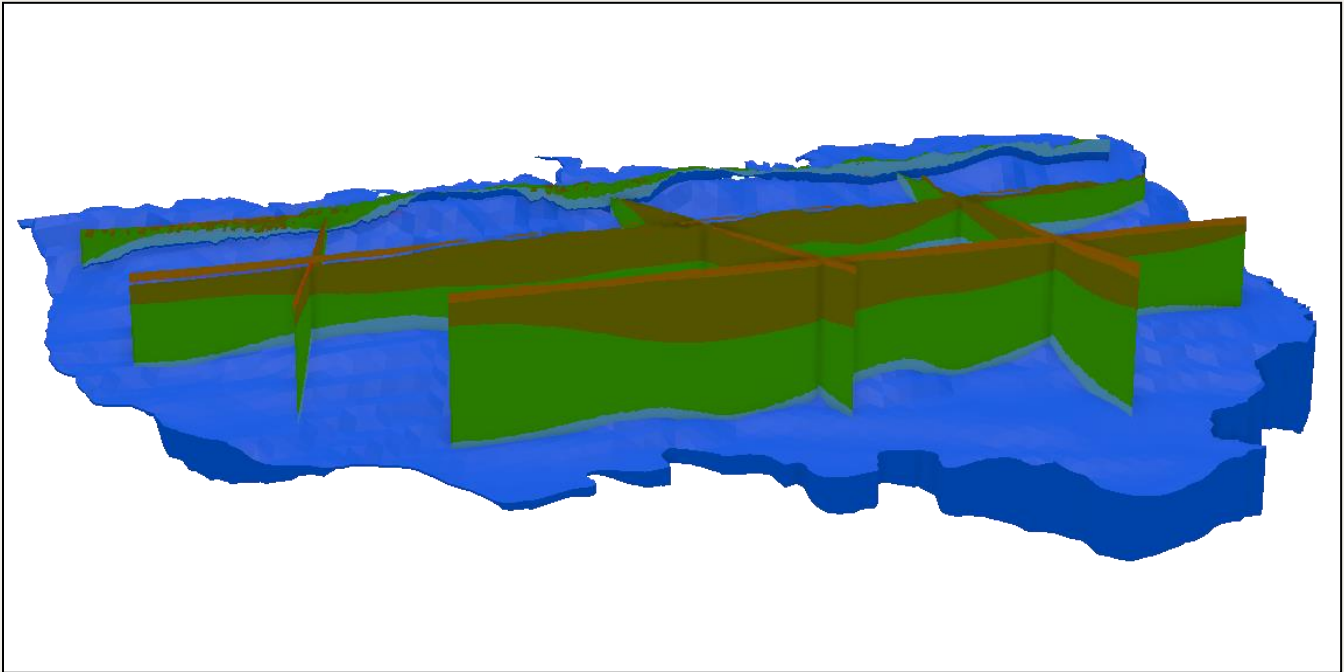




AHGW Pro 1.0 Tutorial

## ***Building 3D Models with the Horizons Method***

From cross sections and rasters to GeoVolumes



### Objectives

Learn how to use the Arc Hydro Groundwater Pro to manage subsurface data and create 3D representations of hydrostratigraphy.

#### Prerequisite Tutorials

- None

#### Required Components

- ArcGIS Pro
- 3D Analyst
- Subsurface Analyst

#### Time

- 30–50 minutes

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## 1 Introduction

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Arc Hydro Groundwater Pro (AHGW Pro) is a geodatabase design used for representing groundwater datasets within ArcGIS Pro. The data model helps to archive, display, and analyze multidimensional groundwater data, and includes several components to represent different types of datasets, including representations of aquifers and wells/boreholes, 3D hydrogeologic models, temporal information, and data from simulation models.

The Arc Hydro Groundwater Pro Tools help to import, edit, and manage groundwater data stored in an AHGW Pro geodatabase. This tutorial illustrates how to use the tools to manage subsurface data and create 3D representations of hydrostratigraphy. A basic familiarity with the AHGW Pro data model is suggested, but not required, prior to beginning this tutorial.

### 1.1 Outline

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This tutorial works with simplified subsurface data from Roseville, California. The following tasks will be discussed and demonstrated:

- Create section line features.
- Explore the concept of horizons in a mosaic dataset.
- Create GeoSection features.
- Explore the Clip and Fill options when creating GeoSections and GeoVolumes.

- Create GeoVolume features.

The XMS Wiki has more information about the Groundwater Data Model<sup>1</sup> and horizons, clip, and fill attributes.<sup>2</sup>

## 1.2 Required Modules and Interfaces

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Enable the following components in order to complete this tutorial:




- ArcGIS Pro license
- 3D Analyst (the tools in this tutorial can be run without 3D Analyst, but not all the data can be visualized)
- AHGW Pro Tutorial Files

The Arc Hydro Groundwater Pro Tools require installation of a compatible ArcGIS Pro service pack. Check the Arc Hydro Groundwater Pro Tools documentation to find the appropriate service pack for the version of the tools being used. 3D Analyst is required for the latter portion of the tutorial involving 3D objects. A license for 3D Analyst is required to view the results of the tutorial. The tutorial files should be downloaded and saved on a local drive.

## 2 Getting Started

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To start, open the project file for this tutorial.

1. If necessary, launch *ArcGIS Pro*.
2. If on the *ArcGIS Pro* start page, select  **Open another project** in the bottom right corner of the window to open the *Open Project* dialog.
3. If already in the user interface, use the  **Open** macro to open the *Open Project* dialog.
4. Browse to the location with tutorial files for this tutorial.
5. Select the file “ horizons.aprx” located in the *SubsurfaceAnalystPro\horizons* folder.
6. Click **OK** to import the project.

A *Map* view, an *XS2D* view, and a *Scene* view appear. The map includes a boundary defining the extent of the 3D model as shown in Figure 1.

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<sup>1</sup> See [https://www.xmswiki.com/wiki/AHGW:Arc\\_Hydro\\_Groundwater\\_Data\\_Model](https://www.xmswiki.com/wiki/AHGW:Arc_Hydro_Groundwater_Data_Model)

<sup>2</sup> See [https://www.xmswiki.com/wiki/AHGW:Horizons,\\_Clip,\\_and\\_Fill\\_Attributes](https://www.xmswiki.com/wiki/AHGW:Horizons,_Clip,_and_Fill_Attributes)

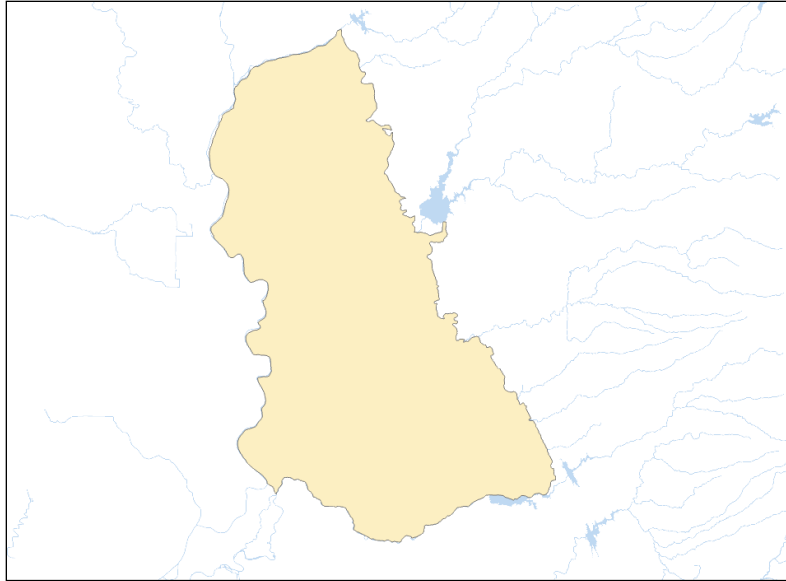







Figure 1 Boundary of the 3D model

Next, ensure that the AHGW Pro tools are correctly configured.

7. Expand the  *Toolboxes* list in the *Catalog* pane. Check if  “ArcHydroGroundwater.pyt” is there. If it is not there, follow steps 8-10.
8. In the *Catalog* pane, right-click on *Toolboxes* and use the  **Add Toolbox** command.
9. In the *Add Toolbox* dialog, browse to the location where the Arc Hydro Groundwater Toolbox files were saved.
10. Select  “ArcHydroGroundwater.pyt” and click **OK**.

 “ArcHydroGroundwater.pyt” now appears in the *Toolboxes* list. When using geoprocessing tools, it's possible to set the tools to overwrite outputs by default, and automatically add results to the map/scene. To set these options:

11. On the ribbon, select the *Project* tab.
12. From the list on the left, select **Options** to open the *Options* dialog.
13. Select *Geoprocessing* from the list under *Application* on the left of the dialog.
14. Ensure that *Allow geoprocessing tools to overwrite existing datasets* and *Add output datasets to an open map* are turned on.

The options should appear similar to Figure 2.

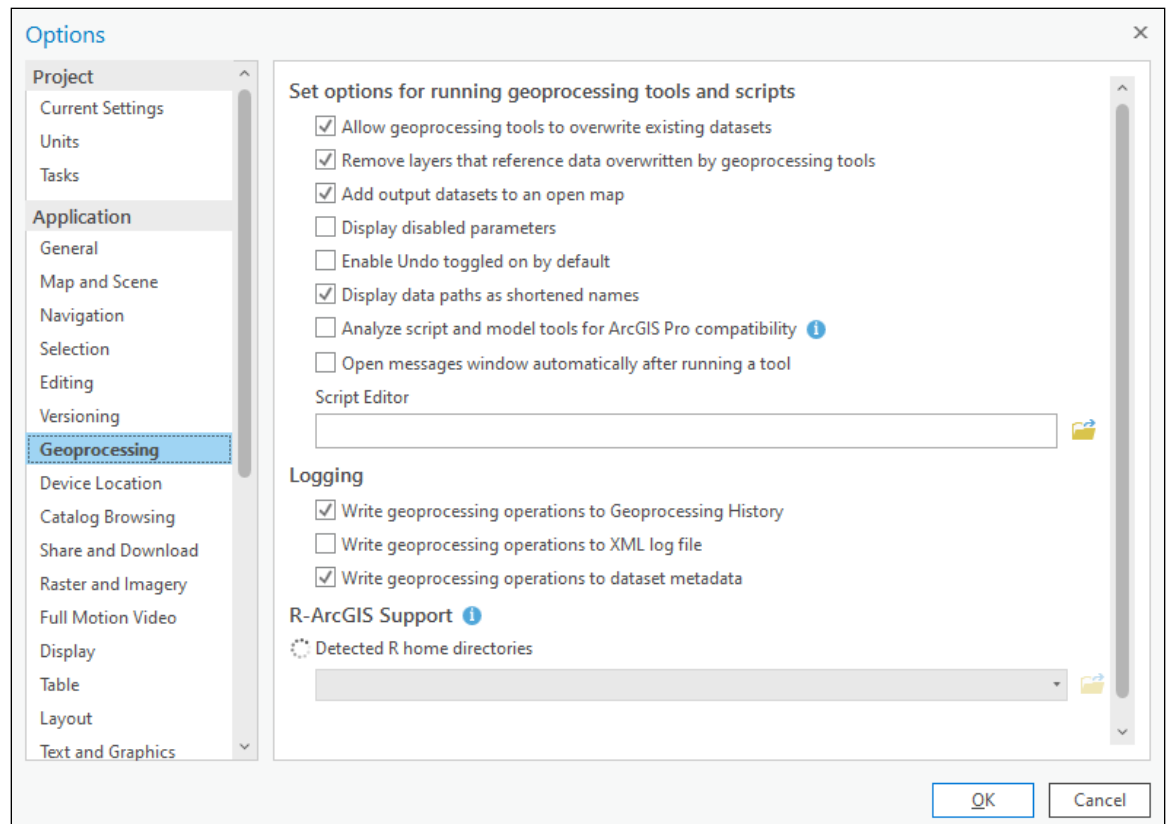


Figure 2 Setting Geoprocessing tools to overwrite outputs by default and to add results of geoprocessing tools to the display

15. Select **OK** to exit the *Options* dialog.
16. Using the ↶ arrow in the upper left corner, return to the main user interface.

### 3 Creating SectionLines

As the first step, create a set of section line features from which the 3D features will be derived.


#### 3.1 Sketching the SectionLines

To start sketching section lines:

1. On the ribbon, select the *Edit* tab.
2. If necessary, click **Edit** to enable editing.

The necessity of step 2 depends on the ArcGIS Pro settings on the local machine.

3. In the *Features* section, click on the **Create** button to open the *Create Features* pane.
4. In the *Create Features* pane, select the “SectionLine” layer under the *SectionLine* heading to make the tools for lines available.
5. Click on the **Line** button to create a line feature in the *Map* view.

6. Create line A-A', as shown in Figure 3, by clicking to begin the SectionLine, then double-clicking to end it. Make sure the lines stay within the model domain.
7. Repeat step 5 for lines B-B', C-C', D-D', E-E', and F-F', as shown in Figure 3.
8. In the *Contents* pane, right-click on "SectionLine" and select  **Attribute Table** to bring up the *SectionLine* table view displaying the SectionLines just created.
9. In the *SName* column on the fourth row, enter "A-A".
10. Repeat step 7 for B-B', C-C', D-D', E-E', and F-F', respectively from the second row down.

At this point, the map should be similar to the one shown in Figure 3. The *SName* values will not appear in the *Map* view.

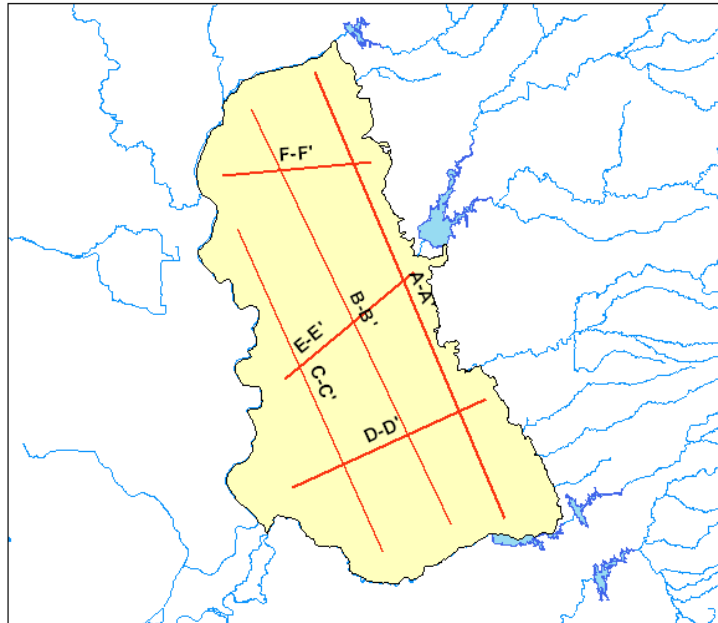






Figure 3 Section lines sketched within the model boundary






### 3.2 Assigning Vertical Exaggeration

Next, assign vertical exaggeration values to the section lines. The cross section features will be scaled based on the vertical exaggeration attribute.

1. On the *Edit* ribbon tab, click **Clear**  to deselect all rows in the table.
2. Right-click on the *Vertical Exaggeration* column header and select **Calculate Field...** to open the *Calculate Field* dialog.
3. In the *VertExag2D=* field near the bottom, enter "20" (without the quotes).
4. Click **OK** to close the *Calculate Field* dialog and change the value in the *Vertical Exaggeration* column for each row.
5. On the *Edit* ribbon tab, select  **Save** to save the edits to the *SectionLine* table.
6. If  **Edit** was clicked above to begin the editing session, click  **Edit** to complete the editing session.
7. Close the *SectionLine* table view.

### 3.3 Assigning HydroIDs




After creating the features, assign HydroID values to them. The HydroID is the unique identifier of the feature within the geodatabase, and is used to create relationships between tables and feature classes.

1. In the *Catalog* pane, expand “ ArcHydroGroundwater.pyt” and “ Groundwater Analyst”.
2. Double-click on “ Create Unique ID Table” to open the *Create Unique ID Table* tool in the *Geoprocessing* pane.
3. Click the **Browse**  button to bring up the *UNIQUEID Table* dialog.
4. In the data tree on the left, under  *Project*, browse to *Databases* and open the *Horizons.gdb* database.
5. Enter “UniqueID” as the *Name*.
6. Click **Save** to close the *UNIQUEID Table* dialog and save the name of the UniqueID table.
7. For the *Last HydroID used*, enter “1”.
8. Click **Run** to run the *Create Unique ID Table* tool.

The tool creates a new table named “UniqueID” and adds it as a standalone table in the *Contents* pane.

### 3.4 Populating HydroID Values

Next, populate the HydroID values for the *SectionLine* features.

1. In the *Catalog* pane under the “ Groundwater Analyst” toolset, double-click on the “ Assign HydroID GW” tool to bring up the *Assign HydroID GW* tool in the *Geoprocessing* pane.
2. Select “UniqueID” from the *Input UNIQUEID Table* drop-down.
3. Select “SectionLine” from the *Input Features to Assign HydroID* drop-down.
4. Select “HydroID” from the *HydroID Field of Input Features* drop-down.
5. Make sure *Overwrite Existing HydroID Values* is on.
6. Click **Run** to run the *Assign HydroID GW* tool.
7. Right-click on “SectionLine” in the *Contents* pane and select  **Attribute Table** to bring up the *SectionLine* table view.

The *HydroID* column has now been populated.

8. Close the *SectionLine* table view.

## 4 Viewing the Scene

Next, create 3D GeoSection and GeoVolume features and visualize them in *Scene* view.

Begin by going to a scene of Roseville.

1. Click the  *Scene* view tab.

The scene should appear similar to Figure 4. This data was obtained from a groundwater model created for the region, then modified for the purposes of the tutorial to illustrate concepts and protect confidentiality. There are different rasters representing horizon data, which will be used to create GeoSection and GeoVolume features.

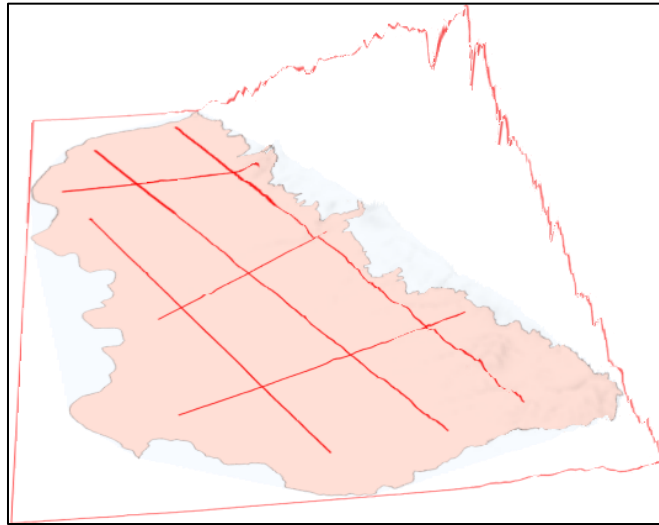



Figure 4 Rasters representing Horizon data

The rasters are also organized in table format as part of a mosaic dataset. The rasters overlap each other and contain different attributes to describe the horizons. The rasters in the mosaic dataset will later be used to build GeoSection and GeoVolume features.

2. After examining the scene, click on the arrow to the left of “Rasters” in the *Contents* pane to reveal the individual rasters: TOP1, TOP2, TOP4, TOP6, TOP7, and BOT7 (they may be listed in a different order).
3. Turn off each of the six rasters, leaving “Rasters” turned on.
4. Select “GeoRasters”.

This is the mosaic dataset storing the same rasters representing the horizon data.

5. Right-click on “GeoRasters” and select *Open Table* /  **Attribute Table** to bring up the *GeoRasters: Footprint* table view (Figure 5).

Note that the table includes a *Raster* field for the rasters, along with a field called *HorizonID* for storing the order of strata representing the horizons. Visualizing all fields usually requires scrolling to the right.

	Name	OBJECTID *	Shape *	Raster	MinPS *	MaxPS *	LowPS *	HighPS *	Category	Tag
1	TOP1	1	Polygon	Raster	0	10000	1000	1000	Primary	Dataset
2	TOP2	2	Polygon	Raster	0	10000	1000	1000	Primary	Dataset
3	TOP4	3	Polygon	Raster	0	10000	1000	1000	Primary	Dataset
4	TOP6	4	Polygon	Raster	0	10000	1000	1000	Primary	Dataset
5	TOP7	5	Polygon	Raster	0	10000	1000	1000	Primary	Dataset
6	BOT7	6	Polygon	Raster	0	10000	1000	1000	Primary	Dataset

Figure 5 The mosaic dataset for the horizons data



6. Close the *GeoRasters: Footprint* table view.








## 5 Building GeoSection Features

The GeoSection features are an ideal starting point for creating subsurface data from horizons. The cross sections (or “fence diagrams”) are simpler to create and easier to view than the solid GeoVolume features. The GeoSection features can be used to see if the interpolation options applied are reasonable before building GeoVolume features for the entire area covered by the rasters in the mosaic dataset.

To build the GeoSection features, one or more SectionLine polyline features is needed to determine where the subsurface cross sections will be created, along with a dataset representing the horizon data, and the multipatch GeoSection feature class where the new features will be created.

### 5.1 Creating a GeoSection Feature Class

The first step will be to create a new GeoSection feature class:

1. In the *Catalog* pane, expand “ ArcHydroGroundwater.pyt”, “ Subsurface Analyst”, and “ Features”.
2. Double-click on the “ Create GeoSection Feature Class” tool to bring up the *Create GeoSection Feature Class* tool in the *Geoprocessing* pane.
3. Click the **Browse**  button to the right of *Output GeoSection Features* to bring up the *Output GeoSection Features* dialog.
4. In the data tree on the left, under  *Project*, browse to the *Databases\Horizons.gdb\* database and double-click on  *Data*.
5. In the *Name* field, enter “GeoSection”.
6. Click **Save** to exit the *Output GeoSection Features* dialog and save the GeoSection feature class name.
7. Leave *Input Spatial Reference* empty.

The Horizons.gdb\Data feature dataset has the correct XYZ coordinate systems defined. Because the GeoSection feature class will be placed in the feature dataset, a spatial reference does not need to be specified.

8. Click **Run** to run the *Create GeoSection Feature Class* tool.

A new feature class named “GeoSection” should be added to the scene in the *Contents* pane.

### 5.2 Reviewing the GeoRaster Mosaic Dataset

At this point, the “SectionLine” feature class layer, the “GeoSection” feature class layer, and the “GeoRasters” mosaic dataset layer should all be listed in the *Contents* pane.

Before building the GeoSection features from the rasters, review the “GeoRasters” table. Do the following:

1. Right-click on “GeoRasters” in the *Contents* pane and select *Open Table* |  **Attribute Table** to open the *GeoRasters: Footprint* table view.

2. Note that the *Clip* and *Fill* columns on the row named “TOP1” both contain a value of “1”.






This means that subsurface layers (which are all of the other layers) do not extend above the “TOP1” layer.

The “TOP1” row in the GeoRasters mosaic dataset table comes from a digital elevation model (DEM) of the ground surface elevation data. Depending on the interpolation values used to generate the rasters stored in the mosaic dataset, there might be portions of the raster on the edges which exceed the ground surface elevation.

3. Close the *GeoRasters: Footprint* table view.

### 5.3 Running the Rasters to GeoSection Features Tool

To run the *Rasters to GeoSections* tool:

1. In the *Catalog* pane, expand “ ArcHydroGroundwater.pyt”, “ Subsurface Analyst”, and “ Features”.
2. Double-click on the “ Rasters to GeoSections” tool to bring up the *Rasters to GeoSections* tool in the *Geoprocessing* pane.
3. Select “SectionLine” from the *Input SectionLine Features* drop-down.
4. Select “GeoRasters” from the *Input Raster Catalog* drop-down.
5. Select “HorizonID” from the *Raster Catalog Horizon ID field* drop-down.
6. Enter “1000” as the *Discretization Spacing*.
7. Select “GeoSection” from the *Input GeoSection Features* drop-down.
8. Select “Clip” from the *Raster Catalog Clip field* drop-down.
9. Select “Fill” from the *Raster Catalog Fill field* drop-down.
10. Select “HGUID” from the *Raster Catalog HGUID field* drop-down.
11. Make sure *Append to Existing GeoSection Features* is turned on.
12. Click **Run** to run the *Rasters to GeoSections* tool.
13. When the tool finishes running, right-click on “GeoSection” in the *Contents* pane and select  **Properties** to open the *Layer Properties: GeoSection* dialog.
14. Select *Elevation* from the list on the left.
15. From the *Features are* drop-down menu, select “Relative to the ground”.
16. For *Vertical Exaggeration*, enter “20”.
17. Click **OK** to save the settings and close the *Layer Properties: GeoSection* dialog.

The GeoSections should be barely visible now. however, the ModelBoundary layer is still blocking most of the view.

18. In the *Contents* pane, turn off the “ModelBoundary” layer by unchecking the box next to it.

The scene should have 3D features similar to those shown in Figure 6.

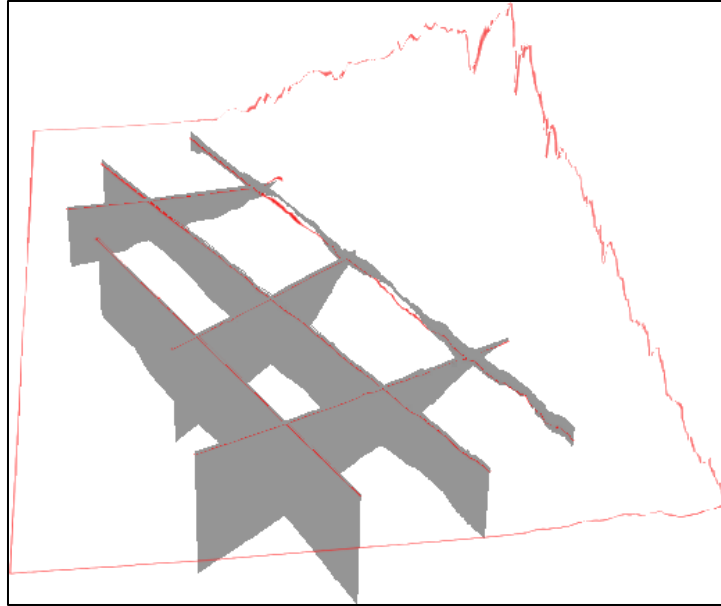




Figure 6 GeoSection features created by running the *Rasters to GeoSections* tool


19. If the 3D features do not appear, click  **Refresh** in the bottom-right corner of the view.
20. If step 19 doesn't work, in the *Catalog* pane, under *Databases* right-click on  "Horizons.gdb" and select **Refresh**.

## 5.4 Symbolizing the GeoSections

To better visualize the cross sections, symbolize the GeoSections by the HorizonID used to build them.

1. Right-click on "GeoSection" in the *Contents* pane, and select  **Symbology** to open the *Symbology* pane.
2. On the *Symbology* pane, under *Primary symbology*, select "Unique Values" from the drop-down menu.
3. Select "HorizonID" from the *Field 1* drop-down.
4. Right-click in the *Value* column in the list table and select **Sort Descending**.

This sorts the unique HorizonID values from the highest value at the top to the lowest value on the bottom.

5. As desired, use the **Explore**  tool to view the GeoSection features from multiple angles to view the results of the tool.

The results should be similar to those found in Figure 7, though the colors may be different.

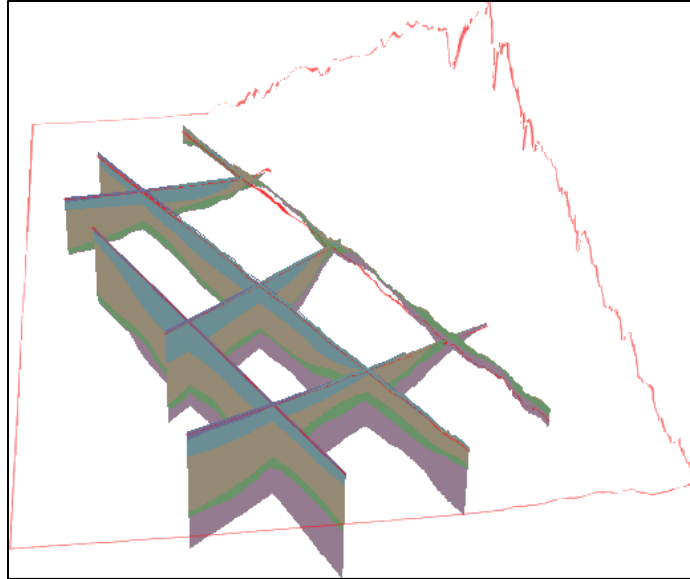


Figure 7 GeoSection features symbolized by the HorizonID field

Next, create 3D GeoVolumes to visualize the hydrogeologic units as volume elements.

## 6 Creating a Projection TIN

A TIN (Triangular Irregular Network) is used to define the extent of the GeoVolume features to be created, as well as to determine the size and extent of the triangle strips used to define the multipatch features. The number of triangles on the TIN determines the amount of processing that must be done. The TIN used in the *Rasters to GeoVolumes* tool is referred to as a projection TIN, because the elevations on the TIN are not used, but the triangles are used only to define the shape and extent of the GeoVolumes.

A simplified projection TIN has been provided in the tutorial for the benefit of those who do not have access to the “3D Analyst Tools” extension.

1. Turn on the “projtin4k” layer in the *Contents* pane.

The TIN should appear similar to Figure 8.

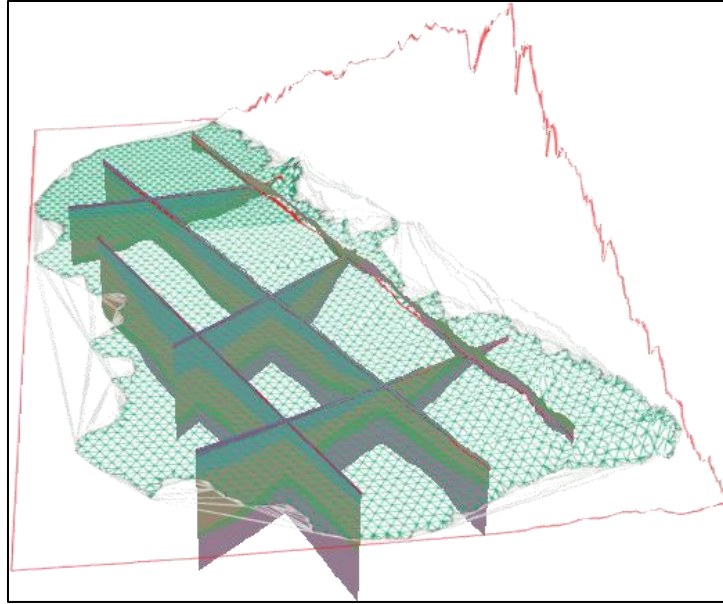


Figure 8 A projection TIN used for creating GeoVolume features

2. Turn off “projtin4k” projection TIN in the *Contents* pane.

## 6.1 Enable the 3D Analyst Extension





A license for the 3D Analyst extension is required to create a TIN using the **Polygon to TIN** tool using the following steps. For those without the 3D Analyst Tools, please skip to Section 7 and use the provided “projtin4k” TIN for the remainder of the tutorial.

If the “3D Analyst Tools” toolbox is not already enabled, do the following:



1. On the ribbon, select the *Project* tab.
2. Select *Licensing* from the list on the left.
3. On the *Licensing* page, under *Esri Extensions*, check to see if the *3D Analyst* row has “Yes” in the column labeled *Licensed*.
4. If it does not, use the **Configure your licensing options** button to open the *Licensing* dialog and configure the license.

## 6.2 Creating a TIN Using 3D Analyst

Next, create a projection TIN:

1. In the *Catalog* pane, expand the “ ArcHydroGroundwater.pyt” toolbox, the “ Subsurface Analyst” toolset, and the “ TIN” toolset.
2. Double-click on “ Polygon to TIN” to bring up the *Polygon to TIN* tool in the *Geoprocessing* pane.
3. Select “ModelBoundary” from the *Input polygon feature* drop-down to set the polygon defining the boundary of the projection TIN.
4. Enter “4000” as the *TIN triangle spacing*.

This creates equilateral triangles inside the TIN with edge spacing equal to the value entered. Irregular triangles are created along the boundary of the TIN.





5. Click **Browse**  to the right of *Output projection TIN* to bring up the *Output projection TIN* dialog.
6. In the data tree on the left, under  *Project*, browse to the *Folders\horizons\* folder.
7. Enter “projtin” as the *Name*.
8. Click **Save** to exit the *Output projection TIN* dialog and save the output projection TIN name.
9. For TIN spatial reference, select *SectionLine* from the drop-down menu.

The *TIN spatial reference* field should automatically populate with “NAD\_1983\_StatePlane\_California\_II\_FIPS\_0402\_Feet / VCS:NAD\_1983”.

10. Click **Run** to run the *Polygon to TIN* tool.

### 6.3 Symbolizing the New TIN

The next step is to symbolize the new TIN by doing the following:

1. Right-click on “projtin” in the *Contents* pane, and select  **Symbolology** to bring up the *Symbolology* pane.
2. On the *Symbolology* pane, select the  **Symbolize your layer using a surface** tab to bring up the *Surface* page.
3. Uncheck the *Draw using* checkbox to turn it off.
4. Now select the  **Symbolize your layer using edges** tab to bring up the *Edges* page.
5. Ensure that the *Draw using* checkbox is on.
6. From the *Draw using* drop-down, select “Simple”.
7. Select the  button to edit the symbol if desired.

The TIN should appear similar to Figure 9.

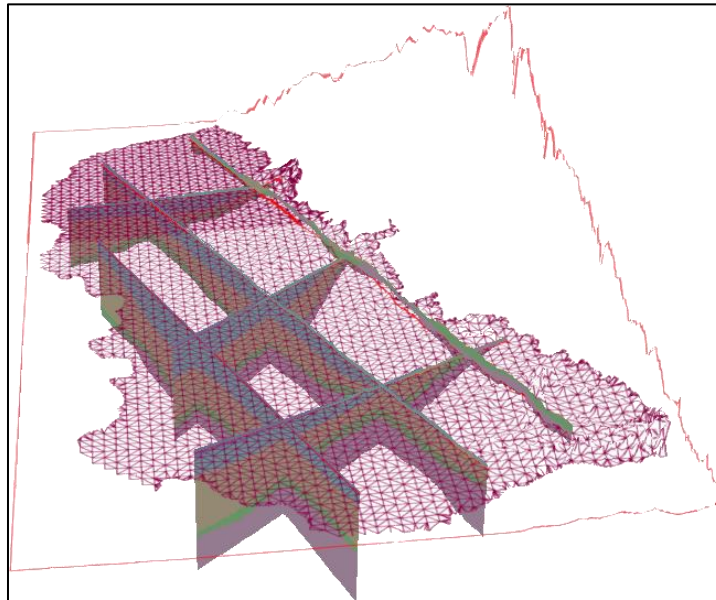


Figure 9 The new appearance of the TIN

## 7 Building GeoVolume Features








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Once acceptable clip and fill options have been determined and a projection TIN has been defined, GeoVolume features can be created to generate a 3D volume of the horizons data. The **Rasters to GeoVolumes** tool contains the same options as the **Rasters to GeoSections** tool for clipping and filling in between rasters.

### 7.1 Creating a GeoVolume Feature Class

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Before creating GeoVolume features from the rasters, create a GeoVolume feature class:

1. In the *Catalog* pane, expand “ ArcHydroGroundwater.pyt”, “ Subsurface Analyst”, and “ Features”.
2. Double-click on the “ Create GeoVolume Feature Class” tool to bring up the *Create GeoVolume Feature Class* tool in the *Geoprocessing* pane.
3. Next to *Output GeoVolume Features*, click **Browse**  to bring up the *Output GeoVolume Features* dialog.
4. In the data tree on the left, under  *Project*, browse to *Databases\Horizons.gdb* and open the  *Data* feature dataset.
5. Enter “GeoVolume” as the *Name*.
6. Click **Save** to exit the *Output GeoVolume Features* dialog and save the GeoVolume features output name.
7. Leave *Input Spatial Reference* blank.
8. Click **Run** to run the *Create GeoVolume Feature Class* tool.





A new “GeoVolume” layer should appear in the *Contents* pane.

### 7.2 Converting Rasters to GeoVolumes

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To simplify the following steps, “projtin4k” will be used for the projection TIN. Feel free to use “projtin” if Section 6 was completed.

Now build the GeoVolume features by doing the following:

1. In the *Catalog* pane, expand “ ArcHydroGroundwater.pyt”, “ Subsurface Analyst”, and “ Features”.
2. Double-click on the “ Rasters to GeoVolumes” tool to bring up the *Rasters to GeoVolumes* tool in the *Geoprocessing* pane.
3. Select “projtin4k” from the *Input Projection Tin* drop-down.
4. Select “GeoRasters” from the *Input Raster Catalog* drop-down.
5. Select “HorizonID” from the *Raster Catalog Horizon ID field* drop-down.
6. Make sure “1” is the value entered as the *Minimum MultiPatch Thickness*.

Sections of the GeoVolume that have a thickness less than this value will not be created.

7. Select “GeoVolume” from the *Input GeoVolume Features* drop-down.
8. Select “Clip” from the *Raster Catalog Clip field* drop-down.
9. Select “Fill” from the *Raster Catalog Fill field* drop-down.



10. Select “HGUID” from the *Raster Catalog HGUID* field drop-down.
11. Make sure *Append to Existing GeoVolume Features* is turned on.
12. Click **Run** to run the *Rasters to GeoVolumes* tool.

The GeoVolumes should now appear as 3D features (Figure 10). However, the GeoVolumes vertical exaggeration has still not been adjusted to match the vertical exaggeration of other layers in the project.

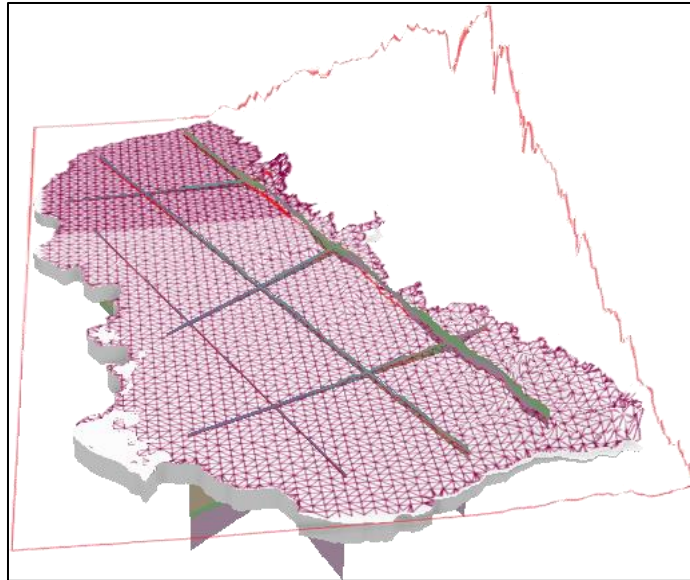





Figure 10 GeoVolume features in 3D

### 7.3 Symbolizing the GeoVolumes by HorizonID

To better visualize the results, first adjust elevation properties.

1. Right-click on the “GeoVolume” layer in the *Contents* pane, and select  **Properties** to bring up the *Layer Properties: GeoVolume* dialog.
2. On the *Elevation* tab, select “Relative to the Ground” from the *Features are* drop-down menu.
3. For *Vertical Exaggeration*, enter “20.00”.
4. Click **OK** to close the *Layer Properties: GeoVolume* dialog.

Now the GeoVolume should be significantly more visible. It now reflects the vertical exaggeration that is used for the rest of the project. Next, symbolize the GeoVolumes by the HorizonID used to build them.

5. Right-click on the “GeoVolume” layer in the *Contents* pane and select  **Symbolology** to open the *Symbolology* pane.
6. In the *Symbolology* pane, click  in the upper right corner and select **Import Symbolology** to open the *Apply Symbolology From Layer* tool in the *Geoprocessing* pane.
7. Ensure that *Input Layer* is set to “GeoVolume”.
8. Set *Symbolology Layer* to “GeoSection”.

This means that the symbology will match the symbology from the GeoSection layer.



9. Click **Run** to run the *Apply Symbolology From Layer* tool.

The GeoVolume features should appear similar to Figure 11, though the colors may vary.

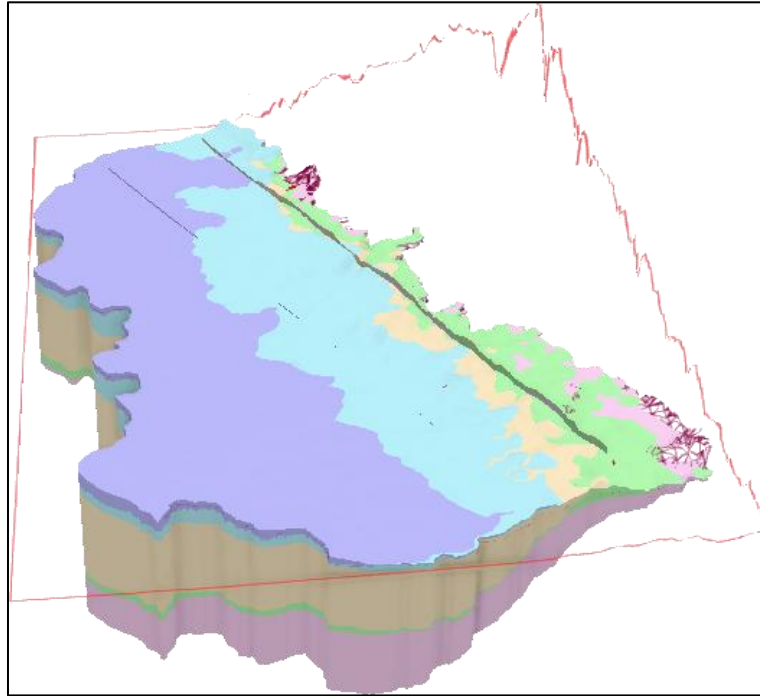



Figure 11 The GeoVolume features symbolized

10. As desired, use the **Explore**  tool or the navigator to view the GeoVolume features from multiple angles to view the results of the tool.

The *Filtering* section in the *Arc Hydro Groundwater* ribbon tab can be used to view individual GeoVolume layers. To view a single GeoVolume:

11. On the ribbon, select the *Arc Hydro Groundwater* tab.
12. Select the “GeoVolume” layer in the *Contents* pane.
13. Select “HorizonID” from the *Field* drop-down in the *Filtering* section.
14. Select “8” from the *Value* drop-down.

The results should appear similar to Figure 12, though colors may vary. Feel free to experiment by selecting different HorizonIDs or HGUIDs from the drop-downs. Additionally, the 3D Effects toolbar can be used to control the layer transparency, face culling, lightning and shading.

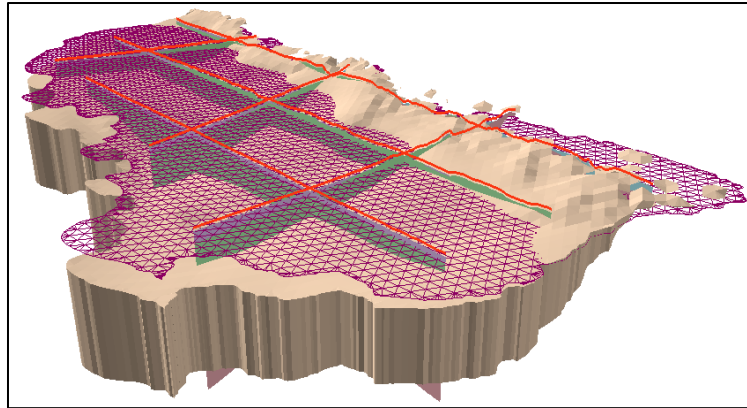


Figure 12 Display only HorizonID 8 by using the Field Filter tool

## 8 Using the HGU Color Manager

The features in the GeoSection and GeoVolume feature classes are different representations of the same hydrogeologic units. The HGU Color Manager can be used to apply a common set of colors to display features tied to the same HorizonID fields.

1. On the ribbon, select the *Arc Hydro Groundwater* tab.
2. On the *Arc Hydro Groundwater* tab, select the **HGU Color Manager** to open the *HGU Color Manager* pane.
3. Select “HydrogeologicalUnit” from the *HGU Table* drop-down.
4. Select “HydroID” from the *HGU ID Field* drop-down.
5. Select “HGUName” from the *HGU Name Field* drop-down.
6. At the bottom of the page, uncheck the checkbox for every layer except *GeoVolume* and *GeoSection*.
7. Click **Apply Symbolology** to apply the changes.
8. Using the *Filtering* drop-downs, view each of the HorizonIDs in turn.

Notice that the colors apply to both the GeoSections and GeoVolumes.

The *HGU Color Manager* has saved the selected colors (as numbers) in the “HGUColor” field of the “HydrogeologicUnit” table. These colors will be available for application to the features when using the *HGU Color Manager* with either a *Map* or *Scene* view.

## 9 Conclusion

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This concludes the “Horizons” tutorial. The following key concepts were discussed and demonstrated in this tutorial:

- SectionLine features are sketched in ArcGIS Pro and used to create 3D GeoSections.
- Horizons can be used to represent stratigraphic units.
- Horizons stored in a mosaic dataset can be used to create GeoSection and GeoVolume features.
- Clip and fill options can be used to manage the way GeoSection and GeoVolume features are created.
- A projection TIN is used to define the GeoVolume features created from the rasters in the GeoRasters mosaic dataset.
- The *HGU Color Manager* is used for managing the symbology of multiple layers representing hydrogeologic units.