Responses to Comment #49 – Minority Report on EMA Recommendations – July 2013 [redacted]

Background – At the June 12-13, 2013 meeting of the Hydrologic Frequency Analysis Work Group (HFAWG) (http://acwi.gov/hydrology/Frequency/minutes/HFAWG_mins_june12-13_2013_meeting_revised_071213.pdf), the HFAWG voted 12 to 1 to accept the recommended changes to Bulletin 17B that were summarized in a June 12, 2013 Memorandum to the Subcommittee on Hydrology (SOH) (http://acwi.gov/hydrology/Frequency/HFAWG-B71B-Recommended-Rev-SOH-12June2013-revised-final.pdf). These revisions included the adoption of the Expected Moments Algorithm (EMA) and the Multiple Grubbs-Beck (MGB) test for detection of potentially influential low floods (PILFs). The lone dissenting vote was from [redacted] who prepared a Minority Report in July 2013 that was provided to HFAWG and SOH members. Comment #49 submitted during the public comment period is the Minority Report prepared [redacted] in July 2013.

There were three primary issues discussed in the Minority Report: stationarity issues, variance issues, and mixture issues. Each issue is briefly stated and a response is provided.

Essence of [redacted] **stationarity comment**: Several studies are cited by [redacted] that note the cyclic or nonstationarity nature of flood data. The implication is that the rejection of the stationarity assumption of the annual flood series is more detrimental to the EMA/MGB procedure than to the Bulletin 17B procedure.

Response: The subject of Comment #48 [redacted] was "Stationarity Issues". See responses in Comment #48 in addition to the following comments.

There are no differences in Bulletin 17B and Bulletin 17C with respect to stationarity assumptions. Both procedures assume that the historic (or paleoflood) and systematic data reflect the same land use and climate. Analysts should use the statistical procedures discussed in Appendix 3 of Bulletin 17C to determine if the flood data series or some subset of it represents stationary conditions. Engineering judgment is needed when analyzing nonstationary time series. In the section of Bulletin 17C on "Climatic Variability and Change", several references are cited that provide some guidance on analyzing nonstationary time series. Guidance for analyzing nonstationary time series will be addressed in future revisions of Bulletin 17C.

Essence of [redacted] **variance comment**: The variance issue relates to uncertainty issues relative to the flood frequency analysis. [redacted] expressed concerns about the use of historic floods that are less reliable and the loss of information from censoring many low floods. [redacted] also commented that the wide confidence bounds exhibited at the upper end of the EMA frequency curve is indicative of the uncertainty in the slope of the frequency curve.

Response: The EMA procedure allows for the use of interval data for historic floods to more accurately characterize their uncertainty of the historic floods. This is an improvement over Bulletin 17B that treated all data as point values when it was known there was large uncertainty in the estimates. The low floods are censored to avoid adversely affecting the high discharge end of the frequency curve. The

number of low floods that were censored are used in determining the frequency of events above the censoring level. Wider confidence limits are being computed in Bulletin 17C than in Bulletin 17B because the new procedures are accounting for more sources of uncertainty (skew, historic data and censoring low floods).

Essence of [redacted] mixtures comment: The mixtures issue in this instance relates to combining low floods (essentially non floods) during the dry years with major floods where the two types of flood represent different distributions. [redacted] does not think the Multiple Grubbs-Beck (MGB) test is a good way of identifying the separation between the two types of floods because the MGB test often censors floods that should be included in the frequency analysis.

Response: The MGB test does provide an objective way of identifying the low floods that have an adverse effect of the high discharge end of the frequency curve. As noted in other comments, if the analyst does not think the MGB test is giving reasonable results, then the threshold can be lowered based on engineering (hydrologic) judgment.