

THESIS

**HYDRAULIC INTERACTIONS BETWEEN RIVER CHENAB AND
MULTAN AQUIFER**



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BY

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(2010-PG-WRM-51)**

FOR THE DEGREE OF

MASTER OF SCIENCE

IN

WATER RESOURCES MANAGEMENT

**CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
University of Engineering and Technology, Lahore**

2012

ABSTRACT

Water is an essential parameter for life establishment and development. Due to this, a historic city as Multan is located along Chenab River. Water from River Chenab is interchanged towards its adjoining Multan aquifers that will cause variations in water table.

This study was undertaken to evaluate water interchange from Chenab River to Multan City. The general survey of Multan city was carried out to collect the data of water table in the city and also depth of water table along the River Chenab. A small area 153×153 m (1000×1000 ft) with three transacts lines 153 m (500 ft) apart from each other was selected along the River Chenab at bridge Head Muhammad Walla. Ground table was measured at monitoring wells and ground levels were determined by elevation survey. Hydraulic conductivity was measured by auger hole method. The water samples of study area were collected through monitoring wells. The EC and TDS of these samples were measured.

MOD-FLOW, ground water model was developed for the selected flow domain of 153×153 m (1000×1000 ft) where each cell of model of 7.6×7.6 m (25×25 ft) size. Five layers were selected with layer thickness of 9, 22, 46, 46, 61 m (30, 70, 150, 150 and 200 ft) to compute the hydrodynamics of the river. Model parameters like initial hydraulic heads, bore hole and observations, field measurements of hydraulic conductivities, storage coefficient and river bed conductance were assigned initially and adjusted during model calibration. The river flow data d/s of Trimmu Barrage from April 2011 to March 2012 was obtained. Flow at the site was calculated assuming no loss/gain in river flow from Trimmu and Sidhnai to study site. River X section data was obtained from Google Earth. River flow depth at site was determined

by HEC RAS. Thus River flow and water level was determined for each month. MODFLOW model was simulated under steady state mode for each month with varying river water depth. The river-aquifer interaction in term of quantity of water was taken from model water budget.

The phreatic surface profile for River Chenab was found to be towards Multan City. Thus River Chenab shows acts infiltrating/recharging channel throughout the year. The quality of river recharge to Multan City was found as $1.88\text{m}^3/\text{sec}$ (≈ 66 cusecs) for 26 km facing length of Chenab River. The annual water recharge is 59.3Mm^3 . EC of the river is $536\ \mu\text{s}/\text{cm}$ and EC of study area varies from $500\ \mu\text{s}/\text{cm}$ to $600\ \mu\text{s}/\text{cm}$. So water is acceptable from EC & TDS point of view only.

It is proposed to carry an extensive study to portray larger picture of river aquifer interaction for Multan city. This study may be carried for a longer time period (2-3 years) and for full river reaches to account for complete low as well as high flow seasons. The complete survey of quality of water interchanging from river to Multan aquifer should be conducted for all drinking water quality parameters.