



**“NETWORK OF DANUBE WATERWAY ADMINISTRATIONS”**  
South-East European Transnational Cooperation Programme

## STATUS QUO REPORT ON WATERWAY MAINTENANCE

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## 1 LIST OF ABBREVIATIONS

ABBR.	Abbreviation
SVP	Slovak water management enterprise
SHMU	Slovak Hydro meteorological Institute
rkm	River kilometre
fkm	Flow kilometre
GPS	Global Positioning System
ADCP	Acoustic Doppler Current Profiler

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## 2 SCOPE OF DOCUMENT

Text

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## 3 INTRODUCTION

### 3.1. Responsibility for waterway administration, Institutions – manage the navigations conditions

The administration of the waterway and all activities related to navigation are defined by „Inland navigation law“ in Slovak republic. For administration of the waterway is responsible SVP š.p., OZ Bratislava and administrator is at the same time (by Slovak law) also waterway operator. He is responsible for maintenance of the waterway, for improving of navigation condition. He is responsible for right signalization of the waterway according to direction of State Navigation Administration. State Navigation Administration has a function of state inspection in administration and maintenance of waterways and harbours, checks operation of ships on waterway and in harbour, checks observation of safety rules for inland navigation..... For navigation are responsible two ministries in Slovak republic (Ministry of transport, post and telecommunication and Ministry of environment).

## 4 CHARACTERISTIC OF WATERWAY

### 4.1. River stretch characterization

Across Slovakia flows 172 km long section of the Danube River (rkm 1880,2 - 1708,2).

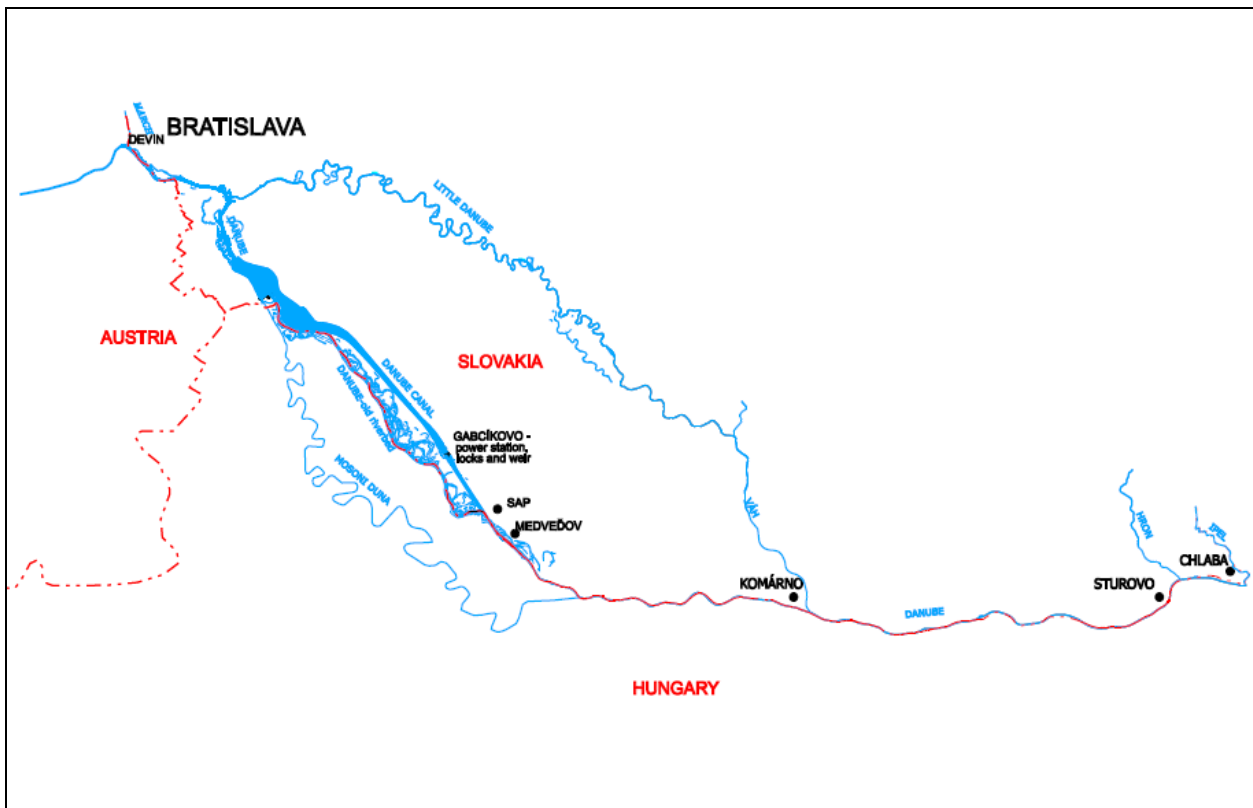
It is 7.5 km section of the border with Austria (rkm 1880,2 – 1872,7), 142 km section of the border with Hungary (1850,2 – 1708,2) and the remaining 22.5 km (1872,7 – 1850,2) is the national section. Waterway section flows from 1880,2 – 1851,15 is defined like natural flow with reinforced river bank.

In rkm 1851,15 is located hydraulic structure Čunovo. This facility, among other things, also provides the distribution of the Danube flows into two parts, part of the flow rating is put into the original riverbed of the Danube and second part flows into the reservoir Hrušov, and then into the 38,75 km long artificially channelled river. On this canal is located in 8,15 rkm hydraulic structure Gabčíkovo. The artificial channel with reservoir Hrušov and two objects (Gabčíkovo and Čunovo) called Gabčíkovo Hydro engineering Structure (VD Gabčíkovo) - are artificially engineered.

In 1811,00 rkm of the Danube, the channel associated with the original riverbed of the Danube into the one flow up to rkm 1708.2. Whole Slovak section of The Danube is navigable.

To pass vessels through objects Čunovo and Gabčíkovo provides locks. Lock Čunovo is length 130.70 m (55.70 m) and 24 m width, lock Gabčíkovo is length 275 m and 34 m width.

Fig.1: General map of Slovak section of the Danube



## 4.2. Waterway parameters

The parameters of the waterway are defined in "Project of fairway". The current version of the project was processed on morphological monitoring department in 2007 for the whole section of the Danube River from rkm 1880,2 – 1708,2. Border sections were submitted and subsequently approved in Border Commissions. The project includes axis of the fairway, right and left edge of the fairway, extension places of fairway, kilometres and hectometres, designed curvature (radius and length of the direct sections).

The proposed width of the fairway is 120 m and depth 2.5 m + 20 cm on section km1880,2 -1791 and on section km 1791 -1708,2 is depth 2.8 + 20 cm.

## 5 WATERWAY MAINTENANCE

### 5.1. Main activities for waterway maintenance – hydrology, survey, signalization

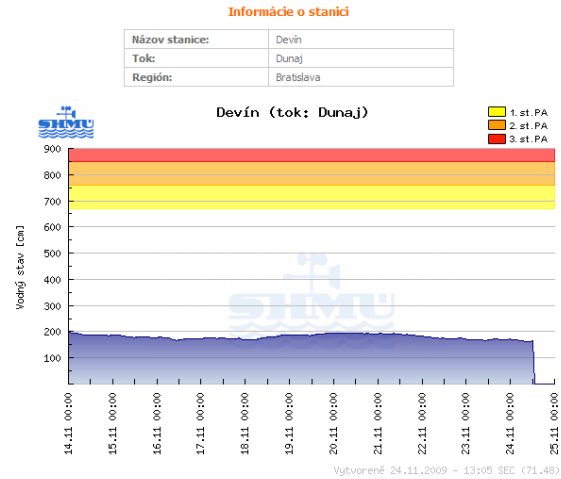
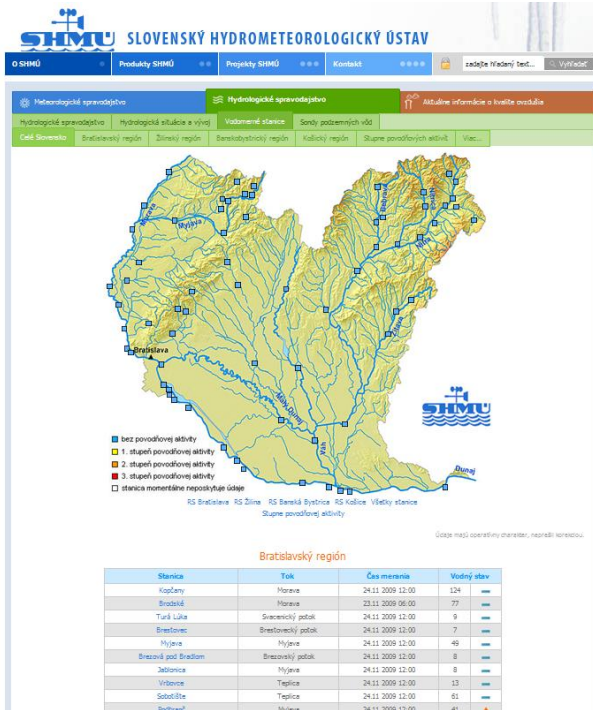
#### 5.1.1. Hydrology

Slovak Hydro meteorological Institute (SHMU) is officially responsible for monitoring of the hydrological situation and for the issue of hydrological forecasts and warnings in Slovak Republic. Processed daily data from 79 stations in Slovakia, of which 7 is on the Danube - Devin, Bratislava, Rusovce, Gabčíkovo, Medvedov, Komarno, Sturovo. The data include morning and evening water conditions, daily differences, discharge, m-daily if necessary. n-year flow, ice phenomena, rainfall, weather, water temperature and air temperature.

It also predicts the trend of hydrological situation on the Slovak flows, concerning the Danube it is 5 stations - Devin, Bratislava, Medvedov, Komarno, Sturovo.

Every day they are doing daily forecasts. Information can be obtained from the web site SHMU ([www.shmu.sk](http://www.shmu.sk)). The information is freely available. They also provide daily actual hydrologic information from whole Slovakia and neighbouring countries all year, assessing the hydrological situation in river basins all Slovakia, forecast water levels and flow rates, the expected evolution of the hydrological situation in the flow of Slovakia. Irregularly or seasonally are provided reports of snow on the territory of Slovakia and water supplies in the snow coverage, temperature of water in the tanks, the information for water tourism and fishing and special information in case of an emergency (during elevated water levels).

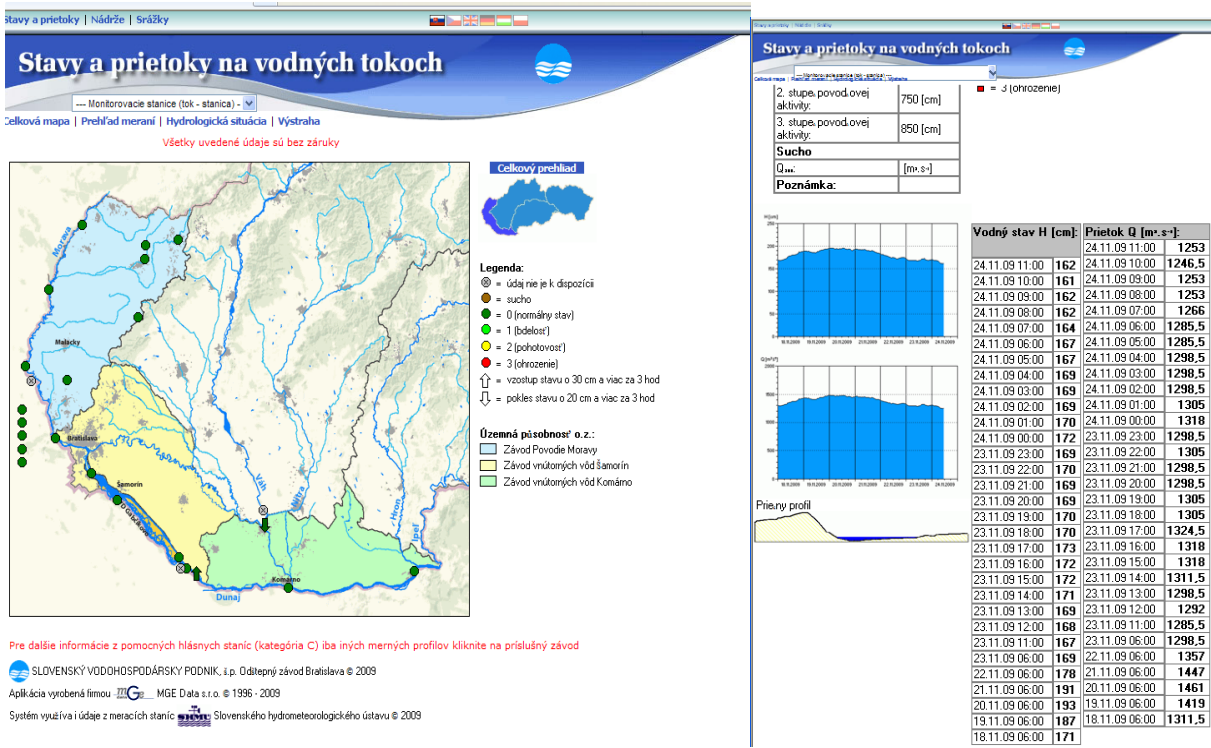
It also provides information about water conditions from 14 water gauges on the Danube - Devin, Bratislava, Cunovo, Rusovce, Hamuliakovo, Dobrohost, Gabčíkovo, Sap, Medvedov, Zlatna na Ostrove, Komarno, Iza, Radvan nad Dunajom, Sturovo. This data is updated hourly. It is also possible to obtain detailed information on individual stations with a history of measurements over the past 24 hours. The data are presented in tabular and in graphical form.



Údaje majú operatívny charakter, neprešli korekciou. Čas je udávaný v LSEČ

Čas merania	Vodný stav [cm]	Teplota vody [°C]
24.11.2009 13:00	165	8.1
24.11.2009 12:00	164	8.0
24.11.2009 11:00	162	7.8
24.11.2009 10:00	161	7.8
24.11.2009 09:00	162	7.8
24.11.2009 08:00	162	7.8
24.11.2009 07:00	164	7.8
24.11.2009 06:00	167	7.8
24.11.2009 05:00	167	7.8

It also provides the SVP website [www.povodia.sk](http://www.povodia.sk) hydrological data of 8 stream gauging station. There are data take over from SHMU web site, but also data from own stream gauging stations. The page looks like the page SHMU - general map of the territory and marked position of water gauges, with possibility of a detailed view of individual stations data - tabulation and graphical history of water levels, but also derived discharge for each water level and cross-section profile. There are also data about water levels important for statement of flood activity. Web side contain also data from selected stations in the German and Austrian Danube section. The page is updated several times a day and is also freely accessible. The data are updated continuously by dispatching of SVP š.p., OZ Bratislava.



### 5.1.2. Survey

For monitoring of the Danube waterway is on OZ Bratislava responsible department of morphological monitoring. Monitoring of the Danube can be divided into monitoring of the riverbed morphology and discharge and current measurement.

#### Monitoring of the riverbed

To monitor the Danube riverbed we use technology of echo – sounding of the river bottom in combination with the determination of position using GPS instruments. We use "single beam Sounding System, which provides data of sufficient density and accuracy for our needs. Measurements are performed in transverse profile with the necessary density, measured data are reduced to reference level and through 3D models are created water depth isolines.

## Measuring equipment and measurement methods

### 1992 - 2007:

- Vessel: Nordica Nimbus 29 C (2 x Volvo Penta), Quicksilver 380
- Echo sounder: Atlas Deso 22 (210 kHz )
- Position sounding : motorized TS + polar track

### 2001 - 2006:

- Vessel: Nordica Nimbus 29 C (2 x Volvo Penta), Quicksilver 380
- Echo sounder: Atlas Deso 22 (210 kHz ), Atlas Deso 15 200 kHz
- Position sounding: GPS Trimble Pathfinder
- System: Navisound 100 PC

### Since 2007:

- New vessel - Targa 25.1 (Volvo Penta 6V 330ph)
- Quicksilver 380 HD (Mercury 15)
- Echo sounder: Kongsberg EA 400 200 kHz + 200 kHz  
Kongsberg EA 400 200kHz + 38 kHz
- Transducer: Kongsberg Combi D 38/200kHz  
Kongsberg 200 7F, 200 kHz
- GPS: 3xTrimble 4000 ssi  
Trimble R8 GNSS  
2 xTrimble Trintalk 450s  
Trible DSM 232
- Software: Kongsberg EA400, Profile 2000, SSM  
Trimble GeomaticOffice  
Microstation V8 XM, InRoads

Fig.2: vessel Targa 25.1



Fig.3: vessel Quicksilver 380 HD



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Fig.4: measuring system for sounding (base, echo sounder, transducer, GPS Trimble)



For monitoring of the Danube we are making use the vessel Targa, for meassuring of the shallow waters we use rubber boat. Both vessels are equipped with GPS Trimble R8 GNSS, which operates under the RTK (real time kinematic). If the GPRS service is available, we use a network of reference stations SKPOS provided Geodetic and Cartographic Institute. If not, we use own reference station "Base station" Trimble 4000ssi. We use technology PDGPS.

For meassuring of water depth we use echo-sounder Kongsberg - Simrad EA400 with appropriate software combined with Konsberg Combi D transducer 38/200kHz or Konsberg 200 7F, 200 kHz.

#### Frequency of monitoring

We are doing monitoring of the Danube in different intervals. Border zones are monitored by engagement of the border commision's working groups. Joint section of the Danube with Hungarian Republic (1708,2 – 1811,0) are monitored every two years. These section is divided into two parts 1708.2 - 1749.00 rkm and 1749.00 – 1811,00 rkm. Monitoring of these sections is exchange every two years. The section of the „original riverbed” of the Danube is monitored by mutual agreement of both countries. Measurements have two countries exchange in WGS-84 coordinate system, format .txt and then evaluate them. Density of measured profiles is 50m. There is a

problem with Hungary, we haven't measured identical profiles and then we are not able to compare changes in the riverbed in individual profiles.

Common section with Austria we monitor once a year (rkm 1880.2 - 1872.7), data are evaluated and treated on the department of morphological monitoring, and Austria receives only a paper version. Density of measured profiles is 50m.

Nacional section is monitored once a year, and evaluate process is done on morfological monitoring department, and serves for internal use. Density of measured profiles is 50m.

VD Gabčíkovo (reservoir Hrušov, artificial canal) is monitored every 2 - 3 year (where necessary). Density of measured profiles is 100m.

In addition to periodic monitoring of the Danube riverbed we perform sounding on the purpose of dredging - dredging site is monitored during dredging and after dredging is finished.

We also carry out a more detailed sounding of the Danube riverbed for the purposes of drawing up projects, civil engineering, if the results of periodic soundings are not sufficient for completion of studies and project documentation.

Applied technology and measuring equipment is possible to achieve very accurate results (a few cm) but the movement of ships and the conditions during the measurement accuracy degrades

#### Data processing

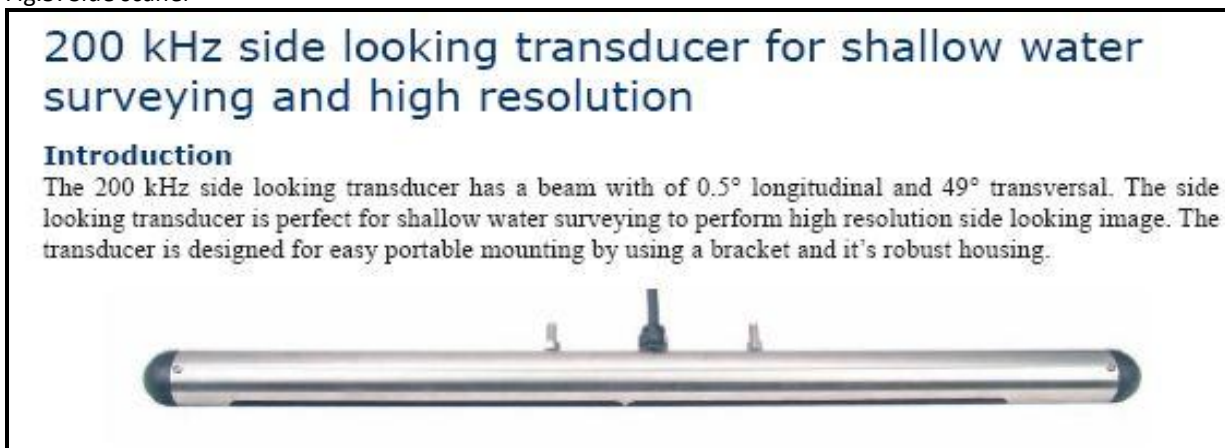
Processing and utilization of measured data is as follows. Measured points of the riverbed in WGS84 are transformed into national coordinate system S-JTSK ( x, y, z). Data are loaded into MSInroads and then we create DTM of the riverbad and DTM of „regulation low water level“. By intersection of these models are generate isolines reduced to HNRV (regulation low water level). The result of the processing and evaluation of data is izoline plan of measured section of the Danube. Plan contains the measured points in each river bed profile reduced to HNRV (regulation low water level) and isolines.

Then the processed results of sounding were subsequently loaded into the ORACLE database through GeoMedia software, and serve as a basis for creating other mapping products needed for the maintenance of fairway or for navigation. Based on this data we are working – out „Project for dredging of the Danube“, "Electronic navigation map" and "Project of signalization fairway."

### Side scanner as an additional monitoring

In 2009 we purchased the side scanner for purpose of to search wrecks and other obstacles in the fairway. Outputs of the side scanner will serve to further complement the monitoring of critical sections of the waterway. Currently, this device is in the testing phase, we tested it yet on the measurement of port pool in Bratislava and Komarno ship yard. Side scanner is with special bracket attached to the vessel Targa 25.1, during the measuring are data monitored and subsequently processed by software SSM (Software for Sidescan Mosaiking)

Fig.5: Side scanner



### *Discharge and current measurement*

Measurement speed and flow rate on the Danube is officially in filled SHMI. The project tasks and studies we are obliged to do on base of data SHMI, but sometime we need measurements in profiles where not data (there are not water gauges) are. In this case we use own measuring system ADCP (Acoustic Doppler Current Profiler). The ADCP measures water currents with sound, using a principle of sound waves called the Doppler Effect. ADCP measuring system was purchased in 2009, it is still in test phase, and has been used for specific project tasks (for hydrodynamic model) in the VD Gabcikovo and arm system.

Fig. 6: ADCP measuring system



### 5.1.3. Bottlenecks

There are few difficult points on Slovak section of the Danube as mentioned in the documents of the Danube Commission:

Slovak – Austrian border section :

Devín	1879,5 - 1879,2	ford
Käsmacher	1875,7 - 1875,0	ford

National section:

Lanfranconi	1871,2 - 1870,9	ford
Starý most	1868,2 - 1868,0	bridge (narrow)

Slovak – Hungarian border section:

Medveďov, Medve	1807,0 - 1805,8	ford
Nagybajcs	1803,2 - 1802,5	ford
Čičov, Vének	1800,6 - 1794,1	ford
Klížska Nemá, Gönyü	1792,1 - 1791,8	ford
Čenkov, Nyergesújfalu	1735,3 - 1732,2	rocky threshold
Kováčov	1714,5 - 1713,9	rocky threshold
Chľaba	1711,2 - 1710,9	rocky threshold

These places are of different nature. Either they are classic fords, created by gravelly coating, bottlenecks (e.g. Old Bridge) or rocky thresholds. The most critical sections of the Danube are annually dredged within the meaning of "Dredging project of the Danube", which is usually approved at the meeting of the Working Group Slovakia – Hungary or Slovak - Austria Border Commission. The project is created on base of 3D model of the Danube riverbed at low water level. Model is made by software Bentley Inroads. We don't need any special studies for this purpose. By reason of the waterway maintenance, Slovakia annually makes regulatory dredging on national section of the Danube about 50 000 m<sup>3</sup>, Slovakia - Hungarian Danube section 60 000 m<sup>3</sup> - 80 000 m<sup>3</sup> and the Slovakia - Austria section about 30 000 m<sup>3</sup> (if necessary, we also dredge ford in section 1879, 5 - 1879,2). For dredging we use chain – bucket dredger (elevator dredger). Excavated material is transported by motor pontoon barge (MEP) to the shore and landed by floating bucket elevators. Fords, there are rock thresholds in the field, are not dredged.

Fig7.: Transport of excavated material by motor pontoon barge



One of the most critical points of Slovak stretch of the Danube is „Old Bridge” – Bratislava fkm 1868, 2. The navigation under the bridge is difficult, because the vertical clearance and width of the fairway is not convenient to current parameters of fairway. The range of the pillars is 86 m downstream and 67m upstream, vertical clearance is 7, 5 m. Today is beginning the reconstruction of the Old Bridge. The goal of reconstruction is, among other things, improvement of navigation conditions under the bridge. After reconstruction the bridge pillars will be at a distance from each other 150m Bridge deck will be approximately 1, 4 meter needs to pick up, this will ensure navigation under the bridge at the time of elevated level of the Danube.

Fig. 8: Bratislava - the „Old Bridge”



#### **5.1.4. Signalization**

For marking of the waterway we use coast signals – fixed signal on the river bank somewhere on conspicuous place, and buoys – fixed or temporary.

Fairway is marked with boys with radar reflector. Red is marking the right edge of fairway, green left edge of fairway. The dangerous sections of fairway are marking with floating lighthouses – buoys with light. Fairway is marked in the profiles of the bridges by lights signals. All navigation signals are control minimum 1 per week.

Signalization of fairway is done by the “Project of fairway signalization”. The first step is to design of fairway on base of actual measuring of the Danube river bed. Then we have to change position of boys and coastal signals by designed course of the fairway, if it’s necessary. The final version of the project is submitted to the State Navigation Administration to approve the project.

Signalization is done by vessel equipped with small crane for this purpose. Our company has two marking vessel. One control section of the Danube from the Gabčíkovo downstream to Ipeľ (fkm 1820 – 1708) and the other cares about stretch Gabčíkovo upstream to Devín (fkm 1880 – 1820). In case of some difficulty, we try to repair it immediately. Damaged or lost buoys are exchanged for new ones. We also repair or replace damaged coastal signals. In case of no functionality of light signalling on bridges, they have to inform our Marking centre witch ensure the repairing of lights.

Fig 9: Vessel “Čajka” for signalization of fairway



Anchors are made in our own workrooms. Buoys are made from sheet steel thickness - 1, 25 mm and length 190 or 120 cm. Radar reflector is high 80 cm. Anchors are manufactured from sheet steel thickness - 50 mm, are hinged and weighing about 60 kg. Buoys are connected with anchor by rope 30 m long.

## 5.2. Report for river engineering constructions and execution

River engineering constructions in 1708 – 1850, 20 (Slovak – Hungarian section):

rkm	river bank(left / right	type of the construction
1717,40 – 1718,90	LB	reinforced bank
1719,00 – 1719,70	LB	reinforced bank
1724,20 – 1724,45	LB	reinforced bank
1733,80 – 1734,80	LB	regulation structure
1735,60 – 1736,30	LB	reinforced bank
1736,80 – 1737,70	LB	reinforced bank
1738,50 – 1741,00	LB	reinforced bank
1743,20 – 1744,90	LB	regulation structure
1744,00	LB	groyne
1744,20 – 1746,60	LB	reinforced bank
1752,00 – 1753,20	LB	reinforced bank
1756,80 – 1764,00	LB	reinforced bank
1766,00 – 1767,80	LB	reinforced bank
1767,10	LB	Port Komarno
1768,50 – 1771,30	LB	reinforced bank
1777,30 – 1780,40	LB	reinforced bank
1782,40 – 1793,20	LB	reinforced bank
1785,85	LB	groyne
1789,77	LB	groyne
1790,20	LB	groyne
1790,68	LB	groyne
1790,98	LB	groyne
1791,175	LB	groyne
1791,35	LB	groyne
1791,52	LB	groyne

1791,76	LB	groyne
1794,84	LB	groyne
1794,90 – 1799,10	LB	reinforced bank
1799,20 – 1800,00	LB	reinforced bank
1795,125	LB	groyne
1795,295	LB	groyne
1798,94	LB	groyne
1799,25	LB	groyne
1799,70	LB	groyne
1799,99	LB	groyne
1800,67	LB	groyne
1801,06	LB	groyne
1801,275	LB	groyne
1801,30 – 1811,00	LB	reinforced bank
1801,494	LB	groyne
1801,70	LB	groyne
1803,315	LB	groyne
1803,49	LB	groyne
1803,65	LB	groyne
1804,25	LB	groyne
1804,605	LB	groyne
1804,80	LB	groyne
1804,965	LB	groyne
1805,16	LB	groyne
1805,36	LB	groyne
1805,79	LB	groyne
1806,00	LB	groyne
1807,662	LB	groyne
1807,95	LB	groyne
1808,35	LB	groyne
1808,85	LB	groyne
1809,15	LB	groyne
1809,30	LB	groyne

1813,75	LB	groyne
1813,95	LB	groyne
1813,75 – 1821,70	LB	reinforced bank
1817,05	LB	groyne
1817,25	LB	groyne
1817,45	LB	groyne
1822,90	LB	groyne
1822,85 – 1847,30	LB	reinforced bank
1848,50 – 1850,40	LB	reinforced bank
1825,60	LB	regulation structure
1826,95	LB	groyne
1827,10	LB	groyne
1827,30	LB	groyne
1829,75	LB	groyne
1829,95	LB	groyne
1830,15	LB	groyne
1833,20	LB	groyne
1833,35	LB	groyne
1833,50	LB	groyne
1833,70	LB	groyne
1837,00	LB	groyne
1837,15	LB	groyne
1837,50	LB	groyne
1837,65	LB	groyne
1837,80	LB	groyne
1839,75	LB	groyne
1839,90	LB	groyne
1840,00	LB	groyne
1840,15	LB	groyne
1840,30	LB	groyne
1843,00	LB	bottom treshold
1843,50	LB	groyne
1843,70	LB	groyne

1843,90	LB	groyne
1845,50	LB	groyne
1845,70	LB	groyne
1845,90	LB	groyne
1846,00	LB	groyne
1846,10	LB	groyne
1846,30	LB	groyne
1846,45	LB	groyne
1846,70	LB	groyne
1846,90	LB	groyne
1847,00	LB	groyne

River engineering constructions in 1850,2 – 1872,7 (national section):

1850,30 -1850,50	LB	reinforced bank
1851,15		hydraulic structure Čunovo
1853,00 - 1857,40	LB	Regulation structure
1855,60 – 1864,80	RB	reinforced bank
1858,30 – 1872,80	LB	reinforced bank
1862,20	LB	groyne
1862,40	LB	groyne
1863,30	LB	groyne
1863,50	LB	groyne
1864,30	RB	groyne
1864,50	RB	groyne
1864,80 – 1866,20	LB	Port Bratislava
1866,60	RB	groyne
1866,70	RB	groyne
1866,80	RB	groyne
1866,40 – 1872,80	RB	reinforced bank
1867,90	RB	groyne
1868,05	RB	groyne
1868,50	RB	groyne
1869,60	LB	groyne

1869,80	LB	groyne
1870,10	LB	groyne
1870,25	LB	groyne
1870,45	LB	groyne
1870,65	LB	groyne
1870,80	LB	groyne
1870,95	LB	groyne
1871,05	LB	groyne
1872,45	RB	groyne
1872,65	RB	groyne

River engineering constructions in 1872, 7– 1880,20 (Slovak - Austrian section):

1875,00 – 1880,20	LB	reinforced bank
1875,15	LB	groyne
1875,25	LB	groyne
1878,75	LB	groyne
1878,85	LB	groyne
1879,00	LB	groyne
1879,15	LB	groyne
1879,30	LB	groyne

In 1853, 00 fkm down stream begins 38,75 km long artificially channelled river (km 1853,00 equals with 38,75 km of canal). In 8,15 rkm is located hydraulic structure Gabčíkovo on this canal. The artificial channel with reservoir Hrušov and two objects (Gabčíkovo and Čunovo) called Gabčíkovo Hydro engineering Structure (VD Gabčíkovo) - is artificially engineered.

### 5.3. Common sector, waterway maintenance

Common stretch of the Danube with Austria is 7.5 kilometers long (rkm 1880.2 - 1872.7) and the joint section with Hungary is 142 km (1850.2 - 1708.2). Cooperation on maintenance of these sections of the waterway is via Border Commissions. These committees discuss about signalization and marking out of the fairway, dredging works,

removing of barriers in fairway, repairing of river bank fortification eventually about building construction for improving navigation conditions, sounding work, creation of joint mapping and database documentation....

For signalization of fairway (buoys) is Hungarian border section of the Danube divided into two parts km 1810 – 1791 and km 1791 - 1708. Every two years these sections are exchanged, but the operation and maintenance of coastal signs are carried by each country on its territory. Surveying vessels of both countries personally informed each other about the problems encountered in the common section of the Danube. At this time marks Slovakia km 1791 - 1708. The marking of the fairway we makes by the „Project for signalization fairway”, which is processed in a two-year intervals, then the country turns its processing.

Dredging works are done by „Project for dredging of the Danube”, which is worked out every two years. Project determines locations of dredging, which the countries agreed, and then they separate locations of dredging for Hungary and Slovak.

For these purposes we must to do measurement on the Danube, soundings are negotiated every two years and serves as the basis for the said projects. Data are changing in coordinate system WGS84, format .txt. It must be done after dredging control measurements too.

Some arrangements in the riverbed, or repairing of fortifications of the riverbank made by countries, must be submitted and approved in the Border Commission. For monitoring performance are made at review meetings and field trips by ship.

Similar cooperation is with Austrian college too. There is an engagement with Austrian college about annual measuring of this section of Danube.

#### **5.4. Waterway maintenance in the ice period**

Winter marking of fairway takes place when water temperature falls below 2 ° C or arm system is frozen. State Navigation Administration issues notices to measure winter marking of Danube fairway. When begins a winter mode, the lighthouses are exchanged to boys with radar reflector and temporary buoys are takeoff. List of winter marking is shown in the “Project of fairway signalization”. In case of more than 10% ice, all floating buoys are withdrawn. Checking of the waterway and its signs is done at least once per week at the time of ice period. In the event of circumstances requiring the intervention is made operational decision. In the case of freezes on adjacent section of the waterway the navigation is stopped. To stop the navigation must be issued by the State Navigation Administration the special decree prohibiting navigation.

### **5.5. Waterway maintenance in the lowest level period**

At a time when the water level in the Danube is declining, the marking of fairway must be adapted to change the width of fairway. We have to move buoys. There is not any spatial project for these changes of marking the fairway at the time of lowest level period.

If the water level falls below of the low water level, navigation is stopped. To stop the navigation must be issued by the State Navigation Administration the special decree prohibiting navigation.

### **5.6. Waterway maintenance in the highest level period**

Before the high-water is coming, we have to remove the boys from water to the shore, so that we avoid big losses. If the voyage is not stopped, marking of fairway is as usually. If the water level reaches the high water level, navigation is stopped. The navigation is stopped by State navigation administration.

### **5.7. Report about the prevention and restoration of flood damages**

We are informed by our dispatching about running of water level several times during the day at the time of flood. Water level and flow rates are monitored daily, regardless of level. At the time of flood is usually voyage stopped by the State Navigation Administration. After the flooding, we need to evaluate and document flood damages, we check marking of fairway, all damaged and lost buoys and navigational signs are replaced with new ones. Course of flooding is described in a summary report on flood. The report contain description of hydrological situation, flood levels, observed flood events, description of measures, assessment of flood damages and draft technical and organizational measures. After flooding, flood damages are calculated. The problem is the reimbursement of damages, because flood damages are unrecovered by the "State" for years.

If flooding is severe and extensive, we monitor changes over the previous state of the riverbed. We make the measurement of river bed and through the DTM is compared the focus after the flood with the previous focus of the Danube riverbed.

## 5.8. Planning for lock maintenance and repairing

The owner of Gabčíkovo Hydro engineering Structure and Čunovo Hydro engineering Structure and locks too is Vodohospodárska výstavba š.p. (also is the official operator), but SVP š.p. OZ Bratislava is delegate by Vodohospodárska výstavba š.p. for operating of locks. It is based on agreement. We are administrator of the Danube River, so we also provide flood protection.

Maintenance of locks is making on several levels:

- Basic service – it is done by SVP š.p. OZ Bratislava - performed continuously
- Middle repairs and overhauling – It is covered by Vodohospodárska výstavba š.p. via outsourcing - scheduled for 2 to 4 year intervals
- Reconstructions – provides Vodohospodárska výstavba š.p., it is depends on durability of constructions and buildings - the structure and scope of repairs and reconstruction determined Vodohospodárska výstavba š.p. in close cooperation with SVP š.p., OZ Bratislava.

Communication with the relevant authorities is clearly given by the law.

If there is planned some maintenance on the lock, Vodohospodárska výstavba š.p. has to inform about intention of State Navigation Administration, and then they have issue special navigation rule or measure.