US Army Corps of Engineers®

Review Supercritical Flood Channel Design Guidance

Products

Derive analytical solutions of supercritical flood waves to complement ERDC engineers in conducting experimental and numerical modeling study. Publish results in peer reviewed journals.

Benefits

The results will help ERDC engineers to configure physical and numerical models to study flow patterns at the confluence of two supercritical flows and evaluate the design of lateral inflow.

Issue

This is a continuation of an FY 04 task. During this period, proposed tasks were completed by providing the U.S. Army Engineer Research and Development Center (ERDC) collaborator with parameters for laboratory experimental and numerical modeling study. These flow parameters and channel geometries were obtained from the ongoing engineering projects in the Las Vegas Valley. ERDC engineers used those data to configure physical and numerical models to study flow patterns at the confluence of two supercritical flows and evaluate the design of lateral inflow. However, due to the complexity of three-dimensional (3-D) flow fields and the high cost of laboratory experimental studies, ERDC collaborators expressed interest in conducting an analytical modeling study to seek preliminary solutions to sophisticated 3-D hydrodynamic models.

Description

All the tasks have been completed and results have been submitted for publication in a peer reviewed journal. In Phase I of this project, the diffusion wave method was applied to solve the unsteady flow St. Venant equation, and the celerity and amplitude of unsteady flood waves under supercritical flow condition was obtained. In Phase II, the analytical solutions of supercritical flow flood wave was extended by introducing a lateral discharge, and the analytical solutions with the experimental and numerical modeling results were compared. And finally in Phase III, the analytical solution to the condition of two supercritical flow confluences was extended, and the analytical solutions with the numerical modeling results were compared.

Sponsor

Urban Flood Damage Reduction and Channel Restoration Development and Demonstration Program for Arid and Semi-Arid Regions (UFDP).

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