

Quality Report



Generated with PIX4Dmapper version 4.7.3 Preview



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	20220930_NIV_v1_EyO_GCP
Processed	2022-10-10 12:10:11
Camera Model Name(s)	ZenmuseP1_35.0_8192x5460 (RGB)
Average Ground Sampling Distance (GSD)	1.58 cm / 0.62 in
Area Covered	0.660 km ² / 65.9704 ha / 0.25 sq. mi. / 163.1009 acres

Quality Check



Images	median of 23533 keypoints per image	
Dataset	2017 out of 2017 images calibrated (100%), all images enabled	
Camera Optimization	0.07% relative difference between initial and optimized internal camera parameters	
Matching	median of 10868.7 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.996 m	

Preview



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

Calibration Details



Number of Calibrated Images	2017 out of 2017
Number of Geolocated Images	2017 out of 2017

Initial Image Positions

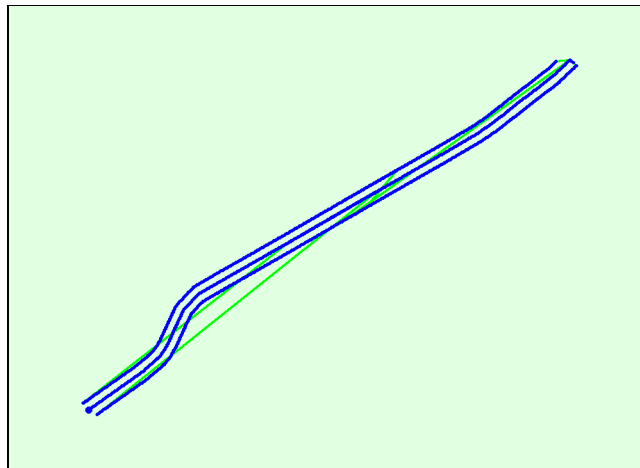
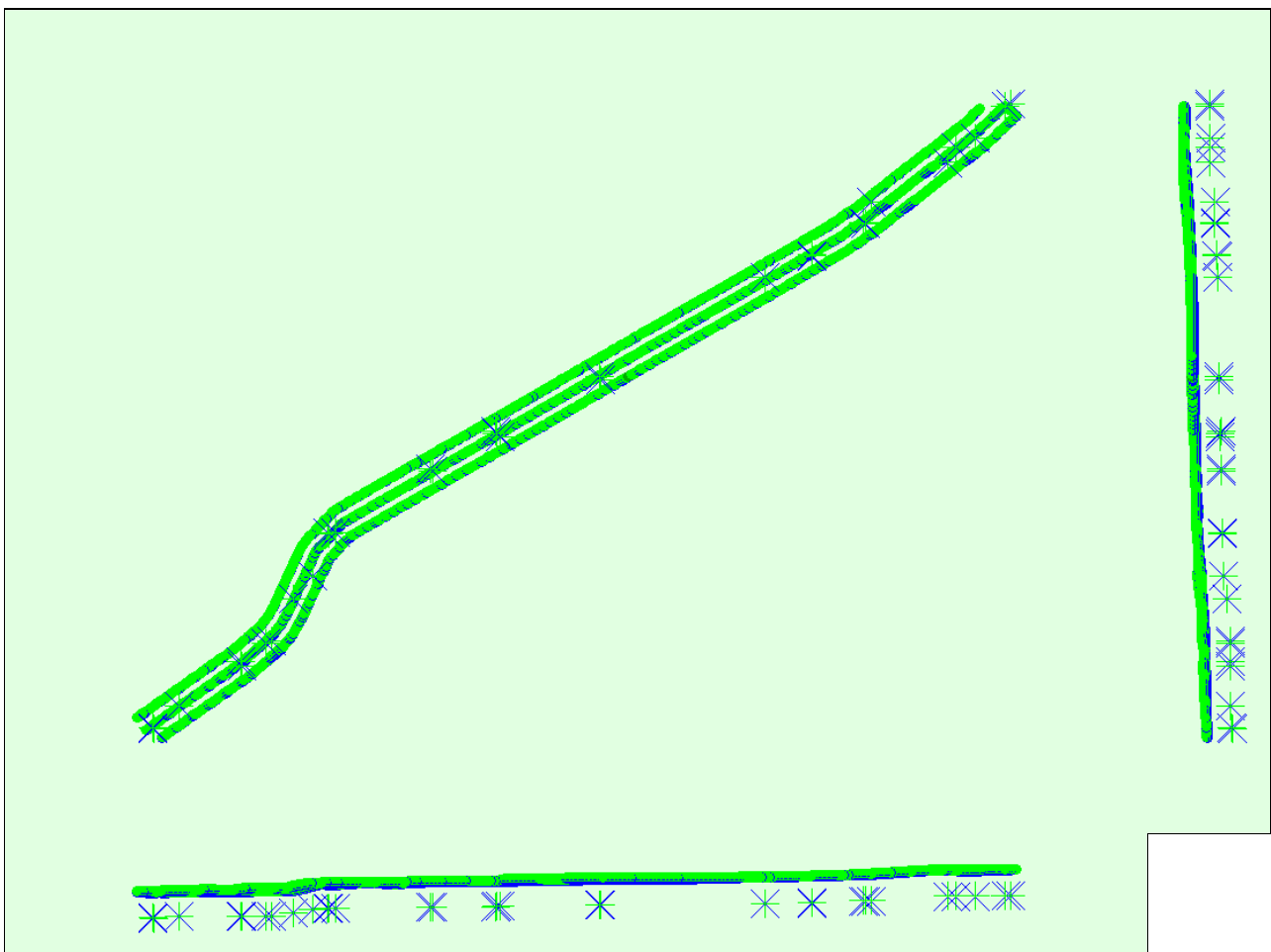


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



Uncertainty ellipses 100x 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). 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	0.012	0.012	0.013	0.007	0.006	0.006

Sigma	0.001	0.001	0.003	0.003	0.002	0.003
-------	-------	-------	-------	-------	-------	-------

Overlap

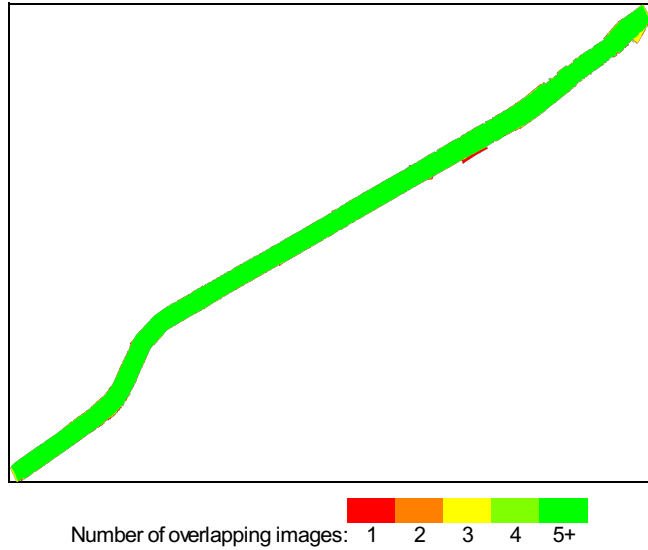


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint 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	21189769
Number of 3D Points for Bundle Block Adjustment	5207795
Mean Reprojection Error [pixels]	0.119

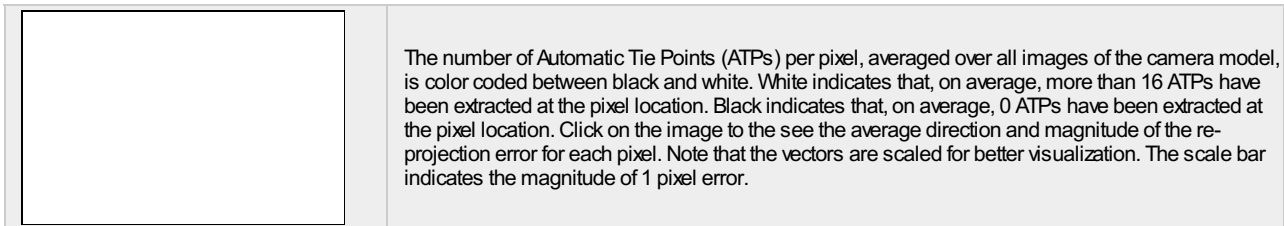
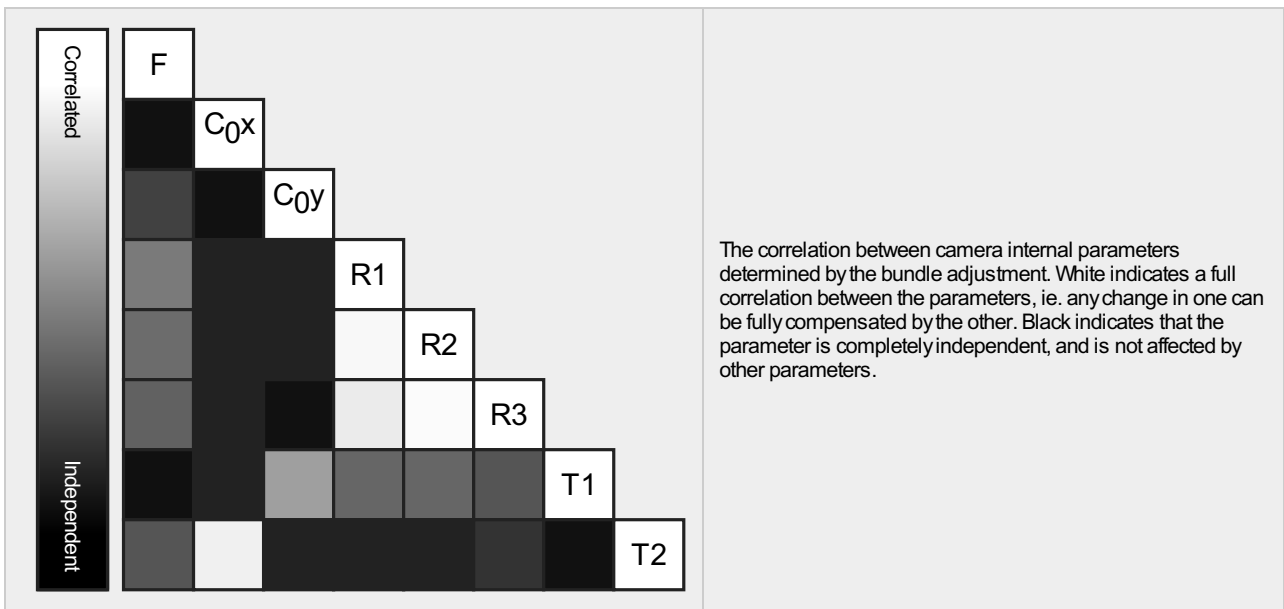
Internal Camera Parameters

ZenmuseP1_35.0_8192x5460 (RGB). Sensor Dimensions: 35.000 [mm] x 23.328 [mm]



EXIF ID: ZenmuseP1_35.0_8192x5460

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	8194.340 [pixel] 35.010 [mm]	4096.000 [pixel] 17.500 [mm]	2730.000 [pixel] 11.664 [mm]	-0.048	0.021	-0.097	0.002	-0.001
Optimized Values	8200.751 [pixel] 35.037 [mm]	4078.895 [pixel] 17.427 [mm]	2738.442 [pixel] 11.700 [mm]	-0.047	0.025	-0.105	0.001	-0.000
Uncertainties (Sigma)	0.202 [pixel] 0.001 [mm]	0.272 [pixel] 0.001 [mm]	0.208 [pixel] 0.001 [mm]	0.000	0.002	0.003	0.000	0.000



? 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	23533	10869
Mn	13870	233
Max	32899	19676
Mean	23325	10506

? 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	2304126
In 3 Images	987401
In 4 Images	545150
In 5 Images	345592
In 6 Images	238265
In 7 Images	175913
In 8 Images	135840
In 9 Images	112360
In 10 Images	85125
In 11 Images	50790
In 12 Images	41864
In 13 Images	36525
In 14 Images	33423
In 15 Images	29793
In 16 Images	23707
In 17 Images	16958
In 18 Images	11958
In 19 Images	7662
In 20 Images	5132
In 21 Images	3664
In 22 Images	2948
In 23 Images	2543

In 24 Images	2214
In 25 Images	1768
In 26 Images	1306
In 27 Images	916
In 28 Images	724
In 29 Images	579
In 30 Images	503
In 31 Images	419
In 32 Images	366
In 33 Images	300
In 34 Images	275
In 35 Images	247
In 36 Images	213
In 37 Images	183
In 38 Images	142
In 39 Images	164
In 40 Images	122
In 41 Images	131
In 42 Images	131
In 43 Images	114
In 44 Images	80
In 45 Images	67
In 46 Images	38
In 47 Images	26
In 48 Images	23
In 49 Images	4
In 50 Images	1

? 2D Keypoint Matches

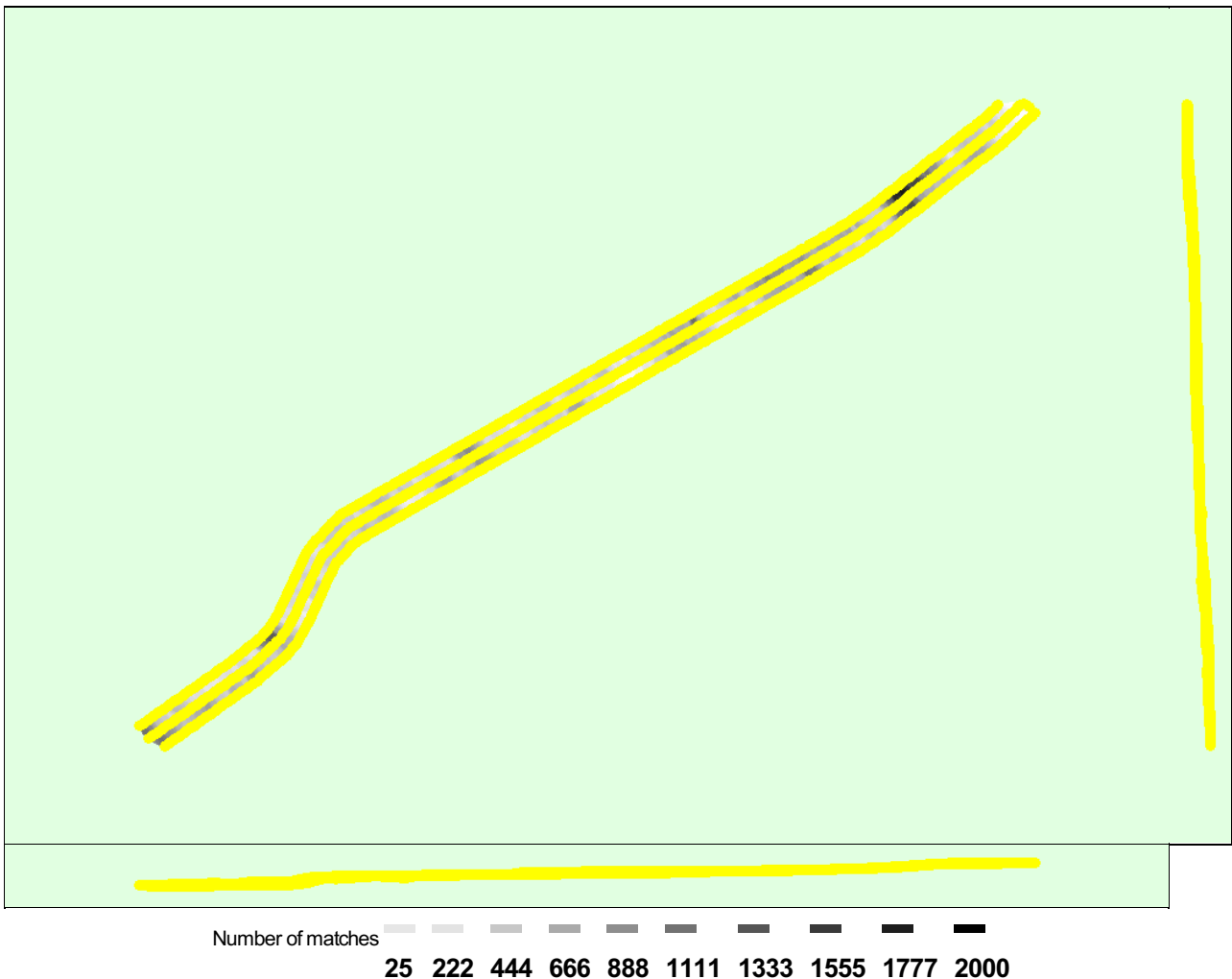


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details

Ground Control Points

GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
1 (3D)	0.020/ 0.020	-0.008	0.023	0.014	0.562	39 / 39
0 (3D)	0.020/ 0.020	-0.238	-0.249	-2.523	0.997	8 / 8
10 (3D)	0.020/ 0.020	0.161	-1.635	-4.598	0.954	45 / 45
11 (3D)	0.020/ 0.020	0.080	-1.766	-4.613	0.901	44 / 44
12 (3D)	0.020/ 0.020	0.263	-0.024	-3.261	18.960	14 / 15
13 (3D)	0.020/ 0.020	0.091	-1.523	-4.882	1.207	44 / 44
14 (3D)	0.020/ 0.020	-0.126	-1.702	-4.632	1.179	45 / 45
15 (3D)	0.020/ 0.020	0.082	-1.773	-4.580	0.717	33 / 33
16 (3D)	0.020/ 0.020	0.021	-1.761	-4.608	1.145	44 / 44
17 (3D)	0.020/ 0.020	0.057	-1.658	-4.511	1.342	34 / 34
18 (3D)	0.020/ 0.020	0.070	-1.779	-4.568	1.213	41 / 41
19 (3D)	0.020/ 0.020	0.104	0.263	-0.127	1.459	30 / 30
2 (3D)	0.020/ 0.020	-0.038	-0.065	0.016	0.909	39 / 39
20 (3D)	0.020/ 0.020	0.060	0.003	0.019	1.208	40 / 40
21 (3D)	0.020/ 0.020	0.032	-0.088	-0.025	1.013	44 / 46
22 (3D)	0.020/ 0.020	-0.034	0.047	0.022	0.944	41 / 41
23 (3D)	0.020/ 0.020	0.041	-0.071	-0.001	0.947	42 / 42
24 (3D)	0.020/ 0.020	-0.065	0.062	-0.005	1.139	41 / 41
26 (3D)	0.020/ 0.020	0.027	0.013	-0.021	1.034	46 / 46
27 (3D)	0.020/ 0.020	0.024	0.048	0.008	1.152	45 / 45
28 (3D)	0.020/ 0.020	0.015	0.048	0.019	0.983	42 / 42
29 (3D)	0.020/ 0.020	-0.041	0.071	0.020	0.968	31 / 31
3 (3D)	0.020/ 0.020	-0.045	0.015	-0.025	1.184	44 / 44
30 (3D)	0.020/ 0.020	0.033	-0.062	-0.011	0.952	31 / 31
31 (3D)	0.020/ 0.020	-0.017	0.033	0.034	0.902	24 / 24
4 (3D)	0.020/ 0.020	0.034	-0.010	0.028	0.938	45 / 45
6 (3D)	0.020/ 0.020	0.009	0.006	0.011	1.025	43 / 43
7 (3D)	0.020/ 0.020	-0.063	0.100	0.020	1.004	44 / 45
8 (3D)	0.020/ 0.020	-0.003	-0.238	0.045	1.227	45 / 65
9 (3D)	0.020/ 0.020	0.171	-1.704	-4.555	0.849	48 / 48
Mean [m]		0.023202	-0.512418	-1.576359		
Sigma [m]		0.090619	0.783743	2.116218		
RMS Error [m]		0.093542	0.936389	2.638804		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Absolute Geolocation Variance

Mn Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-0.11	0.00	0.00	0.15
-0.11	-0.09	0.00	0.00	0.00
-0.09	-0.06	0.00	0.00	0.10
-0.06	-0.04	0.05	0.00	1.24
-0.04	-0.02	0.00	0.10	6.30
-0.02	0.00	53.65	57.37	43.67

0.00	0.02	46.20	42.23	41.79
0.02	0.04	0.10	0.30	4.67
0.04	0.06	0.00	0.00	1.14
0.06	0.09	0.00	0.00	0.30
0.09	0.11	0.00	0.00	0.35
0.11	-	0.00	0.00	0.30
Mean [m]		0.274201	-0.940200	-3.170902
Sigma [m]		0.003318	0.003771	0.022678
RMS Error [m]		0.274221	0.940207	3.170983

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.

Geolocation Bias	X	Y	Z
Translation [m]	0.274232	-0.940185	-3.170657

Bias between image initial and computed geolocation given in output coordinate system.

Relative Geolocation Variance



Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	98.61	98.26	85.41
[-2.00, 2.00]	99.90	99.75	95.83
[-3.00, 3.00]	100.00	100.00	98.71
Mean of Geolocation Accuracy [m]	0.010836	0.010836	0.021385
Sigma of Geolocation Accuracy [m]	0.001114	0.001114	0.003861

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

Geolocation Orientational Variance	RMS [degree]
Omega	1.542
Phi	1.192
Kappa	2.034

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i9-9900KF CPU @ 3.60GHz RAM: 64GB GPU: Microsoft Remote Display Adapter (Driver: unknown), Microsoft Remote Display Adapter (Driver: unknown)
	Operating System: Windows 10 Pro, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 30N
Output Coordinate System	WGS 84 / UTM zone 30N

Processing Options



Detected Template	3DMap_Standard*
Keypoints Image Scale	Full, Image Scale: 0.5
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Geolocation Based Internal Parameters Optimization: All prior External Parameters Optimization: All Rematch: Auto, no

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	06h:05m:14s
Time for Point Cloud Classification	17m:52s
Time for 3D Textured Mesh Generation	39m:30s

Results



Number of Processed Clusters	3
Number of Generated Tiles	8
Number of 3D Densified Points	389797035
Average Density (per m ³)	1217.77

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (1.58 [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 GeoTIFF Without Transparency: no Google Maps Tiles and KML: no
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (1.58 [cm/pixel])

Contour Lines Generation	Generated: yes Contour Base [m]: 0 Elevation Interval [m]: 0.2 Resolution [cm]: 50 Minimum Line Size [vertices]: 20
Time for DSM Generation	04h:19m:19s
Time for Orthomosaic Generation	10h:26m:50s
Time for DTM Generation	04h:31m:50s
Time for Contour Lines Generation	38s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s