Advancing Digital Delivery at the Vermont Agency of Transportation

VERMONT
AGENCY OF TRANSPORTATION

vhb

February 07, 2025

Presenting today

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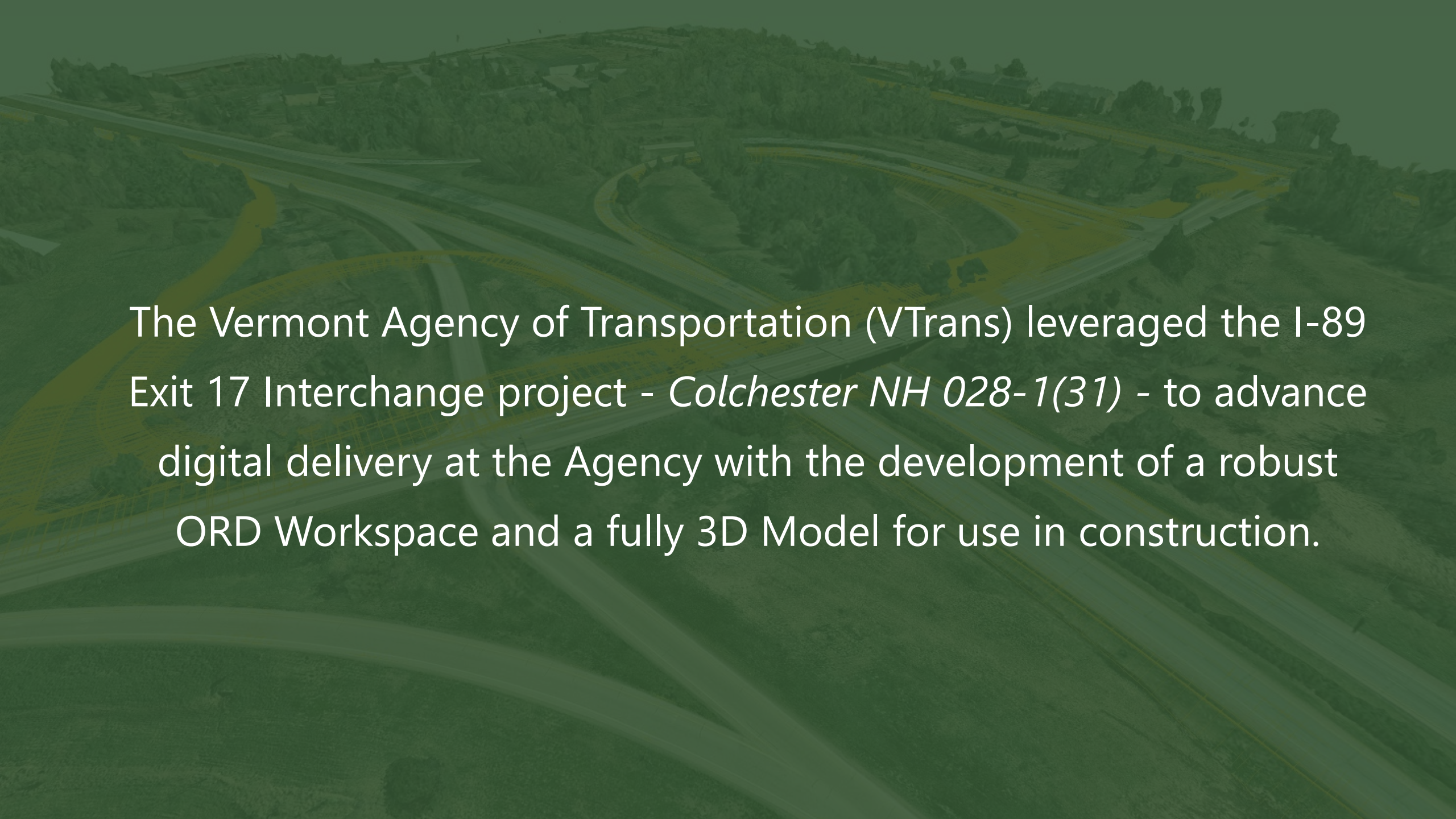


The Vermont Agency of Transportation (VTrans) leveraged the I-89 Exit 17 Interchange project - *Colchester NH 028-1(31)* - to advance digital delivery at the Agency with the development of a robust ORD Workspace and a fully 3D Model for use in construction.

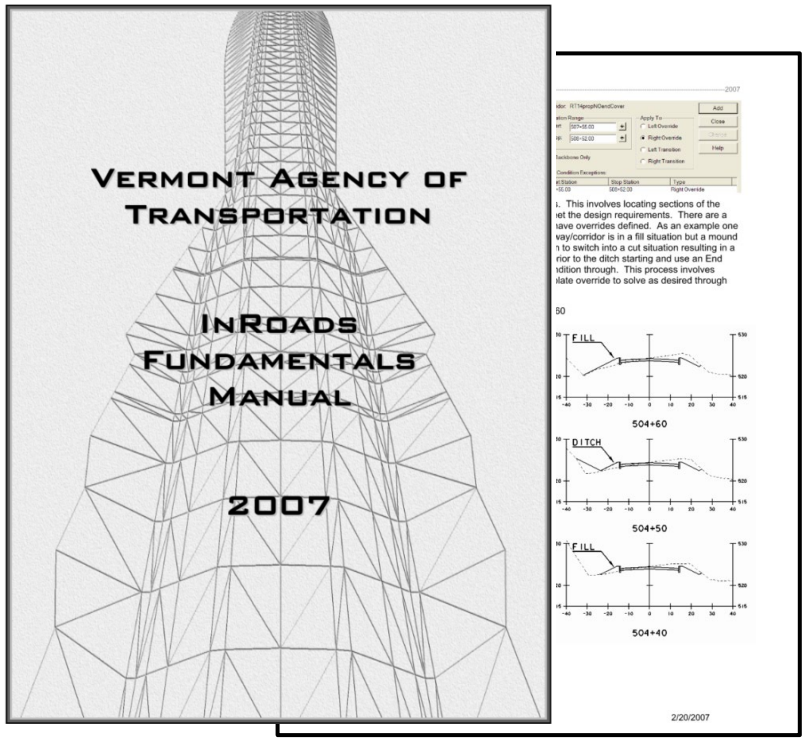
Agenda

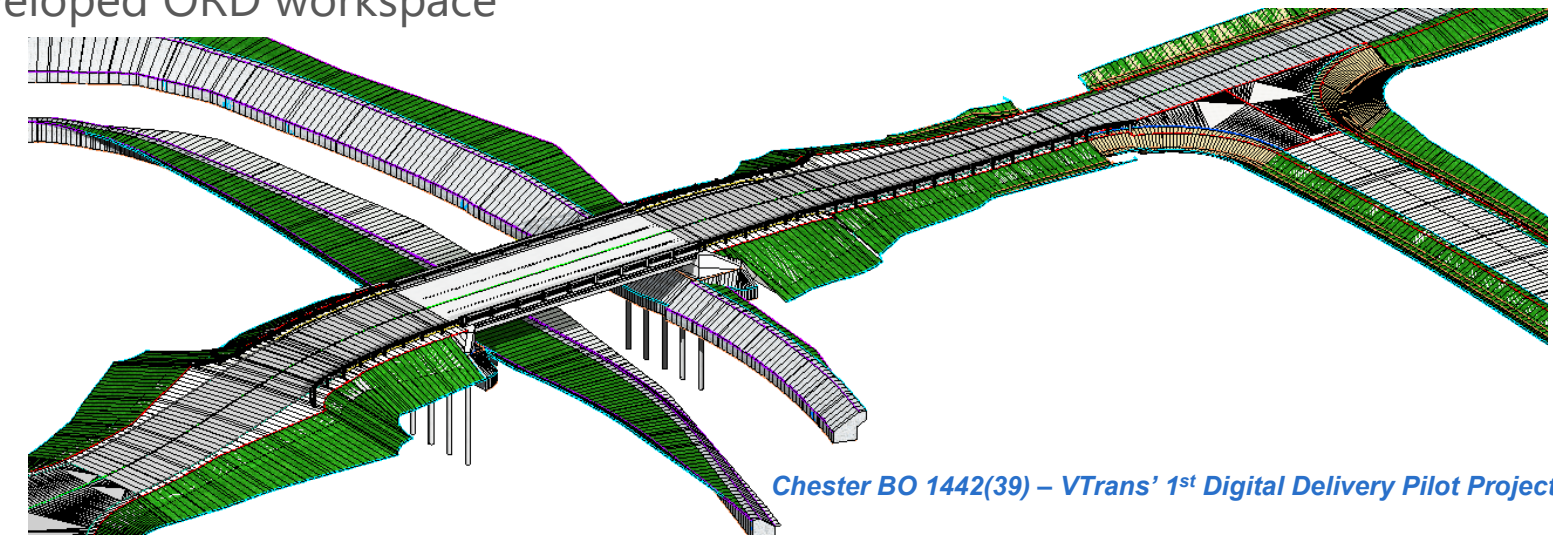
- **Background**
  - 3D Modelling / Digital Delivery at VTrans
  - Colchester Exit 17 project
- **ORD Workspace Development**
- **Use of 3D Model in Construction**
- **Next Steps for VTrans**
- **iTwin Demo**

Background

VTrans Digital Delivery

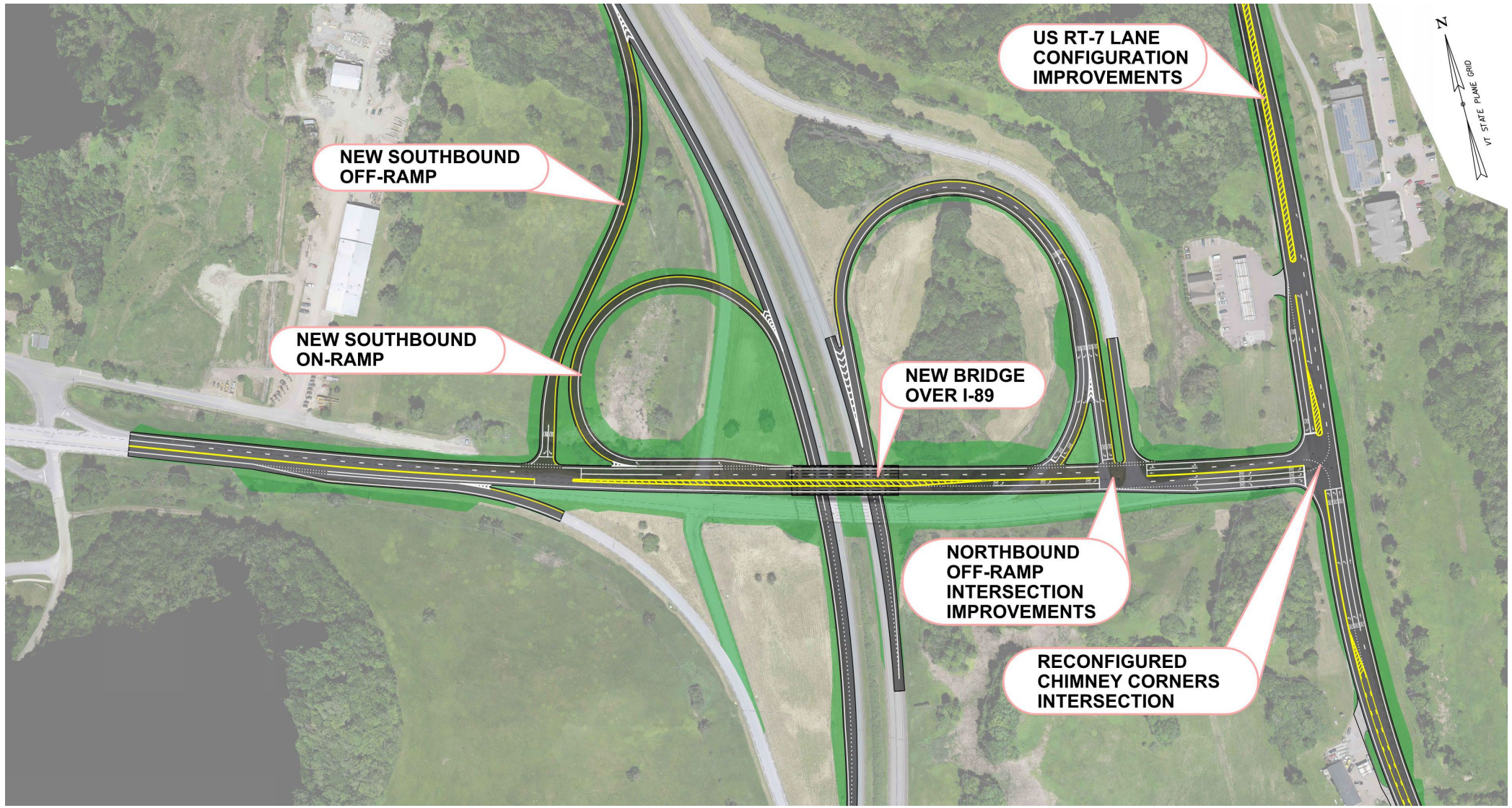
- Pre-2020: MicroStation v8i SS10 / InRoads
- 2020: OpenRoads Designer CE adopted
  - 1st gen ORD Workspace developed under the *Benson STP 017-1(17)* project
- 2020: ***Chester BO 1442(39)*** project identified as a MALD pilot project
  - iTwin Design Review (2022)
- 2021: est. Digital Delivery Working Group
  - Identified the need for a more developed ORD workspace





Chester BO 1442(39) – VTrans' 1st Digital Delivery Pilot Project

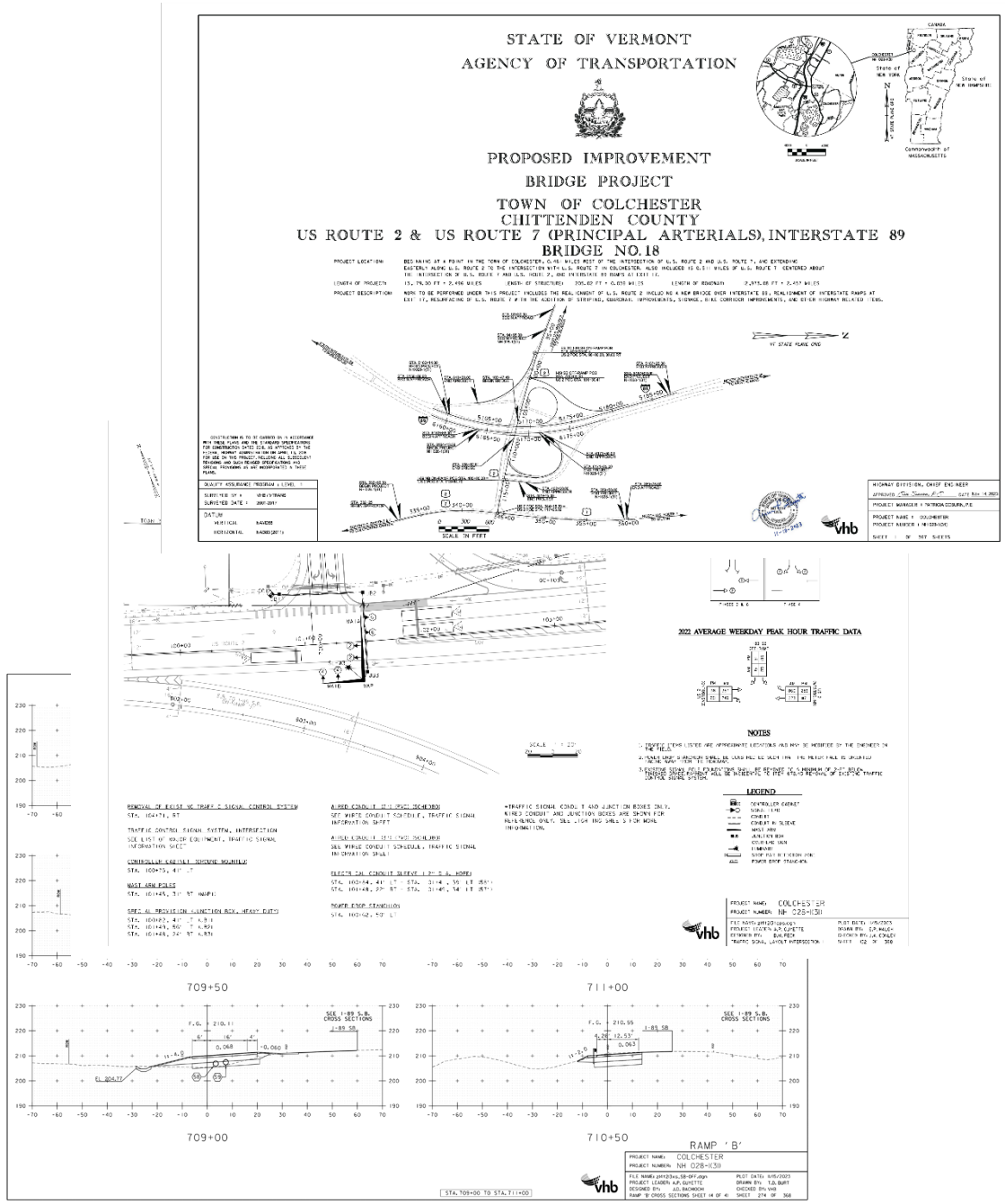
Colchester NH 028-1(31) - Exit 17



Background

Colchester NH 028-1(31) – Exit 17

- 2016: Design begins with MicroStation & InRoads v8i
- 2016-2022: Preliminary/Final Design and ROW Acquisition
- **2022: *Colchester NH 028-1(31)* project identified as pilot project**
  - **2D Contract Plans**
  - **3D Model for reference**
- 2023: ORD Workspace & 3D Model
- 2024: Construction Began



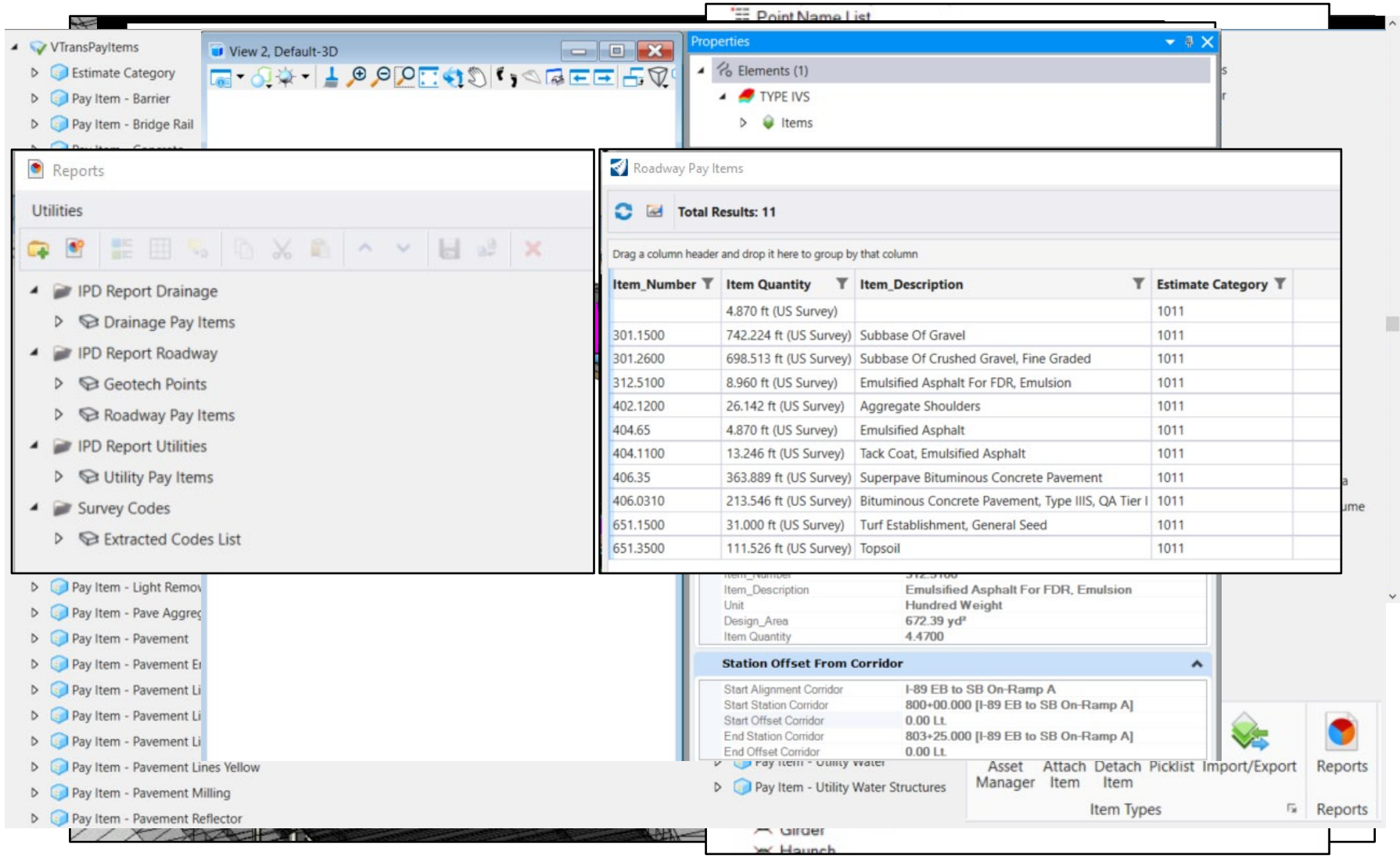
VTrans ORD Workspace Development

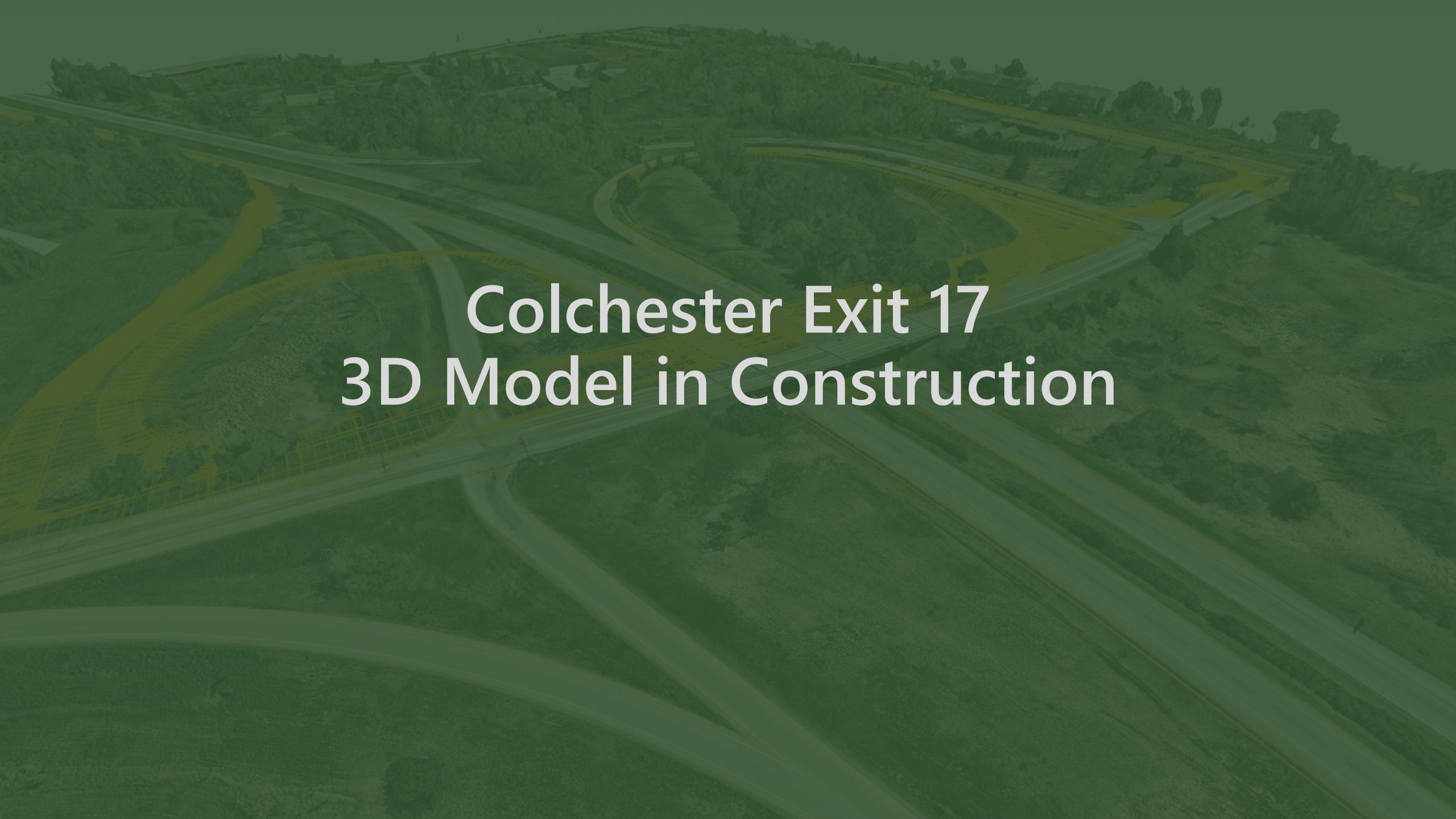
VTrans ORD Workspace

- VTrans ORD Workspace was **overhauled**
  - Teamed with EnvisionCAD for developement
  - Tested by VHB and VTrans
  - Reviewed by Bentley
- Bi-Weekly VTrans Working Group Meetings
  - VTrans (Structures, Roadway, Traffic)
  - Consultants
- Test workspace deployed through Sharepoint so updates were pushed out to testing team in real time
- **Workspace needed to support ongoing pilot projects AND the future of digital delivery at VTrans**

VTrans ORD Workspace

- Feature Definitions and Annotations
  - VTrans_Road.dgnlib
  - VTrans_Drainage.dgnlib
  - VTrans_Utilities.dgnlib
  - VTrans_Survey.dgnlib
- Template Library (.itl)
- Civil Cells
  - Guardrail End Terminals
  - Skewed Bridge Approach
  - Driveways
- 3D Cells (Traffic, Lighting)
- Item Types & Report Definitions



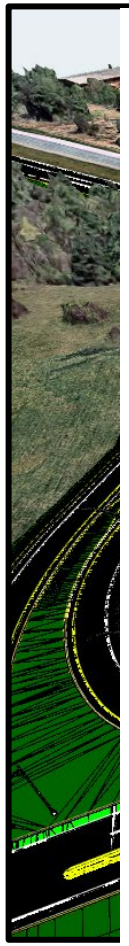


Colchester Exit 17
3D Model in Construction

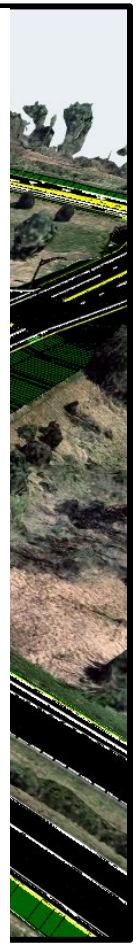
Use of 3D Model in Construction

What we delivered

- Design files
  - ORD & OBM 3D models (dgn)
  - Alignments (xml)
  - Surfaces (xml)
  - Index of files
- Access to iModel
  - SYNCHRO Control
  - SYNCHRO Field



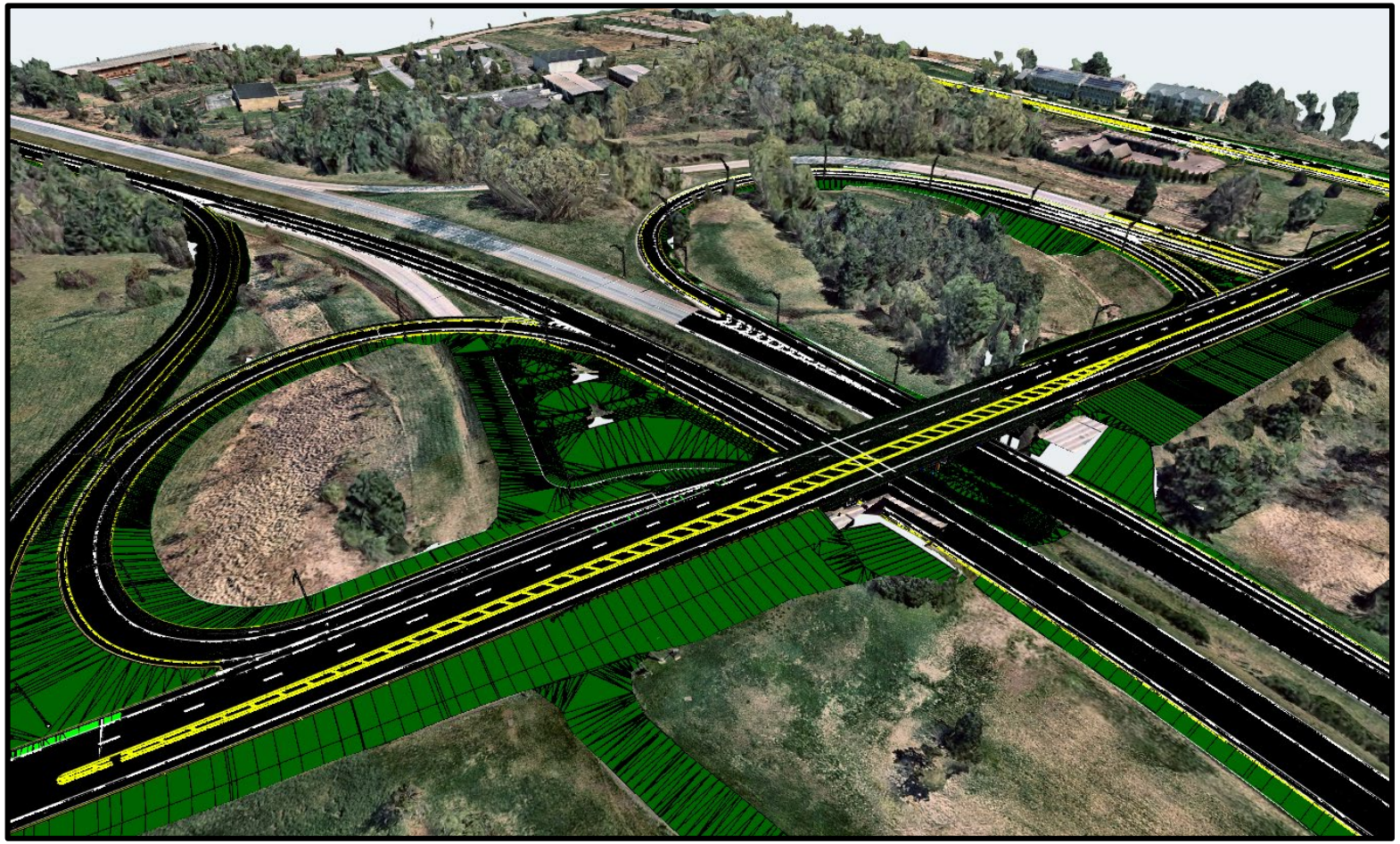
Z14t213_Existing.dgn	Description	Includes
z14t213_og.dgn	Original Ground Terrain Model	
z14t213sv.dgn	Ground Survey Basemap	
z14t213_Ex_Util_US-2	3D Existing overhead utility poles - US-2	Poles (no wires)
z14t213_Ex_Util_US-7	3D existing overhead utility poles - US-7	Poles (no wires)
z14t213_Bridge.dgn		
z14t213_OBD.obdx	OpenBridge Designer File	
z14t213_bridge.dgn	Bridge Concrete and Substructure Elements	Deck, Barriers, Approach Slabs, Moment Slabs, Substructures with Piles, Bearings and Girder Leveling Assemblies
z14t213_sup.dgn	Steel Superstructure Elements	Haunch and Shear Connectors
z14t213_deck.dgn	Deck Reinforcing	
z14t213_deckpanels.dgn	Deck Panels with Reinforcing	
z14t213deck_end.dgn	Deck Reinforcing at Ends	
z14t213railing.dgn	Bridge Railing Reinforcing	
z14t213_abut1.dgn z14t213_abut2.dgn	Abutment No. 1 Reinforcing Abutment No. 2 Reinforcing	
z14t213_appslab1.dgn z14t213_appslab2.dgn	Approach Slab No. 1 Reinforcing Approach Slab No. 2 Reinforcing	
z14t213_momslab1.dgn z14t213_momslab2.dgn z14t213_momslab3.dgn z14t213_momslab4.dgn	Moment Slab No. 1 Reinforcing Moment Slab No. 2 Reinforcing Moment Slab No. 3 Reinforcing Moment Slab No. 4 Reinforcing	
z14t213_pier.dgn	Pier Reinforcing	
z14t213_mse_east.dgn z14t213_mse_west.dgn	MSE Walls at Abutments	
z14t213_Roadway.dgn		
z14t213_geom_*[road]*.dgn	Roadway Alignment Geometry	
z14t213_corr_*[road]*.dgn z14t213_intersect_*[road]*.dgn	Roadway Models - Corridors Roadway Models - Intersections	Pavement, Subbase, Sand, Curb, Aggregate Shoulder, Stone Fill, Topsoil and Turf



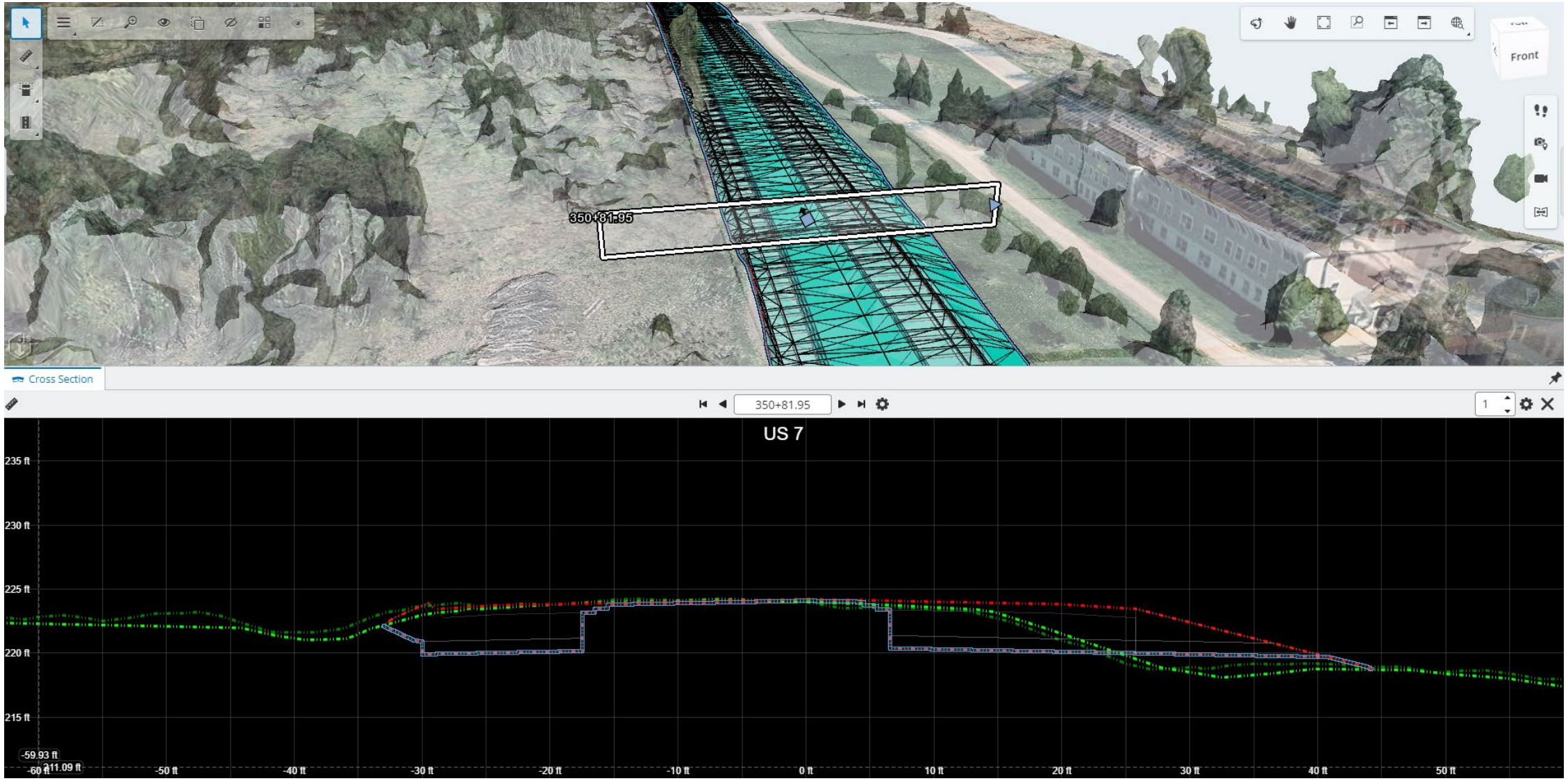
Use of 3D Model in Construction

How it was used

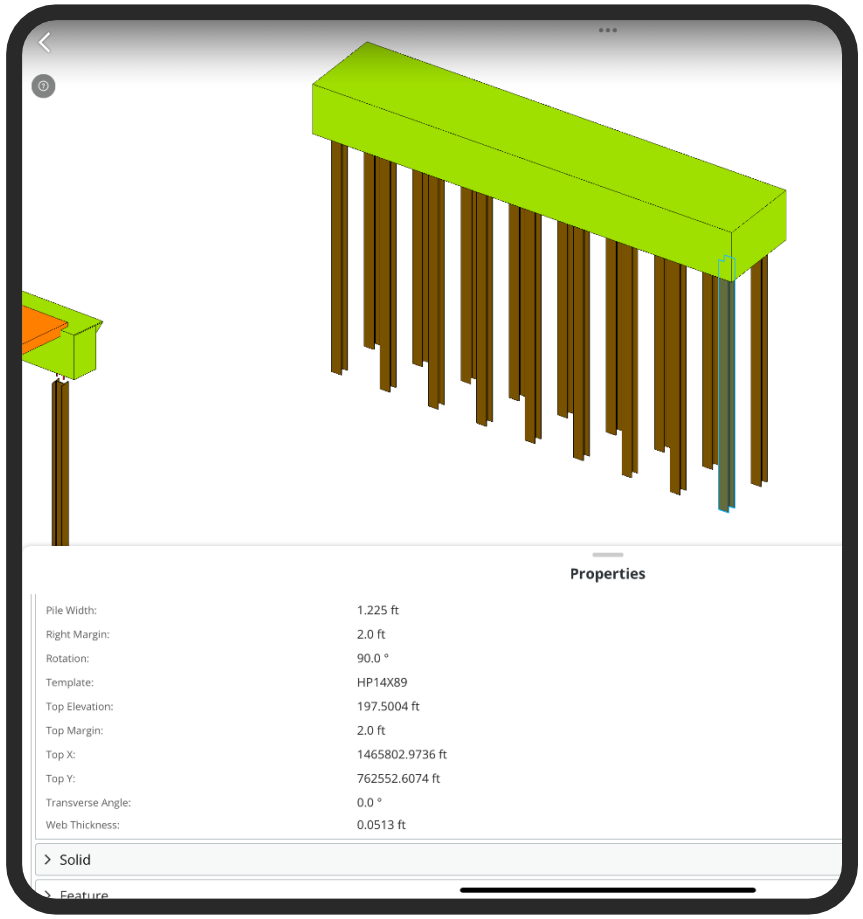
- Top & Subgrade Surfaces for AMG
- Layout of Substructure
- Visualize Reinforcing Steel
- Calculate Rebar & Concrete Volumes
- Layout of select backfill materials
- Create Saved Views for communication with field staff
  - SYNCHRO Control ➔ SYNCHRO Field

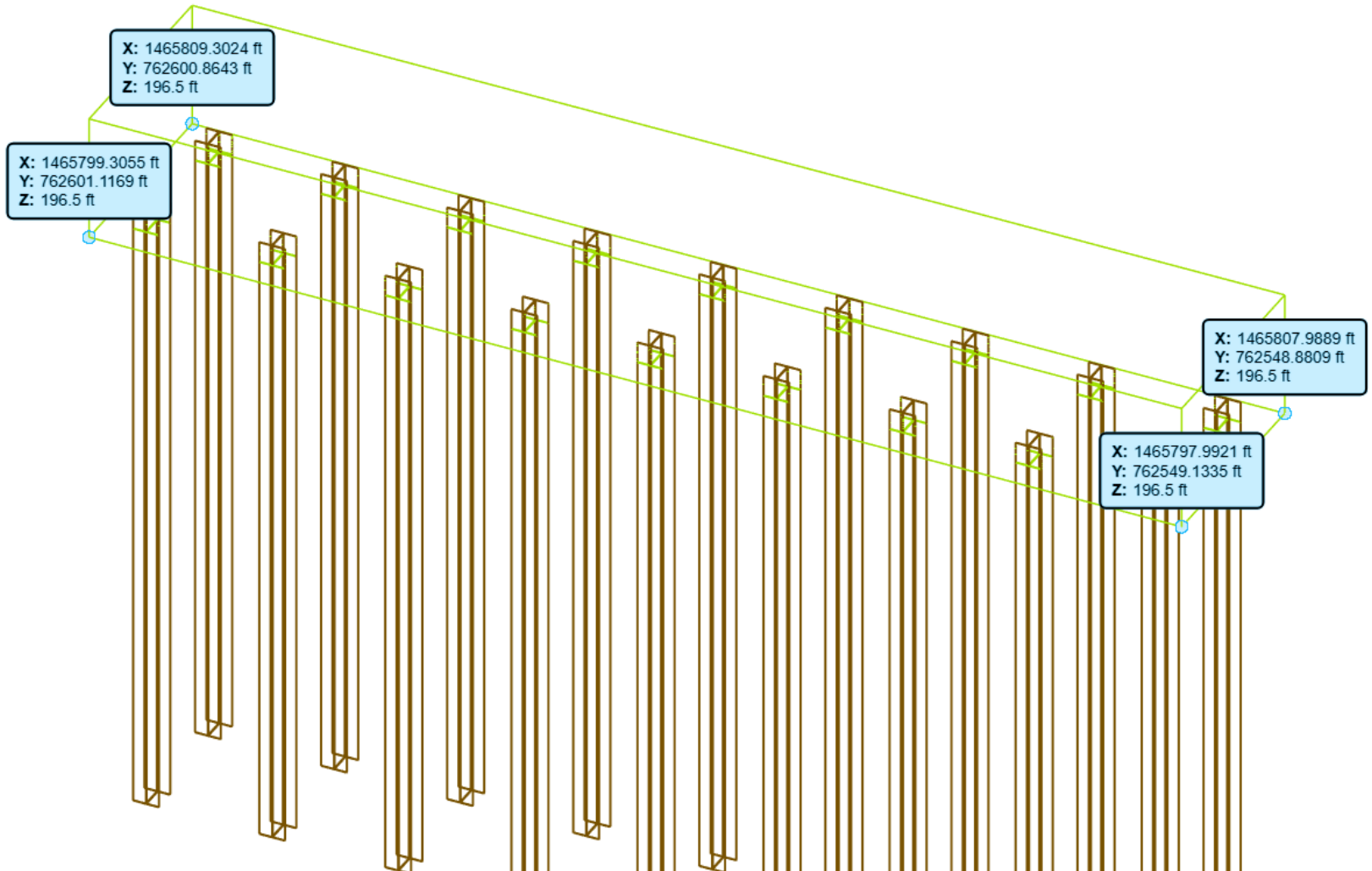


Surfaces for AMG

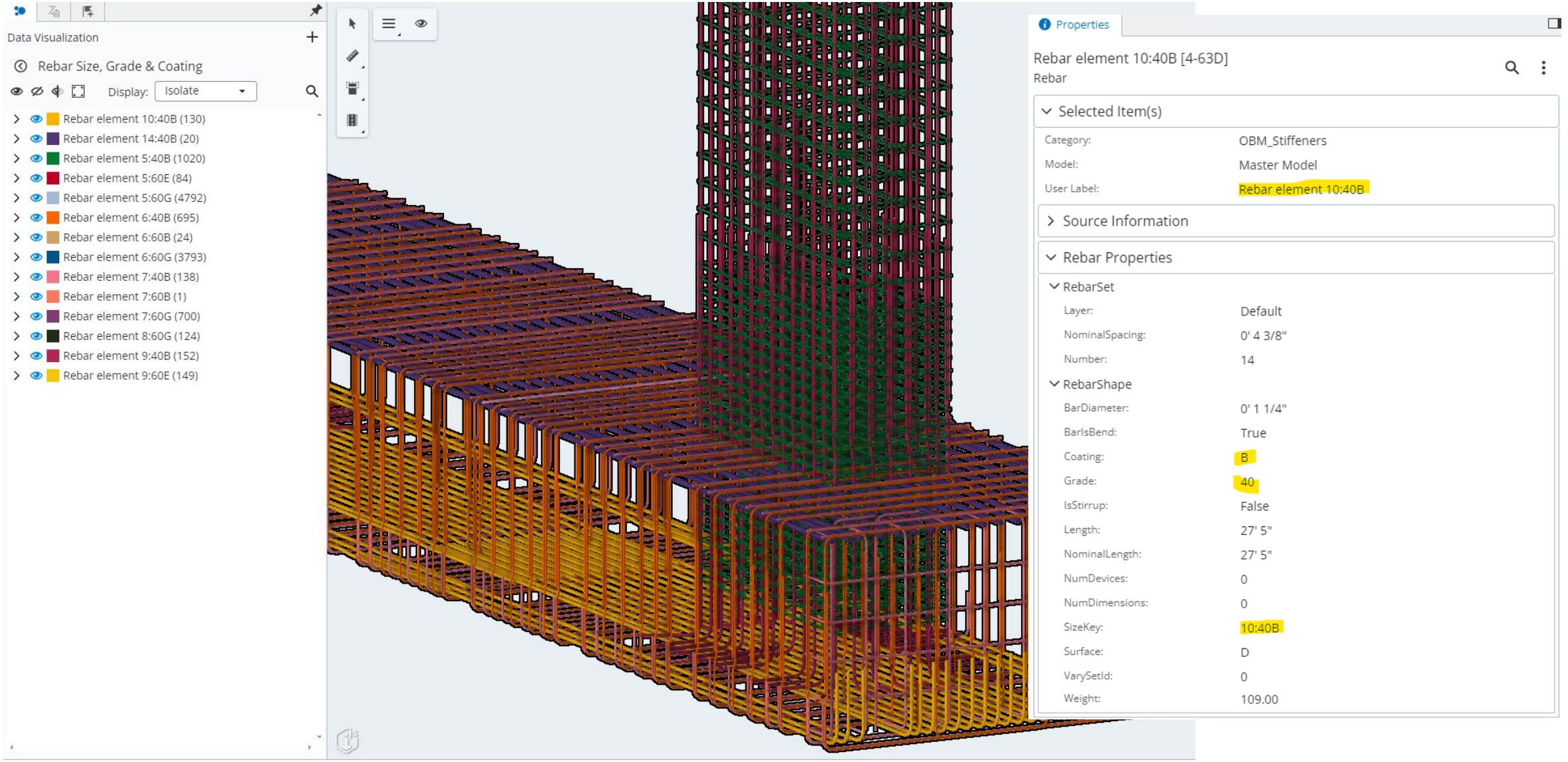


Layout of Substructure

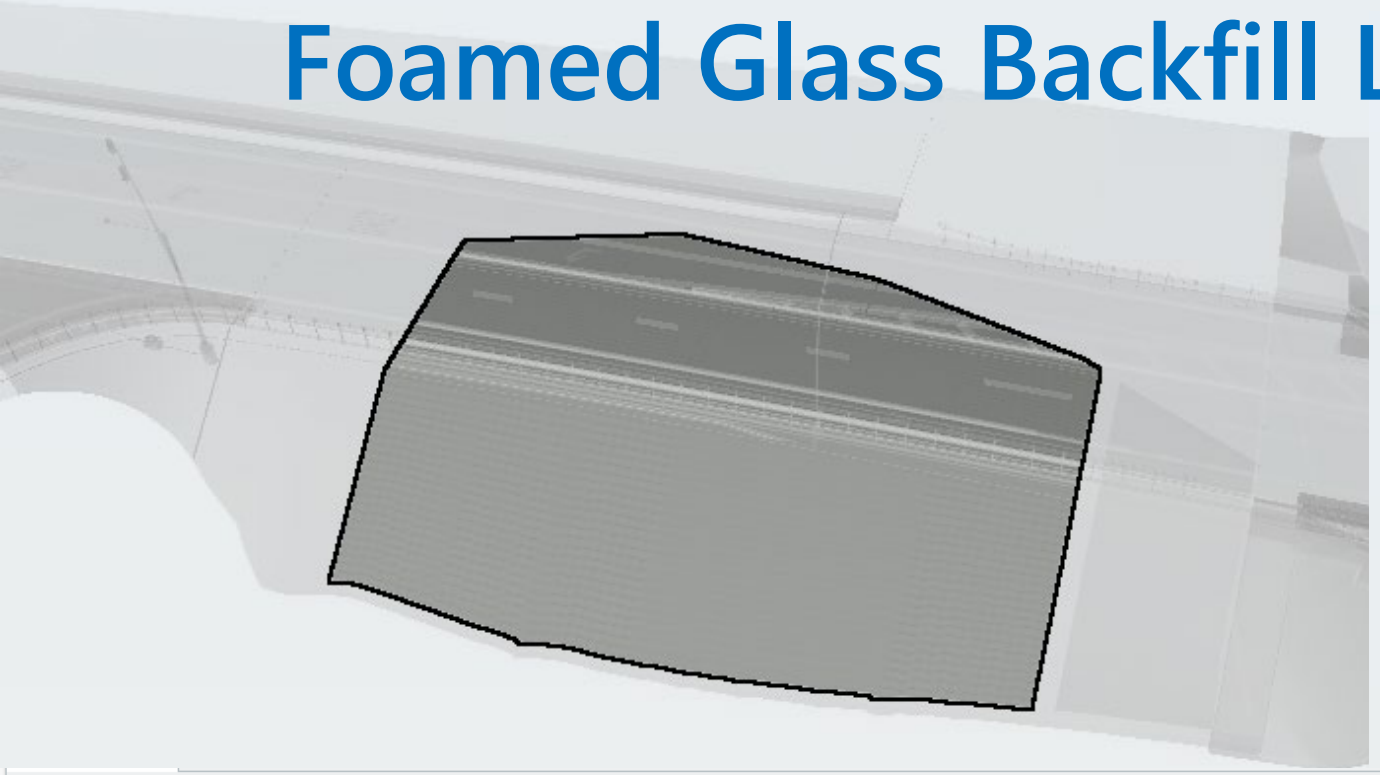


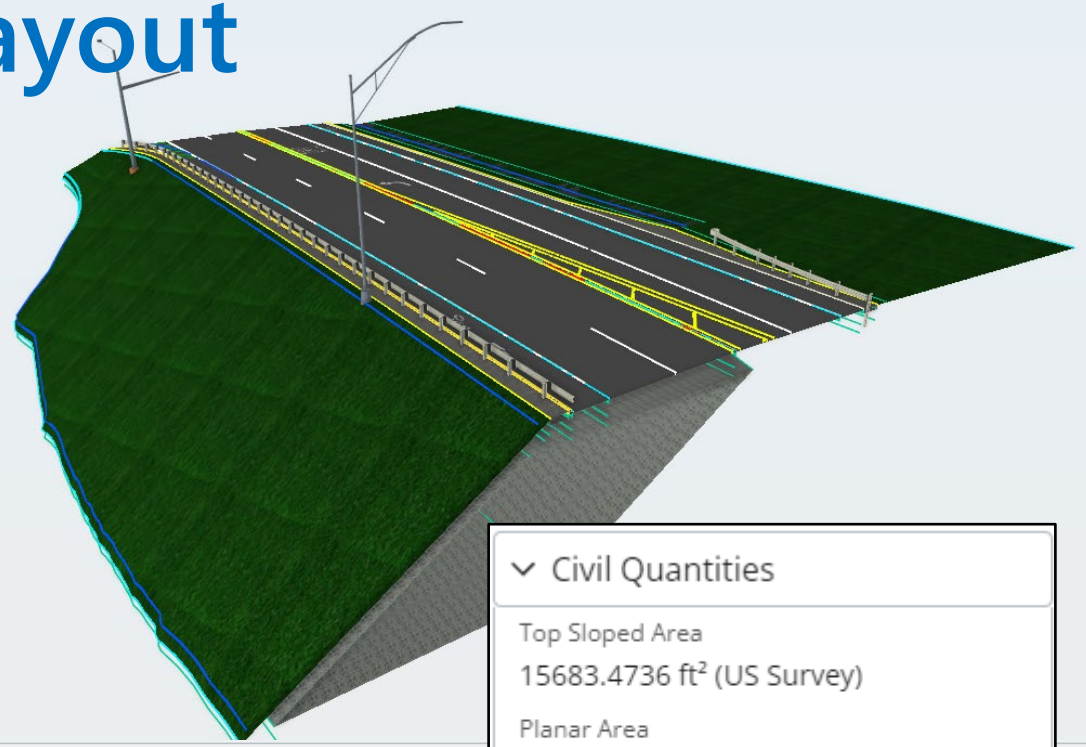


Rebar Visualizations



Foamed Glass Backfill Layout



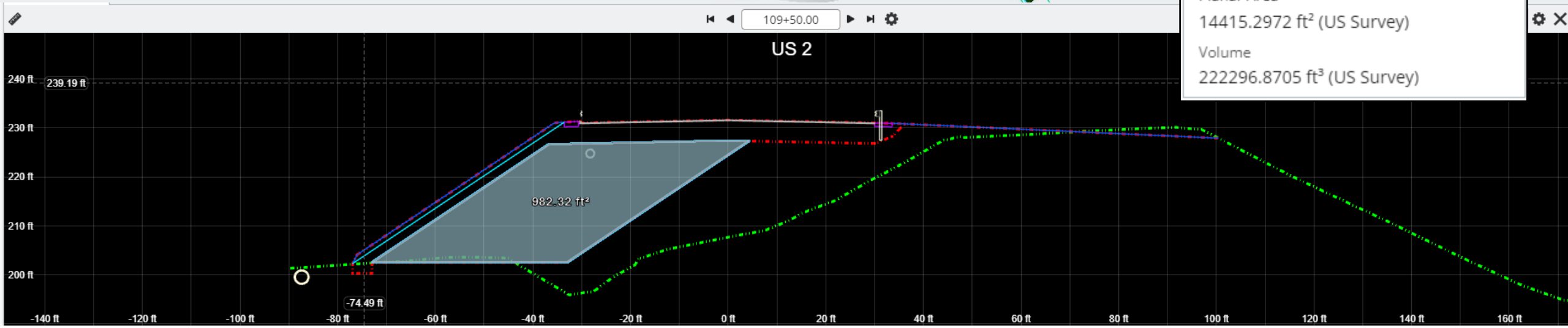


Civil Quantities

Top Sloped Area
15683.4736 ft² (US Survey)

Planar Area
14415.2972 ft² (US Survey)

Volume
222296.8705 ft³ (US Survey)



Construction Continues

Construction Continues

Lessons Learned & Next Steps

Next Steps for VTrans

Lessons Learned

- Walk before you run
- Bring everyone along together
  - Internal and external partners, all disciplines and departments
- Always upgrade to the latest software (ORD, OBM, iTwin)

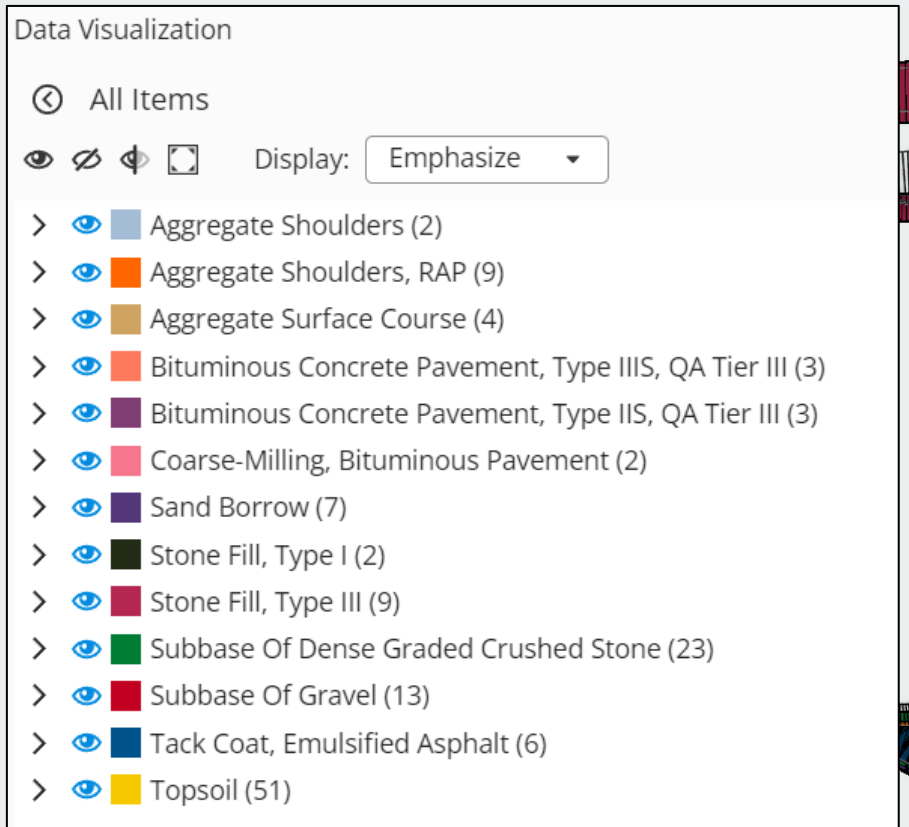
Next Steps

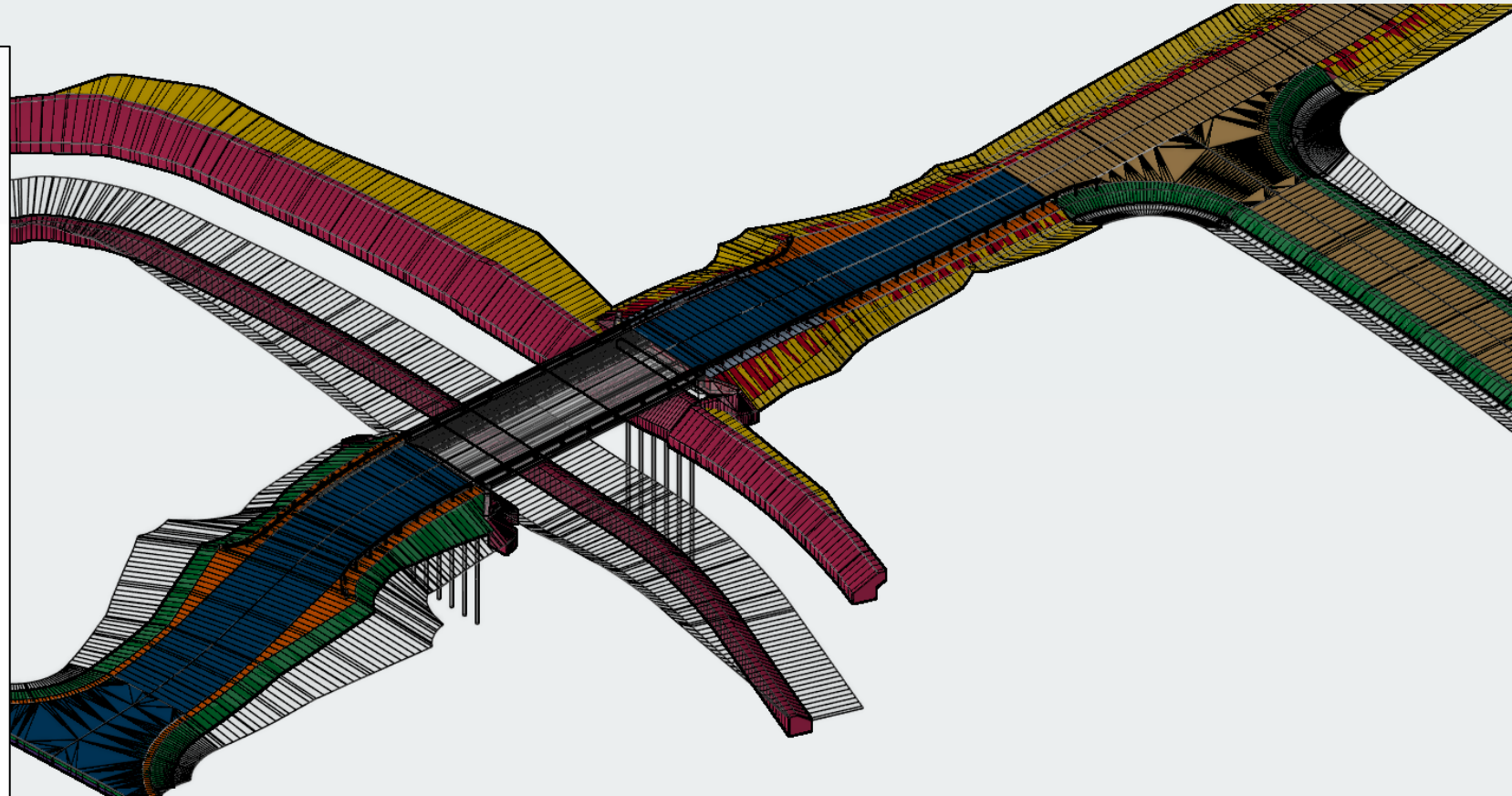
- VTrans Digital Delivery Working Group continues
  - Developing a 5-year road map
  - Need to learn how to review 3D Models
  - Need to learn how to navigate ROW and permitting
  - Looking to identify future pilot projects
  - ADCMS Grants

Next Steps for VTrans

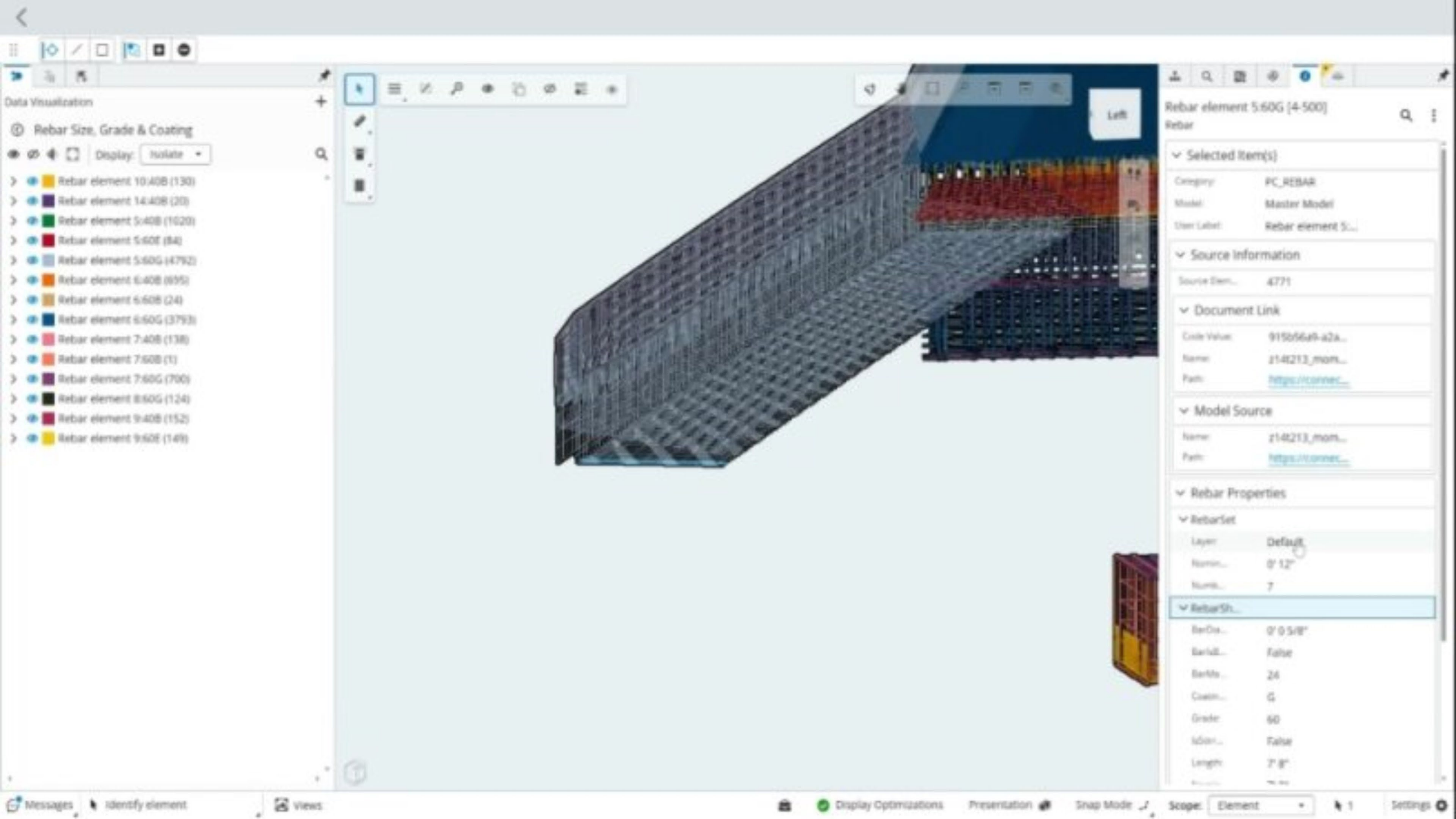
Chester BO 1442(39) project final design MALD

- Contractor Input During Design (2024)
- Construction (2026-2027)





iTwin Demo


Data Visualization
Rebar Size, Grade & Coating
Display:
Isolate
Rebar element 10:40B (130)
Rebar element 14:40B (20)
Rebar element 5:40B (1020)
Rebar element 5:60E (84)
Rebar element 5:60G (4792)
Rebar element 6:40B (695)
Rebar element 6:60B (24)
Rebar element 6:60G (3793)
Rebar element 7:40B (138)
Rebar element 7:60B (1)
Rebar element 7:60G (700)
Rebar element 8:60G (124)
Rebar element 9:40B (152)
Rebar element 9:60E (149)
Left
Rebar element 5:60G [4-500]
Rebar
Selected Item(s)
Category
PC_REBAR
Model
Master Model
User Label
Rebar element 5:...
Source Information
Source Elem...
4771
Document Link
Code Value
915056a9-a2a...
Name
z148213_mom...
Path
https://connec...
Model Source
Name
z148213_mom...
Path
https://connec...
Rebar Properties
RebarSet
Layer
Default
Numbe...
0' 12"
Numb...
7
RebarSh...
BarDia...
0' 0 5/8"
BarIsB...
False
BarMa...
24
Coatin...
G
Grade
60
IsDist...
False
Length
7' 8"
Messages
Identify element
Views
Display Optimizations
Presentation
Snap Mode
Scope:
Element
1
Settings

Questions/Discussion

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