Levee Safety – The Middle Age
Of Levee Safety Development

HDR Showcase Panel Discussion

June 22, 2016

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by Roger Less, PE, CFM

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WHY A CHANGING REGULATORY CLIMATE?

Experience provides a path to increased knowledge

- Good Experience vs. Bad Experience
  - Levee failures receive more attention than levee successes.
  - Typically more is learned from a bad experience than a good experience.
  - Catastrophic events tend to drive changes in policy, design standards, & regulatory requirements.

Des Moines, Iowa – Flood of 2008
LESSONS-LEARNED

Hurricane Katrina - 2005

- Interagency Performance Evaluation Task Force – IPET

  - Findings (Just a few of them):
    - A levee project must **act as a system** to perform well.
    - Consideration must be given to **resiliency** of a levee system if the design event is exceeded.
    - Use **risk-based** potential failure modes to establish design objectives & approaches.
    - **Resiliency**, robustness & redundancy are best practices that should be designed into a levee project and a flood prone community’s infrastructure.
    - Engineers & Floodplain professionals must do a better job of **communicating residual flood risk**.
    - **Sound QA/QC processes** are critical to quality end products.
LESSONS-LEARNED

Levees and Floodwalls

- Changes in levee design standards to add, Resiliency, Robustness & Redundancy
- Greater emphasis on failure modes & risk based decisions during design & construction
- Greater resiliency for when the “design event” is exceeded => overtopping
  - Proper turf establishment is important
  - Transitions between structures & levee embankments are critical erosion areas
  - Overtopping splash protection measures provide added resiliency.
Primary Objectives

- Compile information on regional design approaches & performance expectations including operations, maintenance, flood-fighting efforts & associated documentation.
- Use risk-based potential failure modes to establish design objectives & approaches.
- Assess adequacy of traditional design with risk analysis methods.

Publication ~ Fall 2016
THE FPM DESIGN EVENT

Is the 100-year Standard Sufficient?

- Is the 100-year event a resilient standard?
- What is your perspective?
  - 100 years: A long time or a short time?

100-year => 1.0% annual chance flood event

500-year => 0.2% annual chance flood event
THE EARLY YEARS

100-Year Standard

- Where did the 100-year standard come from?
  - 1950’s – TVA
    - Maximum Probable Flood
    - Regional Flood – based on observed floods
      » Set the stage for using an “intermediate” sized flood for land use planning
  - Late 1950’s the 100-year flood evolved as a consensus among:
    - TVA, USACE, Several States, Involved Academics
TOO HOT / TOO COLD => JUST RIGHT

100-Year Standard

- In 1967 -
  - USACE convened a workgroup of Federal agencies
  - 100-year standard emerged as a balance
    - Need to reduce flood damages
    - While avoiding excessive land use regulation
  - No formal Benefit/Cost analysis
  - Professional judgment standard

The “100-year flood” Term:
The “100-year flood” is a term often used to describe a flood that has a 1% chance of occurring in any year. But the phrase is misleading, and often causes people to believe these floods happen every 100 years on average. The truth is, these floods can happen quite close together, or not for long stretches of time, but the risk of such a flood remains constant from year to year. The 100-year-flood term was originated to delineate areas on a map to determine what properties are subject to the National Flood Insurance Program. Properties within the 100-year-floodplain, as defined by the Federal Emergency Management Agency, have special requirements and mortgage holders will require owners to carry flood insurance on these properties.
THE BASE FLOOD

100-Year Standard & 1-Foot Floodway

- In 1968 –
  - Inception of the National Flood Insurance Program (NFIP)
  - 100-year standard adopted as the Base Flood

- IN 1969 –
  - 1-foot floodway encroachment concept set forth
    in a Water Resources Council publication for Federal agencies
THE DESIGN EVENT

How about a > 100-Year Standard?

- 1975 “FEMA” Study by Schaeffer & Roland
  - Compliance with 100-year standard will reduce the rate of flood damages as compared to a “no regulation” standard.
  - Flood damages across the nation will continue to increase as additional floodplain development occurs that has a 100-year residual risk.
  - Only by imposing a more stringent floodplain standard would flood damages actually begin to decrease.
A NEW DESIGN EVENT

How about a 500-Year Standard?

- A 500-year standard starts to turn the corner on future flood damages
  - 2008 Iowa Floods – Blue Ribbon Panel => Revise the minimum building standard from the 100-year to the 500-year event.
  - Non-starter with the Iowa legislature due to input that such would overly hinder development
  - Note that several Iowa communities have adopted the 500-year flood as their standard.

Cedar Rapids, Iowa – June 2008 Flood
A FLOOD RESILIENCY APPROACH

How about a CISA Standard?

- Executive Order 13690 – Federal Flood Risk Management Standard (FFRMS)
  - January 2015
  - A flood resiliency approach vs a simple elevation standard
  - Per resiliency by elevation
    - Advocates the use of a higher vertical flood elevation & corresponding horizontal floodplain than the standard NFIP Base (100-year) Flood
    - A CISA flood elevation
LESSONS-LEARNED

Designing with Resiliency

- The sign of a resilient community is the ability to quicker recover from a natural disaster.
- Levee / Floodwall overtopping
- Critical Public Infrastructure
  - Pump station resiliency
  - Water treatment plant resiliency
  - Wastewater treatment plant resiliency

Cedar Rapids, Iowa – Flood of June 2008
LESSONS-LEARNED

Communicating Residual Flood Risk

- Changing USACE levee project terminology is one example
  - Flood Control Levee
  - Flood Protection Levee
  - Flood Damage Reduction Levee
  - Flood Risk Management Levee
LESSONS-LEARNED

Communicating Flood Risk

- Moving from identification of flood hazard to identification of the associated flood risk represents a significant shift in emphasis.

- **Flood hazard** refers to naturally occurring or man-made flooding conditions (e.g., rise in water levels) that could cause harm.

- **Flood risk** refers to the likelihood or chance that someone or something is harmed when the flood hazard is encountered.
LESSONS-LEARNED

Communicating Flood Risk

- The focus of the National Flood Insurance Program (NFIP) is shifting from simply identifying flood hazards to helping communities understand their flood risks & take action to reduce those risks.
- Operating Guidance 3-11
  Communicating Flood Risk with Risk MAP Datasets and Products - July 2011
- Iowa DNR – FEMA Cooperating Technical Partnership

Using Grids to Communicate Flood Risk
Gradient of Flood Risk (% Annual Chance Flooding)
1% ANNUAL CHANCE FLOOD (100-YEAR)
LESSONS-LEARNED

Hurricane Katrina - 2005

- Interagency Performance Evaluation Task Force – IPET
  - Findings (Just a few of them):
    - A levee project must act as a system to perform well.
    - Consideration must be given to resiliency of a levee system if the design event is exceeded.
    - Use risk-based potential failure modes to establish design objectives & approaches.
    - Resiliency, robustness & redundancy are best practices that should be designed into a levee project and a flood prone community’s infrastructure.
    - Engineers & Floodplain professionals must do a better job of communicating residual flood risk.
    - Sound QA/QC processes are critical to quality end products.
LESONS-LEARNED

QA/QC Processes

• Current changing regulatory QA/QC climate
  o EC-1165-2-214 Civil Works Review
    • Mandates independent policy & technical reviews
  o EC-1165-2-216 Policy & Procedural Guidance for Processing Requests to Alter USACE Civil Works Projects (the Section 408 process)
    • Mark Ohlstrom’s USACE Section 408 presentation
  o USACE Levee Safety Program – Periodic Inspections per the PL 84-99 program & actions to maintain program eligibility
    • Vicki Twerdochlib’s SWIF presentation

IPET Finding: Sound QA/QC processes are critical to quality end products.

EC-214: QA/QC of Planning, Design & Construction
EC-216: QA/QC of Alterations of Completed Projects
Levee PI’s: QA/QC of Existing Levee Systems
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WHAT IS SECTION 408?

- Section 14 of the Rivers and Harbors Act of 1899 and codified in 33 USC 408:

  Provides the Secretary of the Army authority to grant permission to alter a USACE civil works project if:

  1. It does not impair usefulness of the project.
  2. It is not injurious to the public interest.
SECTION 408 OVERVIEW

- Section 408 is applicable to all types of Civil Works projects.
- Non-federal sponsor request/concurrence is required.
- Federal Action - Environmental Compliance. Section 10/404/103 decisions are separate decisions.
- Section 408 Process/Policy/Procedural Guidance is defined in USACE EC 1165-2-216.
ROLE OF THE NON-FEDERAL SPONSOR

Because non-federal sponsors are cost-share partners and/or have O&M responsibilities:

- Section 408 requests must come from or have written concurrence of the non-federal sponsor.
- If there are multiple sponsors, each sponsor must provide concurrence.
- Written acknowledgment and acceptance of any new O&M requirements.
- Reminder that 33 CFR 208.10 focuses on sponsors’ responsibilities. Decision to approve a Section 408 request is a USACE responsibility. Processes for both can work together, but one does not replace the other.
ENVIRONMENTAL COMPLIANCE

- A Section 408 decision is a federal action and NEPA and other environmental compliance is required.

- Scope of analysis is limited to the federal project areas that would be directly or indirectly affected by proposed alteration.

- NEPA documentation – the requester’s proposal will be identified as the “requester’s preferred alternative.”

- Alternatives analysis is limited to 1) no action and 2) requester’s preferred alternative.
COORDINATION WITH REGULATORY

- When a Section 408 request also requires a Section 10/404/103 decision, close coordination is required.

- Section 10/404/103 decisions are separate decisions and require separate decision documentation.

- Beneficial to leverage the information between the two processes.

- Note, “injurious to the public interest” for Section 408 is not the same as “contrary to the public interest” for Section 10/404/103.

- A Section 408 decision must be made before the Section 10/404/103 decision is issued.
PURPOSE OF EC 1165-2-216

- Provide Policy and Procedural Guidance for processing requests to alter USACE Civil Works projects pursuant to 33 USC 408.

- Improve consistency in the way USACE considers, processes, and documents decisions for requests for alterations to Civil Works projects.

- Create a process that is applicable to all types of Civil Works projects.

- Be transparent on what information is required.

- Create a process that can be tailored by districts to the appropriate scope, scale, and complexity of a proposed alteration.
BASIC LAYOUT OF THE EC 1165-2-216

- The body of the EC provides the policy and procedures (steps) for processing all Section 408 requests.

- The appendices provide supplemental guidance for the following:
  - Dams and Reservoirs (including Navigation Dams).
  - Non-Federal Hydropower Development.
  - Levee, Floodwall or Flood Risk Management Channel Projects.
  - Hydrologic & Hydraulics System Performance Analysis.
  - Accepting funds through Section 214.
STEPS OF SECTION 408 PROCESS

- Step 1: Pre-Coordination
- Step 2: Written Request
- Step 3: Required Documentation
- Step 4: District-Led Agency Technical Review
- Step 5: Summary of Findings
- Step 6: Division Review (if required)
- Step 7: Headquarters USACE Review (if required)
- Step 8: Notification
- Step 9: Post-Permission Oversight
SECTION 408 PROCESS REQUIRED DOCUMENTATION

- Technical Analysis and Design
- Hydrologic and Hydraulics System Performance Analysis
- Environmental Compliance
- Real Estate Requirements
- Discussion of Executive Order 11988 Considerations
- Operations and Maintenance
SECTION 408 REVIEW/APPROVAL PROCESS

District or HQ, USACE Level?

- Does the proposed alteration require a Type II IEPR?
- Does the proposed alteration require an EIS?
- Does the proposed alteration change authorized purpose?
- Does the proposed alteration preclude or negatively affect alternatives for a current GI or other study?
- Is the non-federal sponsor proposing to undertake the alteration as in-kind contributions?
- Is the proposed alteration for installation of hydropower facilities?
- Is USACE proposed to assume O&M responsibilities of the proposed alteration pursuant to WRDA Section 204(f)?
BEST PRACTICES

- Understand potential risk and liability

- Early and frequent coordination and communication with local USACE District

- Conduct process as if performing a USACE civil works project - Use USACE Design Standards

- Use Resources familiar with Section 408 work
CITY OF COUNCIL BLUFFS RIVER ROAD

- District Level Section 408 Required
COUNCIL BLUFFS RIVER ROAD (CONTINUED)

- Submitted August 2013
- Approval Granted September 2013
- Follow-Up
CITY OF OMAHA RELIEF WELL IMPROVEMENTS
OMAHA RELIEF WELLS #2 (CONTINUED)
DISCUSSION & QUESTIONS

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USACE AND SPONSOR ROLES IN LEVEE SAFETY

- Levee Safety Action Classification
- Risk Assessment
USACE AND SPONSOR ROLES IN LEVEE SAFETY

- Periodic/Continuing Eligibility Inspections
- PL 84-99
- Operation and Maintenance
WHAT IS THE SYSTEM-WIDE IMPROVEMENT FRAMEWORK?

- System-wide Improvement Framework (SWIF)
  - Program created by USACE in 2011.
  - Bridge for continued PL 84-99 coverage.
  - Requires planning document for levee improvements.
WHY THE SYSTEM-WIDE IMPROVEMENT FRAMEWORK?

- Implications of Unacceptable Ratings
- Types of Deficiencies
- PL 84-99 Coverage
SWIF REQUIREMENTS

- Letter of Interest
- Coordination with USACE
- Planning Document (Milestones)
  - IRRM
  - Deficiency Correction
  - Funding
- Public Coordination

MEMORANDUM FOR COMMANDERS, MAJOR SUBORDINATE COMMANDS AND
DISTRICTS

SUBJECT: Policy for Development and Implementation of System-Wide Improvement
Frameworks (SWIFs)

1. References.
   a. Engineer Regulation (ER) 500-1-1, Emergency Employment of Army and Other
   b. Memorandum, HQ USACE (CECW-HS), 16 Nov 2007, subject: Levee Safety Program
      Implementation.
   c. Memorandum, HQ USACE (CECW-HS), 9 Jan 2009, subject: Temporary extension of
      P.L. $4-99 Rehabilitation Eligibility for Non-Federal Sponsors Implementing System-wide
      Improvements.
   d. Memorandum, HQ USACE (CECW-CE), not yet released, subject: Policy Guidance
      Letter (PGL) - Process for Requesting a Variance from Vegetation Standards for Levees and
      Floodwalls.

2. Definitions.
   a. A “levee system” consists of one or more segments of earthen embankment or floodwall,
      and all appurtenant structures (such as closures, berms, pumping stations, culverts, and
      interior drainage), which are interconnected and necessary to reasonably reduce the potential
      of floodwater entering a defined area.
   b. An “unacceptable inspection item” is an inspected item on the U.S. Army Corps of
      Engineers (USACE) levee inspection checklist. An unacceptable item or a combination
      of unacceptable items may lead to an overall levee-system rating of unacceptable.
   c. A SWIF is a plan developed by the levee sponsor(s) and accepted by the USACE to
      implement system-wide improvements to a levee system (or multiple levee systems within a
      watershed) to address system-wide issues, including correction of unacceptable inspection items,
      in a prioritized way to optimize flood risk reduction.
SWIF REQUIREMENTS

- Review Process
NATIONAL SWIF STATUS

- 2 Approvals
  - Dallas Floodway Levee
  - Milton-Freewater
- Active SWIFs
  - 66 Active
HDR ASSISTING CLIENTS WITH SWIF PROCESS

- JEO/LPSNRD
  - Lincoln, Nebraska
  - 7 Levee Systems
  - Seepage/Stability, Dispersive Clay, Erosion/Bank Caving, Encroachments

- Orange County Flood Control District
  - Orange County, California
  - 7 Levee Systems (~ 41 miles)
  - Drainage Facilities

- Assisting With Projects listed on SWIF Plans
SWIF IN SUMMARY

- Leave Adequate Time for USACE Coordination and Review
- Leave Adequate Time for Scheduling of Interagency Meetings, as required
- Milestones Should Show Progress from Last Submittal
QUESTIONS?