

B-1

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**CONCERNS OF DISSERTATION
(GAINES)**

Concerns of Micro-Models
based on Andy Gaines' dissertation
by Tom Pokrefke

(1) I still have a concern in the fact that micro-model studies do not reproduce in any fashion the stages, discharges, or hydrographs for the study areas. To my knowledge, these are the **only** model studies that take such relaxation with these physical independent parameters that significantly impact channel morphology. Since sediment transport is some power function of the water velocity, it does not seem reasonable to me to abandon these critical input parameters. To my knowledge, all other models, including numerical models, wave models, and hydraulic structure models, maintain a close relationship between the model and prototype of water elevations (stages) and discharges.

(2) I also continue to have a concern relative to the high model (in essence valley) slope used in the micro-models. The resulting high velocities are going to be harder to "control" during the micro-model testing.

(3) As brought out several times in the Dissertation, the micro-model has no bed forms. In my viewpoint, the micro-model is operating with a bed form (movement) of plane-bed with sediment movement. That means that the higher velocities maintained in the micro-model are moving the model bed material at too high a rate.

(4) Calibration of micro-models to "stable" conditions seems to be inappropriate when one is studying a "problem reach" on a large alluvial river like the Mississippi River. Such "problem reaches" are normally problems because of a high degree of **instability**. To adjust and calibrate a model for stable sediment input and output is a major relaxation from the prototype situation.

(5) The issues of the "hydrograph," determination of the vertical scale, and "shift" really need to be brought out and explained. If there are reasonable and defensible justifications for why and what the micro-modelers do relative to these issues, they need to be explained and discussed.

(6) In the comparison of the various Kate Aubrey models, I have a major concern with what was discussed and presented. Such parameters as presented on Table 6-1 create a real concern to me. The variations and values presented do not appear to be reasonable.

(7) In the flume studies conducted at Rolla, results stated that sinuosity was higher in the 2" flume than in the larger channel. The partial explanation was that the sinuosity in the larger channels was restricted because of the flume length. It seems that this situation would have a direct impact on micro-modeling efforts.

(8) In the flume studies conducted at Rolla, results presented on Table 6-3 indicate for the 2" flume that the scour with the porous dike was about the same as with the solid dike. The Froude number was about the same for both dike types, but the contracted

width was about 12% less for the porous dike. It seems that this situation would also directly impact micro-modeling efforts.

(9) Throughout the dissertation Andy talked about results being inconclusive and the need for addition research in a wide range of areas. At times these statements really diluted the dissertation and I had to ask myself what was worth paying attention to and what issues just weren't to the point of closure yet.

(10) In numerous places throughout the dissertation, Andy talked about considering roughness distortion factor, slope distortion factor, and ripple factor in the design on micro-models. If he ever presented how this could be done, I was unable to see it.

(11) For all of the area, hydraulic depth, width, and width/depth comparisons for various large-scale, micro-models, and prototype surveys, I am not convinced that the method that we used to visually evaluate the model planform to the prototype planform was not the best. I truly believe that **no model** is going to match all of those parameters with the prototype. Add to that the normal objective of a movable-bed model study is to develop a satisfactorily aligned navigation channel, which will reduce annual maintenance dredging, I believe that the past approach is acceptable. It cannot be quantified, but it can be justified.

(12) As long as the micro-modelers continue to avoid the stage/discharge hydrograph issue, the establishment of the vertical after testing, the infamous shift, and the fact that the basis for their calibration of the micro-model is really determined until they see the results, then the engineering community will never be able to fully appreciate what is transpiring during micro-model testing.