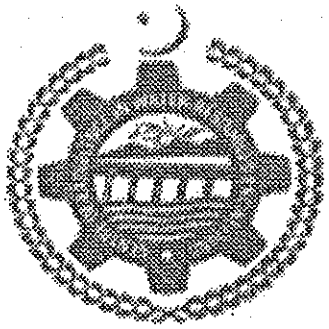
THESIS

MODELING HYDRAULIC PERFORMANCE OF DRAIN UNDER DIFFERENT FLOW CONDITIONS



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ABSTRACT

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Surface drains are provided to evacuate rainfall runoff water out of the area. If the excess water does not flow out of the area it will cause ponding, posing threat to life and property. Drains are designed for capacity enough to handle runoff resulting from average rainfall and thus to deter often-occurring damages. However drains may not provide full protection against large flows and damages for infrequent large rainfall events. It is important to model the hydrologic and hydraulic performance of drains against flows to which it may be subjected in times of floods

This study was conducted with the objectives to find flow hydrographs at the drain inlets, for a 5-year frequency rainstorm for a selected drain (Sheikhupura Drain), determine water surface profile of the drain, examine the depth, extent and duration of flooding and determine the drain performance after improvement (widening and deepening) of the drain flow sections.

The hydrologic and hydraulic performance of Sheikhupura drain was evaluated by using HEC-HMS and HEC-RAS models. Flow hydrographs were generated for the selected drain reaches, inlets and tributary drains by HEC-HMS model The drain flow was evaluated for present urbanized and non-urban conditions. The peak flow rate was determined as 1072 cfs and 859 cfs for present urbanized and non-urban conditions respectively, representing an increase of peak flow rate by 25 % due to urbanization. Drain performance was analyzed in terms of water surface levels and inundation depth (above N.S.L) at different points of the drain for present designed cross sections and

widening of drain by 5 or 10 ft and/or deepening the flow section by 1 ft by using HEC-RAS.The drain overflow results in inundation of lower 11.6 miles (average depth of inundation as 1.3 ft) for present urbanized conditions. The mitigation measures result in decrease of inundation extent and inundation depth respectively as 11.6 miles and 1.2′ for 5′ widening,6 miles and 1′ for 10′ widening,6 miles and 0.9′ for 5′ widening plus 1′ deepening and as 5 miles and 0.86′ for 10′ widening plus 1′ deepening.

For the study, it was concluded that urbanization has considerably increased the drain flow to such an extent that drain region within the urban and industrial units remain under inundation

The drain is otherwise found to perform efficiently for carrying runoff from agricultural areas only. Due to practical limits on widening/deepening of drain, it is proposed that a new and separate disposal drain be constructed to carry the urban runoff.

It is recommended that for the drains passing through urban and industrial zones, provisions in the drain capacity must be provided to carry the city sewerage and industrial effluent in addition to the runoff from agricultural areas.

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