

AS32341

# Visualize the Design Workflow of Custom-Built Homes with FormIt, Revit, and InfraWorks

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## Learning Objectives

- Discover how conceptual, custom home models in FormIt can be visualized in InfraWorks
- Learn how to bring a conceptual model from FormIt to Revit
- Learn about how Revit custom home models can be visualized in InfraWorks
- Learn about the workflow to visualize multiple design options from FormIt and Revit in InfraWorks

## Description

Design visualization is one of the most common ways to help designers portray their concepts to owners. Many owners have a hard time intuitively understanding 2D drawings such as plans, sections, and elevations. 3D models let designers get multiple views and generate visuals quickly for owners and other non-industry stakeholders. The questions for design teams: When do you begin modeling, and how do you convey important siting information during the design phase? This class will demonstrate a workflow utilizing FormIt software, Revit software, and InfraWorks software to create a smoother workflow. We'll incorporate earlier conceptual modeling with FormIt, and site context visualization with the model in InfraWorks. Then we'll transition to construction documentation modeling in Revit and site context visualization in InfraWorks.

## Speaker(s)

Jamie Owens has a background in Architecture and has spent the past decade working in various architectural firms in the Midwest. During this time, he has watched the evolution of BIM and witnessed the Architectural profession's need to embrace '21<sup>st</sup> century' skills for practice. These changes have led firms to become more technology dependent and reinforced the importance of adapting new technology into practice.

Jamie is a Building Solutions expert at IMAGINiT Technologies. He focuses on guiding AEC companies (design, construction and manufacturing teams) in growing their technology platform; assisting companies in becoming more efficient and competitive in the AEC industry; and adopting new workflows to assist in project success.

A certified Revit Professional and Certified Revit Instructor with an undergrad and graduate degree in Architecture; Jamie has presented the previous two years at the FLUG (Florida Local User Group) Conference and has been recognized for his excellence as an instructor and presenter.

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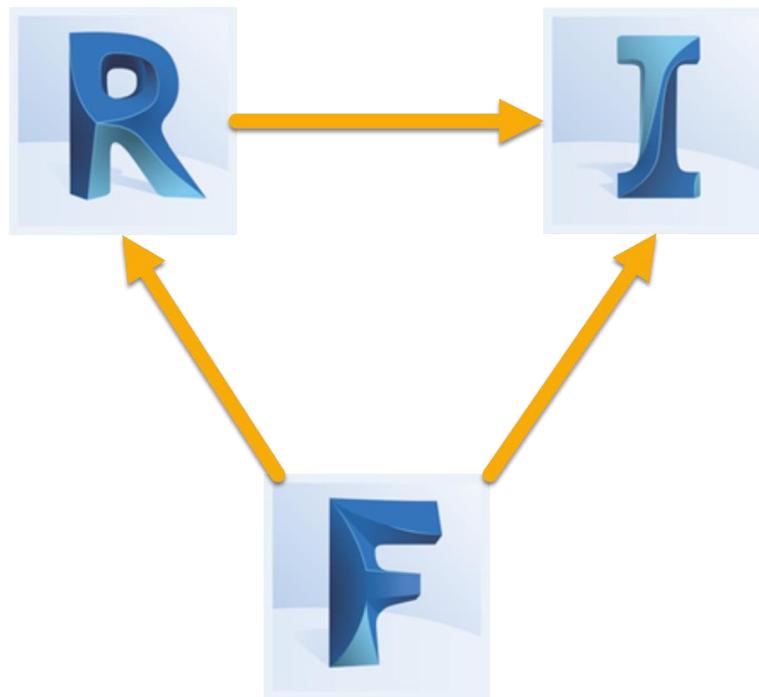
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## Introduction

Whether you are an architect or a designer; you need to relay your design to clients. The typical process of creating 2D drawings (Plans, Elevations, etc.) can only relay so much information; this is where 3D modeling comes in. Autodesk has a large collection of software that assists in developing, visualizing, coordinating, and documenting designs. These products are designed to work closer together, allowing for a better transition between them with less loss of data in the process.

For this class we will be using a custom-built home for our example. This class is going to focus on the workflow of using Autodesk's FormIt, Revit and InfraWorks – to create a conceptual model, visualize the various designs in InfraWorks with context, passing the conceptual model to Revit to enhance the design and then sending the Revit model to InfraWorks to showcase the higher level of detail in our visualizations.



*1 : FORMIT, REVIT AND INFRAWORKS WORKFLOW*

## FormIt for Conceptual Design Model

Autodesk FormIt is a conceptual design model software that assist designers to quickly generate designs using basic sketching concepts on three different platforms:

- Windows Based Desktop Application
- Web-based Browser Application
- Mobile Application on Android or iOS tablets

### Benefits of using FormIt for Conceptual Design

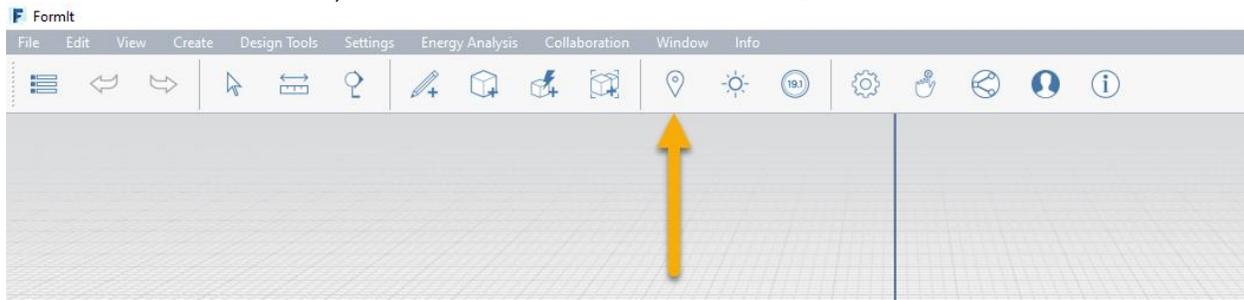
- Ability to work on multiple platforms without losing data.
- Real world site information for context and scale (Background Satellite Image)
- Use familiar 2D and 3D modeling creation tools
- Easily modify geometry with easy push/pull tools
- Ability to incorporate Revit families into concepts to enhance design

### Setting up Location

Setting the location of your project to be its actual location, is important for future uses of analysis and allows you to bring in a to-scale background satellite image to use for reference.

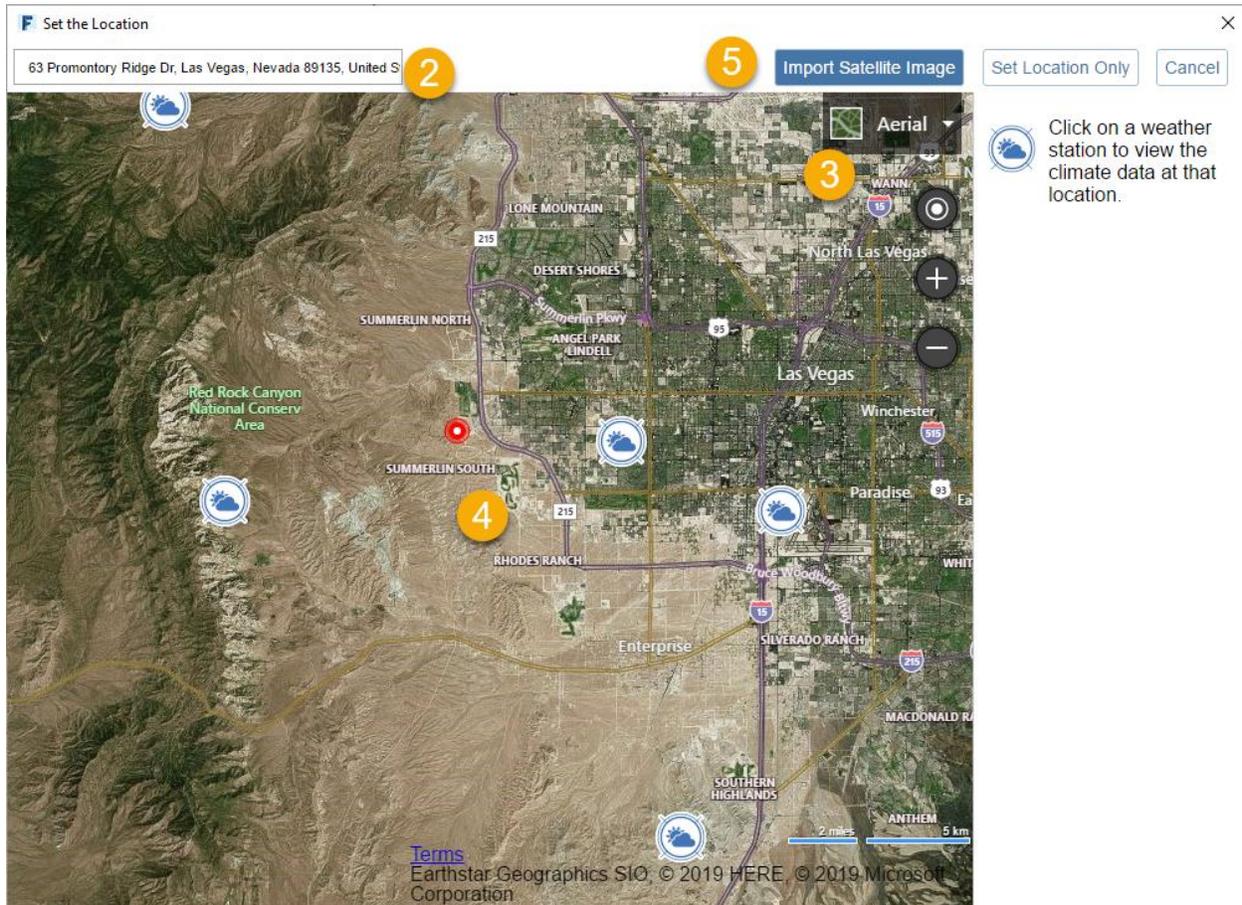
For this class, the project is located on the out skirts of Las Vegas, Nevada. Setting the location of the FormIt Model can be done in a few different methods but uses the same tools.

1. On the Action Bar, select the Location Pin Icon in the Standard Toolbar.



*2 : SET LOCATION ON ACTION BAR*

2. In the Set Location window, use the Search bar in the upper left corner to search for your site address.
  - a. For this class we are using: **1 Promontory Pointe Ln Las Vegas, NV 89135**
3. FormIt uses Bing Maps for it's search engine, you can view the map in two different methods, Road or Aerial.
4. Use the view window to refine your site location and view surrounding context.
5. Determine if you want to Set the Location of the model only or Import the Background Satellite image. For this exercise, Import the Satellite Image.



3: FORMIT LOCATION SETTINGS

\*Note a second dialogue box will show, giving you the ability to zoom in or out on your site to determine how much of the context you want to bring in and the scale of background.

With the Imported Satellite Image, this will show as the background/Base within FormIt that can be used to start the modeling process over.

- If needed, the background can be adjusted to be more transparent so that it doesn't look as bold in the view. Double click on the image and in the properties panel, adjust the transparency as needed.

### Begin the Conceptual Modeling Process

Many times, our design ideas may begin even before getting into FormIt. Our ideas may begin as a simple napkin sketch or maybe even a little more refined, as an AutoCAD drawing.

The benefit of FormIt, is that both sketch types can be brought into FormIt and used as a starting point. The AutoCAD DWG can be brought directly in and used as an underlay that will allow snapping to the vector lines.

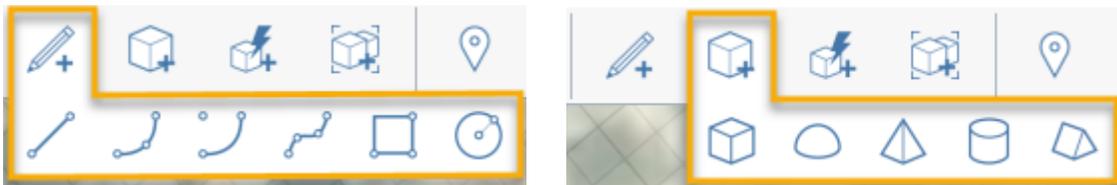
If using a napkin sketch, this can be scanned in or taken a photograph of and then imported in as a background. The napkin sketch can be scaled and oriented as needed to be the accurate size. The house can then be traced over with sketch lines to create the outline and 2D shape.



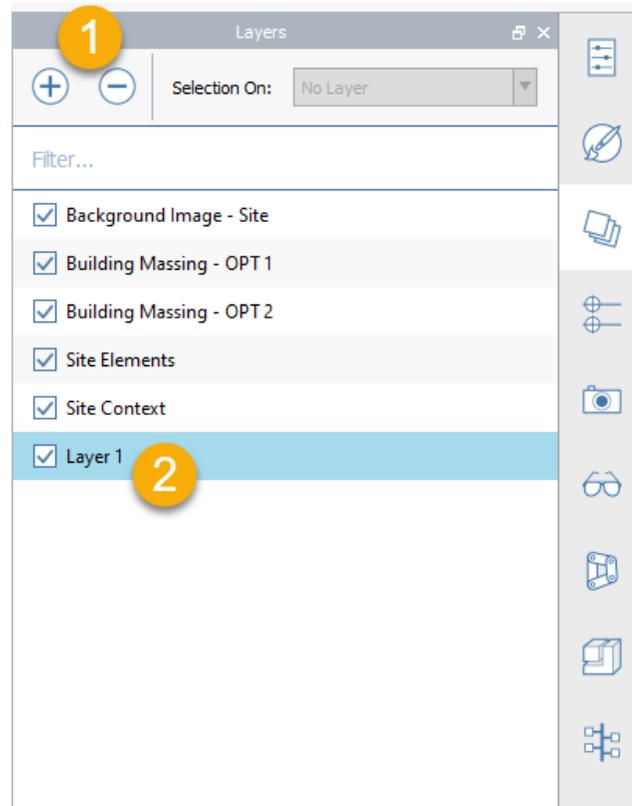
*4: SITE PLAN W/ AUTOCAD FLOOR PLAN IMPORTED*

Once the background sketch is imported, set the grid and axis to align with floor plan, this makes the modeling process easier.

Using the various sketch tools, the conceptual model can be developed.



Using Layers within FormIt will aid in managing the model, allowing for multiple concepts to be generated within the same model or creating site vs building information. Similar logic can be followed in FormIt that is used in AutoCAD for layers.

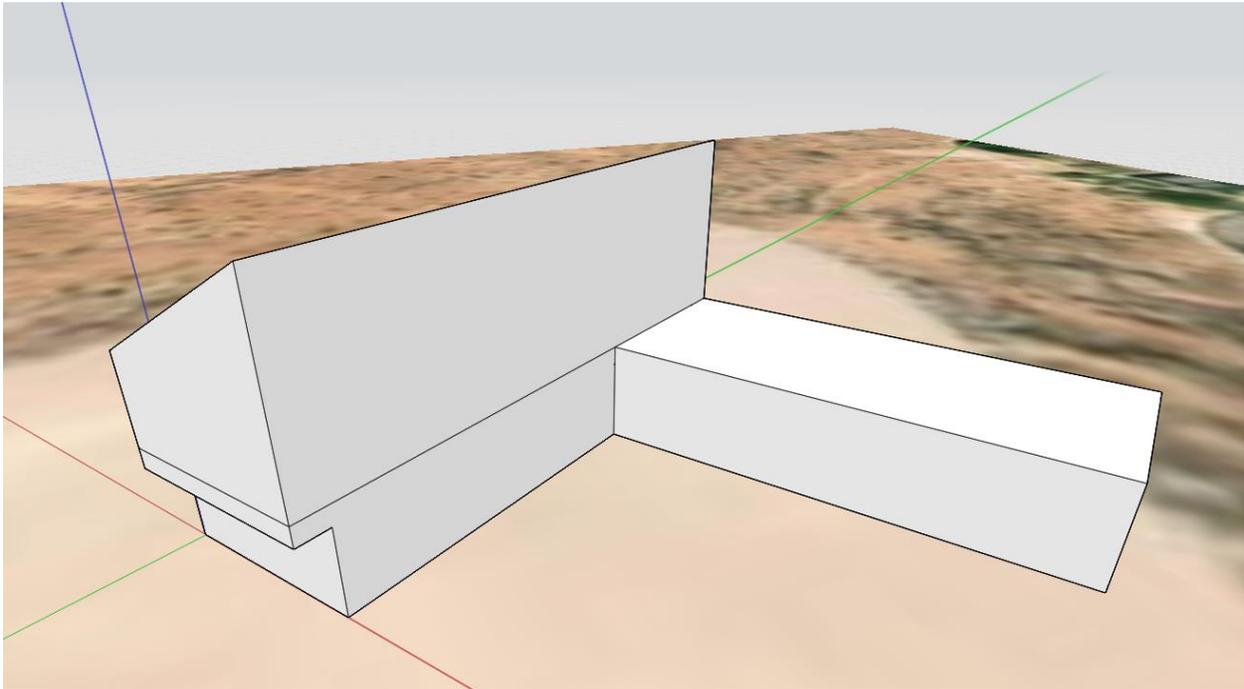


5: FORMIT LAYERS PANEL

1. Create a new layer or delete an existing layer
2. Rename the layer as needed for its purpose.
  - a. Layers can be turned on and off using the checkbox next to their name.

### Developing the Concept

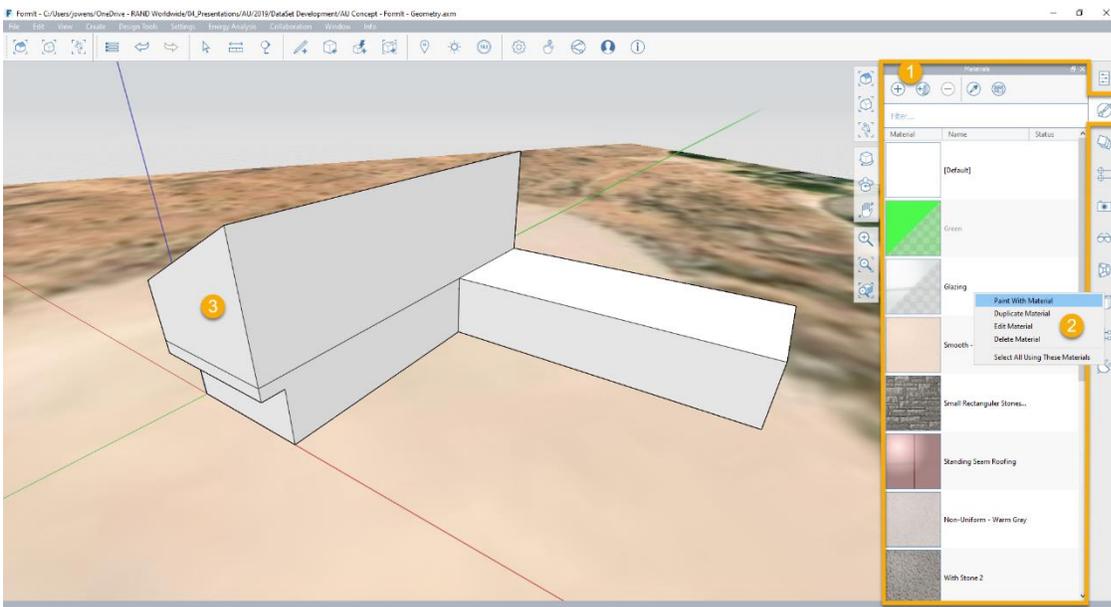
After using the sketch tools to create the concept, the form is a singular material "Default".



6 : FORMIT MODEL "DEFAULT" MATERIAL

Using Materials aids us in the creating visuals to present the design to our clients. FormIt uses Autodesk’s standard Material Library Palette as a basis of materials but offers the ability to create custom materials as the designs required.

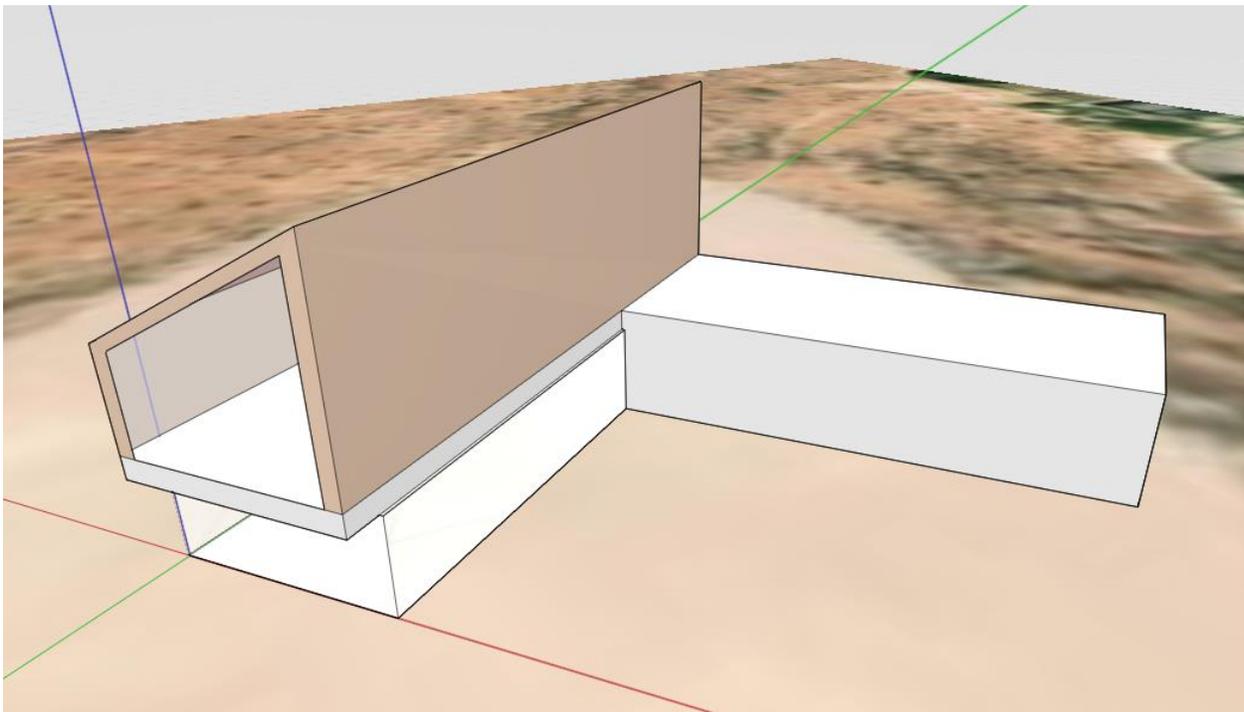
Creating and applying Materials can be accomplished in the material palette.



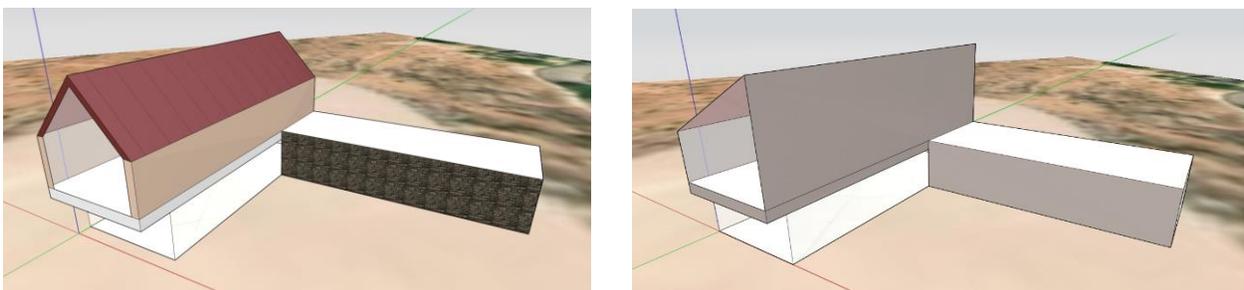
7 : FormIt Material Palette Process

1. Using the + symbol will allow for creating a custom material in the project. Using the Import Material, allows for the ability to import a material from Autodesk's Out of the Box library.
2. Once a material is made, right clicking on a material opens a dialogue box to allow for painting the material (user can also select the material and will be in the painting mode as well).
3. Select the surface that needs to be painted with that material. \*Materials are painted onto the surface of the geometry.

Continue this process until you have the desired appearance.



*8 : CONCEPT WITH MATERIALS PAINTED ONTO SURFACES.*

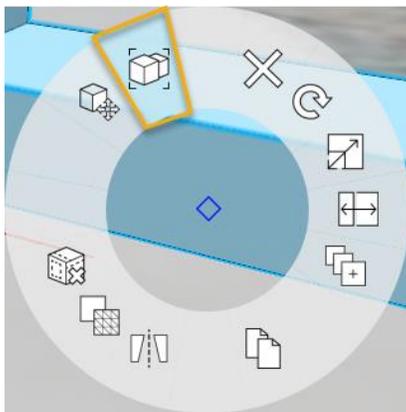


*9 : DIFFERENT CONCEPT STUDIES WITH VARYING MATERIALS*

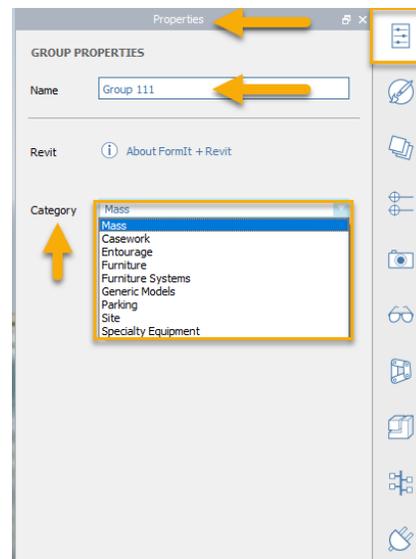
## Grouping FormIt Elements

Grouping elements inside of FormIt, makes it easier to create replicate elements, like door, windows, etc.; however groups don't have to be limited to these types of geometry. For example, a floor plane in the model or an entire storefront system can be grouped for easy handling of the geometry.

To create a group, select all the surfaces and lines that need to be grouped (a quick way is to double click on one of the surfaces to select all the connecting surfaces and edges), right click and select "Create Group". Once the group is created, double clicking will open the group, in the properties panel, a name can be defined and a category assigned.



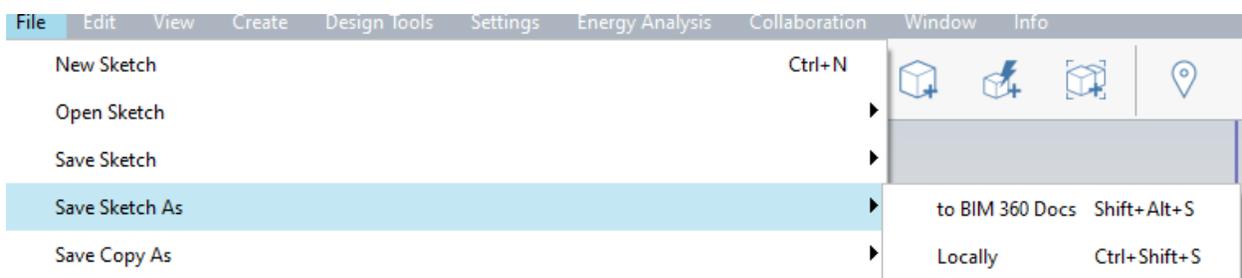
10 : CREATE GROUP



11 : GROUP PROPERTIES

## Saving and Handing Off the Model

Autodesk FormIt offers a couple different methods of saving the model. If using the Windows Application, FormIt models can be saved locally to the computers hard drive or a company server. The model can also be saved to a BIM360 Docs Cloud Project. This method allows for access of the model with the web-browser and the mobile applications.

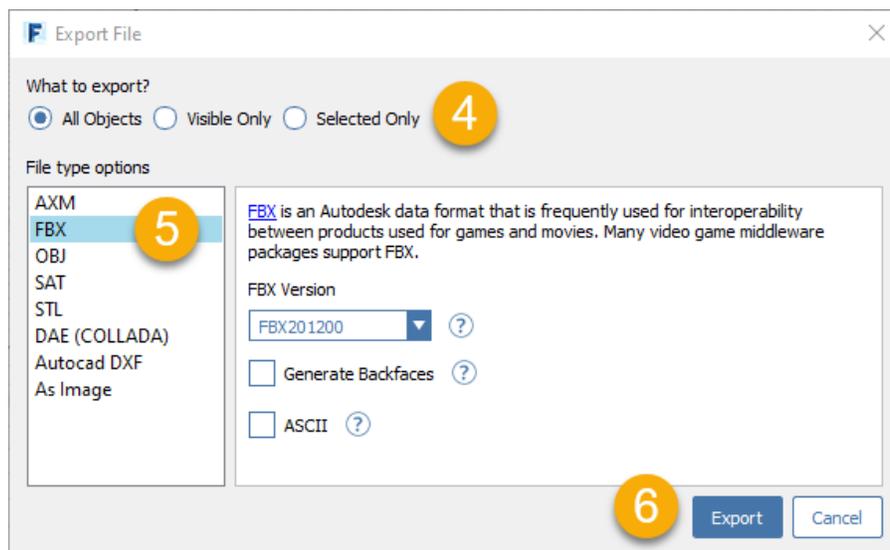
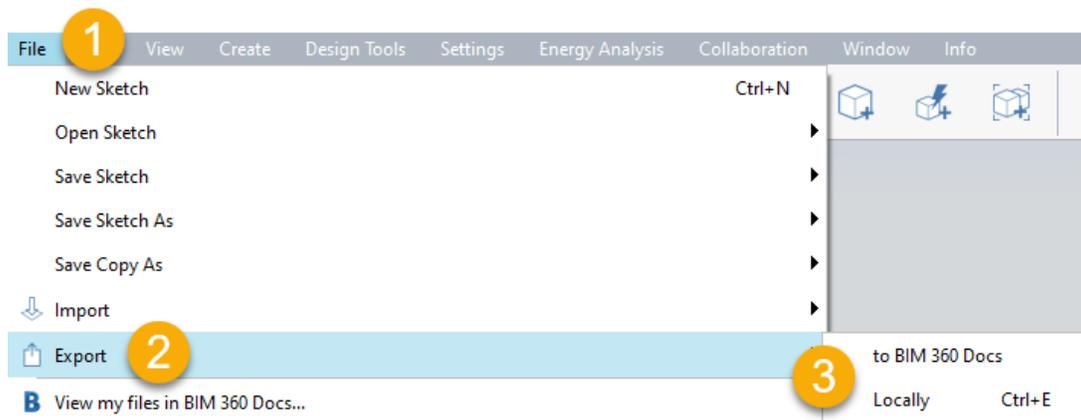


12 : SAVING FORMIT FILES

For this class, we're going to use the local hard drive, in order to use BIM360 Docs, you must be signed into your Autodesk Account and already have a BIM 360 Docs subscription, with a project and proper permissions to save to that project.

FormIt's file type is an .AXM, this is a unique file type that is specific to FormIt. The .axm file type is not supported for importing by many other programs. However, FormIt has ability to export out to many different file formats to exchange models with other programs. This is how to share the model for use within InfraWorks, to see the design within surrounding context and site conditions.

When sharing the model, using the .FBX file type allows for materials to pass along with the geometry.



13 : FORMIT FILE EXPORTING SETTINGS

1. Under the File Tab
2. Select Export

3. Choose your location
4. When exporting you have the option to export three different ways:
  - a. All Objects – This will export all geometry in the model, whether it is hidden or not.
  - b. Visible Only – This will export only the geometry that is currently visible in the model. This is a great way to have multiple design options in the same model (using layers), then turn off the other layers to export what you need for other programs. \*We will use this approach since we have multiple design options on different layers in our model.
  - c. Selected Only – This method will export only the geometry that you have selected. This works well if you didn't use layers to separate your geometry but want to export out a specific piece of the model.
5. Choose which file format you want to export:
  - a. For this exercise we are going to use the FBX format to send the model to InfraWorks. Later we will use the AXM to bring the model into Revit.
  - b. Review all the settings with the File Type, to review what you need for the program you are going into. For this exercise we are going to use the default settings.
6. Export the Model. Make sure to give it name that makes sense and saved to a location that is readily accessible.

## **InfraWorks for Contextual Visualization**

Autodesk InfraWorks is typically used by civil engineers as an infrastructure design software, in the context of the built and natural environment.

InfraWorks is a windows-based application that has the ability to store models in the cloud or on local storage devices. Unlike many of the other AEC products from Autodesk, of allowing multiple versions of the software to be installed, i.e. Revit 2017, 2018, 2019, 2020; InfraWorks only has the ability to have one version installed; meaning all your models will always be upgraded with updates.

### **Benefits of Using InfraWorks for Custom Built Homes**

A custom-built home often needs to be visualized with some of it's surrounding context or even potentially to visualize the views that would be available when completed. This is best done through rendered graphics but developing a contextual model can be time consuming.

Autodesk InfraWorks has the ability to use GIS data to quickly generate topography, public buildings, roadways and waterways. Additionally, users can then expand on this context with additional building styles or unique 3D designed buildings for context, while also adding in site furnishings, like stop signs, park benches, softscapes, etc., as needed for a more realistic scene

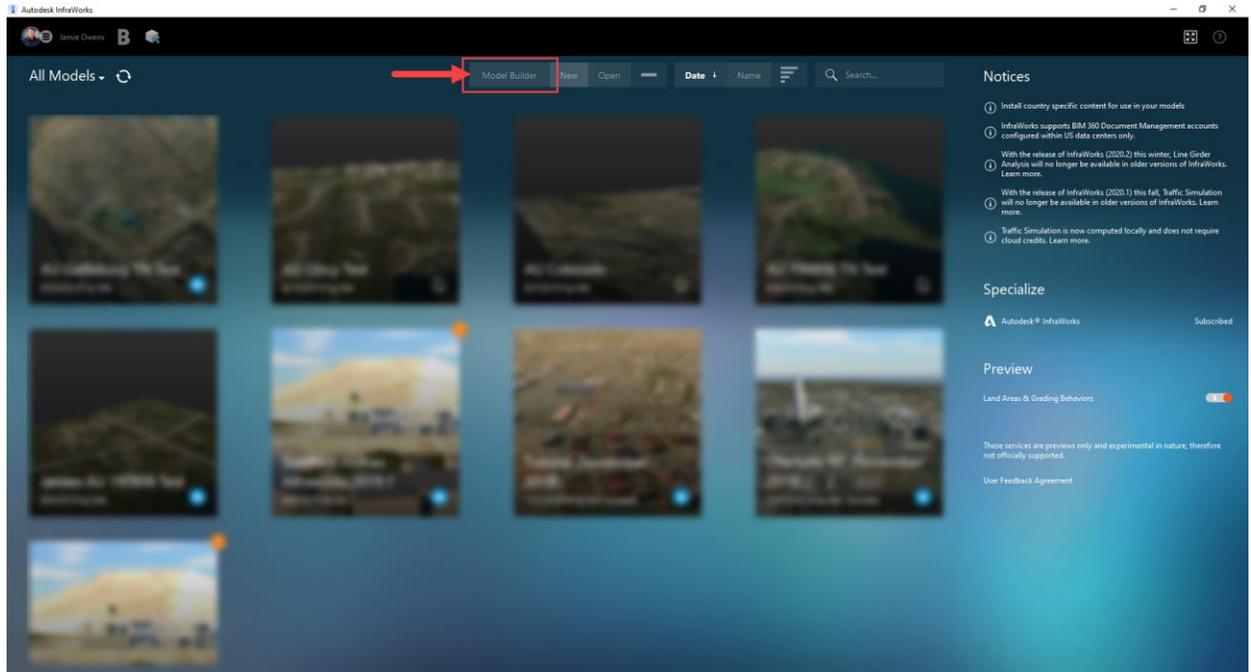
All these parts and pieces help give our design a more realistic feeling. InfraWorks, then allows for the exportation of different views and animations to explore and showcase the design.

### **Building the InfraWorks Contextual Model**

Building the contextual model does require access to the internet as it is pulling mapping service images similar to FormIt.

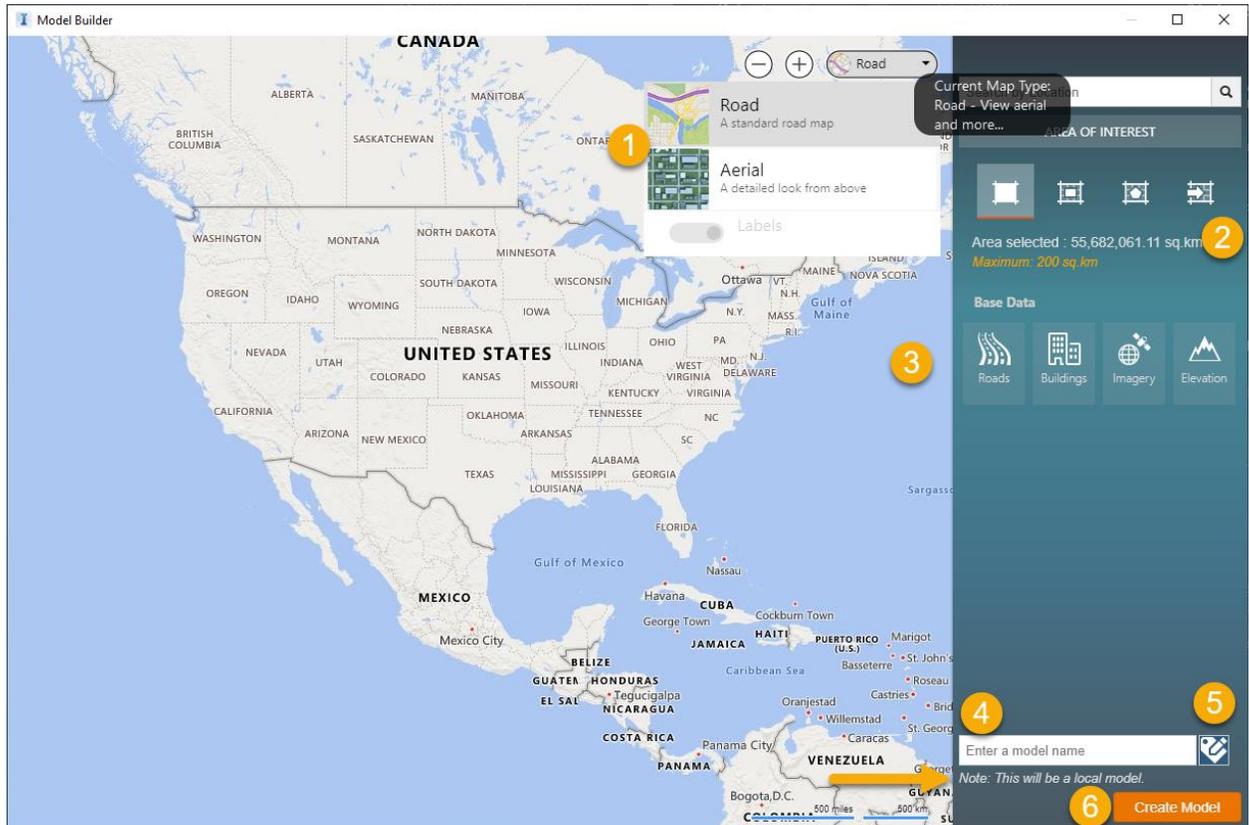
#### **Initial Model Setup**

Upon opening InfraWorks, the image below will appear, this is InfraWorks' Startup/Home page. Use the Model Builder along the top bar to start the Area of Interest (AOI) model building.



14 : INFRAWORKS STARTUP PAGE FOR MODEL BUILDER

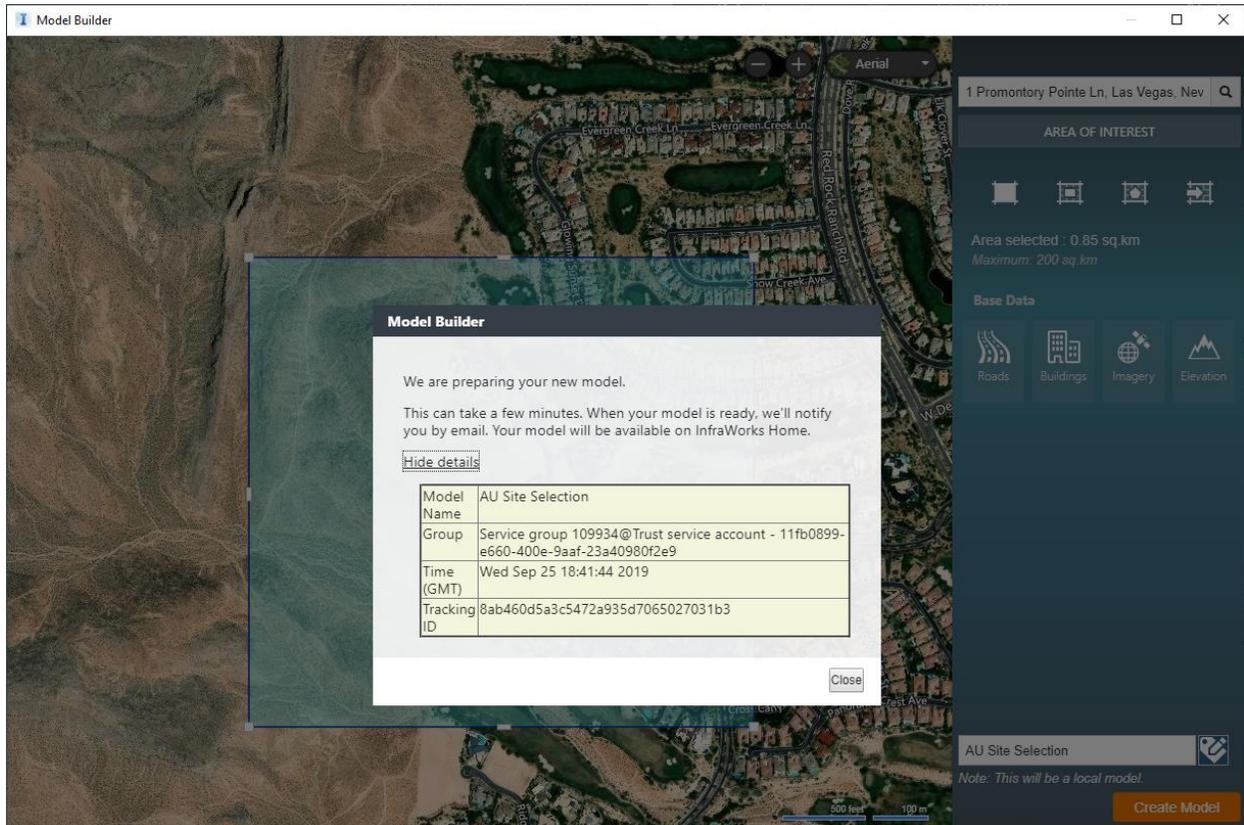
This will bring up a second dialogue box to allow you to identify the area you want to build the AOI model from, while providing some basic information.



15 : INFRAWORKS MODEL BUILDER SITE SETTINGS

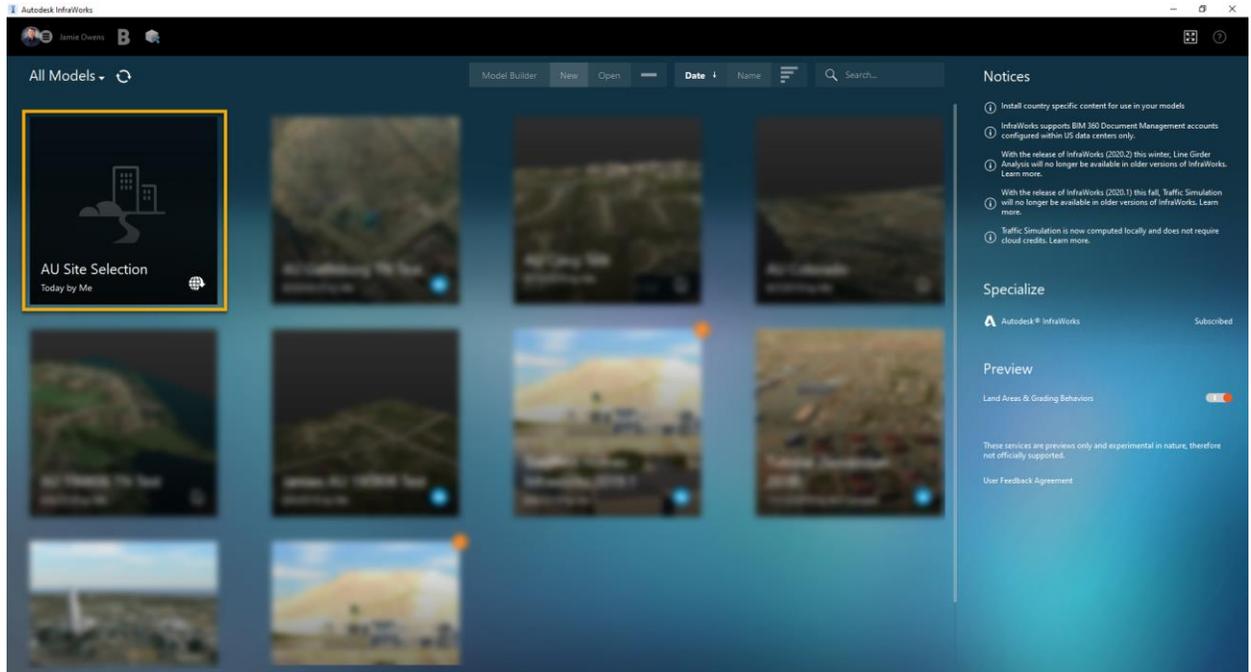
1. Determine if you want to use Road or Ariel mapping
2. Use the Search by Location and Window Selection tools to help identify the Area of Interest (AOI).
  - a. For this class, we are using the same address that we used in our FormIt model location settings : **1 Promontory Pointe Ln Las Vegas, NV 89135**
3. The model will contain the following base data: Roads, Buildings, Imagery and Elevation/Topography.
4. Give your Model a name.
5. Add a model description if desired.
6. Create Model
  - a. This will create a local AOI model that will be used to create an InfraWorks Project.

Once you select 'Create Model', you will get a notification that the model is being prepared with some information on the model. This will build the local model that will be used in the generation of the InfraWorks model.



16 : INFRAWORKS MODEL BUILDER INFORMATION

Once the AOI model is available and ready for use, you will get an email letting you know, as well as it will show up in your InfraWorks Home Page.

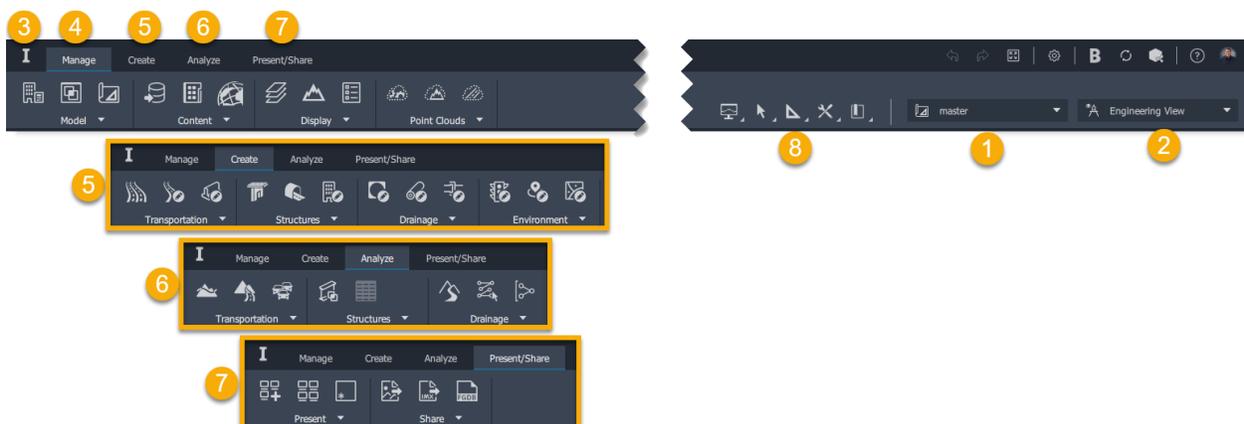


Once the model is generated and ready to use, Select the model in your InfraWorks Home Page.

- This will use the AOI model previously created, to create an InfraWorks Model.
- You will have the opportunity to give your project a unique name or use the name that you used in the Model Builder.
- The process will go through a series of different downloads and processes to create the background image, topography, roads and public source buildings.

### InfraWorks Overview

Without getting too deep into the specifics of each tool, having a little background will help navigate through InfraWorks.



1. Proposals give the ability to create phases and different concepts/proposals; i.e. the ability to create multiple design options to look at for different building and site designs. You can also enhance the “Master” proposal as the basis for all future proposals or create an existing proposal just to see the existing conditions.
2. Visual Styles allows users to switch the display between different visual appearances/styles like Engineering vs Conceptual View. Custom visual styles can be created as desired.
3. The ‘|’ takes you back to the Home/Start Page (all your projects).
4. Manage Tab brings up the Manage Ribbon for the ability to manage model information, data/context info, display information and Point Clouds.
5. Create Tab brings up the Create Ribbon, this is where new roads, structures, drainage and furnishings can be added to the model.
6. Analyze Tab provides a ribbon that allows for the ability to create different analysis functions, like analyzing traffic or drainage.
7. Present/Share Tab switches the ribbon to show ways to create different visual elements like storyboards. This is also where the views and model can be shared with other users.
8. Additional tools like measuring, selection/zooming and bookmarks (snapshots of the model).

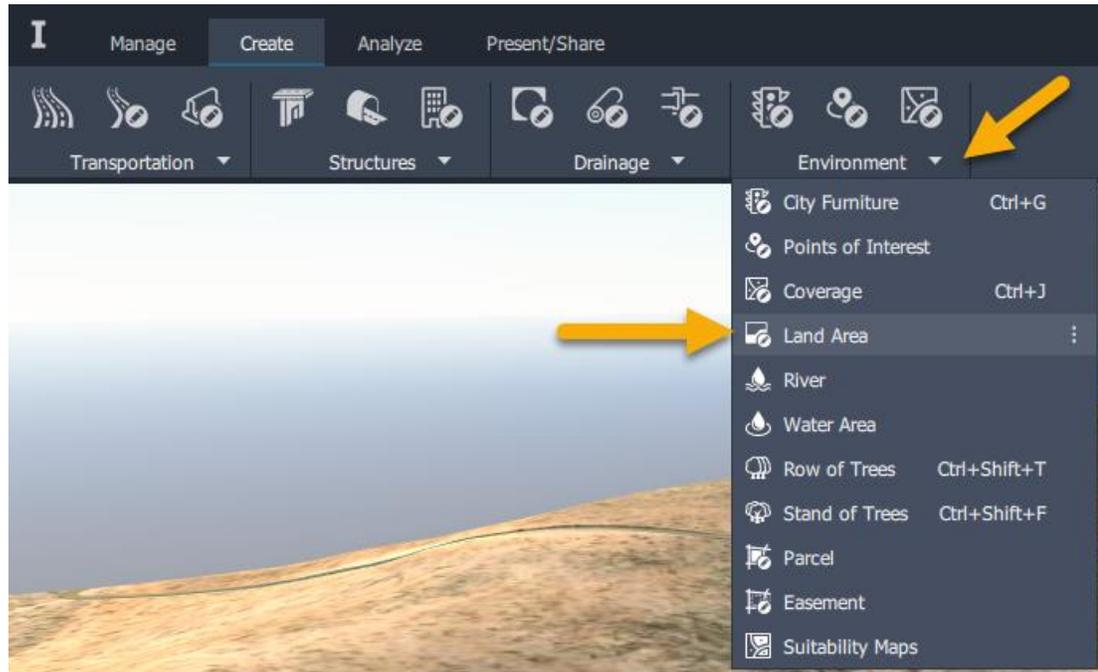
## Enhancing the Existing Conditions Model

While the model builder process does generate many of the existing conditions. There is always a need to expand and further develop the existing conditions.

One of the items that is not automatically generated is residential areas. Through the use of the land areas and buildings, these areas can be generated for conceptual purposes. \*If desired, the contextual houses can be modeled outside of InfraWorks and brought in to be a more accurate representation of the house. We will review later how to bring in these additional data sources.

### Adding Land Areas

Under the Create Tab, in the Environmental Panel, Land Area is available in the dropdown.



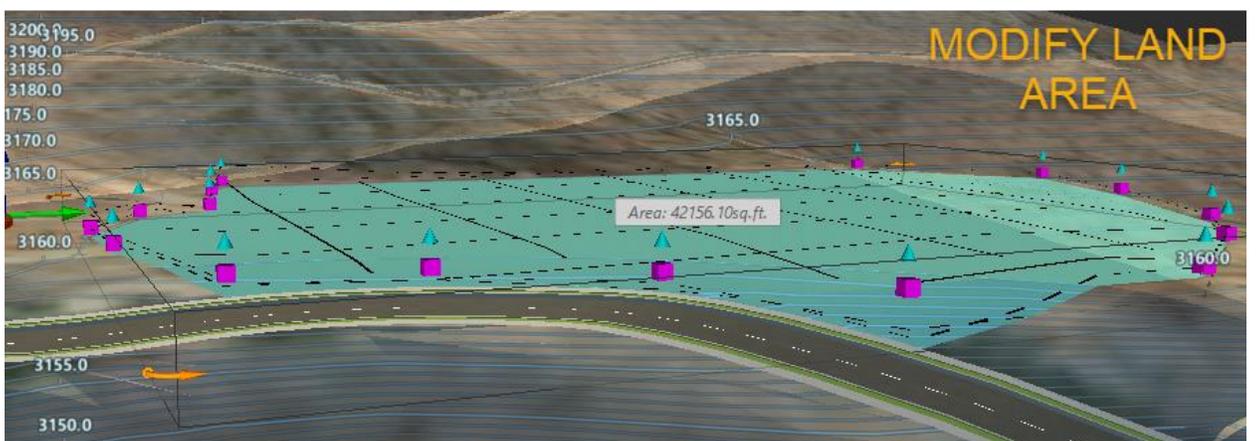
17 : INFRAWORKS LAND AREAS ADDITION

The following dialogue box will pop-up asking for what style you want to use for the Land Area. There are a lot of different styles available for the different types of land area you are trying to create.



With the style selected, you start placing the land area by picking the outer boundaries of the area you are trying to define. It will recognize the existing topography and flatten out the topography with the land area but offer the ability to manipulate the area based on the vertices placed.

18 : INFRAWORKS LAND AREA STYLES



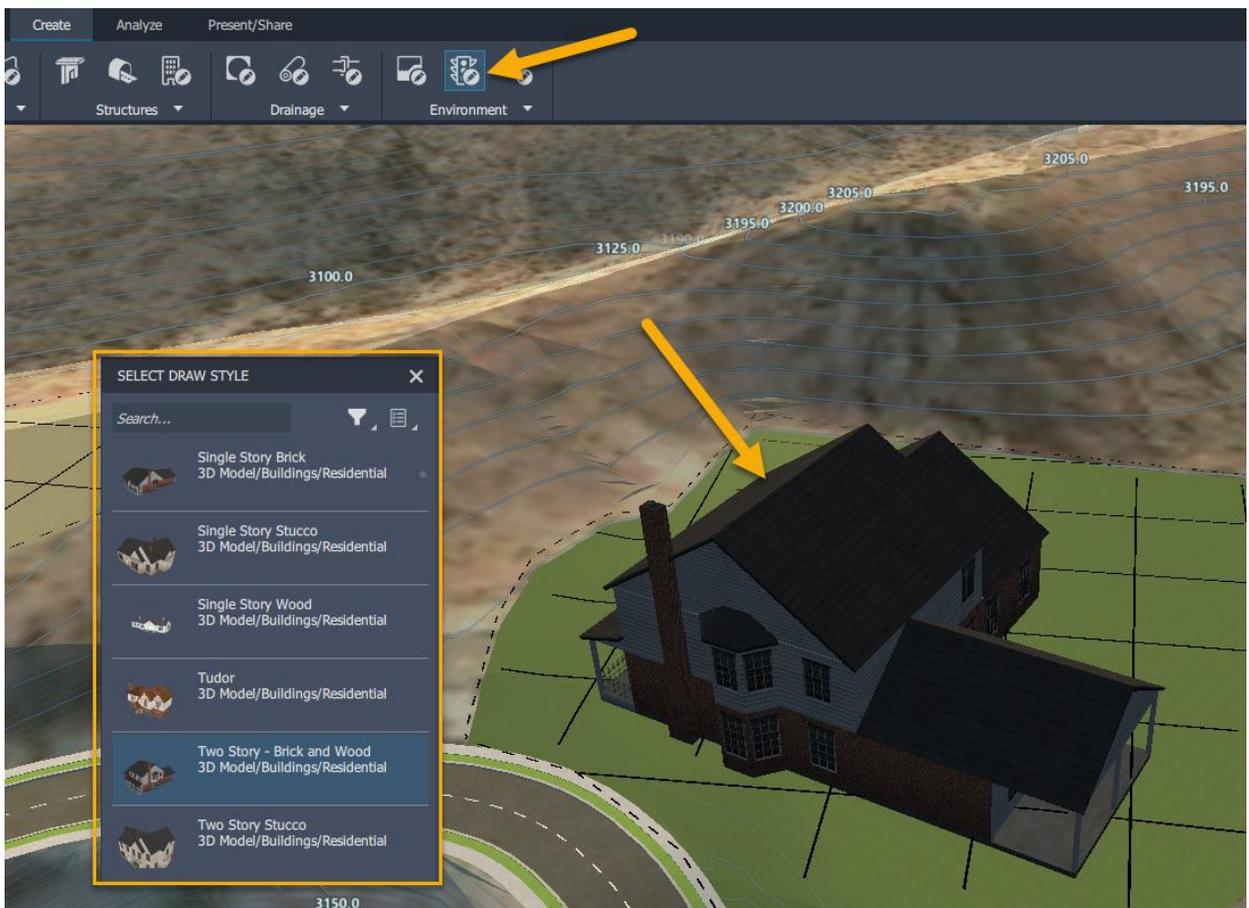
19 : INFRAWORKS LAND AREA EXISTING CONDITIONS

## Adding Contextual Buildings

Adding Contextual Buildings can be accomplished in a couple different fashions, by a building style, adding a site furnishing that is a building or by importing outside data sources.

Under the Create Tab, Structures Panel, the Building Style tool is available. This functions much like the Land Area that you define the boundary of the building you want to build after choosing the style and it will create a building with a façade of that building style. There are a lot of standard styles for commercial buildings, there aren't any for residential houses though. This is where the Furnishings and/or outside Data Sources come in.

Placing a residential house using the city furnishings, is much like placing a piece of furniture inside of Revit or FormIt, select what you want and double click to place it.



20 : INFRAWORKS ADDING CONTEXTUAL RESIDENTIAL HOMES

\*Depending on the style of your surrounding context, there may be a house that matches the style of the context, otherwise you will need to bring in outside data source models

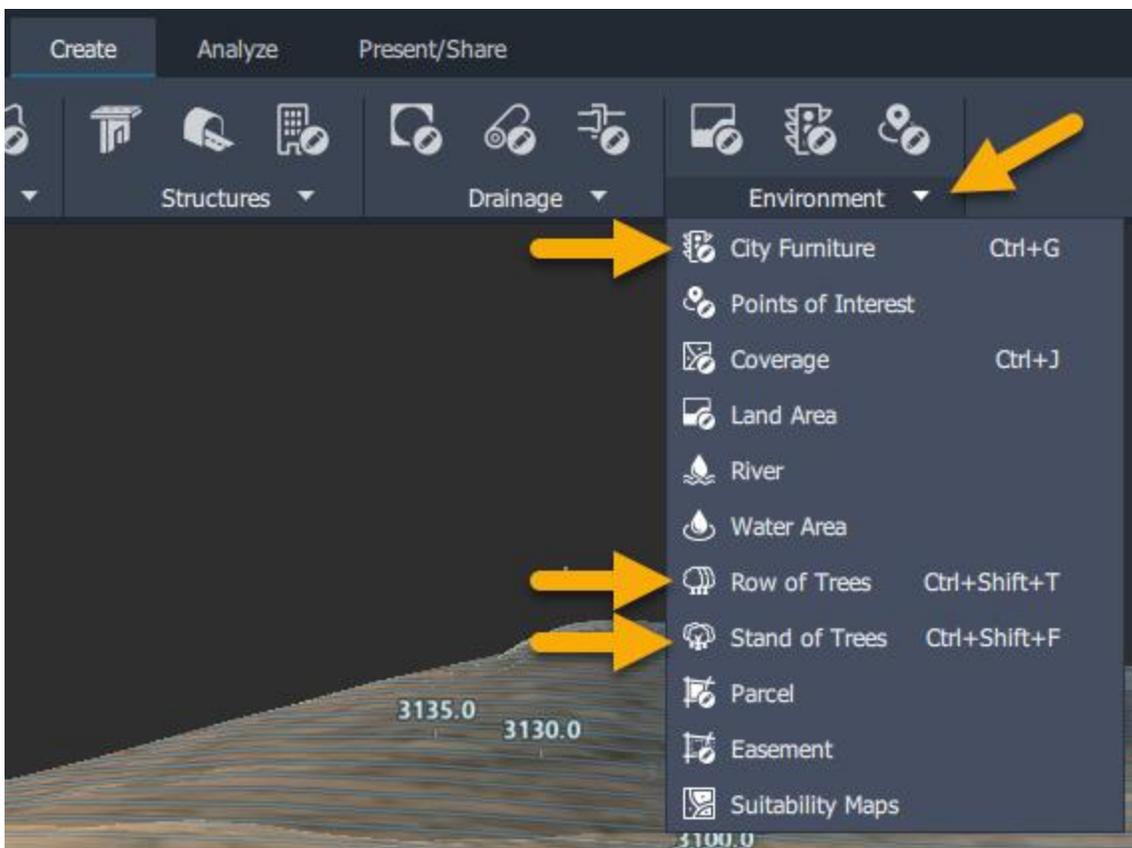
(we will review this process later). You can also create your own Draw Style Residential houses by following the workflow defined in this [AU Class link](#). Continue this process until you are satisfied with your surrounding building context.

### Adding Additional Site Furnishings

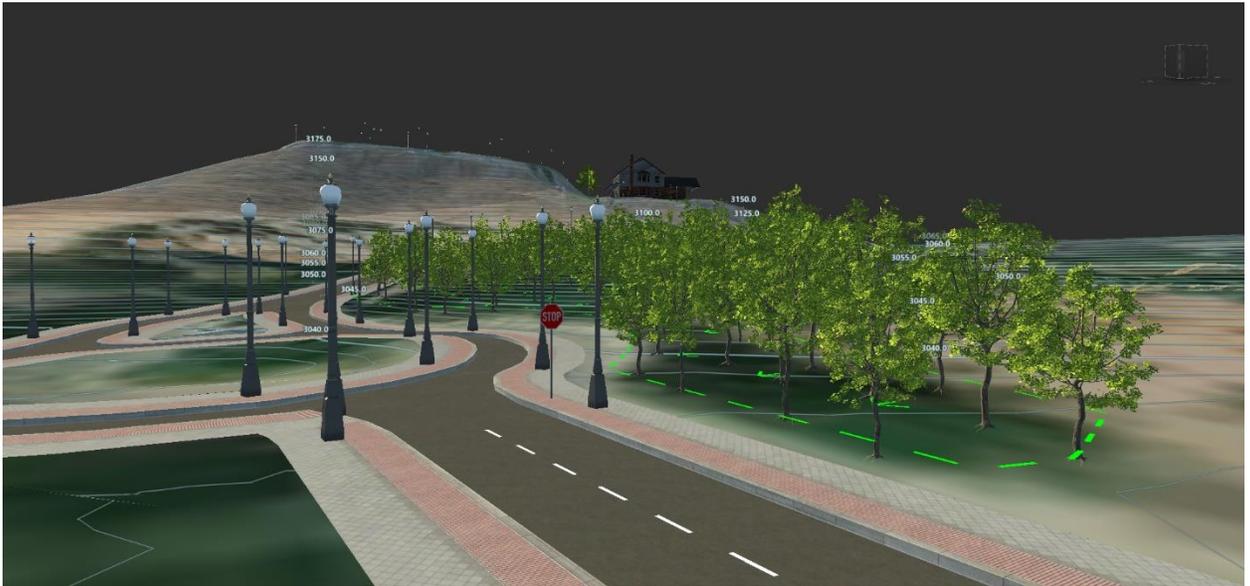
Now that we have created our additional surrounding residential housing and land areas, we need to include some added city/site furnishings, like trees, stop signs, etc as desired to generate as much context as you want.

Using the same tools as the we did previously to add the additional housing; City Furnishings can be populated.

Adding in trees, guardrails and other items help provide a better appearance of the view or context of the design.



21 : INFRAWORKS - ADDING ADDITIONAL CONTEXT ELEMENTS



*22 : INFRAWORKS - ADDITION OF TREES, STREET LAMPS AND STOP SIGN*

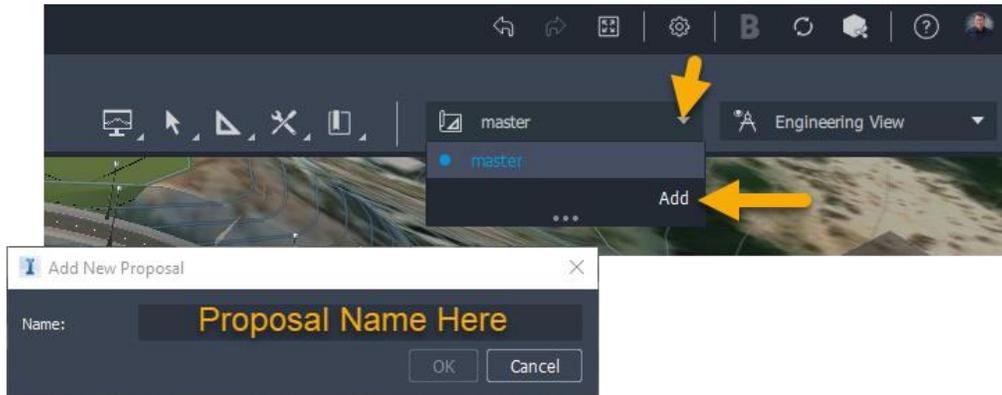
All the existing conditions that have been placed were added to the 'master' proposal, which can be used as a base template for future proposals. Now that the existing conditions are created, additional proposals can be created for the different design proposals.

\* Some prefer to leave the master proposal be what is generated from the model builder and create an existing proposal for any additional context. This method offers a great way to have a basis to always go back to if needed.

## Creating InfraWorks Design Proposals

Proposals allow the InfraWorks model to have different design options (similar to using Design Options in Revit or Layers in AutoCAD/FormIt). An initial proposal is created based on the 'master' proposal.

On the Ribbon, in the proposal area, select the dropdown arrow and 'add' to create a new proposal. New proposals are created based on the active proposal. To create a clean proposal for each design option, start from the 'master' proposal.



23 : INFRAWORKS NEW PROPOSAL

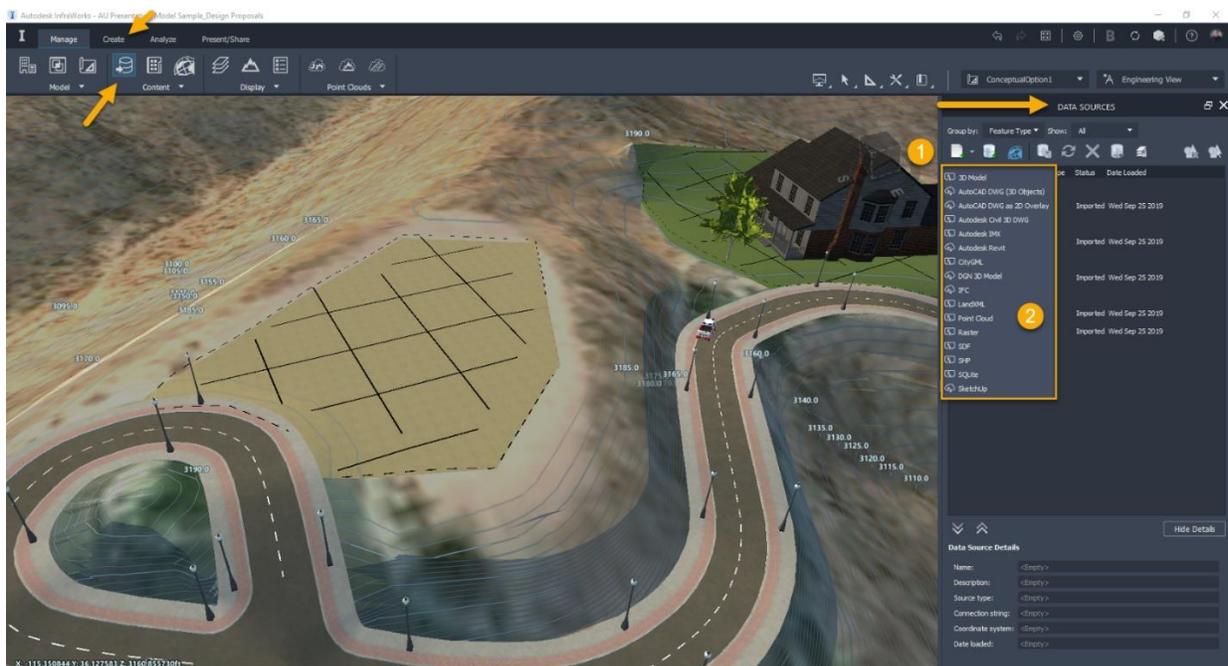
With the new proposal created, the site can be modified as needed for that proposal. The site can also be updated with additional information after the design option is placed.

### Adding Housing Design to New Proposal

With the site modification started, now the house design can be added. The house will get added as a Data Source object, using the exported .FBX model.

### Adding Data Source

Under the Manage Tab, Content Panel, Select the Data Source tool.



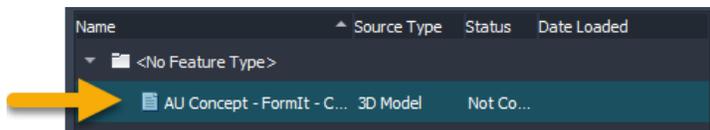
24 : INFRAWORKS DATA SOURCE OBJECTS FOR DESIGN PROPOSAL

In the Data Source Panel:

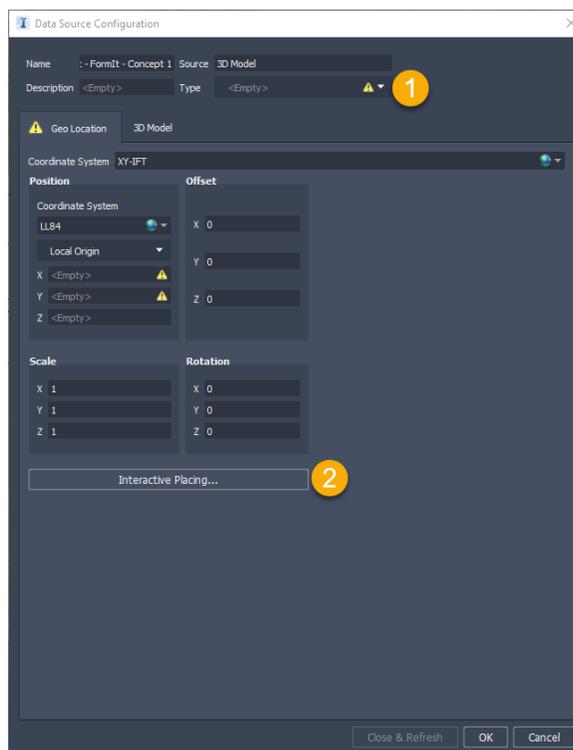
1. Select the 'Add File Data Source'
2. Select the file type that is needed for the model type you are importing in.
  - a. For FormIt, use the 3D Model option, this will allow for the importing of the .FBX file type.
  - b. For Revit, using the Autodesk Revit option will allow for an easier connection, with less work.

### Configuring Data Source and Placing Model

Once the Data Source is added to the InfraWorks Project, then the source model needs to be placed on the site and settings set. Looking at the Data Source in the Data Source Panel, it can be noticed that the model is unorganized.



Right click on the data source and select 'Configure' to set the appropriate settings and place the model on the site.



25 : INFRAWORKS CONFIGURING DATA SOURCE OBJECT

1. Setting the Type, organizes the Data Source into the appropriate category.
  - a. Use 'Building' for the houses.
2. Interactive Placing allows for placement of the .FBX model where you want it.
  - a. The model can be moved and rotated as desired.

Now that the house concept has been placed, any additional site context that is desired on the site can be added, including drives, trees, retaining walls, etc.

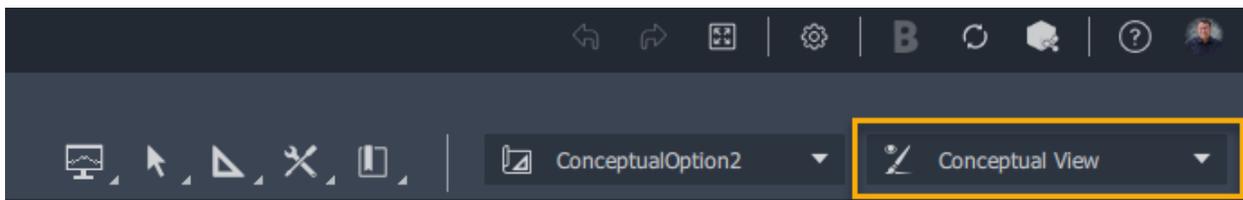
When creating additional proposals, if they are based on the previous proposal, the previous house can be deleted (do not delete the actual Data Source) inside the new proposal to allow for the next concept to be placed.

Once the proposal process is started, to view the design, various tools are available in InfraWorks.

## Visualizing the Design in InfraWorks

### Visual Styles

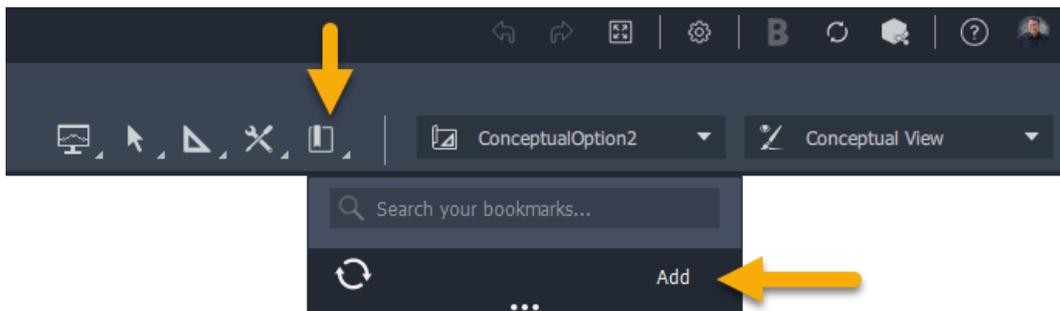
In the Ribbon, different Visual Styles can be created to show different visual qualities as desired.



26 : INFRAWORKS VISUAL STYLE SETTINGS

### Bookmarks

Bookmarks are a way to create camera views that can be recalled quickly when looking at different design concepts/proposals.



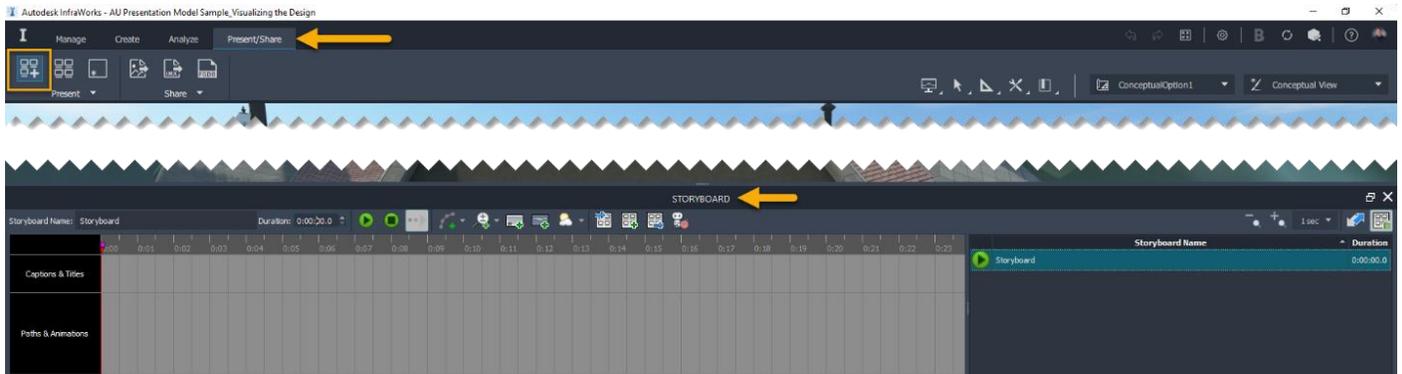
27 : INFRAWORKS BOOKMARKS

Make sure you are in the view, you want before clicking the 'Add', this will be the camera angle that gets created. The camera angle is the only setting stored in the bookmark. Visual Style and Proposal is not stored in the bookmark, these can be changed as needed in the bookmark.

### Storyboarding the Design

In addition to bookmarks, InfraWorks has the ability to create Storyboards to create animations of the design.

Under the Present/Share Tab, Preset Panel, the StoryBoard Creator and Player is available.



28 : INFRAWORKS STORYBOARD CREATOR AND PLAYER

The storyboard has the ability to create an animation from path cameras, still bookmarks, add in captions and titles. When using the animations, the camera paths can use the road information (speed of travel, stop signs, etc.) to control the camera.

\*The use of InfraWorks visualization tools can help sell a design to a client; however, InfraWorks visuals are not photorealistic quality renderings. In order to get this quality of rendering, additional tools need to be used, like 3D Studio Max.

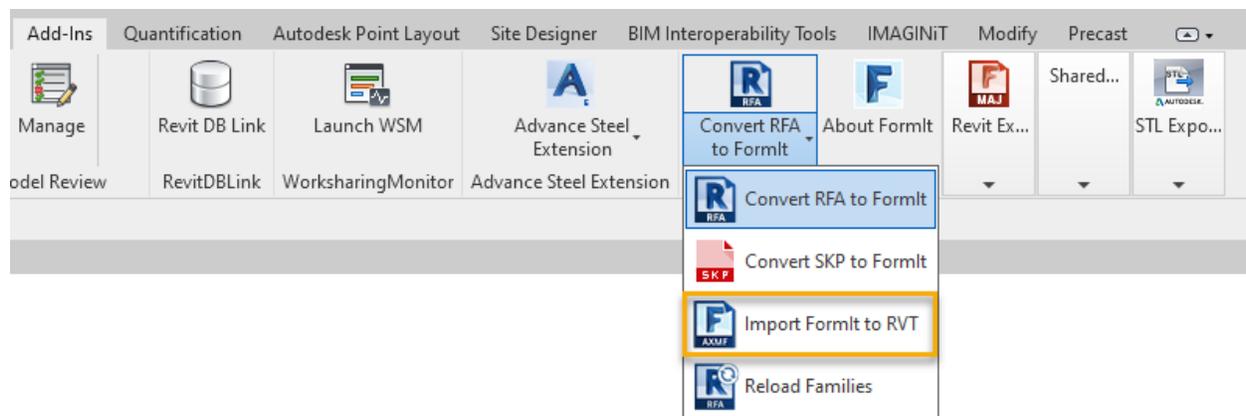
Now that the different housing design concepts have been reviewed; the next step can be started in the design process and create a more detailed design model. This can be done in either Revit or FormIt, then brought into InfraWorks to visualize as well.

## Enhanced Design Development using Revit

Once the design is ready for further development and ready for documentation, the model previously developed can be used to facilitate part of the Revit model development.

### FormIt to Revit

FormIt has an add-in for Revit that aids in the conversion of the FormIt model to Revit. The benefit of this is that you can use your companies own Revit Project Template to start from, giving you a standard baseline and typical documentation standards.



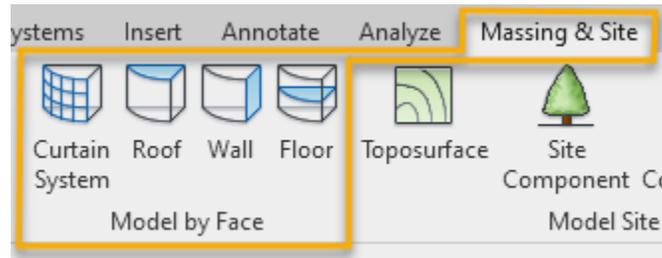
29 : FORMIT ADD-IN FOR REVIT

The FormIt Add-in is not only the best method for bringing the FormIt model into Revit, it also has ability to Convert SketchUp models to FormIt models and able to be used to Convert Revit Families to FormIt (limited to certain categories). For the Revit Families to FormIt, this is a great way to use many of the custom families that have been developed over the years for Revit, inside of FormIt to further enhance the model. When the FormIt model is then brought back into Revit, the families can be reloaded to become Revit Families again.

When a FormIt model is imported into Revit, the different groups in the FormIt model, become families based on the category they are defined as in FormIt.

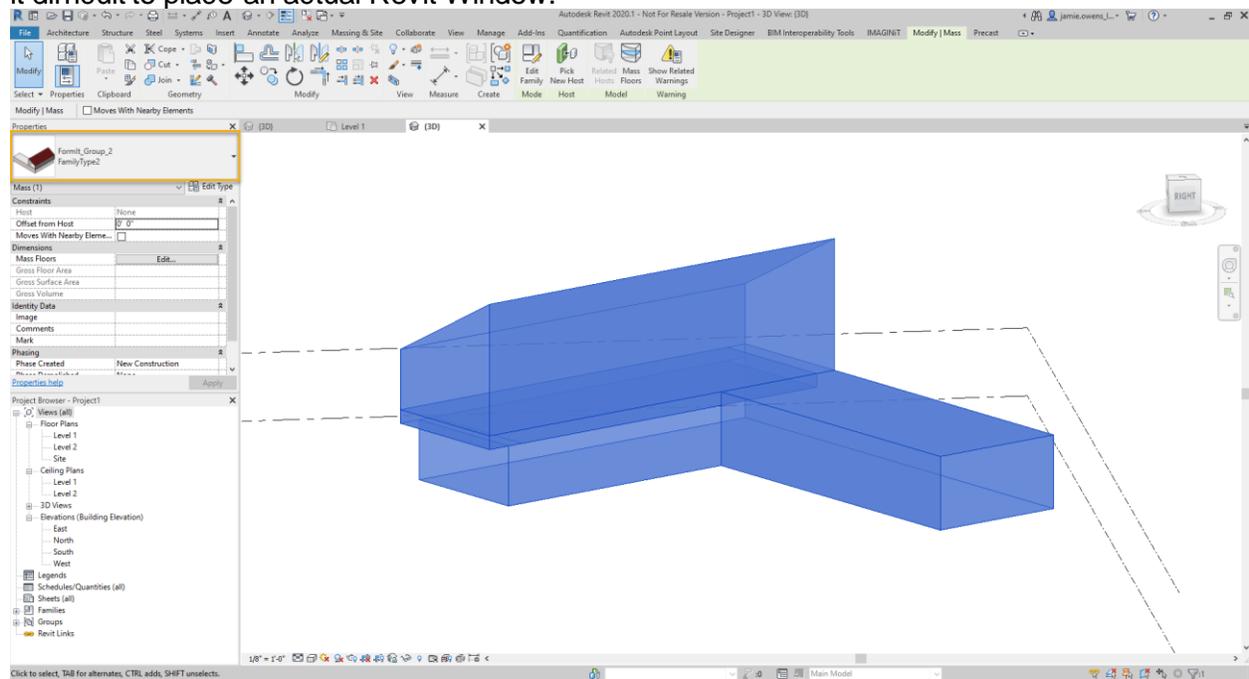
### Revit Modeling by Face

Revit has a variety of tools that can be used with the imported FormIt model. Using Revit's Modeling by Face tools, can make short work of creating a more detailed model from a generic surface model.



30 : REVIT MODEL BY FACE TOOLS

Some things to keep in mind when using these tools is that they work best if the surface is continuous. Meaning, if the FormIt model has elements modeled as windows and doors, then the Model by Face will create a wall for example, with a hole in the wall for the window, making it difficult to place an actual Revit Window.



31 : IMPORTED GEOMETRY FROM FORMIT TO REVIT

Another concern is the accuracy of the FormIt model, since FormIt is a push and pull modeling program, sometimes the models aren't as accurate as needed inside of Revit. Using the Model by Face tools relies on the FormIt model to be modeled accurately.

Sometimes, the FormIt model is better left as a reference, and starting the Revit model from scratch is required.

Once the Revit model is ready, it too can be used inside of InfraWorks to view the design in context.

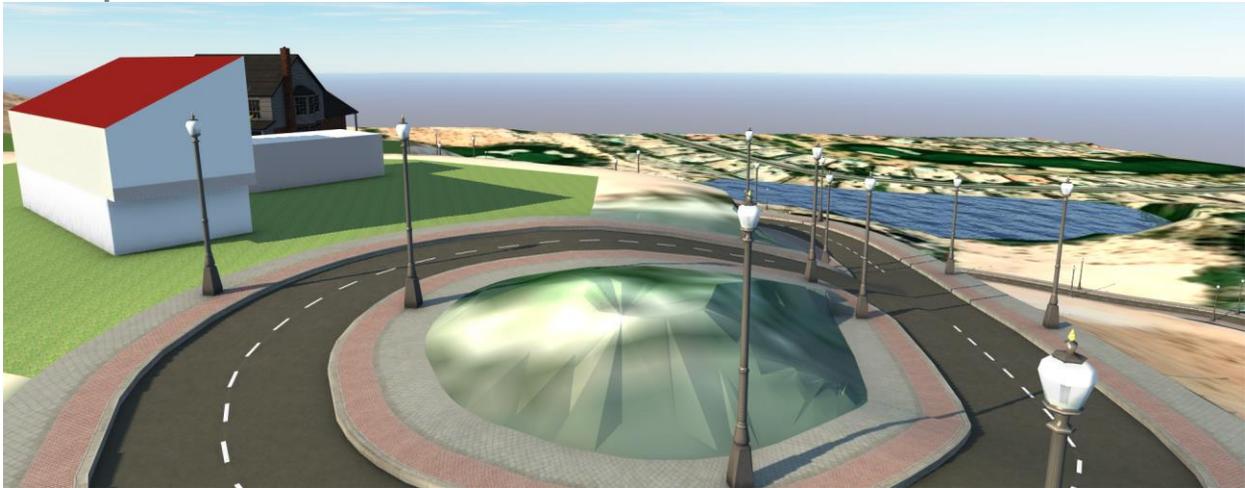


*32 : FINAL REVIT MODEL IN REVIT*

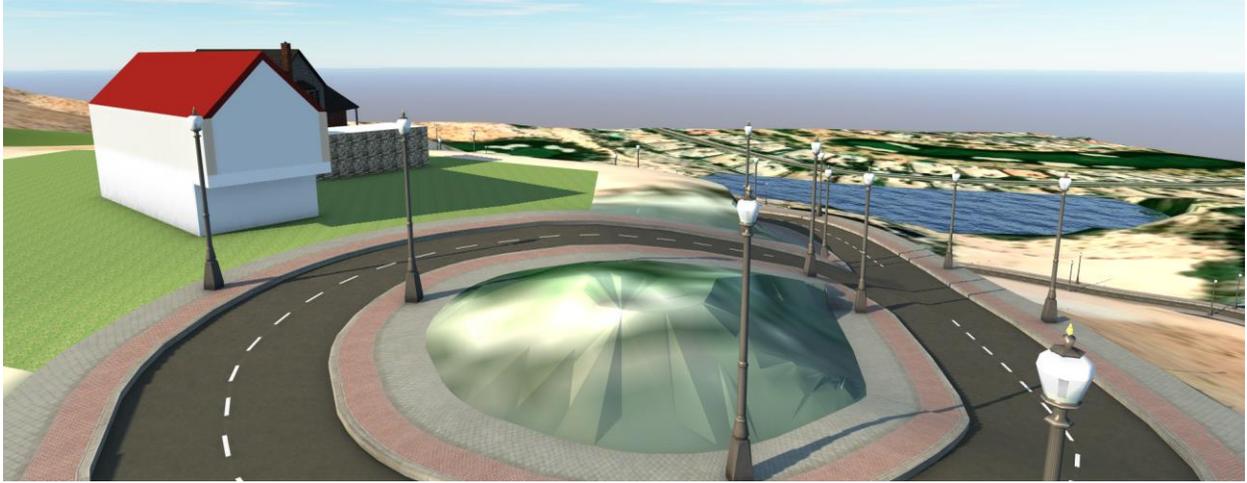
## Images from Each Phase

Here are some images from each concept of the proposal process using InfraWorks.

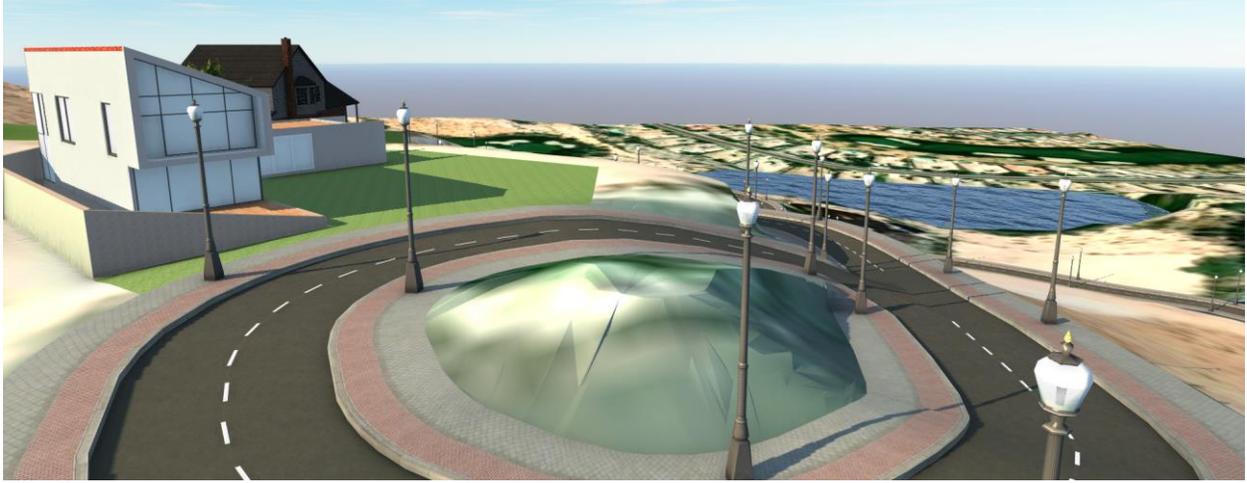
### Concept 1



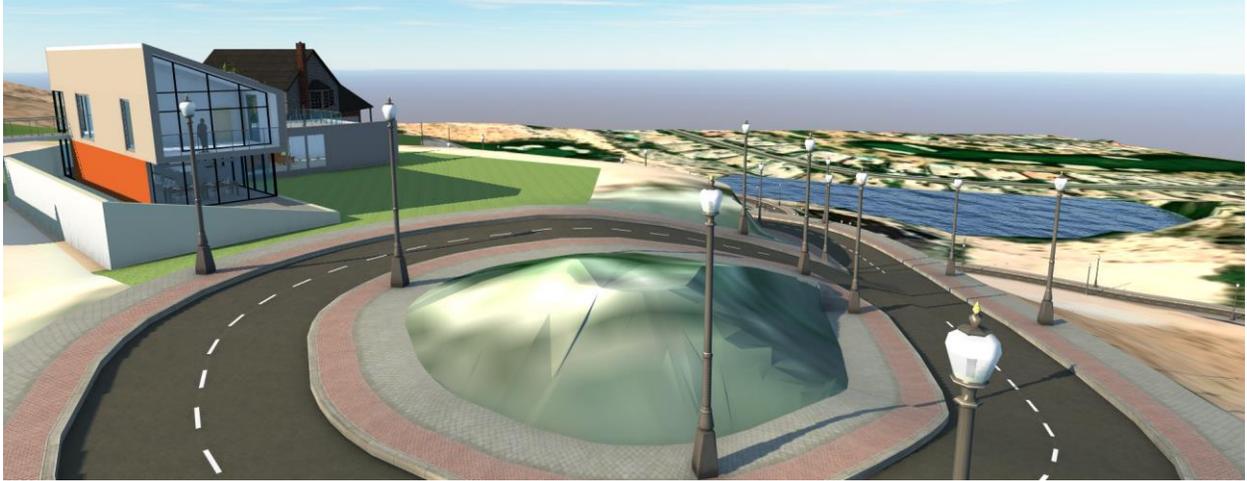
Concept 2



## Design Development



## Revit Imported



# IMAGINIT

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