

Yuwaret Vetchagama 2007: Water Quality Investigation in the Upper Ping River by an Application of the MIKE 11 Model. Master of Engineering (Water Resources Engineering), Major Field: Water Resources Engineering, Department of Water Resource Engineering. Thesis Advisor: Associate Professor Nuchanat Sriwongsitanon, Ph.D. 135 pages.

This study aims to investigate water quality parameters consisting of DO, BOD, and SS in the Upper Ping River between gauging stations P.20 (Chiangdaow District, Chiangmai Province) and P.73 (Jomthong District, Chiangmai Province) by the applications of four modules, which are NAM, MIKE 11 HD, MIKE 11 AD and MIKE 11 WQ, of the MIKE 11 model. For the applications of the NAM and MIKE 11 HD modules, flood events for the year 2001, 2003 and 2005 were applied to identify suitable parameters for each module to support usages of the MIKE 11 AD and MIKE 11 WQ modules. These two modules were calibrated using ten values of each water quality parameter that have been collected between September, 2005 and February, 2006 at each location of the overall twelve locations along the Ping River and its downstream tributaries. Water quality standard during this period was distinguished in Type 2 and 3. Results of each model calibration show that the values of roughness coefficient (Manning's  $n$ ) - the MIKE 11 HD's control parameter - for the channel flow are between 0.030 and 0.040 and for the floodplain flow are between 0.125 and 0.150. The dispersion coefficient - the control parameter of the MIKE 11 AD - was found to be between 50 and 50-500 m<sup>2</sup>/sec. Suitable value of the control parameters of the MIKE 11 WQ include: 1) the BOD decay coefficient, which is 0.15 day<sup>-1</sup>, 2) the maximum oxygen production by photosynthesis, which is 0.75 g O<sub>2</sub>/m<sup>2</sup>/day, 3) the oxygen consumption by respiration of plant and animal, which is 1.00 g O<sub>2</sub>/m<sup>2</sup>/day, 4) the resuspension of organic matter, which is 0.01 g O<sub>2</sub>/m<sup>2</sup>/day, 5) the sedimentation rate for organic matter, which is 0.05 m/day, and 6) the sediment oxygen demand (SOD) at 20 degree, which is 0.20 g O<sub>2</sub>/m<sup>2</sup>/day. Calibrated and validated results of these modules have shown acceptable statistical values. Therefore the model parameters can be applied to investigate changes of water quality in the next 20 years. The results show that water quality in the Ping River along Muang Chiangmai District will be critical with BOD values higher than 2.0 mg/l (Type 4). As the result, water treatment plant along this area should be constructed before critical situation occurs.

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Thesis Advisor's signature

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