HEC-RAS Mapper Results Visualization

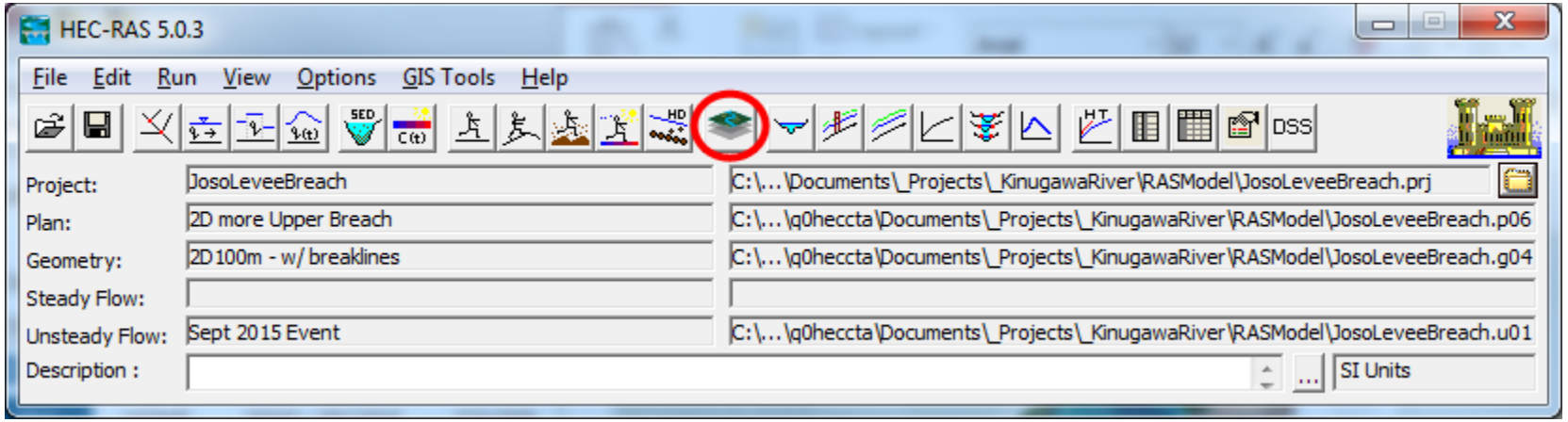
Alex Kennedy
Cameron Ackerman, P.E., D.WRE

USACE, Institute for Water Resources, Hydrologic Engineering Center

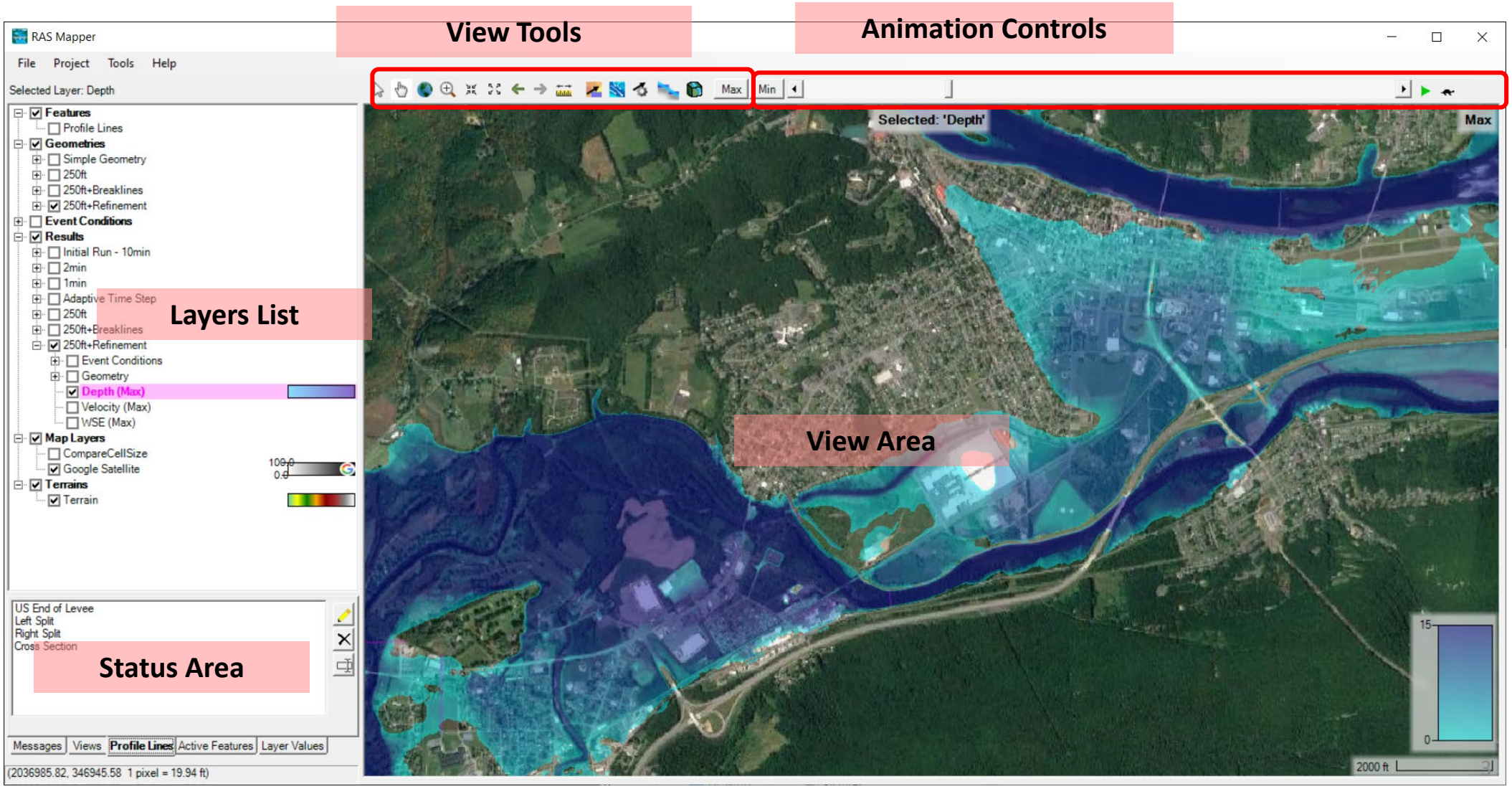
US Army Corps of Engineers

Overview

- How do we visualize RAS results?
- How do we debug our model?
- How do we compare different plans?

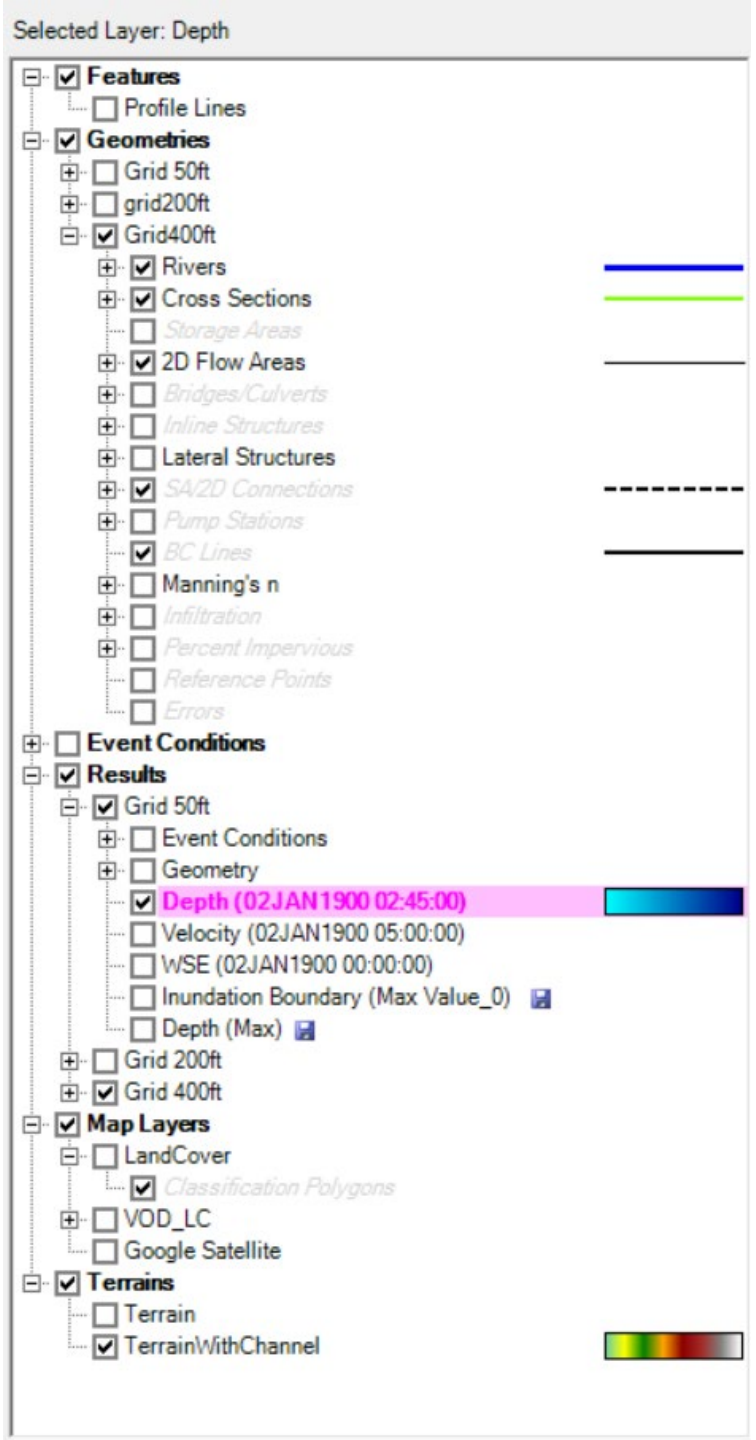


HEC-RAS Mapper



Layers List

- Profile Lines
- Geometries
- Results
- Map Layers
- Terrains

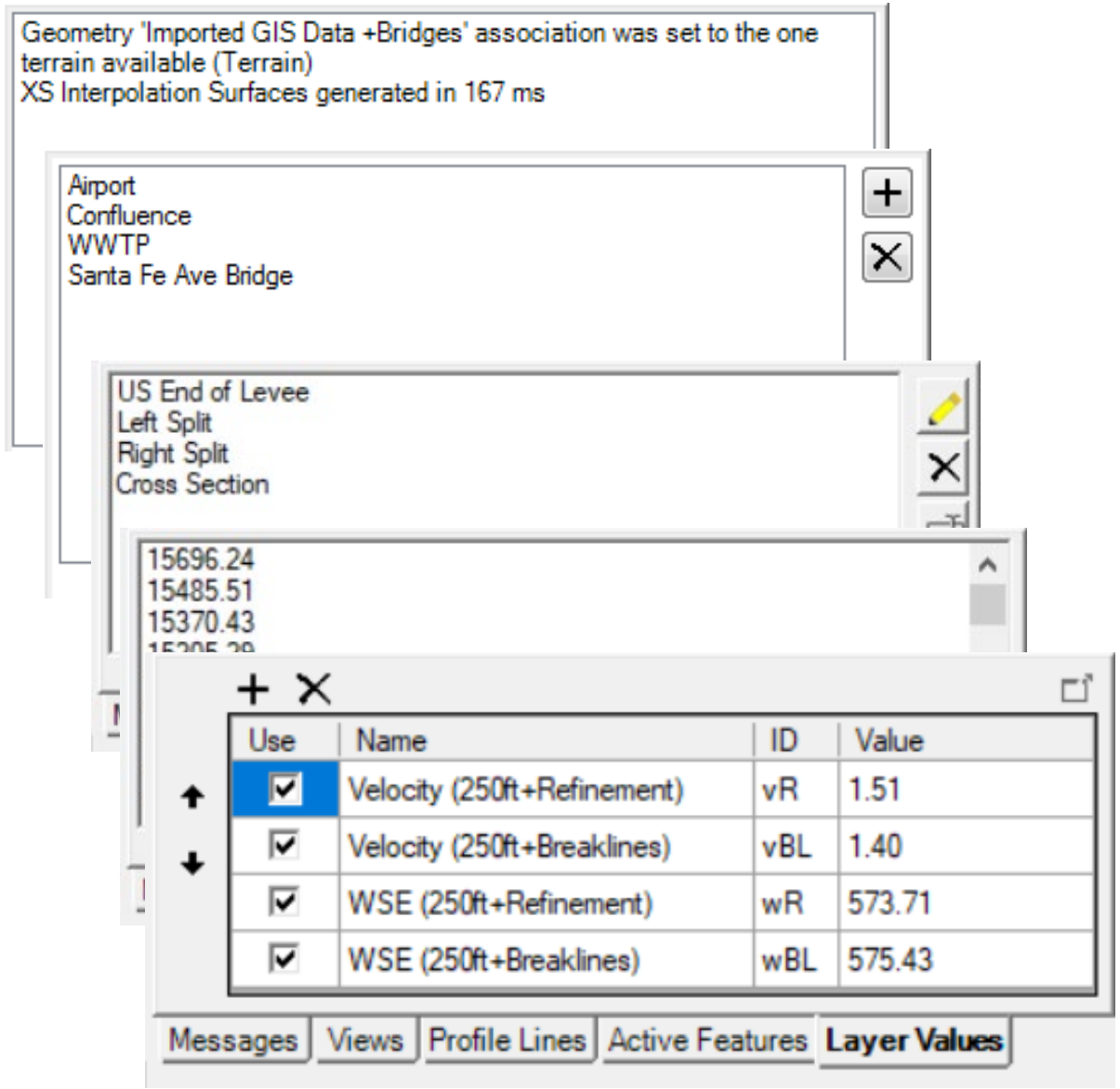


Symbology is shown to the right of any checked layers.

The selected layer is highlighted in magenta.

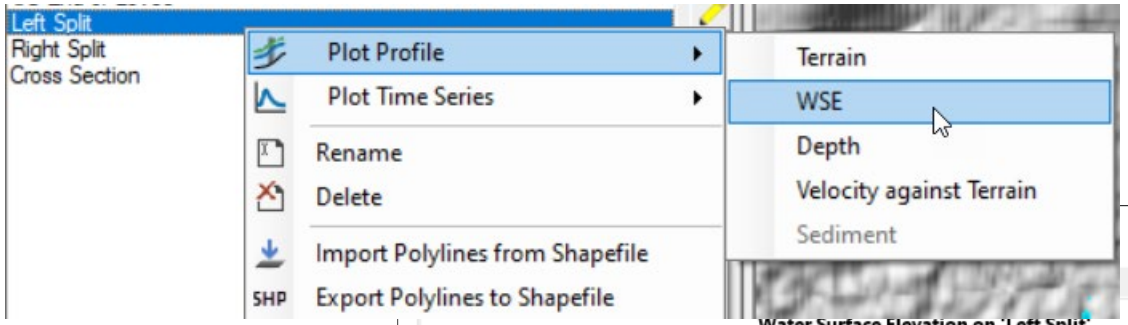
Status Area

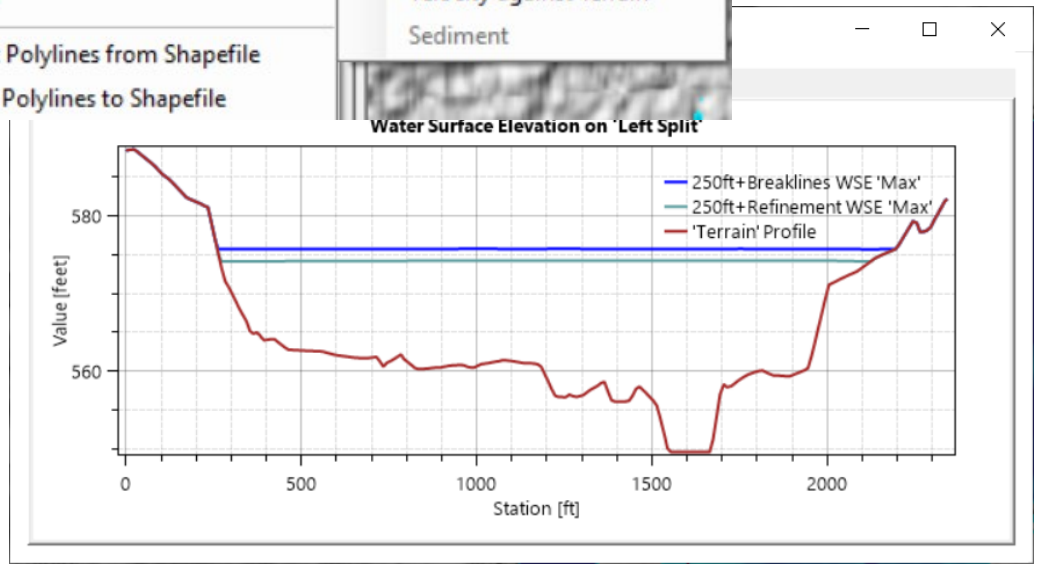
- Messages – What just happened
- View – Quickly zoom to predefined areas
- Profile Lines – Access results at specific locations
- Active Features – Quick access to features in layer
- Layer Values – Watch values for multiple results

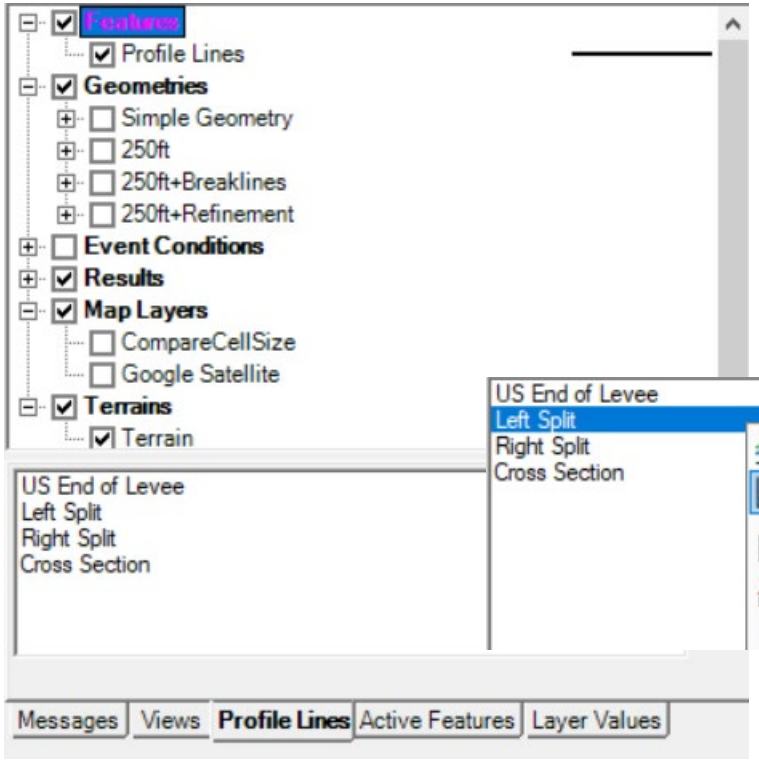


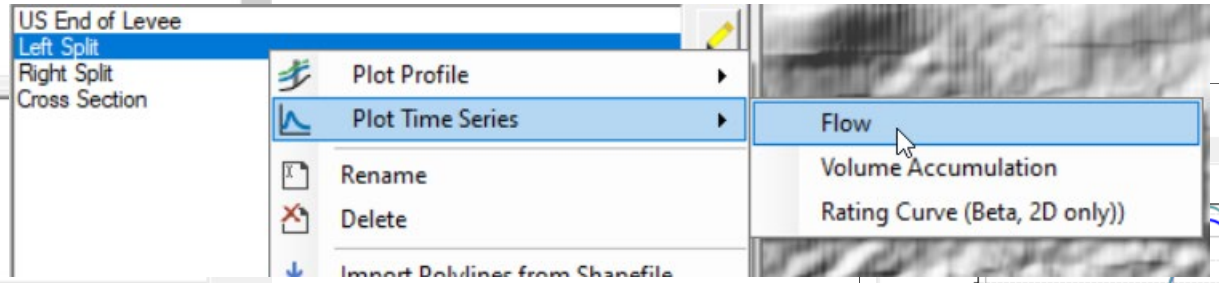
Profile Lines

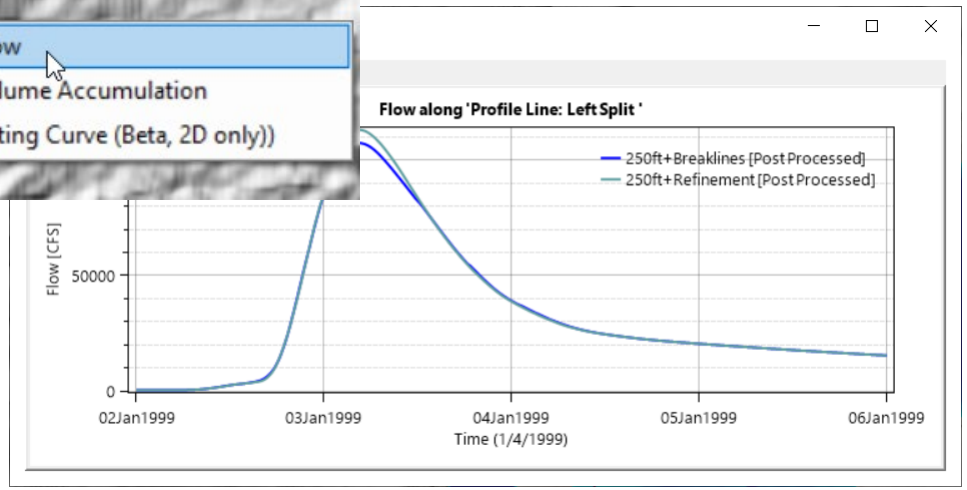
- User-defined/editable features



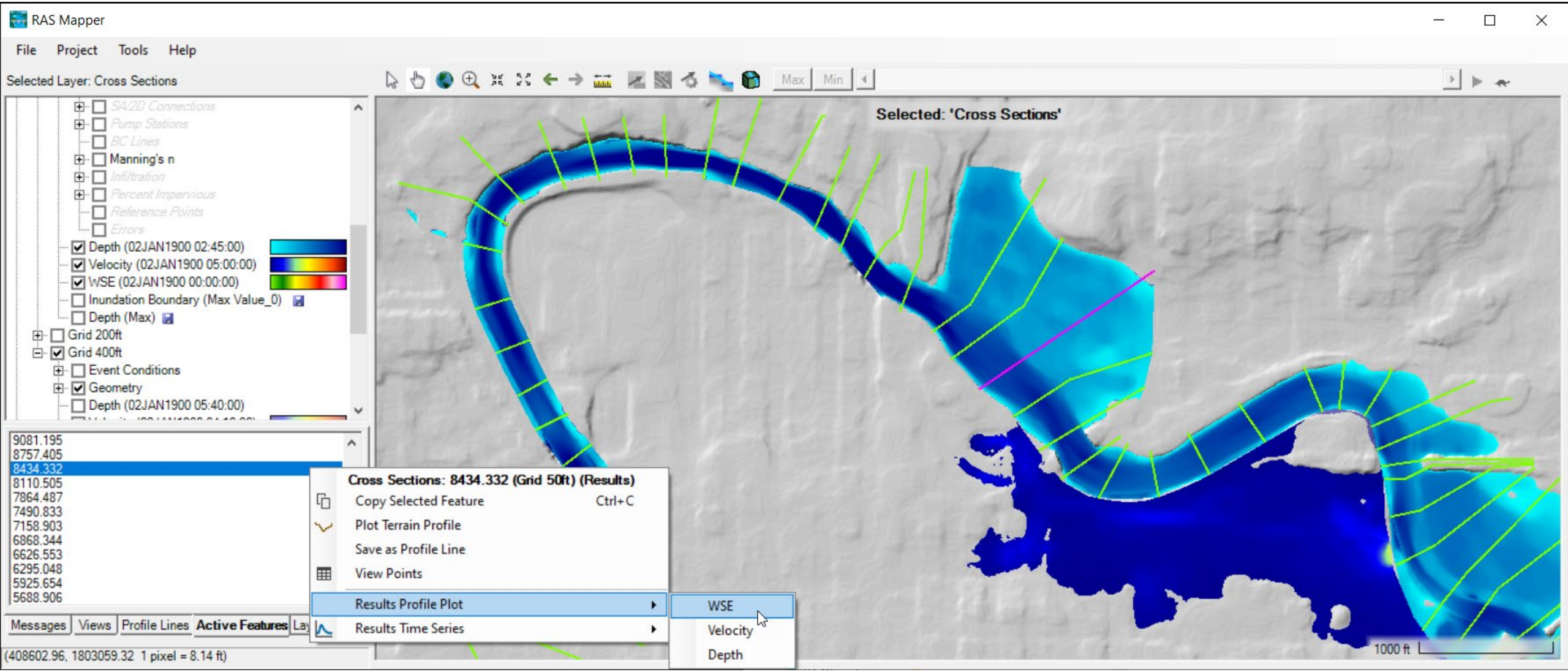




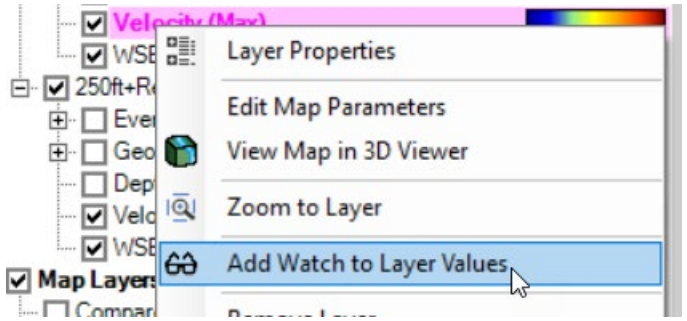


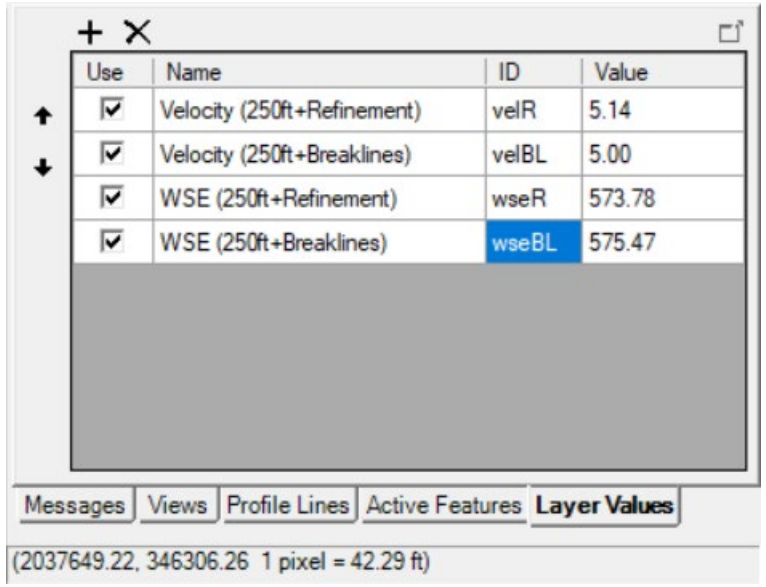


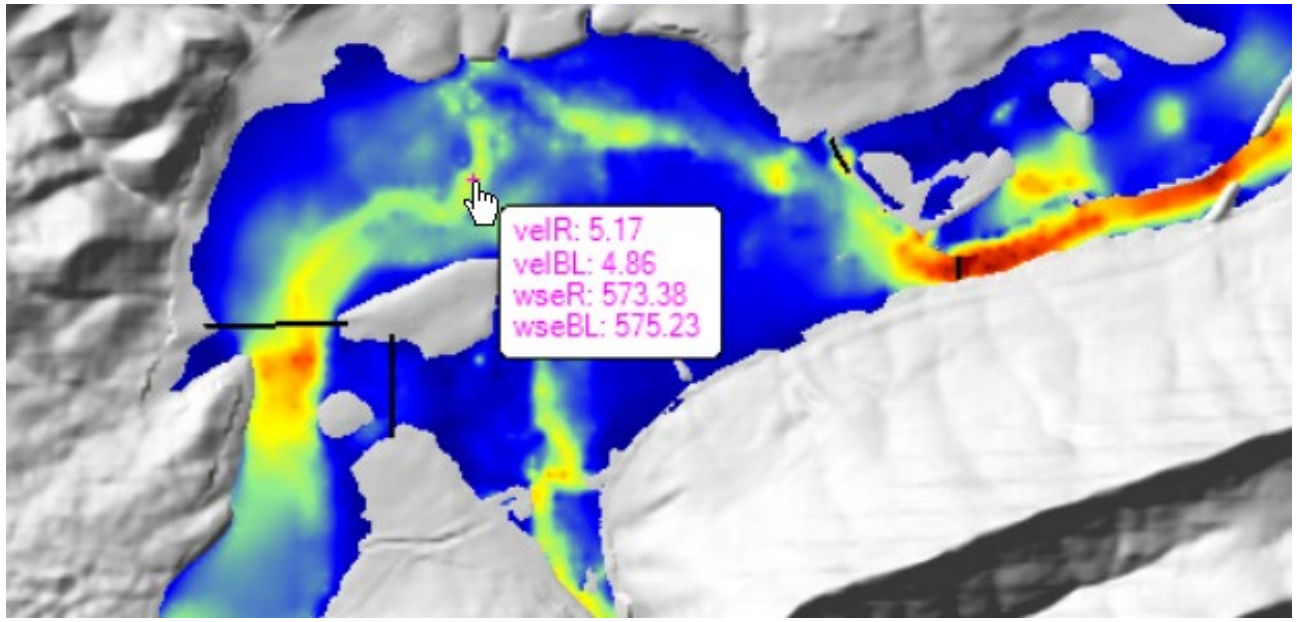
Active Features



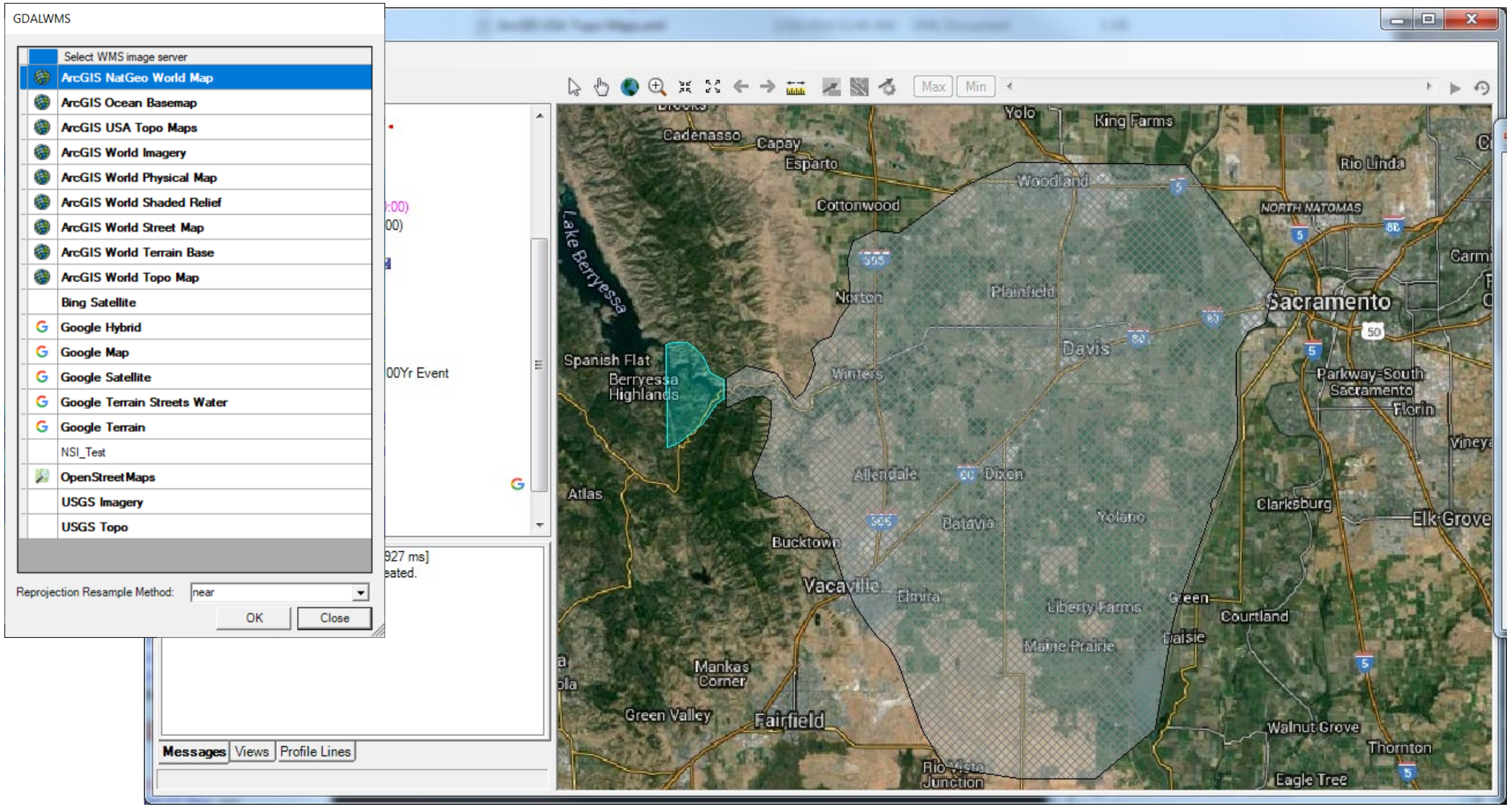
Watch Layer Values





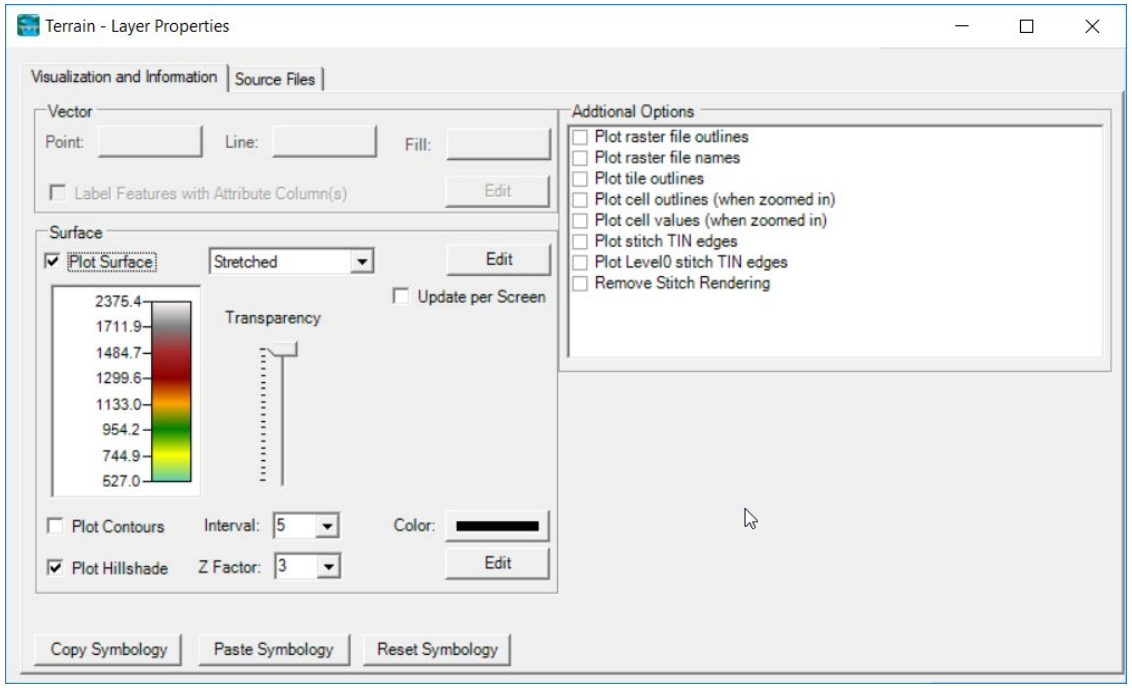


Web Imagery

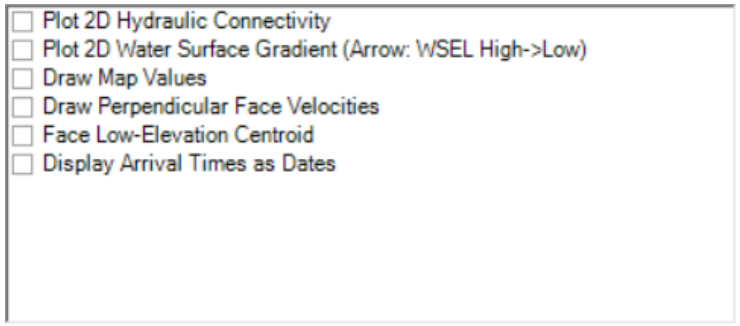

GDALWMS
Select WMS image server
ArcGIS NatGeo World Map
ArcGIS Ocean Basemap
ArcGIS USA Topo Maps
ArcGIS World Imagery
ArcGIS World Physical Map
ArcGIS World Shaded Relief
ArcGIS World Street Map
ArcGIS World Terrain Base
ArcGIS World Topo Map
Bing Satellite
Google Hybrid
Google Map
Google Satellite
Google Terrain Streets Water
Google Terrain
NSI_Test
OpenStreetMaps
USGS Imagery
USGS Topo
Reprojection Resample Method:
near
OK
Close
Max
Min
Messages
Views
Profile Lines
Cadenasso
Capay
Esparto
Yolo
King Farms
Rio Linda
Woodland
Cottonwood
NORTH NATOMAS
Lake Berryessa
Norton
Plainfield
Sacramento
Davis
Spanish Flat
Berryessa Highlands
Winters
Parkway-South Sacramento
Florin
Allendale
Dixon
Atlas
Clarksburg
Elk Grove
Batavia
Yolano
Bucktown
Vacaville
Elmira
Liberty Farms
Green
Courtland
Maine Prairie
Mankas Corner
Green Valley
Fairfield
Walnut Grove
Thornton
Rio Vista Junction
Eagle Tree

Plot Options

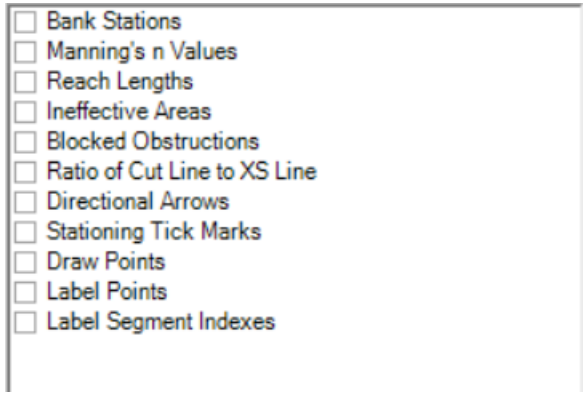
- Terrain



- Depth, WSE

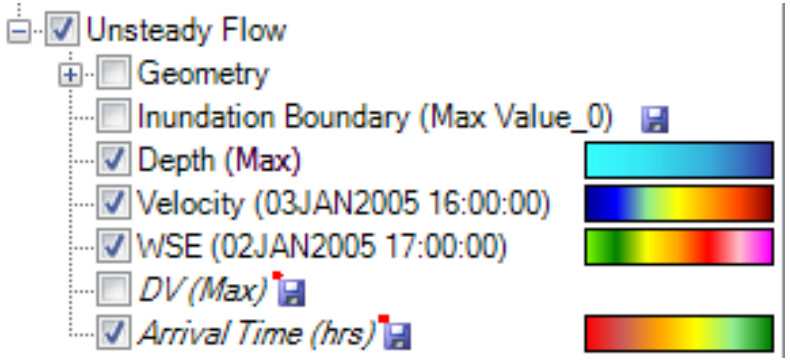


- River, Cross Sections



Results Mapping

- Dynamic Mapping – on-the-fly mapping
  - Animation of results without waiting

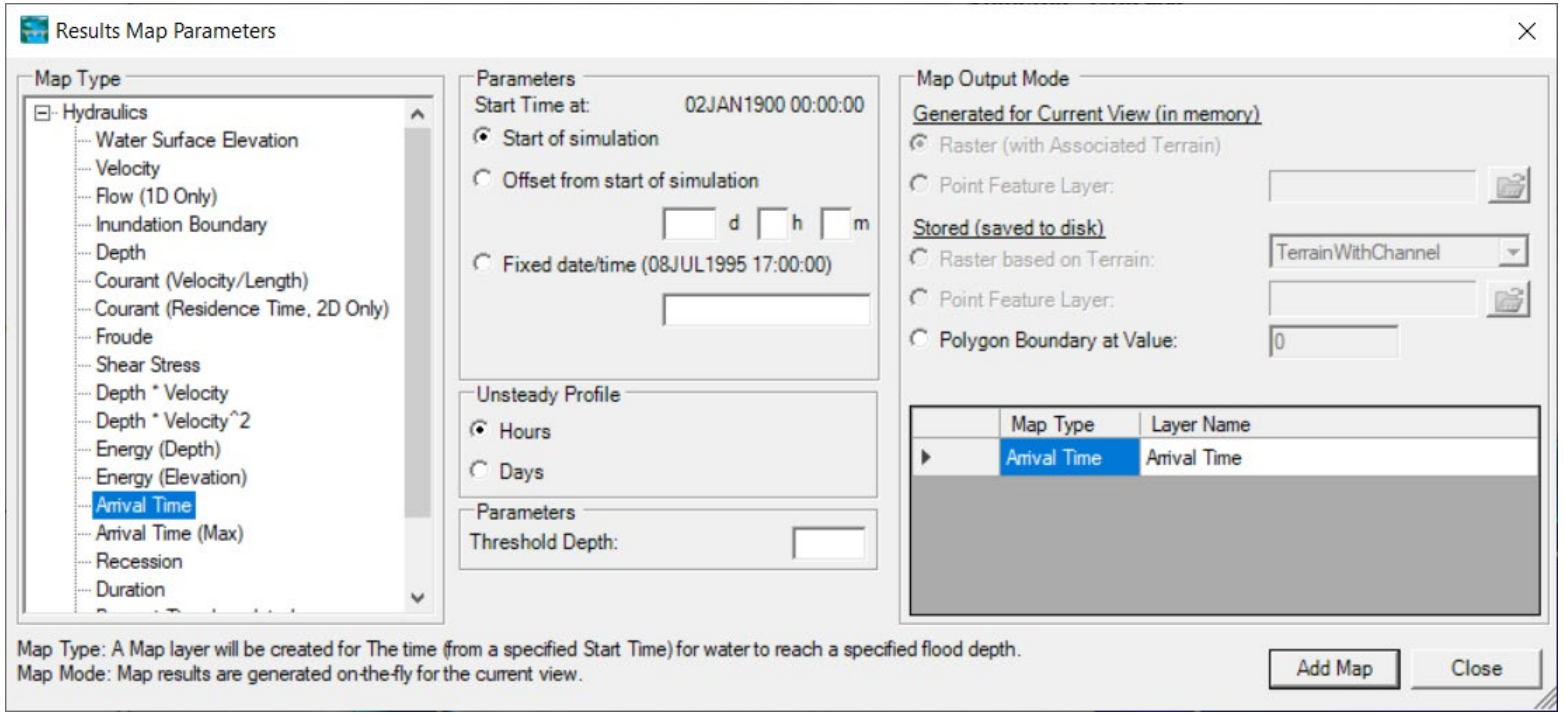


- Stored Maps – results written to file

* *= There was a problem reading data*

Results Mapping

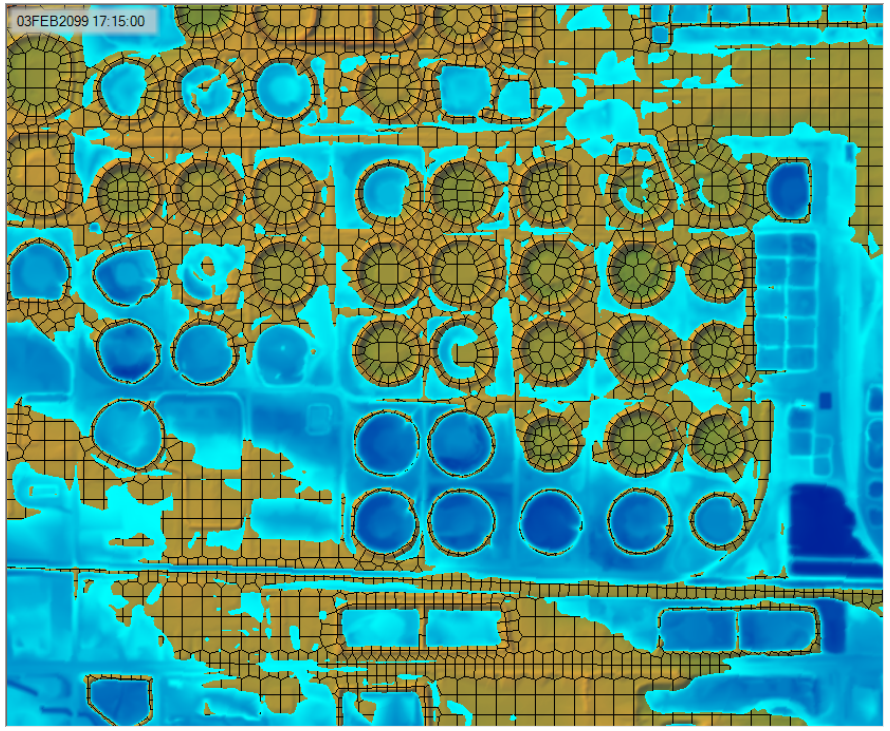
Map Type | Profile/Parameter | Mode



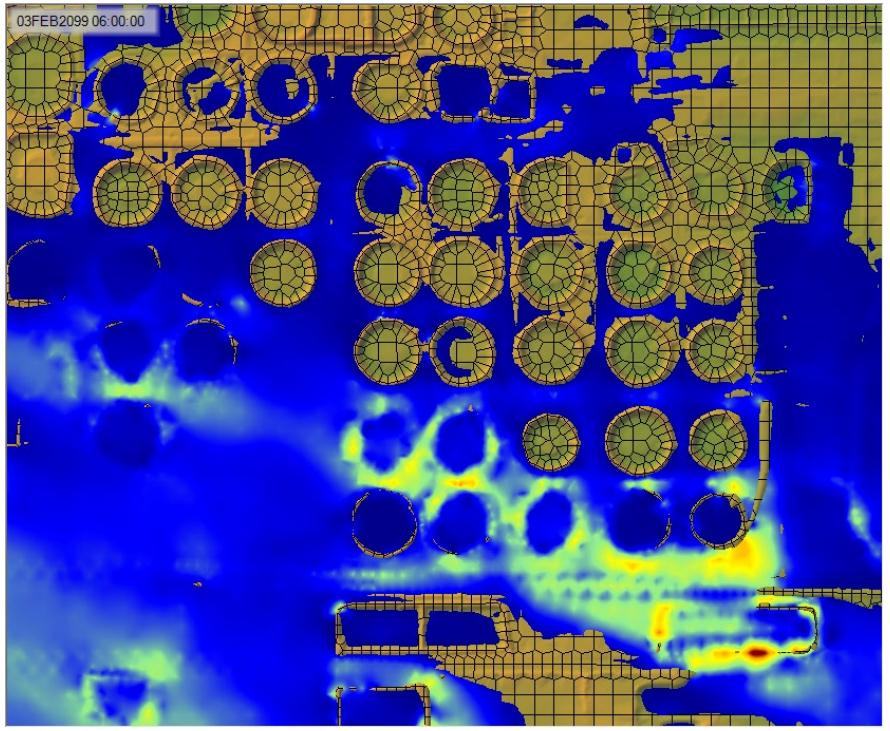
Default maps: Depth, Water Surface Elevation, Velocity

Example Maps

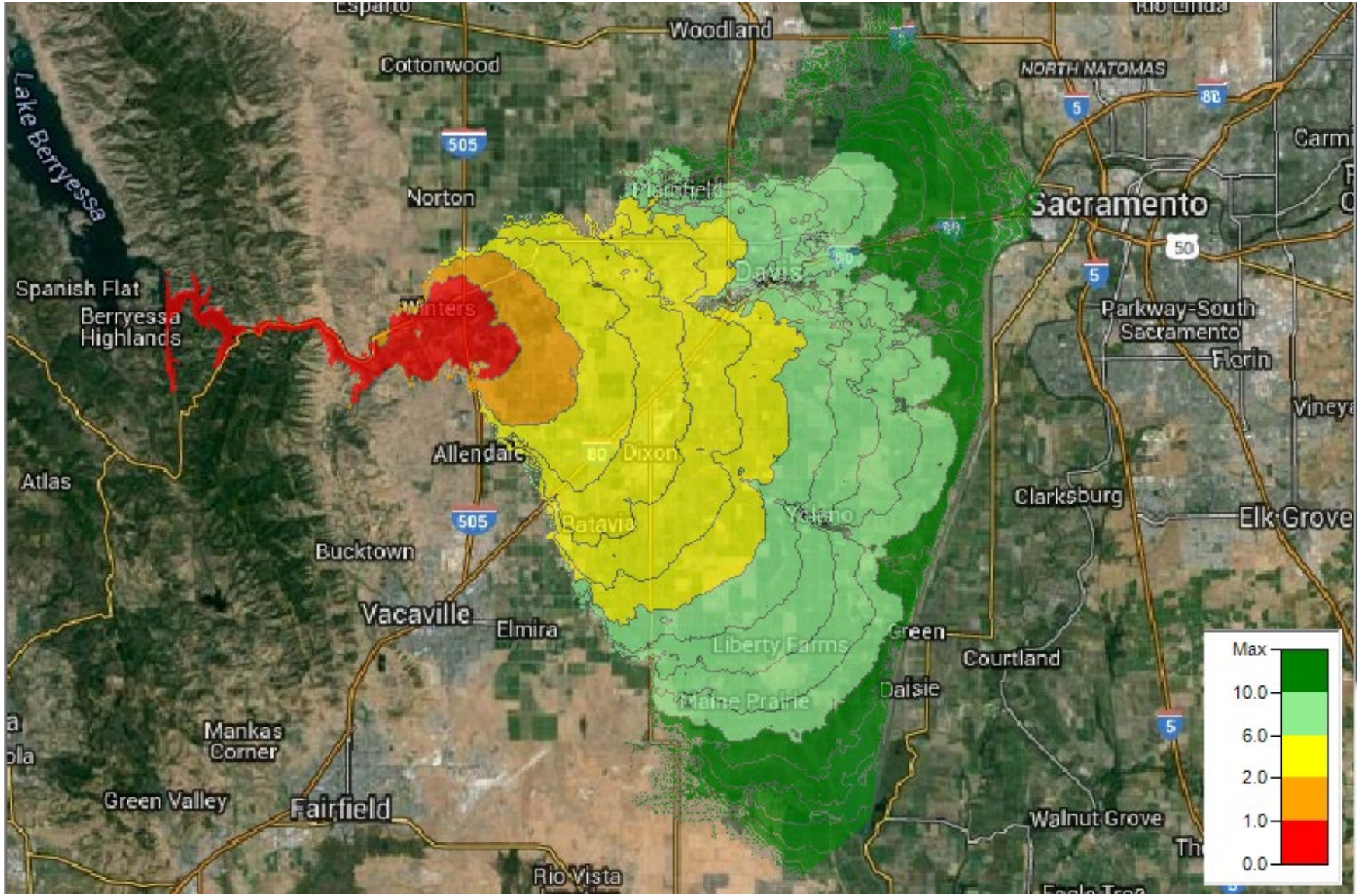
- Depth



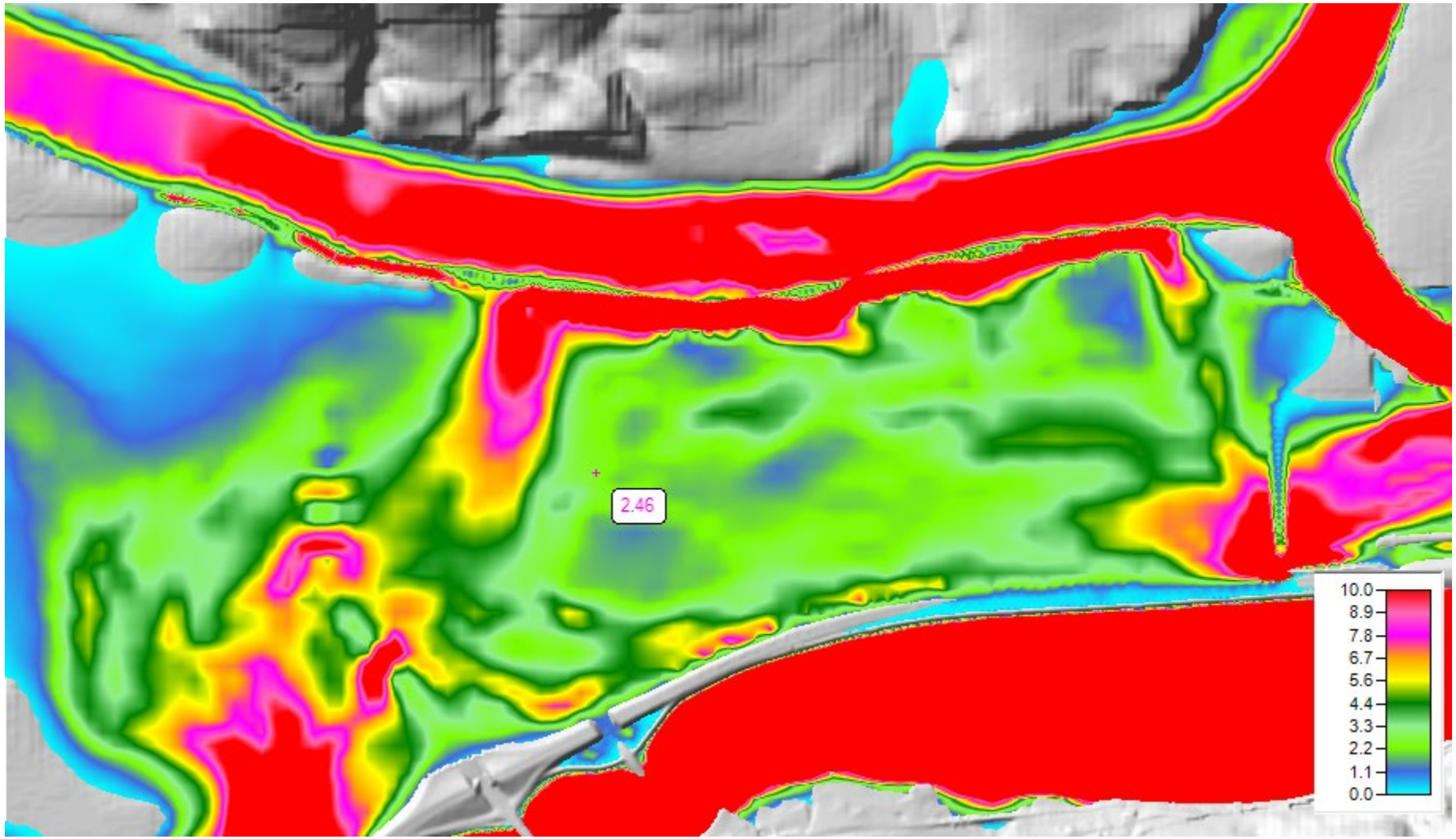
- Velocity



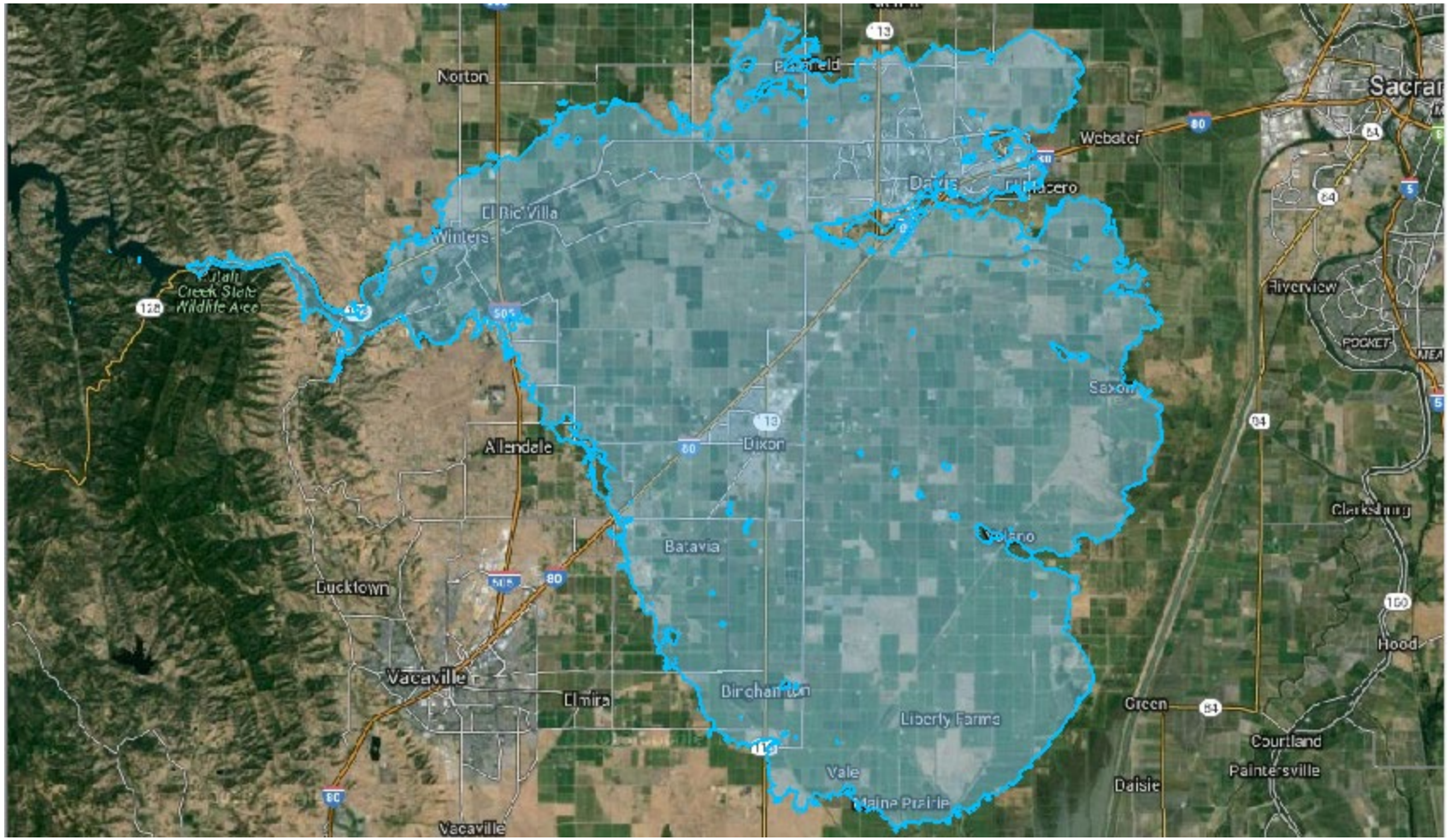
Arrival Time



Hazard Mapping



Inundation Boundary

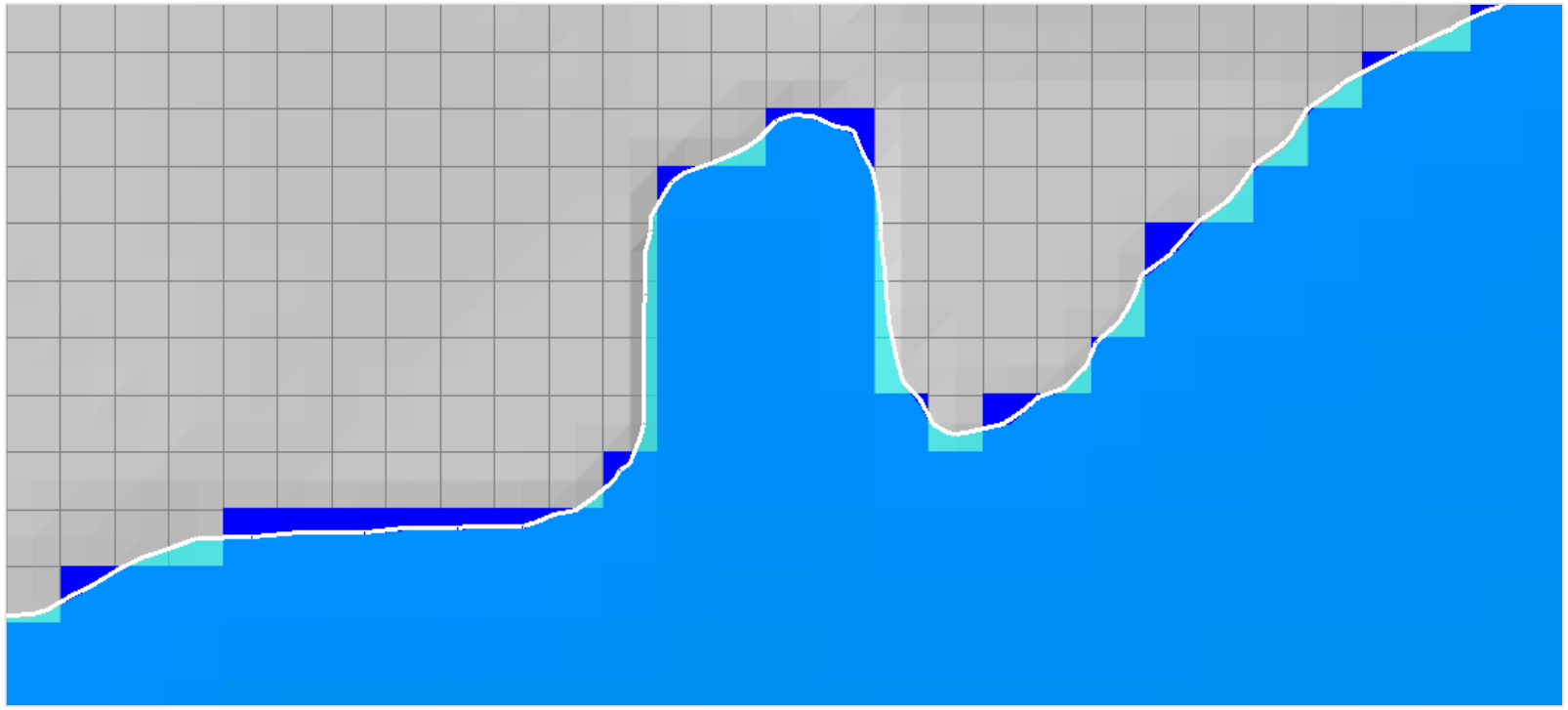


Map Types – Dynamic vs Stored

- Dynamic: Computed on-the-fly
  - Smooth: Computes to screen-resolution
  - Doesn’t use disk space
- Stored: Computed to terrain resolution
  - Stored to disk
  - Faster rendering for slow map types

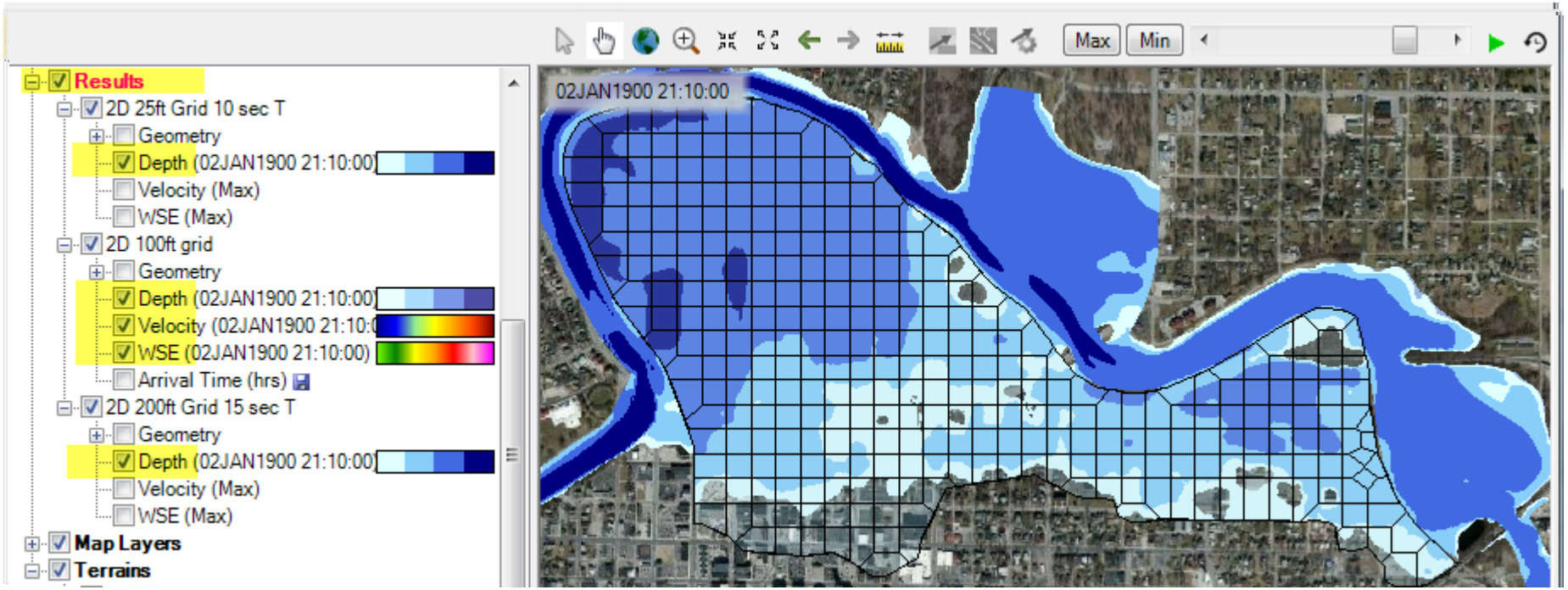
Dynamic vs Stored Results

- Dynamic results plot values for the current pyramid level. Boundaries are defined based on interpolation.
- Stored results have a single value per cell.



Dynamic Mapping

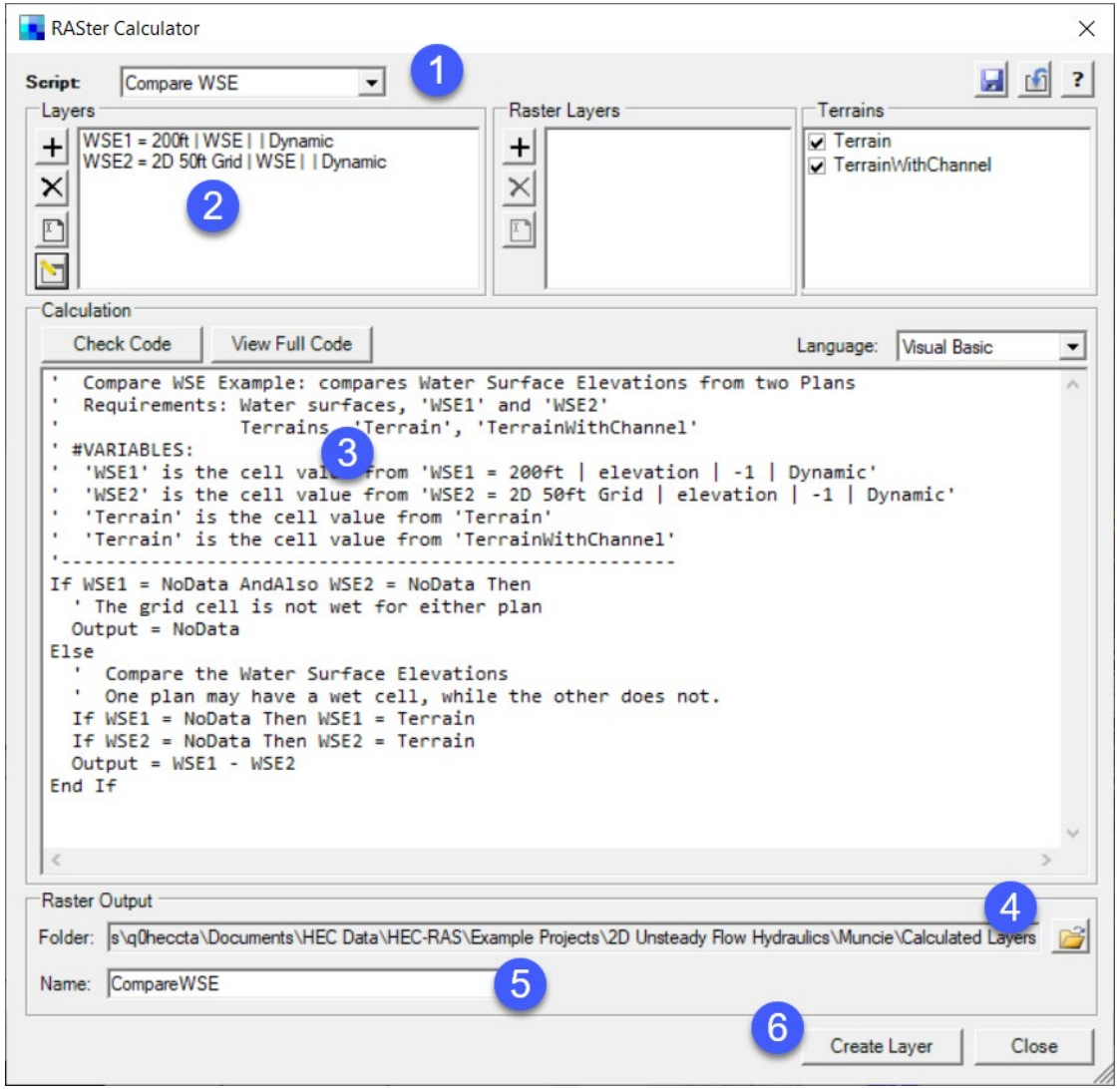
- Animation Toolbar – works on selected layer or group and syncs the timestep



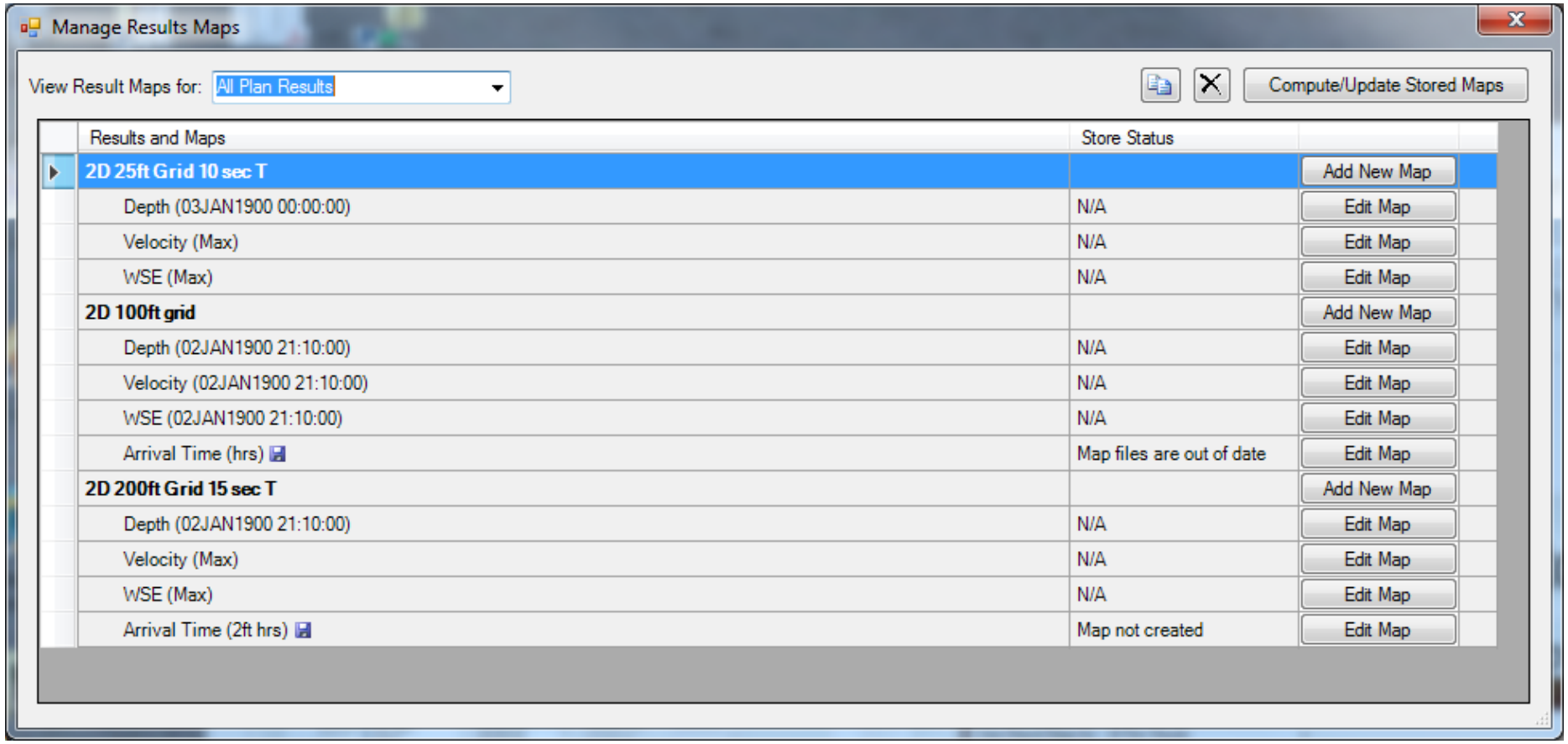
Dynamic Mapping - Animation

Calculated Layer

- RASter Calculator
- Custom scripting code to use multiple results
- Works with RAS Results and Terrains
- Works with Rasters on disk



Stored Maps


Manage Results Maps
View Result Maps for: All Plan Results
Compute/Update Stored Maps
Results and Maps
Store Status
2D 25ft Grid 10 sec T
Add New Map
Depth (03JAN1900 00:00:00)
N/A
Edit Map
Velocity (Max)
N/A
Edit Map
WSE (Max)
N/A
Edit Map
2D 100ft grid
Add New Map
Depth (02JAN1900 21:10:00)
N/A
Edit Map
Velocity (02JAN1900 21:10:00)
N/A
Edit Map
WSE (02JAN1900 21:10:00)
N/A
Edit Map
Arrival Time (hrs)
Map files are out of date
Edit Map
2D 200ft Grid 15 sec T
Add New Map
Depth (02JAN1900 21:10:00)
N/A
Edit Map
Velocity (Max)
N/A
Edit Map
WSE (Max)
N/A
Edit Map
Arrival Time (2ft hrs)
Map not created
Edit Map

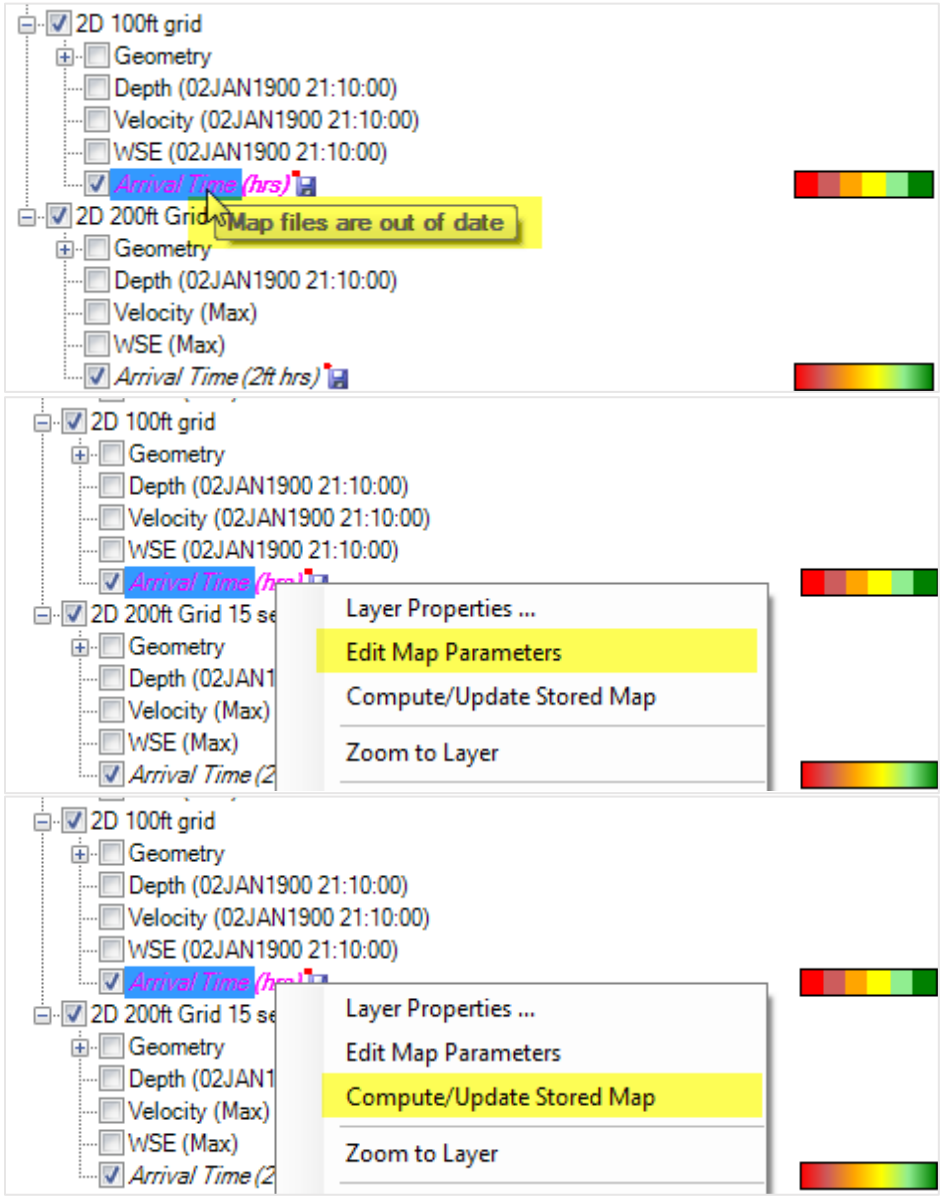
Stored Maps

- Map status message on cursor tool tip

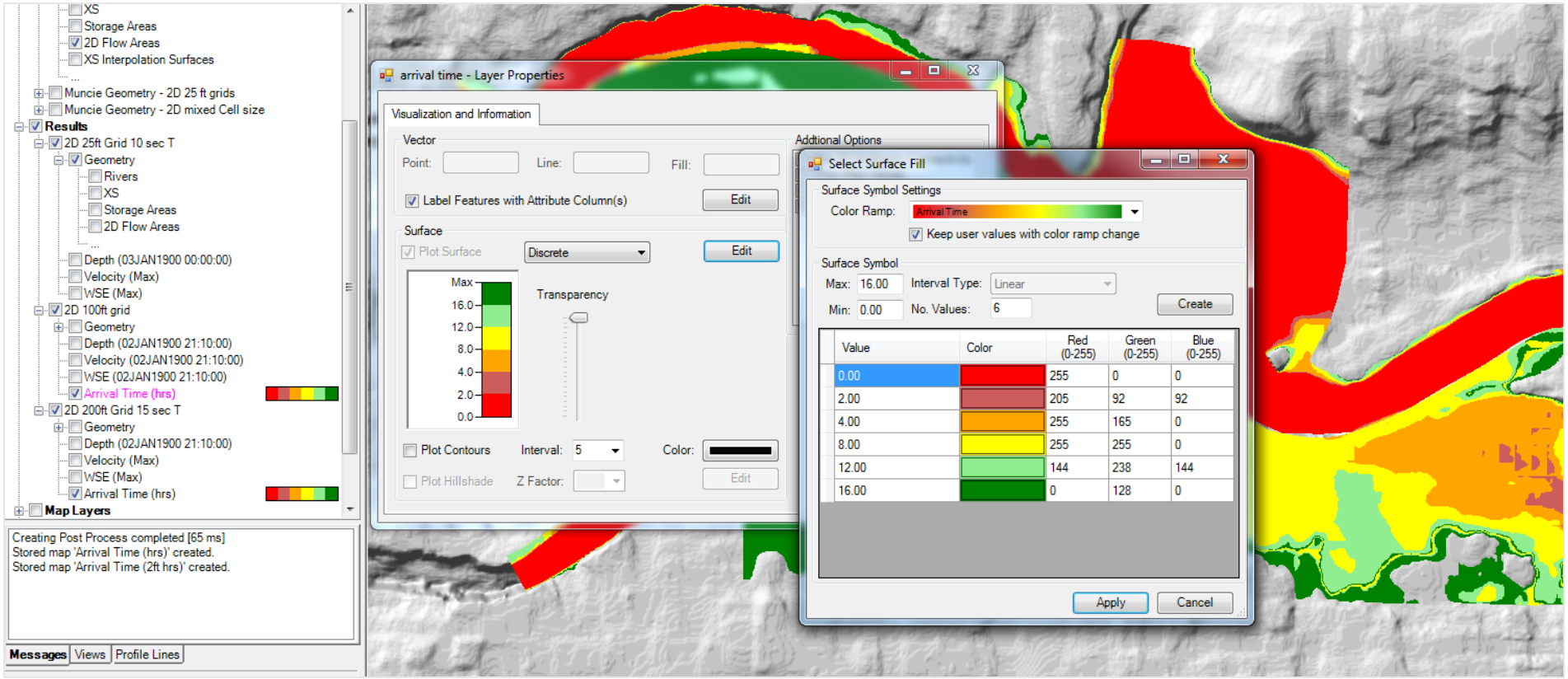
Right-click options:

- Edit Map Parameters

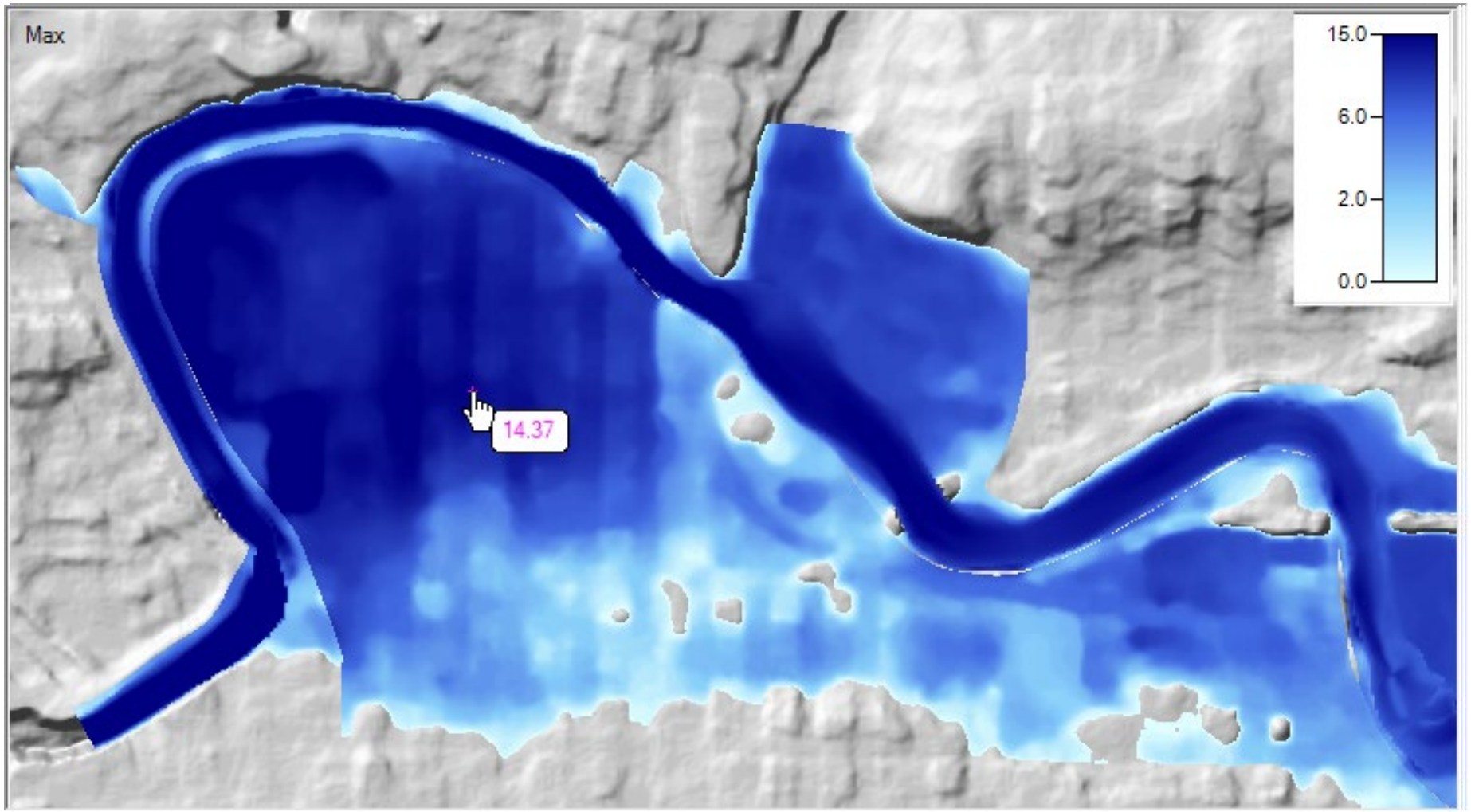
- Compute Map



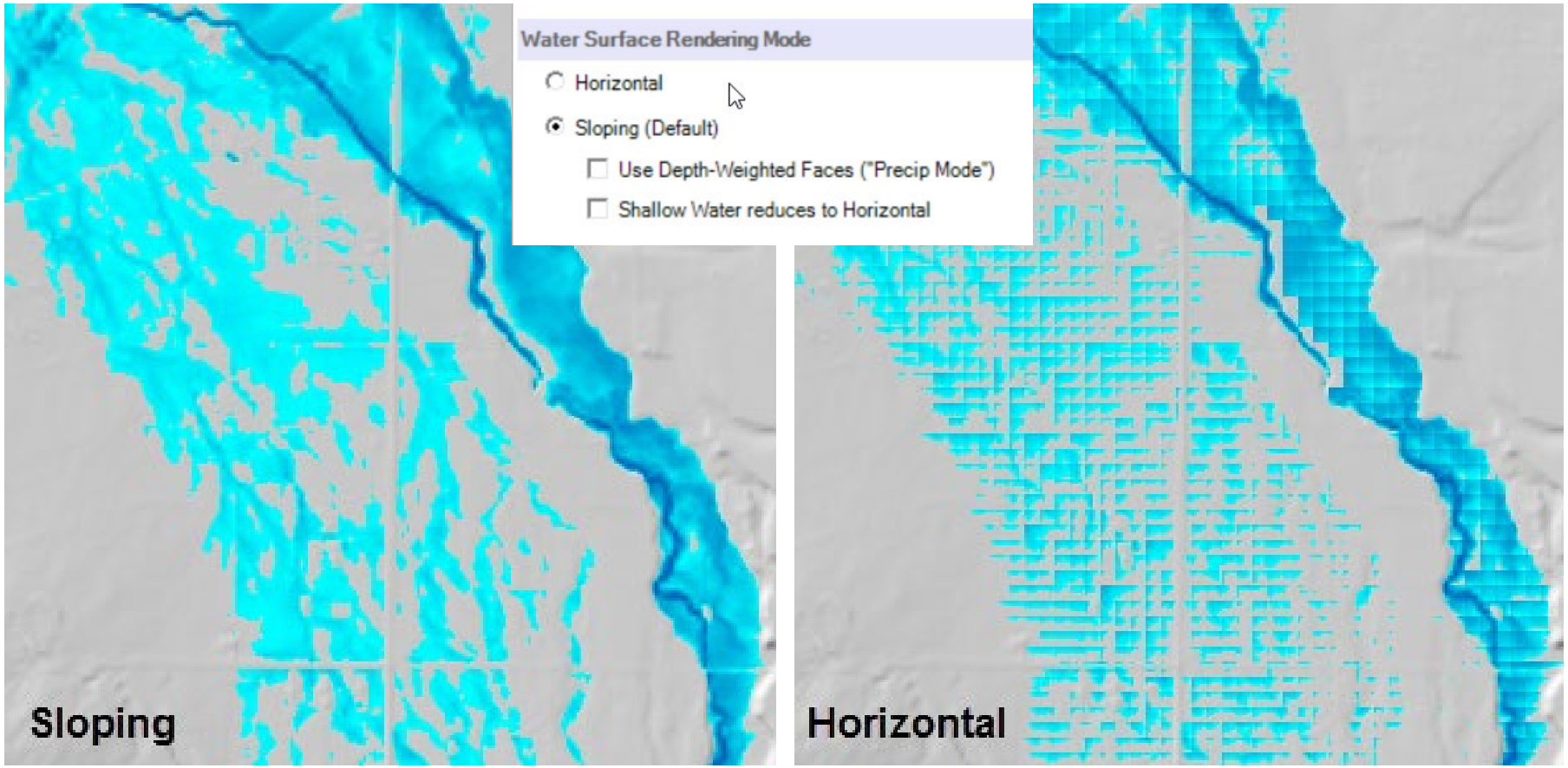
Results Layer Properties



Results Visualization

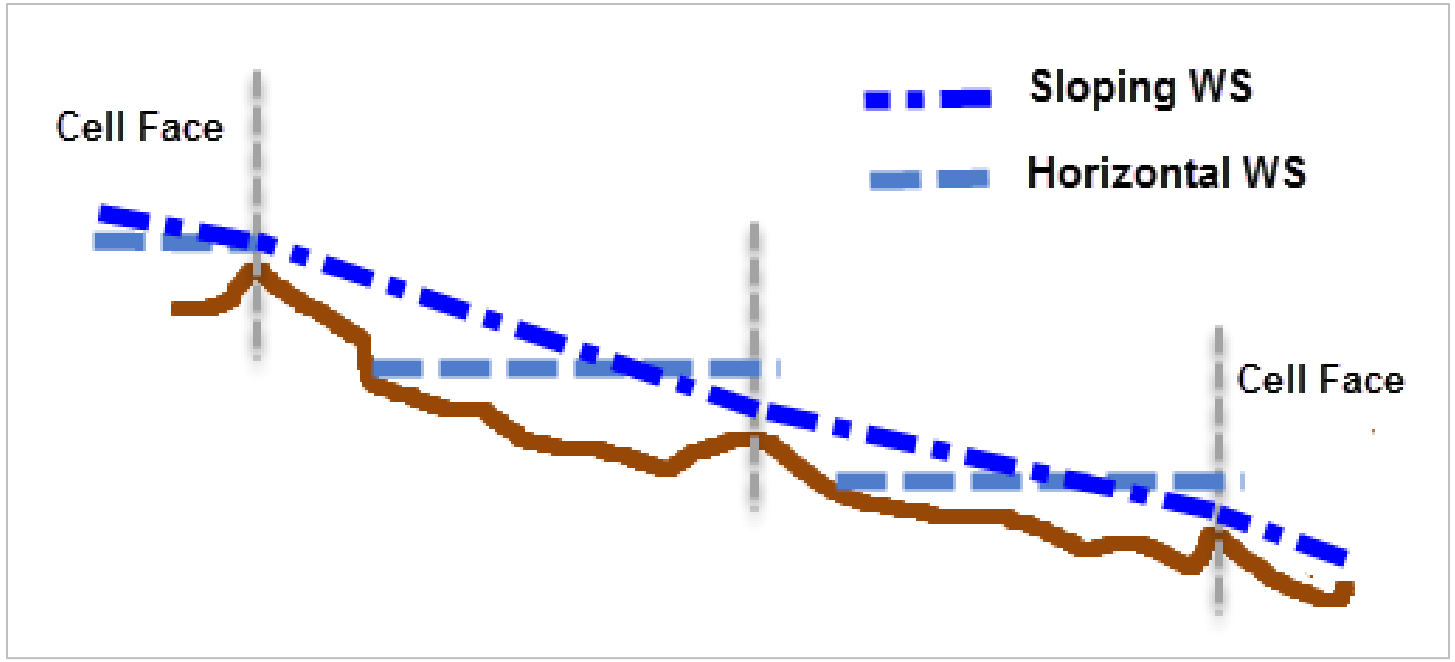


Render Mode Options

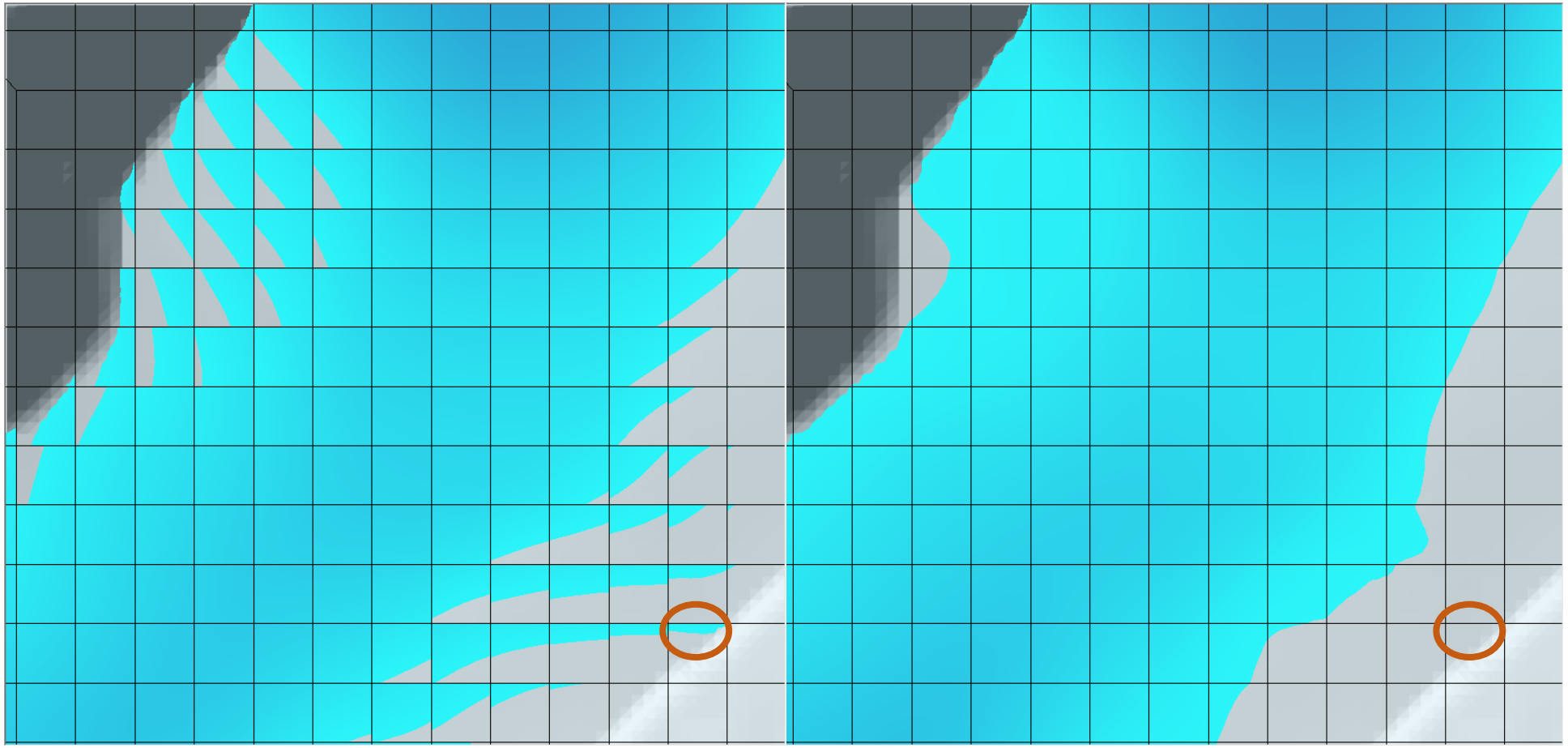


Results Interpolation

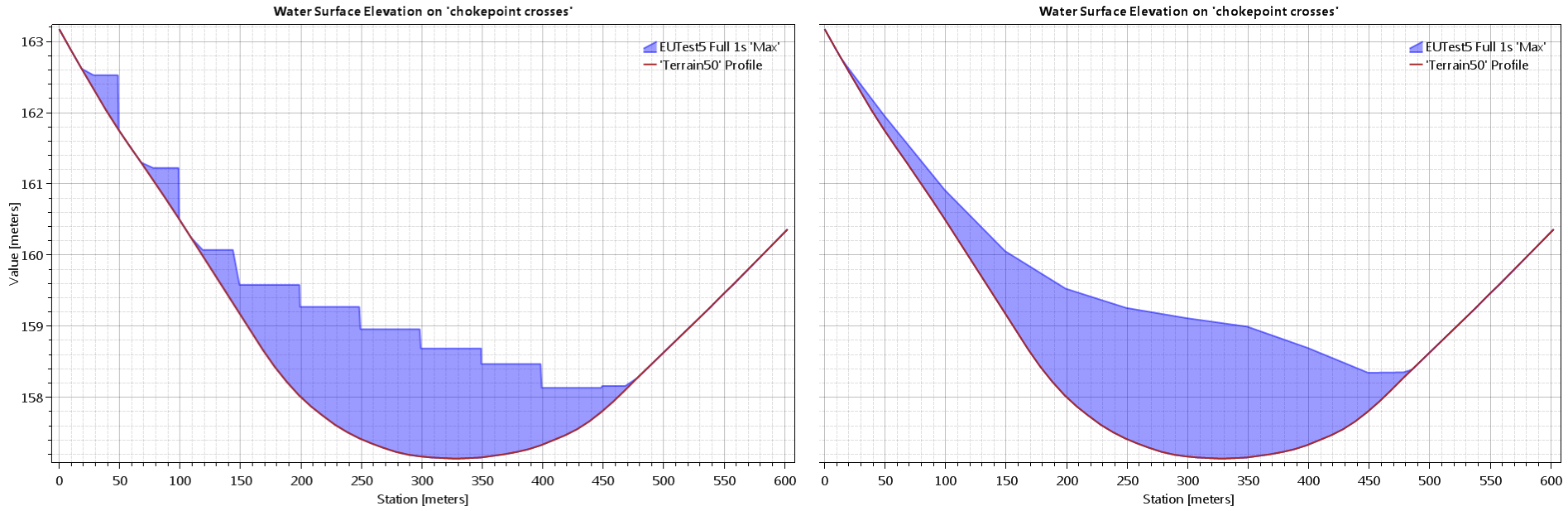
- Render mode options allow for interpolation of water surface elevation values or plotting values at the cell centers.



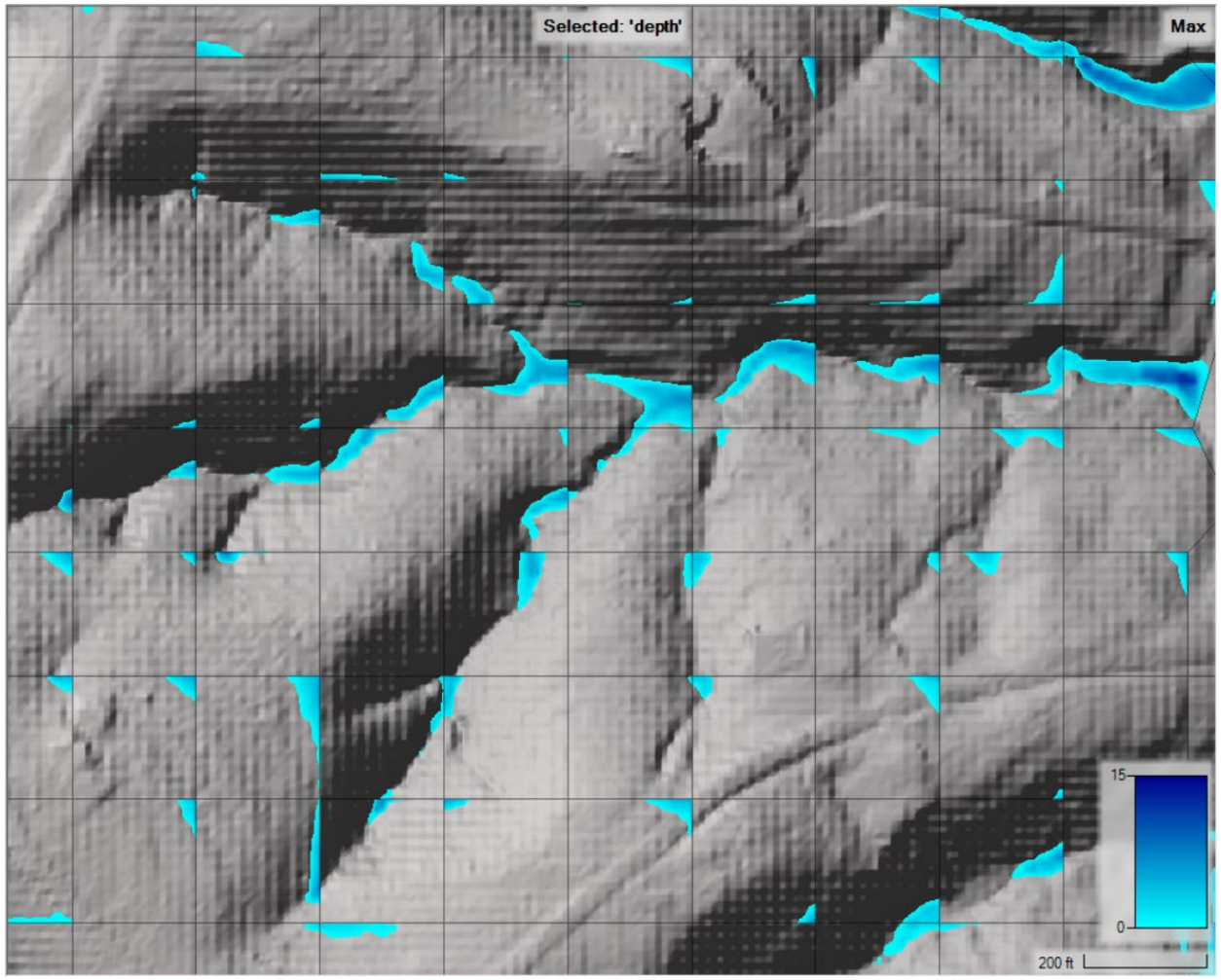
Horizontal vs Sloping Surface



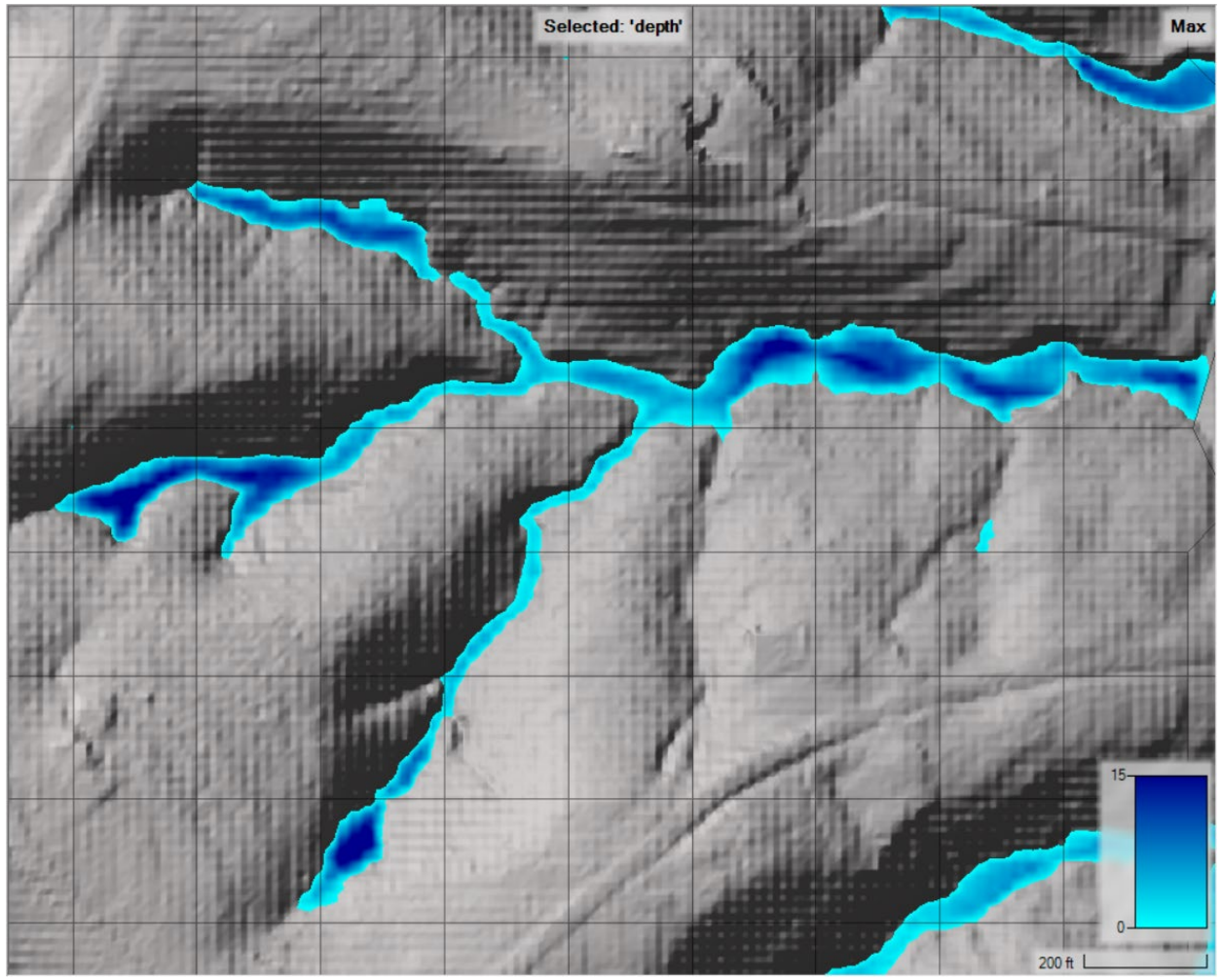
Horizontal vs Sloping Surface



Sloping Surface Errors

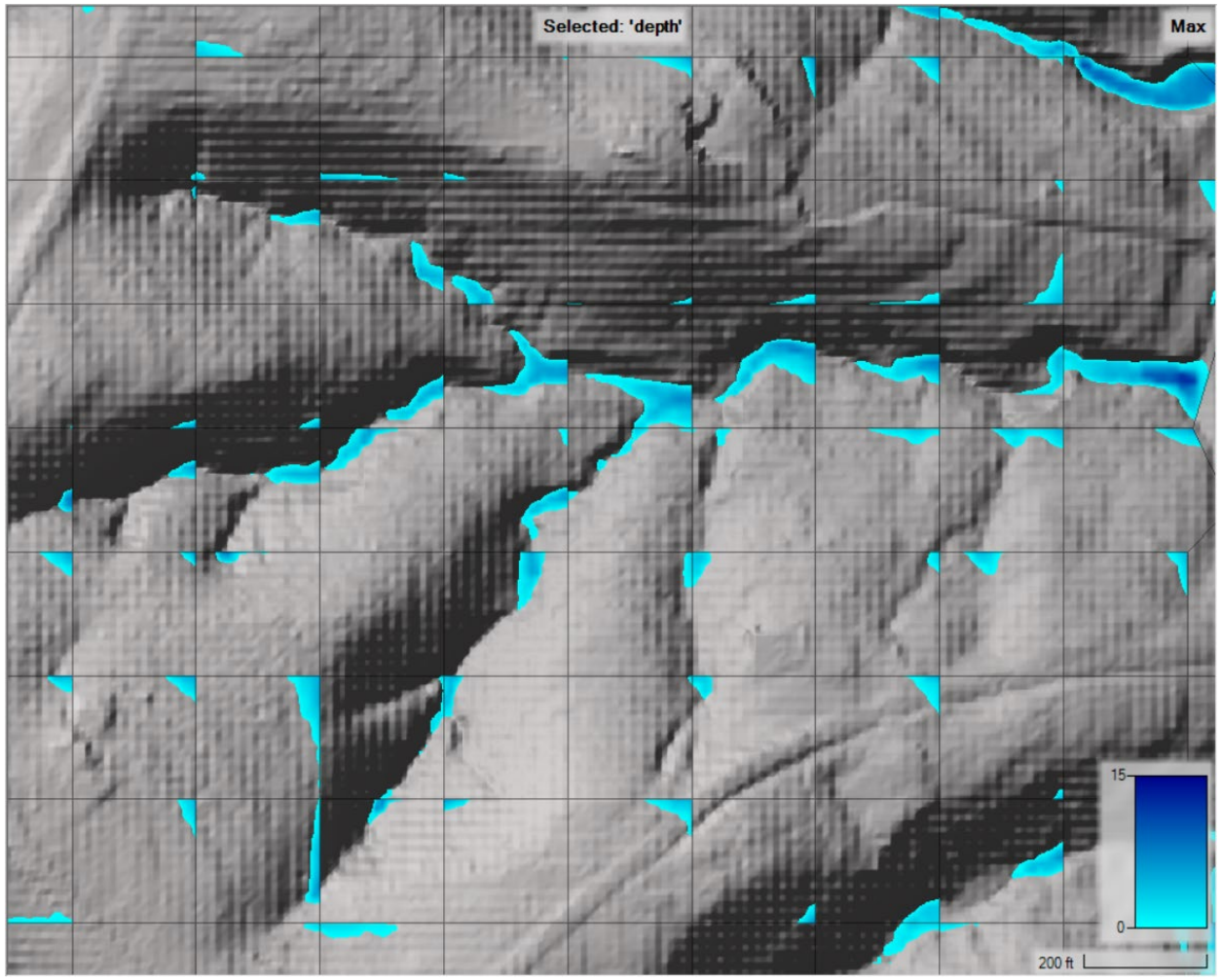


Horizontal

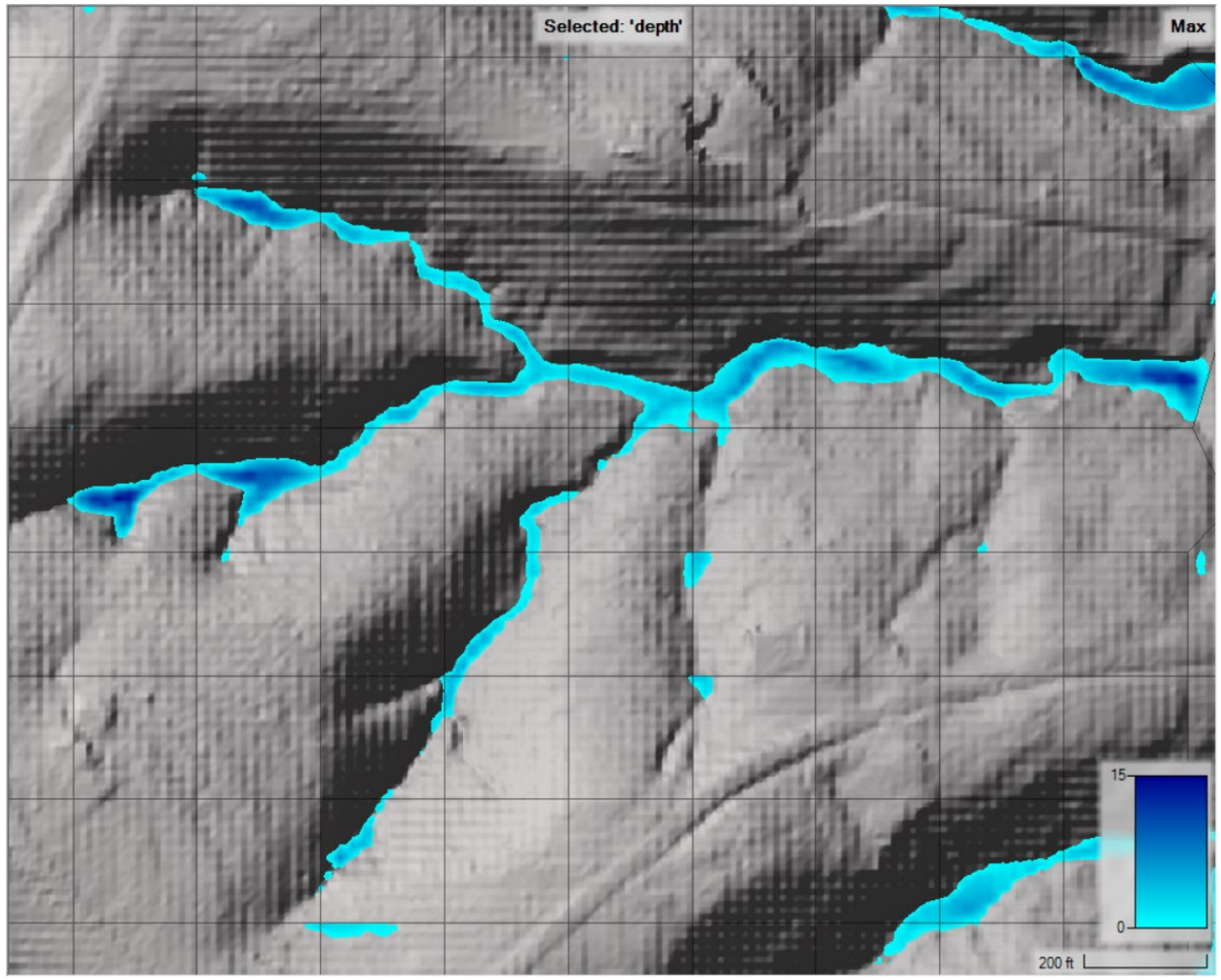


Sloping

Sloping Surface Errors



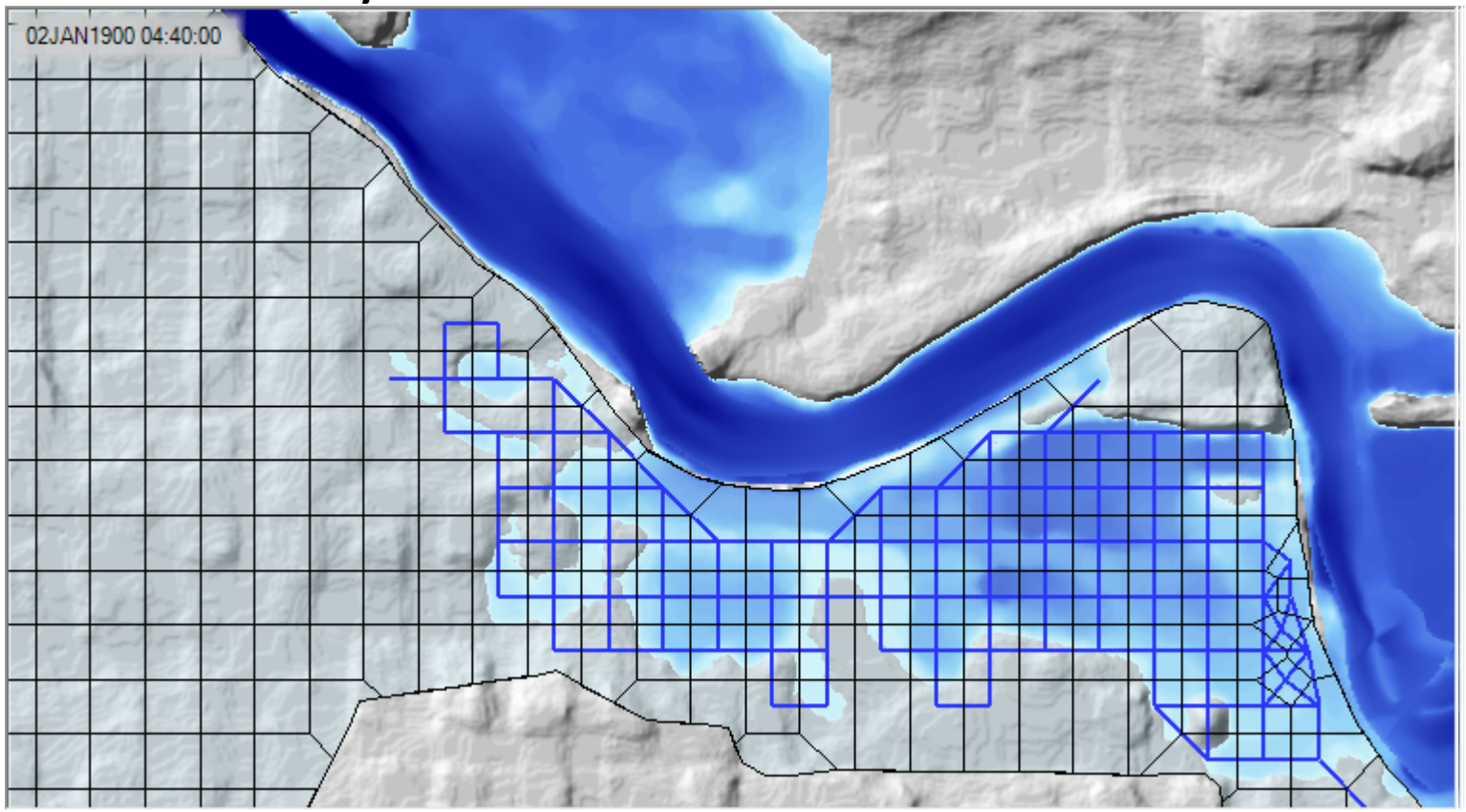
Horizontal



Precip Mode

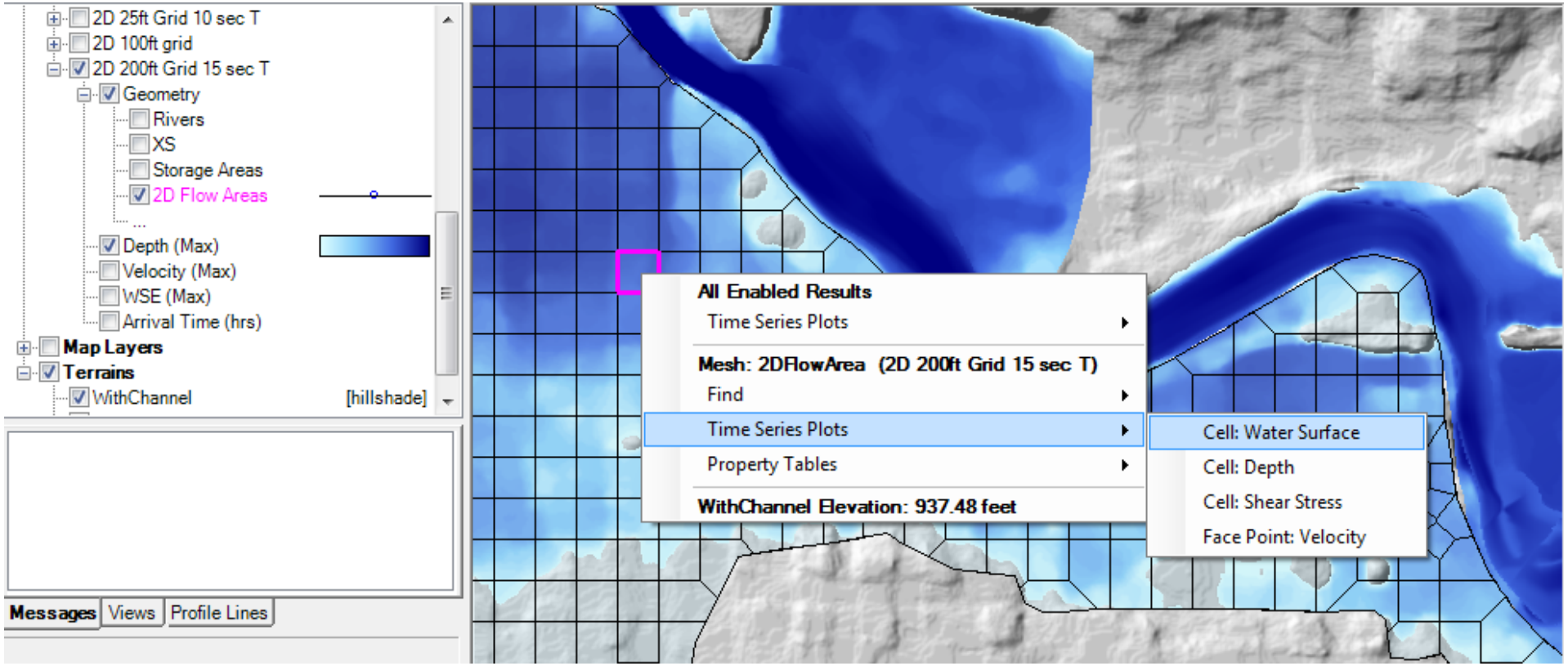
Depth Results

- Hydraulic connectivity from mesh



Results Query

- 2D Flow Area query



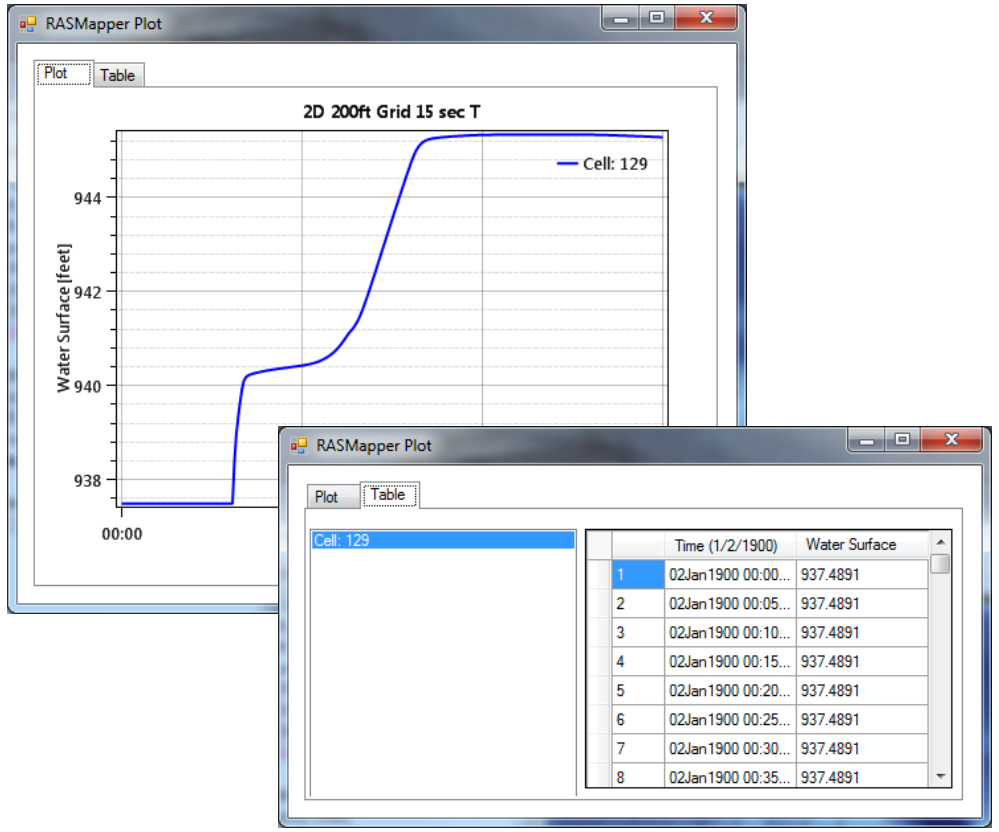
2D Flow Area Queries

- Hydraulic Properties

  - Cell: Volume - Elevation
  - Face: Area - Elevation
  - Face: Wetted Perimeter - Elevation
  - Face: Manning's n - Elevation
  - Face: Profile

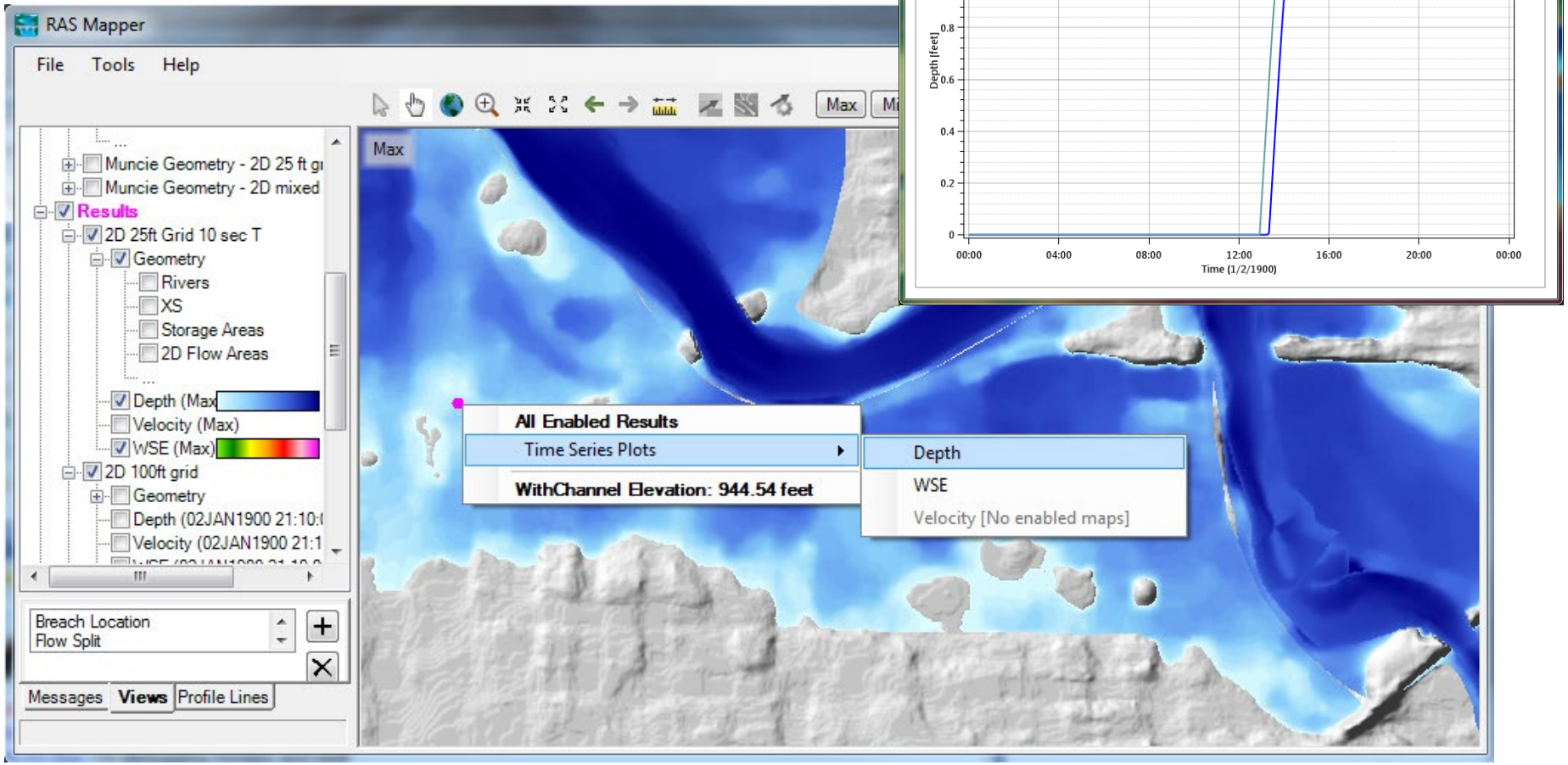
- Time Series

  - Cell: Water Surface
  - Cell: Depth
  - Cell: Shear Stress
  - Face Point: Velocity

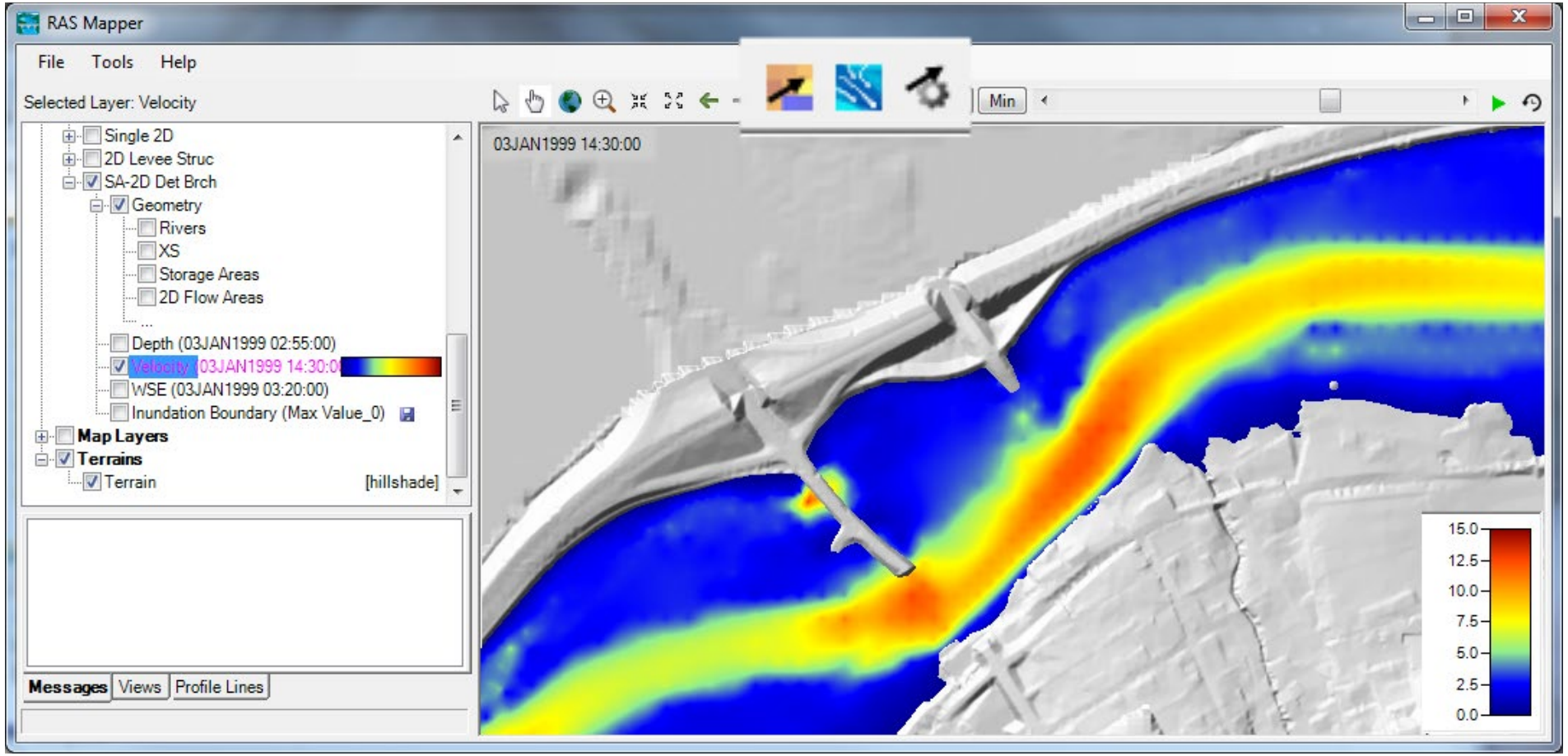


Results Query

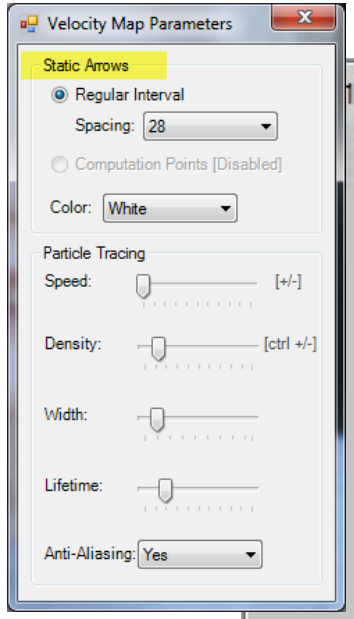
- Time Series

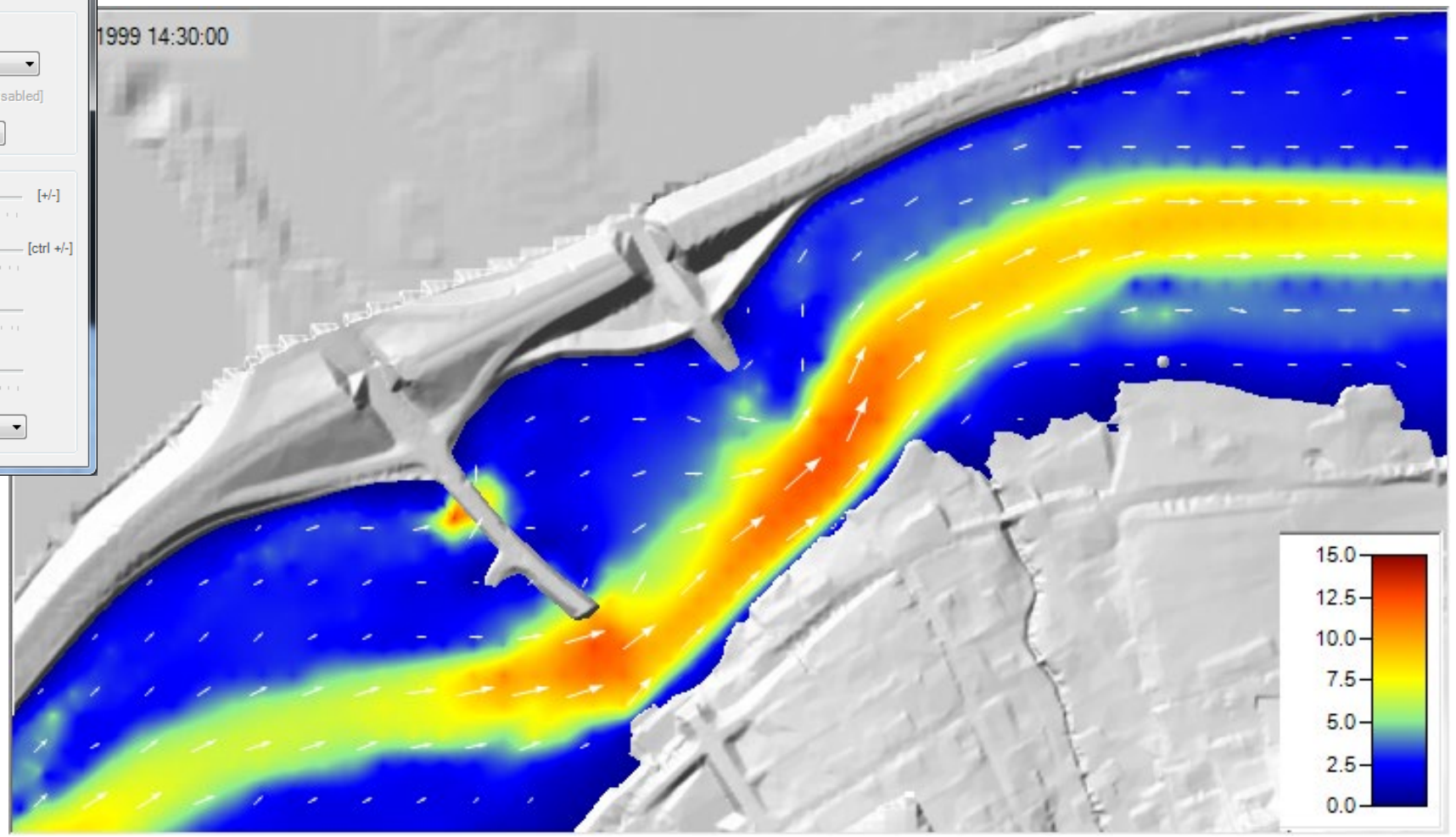


Velocity Results

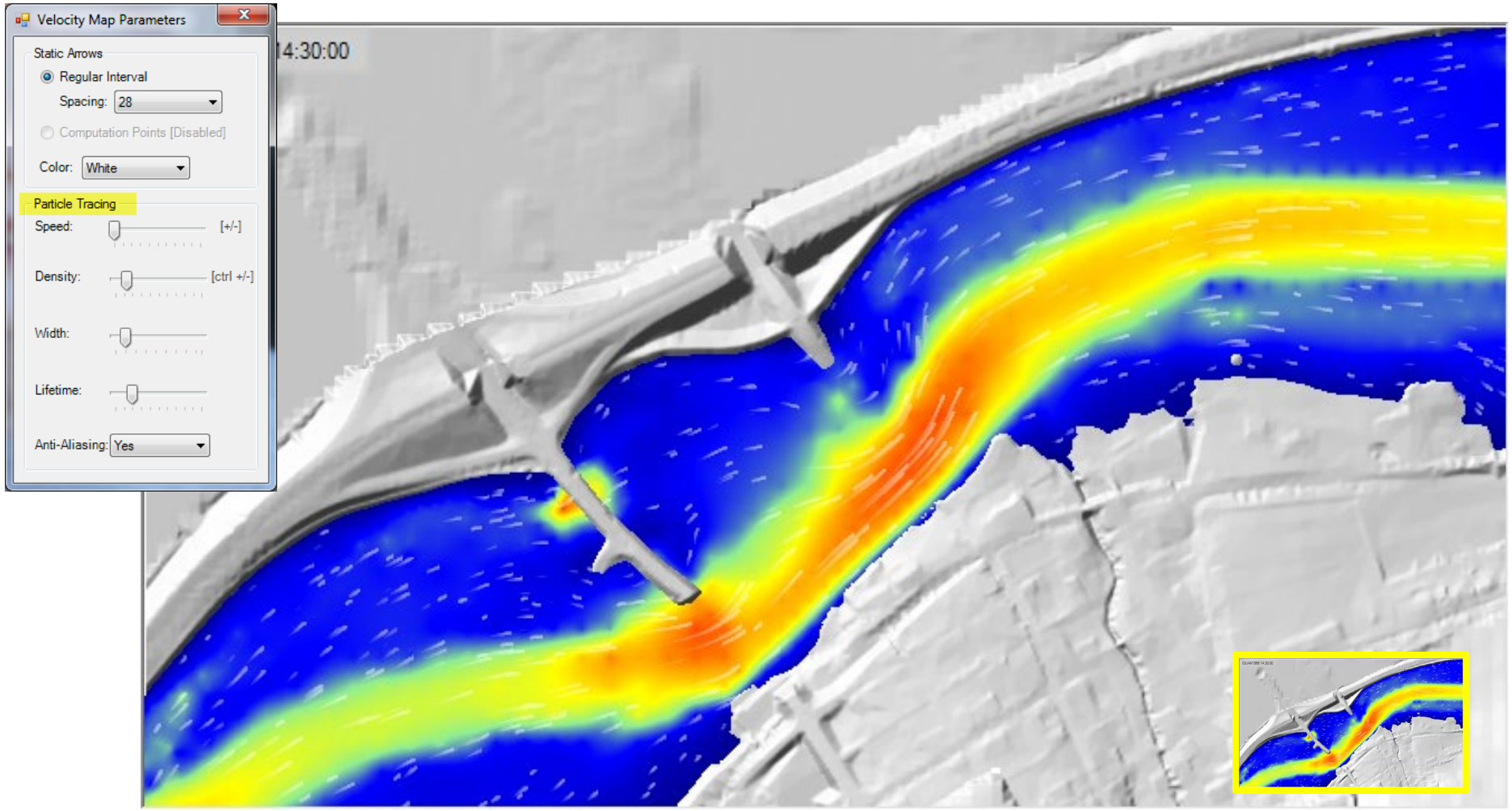


Velocity Arrows

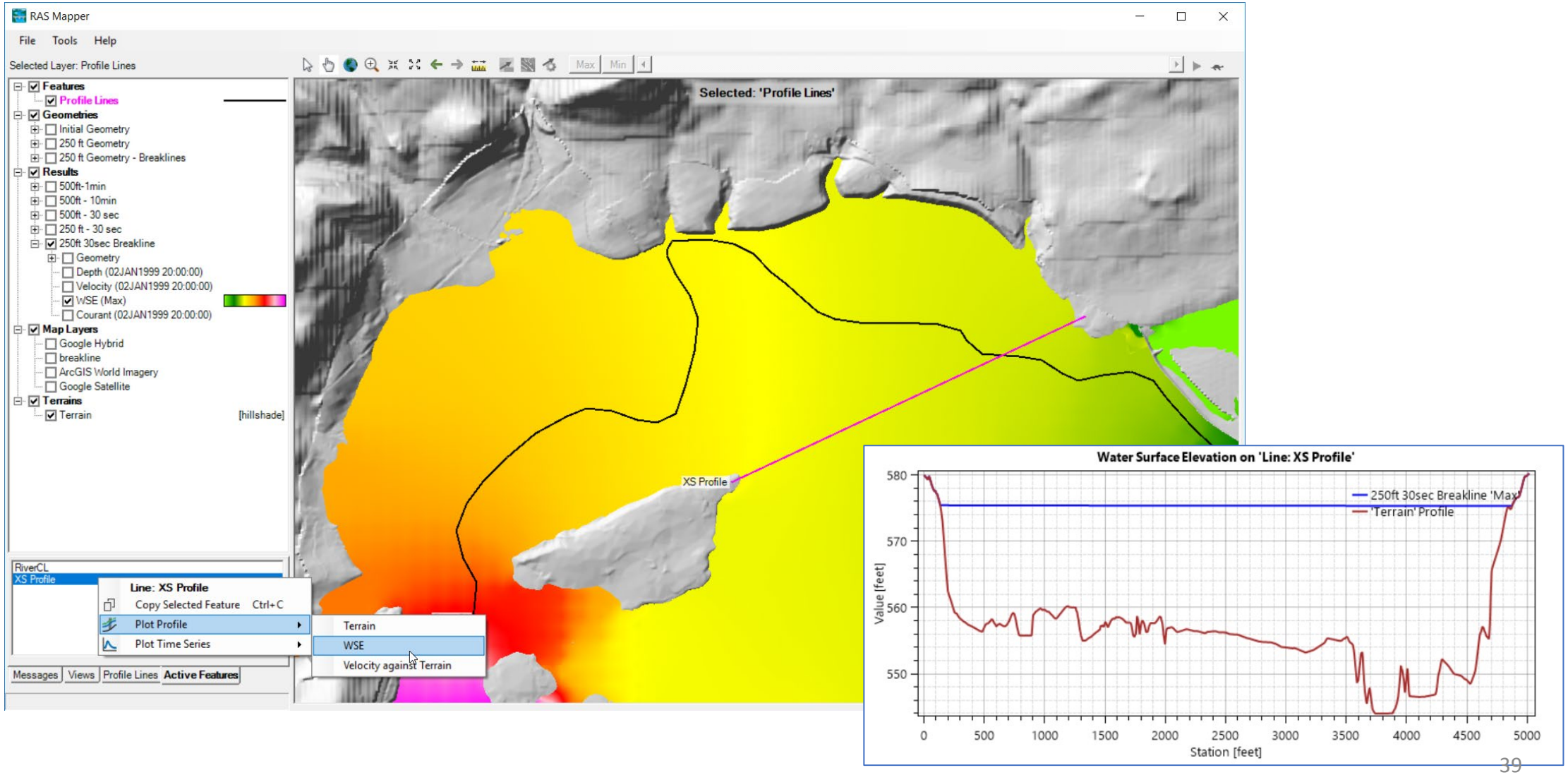




Velocity Tracing

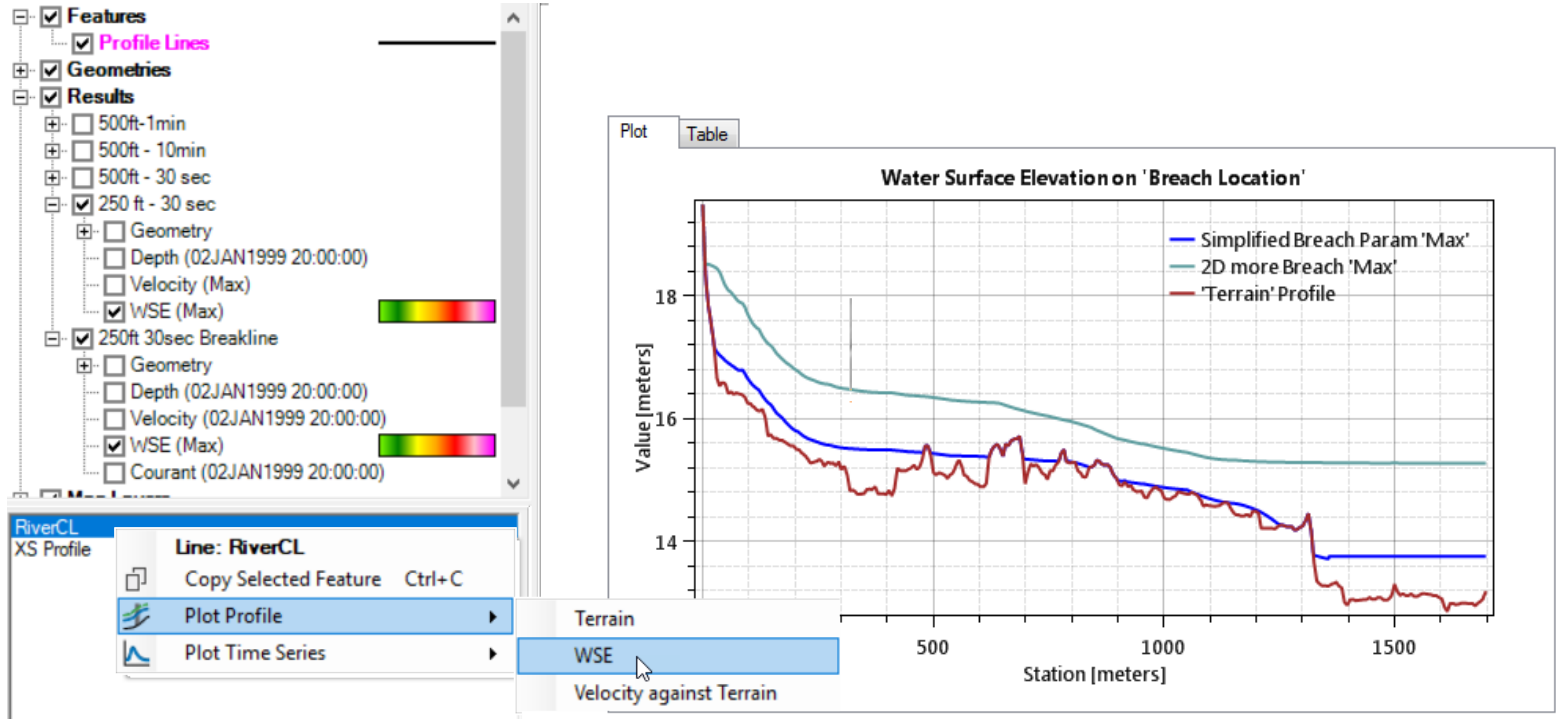


Profile Lines

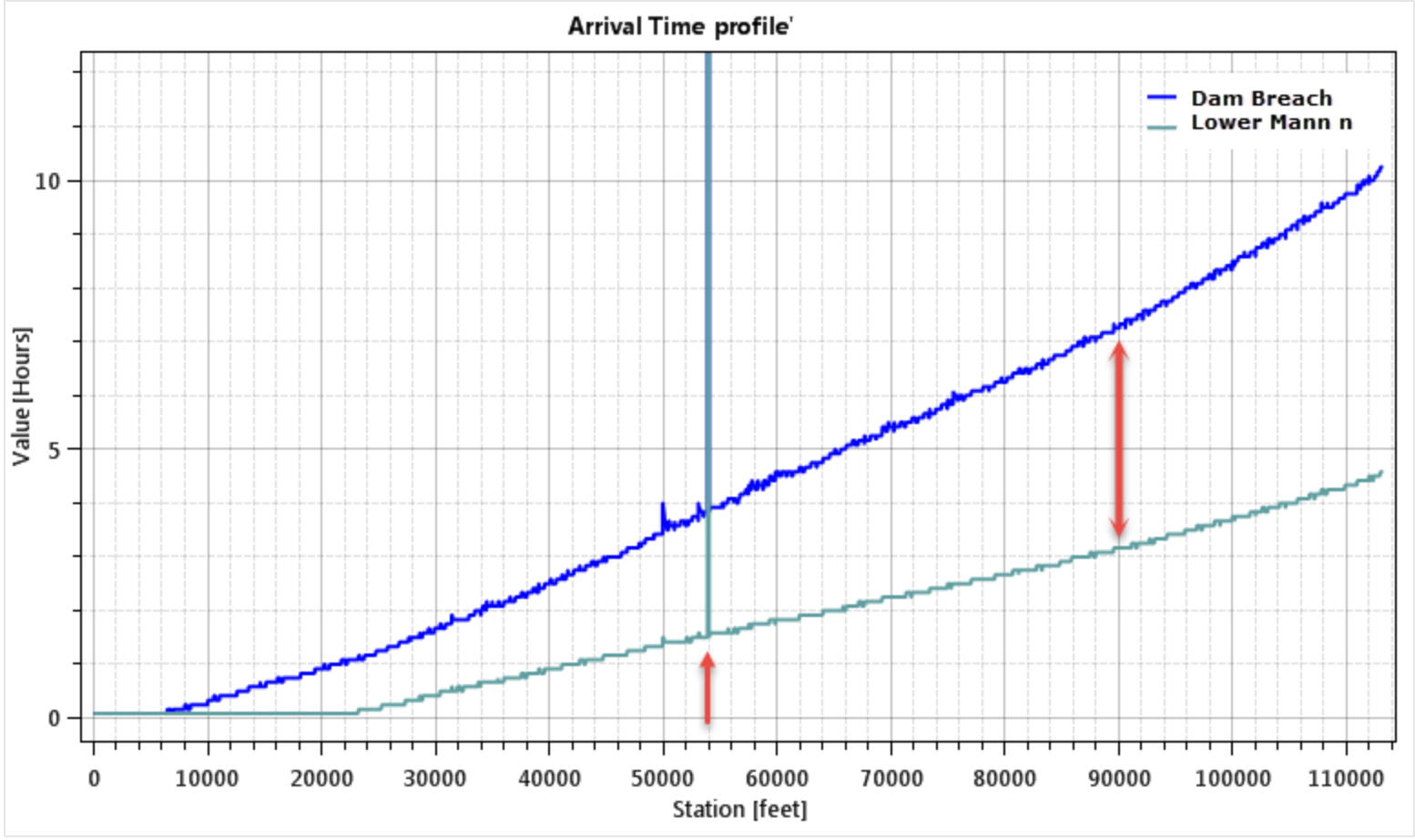


Profile Line - Comparison

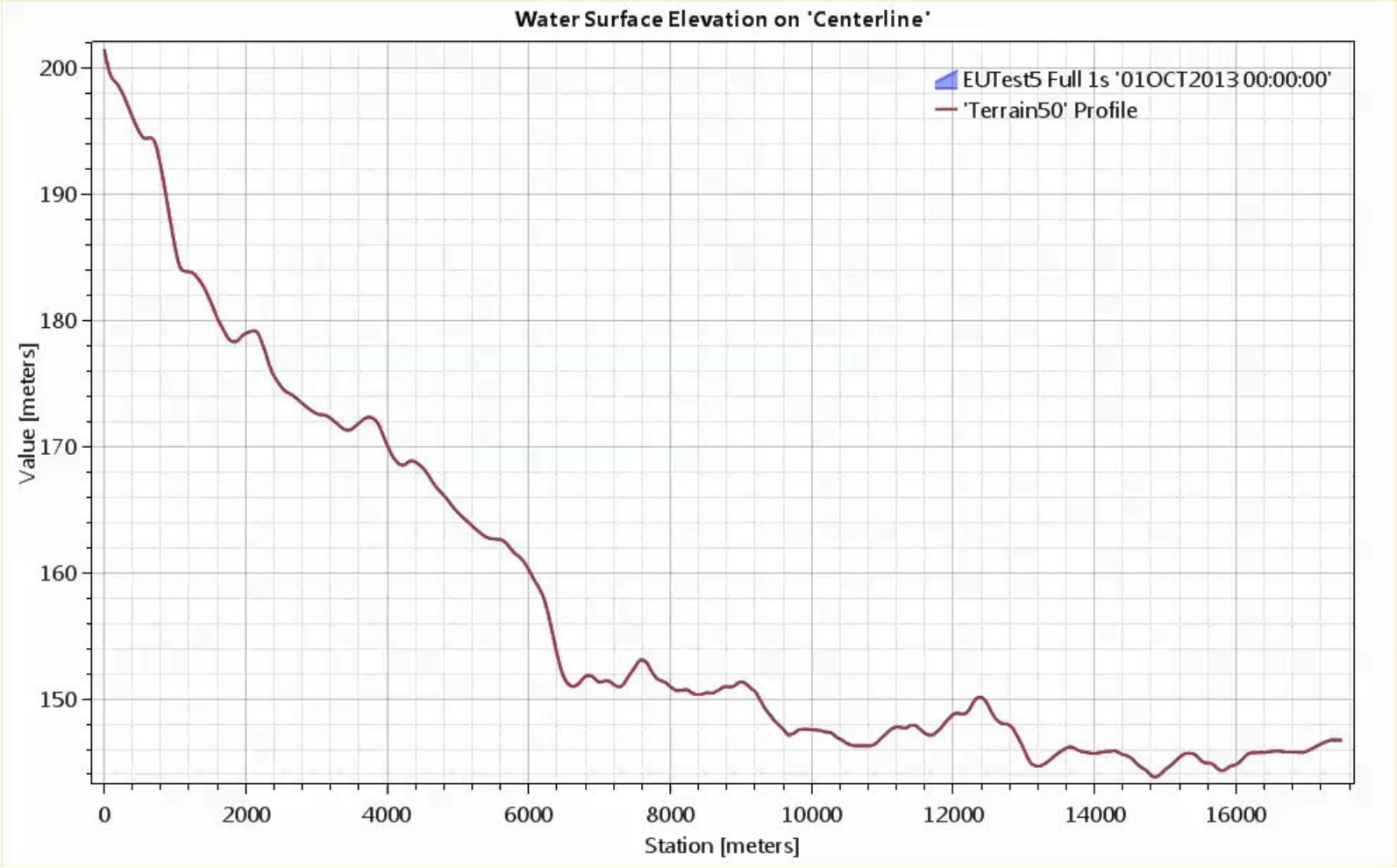
- Turn on multiple result maps
- Choose a Profile (i.e. ‘Max’)
- Choose **Plot Time Series** or **Plot Profile**



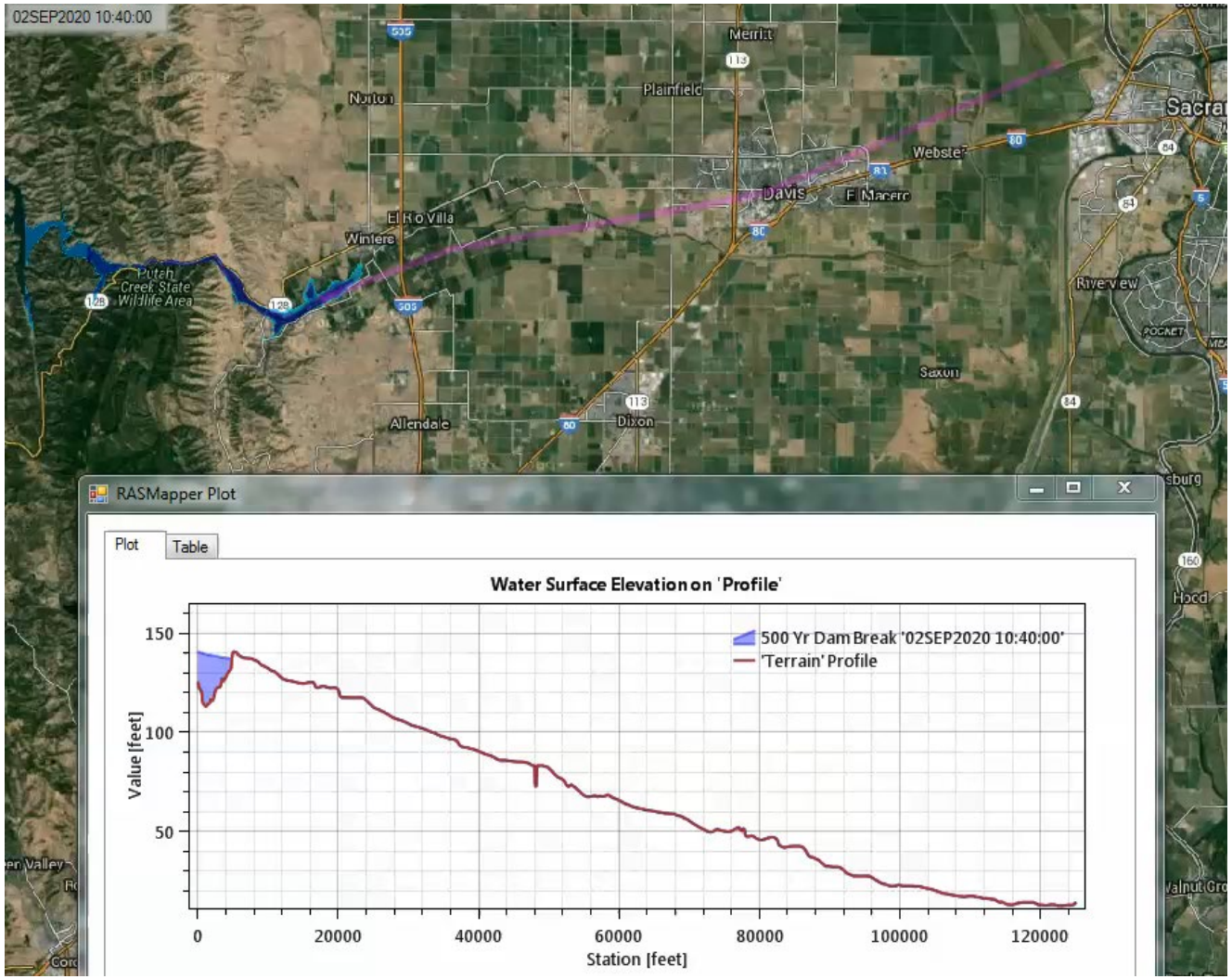
Profile Lines - Comparison



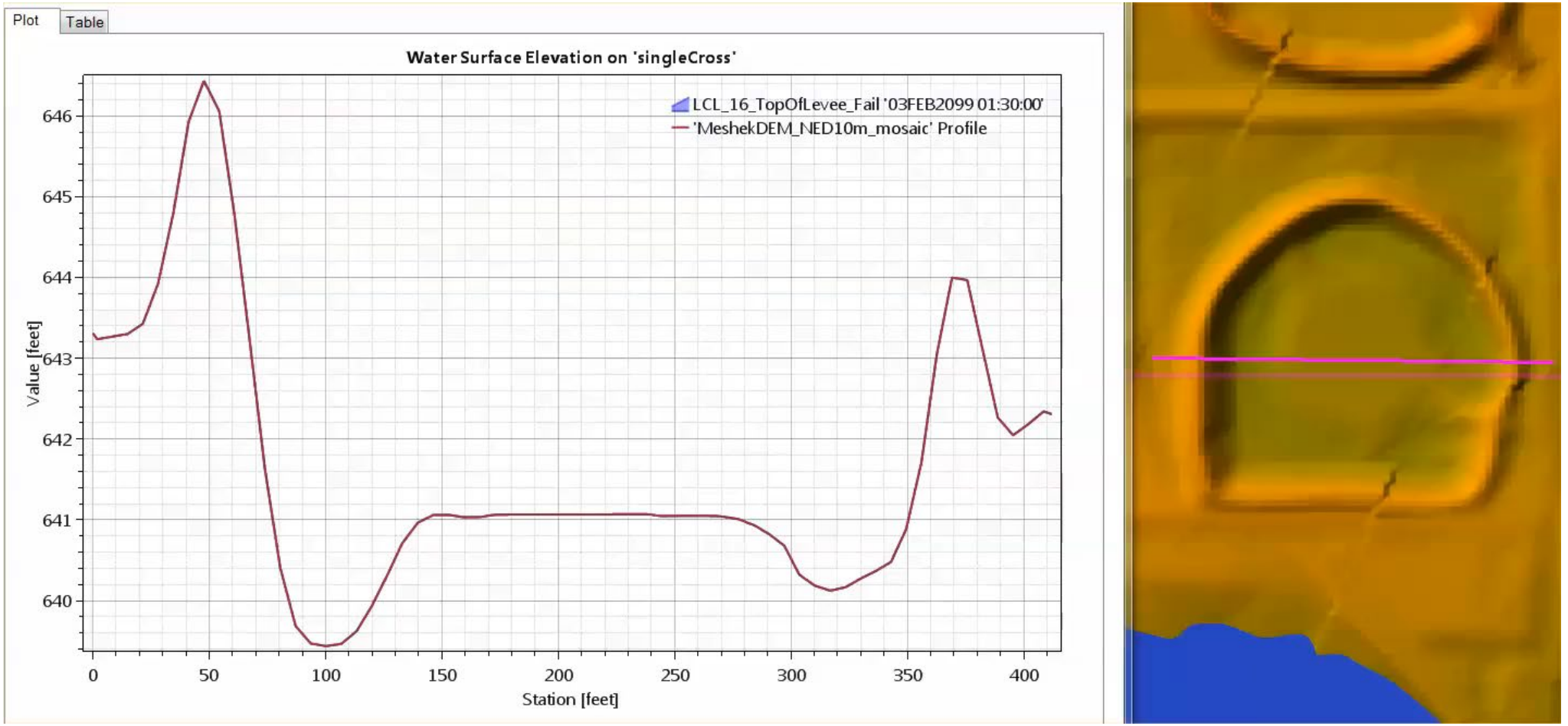
Profile Lines - Animating



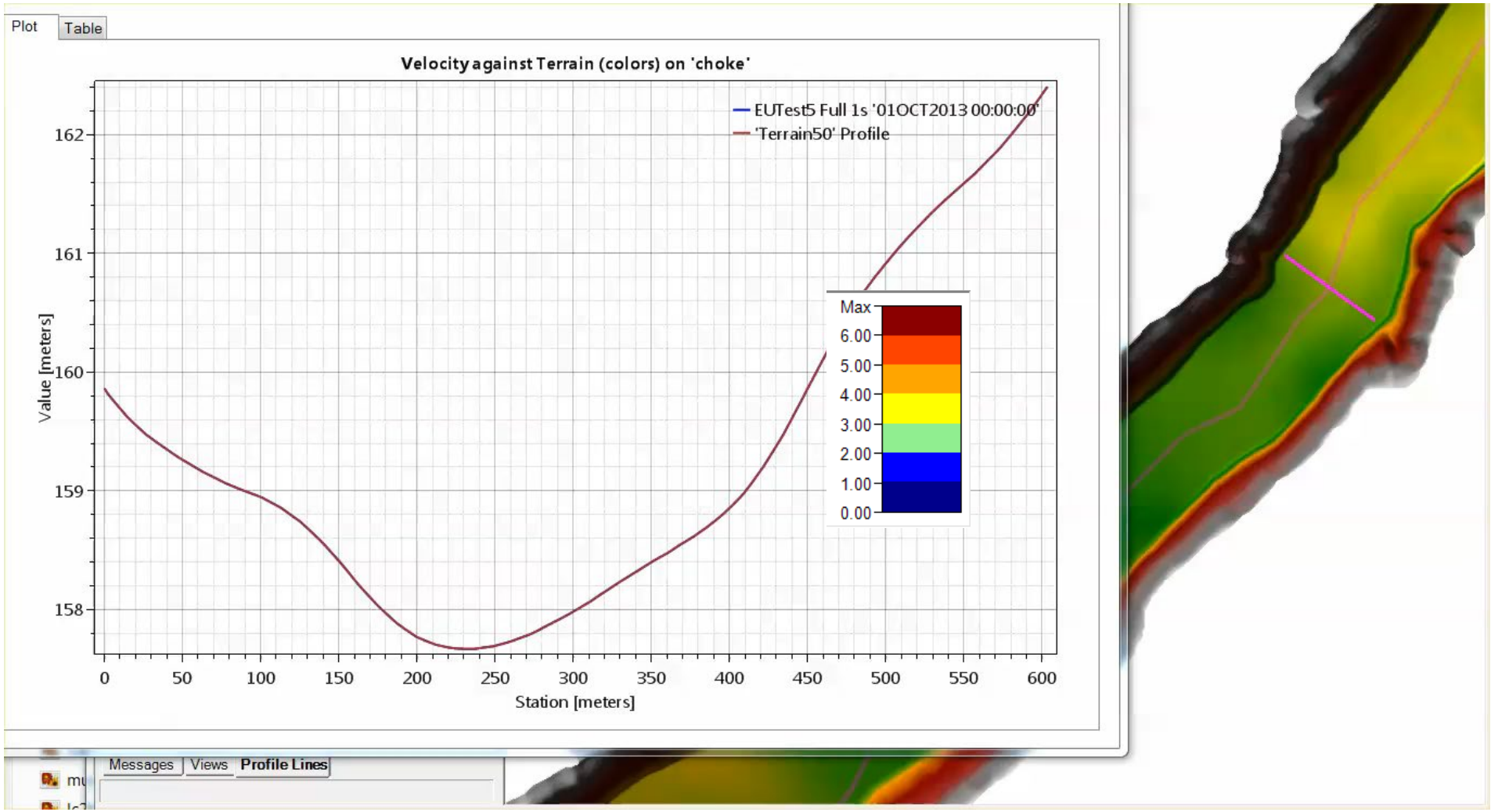
Profile Lines + Spatial Results



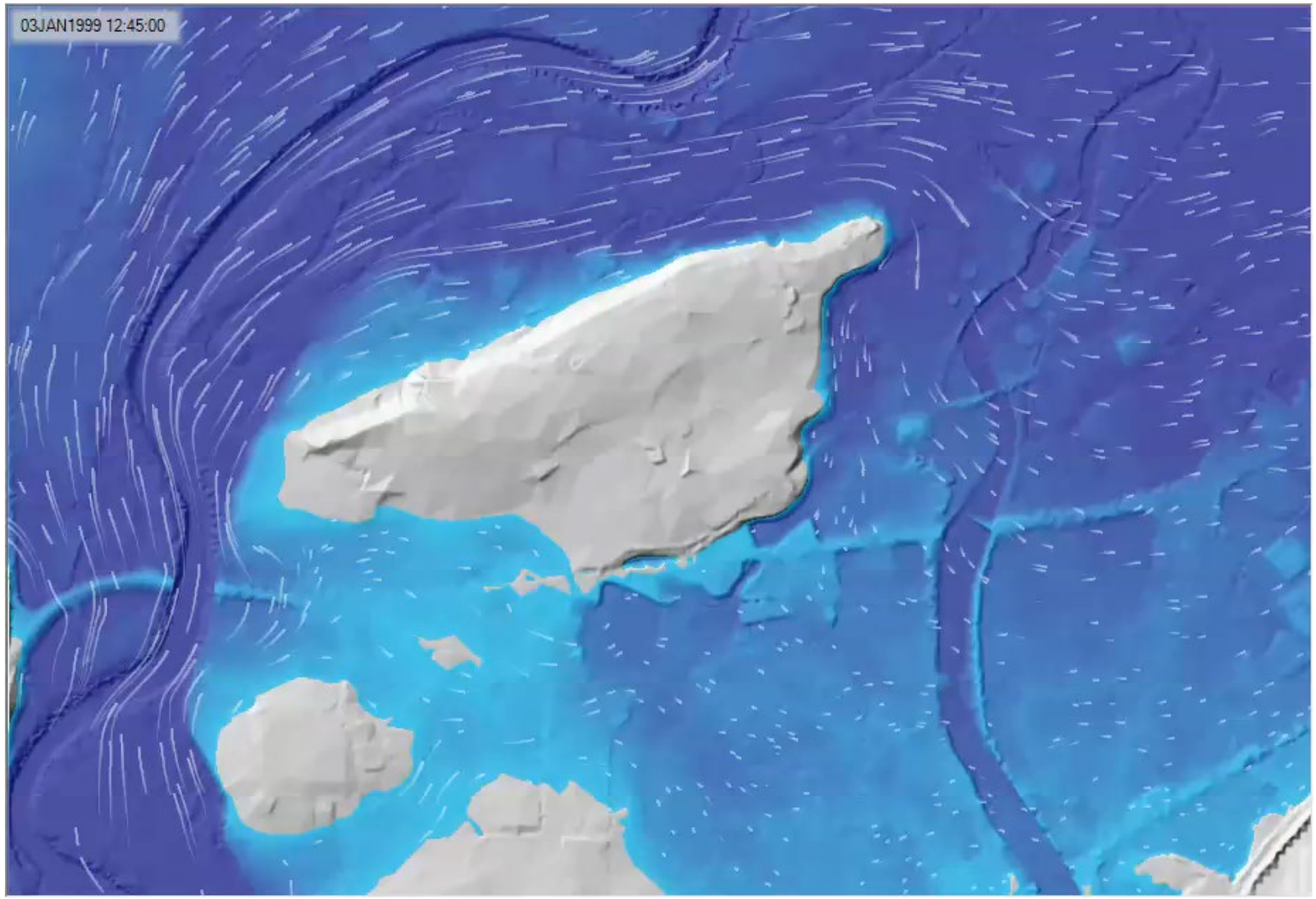
Profile Lines - Animating



Profile Lines – Velocity



Velocity Trace Animation



Questions?

US Army Corps of Engineers