

FLOOD ESTIMATION USING UNIT HYDROGRAPH

Flood estimation is one of the most important components of water resources project planning, design and operation. Unit hydrograph theory may be used to estimate the flood for small catchments up to the size of 5000 sq. km with reasonable accuracy. However, for the catchments having area more than 5000 sq. km, the principle of Unit hydrograph cannot be applied considering catchment as a single unit. A network model may then be developed wherein the flood hydrograph be computed for each sub-catchment and the combined contributions from each sub catchment be routed through the respective river reaches or reservoirs using an appropriate flood routing technique to estimate the flood for the large size catchment.

A package (*FLPACK*) has been developed at the National Institute of Hydrology, Roorkee to estimate the flood for large, medium and small sized catchments using the unit hydrograph approach and reservoir and channel routing procedures. Package includes most of the commonly used approaches for unit hydrograph derivation, change of unit duration of unit hydrograph, development and use of dimensionless unit hydrograph, and development of unit hydrograph for ungauged catchments. It

also deals with processing and analysis of rainfall and runoff data and flood estimation for ungauged catchments.

The software is user-friendly and provides on line help for using various options and sub-options. All important information, which may be helpful for analysing the results, is displayed on the computer screen. For flood estimation for large catchments, package utilizes networking approach in which flood of individual catchment is calculated and then routed through individual channel reach or reservoir to get the final flood hydrograph of the catchment. Package has the capability to compute either design flood or normal flood depending upon the rainfall input.

TECHNOLOGY

FLPACK deals with various options of flood estimation for catchments of different sizes. It also deals with processing and analysis of rainfall and runoff data. These options are categorized in six main groups dealing with:

- (i) Channel routing parameters estimation and application
- (ii) Reservoir routing
- (iii) Unit hydrograph development
- (iv) Unit hydrograph application on small catchment for flood estimation
- (v) Flood estimation for large catchment

(vi) Plotting and other file related display operations.

Under each main category, there are sub-categories of options for various methods of flood routing and unit hydrograph derivation. Also, the options for calibration of unit hydrograph parameters for various sub - catchments

and for calibration of routing parameters for different river reaches from the historical records are provided in the package. A user manual describes the methodology adopted for various options and demonstrates the application of the software with the help of illustrative examples whose sample input and output are provided in the package.

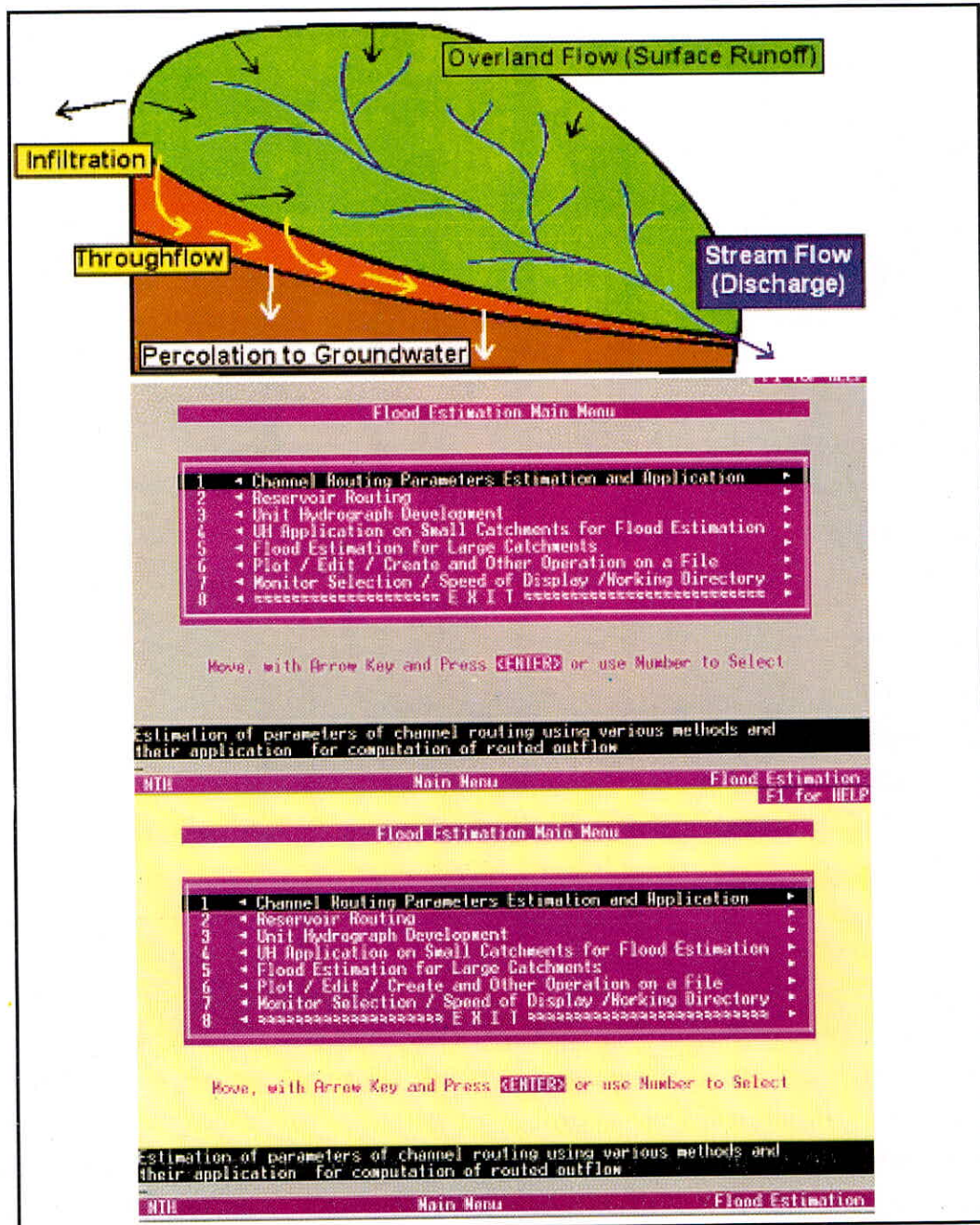


Figure - 1 A schematic of FLPACK

ENVIRONMENTAL IMPACT

The package may be utilised for the estimation of design flood hydrographs for small, medium, and large water resources projects using the appropriate options. This will have positive impact on the environment.

ECONOMICS

The estimation of flood for small as well as large catchments is a prerequisite for any water resources project. The correct estimate of the flood has a direct impact on the economics of any project. Overestimation of flood may result in construction of uneconomical structures. However, underestimation of floods may lead to the failure of the structure. Thus, the reasonably accurate estimate of design flood may be helpful for designing

and construction of economically as well as technically feasible structures. Thus, it will have tangible and intangible benefits.

BENEFICIARIES

The direct beneficiaries of this technology would be the engineers and planners involved in planning, design, and construction of small, medium and large water resources structures. Furthermore, it may be used for designing of culverts, highway, railway bridges, and other cross drainage works.

INTELLECTUAL PROPERTY RIGHTS

The methodology and the software have been developed at the National Institute of Hydrology, Roorkee. Therefore, the Institute reserves the IPR of this package.

