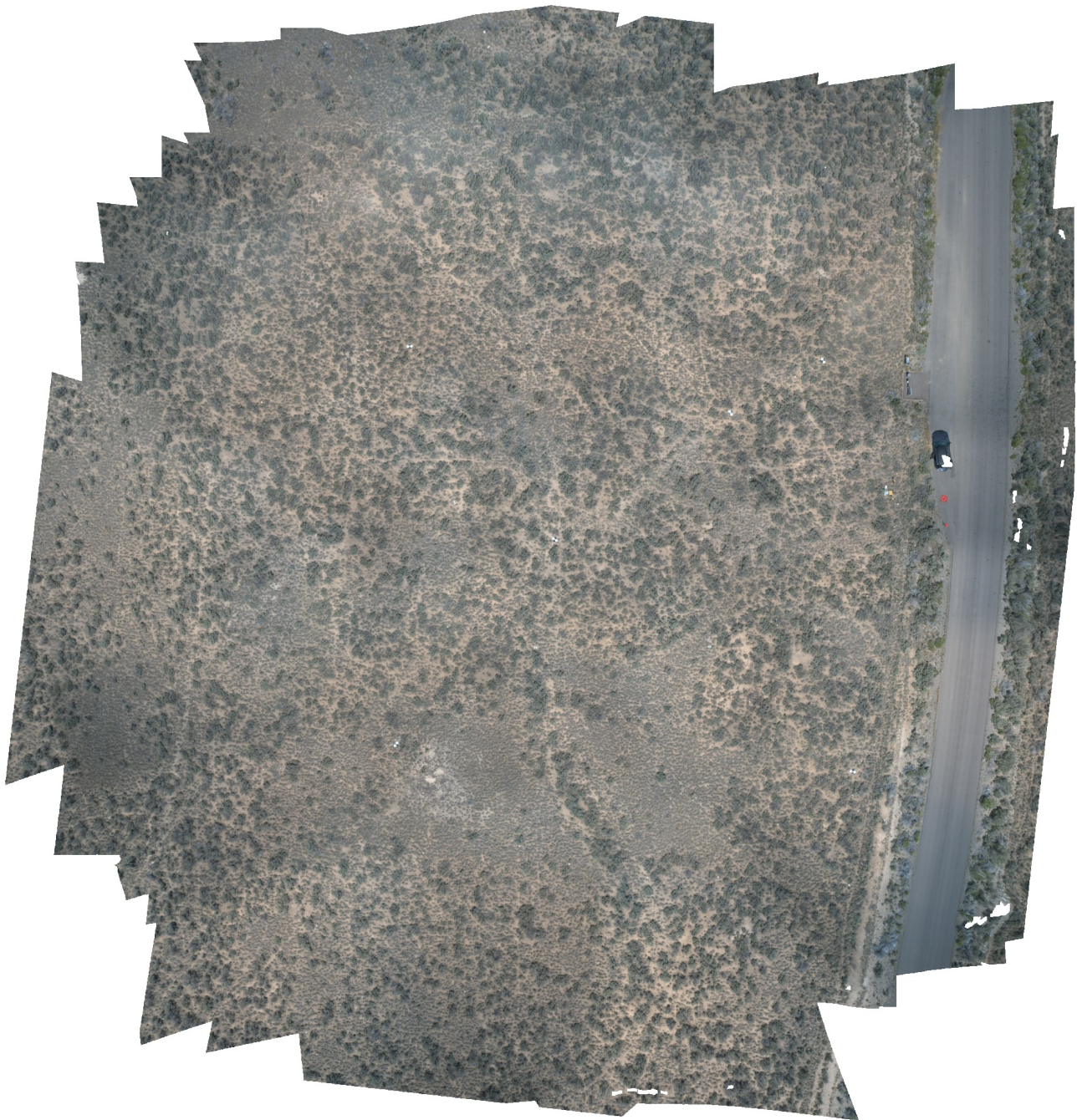


Castle Rocks Site 4 June 2021

Processing Report
Processing completed by Amethyst
Guidance from Anna and Andrii
12 January 2022



Survey Data

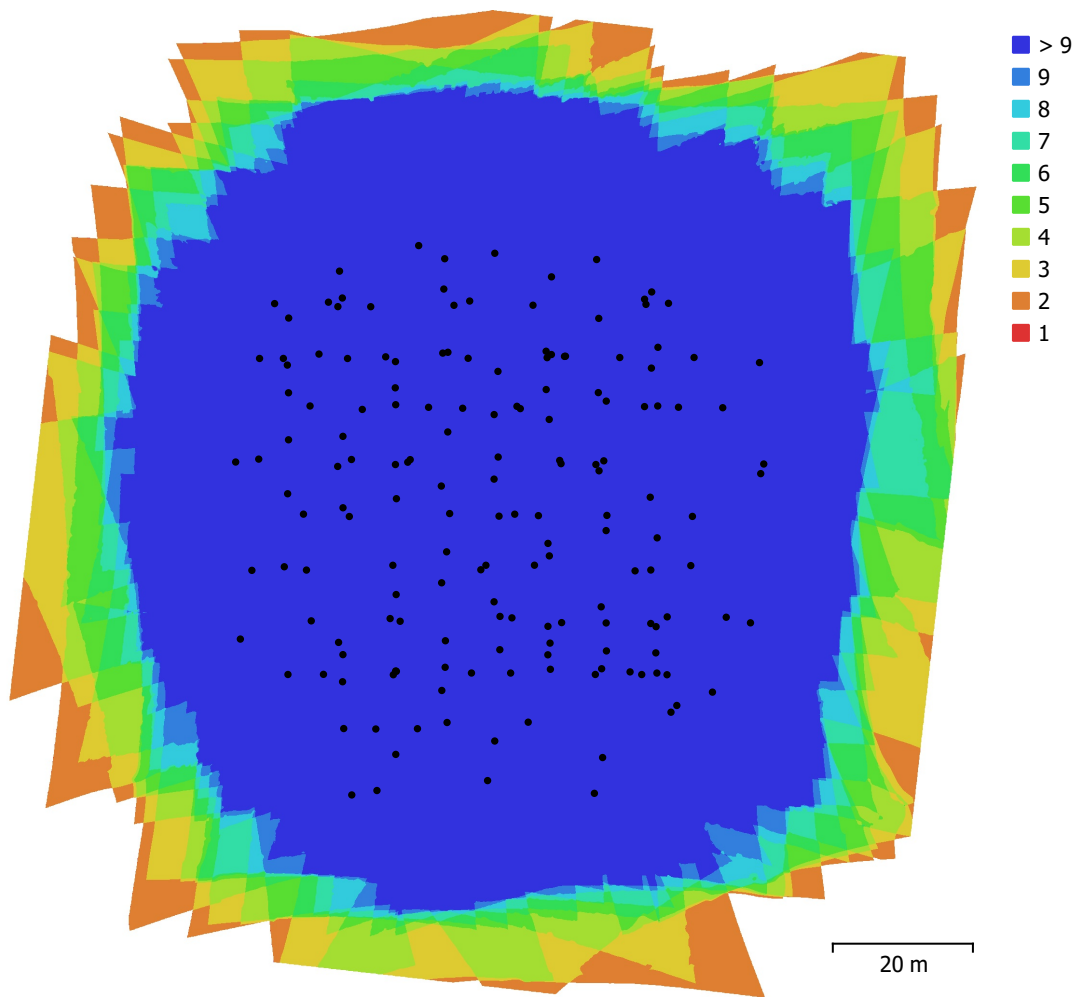


Fig. 1. Camera locations and image overlap.

Number of images:	165	Camera stations:	165
Flying altitude:	40.9 m	Tie points:	1,325,239
Ground resolution:	9.46 mm/pix	Projections:	6,531,336
Coverage area:	0.0158 km ²	Reprojection error:	2.13 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
L1D-20c, 28.0 mm f/2.8 ...	5464 x 3640	10.26 mm	2.41 x 2.41 μ m	No

Table 1. Cameras.

Camera Calibration

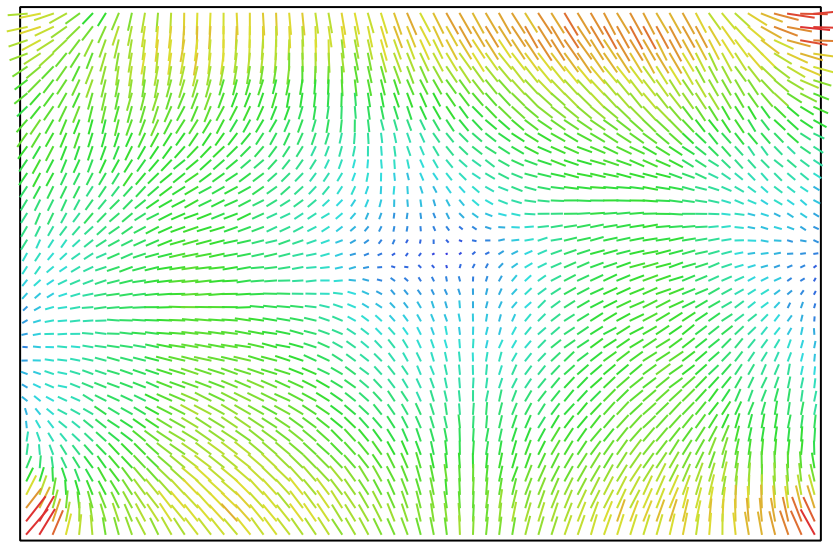


Fig. 2. Image residuals for L1D-20c, 28.0 mm f/2.8 (10.26mm). 3 pix

L1D-20c, 28.0 mm f/2.8 (10.26mm)

165 images

Type Frame	Resolution 5464 x 3640	Focal Length 10.26 mm	Pixel Size 2.41 x 2.41 μm
----------------------	----------------------------------	---------------------------------	-------------------------------------

	Value	Error	F	Cx	Cy	K1	K2	K3	P1	P2
F	3945.17	0.21	1.00	-0.03	-0.94	-0.63	-0.05	0.23	0.10	0.92
Cx	4.10359	0.027		1.00	0.03	0.01	0.01	-0.02	-0.06	-0.03
Cy	77.367	0.072			1.00	0.54	0.09	-0.25	-0.09	-0.91
K1	-0.157044	2.6e-05				1.00	-0.70	0.53	-0.07	-0.59
K2	-0.00980334	5.3e-05					1.00	-0.97	-0.01	-0.07
K3	0.0276084	4.3e-05						1.00	0.04	0.23
P1	0.00107416	8.8e-07							1.00	0.10
P2	-0.00265406	2.5e-06								1.00

Table 2. Calibration coefficients and correlation matrix.

Camera Locations

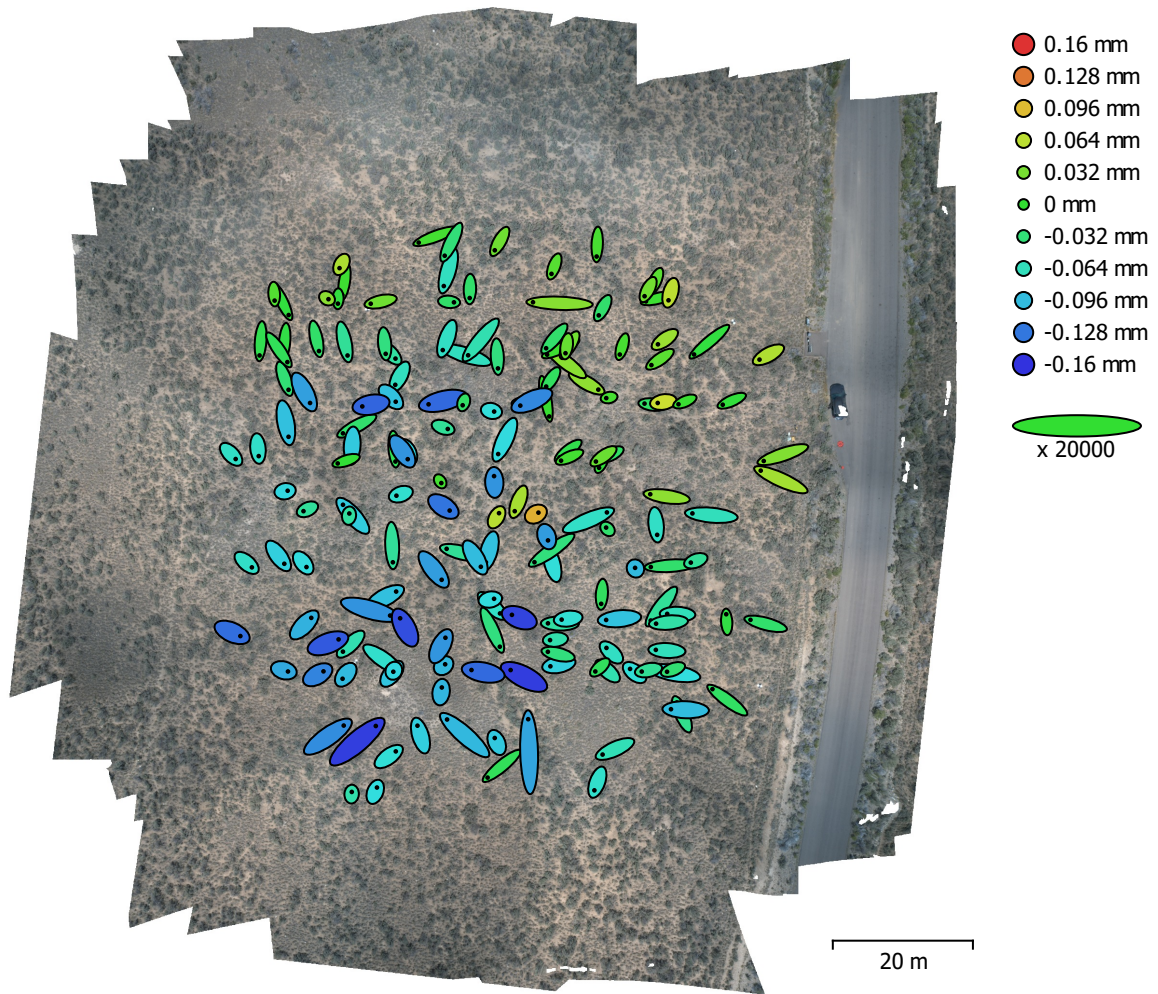


Fig. 3. Camera locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated camera locations are marked with a black dot.

X error (mm)	Y error (mm)	Z error (mm)	XY error (mm)	Total error (mm)
0.125881	0.115679	0.0704129	0.170961	0.184893

Table 3. Average camera location error.

X - Longitude, Y - Latitude, Z - Altitude.

Ground Control Points

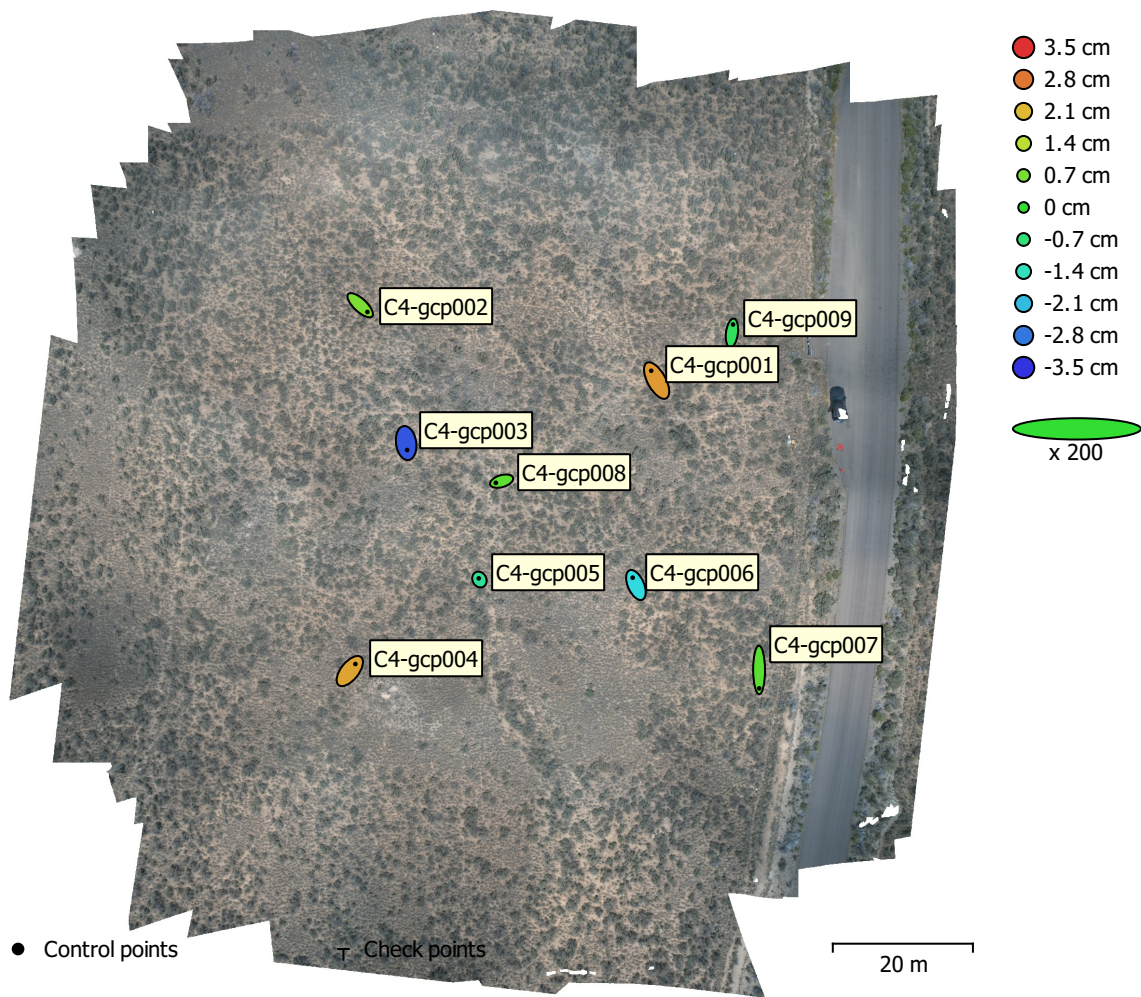


Fig. 4. GCP locations and error estimates.

Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.

Estimated GCP locations are marked with a dot or crossing.

Count	X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total (cm)
9	0.600167	1.26492	1.71994	1.40008	2.21775

Table 4. Control points RMSE.

X - Longitude, Y - Latitude, Z - Altitude.

Label	X error (cm)	Y error (cm)	Z error (cm)	Total (cm)	Image (pix)
C4-gcp001	-0.769582	1.39898	2.45209	2.92612	1.782 (44)
C4-gcp002	1.03207	-0.962322	0.748159	1.59718	1.704 (43)
C4-gcp003	0.143514	-0.995395	-3.12943	3.28706	2.398 (61)
C4-gcp004	0.801602	1.00519	2.34114	2.67094	1.596 (42)
C4-gcp005	-0.0972598	0.168535	-1.02137	1.03974	2.283 (64)
C4-gcp006	-0.46017	1.03972	-1.79671	2.12625	2.386 (52)
C4-gcp007	0.015731	-2.623	0.395541	2.6527	2.170 (20)
C4-gcp008	-0.821849	-0.242955	0.423002	0.955716	2.344 (71)
C4-gcp009	0.155946	1.21125	-0.412428	1.28901	1.588 (27)
Total	0.600167	1.26492	1.71994	2.21775	2.119

Table 5. Control points.
X - Longitude, Y - Latitude, Z - Altitude.

Digital Elevation Model

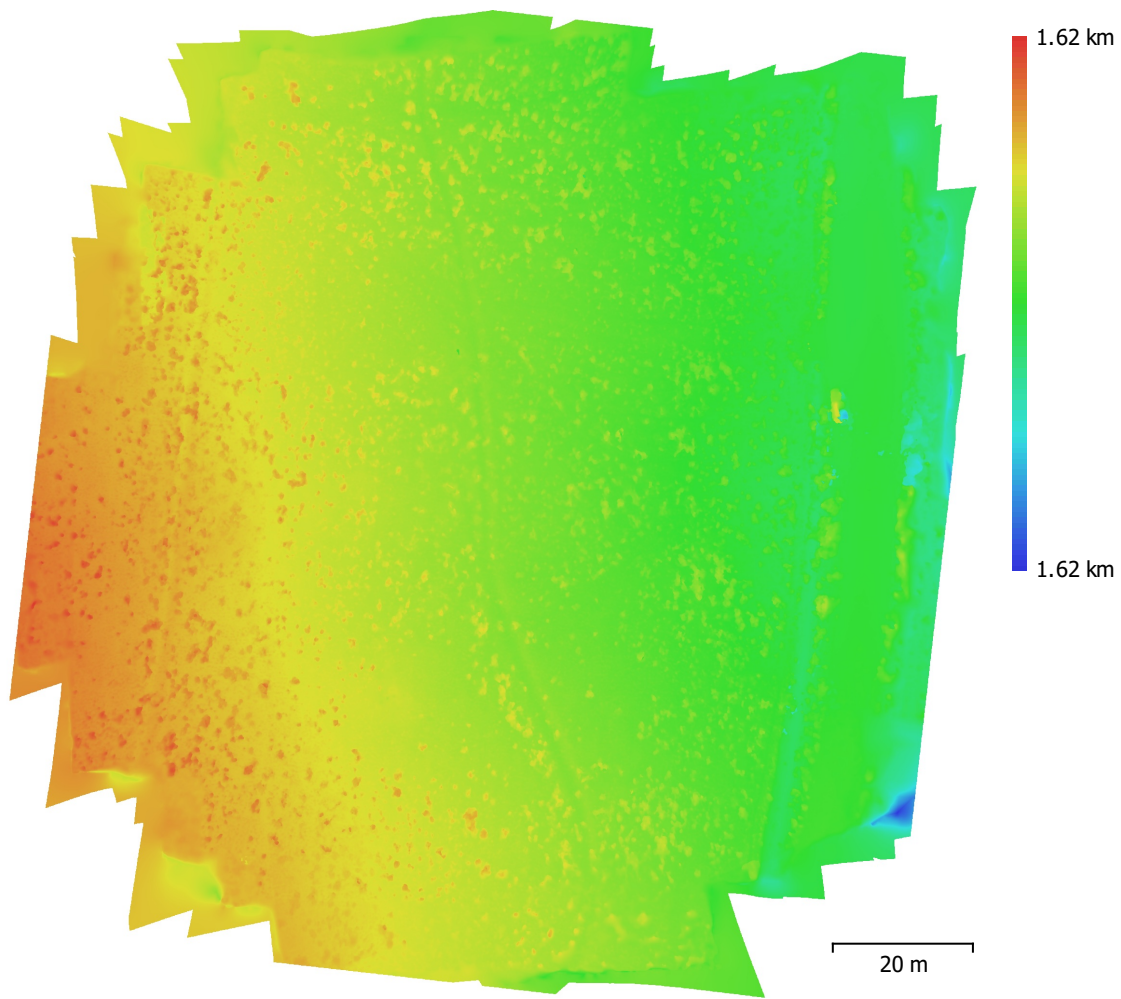


Fig. 5. Reconstructed digital elevation model.

Resolution: 10 mm/pix
Point density: 1 points/cm²

Processing Parameters

General

Cameras	165
Aligned cameras	165
Markers	9
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll

Point Cloud

Points	1,325,239 of 1,448,707
RMS reprojection error	0.52051 (2.13223 pix)
Max reprojection error	1.58522 (53.4179 pix)
Mean key point size	4.87996 pix
Point colors	3 bands, uint16
Key points	No
Average tie point multiplicity	5.84756

Alignment parameters

Accuracy	High
Generic preselection	No
Reference preselection	Source
Key point limit	100,000
Key point limit per Mpx	1,000
Tie point limit	0
Exclude stationary tie points	No
Guided image matching	No
Adaptive camera model fitting	No
Matching time	36 minutes 28 seconds
Matching memory usage	1.55 GB
Alignment time	13 minutes 32 seconds
Alignment memory usage	658.26 MB
Date created	2021:11:13 02:55:02
Software version	1.7.5.13229
File size	167.91 MB

Depth Maps

Count	165
Depth maps generation parameters	
Quality	High
Filtering mode	Disabled
Max neighbors	40
Processing time	28 minutes 1 seconds
Memory usage	14.79 GB
Date created	2021:11:27 22:11:27
Software version	1.7.5.13229
File size	1.41 GB

Dense Point Cloud

Points	266,208,073
Point colors	3 bands, uint16
Depth maps generation parameters	
Quality	Ultra High
Filtering mode	Disabled
Max neighbors	40
Processing time	57 minutes 12 seconds

Memory usage	13.53 GB
Dense cloud generation parameters	
Processing time	2 hours 39 minutes
Memory usage	36.59 GB
Date created	2021:11:13 11:30:04
Software version	1.7.5.13229
File size	4.92 GB
Model	
Faces	8,104,508
Vertices	4,055,190
Vertex colors	3 bands, uint8
Texture	4,096 x 4,096, 4 bands, uint16
Depth maps generation parameters	
Quality	High
Filtering mode	Disabled
Max neighbors	40
Processing time	28 minutes 1 seconds
Memory usage	14.79 GB
Reconstruction parameters	
Surface type	Arbitrary
Source data	Depth maps
Interpolation	Enabled
Strict volumetric masks	No
Processing time	8 minutes 21 seconds
Memory usage	6.61 GB
Texturing parameters	
Mapping mode	Generic
Blending mode	Mosaic
Texture size	4,096
Enable hole filling	Yes
Enable ghosting filter	Yes
UV mapping time	2 minutes 19 seconds
UV mapping memory usage	3.00 GB
Blending time	3 minutes 25 seconds
Blending memory usage	4.81 GB
Blending GPU memory usage	2.08 GB
Date created	2021:11:27 22:19:34
Software version	1.7.5.13229
File size	426.26 MB
DEM	
Size	14,471 x 15,225
Coordinate system	WGS 84 (EPSG::4326)
Reconstruction parameters	
Source data	Mesh
Interpolation	Enabled
Processing time	1 minutes 5 seconds
Memory usage	499.88 MB
Date created	2021:11:27 22:29:41
Software version	1.7.5.13229
File size	453.42 MB
Orthomosaic	
Size	27,590 x 28,174
Coordinate system	WGS 84 (EPSG::4326)
Colors	3 bands, uint16
Reconstruction parameters	
Blending mode	Mosaic

Surface	DEM
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	19 minutes 46 seconds
Memory usage	29.26 GB
Date created	2021:11:27 22:40:58
Software version	1.7.5.13229
File size	136.32 GB

System

Software name	Agisoft Metashape Professional
Software version	1.7.5 build 13229
OS	Windows 64 bit
RAM	127.70 GB
CPU	Intel(R) Core(TM) i9-9940X CPU @ 3.30GHz
GPU(s)	NVIDIA GeForce RTX 2080