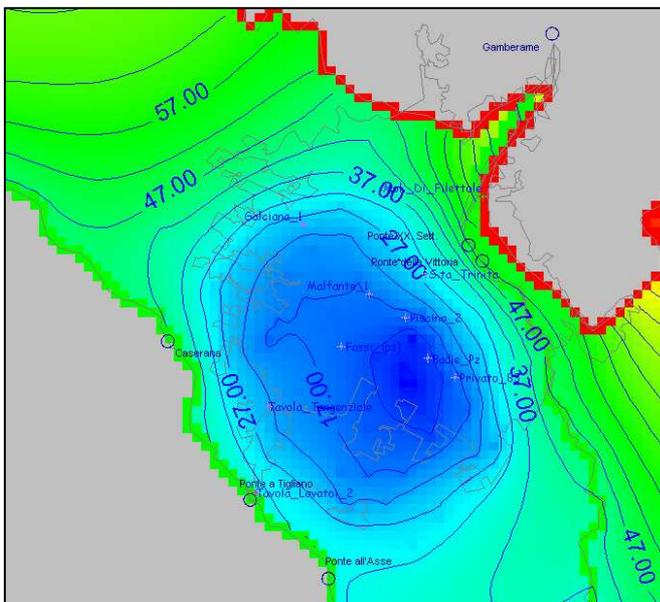


An Overexploited Aquifer in Prato, Italy: a Physical Model for Groundwater Resources Evaluation

The Prato aquifer, essentially by the alluvial fan deposition made by Bisenzio River, plays a key role in the water supply of the whole urban area of the Medio Valdarno, both for drinkable and industrial purposes. A major depletion of groundwater resources due to a strong overexploitation has been recorded over the past 40 years. Many geological, sedimentological and hydrological studies have been carried out over the last 20 years in the area. Geological maps and cross sections along with the monitoring of groundwater levels provided a detailed picture of the Prato hydrogeological structure.

The key approach to understand the Prato aquifer system was the quantification of each single term of the water balance. For this purpose, stepping onto groundwater levels and Bisenzio water levels being continuously monitored by a number of



selected stations since 1950, all data available have been reviewed and reorganised in a database.

On this basis a numerical model of the aquifer was developed. Boundary and starting conditions of the model were chosen according to geographical conditions, literature and collated data and according to direct calculations.

The modelling approach was designed as a multi-step process. As a first step the situation in 1986 was simulated with a single layer model in steady state conditions. The results of the calibrated model provided further information on the relevance for aquifer recharge of infiltration from the Bisenzio River bottom and on the real exchange among aquifers.

To account for the non-equilibrium condition of the aquifer system and its long history of unsustainable groundwater abstractions it was planned to develop a transient model containing different stress periods between 1960 and 2003. The calibrated transient model is aimed for becoming a prediction tool and decision support in the future management of the water resources of the Prato aquifer system, even in the view to investigate the efficiency of artificial recharge measures at different locations within the system.

