

Mass Transport Modeling in the Upper Kodaganar River Basin, Tamilnadu, India

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Groundwater in Upper Kodaganar River basin in Tamilnadu, India, is polluted due to discharge of untreated effluents from 80 tanneries. Total dissolved solids (TDS) in about 100 km are observed ranging from 2,000 mg/l to 30,573 mg/l in open dug wells. A mass transport model was constructed to study the pollutant migration. The basin covering an area of 240 km² was chosen to construct the groundwater flow model in the weathered part of unconfined aquifer system. The shallow groundwater potential field computed through flow model was then used as input to the mass transport model. MT3D computer code was used to simulate the mass transport in groundwater system. The mass transport model was calibrated with field observation. The available database was, however, quite sparse. Notwithstanding, efforts were made to arrive at reasonable guesstimates of the characteristic parameters. Sensitivity analysis, an integral part of calibration was carried out whereby model parameters viz. transmissivity, dispersivity etc. were altered slightly and the effect on calibration statistics is observed. This study clearly indicates that the transmissivity plays a sensitive role than the dispersivity indicating that the migration phenomena is mainly through advection rather than dispersion. The study also indicated that even if the pollutant sources were reduced to 50% of the present level, the TDS concentration level in the groundwater, even after 20 years, would not be reduced below 50% of TDS of present level.

Keywords: Weathered Zone; Unconfined Aquifer; Tannery Industries; Pollution; Groundwater Flow; Mass Transport Model; India