

Modelling of Dam-Weir Operations for Environmental Quality

Darrien Y.S. Mah and Frederik J. Putuhena

Abstract—It is the desire of many societies to have clean and safe potable water sources. As manmade structures are built in water supply catchments for the purposes to increase safe yield, then facilities management of these structures should be steered towards environmental quality. Hydraulics over a weir is well studied. However, this paper probes into benchmarking of flows over a Batu Kitang Weir to guide operations of an upstream Bengoh Dam in Sarawak, Malaysia. Flow releases from the dam are tried and routed through Sarawak Kiri River to achieve supercritical states at weir by means of computer modelling. For daily dam-weir operations, the modelling results suggest a condition of $20 \text{ m}^3/\text{s} < \text{dam releases} < 200 \text{ m}^3/\text{s}$ to meet raw water demand as well as adequate river flow regulation.

Keywords: environmental flow, hydrodynamic, InfoWorks RS, regulated river, water resources

I. BACKGROUND

KUCHING city of Sarawak State, Malaysia relies on Sarawak Kiri River for drinking water, in which the basin is gazetted as Water Supply Catchments since 1993. In order to increase raw water yield of the river, a sheet pile weir is positioned across Sarawak Kiri River in Batu Kitang completed in 2005 [1]. A water treatment plant is located about 700 m from the weir. Further to secure water resources for the capital city, a roller-compacted concrete (RCC) Bengoh Dam is erected 38 km upstream of Batu Kitang Weir (see Figure 1) and completed by end of 2010. However, impoundment has not started during the writing of this paper. The dam with 77.5 m full supply level (see Figure 2) is meant solely as enduring water storage not for direct abstraction but to regulate flow along Sarawak Kiri River [2]. The catchment at the dam site represents about 20% of that at Batu Kitang.

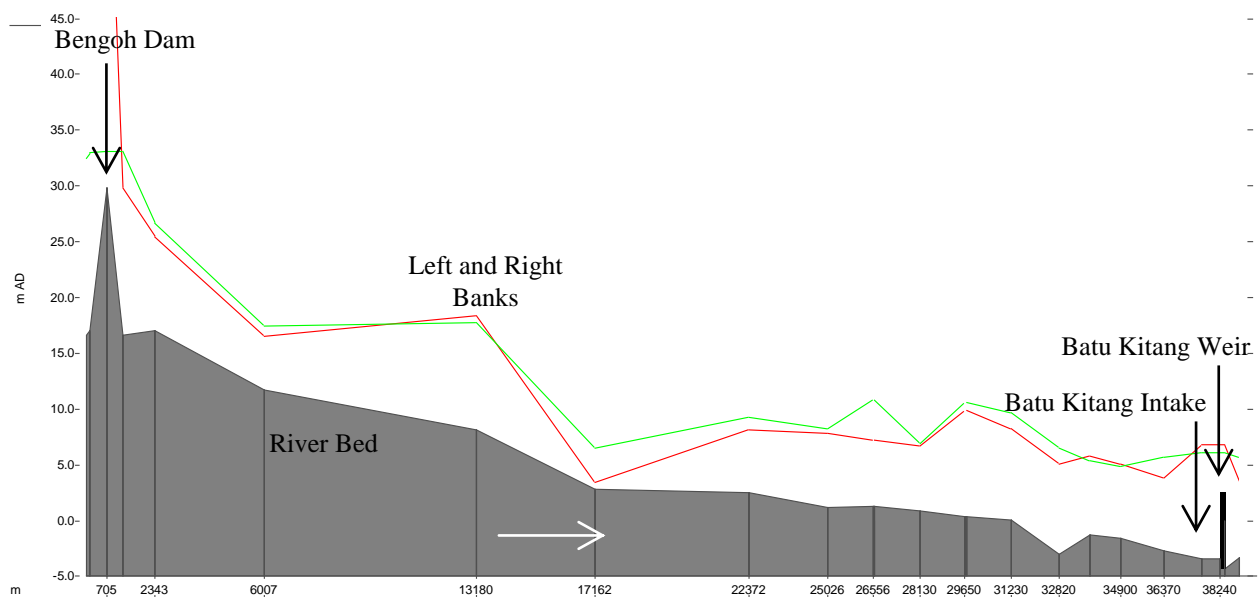


Figure 1. 38-km Long Section Profiles of Sarawak Kiri River

Dr Darrien Y.S. Mah is with the Department of Civil Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia (corresponding author, phone: 082-5832077; fax: 082-583409; e-mail: ysmah@feng.unimas.my).

Prof Dr Frederik J. Putuhena is with the Department of Civil Engineering, Faculty of Engineering, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia (e-mail: fjputuhena@feng.unimas.my).