Topics Covered:

• Levee Truths

• Flood Risk Management

• Corps of Engineers Levee Safety Program Overview

• National Levee Safety Act
Levee Truths – Current State of Levees in U.S.:

- Levees are abundant in many US communities;
- Levees have often inadvertently increased flood risks in the country by attracting development in the floodplain;
- Levees only reduce risk – they do not eliminate risk;
- The location and number of all the levees in the US is currently unknown;
- Levees are often the primary tool in flood risk management;
- There is a limited understanding of levees and the risks associated with them particularly with the general public;
- Many levees originally constructed to protect agricultural fields now protect large urban communities;
- Reliability of many levees is commonly not known.

(From National Committee on Levee Safety)
Level of Protection

Levee Categories

1. Federal O&M
2. USACE built / Local O&M
3. Local built / Enrolled in RIP
4. No Prior Nexus with USACE or FEMA

FEMA NFIP
Objective: Communicate the most current information for flood insurance purposes.

USACE Portfolio
Approximately 2000 levees totaling approximately 14,000 miles

Universe of Levees

100-year
Flood Risk = \( f(\text{chance of flood event, reliability of levee, consequences}) \)
FLOOD RISK MANAGEMENT: BUYING DOWN RISK

All stakeholders contribute to reducing risk!

One Team: Relevant, Ready, Responsive and Reliable

BUILDING STRONG
Hurricane Katrina – 2005

• Loss of life over 1,800 persons

• Over $200 Billion Dollars in Economic Damage

• Catalyst for increased focus on flood risk management and levee safety
Flood Risk Management

- FY 2006 - HQ USACE developed the Flood Risk Management Program

- Comprehensive approach to sustainable national flood risk management

- Coordinate and synchronize flood risk management activities

- Levee Safety Program under this umbrella

Confluence of the KS River with MO River - May 2007
Flood Risk Management Program Framework

- SES Oversight Group
  - Ed Hecker
- Intergovernmental Flood Risk Management Committee
- Program Director
  - Pete Rabbon
- Principal Discussion Group
  - USACE/FEMA
- FPMS/PAS
- Levee Safety Program
- Dam Safety Program
- Initiatives, Policy, Guidance & Legislation
- Congressional Liaisons & Budgeting
- Silver Jackets
- Coastal
- Post Disaster

- Projects & Pre-Flood Programs
- Rehabilitation
- Regulatory
- Research and Development

BUILDING STRONG
USACE Levee Safety Program Mission

Assess the integrity and viability of levees and recommend actions to assure that levee systems do not present unacceptable risks to the public, property, and the environment.

Topeka, Kansas
Program Objectives:

- Hold Public Safety Paramount
- Reduced Economic Impacts
- Maximize Cost Effectiveness
- Develop Reliable and Accurate Information
- Build Public Trust and Acceptance

Osawatomie, Kansas – July 2007
USACE Levee Safety Program Implementation

November 2007 Policy Letter:

• Established Levee Safety Officers
• Established Levee Safety Program Managers
• Established Organizational Structure
• Defined Responsibilities

Levee Safety Program mirrors the Dam Safety Program only twice as complicated.
USACE Levee Safety Program – 3 Main Areas

1. Levee Inventory
2. Improved Levee Inspection Procedures
3. Technical Risk Assessments
Levee Inventory

Developed the National Levee Database (NLD) to inventory all levees in the Corps program.

- NLD will serve as a national source of information to facilitate and link activities such as flood risk communication, levee certification, levee inspection, floodplain management, and risk assessments.

- Database is a geospatial model that will contain all necessary attributes of levees/floodwalls relevant to design, construction, operations, maintenance, repair, and inspections.

- Two step process:
  - Initial survey providing readily available info for each levee
  - Detailed inventory including field surveys, aerial photography, linear referencing from as-builts, head-up digitizing, and video linked GPS secondary feature collection
NWK NLD Population
Levee Inventory

- Initial survey of all levees in Corps of Engineers system completed in FY06
- Detailed inventory has been completed on approximately 9800 miles of the levees in the Corps Portfolio. Only 100yr and greater levees to date.

<table>
<thead>
<tr>
<th></th>
<th>Number of Levees</th>
<th>Miles of Levees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corps of Engineers Portfolio</td>
<td>~ 2000</td>
<td>~14,000</td>
</tr>
<tr>
<td>Kansas City District Portfolio</td>
<td>159</td>
<td>1,034</td>
</tr>
</tbody>
</table>
Portfolio of Corps Levees

Infrastructure follows floods, people follow infrastructure

Portfolio: large, old, and relatively untested.
USACE Levee Safety Program – 3 Main Areas

1. Levee Inventory
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3. Technical Risk Assessments
Levee Inspections

Improvements in Levee Inspections include:

• Revised inspection checklist for routine inspections - to be used on all levee systems USACE inspects. (First utilized in FY07 inspections)
# Levee Embankments

For use during Initial and Continuing Eligibility Inspections of levee segments / systems

<table>
<thead>
<tr>
<th>Rated Item</th>
<th>Rating</th>
<th>Rating Guidelines</th>
<th>Location/Remarks/Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closures)</td>
<td>U</td>
<td>Any of the following issues is cause for this rating: Closure structure in poor condition. Parts missing or corroded. Placing equipment may not be available within the anticipated warning time. The storage vaults cannot be opened during the time of inspection. Components of closure are not clearly marked and installation instructions/procedures are not readily available. Tidal crevices have not been accomplished in accordance with the O&amp;M Manual.</td>
<td>N/A There are no closure structures along this component of the FDR segment/system.</td>
</tr>
<tr>
<td>(A or U only)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. **Slope Stability**

|      | A      | No slides, sloughs, tension cracking, slope depressions, or bulges are present. | M Minor slope stability problems that do not pose an immediate threat to the levee embankment. |
|      | U      | Major slope stability problems (e.g. deep seated sliding) identified that must be repaired to reestablish the integrity of the levee embankment. |                                          |

6. **Erosion/Bank Caving**

|      | A      | No erosion or bank caving is observed on the landward or riverward sides of the levee that might endanger its stability. | M There are areas where minor erosion is occurring or has occurred on or near the levee embankment, but levee integrity is not threatened. |
|      | M      | Erosion or caving is occurring or has occurred that threatens the stability and integrity of the levee. The erosion or caving has progressed into the levee section or into the extended footprint of the levee foundation and has compromised the levee foundation stability. | U |

7. **Settlement**

|      | A      | No observed depressions in crown. Records exist and indicate no unexplained historical changes. | M Minor irregularities that do not threaten integrity of levee. Records are incomplete or inclusive. |
|      | M      | Obvious variations in elevation over significant reaches. No records exist or records indicate that design elevation is compromised. | U |

8. **Depressions/Rutting**

|      | A      | There are scattered, shallow ruts, pot holes, or other depressions on the levee that are unrelated to levee settlement. The levee crown, embankments, and access road crowns are well established and drain properly without any ponded water. | M There are some infrequent minor depressions less than 6 inches deep in the levee crown, embankment, or access roads that will pond water. |
|      | U      | There are depressions greater than 6 inches deep that will pond water. | |

9. **Cracking**

|      | A      | Minor longitudinal, transverse, or delamination cracks with no vertical movement along the crack. No cracks extend continuously through the levee crest. | M Longitudinal and/or transverse cracks up to 6 inches in depth with no vertical movement along the crack. No cracks extend continuously through the levee crest. Longitudinal cracks are no longer than the height of the levee. |

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Key: A = Acceptable. M = Minimally Acceptable; Maintenance is required. U = Unacceptable. N/A = Not Applicable. FDR = Flood Damage Reduction
Levee Inspections

Improvements in Levee Inspections include:

• Revised inspection checklist for routine inspections - to be used on all levee systems USACE inspects. (First utilized in FY07 inspections)

• Developed automated Levee System Inspection Tool - Geographic Information Systems (GIS) / Global Positioning System (GPS) based inspection tool that incorporates the levee inspection checklist and links directly with the NLD. (First utilized in FY08 inspections)
Hardware

Tablet PC, GPS Antennae, and Digital Camera
Inspection Map
eGIS Output - NWP
Levee Inspections

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- Developed automated Levee System Inspection Tool - Geographic Information Systems (GIS) / Global Positioning System (GPS) based inspection tool that incorporates the levee inspection checklist and links directly with the NLD. (First utilized in FY08 inspections)
- Implemented a more robust tiered inspection and assessment approach.
Routine Inspections:
Verifies O&M, More Rigorous Standards, Improved Communication, System-based, Every Year

Periodic Inspections:
Verifies O&M, Evaluates Structure Stability, Compares Constructed Criteria to Current Criteria, Every 5 Years

Periodic Assessments:
Periodic Inspection + Potential Failure Mode and Consequences Analysis, Every 5 Years

Risk Assessments:
Data Intensive, Determine Likelihood and Consequences of Failure, Every 10 Years
WHAT IS NOT ACCEPTABLE?

FLAPGATE COVERED WITH SEDIMENT
ACCEPTABLE OR NOT?

Dropping a Bridge on Levee.
ACCEPTABLE OR NOT?

Unwanted Levee Growth
ACCEPTABLE OR NOT?

Farm Encroachment
ACCEPTABLE OR NOT?

Unapproved Alteration – Power poles installed without review by COE
ACCEPTABLE OR NOT?

Levee breach for construction haul road.
ACCEPTABLE OR NOT?

Bank loss due to flash flood.
ACCEPTABLE OR NOT?

Farm pump discharging into drainage structure CMP.
USACE Levee Safety Program – 3 Main Areas

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3. Technical Risk Assessments
Assessments

Levee Screening Risk Assessment (LSRA)

- Provide a preliminary assessment of general condition and associated risks of levees in Corps Levee Safety Program.
- Provide a relative risk index which can be weighed against other screened levees in the portfolio.
- Levee Screening Tool (LST) currently under development. Beta testing is complete. Scheduled for deployment late FY09.
  - Microsoft Excel spreadsheet based application which will link directly to the NLD.
  - Combine routine levee inspection data with a preliminary engineering assessment for key performance modes to indicate the levee’s ability to perform as designed and the consequences of potential failure, including loss of life.
Screening Philosophy

• Simplified approach
• Rapid assessment
• Existing data
• Risk informed
• Relative results
• Link with inspection tool
Levee Screening Risk Assessment (LSRA) Outcomes:

- Identification of relative risk to initially characterize the Corps portfolio
- Guide setting priorities for PI’s, and Interim Risk Reduction Measures
- Identify performance concerns and potential consequences of levee failure
- Communicate levee deficiencies, qualitative conditional performance and consequences
- Assist in assignment of Levee Safety Action Classification (yet to be developed) for each levee system.
General Risk Model for Classification

Levees classified based on levee system risk as a combination of
probability of failure breach prior to overtopping and
associated consequences

or

combination of
probability of overtopping and
associated consequences

whichever of the two is the more severe risk.
General Risk Model for Classification

Levees classified based on levee system risk as a combination of

- probability of failure breach prior to overtopping and associated consequences

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General Risk Model for Classification

Levees classified based on levee system risk as a combination of:
- probability of failure breach prior to overtopping
- and
- associated consequences

or

- combination of
  - probability of overtopping
  - and
  - associated consequences

whichever of the two is the more severe risk.
WRDA 2007
National Levee Safety Act

- Signed into law Nov 8, 2007
- Compliments Existing Activities & Authorities
- Two Major Components:
  - Recommendations
  - Inventory all nations levees – Safety Data Collection
Level of Protection

FEMA NFIP
Objective: Communicate the most current information for flood insurance purposes.

Levee Categories

Area represents all levees throughout the US.

USACE Inventory and Assessment
Objective: Assess all levees in USACE programs, regardless of level of protection.

WRDA Authorities
Objective: Inventory all levees in nation, lead strategic plan for a National Levee Safety Program

New Nexus from WRDA 2007
Unknown Number of Levees/Miles - May be 5 times as many miles as Corps Program levees.
Section 9003: National Committee on Levee Safety

• Develop recommendations for a National Levee Safety Program

• 16 Members including:
  - Chaired by Director of Civil Works – USACE
  - Administrator of FEMA or designee
  - Eight representatives of state levee safety agencies
  - Two representatives of private sector
  - Two representatives of local or regional govt. agencies
  - Two representatives of Indian tribes

• First meeting in October 2008

• Draft report has been completed
At least coordination should be easy....
Questions?