ICE WaRM
International Centre of Excellence in Water Resources Management

BEGINNING SOON: 2pm Sydney Time

WEBINAR:

Water Modelling using HEC-RAS: 1D and 2D

Presented by Krey Price, Mark Forest, Robert Keller

Australian Government

Surface Water Solutions

HDR

Australian Water School

MONASH University

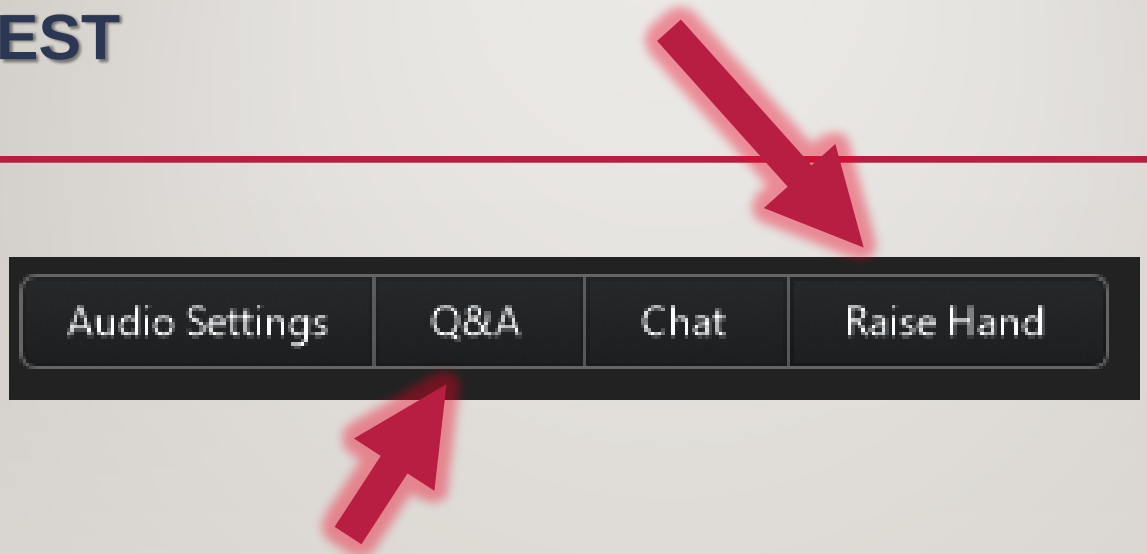
CHAIR

Trevor Pillar,

National Partnerships Manager,

ICE WaRM

TEST



Please click on Q&A and start writing questions as they come to mind.

UP COMING HEC-RAS TRAINING COURSES:

- **Date**: Monday 11th - Friday 15th September, 2017
  - *Attend any or all days*
- **Location**: Brisbane
- **Presenters**: Robert Keller, Krey Price, Mark Forest
- **Register**: http://www.icewarm.com.au/australian-water-school/short-courses/course/5th-hec-ras-water-modelling/

AGENDA

- **Format:**
  - 25 mins: **Presentations:**
    - RAS Mapper and GIS Interfacing (Krey Price)
    - Subgrid Terrain Detail (Mark Forest)
    - Hydraulic Structures (Bob Keller)
  - 25 mins: **Q&A** open to all
- **Recording**- will be sent to all
- **Feedback**
  - 1 minute after Webinar
  - All comments welcome- helps shape future webinars

Today's Attendees:

Today's Presenters

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Mark Forest

Global Practice Leader

HDR Inc.

Dr. Robert Keller

Honorary Associate Professor

Monash University

Krey Price

Director

Surface Water Solutions

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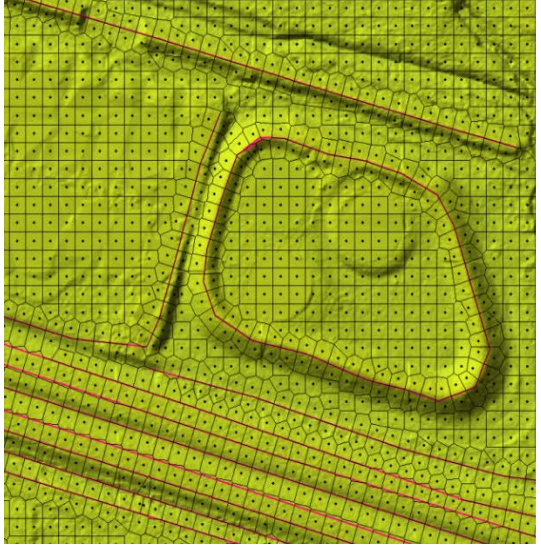
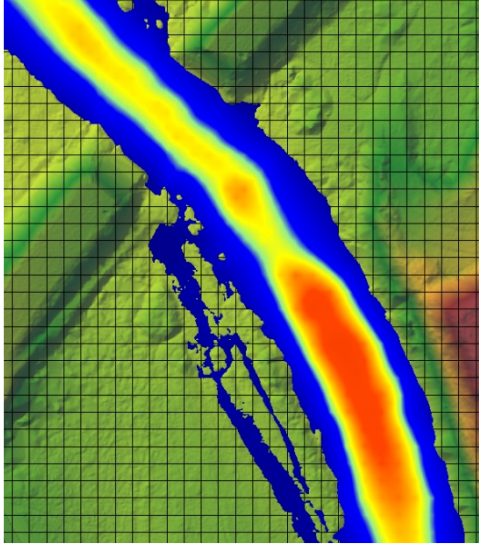
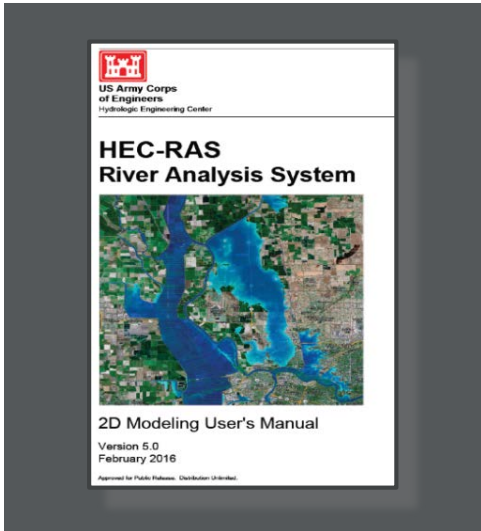
What is HEC-RAS 5.0?

- 2-dimensional Hydrodynamic Flow Routing
- Similar to the use of a Storage Area
- Linked 1D/2D Capability
- Independent 2D Domain for Overbank or Channel
- Full Saint Venant or Diffusion Wave Equation Solution Options
- Implicit Finite Volume Solution Algorithm
- 1D and 2D Coupled Solution Algorithm
- Unstructured or Structured Computational Meshes with Variable Sizes in Domain
- Detailed Hydraulic Table Properties for Computational Cells and Cell Faces
- Multi-Processor Based Solution Algorithm
- 64 Bit and 32 Bit Computational Engines







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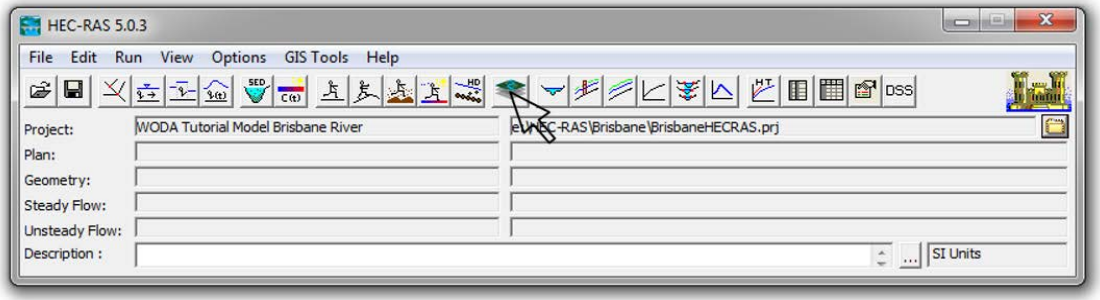
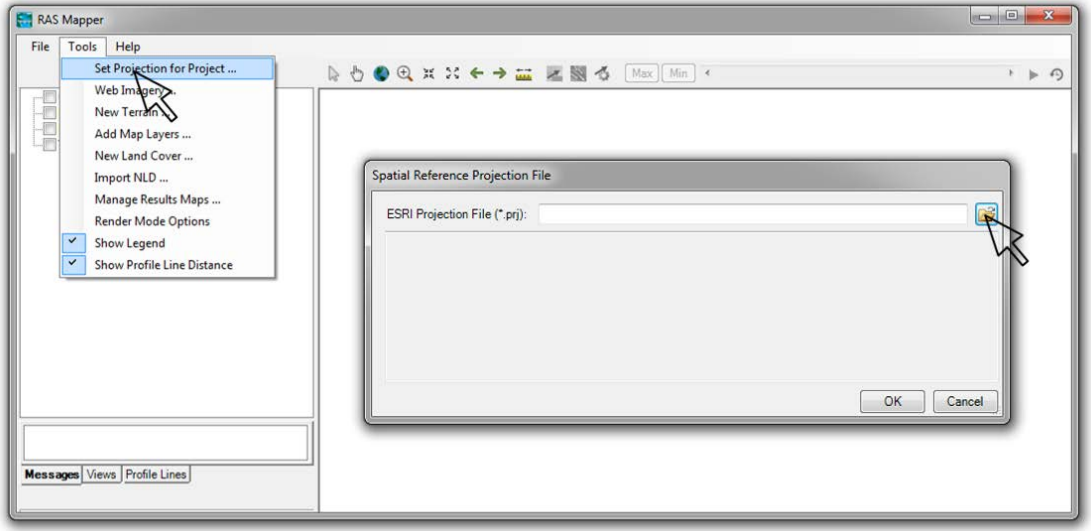
RAS Mapper





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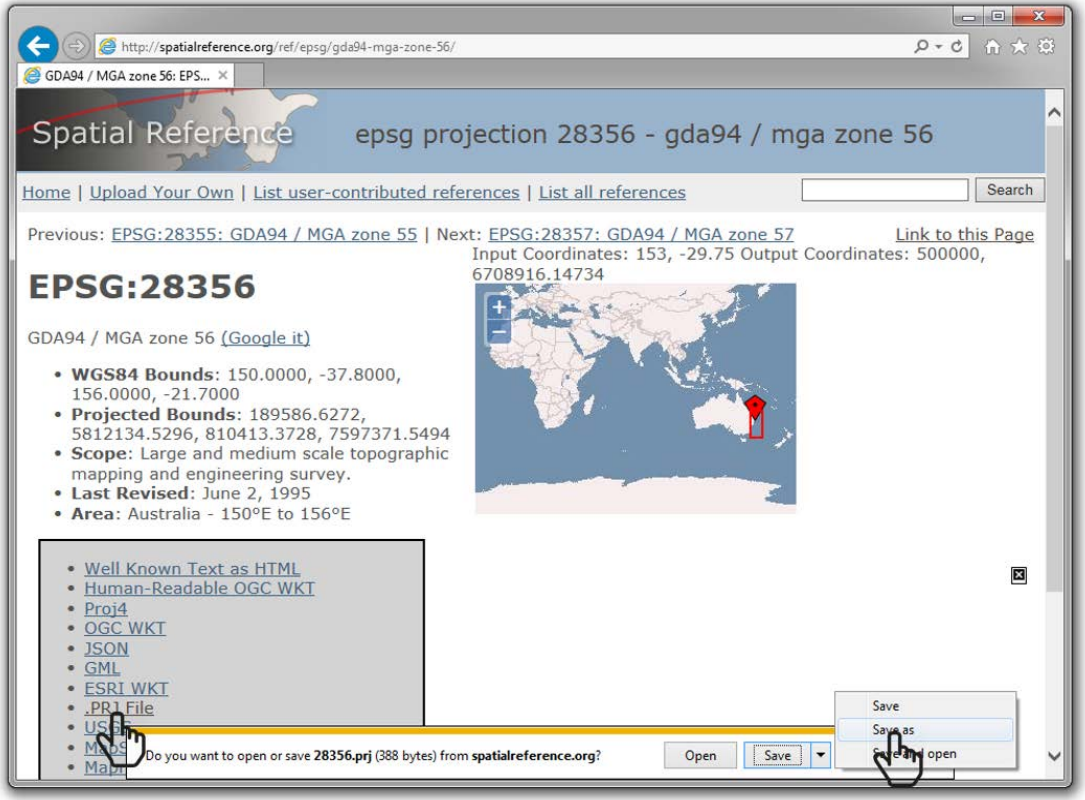

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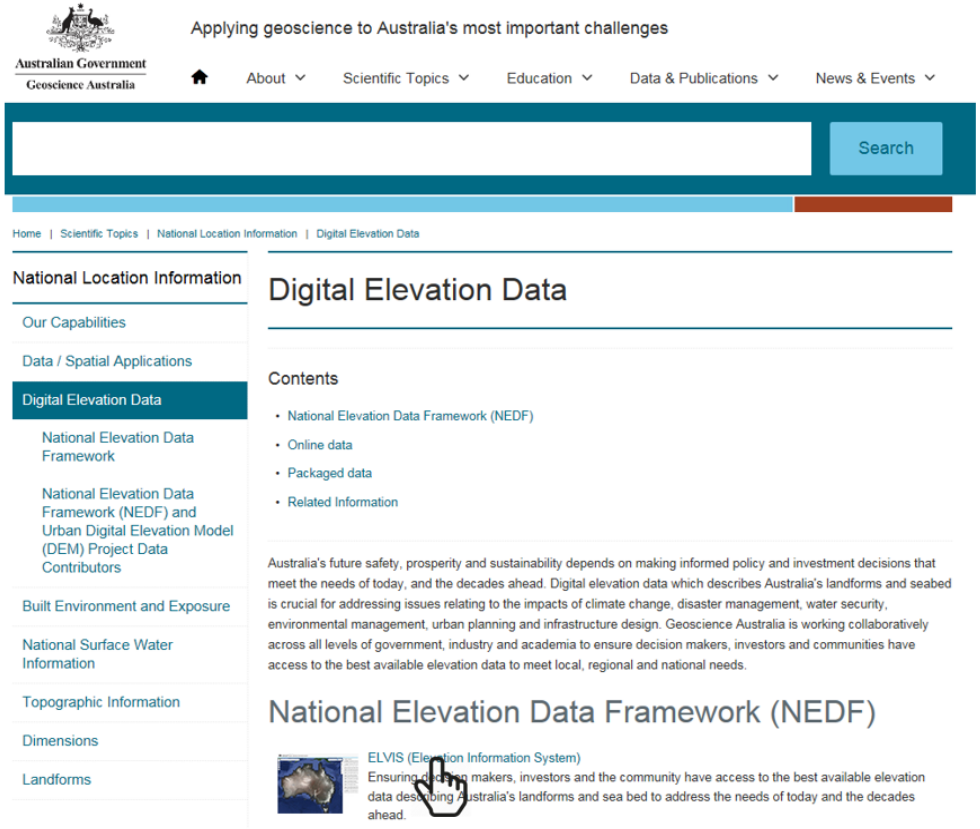

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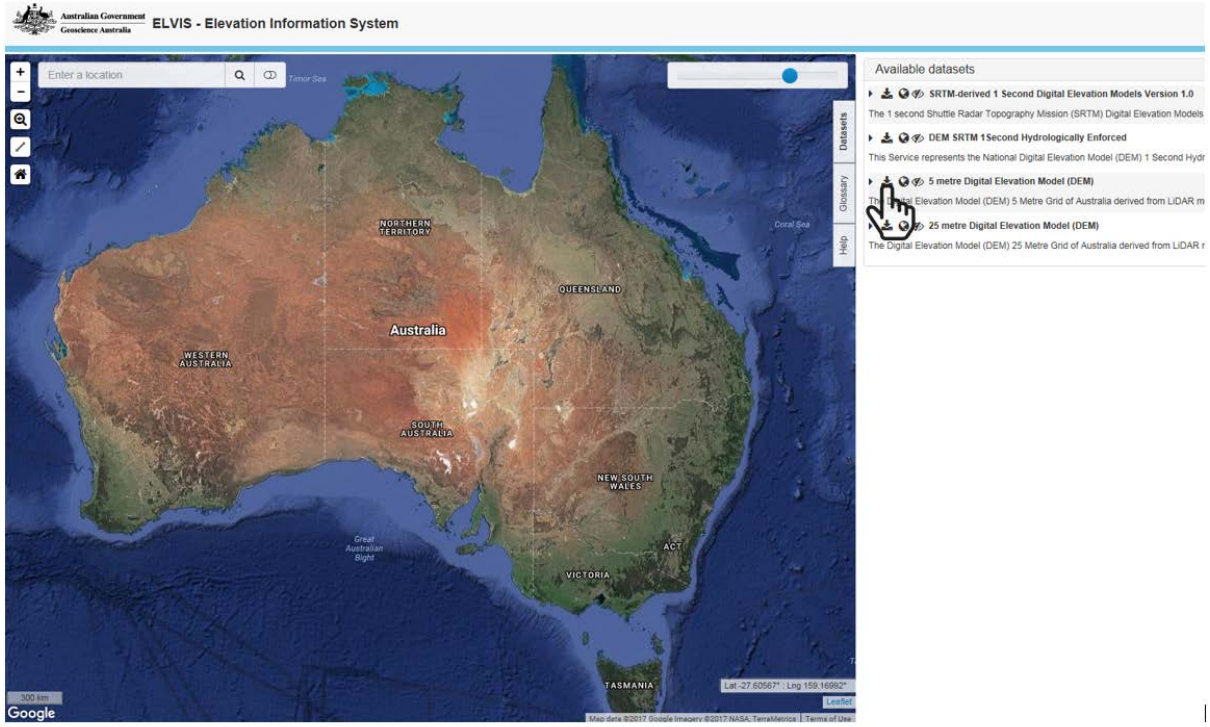

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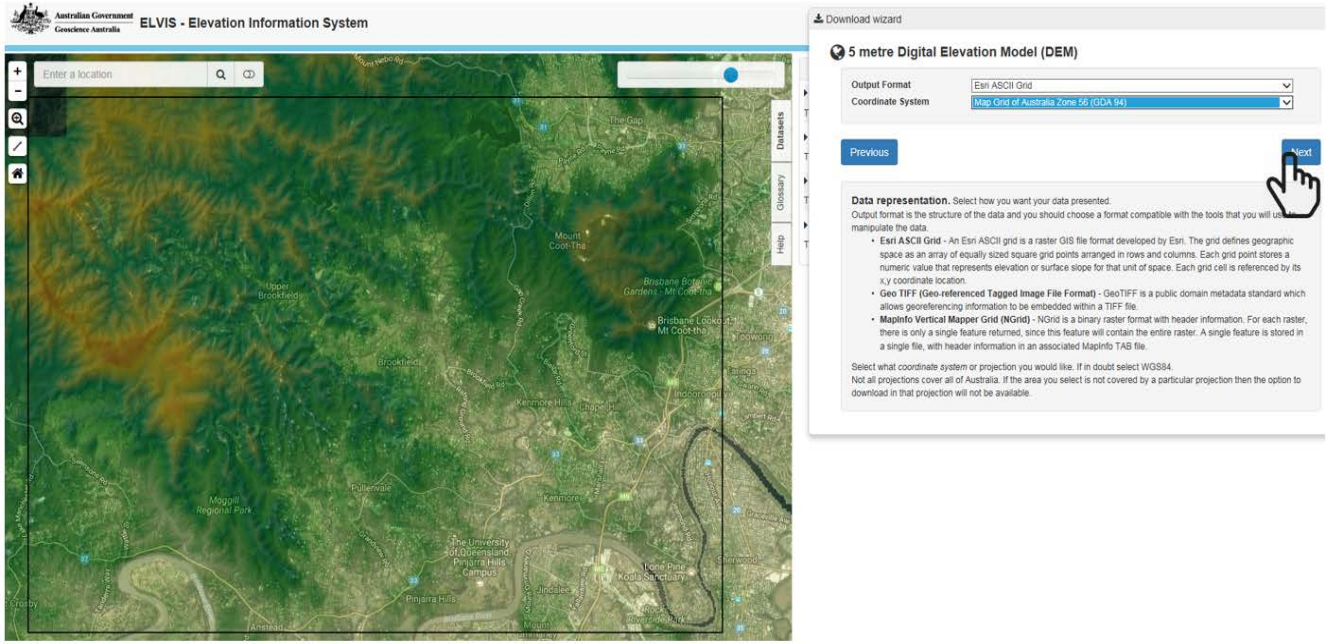

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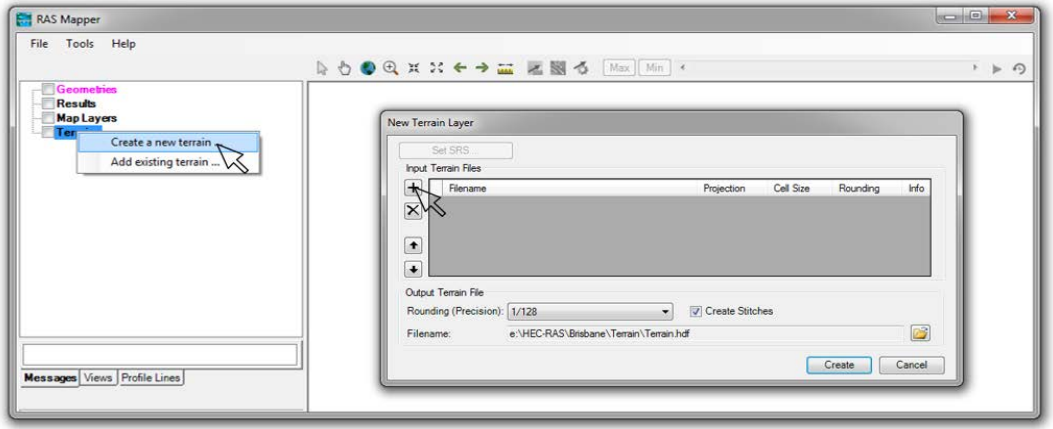

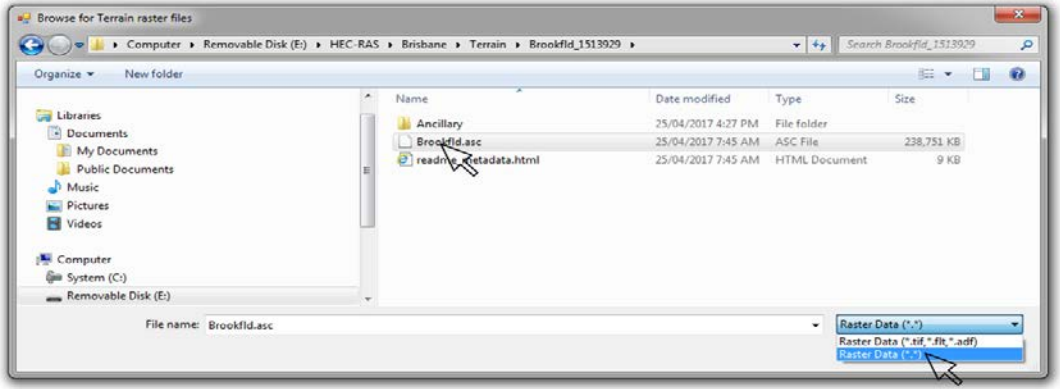

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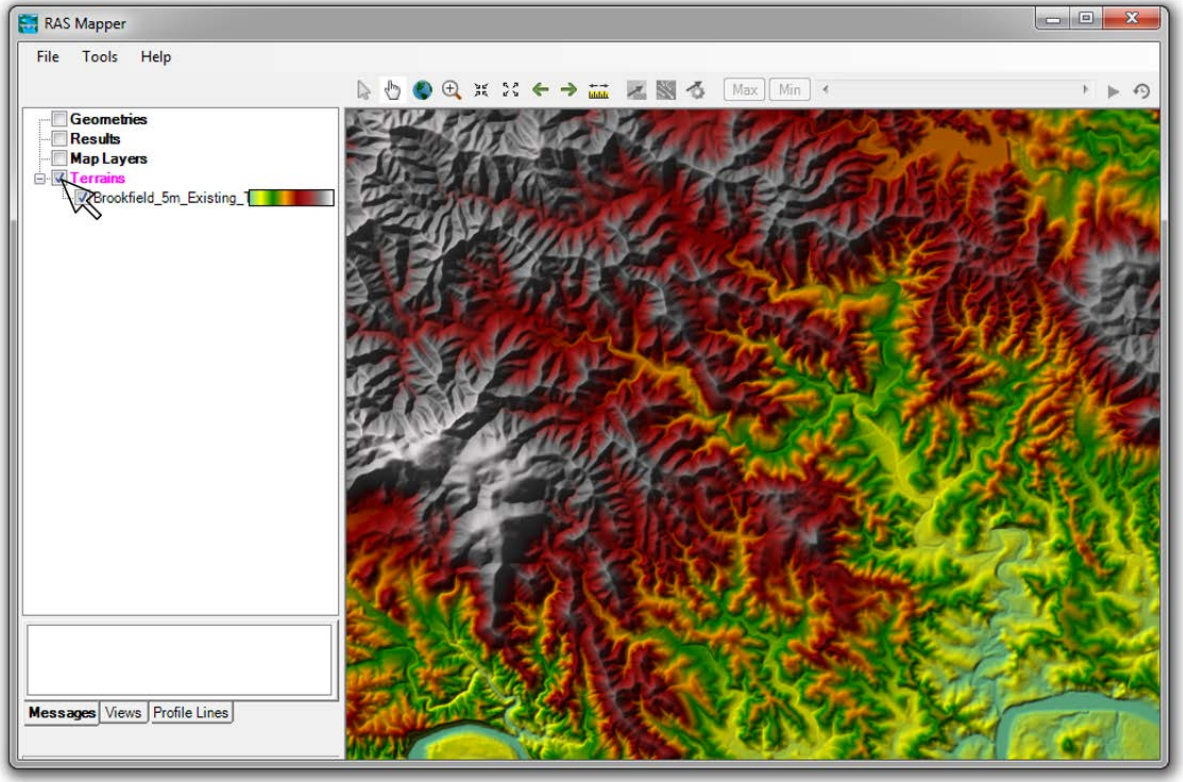

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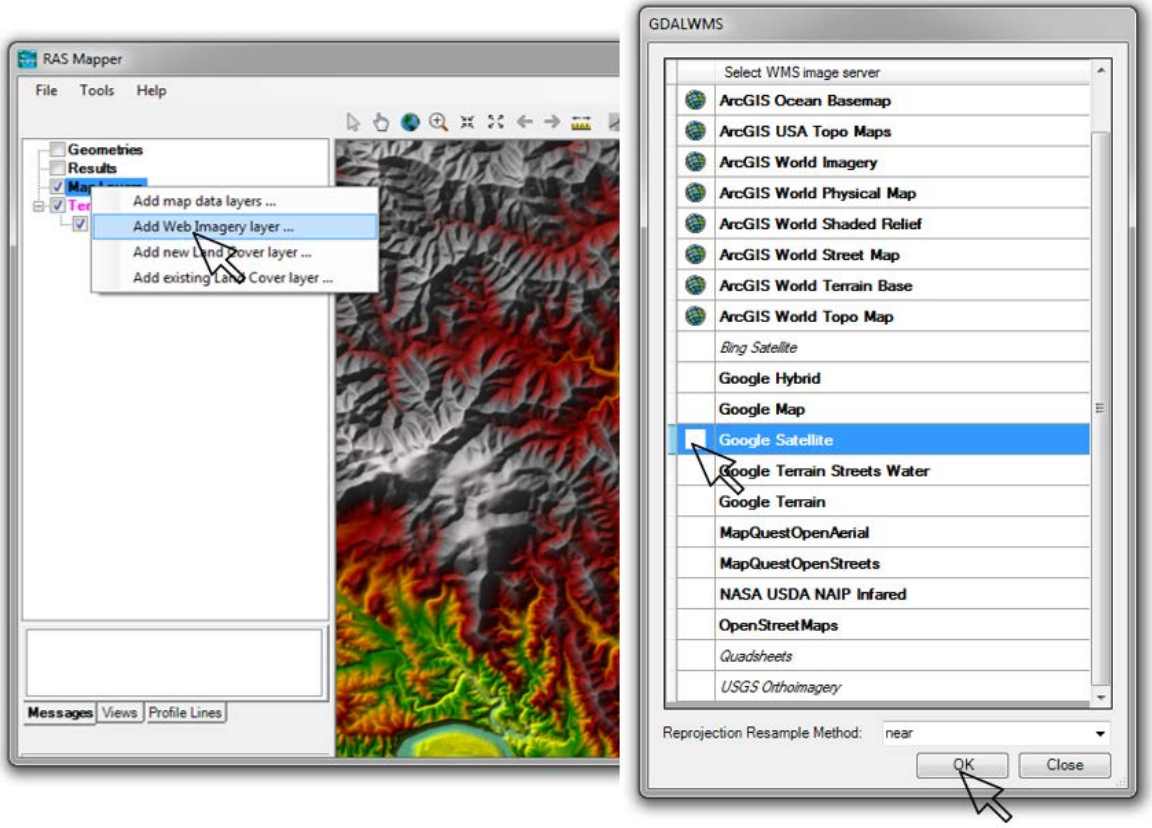

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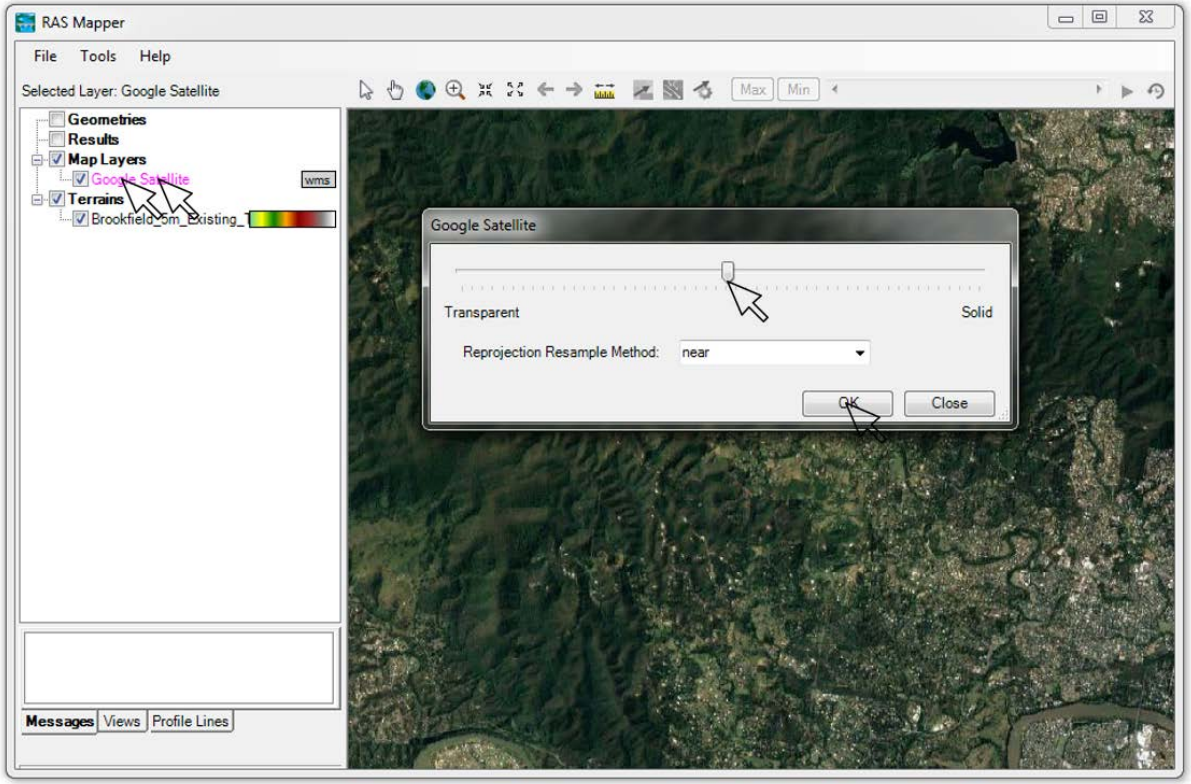

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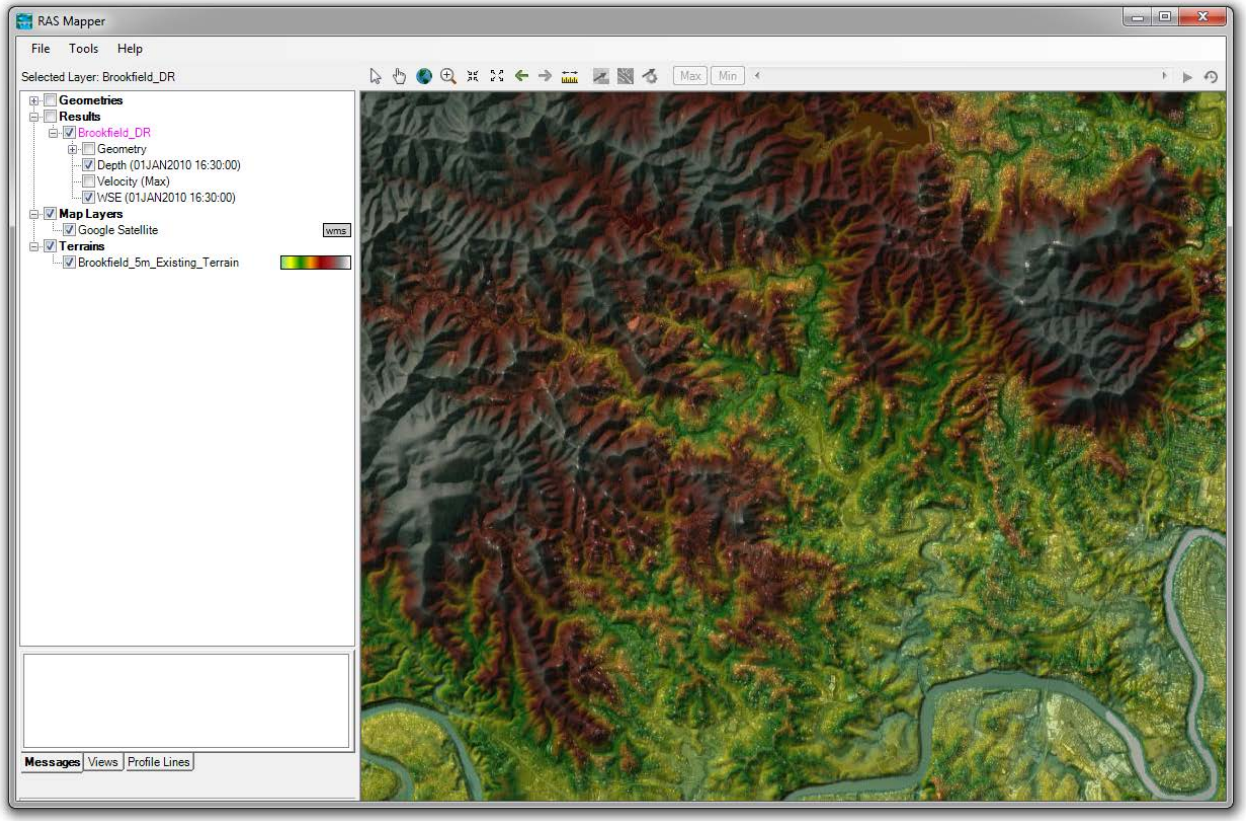

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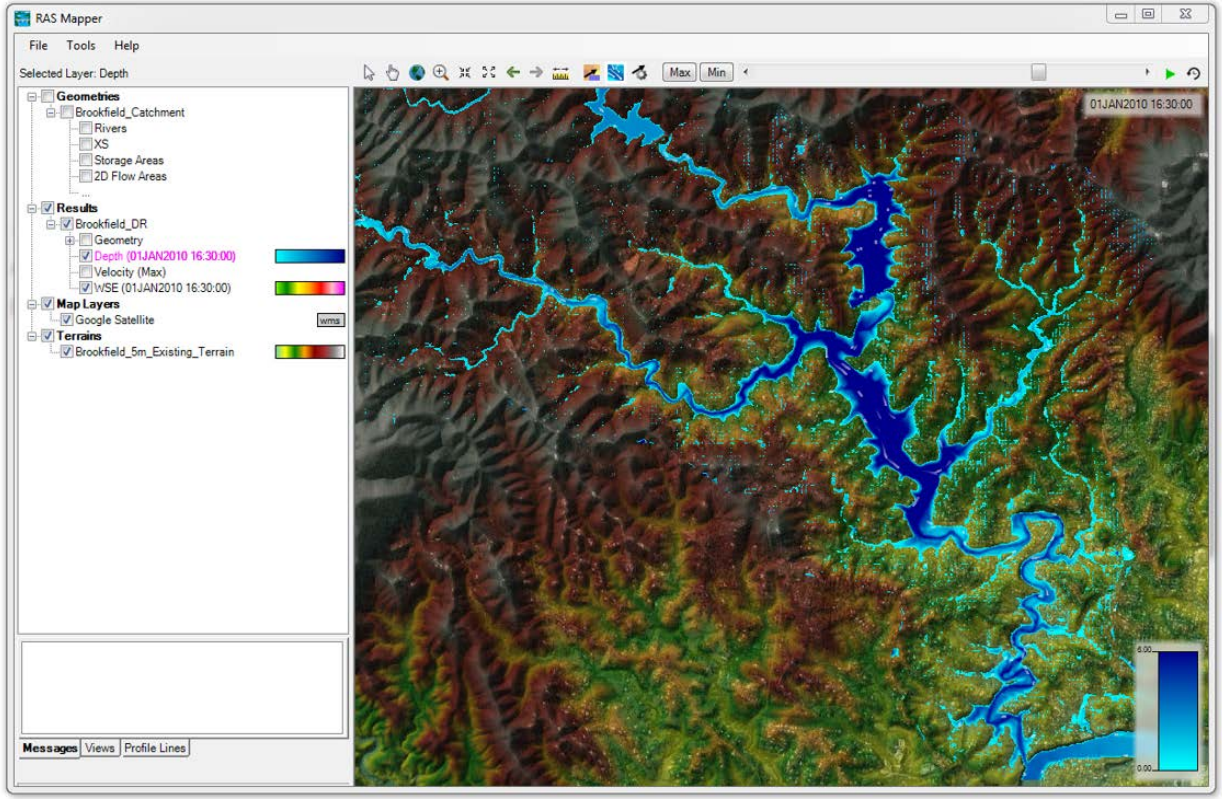
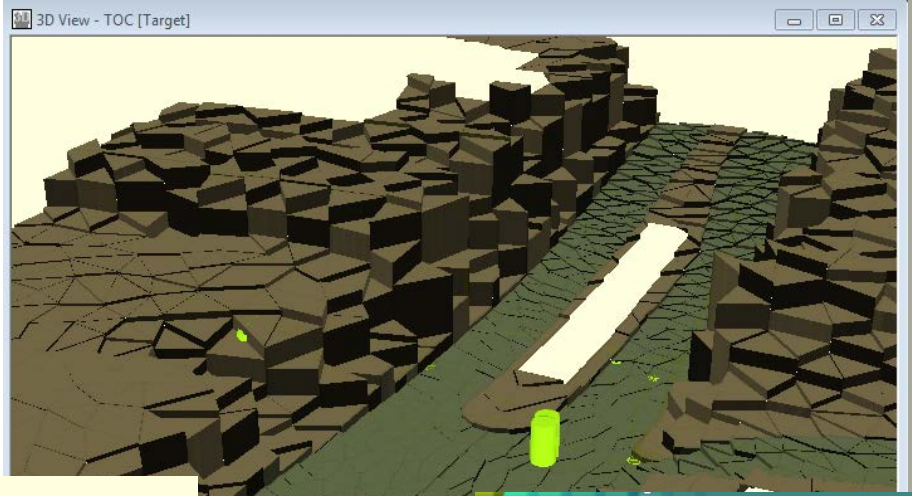
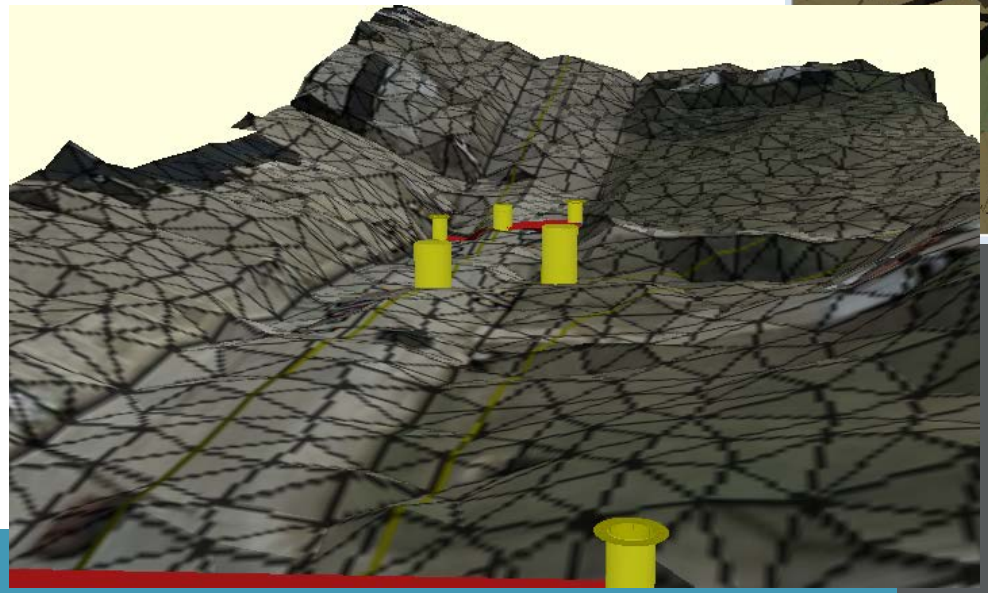
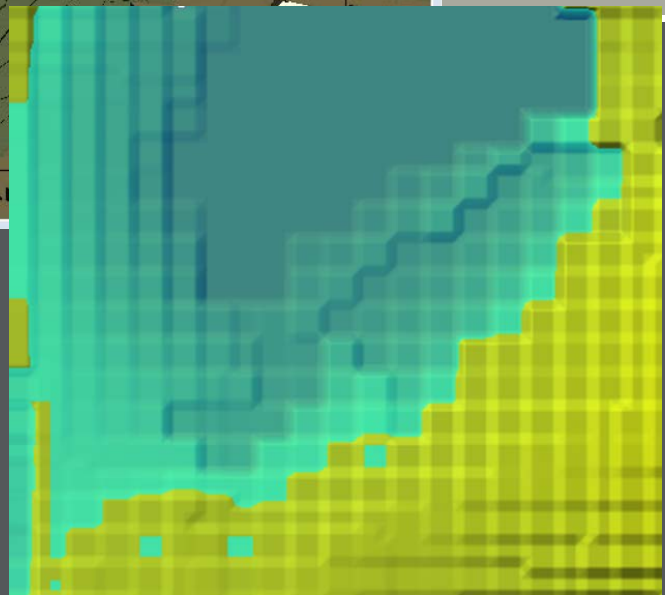


Sub-Grid Level Detail is Important

- Most 2D Software Packages Simplify the Terrain
- Simplified terrain requires smaller grids

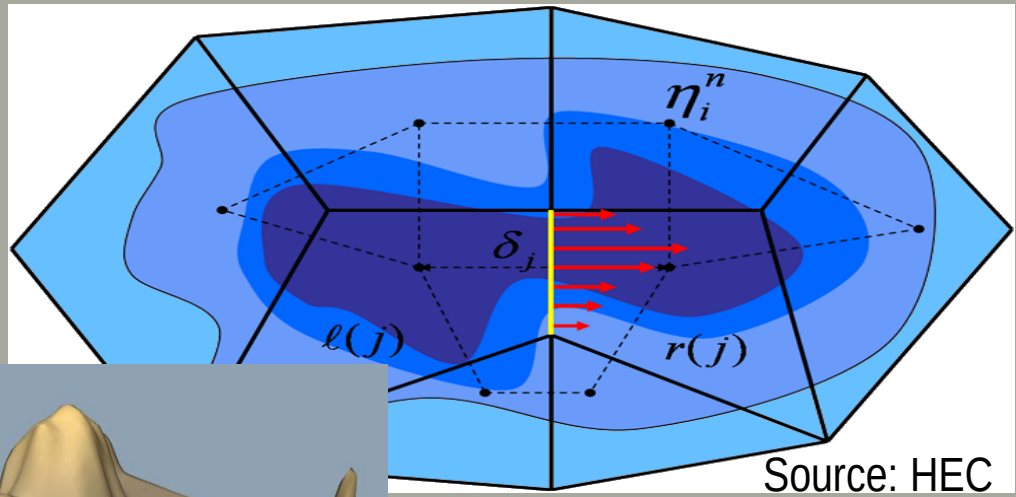




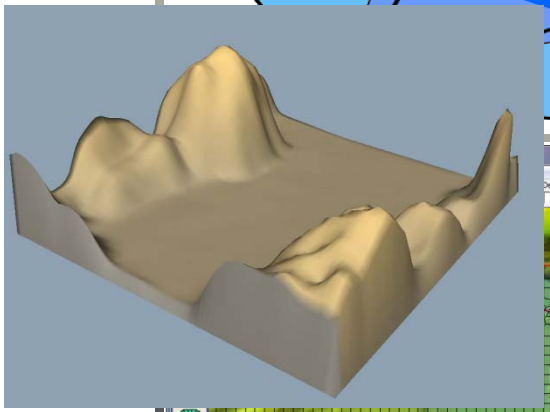


How is RAS Different?

- Computational Mesh with Sub-Grid Terrain Data (Full Terrain Detail is Utilised)
- Gridding Process Defines Hydraulic Property Tables
  - Elev-Wetted Perimeter (Face)
  - Elev-Area (Face)
  - Roughness (Face)
  - Elev-Volume (Cell)
- Cell Face is a Detailed Cross Section
- Able to Capture Complex Hydrodynamics



Source: HEC



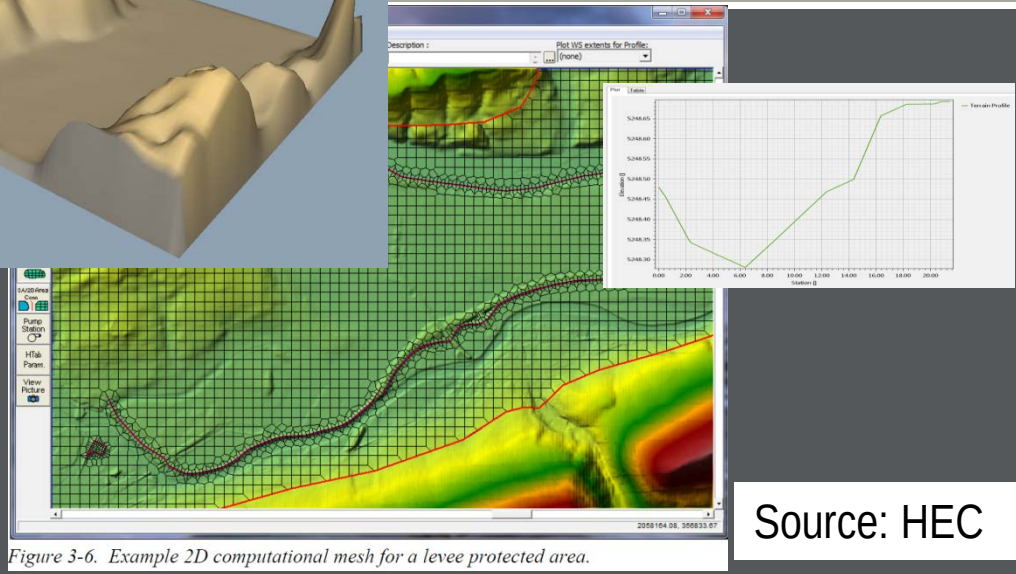


Figure 3-6. Example 2D computational mesh for a levee protected area.

Source: HEC

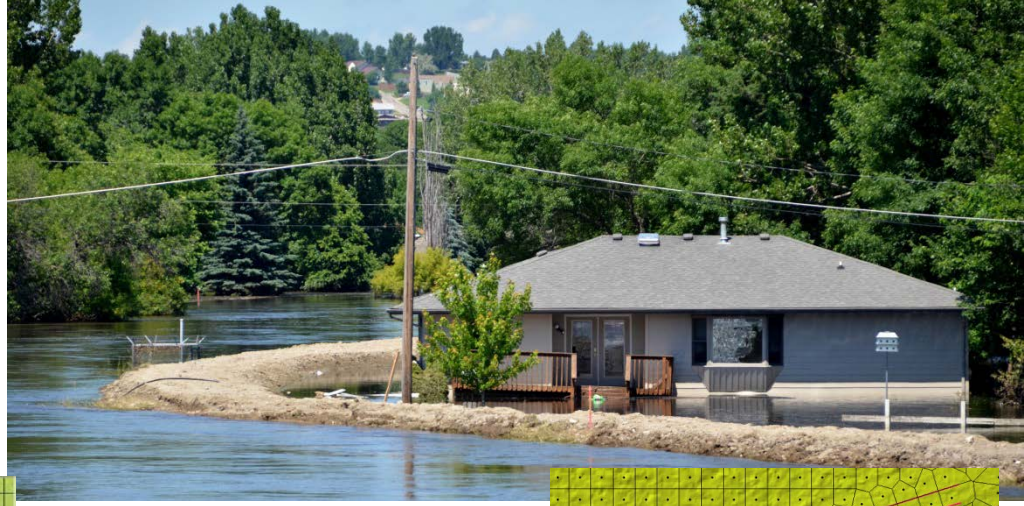
Mississippi/Ohio River Flooding
May 2011 – Forced Levee Breach

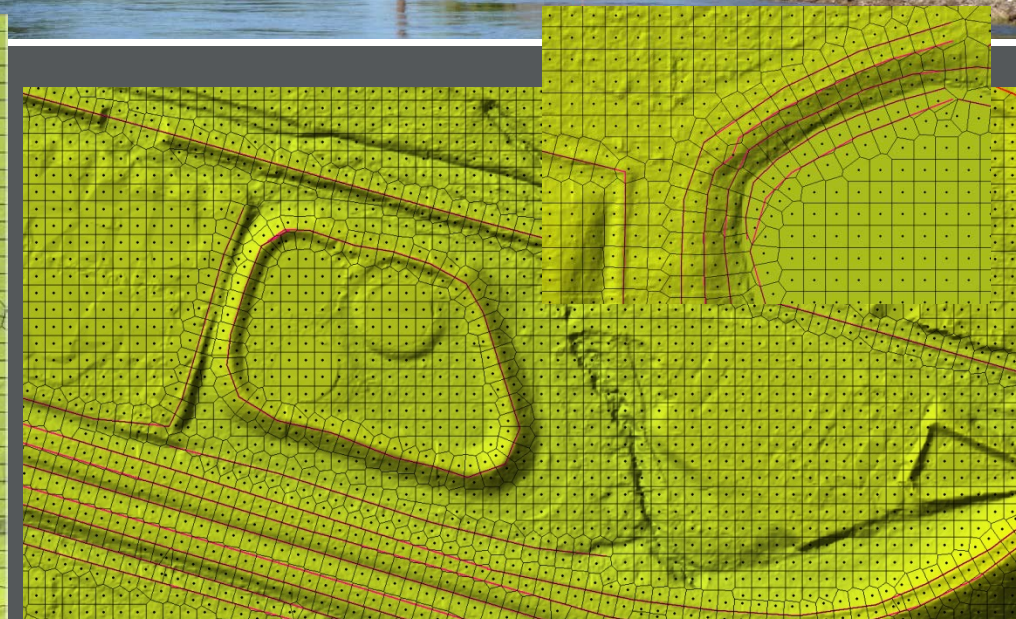
- Installed over 100 Temporary Gages to Capture the Event
- Used as Model Validation

Source: HEC

Adding Breaklines to Capture Linear Features

- Breaklines allow user defined grid boundaries to define linear features and gridding process





Hydraulic Structures

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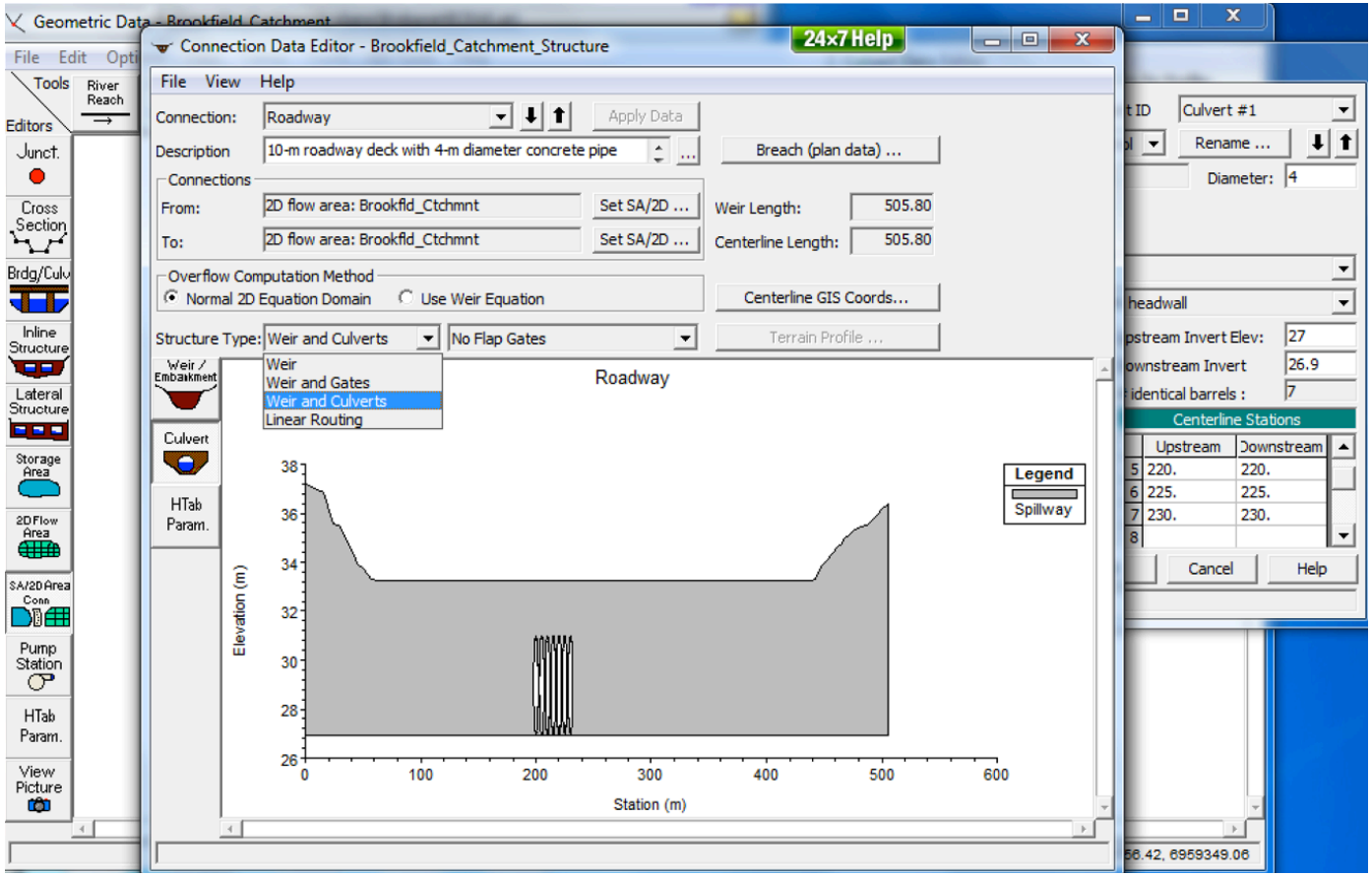

Hydraulic Structures

- Modeling hydraulic structures in RAS 2D very limited
- Some options for adding a bridge
- Eg:
  - Simply modify the terrain to include the bridge embankments, piers, and abutments
  - Advantages:
  - Easy to set up for existing bridges that are included as part of the terrain
  - Disadvantages:
  - Requires manually editing your terrain if you want to model a proposed bridge.
  - Can only simulate low flow through a bridge (can't impact the bridge deck).
  - Can't simulate complex-shaped piers.

Hydraulic Structures

- Alternatively:
  - Use a SA/2D Area Connection with a culvert (or culverts) - useful for wider bridges with relatively small openings when the bridge deck is impacted during the flood - spacing between box culverts simulates the piers.
  - Advantages:
  - Can simulate low flow and high flow conditions (i.e. bridge overtopping).
  - Disadvantages:
  - Uses culvert equations to model a bridge.
  - May not be able to get the culvert shape to perfectly match the bridge opening
  - Requires calibration
- NOTE BRIDGE SCOUR ISSUE

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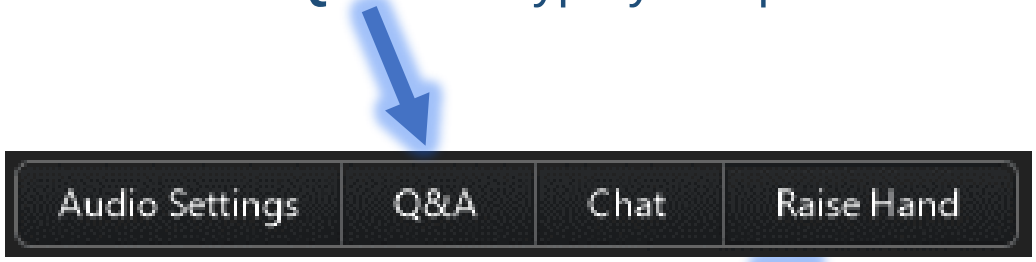
Hydraulic Structures

Hydraulic Structures

- If scour is an issue, must use 1-D modeling
- Other Structures
  - Irrigation controls
  - Pump stations
  - Many lateral structures
  - Etc etc
- Use 1-D modeling for proper structure simulation

Logistics for Q&A

1. Please click **Q&A** and type your question:



2. Please click **raise hand** and ask a **live** question on screen.

Thanks for participating

REMINDER:

- FEEDBACK: complete short survey as you close this window.
- RECORDING: link will be emailed
- BRISBANE COURSE: 11 - 15 September- *attend any or all days*
- FREE WEBINARS:
  - **25th May: Smart Water Grids**: *SA Water CEO Roch Cheroux*
  - **15th June: Hard-Rock Groundwater Recharge**: *Peter Dillon, Yogita Dashora*
  - **29th June: Next Generation Irrigation Management**: *Tim Hyde, Ivor Gaylard*
  - **20th July: Community Wastewater Reuse with HRAP**: *Howard Fallowfield*
- TWITTER: @**ICE_WaRM**_ keep up-to-date with ICE WaRM