AERIAL PHOTOGRAPHY: MAPPING CAMPUS LANDSCAPING

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GEOG 593

ABSTRACT

PSU's Facilities Management (FM) has a need for digital representation and inventory of the native vegetation in the landscape beds on campus property. This project aims to test which method of aerial photography, pole-mapping or drone footage, would work best to reconstruct the vegetation in digital form, an orthomosaic. We began by collecting drone footage, but as many of the campus beds are hidden beneath the foliage of taller trees, we needed to use pole-mapping as well. Data collected was substantial, the drone alone produced 679 photos, images needed to be reduced, eliminating irrelevant photos, as well as organized into individual landscaping beds. These images are then uploaded to the SfM software PhotoScan, which uses photogrammetric processing of digital images to generate 3D spatial data. Once in the software, each individual photo was masked to hide background objects from the final product and aligned to begin constructing the 3D image. The user builds a dense cloud, adds mesh, builds texture and then creates an exportable orthomosaic, for ArcGIS. The orthomosaics created from drone footage can be easily projected to state plane in GIS, due to GPS within aircraft. Before creating an orthomosaic from the pole mapping photos, the model must be rotated to align the (x, y, z) in PhotoScan. Once aligned, the orthomosaic can be created and uploaded to ArcGIS to be georefferenced with GCPs or building footprint, this project used the base map in ArcGIS. Once aligned in GIS, the plants can be identified by points or polygons, producing the deliverable for FM, a georefferenced and inventoried map of vegetation in the campus Landscaping Beds.

Key words: Aerial Photography; Drone; Pole Mapping; PhotoScan; Arc GIS; Orthomosaic; Georefference; Vegetation Inventory

RESEARCH QUESTION??

WHICH METHOD OF AERIAL PHOTOGRAPHY WILL WORK BEST TO RECONSTRUCT CAMPUS LANDSCAPING BEDS IN DIGITAL FORM?

COLLECTING DATA

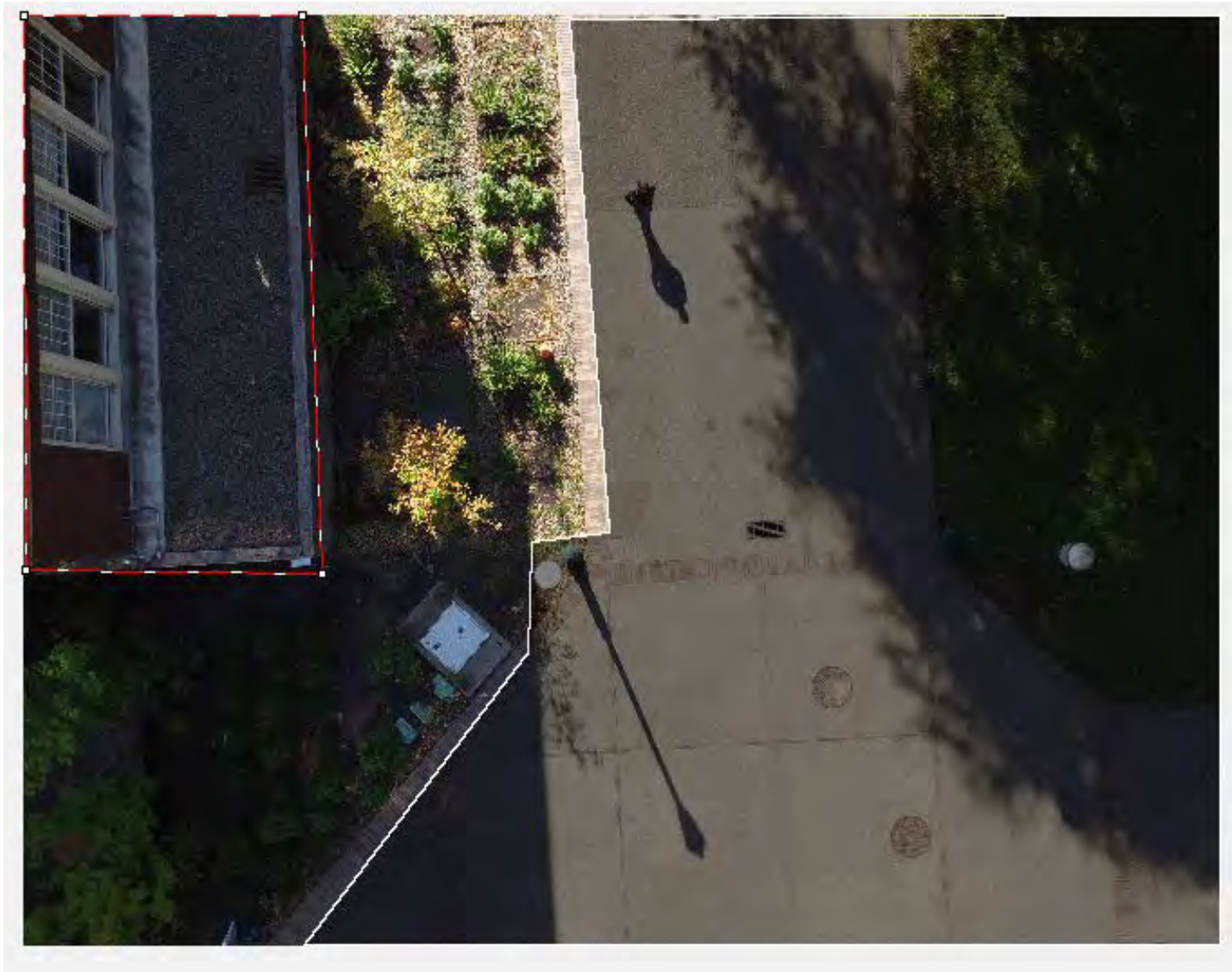
Drone	Pole-mapping
+ Fast +User Friendly +GPS on aircraft	+Inexpensive
-Expensive -Lots of obstruction -Weather dependant	-Heavy -Trick camera angles -Time Consuming - Not georefferenced

Data

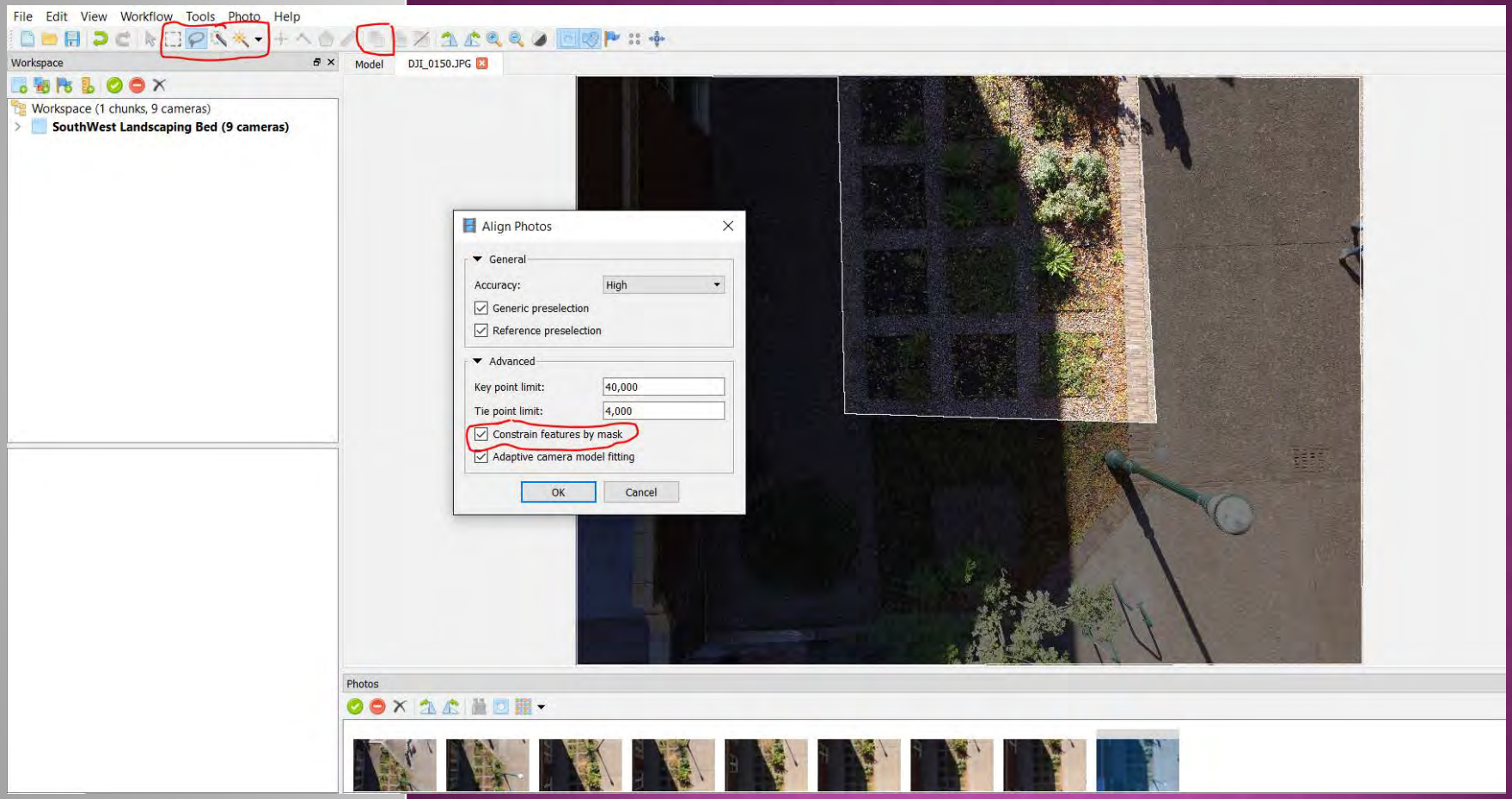

Shattuck Drone Mapping
Quick access
Desktop
Downloads
Documents
Pictures
drone pics
Music
Videos
This PC
Network

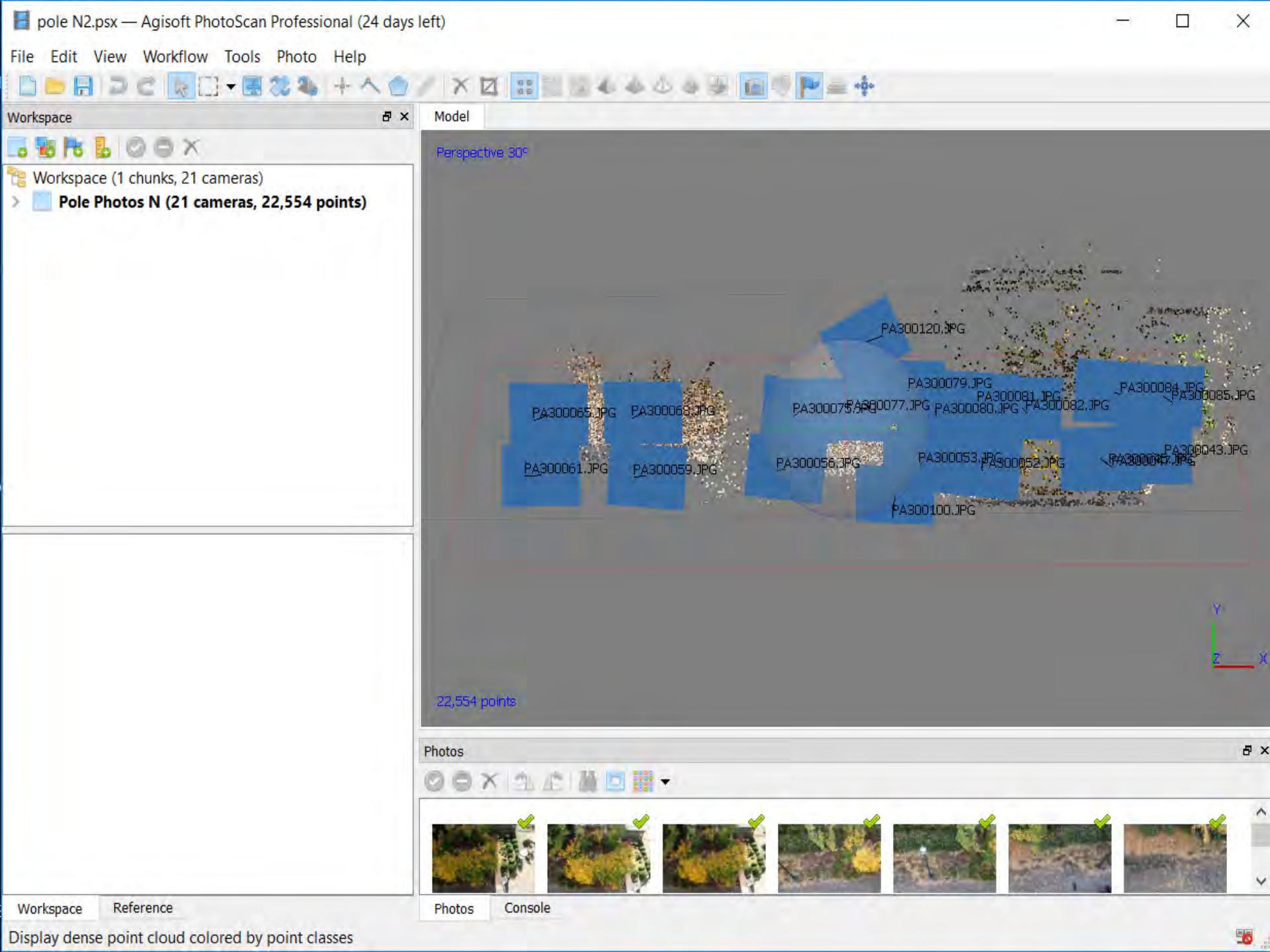
MASK PHOTOS

mask all irrelevant elements on the source photos



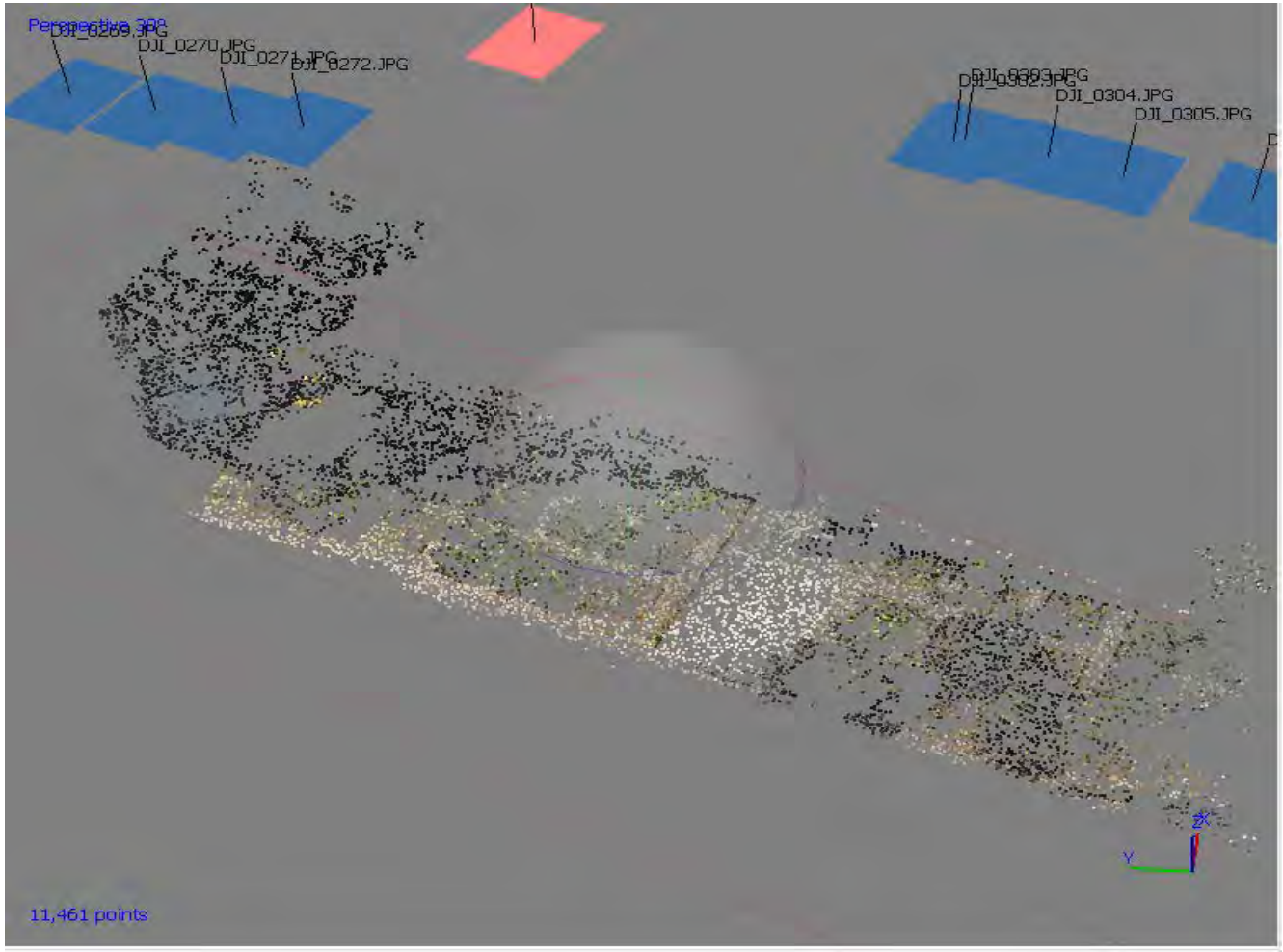
ALIGN PHOTOS



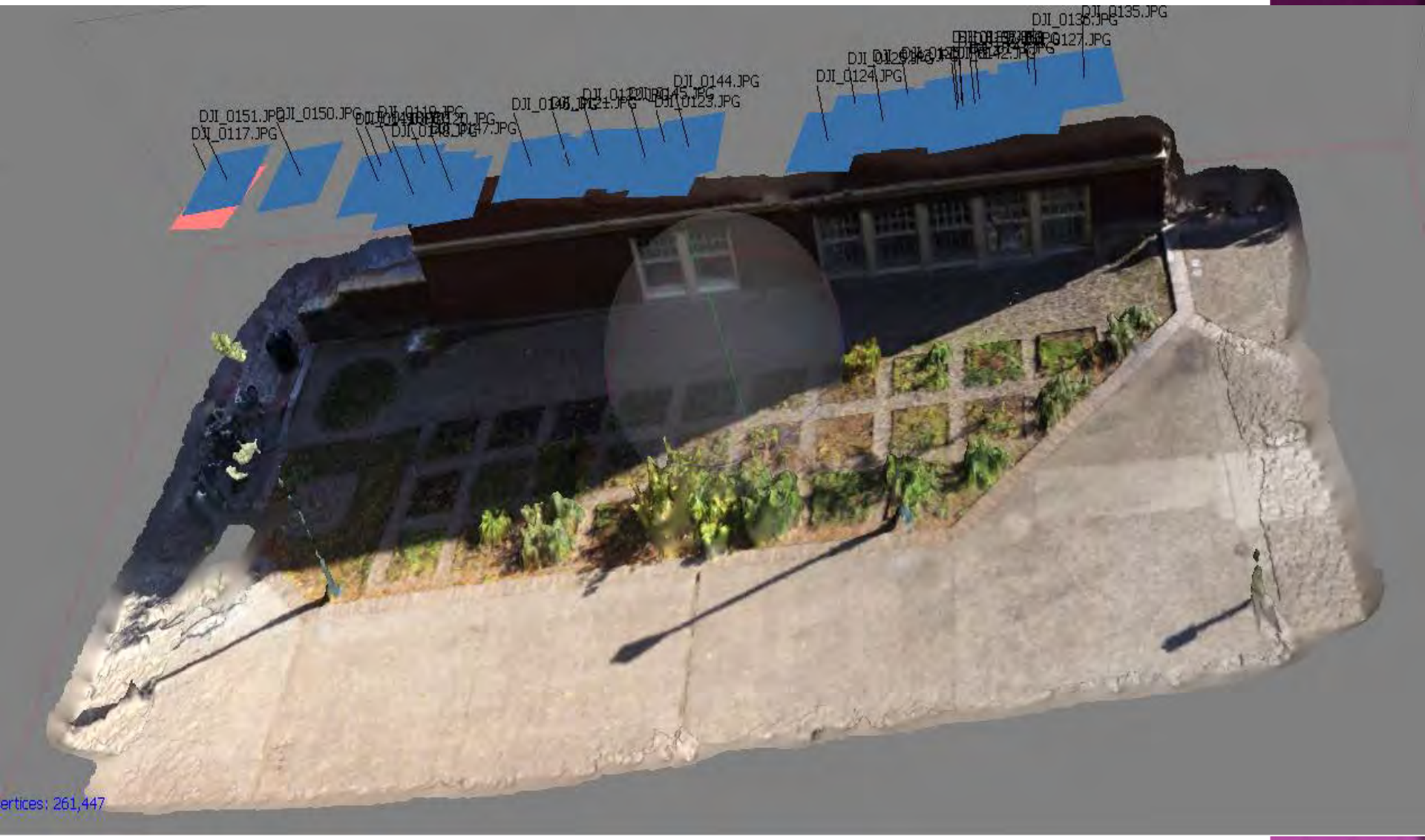

pole N2.psx — Agisoft PhotoScan Professional (24 days left)
File Edit View Workflow Tools Photo Help
Workspace
Workspace (1 chunks, 21 cameras)
Pole Photos N (21 cameras, 22,554 points)
Model
Perspective 30°
PA300120.JPG
PA300079.JPG
PA300084.JPG
PA300085.JPG
PA300081.JPG
PA300077.JPG
PA300080.JPG
PA300082.JPG
PA300065.JPG
PA300068.JPG
PA300061.JPG
PA300059.JPG
PA300056.JPG
PA300053.JPG
PA300052.JPG
PA300043.JPG
PA300100.JPG
Y
Z
X
22,554 points
Photos
Workspace
Reference
Photos
Console
Display dense point cloud colored by point classes

BUILD DENSE CLOUD

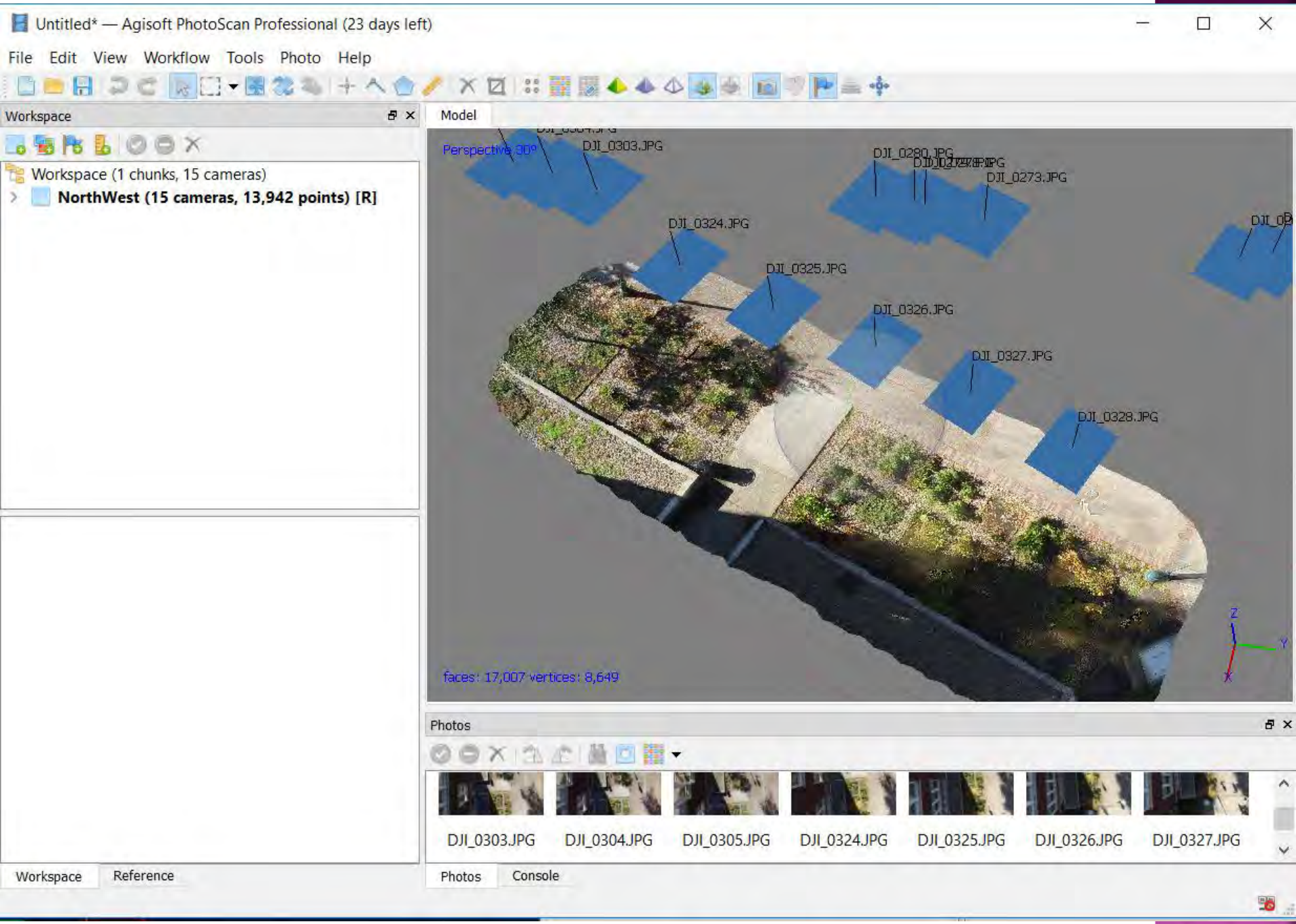
Based on the estimated camera positions the program calculates depth information for each camera to be combined into a single dense point cloud



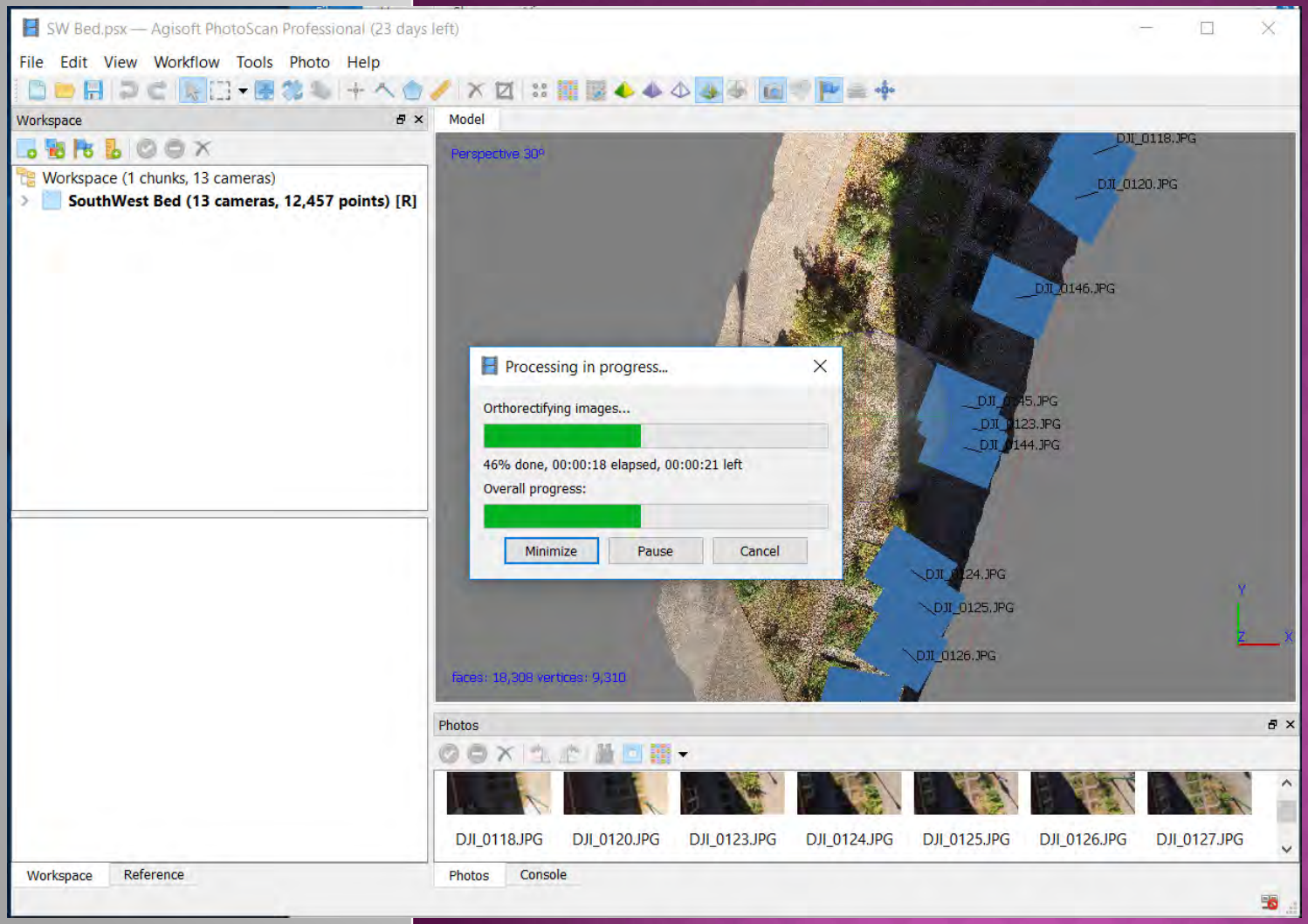
BUILD MESH


DJI_0135.JPG
DJI_0136.JPG
DJI_0127.JPG
DJI_0124.JPG
DJI_0144.JPG
DJI_0123.JPG
DJI_0151.JPG
DJI_0150.JPG
DJI_0117.JPG
ertices: 261,447

BUILD TEXTURE


Untitled* — Agisoft PhotoScan Professional (23 days left)
File Edit View Workflow Tools Photo Help
Workspace
Workspace (1 chunks, 15 cameras)
NorthWest (15 cameras, 13,942 points) [R]
Model
Perspective 30°
DJI_0303.JPG
DJI_0280.JPG
DJI_0273.JPG
DJI_0324.JPG
DJI_0325.JPG
DJI_0326.JPG
DJI_0327.JPG
DJI_0328.JPG
faces: 17,007 vertices: 8,649
Photos
DJI_0303.JPG
DJI_0304.JPG
DJI_0305.JPG
DJI_0324.JPG
DJI_0325.JPG
DJI_0326.JPG
DJI_0327.JPG
Workspace
Reference
Photos
Console

CREATE ORTHOMOSAIC



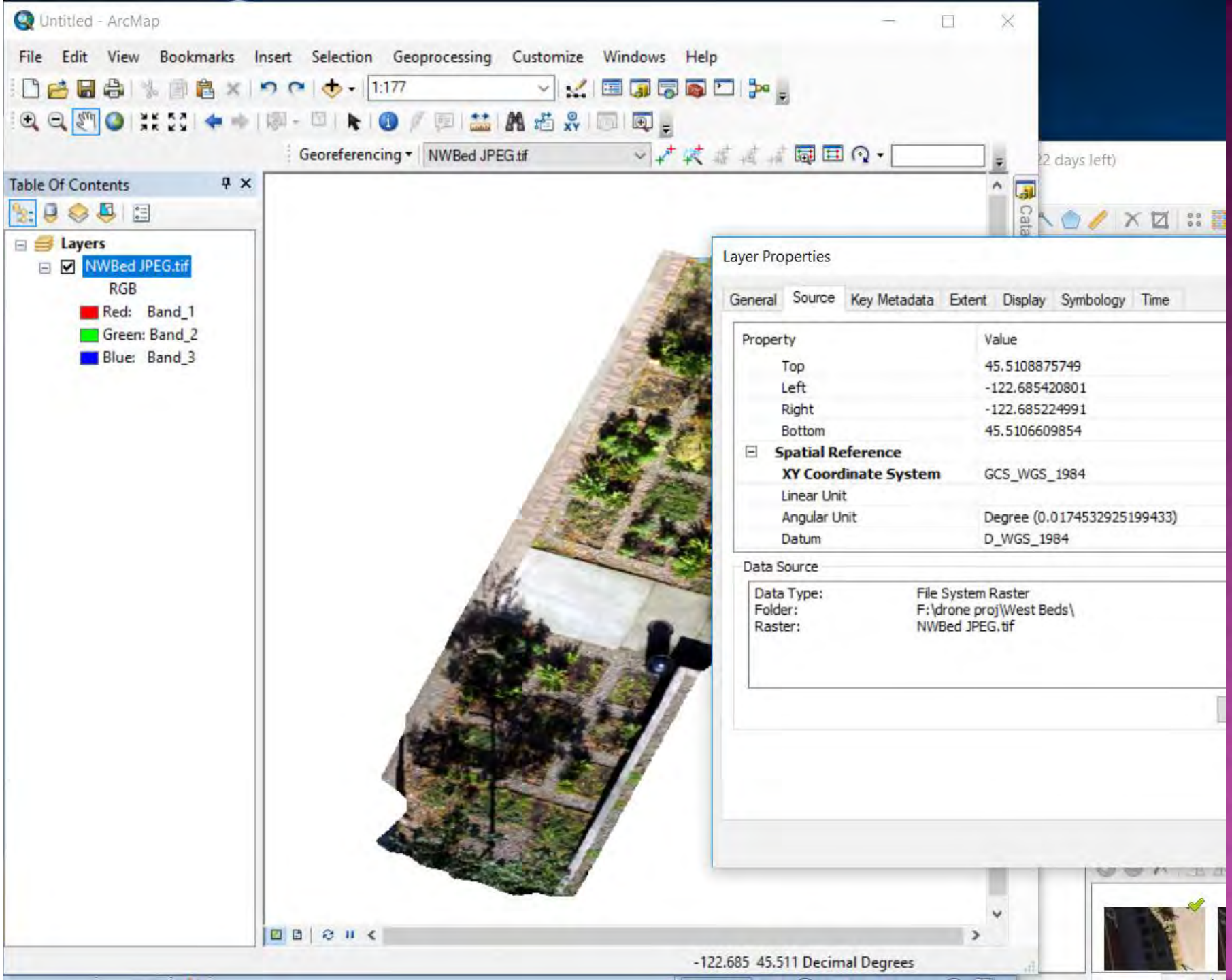
EXPORT TIFF-> UPLOAD TO ARCMAP

DRONE-

- Export ortho in TIF
- Open in ArcGIS
- Project to state plane
- Adjust to align with map
- Create Features

Pole-Mapping

- Use tool to rotate model (align x,y,z)
- Export ortho in TIF
- Open in ArcGIS
- Rectify with GCP or building footprint (base map)
- Add Control Points
- Create Features


Untitled - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:177
Georeferencing
NWBed JPEG.tif
Table Of Contents
Layers
NWBed JPEG.tif
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
Layer Properties
General Source Key Metadata Extent Display Symbology Time
Property Value
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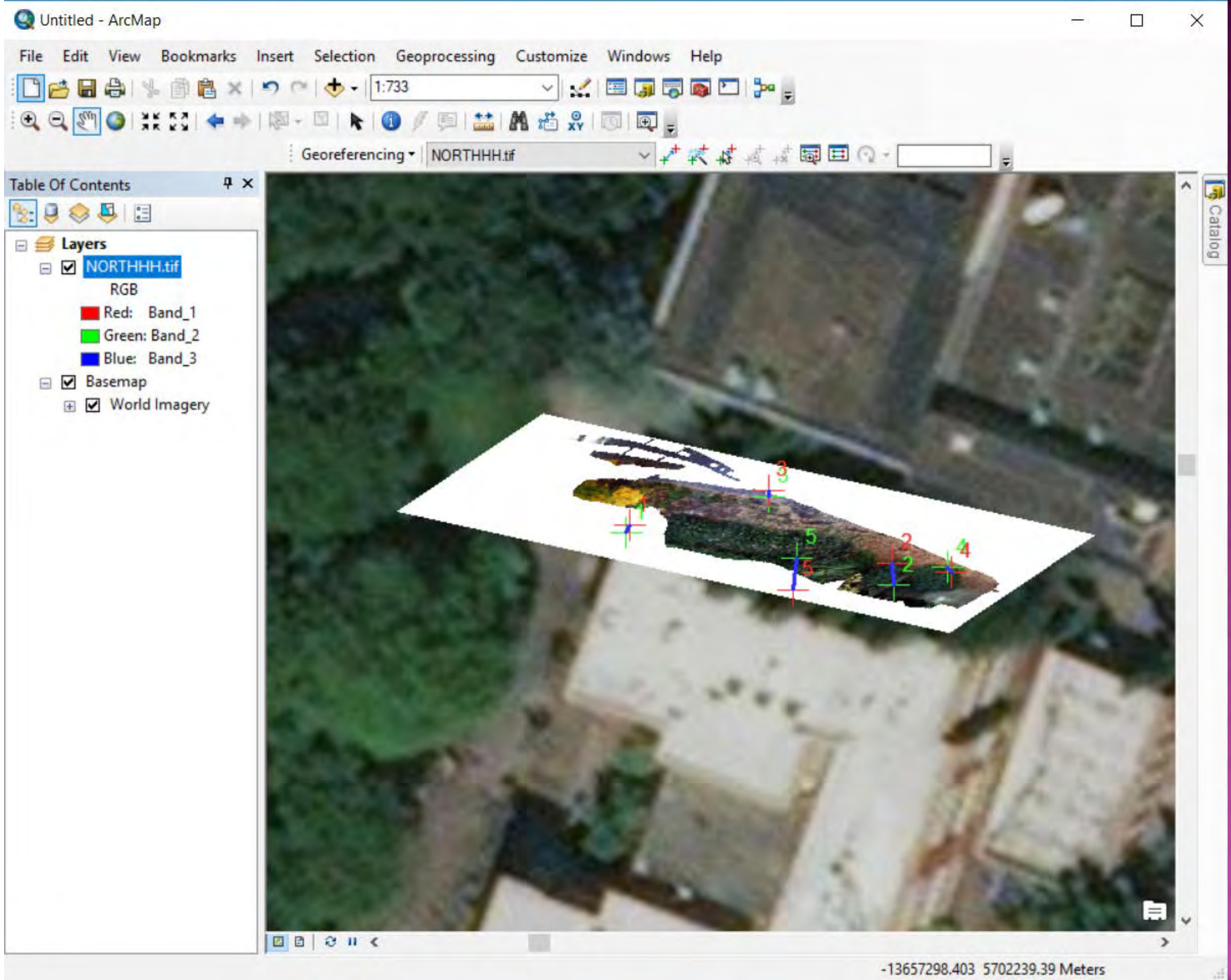
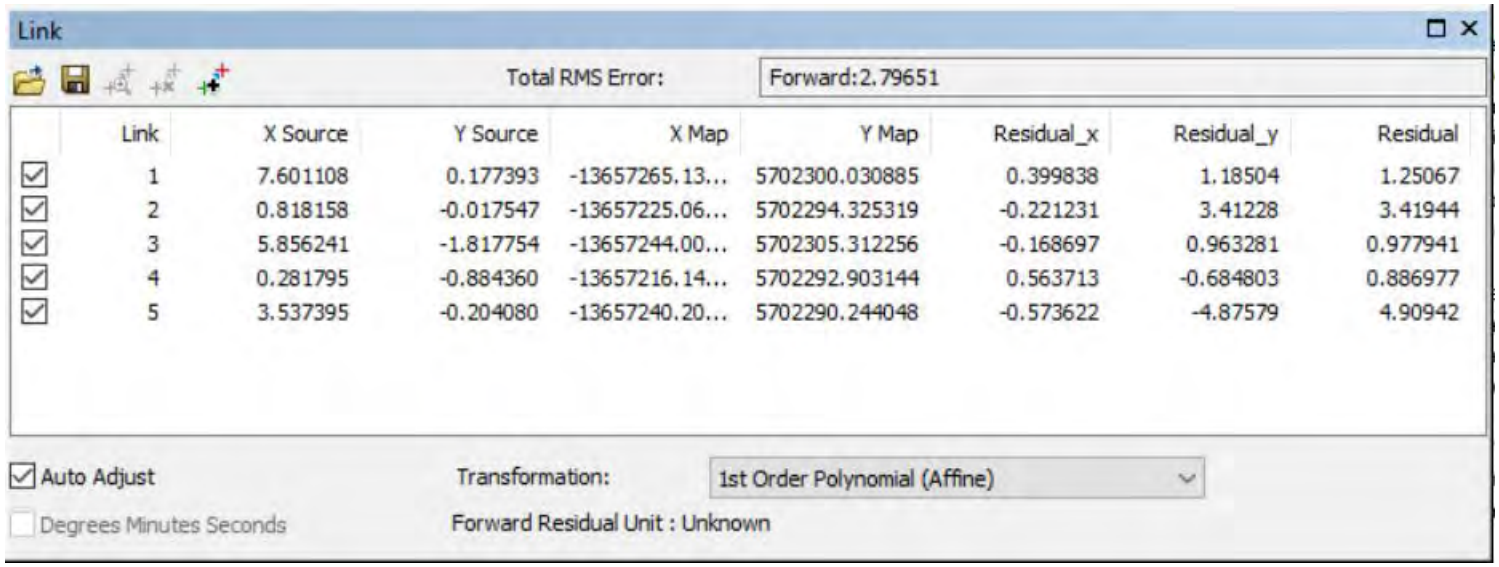
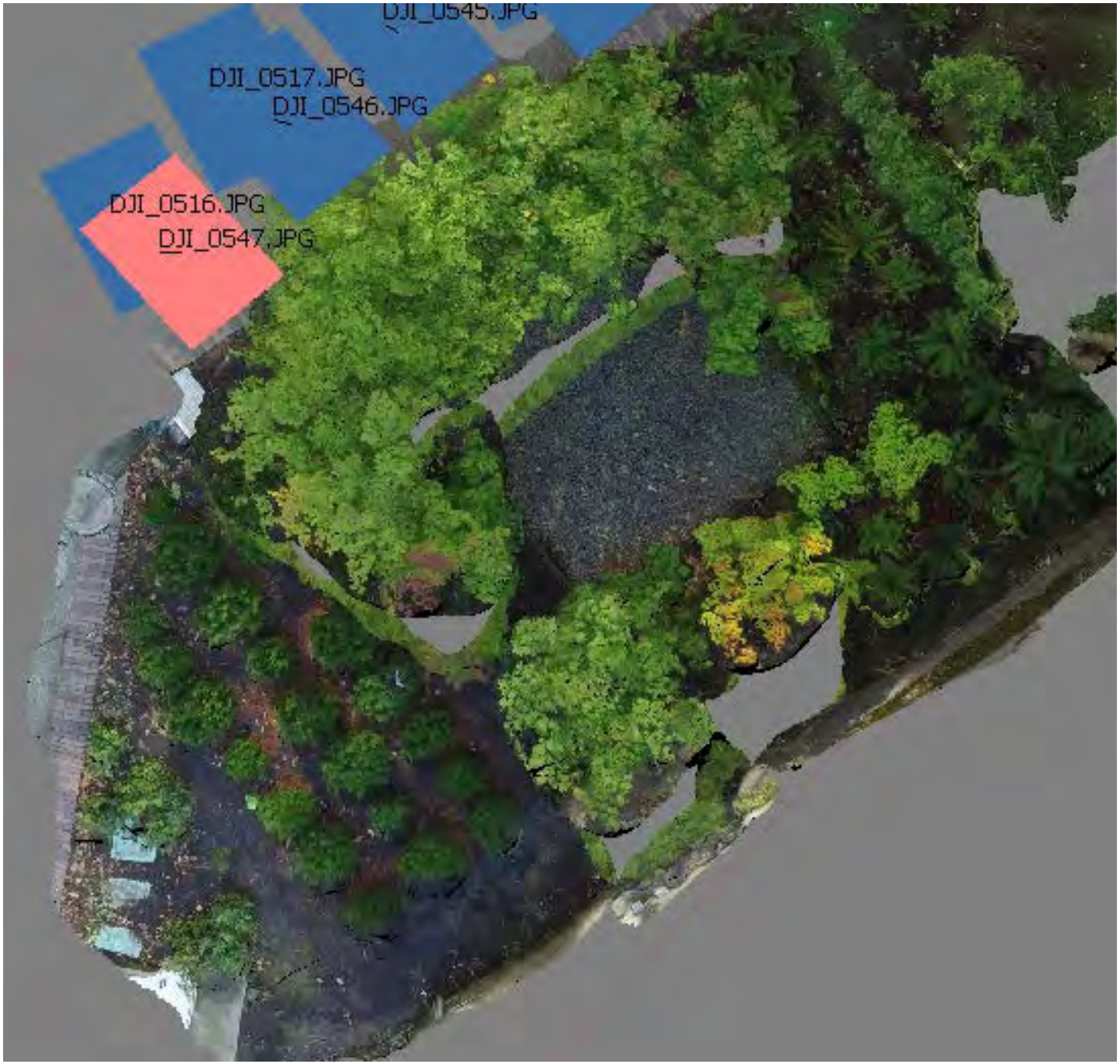
Left -122.685420801
Right -122.685224991
Bottom 45.5106609854
Spatial Reference
XY Coordinate System GCS_WGS_1984
Linear Unit
Angular Unit Degree (0.0174532925199433)
Datum D_WGS_1984
Data Source
Data Type: File System Raster
Folder: F:\drone proj\West Beds\
Raster: NWBed JPEG.tif
-122.685 45.511 Decimal Degrees


Untitled - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:733
Georeferencing
NORTHHH.tif
Table Of Contents
Layers
NORTHHH.tif
RGB
Red: Band_1
Green: Band_2
Blue: Band_3
Basemap
World Imagery
Catalog
-13657298.403 5702239.39 Meters

Add Control Points



OBSTACLES AND LIMITATIONS


DJI_0545.JPG
DJI_0517.JPG
DJI_0546.JPG
DJI_0516.JPG
DJI_0547.JPG

Conclusion

ACKNOWLEDGEMENTS

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