THE EFFECTS OF UNINSULATED SEWAGE TANKS ON GROUNDWATER. A CASE STUDY IN AN EASTERN HUNGARIAN SETTLEMENT

Abstract

In our study we attempt to demonstrate the effects of uninsulated sewage tanks, which are the most important sources of contamination in settlements without sewage systems, on groundwater quality. We compared the results of measurements carried out before and one and a half years after the construction of the sewage system. We established 3 m deep monitoring wells within a 25 m radius of a sewage tank, which were then sampled, and the level of groundwater was recorded. The 3D model constructed on the basis of the saturated zone shows that the effluent wastewater formed a groundwater level dome with a height of more than 1 m. After the sewage tank was taken out of use the difference between the highest and lowest groundwater levels decreased to a few centimeters. In our study we investigated the spatial distribution of NH$_4^+$ (ammonium). Using the 3D model we were able to precisely determine the volume of water bodies with different levels of contamination. In an approximately 25 m$^3$ water body, in the immediate environment of a sewage tank in use we detected NH$_4^+$ at a concentration which was characteristic of undiluted wastewater (>90 mg∙dm$^{-3}$). After the sewage tank was taken out of use, the concentration in its immediate environment decreased by more than 50%, although almost everywhere in the modeled area concentrations were measured above the limit value. Based on the above, we can conclude that the cleaning process has started, but the complete decontamination of the groundwater will take several years.

Key words: ammonium, groundwater contamination, groundwater level, modeling, pollution, wastewater