

# Data Collection Surveys



# Surveys

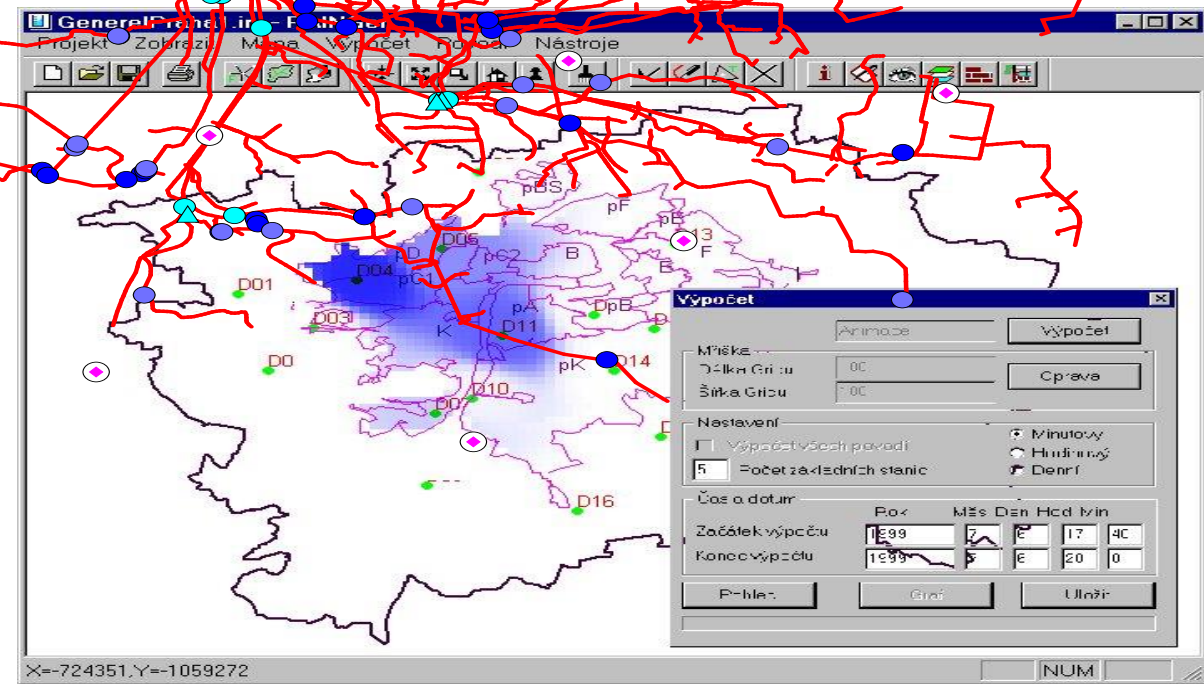
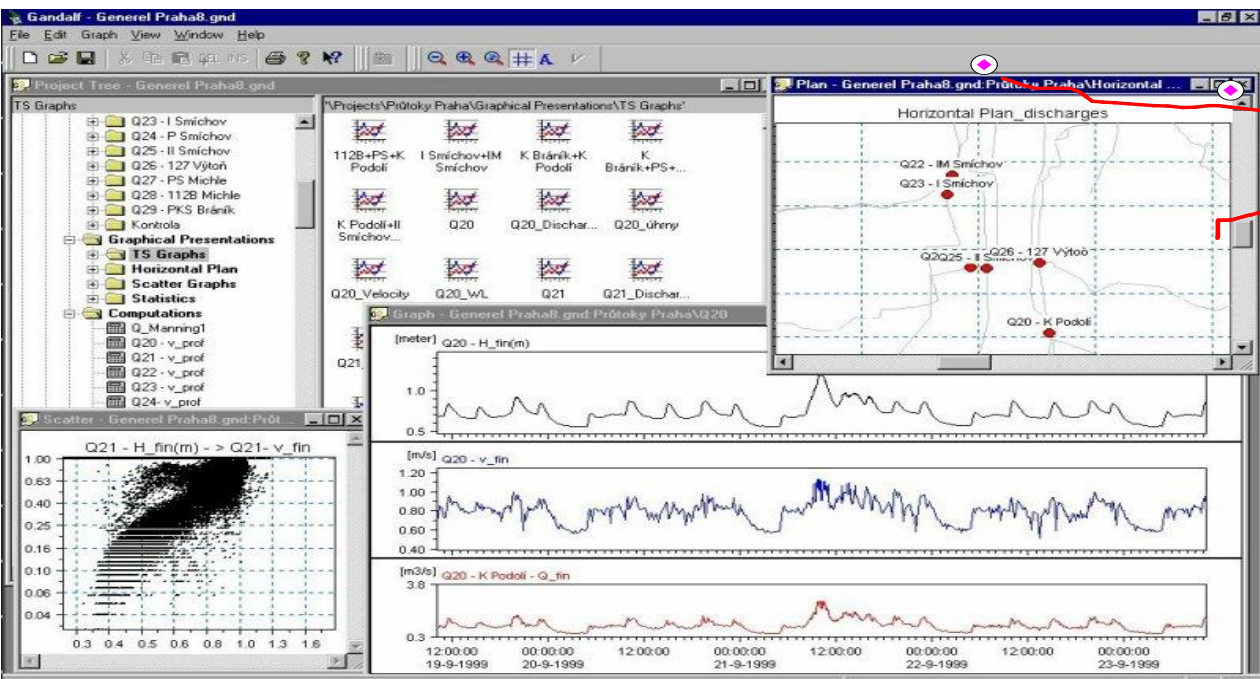
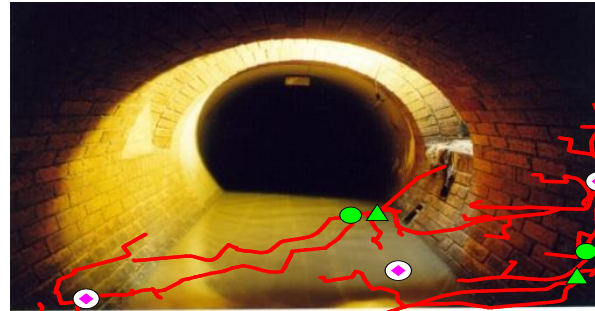
Flow survey – monitoring (flows, pressures, Water levels, raingauges)

Geodetic survey

WQ sampling survey

Structures survey

Impermeability survey

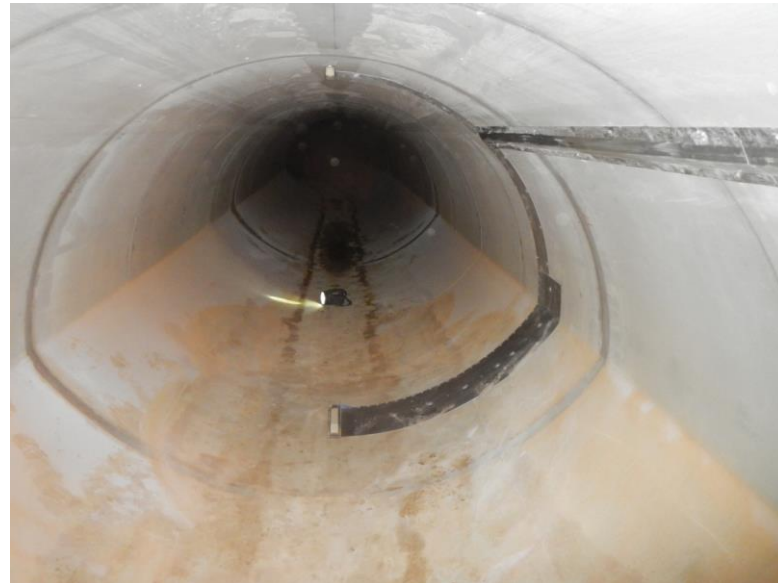


# Monitoring equipment

- Instalation/protection
- Data collection
- Data postprocessing
- NIVUS, ADS, SEBA, Fiedler...

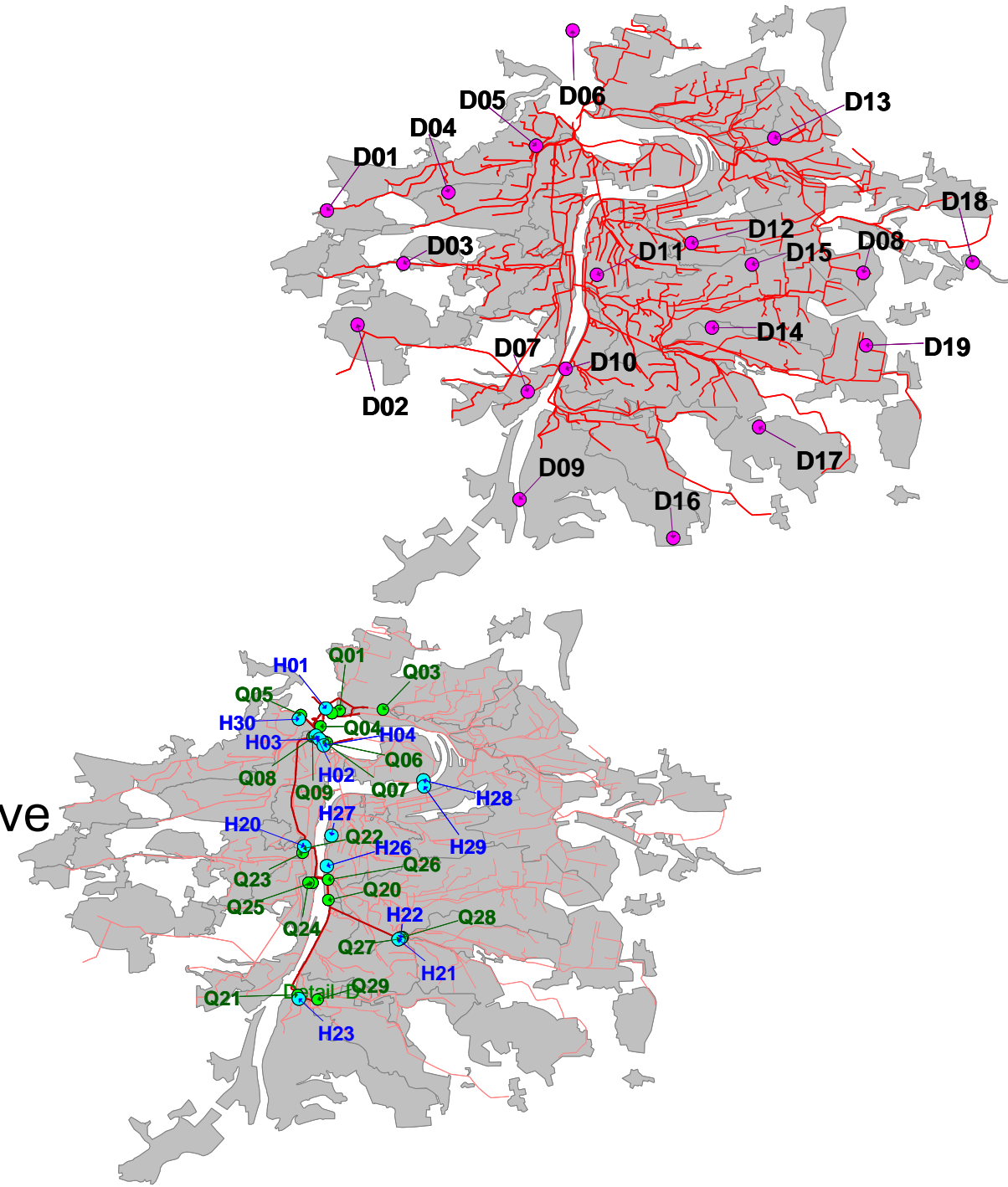


# Measurement site installations

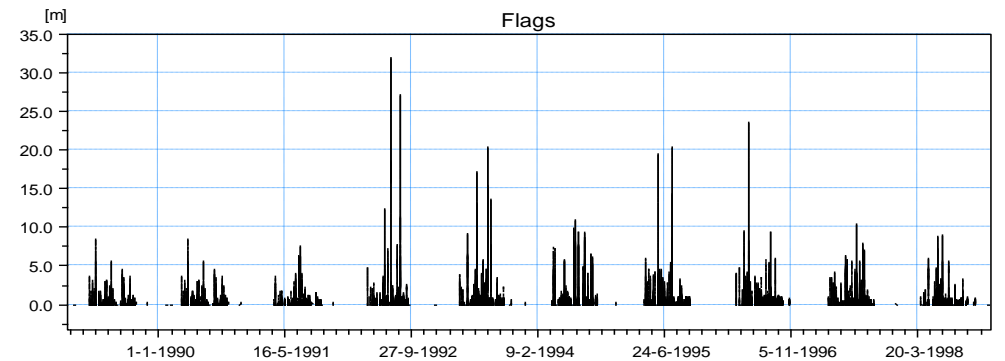
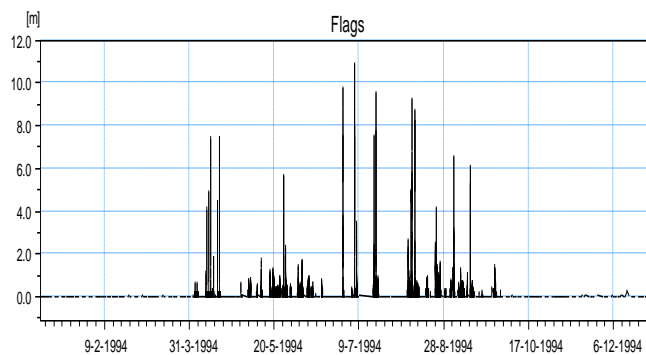
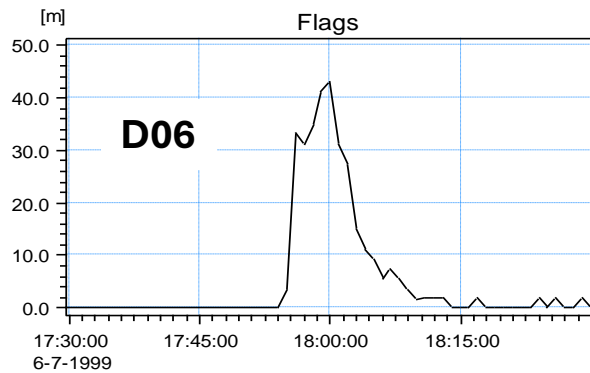
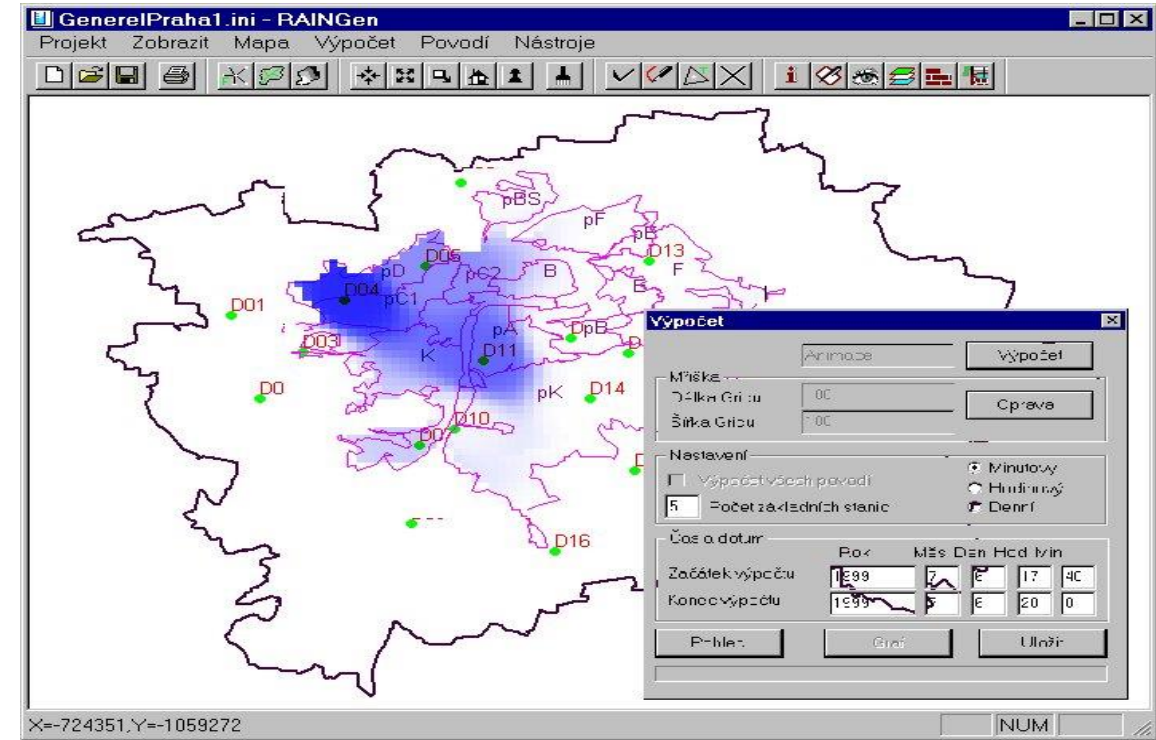
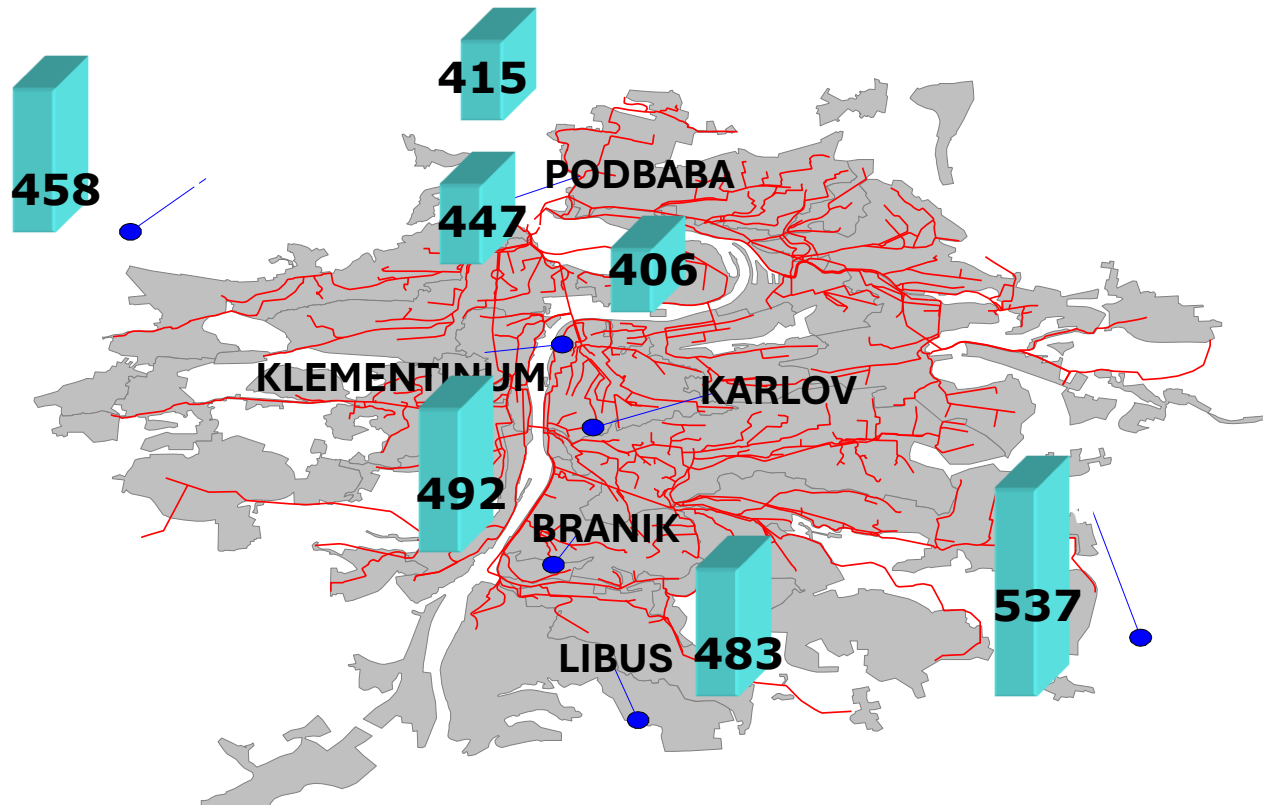


# Concept of monitoring

- Whether and why to measure?
- What to measure (what values)?
- When and how long to measure ?
- Where to measure?
- How to measure and by what means ?
- What kind of time step to use?
- How to collect, process, evaluate and archive the measured data?
- What are the costs of measurement?

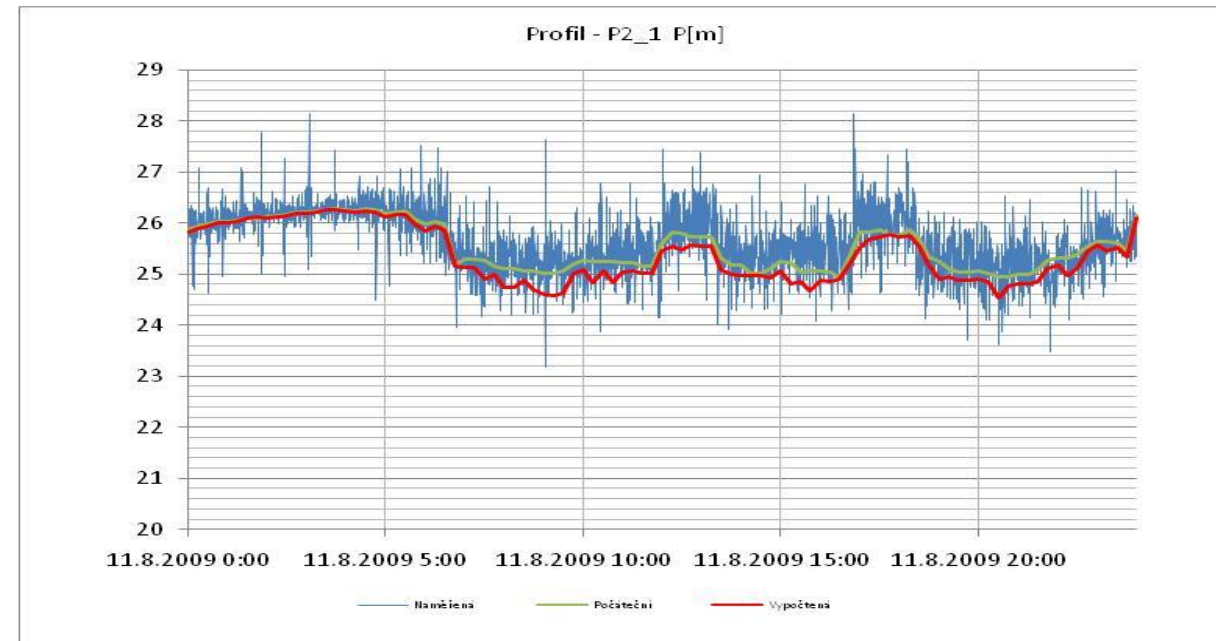
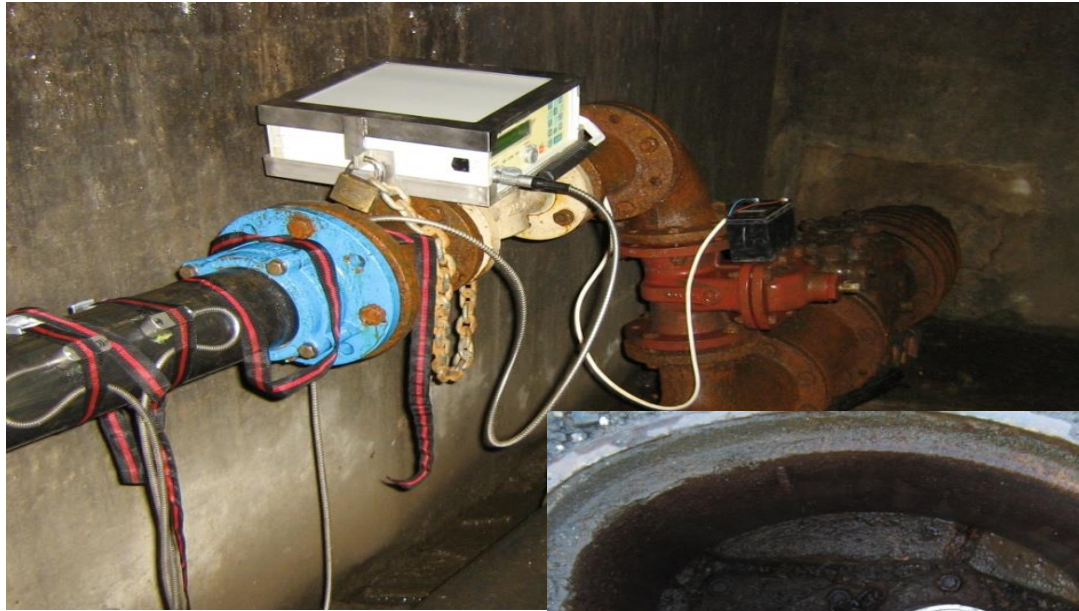


# Rainfall survey

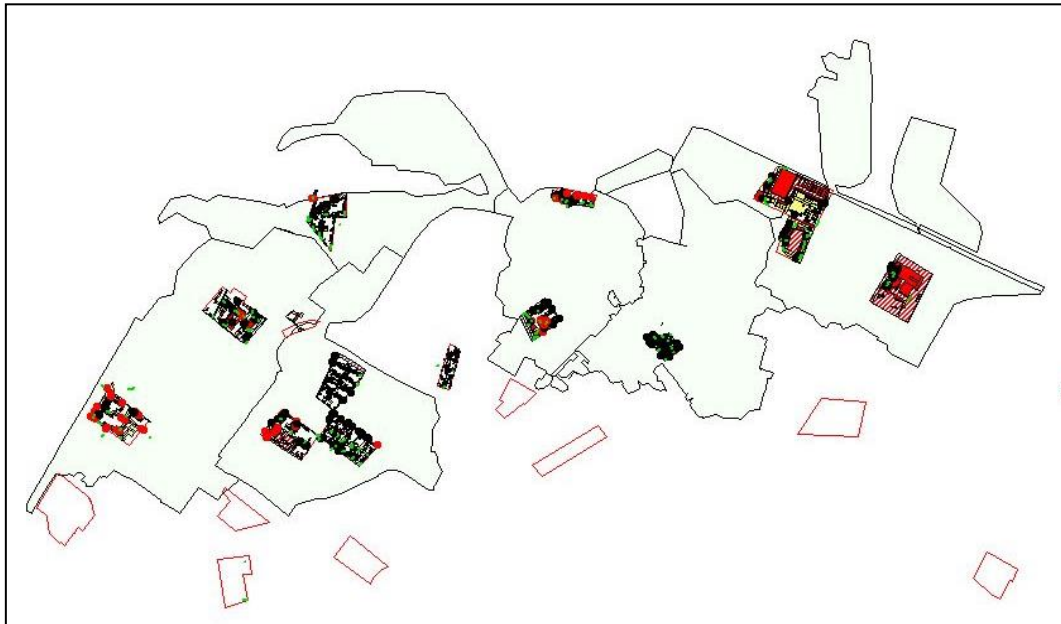
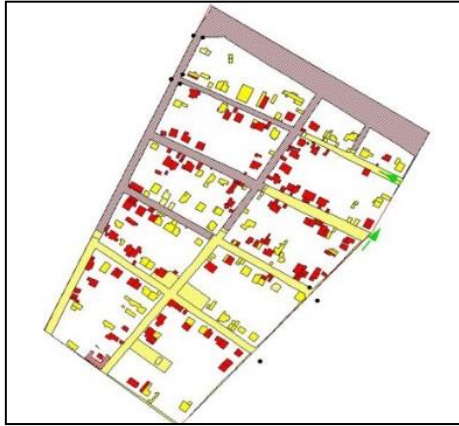


# Flow survey

1. Model calibration
2. Identification of problematic network
3. Basic leakage distribution
4. Infiltration assessment

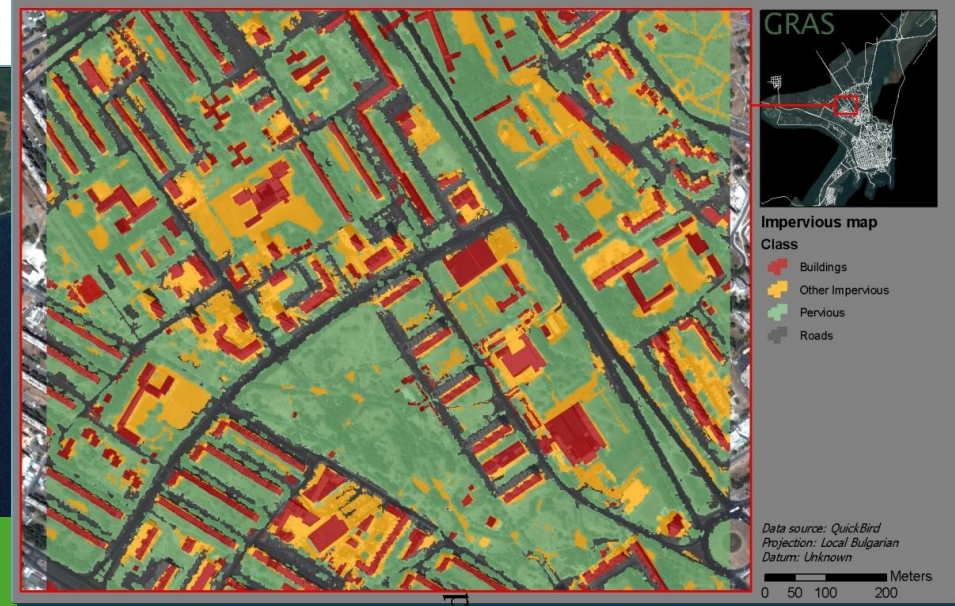
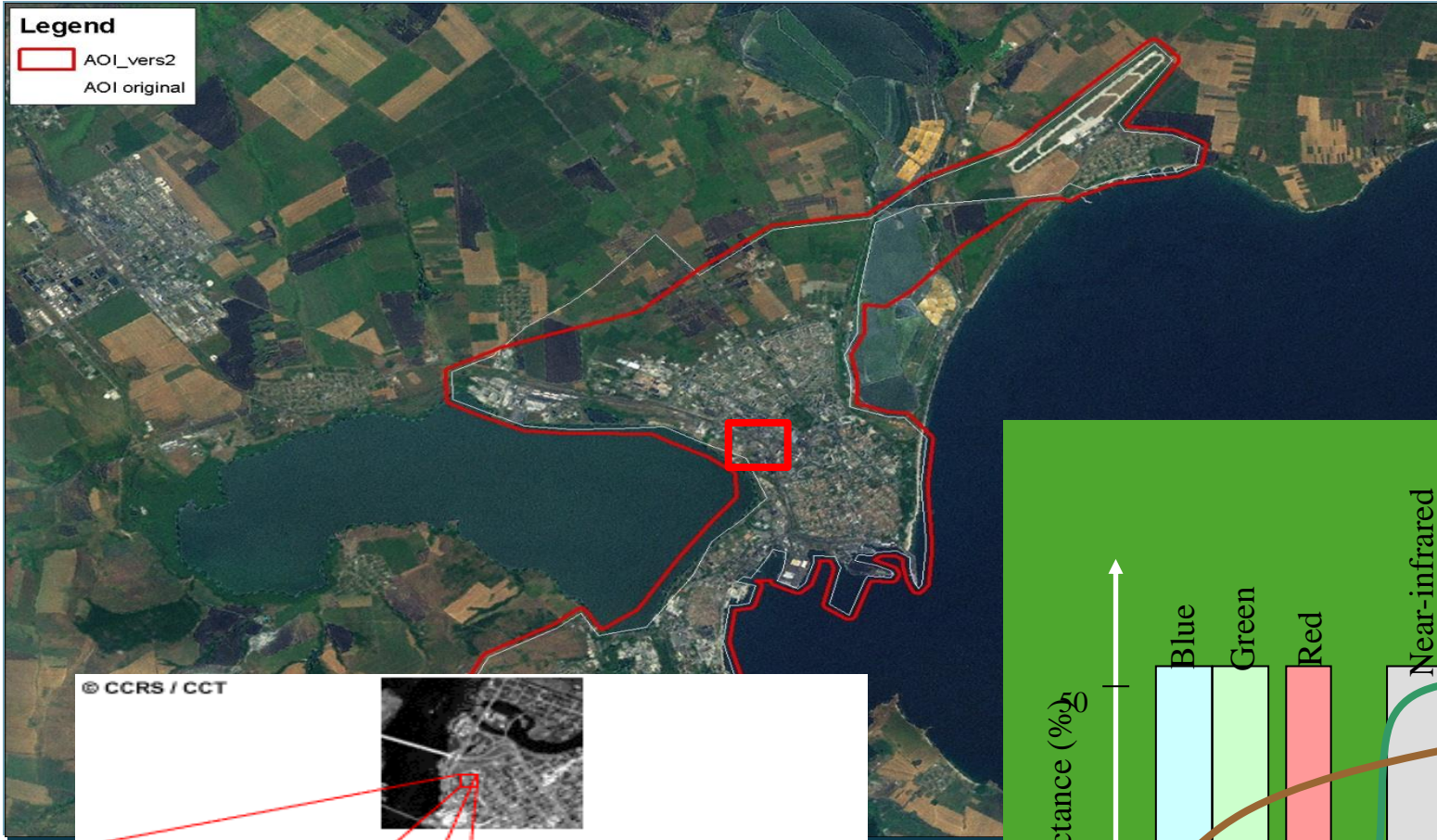


# Impervious surface survey

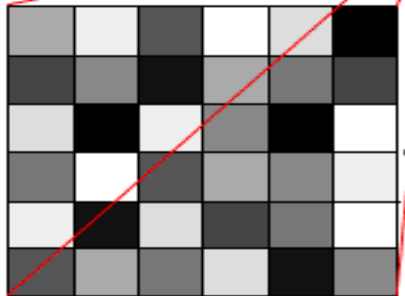


Sample No	Urban Type	IAS imp.Area		GIS imp.Area [ha]		Reduction factor IAS/GIS
		roofs+roads [ha]	roofs	roads	roofs+roads	
Vlad_1	3-house residential area	0.0079	2054	3916	5970	0.01
Vlad_2	2-house concrete area	2.0323	6121	18060	24181	0.84
Vlad_3	1-house city center area	3.1217	11992	8756	20748	1.50
Vlad_4	3-house residential area	0.5396	1629	2912	4541	1.19
Vlad_5	1-house city center area	2.1536	6759	6407	13072	1.65
Vlad_6	10-industrial area	6.0705	15006	6385	21391	2.84
Vlad_7	3-house residential area	1.0360	6045	5947	11992	0.86
Vlad_8	4-house ditched area	0.6969	2040	5870	7910	0.88
Vlad_9	3-house residential area	0.0935	2861	6219	9080	0.10
Vlad_10	2-house concrete area	3.1999	18992	21734	40726	0.79
Vlad_11	10-industrial area	0.1837	7311	2249	9560	0.19
Vlad_12	1-house city center area	1.5146	0	15267	15267	0.99
Vlad_13	10-industrial area	3.1746	15458	6401	21859	1.45
Vlad_14	5-grass sport area	1.6836	4296	973	5269	3.20
Vlad_15	5-grass sport area	8.6492	25698	4828	30526	2.83
Vlad_16	7-grass cemetery area	2.6161	6027	821	6848	3.82
Vlad_17	3-house residential area	3.9853	20240	13062	33302	1.20

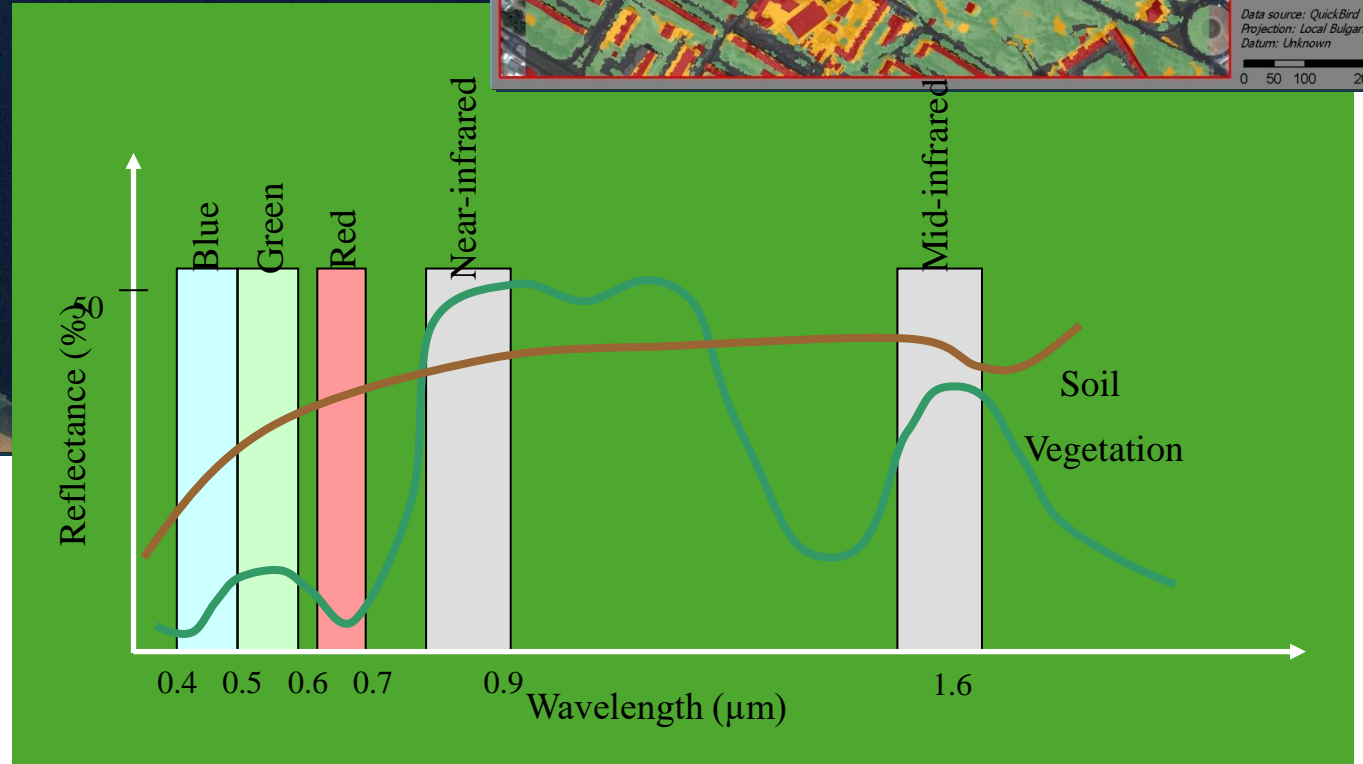
# Surface Impermeability survey



© CCRS / CCT

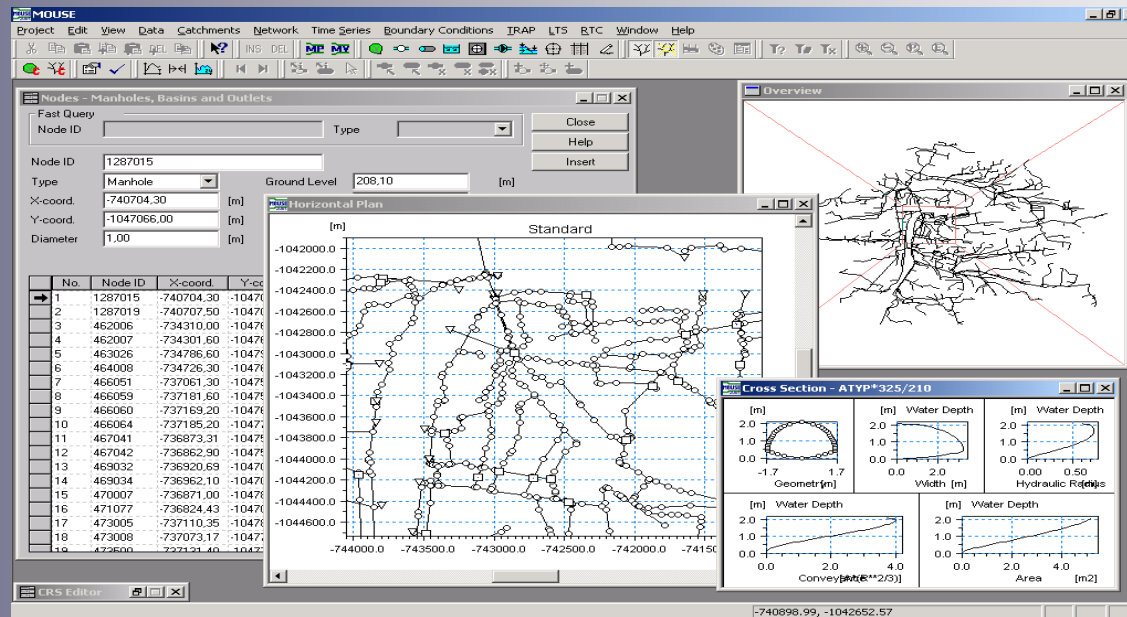


170	238	85	255	221	0
68	136	17	170	119	68
221	0	238	136	0	255
119	255	85	170	136	238
238	17	221	68	119	255
85	170	119	221	17	136



# Power of Data Visualisation

## Computer Graphics



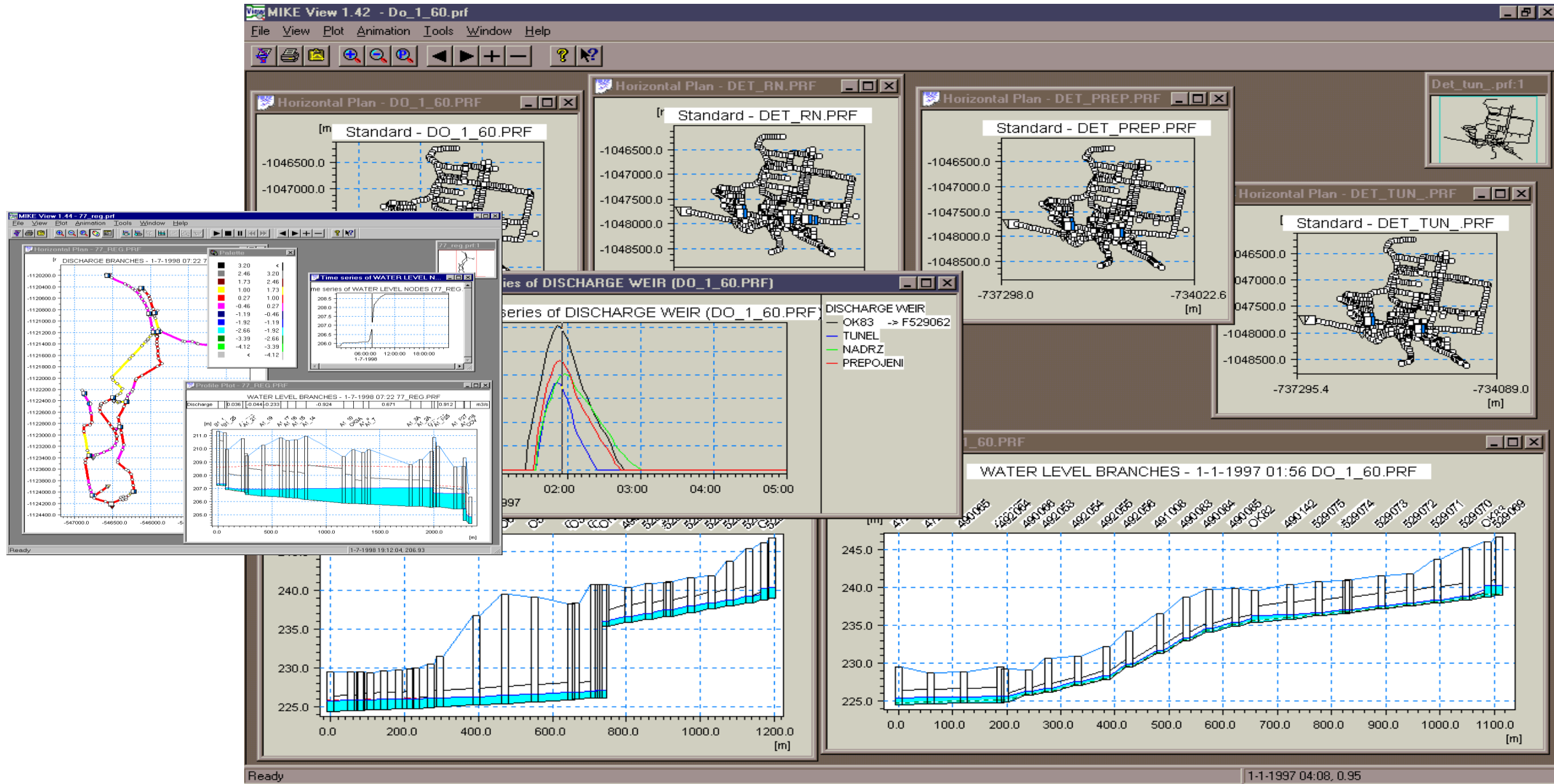
# 0D visualisation

The screenshot displays a software interface for hydrological data visualization, titled "Gandalf - General Praha8.gnd". The interface is divided into several panels:

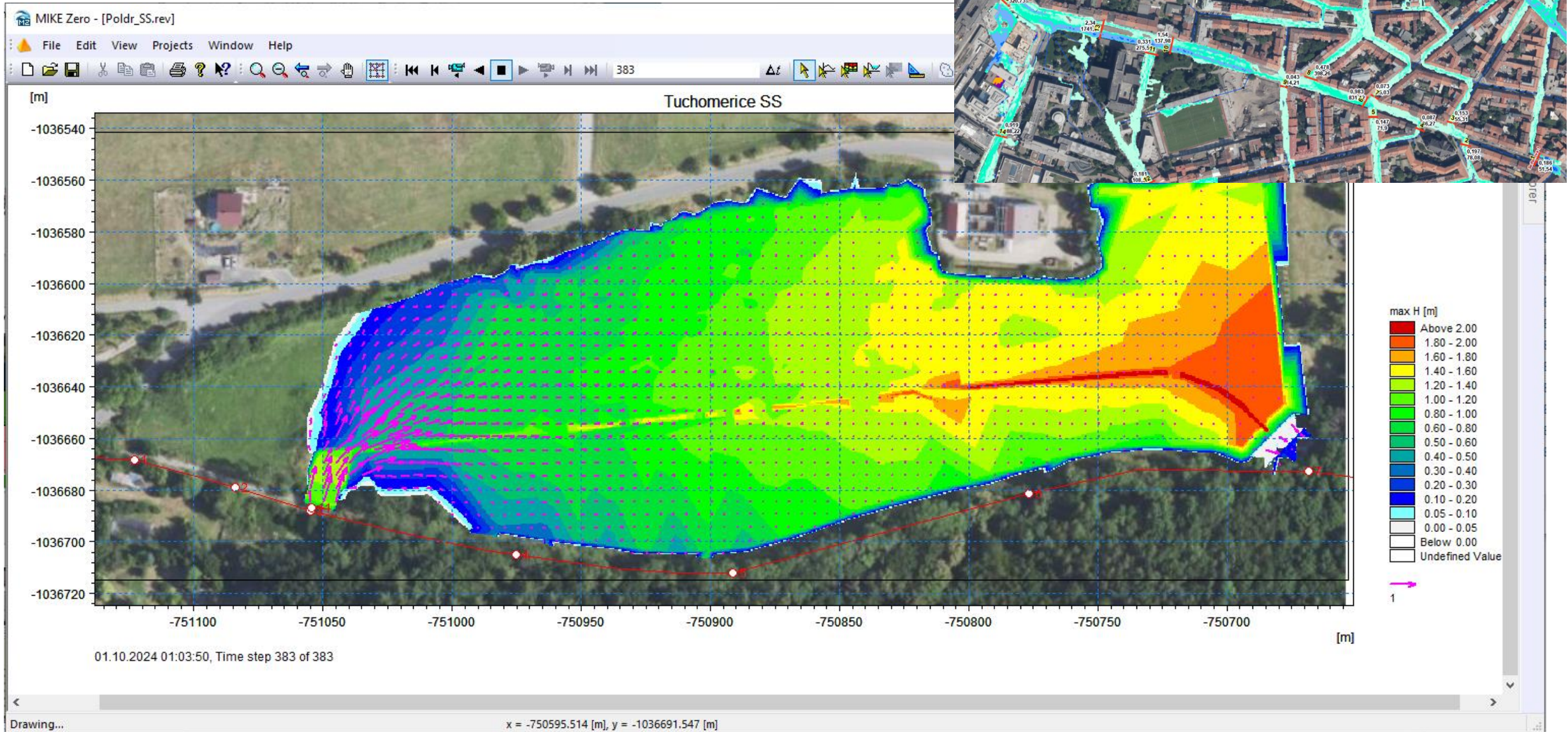
- Project Tree:** Lists various measurement points and graphs, including "Q23 - I Smíchov", "Q24 - P Smíchov", "Q25 - II Smíchov", "Q26 - 127 Výtoň", "Q27 - PS Michle", "Q28 - 112B Michle", "Q29 - PKS Bráník", "Kontrola", "Horizontal Presentations", "TS Graphs", "Horizontal Plan", "Scatter Graphs", "Statistics", "Computations", "Q\_Manning1", "Q20 - v\_prof", "Q21 - v\_prof", "Q22 - v\_prof", "Q23 - v\_prof", and "Q24 - v\_prof".
- Horizontal Plan:** A map titled "Horizontal Plan\_discharges" showing the layout of measurement points: "Q22 - II Smíchov", "Q23 - I Smíchov", "Q20 - K Podolí", "Q20 - I Smíchov", "Q20 - II Smíchov", "Q20 - III Smíchov", "Q20 - IV Smíchov", "Q20 - V Smíchov", "Q20 - VI Smíchov", "Q20 - VII Smíchov", "Q20 - VIII Smíchov", "Q20 - IX Smíchov", "Q20 - X Smíchov", "Q20 - XI Smíchov", "Q20 - XII Smíchov", "Q20 - XIII Smíchov", "Q20 - XIV Smíchov", "Q20 - XV Smíchov", "Q20 - XVI Smíchov", "Q20 - XVII Smíchov", "Q20 - XVIII Smíchov", "Q20 - XIX Smíchov", "Q20 - XX Smíchov", "Q20 - XXI Smíchov", "Q20 - XXII Smíchov", "Q20 - XXIII Smíchov", "Q20 - XXIV Smíchov", "Q20 - XXV Smíchov", "Q20 - XXVI Smíchov", "Q20 - XXVII Smíchov", "Q20 - XXVIII Smíchov", "Q20 - XXIX Smíchov", "Q20 - XXX Smíchov".
- Discharge Graph:** A graph titled "Discharge" showing "Simer [m³/s]" over time. The x-axis ranges from 1998-09-22 to 1999-11-21. The y-axis ranges from 0 to 400. The graph shows several peaks, with the highest peak reaching approximately 400 m³/s around 1999-11-01.
- Data Table:** A table with 16 rows and 3 columns: "Time", "Simer [m³/s]", and "Simer [m³/s]". The data is as follows:
 

	Time	Simer [m³/s]	Simer [m³/s]
1	1.1.1995 00:00:00	27.8	27.8
2	2.1.1995 00:00:00	20.3	20.3
3	3.1.1995 00:00:00	15.6	15.6
4	4.1.1995 00:00:00	12.4	12.4
5	5.1.1995 00:00:00	10.4	10.4
6	6.1.1995 00:00:00	9.32	9.32
7	7.1.1995 00:00:00	8.62	8.62
8	8.1.1995 00:00:00	6.78	6.78
9	9.1.1995 00:00:00	6.57	6.57
10	10.1.1995 00:00:00	5.88	5.88
11	11.1.1995 00:00:00	7.74	7.74
12	12.1.1995 00:00:00	6.99	6.99
13	13.1.1995 00:00:00	6.78	6.78
14	14.1.1995 00:00:00	6.24	6.24
15	15.1.1995 00:00:00	6.03	6.03
16	16.1.1995 00:00:00	5.61	5.61
- Other Graphs:** A "Profil - P2\_1 P(m)" graph showing water level profiles over time. A "Graph - General Praha8.gnd:Průtoky Praha\Q20" graph showing "Q20 - H\_fin(m)" and "Q20 - v\_fin" over time.

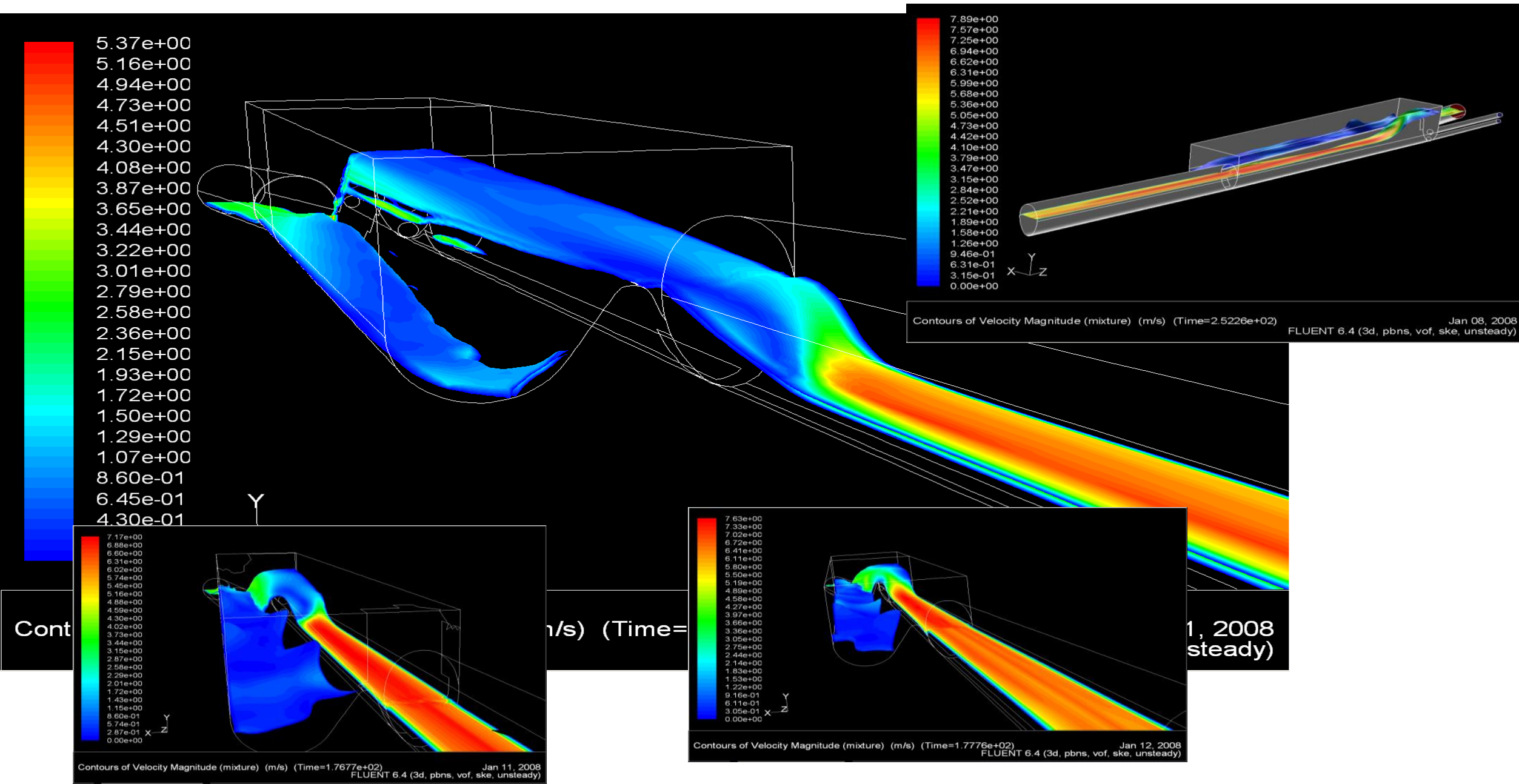
# 1D visualisation



# 2D visualisations



# 3D visualisations



# Thematic views - Sewer system security

**Key performance indicators:** surcharge of the sewer, surcharge time, ...

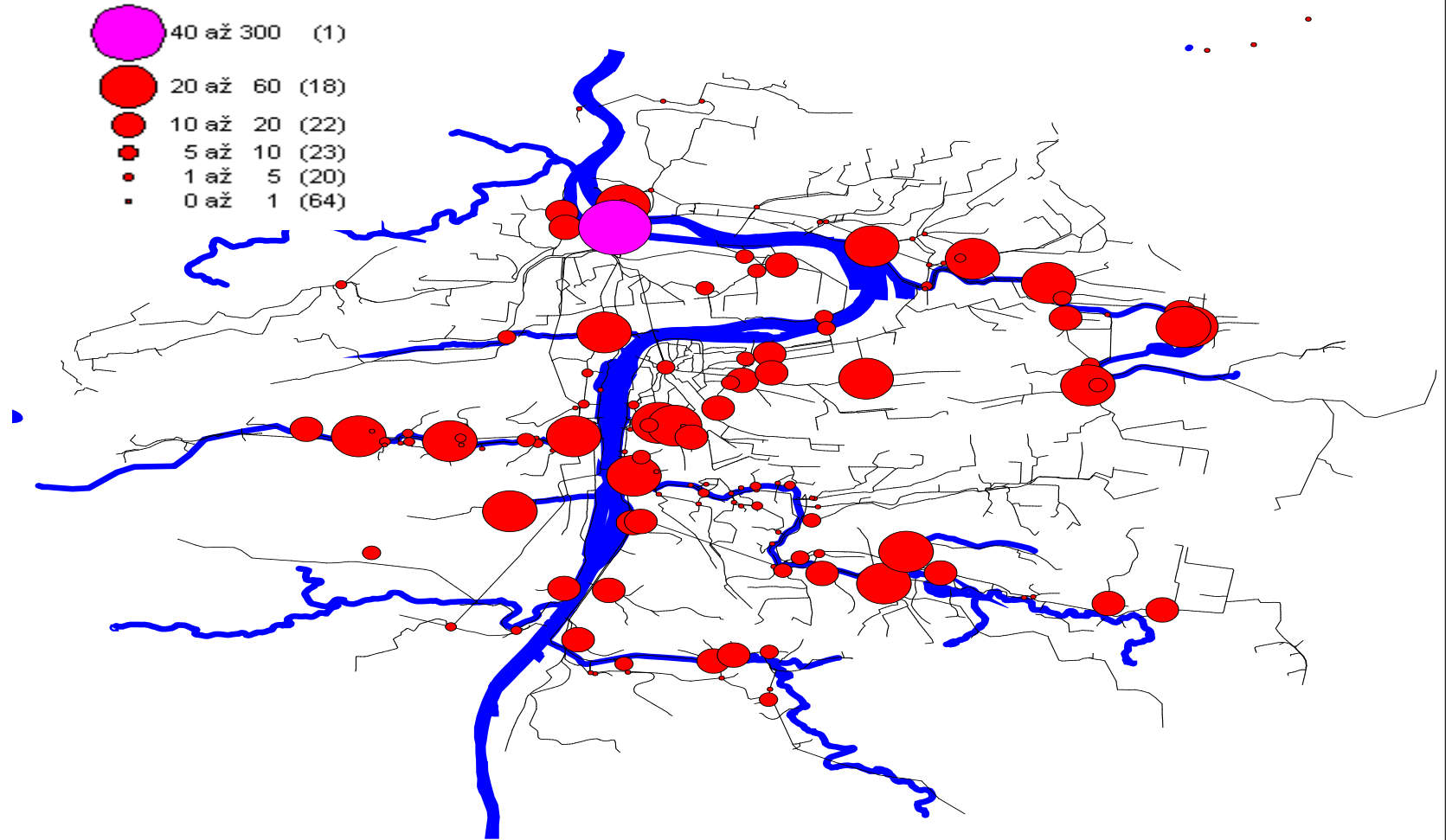


# Thematic views - long term CSO/outlets performance

**Key performance indicators:** Number of spills, total volume, max Q, total time,...

From	To	Q max	No	Max T [hour]
OK_56K	963114	1.8	7	1.3
OK_57K	9815155	1.5	4	1.2
OK_70K	OK_70KO	9.9	17	2.5
RN	V_RN	9.6	10	3.1
OK_71K	539015	0.2	2	0.6
OK_72K	544029	3.8	5	1.3
OK_73K	B9	0.0	0	0.0
OK_75K	OK_75KO	1.0	13	1.7
OK_77K	0	0.2	6	1.2
OK_78K	479073	0.0	0	0.0
OK_79K	B4	0.0	0	0.0
OK_80K	OK_80KO	0.0	0	0.0
OK_81K	OK_81KO	0.0	0	0.0
OK_83K	OK_83KO	1.0	1	0.3

From	To	Tot T [hour]	Suma max.	Suma Tot.
OK_56K	963114	3.5	3 500	6 400
OK_57K	9815155	2.6	3 150	5 100
OK_70K	OK_70KO	15.2	37 700	102 800
RN	V_RN	15.8	36 400	87 000
OK_71K	539015	0.8	150	250
OK_72K	544029	3.5	8 500	14 100
OK_73K	B9	0.0	0	0
OK_75K	OK_75KO	8.7	2 500	6 900
OK_77K	0	3.0	270	500
OK_78K	479073	0.0	0	0
OK_79K	B4	0.0	0	0
OK_80K	OK_80KO	0.0	0	0
OK_81K	OK_81KO	0.0	0	0
OK_83K	OK_83KO	0.3	600	600



# Thematic views

MIKE URBAN - [N:\1561820-03\_Koncepcni\_studie\_povodi\_Seifertovy\_ulice\01\_Praha\06\_MU\_SEIFERTOVA.mup [Base]]

File Edit MOUSE Simulation Model Results View Tools Window Help

MOUSE MOUSE Manholes

Map

- Collection System
  - MOUSE
    - MOUSE Manholes
    - MOUSE Basins
    - MOUSE Outlets
    - MOUSE Soakaways
    - MOUSE Storage Nodes
    - MOUSE Links
    - MOUSE Weirs
    - MOUSE Orifices
    - MOUSE Curb Inlets
    - MOUSE Pumps
    - MOUSE Valves
    - 2D Overland Group
      - 2D Coupled Connections
      - 2D Coupled Areas
      - 2D Initial Conditions
      - 2D Bed Resistances
    - MOUSE Boundaries
    - Load Allocation Group
      - CS Point Loads
      - MOUSE Load Allocation
    - Catchment Group
      - Catchment Processing Group
      - Catchments
  - Seifertova\_Povodi
    - Measurement Stations
    - Measurement Stations
    - Kanalizační systém
    - Měřicí stanice
    - Vrstvy pozadí
      - dmr5g\_1m\_budovyIPR\_Uprava0: Value
      - High : 475,419

Nodes [Base]

Identification & connectivity

Asset ID: \* Data source: \*  
 Node ID: 2306648 Status: \* Imported  
 Model: \* <NULL> Network type: \* <NULL>  
 Description: \* 2306648 X coordinate: -745038.95  
 Y coordinate: -1042695.51  
 Tail level: Links: 2

Geometry Q-H and head loss 2D overland Soakaway  
 Node type: Manhole Max. Inflow

Pipes and Canals [Base]

Identification & connectivity

Asset ID: \* Data source: \*  
 Link ID: 1\_141 Status: \* Imported  
 Description: \* 1\_141 Network type: \* <NULL>  
 From node: 2306648 To node: 396232  
 Pressure main

Geometrical properties

Shape: Circular Length: 507.835  
 Size: 0.3000 UpLevel: 273.76  
 Width: DwLevel: 232.72  
 Height: Slope: 8.08  
 CRS ID: Edit Graph  
 Topography: Edit Max Dx:

Hydraulic friction losses

Material: Concrete (Smooth) Formulation: Manning Explicit  
 Use local data  
 Manning: 0.0118 Eq roughness: H-W coef:

Miscellaneous  
 Non return valve

Link ID *	Shape *	UpLevel	DwLevel	Length	Size	Width
1_141	Circular	<Null>	<Null>	<Null>	0.3000	<Null>
10030111i	CRS	<Null>	<Null>	<Null>	1.1000	<Null>
10030161i	CRS	<Null>	<Null>	<Null>	1.1000	<Null>
10030192	CRS	<Null>	<Null>	<Null>	2.1600	<Null>
10030201i	CRS	<Null>	<Null>	<Null>	1.1000	<Null>
10030211i	CRS	<Null>	<Null>	<Null>	2.1600	<Null>
10030681i	CRS	<Null>	<Null>	<Null>	2.1600	<Null>
10030731i	Circular	<Null>	<Null>	<Null>	0.0100	<Null>
10030732	CRS	<Null>	<Null>	<Null>	2.1600	<Null>

Map Scale: 5012.12024

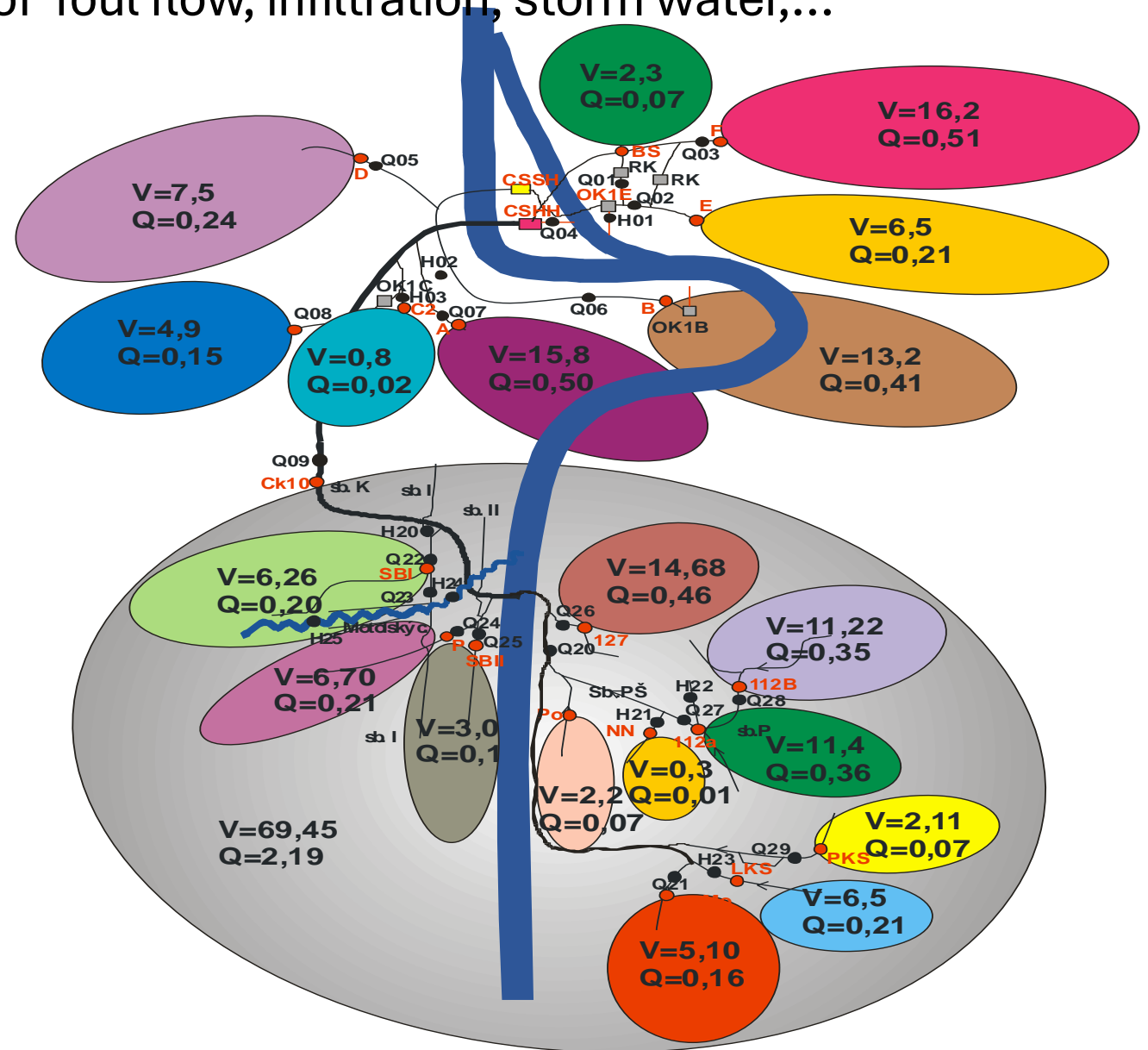
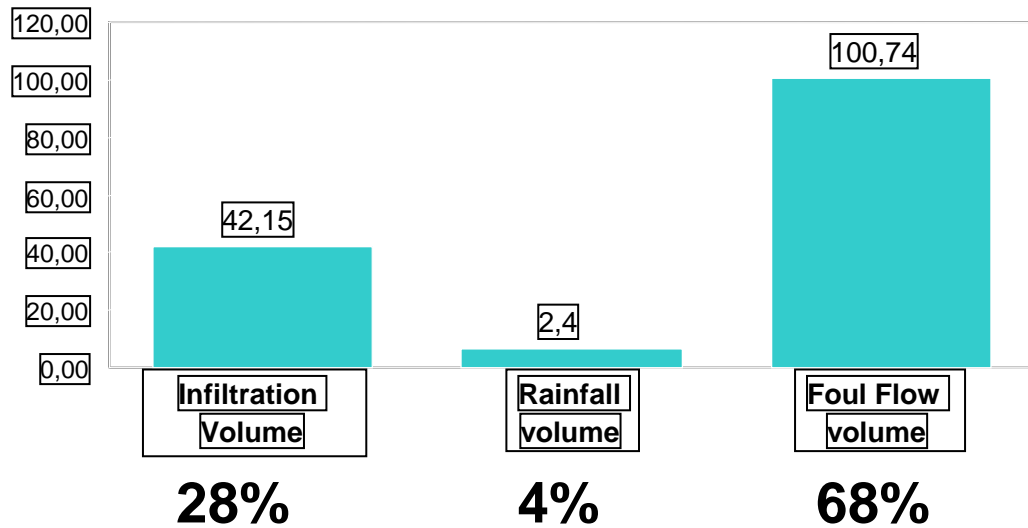
NUM



# Quantitative results - Long term water balance

Key performance indicators: total volume of foul flow, infiltration, storm water,...

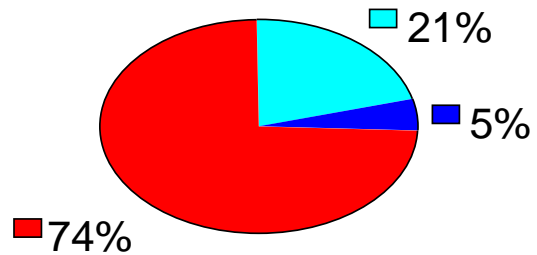
- ▣ Total produced volume: 150 mil. m<sup>3</sup>
- ▣ Total SRC volume: 42 mil. m<sup>3</sup>
- ▣ Total foul flow volume: 101 mil. m<sup>3</sup>
- ▣ Total FRC volume: 6,7 mil. m<sup>3</sup>
- ▣ Total treated volume: 145 mil. m<sup>3</sup>
- ▣ Total diverted volume: 4,6 mil. m<sup>3</sup>



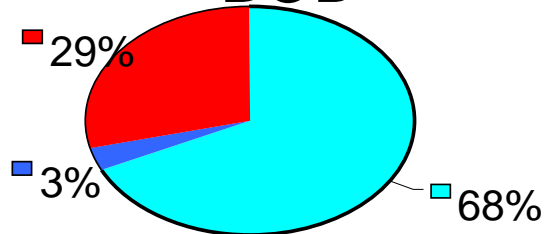
# Quantitative results - cumulative river impact

Key performance indicators: total annual load, ...

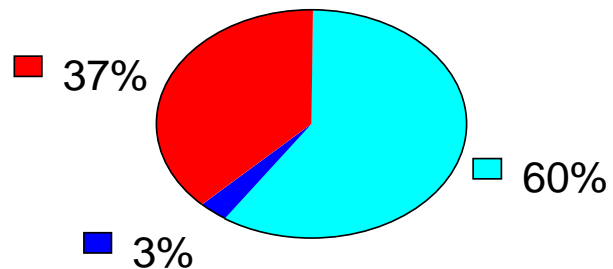
Amonia



BOD



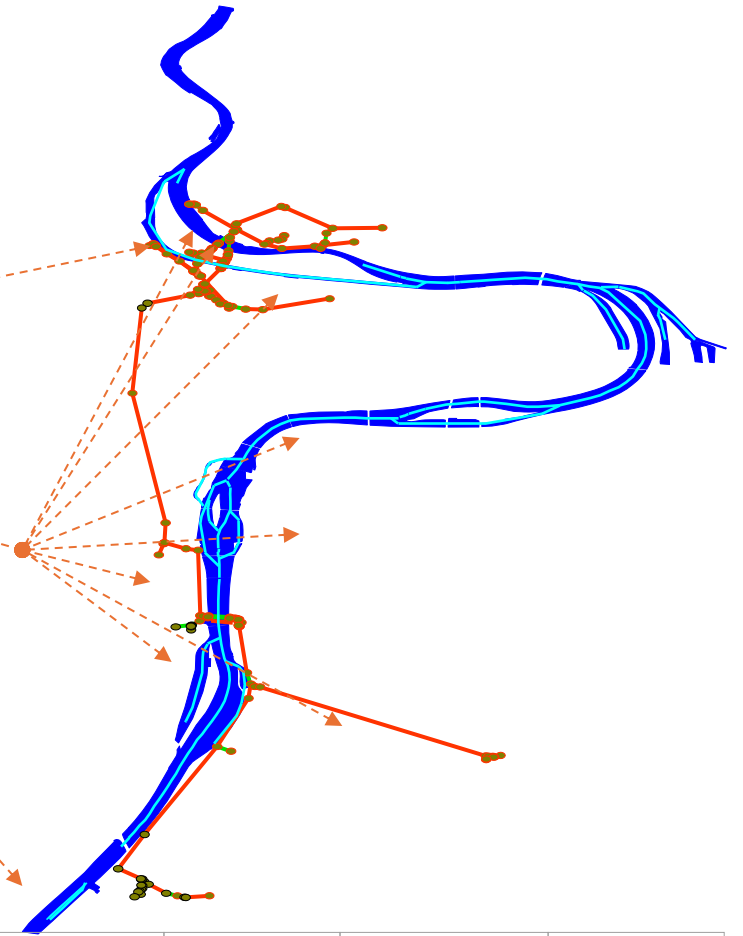
Phosphorus



■ Total WWTP production

■ Total CSO production

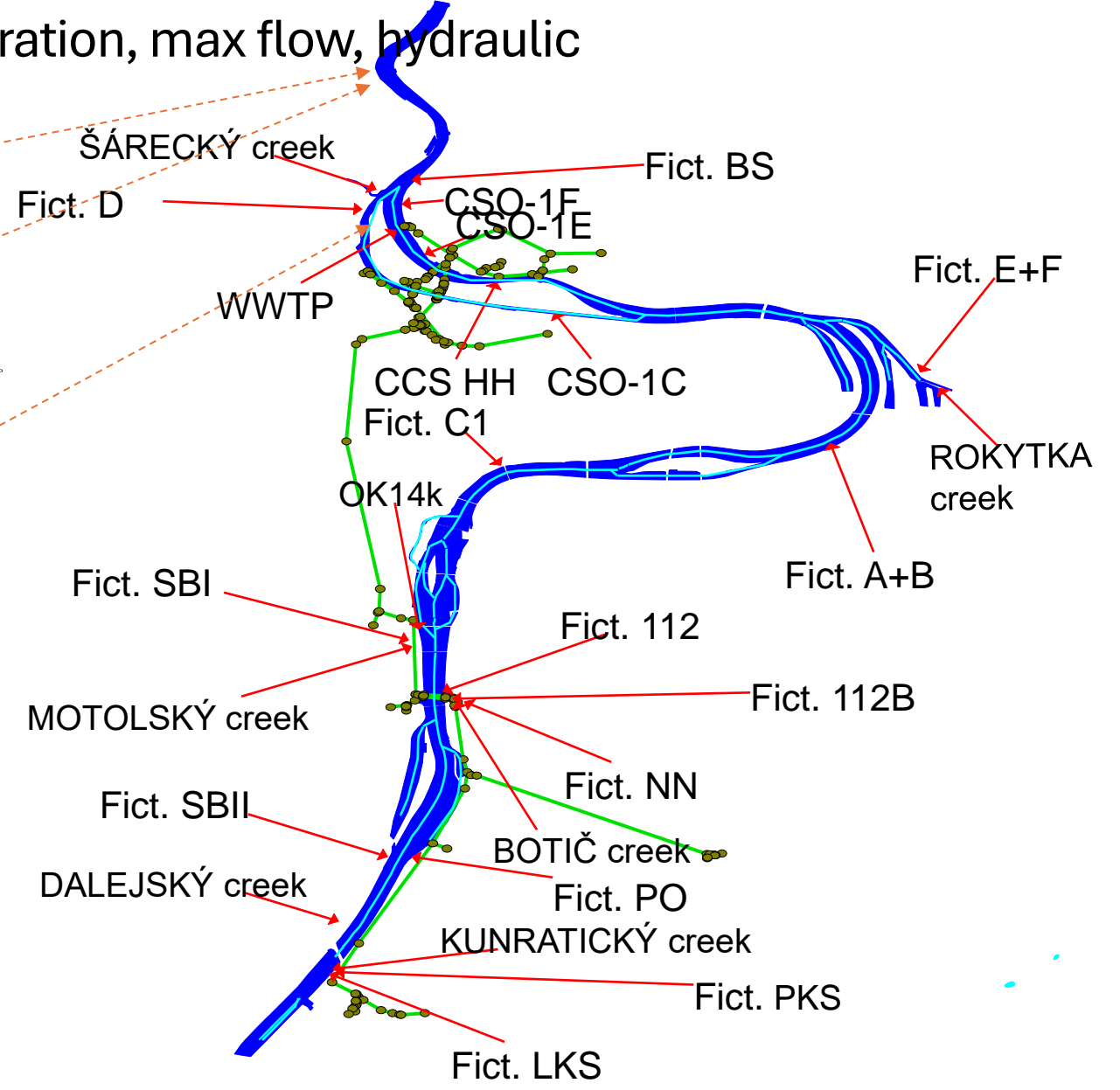
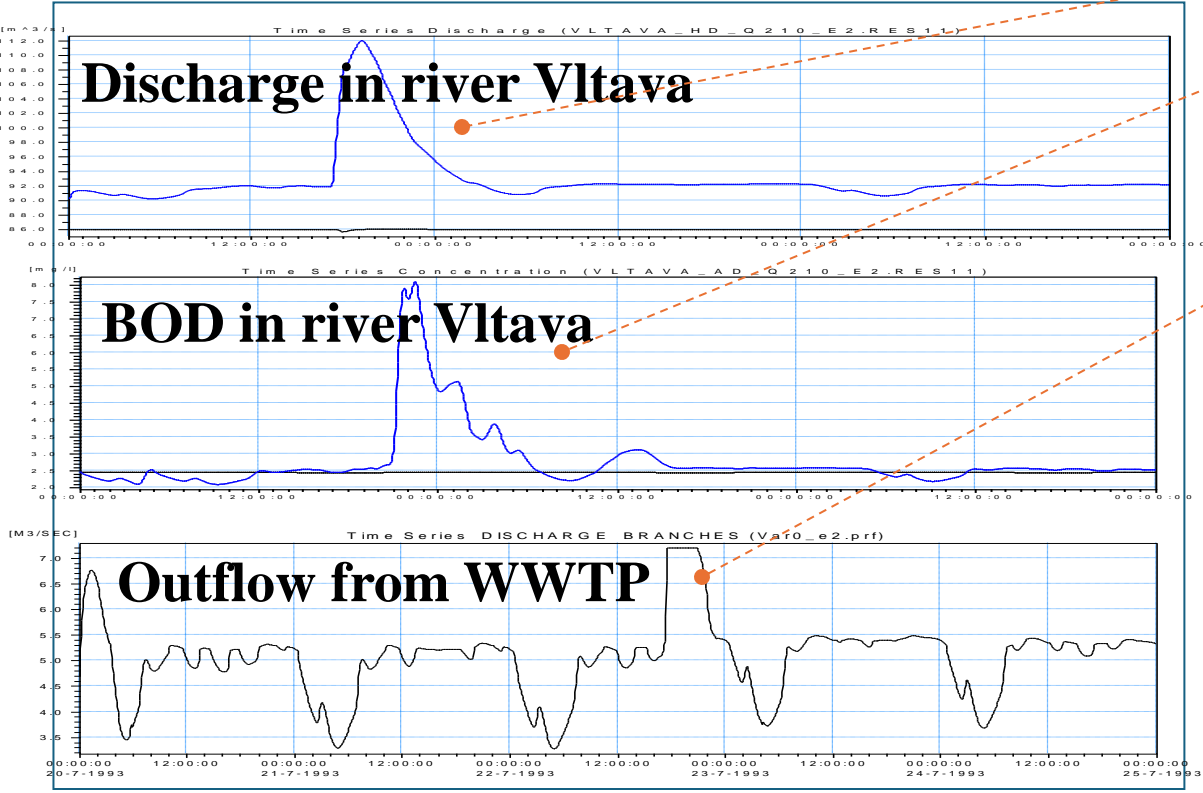
■ Total inflow to the city



Impact parameter	BSK5 [t/year]	CHSK [t/year]	NL [t/year]	N tot [t/year]	N-NH4+ [t/year]	P tot [t/year]
Total inflow to the city	8 700	62 500	44 500	47 500	270	400
Total impact from CSOs	430	1 100	640	107	60	20
Total impact from WWTP	3 700	12 600	5 800	4 100	950	250

# Quantitative results - acute river impact

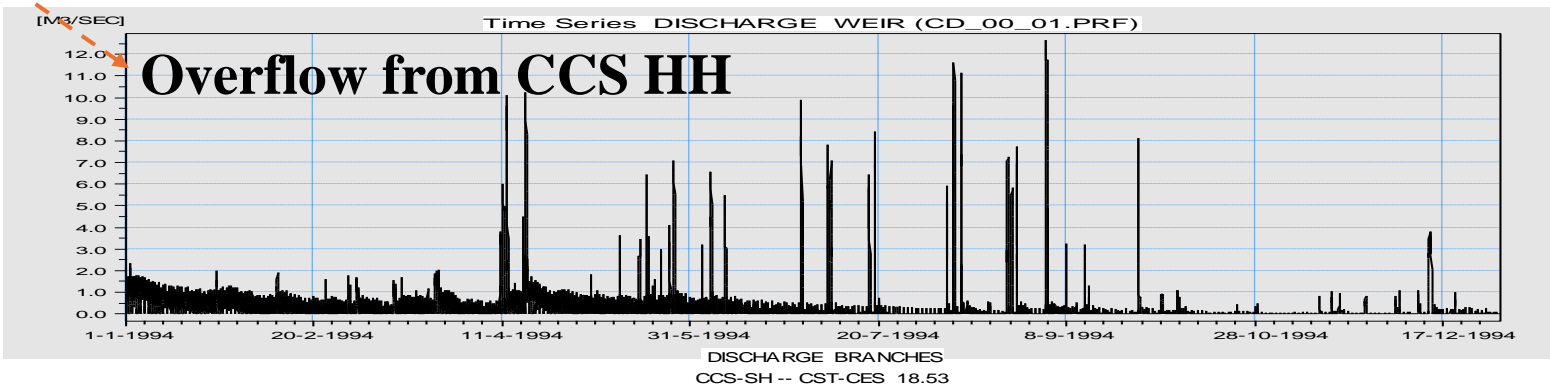
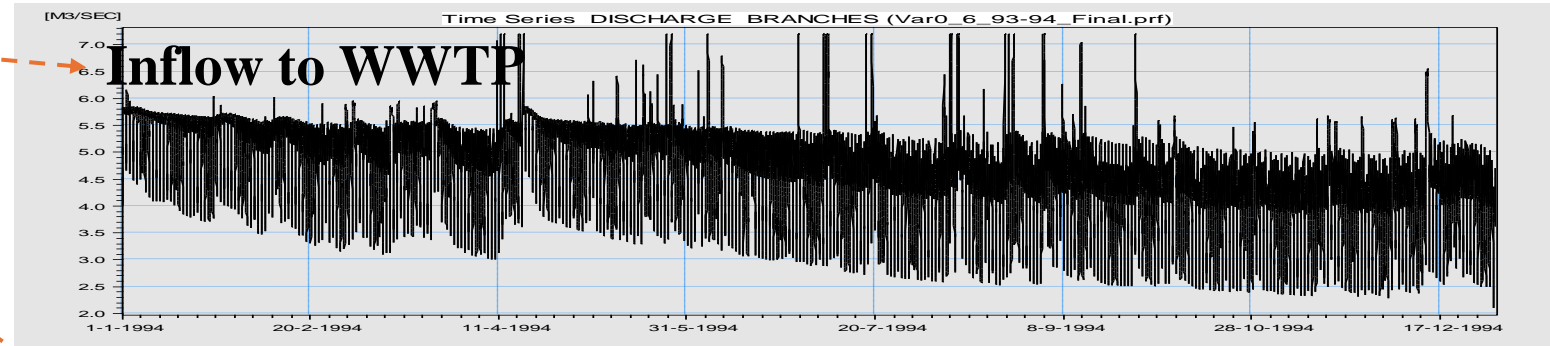
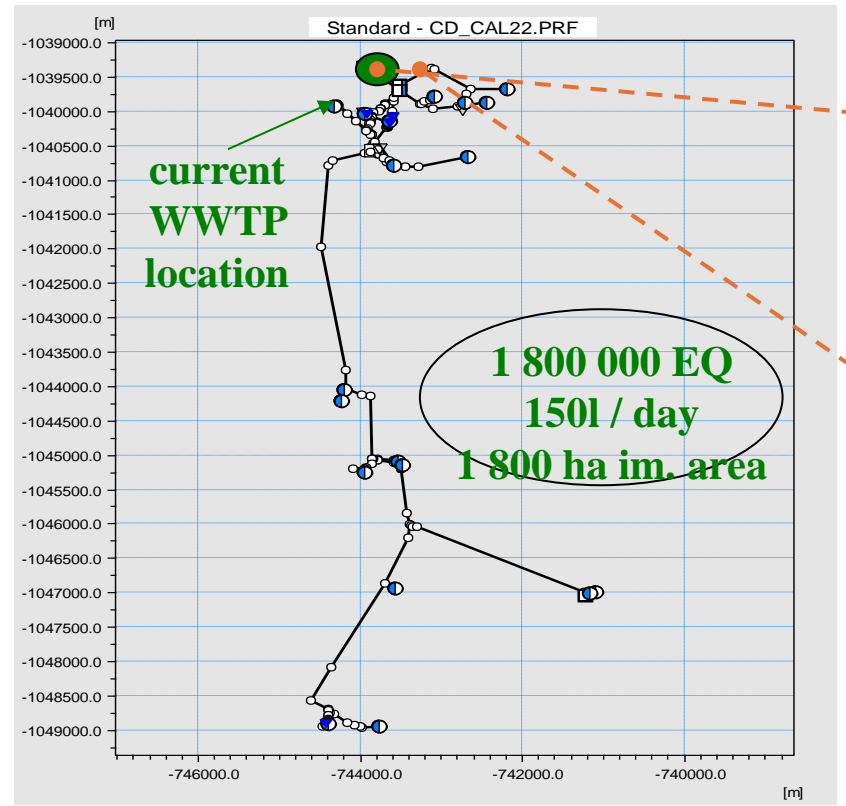
Key performance indicators: accute concentration, max flow, hydraulic



parameter	units	Standard	Simulation
O <sub>2</sub>	[mg/l]	> 5	4.5
BOD	[mg/l]	< 10	8.1
Ammonia	[mg/l]	< 1.5	1.28
Nitrate	[mg/l]	< 31,0	18.3
Phosphorus	[mg/l]	< 0.4	0.54

# Quantitative results - long term performance

Key performance indicators: cumulative distribution curve, min max Q,...



Total water production	149,4 mil m3
Total treated volume	144,7 mil m3
Total diverted volume	4.6 mil m3
Q max	7.2 m3/s
Q min	2.5 m3/s
Q average	4.8 m3/s

