Navigating the floodplain study approval process with WI DNR

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Floodplain Engineer
Wisconsin Department of Natural Resources
When is a study required?

- Is the development in a mapped floodplain?
  - Is it below the BFE even though it is not in an adjacent floodplain?
- Is the development in the floodway?
  - Zone AE floodway ‘OR’ Zone A
- Does the development change the floodway/floodplain boundary?
  - LOMR or LOMR-F
Who to contact

- Local ZA
- [https://www.wccadm.com/wcca-contacts](https://www.wccadm.com/wcca-contacts)
## Who to contact

### DAM SAFETY / FLOODPLAIN CONTACTS

![Map of Wisconsin with counties labeled for dam safety and floodplain contacts.](image)

### Engineer Contact Information

<table>
<thead>
<tr>
<th>County</th>
<th>Name of WME</th>
<th>DNR Office</th>
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<tr>
<td>Adams</td>
<td>Joe Behlen</td>
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<tr>
<td>Iowa</td>
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Floodplain Ordinance

(c) HYDRAULIC AND HYDROLOGIC STUDIES TO ANALYZE DEVELOPMENT
All hydraulic and hydrologic studies shall be completed under the direct supervision of a professional engineer registered in the State. The study contractor shall be responsible for the technical adequacy of the study. All studies shall be reviewed and approved by the Department.

1. Zone A Floodplains:
   a. Hydrology
      i. The appropriate method shall be based on the standards in ch. NR 116.07(3), Wis. Admin. Code, Hydraulic Analysis: Determination of Regional Flood Discharge.
   b. Hydraulic modeling
      The regional flood elevation shall be based on the standards in ch. NR 116.07(4), Wis. Admin. Code, Hydraulic Analysis: Determination of Regional Flood Elevation and the following:
      i. determination of the required limits of the hydraulic model shall be based on detailed study information for downstream structures (dam, bridge, culvert) to determine adequate starting WSEL for the study.
      ii. channel sections must be surveyed.
      iii. minimum four foot contour data in the overbanks shall be used for the development of cross section overbank and floodplain mapping.
      iv. a maximum distance of 500 feet between cross sections is allowed in developed areas with additional intermediate cross sections required at transitions in channel bottom slope including a survey of the channel at each location.
      v. the most current version of HEC_RAS shall be used.
      vi. a survey of bridge and culvert openings and the top of road is required at each structure.
      vii. additional cross sections are required at the downstream and upstream limits of the proposed development and any necessary intermediate locations based on the length of the reach if greater than 500 feet.
      viii. standard accepted engineering practices shall be used when assigning parameters for the basic model such as flow, Manning’s N values, expansion and contraction coefficients or effective flow limits. The base model shall be calibrated to past flooding data such as high water marks to determine the reasonableness of the model results. If no historical data is available, adequate justification shall be provided for any parameters outside standard accepted engineering practices.
   ix. the model must extend past the upstream limit of the difference in the existing and proposed flood profiles in order to provide a tie-in to existing studies. The height difference between the proposed flood profile and the existing study profiles shall be no more than 0.00 feet.
   c. Mapping
      A work map of the reach studied shall be provided, showing all cross section locations, floodway/floodplain limits based on best available topographic data, geographic limits of the proposed development and whether the proposed development is located in the floodway.
      i. If the proposed development is located outside of the floodway, then it is determined to have no impact on the regional flood elevation.
      ii. If any part of the proposed development is in the floodway, it must be added to the base model to show the difference between existing and proposed conditions. The study must ensure that all coefficients remain the same as in the existing model, unless adequate justification based on standard accepted engineering practices is provided.

2. Zone AE Floodplains:
   a. Hydrology
      If the proposed hydrology will change the existing study, the appropriate method to be used shall be based on ch. NR 116.07(3), Wis. Admin. Code, Hydraulic Analysis: Determination of Regional Flood Discharge.
   b. Hydraulic model
      The regional flood elevation shall be based on the standards in ch. NR 116.07(4), Wis. Admin. Code, Hydraulic Analysis: Determination of Regional Flood Elevation and the following:
      i. Duplicate Effective Model
         The effective model shall be reproduced to ensure correct transference of the model data and to allow integration of the revised data to provide a continuous FIS model upstream and downstream of the revised reach. If data from the effective model is available, models shall be generated that duplicate the FIS profiles and the elevations shown in the Floodway Data Table in the FIS report to within 0.1 foot.
      ii. Corrected Effective Model
         The Corrected Effective Model shall not include any man-made physical changes since the effective model date, but shall import the model into the most current version of HEC-RAS for Department review.
      iii. Existing (Pre-Proiect Conditions) Model
         The Existing Model shall be required to support conclusions about the actual impacts of the project associated with the Revised (Post-Project) Model or to establish more up-to-date models on which to base the Revised (Post-Project) Model.
      iv. Revised (Post-Proiect Conditions) Model
         The Revised (Post-Proiect Conditions) Model shall incorporate the changes to the topography caused by the proposed development. This model shall reflect proposed conditions.
Who to contact

Engineering Library

The FEMA Engineering Library is responsible for the archival and maintenance of all technical and administrative support data and related publications associated with the National Flood Insurance Program. This page is intended for mapping professionals and contractors and engineers looking to obtain these data and publications and learn more about the FEMA Engineering Library.

For information on how to order the available products visit: How to Order Technical and Administrative Support Data.

- Expand All Sections

- Forms And Fee Schedule

- Online Search And Download Using FEMA's Flood Risk Studies Engineering Library (FRISEL)

- Frequently Asked Questions (FAQ)

- Hours Of Operation

- For More Information

Last Updated: 06/01/2018 - 11:13
Who to contact

Floodplain management and mapping

Interactive floodplain maps.

Understand

the mapping process.

Learn

about regulating floodplains.

Find

floodplain and dam customer assistance.

The goals of the Wisconsin floodplain management program are: to protect life, health, and property; to minimize costs for flood control projects; to reduce tax dollars spent for rescue, relief and repair of flood damage; to shorten business interruptions caused by flooding; to prevent future flood blight areas; to discourage victimization of unwary land and home buyers; and to prevent increased flood levels caused by unwise floodplain development.

Mapping

- Mapping process
  - Risk MAP
  - Find a Map
  - UCMA
  - Engineering and Modeling

Ordinances

- Regulations
  - What is regulated?
  - Ordinance adoption
  - Definitions and acronyms

Overview

- Definitions
  - Standards
  - Staff
  - Resources

Flood Insurance

- NFIP
  - Community rating system
  - Resources

Grants

- Mitigation

Resources

- Model ordinances
  - Newsletters/Press releases
  - Publications/Publications
  - Fact sheets
Who to contact

Floodplain engineering data

Available data
The engineering data from the Flood Insurance Studies can be found on the department Surface Water Data Viewer. If the effective model is not on the Surface Water Data Viewer, then staff can assist users in determining whether or not engineering data exists.

Staff can answer specific technical questions on studies related to the floodplain. For most engineering hydraulic studies, HEC-RAS is the accepted model. A free copy of HEC-RAS can be downloaded from the US Army Corps of Engineers link here.

DNR study review
Department of Natural Resources staff reviews engineering studies for compliance with NR 116 Wis. Admin. Code. A floodplain study checklist has been created to assist in preparing a floodplain study submittal to DNR for review. Please save this document locally and fill out digitally if possible, then include in your submittal package to DNR.

Hydrologic and hydraulic model revisions due to development should follow the local community’s floodplain ordinance. Specifically, refer to section 7.1 (2) (c) of the model ordinance image.

Federal Emergency Management Agency review
Users should contact the FEMA Map Information Exchange at 1-877-336-2627 or FEMAMapSpecialist@riskmapcds.com for questions related to Letter of Map Change submittals.

Resources
More information on floodplain management.
Checklist for Submitting a Floodplain Study

Wisconsin Department of Natural Resources

This outline for department review of floodplain studies may not contain all of the requirements of the administrative code. It is a general outline and detailed examination of the codes should be done to be assured that a submittal may meet department approval. Appropriate areas should be filled in by the engineer submitting the study for WDNR review.

Community/Zoning Authority:
Official Stream Name:
County:
Study Author:
Submission Date:
Submitted to:

Legal Description:
Upstream Limit: 1/4(QQ), 1/4(Q), Section(s): Township: Range:
Downstream Limit: 1/4(QQ), 1/4(Q), Section(s): Township: Range:

Study Type (circle): Bridge/Channel, Channel Realignment, Enclosure, Filling/Excavating, BFE determination, Other:

I. General Documentation

___ Contact (Telephone Conservation) Reports
___ Meeting Minutes/Reports
___ General Correspondence
___ Submittal letter or e-mail from zoning authority requesting review

II. Narrative Report

___ Purpose of the study
___ Geographic location of the study
___ Detailed description of the methodology used for hydrology, hydraulics and any special applications used in the study
___ Description of the project location related to model river stations
___ Documentation of the changes made between each model run
___ Floodway Data Table
   Note: Include at least one table with the following output variables: 'Rver Sta', 'Q Total', 'W.S. Ele', 'Top With Act', 'Flow Area', 'Vel Total'
___ Previous studies on the same watercourse – date/author/source of study
___ Data collection methods
___ Past flooding
___ Benchmark identification and location
___ Coordination with other agencies
___ Other supporting documentation provided
   (circle) Soils Maps, Watershed Maps, Photographs, Stream Flow Records
   Other:

1 05/19/17
2 05/19/17
III. Engineering Analyses

1) Hydrologic Analysis (electronic input/output files)
   _____ Is there an existing model?
   Existing model input file name: ________________________

The two techniques used to determine the regional flood flow discharges:
   _____ Log-Pearson Type III, described in Technical Bulletin #17B
   _____ Regional Regression Equations (i.e. Congeys)
   _____ Synthetic hydrographs (i.e. HEC-RM5)
   _____ Was floodplain storage explicitly taken into account to attenuate flood peak flow?
   _____ If yes, have flood storage district maps been created for the community to adopt?
   _____ Which rainfall distribution was used?
   _____ If a distribution other than NRCS’s MSEJ/MSE4 was used, what duration was the critical duration when the critical duration analysis was performed to identify the peak storm duration?
   _____ Technical Release No. 35 (TR-35)
   _____ Comparison of similar drainage basins at gaged sites
   _____ Historic flood data
   _____ Other methods with department approval (comment on what method)
   Input file name: ________________________
   _____ New peak flows tie in with upstream and downstream published flows

2) Hydraulic Analysis (electronic input/output files)
   Note: The same model must be used for both existing and proposed conditions for relative consistency
   _____ Is there an existing model?
   Existing model input file name: ________________________
   _____ Existing model was not truncated from its original study reach

New hydraulic model type (i.e. HEC-RAS) ________________________
New input file name (project model name that has one or multiple runs):
   _______________________________________________________

Model plan descriptions:
   _______________________________________________________
   (ex. p.01 = effective, p.02 = corrected effective, p.03 = pre-project, p.04 = post-project...)

What is the vertical datum of the survey/geomeric data (NAVD88, NGVD29...)?
   _______________________________________________________

_____ Is there a dam with operable gates in the study reach?
   _____ If yes, does the modeled operation represent the DNR approved Inspection, Operation, and Maintenance Plan (IOM)? The dam operator then assumes liability that the gates will be operated as outlined in the IOM.
   If not, explain

_____ Is there a detailed study upstream of the submitted reach? (Y/N)
   _____ If yes, do the profiles match within 0.5’ at the boundary? (Y/N)

_____ Is there a detailed study downstream of the submitted reach? (Y/N)
   _____ If yes, do the profiles exactly at the boundary? (Y/N)

_____ Model shows increases due to development (proper legal arrangements required)
3) Miscellaneous
   ___ Supporting hand calculations, sketches and figures used in analyses
   ___ Key to Cross-Section Labeling
   ___ Key to Transect Labeling (coastal study only)

IV) Mapping Information
   ___ Workmaps including floodway, floodplain, cross sections, and stream centerlines
      Floodway Data Table
      Note: Include at least one table with the following output variables:
         ‘River Sta’ ‘Q Total’ ‘W.S. Elev’ ‘Top Width Act’ ‘Flow Area’ ‘Vel Total’

   Digital mapping data provided: ________________________________
   (Circle) ESRI shapefile(s)/database  CAD data  Other
   Horizontal coordinate system used: ________________________________

V) Certification
   ___ Signed, stamped, and submitted by a Professional Engineer registered in Wisconsin

   Name ____________________________  Registration # ____________________________
Model requirements AE zone

• **Hydraulics**
  - Existing/Duplicate effective (FIS model)
  - Corrected effective
  - Pre-project
  - Post-project
  - Encroachment (floodway run...necessary?)
  - Elevation to 2 decimals
Model requirements A zone

- Hydrology – 2 methods
- Hydraulics – HEC-RAS preferred
- Engineered A zones – there are many model backed A zones in WI, check with the regional engineer
• Importing a HEC-2 into HEC-RAS
HEC-RAS 101

- All plans in one project
- Clearly label plans

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| Plan 04          | D:\Data\Consultant\Duck Creek\HEC-RAS\456.p01                |
| Plan 05          | D:\Data\Consultant\Duck Creek\HEC-RAS\456.p04                |
| Plan 06          | D:\Data\Consultant\Duck Creek\HEC-RAS\456.p06                |
| Plan 07          | D:\Data\Consultant\Duck Creek\HEC-RAS\456.p07                |
| Pedestrian Bridges | D:\Data\Consultant\Predonia_disc_golf\DiscGolfStudy2017.p07   |
| Existing FIS     | D:\Data\Consultant\Predonia_disc_golf\DiscGolfStudy2017.p03   |
| Current FIS cond. no pedestrian bridge | D:\Data\Consultant\Predonia_disc_golf\DiscGolfStudy2017.p05 |
| Pedestrian Bridges | D:\Data\Consultant\Predonia_disc_golf\DiscGolfStudy2017.p07   |
HEC-RAS 101

- Floodway limits
  - Blocked obstruction vs. ineffective flow (sensitivity analysis)
Mapping

- Include map (electronic) to scale with current & proposed floodplain/floodway, topo, and cross sections
Mapping

- Tie-in (hydrology, hydraulics, and floodplain) upstream and downstream
- Mapped floodway topwidths match model
- ESRI products (shapefiles) preferred
When is a CLOMR/LOMR required?

- CLOMR when risk (BFE/FW/fp) increases
- LOMR within 6 months of project completion
- Revisions based on FEMA comments require another WDNR review
Questions?