

DCS 1100 - Fall 2016

Geoprocessing Assignment

Due via Blackboard on Monday 9/19 at 5:00pm

Assignment Overview

You will learn how to create a hillshade, represent visibility, and generate a 3D model.

The Big Picture:

This assignment is part of our ongoing discussion of how data is created, how technology and computation can help us to ask new questions (or answer old ones), and how these developments might help us understand Chamberlain's decisions at Little Round Top.

1. Set up (Windows login, mapping network drive, copying materials for Geoprocessing Lab to student folder).
2. Follow instructions for geoprocessing: creating a hillshade and a map of visibility from a vantage point atop Little Round Top using ArcMap.
3. Follow instructions for then creating a 3D visualization from that accumulated data using ArcScene.
4. Geoprocess your historic map.

Working with your georeferenced historic map, examine Chamberlain's visibility on the field of battle (and perhaps that of his troops). Then compare your historic map to the 3D visualization.

5. Critical reflection.
Answer the following question in paragraph form: In the context of data about Little Round Top, how do the manipulations in ArcGIS contribute to our vision by making new data to analyze or by making us confront what we *can* and *can't* see with a map?
6. Submission.

Submit your work via Blackboard by the deadline. This includes the response to the question in Step 5 (above) and 3 map exports (should be embedded in Word or pdf).

In your Student Folder save two new ArcGIS files: one .mxd (with the hillshade and visibility information) and one .sxd (with the 3D model). Your .mxd should include your point and visibility layers, your hillshade raster, and your georeferenced historic map. Your .sxd should include the 3D rendering of the original DEM file, your visibility layer draped over it, and your Chamberlain (or other) points.

Evaluation

Your assignment will be graded on the following components (provided the deadline is met):

- 60 pts. – three images are submitted via Blackboard and saved in “Projects” folder, reflect the required material; the images reflect accurate work and critical decisions about where to place Chamberlain, how to georeference the map, and the creation of the visibility layer and 3D visualization parameters.
- 40 pts.- the response to the question in part 5 stays on topic, is concise, and is organized (topic sentences, use of details to support the topic sentence, and reaches a conclusion that summarizes the overall point of the decisions made during the lab)

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Credit: Gaby Papper with Profs. Gilbreath, Johnson, and Hall

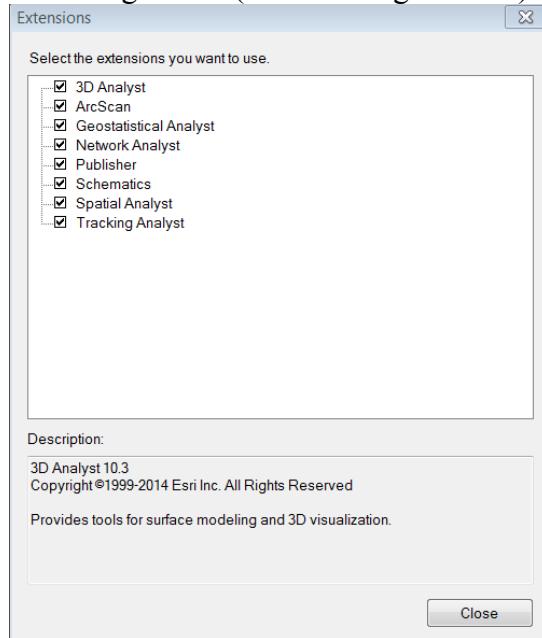
GeoProcessing with ArcMap

1. First, start the computer using Windows, not the Mac OS. This will take a few minutes while the computer restarts.
2. Then you'll need to connect to your microwave space in order to access the data and files that you will use. Like last week, map the network drive to the course folder from your computer. If you are at the same computer you may not need to do this. On your desktop, click on computer. Then click map network drive. Then type \\microwave\courses\dcs1100 into the pop-up box. When you open GIS, you will have all the data from your microwave space available to use in the Catalog (found on the right hand side).
3. Open the Materials folder and copy the "Geoprocessing" folder to your student folder (all in the \dcs1100 main folder).
4. Open ArcGIS by clicking the Start/Windows icon in the lower left of the desktop. Click "All Apps" then "ArcGIS" then "ArcMap10.4". Select a blank project.
5. Immediately save the new project to your student folder in the course folder for DCS1100. From the "File" menu choose "Save As" and navigate to computer, the microwave space, and the subfolders. Follow the steps from last week to make a new **Default Geodatabase**.
6. Now also make sure that any of your relevant data is also saved to that same space by again clicking "File" and "Map Document Properties" all the way at the bottom of the menu. Make sure that at the bottom of the dialog box the box for "Pathnames" is checked to store relative pathnames to data sources. This means that when you submit your work, your professors will be able to open it correctly. Otherwise your historical map may save to the machine you are using today, not a commonly accessible space like microwave.
 - a. TIP: If you want to make most of the icons larger, follow these instructions:
<http://desktop.arcgis.com/en/arcmap/10.3/guide-books/customizing-the-ui/displaying-toolbars-with-large-icons.htm>
7. Add the **Editor** and **Georeferencing** toolbars so that you will be ready to georeference. Click on **Customize** (in the top bar) → Toolbars. Click on both Editor and Georeferencing so that they will appear in the main window.
8. The second important piece of getting ready for this week's assignment is to turn on some of the tools that we will be using within ArcMap. You will want to turn on these tools anytime you use ArcMap on any computer.
9. Under the **Customize** Dropdown menu, select **Extensions**.

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10. As a default all of the boxes are checked. Uncheck them. Select only Spatial Analyst and 3D Analyst for use with this assignment. (See the image below.)



11. Open the folder Geoprocessing in the ArcCatalog window so you can see all the files. From the subfolder "ClippedDEM" add the file *rtdemutm* to your map. This will be the first input you will use. This file shows the elevation at Gettysburg.
12. In your folder, you will also see a Tool Box called “GeoprocessingTools”. Click on the plus sign next to this toolbox to see the different Tools we will use



GeoprocessingTools.tbx

Hillshade

Tool	Description
Hillshade	Creates a shaded relief from a surface raster by considering the illumination source angle and shadows.
Visibility	Determines the raster surface locations visible to a set of observer features, or identifies which observer points are visible from each raster surface location.

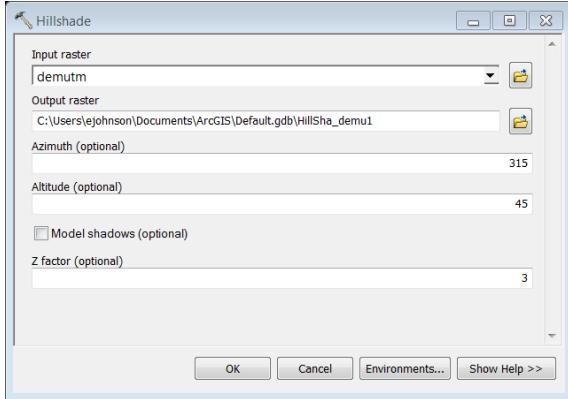
Hillshade in ArcGIS

13. In order to better understand the topography, we will use the Hillshade Tool to show the relief for the area. Double click on the Hillshade Tool. It will bring up a new tool. Select the *rtdemutm* from the input raster drop-down menu. Name the file *hsdemutm* and be sure save it to your folder. Set the z value to 3 (this will accentuate the topography). Be sure to select the settings as shown below so that your data will be shaded on a scale from lowest to highest elevation. This might take a few moments (and a new pop-up about the

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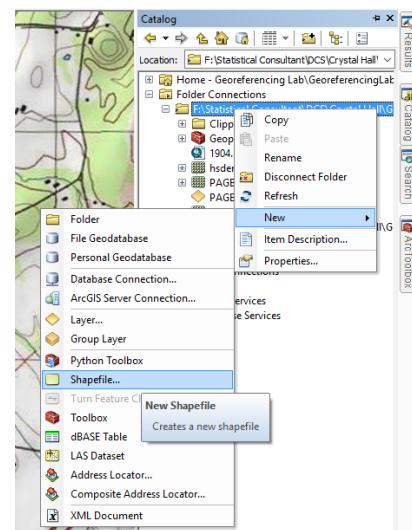
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license for ArcGIS may appear). If you get an error message, try using the tool directly from the ArcToolbox. ***Click on the toolbox button in the upper center of the screen , and then navigate to Spatial Analyst Tools >Surface>Hillshade and repeat the steps above.***



14. Make sure that your coordinate system is still the same as before. For this tutorial, it is recommended that you use **UTM Zone 18N NAD 83**. Right click on the hsdemutm layer in the table of contents, select **Properties**, click on the **Source** tab, and scroll down until you see the coordinate system.
15. You will want to add the point that you will use to determine visibility. For this tutorial, that point will be your interpretation of Chamberlain's position at LRT.
16. Before you create this new data, compare what you have already assembled. Add in the Topographic map as we did last week. You may also want to add in the RoundTopUTM.shp point as well. Turn off the hillshade layer. Using the topographic map, zoom to Little Round Top. Turn the hillshade back on and you will see how the DEM shows the topography of the area. Turn the hillshade off so you can see the Topographic map and Little Round Top.
17. Then, to add the point, you will create a new **Shapefile** that will then be added as a new layer in the table of contents. In the Catalog pane, right click on the folder connection that contains your project, scroll down to **New** and select **New Shapefile**. You can change the name here, but you don't have to.

This Shapefile will store the location, shape, and attribute of the geographic feature. For Feature Type select Point (this may be the default) and then click on the Edit button. Select Projected Coordinate Systems >UTM >NAD83 >NAD1983 UTM Zone 18 N.



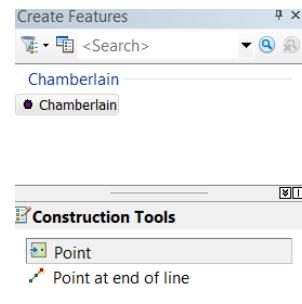
18. Right click on the new point you have created (it should be at the top of the Layers in the Table of Contents on

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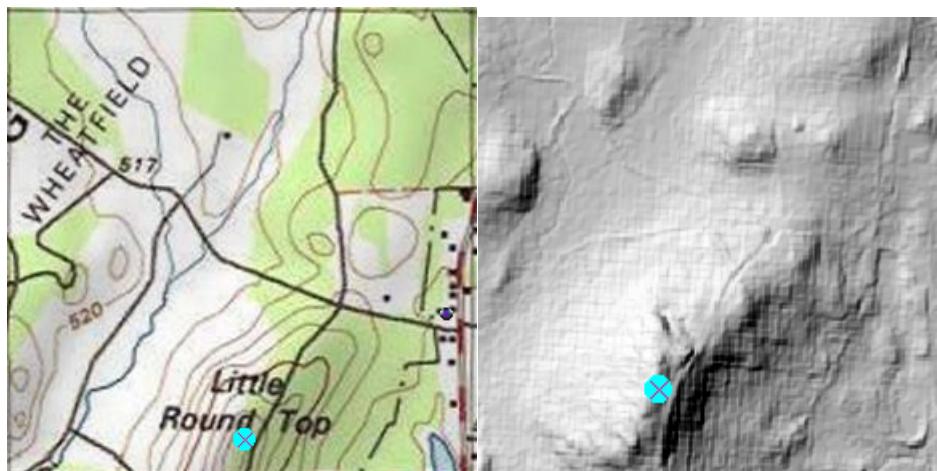
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the left). Select Properties>General, if you didn't do so before, change the layer name to **Chamberlain** (or something appropriate), and hit OK. Right click on Chamberlain again, and select Edit Feature > Start Editing (see image below).

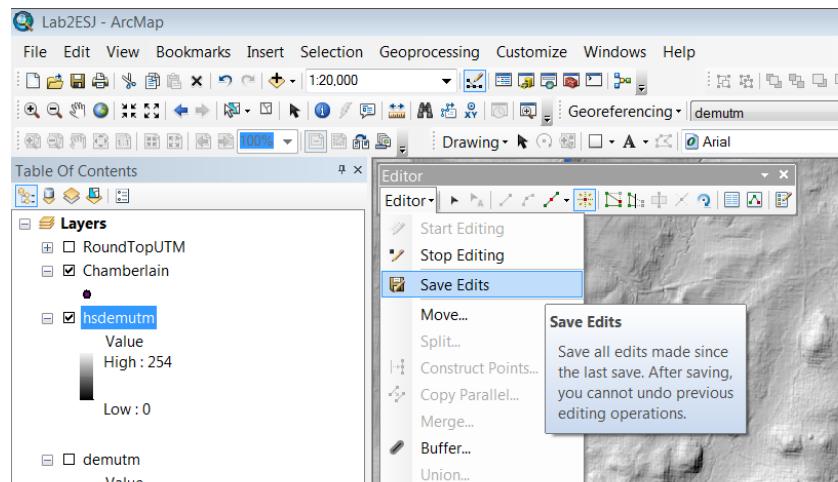
On the Editor tool bar, at the far right, click the Create Features button  . At the top of the new window that appears on the right, click your new point. Then, at the bottom of that new window, click on Point in order to create a new Point. (See the image at right.)



19. Click on the position where you believe Chamberlain might have stood on Little Round Top. Turn the hillshade back on to see the point at the top of the hill.



In the Editor drop down menu (the tiny arrow next to the word “Editor”), Select Save Edits then go back to that same menu and click Stop Editing. This will save your point. (See below.) Then save your map.



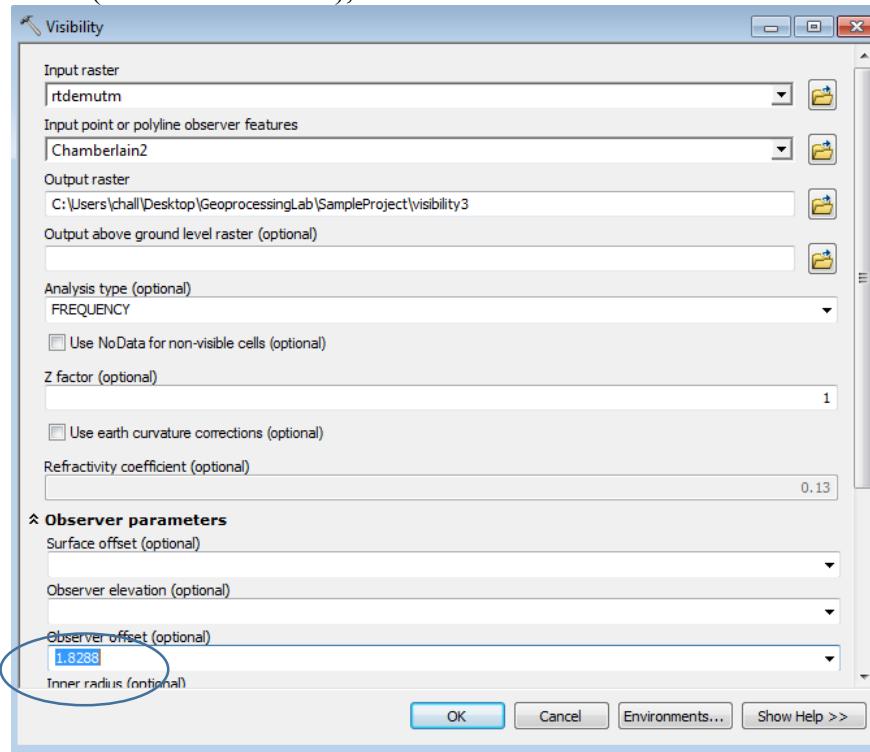
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Visibility with ArcMap

Now you will create different layers that will ultimately lead to showing you the visibility at Little Round Top.

1. In the GeoprocessingTools toolbox (in the Catalog pane), double-click on the **Visibility tool**. Your input raster will be **rtdemutm** layer that you imported at the beginning (select from dropdown menu) and your input point will be **Chamberlain** (also select from dropdown menu). You need to identify and name the Output raster: click on the Folder icon for the Output Raster, in the “Look in:” box, click your Student Folder and then enter a name in the “Name:” box at the bottom of the window, for example: **Visibility1**. Click “Save”. Make sure that the folder is your Student Folder (not C:\\...). This will create the map layer that will show you what is and is not visible from Little Round Top. Scroll down and expand the **Observer parameters** section. Scroll down again and set an Observer offset value of around 1.8288 (meters). This raises the viewer from ground level to account for a standing commander. When your box looks like the image in the image below (without that C:\\...), click OK.



This will take a few moments to calculate and the screen might flicker. Right click on the visibility layer and save it as a layer file (you will import this into ArcScene in the next part of the project).

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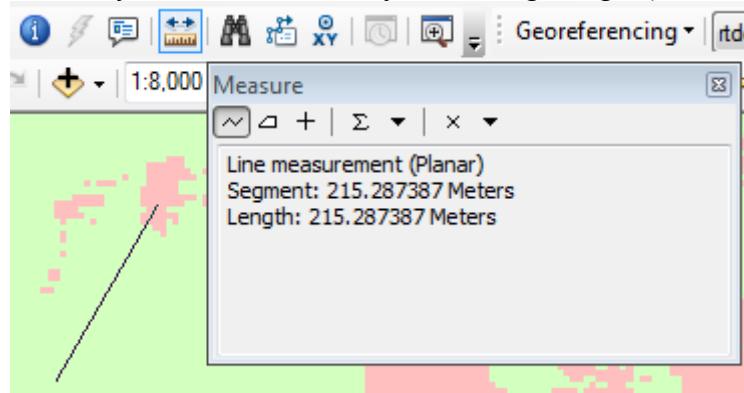
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Your result should look something like the image on the next page. The details will be different depending on where you put your Chamberlain point:



Export your map. Save a copy in the “Projects/JLCViz” folder in our course directory. Submit a copy with your answer to assignment’s question (Step 5 in the overall description).

TIP: Now is a good time to introduce the "Measure" tool that you lets you explore distances between points (that you choose) on the map. From the main tool bar click the icon that looks like a ruler (seen below). Click a start and end point for the distance you would like to measure and the Measure window will track your selections. Make sure to click the hand icon to revert to moving the map (otherwise you will be constantly measuring things...)



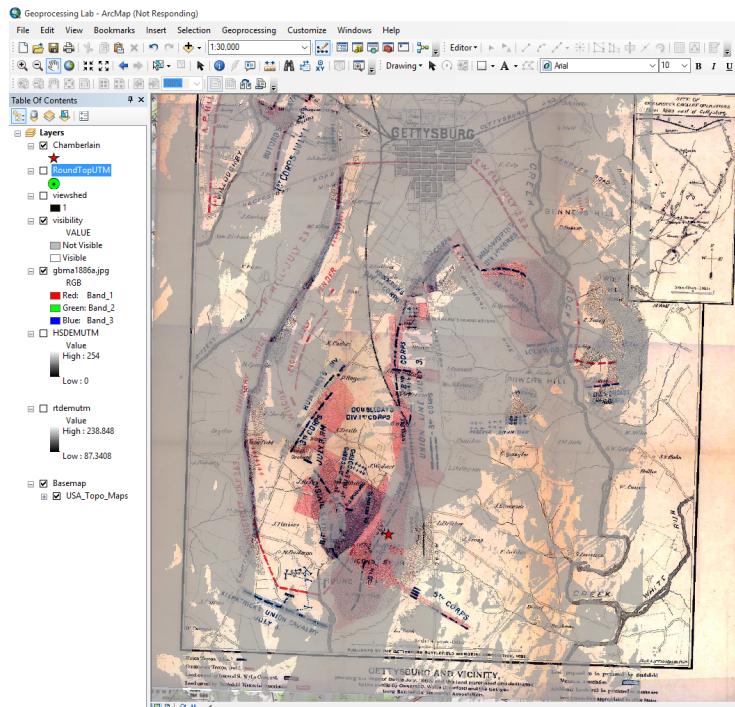
Right click on your visibility layer and click on the symbology tab. Double click on the color box next to the visible category and select “no fill.” Change the other color to something that symbolizes “not visible” to you. Now, by changing the order of your layers in the table of contents, you can see these multiple layers of information at once. You might also use the Display tab under properties to make your layer a little bit transparent (30% looks good). This will allow you to see what was invisible to Old Josh. For now, you should use the "PAGB1904" layer included in the lab folder. When you get to the overall “Step 4” for the Assignment, you will need to import your historic map (georeferenced in the first assignment) as a layer by

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finding your “Georeferencing” folder in the Catalog window and dragging in the georeferenced historic map.

To change the order, click on the layer for your map and drag it higher on the list than the other layers in the Table of Contents pane.



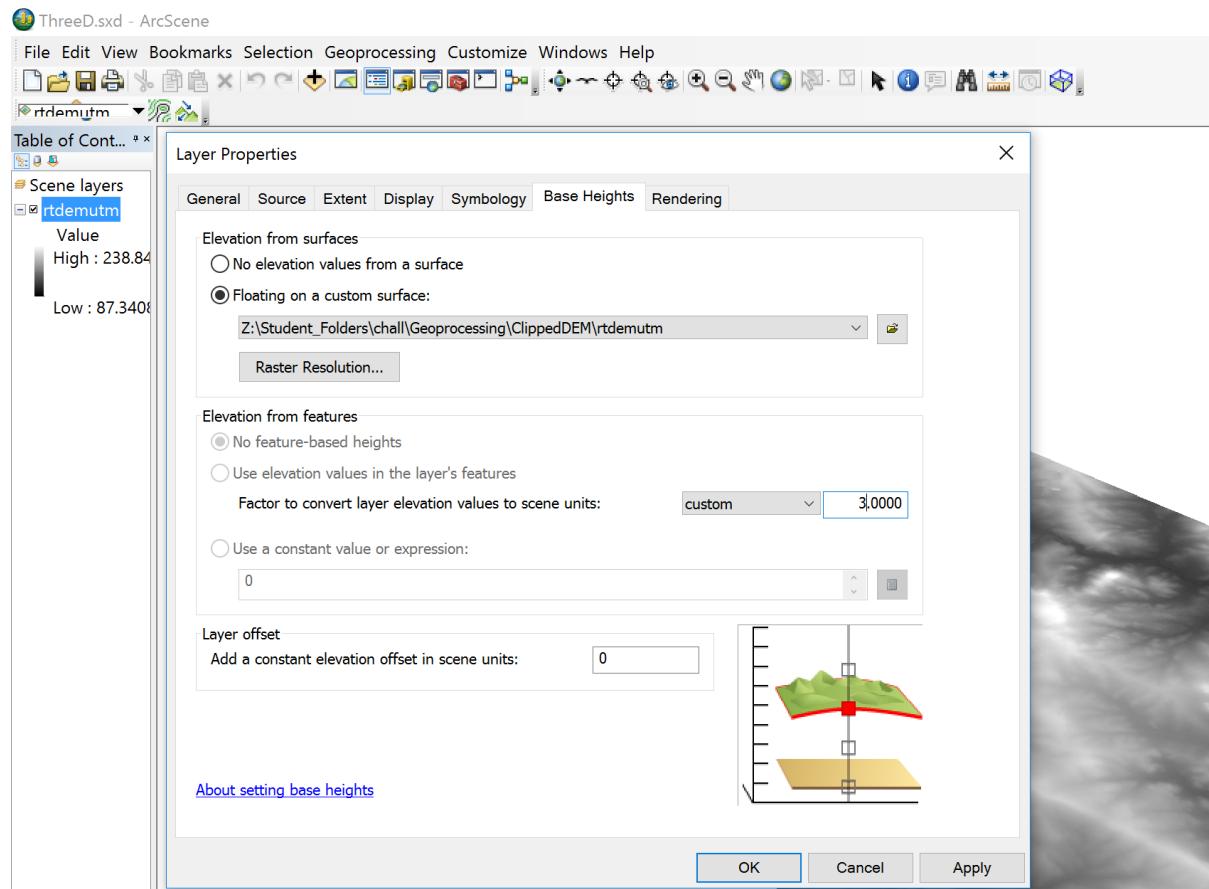
Geoprocessing with ArcScene

Now we are going to switch platforms and use ArcScene to create a 3D visualization of the field at Gettysburg.

1. You can open this from the same folder where you find ArcMap.
2. Open a blank scene. Immediately save it to your student folder, then change the "Scene Document Properties" to store the relative pathnames (very similar to ArcMap). Apply and click "OK".
3. Now from the Catalog, you can drag in the original rtdeutm file. Right click on the layer for the rtdeutm, select Properties and navigate to the "Base Heights" tab. (Shown below.)

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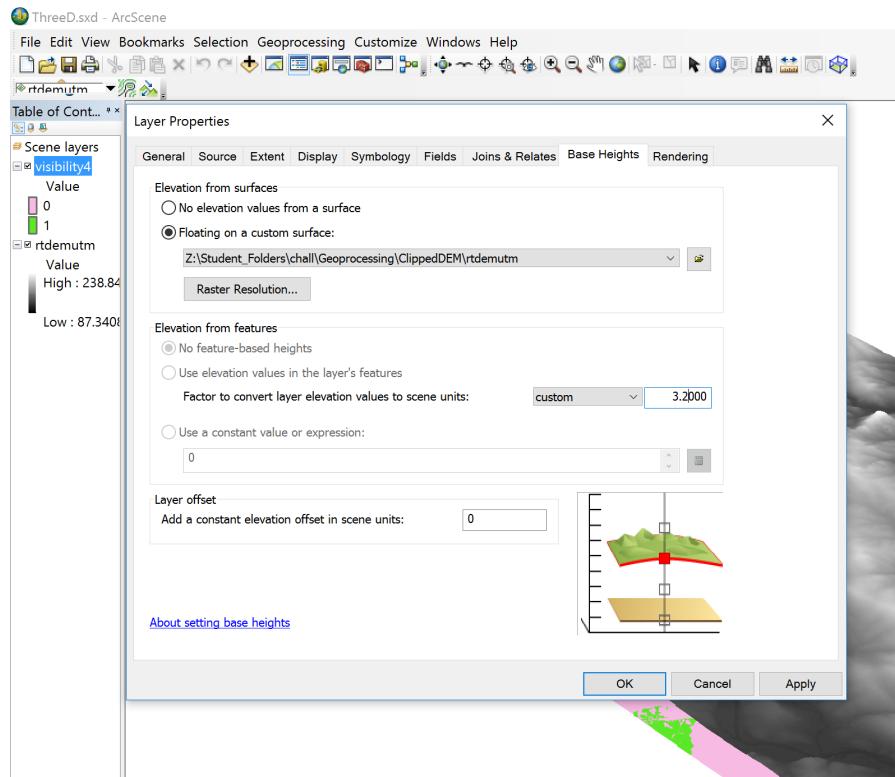


Choose "Floating on a Custom Surface" and set the "Elevation from Custom Features" factor to 3.0, where indicated in the image above.

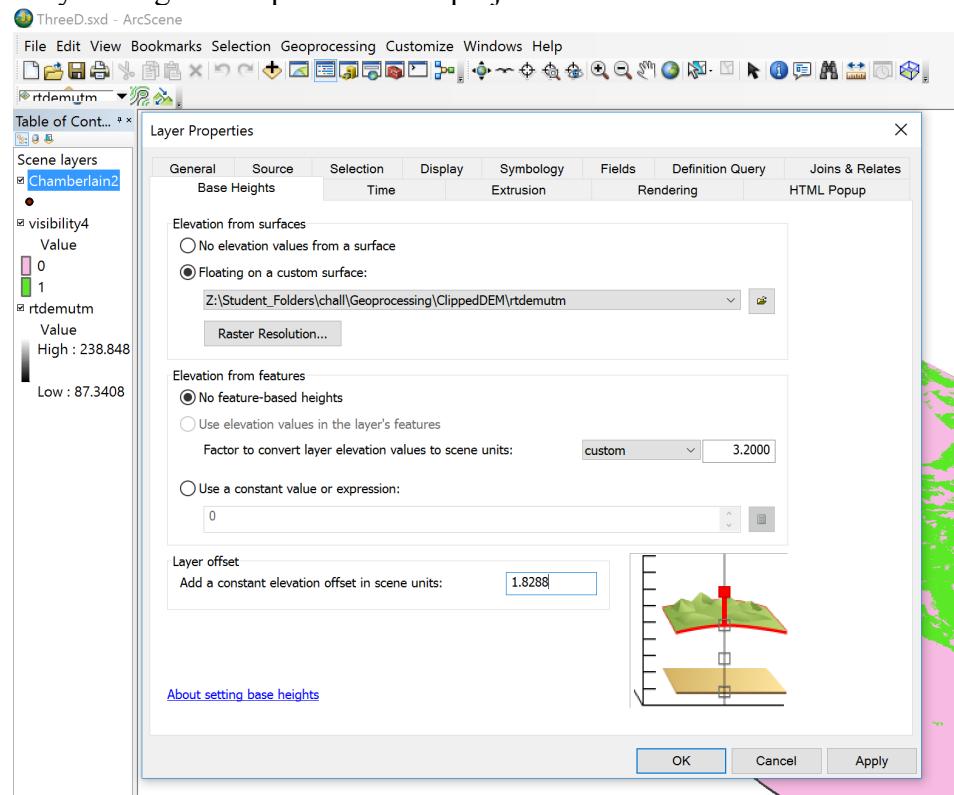
4. Now import your visibility layer and our default historic map (PAGB1904). In the DIY portion of the assignment, you will use your georeferenced historic map from the first assignment. If you see a pop up about raster data and pyramids, click "Yes." You will want to alter the Base Heights to 3.2 so that they are constantly visible. Make sure that their custom surface is still the "rtdemutm" layer (not their own information). See below.

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5. You will then add an offset of 2 (meters) for the Chamberlain point (if you assume that he is standing) after you drag that .shp file into the project.

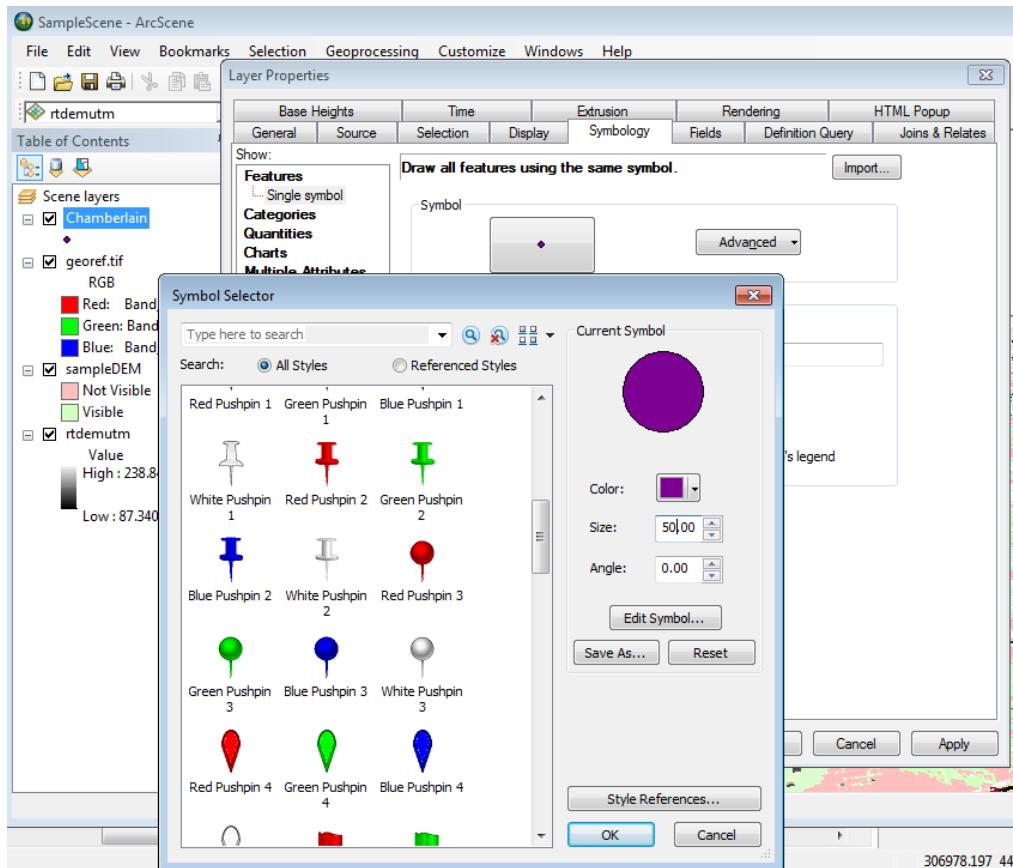


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Zoom to the Chamberlain point layer and start clicking around to manipulate the three-dimensional model so that you can see the valley and visibility. Save a screen capture that best reflects your understanding of how spatial concerns may have influenced Chamberlain's decisions or other eyewitness testimonies. Submit a copy, but save a copy in the Projects\JLCviz folder too.

You can also change the symbol used for Chamberlain to have it be more visible. Again, right click on the point layer, click on Properties, and navigate to the "Symbology" tab. By clicking on the Symbol box, a new menu will appear. For pushpins, a good size might be 75.



What data do you have after geoprocessing?

- Original elevation data
- Shapefile with visibility data point
- Digital Elevation Model (DEM)
- Historic map layer
- Hillshade layer
- Visibility layer
- Contour model
- 2 screen captures