GENERAL GUIDELINES
FOR THE
HYDROLOGIC-HYDRAULIC ASSESSMENT
OF
FLOODPLAINS IN INDIANA

Comments or questions regarding these guidelines are always welcome. The Department of Natural Resources intends to update this document on a regular basis as changes and improvements warrant. You can contact the Division of Water by the following means:

- E-Mail your questions or comments to:
  water_inquiry@dnr.state.in.us
- Send questions or comments to:
  Indiana Department of Natural Resources
  Division of Water
  402 West Washington Street, Room W264
  Indianapolis, IN 46204
- Call or fax your questions or comments to these Division of Water numbers:
  Main office - (317) 232-4160 or toll free 1-877-928-3755
  Fax number - (317) 233-4579

In order to help us track and compile comments regarding these guidelines, e-mail is the preferred option for your general comments. If using the e-mail portion of our website, enter “guideline comment” in the field labeled “Staff Name”.

Indiana Department of Natural Resources
Division of Water
Indianapolis, Indiana
December 5, 2002
General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana was created to assist the floodplain management community in establishing base flood elevations and floodway limits and in evaluating projects in accordance with the Indiana Flood Control Act and the National Flood Insurance Program. The guidelines detail methods acceptable to both the Indiana Department of Natural Resources (IDNR) and the Federal Emergency Management Agency (FEMA) with respect to hydrologic and hydraulic modeling and floodplain mapping. Also included in this guide are recommendations on presenting results of a floodplain study and other useful reference material.

As noted above, these guidelines are intended to assist the floodplain management community. They are geared to a knowledgeable audience and are not meant to be a self contained document.

This guide was authored by a team of water resource professionals representing the IDNR - Division of Water and engineering consulting firms active in the area of water resources in the state of Indiana. The team members are:

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BIBLIOGRAPHY

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FLOW CHART: OVERVIEW FOR PERFORMING A DETAILED FLOODPLAIN ANALYSIS

HYDRAULIC MODELING CHECKLIST
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BFE</td>
<td>Base Flood Elevation</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Drafting</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CLOMR</td>
<td>Conditional Letter of Map Revision</td>
</tr>
<tr>
<td>CR</td>
<td>Contraction Ratio</td>
</tr>
<tr>
<td>DEM</td>
<td>Digital Elevation Model</td>
</tr>
<tr>
<td>DOQ</td>
<td>Digital Orthophoto Quadrangle</td>
</tr>
<tr>
<td>DOW</td>
<td>Division of Water (within IDNR)</td>
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<tr>
<td>ER</td>
<td>Expansion Ratio</td>
</tr>
<tr>
<td>ESC</td>
<td>Engineering Services Center (part of Division of Water)</td>
</tr>
<tr>
<td>FARA</td>
<td>Floodplain Analysis Regulatory Assessment</td>
</tr>
<tr>
<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FIRM</td>
<td>Flood Insurance Rate Map</td>
</tr>
<tr>
<td>FIS</td>
<td>Flood Insurance Study (used by FEMA)</td>
</tr>
<tr>
<td>FW</td>
<td>Floodway</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HD</td>
<td>Hydraulic Depth (average)</td>
</tr>
<tr>
<td>HEC</td>
<td>Hydrologic Engineering Center</td>
</tr>
<tr>
<td>HEC-HMS</td>
<td>Hydrologic Engineering Center – Hydrologic Modeling System</td>
</tr>
<tr>
<td>HEC-RAS</td>
<td>Hydrologic Engineering Center – River Analysis System</td>
</tr>
<tr>
<td>IAC</td>
<td>Indiana Administrative Code</td>
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LINKS


Indiana Floodplain Management Act:

312 IAC 10 Floodplain Management Rule:  http://www.in.gov/legislative/iac/title312.html

Request for Floodplain Information:  http://www.in.gov/icpr/webfile/formsdiv/50356.pdf

44 CFR

FEMA Guidelines (Feb 2002)
  http://www.fema.gov/mit/tsd/dl_cgs.htm

MT-2 Forms
  http://www.fema.gov/mit/tsd/dl_mt-2.htm

Division of Water links

Floodplain Mapping:
  http://www.in.gov/dnr/water/publications/index.html

County / City Mapping: <under construction>
FEMA workmaps: <under construction>


Coordinated Discharges:

http://www.in.gov/dnr/water/surface_water/coordinated_discharges/index.html

Rainfall Frequency:

http://www.in.gov/dnr/water/surface_water/rainfallfrequency/index.html

Drainage Areas of Indiana Streams:

http://www.in.gov/dnr/water/surface_water/drainage_area/index.html

Modeling Checklist:


USGS Mapping links

DOQ: http://www-wmc.wr.usgs.gov/doq/

Quads: http://mcmcweb.er.usgs.gov/topomaps/


Drainage Areas of Indiana Streams: http://in.water.usgs.gov/cdfactsheet/arcinfo.html

HEC-RAS: http://www.hec.usace.army.mil/

CheckRAS: http://www.fema.gov/mit/tsd/frm_crdl.htm

WSPRO: http://water.usgs.gov/software/wspro.html

E431: http://water.usgs.gov/software/e431.html

ICPR: http://www.streamnologies.com/icpr.htm

EXECUTIVE SUMMARY

*General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana* was created to assist the floodplain management community in establishing base flood elevations (BFEs) and floodway limits and in evaluating projects in accordance with the Indiana Flood Control Act and the National Flood Insurance Program. Members of the floodplain community and, therefore, the intended audience of these guidelines includes individual property owners, developers, engineers, surveyors, elected and appointed officials and interested citizens.

The guidelines were authored by a team of water resource professionals representing the Indiana Department of Natural Resources (IDNR) – Division of Water and engineering consulting firms active in the area of water resources in the state of Indiana. The current version of these guidelines is available at the IDNR website (http://www.in.gov/dnr/water).

Chapter 1 reviews federal and state floodplain acts and codes, defines some key terms and expands on the purpose of the guidelines. The process of obtaining BFEs and floodway limits for projects consisting of a single lot and/or structure is explained in Chapter 2. In these cases, the IDNR may provide or calculate the BFE.

Chapter 3 provides an overview of detailed floodplain analyses. Historically, the IDNR has provided BFEs and floodway limits for proposed developments in unstudied areas, assuming the area of contributing watershed at the development is greater than one square mile. As of July 1, 2002, the Department required that these hydrologic-hydraulic assessments be performed by the requester and submitted to the IDNR for review and approval. Overview topics discussed in Chapter 3 include gathering data and information, submitting analyses to IDNR, revising existing BFEs and/or floodway limits, and computer model requirements. Subsequent chapters elaborate on the overview topics.

Suggestions for selecting or creating a map suitable for plotting floodplain and floodway limits are offered in Chapter 4. Chapter 5 prescribes surveying standards and suggests surveying methods likely to lead to determination of BFEs and plotting of floodplain and floodway limits acceptable to the IDNR.

Computer modeling is discussed in Chapter 6. This chapter provides guidance on potential model sources and offers suggestions on how to evaluate the suitability of a model. The overall thrust of this chapter is to facilitate optimum use of existing modeling. Chapter 7 temporarily shifts the guideline’s emphasis from hydraulics, to hydrology, that is, from BFE’s and floodplain and floodway limits to flood flows. Described are three options for determining peak discharges acceptable to IDNR.
Returning to hydraulics, Chapter 8 offers suggestions for more effectively creating and using a HEC-RAS model. HEC-RAS, a widely used hydraulic model developed by the U.S. Army Corps of Engineers, is preferred by the IDNR for floodplain analyses. Chapter 9 recognizes that other hydraulic models may occasionally be used. Accordingly, this chapter discusses issues that should be considered when using such models. Finally, Chapter 10 provides suggestions on how to effectively present to the IDNR the modeling that supports a floodplain hydrologic-hydraulic assessment. Included is a discussion of a modeling checklist.

*General Guidelines for the Hydrologic-Hydraulic Assessment of Floodplains in Indiana,* is a living document whose content will be continuously refined in response to improvements in the art and science of floodplain analyses as the IDNR interacts with the floodplain community. In the spirit of continuous improvement, the IDNR welcomes questions and suggestions. Refer to the title page for contact information.

**Keywords:** base flood elevation, cumulative effects, Federal Emergency Management Agency (FEMA), flood hazard, floodplain, floodway, hydraulics, hydrology, Indiana Department of Natural Resources (IDNR), modeling, regulation