

Levee Safety Action Classification (LSAC)

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Omaha District

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US Army Corps of Engineers
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Background Information

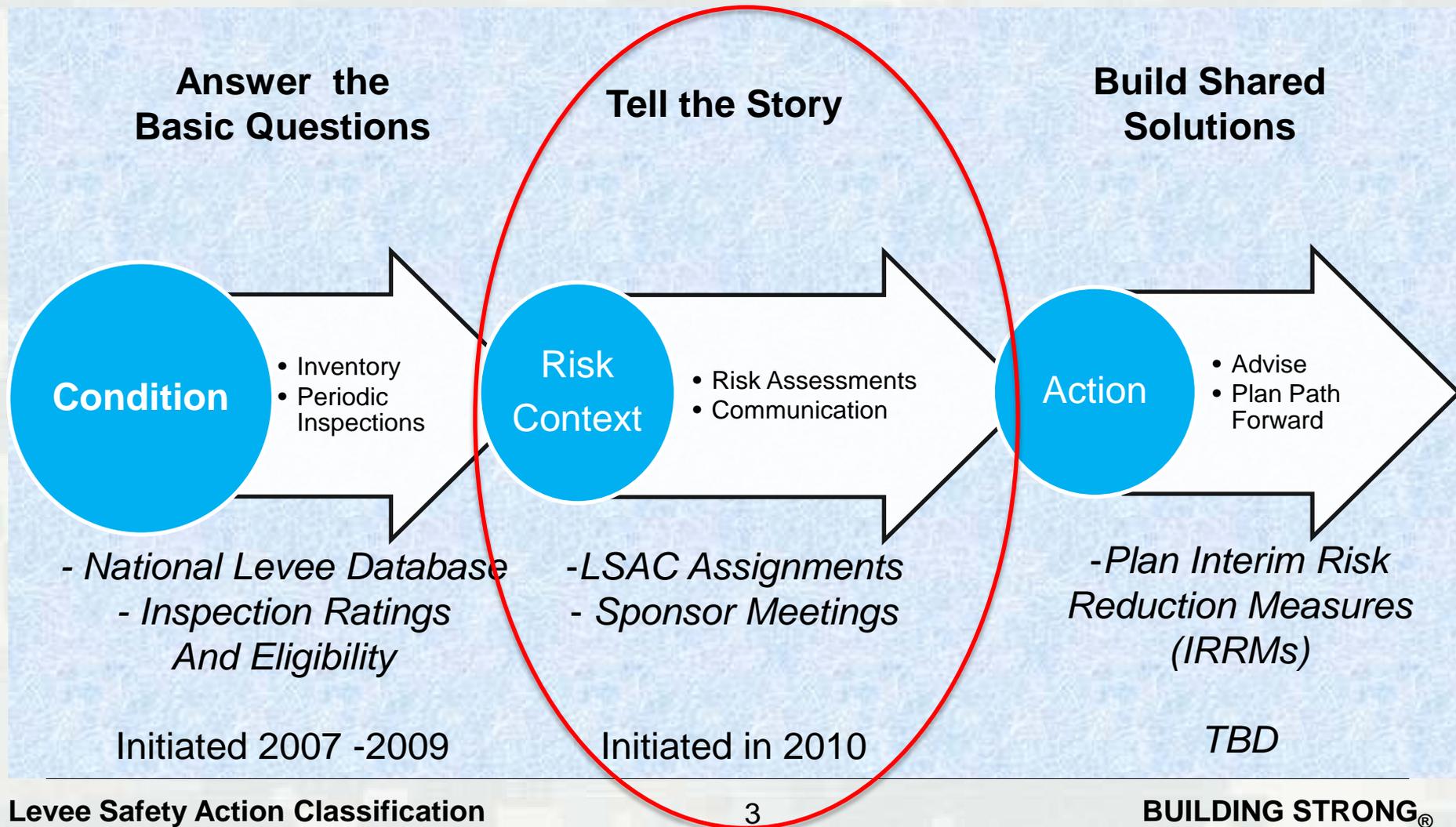
- Why is USACE doing this?
- WRDA 2007 Title IX Authorities for Risk Communication

Section 9004 a. “The Secretary shall establish and maintain a database” including:

- ▶ Information on the location, general condition, and estimate of the consequences associated with levee failure or over-topping
- ▶ Availability of Information:
 - Complete access For Official Use Only users
 - A subset of information will be disseminated to Levee Sponsors and States. The format and content are still being determined.



Why are We Communicating Risks: Our Responsibilities...



Levee Safety Action Classification

- Not a Rating
- Characterization of Urgency for Actions
 - ▶ Consistent and systematic
 - ▶ Risk Informed
 - ▶ Used to prioritize actions to address safety issues
- Based on three inundation scenarios
 - ▶ Breach prior to overtopping
 - ▶ Overtopping with breach
 - ▶ Component malfunction scenario
 - ▶ Does not consider overtopping without breach

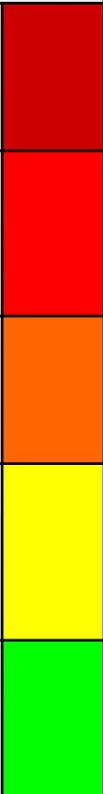


What Does the LSAC Tell Us?

- **Enables Consistent Communication of the Relative Risk for Living Behind a Levee System**
 - Levee's Expected Performance (Based on Performance and Flood Probability)
 - Consequences of Non-Performance
- **Informs the Urgency and Priority of Potential Federal Actions**
 - Advice on Interim Risk Reduction Measures
 - Priorities for Studies and Rehabilitation Projects
- **Will not necessarily have a direct impact on**
 - O&M Inspection Rating
 - Participation in the Rehabilitation and Inspection Program (RIP)
 - FEMA Accreditation



Levee Safety Action Classification

| Class | Urgency | | Characteristics | Actions |
|-------|-----------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| I | Urgent and Compelling |  | Likelihood of inundation with associated consequences characterizing each class, emphasis on life-safety. | Actions recommended for each class and level of urgency grouped by responsible O&M entity. |
| II | Urgent | | | |
| III | High Priority | | | |
| IV | Priority | | | |
| V | Normal | | | |



Goals of Levee Screening and Levee Communication

- Set the stage across USACE for discussions about risks with the ultimate goal of:
 - Improving understanding of risk
 - Driving actions to mitigate risk
 - Building a foundation for a shared responsibility approach to planning interim risk reduction measures



Levee Screening

- A routine levee safety activity to assess the inundation risk relative to other levees within USACE
- Includes both qualitative and quantitative elements
- Used to indentify levee safety issues, inform classifications (**LSAC**), prioritize levee safety program activities, define the scope of further evaluations, and develop interim risk reduction measures



USACE/Sponsor/Partner Roles

- Sponsor engaged from beginning: on inspections through screenings and assignment.
- After assignment, sponsor & USACE have joint appearance(s) to discuss risk associated with levees with public. Partners support joint message, may assist in discussion.
- USACE, Sponsors and Partners work together to develop sustainable solutions.



Levee Screening Process

1. A relative risk assessment is done at the district level.
2. A roll-up, consistency review, and proposed LSAC assignment is completed at the national level.
3. A review and development of a recommended LSAC for each system is done by a group of senior-level USACE levee safety officials.
4. That recommendation is forwarded to the HQUSACE Levee Safety Officer for approval, action, and dissemination.



Levee Screening Tool

- Web-based Tool
 - Screening Input
 - Calculations
 - Document Storage
 - Comments
 - Progress Tracking
- Provides a framework to guide the judgment of risk assessors and decision makers when evaluating a levee to obtain a common understanding of the inundation risk.
- Provides the framework to “Tell the story”



District Levee Screening Team

- Facilitator
- Hydrology & Hydraulic Engineer
- Geotechnical Engineer
- Structural Engineer
- Economics (Consequences)
- Non-Federal Sponsor
- District Levee Safety Program Manager
- District Levee Safety Officer



Levee System :

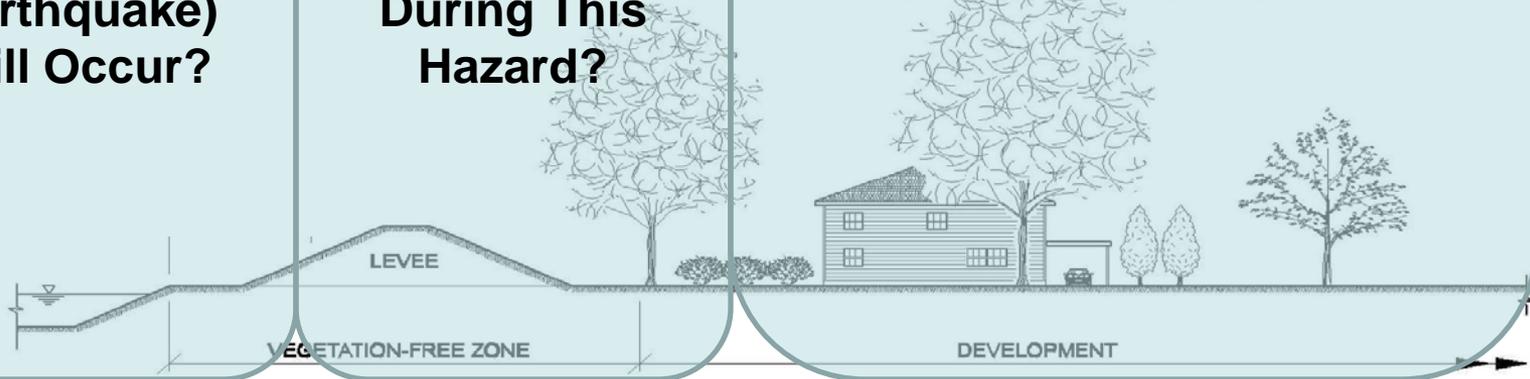
Loss of life is of paramount concern.

Economic and environmental losses are also important.

How Likely is it that the Hazard (Flood, Earthquake) Will Occur?

How Will the Infrastructure Perform During This Hazard?

What are the Consequences for Non-Performance?



The USACE Risk Framework

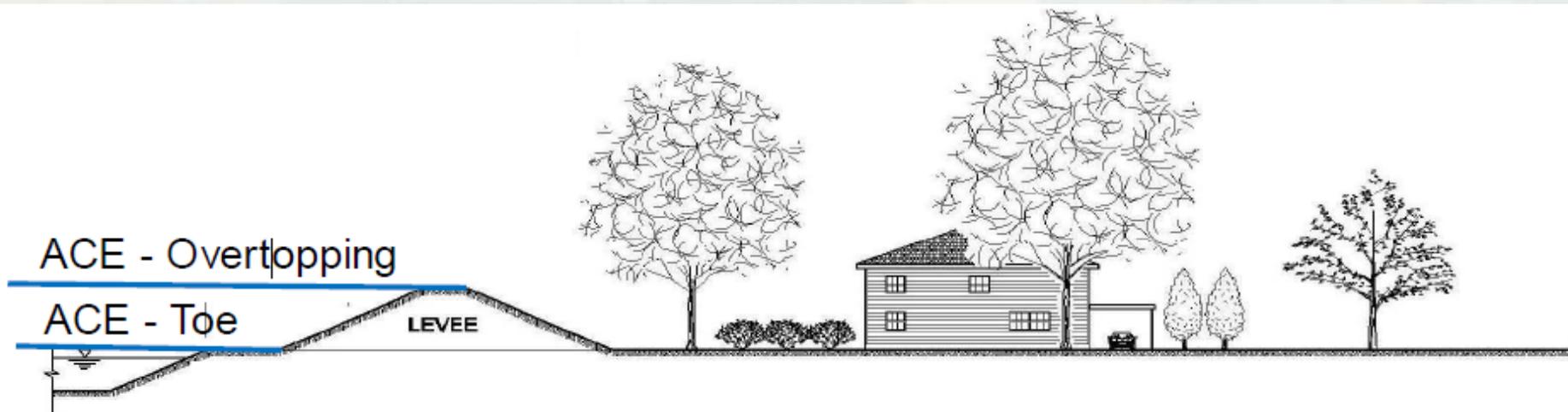


Levee Screening Inputs

- Flood Loading
- Performance
- Consequences



Flood Loading



- How often does the levee experience a flood loading?
- How often does the levee overtop?
- What other information is readily available to characterize the flood loading on the levee?



Flood Loading Data Sources

- No new analysis is completed
- Flood Insurance Study
- Project Drawings and Reports
- Design Memoranda
- Local or Regional Flood Frequency Studies and Reports
- Historical Flood Records
- US Geological Survey - Surface Water Data
- National Weather Service - Advanced Hydrologic Prediction Service
- USACE National Levee Database



Levee Screening Tool

Hydrology and Hydraulic Screening Tool Module



Home Levee Screenings Reports

Levee Information Hydrology and Hydraulics Performance Consequences Documents Computations Results Map Status

Levee Screening Search > RD 0985 - Netherlands - Unit 4, Sacramento River > Hydrology and Hydraulics

Flood Frequency Data Sources and Methods Design and NFP Levee Evaluation Criteria

1. What is the representative annual chance exceedance (ACE) for water level at the toe of the levee at the location that is likely to get loaded first?
2. What is the representative annual chance exceedance (ACE) for water level at the current authorized capacity of the levee?
3. What is the representative annual chance exceedance (ACE) for the incipient overtopping event at the location that is likely to be overtopped first?
4. What is the representative annual chance exceedance (ACE) for the largest historical flood that has occurred since construction of the levee?
5. What is the representative loading associated with the largest historical flood as a percentage of the levee height?
6. How would you describe the flood duration characteristics for a typical hydraulic flood load on this levee?

Flood Frequency, Data Sources and Methods, and Design and NFIP Levee Evaluations



Levee Screening Inputs

- Flood Loading
- Performance
- Consequences



Performance

- Embankment and foundation seepage and piping
- Embankment stability
- Embankment erosion
- Closure systems
- Floodwall stability
- Floodwall underseepage and piping



| Performance indicator (1) | Performance mode | | | | | |
|--------------------------------------------------------|-----------------------------------------------------|-----------------------------|---------------------------|------------------------|----------------------------|-------------------------------------------|
| | Embankment and foundation seepage and piping (2) | Embankment stability (3) | Embankment erosion (4) | Closure systems (5) | Floodwall stability (6) | Floodwall under-seepage and piping (7) |
| Unwanted vegetation growth | x | x | | | x | x |
| Encroachments | x | x | | | x | x |
| Settlement | x | x | | | | |
| Cracking | x | x | | | | |
| Animal control | x | | | | | |
| Culverts/ discharge pipes | x | | | | | x |
| Underseepage relief wells / toe drainage systems | x | x | | | x | x |
| Seepage | x | | | | | x |
| Slope stability | | x | | | | |
| Depressions/ rutting | | x | | | | |
| Sod cover | | | x | | | |
| Erosion/ bank caving | | | x | | | |
| Riprap revetments and bank protection | | | x | | | |
| Revetments other than riprap | | | x | | | |
| Condition | | | | x | | |
| Supply, storage, and security | | | | x | | |
| Operational history | | | | x | | |
| Miscellaneous items | | | | x | | |
| Concrete surfaces | | | | | x | |
| Tilting, sliding, or settlement of concrete structures | | | | | x | |
| Foundation of concrete structures | | | | | x | |

Performance Assessment Ratings

Acceptable – A:

The assessor has a high level of confidence that the indicator being rated will not contribute to a failure for the performance mode being evaluated. An A rating for the primary indicator in particular means that the assessor has a high level of confidence that the performance mode being evaluated will not occur under the full range of loading and duration of the flood event.

Minimally Acceptable – M:

The assessor believes that the indicator being rated probably won't contribute to a failure for the performance mode being evaluated. An M rating for the primary indicator in particular means that the assessor believes the performance mode being evaluated probably won't occur over the full range of loading and duration of the event.



Performance Assessment Ratings

Unacceptable – U:

The assessor believes the indicator being rated will likely contribute to a failure for the performance mode being evaluated. A rating of U for a primary indicator in particular means that the assessor believes the performance mode being evaluated will likely occur over the full range of loading and duration of the flood event.



Performance Indicator

Encroachment Example



Evidence for an “U” rating: This house addition was built directly into the levee.



Encroachment Example



Evidence for an “A” rating: Power Poles located off the levee toe.



Performance Assessment

Closure Performance

The LST has 6 types of closure performance modes:

- Post-and-panel and Stoplog/Bulkhead



Performance Assessment

Closure Performance

- Moveable Gate



- Sand Bags



Performance Assessment

Closure Performance

- Soil Pile and Plastic Sheeting



Performance Assessment Closure Performance

- Culvert Gate Closure



Performance Assessment

Closure Performance

Items Reviewed for Closures

- Supply, Storage and Security
- Operating Plan and Experience
- Condition
- Miscellaneous Issues



Performance

Historic Performance

- Has the levee breached?
- Has the levee overtopped?
- How many times has the levee been loaded to 25% of the levee height? , 50% and 75%?
- Has heroic flood fighting occurred to prevent breach or overtopping?



Levee Screening Inputs

- Flood Loading
- Performance
- Consequences



Consequences

- The LST estimates loss of life and direct economic damages to structures and contents located with the levee area caused by inundation due to breach or overtopping of a levee.
- Readily available data and information are used along with limited analysis to assess the potential consequences related to the two flooding scenarios (overtopping and breach)



Consequences

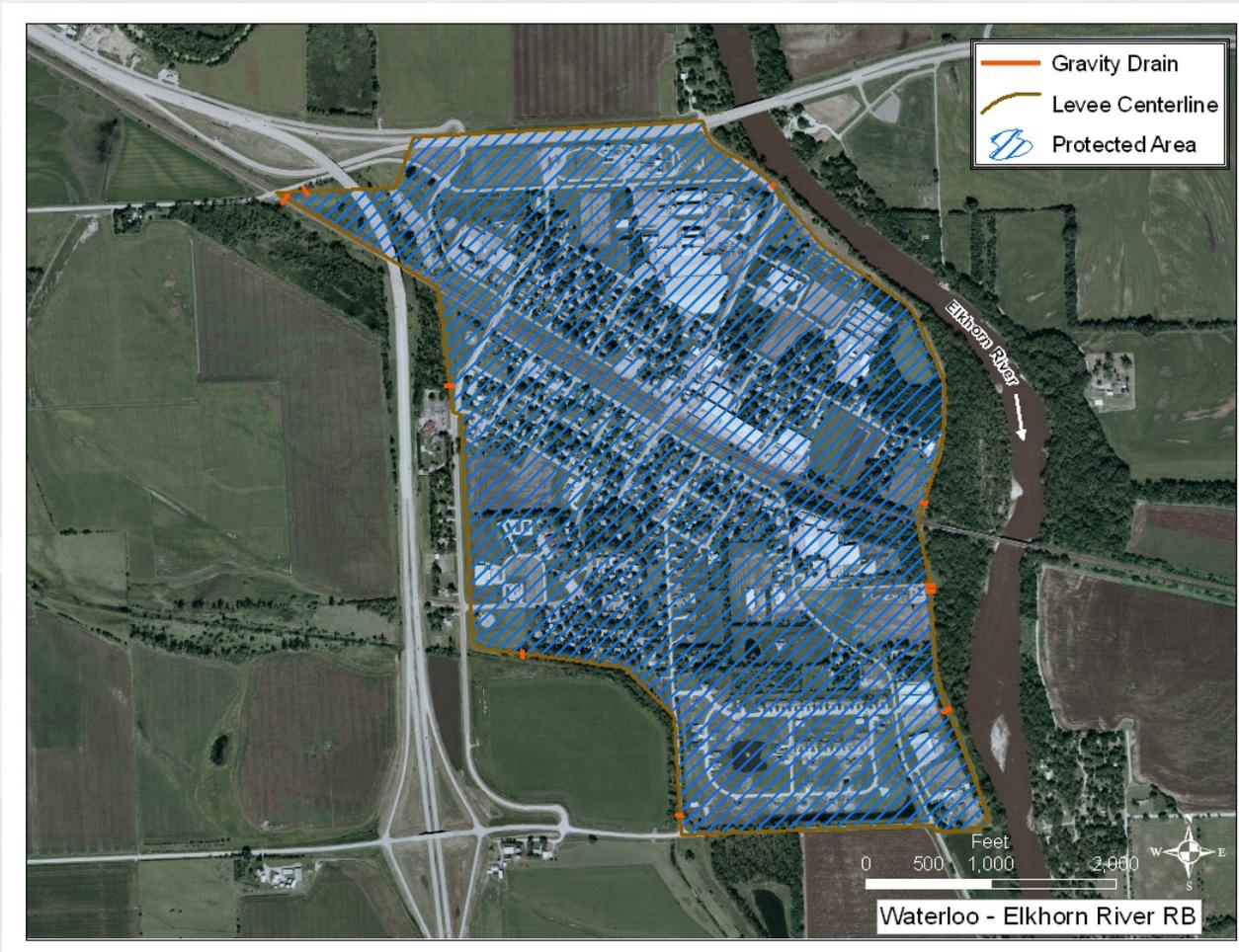
Base Data

- Population is based on the 2000 census
- Economic estimates are based on the most recent FEMA HAZUS update (2006)
- Base Values determined for Levee Area



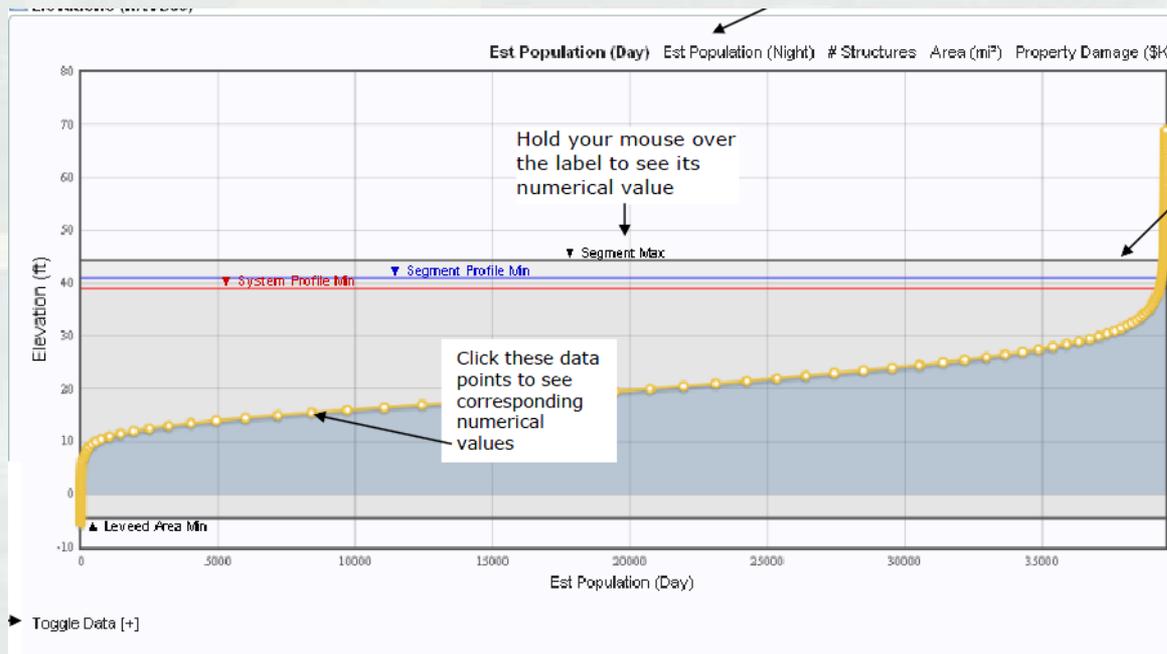
Consequences

Levee Area Example



Consequences

- All base data reviewed by an economist and can be indexed in the levee screening tool to reflect the current conditions



Consequences

Evacuation Effectiveness

- Evacuation Planning
 - Does a plan exist?
 - What is the date of the evacuation plan?
- Community Awareness
 - How informed are the people in the levee area?
- Flood Warning Effectiveness
 - How would people be informed of the need to evacuate during a flood event?



Consequences

Critical Infrastructure

- Populated by the Levee Screening Tool
Department of Homeland Security
Infrastructure Program (HSIP) Gold database
- Additional Items may be added that would have a regional or national impact.



Levee Screening Products

- Completed Levee Screening Tool file
- Presentation for next level of review
- Levee Screening Report
- Levee Screening Fact Sheet



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In Summary

- Build Understanding of the Risk Environment
- Develop a consistent framework for discussion on Flood Risk.
- Help the Sponsor Tell the Story
- Assist with Technical Products (IRRM)
- Help Plan the Path Forward
(Interagency Teams, Silver Jackets, Flood Risk Managers)



Contact Information

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<http://nld.usace.army.mil> – USACE National Levee Database

<http://www.usace.army.mil/Missions/CivilWorks/LeveeSafetyProgram> - HQUSACE Levee Safety Program

