THESIS

EFFECT OF DRAINAGE DENSITY ON THE PEAK DISCHARGE OF CATCHMENT BY USING HEC MODELS.

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ABSTRACT

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In the canal irrigated areas where the water delivery losses are high and the application of water is not according to the requirement of the crops the high water table problem is produced. This problem reduced the water storage capacity of soil profile. In the monsoon seasons long duration rains produce severe flooding conditions in the fields. Surface drains are constructed upon the emergence of the flooding problem in the agriculture field areas. As the time passes, the length and/or number of these drains are increased so that more area is drained out by these surface drains. These sub-drains discharge into a single main drain. The increase in length and number of the sub-drains is done without considering the effect of their discharges on the main drain. The drainage density describes the total drain length in a unit area within a catchment area. The objective of this study is to evaluate that how this increase in sub-drains length and/or number effects the peak discharge in the main drain. The other objective is to determine how the effect of increase in drainage density reduces the potential for rise of water table in the drain catchment area.

The Hydrologic Engineering Centre, U.S Army Corps Of Engineers HEC-1 (Flood Hydrograph Package) was used to compute the runoff hydrographs at the outlet

of flood plain basin. Raiwind drainage system was selected for this study. The system consists of one main drain and 14 sub-drains. An approach is developed in this study to simulate the effect of discharges of the sub-drains on the main drain for different sub drain length scenarios. Six input data files are prepared which represent different sub drain length scenarios. The 14 sub-drains are divided into 14 sub-basins. SCS Curve Number method was used to determine runoff depths from drained and undrained areas. The Kinematic wave routing technique of HEC-1 was used to route the runoff from catchment area to the sub-drain and from sub-drain junction to the outlet point of the Raiwind main drain. The validity of HEC-1 model for Raiwind drainage basin conditions were checked by comparing the simulated peak discharge evaluated by HEC-1 model for actual existing drainage length system to the design peak discharge evaluated by WAPDA.

It is concluded that increase in drainage density leads to higher peak discharges in the main drain. By proper hydraulic designing of main drain we can mitigate the adverse effects of severe flooding around the main drain and in the sub-basins of floodplain. The danger of water table build up with in catchment from particular rain fall storm decreases with increase in the drainage density. This is because with the increased drainage density more runoff outflows from the catchment and water has less chance and time to infiltrate into the soil profile.

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