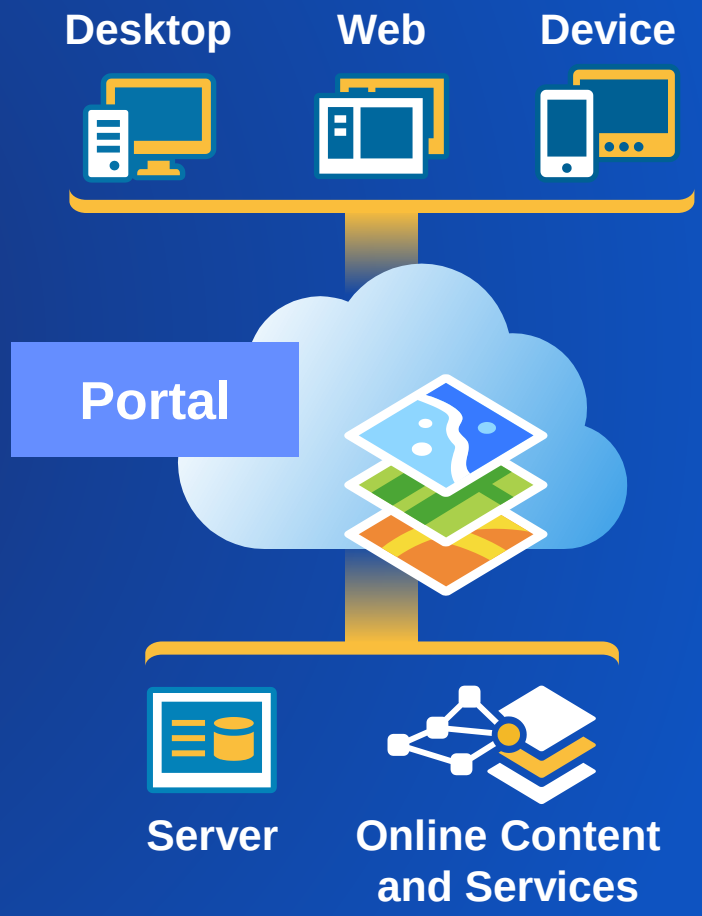
3D Mesh and Lidar Point Clouds

Lindsay Weitz: 3D Product Engineer, 3D Analyst

Seán William Morrish: 3D Product Engineer, Scene Layers

3D GIS Platform

- Synthesize 2D and 3D in web **GIS** architecture
- Default Elevation Service
- Multiuse dynamic services across clients
- Securely manage large enterprise geodatabases
- Analyze across real-time and historical data

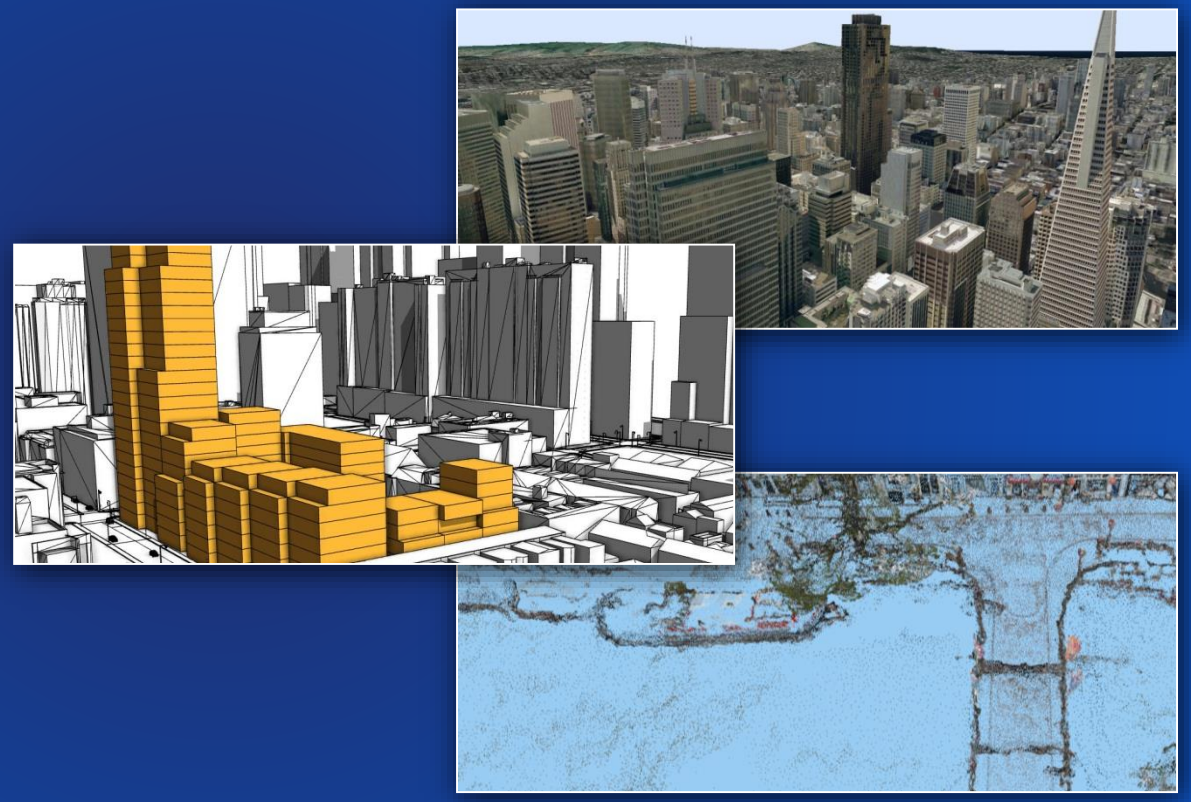


ArcGIS 3D Scene Layers

- 3D Objects Scene Layer
- 3D Point Scene Layer
- 3D Integrated Mesh Layer
- 3D Point Cloud Scene Layer
- 3D Buildng Scene Layer
- Elevation Layer

Content Profiles

- Support different geometry types
  - **Individual Features**
    - Points
    - Multipatches
  - Integrated Meshes
  - Pointclouds
  - Point Symbols
  - Building Layers
  - Analytics



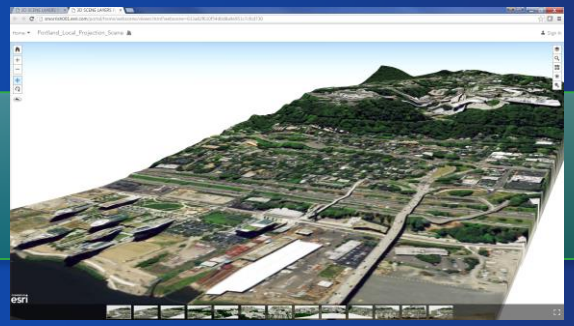
Parts of a Scene

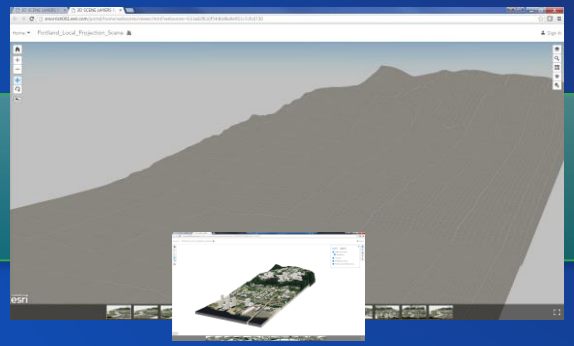
Feature Service Layers

Web Scene Layers (i3S)

Your Local Imagery

Your Local Terrain





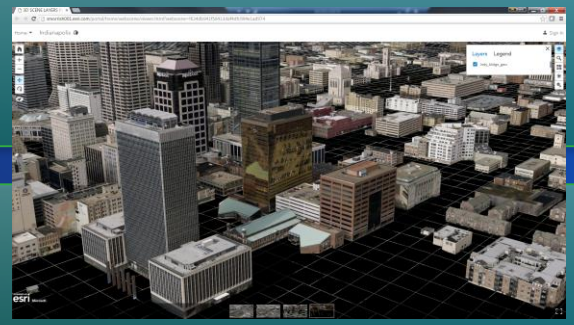
2D Layers
Draped or *Absolute**

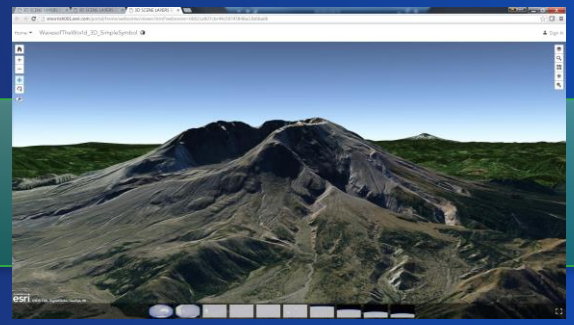
3D Layers
(Absolute Z')

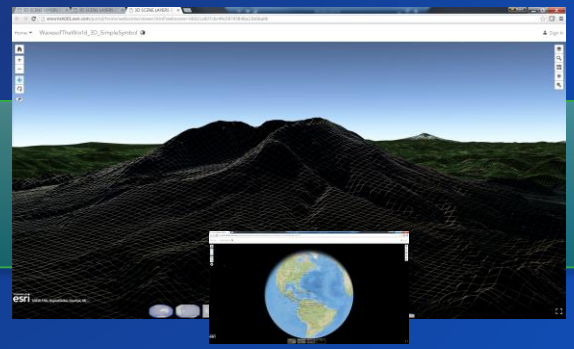
Draped Imagery

Terrain

Local Scene







Feature Service Layers

Web Scene Layers (i3S)

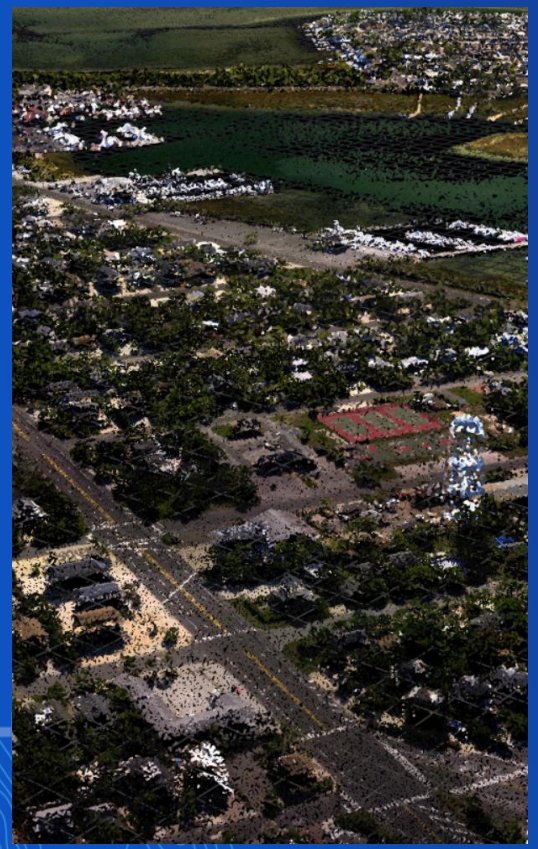
ArcGIS Online

ArcGIS Online

Global Scene

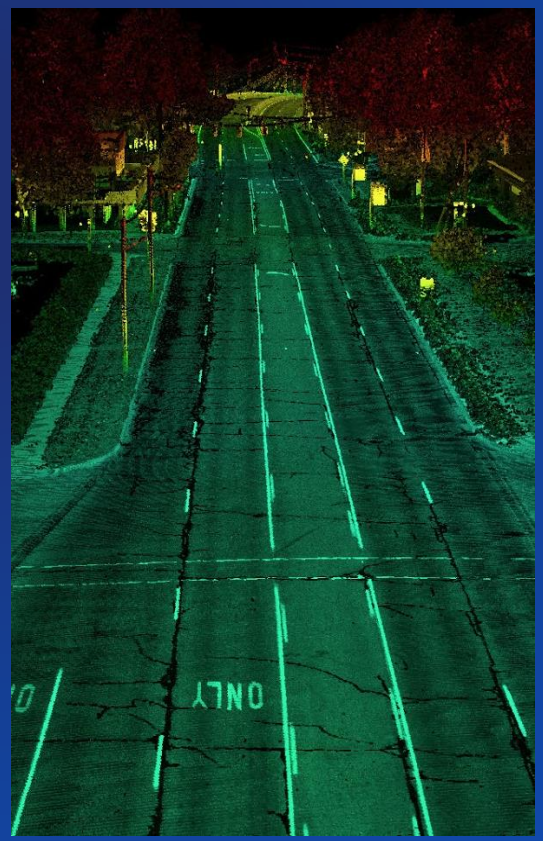
ArcGIS Supports

Airborne

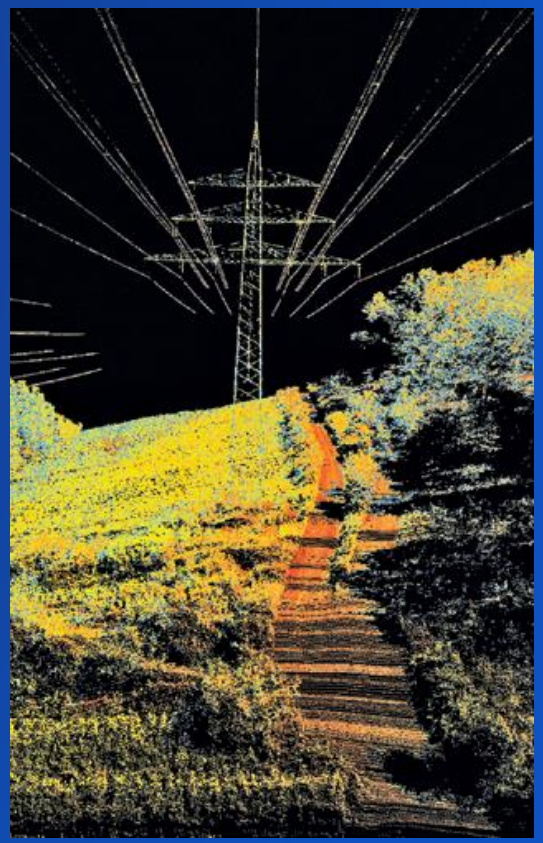


Terrestrial

Mobile



Drone/UAV

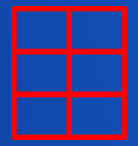


Data Structures for lidar support in ArcGIS

File01.las
File02.las
…
File99.las

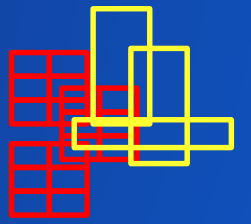
Multiple files/folders

Analyze and Update



LAS dataset / Terrain dataset

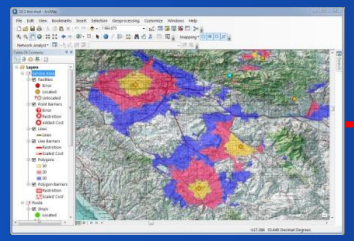
Manage and Share



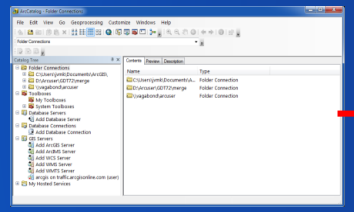
Mosaic dataset / Point cloud scene layer

Application Fusion: ArcGIS Pro

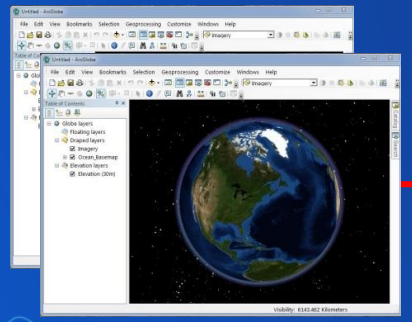
ArcMap

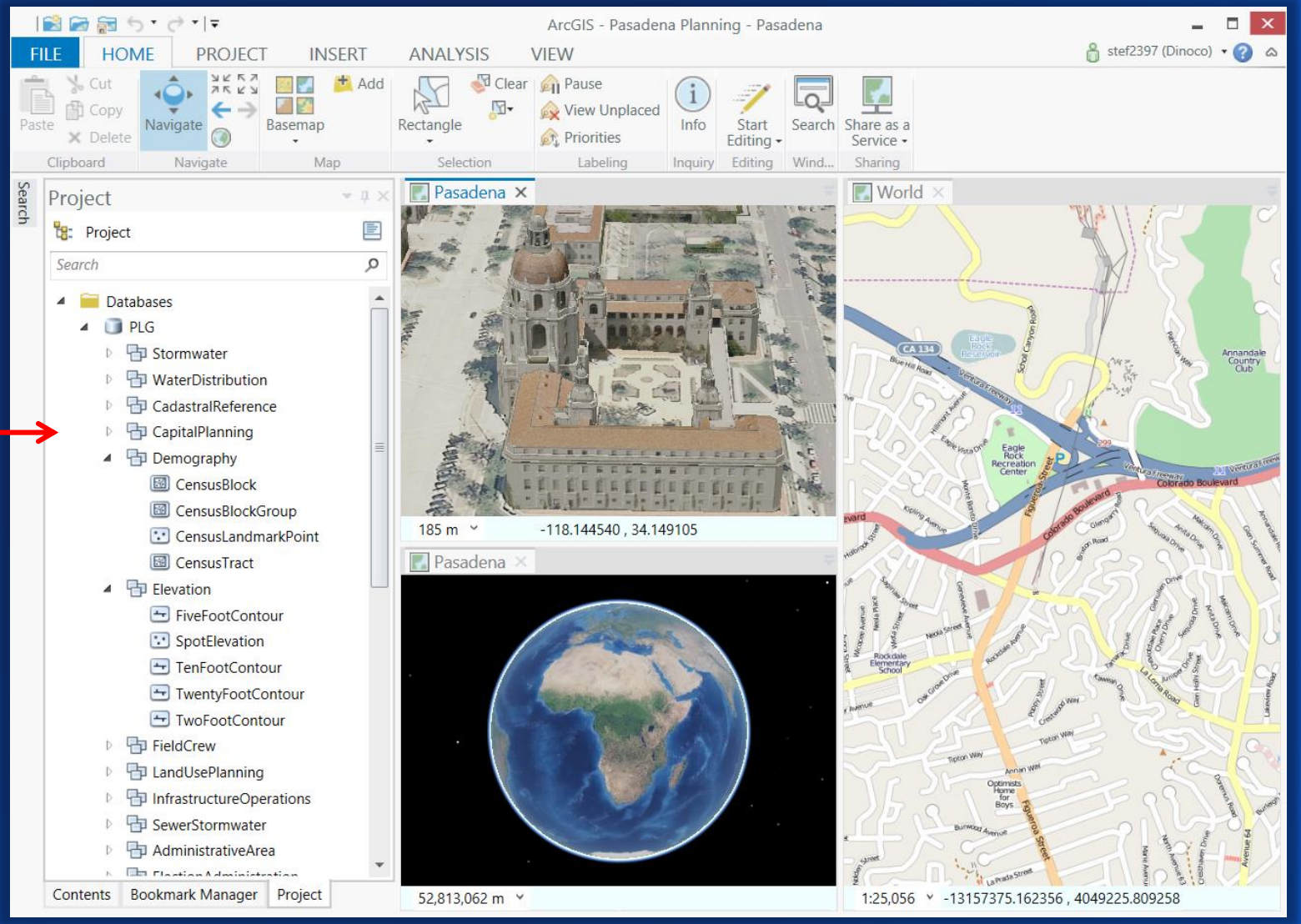


ArcCatalog



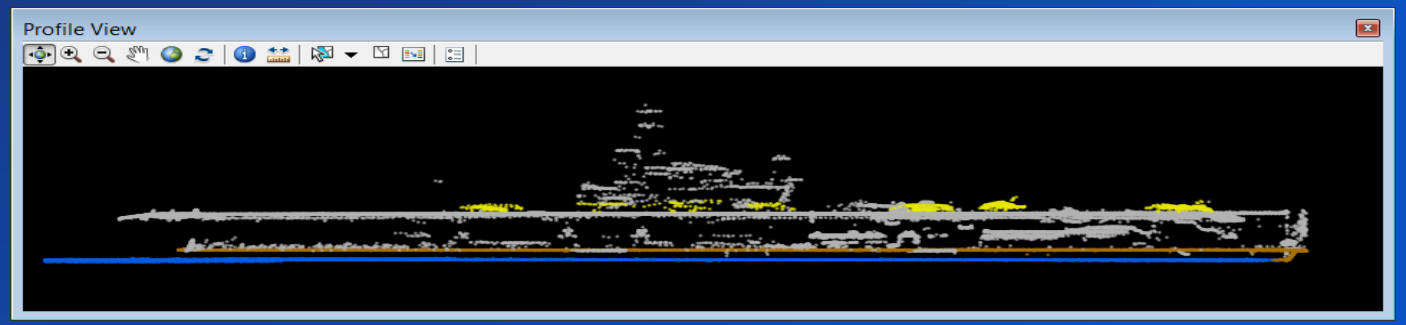
ArcGlobe / ArcScene



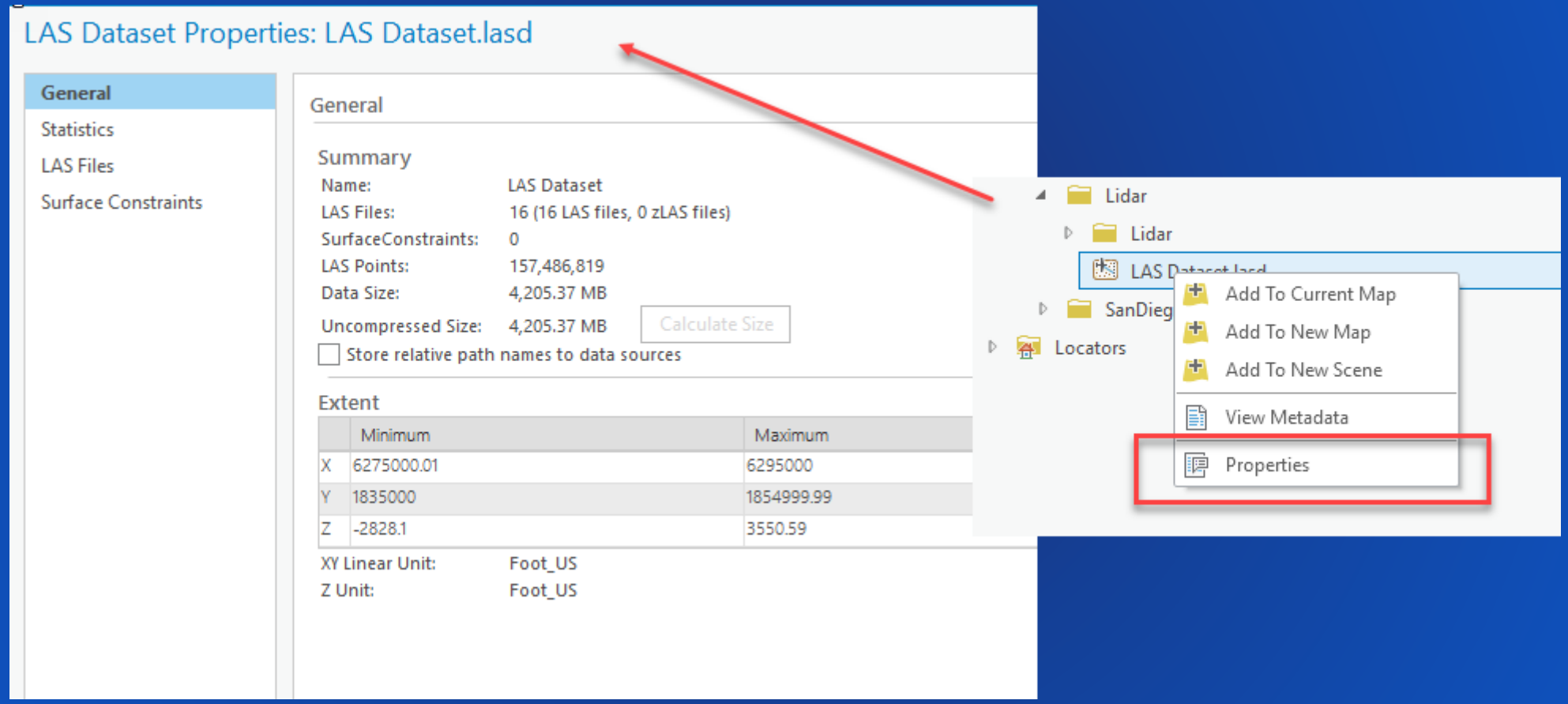


Lidar data with a LAS dataset

- Direct read of LAS or zLAS format lidar
- File based
- QA/QC tools
- Stores references to LAS/zLAS files on disk
- Optionally reference breakline and control point data
- Treats a collection of LAS/zLAS files as one logical dataset (“Project”)



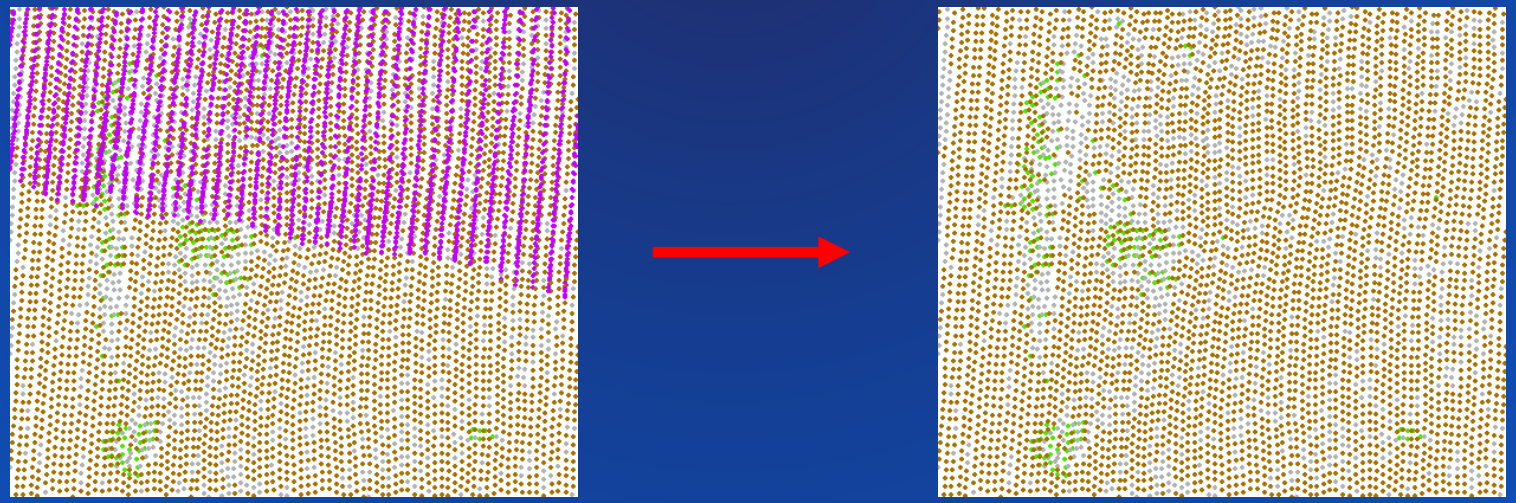
LAS Dataset Properties



Classify LAS Overlap

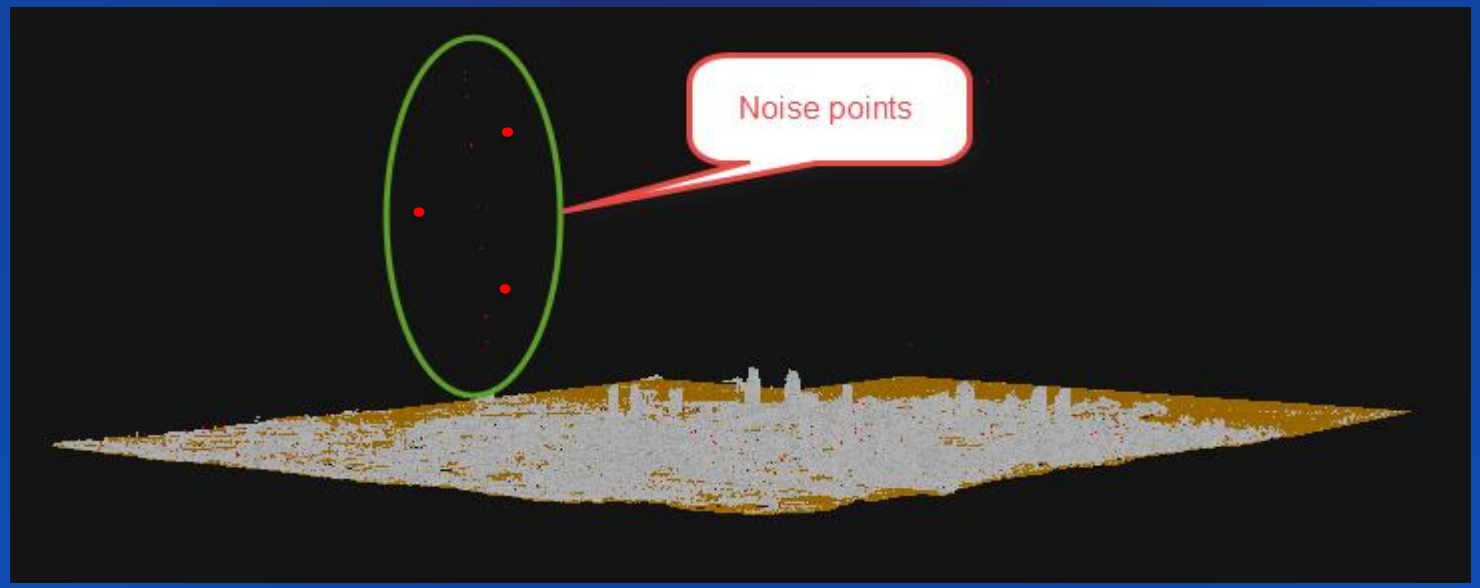
- Geoprocessing tool to assign the overlap flag/code to points in areas of overlap between flight lines.
- Area of overlap introduces high frequency noise to ground which interferes with creation of high quality DEMs. It’s therefore desirable to exclude the overlap.
- Tool helps improve quality of DEMs ArcGIS can produce.

Overlap in purple



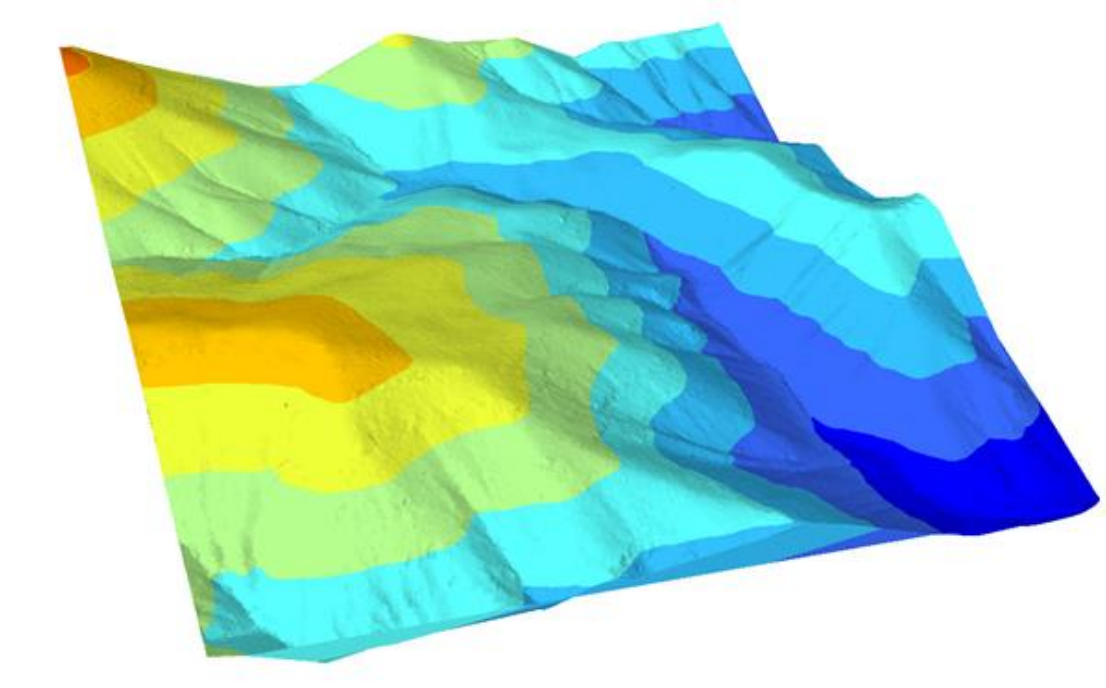
Classify LAS Noise

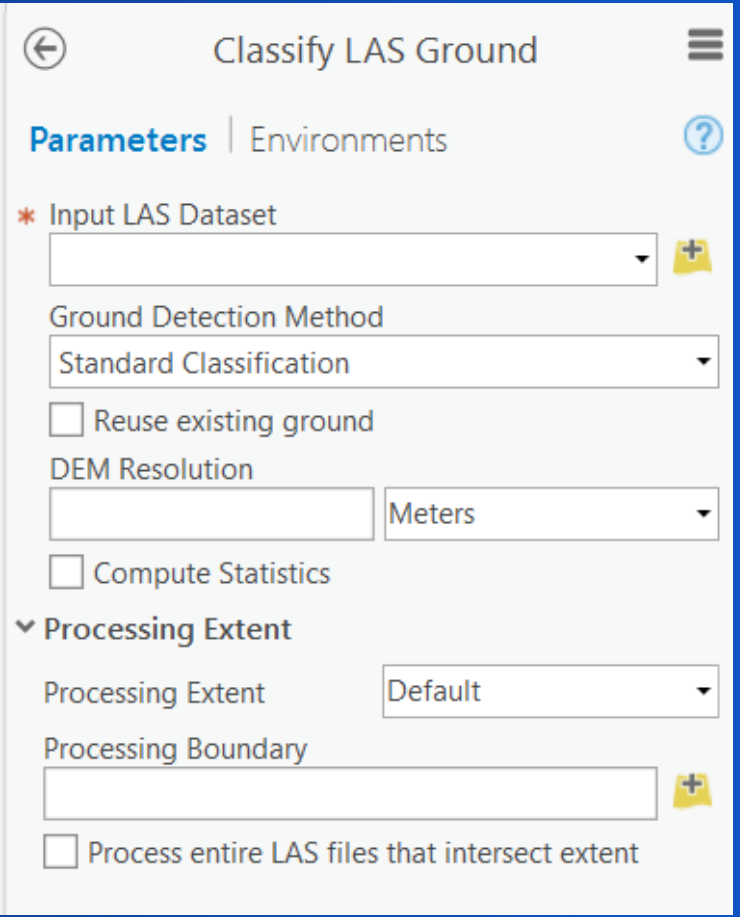
- Tool to classify noise points in lidar.
- Erroneous points are caused by a variety of things such as haze, birds, and water.
- Present at least to some degree in all lidar collections.
- Noise interferes with display and processing of the data.
- This is a fundamental capability.



Classify LAS ground

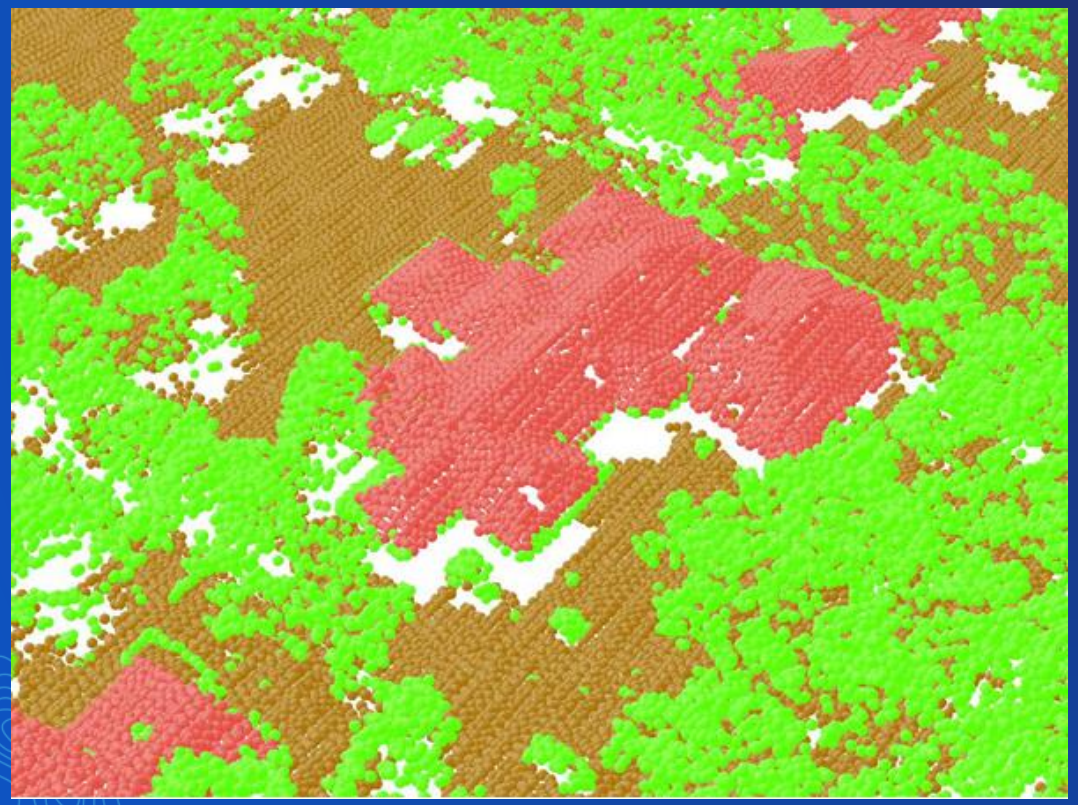
- Classifies ground points in lidar data
- Only the last return of LAS points with class code values of 0, 1, or 2 will be considered for reclassification as ground.

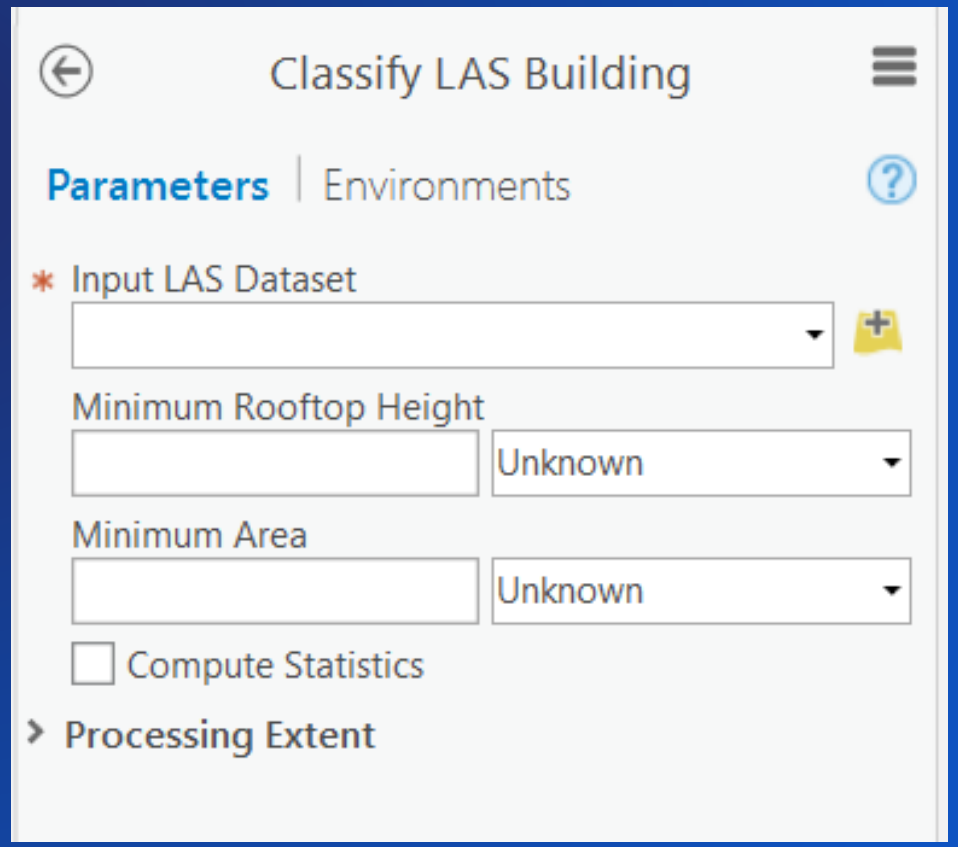




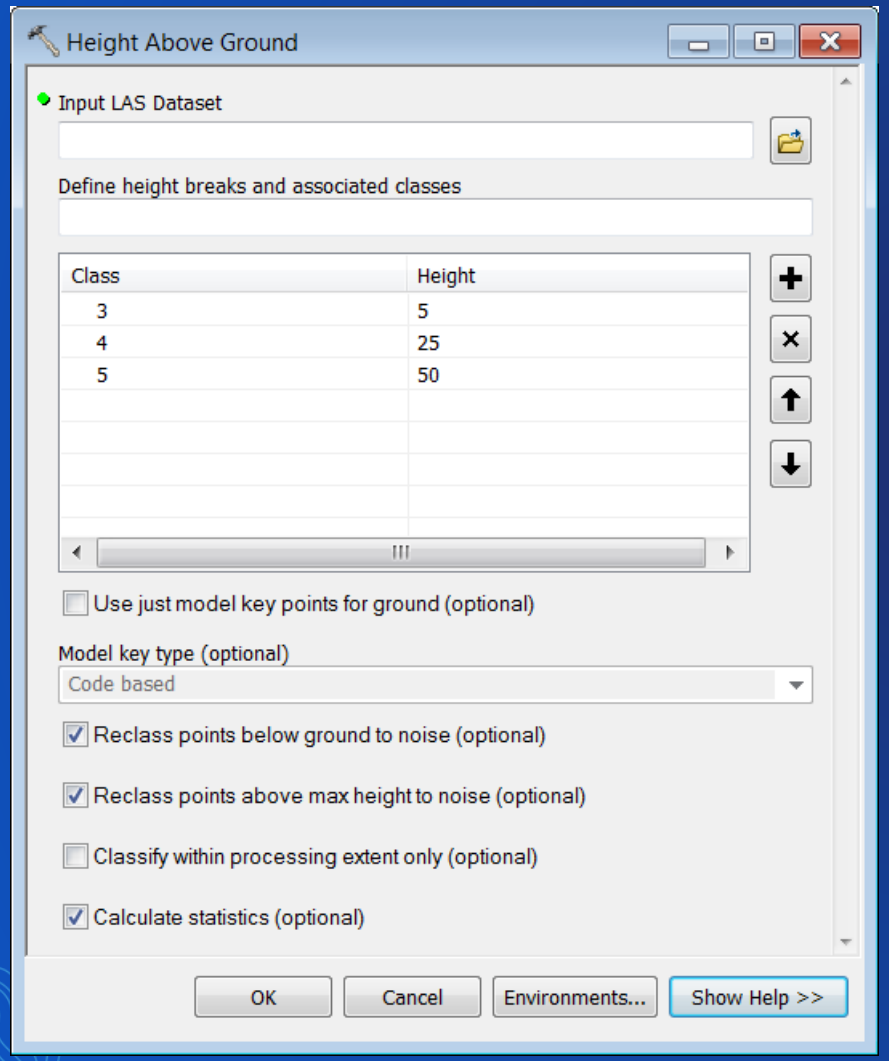
Classify LAS buildings

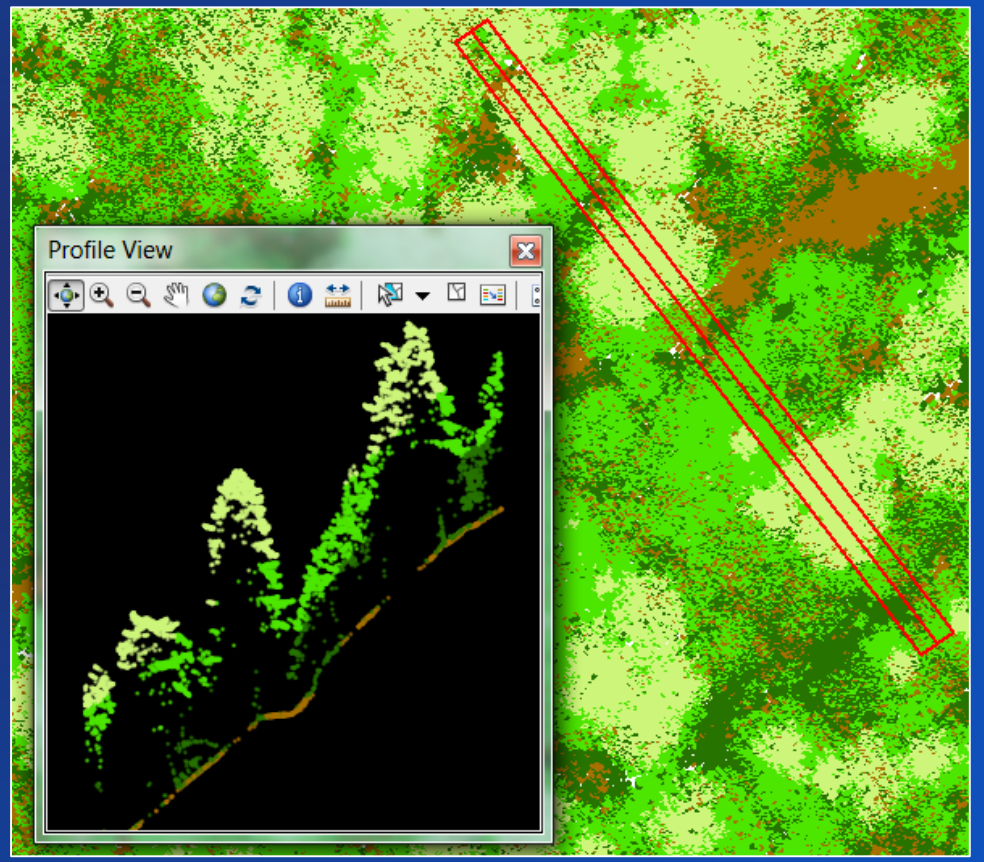
- Classifies building rooftop points in aerial lidar data
- The lidar data must have ground points that are assigned a class code value of 2.



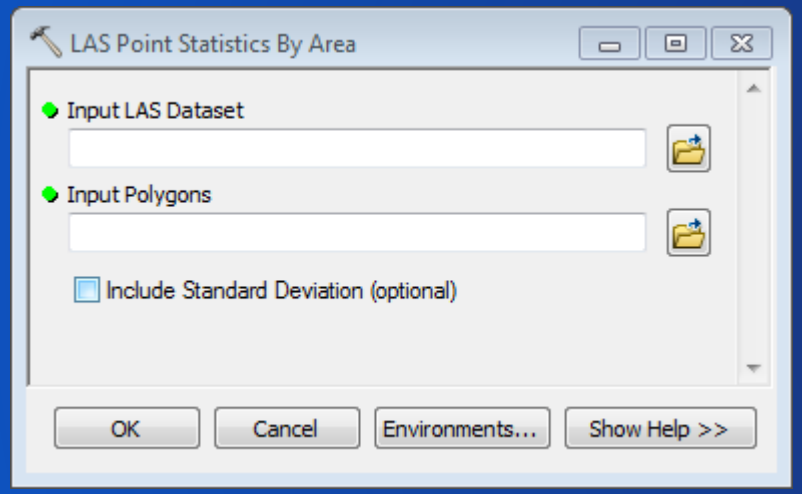


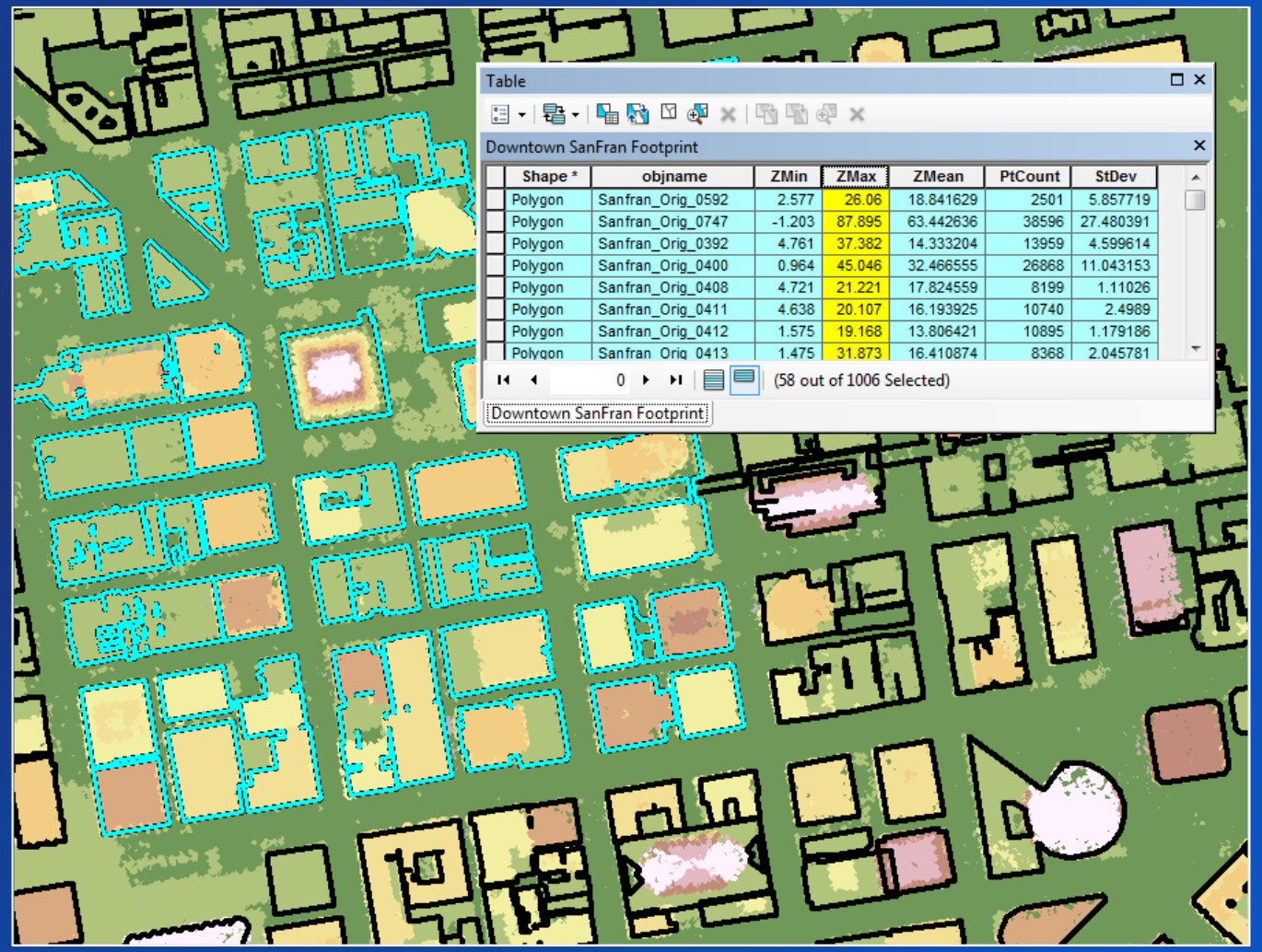
Classify LAS by Height





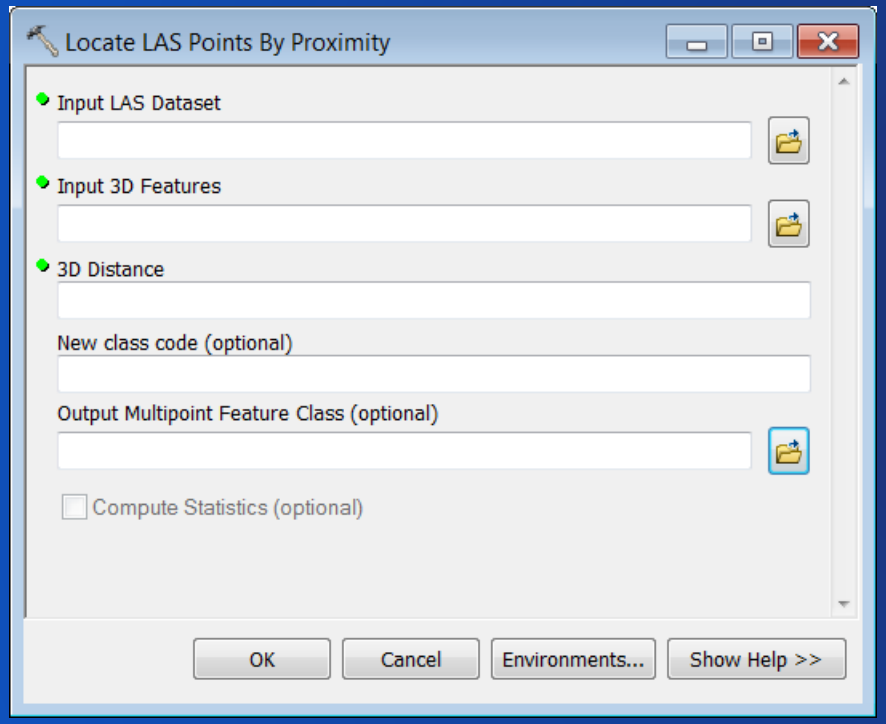
LAS Point Statistics By Area

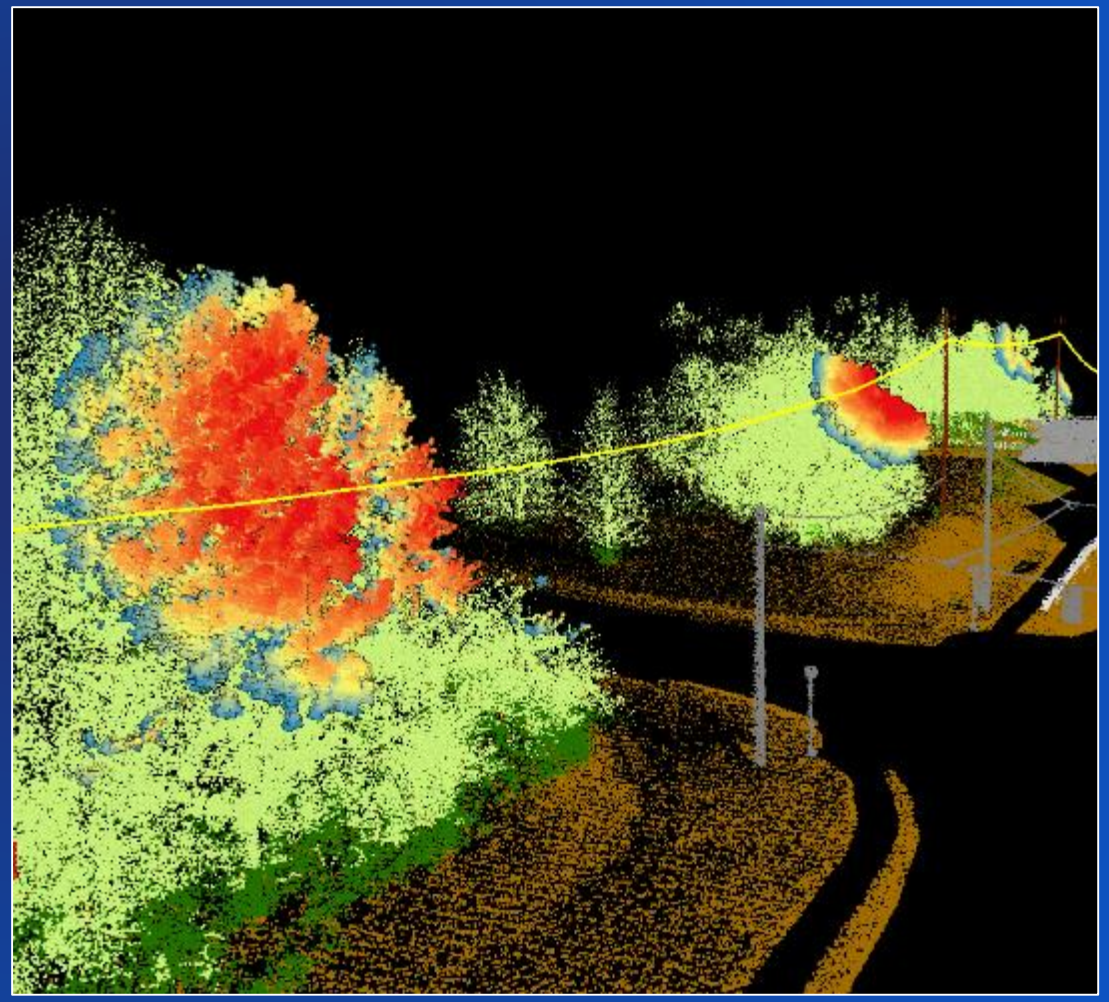




Shape *	objname	ZMin	ZMax	ZMean	PtCount	StDev
Polygon	Sanfran_Orig_0592	2.577	26.06	18.841629	2501	5.857719
Polygon	Sanfran_Orig_0747	-1.203	87.895	63.442636	38596	27.480391
Polygon	Sanfran_Orig_0392	4.761	37.382	14.333204	13959	4.599614
Polygon	Sanfran_Orig_0400	0.964	45.046	32.466555	26868	11.043153
Polygon	Sanfran_Orig_0408	4.721	21.221	17.824559	8199	1.11026
Polygon	Sanfran_Orig_0411	4.638	20.107	16.193925	10740	2.4989
Polygon	Sanfran_Orig_0412	1.575	19.168	13.806421	10895	1.179186
Polygon	Sanfran_Orig_0413	1.475	31.873	16.410874	8368	2.045781

Locate LAS Points By Proximity

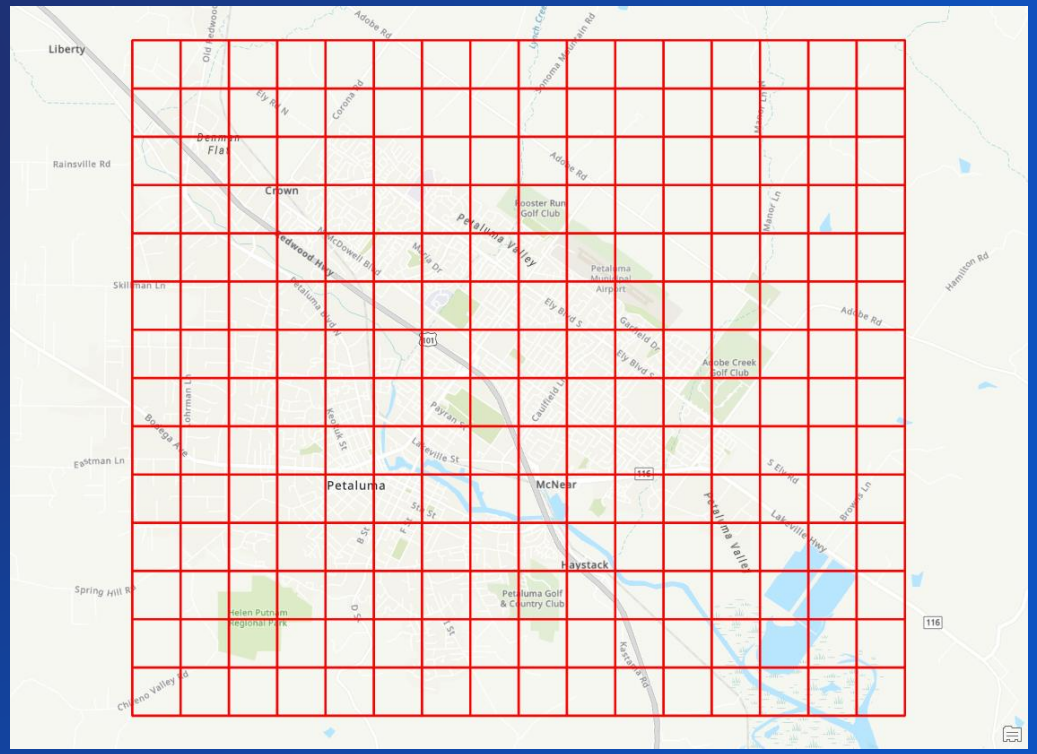




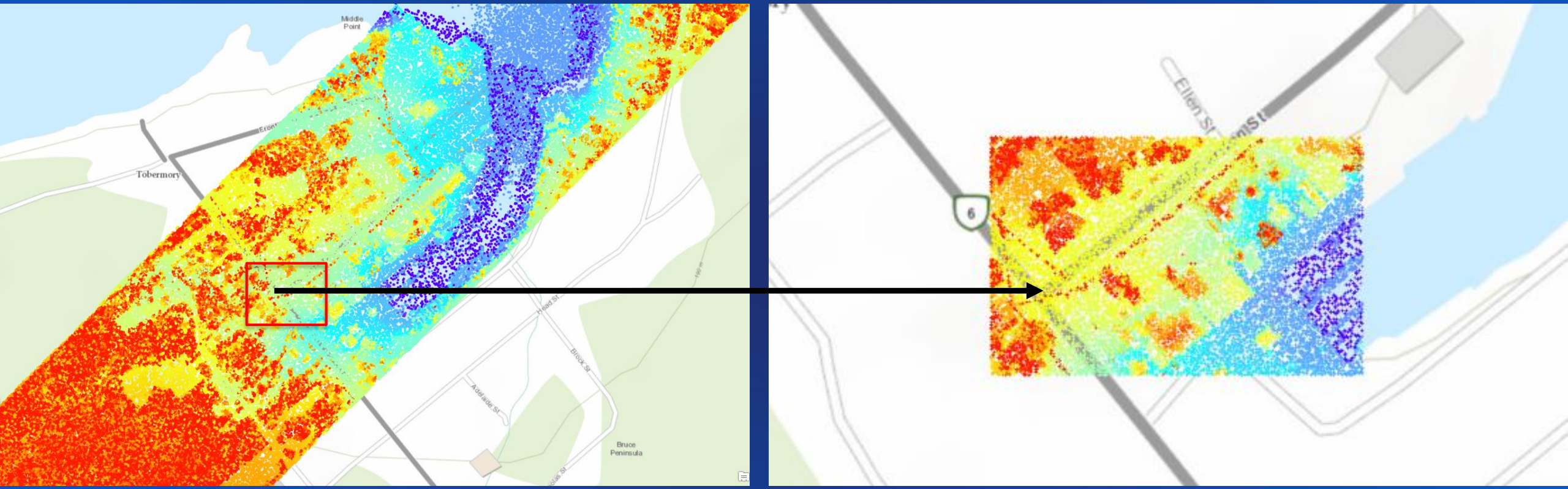
Data courtesy of PhotoScience

Tile LAS

- Creates a set of nonoverlapping LAS files whose horizontal extents are divided by a regular grid.
- Improves performance of operation that rely on reading data in spatial clusters. For example: analysis operations and visualization.



Extract LAS



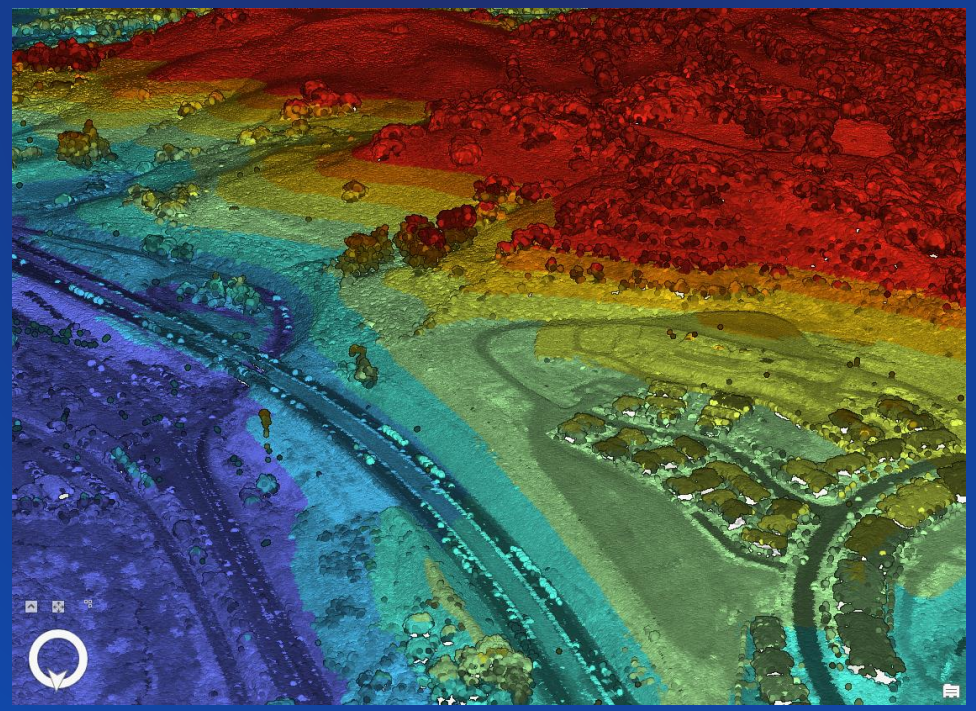
Data courtesy of Optech

Colorize LAS

- Applies colors and near-infrared values from orthographic imagery to LAS points.
- Displaying LAS points using RGB information can provide a photorealistic display that delivers a unique display experience.

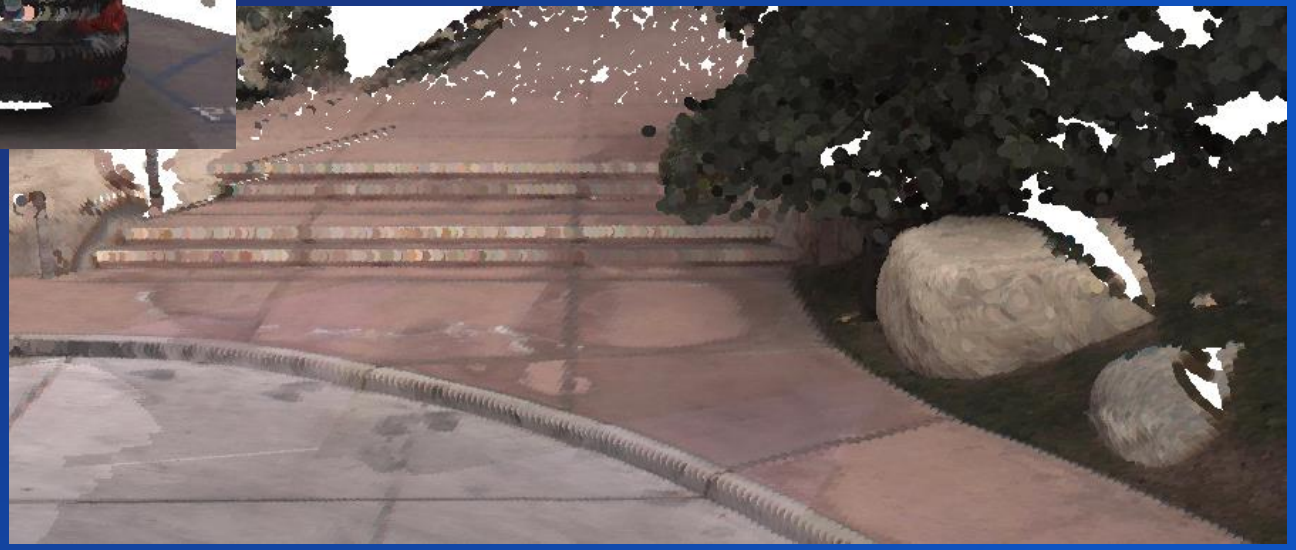
Convert LAS

- Converts LAS files between different compression methods, file versions, and point record formats.
- Convert between LAS, ZLAS, and LAZ files by selecting either the individual file, a folder containing the files to be processed, or a LAS dataset to reference a collection of LAS and ZLAS files.



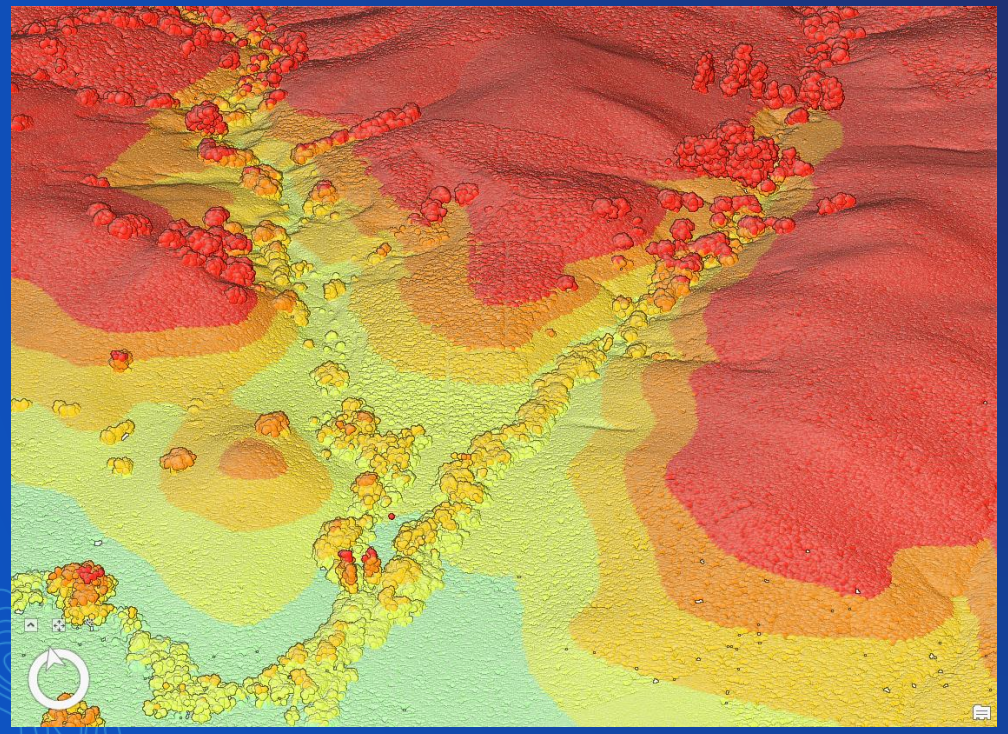
Thin LAS

- Creates new LAS files that contain a subset of LAS points from the input LAS dataset.



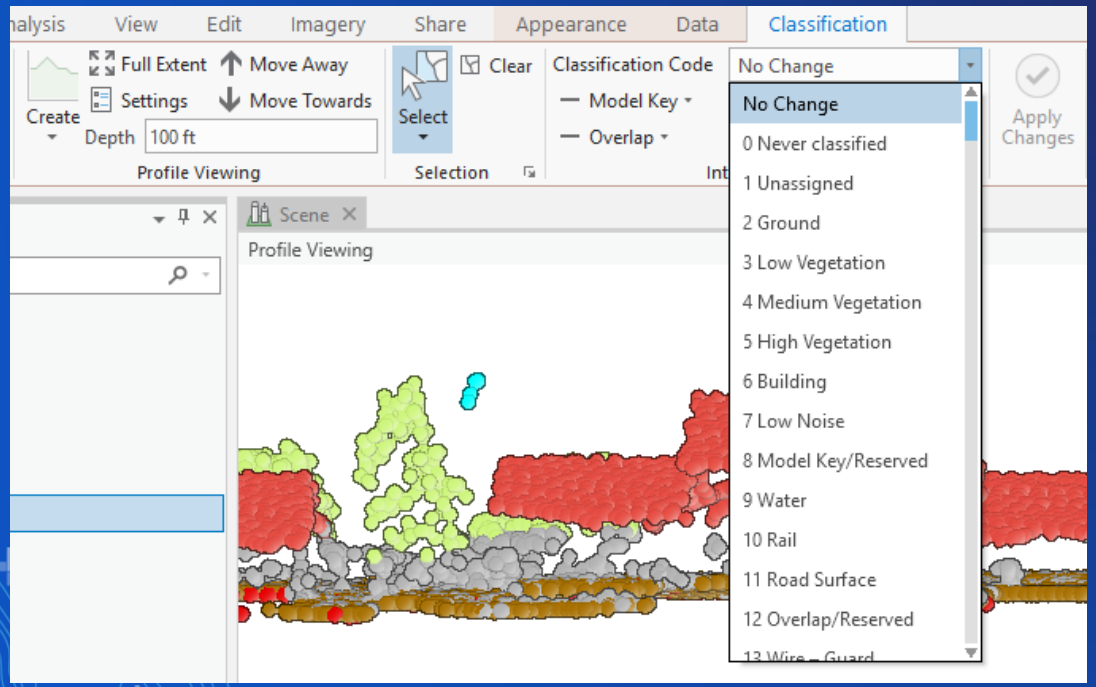
Eye-Dome Lighting

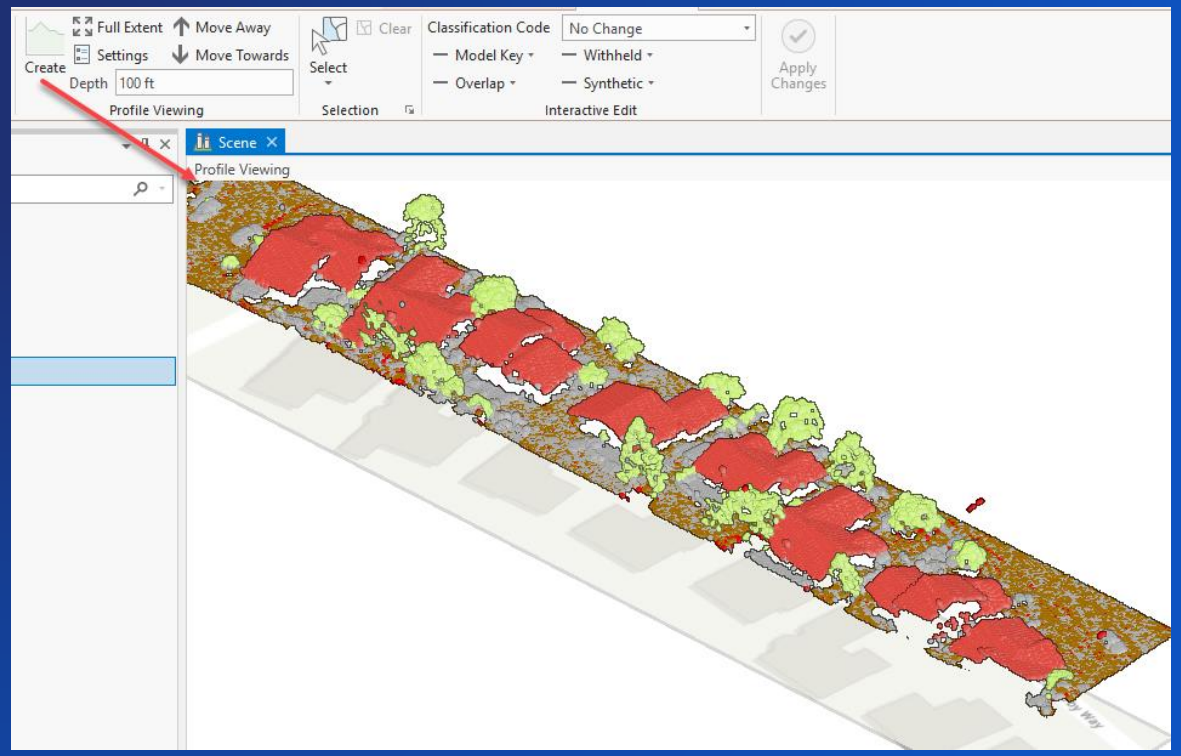
- At Pro 2.4 a new eye-dome lighting technique was added to display point clouds.
- Eye-dome lighting is a shading technique that improves depth perception when viewing lidar points in 3D.



Profile Viewing: Pro

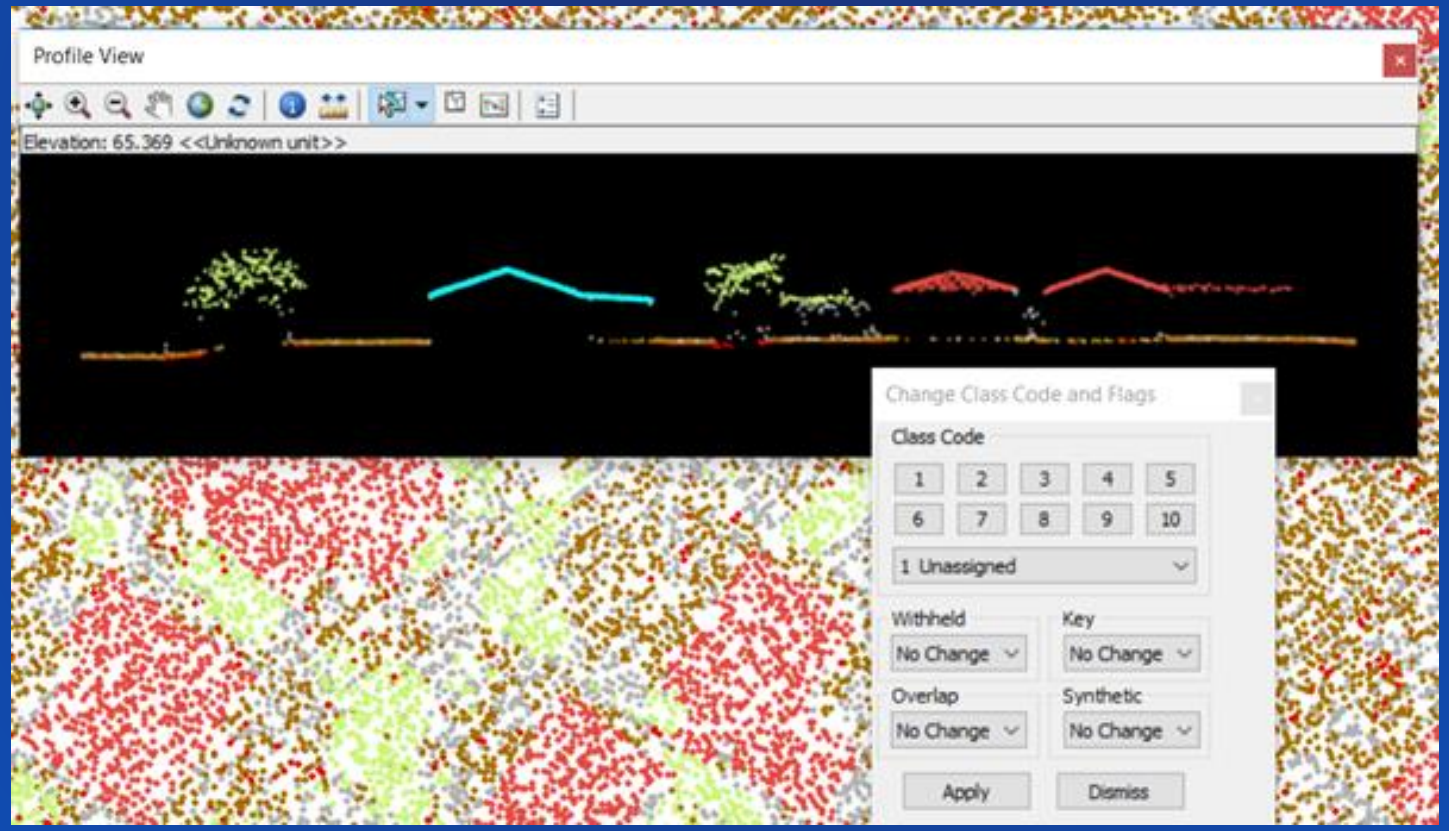
- New for 3D views is the ability to create a profile viewing state.
- For lidar this helps in fixing data anomalies and misclassifications.
- You can interactively add a profile line in the scene, and the view automatically shifts to display a vertical slice of the content.





Profile Viewing: ArcMap

- Fixing data anomalies and misclassifications via point profile window



Point Cloud Classification

Lindsay Weitz

A Variety of Choices

Fixed wing, rotary, satellite - sensors

3D Robotics – Solo

Ultracam Vexel

WorldView-4 DigitalGlobe Vricon

Aeryon Labs - SkyRanger

DJI – Phantom

SenseFly eBee

Altavian NOVA

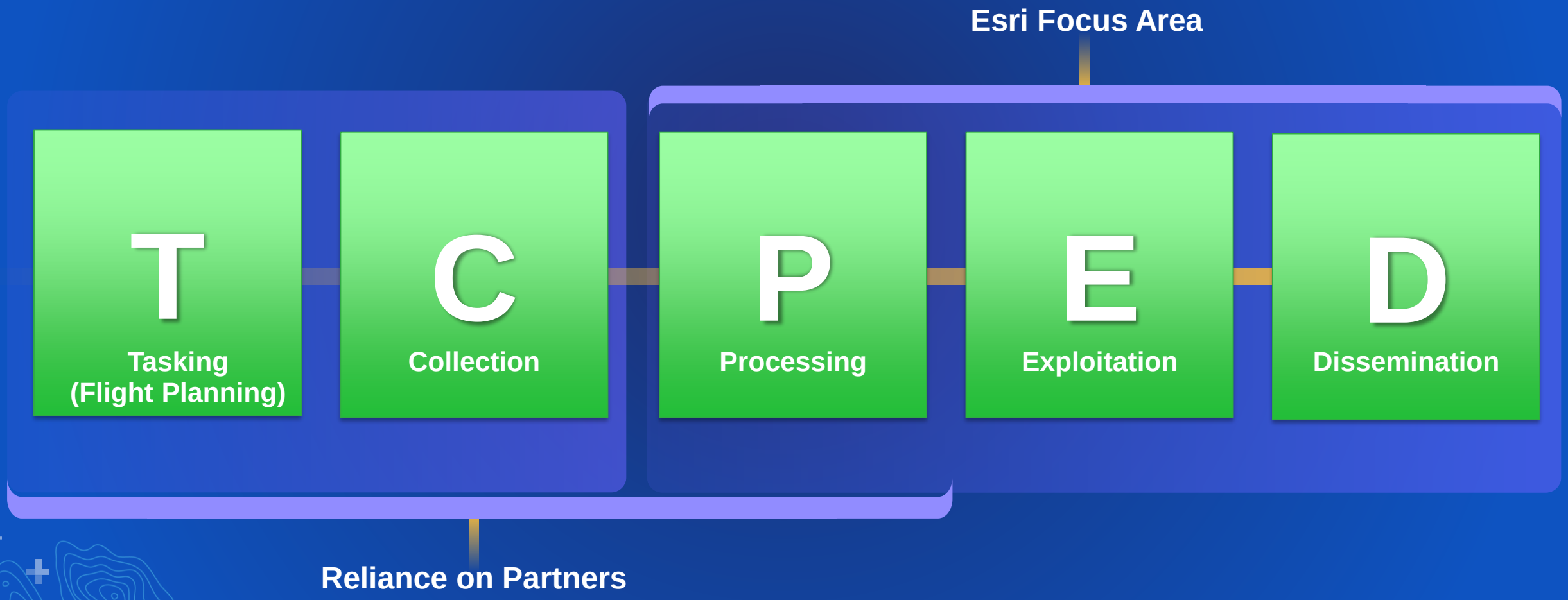
GoPro Hero

MicaSense RedEdge

Sony qX1

Typical Imagery Workflow

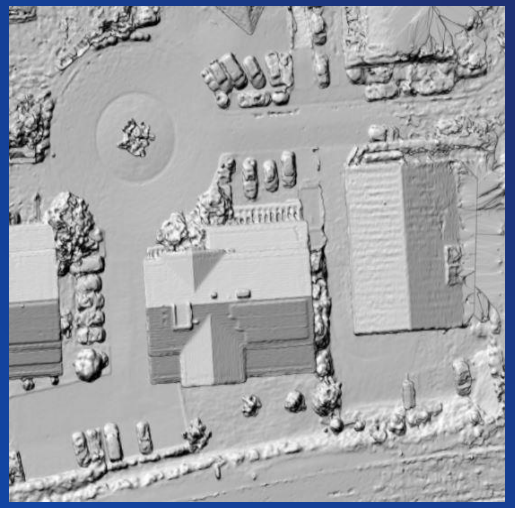
Applies to Drone Operations



Photogrammetric output

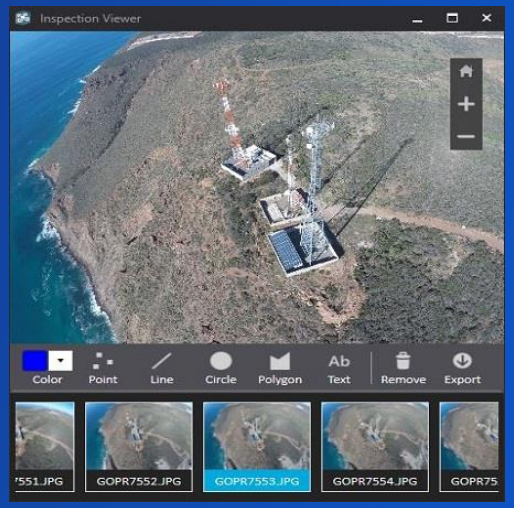
- Generate 2D and 3D products from raw imagery

Orthomosaics



Digital Surface Models

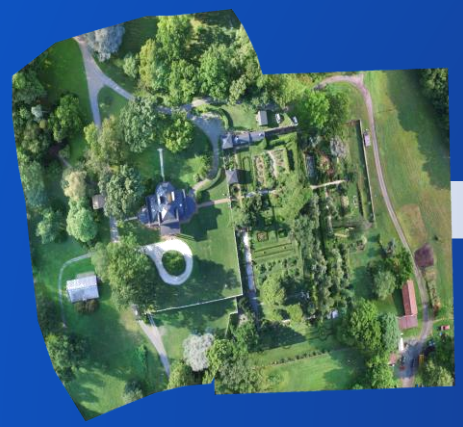
Point Clouds and Meshes



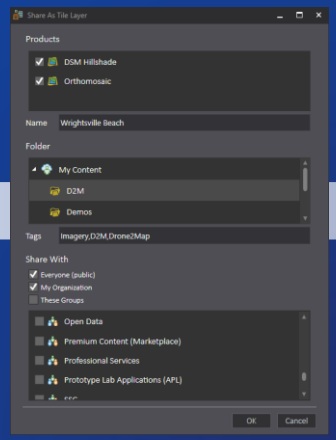
Smart Inspection

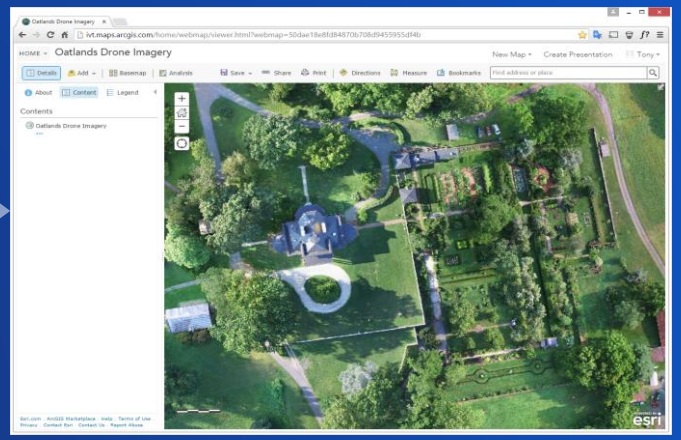
Share Imagery Fast

- Get Imagery & 3D Products To Your Users When They Need It



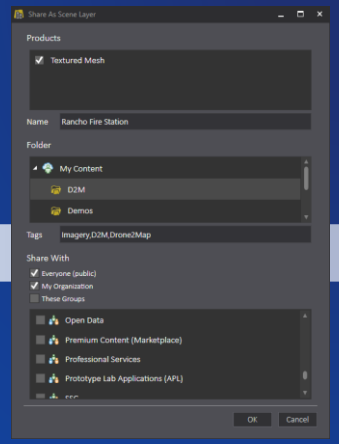
2D products

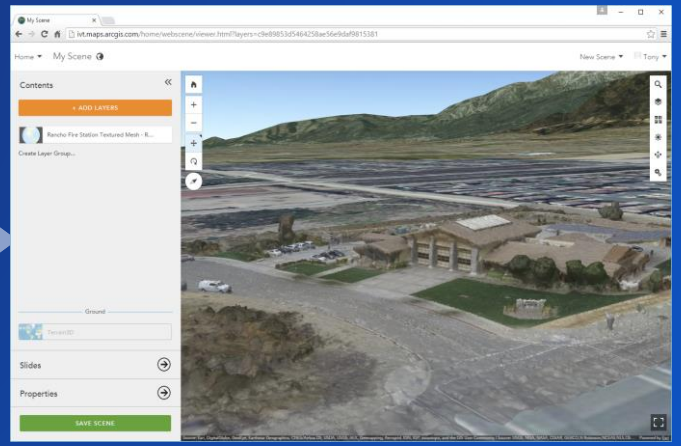




Tile Layers

3D products

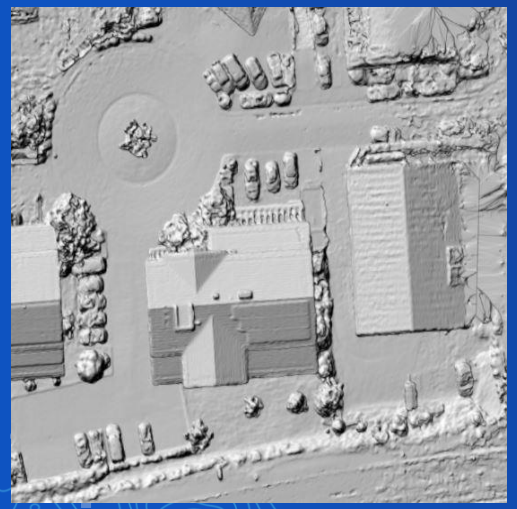


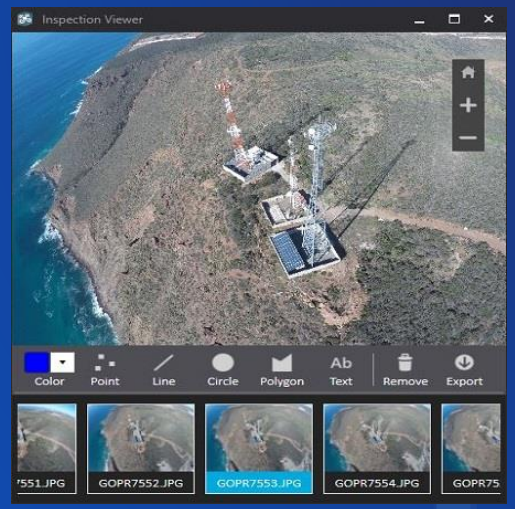


Scene layers

Using Photogrammetrically derived data With Other ArcGIS Apps

- Leverage the ArcGIS Platform for Visualization and Analysis





ArcGIS

- ArcGIS Earth
- ArcGIS Pro
- ArcGIS for Server
- AppStudio for ArcGIS
- Collector for ArcGIS
- Operations Dashboard
- Navigator for ArcGIS
- Explorer for ArcGIS
- Business Analyst Online

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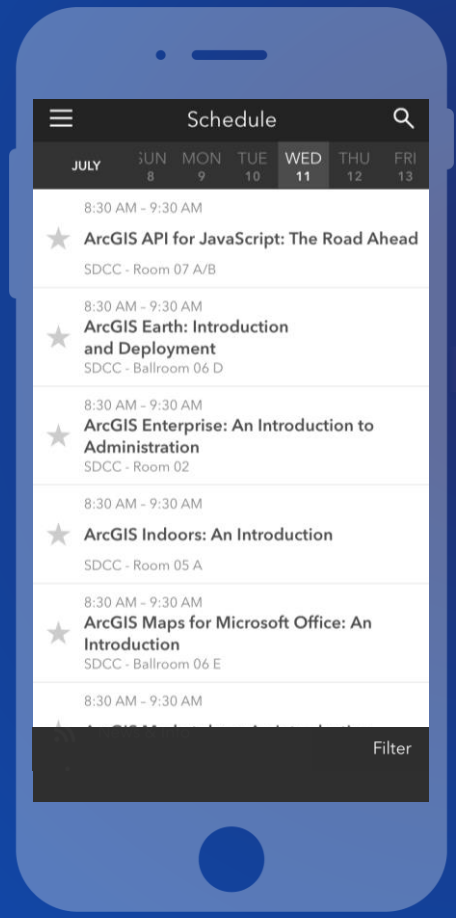
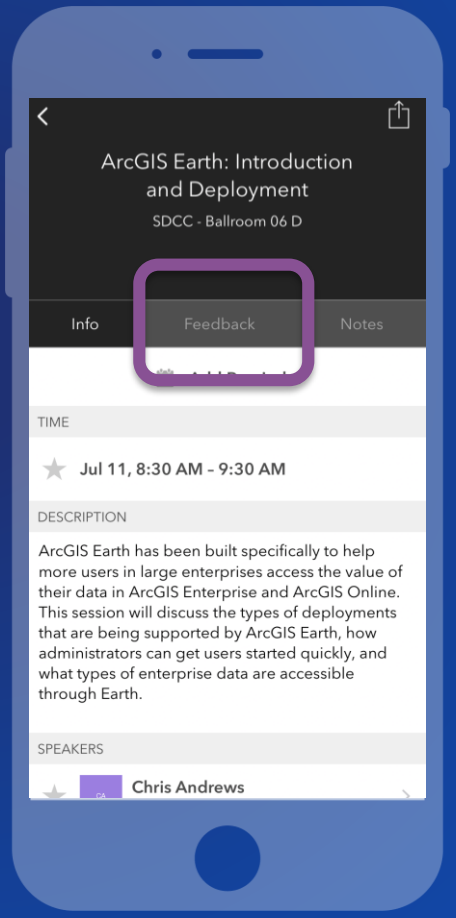


Select the Feedback tab



Complete answers and select “Submit”