

Modeling and Mapping Non-Accredited Levees: Structural-Based Inundation Procedure

Structural-Based Inundation Procedure

The Federal Emergency Management Agency (FEMA) has developed a new set of procedures for analyzing and mapping flood hazards on the landward side of non-accredited levee systems on Flood Insurance Rate Maps (FIRMs). Non-accredited levee systems are those that do not meet all the requirements outlined in Title 44 of the Code of Federal Regulations (CFR), Section 65.10.

This fact sheet summarizes the *Structural-Based Inundation* procedure. This procedure applies to levee reaches that are above BFE but below the freeboard requirements outlined in Title 44 CFR 65.10. The *Structural-Based Inundation* procedure can be applied to one or more reaches in the levee system or the entire system.

When to Use the Structural-Based Inundation Procedure

Figure 1 illustrates a non-accredited levee reach with structural integrity deficiencies that have resulted in breaching. The structural integrity of a levee system can be diminished in a variety of ways. The following types issues can affect structural integrity:

- Encroachment into the levee structure such as vegetation, animal burrows, and construction
- Piping and sand boils during times of high water
- Rivers that could overtop and erode the levee
- Other information that indicates the levee is structurally inadequate

Updated Levee Analysis and Mapping Methodologies

FEMA has developed procedures for analyzing and mapping hazards associated with non-accredited levees shown on FIRMs. An overview is provided in Fact Sheets titled:

1. Dividing Levee Systems into Multiple Reaches
2. Natural Valley Procedure
3. Sound Reach Procedure
4. Freeboard Deficient Procedure
5. Overtopping Procedure
6. Structural-Based Inundation Procedure
7. Understanding the Zone D Designation

For more information, please visit:

<https://www.fema.gov/flood-maps/living-levees/tools-templates>.

The CFR can be accessed at:

<https://www.ecfr.gov>.

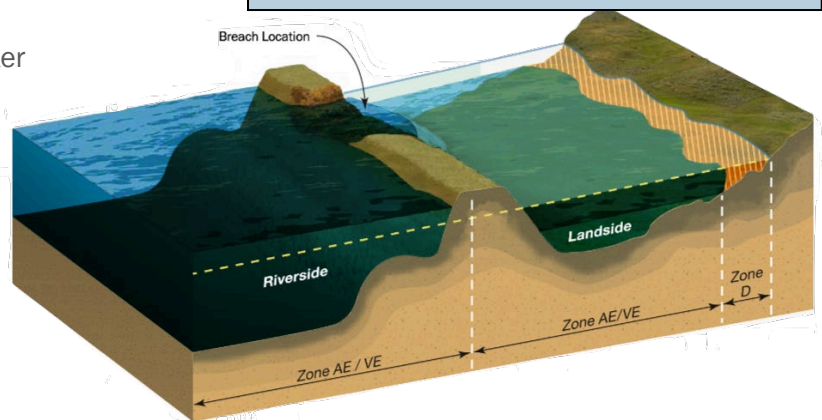


Figure 1. Cross-section of a structurally deficient reach that is breached, allowing inundation on the landward side of the levee



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When a levee experiences flood flows, the volume and depth of water within the river channel increases, causing additional force. The additional water pressure may result in structural failure of weaker levee reaches. When a levee fails due to structural integrity issues, material from the levee system collapses and forms a breach on the levee that allows river water to flow through the damaged section.

Predicting with certainty the exact location of a levee breach is not possible. The *Structural-Based Inundation* approach does not predict the probability of failure at any specific location, nor does it provide an evaluation of the overall levee system performance. The procedure only determines the likely volume of water and duration of flow that would escape the river channel if the levee did breach.

Minimum Levee Documentation Requirements

The *Structural-Bases Inundation* analysis and mapping procedure does not require the same documentation from levee owners or the associated communities for their levee systems as some of the other procedures. However, reach sections must be described sufficiently to support the calculations provided.

Structural-Bases Inundation Analysis and Mapping Procedures

In the *Structural-Bases Inundation* procedure, multiple breaches are modeled and mapped, resulting in a composite Special Flood Hazard Area (SFHA). Figure 2 shows an example of how flood zones may be mapped for a portion of a non-accredited levee system with structurally deficient reaches. In the example shown there are three breach locations with resulting mapped flood hazard areas.

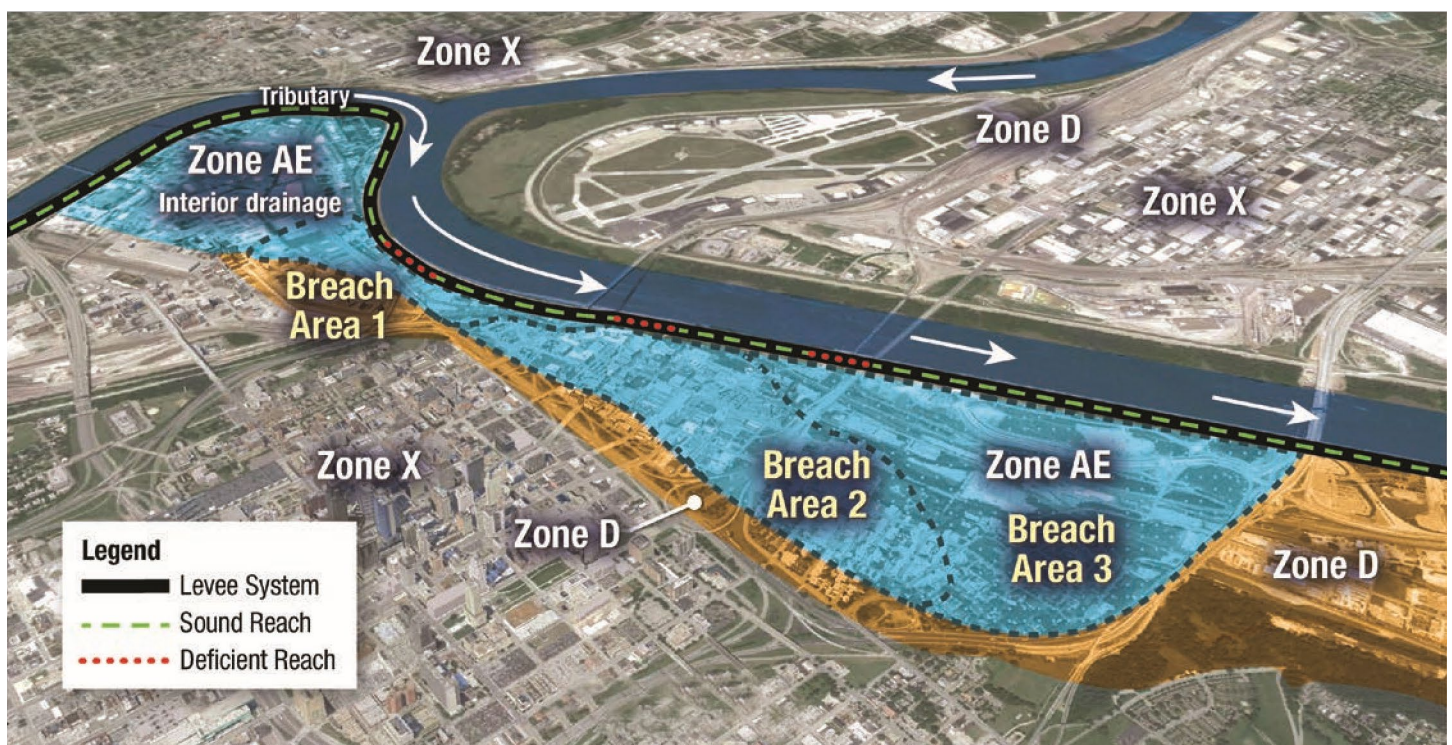


Figure 2. Example of mapped flood zones behind structural breach areas