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Flood Hazard Analysis of Proposed Regulator on Shatt Al-Arab River

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Abstract: Recently, the Shatt Al-Arab River has suffered from increased salinization of its water due to the reduction of freshwater from its tributaries, mainly from the Tigris River, which has resulted in long-distance salinity intrusion. Therefore, there is a need to establish a regulator in the Abu-Flus district to prevent salt intrusion. The aim of the study is to investigate the effect of a proposed regulator on the Shatt Al-Arab River with simulations using the Hydrologic Engineering Center's River Analysis System (HEC-RAS) model. The upstream boundary conditions were the daily discharges of Tigris River and the downstream boundary conditions were the hourly water stages of the Shatt Al-Arab River. The river model was operated by using the daily discharges recorded in 2014 for calibration and verification of the model. Then, a program operated with a suggested regulator and a flood wave assumed a 200 m3/s peak flow for a duration of 27 days. The flooding occurrence period of the flood wave was investigated under the effect of three study cases of regulator gates, which were fully open (case B1), tide gate (case B2), and fully closed (case B3). The results showed that flooding inundation occurred only in two cases (B2 and B3). These results will encourage the construction of the regulator considering certain precautions.

Keywords: HEC-RAS; Shatt Al-Arab; numerical simulation river; 1D/2D; floodplain

1. Introduction

The Shatt Al-Arab River is located in southern Iraq. It is formed from the confluence of the Euphrates and Tigris Rivers at the Al-Qurna district, north of Basrah Province (31°00 17 N and 47°26 29 E). Then, it flows to the south of Basrah Province towards the Arabian Gulf [1], (see Figure 1). Recently, the hydrological system of the river has been influenced mainly by the discharge of the Tigris River and the tides from the Arabian Gulf [2]. The Shatt Al-Arab River has a length of about 200 km, the width varies in the range of 250 m to nearly 2 km, and the depth ranges from 8 to 17 m [3]. The tides in the Arabian Gulf are mostly semidiurnal, and their impact is felt up to the city of Al-Qurna in the north of the Basrah governorate [4].

The salinity of the water in the Shatt Al-Arab River has increased dramatically in recent years, especially in the summer season. The main reason for this is the reduction of incoming freshwater from the Tigris River (less than 50 m^3/s), which has led to the intrusion of saltwater during high tide from the Arabian Gulf to the upstream of the Shatt Al-Arab River, reaching up to the Qurna district [5]. The Water Resources Directorate in Basrah indicated that the total dissolved solids (TDS) value of the water of the Shatt Al-Arab River exceeded 15,000 ppm at the Basrah center in July 2018. The Basrah governorate was adversely influenced by the high salinity of the water in the Shatt Al-Arab River, which is the main source for irrigation and water supply. Specialists have suggested constructing a regulator on the Shatt Al-Arab River to avoid the intrusion of seawater in order to solve this issue. The suggested location for this regulator is near to the Abu-Flus port. However, there are two contradictory views regarding the