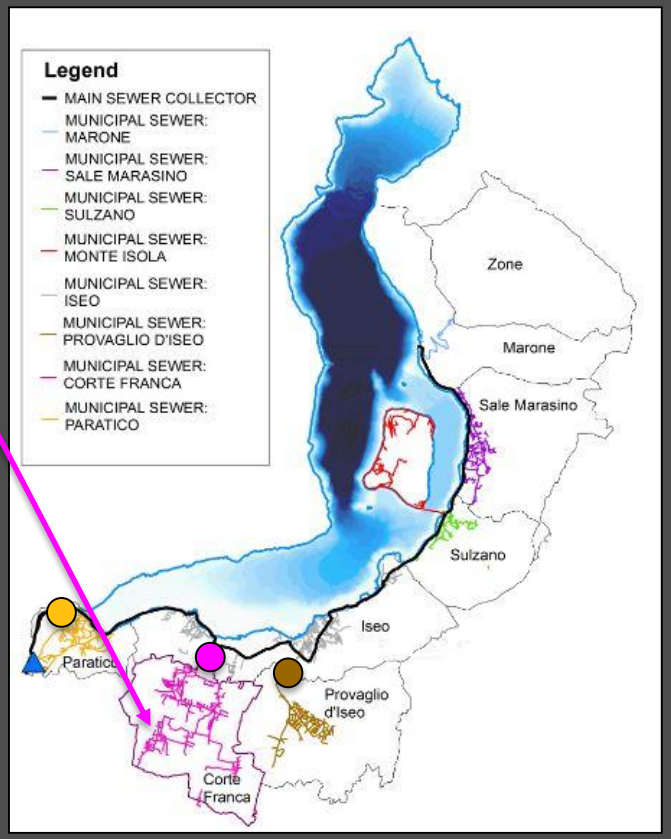
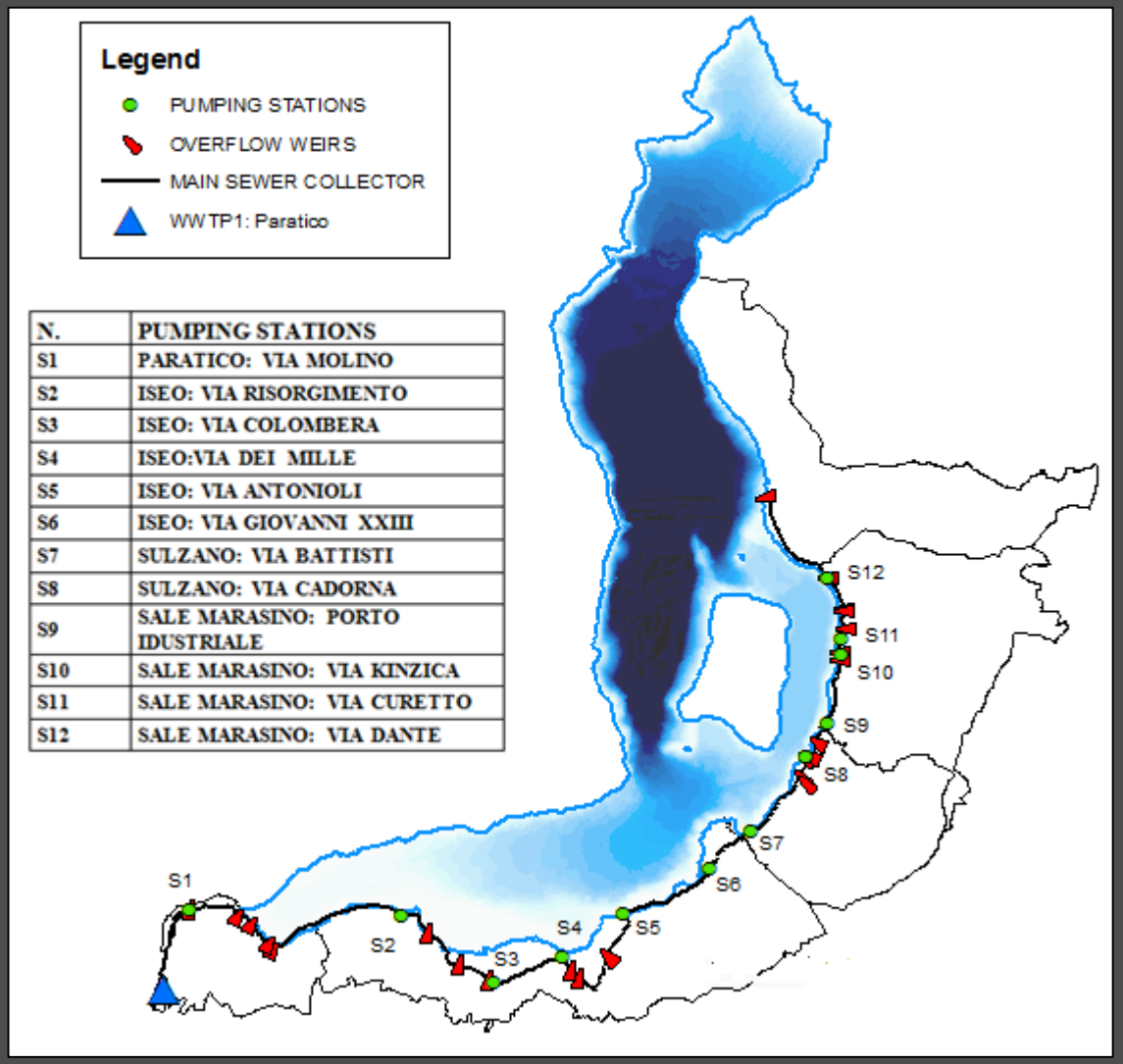
Collector and municipal sewer modeling:

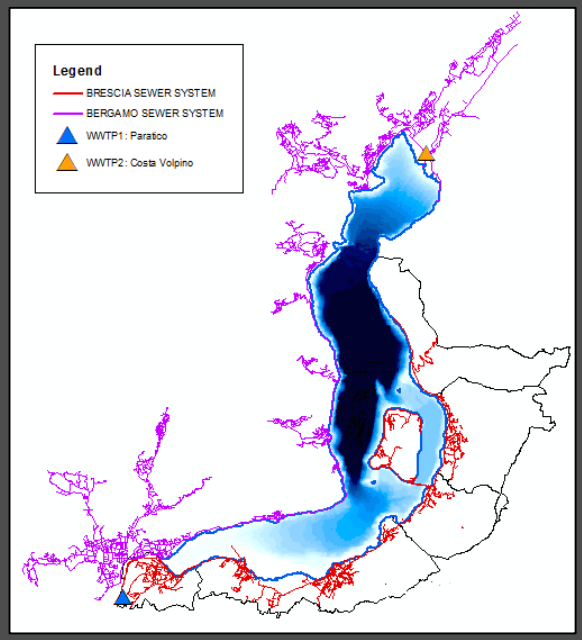
- ☑ Hydraulic-hydrologic model of the sewer collector around Lake Iseo and model calibration;
- ☑ Hydraulic-hydrologic model of a municipal sewer: Corte Franca;
- ☑ Measures of the inflow to the CSO of Corte Franca, upstream the entrance of municipal line in the collector, and of the flow discharged to lake;
- ☑ Corte Franca hydraulic-hydrologic model calibration;
- ☑ Installation of 2 portable automatic samples and of a conductivity probe for the analysis of the water quality;
- ☑ Hydraulic monitoring and modeling of the CSO of Paratico along the collector;
- ☑ Hydraulic monitoring and modeling of the CSO of Provaglio upstream the entrance in the collector.



Main sewer collector around Lake Iseo (East side)



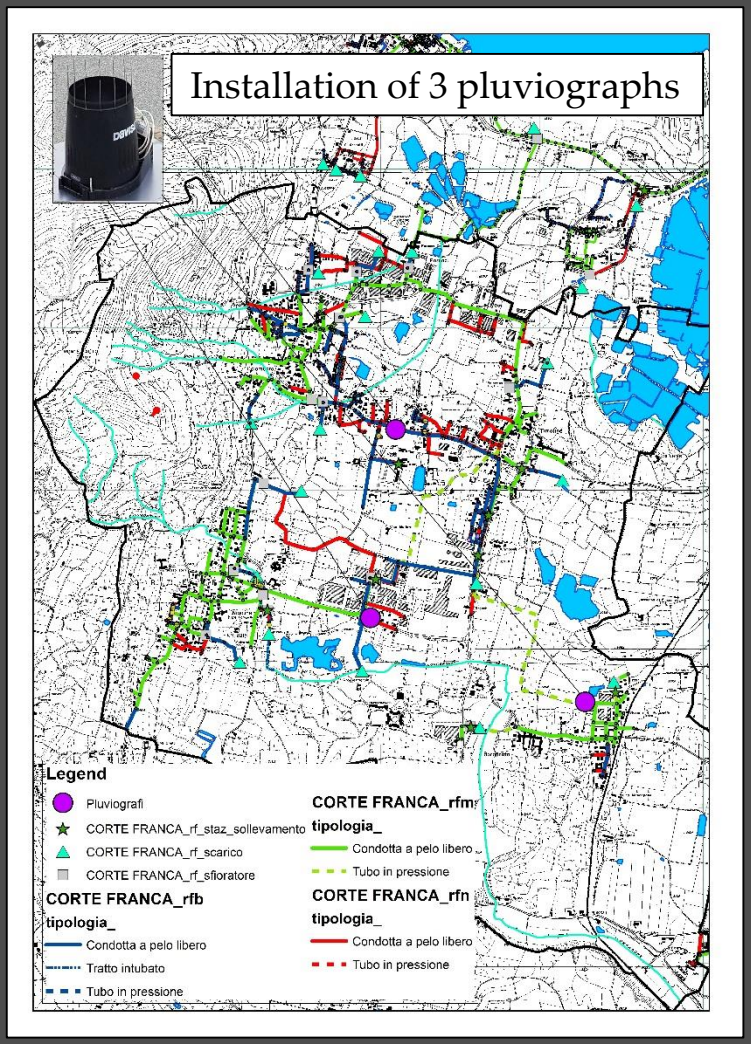
N.	PUMPING STATIONS
S1	PARATICO: VIA MOLINO
S2	ISEO: VIA RISORGIMENTO
S3	ISEO: VIA COLOMBERA
S4	ISEO:VIA DEI MILLE
S5	ISEO: VIA ANTONIOLI
S6	ISEO: VIA GIOVANNI XXIII
S7	SULZANO: VIA BATTISTI
S8	SULZANO: VIA CADORNA
S9	SALE MARASINO: PORTO IDUSTRIALE
S10	SALE MARASINO: VIA KINZICA
S11	SALE MARASINO: VIA CURETTO
S12	SALE MARASINO: VIA DANTE



BS sewer system:

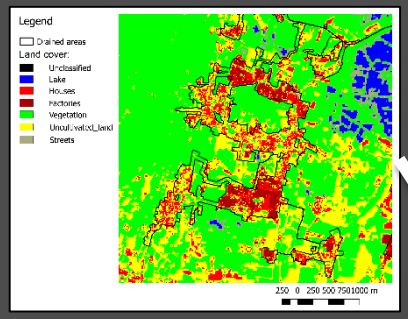
- *Drained area: 330 haimp;*
- *Land use: mainly residential;*
- *Equivalent population: 36˙292 p.e.;*
- *Sewer system length: 23 km;*
- *12 Pumping stations;*

Detailed hydraulic and hydrologic modeling of the municipal sewer system of Corte Franca

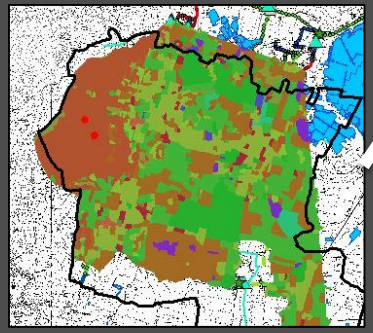


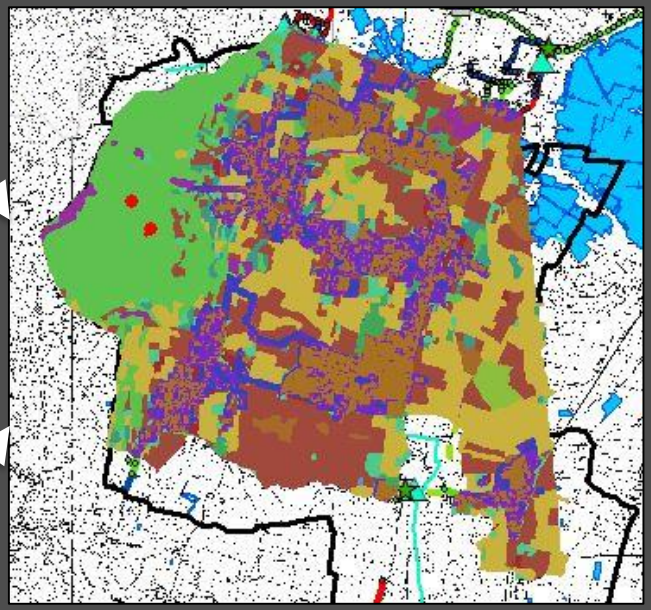
CN map: integration of information of Dusaf with land cover from satellite images analysis

CN map: satellite images

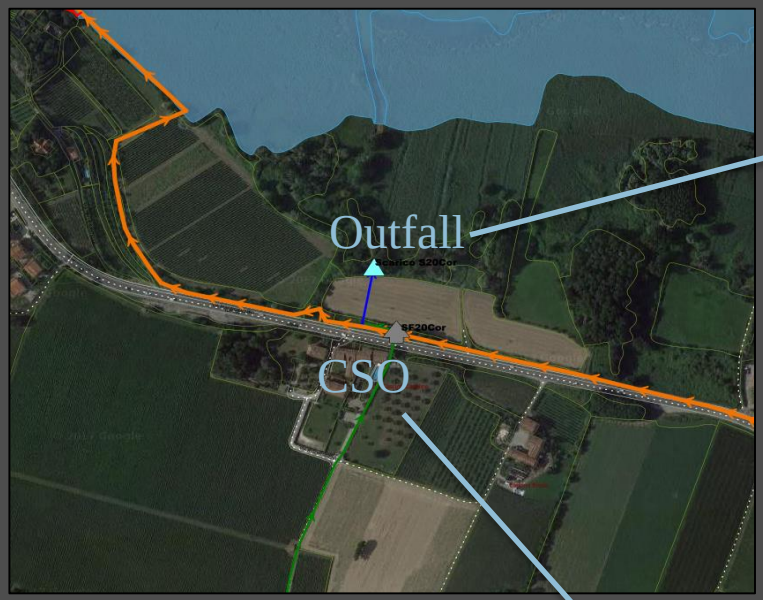


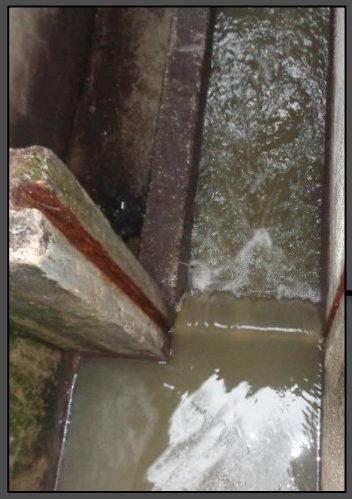
CN map: Dusaf

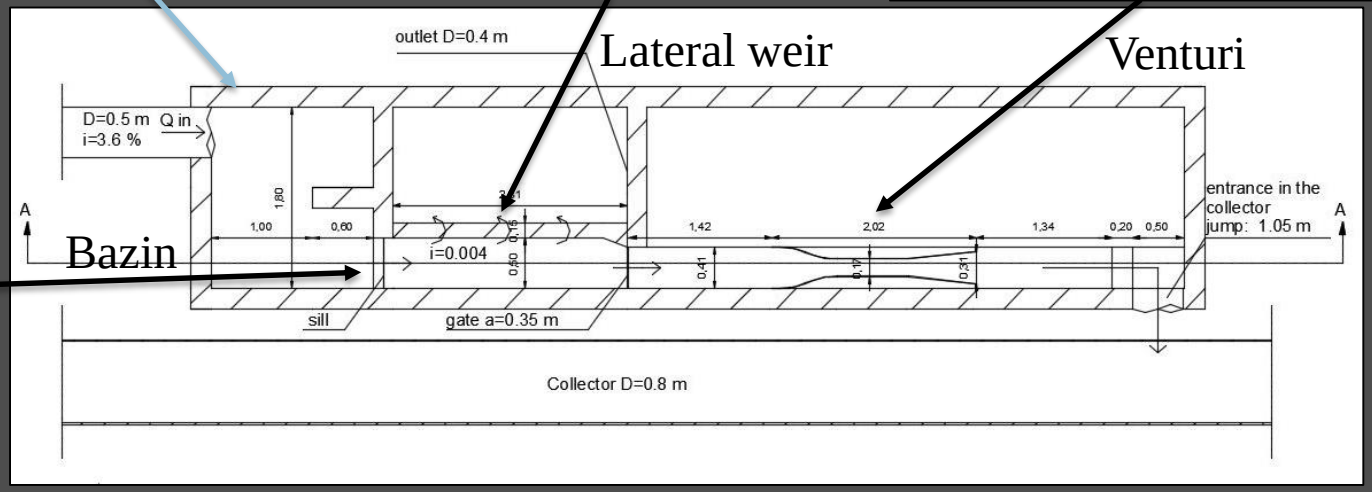




CSO of Corte Franca, upstream the entrance of municipal line in the collector

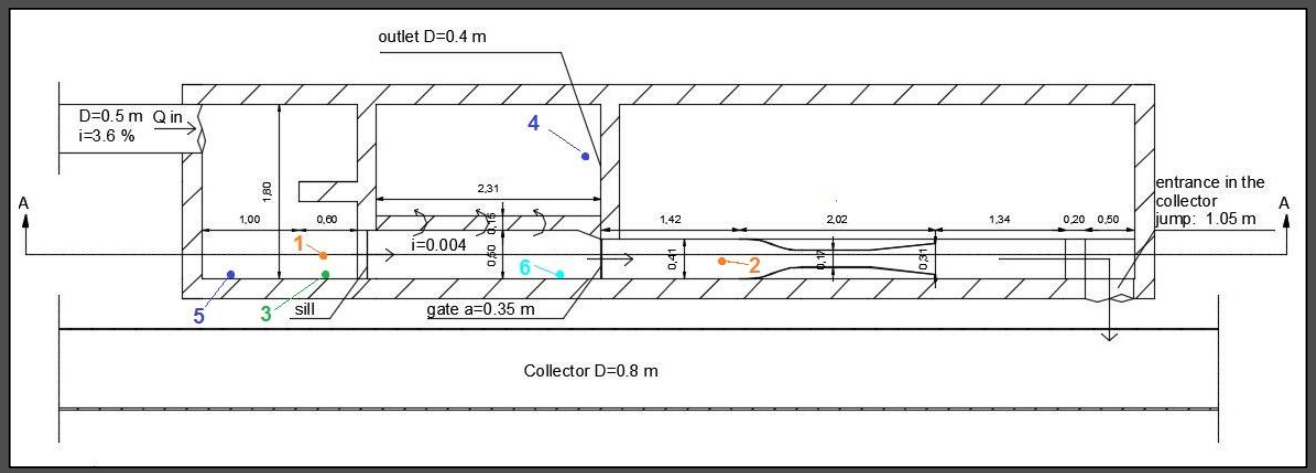






Measured data: CSO of Corte Franca

2 ultrasonic sensors for level measurement



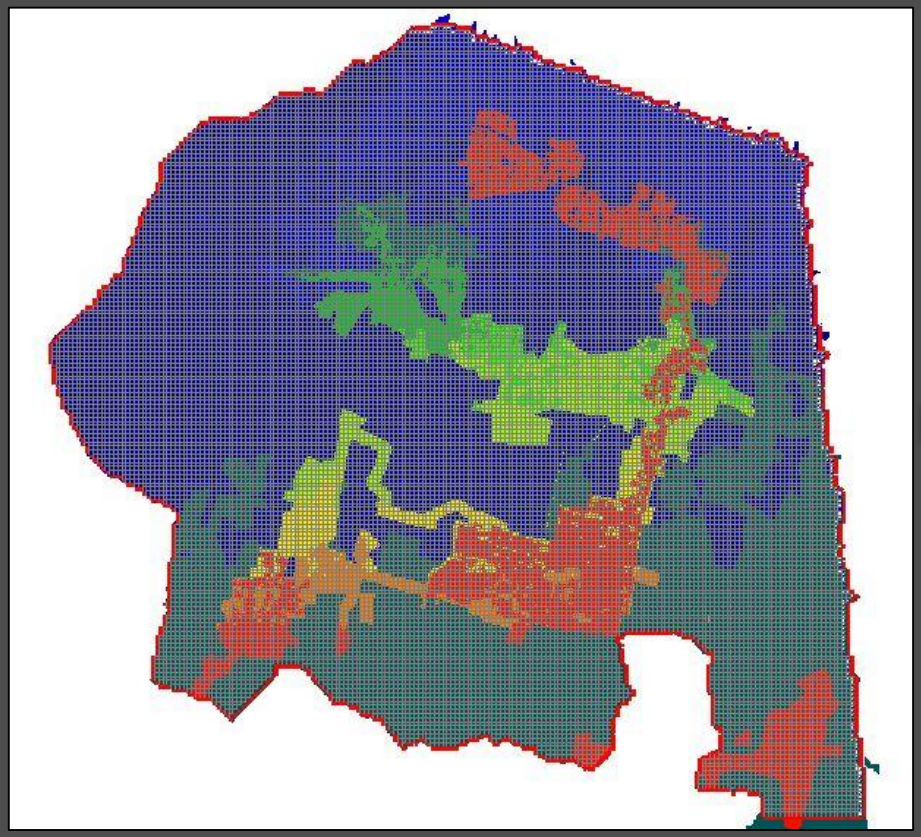
1 portable discharge measurement device (Doppler sensor) for stage-discharge curve calibration

1 portable sampler and 1 conductivity and temperature probe

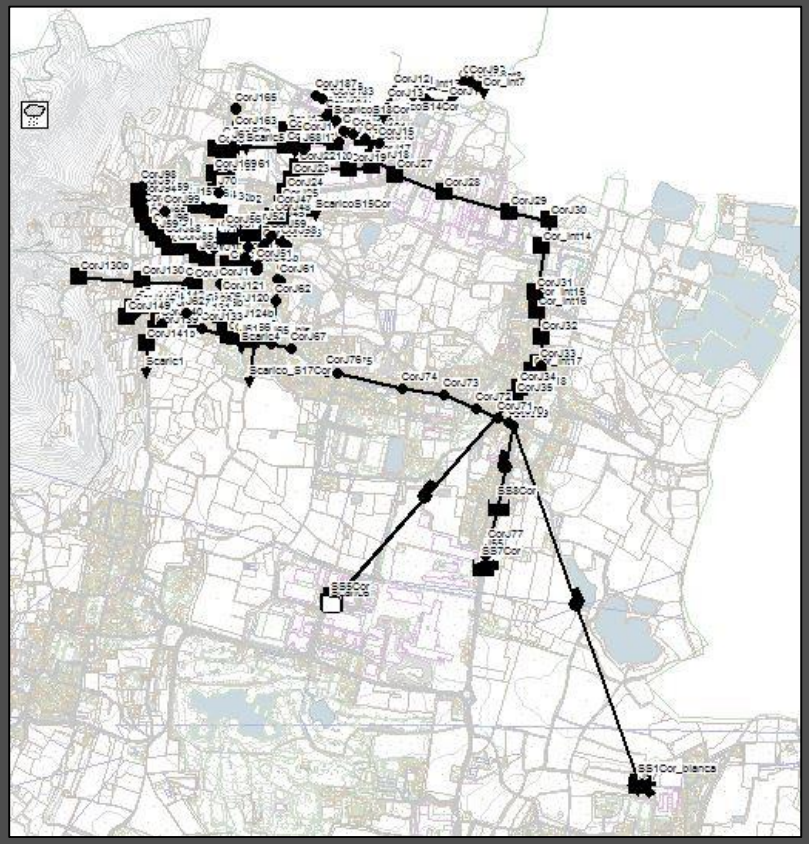
1 tracimation sensor CSV

Coupling of hydrologic and hydraulic model of Corte Franca

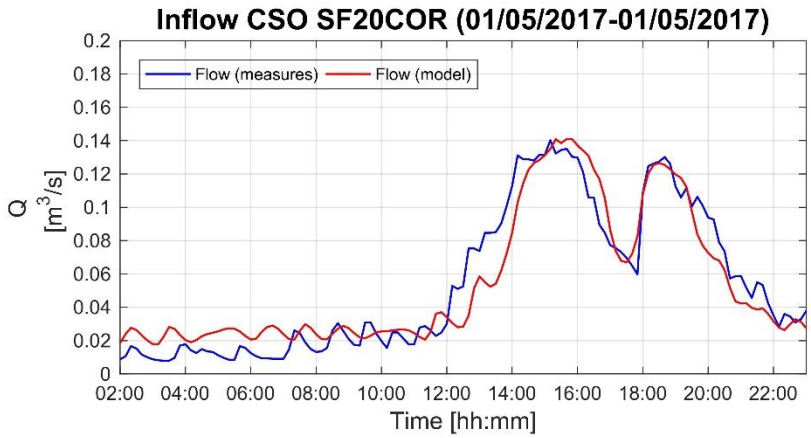
FLO-2D:
Calculation code for the bidimensional hydrologic modeling

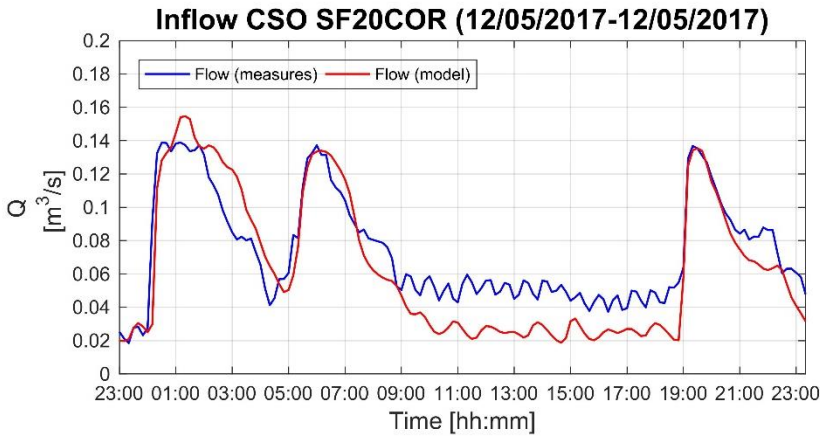


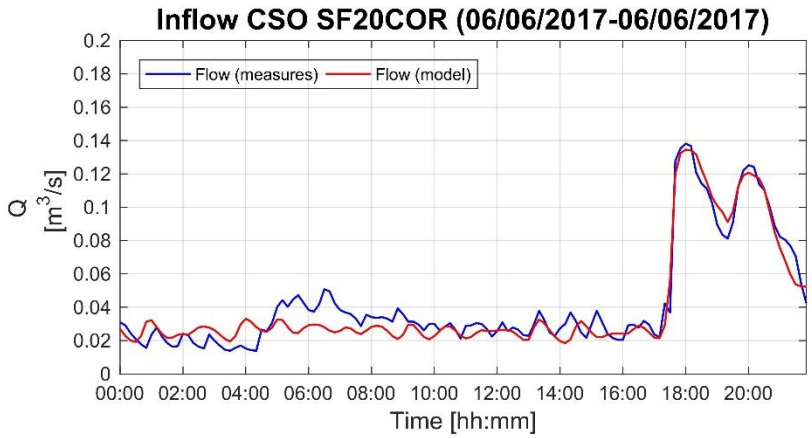
SWMM:
Calculation code for the hydraulic modeling of sewer systems

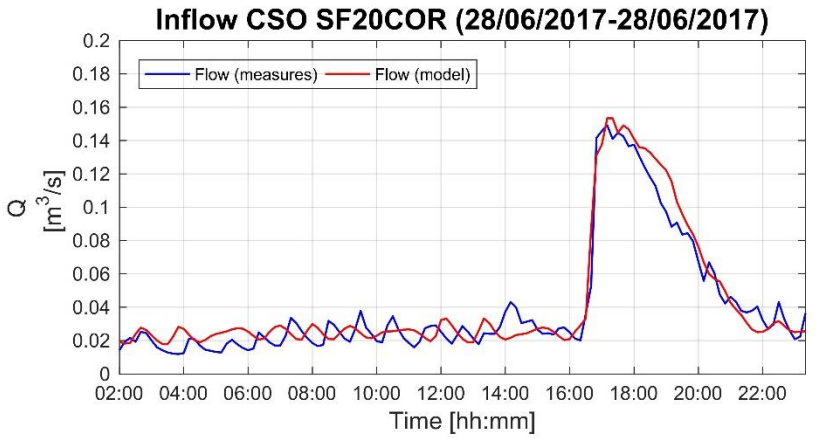


Results of hydraulic-hydrologic model of Corte Franca (FLO-2D – SWMM): comparison between measured and calculated flow

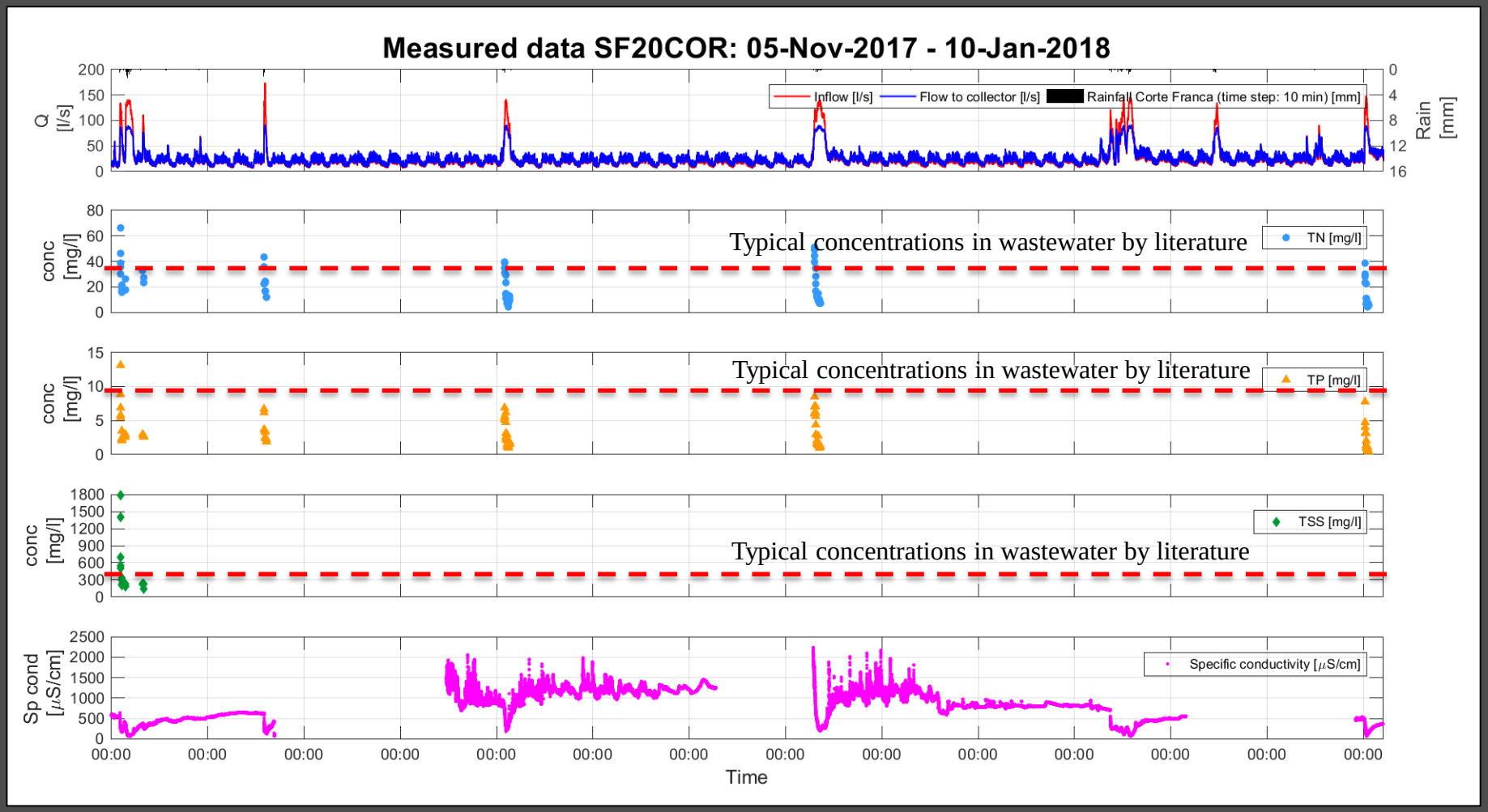




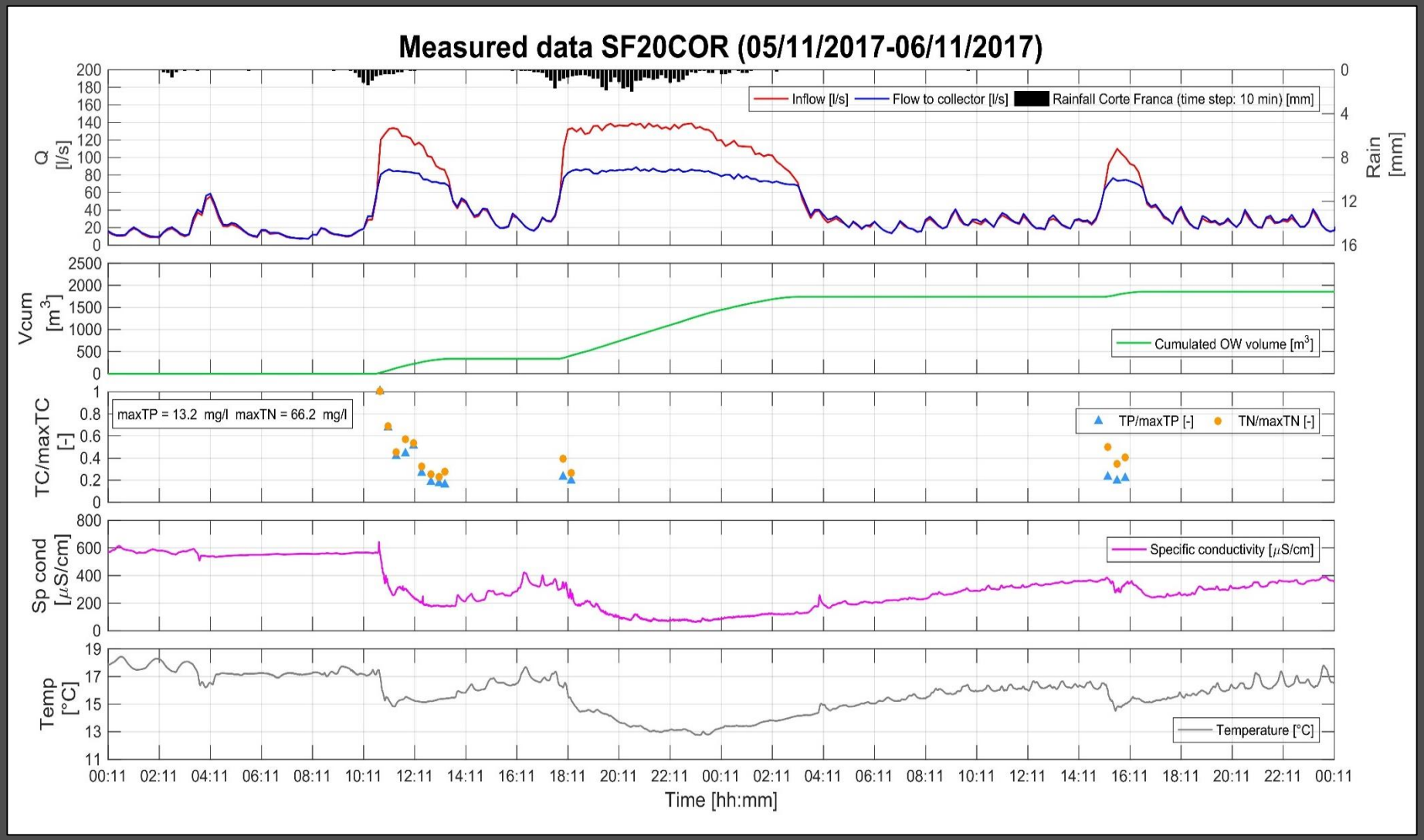




Measures of discharges and pollutants concentrations

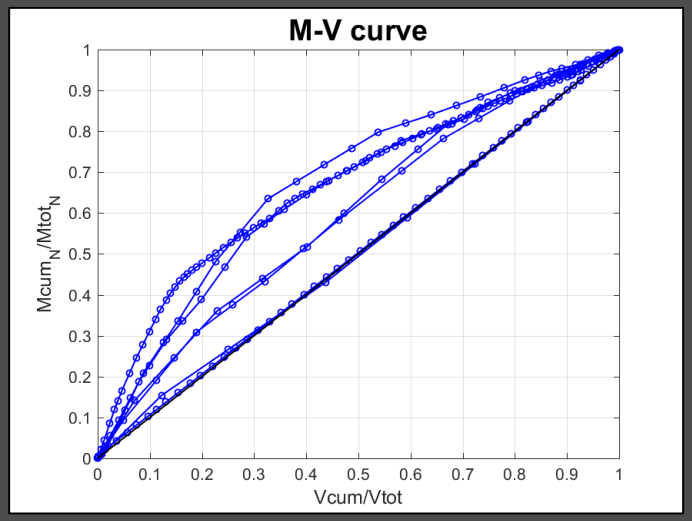


Measures of discharges and nutrients concentrations

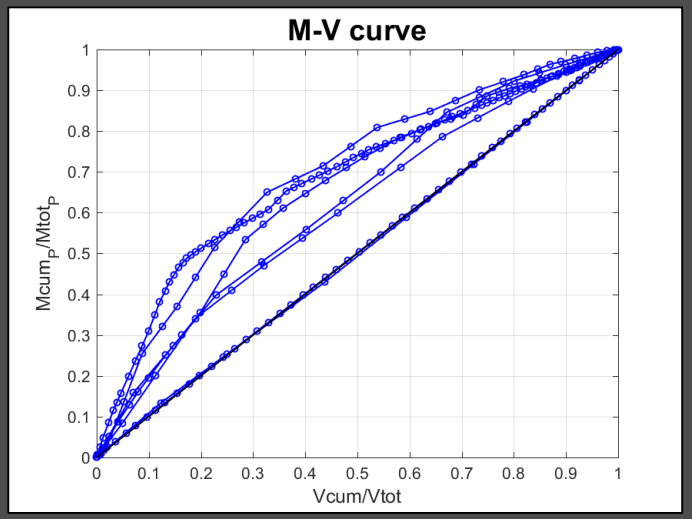


First flush analysis

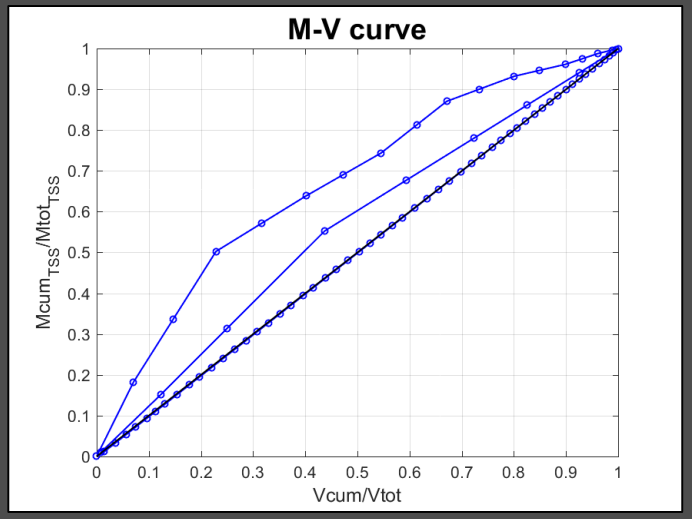
Total N



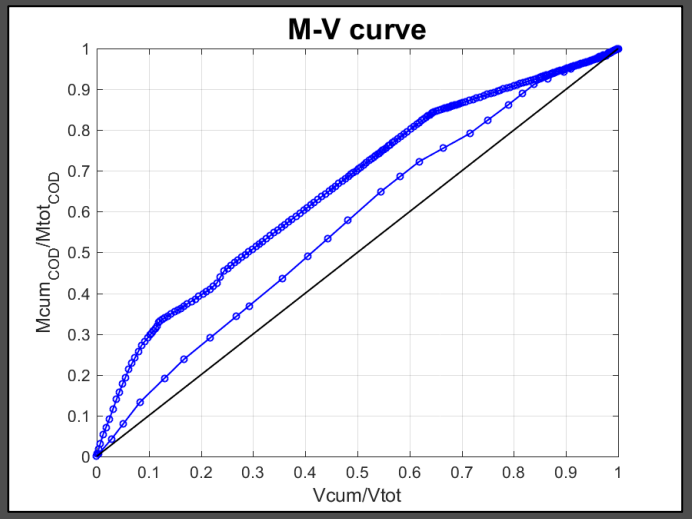
Total P



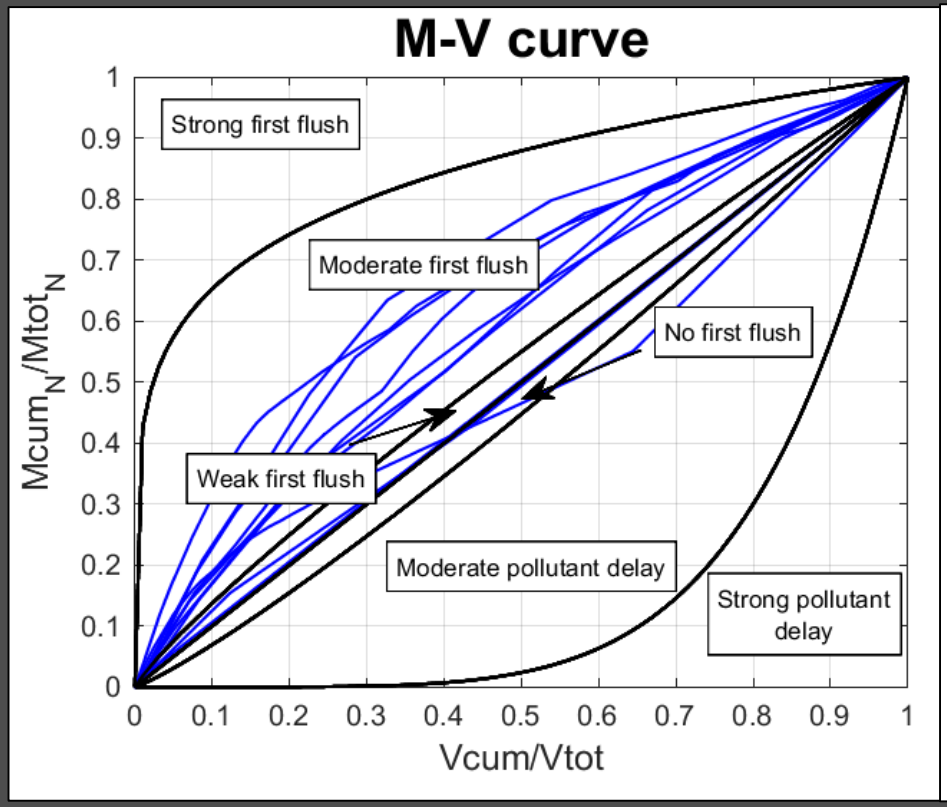
TSS

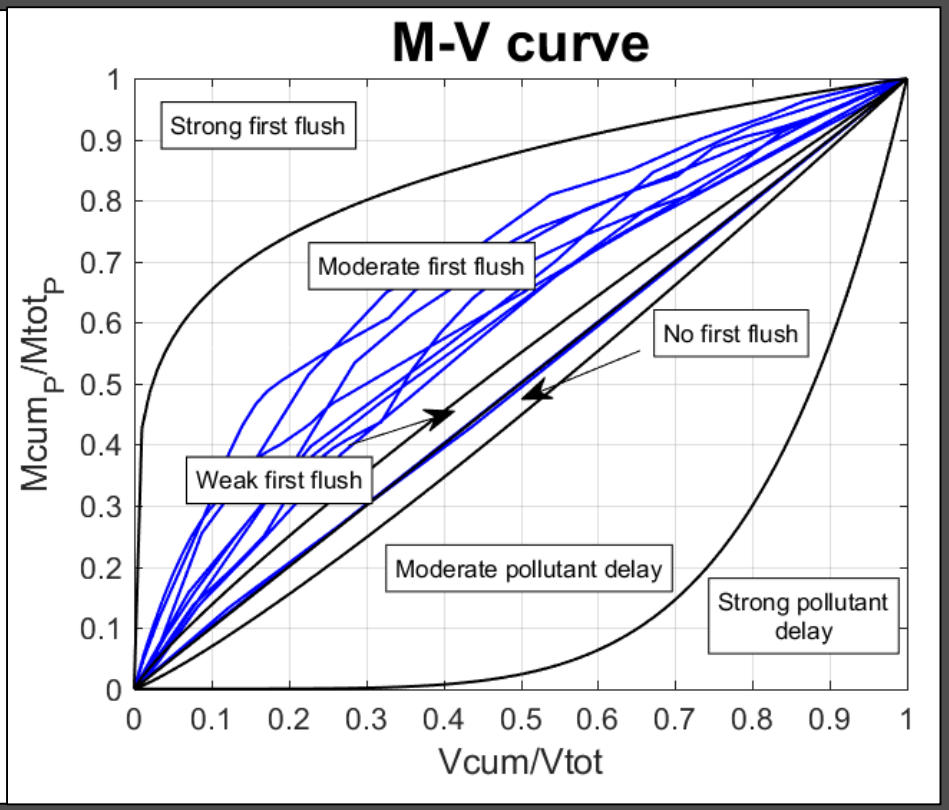


COD

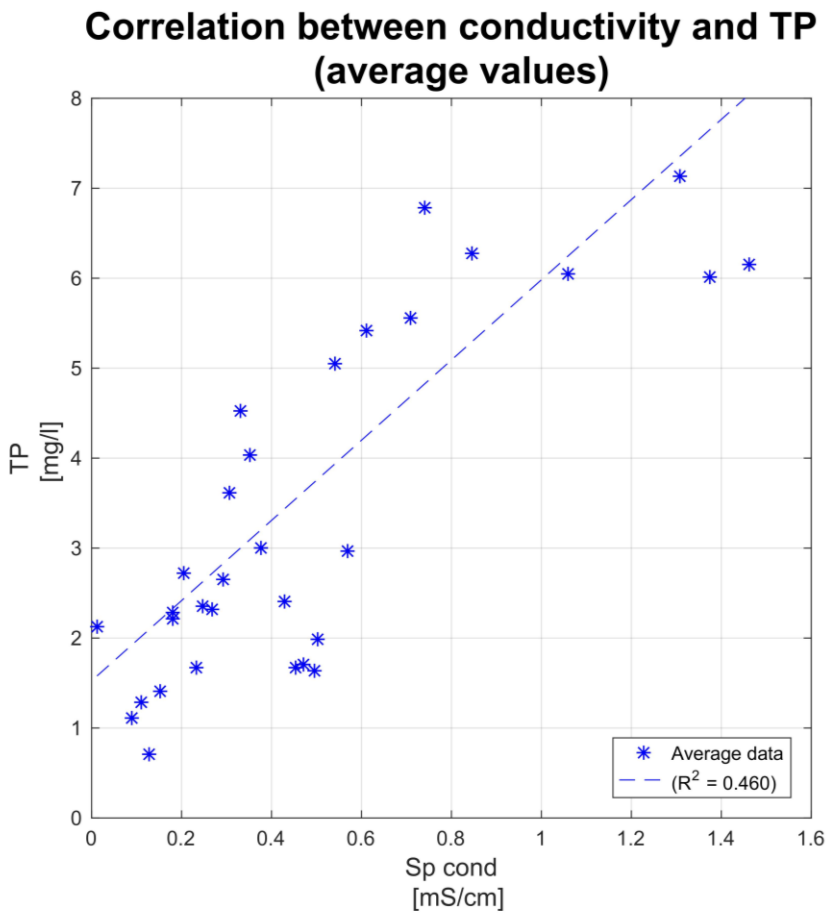


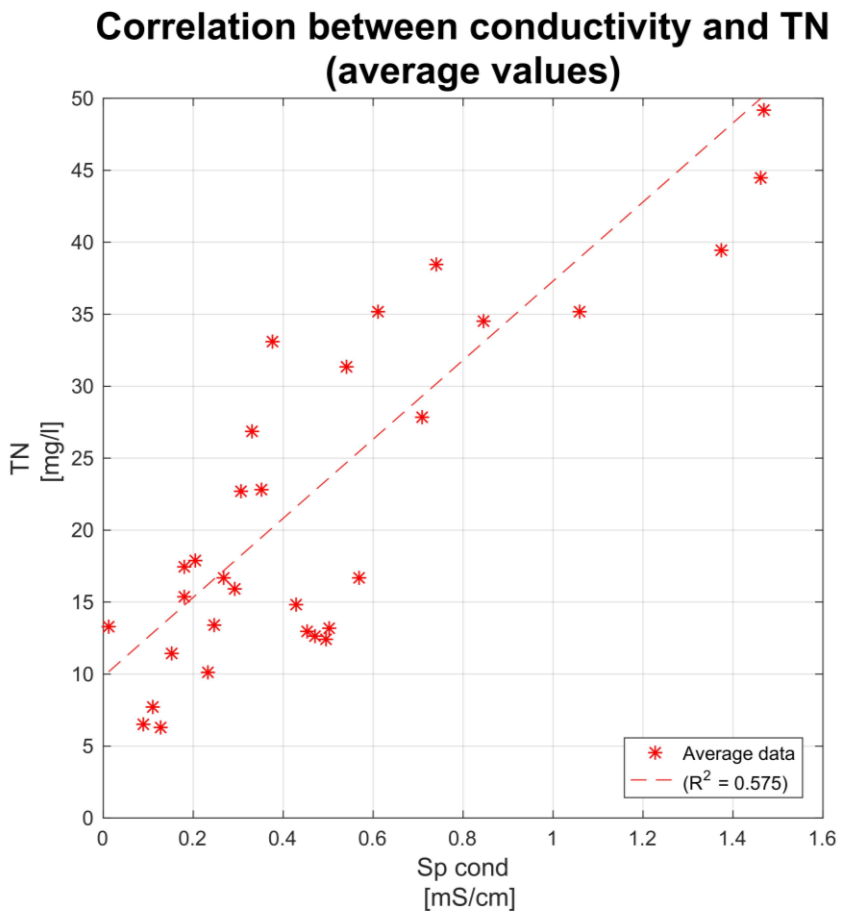
First flush analysis of the CSO events for Total Nitrogen and Total Phosphorus



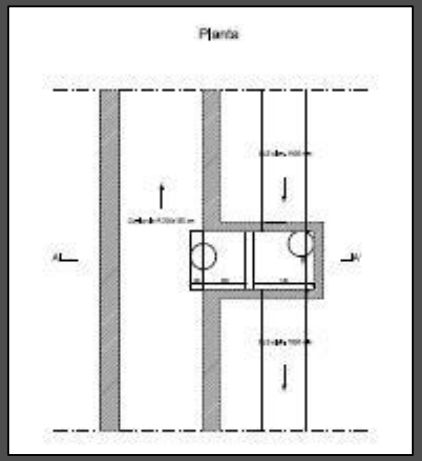


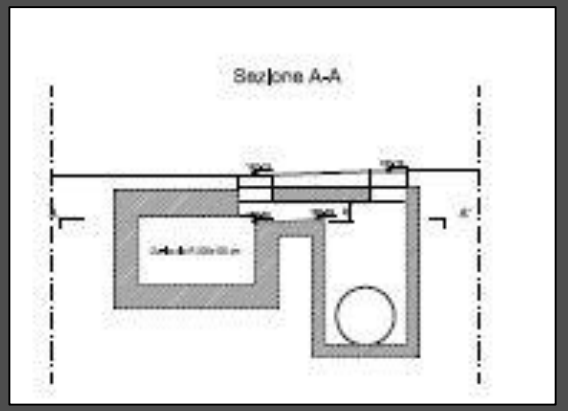
First flush analysis using conductivity data





Measured data: CSO of Paratico



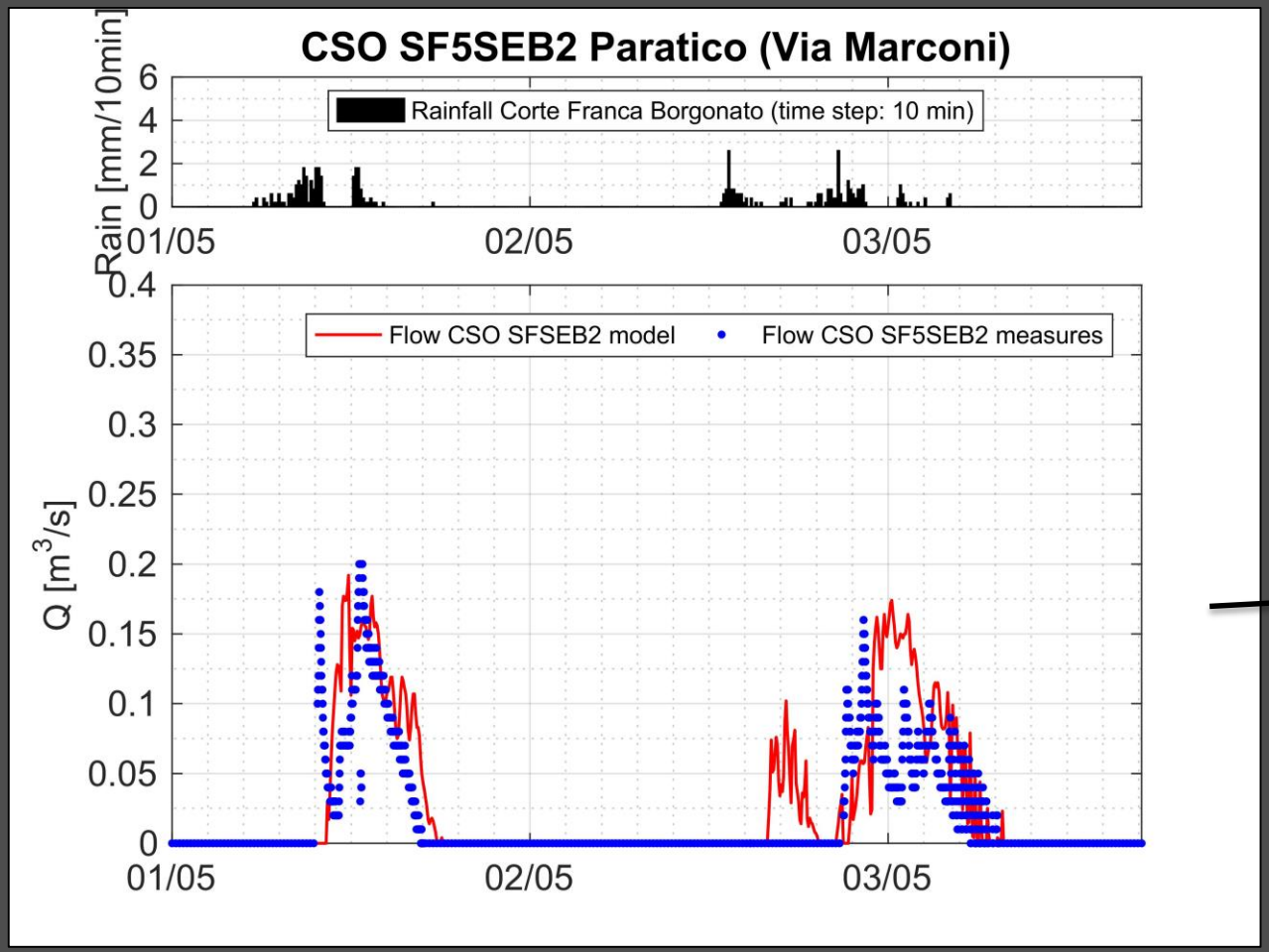


1 ultrasonic sensors for level measurement with tracimation sensor

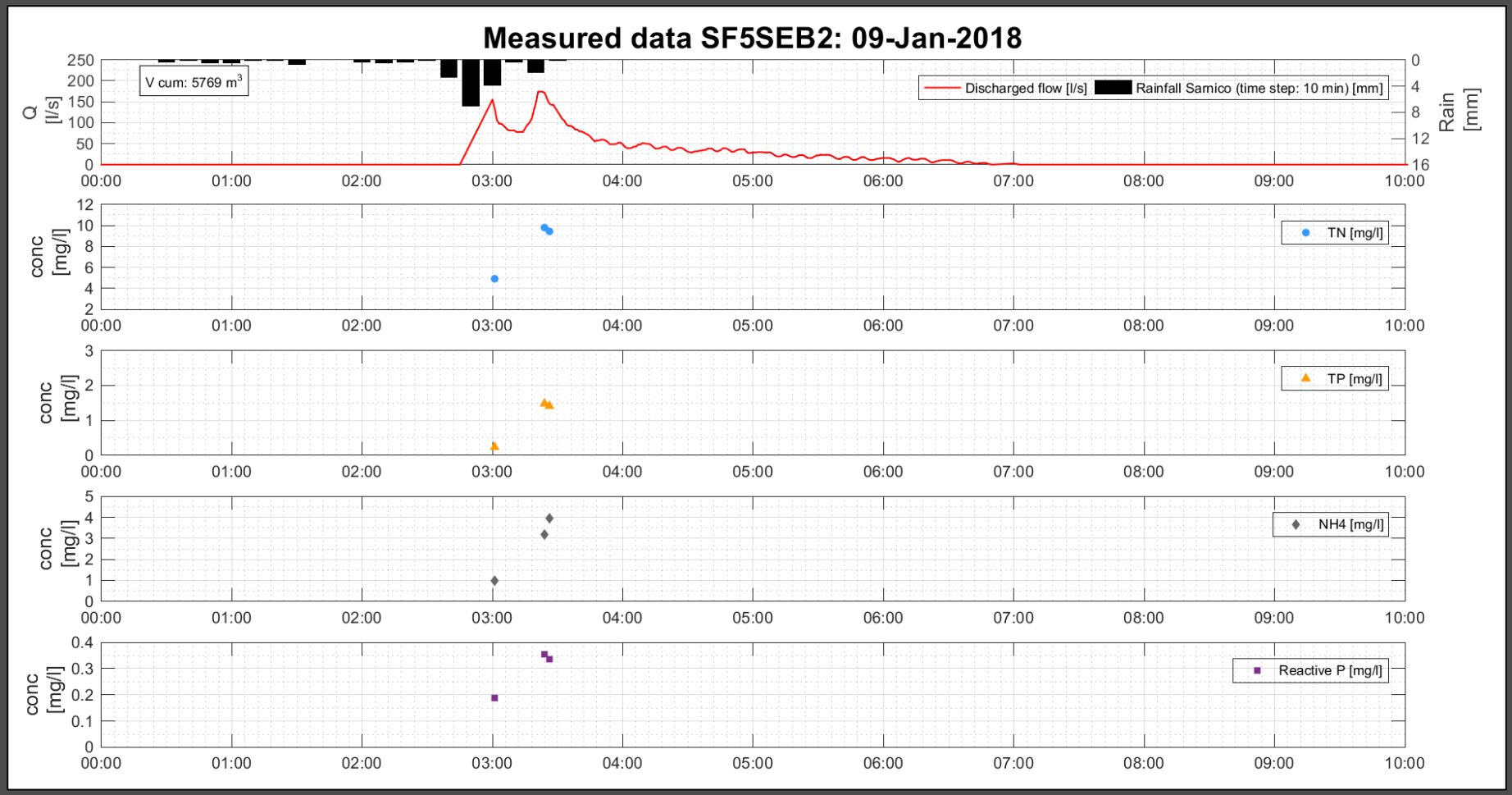
1 portable sampler (to be installed)

1 portable discharge measurement device (Doppler sensor) for stage-discharge curve calibration

CSO of Paratico along the main sewer collector: comparison between discharged flow measured and modeled



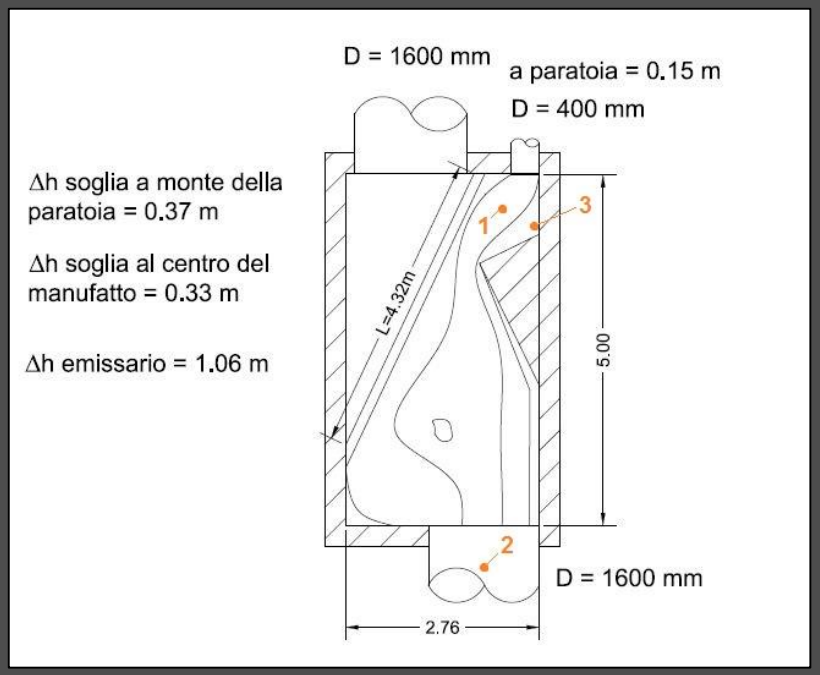
Measured data: CSO of Paratico

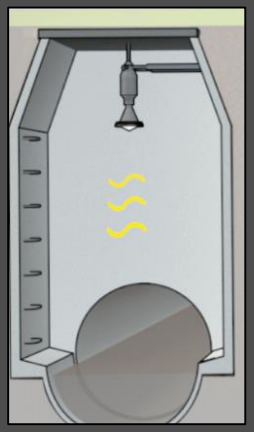


Hydraulic-hydrologic model of the municipal sewer system of Provaglio d'Iseo: in the calibration phase

CSO of Provaglio, upstream the entrance of municipal line in the collector

Measured data: CSO of Provaglio d'Iseo





1

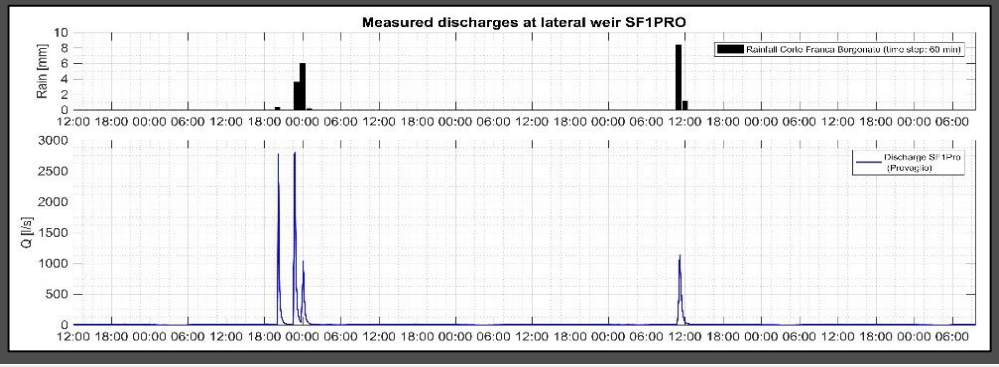
1 radar sensors for level measurement upstream the sluice gate

2

1 portable discharge measurement device (Doppler sensor) for stage-discharge curve calibration

3

1 tracimation sensor CSV



Calculation of stage discharge curve: comparison between discharge calculated with direct method (area velocity) and the one calculated through the stage-discharge curve, where water depth is provided by radar.