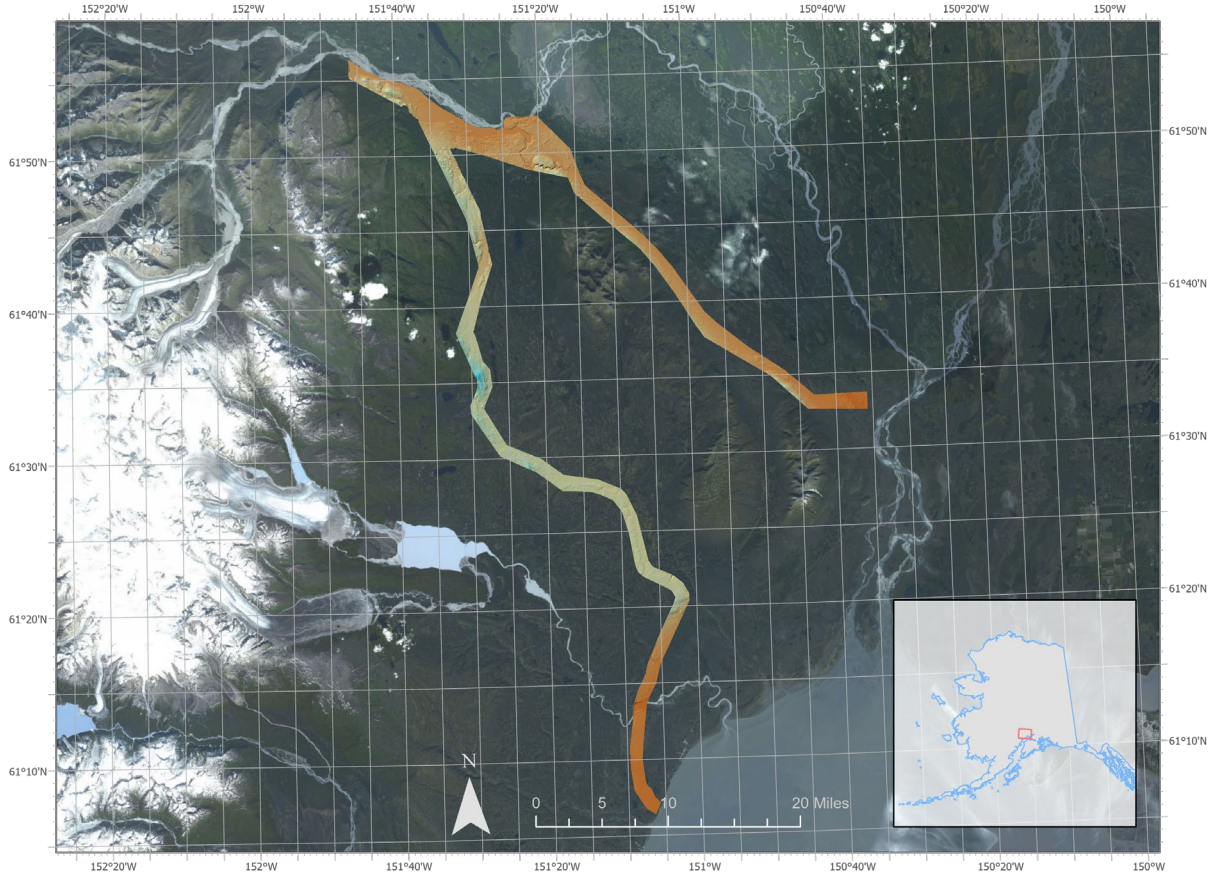
HIGH-RESOLUTION LIDAR DATA FOR THE WEST SUSITNA AREA, SOUTHCENTRAL ALASKA

Ronald P. Daanen, Gabriel J. Wolken, and Andrew M. Herbst

Raw Data File 2020-5



This report has not been reviewed for technical content or for conformity to the editorial standards of DGGS.

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HIGH-RESOLUTION LIDAR DATA FOR THE WEST SUSITNA AREA, SOUTHCENTRAL ALASKA

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ABSTRACT

The Alaska Division of Geological & Geophysical Surveys used airborne lidar to produce a digital terrain model (DTM) and digital surface model (DSM) for the west Susitna area, about 65 km (40 mi) west of Wasilla, Alaska. Airborne data were collected November 4–10, 2019, and subsequently processed in Terrasolid and ArcGIS. Ground control data were concurrently collected by DGGS. This data is released as a Raw Data File with an open end-user license. All files can be downloaded, free of charge, from https://elevation.alaska.gov/.

INTRODUCTION

This dataset includes point cloud data and two 32-bit raster elevation models that cover an area of interest for proposed infrastructure development in the west Susitna region.

LIST OF DELIVERABLES

Classified Points

DSM and DTM

Metadata

MISSION PLAN

Aircraft and Instrument

DGGS operates a Riegl VUX1-LR lidar integrated with a GNSS and Northrop Grumman IMU system. The integration was designed by Phoenix LiDAR systems. The sensor is capable of collecting up to 820,000 points per second over a distance of 150 m. This survey was flown at a pulse rate between 200,000 and 400,000 pulses per second, at a scan rate between 80 and 150 loops per second. The average pulse spacing was 31.27 cm and the average density was 10.23 pts/m^2. This survey was flown with an average elevation of 1,000 m above ground level and a ground speed of approximately 40 m/s with a fixed wing aircraft configuration, using a Cessna 185 aircraft. The scan angle was set from 55 to 305 degrees.

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Weather Conditions and Flight Times

Airborne data were collected November 4–10, 2019. Weather conditions were generally sub-optimal throughout the survey, requiring operations to take place in thick fog and low-lying clouds, at the risk of increased levels of noise in the product. Snow was present across the majority of the study area surface and accumulated throughout the survey period, especially in the northernmost section.

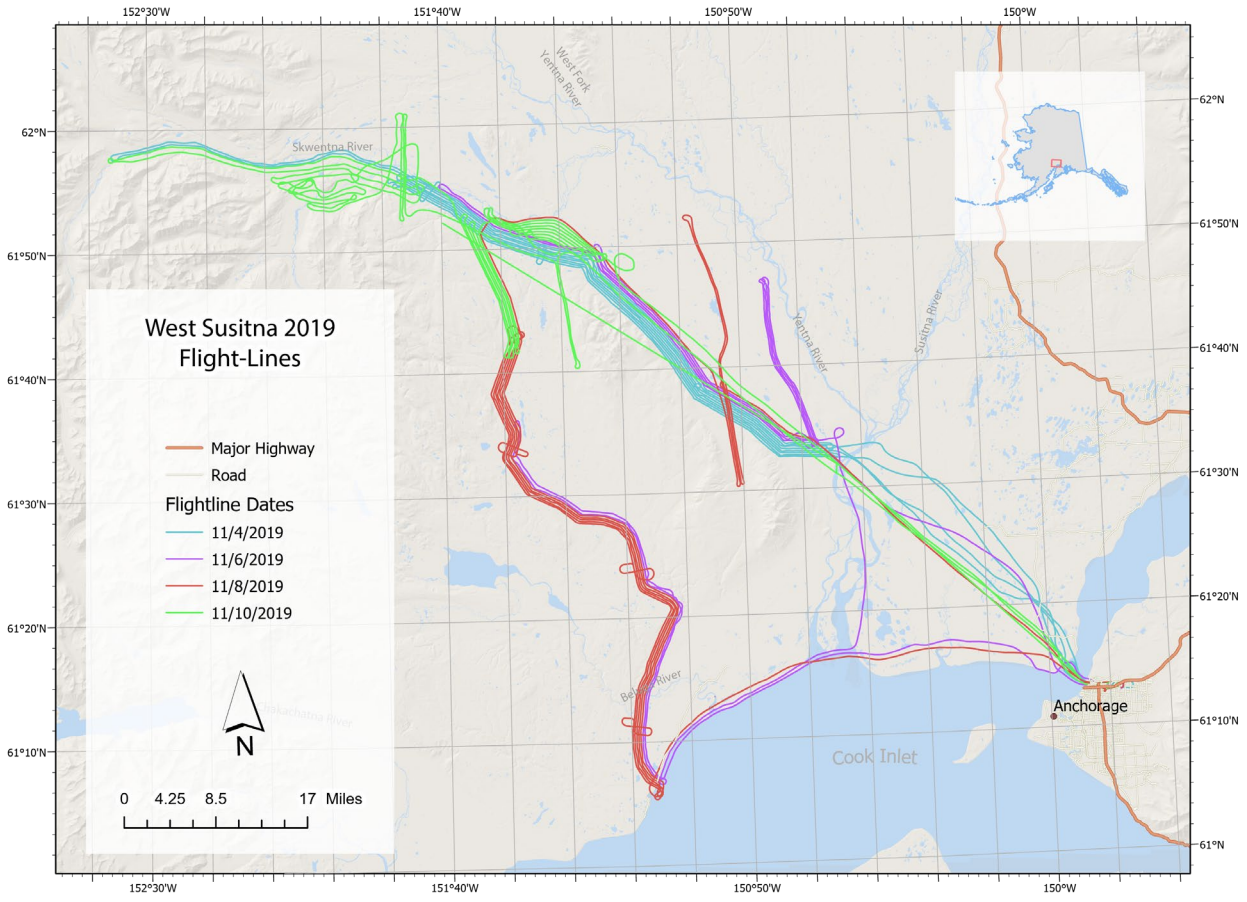

Figure 1. Project flight-lines with dates.

PROCESSING REPORT

Lidar Dataset Processing

Point cloud data was run through SDCimport software for initial filtering and disambiguation of errors. Once filtered, the point cloud and trajectory data were fused together by integrating IMU and GPS information.

Points were classified in accordance with ASPRS 2014 guidelines. A significant amount of noise, due to snow and weather conditions during the survey, was separated from the rest of the

data and designated to class 8, model keypoints. All classified points were vertically transformed to maintain a mean offset fewer than 10 cm from surveyed ground control.

Raster products were produced from las files in ArcMap and were clipped according to a lidar point density threshold of 8pts/m^2. DTM and DSM were created using a tin-based method.

DTM

DTMs represent surface elevations of ground surfaces, excluding vegetation, bridges, buildings, etc. The DTM is a single-band, 32-bit float GeoTIFF file, with a ground sample distance of .5 meters. No Data value is set to -3.40282306074e+038.

DSM

DSMs represent surface elevations, as they appear to the naked eye. They include the heights of vegetation, buildings, bridges, etc. The DSM is a single band, 32-bit GeoTif file, with a ground sample distance of .5 meters. No Data value is set to -3.40282306074e+038.

SURVEY REPORT

Ground Control and Accuracy

Trimble R8 and R9 RTK GPS systems were used to collect ground control points (GCPs). An R44 helicopter was used to transport ground survey personnel across the study area. Points were adjusted for accuracy, according to OPUS corrections, in Trimble Business Center. Seventy-five checkpoints were used to calculate a vertical accuracy of 39 cm RMSE. Relative accuracy was evaluated as the interswath consistency and was measured at 2.1 cm RMSE.

Coordinate system and Datum

All data was processed and delivered in UTM5 NAD83 (2011) and vertical datum NAVD88 with a GEOID correction following the latest GEOID12B for Alaska.

QA/QC REPORT

The quality of the data is discussed in the previous paragraphs as average elevation compared to an independent dataset. The second aspect of the quality of the data is related to point density distribution over the survey area (fig. 2). The average point density is 10.23 points per square meter. Elevation surfaces interpolated from areas with a point density of fewer than 1pt/m^2 were reclassified as nodata.

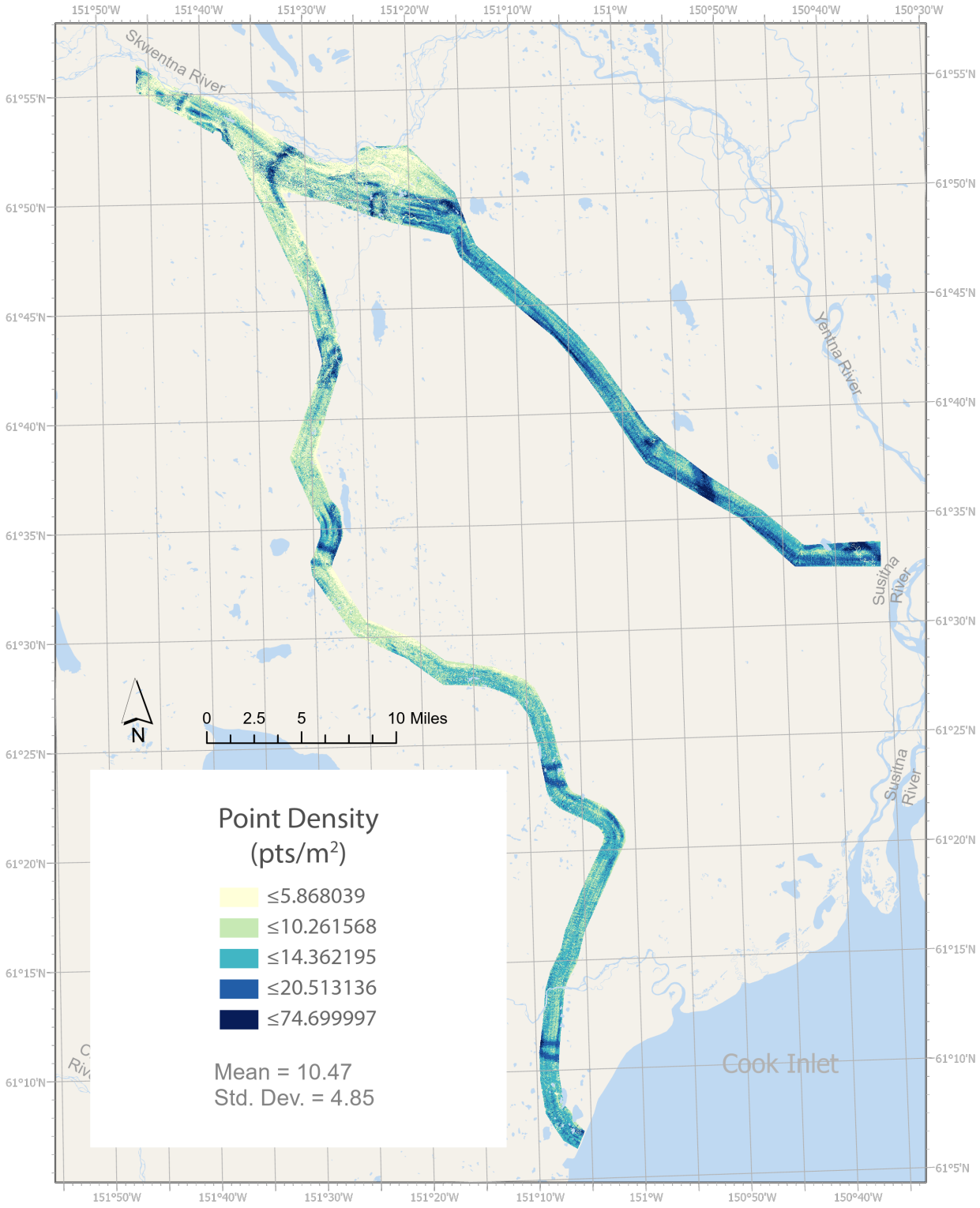

Figure 2. Ground point density displayed as 1-meter raster for the survey.

Appendix 1. Checkpoints

Number	Easting (m)	Northing (m)	Known Z (m)	Laser Z (m)	Dz (m)
17	586827.816	6861242.55	64.332	65.27	0.938
57	612987.189	6831659.688	117.892	117.04	-0.852
3	580196.689	6849813.753	254.653	255.4	0.747
13	586798.288	6861258.934	64.463	65.2	0.737
14	586798.679	6861236.982	64.436	65.16	0.724
1	580212.399	6849808.581	254.89	255.59	0.7
6	580204.149	6849846.842	254.806	255.44	0.634
11	586829.898	6861292.81	64.792	65.4	0.608
21	575755.271	6858204.792	185.171	185.77	0.599
5	580189.04	6849846.453	254.72	255.31	0.59
20	586869.916	6861256.461	63.941	64.53	0.589
18	575762.826	6858191.672	185.218	185.8	0.582
4	580196.157	6849827.003	254.876	255.44	0.564
15	575781.26	6858185.846	184.996	185.55	0.554
23	586892.236	6861273.582	63.946	64.43	0.484
27	575780.707	6858215.66	184.347	184.83	0.483
66	599625.05	6812615.524	245.896	245.42	-0.476
56	612983.115	6831668.865	118.027	117.56	-0.467
69	599586.269	6812642.667	245.806	245.35	-0.456
68	599588.681	6812620.149	245.745	245.31	-0.435
30	575784.967	6858207.224	184.45	184.88	0.43
70	599593.043	6812656.788	245.94	245.52	-0.42
8	596266.167	6850039.003	94.847	94.49	-0.357
63	589423.812	6817406.189	266.618	266.27	-0.348
10	596290.265	6850055.225	94.69	94.35	-0.34
25	602777.489	6796470.384	96.35	96.02	-0.33
46	623893.051	6827517.92	41.979	41.65	-0.329
55	617995.302	6829980.899	74.068	73.74	-0.328
64	589408.455	6817408.02	266.628	266.3	-0.328
12	596286.425	6850044.641	94.716	94.39	-0.326
9	596264.247	6850050.538	94.824	94.51	-0.314
61	605972.409	6840069.077	85.989	85.68	-0.309
7	596281.268	6850028.527	94.707	94.4	-0.307
62	589431.969	6817415.672	266.466	266.16	-0.306
28	602780.068	6796455.374	96.193	95.89	-0.303
48	623869.441	6827541.563	42.101	41.8	-0.301

65	589417.706	6817443.753	266.241	265.94	-0.301
45	623906.207	6827505.326	41.896	41.6	-0.296
47	623879.756	6827528.991	42.042	41.75	-0.292
67	599609.155	6812605.197	245.797	245.51	-0.287
52	617977.374	6829972.059	73.862	73.58	-0.282
75	602970.582	6804013.688	274.649	274.37	-0.279
2	600363.888	6780915.515	26.658	26.38	-0.278
53	617977.536	6829984.875	73.901	73.63	-0.271
49	617996.239	6829958.1	73.87	73.6	-0.27
58	612972.293	6831666.122	117.944	117.68	-0.264
51	617982.438	6829964.553	73.835	73.58	-0.255
44	612426.882	6833051.376	93.661	93.41	-0.251
16	602756.116	6796457.092	96.266	96.02	-0.246
42	570916.189	6865020.992	100.384	100.14	-0.244
72	602954.014	6804057.038	274.263	274.02	-0.243
54	617983.155	6829993.55	73.928	73.69	-0.238
22	602768.475	6796476.96	96.364	96.13	-0.234
31	586638.279	6856785.386	134.81	134.58	-0.23
73	602969.354	6804054.296	274.2	273.97	-0.23
19	602757.523	6796473.739	96.315	96.09	-0.225
59	605982.195	6840059.11	85.935	85.71	-0.225
74	602981.9	6804035.493	274.306	274.09	-0.216
71	602943.102	6804025.968	274.523	274.31	-0.213
26	586616.699	6856781.165	135.003	134.79	-0.213
41	612391.007	6833030.383	93.736	93.53	-0.206
33	586636.361	6856796.531	134.814	134.61	-0.204
24	575765.322	6858227.177	184.443	184.61	0.167
60	605977.631	6840062.355	85.927	85.77	-0.157
50	617987.738	6829958.578	73.793	73.64	-0.153
36	574935.765	6860567.992	101.311	101.19	-0.121
32	574992.148	6860628.631	100.275	100.17	-0.105
38	574924.668	6860592.999	101.046	100.95	-0.096
37	612389.035	6833000.482	93.597	93.69	0.093
29	586627.243	6856778.929	134.972	134.89	-0.082
34	612407.223	6833015.265	93.621	93.54	-0.081
40	574941.388	6860609.727	101.022	100.96	-0.062
43	612413.71	6833055.154	93.667	93.62	-0.047
35	574961.882	6860555.968	101.261	101.23	-0.031
39	612386.659	6833017.765	93.759	93.73	-0.029

Average dz	-0.065
Minimum dz	-0.852
Maximum dz	0.938
Average magnitude	0.337
Root mean square	0.39
Std deviation (m)	0.388

ACKNOWLEDGMENTS

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