

discipline | Intensity | collaboration | shared ownership | solutions



# LiDAR Case Studies in Transportation Design

## Wilson & Company

TAKING SHARED OWNERSHIP IN ROADWAY DESIGN SUCCESS



# Safety



- ▶ 2 minutes to start our meetings with a safety brief.
- ▶ 2 seconds to recognize our surroundings.
- ▶ Knowing 2 different ways to perform our tasks safely.



# Introductions



Whit Lynn, Geospatial Project Manager



Will Knight, PLS, Midwest Survey Manager



# LiDAR Overview

- ▶ LiDAR: Light Detection And Ranging
- ▶ A Remote Sensing tool that uses focused light to measure distances to objects
- ▶ Active Sensor
- ▶ Airborne – Topographic and Bathymetric
- ▶ Terrestrial – Mobile and Static





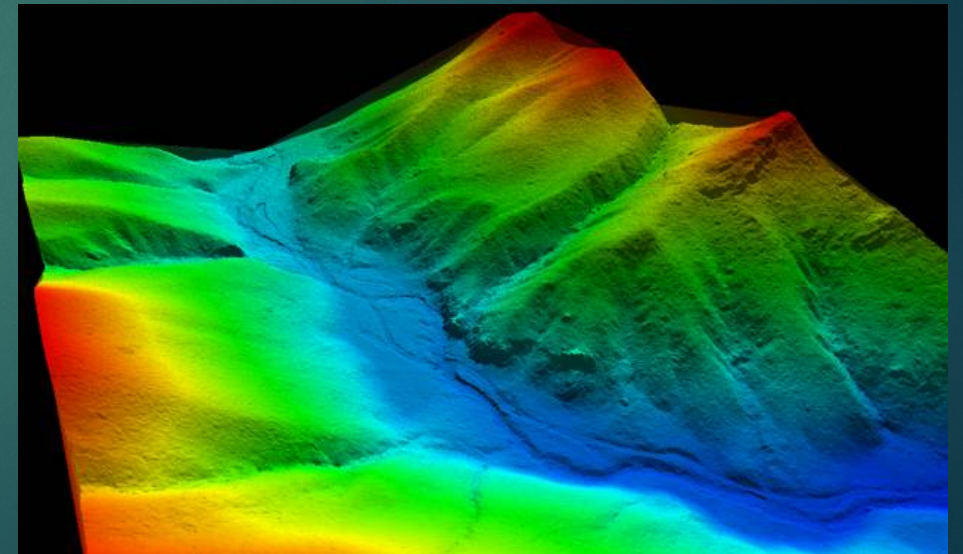
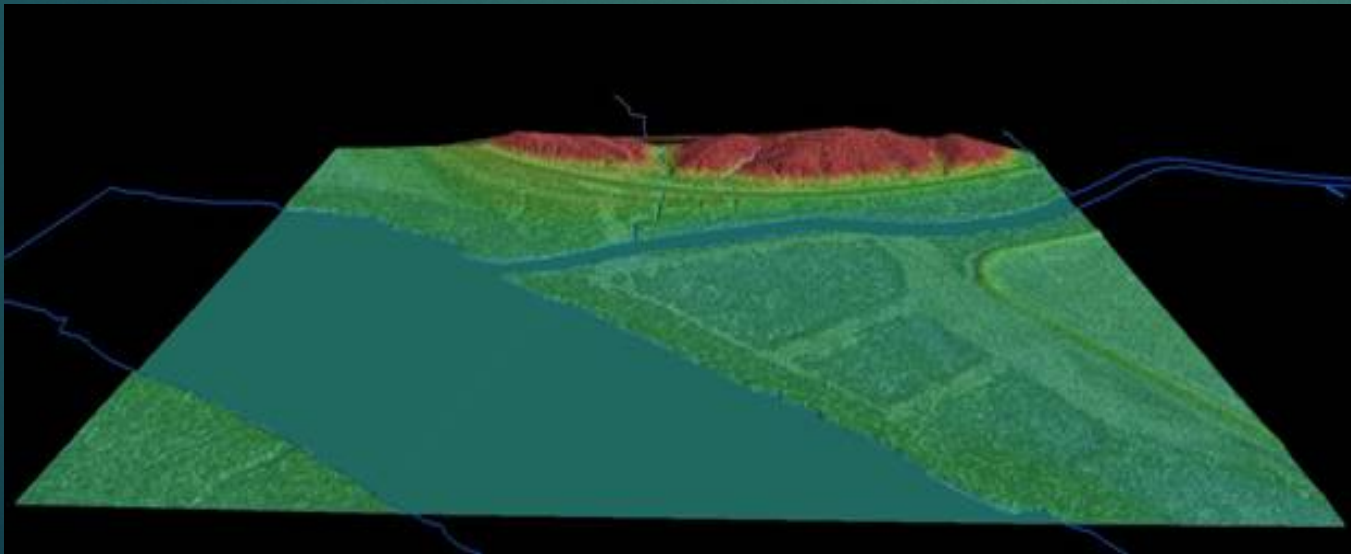
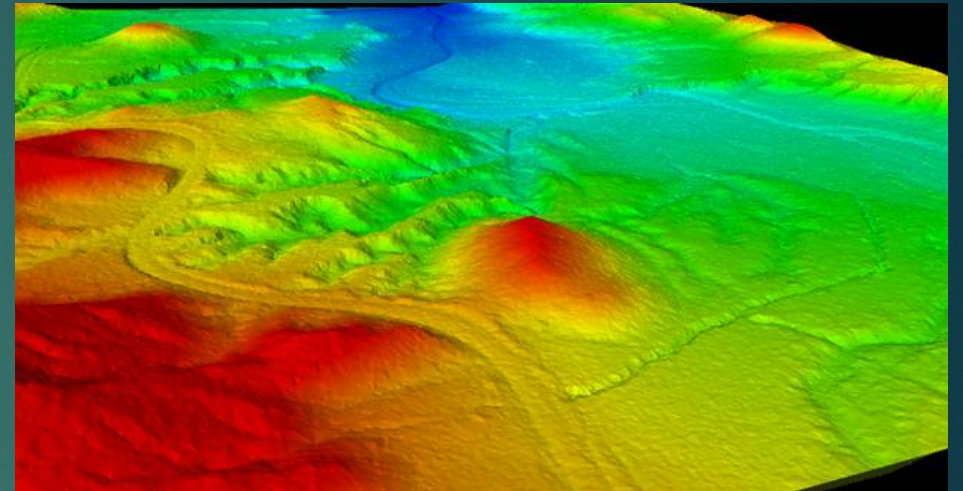
# LiDAR Platforms





# Fixed Wing LiDAR

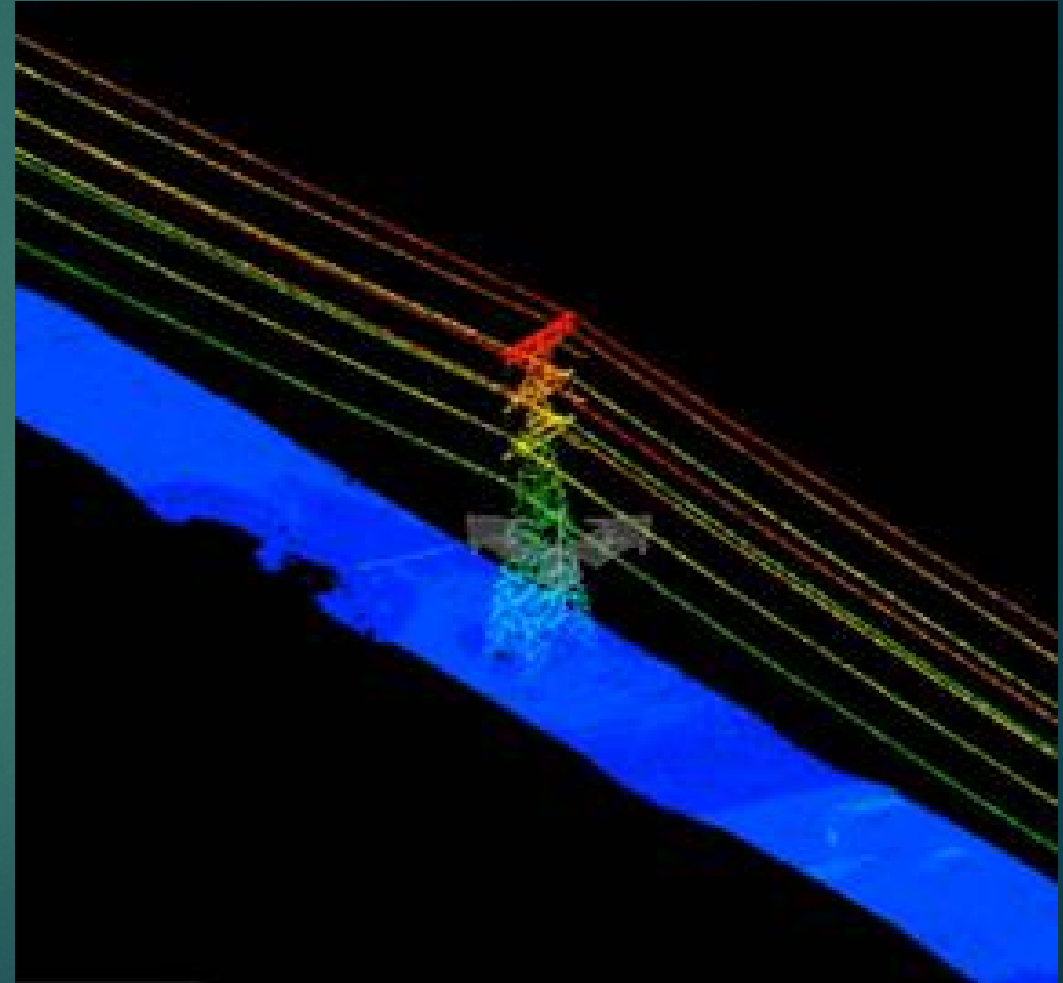
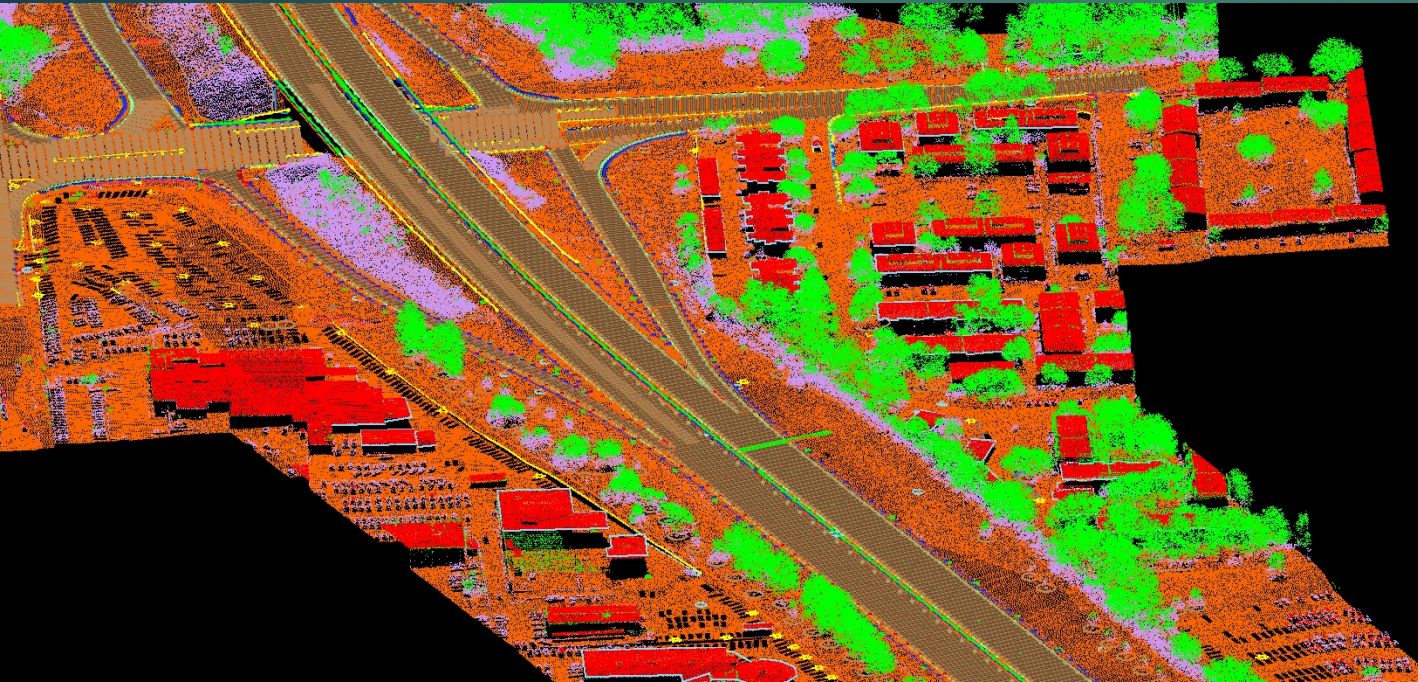
- ▶ Wide Area Mapping
- ▶ Floodplains
- ▶ Counties/States
- ▶ Landfills/Quarries/Volume Analysis
- ▶ Most 1' & 2' Contour Interval Projects





# Helicopter LiDAR

- ▶ Dense and high-accuracy datasets
- ▶ Data-Fusion: Simultaneous LiDAR & Imagery
- ▶ Corridor Mapping
- ▶ DOT
- ▶ Transmission





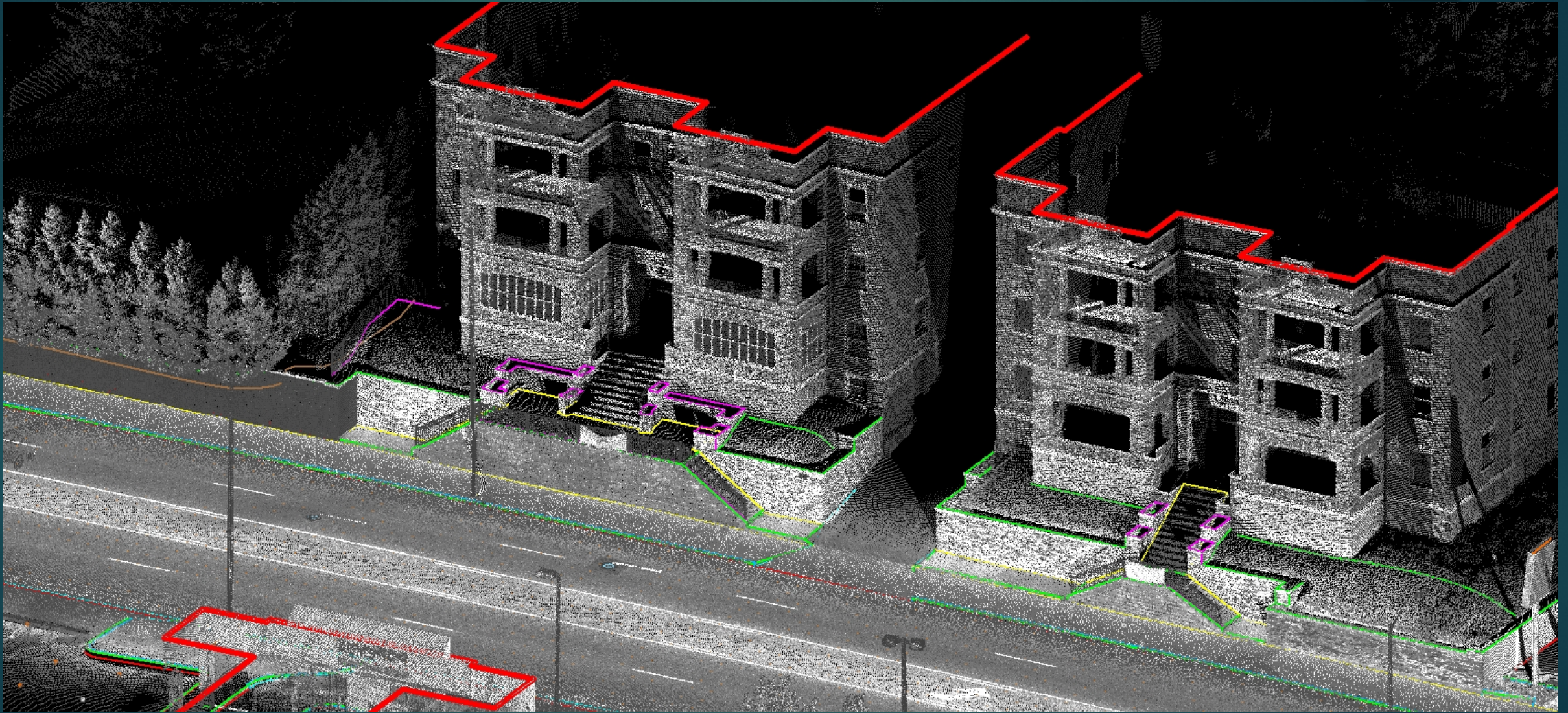
# Mobile LiDAR

- ▶ Most often used for transportation corridor mapping
- ▶ Often utilize co-mounted sensors for simultaneous imaging and LiDAR.
- ▶ Dense and accurate datasets perfectly suited for pavement modeling and deformation studies.





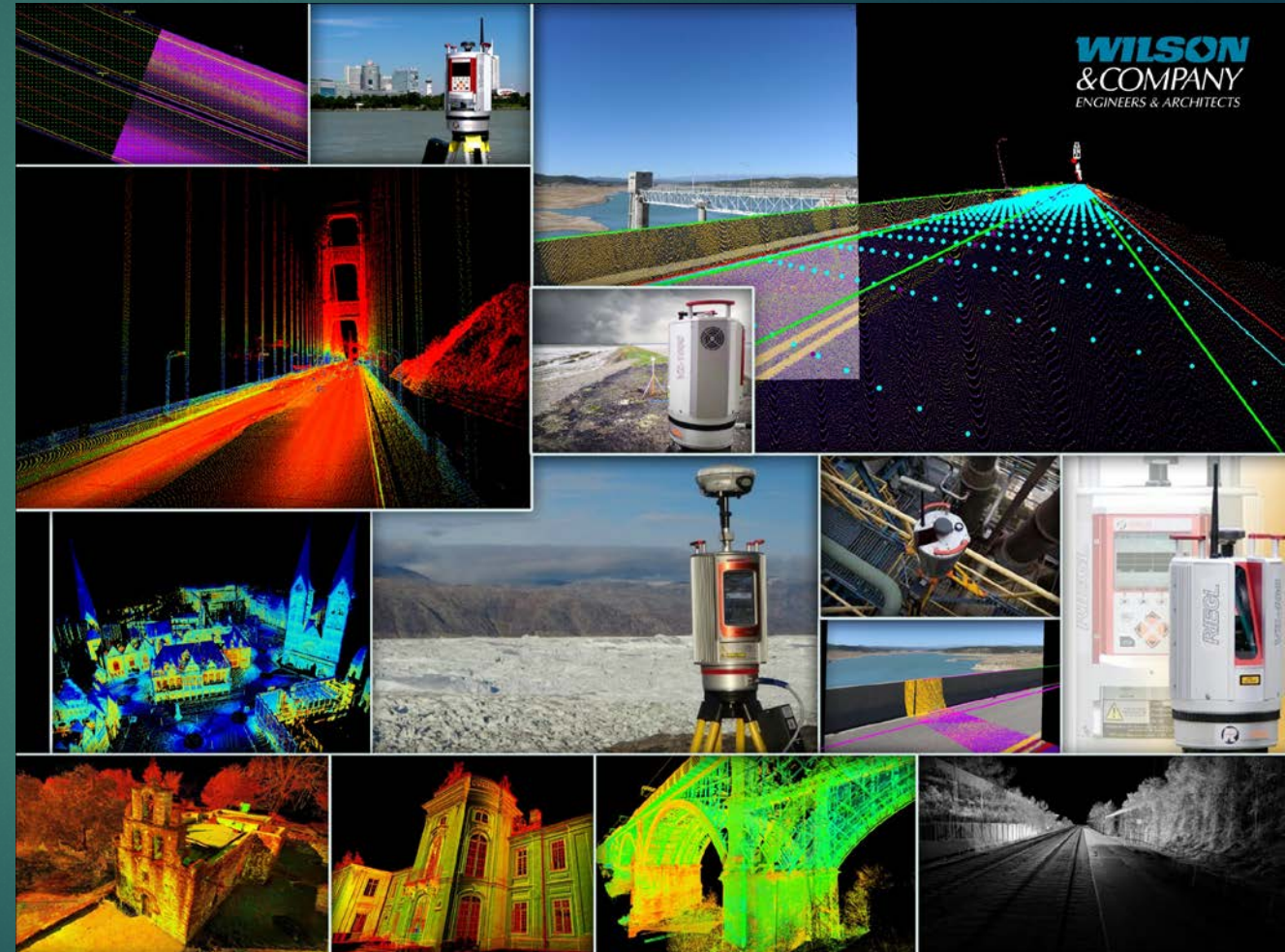
# Mobile LiDAR





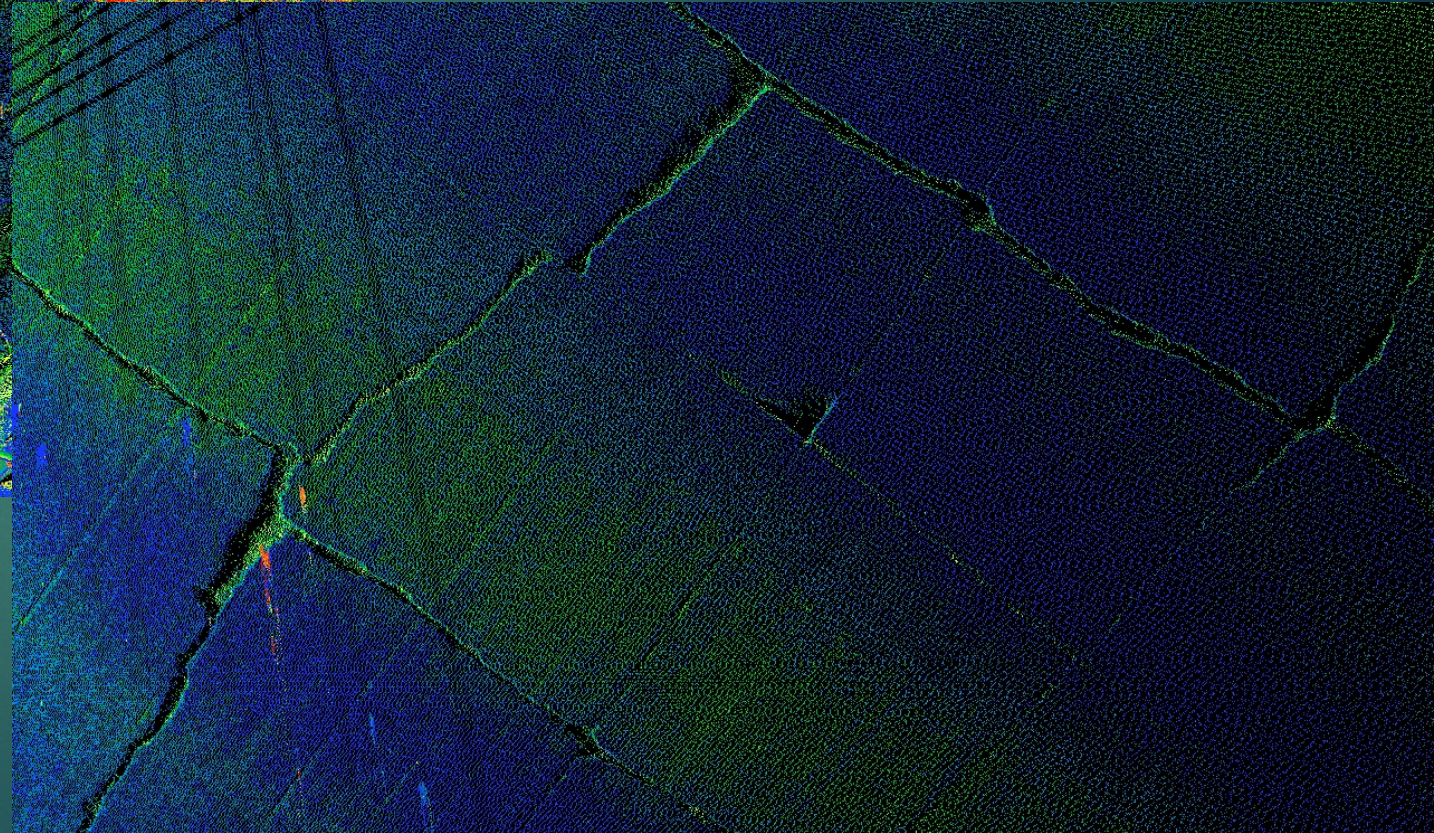
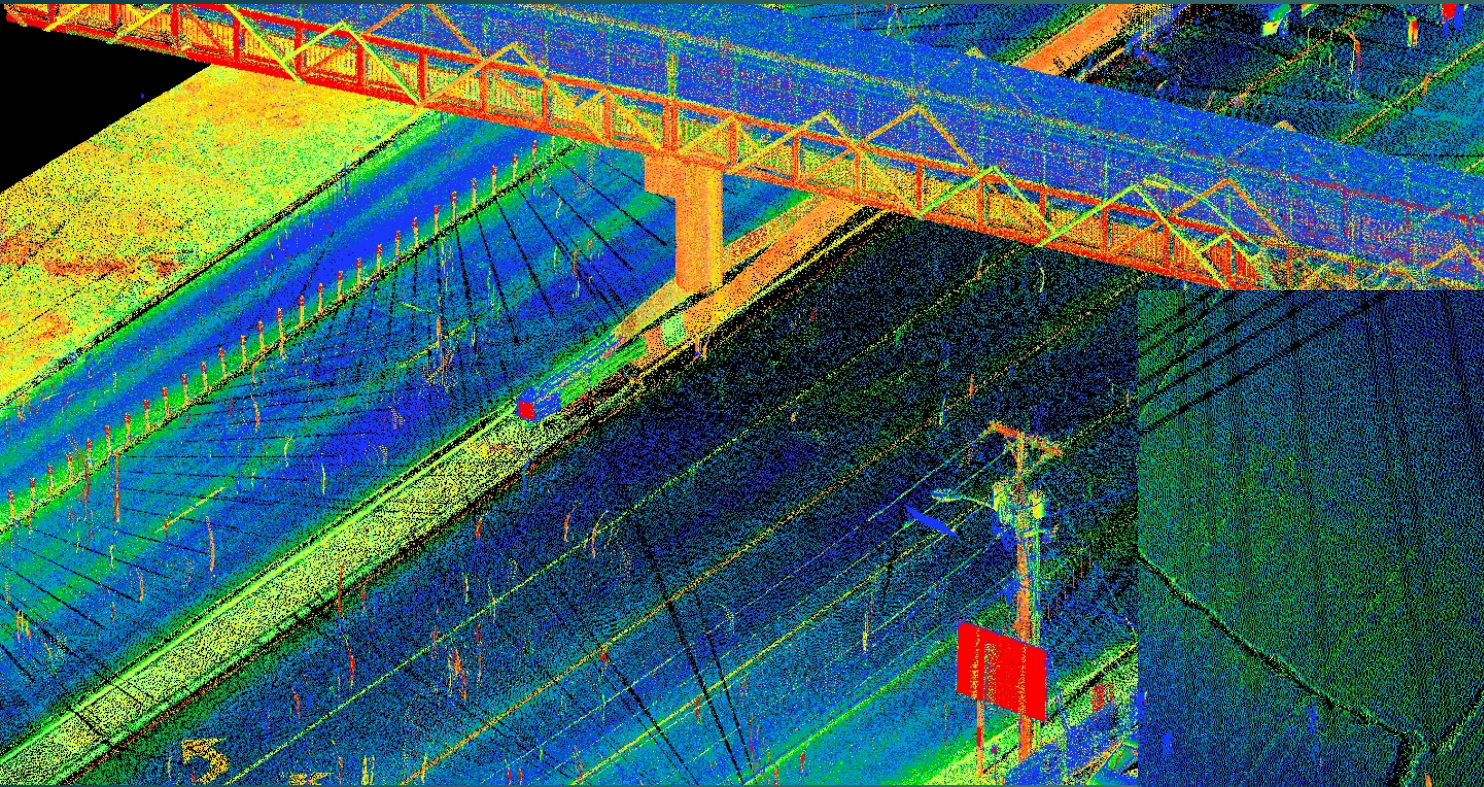
# Static LiDAR

- ▶ Extremely dense and accurate LiDAR
- ▶ Great for bridges, intersections, & short roadway corridors
- ▶ Also utilizes imaging sensor
- ▶ Riegl VZ-400
  - Tripod-based – range up to 600m
  - Up to 122,000 measurements/sec
  - 360 degree scan in minutes
  - Accompanied with 12.1 megapixel Nikon D700 for high resolution calibrated color images
  - Multiple high accuracy survey-grade registration techniques





# Static LiDAR





# The Toolbox

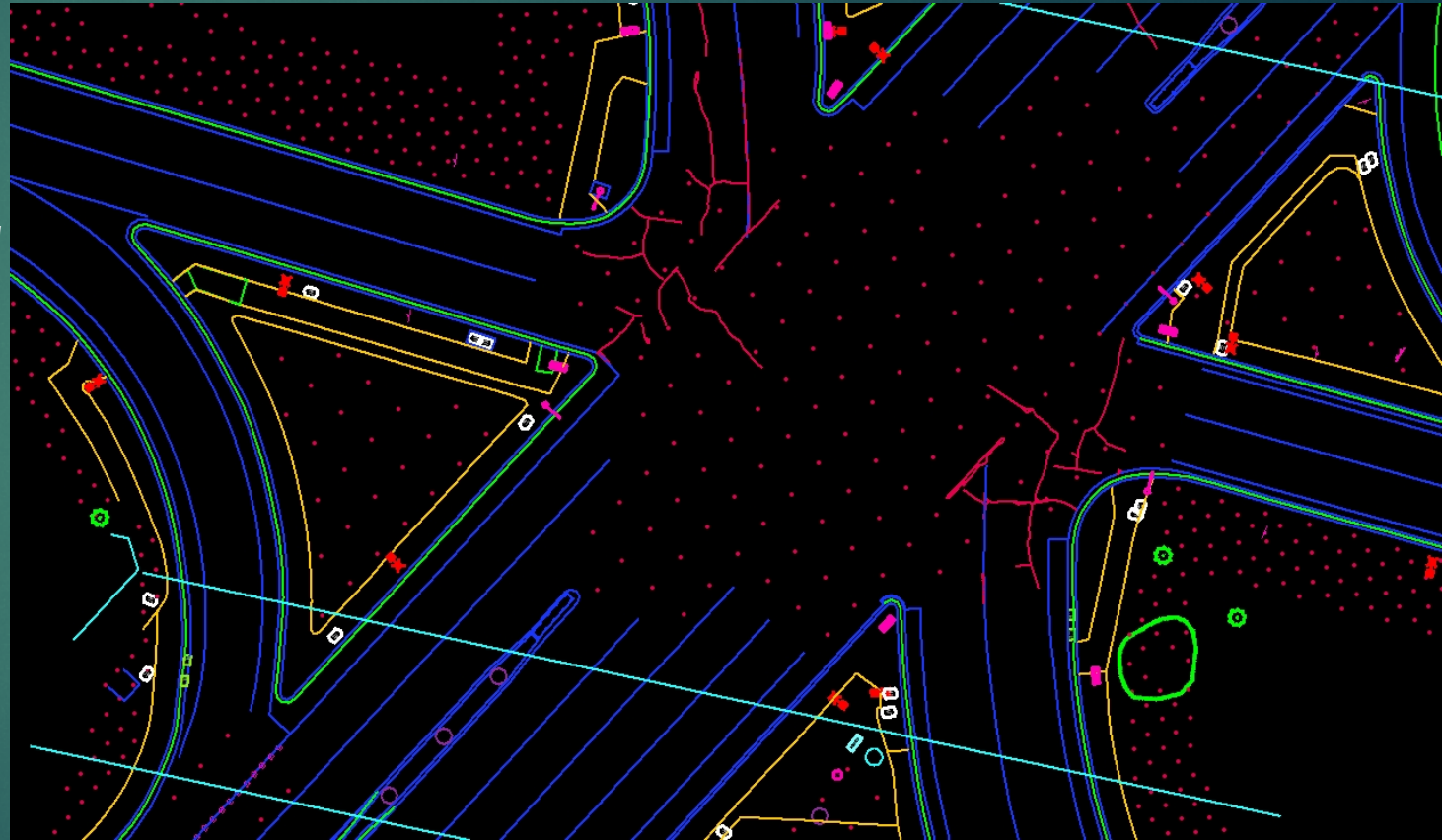
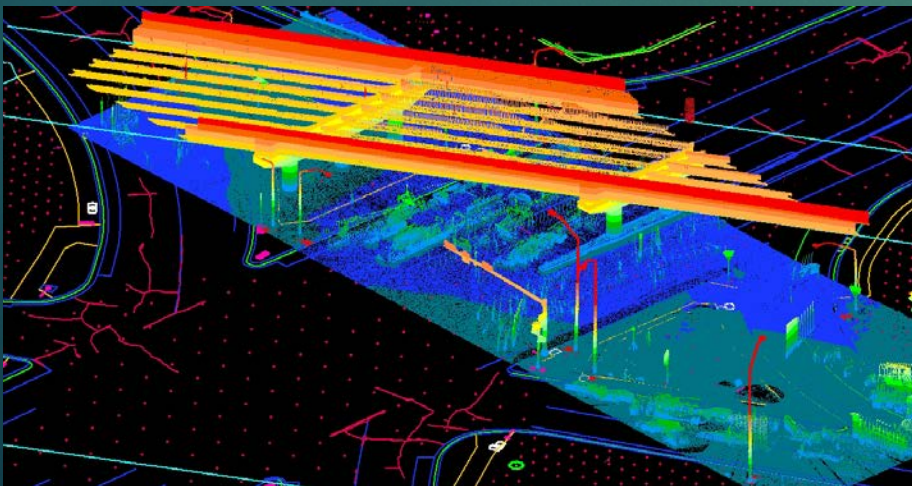
- ▶ Many tools and combinations to choose from
- ▶ Collaboration is key to receiving the best mapping for the lowest cost
- ▶ Project size, layout, and required accuracies help determine tool(s) used



# LiDAR Deliverables

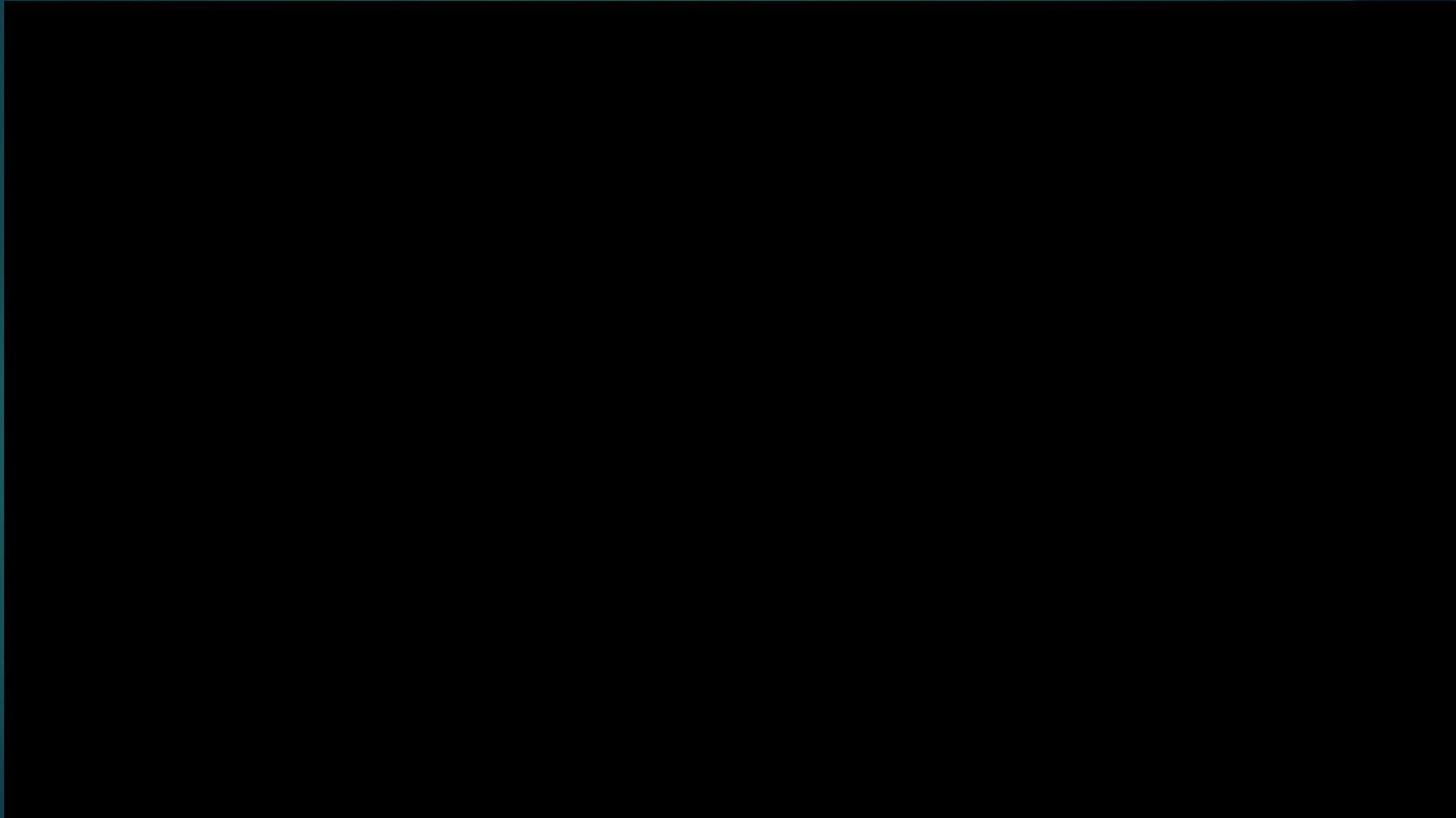
## ► Deliverables

- *Point Cloud - .LAS, ASCII, PLS-CADD*
- *CADD Products - .DGN, .DWG, .DXF*
- *Intelligent 3D Modeling / Solids Modeling*
- *Surfaces – DTM, TIN, InRoads, Geopak*
- *Contours*
- *Visualizations*





# Static LiDAR Fly-through





# Case Studies: 119<sup>th</sup> & I-35, Olathe, KS

- ▶ Bridge Redesign
- ▶ Overcapacity
- ▶ Poor Traffic Routing
- ▶ New commercial development



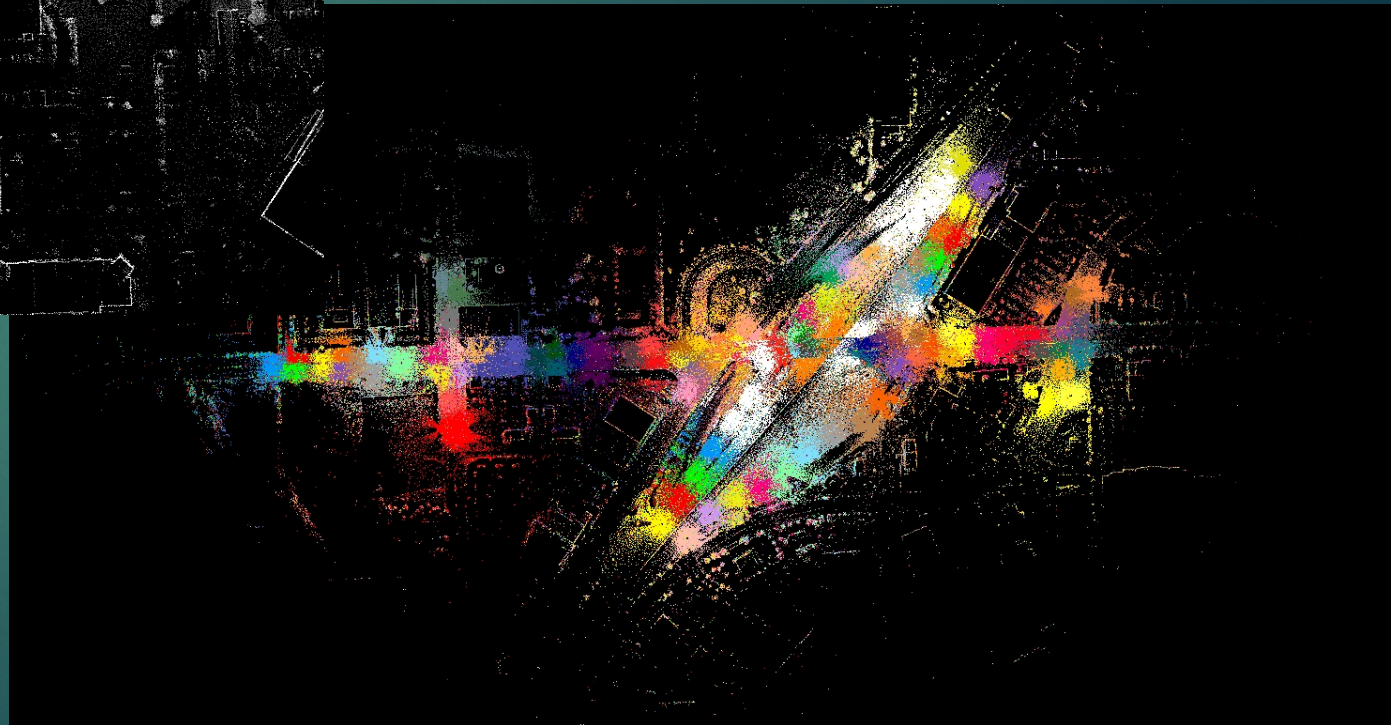


# Case Studies: 119<sup>th</sup> & I-35, Olathe, KS



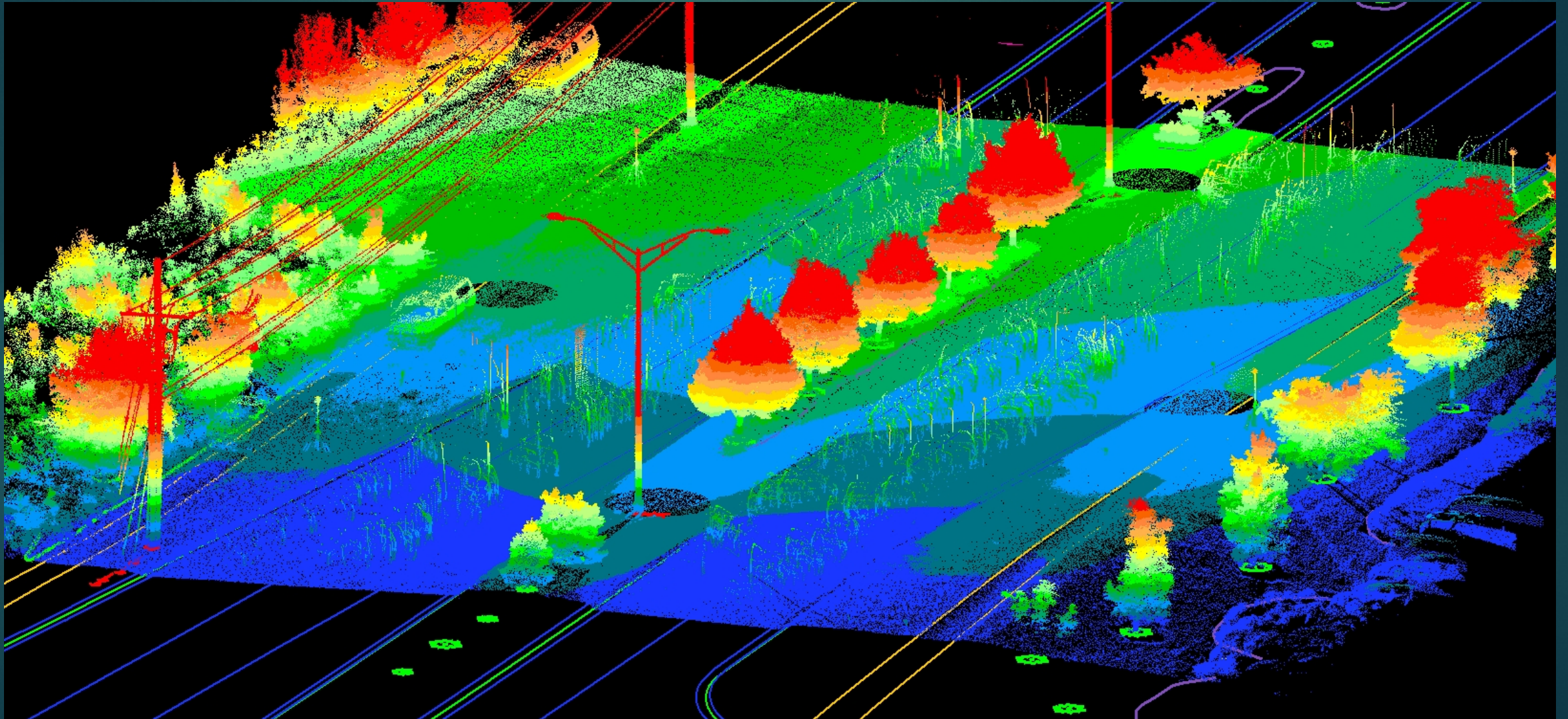


# Case Studies: 119<sup>th</sup> & I-35, Olathe, KS



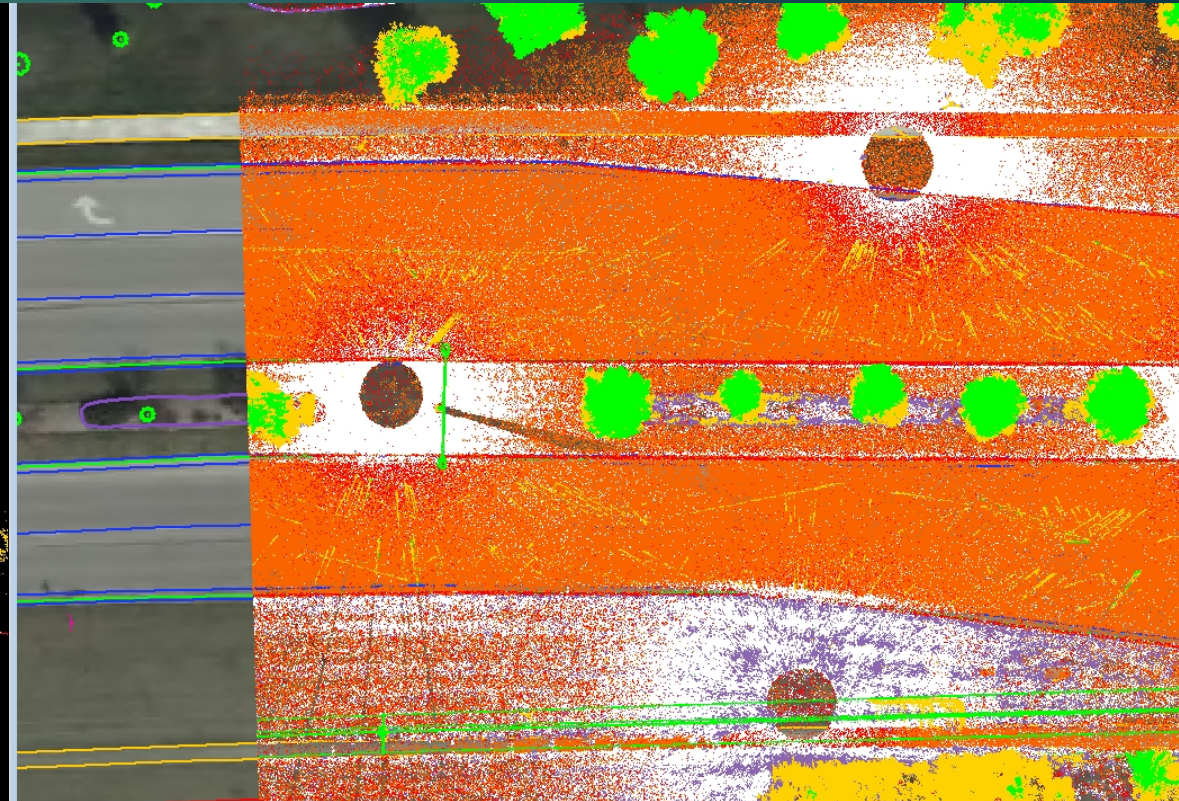


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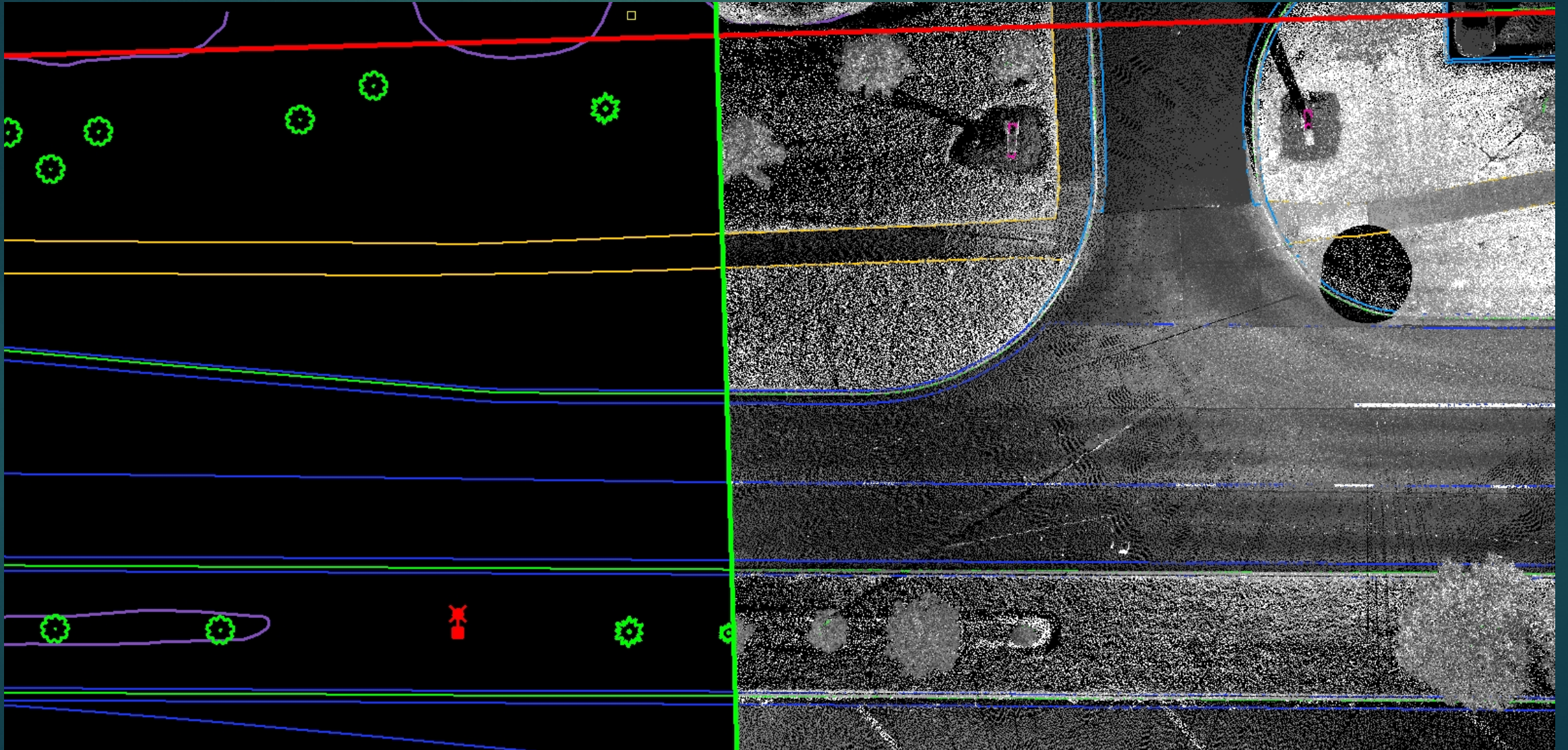


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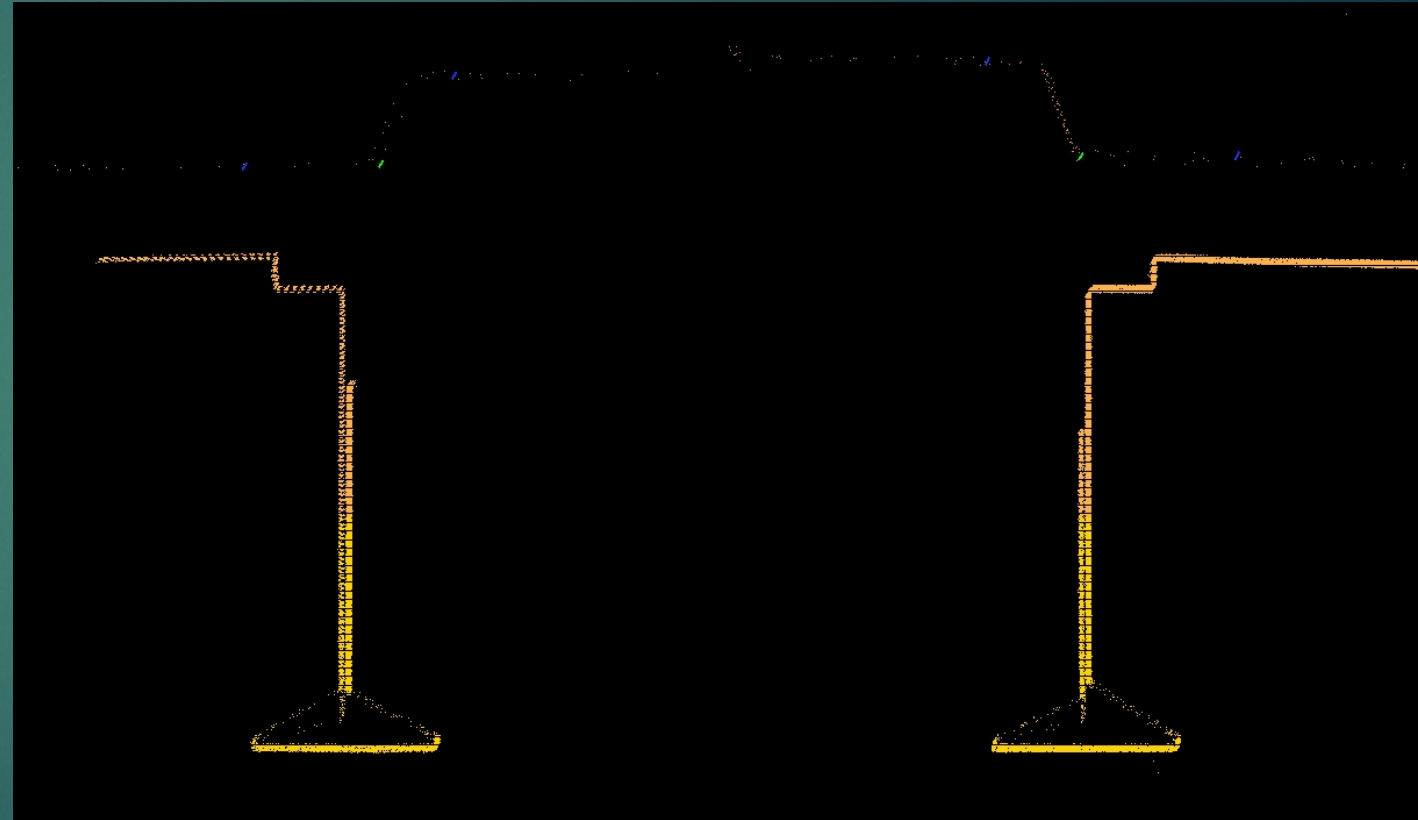
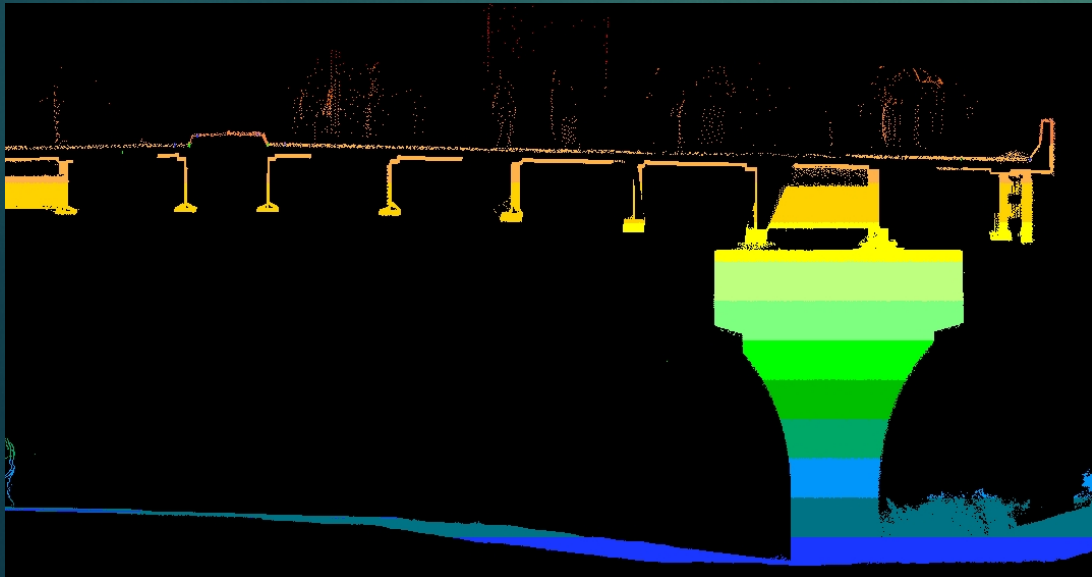
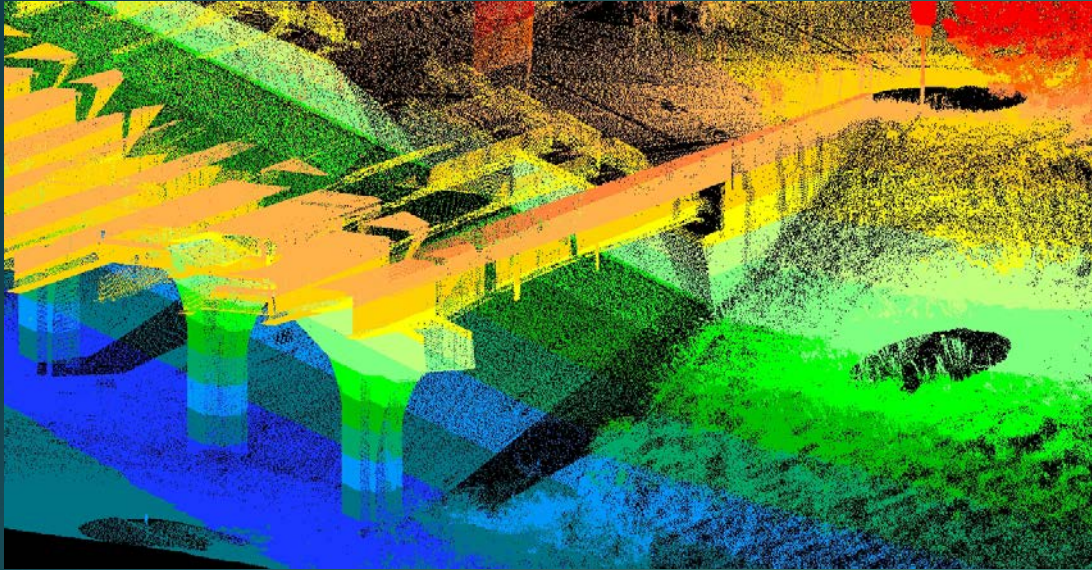


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## Why LiDAR?

- ▶ No Lane Closures
- ▶ “Hard-To-Reach” Features
- ▶ Safer Field Data Collection
- ▶ More Precise, Customized Deliverables



# Case Studies: Lewis & Clark Viaduct

- ▶ Final Design
- ▶ Precarious Location
- ▶ Survey
  - *Top of Pier*
  - *Bearing Pads*



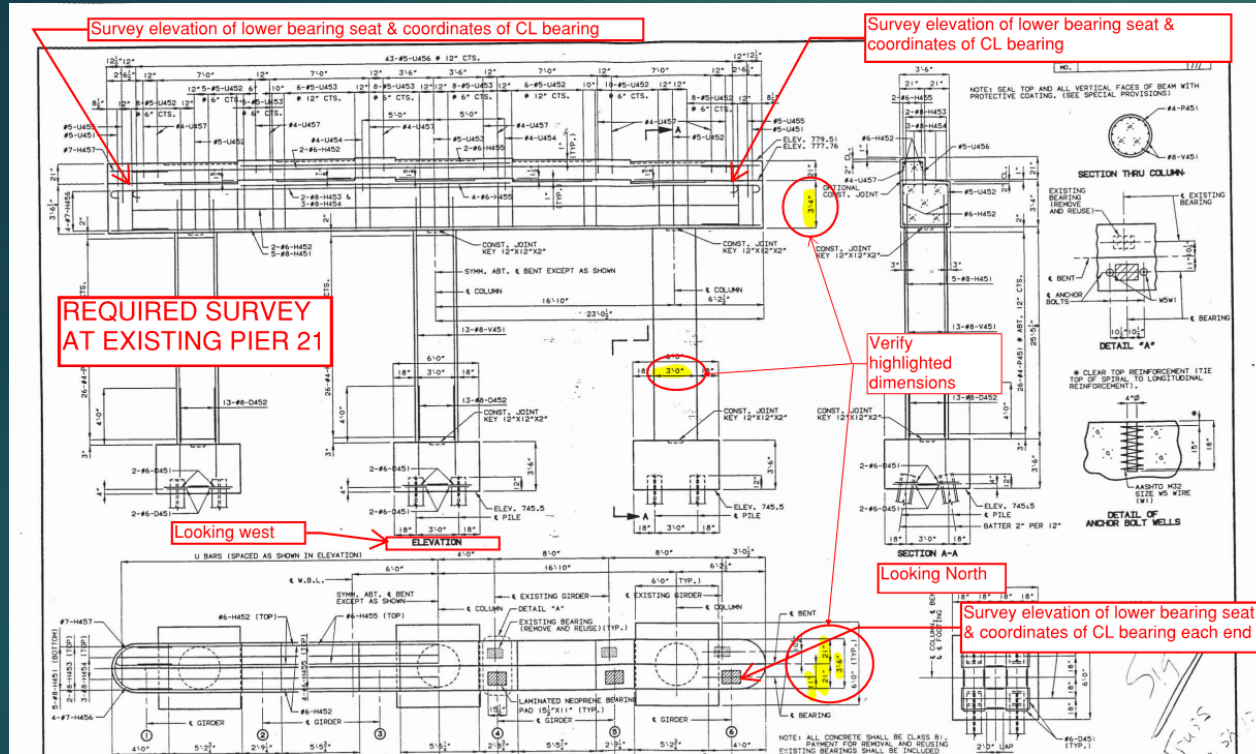


# Case Studies: Lewis & Clark Viaduct



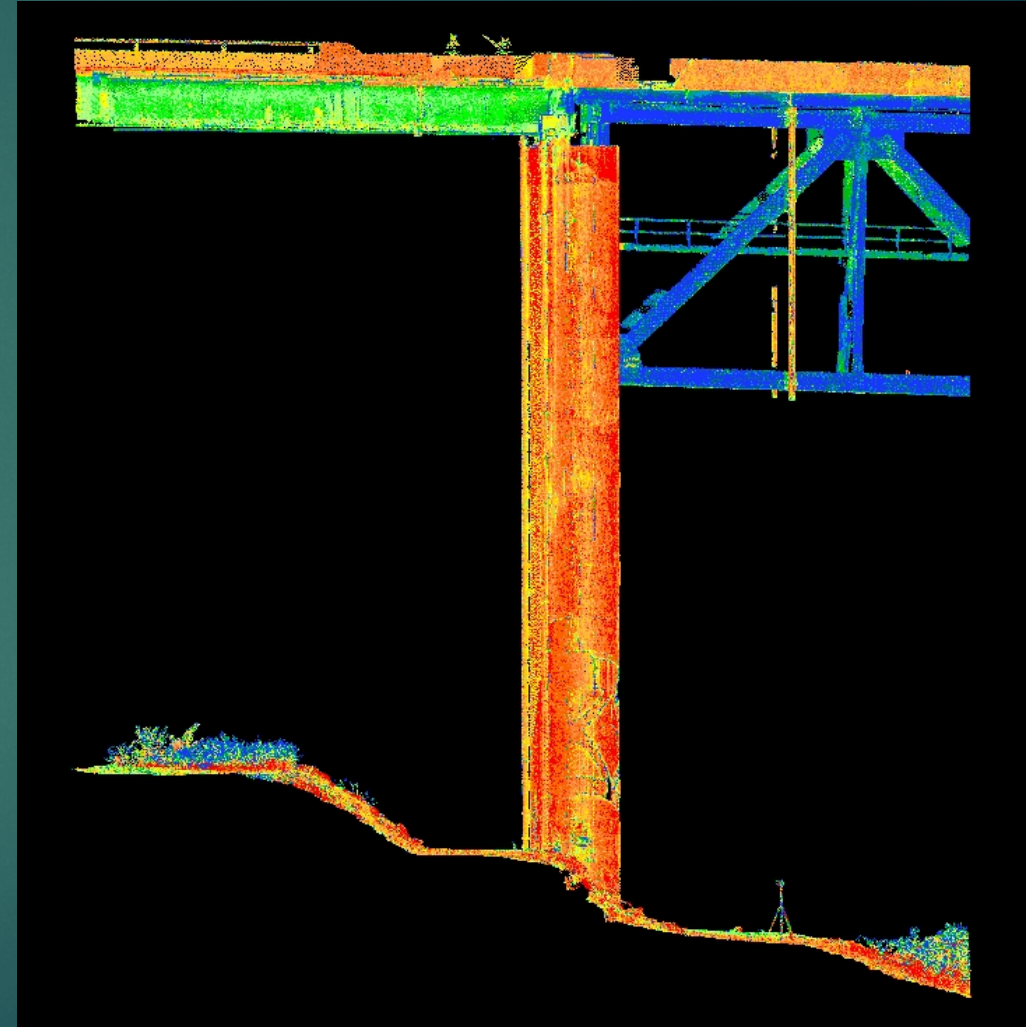
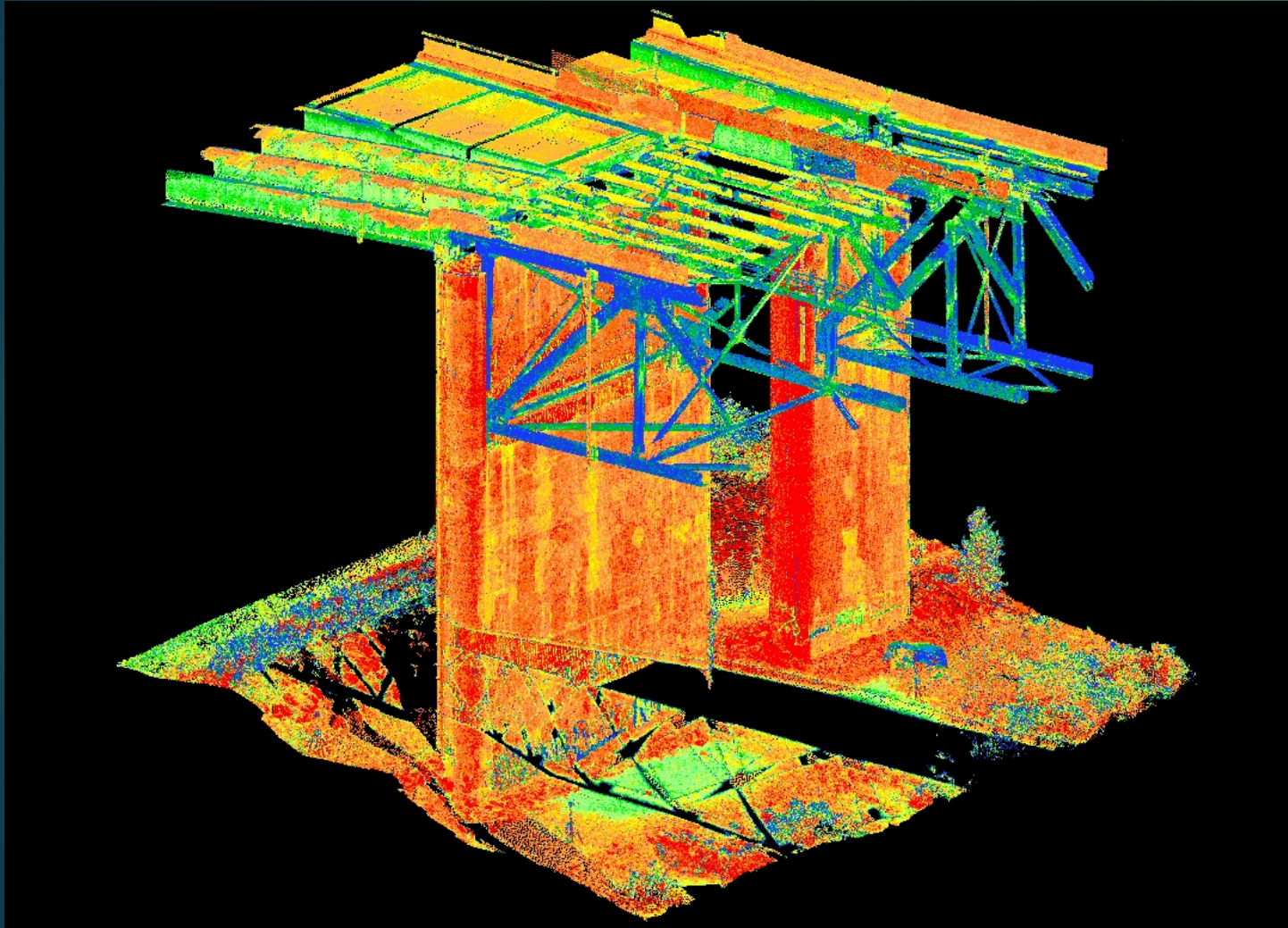


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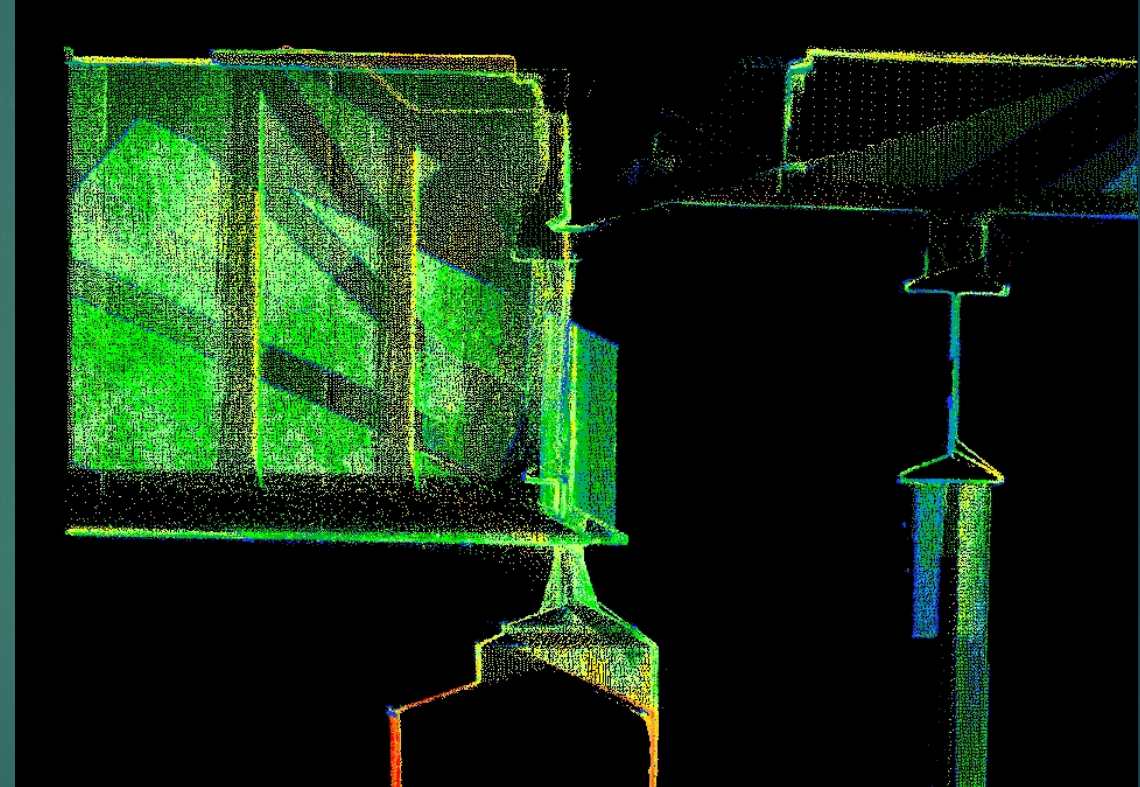
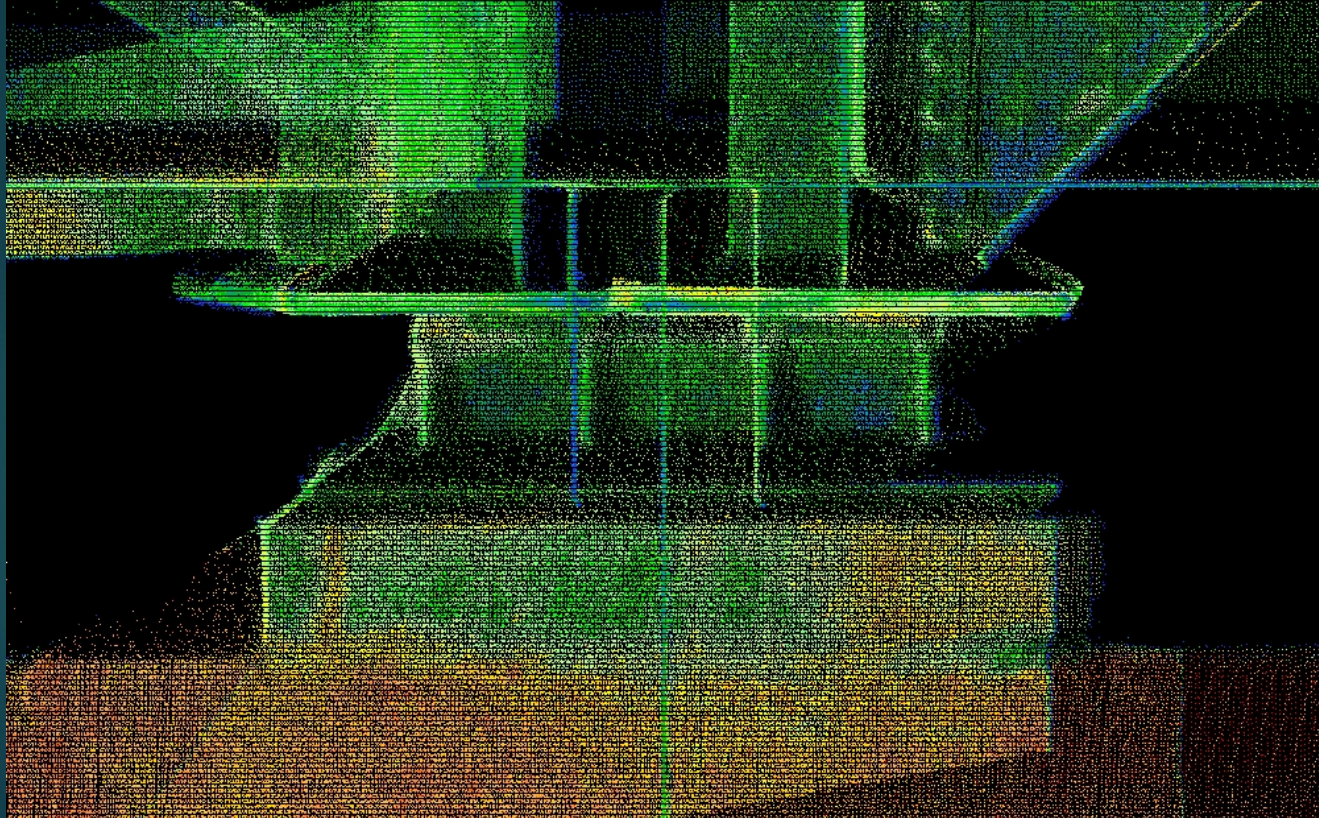


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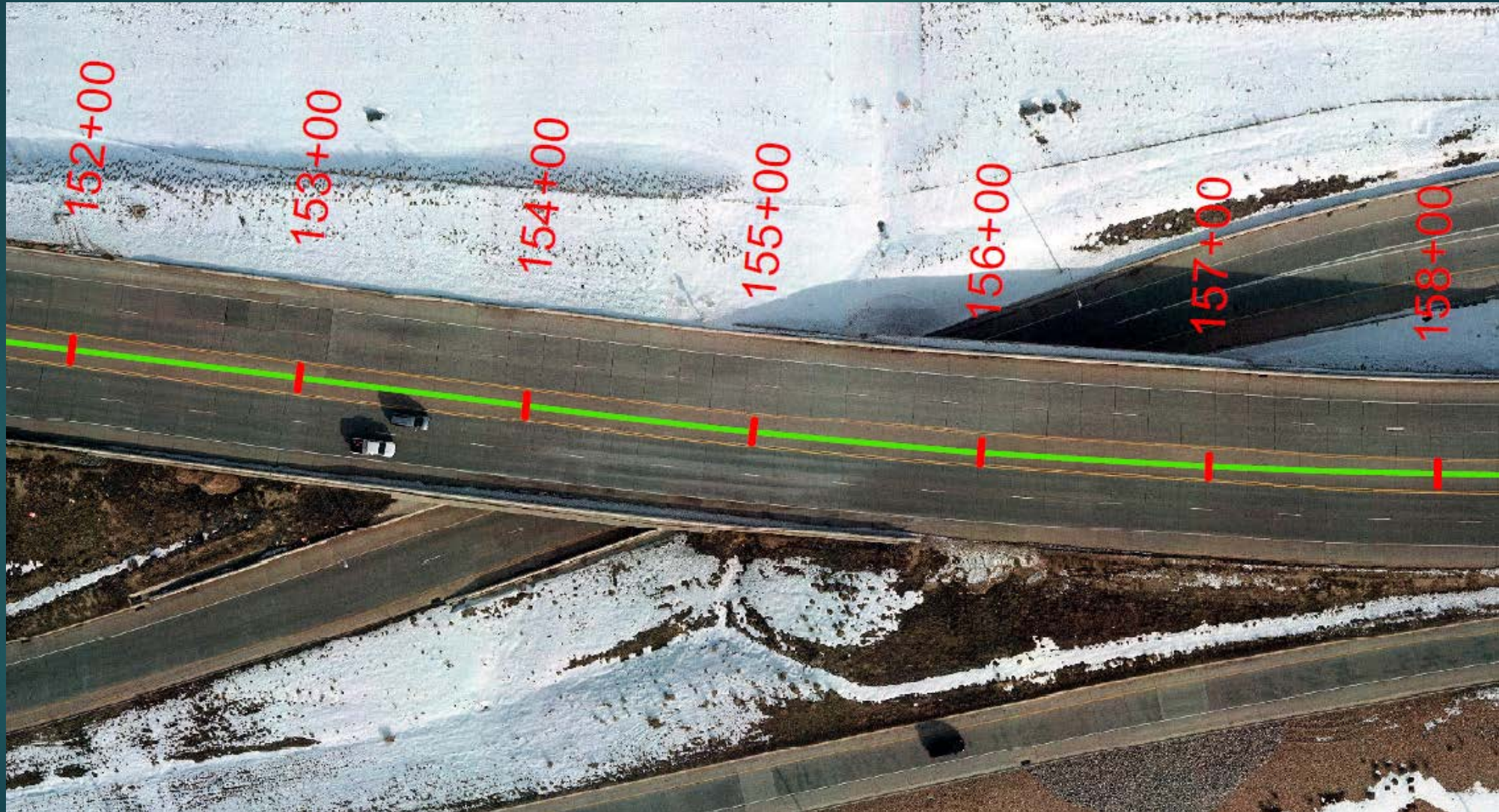


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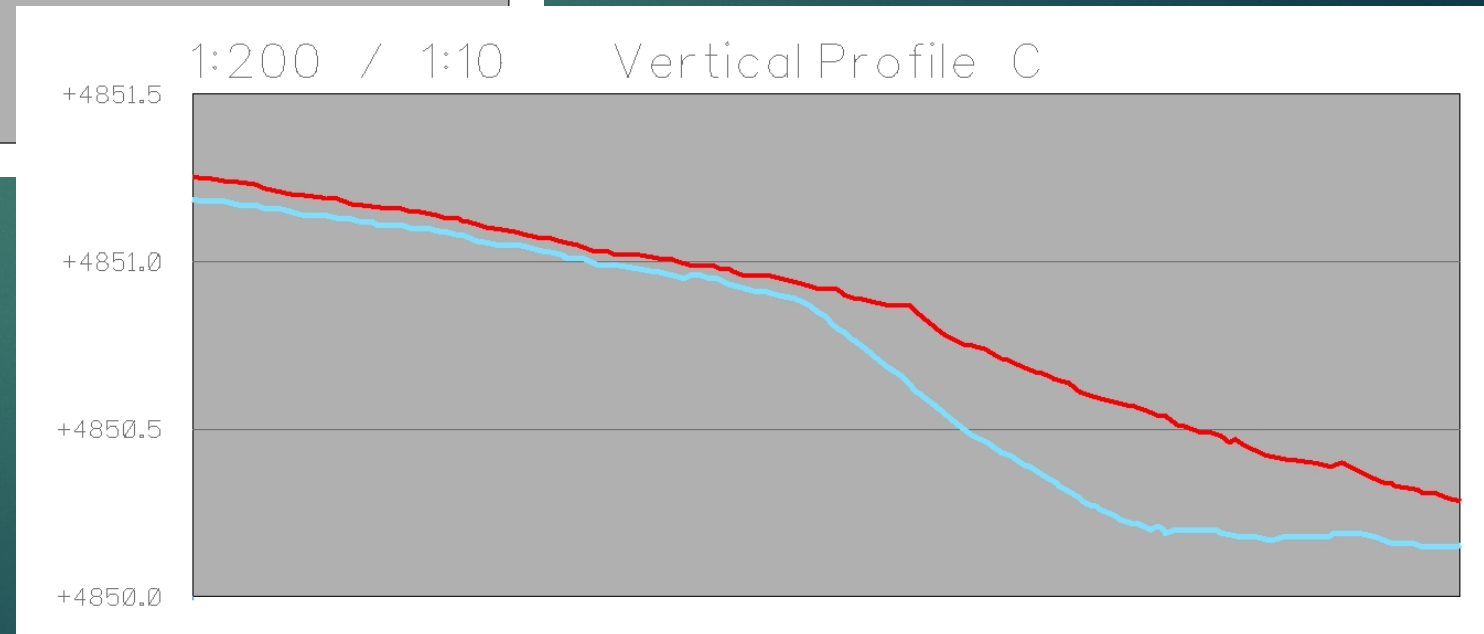
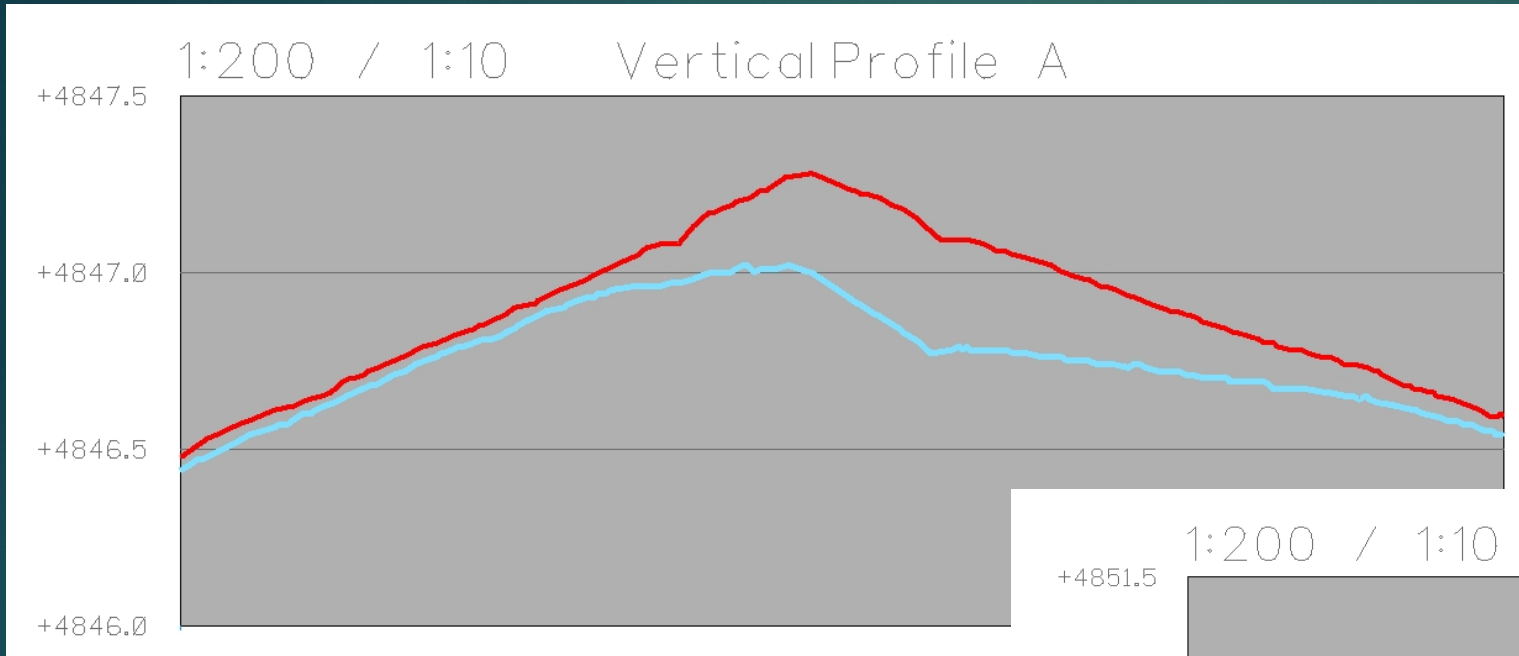


# Case Studies: LiDAR Road Analysis



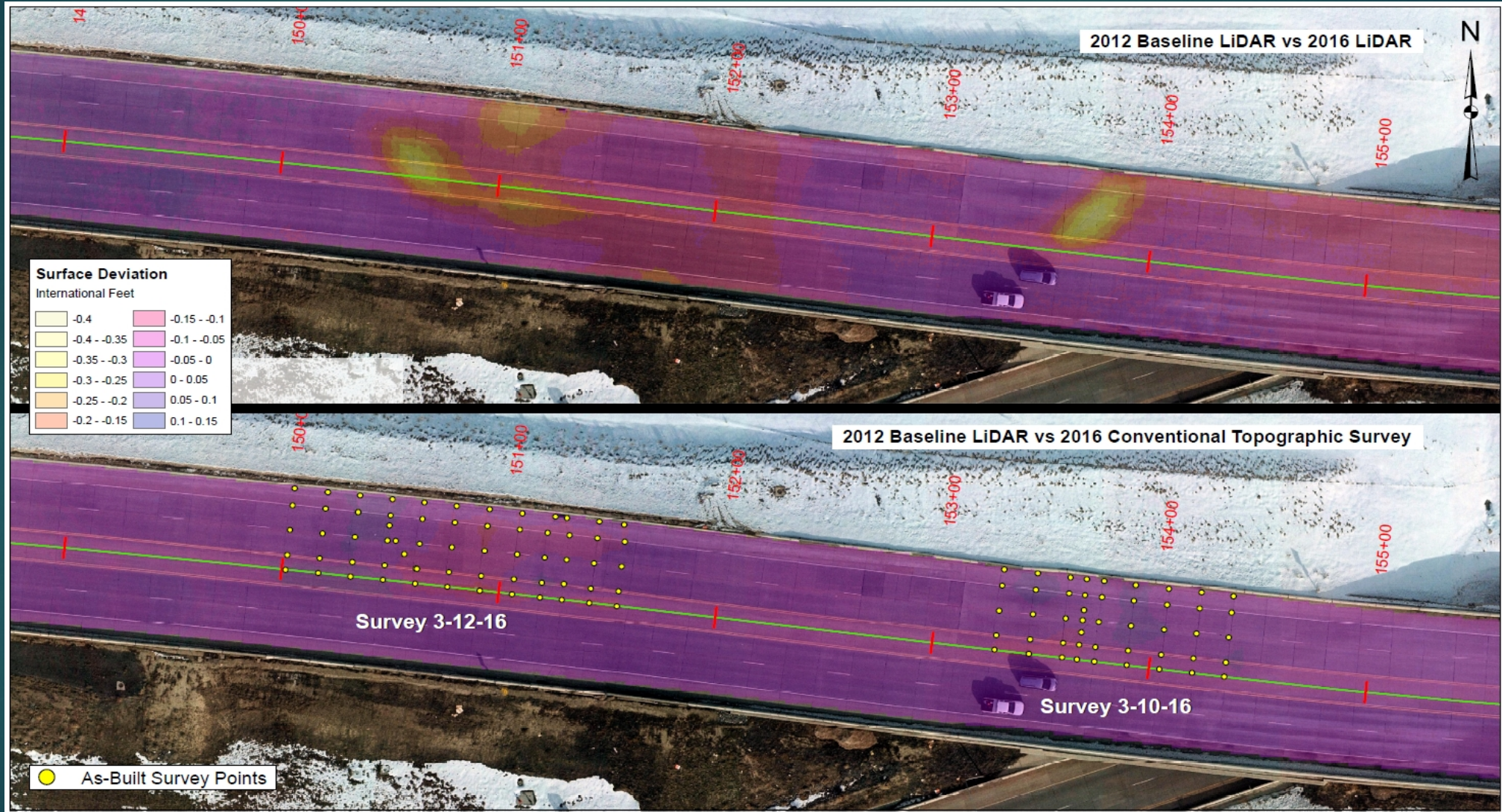


# Case Studies: LiDAR Road Analysis





# Case Studies: LiDAR Road Analysis





# Why does any of this matter?

- ▶ Safety. Keeping workers out of the travelled way limits surveyors exposure, also while minimizing traffic delays.
- ▶ New technology allows for customized solutions over traditional methods. Integrated survey solutions give a more complete dataset for designers to use. Less change orders and less contractor guesswork during construction...
- ▶ Combining (fusing) datasets requires specialized skill sets.





# Q & A

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**WILSON**  
& COMPANY



# Bonus Time...

## Questions: (Time to interact)

- ▶ What point density do you typically use?
  - *4-8ppm for topographic LiDAR with stereo imagery support. >20ppm for Transportation LiDAR & Ortho*
- ▶ When would you recommend using a higher point density?
  - *Possibly when no imagery is being acquired, and definitely if the transportation features will be modeled.*
- ▶ What kind of items will LIDAR not pickup (i.e.- what will we still need to pickup with ground survey)?
  - *We use a combination of imagery, LiDAR and ground survey to extract more than just a LiDAR point cloud would identify, however some features are still too small or obscured to accurately be represented. Utilities, right-of-way, land corners, etc.*



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