Introducing AerialZeus

May 2023

Outline

Seven Use Cases

1. **Ground Motion and Land Subsidence**
2. **Building Information Modeling**
3. **Natural Hazards Assessment**
4. **Wildfire Mitigation**
5. **Land Objects Classification**
6. **Habitat /Landscape Assessment**
7. **Transportation Mapping**

AerialZeus
INTELLIGENT ENGINEERING

AerialZeus Mission

We believe the climate emergency compels immediate departure from traditional solutions.

We apply the intelligence of pixels and digital insight to infrastructure and nature-based solutions regardless of scale.

AerialZeus
INTELLIGENT ENGINEERING

Our Manifesto

We are **innovators, technologists and project managers**. We believe that **technology** combined with **trusted partnerships** can yield the best results.

We believe in safeguarding our clients most precious assets: **time** and **resources**. We believe that **solutions** should be based on **client needs**.

We believe that a **pixel** can make a difference – can create **insight, excitement** and **innovation**.

We believe in the power of **focus, diligence** and **strategy**.

WE ARE AERIALZEUS

AerialZeus
INTELLIGENT ENGINEERING

Core Team

AerialZeus

LUIS ROBLES
CEO & Co-Founder
MSc, Mechanical Engineering

ERIKA MORGAN
Chief Operations Officer
MBA/Masters in Management

NENAD SURJANAC
Director of AZ Labs
MSc.. Forestrv: PhD. Remote Sensing 2025

PAUL GRANADO
Sr. Scientist in GIS and Photogrammetry
MSc., Biology

IGNACIO GATTI
Sr. Disaster Risk Consultant
Masters, Environmental Sciences, PhD 2024

GABRIEL ROBLES
BSc, Civil Engineering, EIT
MSc Structural Engineering 2024

Core Capabilities

Remote Sensing

- LiDAR (Light Detection and Ranging)*

- SCAN to BIM (Building Information Modeling)*

- Synthetic Aperture Radar (SAR)*

- Interferometric SAR *

- Photogrammetry

Geographic Information Systems (GIS)

- Mapping

- Risk Assessment*

- Transportation *

- Wildfire Mitigation Verification

Environmental Studies

- Wildfire Mitigation: Vegetation Management

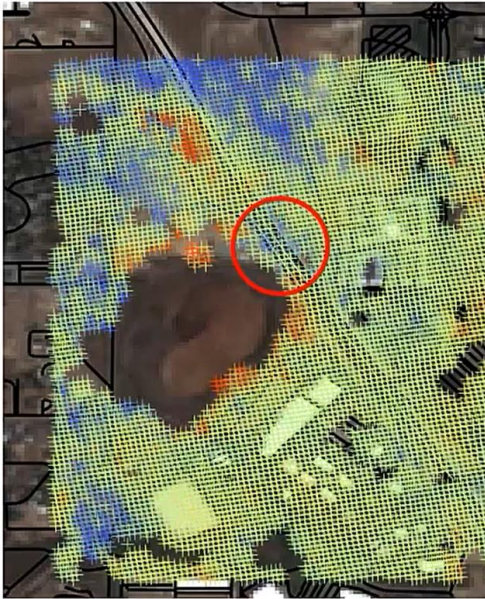- Habitat Assessments*

- Historical Environmental Remediation

Infrastructure Inspections

- Asset Condition

- Quality Assurance

- Wildfire Mitigation: Grid Hardening

* = Use Case included

Use Case: Ground Motion & Land Subsidence

Using Interferometric Synthetic Aperture Radar (InSAR)

Land Subsidence in Highway 36, Broomfield, Colorado

-10 mm   0   10 mm

SAR datasets classification for detecting land movement

6:00 A.M.   2:30 P.M.

Figure 1: Highway 36 collapse over time. The cracking on the highway's surface was noticed a week prior to the incident, and was seen to be spreading the night before the complete collapse. This allowed the Colorado Department of Transportation to be prepared to re-route traffic and begin mitigation efforts.

Figure 2: A side view of the collapse. This area is directly next to Lower Church Lake, a reservoir, which may have induced moisture into the unstable soils, furthering the collapse. Wet clay collapses are a common phenomenon in Colorado (Rosenbalm & Zapata, 2017; Varnes, 1949).

Land subsidence, side view of the collapse

Detection of underground building activities:

- 43 TerraSAR-X (Satellite Sensor)
- Approach: ASBAS & PS Interferometric Stacking
- Optical image from multispectral satellite sensor SPOT-5

Vertical Velocity.

-11   [mm/yr]   +11

© Astrium, Infoterra GmbH

SAR datasets classification for detecting land movement

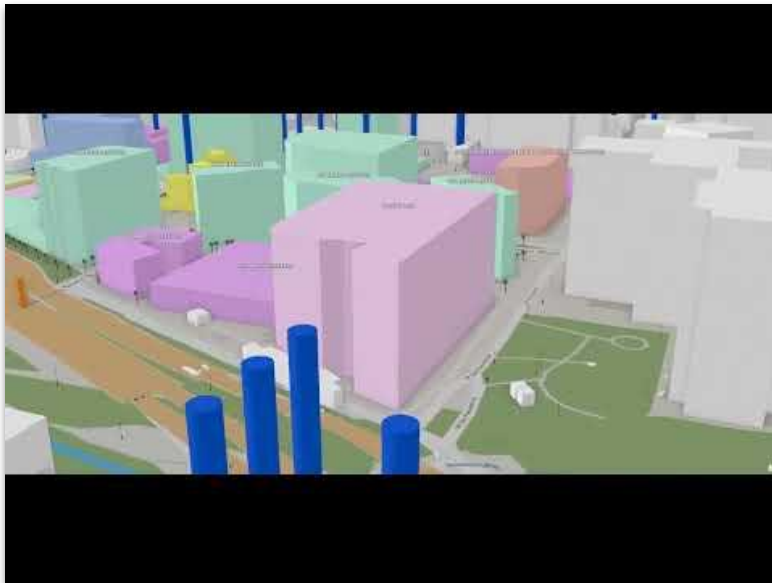AerialZeus
INTELLIGENT ENGINEERING

L3HARRIS™
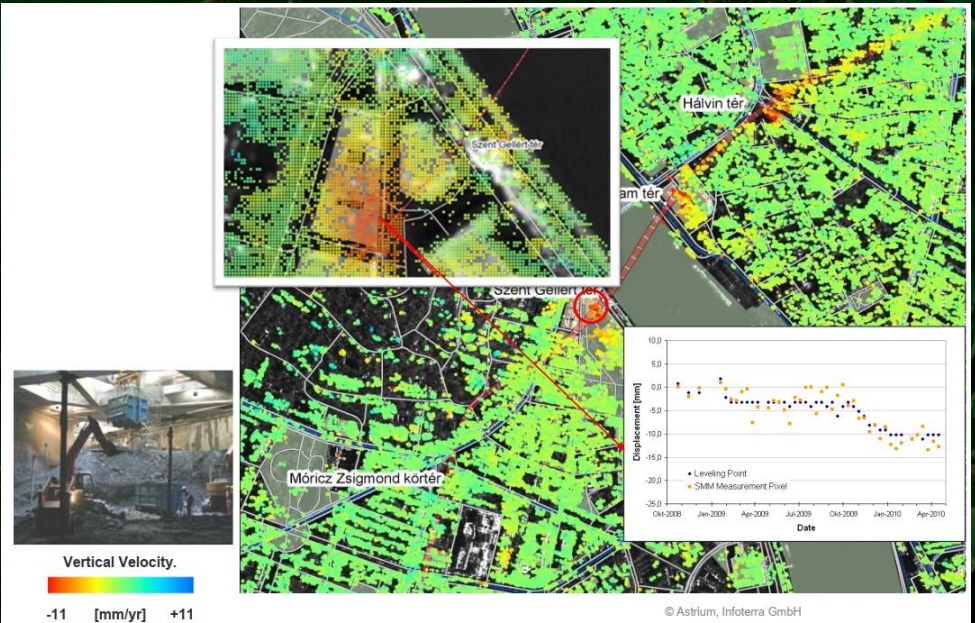
Ground Motion & Land Subsidence (2)

## *InSAR and GIS*

Historical resources tracking using INSAR
- San Jose has over 4000 listed historic properties
- Monitoring architectural infrastructure is key during tunnel construction
- SAR and geological data have an essential role in tracking infrastructure

3D visualization of the historical resources around Santa Clara street (blue bars)
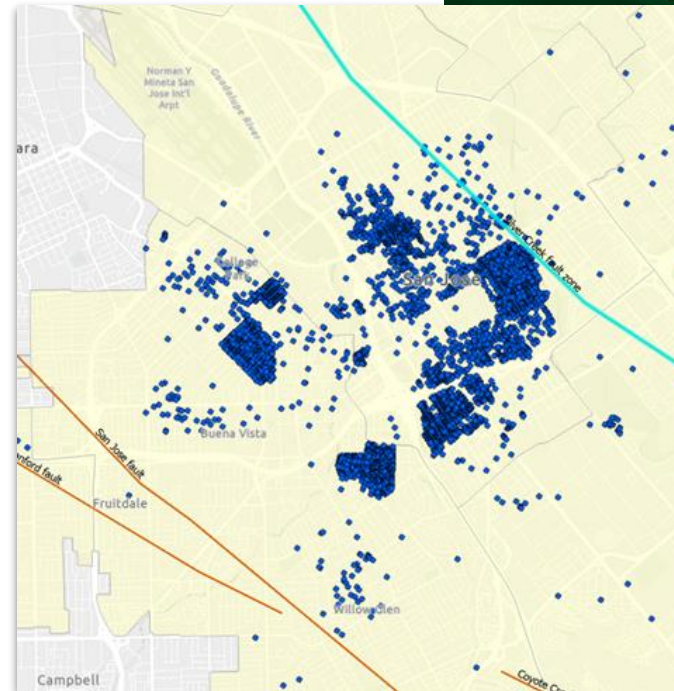
Historical resource locations (blue dots) and geological faults, Silver Creek fault is highlighted
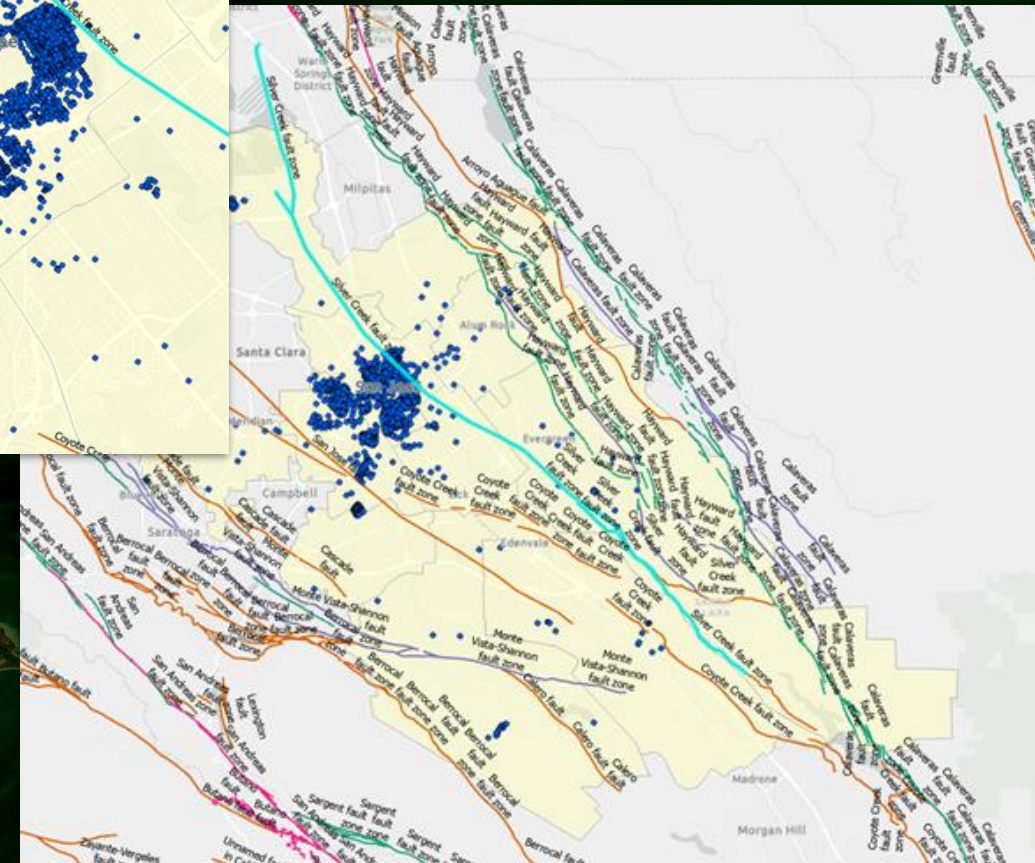
AerialZeus
INTELLIGENT ENGINEERING

Building Information Modeling (BIM) Using Terrestrial LiDAR

Hotel De Anza data:

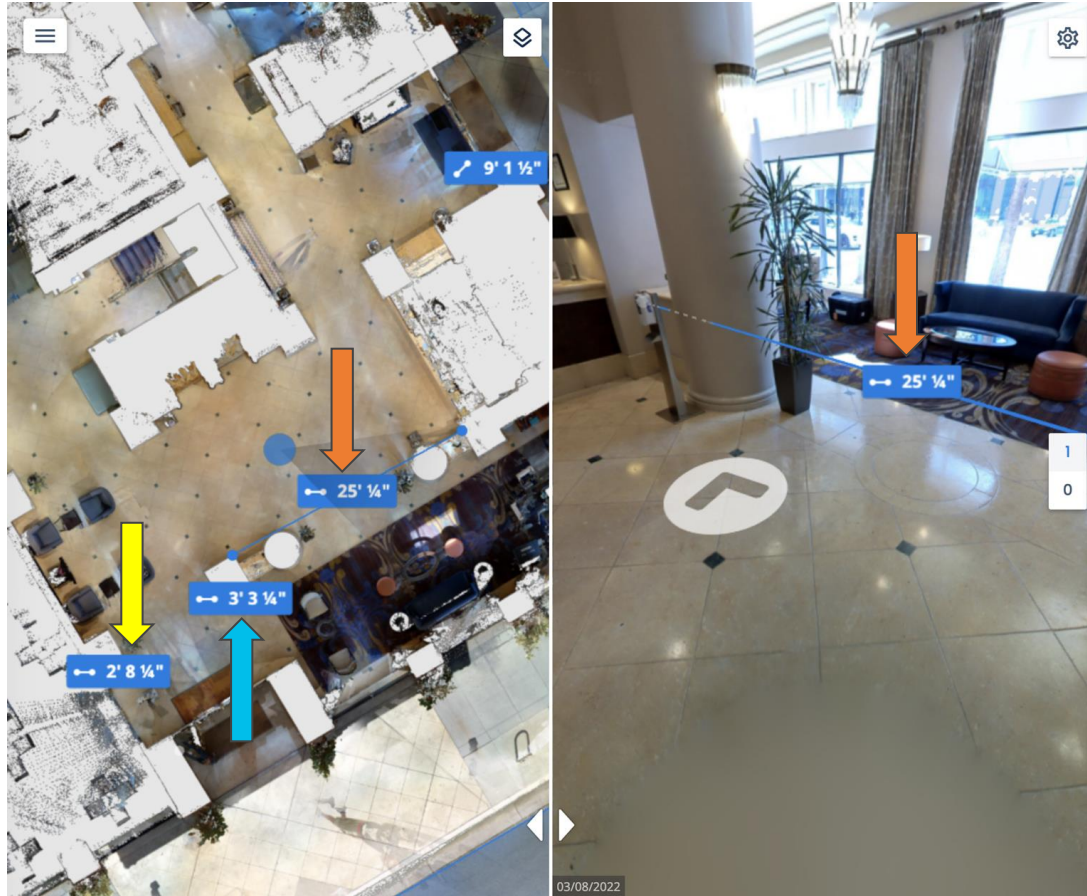High precision drawing and BIM modeling from terrestrial point cloud
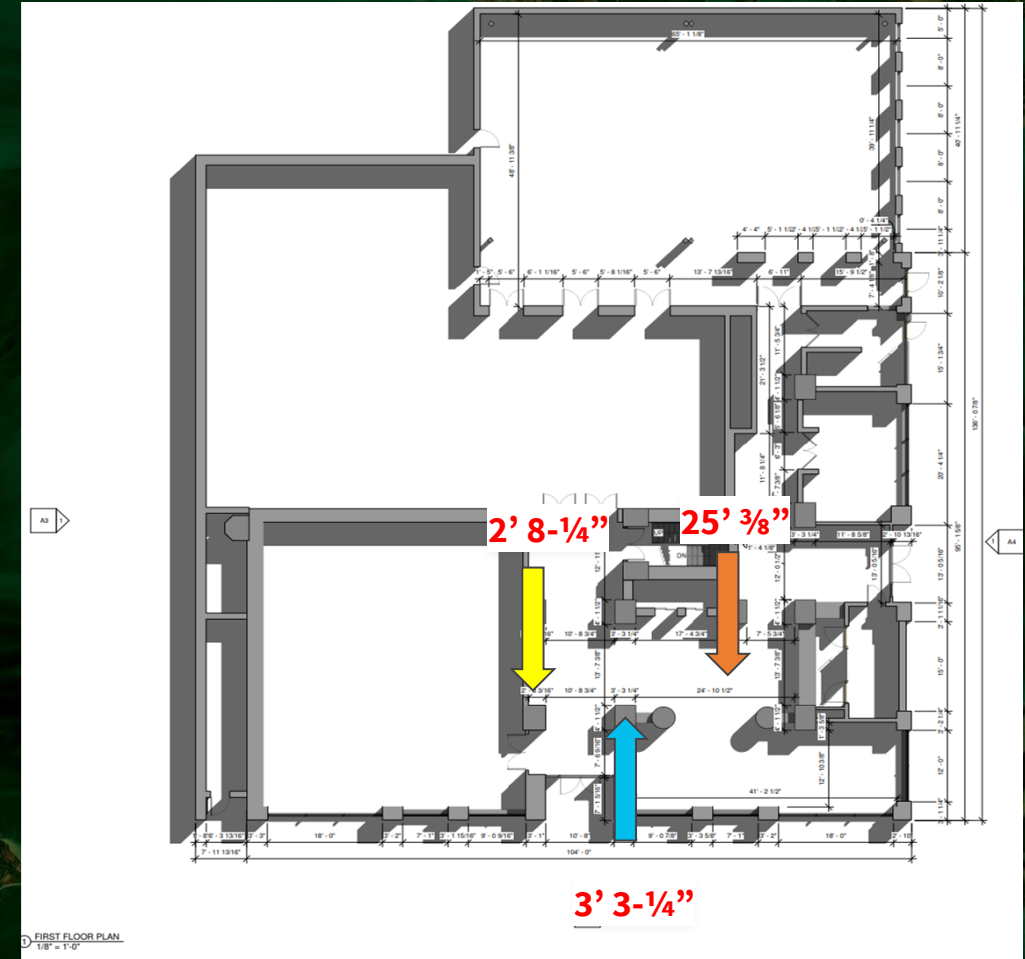

NavVis Scanner
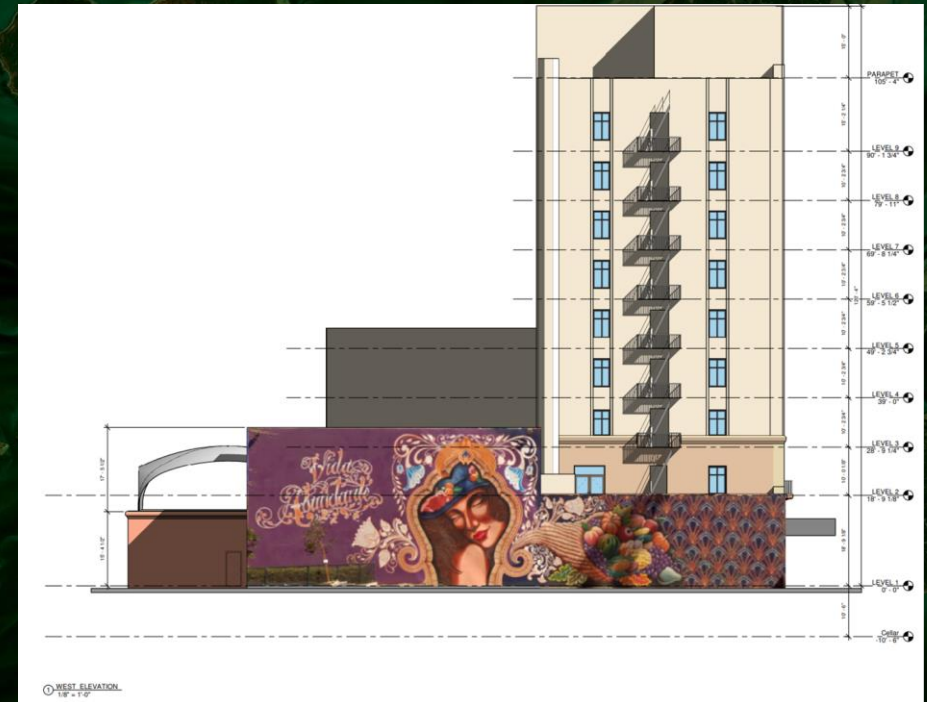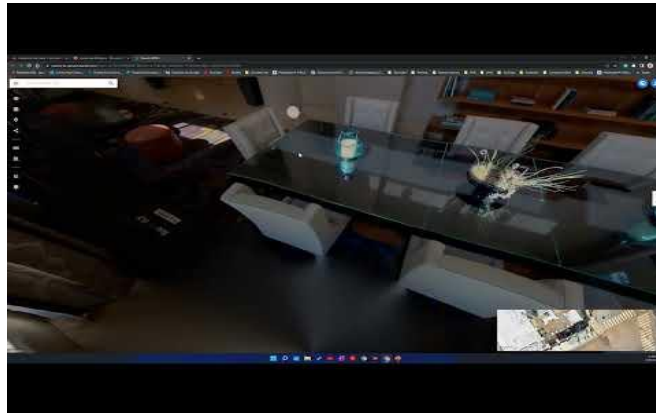
Building Information Modeling (2)

Drawing Verification

CAD drawings and BIM models overlapping with point clouds for infrastructure measurements

Building Information Modeling (3)

Product Quality Assurance Process

01	Point Cloud data collection

- Use terrestrial scanners
- Collect as-built information
- Create point clouds

02	Infrastructure digitalization

- Generate civil plans/construction plans
- Create BIM models
- Quality assessment (measurements)

03	Data comparison

- Compare Designed vs Built
- Report discrepancies if applicable

AerialZeus
INTELLIGENT ENGINEERING

Use Case: Natural Hazard Assessments

Flood Detection Using Synthetic Aperture Radar (SAR)

- Flood monitoring capabilities
- Estimation of water extent and water depth
- Vulnerability computing
- Building damage estimation
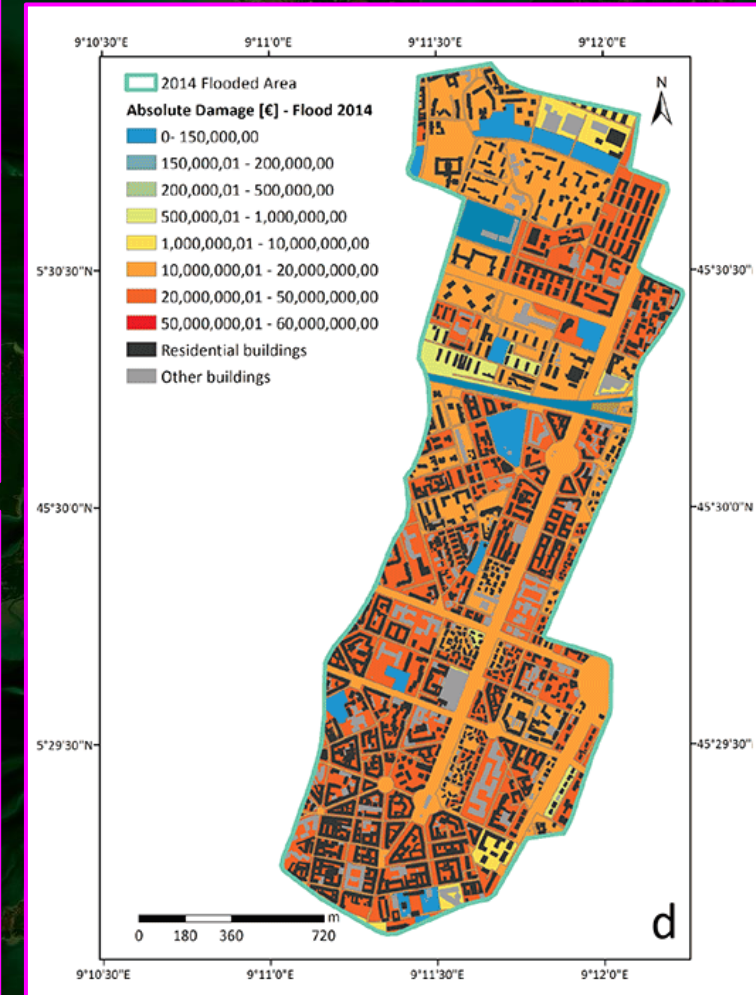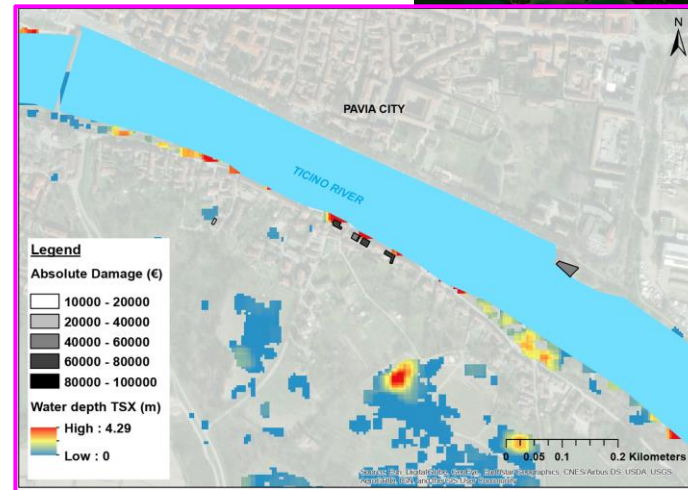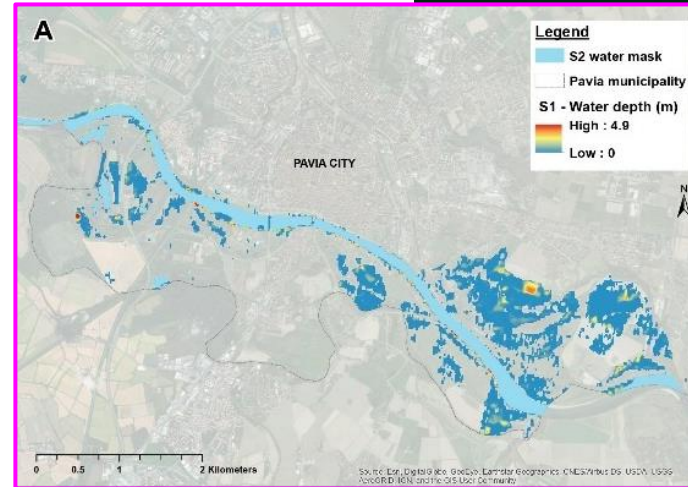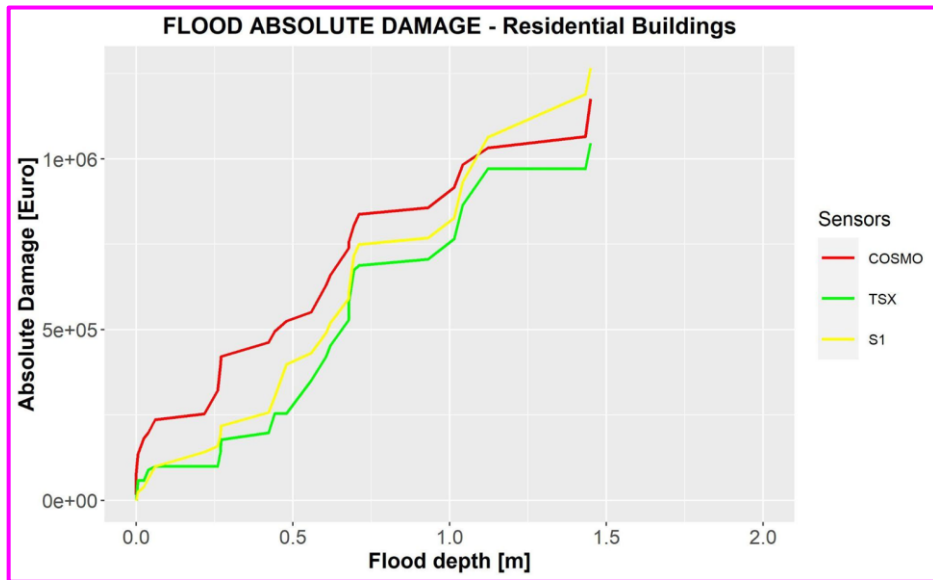
Use Case: Wildfire Mitigation

Risk Assessment Modeling

- Statistical and spatial model that explores and quantifies wildfire risk and vulnerability

- Objectives:
  - To identify population and asset vulnerabilities
  - To reduce wildfire impact uncertainties

- Overtakes simple hazard models (i.e. Fire Hazard Severity Zone in California) providing information about social and ecological vulnerability.

AerialZeus
INTELLIGENT ENGINEERING

Wildfire Risk Assessment Model (WIRIAM)

For more details, check out WIRIAM Story Maps:
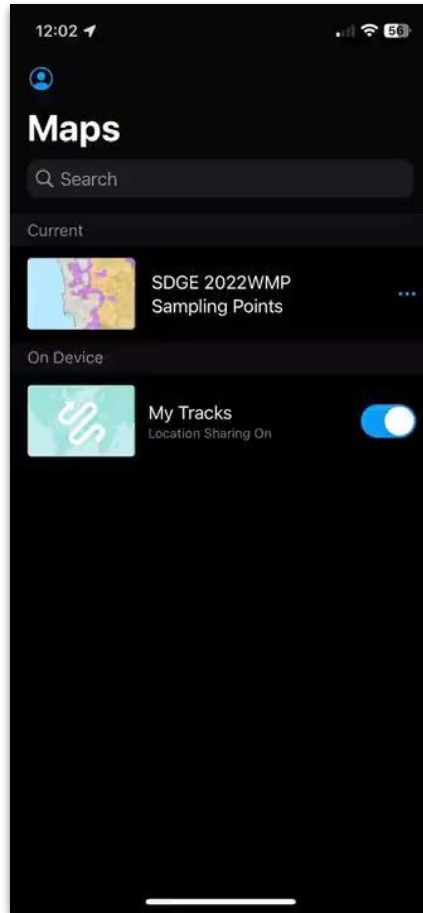https://arcg.is/19Tbq
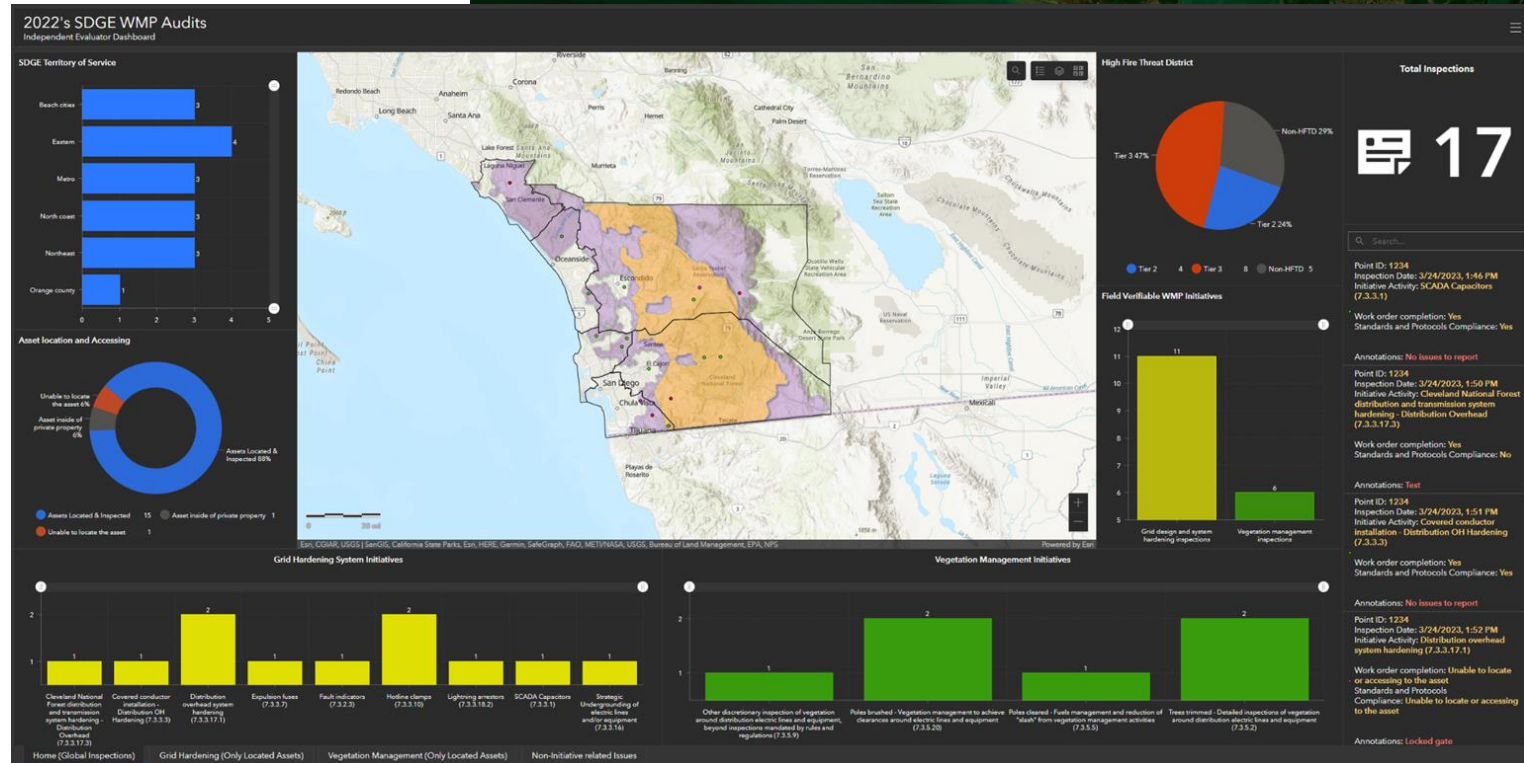
Wildfire Mitigation (2)

Real-time Tracking via App and Dashboard Connectivity Tools

ArcGIS Survey123

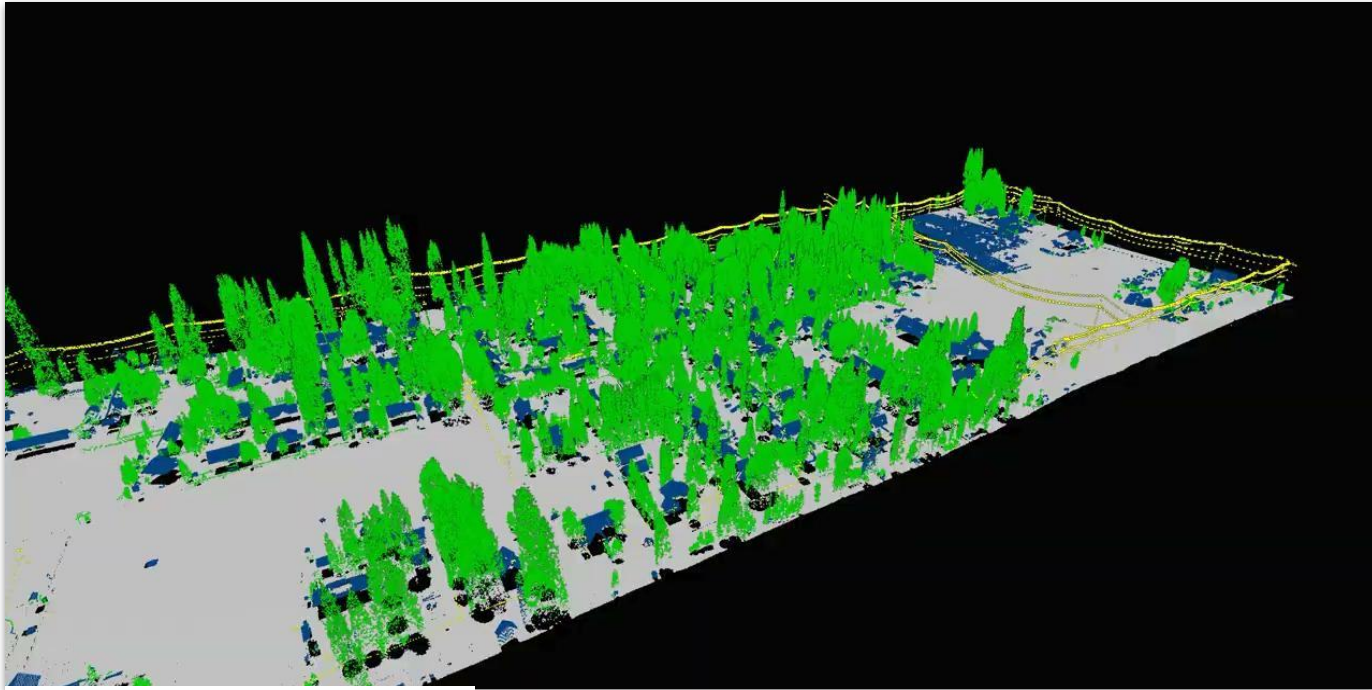ArcGIS FieldMaps

Online Dashboard
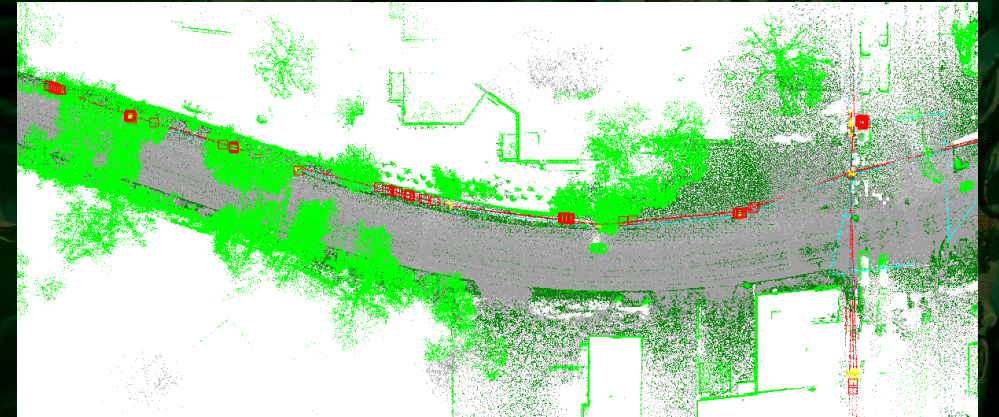
Use Case: Land Objects Classification

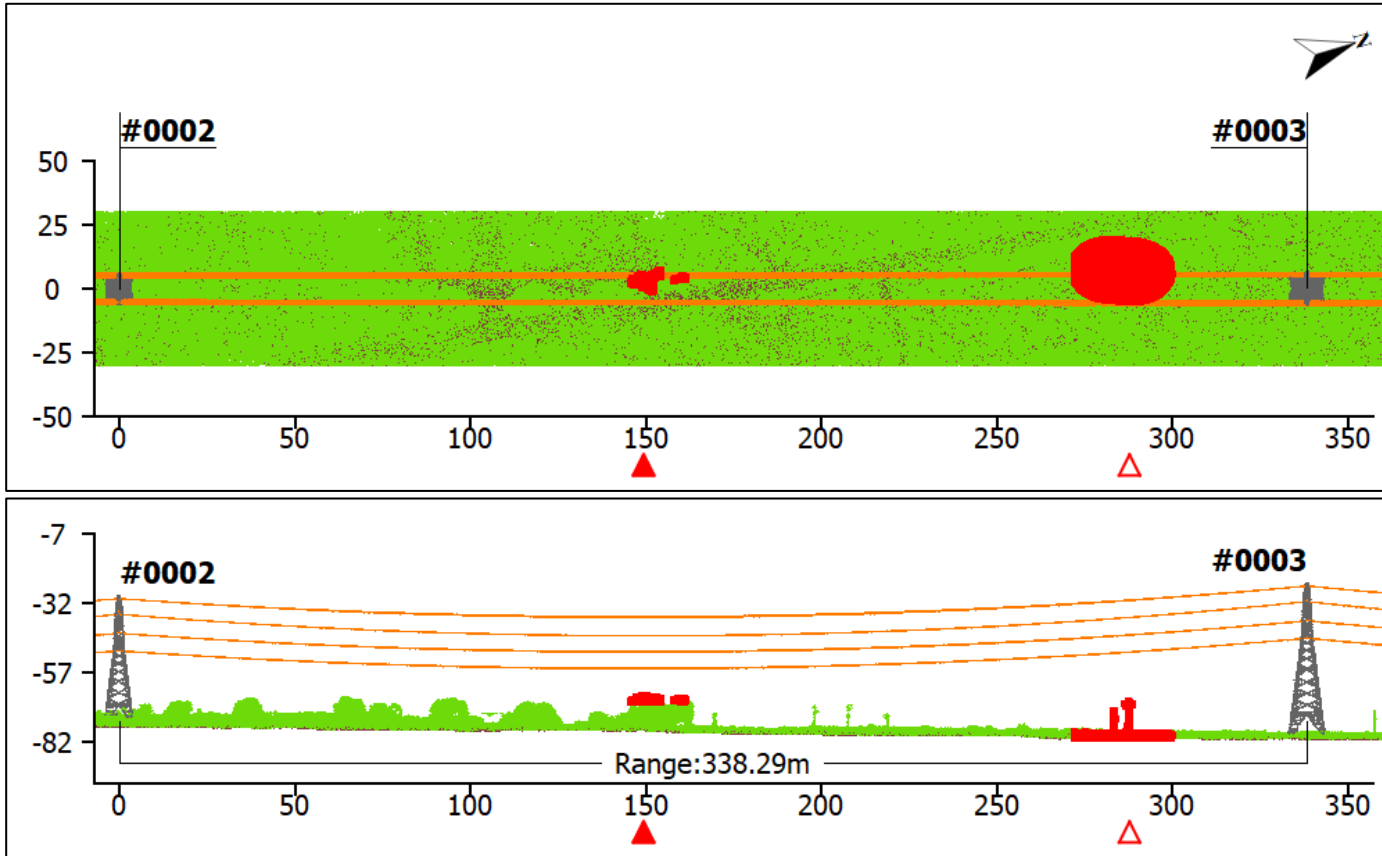## *Vegetation Encroachment From Aerial LiDAR*

Point cloud classification

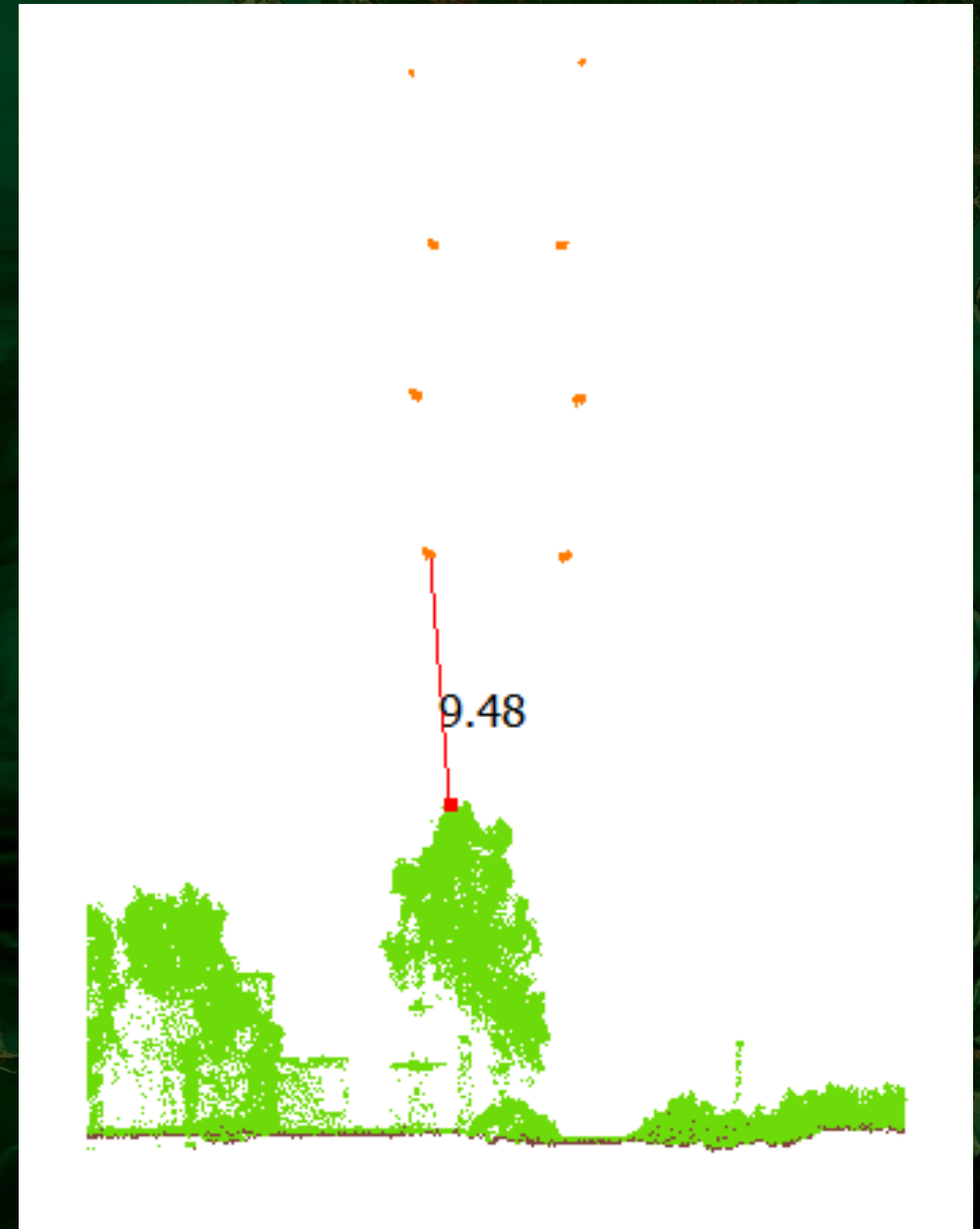AerialZeus
INTELLIGENT ENGINEERING

Corridor Analysis

Vegetation Encroachment Analysis

Use Case: Land Objects Classification

Vegetation Encroachment From Aerial LiDAR

Analyses report

AerialZeus
INTELLIGENT ENGINEERING

Vegetation Encroachment Analysis

Use Case: Habitat/ Landscape Assessments

Example - Willits Bypass Offsite Mitigation Project, Caltrans D1

- **Objective -** Document location and distribution of species of concern in rehabilitated wetland mitigation areas.

- **Method –** AerialZeus mapping of 49-acre parcel performed with multirotor drone, RGB camera and five-channel multispectral camera

- **Other applications**
  - Landscape reconstruction (historical; current)
  - Rights-of-Way Assessments for Carbon Mitigation

Baker's Meadowfoam
(*Limnanthes bakeri*)
Photo: AerialZeus

North Coast Semaphore Grass
(*Pleuropogon hooverianus*)
Photo data base: Calfora

Use Case: Habitat/ Landscape Assessments

Example - Applications of Digital Photogrammetry and Machine Learning (ML) in Remote Sensing

- Historical imagery for land use change detection
- Multispectral monitoring of trees in urban area
- ML invasive species monitoring
- ML in wild blueberry habitat monitoring
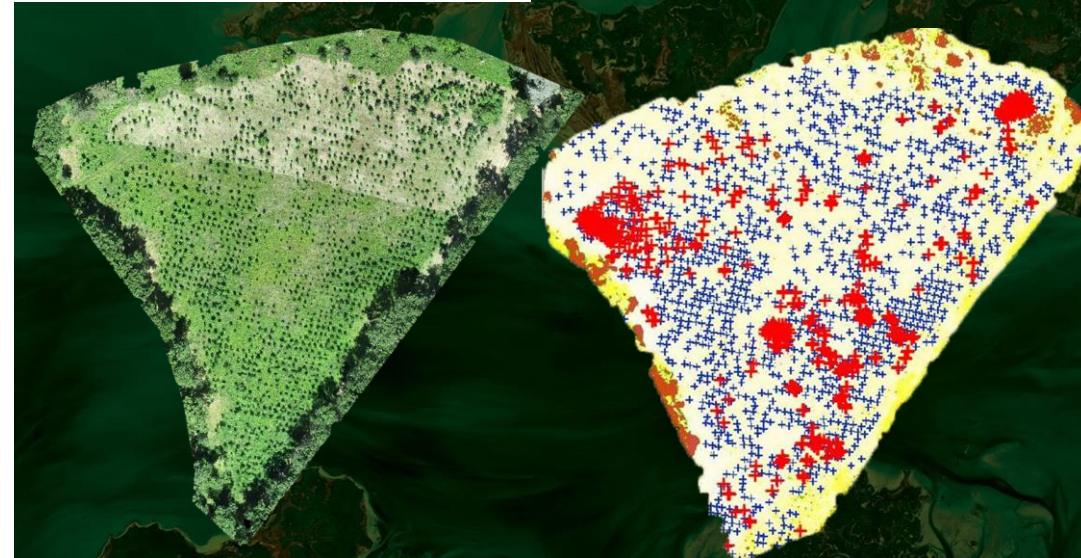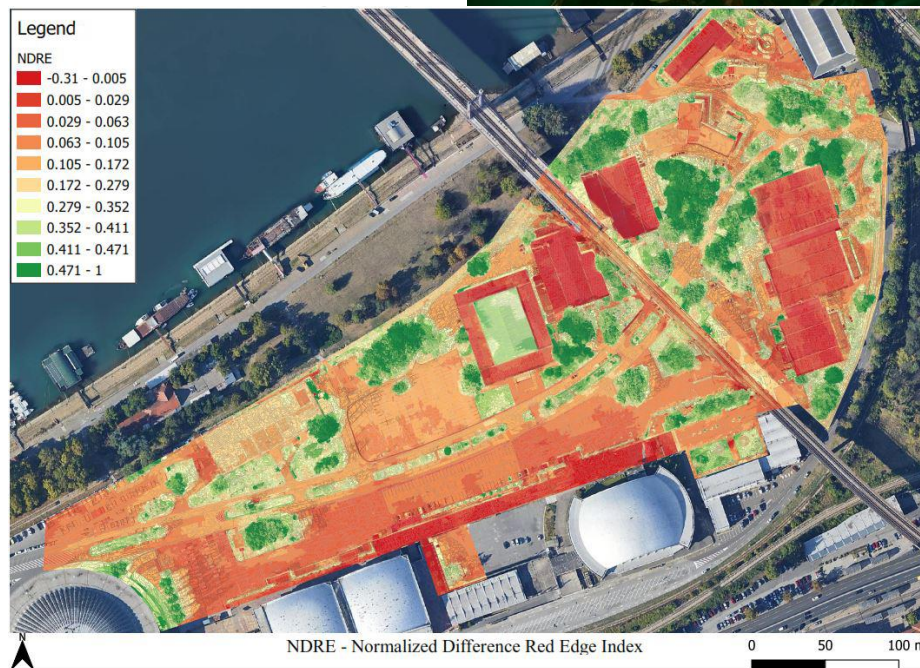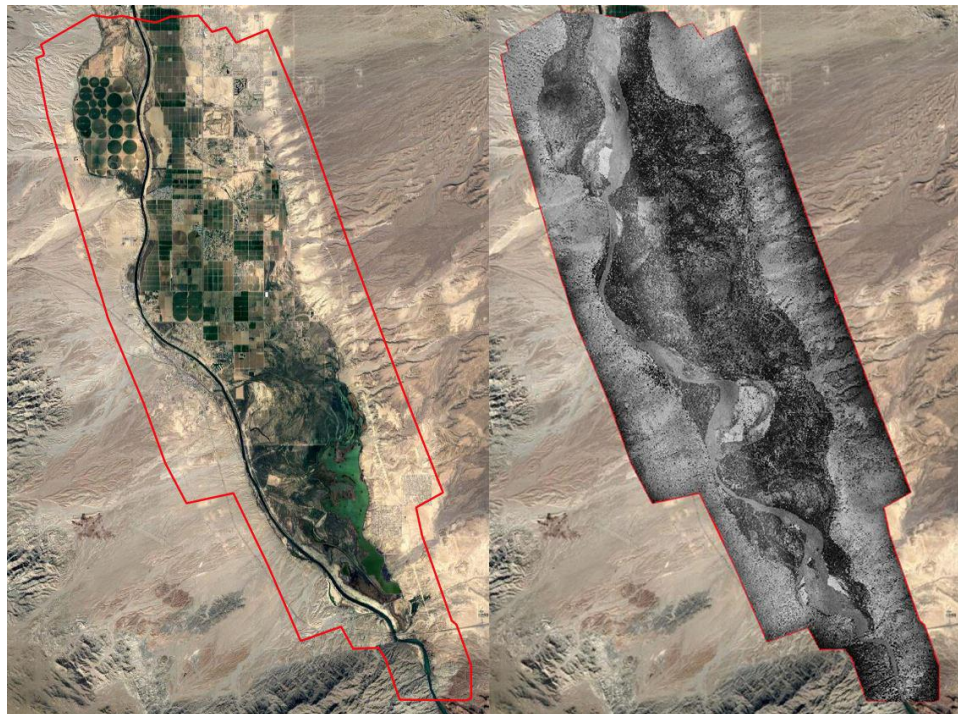
Use Case: Habitat/ Landscape Assessments

Example - Applications of Digital Photogrammetry in Infrastructure Modeling and Inspection

- Bridge 3D modeling
- Facility mapping for reuse
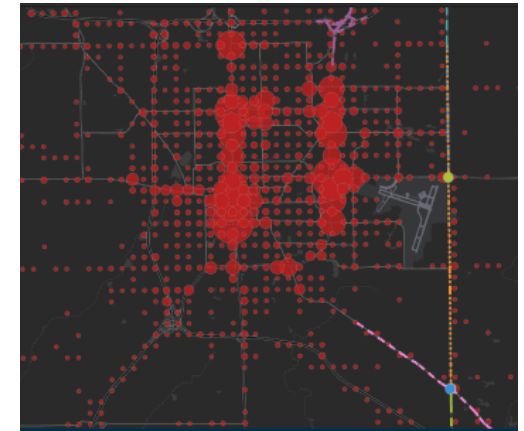- Solar panel installation preparation

Use Case: Transportation Mapping

- Real-time mapping of infrastructure and roadway stress, buildings, bus stops
- Provide information to drivers about road conditions
- Safety, congestion mitigation, and economic development
- Land assessment for transportation projects

Real-time monitoring of busses in Manhattan

- Life traffic incident to identify problems
- Allows 3D visualization, multiple database incorporation, embedded real-time video
- Alert the driver to high risk incident zones
- Incorporate information about, drivers, busses location and maintenance

LiDAR Sensors for object detecting and counting

Static and Dynamic Mapping

Regional Transit

Michael Baker INTERNATIONAL

AerialZeus INTELLIGENT ENGINEERING

Discussion and Next Steps

Potential Collaboration on:
- Metropolitan Transportation Commission "Transit 2050+" - Transit planning scope (due May 2)

- California State Lands Commission - Environmental Services Offshore Marine Areas (RFQ due May 19)

- VTA GIS **Infrastructure** Improvement (RFP due June 16)

- International Expansion (Western Balkans, Ukraine, Mexico)