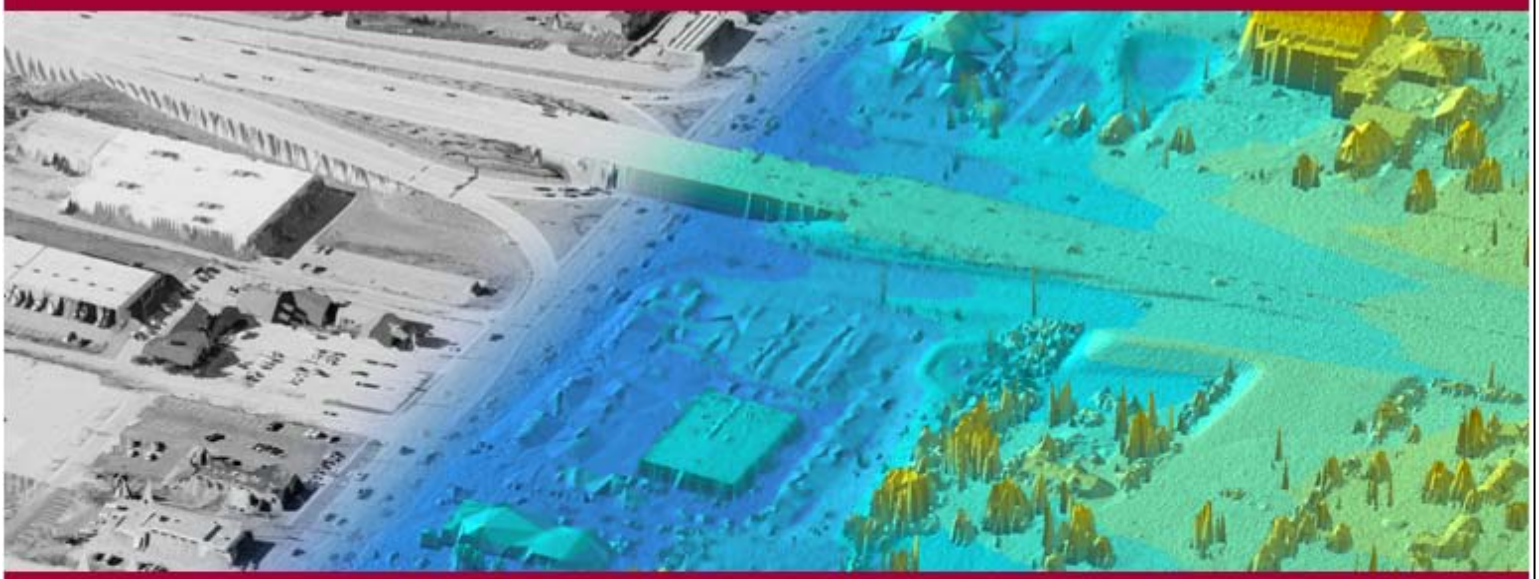
LiDAR ACCURACY REPORT

Project:	Missouri Counties LiDAR Project
Report Area:	Adair County, MO
Delivery Order No.:	0007
Contract No.:	W912P9-10D-0538
Date:	12-December-2012
Submitted by:	Wade Williams, Project Manager



US Army Corps of Engineers, St. Louis District

Project Overview

The St. Louis District of the United States Army Corps of Engineers (USACE) contracted with Surdex Corporation in the fall of 2011 to collect high resolution LiDAR elevation data over multiple counties as part of the Missouri Counties Lidar Project. The project combines the varied interests of the NRCS, USGS, USACE and State Emergency Management Agency (SEMA) totaling over 6,500 square miles of coverage. Processing of the LiDAR data and bare-earth model followed USGS Base LiDAR Specifications V13 standards. Surdex tested that the deliverables meet or exceed accuracy as stated in NDEP Guidelines for digital elevation data, Version 1.0 for NSSDA of 95% confidence for 2' contours and ASPRS Class I Standards. Survey points were collected on hard surface, in grass & under trees for each delivery area as specified by the USACE. The survey ground truth points were compared to both the LAS LiDAR data & bare-earth ESRI Grid DEM and the differences have been outlined in this report. In order to meet project specifications the overall vertical accuracy of these points should be 12.5 centimeters RMSEz or less. The RMSEz was calculated as the square root of the average of the set of squared differences between the bare-earth and the survey points collected for the individual features (hard surface, grass & trees). Also, 95 percent of the feature types should be less than 1.96 times the RMSEz which equals 36.3 centimeters or less. The final results for this delivery area are listed on the last page of this report.

Delivery Area

This report covers the collection and processing of LiDAR elevation data over Adair County MO. The project limits are presented in the graphics below. The project area consisted of approximately 706 square miles of elevation data.

Figure 1 Adair Co. Project Area

LiDAR Data Collection Scenario

The LiDAR elevation data for this project was collected with a Leica ALS-50II MPIA aerial LiDAR sensor system. The project design called for acquisition of LiDAR data with lines flown east-west. The nominal collection scenario called for the acquisition of nominal point spacing of 1 meter on the ground.

Adair Co. Swath LiDAR Control

The field survey for this delivery consisted of 11 hard surface (HS) control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points on the delivery area map.

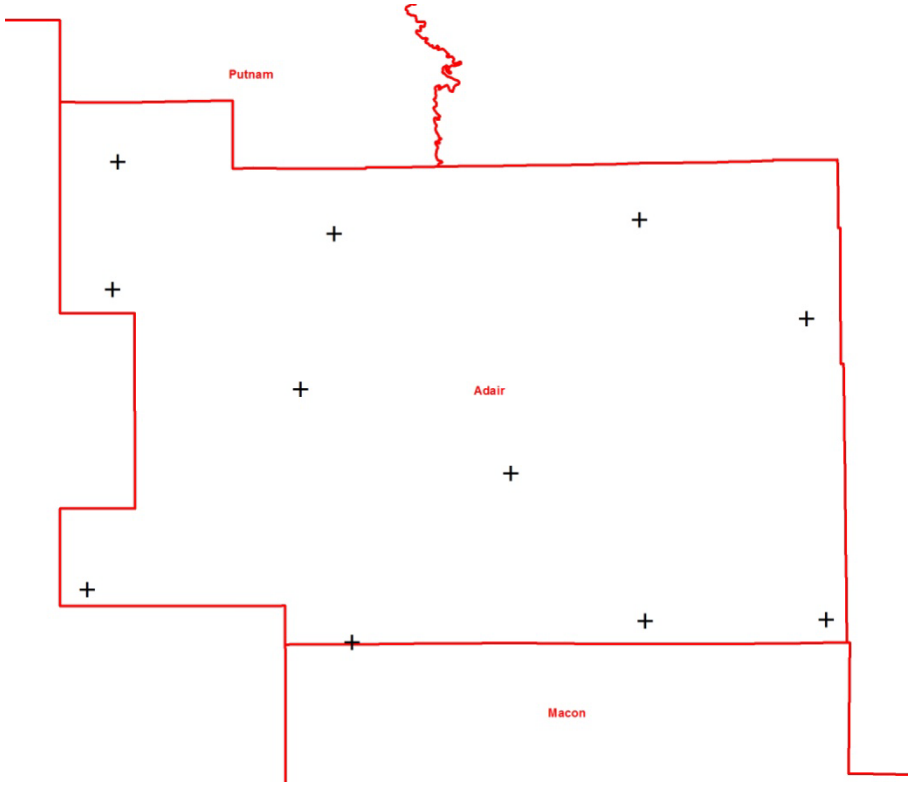


Figure 2 Adair Co. Swath LiDAR Control

Swath LiDAR Control Accuracy Results

The table below presents the results of the control accuracy analysis for the Adair Co., MO unclassified swath LAS data. All values are in meters.

Stat	Hard Surface (HS)
Count	11
RMSEz (FVA)	0.100
95% Confidence Level (FVA)	0.196

Adair Co. LiDAR QC Check

An additional set of survey points were collected for an independent QC of the Classified LAS & ESRI Grid deliverable tiles. The points were collected over the following feature types: 31 hard surface (HS), 34 grass (G) points & 30 tree (TR) points for a total of 95 qc check points. The graphic below presents these QC check points on the delivery area map.

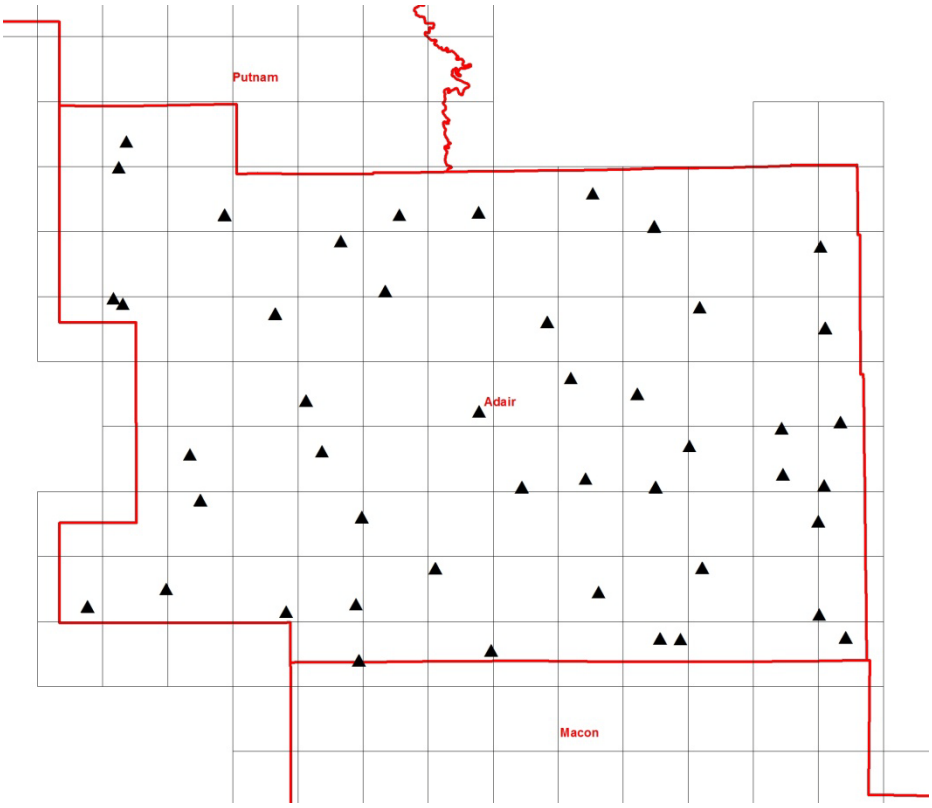


Figure 3 Adair Co. LiDAR QC Check

These points consisted of various types of ground cover including asphalt, gravel, short grass, tall grass and trees. Examples to the types of points surveyed are included below.






The required LiDAR elevation data values were derived within ArcGIS from the bare earth LAS files. For each control point location a LiDAR elevation value was derived and exported and the surface value subtracted from the survey elevation. These derived values were imported into Excel and comparisons were performed to generate statistics by ground cover type and for the overall dataset.

Classified LAS QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Adair Co., MO classified LAS tile data. All values are in meters.

Stat	Overall	Hard Surface (HS)	Grass (G)	Trees (TR)
Count	95	31	34	30
RMSEz (FVA)	0.114	0.121	0.100	0.120
95% Confidence Level (FVA)	0.223	0.238	0.196	0.236
95th Percentile (CVA & SVA)	0.199	0.192	0.196	0.214

As indicated above the LAS LiDAR surface meets hard surface Fundamental Vertical Accuracy (FVA) project specifications of RMSEz less than or equal to 12.5 cm, with an RMSEz of 12.1 cm. The FVA 95% confidence level of 24.5 cm or less was also meet with a value of 23.8 cm.

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Adair Co., MO derived bare-earth ESRI Grid DEM tile data. All values are in meters.

Stat	Overall	Hard Surface (HS)	Grass (G)	Trees (TR)
Count	95	31	34	30
RMSEz (FVA)	0.112	0.119	0.099	0.119
95% Confidence Level (FVA)	0.220	0.234	0.193	0.232
95th Percentile (CVA & SVA)	0.199	0.193	0.194	0.199

As indicated above the derived DEM LiDAR surface meets both Supplemental & Consolidated Vertical Accuracy (SVA & CVA) project specifications of 95th Percentile less than or equal to 36.3 cm.