

THESIS

HYDRAULIC PERFORMANCE OF RIVER RAVI NEAR  
LAHORE UNDER EXTRAORDINARY FLOODS



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Submitted By

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(2006-PG-WRM-26)

For the Degree of

MASTER OF Philosophy

IN

WATER RESOURCES MANAGEMENT

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

2011

## ABSTRACT

Flow through bridges may be computed using a one-dimensional or a two-dimensional model. A one-dimensional approach determines the flow rate through the bridge on the basis of the water surface elevations at the upstream and downstream sides of the structure assuming steady, gradually varied flow conditions. It is impracticable to perform the hydraulic analysis for a bridge by manual calculations due to the flow complexities being simulated and the interactive, complex nature of the calculations involved. These analyses should be compiled using an appropriate computer program.

This study is meant for hydraulic performance of Bridges & combatting flood impacts to minimum compatible with flood hazards plans for Shahdra & Lahore city from *Shahdra Railway Bridge to Shahdra Highway Bridge (New)* reach of River Ravi in Pakistan.

In the present study, frequency analysis was used to estimate the magnitude of flood of different recurrence intervals. Log Pearson-III Distributions was used to estimate the flood magnitude of 50, 100 and 200 recurrence intervals were determined.

HEC-RAS was used to model a reach according to the existing geometric conditions. Shuttle Radar Topographic Mission (SRTM) 90 metre Digital Elevation Model (DEM) was used to extract the geometry of the River Ravi. HEC-GeoRAS extension of ARC-GIS was used to extract the river geometry and assigning Manning's roughness values. The unsteady flow analysis of HEC-RAS showed that the flow of 3, 00000 cfs can easily pass from all the three Bridges such as Shahdra Highway Bridge (Old), Shahdra Highway Bridge (New) and Shahdra Railway. Rating

curve of 2010 at Shahdra was used to calibrate the model. This statistics of the model calibration has been found satisfactory.

The steady flow analysis of HEC-RAS model showed that by increasing the width of the Shahdra Railway Bridge and Shahdra Highway Bridge (Old) by 180ft and 450ft respectively, could pass the design flood with lower depths by 0.45 ft. By decreasing the roughness value to 0.02 (this can be achieved by lining this reach with Unfinished Concrete/Unfinished with gravel bed material), then all the three Bridges passed flood of 3, 00000 cfs with lower depth of 4ft.