

THESIS

EVALUATION OF SEDIMENT TRANSPORT CAPACITY OF
MARALA RAVI LINK CANAL



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ABSTRACT

After independence on stopping the supplies of River Sutlej all the canals of Sutlej valley off-taking from Sulemanki and Islam Headworks suffered badly. Punjab Irrigation and Power Department proposed to supplement the supply of river Sutlej by constructing two link canals. Marala Ravi Link Canal is one of these canals. The canal was constructed during 1957 to transfer 22,000 cfs ($622 \text{ m}^3/\text{sec}$) from Chenab river to Ravi during Kharif season for supplementing flows in Lower Bari Doab Canal (LBDC) and for onward transmission to Sutlej river via the Balloki Sulemani (B.S.) link canal. This link taking off initially from old weir and now from new barrage is an unlined canal and has a length of 97 km. Unlucky the canal got silted by 11 ft and widened by 500 – 550 ft by the year 1985. Capacity of the canal reduced to about 15,000 cfs ($425 \text{ m}^3/\text{sec}$). The inter river transfer capacity therefore got seriously reduced affecting very adversely to the dependent off-taking canal systems at Balloki and Sulemanki Headworks.

Sediment load at the head of the canal was analyzed using the last five years data from 1999-2003 which indicated a strong seasonal pattern. The maximum sediment concentration was observed from June to the beginning of August which corresponds with the peak of the annual floods in the river Chenab. The deposition trend was observed in the head reach of the canal from RD's (0 – 237+230) which rose full supply levels and erosion trend in the reach RD's (237+230 – 313+500) with fell in water surface levels. The maximum observed rise in bed and water surface levels in the first reach were 3 ft

and 3.11 ft respectively. The maximum scour of bed was (- 2.67 ft) and (-3.98 ft) at RD's (285+000) and (310+000) with fall in water surface levels by (-0.40 ft) and (-1.92 ft) respectively.

The hydraulic design for the Marala Ravi Link Canal was made with Manning's roughness coefficient 'n' equal to 0.02 for the entire length w.r.t particle sizes which did not take into account the bed roughness and was significantly less than what the canal choose for itself for the flow period from May to September.

The Manning 'n' roughness calculated for the canal by different formulae for the years 1999 and 2000 on the basis of ISRIP data by taking into account the particle sizes and bed forms met the requirements of ACOP data i.e. 0.026 for design of alluvial canals and rivers. The average accurate values near to ACOP data for different reach RD's (0 – 1000+000), (100+000 – 268+000) and (268+000 – tail) were calculated as 0.025, 0.024 and 0.023 respectively and chosen for the study.

The analysis of sediment sampling showed that overall the percentage of fine sediment at entering intake was on higher side whereas the ratio of sand and fine sediment deposited in the bed of the canal was almost equal. Moreover, the turnouts from the Marala Ravi Link Canal were drawing more fine sediment than the sand.

The designed sediment transport capacity of the canal was 275 ppm on the basis of performance between 1992 and 1996 by Engelund and Hansen method. To ascertain the accuracy the different formulae and computer models (SEDDISH & SHARC) were used. The results showed that the value adopted in the design was incorrect. The canal has deposition trend with maximum deposition of 1.85 mm/day which raised the bed to the extent of 1.05 meter in one of the reach of the canal during the operational period of 120 days as given by the "SHARC" model.