

CES322236 - Connected BIM Interoperability

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Parsons Corporation

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Autodesk





About the speaker

Tushar Talele, BIM Engineer

Based in Denver, Colorado.

BIM Specialist with Masters degree in Construction Management and Tushar's goal in BIM is to bring new technology into daily practice by creating procedures and tools that can be used by everyone.

Assisting team Parsons Construction Group for integrated BIM and Digital Twin delivery.

6 plus years in Construction Industry



About the speaker

Sean Hulbert

Is a registered professional engineer in the state of Oregon, and a Designated Support Specialist at Autodesk, Inc., (supporting Infrastructure Design Tools).

Learning Objectives

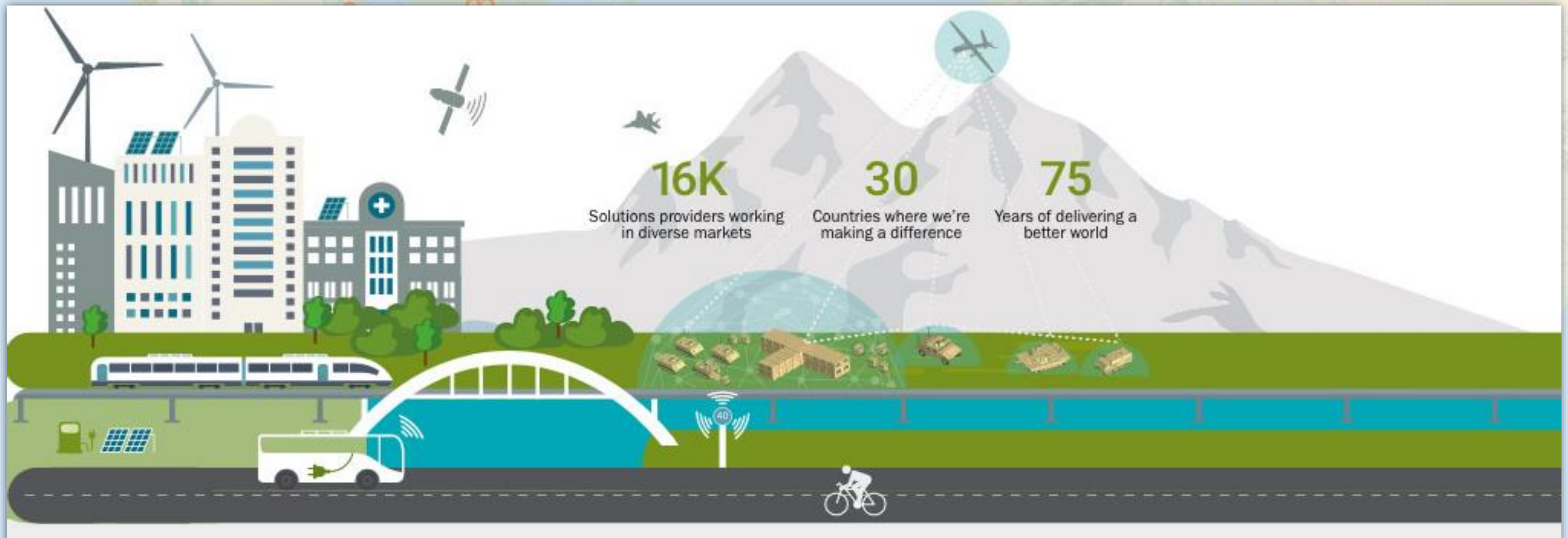
- ✓ Discover the workflow for using InfraWorks, Autodesk Civil 3D, Inventor, Revit and Navisworks
- ✓ Discover the process of Transportation Modeling
- ✓ Learn about interoperability challenges and preparing data for consumption
- ✓ Lessons learned: solutions

Class Summary

- ✓ Model Centric Workflow
- ✓ Preparing Data for consumption
- ✓ Data Translation – Alignment Design Data For InfraWorks
- ✓ Modeling Custom Bridge Components using Inventor
- ✓ Detailed Construction Planning in Navisworks
- ✓ Future Advancement Wishlist

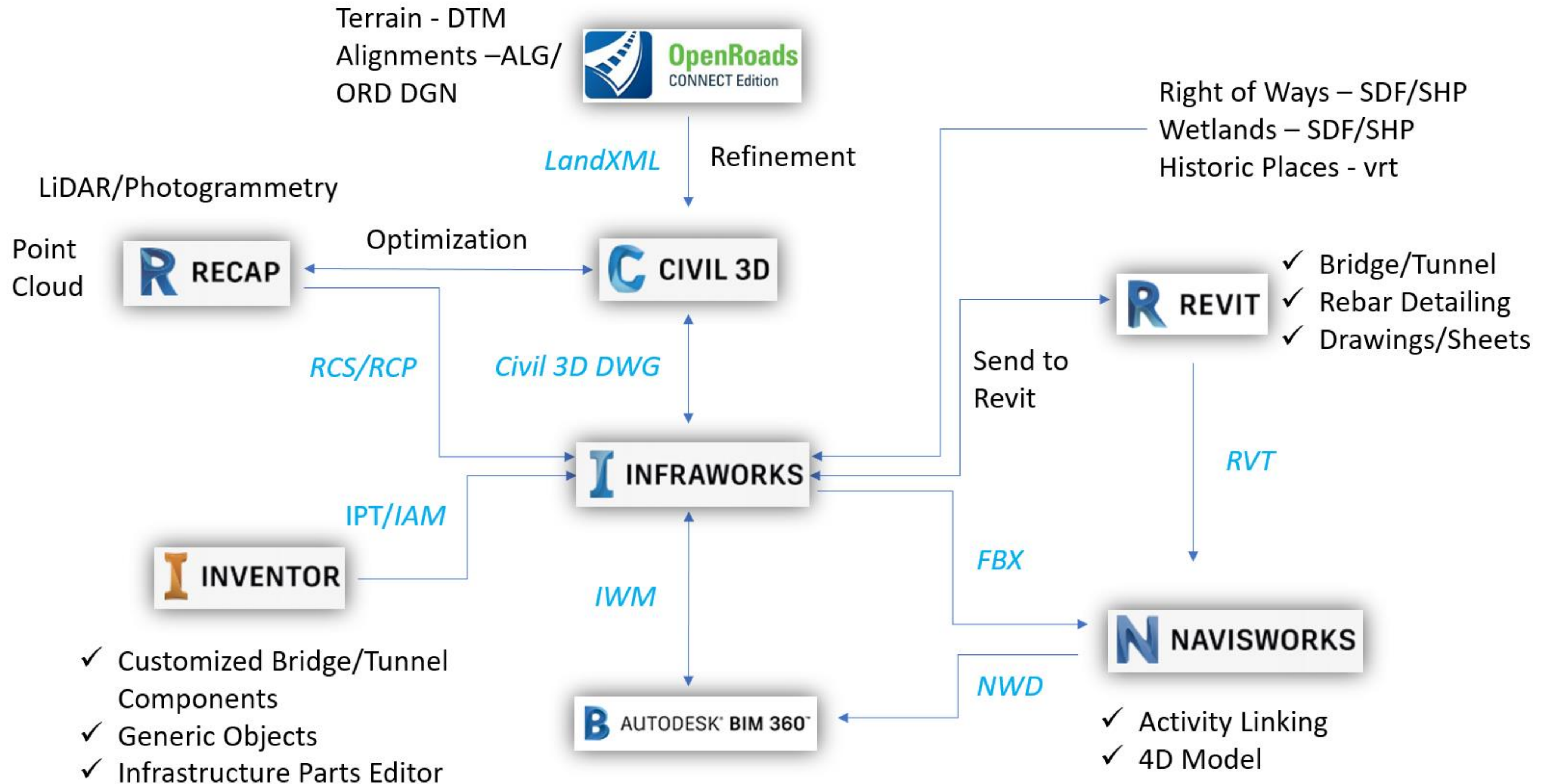
Parsons In Brief

"Global solutions provider focused on the defense, intelligence, and critical infrastructure markets"



Model Centric Workflow

InfraWorks Led Workflow for Transportation Modeling



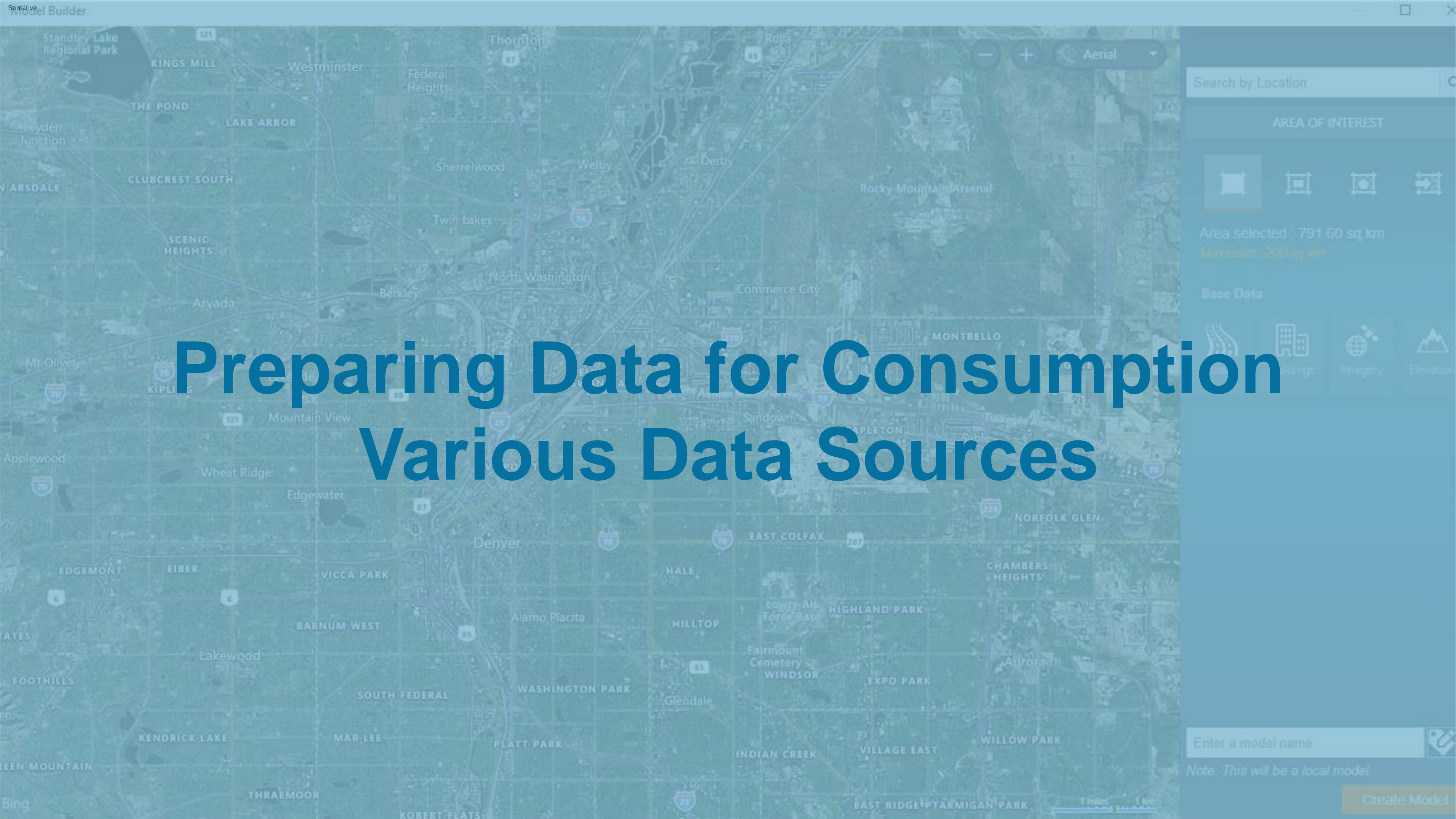
InfraWorks Led Workflow for Transportation Modeling

Why InfraWorks?

Selection Criteria and Point of View from contractor's perspectives

- ✓ Easy to use Interface
- ✓ Learning Curve
- ✓ Conceptual iteration of design ideas
- ✓ Enhancing Meetings
- ✓ 3D Visualizations
- ✓ Leveraging available AEC tools

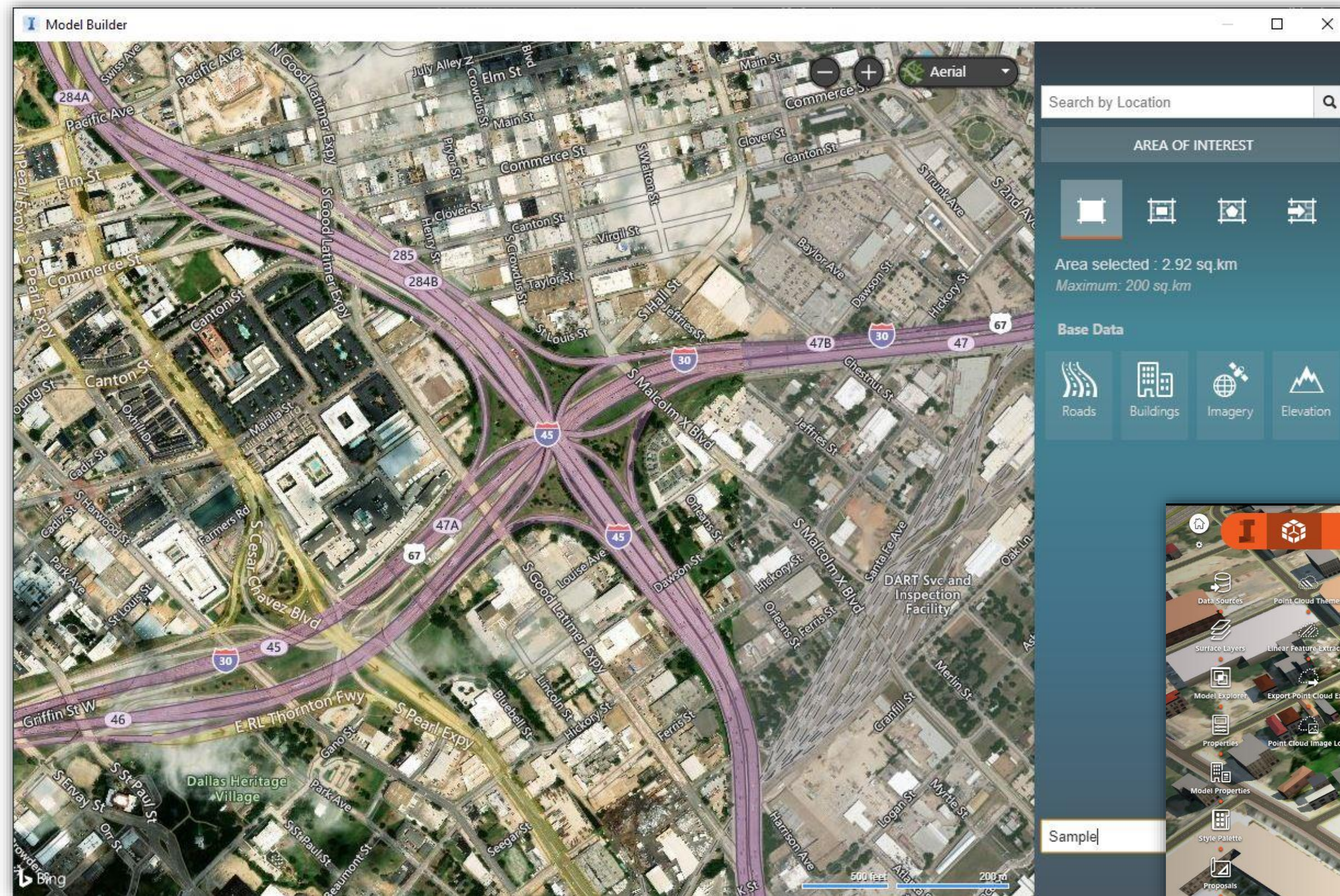




Preparing Data for Consumption

Various Data Sources

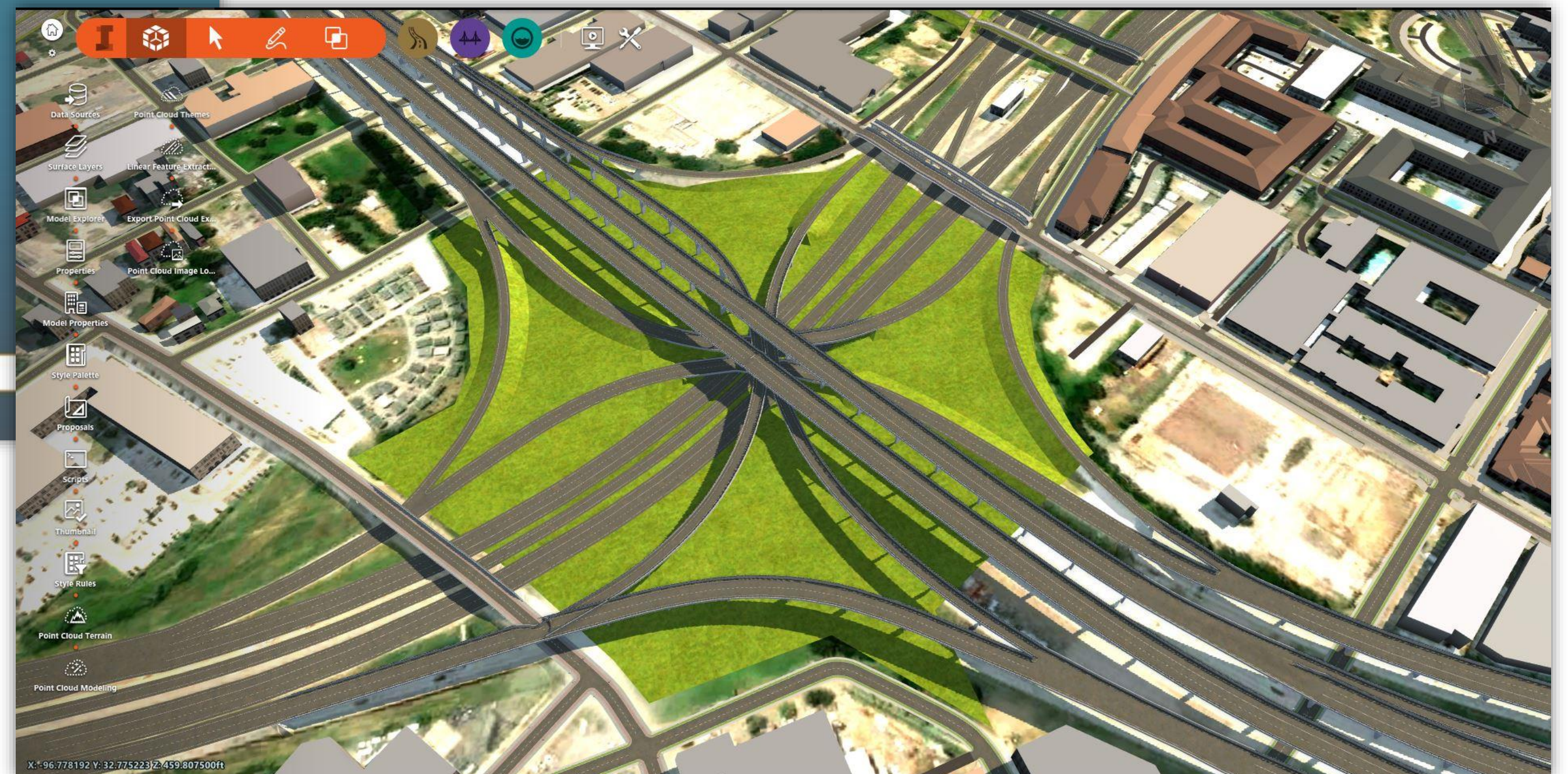
Preparing Data for Consumption



Model Builder Creating New Project



Model Builder Data



Preparing Data for Consumption

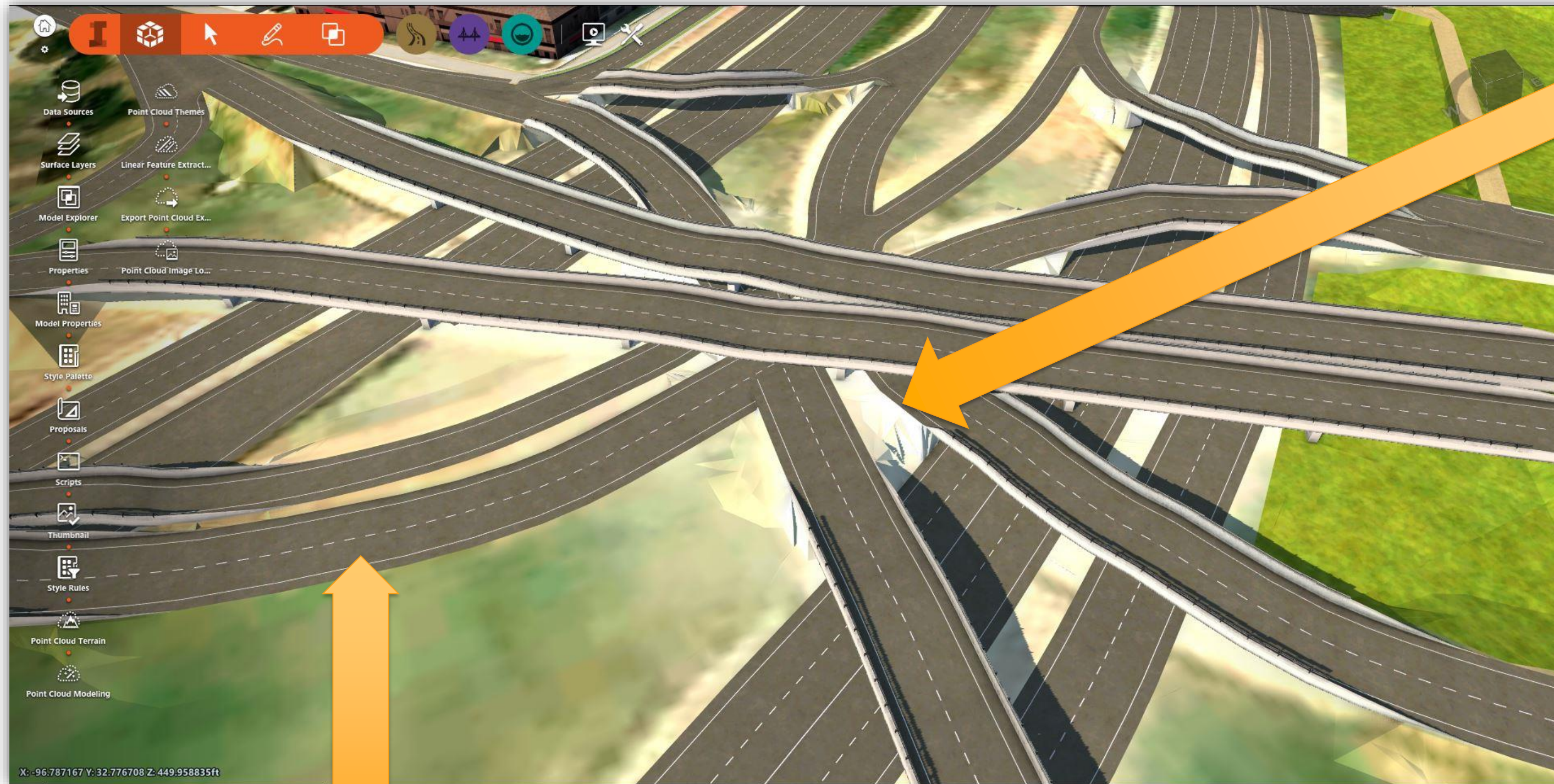
Terrain - DTM
Alignments –ALG/
ORD DGN



LandXML



Civil 3D DWG



Requires Topography Enhancement

Bridges refinement to fulfil design requirements

Road refinement – Planning Roads to Component Roads

Design Alignment, Profiles and Grading



Preparing Data for Consumption – ArcGIS Connector

The screenshot displays the Autodesk Connector for ArcGIS interface, which is used to prepare data for consumption in InfraWorks. The interface is divided into three main sections:

- Left Panel (My Content):** A list of datasets available for selection. The datasets include:
 - Barrier_Island_Imag...
 - Barrier_Lake_Exhibit
 - Barrier_Lake_Obstac...
 - Barrier_Lake_Restro...
 - Barrier_Lake_Toilet...
 - barriers
 - Barriers
 - Barriers to ArcGIS ...
 - barriers1-test
 - Barriers_IWF
 - Barriers_to_Pedestr...
- Central Panel (Layers):** A configuration panel for the selected dataset, titled "barriers". It shows the following layers:
 - ☒ Point layer: Points of Interest
 - ☒ Line layer: Coverage Areas
 - ☒ Polygon layer: Coverage Areas
- Right Panel (Map):** A map view showing the spatial distribution of the data. The map includes labels for various locations such as Norfolk, Portsmouth, Virginia Beach, and the Great Dismal Swamp National Wildlife Refuge. A search bar at the top of the map allows for location-based queries.

A large double-headed arrow connects the "ArcGIS Datasets" box (orange) to the "InfraWorks" box (blue), indicating the flow of data from the datasets to the InfraWorks environment.

An aerial photograph of a complex road intersection, including a highway interchange and several surface streets. The image is overlaid with a semi-transparent blue filter. The text 'Data Translation Design Data for Use in InfraWorks' is centered over the image in a bold, dark blue font.

Data Translation Design Data for Use in InfraWorks

Technical Challenges

1

Data Interoperability

- ❖ Design Iterations and Updated Design Files



2

Following State DOT's design requirement for Horizontal and Vertical Alignment in InfraWorks

- ❖ InfraWorks alignments are always centerline – InfraWorks Traffic Direction
- ❖ Alignment location to get correct lanes configuration and traffic flow for analysis
- ❖ Intersection attributes

Two bridges for one design alignment

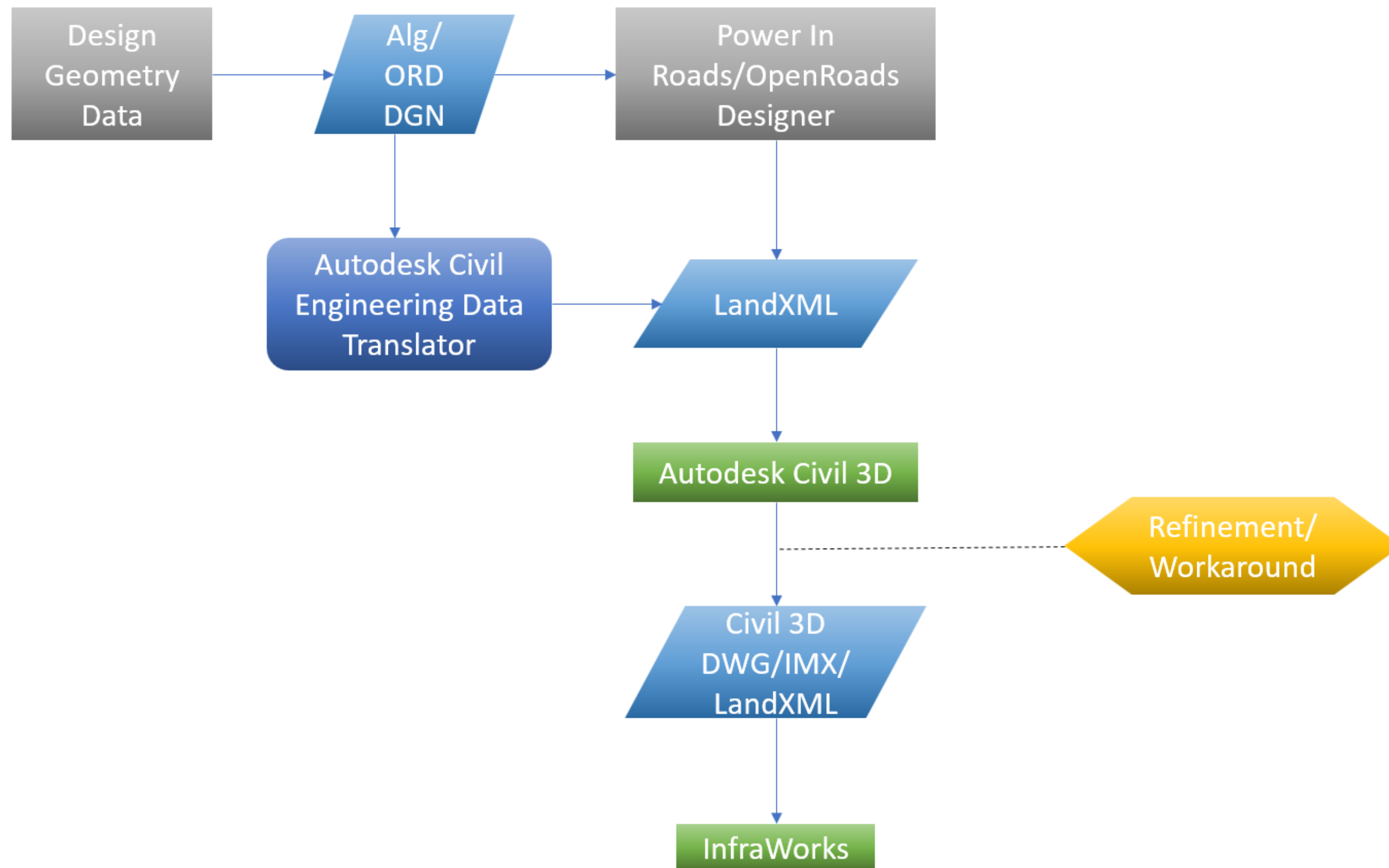
3

Solutions

- ✓ Offset alignments for Mainline depending number of lanes each way traffic and Intersection Design
- ✓ Offset alignments for Ramp Entrance and Exit
- ✓ Connected alignments for Ramp Entrance and Exit



Data Translation Workflow

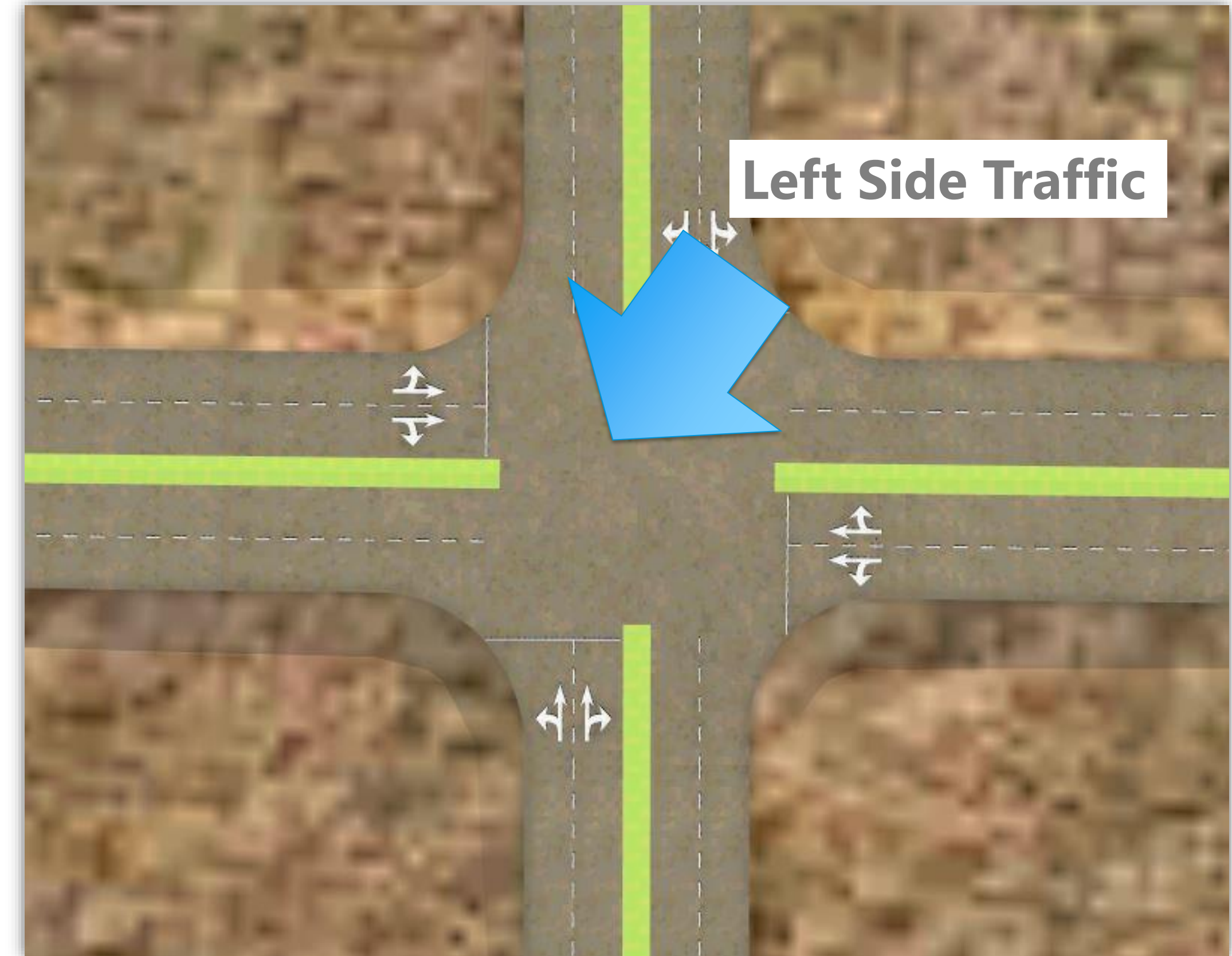


Points to consider

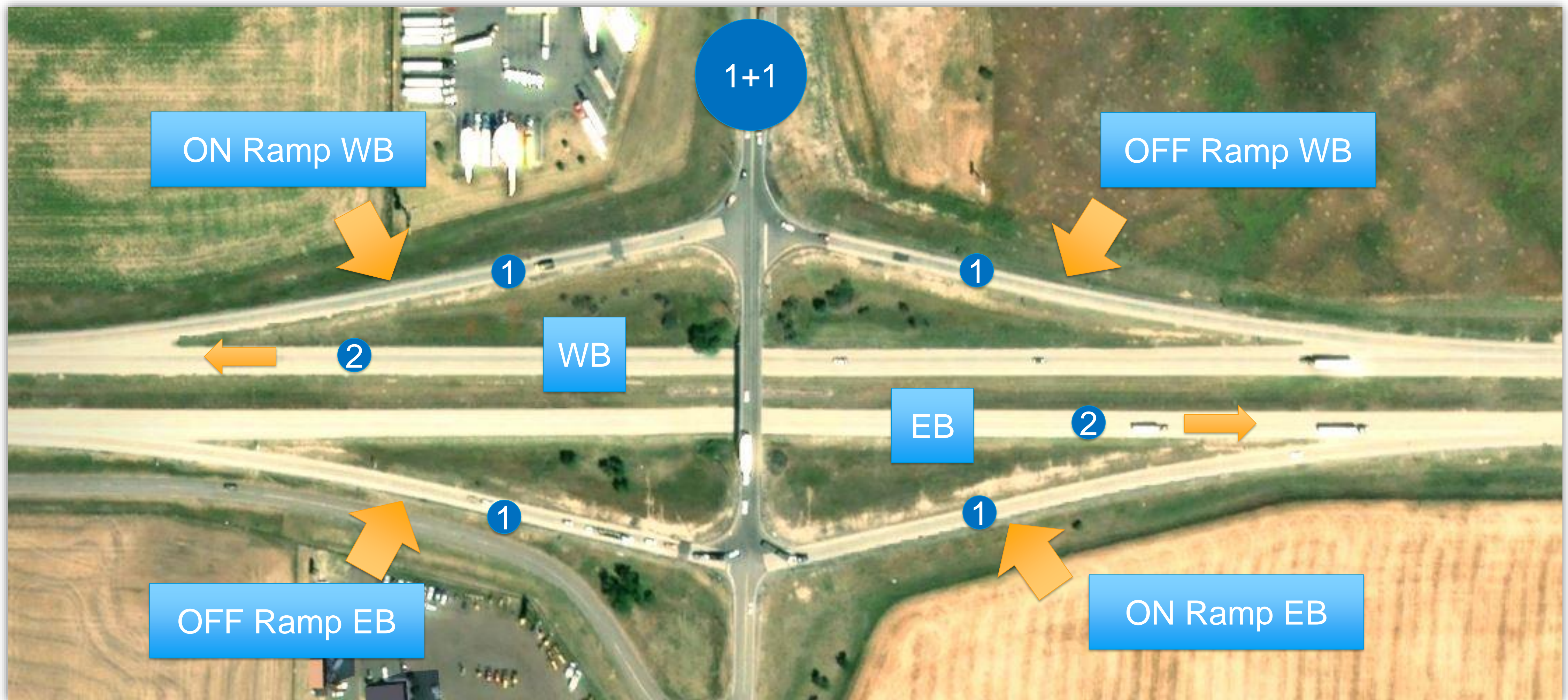
2

InfraWorks Traffic Direction

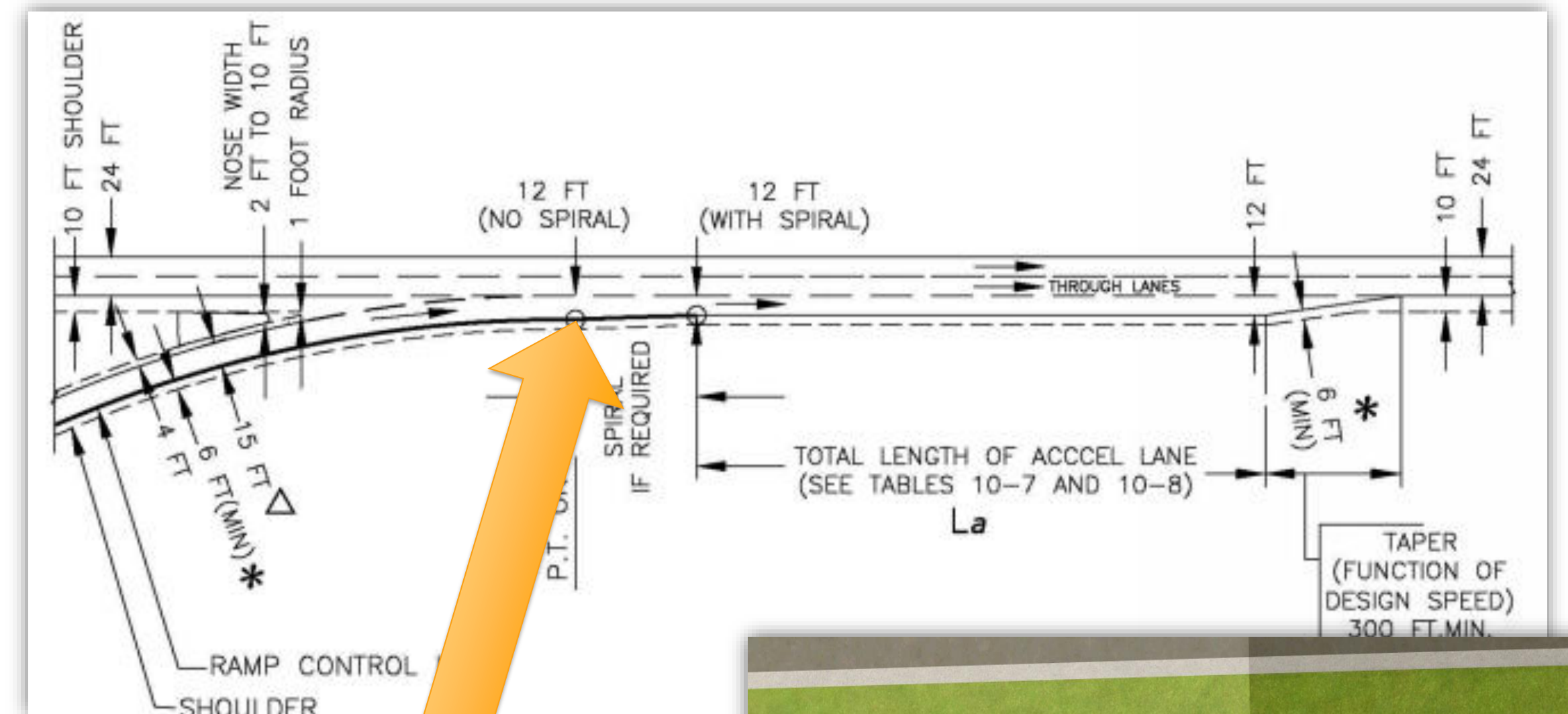
- ✓ How it Works?
- ✓ Why it is important?



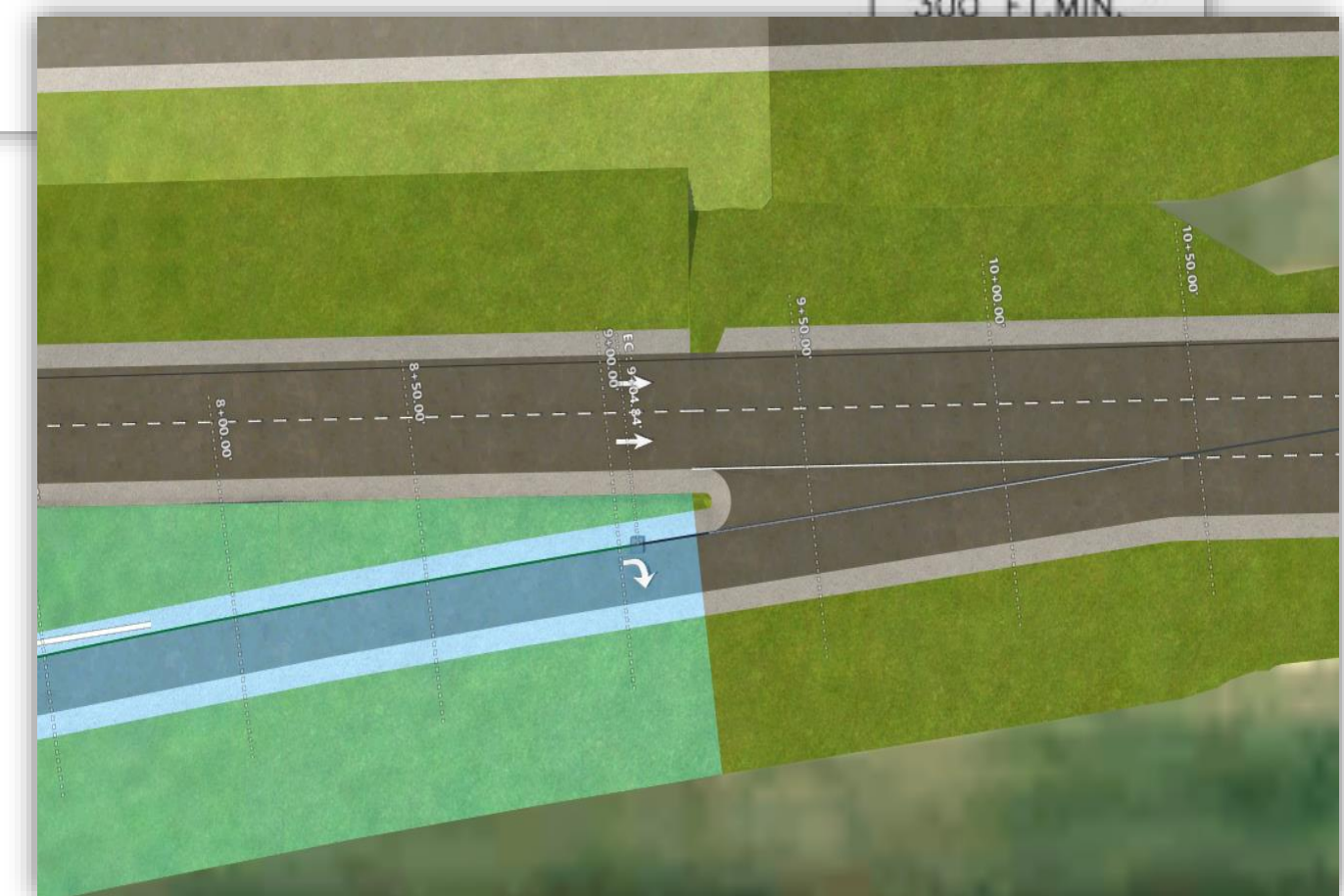
Sample Intersection Scenario



Case 2: Parallel Type

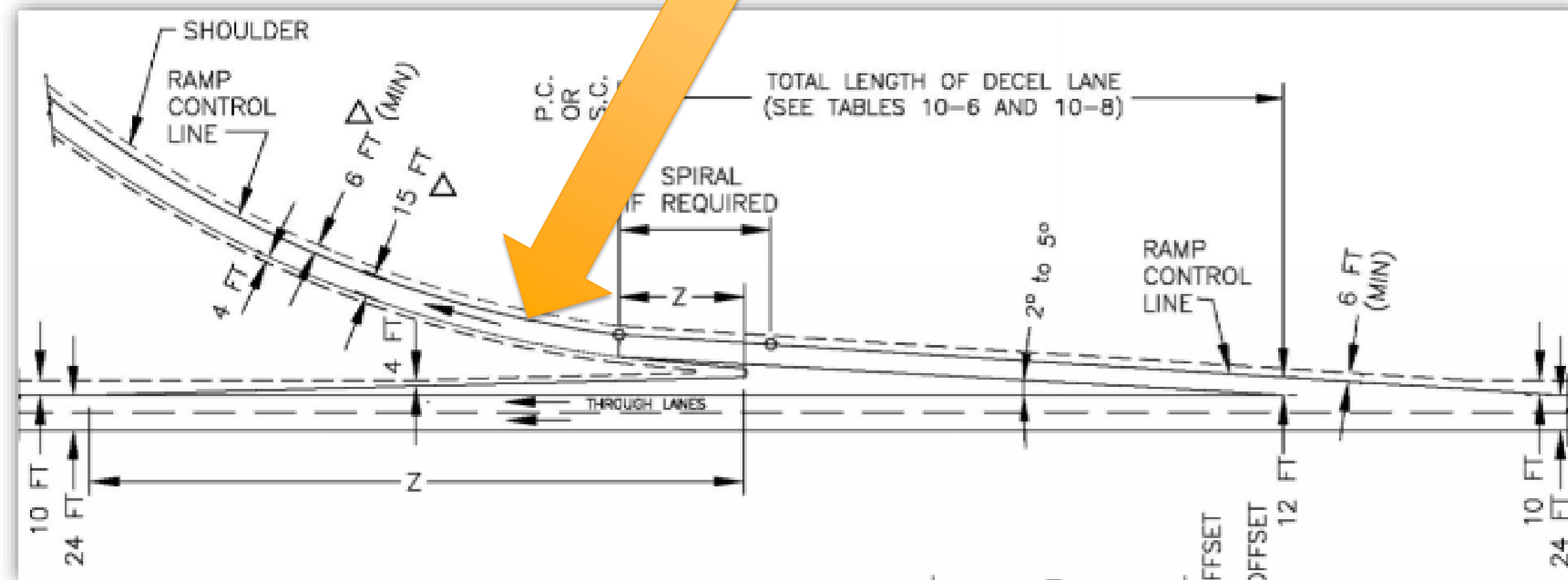


Ramps control alignments are at outer shoulder

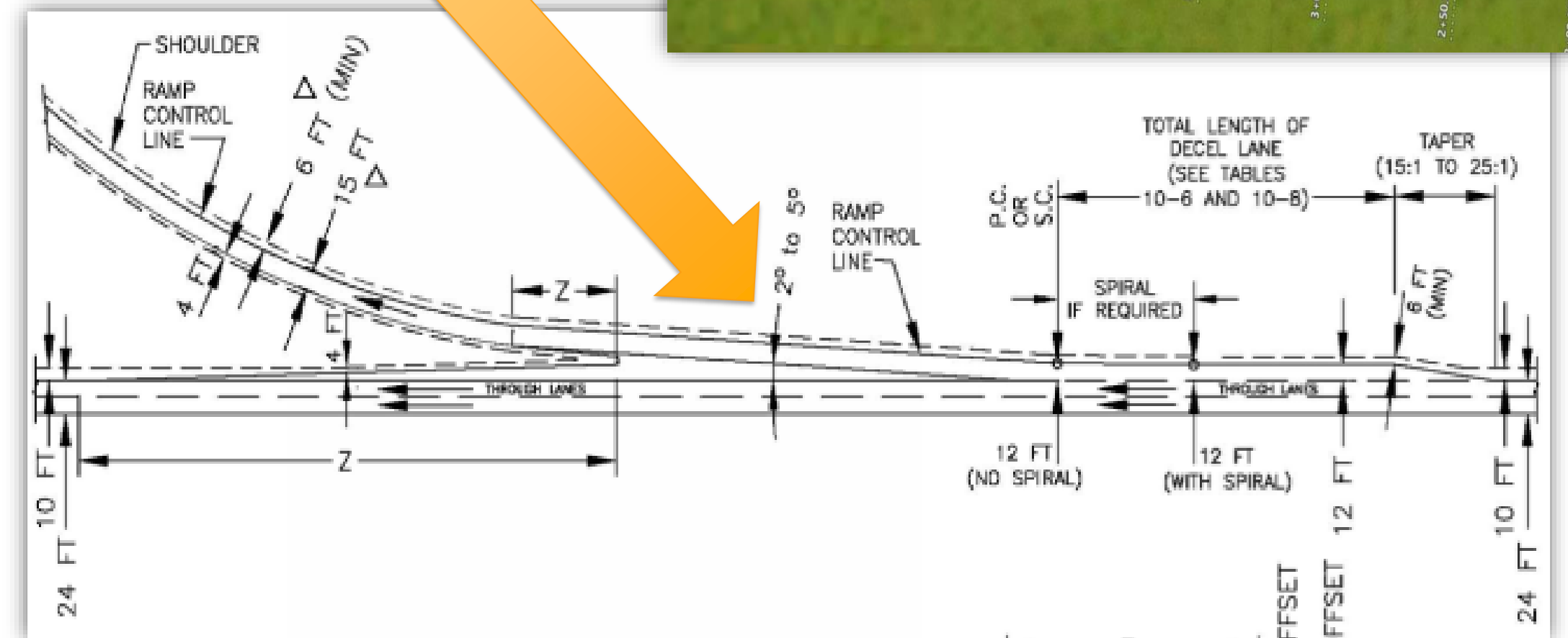


Typical Freeway Exit Terminal

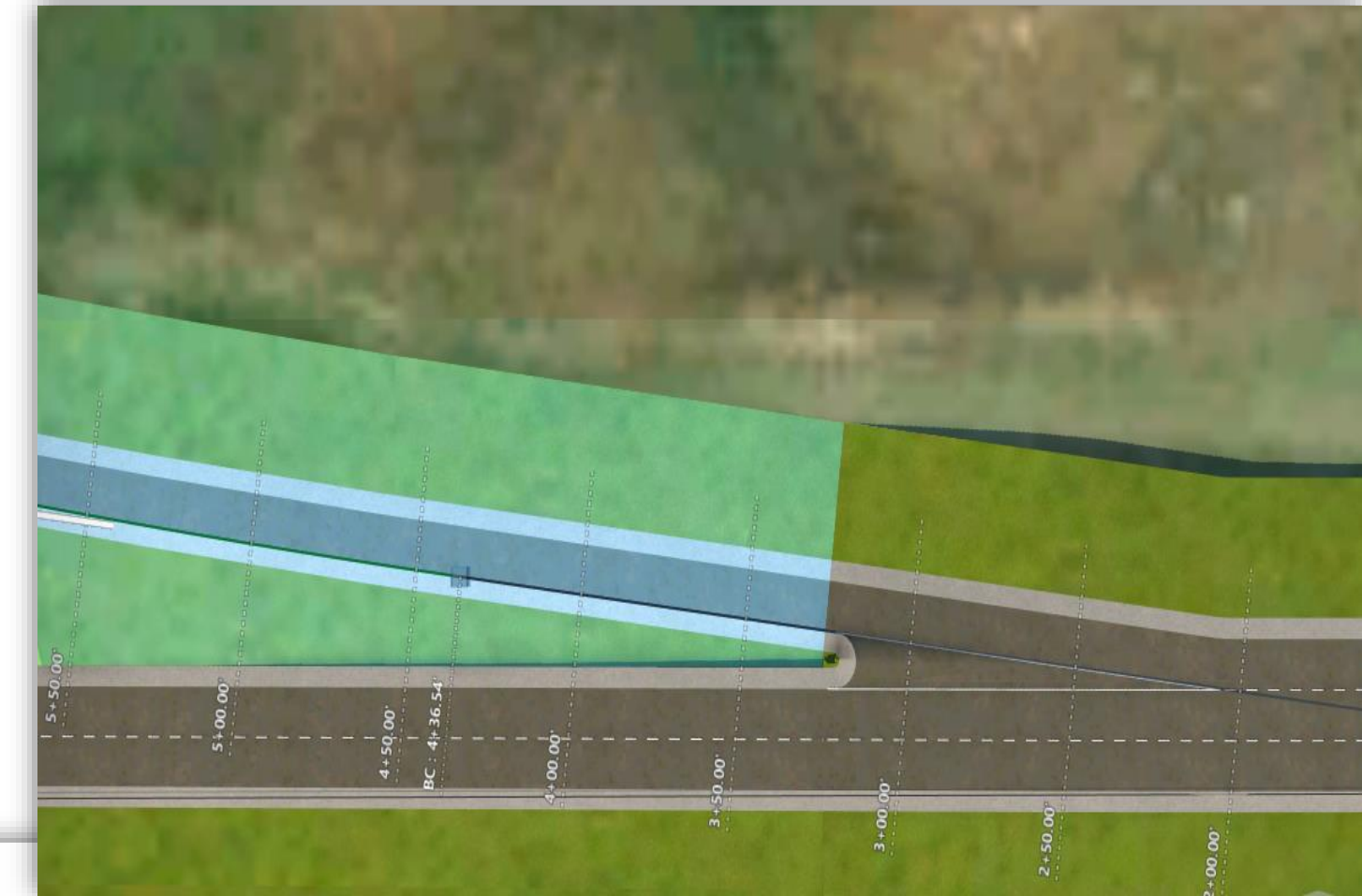
Ramps control alignments are at outer shoulder



Case 1: Taper Type

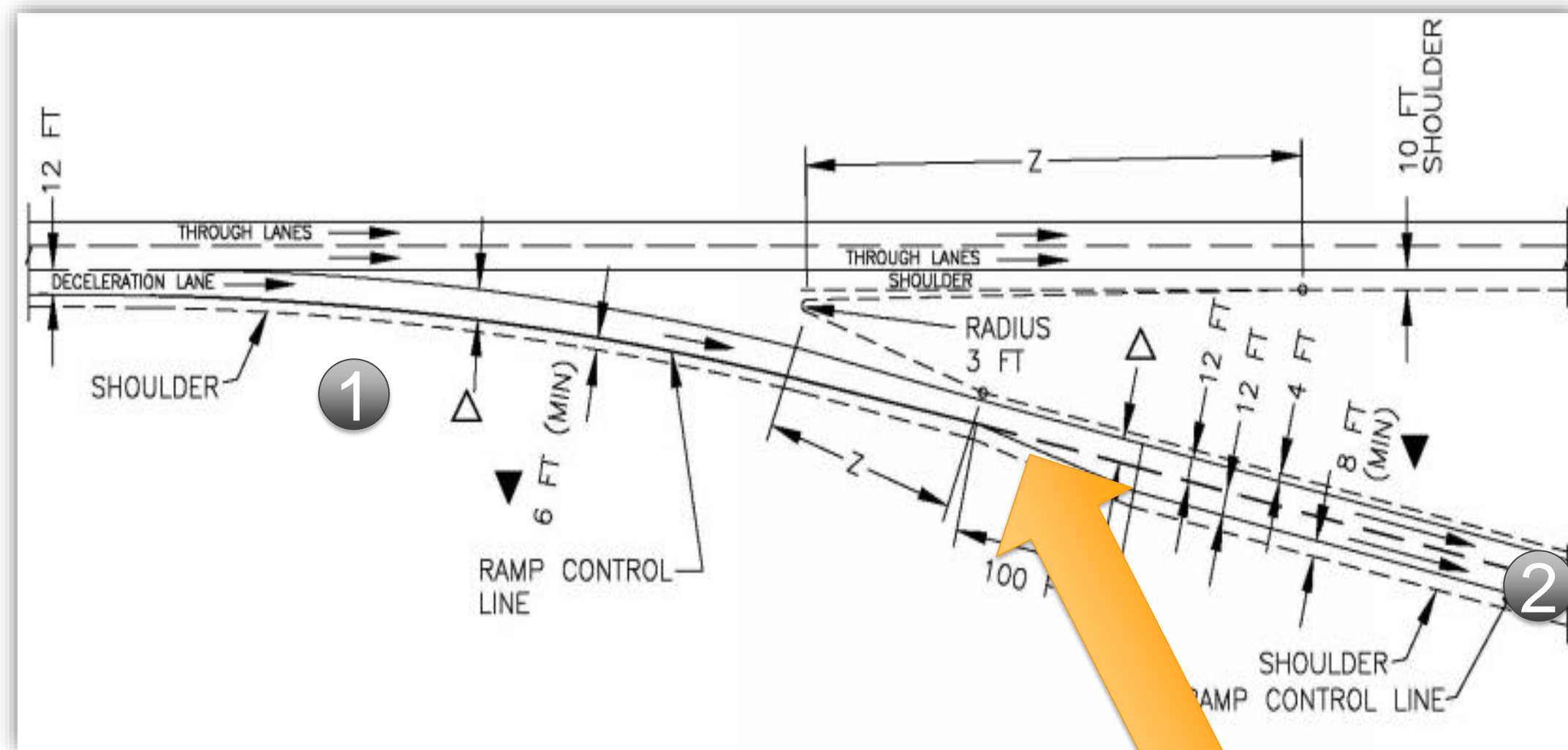


Case 2: Parallel Type

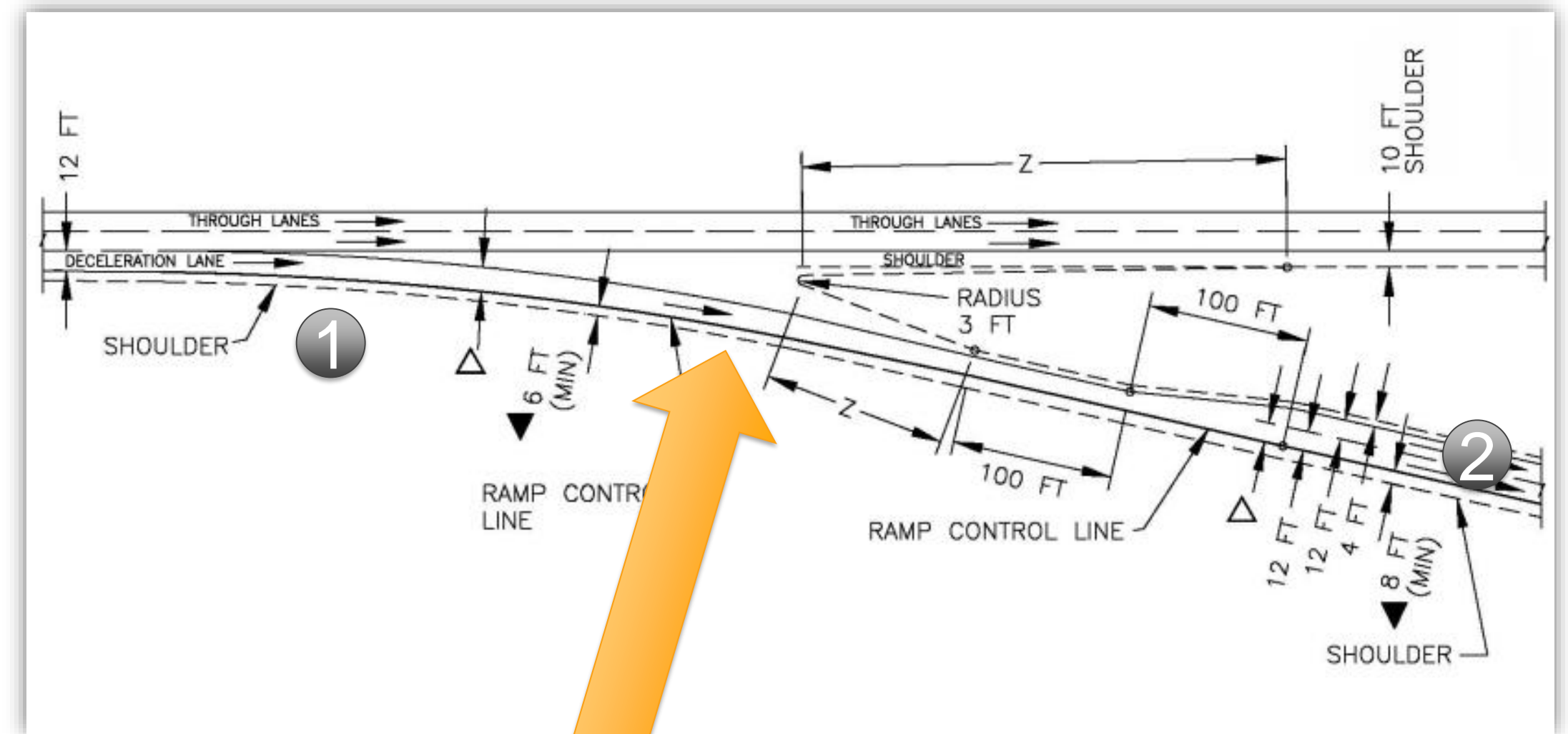


Typical Freeway Exit Terminal

Case 1

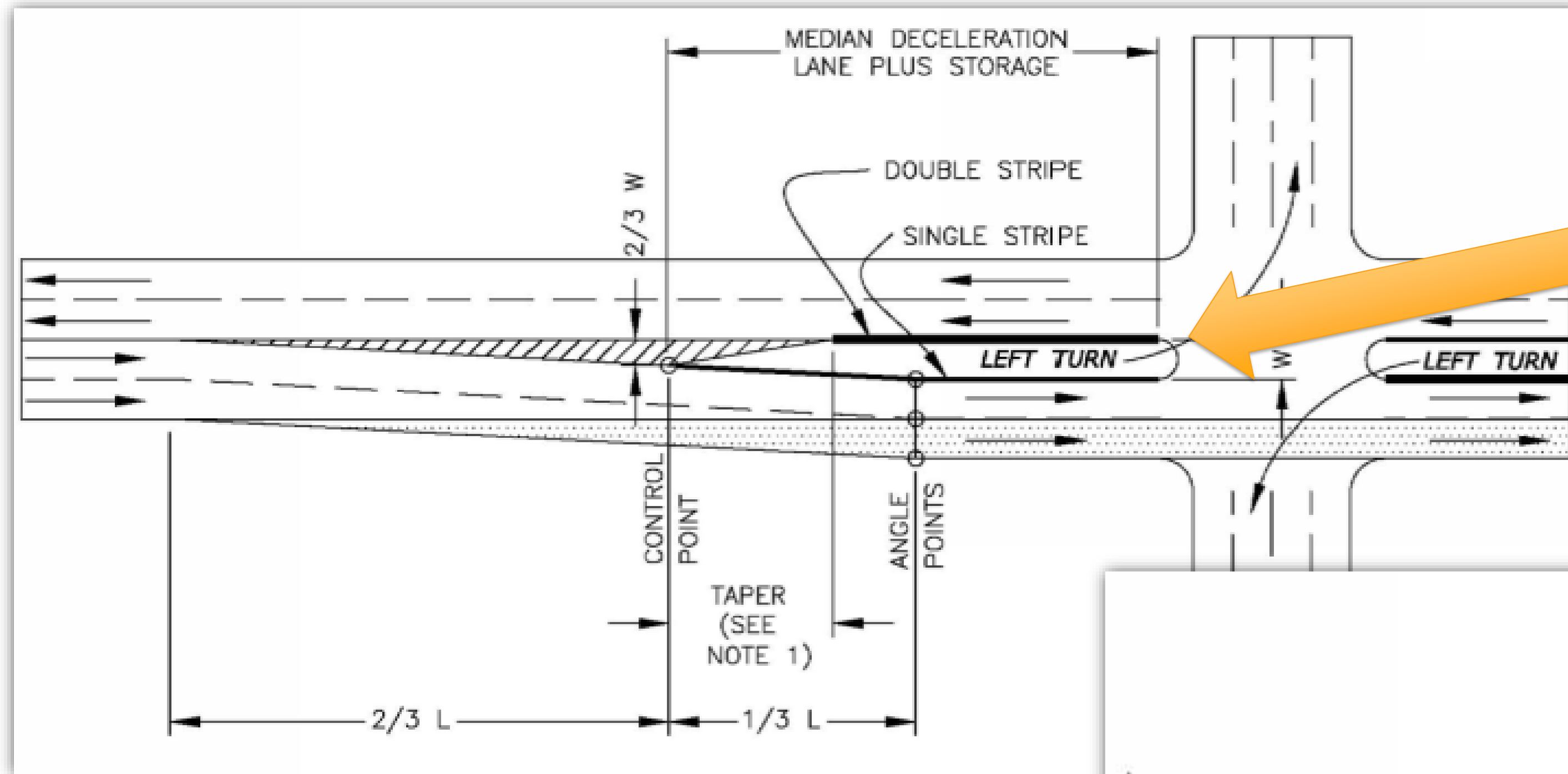


Case 2

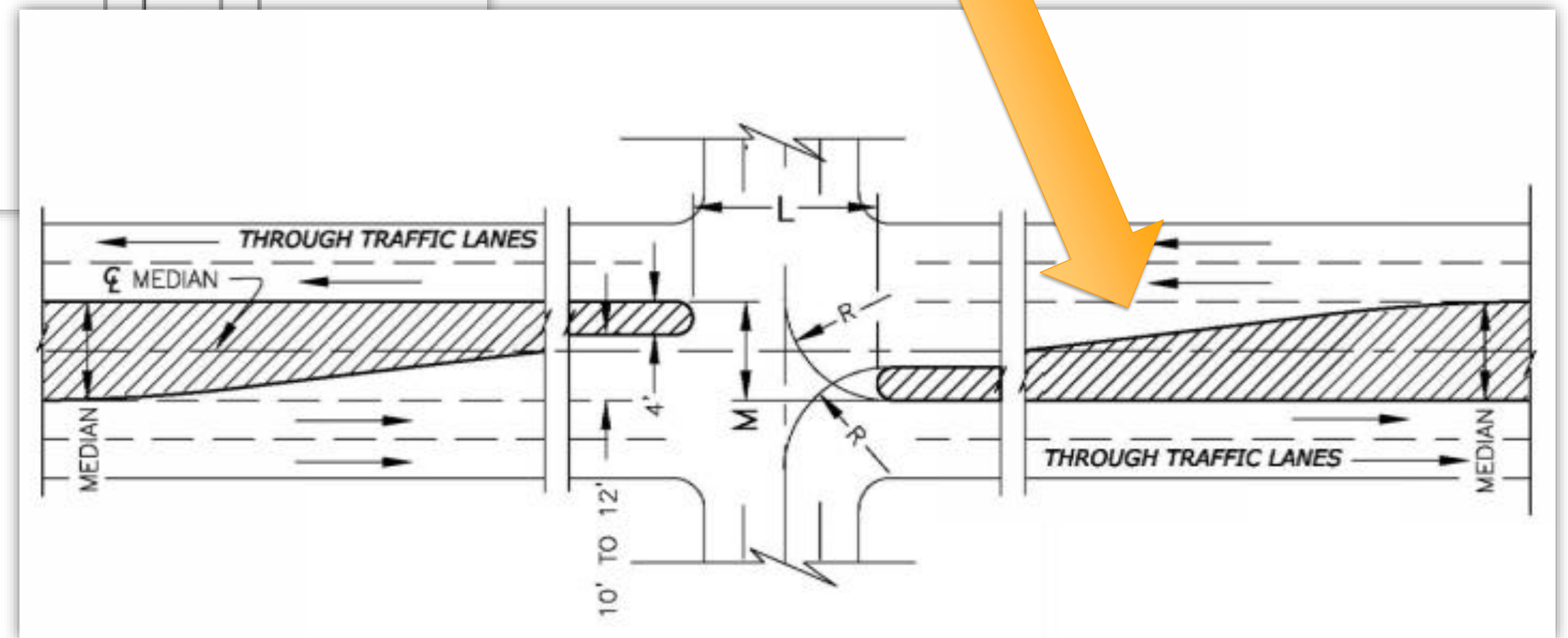


Single lane ramp exit transition to two lane

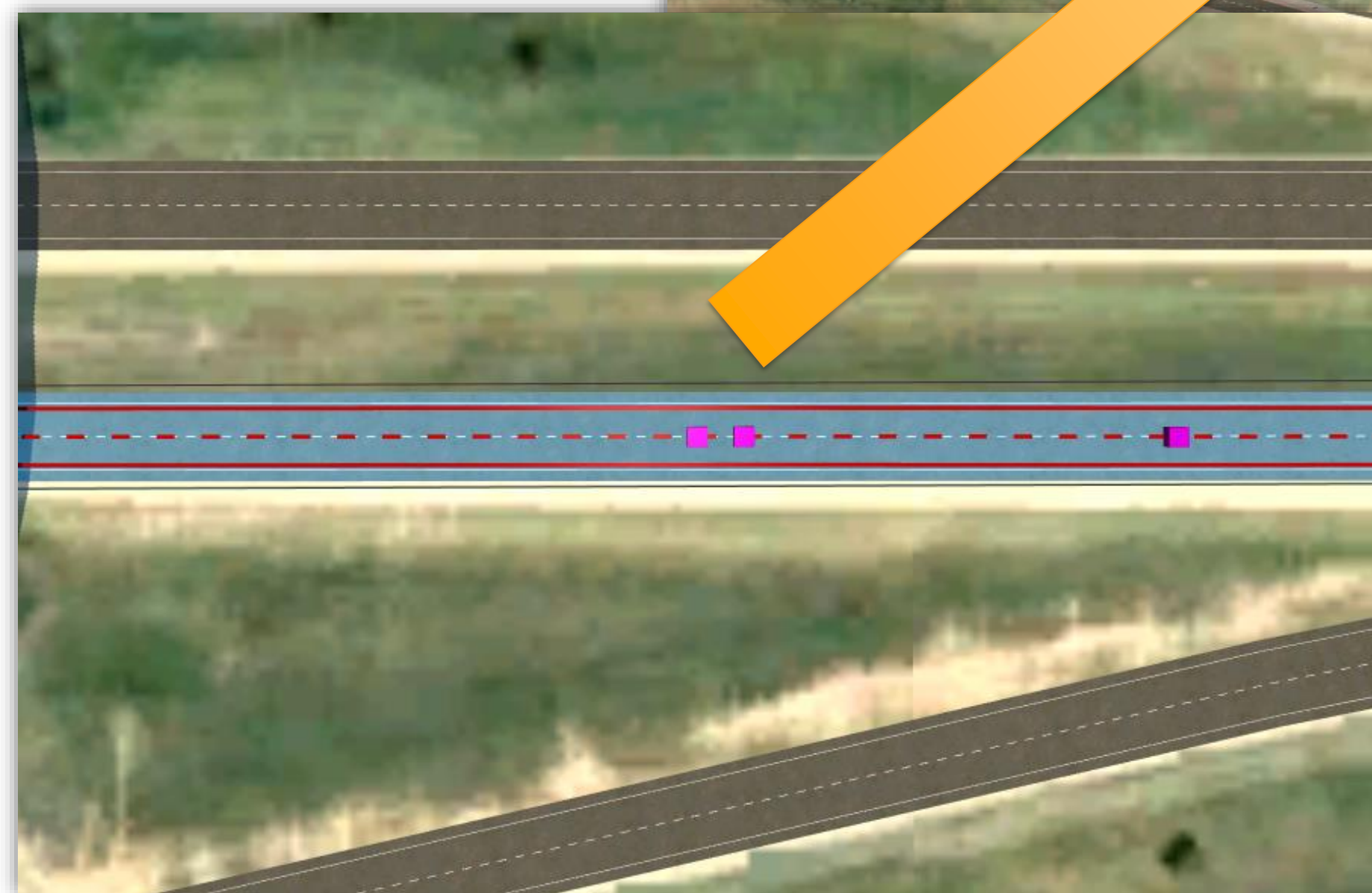
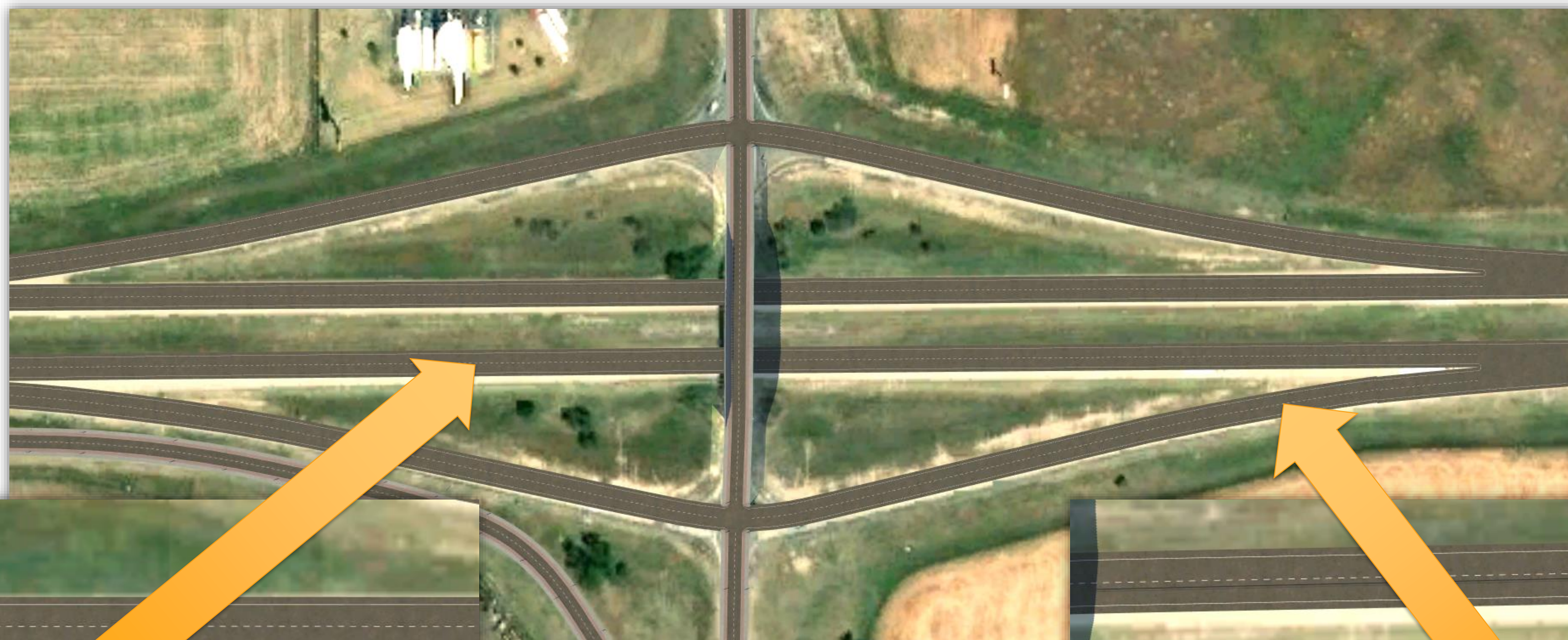
Median Left And Right Turn Design



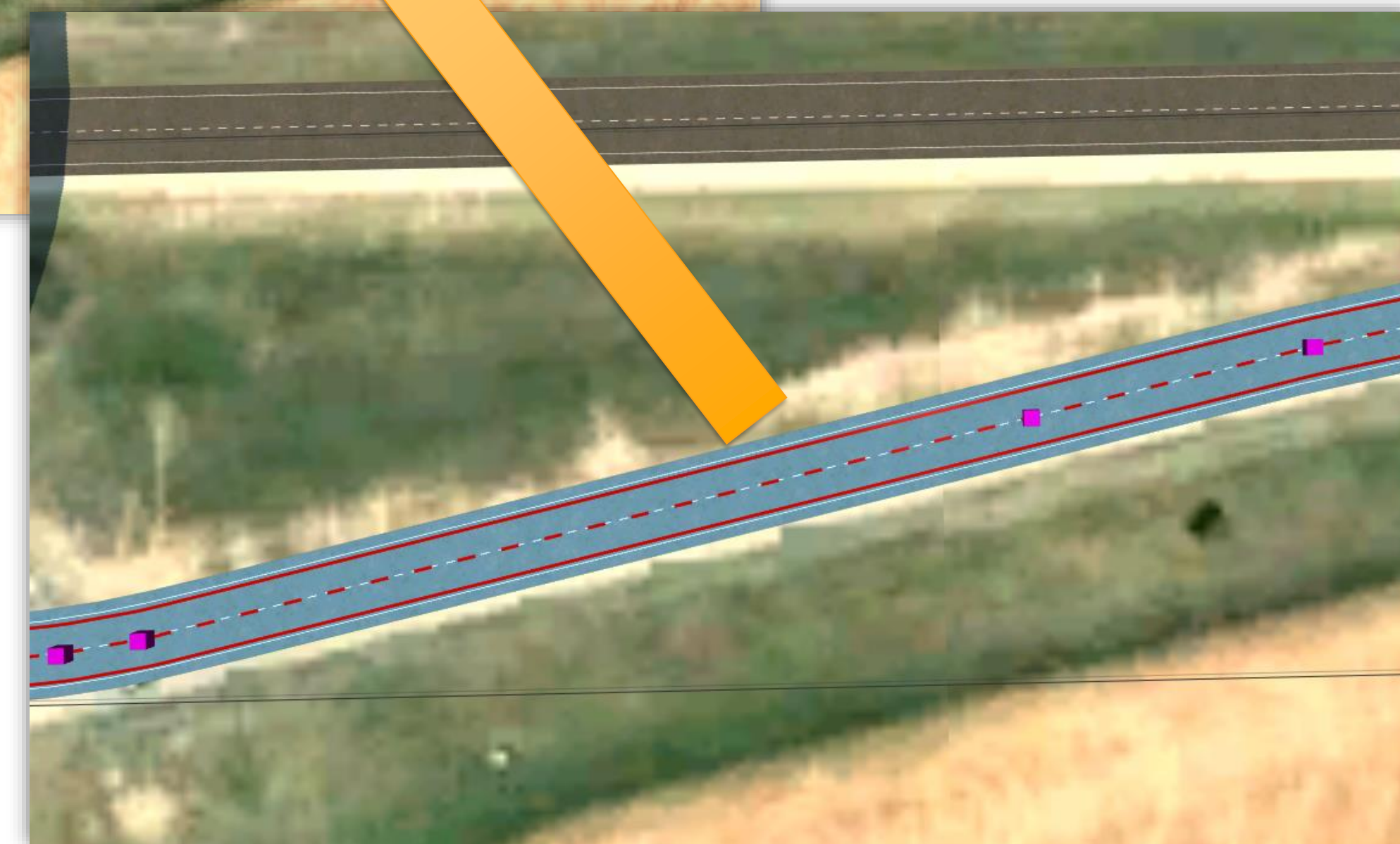
Challenges for alignments in
InfraWorks for highlighted design



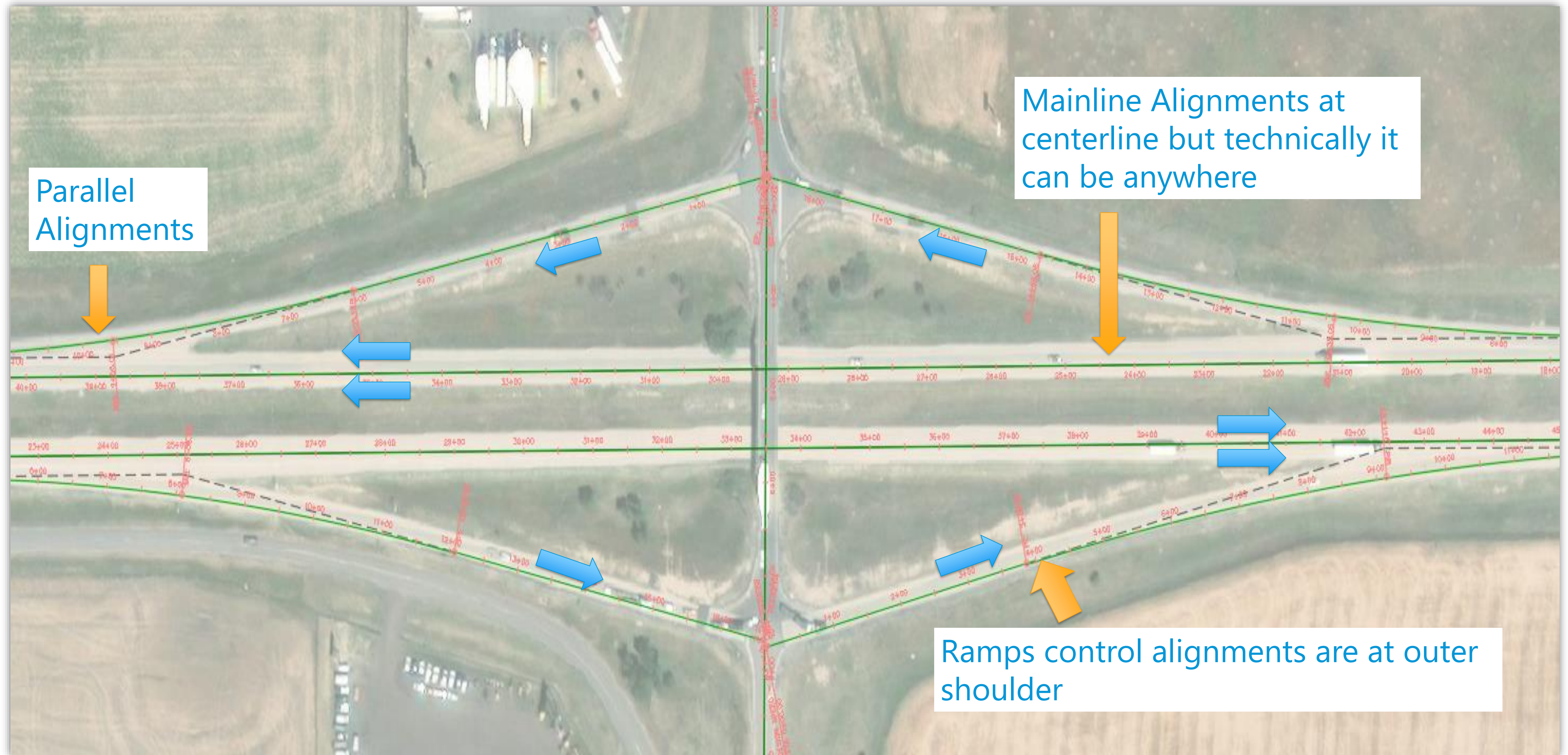
Alignments based on centerline design (two-way traffic)



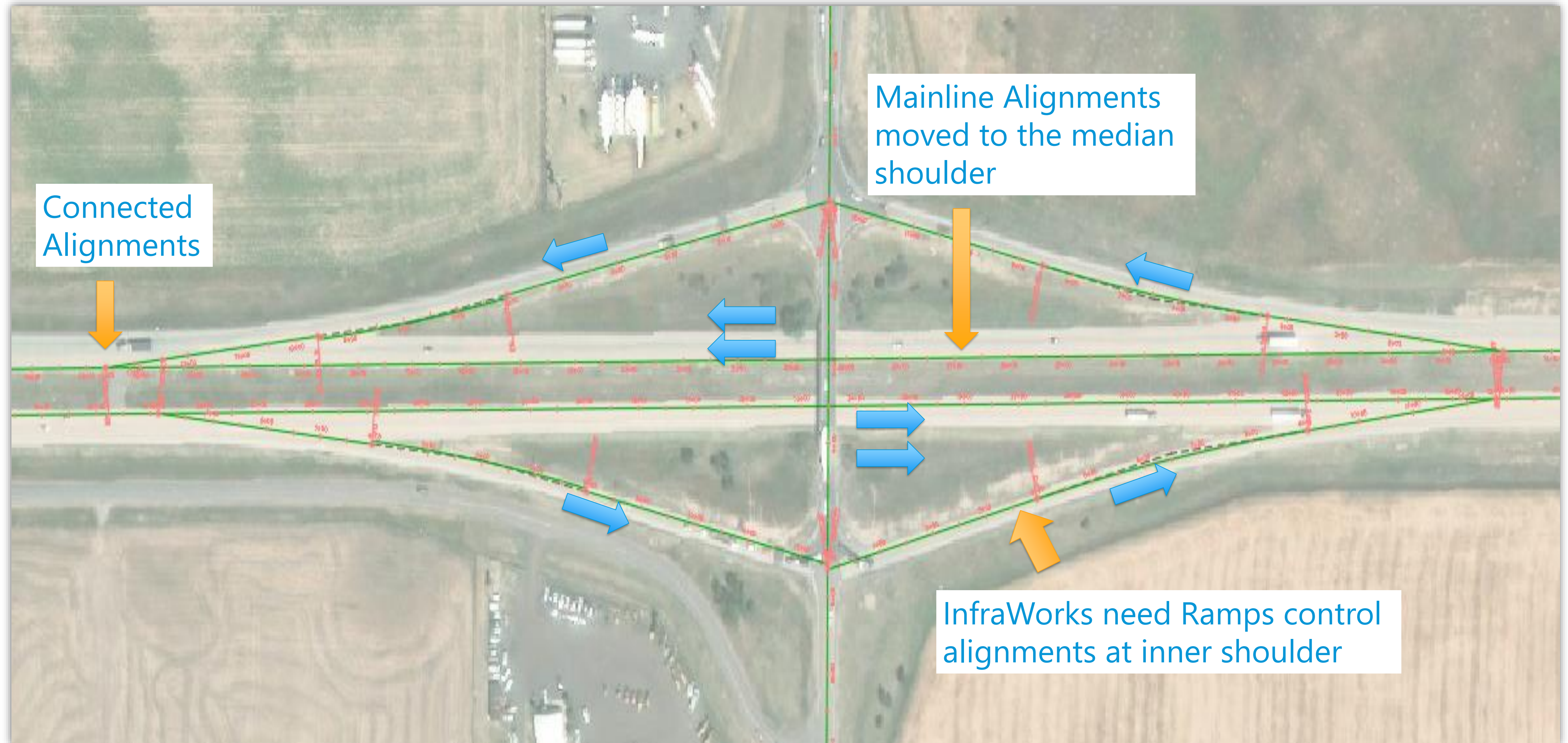
InfraWorks Model
Builder Alignments



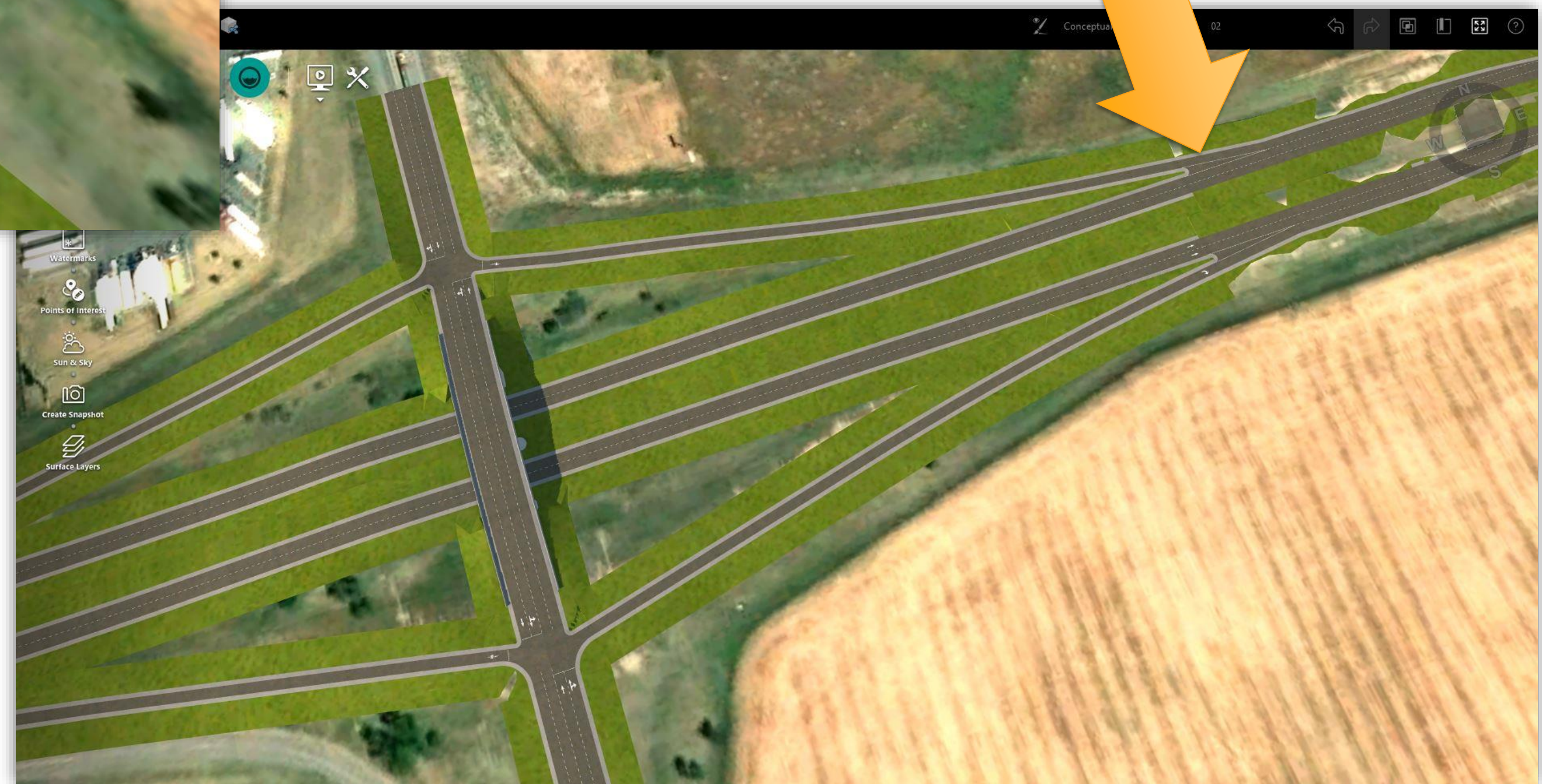
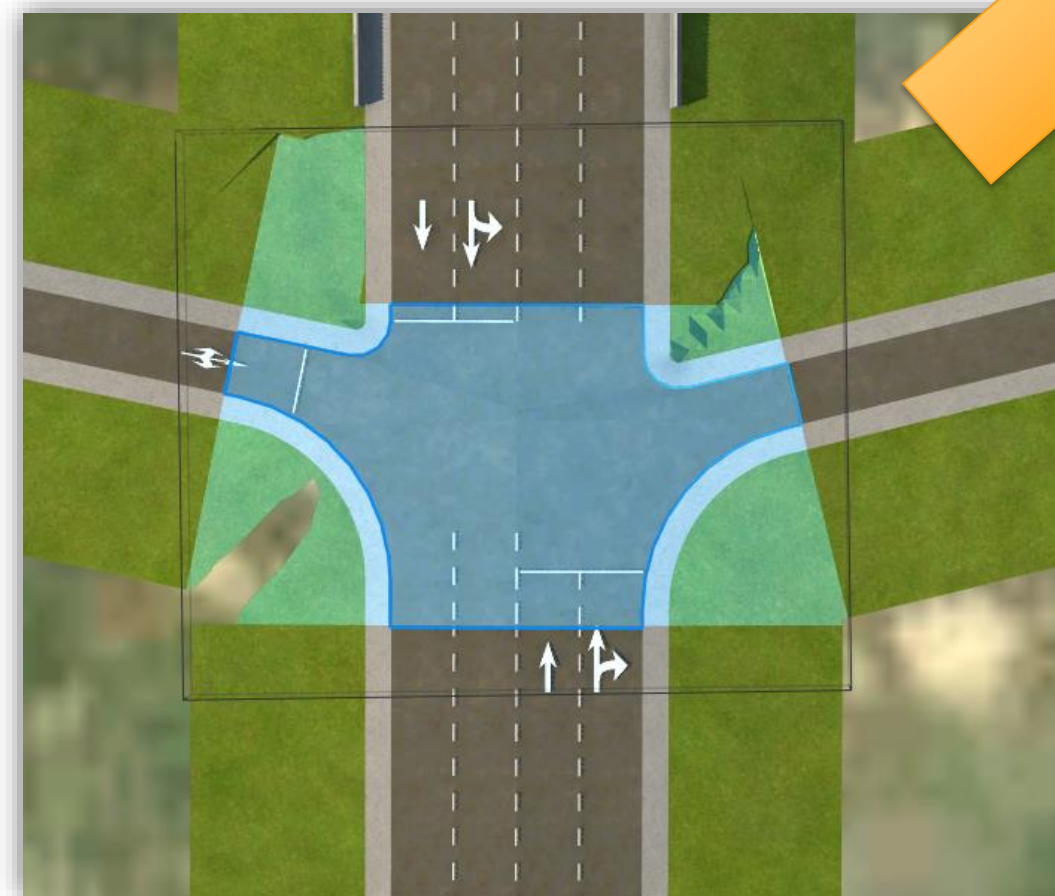
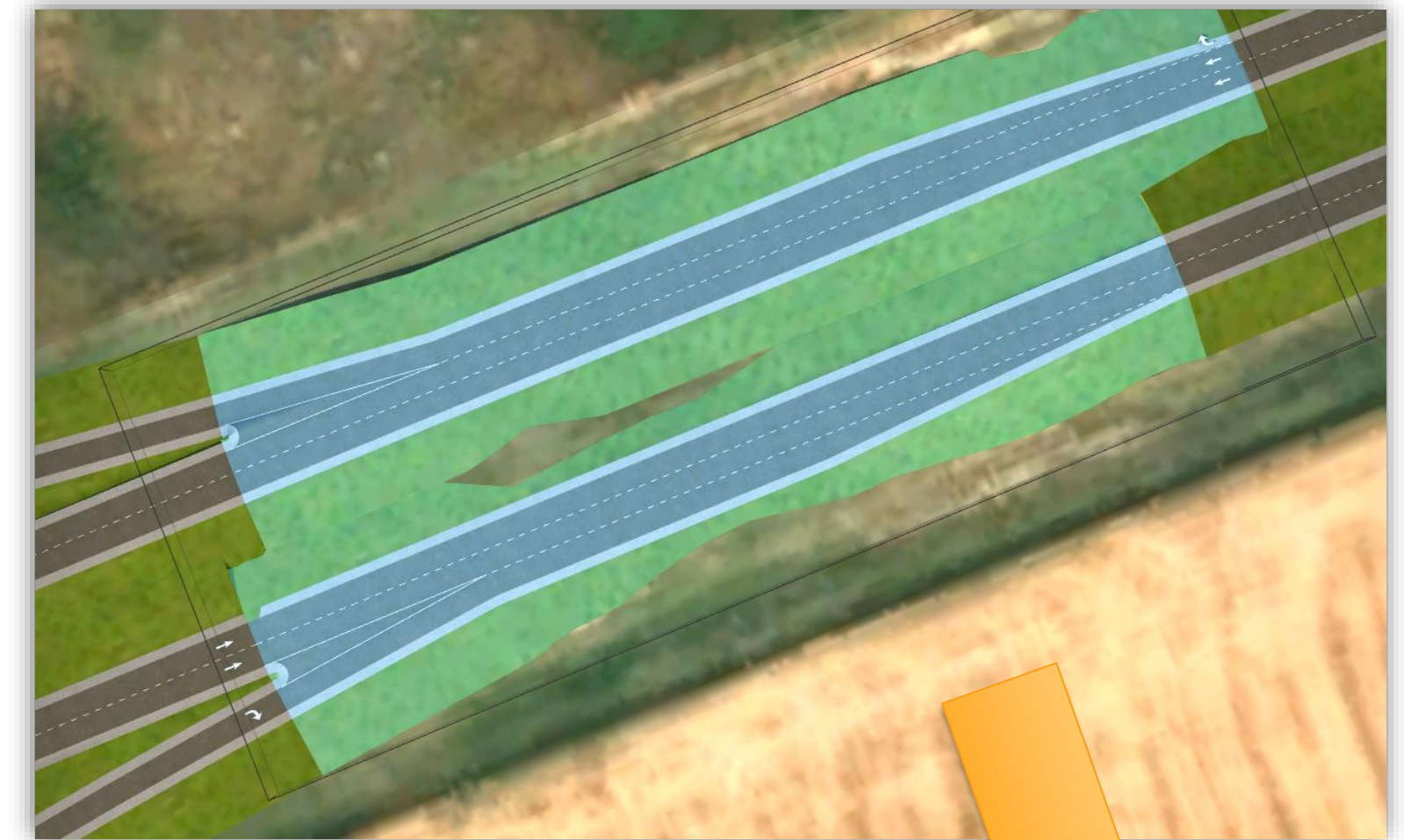
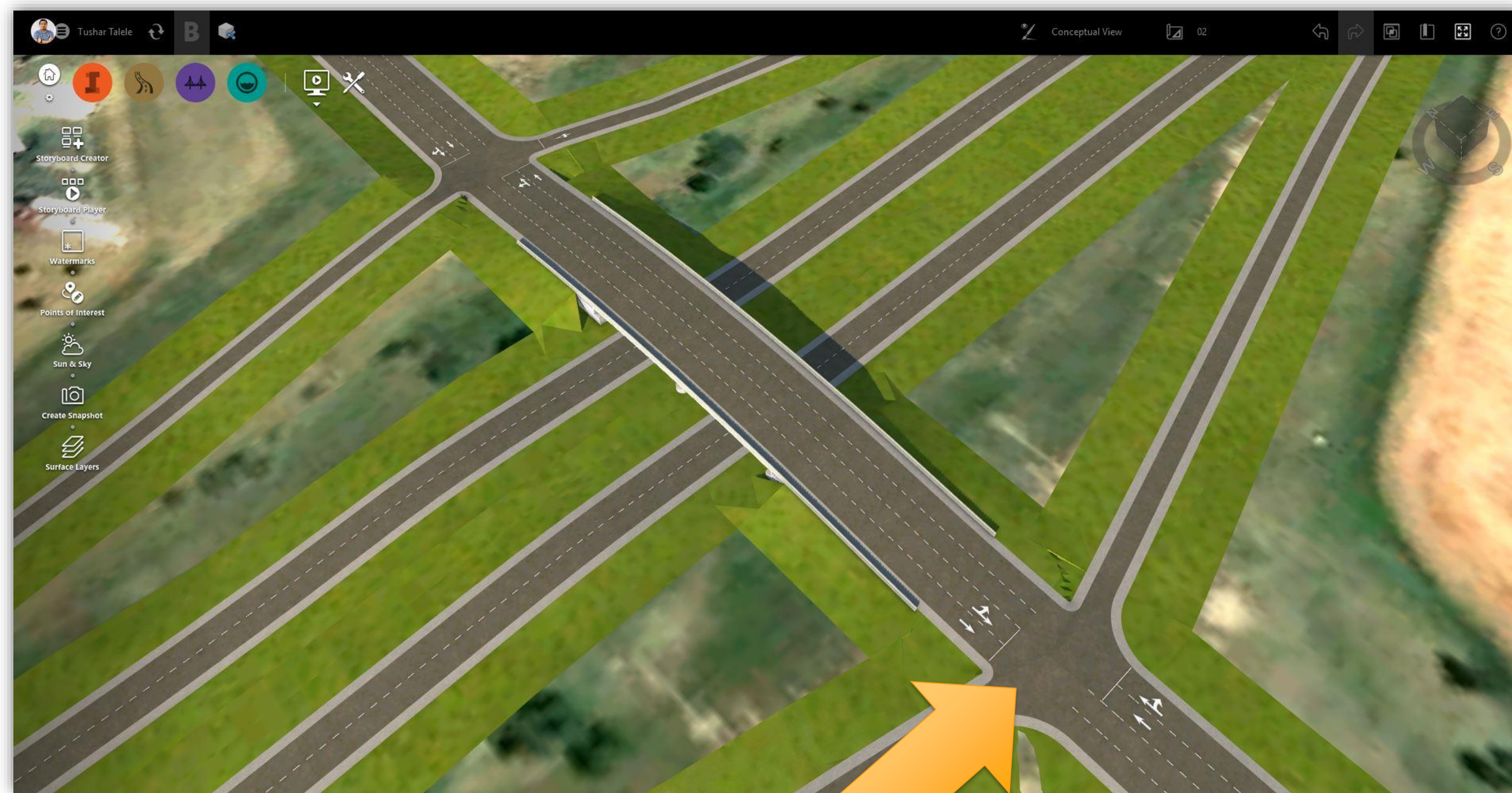
Alignments per Department of Transportation Standards



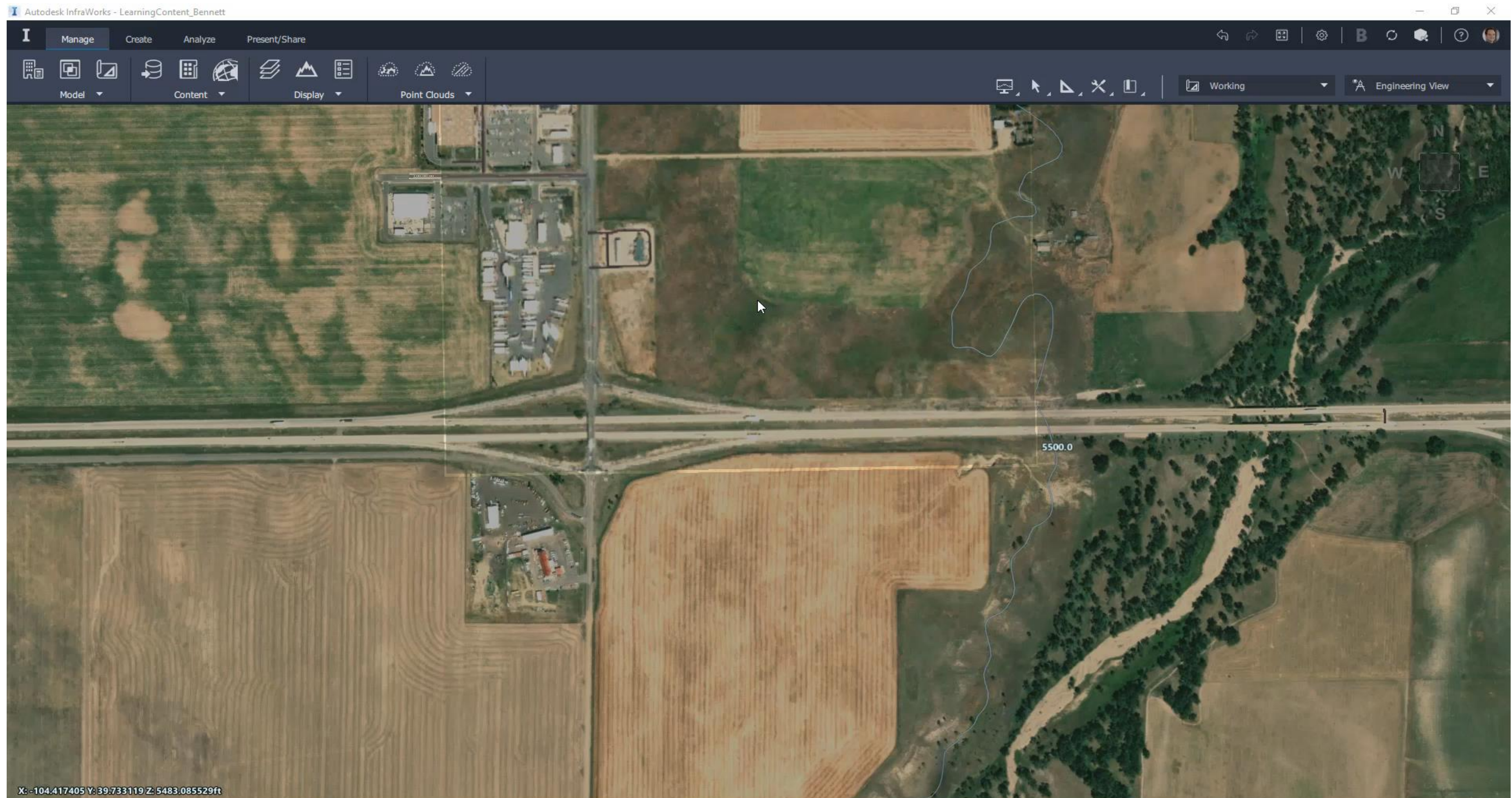
Alignments need for InfraWorks Modeling



Finished InfraWorks Modeling



InfraWorks Roadway Intersection Model



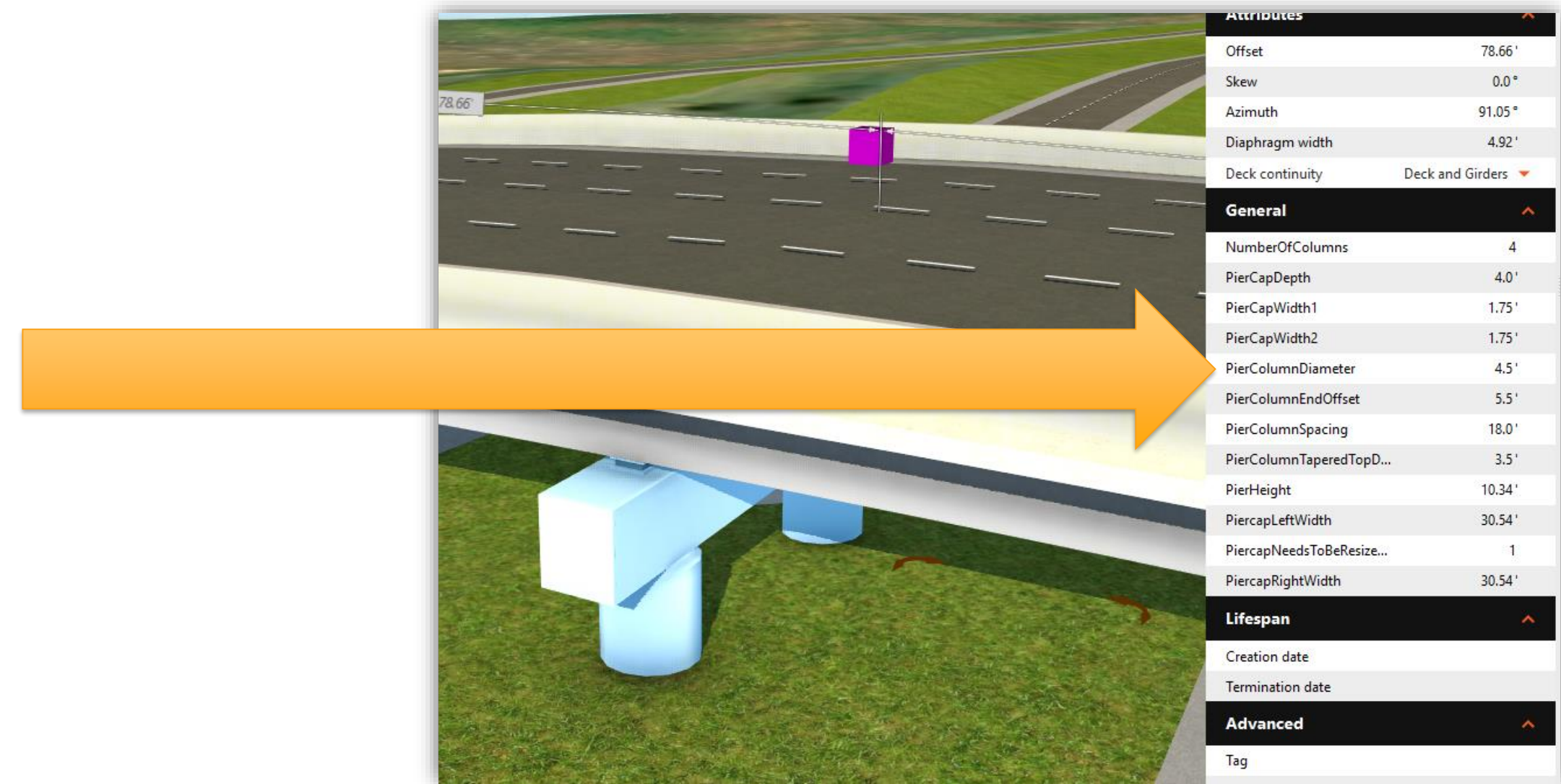
A 3D architectural rendering of a cable-stayed bridge, viewed from a low angle looking up at the bridge deck and the massive pylon. The bridge is white, with numerous yellow cables fanning out from the pylon to the deck. The background shows a body of water and a distant shoreline with greenery. The text is overlaid in a bold, blue font.

Modeling Custom Bridge Components Leveraging Inventor

Why Inventor?

Parametric Modeling

Parameter Name	Consumed by	Unit/Type
Model Parameters		
PierDia	Sketch1	ft
PierHeight	Extrusion1	ft
d2	Extrusion1	deg
PiercapRightWidth	Sketch2	ft
PiercapLeftWidth	Sketch2	ft
PierDepth	Extrusion2	ft
d6	Extrusion2	deg
User Parameters		

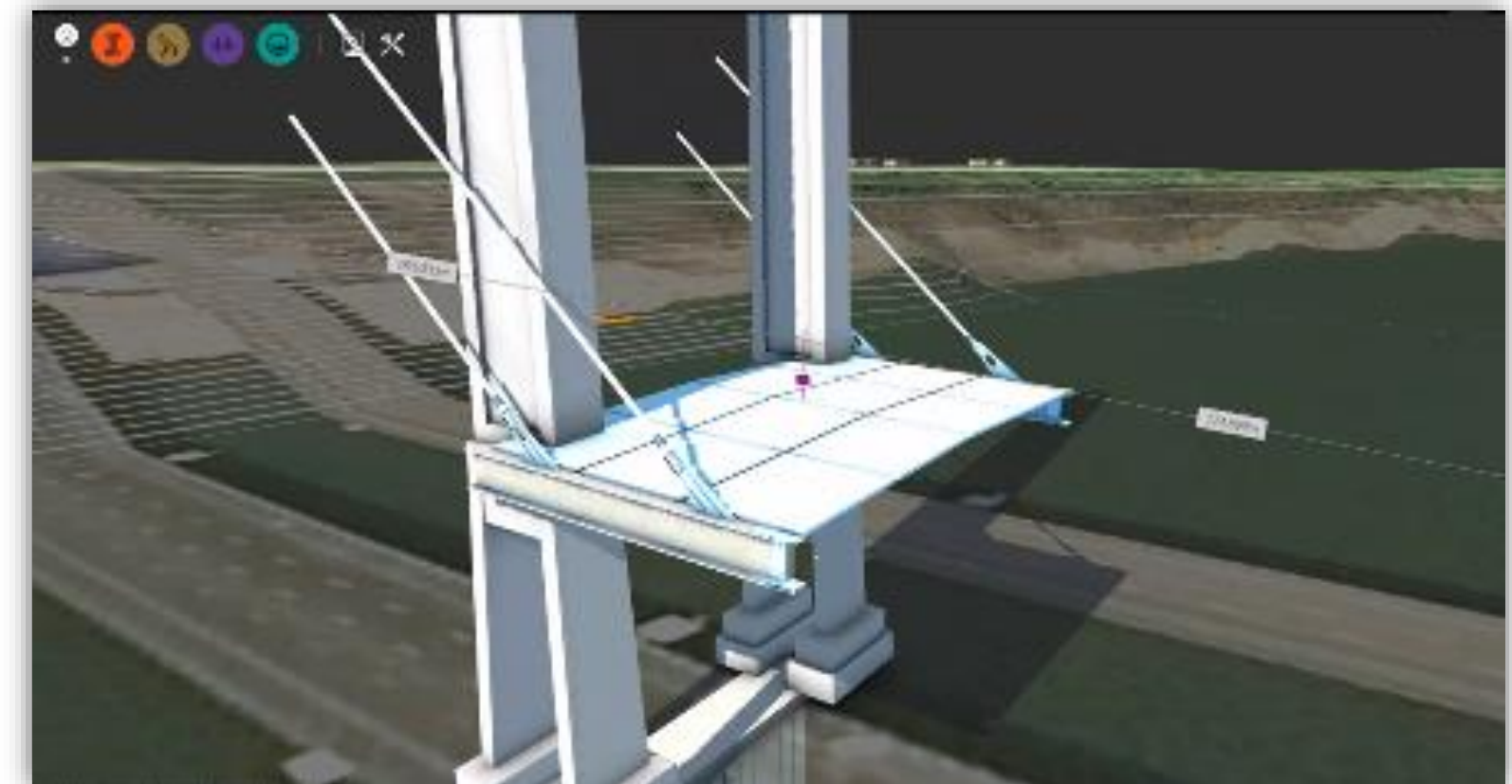


To be more civil friendly

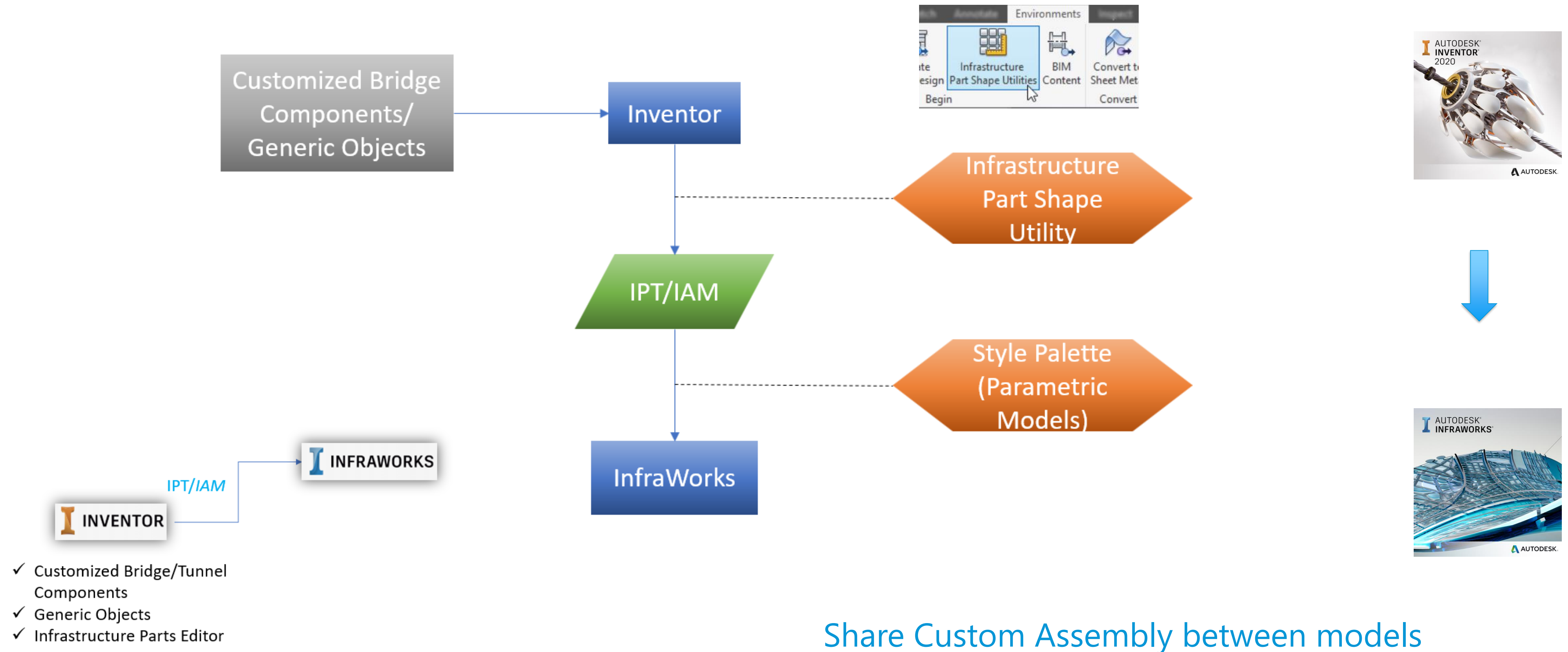
Flexibility to fulfil design requirements

Custom Bridge Components

Generic Objects

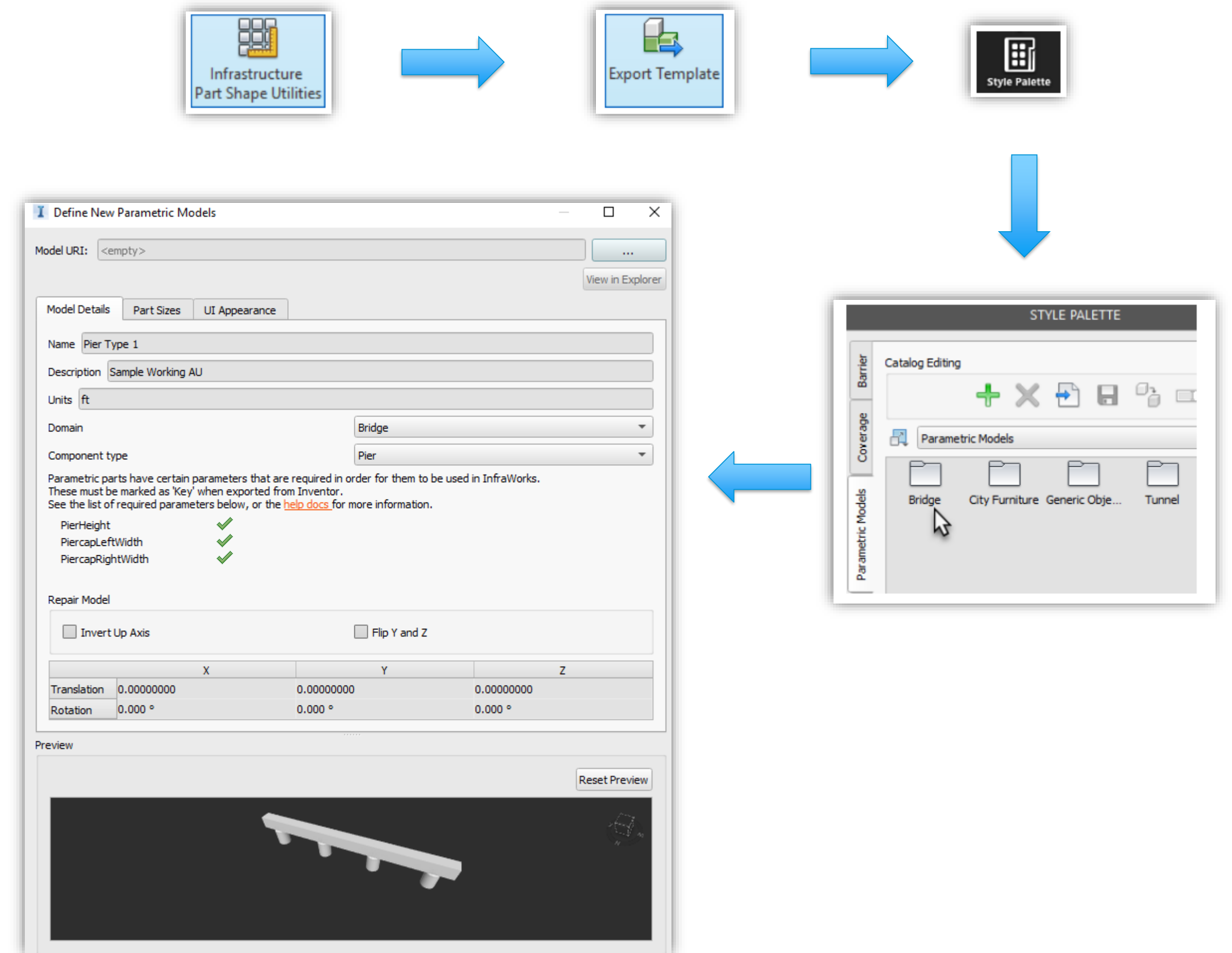


Modeling Custom Bridge Components and Generic Objects

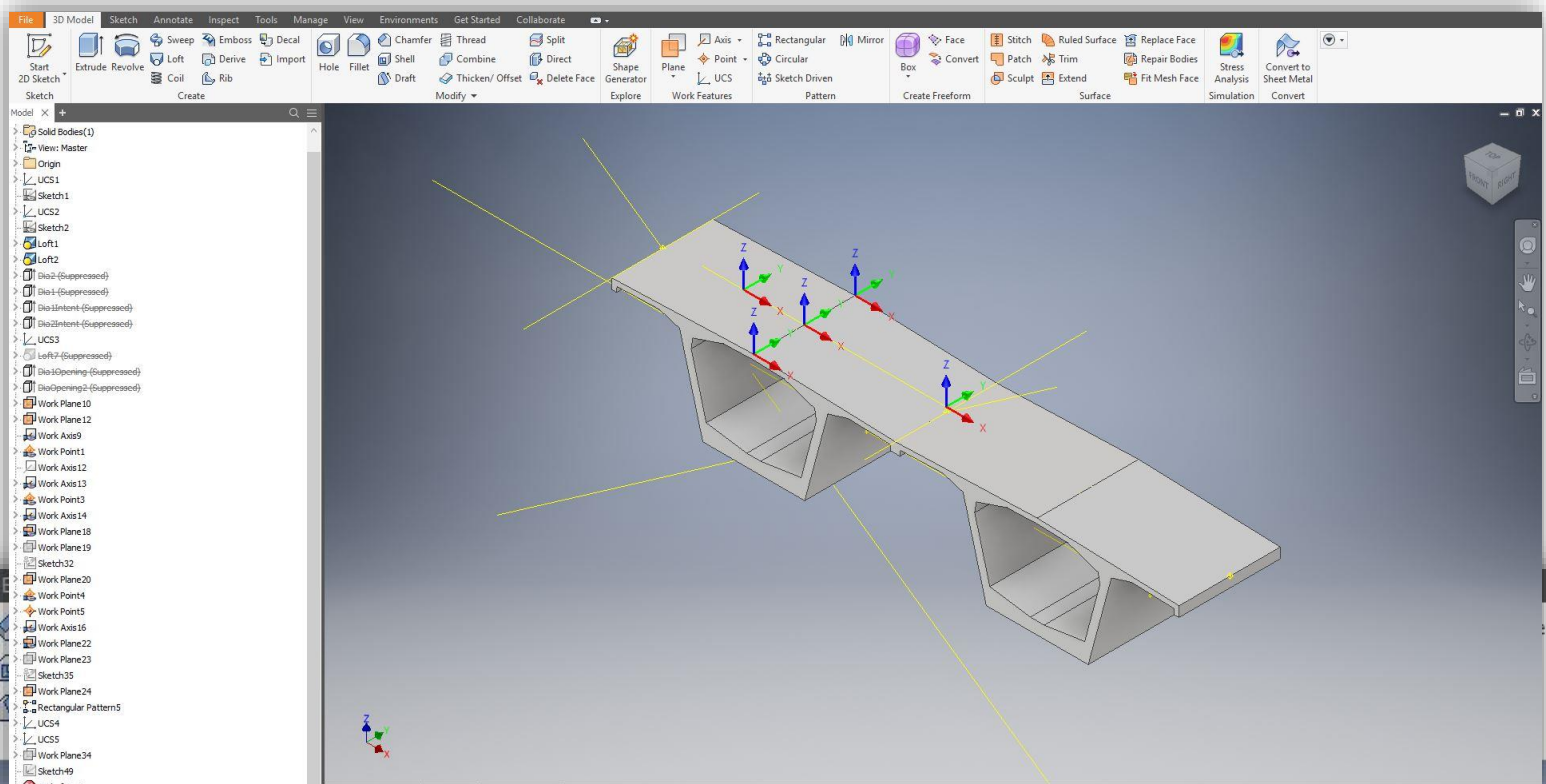
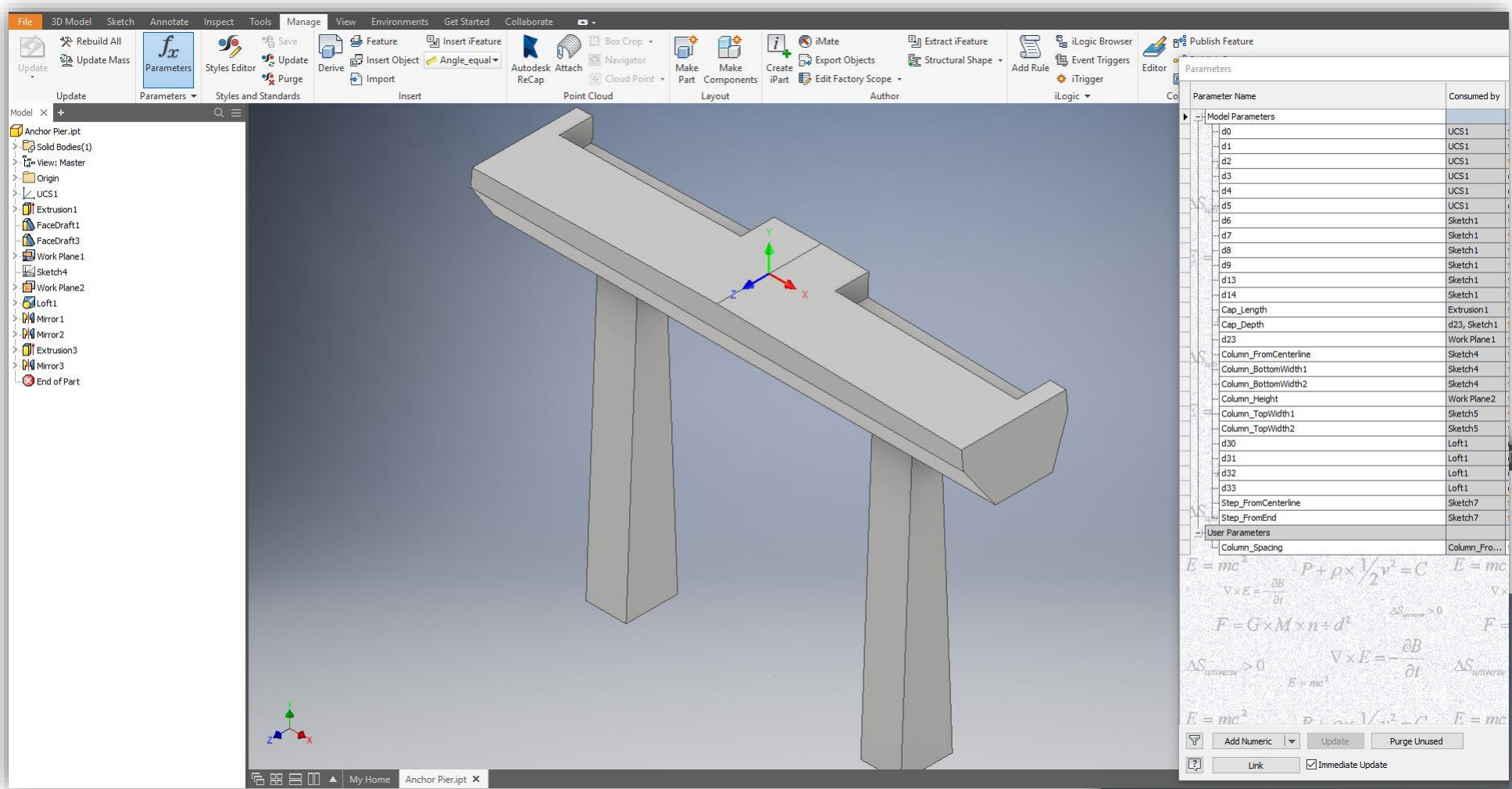


Modeling Custom Bridge Components and Generic Objects

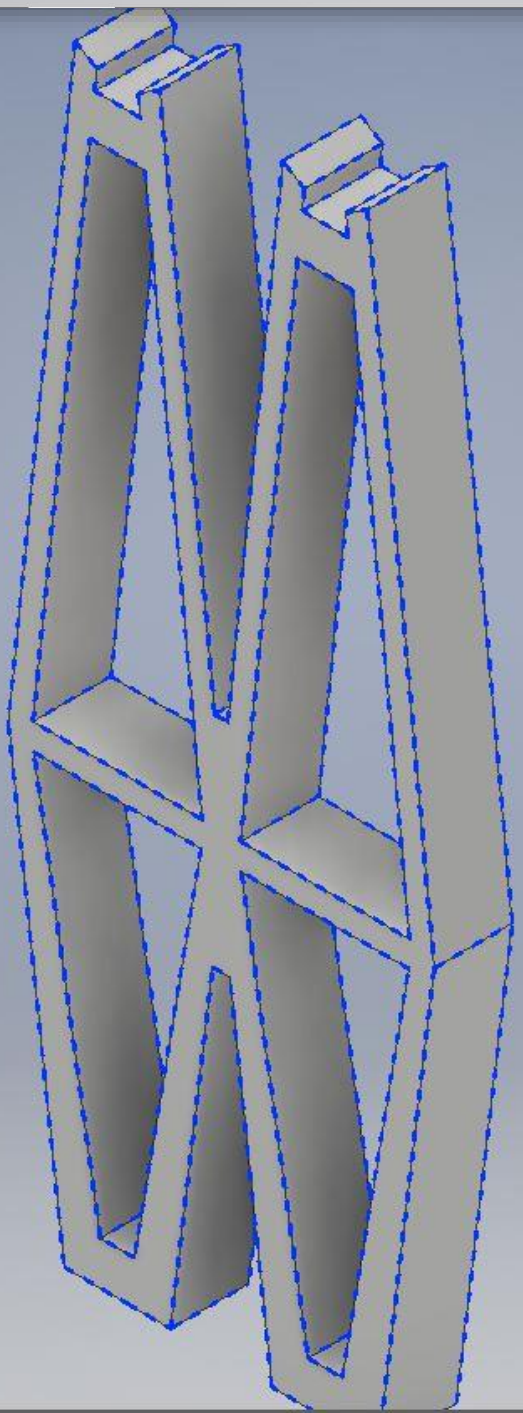
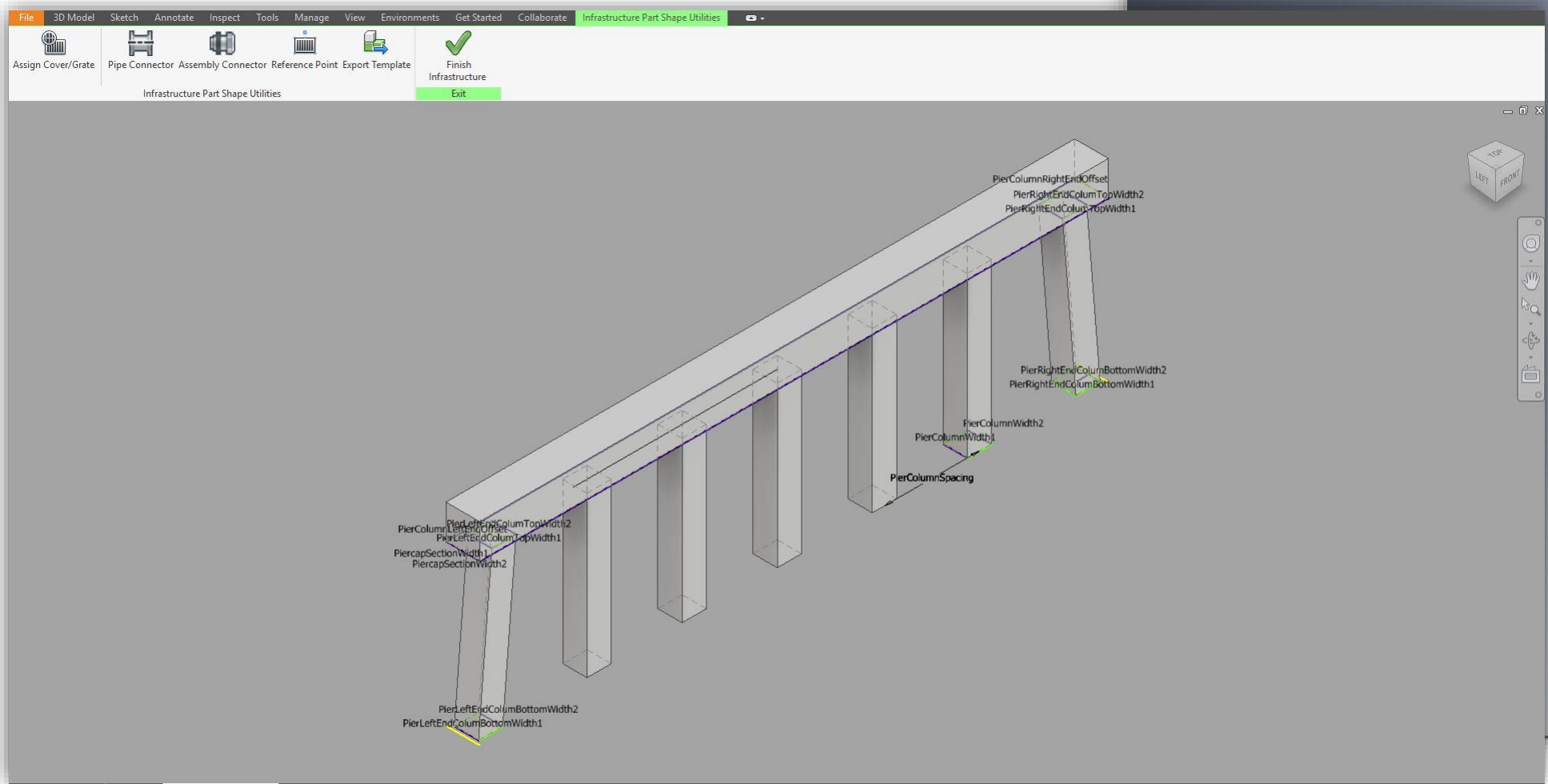
- ✓ Model Inventor Parts and Assemblies
- ✓ Add InfraWorks required Parameters – Case sensitive
- ✓ Publish Parts for InfraWorks - Use the Infrastructure Part Utilities in Inventor to export the templates for InfraWorks
- ✓ Import these templates into InfraWorks – Use Parametric Models Tab under Style Palettes
- ✓ Assign the custom parts to InfraWorks Bridge Model
- ✓ Send bridge model to Revit
- ✓ Use Civil 3D to import the bridge model as 3D solids



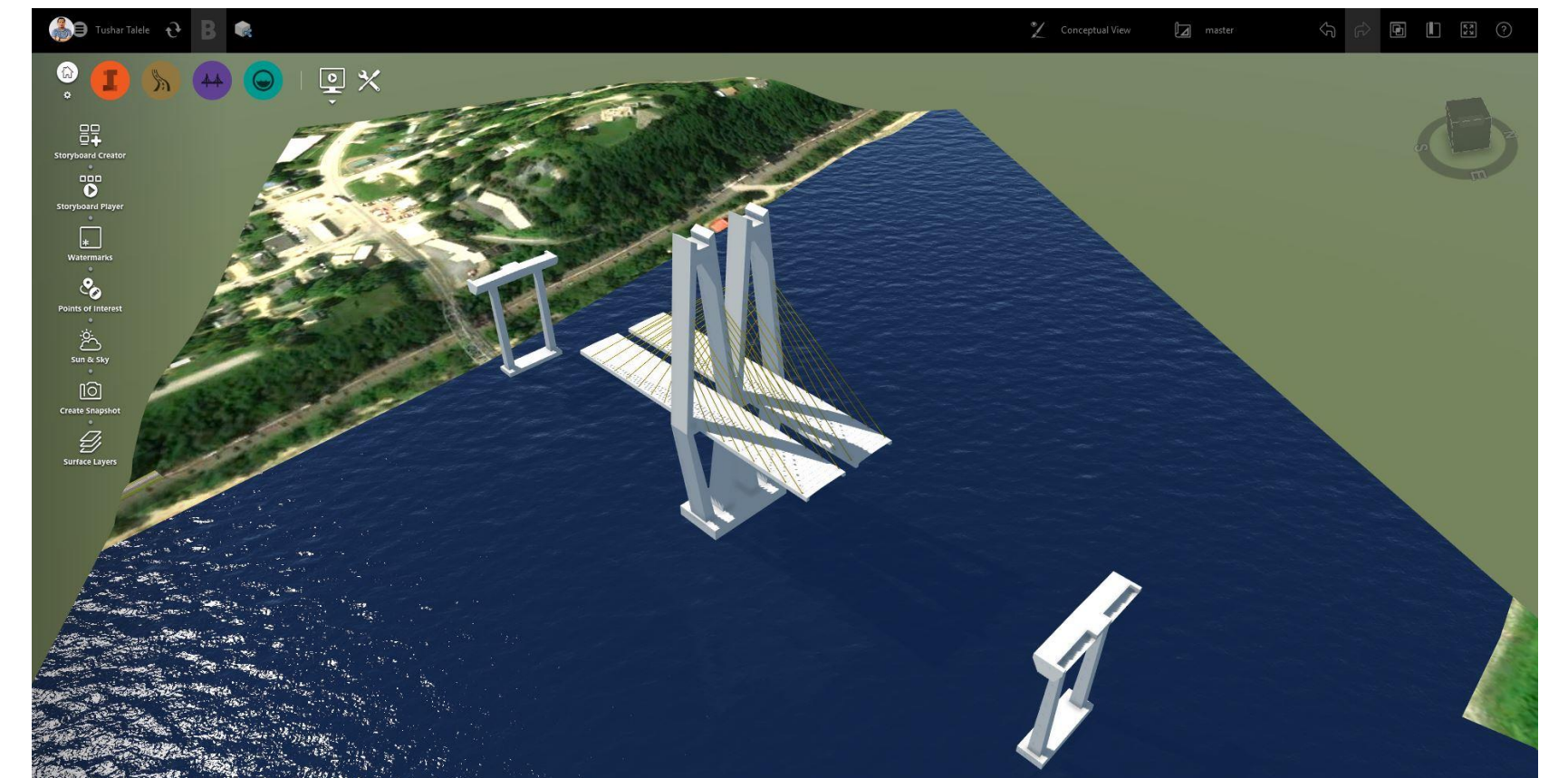
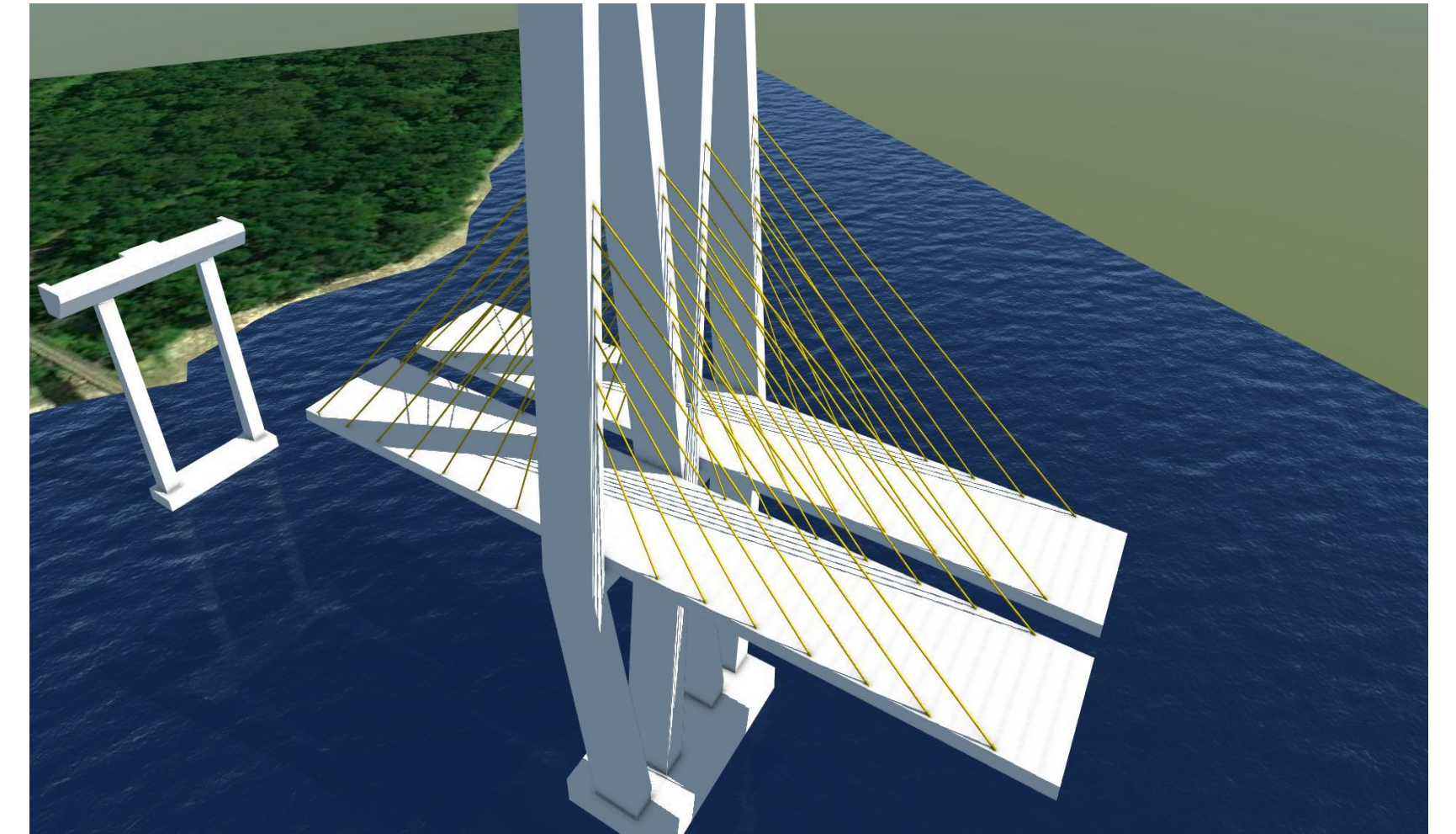
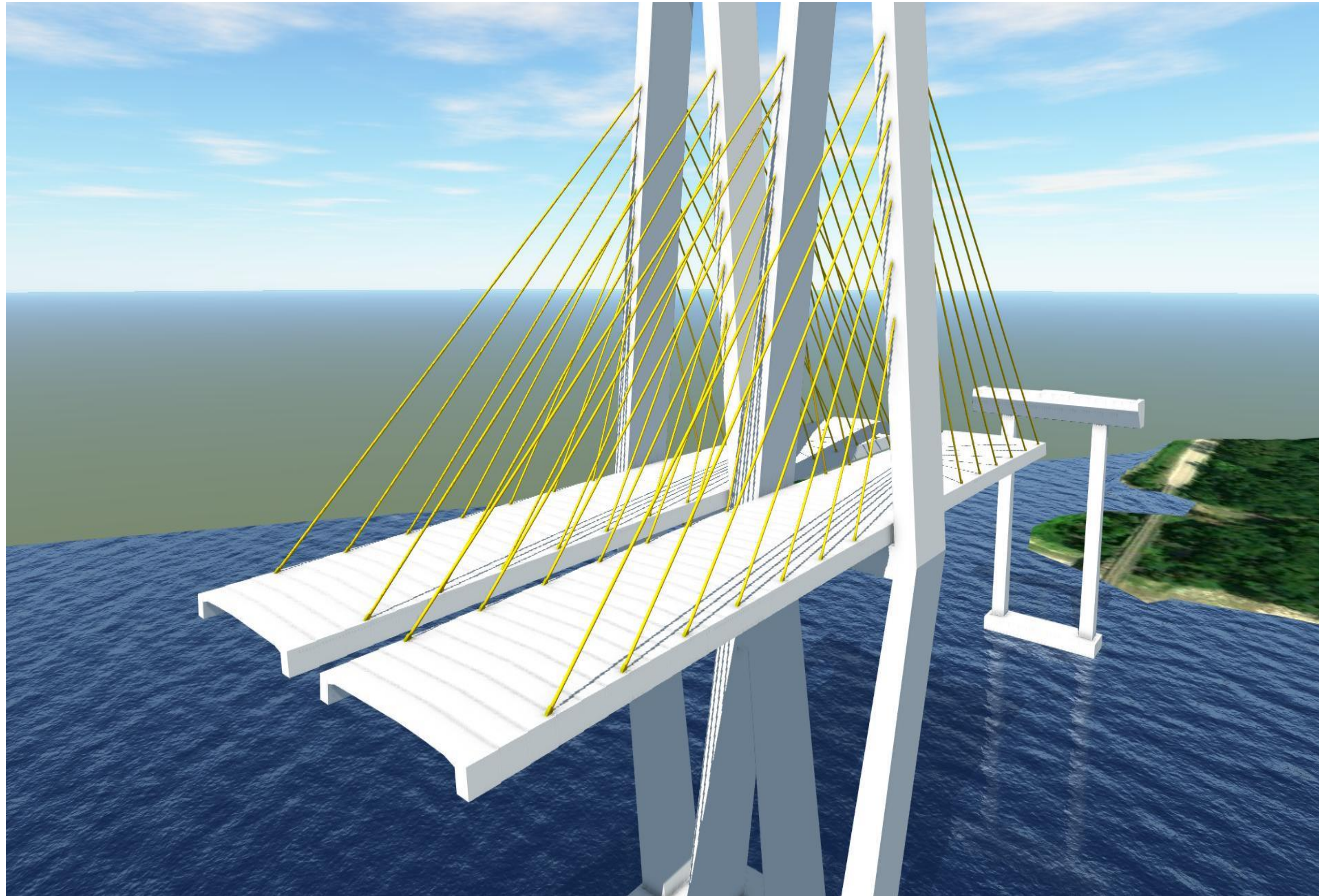
Modeling Custom Bridge Components and Generic Objects



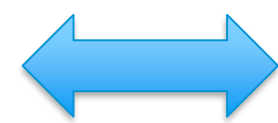
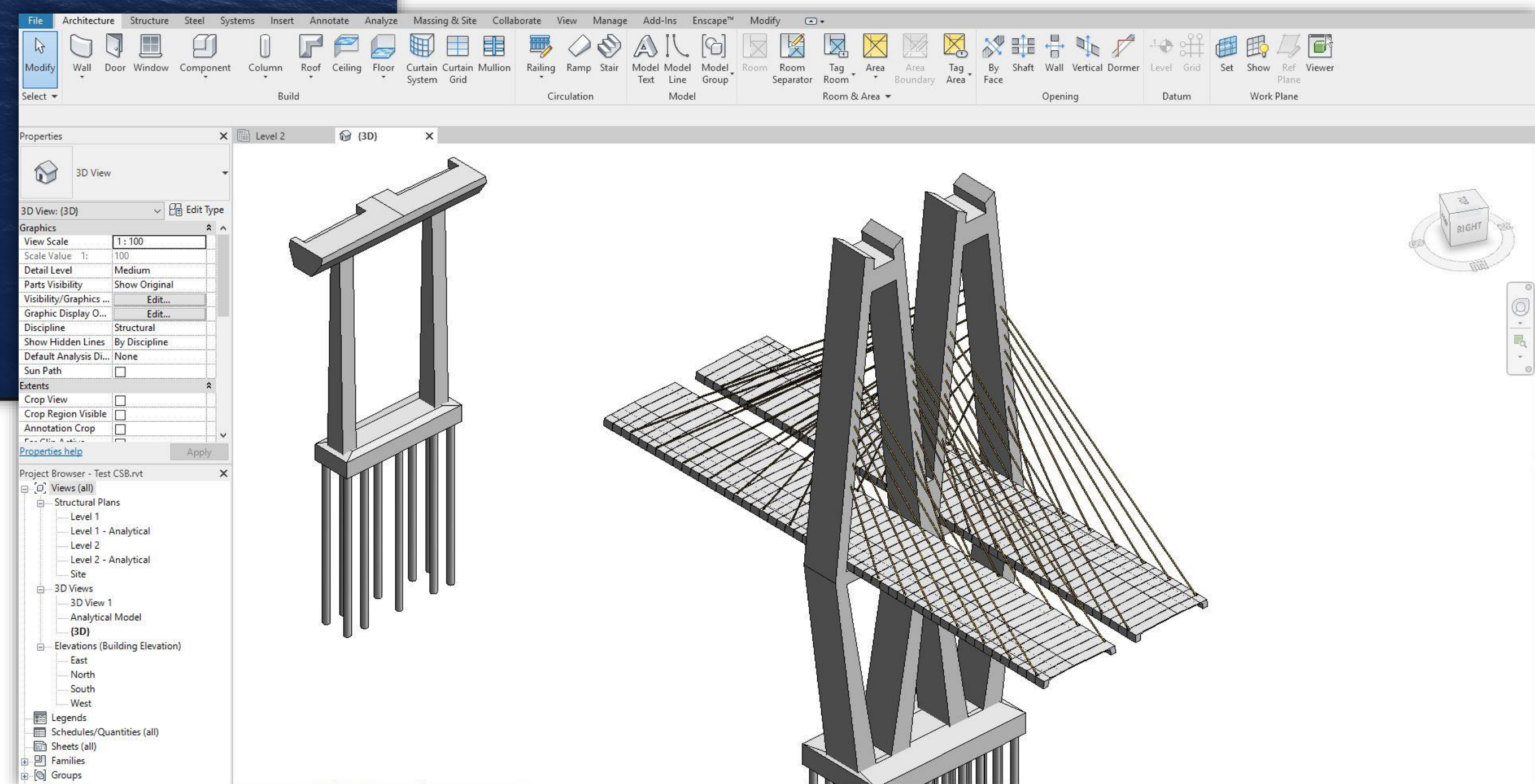
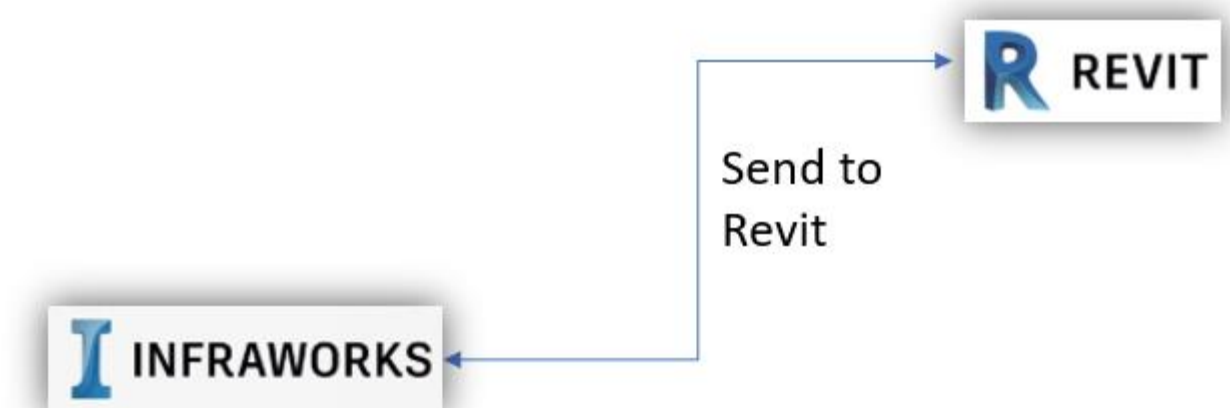
Parameter Name	Consumed by	Units
Model Parameters		
d0	Work...	ft
PierCapDepth	PierH...	ft
PierRightEndColumnBottomWidth1	Sket...	ft
PierRightEndColumnBottomWidth2	Sket...	ft
PierColumnWidth1	Sket...	ft
PierColumnWidth2	Sket...	ft
PierLeftEndColumnBottomWidth1	Sket...	ft
PierLeftEndColumnBottomWidth2	Sket...	ft
PierRightEndColumnTopWidth1	Sket...	ft
PierRightEndColumnTopWidth2	Sket...	ft
PierLeftEndColumnTopWidth1	Sket...	ft
PierLeftEndColumnTopWidth2	Sket...	ft
d33	Loft2	ul
d34	Loft2	deg
d35	Loft2	ul
d36	Loft2	deg
d37	Loft3	deg
d38	Loft3	deg
d39	Loft3	ul
d40	Loft3	deg
d41	Sket...	ft
PierColumnRightEndOffset	d45, ...	ft
d43	Sket...	ft
PierColumnLeftEndOffset	d43, ...	ft
d45	Sket...	ft
PierColumnSpacing	d45, ...	ft
d49	Sket...	ft
d50	Sket...	ft
PiercapSectionWidth1	Sket...	ft
PiercapSectionWidth2	Sket...	ft
User Parameters		
PierHeight	PierH...	ft
PiercapLeftWidth	d50	ft
PiercapRightWidth	d49	ft
PierHeight1	d43, ...	ft
PiercapneedstoberesizedToMatchGirderLayout		ul
NumberOfColumns		ul



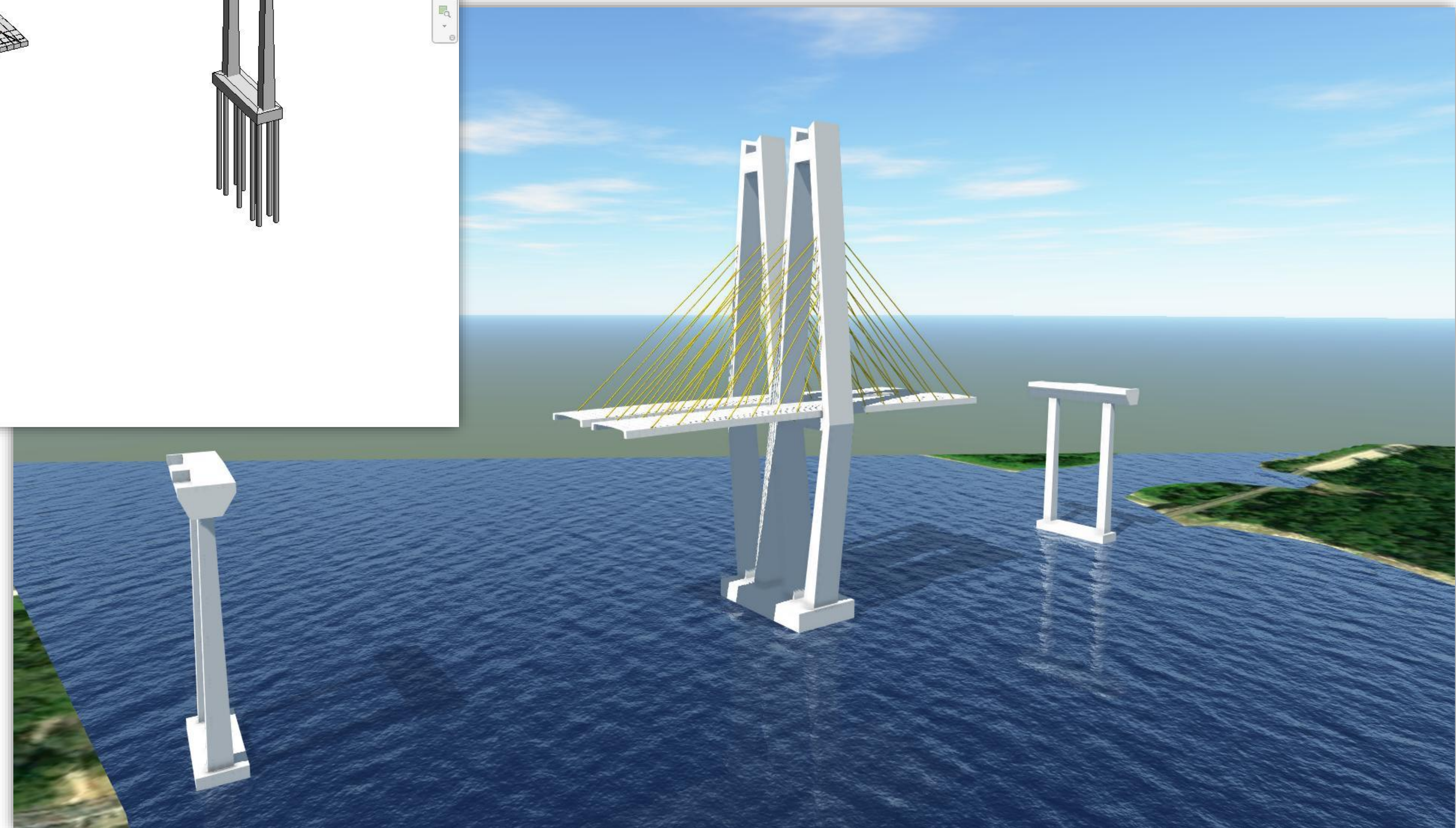
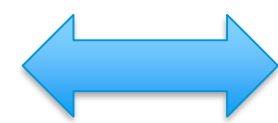
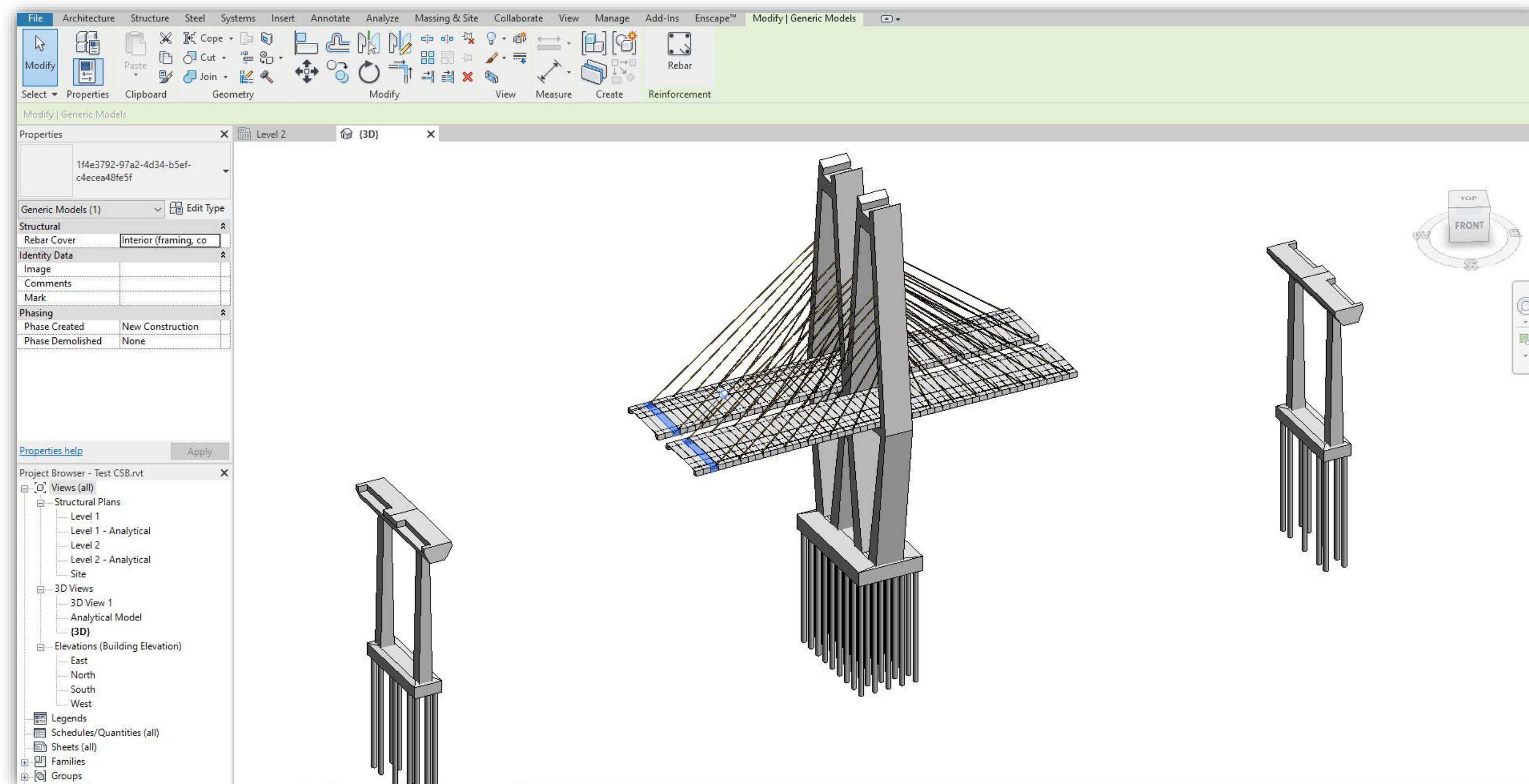
Modeling Custom Bridge Components



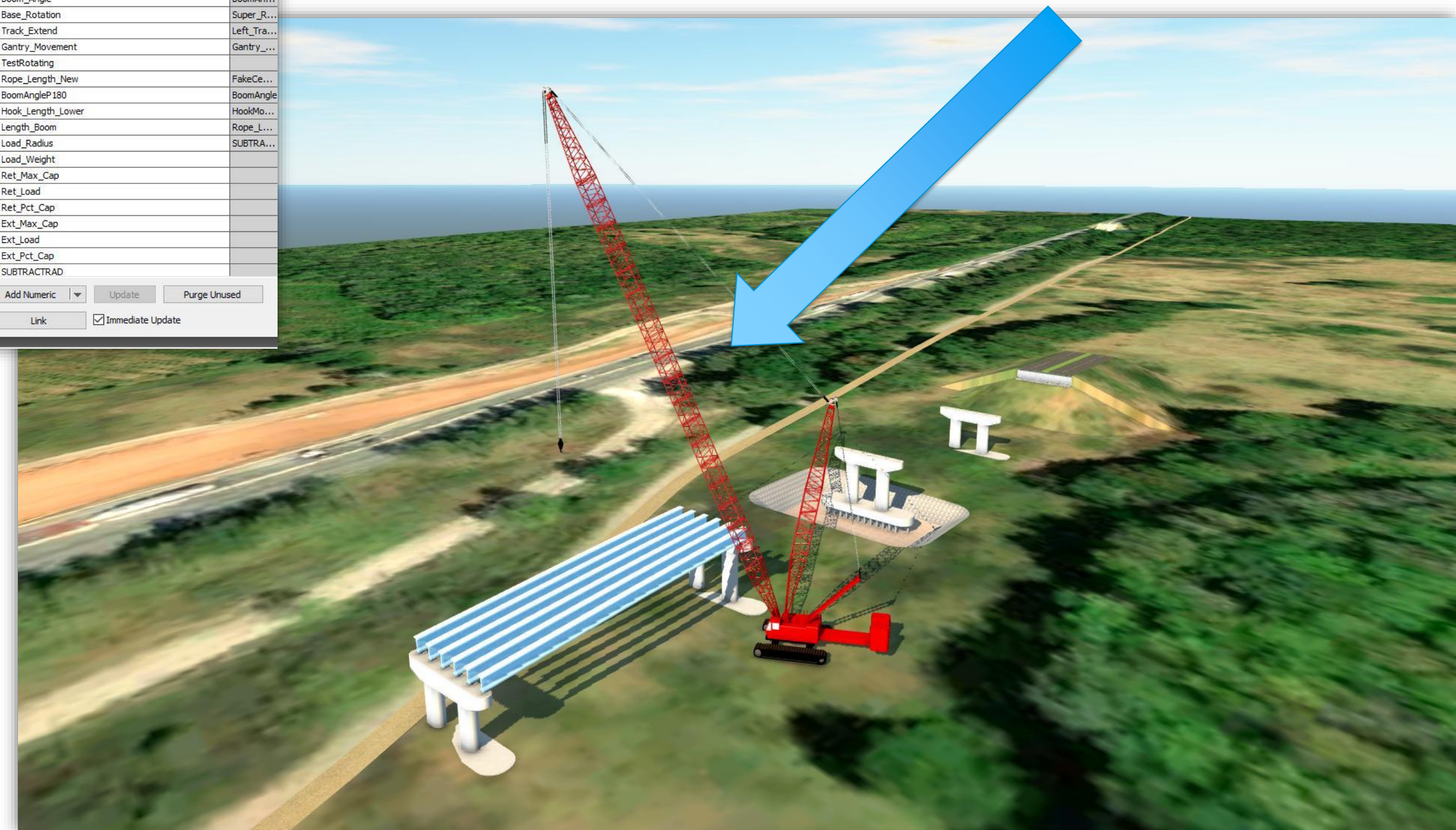
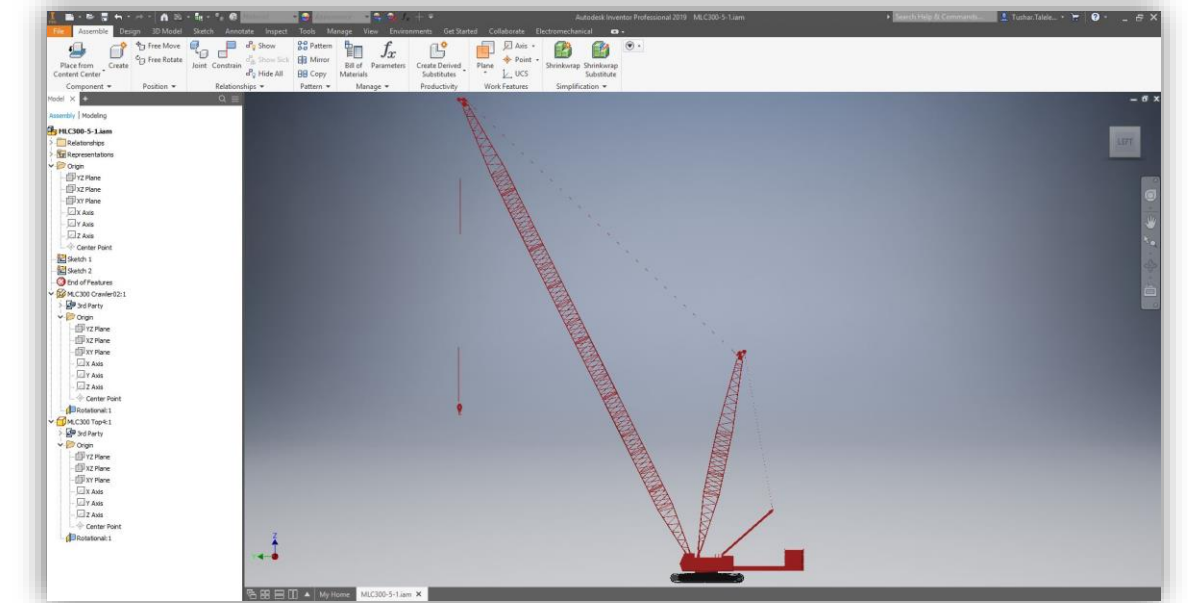
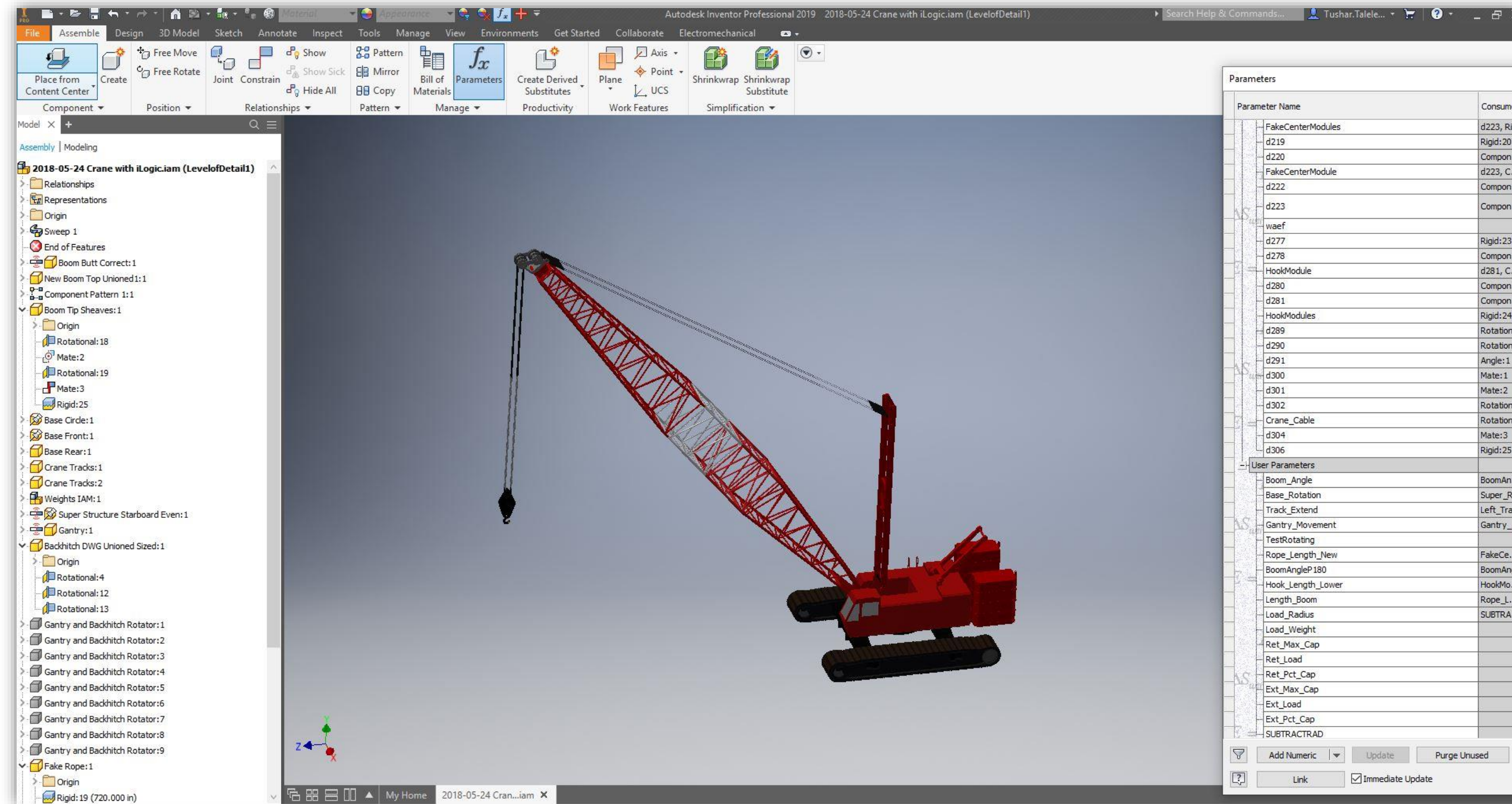
Modeling Custom Bridge Components



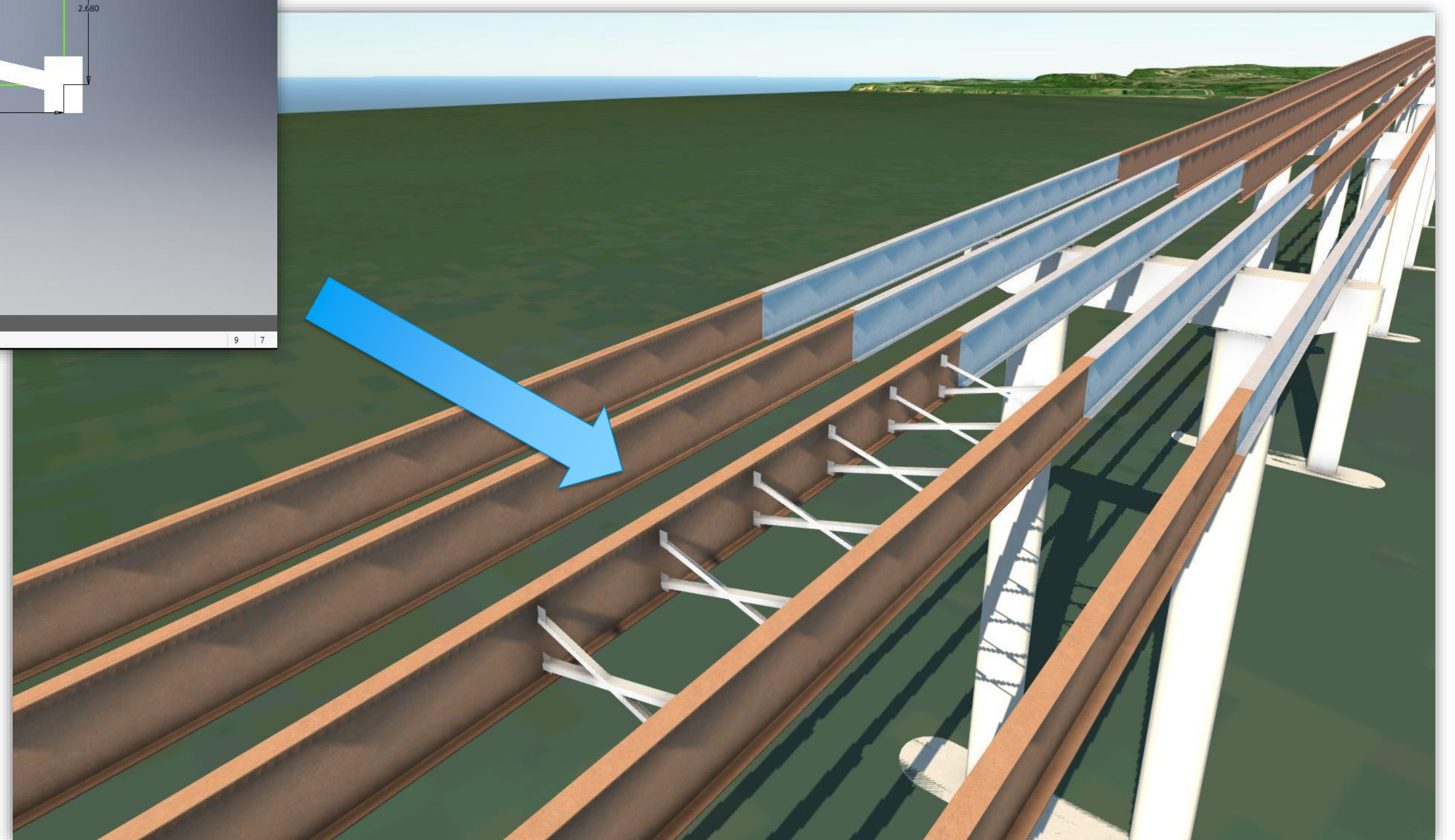
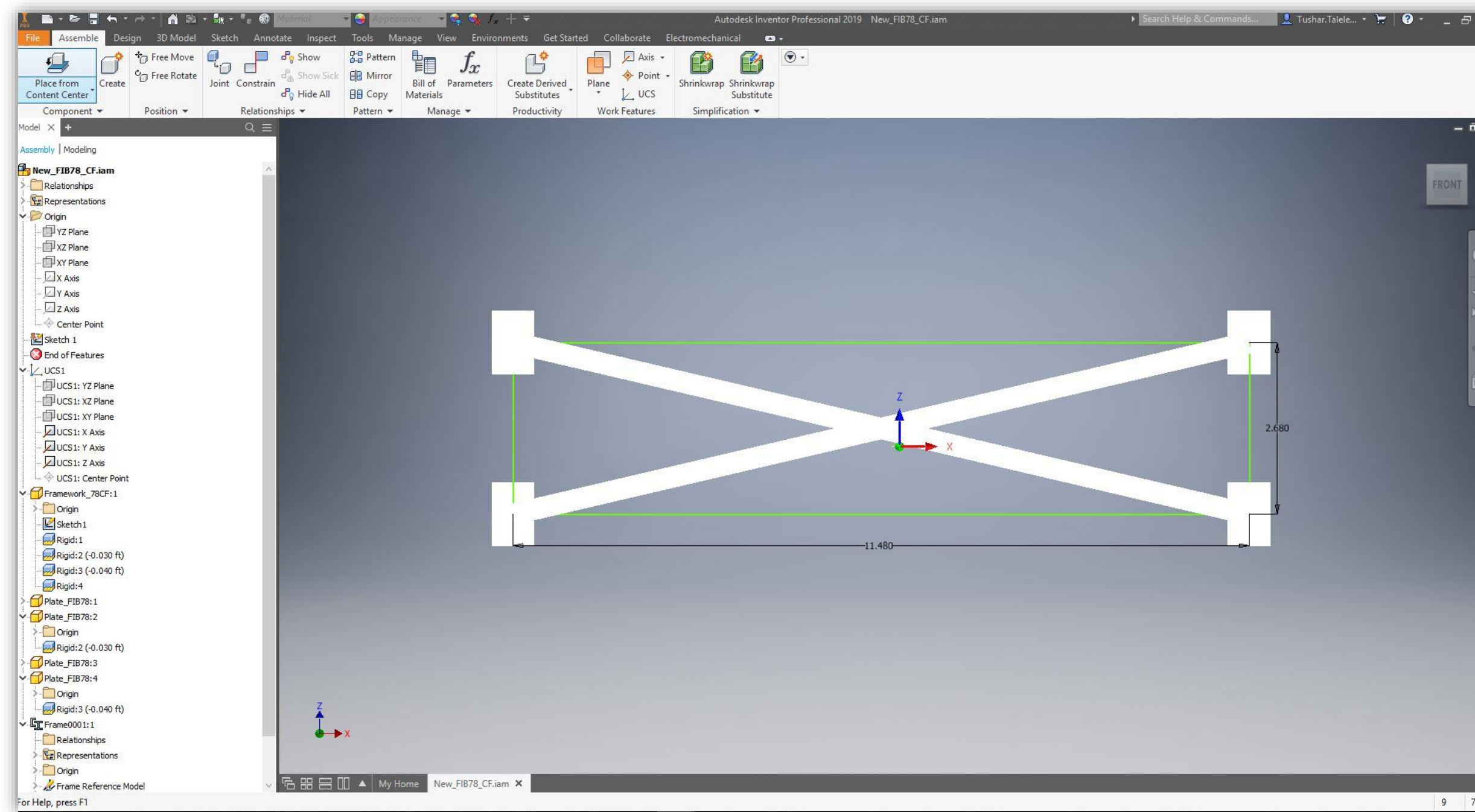
Modeling Custom Bridge Components



Leveraging Equipment as Parametric Generic Objects



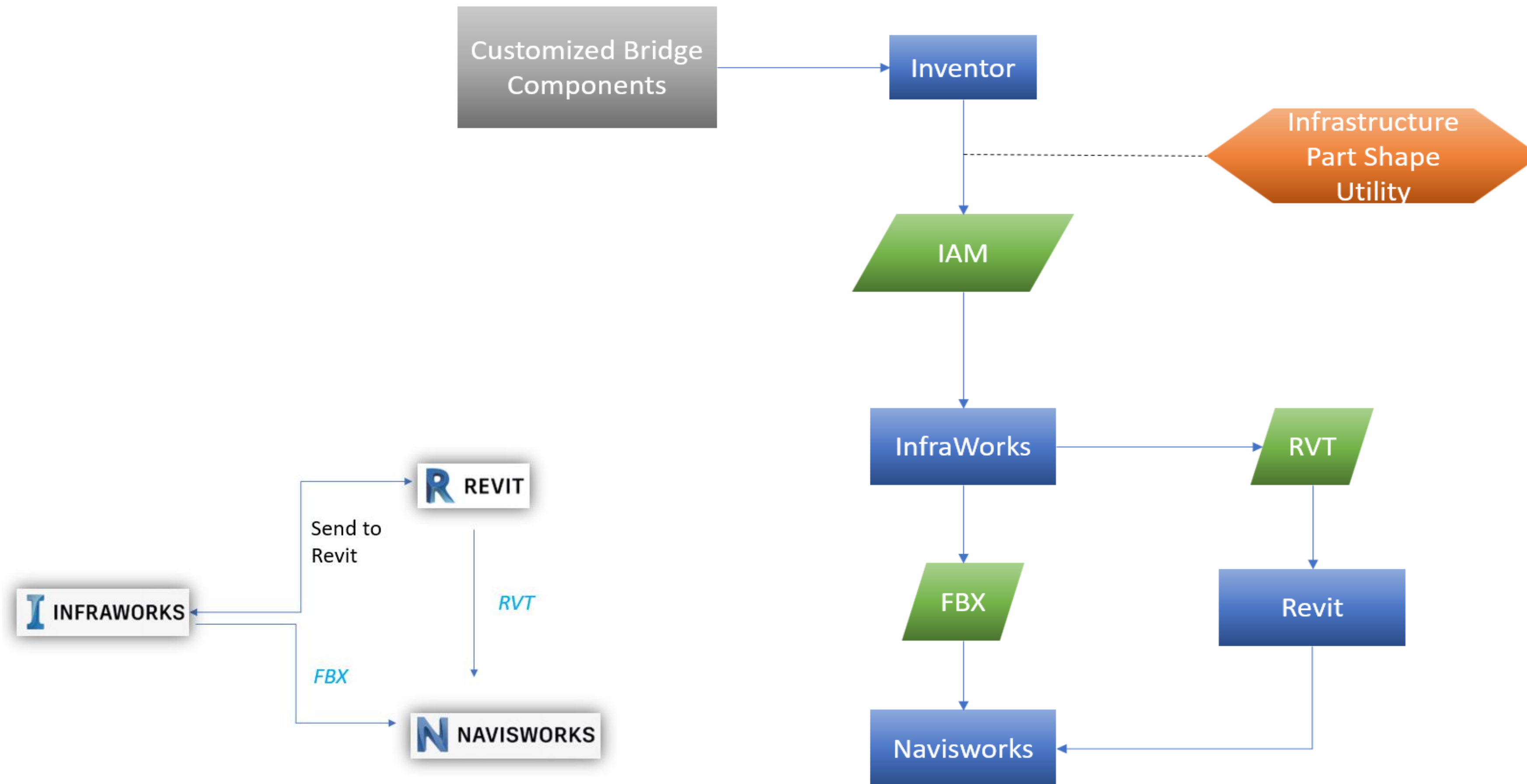
Leveraging Bridge Components as Parametric Generic Objects



Detailed Construction Planning InfraWorks Led Workflow Leveraging Navisworks

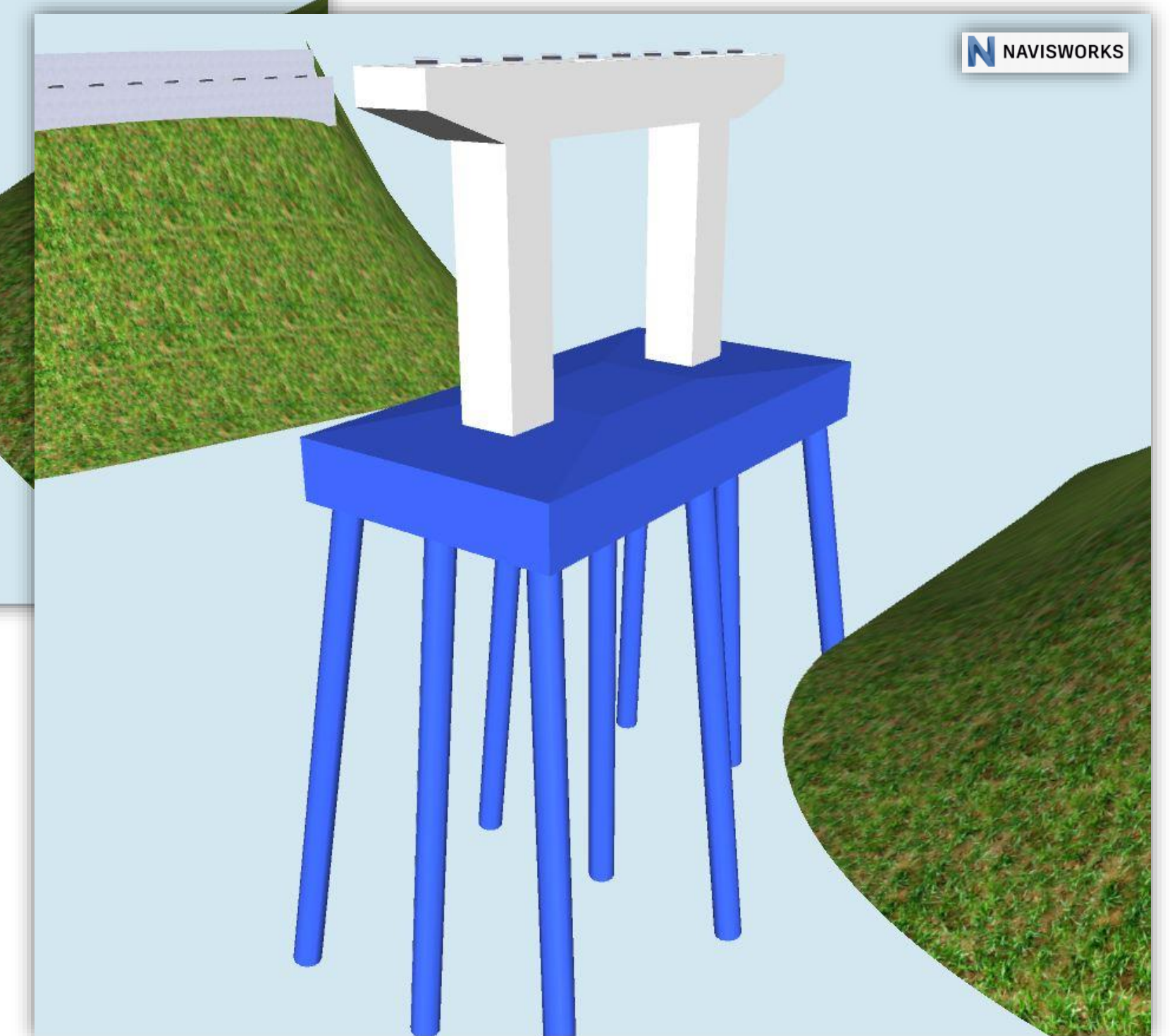
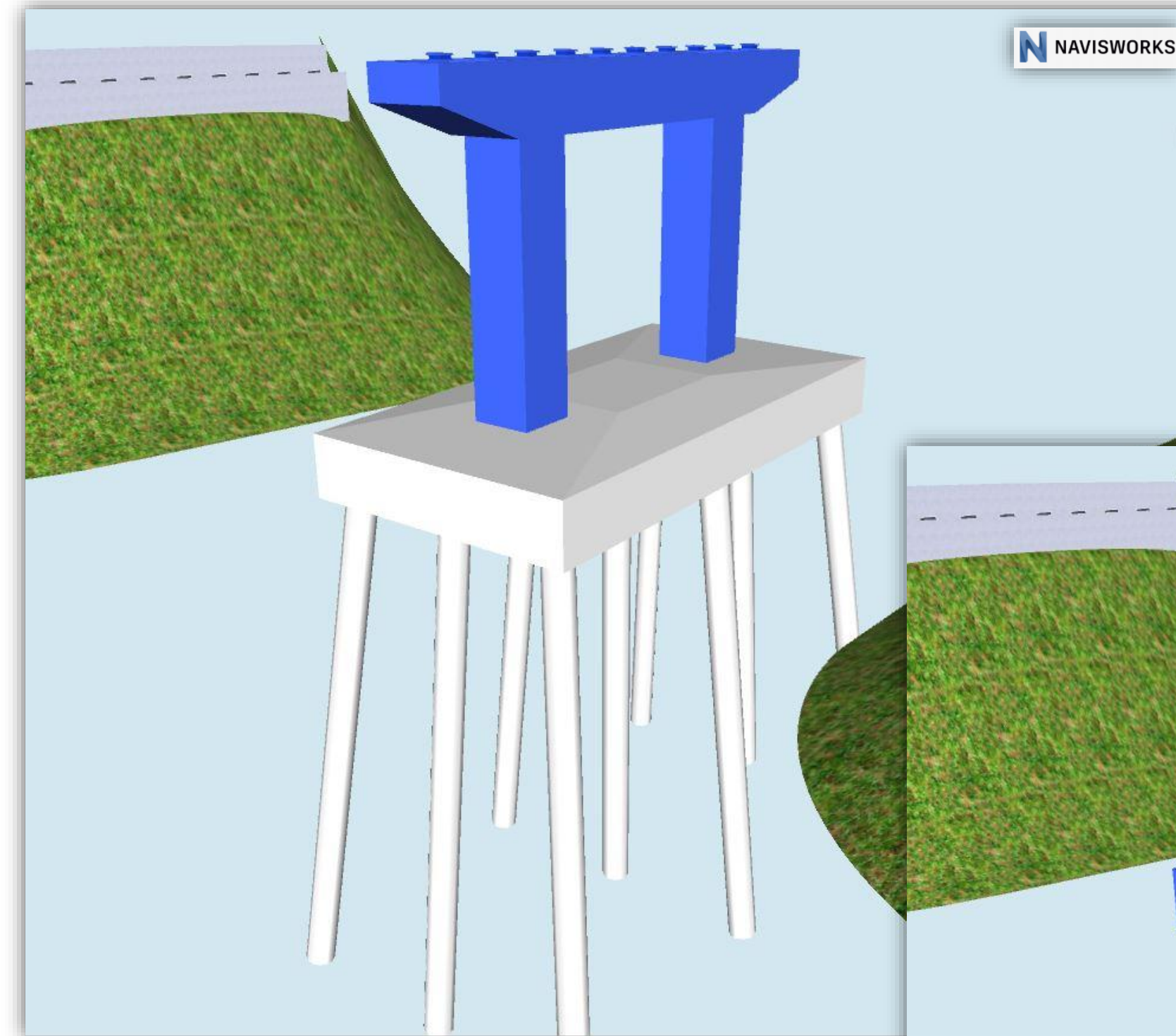
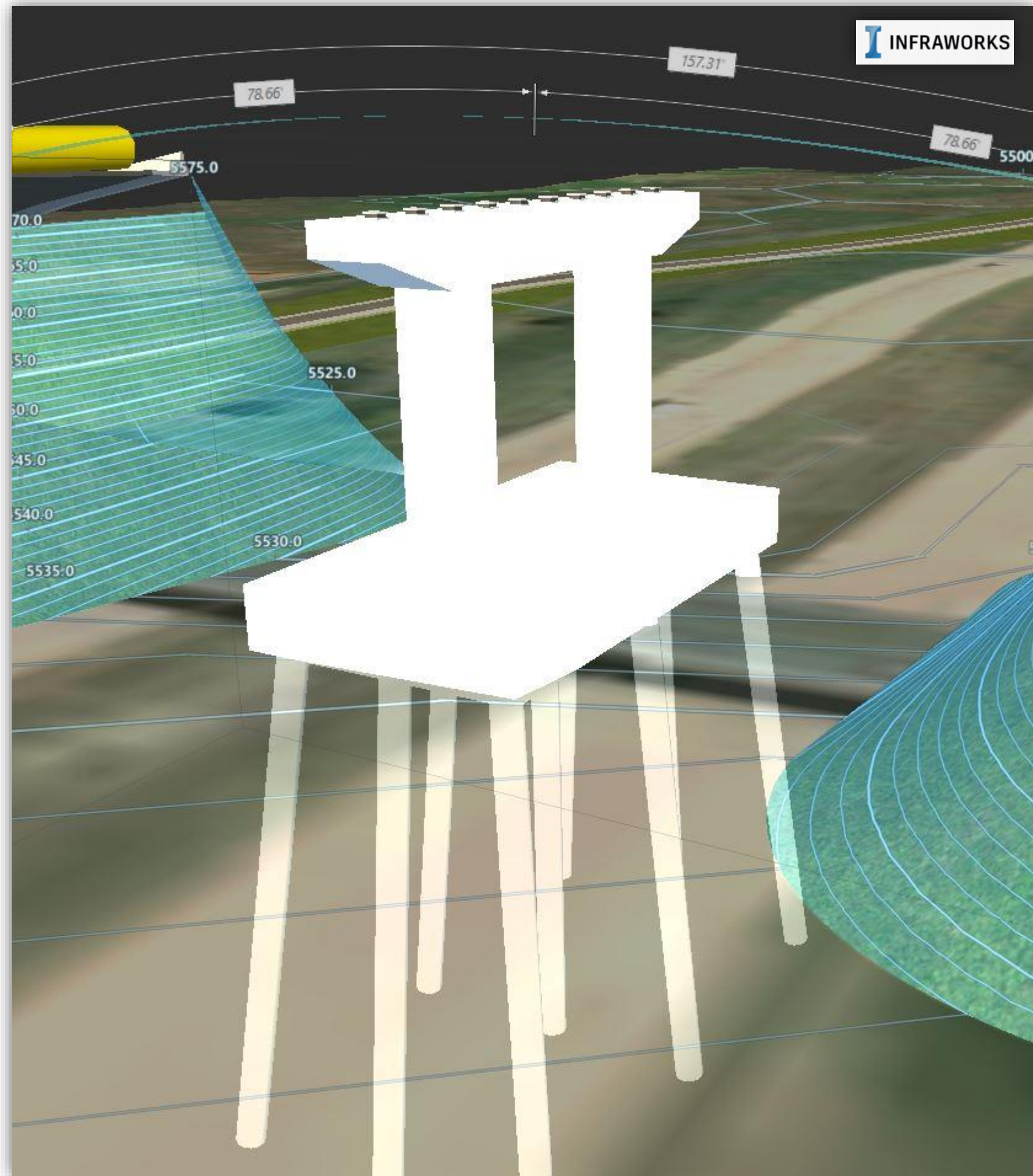


Construction Planning Leveraging Navisworks



Technical Challenges

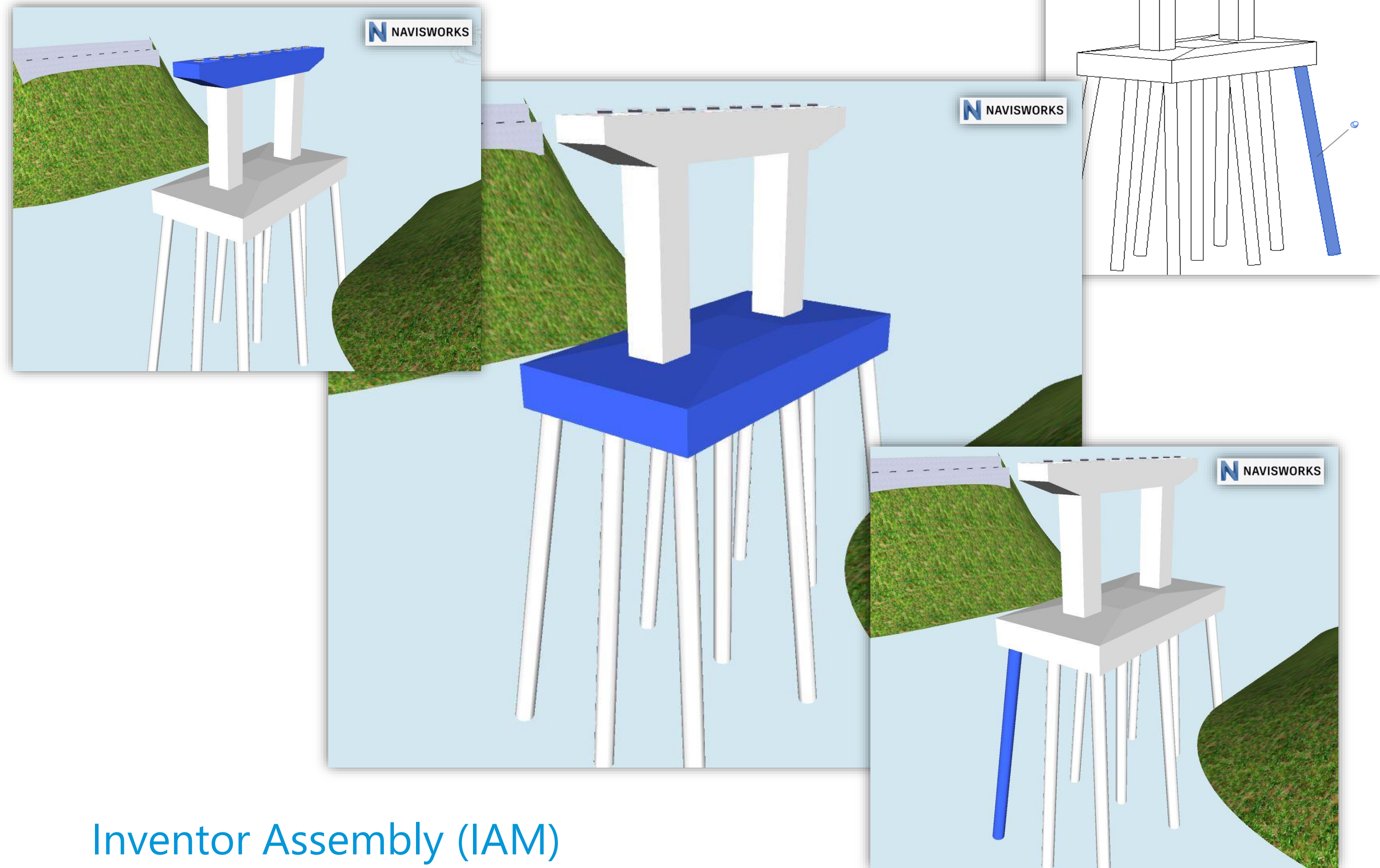
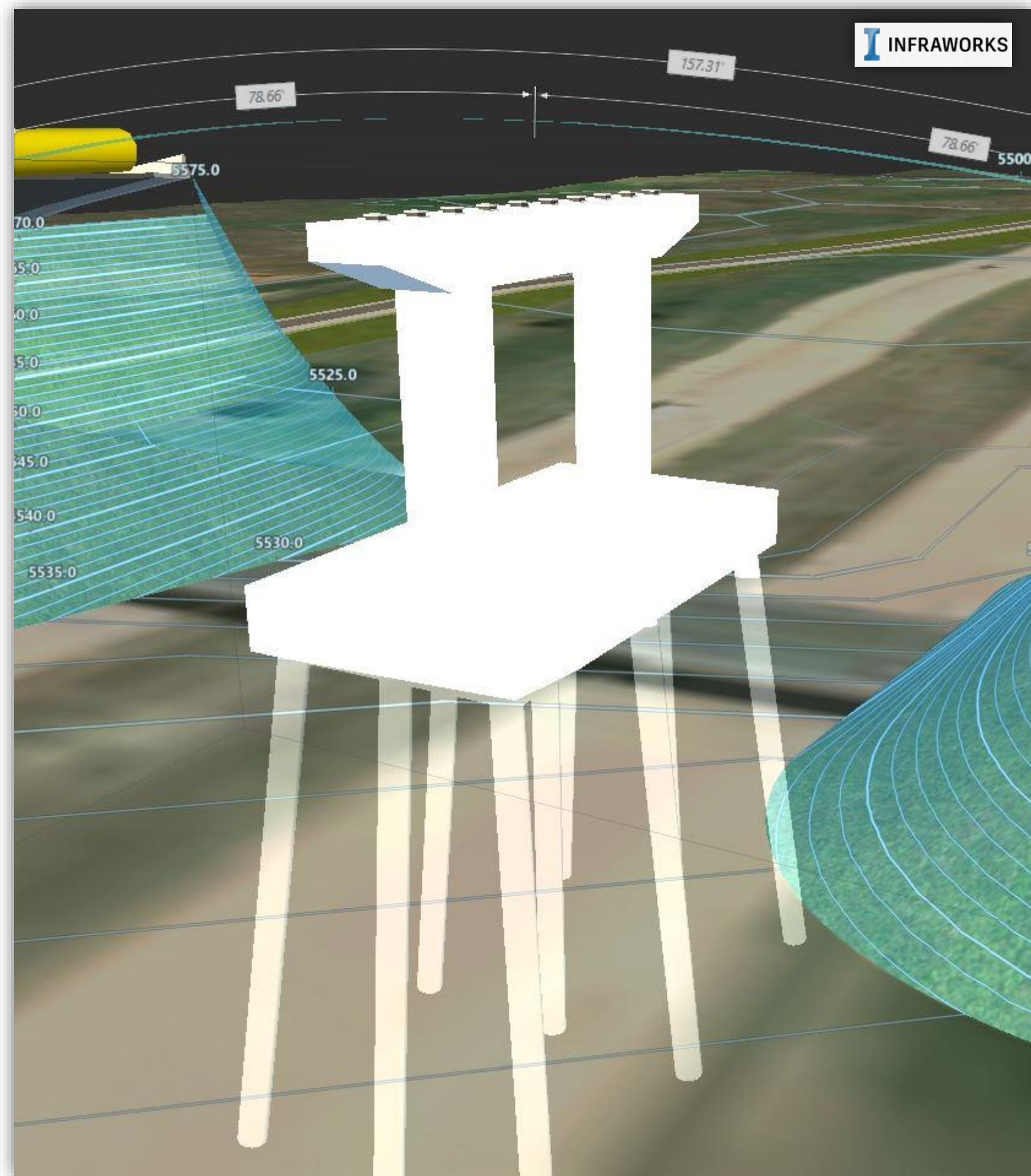
Selecting individual entities to link with phasing activities



Inventor Parts (IPT)

Technical Challenges

Solution – Use of Inventor Assemblies (IAM) in InfraWorks allows users to select individual phasing component



Inventor Assembly (IAM)

Future Advancement Wishlist

- ✓ Flexibility and more control over Intersections in InfraWorks

- Wishlist - Ability to select alignments manually to form intersection with each other and more control over traffic direction

- Present Scenario - Automatically creates Intersection for alignments crossing each other

- ✓ Merging of Proposals in InfraWorks

- Wishlist – It will give ability to merge alternative concept proposals and existing – proposed proposal for MOT study

- Present Scenario – Not available in current release. Merging of proposals used to be part of InfraWorks but not efficient

- ✓ Point Cloud Visibility on BIM 360 through published IWM model files

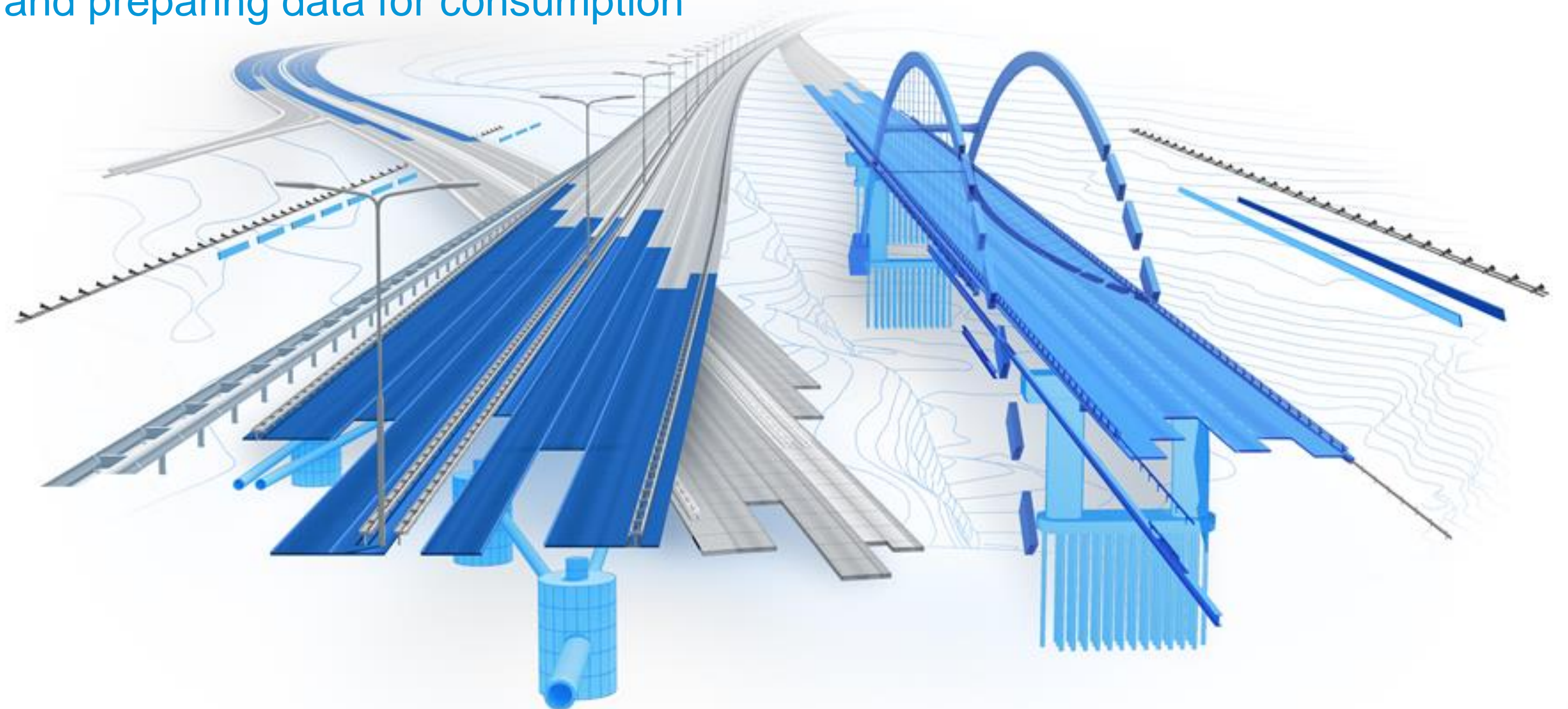
- ✓ Improvement in Point Cloud Feature extraction tools for photogrammetry generated Point Clouds in InfraWorks

- ✓ Reality Visualization AR/MR direct integration with InfraWorks Model

Conclusions

Connected BIM Interoperability – Solving Real World Problems Modelling Infrastructure Projects

- ✓ Discover the workflow for using InfraWorks, Autodesk Civil 3D, Inventor, Revit and Navisworks
- ✓ Discover the process of using Transportation Modeling
- ✓ Learn about interoperability challenges and preparing data for consumption
- ✓ Lessons learned: solutions



Questions ?

THANK YOU

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CES322236: Connected BIM
Interoperability: Solving Real-World
Problems Designing Infra Projects
Marcello 4502, Level 4

FAVORITE SESSION

 **Bookmark added**

TIME AND PLACE

 **Nov 21, 9:15 AM – 10:15 AM**

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