B1. Identifying Flood Risk in Unmapped Urban Environments
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Stakeholder Appreciation:
Missouri SEMA
St. Louis MSD
All St. Louis Communities
Discussion Topics

• The Problem / Challenges
• Examples – Signs?
• St. Louis - Cahokia Watershed Project
  – Community Outreach
  – Unmapped Urban SWMM Methodology
  – Hydrology & Hydraulics
  – Calibration/Historical Storms
• Next? Beyond Floodplain Identification
The Problem/Challenges

- Many communities have urban drainage systems developed prior to floodplain management
- Many of these systems do not have open channel systems
- Many of these systems are unmapped
  - On purpose or otherwise....
- Requires a different level of detail to study
- Communicating risk is complicated & IMPORTANT
  - Never mapped before – future development – etc

ST. Louis Cahokia Project
Applicable to All
Examples - Signs

- Abrupt Floodplain Extents
Examples - Signs

• Shaded Zone
X Areas
Examples - Signs

• Historical Observations
Examples - Signs

- Closed System
- Surcharging Systems – Where’s Waldo?

A presentation by Wood.
St. Louis – Cahokia Watershed Project

- **Overview**
  - 185.8 sq mi
  - 190.4 stream miles
  - 36.1 closed system miles

- **Scope** – 2 Projects (Ongoing)
  - Community Outreach
  - Hydrology & Hydraulics
  - Floodplain Mapping
  - (Later) Map Production & Processing
St. Louis – Cahokia Watershed Project

- Watershed with County & St. Louis City
- 93 Communities
- 72 Communities Impacted
St. Louis – Cahokia Watershed Project

Community Outreach – Throughout Life of Project(s)

- Community Pre-Scoping Input (Engineering & Policy)
- H&H Data Sharing (Engineering)
- Community Flood Study Review (Engineering, Policy, Mapping)
- Public Flood Study Review - Later (Engineering, Policy, Mapping, & etc)

Internal Independent QA/QC

Unparalleled & Custom Engineering

External Independent QA/QC

Quality Flood Risk Product
Unmapped Urban SWMM Methods

WHAT NOW?!?!

CSO What....

http://mysticriver.org/csos/
Step 1

Where is storage?
Unmapped Urban SWMM Methods

Step 2

Desired Extent?

Select Primary Conveyance Systems

Look for areas of 1 sq mile CDA
Unmapped Urban SWMM Methods

Step 3

Storage or 2D?

2D Path

Storage

Storage
Unmapped Urban SWMM Methods

Step 4

What systems needed?

We need some collectors to capture 2D overflow
Unmapped Urban SWMM Methods

Step 5

Link it all together.

- Use any available SWMM models. **THANK YOU MSD!!**
- Extract desired elements.
- Develop additional information (subcatchments, 2D, etc)
- Simulate Model
- Analyze, Trial & Error...
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Hydrology
• 7 HEC-HMS Models
  – 106.4 sqmi
• 5 PC-SWMM Models (SWMM 5.0)
  – 79.4 sqmi

Parameters
– Custom Rainfall Distributions
– Critical Duration Rainfall/Runoff Analysis
– Clarks UH or SWMM Runoff Block
– CN Infiltration
  • Detailed Impervious Data
– Muskingum-Cunge or SWMM Dynamic Wave Routing
– Sinkhole Accommodations
Hydrology

- Custom Rainfall
  - Collaboration
  - Frequency Modified Pilgrim Cordery Temporal Distribution
    - 6-, 12-, & 24-hr
    - 2- & 3-hr same as 6-hr
- Critical Duration Analysis
  - Simulate all frequency events for each duration.
    - 37 SIMULATIONS!!!
  - Analyze and select critical duration
St. Louis – Cahokia Watershed Project

Hydrology Response – Nexrad Validation
September 2008 & 2015 Historical Storm
St. Louis – Cahokia Watershed Project

11 USGS Gages

SWMM & HMS Methods Validated!
St. Louis – Cahokia Watershed Project

Hydraulics

- 154.3 miles HEC-RAS
  - Steady & UnSteady-State
- ~36.1 miles PC-SWMM (SWMM 5.0)
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Hydraulic Response Validation
- 11 USGS Gages
- 50 Community HWM Locations

~0.3 ft HWM Average Deviation
Unmapped Urban SWMM Methods – Other

Not Just in Closed Systems
Next? Beyond Floodplain Identification

- What's Next?
  - Finish H&H & Community Review
  - Proceed into Mapping Production
  - Effective Maps

- Beyond Flood Risk Identification – Management?
  - Future Development
  - Mitigation
  - Emergency Management

These maps can go beyond flood risk....
Questions / Discussion

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