

Environmental impact assessment of risk associated with groundwater overdraft remediation in cone of depression, Jining, China

Abstract

In this paper, a simple scenario and probabilistic approach is used to assess the potential groundwater risk due to proposed overdraft remedial actions in cone of depression, Jining City, China. Focusing on the concentrations of Chloride ions (Cl⁻) and total hardness (TH), the impact of artificial recharge and reduced pumping on groundwater quality and quantity is analysed by using the three-dimensional finite difference groundwater flow and transport model, Visual MODFLOW, to simulate groundwater flow and transport within the study area based on scenarios, and utilizes SURFER software to map risk levels. Although 5, 10 or 15% reduced pumping with artificial recharge leads to more decrease in Cl⁻ and TH concentrations than the 25%, less volume increase is achieved for the remediation of land subsidence and other environmental problems in the cone of depression. The Cl⁻ concentrations in recovered groundwater are within the desired concentration of 200 mg/l; however, TH in some cases are above the maximum permissible limit of 500 mg/l, with an exceedence probability of about 0.67 for recharge and recharge with reduced pumping at 25%. The presence of fractures and hydrogeological complexity greatly determines impacts of remediation, and the 22% reduced pumping with artificial recharge offers an optimum strategy for overdraft remediation in the Jining cone of depression.

Authors.

B. T. I. Ong'or, Long-cang Shu & Pei-gui Liu