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MAYNORD

**REVIEW AND COMMENT OF
EVALUATION REPORT**

19 July 2003

Subject: Review and Comment of July 2003 Micromodel (MM) Evaluation Report by Stephen T. Maynard

General Comments:

1. It is important to acknowledge that Andy Gaines has been asked to put together a report under impossible constraints. Although I hate to emphasize one of these constraints, I must state what I stated at the Memphis meeting last fall. My conclusions must be shown and they are not areas of consideration or future study. Further, they must be placed in the conclusions section or the report is not acceptable.
2. All JV members agree that the MM can be used for Demonstration, Education, and Communication (DEC). The main issue that potential MM users need to know is whether the MM can be used as a screening tool to compare alternatives. I prefer to address this issue by asking what I believe to be the primary question, **“Does the MM give predictions adequate to compare alternatives?”** I believe the present report focuses on far less important issues and should be refocused on this primary question.
3. The report attempts to justify poor performance in the MM by poor performance in the ERDC coal bed models. This is the continuing effort to show that the MM is somehow equal to the ERDC coal bed models. Some seem to believe that if this can be done, this greatly diminishes any responsibility to answer the primary question. This is not a valid approach because:
 - a. The MM needs to be sold on its successful predictions.
 - b. The evaluation team was not tasked to evaluate ERDC coal bed models and the comparison methods used are not adequate to compare models.
 - c. The techniques used to compare width, depth, etc are based on reach averages which tend to hide differences in the problem area. Reaches having large deviations where parameters are too large and then too small cancel each other out. The percentages shown give potential users a false sense of accuracy. The reach averaged values should not be used for anything. The plots of model-prototype parameters along the length of the model we presented in the appendix would likely be useful in the calibration process.

Remove all attempts to equate coal bed and MM and focus on the primary question by showing successes and failures of the MM. Any critique of ERDC coal bed models needs to be approved by Tom Pokrefke.

4. The report focuses on the process of design, operation, and interpretation for the purpose of emphasizing the value of the knowledge gained during the process. I have no doubt that the modeler learns a great deal in this process and I consider this to be an element of DEC. This is education of the modeler. This process cannot overcome a model that gives wrong answers. The constantly repeated focus on the process is a distraction from the primary question.

5. The case study section in chapter 3 contains a significant amount of anecdotal information about the MM providing successful performance. Some of these sound like that if they had been pursued with an actual analysis and data comparison, they would have had significant value to this evaluation. Unfortunately, we do not know. We cannot conclude predictive capability based on such evidence in which the details are not known.
6. The report also needs the following: (1) omit repetition of various items, particularly the process issue, (2) rearrange the case histories/model-prototype comparisons and put in one location with a consistent message. For example, Mouth of the White River is in 3 separate locations on pages 25, 40, and 43 yet it still does not include the information I provided in my submittal showing huge deviations in hydraulic depth. Page 25 says “model channel bathymetry did not replicate exact prototype bathymetry”. While page 43 says “Despite the fact that micromodel calibration may have been poor”, it gives the reader no sense of how poor it was and it says it “may” have been poor. (3) I found comments from my submittal to be understated such as the 2nd pp on page 45 on Vicksburg Front MM such as “...Maynard’s (2002) presentation of surface velocity.... displays some disagreement of micromodel and prototype velocities...” and “agreement of surface patterns was less than desirable” to be extremely kind descriptions of what I said about this model. Some of my input was omitted entirely such as Sante Fe Chute where the calibration had errors in depth of up to 30-40 ft but no mention is made on page 27. No mention is made of my findings submitted on New Madrid on page 26 where large deviations in depth were present in the problem area. The description of Savannah Bay in the last sentence of the first pp on page 28 makes the model sound much better than the cross-section I plotted where the model scoured about 30 ft more than the prototype at the location where prototype dredging was greatest. (4) correct statements about Schienimann Chute on page 29 where it states that problems occurred in the study that would tend to make this study one we should not critique. None of those problems were mentioned in the Schienimann model report. The evaluation draft states “The (Schienimann) model study did not investigate the design’s effects on the bathymetry in the main channel”. The Schienimann model study report states in the abstract “The study also showed that the desired designs would not have an effect on bed response of the main navigation channel.” My submittal to this report included a critique of Schienimann Chute that was not found in the report. Wolf Island had scour depth differing by up to 40 ft immediately upstream of the problem area. The evaluation draft on page 28 about Wolf Island does not reflect this problem. Page 30 on Peoria Lake states that “... flow patterns in the model differed slightly from those in the prototype...” is not in agreement with the plates in the Peoria report and in my submittal presenting far greater differences.
7. The section on predictions in the MM includes New Madrid and Mouth of the White River. Both were poor calibrations and cannot be considered successful predictions. Remove both. I went back and checked the Marquette report. It implies or says nothing about the 3-step calibration. It says the model was calibrated twice. I strongly suspect that the report would have been quite explicit if it had been successful at placing the bendway weirs in the calibrated model w/o

weirs and running the model w/o the second calibration. Remove Marquette unless a previously published document shows this to be a true validation using the 3-step calibration. Kate Aubrey remains the only validation attempt I have seen in this evaluation. It showed lack of prediction in the MM. Kate Aubrey was a critical element of this evaluation. The results of this lack of prediction should be highlighted in this report.

8. As written, the report does not show my findings on the MM in the conclusions. As a minimum, it must have a conclusions section with my conclusions with my name, and no other input from anyone in my section. If that does not happen, the report is not acceptable. I would like my conclusions section to read as follows:

“The micromodel, because of its small size and totally empirical design/operation, is different from previous movable bed models and does not fit into either of Graf’s categories of empirical or rational models. In addition to its size being as small as 4 cm channel width, the large vertical scale distortion, large Froude number exaggeration, and no correspondence of stage in model and prototype, place the micromodel in a category by itself.

In some studies, the micromodel has been calibrated to match the bathymetric trends of the prototype. In other studies the calibration was poor and the micromodel did not match the bathymetric trends of the prototype. The Vicksburg Front and Peoria Lake comparison of surface velocity in calibrated model and prototype showed no agreement. No previous studies have shown validation of the micromodel to demonstrate the model can predict bathymetry. The two Kate Aubrey micromodel validations did not agree with the observed prototype response. Extreme relaxations of similitude are a primary cause of the model and prototype differences. Recommended applications of the micromodel follow.

- a) Demonstration, education, and communication- The micromodel is useful in demonstration, education, and communication and is effective in generating ideas for problem solution and demonstrating river engineering concepts.
- b) Qualitative bathymetry analysis- Qualitative bathymetry analysis is use of the micromodel as a screening tool to compare alternatives based on analysis of bathymetry. No numbers should be assigned to alternative features or results from the model in this category. This category is the primary question to be answered in this evaluation. Can the micromodel, which operates with extreme deviations in similarity criteria and can frequently achieve only a poor calibration, still be used to predict and compare alternative plans, even in a qualitative sense? This evaluator has seen no evidence supporting use as a screening tool. Future application of the micromodel in this area requires that the user demonstrate that the model can be validated, i.e. shown to predict changes to the prototype. At some point in the future, several successful validations of the micromodel in each specific study type (for example long constrictions or single dikes or bendway weirs or traditional dikes) would allow use of the existing calibration only model adjustment process for this study type.

- c) Quantitative bathymetry analysis- Quantitative bathymetry analysis is use of the micromodel in which numerical values are used to characterize alternative features or in which numbers are assigned to bathymetric results from the model. The following reasons prevent this category from being a capability of the micromodel in either of the two levels of quantitative use described in a previous paragraph.
 - 1) The absence of studies showing predictive capability
 - 2) The poor prediction of bathymetry in Kate Aubrey models
 - 3) Poor replication of currents in Vicksburg Front model
 - 4) Poor or inadequate calibration in about ½ of the micromodel studies
 - 5) Extreme deviations in similarity criteria
 - 6) Lack of correspondence of stage
- d) Flow patterns to assess navigation This is use of the micromodel in which confetti pathlines or PIV flow visualization are used to compare alternatives for navigation improvement. The reasons given in item c) prevent this from being a capability of the micromodel.
- e) Environmental Studies- The above recommendations are based on the application of the micromodel to a navigable river or to a non-navigable river in the vicinity of a hydraulic structure. While environmental concerns are equal in importance to navigation concerns, the required accuracy of environmental studies may be less than navigation studies. If the required accuracy is less, the existing two-step calibration procedure should be adequate for qualitative bathymetry studies of environmental concerns that do not impact a navigation channel.

In summary, no evidence has been found that the micromodel can be used for anything beyond demonstration, education of both the modeler and the public, and communication between diverse interests. No evidence exists that the model results are adequate to predict the effects of alternatives that is the requirement for use as a screening tool. Contrary evidence exists showing that the model cannot predict in the two Kate Aubrey studies that were critical components of the evaluation.”

End of my input to conclusions section.

Specific Comments on Evaluation Draft:

- 9. Section 1.6, 1st pp- Omit the conclusion “Results from several MM” And put in conclusions section under author’s name who stated this.
- 10. 1.6, 3rd pp- This pp covers too much ground and is confusing to me.
- 11. 1.6, last pp- we can state how we use these terms and at least avoid confusion in this report rather than raising doubt about their meaning.
- 12. Section 2.4- The navigation category includes screening of alternatives as shown on page 55. On page 17, change last sentence of item D to “to screen alternatives or make conclusions about safe navigation”. This should eliminate the confusion discussed under the 4 categories.

13. Section 2.5, 2nd and 3rd pp are repetitious. Next to last pp is yet another presentation of the “process” issue.
14. Section 3.3.6- The suspended sediments issue should relate to whether a stream is predominately bedload which is delineated by some value of U^*/w (1?) and not whether it is active bed transport.
15. Section 3.4, Case studies need to be combined with model-prototype comparisons. Sentence “Because MBM typically depart from ideal similarity” brings to mind a discussion we had on the definition of similarity and similarity criteria. We should probably define these two terms in section 1.6.
16. Section 4.1- What is the 3rd pp talking about? It appears to me that the last pp of 4.5 describes use of the MM for DEC.
17. Chapter 5- Note in the text that many of the issues are the same ones found in MM contrasted with other empirical MBM. Add to this section another area of consideration- “Use as a Screening Tool” with text as follows: The micromodel has been used to screen alternatives. Screening requires the model to predict the effects of a plan. Results of available validation tests show that use of the micromodel as a screening tool is debatable.
18. Conclusions:
 - a. 2nd pp- remove last 3 sentences because they do not add to report.
 - b. 3rd pp- no amount of data would have resulted in a consensus. This pp should be removed because it does not add anything.
 - c. I find no conclusions that would help a potential user and little in the remainder of this section to be of great value to the report. Some of the items in the next to last pp are new that should have been presented in the body of the text. I provided conclusions as part of my input that were placed in closing remarks that also contains some conclusions by others. My conclusions section is shown above and should be placed in the conclusions section with my name on them. Have Dave and Andy write their conclusions and put their name on their conclusions. Be specific. Address the issue of using the MM as a screening tool. Avoid statements like the MM provides “additional” information , “useful” information, or “positive results”. Don’t spend a great deal of time trying to discredit my arguments. State what you believe and why as I have tried to do in my conclusions.
 - d. It appears from statements made in the report that some of the JV members believe the following “Even with a poor calibration, the MM gives predictions of the prototype adequate to compare alternatives.” If that is your belief, state so rather using vague statements that do not help a potential user.
19. Closing remarks section- omit this section and put in conclusions. I found it somewhat disheartening to see my conclusions given in this section rather than in the conclusions section.

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