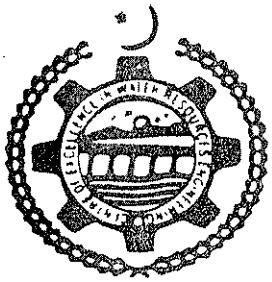
THESIS

HYDRAULIC ANALYSIS OF 2010 FLOOD ONSLAUGHT IN INDUS- CHENAB CORRIDOR IN MUZAFFAR GARH DISTRICT



BY

SARDAR ATEEQ-UR-REHMAN
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HYDRAULIC ANALYSIS OF 2010 FLOOD ONSLAUGHT IN INDUS- CHENAB CORRIDOR IN MUZAFFARGARH DISTRICT

ABSTRACT

A flood is an anomalous high water flowing, which flows over the embankments along either natural or artificial steams. Mainly the floods occur due to intense storms, which cause more runoff than an area can absorb or the capacity of the steam within its normal channel section. Effective flood management requires structural and non-structural measures. In 2010 Pakistan faced worst flood due to heavy rainfall in the catchment of Indus River which directly affected approximately 796,095 square kilometers (307,374 sq. mi) area and about 20 million population. The area of study is Muzaffargarh district where breach of Left Marginal Bund (LMB) of Taunsa Barrage caused the flooding. The populace of study area could not be evacuated during flood because the administration had no tools through that they could determine which areas would be actually affected from the flood wave and requires to be evacuated. On the other hand some areas in evacuated region were not affected by flood wave and large population of such areas faced undue hardship. Population of Muzaffargarh city was also falsely alerted against flood threat.

This study was planned to develop a flood management tool to add in finding flood route, extent and depth of flood with respect to time and the warning time when flood wave entered in different areas, formulate a hydraulic modeling, determine flood water levels/depths in flood affected areas and compare the simulated results with field flood data.

Complete physical survey of the study area was under taken after the floods and all the data related to flood water movement, depth and time of flooding at different locations were noted from flood water marks on trees/buildings and interview of local populace. A Complete map of area under inundation was prepared on the basis of the results of physical survey.

HEC-RAS computer model was used to simulate flood movement and determine flood water depth and area of inundation in the study area from flood 2010. Two flood flow reaches of 50 km each having 96 cross sections were marked in the study area. Reach 01 included area between Indus left flood bund to Multan-Mainwali railway line and Reach 02 included areas between railway lines to Muzaffargarh canal. The flow from both reaches joined at southern end of these reaches. The upstream boundary to the computer model for computation was assigned known inflow hydrograph from canal breaches and downstream boundary condition was assigned normal depth for which average surface slope of the downstream flooded reach was assigned (0.0025 m/m).

HEC-RAS computer model results were compared with the results of physical survey and it was concluded that the HEC-RAS computer model provided realistic flood water level of the inundated area. The area of inundation determined by using HEC-RAS computer model closely related with results of physical survey of the study area. It was also concluded that HEC-RAS computer model can effectively and faithfully predict the flood movement in potential flood threat areas in terms of time, depth and duration of inundation. It is recommended that hydraulic model may be formulated for all potential flood threat areas for advance predicting flooding area, to visualize any future flood threat, to find flood affected area etc. Further that breach dynamics may be incorporated in this model for more purposefulness flood threat analysis. The cross sections for flow modeling may be spaced maximum of 4 km apart to obtain flooding extent, but small spacing of 1 km is most desirable. The breach dynamics should include description in terms of breach geometry, breach enlargement, upstream water flows and levels, hydraulics of flow through the breach in terms of downstream water depths spreading etc.