

Steps in Developing an HEC-RAS Model

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U.S. ARMY

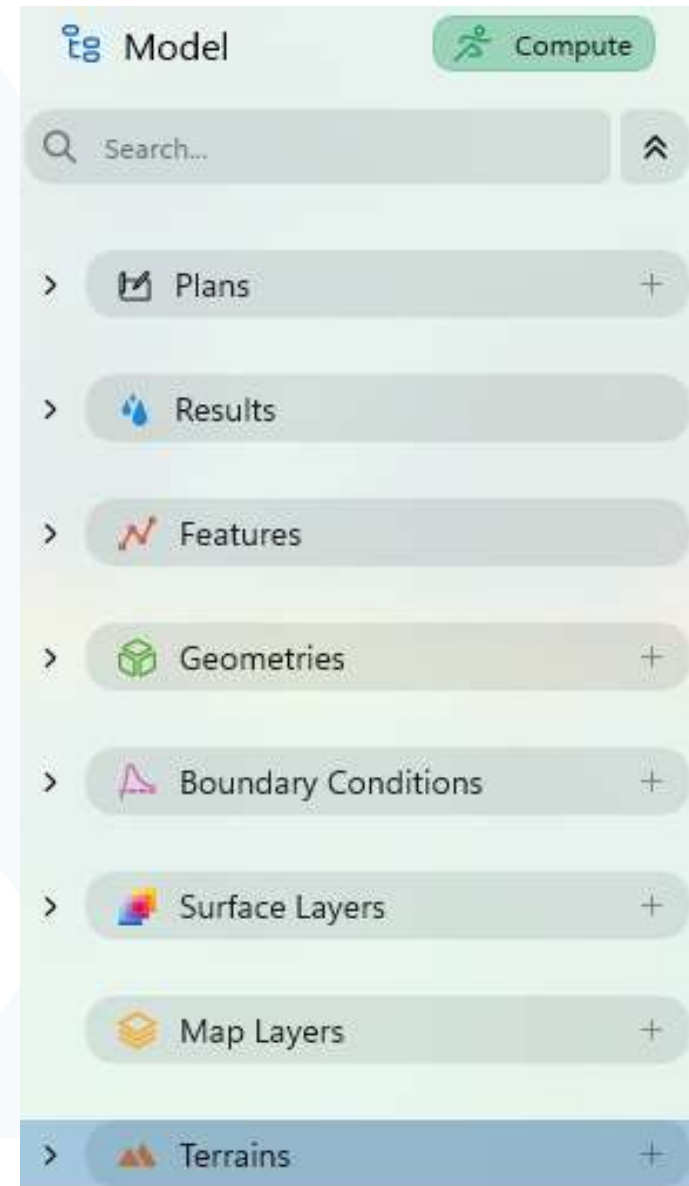


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Objective

- This presentation will provide an overview of the steps in required to build an HEC-RAS Model. Following presentations will cover each topic in detail.
 - Start a New Project
 - Add a Terrain Layer
 - Create Manning's n value Layer
 - Create Geometry
 - Create Boundary Conditions
 - Create a Plan Perform Computations
 - Evaluate Results
 - Refine Model and Re-run



Start a New Project

The screenshot displays the RAS 2025 application interface. The main window features a top menu bar with 'File', 'View', 'Tools', and 'Help'. Below the menu bar, there are tabs for 'Model', 'Extents', and 'Components'. The 'Components' tab is active, showing a 'Releases' section with an 'Update Available' button. The 'Update Available' notification states: 'A new update is available. During the RAS 2025 Alpha, we are constantly fixing bugs and adding new features. Updating helps improve your experience, as well as guarantees we have the most up-to-date feedback and bug reports.' Below this, the 'Releases' section lists 'RAS 2025 Live' with a version number '0.1.0.2224-dev' and a date 'November 20, 2025'. A pull request '#275: WIP structured logging to h5' is also mentioned.

The 'Application Settings' dialog box is open, showing the RAS 2025 logo and version 'v0.1.0.2218-dev'. The dialog has a left sidebar with options: 'New Project' (highlighted with a red box), 'Open Project', 'Example Datasets', and 'GIS Mode'. The 'New Project' option is described as 'Create a new RAS project.' The main area of the dialog shows 'Open Last Project on Launch' with a 'Clear Recent Projects' button and a toggle switch. Below this, the 'Default Project Folder' is set to 'C:\Users\q0heccta\Documents\Support_Examples\RASr' and is highlighted with a red box. A 'Pick Folder' button is next to it. The 'Default Theme on Startup' is set to 'Light'.

At the bottom of the dialog, there is a preview of a project folder: '11/20/2025 11:11:01 AM C:\Users\q0heccta\Documents\Support_Examples\RASr\MeshForRAS6_Workshop'. The bottom of the application window has 'Settings' and 'Bug Report' buttons.



New Project

- Project Name
 - A subfolder will be created
- Description
 - Models live forever, help the next person out!
 - Purpose
 - Anything else that will be helpful
- Projection
 - RAS is geospatial-first
- Press Create

New Project

Name
Example Step by Step
C:\Users\q0heccta\Documents\Support_Examples\RASr

Description
Easy River located in beautiful Eastern California Sierra Nevada Mountains. The purpose of this model is to demonstrate the steps in creating an HEC-RAS model. It is not intended for detailed modeling.

Created by Cameron Ackerman (November 2025)
Contact waterwacko@gmail.com, 530-123-4567
Last modified 2025-12-07

Projection
 Projected Local

Drop a file here or Click To Pick A File

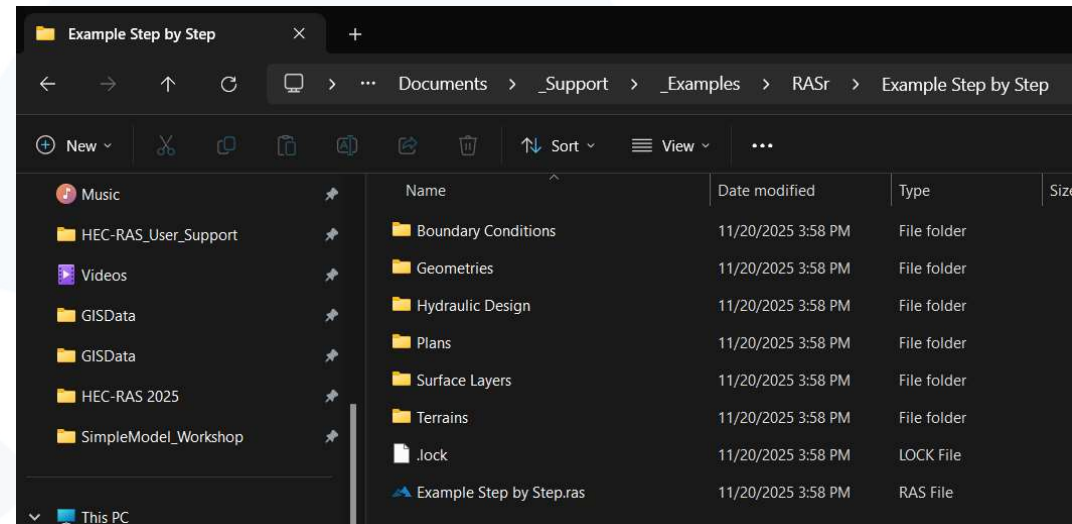
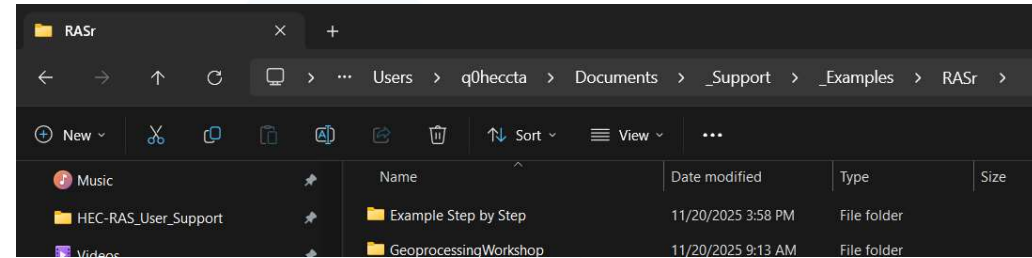
PROJCS["NAD83 / California z Search Projections By Name

Cancel Create



New Project

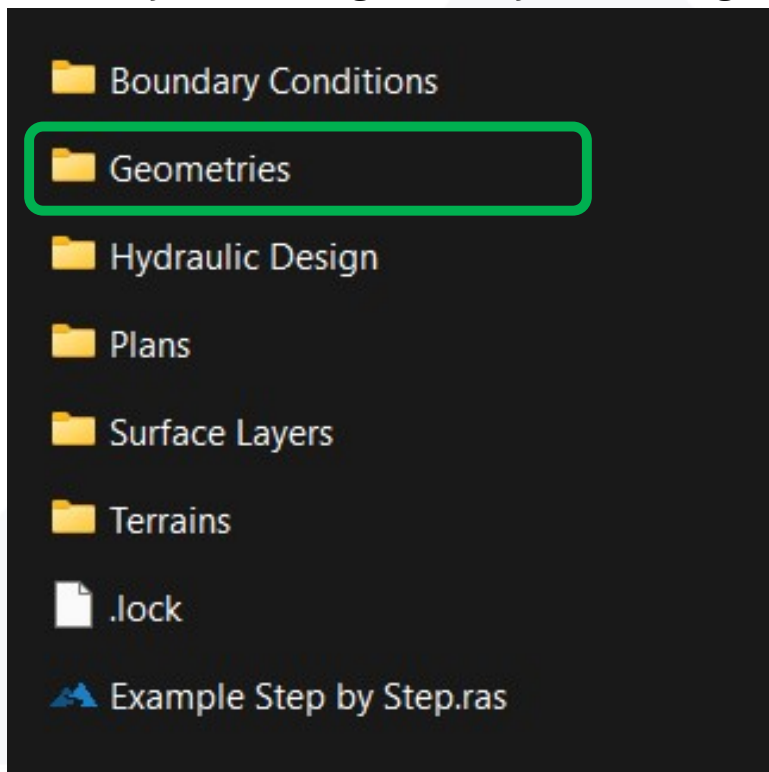
- HEC-RAS creates a new folder with the specified name
- ***ProjectName.ras*** is created along with folder structure
 - Files organized by folder (i.e. Geometry files in Geometries folder)





New Project

- No more
 - `ProjectName.g01...ProjectName.g##`

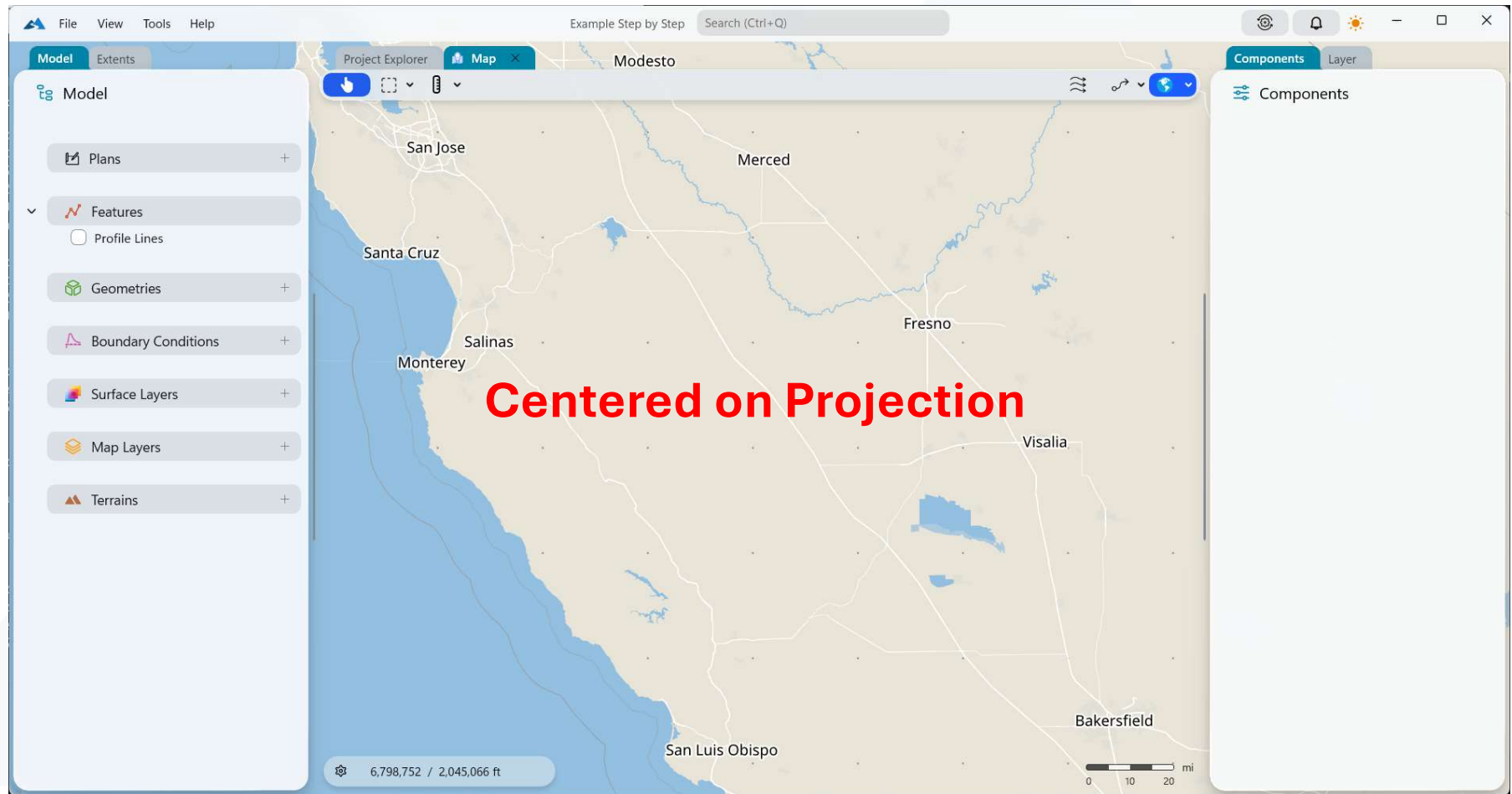


- RAS files end in .h5
- RAS automatically looks for files in folder structure

Name	Date modified
2b. 200ft wCh3 Backups	2/25/2026 10:27 AM
HDR 1a. 400ft.h5	1/5/2026 10:38 AM
HDR 1b. 400ft nCh.h5	1/5/2026 10:38 AM
HDR 1c. 400ft nCh wCh.h5	1/5/2026 10:38 AM
HDR 2a. 200ft wCh1.h5	1/5/2026 10:38 AM
HDR 2b. 200ft wCh3.h5	2/25/2026 10:29 AM
HDR 3a. 100ft wCh1.h5	1/5/2026 10:38 AM
HDR 3b. 100ft wCh3.h5	1/5/2026 10:38 AM




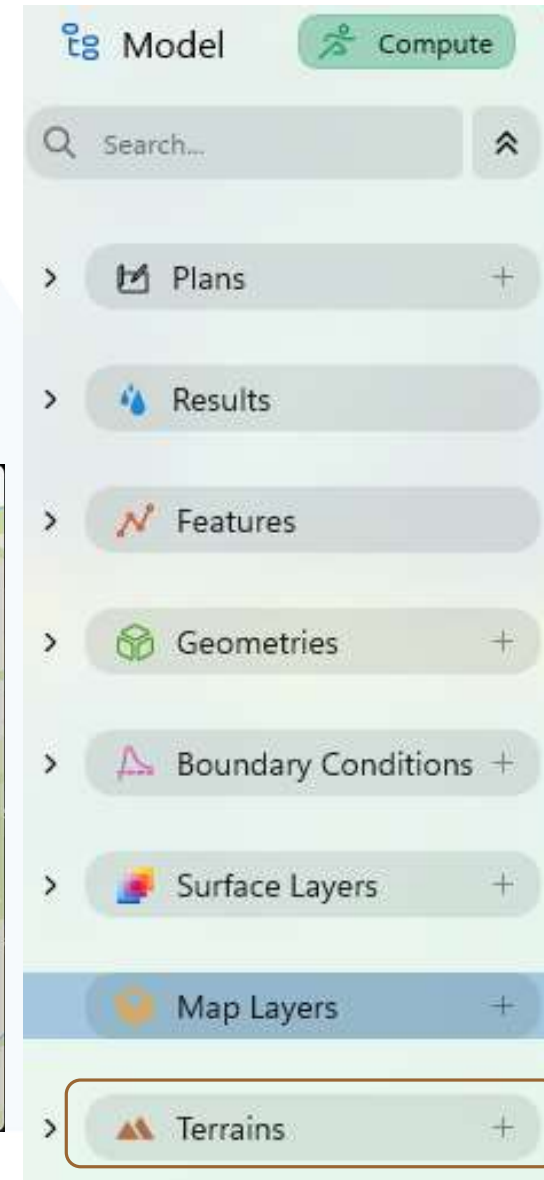
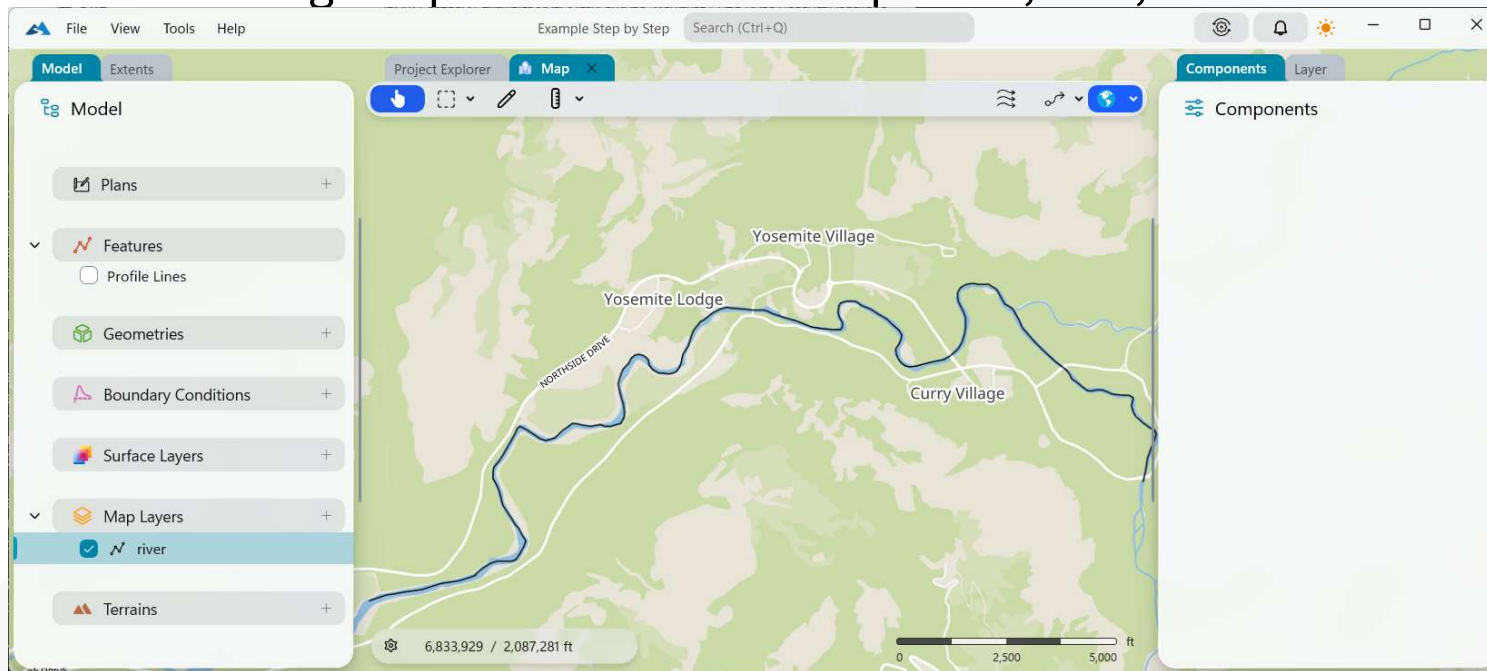
New Project





New Project

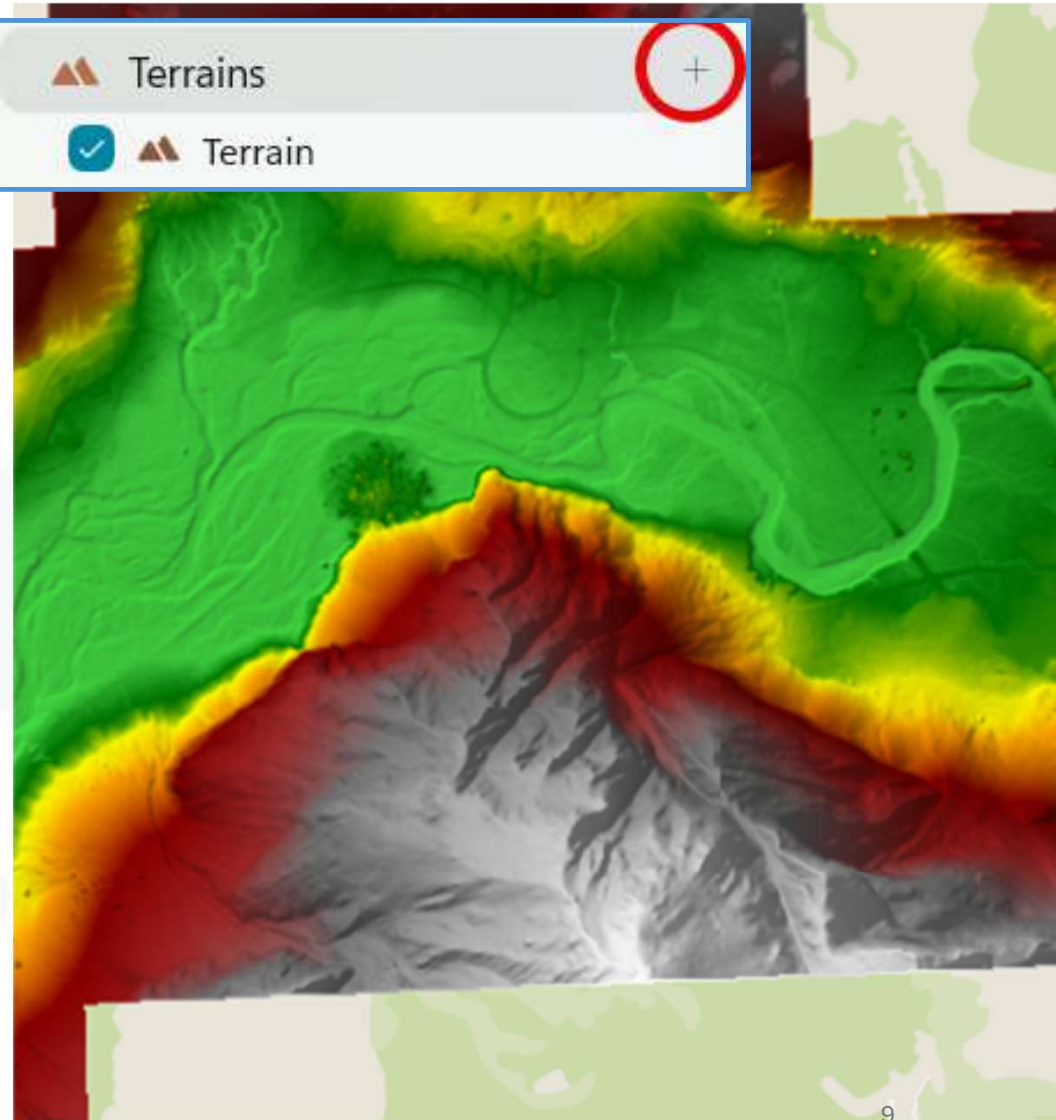
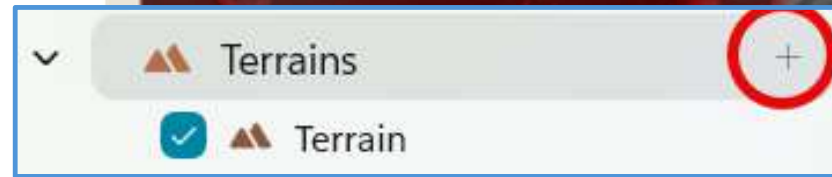
- Zoom to your area of interest
- Add a reference layer 
 - Drag-drop is enabled for shapefiles, tiffs, etc.





Terrain Layer

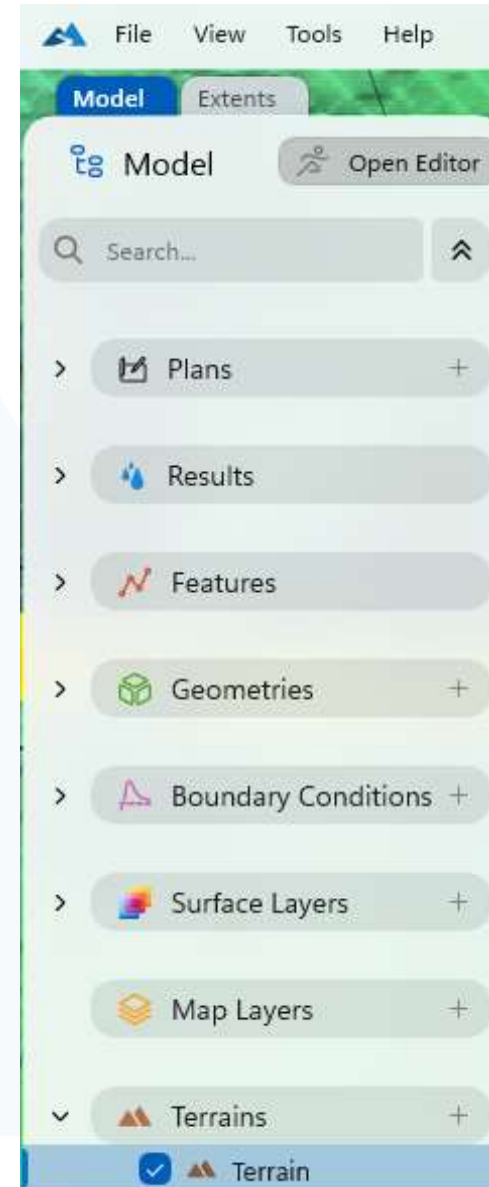
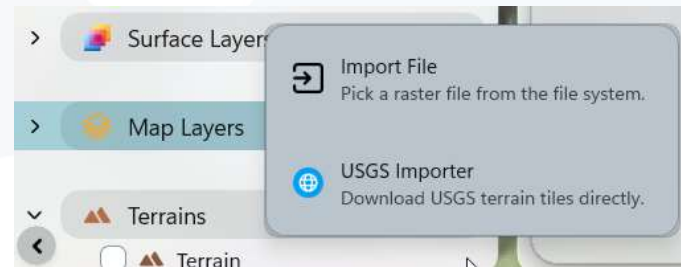
- Create a Terrain layer
- Import an existing raster dataset
- Use the USGS Download tool
- If you already have a Terrain layer created by HEC-RAS 2025 move/copy it into the Terrains folder – it will automatically show up in the interface

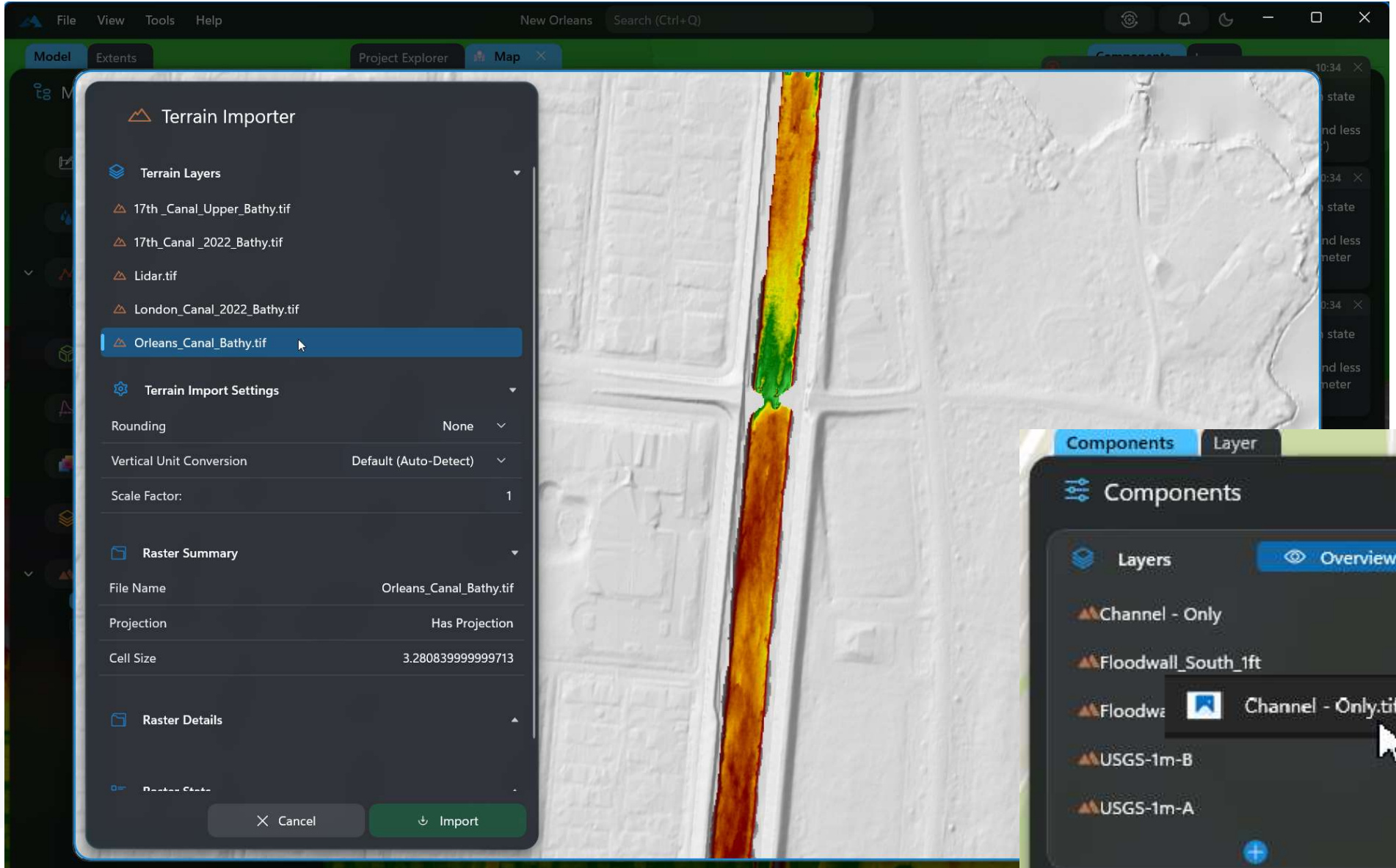


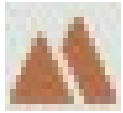


Creating Terrains from File

- Create an empty Terrain then add raster data
 - Select from File Explorer
 - Drag-Drop
- Import Settings
 - Rounding
 - Unit Conversion
- What happens?
 - Reads in raster data
 - Writes GeoTIFFs to Terrains directory
 - Not merging or stitching tiles yet*



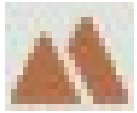




USGS Importer

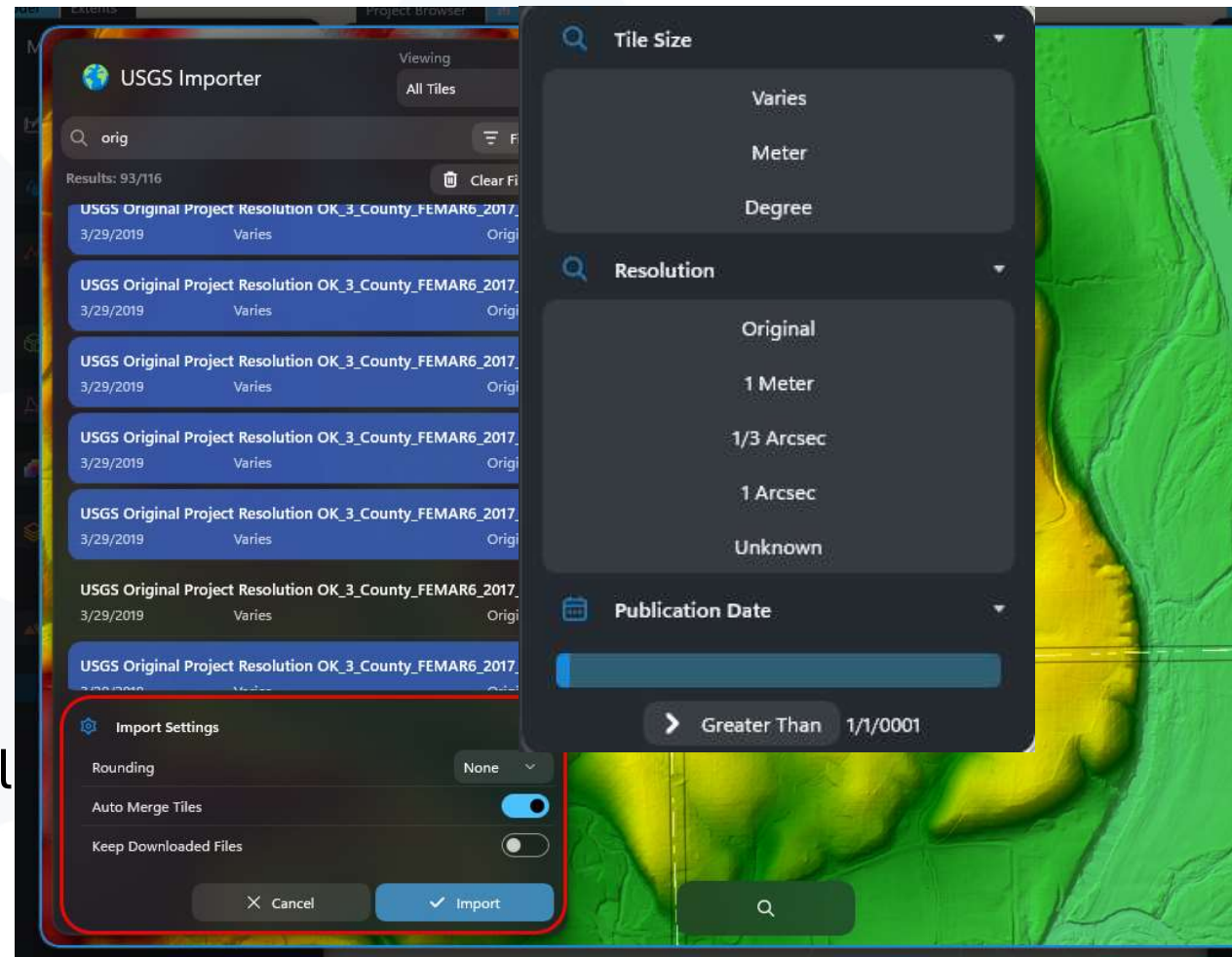
- Queries USGS 3D Elevation Program products for view
- Interactive terrain tile selection
- Bulk select:
Shift + drag
- Download progress
- Import...

The screenshot displays the USGS Importer web application. On the left, a search bar contains the text 'orig', and below it, a list of search results shows multiple entries for 'USGS Original Project Resolution OK_3_County_FEMAR6_2017_D1'. The main area is a map showing a grid of terrain tiles with a color gradient from green to red. A settings panel is open on the right side of the map, displaying details for a selected tile: 'USGS Original Project Resolution OK_3_County_FEMAR6_2017_D18 15SUV2778'. The settings panel includes fields for 'Tile Size' (Varies), 'Resolution' (Original), 'Publication Date' (3/29/2019), and 'File Size' (7.57 MB). At the bottom of the interface, there are 'Cancel' and 'Import' buttons.



USGS Import Options

- Filter Options
 - Tile Size
 - Resolution
 - Date
- Search bar
- Import Settings
 - Auto-Merge
 - Rounding
 - Keep Downloads
- Builds Terrains in Parallel





File View Tools Help New Orleans Search (Ctrl+Q)

Model Extents Project Explorer Map

Model Open Editor

- Plans +
- Results
- Features
 - Profile Lines
- Geometries +
- Boundary Conditions +
- Surface Layers +
- Map Layers +
- Terrains +
 - New Orleans Canals
 - USGS Import

Components Layer

Layer

Additional Options

Resample Mode Render-Block

Plot Raster Tile Outlines

Raster Symbology Settings

Gray Scale

Opacity

Terrain

Interpolation Histogram

-195.44293
-15.633938
-7.4388914
-4.4955473
-2.5440758
-0.496719
1.6312317
4.4745923
28.481636

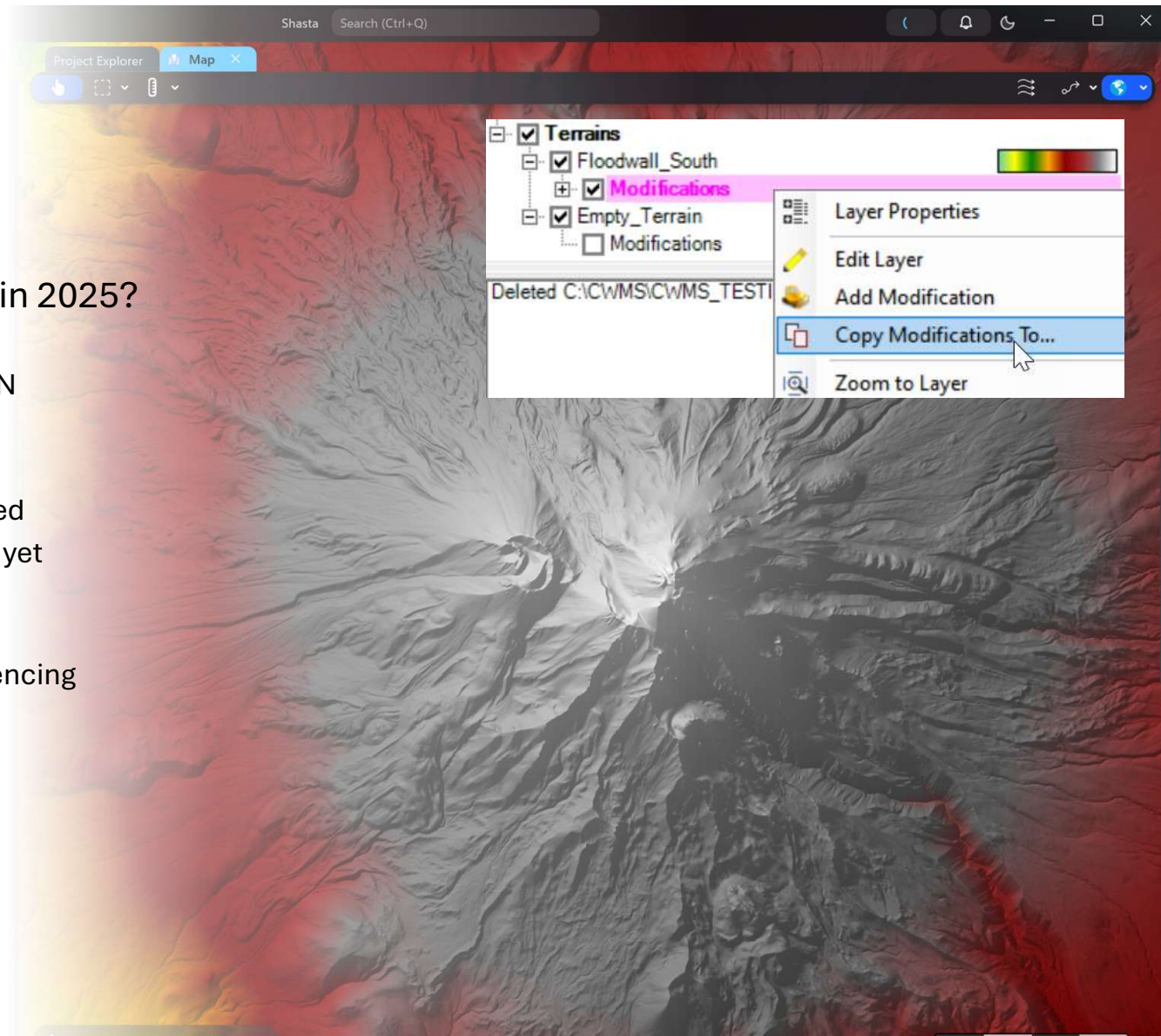
Update For View Save Symbology

Reset Symbology

3,663,903 / 543,887 ft

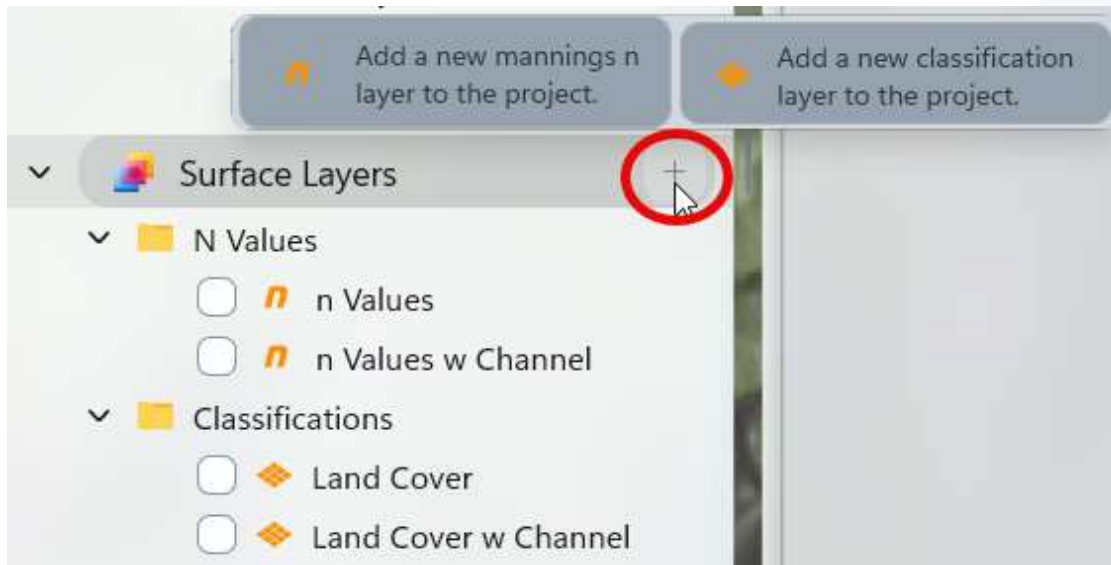
FAQs

- Can I use my 2025 Terrain in RAS 6?
 - No, they are a different format
- How can I get my RAS 6 terrain mods in 2025?
 - Copy modifications to empty terrain
 - Export-> Rasterize Terrain Mods option ON
- Why the little gaps between my tiles?
 - USGS Import - They were not auto-merged
 - From File Import - Not stitching / merging yet
- USGS Import Tool is broken
 - The USGS National Map has been experiencing frequent outages
 - NEW: Offline Access
- Where can I get bathymetry data?
 - NOAA Digital Coast Access
 - eHydro – USACE Navigation

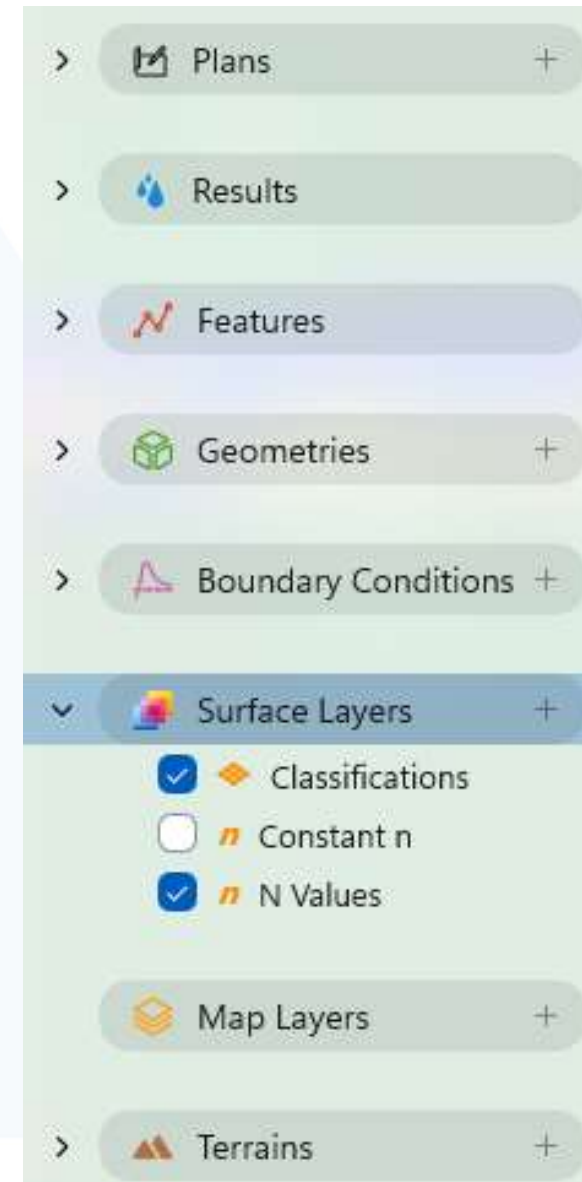




Manning's n Values

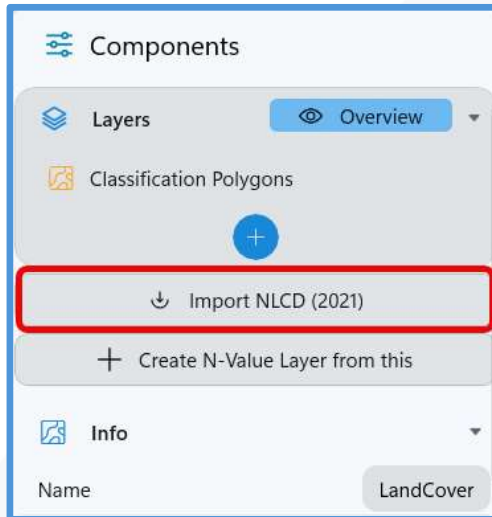


- Classification Layer (General)
- Manning's n value Layer (Specific)



Classification Layer

- Direct import of land cover data



- Classify data by type
- Handles raster or vector data
- Manual creation of polygons



Manning n values

- Determine Mannings n type
 - Constant
 - Classification Layer



- Assign Manning's n values based on Classification

The screenshot shows a map interface with a river and a table of Manning's N values. The table lists various land use classifications and their corresponding Manning's N values.

Name	Manning's N
NoData	0
Open Water	0.035
Perennial Ice/Snow	0.022
Developed, Open Space	0.04
Developed, Low Intensi	0.06
Developed, Medium Int	0.1
Developed, High Intens	0.16
Barren Land Rock/Sand	0.026
Deciduous Forest	0.15
Evergreen Forest	0.12
Mixed Forest	0.14
Dwarf Scrub	0.036
Shrub/Scrub	0.11
Grassland/Herbaceous	0.04
Sedge/Herbaceous	0.04
Lichens	0.027



Classification: Land Cover - NLCD

Example Step by Step Search (Ctrl+Q)

Model Extents

Project Browser Map

Model

- Latest Flood (1)
11/21/2025 2:57:01 PM
 - Flood
 - Existing
 - Flood
- Features
 - Profile Lines
- Geometries
 - Existing
- Boundary Conditions
 - Flood
 - Boundary Condition Lines
 - Precipitation
- Surface Layers
 - LandCover
 - n values
- Map Layers
 - river
- Terrains

Components Layer

Components

Layers Overview

- Classification Polygons
- nlcd_clipped
- Import NLCD (2021)
- Create N-Value Layer from this

ID	Name
0	NoData
11	Open Water
12	Perennial Ice/Snow
21	Developed, Open Space
22	Developed, Low Intensity
23	Developed, Medium Intensity
24	Developed, High Intensity
31	Barren Land Rock/Sand/Clay
41	Deciduous Forest
42	Evergreen Forest
43	Mixed Forest
51	Dwarf Scrub
52	Shrub/Scrub
71	Grassland/Herbaceous
	Sedge/Herbaceous

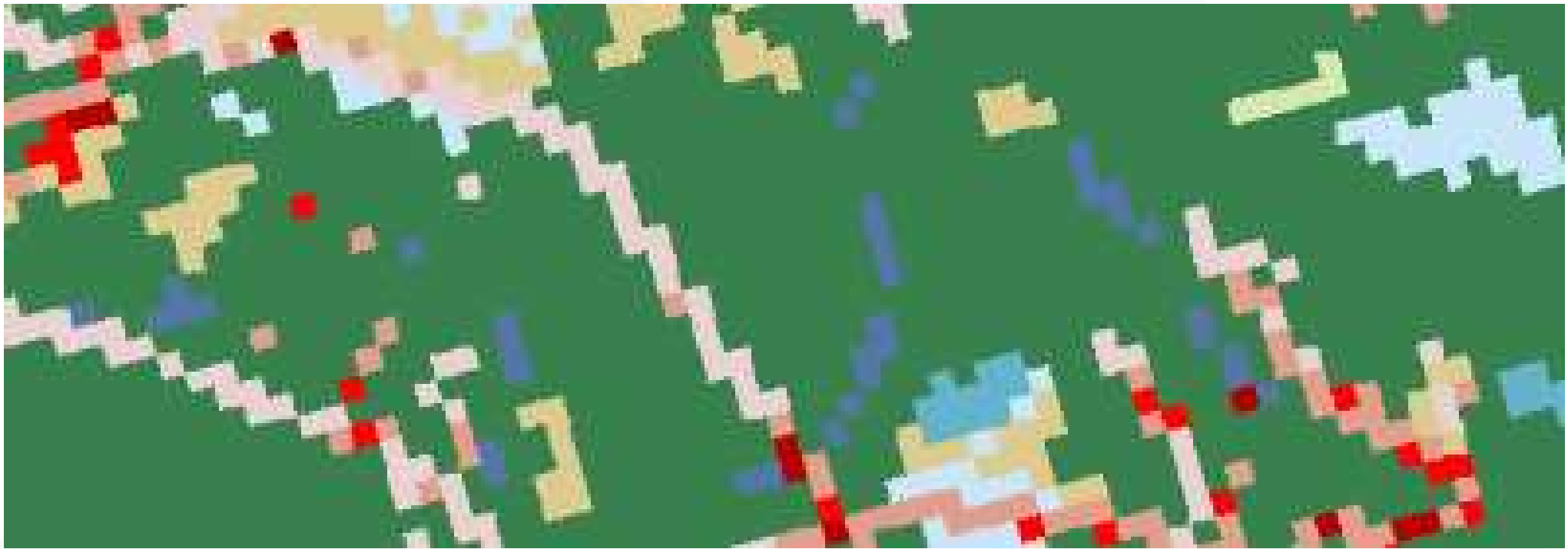
6,840,601 / 2,100,661 ft

0 1,000 2,000 ft



Classification: Land Cover - NLCD

What do you think of this channel data?





Classification: Land Cover - Polygons

The screenshot displays a GIS application window titled "Example Step by Step" with a search bar (Ctrl+Q). The interface is divided into several panels:

- Model Panel (Left):** Contains a list of model components. Under "Surface Layers", "LandCover" is selected and checked. Other options include "Profile Lines", "Geometries", "Boundary Conditions", "Flood", "Map Layers", and "Terrains".
- Map Panel (Center):** Shows a satellite-style map with a land cover classification. A blue polygon outlines a channel. Red dashed arrows point from the "Classification Polygons" layer in the Components panel to the map.
- Components Panel (Right):** Shows the "Layers" section with "Classification Polygons" selected. Below it, the "nlcd_clipped" layer is visible. A red box highlights the option "+ Create N-Value Layer from this".

At the bottom of the map, a coordinate display shows "6,839,546 / 2,091,234 ft" and a scale bar indicates 0, 1,000, and 2,000 feet.



Manning's n Values – by Land Cover

The screenshot shows a software interface with a central map displaying land cover data. The map is color-coded, with green representing forested areas and yellow/brown representing developed or open areas. A red line is drawn across the map, likely representing a channel or boundary. The interface includes a menu on the left, a top toolbar, and a right-hand panel with various settings and a table.

Model

- Profile Lines
- Geometries
 - Existing
 - Conceptual Mesh
 - Mesh
 - Culvert Barrels
- Boundary Conditions
- Surface Layers
 - LandCover
 - n values
- Map Layers
 - river
- Terrains

Components

- Constant
- Classification Layer

Mode: Classification Layer

Classification Map: Set NLCD

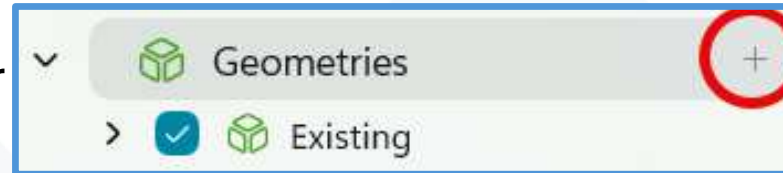
Classification Layer: LandCover

Name	Manning's
NoData	0
Open Water	0.035
Perennial Ice/Snow	0.022
Developed, Open Space	0.04
Developed, Low Intensity	0.06
Developed, Medium Intensity	0.1
Developed, High Intensity	0.16
Barren Land Rock/Sand/Clay	0.026
Deciduous Forest	0.15
Evergreen Forest	0.12

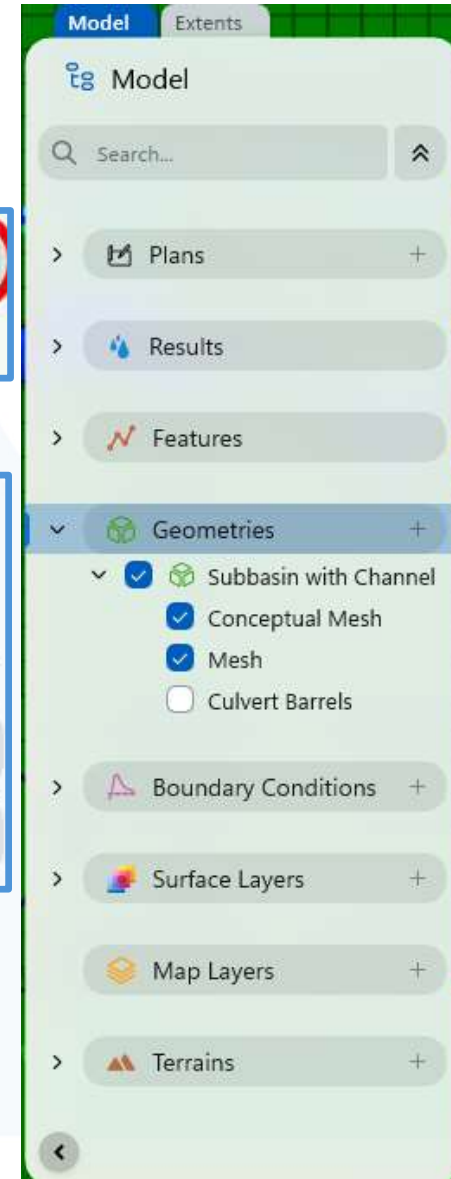


Geometry

- Create a Geometry Layer



- Associate with Terrain
- Associate with n Values





Geometry

- Conceptual Mesh – Arcs and Nodes form Regions

The screenshot displays a software interface for creating a conceptual mesh. The central 'Map' window shows a topographic map with a network of purple lines (arcs) and dots (nodes) forming a mesh. The 'Model' panel on the left has a 'Geometries' section with 'Conceptual Mesh' selected. The 'Components' panel on the right lists 'Regions' 7 through 14. A red dashed arrow points to the 'Conceptual Mesh' option in the 'Model' panel, and another red dashed arrow points to a blue square icon in the 'Map' window toolbar.



Geometry

- Computational Mesh – Mesh Type and Properties

The screenshot displays a software interface for creating a computational mesh. The central map view shows a topographic map with a mesh overlaid on a specific region. A tooltip over the map indicates a cell size of 200 and no tags. The 'Model' panel on the left lists various features and geometries, with 'Conceptual Mesh' selected. The 'Components' panel on the right lists regions and properties, with 'Region 17' selected and its properties displayed, including a triangular cell type and a cell size of 200.



Geometry

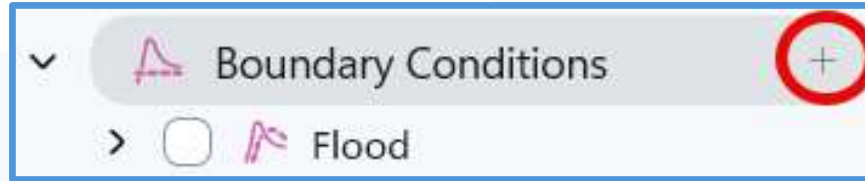
- Computational Mesh – Mesh Cells

The screenshot displays a software interface for a hydrological model. The central map shows a terrain with a grey triangular mesh overlaid on a portion of it. On the left, the 'Model' panel is open, showing a tree view where 'Mesh' is selected under the 'Geometries' category. A red dashed arrow points from the 'Mesh' option to the mesh on the map. On the right, the 'Components' panel is open, showing 'Flow Area Info' with a 'Cell Count' of 3330, which is highlighted with a red box.



Boundary Conditions

- Create a Boundary Condition Layer



- Specify Name
- Specify Time Window

New Boundary Condition

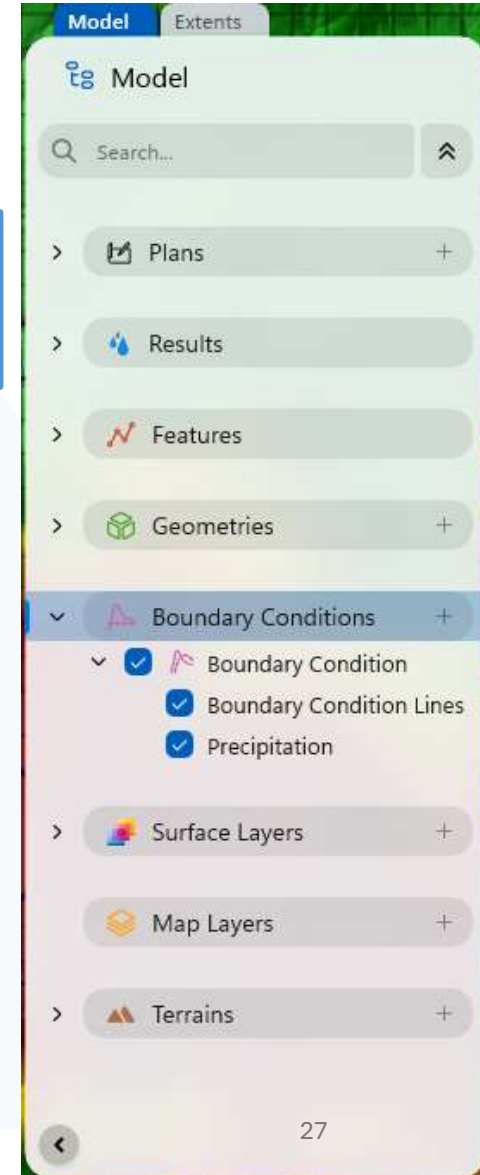
Name
Flood

Time Window

Start Time
2000-01-01 00:00:00

End Time
2000-01-04 24:00:00

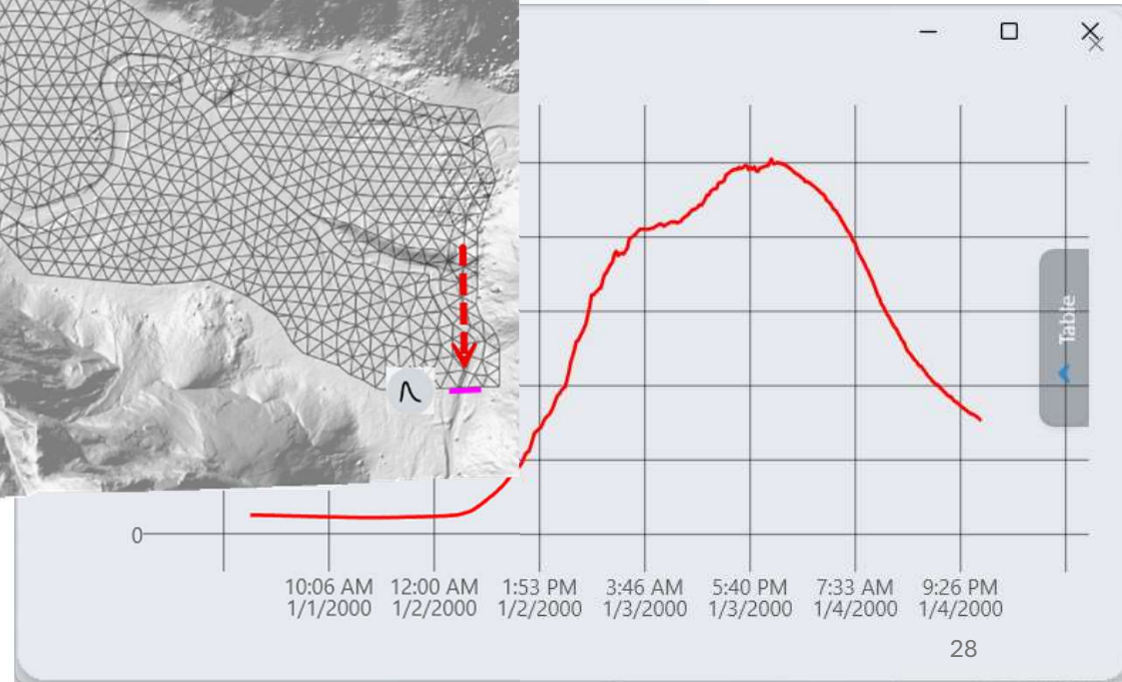
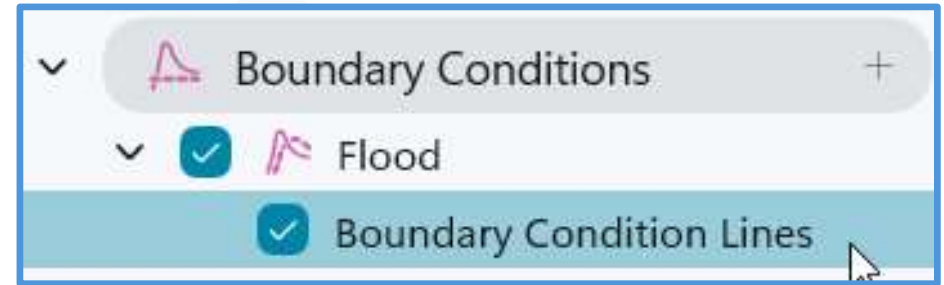
Cancel Create





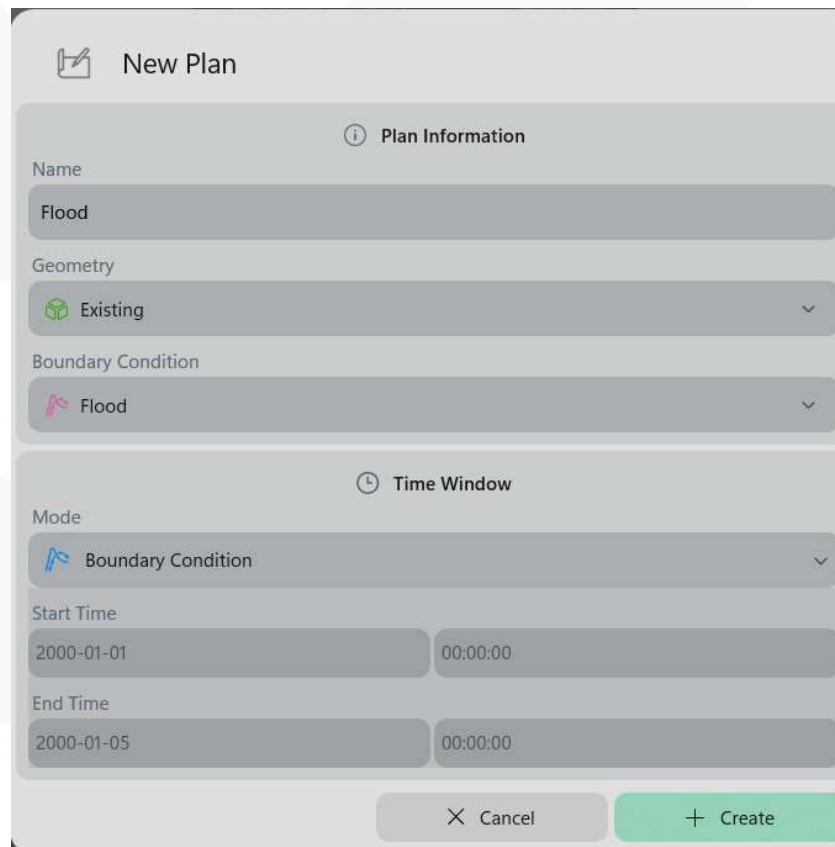
Boundary Conditions

- Create Boundary Condition Lines
- Enter Hydraulic Data



Plan

- Create a Plan
- Specify Name
- Select Geometry
- Select Boundary Condition
- Identify Time Window
 - Boundary Condition
 - Override BC time window with a custom time window (must be smaller than BC)



New Plan

Plan Information

Name: Flood

Geometry: Existing

Boundary Condition: Flood

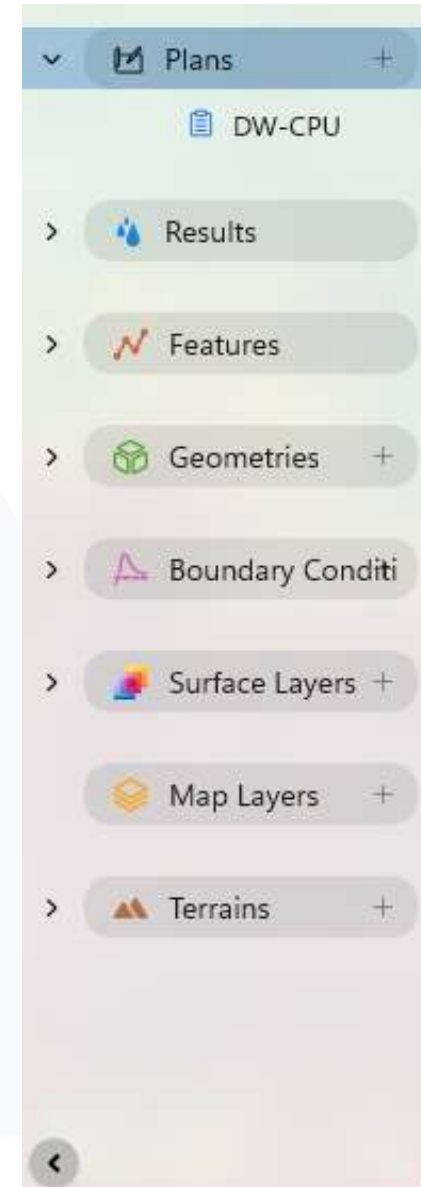
Time Window

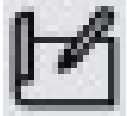
Mode: Boundary Condition

Start Time: 2000-01-01 00:00:00

End Time: 2000-01-05 00:00:00

Cancel Create





Plan

- Set Computation Options
 - General Options
 - Advanced Options

- Compute

Project Browser | Map | Plans

Plans

Flood

General Options

Advanced Options

Compute

Description

Associations

Geometry: Existing

Boundary Condition: Flood

Time Window

Time Window Mode: Boundary Condition

Time Window: 4d
2000-01-01 00:00:00 to 2000-01-05 00:00:00

Computation Options

Equation Set: Shallow Water Equations

Processor: CPU

Compute Timestep: 1 Minute

Output Interval: 10 Minute

River Radar (Errors)

Plans

DW-CPU

Results

Features

Geometries

Boundary Condition

Surface Layers

Map Layers

Terrains



Compute (Run)

The screenshot displays a software interface for a flood simulation. The main window is titled "Example Step by Step" and contains several panels:

- Left Panel (Model):** Shows the "Flood" model selected under "Plans". It includes sections for "Results" (with a "Latest Flood (12)" entry), "Features" (Profile Lines), "Geometries" (Existing, Conceptual Mesh, Mesh, Culvert Barrels), "Boundary Conditions" (Flood, Boundary Condition Lines, Precipitation), and "Surface Layers".
- Central Panel (Flood):** Displays the "Compute Status" with a "Stop" button. It shows simulation details: Elapsed Time (00:01:28), Estimated Time Remaining (00:00:41), Simulation Time (2000-01-03 17:25:00), Computational Speed (2675.16x), and Global Timestep (0.306714 s). Below this are two line graphs: the top one shows time (2.471sec to 0.181sec) and the bottom one shows mesh status (61% to 7% wet cells).
- Log Window:** A central log window shows a timeline of events from 17:04:00 to 17:04:01, including messages like "Associated Terrain: Terrain", "Preparing Geometry...", and "Computing...". A progress bar above the log indicates 68% completion.
- Right Panel (Components):** Shows "Advanced Options" with an "Open Log" button. It includes sections for "Description", "Associations" (Geometry: Existing, Boundary Condition: Flood), "Time Window" (Time Window Mode: Boundary Condition, Time Window: 4d), and "Computation Options" (Equation Set: Shallow Water Equations, Processor: CPU, Compute Timestep: 1 Minute, Output Interval: 10 Minute).



Evaluate Results

File View Tools Help Example Step by Step Search (Ctrl+Q)

Model Extents

Project Explorer Map

Model

- Plans
 - Flood
- Results
 - Flood (Latest Result)
 - Latest Result 11/21/2025 1:58:59 PM
 - Depth
 - Existing
 - Flood
 - Flood
- Features
 - Profile Lines

Map

Latest Result 2000-01-03 00:40:00

3,963 ft
Terrain
3,234375
Flood Depth

Model Extents

Model

Search...

Plans

Results

- Quasi 1D (Latest)
 - Latest Quasi 1D (1) 12/4/2025 8:22:42 AM
 - Quasi 1D
 - Quasi 1D
 - Boundary Condition
 - Optimized Mesh (Latest)
- Features
- Geometries
- Boundary Conditions
- Surface Layers
- Map Layers
- Terrains



Evaluate Results – Query Time Series

File View Tools Help

Model Extents

Project Explorer Map

Model

- Plans
- Flood
- Results
- Flood (Latest Result)
 - Latest Result 11/21/2025 1:58:59 PM
 - Depth
 - Existing
 - Flood
 - Flood
- Features
 - Profile Lines

Query Time Series

