AeroVironment

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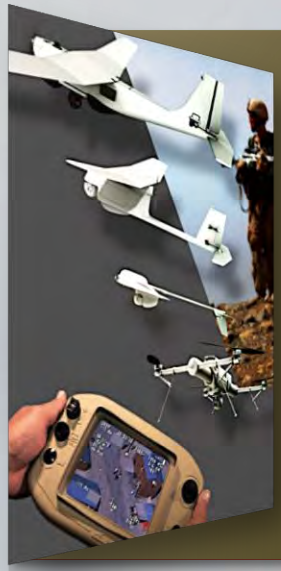
AeroVironment

AeroVironment Business Segments



UAS
(Unmanned Aircraft Systems)

Networked Information & Communication

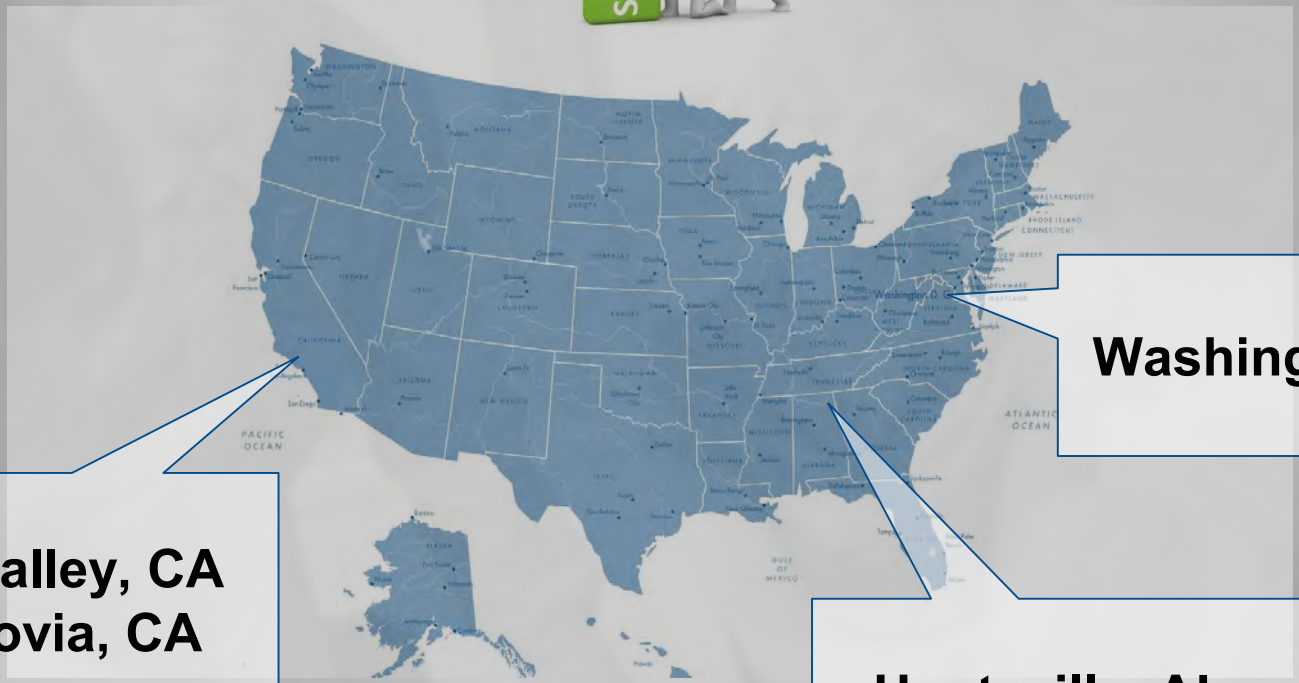
EES
(Efficient Energy Systems)

Alternative Transportation Fuel Solutions

- Target Global, Long-Term Trends with Innovative New Solutions
- Help Our Customers Succeed in Important Ways
- Public Company - $520mil Market Cap - $265mil in Revenue FY16
- 600 Employees

AeroVironment Locations

600+ Team Members



Washington D.C.

Simi Valley, CA
Monrovia, CA

Huntsville, AL

Aviation and Science Pioneers

Gossamer Condor

First controlled human powered flight

Smithsonian

Solar Challenger

World Records: Longest, highest, farthest solar powered flights

Smithsonian

Pointer

First backpack portable SUAS

GM Impact

First modern electric car

Helios

Absolute altitude world record

1977 | 1979 | 1981 | 1985 | 1986 | 1987 | 1989 | 1999 | 2001

Gossamer Albatross

First human powered flight across English Channel

Smithsonian

Pterosaur

Featured in IMAX film, *On The Wing*

Smithsonian

Sunraycer

Winner 1st solar car race

Smithsonian

Industrial Rapid Charger

1st high-efficiency industrial rapid charger developed for the US Air Force.

Aviation and Science Pioneers

Power Cycling & Test Systems

Worldwide Technology Award: Energy category

2003

Global Observer®

1st LH2 powered UAS

2004

Pathfinder Plus

Solar platform for "Eternal Flight"

Smithsonian

2005

Nano Air Vehicle

1st flapping wing nano UAV with tri-axis control

2006

First FAA Commercial COA for PUMA AE

2008

Dragon Eye

First US DoD Small UAS Program of Record

Smithsonian

2003

Raven®

1st to deploy 1000s of rucksack portable UAVs to US Forces in a single year

2005

PosiCharge

1st fast charger to support an enterprise-wide Fortune 500 implementation

2006

SUAS Digital Data Link™

A wireless communications link that expands the utility of small UAS through enhanced capabilities

2009

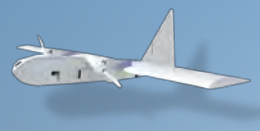
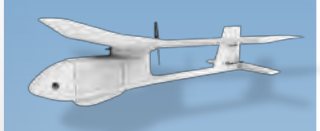
Nissan Leaf Changing System

Selected as exclisive manufacturer and installer of home changing stations for Nissan Leaf

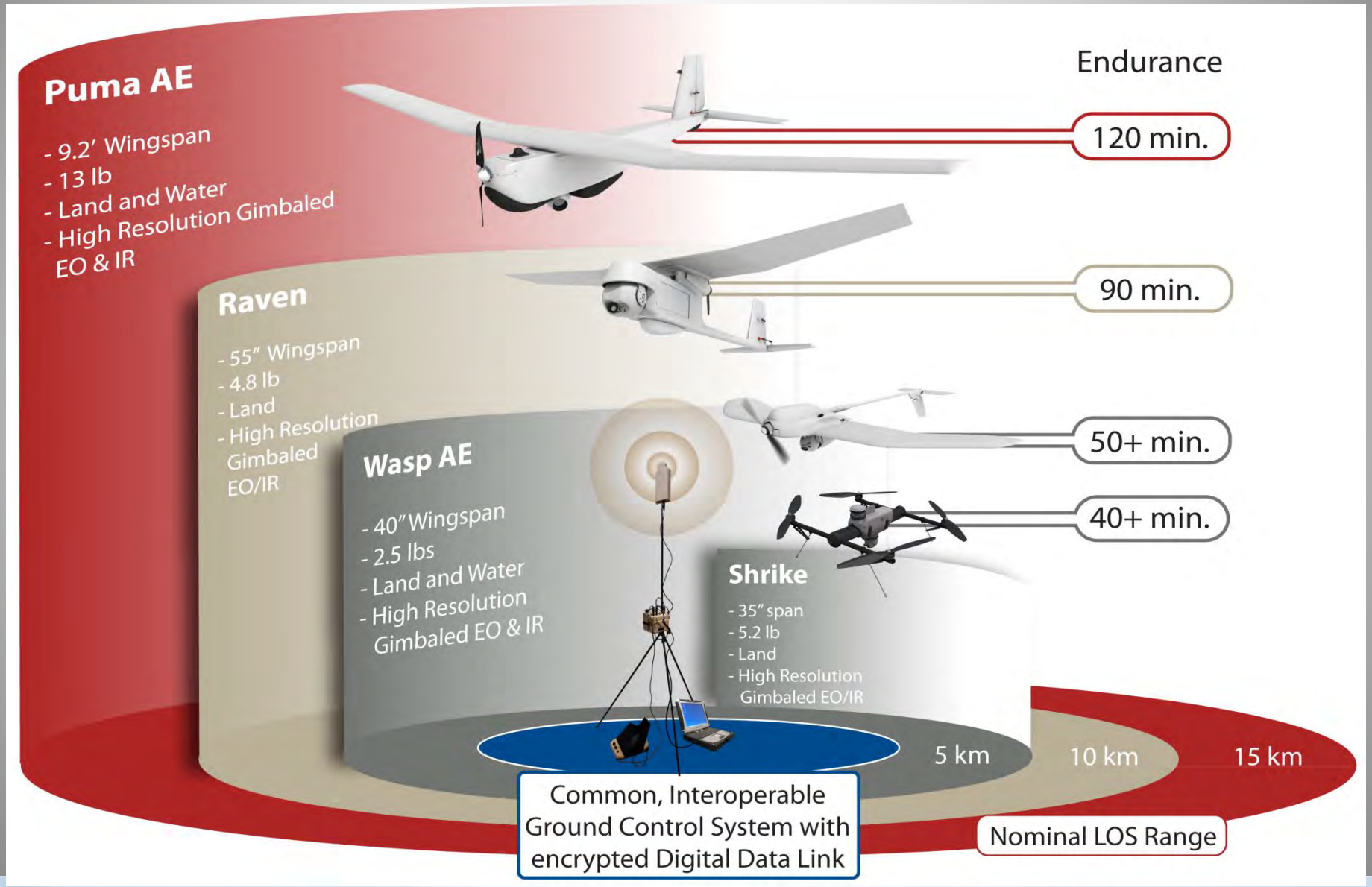
2010

AeroVironment's Small UAS Evolution

- Won **all 5** competitions for DoD programs of record for small UAS
- Delivered **more than 27,000** air vehicles
- Accumulated **over 1 million** operational flight hours

2003	2005	2006	2008	2012
				
Dragon Eye	Raven	Wasp	Puma	Wasp AE

AV SUAS family of systems



AV Services

- Turnkey services using highly skilled and experienced operators
- Impeccable safety record and proactive safety risk management program
- Over ten years of experience providing UAS training and services
- Proven equipment with the ability to downlink real time imagery that is recorded and networkable

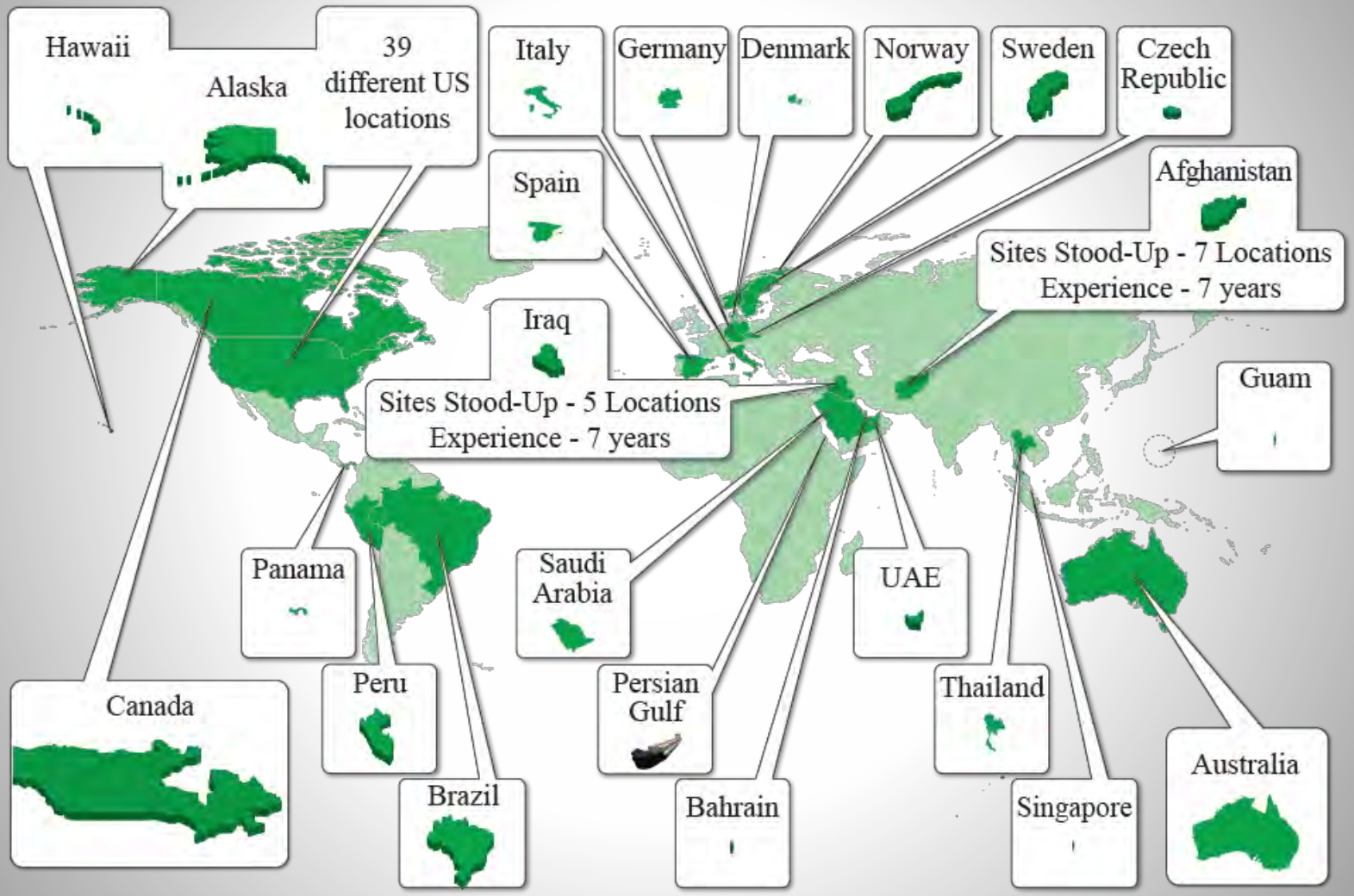
AV Services (cont.)

- AV operators perform a detailed site survey, pre-mission plan and briefing before each flight
- Puma has the ability to fly waypoints and remain airborne for over 3 hours
- Vehicle and Mission Operator work as a team to ensure flight safety and mission capabilities are maintained
- Level of operational experience unsurpassed in the industry

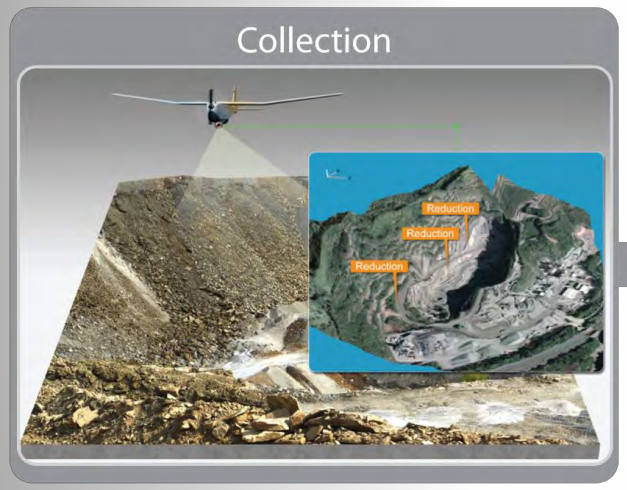
AV Services (cont.)

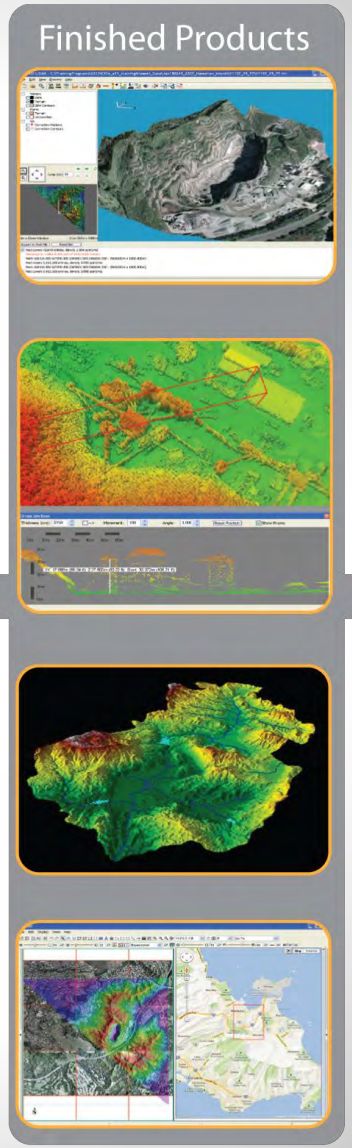
- Safety and environmental concerns are a primary consideration of UAS operations.
- One of the biggest concerns with UAS operation is the inadvertent landing of the UAS in an unintended or uncontrolled location. AV is uniquely capable of addressing those concerns since this is similar to operations we are currently conducting.
- AV personnel have established numerous operational sites in remote locations around the world. We have well established processes for logistics, maintenance, and training.

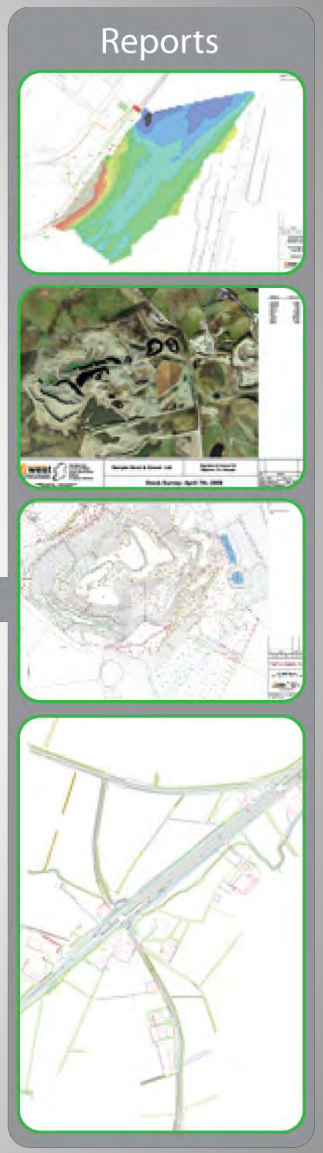
Locations AV has Conducted Flight Operations



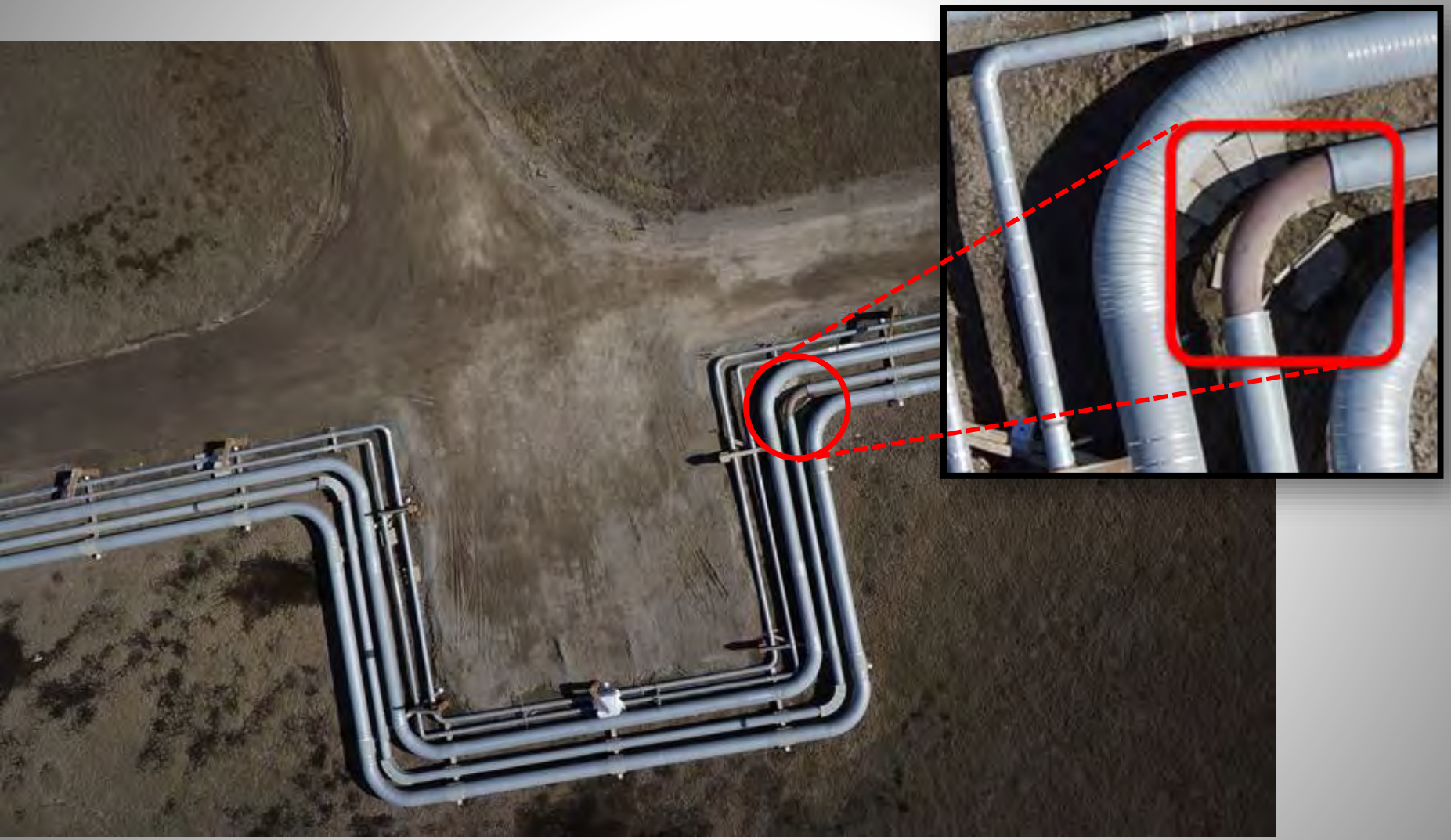
Product Lifecycle Support



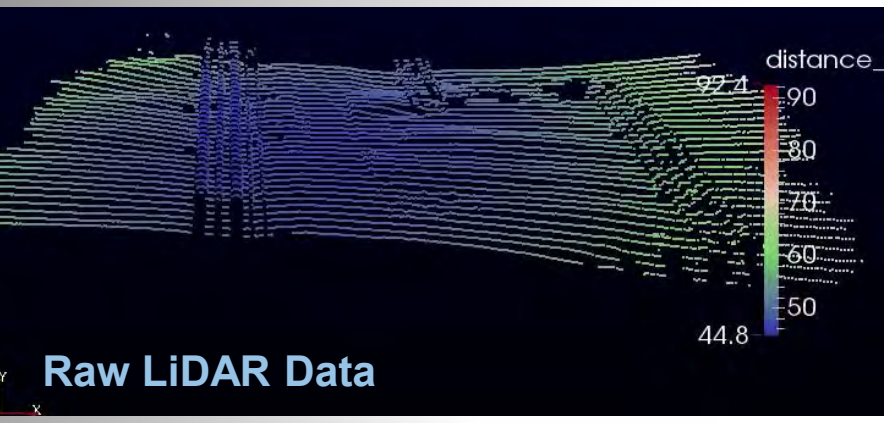


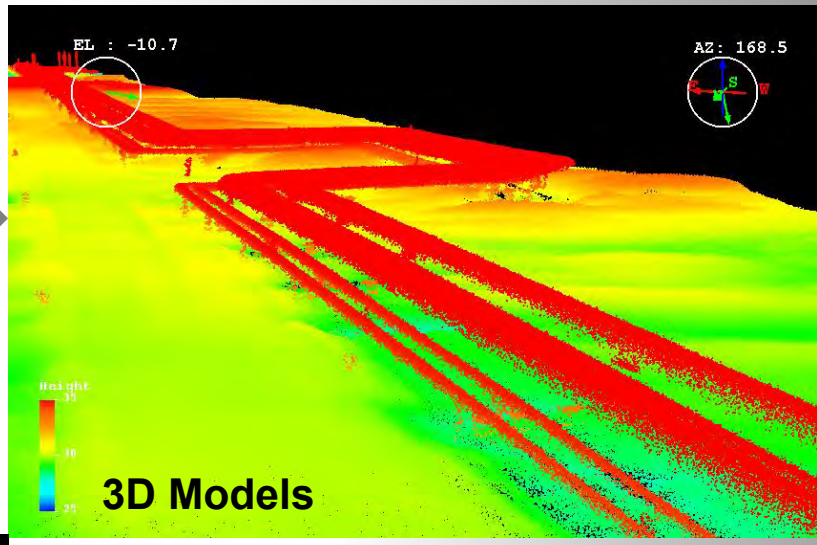


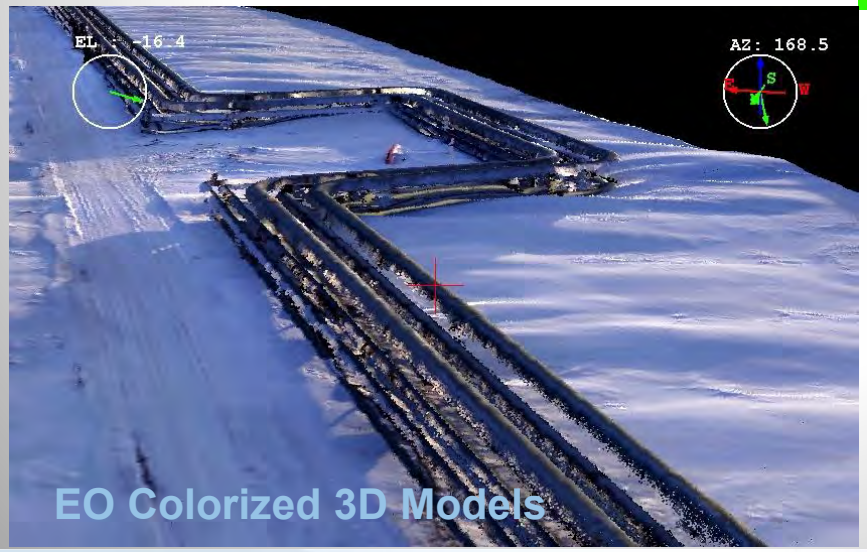
Energy Solutions – Pipeline Monitoring



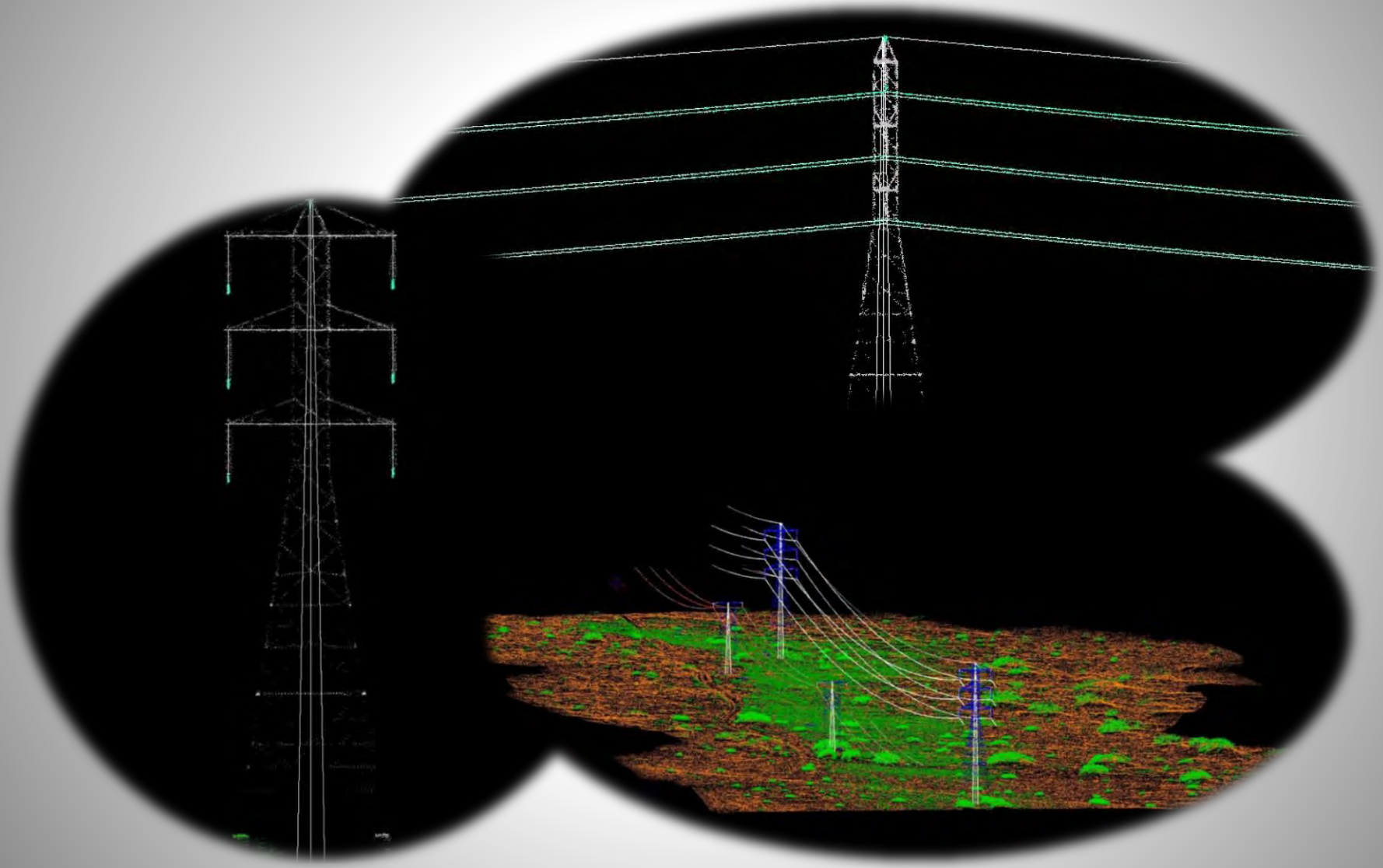
Energy Solutions – Pipeline Monitoring



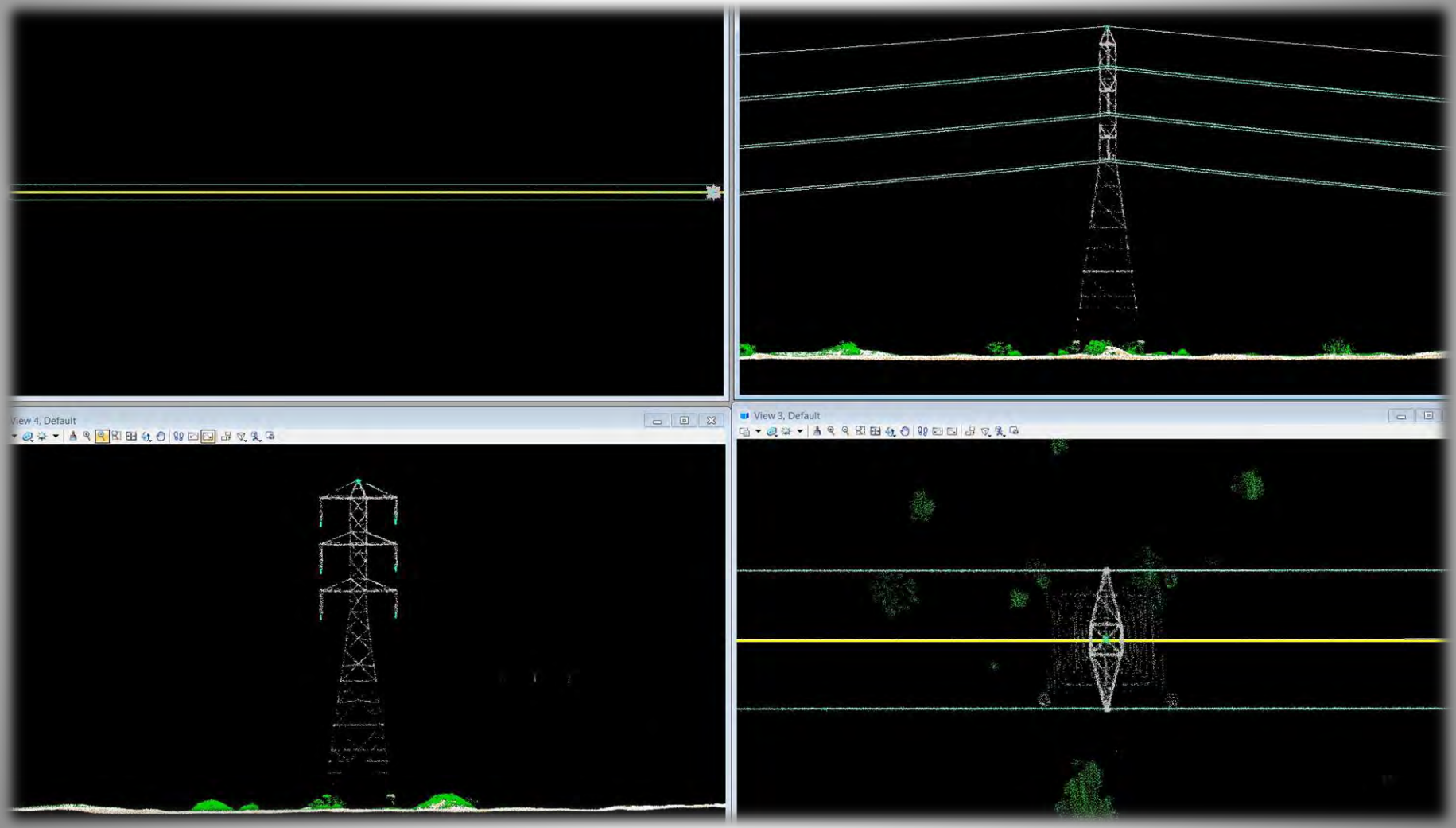




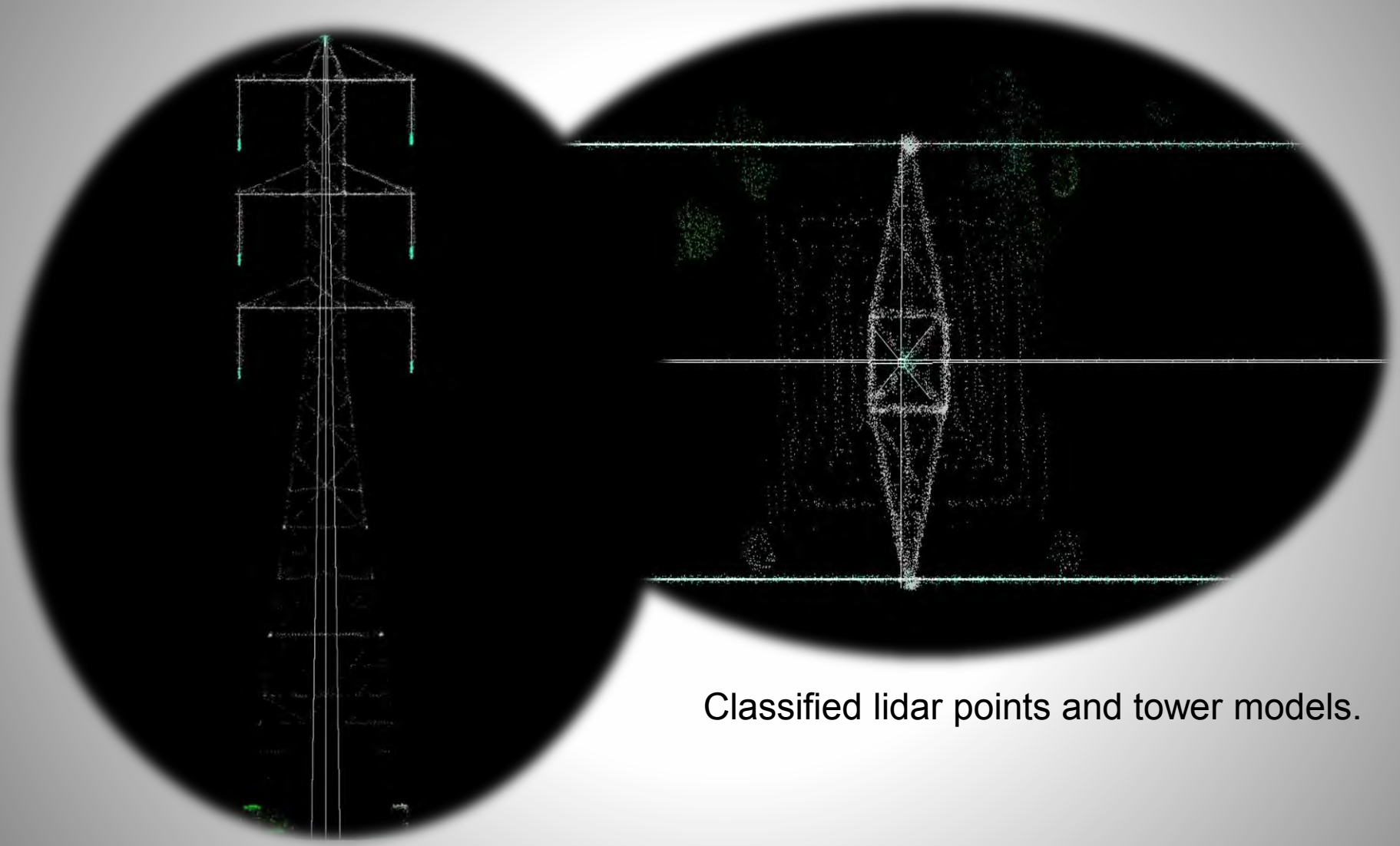
Energy Solutions – Power line Management



Energy Solutions – Transmission Towers

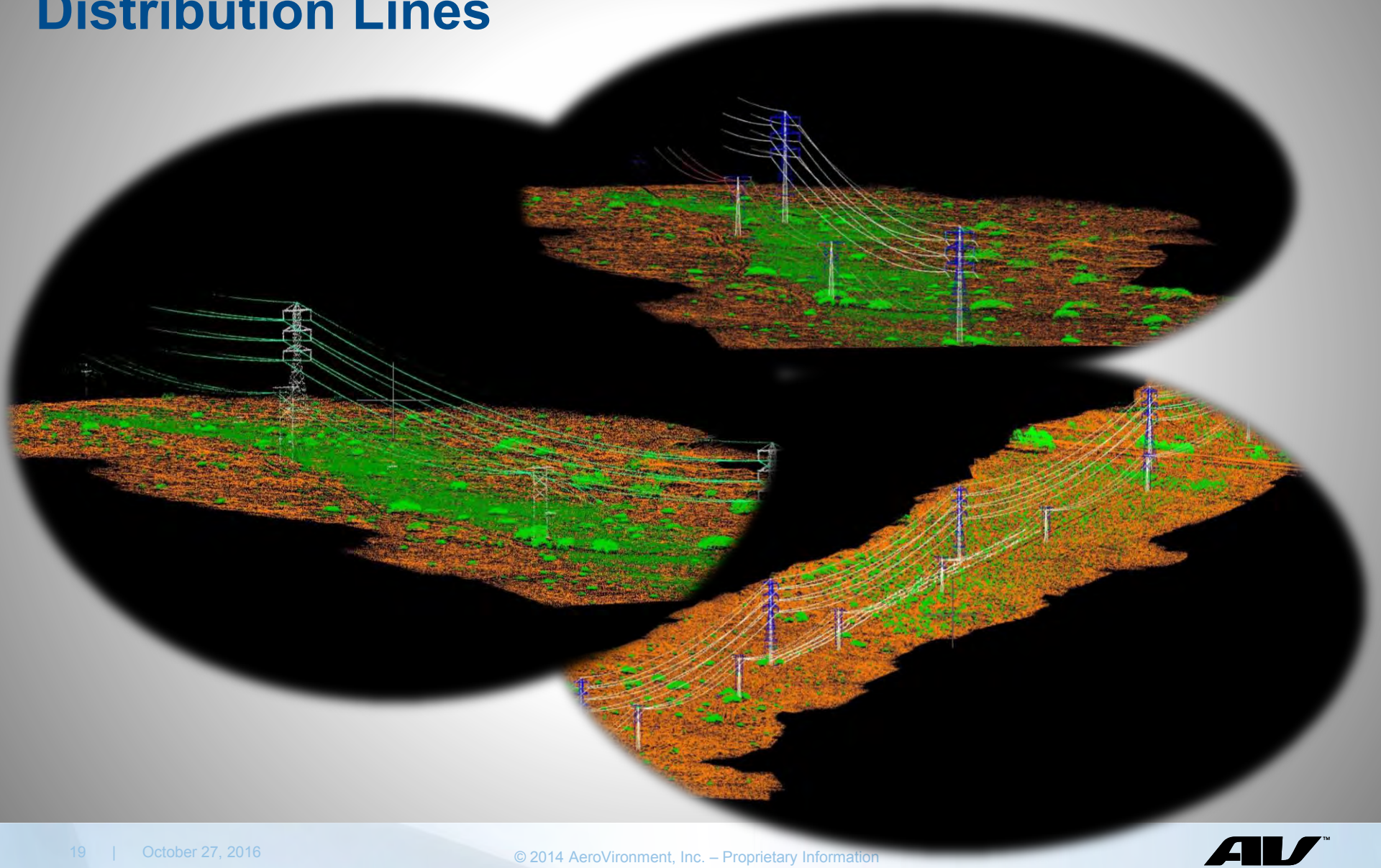


Energy Solutions – Transmission Towers

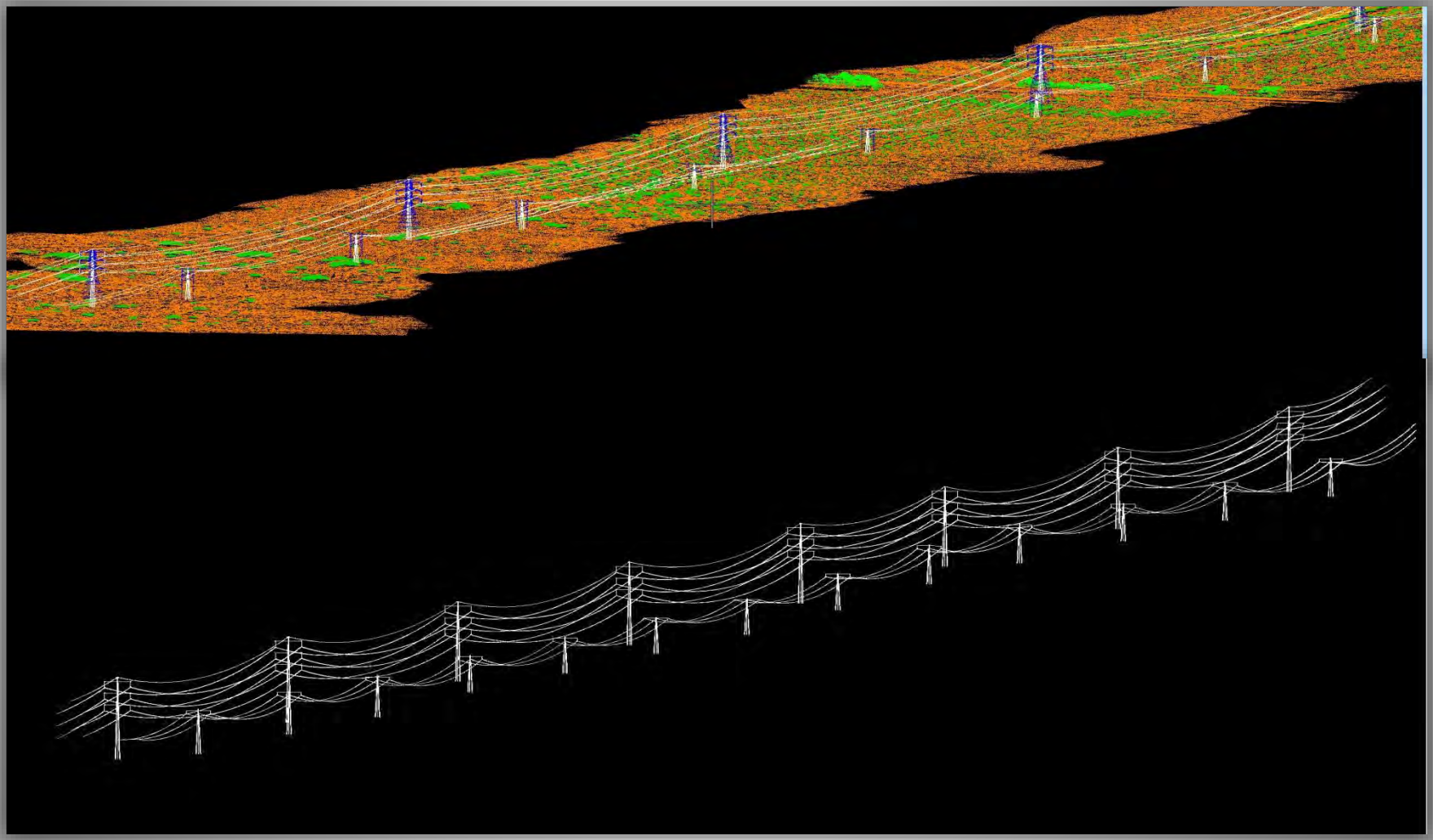


Classified lidar points and tower models.

Energy Solutions – Transmission and Distribution Lines

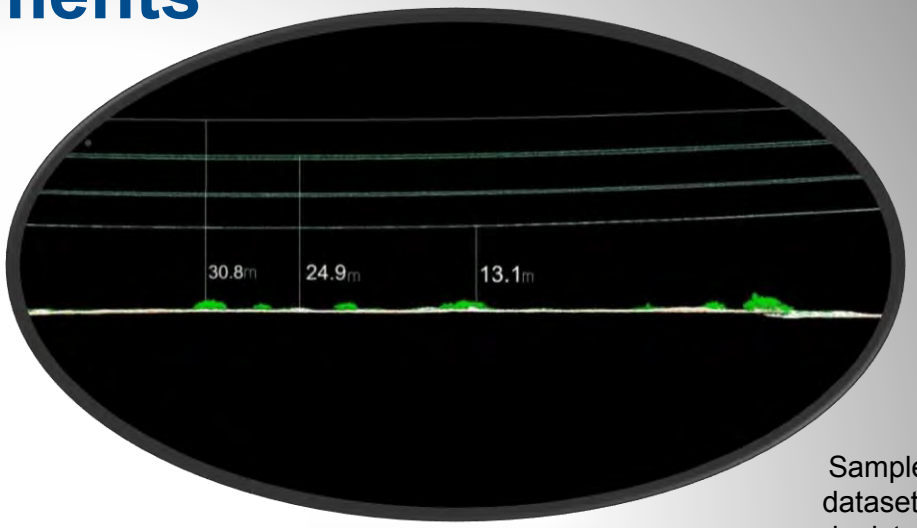


Energy Solutions – Wire/Tower Models created using Lidar

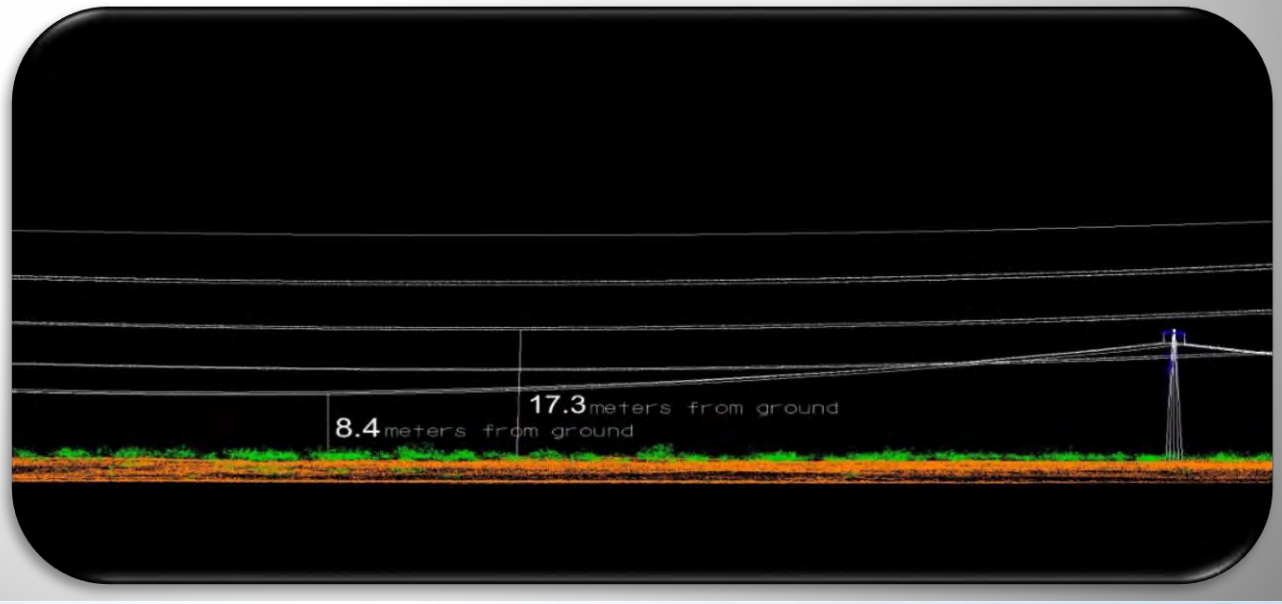


Energy Solutions – Transmission Lines- Other Analysis and Measurements

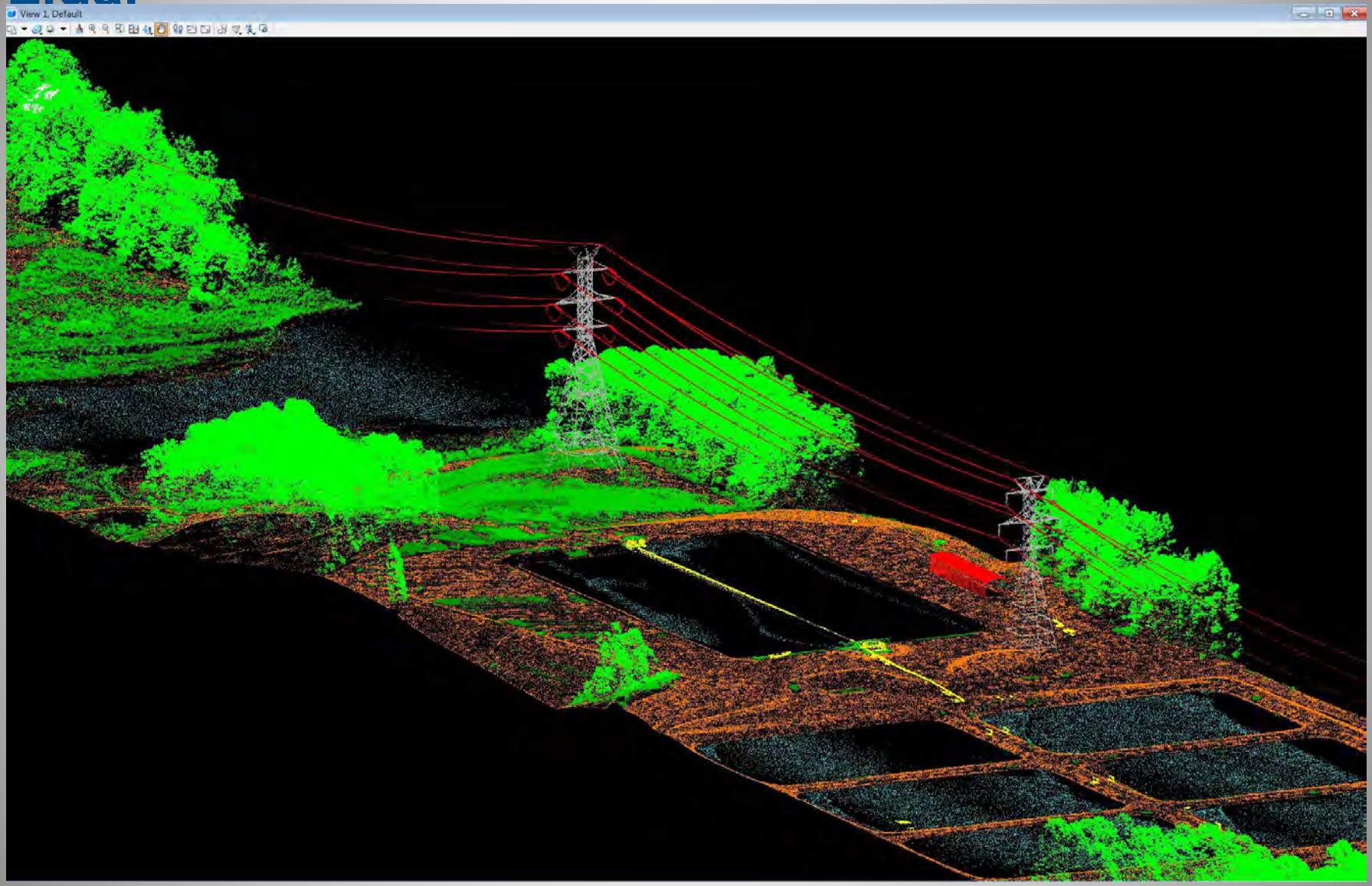
- Catenary Heights/Sag
- Wire to Wire
- Tower Heights
- Danger Objects
- Vegetation
- Elevations
- Slopes



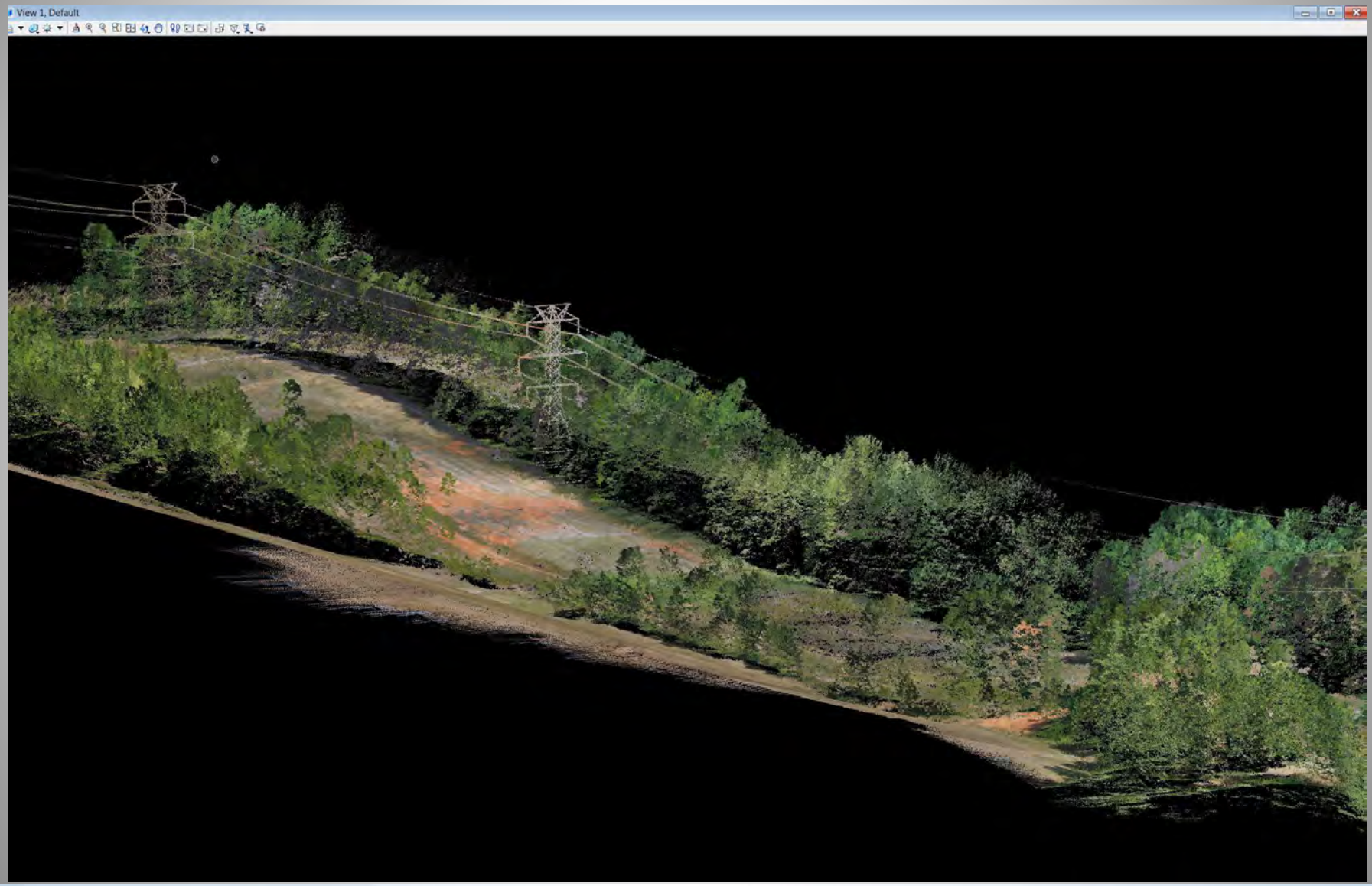
Sample datasets depicted



Energy Solutions - Transmission Lines with Lidar

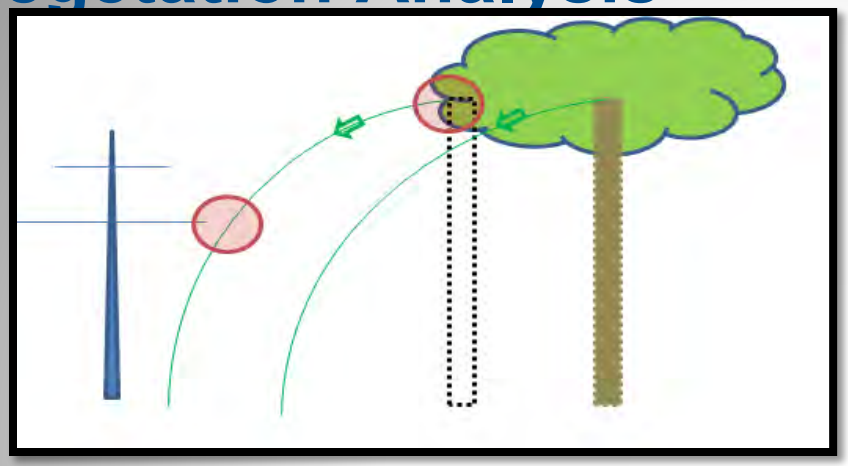


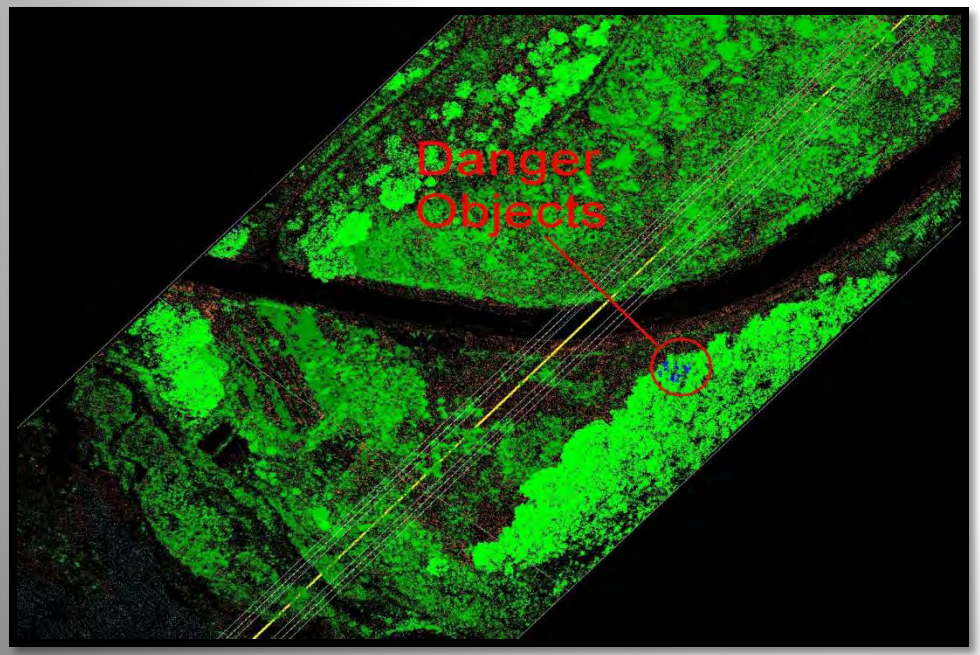
Energy Solutions - Transmission Lines with Colorized Lidar



Energy Solutions - Transmission Lines – Multispectral Colored Lidar

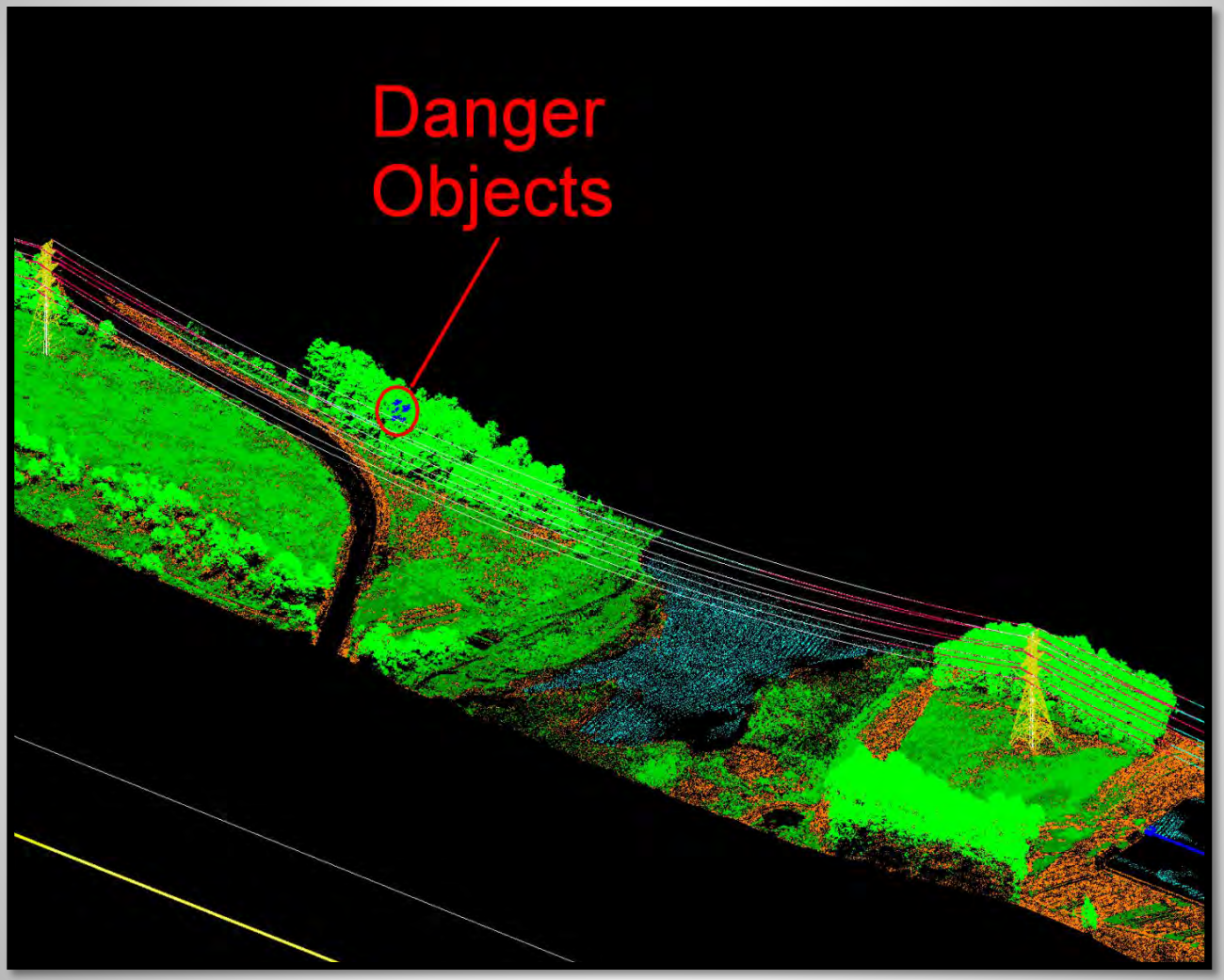
Energy Solutions - Transmission Lines – Vegetation Analysis



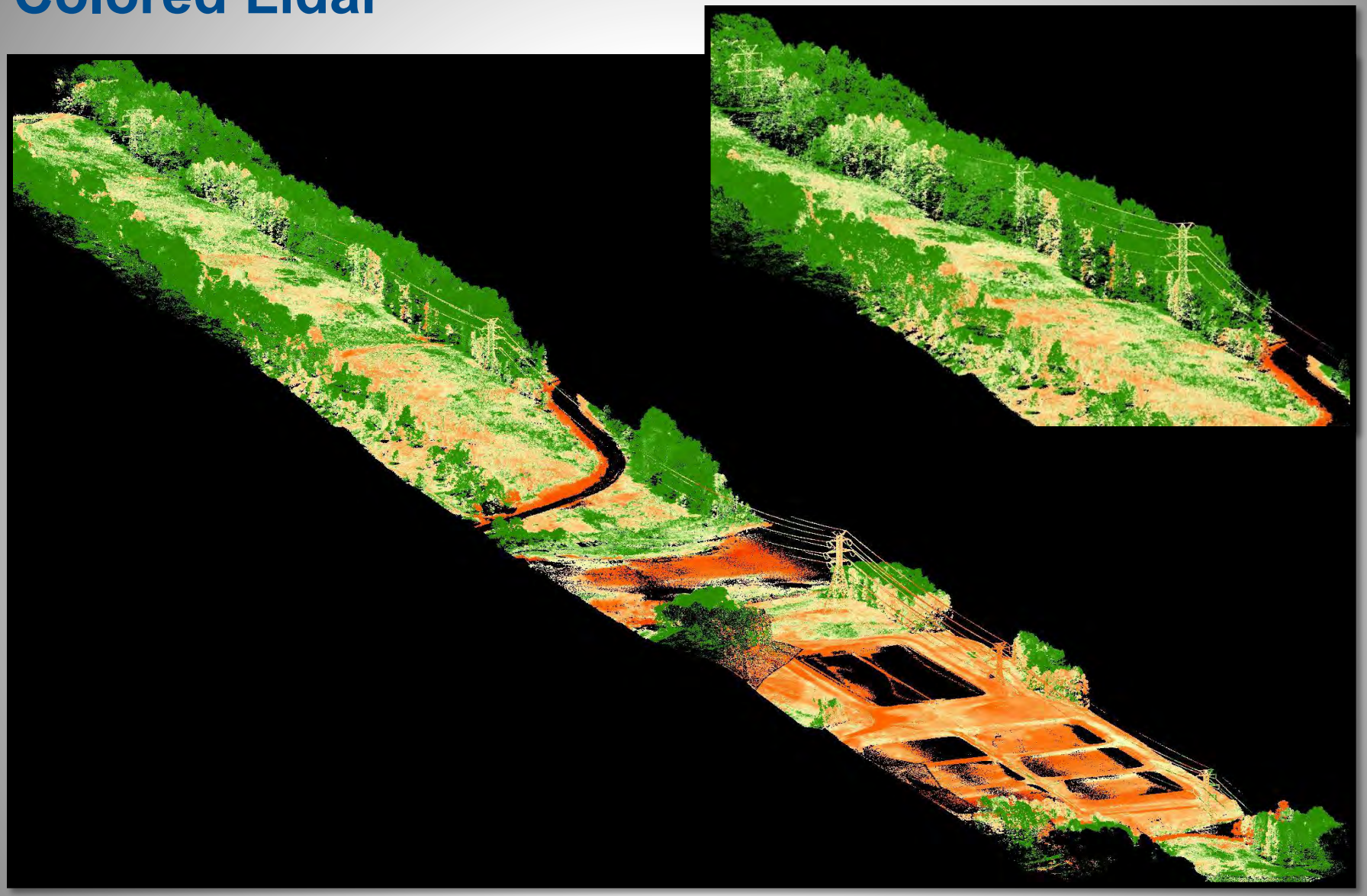


- For our analysis, we chose 5 meters to be the distance at which we consider a point dangerous.
- The blue points in the trees identified in the classified point clouds below represent the danger objects.
- These are points high in a tree on the south side of the transmission line corridor .
- A tabulated report also describes the positions of these points in Easting and Northing.
- It also describes which wire would be affected by these danger objects.
- The large number of danger points is due to the high density of lidar data; these points all lie within a meter or two of each other.

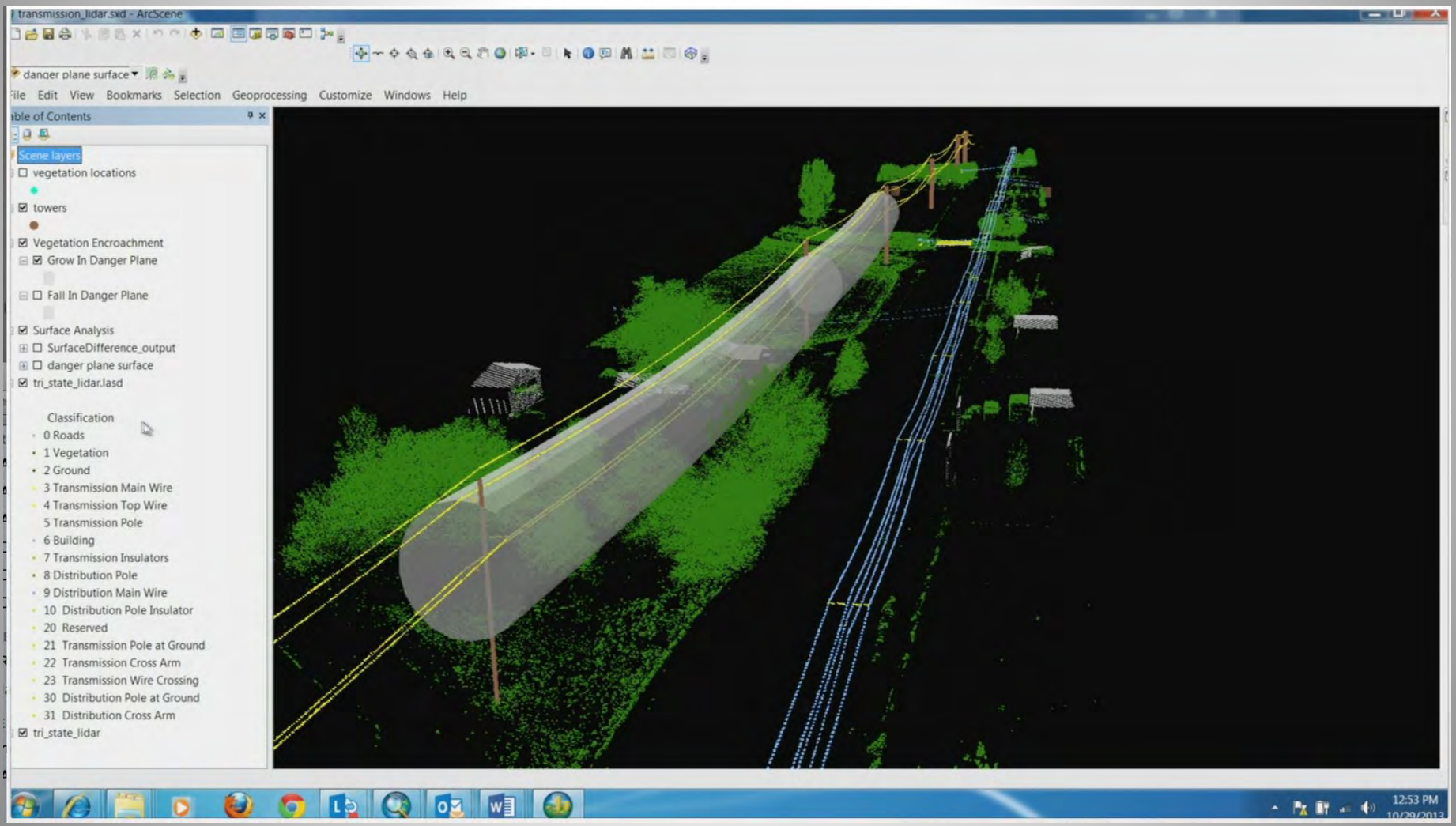
Energy Solutions - Transmission Lines – Vegetation Analysis (Cont.)



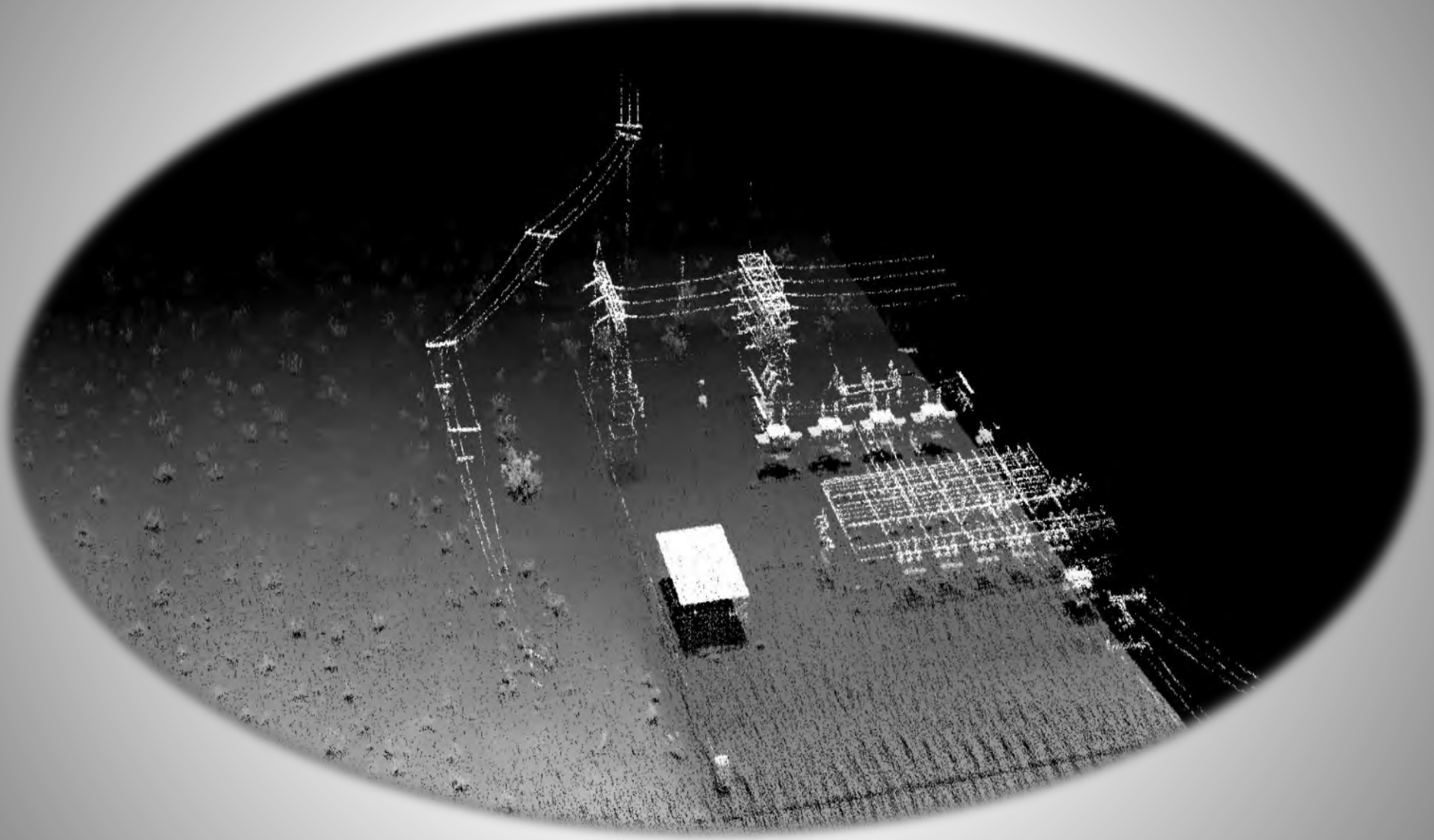
Energy Solutions - Transmission Lines – NDVI Colored Lidar



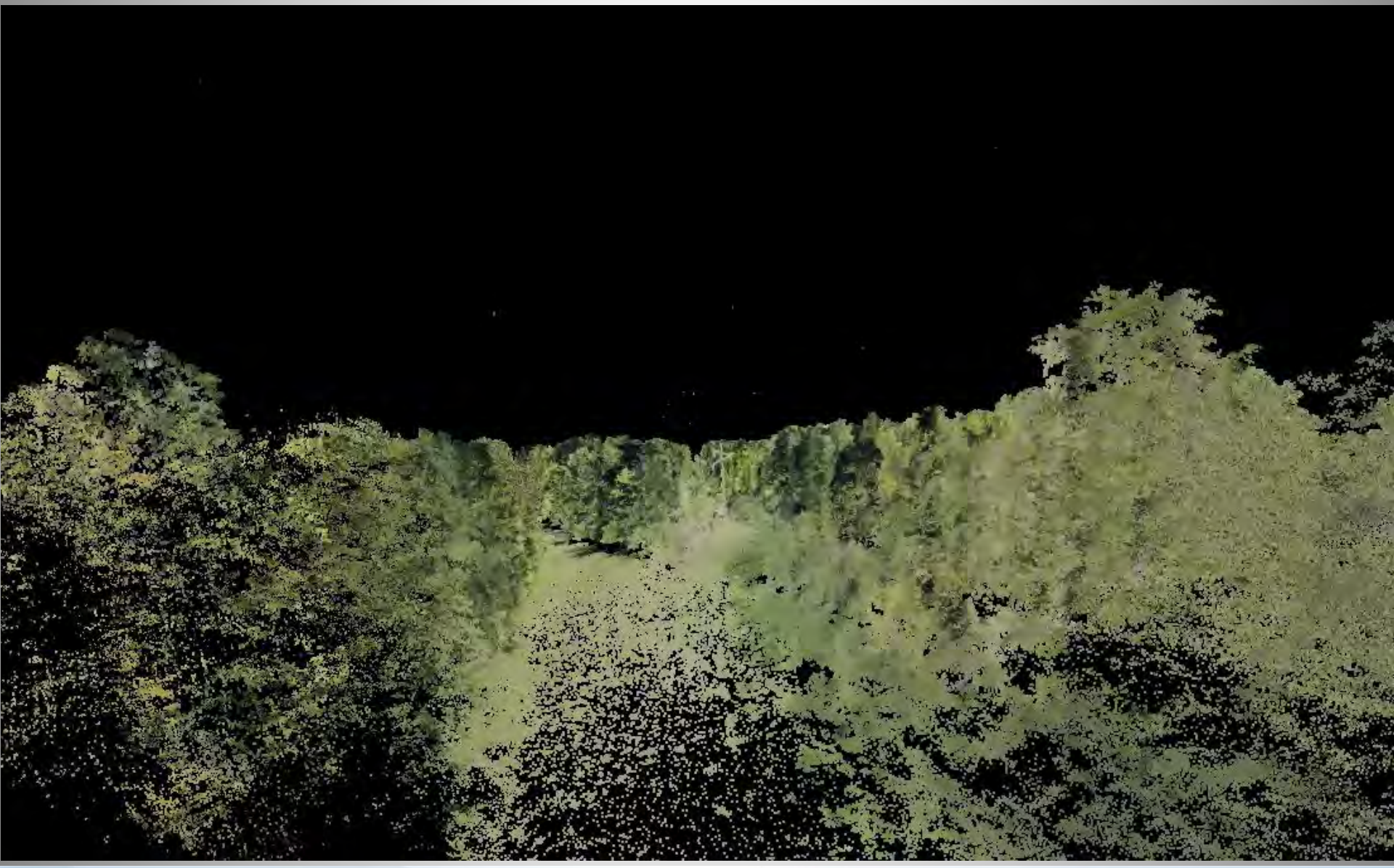
Energy Solutions – Safety Buffer Mapping



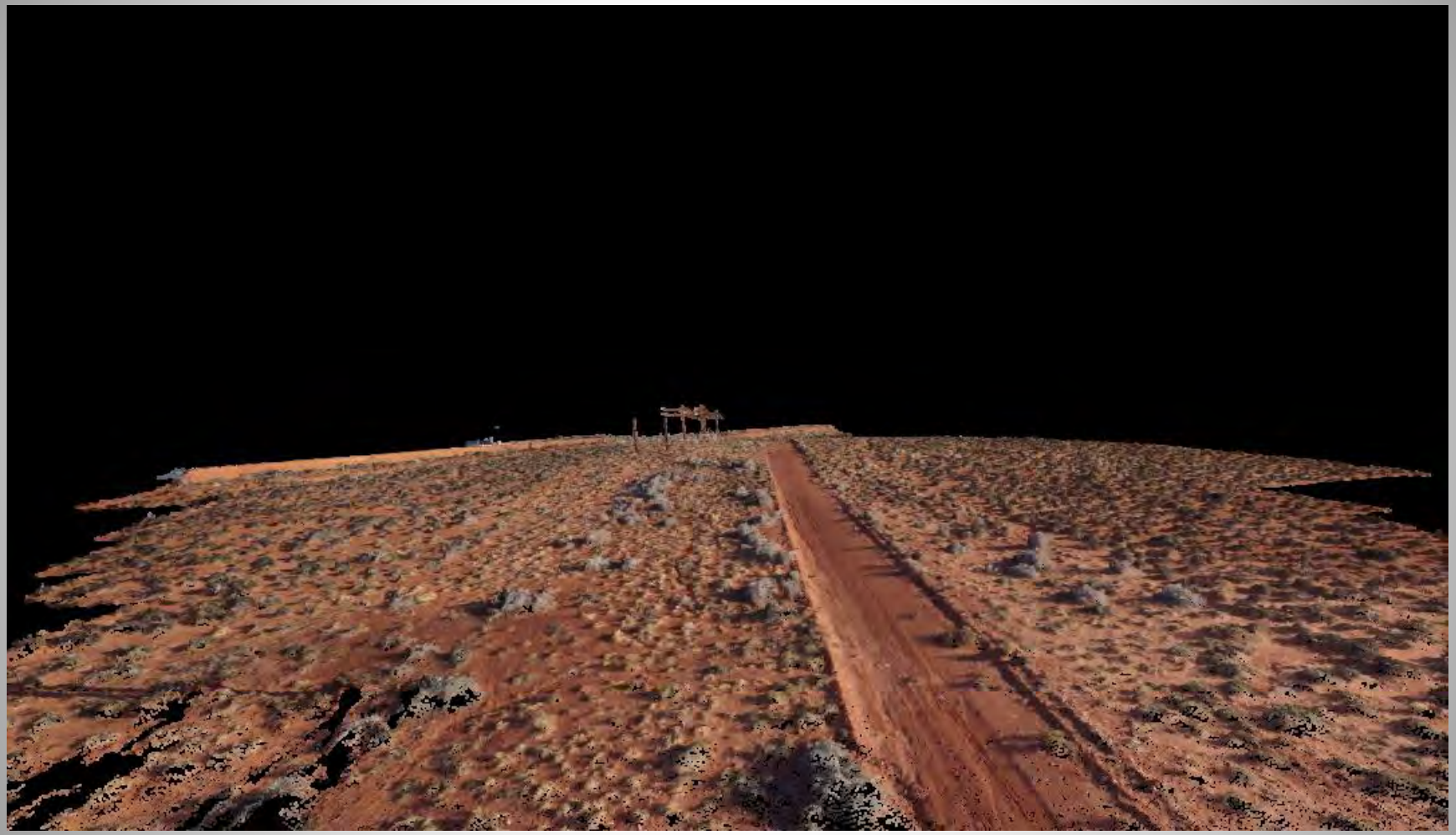
Energy Solutions – Substation modeling with Lidar



Energy Solutions – Fly Through Modeling



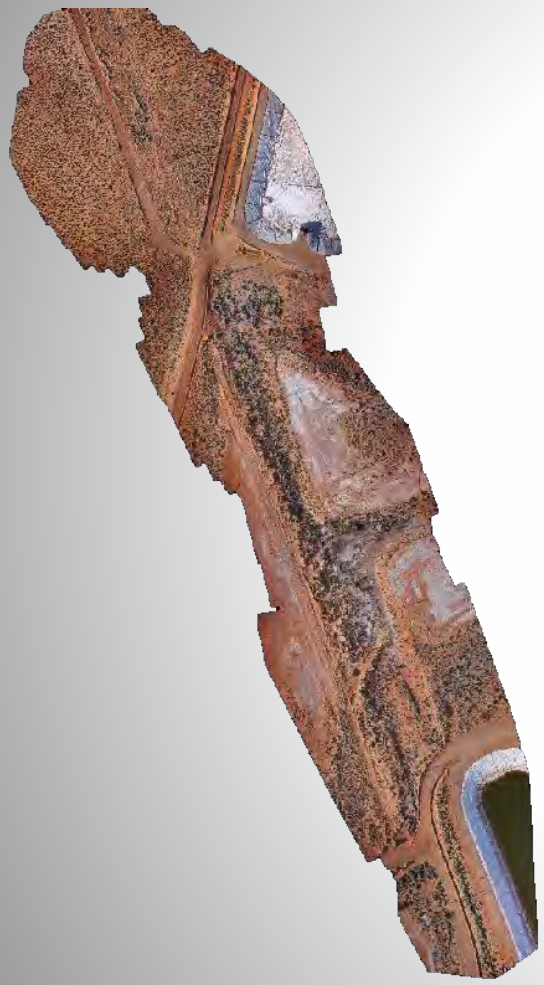
Energy Solutions – Fly Through Modeling

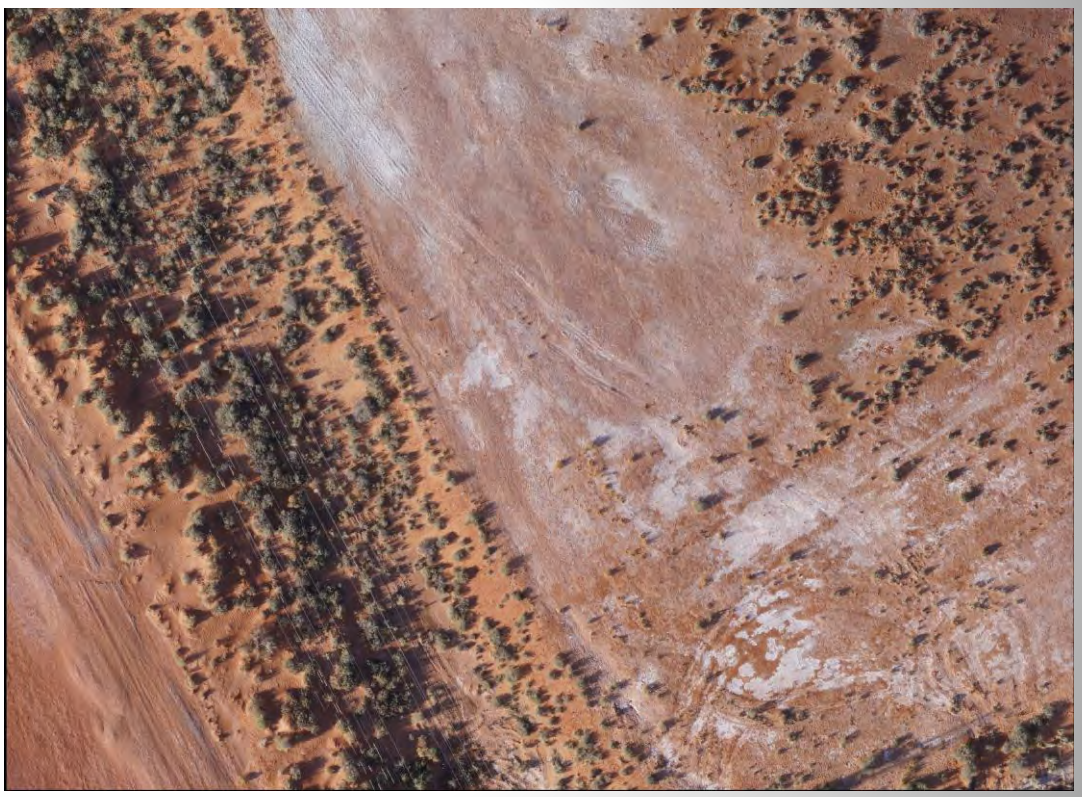


Energy Solutions – High Resolution Imagery

Energy Solutions – High Resolution Orthophotography

Energy Solutions – High Resolution Orthophotography





Energy Solutions – High Resolution Imagery

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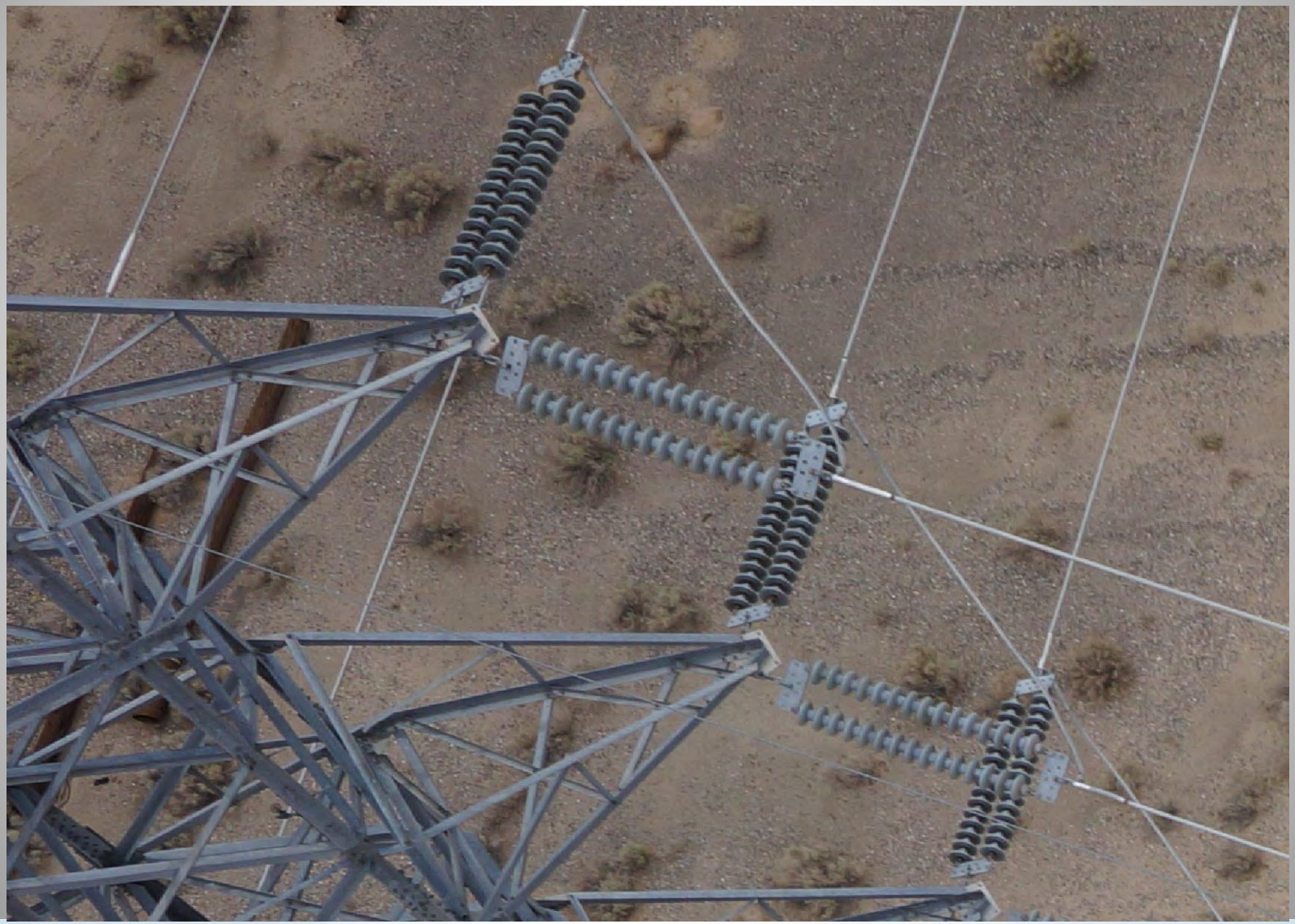
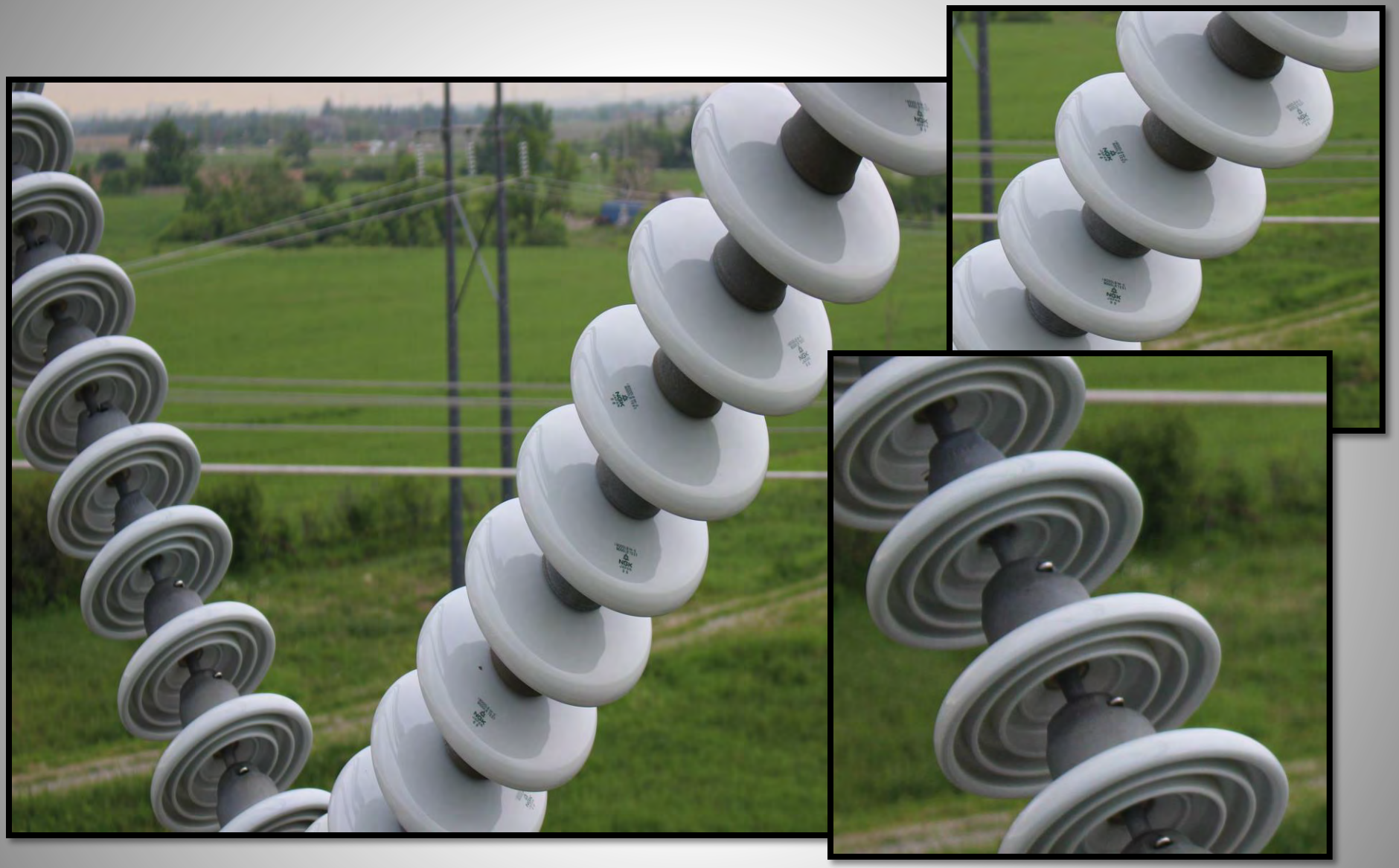
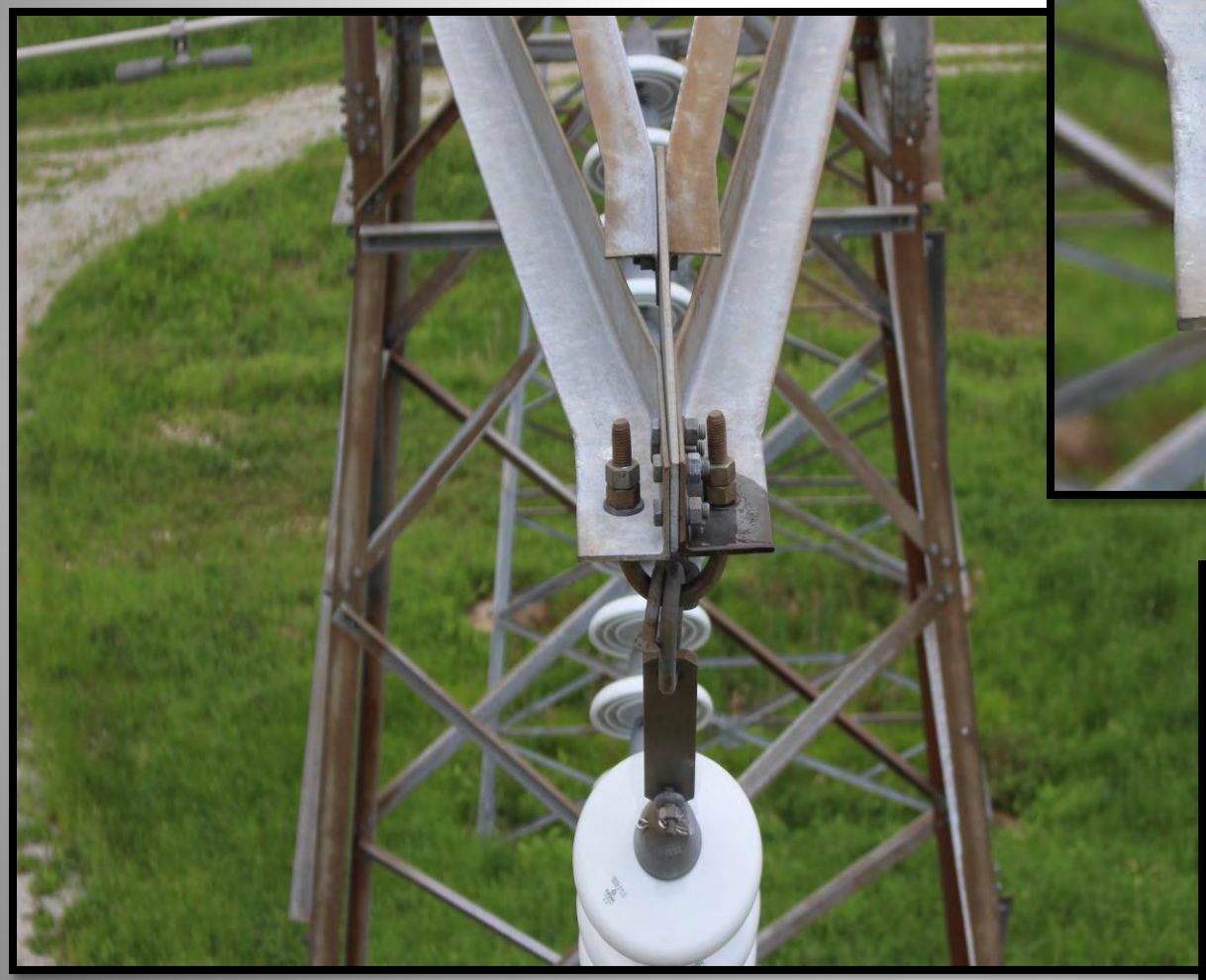
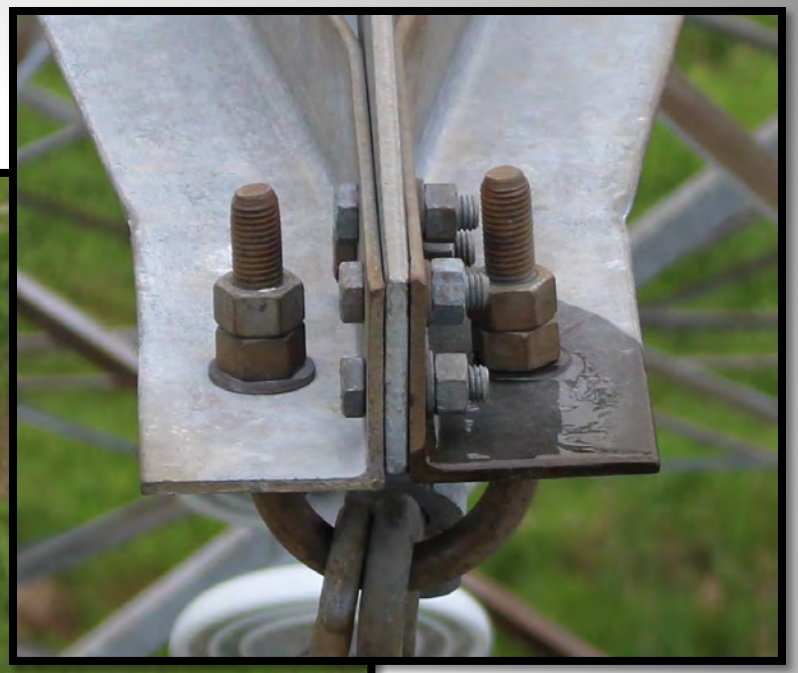


Energy Solutions – Hi Resolution Imagery



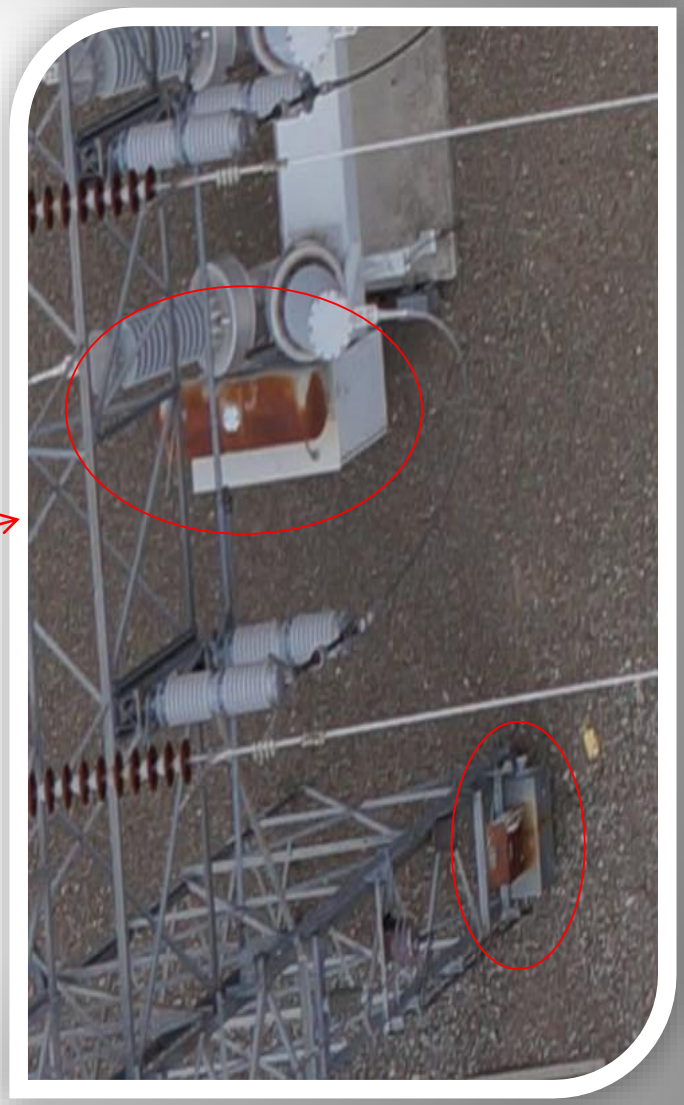
Energy Solutions – Hi Resolution Imagery



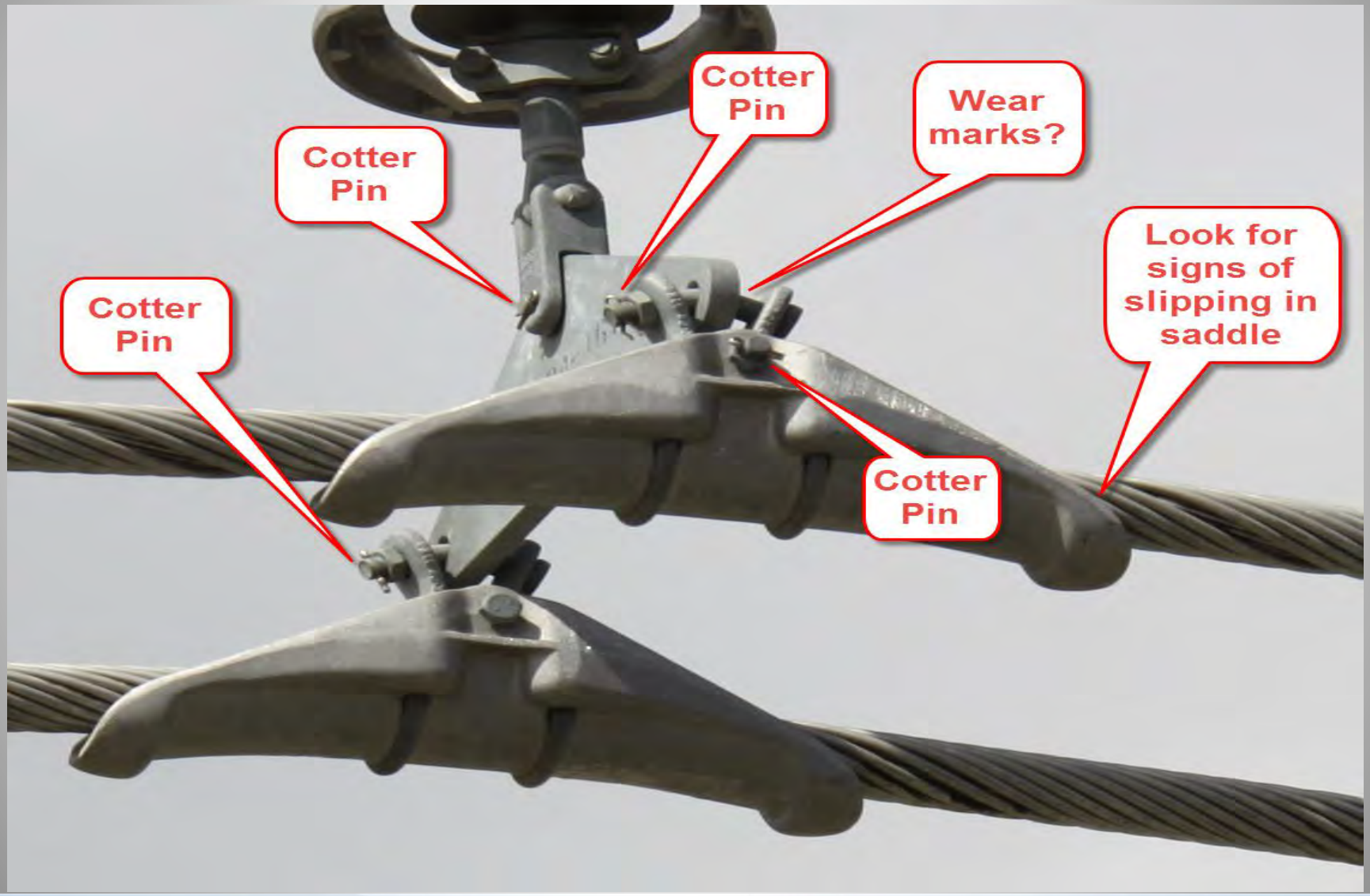


High Resolution Images

Area of substantial rust

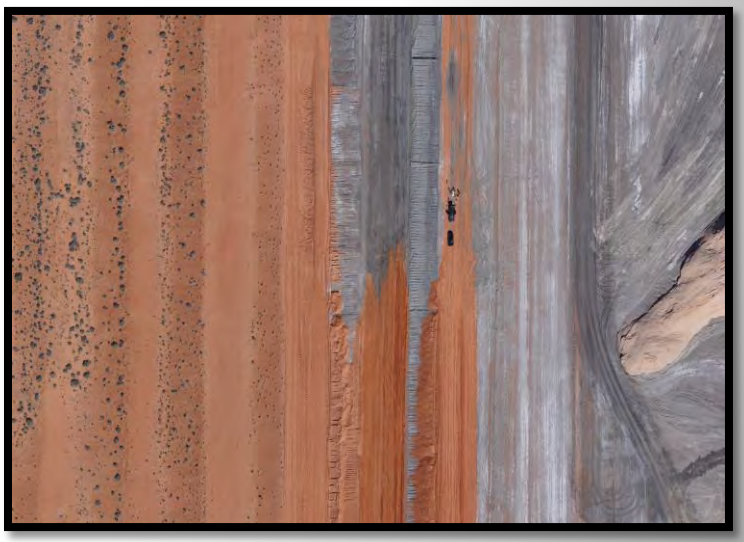


Energy Solutions – Hi Resolution Imagery



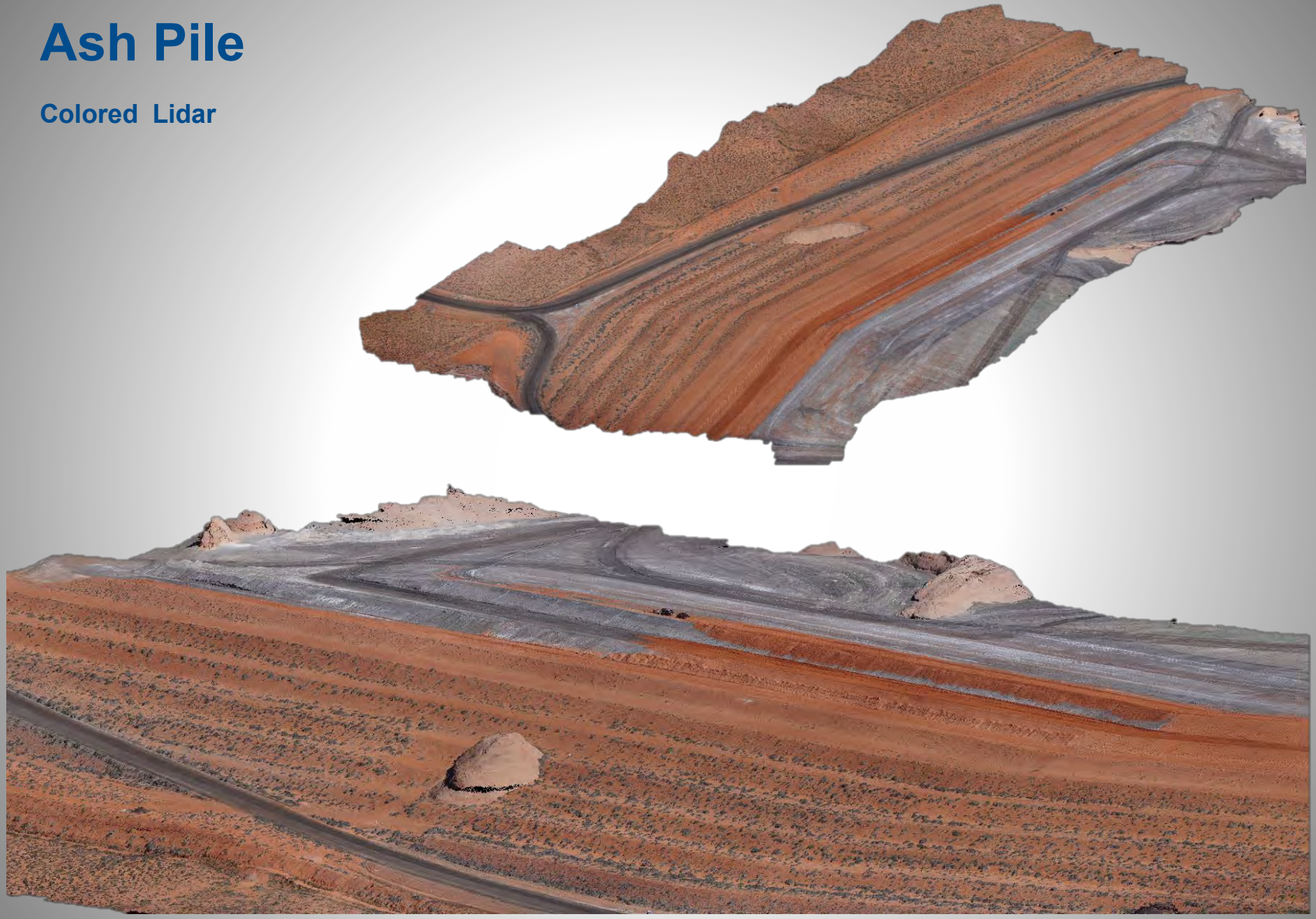
Ash Pile

Orthomosaic



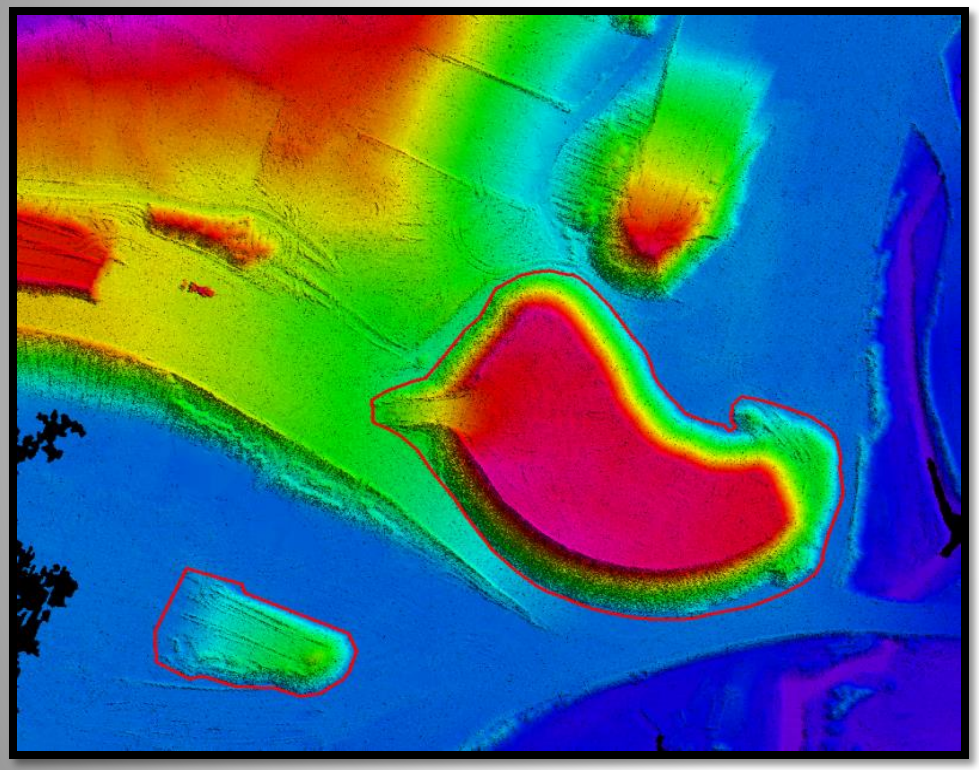
Ash Pile

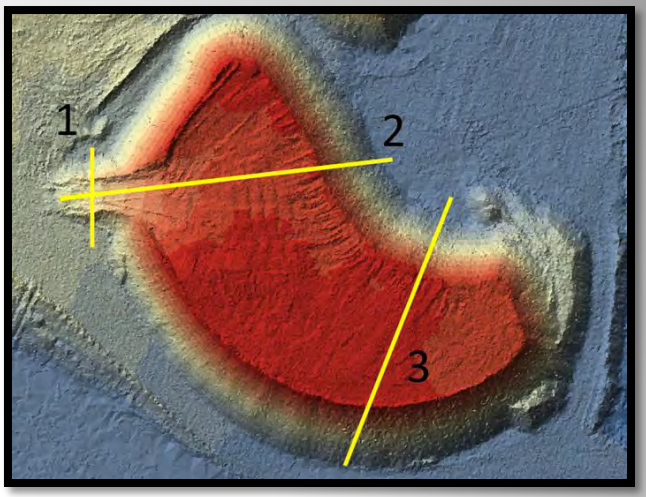
Colored Lidar



Gravel Pit– Volumetrics

AV found a total of 63,090 cubic yards





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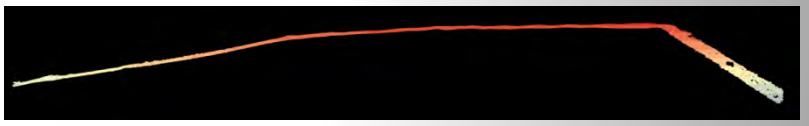

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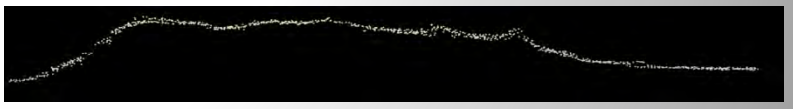
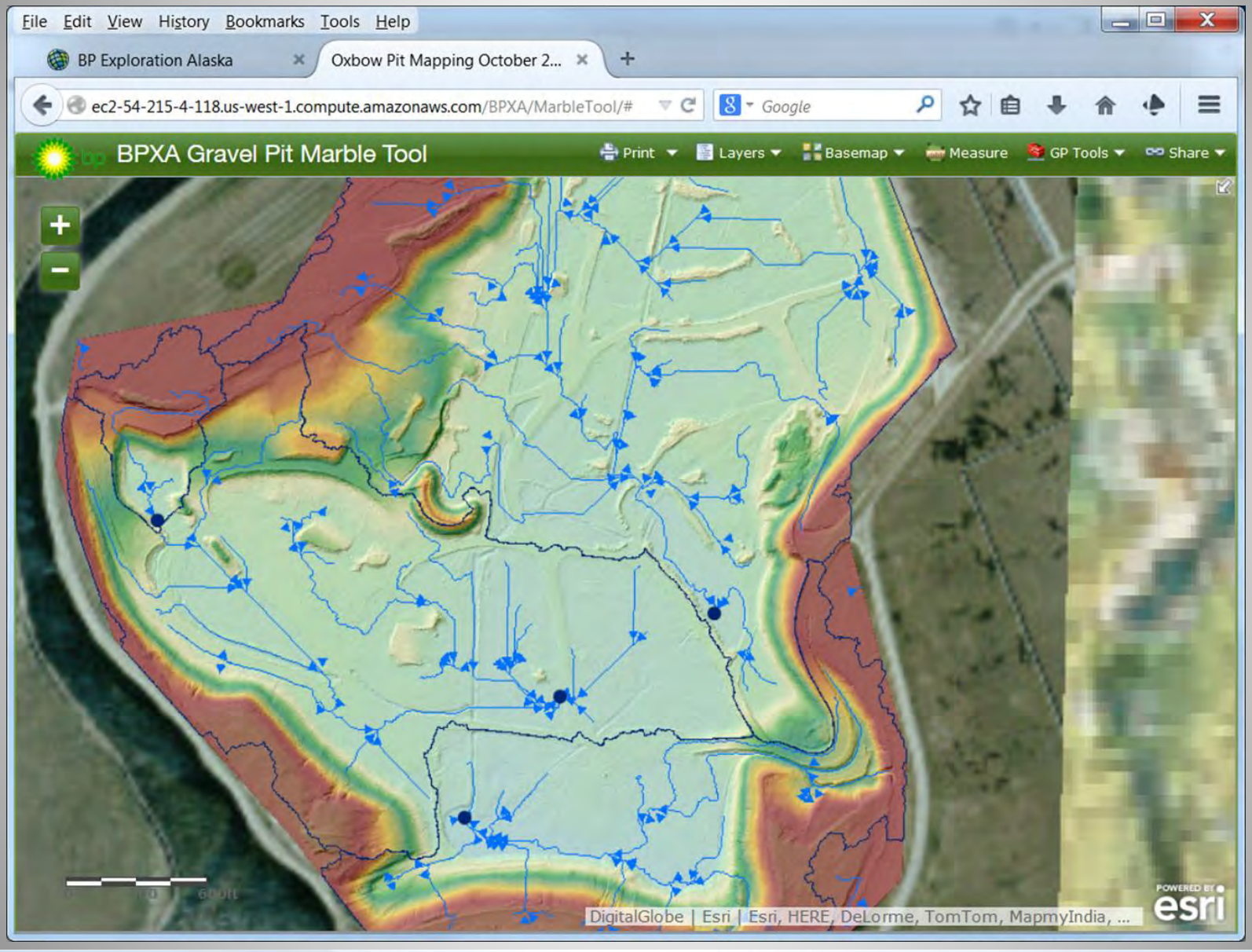


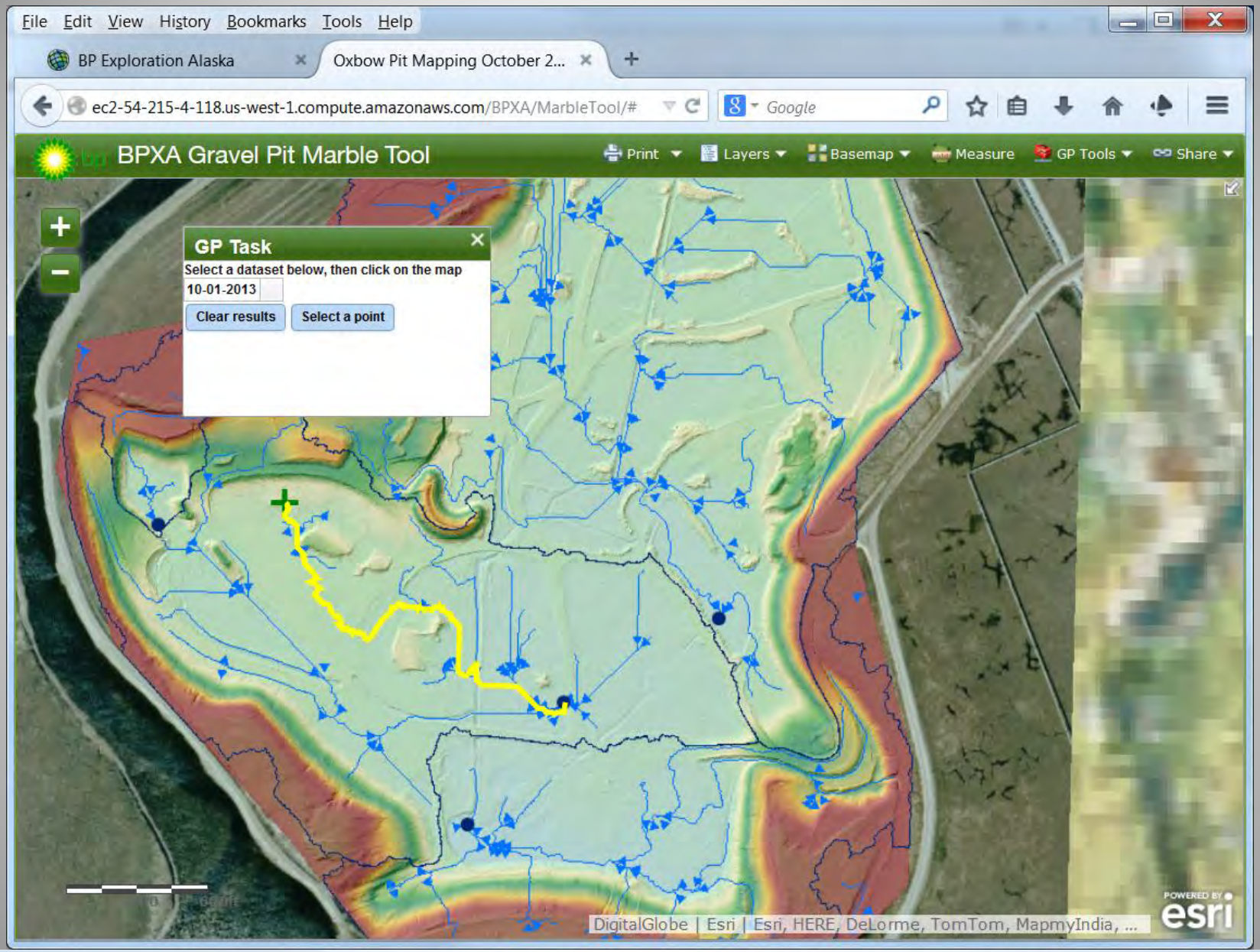
3

Gravel Pit Volumetrics

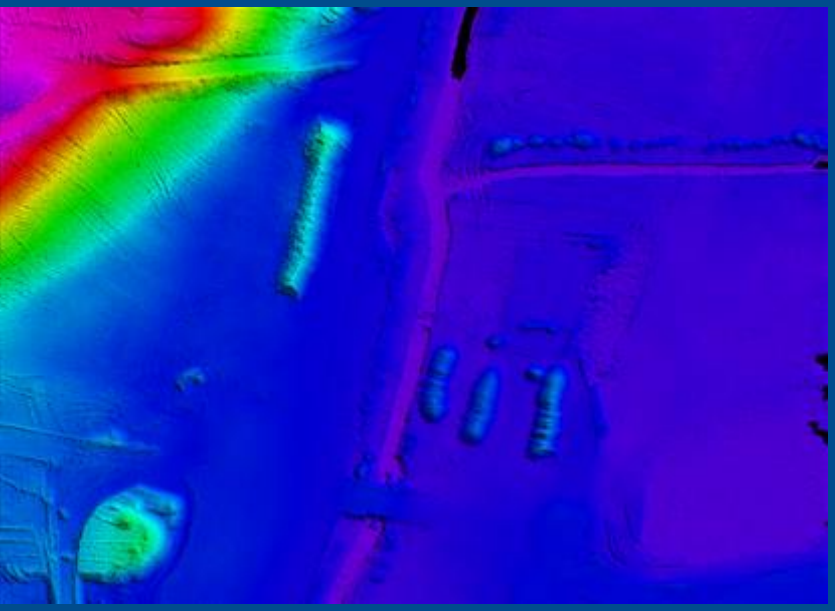
Gravel Pit – Watershed Analysis – Sink point and drainage path identification

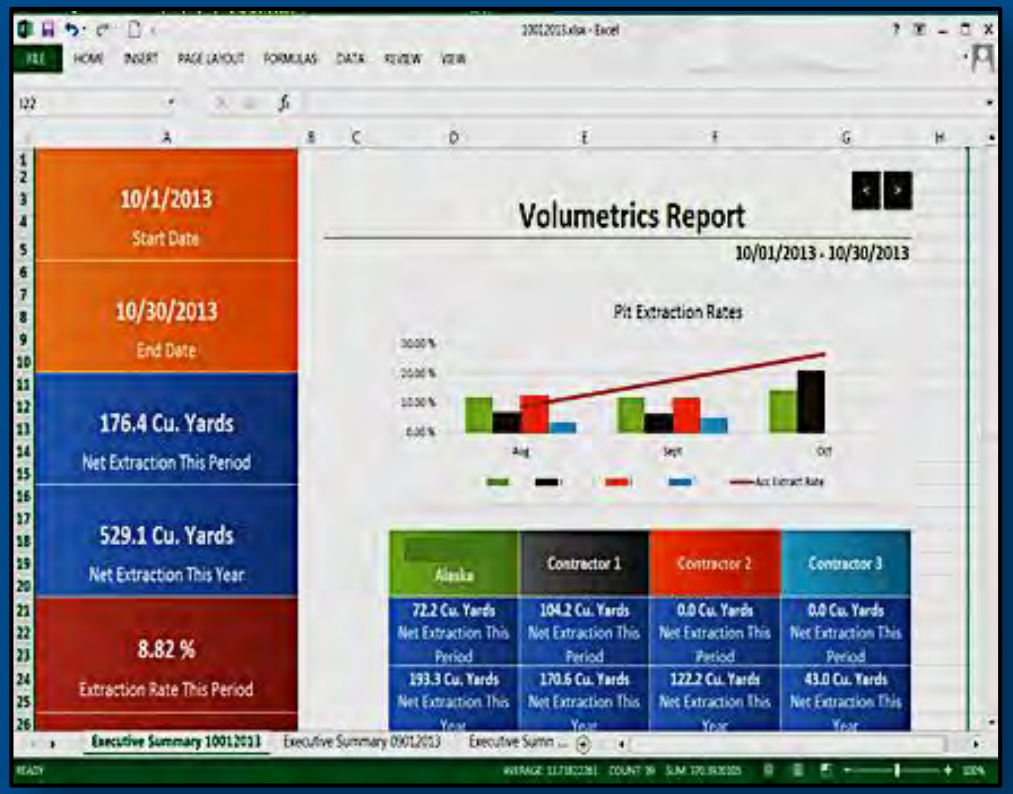


Gravel Pit – Marble Tool – Water flow analysis using selected point(s)

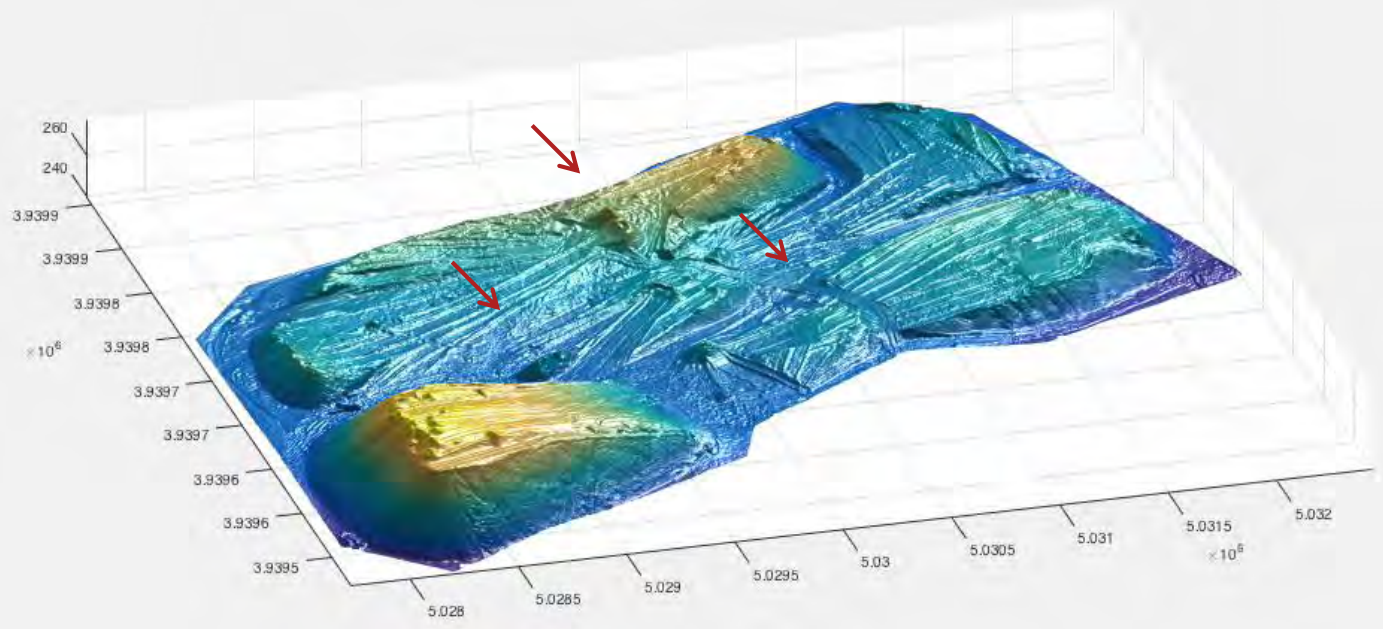


Energy & Mining Solutions – Volumetrics



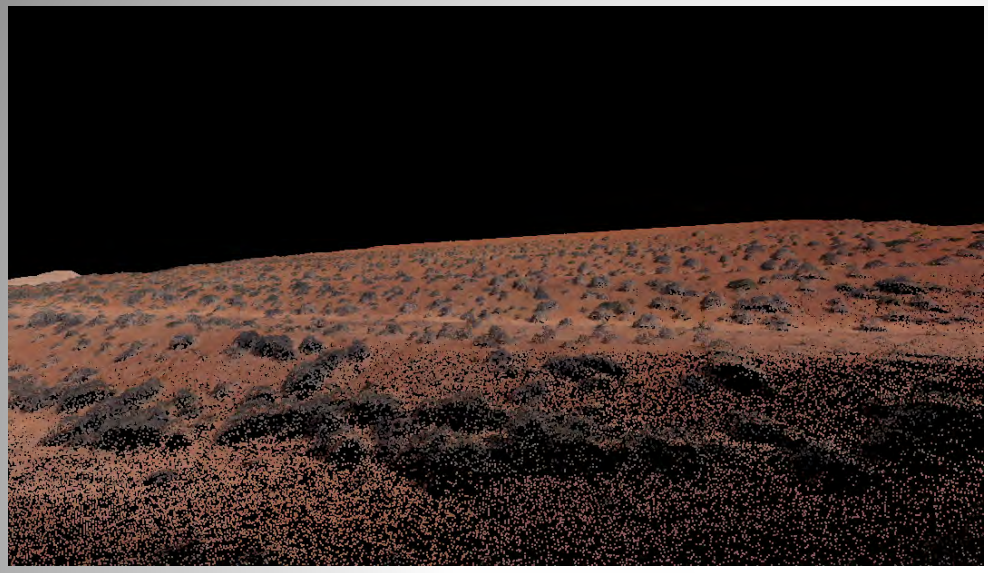


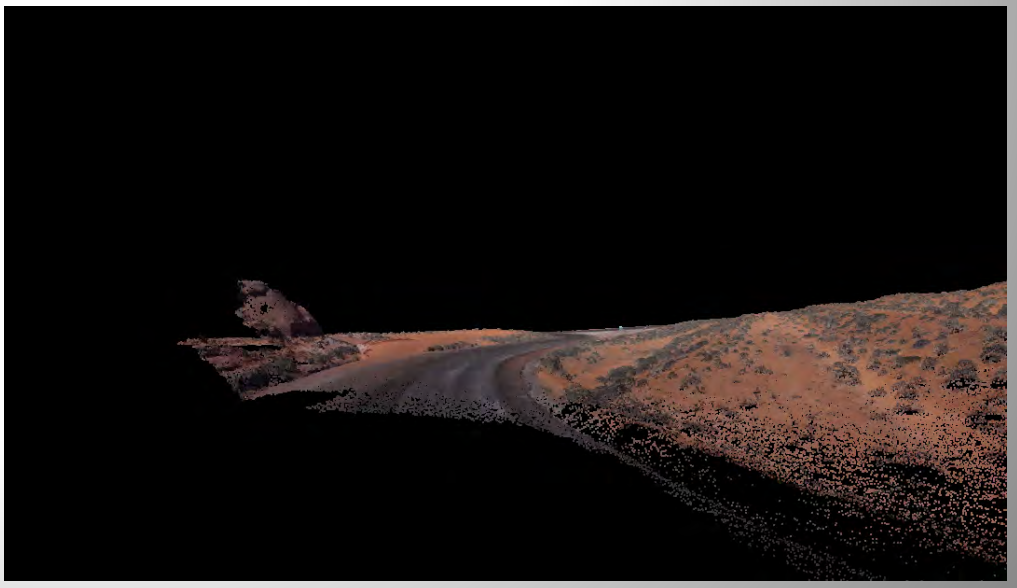
Coal Pile – Volumetrics



Ash Pile

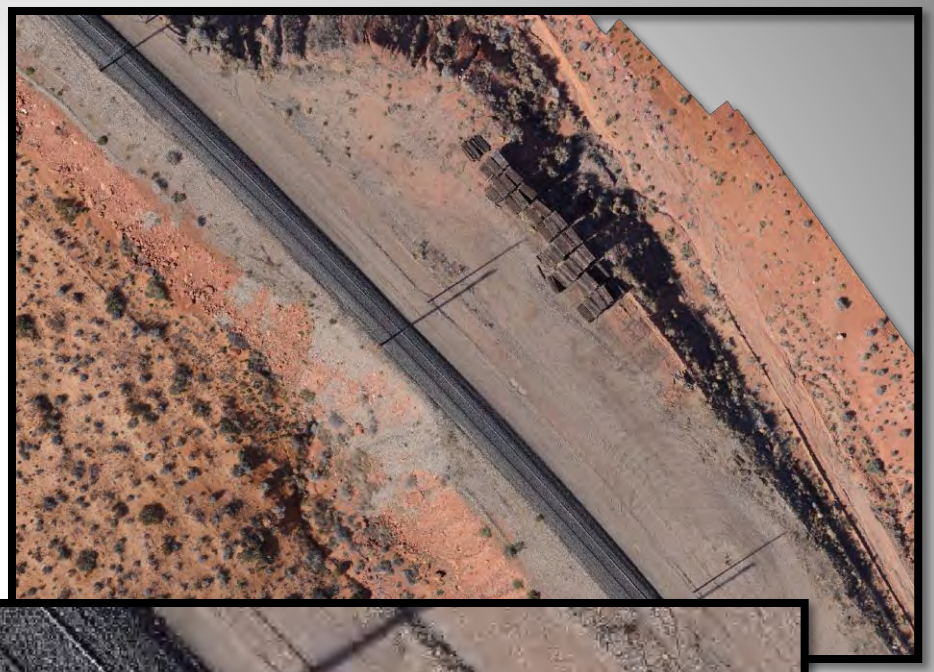
Fly-Through Videos





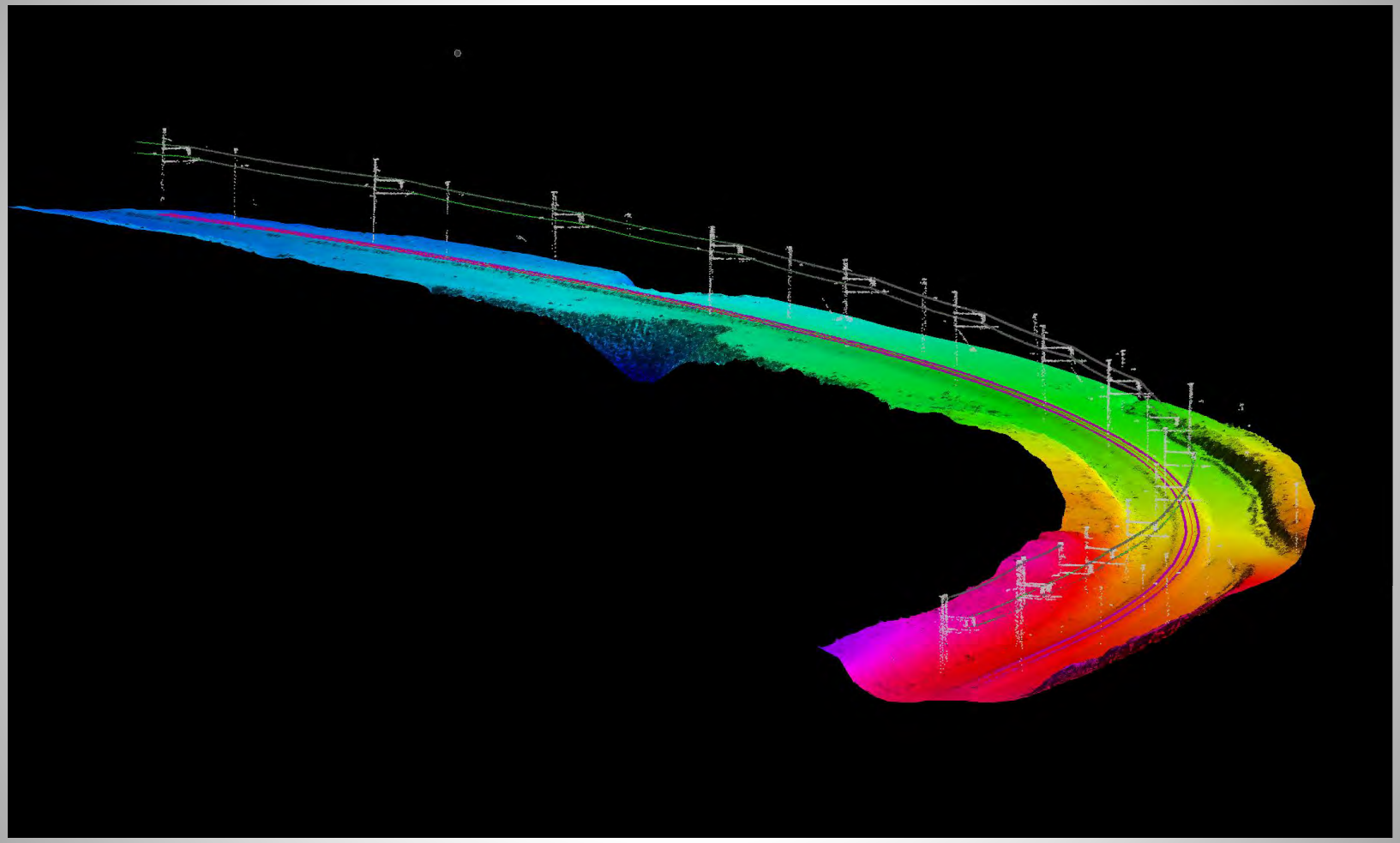
Rail

Orthomosaic



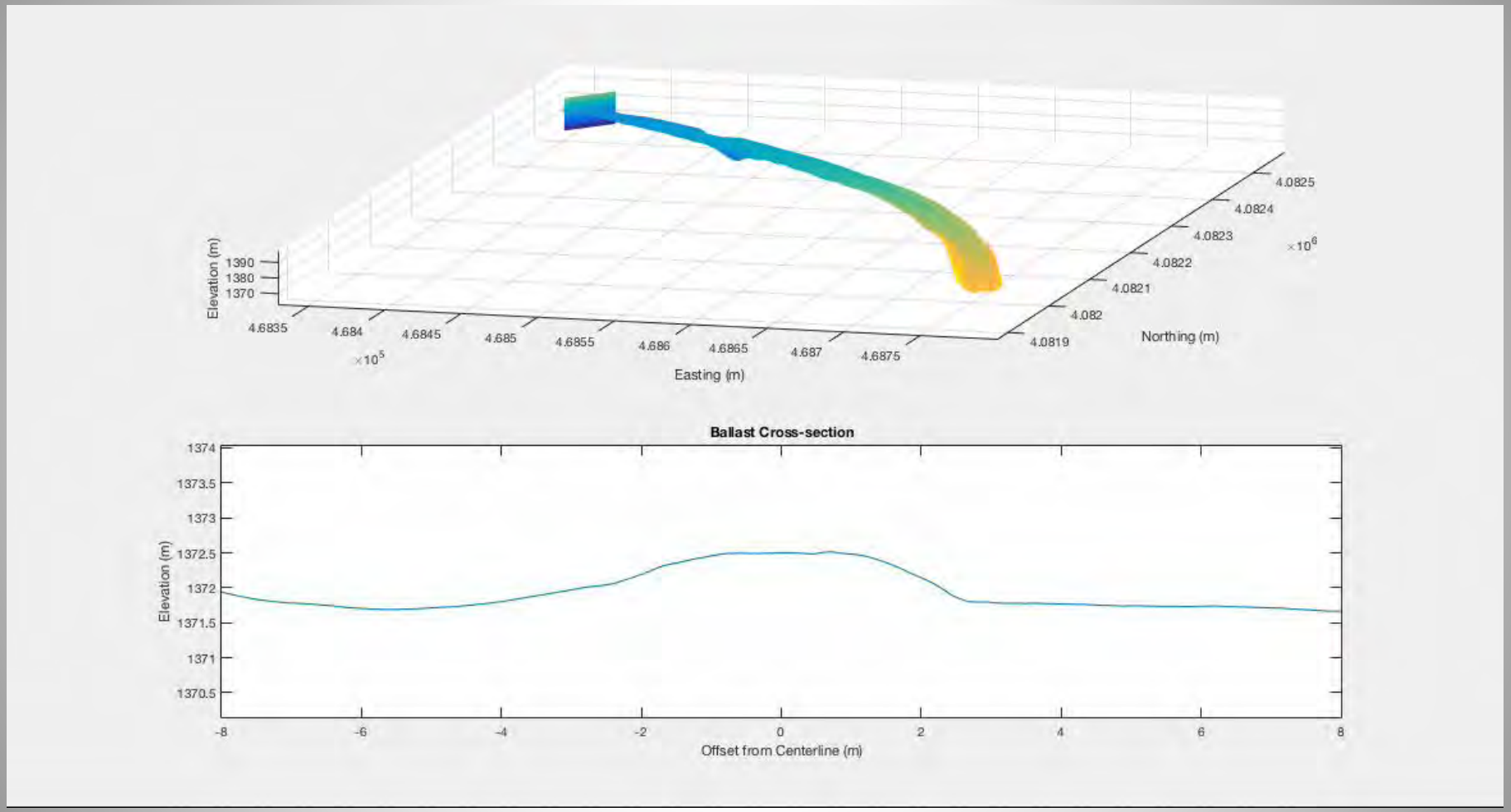
Rail

Lidar



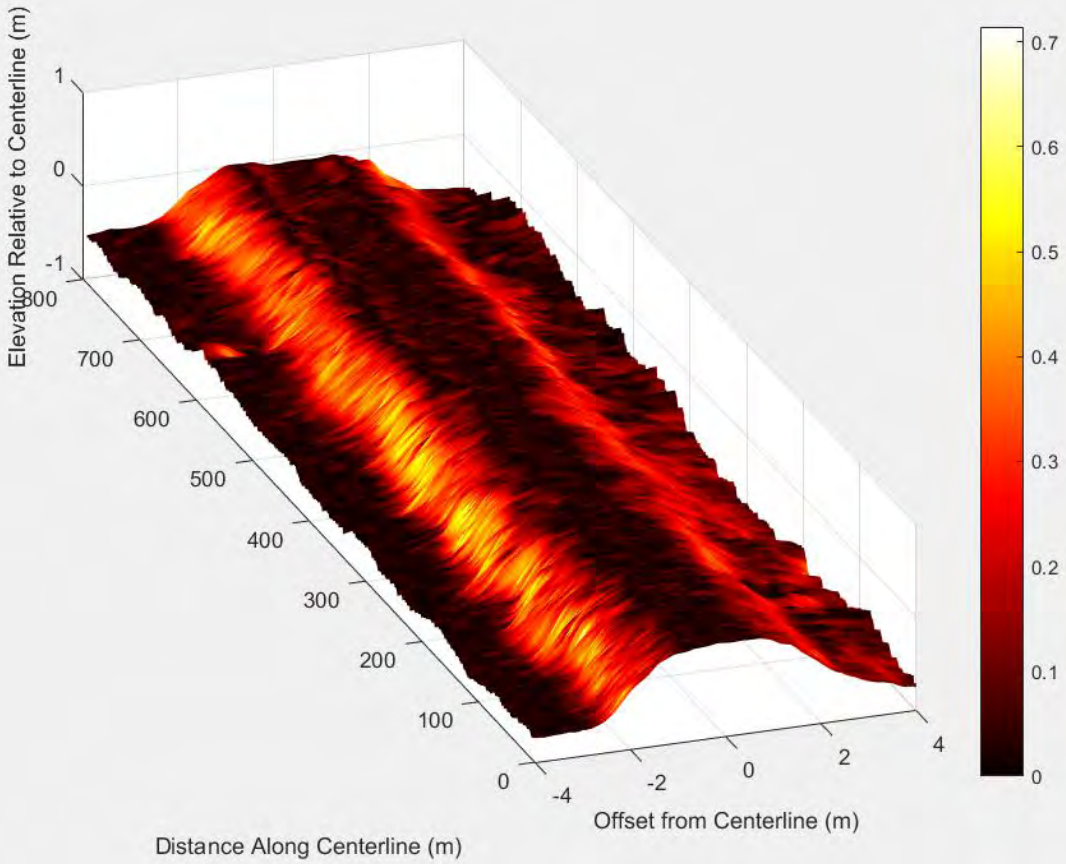
Rail

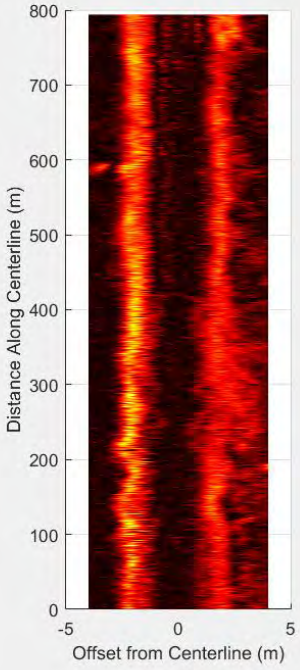
Measurements: Cross Sections



Rail

Measurements: Ballast Slopes

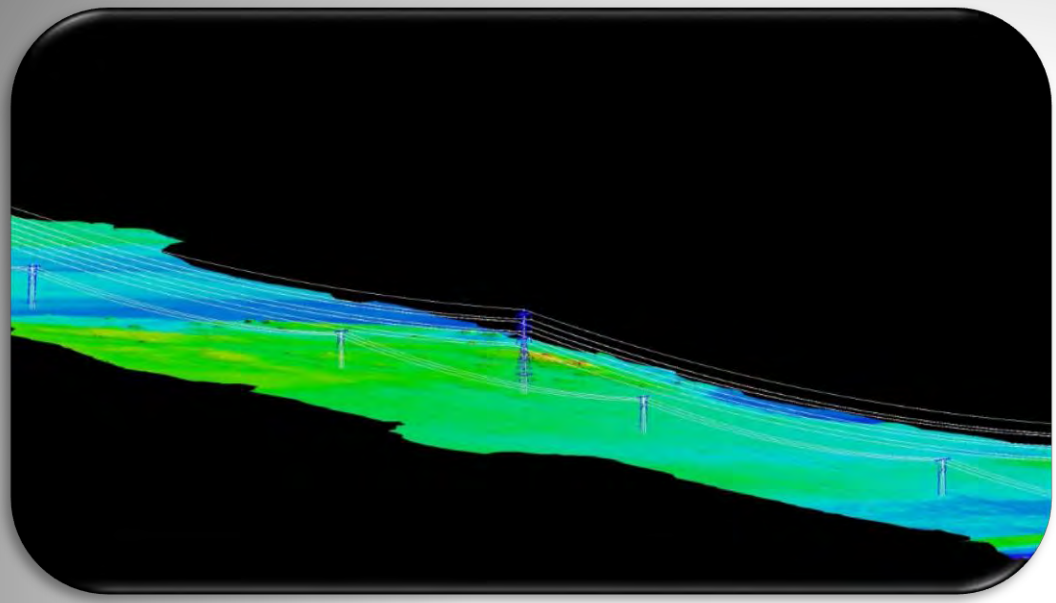


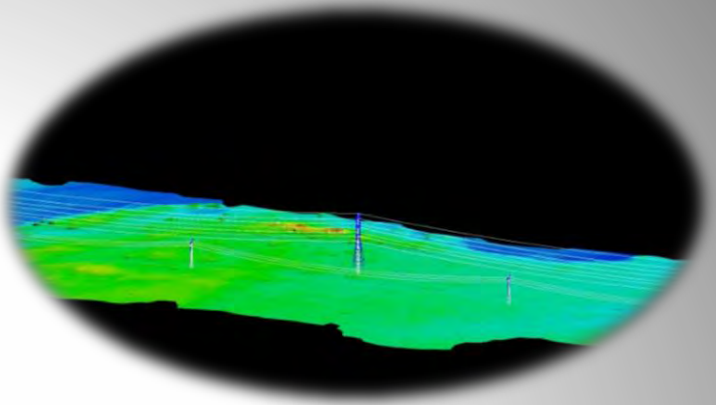


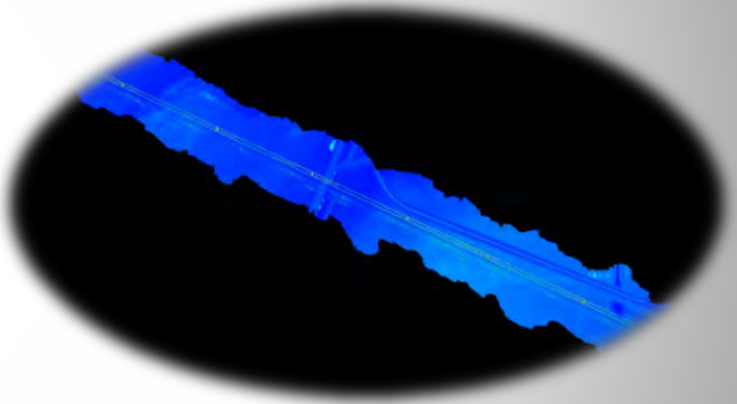
Rail

Fly-Through Videos

Surface Models generated with Lidar

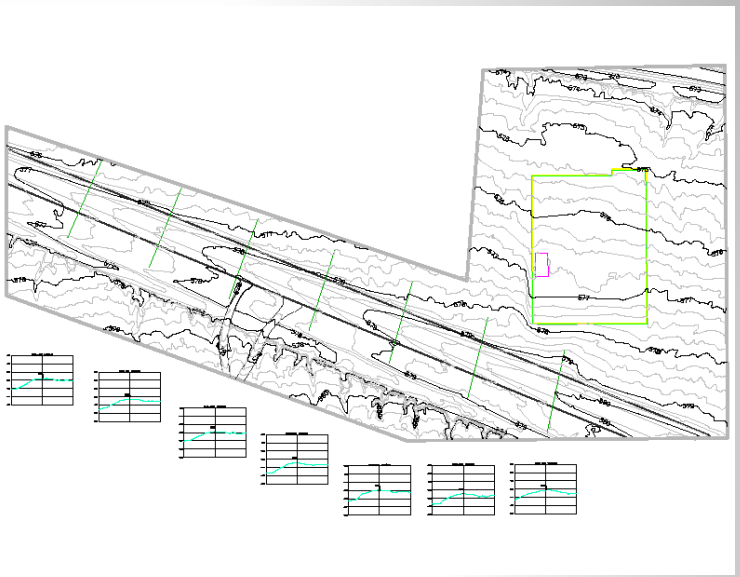


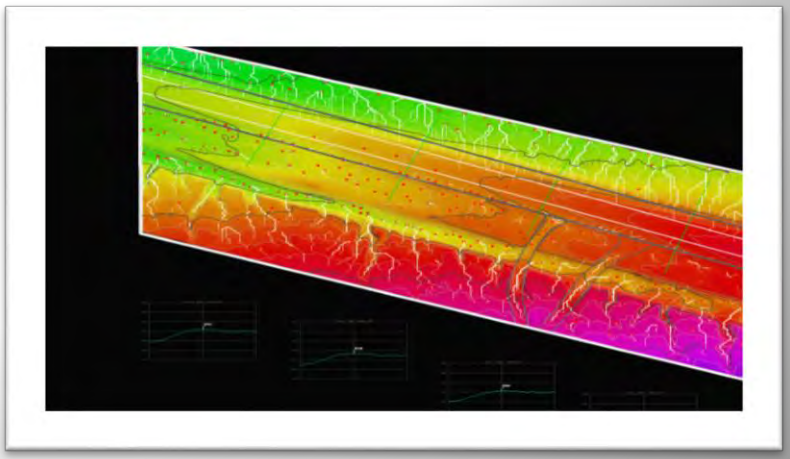




Road Analysis- Terrain modeling

- Topo data from lidar
- Elevations in meters (ellipsoidal height)
- Orthometric elevations readily modeled
- Road profiles at 40m intervals
- Drainage and flooding can be modeled





Flood Modeling

Energy Solutions – Security (MTI)

Energy Solutions – Beyond Visual Line of Site

Energy Solutions – Beyond Visual Line of Site

Thank you – Questions?