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Runoff Estimates for Small Rural Watersheds and Development of a Sound Design Method: Volume III. Appendix A

Joel E. Fletcher
A. Leon Huber
Frank W. Haws
Calvin G. Clyde

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RUNOFF ESTIMATES FOR SMALL RURAL WATERSHEDS AND DEVELOPMENT OF A SOUND DESIGN METHOD

Vol. III Appendix A

October 1977
Final Report

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Prepared for
FEDERAL HIGHWAY ADMINISTRATION
Offices of Research & Development
Washington, D.C. 20590
FOREWORD

This report is composed of three volumes: Volume I is the Research Report; Volume II consists of recommendations for establishing design manuals and Appendices B, C, D, E, F, G, and H, which are the design aids required for establishing design manuals; Volume III consists of Appendix A, an accumulation of the data base used in the study. FHWA chose to arrange the report as described to facilitate distribution of the results. The methods reported herein and designated as the Federal Highway Administration Methods are designed to be applied to watersheds smaller than 50 square miles but may be used on areas up to 100 square miles in size.

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Sufficient copies of Volumes I and II will be distributed to provide a minimum of one copy to each FHWA Regional office, FHWA Division office and State Highway Agency. Volume III will be distributed only upon special request since it will be of interest primarily to individuals wishing to verify equations or develop new equations. Direct distribution is being made to the Division offices.

Charles F. Schell

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Annual Flood Peak Frequency Curve and Data for the
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for Gumbel, Log Normal, Log Pearson III, and Rank Probability
Distributions as Ratios to the Average of Record

The material assembled in Appendix A consists of the plotted results of the frequency analysis for all watersheds included in this study. The annual maximum flow data are plotted on Gumbel paper with the curves derived from the data for the Gumbel distribution, the Log Normal distribution, the Log Pearson III distribution and the mean of the three giving four curves in all. The arrangement of watersheds is alphabetically by states with the numbers of the watersheds in increasing magnitude.
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The Offices of Research and Development of the Federal Highway Administration are responsible for a broad program of research with resources including its own staff, contract programs, and a Federal-Aid program which is conducted by or through the State highway departments and which also finances the National Cooperative Highway Research Program managed by the Transportation Research Board. The Federally Coordinated Program of Highway Research and Development (FCP) is a carefully selected group of projects aimed at urgent, national problems, which concentrates these resources on these problems to obtain timely solutions. Virtually all of the available funds and staff resources are a part of the FCP, together with as much of the Federal-aid research funds of the States and the NCHRP resources as the States agree to devote to these projects.

**FCP Category Descriptions**

1. **Improved Highway Design and Operation for Safety**

   Safety R&D addresses problems connected with the responsibilities of the Federal Highway Administration under the Highway Safety Act and includes investigation of appropriate design standards, roadside hardware, signing, and physical and scientific data for the formulation of improved safety regulations.

2. **Reduction of Traffic Congestion and Improved Operational Efficiency**

   Traffic R&D is concerned with increasing the operational efficiency of existing highways by advancing technology, by improving designs for existing as well as new facilities, and by keeping the demand-capacity relationship in better balance through traffic management techniques such as bus and carpool preferential treatment, motorist information, and rerouting of traffic.

3. **Environmental Considerations in Highway Design, Location, Construction, and Operation**

   Environmental R&D is directed toward identifying and evaluating highway elements which affect the quality of the human environment. The ultimate goals are reduction of adverse highway and traffic impacts, and protection and enhancement of the environment.

4. **Improved Materials Utilization and Durability**

   Materials R&D is concerned with expanding the knowledge of materials properties and technology to fully utilize available naturally occurring materials, to develop extender or substitute materials for materials in short supply, and to devise procedures for converting industrial and other wastes into useful highway products. These activities are all directed toward the common goals of lowering the cost of highway construction and extending the period of maintenance-free operation.

5. **Improved Design to Reduce Costs, Extend Life Expectancy, and Insure Structural Safety**

   Structural R&D is concerned with furthering the latest technological advances in structural designs, fabrication processes, and construction techniques, to provide safe, efficient highways at reasonable cost.

6. **Prototype Development and Implementation of Research**

   This category is concerned with developing and transferring research and technology into practice, or, as it has been commonly identified, "technology transfer."

7. **Improved Technology for Highway Maintenance**

   Maintenance R&D objectives include the development and application of new technology to improve management, to augment the utilization of resources, and to increase operational efficiency and safety in the maintenance of highway facilities.

*The complete 7-volume official statement of the FCP is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161 (Order No. PB 242057, price $45 postpaid). Single copies of the introductory volume are obtainable without charge from Program Analysis (HRD-2), Offices of Research and Development, Federal Highway Administration, Washington, D.C. 20500.*