

Optimal pumping from skimming wells from the Yamuna River floodplain in North India

Rao, S V N., Sudhir Kumar, ShashankShekher and S K Sinha and S Manju

ABSTRACT

This report examines the problem involving the pumping of groundwater from a group of 90 existing wells along the banks of the Yamuna River, northwest of Delhi (India), underlain with geologically occurring saline water. It is known that unregulated pumping will lead to upconing of saline water and therefore it is necessary to determine optimal rates and associated well locations (from an existing group of candidate wells that supply drinking water to the city of Delhi) that will minimize the total salinity. The nonlinear, non-convex problem is solved by embedding the calibrated groundwater model within a simulation-optimisation (S/O) framework. Optimisation is accomplished by using simulated annealing (SA), a search algorithm. The computational burden is primarily managed by replacing the numerical model with a surrogate simulator-artificial neural network (ANN). The model is applied to the real system to determine the optimal pumping schedule. The results of the operational model suggest that the skimming wells must be operated from optimal locations such that they are staggered in space and time to obtain the least saline water.