

AS120173

InfraWorks for Architects

Matt Wunch, BIM / Technology Manager
AI Engineers, Inc.

Learning Objectives

- Create an existing conditions model using InfraWorks' Model Builder
- Import Revit models into InfraWorks for design visualization and analysis
- Quickly create still images, fly-overs and drive-throughs
- Create a VR experience

Description

InfraWorks isn't just for civil engineers. Architects can benefit from InfraWorks' streamlined interface and easy-to-use tools to plan, analyze, and present a proposed building on a site within the context of the existing surroundings. Learn how to geolocate and import your Revit model to perform sun/shadow studies, create multiple proposals, bookmark views and batch print them (Javascript code included), generate quick and easy fly-over videos, and finish off with an easy way to create & share a VR experience of your proposed building located on the site.

Speaker

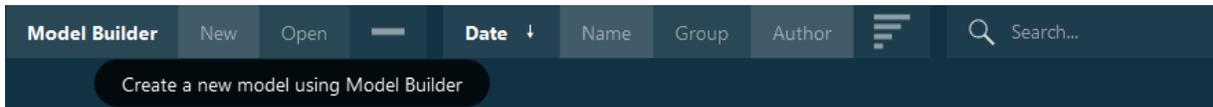
Matt received his Associates in Science in Civil Engineering from Springfield Technical Community College and is currently the Technologist / BIM Manager for AI Engineers, Inc. a multi-discipline engineering firm located in Middletown, Connecticut with satellite offices in New York, Rhode Island, Massachusetts, and Virginia. He provides BIM implementation, training, and technical support for the firm's engineering design software including Autodesk Revit, AutoCAD Civil 3D, InfraWorks, Navisworks and more. Matt has more than 25 years of experience with Autodesk software usage, installation and customization. He also supports the design team and their use of Leica scanners – P40 and BLK360 – for the collection and conversion of point cloud data for use in InfraWorks, Civil 3D and Revit. In addition, Matt is a member of the Autodesk Expert Elite program, a member of the Planning Committee of the Construction Institute's BIM Council, certified in Autodesk Building Performance Analysis, and is a Certified Professional in all versions of Revit – Architecture, Structure, MEP Mechanical and MEP Electrical, and has recently earned his sUAS Small Unmanned Aerial Systems license to fly drones.

Create an existing conditions model using InfraWorks' Model Builder

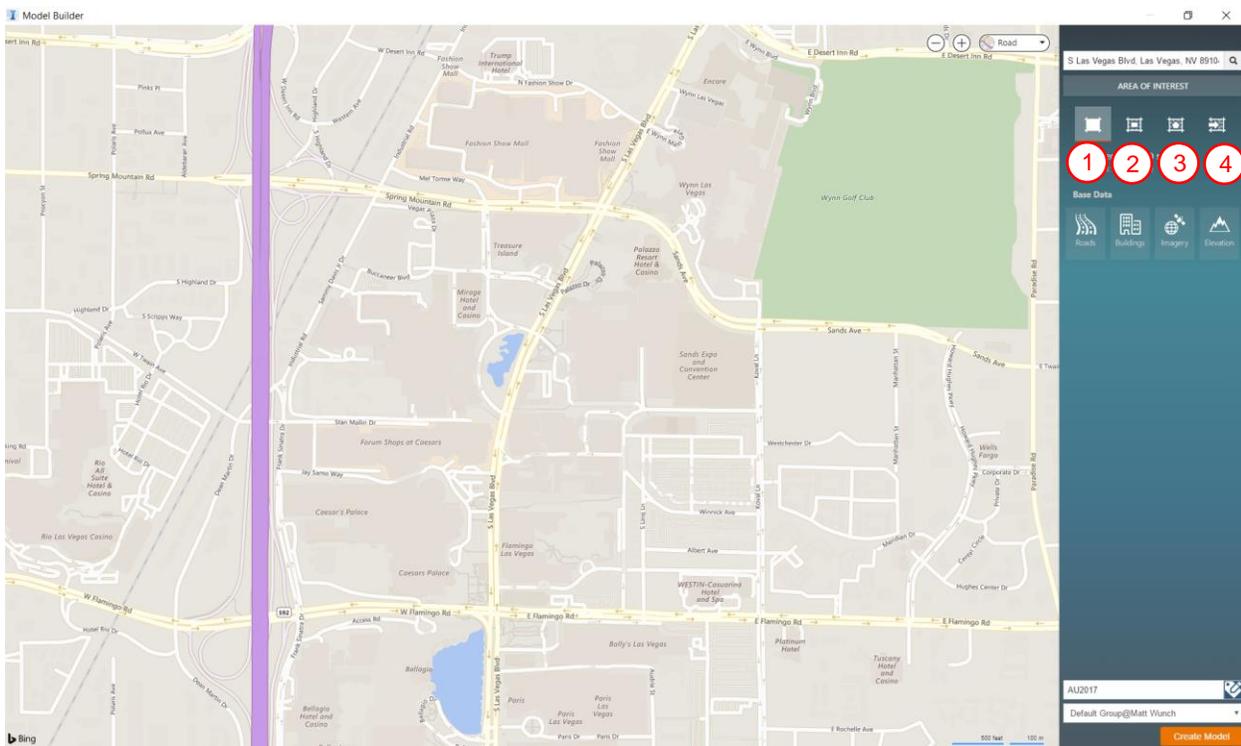
InfraWorks' Model Builder is a great way to create an existing conditions site plan with nothing more than an address.

Model Builder

Using InfraWorks' Model Builder is by far the fastest and easiest way to create a 3-dimensional model of an existing site. All you need is an address or general location to begin the automated creation of an existing conditions model.



INFRAWORKS HORIZONTAL MENU BAR

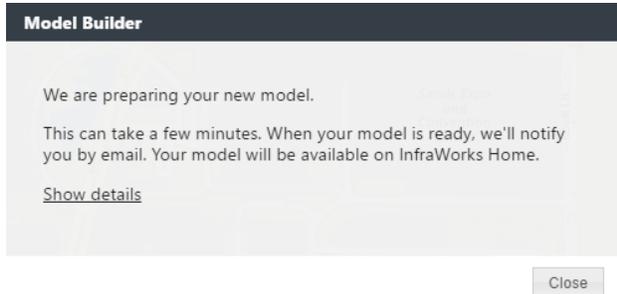


MODEL BUILDER DIALOG BOX

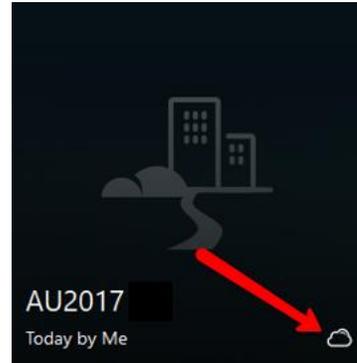
When you launch Model Builder you will get a BING Maps view of the world. You can either use your mouse to pan/zoom to a location or type in the address if you know it, then use one of the following four options to refine the Area of Interest (AOI), or the area that will be used to create the 3D model.

1. The VISIBLE area within the Model Builder window of the AOI
2. Allows you to pick a rectangular selection window to define the AOI
3. Allows you to pick a polygonal selection window to define the AOI
4. Import an SHP file to define the extents of the AOI

Once you have the AOI selected simply fill in a name for the model, select a group to add the model to, then click CREATE MODEL and let the power of the cloud do the rest. You'll receive an email as soon as your model is ready to be downloaded.



MODEL BUILDER NOTIFICATION



THIS ICON INDICATES THE MODEL HAS NOT BEEN DOWNLOADED YET FROM THE CLOUD.

Model Clean Up

Before you do ANYTHING, make a new proposal and clean up the model. Do things such as adjust building heights ([you can do this by setting – approximately – the date/time of the InfraWorks model the date/time of the satellite imagery](#)), adjust or remove building facades, fix roads, rails, waterways if necessary, and increase satellite imagery resolution.



*TOP: DEFAULT SATELLITE IMAGERY RESOLUTION (17)
BOTTOM: HIGHEST RESOLUTION SATELLITE IMAGERY (19)*

Proposals

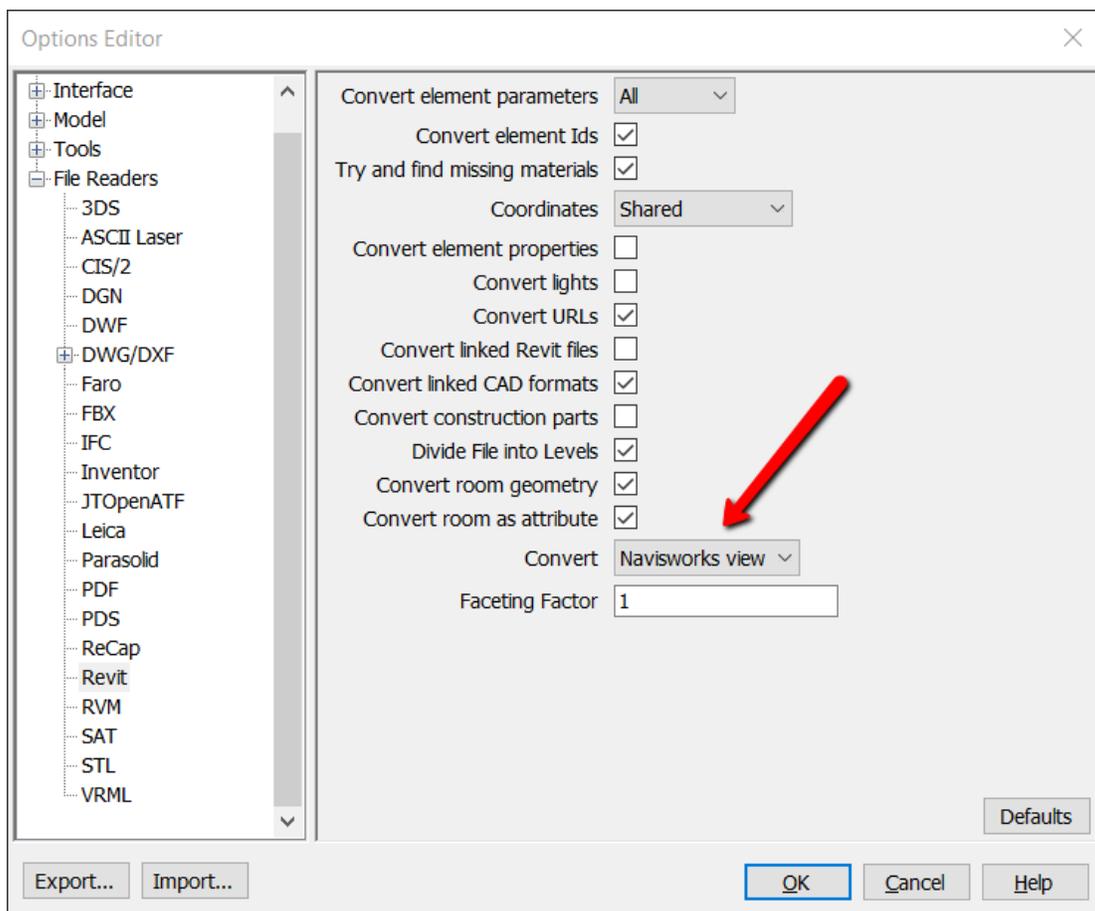
Proposals give you a way of showing different options within the InfraWorks model. For example, you can show a proposed building in a different location or orientation within the model without having to do a lot work.

Import Revit models into InfraWorks

Now that you've got a model created and cleaned it up, it's time to load the Revit model. There are two ways to import and place a Revit model – interactive placement (manually placing the model) or using geo-location. (for the purpose of this class, interactive placement will be used).

Best Practices

Prior to loading the model into InfraWorks it's important to set up the 3D view that's going to be used. By default, InfraWorks will use the "Navis" view (this is a view within Revit that has the prefix "Navis". If that view doesn't exist within the model it will use the default {3D} view and if THAT view doesn't exist then whichever 3D view was last created will be used. I personally use the "Navis" view as this helps me keep it separate from other views that may or may not be used for other things or deleted. Regardless of which 3D view you decide to use, it's important to remember that whatever is displayed in that view is what's going to be brought into InfraWorks so be sure to turn on only the categories you want to see.



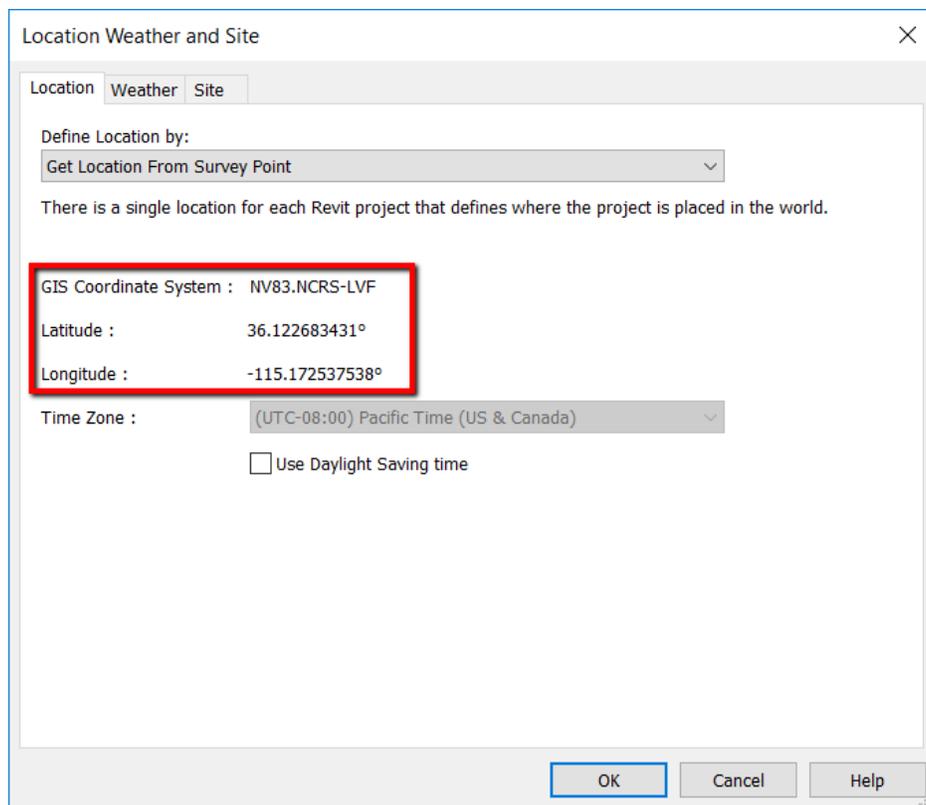
NAVISWORKS OPTIONS EDITOR DIALOG BOX

Interactive Placement

Interactive placement is just that.... An interactive way of manually placing and rotating a model. Its location is completely up to you.

Geo-location

Geo-locating a model will automatically place it in the X, Y, Z location as defined by a coordinate system. Geo-locating a model is not as difficult as you may think. One way of doing this is to acquire the coordinates from a Civil 3D DWG file. You can easily create a geo-located DWG by importing the site from the InfraWorks model. Once you've imported from InfraWorks simply save the DWG and import it into Revit. Before you acquire the coordinates, you must first rotate the DWG and/or elevate it to the approximate finish floor elevation, or some other known elevation. After the DWG is in place, click on *MANAGE* → *PROJECT LOCATION* → *COORDINATES* → *ACQUIRE COORDINATES* and select the Civil 3D DWG. You can verify that the coordinates have been acquired by clicking on *MANAGE* → *PROJECT LOCATION* → *LOCATION*. For additional information, [check out this Screencast video](#).



REVIT LOCATION WEATHER AND SITE DIALOG BOX SHOWING ACQUIRED COORDINATE SYSTEM FROM DWG



DEFAULT MODEL USING MODEL BUILDER



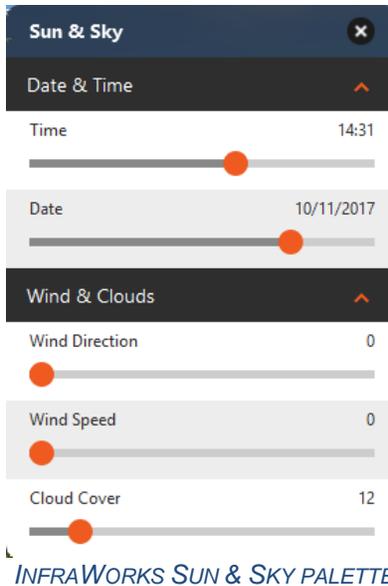
MODEL AFTER SWAPPING OUT DEFAULT BUILDINGS

Design Visualization and Analysis

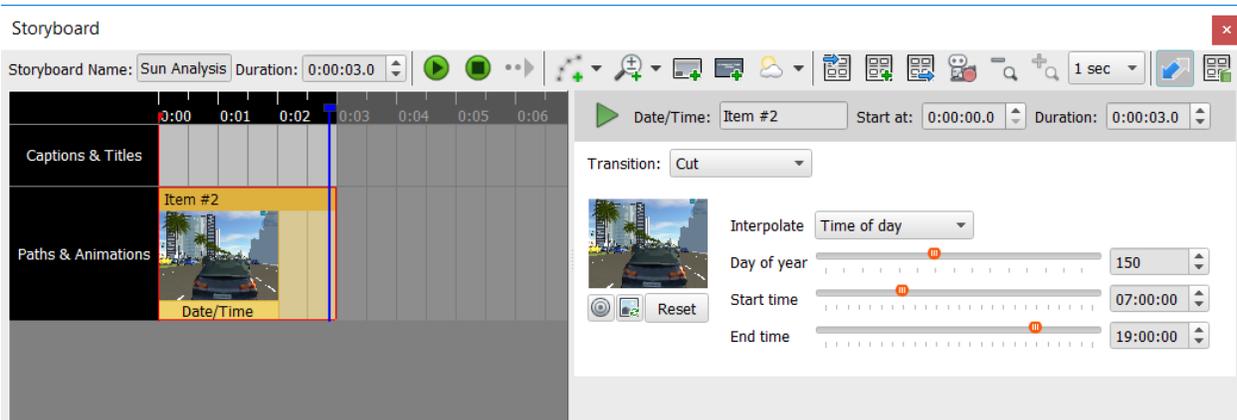
Now that the Revit model is loaded into InfraWorks, we can begin to look at it within the context of the existing surroundings.

Sun/Shade Analysis

This is probably the simplest type of analysis you can do in Revit. A sun/shade analysis can be done for any day at any time. Simply adjust the date/time of the model using the sliders on the Sun & Sky palette.



Another way to analyze the sun/shadows is through the use of the Storyboard and the Date/Time Animation. Change a few settings – Day of the Year, Start Time, End Time, Duration then click the Play button and watch as the sun rises and sets auto-magically.

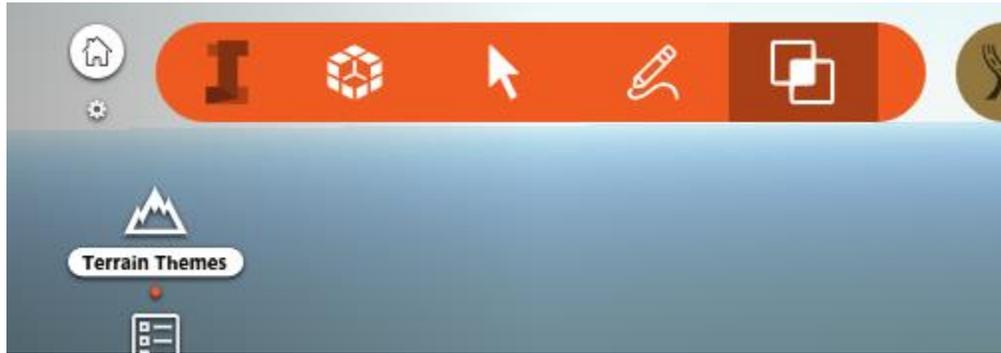


Terrain Themes

Terrain themes allow you to visualize the surface of your site in a variety of ways, for example, by showing the high and low points or illustrating areas that may be affected by direct sunlight.

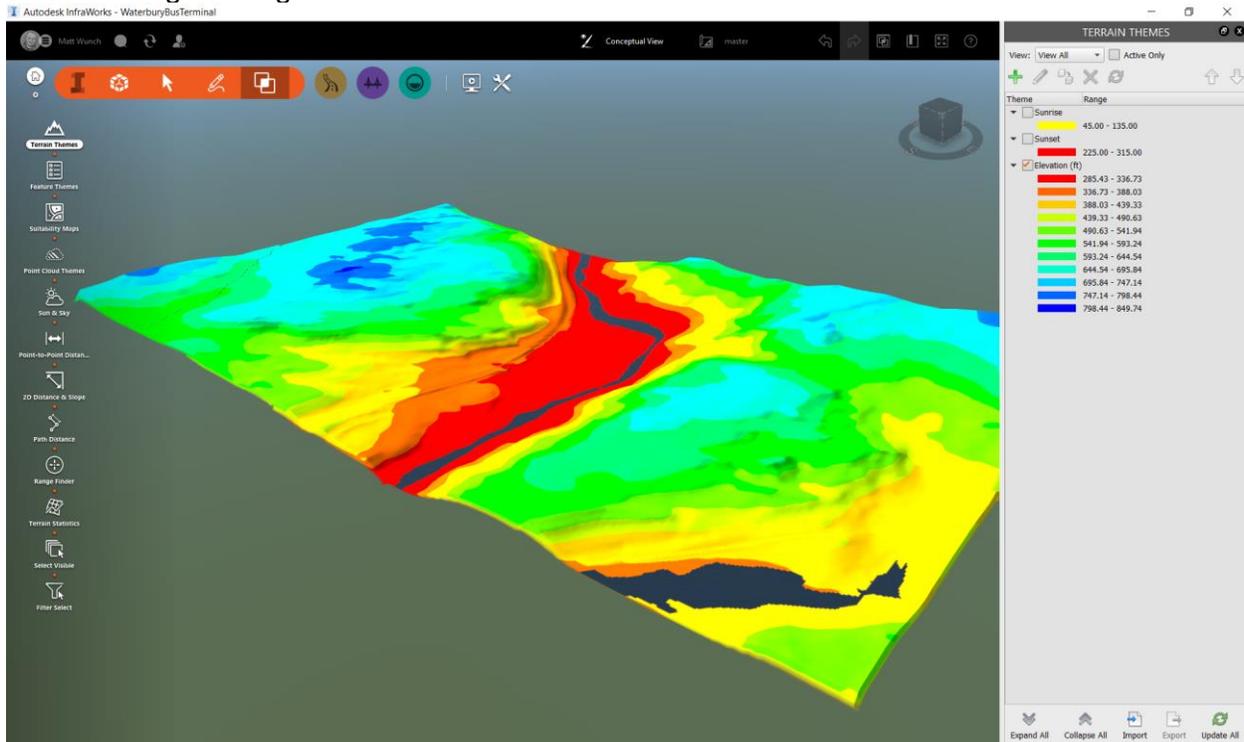
Elevation

To view the high & low spots of a site, click on Terrain Theme under the Analyze Your Model icon.



TERRAIN THEMES

This will open the Terrain Themes palette where you can define the type of terrain theme analysis. The default is ELEVATION and will color code the elevation model based on the selected range settings and colors.



Sunrise / Sunset

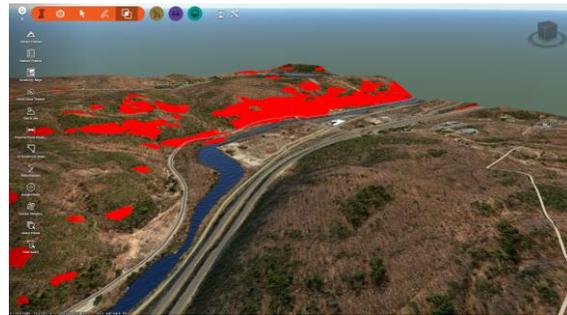
The second type of analysis is one for sunrise and sunset to show areas that may be affected by direct sunlight. To do this, in the Theme Properties dialog box, change the Analysis Type to ASPECT, set MINIMUM VALUE = 45, MAXIMUM VALUE = 135, and NUMBER OF RULES = 1. These settings will show the terrain highlighted as if the sun were shining from an Easterly direction. To analyze for sunset, make the appropriate changes as shown in the chart below.

<i>Sunrise</i>	
Analysis Type	Aspect
Minimum Value	45
Maximum Value	135
Number of Rules	1

<i>Sunset</i>	
Analysis Type	Aspect
Minimum Value	45
Maximum Value	135
Number of Rules	1



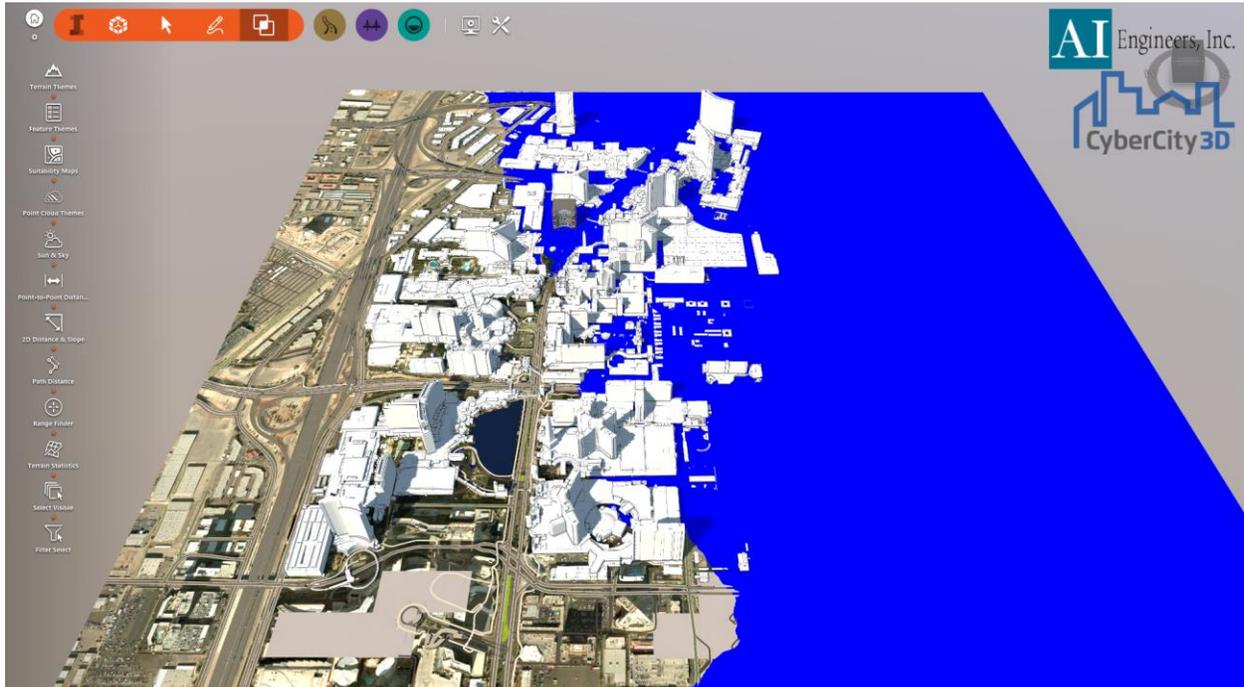
SUNRISE TERRAIN THEME



SUNSET TERRAIN THEME

Simple Flood Analysis

A building can be used to simulate a flooding scenario. Create a building the size of the entire site (or the area you want to focus on), set the elevation of it so that it's below the lowest point of the site (hint: use a terrain theme to help you identify the low point), then change the façade and roof styles to a blue color or use a water material. Now all you have to do is grab the gizmo on the roof of the building and raise and lower it to see which portions of your area of interest will flood first.



"FLOOD" SIMULATION USING A BLUE BUILDING

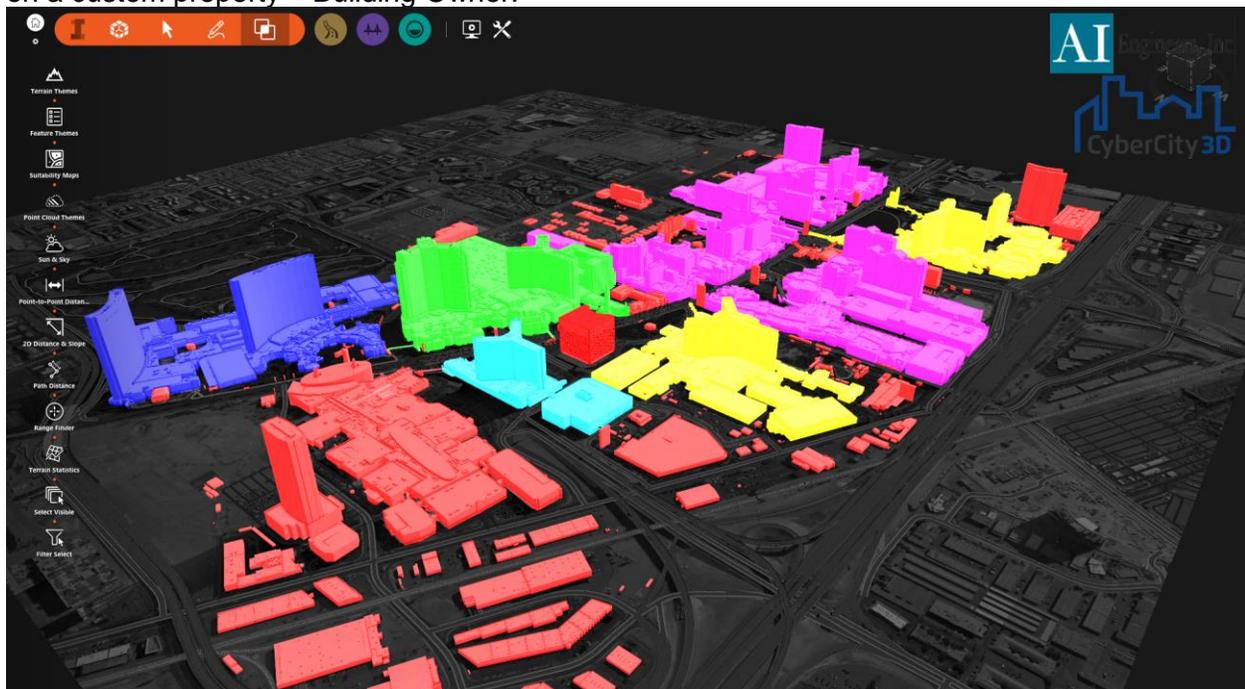
Feature Theme

Feature Themes allow you to visually display buildings, roadways, city furniture or just about anything else based on any one of their class features. For example, you can create a theme to view buildings based on energy usage, or construction type. You could create a theme to view roads based on traffic volume or construction material. Or you can theme trees based on their species. And if you use the [InfraWorks Data Model Editor](#) to create custom properties, the sky is the limit.

NOTE: This tool is NOT supported and could damage the properties of your model data as well as the model itself.

Alternatively, you can do this by [manually editing the im.schema.json file](#) (again, NOT supported).

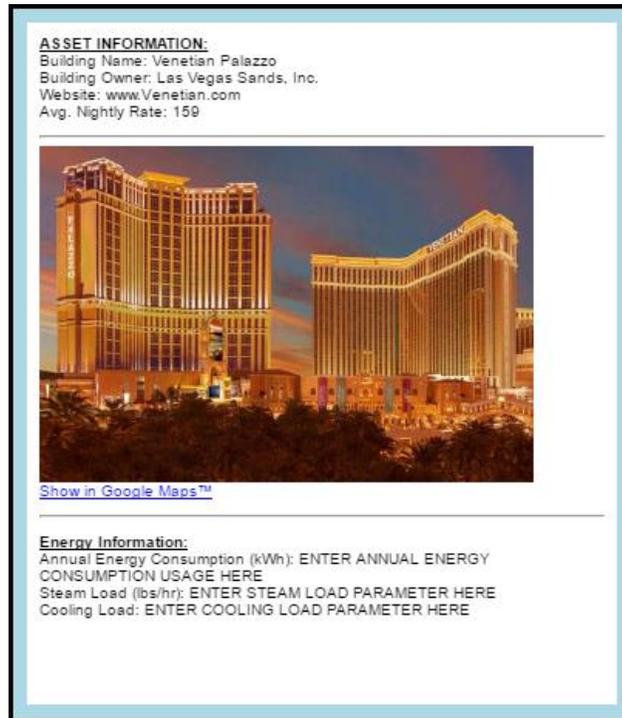
In the example shown below, I'm analyzing the building data by highlighting the buildings based on a custom property – Building Owner.



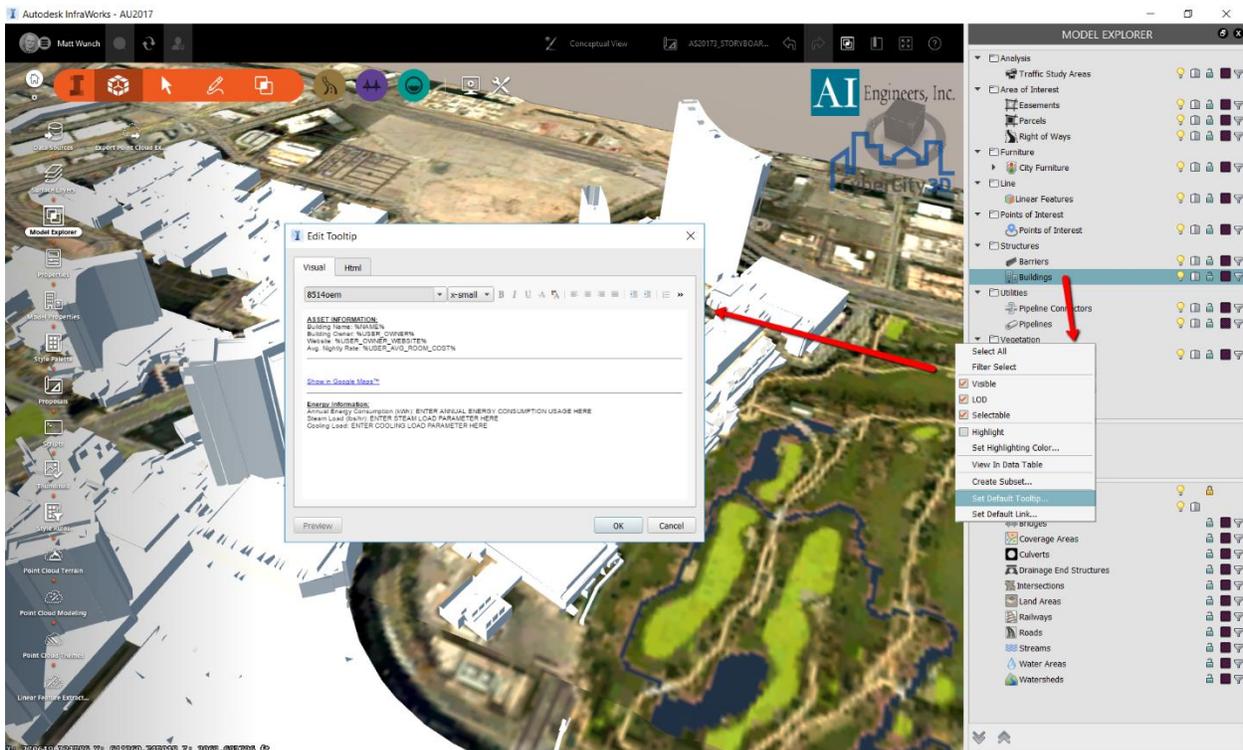
FEATURE THEMING

Enhanced Tooltips

Tool tips are a terrific way to view data about a particular building or feature class. And with a little HTML code and some custom properties, you can create something that looks like this.



CUSTOM TOOLTIP



SETTING DEFAULT TOOLTIP

```

<tooltip>
<forcewebview>true</forcewebview>

<style>
background-color:#ADD8E6;
max-width:400;
max-height:460;
border-color:#000000;
border-style: solid;
background-radius:10;
border-width:3;
</style>

<script id="0" entrypoint="googleMaps">
function googleMaps(feature, classID) {
var vector = feature.GEOMETRY.Centroid2d;
if(vector == null) { return; }
vector = app.ReprojectPointDbToLL84(vector);
if(vector == null) { return; }
var gmaps = "http://maps.google.com/maps?geocode=&q=" + vector.Y + "+" + vector.X +
"&t=h";
app.OpenUrl(gmaps);
}
</script>

</tooltip>

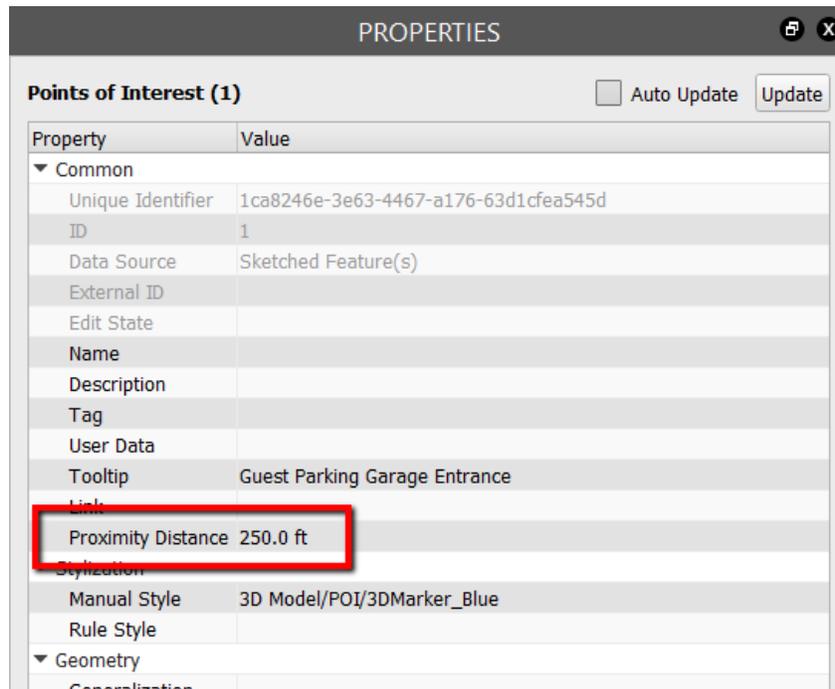
<font size="1" face="Arial">
<p><b><u>ASSET INFORMATION:</u></b><br>
Building Name: %NAME%<br>
Building Owner: %USER_OWNER%<br>
Website: %USER_OWNER_WEBSITE%<br>
Avg. Nightly Rate: %USER_AVG_ROOM_COST%<br>
</p><hr>
<br>
<a href="script:///0"><font color="#0000ff">Show in Google Maps™</font></a><p></p>
<hr>
<p><b><u>Energy Information:</u></b><br>
Annual Energy Consumption (kWh): ENTER ANNUAL ENERGY CONSUMPTION USAGE
HERE<br>
Steam Load (lbs/hr): ENTER STEAM LOAD PARAMETER HERE<br>
Cooling Load: ENTER COOLING LOAD PARAMETER HERE<br>
</p></font>

```

CUSTOM TOOLTIP HTML CODE

Points of Interest

Points of Interest (POIs) are like Tooltips but with one huge difference. Instead of needing to hover the mouse over an object, you can enter a Proximity Distance value and as soon as the view within InfraWorks is within the proximity distance of the POI, it will automatically display a tooltip. And just like regular tooltips, you can customize the look of the POI display with just a little bit of HTML code. The use of POIs and their proximity distance property are great for videos to call attention to a particular feature, or display a roadway name or anything else, as you get closer to it. Likewise, it will disappear the further away you get.



POINT OF INTEREST – PROXIMITY DISTANCE

Select Visible

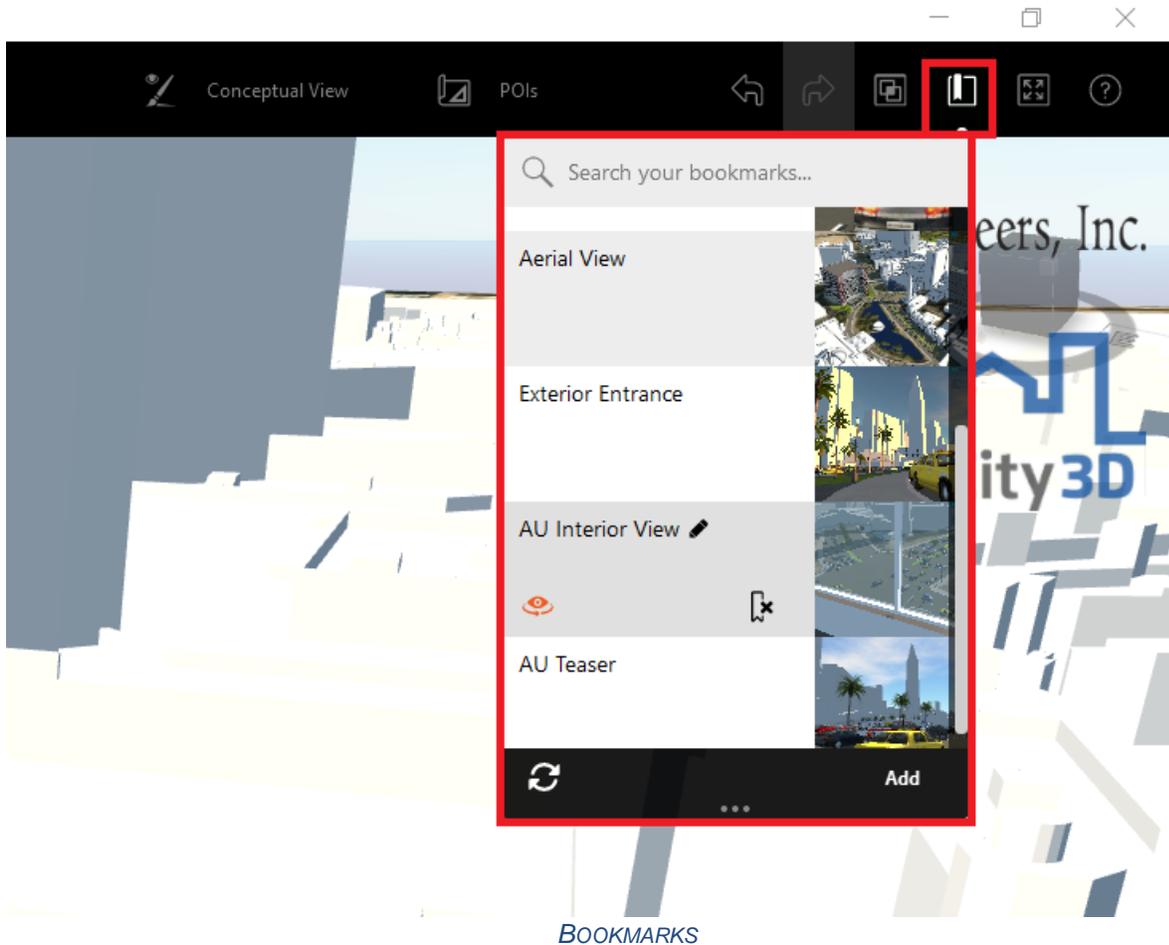
The Select Visible command will do just that... it will select everything that's visible on the screen from the camera's point of view. This is ideal for projects where, for example, adjacent neighbors may be concerned a new rooftop AHU will be too large. Will it need some sort of screen? Or how about a new residential development at the top of a hill near a private beach? Will the new homes be too obtrusive to the private beach-goers? It's important to note that the model's current Display Detail level influences how graphics are displayed which in turn determines if they're selectable. For example, if the Display Detail level is at its lowest setting (or near lowest setting), then some objects will disappear the further away they get but then reappear as you get closer to them. If the object(s) you are concerned with seeing are far away and you have the Display Detail level turn down low, you may get a false reading when checking if they're visible.

Create Still Images

Creating still images (using Bookmarks), fly-overs and drive-throughs is incredibly simple using InfraWorks and I'll outline the steps for each below.

Bookmarks

To create a bookmark simply navigate to a view that is visually appealing and displays the desired design intent of the model, click on the Bookmarks icon on the top menu bar and click Add then enter a meaningful name or description for the bookmark.



Batch Snapshots

With a little bit of JavaScript code, you can automate the process of creating snapshots for each bookmarked view. Just copy/paste the code below into the Scripting dialog box and click the Start Script button to run the code. If you'd like to change the output directory and/or width & height of the images, modify the code as desired.

NOTE: The current proposal will be used when exporting the bookmark views.

```
// Some global vars...
var doc = app.ActiveDocument ();
var bmList = app.ActiveDocument ().Bookmarks;
var imgWidth = 1920; // Modify the number to change the image width
var imgHeight = 1080; // Modify the number to change the image height

for (var i=0; i<bmList.length; i++) {
    var bm = bmList [i];
    var strFilePath = "C:\\temp\\"; // Modify to change the output directory
    var bName = (bm.name);
    var bmName = (bm.name+".jpg");
    strFilePath = strFilePath + bmName;
    CreateBookmarkSnapshot (bName, strFilePath);
}

function CreateBookmarkSnapshot (strBookMarkName, strJPGPath) {
    doc.MoveToBookmark (strBookMarkName);
    app.CreateSnapshot (strJPGPath, imgWidth, imgHeight);
}
```

BOOKMARK JAVASCRIPT CODE

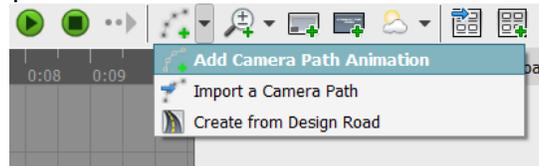


SCRIPTING DIALOG BOX

Create Fly-Overs and Drive Throughs

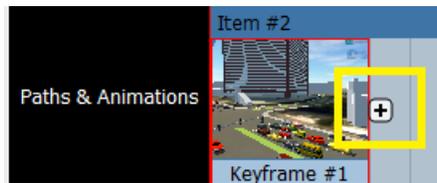
Fly-overs

Fly-overs are a great way to present your model to a customer, client, stake-holder, or for marketing purposes and InfraWorks makes it as easy as point and click. It's only a matter of setting interesting views and letting InfraWorks stitch them together in a smooth fashion as the camera moves from one view to another. Simply set a view, click Add Camera Path Animation and the keyframe will be captured.



INFRAWORKS STORYBOARD EDITOR – ADD CAMERA PATH ANIMATION (I.E. KEYFRAMES)

Navigate to another part of the model for another viewpoint of interest, but this time click the plus icon (+) to the right of the keyframe. Continue this process of moving to another view and adding a new keyframe (make sure you preview the video as well) until you're satisfied with the results.



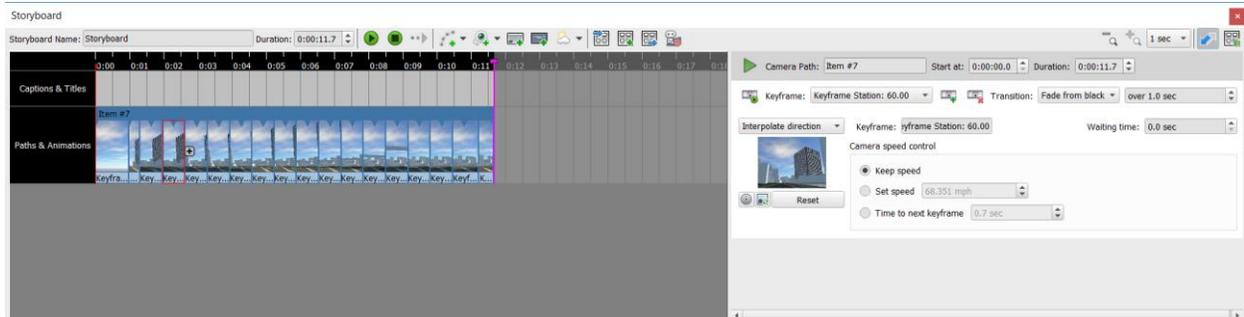
ADD KEYFRAMES

Drive-throughs

Drive-throughs are probably the easiest way to create a video presentation of a design. All they require is a design or component road. To create the video all you do is select the road you want to “drive” down and change a few offset options – to simulate driving on either the left or right-hand side of the road, and an offset for how high or low you’re sitting in the vehicle. If you’d like to put the focus more towards the side of the road to see how a proposed building might look from a driver’s perspective, for example, you



CREATE A CAMERA PATH FROM A DESIGN ROAD DIALOG BOX



INFRAWORKS STORYBOARD EDITOR – RESIGN ROAD

Branding – Part I

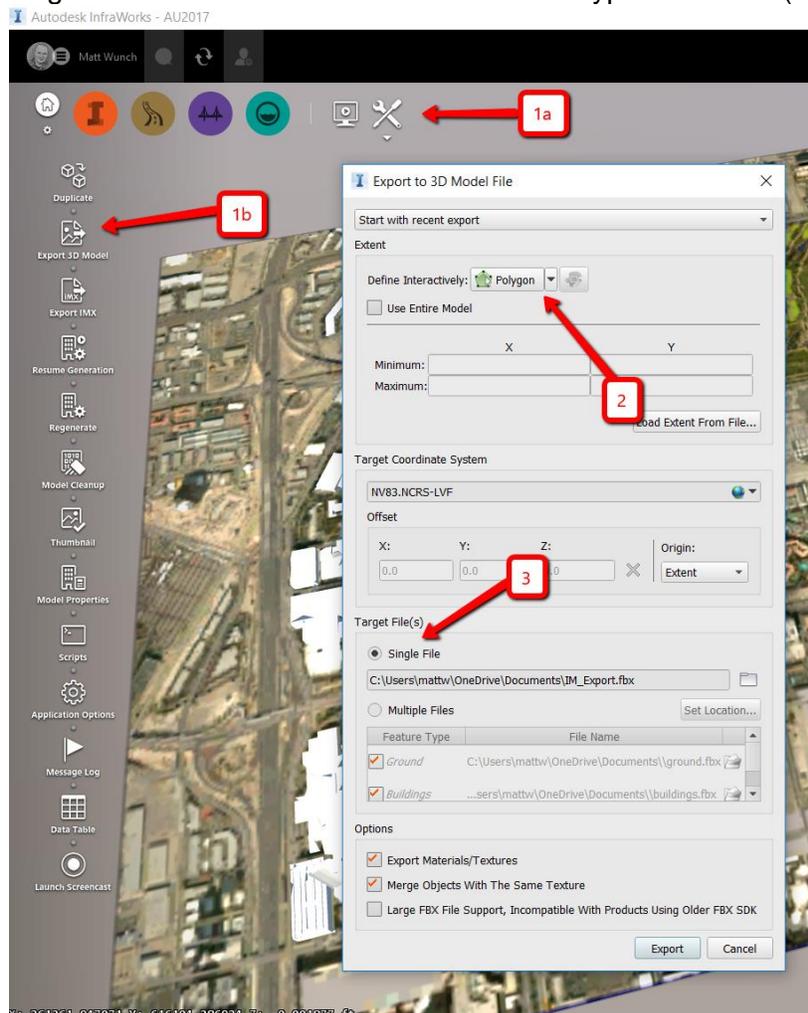
After creating your bookmarks for Snapshots and fly-over/drive-through video(s), you're most likely going to want to brand them so the viewing audience can see who created them. To do this, simply click on the **Create and conduct infrastructure design presentations** icon then select **Watermarks**. Browse for your company logo and set the location of it within the viewing area and it will show up on videos and snapshots.

Create a VR Experience

VR is all the rage these days so why not incorporate that into your current workflows? And creating a VR experience is not as difficult or daunting of a task as you may have thought it was. Let's explore three types of VR experiences and how they can be created.

The simplest way to go from InfraWorks to VR (that I've found) is to export the InfraWorks model to FBX format and import into Navisworks. From Navisworks you just set a view and send the render to the cloud for processing.

1. Click on Settings and Utilities > Export 3D Model
2. Determine the type size and shape of AOI you want to export
3. Create a single FBX file with all materials and feature types attached (keep it simple)

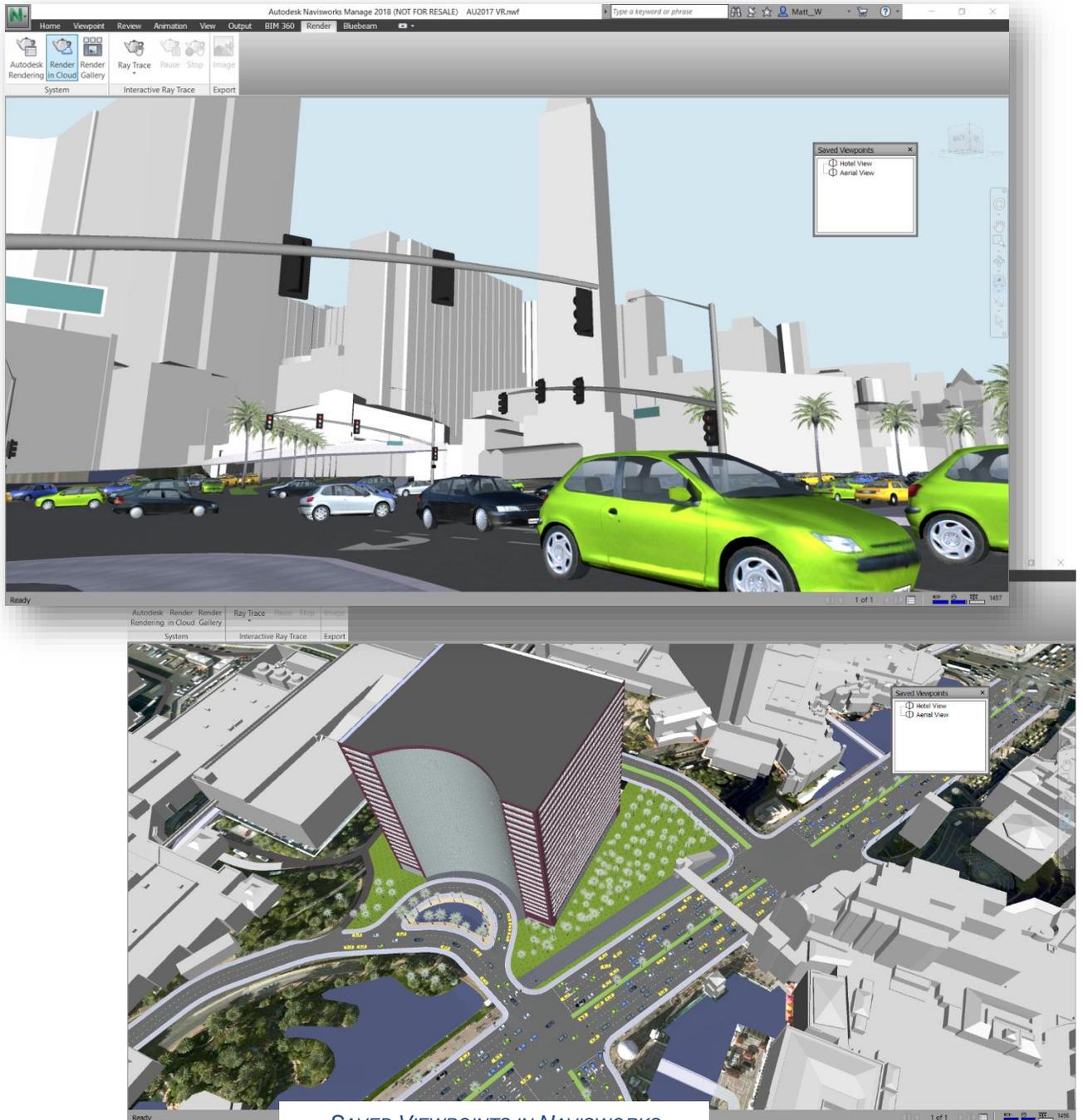


INFRAWORKS – EXPORT 3D MODEL

“Poor Man’s VR”

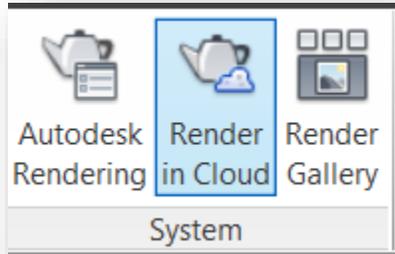
This is the simplest form of VR and unlike the following two types, this one doesn’t require any special extra gear or hardware such as VR goggles or a headset. It can be viewed by anyone, anywhere, so long as they have a web browser. And that’s why I’ve labeled this one the “Poor Man’s VR”.

Once you have the FBX created, simply open it in Navisworks and you’ll see all of your buildings, roadways, terrain imagery, etc. At this point all you have to do is set your point of view and you’re just about ready to render.



SAVED VIEWPOINTS IN NAVISWORKS

Before you render, you should use the Look Around tool to look ALL around because the rendering process will create a spherical rendering so if your right up against a wall looking out, you may want to adjust your point of view before using any cloud credits on a bad rendering. Once you're completely satisfied with the view, click the Render in Cloud icon and change the desired settings, making sure the Output Type is set to Panorama.



RENDER IN CLOUD

Autodesk RENDERING

Select 3D views to render in the Cloud

3D View: Current View

Output Type: Panorama

Render Quality: Final

Exposure: Advanced

Width: 4000 px

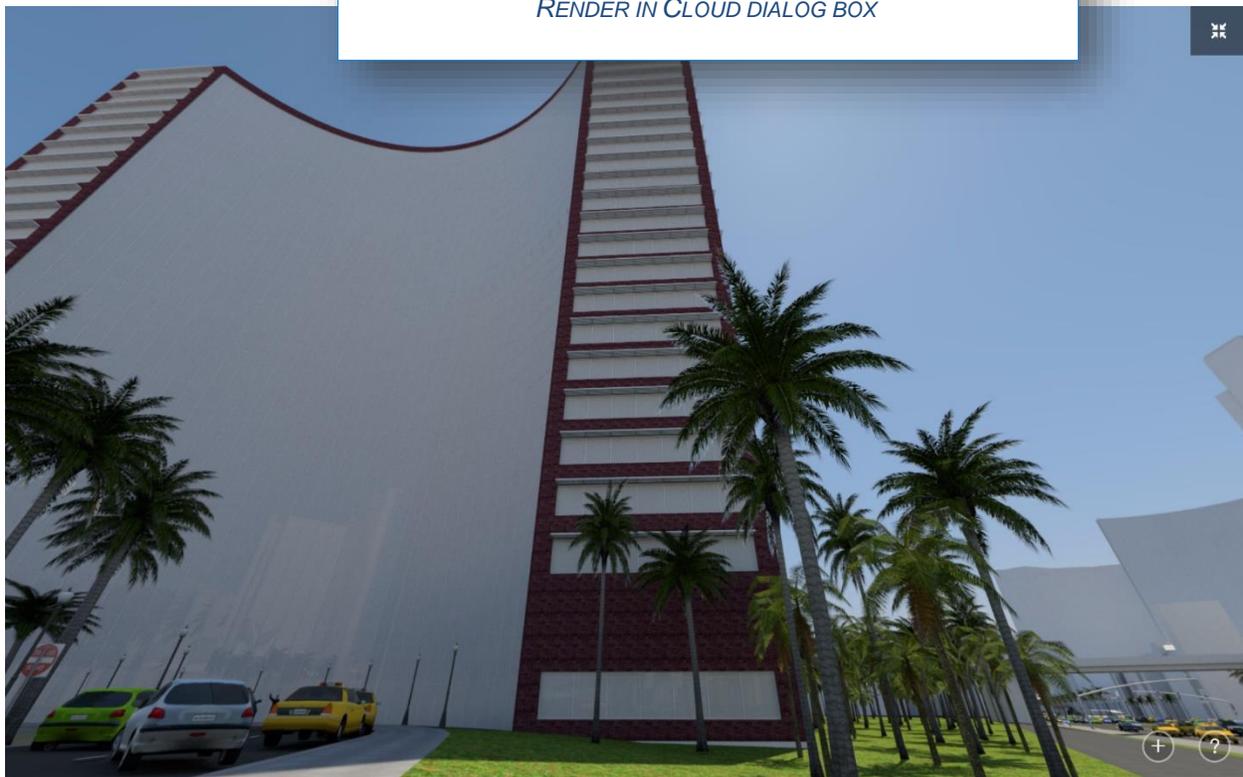
Cloud Credits: FAQ

Required	Available	Left
48	49431	49383

Estimated wait time: <10 minutes

Email me when complete

RENDER IN CLOUD DIALOG BOX



"POOR MAN'S VR"

Stereo Panorama

The Stereo Panorama is just as simple to create as the “Poor Man’s VR” but the viewer needs VR goggles or a Google cardboard-like device to properly experience the view. And the process is the same as the “Poor Man’s VR” except instead of creating a Panorama rendering, you’ll select the Stereo Panorama option.



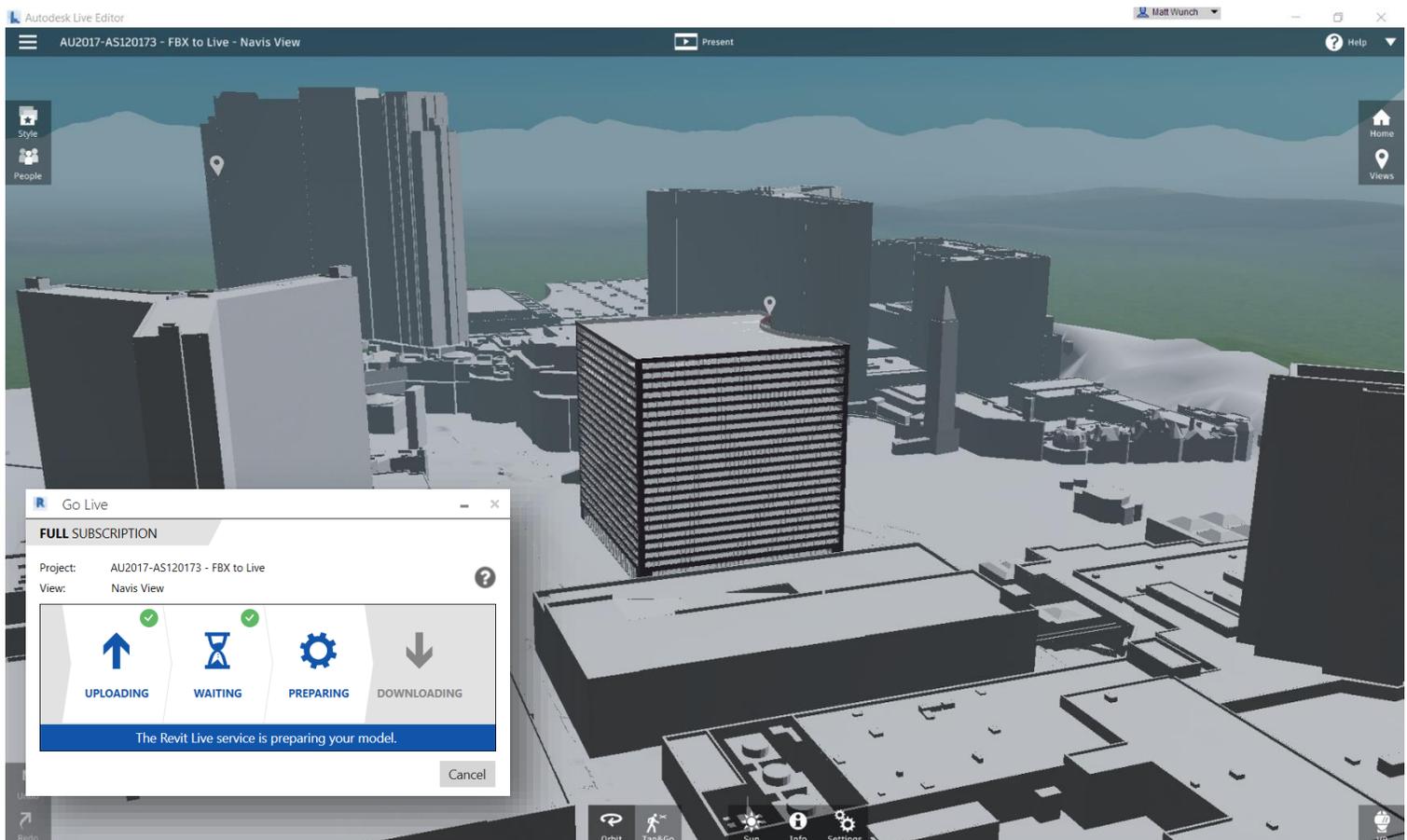
STEREO PANORAMA VR USING CARDBOARD-LIKE DEVICE

Revit Live

And last, but not least is [Revit Live](#). This particular VR experience is best viewed with an HTC Vive (but you can go the “poor man’s” route and use the [desktop viewer](#) to navigate around the model. To get your InfraWorks data into Revit and then out to Live, you’ll need to take a few extra steps.

1. Import the DEM into Revit. To do this, you’ll need the [Site Designer add-in](#) and Civil 3D.
 - a. Import the InfraWorks model into Civil 3D
 - b. Export the terrain data to LandXML format from Civil 3D
 - c. In Revit, import the LandXML data using the Site Designer add-in
2. Import the surrounding building models into Revit.
 - a. Export a portion of the InfraWorks model to FBX format (NOTE: It’s extremely important to set the coordinates to USER defined and zero them out – 0,0,0)
 - i. INSERT IMAGE
 - b. Import the FBX file into AutoCAD Civil 3D and save the DWG
 - i. Import the DWG into Revit using Shared Coordinates OR...
 - ii. Export the Civil 3D model to IFC format
 - c. Import/link the DWG or IFC file into Revit (NOTE: IFC is faster within Revit than an FBX of a DWG with lots of polygons)
3. Go Live!!

NOTE: Currently, NWD – Coordination Models – are NOT supported in the Live process.



REVIT LIVE WITH INFRAWORKS MODEL

Branding – Part II

Now that you've got your model built and have created a few VR experiences, what better way to share that with clients and potential customers than with a customize VR mailer. There are several sites that will allow you to really customize the look of the VR mailer by adding your company's logo and QR codes for your VR experiences. When the client gets it in the mail, they simply unfold it to create the cardboard viewer, scan the QR codes with a QR reader (many are free, however, they have ads which decreases the maximum viewing area) and they can see the great work you've done and can do, and hopefully on their next project.



VARIOUS VR VIEWING DEVICES

<http://www.imcardboard.com/>
<https://www.viarbox.com/>
<https://www.unofficialcardboard.com/>
<https://www.maxboxvr.com/>
<https://www.dodocasevr.com/>