

Dam Failure Inundation Mapping - Items for Submittal; May 17, 2007

Ohio Administrative Code Rule 1501:21-3-02 requires that a registered professional engineer perform detailed investigations and analyses of dams, which would include dam failure inundation mapping. The following provides a basic guideline for the content of a dam failure inundation mapping report.

Dam Hydrology and Hydraulics

- Provide the working hydrology and hydraulics for the dam and how it performs during various flood events.

Dam Failure Analysis

- Discuss the selection of breach parameters (time to failure, breach width, breach side slopes, pool elevation for failure initiation) or other determination of flows downstream of the dam. [Ref. 1]
- Consider three failure scenarios: (1) sunny day, (2) 100-year to 25%PMF, and (3) PMF. If any of these is omitted, justification should be provided.
- Discuss the sensitivity of parameters.

Hydraulic Model of the Inundation Area

Base Map(s)

- Show the extent of the valley that was modeled and the locations and names of cross sections.
- Discuss the termination point of the model. [Refs. 2 & 3]
- Discuss how the cross sections were obtained.

Flood Modeling

- Describe the flood model (hand calculations, HEC-1, HEC-RAS, or other suitable model).
- Provide digital copy of the computer files.
- Discuss modeling procedure and content. [Refs. 4, 5 & 6]

Inundation Maps

- Clarity – it is crucial that the map can be easily read. [Refs. 3, Ch. 6, & Ref. 7]
- Verify that content of hazard area is current; this will likely require a field visit.
- Show several cross sections and the distance downstream, time of arrival, water elevation, and time to peak for each.
- Briefly discuss the scenario and note that the map is an approximation.

References

1. Prediction of Embankment Dam Breach Parameters (DSO-98-004), USBR
2. Downstream Hazard Classification Guidelines (ACER Technical Memorandum No. 11), USBR
3. Engineering Guidelines for the Evaluation of Hydropower Projects, Chapters 2 & 6, FEMA
4. Guidelines and Specifications for Study Contractors (Flood Insurance Study), FEMA 37, FEMA
5. EM 1110-2-1416 River Hydraulics, USACE
6. HEC-RAS Hydraulic Reference Manual & HEC-RAS Users Manual, USACE
7. Emergency Action Planning for Dam Owners, FEMA 64, FEMA
8. Technical Release 60 – Earth Dams and Reservoirs, NRCS
9. Technical Release 66 – Simplified Dam-Breach Routing Procedures, NRCS
10. National Weather Service Simplified Dam Break Model

* All references are available via the web.

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Comments

- * It is recommended that the investigating engineer discuss the project with Division of Water engineers prior to beginning.
- * In dam failure modeling, it is always important to keep the final use of the inundation mapping in mind.
- * Simplified methods could be acceptable if the hazard area is easily defined (isolated house or short reach). Using these methods may result in a less costly option for dam owners while still providing appropriate information for emergency personnel.
- * If isolated homes, note addresses and telephone numbers; if several homes, coordinate with county emergency management agency for documentation.
- * Contributing drainage area should be considered in the extent of the analysis for flood scenarios. As a general rule, uncertainty in the analysis rises considerably when ratio of dam drainage area to other contributing drainage areas is about 10 to 1.
- * The scales of the base map and the inundation map do not need to be the same: a USGS quadrangle map with a 20-foot contour interval is not sufficient for obtaining cross sections but could be sufficient for inundation mapping.

Common Pitfalls

- * Not including the river channel when 2-foot contours are available
- * Cross sections not reflective of overall river corridor
- * Not modeling ineffective flow areas
- * Misplacing the failure flood peak (having the breach form significantly before or after a storm peak) or choosing a time interval that skips the peak
- * Ignoring or improperly modeling bridges (all crossing should be discussed or modeled)
- * Over-hatching inundation area on map to where the background map cannot be read.
- * Not investigating all three failure scenarios.
- * Not considering the sensitivity in dam breach parameters, and therefore under- or over-estimating peak dam failure flows.