Overview of HEC-RAS 2D Modeling and How It Can Be Used to Evaluate and Reduce Flood Hazards

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How did HEC-RAS come to be?
1824: U.S. Army Corps of Engineers (USACE) starts their first Civil Works project - to promote safety on the Ohio and Mississippi River.
1936: Flood Control Act gives USACE authority to provide flood protection across entire country.
1966: USACE releases the computer program “Backwater Any Cross Section”
1968: HEC releases the software HEC-2 to estimate water levels on a river

Original computer for running HEC-2
1984: HEC-2 can be run on a personal computer

IBM personal computer in 1981
1995: HEC releases HEC-RAS Version 1.0

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<th>Project</th>
<th>Trapezoidal Bridge</th>
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<tr>
<td>Plan</td>
<td>Test of trapezoidal bridge opening</td>
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<tr>
<td>Geometry</td>
<td>trapezoidal sections and bridge</td>
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<td>Flow</td>
<td>Five profiles</td>
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HEC-RAS version 1.0
1995-2015: HEC-RAS is limited to 1-dimensional modeling
2016: HEC-RAS 5.0 is released with 2-dimensional modeling

HEC-RAS 2-D Flow Area
How do you set up and run a HEC-RAS 2D model?
Model Setup

Indian River
Model Setup

Land Use
Model Setup
Model Setup
Model Setup

Add bathymetry
Model Setup
Model Setup
Model Setup
Model Setup
Field Work
Field Work
Model Setup

Add bridges/culverts/dams
Model Setup

Inflows
Model Setup

Inflow Locations
Model Setup

10-Year Storm

25-Year Storm

50-Year Storm

100-Year Storm
Run the Model

Simulation Duration: 1.5 days

Time Step: 5 seconds
View Results

100-Year Storm – Animation
View Results

100-Year Storm – Animation

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Peak flow through Green Farms Culvert about 200 cfs.
Calibrate the Model

Just compare results

OR

Simulate historic storm
Identify Locations with Significant Flooding

- # of Buildings in flood zone
- Critical road flooded
Identify Locations with Significant Flooding
Perform Simulations with Proposed Changes

- Increased culvert opening from 5' diameter to 8' diameter.
- Currently half of culvert blocked by sediment. Cleared sediment.
Perform Simulations with Proposed Changes

Red: Existing Conditions
Hatch: Proposed Conditions
Perform Simulations with Proposed Changes

Peak flow through Green Farms Culvert increased to about 300 cfs.
Once you have a model, the possibilities are endless.

Thank you!

Feel free to contact me at Christine.Suhonen@gza.com
Sources

- https://www.civilgeo.com/the-road-to-hec-ras/