

Evolution of Drought Issue and Water Shortage within the Rakovník Region



**MGS 2018, Prague
18.10.2018**





Evolution of Drought Issue in the Region of Rakovník



Initial Pilot Project – Options for current climate change impacts mitigation through improvement of retention and accumulation capacity within the Rakovnícký Brook catchment area

- Executed during years 2009-2012
- Issued by National Agency for Agricultural Research
- In a framework of the research Program in Agrarian sector
- Project manager: Ing. Ladislav Kašpárek, CSc.

Climatic and Hydrological Conditions

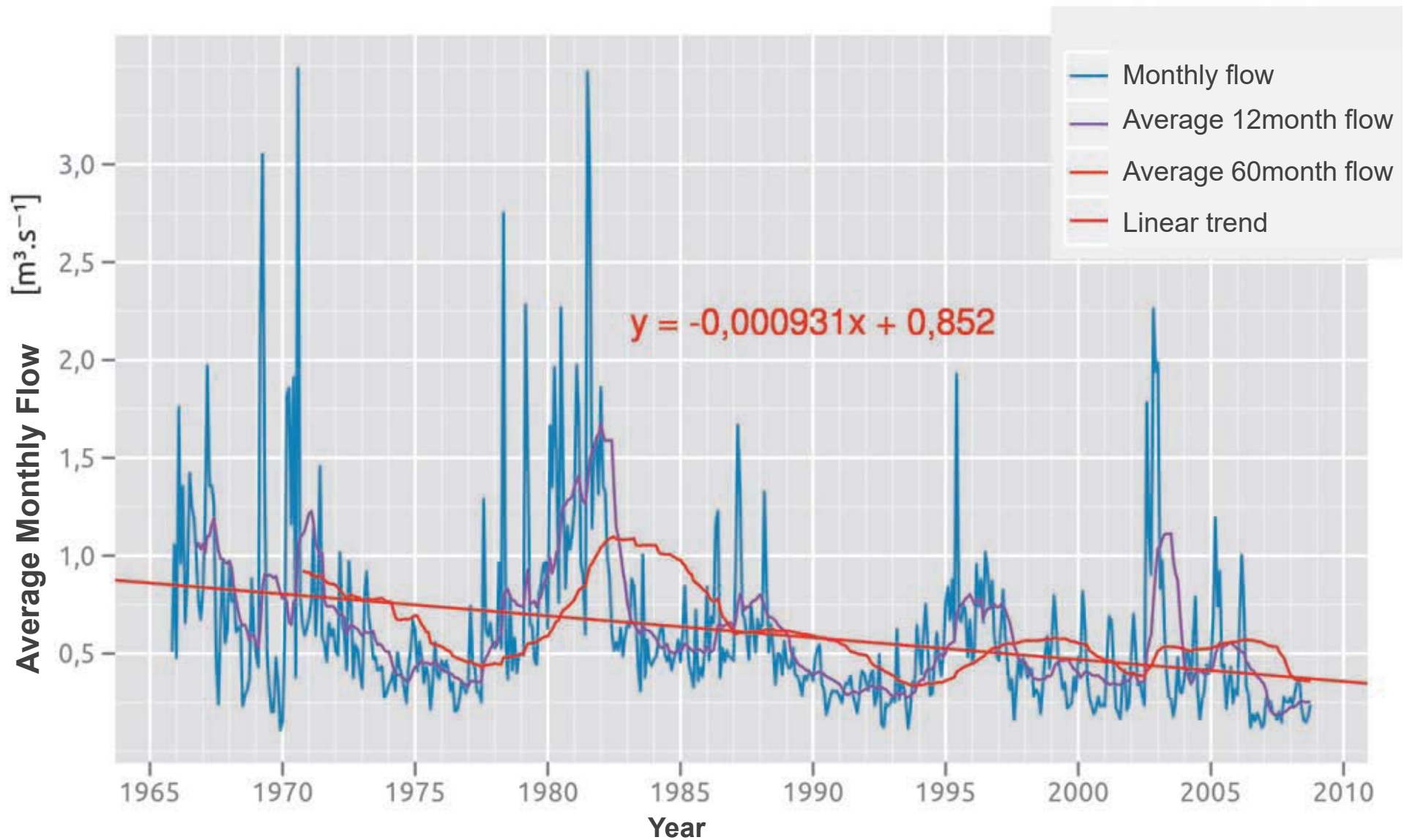
Climate:

- Long-term total annual precipitation 484 – 584 mm (the lowest precipitation value in the Czech Republic)
- Total annual precipitation has decreased slightly, but its distribution has changed – decrease of precipitation amount during the period of April-June
- High precipitation occurrence has decreased substantially within catchment area
- Air temperature has increased in the period 1960 – 2008 with 1,4° C

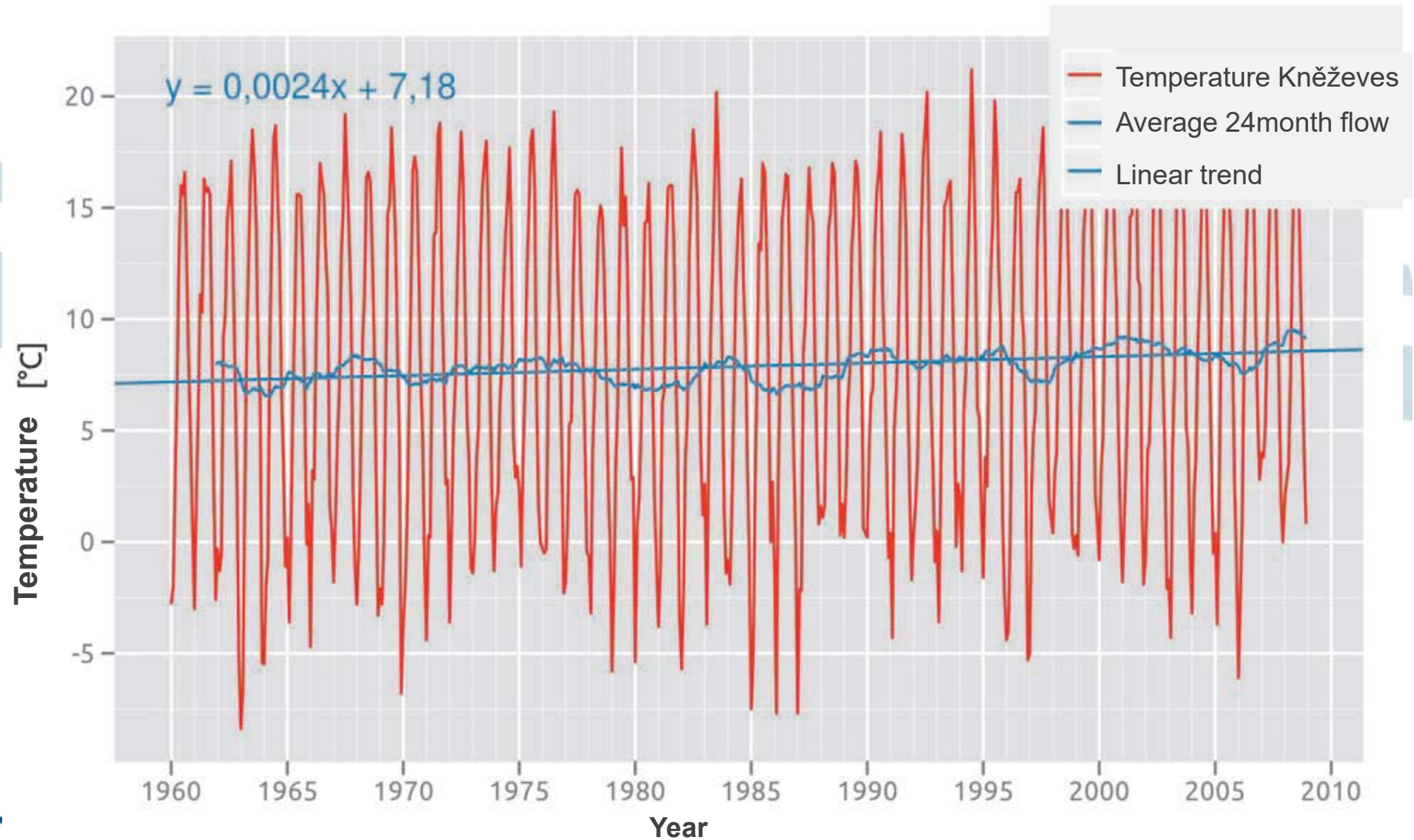
Hydrology:

- The analysis of reconstructed sequence of flow rates in Rakovník gauge since 1960 confirmed enormous decrease of flows
- Decrease in spring and summer is larger than in autumn, the least decreases are in winter
- Trend of decreasing groundwater level, during last 40 years / decrease is approx. 23% /

Time Sequences and Linear Trend of Average Monthly Flows in Rakovnický Brook



Time Sequences and Linear Trend of Average Monthly Temperatures in Kněževés Station



Evaluation of Climate Change Impact

- Long-term total annual precipitation have not decreased significantly
- Significant warming, especially after 1980, reduced frequency and amount of heavy rainfalls, spring precipitations reduction
 - » **decrease of flow rates by 30 - 60%, unequally throughout the year**
 - » **outflows from catchment areas sensitively follows ongoing increase of air temperatures**
- Decrease in total outflows is caused by decrease of the base flow (due to declining of groundwater recharge)
- Substantial part of the groundwater recharge takes place during February and March
- Reasons for decrease – not enough water recharge from snow cover, evaporation increase during January and February
 - » Soil is not completely saturated with water at the end of winter
 - » Precipitation is not infiltrated deeply to the ground but just supply soil water storage

Options for Adaptation Measures

- **Change in land use**
 - Small change of outflow from catchment area in practice
- **Water retention in small water reservoirs (SWR) and flow regime improvement in the river water bodies**
 - proposed 8 potentially suitable locations, flow improvement 190 l/s in total
 - reduction of 4 reservoirs – flow improvement in Rakovník 80 l/s
 - in case of temperature increase 2 ° C – flow improvement 50 l/s
- **Water transfer from Ohře/Eger River Basin**
 - from Nechanice dam
 - collaboration with Povodí Ohře
 - water transfer as well for Bišanka a Liboc river sub basins– feasibility study
 - not possible to be implemented gradually, higher operating costs

Feasibility Study of SWR Locations

Povodí Vltavy, State Enterprise proposed adaptation measures in Pilot project by set of specialized feasibility studies

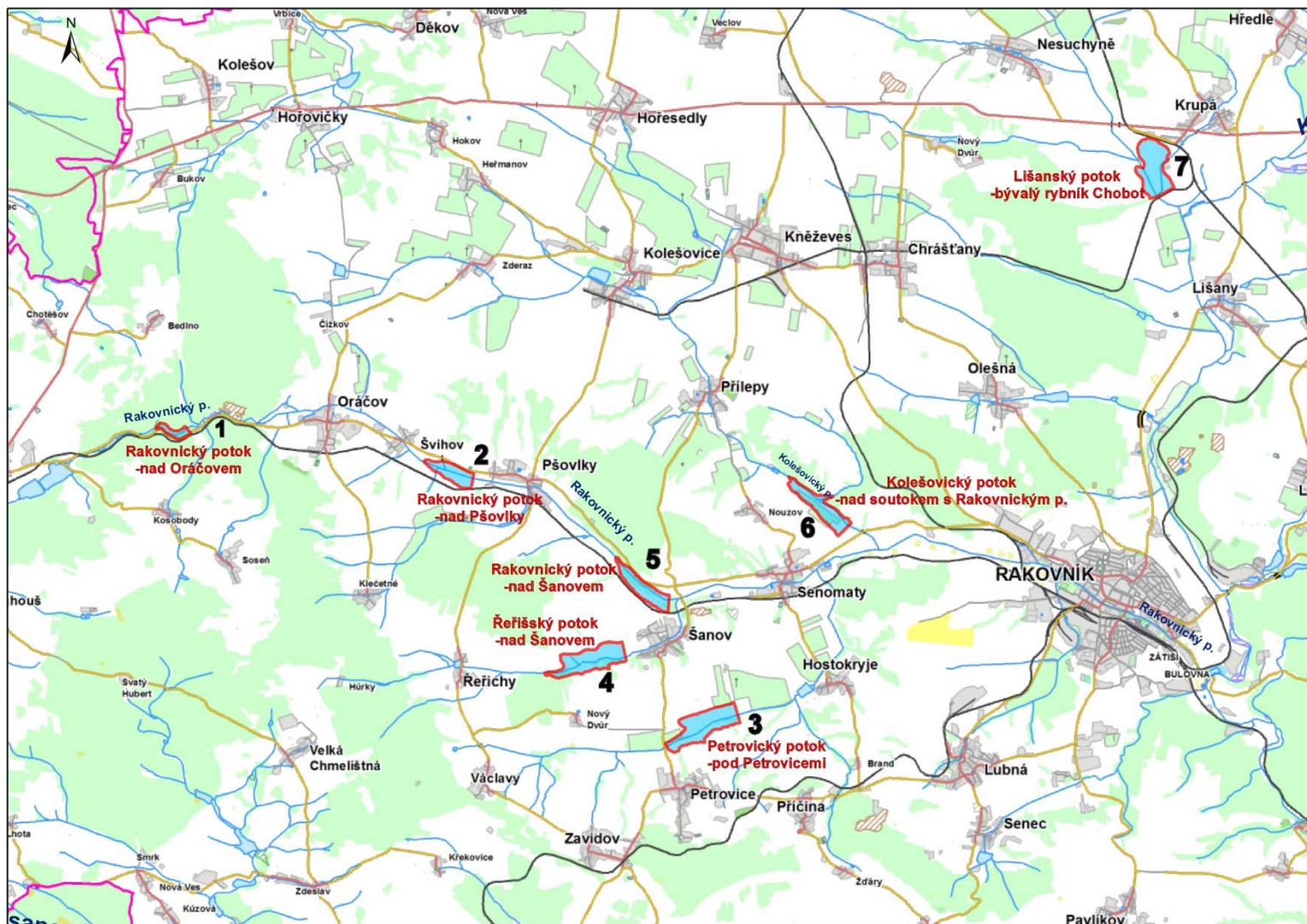
- **„Feasibility study of water reservoirs within catchment area of Rakovnický Brook“**

- Executed by: Vodohospodářský rozvoj a výstavba, a.s.
- Ing. Marek Holinka, Ing. Vendula Koterová, Ing. Robin Hála
- Executed during years 2013 – 2014, in two stages

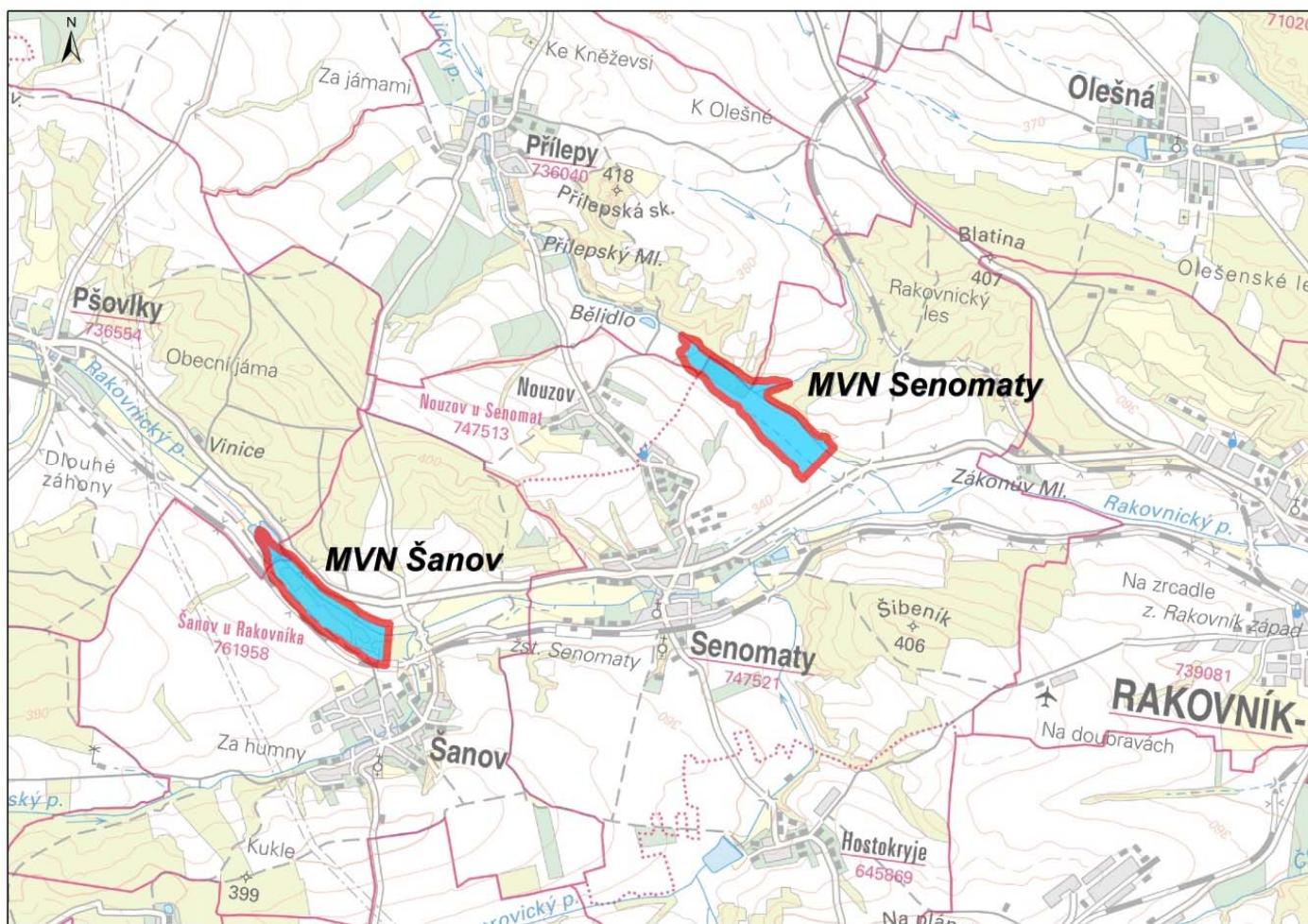
- **In the frame of the study was**

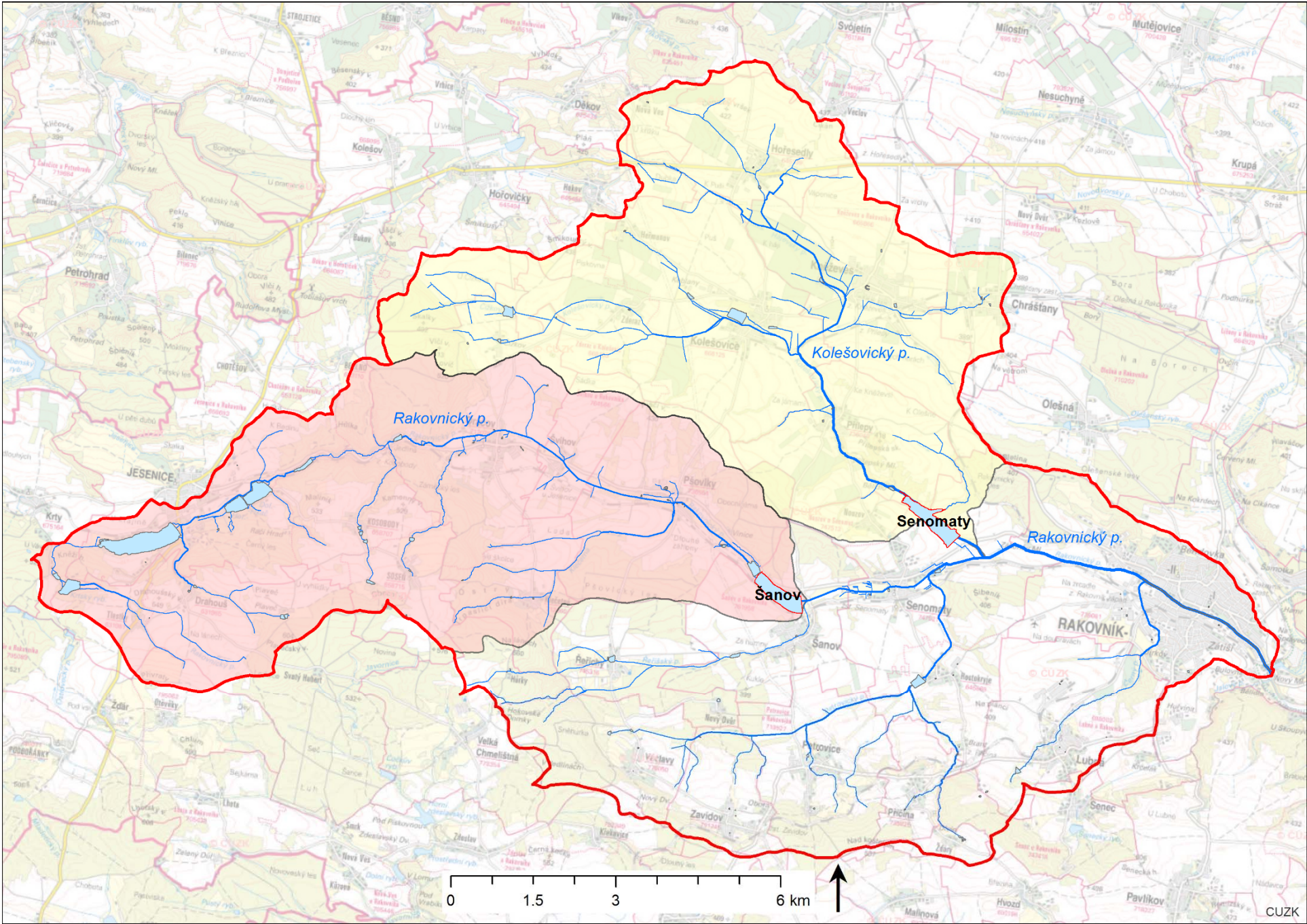
- assessed 7 selected locations
(location “pod Kolešovicemi” was changed with location “U Senomat” because of conflict with development plans for new Waste Water Treatment plant)

Proposed Locations



Feasible SWR Proposed for Implementation





k přípravám realizace vodních nádrží v regionech postihovaných suchem a rizikem nedostatku vody

Vláda

- I. bere na vědomí informace uvedené v části II až IV materiálu čj. 1050/16;
- II. schvaluje jako investora vodních děl Senomaty a Šanov podnik Povodí Vltavy, státní podnik;
- III. ukládá
 1. ministrům životního prostředí a zemědělství zpracovat do 31. prosince 2017 komplexní návrh přírodně blízkých opatření v povodí Zdobnice (vodní dílo Pěčín), Vlárky (vodní dílo Vlachovice), Rakovnického potoka a Kolečovického potoka (vodní dílo Senomaty a Šanov) jako součást systému opatření v daných povodích,
 2. ministru zemědělství
 - a) zahájit neprodleně projektovou přípravu a uplatnit neprodleně požadavek na zajištění souladu územně plánovací dokumentace ve vztahu k vodním dílům Senomaty a Šanov,
 - b) realizovat nezbytné práce vedoucí k přípravě vodních děl Pěčín a Vlachovice.
 3. ministrům zemědělství a životního prostředí zpracovat a vládě do 31. března 2018 předložit návrh účinných adaptačních opatření jako kombinaci technických opatření a přírodně blízkých opatření v povodí včetně návrhu jejich financování zpracovaného se stejnou podrobností pro jednotlivé vodní nádrže a lokality s doplněním informace o souladu s územně plánovacími dokumenty,
 4. ministru dopravy zpracovat ve spolupráci s příslušnými hejtmany do 31. prosince 2017 návrhy změn dopravní infrastruktury v lokalitách připravovaných vodních děl Pěčín a Vlachovice.

Provedou:
ministr zemědělství,
životního prostředí,
dopravy

Na vědomí:
hejtman Středočeského kraje,
hejtman Královéhradeckého kraje,
hejtman Zlínského kraje

Mgr. Bohuslav Sobotka, v. r.
předseda vlády

RESOLUTION

THE GOVERNMENT OF THE CZECH REPUBLIC
of August 24, 2016, No.727

preparation of the implementation of water reservoirs in the regions affected drought and the risk of water scarcity

2. Minister of Agriculture

(a) initiate the design preparation without delay and apply the retention requirement without delay compliance of land-use planning documentation in relation to the water works of Senomaty and Shanov,

3. to the Minister of Agriculture and the Environment, and to the Government by 31 March 2018 to propose effective adaptation measures as a combination of technical measures and nature-friendly measures in the river basin, including the proposal of their financing being processed with the same detail for individual water reservoirs and sites with information compliance with land-use planning documents,



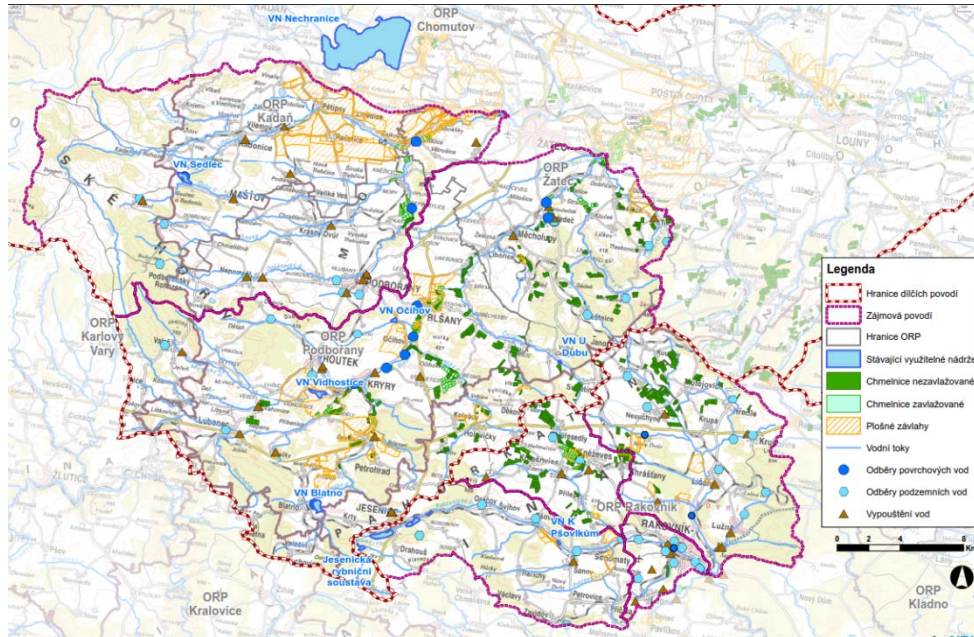
Water Transfer from neighbour River Basin

Study and Investment Intents:

Water transfer from Ohře/Eger River Basin to the Blšanka River and Rakovnický Brook river subbasins

- Ordered by: Povodí Vltavy and Povodí Ohře, State Enterprises
- Executed by: company Sweco HDP + VRV
- Executed in 2016
- Main project manager: Ing. Miroslav Lubas

Water Balance



1. Assessment of water management needs for Liboče, Blšanky, Rakovnický brook river basins + Smolnický brook and Hasiny

- Ensuring a minimum residual flow rate
- Water abstractions for Industry
- Water abstractions for Water supply
- Water for irrigation (hop plants)

2. Analysis of insufficient water needs for periods:

- 1981-2010
- 2021-2050
- 2071-2100

3. Evaluation of potential water sources

- VD Hlubocká pila
- VD Nechranice – VD Nechranice - ČS Stranná

4. Assessment of design flow for water outlet system with 95% security

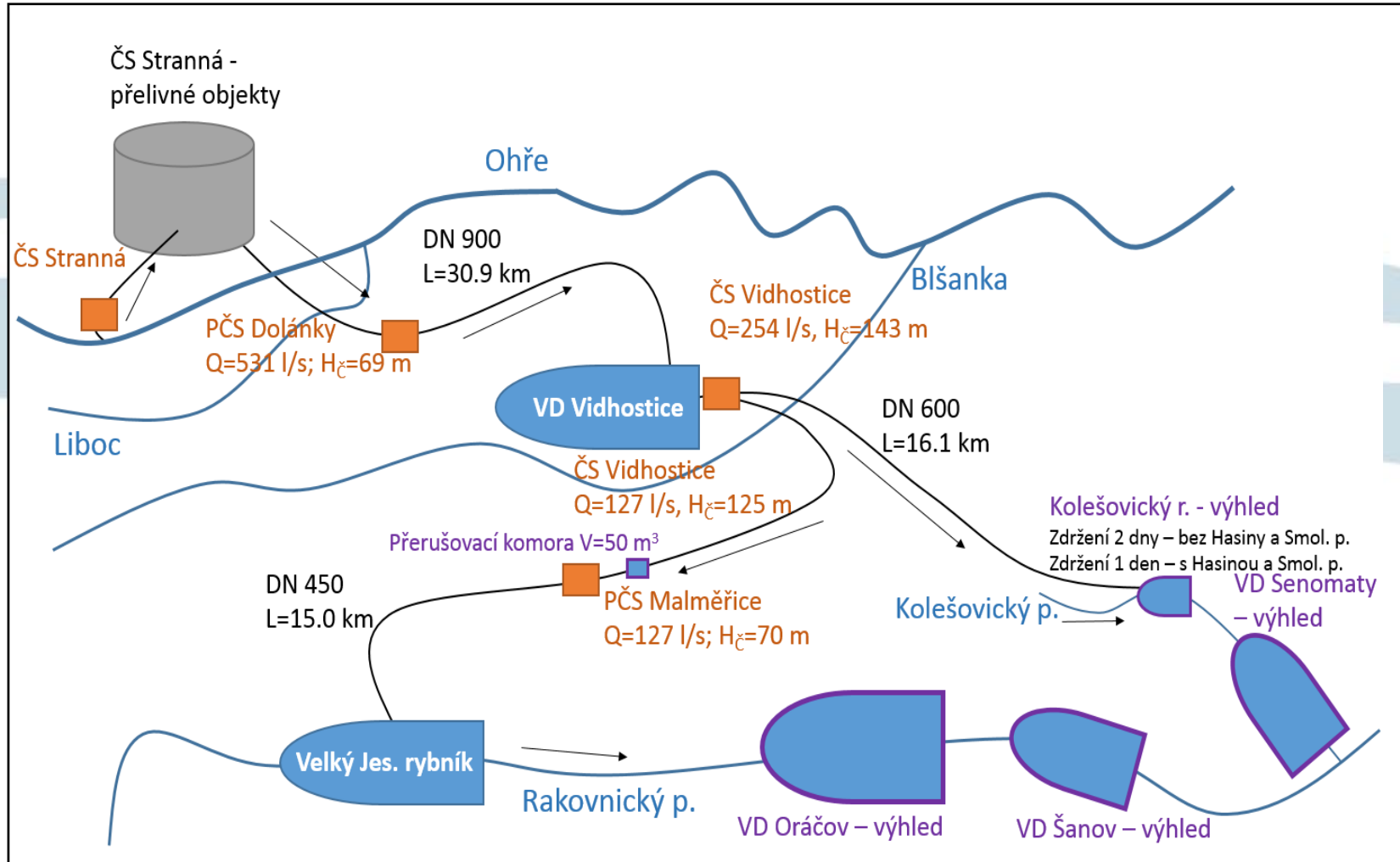
Povodí	Zajištění MZP + závlahy	
	Stav Q95% (m ³ /s)	Výhled Q95% (m ³ /s)
Povodí Liboče (Li)	0,037	0,091
Povodí Blšanky (Bl)	0,212	0,277
Povodí Rakovnického potoka (Rp)	0,107	0,127*
Povodí Rakovnického potoka se Smolnickým potokem a Hasinou	0,181	0,254*
Soustava (Rp, Bl, Li)	0,286	0,417
Soustava (Rp, Bl, Li + Smo, Ha)	0,407	0,531*

* Údaje na základě kterých bylo provedeno dimenzování sítí

Situation of Water Transfer



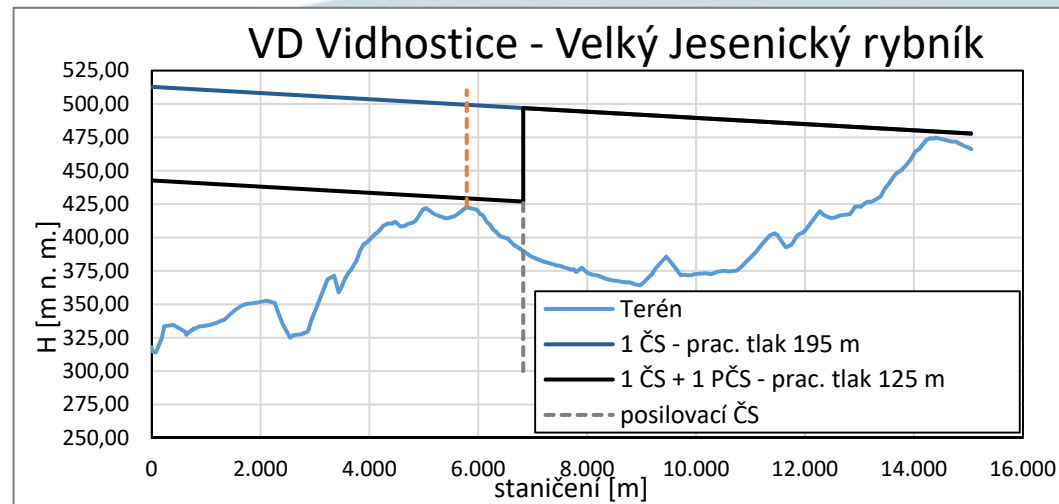
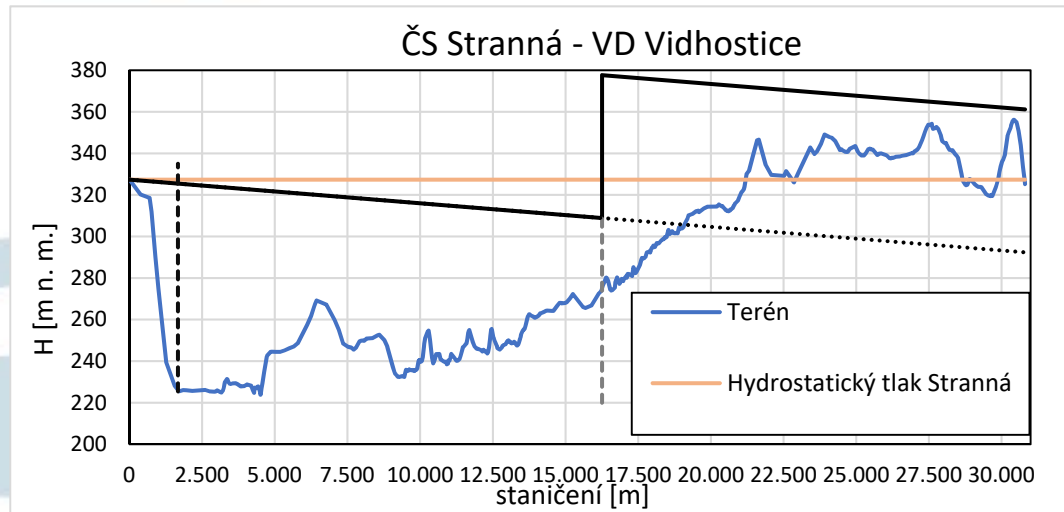
Technical Solution Scheme



Water Transfer from VD Vidhostice conducts water to Rakovnický and Kolečovický brooks using the Jesenice Pond System and planned waterworks Šanov a Senomaty.

The water transfer consists of three separate pipeline sections:

- **Section 1- Pumping station Stranná (overflowing object) - VD Vidhostice – 30,9 km**
pipeline DN 900, maximum transferred amount 531 l/s
affected municipalities: Březno (ORP Chomutov); Nové Sedlo (ORP Žatec); Podbořany, Vroutek (ORP Podbořany)
- **Section 2- VD Vidhostice - Velký Jesenický pond (Rakovnický brook) - 15 km**
pipeline DN 450, maximum transferred amount 127 l/s
affected municipalities : Jesenice, Krtý (ORP Rakovník); Blatno, Kryry, Lubenec, Vroutek (ORP Podbořany)
- **Section 3- VD Vidhostice - Kolečovický brook – 16,1 km**
pipeline DN 600, maximum transferred amount 254 l/s (with Hasina brook and Smolnický brook).
affected municipalities: Hořovičky, Kolečov, Kolečovice, Oráčov (ORP Rakovník); Kryry, Vroutek (ORP Podbořany)



Nature friendly measures within the catchment areas of Rakovnický and Kolečovický Brooks (Waterworks Senomaty and Šanov)

- According to resolution of the government of Czech Republic of August 24. 2016, No.727 as part of system of measures for the river basin over proposed reservoirs
- Ordered by: Povodí Vltavy and Povodí Ohře, State Enterprises
- Executed by: company Sweco HDP + VRV
- Main project manager: Ing. Martin Pavel

Comprehensive Design of Measures in the Catchment Area above Proposed Waterworks

- **Revitalisation and Renaturation of river network and connected meadows**
 - Increasing of self-purification capacity and retention capability of water courses and connected meadows, sediments transport reduction
- **Decreasing of water erosion and substance flushing from focused catchment areas**
 - Retention and anti-erosion measures on agricultural and forest lands, revision of agriculture amelioration measures
- **Decreasing of pollution from urban sources**
 - Consistent urban waste water treatment with an emphasis on phosphorus elimination, prevention of contamination from overflows, separation of rainwater and sewage water, infiltration of precipitation water

Feasibility study of Kryry dam on Podvinecký brook

- Ordered by: Povodí Ohře, State Enterprises
- As a dominant water reservoir within resolved dry area with the possibility to cover the water demands in the Blšanka River Subbasin and with the ability to transfer water into Rakovnický Brook River Subbasin individually
- Multipurpose over-year reservoir – flow regime improvement, irrigation, protection of Kryry town
- Potential maximum total volume capacity 8.0 mil. m³ with useful storage capacity 6.2 mil. m³
- Alternative processing with consideration of climate changes

**THANK YOU
FOR
YOUR ATTENTION**