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Use 3D Thematic Symbology to Display Features in a Scene

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Use 3D Thematic Symbology to Display Features in a Scene

Time: 1 hour, 30 minutes

Overview

Many 3D scenes attempt to re-create the real world, with textured buildings, ground imagery, realistic trees, cars, and so on. While there are GIS uses for these scenes–for example, studying the visual impact of construction, transmission lines, and wind farms–there are also many opportunities for using cartographic symbolization instead.

In this lesson, you will be using a 3D scene for Portland, Oregon, to visualize and display features cartographically by modifying size, shape, and color to better describe and explain geographic content to others, much like with 2D cartography.

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

- Use vertical offsets
- Author layers for use across multiple levels of detail
- Use shading and exaggeration to highlight surfaces
- Apply metaphors in layer symbology

Open map package

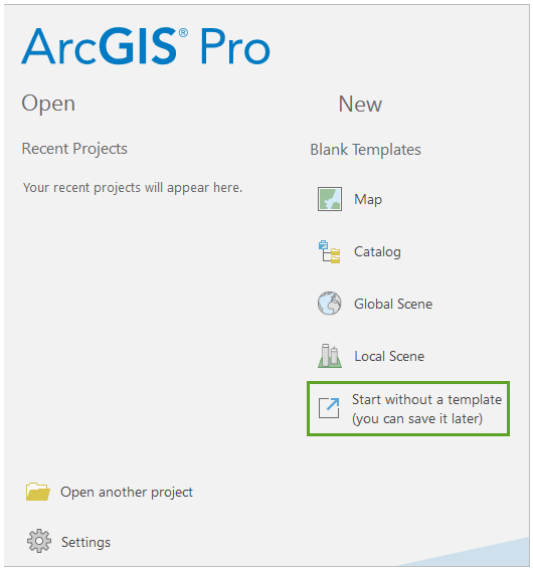
First, download the data.

1. Download the Thematic-Symbology.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 Thematic Symbology 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.

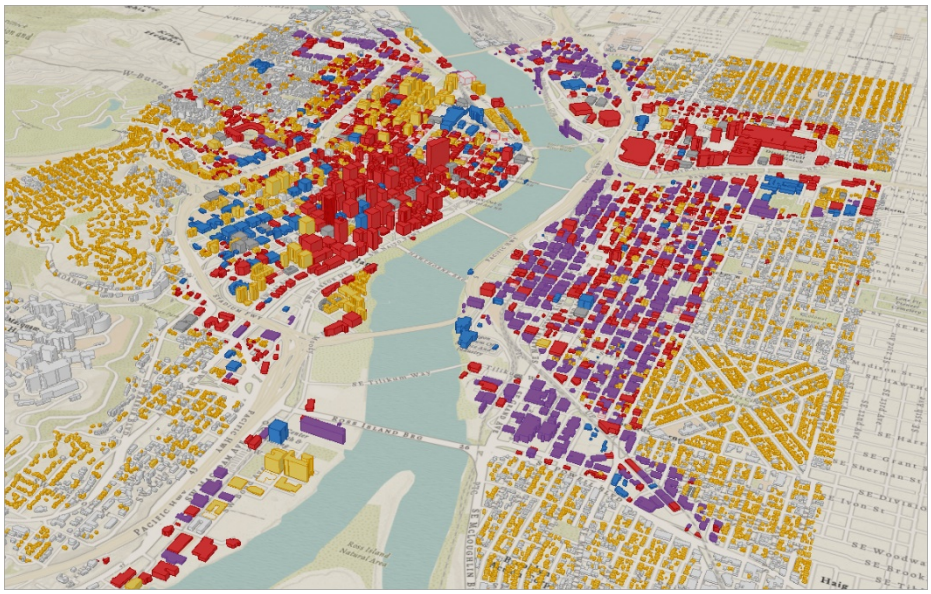
   Next, create a project using the **Blank** project template.
4. Start ArcGIS Pro and under **New**, click **Start without a template**.

Note: If you don't have ArcGIS Pro or an ArcGIS account, you can sign up for an ArcGIS free trial.



5. On the **Insert** tab, in the **Project** group, click **Import Map**.

6. Browse to or search for **PortlandScene.mpkx** to import this scene and click **OK**.



The scene opens and displays a 3D view of Portland.

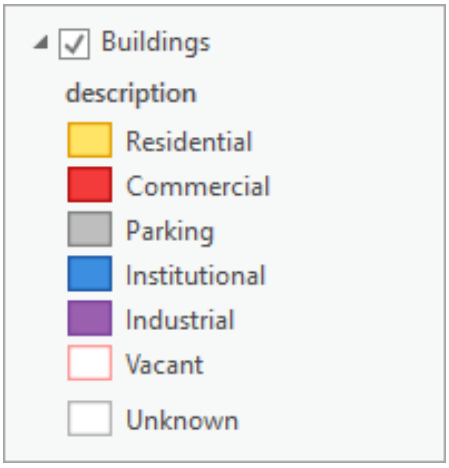
7. On the Quick Access toolbar, click Save or press Ctrl+S to save your project.

8. In the **Save Project As** window, navigate to your **Thematic Symbology** folder and save the project as "PortlandScene".

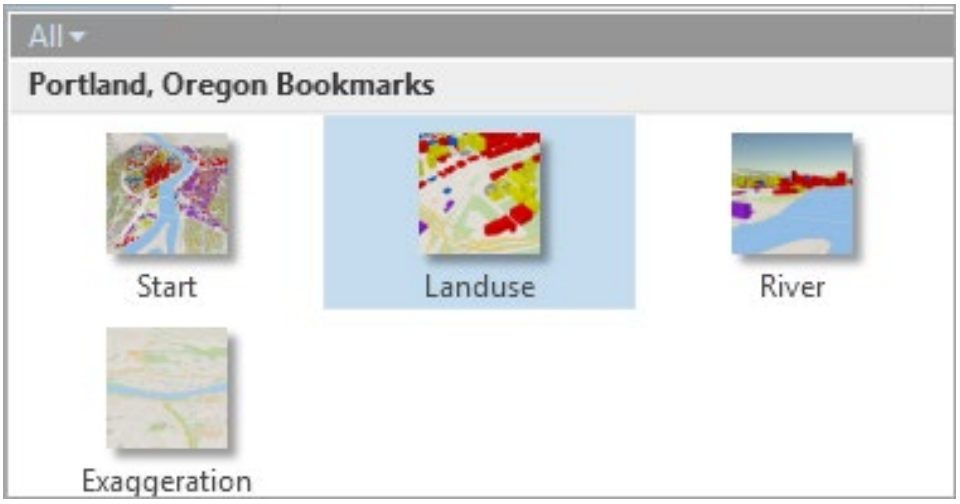
Review current display

You will now review the contents of the scene. The **Buildings** layer is a scene service layer. It was published from multipatch features and made available by the City of Portland. The building features are displayed using a unique-value renderer, in which the colors represent the land-use type of each building.

1. In the **Contents** pane, expand the legend for the **Buildings** layer.



2. On the **Map** ribbon tab, in the **Navigate** group, open the **Bookmarks** gallery and click **Landuse.**

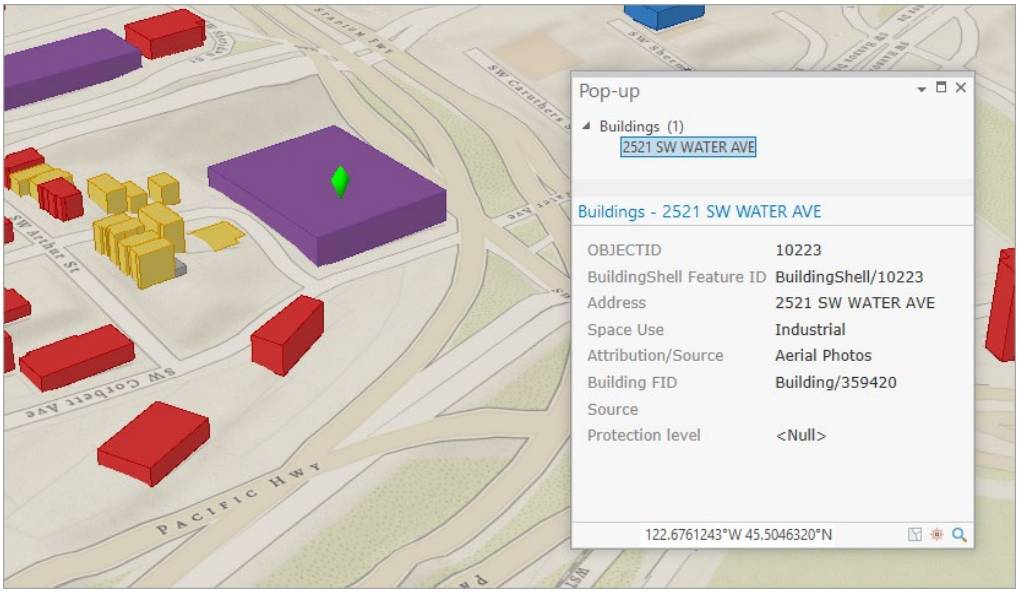


3. Click a red building in the scene to open a pop-up window showing its attributes.



The Space Use value will be one type of commercial usage, such as Commercial Hotel.

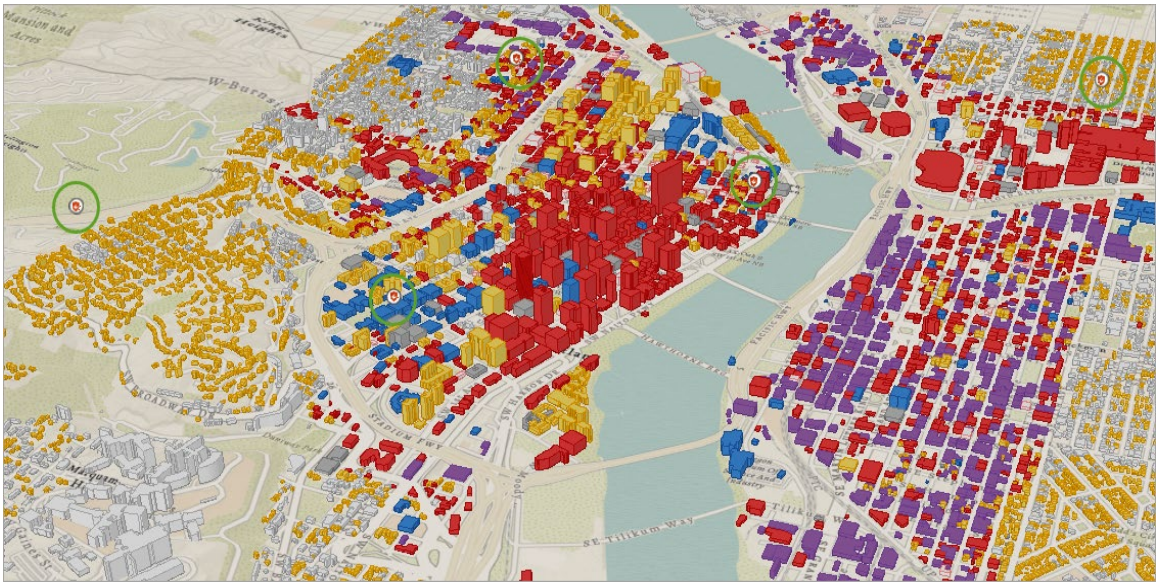
4. Click a yellow building and a purple building in the scene.



Note the different Space Use value representing different land use. Purple represents industrial and yellow represents residential. The use of this style of symbology helps us quickly understand where the commercial, residential, and industrial sectors of the City of Portland are located.

5. Close the pop-up window.
6. On the **Map** ribbon tab > **Navigate** group > **Bookmarks** gallery > click **Start**.
7. In the **Contents** pane, expand the legend for the **FireStations** layer.
8. In the **Contents** pane, check the **FireStations** layer.

   Five fire stations appear across the city.



   The **FireStations** layer is a file geodatabase point feature class and contains the name and address of fire stations in the central region of the City of Portland. It is currently being rendered as a single-symbol icon point.

9. On the **Map** ribbon tab > **Bookmarks** gallery, click **River.**

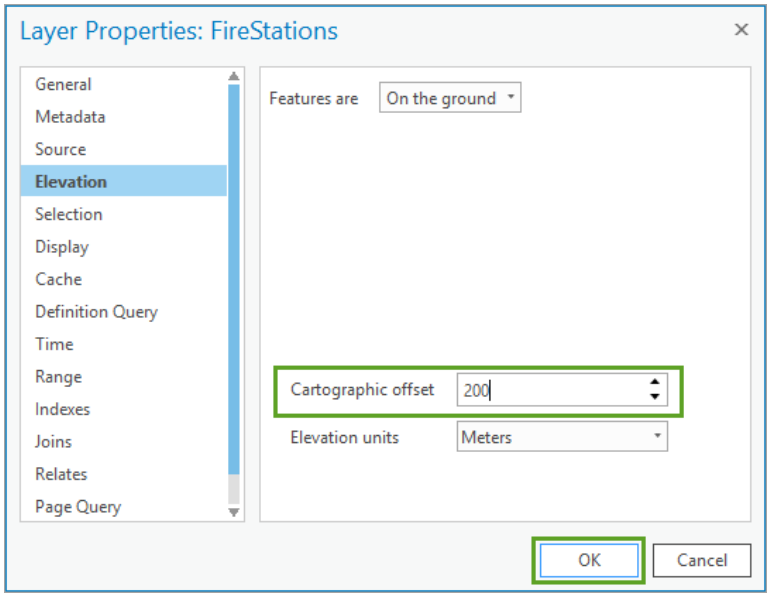


Notice that the icons are difficult to see from certain viewing angles and can be obscured by the buildings.

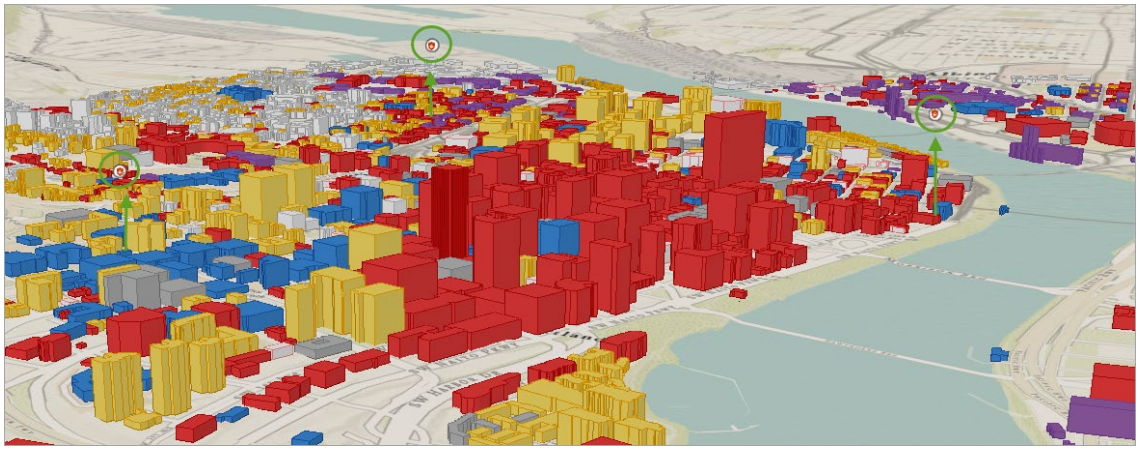
Improve the visibility of the fire station points

To make fire stations easier to identify, use vertical offsets to lift the points from their hidden locations inside the urban canyons.

1. In the **Contents** pane, right-click the **FireStations** layer, and click **Properties**.
2. On the **Elevation** tab, set the **Cartographic** offset value to **200** meters, and click **OK**.

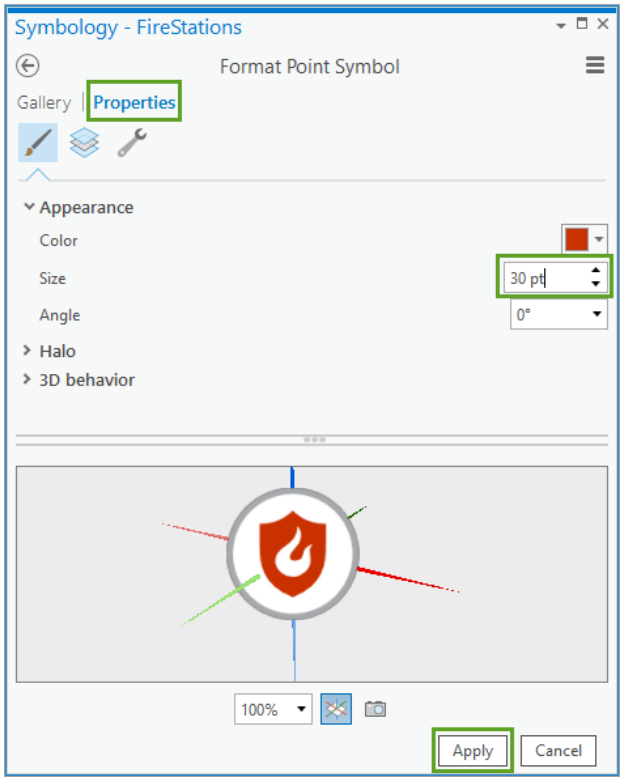


Notice how fire stations are now displayed at a 200-meter offset from the ground. This makes it easier to identify them. However, the symbol size is still a little small.

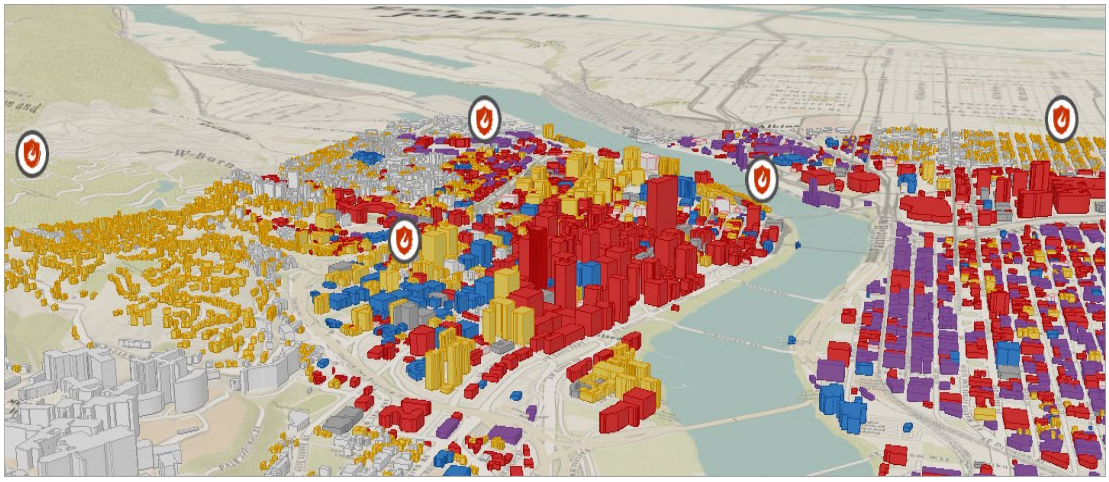


3. In the **Contents** pane, click the symbol for the **FireStations** layer to open the **Symbology** pane.

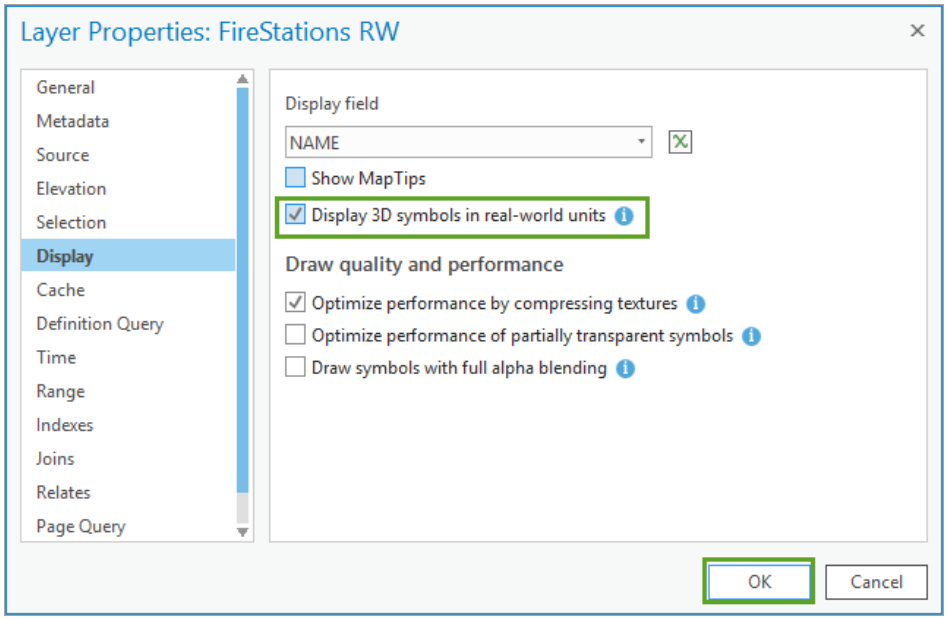
4. In the **Symbology** pane > **Properties**, set **Size** to **30 pt**, press **Enter** to submit the change, then click **Apply.**



The fire stations symbols are larger now but are not linked to any point on the ground. Next, add another layer for that purpose.



5. In the **Contents** pane, right-click the **FireStations** layer, and click **Copy**.
6. In the **Contents** pane, right-click **Portland, Oregon**, and click **Paste**.
7. Rename the duplicated layer as “FireStations RW”.
8. Open the **FireStations RW** layer properties.
9. In the **Layer Properties** window, select the **Display** tab, and check the **Display 3D symbols in real-world units** check box and click **OK**.



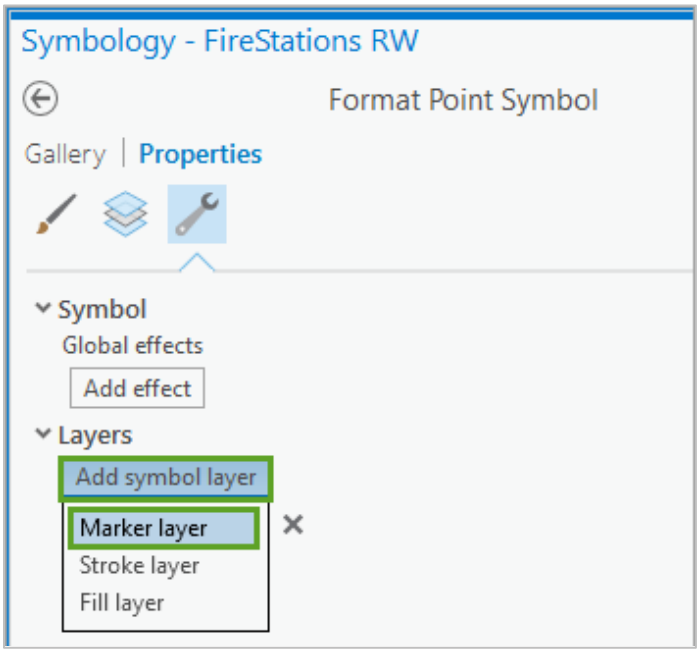
10. In the **Contents** pane, uncheck **FireStations**.

    Next, you'll edit the symbology of the **FireStations RW** layer to include a leader line.

11. In the **Contents** pane, click the **FireStations RW** layer symbol to open the **Symbology** pane.

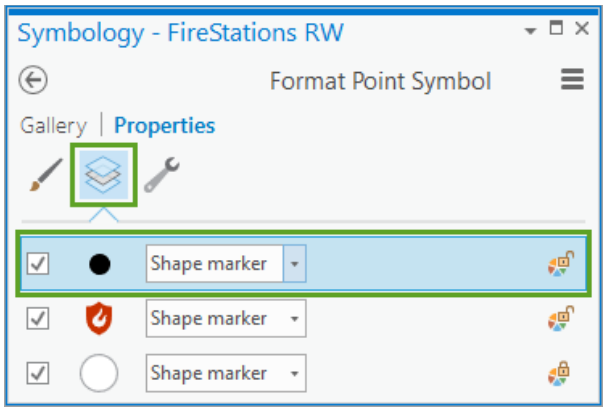
12. In the **Symbology** pane > **Properties**, click the **Structure**  button.

13. Click **Add symbol layer**, then choose **Marker layer**.



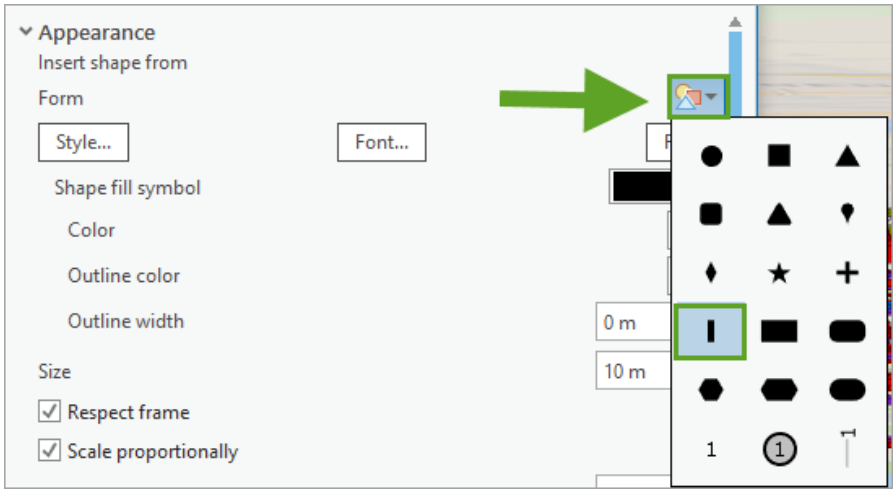
    A new marker layer represented by a solid black dot symbol is added to the current shield symbol. Next, you will update and modify this marker layer.

14. Click the **Layers** button  and click the new marker layer to select it.

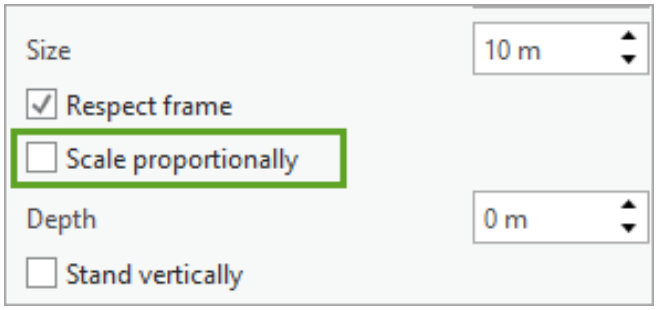


15. In the symbol layer properties, **Appearance** group, make the following updates:

    a. Open the **Form** gallery and choose the vertical stick shape.



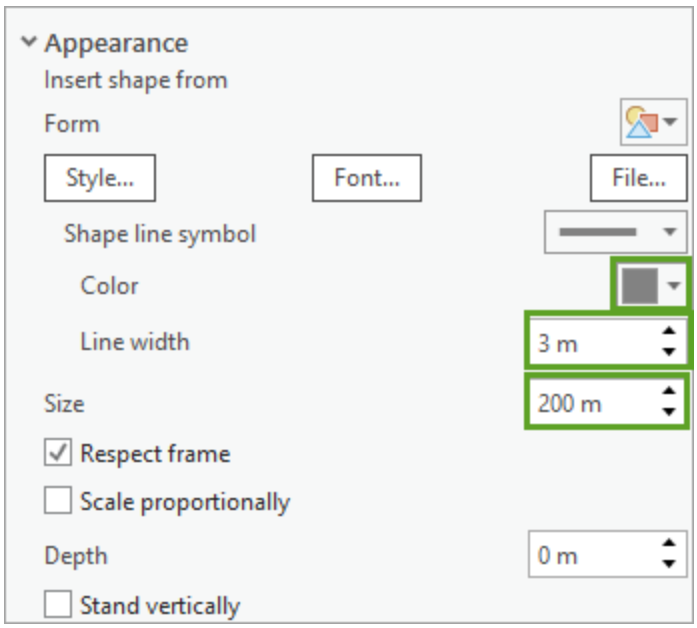
    b. Scroll down, and in the **Size** group, uncheck the **Scale proportionally** option.



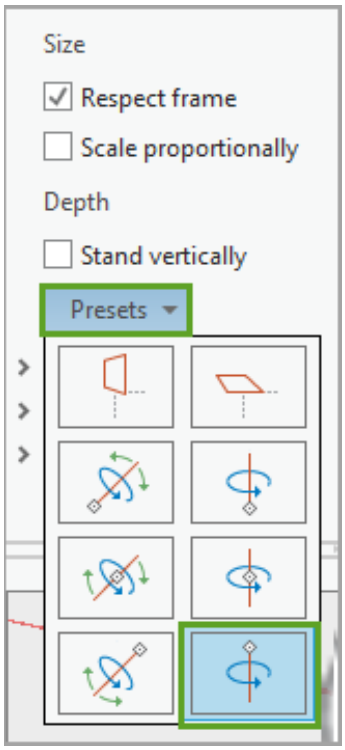
    c. Set the **Line width** to **3 m**.

    d. Set the **Size** to **200 m** (to match the FireStation symbol height).

e. Set **Color** to **Dark Gray**.

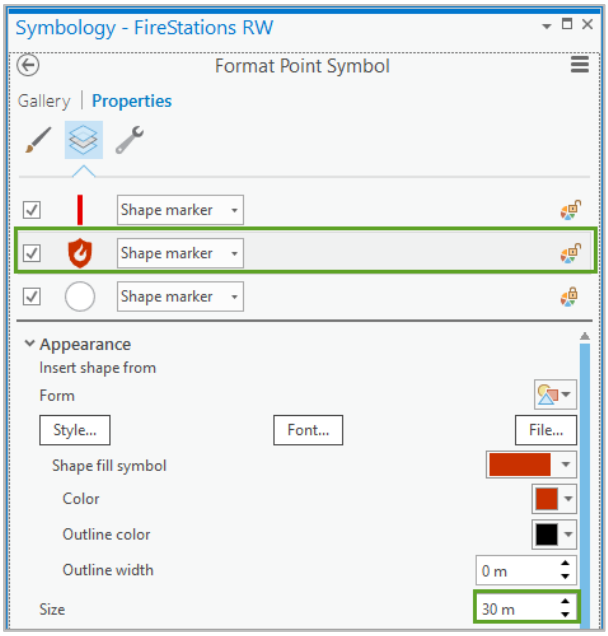


16. In the **Appearance** group, open the **Presets** gallery, select the **Signpost anchor at top.**



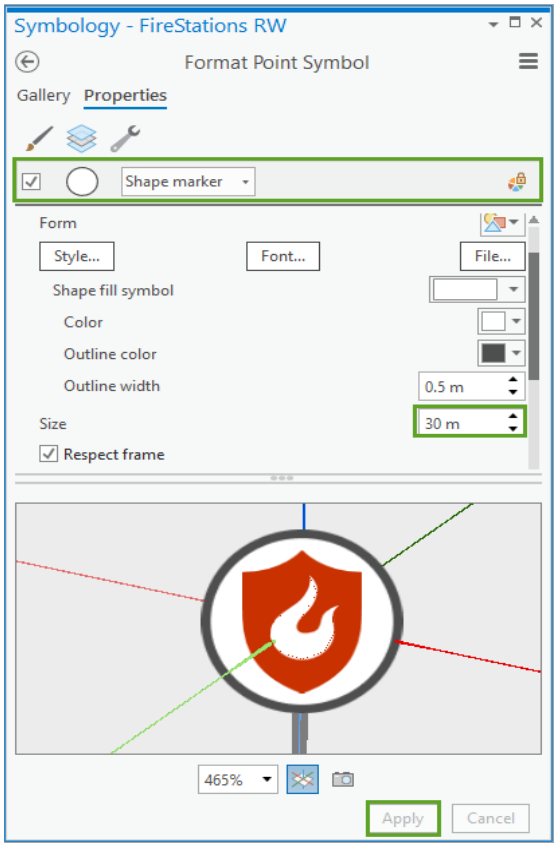
Next you will edit the shield shape marker.

17. In **Layer** properties, click the **shield symbol** and change its **Size** to **30 m**.

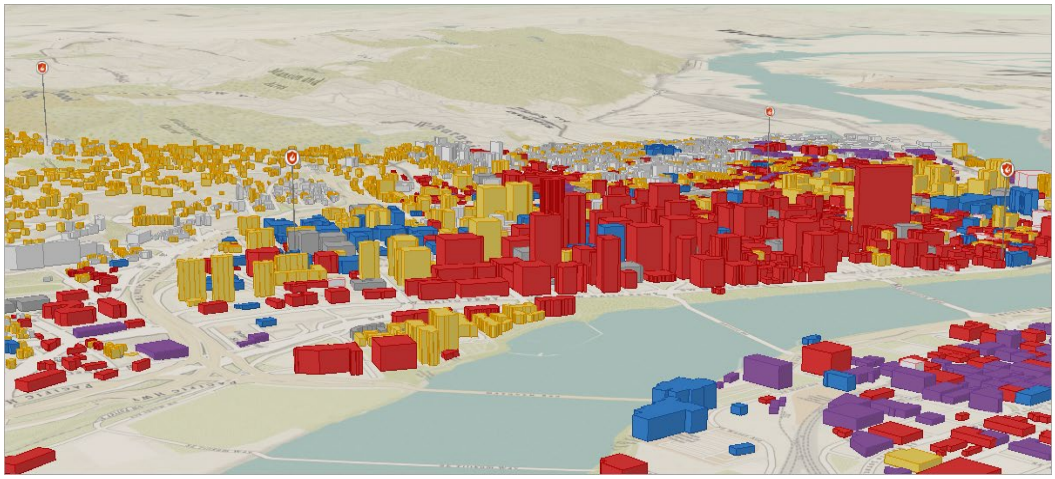


18. Update the third symbol layer (black-circle) and set **Size** to **30 m**.

19. In the **Symbology** pane, click **Apply**.

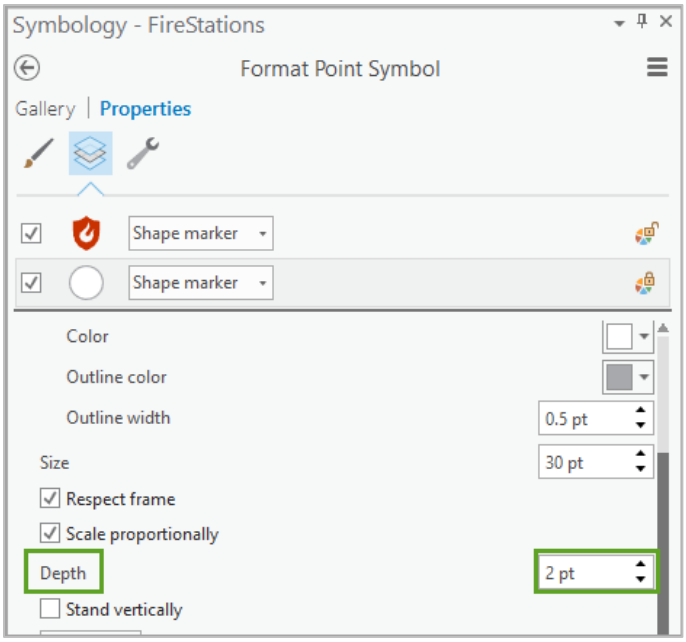


The additional symbol element drops down 200 meters to the ground for each of the fire stations, and the display sizes of the 30-meter-high icon points indicate their distance from the camera.



Now you have one layer defined for close viewing, and one defined for viewing at a distance. An important 3D cartographic technique is combining symbology together to create a smooth user experience across scale. You'll edit the FireStations RW symbology to blend seamlessly with the FireStations symbology.

20. In the **Contents** pane, click the symbol of the **FireStations** layer.
21. In the **Symbology** pane, under **Properties > Layers**, select the shield symbol layer.
22. In the **Appearance** group, set the **Depth** value to **2 pt** and press **Enter**. This “thickens” the symbol so it doesn’t clash with the FireStations RW layer.



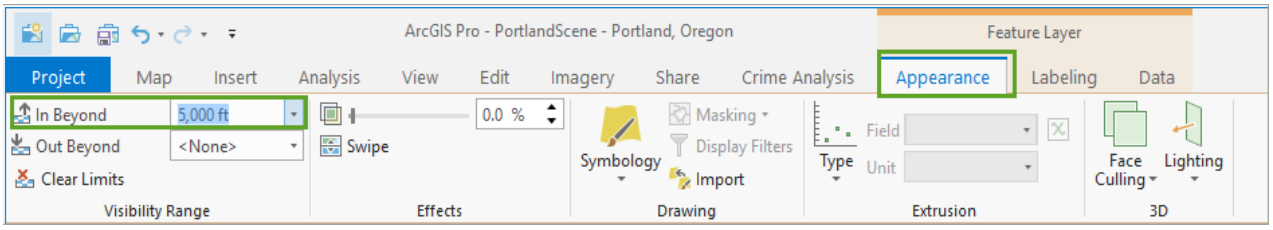
23. Repeat updating the **Depth** to **2 pt** for the second symbol element (white circle).

24. Click **Apply**.

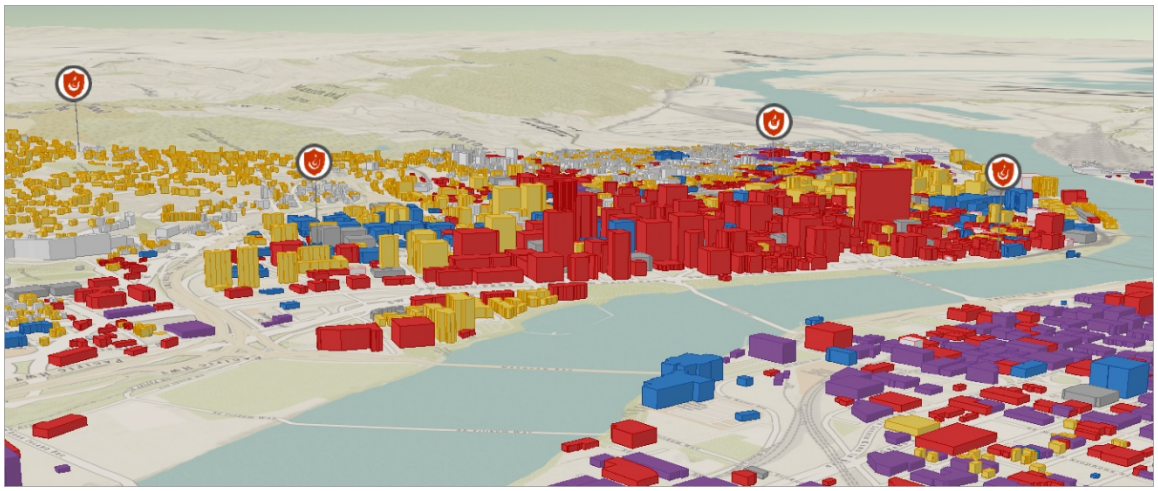
25. Close the **Symbology** pane.

26. Turn on the **FireStations** layer and ensure that it is selected in the **Contents** pane.

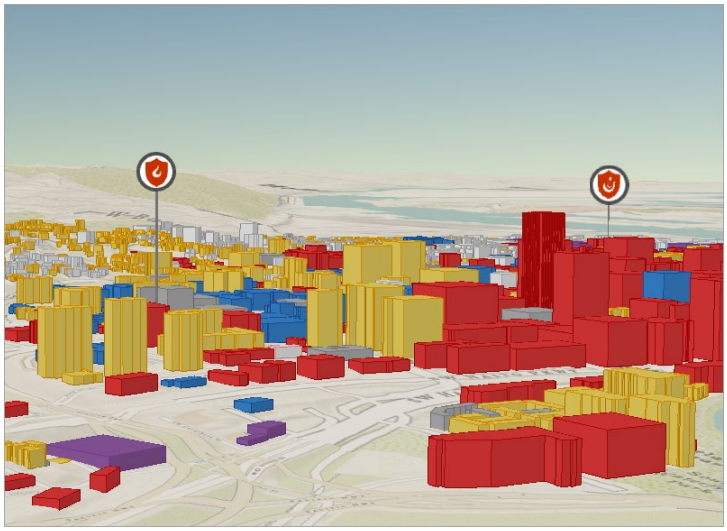
27. On the **Appearance** tab, set the **In Beyond** display limit to **5,000 ft** and press **Enter**.



28. Right-click and drag to zoom in and out on one of the fire station points.



The two layers work well together to show fire station locations from all viewing distances.



Improve surface display using shading and exaggeration

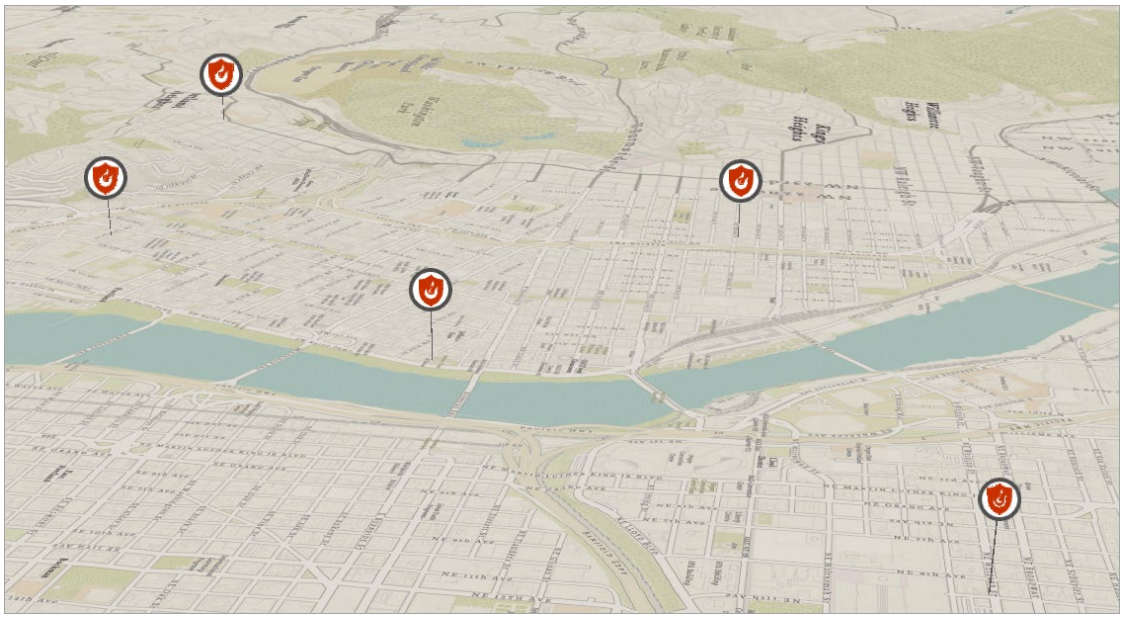
The ground surface of a scene has many roles. It provides a canvas upon which draped content, such as aerial imagery or basemaps, can be placed. It provides an elevation source for 2D features, such as tree points or fire station locations. It can also provide significant context for the data around it.

Surfaces can be difficult to visualize well in the view, especially in flat locations (such as Florida or the Netherlands) or from high viewing positions (such as several thousand feet above the earth). In these cases, both surface shading and vertical exaggeration can be helpful.

1. On the **Map** tab > **Bookmarks** gallery, click **Exaggeration**.

2. In the **Contents** pane, uncheck the **Buildings** layer.

   It is difficult to visualize the surface terrain. The current basemap does not contain any terrain details, such as shading. From the current extent and viewpoint, around 5,000 feet, the scene is visually flattened, and you cannot discern any terrain morphology.

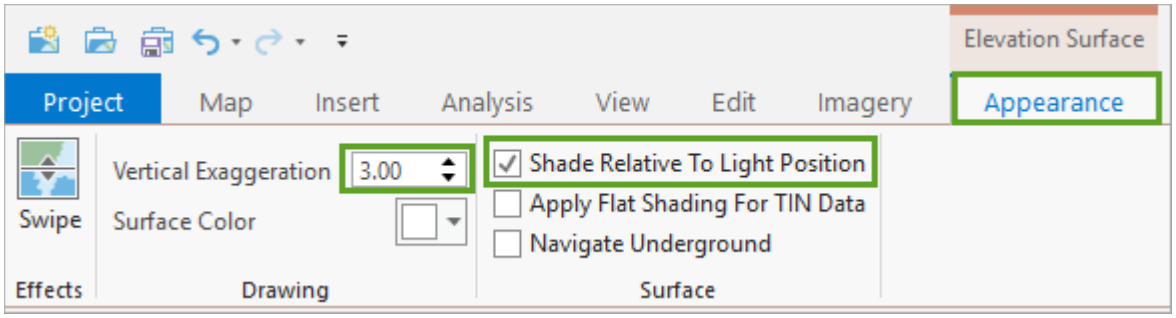


   You can improve this by adding shading and exaggeration of the ground surface.

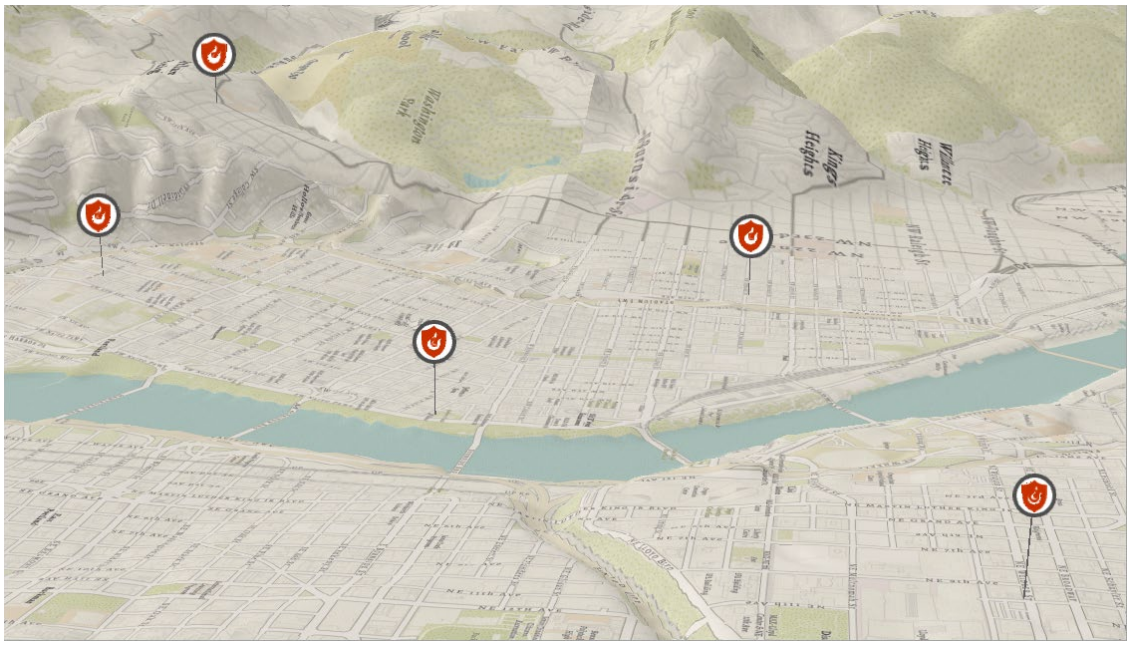
3. In the **Contents** pane > **Elevation Surfaces** group, click **Ground**.

4. On the **Appearance** tab > **Drawing** group, set the **Vertical Exaggeration** to **3.00** and press **Enter**.

5. In the **Surface** group, check the **Shade Relative to Light Position** check box.



   Notice how the shading and exaggeration of the ground surface has improved.



Apply metaphors in layer symbology

Sometimes the best use of symbology is to take a familiar notion and use it as a metaphor in the scene.

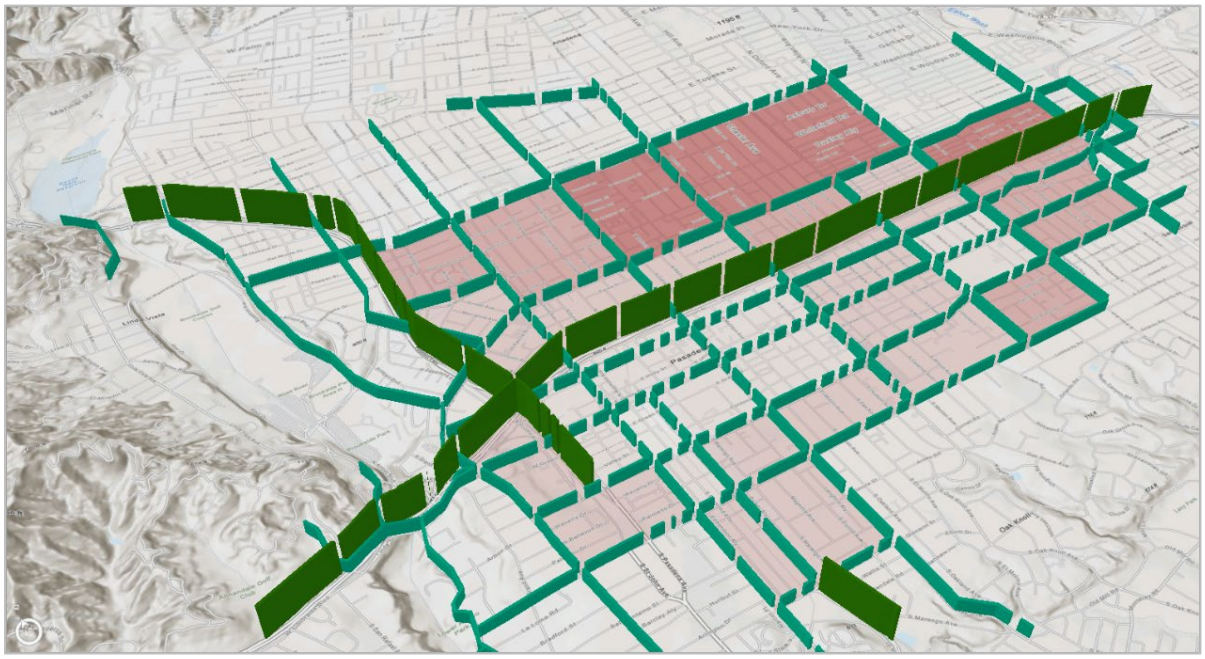
For example, walkability in urban environments can have a big impact on people's lives. If their community is cut off from the rest of the city by barrier features such as rivers, canyons, and major roads, they are less likely to exercise on local streets, use local parks, and meet their neighbors. Instead of thinking about the containing lines as symbols, like "thick and black", you can literally model them as walls that are blocking the way. Let's quickly review an existing scene that shows this.

1. On the **Insert** tab > **Project** group, click **Import Map**.
2. Browse to your data folder and choose **PasadenaWalkability.mpkx**.
3. Click **OK**.



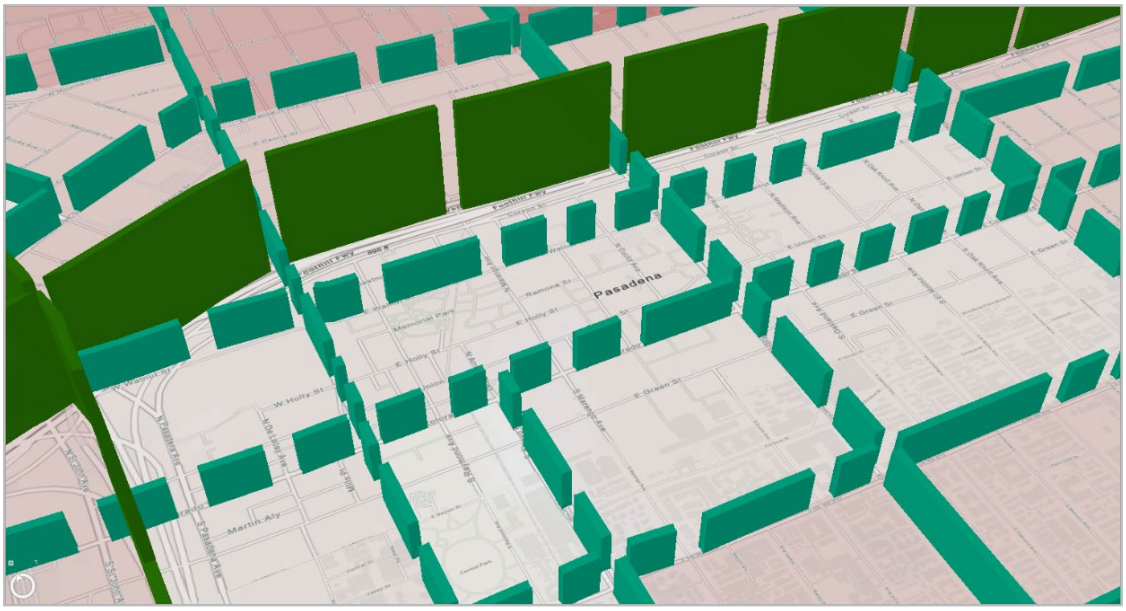
The existing draped layer shows neighborhoods in Pasadena, California, colored by their walkability index. Although walkability seems to be better in the center-left of the city, it is unclear why.

4. In the **Contents** pane, click the **3D** layers group, and check **Freeways as Walls** and **Major Roads as Walls**.

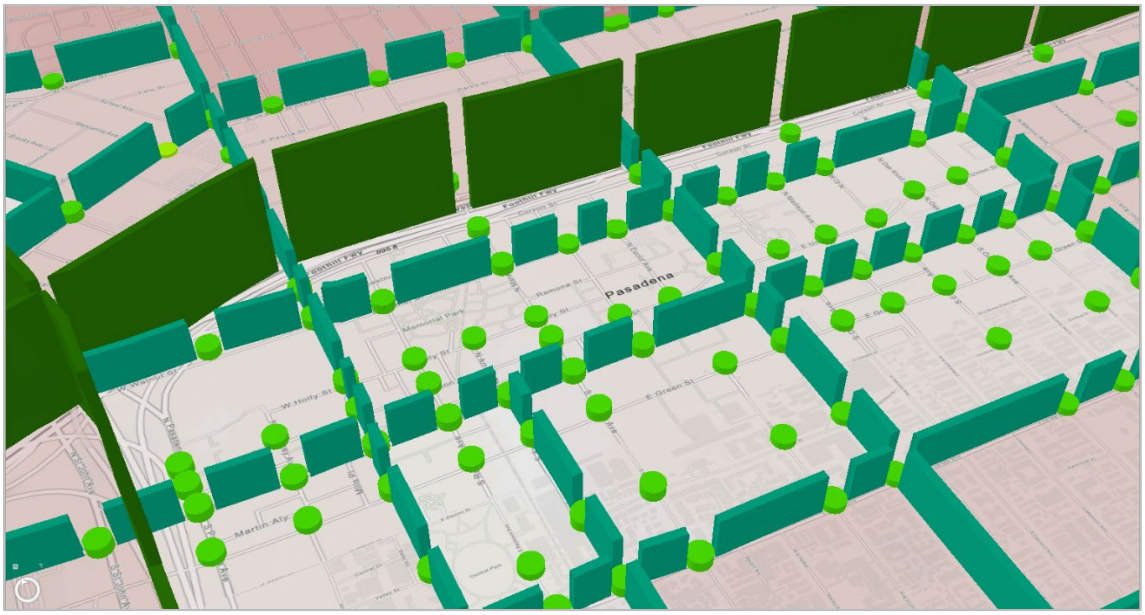


The addition of the walls makes the shape and classifications of the areas easier to understand.

5. In the **Map** tab > **Bookmarks** gallery, click **High Walkability**.

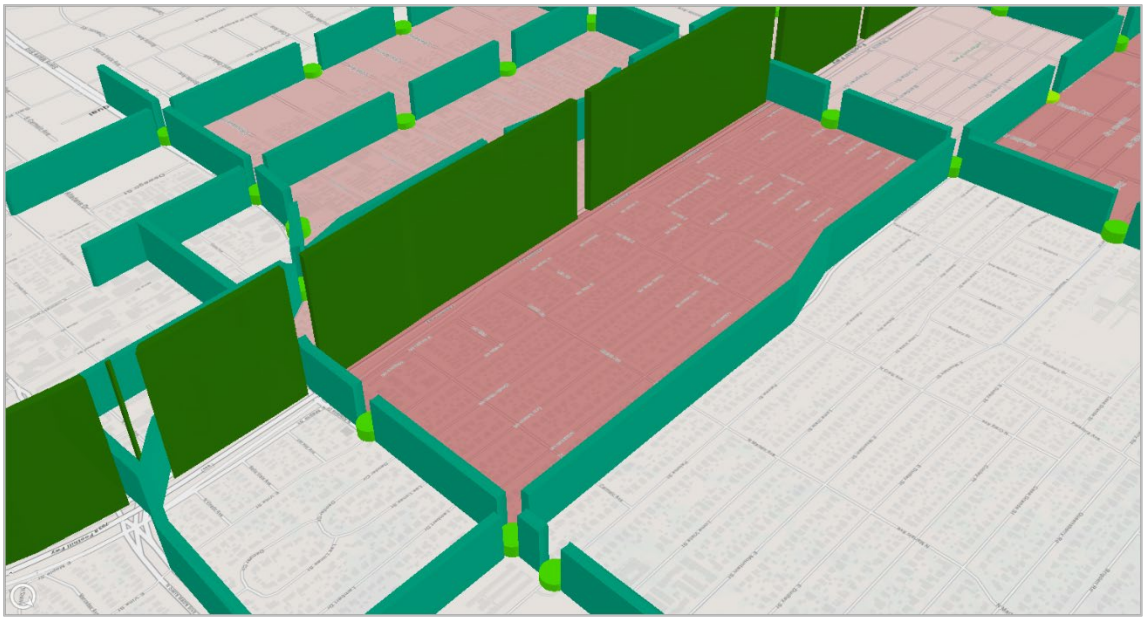


6. In the **Contents** pane, check **Intersection Delays**.



This is the commercial area. There are many intersections that break the walls apart to improve access.

7. In the **Map** tab > **Bookmarks** gallery, click **Low Walkability**.



This is a residential area. It is blocked-in by the freeway on one side and a major road on the other, and both have very few access points for pedestrians. The residents of this area probably feel, quite rightly, that they are trapped in a small area, cut off from the rest of the city.

8. Save your project and close ArcGIS Pro.

Summary

The options for thematic representations of GIS content in a 3D view are endless and moving away from reality and into the cartographic realm, which can allow you to describe your GIS content in a clearer and more concise way.

In this lesson, you learned that features can be moved from their physical location to a more visible place, and then point back to where they came from. You also learned that 3D views have a continuous range of scales, or levels of detail, throughout the view, and that symbols can be configured to work well across a wide range of distances. Surface data can play a supporting role for other content, or it can be highlighted as the primary element in the view. And you learned that well-understood human concepts can be used to help describe data, and the story it is telling, to the consumers of our work.