# **Quality Report**



Generated with Pix4Dmapper version 4.5.6



Important: Click on the different icons for:

- Pelp 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	123
Processed	2020-03-31 00:58:49
Camera Model Name(s)	FC7203_4.5_4000x2250 (RGB)
Average Ground Sampling Distance (GSD)	2.13 cm / 0.84 in
Area Covered	0.070 km <sup>2</sup> / 6.9507 ha / 0.03 sq. mi. / 17.1845 acres
Time for Initial Processing (without report)	08m:18s

## **Quality Check**



? Images	median of 20603 keypoints per image	<b>②</b>
? Dataset	104 out of 105 images calibrated (99%), all images enabled	<b>O</b>
? Camera Optimization	7.67% relative difference between initial and optimized internal camera parameters	Δ
Matching	median of 4712.88 matches per calibrated image	<b>②</b>
? Georeferencing	yes, no 3D GCP	<u> </u>





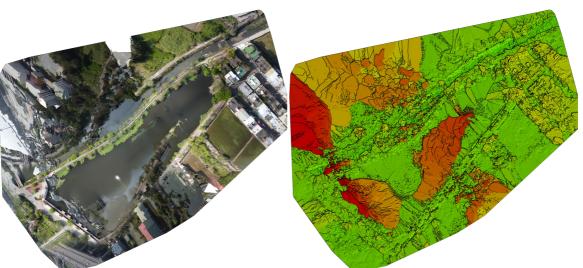


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

## **Calibration Details**





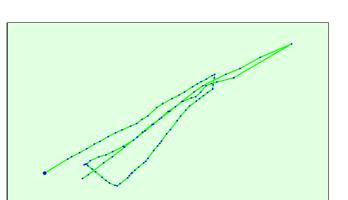
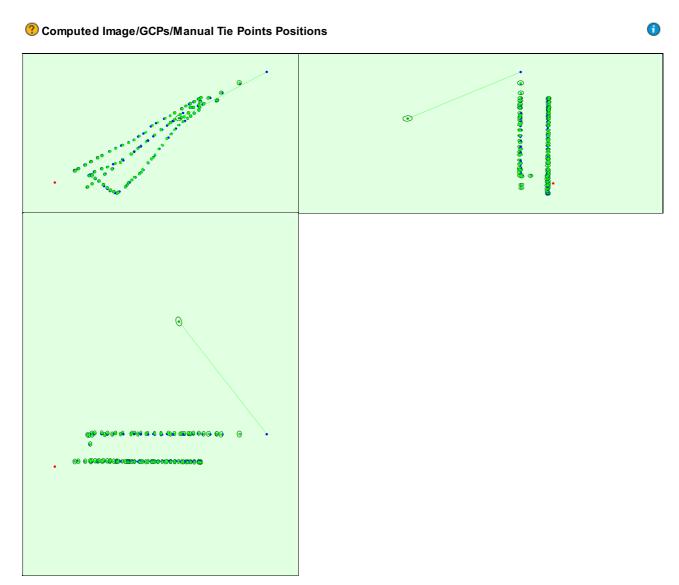


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.



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.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.501	0.490	0.807	0.233	0.207	0.206
Sigma	0.109	0.095	0.104	0.029	0.010	0.024



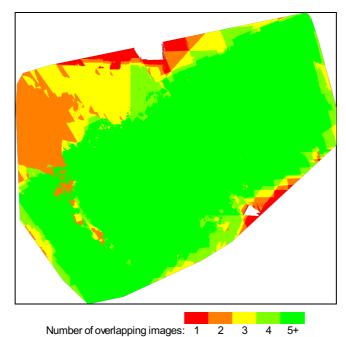


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.

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**

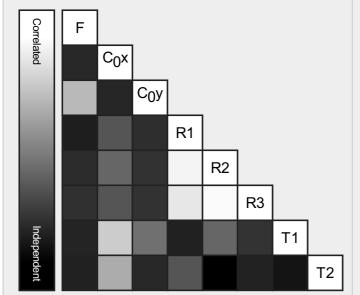
Number of 2D Keypoint Observations for Bundle Block Adjustment	621681
Number of 3D Points for Bundle Block Adjustment	243119
Mean Reprojection Error [pixels]	0.206

## Internal Camera Parameters

### © FC7203\_4.5\_4000x2250 (RGB). Sensor Dimensions: 6.548 [mm] x 3.683 [mm]

EXIF ID: FC7203\_4.5\_4000x2250

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2742.857 [pixel] 4.490 [mm]	2000.000 [pixel] 3.274 [mm]	1125.000 [pixel] 1.842 [mm]	0.000	0.000	0.000	0.000	0.000
Optimized Values	2953.242 [pixel] 4.834 [mm]	2026.510 [pixel] 3.317 [mm]	1148.925 [pixel] 1.881 [mm]	0.211	-0.645	0.469	-0.000	0.000
Uncertainties (Sigma)	1.126 [pixel] 0.002 [mm]	0.413 [pixel] 0.001 [mm]	0.703 [pixel] 0.001 [mm]	0.001	0.003	0.003	0.000	0.000



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the reprojection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

## 2D Keypoints Table

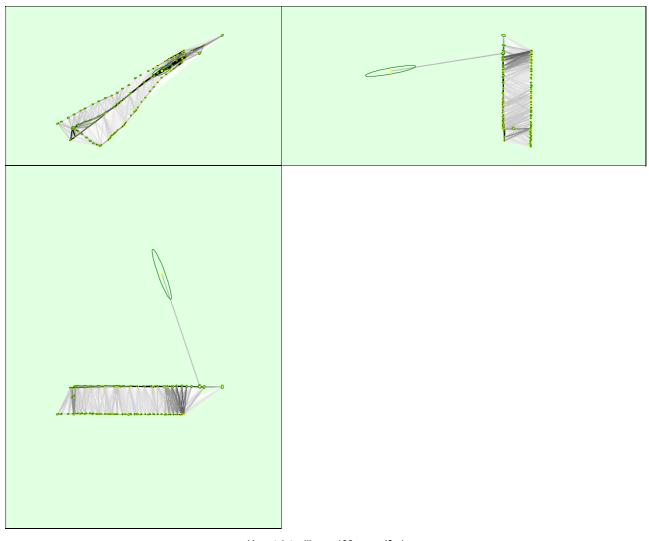


	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	20603	4713
Min	11920	443
Max	33554	18092
Mean	20913	5978

## 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	172946
In 3 Images	40554
In 4 Images	14264
In 5 Images	6928
In 6 Images	3567
In 7 Images	1950
In 8 Images	1135
In 9 Images	727
In 10 Images	433
In 11 Images	279
In 12 Images	162
In 13 Images	88
In 14 Images	45
In 15 Images	28
In 16 Images	11
In 21 Images	1
In 22 Images	1



Uncertainty ellipses 100x magnified

Number of matches 25 222 444 666 888 1111 1333 1555 1777 2000

23 222 444 000 000 1111 1333 1333 1777 2000

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 0.017 0.013 0.018 0.014 0.013 0.007 0.016 0.009 0.043 0.003 0.003 0.003 Sigma

# Geolocation Details

### Absolute Geolocation Variance

Min 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	3.88	0.00	0.00
-3.00	0.00	51.46	52.43	47.57

0.00	3.00	38.83	43.69	52.43
3.00	6.00	5.83	3.88	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	0.00
15.00	-	0.00	0.00	0.00
Mean [m]		-0.049387	0.009935	-0.033704
Sigma [m]		1.823748	1.222142	0.718494
RMS Error [m]		1.824417	1.222183	0.719284

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]	97.09	100.00	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	5.000000	5.000000	10.000000
Sigma of Geolocation Accuracy [m]	0.000000	0.000000	0.000000

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

Geolocation Orientational Variance	RMS [degree]
Omega	29.435
Phi	16.855
Карра	101.829

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

## **Initial Processing Details**



## System Information

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Hardware	CPU: Intel(R) Core(TM) i5-7200U CPU @ 2.50GHz RAMt 8GB GPU: Intel(R) HD Graphics 620 (Driver: 24.20.100.6286)
Operating System	Windows 10 Home, 64-bit

#### **Coordinate Systems**



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 51N (EGM96 Geoid)

#### **Processing Options**



Detected Template	∃ 3D Maps		
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		