Supplementary Material: Pix4DMapper Pro® data outputs

This supplementary material has the purpose of reporting the Pix4DMapper Pro® outputs of the UAS SfM-photogrammetry. The UAS-imagery data were taken in August 2018 using the DJI Phantom 3 Pro. The outputs were processed in the professional drone mapping and photogrammetry software, Pix4DMapper Pro® in February 5th of 2018. The Pix4DMapper Pro® report is shown in Table S1 and the statistics in Table S2. In summary, the Pix4DMapper Pro® outputs resulted in the following: (1) the area spanned was 0.276 km^2; (2) the dataset consisted of 294 images; (3) the mean projection error, in pixels, was equal to 0.255; and (4) the median of keypoints per images was 45,222. The mean absolute camera uncertainty values were found to be 0.15 m in the x and y directions and 0.374 m in the z direction.

Table S.1: Pix4D report of the SfM-photogrammetry taken in August 2017 and processed in February of 2018

Summary	
Project	Finn Creek 21 Reservoir
Processed	2018-02-05 15:59:54
Camera Model Name(s)	FC300X_3.6_4000>3000 (RGB)
Average Ground Sampling Distance (GSD)	4.62 cm / 1.82 in
Area Covered	0.276 km^2 / 27.6250 ha 0.11 sq. mi. / 68.2981 acres
Quality Check	
Images	median of 45222 keypoints per image
Dataset	294 out of 294 images
Camera Optimization	1.71% relative difference between initial and optimized internal camera parameters
Matching	median of 18394.1 matches per calibrated image
Georeferencing	Yes, 5 GCPs
Bundle Block Adjustment Details	
Number of 2D Keypoint Observations for Bundle Block Adjustment	5509080
Number of 3D Points for Bundle Block Adjustment	1982570
Mean Reprojection Error [pixels]	0.255

Table S.2: Statistics of the SfM-photogrammetry taken in August 2017 and processed in February 2018. It is shown: a) camera uncertainties and b) camera parameters

a. Absolute Camera Position and Orientation Uncertainties						
	X [m]	Y [m]	Z [m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.155	0.155	0.374	0.111	0.116	0.042
Sigma	0.025	0.025	0.082	0.003	0.002	0.001

b. Internal Camera Parameters								
	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	2285.722 [pixel] 3.610 [mm]	2000.006 [pixel] 3.159 [mm]	1500.003 [pixel] 2.369 [mm]	-0.014	0.013	-0.000	0.001	0.000
Optimized Values	2246.433 [pixel] 3.548 [mm]	2013.005 [pixel] 3.179 [mm]	1512.031 [pixel] 2.388 [mm]	-0.008	0.008	0.004	-0.001	-0.000
Uncertainties (Sigma)	1.147 [pixel] 0.002 [mm]	0.178 [pixel] 0.000 [mm]	0.121 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000