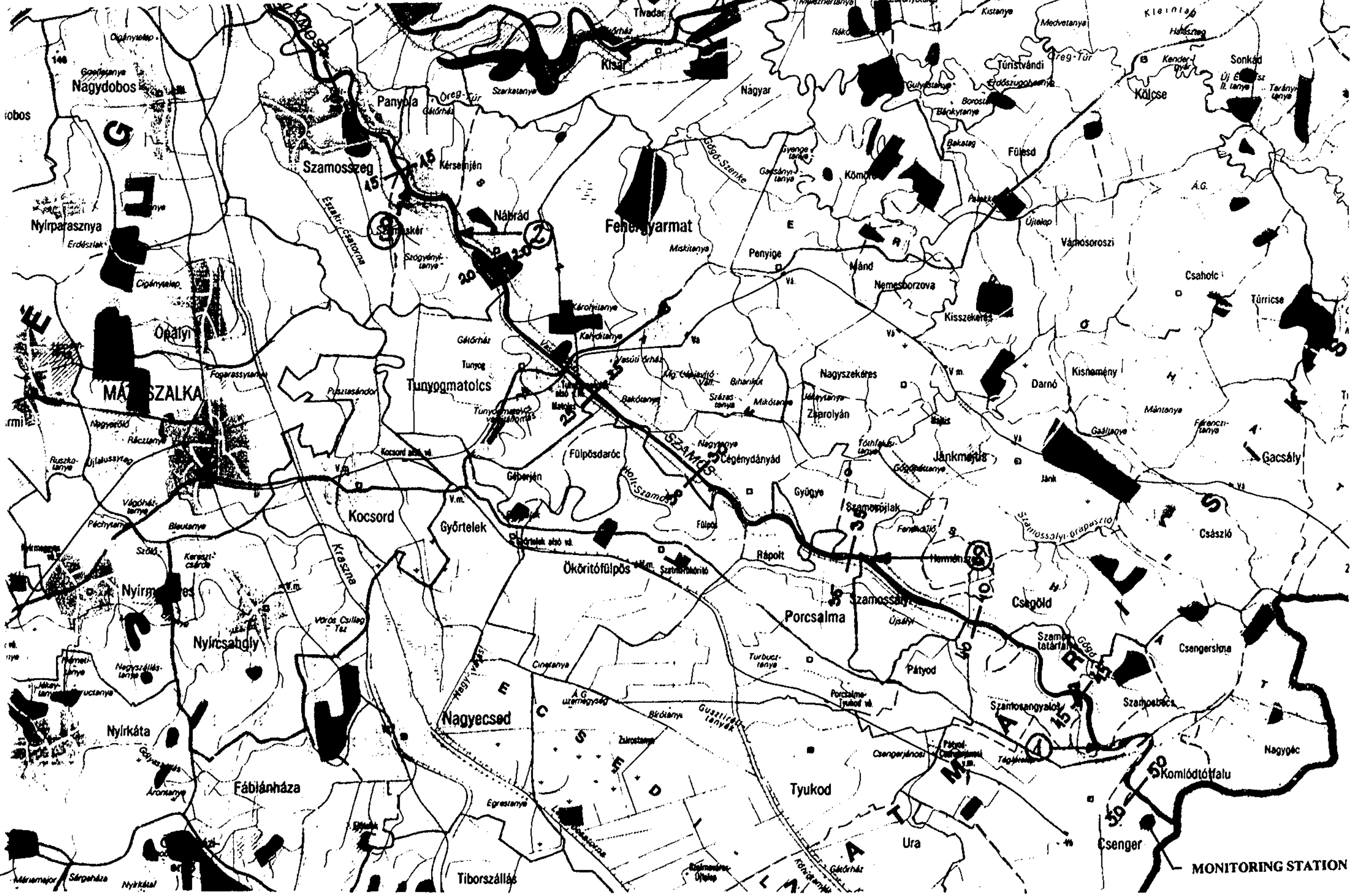
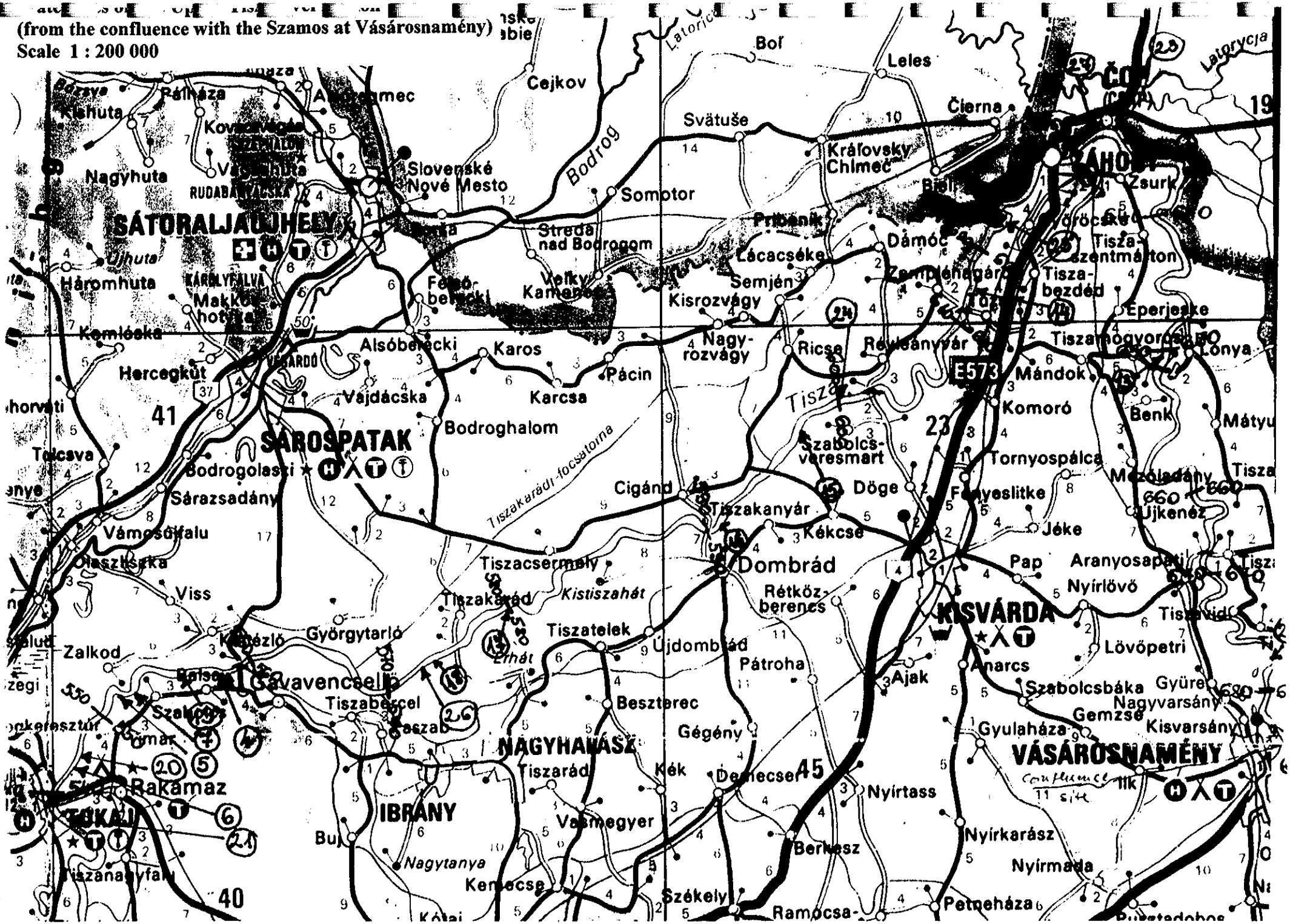
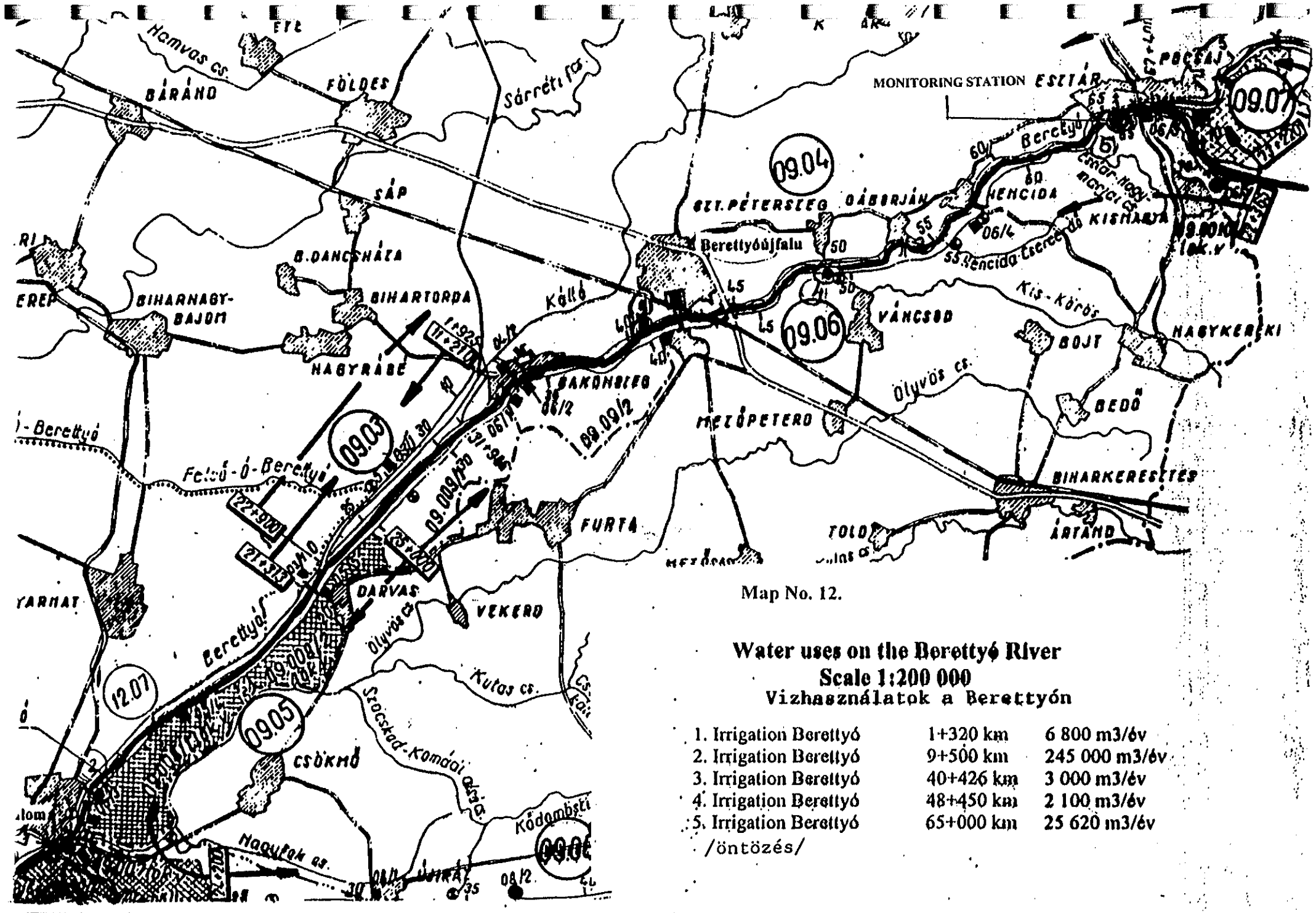
Ma... 10 Wa... ses ... he S...mos

Scale 1 : 200 000



(from the confluence with the Szamos at Vásárosnamény)
Scale 1 : 200 000





Map No. 12.

Water uses on the Berettyó River
Scale 1:200 000
Vizhasználatok a Berettyón

1. Irrigation Berettyó	1+320 km	6 800 m3/év
2. Irrigation Berettyó	9+500 km	245 000 m3/év
3. Irrigation Berettyó	40+426 km	3 000 m3/év
4. Irrigation Berettyó	48+450 km	2 100 m3/év
5. Irrigation Berettyó /öntözés/	65+000 km	25 620 m3/év

Annex A.1. Structure of WQMSs

WQMSs consist of the functional sub-systems:

I. Instrumentation

Primary instrumentation is needed for the following measuring circuits

1. Analogous measuring circuits of water quality parameters

Functions:

Producing water quality data such as basic parameters (temperature, dissolved oxygen, conductivity, pH) and according to the local needs: TOC, surface oil slick, chlorophyll, toxicity, etc.

2. Analogous measuring circuits for control parameters

Functions:

Sampling and the supervision of the correct operation of the instruments. The parameters include as example: gas pressure for TOC, loss of pressure in the suction line for checking clogging, etc)

3.Control circuits

Functions:

Operation of controllable units (e,g. starting pumps, calibration facilities, opening-closure of controllable fittings, such as valves)

4. State indicator circuits

Functions:

Indication of changes in the state of operation of various facilities. (e.g monitoring of electrical network, operation condition of pumps, indication of inundation etc). Keeping of a diary on operation signals can facilitate trouble diagnosis and help optimize the scheduling of maintenance actions.

II. Sampling pumps

Functions:

Conveyance of water samples from the river to the sensors.

Design:

Pumps should be installed within the stations. Pumps should be of the jet-pump type with capacities of at least 8 m suction head.

(Maintenance of pumps mounted in the channel or in a shaft which is located on the flood-plain might be cumbersome and expensive and also impossible in certain periods, e.g during floods).

Pumps shall be equipped with self-priming and back-flushing facilities (see under auxiliary equipment).

III. The hydraulic system

Functions:

Conveyance of sample water from the pumps to the sensors. Provision for back-flushing and cleaning.

Elements of the system:

- Through-flow chamber for the sensors of various parameters;
- Other facilities which might be needed for certain sensors, such as sand-separator, filter, etc;
- Overflow tank for securing constant head;
- Controllable shut-off fittings for automatic cleaning, emptying, etc (Shut-off fittings shall be of spherical-valve type, because the seat of normal valves might get upsilted thus preventing perfect closure)
- Pipe fittings between units
  (rapid pipe joints and flexible tubes shall be applied for securing rapid and simple maintenance)

IV Auxiliary equipment

1. Oil-free compressor

Function:

- Provides for the carrier gas for the TOC analyzer;
- Provides black-blow pressure for cleaning the sample tube;

  The two functions shall be served by a separate pressure tank each, equipped with automatic condensed water release facility.

2. Water jet ejector

Function:

- Secures the automatic priming of the sampling pump by vacuum suction of water after the back-flushing of the suction pipe or in any other cases when the pipe is empty.

3. Automatic sampler

Function:

- Taking and refrigerated storing of samples until their transfer for laboratory analysis.

V. Measurement controller-data logger

Functions:

1. Control of sampling
   - - Control of sampling pumps
   - - Control of back-flushing and cleaning processes
2. Control of calibration
3. Start-up of automatic sampling
4. Reading of data of automatic-analyzers described under section I.1, testing of acceptability, keeping of diary.
5. Collection of data as of section I. 2 for the testing of the operation of the system. testing of the correctness of measurement.
6. Keeping a diary of the events
7. Forwarding stored data to the RTCs
8. Sending warning signal in the case of accidental events.

9. Securing remote control

Elements of the hardware for measurement controller-data logger

The CPU unit

- ISBC (industrial single-board computer) in configuration suitable for the proposed softwares with watch-dog option
- Operation interface: VGA LCD display, folia keyboard, track-ball or mouse or touch-screen;
- DCF clock module for periodically correcting the system-time

Process connecting unit

- Sensor-to-computer interfaces
- Power supply unit
- Relays
- Over-charge protectors, etc.

Unceasing power supply unit (UPS)

10 minutes bridge-over time for the measuring circuits and the control electronics. Pumps and the compressor must not be connected to UPS

Housing

Sheet metal instrument cabinet (Rittael, Sarel or of equivalent quality)

Degree of protection: IP 54

The cabinet can be mounted on the wall or standing on supports. (In the case of flooding the water must not reach the electrical units). The door shall have a glass window. Switches, indicator lamps, the LCD display and the folia keyboard shall be mounted on the front panel).

The mechanical and electrical design of the control cabinet shall meet the requirements of the relevant Hungarian standard.

Software environment

Windows 98

MS Excel

Communication and remote control programme (such as Norton pcAnywhere or similar type)

Operation modes

Automatic control

Local manual control

Remote manual control

The List of Equipment was attached to this document, however, it was so many times modified on the basis of different requirements of the Inspectorates that it is advisable to attach the list to the report on the detailed plans, only, as seen lower.

Annex A.2.

Water users and pollution pattern of the 3 monitoring stations

See Maps 9-11

Monitoring station on the Hernád River at HERNÁDSZRUDOK

The monitoring station at the 16.55 rkm of the Hernád river was built under the auspices of the North-Hungarian Water Authority ÉVIZIG in the second half of the 70-ies. Now it is owned by the North Hungarian Environmental Inspectorate. Due to altered runoff and water quality conditions it is deemed necessary to reconstruct (upgrade) the station both technically and in respect to the water quality monitoring requirements.

In the past decades considerable changes were made in the watercourses of the Hernád (Hornad) River system, such as construction of reservoirs and the regulation of the channels. Sources of pollution and wastewater treatment facilities and techniques have also been altered, resulting in changes of the water quality conditions.

River Hernád has its sources in the northern side of the Low Tatras, hardly a few kilometers away from the springs of the River Vág/Vah.

The length of the River Hernád is 286.2 km of which 108 km is in Hungarian territory. The intensely meandering river is 1.3 times longer than the 220 km long river valley.

A characteristic feature of the Hungarian part of the River Hernád is that there are no tributaries which would match the size of the main river, as contrasted to the Slovak part where rivers of about the same size exist and the Basin can be split into sub catchments of similar size and stream density, which are as follows:

- Catchment of the Hernád until the confluence with Gölnic/Hnilec (1,140 km^2);
- Drainage area of the Gölnic (648 km^2);
- Hernád with Svinka until the confluence with Tarca/Torysa (543 km^2);
- Tarca with Brook Szekcső/Sekcov (1347 km^2);
- Hernád with Osva/Olsava until the country border (745 km^2)
- Total 4,423 km^2

Lengths of the streams Glönic/Hnilec and Tarca/Torysa are 87 km and 129 km, respectively.

55

Main Hungarian tributaries include the Csekő, Szartos, Garadna, Vasonca and Vadász creeks. The total Hungarian catchment is 1013 km^2, while the total (Slovak+Hungarian) drainage basin area is 5436 km^2. See the attached maps.

Data of Hungarian water users (see the attached map)

There are two water diversions in the Hungarian part of the River Hernád:

- The Channel Bársonyos at Hernádszurdok barrage with the carrying capacity of 3.0 m^3/s and
- The power Channel of the Kesznyéten power plant at Bőcs of 33 m^3/s discharge capacity.

- Hydraulic Power stations (some of them with very small output)
  - on the River Hernád:
    - Gibárt
    - Felsődobsza
    - Bőcs/Kesznyéten
  - on Channel Bársonyos:
    - Hernádvécs
    - Felső-Méra
    - Alsó-Méra
    - Forró
    - Halmaj

In the Hungarian part of the basin there are two reservoirs:

- The Telkibánya reservoir is located on a left-side tributary (the Brook Csekő), which has been empty for several years due to the failure of the outlet structure.

- The water quality protection reservoir of the Brook Szartos was built for retaining industrially polluted flows arriving from abroad, however, industrial wastewater of the Kassa/Kosice Metal Works, which were suspected to cause the problem, have not been discharged into the Brook Szartos since about December, 1987.

Data of known foreign potential sources of industrial pollution

It is assumed that the potential pollution sources of the Slovak part of the **Hernád basin** are listed as follows:
Kosice/Kassa is the second largest city of Slovakia and the seat of the administrative unit East-Slovakia. Kosice is one of the most important industrial towns of Slovakia. The metallurgical factories, the East-Slovak Steel Works, is the most important industrial establishment. Other important industries include: Magnezite processing industry, machine factories, canneries, breweries, food processing, dairies, tobacco industry, construction, wood and metal workshops, etc. The population is abt. 200000.
Krompachy/Korompa: Iron smelter and electrical industry.
Spisská Nová Ves/Igló: Centre of iron and other metal ore mining. Iron works, food processing industry
Levoca/Lőcse: developed food processing and metal industries.

In the **Torysa/Tarca Valley**:
Solivar/Sóvár. The only salt-mine of Slovakia is located here, producing 25,000 tons of salts annually. Salt is brought to the surface in dissolved form and then vacuum processing is applied. The salt works has been in operation since 1572.
Presov/Eperjes. The second largest city after Kassa in East-Slovakia. Several dozens of industrial plans include electrical industry, cloth manufacturers, food processing and printing. Population is in abt.70000.
Sabinov/Kisszeben is a small town in East Slovakia in a famous fruit growing land. Industrial plants include canneries and wood processing.

In the **Hnilec/Gölnic Valley**:
Gelnica/Gölnicbánya. Iron mines and wood processing. Population is approx. 5,500.

Accidental pollution events in the past ten years

The water quality of the border station is primarily influenced by the **pollution loads of the Kassa and Eperjes region**. Earlier, about a decade ago, the extremely unfavorable water quality conditions were mainly influenced by the untreated (acidic and iron containing) discharges of the East-Slovak Iron Works which arrived via the Brook Szartos. Directly or indirectly these effects represented hazards to the aquatic ecosystem of the Hernád river and the human water uses of the river: the fisheries, irrigation, drinking water intake and the bank filtered water supply of the Bőcs brewery (Borsodi Sörgyár). However, water quality conditions have substantially changed since about 1987. By this time the East-Slovak Iron Works has been equipped with wastewater treatment facilities and ever since the Szartos water quality protection reservoir has been receiving water of much better quality. Thus its main present function is the retention of floating debris.

The following information, regarding accidental pollution of the past decade, can be given on the basis of the available sources:

Pollution incidents in the River Hernád in the period 1985-1997:
1986: The most important pollution hazard prevention activities of this year were related to the **Chernobil Nuclear Accident.** Radiological measurements were made. On the 8th of March a sudden increase in radioactivity was detected with peaks on the 9th and 10th. Activity values decreased to the earlier level by the 20 of May, 1986

1991: Untreated wastewater of the East-Slovak Iron Works was discharged into Hernád via the brook Szartos. The aquatic ecosystem of the creek was highly deteriorated due to the continuing and accidental pollution loads. The water of Szartos qualified as "heavily polluted" in terms of pH, total dissolved solids, total iron, sulfate and ammonium. Upon measures made at the East-Slovak Iron Works the quality of water arriving from Slovakia has been improving, although full recovery can be expected only after the commissioning of the waste water treatment plant of the Iron Works, under construction.

1994: Failures of the Kassa/Kosice wastewater treatment plant resulted in considerable discharges of activated sludge. Dilution water was released from the Ruzsin reservoir to mitigate

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the effects of this accident. No severe effects of this pollution event were detected in Hungary. There was a high algae count and aquatic weeds bloom in July, disrupting the oxygen household, but no serious damages were detected.

1996: The quality of water fell into Class IV at Tornyosnémeti (the border station) in terms of the components of the oxygen household. Both the components of the nutrient cycle and micropollutants reached the level of Class V (heavily polluted). The likely sources to be blamed were again the Kassa Iron Works and the communal sewage of Kassa. Ammonium concentrations have also substantially increased in the border section, in comparison to those of the former years.

Accidental water pollution emergency action system

Techniques of fighting water pollution incidents of surface waters include the following type of measures:

- Aeration by rotors, weirs and existing hydraulic structures
- Chemical treatment such as neutralization, ammonia and sulfur dioxide removal
- Physical measures, such as dredging, removal of weeds, debris and animal cadavers
- Retaining, absorbing and removing of floating oil, use of chemical dispersing, flocculating agents
- Disposal of removed solid and liquid pollutants and contaminated adsorbents
- Use of water and air jets and "air curtains"
- Cleaning of river banks and the channel after the spill

Table 1 indicates the travel time of pollution impulses at different flow velocities to the significant river sections (see also map). Their task is laid down in the regulation of the Water Directorate in case of emergency situation. Among the others they help in giving alarm to the farmers to stop irrigation. The list of water uses can be seen on Fig.

Table - Annex A.2.-1

Time of travel of pollution impulses from the border station to downstream water users

Remark: 16 irrigation water intakes are licensed along the entire length of the river and the channels, no other surface water users exist. See also the map No.2.

Station/water user	river km*	Time of travel at various flow velocities (hour)		
		low (v=0.27 m/s)	Medium (v=0.65 m/s)	High (v=1.8 m/s)
Border station (Abaújvár)	0.00	0.0	0.0	0.0
Szartos reservoir	10.0	10.29	4.27	1.54
Hidasnémeti, bridge	13.0	13.37	5.56	2.01
Hernádszurdok, site of pollution defense action	16.45	16.92	7.03	2.54
Hernádszurdok, monitoring station	16.55	17.03	7.07	2.55
Fork-off of Channel Bársonyos	16.65	17.13	7.12	2.57
Gibárt, power station	43.82	45.08	18.73	6.76
Felsődobsza, power station	55.36	56.95	23.66	8.54
Bőcs, dam	96.445	99.22	41.22	14.88
Mouth of Channel Bársonyos	99.03	101.88	42.32	15.28
Mouth of the Kesznyéten power Channel	110.0	112.22	46.97	16.98

Remark: data are only approximate values and actual times of travel will vary within wide range.

* river kilometers are specified for this case in a reversed manner as contrasted to the general method of accounting from the river mouth.

Monitoring station on the Szamos River at CSENGER

The necessary instrumentation for water quality monitoring has been placed into the building of the hydrological station at **Csenger**, property of the Upper-TiszaWater Directorate (FETIVIZIG).

The monitoring station was established in 1978 at the left side of the Szamos river bank at the 43+500 river km.

Water level fluctuation on the Szamos is significant it could reach the 10,02 m between the highest and lowest water level measured.

The watershed area of the Szamos River is the largest sub-watershed of the Upper-Tisza river system that is located on the northern part of the Transylvanian basin. Because of its very large area in Romania its map is omitted. See map.

Table - Annex A.2.-2. Water uses and travel time of pollution jet

The various water uses on the Szamos River are given below *(from the Csenger monitoring station to the Tisza at the Tokaj section).*

Remark: Recreational areas not indicated here. See the map, as well.

	Station/water user			River/river km	Time of travel of pollution (hour) v=0.5 m/s v= 1.5 Szamos v=0.3 m/s v= 1.7 Tisza		
1	Csenger Agricult.Coop.	irrigation	250 ha	Szamos,right, 46.7 rkm	20	-	7.0
2	Nábrádi Agricult.Coop.	irrigation	57 ha	Szamos 18 rkm	27	-	9.2
	Vásárosnamény (Confluence with Tisza)						
3	Area of Záhony	irrigation	170 ha	Tisza, right, 638-640 rkm	103	-	22.6
14	Tuzsér beach, hotel			Tisza left, 616.2-616.5 rkm	116	-	25.5
23	Water intake to Ukraine via the Eszenyi sluice			Tisza 635.9 rkm	104	-	22.8
24	Water intake of the Rétközi Lake by the Tiszai sluice gate			Tisza left, 603.2 rkm	124	-	28.9
25	Aquifer of the Záhony drinking water supply	drinking water supply		Tisza left, 622 rkm	114	-	24.6
26	Aquifer of the Jásztelep	drinking water supply		Tisza left, 572-573 rkm	152	-	34.0
27	Planned water intake (Ungvár regional water works)			Tisza right, 632-634 rkm	105	-	23
4	Gávavencsellő	irrigation	1350 ha	Tisza left, 558.6 rkm	165	-	36.3
5	Timár	irrigation	350 ha	Tisza left, 551.6 rkm	173	-	37.4
6	Rakamaz	irrigation	220 ha	Tisza left, 551.75 rkm	173	-	37.4
7	Rakamaz	irrigation	1000 ha	Tisza left, 539.0 rkm	184	-	39.4

Data on the potential (transboundary) pollution points upstream

1. Kolozsvár/Cluj-Napoca: leather tannery, treated food industrial wastewater and treated communal wastewater

2. Dés/Dej: paper factory with high water use

3. Nagybánya/Baia-Mare: the Zavar Creek carries spent mining water (source of cyanide and heavy metal pollution in February 2000)

4. Szinérváralja/Seini: untreated communal wastewater

5. Szatmárnémeti: partially treated communal wastewater

6. Darócz/Dorolt: untreated wastewater of the cattle farm is discharged via the city sewer into the Szamos

7. Vetés/Vetis: near to border pig farm, planned to be closed, similar situation to the above listed ones

Pollution events during the past years

The pollution due to the excessive growth of the algae (algal blooms, especially by diatoms) is particularly frequent during the summer period when low flow rates are paralleled with high ambient temperatures. The actual problem starts when the generated large volume of algal biomass starts to be decomposed and as the results of the biodegradation of the organic material oxygen depletion conditions develop on the river. The color of the water is brownish and its chemical composition has a deteriorating effect on the water quality of the Tisza River and on the various water uses both on the Tisza and on the Szamos.

A large pollution on the Szamos was experienced in early November 1993 when floating booms were used for the removal of ten tons of heavy heating oil from the surface of the water. The clean up activities were conducted through several days in order to protect the downstream river sections form the pollution wave arrived from Romania.

The catastrophic pollution events in the year 2000 were dealt with in the scope of the Workshop (see Chapter 5).

Water quality prevention measures

There are three built emergency (clean up) site on the Szamos river. These are situated at Szamosújfalu, Komlódfalu and Olcsva municipalities. The clean up team is predominantly equipped for the treatment and removal of floating type of pollution. Clean up devices and gears are stored in the central warehouse facility at Nyiregyháza, and to a lesser extent these are also distributed on site.

Monitoring station on the Berettyó River at POCSAJ

The location of the monitoring station is at the 66.172 river km on the Berettyó River at **Pocsaj** (Kismarja community).
The presently updated hydrological monitoring station at **Pocsaj** is fully complemented by the establishment of the water quality monitoring installation.

The watershed area of the Berettyó River is a sub-watershed of the Körös river system. The source of the Fehér-, Fekete- and Sebes- Körös rivers is situated in Romania and confluence of the Hármas-Körös to the Tisza is at Csongrád (see map...).
The total surface of the watershed is 6095 km^2, from which more than half belongs to Romania. The total length of the river is 203.8 km from which 74.5 km falls to Hungarian territory. The difference between the low and high water levels could reach 600-800 cm. See map.

Data of the downstream water uses

Water uses on the Berettyó river is given in Table. (See also map).

Table- Annex A2..3. Data of the endangered water uses

Name of section	River km	Water intake	Travel time*	Name, address, phone no. of the operator
Berettyó left bank	48+500	irrigation	2.5 hour	Rezes Gábor, 4034 Debrecen, Lándzsa u. 11/a. 06-52-418-317
Berettyó left bank	9+500	irrigation	1.5 hour	Sárréti Mg.Szövetkezet, 5521 Szeghalom, Kossuth u. 16., Husza Jánosné 06-66-371-344
Berettyó right bank	65+000	irrigation	3 hour	Esztér Mg. Szövetkezet, 4124 Esztár, Bocskai u. 2., Széchy Károly 06-54-414-084
Berettyó right bank	40+426	irrigation	1 hour	Matolcsi Antal, 4100 Berettyóújfalu, Benczúr u. 3. 06-60-412-976
Ér main channel	0+500	irrigation	1 hour	Alimán József, 4125 Pocsaj, Táncsics u. 8. 06-54-415-054

* the figures represent the worst conditions

Main concerns in respect of water uses are as follows:

- Discharge of the Berettyó river across the national boundary effects the Sebes-Körös, Hármas-Körös and the Tisza rivers downstream of the Csongrád section where significant water intake points are located,
- The water uses (industrial, agricultural and ecological) on the mentioned rivers are demanding continuos water jet in the magnitude of few m^3/sec,
- The river section between the confluence point of the Berettyó and Bakonszeg is part of a water transfer path on which water could be directed into the direction of the Tisza-Eastern Main Channel- Berettyó- Sebes-Körös-Kettõs-Körös-Hármas-Körös system at 1.0-8.0 m^3/sec flow rate depending on the natural discharge rate of the Berettyó river.
- This transferred water jet can only be utilized if the water quality meets the demands continuously.

Data on the upstream (transboundary) potential pollution sources

On the Romanian watershed area of the Berettyó River the following potential pollution sources are listed:

1. Oil refinery at Berettyószéplak/Suplacu de Barcau
2. NUTRIX S.A. at Margita/Margitha

As the most frequently occurring ecological risk type is the accidental oil spill from the upstream watershed area (in Romania). The detection of the floating oil pollution is considered as a prime task.

The following table summarizes the travel-time data on the Berettyó in case of a hypothetical oil spill at Berettyószéplak/Suplacu de Barcau:

Table - Annex A.2.-4. Travel time of pollution jet from the Romanian source to the Sebes Körös

River km from the confluence	Distance between the neighboring station (km)	Water velocities m/sec		Travel-time in hours between the neighboring station	
		Low water flow	Medium flow	Low water flow	Medium flow
Berettyószéplak/ Suplacu de Barcau	143	0.5	0.7	-	-
Margita/Margitha	115	0.5	0.7	16	11
National border	74	0.4	0.6	23	16
Pocsaj	68	0.3	0.5	4*	3*
Berettyóújfalu	43	0.3	0.5	23	14
Szeghalom	0	0.3	0.5	29	24

*from border

It is quite obvious form the previously obtained spill prevention practices that the first few hours are considered as critical ones during the intervention in combating oil spills. The water quality monitoring station will provide further reduction of detection time and as a consequence of this, additional time will be available for the appropriate decision making.

Accidental spills and pollution events during the past 10 years, mitigation of pollution sources

There were 10 registered Romanian oil pollution waves in 1987. The volume of these spills was low and no preventative measures were conducted. Nonetheless, some of the water uses,- such as at the fish farms- had to be excluded from the service for at least one week.

The oil spill arrived in February of 1992 had such a magnitude that prevention measures were conducted through 8 days at Pocsaj. The pollution wave arrived via the Ér main channel at Pocsaj. Similarly to previous events the Romanian partner on the details of the oil spill gave no explanation and description.

One major spill reached the Hungarian territory in 1995. In fact, this was the largest one ever registered. From January 02 until February 10 heroic prevention measures were undertaken on the Berettyó during which 460 tons of mineral oil was removed by the oil spill control teams of the Debrecen and Gyula Water Directorates. The Romanian partner decided to take unexpected action in that case, the removed oil was transferred back to Romania. The name and location of the pollution source was given to us by the Romanian partner in that particular case, this was the Petrol SUB SA., at Berettyószéplak/Suplacu de Barcau. The total cost of the oil spill control reached 60 million HUF that could not be reimbursed at the Romanian partner.

Water quality prevention measures

Upon the registration of the coming oil pollution wave the TIVIZIG is almost automatically starts the implementation of the prevention measures, with the available man-power and protective gears at Pocsaj, that is the most feasible point for the removal of the pollution.

On the basis of the experiences obtained during the past few years the following temporary points are feasible on the Berettyó for the removal/prevention of the pollution:

Name of municipality	river km on Berettyó	Protection method/access
Kismarja	72.6	stabilized protection point with easy access.
Hencida	58.1	Booms and floating skimmers in both places, as well as telecom and electric supply services

Stationary, constantly available sites for oil spill control

Name of municipality	river km on Berettyó	Protection method/access
Pocsaj	66.2	paved two platforms site with mechanized gears
Berettyóújfalu	43.3	storage facility for skimmed materials, telecom and electric energy are available

According to the presently available oil spill prevention technology, 1-2-3 lines boom gear could be established on the river within 1-2 hours at Pocsaj. The manual cleaning and removal of the floating pollution could be initiated immediately.

The mechanized oil skimming could be fully implemented in 3-6 hours from the emergency signal. Parallel to the establishment of the Pocsaj clean up site the prevention could be started at Berettyóújfalu in about 1-2 hours by the establishment of the 1-2 line T booms.

Temporary protection points (Kismarja, Hencida) serve to decrease the load on the constant clean up points (Pocsaj and Berettyóújfalu) by the establishment of temporary 1-2 line booms.

Pollution, other than oil could be managed by similar means with the complementation of other techniques depending on the type of pollution (dilution and neutralization). Dilution is applied if the polluted discharge is in the range of 1.0-8.0 m^3/sec and significant improvement could be achieved by the addition of good quality dilution water.

Annex A.3.

Emergency action in case of accidental pollution

Emergency actions

Emergency actions in case of extraordinary pollution requires the well-coordinated activity of a great number of participants. According to the related governmental regulation, the steering of operation is the task of the competent Water Directorate. The most important tasks can be summed up as follows. In case of each announcements:

- continuous and mutual exchange of information between the District Water Directorate and the Environmental Inspectorate,
- verification of the information about water pollution by the competent local Departments of the Directorate, Inspectorate, resp.,
- determination of the water users affected by the pollution,
- determination of the necessity and the extension of local survey,
- declaration of the degree of water quality alert.

The **immediate actions** must be aiming at the prompt localization of pollution and at the mitigation of further damages:

- termination of pollutant supply,
- determination of the technology of emergency actions and the exact place of its implementation,
- implementation of the localization works.

The **delayed actions** are aiming at controlled passing down the pollutant already localized (detained) and at its removal from the water:

- determination of the operational schedule of controlled passing down,
- removal, stripping of the pollutant,
- collection of the removed matter,
- preparation of the collected matter for transportation,
- cleaning, neutralization of the pollutant.

The **subsequent actions** are aiming at the re-establishment of the conditions previous to the pollution:

- transport and annihilation of the waste and pollutants collected during emergency actions,

- termination of all degrees of alert,
- demolition and dismounting of provisional protection works, regaining of built-in materials and devices, their cleaning and storing,
- maintenance, repair, replacement and storing of used materials, devices and tools,
- clearing the accounts of the participants of emergency actions,
- initiation and/or implementation of official measures necessary for preventing similar events in the future.

Possibilities of abatement

The possible alternatives of abatement to be adopted in case of a given extraordinary pollution event are to be elaborated by the competent District Water Directorate, informing immediately the Environmental Inspectorate. Pondering these possibilities, has to be taken into account, that each of the emergency actions (technologies) can be adopted not only alone, but also combined with other measures.
The selection of technology or set of technologies most suitable for the given situation must be based on the consideration of the conditions as follows:

- type, quantity and/or concentration of pollutant,
- hydraulic system (water courses, canals, river-beds) and technical conditions of structures (possibilities of storage and diversion),
- hydrological and meteorological data (water level, discharge, velocity, temperature, etc.)
- operational data of water users (quantitative and qualitative water demand, time schedule of water use, water deficiency tolerance, etc.).

In the following the emergency actions will be described for which the Control Detachment of the competent District Water Authority has the necessary devices and practice. The most suitable one of these has to be selected by harmonizing the requirements and interests arising on the given site, at the given time.

In the case of the appearance of the dissolved or suspended pollutant, the most frequently used method of abatement consist in **controlled passing down** the wave of pollution. This method can be adopted if:

- the aquatic ecosystem and the water users are not immediately endangered by the type and the quantity of the pollutant,
- damages can be prevented by proper safety measures at the water users,
- prevention of the pollution is not possible for technical or economical reason.

Whenever ordering the facilitation of controlled passing down a pollution wave, the following actions have to be taken:

- watching in an increased degree,
- frequent, directed sampling and decision about the necessity of specific investigation,
- information of water users, consideration of protecting measures,
- information of the interested institutions and the public.

The ordering of increased watching is absolutely necessary in all cases when facilitation of controlled passing down has been decided.

Frequent, directed water quality investigations have to be carried out if:

- the concentration of pollutant reaches or surpasses the critical value prescribed for the aquatic ecosystem or the water users, or
- there is no information available concerning the origin and the supplier of the pollution.

The following institutions have to be drawn into the implementation of eventually required specific investigations:

- public health organizations, scientific research institutes, stations of agrochemistry and plant protection, water works, water quality and hydrobiological laboratories of water users and wastewater dischargers.

All affected water users must be informed in each case about the passing down of the pollution wave. They may take measures of damage abatement and/or protection, depending on the degree of endangerment and on the expected duration of the pollution wave, as follows:

- watching in an increased degree,
- continuous sampling and testing,
- opening up reserve water resources,

- changing the technology of water treatment,
- restriction or stopping the water intake.

Administrative and public order authorities of the settlements alongside the river have to be informed about the passing down of the polluted wave endangering life or health of public or animals. Alarm may be carry out through the organizations of the municipalities, home affairs and civic protection.
If necessary, the population of the settlements, the agricultural and industrial plants, the health resorts, and the sport-associations alongside the river have to be informed about the expected impacts of the pollution.

Prevention of extraordinary pollution by **flow control** is adopted if there is a possibility to transfer, to store or to dilute the polluted water within the same hydraulic system, in order to perform the emergency actions or to protect the water users. Flow control enables to decrease the concentration of the pollutant or to keep of the pollution from the river or bank section to be protected.

Water transfer means to conduct the polluting wave into an other section of the section of the river or into an other recipient. By this method, not the actual quantity of the pollutant, but its damaging impact is being reduced by diverting it in a recipient less sensible against pollution.
Storing means to retain the passing down of pollution in order to ensure the time and space necessary for natural pass-down processes or artificial cleaning technologies. This method can be adopted either finally or provisionally.

Dilution means the termination of harmful concentration by admixing water (diluent) free of pollutant.

Aeration may be applied for enhancing the self-purification of a given water body, for improving the oxygen saturation of water bodies sealed by ice or snow, and for neutralizing the biologically degradable organic matters, the discoloring pollutants and the absorbed gases.

Aeration may be carried out:

- **by structures, overfall weirs**, providing simple and rapid means for terminating oxygen deficiency, wherever the local conditions are available. This action (decrease of storage level, release of stored water) is, with only a few exceptions, unfavorable for the orderly operation of the structure. For implementing aeration, various possibilities are available, depending on the river-bed conditions and on the features of the structure:
- regulation of the **closing devices** of barrages or sluices,,
- pulverization of water jet along the **downstream floor** of barrages,
- putting into operation of **hydropower plant.**
- by **pumping**, when the water jet, after contacting with the fresh air on a great surface, thus after a considerable enrichment of its oxygen content, falls back onto the water surface, helping the degradation of the oxidable pollution.

  Aeration by pumping can be implemented either by free outrush or by a jet passing through a spraying disc.

  The pumps can be mounted onto panels, thus transformed into automotive.
- by **specific devices**, introducing oxygen through pulverized water drops and air bubbles entering the turbulent water surface. The devices can be held, by swimmers, directly on the surface of the polluted water. Their operation requires electric energy.
- The **rotating brush** returns the sucked-up water, after pulverizing it on the rotating wires, into the water body.
- The **water aerator** provides the same effect by spraying dishes.

The **localization** of suspending or floating mechanical pollutants (oil and its derivatives, organic floating matter, mass of hydrophytes, duckweed, detergent foam, etc.) can be carried out either by various types of submerged walls or by pontoons, situated in an angle of 30-45° to the direction of waterflow.

The important tasks thereby are the selection of a suitable control place, of the type of submerged wall and finally its allocation.

The **VIKOMA-type submerged wall** is a textile based plastic structure, consisting inflatable elements of 10 m long, fitting each other by aluminum rail profiles, mounted on both ends, which can be fixed by screwed joints. The cable on the submerging part provides loading and

the bearing of mechanical forces. Its advantages are the smaller space requirement, the easy handling and the quick allocation. Its disadvantage is the higher vulnerability.

The **river-bed closing by pontoons** is generally used for localization of pollution of great masses and long duration, or in case of rough weather conditions as well as in all cases when submerged walls have to be substituted by any reason.
Its advantages are the adjustable immersion by loading pontoons, the thoroughfare and suitability to work on. Its disadvantages are the great space and long time requirement for transportation and installation.

Obligations of reporting

The governmental regulation No. 132/1997. (VII.24.) Korm. about the tasks related to water quality emergency actions has overruled also the order No. 9/1978. (V.É.12.) OVH, having listed the obligations to report on damage events and the prescriptions of the contents of these reports. According to § 16 of the new governmental regulation, the elaboration of the new rules of the order of reporting is now under way in the competent ministries.
Until this regulation will be issued, the interim orders of the Ministry of Transport and Water Management and of the General Water Directorate (OVF) have to be adopted.

Annex A.3. - Table A.3.-1.

IRÁNYÍTÁSI KÖZPONTOK ADATAI

DATA OF DIRECTING CENTRES

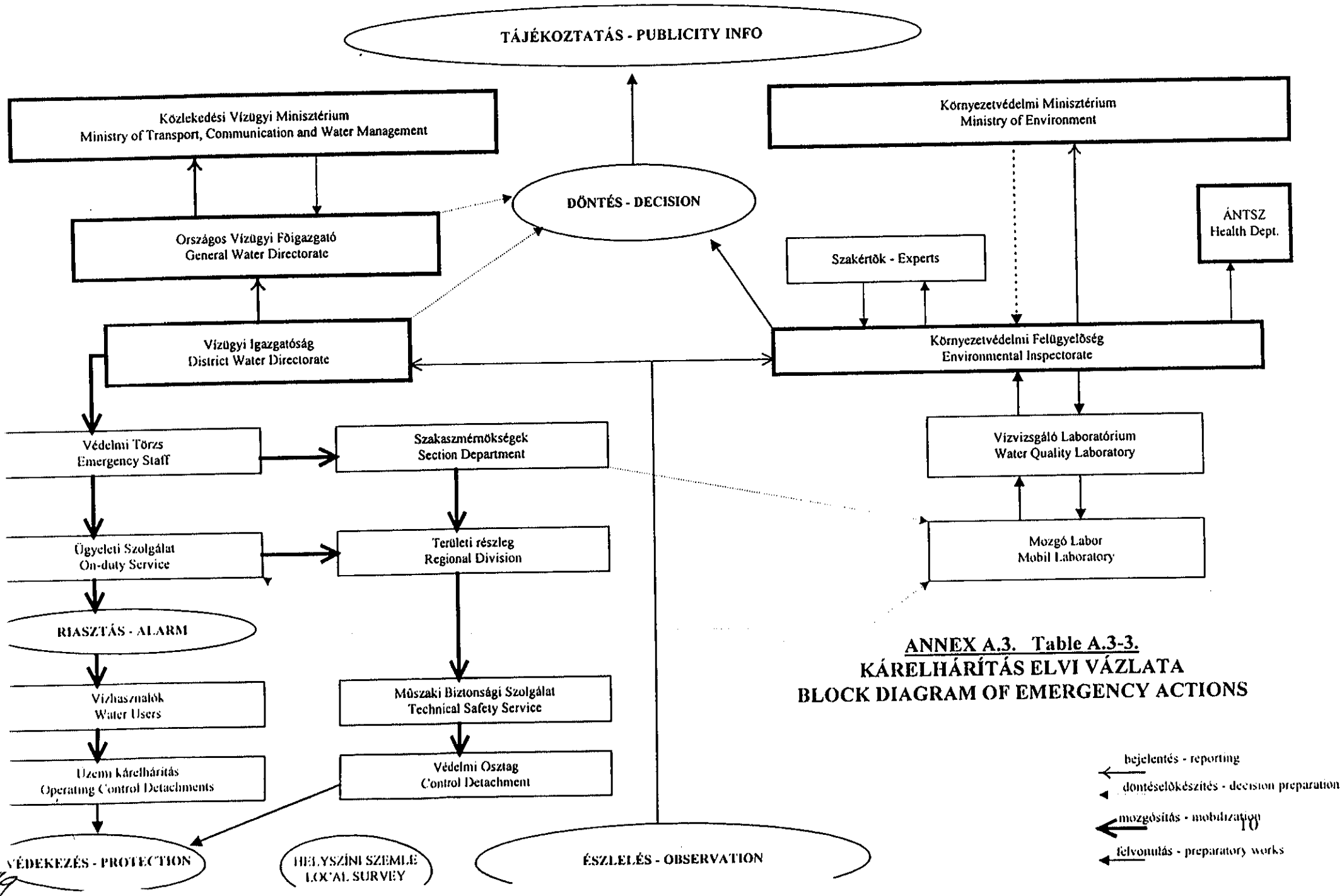
Intézmény neve, címe Name and address of institution	Irányítók címe Address of leaders	Telefon Phone
ORSZÁGOS KÖZPONT – STATE CENTER		
Közlekedési és Vízügyi Minisztérium Ministry of Transport and Water Management 1077 Budapest, Dob u. 75-81.	miniszter – minister h. államtitkár – deputy state secretary főoszt.vezető –department leader főtanácsos – counselor	(1) 322-0220
Országos Vízügyi Főigazgatóság General Water Directorate 1012 Budapest, Márvány u. 1/c	főigazgató – director general főigazgató h. –deputy dir.general főoszt.vezető –department leader osztályvezető –section leader főtanácsos- counselor	(1) 375-1244
Ár- és Belvízvédelmi Készenléti Szervezet Flood Protection and Inland Water Control Org. 1211 Budapest, Szabadkikötő út 4.	igazgató – director	(1) 420-8541
KÖZPONTI SZOLGÁLAT – CENTRAL SERVICE		
Vízügyi Igazgatóság District Water Directorate	igazgató – direktor	(46)411-411* (46)310-155** (52)410-677***
Vízgazdálkodási Osztály Department of Water Management	dept. leader – osztályvezető	
Vízrendezési és Vízhasznosítási Osztály Department of Watershed Man. and Water Use	dept. leader – osztályvezető	
Árvízvédelmi és Folyószabályozási Oszt. Dep. of Flood Protection and River Regulation	dept. leader – osztályvezető	
Víziközmű Osztály Department of Water Public Works	dept. leader – osztályvezető	
Műszaki Ügyelet Technical Inspection	dept. leader – osztályvezető	
Vízminőségi Kárelhárítási Törzs Water Quality Emergency Action Staff	dept. leader - osztályvezető	
TERÜLETI SZOLGÁLTATÁS – LOCAL SERVICE		
Szakaszmérnökség Section Department	leader – vezető	
Műszaki Biztonsági Szolgálat Technical Safety Service	leader – vezető	

*Miskolc
**Nyíregyháza
***Debrecen

Annex A.3. Table A.3.2.

ÉRTESÍTENDŐINTÉZMÉNYEK ADATAI
DATA OF INSTITUTIONS TO BE INFORMED

Intézmény neve Name of institution	Irányítók Operation leaders
Szomszédos országok Vízügyi Igazgatósága District Water Authority of Neighboring Country	igazgató – director
Környezetvédelmi Minisztérium Ministry of Environment 1011 Budapest, Fő u. 44-50.	Környezetbiztonsági Osztály Environmental Safety Department
Környezetvédelmi Felügyelőség Environmental Inspectorate	igazgató – director
Vízminőségvédelmi Osztály Department of Water Quality Protection	osztályvezető – department leader
Vízvizsgáló Laboratórium Water Quality Laboratory	laborvezető – lab leader
Vízügyi Igazgatóság District Water Directorate	igazgató – director
Állami Népegészségügyi és Tisztiorvosi Sz. State Medical Officer's Service	tisztifőorvos – chief medical officer
Állategészségügyi Intézet Institute of Veterinary Hygiene	igazgató – director
Növényegészségügyi és Talajvédelmi Állomás Plant Sanitation and Soil Protection Station	igazgató – director
Polgári Védelmi parancsnokság Civic Protection Headquarters	officer in charge
Megyei Rendőr Főkapitányság County Police Headquarters	officer in charge
Határőr Igazgatóság Directorate of Border-Guards	officer in charge
Megyei Tűzoltó Parancsnokság County Fire-Guard Headquarters	officer in charge



ANNEX A.3. Table A.3-3.

KÁRELHÁRÍTÁS ELVI VÁZLATA

BLOCK DIAGRAM OF EMERGENCY ACTIONS

Annex A.4.

Warning and Defense Actions, Workshop

Warning and Defense Actions, Workshop

The Workshop was aiming at the defensive actions of the competent Hungarian organizations in case of emergency situations alarmed by the automatic water quality monitoring stations established by US AID assistance and by the contribution of the Hungarian Government. It was held in Miskolc on 21-22 March 2000.

This objective was underlined by the catastrophic water pollutions in the Tisza-Szamos catchment in February-March 2000 caused by Romanian mining companies.
Remark: The Emergency Action Plan prepared by VITUKI Innosystem Ltd. was distributed to the participants at the registration of the Workshop.

Though the two-days program (see Annex) outlines the major topics of the Workshop the focal points on the basis of the discussions might be described as follows.

Integration of the 3 monitoring stations (built at the border sections of Hernád, Szamos and Berettyó rivers) into the System of Accidental Emergency Warning (AEPWS) established in the Danube Basin in 1997 in the scope of the Danube countries cooperation under the flag of the European Union (ICPDR, formerly known as Program Coordination Unit, Vienna).
The participants of AWPWS Expert Group outlined the warning system extending to the total Danube Basin. There are centres so called "PIAC" supplied with serial numbers in the Danube countries. (See Chapter 1). The Hungarian one is PIAC-05 and it is in Budapest within the premises of VITUKI Plc. These centres communicate with the ICPDR in Vienna and with the neighbouring ones concerned in case of emergency situation. The local sub-centres are in the 12 Environmental Inspectorates belonging to the Ministry of Environment in Hungary. The problem raised in the discussion was in connection with the way of communication between the Inspectorates and the PIAC-05. The newly built 3 automatic monitoring stations are equipped with proper telecommunication means to the Inspectorates and to the Water Directorates, however, the flow of information from the Inspectorates to the PIAC-05 is by "conservative" means only, that is by telex, fax or e-mail, while the Water Directorates (responsible for defence actions in case of emergency) are electronically

interconnected with the PIAC-05 (hydrological data flow). In the near future the Ministry of Environment should help to establish a similar telecommunication for the Inspectorates.

The cyanide and heavy metal contamination effect to the Hungarian-Romanian cooperation. The Romanian cyanide contamination of the Szamos and Tisza rivers in February 2000 had a catastrophic effect to the ecosystem of the rivers. For the Tisza it started from the confluence with the Szamos. The upper section of the Tisza above the confluence saved from contamination, then a heavy metal (most dangerously lead!) shock wave arriving in early March from Romania, through Ukraine it was polluted, as well.

The cyanide contamination flew through as a plug of several 10 kms and killed the biota of the river along its route. Several ten thousand tons of fish cadavers were removed from the river surface, however, the worst devastating effect was the killing of the planktonic and benthic life leaving no food resources for the remaining or immigrating fish population. The Csenger monitoring station was under trial operation in February-March and the chlorophyll-a measuring equipment could not sense the least quantity of algae in the river after the catastrophe.

The heavy metal shock arrived to Hungary with a simultaneous flood-wave and the contaminated suspended solids were spread to the flood-plain between the dykes of the river, as well. Though the flood caused significant dilution to the pollution jet, it is not known how much metals (zinc, copper, lead, etc) settled to the river bed and its surroundings resulting in retarded toxic effects at a later period.

The Romanian experts acknowledged that the mining conditions (gold mine in case of the cyanide release and mining other metals in the second case) were poor mainly because of the improper construction of the dykes of the slurry reservoirs and their government launched an exploratory investigation on the potential pollution sources for setting a data-bank of those. It should be mentioned that the emergency warning through phone connection from Romania to Hungary was duly done and this way the local agencies had been in advanced alert before the arrival of the contamination.

The Romanian expert pointed out that similar automatic monitoring system should be established on their own river sections in different areal distribution as it was in Hungary.

In connection of above events the question emerged what could have been done in Hungary as an emergency response? It was clear that beyond alerting the water intake works, **nothing**. Because of the fact that both the Szamos and the Tisza are great rivers (at the time of the catastrophe with a flow of several hundred m^3 per second) it was absolutely impossible to exert any protective measure. Against similar situations the only possible protection is the **prevention**.

In connection of the above emergency cases the participants raised the question of supplying the 3 stations with heavy metals and toxicity measuring equipment.

The official alert routine between the neighbours. As far as the emergency alert system in the scope of the bilateral agreements is concerned between Hungary and Slovakia this has been laid down. With Romania the accidental water pollution issue has not been previously properly included into the agreement, and it is now under re-negotiation. The latest catastrophic accidents will certainly speed up the legal procedure. It is strange that in contrast to the PIAC-system of the Danube Basin, such a legal-act has been missing.

Prevention methods against accidental pollution in the upstream countries of Slovakia and Romania. Romania is an absolute upstream country of this part of Europe situated at the top of the Carpathian range. In the framework of the US AID project of Transboundary Pollution Reduction wastewater treatment investment is assisted in the catchment area of the Cris/Körös river system. There is an exploratory study underway in the Maros river valley, as well, aiming at the reduction of pollution of the significant subsurface aquifer utilizing for drinking water supply in South-eastern Hungary.

In Slovakia, once again, in the scope of the common US AID project the main potential polluter of the Hernád river, the Kosice/Kassa wastewater treatment plants are assisted by accessories for upgrading those plants. Simultaneously on the Uh/Ung river, (a tributary of the Tisza) automatic monitoring station has been established at the Slovak-Ukrainian border.

where frequent oil pollution was observed in the past years. The structure and equipment of this station was reviewed in the workshop.

As far as the Hungarian-Slovak common rivers are concerned in Northern Hungary, on the Sajó and Bodrog rivers further actions are waiting. On the Slovak part the prevention of pollution and on the Hungarian part establishing automatic monitoring stations are among the further tasks.

Visiting the Hernádszurdok monitoring station

The Hernádszurdok monitoring station near the Slovak border on the Hernád river was examined mainly in respect of water intake structure, surface oil sensing and data transmitting. The impression among the participants was positive. No objection was raised in any respects. The reliability of the adapted system is underlined by the similar one in the Zala river being in operation since 1998.

The set of equipment in the 3 stations with emphasis on the toxicity measurement and the levels of emergency. an interesting issue was the automatic toxicity measurement in the stations. The German supplier of the chlorophyll sensing equipment explained that this (mounted in all 3 stations) is capable to make alert in case of toxic effect in the water. Two participants, the biologist of Miskolc Inspectorate and Mr. Pintér of AEPWS Expert Group expressed the necessity of establishing the Daphnia test apparatus. No support arrived to this idea from the participants of the Inspectorates. They are aware of the cumbersome operation of such an expensive equipment. Consequently no decision was taken as to the future of Daphnia tests.

Direct cyanide measuring equipment was also discussed and the Slovak expert presented the description of such an equipment. The Hungarian suppliers received an Australian offer, as well, however, much more expensive (40 000 USD) than the Slovak one. No decision was made to install later this apparatus to the stations.

DANUBE EMERGENCY RESPONSE
AGENDA FOR TRAINING WORKSHOP

Final program

TIME	ITEM	SPEAKER
March 21		
9^{30}-9^{45}	1. INTRODUCTION	Mr.Csaba Kupas, US Ambassy
	• KEYNOTE SPEAKERS	Mr. Gyula Dankó, representing the Ministry of Environment
	• OBJECTIVES OF WORKSHOP	Mr.Brian Harrington, Metcalf&Eddy Inc.
9^{45}-10^{30}	2. OVERVIEW OF TRANSBOUNDARY POLLUTION PREVENTION	
	• OBJECTIVES	Mr. Gyula Dankó, Director, Miskolc Inspectorate
	• BILATERAL AGREEMENTS	Ms.Rozália Kisgyörgy on behalf of Mr. László Balázs, Ministry of Environment
	• ROLE OF ICPDR IN THE DANUBE BASIN	Mr. Igor Liska – Water Management Quality ICPDR
	• THE DANUBE ACCIDENT EMERGENCY WARNING SYSTEM	Mr. György Pinter, AEPWS Expert Group
	• EXAMPLES OF EMERGENCIES ELSEWHERE	
	- Szamos and Tisza River Poisoning	Ms. Kornélia G. Kocsis, Deputy Director Nyiregyháza, Inspectorate
	- Zala River Stations in Hungary	Mr. Miklós Berzsenyi, Director, Controlsoft
	- Uh Station in Slovakia	Mr. Svetozar Luther, Mr. Juraj Kaprinay, WRI, Slovakia
10^{30}-10^{45}	*Coffee Break*	

10^{45}-11^{30}	3. HOW THE SYSTEM IS INTENDED TO WORK • INTERNATIONAL NOTIFICATION & COOPERATION • LOCAL RESPONSE • HYDROLOGICAL DATA TRANSFER AND STORAGE	Mr. Aurel Varduca, AEPWS Expert Group Mr. Septimius Mara, PIAC Expert, Romania Mr. Ferenc Papp, Chief Engineer, VIZINTER Mr. Péter Bartha, Deputy Director, VITUKI Plc.
11^{30}-12^{00}	*Discussion*	
12^{15}-13^{45}	*Lunch*	
14^{00}-14^{45}	4. SAMPLING & MONITORING STATIONS • WHERE THEY ARE • WHAT THEY DO	Mr. Pál Benedek, Mr. Szilárd Kovács, Mr. Christian Moldaenke (Germany), Designers and Suppliers
14^{45}-15^{30}	5. WHEN AN EMERGENCY OCCURS • NATIONAL LAWS & REGULATIONS - Methods of Response - Categories of Emergency • LOCAL LEVEL - Contain/Abate/Remediate - Community/Downstream User Awareness so They Can Take Protective Action	Mr. József Horváth chief counselor, Ministry of Environment Mr. Tamás Felbermann, Deputy Director, Miskolc, Water Directorate
15^{30}-16^{00}	*Coffee Break*	
16^{00}-17^{00}	*Discussion*	
18^{30}-19^{30}	*Buffet - reception*	

March 22		
	6. BUS TRIP TO HERNÁDSZURDOK MONITORING STATION	
8^{30}	Bus starts from Miskolc	
9^{30}	Arrival at Hernádszurkok	
9^{45}-10^{45}	Presentation of technical details	Mr. Miklós Berzsenyi, Mr. Szilárd Kovács, Mr. István Kurek, Contractors for Building and Installation
10^{45}-11^{15}	Questions and Discussion	
11^{15}-12^{15}	Return to Miskolc	
12^{30}-13^{45}	Lunch	
14^{00}-15^{00}	7. LOCAL EMERGENCY RESPONSE PLANS	Ms. Annamária Konecsny, Nyíregyháza Ms. Tímea Porkoláb, Debrecen Ms. Ferencné Vasas, Gyula Mr. Endre Fekete, Szeged
	• LIKELY SOURCES & TYPES OF POLLUTION • STATION LOCATIONS & INFORMATION • ENDANGERED USERS – WHO ARE THEY?	
15^{00}-15^{15}	*Coffee Break*	
15^{15}-15^{45}	Continuation of item 7 • IDENTIFYING THE EMERGENCY • RESPONSE TO CONTAIN/ABATE • REPORTING	
15^{45}-16^{15}	8. NEXT STEPS	Representatives of the Ministry of Environment and the Inspectorates
16^{15}-16^{30}	9/ CONCLUDING REMARKS	Mr. Brian Harrington, Metcalf&Eddy Inc.