



Creative Applications of Model Based Design

Presented by

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Today's Speakers



Joe Kolb, PE
Real Estate Services Director



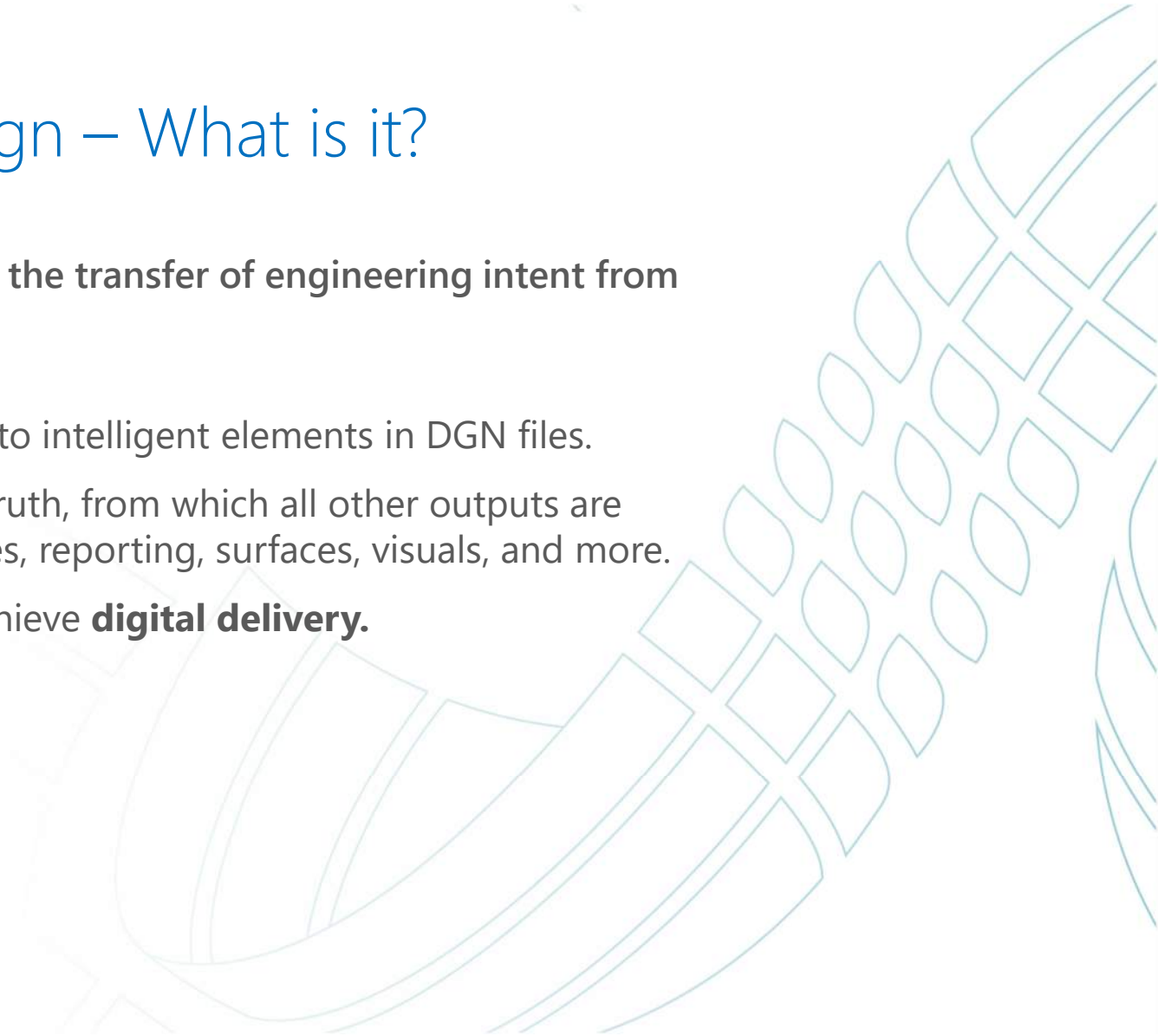
Kyle Rosenmeyer, PE
Model Based Design Leader

Joe and Kyle work out of VHB's Orlando Office,
among more than 2,000 colleagues along the
east coast.

Model-Based Design – What is it?

Model-Based Design describes the transfer of engineering intent from drawings to models.

- The focus of engineering shifts to intelligent elements in DGN files.
- This creates a single source of truth, from which all other outputs are derived, such as plans, quantities, reporting, surfaces, visuals, and more.
- MBD is an important step to achieve **digital delivery**.



Model-Based Design Unlocks Creativity

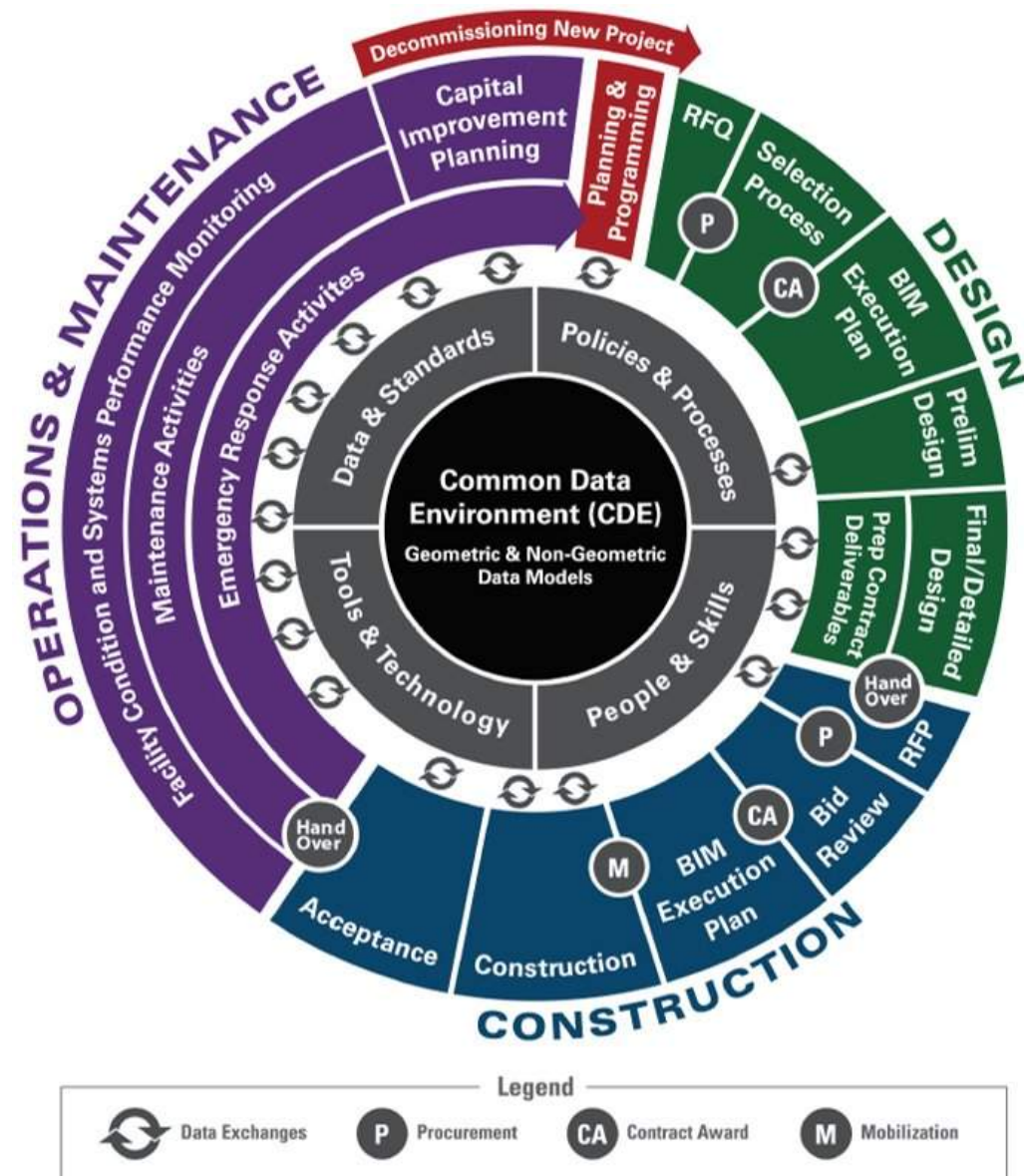
Imagine being able to:

- Bring ideas to maturity in hours, answering the “what-ifs” with compelling visualization and data.
- Design a project that is fully immersed in a 3D environment, tracking the design, quantities, and costs in real time as decisions are made.
- Review a project in a fully 3D interactive environment, “seeing” the project in mixed reality, and extracting all of the information you used to see in plans, plus much more.
- Bring your as-builts to life with live data, seeing the infrastructure perform in real time.

A New Future is Emerging

FHWA's BIM for Infrastructure vision is Model Based

- Project Data supports all phases of the infrastructure lifecycle.
- Major efficiencies will be achieved between all stakeholders in a project.
- New possibilities are unlocked for all stakeholders that weren't previously possible or were cost prohibitive.



And the Technology is Here Today

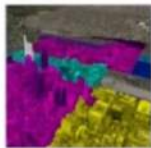
Software Vendors are building the tools to achieve the goals of owners.

Infrastructure Digital Twin

A synchronized, virtual representation of



Maps



Reality Models



Terrain & Subsurface Models



2D Design

BIM IS THE FOUNDATION OF DIGITAL TRANSFORMATION

Empowering seamless collaboration, decision making and better outcomes for all stakeholders, and built on a connected data experience allowing continuous iteration and improvement



DIGITAL TWIN



CONTENT MANAGEMENT, COLLABORATION, WORKFLOW AUTOMATION, PROJECT CONTROL & COMPLIANCE

DATA CAPTURE

VISUALIZATION, ANALYSIS & OPTIMIZATION

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Model-Based Design is Not New (Just New to Us)

Most award-winning infrastructure projects are international.
8 out of 55 projects that were recognized this year by Bentley Systems were American.



The Tools of Model-Based Design

Planning

- Infraworks
- ConceptStation
- SiteOps

Design

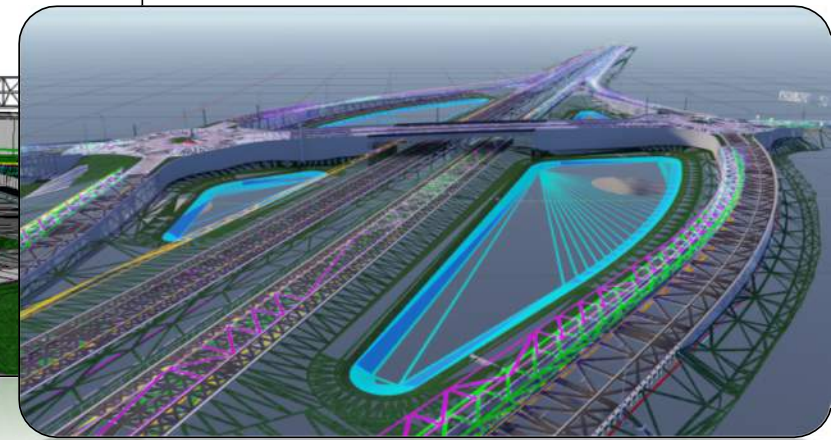
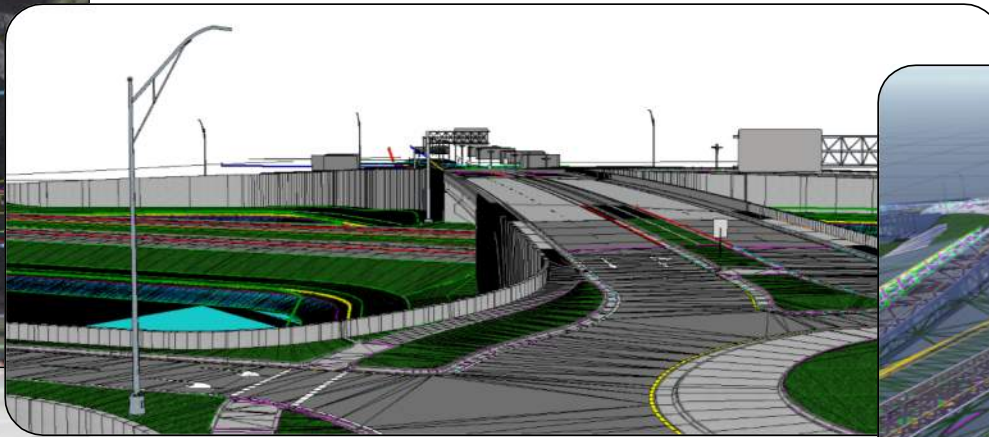
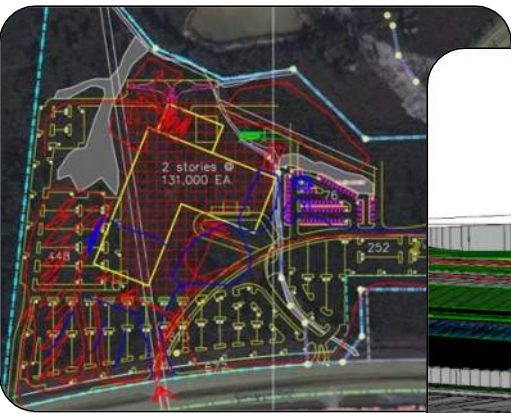
- ReCap, iTwin Capture
- Civil3D
- OpenRoads Designer

Construction

- ACC, ProjectWise
- iTwin, Forma
- Synchro, NavisWorks

Operation

- AssetWise
- ArcGis
- (IoT APIs)



Conceptual Modeling Tools – Applications in Model-Based Design

The screenshot displays a conceptual modeling software interface. The top menu bar includes Project, Import, Export, Edit, Draw, Layout, Grading, Stormwater, View, and Help. The toolbar contains various tools for editing and drawing, such as Delete, Copy, Paste, Undo, Redo, Move, Rotate, Flip, Cut Area, Surface, Length, Set start point, Chain Sides, Chain, Group, Block, Assign Block, Isolate Layer, Isolate Object, Desolate, Move by Amount, Move to Location, Layout Solver, Grading Solver, and Utility Solver.

The main workspace shows an aerial view of a site with a large rectangular area highlighted in green. A red box with the text "Grade is not Feasible" is overlaid on the highlighted area, with a subtext "Please check min / max slopes to correct. No pipes will be generated."

The bottom left corner displays a table of site statistics:

Item	Value
UTM Zone (WGS84)	17N
Revision:	
Number of spaces	0
Length of roads	0.0 ft [0.0 yd]
Parcels	0 (0.00 plac.) [0.0 ac = 0.00%]
Parking islands (internal)	0.0 sf [0.0 ac]
Total surface	803691.90 sf [18.45 ac]
Impervious surface (0%)	0.0 sf [0.0 ac]
Building surface (0%)	0.0 sf [0.0 ac]
Total disturbed (90%)	724937.89 sf [16.64 ac]

The bottom status bar shows the coordinates: SNAP E: 1483691.64 N: 10251776.18 Z: 0.000 and the message "Done processing GIS import".

The right sidebar contains a "Selected Path" panel with tabs for "Select All Sides" and "Select All Points". The "Select All Sides" tab is active, showing a table of miscellaneous costs:

Item	Value
Name	
Type	Car Drive P...
Miscellaneous Cost	
Cost Category	Undefined
Cost Name	Undefined
Unit	Undefined
Unit Price	NaN
Quantity	NaN
Total	NaN

Conceptual Modeling Tools – Applications in Model-Based Design

Example of concept plan prepared in OpenSite™



Prepared using ESRI™ data base in less than two hours

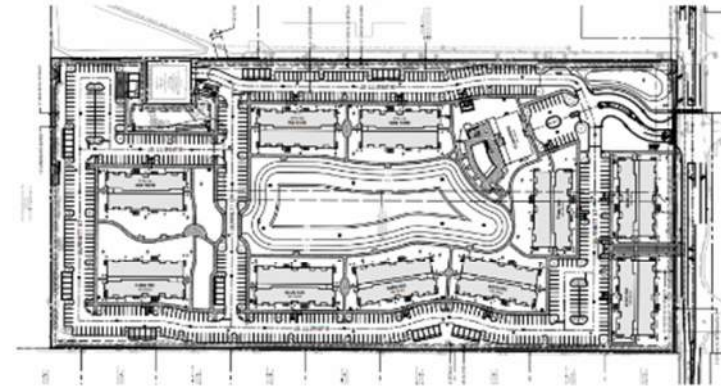
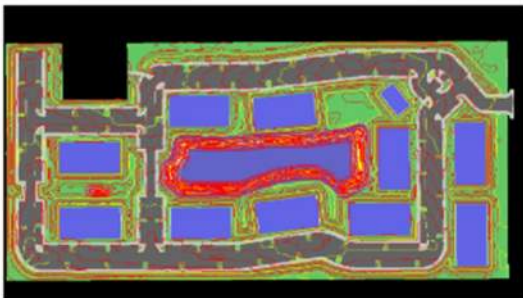


Image of construction plans for comparison



*Conceptual
model provides
cut/fill analysis
and construction
cost estimate*

Conceptual Modeling Tools – Applications in Model-Based Design

Example of concept plans prepared in OpenSite™ - Residential



Base



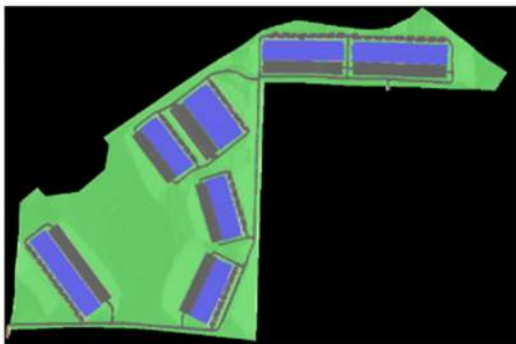
Optimized Grading Module

	A	B	C	D	E	F	G
1	Substation	1000	1000	1000	1000	1000	1000
2	Substation	1000	1000	1000	1000	1000	1000
3	Substation	1000	1000	1000	1000	1000	1000
4	Substation	1000	1000	1000	1000	1000	1000
5	Substation	1000	1000	1000	1000	1000	1000
6	Substation	1000	1000	1000	1000	1000	1000
7	Substation	1000	1000	1000	1000	1000	1000
8	Substation	1000	1000	1000	1000	1000	1000
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11	Substation	1000	1000	1000	1000	1000	1000
12	Substation	1000	1000	1000	1000	1000	1000
13	Substation	1000	1000	1000	1000	1000	1000
14	Substation	1000	1000	1000	1000	1000	1000
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33	Substation	1000	1000	1000	1000	1000	1000
34	Substation	1000	1000	1000	1000	1000	1000
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93	Substation	1000	1000	1000	1000	1000	1000
94	Substation	1000	1000	1000	1000	1000	1000
95	Substation	1000	1000	1000	1000	1000	1000
96	Substation	1000	1000	1000	1000	1000	1000
97	Substation	1000	1000	1000	1000	1000	1000
98	Substation	1000	1000	1000	1000	1000	1000
99	Substation	1000	1000	1000	1000	1000	1000
100	Substation	1000	1000	1000	1000	1000	1000

Cost Estimate

Conceptual Modeling Tools – Applications in Model-Based Design

Examples of concept plans prepared in OpenSite™



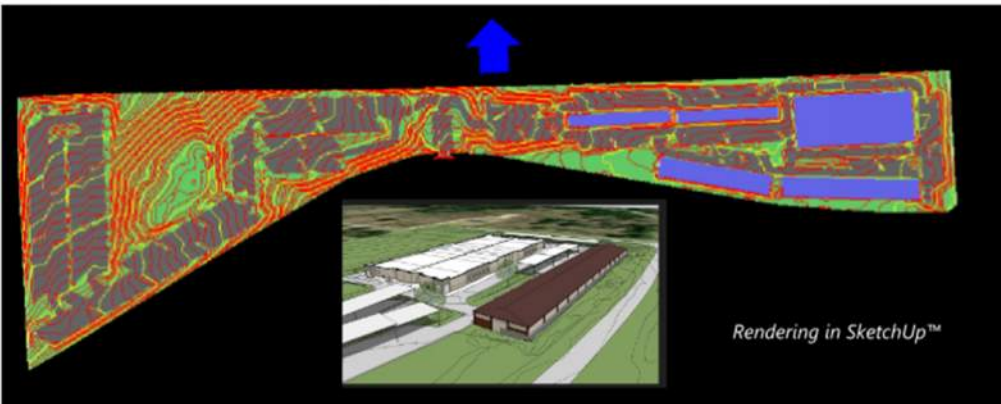
Warehouse

ATM Zone (SQFOOT)	1279
Receptor	
Number of spaces	503
Length of roads	7912.92 ft (1004 ft mi)
Paved	0 (0.00 pct) (0.0 ac) 0.0
Parking islands (external)	0.0 ft (0.0 ac)
Total surface	762542.08 ft (17.51 ac)
Impervious surface (40%)	303786.01 ft (0.70 ac)
Exposed surface (60%)	458756.07 ft (1.04 ac)
Total disturbed (90%)	762542.08 ft (17.51 ac)

Provides site data (imperious surfaces, parking counts, building coverage)

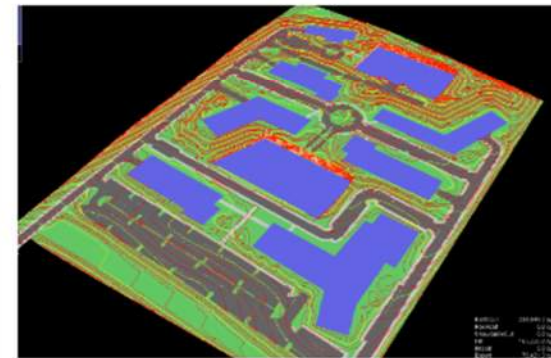


Retail



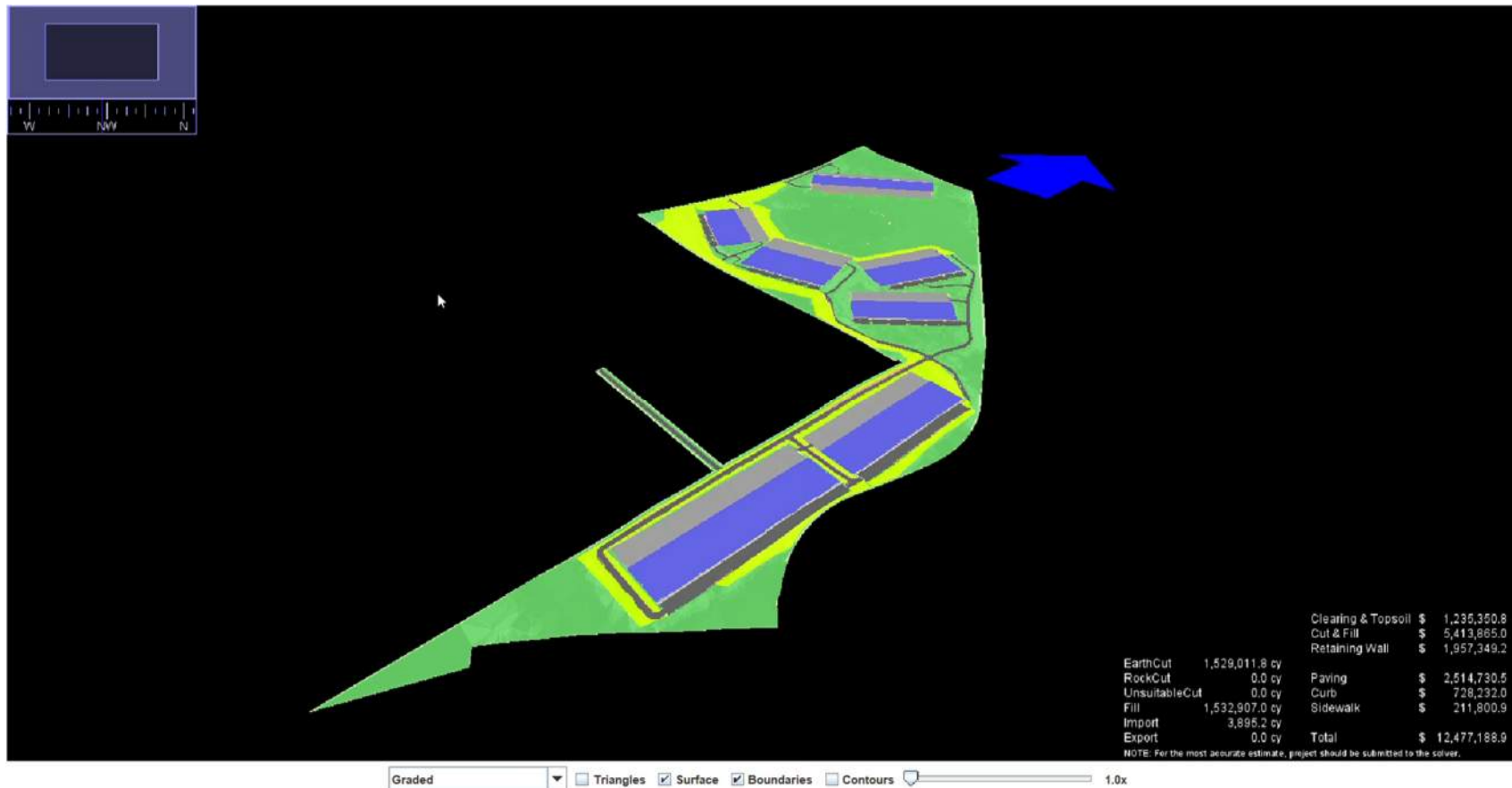
Self-Storage

Rendering in SketchUp™



Medical Campus

Conceptual Modeling Tools – Applications in Model-Based Design



Conceptual Modeling Tools – Applications in Model-Based Design

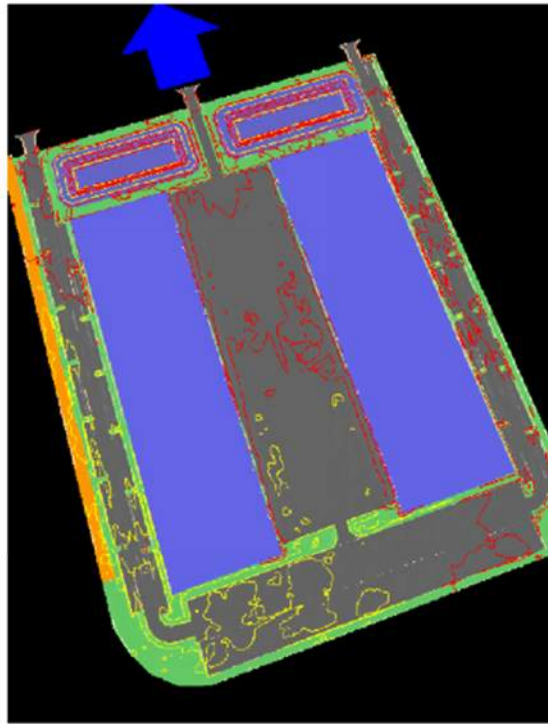


Conceptual Modelling Tools – Applications in Model-Based Design

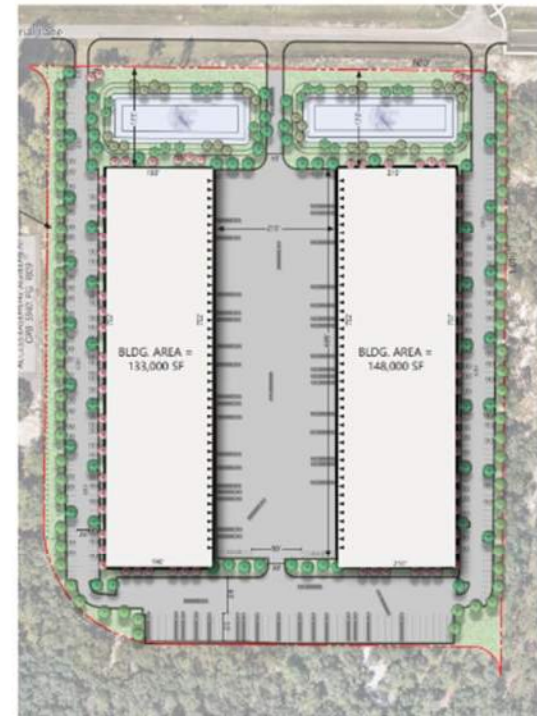
Example of concept plans prepared in OpenSite™ - Warehouse #1



Base



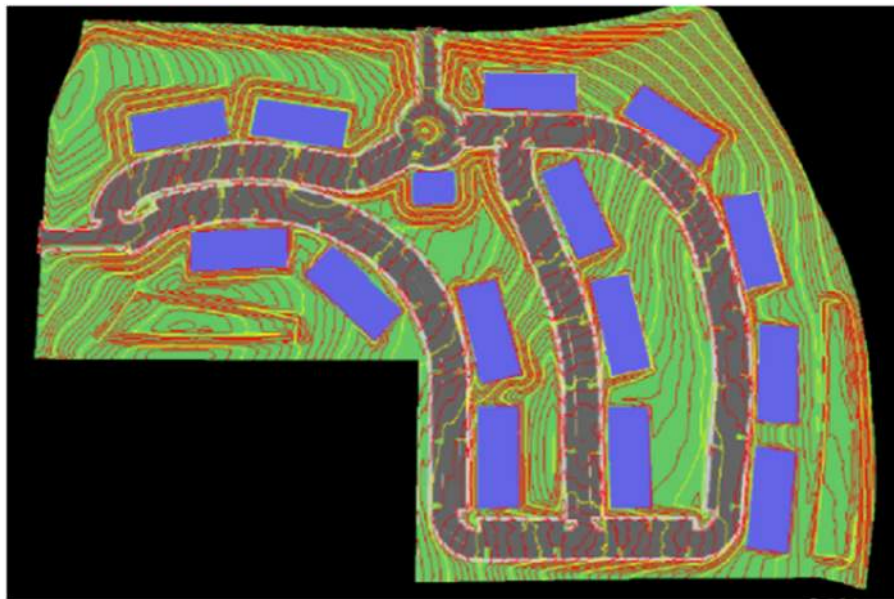
Optimized Grading Module



Final Concept Plan for comparison

Conceptual Modeling Tools – Applications in Model-Based Design

Example of concept plans prepared in OpenSite™ - Multifamily



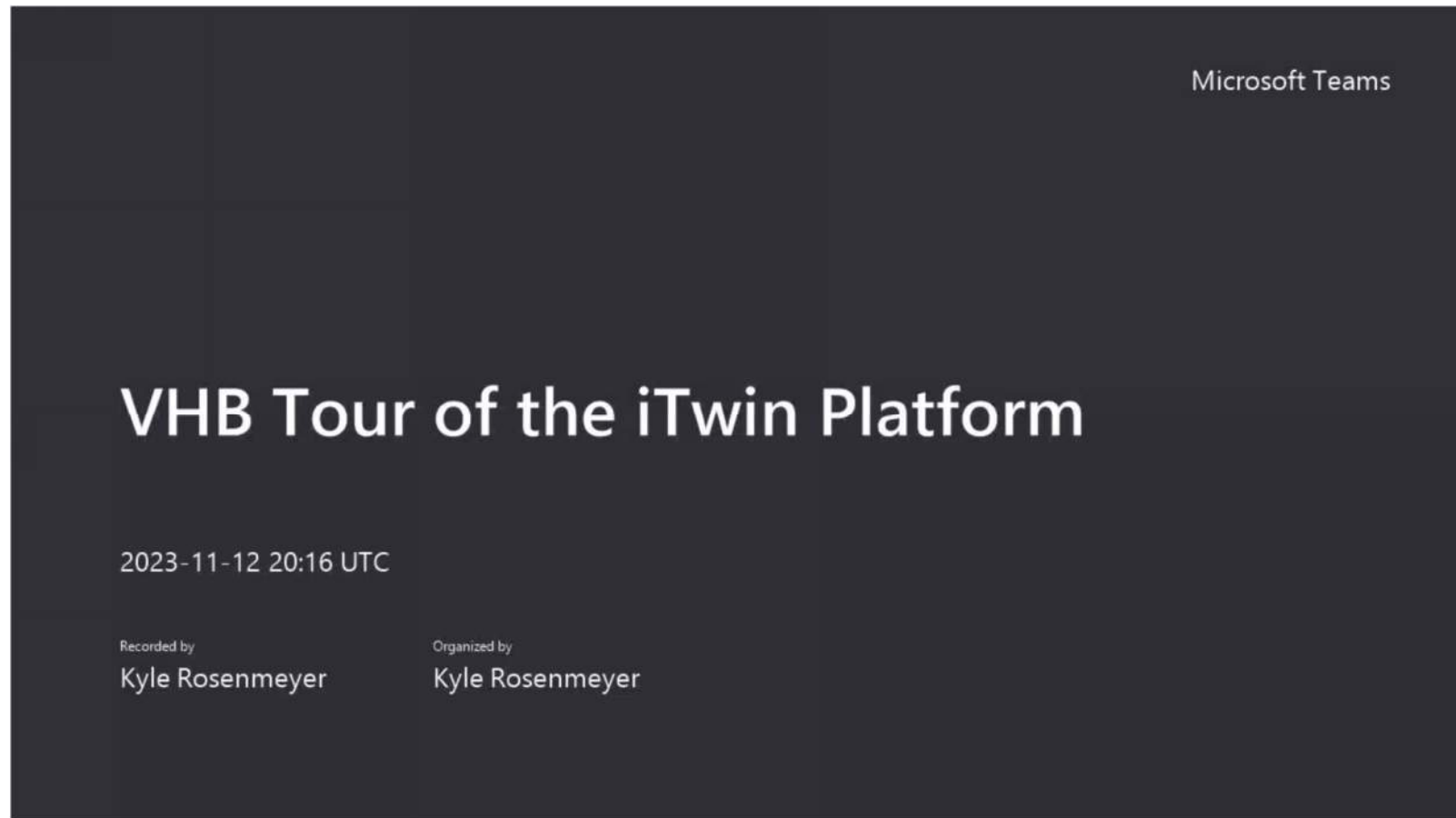
Final Concept Plan for comparison

Model-Based Design is Collaborative at its Core



Creative Tips for Working with a Model-Based Design

A tour of Bentley's Infrastructure Cloud iTwin Platform



Questions?

