



FEMA



# Modeling and Mapping Non-Accredited Levees: Natural Valley 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 **Natural Valley** procedure. The term “natural valley” refers to the river channel and floodplain of a river system or coastal area prior to the addition of flood control structures and construction of levees. The **Natural Valley** procedure can be applied to one or more reaches in the levee system or the entire system.

The results of the **Natural Valley** procedure may be used in two different mapping functions:

1. **To establish areas of potential inundation** within the 1-percent-annual-chance floodplain which are not otherwise mapped as a Special Flood Hazard Area (SFHA). Due to the heightened risk behind leveed areas, those areas that are not otherwise mapped as a SFHA need to be identified and the risks properly communicated.
2. **To map the SFHA** within the natural valley of the floodplain when this method is appropriate as explained below.

## When to Use the Natural Valley Reach Procedure

The **Natural Valley** procedure can be applied to all non-accredited levee reaches. It is the least complex and requires the least data of all analysis approaches. The procedure results may be used as the SFHA in the following three situations:

1. A levee reach is so significantly overtopped during a 1-percent-annual-chance or more frequent flood event, that the existence of the levee does not have a noticeable effect on water-surface elevations.
2. If the quality and quantity of data is insufficient to support the other procedures.
3. Because of the more limited data and resources needed, a community may prefer to use this method.

## 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:

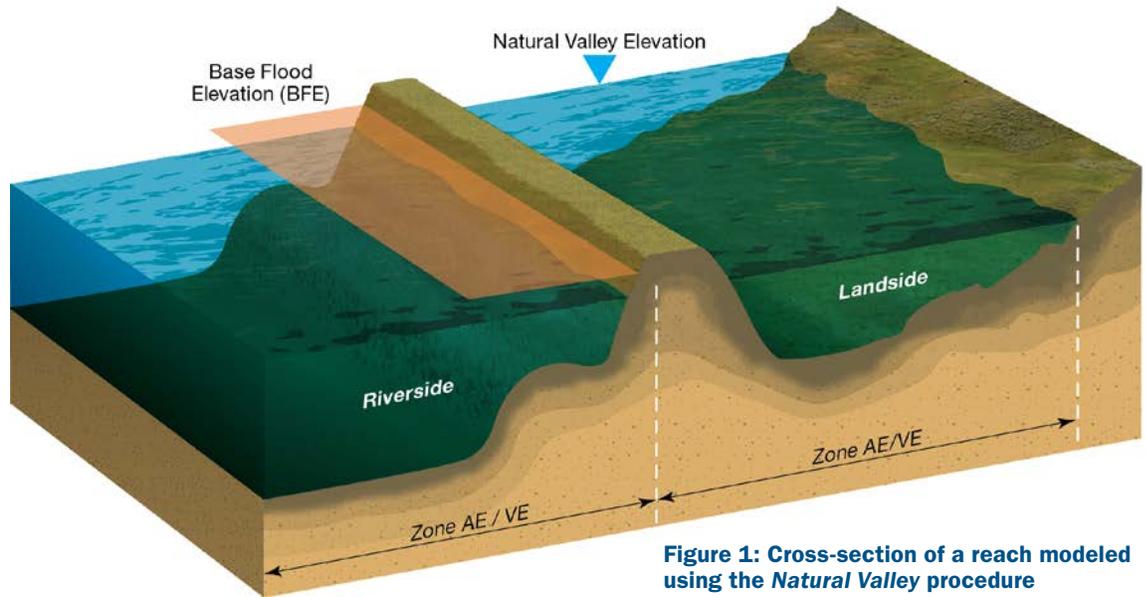
1. **Dividing Levee Systems into Multiple Reaches**
2. **Natural Valley Procedure**
3. **Sound Reach Procedure**
4. **Freeboard Deficient Procedure**
5. **Overtopping Procedure**
6. **Structural-Based Inundation Procedure**
7. **Understanding the Zone D Designation**

For more information, please visit:  
<http://www.fema.gov/final-levee-analysis-and-mapping-approach>

The CFR can be accessed at:  
<http://ecfr.gpoaccess.gov>

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Figure 1 shows a cross-section of a model using the **Natural Valley** procedure. The **Natural Valley** procedure assumes the levee does not impede flood flows. Thus, as depicted in Figure 1, the flood elevations determined by the procedure may be lower on the landward side, than the Base Flood Elevation (BFE) on the riverside when the levee remains in place.



**Figure 1: Cross-section of a reach modeled using the *Natural Valley* procedure**

### Minimum Levee Documentation Requirements

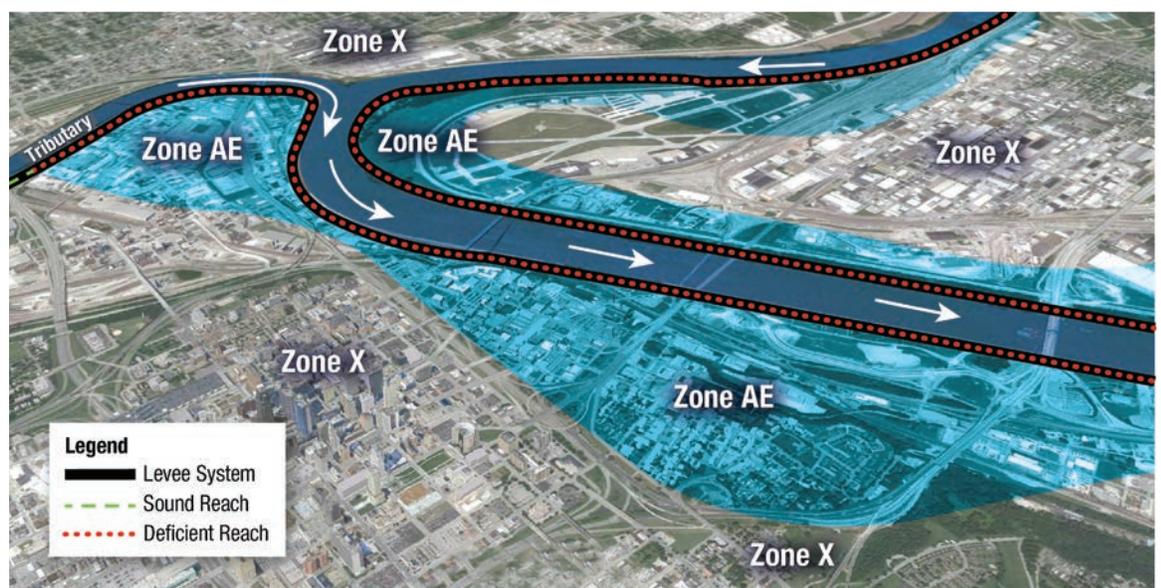
The **Natural Valley** procedure does not require any technical levee system documentation from levee owners or communities. The procedure requires only limited data and can be used to analyze any non-accredited levee reaches where desired.

### Natural Valley Analysis and Mapping Procedures

Regardless of which procedure is ultimately applied, FEMA will begin by analyzing ALL non-accredited levee systems using the **Natural Valley** procedure to establish areas of potential inundation. Modeling techniques using the **Natural Valley** procedure differ depending on whether the flood source is riverine or coastal. It is important to note that flood hazards greater than those determined using the **Natural Valley** technique are possible behind levees. This is particularly true in situations where flood water enters the system and has no way out.

If the **Natural Valley** procedure is selected to actually map the SFHA, the flood elevation determined by the **Natural Valley** procedure will be mapped on the landward side of the levee system to describe the anticipated extent of flooding during the 1-percent-annual-chance flood event. When the **Natural Valley** procedure is selected, the flood hazard area will usually be designated as Zone A or AE. Figure 2 shows an example of an area mapped using the **Natural Valley** procedure.

For **coastal levee** reaches, the modeling on the coastal side of the levee may have both storm surge and wave action. Wave conditions landward of the non-accredited levees are not included when determining the extent of the natural valley floodplain, but where applicable will be added to determine BFEs.



**Figure 2: Example of an area mapped using the *Natural Valley* procedure**