THESIS

IMPACT OF MUNICIPAL SUPPLY WELL FIELD ALONG JHANG BRANCH CANAL ON PERFORMANCE OF EXISTING IRRIGATION WELLS IN THE SURROUNDING AREAS

Submitted By

Saleem Sarwar
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University of Engineering and Technology, Lahore-Pakistan

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ABSTRACT

Faisalabad is the third largest city of Pakistan. The present water production required to meet the city water supply demand for 75 percent coverage is around 125 Million gallon per day (MGD) in keeping with 30 gallon per capita per day, whereas at present water production capacity of water by WASA from all the resources is 65 MGD. Owing to this acute shortage of water, and considering ground water quality in Faisalabad that is not so good to use for drinking purposes, Japan International Cooperation Agency conducted a preliminary study in October 1997 and recommended installation of new tube wells near Jhang branch canal. This proposed well field area is located along Jhang branch canal at its left bank 12 Km west of city from RD-215 to RD-280. Water quality at this site is about 500 to 700 parts per million(ppm).

The proposed number of tube wells to be installed along the left side of Jhang branch canal by JICA is 23 and target discharge from these tube wells will be 91,000 m3/day. After the installation of these tube wells approximately 20 MGD additional water will be pumped. Residents of the surrounding area of the planned well field opposed this project with support of political representatives of the region. The matter of the opposition was the apprehension of lowering of groundwater in the surroundings and its affect on the ground water withdrawals and costs of pumping. This study was carried out to evaluate the present ground water depth and ground water pumpage in the area and access the affect of purposed well water supply field on water table in the surrounding areas.

A ground water model Modflow was formulated for an area 30 Km along the canal and 20 Km wide for this study. Water levels of the study area were determined by drilling shallow bore holes in the study area. Measured pumpage from irrigation wells were determined by field surveys. Hydraulic conductivity (K) was taken as 33 m/day, transmissivity (T) was taken 18000 m^2/day, thickness of the model was taken as 120 m to fully include the design of total length of proposed well field. Head dependent boundaries were selected on all sides of the boundaries, canal recharge,Distributary recharge and aerial recharge as determined by IRI was taken as 0.01 m/day, 0.005 m/day and 0.001 m/day respectively.

The model results of the study revealed that presently water table elevation is varying from 175 m to181 m, water table depth of the study area is varying between 6 m to 9.5 m against the observed water levels of 176 m to 179 m. The computed water levels show very much similarity with observed water levels from the model. The model results differ slightly from observed results; this small difference could be due to localized error of estimating canal recharge, aerial recharge, pumpage in the area etc.

The future depth of water table elevation after the operation of proposed well field is likely to vary between 174 m to 180 m. Ground water table depth is likely to vary between 7 m to 11.5 m.

Well field will cause the water table elevation to decline by 3 m, water table depth will increase by 1 m to 2.5 m resulting in additional draw down of 0.3 m to 3 m.

Sensitivity analysis with 20 % increase recharge shows water table elevation varies between 175 m to 181 m and water table depth varies between 7 m to 24 m in comparison to water table elevation of 154 m to 176 m and water table depth of 7 m to 11.5 m with no increase in recharge. Decline in water table elevation is 1.5 m less than for the condition of no recharge increase. However the additional draw down produced is estimated as 0.3 m to 2 m indicating significant impact on water levels.

It is concluded from this study that the study area is agriculture based land. Tube wells are used in the study to meet the crop requirement due to shortage of irrigation water and total pumpage in the study area due to irrigation wells is 3444 lps. The impact of well field (close to the proposed well field) is likely to be very significant as additional draw down created near the proposed well field is 3 m. This additional lowering of the water table by the field will force the farmers to change the design of irrigation wells by deepen the pump house well from ground surface, increasing the length of power pulley and deepen the pump setting. This will increase the installation of wells as well as cost of pumping of the irrigation wells. Apprehensions of the farmers are not unfounded because installation of well field area along Jhang branch canal will not only produce the additional draw down but also will affect the ground water regime significantly. It is recommended that new model should be formulated on more elaborated/ complete details of the study area to verify the present study because model was formulated for this study was based on limited data.