

North Dakota Industrial Commission
Oil & Gas Research Program



Development & Automation of Aerial Analytics Tools for Remotely Measuring Reclamation Success & Landslide Susceptibility in North Dakota

Who we are



Leaders in Aerial Analytics




Experts from Planet Labs, USGS, BLM,
DOD Geospatial Intelligence, Oil & Gas

175 Years in Geospatial Data Science

167 Years in Soil & Environmental Science

1,200,000+ Acres Analyzed

What we do

	Identify	Assess	Forecast
 Vegetation	✓	✓	✓
 Stormwater	✓	✓	✓
 Soil Movement	✓	✓	✓



North Dakota Goals for Oil & Gas Industry



Zero-spill challenge achieved through innovation

-Governor Doug Burgum



Aerial imagery to improve well site reclamation program efficiencies

-Director of Mineral Resources Lynn Helms



Remote sensing technology is key



North Dakota Goals for Oil & Gas Industry

“Huge amounts of data can be collected
...but those data require appropriate analysis.

Zero-spill challenge achieved through innovation

-Governor Doug Burgum

To make analysis of large quantities of data
economical, automated data processing and
analysis must be employed.”

-OGRC Project G-43-01 Final Report, “Liquids Gathering Pipelines: Survey of Emerging Technologies and Applications of Risk Assessment to Increase Pipeline Integrity”

Project Objectives

Reclamation

Develop & validate scalable metrics for remotely measuring well site reclamation success

Landslides

Develop & validate landslide susceptibility & threat models specific to the Bakken Shale region of North Dakota

Automation

Automate the above aerial analytics tools within a secure, open source, web-based platform



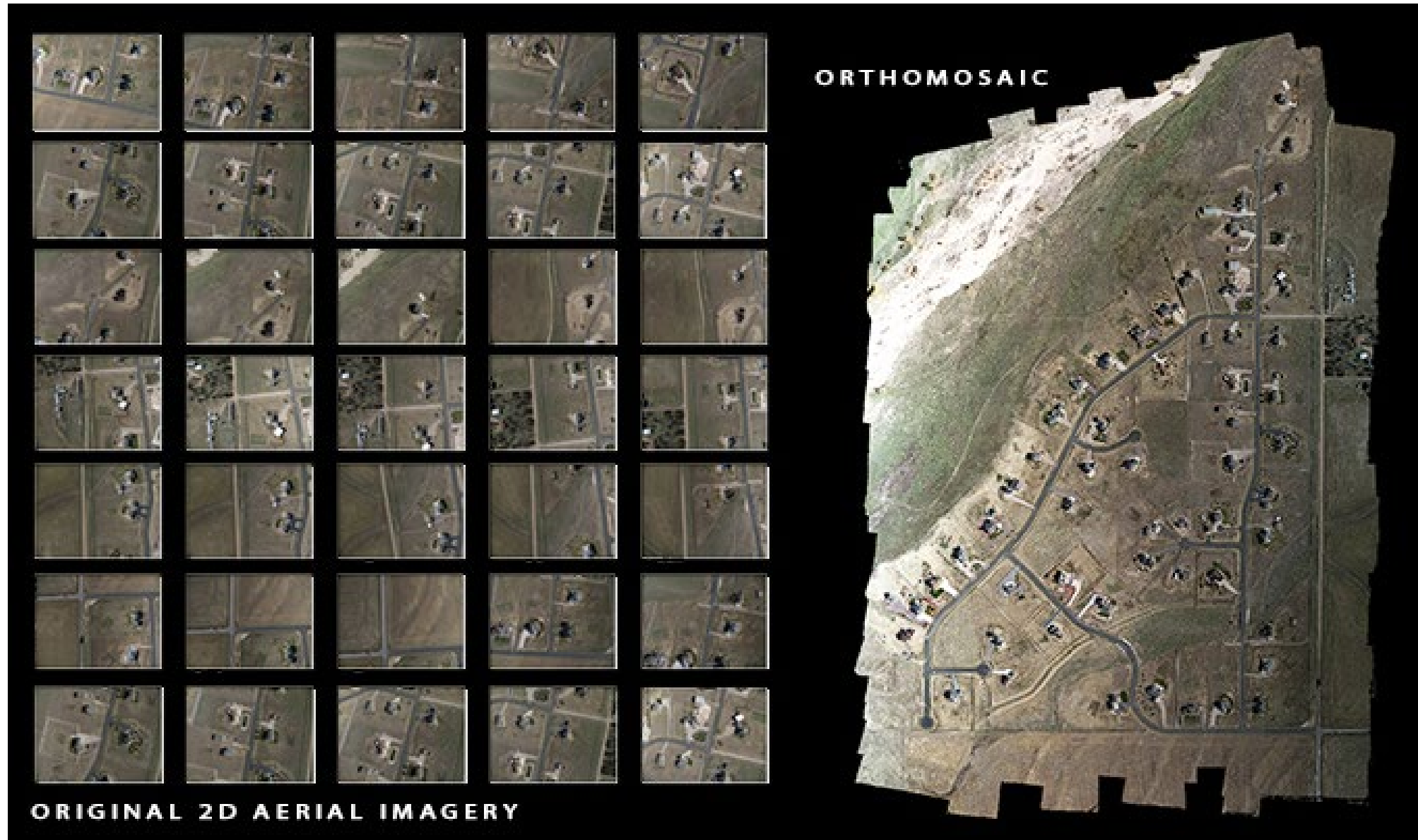
Project-wide Aerial Data Collection

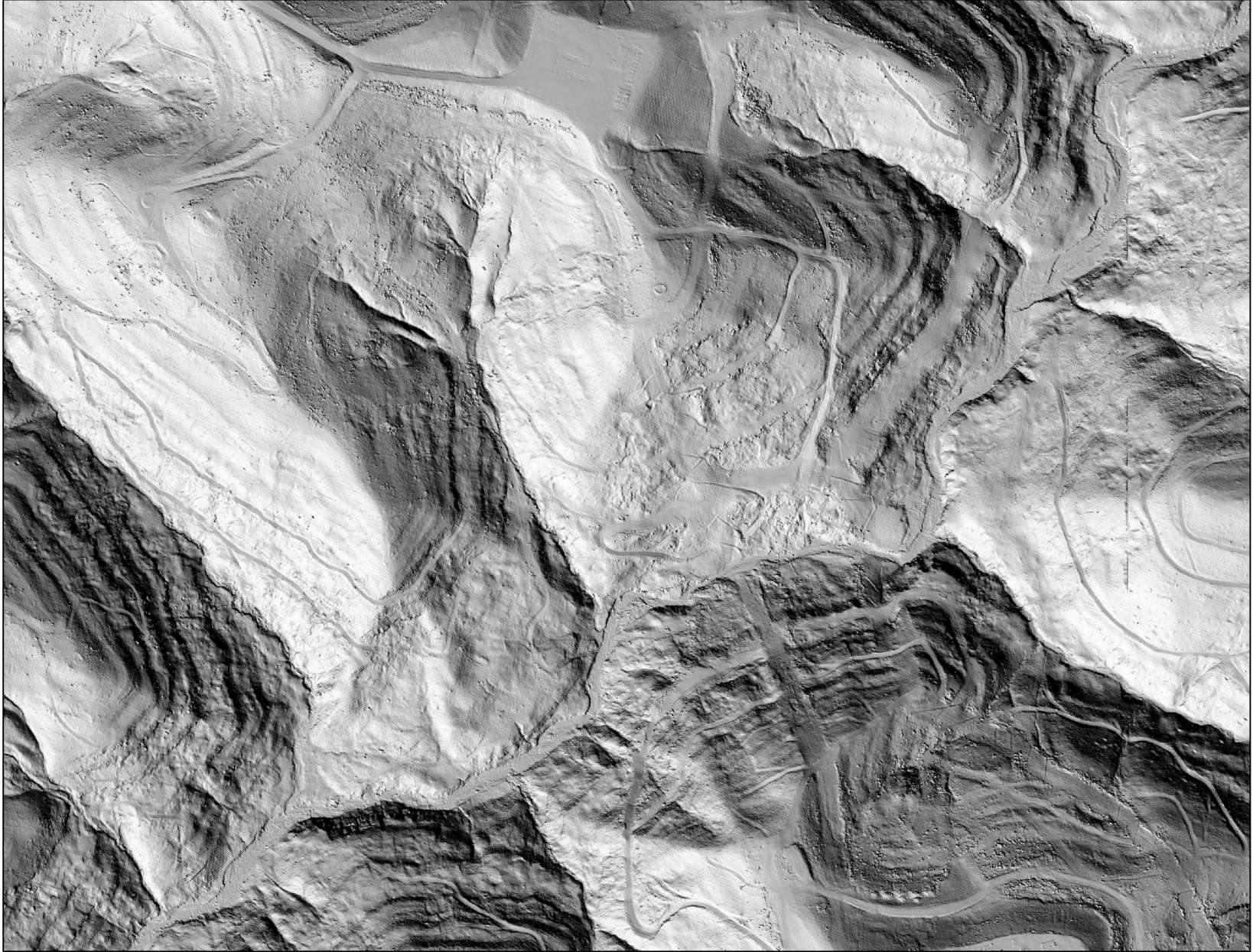


ISIGHT RPV SERVICES



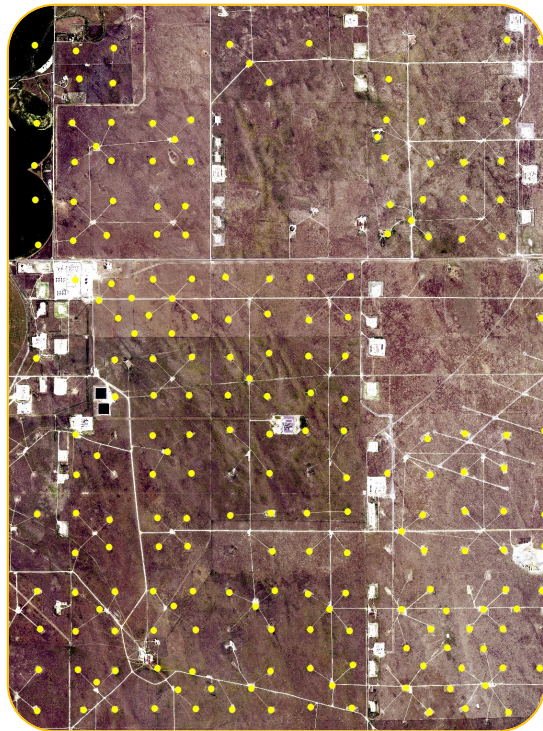
Photogrammetry



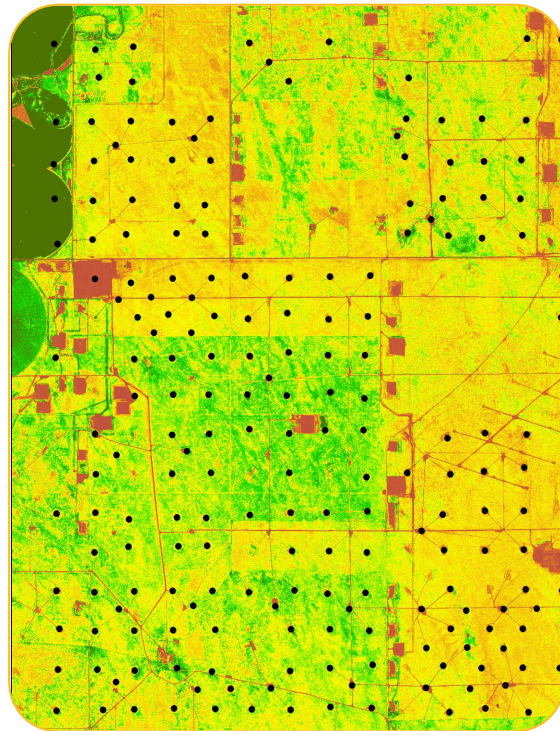


Methodology Reclamation

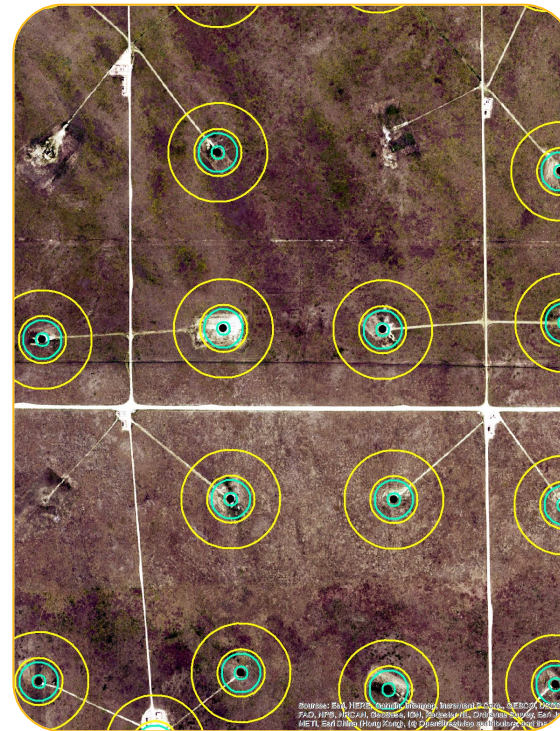
Preliminary Reclamation Assessment
2,175 well sites



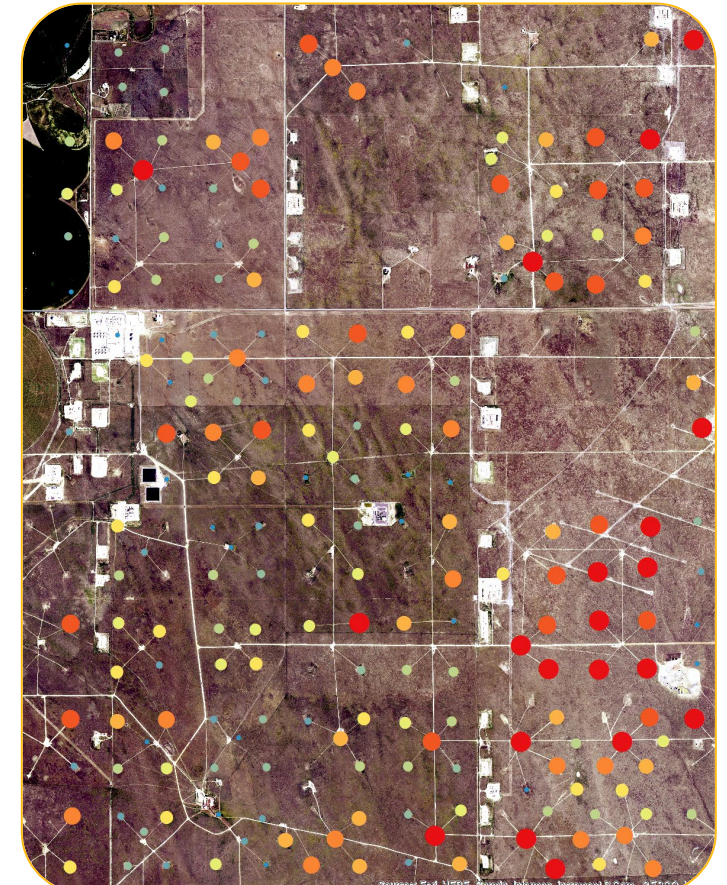
Well site system atop imagery



Vegetation spectrum data



Areas of analysis



Preliminary ranking of reclamation success



Methodology

Reclamation

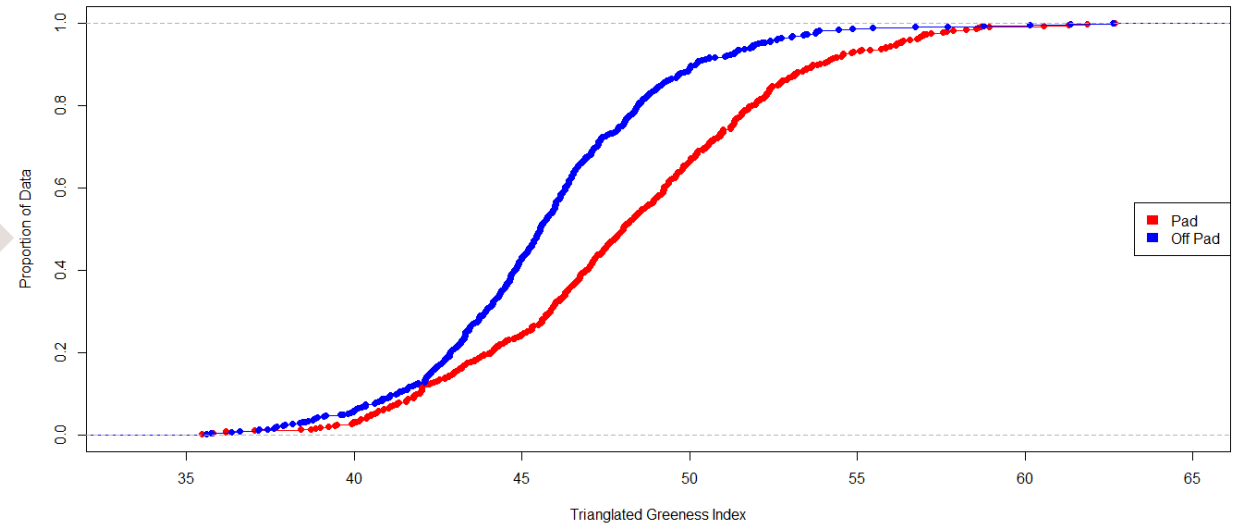


Aerial Reclamation Assessment

52 well sites



Vegetation Spectrum Assessment



Methodology

Reclamation

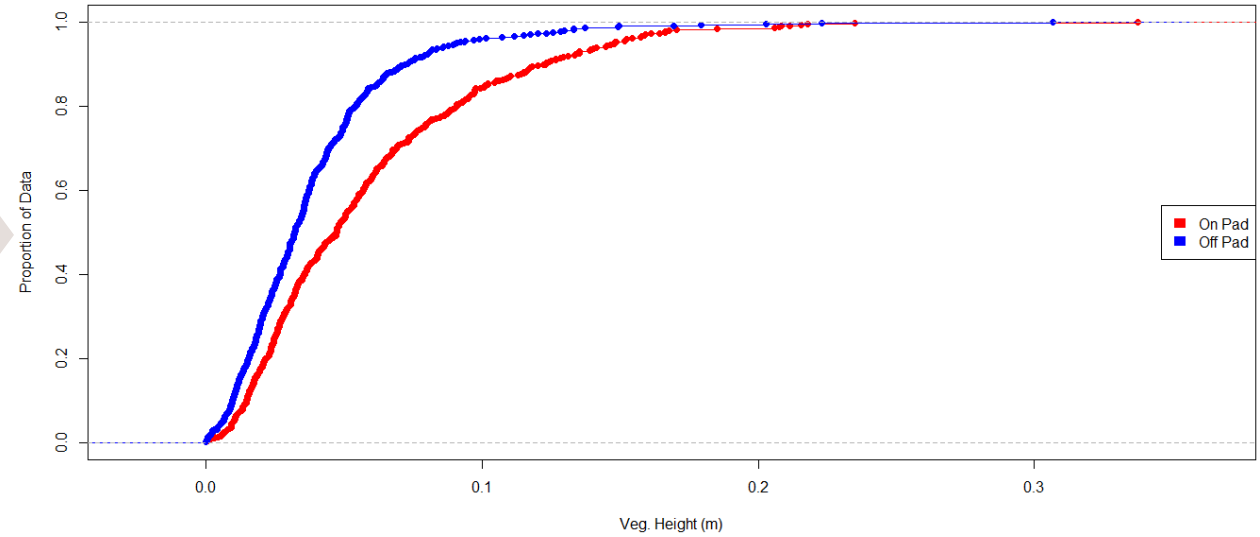


Aerial Reclamation Assessment

52 well sites



Vegetation Structure Assessment



Methodology Reclamation



Validation

Comparison between preliminary & aerial assessments

Ground truthing of 50% aerially assessed sites **DURAROOT**

NDIC inspection of 25% of aerially inspected sites

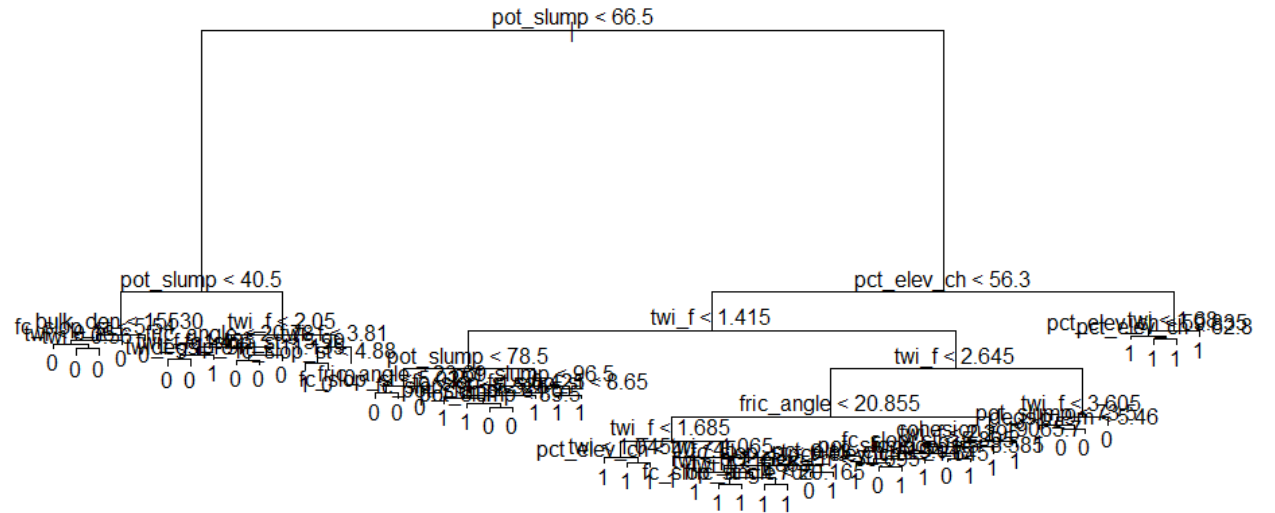
**Measure effectiveness of tool ability to
remotely determine reclamation success**



Methodology Landslides

Landslide Susceptibility Model Development

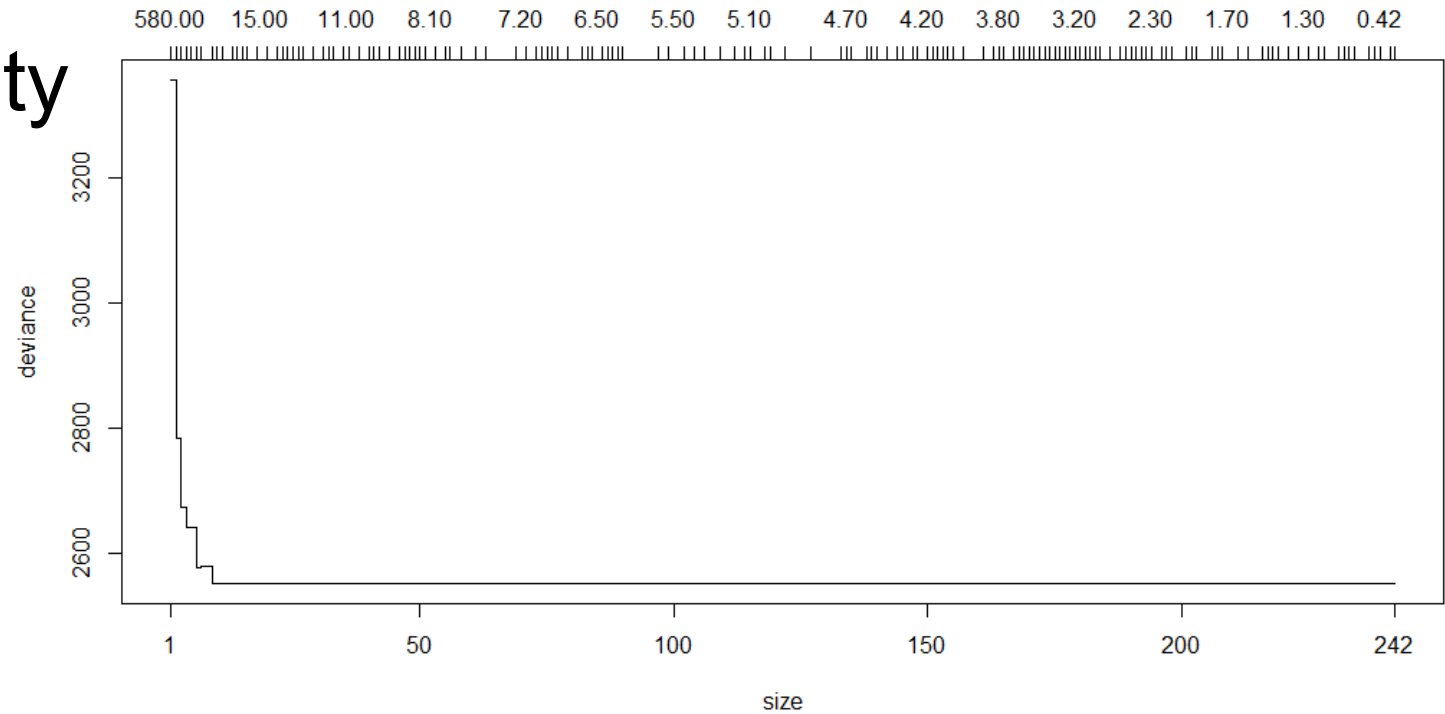
- › Lidar
- › Historical landslides
- › Soil properties
- › Terrain properties



Methodology Landslides

Landslide Susceptibility Model Development

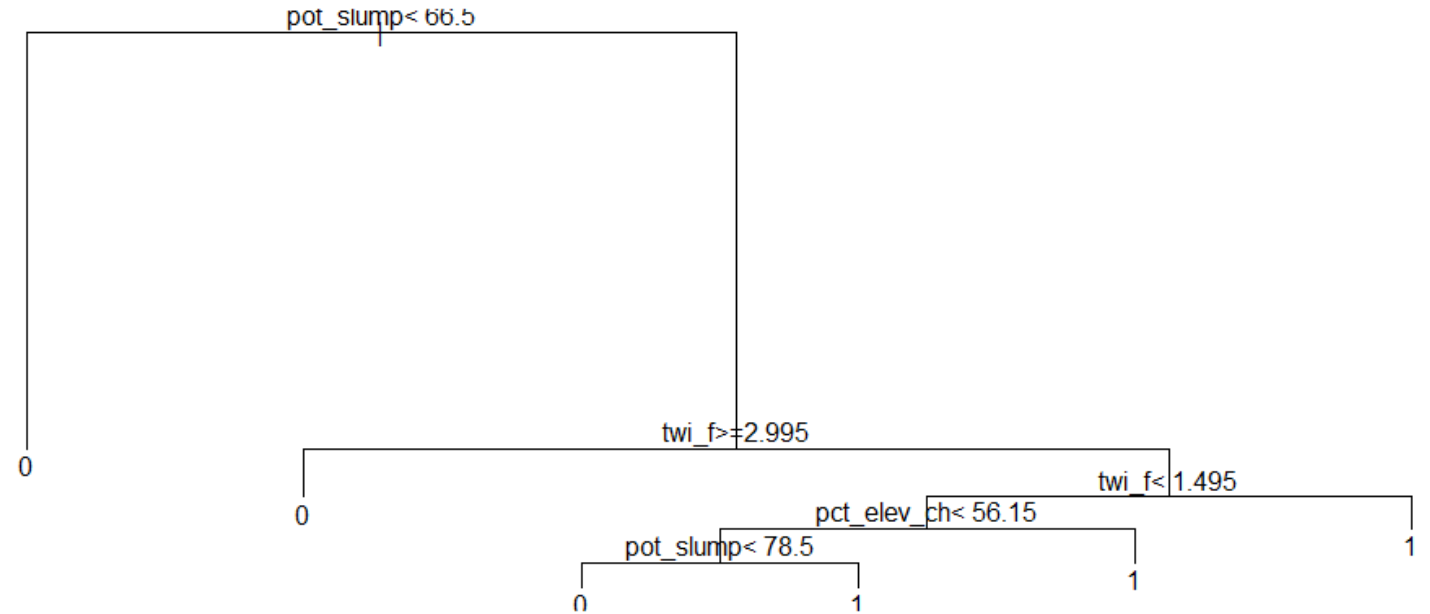
- › Lidar
- › Historical landslides
- › Soil properties
- › Terrain properties



Methodology Landslides

Landslide Susceptibility Model Development

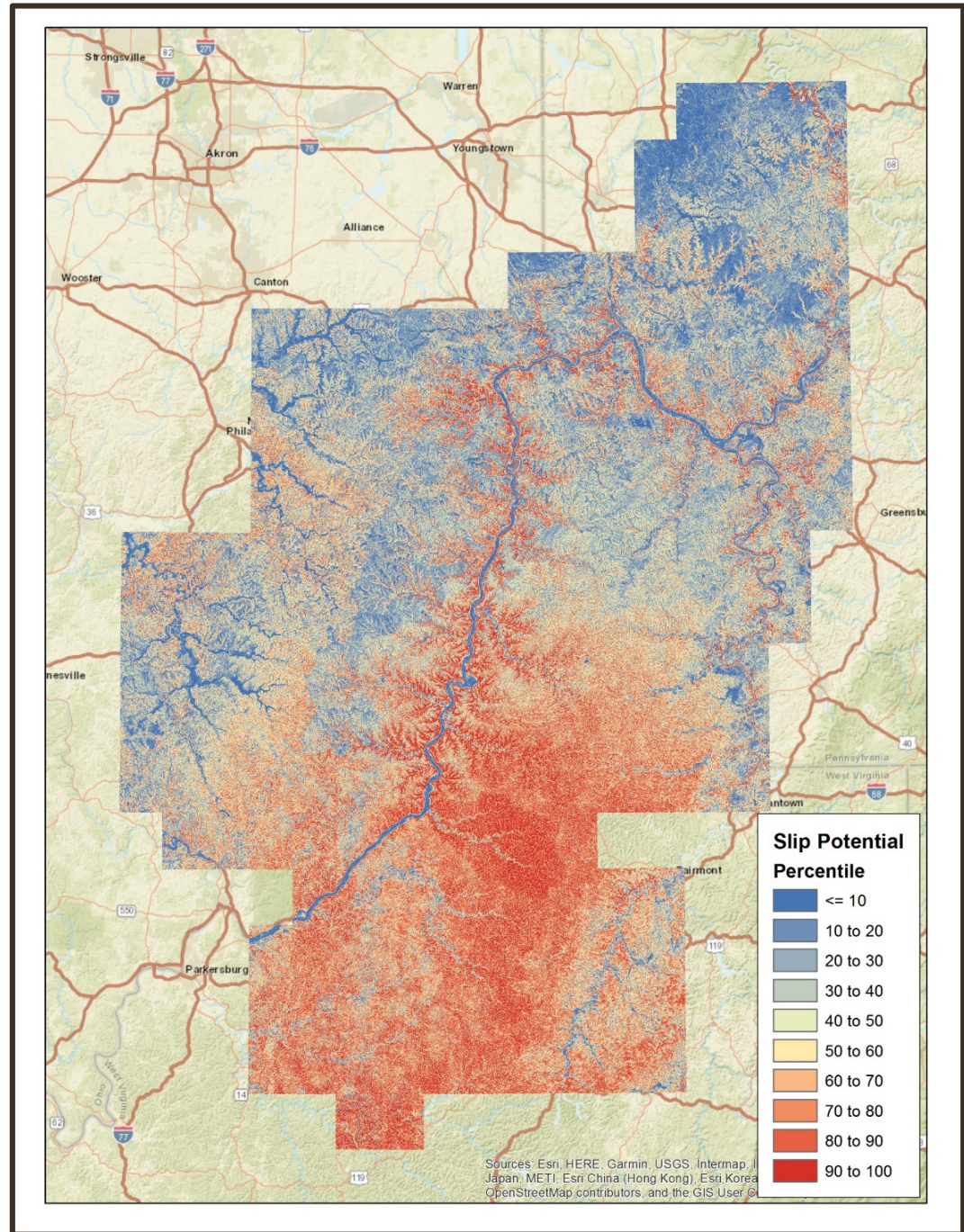
- › Lidar
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Methodology Landslides

Landslide Susceptibility Model Development

- › Lidar
- › Historical landslides
- › Soil properties
- › Terrain properties

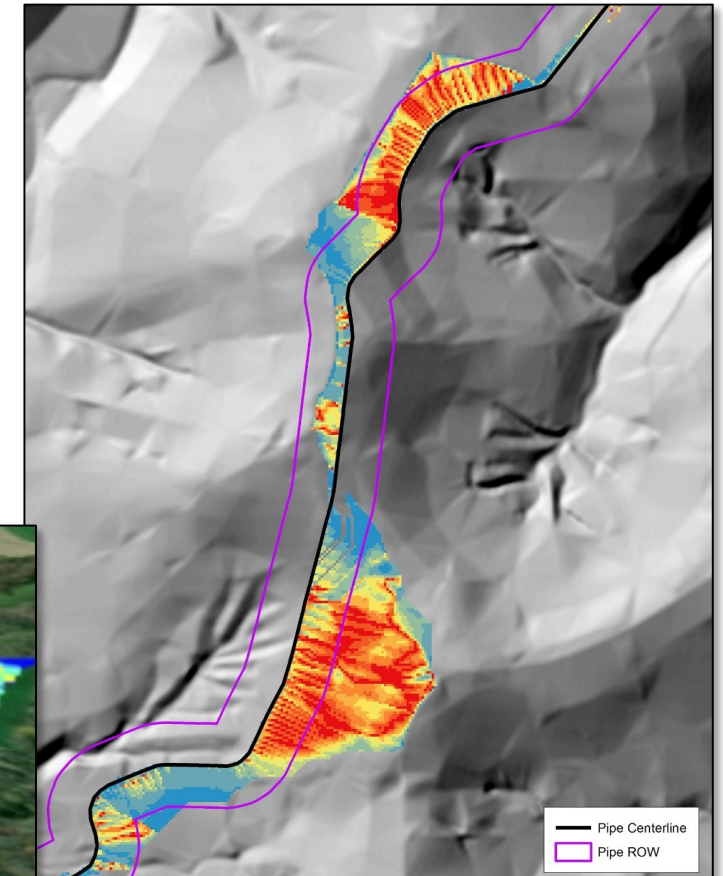
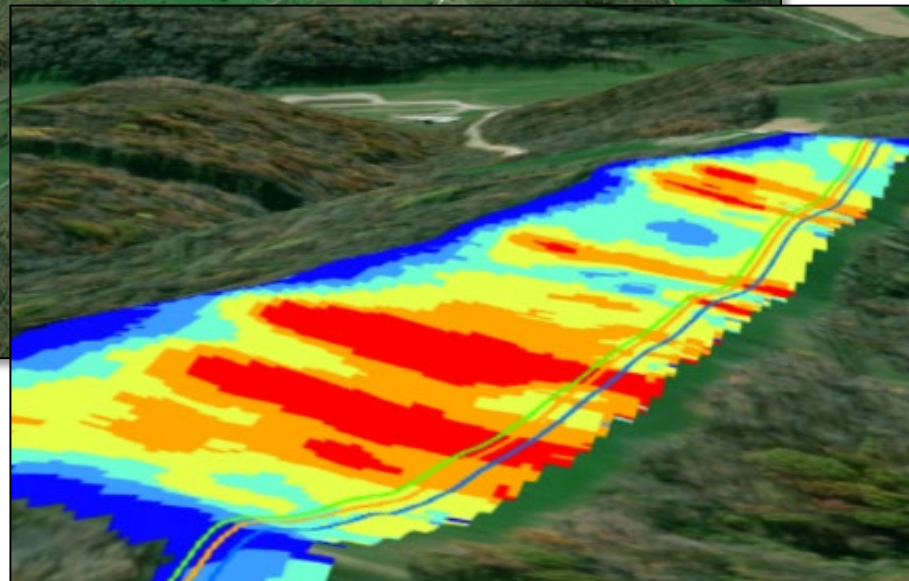
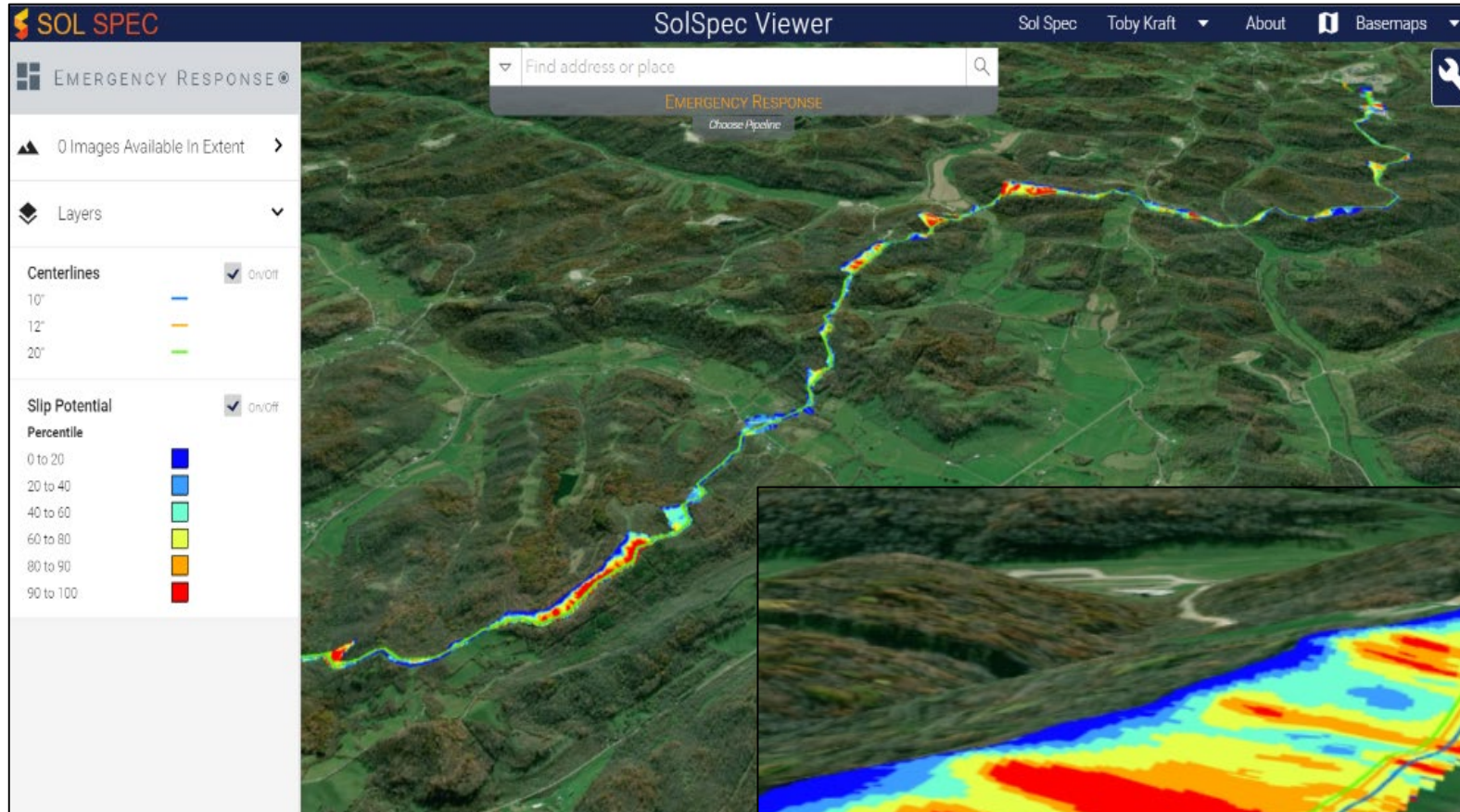


Methodology Landslides

Landslide Threat Assessment



100 ROW miles



Validation

Test model against historical landslide training data

Ground truthing of 10% of ROW segments

DURAROOT

Measure effectiveness of model ability to predict ROW landslide susceptibility & threat



Methodology Automation



The screenshot shows the SolSpec web application interface. At the top left is the SolSpec logo. To its right is the text "SOLSPEC" with a dropdown arrow. On the far right is a user profile icon for "KELLY".

On the left side, there is a vertical list of client entries, each with a date and time, a client name, and a project count:

- 7/8/2019 at 3:03PM: new client 80 (7 Projects)
- 7/2/2019 at 3:12PM: new client 12 (7 Projects)
- 6/28/2019 at 2:11PM: new client 19 (1 Project)
- 6/27/2019 at 4:18PM: new client 16 (No Projects)
- 6/27/2019 at 4:12PM: new client 15 (1 Project)
- 6/24/2019 at 2:58PM: (No Projects)

The main content area features a "Welcome to SolSpec" message. Below the welcome message are two buttons: "+ ADD COMPANY" and "+ ADD CLIENT".

Below the buttons are four red circular icons representing the workflow steps:

- Upload**: Inload batches
- Processing**: Our best-in-
- Analysis**: Select your
- Viewer**: Analytics will be

On the right side of the main content area, there is a 3D visualization of a drone flying over a terrain map.



Anticipated Results

Aerial imagery & big data are not enough.

“What operators require is **actionable intelligence** from this data.”

-OGRC Project G-43-01 Final Report



Questions?

