Geophysical Research Abstracts
Vol. 16, EGU2014-13556, 2014
EGU General Assembly 2014

Mathematical numeric models for assessing the groundwater pollution from Sanitary landfills

Vasil Petrov (1,1), Nikolay Stoyanov (2), and Petar Sotinev (3)

(1) University of mining and geology “St. Ivan Rilski”, Sofia 1700, Bulgaria (vpp973@gmail.com), (2) University of mining and geology “St. Ivan Rilski”, Sofia 1700, Bulgaria (asmg.bg@gmail.com), (3) Sofinvest Ltd; Sofia 1700, (pastoinov@yahoo.com)

Landfills are among the most common sources of pollution in ground water. Their widespread deployment, prolonged usage and the serious damage they cause to all of the elements of the environment are the reasons, which make the study of the problem particularly relevant.
Most dangerous of all are the open dumps used until the middle of the twentieth century, from which large amounts of liquid emissions flowed freely (landfill infiltrate). In recent decades, the problem is solved by the construction of sanitary landfills in which they bury waste or solid residue from waste utilization plants. The bottom and the sides of the sanitary landfills are covered with a protective waterproof screen made of clay and polyethylene and the landfill infiltrate is led outside through a drainage system. This method of disposal severely limits any leakage of gas and liquid emissions into the environment and virtually eliminates the possibility of contamination.
The main topic in the conducted hydrogeological study was a quantitative assessment of groundwater pollution and the environmental effects of re-landfilling of an old open dump into a new sanitary landfill, following the example of the municipal landfill of Asenovgrad, Bulgaria.
The study includes:
1.A set of drilling, geophysical and hydrogeological field and laboratory studies on:
-the definition and designation of the spatial limits of the main hydrogeological units;
-identification of filtration parameters and migration characteristics of the main hydrogeological units;
-clarifying the conditions for the sustentation and drainage of groundwater;
-determininng the structure of the filtration field;
-identifying and assessing the size and the extent of groundwater contamination from the old open dump .
2.Mathematical numeric models of migration and entry conditions of contaminants below the bottom of the landfill unit, with which the natural protection of the geological environment, the protective effect of the engineering barriers of the sanitary landfill, and the potential risk of contamination of the groundwater were evaluated.
The migration of contaminants through the zone of aeration and the engineering barriers are modeled with 2D models, and their potential distribution in groundwater - with 3D models. The models simulate the behavior of highly mobile and less mobile contaminants by the example of chloride and ammonium ions (Cl-and NH4 +).The mechanism of mass transfer is set in its full form: convective transport, accompanied by reversible elimination (sorption), mechanical dispersion (longitudinal and transverse), molecular diffusion and dilution. The concentration of the infiltrating under the bottom of the dump unit pollutants is set to exponentially decreasing function, determined by data from the monitoring.
Two-dimensional models are developed using the computer program VS2DTI - v.1.3, and three-dimensional models by Modflow and MT3D-MS.dimensional models by Modflow and MT3D-MS.