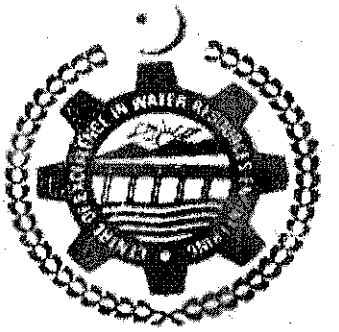
THESIS

MODELLING FOR SEDIMENT MANAGEMENT ALTERNATIVES IN IRRIGATION CANAL



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(2002-PG-WRM-06)

For the Degree of

MASTER OF SCIENCE

IN

WATER RESOURCES MANAGEMENT

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
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2004

ABSTRACT

Chashma Right Bank Irrigation Project is a large irrigation system spread over two provinces (Punjab and North West frontier Province) of Pakistan. It is fed by the Indus River through the Chashma Barrage. The total command area of the project is 230,675 hectares (570,000 acres) of land on right bank of Indus River. The canal had been planned to deliver the design discharge of 138 cumecs (4879 cusecs). The main canal is 273 Km (170 miles) long and there are 71 offtaking channels, which irrigate a narrow strip of land between the Chashma Right Bank Canal and Indus River. A sediment deposit up to ± 7 feet was observed in different reaches of canal in the closure period of January 1999. The canal is unlined up to RD 120+000 (36.5 Km), whereas the rest of canal is lined having a trapezoidal section. There was erosion in unlined section whereas deposition was observed in lined section of the canal. The severe deposition was observed from RD 180+000 to RD 475+000.

The proposed study was carried out for sediment management in CRB canal with main objectives, application of numerical model to study the impact of sedimentation on canal operation, to study the sedimentation phenomenon in Chashma Right Bank Canal and to study flushing and de-silting options for sediment management in Chashma Right Bank Canal.

One dimensional movable boundary open channel flow model HEC-6 was used for sediment simulation. The total canal length was divided in to ten reaches due to model limitation. The simulation was carried out for a period of one year. The model gave satisfactory results in terms of longitudinal bed profiles, sediment budget and sediment

deposited patterns. Two sediment management alternative scenarios were simulated. In first scenario maintaining the water surface level at the downstream of reach 1 (RD 97+500 cross regulator) upto design WSL' and in the second scenario 'operation of escape channel at the downstream of reach 4 (RD 377+500). The first scenario was simulated to reduce the erosion trend of reach 1. Escape at RD 377+500 was simulated to flush out the sediment deposit in the reach 3 and reach 4 (RD 180+000 to RD 377+000). Escape channel operated independently for a period of 330 days.

Maintaining of design surface water level at RD 98+000 will reduce the erosion from 73486 tons to 255 tons. Escape channel has flushed out 24593 tons & 19566 Cu.m (25576 cu.yds) sediment volume from bed of the canal.

Water management strategies given by the Project Management Consultants for CRBC Stage-III to operate the canal at optimum discharge, were reviewed. It was found that artificial heading up to fed the distributaries was not suitable at low discharge; also running the canal on low discharges (63 % & 47 % of full supply discharge) gave a harmful sedimentation pattern. It is suggested to run the canal on full supply discharge using additional flow for flushing through escape and maintaining exact water surface levels at cross regulators.

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