

THESIS

AN APPRAISAL OF REGIME GEOMETRY EQUATIONS  
FOR ALLUVIAL CHANNELS



6347

By

ATEEQ-UR-RAUF  
(2000-PG-WRE-30)

For the Degree of

MASTER OF PHILOSOPHY

IN

WATER RESOURCES ENGINEERING

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING  
University of Engineering and Technology, Lahore, Pakistan.

2002

## ABSTRACT

The present study reviews the historical development of the regime geometry equations proposed by many researchers since 1895 and different approaches/numerical models developed in recent years for the prediction of stable channel geometry, using the available regime theories. Fairly accurate and similar results have been achieved using these methods from the computer simulations of the numerical methods, physical model studies, and from field data.

The search for attributes of stable channels started with the work of Kennedy between 1890 and 1894, on the Upper Bari Doab Canal of Punjab. Lindley (1919) presented the regime concept that was transformed into a set of widely used regime relations by Lacey in 1930 and after. Later Blench (1941-1957), and Simons and Albertson (1960) presented their equations. This period is called "canal regime period" because most of the research focused on canal design. In 1953, Leopold and Maddock extended the regime concept to river systems. In 1963, Henderson proposed some regime equations those can be applied for predicting canal and river geometry. This period was a transition from canal regime period to river regime period and from empirical approach to analytical approach and is called as 'Transitional Period'. The researchers such as, Langbein (1964), Kellerhals (1967), Engelund and Hansen (1967), Griffiths (1981), Bray (1982), Chang (1986), Hey and Thorne (1986), and Julien (1988) presented the information based on analytical approach, or combination between analytical and empirical approaches, and more

focused to river regime especially gravel bed river regime. This period is, called 'River regime period'.

This study also aims the comparison of different available theories regarding stable channel alluvial geometry by applying them to some alluvial channels of Pakistan and comparing the results with the actual data. Computer model has been developed in C++ for the design of the alluvial channels using the different theories.

Five canals were selected from different provinces of Pakistan, for the analysis. With respect to the cross-section of the canals, the Lacey's silt theory, Simon & Albertson's approach and tractive force method give results slightly close to the actual field data. From empirical approaches, the Lacey's silt theory, Simon & Albertson's approach give reliable results with respect to bed width, depth and velocity. From rational approaches tractive force and variational stream power method give best results as compared to other rational approaches.