A Unique Approach to City-Wide Inundation Mapping: Using Hydrodynamic Modeling to Create Non-Regulatory Products

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Agenda

- Background
- Need for change in thinking
- New Data Development
- Non Regulatory Products
- Other applications
- Questions
Typical urban drainage patterns
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History

• Fort Worth historic development philosophy:
  – Replace the creek with a pipe

• Result:
  – More flooding outside of FEMA mapped FP than within it.

• No mapping, limited studies outside of FEMA

• Previous Data: GIS maps, design plans & Steve’s brain

• Flood prevention needs to be proactive, not reactive

• Need for prioritization

• New Tool to define the issue

• Need to communicate to public

<table>
<thead>
<tr>
<th>Inside COFW</th>
<th>Inside FEMA (100-yr)</th>
<th>Outside FEMA (100-yr) &gt;0.5’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30,000 Acres</td>
<td>48,000 Acres</td>
</tr>
<tr>
<td></td>
<td>6,881 Structures</td>
<td>31,810 Structures</td>
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New Tool Development

- **What do we want?**
  - Citywide master plan

- **What do we have?**
  - LIDAR
  - Asset Inventory
  - Mapsheds
  - Other GIS data

- **Can we get there?**

- **How?**
  - Detailed Studies
  - Rapid assessments
GIS Tool Development

Now What?

– Known
  · Pipe Geometry
  · Drainage Area
  · Complaint Locations
  · Building Locations
  · Development Permit Locations

– Can figure out
  · Pipe Capacity
  · Density of:
    · Complaints
    · Existing Development
    · Future Development

– Basis of Metric 1 Mapshed “Grades”
Citywide Flood Hazard Assessment

- LIDAR only 2D Model
- Rainfall on Grid
- Shows us where the low spots or “at risk” areas are
- Flow TO the stream
- Initial comparison between systems
- Can continue adding detail

81 Structures At Risk
Or 1 per every 105 LF of Storm Drain
Comparison to Detailed Modeling

- No pipes
- Rainfall on mesh
- Runoff not dumped straight into inlets
- Large, coarse mesh
- No breaklines, voids, terrain adjustment, etc…
- Assumes 0.5 in/hr removed from design storm hyetograph
- End results tells about the same story…
- Quick turnaround
Non Regulatory Products

- Potential Depth/Inundation Grids
- Velocity maps
- Hazard maps
- HAZUS
Citywide 2D – Other Potential Uses

- Feed into Study Metrics
- Scoping Tool for Studies
- Evaluation of Emergency Vehicle Access
- Quick Evaluation of Roadway CIP (other CIP coordination)
- Overflow between watersheds
- Communication Tool
  - Council
  - Stakeholders
  - Public
Limitations

• Terrain Only, No Pipes

• Planning level, Metric 1 only
  – “This Mapshed is worse than that Mapshed.”
  – “This Study has more benefit than that study.”

• Not detailed enough to make specific design level pipe improvement recommendations (Can recommend study areas)

• Not valid for open channel flow, default to FEMA

• When detailed 2D study models become available, adopt those results (best available data)

• NOT REGULATORY
  – Inundation/hazard ≠ “Floodplain”
    **Be careful how data is used and who has access**
How this benefits the City

- Tells us things that aren’t obvious
- Cheaper & quicker than detailed studies
- Is being used to communicate with public
  - Limits/Liabilities
Questions?