

Memorandum

To: Jon Jones, P.E.

From: Marty Matlock, Ph.D., P.E., C.S.E.

Re: Review of Aqua Terra's Data Gap Analysis

Date: 08-29-10

This memorandum conveys my review of the document "*Preliminary Data Review and Analysis for Water Quality Modeling and TMDL Development for the Illinois River Watershed*" by Aqua Terra, dated 08-03-10. The review follows the sections of the report.

Precipitation. The most appropriate precipitation data for this basin is from the USGS Mississippi River Basin Program (Xie et al., 2005). Daily rainfall, temp, and solar radiation are necessary for simulating the hydrologic balance of this watershed. Snow data is anecdotal in this basin; we get too little snow over an annual cycle to differentiate the impact from rainfall.

Evaporation. This variable is critical for simulating runoff from frequent low intensity storm events. These events drive nonpoint source (NPS) pollutant loads. If ET is underestimated, soil moisture, infiltration, and runoff will be biased. The review indicates that a single Potential ET site will be used, but it is located 30 miles south of the watershed. The impact of 30 miles south is about 25 minutes latitude, a significant difference in day length and thus temperature. However, elevation is as important; the sites to the south is likely at 500 feet MSL, while the average elevation of the Illinois River Basin is over 1000 feet MSL. Air temperatures are cooler, weather patterns are different, and thus ET is different. This region has highly variable ET, based on soil type, slope aspect, wind, season, and vegetative cover. The proposed weather station for PET at Blue Mountain Dam is in a different ecoregion, and will not reflect the conditions in the Illinois River Basin. ET should be actively simulated within SWAT or HSPF.

Streamflow. Calibration and validation statistics of the flow in the Illinois River Basin is the foundation for assessing the utility of the simulation model to predict or assess pollutant load and transport processes. The thresholds for acceptance must be defined prior to modeling in order to establish objective criteria for success. Failure to adequately define *a priori* the thresholds of acceptance for quality control constitutes a significant bias in the modeling effort. The authors suggest on Page 14 that the quality of the analysis might be compromised from the outset due to limited resources to adequately calibrate and validate the hydrology of the system: "There appears to be adequate periods of record for three to five calibration sites within each state, if project resources support this level of calibration effort." If project resources do not support this level of calibration effort, what level of effort is acceptable?

Water Quality Data. The data collected by the University of Arkansas from 2007-2010 on Osage and Spring Creeks are not identified in the water quality dataset. These data

represent the most comprehensive analyses of water quality in the upper basin in 10 years, and is adequately resolved to provide for point source calibration. These data were provided to Aqua Terra on three different occasions by the University of Arkansas. In addition, the City of Rogers has an on-going NPS monitoring program. Those data can be provided through ADEQ.

Atmospheric Deposition. The Cherokee Nation Environmental Protection Department maintains atmospheric monitoring stations throughout the region. Their data will be of higher relevance than the NADP data due to the intensity of sampling and locations.

Channel Characteristics. The upper Illinois River Watershed stream bank and bed were characterized using USEPA QAPP Approved methods by the University of Arkansas Ecological Engineering Group in 2004 (Parsons – USEPA Region 6) and in 2007-9 (McGoodwin Williams and Yates, 2010). These data were provided to Aqua Terra on three different occasions by the University of Arkansas. The data are not mentioned in this review.

Land Use. The University of Arkansas Center for Advanced Spatial Technology (CAST) maintains a high resolution land use database for Arkansas. Those data are available in multiple geospatial formats, and are not represented in this review.

General Comments. The Cherokee Nation, not the United Keetowah Band, has Federally recognized jurisdiction over the waters of the Illinois River and other waters in the original boundaries of Cherokee Country. The Cherokee Nation Environmental Program should be included in this discussion.

The conditions in this watershed are changing in a directional manner; phosphorus loads from point and nonpoint sources seem to be decreasing. Calibrating a model for conditions in 1990 or 2000 and extending it to 2005 for validation will not bracket the expected conditions of the basin, and therefore do not represent a viable simulation of the system for predicting impact or identifying sources. The current conditions are outside the range of calibration or validation data. This issue must be addressed if the model is to be used for load allocation.

References.

Xie, Hongjie, Xiaobing Zhou, Enrique R. Vivoni, Jan M.H. Hendrick, and Eric E. Small. 2005. GIS-based NEXRAD Stage III precipitation database: automated approaches for data processing and visualization. *Computers & Geosciences* 31: 65–76.