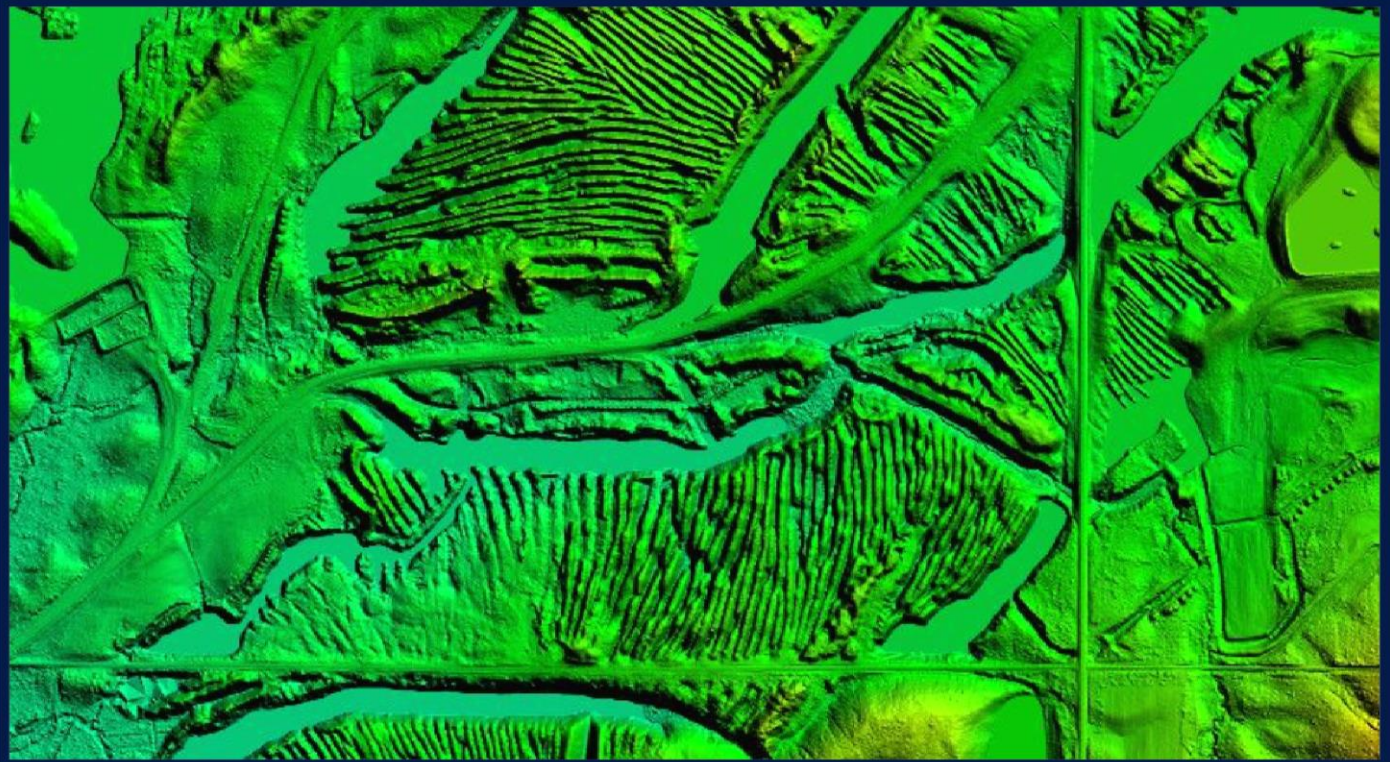




LIDAR ACCURACY REPORT

Project:	2015 ILHMP LiDAR Project
Report Area:	Bureau County, IL
Project No.:	U160014
Retainer Contract:	E0015873-R1
Date:	27-April-2016
Submitted by:	Wade Williams, C.P. Project Manager

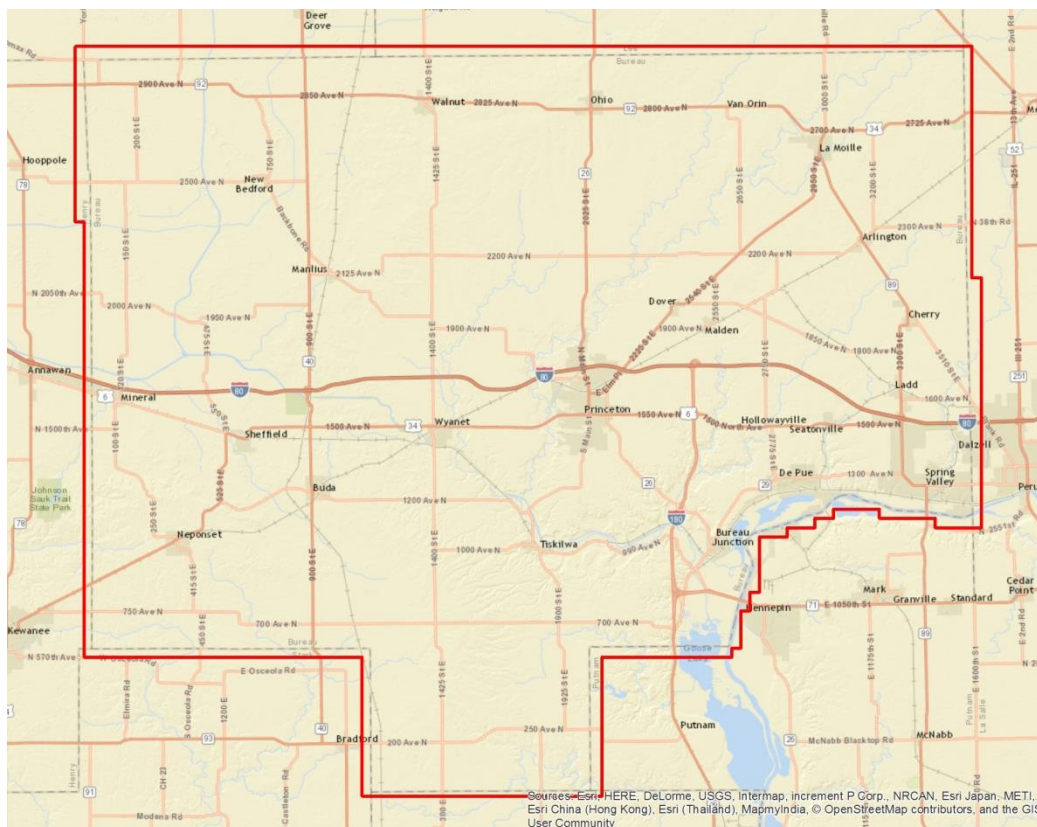


Project Overview

The University of Illinois contracted with Surdex Corporation in the spring of 2015 to collect high resolution LiDAR elevation data as part of a single county LiDAR Project. The purpose of the project was to acquire detailed surface elevation data for the Illinois Height Modernization Program (ILHMP) which is managed by the Illinois State Geological Survey (ISGS). The Bureau County project area totaled 875 square miles of coverage. Processing of the LiDAR data and bare-earth model followed USGS Base LiDAR Specifications V1.2 standards. Surdex tested that the deliverables meet or exceed Quality Level 2 (QL2) accuracy as stated in the USGS National Requirements for Enhanced Elevation Data. Non-Vegetated bare earth survey control points were collected by Surdex in order to calibrate the swath LAS data, the results are listed in the table on page 3. In addition, independent survey check points were collected on bare earth features, in brush, short and tall grass & under trees. In order to meet the Non-Vegetated Vertical Accuracy (NVA) project specifications the overall vertical accuracy of these points should be 10.0cm (0.328 feet) 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 (bare-earth, brush, short grass, tall grass & trees). 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 Bureau County IL. The project limits are presented in the graphics below. The project area consisted of 6,422 tiles sized 2,000' square, covering approximately 875 square miles of elevation data (county plus buffer for full tiles).

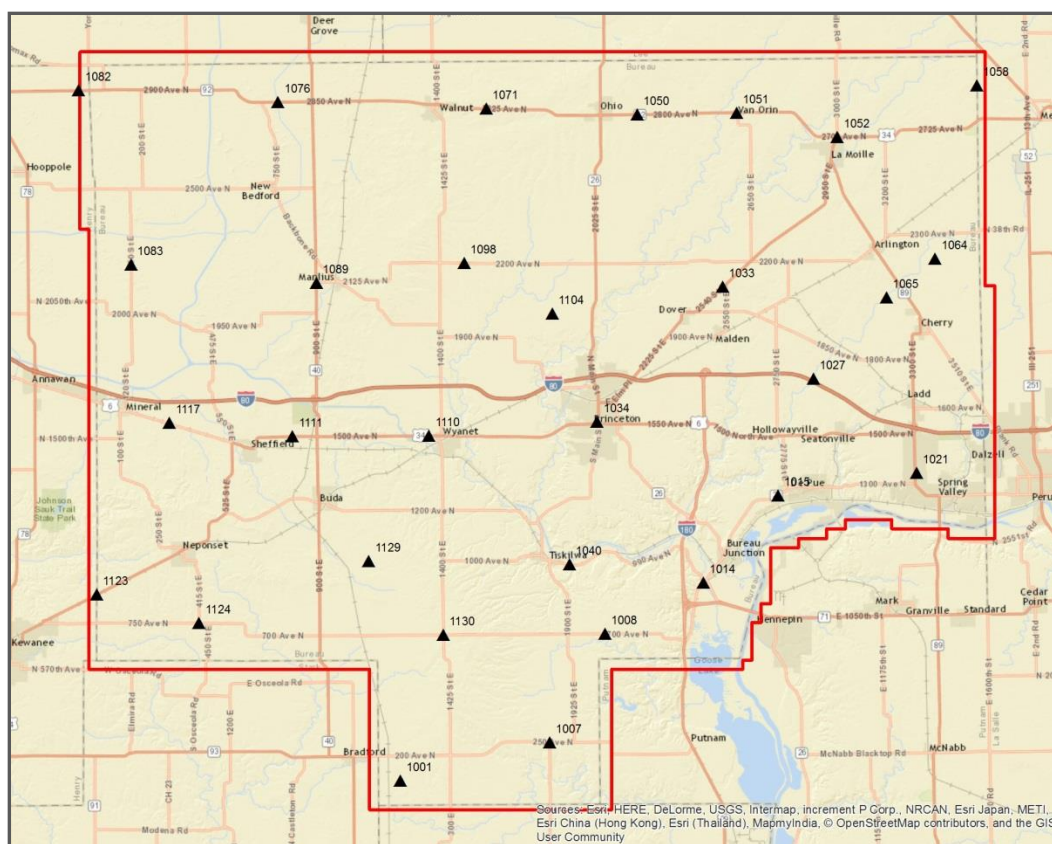


LiDAR Data Collection

The LiDAR elevation data for this project was collected December 4 to 9, 2015 with a Leica ALS70HP Aerial LiDAR sensor system mounted in a twin engine Cessna 335. The acquisition of LiDAR data lines was flown approximately 6,400' above mean sea level in a north-south alignment, with a perpendicular cross flight used for calibration purposes. The collection scenario called for the acquisition of a minimum contract point spacing of 0.67 meters on the ground.

Bureau Co. Swath LiDAR

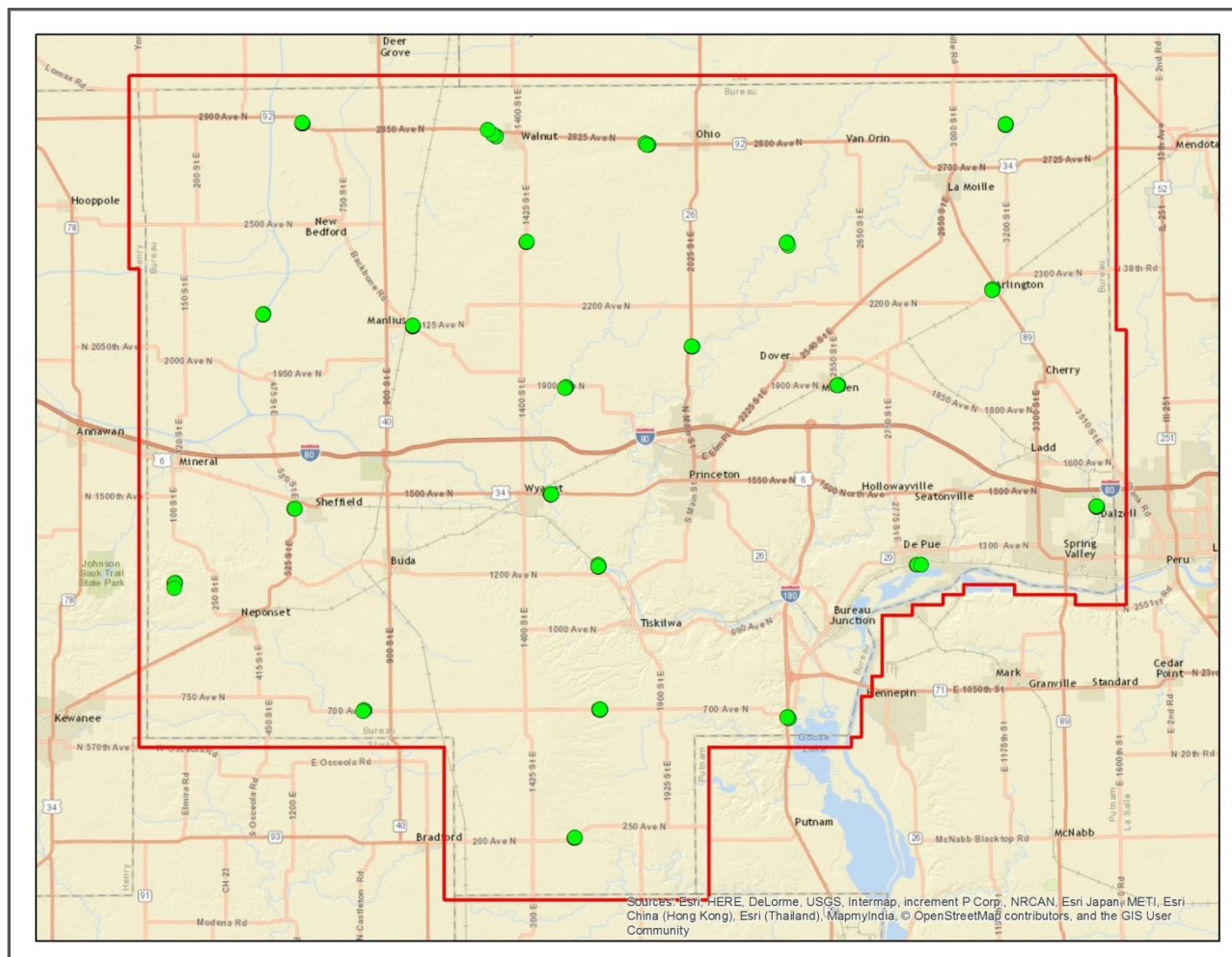
The field survey for this county consisted of 30 bare-earth control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points over the county. A complete copy of the results has been provided in the Accuracy folder, this chart shows the results.



Stat	Bare-Earth (BE)
Count	30
RMSEz (NVA) feet	0.152
95% Confidence Level (NVA) feet	0.298

Bureau Co. LiDAR QC Check

An additional set of survey check points were collected over the Bureau flight plan for an independent QC of the LiDAR as validated against the swath LAS & DEM deliverable tiles. The points were collected over the following feature types: 21 bare-earth points, 22 short grass points, 22 tall grass points, 20 tree & 20 brush points for a total of 105 QC check points in the county. The graphic below presents the distribution of QC check points over both counties.



These points consisted of various types of ground cover including bare-earth, brush, short grass, tall grass and trees. Examples of actual points surveyed in Bureau County are included below.



Brush –Point 1006b



Trees –Point 1004t



Short Grass – Point 1002sg



Tall Grass – Point 1003tg



Hard Surface – Point 1005hs

The required LiDAR elevation data values were derived within ArcGIS off the classified LAS and 4' gsd raster grids. For each QC 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. Values reported are in US Feet due to the fact that all data was processed in IL Stateplane, NAD83, West Zone however metric equivalents are stated in some cases.

As indicated above the Swath LiDAR LAS hard surface Non-Vegetated Vertical Accuracy (NVA) meets project specifications RMSEz less than or equal to 10.0 cm (0.328 feet) & 19.6cm (0.643 feet) at the 95-percent confidence level. The calculated bare-earth RMSEz equals 5.5 cm (0.182 feet) and 10.9 cm (0.357 feet) at the 95-percent confidence level.

In addition, the DEM grids Vegetated Vertical Accuracy (VVA) meet project specifications less than or equal to 29.4cm (0.965 feet) at the 95th percentile.

Swath LAS QC Accuracy Results

Stat	Bare Earth (BE)
Count	21
RMSEz (NVA) feet	0.182
95% Confidence Level (NVA) feet	0.357

Classified LAS QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the county. The data set was derived from the classified LAS tile data. All values are in US Feet.

Statistic	Overall	Bare Earth	Short Grass	Tall Grass	Trees	Brush
Count	105	21	22	22	20	20
RMSEz	0.252	0.174	0.195	0.273	0.261	0.330
95% CI	0.493	0.341	0.382	0.534	0.511	0.647
95th Percentile	0.501	0.268	0.348	0.478	0.500	0.610

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the county data set derived from the DEM grids. All values are in US Feet.

Statistic	Overall	Bare Earth	Short Grass	Tall Grass	Trees	Brush
Count	105	21	22	22	20	20
RMSEz	0.250	0.139	0.196	0.260	0.279	0.337
95% CI	0.490	0.272	0.383	0.509	0.547	0.661
95th Percentile	0.526	0.235	0.347	0.435	0.532	0.605