

**OFFICE OF STRUCTURES
MANUAL FOR HYDROLOGIC AND HYDRAULIC
DESIGN**

**CHAPTER 1
INTRODUCTION**



2011 REVISION

CHAPTER 1 INTRODUCTION

Welcome to the Manual for Hydrologic and Hydraulic Design. This manual is prepared by the Office of Structures, Structure Hydrology and Hydraulics Division, to offer guidance and direction to engineers involved in locating, designing and inspecting bridges and large culverts in Maryland. In most cases, the information in this manual supersedes other written policies and directives of the Office of Structures in regard to the hydraulic design of structures.

Please note that the name of the Office of Bridge Development has been changed to the Office of Structures. Also, the name of the Structure Hydrology and Hydraulics Unit has been changed to the Structure Hydrology and Hydraulics Division. .

The material presented in the OOS Manual for Hydrologic and Hydraulic Design has been carefully researched and evaluated. It is being continually updated and improved to incorporate the results of new research and technology. However, no warranty expressed or implied is made on the contents of this manual. The distribution of this information does not constitute responsibility by the Maryland State Highway Administration or any contributors for omissions, errors or possible misinterpretations that may result from the use or interpretation of the materials contained herein. Questions regarding the use of the Manual should be referred to the Structure Hydrology and Hydraulics Division.

We have made every effort to incorporate into the manual the latest results of research and technology transfer from the Federal Highway, AASHTO, Transportation Research Board and others. However, we recognize that the judgment of the Engineer remains of paramount importance in the planning, design and construction of structures that meet the needs of the SHA and the State of Maryland. We encourage the Engineer to utilize the information in this manual when making judgments about hydraulic designs. We also recommend that the engineer become familiar with other important publications such as the hydraulic manuals of the Federal Highway Administration.

The manual has been regularly revised and up-dated since its inception. We anticipate that this process will continue.

For some subjects, such as hydrology or bridge scour, we can accomplish updates rather easily by revising a specific chapter. For other topics relating to procedures and design policies, several chapters are interrelated and need to be read in context with each other in order to understand the scope of the guidance provided. We have included cross-references to assist you with this task. In particular, Chapter 3 and its Appendix serve as a summary of many of the other chapters regarding design approaches and processes.

Each chapter is dated and provided with footer notes to alert the user as to the last time the chapter was revised. It is possible that the manual may not reference the latest version of software such as GIS-Hydro or HEC-RAS. The user should always check with Structures H&H if there is there is a question about which software version to use.

We are no longer providing hard copy of the manual to others. Since the manual has become very large, it is not possible to send it as a unit via email. The manual is available in a PDF format on line at www.gishydro.umd.edu

Questions regarding use of the manual should be directed to Mr. Andrzej Kosicki (410 545-8340) or Mr. Len Podell (410 545-8363)

BACKGROUND ON THE MANUAL

The responsibility for hydrologic and hydraulic design in the Maryland State Highway Administration (MDSHA) is divided between the Office of Structures and the Office of Highway Development. The policies and procedures set forth in this Manual apply only to structures or other floodplain encroachments determined to be the responsibility of the Office of Structures¹ as defined below:

- Structures with a drainage area of one square mile or greater.
- Roadway encroachments on floodplains or streams having a drainage area of one square mile or more.
- Small concrete slab and rigid frame structures with a drainage area less than one square mile.

The following categories of drainage facilities and systems are the responsibility of the Office of Highway Development¹:

- Small culverts and other similar structures with a drainage area less than one square mile.
- Roadway drainage and storm water management facilities and systems.

Questions relating to such drainage facilities or systems should be referred to the Office of Highway Development.

Footnote 1: As of March 2011, the Office of Structures has been involved in studies and designs for replacement of certain small drainage structures with watersheds of less than one square mile. Procedures for handling these replacement structures are set forth in this manual in Chapter 13, Culverts. Questions relating to these specific structures should be referred to the Office of Structures.

The Manual for Hydrologic and Hydraulic Design, herein after referred to as the Manual, consists of 2 volumes:

Volume 1 sets forth design policies and project development procedures for:

-collection, evaluation, analysis, submittal and documentation of information for hydrologic, hydraulic and scour evaluation reports,

-development and review of plans and other project documents for the location and design of hydraulic structures, and

-coordination procedures for ensuring that the policies of the Office of Structures are fully considered in the location and design phases of project development

Volume 2 contains detailed guidelines and recommendations of the SHA for various aspects of the design of hydraulic structures.

The table of contents for the manual is provided below.

Office of Structures
Structures Hydrology and Hydraulics Division
Manual for Hydrologic and Hydraulic Design

- **Title Pages**
 - **Volume 1: Policies and Procedures**
 - **Volume 2: Design Methodologies**

VOLUME 1- POLICIES AND PROCEDURES

- **Chapter 1 Introduction**
- **Chapter 2 Legal Aspects**
 - **Appendix A: Annotated Code of Maryland**
 - **Appendix B: Claims Against the State of Maryland**
 - **Title 26**
- **Chapter 3 Policy**
 - **Appendix A: Checklists for Preparation of H&H Reports**
 - **Appendix B: Checklists for Design-Build Contracts**
- **Chapter 4 Documentation**
 - **Appendix 4-A Survey Request Form**
 - **Appendix 4-B Form for Requesting Aerial Surveys, Mapping or Other Graphics**
- **Chapter 5 Project Development**
 - **Appendix A: Coordination with FEMA**
 - **Appendix B: MDE Guidelines for In-Kind Replacement of Culverts and Bridges**
 - **Appendix C: Guidelines for Developing Design-Build Projects**
- **Chapter 6 Data Collection** (This chapter has not been written.)

VOLUME 2 - DESIGN METHODOLOGIES

- **Chapter 7 Scour Program for Existing Bridges**
- **Chapter 8 Hydrology**
- **Chapter 9 Channels**
 - **Appendix A - Hydraulic Design Equations for Open Channel Flow**

- **Chapter 10 Bridges**
 - **Appendix A: Tidal Bridges**
 - **Appendix B: Sea Level Rise**
 - **Appendix C: Floating Debris**
 - **Appendix D: Pedestrian Bridges**
- **Chapter 11 Evaluating Scour at Bridges**
 - **Appendix A: ABSCOUR Users Manual, Parts 1 and 2**
 - **Appendix B: TIDEROUT 2 Users Manual**
 - **Appendix C: Estimating Scour in Bottomless Culverts**
 - **Appendix D: Scour Countermeasures for Piers and Abutments**
 - **Appendix E: Guidelines for Obtaining Soil Samples in Streams and on Flood Plains**
 - **Appendix F: Scour Evaluations and Assessments for County Projects**
 - **OOS Memo on Scour Assessments**
- **Chapter 12 Bridge Deck Drainage Systems**
- **Chapter 13 Guidelines for the Selection and Design of Culvert Installations**
- **Chapter 14 Stream Morphology**
 - **Appendix A: Historic and Contemporary Modifications to Channels and Valleys**
 - **Appendix B: Evaluation of Soil and Bed Load Materials for Scour Studies**
 - **Appendix C:**
 - **Example of a Preliminary Stream Morphology Report**
 - **Attachment A: Background and Analysis**
 - **Attachment B: Photographs**
 - **Appendix D Detailed Study Report Example**
- **Chapter 19 Construction Guidelines**
- **H&H Software Programs**
 - **Maryland SHA Bridge Scour Program (ABSCOUR 9)**
 - **Maryland SHA Pavement and Bridge Deck Drainage Program (MPADD)**
 - **Maryland OOS Design Procedure for Riprap Outlet Basins for Culverts**
 - **Maryland SHA Design Method for Evaluating Flow at Tidal Bridges (TIDEROUT 2)**
 - **GIS HYDRO 2000- Web Version dated January 8, 2011.**

The following chapters have not been written:

- **Chapter 6 Data Collection**
- **Chapter 15 Surface Water Environment**
- **Chapter 16 Erosion And Sediment Control**
- **Chapter 17 Bank Protection**
- **Chapter 18 Coastal Zone**