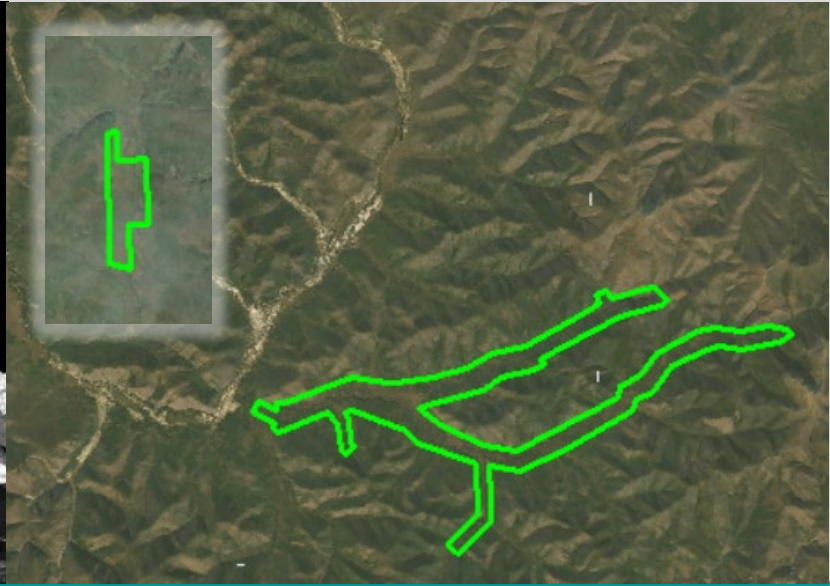
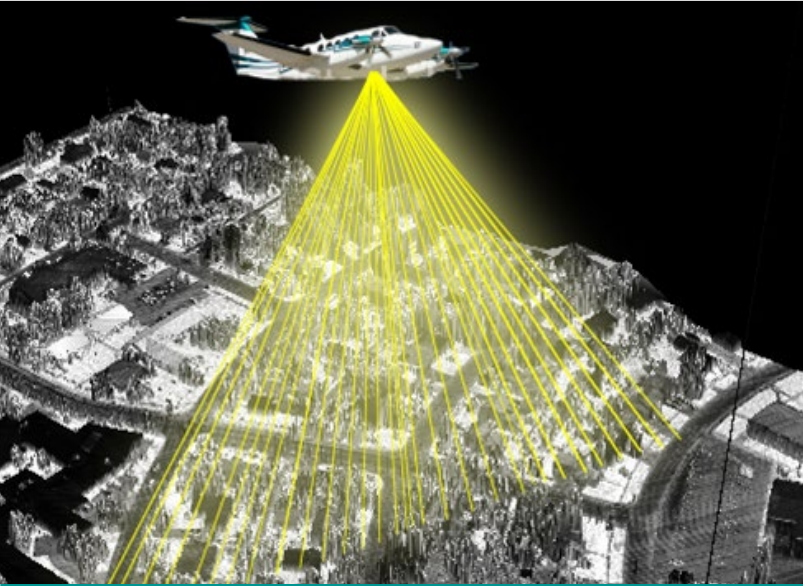




McElhanney



Aus-Mel and California Creeks

LiDAR and Orthophoto

August 31, 2022

Submitted to: TruePoint Exploration Ltd..
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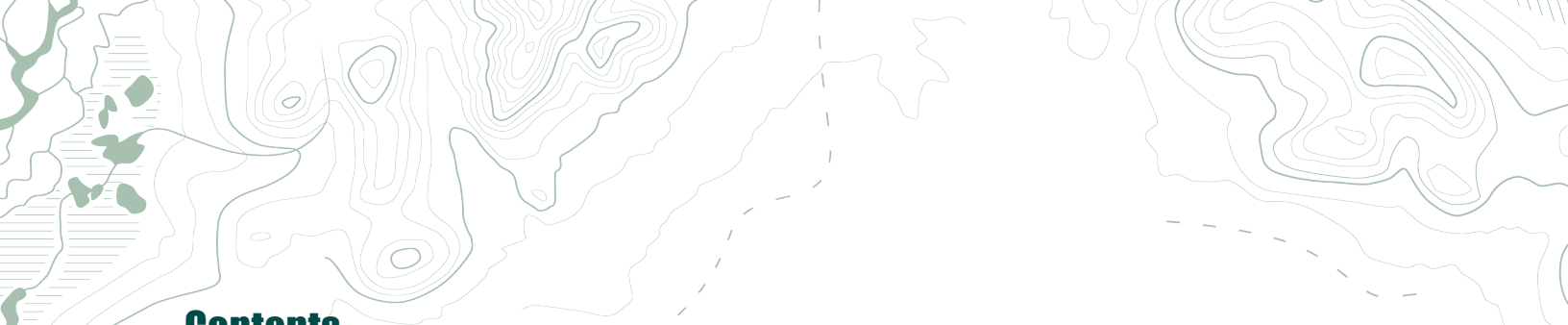
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Our file: [McE BMS #2611-20070-01]



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Project Summary

McElhanney Ltd performed LiDAR and aerial photography acquisition for the Aus-Mel and California Creeks project areas, as shown in Figures 1 and 2.

The sites were flown June 16, 2022. This report describes the acquisition, post-processing and quality control methodology used to produce the deliverables.

1. Mission Plan

- Project Number: 2611-20070-01
- Date: June 16, 2022
- Location: Aus-Mel Creeks (63°37'00"N, 138°26'00"W) and California Creek (64°04'00"N, 140°22'00"W) projects. Dawson City area, western YT.
- Topography: rolling hills, subdued mountains.

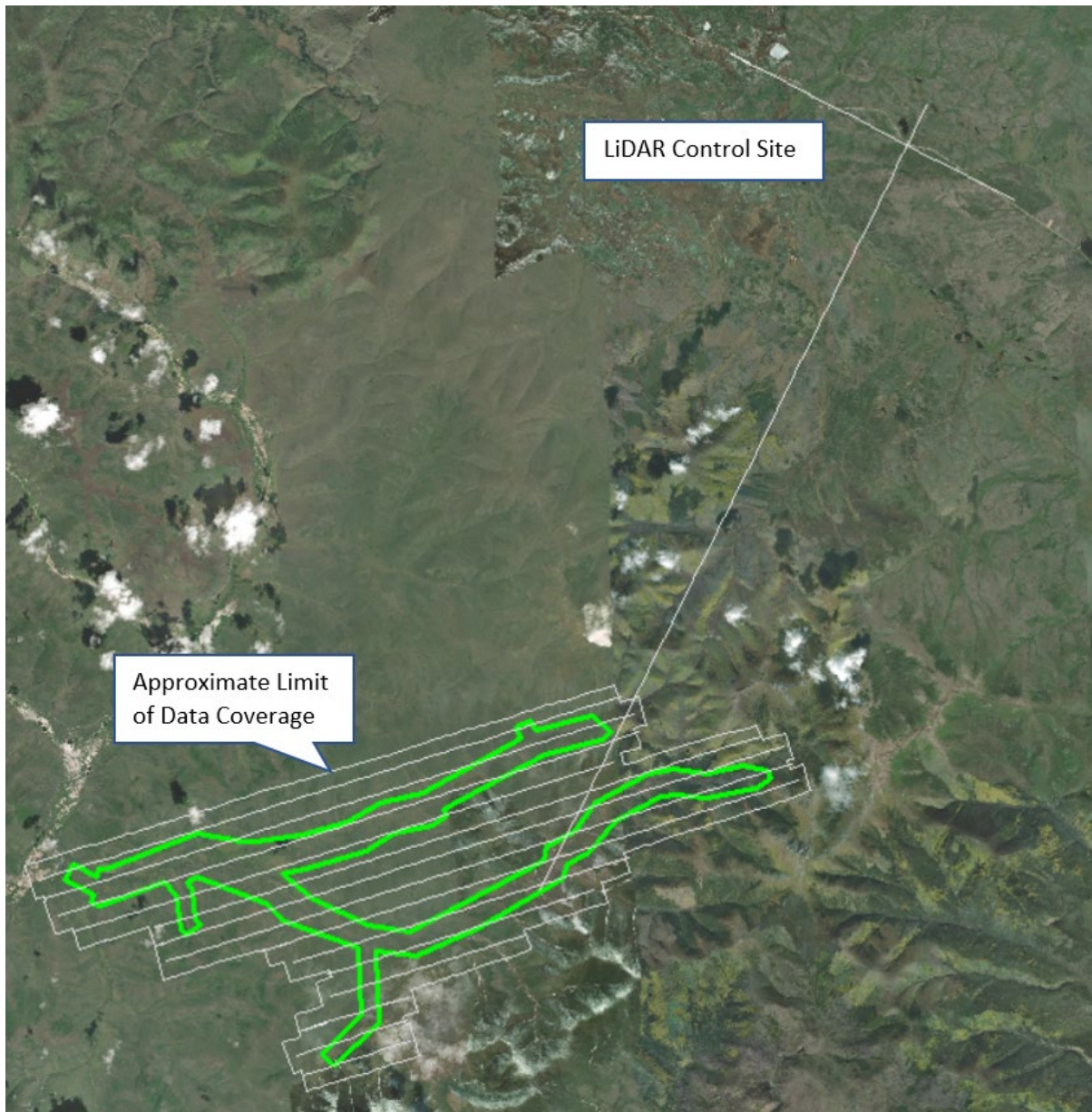


Figure 1 – Aus-Mel Creek project site and control area.

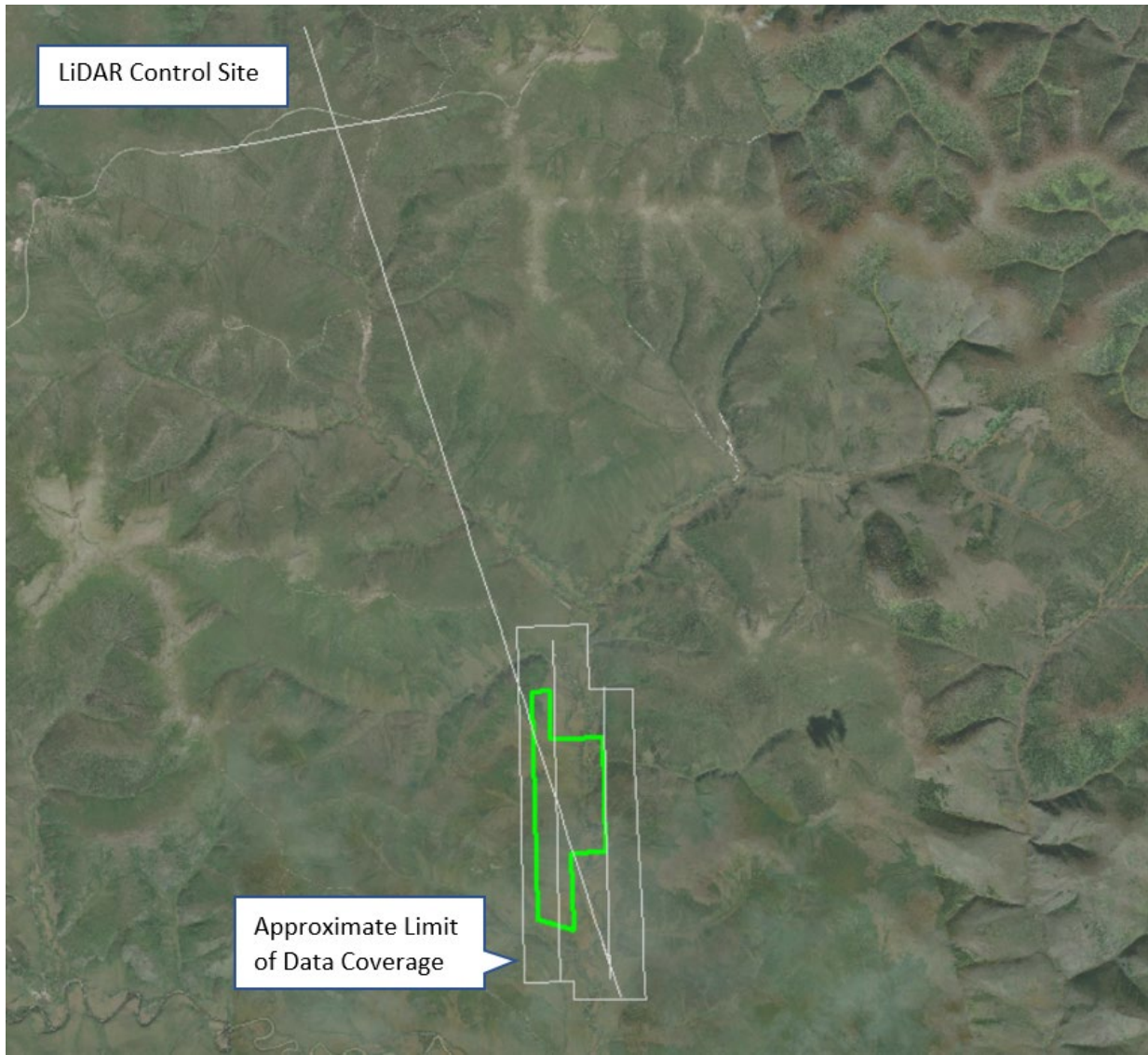


Figure 2 – California Creek project site and control area.

2. Equipment

McElhanney utilized the Leica Terrain Mapper-2 (TM2), Hyperion2+ system for LiDAR Capture (Figure 2).

For Product Specifications please see

<https://leica-geosystems.com/products/airborne-systems/topographic-lidar-sensors/leica-terrainmapper-2>

The LiDAR system is mounted on Piper Navajo fixed wing aircraft, C-FKMA.

On-board camera - Leica MFC150 / Leica MFC150-NIR Camera Head - simultaneous capture.



Figure 3 – Leica Terrain Mapper II LiDAR System

3. Flight-Line Parameters

Aus-Mel Creeks - 16 flight-lines were flown for a total of approximately 268.3 line-km, including approximately 44.1 km of control lines, and excluding turns.

California Creek - 4 flight-lines were flown for a total of approximately 37.8 line-km, including approximately 26.7 km of control lines, and excluding turns.

Table 1 – Flight-line Parameters

Aus-Mel Creeks

Flight Line	Swath Width [m]	Alt MSL [m]	Length [m]	Line Direction [deg]	Line begin time [UTC]	Line end time [UTC]	Laser Pulse Rate [Hz]	Scan Rate [Hz]	FOV [deg]
003	1310	2365	22512.1	74.8	22:24:02	22:29:22	1800000	150	40
004	1310	2365	22753.4	254.8	22:17:00	22:22:17	1800000	150	40
005	1310	2368	22413.5	74.8	22:10:10	22:15:26	1800000	150	40
006	1310	2376	20859.3	254.8	22:03:51	22:08:40	1800000	150	40
007	1310	2386	23434.1	74.8	21:56:20	22:01:56	1800000	150	40
008	1310	2390	24107.7	254.8	21:48:41	21:54:21	1800000	150	40
009	1310	2393	24143.7	74.8	21:41:26	21:47:06	1800000	150	40
010	1310	2396	20681.7	254.8	21:34:05	21:39:00	1800000	150	40
011	1310	2399	12928.2	74.8	21:27:49	21:31:00	1800000	150	40
012	1310	2402	10256	254.7	21:23:47	21:26:11	1800000	150	40
013	1310	2403	7562.6	74.9	21:19:49	21:21:39	1800000	150	40
014	1310	2405	4222	254.9	21:16:36	21:17:43	1800000	150	40
015	1310	2407	4275.5	74.7	21:13:49	21:14:58	1800000	150	40
016	1310	2437	4108.4	254.8	21:10:57	21:12:03	1800000	150	40
019 Control	1310	2373	11797.4	120	20:55:50	20:58:36	1800000	150	40
020 Control	1310	2395	32283.8	208.7	21:01:52	21:09:10	1800000	150	40

California Creek

Flight Line	Swath Width [m]	Alt MSL [m]	Length [m]	Line Direction [deg]	Line begin time [UTC]	Line end time [UTC]	Laser Pulse Rate [Hz]	Scan Rate [Hz]	FOV [deg]
001	1310	2409	5977.3	179	22:55:06	22:56:41	1800000	150	40
002	1310	2410	5116.7	359.3	22:52:30	22:53:47	1800000	150	40
017 Control	1310	2694	8824.5	80.3	23:05:42	23:07:45	1800000	150	40
018 Control	1310	2409	17864.1	342.5	22:58:03	23:02:24	1800000	150	40

4. Data Processing

All airborne GPS and IMU Data was processed using Inertial Explorer v8.9 software. The laser data was extracted using Leica HxMap 3.3 software. The GPS antenna position in the airplane was calculated by post-processing the raw data at one (1) second intervals for the entire flight. We have used Precise Point Position (PPP) to process the trajectory.

5. Point Density

The surveys were designed to collect LiDAR data at a nominal design density of 10 pulses/m², irrespective of swath overlap. The mean point densities stated below vary with tree canopy closure, understory vegetation density and topographic features.

Area	Point-Cloud Density (points/m ²)	Bare-Earth Density (points/m ²)
Aus-Mel Creeks	27.07	14.12
California Creek	25.06	13.23

6. Calibration

System: Leica TM-2 system

LiDAR Calibration flight:

Calibration Date: April 24, 2022 Location: Abbotsford, B.C.

Base Station Used for Calibration,

BCAB N 49° 03' 7.81125" W 122° 19' 46.2715" 72.996m

NAD83 CSRS 2002

The LiDAR system calibration was flown over Abbotsford calibration site. The lever arms offset between GPS antenna IMU and Laser Mirror, were calibrated based on 31 ground survey points.

7. Quality Control

The LiDAR data consistencies have been checked between the flight lines using Terrascan software.

Comparison of Bare Earth LiDAR Data with Control Data – Vertical Accuracy

As ground control data was not available within either of the project areas, flight-lines were flown connecting each area to a strip of road where controlled LiDAR of known accuracy was available. Relative to data along the roads, the vertical accuracy of new LiDAR is as follows:

$$RMSE_z = Sqrt[\sum (Z_{Lidar(i)} - Z_{check(i)})^2 / n]$$

where the "check" refers to the ground truthing and n is the number of checkpoints used.

Aus-Mel Creeks		California Creek	
Average dz	+0.003 m	Average dz	-0.002 m
Minimum dz	-0.077 m	Minimum dz	-0.105 m
Maximum dz	+0.076 m	Maximum dz	+0.135 m
Average magnitude	0.025 m	Average magnitude	0.041 m
Root mean square (vertical accuracy)	0.031 m	Root mean square (vertical accuracy)	0.047 m
Std deviation	0.031 m	Std deviation	0.047 m
No. check points	302	No. check points	2056

Aus-Mel LiDAR data was checked against 2014 LiDAR data with a reported accuracy of 0.09m RMSE. California creek LiDAR data was checked against 2018 LiDAR data with a reported accuracy of 0.14 m RMSE. As the 2022 LiDAR data was checked against and then adjusted to bare-earth LiDAR points rather than RTK ground control, these are relative accuracy values. See Recommendations section regarding notes on LiDAR relative accuracy.

Orthophoto was processed using Leica Hxmap and Pix4D software and controlled with refined Exterior Orientation and LiDAR intensity points.

LiDAR Horizontal Accuracy

LiDAR horizontal accuracy involves a visual assessment relying on the ability to discern features in LiDAR data. The ability to discern features in LiDAR data is strongly linked to the point-cloud density, and thus, mean point-spacing, achieved over the assessment area. Aus-Mel horizontal accuracy was assessed by comparing the positions of a structure (646185E, 7083530N) adjacent to the road, captured in 2014 and

2022 LiDAR data. The mean bare-earth point spacing along the road at the assessment site is 0.28m and the offset, as seen in the two sets of LiDAR data, was indiscernible at the mean point spacing. Figure 4 shows a polygon digitized around the structure, as seen in a 2014 LiDAR intensity image on the left, and then overlain on the 2022 LiDAR point-cloud, on the right. The structure is approximately 5.5m x 6m.

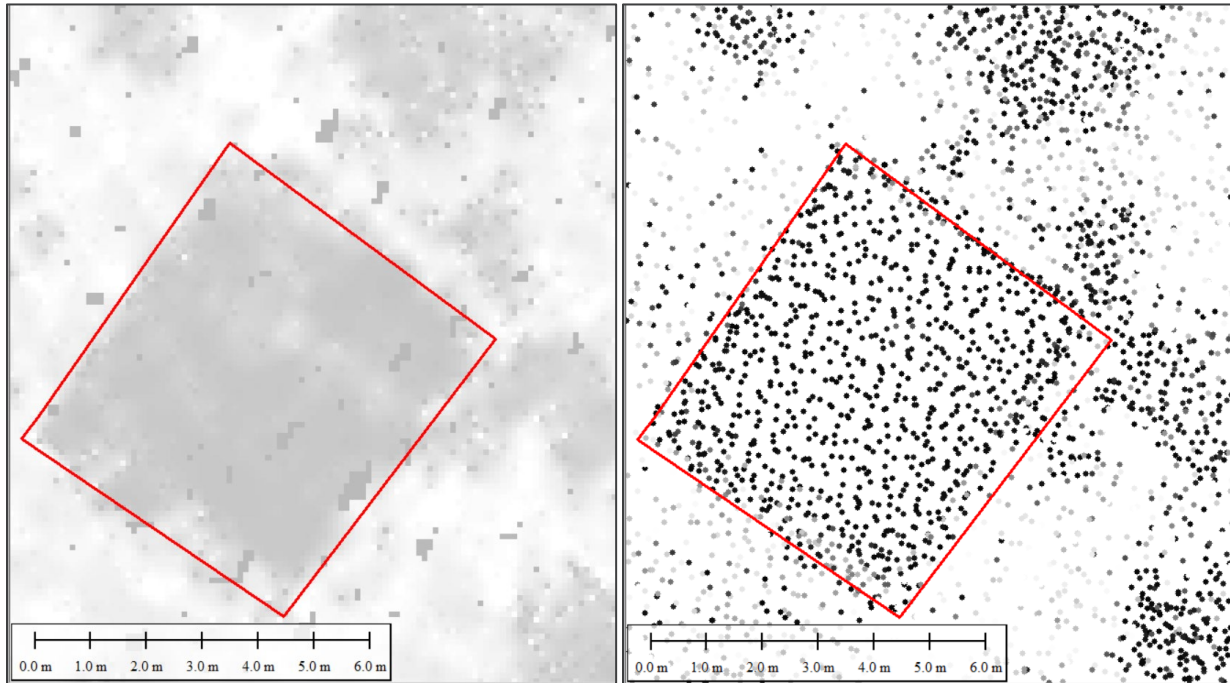


Figure 4 – LiDAR Horizontal Accuracy

It was not possible to apply a number to the horizontal accuracy of the California creek data as no structures or other suitable features were apparent within the control area. Road edges, as seen in 2018 and 2022 data were compared, and no measurable offset could be discerned.

Table 3. Shows Orthophoto Aerial-Triangulation Results

Table 2 – Airphoto Aerial-Triangulation Control Results

Area	RMS XYZ residual error (m)	Average XYZ residual error (m)	Standard deviation of XYZ residual error (m)
California Creek	0.288	0.213	0.195
Aus-Mel Creeks	0.451	0.338	0.299

Orthophoto image enhancements and colour/tone balancing were done in Adobe Photoshop.

8. Deliverables

Final output data is provided in NAD83CSRS UTM07 and the elevations are based on the CGVD28 HT2 geoid model.

The deliverables include:

- Bare-earth (BE) 1km² LiDAR tiles in LAZ format
- Model key points (mkpts) 1km² LiDAR tiles in XYZ and LAZ formats
- Non bare-earth (NBE) 1km² LiDAR tiles in LAS format
- Shaded-relief (LiDAR interpretation imagery) 1m pixel – geotiff format
- DTM Surface 1m grid files in ArcGrid format
- 5m contours in ESRI shape format
- 15cm-pixel colour orthophoto in 1km² tif /tfw tiles
- 15cm Orthophoto mosaic files in ecw file format
- Project Report

9. Recommendations

The vertical accuracy values stated in the Quality Control section were determined after adjusting 2022 LiDAR data to match the position of earlier LiDAR data along sections of road. Data was not shifted horizontally as checks at neither site indicated that shifting was necessary. As 2022 accuracy is reported relative to other LiDAR data rather than RTK ground control points, the accuracies reported for 2022 data are relative values, not absolute values. If deliverables are to be used for work where absolute accuracy values must be known, we recommend that a minimum of 50 RTK check points be established for each site and that this data be used to establish absolute accuracy values for 2022 LiDAR data.