Texas A & M University and U.S. Bureau of Reclamation

Hydrologic Modeling Inventory
Model Description Form

August 12, 2008

Name of Model: FHAR

Model Type: Rainfall - Runoff

Model Objective(s) : Calculates runoff from rainfall and produces a flood hydrograph and performs hydrologic routing.

Agency and Office: Bureau of Reclamation, Technical Service Center, Flood Hydrology and Meteorology Group

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Model Structure or Mathematical Basis: Calculates runoff hydrographs starting with precipitation increments. A variety of methods are available for accounting for infiltration and other losses. Options are available for both river and reservoir routing along with the ability to combine hydrographs. Several input procedures are available and the model can be run in more than one manner. Intermediate results can be examined as the modeling progresses.

Model Parameters:

Spatial Scale Employed in the Model: Subbasins are treated as hydrologically and meteorologically homogeneous areas. Average values are used for parameters and inputs for each individual subbasin. Precision may be altered by changing the number and sizes of the subbasins.

Temporal Scale Employed in the Model: Time increments are selected to match the particular application. Typical time increments used vary from 15 minutes to 3 or 4 hours depending upon precipitation inputs, hydrologic response time and drainage area.

Input Data Requirements: Hydrologic runoff and routing parameters, and precipitation inputs.

Computer Requirements: Personal Computer.

Model Output: Calculations and hydrographs, in well designed tables and also in forms for use in further modeling or for use in other programs such as graphics or text processing programs.

Parameter Estimation / Model Calibration: Hydrologic parameter estimates are often based on information contained in the USBR Flood Hydrology Manual (1989), or on the users experience and judgement. Precipitation parameters come from various Weather Service publications or historic storm data

Model Testing and Verification: The model was tested and verified by the Department of Energy for use with the Nevada High Level Nuclear Waste Repository Site investigations. The model was tested against the Corps of Engineers HEC-1 model. If the two models are given exactly the same input information, they will produce exactly the same output.

Model Sensitivity: The model has only four major input parameters. The model is sensitive to each of these parameters, basin area, basin precipitation, basin lag times and basin loss rates. The model is less sensitive to basin unit hydrograph selection.

Model Reliability: The model is usually very reliable, after input files and sequences are properly prepared. Some minor problems may occur with very small time steps.

Model Application / Case Studies: The model is primarily used to convert a PMP (Probable Maximum Precipitation) storm sequence to PMF (Probable Maximum Flood) hydrograph. Several case studies are available in the USBR Flood Hydrology Group files.

Documentation: This program has been documented by "Interim Documentation for the FHAR Program," by Robert Main, April 1988. In addition, documentation updates exist for subsequent changes and improvements to the model. These include "Creating Version Number 4.11 of FHAH," "Creating Version Number 4.12 of FHAR," "Changes to the FHAH Program made in Creating Version 4.13," and "FHAR Program Version 4.14," January 24, 1990.

The best documentation would be to look at input and output files from a case study available in the USBR Flood Hydrology Group Files.

Other Comments:

Strengths: Versatile, very easy to apply, uses standard methods, well tested and technically sound. Revised modeling accomplished with a minimum of additional effort. Can be run in a user friendly interactive mode.

Weaknesses: Designed for planning and design flood studies. The model is not readily applicable to real time and operational studies.

The model is now obsolete. PMP and PMF studies are no longer being used with the USBR Dam Safety Program. The program is used on occasion for other outside agency work. The FHAR program continues to be maintained by the USBR because of the large number of previous studies completed using this program. The ability to recreate some portion of the past PMF studies may have some value for creating input to future basin studies.