THESIS

STORAGE POTENTIAL IN RIVER CHENAB AT KHANKI

BY

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ABSTRACT

Pakistan being an agriculture country mainly depends upon the natural water resources. The water resources of Pakistan are 172.7 BCM and Pakistan has only 15.74 MAF in storage representing 13% of the total annual flows of 136 MAF. Chenab River is major tributary of the Indus River in Pakistan with average annual flow of 12.38 MAF. Marala, Khanki, Qadiraabad, Trimmu and Panjnand are barrages/headworks on Chenab River. Khanki is oldest one and having strategic position in irrigation of Punjab province needs essentially to be rehabilitated/remodeled on priority basis to avert any mishap, which can generate catastrophic condition. The Irrigation and Power Department opined that when a new barrage is going to be constructed, then option of storage may also be evaluated.

The frequent flood flows in River Chenab which presently thrown away in sea as unused, could be used to fill up potential storage reservoirs at some appropriate locations at River Chenab for the availability of water in dry season. As Khanki barrage is going to be constructed then a sizable storage provision and power generation due to upstream raised water level could be easily incorporated in the barrage plan. This study is conducted to find storage capacity, pond area and required height of dikes for containment of flood flow at Khanki.

In this study Arc GIS software was used to extract the river geometry from the SRTM DEM of 90 meters resolution for storage capacity and flood analysis of the selected river reach. DEM cross sections were verified with surveyed cross sections at few points and noted that DEM cross sections or geometry require correction. The DEM was adjusted after calculating RMSE by adding selected factor. The DEM was adjusted by adding the elevation of +14.6 feet after calculating RMSE.

New location of Khanki barrage was selected ≈ 7 Km d/s of existing wier at narrow river section. Storage capacity and additional required pond area were determined by using GIS 3D analyst tool for volume and surface area. Storage capacity was determined for two cases: 1) storage at NSL and 2) storage curtailed by dikes. Storage at NSL was bounded by the high ground levels or existing dikes/levees whichever is more stringent and for storage curtailed by dikes, a dike was constructed at suited site. Storage capacity and pond area were analyzed for pond levels of 732 ft, 734 ft, 736 ft, 738 ft and 741 ft. Hydropower energy potential at head of LCC and loss of energy generation at Shadiwal hydropower station was also worked. Finally, the 741 ft pond level for NSL was selected on the basis of storage capacity achieved (0.22 MAF), additional pond area required (15742 acres), villages inundated (1 village) and net potential hydropower energy generation benefits (107.67 GWH).

HEC-RAS was used to perform flood analysis for design flood discharge (1100000 cfs) of Khanki barrage at selected pond level 741 ft to determine the required height of dikes to containment of flood within existing dikes and it showed that LMB required to raise between1.02 m (min) and 5.07 m (max.) with an average of 3.98 m and RMB required to raise between 0.15 m (min) and 2.47 m (max.) with an average of 1.65 m for a length of 24 km.

It is recommended that storage optional at Khanki may be adopted. Further a better resolution DEM may be used to enhance the accuracy of elevation data, bund detail and other river features to be extracted. Survey data for the calibration of DEM should be of the same date/time and grid.