



River rehabilitation within water supply areas – requirements for a process-based and water-quality oriented groundwater protection

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The rising demand for river restoration in many areas of Europe and North America emerges questions concerning the sustainable use of water resources. River restoration generally intensifies the exchange between river and groundwater and related dissolved compounds or particles. Recommendations concerning ecological measures of river rehabilitation within water supply areas should allow differentiated solutions ensuring groundwater and flood protection.

Finding sustainable solutions considering the conflicting interests between river rehabilitation and groundwater protection is a large cross-disciplinary challenge. The traditional approaches of groundwater protection were, e.g. demanding no alteration of overlying strata, the compliance with required groundwater travel times and distances as well as disconnecting river and groundwater. However these approaches do not meet the complexity of the demanded, improved river-groundwater interaction, in particular in urban and agriculturally intensively used areas. An extension of the existing protection concepts considering river-water quality and the filtration efficiency between rivers and production wells allow to combine the objectives of groundwater protection and those of nature-orientated water-ecosystems.

The concepts and methods presented here are illustrated by various field data and modeling examples from the Langen Erlen study site, located in an area of artificial groundwater recharge and production which contributes to the drinking water supply of the city of Basel, Switzerland. Processes of river-groundwater interaction have been characterized by analyses of physical, chemical, and microbiological data that were sampled in several observation wells between the river Wiese and production wells.

These data together with additional data from tracer experiments are incorporated for modeling the river-groundwater interaction. The transient groundwater model is used for realizing of previously developed scenarios of river rehabilitation and to evaluate the well capture zones. This paper identifies existing challenges in the conflicting interests between river rehabilitation and groundwater protection and presents further concepts beyond traditional approaches.