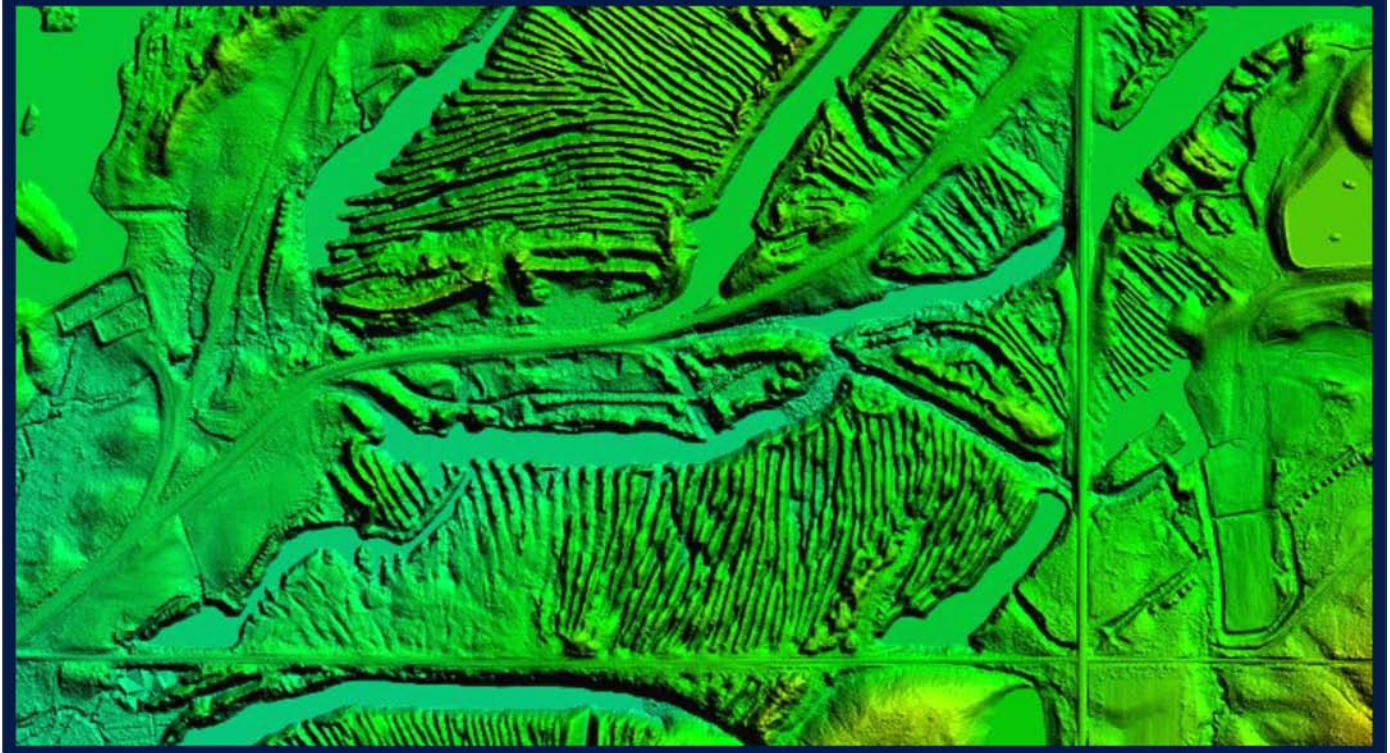




LIDAR ACCURACY REPORT

Project:	2015 ILHMP LiDAR Project
Report Area:	Jefferson-Marion Counties, IL
Project No.:	U15036
Retainer Contract:	E0015873-R1
Date:	19-August-2015
Submitted by:	Wade Williams, C.P. Project Manager

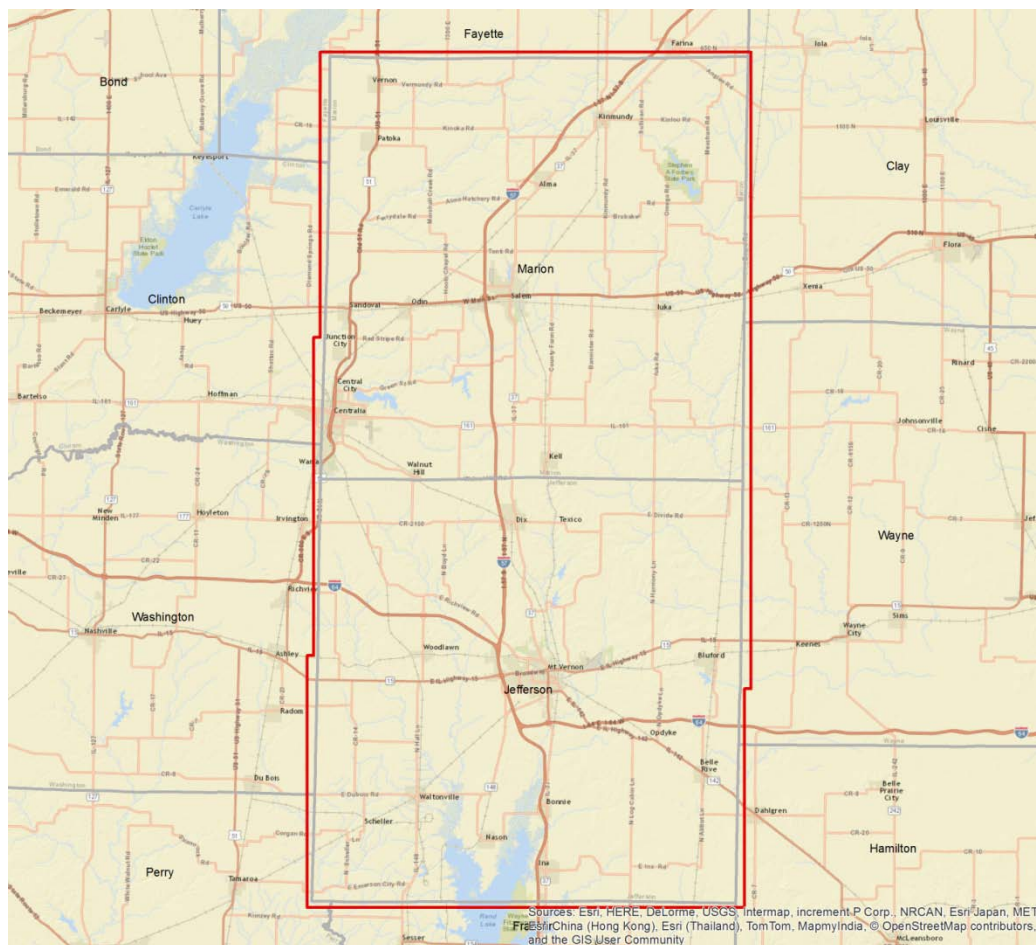


Project Overview

The University of Illinois contracted with Surdex Corporation in the spring of 2015 to collect high resolution LiDAR elevation data as part of a multiple 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). When combined, the two IL county (Jefferson & Marion) project area totaled over 1,215 square miles of coverage. Processing of the LiDAR data and bare-earth model followed USGS Base LiDAR Specifications V1.0 standards. Surdex tested that the deliverables meet or exceed Quality Level 3 (QL3) accuracy as stated in the USGS National Requirements for Enhanced Elevation Data. Non-Vegetated hard surface (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 hard surface features, in brush, short and tall grass & under trees for each county area. In order to meet the Non-Vegetated Vertical Accuracy (NVA) project specifications the overall vertical accuracy of these points should be 12.5cm (0.41 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 (hard surface, 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 Jefferson & Marion Counties IL. The project limits are presented in the graphics below. The project area consisted of 8,476 tiles sized 2,000' square, covering approximately 1,215 square miles of elevation data (county plus buffer for full tiles).

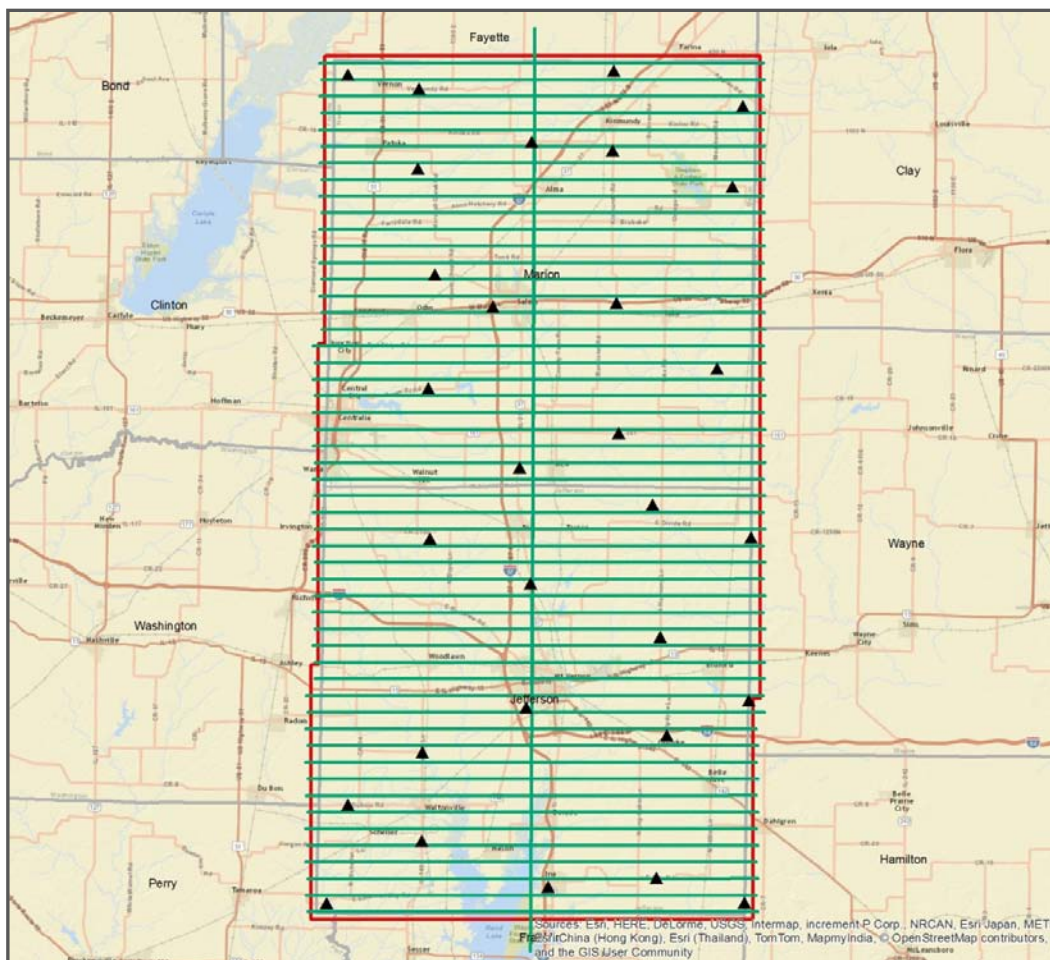


LiDAR Data Collection

The LiDAR elevation data for this project was collected January 24 to February 6, 2015 with a Leica ALS70HP Aerial LiDAR sensor system mounted in a twin engine Cessna 335. For efficiency purposes, this project design called for one combined flight plan for both Jackson and Perry Counties, with acquisition of LiDAR data with lines flown approximately 8,800' above mean sea level in an east-west alignment, with a perpendicular cross flight used for calibration purposes. The collection scenario called for the acquisition of a minimum contract point spacing of 0.95 meters on the ground.

Jefferson-Marion Co. Swath LiDAR Control

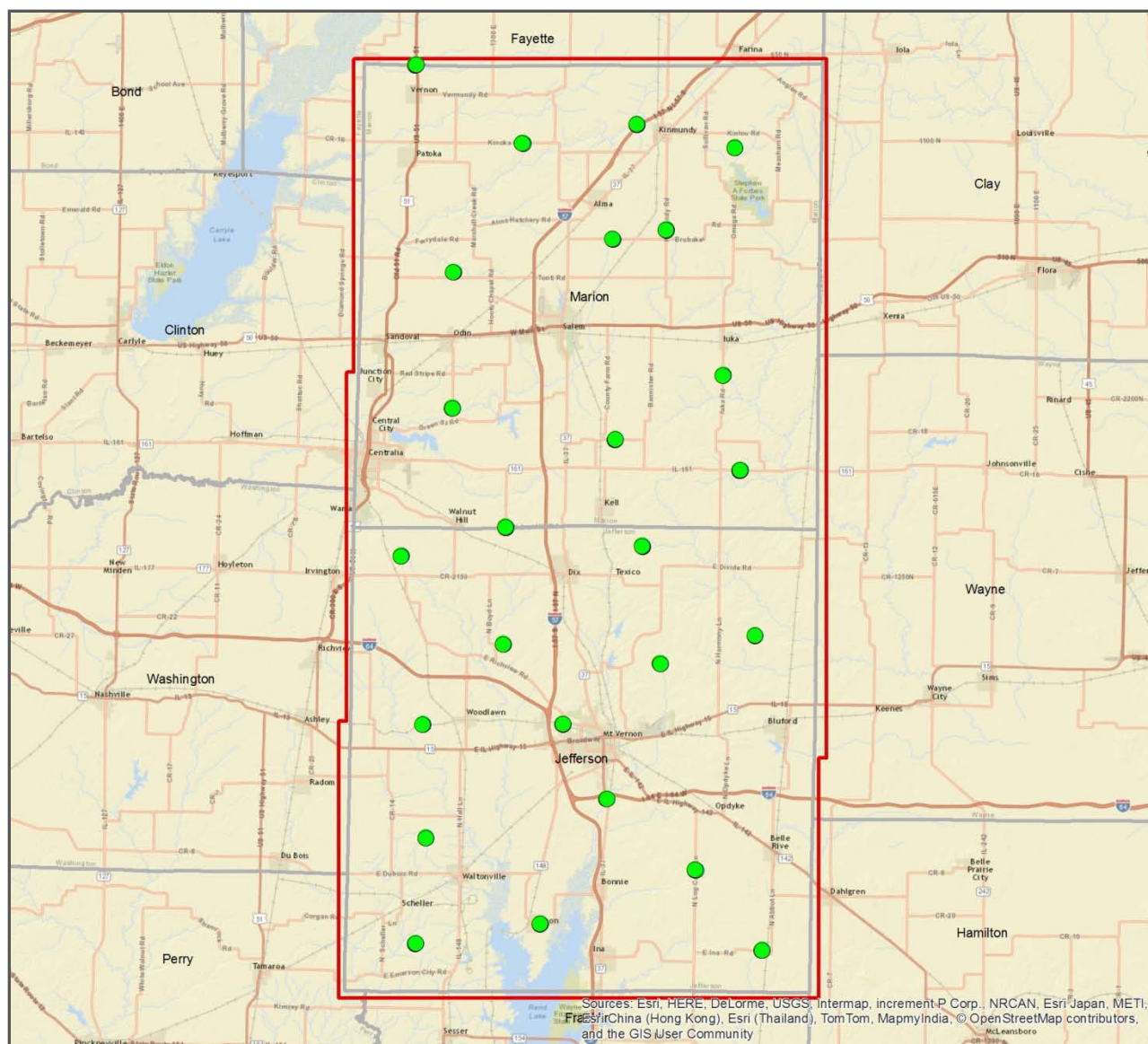
The field survey control for this two county area consisted of 26 hard surface (bare-earth) control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points over both counties. A complete copy of the results has been provided in the Accuracy folder, this chart shows the results.



Stat	Hard Surface (HS)
Count	26
RMSEz (NVA) feet	0.299
95% Confidence Level (NVA) feet	0.586

Jefferson-Marion Co. LiDAR QC Check

An additional set of survey check points were collected over the combined Jefferson-Marion flight plan for an independent QC of the LiDAR as validated against the classified LAS & DEM deliverable tiles. The points were collected over the following feature types: 33 hard surface points, 26 short grass points, 40 tall grass points, 26 tree & 25 brush points for a total of 150 QC check points in the two counties. The graphic below presents the distribution of QC check points over both counties.



These points consisted of various types of ground cover including hard surface, brush, short grass, tall grass and trees. Examples of actual points surveyed in Jefferson-Marion are included below.



Brush –Point 1009b



Trees –Point 1010t



Short Grass – Point 1002sg



Tall Grass – Point 1013tg



Hard Surface – Point 1001hs

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, East Zone however metric equivalents are stated in some cases.

As indicated above the classified LiDAR LAS hard surface Non-Vegetated Vertical Accuracy (NVA) meets project specifications RMSEz less than or equal to 12.5 cm (0.41 feet), with an RMSEz of 11.2 cm (0.369 feet overall RMSE).

In addition, the DEM grids Vegetated Vertical Accuracy (VVA) meet project specifications less than or equal to 36.3cm (1.191 feet).

Classified LAS QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Jefferson & Marion Counties., IL data set derived from the classified LAS tile data. All values are in US Feet.

Statistic	Overall	Hard Surface	Short Grass	Tall Grass	Trees	Brush
Count	150	33	26	40	26	25
RMSEz	0.514	0.369	0.439	0.484	0.557	0.714
95% CI	1.008	0.723	0.860	0.949	1.091	1.400
95th Percentile	0.989	0.738	0.771	0.858	0.972	1.113

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Jefferson & Marion Counties., IL data set derived from the DEM grids. All values are in US Feet.

Statistic	Overall	Hard Surface	Short Grass	Tall Grass	Trees	Brush
Count	150	33	26	40	26	25
RMSEz	0.504	0.353	0.442	0.474	0.548	0.697
95% CI	0.988	0.692	0.867	0.929	1.075	1.366
95th Percentile	0.932	0.675	0.786	0.827	0.912	1.077