Scour on Alluvial Bed Downstream of Grade-Control Structures

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Abstract

This paper describes an approach for predicting local scour downstream of grade control structures. The developed analysis applies the incomplete self—similarity (ISS) theory for deducing some physically based dimensionless groups controlling the geometrical pattern of the scour profile. The scour measurements available in the literature in conjunction with numerous unpublished data allow a multiregressive calibration of the ISS relationships. The experimental sample includes different bed grain-size distributions and scales of the erosive phenomenon. The results prove that the ratio between the upstream water head and the weir height is able to explain the measurements of scour depth carried out in both small- and large-scale installations. This estimation of maximum scour depth was improved, introducing variables representative of both the jet contraction and the bed particle grain—size distribution. Variables related to the longitudinal sizes of the scour profile tend to be predicted with more accuracy than those related to the scour depth and appear more influenced by the coarsest component of the alluvial bed.