To: Interested persons.
Subject: Negotiation model work.

July 26, 1996

From Bill Sikonia, regarding the effort to document and quality assure the Negotiation Model for the Truckee River Operating Agreement:

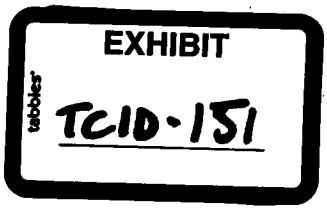
The following describes my evaluation and how I intend to proceed. I want to emphasize that others are free to do as they like; the decisions relate to my evaluation and what that means regarding work that I had planned for the future.

When we first started working with the Negotiation Model on March 18, 1996, I thought that the process of understanding its logic flow might be difficult but would yield to moderate scrutiny. However, over the past 4 months, I have come to believe otherwise. I think the model is in such a state that it is essentially impossible to go through with understanding. Furthermore, I could not and would not defend it in court. Because it is so difficult to understand, I have reached the point that I think proceeding would be unreasonable and not something I can continue.

The code has grown in unbridled fashion since the 1970's. Started as a U.S. Bureau of Reclamation model at that time, it is now, as far as I can see from code we've examined, written very largely by Rod Hall, a consultant with Sierra Hydrotech. For a model of this size, one would have to exert considerable control over coding modifications so that the code remained manageable and understandable. However, the model development did not adhere to good coding practices that would ensure this outcome. (MODFLOW, under the influence of Arlan Harbaugh, is a good example of how to do this right.)

The Negotiation Model has, by contrast, grown in out-of-control fashion, often in pressure-cooker situations that required major revisions and results in a day or two. The code is now extremely convoluted. One cannot tell what parts of the overall program perform a certain function, or even which parts of a single subroutine might. In going through the code, we often heard, when we questioned a seemingly invalid operation, that the problem was probably fixed up somewhere else. There was no clear, understandable path through the code, and ever arriving at understanding of the model's operation would, I think, be next to impossible.

Another issue has to do with estimates of processes and parameters. It is extremely difficult to separate whether operations are simply personal estimates (usually with little justification) on processes and constants, or whether the choices are actually based or rational analysis or dictated by court cases. The model has almost no internal documentation describing the model's operation, the reasoning behind choices, the flow of logic, or anything else.



Yet another aspect of the coding style, which makes the code almost impossible to understand, is that the program uses local variable names of "dog, rat, cat, cow, hog, fox", etc. Using such non-meaningful names means that it is nearly impossible to read through a subroutine and make sense of it. The meanings of these variables can change many times (even as many as twenty times) within a single subroutine.

I think that the code would be so difficult and costly to put in understandable, defensible shape, that it does not make sense to continue to try. I think even to go through a first pass that really starts to get at understanding of the logic might cost $1,000,000 and take 2-4 people up to 2 years. (Besides the initial effort, just consider that two additional people will have to review the work, which would probably amount to 2,000 pages or more. That probably would never make it through the U.S. Geological Survey.) Even if we were able to complete a first pass, we would only then be at the beginning of really trying to make sense of the model. The first pass would not answer hundreds of questions about the correctness of the simulation (we already have scores of these). These questions must necessarily be answered for the model to be defensible, and that would presumably be accomplished on future second or third passes. And beyond that, we have not begun to really get at questions of whether the code truly simulates court decisions about water rights. Trying to understand whether code does correspond to them is, of course, a central issue in the negotiations. However, it is nearly impossible to tell if the model does correspond properly, or to distinguish arbitrary and personal choices from imposed court decisions.

I have no confidence that there would ever be a second or third pass, which might take years into the future. Thus, I would probably be in the untenable position of being asked to defend in court a model for which we had little understanding. I can't and won't. Neither does it make sense to try to recapture the model as a Federal model. The model is now essentially the work of a private individual. We have many, many questions about the way his processes and parameters operate. I believe the money and effort would be much better spent by starting from scratch in simulating these processes with the U.S. Geological Survey's daily model, perhaps in conjunction with another simplified, general-purpose water-rights model.

Stetson Engineers apparently has in mind continuing with the Department of Justice idea to produce overview documentation by December 1996. This documentation by no means provides adequate enough understanding to be able to defend the model in a court case.

In meetings to document the code with Rod Hall, and engineers from Stetson and Orlob and Associates, we only skimmed through modules to satisfy the Stetson and Orlob objective of cursory documentation. We did not take the time to truly understand model operation. The idea was simply to race through as fast as possible, mindful of the huge number of lines of code sitting out there unfinished. This approach could not result in understanding the model's operation on this pass, and, as I've said, I do not believe there ever will be additional passes through the code.

Since March 18, I have tried to remain positive, hoping that somehow it would get easier or that we might be able to work with Stetson and Orlob engineers even though we had very different objectives. I thought Bill Greer, of the U.S. Bureau of Reclamation, and I might be able to continue with additional effort to give understandable first-pass documentation, even though that of Stetson and Orlob was to be only an overview. I had been especially concerned that we try to maintain a positive outlook in reports to others, who might very well amplify problems to more than they really were. However, the concerns are real, and so significant that I just don't think it makes sense for either me, personally, or for the Survey to continue. I cannot, in fact, force myself to look at any more of this code, which is exceedingly difficult to try to make sense of. Because of the lack of a clear understanding of the model's operation, I do not think one can assure the model results are valid. (In fact, I have examples of coding errors that definitely change model results.)

Moreover, it looks to me as if future scenarios make very questionable sense: We might spend huge amounts of time and effort in making something workable of the code, and then find that nobody was really interested, for one reason or another. For example, court cases might proceed on the basis of perception and clever attorney arguments, without even using our work, or the program might become moot because the USGS daily model is in operation. On the other hand, we might never be able to decipher the program, or might spend totally inadequate amounts of time to truly understand it. Either situation would place me in a position of being asked to defend a model that I didn't believe in, and didn't think we could ensure was working properly.

For these reasons, I just don't think it makes sense to continue the effort. Much more intense effort would be required to understand the program and put it in defensible shape than I think is realistically and economically justified.

Best regards,

Bill Sikonia

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