Setting up a 3D environment for the City of Portland

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Time: 30 minutes

Overview

The City of Portland has undertaken a project to update and modernize its citywide database by including more 3D data and capabilities. This includes displaying orthophotos and draping layers over the surface to provide a map user with the ability to verify spatial alignment and 3D representations of real-world objects.

In this lesson, you will learn to do the following:

- Shade a surface to emphasize variations on relief
- Drape content on the surface
- Move layers from 2D to 3D sections to add 3D symbology

Download the data

First, download the data.

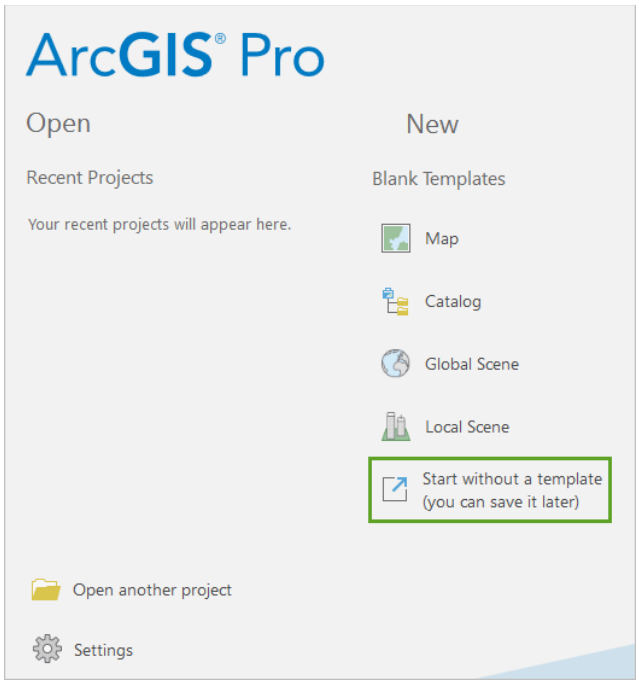
1. Download the **Draped-Content.zip** compressed folder.
2. Locate the downloaded file on your computer and extract it to a location you can easily find, such as your Documents folder.
3. Open the Draped Content folder.

The data covers a few parts of the metropolitan area of Portland, Oregon. The data has been obtained from the City of Portland, Bureau of Planning and Sustainability.

Open map package

First, create a project using the Blank project template.

1. Start ArcGIS Pro and click **Start without a template**.



2. On the Quick Access toolbar, click the save button  , or press Ctrl+S to save your project.
3. In the **Save Project As** window, navigate to your **Draped Content** folder and save the project as "PortlandScene".
4. On the **Insert** tab, in the **Project** group, click **Import Map.**
5. From the Draped Content folder, browse to or search for **Draped_Content_Portland.mpkx** to import this global scene.
6. Click **OK**.

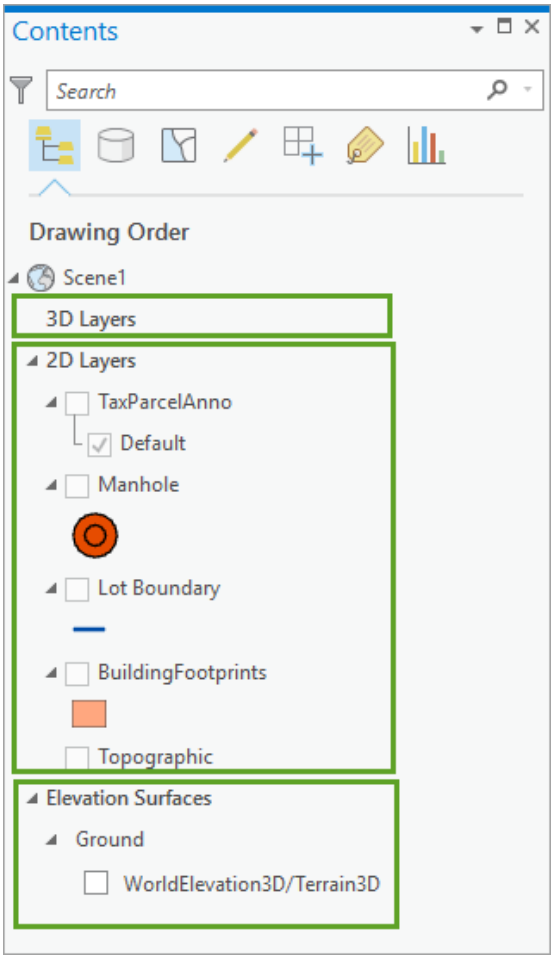
Explore the data

To better understand the draped layer usability, first we need to examine the data and configuration settings.

Note: *In this scene, all layers are initially turned off.*

Review the **Contents** pane; notice that it is divided into three groups of layers—**2D Layers**, **3D Layers**, and **Elevation Surfaces**. These groups define how the layer is rendered. 2D draped content is shown in the **2D Layers** category in the **Contents** pane, and all 3D layers are in the **3D Layers** category.

- **3D Layers** represent Z aware data that can be extruded and is placed under this section by default as vector content. In the current scene there are no 3D layers.



- **2D Layers** represent non-z aware data. The City of Portland's data in this scene is mostly 2D and non-Z-aware and is thus added to the scene as draped content. When rendered, these layers will be draped over the **elevation surfaces**.
    - Tax Parcel Anno (Annotation feature class)
    - Manhole (Point feature class)
    - Lot Boundary (Line feature class)
    - Building Footprint (Polygon feature class)
    - Topographic (Topographic
    - Basemap layer)

- **Elevation Surfaces** represents supported elevation surfaces.
    - Ground (default Terrain 3D ground source surface from ArcGIS Online)

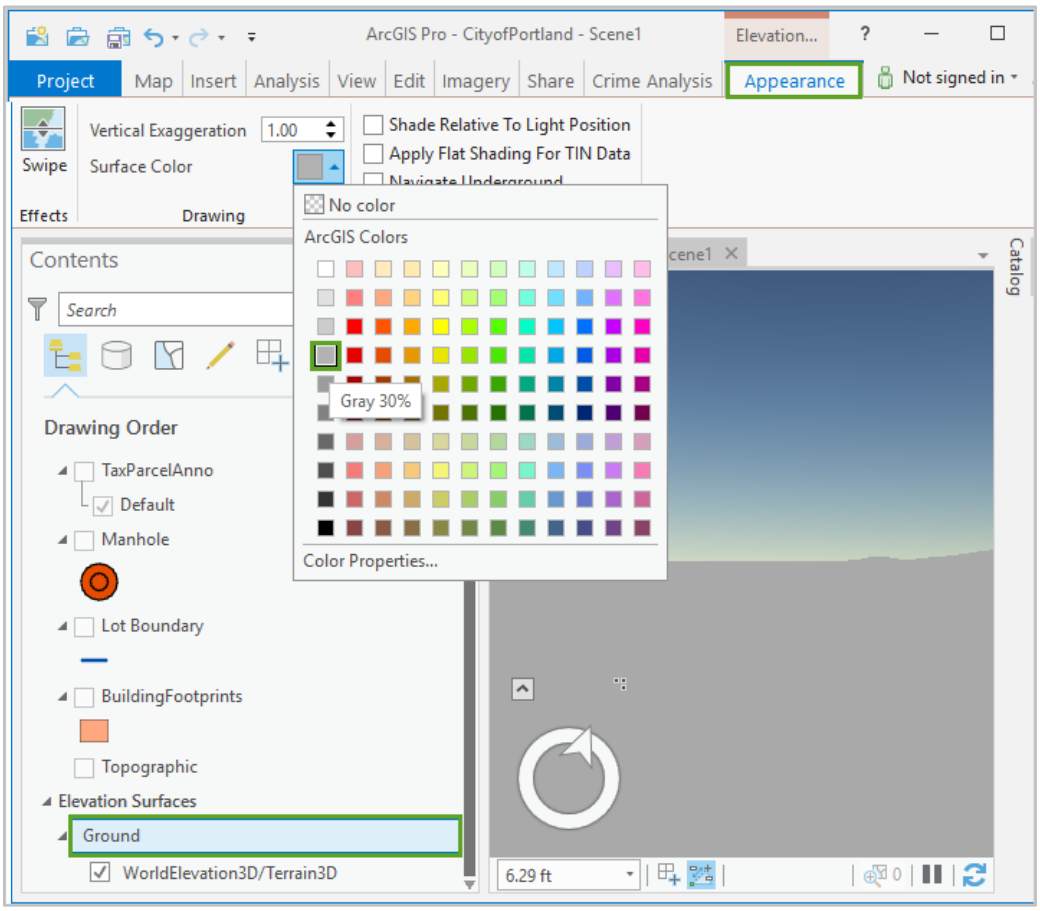
Shade the surface

In the **Contents** pane, review **Elevation Surfaces**. Elevation surfaces define height values across the extent of a scene. A scene always has at least one elevation surface, which represents the ground. You cannot remove the ground surface, but you can replace its elevation source and can add additional custom elevation surfaces.

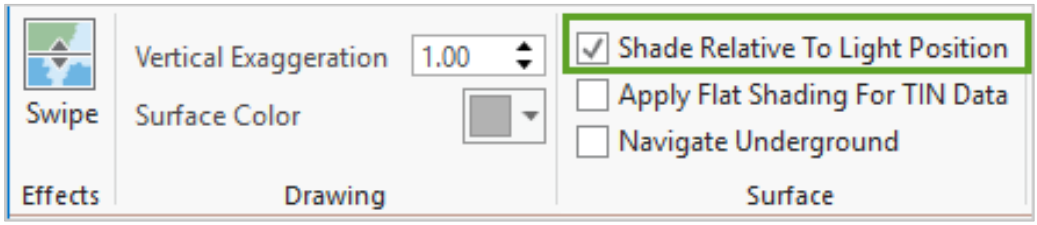
1. For **Elevation Surfaces, Ground**, check the **WorldElevation3D/Terrain3D** layer check box**.**

For ground, the base elevation source comes from ArcGIS Online as Terrain 3D. This is the default for global or local 3D scenes.

2. In the **Contents** pane, click **Ground.**
3. On the ribbon, in the **Appearance** tab > **Drawing** group, click **Surface Color**, then select **Gray 30%.**



4. On the ribbon, **Appearance** tab > **Surface** group, check the **Shade Relative To Light Position** check box.



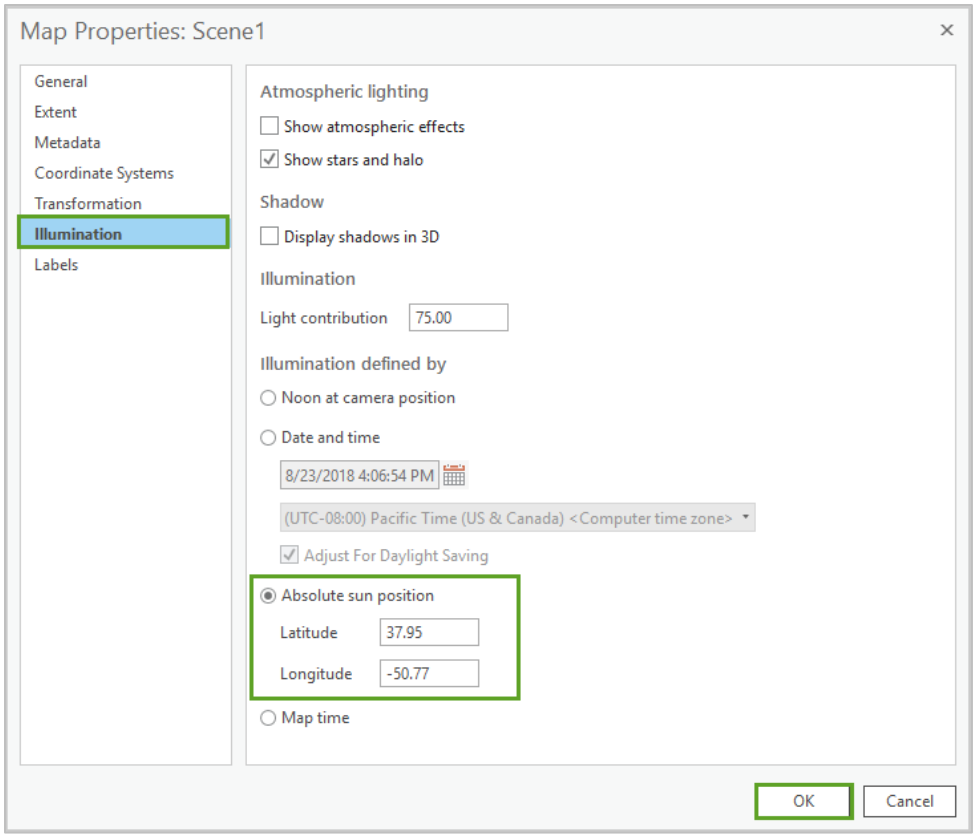
A unique element to authoring scenes is that you can also define illumination properties. This includes properties such as the time of day, if the sun casts a shadow, and how much ambient light is used. You can access these illumination properties for maps and scenes by right-clicking the scene in the **Contents** pane, clicking **Properties**, and clicking the **Illumination** tab.

5. In the **Contents** pane, right-click **Scene1** and click **Properties** to open the **Map Properties** dialog box.

6. Click the **Illumination** tab.

You will define the sun position for the scene.

7. In the **Illumination** panel, scroll down, and click **Absolute sun position**, then click **OK**.



This defines the sun position by a specified latitude and longitude. Review **Scene1** and observe the effect of setting illumination to an absolute sun position.

Next, to contrast setting the sun position to a fixed latitude and longitude, update the illumination using **Map time**.

8. Using the above procedure, in the **Illumination** panel in the **Scene Layer Properties** dialog box, scroll down, and click **Map time**.

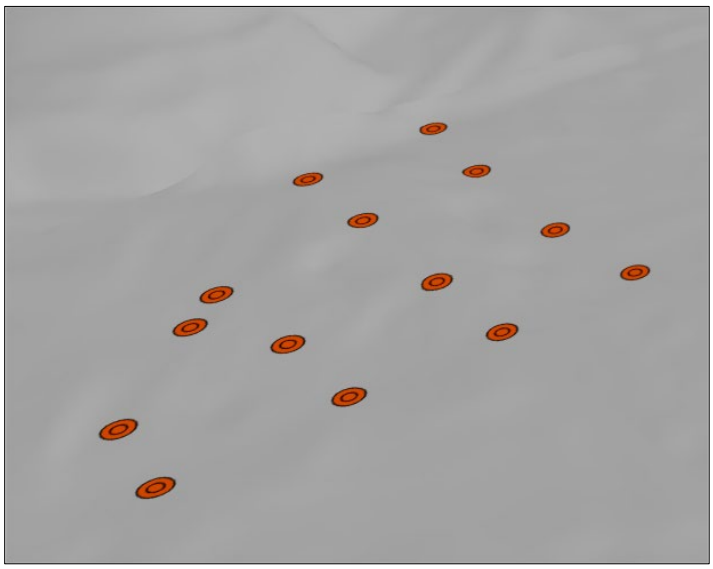
9. Click **OK** to close the properties window.

Notice how the shading on the surface changes depending on the illumination settings, surface color, and other settings you can make to bring out more surface terrain details.

Drape content on the surface

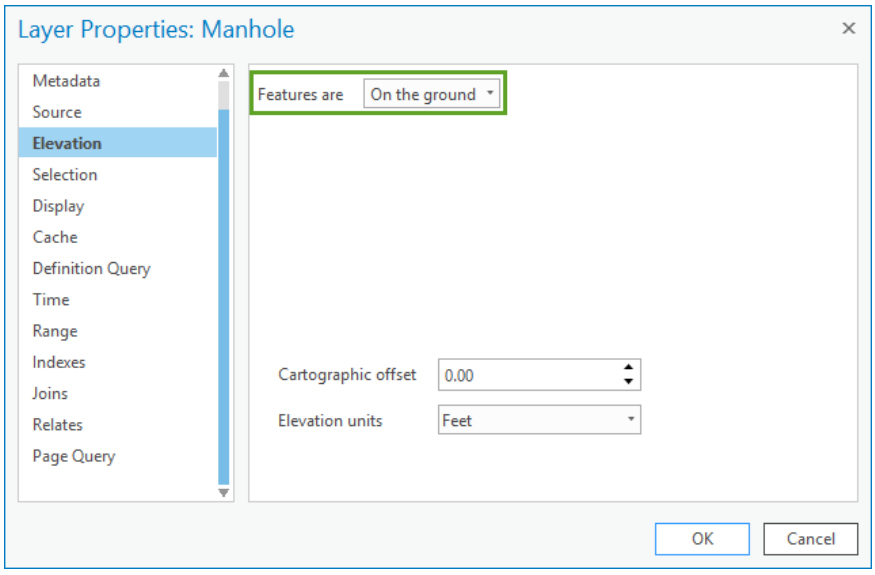
1. In the **Contents** pane > **2D Layers**, check the **Manhole** layer.
2. If necessary, right-click **Manhole** and chose **Zoom To Layer**.

Navigate around to notice how the manhole points are being rendered as draped content on the surface.

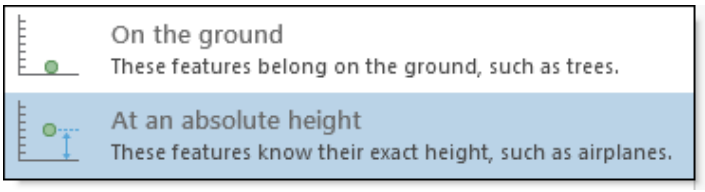


3. In the **Contents** pane, right-click the **Manhole** layer, then choose **Properties**.
4. In **the Layer Properties** window click the **Elevation** tab.

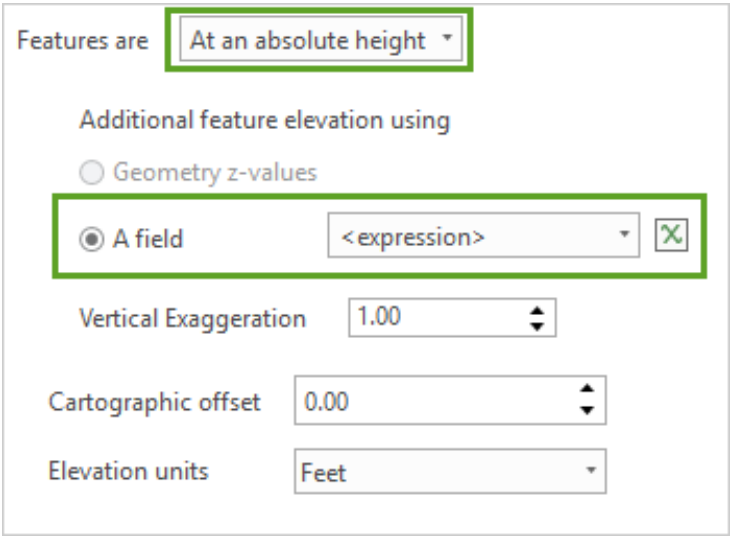
In the **Elevation** panel, review the methods to define layer elevation. Notice the by default features are displayed **On the ground**.



5. Click the drop-down menu and select **At an absolute height**.



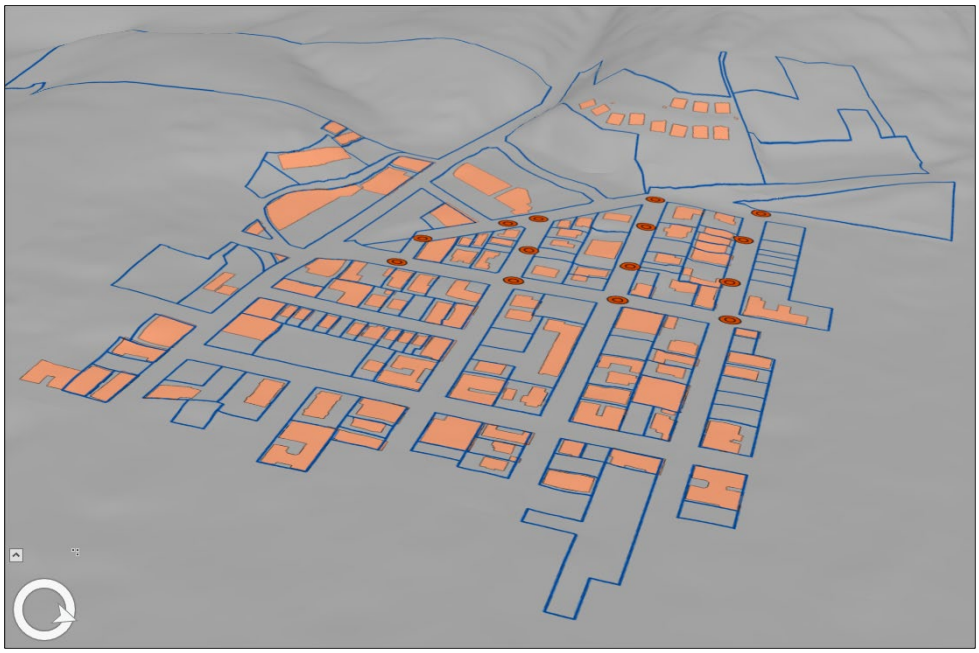
Notice that if you set the feature height as absolute, height can be derived from an attribute field where different features could have varying heights.



In addition, you can add a vertical exaggeration to the absolute height. This way, you can make differences in the elevation more prominent. You can also set a cartographic offset, where you vertically adjust the z-value of the entire layer. This raises or lowers all features in the layer by a given height. For example, you can raise point symbols representing fire stations off the ground so they aren't obstructed by surrounding buildings. For manholes, it is not necessary to adjust the current elevation.

6. Click **Cancel** to close the layer properties.
7. In the **Contents** pane, under **2D Layers**, and check **Lot Boundary** and **Building Footprints.**

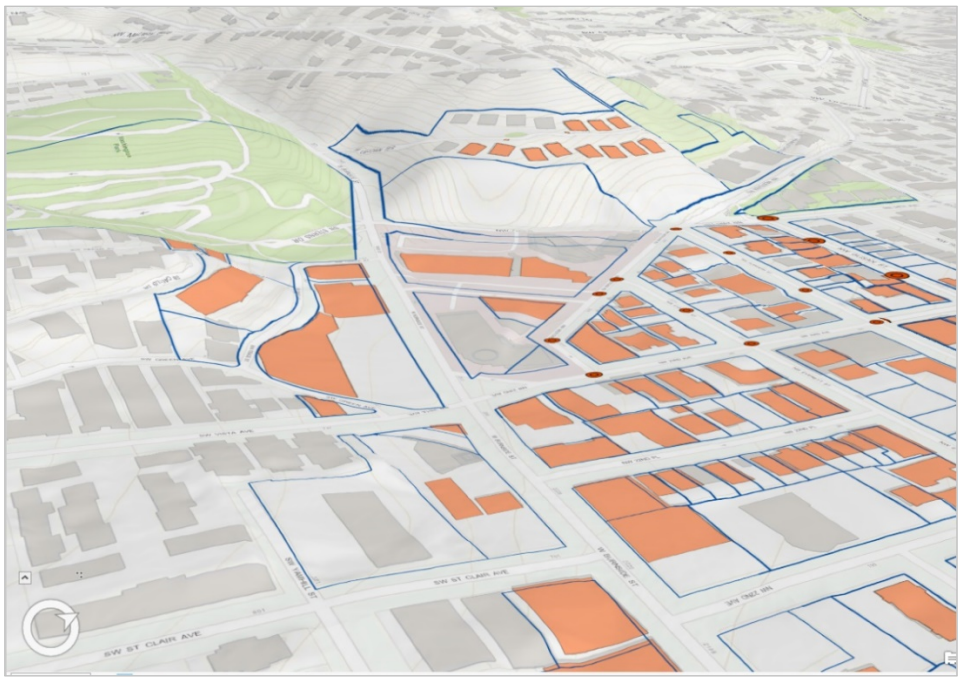
Navigate around to notice how the layers are being rendered as draped content on the surface.



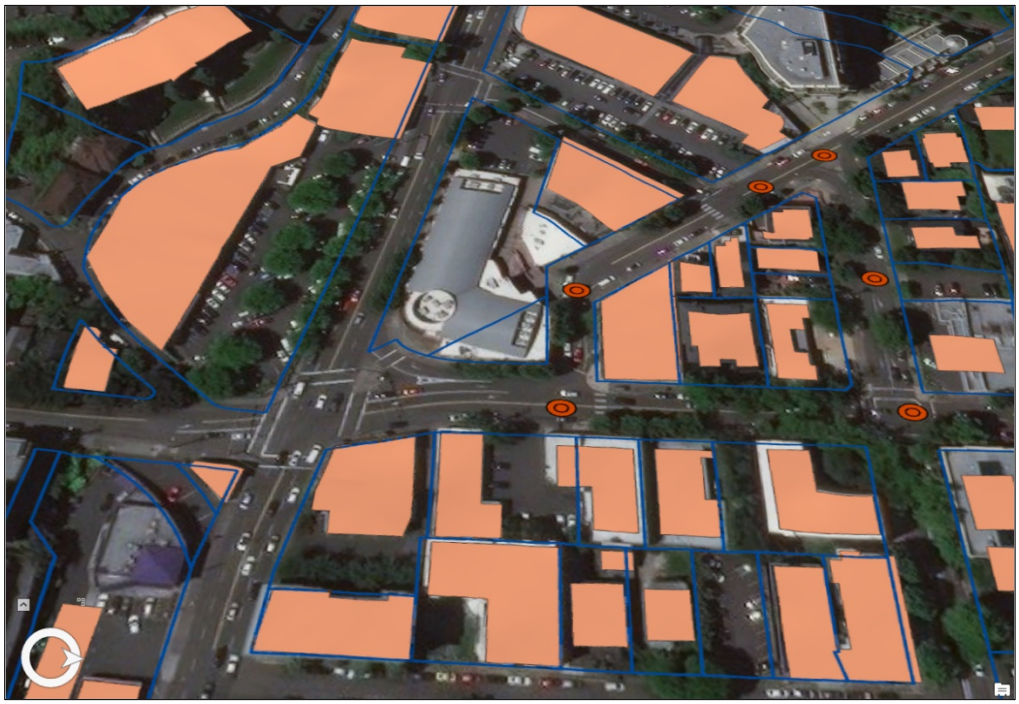
Add a basemap

1. In the **Contents** pane, under **2D Layers**, and check the **Topographic** layer.

This is a 2D basemap layer. Navigate around to see how this basemap content drapes around the surface.



2. On the Map ribbon, in the **Layer** group, and click **Basemap** and select **Imagery.**



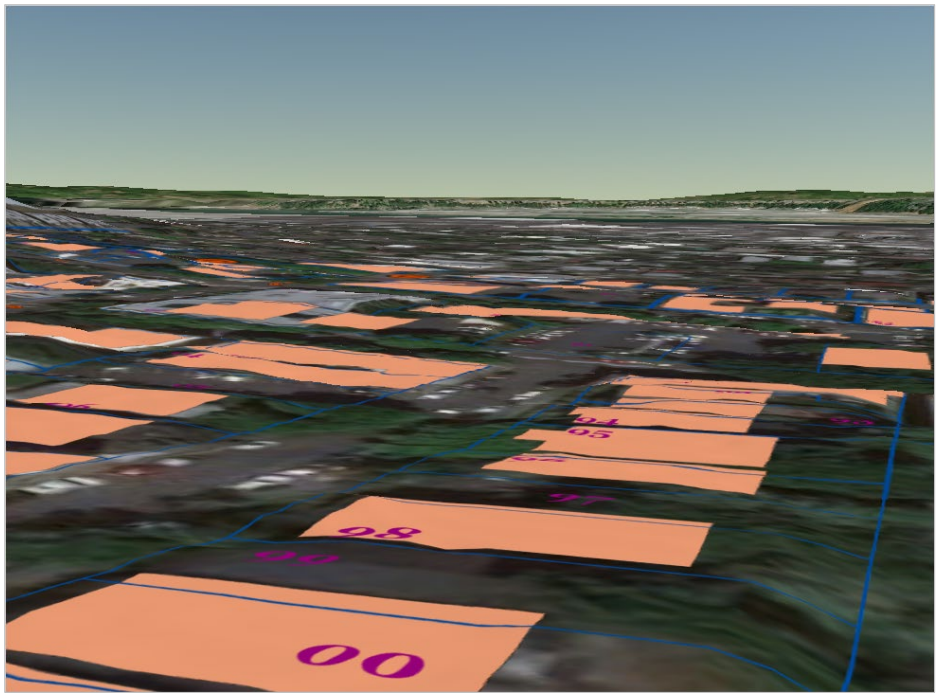
Navigate around to see how this new basemap content drapes around the surface. By observing the building footprints, it is now possible to see that several footprints are not spatially aligned and that the City of Portland is correct in using 3D functionality to help update and modernize its citywide database.

Move a layer from 2D to 3D

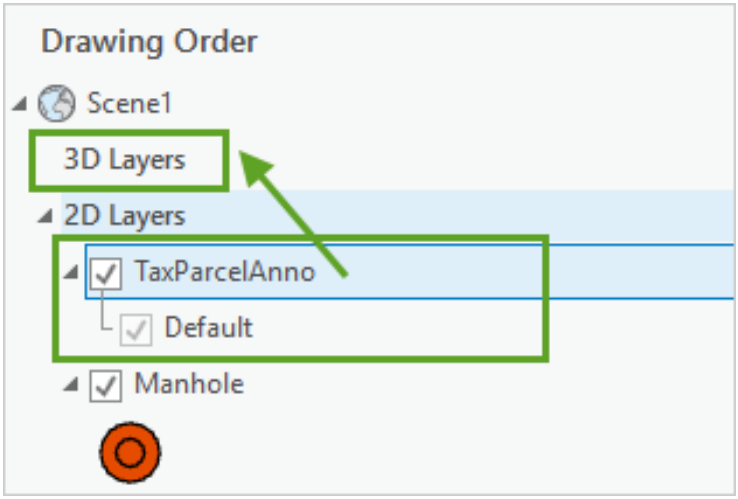
By default, most layers initially display as 2D layers within the scene. These layers drape onto the ground surface of the scene, such as aerial imagery, and will not have any 3D symbology. The **Contents** pane lists these layers in the **2D Layers** category. To apply 3D symbology to a layer, such as building footprints or showing lines as tubes, or annotation in perspective, drag the layer into the **3D Layers** group in the **Contents** pane.

1. In the **Contents** pane, under 2D Layers, and check the **TaxParcelAnno** layer**.**

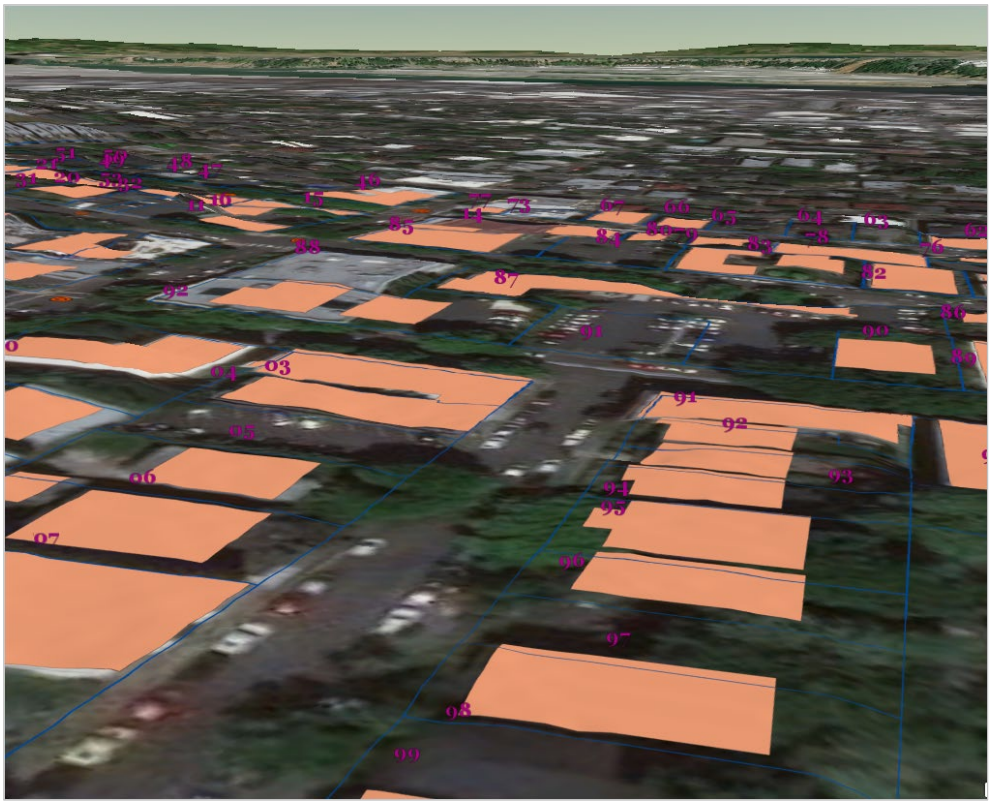
Navigate around and notice how the labels are hard to read unless you view them from the top down.



2. In the **Contents** pane, select and drag the **TaxParcelAnno** layer to the **3D Layers** group.



Navigate around and notice how the labels are much easier to read once they have been added to the **3D Layers** group.



3. Save your project and close ArcGIS Pro.

Summary

In this exercise, you used a scene in ArcGIS Pro to drape several 2D layers on an elevation surface, giving you the ability to tilt up your 2D map and view spatial relationships in the 3D scene, making the data more understandable. Working in 3D allows you to incorporate real-world elements with your content, highlighting influences such as the undulations of the terrain and the 3D extent of features such as trees, buildings, and subsurface pipelines.