

Using particle tracking as a tool sustainable bank infiltration techniques: a case study in an alluvial area

ABSTRACT

This study was inspired by the Klang Valley water crisis, for which bank infiltration (BI) is considered a potential solution. This paper presents a case study of the BI techniques, which evaluates the effects of groundwater pumping and BI operation on the installation of wells. This study also determines the effect of pumping rate on flow paths, travel time, the size of the pumping and capture zone delineation, and groundwater mixing in a pumping well in Jenderam Hilir, Malaysia. The proposed method performs infiltration safely and achieves the ideal pumping rate. Numerical modeling packages, MODFLOW and MODPATH (particle tracking) were used. Results indicate that the migration of river water into the aquifer is generally slow and depends on the pumping rate and distance from well to the river. Most water arrives at the well by the end of a pumping period of 1 to 5 days at 3,072 m³/day for test wells DW1 and DW2, and during simultaneous pumping for DW2 and PW1 for a well located 36 and 18 m, respectively, from the river. During the 9.7-day pumping period, 33 % of the water pumped from the DW1 well was river water, and 38 % of the water pumped from DW2 throughout 4.6 days was river water.

Keyword: Bank infiltration; Particle tracking; Groundwater; Modeling; MODFLOW; MODPATH