To: Interested persons.
Subject: Memo from co-worker Bill Greer that may interest you.
From: Bill Greer
Date: August 5, 1996
Subject: Comments regarding documentation and quality-assurance work on the Truckee River Negotiation Model

I assume that you have read the memo from Bill Sikonia, which presents his assessment of the Negotiation Model, and his intention not to continue with the documentation and quality-assurance project. The following are my thoughts/comments on our work:

1. The task of Bill Sikonia and myself has been to thoroughly document and provide quality assurance for the model. This work consists of two phases. The first is to go through each of the 116 or so subroutines line by line, seeking to understand all the detailed comments within the code to define variables and explain what the code is doing, and, along with the comments, inserting questions regarding anything within the code which is unclear. No changes to the actual code are to be made in the first phase, except to change the names of temporary variables from dog, cat, etc. to something unique within the subroutine and meaningful. Our first phase work is being done in cooperation with Stetson Engineers, San Rafael, CA. The procedure has been to meet with Stetson and with Rod Hall, the primary author of the model, about once every two to four weeks. At these meetings, Rod Hall goes rapidly through about four to six of the subroutines, explaining briefly what the lines of each are doing. In order to get through all of the subroutines planned for the meeting, little time is allowed for reflection on the logic or for asking/answering in-depth questions about the subroutines. After these meetings, Stetson has been quickly inserting cursory comments within each subroutine to explain what the different sections of the subroutine are attempting to do. Using our own notes from the meetings, along with Stetson's comments, if available, Bill Sikonia and I have then set about our task of critically examining the logic of each of the subroutines and inserting detailed documentation with questions.

The second phase is to go through each of the subroutines and resolve the questions generated in the first phase. This is to be done through consultation with Rod Hall and other technical and legal experts on the river and reservoir system. As questions are resolved, comments within the code will need to be revised. Also, the code itself will, in some cases, need to be modified. At some point, either as part of the second phase or as a third phase, the code must be carefully checked for compliance with the various court decisions and agreements which govern river/reservoir operations.

2. Our work on the first phase tasks has been very slow. To date, we have gone over 27 subroutines in our meetings with Stetson and Rod Hall. Bill Sikonia and I have completed our first phase documentation on eight subroutines. Another nine or so routines have been partially completed. I agree with Bill Sikonia's comments on the difficulties we have encountered in our task. In many places the code is extremely convoluted, making it difficult to tell where or how or under what conditions a particular calculation is made; many calculated quantities are constrained by a number of upper and/or lower limits, some of which appear either superfluous or irrelevant; some switches, which prescribe the path the computer follows through the code, are undefined or incompletely defined, so that the conditions under which a particular path is followed are unclear; some portions of the code are apparently never used, but nevertheless remain in place; many temporary variables are assigned names which have no connection with what they represent; in many cases, the same temporary variable name is used over and over within a subroutine to represent different quantities; and in a number of subroutines, hydrologic quantities are calculated using coefficients or factors which, apparently, are not explained or justified anywhere.

I believe that the last time the matter was discussed (our June 18 meeting in Carson City), the date for completing the first phase was adjusted to March 1997. At the present rate of progress and with Bill Sikonia's departure, that completion date will not be met. Bill Sikonia's estimate of two to four people requiring up to two years is probably realistic. The second phase will take at least another year and possibly considerably longer depending on the nature and extent of needed changes.

3. Assuming the documentation project continues, I think the way the work is done should be radically changed. As Bill Sikonia pointed out, the model is, for all practical purposes, Rod Hall's. It is no longer a federal model. I think Rod Hall should be responsible for producing the documentation for the model. He should examine program logic, make note of and correct any errors found, replace temporary variable names with unique, meaningful names, and provide detailed comments within the code as we are now attempting to do. He should also provide the back up data/analysis to justify the many coefficients/factors that appear throughout the model. Where data and/or analysis do not exist, comments making that clear should be included in the code. As Rod completes portions of his documentation, a team of two or more hydrologists/hydraulic engineers should carefully review the completed portions. The team should have other experts (e.g. water-rights expert, FORTRAN programmer, and other hydrologists/engineers) to consult with in the review.

Simultaneously with Rod Hall's documentation work, a team composed of persons who understand the present operating practices for the river and reservoir system, including the requirements of the various relevant court decisions and agreements, should set down in clear, concise language the rules, priorities, etc. which the model must enforce. This will greatly assist the reviewers in their task.

Rod should work with the reviewers to address their comments and correct the code as required. The model in its final form will need to be extensively tested to determine if it is functioning correctly.

4. Bill Sikonia's position is that the Negotiation Model is beyond repair, even if Rod Hall should take on the job of examining it closely, correcting errors, and documenting. I personally am not yet convinced that the present model is beyond repair. However, I am convinced that the only practical way that it could be repaired and documented would be for Rod Hall to do the correcting and documenting and for others to provide a careful, line-by-line review. I think it may indeed be simpler and faster to build a new model, perhaps using a generic water-rights code, assuming a suitable one is available that can be adapted to the Truckee system. Such a model should be much better organized and easier to review, document, and use than the present one. Another alternative is to concentrate on completing the USGS daily model, incorporating into it the essential features of the Negotiation Model, if that is practical to do.