

HYDROLOGIC ASPECTS OF PLANNING FLOOD CONTROL
WORKS IN NEW MEXICO

By

John T. Martin*

1. General. -First I would like to give the items which the Corps of Engineers consider as hydrology, namely:

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| a. Watershed | f. Humidity |
| b. Weather | g. Evaporation |
| c. Precipitation | h. Wind |
| d. Snowfall | i. Stream flow characteristics |
| e. Temperature | j. Runoff |
| k. Sediment | |

In the planning of flood control projects these items have varying significance depending upon the nature of the project. Due to the limited time, I will confine my talk to certain of these items which are more directly related to the economic feasibility of a flood control project.

2. Stream Flow Characteristics Including Channel Capacities.

We study the stream pattern of the watershed and the nature of the stream flow; that is, the relationship of peak flow to volume. In other words, are the floods of a flashy type with relatively high peaks and small volume, or of a type which may be produced by snow melt runoff of comparatively low peaks and large volume? Also pertinent to the economic analysis are the minimum channel capacities in a selected damage reach or at a location of concentrated flood damage.

3. Runoff.- In many instances in New Mexico, there are no stream flow records or too short a period of record upon which to base the economic studies. We determine which is better related to the flood damages, the flood volume or the peak discharge. In many cases in New Mexico, due to the lack of defined channels and the influence of man made barriers, the flood damages are found to be better related to the flood volume. In order to evaluate flood control projects as to economic feasibility, the Corps of Engineers estimates the probable recurrence of floods. When sufficient stream flow records are not available a hypothetical flood history is estimated, generally from rainfall records. In doing this, it is

*Chief, Hydrology Section, Corps of Engineers, Albuquerque, New Mexico.

recognized that such a flood history may have had floods occurring when actually there were no floods and may not have floods indicated when actually there were floods and the accuracy of this procedure is dependent on how well this condition averages over a long period of time.

4. Infiltration. - To provide tools for estimating this hypothetical flood history and for the project design floods, it is necessary to make a study of the watershed characteristics to determine average and minimum infiltration or rainfall loss rates. The average loss rates are used in computing a flood history, while the minimum loss rates are used to compute the design floods so that these flood estimates are conservatively high. The infiltration rates are generally based on a study of precipitation and stream flow records on the other watersheds with similar runoff characteristics.

5. Unit Hydrograph. - The unit hydrograph method is used by the Corps of Engineers primarily for the determination of flood peak discharge. Mr. F. F. Snyder's method is generally used and, by the way he is an employee in the office, Chief of Engineers, his method is basically the same as Mr. Sherman's method which you may be familiar with as published in certain texts. As for rainfall loss rates, unit hydrograph coefficients have to be transferred from one watershed to the other by a study to determine similar watershed characteristics.

6. Standard Project Flood. - The Corps of Engineers uses what I like to call a yard stick for the design of flood control projects. This yard stick is called the standard project flood or maximum probable flood. In some cases the flood volume is the major consideration, while in others such as leveed floodways or diversion channels the peak discharge is a major consideration. The standard project flood is estimated by a study of the major storms of record in the general vicinity which could have just as well occurred over the watershed under study. Then the storm is selected for transposition which would give either the maximum peak or the maximum volume from the watershed as desired. After the storm is selected it is moved over the watershed under study and rotated to fit the new topography and the storm precipitation is adjusted, up or down, for the difference in inflow barrier. The basis for the adjustment for this difference in elevation is determined along the path of the moist air inflow for the storm. The percent adjustment per increment of inflow barrier change has been provided by the U. S. Weather Bureau. The minimum in-

filtration rates are applied to the standard project storm rainfall and the rainfall excess is applied to the unit hydrographs for the watershed to determine the standard project flood hydrograph. The flood control project is designed for any degree of protection up to the standard project flood, depending on economic justification. In general a concentrated locality of flood damage such as an urban area where loss of life may be involved it is found economically feasible to provide protection against a flood equal to the standard project flood.

7. Spillway Design Flood.- The Corps of Engineers for many years has cooperated with the U. S. Weather Bureau in a storm study program of all the major storms. The Corps prepares the storm studies and submits them to the Weather Bureau for review and comments. On reservoir projects, the Corps of Engineers provides a spillway adequate to pass the flood which would result from the estimated maximum possible precipitation over the watershed. In the planning of such a project, the Corps submits a description of the watershed and the major storms which have occurred in the general vicinity to the U. S. Weather Bureau and requests the maximum possible precipitation to be used. This criteria for the design of the spillway has a considerable effect on the economic feasibility of the reservoir project.

8. Sediment.- Another consideration in reservoir projects in New Mexico which has a considerable effect on the economic feasibility is the provision of sediment reserve storage. In addition to the storage allocations required for flood control and other water uses, a sediment storage allocation equal to the estimated reservoir depletion during the economic life of the project is provided. In connection with leveed floodways and diversion channel projects, aggradation or degradation may materially increase the maintenance costs of the project which in turn affect the economic feasibility.

9. Coordination with Other Projects.- In the planning of reservoir flood control projects in New Mexico it is considered very essential to make the necessary operation studies to determine the effect of the project on irrigation and other water supplies. It is also necessary to coordinate the flood control regulation with the regulations provided by other projects in the same watersheds. In the planning of levees, floodways, and diversion projects consideration is given to the restriction to the flood plain and to the probable increase of flood depths on other land. In the case of diversion projects, sometimes it is necessary to pass certain flows on down the natural water course and just divert the flood flow. Further, such projects may cause damaging aggradation or degradation at another project or location.

