

## **Hydrologic Frequency Analysis Work Group (HFAWG) Conference Call October 23, 2006**

The purpose of the conference call was to discuss the data base and the testing procedures for comparing flood discharges (such as the 1-percent annual chance flood) estimated by Bulletin 17B procedures and the Expected Moments Algorithm (EMA). The objective of the testing is to determine if there are significant differences in flood discharges estimated by the two methods.

A small work group that is a subset of the HFAWG was formed to discuss the data base and testing procedures and the following people participated in the October 23 conference call: Martin Becker, Will Thomas, Ken Bullard, Jerry Coffey, Beth Faber, and Don Woodward. The proposed work plan is as follows.

The conference call began with a discussion of the status of the EMA code. Tim Cohn, USGS, has the task of incorporating the most current EMA code into the production version of the USGS program PEAKFQ that implements Bulletin 17B guidelines. Will Thomas reported that as of early October the PEAKFQ code had not been modified. Will Thomas agreed to contact Tim to get some estimate of when this task would be completed. The work group concluded that we needed:

- A narrative description of the EMA code and what it does.
- An explanation of why these particular algorithms were adopted.

Will Thomas previously compiled (September 11, 2006) a data base of 82 gaging stations with record lengths on the order of 75 to 90 years. The geographic distribution of the 82 stations is shown in Figure 1. The gaging stations were selected primarily from the USGS HydroClimatic Data Network and the streamflow and watershed characteristics are not significantly affected by urbanization, deforestation, regulation, etc. These data will form the basis for the testing of Bulletin 17B and EMA methods using **observed** flood data. The work group agreed that split sampling analyses on these observed data would be worthwhile as part of Phase I of testing. The Phase I testing will provide results and ideas for additional testing in Phase II.

### **Phase I testing**

For the first part of the Phase I testing, Bulletin 17B and EMA methods will be applied to split samples for the 82 gaging stations. This testing will consist of:

- Running both methods for the first 20 years, first 40 years, first 60 years and the full record for each station. The beginning of the record will be the first year of the systematic record and the historical data will be used in each cumulative analysis. For example, for the first 20 years, the historical data will be considered the highest at the ending of the systematic record (e.g., historical flood in 1850, systematic record from 1900 to 1920, then historical flood highest in 70 years).

- Summarizing the estimates for Bulletin 17B and EMA for each analysis in a table.
- Plotting the x-percent chance flood discharge for each method versus the cumulative period of record.
- Relating the relative differences for the two methods to particular conditions of the observed data sets (high and low outliers, historical data, etc.).

A second part of the Phase I testing will be to perform Monte Carlo simulations. This method assumes that the **simulated** flood data comes from a particular frequency distribution, and repeatedly samples from it for some number of years of record, and fits an LPIII or an alternative frequency distribution by Bulletin 17B and EMA methods. Beth Faber, USACE, provided an excel spreadsheet with six different frequency curves that are recommended for Monte Carlo testing. (**Note:** The excel spreadsheet is provided as a separate file from this document.) The benefit of the Monte Carlo simulations is that we will know the "true" distribution and x-percent chance flood, and so the errors of the two methods can be compared for different frequency distributions. The appropriate frequency distributions are to be determined. An additional aspect of this testing will be to combine two frequency distributions and test the two methods.

## **Phase II testing**

Based on the Phase I testing, additional testing will be undertaken. The plans are not definite yet but the some ideas were discussed:

- Subject each method to goodness-of-fit tests like the probability plot correlation coefficient or the Kolmogorov-Smirnov test. Different theoretical frequency distributions could be assumed for these tests.
- Take stable data sets and transform them stochastically to get data sets with outliers or unusual characteristics, combine two data sets to get a mixture of conditions, etc. In each instance, the "true" x-percent chance flood discharge can be determined.

The Phase I testing can begin as soon as the production version of the USGS program PEAKFQ includes the latest and final EMA code. The plans are for Tim Cohn, USGS, and John England, USBR, to do the actual testing and report the results back to the entire HFAWG.

Will Thomas  
 Chair, HFAWG  
 October 25, 2006 – Revised November 13, 2006

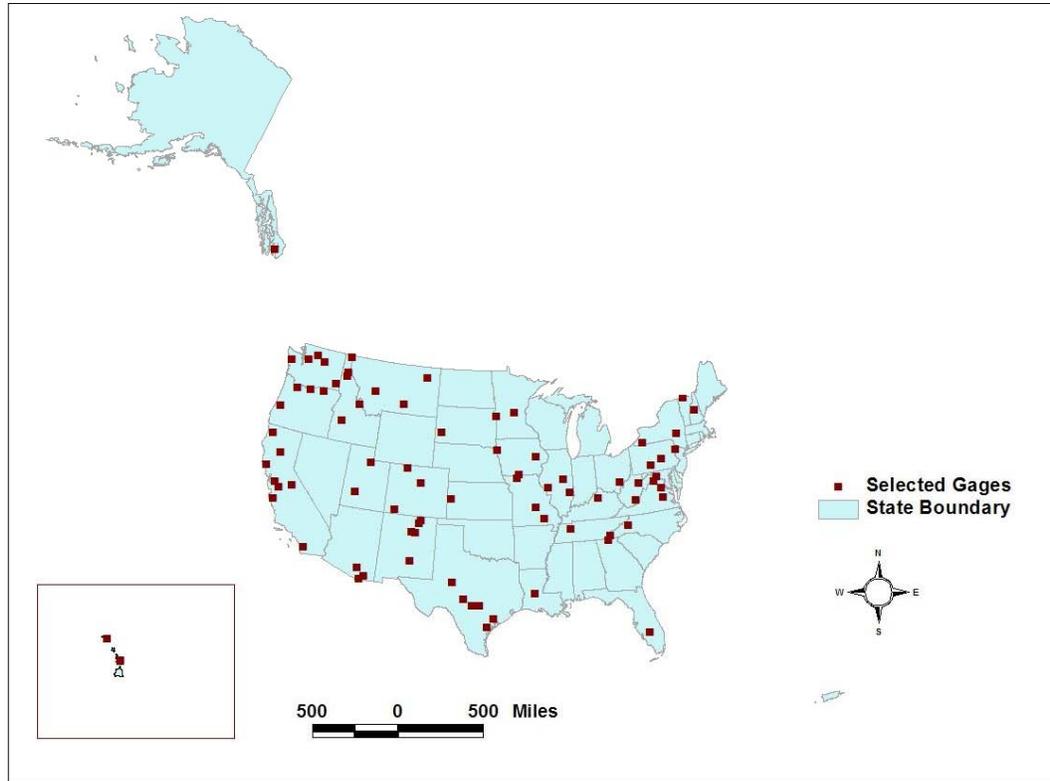


Figure 1. Map showing the geographic distribution of the gaging stations to be used in the Bulletin 17B – EMA testing.