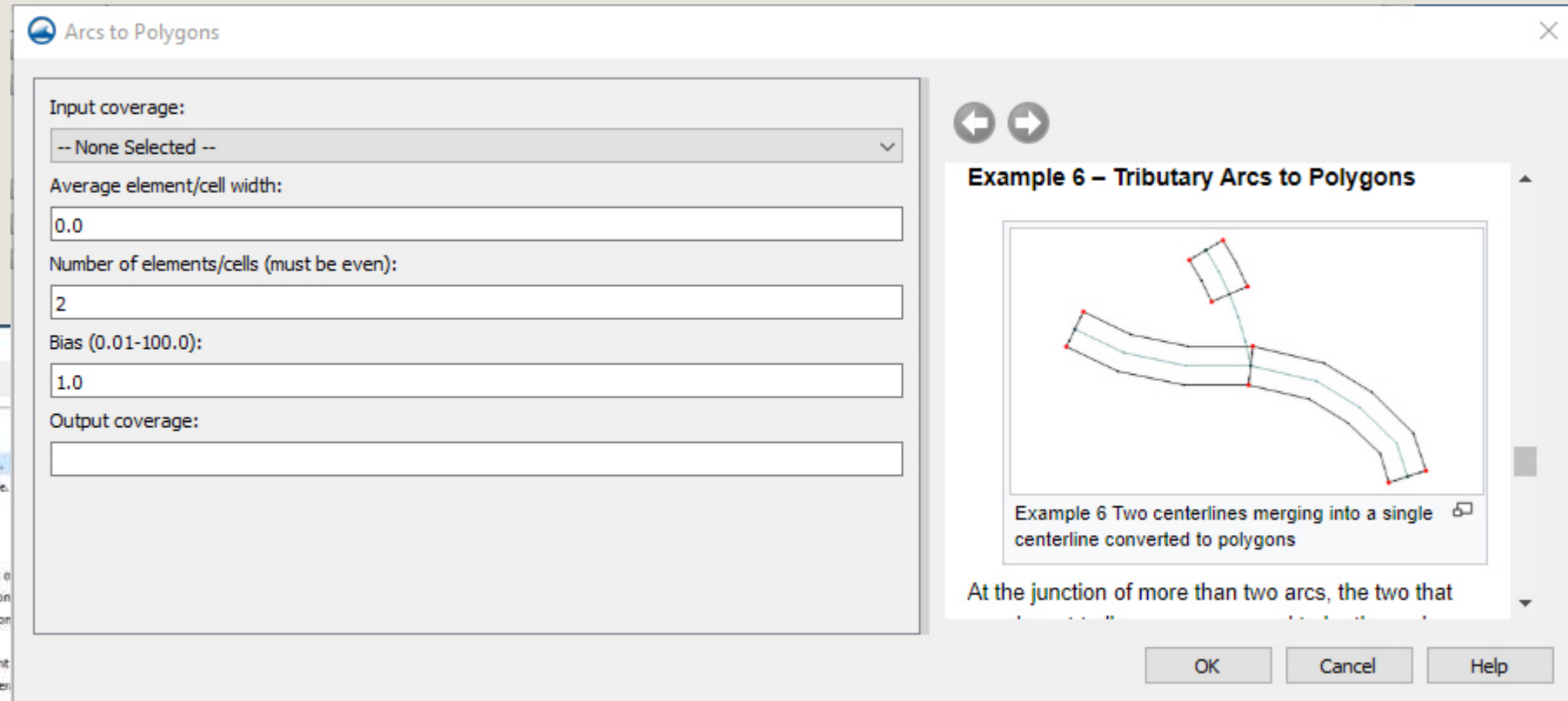
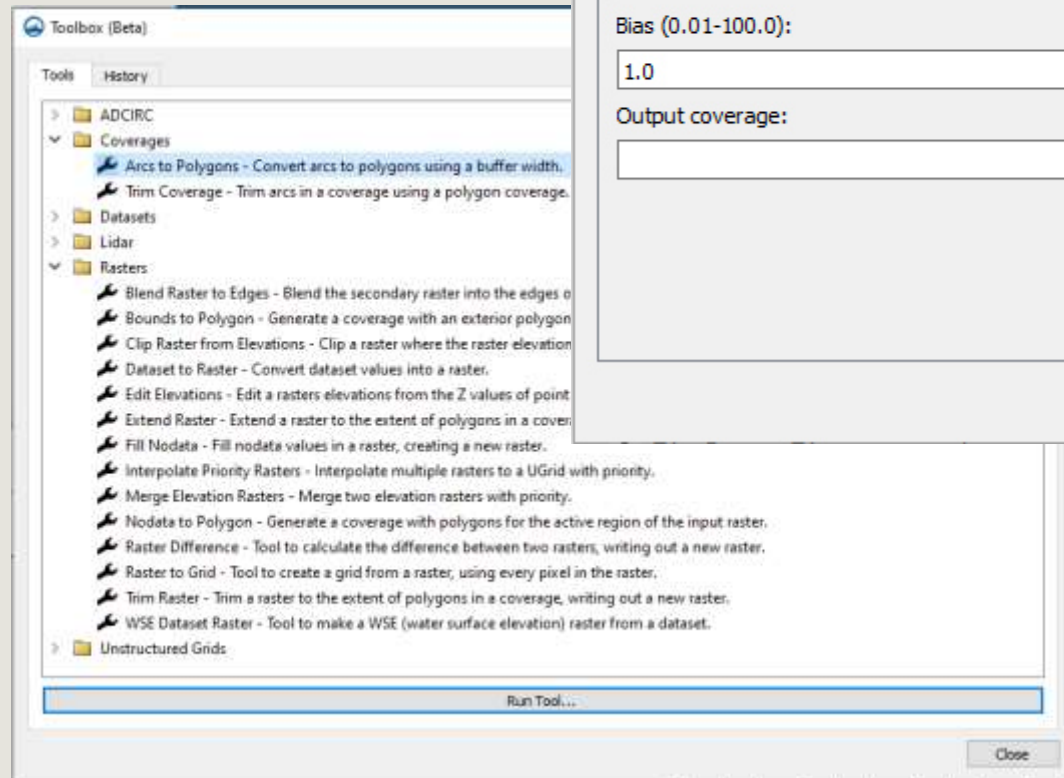


HydroAS User's Conference September 2022

Key Advances in 2D Hydraulic Modeling SMS Interface Features

Toolbox

- Python based tools
- Standard layout
 - Includes help pane
- History



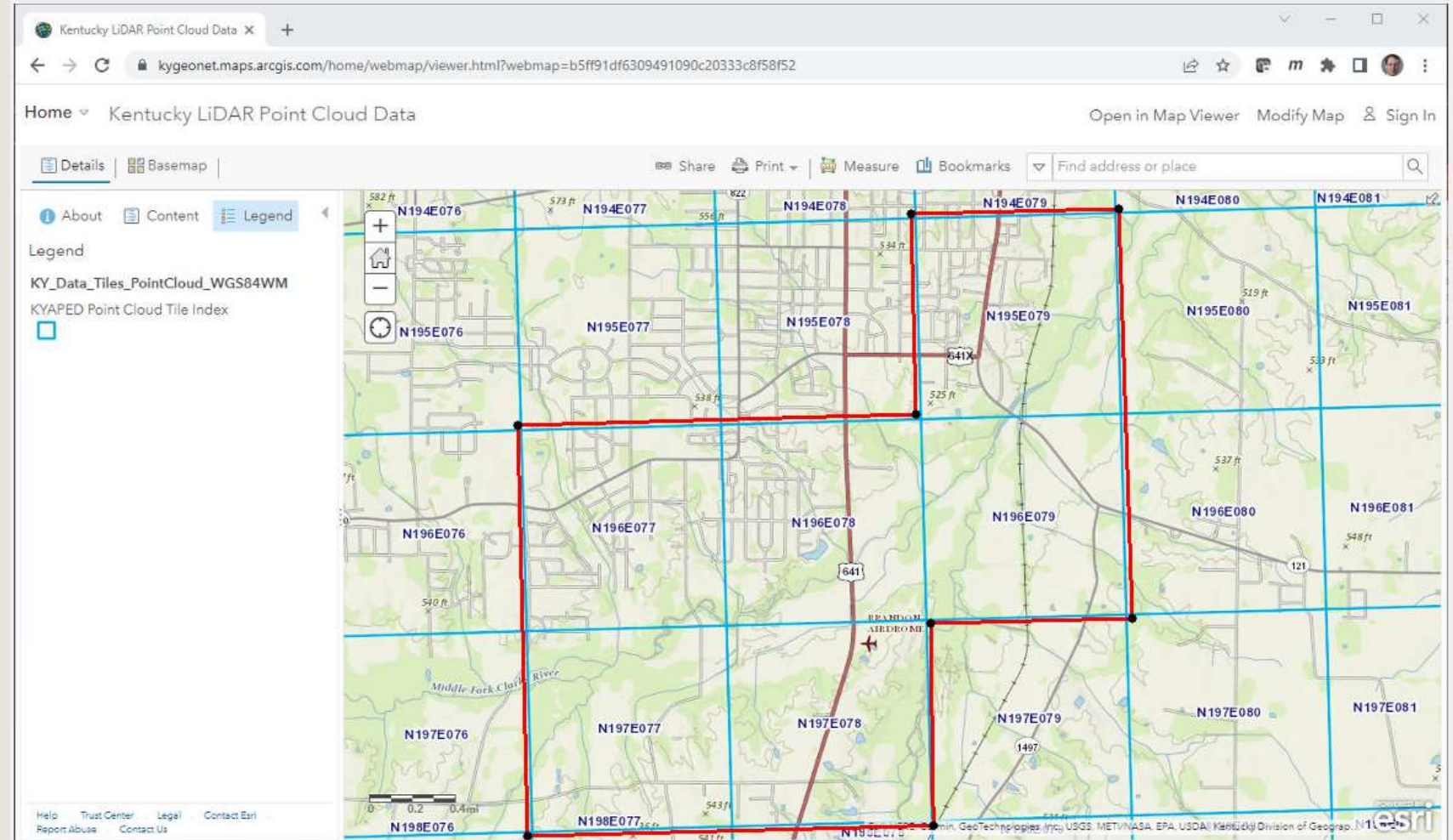
Demonstration of Tools via Mesh Generation Workflow

- Lidar tiles
- Raster terrain
- Domain definition
- Feature manipulation
- Mesh quality review

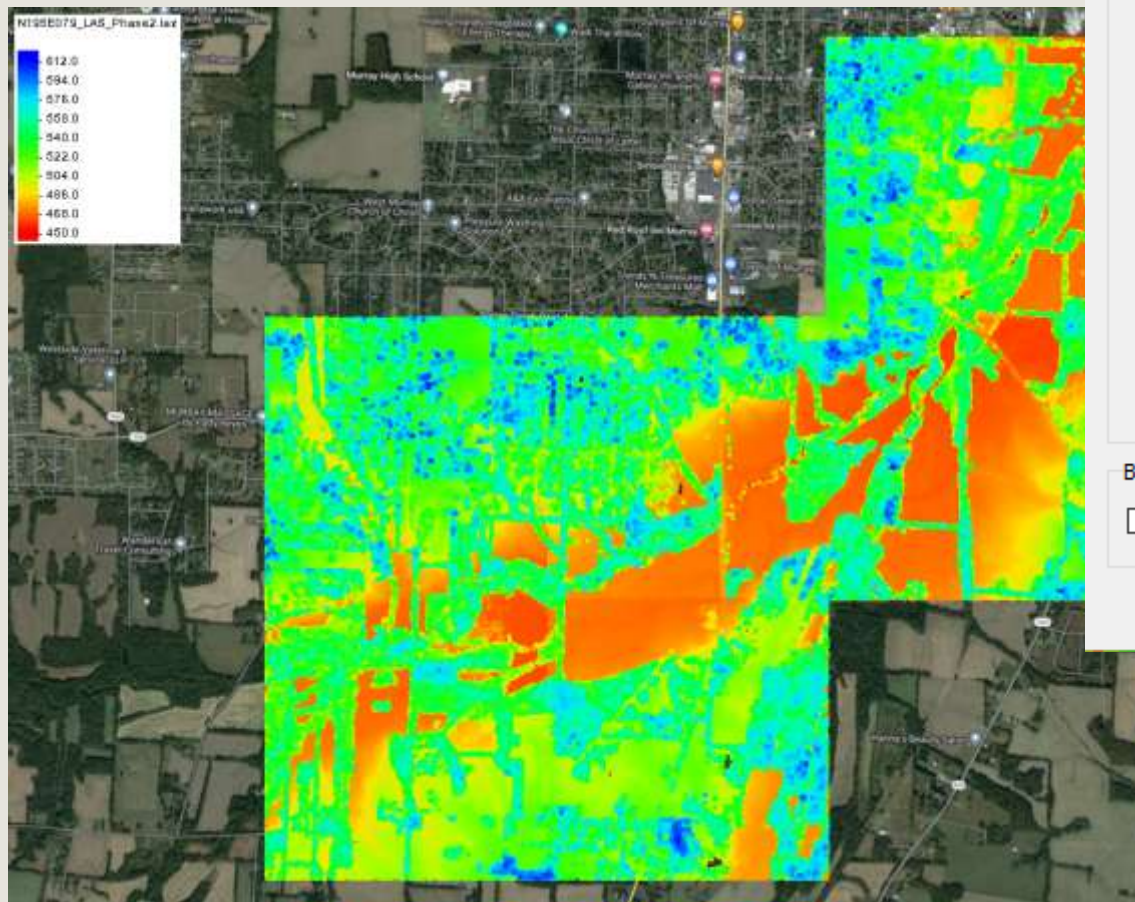


Lidar Tools

- Lidar management in SMS
 - Download from data depot
- LASlib library functions



Lidar Data Display



Lidar Display Options - N195E079_LAS_Phase2.laz

Points

- ☒ Display points
- ☐ All one color
- ☐ Color by classification
- ☒ Contours

Point size: 4

Max number of points displayed: 50000

Total number of points in file: 12317210

Bounding box

- ☐ Show bounding box

Exclude point options

(Excluded points are not displayed, exported or used in interpolation.)

- ☐ Exclusion extents: Options...
- Exclude by**
- ☒ Classification
- ☐ Return type

Classification	Color	Points
<input checked="" type="checkbox"/> 1 - Unclassified		5461039
<input checked="" type="checkbox"/> 2 - Ground		6849889
<input type="checkbox"/> 7 - Low Point (Noise)		617
<input checked="" type="checkbox"/> 17 - Bridge		5010
<input checked="" type="checkbox"/> 18 - High Point (Noise)		655

OK Cancel Apply Help...

Filter Lidar and Conversion to Raster

Lidar Exclusion Extents

×

Exclude points outside range

☒ X/Y

Update min and max from current view:

Update

☒ Z

	Min	Max
X	4159240.1953558	4168972.2927908
Y	3378162.5466264	3384784.6207189
Z	414.4	511.0

Help...

OK

Interpolate Lidar to Raster

×

Number of cells in X:

2311

Number of cells in Y:

1863

Cell size:

5.0

☒ Don't fill NODATA cells

☐ Fill NODATA cells with filter

☐ Interpolate

OK

Cancel

Help

Rasters

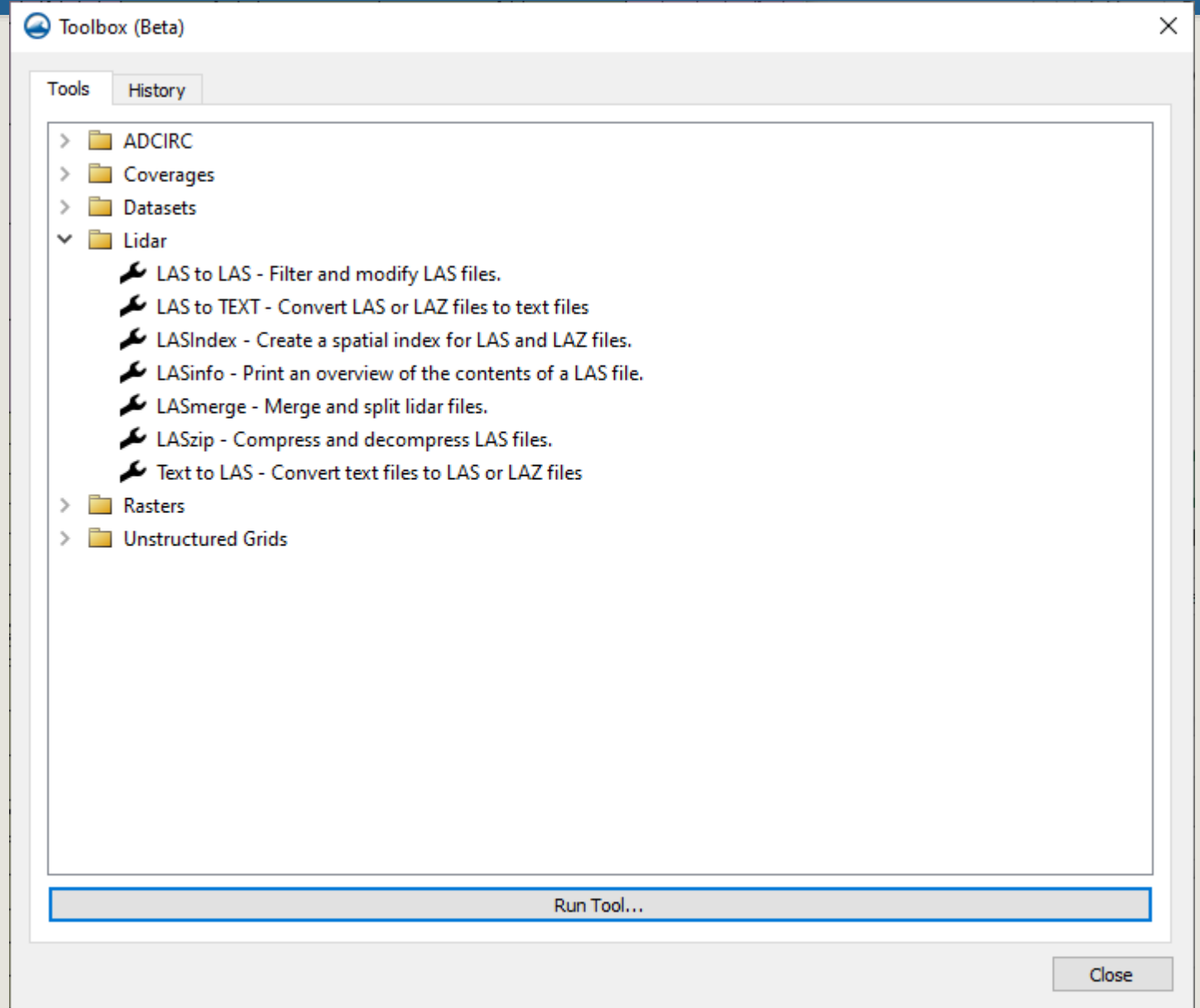
512.0
506.0
500.0
494.0
488.0
482.0
476.0
470.0
464.0
458.0

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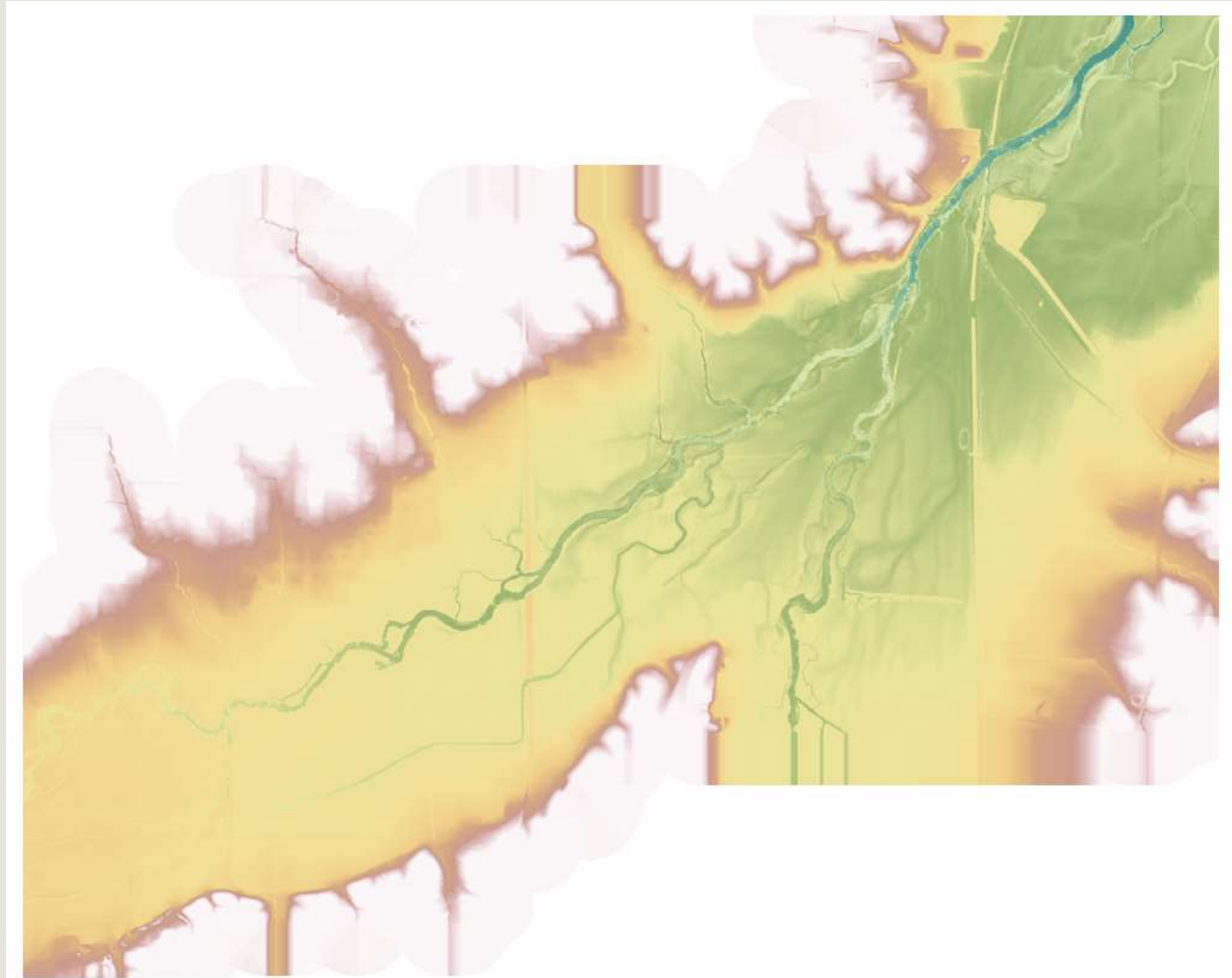
© 2022 Aquaveo, LLC

- Data conversions



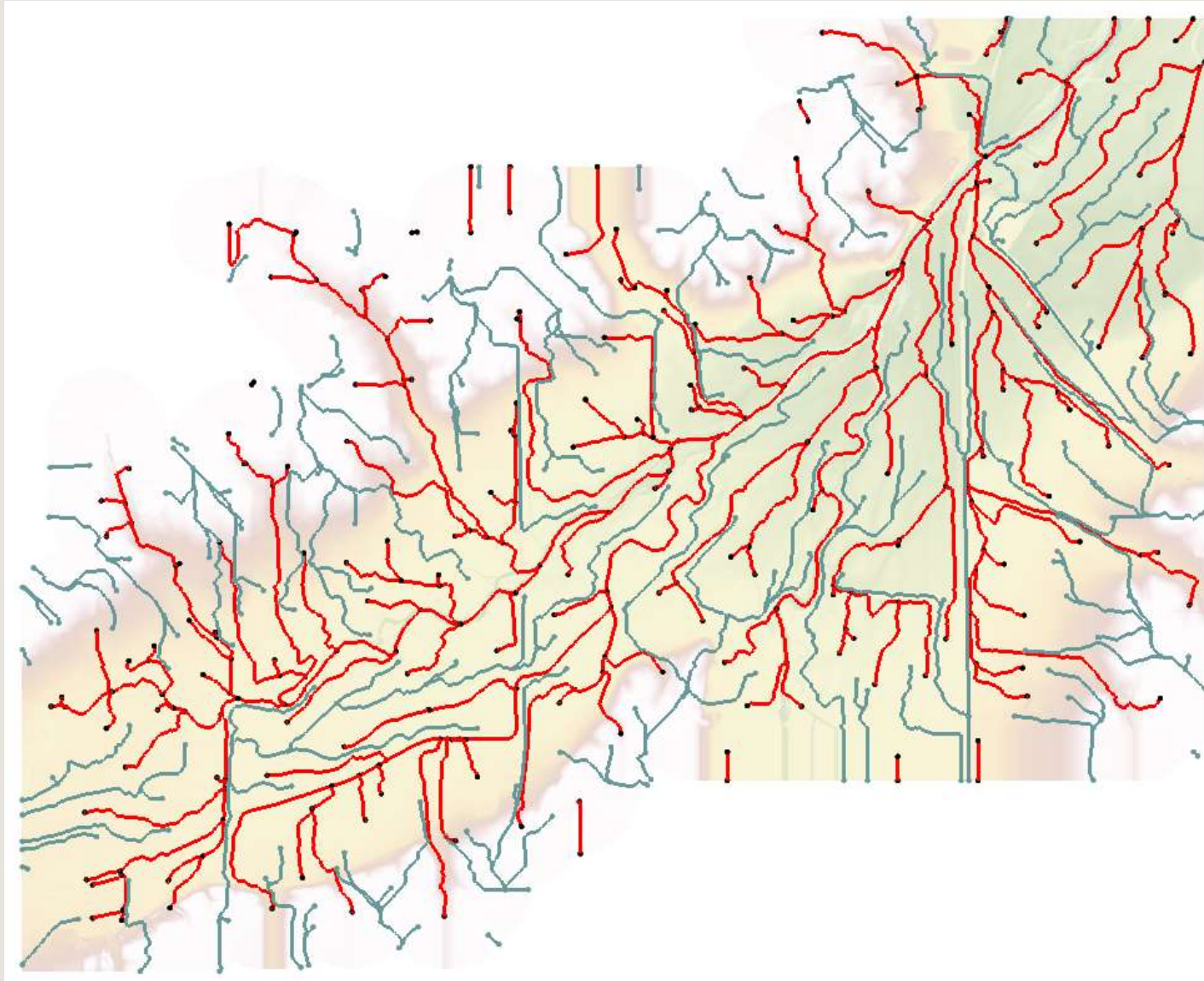
Raster Tools in the Toolbox

- Fill holes (blend)
- Edit – low flow channel
- Bounds/Holes to polygons
- Blend between rasters
 - Can be multi-source
- Conversion of other data to raster
- Interpolate from raster(s)



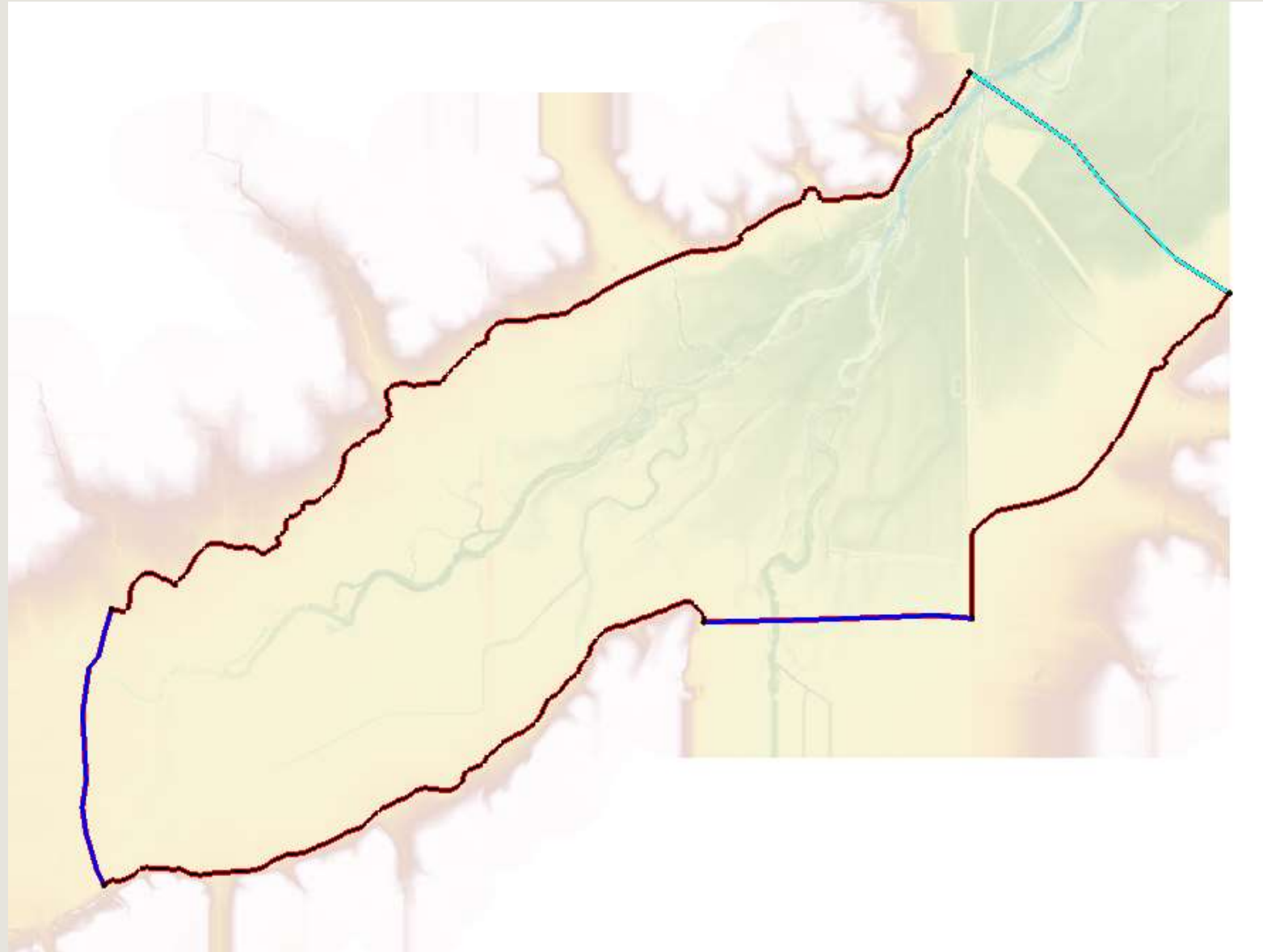
Feature extraction from Raster

- TOPAZ



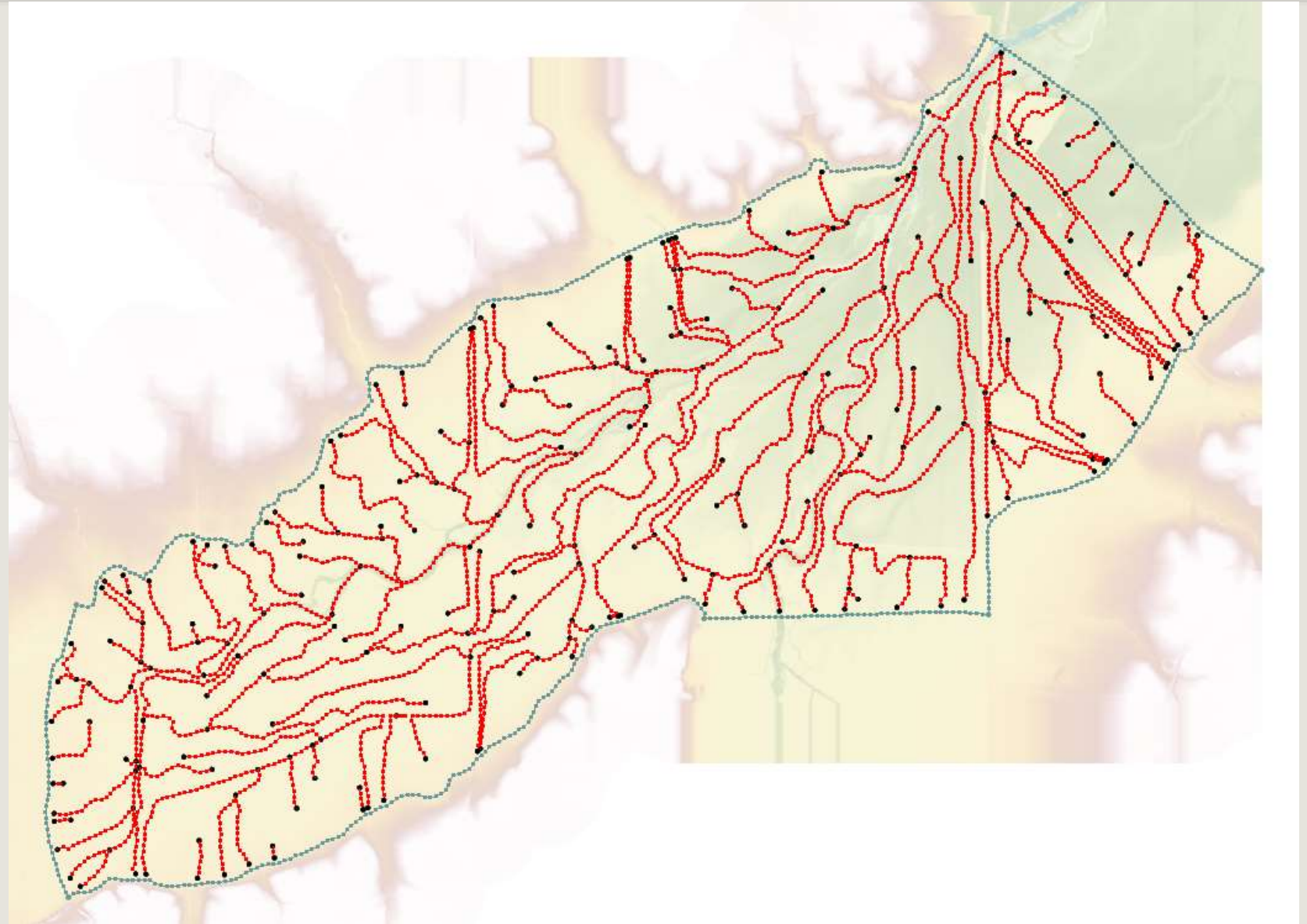
Define Domain

- Lateral Sides
 - Digitize (manual)
 - Extract contour and clean
- Define BC locations
 - Use best judgement



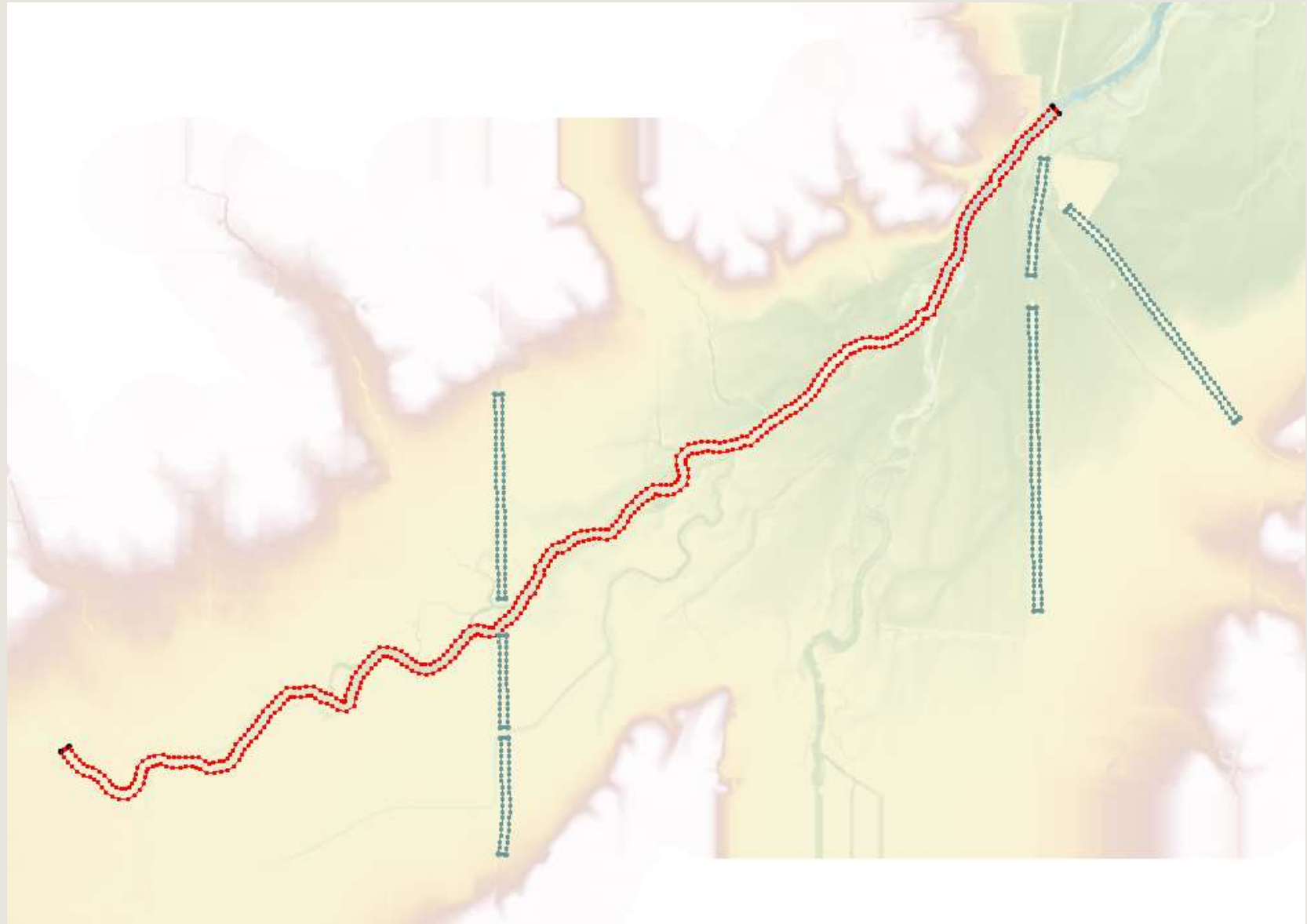
Coverage Tools – Trim coverage

- Apply toolbox tool
 - Inside or Outside
 - Buffer distance
- Mesh generation is iterative
- Minor manual edits

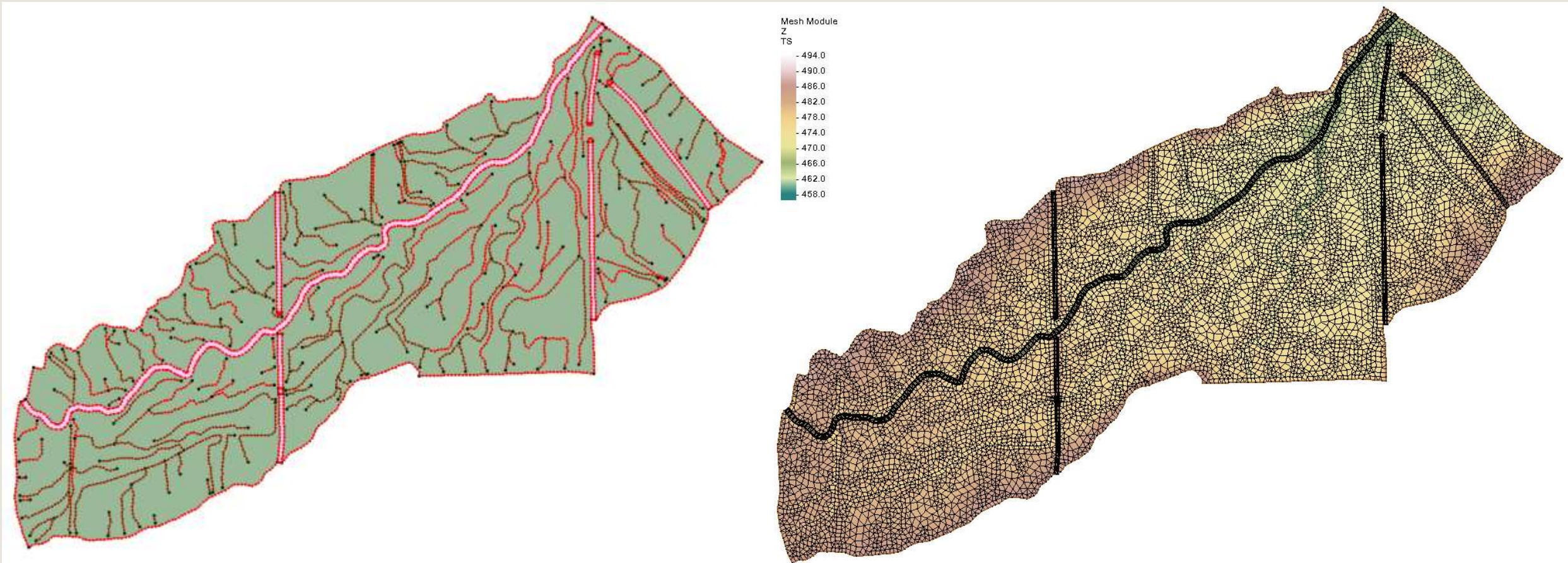


Coverage Tools – Arcs to Polygons

- Key hydraulic features
 - Channels
 - Embankments
- Creates polygons for each



Combine Domain Boundary, Networks, and Hydraulic Feature Polygons



Bridge Meshing (Toolbox)

- Coverage defining bridge parameters
- Create Bridge Footprint tool
 - Creates coverage and mesh
- Incorporate footprint into “Mesh Generator”
- Generate mesh with hole for bridge
- Merge bridge mesh into hole
- Can also be used to create box culvert mesh

Create Bridge Piers

Input coverage:
Map Data/Pre/3D Bridge/Uniform Skew Param

Bridge width:
40.0

Bridge wrapping width:
8.0

☐ Specify number of segments
☒ Has abutments

Pier type:
Wall

Wall width:
3.0

Element wrapping width:
2.0

Wall pier length:
30.0

Wall pier number of side elements:
6

Pier end type:
Square

Output grid:
Uniform Skew

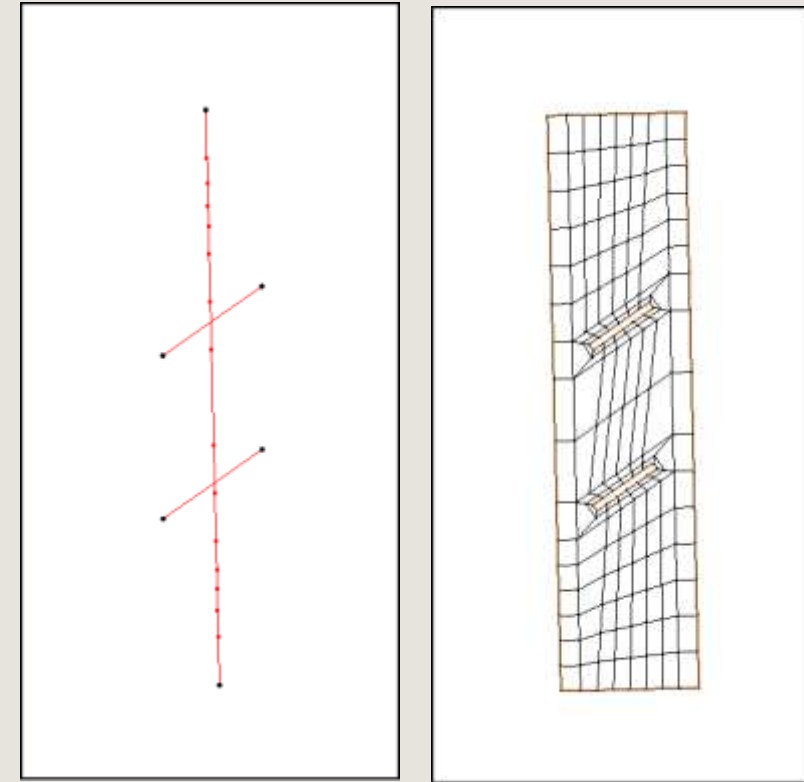
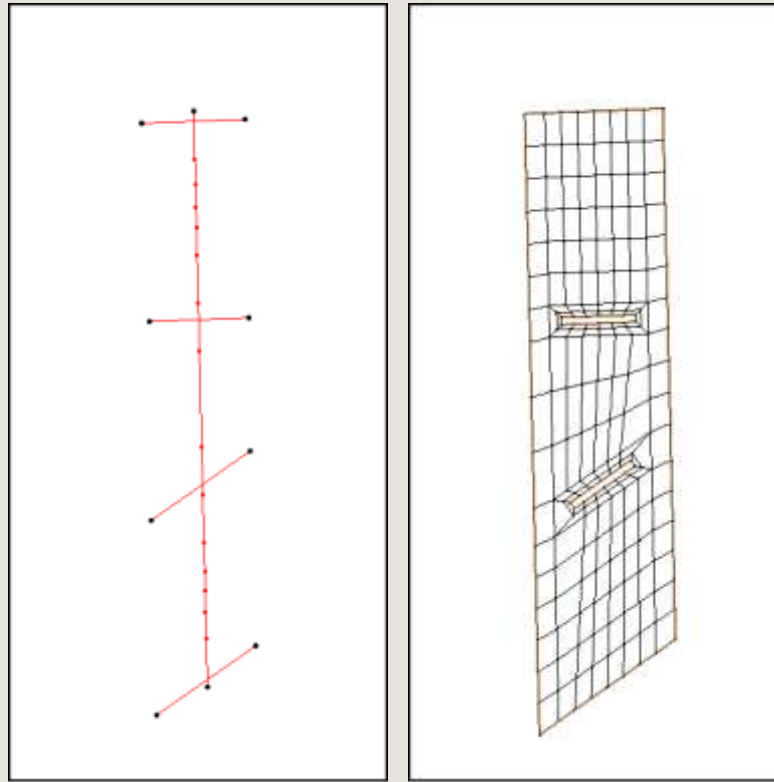
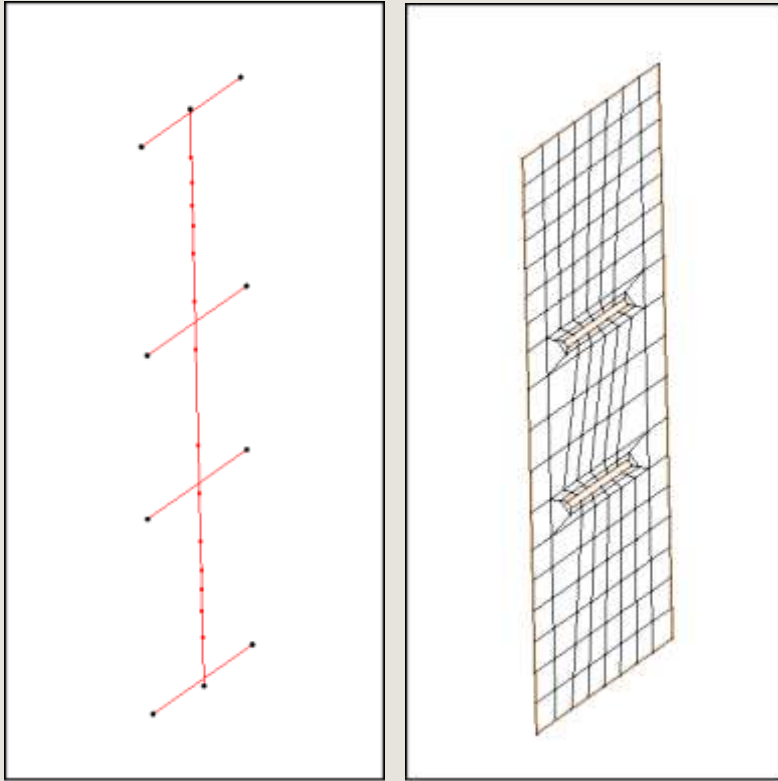
Output coverage:
Uniform Skew

Input parameters

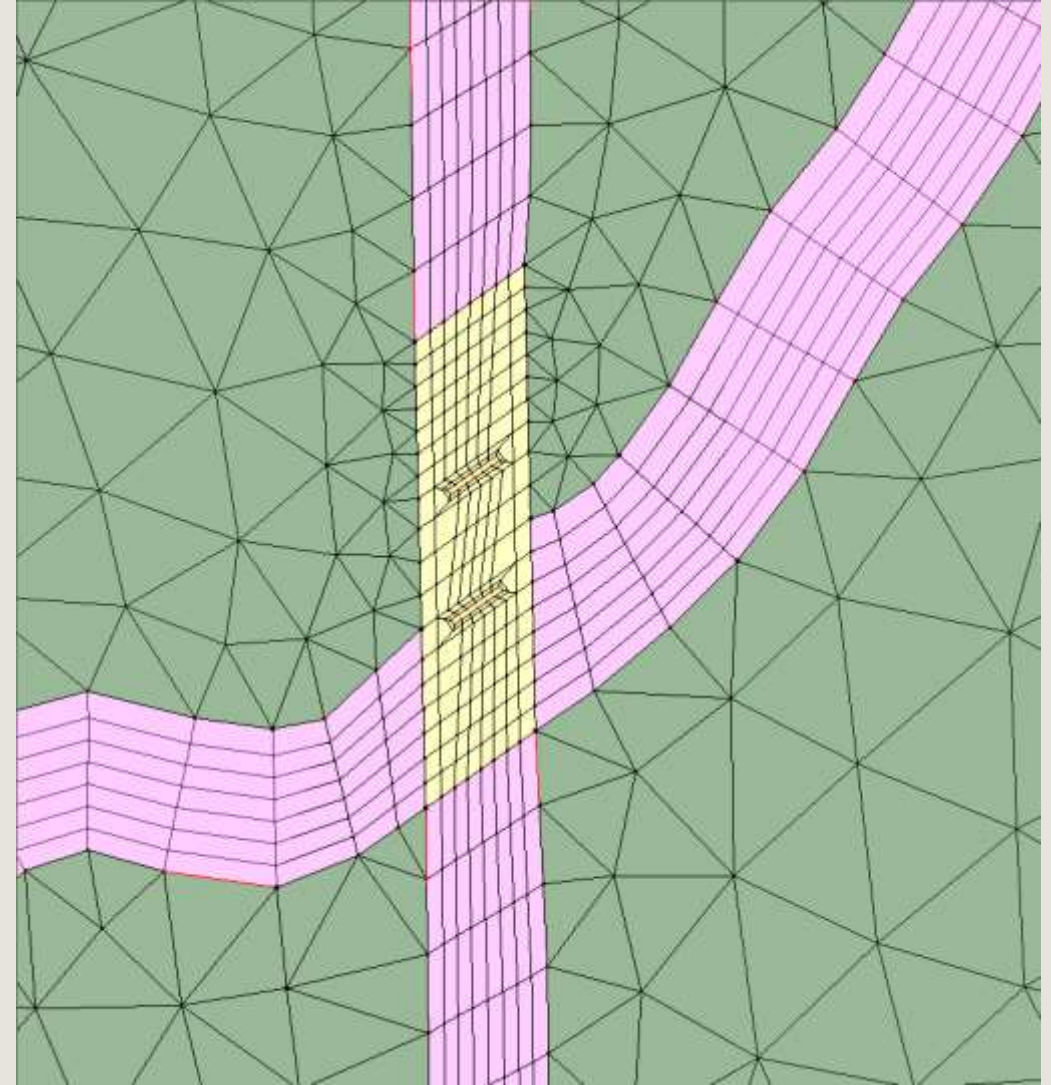
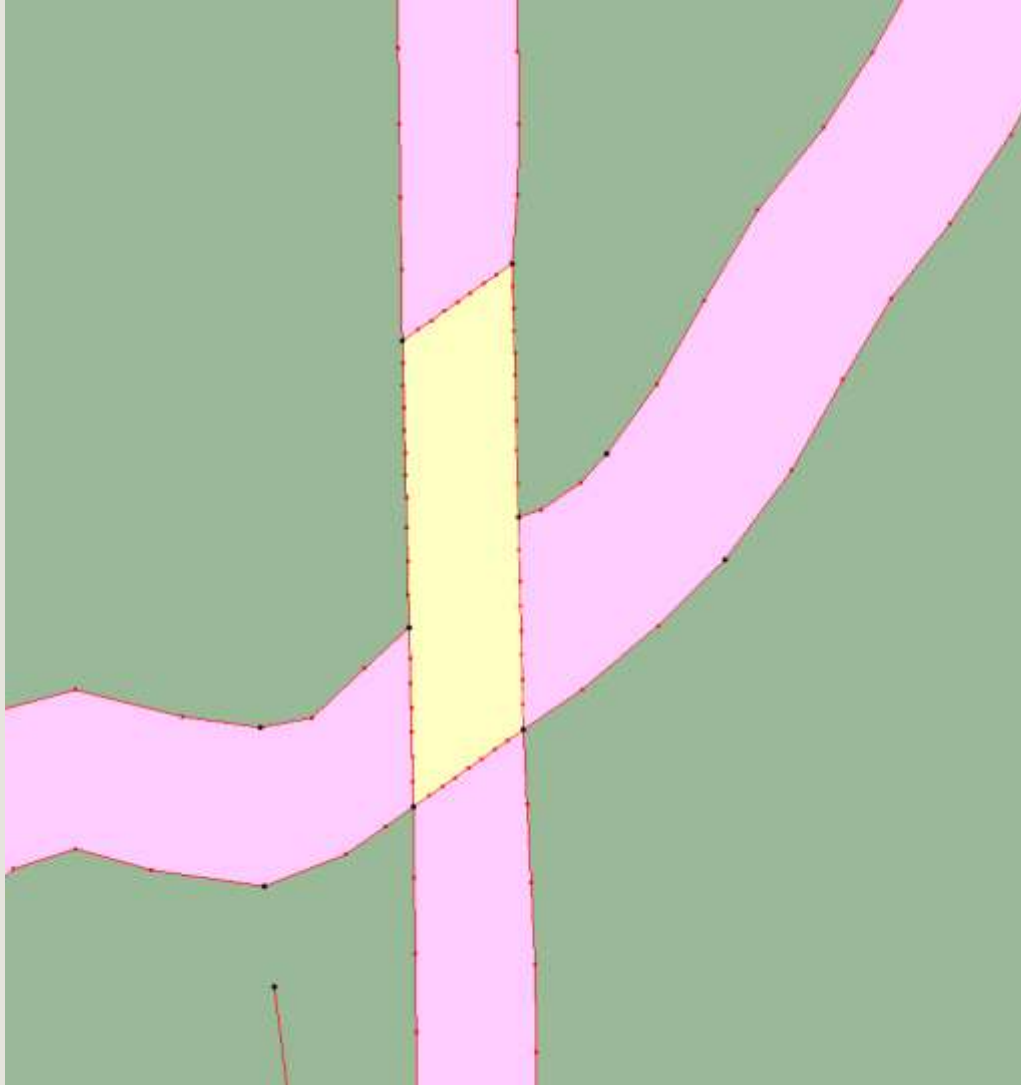
- *Input coverage* – This can be any coverage but it represents a single bridge. The coverage will have no polygons or feature points (points that are not part of any arcs). The longest arc is interpreted as the bridge centerline. All other arcs in the coverage should cross, but not intersect this arc (intersecting would result in splitting both arcs). All other arcs (which cross the bridge centerline) are assumed to define the location of a wall pier or pier group, unless the "Has abutments" toggle is selected. In this case, the arcs that intersect the centerline closest to the ends of the centerline arc define the orientation of the bridge abutments at the ends of the centerline. See the figure in the examples below.
- *Bridge width* – Enter the total width of the bridge from upstream face to downstream face. The units (foot/meter) correspond to the display projection of SMS.
- *Bridge wrapping width* – Enter the width of a rows of cells created just upstream and just downstream of the bridge footprint. These will be quadrilateral cells to cleanly represent the flow entering/leaving the bridge region. This width is usually specified to transition from

OK Cancel Help

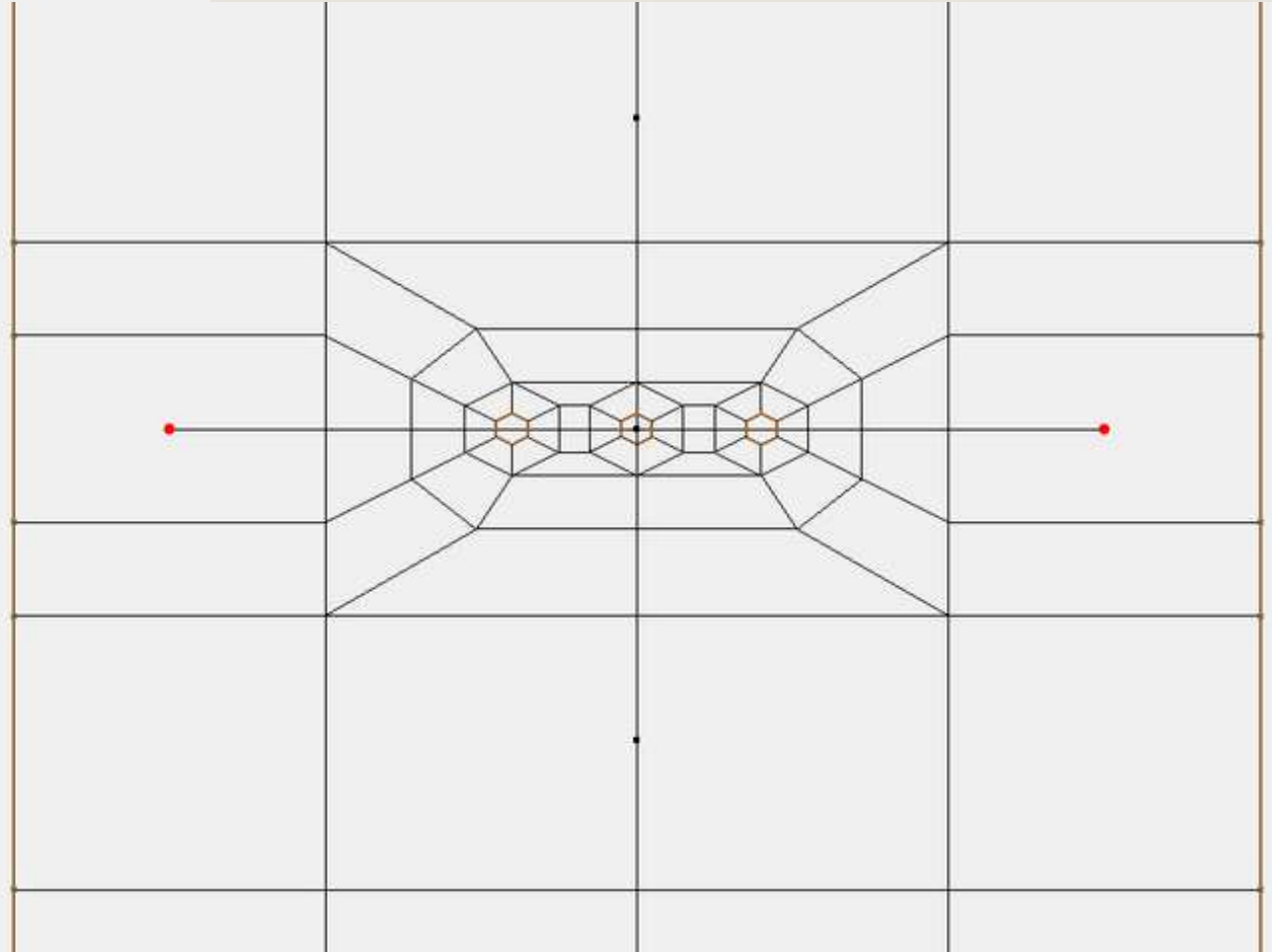
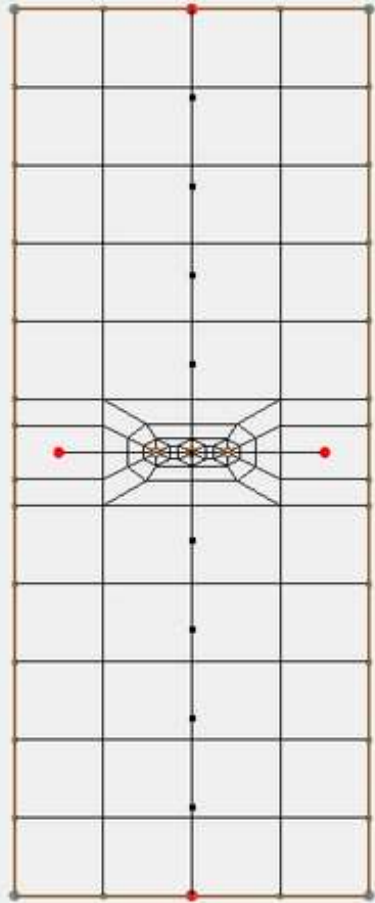
Examples of Bridge Mesh Options



Bridge Mesh Incorporated into Domain Mesh

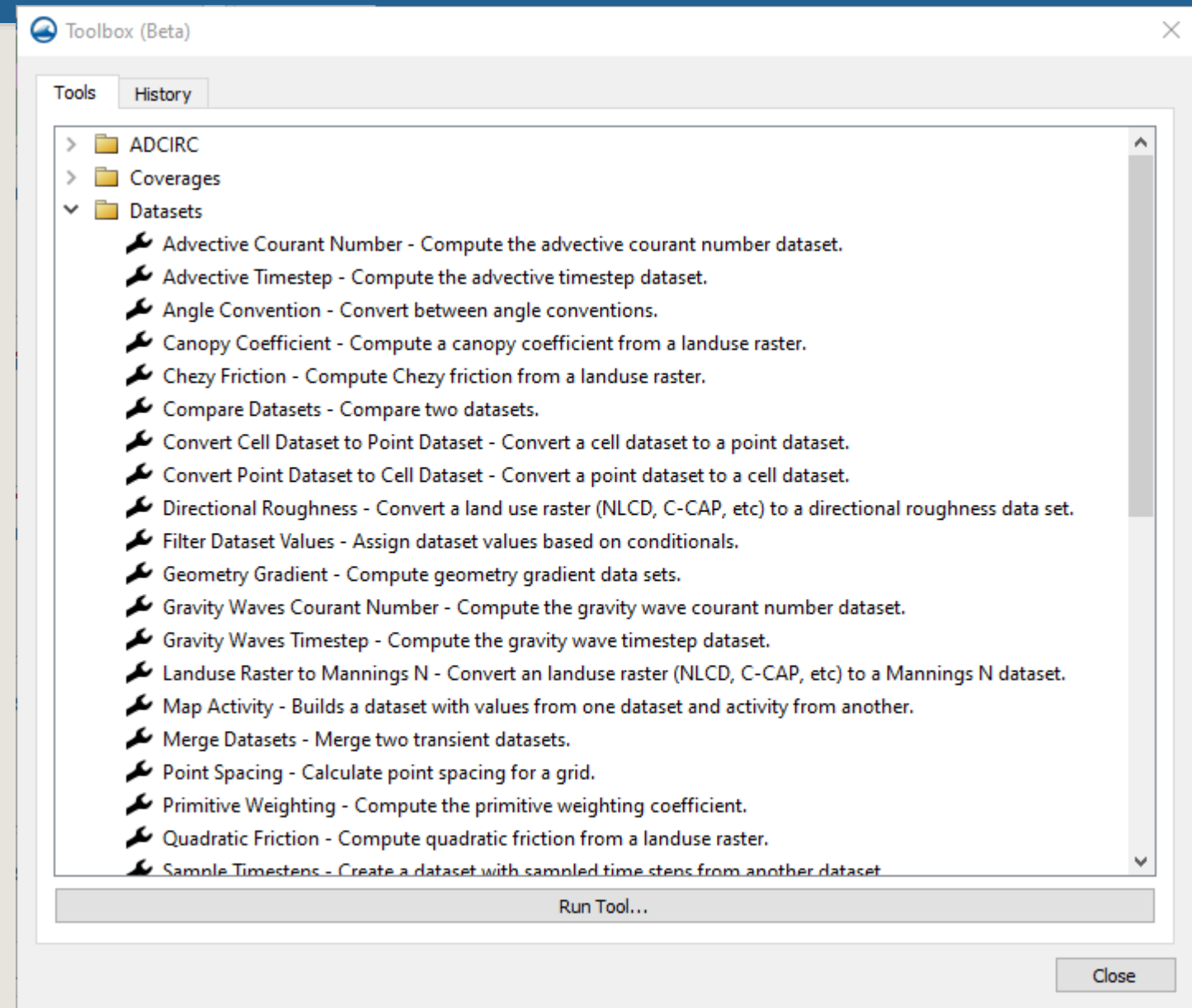


Bridge Mesh – Pier Groups



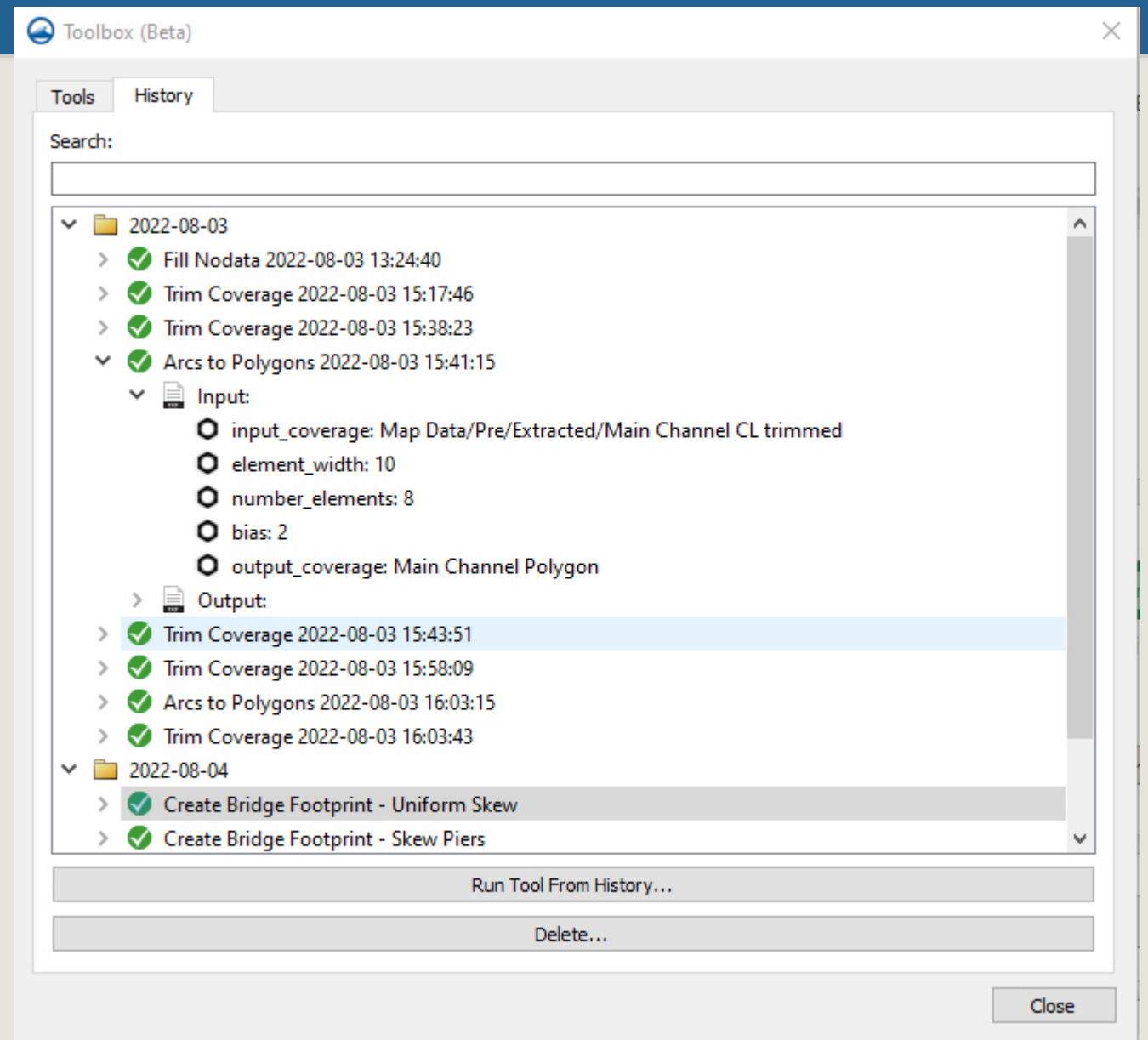
Dataset Tools

- Equivalent to Dataset Toolbox
- Python functionality
- History



Toolbox History Function

- Re-run tools
- Saved with project
- Searchable
- Editable
- Input/Output



Themes

- Types of theme
 - General Theme (view, lighting, etc.)
 - Geometry Theme (module display attributes/options)
 - Object Theme (project explorer objects)
 - Contour Theme (can be associated with dataset names)
 - Vector Theme
- Stored with project
- In Project Explorer
- Use one type at a time
- Tutorials

Display Theme Properties

Display Theme name:
Terrain

☒ Load this theme when objects with the following names are selected in the Project Explorer:

1	Z
2	

Delete

☐ Match exactly

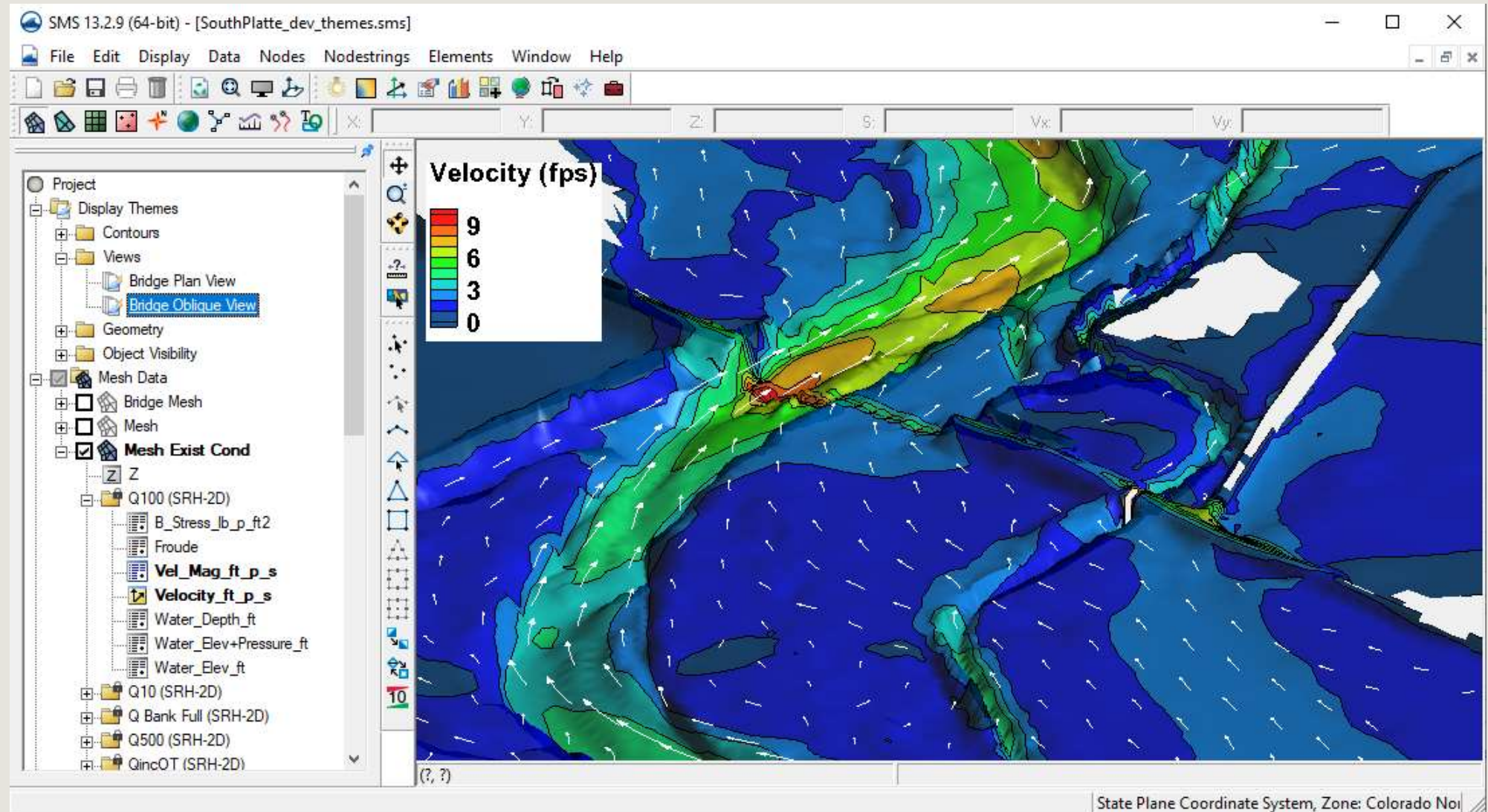
Display options to include

- ☐ General (view, lighting, etc.)
- ☐ Geometry (scatter sets, mesh etc.)
- ☐ Object visibility
- ☒ Datasets
 - ☒ Contours
 - ☐ Vectors

OK Cancel Help

General Theme

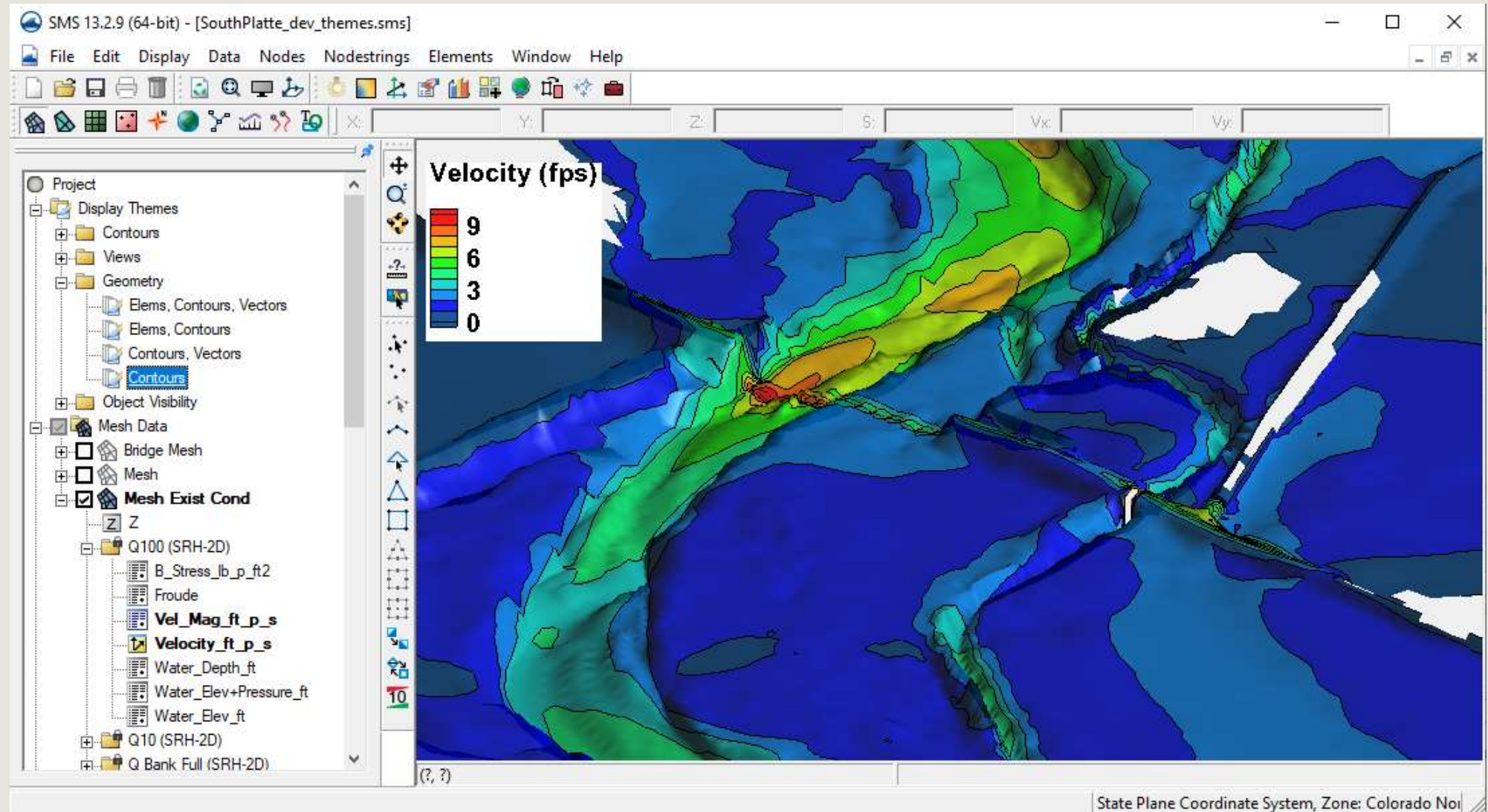
- Multiple Display Option Tabs
 - General
 - Lighting
 - View



Geometry Theme

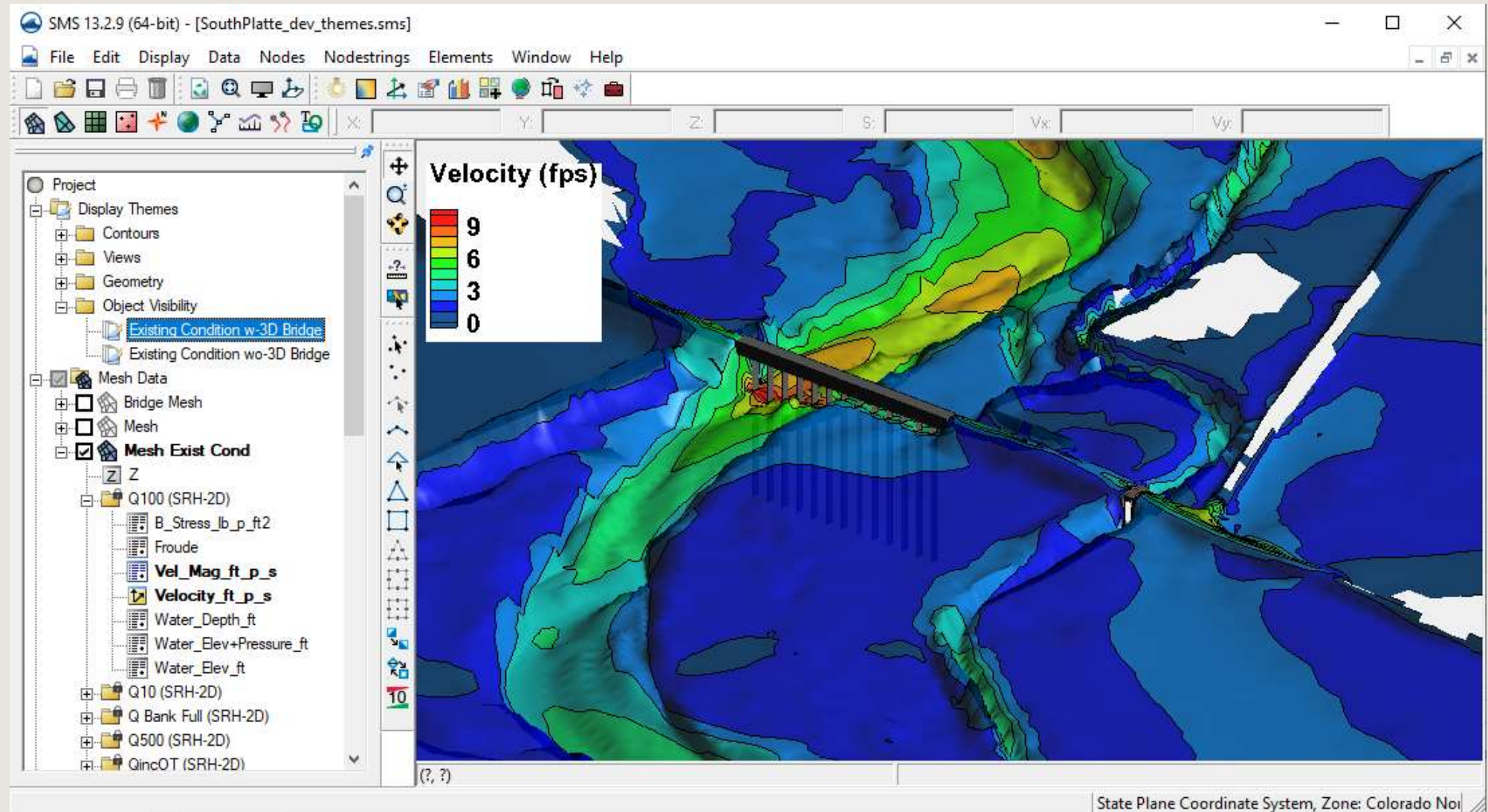
- Geometry Display Option Tabs

- 2D Mesh
- Scatter
- Map
- UGrid



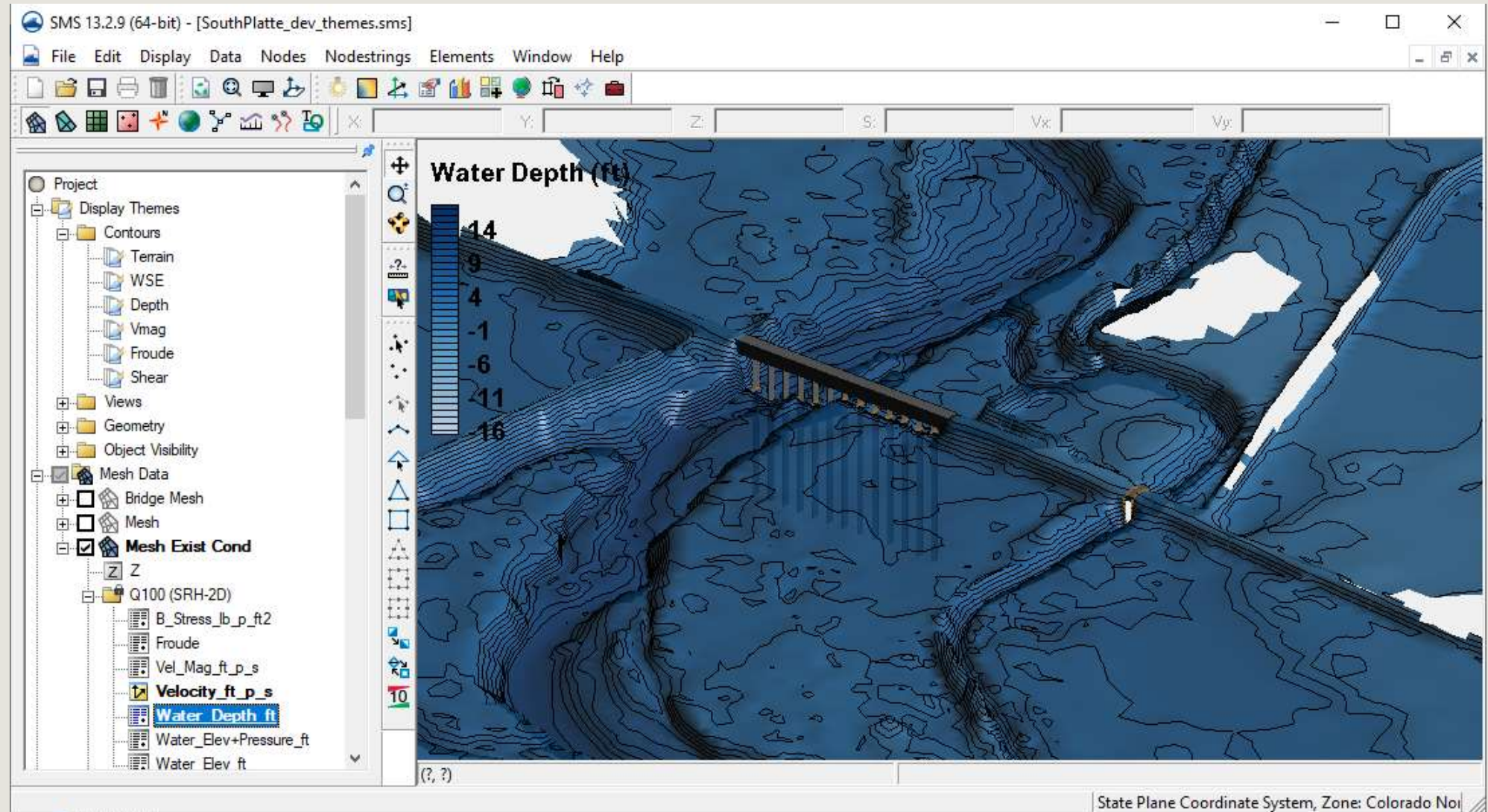
Object Theme

- Check boxes in the Project Explorer



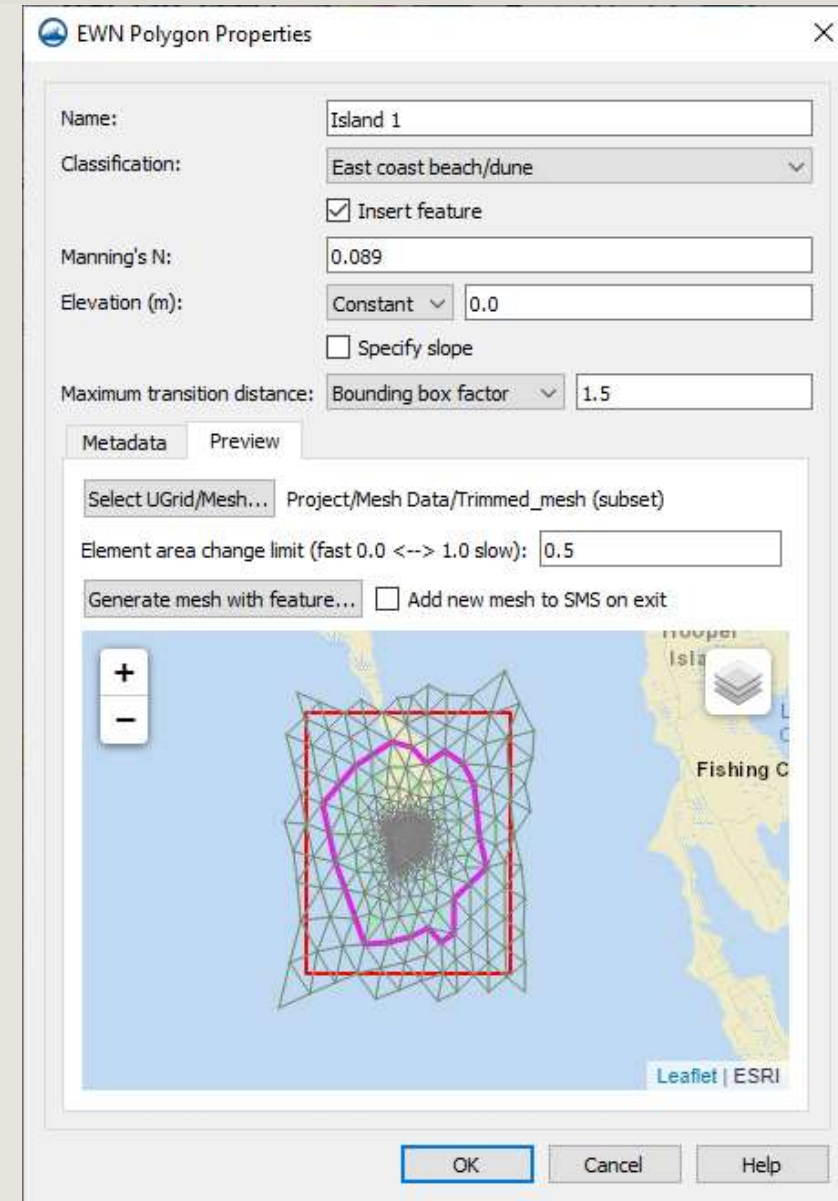
Dataset Theme

- Contour and Vector Options
- All modules



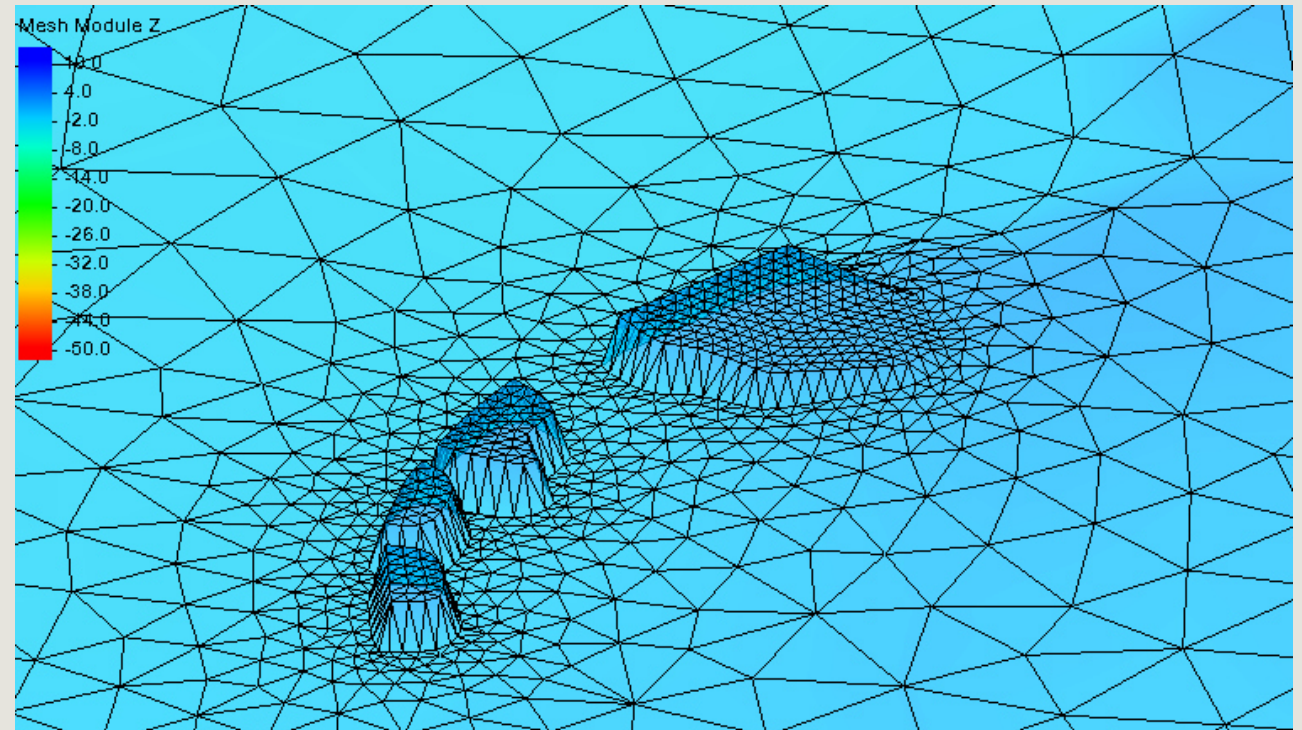
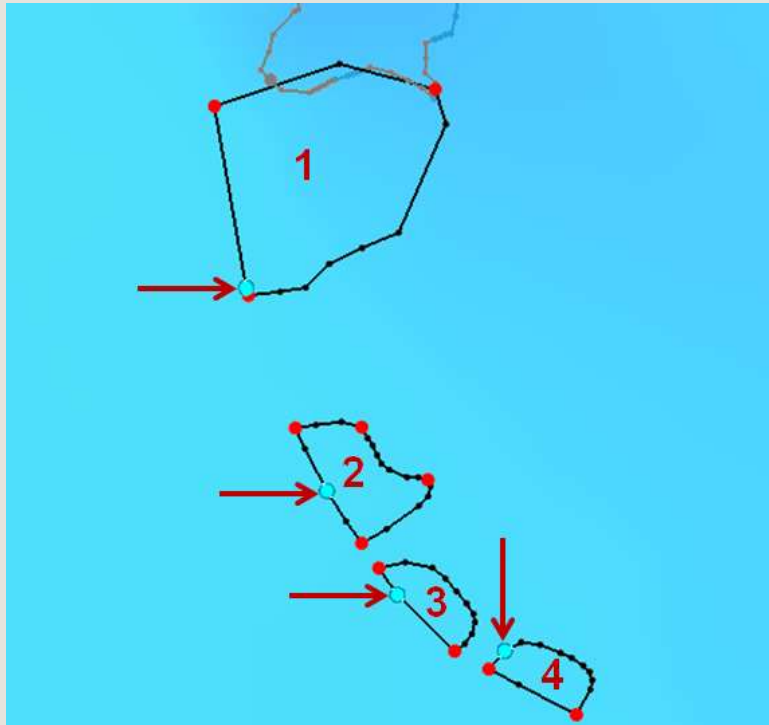
Engineering With Nature (EWN) – Mesh editing tools

- Insert polygons
 - Berm
 - Dune
 - Island
- Insert void
 - Levee
 - Embankment
- Transition into existing mesh



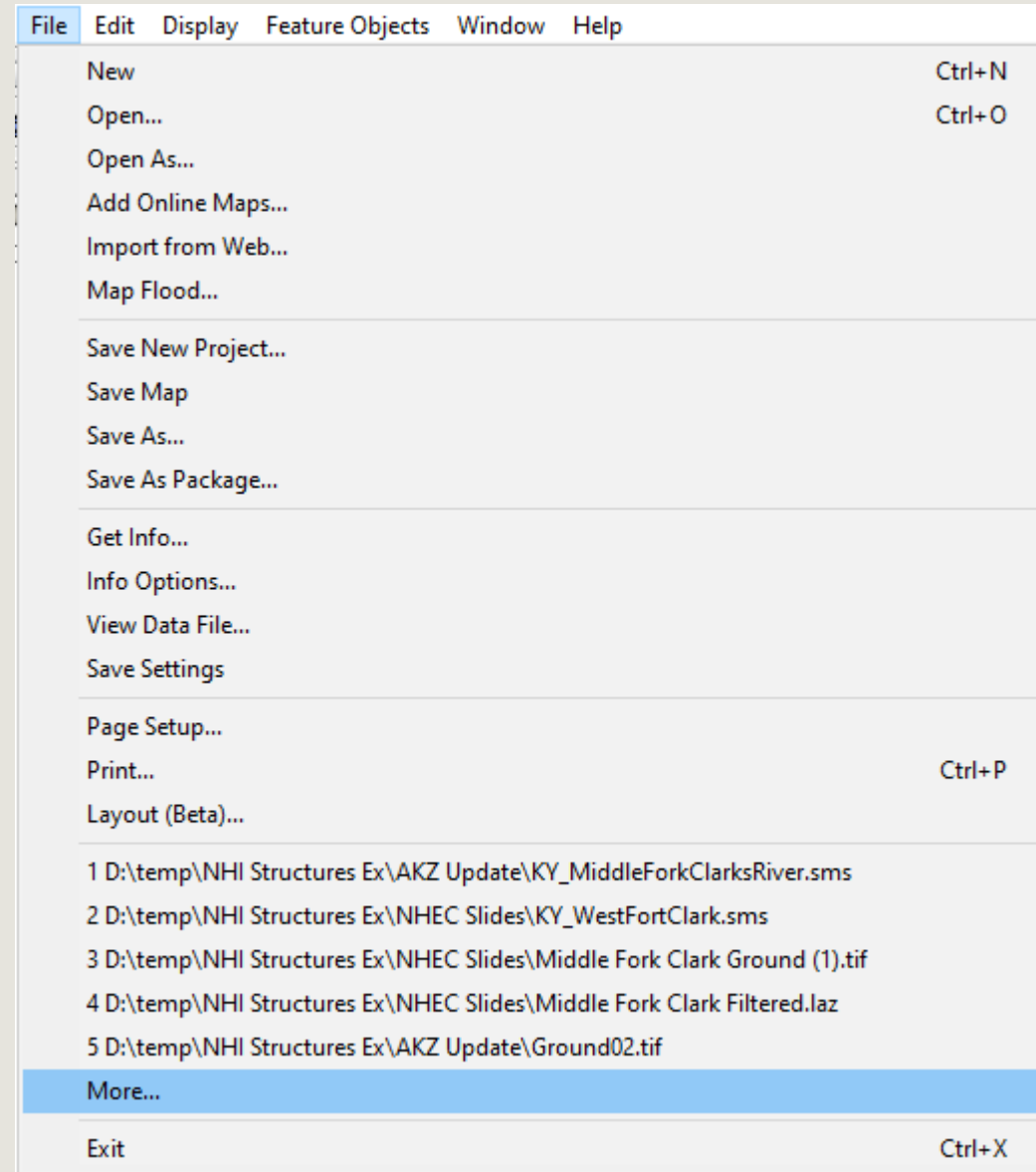
Insertion Into Existing Mesh

- Specified
 - shape
 - Resolution
 - Transition



Feedback from Users

- Recent projects
- “CAD” style commands
 - Specify arc/line length
 - Trim/extend arc
 - Create horizontal/vertical segments
 - Drag an arc
- Larger “Plot” dialog
- Feedback encouraged



Cross Section processing

- Import from annotated cross section text file.
- Correct and edit cross sections
- Interpolate cross sections
- Convert cross sections to surface (TIN)

- Thank you!
- Questions?
- Alan Zundel
 - azundel@aquaveo.com