Experimental investigation of scour at a channel junctions of different diversion angles and bed width ratios

ABSTRACT

Diversion flows from rivers or main channels affect bed morphology and cause erosion and sedimentation at the diversion channel junction. In a diversion channel flow system, the scour depth and scour length are considered important parameters and should be taken into account during the project construction stage because it affect the stability of main channel banks and crossing structures. In this study, the scour depth produced by diversion flow in a main channel was investigated using a physical sand bed model. The investigations considered five diversion angles (30°, 45°, 60°, 75°, and 90°), three bed width ratios (29%, 38%, and 48%), and five total discharges (7.25, 8.5, 9.75, 11, and 12.25 L/s). Results indicated that the scour depth in the main channel reduced as the diversion angle reduced. Empirical relationship to demonstrate relative scour depth (Kds) for different diversion angles and bed width ratios was proposed. Relative scour depth can be defined as a relative scour depth in case of a diversion angle of $\theta°$ to that with 90° for the same flow condition and bed width ratio. Empirical relationships to estimate the scour depth and scour length with the governing hydraulic parameters were also established with a good accuracy. Testing the proposed relationships gave reasonable mean errors of 3.46% and 10.3% in predicting scour depth and scour length, respectively.