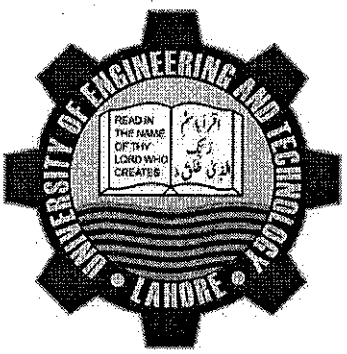
ACCELERATED GROUNDWATER RECHARGE THROUGH PROPOSED INFILTRATION GALLERIES IN MODEL TOWN LAHORE



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ABSTRACT

Lahore is the provincial capital of Punjab and second biggest city of Pakistan with respect to the population. Average annual population growth of Lahore is 4.14% from 1998-2017, which is much higher than the average population growth rate of Pakistan which is 2.4 %. According to various past studies, average annual groundwater depletion rate of Lahore is 1.07 m/year. This rate of recession is alarming and will lead to water shortage in near future depriving the occupants from the underground source of water.

As with the growth of population new housing societies are being built to accommodate the burgeoning population. When housing societies are launched, causes huge increase in impermeable areas, thus reduces the groundwater recharge. Moreover, pumping to fulfill the water requirements of the occupants further worsen the groundwater depletion rates. These societies are launched without any detailed designing and basic requirements from environment point of view. One among them is groundwater hydrological balances in the society areas. These societies increase impermeable areas, pump huge amount of groundwater from the underground water source and do nothing for recharging of the aquifer. No body considers groundwater hydrology balance before launching a society. It is the main issue of developing countries like Pakistan. There should be means and base so that minimum imbalance takes place. There should be sustainability in water pumping through water recharging. Therefore it is necessary to find out alternative means to recharge the groundwater aquifer of Lahore. There are many techniques which are used worldwide to recharge the groundwater like recharge wells, rain gardens, permeable pavements, infiltration galleries etc., among them infiltration galleries are most effective. Therefore, in the

present study, role of infiltration galleries to accelerate the groundwater recharge in the Model Town area of Lahore was investigated.

In order to investigate the present situation of groundwater table, temporal/spatial distribution was plotted on ArcMap. HEC-HMS was used for the calculation of discharges, the Model was verified with the observed flood value of 1996. Groundwater model prepared on Visual MODFLOW was calibrated and validated for the data years 2000-2008, 2010-2018 respectively. The calibrated model showed a close agreement between observed and simulated heads. The results indicate that due to overexploitation water levels continue to decrease with the passage of time. The average simulated water table decline rate was computed as 1.1 m/year in the study area.

So in order to overcome this alarming water table declining rate, infiltration galleries were proposed and designed for the study area. These galleries were designed according to the stormwater best management manuals (IDEQ). They were incorporated in the model prepared on Visual MODFLOW and their effect was studied. It was seen that these infiltration galleries allow recharging the groundwater at better rate. Model results showed that with infiltration galleries the average depletion rate of groundwater reduces to 0. 8 m/year.

The study concludes that the Infiltration Galleries have a potential to recharge the groundwater at good rate, therefore, installation should be considered to least disturb the groundwater hydrological balance in the society.

Author of the thesis strongly recommend that no housing society should be approved by the relevant city development authorities without availability of the sound groundwater hydrological balance study and provision of some groundwater recharging mechanism.