aero-graphics

AGRC Aerial LiDAR 2020
Ground Survey Report

For

Sanborn

Southern Utah Area

October 2020

Aero-Graphics, Inc.

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1. Project Information

Project Scope:

The purpose of this is report is to document the equipment and processes for the ground survey conducted to support the aerial acquisition of LiDAR data in Utah. The survey was performed by Aero-Graphics, Inc, for Sanborn.

The field survey work was conducted May 1 – 12, 2020, and Aug 18, 2020.

Project Datums:

Horizontal: NAD83(2011) UTM Zone 12 Meter

Vertical: NAVD88 (Geoid12B) Meter

Karl Jensen, PLS, CP

Oct 21, 2020

ASPRS Certified Photogrammetrist, exp date 9/17/2023
Utah Licensed Professional Land Surveyor #7643406, exp date 3/31/2021
Colorado Licensed Professional Land Surveyor #PLS-0038527, exp date 10/31/2021

2. Equipment List

The equipment listed below was used to survey the ground points for this AGRC LiDAR project.

TOPCON Dual Frequency/ Dual Constellation GNSS Receivers:

- HiPER Ga, S/N: 498-00418
- HiPER Ga, S/N: 457-02513
- HiPER SR, S/N: 1064-16270
- HiPER SR, S/N: 1209-11478
- HiPER SR, S/N: 1209-10832
- HiPER SR, S/N: 1209-14758
- HiPER SR, S/N: 1209-18284
- HiPER SR, S/N: 1209-18273

Spectra Precision Ranger 3 Data Collector

Triple Magnet GNSS Receiver Mount

Two meter fixed height range pole for each Topcon GNSS Hiper receiver with attached bipod legs for stability.

3. Surveying Methods

Multiple methods were used during the ground survey to collect the control and check points. Each method is detailed below.

LiDAR identifiable features or surveyor set/painted targets were used as control points.

LiDAR identifiable features were also surveyed where possible for NVA check points.

STATIC:

Static (or Rapid-Static) Surveying is a method that Aero-Graphics has employed for many years to collect ground control points. A base station location is selected, usually at one or more control locations, and a GNSS receiver is left there for the entire day to complete the survey. The other GNSS receivers are then used as rovers to survey the other point locations.

The duration of the rover receivers will vary depending upon the distance from the base receiver. Normally the rover will not be further than 10 km from the base. The greater the distance the rover is from the base receiver, the longer the recording duration of the rover needs to be. Each rover location is surveyed for a minimum of 15 minutes or greater.

Static Surveying was used to collect control and check points (CTL, NVA, VVA).

The individual point locations are post-processed after the field survey is completed. The GNSS data collected by the receivers is downloaded and processed in NovaTel's Waypoint GravNET software. The base station coordinates are used to differentially correct the other point's locations.

The NGS Online User Positioning Service (OPUS) was used to process the base station location data. A minimum of 2+ hours of GNSS data was be collected for base stations to be processed through OPUS.

THE UTAH REFERENCE NETWORK (VRS):

The Utah Reference Network Virtual Reference Station (VRS) was used to survey control and check points where a cell phone signal was available. The field surveyor's data collector and roving receiver utilized the real-time broadcast positional correction to observe and survey the points.

The maximum baseline restriction for the roving receiver is 70km while using this method.

KINEMATIC POINTS:

Kinematic Surveying points were collected with a GNSS receiver while the surveying vehicle was in motion and then post processed to compute the location of each point. This method was used to collect some of the NVA points.

For this method a GNSS receiver is placed on the roof of the survey vehicle with a magnetic mount. The receiver collected the data at a rate of 1 second, non-stop, no matter where the driver went.

The points surveyed with this method were post-processed with NovaTel's Waypoint GravNAV software. At least one base station was included to differentially correct the data.

After the data was post-processed, the points were thinned to one per kilometer along the roads driven. The statistical quality of the points were also monitored to remove points of low quality (ie. high PDOP, low number of satellites).

STOP-AND-GO SURVEYING

The Stop-and-Go Surveying method was used to survey NVA and VVA check points. For this method, a GNSS receiver was mounted to the survey vehicle. The receiver would continuously collect data while the surveying vehicle was in motion, similar to the Kinematic Method. When the field surveyor could not use the VRS system due to no cell phone coverage, this receiver could be carefully removed from the vehicle and mounted onto a two meter fixed height range pole to survey the check points. Each point was occupied for a minimum of 30+ seconds. This duration allowed the individual points to be identified in the data.