# Processing Report

**Documenting processing parameters and user settings.**

**04 August 2023**

# Survey Data

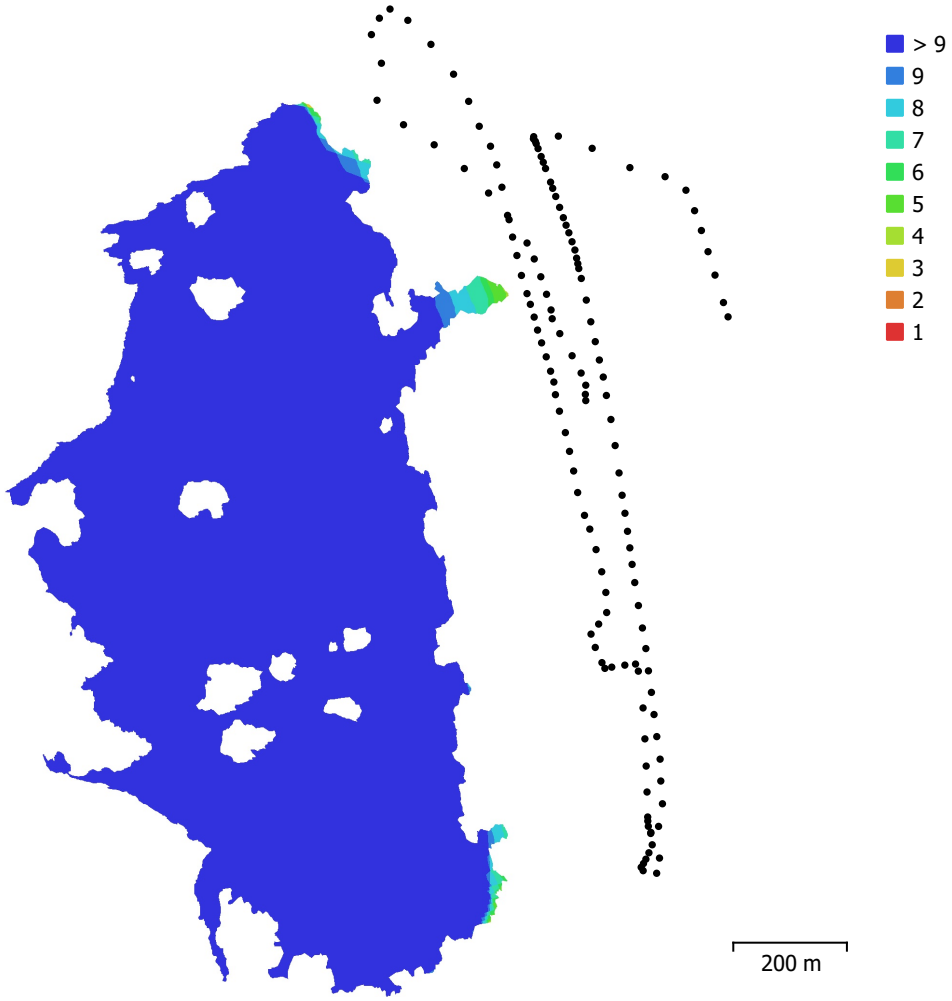


Fig. 1. Camera locations and image overlap.

| | | | |
|---|---|---|---|
| Number of images: | 138 | Camera stations: | 138 |
| Flying altitude: | 454 m | Tie points: | 50,030 |
| Ground resolution: | 0.124 m/pix | Projections: | 194,864 |
| Coverage area: | 7.6e+05 m² | Reprojection error: | 0.316 pix |

| Camera Model | Resolution | Focal Length | Pixel Size | Precalibrated |
|---|---|---|---|---|
| Test_Pro (10.26mm) | 5472 x 3648 | 10.26 mm | 2.41 x 2.41 µm | No |

Table 1. Cameras.

# Camera Calibration

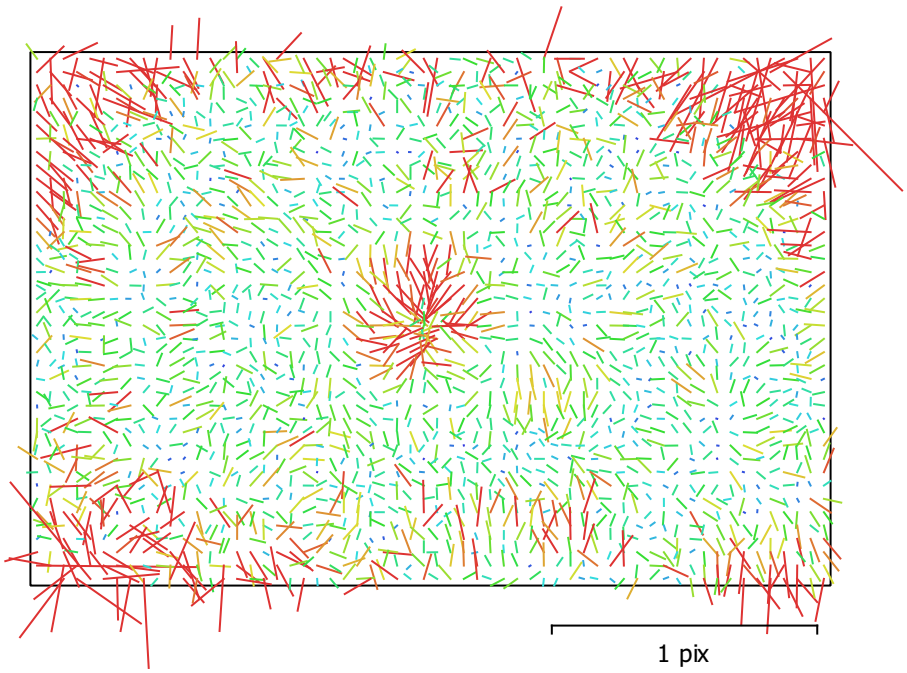


Fig. 2. Image residuals for Test_Pro (10.26mm).

**Test_Pro (10.26mm)**

138 images

| Type | Resolution | Focal Length | Pixel Size |
|---|---|---|---|
| **Frame** | **5472 x 3648** | **10.26 mm** | **2.41 x 2.41 µm** |

| | Value | Error | F | Cx | Cy | K1 | K2 | K3 | P1 | P2 |
|---|---|---|---|---|---|---|---|---|---|---|
| **F** | **4373.93** | 0.14 | 1.00 | -0.07 | -0.60 | 0.06 | 0.11 | -0.11 | -0.09 | -0.18 |
| **Cx** | **-12.7772** | 0.25 | | 1.00 | 0.07 | -0.03 | 0.02 | -0.02 | 0.94 | 0.08 |
| **Cy** | **-47.4136** | 0.23 | | | 1.00 | -0.07 | 0.01 | -0.01 | 0.08 | 0.60 |
| **K1** | **0.0132577** | 6.9e-05 | | | | 1.00 | -0.93 | 0.87 | -0.03 | -0.15 |
| **K2** | **0.035523** | 0.00028 | | | | | 1.00 | -0.98 | 0.00 | 0.06 |
| **K3** | **-0.0339906** | 0.00037 | | | | | | 1.00 | -0.00 | -0.05 |
| **P1** | **0.000119782** | 1.8e-05 | | | | | | | 1.00 | 0.10 |
| **P2** | **-0.00333869** | 9e-06 | | | | | | | | 1.00 |

Table 2. Calibration coefficients and correlation matrix.

# Camera Locations

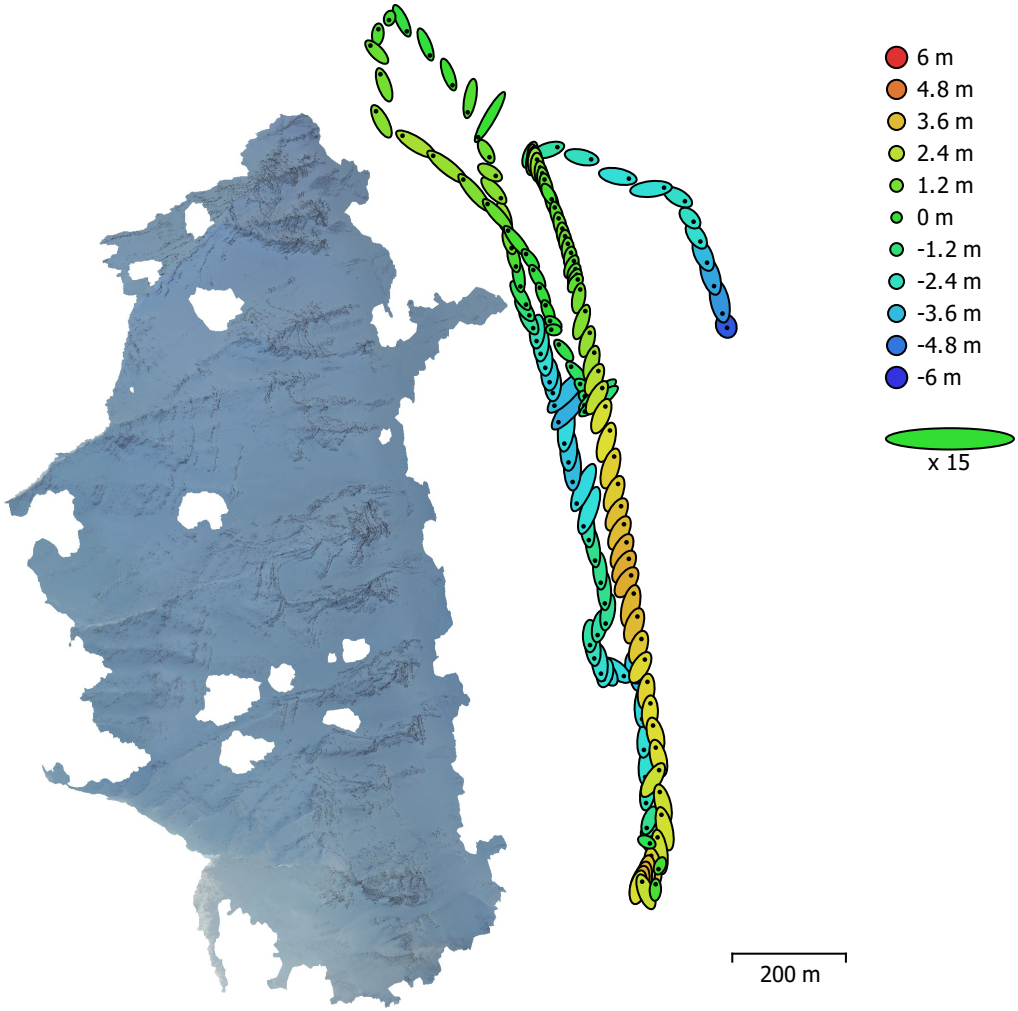


Fig. 3. Camera locations and error estimates.
Z error is represented by ellipse color. X,Y errors are represented by ellipse shape.
Estimated camera locations are marked with a black dot.

| X error (m) | Y error (m) | Z error (m) | XY error (m) | Total error (m) |
|---|---|---|---|---|
| 1.14665 | 2.19744 | 2.32263 | 2.47862 | 3.39678 |

Table 3. Average camera location error.
X - Longitude, Y - Latitude, Z - Altitude.

# Digital Elevation Model

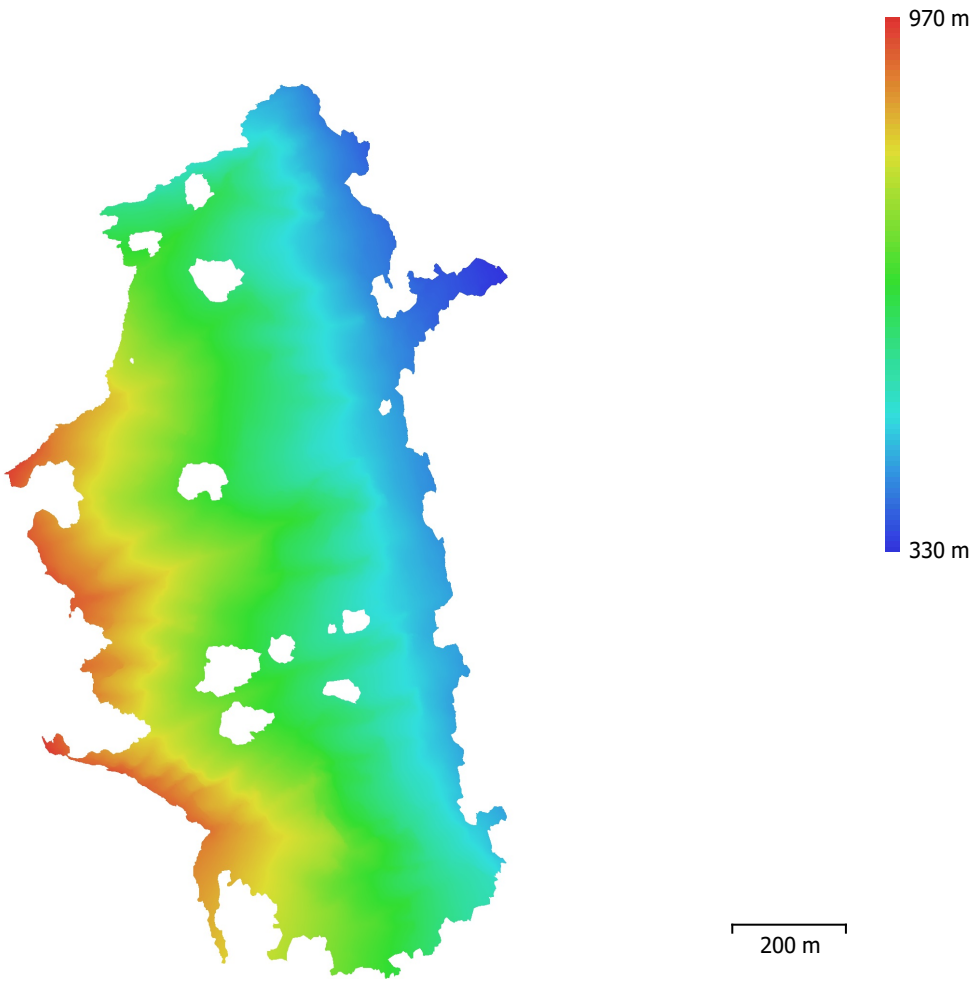


Fig. 4. Reconstructed digital elevation model.

| | |
|---|---|
| Resolution: | 0.247 m/pix |
| Point density: | 16.4 points/m² |

# Processing Parameters

| | |
|---|---|
| **General** | |
| Cameras | 138 |
| Aligned cameras | 138 |
| Coordinate system | WGS 84 (EPSG::4326) |
| Rotation angles | Yaw, Pitch, Roll |
| **Tie Points** | |
| Points | 50,030 of 387,138 |
| RMS reprojection error | 0.140409 (0.315576 pix) |
| Max reprojection error | 0.449088 (1.33662 pix) |
| Mean key point size | 2.2198 pix |
| Point colors | 3 bands, uint8 |
| Key points | No |
| Average tie point multiplicity | 5.89624 |
| **Alignment parameters** | |
| Accuracy | High |
| Generic preselection | Yes |
| Reference preselection | Source |
| Key point limit | 60,000 |
| Key point limit per Mpx | 1,000 |
| Tie point limit | 0 |
| Exclude stationary tie points | Yes |
| Guided image matching | No |
| Adaptive camera model fitting | No |
| Matching time | 3 minutes 38 seconds |
| Matching memory usage | 462.47 MB |
| Alignment time | 3 minutes 22 seconds |
| Alignment memory usage | 172.65 MB |
| **Optimization parameters** | |
| Parameters | f, cx, cy, k1-k3, p1, p2 |
| Adaptive camera model fitting | No |
| Optimization time | 1 seconds |
| Date created | 2023:08:03 10:53:56 |
| Software version | 2.0.2.16334 |
| File size | 37.10 MB |
| **Depth Maps** | |
| Count | 138 |
| **Depth maps generation parameters** | |
| Quality | High |
| Filtering mode | Mild |
| Max neighbors | 16 |
| Processing time | 8 minutes 12 seconds |
| Memory usage | 3.98 GB |
| Date created | 2023:08:03 11:08:39 |
| Software version | 2.0.2.16334 |
| File size | 506.44 MB |
| **Point Cloud** | |
| Points | 19,837,051 |
| **Point attributes** | |
| Color | 3 bands, uint8 |
| Normal | |

| | |
|---|---|
| Confidence | 1 - 94 |
| **Point classes** | |
| Created (never classified) | 13,051,148 |
| High Noise | 6,785,903 |
| **Depth maps generation parameters** | |
| Quality | High |
| Filtering mode | Mild |
| Max neighbors | 16 |
| Processing time | 8 minutes 12 seconds |
| Memory usage | 3.98 GB |
| **Point cloud generation parameters** | |
| Processing time | 25 minutes 53 seconds |
| Memory usage | 8.81 GB |
| Date created | 2023:08:03 11:25:09 |
| Software version | 2.0.2.16334 |
| File size | 278.17 MB |
| **Model** | |
| Faces | 2,744,333 |
| Vertices | 1,373,739 |
| Vertex colors | 3 bands, uint8 |
| Texture | 4,096 x 4,096 x 10, 4 bands, uint8 |
| **Depth maps generation parameters** | |
| Quality | High |
| Filtering mode | Mild |
| Max neighbors | 16 |
| Processing time | 8 minutes 12 seconds |
| Memory usage | 3.98 GB |
| **Point cloud generation parameters** | |
| Processing time | 25 minutes 53 seconds |
| Memory usage | 8.81 GB |
| **Reconstruction parameters** | |
| Surface type | Arbitrary |
| Source data | Point cloud |
| Interpolation | Disabled |
| Strict volumetric masks | No |
| Processing time | 7 minutes 18 seconds |
| Memory usage | 3.97 GB |
| **Texturing parameters** | |
| Mapping mode | Generic |
| Blending mode | Mosaic |
| Texture size | 4,096 |
| Enable hole filling | Yes |
| Enable ghosting filter | Yes |
| UV mapping time | 1 minutes 32 seconds |
| UV mapping memory usage | 2.95 GB |
| Blending time | 2 minutes 14 seconds |
| Blending memory usage | 5.34 GB |
| Blending GPU memory usage | 4.45 GB |
| Date created | 2023:08:03 13:52:28 |
| Software version | 2.0.2.16334 |
| File size | 270.70 MB |
| **Tiled Model** | |
| Texture | 3 bands, uint8 |
| **Reconstruction parameters** | |
| Source data | Mesh |
| Tile size | 256 |

| | |
|---|---|
| Face count | High |
| Enable ghosting filter | No |
| Processing time | 15 minutes 7 seconds |
| Memory usage | 2.46 GB |
| Date created | 2023:08:03 16:34:08 |
| Software version | 2.0.2.16334 |
| File size | 144.51 MB |
| **Additional Parameters** | |
| Sparse cloud reconstruction uncertainity | 20.0 |
| Sparse cloud projection accuracy | 2.8 |
| Sparse cloud reprojection error | 0.3 |
| Point cloud confidence (minimum threshold) | 5 |
| Mesh connected components | 99 |
| **System** | |
| Software name | Agisoft Metashape Professional |
| Software version | 2.0.2 build 16334 |
| OS | Windows 64 bit |
| RAM | 127.78 GB |
| CPU | Intel(R) Core(TM) i9-9900K CPU @ 3.60GHz |
| GPU(s) | GeForce RTX 2080 |