



MOBILE MAPPING



**GeoSmart Asia – Locate 18
ESP Associates, P.A.**





ABOUT ESP

- Founded in 1986 (28 Years of Experience with DOT's)
- ESP has 14 offices throughout the US
- 37 States, Canada, and Australia
- 400 employees
- ENR 500 (#299)
- Began Mobile Mapping in 2010



MOBILE LIDAR / ASSET MGT.

- Improve efficiency by capturing the most possible data at traffic speeds in a single pass
- Fully synched and georeference the data from multiple sensors
- Capture data that is relevant for GIS and Survey applications
- Extract intelligent information by automated means to the fullest extent possible
- Efficiently manage terabytes of data
 - Get it to a level that the client is comfortable
- Value Added Data – Collect Once use Many
- Safe Work Zone – NO ONE IN THE ROADWAY!



TRIMBLE MX 2, MX 7 AND MX 8 SYSTEMS





TRIMBLE MX 8 MOBILE SYSTEM





MX 8 SYSTEM



Trimble MX8 Components

- 2 - VQ 250 Lasers
- 6 – 5 megapixel cameras
- 1 - Applanix POS LV420 IMU
- 2 – Trimble GNSS GPS Receivers
- 1 – DMI unit





MX 8 SYSTEM





RIEGL VMX-1HA





RIEGL VMX-1HA

- Riegl VMX-1HA
- Applanix POS LV 610 Inertial Measurement System (IMU)
- 2 Riegl VUX-1HA lasers 1 million points per sec X 2 (2,000,000/sec)
- 4 Riegl 5mp cameras
- 1 Flir Ladybug 5 30 mp camera
- 1 Nikon D-800 36 mp DSLR (High Res Photos)



MX 8 SYSTEM UPGRADES



Trimble MX8 Upgrades

- Detachable Hy-Rail system
- Dalsa Spyder Pavement Imaging Camera
- High Intensity Light Bar
- IR Illuminator
- Ladybug5





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MOBILE LIDAR / ASSET MGT.

Data Asset Extraction

- Sign / Pole Inventory
- Infrastructure Inventory
- Bridge Clearances
- Lane Markings
- Walls
- Bulkheads
- Utility lines
- Oblique LiDAR and Photo

Pavement DTM Details

Hydroplane Detection

Roadway Cross Sections

Asbuilt – Existing Condition

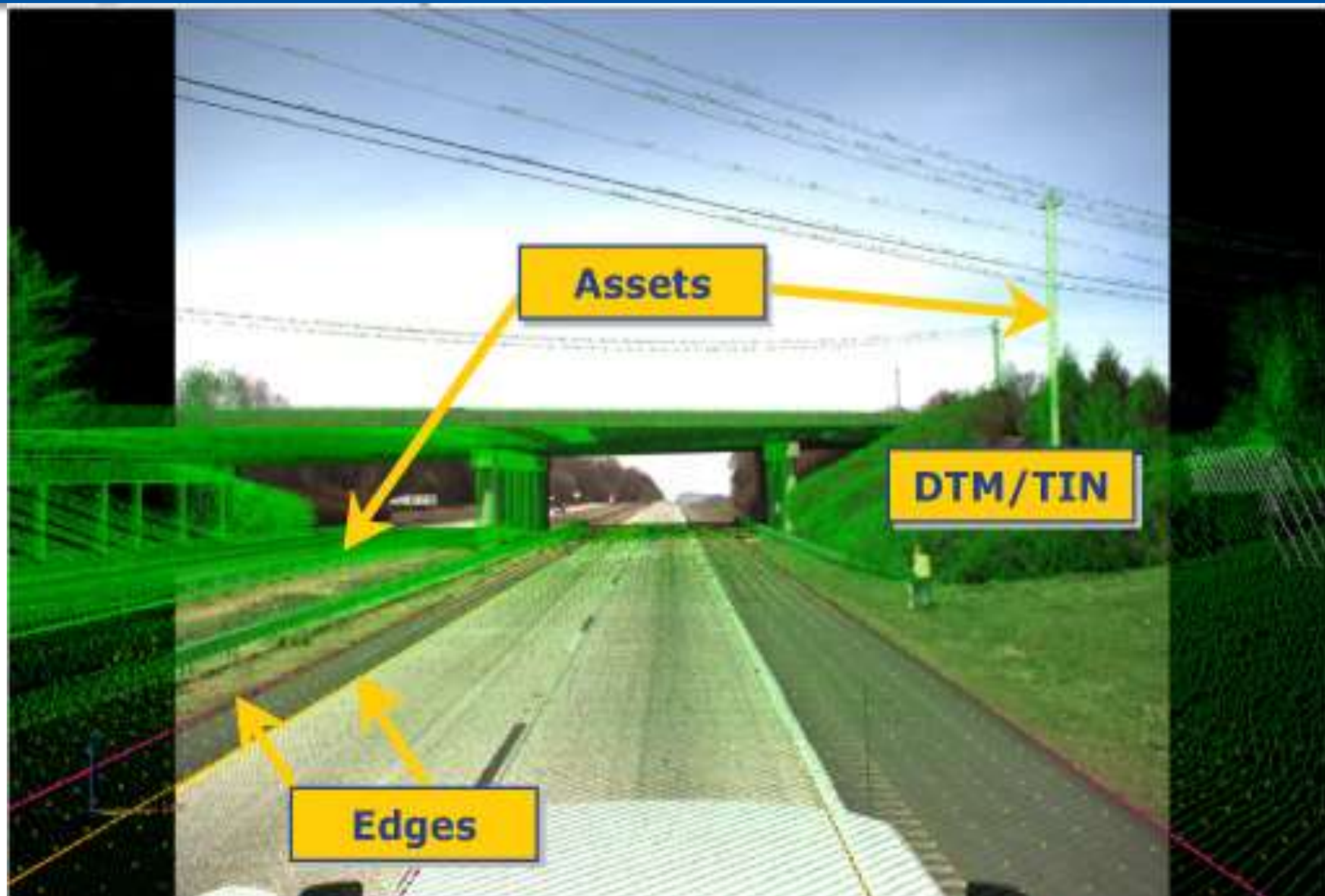
Floodplain Mapping and Risk Analysis

Storm Inventory

Hi-Rail Surveys

SUE designation location

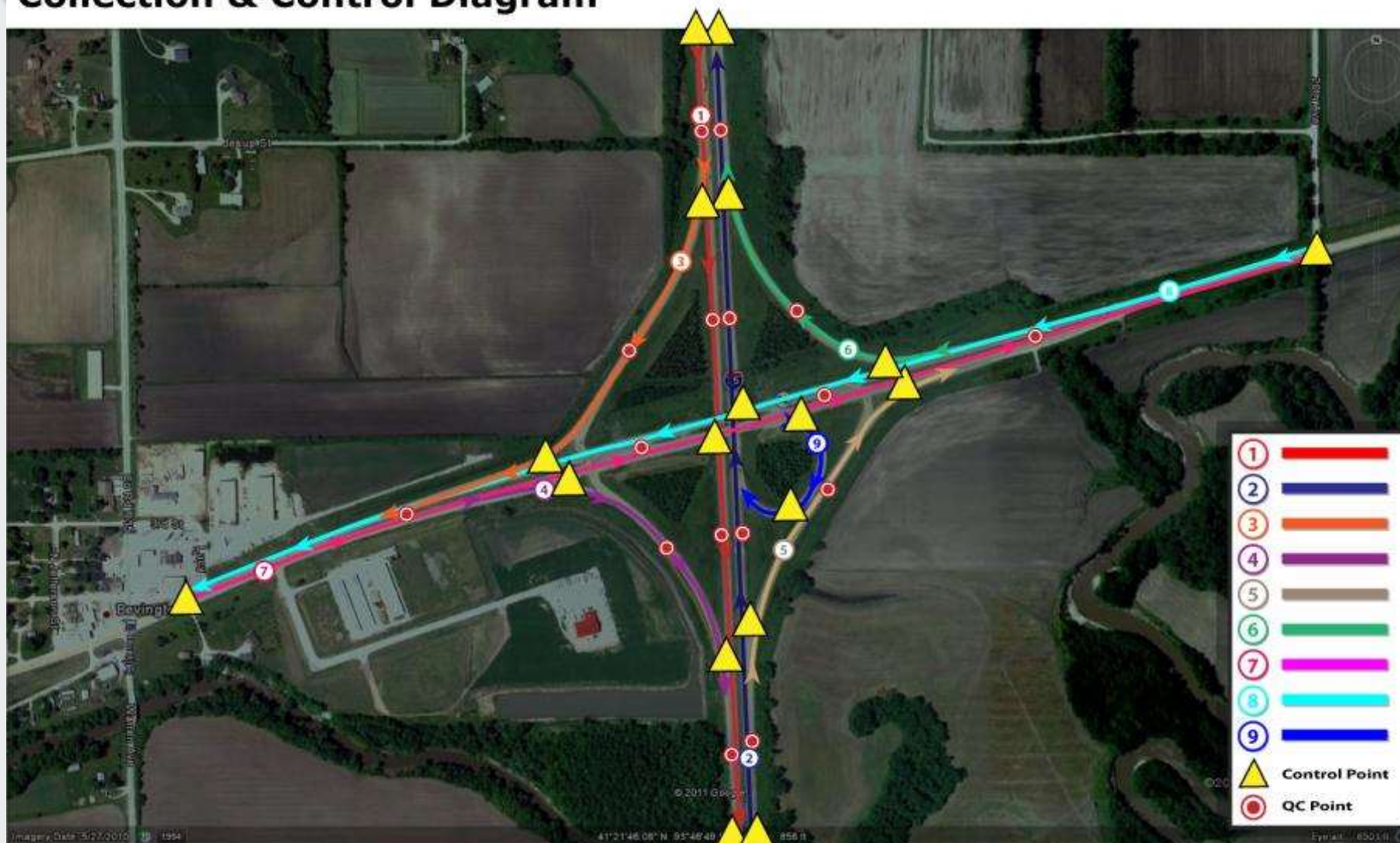
LIDAR / PHOTOS = PRODUCTION





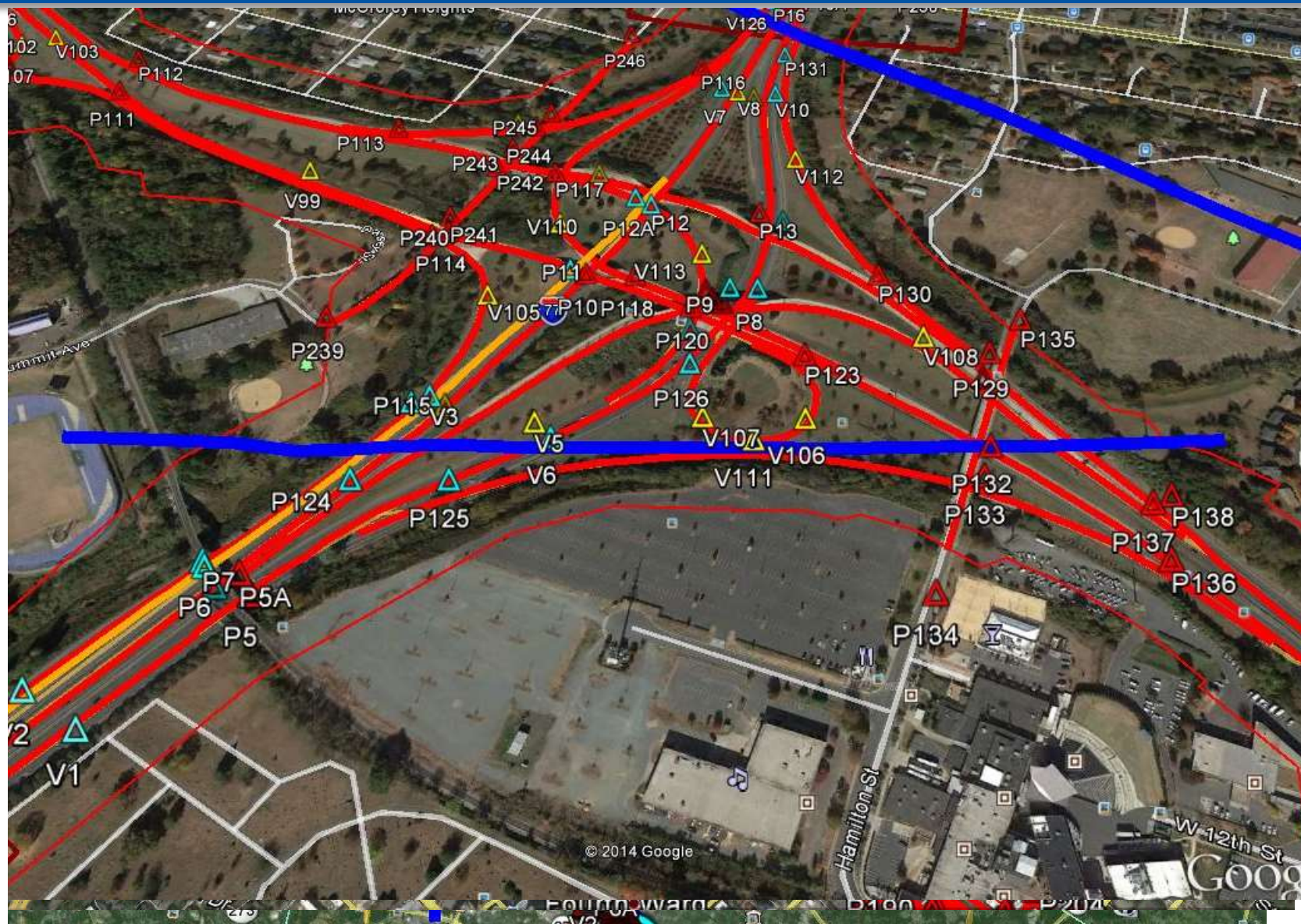
TYPICAL CONTROL LAYOUT

Collection & Control Diagram





I 77 - I 277 - I 485 - I 85 MOBILE MAPPING



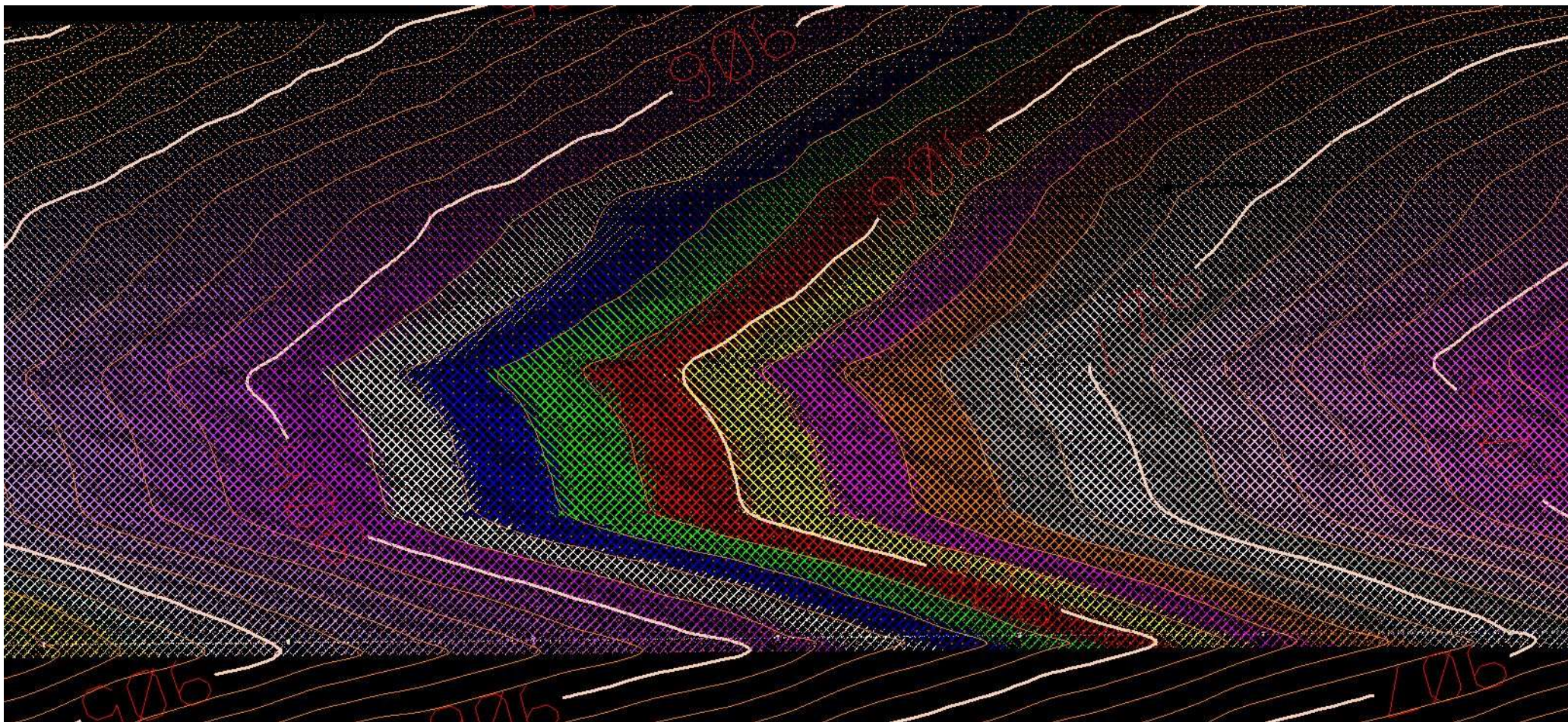


I 77 - I 277 – I 485 – I 85 MOBILE MAPPING



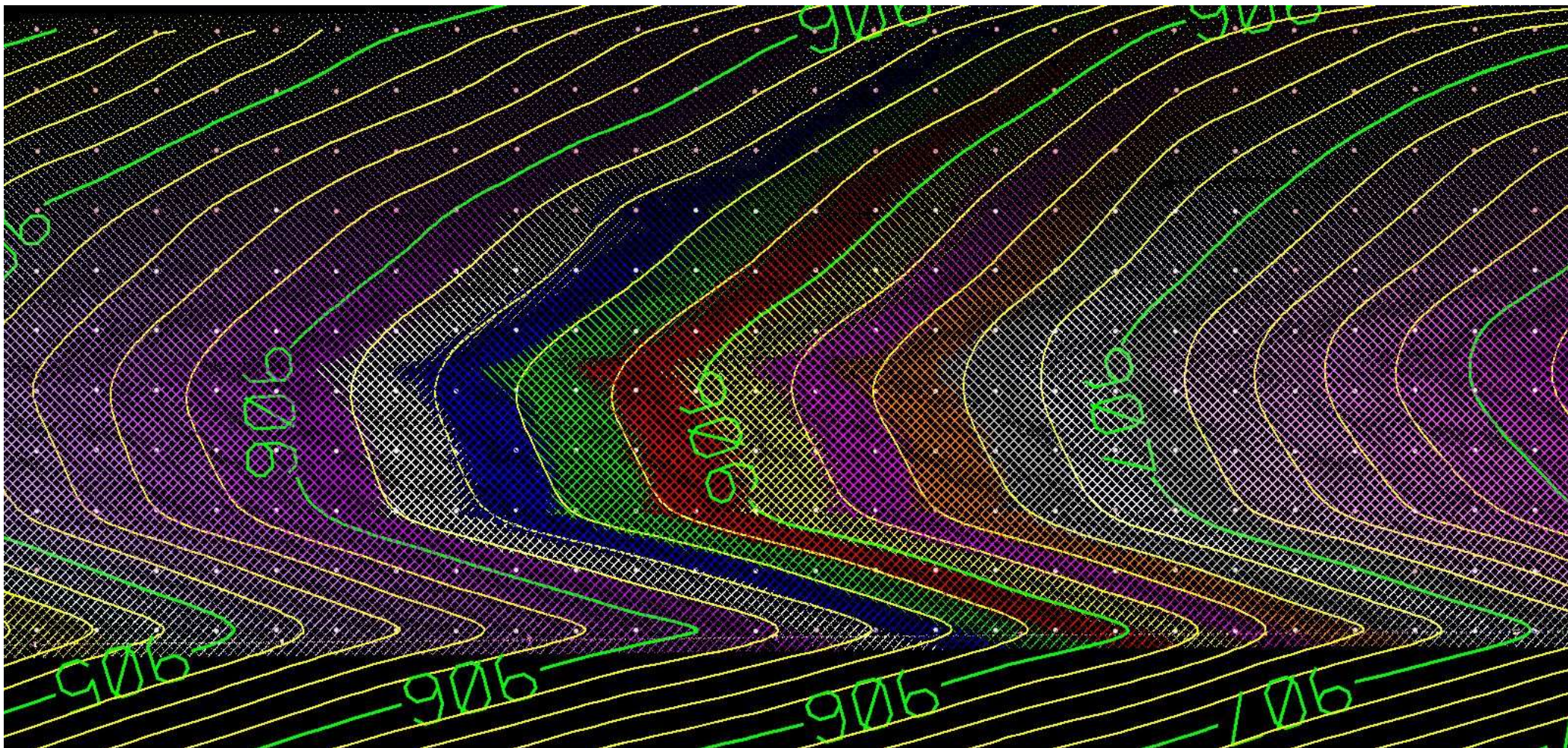


PAVEMENT DTM / DETAILS



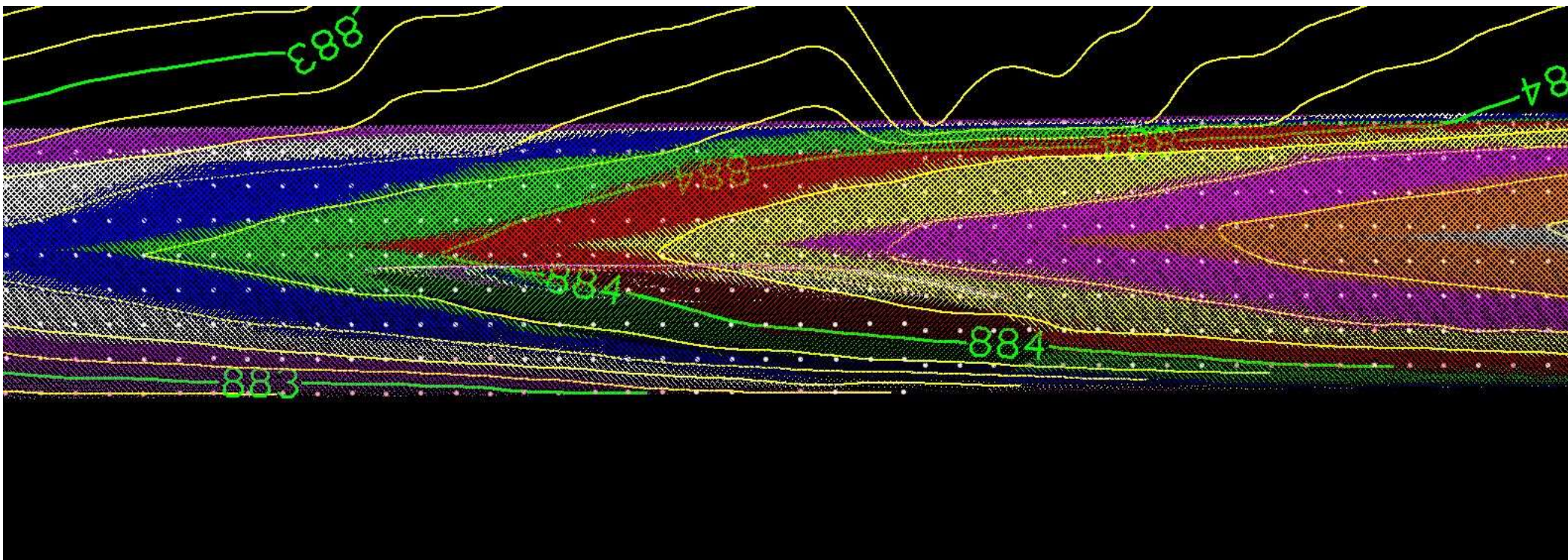


APPLICATION: PAVEMENT CROSS SECTIONS





APPLICATION: PAVEMENT CROSS SECTIONS





EAGLE P3 PROJECT

Eagle P3 Commuter Rail

Denver, CO

1.5 days on site for the scanning. 200 hours for survey control (every 2500')

Conventional survey estimated at approx. 3000 hours

Scanning was complete in 18 hours

Extraction is on going (Still mining the data)

No additional software was needed for the design team

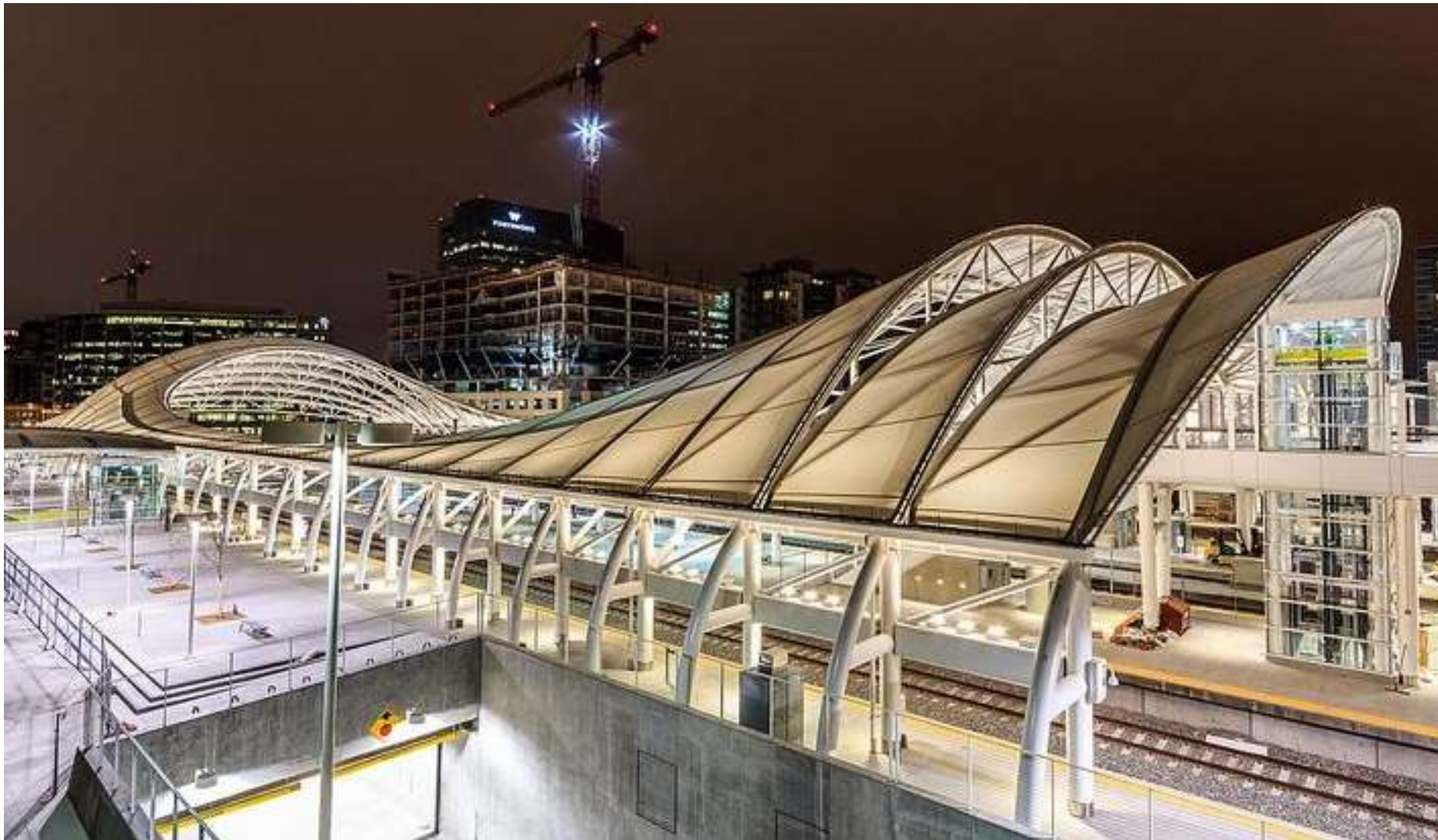
Scan data is transferred via external hard drives. 23 mile project equaled 500 GB (1/2 TB) of data

Additional tasks can be identified at a later date with no re-mobilization to the site. Example: Bridge clearance heights.



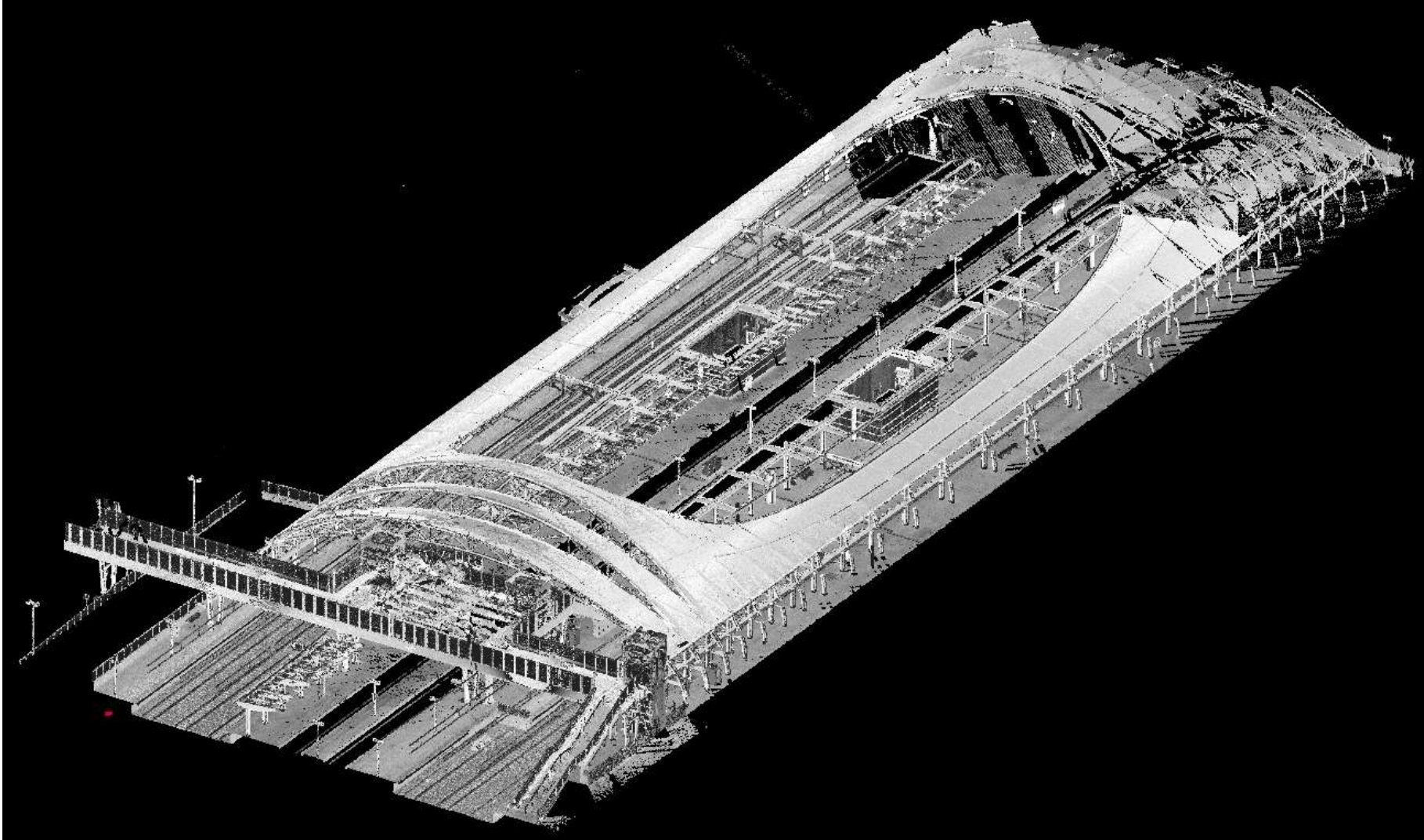


DENVER CO LIGHT RAIL PROJECT





DENVER CO LIGHT RAIL PROJECT





EAGLE P3 PROJECT

Eagle P3 Commuter Rail - Denver, CO
At Grade Crossing





EAGLE P3 PROJECT

Eagle P3 Commuter Rail - Denver, CO
Georeferenced Photos

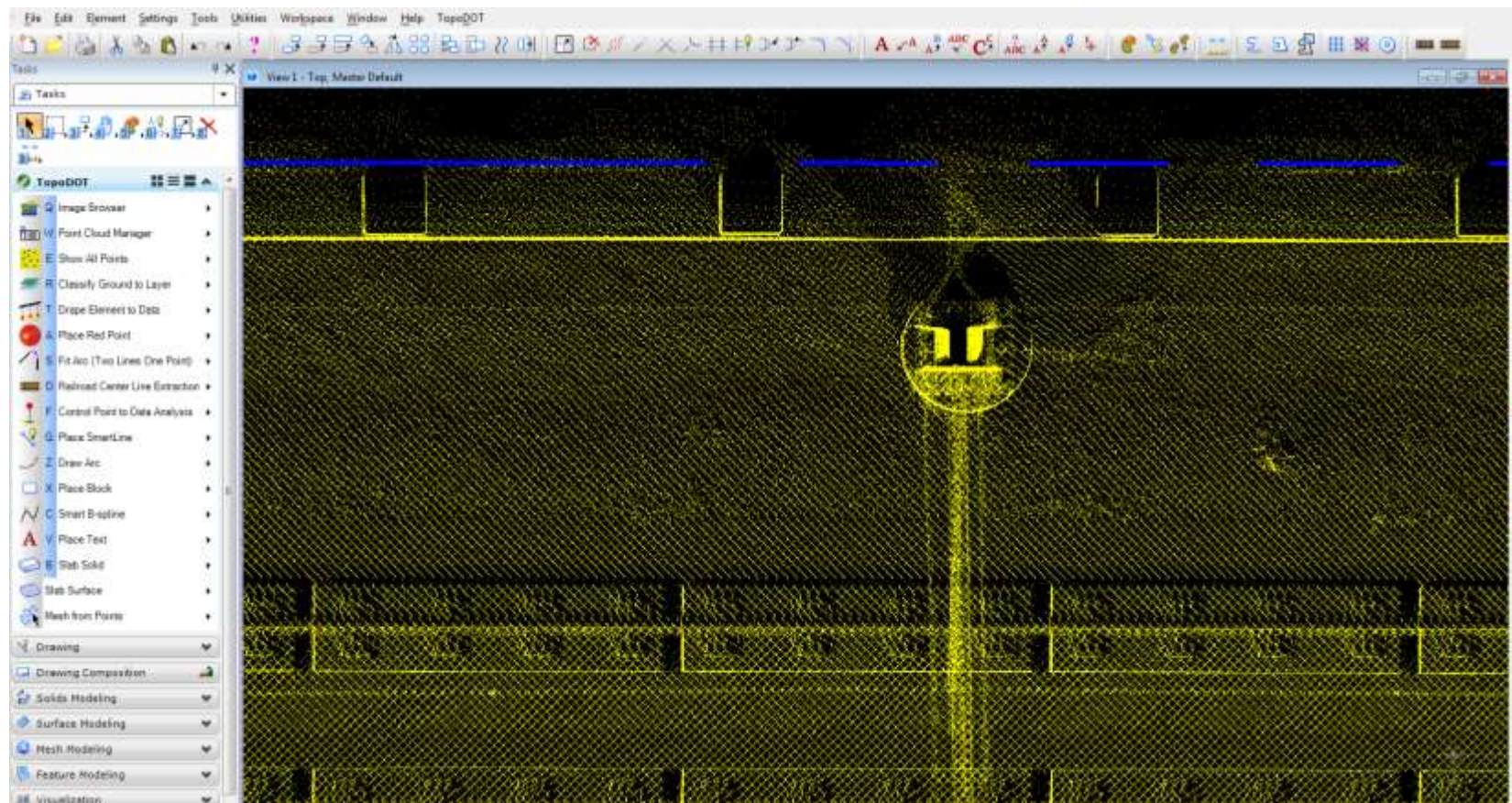




EAGLE P3 PROJECT

Eagle P3 Commuter Rail - Denver, CO

Encroachments

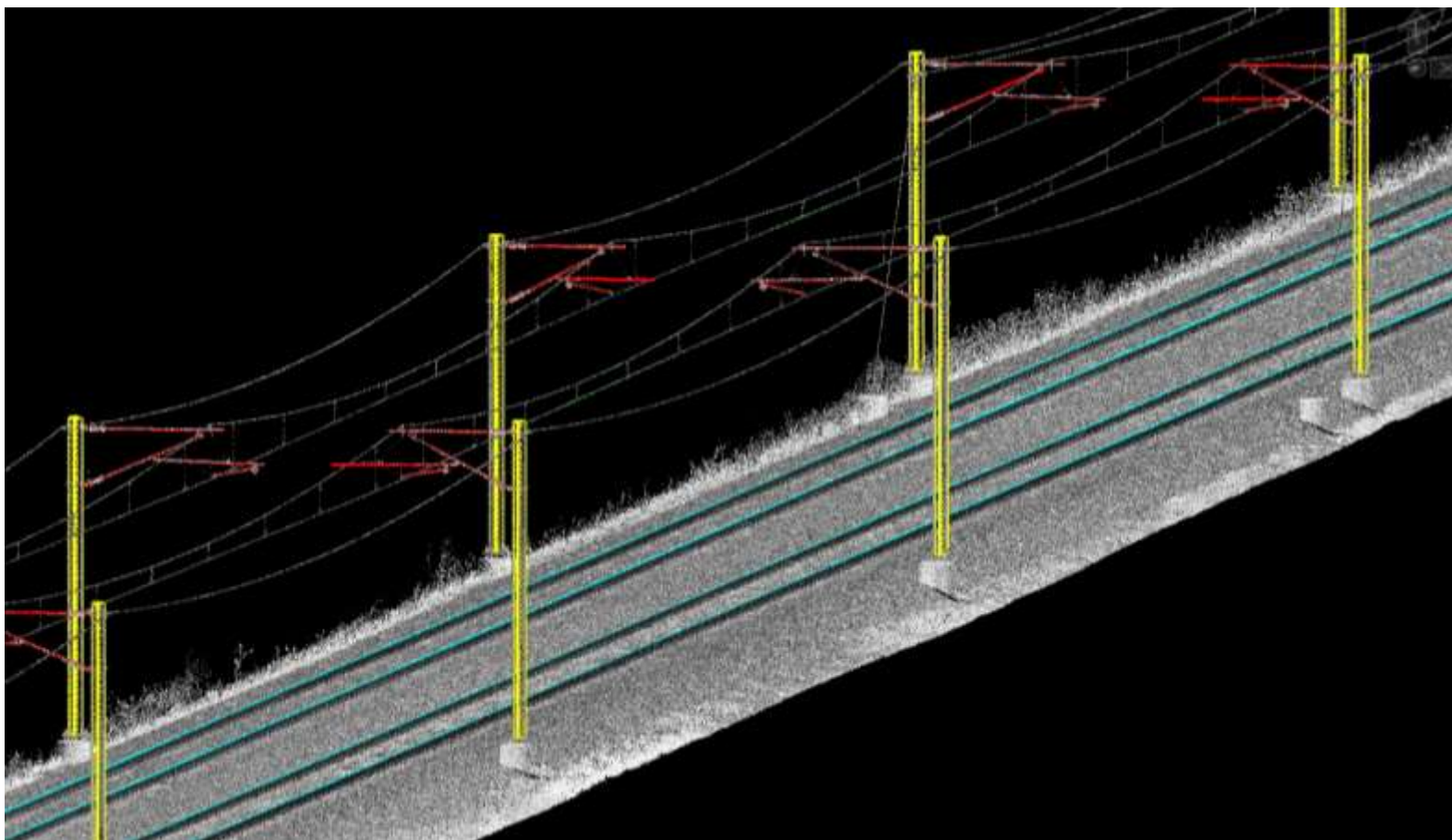




EAGLE P3 PROJECT

Eagle P3 Commuter Rail - Denver, CO

Rail Extraction



ASBUILT – MODEL





ASSET EXTRACTION – SIGN INVENTORY

Extraction of Assets using Photogrammetry only
or LiDAR only or both simultaneously

The screenshot displays the ITRE 8.2 software interface for sign inventory extraction. The main window shows a 3D point cloud of a road scene with a green sign. The sign is labeled "EXIT 293 TO I-540 TO I-40 Lumley Rd Westgate Rd 1 1/4 MILES". The software interface includes a menu bar, a toolbar, a 3D Map view, a Legend, a 2D Analysis view, and a Message Log. The 2D Analysis view shows a photo of the sign and a table of Object Attributes. The Legend shows a list of assets extracted from the point cloud, including signs and points. The Message Log shows a list of messages.

Object Attributes - R_20141007(3).las

Field	Value
ID	27462094
X	3075.77317908
Y	77761.873001
Z	434.343263
Norm. Angle V	-2.681227
Norm. Angle H	1.572655
Angle V	1.301127
Angle H	1.572655
Beam Distance	30.153488 ft us
Lateral Distance	34.372716 ft us
Retno	0.987538
Classification	0 - Cracked, near clas
R	0
G	0
B	0
Confidence	1255
Scan Size	0
GPS Time	54523.00545

Layer Form: ITRE_Sign_1_NCB

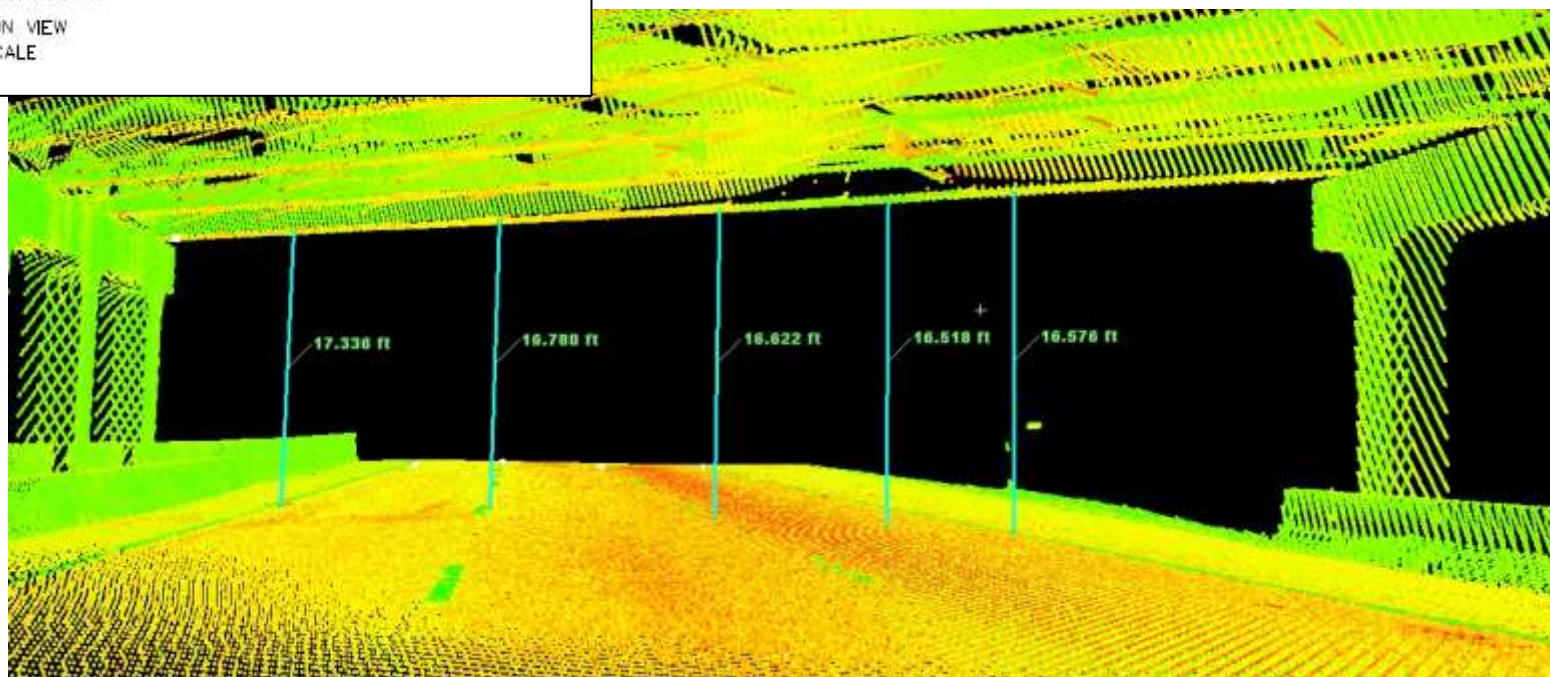
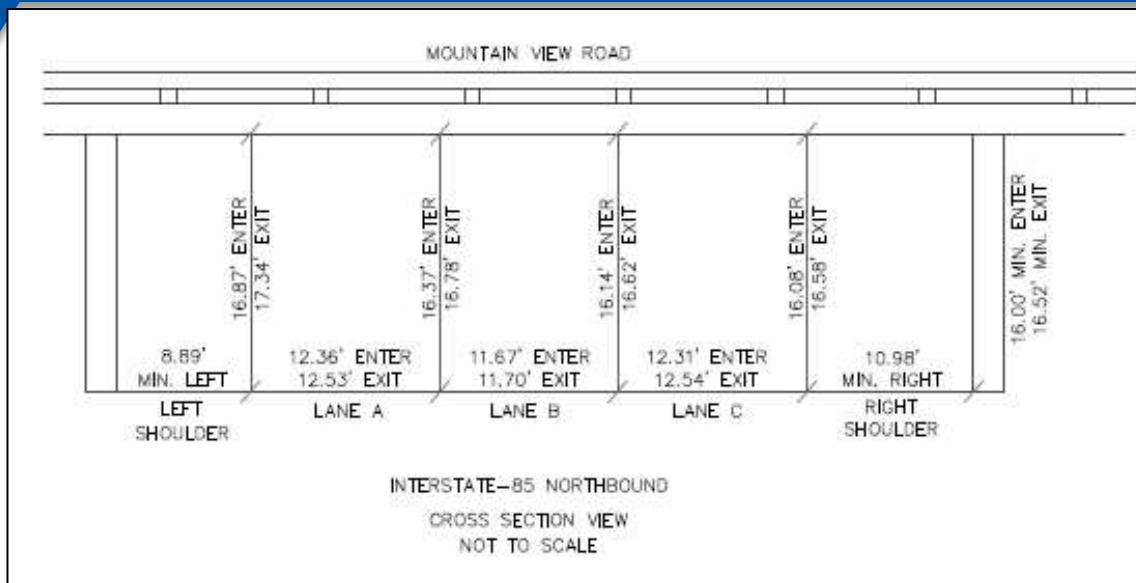
Field	Value
Sequence	FC_20141007(3).las
Hits_Intensity	352.88
Width	9.0000
Height	2.0000
Code	UNKNOWN
Ground_Mounted	Yes
Overhead_Mounted	No
Number_of_Signs_in_Assembly	2 - 2
Sign_Description	EXIT 293
Roadway_Location	Right
Location_in_Assembly	1 - 1
Distance_from_Roadway	17.35
Shooting_Type	nil
Comments	(distance from edge of pavement)

Layer Form: ITRE_Sign_3_NCB

Field	Value
Sequence	FC_20141007(3).las
Hits_Intensity	3784.98
Width	15.5000
Height	12.0000
Code	nil-2s
Ground_Mounted	Yes
Overhead_Mounted	No
Number_of_Signs_in_Assembly	2 - 2
Sign_Description	I-540 TO I-40 Lumley Rd Westgate Rd 1 1/4 MILES
Roadway_Location	Right
Location_in_Assembly	2 - 2
Distance_from_Roadway	17.35
Shooting_Type	nil
Comments	(distance from edge of pavement)

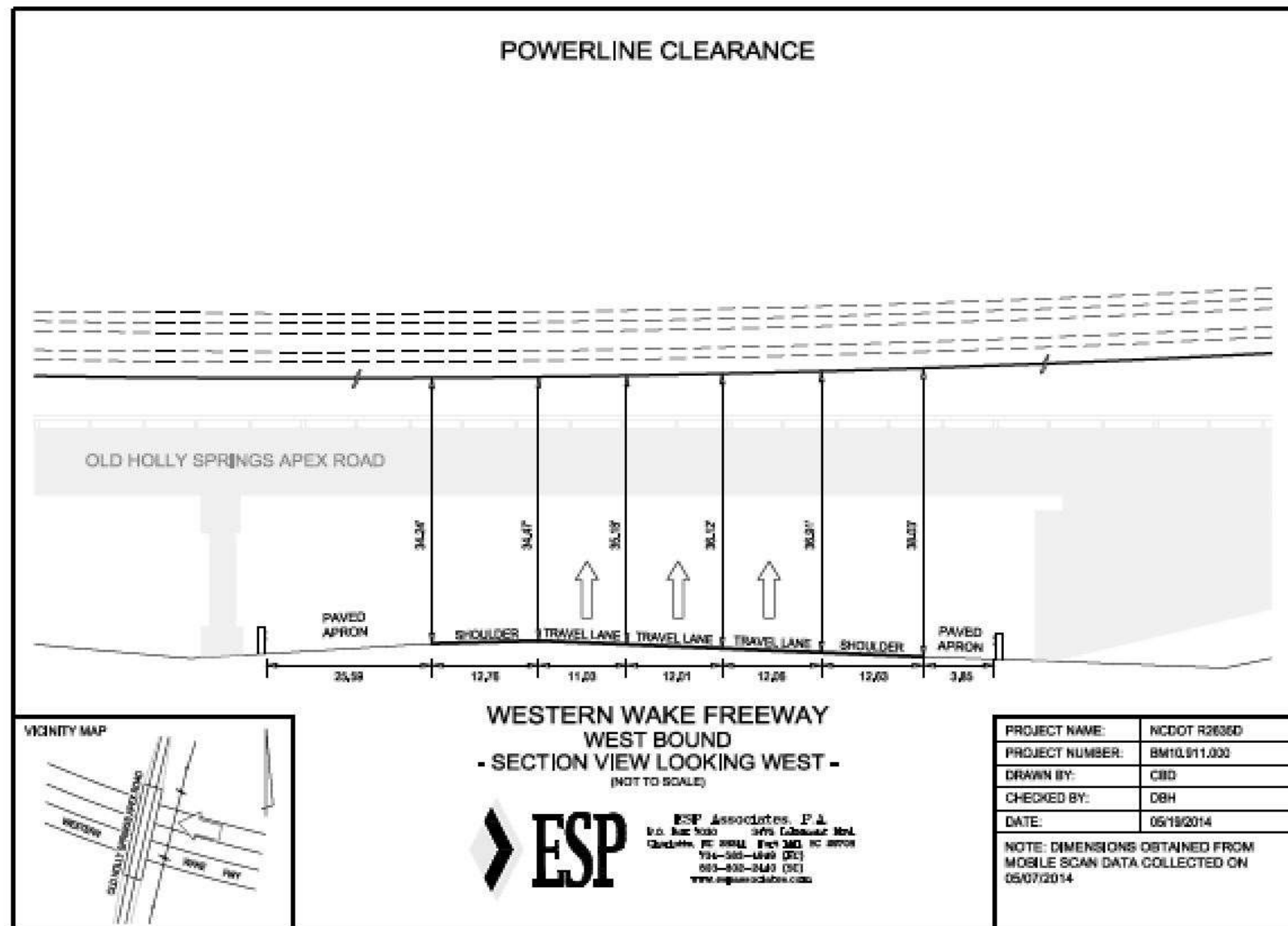


APPLICATION: BRIDGE CLEARANCES



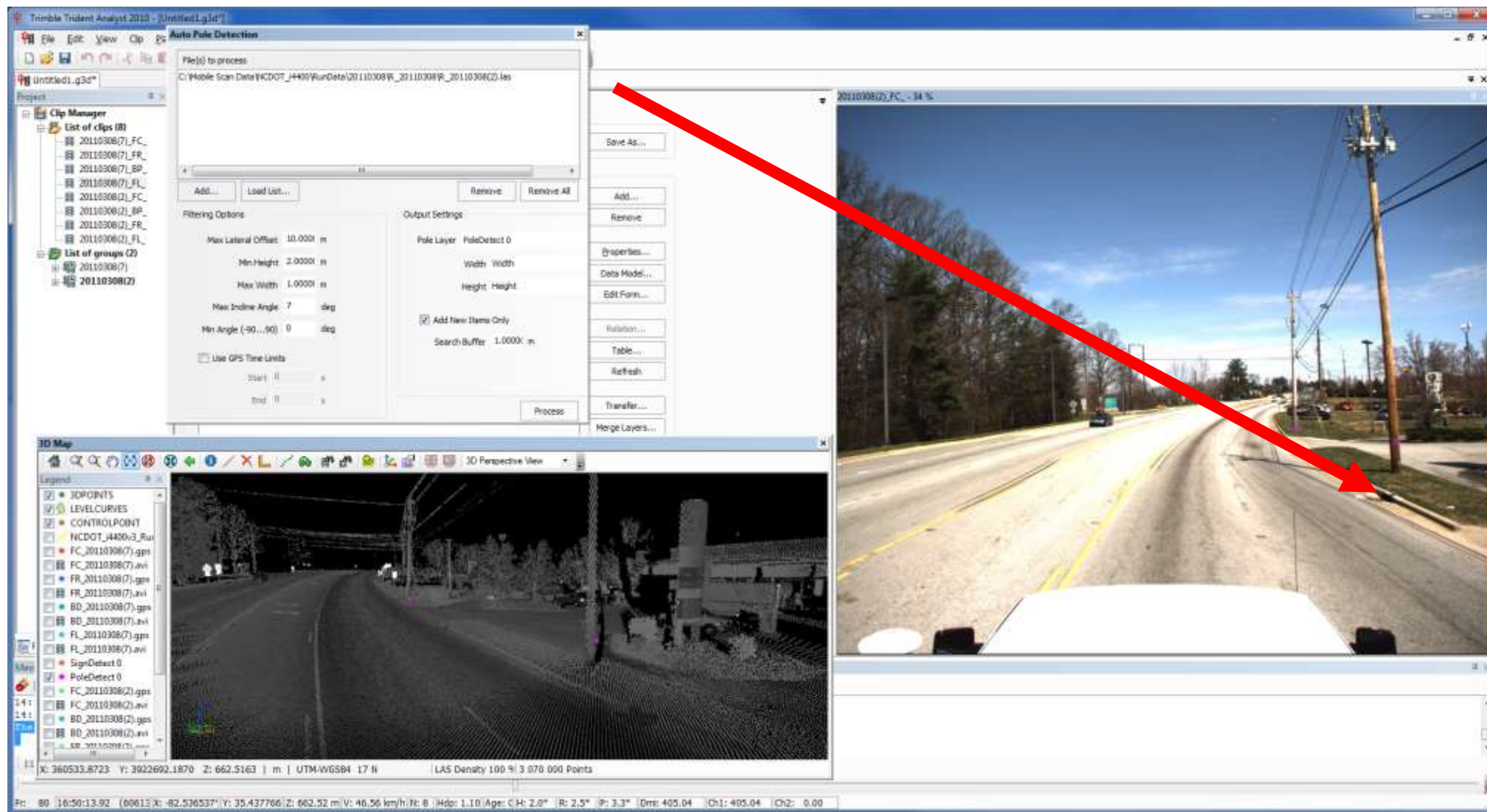


APPLICATION: POWERLINE CLEARANCES





INFRASTRUCTURE ASSETS MAPPING





“STRUCTURE-LEVEL” DATA FOR RISK ASSESSMENTS

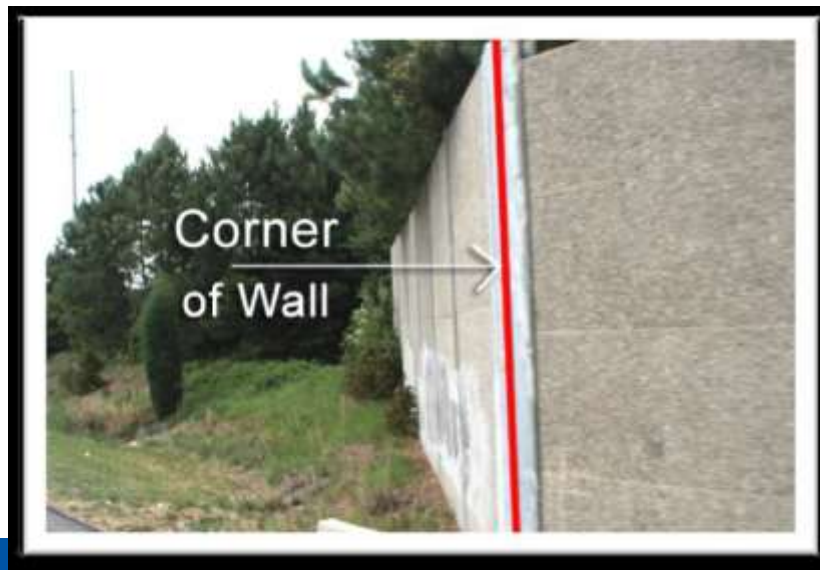
Pioneer in Efficient FFE Collection Methods



APPLICATION: TUNNELS

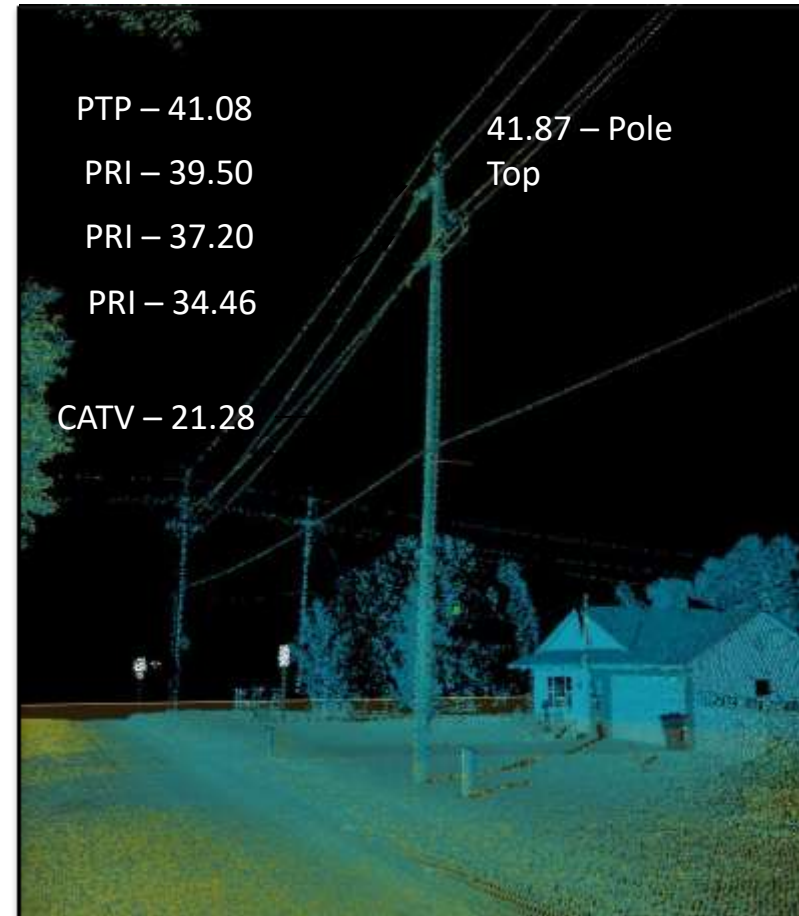
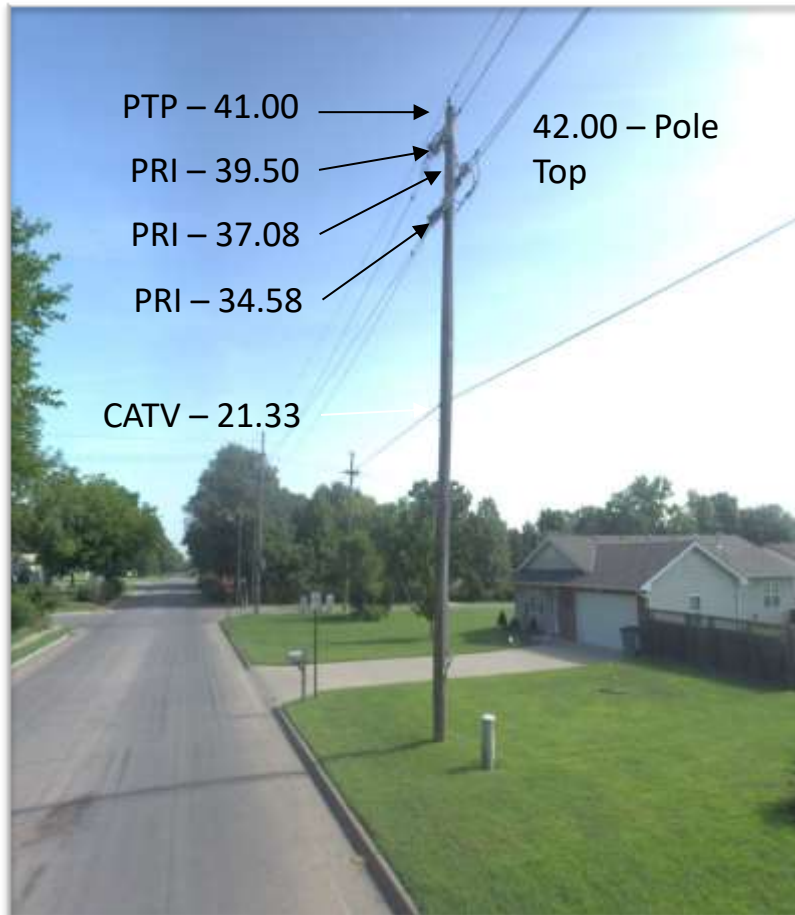


NOISE RETAINING WALLS



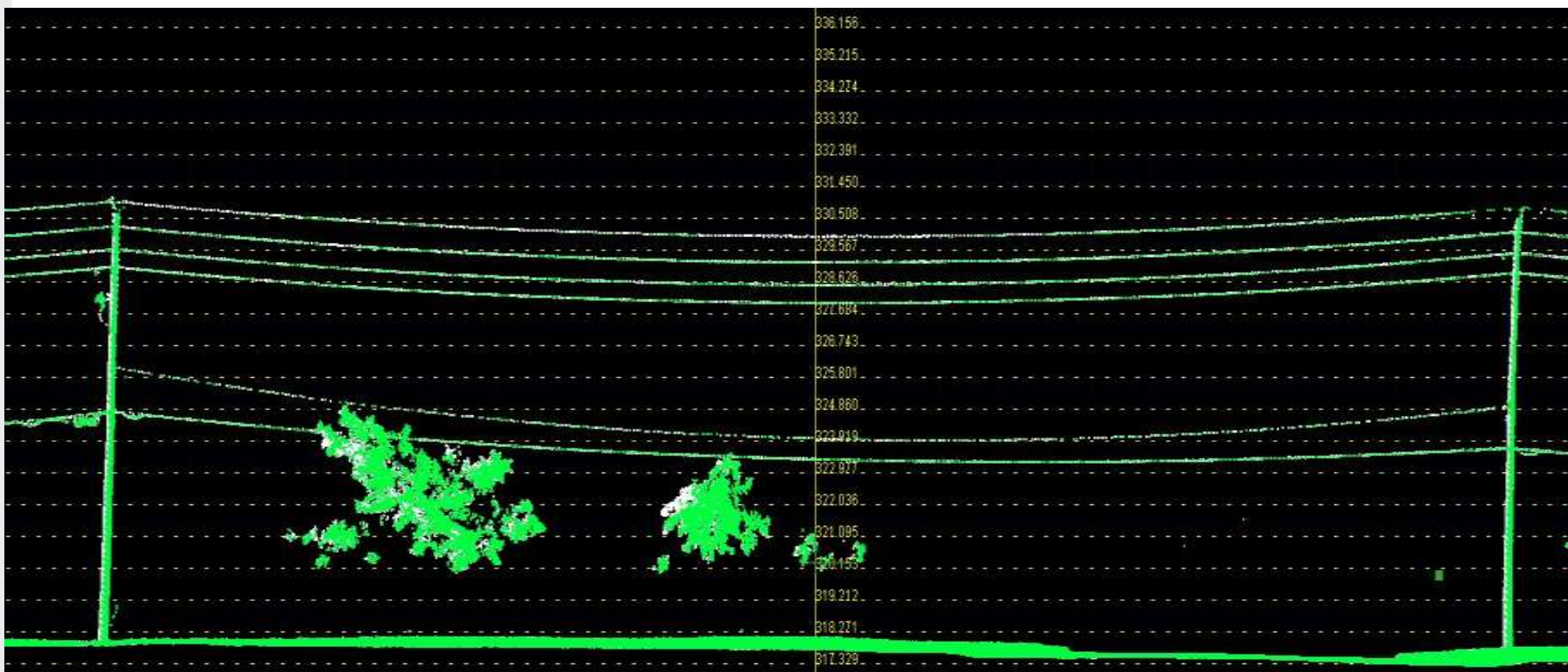


Utility Extraction





MID-SPAN CLEARANCES





ACCURACIES

Scalable

- Function of the GNSS, Control, Surface, Foliage
- Function of the project – be practical

MX8 – Max control < 1 cm (200 – 500 m)

Control at 1200 – 1500 m spacing = 2 cm

Kinematic GPS = 5 – 7 cm or more*

- more of a function of the Base Station



DELIVERABLES

CAD or GIS Product

- Main Production Tool = Trident Trident
 - MicroStation
 - TopoDOT
 - AutoCAD
 - ArcGIS
- ESP Analyst
- TIN or DTM surfaces
- Contours
- Cross Sections
- Databases
- Shapefiles
- Standard Forms



THANK YOU
QUESTIONS?

