Abstract

The objective of this study was to develop a hydrogeologic model for a quarternary main aquifer, shown on the map sheet No. 7940 Obing, Germany, with special regard to the exchange processes between ground- and surface waters. The hydrogeologic model can be considered as a process to develop conceptions of the hydrogeologic system that range from the consideration of the initial information to the development of a plausible, spatial differentiated, at any point quantifiable hydrogeologic conceptual model up to its verification. The art of questioning and the objective, the economical feasibility as well as the tools available should be named as controlling factors for this process. The hydrogeological model of the quarternary main aquifer was organized in the following logically interconnected information levels:

- drilling register and classification of wells and bore holes
- digital landscape model
- digital topographic map based on the object range of ATKIS 25 (preliminary stage)
- groundwater contour map with evaluation of long-term observance of ground- and surface water levels
- areal representation of the bottom of the aquifer
- aquifer thickness maps and depth to water table maps
- areal representation of geohydraulic parameters
- areal and temporal representation of the nitrate contamination
- temporal occurrence of herbicides and insecticides

Statistical (histogram, distribution evaluation) and linear geostatistical methods (variogram analysis, ordinary kriging) served to regionalize the information that exists punctually like groundwater level, etc. Anisotropies within individual data sets of the groundwater table, the base level of the aquifer and its thickness were detected by the geostatistical methods applied. The orientation of the anisotropy ellipse with the highest range and sill values corresponds with the general groundwater flow direction of the main aquifer. Futhermore, unrealistic groundwater base level data were detected by a combination of the classification of bore holes and variogram analysis. Problems occurred by application of the classical linear geostatistical methods in regard to the robustness of the estimation. The reasons for this are the partial existence of drift components, an irregular measuring raster as well as data sets outside the normal distribution range.

In the quarternary main aquifer an areal nitrate contamination (35.6 ± 12.3 mg/l) was detected with concentrations that partially exceed the drinking water standards. The same was found for the herbicides Atrazin and its primary degradation product Desethylatrazin. Influence factors could be formulated with the help of the hydrogeologic conceptual model and the transport behaviour of these pollutants (little to no retardation in the saturated zone). Influence factors to be mentioned are land use, depth to water table, the supporting of the monitoring wells, bank infiltrate and seepage processes and the nature of groundwater basins. The local hydrogeologic conditions are to be considered when the reduction the pollutant concentrations in individual groundwater catchment areas is sought, rather than a nonexistent universally valid concept.

In the area of lakes hydrochemical changes are caused by seepage and bank infiltrate processes. In addition to the hydrochemical changes like reduced oxygen content, denitrification, reduction processes of iron, manganese and in some areas sulfate a high rate of groundwater recharge is featured. With the use of fluorescent dyes (Uranin and Eosin) to determine bank infiltrate processes a retardation of these tracers was detected in the highly organic soils. The investigations were verified by laboratory tests (batch and column tests with bromide as reference tracer).