

## Summary

Project	July1East
Processed	2019-06-13 22:50:18
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	0.31 cm / 0.12 in
Area Covered	0.007 km <sup>2</sup> / 0.7073 ha / 0.00 sq. mi. / 1.7486 acres
Time for Initial Processing (without report)	03h:21m:06s

## Quality Check

<b>Images</b>	median of 78420 keypoints per image	✓
<b>Dataset</b>	478 out of 479 images calibrated (99%), all images enabled, 4 blocks	⚠
<b>Camera Optimization</b>	19.99% relative difference between initial and optimized internal camera parameters	⚠
<b>Matching</b>	median of 6645.77 matches per calibrated image	✓
<b>Georeferencing</b>	yes, no 3D GCP	⚠

## Preview

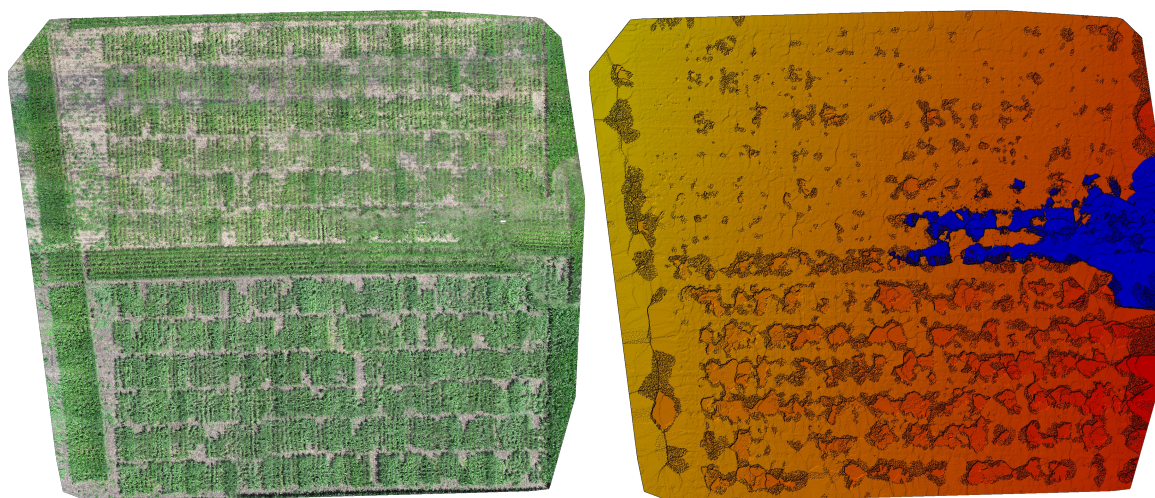


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## Calibration Details

Number of Calibrated Images	478 out of 479
Number of Geolocated Images	479 out of 479

## Initial Image Positions

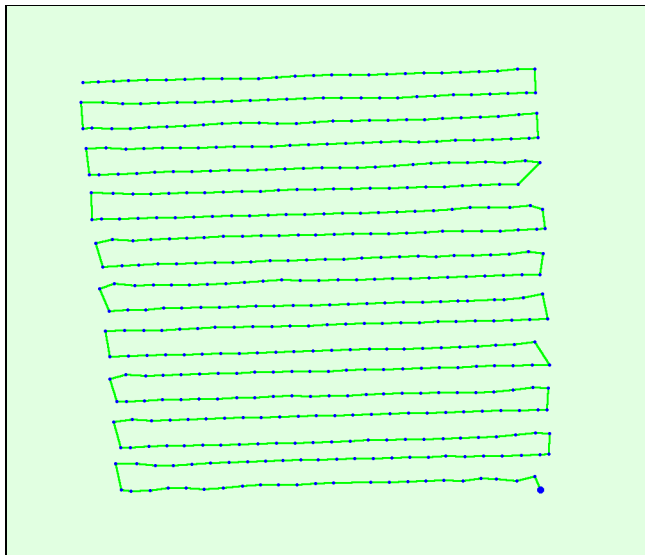
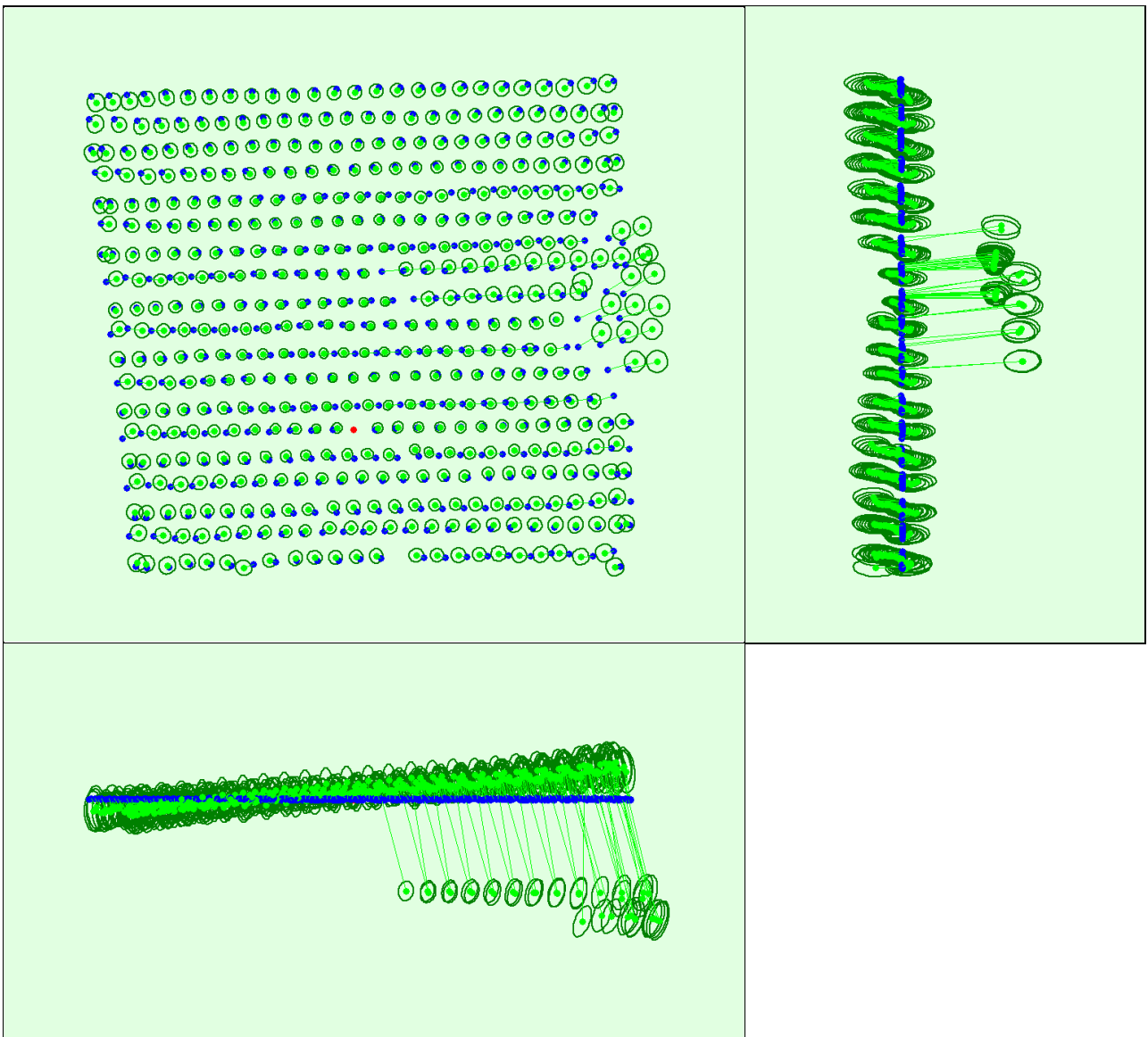


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

### Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 5x magnified

Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

## Absolute camera position and orientation uncertainties

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.202	0.203	0.452	0.697	0.648	0.285
Sigma	0.037	0.038	0.092	0.003	0.004	0.008

## Overlap

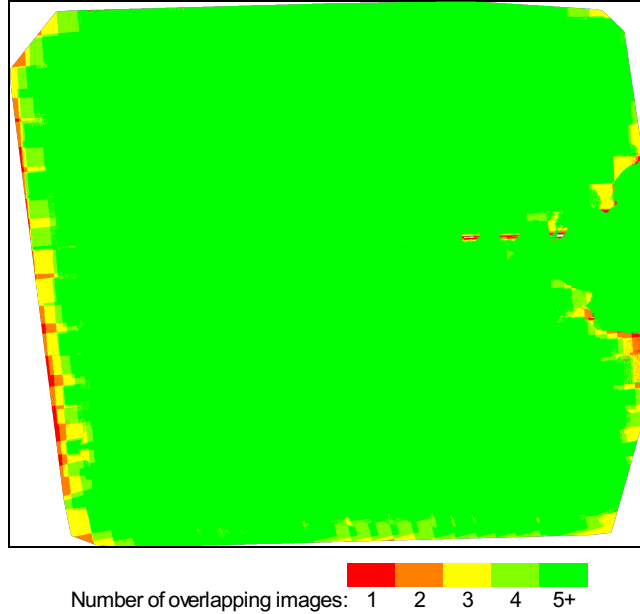


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

## Bundle Block Adjustment Details

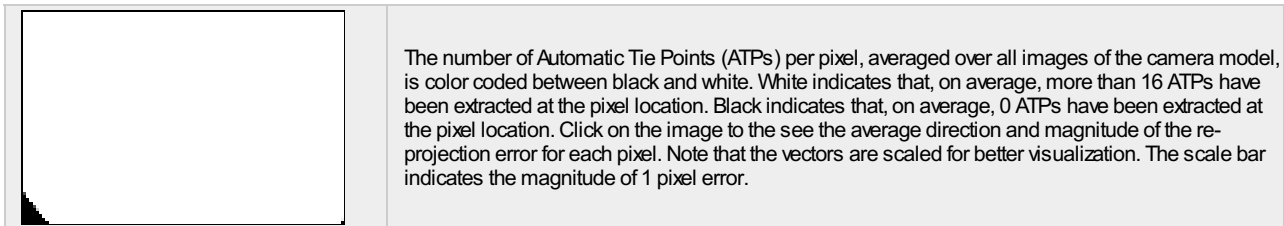
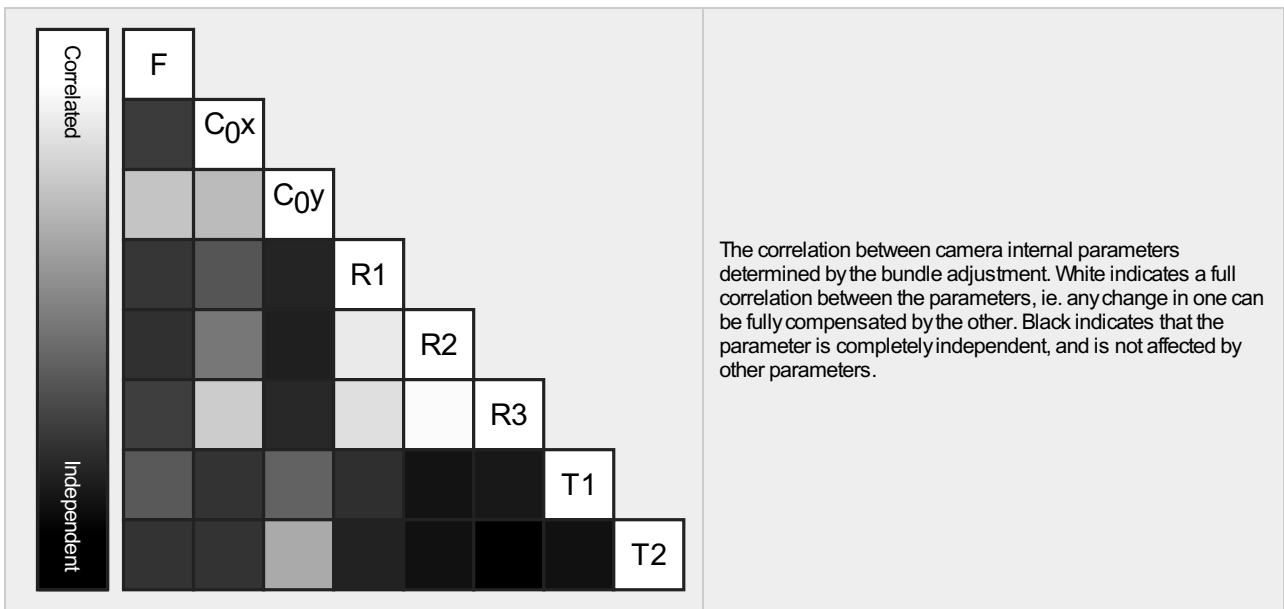
Number of 2D Keypoint Observations for Bundle Block Adjustment	3340476
Number of 3D Points for Bundle Block Adjustment	1362575
Mean Reprojection Error [pixels]	0.177

### Internal Camera Parameters

FC6310\_8.8\_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310\_8.8\_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3668.759 [pixel] 8.604 [mm]	2736.001 [pixel] 6.417 [mm]	1823.999 [pixel] 4.278 [mm]	0.003	-0.008	0.008	-0.000	0.000
Optimized Values	4402.405 [pixel] 10.325 [mm]	2818.129 [pixel] 6.609 [mm]	1611.910 [pixel] 3.780 [mm]	0.009	-0.021	0.023	-0.001	0.000
Uncertainties (Sigma)	7.597 [pixel] 0.018 [mm]	3.206 [pixel] 0.008 [mm]	3.257 [pixel] 0.008 [mm]	0.000	0.001	0.001	0.000	0.000



### 2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	78420	6646
Mn	74199	121
Max	82648	25418
Mean	78472	6988

### 3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	1035726
In 3 Images	192903
In 4 Images	67940
In 5 Images	30072
In 6 Images	14986
In 7 Images	8388
In 8 Images	4945
In 9 Images	2977
In 10 Images	1819
In 11 Images	1096
In 12 Images	694
In 13 Images	413
In 14 Images	268
In 15 Images	162
In 16 Images	104
In 17 Images	63
In 18 Images	14
In 19 Images	2
In 20 Images	3

### 2D Keypoint Matches

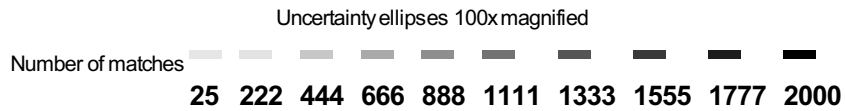
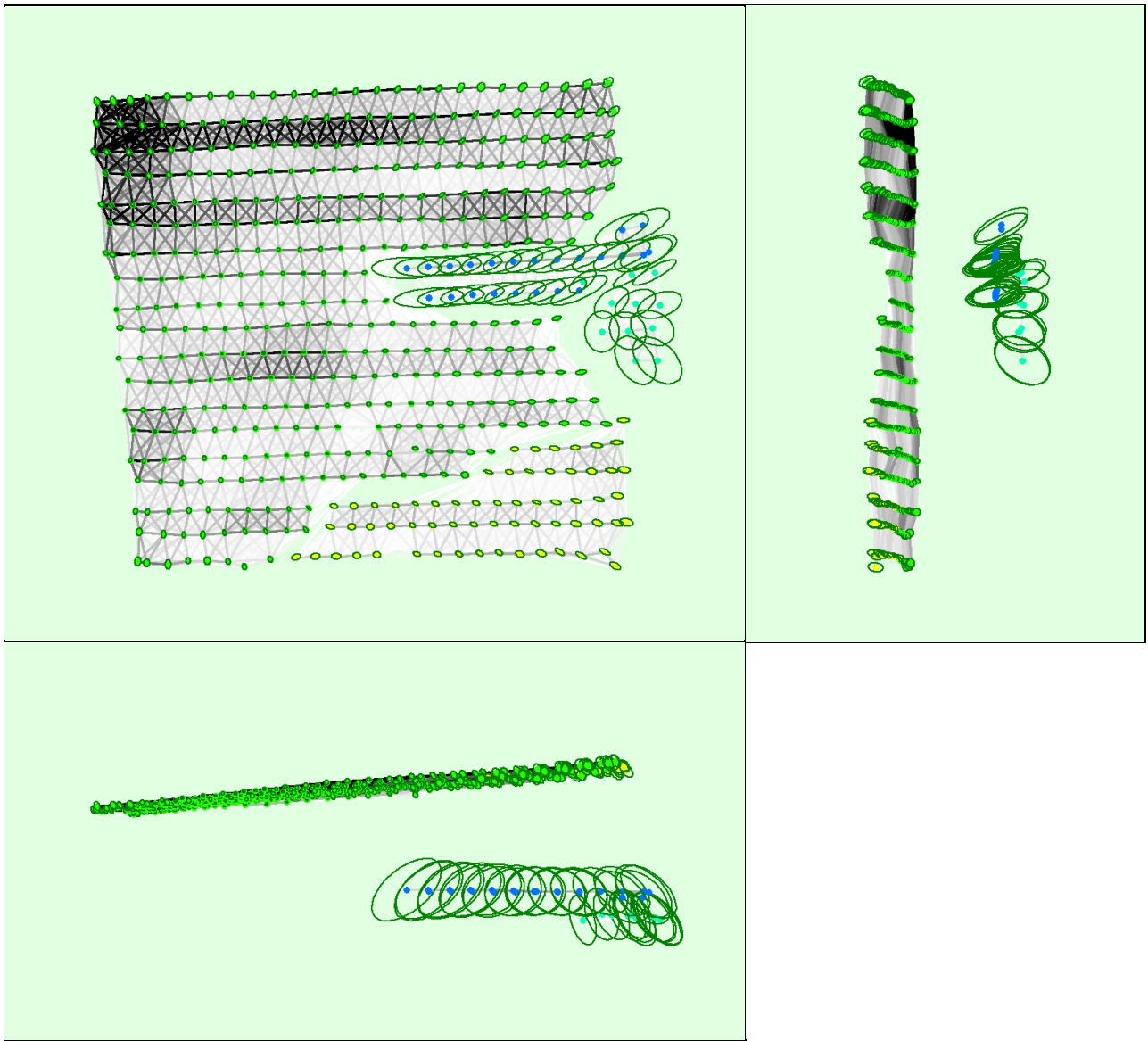


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

#### Relative camera position and orientation uncertainties

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.007	0.005	0.007	0.016	0.017	0.009
Sigma	0.010	0.005	0.009	0.011	0.014	0.009

## Geolocation Details

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#### Absolute Geolocation Variance

Mn Error [m]	Max Error [m]	Geolocation Error X[%]	Geolocation Error Y[%]	Geolocation Error Z[%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00

-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	5.02	0.00	19.04
-3.00	0.00	38.49	42.05	44.56
0.00	3.00	56.49	57.95	29.29
3.00	6.00	0.00	0.00	0.00
6.00	9.00	0.00	0.00	0.00
9.00	12.00	0.00	0.00	0.00
12.00	15.00	0.00	0.00	4.60
15.00	-	0.00	0.00	2.51
<b>Mean [m]</b>		-0.013261	-0.002198	-0.006113
<b>Sigma [m]</b>		1.396205	0.558769	4.662720
<b>RMS Error [m]</b>		1.396268	0.558774	4.662724

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

### Relative Geolocation Variance

Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	99.37	100.00	92.89
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
<b>Mean of Geolocation Accuracy [m]</b>	5.000000	5.000000	10.000000
<b>Sigma of Geolocation Accuracy [m]</b>	0.000000	0.000000	0.000000

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

## Initial Processing Details

### System Information

Hardware	CPU: Intel(R) Core(TM) i7-7700 CPU @ 3.60GHz RAM: 32GB GPU: AMD Radeon T R7 450 (Driver: 21.19.128.4), Intel(R) HD Graphics 630 (Driver: 22.20.16.4771)
Operating System	Windows 10 Enterprise, 64-bit

### Coordinate Systems

Image Coordinate System	GCS_WGS_1984 (EGM96 Geoid)
Output Coordinate System	WGS_1984_UTM_Zone_14N (EGM96 Geoid)

### Processing Options

Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

# Point Cloud Densification details

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## Processing Options

Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	no
LOD	Generated: no
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	01h:04m:57s
Time for Point Cloud Classification	50s
Time for 3D Textured Mesh Generation	NA

## Results

Number of Generated Tiles	4
Number of 3D Densified Points	47929682
Average Density (per m <sup>3</sup> )	64922

# DSM, Orthomosaic and Index Details

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## Processing Options

DSM and Orthomosaic Resolution	1 x GSD (0.313 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (0.313 [cm/pixel])
Time for DSM Generation	31m:33s
Time for Orthomosaic Generation	52m:15s
Time for DTM Generation	16m:08s
Time for Contour Lines Generation	00s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s