

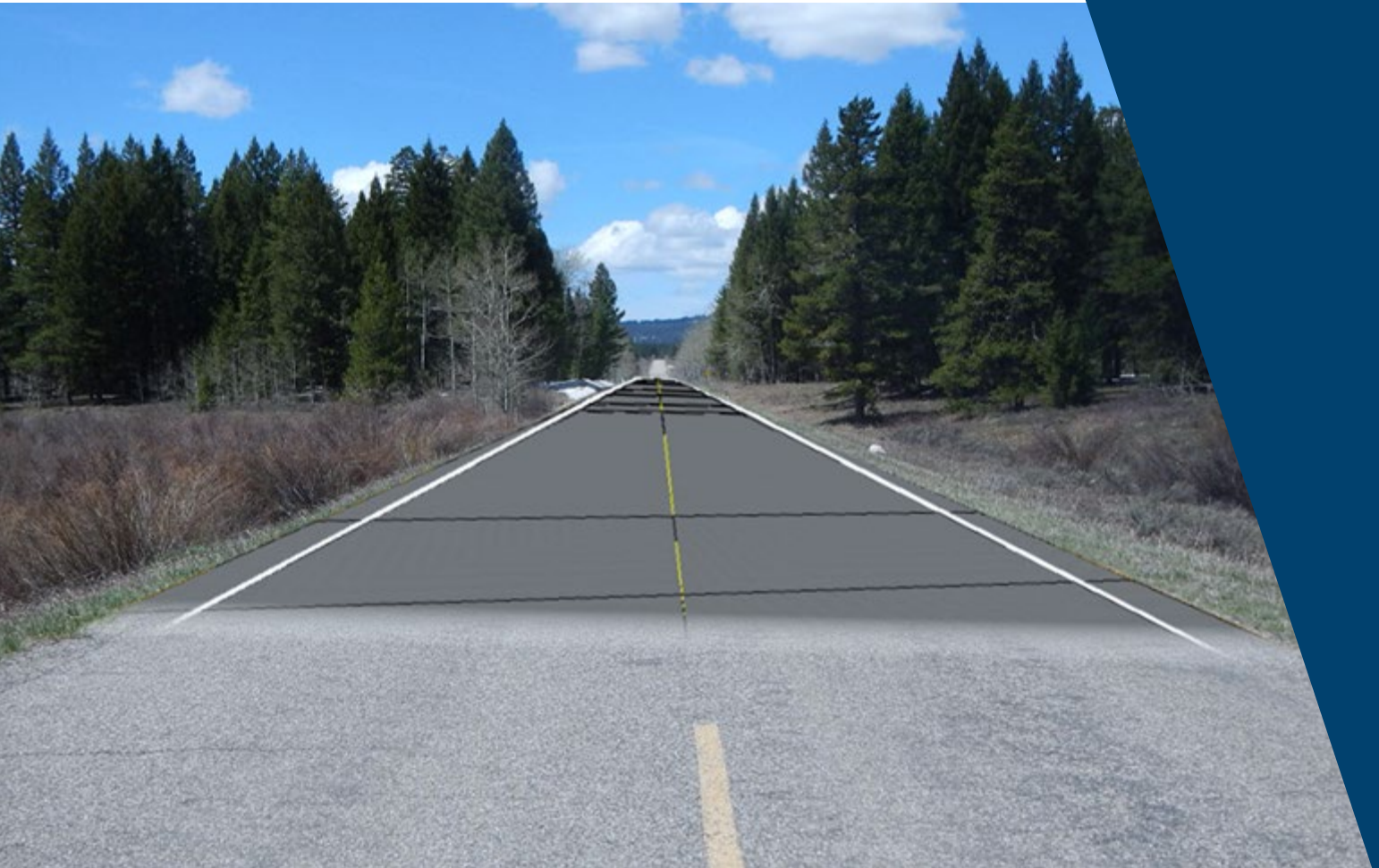
OpenRoads Designer User Manual



U.S. Department
of Transportation
**Federal Highway
Administration**

Chapter 28

LUMENRT



Chapter 28 LumenRT

LumenRT is a graphic rendering software that directly plugs into OpenRoads Designer (ORD). 3-dimensional models built in ORD can be imported into LumenRT to create realistic imagery and animations of the proposed design.

The LumenRT software is free with a valid ORD license. However, LumenRT is not included in the ORD installation package and must be separately downloaded and installed. Before continuing with this chapter, ensure that LumenRT is installed.

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28A – INTRODUCTION TO LUMENRT

LumenRT is a graphic rendering software that directly plugs into OpenRoads Designer (ORD). 3-dimensional models built in ORD can be imported into LumenRT to create realistic imagery and animations of the proposed design.



There are two versions of LumenRT: **LumenRT Designer** and **LumenRT Pro**.

The **LumenRT Designer** software is free with a valid subscription to the OpenRoads Designer software. However, the LumenRT Designer is NOT included in the ORD installation packaged and must be installed separately. Realistic visuals can be created with **LumenRT Designer** (free version). **NOTE:** Screenshots and videos created with LumenRT Designer will contain a watermark that shows the "LumenRT Designer" logo.

The **LumenRT Pro** software requires an additional paid subscription for use. Compared to LumenRT Designer, the LumenRT Pro software has additional features and pre-made object resources for creating realistic visuals.

The operation of both versions is identical.

Before continuing with this chapter, ensure that a version of LumenRT is downloaded and installed. Consult with your CAD Network Administrator.

NOTE: By default, LumenRT Designer is automatically opened after importation from ORD. The procedure for switching to LumenRT Pro is shown in [28D.1 LumenRT Setup Recommendations \(Units and LumenRT Pro\)](#).

28A.1 Capabilities and Limitations of LumenRT

Understanding the capabilities of LumenRT is necessary for successful and efficient use of the software.

Capabilities: The purpose of LumenRT is to give an ORD Model a sense of realism by adding lighting, shadows, textures, and backdrops.

Additionally, there are pre-packaged object libraries for adding vegetation, vehicles, signage, buildings, humans, and animals to the LumenRT rendering.

Most objects in the pre-packaged libraries can be programmed with a custom animation. For example, a vehicle can be programmed with a custom animation path to show it driving around the proposed ORD Model.




LumenRT is compatible with BIM (Building Information Modeling) files. BIM files are produced by architectural and structural engineering software such as Revit and SketchUp. Commonly, buildings and structures are modeled and converted to a BIM file type. A BIM file can be imported into the LumenRT to show a proposed structure in conjunction with the graphics from the ORD Model.

Limitations: The pre-packaged object libraries found in LumenRT are limited. For example, there are ONLY two types of homes available for placement in LumenRT. The size of the homes can be scaled to any dimension. However, the color of the homes CANNOT be modified. **The pre-packaged libraries may NOT contain objects commonly found in a FLH Project, such as a restroom in a parking lot and bridges.**

Similarly, the pre-packaged libraries contain common signage and traffic control features, such as stop signs, speed limit signs, one-way signs, traffic lights, and traffic barrels. However, less common and custom signage is NOT available, nor can be created in LumenRT.

LumenRT is NOT a drafting or modeling software. If an object is NOT found in the pre-packaged libraries, then it must be created/modeled in OpenRoads Designer or another software, such as SketchUp or Revit. After the object is modeled in a separate software, it can be imported and placed in the LumenRT rendering. For more information on creating custom objects, see [28H.4 Import a Custom Object](#).

It is NOT possible to draw lines, shapes, or objects within LumenRT. The proposed design must be entirely modeled in OpenRoads Designer. For example, proposed pavement markings CANNOT be drawn directly in LumenRT. Similarly, existing features, such as roads and bridges, must be displayed from a draped aerial or modeled in ORD. The process for creating a draped aerial is shown in [28B.1 Reference in and Modify the Existing Ground Terrain Model](#).

In the importation process, LumenRT captures all elements shown in the *3D Design Model*  of the ORD File. Levels that are toggled OFF will NOT be shown in the LumenRT import. Elements found in the *2D Design Model*  are NOT shown in LumenRT. The proposed design must be fully developed in the *3D Design Model*  before importing to LumenRT.

Only 3D Mesh Elements, such as Template Components (created by Corridors, Linear Templates, and Surface Templates) and Terrain Models, are imported into LumenRT.

Simple 3D Linear Elements are NOT imported into LumenRT. For example, the Edge of Pavement line is NOT imported. However, the Pavement Layer components are imported. 3D Linear Elements that have complex graphical elements attached are imported into LumenRT. For example, the 3D Linear Elements that show guardrail and pavement marking graphics are imported into LumenRT.

28B – PREPARING THE ORD MODEL FOR IMPORT INTO LUMENRT

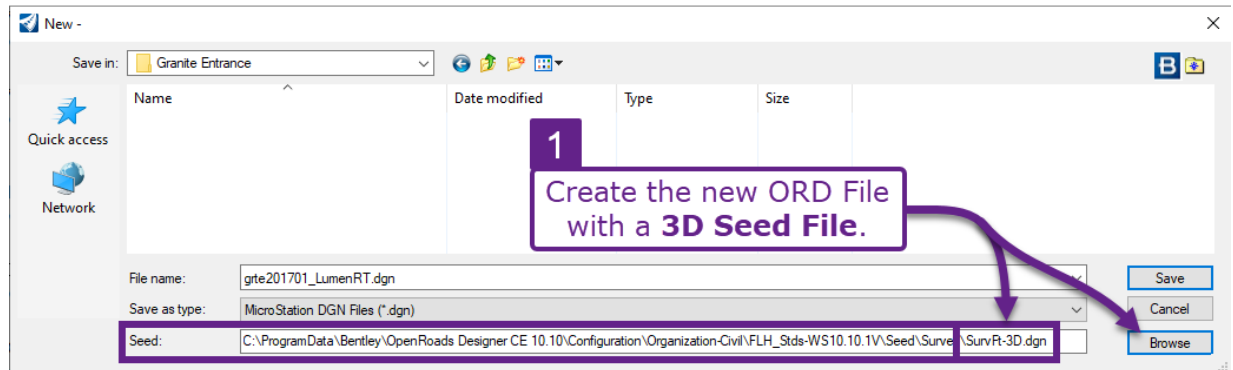
When exporting to LumenRT, it is recommended that a new ORD File is created. LumenRT ONLY exports the contents of the *3D Design Model*. Therefore, create the new ORD File with a **3D Seed File**.

1

Create a new ORD File using a **3D Seed File**. This creates an ORD File that ONLY contains a *3D Design Model*.

Seed Files are found in the FLH WorkSpace at the following location:

OpenRoads Designer CE 10.10\Configuration\Organization-Civil\FLH_Stds-WS10.10.1V\Seed



In the new ORD File, reference in Design ORD Files that contain the proposed design features.

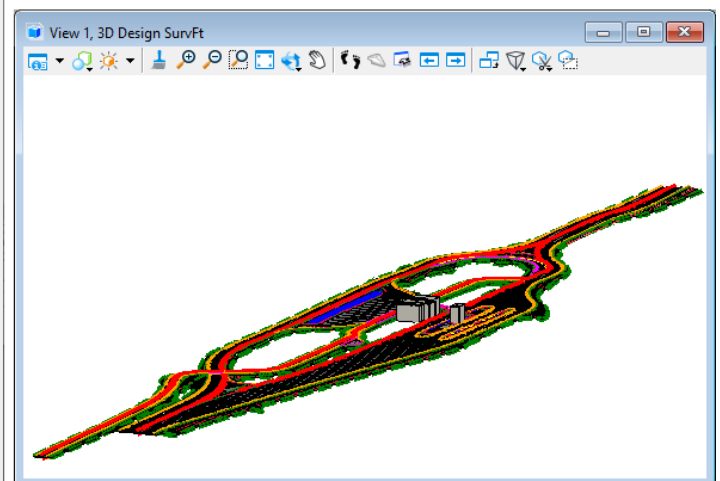
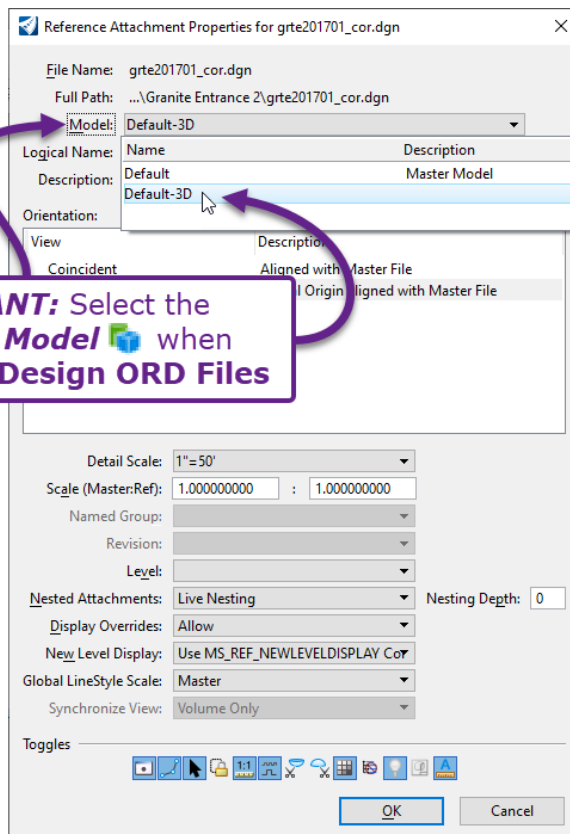
2

Reference in the Design ORD Files.

IMPORTANT: In the Reference Attachment Properties menu, select the *3D Design Model* as the **Model** to reference in.

2

IMPORTANT: Select the *3D Design Model* when referencing in **Design ORD Files**

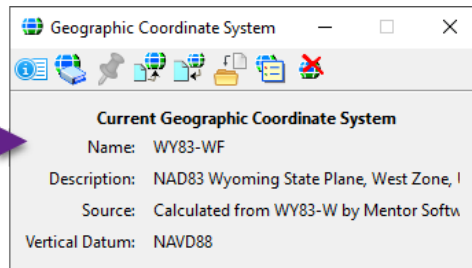


In the new ORD File, set the project Coordinate System.

3

Set the **Coordinate System** for the new ORD File. For more information on setting the Coordinate System, see [3D.1 Set the Coordinate System](#).

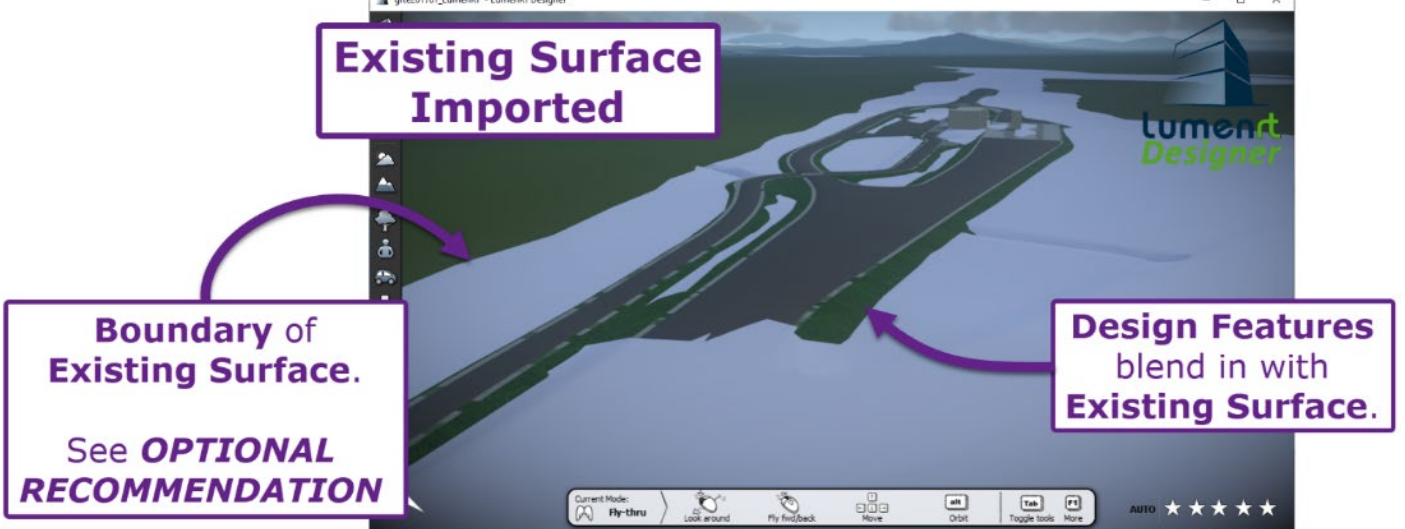
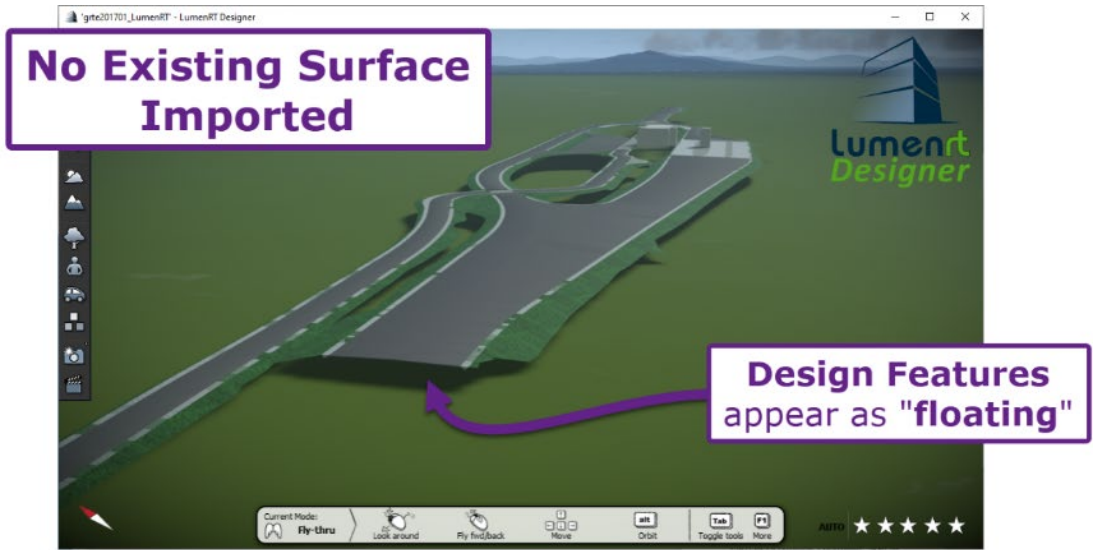
3
Set the
Coordinate System



28B.1 Reference and Modify the Existing Ground Terrain Model

Before exporting to LumenRT, the Existing Ground Terrain Model should be referenced into the new ORD File and modified for a more aesthetical appearance.

The Existing Ground Terrain Model is used as a surface in LumenRT to place objects on (i.e., trees, buildings, and vehicles). Similarly, the Existing Ground Terrain Model provides a realistic sense of topography in the LumenRT. If the Existing Ground Terrain Model is NOT included in the import, then the ORD Model appears as floating in LumenRT.



OPTIONAL RECOMMENDATION: In situations where the Existing Ground Terrain Model does NOT extend much farther than the proposed design features, it may be beneficial to supplement the Existing Ground Terrain Model with LiDAR data to create a larger existing surface in LumenRT. The larger existing surface will enhance the realism of the LumenRT rendering. For more information on acquiring and merging LiDAR data with the Existing Ground Terrain Model, see [5C - Import LiDAR Data into ORD](#).

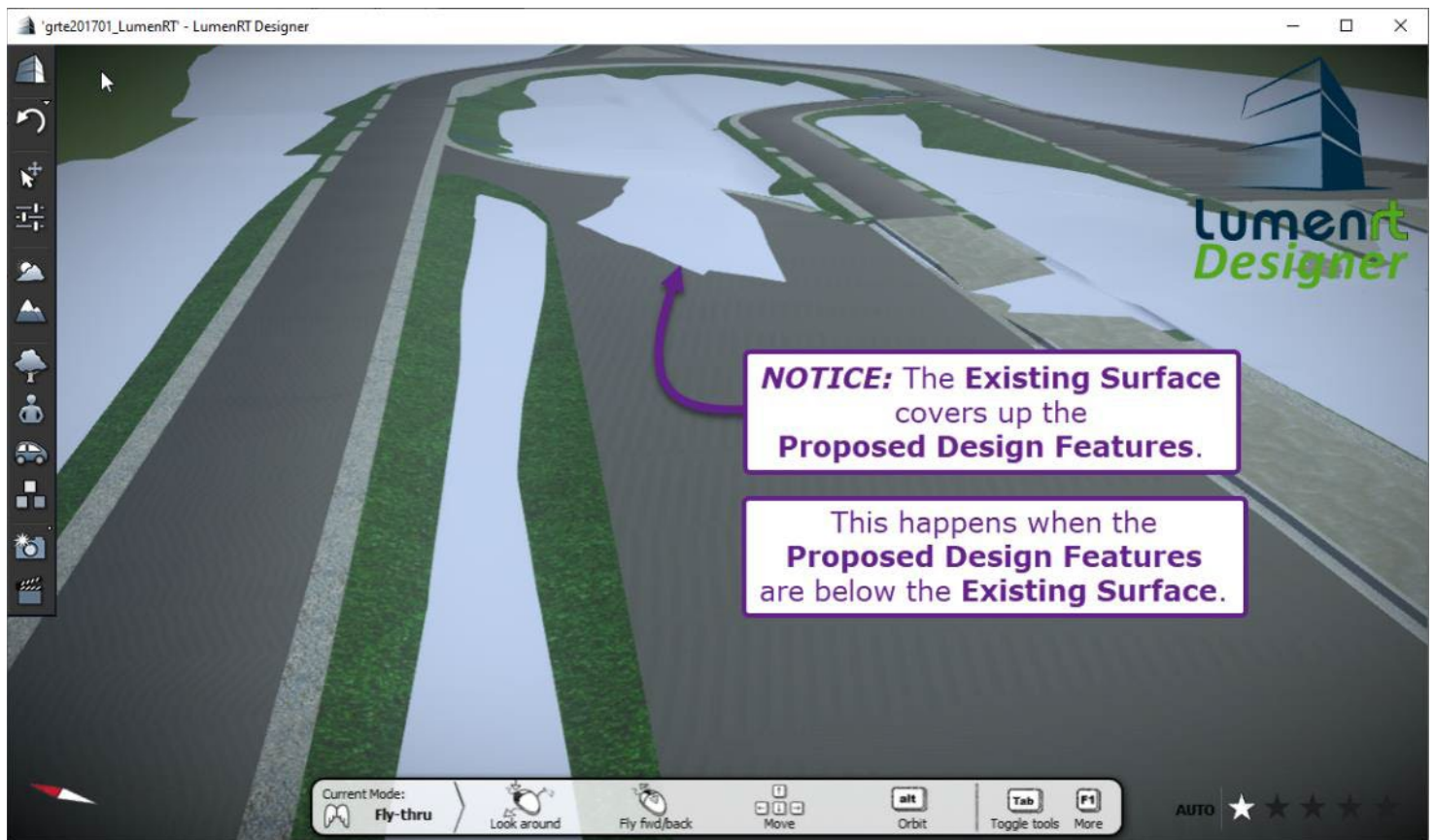
1

Reference in the Survey ORD File or whichever file contains the **Existing Ground Surface**.

Before exporting the ORD Model to LumenRT, the Existing Ground Terrain Model should be clipped, and an aerial image draped atop it.

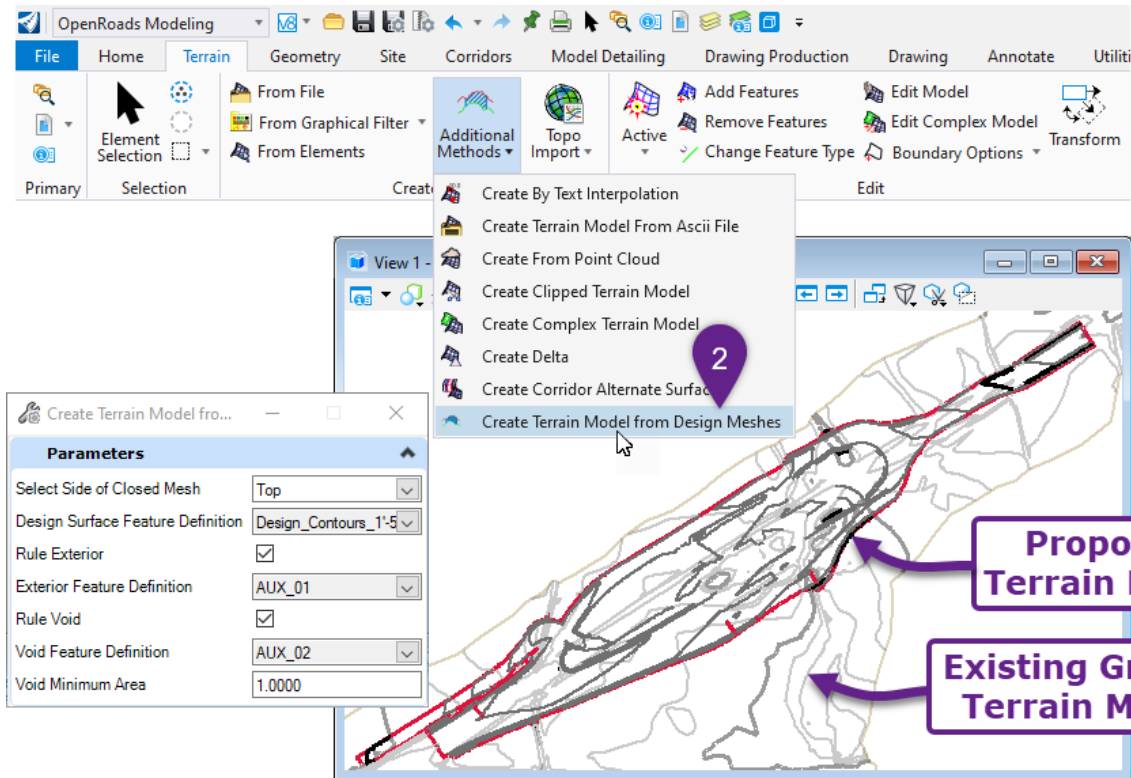
28B.1.a Clip a Void in the Existing Ground Terrain Model:

A void should be clipped in Existing Ground Terrain Model. The void should correspond with the limits of the proposed design features. This process is necessary because the Existing Ground Terrain Model may cover up the proposed design features in areas of overlap.



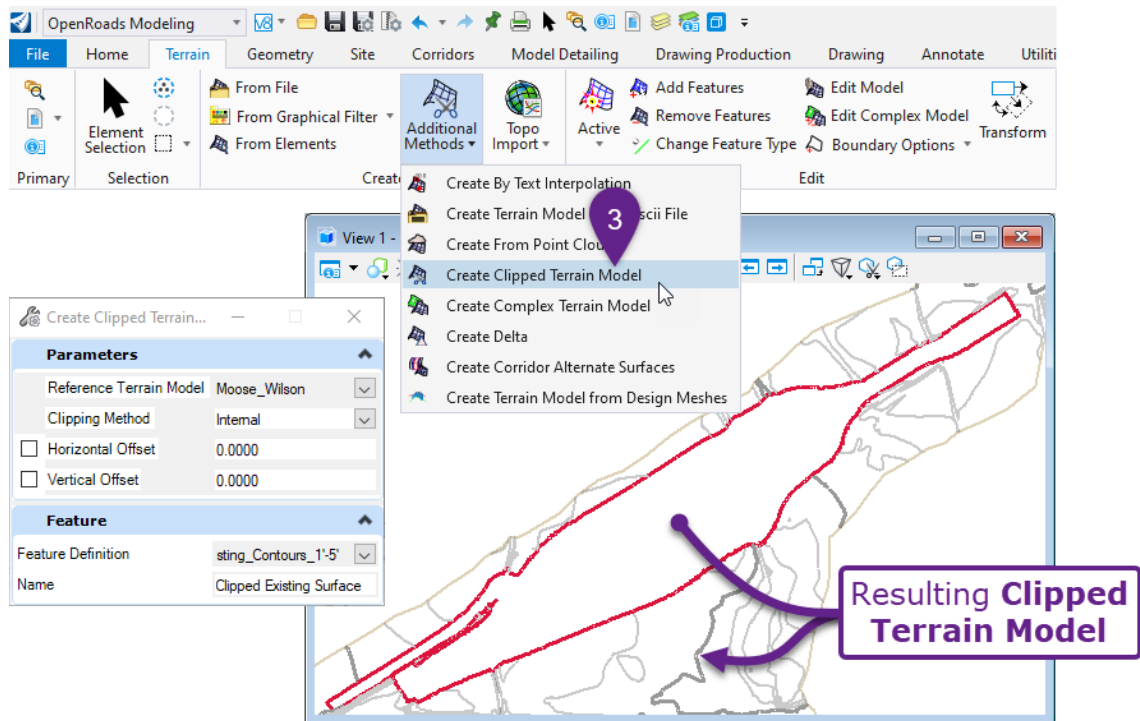
This process is accomplished by creating a Terrain Model from the proposed design features using the *Create Terrain Model from Design Meshes* tool. The resulting proposed Terrain Model will be used the clipping element to create a void in the Existing Ground Terrain Model.

2 Use the *Create Terrain Model from Design Meshes* tool to create a Terrain Model from the proposed design features. For more information, see [22A.1.c Use the Create Terrain Model from Design Meshes tool](#).



3 Use the *Create Clipped Terrain Model* tool to remove the Proposed Terrain Model area from the Existing Ground Terrain Model. For more information, see [22D - Create a Clipped Terrain Model](#).

Locate Reference Terrain Model Element: Select the Existing Ground Terrain Model.
Locate Clipping Element: Select the Proposed Terrain Model.



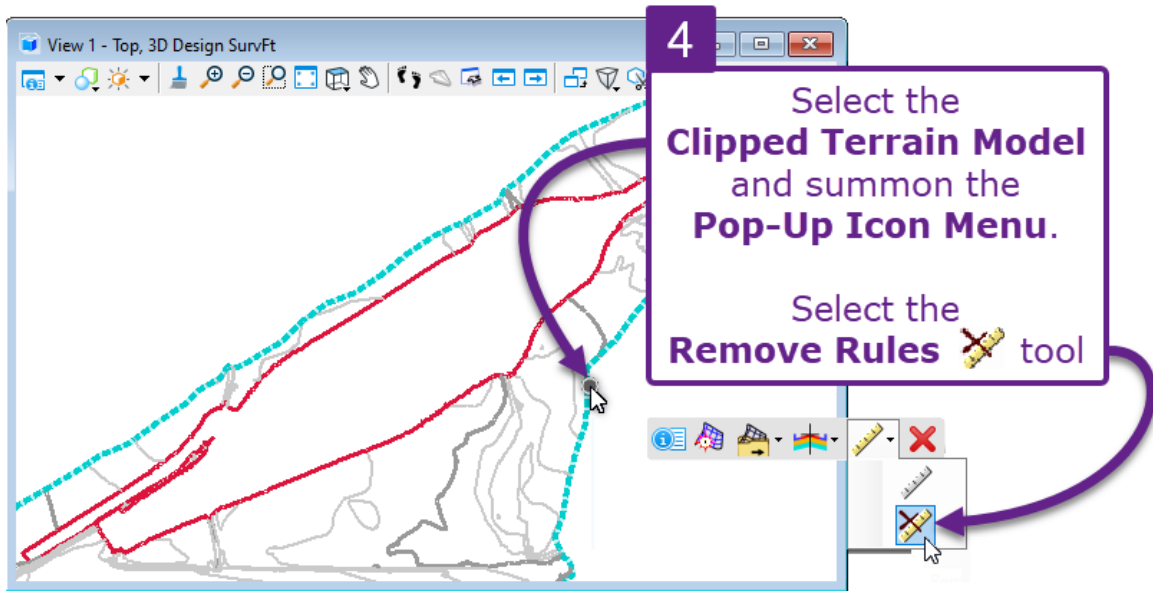
NOTE: The *Create Clipped Terrain Model* tool does NOT directly clip the Existing Ground Terrain Model. Instead, a new Terrain Model with a clipped void is created.

After step 3, there is three Terrain Models in the ORD File: The Clipped Terrain Model, the Proposed Terrain Model, and the Existing Ground Terrain Model.

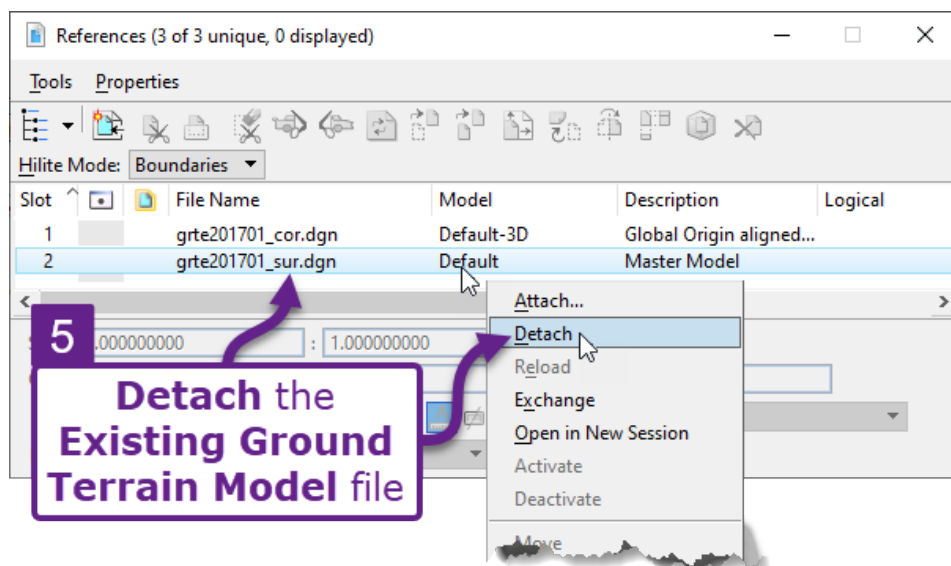
The Proposed and Existing Ground Terrain Models are NOT required for importation into LumenRT and should be removed from the ORD File. However, the Clipped Terrain Model is dependent on the Proposed and Existing Ground.

Use the *Remove Rule* tool on the Clipped Terrain Model to remove the dependencies to the Proposed and Existing Ground. After this tool is used, the Proposed and Existing Ground can be deleted or detached.



4 Select the **Clipped Terrain Model** and hover the mouse cursor over it to summon the Pop-Up Icon Menu. Select the *Remove Rules* tool.

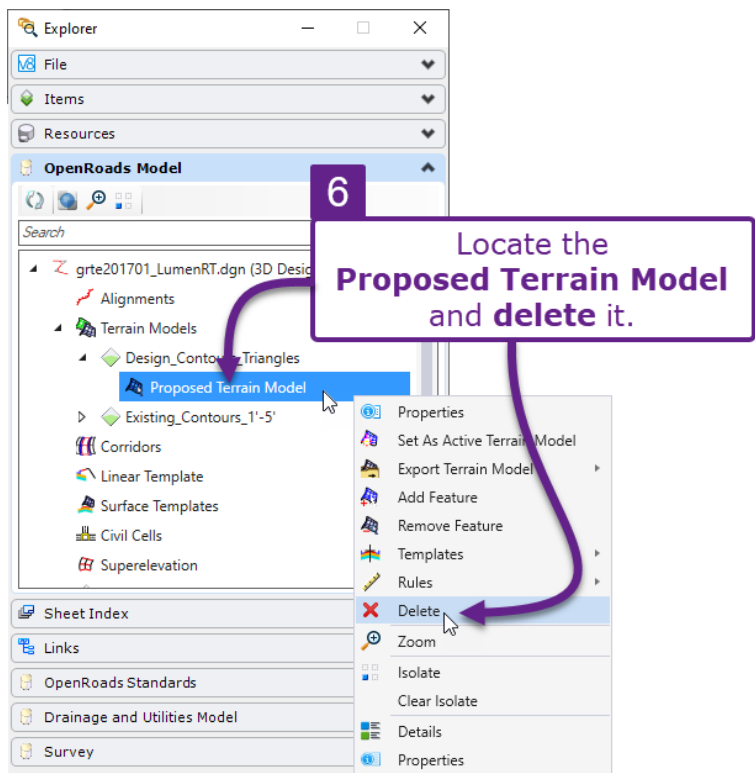


5 Remove the **Existing Ground Terrain Model** by detaching the reference file (i.e., the Survey ORD File) that it belongs to.



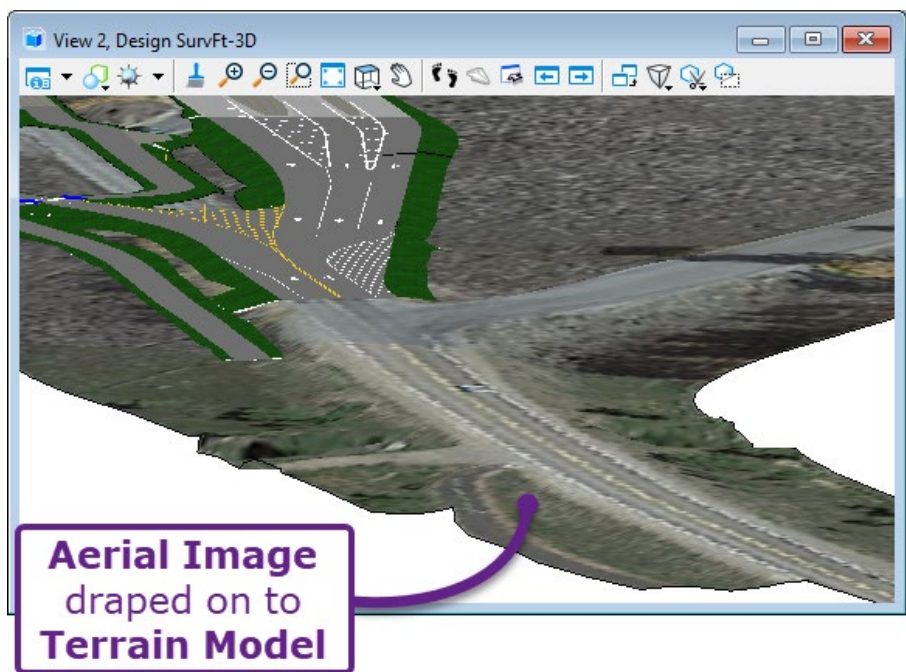
Delete the **Proposed Terrain Model**.

6 The Proposed Terrain Model can be quickly located and deleted through the Explorer , under the OpenRoads Model drop-down. Once the Proposed Terrain Model is in the Explorer , right-click and delete it.



28B.1.b Drape Aerial Imagery onto the Clipped Terrain Model:

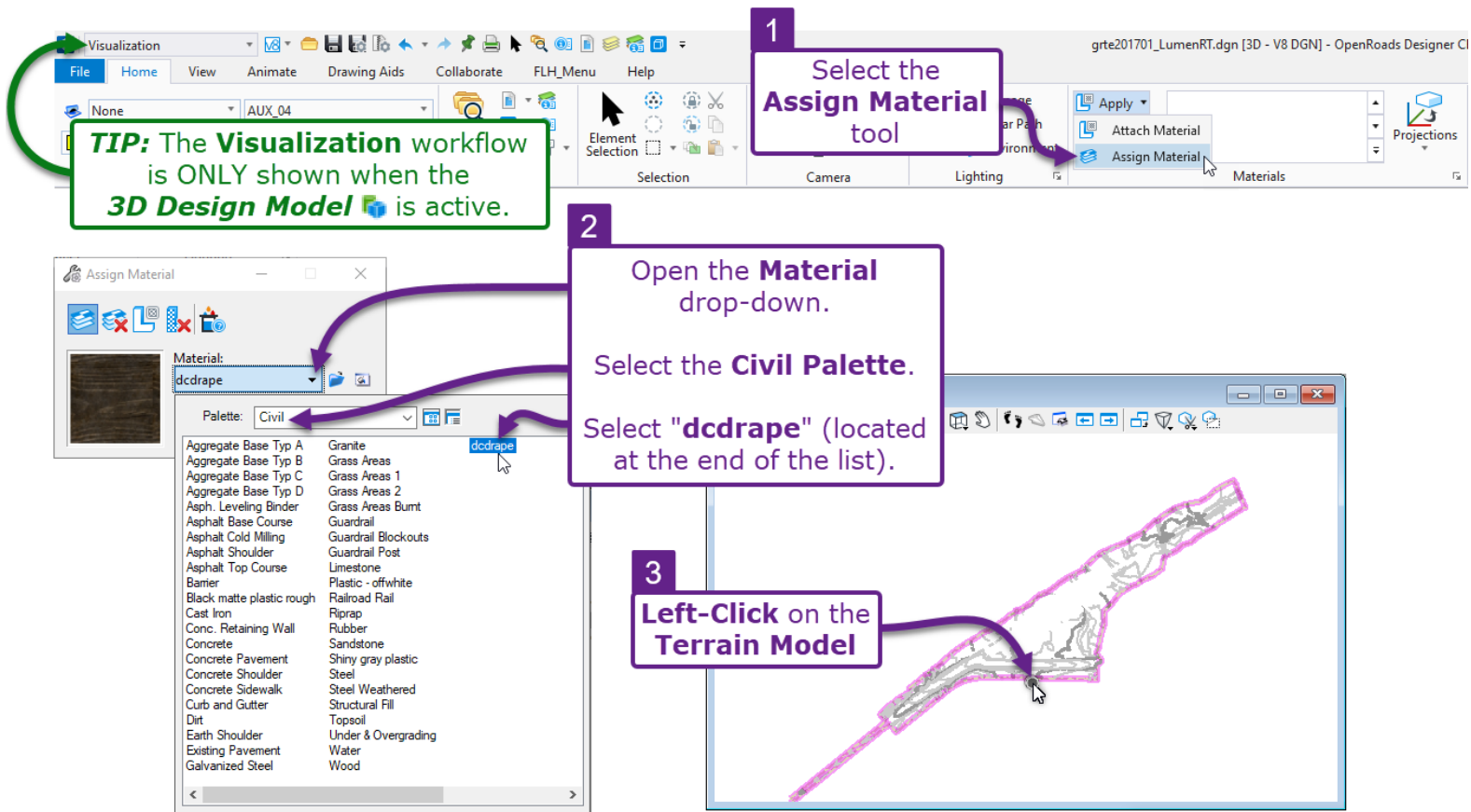
If an aerial image (raster) is available, then drape it onto the Clipped Terrain Model to make the LumenRT rendering appear more realistic. In LumenRT, the aerial image is also helpful for placing objects (i.e., trees and buildings) in the appropriate position.





The process for draping an aerial on a Terrain Model is as follows:




Assign the Clipped Terrain Model to the "dcdrape" Material: A Material must be assigned to the Terrain Model to enable it for raster draping. The "dcdrape" material is specifically intended for draping. Assigning a Material is accomplished with the *Assign Material* tool.

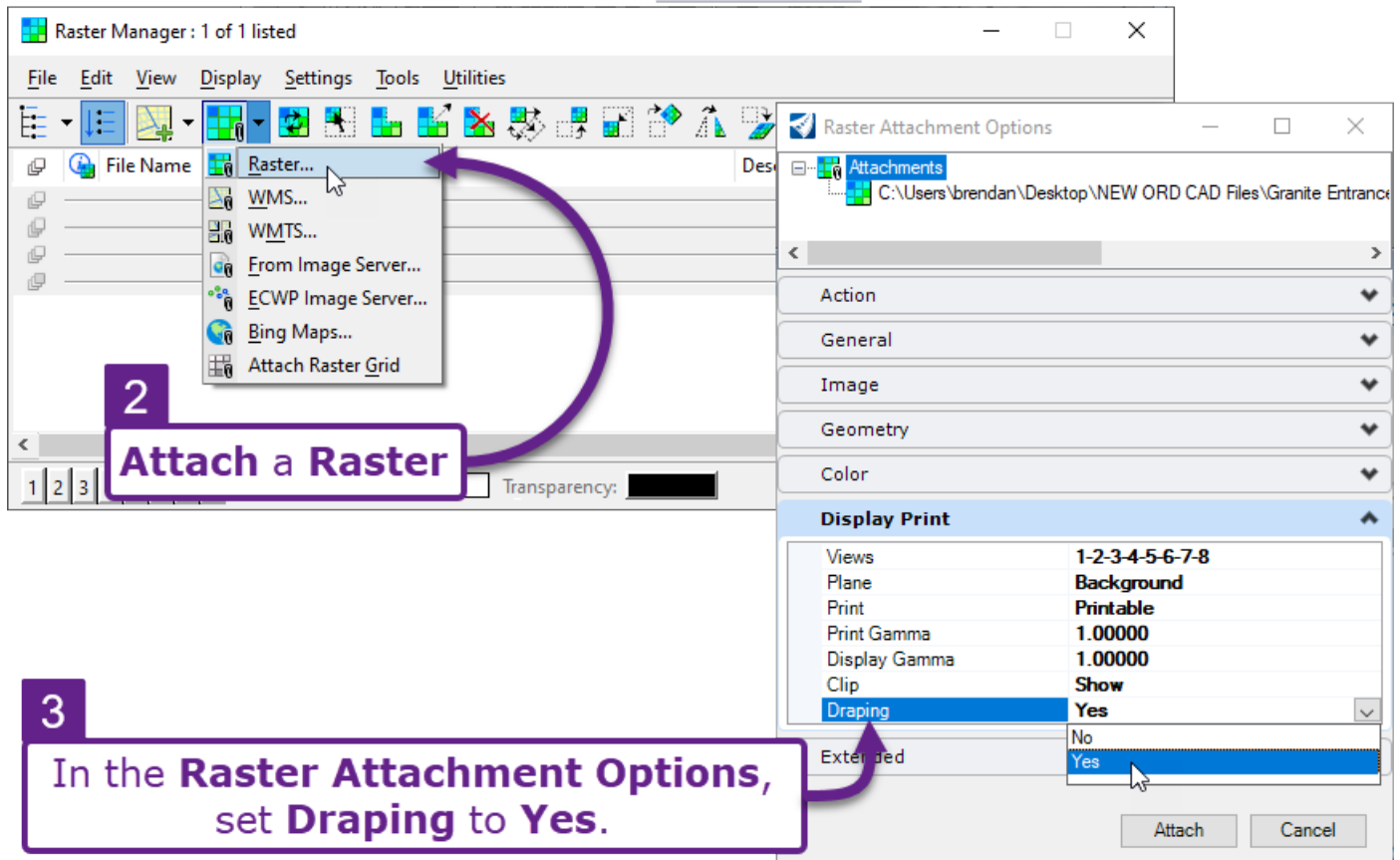
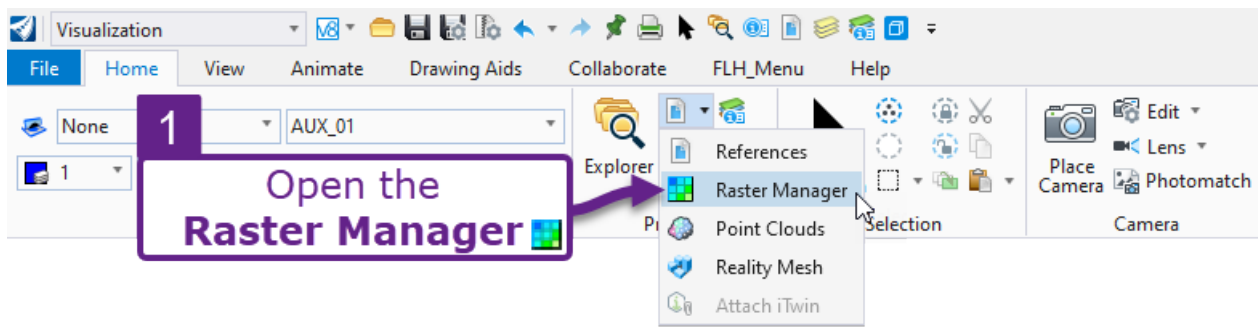
- 1 From the Ribbon, select the *Assign Material* tool:
[**Visualization** → **Home** → **Materials** → **Apply**].
- 2 In the *Dialogue Box*, select the "dcdrape" material from the drop-down. The "dcdrape" material is in the **Civil** palette at the very end of the list.
- 3 Left-Click on the Terrain Model to apply the Material.



WARNING: The "dcdrape" material is ONLY capable of showing 1600 x 1600 pixels for a raster draped onto a Terrain Model. If the image is greater than 1600 x 1600 pixels, then a loss of resolution quality will occur. If the pixel limit is exceeded, then the raster is automatically compressed, which results in loss of quality.

Attach an Aerial Image through the Raster Manager : When an image is attached through the Raster Manager , there is an option for Draping. If Draping is enabled, then image is placed on top of the Terrain Model that is assigned to the "dcdrape" material.


- 1 From the Ribbon, open the *Raster Manager*  tool:
[**Visualization** → **Home** → **Primary** →  **drop-down**].
- 2 Attach a **Raster** from the  drop-down.
- 3 In the Raster Attachment Options box, locate the **Draping** option and set it to **Yes**.

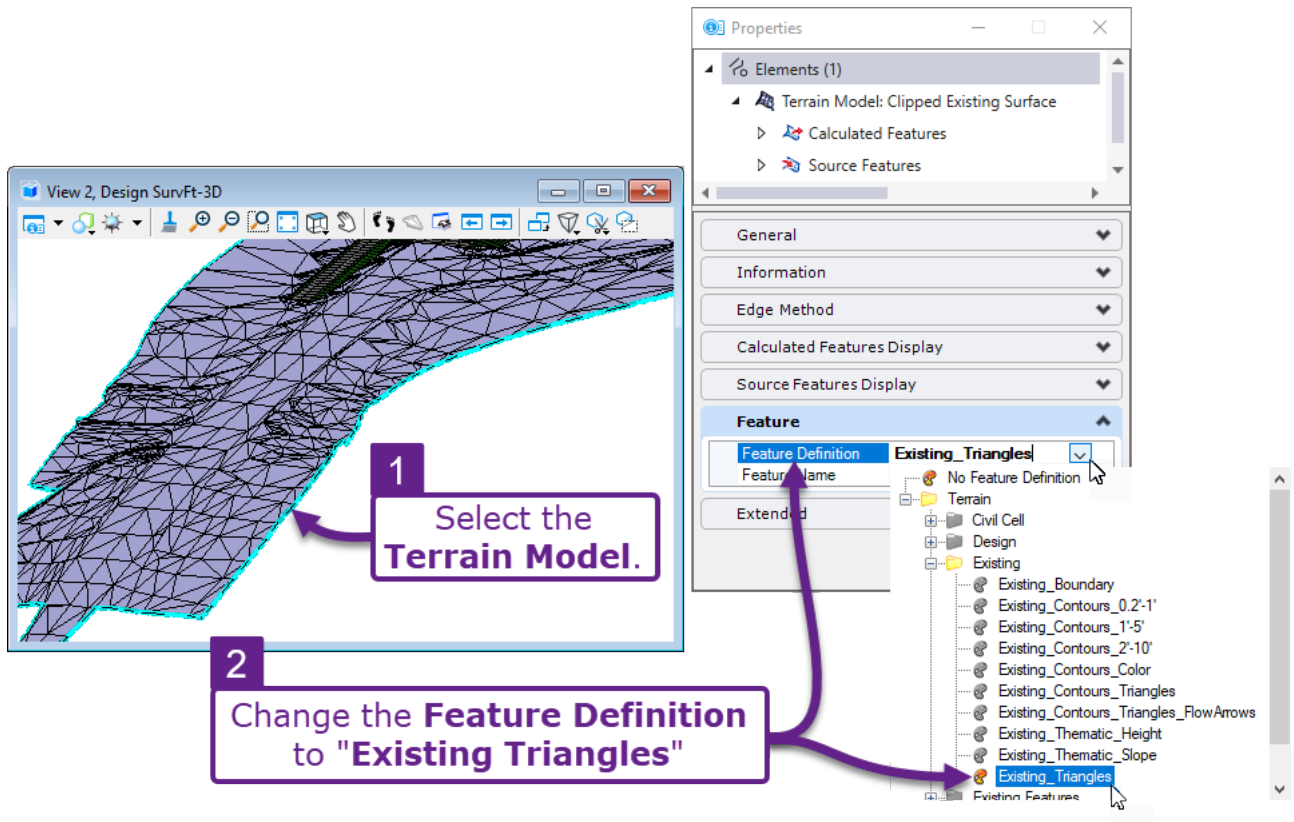


IMPORTANT: To display the Raster draped onto the Terrain Model, the following two conditions must be met.

- The Triangles of the Terrain Model must be displayed. Set the Terrain Model to the "Existing_Triangles" Feature Definition.
- The Display Style for the *View* window must be set to a "Smooth" or "Illustration" style. The recommended Display Style is "Smooth: White Background".

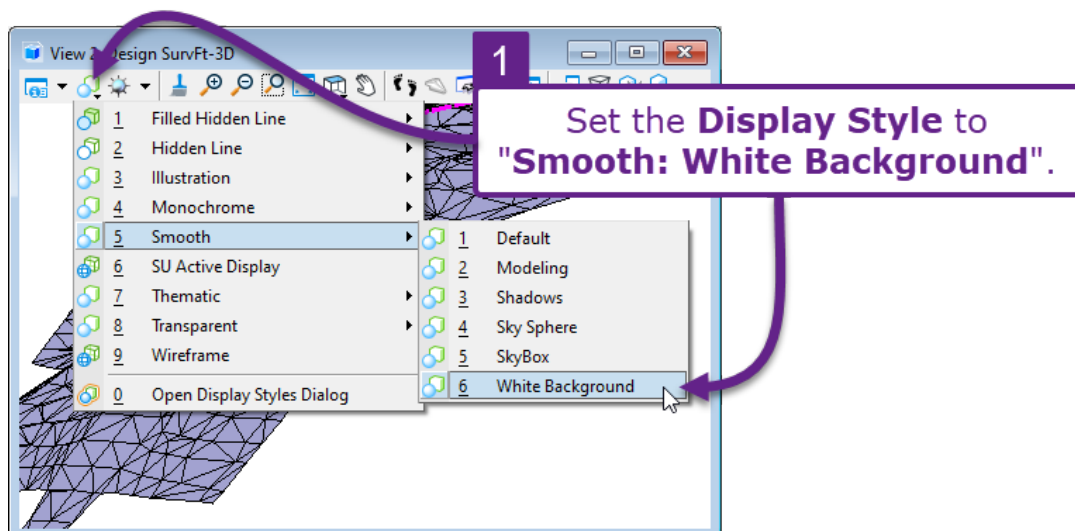
Set the Terrain Model to the "Existing_Triangles" Feature Definition: The Triangles serve as the solid surface to which the raster is draped on. Set the Terrain Model to the "Existing_Triangles" Feature Definition to display the triangles.

- 1 Select the Terrain Model.
- 2 In the Properties  box, change the Feature Definition to "Existing_Triangles".





Set the Display Style to a Smooth or Illustration style: If NOT set to a Smooth or Illustration style, then the aerial will NOT display. The recommended Display Style is "Smooth: White Background".

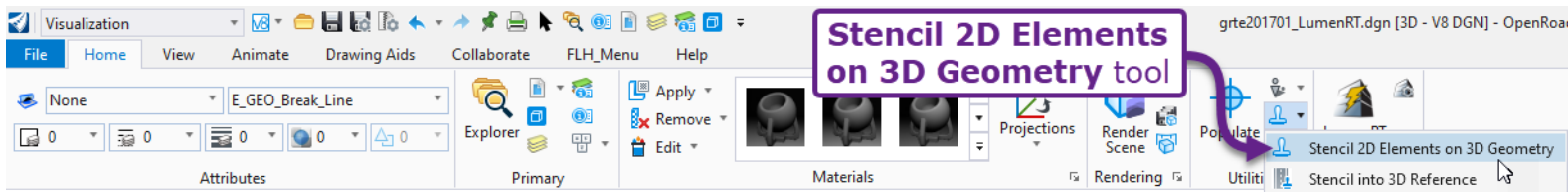
- 1 From the Display Style  drop-down, select "Smooth: White Background".




28B.2 Show 2D Pavement Markings in the 3D Design Model and LumenRT

To import pavement markings into LumenRT, they must be displayed in the *3D Design Model* .

Commonly, pavement markings are manually drawn in the *2D Design Model* . The *Stencil 2D Elements on 3D Geometry* tool is used to drape 2D pavement markings onto the surface of 3D modeling elements. After this tool is used, the 2D pavement marking elements are converted to Mesh elements and will be imported into LumenRT.



NOTE: Occasionally, pavement markings are built into the Template of a Corridor. In this configuration, a Template Point with a pavement marking Feature Definition is used. This results in a *3D Linear Element* created shown in the *3D Design Model* . However, as mentioned in [28A.1 Capabilities and Limitations of LumenRT](#), *3D Linear Elements* are NOT imported into LumenRT. Only Mesh elements are imported into LumenRT. As a workaround, use the *Stencil 2D elements on 3D Geometry* to convert the 2D elements (created by the Corridor) into 3D Mesh elements.

In the *3D Design Model* of the LumenRT ORD File, reference in the Design ORD File that contains the 2D pavement markings.

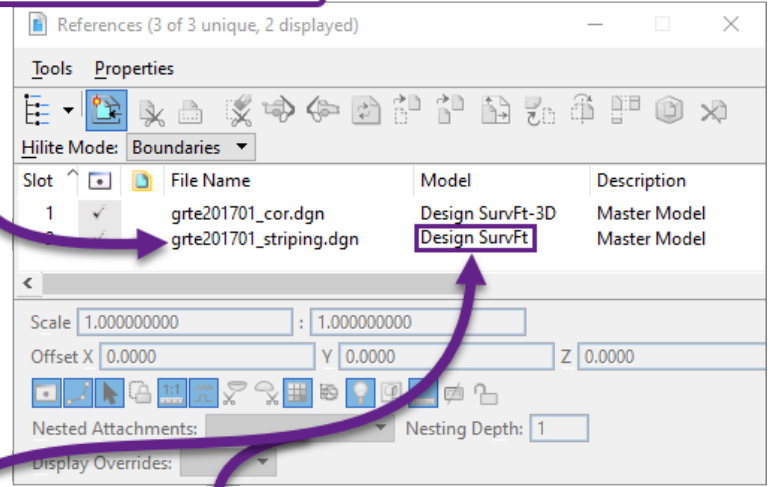
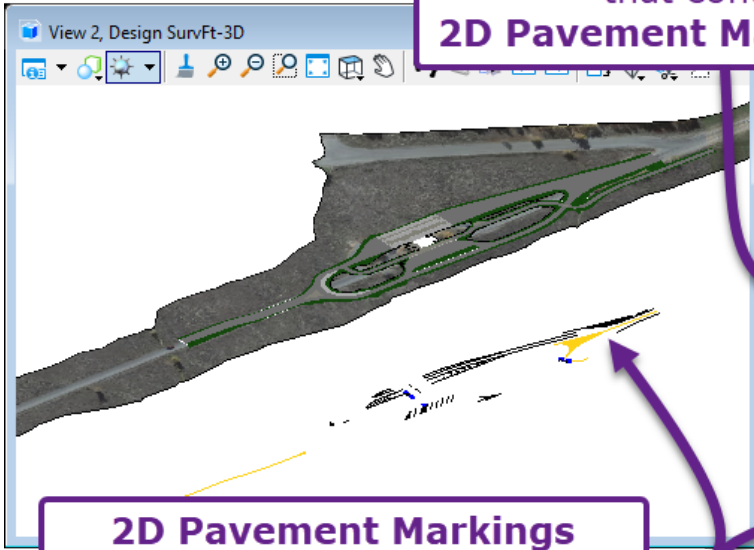
1

IMPORTANT: If the Pavement Marking ORD File contains both a *2D Design Model* and *3D Design Model*, then **ONLY** reference in the **2D Design Model**.

In this case, the 2D pavement markings are contained in an ORD File called: "grte201701_stripping.dgn".

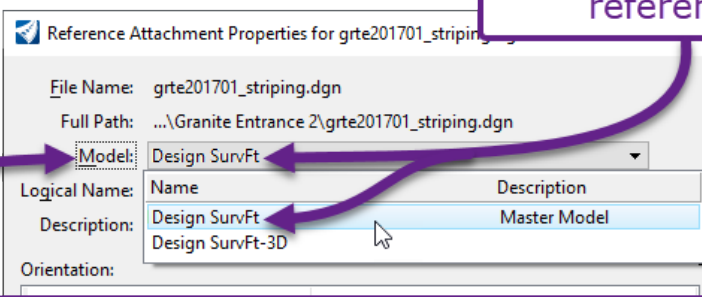
1

Reference in the ORD File that contains the 2D Pavement Marking elements.



Slot	File Name	Model	Description
1	grte201701_cor.dgn	Design SurvFt-3D	Master Model
	grte201701_stripping.dgn	Design SurvFt	Master Model

2D Design Model reference



Reference Attachment Properties for grte201701_stripping.dgn

File Name: grte201701_stripping.dgn
Full Path: ...\\Granite Entrance 2\\grte201701_stripping.dgn

Model: Design SurvFt

Name	Description
Design SurvFt	Master Model
Design SurvFt-3D	

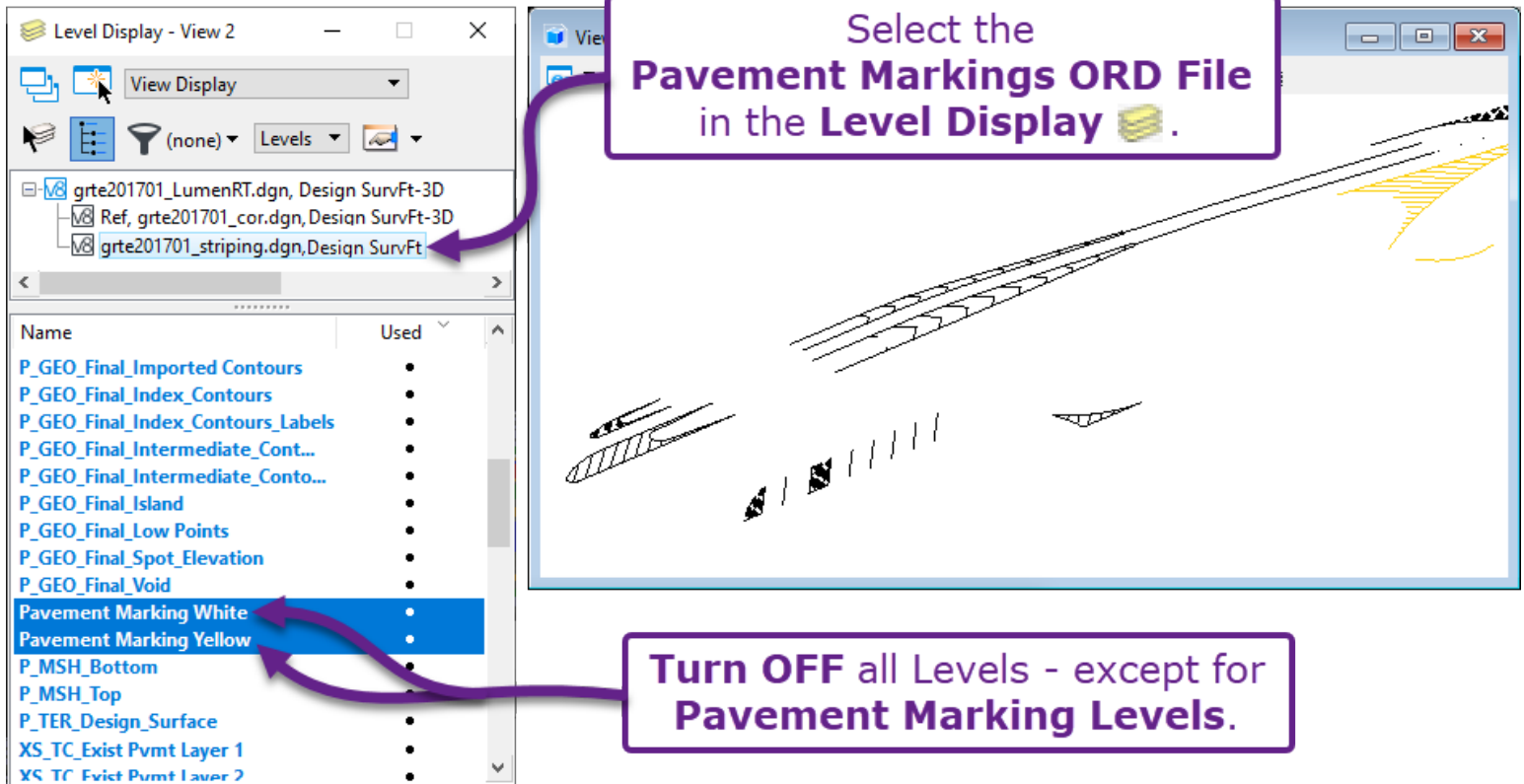
If the Pavement Markings ORD File contains both a 2D Design Model and 3D Design Model, then reference in the 2D Design Model.

Detail Scale: 1"=50'
Scale (Master:Ref): 1.000000000 : 1.000000000

For the Pavement Marking ORD File, turn OFF all Levels that do NOT contain pavement markings.

2 **NOTE:** The *Stencil 2D Elements on 3D Geometry* tool will ONLY affect elements that are currently displayed.

2 Select the **Pavement Markings ORD File** in the **Level Display**.



Name	Used
P_GEO_Final_Imported Contours	•
P_GEO_Final_Index_Contours	•
P_GEO_Final_Index_Contours_Labels	•
P_GEO_Final_Intermediate_Cont...	•
P_GEO_Final_Intermediate_Conto...	•
P_GEO_Final_Island	•
P_GEO_Final_Low Points	•
P_GEO_Final_Spot_Elevation	•
P_GEO_Final_Void	•
Pavement Marking White	•
Pavement Marking Yellow	•
P_MSH_Bottom	•
P_MSH_Top	•
P_TER_Design_Surface	•
XS_TC_Exist Pvmnt Layer 1	•
XS_TC_Exist Pvmnt Layer 2	•

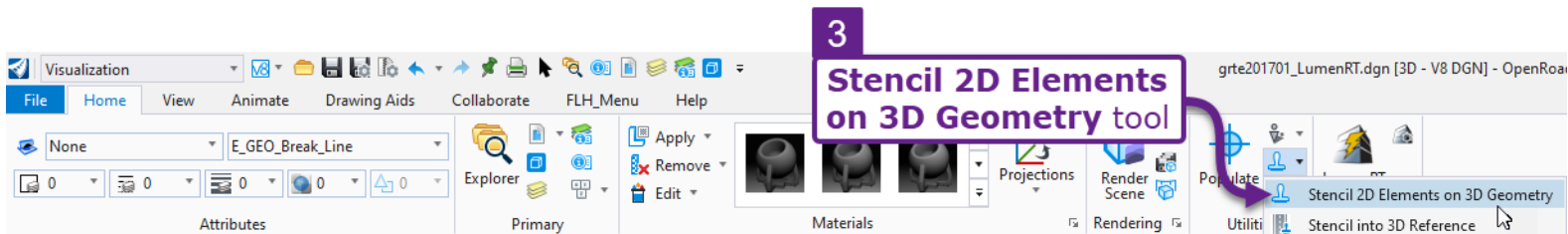
Turn OFF all Levels - except for Pavement Marking Levels.

From the Ribbon, select the *Stencil 2D Elements on 3D Geometry* tool:

[**Visualization** → **Home** → **Utilities** →  **drop-down**].

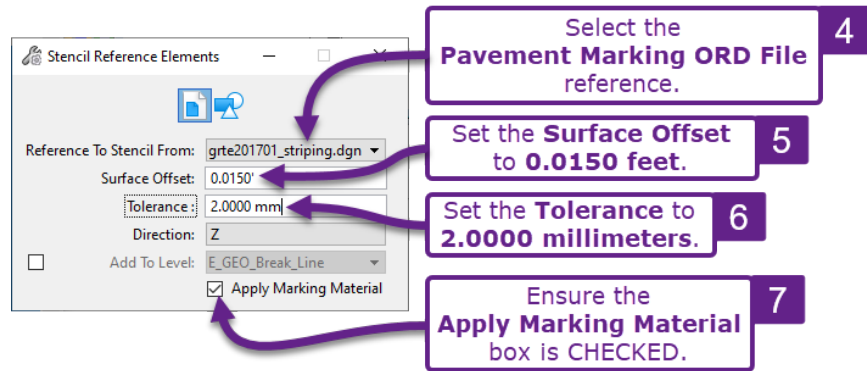
3 **NOTE:** The *View* window of the *3D Design Model* must be active when this tool is selected. The **Visualization** drop-down is ONLY shown when the *3D Design Model* is active.

3 **Stencil 2D Elements on 3D Geometry** tool



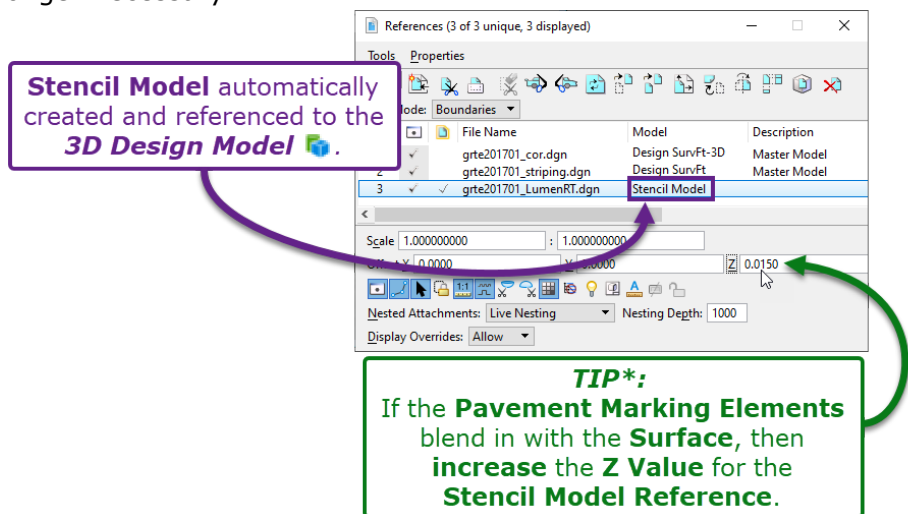
The screenshot shows the software interface with the 'Visualization' ribbon active. The 'Utilities' panel is expanded, and the 'Stencil 2D Elements on 3D Geometry' tool is highlighted. The background shows a 3D model of a road with pavement markings.

- 4 Reference To Stencil From:** In the *Dialogue Box*, select the Pavement Marking ORD File from the drop-down.
- 5 Surface Offset:** This value determines the vertical offset distance between the resulting Pavement Marking mesh elements and the surface element. The Pavement Markings elements should be draped slightly above the surface elements. If this value is set to 0 feet, then the resulting draped elements will visually blend into the surface elements. It is recommended that this value is set 0.021 feet (0.25 inches).
- TIP*:** If the pavement markings visual blend into the surface elements, change the Surface Offset value by increasing the Z value of the Stencil Model reference. See the graphic below.
- WARNING:** If the Surface Offset value is too large, then the pavement markings will cast a shadow onto the surface elements in LumenRT, which may look unrealistic.
- 6 Tolerance:** The tolerance affects curved elements. This tool converts 2D curved elements into 3D segmented lines for proper display. The Tolerance value determines the distance between 3D segmented line vertices when a 2D curve is converted.
- 7 Apply Marking Material box:** This box must be CHECKED, to ensure the resulting Mesh elements are treated like pavement markings for visualization purposes.



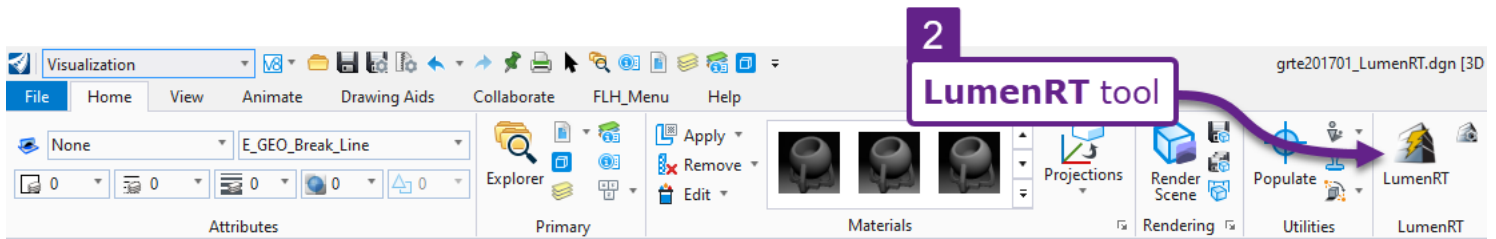
8 After the *Dialogue Box* is configured, left-click anywhere in the *View window* for the *3D Design Model* to run the tool and create the draped Mesh elements.

NOTE: After this tool is used, a **Stencil Model** is automatically created and attached to the *3D Design Model*. The Stencil Model contains the draped Mesh Elements. Detach the Pavement Marking ORD File because it is no longer necessary.



28C – IMPORT THE ORD MODEL INTO LUMENRT

Importing the ORD Model into LumenRT is accomplished with the *LumenRT* tool.



This tool does NOT have *Dialogue Box* options. When this tool is executed, a LumenRT model is automatically created. The LumenRT model consists of Template Components and Meshes created with Corridors, Linear Templates, and Surface Templates. Additionally, Terrain Models and pavement marking Mesh elements are included in the LumenRT model.

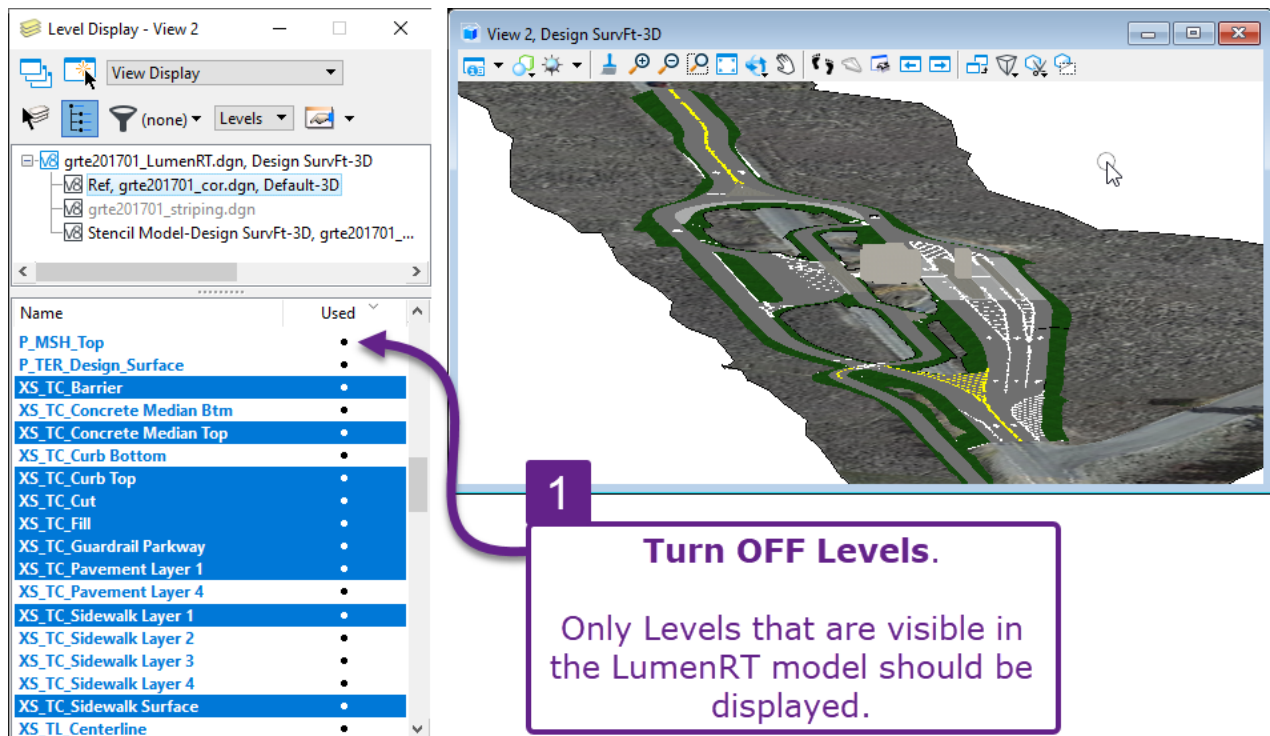
IMPORTANT: ONLY elements that are currently displayed will imported into LumenRT.




LumenRT is very graphics intensive and can bog down computers that have insufficient graphics card hardware. To reduce the size and processing requirements of the LumenRT model, turn OFF all Levels that do NOT need to be shown in Lumen RT.

For example, the Pavement Layer 4 component typically corresponds with aggregate base-course. The aggregate base-course component does NOT need to be included in the LumenRT model, because it is covered up by other components (such as asphalt).

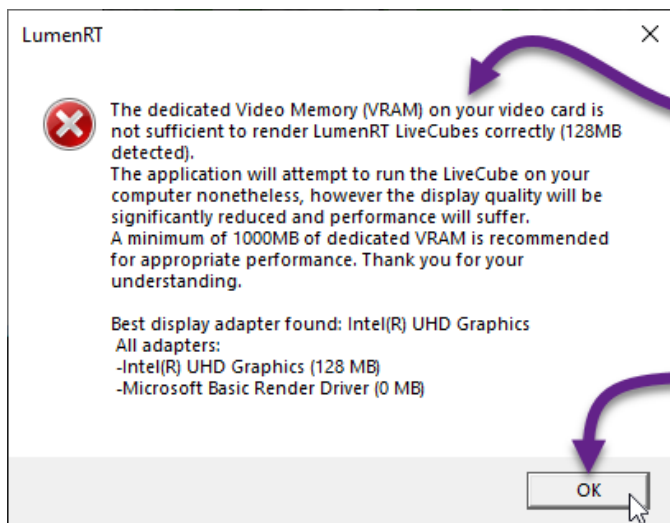
Similarly, turn OFF Levels that correspond with *3D Linear Elements*. LumenRT does NOT import or support *3D Linear Elements*. Turn OFF Levels that correspond with proposed Terrain Models (i.e., "P_TER_Design_Surface").

Only turn ON Levels that correspond with Template Components and Meshes elements that are on top and would be visible in LumenRT. Additionally, ensure that the Existing Ground Terrain Model and draped aerial image is displayed.



Lastly, the LumenRT ground surface is set to match the elevation of the lowest element found in the *3D Design Model* . For example, if an element is placed at elevation 0 in the *3D Design Model* , then the LumenRT ground surface is placed at elevation 0. This would be problematic because design would appear floating far above the LumenRT ground surface. Before exporting, scan the *3D Design Model*  for elements placed at elevation 0 or well below the 3D design elements. Turn OFF or delete low hanging elements.

1	Turn OFF Levels that should NOT be shown in LumenRT.
	From the Ribbon, select the <i>LumenRT</i> tool: [Visualization → Home → LumenRT].
2	The LumenRT software will be automatically opened and a model is created.
	NOTE*: A warning message is displayed if your computer has an insufficient graphics card. If the OK button is pushed, the software is opened. However, performance in the LumenRT software may be slow and visuals may be of substandard graphical quality.



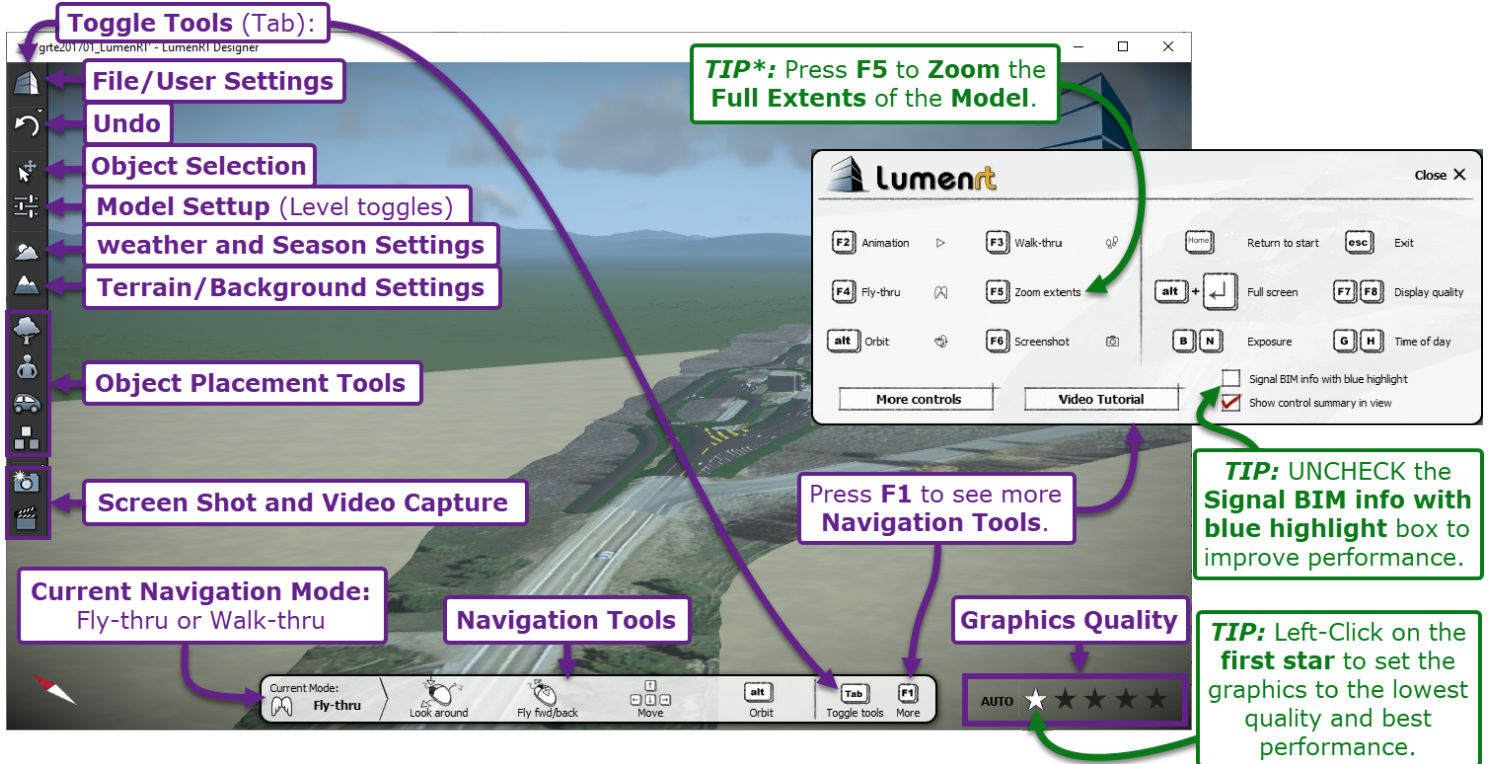
NOTE*: If your computer has an insufficient **Graphics Card**, then this **Warning Message** is shown.

The **LumenRT** can still be ran if the **OK** button is pushed. However, graphic quality in the LumenRT software will be substandard.

28D – NAVIGATING AND SETTING UP LUMENRT

The graphic below shows the basic interface layout for LumenRT.

TIP*: When the LumenRT model is first generated, the zoom location may NOT show the project. Press the F5 key to center the zoom extents onto the project.



Toggle Tools (Tab): The vertical toolbar on the left-side of the interface is used to adjust settings, place objects, and take screenshots and video captures.

Navigation Tools: The horizontal toolbar on the bottom shows the mouse and keyboard operations used to navigate around the LumenRT model. Press the F1 key to see additional navigation keyboard commands.

This tool bar also shows the **Current Navigation Mode**, which could be either Fly-thru or Walk-thru. In Fly-thru mode, the LumenRT camera floats around the model. In Walk-thru mode, the camera is fixed to the surface of the model, at approximate eye-level. This mode is used to walk along the surface of the model. Press the F3 key to enter Walk-thru mode. Press the F4 key to return to Fly-thru mode.

Graphics Quality: The rendering quality of the graphics is denoted by the stars shown in the bottom-right corner. By default, LumenRT starts in AUTO mode. In AUTO mode, the graphics quality is dynamic depending on the processing requirements of the current camera location and the User's computer hardware capabilities. Left-Click on a star to exit AUTO mode and maintain a constant graphic quality.

TIP: To improve performance while placing objects and moving around in LumenRT, left-click on the first star. This will lock the graphics quality to the lowest level. Change to 5 stars when taking screenshots.

TIP: To improve performance, press F1 to show additional navigation/operation options. UNCHECK the "Signal BIM info with blue highlight" box. When this box is CHECKED, then objects are highlighted when the mouse cursor is hovered over them, which makes it difficult to select objects and reduces performance. ALWAYS keep the "Signal BIM info with blue highlight" box UNCHECKED, because ORD elements do NOT contain BIM information.

28D.1 LumenRT Setup Recommendations (Units and LumenRT Pro)

Initially, LumenRT is set to Metric units. By default, tools and operations use Metric units for input. To change the units to Imperial, follow the steps below:

The screenshot shows the LumenRT Designer interface with several callout boxes providing instructions:

- Click the File settings**: Points to the gear icon in the top-left toolbar.
- Change LumenRT to Imperial Units**: A large purple box at the top center.
- TIP: Click the LumenRT Pro button to switch to LumenRT Pro if available (subscription required)**: A green box pointing to a small 'Pro' button in the top-right corner.
- Click the User settings**: Points to the gear icon in the left-hand settings panel.
- Expand the Miscellaneous drop-down**: Points to the 'MISCELLANEOUS' section in the settings panel.
- Change the Units to Imperial**: Points to the 'Units' dropdown menu in the settings panel, which is currently set to 'Imperial'.
- When pressed, Imperial Units will be used for future use of the software.**: A purple box pointing to the 'Imperial' option in the units dropdown.
- Press Save current config as default**: Points to the 'Save current config as default' button at the bottom of the settings panel.



The main window displays a 3D architectural rendering of a building complex on a hillside. The 'LumenRT Designer' logo is visible in the top right corner of the window.

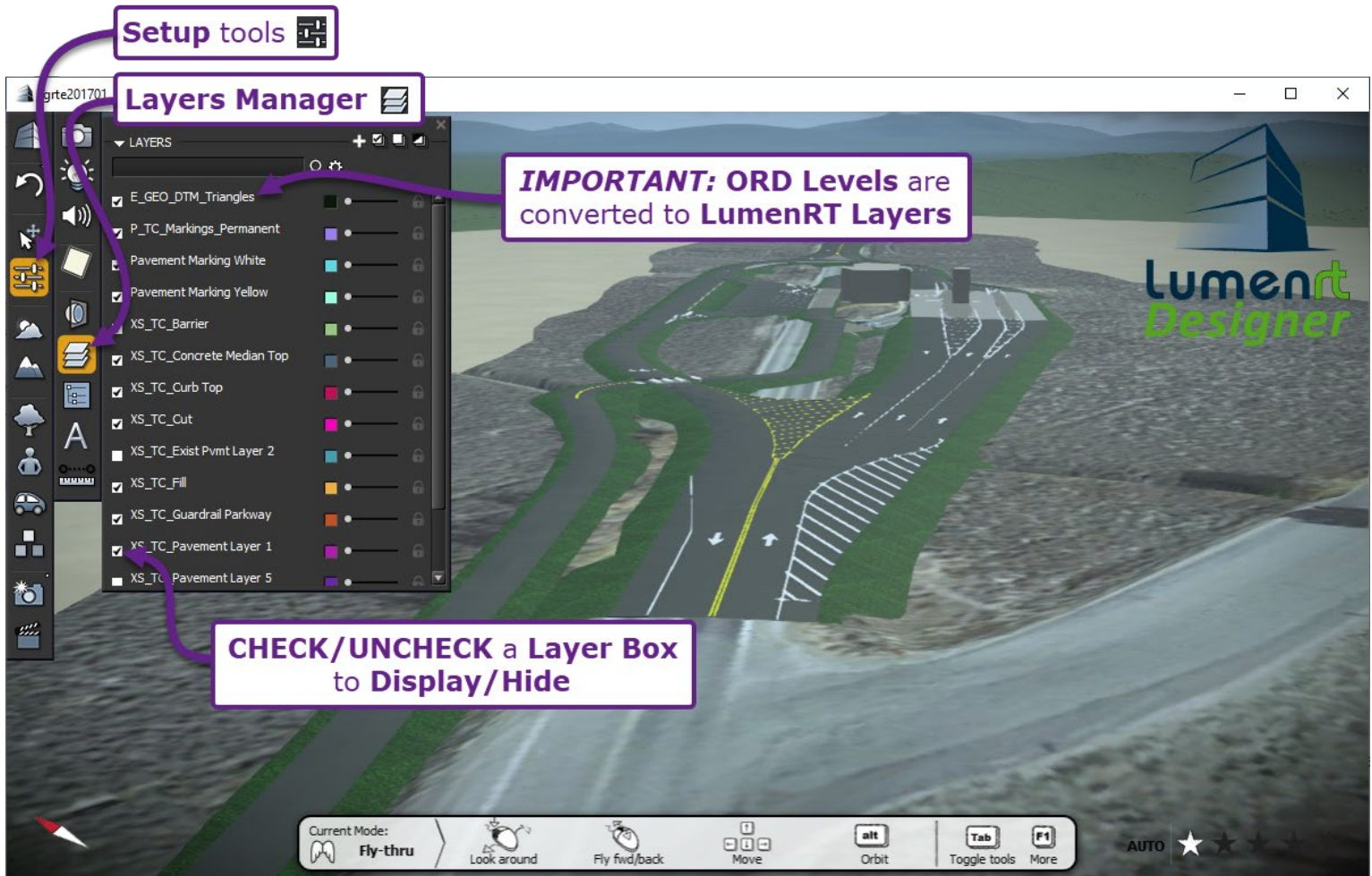
LumenRT Pro: By default, LumenRT Designer is opened when an ORD Model is exported. To switch to LumenRT Pro, push the LumenRT Pro button. See the **TIP:** in the graphic above.

28D.2 Turn OFF Layers (Levels) in LumenRT

LumenRT operates similarly to OpenRoads Designer for displaying and hiding elements. LumenRT has a **Layers Manager** for turn ON/OFF the display of objects.

NOTE: In ORD, elements are assigned to **Levels**. In LumenRT, elements/objects are assigned to **Layers**.

The **Layers Manager**  is accessed through the **Setup** tools :



28E – OVERALL WORKFLOW FOR LUMENRT

The recommended sequence for creating a LumenRT Model is as follows:

Modify the Material, Texture and Color for the imported ORD Elements.

28F – Modify the Material, Texture, and Color for ORD Elements



Select a Background for the LumenRT Model.

28G.1 Set the Background



Sculpt the LumenRT Terrain surrounding the ORD Elements.

28G.2 Terrain Sculpting Tools



Paint a Material onto the LumenRT Terrain.

28G.3 Paint the Terrain with a Material



Place Plants and Objects onto the LumenRT Terrain and ORD Elements.

28H – Place Plants and Objects



If necessary, Import Custom Objects into the LumenRT Model.

28H.4 Import a Custom Object



Place Vehicles and Characters in the LumenRT Model. Then, create an Animation Path for the Vehicles and Characters.

28I – Place Vehicles/Characters and Assign an Animation Path



Modify the Weather, Clouds, and Sun Position Settings.

28J – Modify the Weather, Clouds, and Sun Position



Record Videos and Screen Captures of the LumenRT Model.

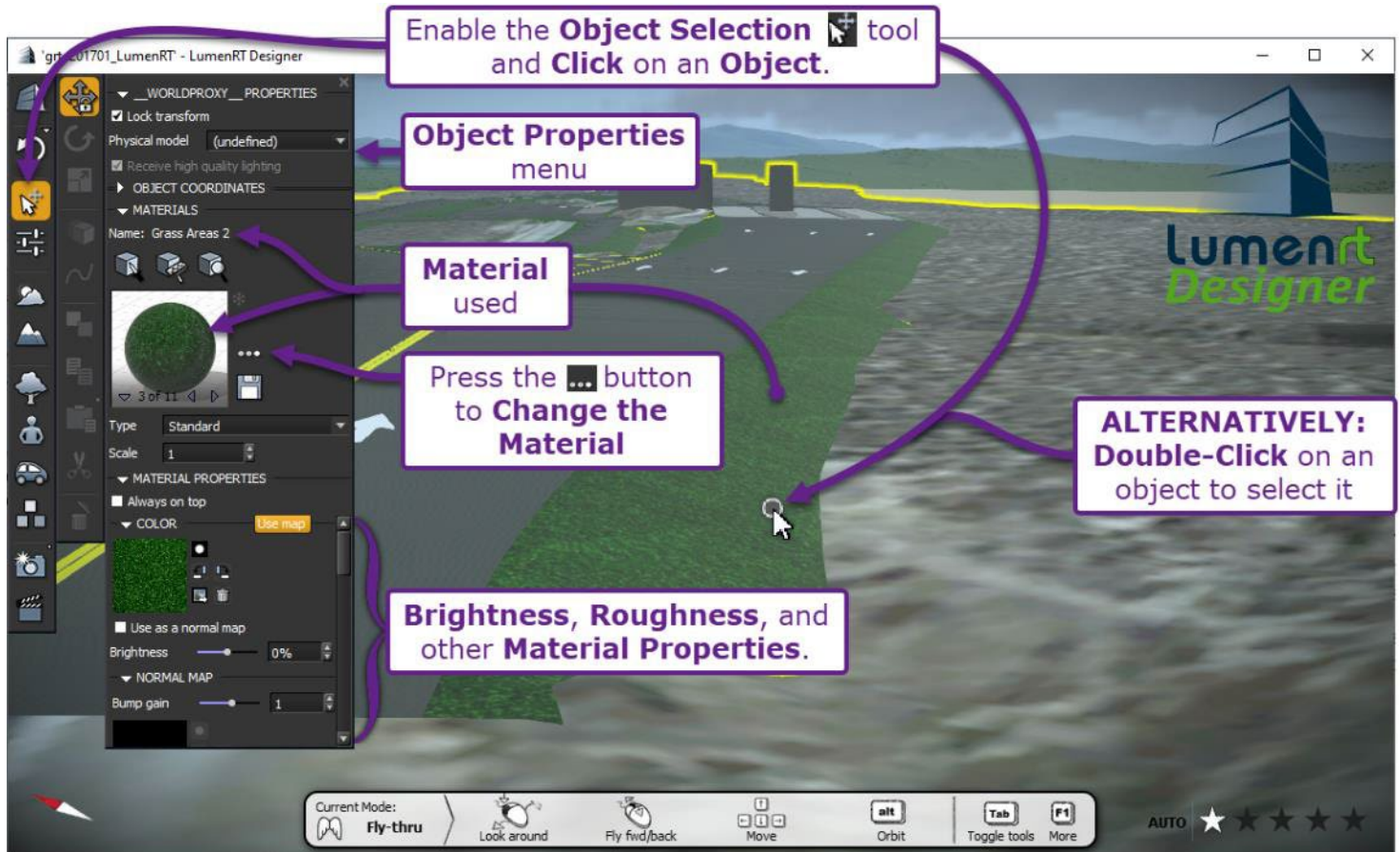
28K – Take Screenshots and Videos of the LumenRT Model.

28F – MODIFY THE MATERIAL, TEXTURE, AND COLOR FOR ORD ELEMENTS

Any exported ORD Element can be modified through the Object Properties menu. Some common modifications include changing the texture, color, brightness, or assigned material for an ORD Element.

The Object Properties menu is shown when an object is selected. To select an object, enable the Object Selection tool and click on it. Alternatively, do NOT enable the Object Selection tool and double-click on the object to edit.

The graphic below shows the Object Properties for the Fill Slope (grass) element generated by ORD.



Three common edits are made to ORD elements:

28F.1 Change the Material for Cut/Fill (grass) Slope elements

By default, the grass material used for Cut/Fill Slope elements is not very realistic. In the Object Properties, replace the grass material with a material found in the LumenRT Material Library.

The image is a composite screenshot of the LumenRT Designer interface, illustrating the steps to change the material for a grass slope element. The main 3D view shows a landscape with a grassy slope and a building. A purple arrow labeled '1' points to the slope, with a callout box: "Select a Cut/Fill Slope element to open the Object Properties." Another purple arrow labeled '2' points to a menu icon in the Object Properties panel, with a callout box: "Press the ... button to open the LumenRT Material Library." A third purple arrow labeled '3' points to the 'Grass' category in the Material Library window, with a callout box: "Select the Material Category. In this case, the Grass category is selected." A fourth purple arrow labeled '4' points to a specific grass material thumbnail in the library, with a callout box: "Click on a Material to select it." A final purple arrow labeled 'Grass Material updated' points to the updated material in the Object Properties panel. The Object Properties panel shows the material name as 'Material' and the type as 'Grass'. The Material Library window shows a grid of various grass materials, with 'Grass Tahoe' selected. The bottom of the screen shows the current mode as 'Fly-thru' and various navigation tools.

1 Select a Cut/Fill Slope element to open the Object Properties.

2 Press the ... button to open the LumenRT Material Library

3 Select the Material Category. In this case, the Grass category is selected

4 Click on a Material to select it

Grass Material updated

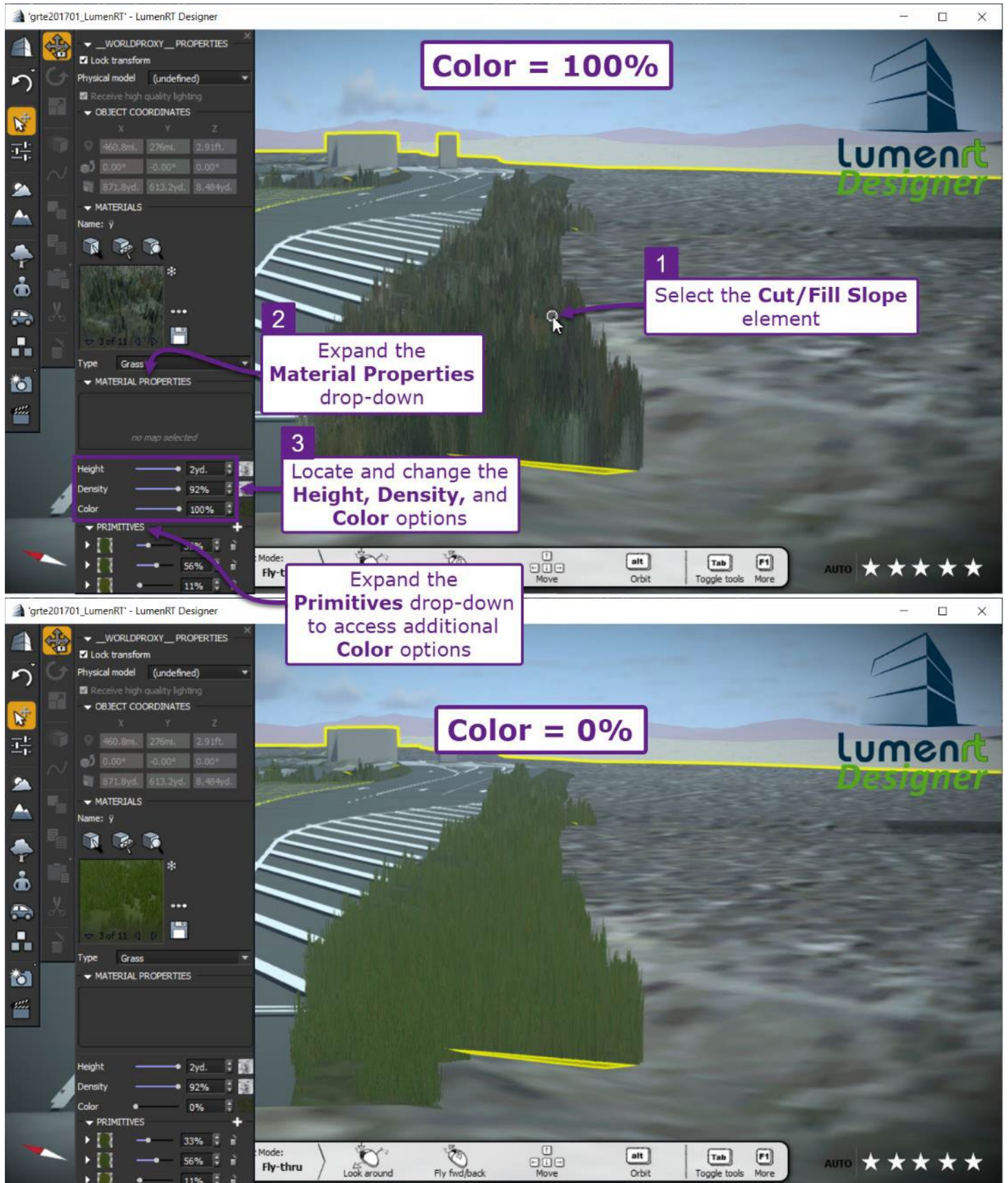
LumenRT Material Library

Current Mode: Fly-thru

Look around Fly fwd/back Move Orbit Toggle tools More

AUTO ★ ★ ★ ★ ★

TIP: The color, height, and density of the grass can be modified to better match project conditions. These options are located under the **Material Properties** drop-down.



28F.2 Change the Brightness for Aerial draped onto the Terrain Model

It may be necessary to brighten or dim the aerial image. This is accomplished by selecting the Terrain Model/Aerial and changing the **Brightness** in the Object Properties.

The image consists of two screenshots from the LumenRT Designer software interface, illustrating the steps to adjust the brightness of an aerial image draped on a terrain model.

Top Screenshot: The aerial image is dimmed. A callout box indicates "Aerial Brightness = 46%". Three numbered callouts provide instructions:

1. Select the Terrain Model/Aerial element (indicated by a mouse cursor pointing to the terrain).
2. Expand the Material Properties drop-down (indicated by an arrow pointing to the "MATERIAL PROPERTIES" section in the left sidebar).
3. Locate and change the Brightness option (indicated by an arrow pointing to the "Brightness" slider in the "MATERIAL PROPERTIES" section, which is currently set to 46%).

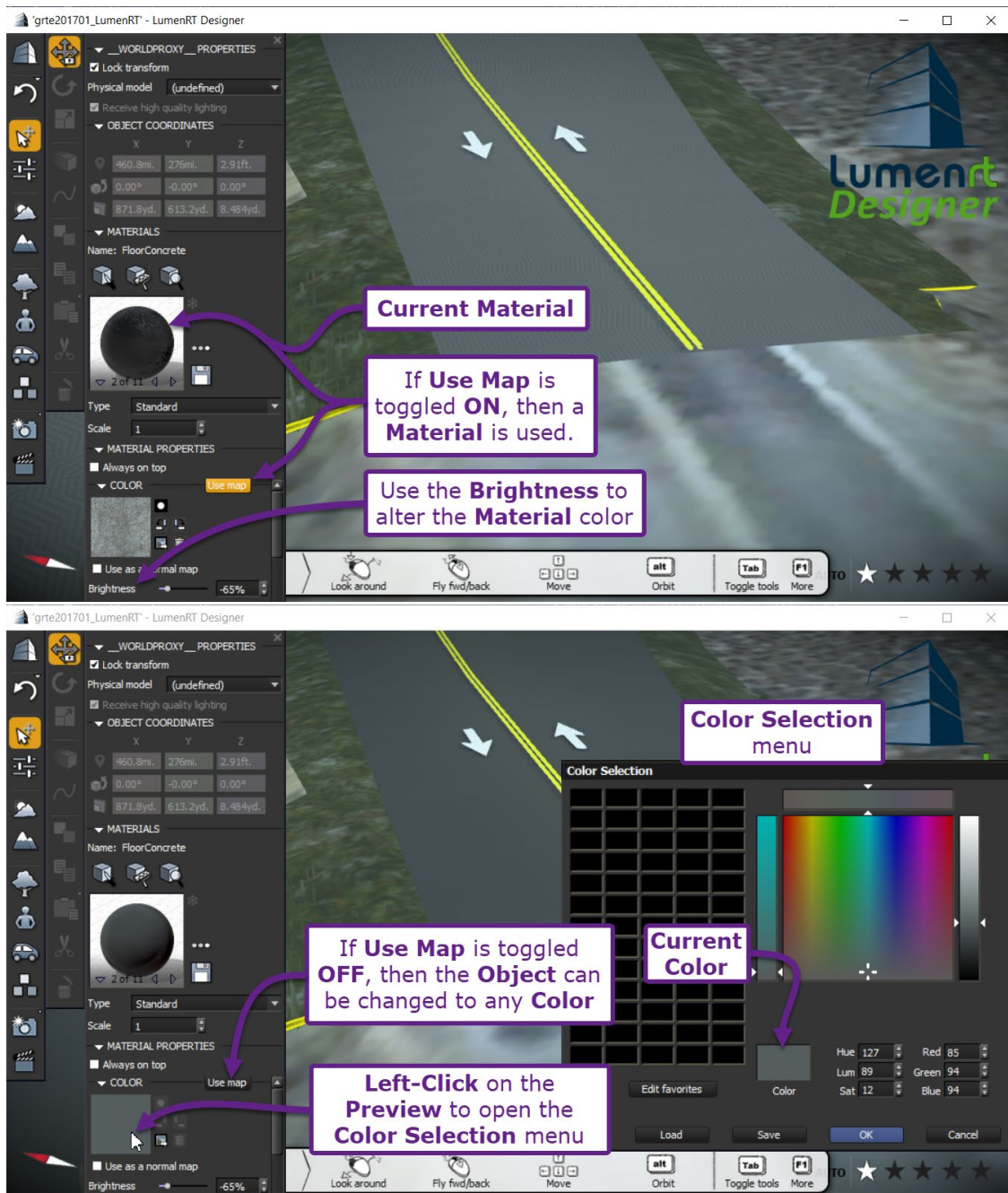
Bottom Screenshot: The aerial image is now bright. A callout box indicates "Aerial Brightness = 100%". The "Brightness" slider in the "MATERIAL PROPERTIES" section is now set to 100%. The "Fly-thru" mode is selected in the bottom toolbar.

28F.3 Change the Pavement Color

The color of the ORD Pavement element can be changed to better match the adjacent existing pavement shown in the draped aerial image.

Select the ORD Pavement element to open the Object Properties. Under the **Color** drop-down, there is a preview of the current Material and the "Use Map" toggle. When "Use Map" is toggled ON, then the current Material establishes the color for the Object. **NOTE:** The Color of the Material can be altered by modifying the Brightness option.

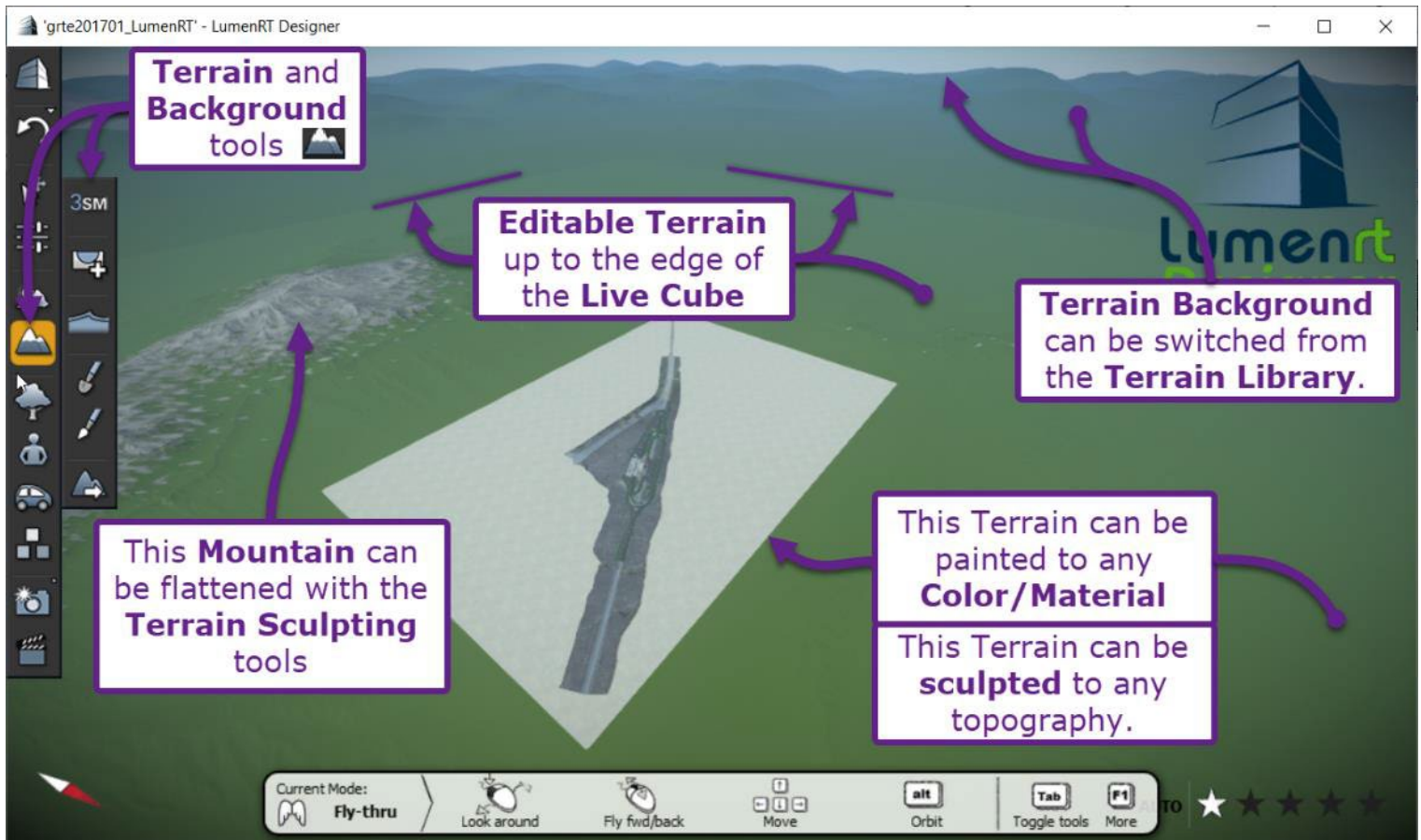
When "Use Map" is toggled OFF, then the Material is NOT used, and Object appears as a single solid color. When "Use Map" is toggled OFF, then the **Color Selection Menu** is used to set the color of the Object.



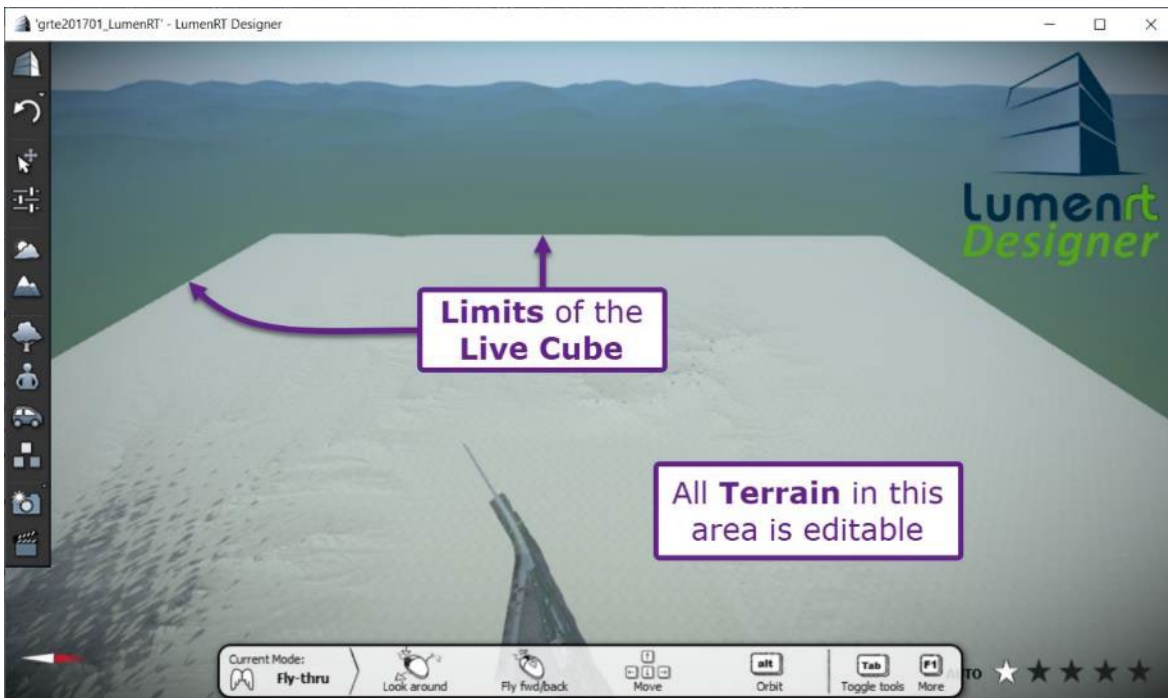
NOTE: LumenRT does NOT have Asphalt materials available in the Material Library. However, Concrete materials are available. As an alternative to the procedure shown above, change the ORD Pavement element material to a Concrete material found in the Material Library. Use the Brightness option to change the color of the Concrete Material.

28G – SELECT A BACKGROUND AND SCULPT THE TERRAIN

The topography and background of the LumenRT Model is modified with **Terrain** and **Background** tools:



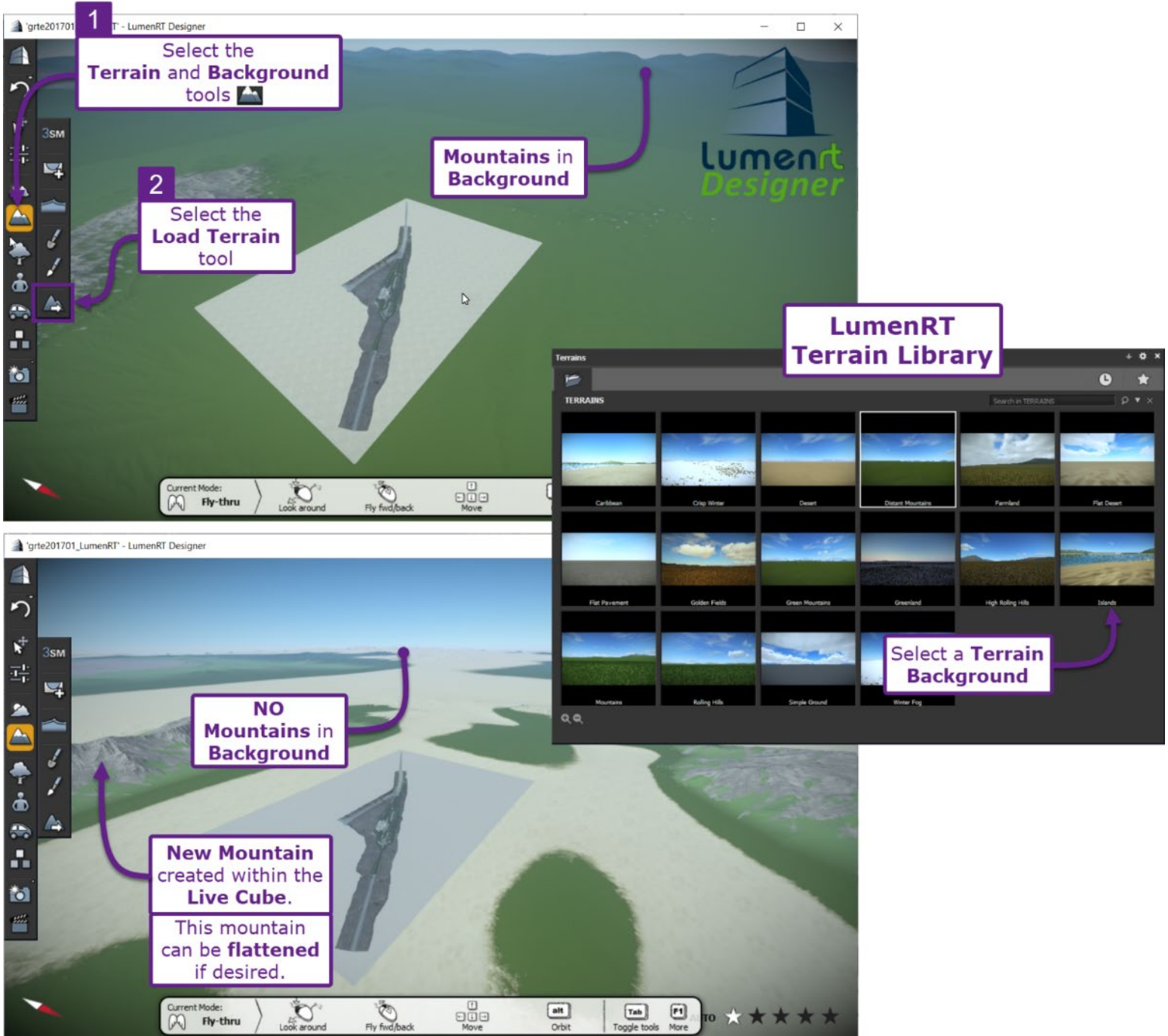
NOTE: The term **Live Cube** refers to the workable space in the LumenRT model. In the graphic below, the entire surface of the Live Cube has been painted to the same material to clearly show the limits.



28G.1 Set the Background

LumenRT has a library of pre-created Terrain Backgrounds to simulate the project environment. Use the **Load Terrain** tool to switch the background.

NOTE: The selected Background also affects the Terrain within the limits of the Live Cube. When a Background is switched, new terrain features (i.e., mountains and hills) are created within the Live Cube.

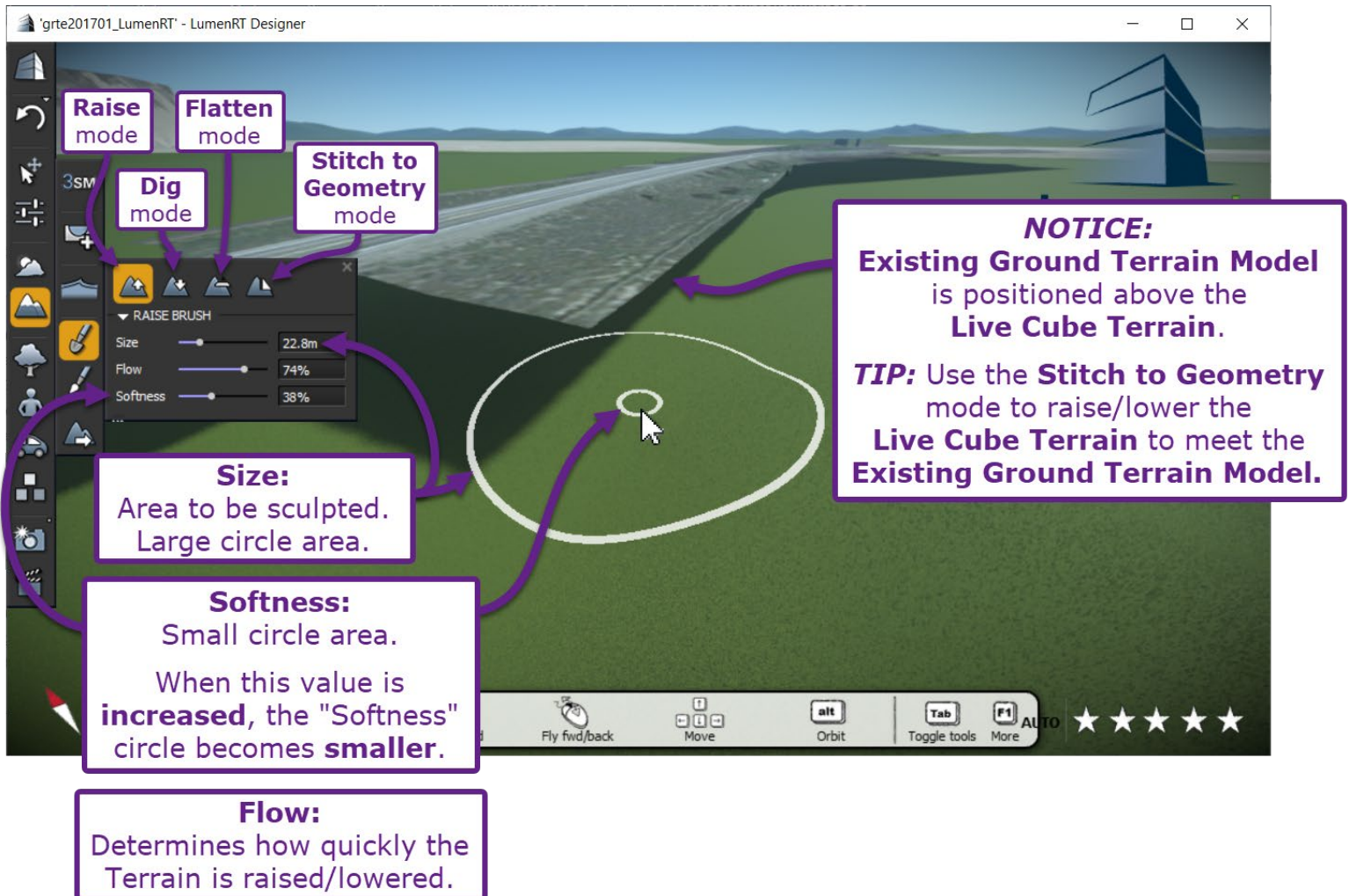


TIP: Use the "Simple Ground" terrain to create a flat topography that can be sculpted as desired.

TIP: A custom Background can be loaded if a HDRI map is available for the project. A HDRI map is a 360° panoramic image take from a single viewpoint. The HDRI map is shown beyond the Live Cube. Adding a HDRI map is accomplished in the **Weather and Season** settings. See [28J - Modify the Weather, Clouds and Sun Position](#).

28G.2 Terrain Sculpting Tools

The Sculpt Terrain tool is used to raise or lower the Terrain within the Live Cube. This tool has four modes:



Raise mode: Used to raise the elevation of the Live Cube terrain. Only the area in the "Size" (large circle) area is raised. If "Softness" is set to 100%, then the terrain is raised in a cone formation. If "Softness" is set to 0%, then the terrain is raised in a flat-top, cylinder formation.

Dig mode: Used to lower the elevation of the Live Cube terrain.

Flatten Mode: With this mode, the elevation of the terrain in the "Size" circle is raised/lowered to match the elevation within the "Softness" circle. **TIP:** Set the "Softness" circle to 100% when using this tool. The terrain in the "Size" circle will raise/lower, to meet the elevation at the location of the mouse cursor. If the "Softness" circle is set to 0%, then the terrain is raised/lowered to meet the average elevation in the "Softness" circle.

Stitch to Geometry mode: This mode is used to raise/lower the Live Terrain to meet the elevation of an object, such as the Existing Ground Terrain Model or other ORD elements.

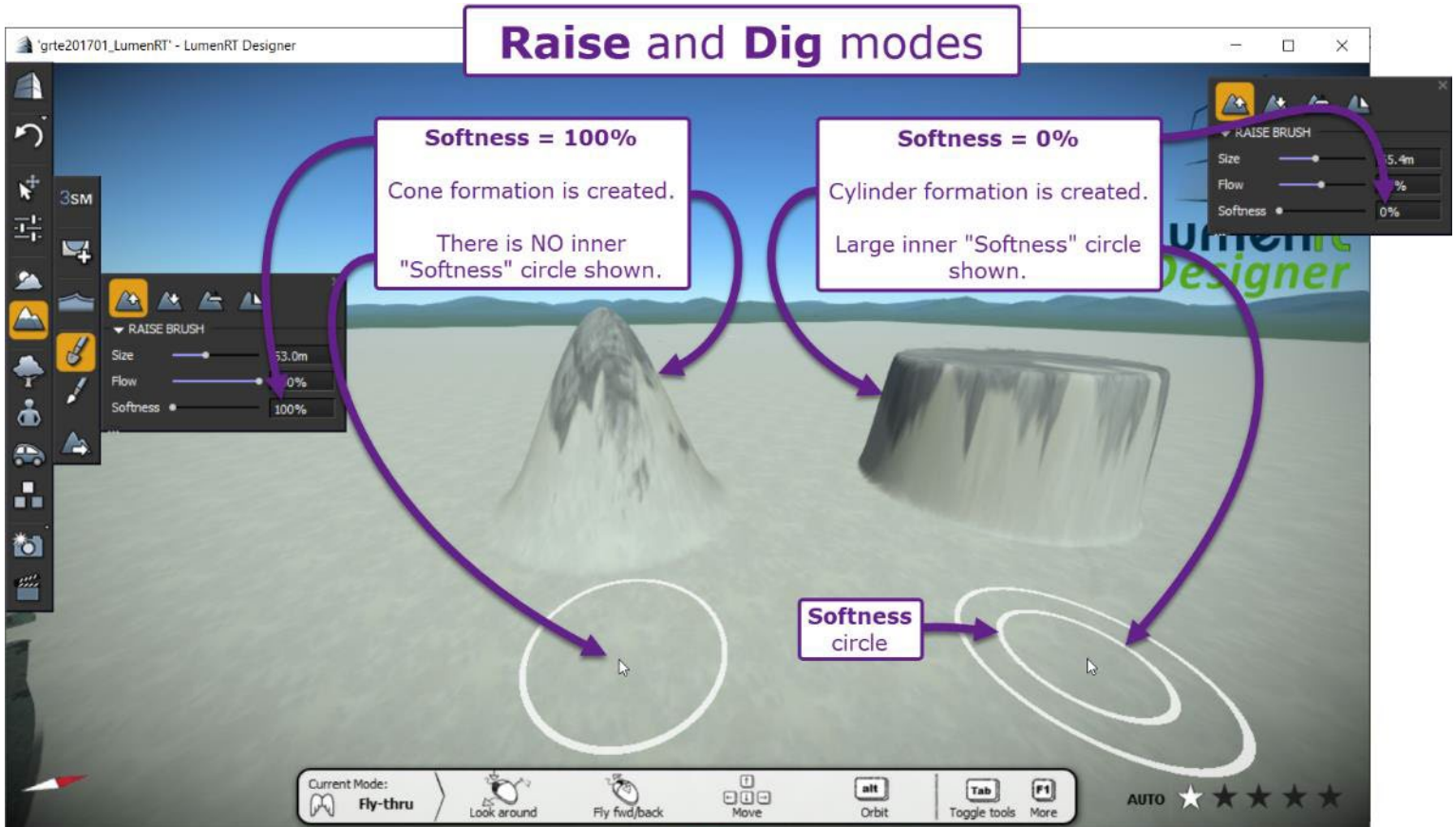
BACKGROUND INFORMATION: Initially, there may be slight elevation discrepancies between the Existing Ground Terrain Model and the Live Cube terrain, as shown in the graphic above. Portions of the Existing Ground Terrain Model may appear floating above or beneath the Live Cube terrain. Use this mode to rectify the elevation discrepancy. See [28G.2.b Stitch to Geometry Mode](#).

28G.2.a The "Softness" Parameter and Terrain Sculpting Tips

The "Softness" parameter is represented by the inner circle within the larger "Size" circle. The diameter of the "Softness" circle will increase when the "Softness" parameter is decreased.

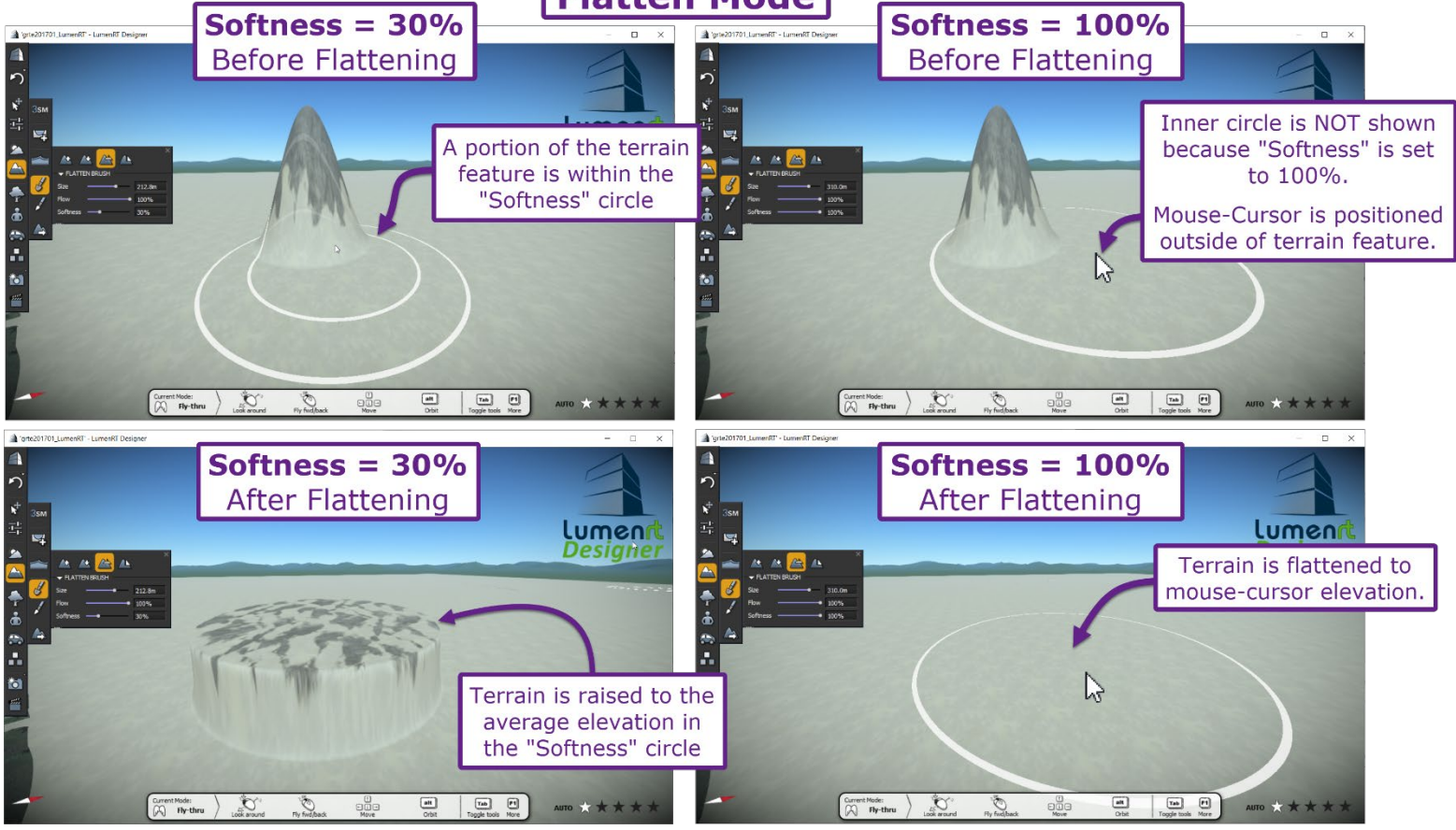
The "Softness" parameter functions differently depending on the selected mode.

Raise and Dig modes: In these modes, the "Softness" parameter affects the shape of the terrain. If set to 100%, then a cone formation is created. If set to 0%, then a flat-top, cylinder formation is created.



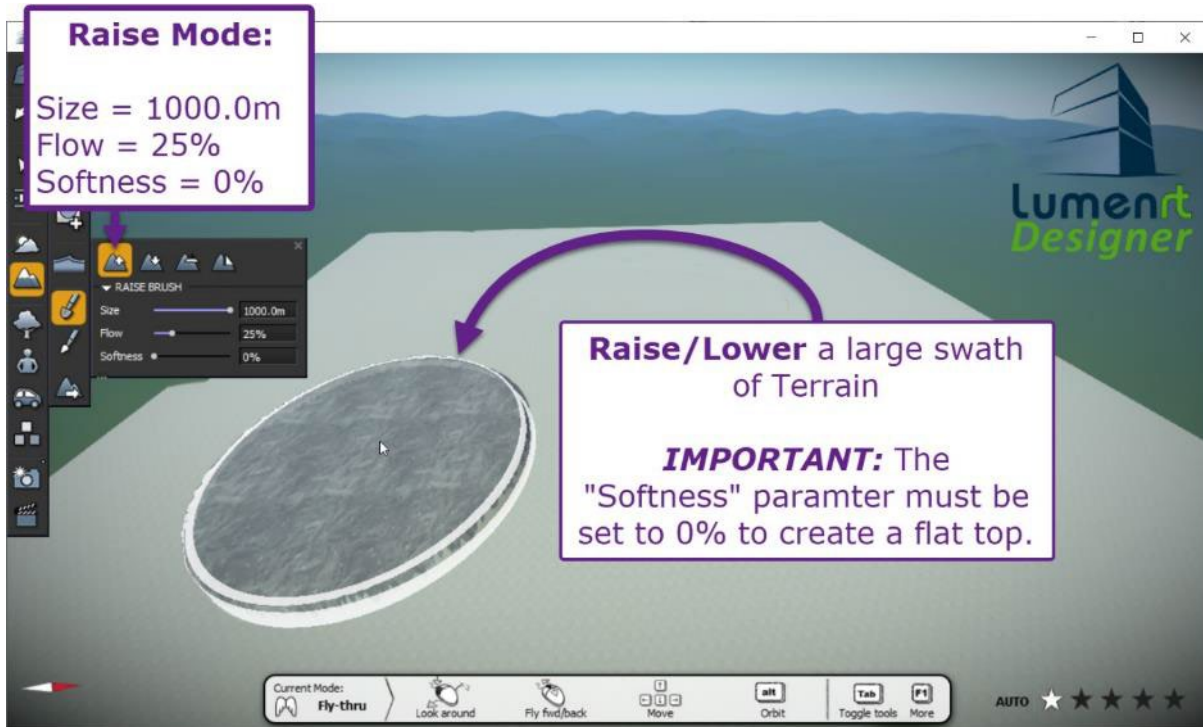
Flatten mode: In this mode, the "Softness" parameter affects the elevation which the terrain is flattened to. All terrain in the larger "Size" circle is raised/lowered to the average elevation in the smaller "Softness" circle. If "Softness" is set to 100%, then the terrain is raised/lowered to current elevation at the mouse-cursor.

Flatten Mode

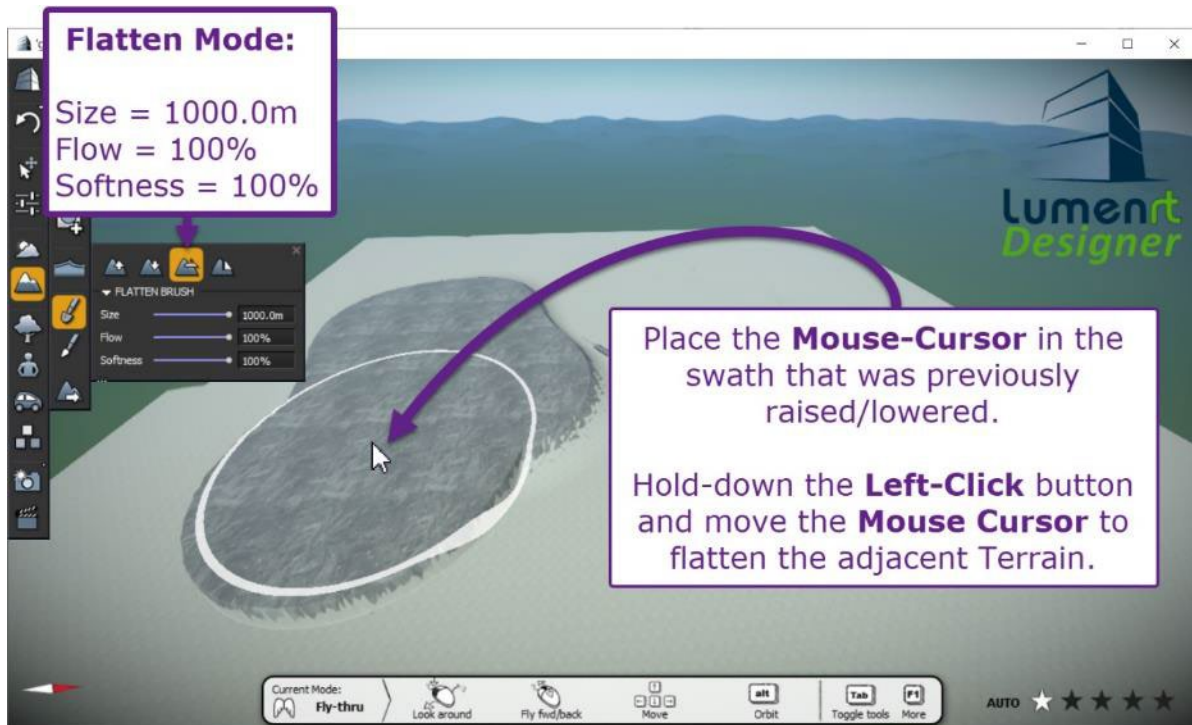


TIP: There is NOT a tool for raising or lowering the entire elevation datum of the Live Cube terrain.

As a workaround, use the **Raise** or **Dig** mode with the "Softness" parameter set to 0% and the "Size" parameter set to a large value (i.e., 1000m). Also, set the "Flow" parameter to a relatively small value (i.e. 25%). This combination of parameters allows a large swath of terrain to be raised/lowered in a controlled operation.

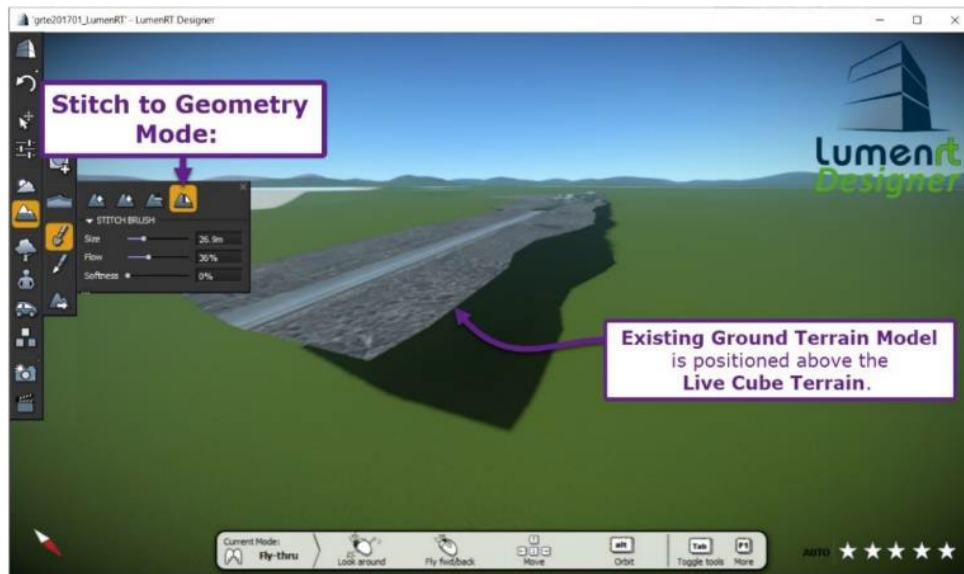


Next, use the **Flatten** mode to raise/lower the remaining terrain area. Set the "Softness" parameter to 100% and the "Flow" parameter to a relatively large value (i.e., 100%). Place the mouse-cursor in the swath of terrain that was raised/lowered in the previous step. Hold down the left-click button and move the mouse-cursor around to raise/lower the adjacent areas.



28G.2.b Stitch to Geometry Mode

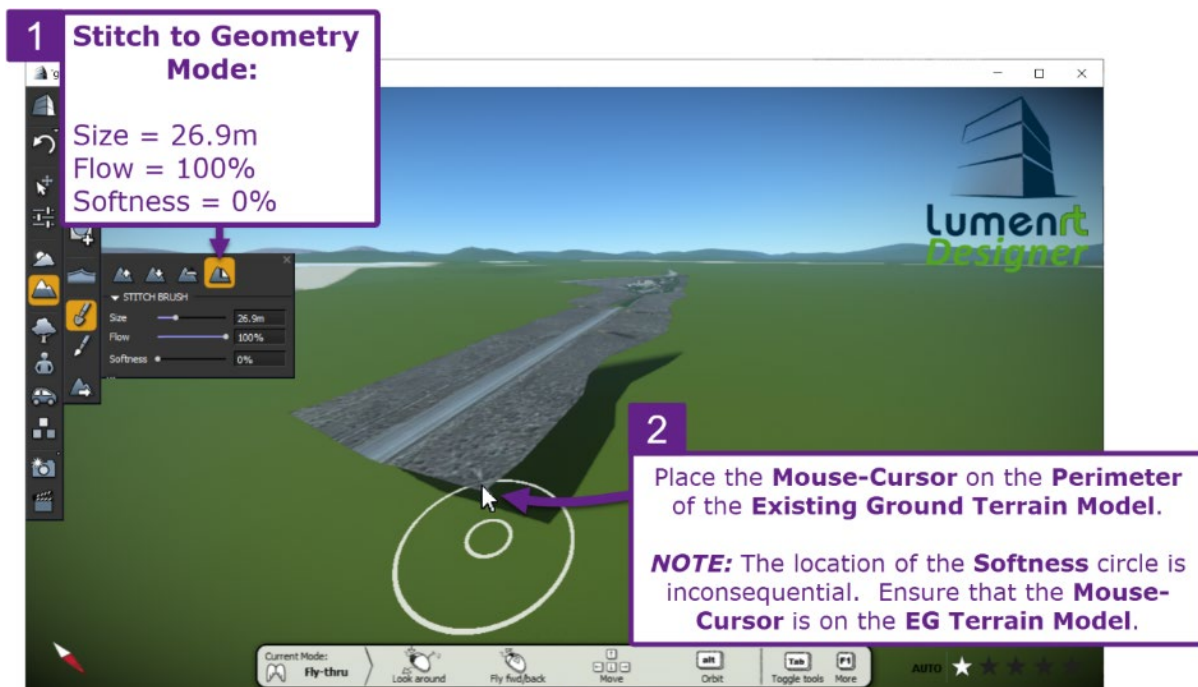
The **Stitch to Geometry Mode** is primarily used to raise/lower the LumenRT Terrain to meet the elevation of the Existing Ground Terrain Model or other ORD objects. This mode analyzes the elevation of the Existing Ground Terrain Model (or other ORD Objects) at the current location of the mouse-cursor. All Live Cube terrain in the "Size" circle is raised/lowered to meet the ORD Object elevation.

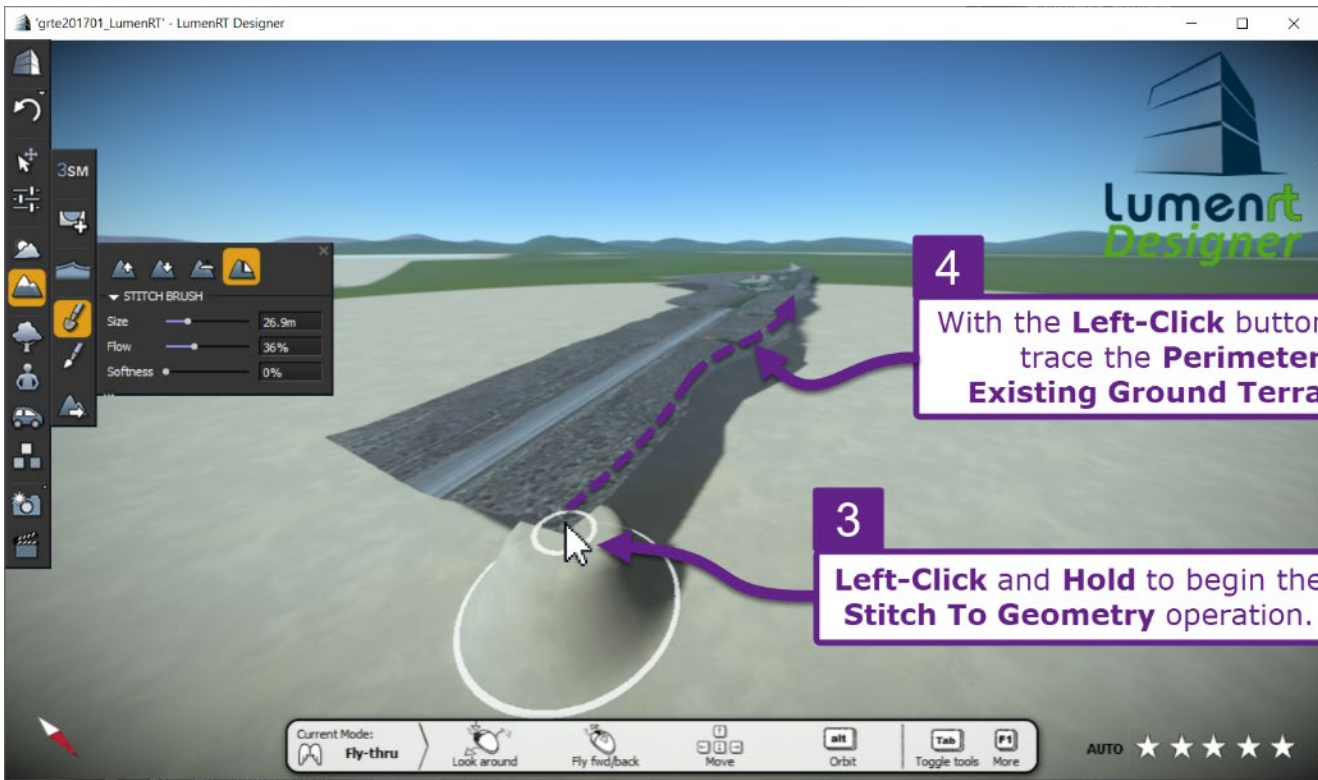


In the workflow shown below, the **Stitch to Geometry** mode is used to raise the LumenRT terrain to meet the perimeter the Existing Ground Terrain Model. In this operation, the User must move the mouse-cursor along the perimeter of the Existing Ground Terrain Model.

Set the "Size" parameter to a relatively small value (i.e., 27.0m). This is recommended to account for elevation changes along the perimeter Existing Ground Terrain Model. If the "Size" is too large, then changes in elevation may be covered up by the Live Cube terrain.

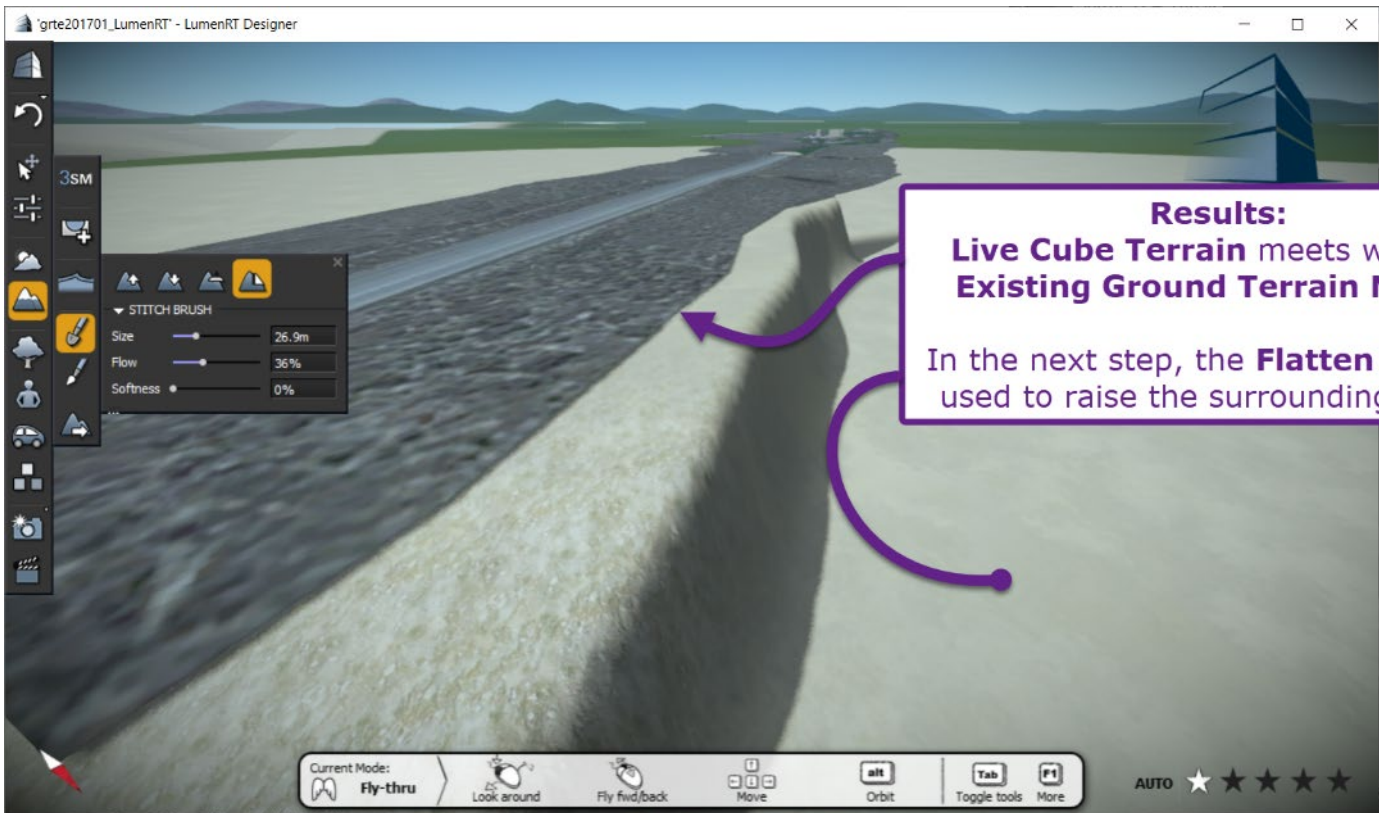
Set the "Flow" to 100% to quickly raise/lower the Live Cube terrain. Set the "Softness" to 0% to ensure the Live Cube terrain is raised/lowered with a flat top.





4
With the **Left-Click** button held down, trace the **Perimeter** of the **Existing Ground Terrain Model**.

3
Left-Click and Hold to begin the **Stitch To Geometry** operation.



Results:
Live Cube Terrain meets with the **Existing Ground Terrain Model**.
In the next step, the **Flatten Mode** is used to raise the surrounding areas.

Use the **Flatten Mode** to raise the surrounding area to meet with the ridge created in the previous step. Place the mouse-cursor on the edge of the ridge. Trace the edge of the ridge to expand it. This operation will require many passes along the ridge edge to flatten a sufficient area.

5 Flatten Mode:
Size = 26.9m
Flow = 100%
Softness = 100%

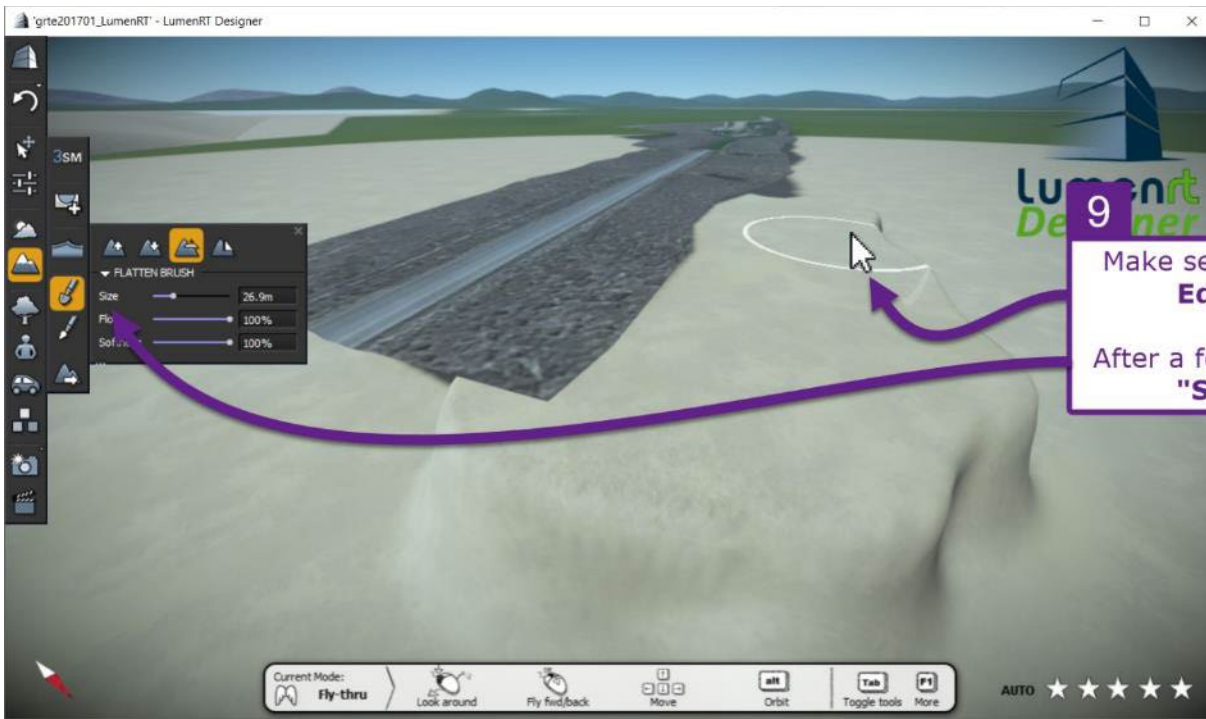
6 Place the **Mouse-Cursor** on the **Edge** of the **Live Cube Terrain** ridge.
IMPORTANT: Ensure that **Softness** is set to 100% for this **Flatten Mode** operation.

7 **Left-Click** and **Hold** to begin the **Flatten** operation.

8 With the **Left-Click** button held down, trace the **Edge** of the **Ridge**.

Current Mode: Fly-thru | Look around | Fly fwd/back | Move | Orbit | Toggle tools | More | AUTO ★★★★★

NOTE: Begin this operation with the "Size" parameter at a relatively small value. If the "Size" is increased, then the Existing Ground Terrain Model may be covered up. On each pass along the ridge edge, increase the "Size" to flatten a larger area without covering up the Existing Ground Terrain Model.

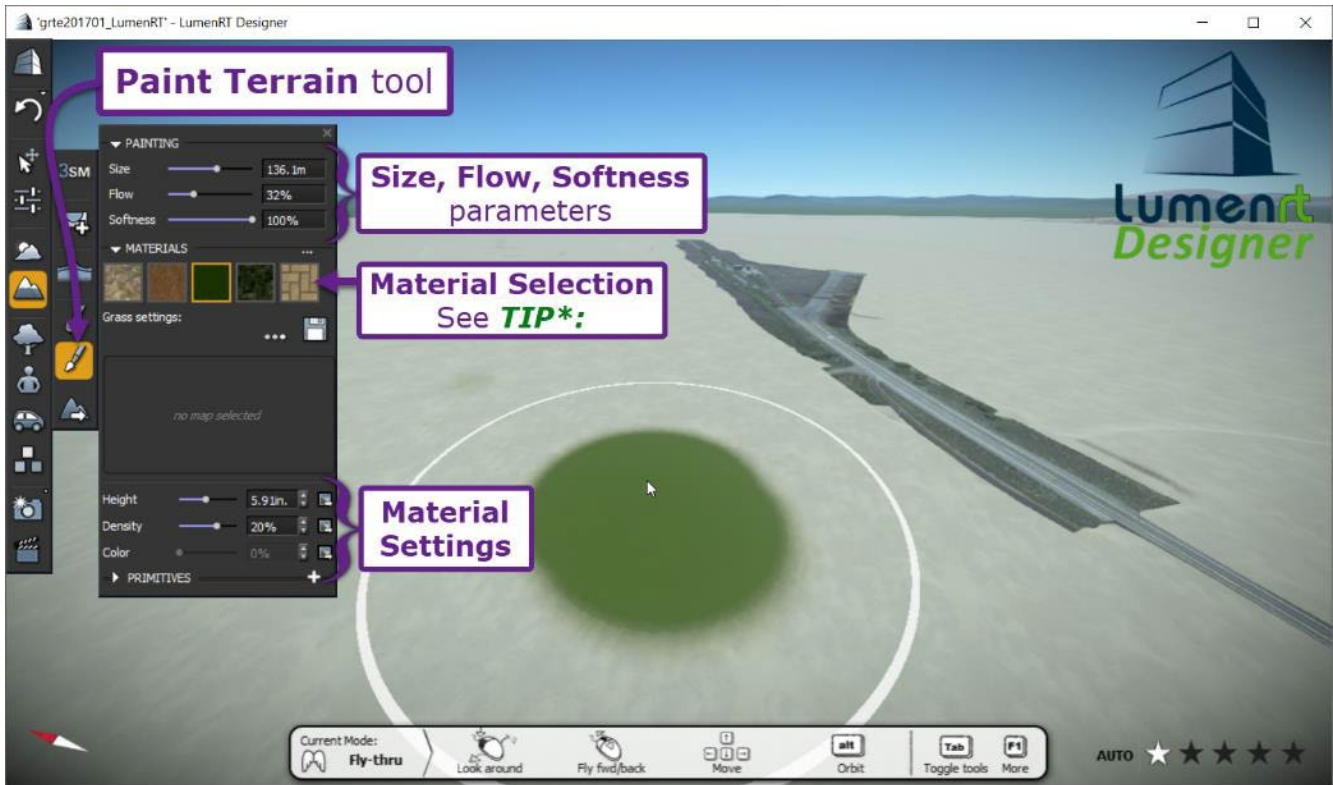


9
Make several passes along the **Edge** of the **Ridge**.
After a few passes, increase the **"Size"** Parameter.

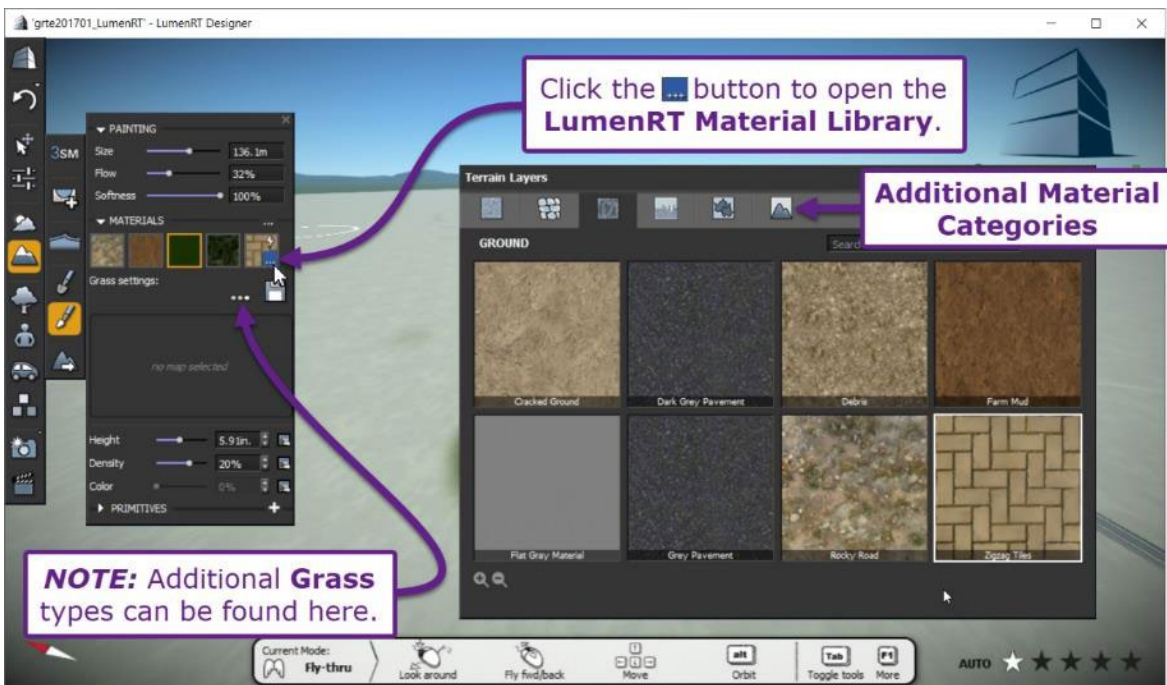
28G.3 Paint the Terrain with a Material

Using the **Paint Terrain** tool, the terrain surface of the Live Cube can be assigned a material.

NOTE: The "Size" and "Flow" parameters function the same as the Terrain Sculpting tools. The "Softness" determines the rate which the material spreads radially from the mouse-cursor location.




TIP*: By default, there are ONLY five materials shown in the **Material Selection** menu. Additional materials can be selected from the LumenRT Material Library. The Material Library Menu includes hardscape materials, such as asphalt and concrete. The LumenRT Material Library is ONLY accessible from the last material (furthest right) in the menu:

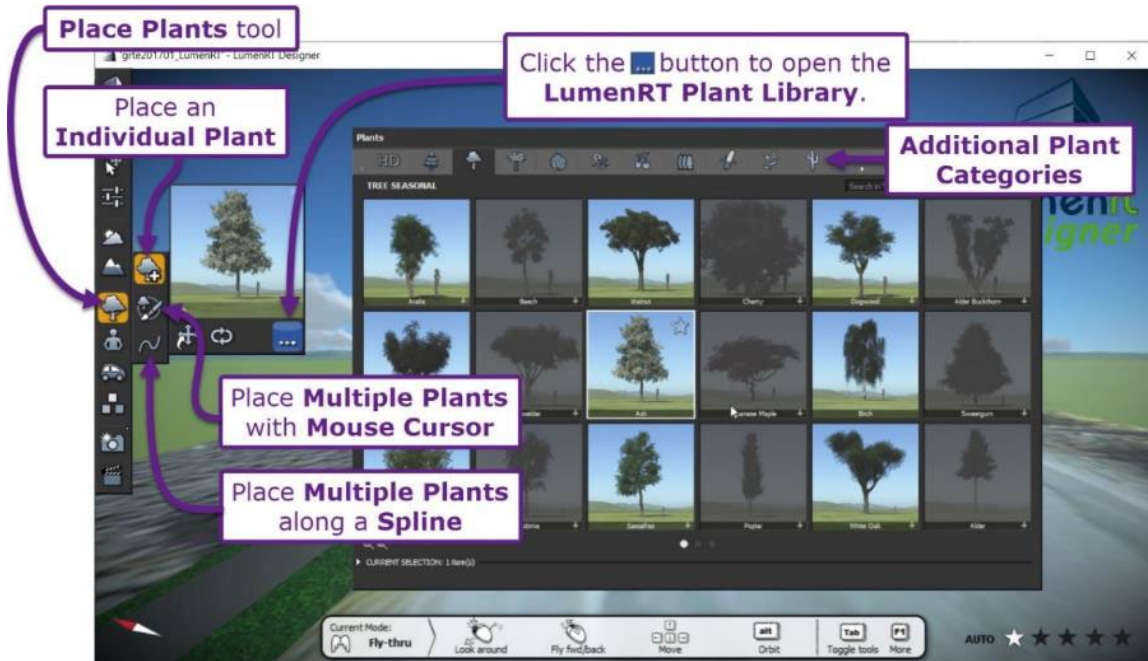



28H – PLACE PLANTS AND OBJECTS

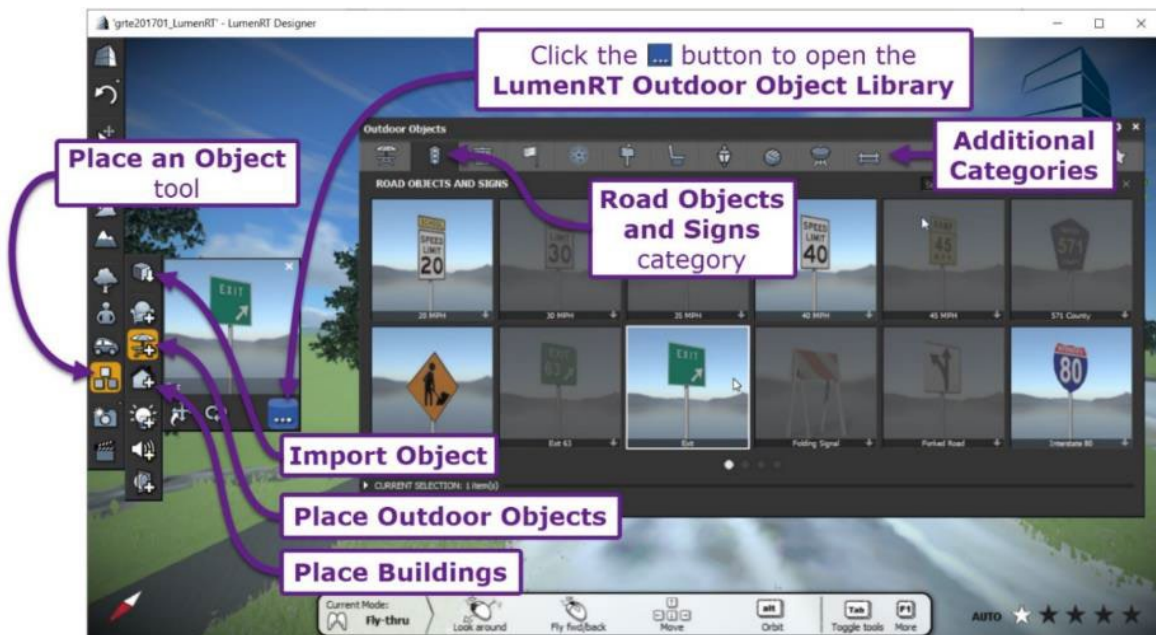
After the Live Cube Terrain has been sculpted, place plants and objects in the appropriate locations.

NOTE: By default, plants and objects are placed directly on top of the Live Cube Terrain and ORD Elements.

Place Plants tool : This tool is used to place trees and bushes on top of the Live Cube Terrain and ORD Elements. There are modes for either placing plants individually or in multiple plant clusters. **TIP:** In the **Weather and Season** settings, the **Season** setting affects the foliage of trees and plants. For example, if placed to winter, the trees will have no leaves. See [28J – Modify the Weather, Clouds, and Sun Position](#).



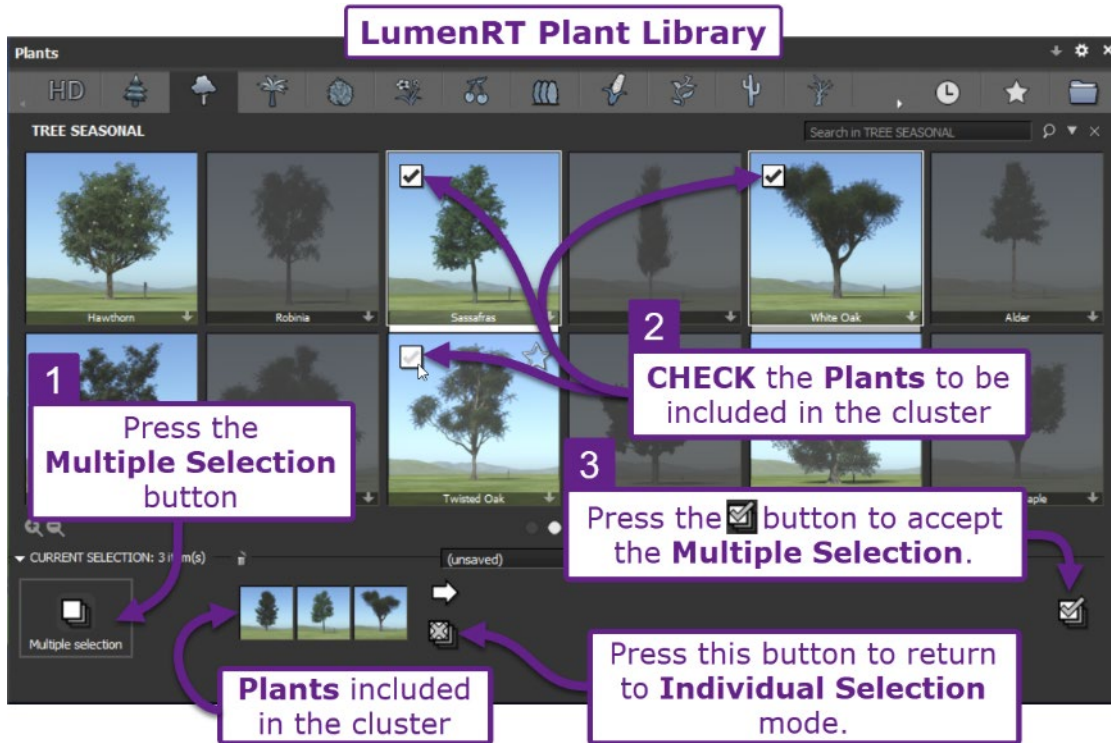
Place Objects tool : This tool is primarily used to place Outdoor Objects (i.e., Road Objects and Signs) and Buildings. Also, the **Import Object** tool is found in this location. The Import Object tool is used to place custom objects that were created in ORD or in a BIM software. For example, an architectural firm may create a proposed structure in Revit, which can be placed in the LumenRT model.




28H.1 Place Plants

To place either individual or multiple plants, open the LumenRT Plant Library to select plant(s).

If placing multiple plants in clusters, then multiple plant types can be selected to form the cluster. The process for selecting multiple plant types for a cluster is shown below:



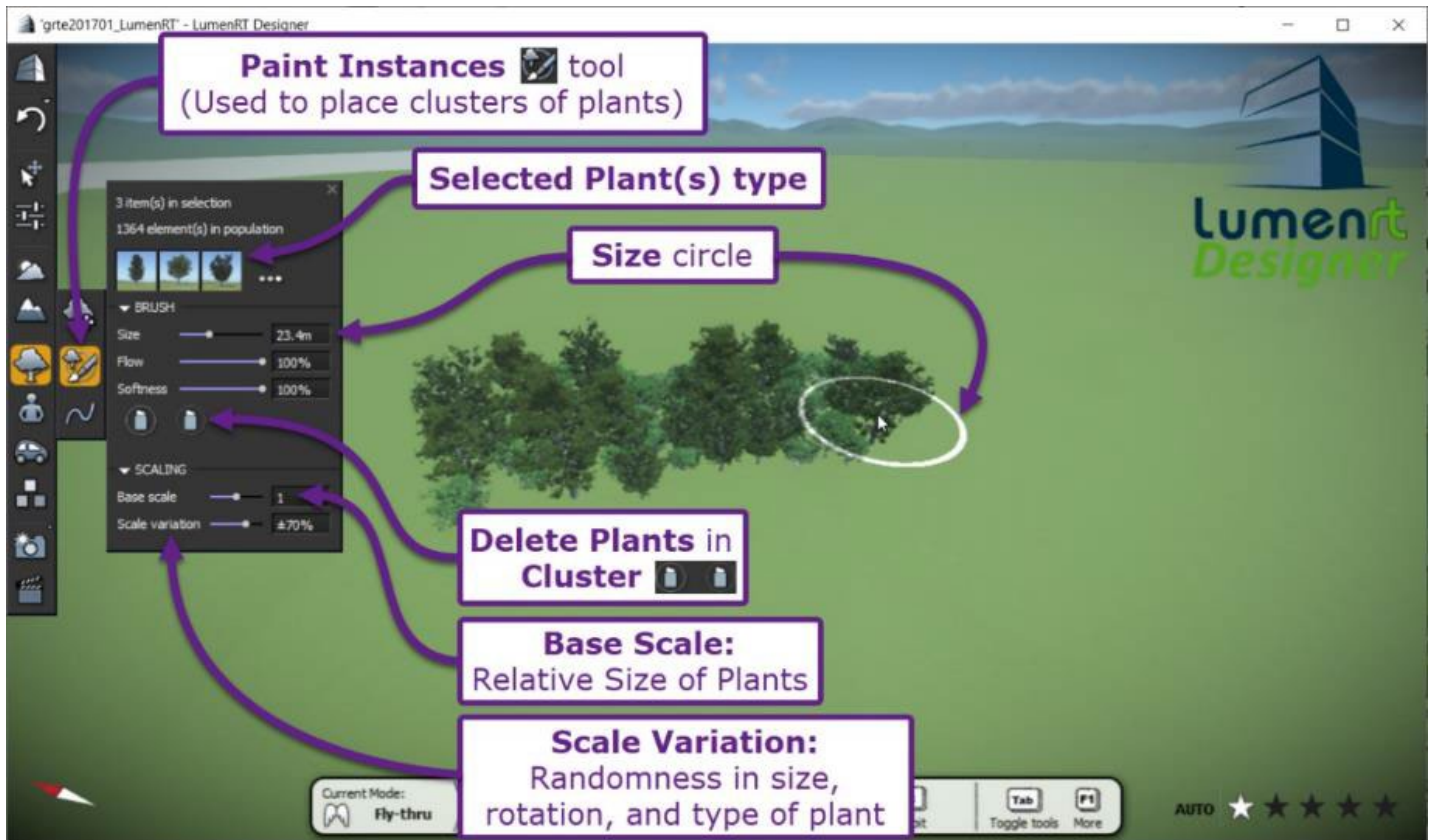
Place an Individual Plant: When placing an individual plant, consider toggling the  button. If this button is toggled OFF (default), then the plant is automatically selected for editing after placement. If toggled ON, then several individual plants can be placed consecutively.



Placing Multiple Plants in Clusters: The *Paint Instances* tool is used to create clusters of plants by moving around the mouse-cursor. Each plant in the cluster is created with a slightly different size (scale) for a sense of randomness. **TIP:** The cluster can consist of multiple plant types or a single type.

WARNING: Placing large plant cluster significantly reduces the performance of the LumenRT model and may crash the software.

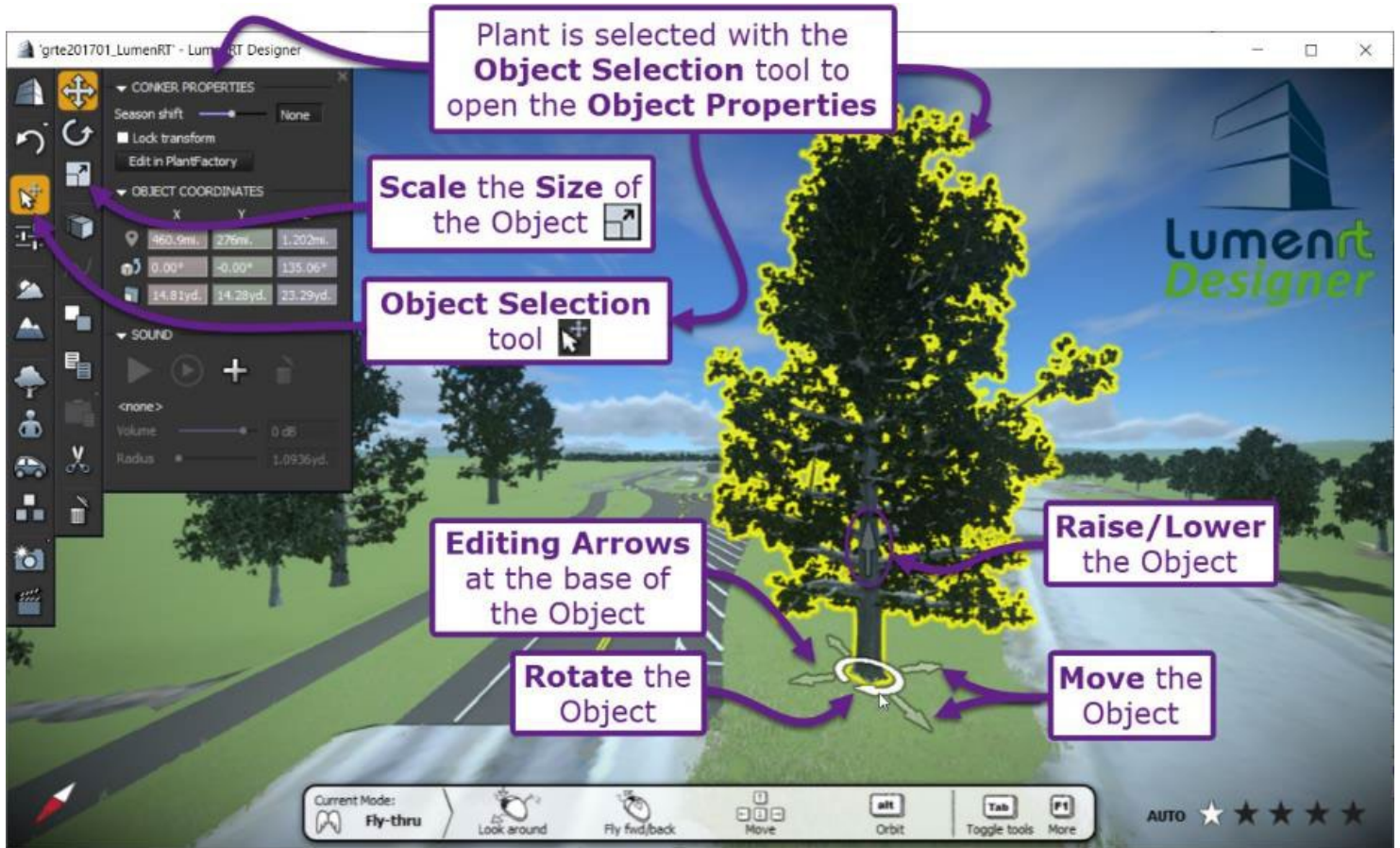
TIP: This tool may require single click to start the plant cluster and then click and drag the mouse cursor to form the plant cluster.



28H.2 Edit, Move, Rotate, and Scale an Object after Placement

After placing an object, it can be moved, rotated, and/or scaled in size. For editing purposes, the object must be selected, and the Object Properties must be shown. After the object is selected, editing arrows are shown near the base of the object. Hold down the Left-Click button and move the editing arrow to reposition the object.

TIP: To scale the size of an object, first the  button must be selected in the Object Properties menu.

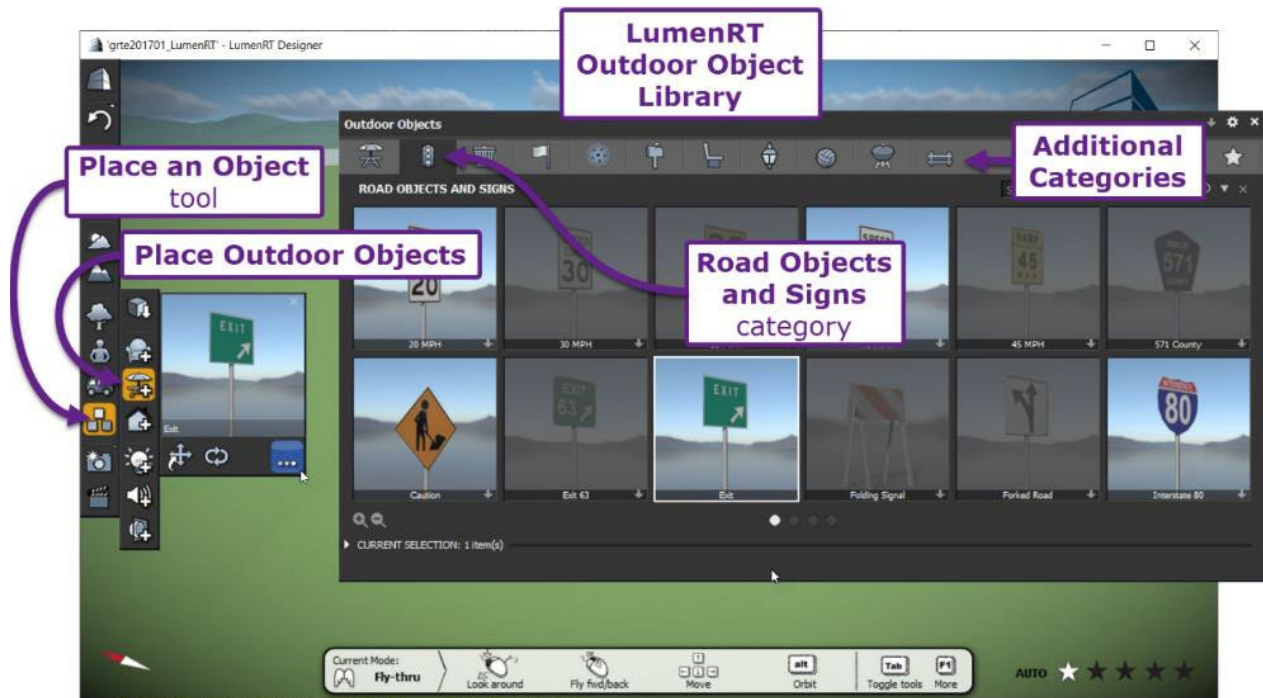


28H.3 Place Objects

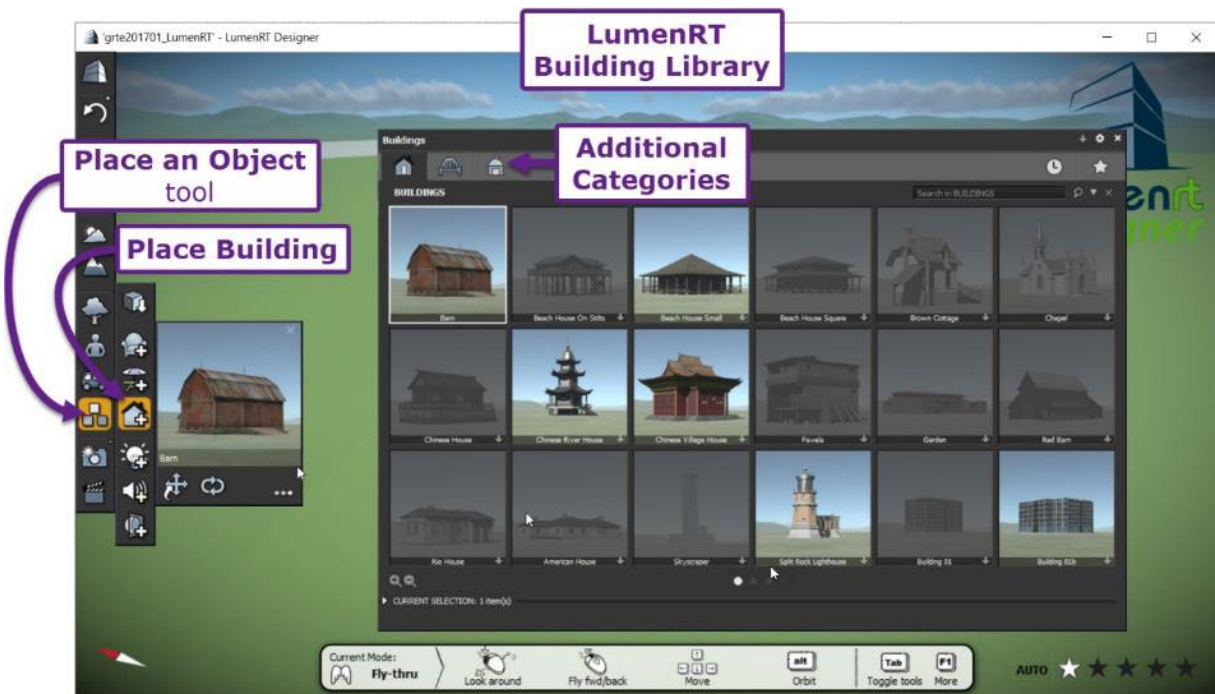
Placing and editing objects is like placing and editing plants. See [28H.1 Place Plants](#) and [28H.2 Move, Rotate, and Scale an Object after Placement](#).

Among the several tools for placing objects, the most applicable object placement tools for FLH projects are the **Place Outdoor Object** and **Place Building** tools. The signage and buildings options found in LumenRT are limited. For a complete LumenRT Model, it may be necessary to import custom objects.

Place Outdoor Objects tool: This tool contains pre-created objects for placing signage, traffic lights, traffic cones/barrels, flag poles, manholes, benches, trash cans, mailboxes, and bike racks.



Place Building tool: This tool contains pre-created buildings and footbridges.



28H.4 Import a Custom Object

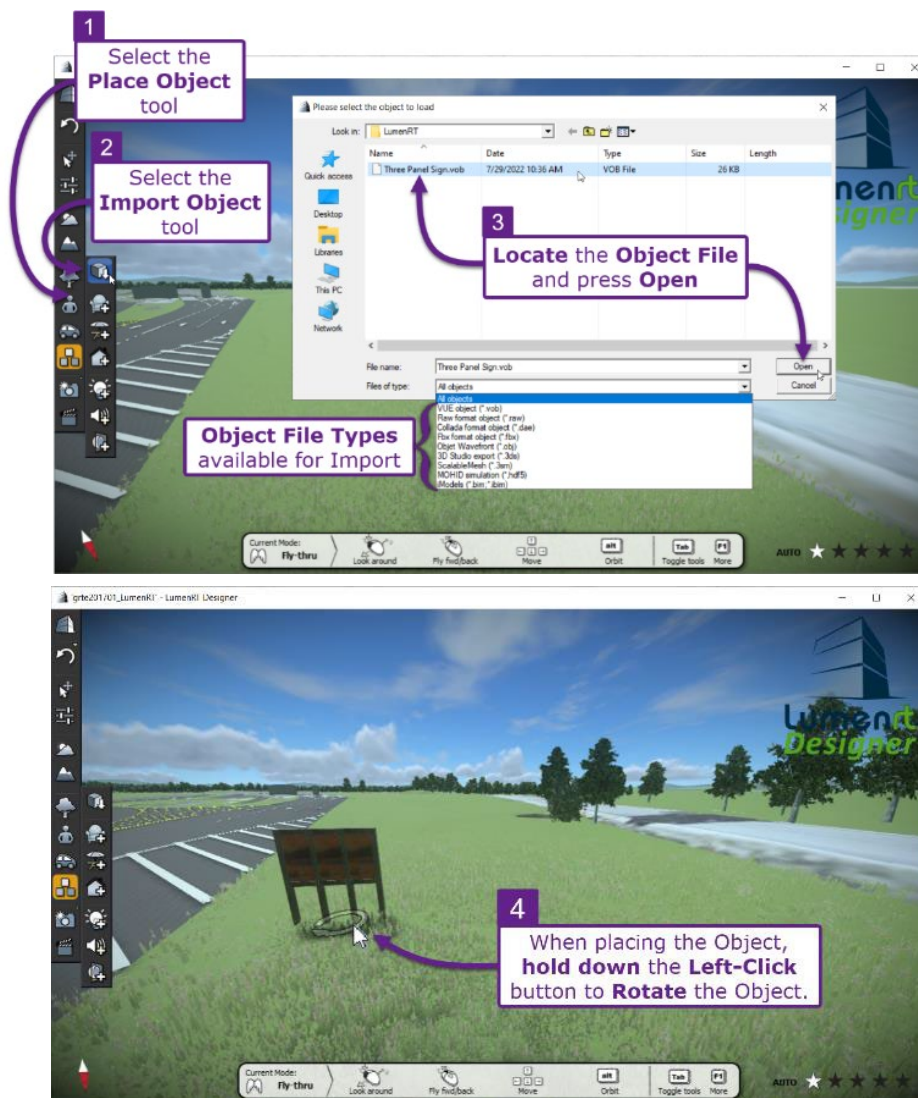
3-Dimensional models and objects can be imported into LumenRT Model. The custom object must be packaged in a file type shown below:

- .bim or .ibim (BIM Model)
- .vob (VUE Object)*
- .raw (Raw Format Object)
- .dae (Collada Format Object)
- .fbx (FBX Format Object)*
- .obj (Object Wavefront)*
- .3ds (3D Studio Export)
- .3sm (Scalable Mesh)
- .hdf5 (MOHID simulation)

File types marked with an asterisk (*) can be exported directly from the OpenRoads Designer Software. For example, a 3D object modeled in ORD can be exported as a .vob, .fbx, or .obj file.

BEST PRACTICE: The recommended file type for exporting objects from ORD is the .fbx file type.

Placing custom objects in ORD is the same procedure as placing plants, objects, vehicles, and characters.




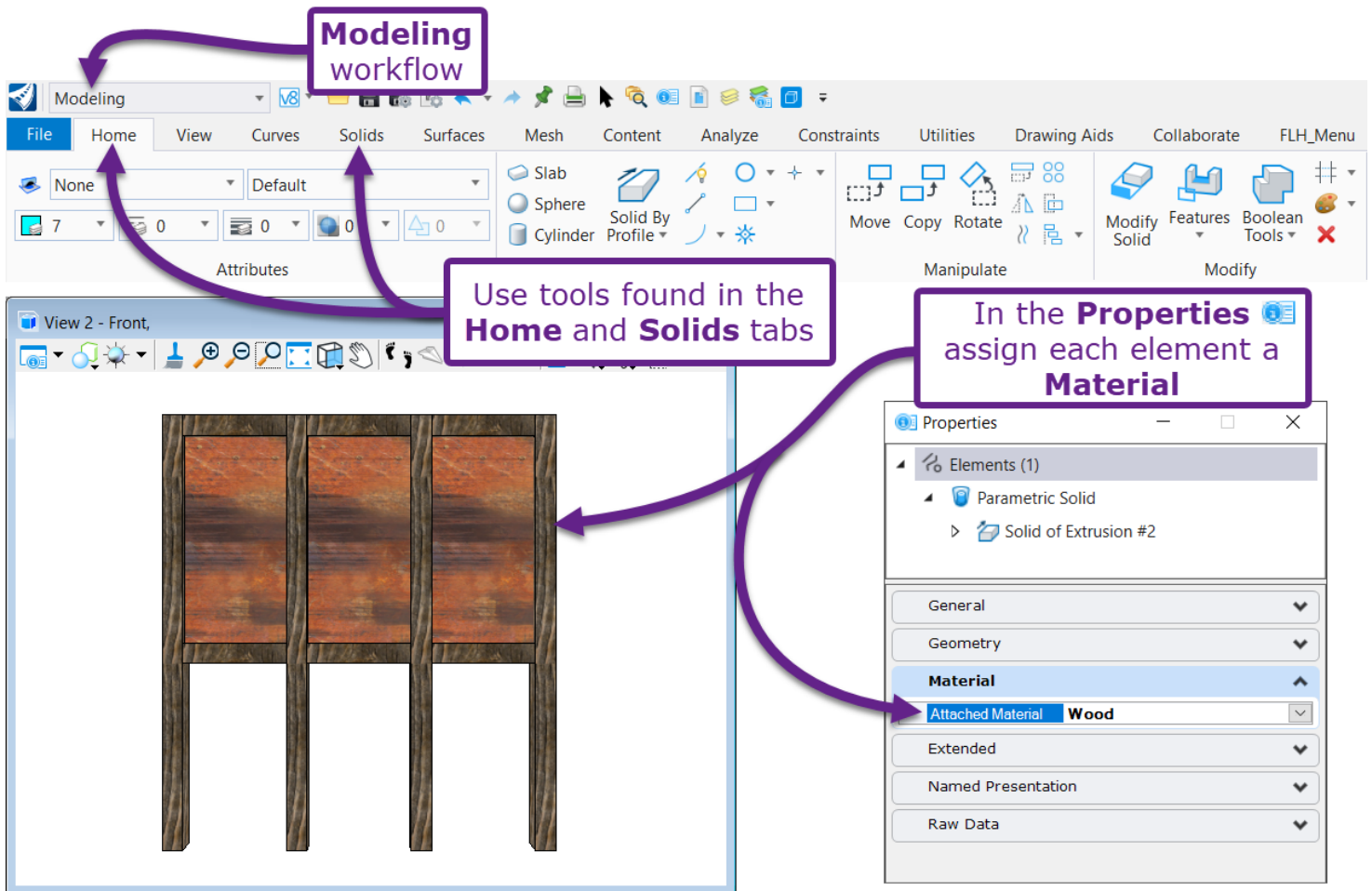
28H.4.a Create a Custom Object in OpenRoads

This section gives a brief synopsis of creating a custom object in ORD for placement in LumenRT.

When creating objects, create a new ORD File using a **3D Seed File**. Objects should be drafted in an empty *3D Design Model*. **NOTE:** Create a new ORD File for each object. When importing into LumenRT, the ORD File should contain a single object.

Drafting an object is accomplished with 3D drafting tools found in the **Modeling** workflow. Each element should be a 3-dimensional solid object.

Each element must be assigned a **Material**. After drafting an element, select it, and assign a Material in the Properties  box.



TIPS FOR DRAFTING SOLIDS IN THE 3D DESIGN MODEL

AccuDraw inputs and Keyboard Shortcuts must be used for accurate drafting in 3D.

The following Keyboard Shortcuts should be used to ensure the AccuDraw Compass is aligned with the appropriate 3D Plane when drafting. If the AccuDraw Compass is NOT carefully monitored, then it is possible to draw an element at an intended angle.

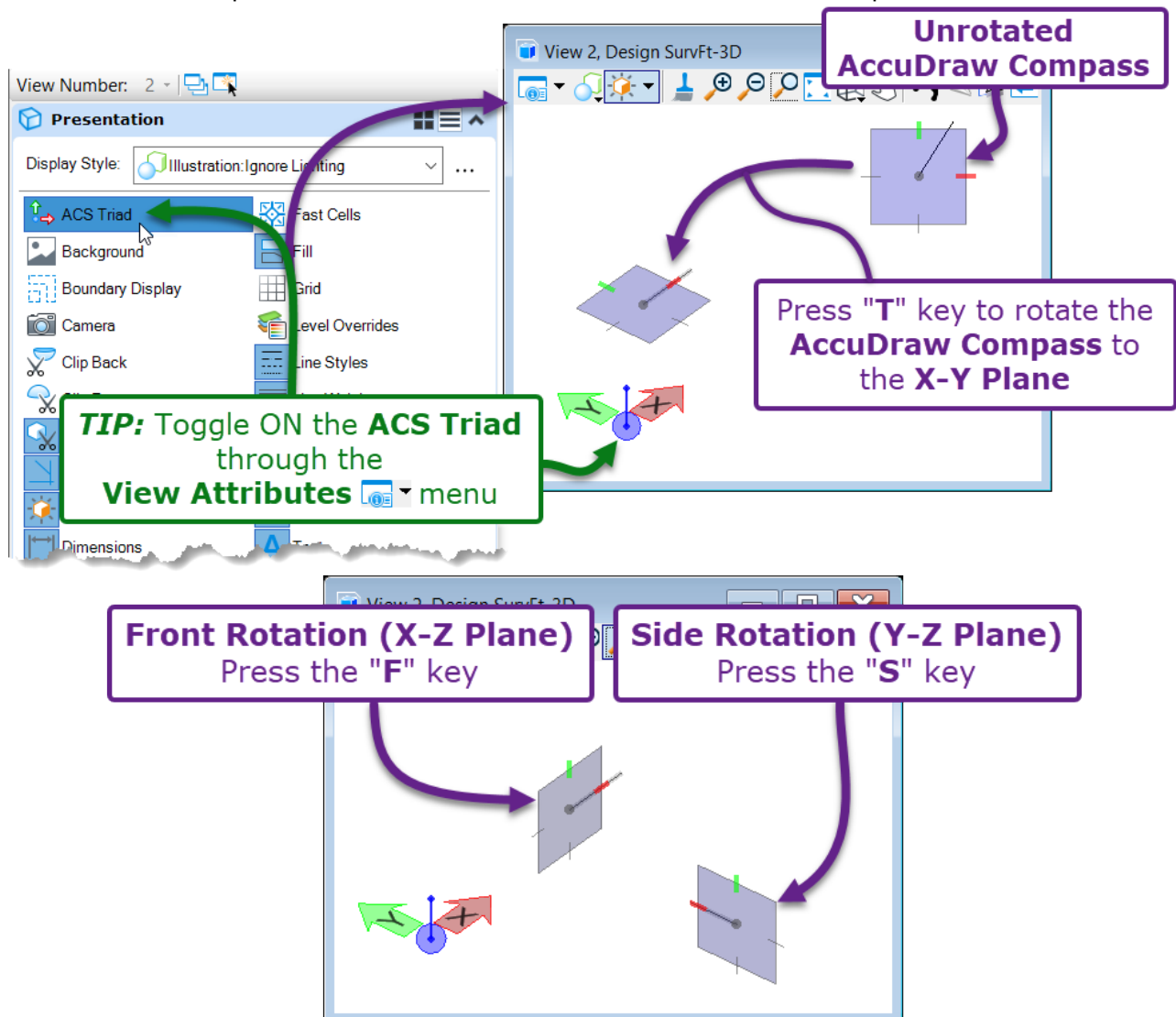
Top Rotation: Press the "T" key to execute this Keyboard Shortcut. The AccuDraw Compass will rotate to the **X-Y plane**.



Front Rotation: Press the "F" key to execute this Keyboard Shortcut. The AccuDraw Compass will rotate to the **X-Z plane**.

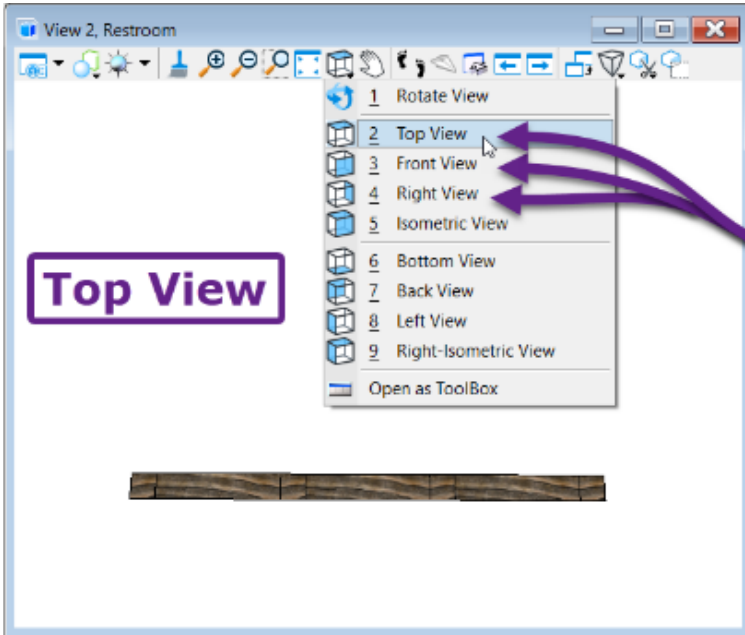
Side Rotation: Press the "S" key to execute this Keyboard Shortcut. The AccuDraw Compass will rotate to the **Y-Z plane**.

NOTE: The Keyboard Shortcut must be executed during the operation of a MicroStation drawing tool (i.e., *Place Smart Line* tool). For example, select the *Place Smart Line* tool, select the start point for the line, and then execute the Keyboard Shortcut.

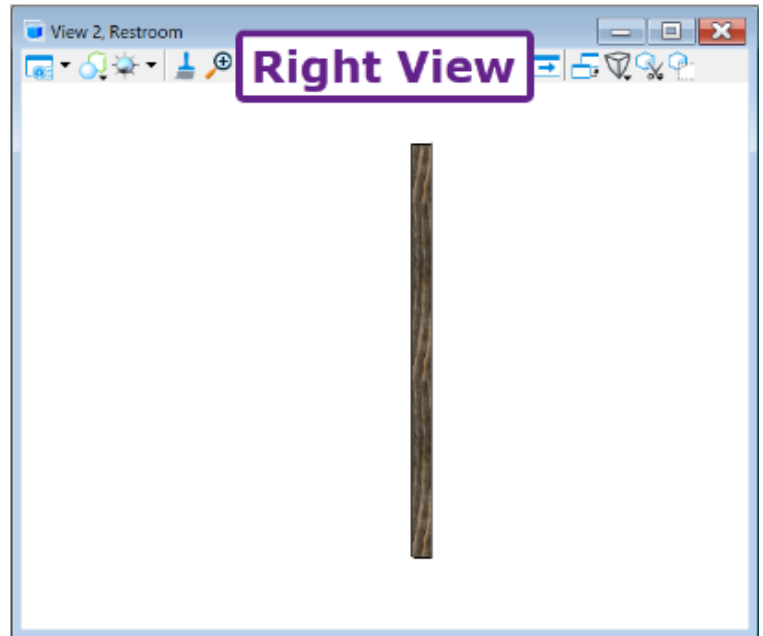
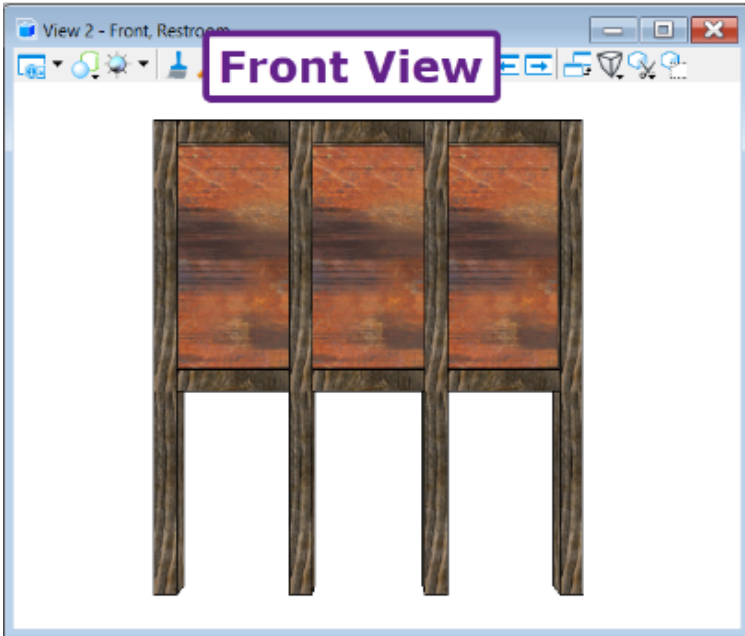
TIP: Enable the ACS toggle to show the ACS Triad. The ACS Triad provides a visual orientation reference to compare with the current rotation of the AccuDraw Compass.



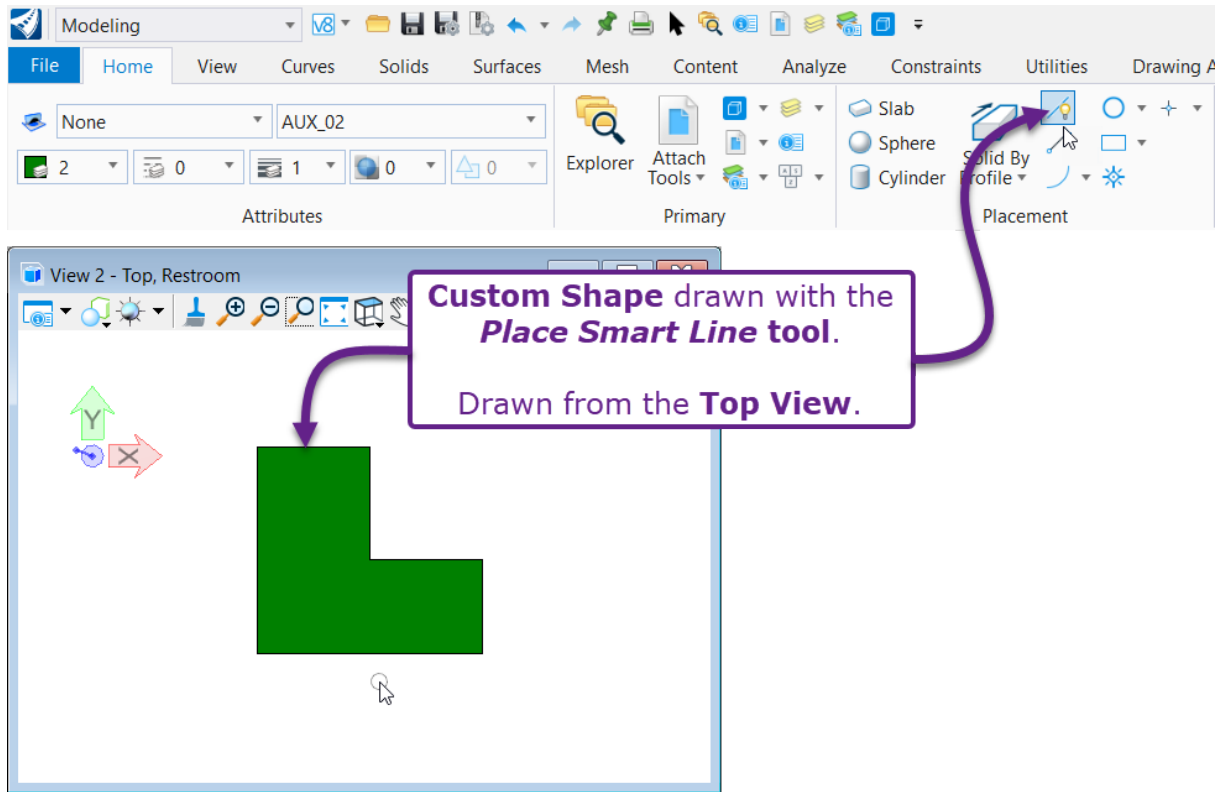
TIP: Use the *View Rotation*  tool to change between **Top**, **Front**, and the **Right View** orientation. As shown in [1A.3.b.i Move Around and Orbit the 3D Design Model](#), use the *Rotate View*  option to orbit the view orientation.



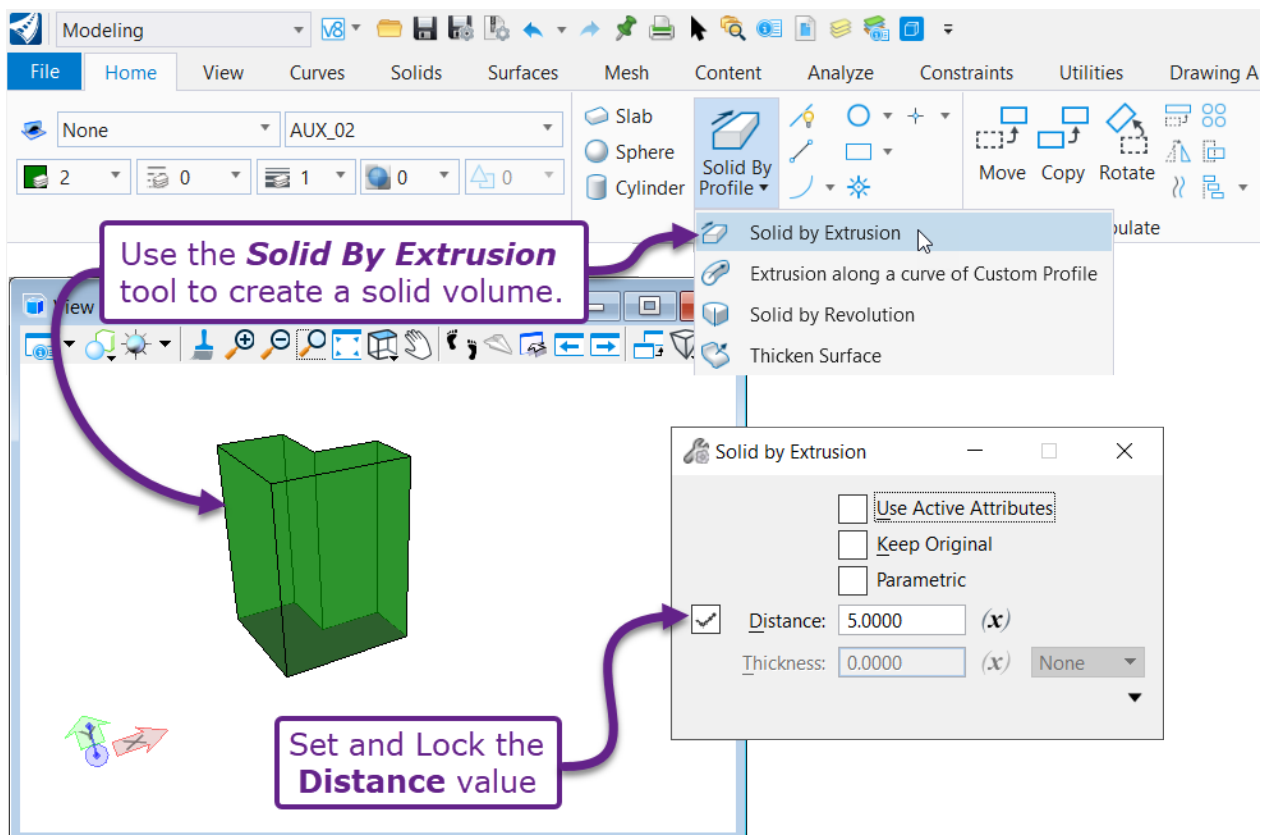
Draft elements in the **Top, Front, or Right View**



Use MicroStation Drafting tools (i.e., Smart Lines, Rectangles, and Circles) to create a closed, planar shape. Draw the closed, planar shape from the **Top View, Front View, or Right View** orientation.

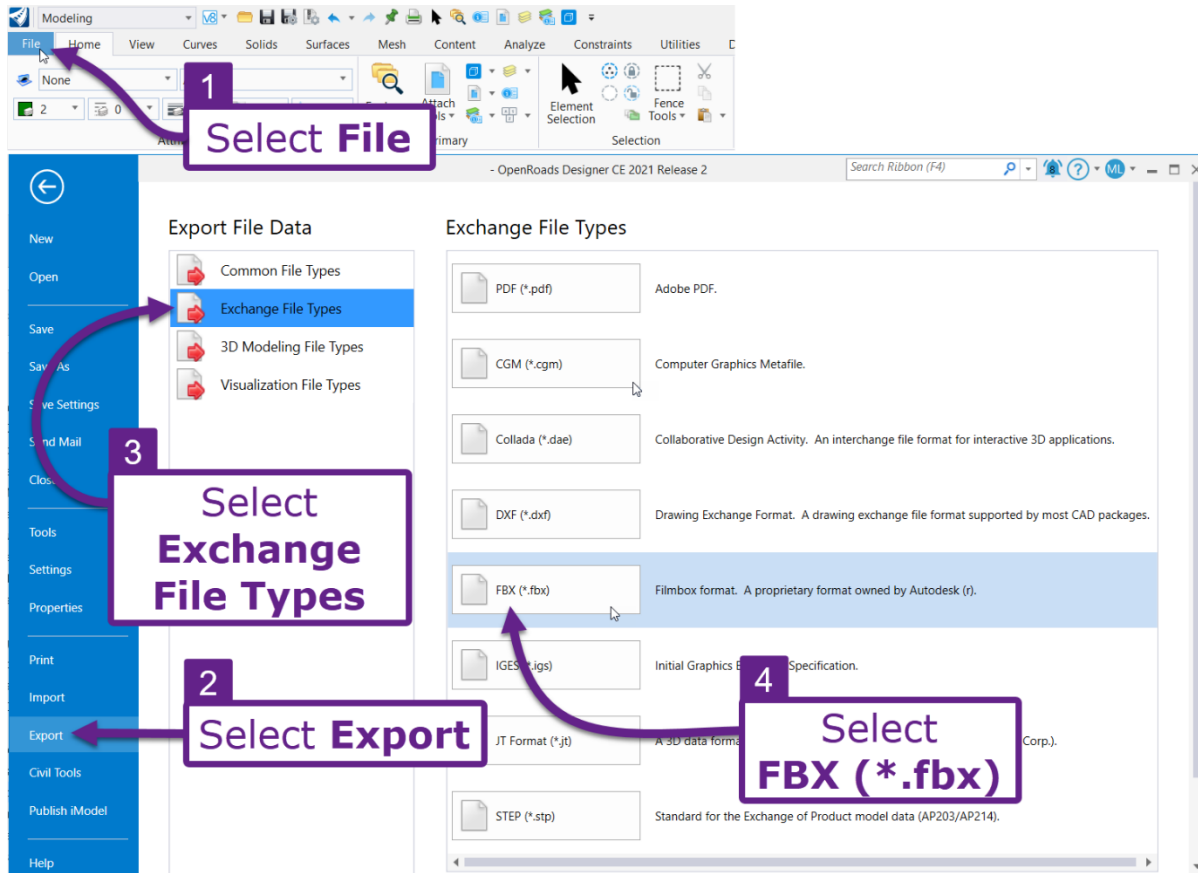


Then, use the *Solid By Extrusion* tool to extrude the planar shape into a solid volume. **NOTE:** For complicated shapes, this tool may fail, and the shape will NOT be extruded. If this happens, then draw multiple smaller shapes that match the geometry of the original shape. Extrude the smaller shapes.

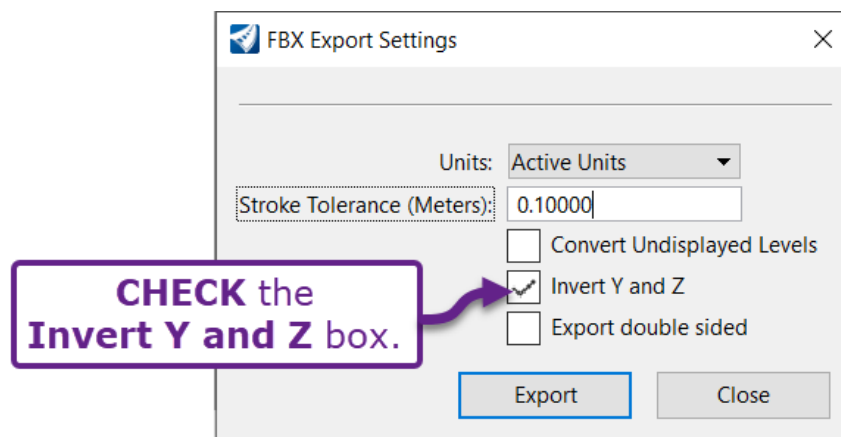


28H.4.b Export an Object File Type from OpenRoads

After the object is created, it must be exported from OpenRoads in a file type that is compatible with LumenRT. In this case, the object is exported with an FBX (*.fbx) file type.



After selecting the FBX (*.fbx) file type, the following options are presented. **IMPORTANT:** CHECK the "Invert Y and Z" box. If this box is UNCHECKED, then the object will be upside when importing into LumenRT.



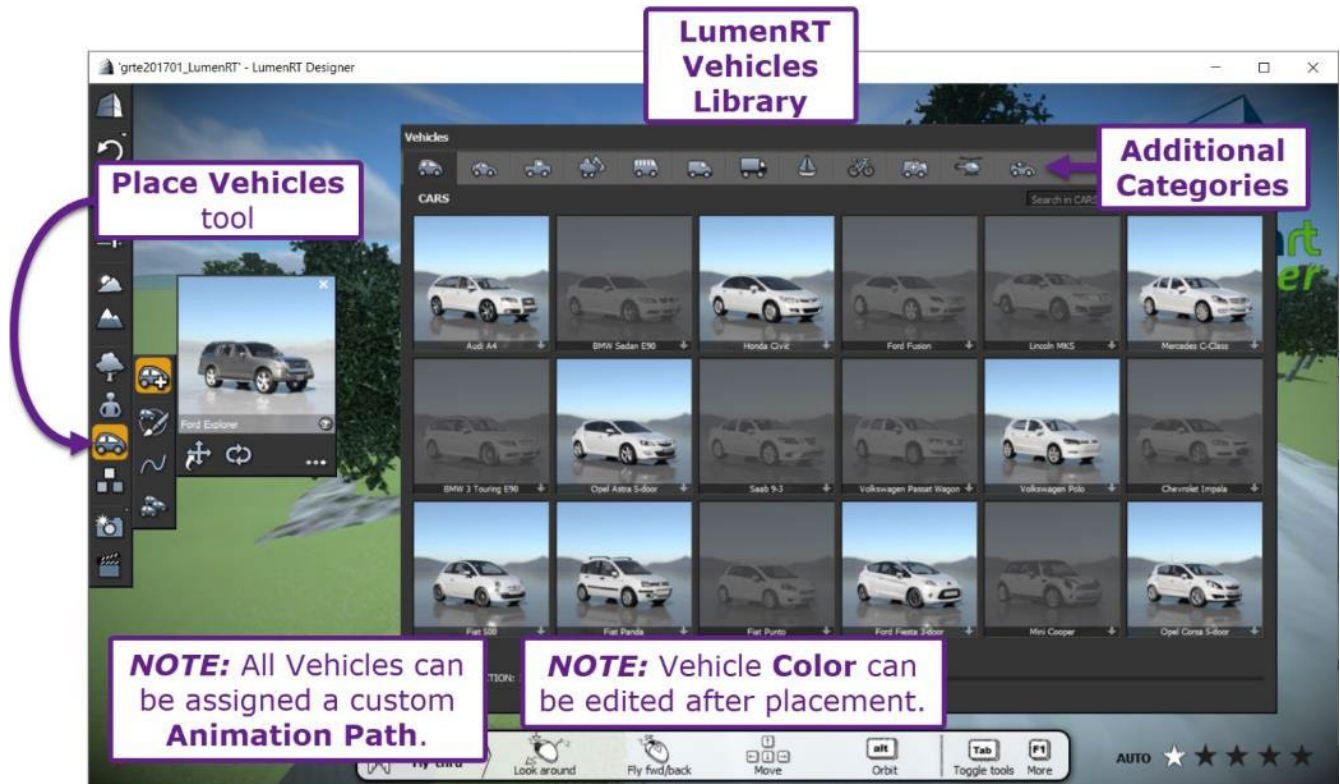
Stroke Tolerance (Meters): This setting affects how curved surfaces appear in the rendering. Curved surfaces are simplified into polygons in the exporting process. This setting affects the size of the resulting polygons. If this setting is increased (i.e., 0.2), then curved surfaces may appear jagged because the polygon sizes will be larger. If this setting is decreased (i.e., 0.05), then curve surfaces appear smoother. **NOTE:** Decreasing this setting results in smoother curved surfaces but will increase the file size and rendering processing times for the object.

Convert Undisplayed Levels: If this box is CHECKED, then Levels that are currently turned OFF will be included in the export. If this box is UNCHECKED, then only Levels that are currently turned ON will be captured in the export.

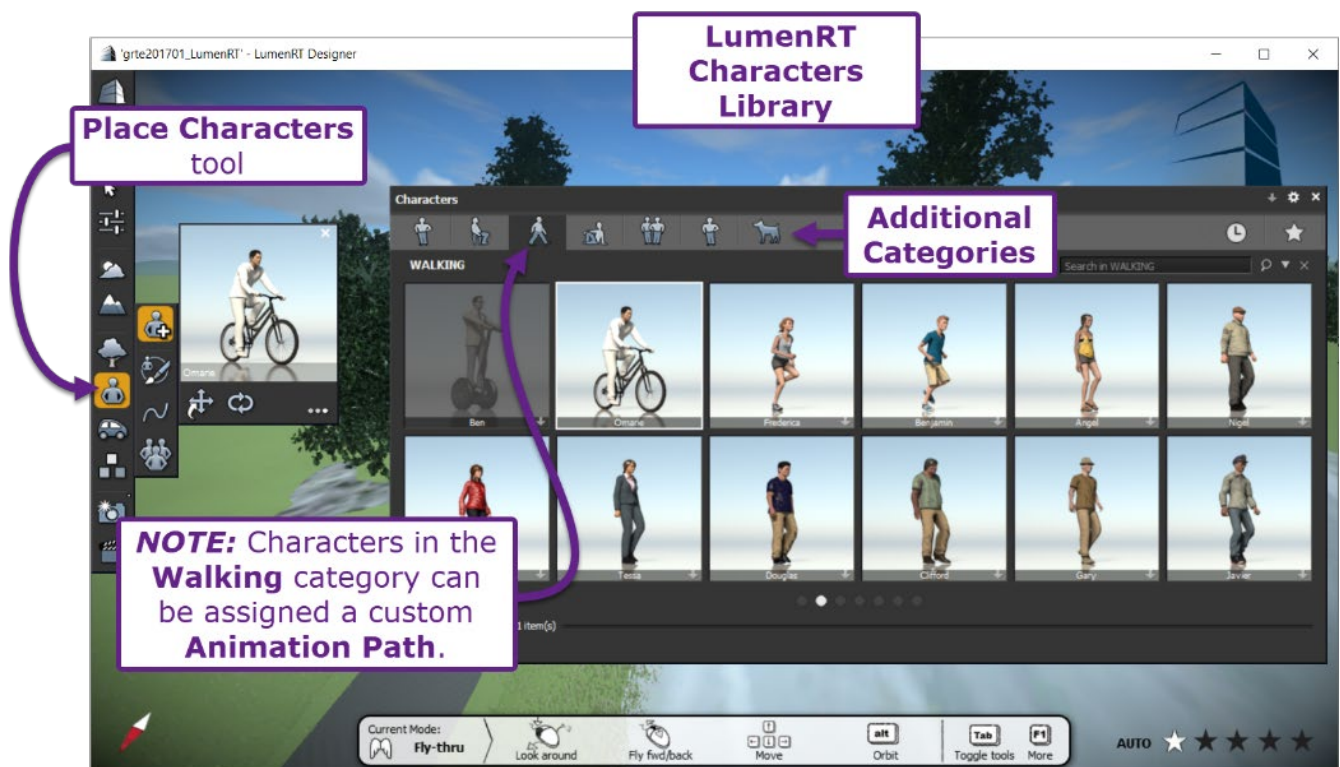
Export Double Sided: If this box is CHECKED, then the interior faces of objects are rendered. Keep this box UNCHECKED, because interior faces are NOT visible for solid objects and this setting increases file size and rendering processing times.

28I – PLACE VEHICLES/CHARACTERS AND ASSIGN ANIMATION PATHS

Use the **Place Vehicles** tool to add vehicles to the LumenRT Model. After placement, a custom animation path can be programmed to drive the vehicle.



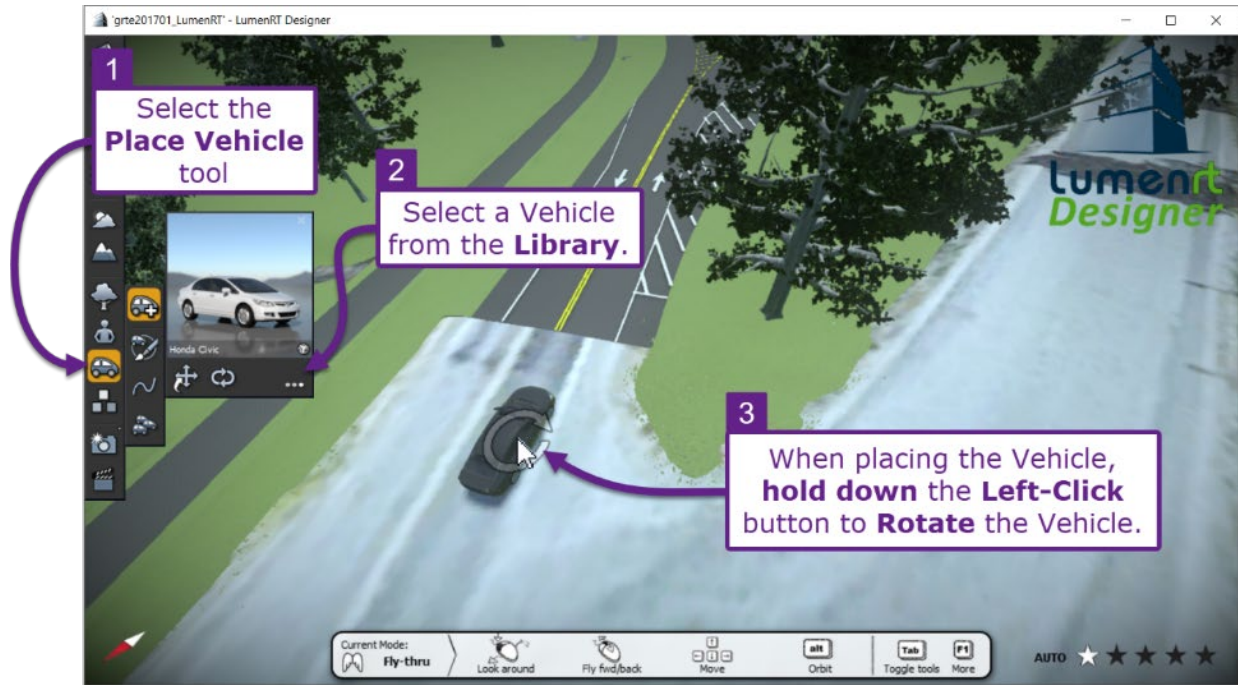
Use the **Place Characters** tool to add humans and animals to LumenRT Model. Characters in the **Walking** category can be assigned a custom animation path. Also, the **Walking** category contains a character that is riding a bike.



28I.1 Place a Vehicle

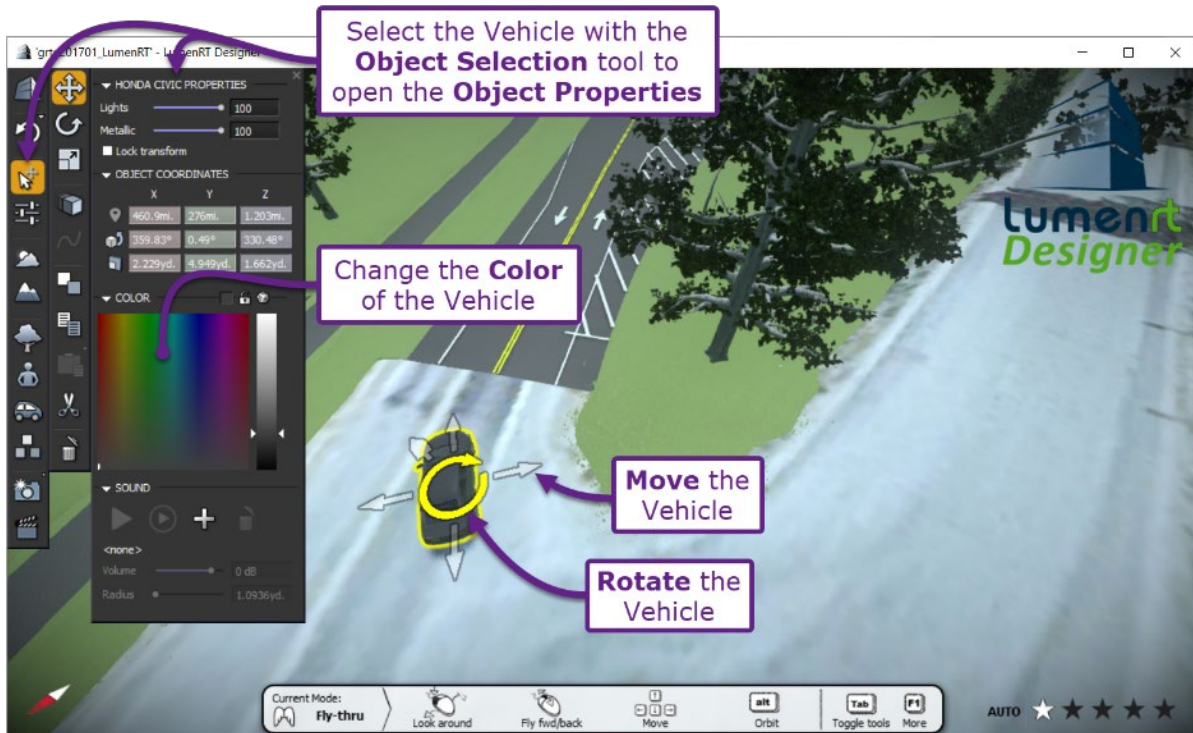
Before placement, select a vehicle type from the LumenRT Vehicle Library.

IMPORTANT: In placement of the vehicle, hold down the left-click button and move the mouse cursor to rotate the vehicle. Release the left-click button to place the vehicle.



28I.2 Edit a Vehicles Color and Position after Placement


Editing the vehicle's color and placement is accomplished through the **Object Selection** menu. After the vehicle is selected, editing arrows are shown around the base of the vehicle. Hold down the Left-Click button and move the editing arrow to reposition the vehicle.

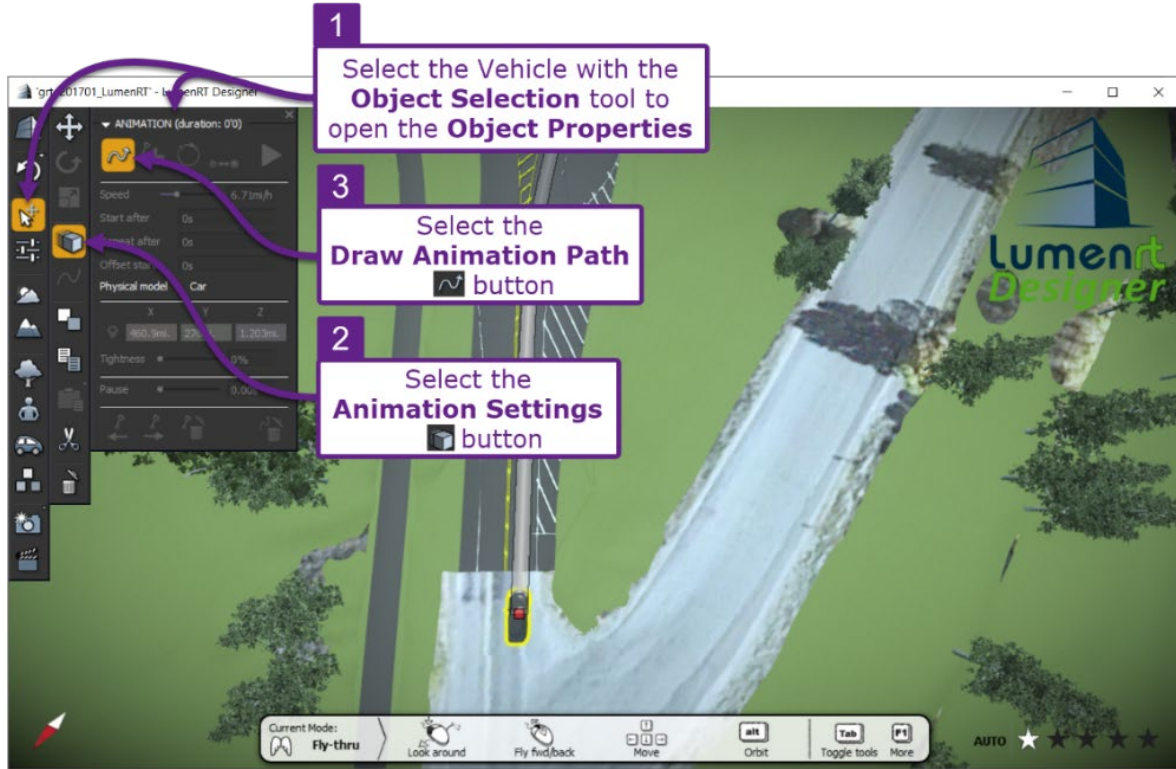



28I.3 Assign an Animation Path to a Vehicle

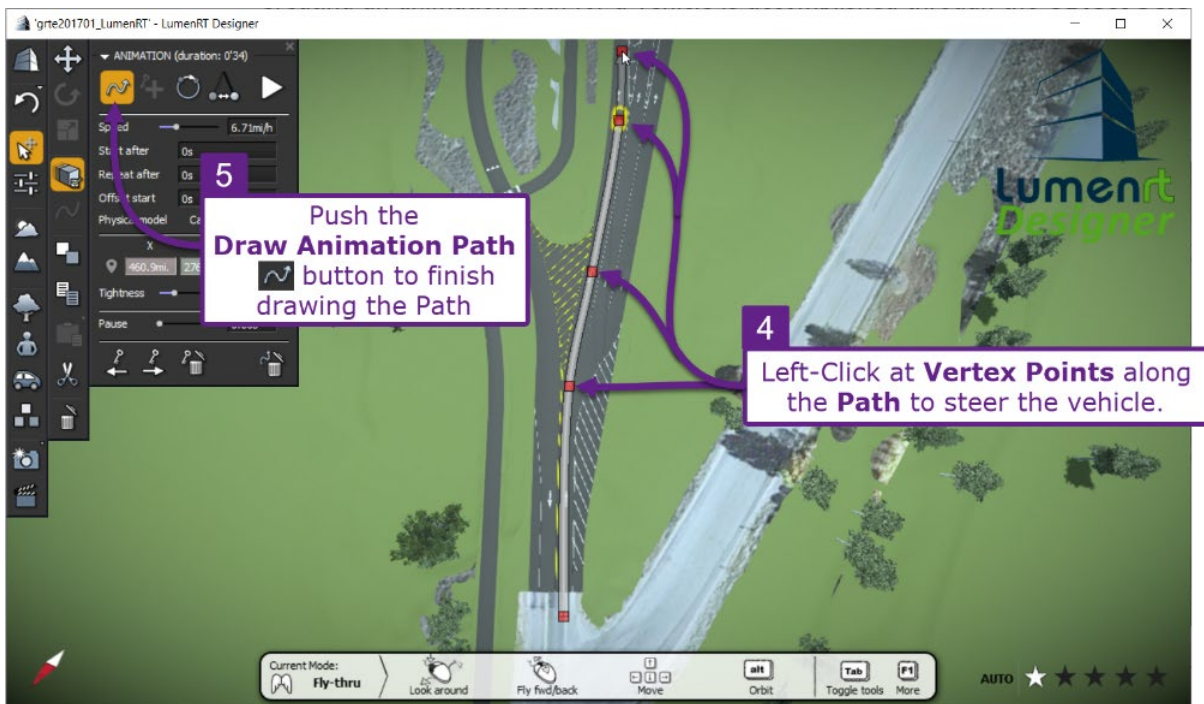
Creating an animation path for a vehicle is accomplished through the **Object Selection** menu.

NOTE: When creating static renderings (i.e., screen shots), then animation paths are unnecessary and should NOT be set. Animation paths should only be set if video capture is required for the project.

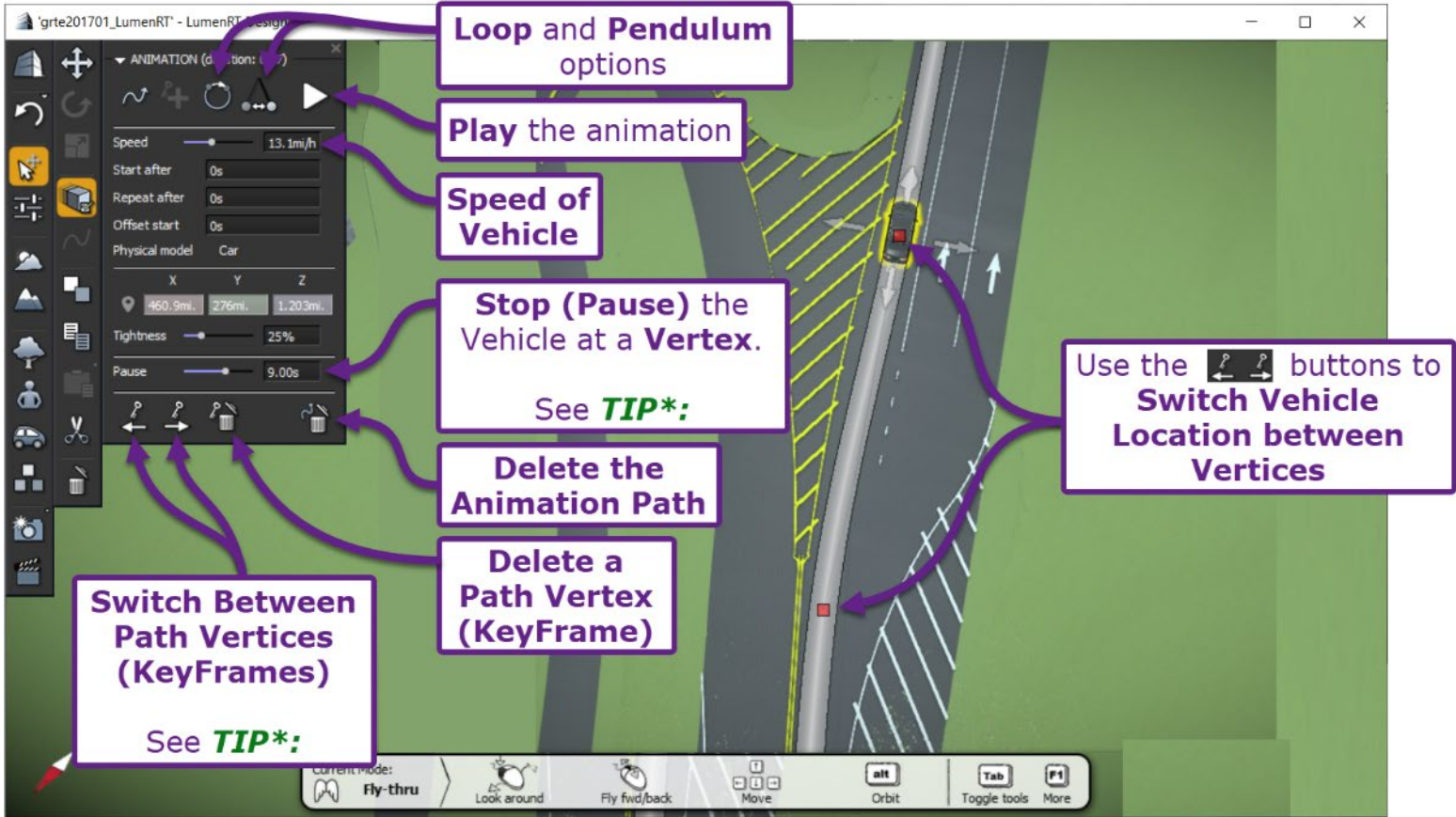
Select the **Animation Settings**  icon to access the Animation Path menu:




After the **Draw Animation Path**  is pushed, the path is drawn as a spline. Left-Click at vertex points along the path to steer the vehicle and define the spline. Vertex points are shown as red squares.




Animation Settings: After setting the Animation Path, set the speed and other settings for the animation.




NOTE: A “KeyFrame” is placed at every vertex in an animation path. For animation paths, a “KeyFrame” represents a direction change in the animation path. Also, “KeyFrames” are needed for locations where the animation is to pause (i.e., a vehicle parked).

TIP*: To show a vehicle coming to a stop, place a vertex at the desired stopping location. Use the  buttons to position the vehicle on the stopping vertex. Use the **Pause** option to set the stopping time for the vehicle on the selected vertex.

Loop and Pendulum Options: These toggle options determine how the vehicle behaves once it reaches the end vertex of the animation path. If both toggles are OFF, then the vehicle will restart at the start vertex after it reaches the end vertex.

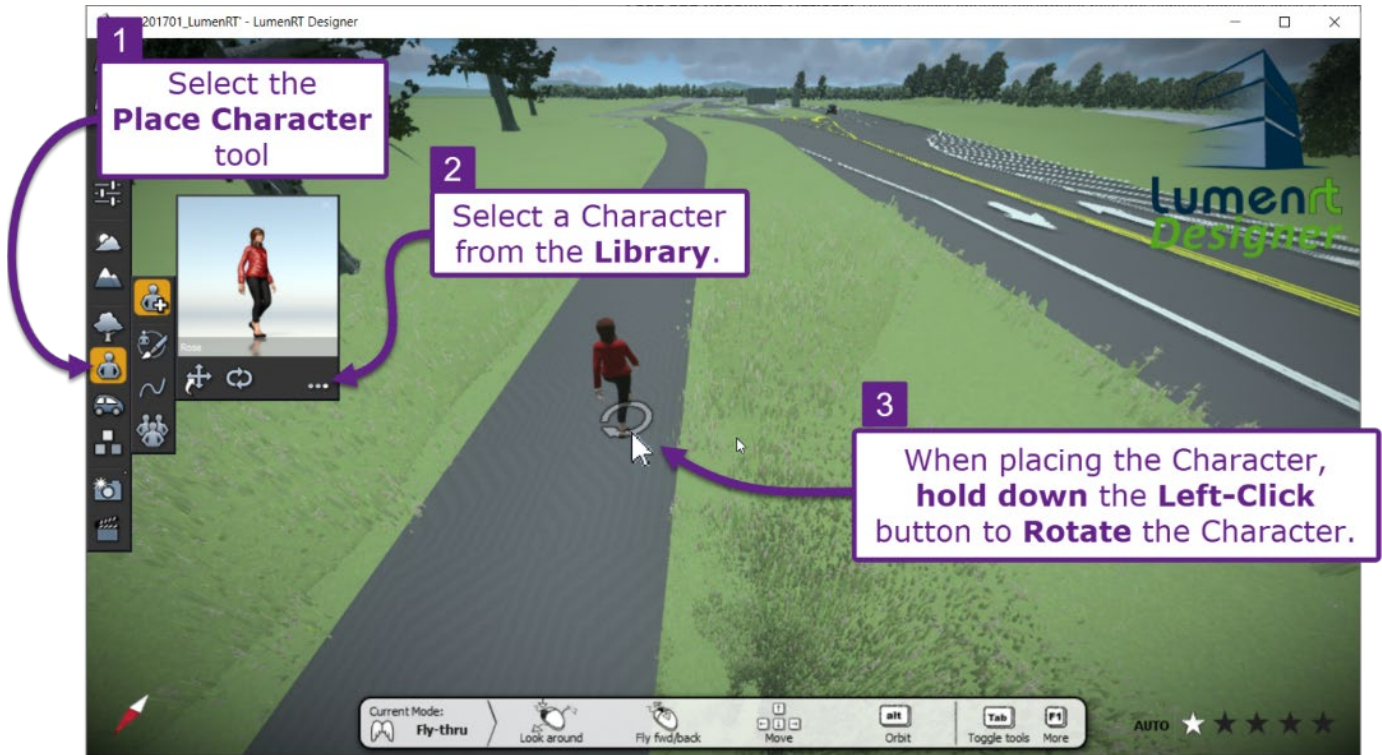
Loop : If this toggle is ON, then the first and last vertices are automatically connected, which causes the vehicle to drive in a loop.

Pendulum : If this toggle is ON, then the vehicle will reverse after it reaches the end vertex of the path.

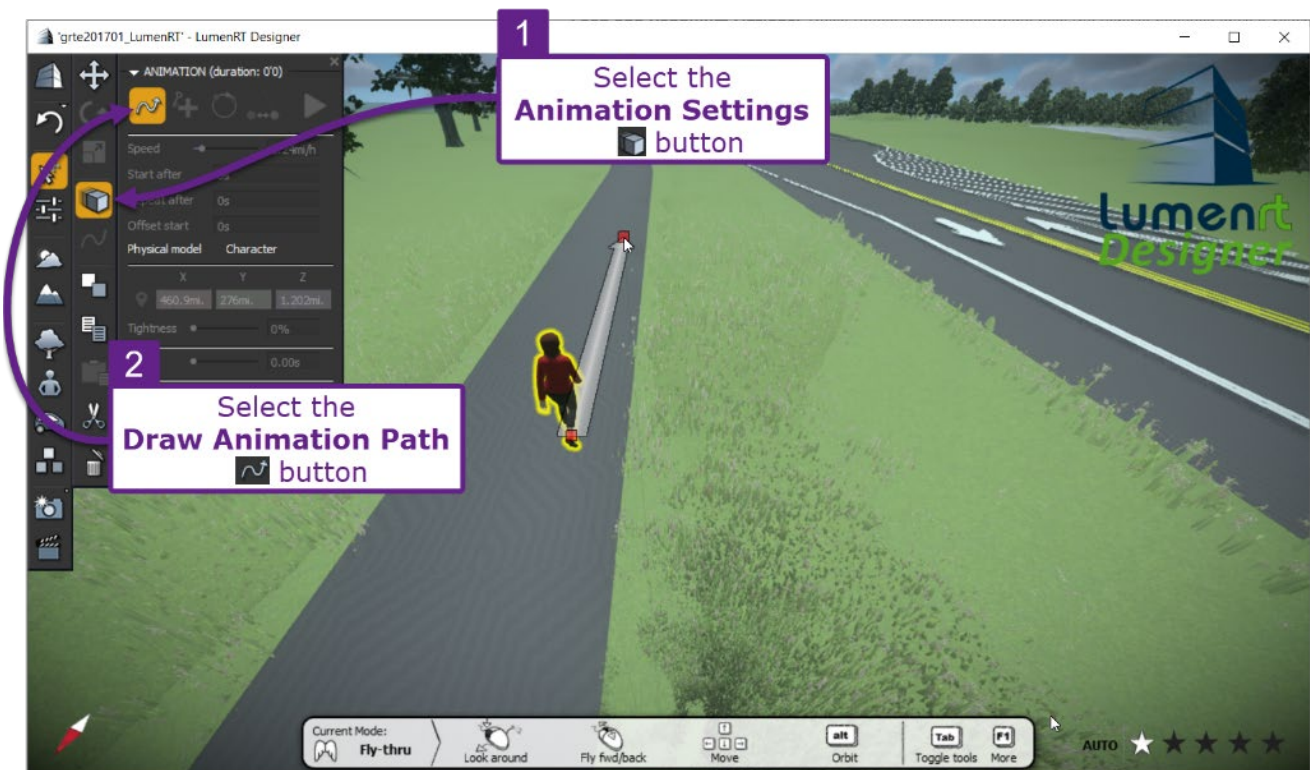
28I.4 Place Characters

Before placement, select a Character from the LumenRT Character Library.


IMPORTANT: In placement of the character, hold down the left-click button and move the mouse cursor to rotate the character. Release the left-click button to place the character.



TIP: If a Character from the **Walking** category is used, then program an animation path after placement. See [28I.3 Assign an Animation Path to a Vehicle.](#)



28J – MODIFY THE WEATHER, CLOUDS, AND SUN POSITION

The **Weather and Season** settings  are primarily used to the appearance of the sky, sun (shadows), and clouds.



Sun Position: These settings affect the position of the sun, which affects the orientation of shadows in the LumenRT Model.

Time: Affects the position of the sun according to time. For example, if placed at 6:00PM, the sun will appear setting in the west.

North: Changes axis position of the sun as it travels through the sky.

Date: Affect the position of the sun in relation to the **Time**.

Season: This setting affects the condition of leaves on plants and trees. If set in the middle of the slider, leaves will appear full and healthy (summer). If set to the far right or left, the leaves will fall off the trees (winter).

HDR Map: An HDR map is a 360° panoramic image take from a single viewpoint. An HDR map can be used to replace the Terrain Background and sky. Use the **Rotation** slider to spin the HDR map. Use the **Brightness** slider to dim or brighten the HDR map.

Weather: These setting control the overall number of clouds or haze in the sky.

Clouds: These settings control the direction of the wind and movement of the clouds. **TIP*:** For static renderings, set the **Speed** to 0 to ensure the clouds stay in the same positions for screenshots from different perspectives.

Wind in Plants: This slider controls the animation effect of wind through plants. If the slider is increased, then plant movement will increase.

Birds: By default, this is set to **None**. If the slider is increased, then birds are added to the LumenRT Model. **WARNING:** Adding birds is very graphically intensive and may slow down the LumenRT model.

28K – TAKE SCREENSHOTS AND VIDEOS OF THE LUMENRT MODEL

Creating Screenshots and Movies are accomplished with the tools shown below.

TIP: Before Creating Screenshots and Movies, set the Graphics Quality to the highest setting (5 stars). Doing so increases the graphical quality of the rendering.

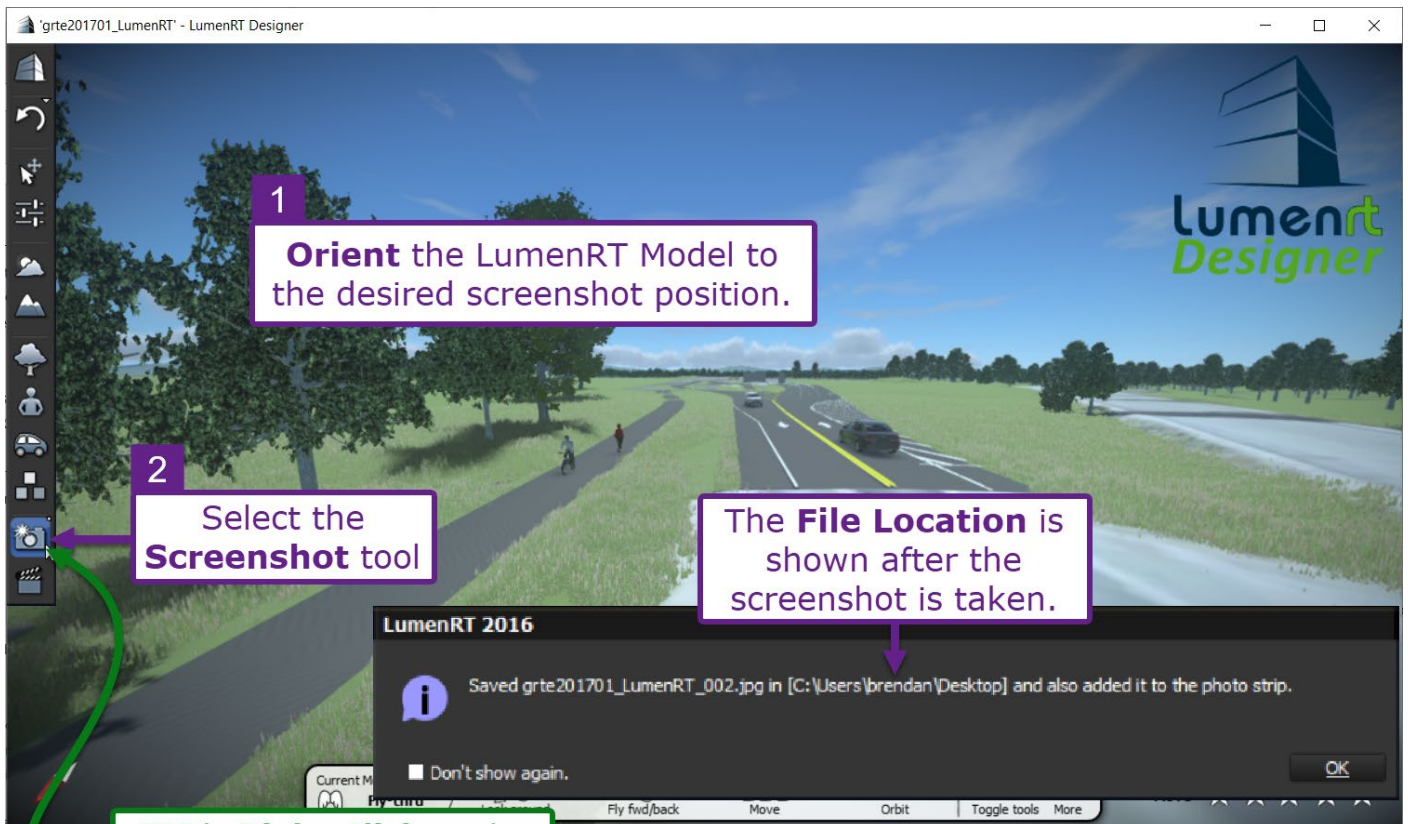


28K.1 Taking Screenshots

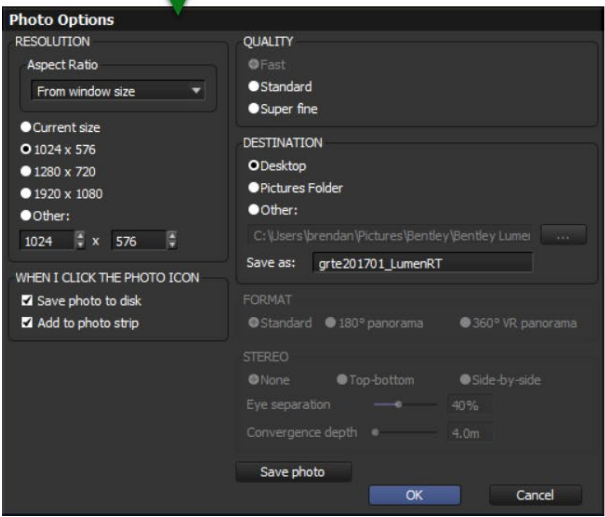
When the *Screenshot* tool is pressed, the currently shown graphics are captured. After the capture, LumenRT displays the file location where the Screenshot file is saved.

- | | |
|---|---|
| 1 | Orient and orbit the LumenRT Model to the desired Screen Shot position. |
| 2 | Select the <i>Screenshot</i> tool. |

TIP*: Right-Click on the *Screenshot* tool icon to open the **Photo Options** menu. In this menu, the **Quality**, **Size**, and **Destination** (file location) for the resulting screenshot can be specified. Settings manually changed in the Photo Options menu will be saved for any future screenshots.



TIP*: Right-Click on the **Screen Shot** tool to open **Photo Options** menu.



28K.2 Creating Movies of the LumenRT Model

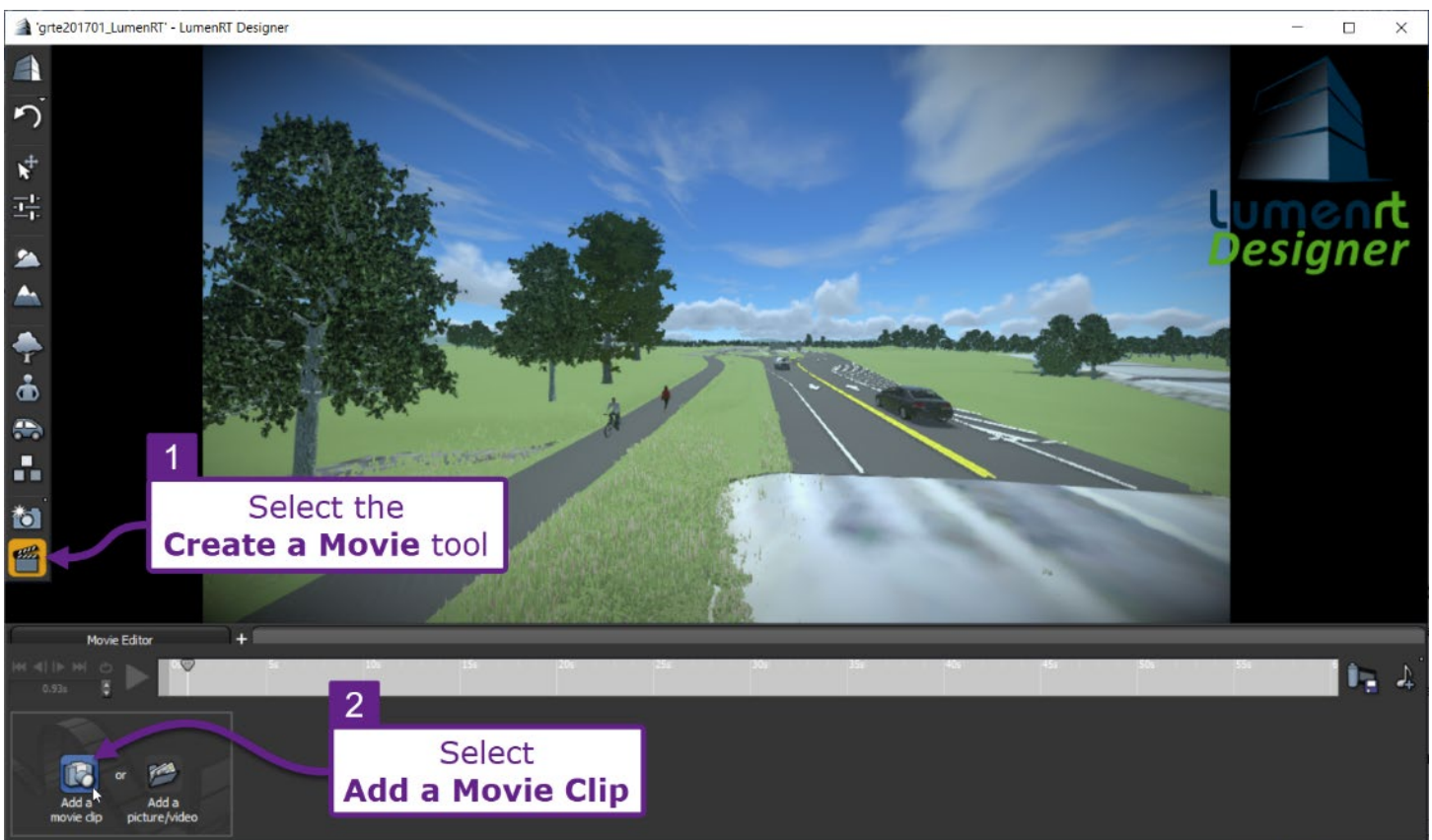
When the *Create a Movie* tool is selected, then the Movie Editor is shown at the bottom of the LumenRT interface window.



A Movie can be taken from a single, fixed position. Alternatively, a camera path can be programmed to show the camera moving/transition from different locations in the LumenRT model.

28K.2.a Create a Movie from a Fixed Position

To create a movie from a fixed position, orient the LumenRT model in the desired position.


1	Select the <i>Create a Movie</i> tool.
2	In the Movie Editor, select Create a Movie . A screen shot of the current location will be shown in the Movie Editor.



- 3 Hover the mouse-cursor over the screenshot and left-click on the  icon at the bottom left-corner of the screenshot.
- This icon sets the movie time shown at the screenshot location. By default, this value is 0 seconds. Set the screenshot time to the desired duration of the video (i.e., 20 seconds).
- 4 To export the movie, select the  button and select **Export Clip...**



The screenshot shows the LumenRT Designer interface. The main window displays a 3D rendered scene of a road with trees and a car. The interface includes a toolbar on the left, a timeline at the bottom, and a context menu on the right. Annotations with purple boxes and arrows point to specific elements:

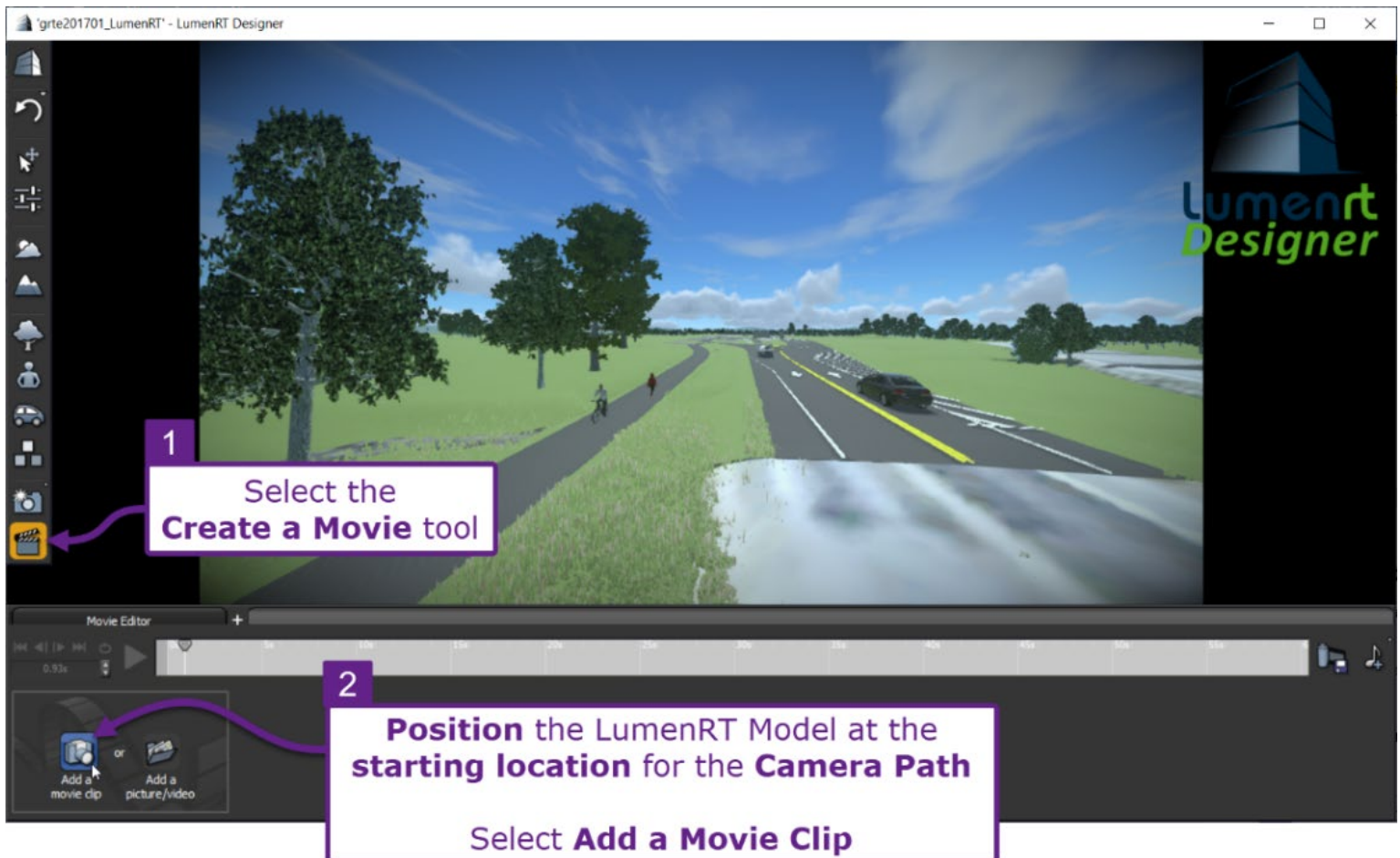
- Step 3:** A callout box says "Press the **Play** button to preview the Movie." with an arrow pointing to the play button on the timeline.
- Step 3:** A callout box says "Left-Click on the  icon. Key-in the desired **Movie Length Time**" with an arrow pointing to the clock icon on the screenshot thumbnail in the timeline.
- Step 4:** A callout box says "Select the  button and select **Export Clip...**" with an arrow pointing to the hamburger menu icon on the screenshot thumbnail.
- Step 4:** A callout box says "Select the  button and select **Export Clip...**" with an arrow pointing to the hamburger menu icon on the right side of the timeline.



The context menu on the right side of the screenshot thumbnail includes the following options: Move Clip Up, Move Clip Down, Duplicate Clip, Hide Clip from Movie, Delete Clip, and Export Clip... (highlighted in blue).

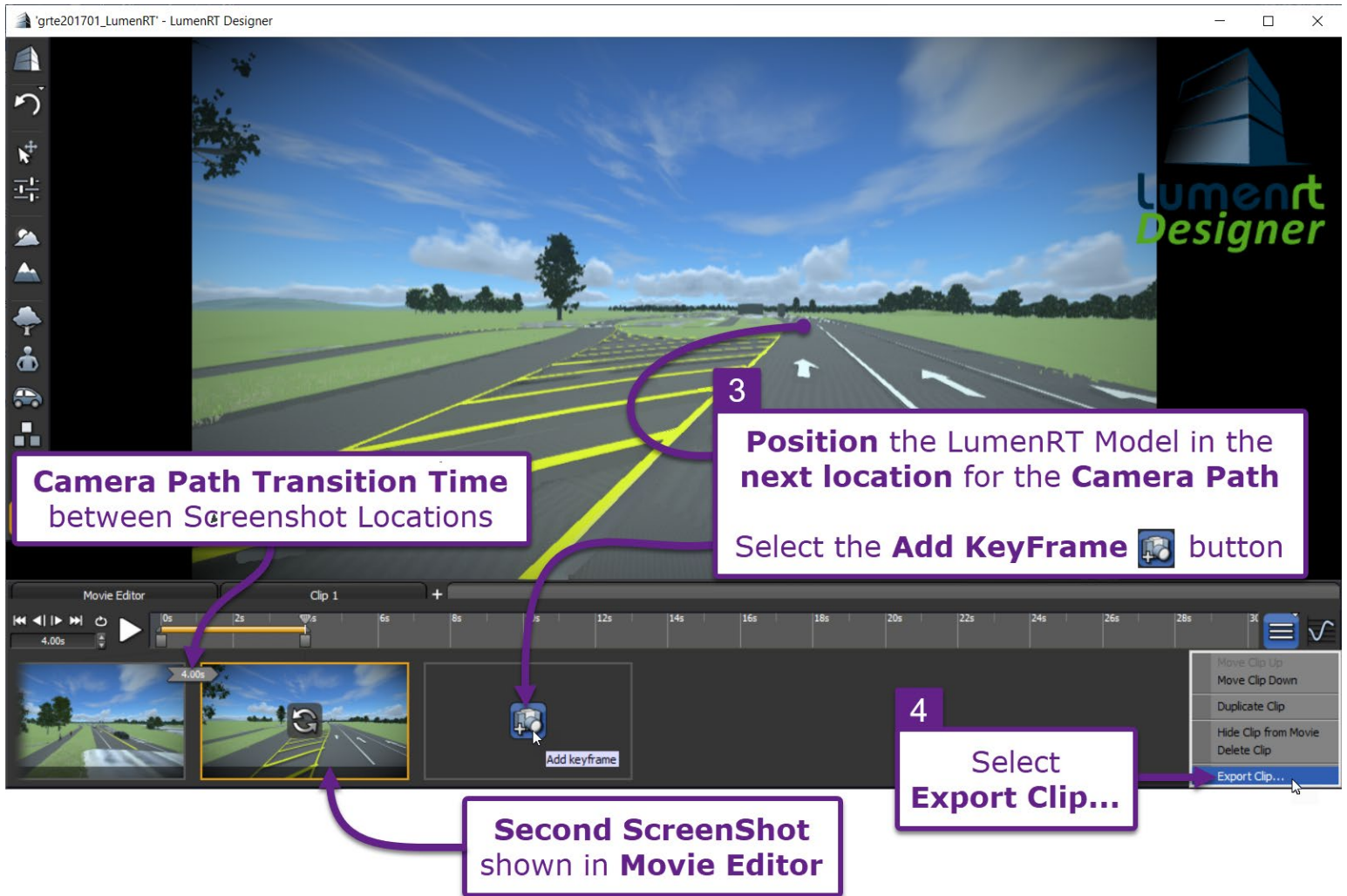
28K.2.b Create a Moving Camera Path for a Movie


Creating a Movie with a moving camera path is accomplished by taking individual screenshots (KeyFrames) at different locations. When the movie is played, the camera path will automatically move/transition from the first screenshot location (KeyFrame) to the next screenshot location and so on. When played, the camera path takes the shortest route between screenshot locations and pan/orbit the camera in a smooth manner.

- 1 Select the *Create a Movie* tool.
- 2 Position the LumenRT model in the start location for the camera path.
In the Movie Editor, select **Add a Movie Clip**. A screen shot of the current location will be shown in the Movie Editor.



- 3 Position the LumenRT in the next location along the camera path.
In the Movie Editor, select the **Add KeyFrame**  button.
- 4 Repeat step 3 until the camera path route is fully defined by screenshot locations.
- 5 To export the movie, select the  button and select **Export Clip...**
The **Export Clip...** recommended settings are shown on the next page.



The screenshot shows the LumenRT Designer interface. The main window displays a 3D perspective view of a road with yellow dashed lines indicating a camera path. A white arrow on the road points forward. A purple callout box labeled '3' points to a keyframe on the path, with text: "Position the LumenRT Model in the next location for the Camera Path" and "Select the Add KeyFrame  button".

Below the main view is the Movie Editor. It features a timeline from 0s to 30s. A callout box labeled '3' points to the 'Add keyframe' button in the Movie Editor, with text: "Camera Path Transition Time between Screenshot Locations".

The Movie Editor shows two preview windows. The first shows a screenshot of the road at 4.00s. The second shows a screenshot of the road with a circular arrow icon, indicating a keyframe. A callout box labeled '4' points to the 'Export Clip...' button in the Movie Editor's right-hand menu, with text: "Select Export Clip...".

A callout box labeled '4' also points to the 'Export Clip...' button in the Movie Editor's right-hand menu, with text: "Select Export Clip...".

A callout box labeled '5' points to the 'Export Clip...' button in the Movie Editor's right-hand menu, with text: "Select Export Clip...".

Export Clip Recommended Settings: The recommended settings for the clip export are shown in the graphic below. Typically, the default options are acceptable. However, the **Destination** and **Video Encoder** and should be changed.

Resolution: When resolution increase, the video quality increases. Using too low of a resolution may result in grainy video quality. However, increasing resolution also increases file size and processing times for the export. The recommended Resolution is **720p HD (1280 x 720)**.

Destination: The Destination option specifies the file location where the animation clip is saved. Use the **Other:** option to manually specify a file location. The **Save as:** box sets the file name.

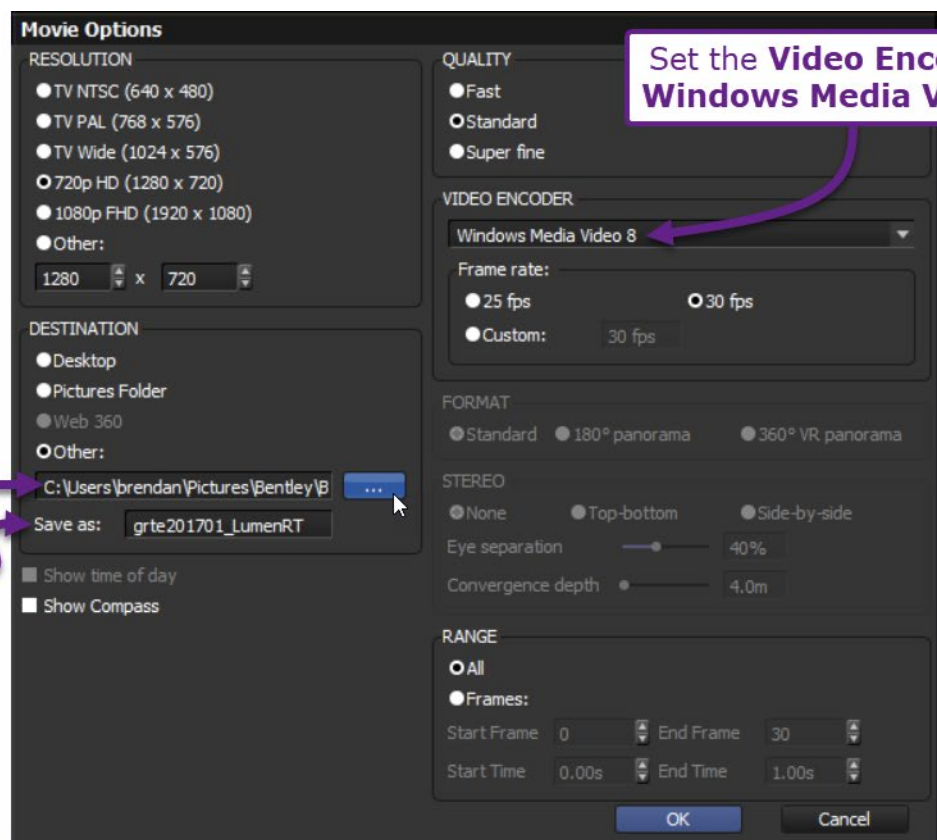
Show Compass: If this box is CHECKED, then a Compass is shown in the bottom left-corner of the animation clip. As the animation clip progress, the Compass to always point north and provide a sense of direction.

Quality: The Quality setting determines the graphical quality of foliage, grass, reflections, clouds, shadows, and other LumenRT objects. Increasing the Quality will increase the file size and processing times for the export. The recommended Quality is **Standard** or **Super Fine**.

Video Encoder: The Video Encoder setting determines the file type for the animation clip. The recommended Video Encoder is the **Windows Media Video 8** option, because this file type can be opened by standard video software.

Frame Rate: The Frame Rate corresponds with the smoothness of motion in the animation clip. Increasing the Frame Rate will increase the file size and processing times for the export. The recommended setting is **25 fps** or **30 fps**.

Range: If the **All** option is selected, then the entire animation clip is exported. Selecting the **Frames:** option allows a specified portion of the animation clip to be specified.



Select **Other:** to specify a **File Location**.

The **Save As:** box sets the **File Name**

Set the **Video Encoder** to **Windows Media Video 8**.