

Creative applications for 2D Rapid Inundation Modeling

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Elise Ibendahl, PE, CFM, ENV SP



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Content

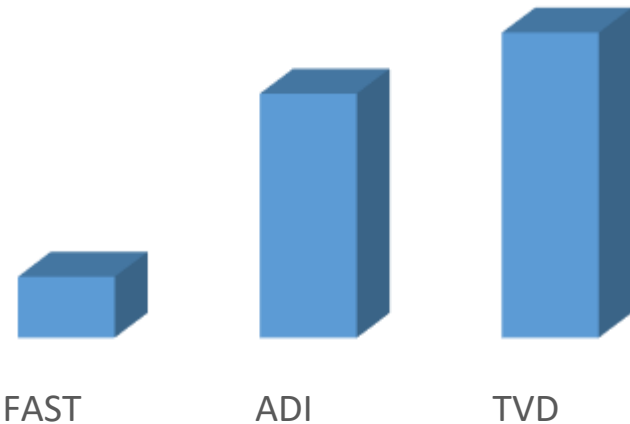
Unique applications for the 2D Rapid Inundation solvers with real-world examples

- FAST solver overview
- Hot-Spot identification
- Zone A assessments
- Detailed extent definition
- Storm surge propagation
- SWMM surcharging
- Boundary conditions

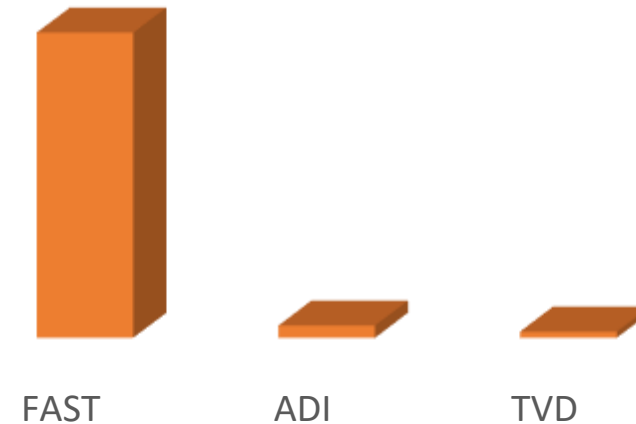
Types of 2D Solvers

- ADI & TVD are 'full solvers' (full shallow water equations: mass & momentum)
- **FAST is a 'simplified solver' (mass conservation, but ignores momentum)**
- ADI = alternating direction implicit, TVD = total variation diminishing, FAST = fast

Physics included (=potential accuracy?)



Calculation speed



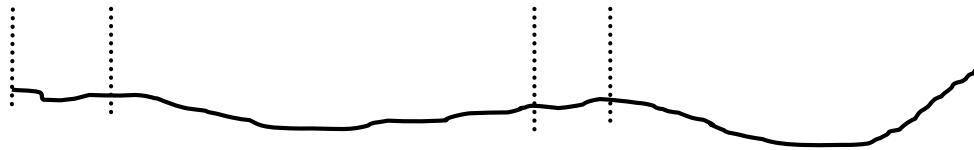
Rapid Inundation solver in Flood Modeller

- Start with topography



Section through topography

- Split into depressions



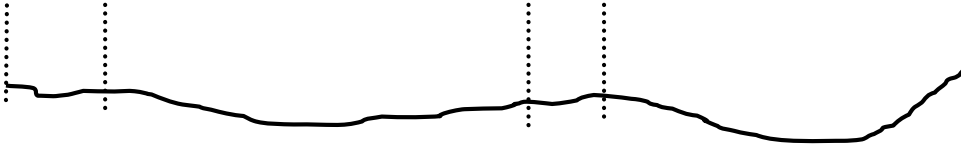
Low areas separated by 'ridges' in DTM



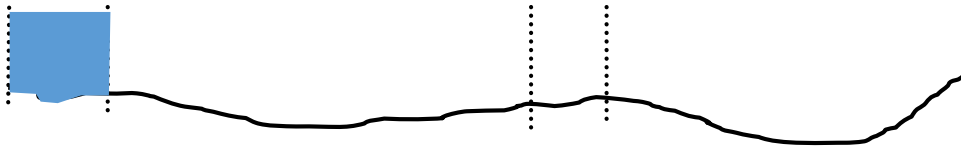
Rapid Inundation solver in Flood Modeller



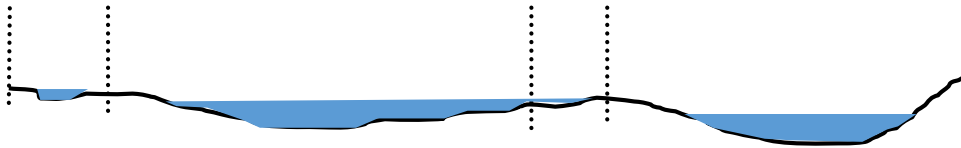
- Start with topography



- Split into depressions



- Insert volumes from sources



- Spread over floodplain



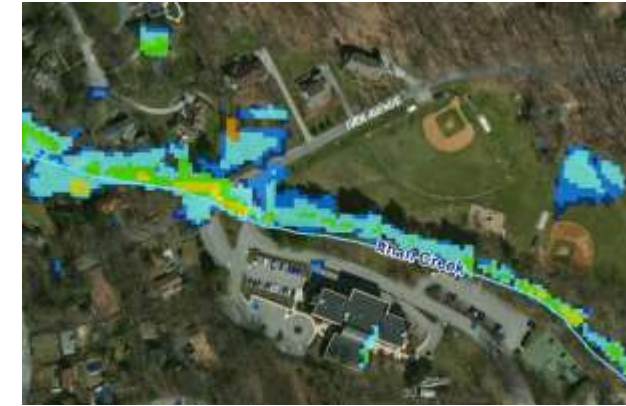
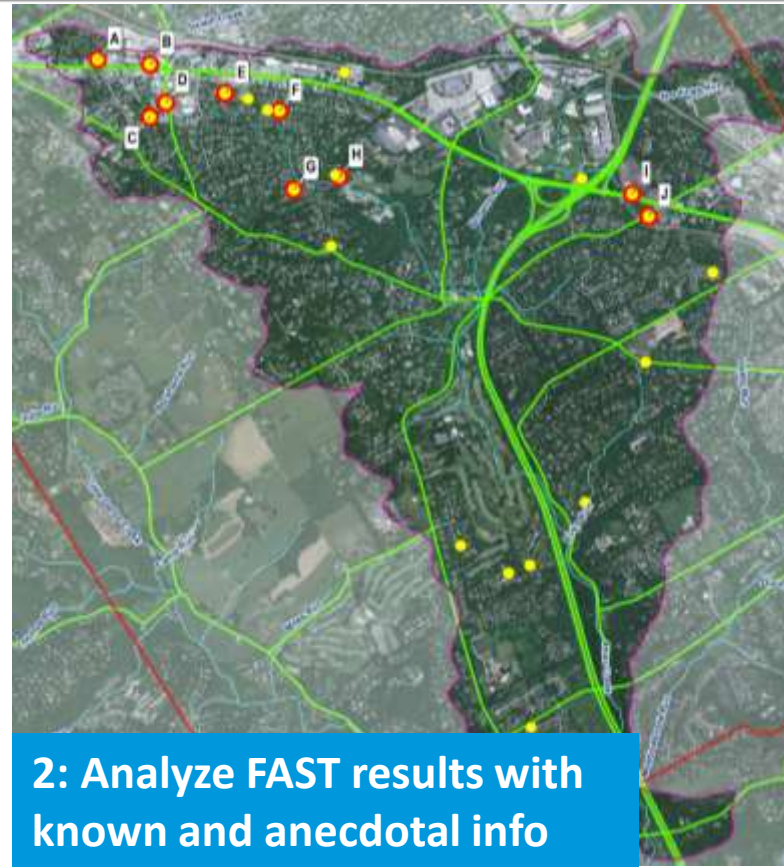
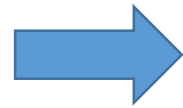
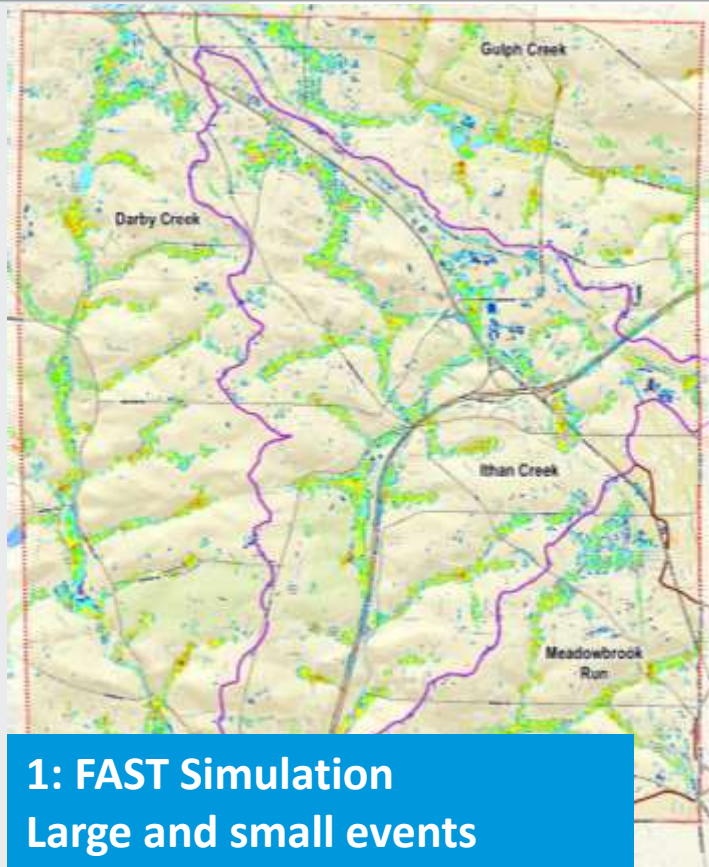
Unique Applications



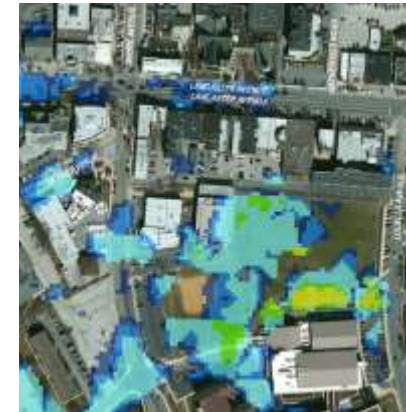
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Localized Stormwater Problem Hot-Spot Identification



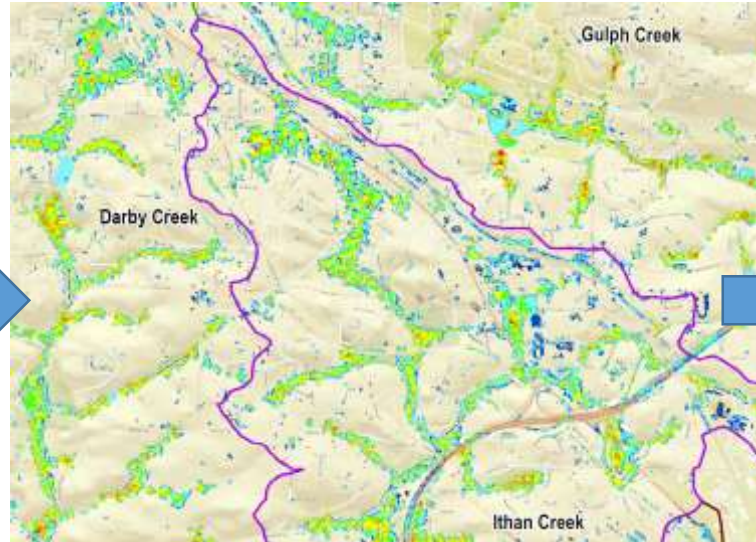
3: Select key
hot spots for
study and
master plan



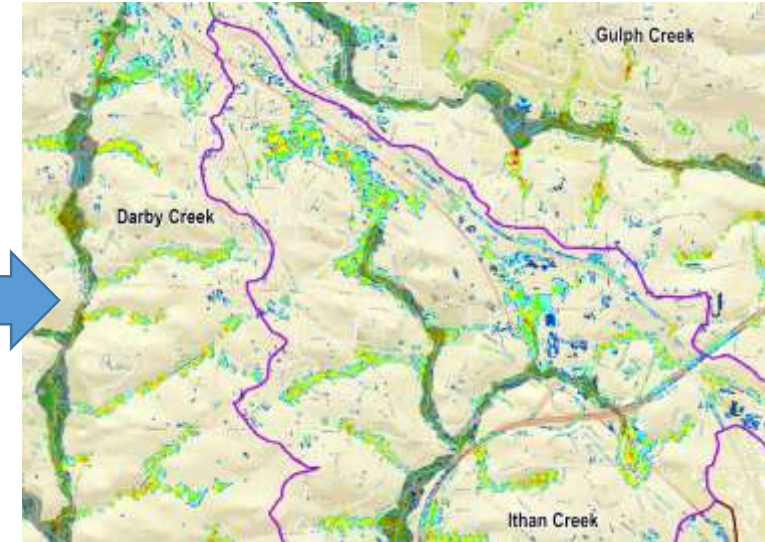
FIRM Zone A Assessment



1: FIRM Zone A

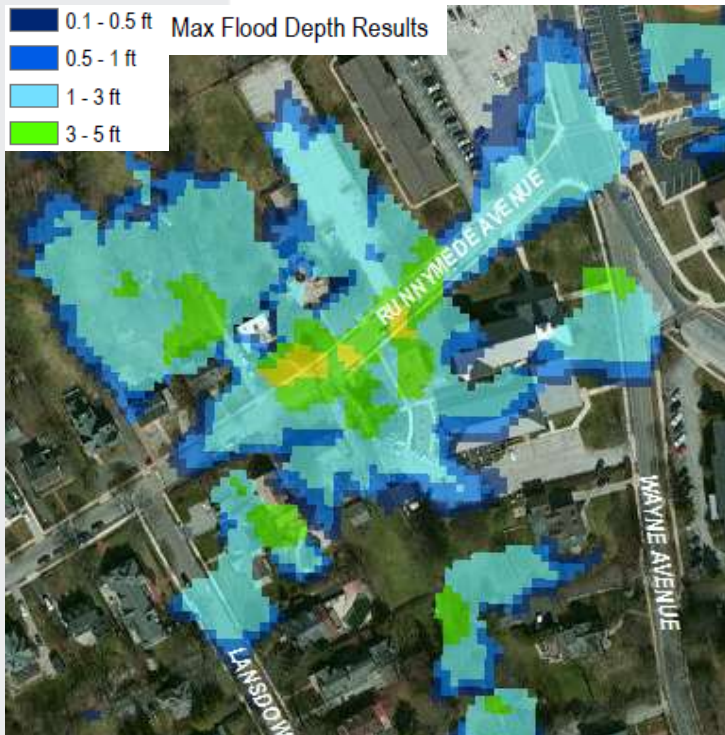


2: 100-yr FAST Simulation

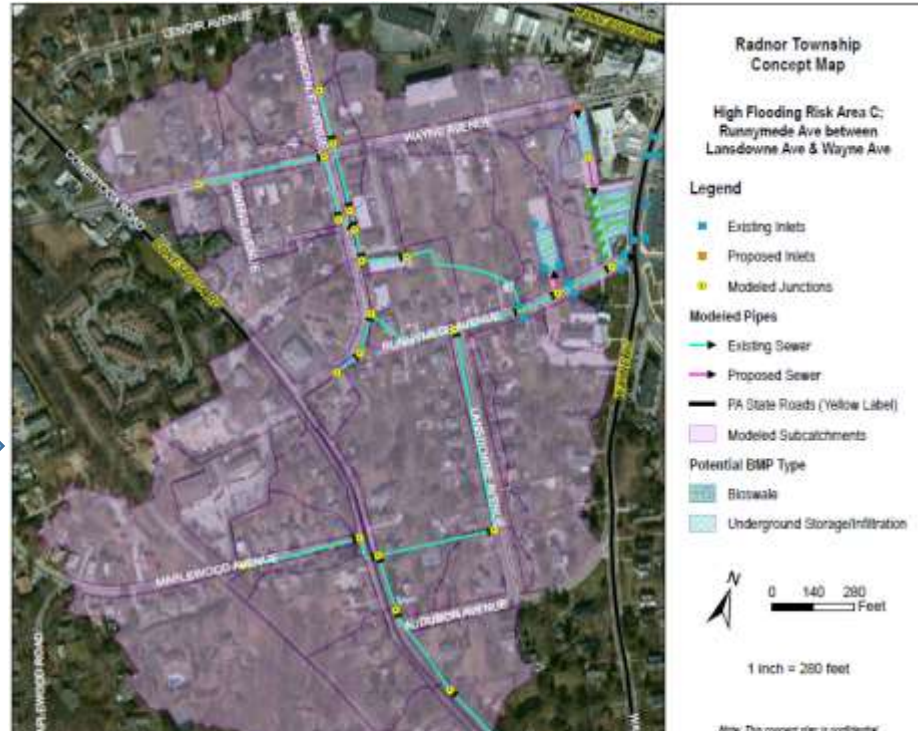


3: Comparison

Establish Detailed Modeling Extents and Links



1: FAST simulation in problem catchment

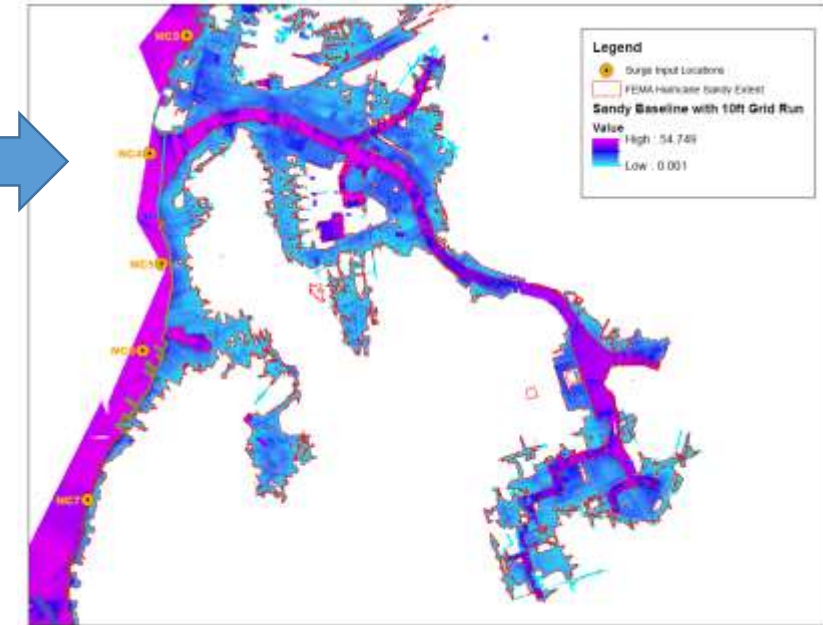
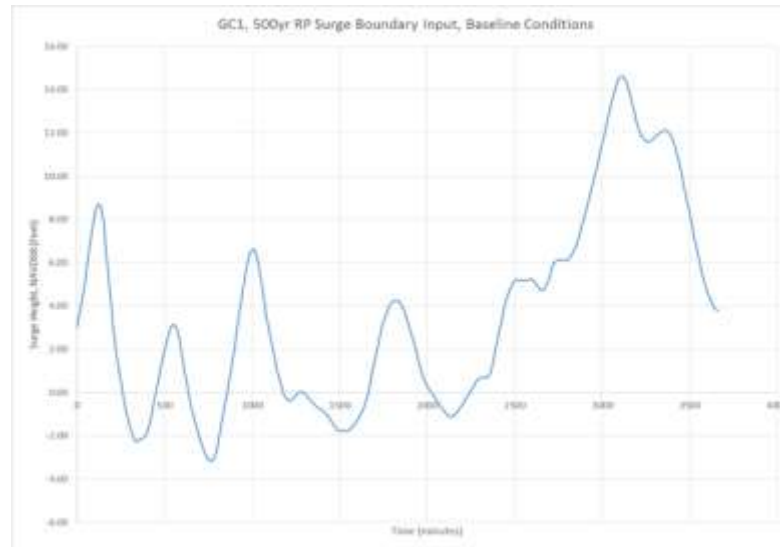
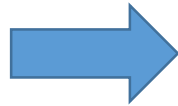
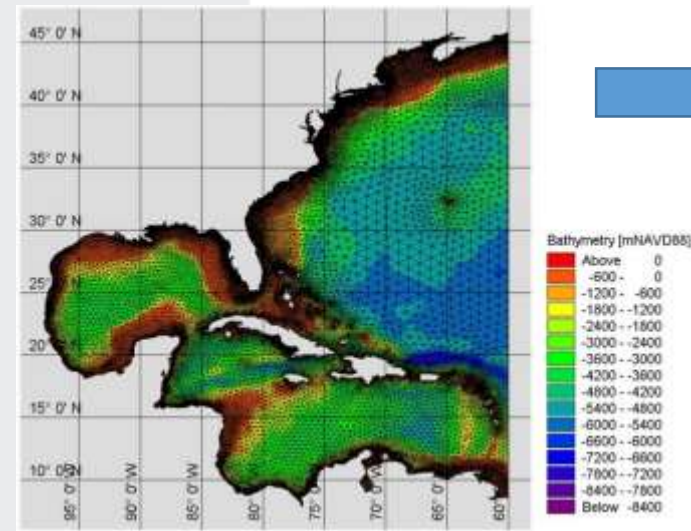


2: Detailed SWMM model with FAST link, Existing and Proposed



3: Detailed concept design

Refine Landside Storm Surge Propagation

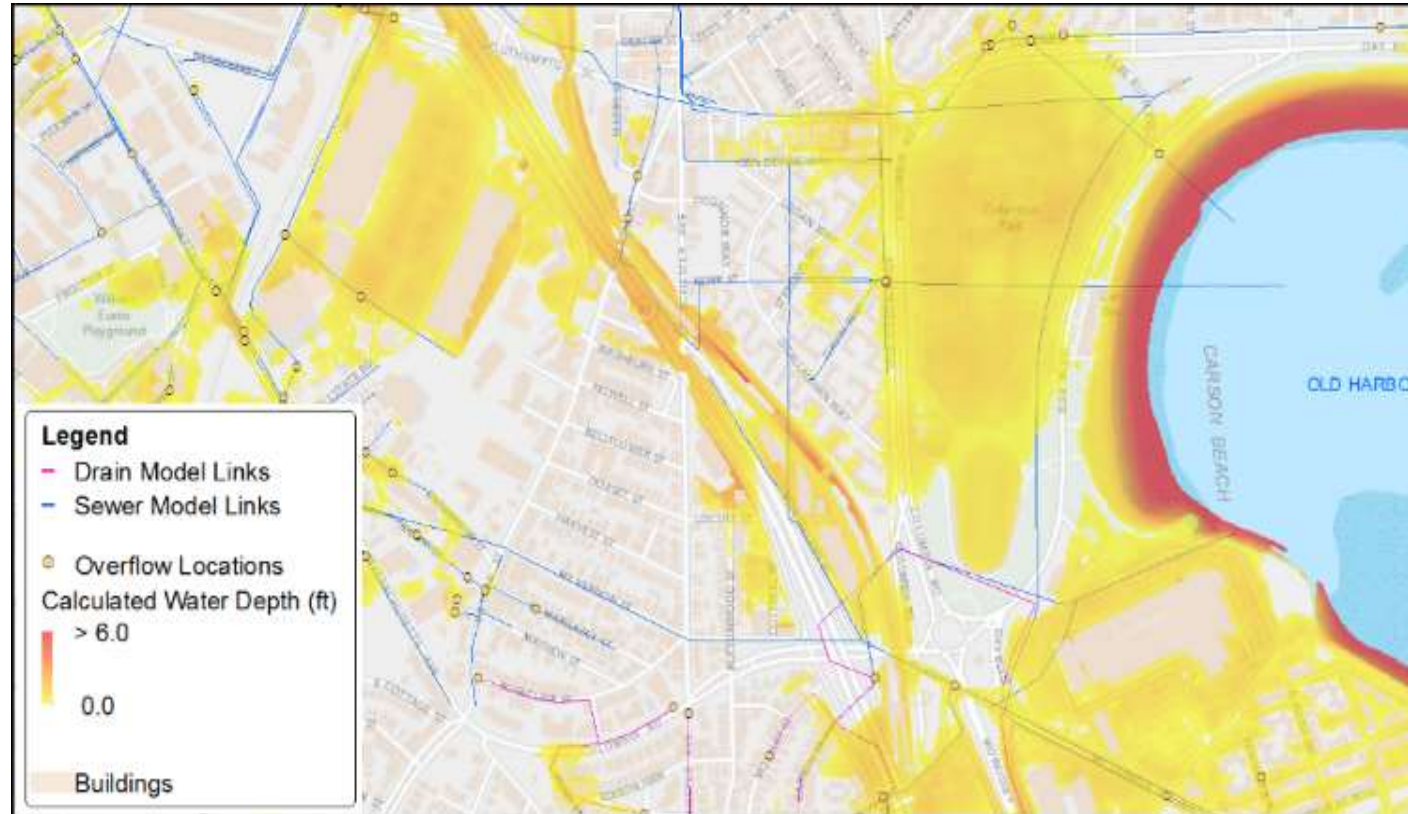


1: MIKE 21 regional surge modelling with coarse, flexible mesh

2: MIKE 21 surge modeling output generates boundary conditions along shoreline

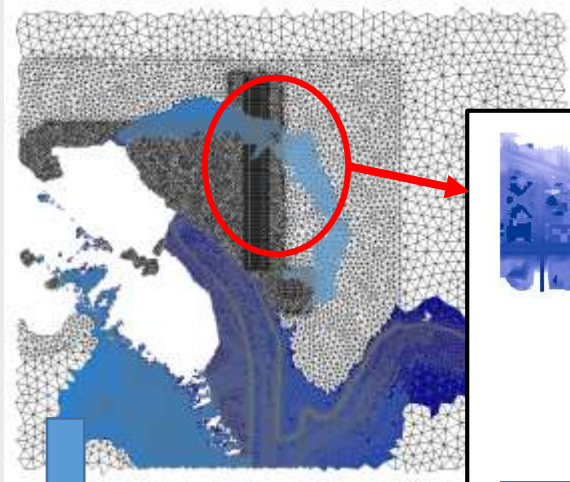
3: FAST Simulation of storm surge boundary condition input, 3ft bare earth DEM

SWMM Surcharging Surface Extents



Flood Modeller 2D FAST solver used for the city of Boston to help identify areas that will be prone to flooding at future year milestones due to sea level rise, storm surge, combined and storm sewer systems surcharging.

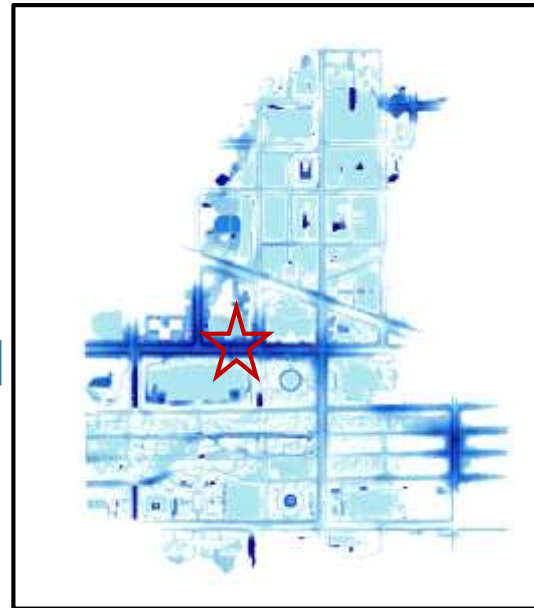
2D Boundary Conditions Example: 100-yr Rainfall and Levee Breach during Storm Surge with SLR



1: MIKE 21 sea level rise surge modelling with coarse, flexible mesh



2: Generate Detailed Surge Impact Boundary with FAST



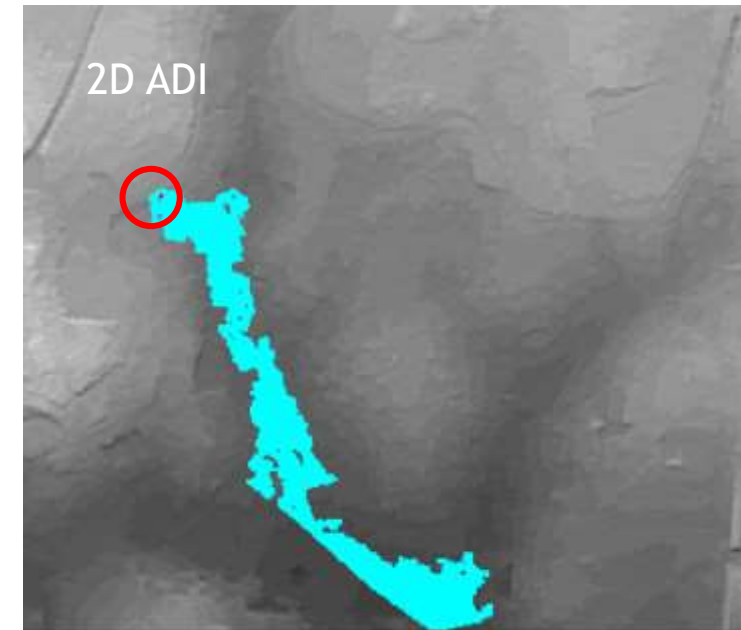
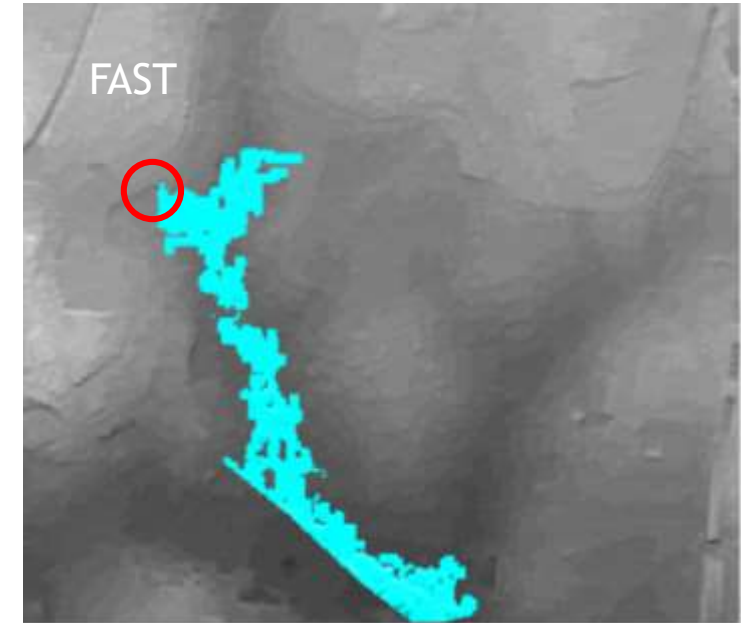
3: ADI 2D Catchment Surface Flooding Model, 100yr Event



4: ADI 2D Model with FAST Surge Boundary Condition

Conclusions

- Rapid Inundation Modeling is a simplified approach – focus on calculation speed
- Doesn't consider momentum
- In addition to using for preliminary results, Rapid Inundation is useful for:
 - Identifying hot spots
 - Assessing Zone A
 - Defining detailed model extents
 - Storm surge propagation
 - SWMM surcharging
 - Setting boundary conditions



Questions?

Elise Ibendahl

Elise.Ibendahl@ch2m.com

