Quality Report

⚠ **Important**: Click on the different icons for:

❓ Help to analyze the results in the Quality Report

ℹ Additional information about the sections

💡 Click here for additional tips to analyze the Quality Report

Summary ℹ

Project	2018_11_30_sherpashort
Processed	2018-11-30 19:20:46
Camera Model Name(s)	CanonPowerShotELPH110HS_4.3_4608x3456 (RGB)
Average Ground Sampling Distance (GSD)	4.42 cm / 1.74 in
Area Covered	0.5944 km^2 / 59.4405 ha / 0.2296 sq. mi. / 146.957 acres
Time for Initial Processing (without report)	34m:12s

Quality Check ℹ

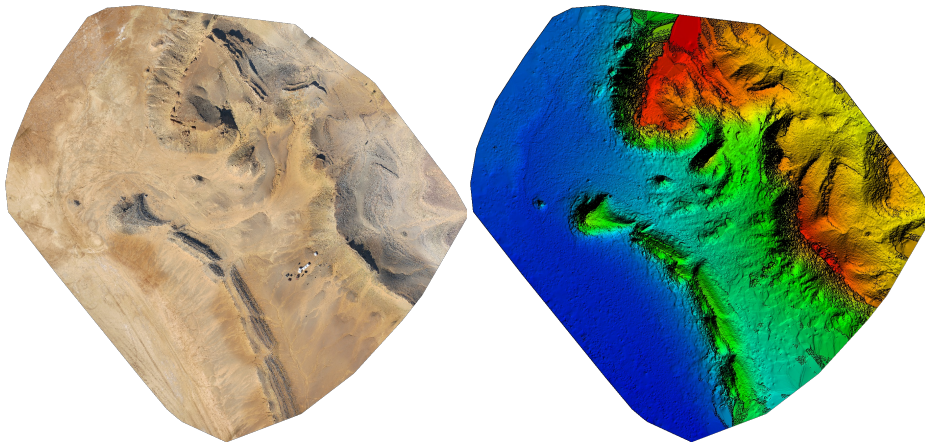|			
❓ **Images**	median of 28408 keypoints per image		✓
❓ **Dataset**	139 out of 139 images calibrated (100%), all images enabled		✓
❓ **Camera Optimization**	0.36% relative difference between initial and optimized internal camera parameters		✓
❓ **Matching**	median of 14008.3 matches per calibrated image		✓
❓ **Georeferencing**	yes, no 3D GCP		⚠

❓ Preview ℹ

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

Calibration Details ℹ

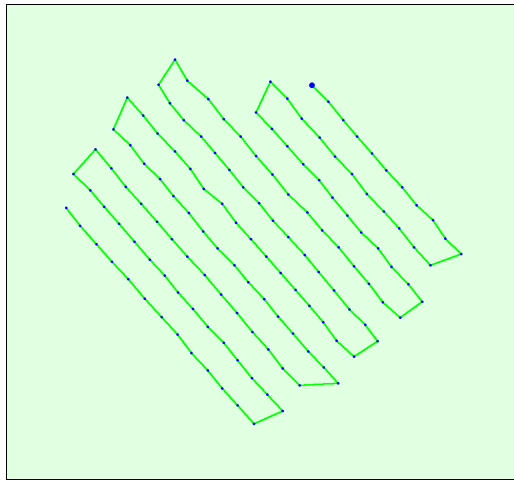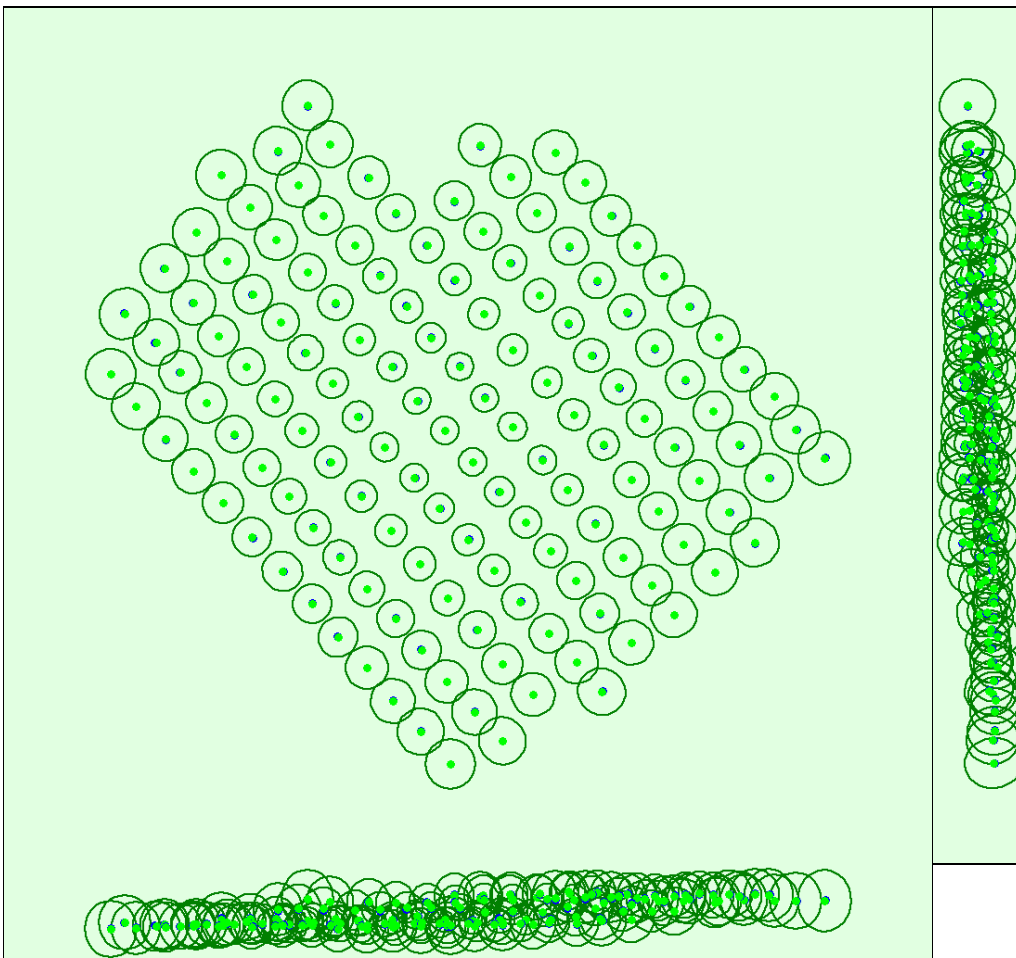|	
Number of Calibrated Images	139 out of 139
Number of Geolocated Images	139 out of 139

❓ Initial Image Positions ℹ

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 ℹ

Uncertainty ellipses 50x 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 ℹ

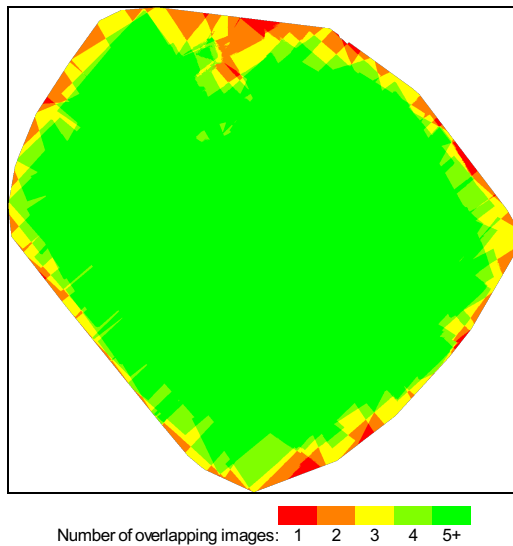|	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.471	0.472	0.484	0.090	0.094	0.072
Sigma	0.075	0.075	0.101	0.006	0.006	0.002

❓ Overlap ℹ

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	1991292
Number of 3D Points for Bundle Block Adjustment	739175
Mean Reprojection Error [pixels]	0.155

Internal Camera Parameters

CanonPowerShotELPH110HS_4.3_4608x3456 (RGB). Sensor Dimensions: 6.172 [mm] x 4.629 [mm]

EXIF ID: CanonPowerShotELPH110HS_4.3_4608x3456

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3263.377 [pixel] 4.371 [mm]	2324.394 [pixel] 3.113 [mm]	1793.154 [pixel] 2.402 [mm]	-0.049	0.056	-0.034	0.005	0.002
Optimized Values	3275.446 [pixel] 4.387 [mm]	2230.943 [pixel] 2.988 [mm]	1765.819 [pixel] 2.365 [mm]	-0.050	0.062	-0.036	0.002	-0.004
Uncertainties (Sigma)	1.399 [pixel] 0.002 [mm]	0.381 [pixel] 0.001 [mm]	0.465 [pixel] 0.001 [mm]	0.000	0.001	0.001	0.000	0.000
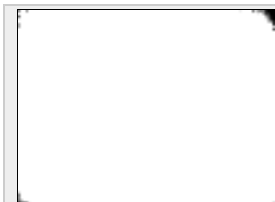
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization.

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	28408	14008
Min	20154	2109
Max	52999	25726
Mean	31365	14326

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	480764
In 3 Images	136735
In 4 Images	55912
In 5 Images	30194
In 6 Images	17664
In 7 Images	9555
In 8 Images	4879
In 9 Images	2202

In 10 Images	866
In 11 Images	309
In 12 Images	77
In 13 Images	14
In 14 Images	3
In 15 Images	1

2D Keypoint Matches

Uncertainty ellipses 100x magnified

Number of matches

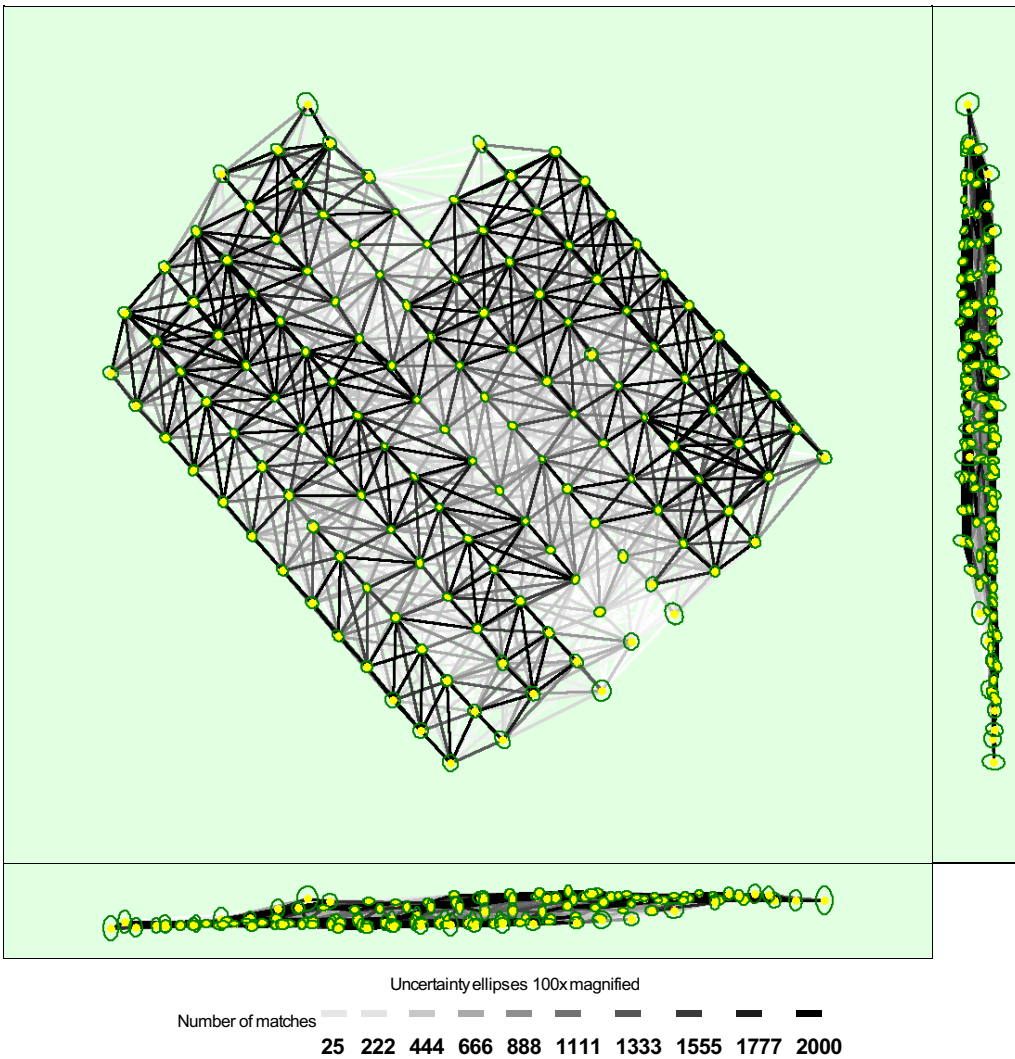**25 222 444 666 888 1111 1333 1555 1777 2000**

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	0.063	0.064	0.065	0.036	0.033	0.011
Sigma	0.015	0.017	0.028	0.014	0.013	0.004

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-6.58	0.00	0.00	0.00
-6.58	-5.27	0.00	0.00	0.00
-5.27	-3.95	0.00	0.00	0.00
-3.95	-2.63	0.00	0.00	0.00
-2.63	-1.32	0.00	0.00	5.76
-1.32	0.00	46.76	51.08	42.45
0.00	1.32	53.24	48.92	46.04

1.32	2.63	0.00	0.00	5.76
2.63	3.95	0.00	0.00	0.00
3.95	5.27	0.00	0.00	0.00
5.27	6.58	0.00	0.00	0.00
6.58	-	0.00	0.00	0.00
Mean [m]		0.001773	-0.000432	0.002821
Sigma [m]		0.343280	0.415568	0.830260
RMS Error [m]		0.343284	0.415568	0.830265

Min Error and Max Error represent geolocation error intervalsbetween -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 intial 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]	100.00	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]	4.165698	4.165698	3.540065
Sigma of Geolocation Accuracy [m]	0.099761	0.099761	0.207740

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

Geolocation Orientational Variance	RMS [degree]
Omega	2.923
Phi	3.289
Kappa	5.388

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) i7-4600U CPU @ 2.10GHz RAM: 16GB GPU: Intel(R) HD Graphics Family (Driver: 10.18.10.3574), RDPDD Chained DD (Driver: unknown), RDP Encoder Mirror Driver (Driver: unknown), RDP Reflector Display Driver (Driver: unknown)
Operating System	Windows 7 Enterprise, 64-bit

Coordinate Systems

Image Coordinate System	WGS84
Output Coordinate System	WGS84 / UTM zone 30N

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 Bundle Adjustment: Classic

Point Cloud Densification details

Processing Options

Image Scale	multiscale, 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
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1

Advanced: Matching Window Size	7x7 pixels
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Advanced: Limit Camera Depth Automatically	no
Time for Point Cloud Densification	39m:32s
Time for 3D Textured Mesh Generation	09m:57s

Results

Number of Generated Tiles	1
Number of 3D Densified Points	12613060
Average Density (per m^3)	40.3

DSM, Orthomosaic and Index Details

Processing Options

DSM and Orthomosaic Resolution	1 x GSD (4.42 [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
Grid DSM	Generated: yes, Spacing [cm]: 50
Time for DSM Generation	29m:15s
Time for Orthomosaic Generation	37m:33s