



US Army Corps
of Engineers®

Water Resources Infrastructure R&D Program

Estimating Probability of Extreme Floods

- Description** The U.S. Army Corps of Engineers is currently evaluating its portfolio of dams with regard to risk and related maintenance. A draft Engineer Technical Letter “Risk Analysis and Assessment for Dam Safety” is under review. This ETL describes processes that will be used for screening projects for planning of corrective actions. One of the contributing factors that must be uniformly evaluated across all projects is the development of inflow frequency curves (peak flow and volume frequency) that extend out to the Probable Maximum Flood (PMF).
- A seminar was held at the Hydrologic Engineering Center (HEC) to investigate the procedures by which an Annual Exceedance Probability (AEP) could be associated with rare events up to and including the PMF. Quantification of the full frequency curve up to the PMF is necessary to evaluate the hydrologic risk for any dam as the PMF is characterized as the upper limit of hydrologic loading. While the frequency curves must be defined out to the PMF, more emphasis needs to be placed on defining the curves from the 100-year to the 5,000-year event, as this area of the curve plays a much more important role in the Dam Safety Portfolio Risk Assessment (PRA) analysis..
- Benefits** Currently there is no credible scientific approach to assign a single probability to a flood of the magnitude of the PMF. Additionally, no single method exists for extending gauged frequency curves out to the PMF level. Development of credible estimates of infrequent annual exceedance probabilities will rely on the use of data from multiple sources and a regional approach. The Extreme Floods work will generate recommendations and guidance that District engineers can apply for extrapolation of frequency curves. These methods will range from simple to complex.
- Status** Several possible methodologies have been identified. These methods have been applied to some locations around the United States. USACE Hydrology Committee review is expected within the 2nd quarter of FY08. The external review team for the PRA has been identified, and it is expected that review of these extreme flood methodologies will take place after Hydrology Committee review is concluded.
- Distribution Source(s)** When completed, information and methods for frequency curve extension will be available from the HEC Web site at the following location: www.hec.usace.army.mil.
- Available Documentation** No final documentation of the extrapolation methodologies is available. Once review is complete, the current existing draft documentation that describes extrapolation methods will be finalized for possible release as an Engineer Manual.

- Available Training** There is currently no specific training on frequency curve extrapolation. However, there are PROSPECT classes at HEC regarding frequency analysis, frequency curve development and Dam Safety. Specifically, PROSPECT training is available in the H&H for Dam Safety, Statistical Methods in Hydrology and Flood Frequency Analysis courses. To find out more about these classes, and when they are offered, visit the HEC Web site under the Training Area.
- Available Support** Currently, HEC provides statistical analysis and frequency analysis on an as-needed basis to all Corps Districts.
- Application** Draft methodologies have only been used at HEC for demonstration purposes.
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- Partners** The Extreme Floods frequency curve methods are being developed by HEC with input from the Corps of Engineers Hydrology Committee and input from the Portfolio Risk Assessment team whose methods will employ the frequency curve extension methodology developed in this work unit.