JOURNAL OF CURRENT RESEARCH IN SCIENCE (ISSN 2322-5009)
CODEN (USA): JCRSDJ
2014, Vol. 2, No. 4, pp: 554-556
Available at www.jcrs010.com

BRIEF NOTE

THE STUDY OF ROADWAY CONSTRUCTION EFFECT ON THE GEOMETRIC AND HYDRAULIC CHARACTERISTICS OF MEHRANEHROUD RIVER USING HEG-RAS SOFTWARE

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ABSTRACT: Non-natural factors caused by human interference in the catchment and watercourse of stream and rivers has caused a year-by-year increase of both number and caused damage of floods. So it is obvious that predicting the hydraulic manner of rivers, causing probable floods in order to reduce the damage on cities and investigating the effect of structures build in the rivers' path, is of significant importance. To reduce the heavy traffic in the area of *Ghari Bridge*, municipality of *Tabriz* City had to build a roadway inside *Mehraneh-Rood* River. In this research the effect of Construction this roadway on the hydraulic of stream has been studied for three river situations (first, before constructing a roadway, second, after constructing a roadway, and third, constructing and widening the southern span of bridge for recovering the reduced flow area). For this purpose, after preparation a topographic maps, transverse and longitudinal profiles of the study were extracted. In the next step, information collected by using the results of surveying operations, geometrics river information and transverse structures had been built within river side. The used software in this study is HEG-RAS that is common in river engineering. As results indicated that The flow rate in all three situations River Range is no problem in terms of erosion and sediment but it is essential to keep the bridge safety, the southern span is widened and choosing the suitable factor for Manning coefficient is most important.

KEYWORDS: Velocity, Mehraneh-Rood River, Roughness Coefficient, HEC-RAS.

INTRODUCTION

In international culture, Flood water is kind of flow with great flow rate which during that water comes up and drowns the grounds surrounding which aren't under the water (Godsiyan, 1998). The view behavior of river passes and doing the activities which are friendly with river and in time engineering doing, those had been concerns that engineers were involved with this field. According published statistics in natural disaster, Flood cause the most damages in human societies that are true in our country too (Bakhtiyari *et al.*, 2012).

Flood forecasting by weather analysis, river and its region condition that cause flood water and numerical water. The first forecast of flood in the universe comes from 1854 in France. In that year Bel grand forecasted the possibility of acting flood about these days before by telegraphy and simple relation among increase of level of head branch in Paris. Progressed instruments of forecasting flood is paid attention or considered by many of countries about more than forty years (Anonymous, 2006).

Seraty calculated width of flood for flow rate with various return period for north rivers of Tehran by preparing hydrolic model HEC-RAS (Rati, 2007). Shabanlo and his colleague worked on width of flood water of river of Golestan province by the software HEC-HUS and HEC-RAS and identified the regions of flood threat and finally the total area of damaged area by using software HEC-RAS for various return periods calculated (Shabanlo *et al.*, 2008). Smaili and his colleagues studies on Kanchancham river in Ilam province and Eflekhari and his colleagues on the villages on routes of river Gangenroud and Hekmatifar and his colleagues especially agricultural lands of Silab Dasht of river at Kermanshah city are studies which confirm HEC-RAS model efficiency (Smaili and Hasonizadeh, 2008; Eftekhari *et al.*, 2009; Hekmatifar *et al.*, 2009).

MATERIALS AND METHODS

2.1. Characteristics of Mehraneh River

Mehraneh river basin is one of the sub-basins of Ajichai and its east longitude is 46-180 to 46-33-57 and north Latitude is 29-33-37 to 38-5-41 with a maximum altitude of 3707m and a minimum altitude of 1550m. The river divides into two branches in five kilometers southeast of the city of Tabriz and incorporates again at the

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stone bridge (Dash Korpusi) and flows into Ajichai in the southern side of the airfield in the northwest of Tabriz. The total area of the river basin is approximately 625 square kilometers and its total length is 49 kilometers. Its length is about 15 km within the city and its width varies from 25 to 66 meters along the city (Danandehmeher *et al.*, 2005).

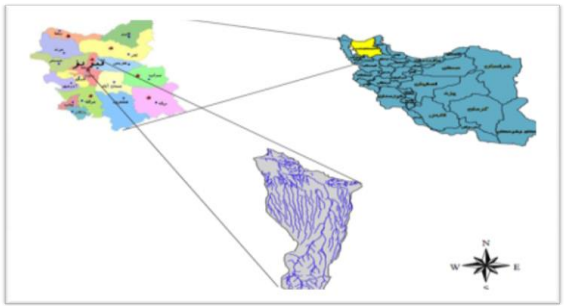

Figure 1: Providing a hydraulic model for Mehraneh river

2.2. Geometric data

Channels along the roadway runs for about 400 meters and in this route, there are a number of slope breakers which it is required to consider these slope breakers and the fractional change of the slope of the channel bottom elevation in the simulation model. So a section is chosen before and after the slope breaker to consider the changes of the slope. There is a telecommunication bridges in the middle of the track. Four sections to the middle and around the bridge are intended to specify all the sub-critical and supercritical flows on this route. Total of 27 cross sections are considered along the way which is shown in fig 2-4. Data related to cross-sections collected during field operation are saved in an excel file and are introduced into the software in order to provide the plan of the time period of this study.

2.2.1. Geometric data of the bridge

Geometry of the bridge are introduced in the form of upstream and downstream cross sections of the bridge, bridge deck, bridge foundations, modeling methods and determination of the coefficients.

2.2.2. Boundary conditions

Boundary conditions should be determined in the range of both upstream and downstream situations. Boundary conditions were reconstructed at the upstream and downstream physical boundary in the desired range. For this purpose, we used the normal depth method which involves inserting the slope of the energy and also the determined Debi in the desired place. If there is no energy slope, the slope of the river bottom can be used which is determined according to the longitudinal profile of the river upstream and downstream.

HYDRAULIC CALCULATIONS

Hydraulic calculations have been made in three river conditions including: a) the current state of the river before the construction of the roadway, Figure (2) conditions of the river with the construction and implementation of roadway, Figure (3) conditions of the river with the construction of roadway and widening the southern mouth of the telecommunication bridge.

Figure 2: before the construction of the roadway

Figure 3: conditions of the river with the construction and implementation of roadway

RESULTS AND DISCUSSION

In this paper, based on the cases mentioned in the previous sections, various parameters of hydraulic flow of Mehraneh river is modeled in three different modes (with roadway construction, removing it and roadway construction and widening of its southern entrance) and the design is conducted based on the substrate roughness coefficient and flood Debi of 25 years and some of the results are shown below. Longitudinal profile of the stream while flood crossing in all three modes of the river is displayed in (1-3), (2-3) and (3-3). The parameters of depth and flow velocity at the entrance of water in upstream and downstream of the telecommunication bridge were evaluated in three different modes. Also, antibiotic sensitivity testing, rapid changes in the upstream of telecommunication bridge in the third mode of the river (roadway construction

and widening the southern mouth of the bridge) for different values of the coefficient of n were determined.

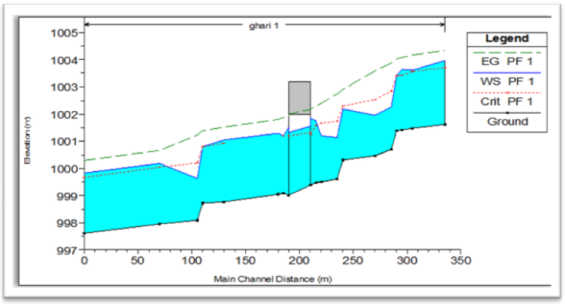

Figure 4: Diagram of longitudinal stream profiles in the first mode

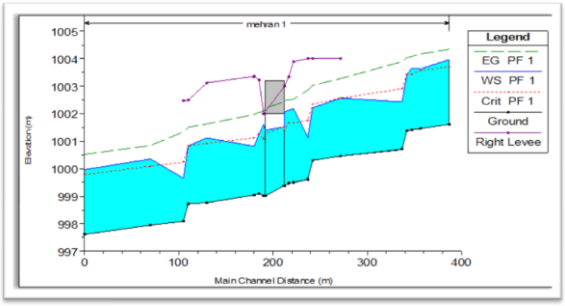

Figure 5: Diagram of longitudinal stream profiles in the second mode

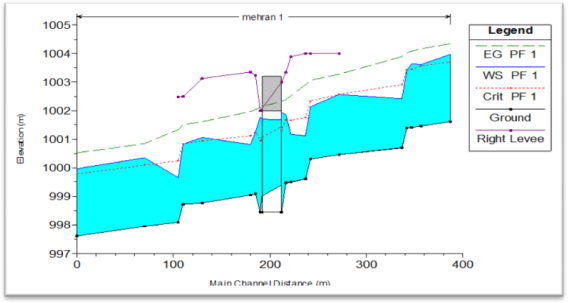

Figure 6: Diagram of longitudinal stream profiles in the third mode

CONCLUSIONS

In order to construct the roadway in the Mehraneh River and to block the northern entrance of the telecommunication bridge, it is required to compensate the reduction of the cross-sectional area of flow. To this purpose, the river Mehraneh along the telecommunication bridge with the length of approximately 400 meters was simulated using the software HEC-RAS. The results are summarized as follows:

- The results showed that the flow rate of the river at all three modes of the river was in the limit and there was no problem about erosion and sediment.
- The flow velocity in the third mode (roadway construction and widening the southern mouth of the bridge) is better than other states due to the low controllability in the downstream of the bridge.
- The results show that in the mode of constructing the roadway, the velocity increases about 10 percent and water level increases by 0.02% compared to the pre-construction mode.
- Widening the southern entrance of the bridge for the construction of the bridge roadway in the northern mouth is felt in order to further protection of the flow of flood and the protection of the bridge structure.
- The results of this study demonstrate the effectiveness of the Manning roughness coefficient in the velocity and the height of the flood discharge.

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