Risk MAP
Mapping | Assessment | Planning

IAFSM 2011 Annual Conference
March 9, 2011

Suzanne Vermeer, P.E., CFM – FEMA Region V
Agenda

- Risk MAP Vision and Alignment
- Status of Studies
- Watershed Approach
- Project Prioritization
- New Datasets in Risk MAP
- New Products in Risk MAP
- Additional Outreach Meetings
Risk MAP Lifecycle

1. Identify Risk
2. Assess Risk
3. Mitigate Risk
4. Communicate Risk
5. Plan for Risk

Risk MAP
REduce LOSS
OF LIFE & PROPERTY

Map Risk Data

Transfer Risk
Reduce Risk

Assess Present & Future Risks
Goal – Measure Quantifiable Risk Reduction

Goal – Measure Quantifiable Risk Reduction

FEMA
Risk MAP (Mapping, Assessment Planning)

Through collaboration with State, Local, and Tribal entities, Risk MAP will deliver quality data that increases public awareness and leads to action that reduces risk to life and property.
FEMA’s Map Modernization Program
Geographic Approach / Strategy

Countywide

Watershed
Prioritization – Sequencing – Planning

<table>
<thead>
<tr>
<th>Risk</th>
<th>HAZUS - Annualized Loss Study</th>
<th>• Available for FY-2011 Sequencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs</td>
<td>CNMS and Stream Inventory</td>
<td>• Available for FY-2011 Sequencing</td>
</tr>
<tr>
<td></td>
<td>- Phase 3 -</td>
<td></td>
</tr>
<tr>
<td>Topography</td>
<td>High Resolution Topography</td>
<td>• Available for FY-2011 Sequencing</td>
</tr>
<tr>
<td></td>
<td>- ongoing inventory -</td>
<td></td>
</tr>
<tr>
<td>Contribution</td>
<td>Cash-Match or Partner</td>
<td>• Being considered for future</td>
</tr>
<tr>
<td></td>
<td>Contribution ($)</td>
<td>prioritization - FY-TBD -</td>
</tr>
</tbody>
</table>

Example trifecta hotspot

Trifecta-based prioritization can not occur without state-based input!
Risk Management
(estimated flood losses - HAZUS)
Coordinated Needs Management Strategy (CNMS)
Coordinated Needs Management Strategy (CNMS)

Which studies are valid? Which studies are not?

CNMS (i.e. IDNR-OWR) tells us!
Topographic Data Inventory
Traditional products are regulatory and subject to statutory due-process requirements

Risk MAP products are non-regulatory and are not subject to statutory due-process requirements
Flood Risk Datasets

- Changes Since Last FIRM
- Flood Depth & Analysis Grids
- Flood Risk Data
- Areas of Mitigation Interest

RiskMAP
Increasing Resilience Together
Changes Since Last FIRM Dataset
New Mapping (w/ LiDAR)
New Mapping
## Changes Since Last FIRM

### Data Fields Include

<table>
<thead>
<tr>
<th>Field</th>
<th>Example Data Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Study Date</td>
<td>e.g. 1985</td>
</tr>
<tr>
<td>Old Model Type(s)</td>
<td>e.g. HEC-1 / HEC-2</td>
</tr>
<tr>
<td>Old Zone Type</td>
<td>e.g. Zone A</td>
</tr>
<tr>
<td>Old Topography</td>
<td>e.g. USGS 10-ft</td>
</tr>
<tr>
<td>New Study Info/Methods</td>
<td>Dates, Models, etc.</td>
</tr>
<tr>
<td>New Study Zone</td>
<td>e.g. Zone AE</td>
</tr>
<tr>
<td>New Topography</td>
<td>e.g. LiDAR 2-ft</td>
</tr>
<tr>
<td>New Study Engineering Factors / Changes</td>
<td>e.g. new structures, gages, topo, landuse, etc.</td>
</tr>
<tr>
<td>Estimated Structures</td>
<td>e.g. 9</td>
</tr>
<tr>
<td>Estimated Population</td>
<td>e.g. 27</td>
</tr>
</tbody>
</table>

### SFHA Increase

- Unchanged
- Enhanced

### SFHA Decrease

- Enhanced

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*Enhanced*
Flood Depth & Analysis Grids
Flood Depth Grids

- Each Grid Cell has a Unique Value

FIRM 1% Annual Chance (100-yr) Floodplain

1% Annual Chance Depth Grid

Individual Grid Cell
Flood Depth Grids

- Water Surface Elevations (WSE) Calculated and WSE Grid Produced
Flood Depth Grids

- Depth Grid Calculated as Difference between WSE and Ground
10% Depth (10-Year)

1% Annual Chance Floodplain Boundary

1.5 ft

0.0 ft
4% Depth (25-Year)
1% Depth (100-Year)

4.7 ft

0.0 ft

0.1 ft
0.2% Depth (500-Year)

8.9 ft

4.3 ft

1.7 ft
Flood Risk Assessment Datasets

- **Flood Risk Assessment Data**
  - 2010 HAZUS Average Annualized Loss (AAL) Study
  - Refined HAZUS and Other Risk Analyses

[HAZUS MH image]

[Map of Flood Risk Assessment]
2010 AAL HAZUS Study

- 2010 HAZUS-MH Flood Average Annualized Loss Estimation (AAL) was performed for continental U.S. using MR4

- Inputs:
  - County-wide study regions
  - 30 meter DEM
  - Default Census data

- Final Output included
  - Total exposure
  - Average Annualized Loss
    - Annualized Loss Ratio

![Map of Annualized Loss by State](image)
Estimation of Losses

- **Dollar Losses**
  - Residential Loss
  - Commercial Loss
  - Other Asset Loss

- **Percent Damage**
  - Evaluates Building Stock
  - Structure and Content Considerations

- **Business Disruption**
  - Considers Total Occupancy Tables
  - Considers Lost Income and Wages
4% Chance Risk (25-yr)
1% Chance Risk (100-yr)
0.2% Chance Risk (500-yr)
Annualized Risk
Enhanced Risk Assessment Analyses

- Enhancements could include:
  - Risk Assessments at site-specific locations
  - Incorporation of locally-provided inventory data (first-floor elevations and/or parcel data)
  - Additional sources of flood depth grids
  - Supplemental HAZUS analyses or other types of analyses
Areas of Mitigation Interest (Enhanced)
Flood Claims Hot Spot

Description:
Quietwater neighborhood has flooded on 4 separate occasions since 1995. The results have produced over 36 claims from 16 structures. Of these structures, 12 are Repetitive Loss and 2 are Severe Repetitive Loss.

Source:
State NFIP and SHMO
Waterloo Planning and Zoning Dept
**Dam Location**

**Description:**
The Blue River Dam was built in 1950 and is classified as 'high hazard'. According to the Emergency Action Plan (EAP), approximately 250 structures are located immediately downstream of this dam within its inundation mapping limits.

**Source:**
County Engineering Dept
Coastal Erosion Area

Description:
Structures along Sunny Beach experienced significant erosion following a series of April 2009 storm surges. Affected structures include approximately 12 residential and 4 commercial businesses determined vital to local economy.

Source:
Coastland Emergency Management and Economic Development Depts
The City of Floodville successfully mitigated 7 structures through a 2005 HMGP buyout and elevation project.

Source:
State Hazard Mitigation Officer
Floodville Planning Dept
Areas of Mitigation Interest

Sources of Data

- Community Provided Data
  - Interviews and questionnaire from Discovery Meeting
  - Mining of existing mitigation plans

- Engineering Data
  - Review of existing H&H models
  - Engineering data from other reports (e.g. USACE)

- Other Government Agency Data
  - Claims data (inc. RL, SRL, clusters, etc)
  - CNMS data
  - Flood control structures
Flood Risk Products

- Flood Risk Database
- Flood Risk Report
- Flood Risk Map
Flood Risk Database (red = enhanced)

Changes Since Last FIRM
• Horizontal Changes and Results
• Structure/Population counts impacted by change

Depth & Analysis Grids
• Depth (10, 04, 02, 01, 0.2 percent chance)
• Percent Annual Chance
• Percent 30-Year Grid
• Delivery of Water Surface Elevation (multi-freq)
• Water Surface Elevation Change Grid (1%)
• Velocity Grids, Annualized Depth, Top and Toe of Levee
• Multi Freq Grids for Levee and Coastal Areas, etc.

Flood Risk Assessment
• Average Annualized Loss – 2010
• Refined Flood Risk Assessment
• HAZUS or Non-HAZUS with improved data/assumptions

Areas of Mitigation Interest
• Areas of Mitigation Opportunity or Awareness
Flood Risk Report Content Overview

- **Background:**
  - Purpose, Methods
  - Risk Reduction Practices

- **Project Results**
  - Changes Since Last FIRM
  - Depth & Analysis Grids
  - Flood Risk Assessment
  - (enhanced analyses)
    - e.g. Areas of Mitigation Interest

- **Summarized by Locations**
  - Communities and Watersheds
Flood Risk Report
Content – Details

Risk Awareness Information

Flood Risk Report

For project areas including: Watershed USA, Village of Coatsland, Village of Drytown, City of Floodville, Town of Waterloo, County A*, County B*, and County C*

*Spans more than one watershed. This report covers only the area within the studied watershed.

Report Number 001

MM/DD/YYYY

FEMA

RiskMAP
Increasing Resilience Together

Watershed Flood Risk Report

1. INTRODUCTION

1.1 Overview

Floods are natural occurring phenomena that present a risk to human lives and property. Flood events are caused by rapid accumulation of water from precipitation, snow melt, or storm surge. Floods can result in significant damage to structures and infrastructure, and can displace people from their homes.

Flood hazard zones are based on the likelihood of flooding and are often delineated on maps. The National Flood Insurance Program (NFIP) requires flood hazard zone maps to be published by flood plains management agencies. These maps provide information on the risk of flooding and are used to determine flood insurance rates.

Flood Risk Mitigation Implementation

RiskMAPP provides a comprehensive approach to flood risk mitigation. This approach includes:

- Identification of flood risk areas
- Development of flood risk reduction strategies
- Implementation of flood risk mitigation measures

Table 1: FEMA Hazard Mitigation Assistance Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA</td>
<td>Hazard Mitigation Assistance Program (HMA)</td>
</tr>
<tr>
<td>SGF</td>
<td>State, Tribal, and Local Disaster Assistance Program (SGF)</td>
</tr>
<tr>
<td>GM</td>
<td>Grant Management System (GM)</td>
</tr>
<tr>
<td>IC</td>
<td>Implementation Center (IC)</td>
</tr>
</tbody>
</table>

Sidebar: Flood Risk Reduction Strategies

- Elevate or floodproof buildings
- Install flood barriers
- Use permeable pavements

Sidebar: Flood Risk Mitigation Measures

- Flood damage reduction measures
- Emergency preparedness measures
- Public education and awareness campaigns

Sidebar: Flood Risk Mitigation Benefits

- Reduced flood damage and loss of life
- Improved property values
- Enhanced public safety

Sidebar: Flood Risk Mitigation Challenges

- Limited funding sources
- Political and social barriers
- Inadequate planning and implementation

Sidebar: Flood Risk Mitigation Success Stories

- Successful implementation of flood risk mitigation measures in various communities
- Reduction in flood damage and loss of life
- Improved property values and public safety
Flood Risk Report
Content – Details

Watershed /Project Level Summary

For project areas including: Watershed USA, Village of Coastland, Village of Drytown, City of Floodville, Town of Waterloo, County A*, County B*, and County C*

*Spans more than one watershed. This report covers only the area within the studied watershed.

Report Number 001

MM/DD/YYYY
CSLF within the Flood Risk Report

<table>
<thead>
<tr>
<th>Area of Interest</th>
<th>Total Area (mi²)</th>
<th>Increase (mi²)</th>
<th>Incr Population</th>
<th>Incr Buildings</th>
<th>Decrease (mi²)</th>
<th>Decr Population</th>
<th>Decr Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area within SFHA</td>
<td>21.082</td>
<td>1.038</td>
<td>1,785</td>
<td>4,939</td>
<td>-2.556</td>
<td>-1,909</td>
<td>-647</td>
</tr>
<tr>
<td>Area within Floodway</td>
<td>3.2121</td>
<td>0.739</td>
<td>100</td>
<td>42</td>
<td>-0.1328</td>
<td>-17</td>
<td>-17</td>
</tr>
</tbody>
</table>

Enhanced

Net Change (mi²)  | Net Population | Net Buildings |
------------------|----------------|---------------|
Area within SFHA  | -124           | 4,291         |
Area within Floodway | 83             | 25            |
Flood Risk Map

- Visually Promotes Risk Awareness
  - Contains results of Risk MAP project non-regulatory datasets
  - Promotes additional flood risk data not shown but located within the Flood Risk Database

[Image of Flood Risk Map: Watershed USA]
NON-REGULATED DAM STRUCTURE*

The Big Lake Dam, an unregulated structure located along Tributary A, causes upstream backwater during flood events more frequent than the 1% annual chance of occurrence. During large flood events, portions of River Road are un-passable and several homes receive flooded yards and basements.
The Process of Flood Risk Assessment
Flood Risk Assessment Process

- Flood Risk Assessment is an iterative process
- The iterative process starts as a broad sweep to initially gain a high level understanding of the relative flood risk and to ultimately hone in on a refined quantification of vulnerability.
- The process must include frequent sanity checks with stakeholders to ensure it remains on target. Stakeholders include, but are not limited to:
  - Local planners
  - Local mitigation specialists
  - Local emergency managers
  - Local business leaders
  - Local elected officials
Flood risk assessment is an iterative process that starts with flood hazard data, includes significant stakeholder coordination, and ends with flood risk quantification.
Flood Risk Assessment Process

Step 1: Identify flooding sources for development of flood hazard and flood risk data; perform broad preliminary flood risk data mining.

Step 2: Perform broad flood risk triage using AAI and other available flood hazard and vulnerability data (including data from mitigation plans) to identify and target high risk hot spots.

Step 3: Create Discovery Map to communicate results of Step 1 and Step 2 for use at Discovery Meeting.

Step 4: Meet with local stakeholders at Discovery meeting to present Discovery Map; gain additional insight into local flood risk factors; make decisions on base vs. enhanced flood risk dataset creation.

Do results of Step 5 validate decisions made at Step 4 and meet stakeholder needs?

Yes

Step 6: Perform hydrologic and hydraulic analyses; then create companion flood risk data (depth grids etc.) and quantify flood risk.

Step 7: Create and communicate draft flood risk data and products.

Do draft flood risk data and products meet stakeholder expectations and needs?

Yes

Step 8: Create and deliver final Flood Risk Report, Flood Risk Map, and Flood Risk Database.

No

Step 5: Perform in-depth data mining at the local level to align with decisions made in Step 4. Continue to gain and refine insight into local flood risk factors.
Flood Risk Products – Project Lifecycle Overview
Map Modernization & Risk MAP Timelines

Year 1
- Scoping Meeting
  - a. Scoping (1-2 Mos.)
  - b. Data Collection (2-3 Mos.)
  - c. Engineering (3-9 Mos.)
  - d. Hazard Mapping (3-9 Mos.)

Year 2
- Preliminary FIRM Issuance
  - e. Preliminary FIRM Production (3-4 Mos.)
  - f. FIRM Public Notification (1-3 Mos.)

Year 3
- Consultation Coordination Officer (CCO) Meeting
  - g. Appeal Process (3 Mos.)
  - h. Resolve Appeals (1-2 Mos.)
  - i. Post-Preliminary FIRM Processing (1 Mo.)
  - j. FIRM Adoption (4-6 Mos.)

Year 4
- FIRM Effective

Year 5
- Ongoing Maintenance of Maps

Discovery Meeting
- Updated Discovery Map
- Draft Project Plan

Optional Flood Risk Review Meeting
- Draft Outreach Strategy and Communication Plan
- Risk MAP Products (Flood Risk Map, Report, & Database)

Resilience Meeting
- Potential actions to incorporate into mitigation plans

Changes Since Last FIRM Impacts

Consultation Coordination Officer (CCO) Meeting
- Open House
- FIRM (Regulatory)
- Risk MAP Products (Flood Risk Map, Report, & Database)

A. Planning & Budgeting (3 Mos.)
B. Discovery (2-4 Mos.)
C. Data Development & Sharing (9-15 Mos.)
D. Risk Awareness & Mitigation Outreach (1-3 Mos.)
E. Proposed NFIP Map Changes & Impacts (1-3 Mos.)
F. Preliminary NFIP Map Release & Mitigation Plan Path Forward (1-3 Mos.)
G. Due Process & Path Forward (9-15 Mos.)
Discovery Meeting

- Occurs after intense up-front coordination with watershed stakeholders
- Discuss Discovery Map, watershed vision, flood risks and mitigation needs
- Not a data-collection meeting
- Outputs
  - Discovery Map
  - A project charter and scope of work are developed if it is decided that a Risk MAP project will occur
Resilience Meeting

- Occurs after Data Development and Sharing, but before preliminary map is released
- To assess Risk MAP products and potential actions to incorporate into mitigation plans
- Meeting is focused on flood risk, not “in or out” discussions
  - Change Map product not discussed or shown at this meeting
CCO/Open House Meeting

- Focus is on preliminary map release and way ahead
- Discussion also includes a review of actions taken to reduce risk, progress toward watershed vision, understanding of path ahead, and adoption FIRM and FIS
Optional Meeting

- May include
  - Follow-up Discovery Meeting
  - Project Kickoff Meeting
  - Congressional briefing
  - Flood Study Review Meeting
  - Outreach discussion meeting
  - Other meeting as appropriate
Challenges (i.e. opportunities)

Levees

Provisionally Accredited Levees
Questions / Discussion

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