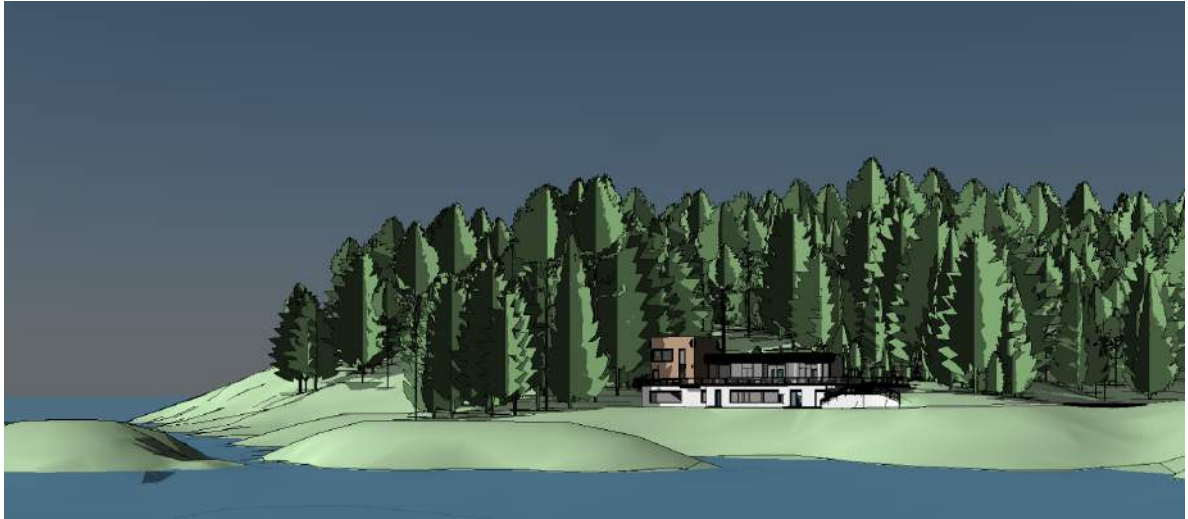


Session 2.1

Revit Sites and Landscapes

Lauren Schmidt, landarchBIM



Class Description

Have you ever tried to model a landscape or site in Revit? Do you find yourself wishing for better Site Tools in Revit? Are the landscape architects the only discipline at your firm not using Revit?

Revit and BIM are not just for buildings. Landscape architects around the world are using Revit more and more for design and documentation. And though some of the current tools are somewhat lacking, Revit is still quite capable of creating detailed sites and landscapes.

This course will focus on:

- The challenges and limitations of creating landscapes in Revit.
- The benefits of sites and landscapes in Revit.
- How to create and update landscape elements, including topography, hardscape, curbs, parking, and plantings.
- How to coordinate with architecture, interiors, structure, and MEP in Revit.
- Who has the most to gain by using Revit in the landscape.

About the Speaker

Lauren Schmidt is a graduate landscape architect and BIM designer. Though from the United States, she is currently living with her husband in Rotterdam (in the Netherlands).

She is currently an independent landscape architectural consultant providing a range of services, including design, planning, Revit training, implementation, and support.

In addition to consulting work, Lauren is an active Revit and BIM blogger at landarchBIM.com. She is dedicated to advancing the use and knowledge of BIM, particularly within the realm of landscape architecture.



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website: landarchbim.com

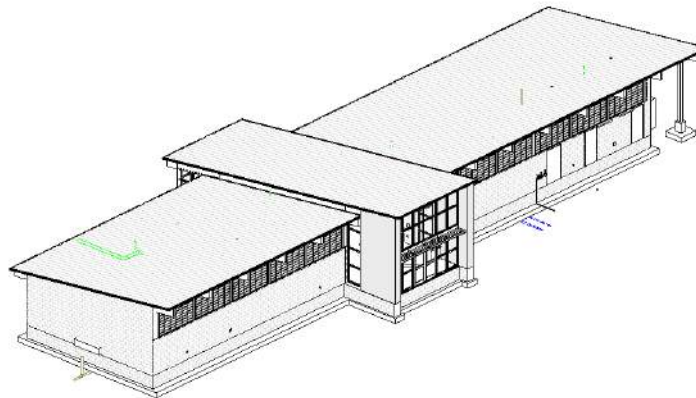
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Where is the Landscape?

What does a great Revit project look like?

Architectural, structural, mechanical, electrical, and plumbing. All together in a unified project environment. Sounds great, right?



The only problem is that most buildings do not float in empty white space. Where is the site, the landscape? Unlike the building disciplines, the landscape is seen as this separate entity. And yet, in the real world, the building is never separated from its site. In fact, it is always built or at least assembled on site.

Some architects recognize that this is a bit of a problem, so they might:

- Create a quick context site model for the building to sit on
- Or recreate a more detailed site model

But why? Would it be acceptable for any of the building disciplines to slide by without a model? And with models now being handed off into construction, leaving the landscape behind is becoming less and less feasible.

Challenges and Limitations

One of the biggest challenges facing the landscape architectural profession is the general lack of interest and awareness of BIM. The process of BIM is here to stay and if we don't incorporate it into our process, someone else will, and we will be out of a job.

This is starting to change, but only with some pushing:

- Architects and clients are requiring BIM on their projects
- And there are also some government mandates, most notably the UK

These two factors are pushing firms, especially the larger firms that work on an international-level, to pursue BIM within the realm of landscape architecture. The biggest players so far seem to be (in order):

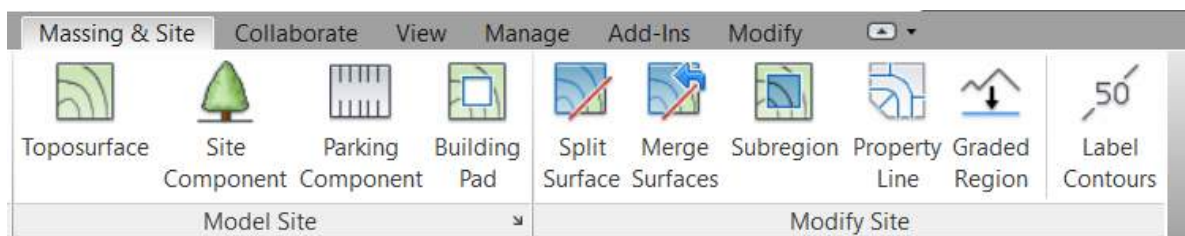
1. United States
2. United Kingdom
3. Australia
4. Canada

But as we are being pushed into BIM, there is still a lack of interest among software developers. So what are the options for a landscape architect who wants to get into 3D modeling or BIM?

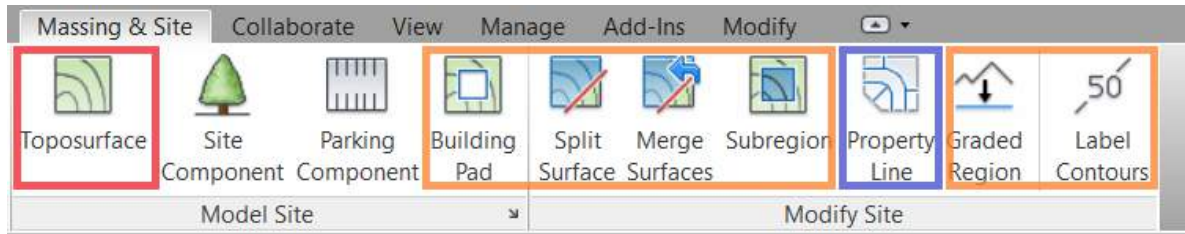
- AutoCAD + [Sketchup](#) (with various plug-ins, example: [LandFX](#))
- [Rhino](#) (with [Lands Design](#) plug-in)
- [Vectorworks Landmark](#)
- [AutoCAD Civil 3D](#)
- Revit

Overall challenge of Revit

Quite simply, Revit is not intended for substantial landscape or site modeling.



The Site portion of the Massing & Site tab does not have very many tools. There are essentially only 3 site tools:



1. Create a Toposurface (red)
2. Modify (or annotate) a Toposurface (orange)
3. Create Property Lines (blue)

BUT, that is the biggest challenge we face. Landscape architects and even civil engineers are interested in Revit. But they might decide not to use it because it doesn't have the tools they want.

It is a cycle.

- If you don't use a program, how do you know its capabilities?
- And how can you suggest new tools if you don't know what the current ones do?
- And so the tools haven't improved because no one knows enough and no one cares enough.

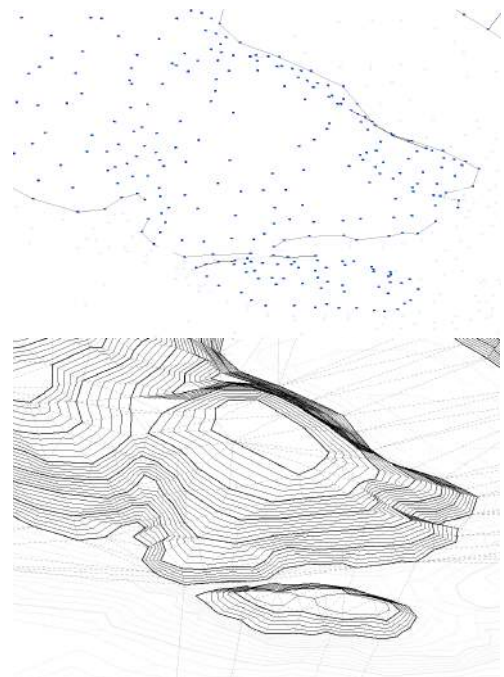
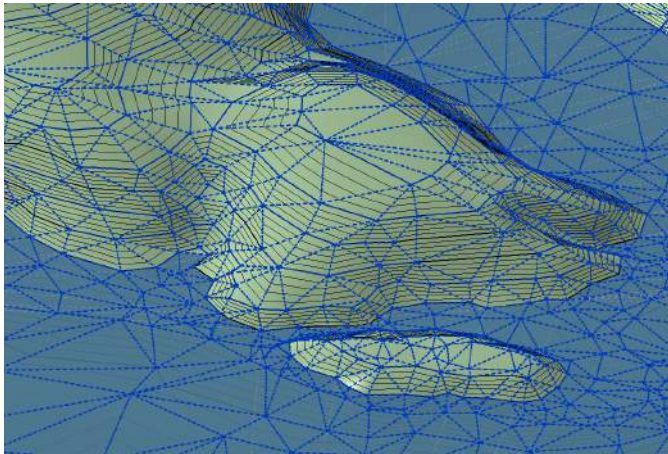
If you want something to change, you have to **break the cycle**. You have to jump in somewhere and just start.

Specific limitations (and potential solutions)

There are many challenges and limitations to Revit site modeling. These challenges will vary depending on the type and scope of a project. Here are some of the most challenging limitations, and some potential solutions (or workarounds).

Topography

- Mesh element
 - Does not behave like most other elements (which are solids)
- Time-consuming and difficult to modify



Limitation: Imprecise Surface Engine

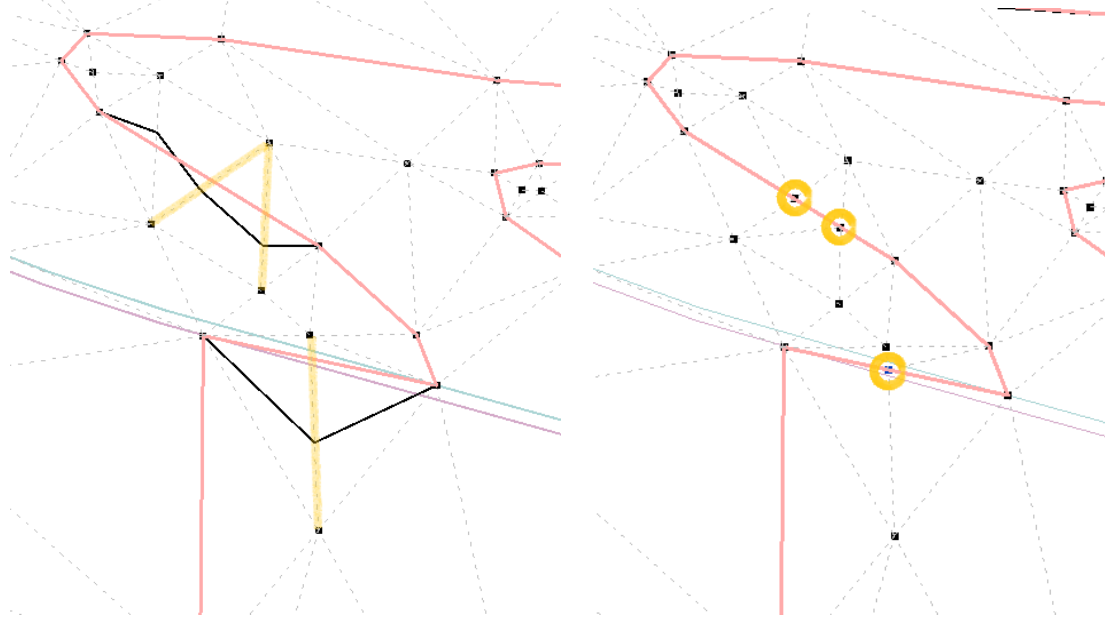
- Input: points (only)
- Output: triangulation and contour lines
 - Cannot control or adjust output**

**Though, there are indications that Autodesk may be moving towards a more consistent UI among their surface engines (in Revit, Civil 3D, and InRoads).

Solutions:

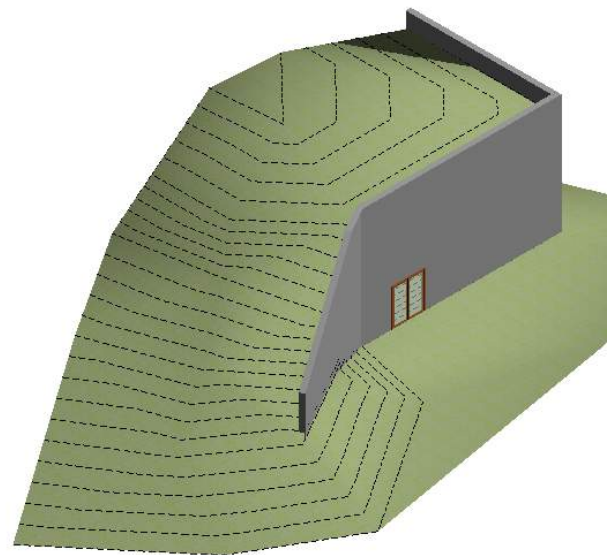
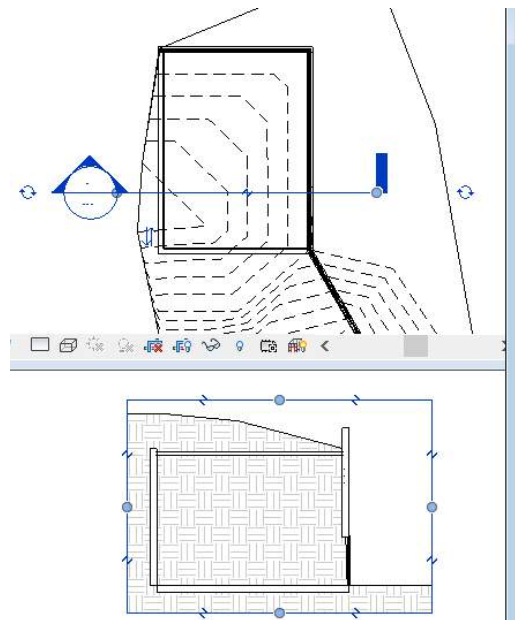
- Do not rely on Revit-generated contour lines.
 - Use model lines or CAD import lines, if necessary.
- Understand how Topography triangulates between points, so you can modify Topo quickly and more effectively.

For example, this Toposurface was generated from the red import contour lines and it generated the black contour lines. To "fix" the contour lines, adjust the triangulation by adding points along the triangulation lines highlighted in yellow.



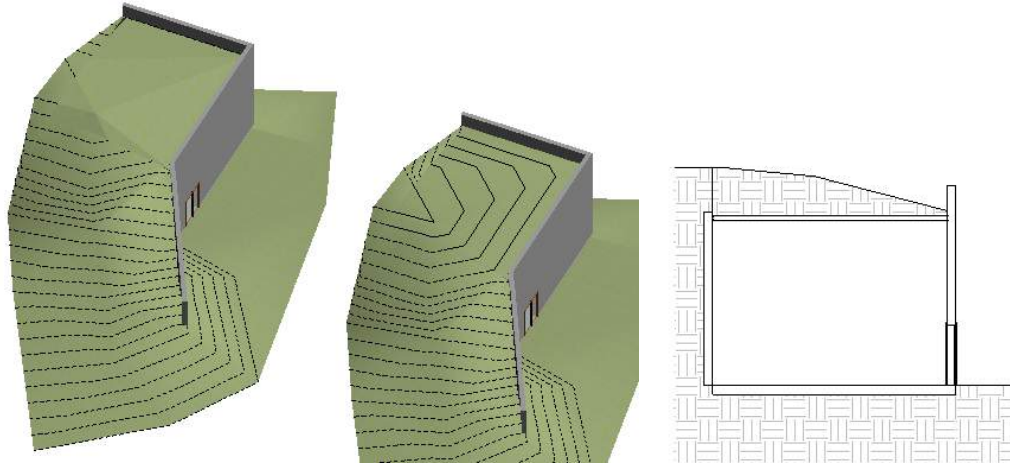
Limitation: Structures below Topo

- Cannot create void in Topo for structures below grade.



Solutions

- Roof (or Floor) for "Topo" above structure
 - Different category and element; does not generate contour lines.
- Separate Revit file
 - Create Topo above structure in a separate file and then link it back in.

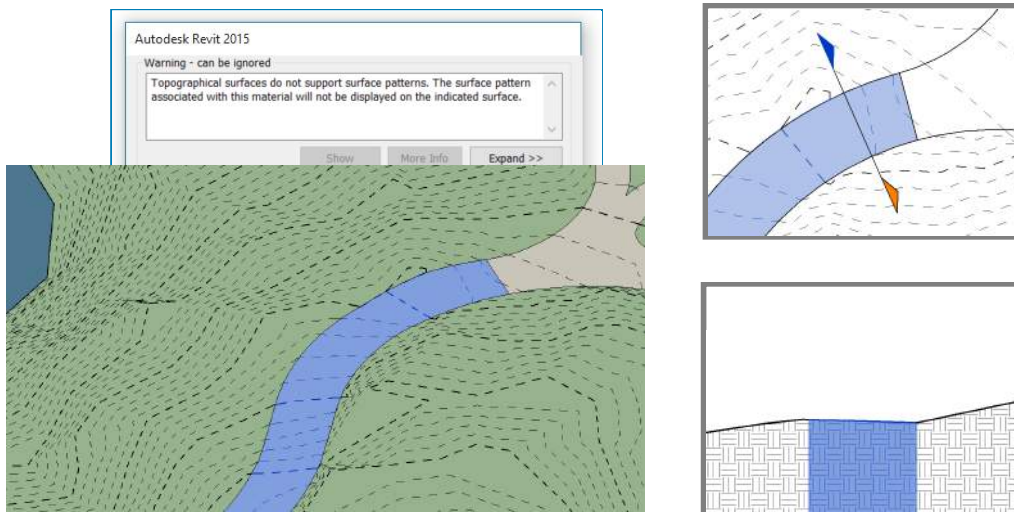


Structure with "Topo" Roof (left) and Structure with Topo link (right), section is the same for both

Hardscape

There is currently no designated hardscape tool for creating roads, sidewalks, or any other multi-sloping hardscape. The only built-in option is to use Subregions, however, they are almost useless since they are Topography, and thus:

- A. Have no thickness
- B. Cannot display surface patterns



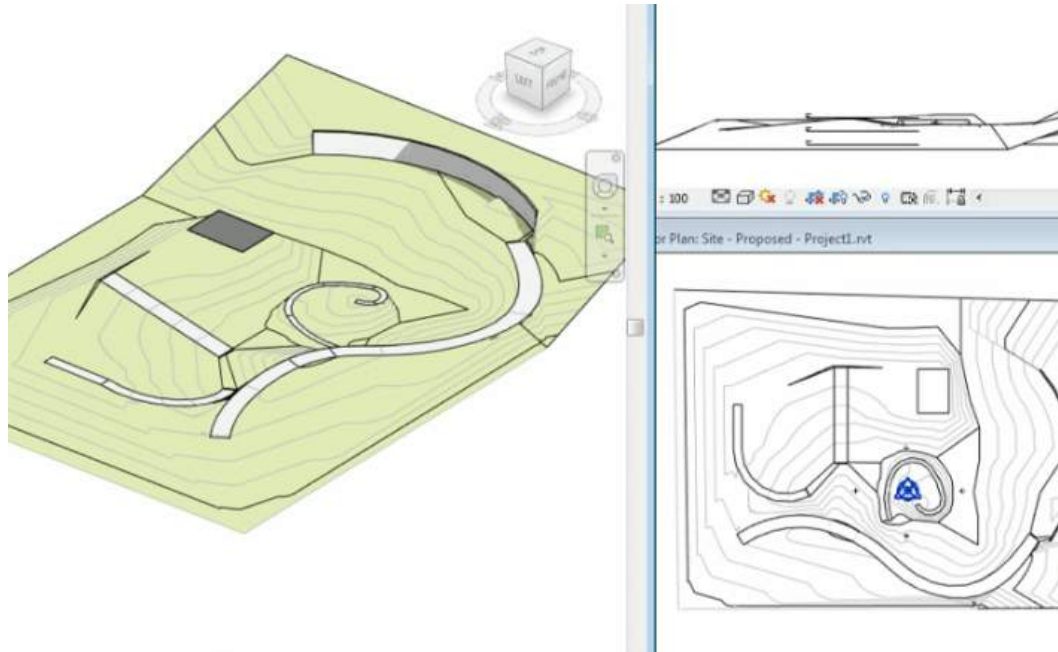
Since Subregions are only useful for visualization and cannot be used for documentation, a common workflow is to create hardscape by shape-editing either Roofs or Floors.

Limitation: Interaction with Topo

- Floors and Roofs do not interact with Topography
 - Requires duplicate editing; any editing made to one element must also be made (again) to the other.
 - Time-consuming

Solutions

- Can automate this with access the Revit API
 - Add-in/ app: [Topo Align](#). Topo Align has three features, Align to Element, Points from Line, and Reset Region, all of which edit Topography.

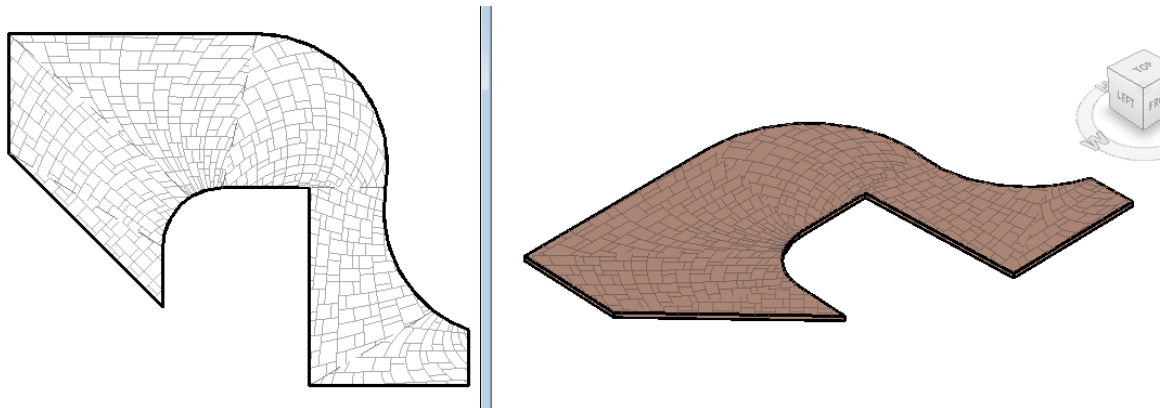


- Custom script or Dynamo



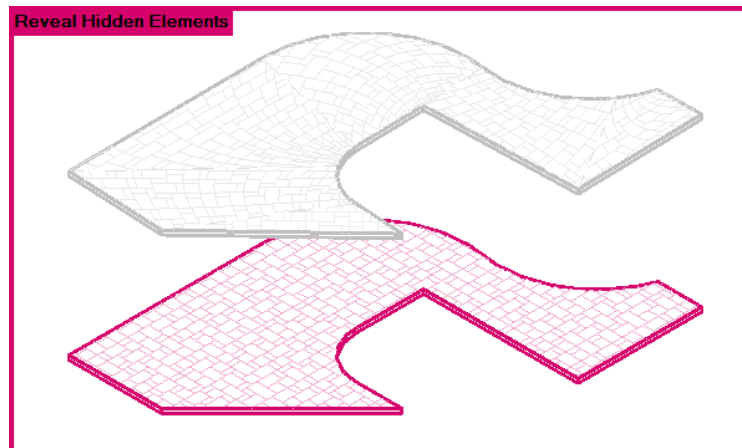
Limitation: Surface Patterns

- Cannot drape surface patterns
 - Floor (and Roof) patterns do not drape across multiple faces. This is notable when working with shape-edited slabs and is a particular issue when working with distinct and necessary patterns (such as pavers).



Solutions

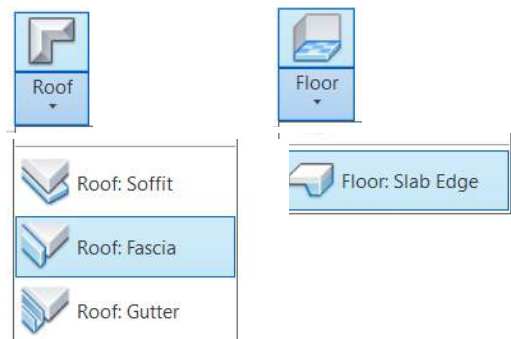
- Manually move pattern
- Avoid using patterns
- Duplicate flat Floor
 - Flat Floor is only visible in plan, while the shape-edited Floor is visible in all other views
 - Use Worksets to control visibility



Curbs

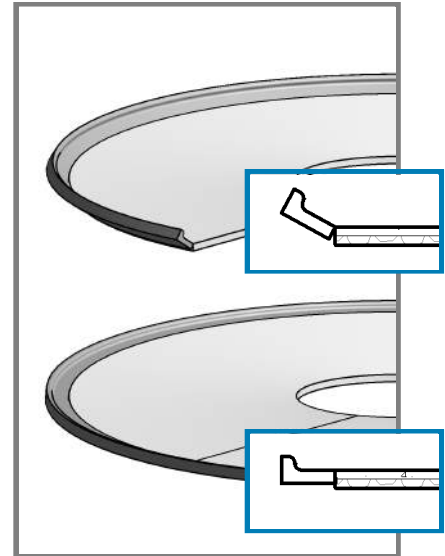
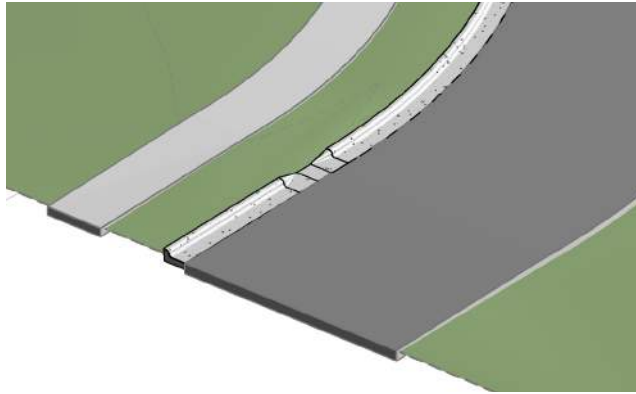
Limitation: No Curb Tool

- Other curb-like tools
 - Fascia, Gutters, Slab Edges
 - Cannot be created on curved and sloped edges.



Solutions

- In-Place Component
 - Profile twists on sloped curves (most noticeable on steep curves)

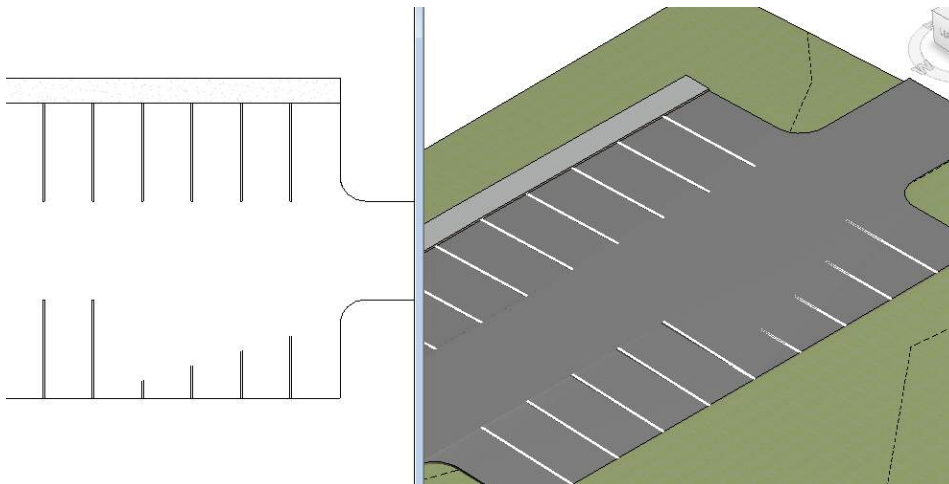
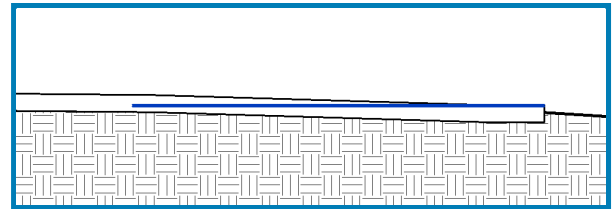


- Other solutions? API

Parking (Striping)

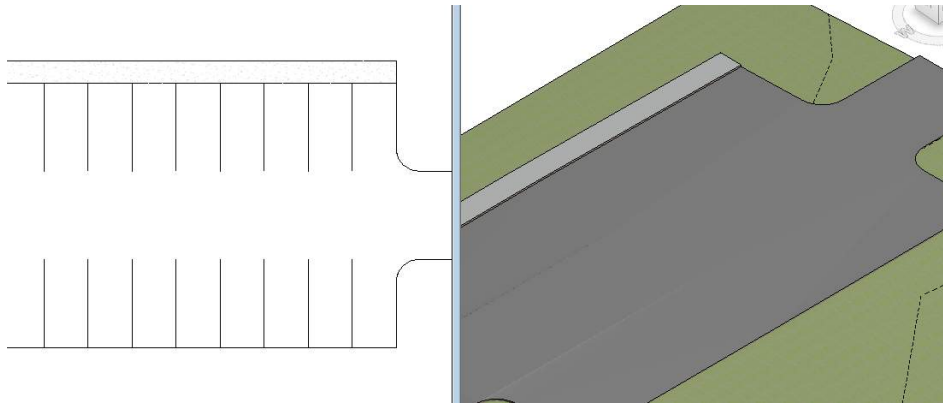
Limitation: Cannot drape

- Parking on multi-sloping surfaces frequently half embed and/or float (no loadable component has the ability to drape onto Floors or Topo)



Solutions

- Use Subregions (This is NOT recommended).
 - Subregions are highly unstable and do not like to share boundaries
 - Only works on Topography (not Floors)
- Host parking to a flat surface and only display in plan views.



flat Parking bay family, with striping shown as single Symbolic lines (hosted to a Level)

Benefits

If you can overcome the initial challenges, there are many benefits to having a site or landscape in Revit. Many of those benefits are standard benefits that come with working in Revit, such as Worksharing (multiple people working in same file) and the unified Project Browser environment (having all views and sheets in a single file).

But what are the specific benefits for a landscape architect working in Revit?

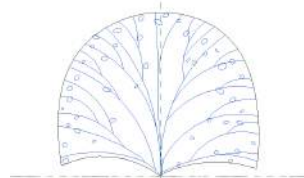
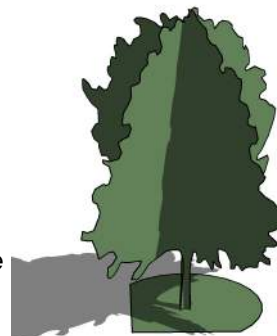
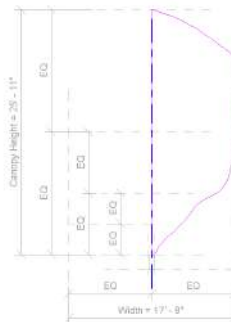
Plantings

Like most shipped Revit content, the default Revit Plantings are not very impressive. But Revit's ability to create and customize your own components is a big benefit, so you can create some pretty powerful planting families.

Planting families

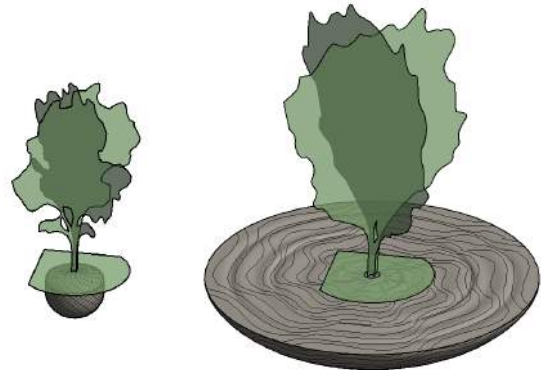
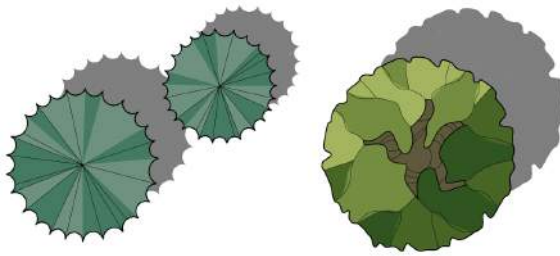
Variety of Forms

- 3D Solids
 - Created from revolve(s)
 - Less graphically appealing
 - More functional
 - Clash detection
- RPC
 - More graphic capability
 - Render realistic plant
 - Proprietary format: Archvision
 - Variety requires subscription
 - RPC Creator to create your own
- Custom Geometry
 - Simple
 - Planar (similar to RPC)
 - Complex (adaptive components)
 - [WhatRevitWants Tree](#)
 - [RevitSwat Palm](#)



Other Elements

- Rootballs
 - Install size
 - Mature spread
- Plan Symbols
 - Scaleable (by nesting)
 - Color (with detail components)



Parameters

Plantings can have a wide variety of a parameters.

- Scheduled parameters
 - There are not any default planting parameters, so will need to create your own Shared Parameters

Count	Key	Scientific Name	Common Name	Size	Condition	Comments
Evergreen Trees						
8	JUN-S	Juniperus scopulorum	Rocky Mountain juniper	5' Ht	B&B	
4	PSE-M	Pseudotsuga menziesii	douglas fir	6' Ht	B&B	
1	TSU-C	Tsuga canadensis	Eastern Hemlock	6' Ht	B&B	
Shrubs						
19	GAU-S	Gaultheria shallon	salal	3 Gal, 24" min	Cont.	
15	PHY-C	Physocarpus capitatus	Pacific ninebark	24" min Ht	B&B	
4	VAC-O	Vaccinium ovatum	evergreen huckleberry			
Ferns						
1	BLE-S	Blechnum spicant	deer fern			
17	POL-M	Polystichum munitum	lady fern			

- Scaling parameters
 - Plants grow and change in size- can be used to show landscape at installation and then at maturity
 - Also randomize heights
- Design parameters
 - Show general plant characteristics, such as bloom time, water and sun requirements for the plant species

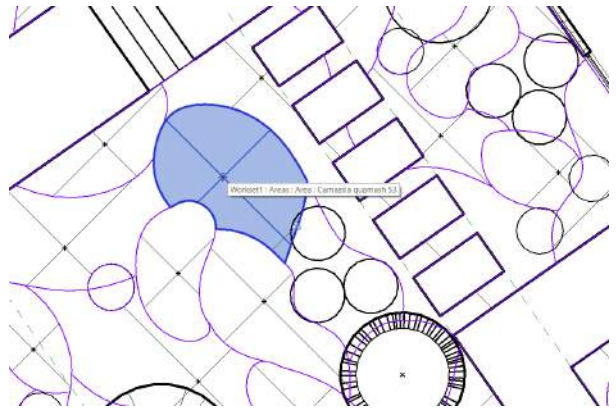
Text	
Scientific Name	Physocarpus capitatus
Common Name	Pacific ninebark
Install Size	24" min Ht
Install Type	B&B
Dimensions	
Width	6' 0"
Height	10' 0"
Install Width	2' 0"
Install Height	3' 0"
Width Min	4' 0"
Width Max	7' 0"
Height Min	8' 0"
Height Max	13' 0"
Identity Data	
Bloom	May - June
Water	Moist
Sun	Sun - Shade
Description	"Snowball bush" likes wet, open
Render Appearance Properties	Edit...

Areas as Planting Areas

Planting families work well for larger individual plants, such as trees and shrubs, but for smaller planting masses, a common (if slightly unconventional) workflow uses Areas.

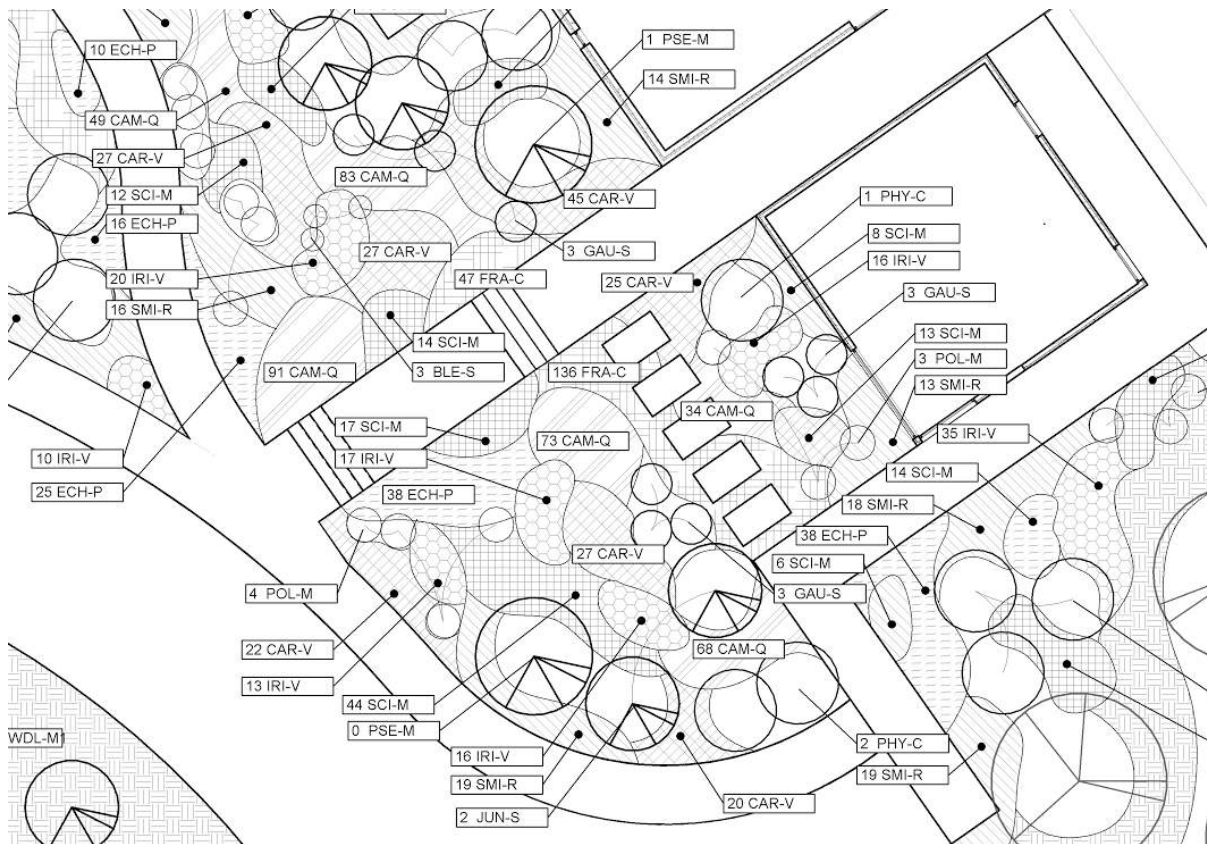
Benefits

- Have area parameter
 - Calculate plant quantity based on spacing
- Unlike other area-based families (such as Floors), Areas share boundaries, which reduces repetition in drawing boundaries.



Limitations

- Areas are only visible in plan views (not visible in 3D views or sections)
- Only visible in Area Plans (specific type of plan view)





Planting Area Tips:

- Use Area Styles to create Area “types”
- The formula to calculate plant quantities is:

$$\text{Area}/(\text{Spacing}*\text{Spacing}*0.8666)$$
- A script will allow you to push the plant count into a Shared Parameter (this can be done with Dynamo)

Grading

Spot Dimensions

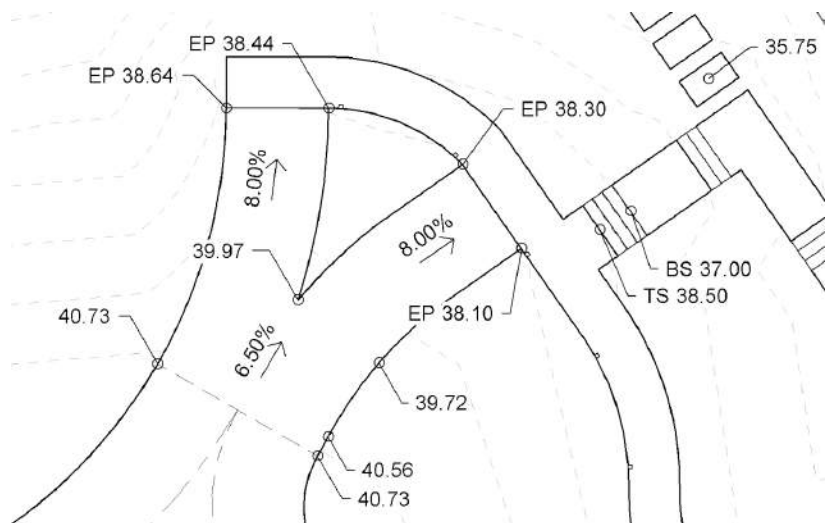
While it can be time consuming to edit all of the individual points of a Shape-Edited Floor, all of the point elevation data can be used when placing Spot Elevations.

Spot Elevation

- Automatically pull correct elevation
 - Update with changes
- Absolute or relative

Spot Slope

- Face of any element
- Only for the single, steepest slope



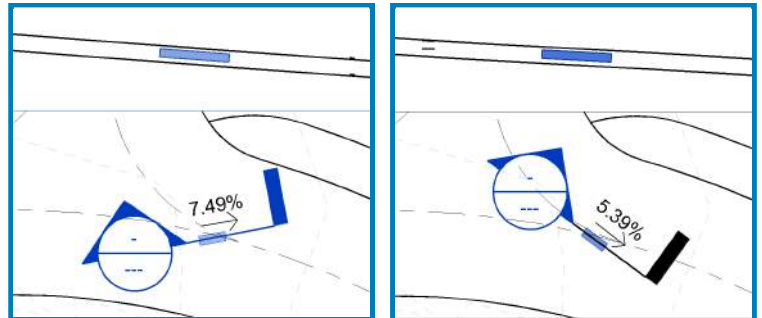
Custom Families

However, with some custom families you can make the Spot Slope rotate, and even create a framework for your entire grading plan.

Spot Slope Host

Even though you cannot rotate the Spot Slope, you can create a host family for it to snap to, and then rotate the family.

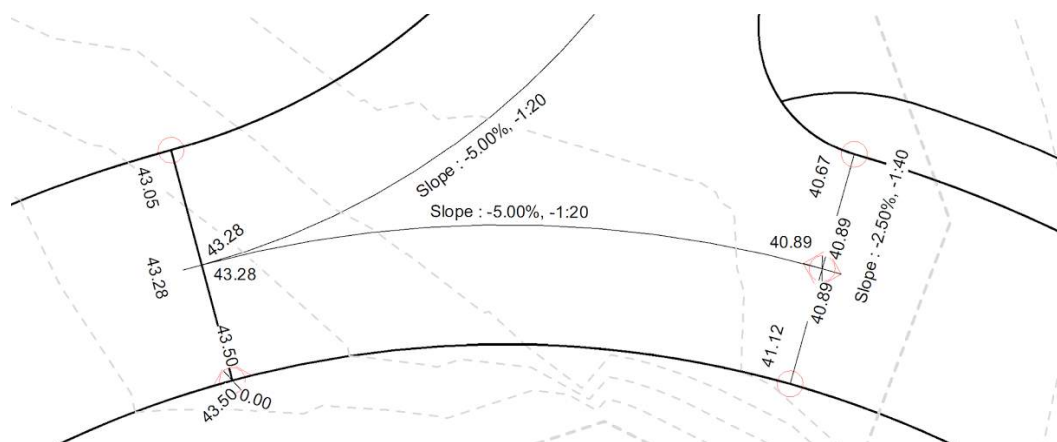
- Level-based
 - Not always vertical
- Rotational rig
- Easily hidden with a Subcategory and/or a Workset



Grading Calculator

Also create custom families to assist with the entire Grading process. Grading is done by drawing lines between points, and setting elevations and slopes.

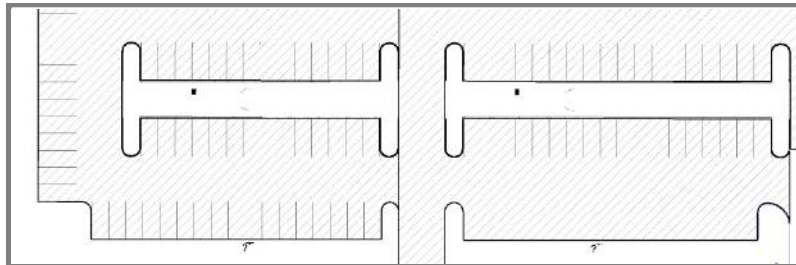
- Line-based family
 - Calculate Midpoint
 - Specify Slope, will Calculate End Point
 - Specify End Point, will Calculate Slope
- Create Framework



Schedules

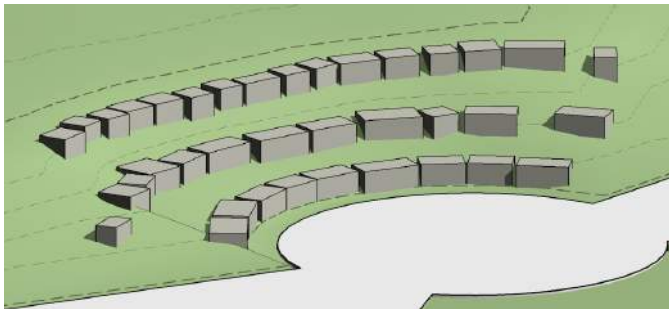
Quantity Schedules

- Parking Schedule
 - Count individual parking spaces



<Parking Schedule - South>	
A	B
Family	Count
Existing	
SAI Parking Space - Standard	213
	213
Phase 2	
SAI Parking Space - ADA	8
SAI Parking Space - Angled - Nested	39
SAI Parking Space - Standard	194
	241
	454

- Landscape Features
 - Count different types
 - Schedule dimensions



<Site-Feature Schedule>			
A	B	C	D
Type	Length	Depth	Count
1.5 x 2.5	2.50'	1.50'	2
1.5 x 3	3.00'	1.50'	1
2 x 2	2.00'	2.00'	8
2 x 2.5	2.50'	2.00'	5
2 x 3	3.00'	2.00'	5
2 x 3.5	3.50'	2.00'	6
2 x 4	4.00'	2.00'	4
2.5 x 2.5	2.50'	2.50'	2
2.5 x 4	4.00'	2.50'	3
3 x 3	3.00'	3.00'	1
			37

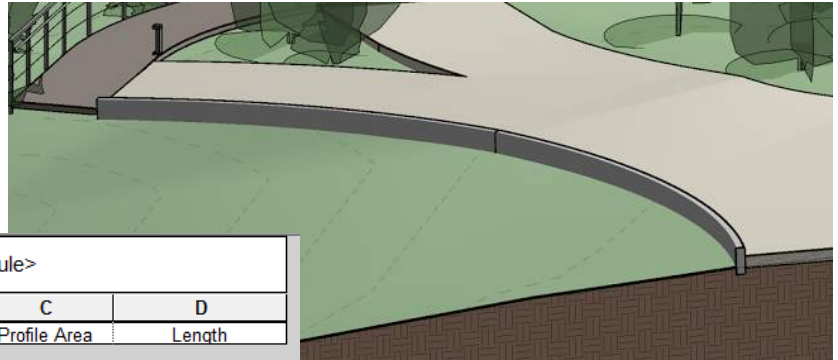
Area Schedules

- Hardscape/ Floor Schedule
 - Cost estimation
 - Multiple units
 - Phasing

<Paving, Vehicular Schedule>						
A	B	C	D	E	F	
Type	Type Ma	Area (SF)	Area (SY)	Phase Created	Phase Demolish	Com
Existing						
AMO - Asphalt, Mill & Overl	AMO	78725 SF	8747	Existing	None	
AMO - Asphalt, Mill & Overl	AMO	41292 SF	4588	Existing	None	
		120017 SF	13335			
A-10 - Asphalt	A-10	45782 SF	5087	Existing	Phase 1	
A-10 - Asphalt	A-10	15785 SF	1754	Existing	Phase 1	
		61567 SF	6841			
Phase 1						
A-10 - Asphalt	A-10	37910 SF	4212	Phase 1	None	
A-10 - Asphalt	A-10	14368 SF	1596	Phase 1	None	
A-13 - Asphalt, Heavy-Duty	A-13	7017 SF	780	Phase 1	None	
A-19 - Asphalt, ROW	A-19	1680 SF	187	Phase 1	None	
G - Gravel	G	8051 SF	895	Phase 1	None	
G - Gravel	G	282 SF	31	Phase 1	None	
		69309 SF	7701			

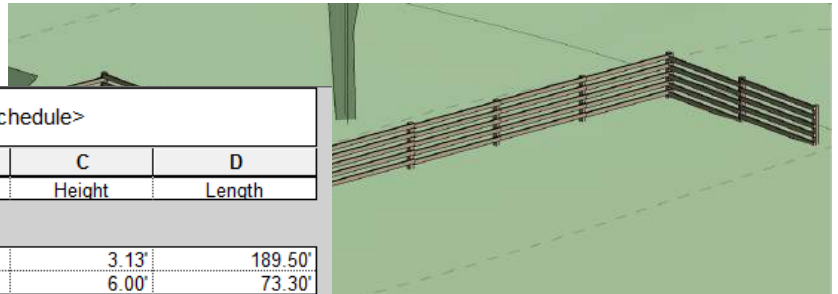
Length Schedules

- Curbs
 - In-Place
 - Volume/Area of Profile



<\$-Curb Schedule>			
A	B	C	D
Type	Volume	Profile Area	Length
Curb and Gutter			
Curb - Entrance	197 CF	1.25 SF	157.93'
			157.93'
Curb, Straight			
Curb - Road	49 CF	0.75 SF	65.00'
Curb - Path	81 CF	0.75 SF	107.68'
			172.67'

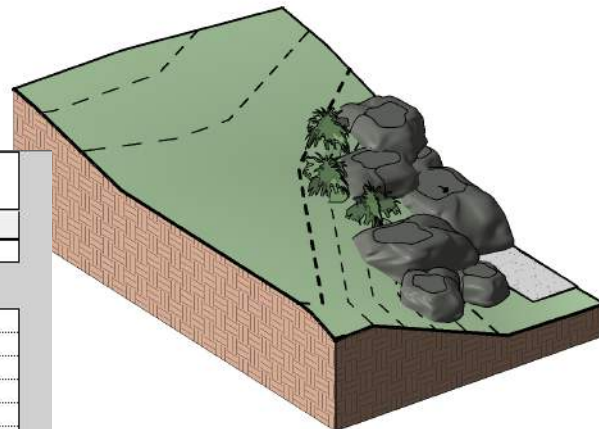
- Fences
 - Loadable Component



<\$-Site-Fence Schedule>			
A	B	C	D
Count	Type	Height	Length
Fence - Wood - Horizontal Picket			
24	3' x 6'	3.13'	189.50'
	8'6" x 10'	6.00'	73.30'
Gate - Double Swing			
1	Gate - Double Swing	4.00'	22.00'

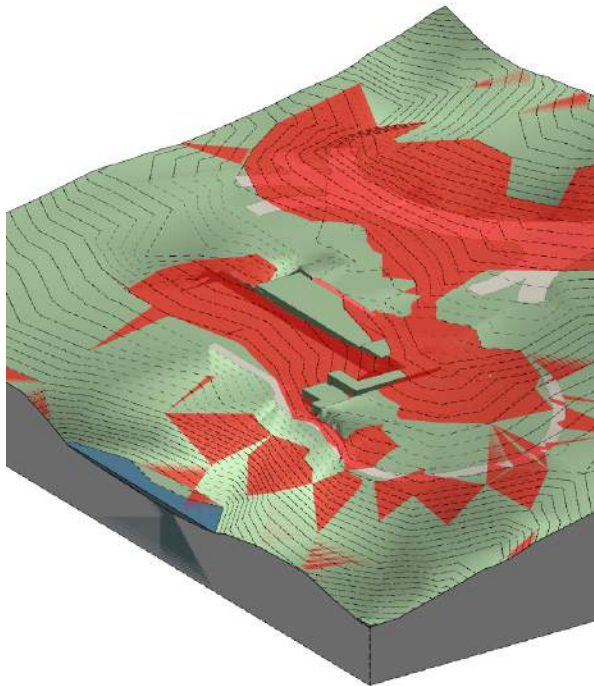
Volume Schedules

- Material Takeoff
- Irregular-shaped families
 - Rocks/ boulders



<Boulder Material Takeoff>		
A	B	C
Count	Family	Volume
Other Landscape Features		
1	Rock	119 CF
1	Rock	50 CF
1	Rock	69 CF
1	Rock	69 CF
1	Rock	92 CF
1	Rock	24 CF
1	Rock	35 CF
		459 CF

- Topography
 - Cut and Fill



<Topography Schedule>				
A	B	C	D	E
Name	Surface Area	Cut	Fill	Net cut/fill
Existing				
	2794211 SF	0 CF	0 CF	0 CF
Water	1393883 SF	0 CF	0 CF	0 CF
				0 CF
Phase 1				
Main Topo	2190119 SF	2834 CF	2878 CF	45 CF
	2283 SF	8784 CF	0 CF	-8784 CF
	576908 SF	41769 CF	30818 CF	-10951 CF
	21549 SF	22870 CF	1435 CF	-21435 CF
	1148 SF	250 CF	874 CF	624 CF
	254 SF	1653 CF	0 CF	-1653 CF
	1234 SF	0 CF	0 CF	0 CF
	616 SF	0 CF	0 CF	0 CF
	226 SF	0 CF	0 CF	0 CF
				-42154 CF

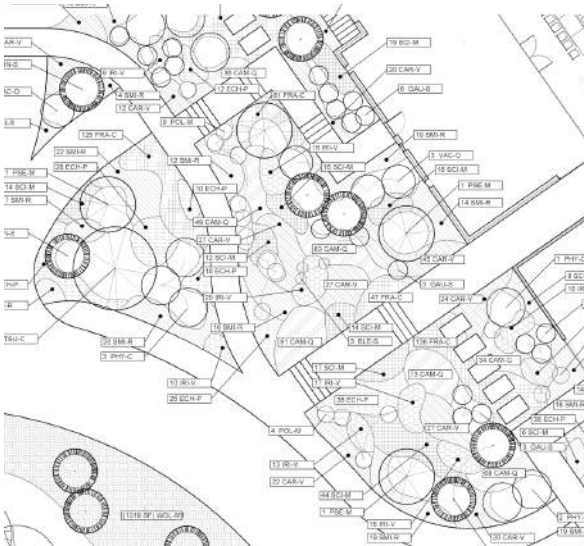
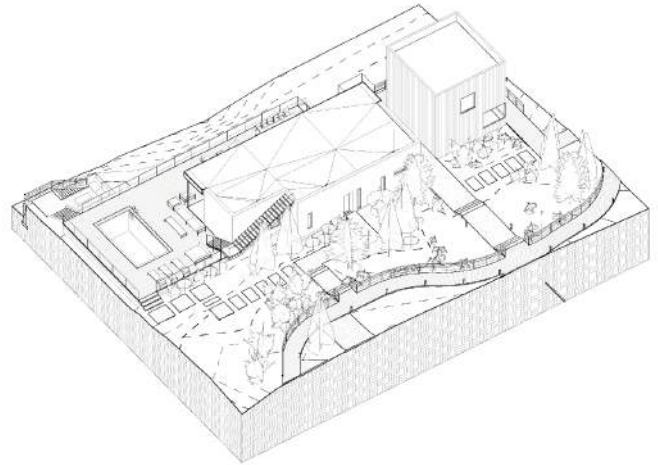
Schedule Tips:

- Use Filters with certain parameters (such as Assembly Code) to narrow down large schedules
- Establish standard Shared Parameters for frequently used parameters (such as Height, Width, or Area)

Communication + Collaboration

Overall, one of the biggest benefits of creating a site or landscape in Revit is simply having the 3D model of the landscape.

- Better understanding of the project
 - For the entire team
 - Designers
 - Client
 - Throughout entire process
 - Design
 - Documentation
 - Construction



Interdisciplinary Collaboration

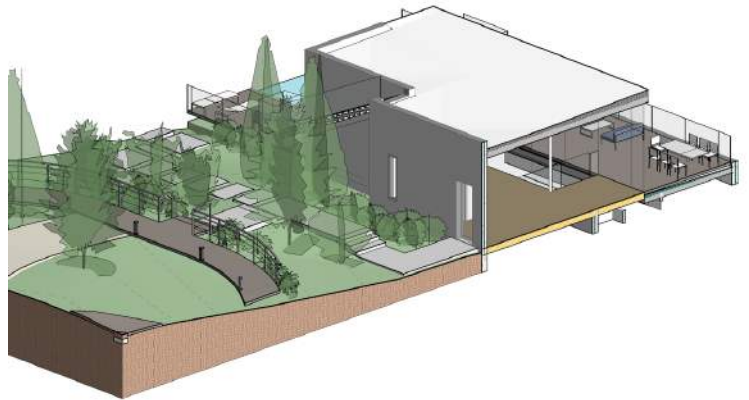
One of the biggest benefits in Revit is the ability to coordinate and collaborate with other Revit models. Here are some examples of how a landscape or site designer can coordinate with other disciplines that frequently use Revit.

Architecture + Interiors

Most of the coordination between the architecture and site model is centered around the transitions between indoor and outdoor space. This may seem obvious, but coordinating transitions with a 3-dimensional building becomes a lot easier when you can actually see the building and the site in 3d.

Transitions

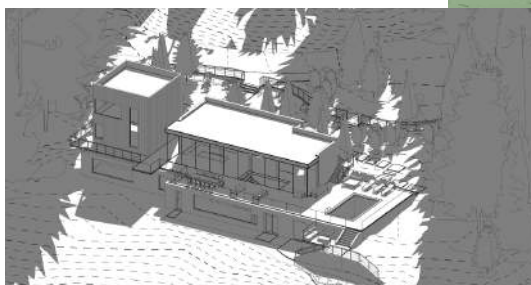
- Site/ Landscape
 - Always see building entry and exits
 - Live model- no waiting around for an export
 - Understand entries in elevation and 3D
- Architect
 - Understand exterior side of these spaces



Design Elements

This is where an actual Revit landscape is highly useful. Because many landscapes have architectural elements that relate directly to the building. It is not much different than coordinating between architecture and structure.

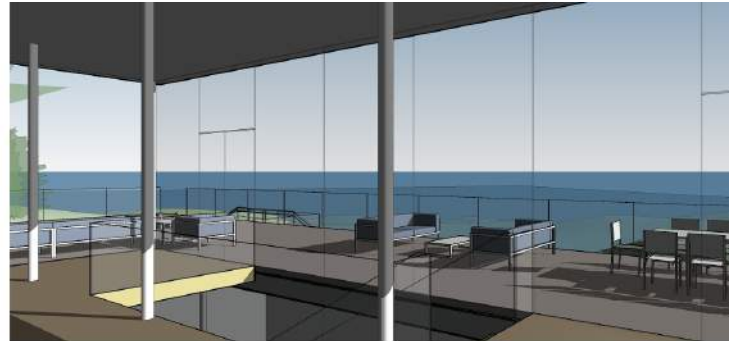
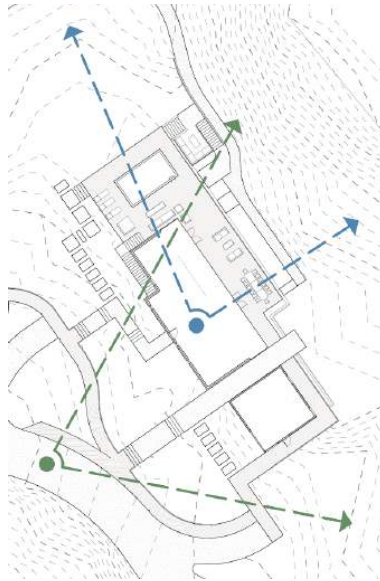
- Architectural elements
 - Furniture
 - Walls
 - Railings
- Landscape elements
 - Plantings
 - Hardscape
- Sun studies



Views

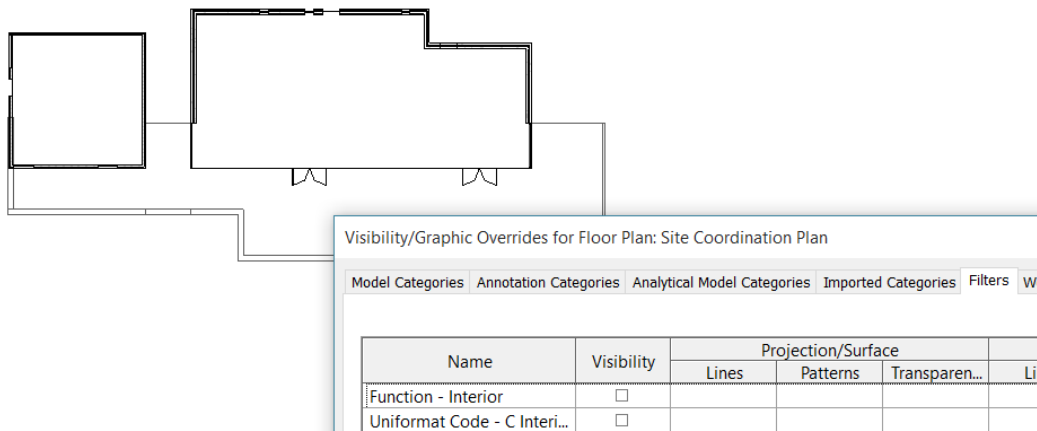
When the site or landscape is modeled in Revit, anyone can create accurate views of the project within its correct context.

- Looking at/ approaching the building
- Looking out at the landscape



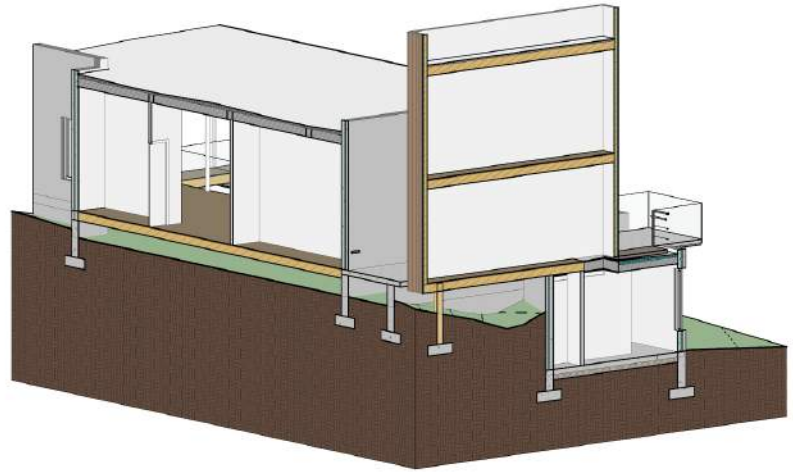
Critical Workflows:

- Shared Coordinates
 - Locate architectural file within the site, then Publish Coordinates from the site file to the architectural file.
- Establish a “clean” Floor Plan view in the architectural file.
 - Use Filters to hide all interior elements (Assembly Codes and Function)



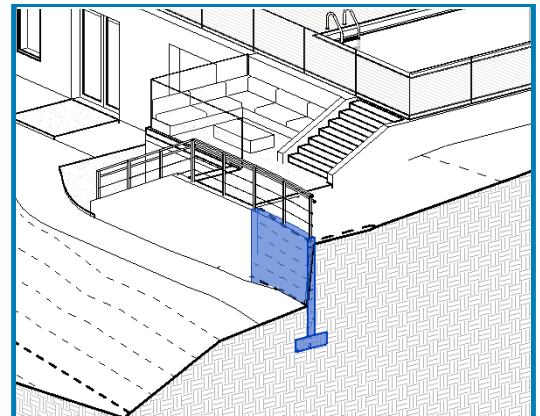
Structure

There may be certain projects where the structure and the site do not have much coordination, but the coordination can become quite important if there is any substantial elevation or grade change.



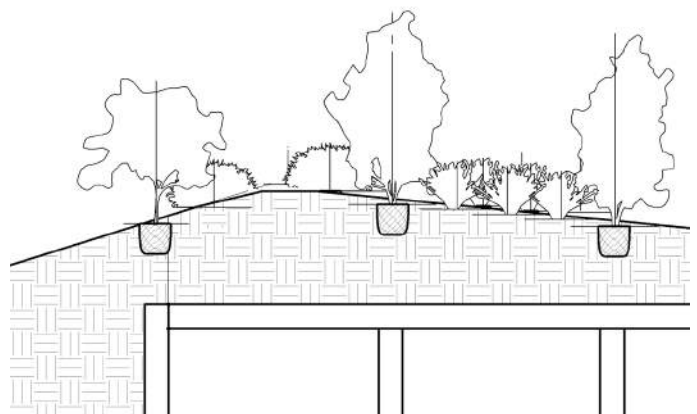
Grade Change

- Foundations (where the building physically meets the ground)
 - Coordinating foundation depths is much easier when there is an accurate model of the finished grade
 - Also may require coordination with architecture if the building Facade needs to be stepped.
- Retaining Walls
 - Initial design can be done in landscape file, then migrate into structure for documentation



Green Roofs

- Intensive systems, particularly when there are large plants
 - Must be placed with grid
 - Coordinate depth and root balls with structure
- London Embassy project
 - [OLIN](#)
 - landscape implemented entirely in Revit



Critical Workflow:

- Shared Coordinates
 - Architecture is central coordination point. Coordinates should be pushed from Site to Architecture, and then from Architecture to the rest of the building (Structure/ MEP).
 - Must be done when
 - Structure/ MEP needs to link Site
 - Site needs to link Structure/ MEP

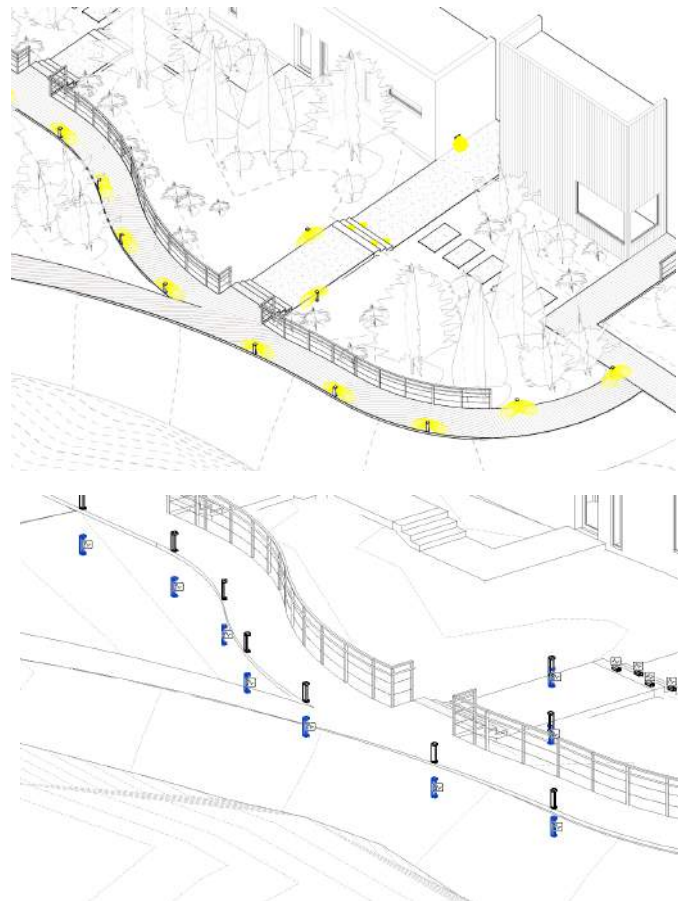
Electrical

Site Electrical

- Site Lighting
- Equipment or Fixtures

Potential Issues

- If Site Electrical elements are hosted and placed relative to the building (in a building file)
 - Elements will float/ embed due to elevation change
 - If building moves, Site elements will move



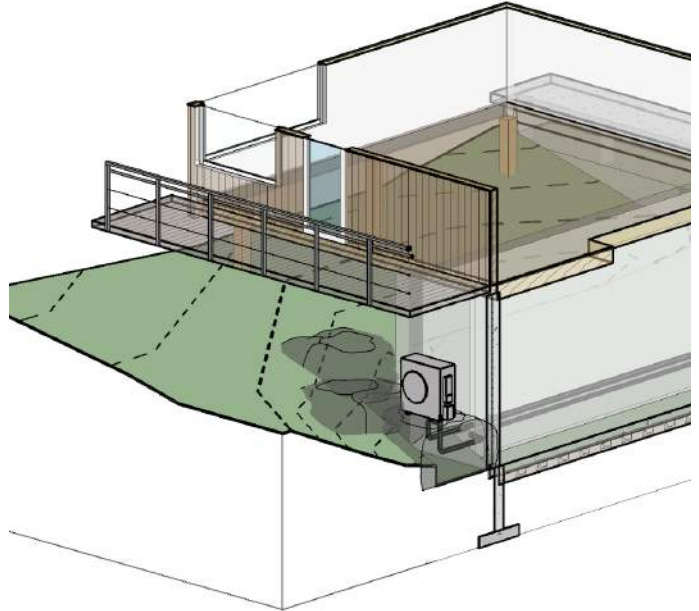
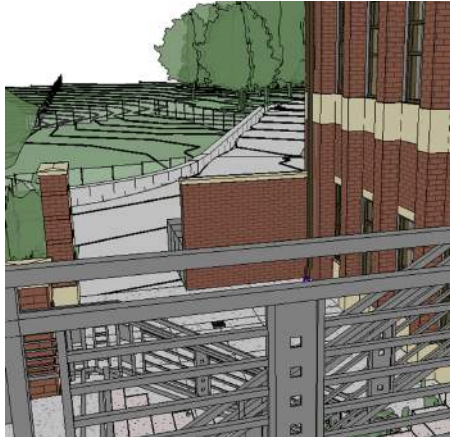
Critical Workflow:

- Copy/Monitor all site electrical elements (between Site and Electrical)
 - Place elements in Site file first, then copy/monitor
 - Or Place in Electrical first
 - Copy/monitor must be done manually in Site (cannot rehost lighting)
 - Must manage duplicate elements (can use Worksets)
 - Result
 - All electrical elements are at accurate elevations
 - If building moves, copy/monitor coordination can be used to automatically realign elements with location in site model

Mechanical + Plumbing

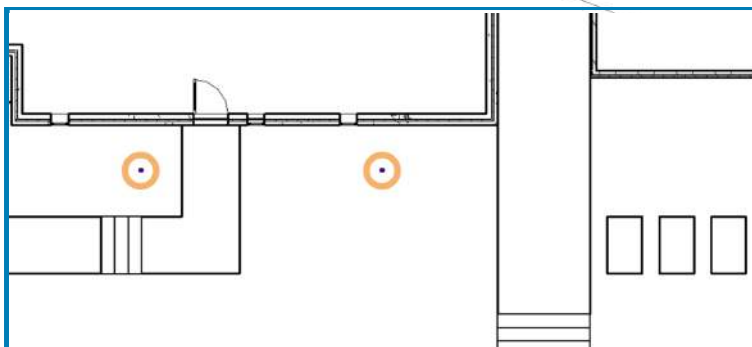
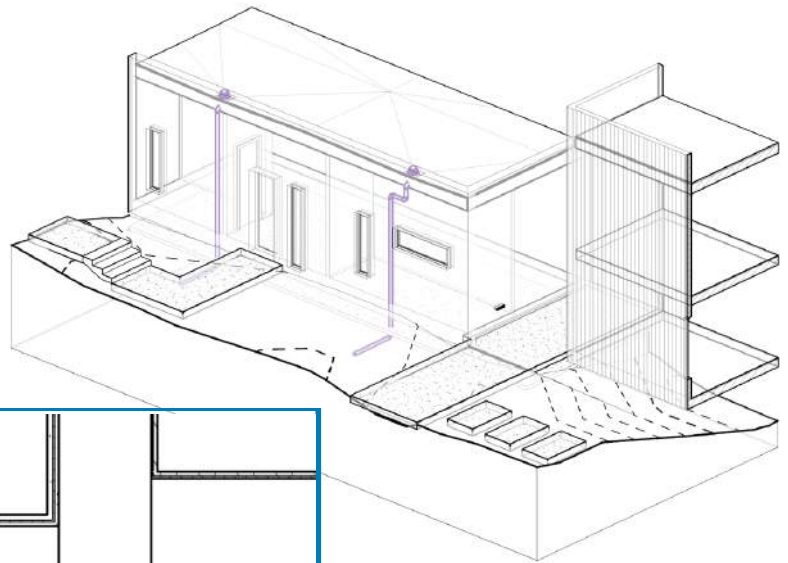
Equipment

- Can use Copy/Monitor
- Screening
 - Wall
 - Fence
 - Plantings



Piping

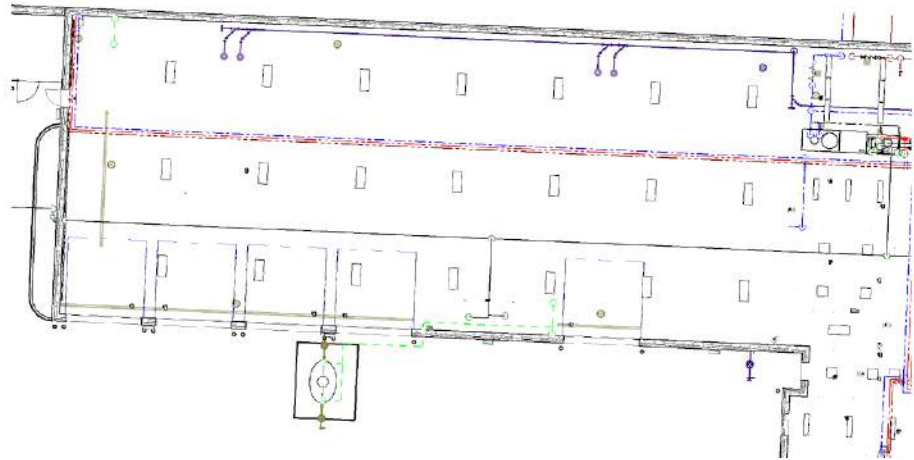
- Plumbing → Site Utilities
 - Downspouts
 - Roof Drains
 - Any other connection
- Export for Civil
- Pipe Fitting



Critical Workflow:

For Mechanical, Electrical, and Plumbing

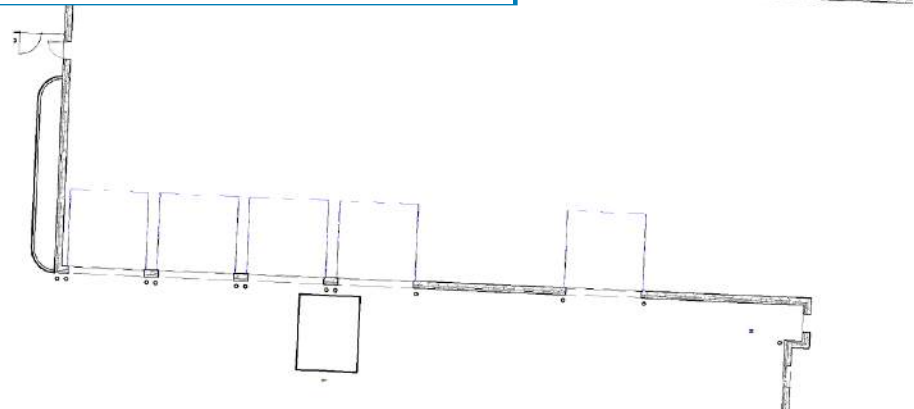
- Establish a “clean” coordination view
 - MEP links are messy in site plan views



- Establish a parameter
 - Apply to components
 - Set parameter
- Create view with corresponding Filter

Visibility/Graphic Overrides for Floor Plan: Site Coordination Plan

Name	Visibility	Projection/Surface		
		Lines	Patterns	Transparen...
Location - Not Site	<input type="checkbox"/>			



Tips and Reminders

To wrap things up, here are some general tips and reminders for collaborating with a site or landscape in Revit.

- Landscapes have very large View Ranges
 - Typically are looking at site from pretty high up, and might be looking down to Sea Level.
- Might be working closely with a dwg (survey) link
 - So turn on the dwg, if necessary.
- Be aware of what is accurate in the site model
 - Certain elements might have different levels of development, such as Topography and Hardscape.
- Use coordination views
 - This can go both ways; the site/ landscape can create a coordination view for the building to reference, and the building disciplines can create coordination views of the site to reference.
- Most importantly, if you have a landscape or site in Revit, **make sure it is visible!**
 - It should be linked in and loaded.



Who has the most to gain?

1. **Frequent collaborators** (those who frequently collaborate with disciplines and firms that already use Revit)
 - a. Multidisciplinary (architecture/ engineering) firms
 - b. Landscape firms that work frequently with architects in Revit
2. Designers and contractors of complex landscapes (anyone who designs and constructs complex landscapes)
3. Landscape architects looking for a BIM process

And what can you do about it?

- As a landscape architect... **be open to change**. Know the software and terminology so you can engage and be a part of the discussion.
- As an architect or BIM manager... **share your knowledge**. It is very likely that your landscape architects or site designers do not know what is possible with Revit. With great knowledge comes great responsibility, so share!
- As an Autodesk customer... **demand better tools**. Revit is a great product, and Landscape architects want to use it, but the lack of Site Tools is downright appalling.

And finally, if you do decide to use Revit in the landscape...

- Start small. Pilot at least one smaller and more manageable landscape in order to understand the workflows.
- Know your priorities and deliverables. You do not have to create a perfect model with perfect data every time. Be aware of what is reasonable and feasible.
- And remember... it is not AutoCAD.

Additional Resources

Revit Landscape: An Introduction to Revit and Site Modeling

I also have an online Udemy training course, [Revit Landscape: An Introduction to Revit and Site Modeling](#). This is an introductory course that focuses on modeling sites and landscapes in Revit. It is a video-based course and is specifically designed for new Revit users, so no prior Revit experience is required.

Revit Landscape: An Introduction to Revit and Site Modeling

Learn how to use Autodesk Revit to create sites and landscapes.

★★★★★ 1 ratings, 20 students enrolled

Instructed by Lauren Schmidt Design / Design Tools



€323

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Lectures	33
Video	5 Hours
Skill level	All level
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♥ Wishlist

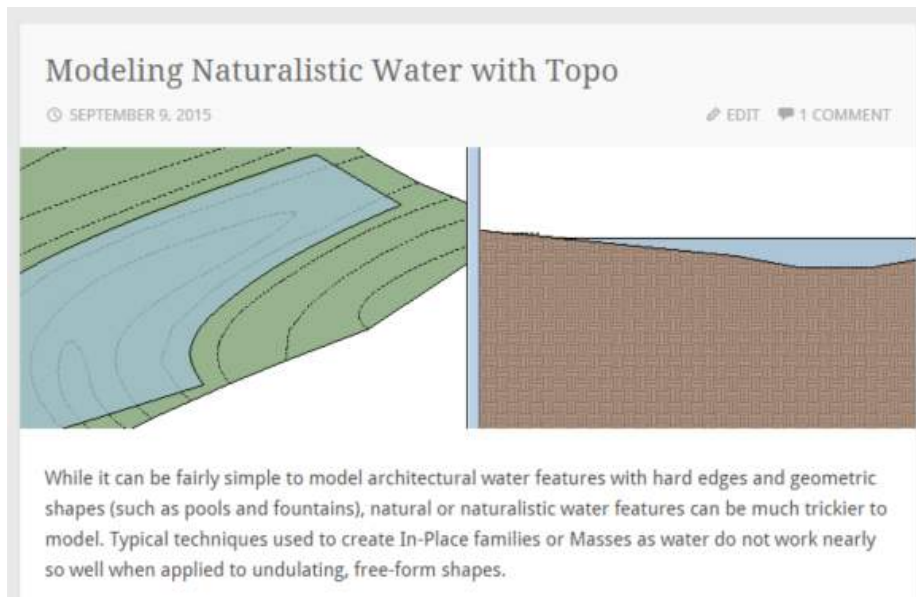
The current price for the course is \$280 (€323 incl. VAT) though I frequently offer a [discounted price through my website](#).

With the Udemy platform, you pay once for the course and then have lifetime access, so you can learn at your own pace.

landarchBIM

If you are interested in learning more about landscape architecture and Revit, you should also check out my blog and website, landarchBIM.com.

I frequently post successful landscape workflows:



And I also sometimes post custom landscape Revit families:

