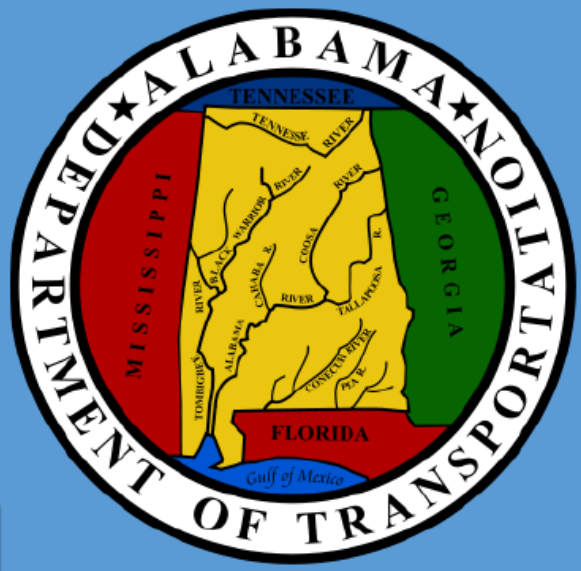
ALDOT's Hydraulic Manual

Hydraulic Manual



Presentation by:
John E. Curry, P.E.

Revised: January 2019

Previous Manual

STATE OF ALABAMA
HIGHWAY DEPARTMENT
MONTGOMERY, ALABAMA 36130

GUY HUNT
GOVERNOR

September 28, 1990

JOYCE G. KING
HIGHWAY DIRECTOR

Mr. J. F. Caraway
Assistant Chief Engineer
O F F I C E

RE: Chapter 1 and 4 of
the Hydraulic Manual

Dear Sir:

Enclosed are copies of Chapters 1 and 4 of the Hydraulic Manual. These chapters have received extensive review by the Hydraulic Section and the University of Alabama Research staff. Comments by the FHWA have been addressed. These chapters are now in finalized form, and we recommend the approval of same.

Please forward this document to the Chief Engineer and Highway Director for their approval.

Please forward your reviews and comments by October 3, 1990, and upon completion return letter and documents for our file.

Yours truly,

Ray D. Bass

Ray D. Bass
Chief, Design Bureau

RDB/COM/ESY/jcb
Attachments
cc: File

Approval Recommended:

J. F. Caraway
Assistant Chief Engineer — 9/27/90 Date

Chief Engineer — 9/27/90 Date

Approved:

Highway Director — 9-28-90 Date

1.1 GENERAL INTRODUCTION

This manual has been prepared to outline the general guidelines, procedures and practices used by the State of Alabama Highway Department (hereafter referred to as the Department) for hydrology and hydraulic design. The manual attempts to distill a very complicated process and to present the Department's preferred design procedures in simple and straightforward terms.

1.2 OBJECTIVES

The primary goal of this manual is to allow the user to locate, understand and use the guidelines and procedures most pertinent to the portion of the hydrology/hydraulic process with which he or she is dealing. To accomplish this goal, the authors established the following objectives:

1. Gather hydrology and hydraulic information into a single source document, with references where needed to appropriate federal policies or regulations, state policy and practice documents, texts, circulars or other factual publications.
2. Set out the methodologies and procedures preferred by the Department because of their unique application to local conditions within this state.
3. Provide a degree of uniformity for hydrologic and hydraulic design performed at the Department's various offices around the state.
4. Provide text material for the training of new employees or for employees new to the hydrology/hydraulic field.
5. Introduce and explain the computer programs adopted by the Department for hydrologic and hydraulic analysis and design.

1.3 OTHER HYDROLOGY PUBLICATIONS

This manual contains the procedures normally utilized by the Department for hydrologic and hydraulic design. The manual is based upon provisions of the Department's *Guidelines for Operation*. The provisions of this manual conform to

Department Personnel

Mr. Steve Walker, PE
Mr. Stan Biddick, PE
Mr. Wade Henry, PE
Mr. David Ramsey, PE
Mr. Paul Beaird, PE
Dr. Scott Rogers, PE
Mr. Jason Masters
Mr. Tom Flournoy, PE
Mr. Doug Peterson, PE
Mr. Gregg Bissot, PE
Mrs. Ashley Armstead, PE
Mr. John Ammons, PE
Mr. Michael Gillis
Mr. Terrell Martin
Ms. Beverly Wilson
Mr. Steven Simpson, PE

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References

- American Association of State Highway and Transportation Officials (AASHTO). 2007. Highway Drainage Guidelines, 4th Ed.
- American Association of State Highway and Transportation Officials (AASHTO). 2014. Drainage Manual, 1st Ed.
- Hydraulic Design of Energy Dissipators for Culverts and Channels Hydraulic Engineering Circular HEC-14
- Urban Drainage Design Manual HEC-22
- National Engineering Handbook
- Magnitude and Frequency of Floods in Alabama
- Magnitude and Frequency of Floods for Urban Streams in Alabama
- Magnitude and Frequency of Floods on Small Rural Streams in Alabama
- NOAA Atlas 14
- Hydraulic Design Series HDS4
- Hydraulic Design of Highway Culverts HDS5
- TR55 Urban Hydrology for Small Watersheds
- Guidelines for Determining Flood Flow Frequency Bulletin 17C
- Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains
- Accuracy of Computed Water Surface Profiles
- HEC-RAS Hydraulic Reference Manual
- Design of Roadside Channels with Flexible Linings HEC-15
- Bridge Scour and Stream Instability Countermeasures HEC-23
- Geometric Design of Highways and Streets
- Design Charts for Open-Channel Flow HDS3
- Design of Bridge Deck Drainage HEC-21
- Alabama Department of Transportation (ALDOT) Survey Requirements
- Guidelines For Operation Post Development Stormwater Runoff Management for Small Frequent Rain Events.
- Open channel hydraulics

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References

- Small Storm Flow and Particulate Washoff Contributions to Outfall Discharges
- Small Storm Hydrology and Why it is Important for the Design of Stormwater Control Practices.
- The Source Loading and Management Model (WinSLAMM)
- Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects
- River Engineering for Highway Encroachments HDS6
- Applied River morphology
- The Federal Interagency Stream Restoration Working Group
- Corps of Engineers Wetland Delineation Manual
- Hydraulic Design of Stream Restoration Projects
- National Engineering Handbook (NEH) Part 654 - Stream Restoration Design.
- Evaluating Scour at Bridges
- Roughness Characteristics of Natural Channels
- Hydraulics of Bridge Waterways HDS1
- Highways in the Coastal Environment HEC-25
- Clear-Water Contraction Scour at Selected Bridge Sites in the Black Prairie Belt of the Coastal Plain in Alabama
- Stream Stability at Highway Structures HEC-20
- Shore Protection Manual

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New Manual Currently

- PDF file format
- 12 Chapters
- 9 Appendices
- 460 pages

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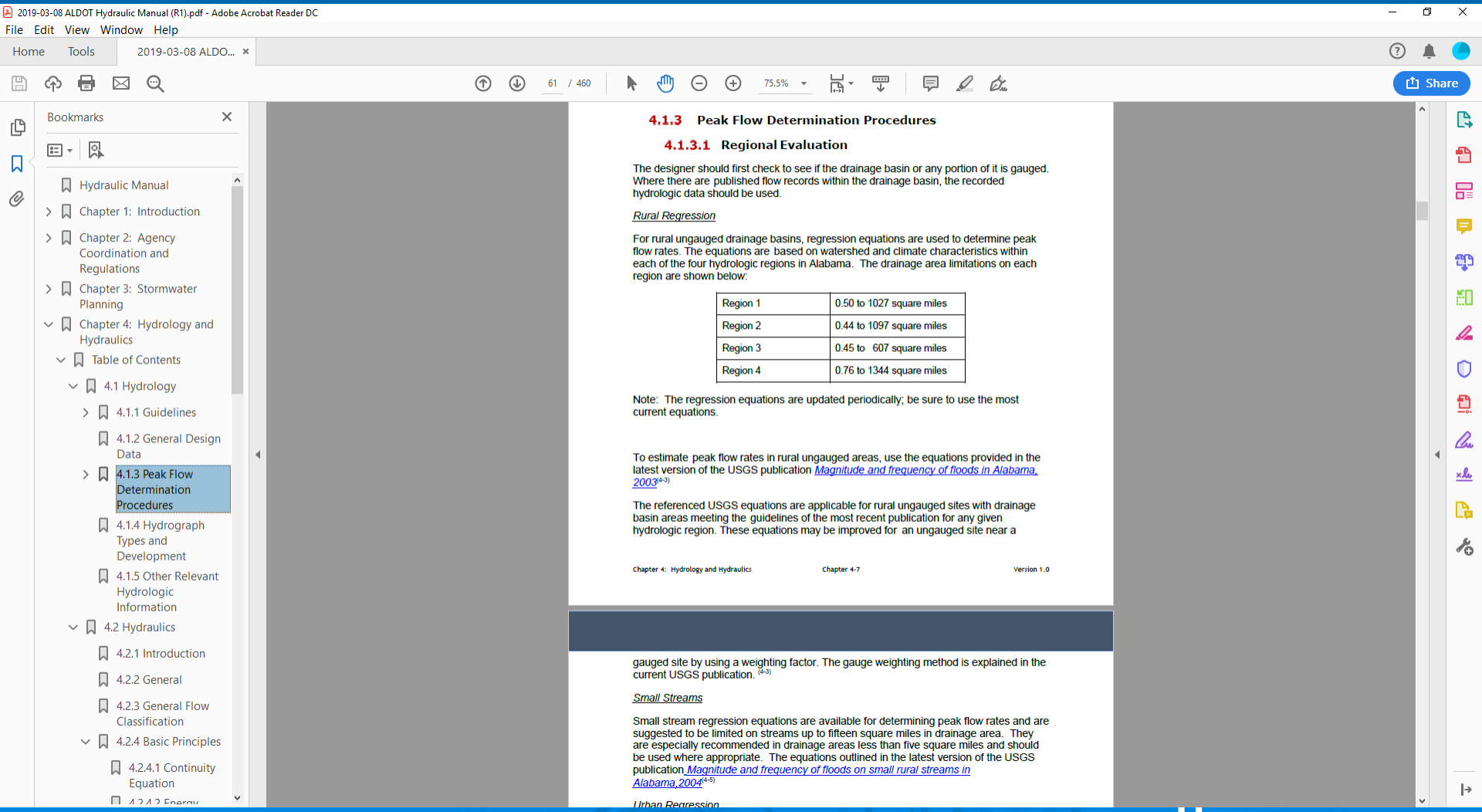
Clickable Table of Contents



Chapter 1: Introduction

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Chapter 1

Introduction

- General overview of the manual
- Acknowledgments

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“If you have ten thousand regulations you destroy all respect for the law.”
Winston Churchill

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Chapter 2: Agency Coordination and Regulations

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Chapter 2

Agency Coordination and Regulations

- Laws affecting drainage
- Coordination with regulatory agencies

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Chapter 3: Stormwater Planning

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“Always plan ahead. It wasn’t raining when Noah built the ark.”
Richard Cushing

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Chapter 3

Stormwater Planning

- Project workflow and design considerations
- Project requirements

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Chapter 4: Hydrology and Hydraulics

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“Climate is what we expect, weather is what we get.”
Mark Twain

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Chapter 4

Hydrology and Hydraulics

- Guidelines
- General design data
- Peak flow determination procedures
- Hydrograph types and development
- Hydraulics basic principles - equations
- Weirs/Orifices
- Open Channel Flow
- Closed Conduit

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Chapter 5: Channels

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“Water is dumb. We get to tell it where to go and how fast to get there.”
Barry Fagan

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Chapter 5

Channels

- Open channel hydraulics
- Channel shape and protection
- Channel alignment
- Channel grade
- Stream bank protection from erosion
- Typical design data requirements
- Roadside and median channel design procedures

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Chapter 6: Pavement Drainage

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“I guess I thought I was Elvis Presley but I'll tell ya something. All Elvis did was stand on a stage and play a guitar. He never fell off on that pavement at no 80 mph.”
Evel Knievel

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Chapter 6

Pavement Drainage

- Hydroplaning
- Gutter spread and design storm frequency
- Gutter flow
- Inlet types
- Design procedures

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Chapter 7: Storm Drain Design

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Chapter 7

Storm Drain Design

- Design guidelines
- Hydraulics of storm drain systems
- Design procedures
- Energy/Hydraulic grade line
- Computer programs

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Chapter 8: Culverts

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Chapter 8

Culverts

- Design guidelines
- Culvert design approach
- Culvert design method
- Types of energy dissipation
- Computer Program

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Chapter 9: Post-Development Stormwater Management

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Chapter 9

Post-Development Stormwater Management

- Policy
- Determining post-development hydrology changes
- Design storm
- Stormwater runoff volume and peak discharge calculation
- Post-construction BMP selection

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Chapter 10: Stream & Wetland Restoration Concepts

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“Good fortune is when opportunity meets with planning”
Thomas Edison

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Chapter 10

Stream & Wetland Restoration Concepts

- Permitting
- Stream design and restoration
- Wetland restoration/mitigation

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Chapter 11: Requirements for Hydraulic Design Studies

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“If you build in the floodplain your gonna get wet”
Charles Ming

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Chapter 11

Requirements for Hydraulic Design Studies

- Design Criteria
- Design Data Required
- Design Methods/procedures H&H Studies
  - Riverine
  - Tidal

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Chapter 12: Bridge Deck Drainage Systems

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Chapter 12

Bridge Deck Drainage Systems

- Design guidelines (HEC-21)
- Information needed for designs
- Design methods and procedures

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APPENDIX
A, B, C, D, E, F

- A: Acronyms
- B: FEMA Agency Coordination, Regulations, and Documentation
- C: Designer's Checklist for Project Documentation
- D: Manning's Tables
- E: FHWA Culvert Design Form and Permissible Velocity Tables
- F: HYD Forms

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APPENDIX
G, H, I

- G: Rational Method Example and USGS Alabama Hydrograph Method
- H: Additional Bridge Information
- I: Post-Development Stormwater

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QUESTIONS

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