

تخمین تغذیه سالانه به آبخوان سرخس با استفاده از

FREEWAT

Estimating annual recharge to the Sarakhs aquifer using FREEWAT

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Abstract

Estimating recharge is important in groundwater studies, especially in budget calculations to properly manage groundwater withdrawals. Alluvial aquifer of Sarakhs with an area of about 874 square kilometers in northeastern Iran is located adjacent to Turkmenistan border line. Because of locating in arid areas, it has no surface water resources, and the only source of drinking water, agriculture and industry in Sarakhs city is groundwater. In this research, the conceptual model of Sarakhs aquifer was prepared using geological and hydrogeological data of the aquifer. The conceptual model was transformed into a numerical model using the MODFLOW-2005 in FREEWAT software. It was calibrated in unsteady states during a two-year period (Water-year 2015-2016 and 2016-2017, starting at September 23) and verified. The simulated Iso-potential map of the aquifer indicates the general direction of groundwater flow is from south to the north. Increased extraction by pumping wells has changed the pattern of flow and created a closed depression in Iso-potential map, causing the cease of groundwater outflow from the aquifer. The sensitivity process confirmed validity of the numerical model in estimation of the aquifer recharge. Accordingly, the annual surface recharge was estimated at 80 million cubic meters (MCM), occurring from rainfall (32 MCM/year) and irrigation return flows (48 MCM/year). In this regard, rainfall recharge coefficient was estimated about 20% of the annual rainfall and irrigation return flow coefficient was calculated about 15% of the annual discharge rates of the discharging wells. Simulated temporal variations of the groundwater recharge indicates occurrence of the rainfall recharge during January to June and irrigation return flows from November to April months of the year. The estimated recharge coefficients can be used in budget studies to properly manage the Sarakhs aquifer, as well as the same aquifers in Iran.

Keywords: Irrigation return flow, Budget, Rainfall recharge, Khorasan Razavi, MODFLOW.

The thesis is written in Persian (Farsi) language.

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