



Moravia Levee Flood Hazard Identification

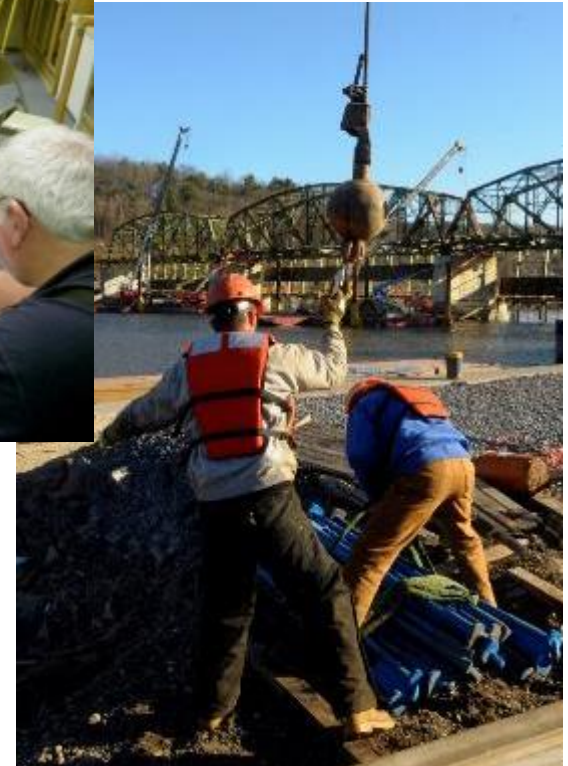
Local Levee Partnership Team (LLPT) Meeting 1

September 18, 2017



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FEMA Mitigation Division



Reduce the loss of life and property by lessening the impact of disasters.



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Today's Goals

1

Overview of Levee Systems



2

Discuss Levee Flood Hazard Identification



3

Identify Local Levee Partnership Team (LLPT) Members



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“Levees reduce the risk of flooding. But no levee system can eliminate all flood risk. There is always the chance that a flood will exceed the capacity of a levee, no matter how well it was built. Levees do not always perform as intended. In fact, levees sometimes fail even when a flood is small.”

— American Society of Civil Engineers



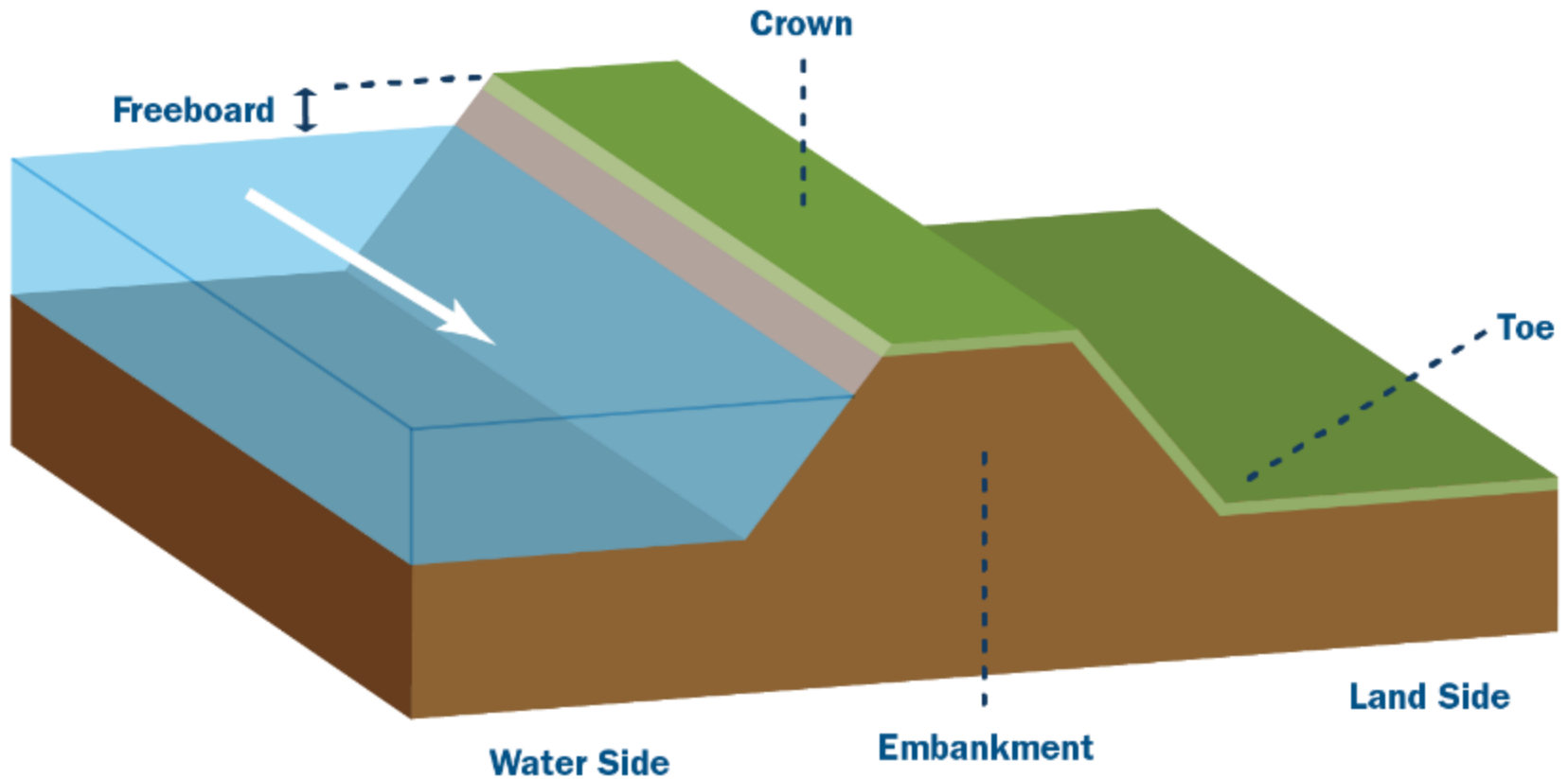
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Overview of Levee Systems



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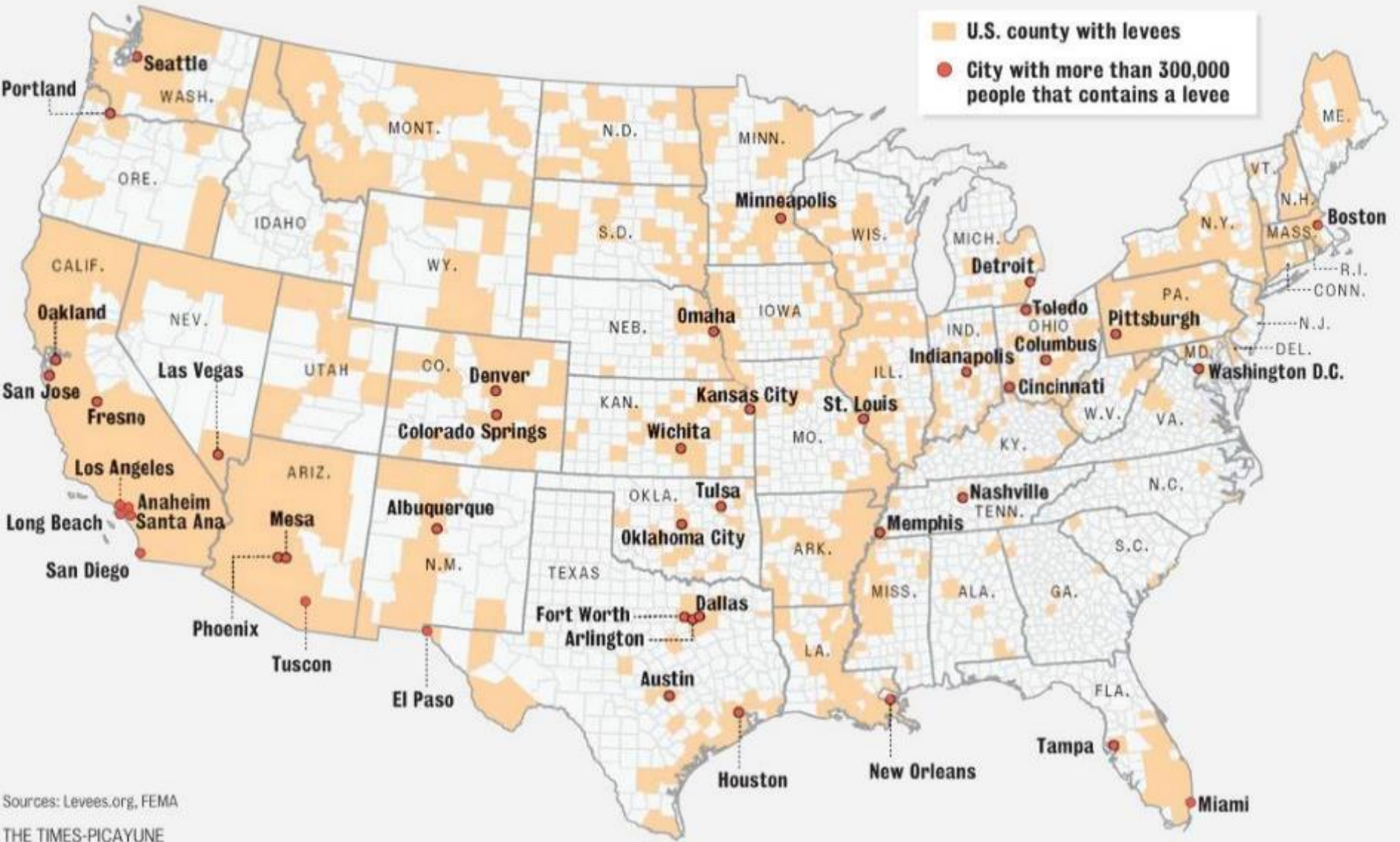
Anatomy of a Levee



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LEVEES EVERYWHERE

There are 881 counties in the U.S. with levees. Those counties contain more than 50 percent of the nation's population.



Sources: Levees.org, FEMA
THE TIMES-PICAYUNE

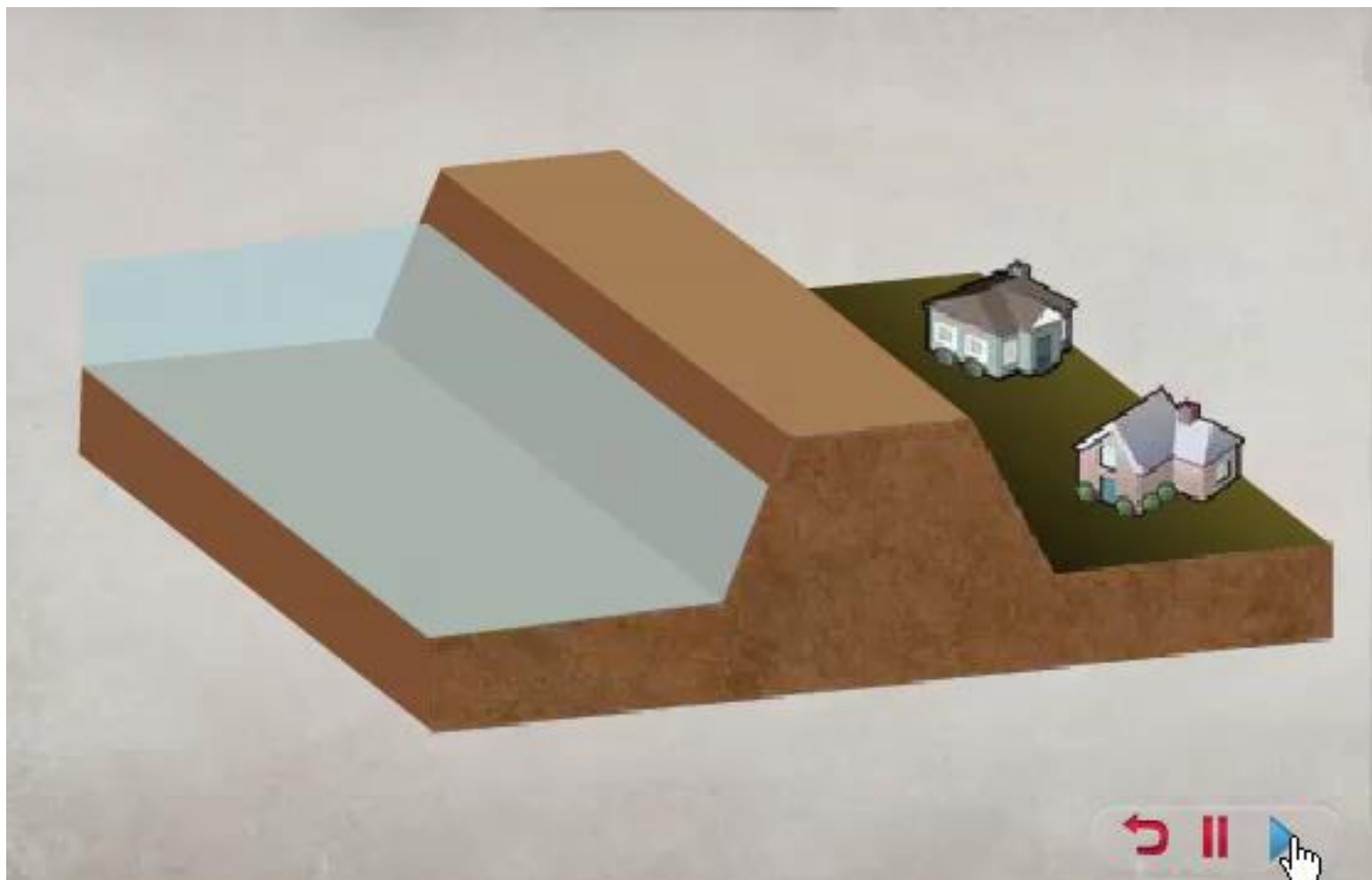


How Flooding Occurs with Levees

- ☐ Overtopping
- ☐ Erosion
- ☐ Structural Instability
- ☐ Piping and Under seepage
- ☐ Settlement
- ☐ Seismic Activity
- ☐ Aging
- ☐ Poor Maintenance

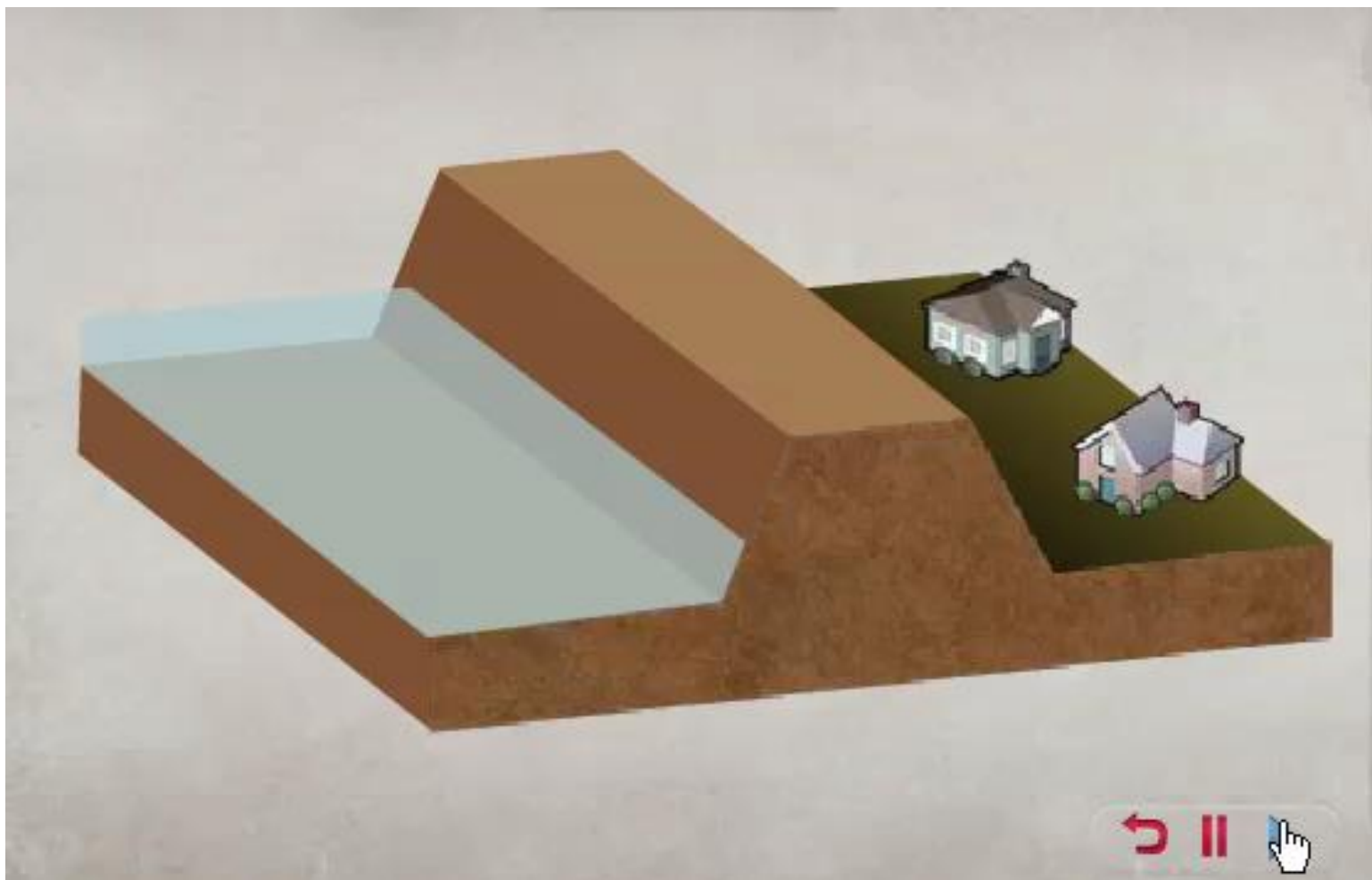


Overtopping



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Breaching



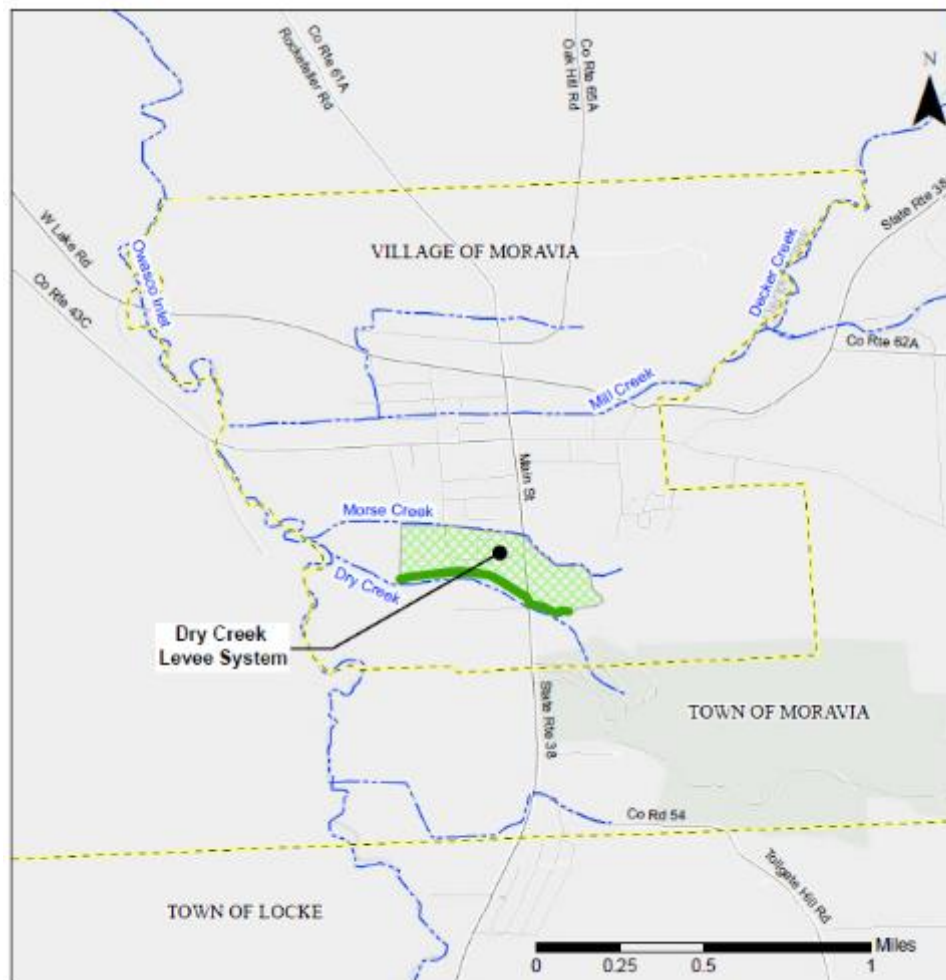
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Piping and Under Seepage



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Dry Creek Right Bank Levee System



FY17 Dry Creek
LAMP Scope
Cayuga County, NY

Legend

- Closures
- Floodwalls
- Levees
- Leveed Area
- Stream
- Jurisdictional Boundary
- County Boundary

Levee System Information

Dry Creek (Moravia)
(NLD System: 4505000014)

LLPT Information

LLPT 1 - Village of Moravia

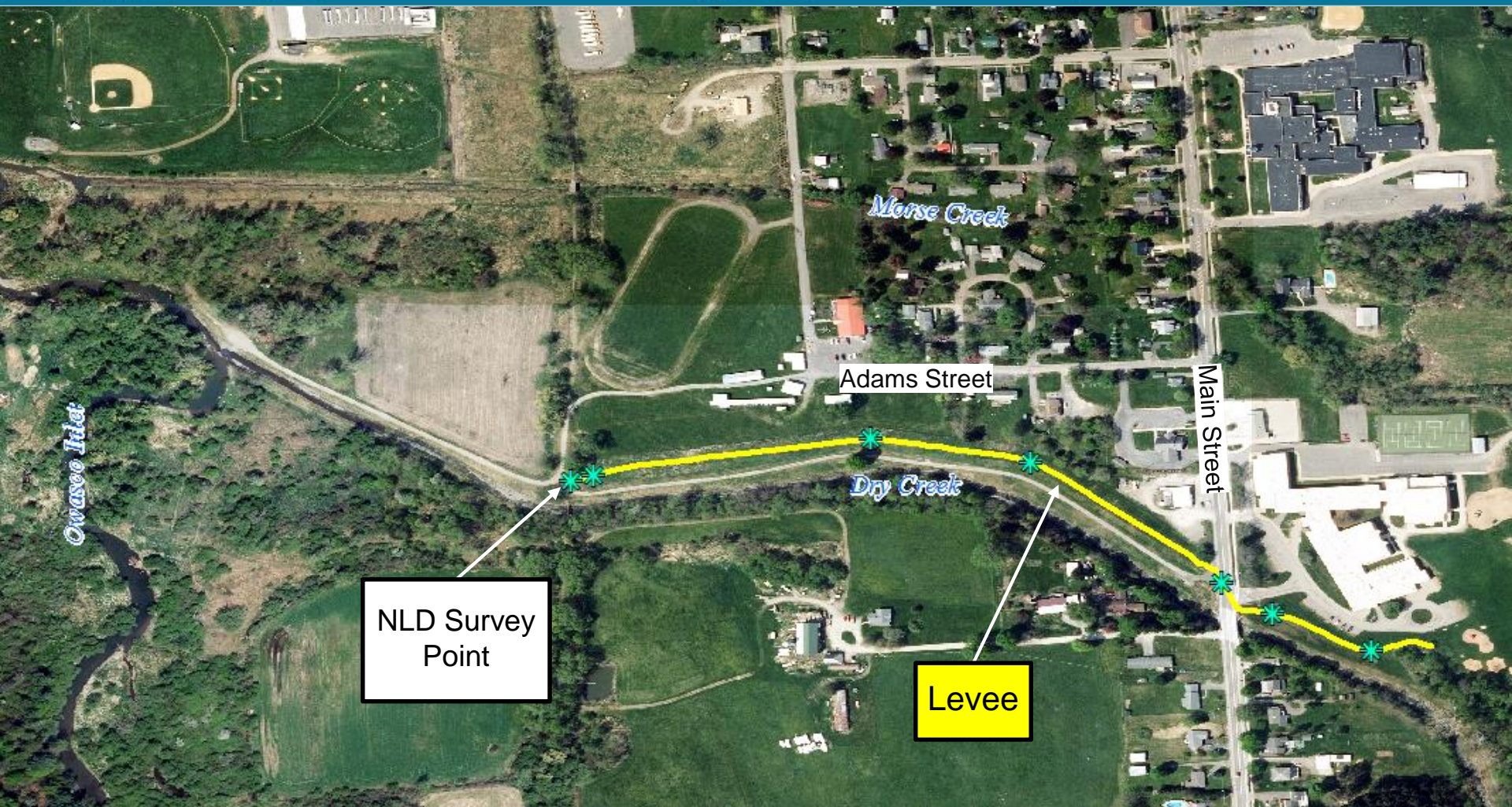


7/12/16 Created by: James Bonavita Checked by: Curtis Smith/Julia Chen



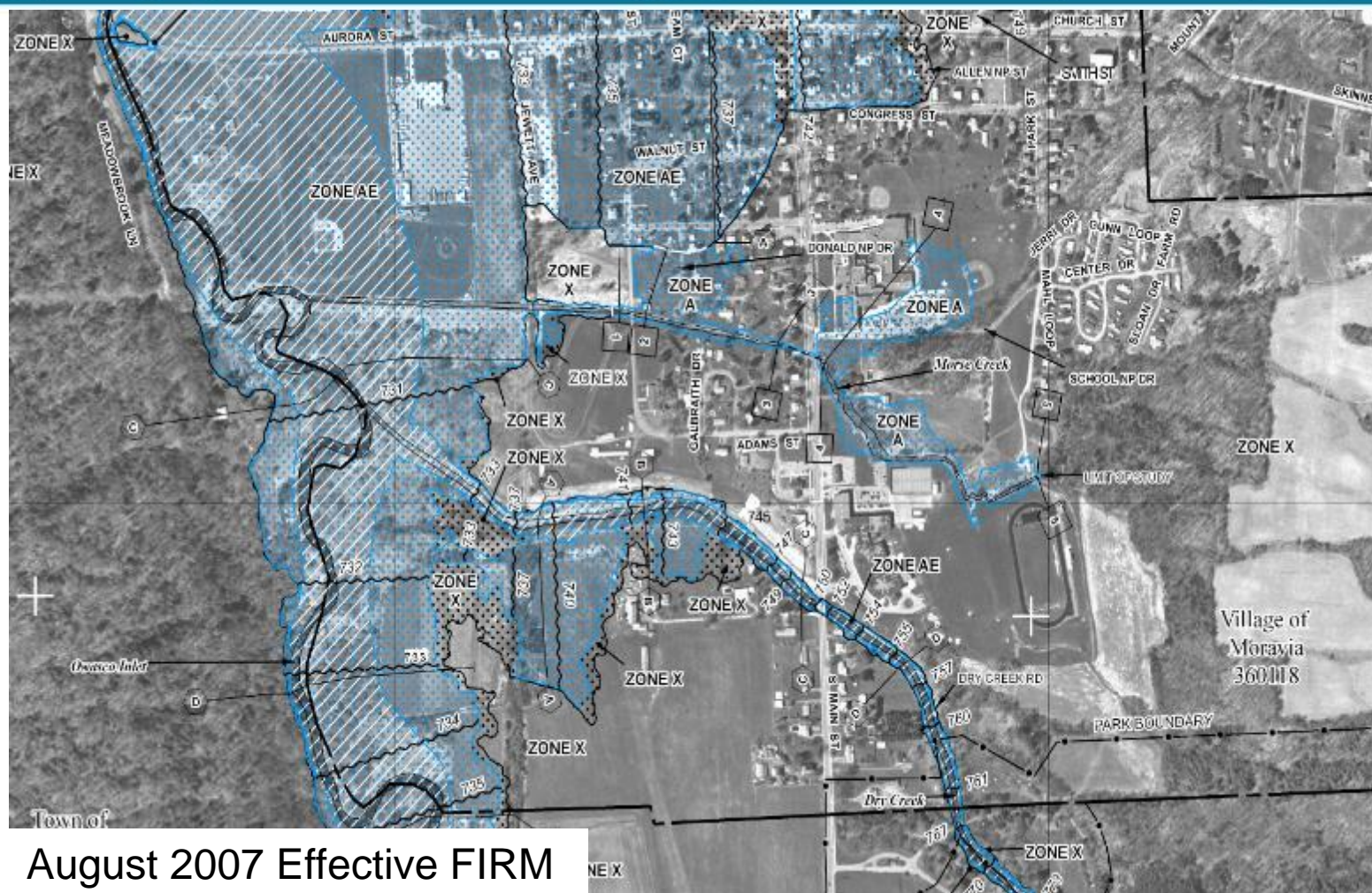
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Dry Creek Right Bank Levee System



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Dry Creek Right Bank Levee System



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Dry Creek Right Bank Levee System

- Floodwall and Earthen Levee
- USACE constructed levee. Active in USACE PL 84-99 Rehabilitation Program.
- Affected Community – Village of Moravia, Cayuga County
- Length: Per National Levee Database approximately 0.4 miles along Dry Creek
- Initial Data Collection:
 - National Levee Database – Top of levee data
 - HEC-RAS hydraulic model for Dry Creek
 - Base mapping data

Discuss Levee Flood Hazard Identification



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How Levee Systems Are Categorized

Accredited Levee System:

1. Certified Levee documentation* has been provided that demonstrates all requirements** have been met.
2. Leveed areas shown on Flood Insurance Rate Maps (FIRMs) as reducing risk from the one-percent-annual-chance flood.

Non-Accredited Levee System:

1. Certified Levee documentation* that demonstrates all requirements** have been met **has not been not provided**.
2. Leveed areas shown on Flood Insurance Rate Maps (FIRMs) as **not reducing risk** from the one-percent-annual-chance flood.

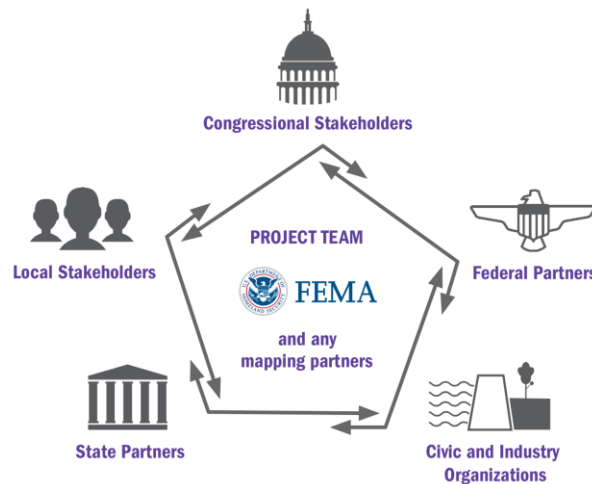
***Certified levee documentation:** As-built plans and additional data must be submitted to support that a given levee system complies with the structural requirements. This data must be certified by:

- A registered professional engineer.
- A Federal agency with responsibility for levee design may

****Requirements** outlined in [44 CFR 65:10](#).

The Focus is on Flood Risk

- The Federal Emergency Management Agency (FEMA) works with Federal and State partners, local communities and other stakeholders to assess and communicate flood risks in areas impacted by non-accredited levees.
- The **levee analysis and mapping procedures** process approach breaks levee systems into segments for analysis.



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Levee Analysis Case Study: Village of Herkimer, NY

- **Issue:** The community thought they had more protection from their current levee system.
- **Method:** Community opted for the structural-based inundation (simulation of levee breaching).
- **Outcome:** A flood hazard was found upstream that had the potential to decimate the levee system nearby and impact residences and businesses.



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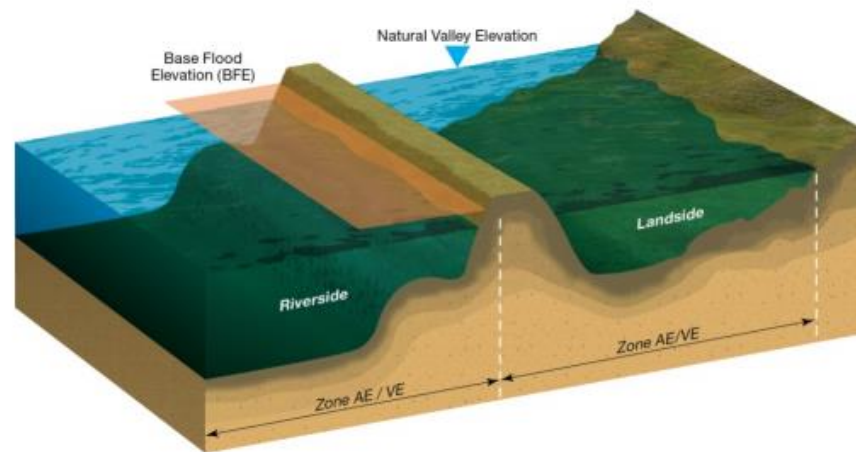
Levee Risk Analysis: Complete System

System Level Analysis

- Determine the “Natural Valley” floodplain of the leveed area.



Natural Valley Procedure: Reflects the levee geometry in a hydraulic model, but will allow water to flow on either side of the levee.



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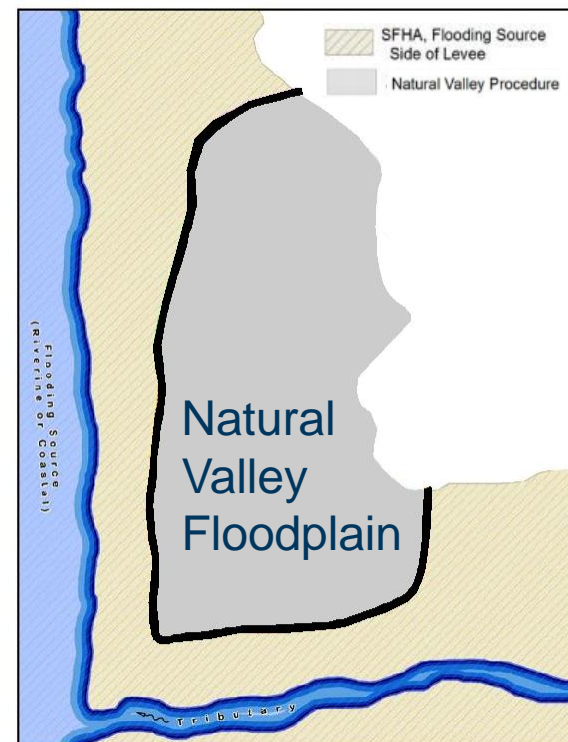
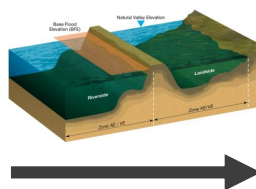
Levee Risk Analysis: Complete System

System Level Analysis

- The results from the Natural Valley Procedure will serve as a baseline for the Levee Analysis and Mapping Process.



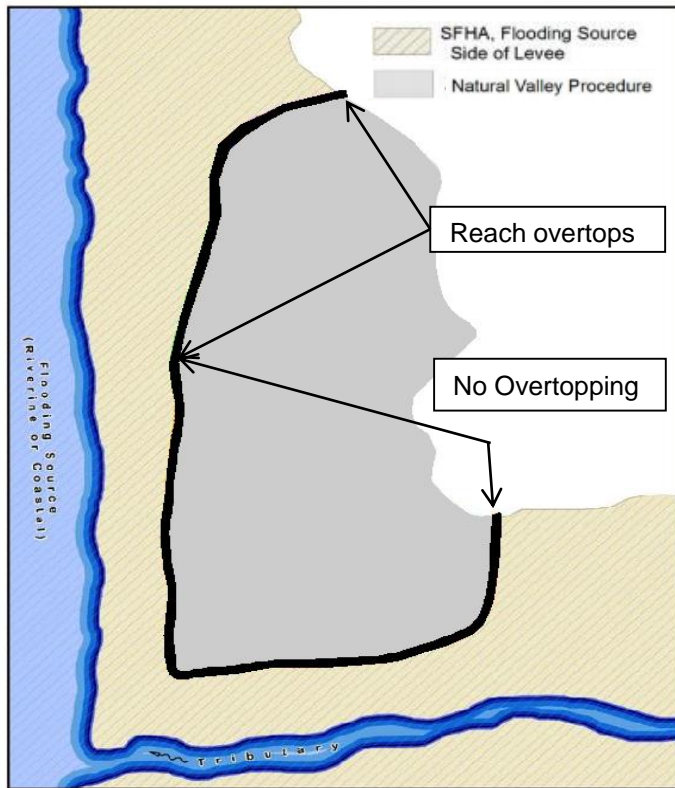
Natural Valley Procedure



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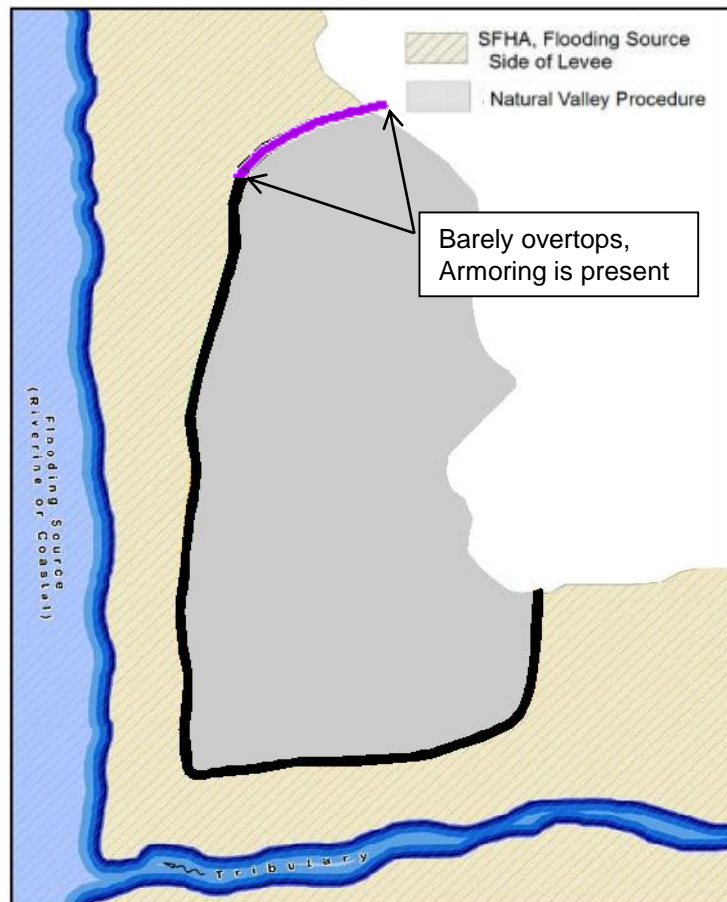
Levee Risk Analysis: Reach Analysis

Reach Level Analysis

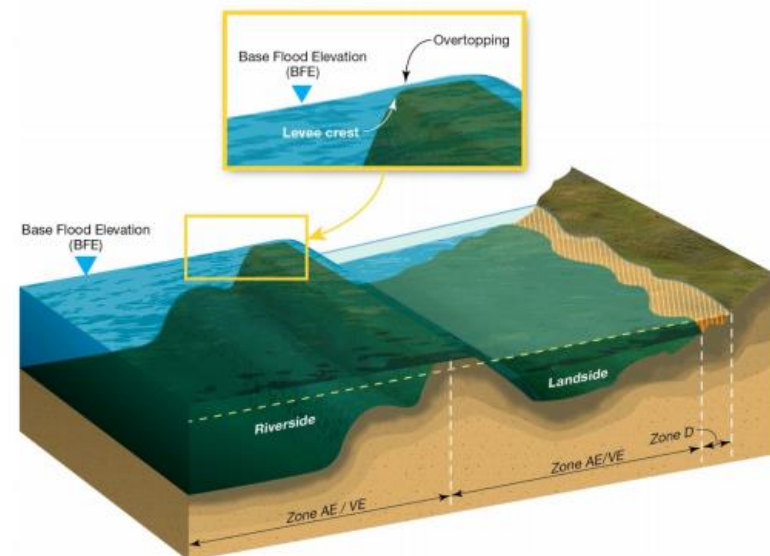


- Using the Natural Valley Results, analyze the levee system on a **reach level**:
 - Can the levee be divided into segments?
 - What are the impacts at the reach level?
 - What data exists for each levee segment?

Reach Analysis: Overtopping

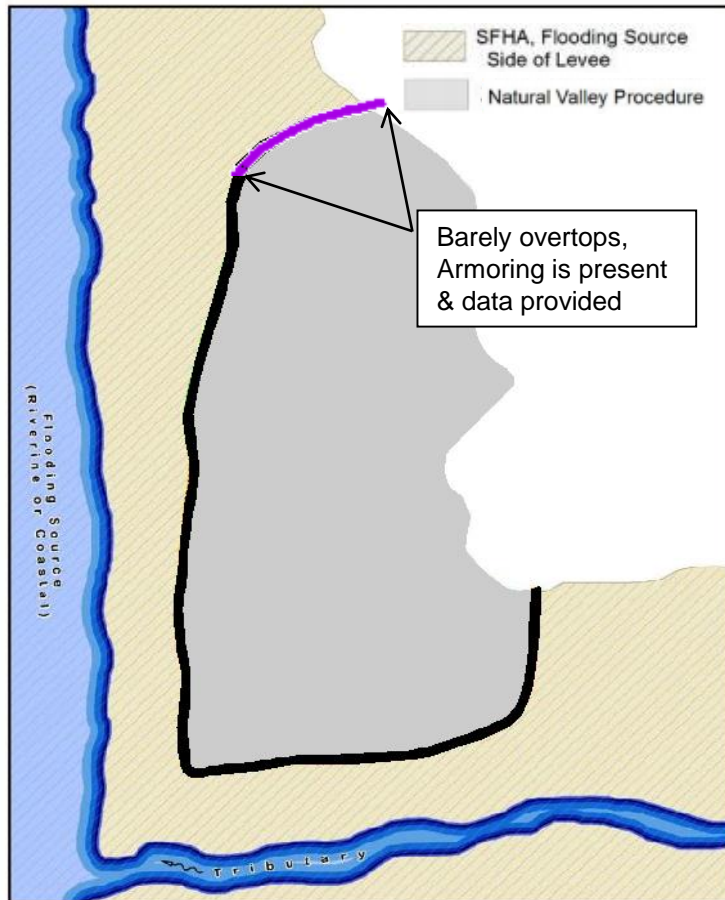


Overtopping Procedure: Can be applied when the BFE is above the levee crest for a reach, but it can be demonstrated that the 1- percent-annual-chance flood will not cause structural failure & **data requirements are satisfied.**

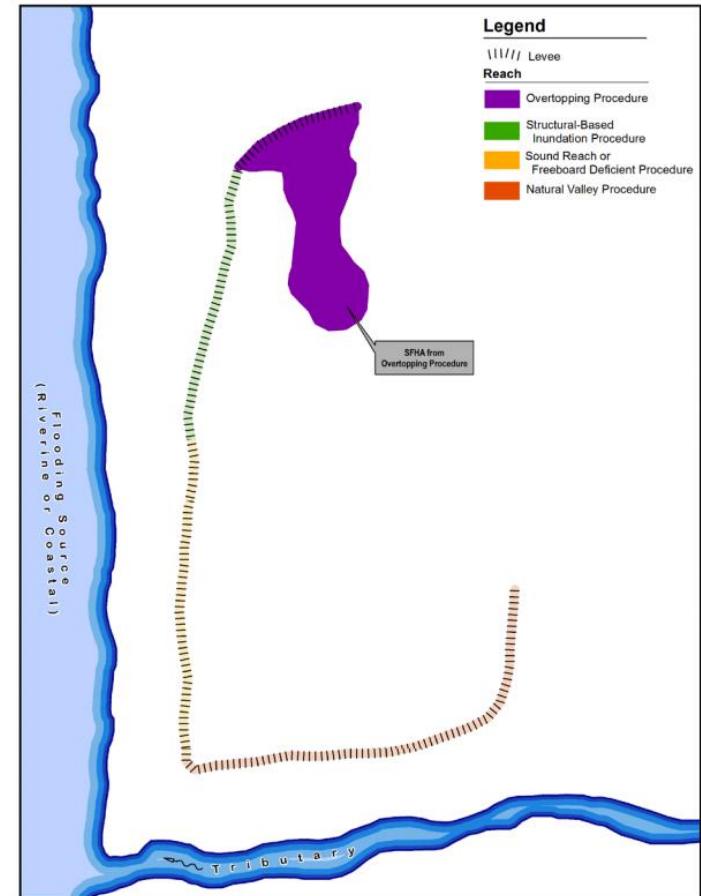
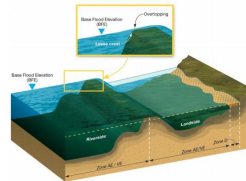


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Reach Analysis Procedure: Overtopping

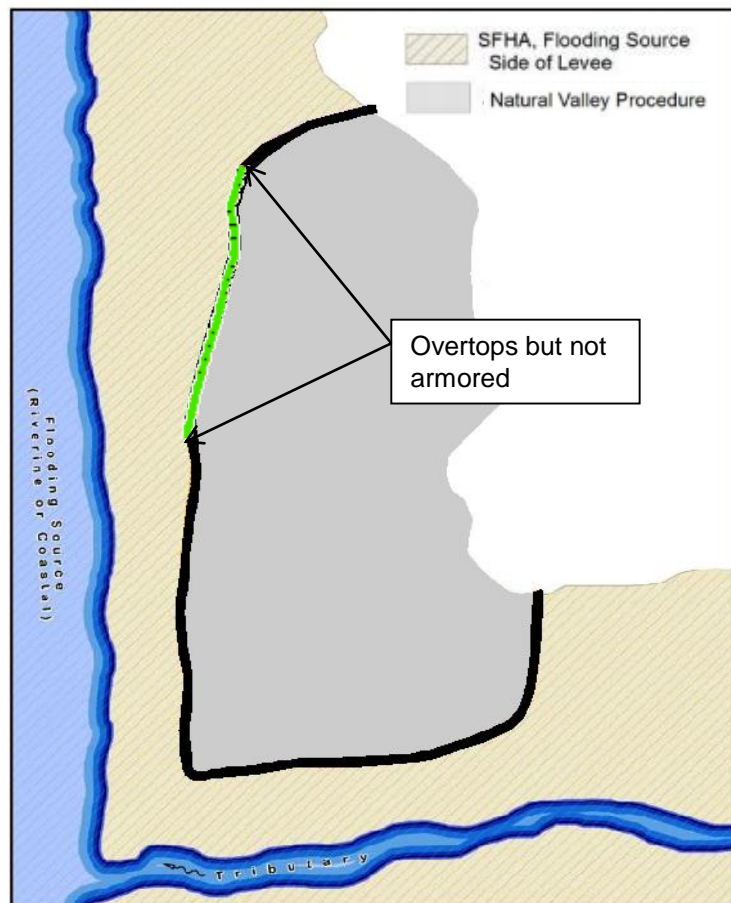


Overtopping Procedure

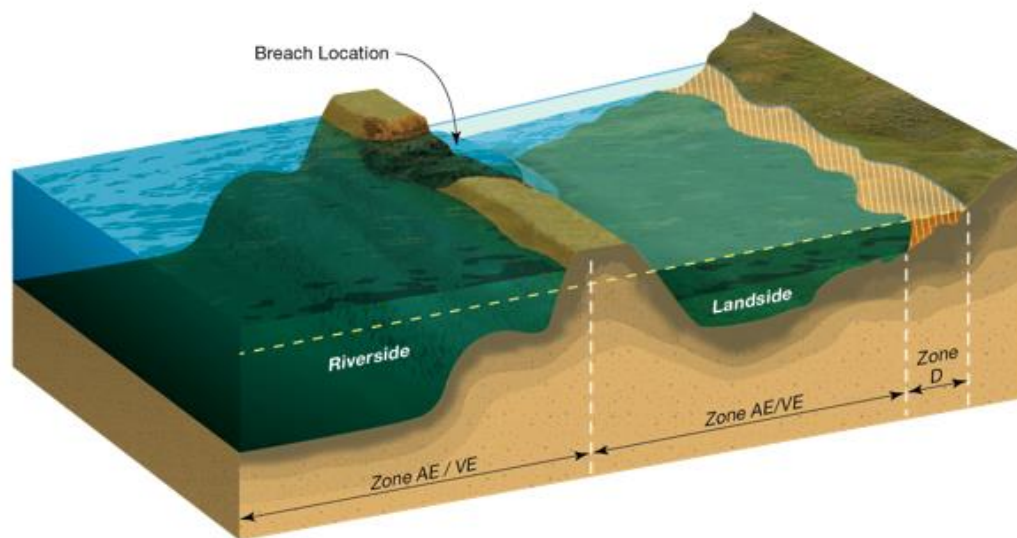


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Reach Analysis: Structural-Based Inundation

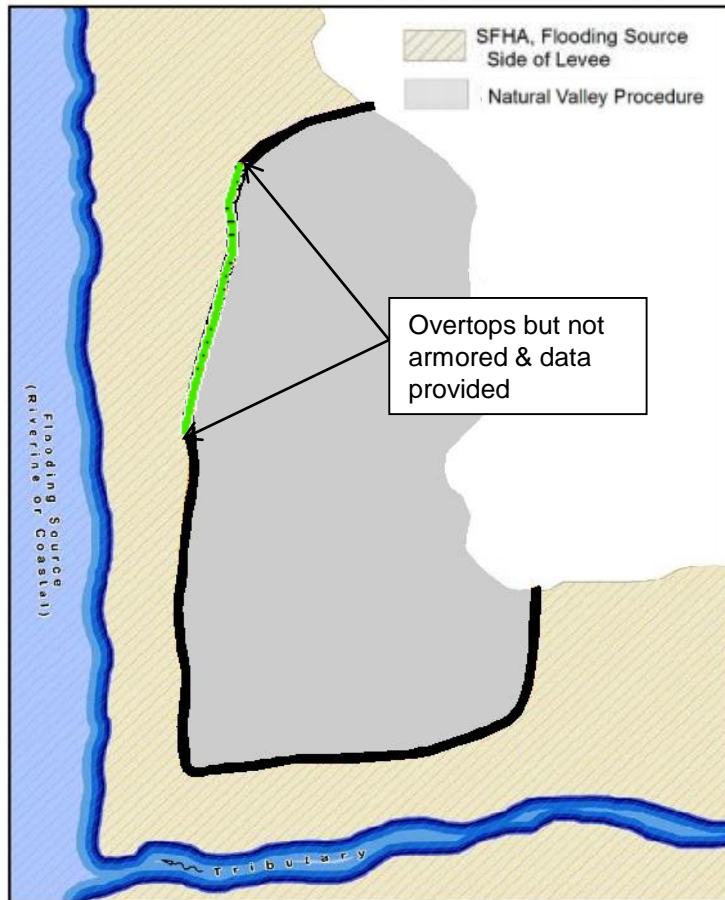


Structural-Based Inundation Procedure:
Can be applied if known structural deficiencies exist, the community feels this approach is applicable & **data requirements are satisfied.**

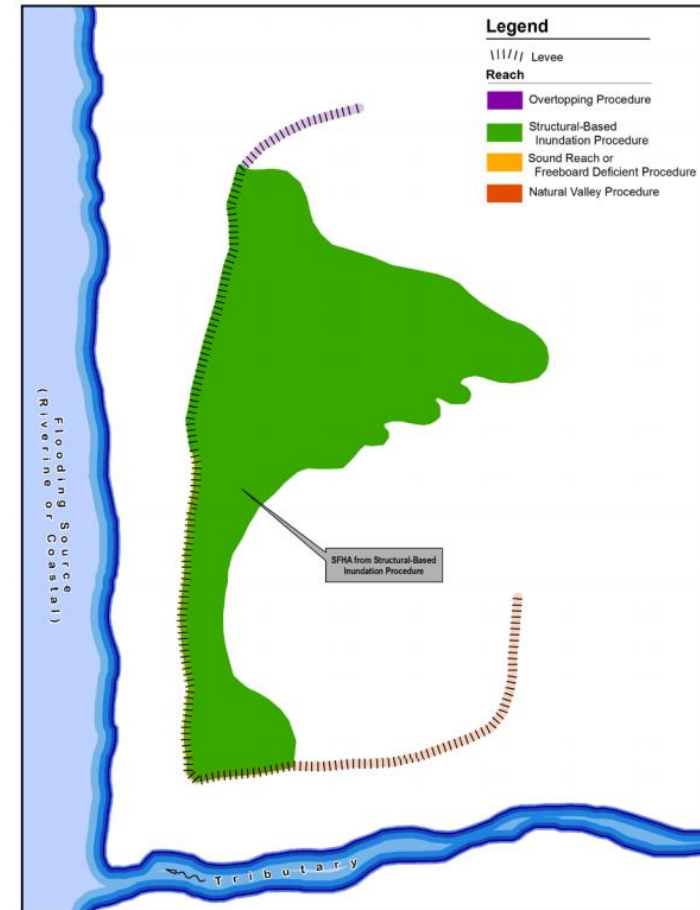
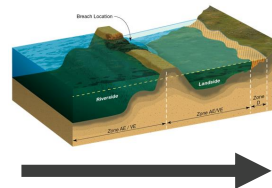


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Reach Analysis: Structural-Based Inundation

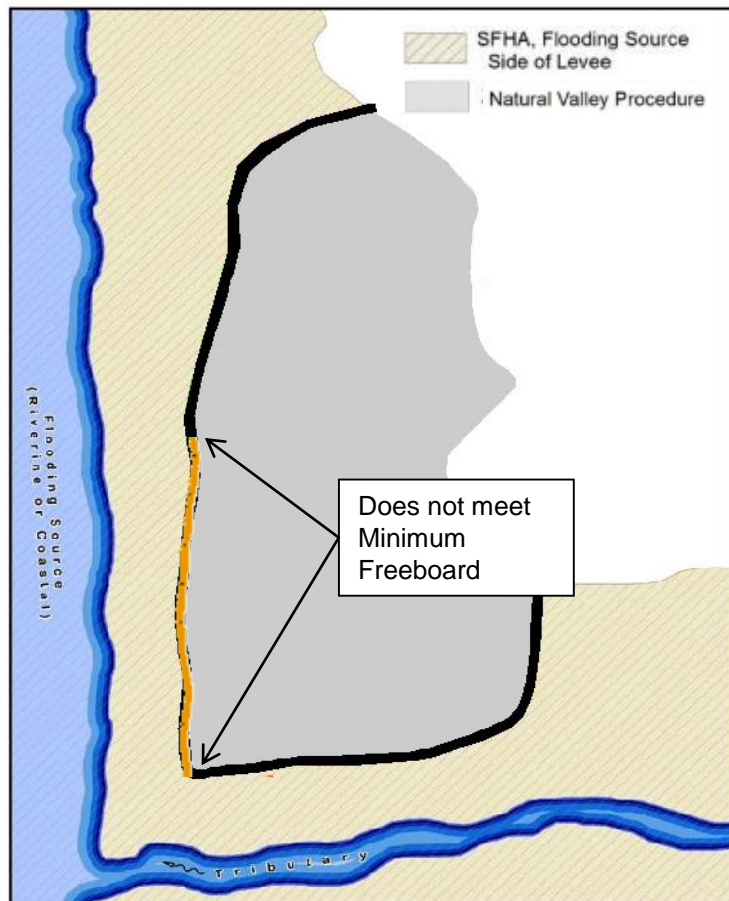


Structural-Based Procedure

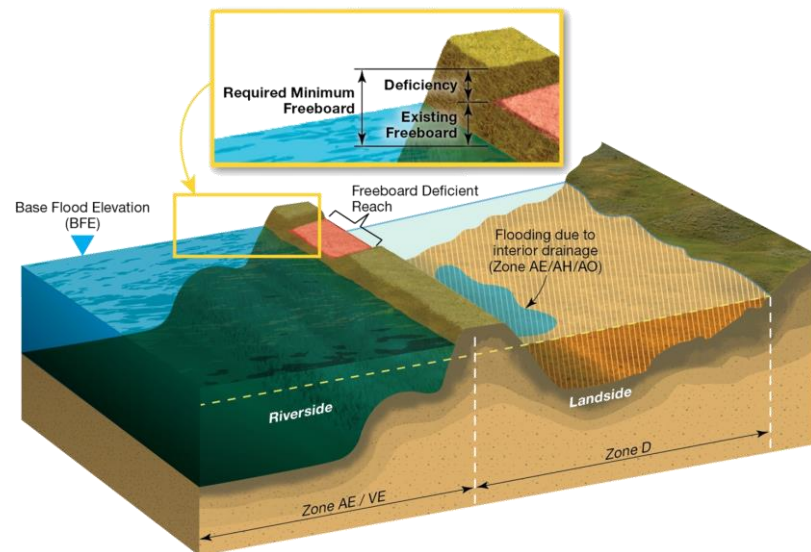


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Reach Analysis: Freeboard Deficient

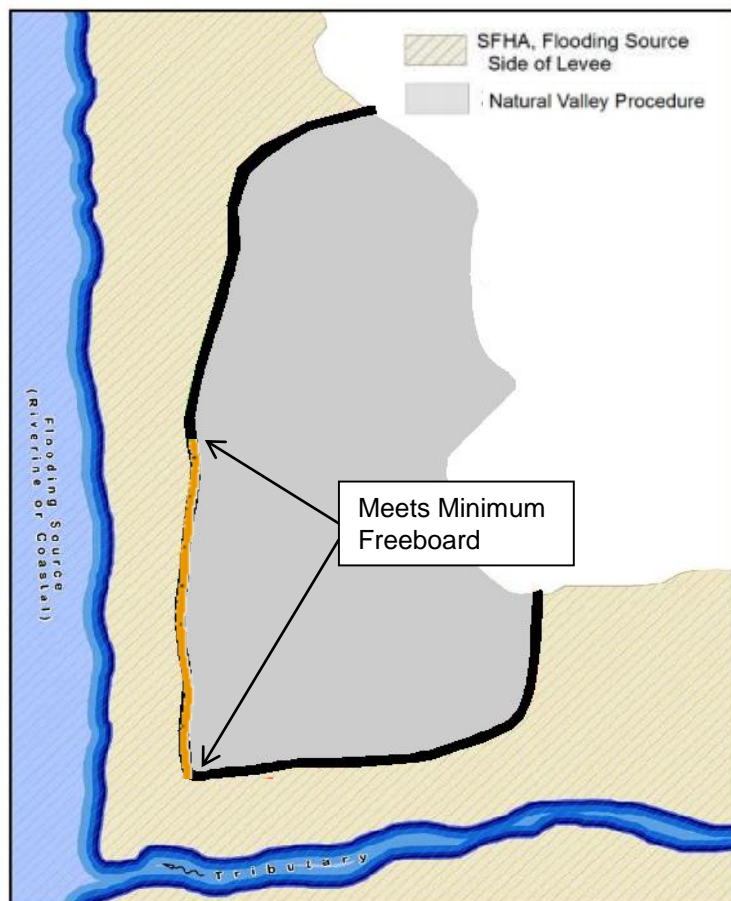


Freeboard Deficient: Can be applied if the reach has been documented to be structurally sound, the crest of the levee is higher than the BFE, but the freeboard between the BFE and the crest of the levee **does not** provide an adequate factor of safety.

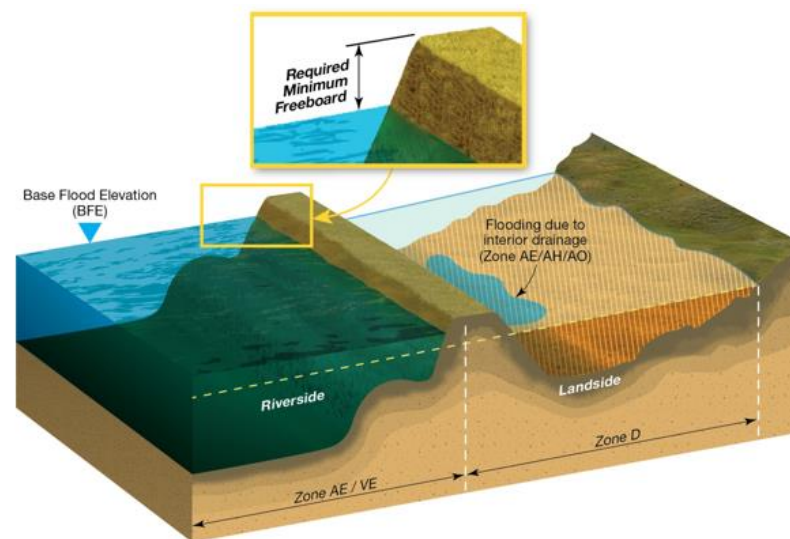


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Reach Analysis: Sound Reach

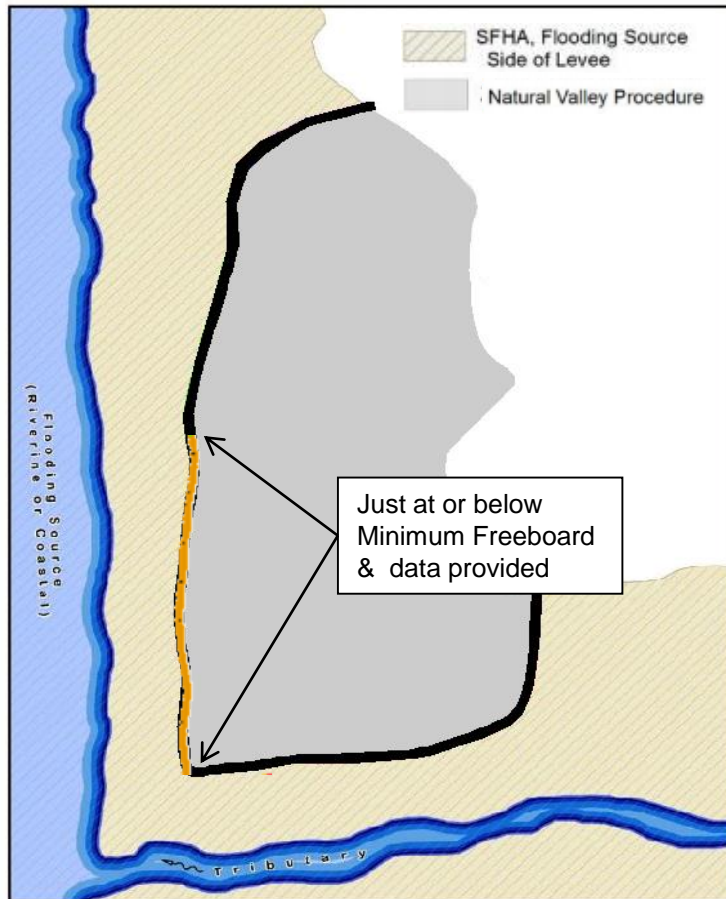


Sound Reach: Can be applied if the reach has been documented to be structurally sound, the crest of the levee is higher than the BFE, but the freeboard between the BFE and the crest of the levee **does** provide an adequate factor of safety.

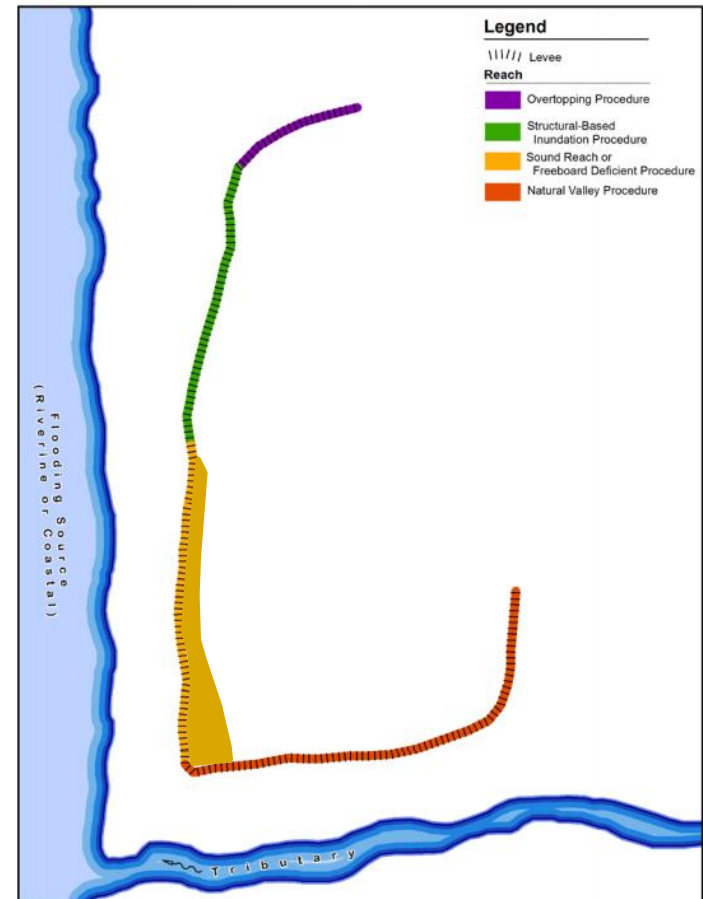


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Reach Analysis: Freeboard Deficient & Sound Reach

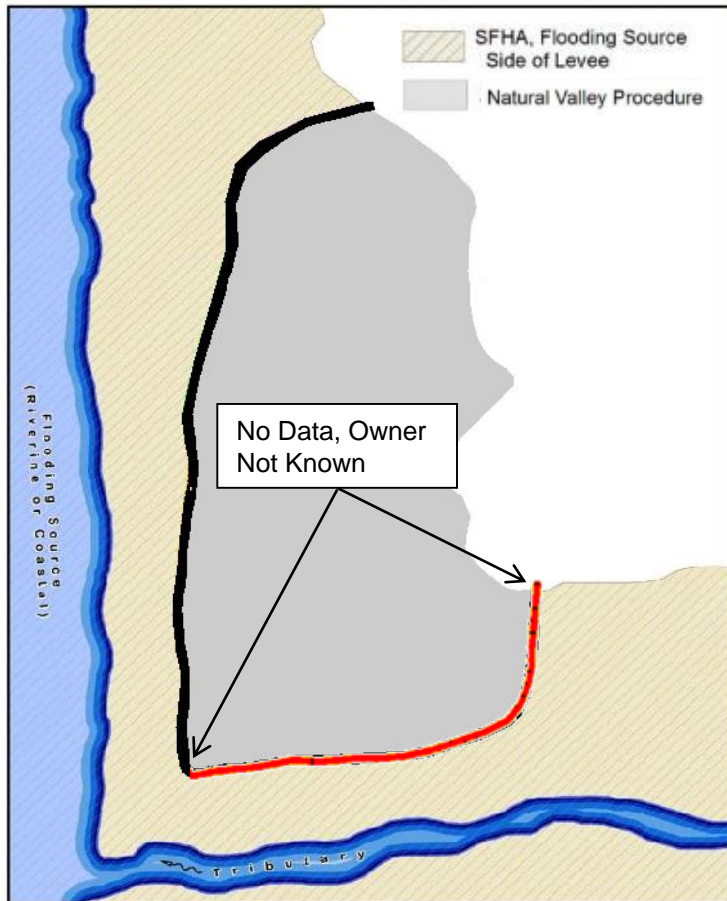


**Sound
Reach
—or—
Freeboard
Deficient**

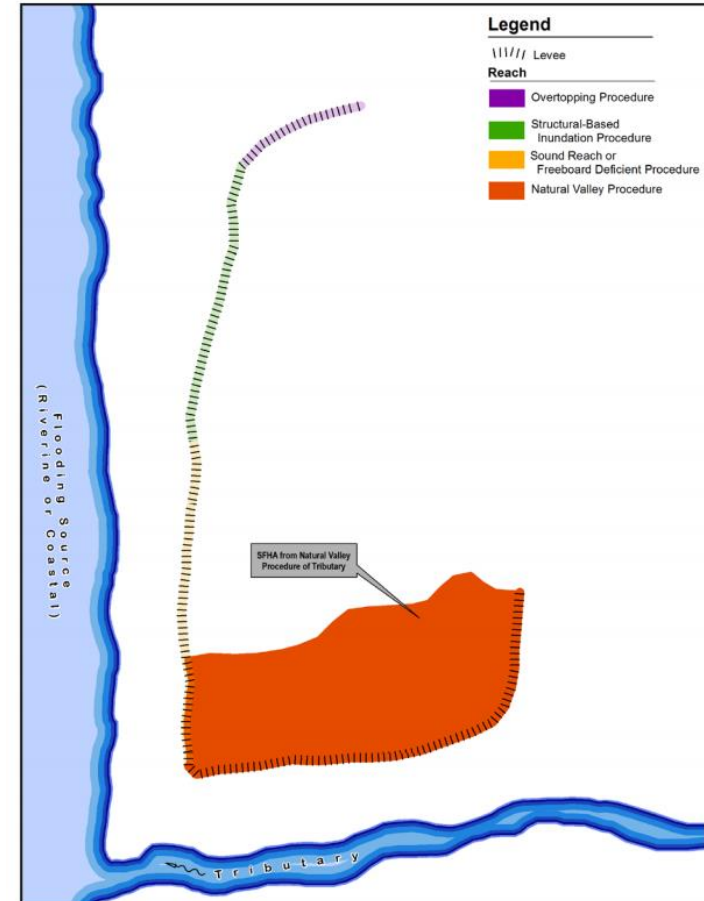
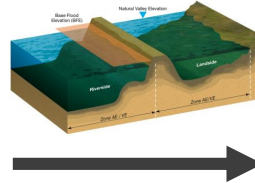


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Reach Analysis: Natural Valley

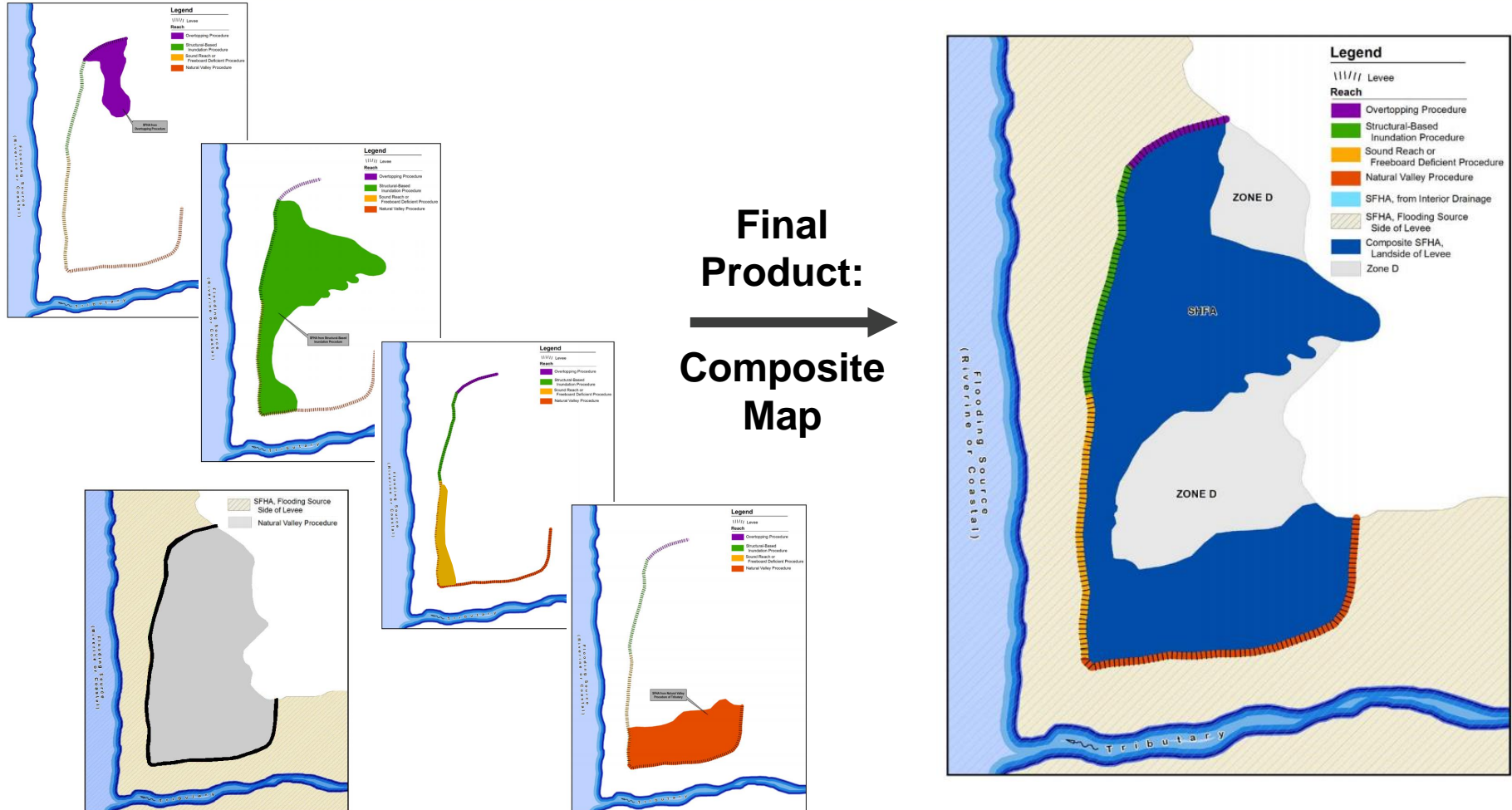


Natural Valley Procedure for the Tributary



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Levee Risk Analysis: Composite Mapping



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Analysis Procedures & Data Needs Summary

	Sound	Freeboard Deficient	Overtopping	Structural-Based Inundation	Natural Valley
Elevation Information for the Levee Crest	Required	Required	Required	Required	-
BFE + Freeboard Less than Levee Crest	Required	-	-	-	-
BFE Less than Levee Crest	Required	Required	-	-	-
Operations and Maintenance Plan	Required	Required	Required	Recommended	-
Structural Design Requirements	Required	Required	Required	Recommended	-
Inspection Reports	Required	Required	Required	Recommended	-
Evaluation of Overtopping Erosion Potential	-	-	Required	-	-

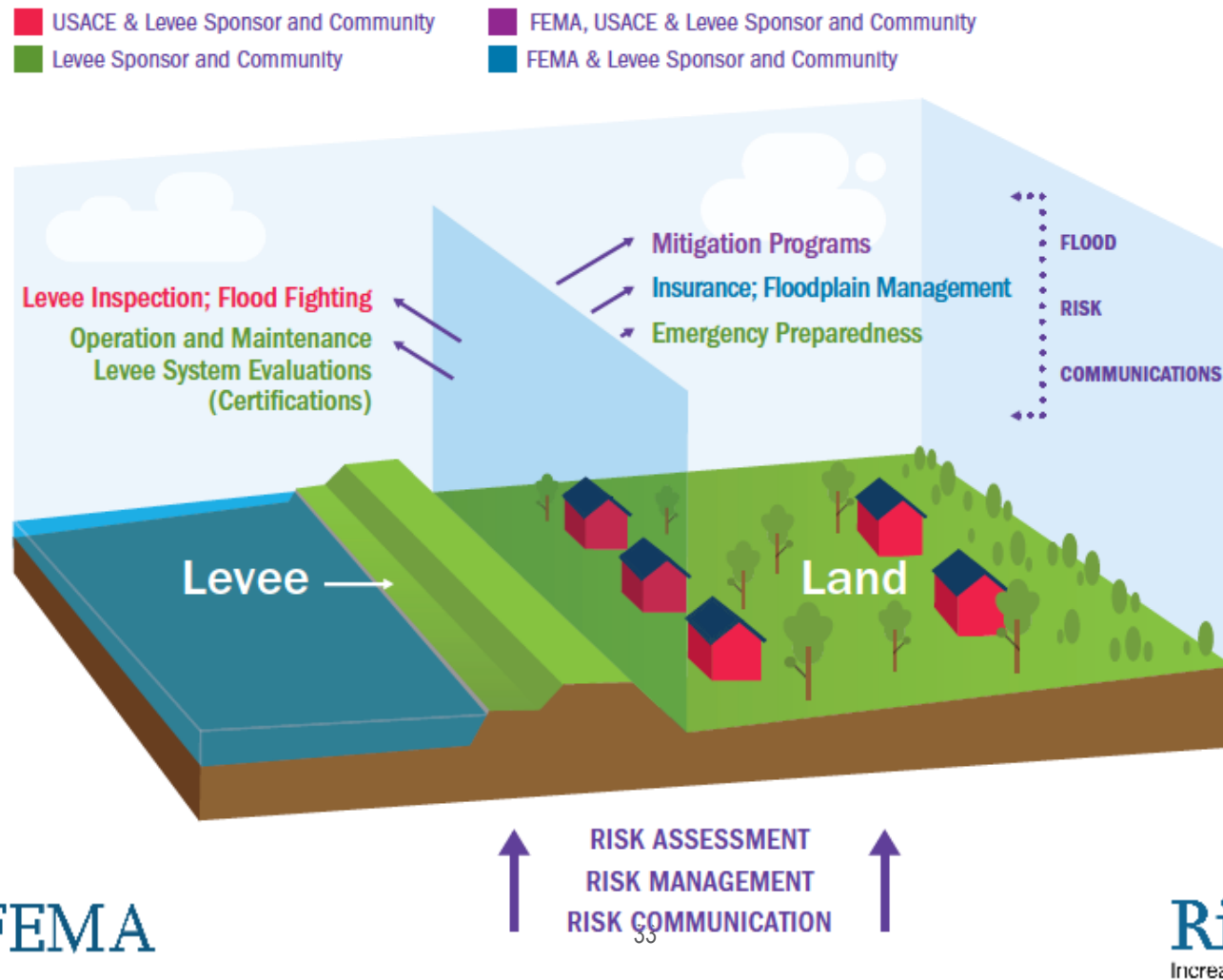
Local Levee Partnership Team (LLPT) Identification



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Shared Levee Responsibilities

SHARED RESPONSIBILITIES & FLOOD RISK COMMUNICATIONS



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RiskMAP
Increasing Resilience Together

Community Action #1: LLPT Identification

Identify LLPT members with FEMA to collect local levee data and related levee system information.



Community Action #2: Data Needs

Identify other community information, resources, developments in the community, and current mitigation projects currently underway

- Elevation Information for the Levee System (Toe & Crest)
- Design Base Flood Elevation (BFE)
- Structural Design Information
- Geotechnical Evaluation
- Interior Drainage Analysis
- Evaluation of Overtopping Erosion Potential
- Operation and Maintenance Plans
- Levee Inspection Report



Levee Analysis and Mapping Procedure

FEMA Region II — Levee Analysis and Mapping Procedure

1 LLPT 1: STAKEHOLDER COORDINATION AND DATA COLLECTION MEETING

Identify Local Levee Partnership Team (LLPT) members with FEMA and begin data collection



2 INITIAL LEVEE DATA ANALYSIS

FEMA performs the initial levee data analysis based on collected information from the LLPT



The reach analysis procedures that will be reviewed include the following:

- Natural Valley
- Freeboard Deficient
- Overtopping
- Structural-Based Inundation
- Sound Reach

3 LLPT 2: MEETING TO REVIEW INITIAL DATA ANALYSIS

Technical review of initial levee data analysis results with LLPT members



4 LLPT 3: REVIEW LEVEE ANALYSIS AND MAPPING PLAN

Discuss the draft levee analysis and mapping plan and ways to convey risk and mitigation information to citizens



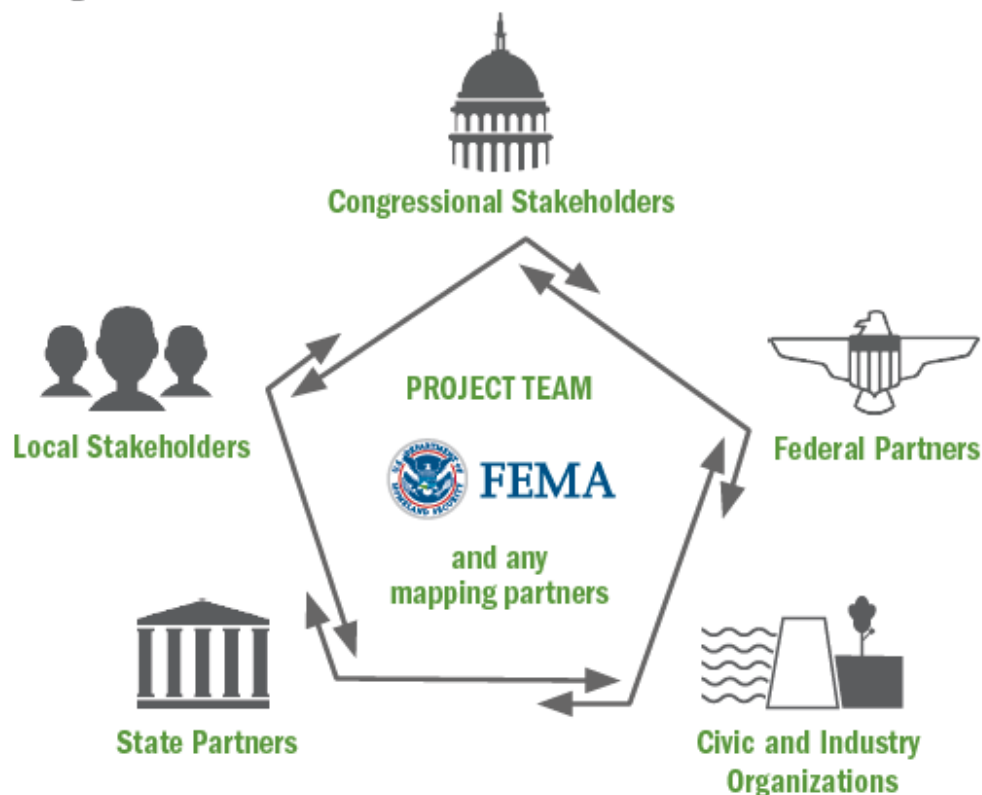
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FEMA Region II — Levee Analysis and Mapping Procedure

1

LLPT 1: STAKEHOLDER COORDINATION AND DATA COLLECTION MEETING

Identify Local Levee Partnership Team (LLPT)
members with FEMA and begin data collection

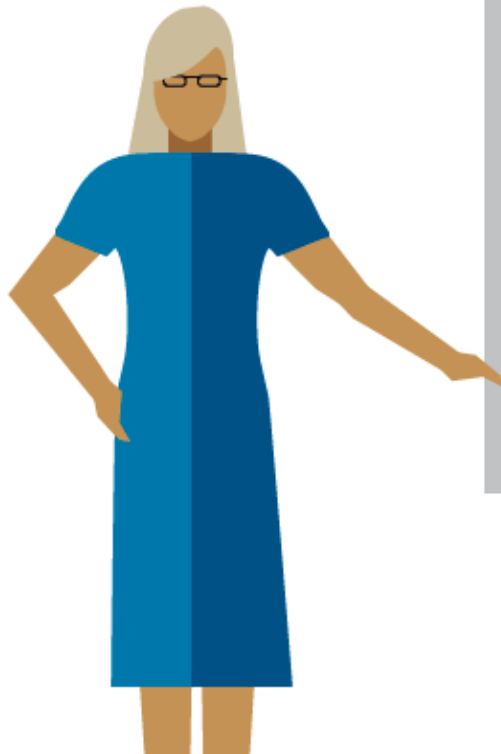


FEMA Region II — Levee Analysis and Mapping Procedure

2

INITIAL LEVEE DATA ANALYSIS

FEMA performs the initial levee data analysis based on collected information from the LLPT



The reach analysis procedures that will be reviewed include the following:

- Natural Valley
- Freeboard Deficient
- Overtopping
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FEMA Region II — Levee Analysis and Mapping Procedure

3

LLPT 2: MEETING TO REVIEW INITIAL DATA ANALYSIS

Technical review of initial levee
data analysis results with LLPT members



FEMA Region II — Levee Analysis and Mapping Procedure

4

LLPT 3: REVIEW LEVEE ANALYSIS AND MAPPING PLAN

Discuss the draft levee analysis and mapping plan and ways to convey risk and mitigation information to citizens



QUESTIONS?

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