A Tale of Two Cities?
Applying FEMA's LAMP Procedures in Western Kentucky

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Description of Study Area

Project Background
Project Background

- Union County, KY (western KY)

- 2 cities. 2 Levee systems.

- Both levee systems regularly inspected by USACE Louisville District

- Both systems deaccredited

- Both systems in the process of being restored to designed protection level
Uniontown, KY LFPP

- City of Uniontown
  - Total Area of 0.9 mi$^2$
  - Pop. Density of 1,065 people/mi$^2$
- Principal flooding source is Ohio River
- Levee system facts:
  - Built in 1951
  - Approximately 2 miles long
  - 3 ft of freeboard above 1937 flood on Ohio River
Sturgis, KY LFPP

- City of Sturgis
  - Total Area of 1.6 mi²
  - Population density of 1,209 people/mi²

- Sturgis affected by Ohio River, Tradewater River, Dyson Creek, and tributaries

- Levee system facts:
  - Built in 1970
  - Approximately 4 miles long
  - 3 ft of freeboard above 1937 flood on Ohio River
The May 2011 Flood

Photos from: Evansville Courier & Press
The May 2011 Flood

- Evansville (IN) Courier & Press
  - “According to the National Weather Service in Paducah, the river at Shawneetown had risen three inches between Wednesday and Thursday. Since Monday, it rose nearly two feet. As of 6 p.m. Thursday, it was recorded at 56.38 feet, which is the second highest crest in recorded history at that location. First is the Great Flood of 1937 that was recorded at 65.64 feet.”
  - The increasing flood water encouraged Union County and the City of Sturgis officials to decide to close the flood gate to the city along U.S. 60. today at 7 a.m. Kentucky 109 to the north is currently the only access point for Sturgis. U.S. 60 between Sturgis and Sullivan and at the Union-Crittenden County Line have been closed for days because of water over the roadway in multiple locations.
Leveraging the CTP / Local Relationship

Stakeholder Engagement
KY RiskMAP Learning Modules

https://www.youtube.com/user/KYRiskMAP/videos
CTP Engagement with Community

- Leverage prior relationships with community leaders
- Community levee sponsors pre-meeting
- LLPT meetings with key stakeholders
  - Discussion of proposed analysis & mapping methods
  - Delivery of Draft LAMP plan
- Stakeholder meetings
  - Initial meeting: 17 in attendance
  - Roll-out of LAMP plan

Key Stakeholders Include:

- City of Sturgis
- City of Uniontown
- Division of Water
- BFW
- FEMA
- URS
Stakeholder Engagement – Fact Sheet

Levee Analysis and Mapping Plan: Sturgis and Unionsville Levees

Project Background & Community Flooding History

Flooding is a common occurrence in Union County. Flooding poses a high risk to public safety and property damage. Between 2010-2014, Union County experienced an average of 5.5% of flood events per year. The United States Levee Analysis and Mapping Plan for the Sturgis and Unionsville levees was part of a national FEMA pilot study to evaluate Levee Analysis and Mapping Programs (LAMP).

Union County, Kentucky is located in the eastern area of the Commonwealth along the banks of the Ohio River. The county is predominantly rural and the landscape consists of flat plains and river valleys. The United States Levee Protection Program (LAPP) was constructed to protect the city of Sturgis from the Ohio River; construction was completed in May 2011. The Sturgis LAPP was constructed to protect the city of Sturgis from the Ohio River. Floodwater from Cabin Creek (also known as Cypress Creek) and tributaries was completed in January 2015. Levee certification is required as a mitigation action for both cities and the county. Environmental and local regulatory programs are identified as mitigation actions to reduce risk to these communities.

What is a levee?

A levee is a solid structure usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from flood damage. Levees may reduce the risk of flood damage by maintaining water at a lower elevation. Levees may reduce the risk of flood damage by maintaining water at a lower elevation.

Why is levee maintenance necessary?

Regular levee inspections may help to reduce the risk of flood damage. It is advisable to provide complete protection from flood damage to ensure the safety of the residents.

Levee Components

- Embankment
- Floodway
- Landside
- Waterside

Sturgis Levee

The Sturgis LAPP was completed in January 2015. The Sturgis LAPP offers approximately 4 miles of flood protection.

Unionsville LAPP

The Unionsville LAPP projects were completed in May 2011. The Unionsville LAPP offers approximately 2 miles of flood protection.

LAMP Overview: A New Approach

FEMA’s new Levee Risk Mapping Program (LRMP) is designed to improve the accuracy of levee risk assessments. The LRMP provides a more comprehensive approach to evaluating levee risks and identifying potential mitigation measures.

FEMA Risk MAPP for New Approach to Map Levees

FEMA Risk MAPP for New Approach to Map Levees

Know Your Risk, Know Your Role, Take Action Today!

FEMA’s new system provides a new way of thinking about flood risk and opportunities to reduce risk. The LRMP helps communities identify potential risks and implement effective mitigation strategies.

Risk Awareness Materials

FEMA is working with various partners to promote flood risk awareness and mitigation. This includes developing educational materials and partnerships with local governments and community organizations.

http://fema.gov/flood-analyisis-and-mapping-program

http://fema.gov/risk-mapping-assessment-planning
Local Knowledge + New Data

Data Collection
Historic Data Collection

- BFW Inspection Report (with Volkert Geotechnical Study)
- BFW Interior Drainage Analysis
- USACE Inspection Reports:
  - 2014 Routine Inspection Report and Letter
  - 2012 Routine Inspection Report and Letter
  - 2010 Periodic Inspection Letter, Executive Summary
  - 2006 Routine Inspection Report and Letter
- Operation and Maintenance Plan
- Emergency Flood Evacuation Plan
New Data: Field Survey

- New Field Survey
  - Top and Toe of Levee
  - Key Levee Features (Gatewells, Road Crossings)
New Data: LiDAR

- Recent LiDAR
  - Data collected in Sturgis and Uniontown for RiskMAP contract

- KY RiskMAP has been a key driver for LiDAR collection in the Commonwealth of Kentucky:
Applying LAMP to Union County

The Approach
LAMP Approach - Uniontown

- Flood source is Ohio River
- Levee has deficiencies.
- Levee is in the process of being restored.
Uniontown Levee Deficiencies

Degraded Discharge Pipes

Sand Boil Documented

Pump Station Needs Repair
Uniontown Levee LAMP Reach Designations

Natural Valley Procedure
Uniontown Levee LAMP Reach Designations

Overtopping

Freeboard Deficient
Uniontown Levee LAMP Reach Designations

Structural Inundation

Sound Reach

Required Minimum Freeboard

Flooding due to interior drainage (Zone AE/VE/AR)

Base Flood Elevation (BFE)
Uniontown Levee LAMP Reach Designations

Structural Inundation

O&M not adopted
OR
Repairs not completed on schedule
Uniontown Levee LAMP Reach Designations

O&M adopted
AND
Repairs made on schedule
Uniontown Technical Approach
LAMP Approach - Sturgis

- Multiple flooding sources.
- Levee has deficiencies.
- Levee is in the process of being restored.
- O&M not formally adopted
Sturgis Levee Deficiencies

Degraded Discharge Pipes

Time to Erect Closures
Sturgis Levee LAMP Reach Designations

Natural Valley Procedure
Sturgis Levee LAMP Reach Designations

**Overtopping**

**Freeboard Deficient**
Sturgis Levee LAMP Reach Designations

Structural Inundation

Sound Reach

Breach Location

Riverside

Landside

Zone AE / VE

Required Minimum Freeboard

Base Flood Elevation (BFE)

Flood due to interior drainage (Zone AE/AL/AO)

Zone AE / VE

Zone D
Sturgis Levee LAMP Reach Designations

Structural Inundation

- O&M not adopted
- OR
- Repairs not completed on schedule
- OR
- Insufficient time to erect gateway closures
Sturgis Levee LAMP Reach Designations

Tradewater 1% > Ohio 1%

O&M adopted

AND

Repairs made on schedule

AND

Sufficient time to erect gateway closures
Sturgis Levee LAMP Reach Designations

Tradewater 1% > Ohio 1%

Structural Inundation + Sound Reach
Sturgis Levee LAMP Reach Designations

Ohio 1% > Tradewater 1%

O&M adopted

AND

Repairs made on schedule
Sturgis Technical Approach

Two-dimensional Modeling
The Takeaways

Lessons Learned
Lessons Learned: the “in-between’s”

- Working with communities that have non-accredited levees, but:
  - Are “working” towards accreditation
  - May not be actively pursuing restoration zone (AR) status
  - May not have obvious structural deficiencies
  - Are addressing deficiencies noted in USACE report

- When and where you apply LAMP methods:
  - Perform all analyses up front?
  - Use risk based analysis—read between LAMP’s lines
Lessons Learned: FEMA & USACE

- Involvement of USACE as an engaged partner is critical to the project’s success

- “Mapping” of USACE terminology, goals, and standards to FEMA CFR 65.10 standards will clarify the risk related to particular levee deficiencies and the levee system overall and how this is treated via LAMP procedures

- The Levee Screening Tool may be an interim step from LAMP towards a full risk analysis
  - Not available outside of USACE
  - May not have been performed for your levee
  - Timetable for LST may not fit with LAMP timetable
Lessons Learned: The CTP Advantage

- Communicating early, often, and in-person with key community stakeholders

- Pre-existing relationships between the CTP and local officials pave the way for successful coordination and “win-win” conversations

- CTP education and outreach efforts raise the awareness of the RiskMAP program
Lessons Learned: Finding win-wins

- Sharing data and knowledge between FEMA and stakeholders.

- Incorporate community goals into LAMP schedule to incentivize mitigation actions.
QUESTIONS?