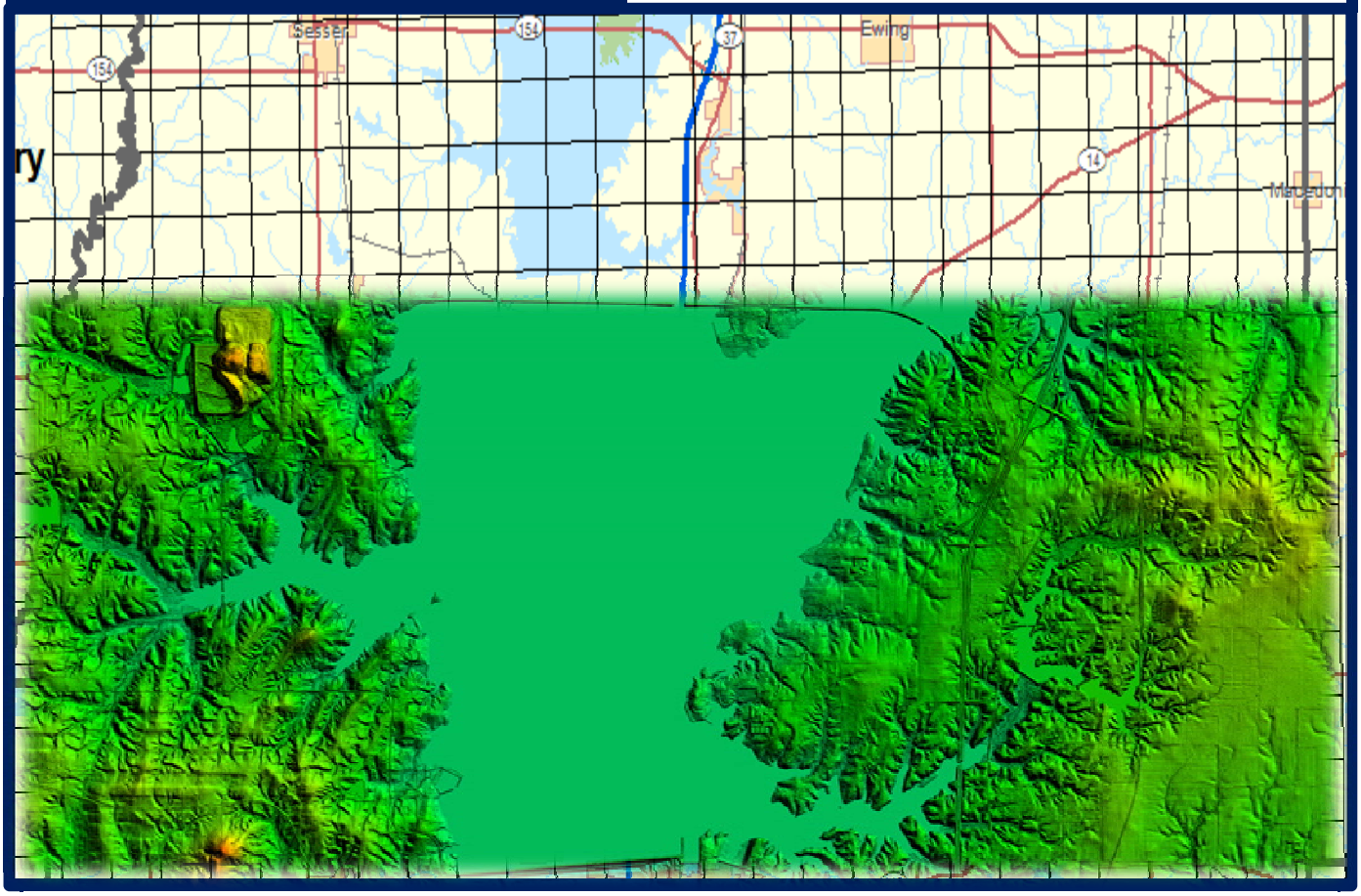
LiDAR ACCURACY REPORT

Project:	2014 ILHMP LiDAR Project
Report Area:	Franklin County, IL
Project No.:	U14113
Retainer Contract:	E0015873-R1
Date:	24-September-2014
Submitted by:	Tim Bohn, C.P., PMP Director of Project Management

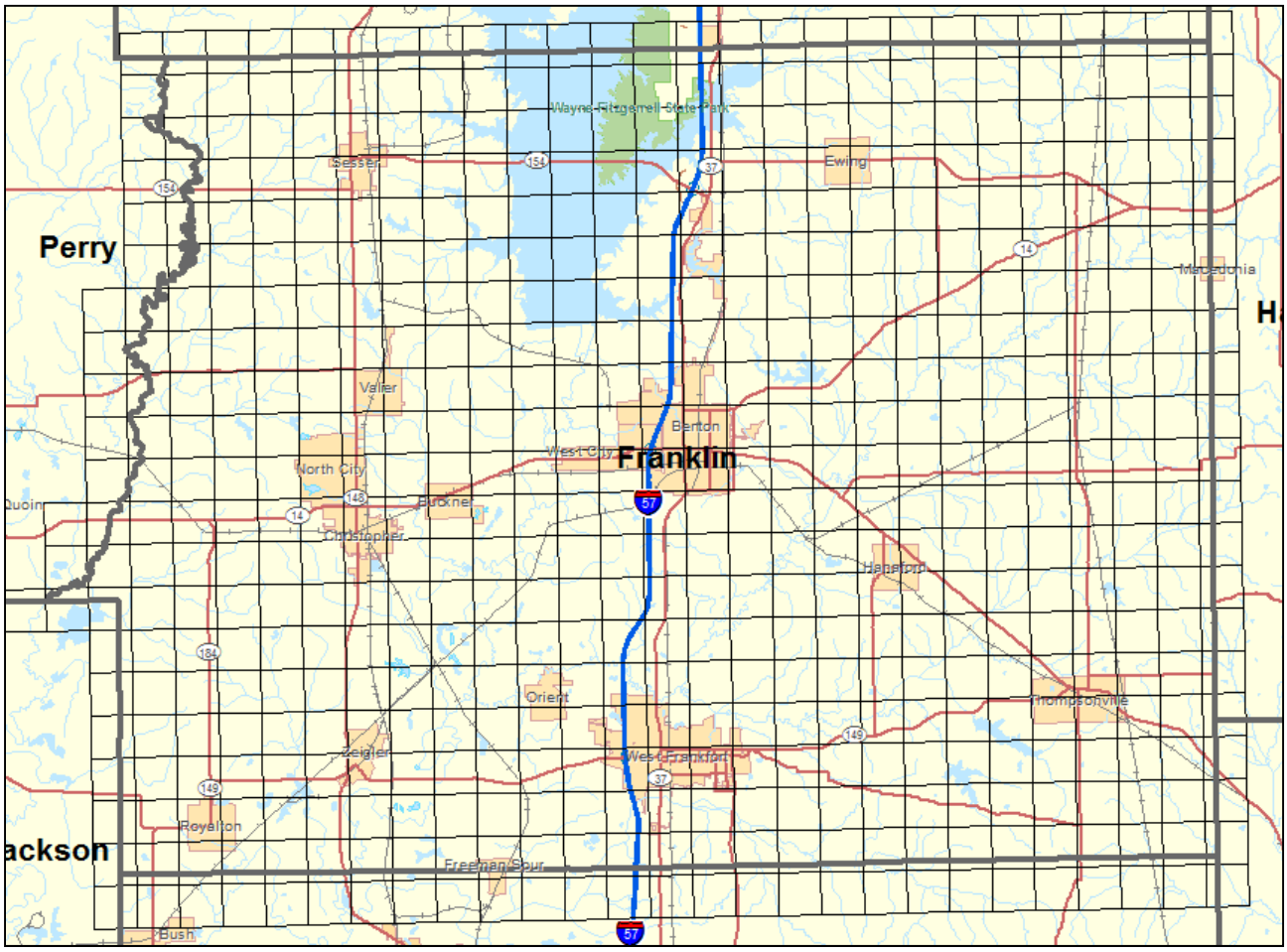


Project Overview

The University of Illinois contracted with Surdex Corporation in the spring of 2014 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 three IL county (Perry, Jackson and Franklin) project area totaled over 1,745 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. 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 Fundamental Vertical Accuracy (FVA) 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.

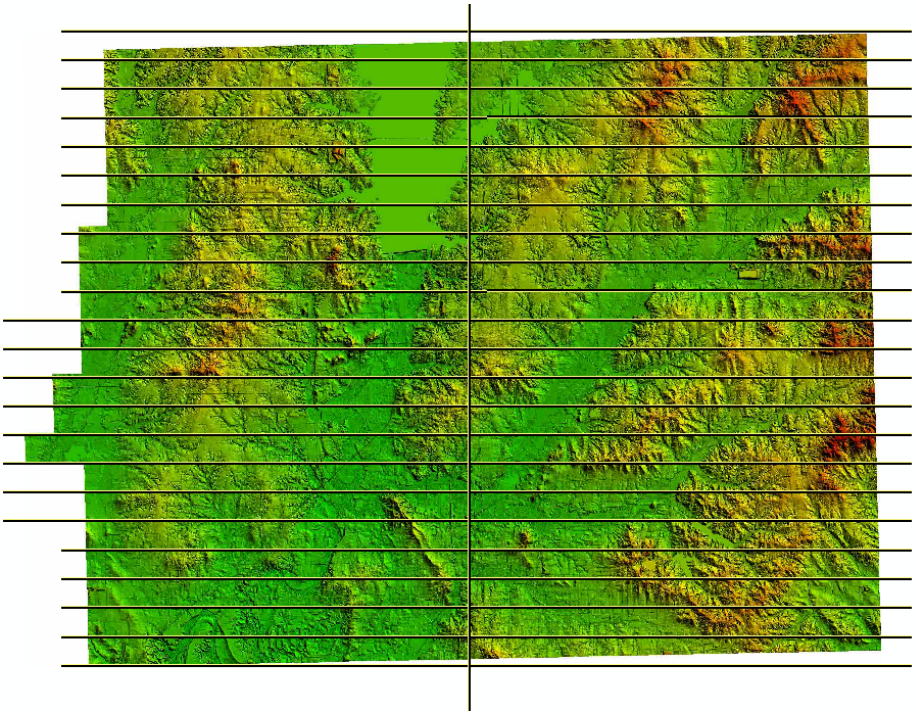
Delivery Area

This report covers the collection and processing of LiDAR elevation data over Franklin County IL. The project limits are presented in the graphics below. The project area consisted of 565 tiles sized 5,000' square, covering approximately 506 square miles of elevation data (county plus buffer for full tiles).



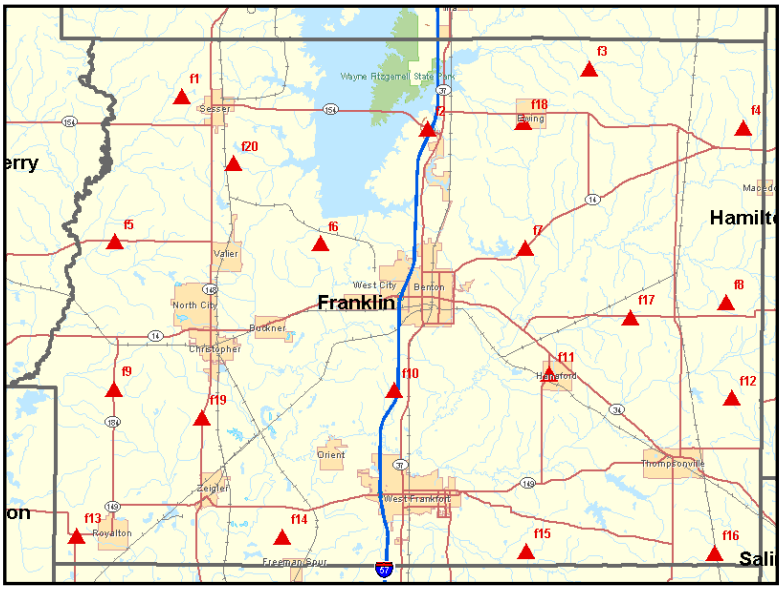
LiDAR Data Collection

The LiDAR elevation data for this project was collected April 17-20, 2014 with a Leica ALS70HP Aerial LiDAR sensor system mounted in a twin engine Cessna 335. The project design called for acquisition of LiDAR data with lines flown approximately 10,200' above mean sea level in an east-west alignment, with a perpendicular cross flight used for calibration purposes. The nominal collection scenario called for the acquisition of nominal point spacing of 0.95 meters on the ground.



Franklin Co. Swath LiDAR Control

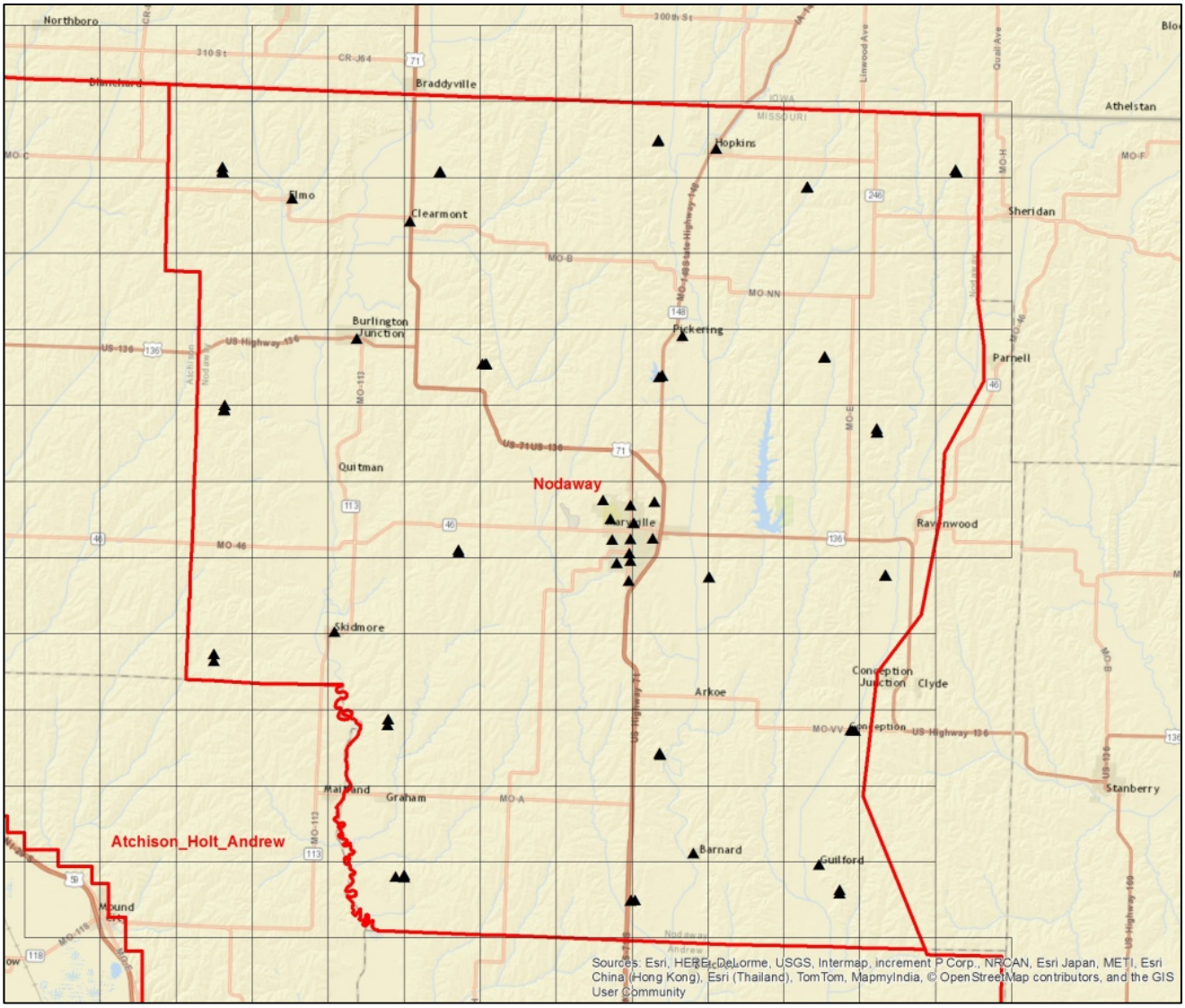
The field survey control for this delivery consisted of 22 hard surface (bare-earth) control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points over the county. A complete copy of the results has been provided in the Accuracy folder, this chart shows the results.



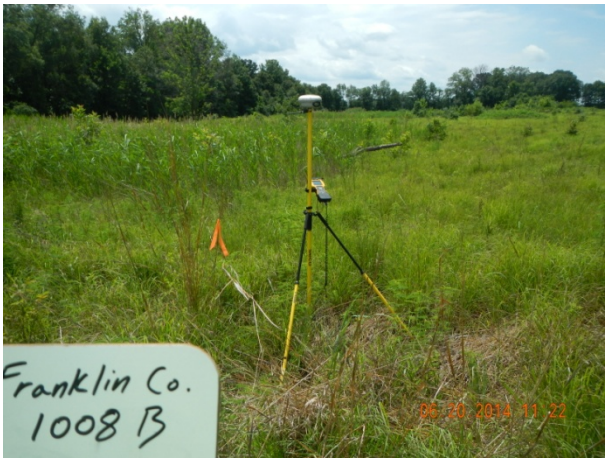
Count	22
Average	0.594
Minimum	0.315
Maximum	0.903
Root mean square	0.615
Std deviation	0.163

Franklin Co. LiDAR QC Check

An additional set of survey check points were collected for an independent QC of the LiDAR as validated against the DEM deliverable tiles. The points were collected over the following feature types: 26 hard surface points, 27 short grass points, 23 tall grass points, 20 tree & 20 brush points for a total of 116 QC check points. The graphic below presents the distribution of QC check points on the delivery area map.



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 Franklin County are included below.



Brush – Franklin point 1008

Trees – Franklin Point 1005

Short Grass – Franklin point 1001

Tall Grass – Franklin point 1004

Hard Surface – Franklin point 1007

The required LiDAR elevation data values were derived within ArcGIS off 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 LiDAR DEM meets hard surface Fundamental Vertical Accuracy (FVA) project specifications of RMSEz less than or equal to 12.5 cm (0.41 feet), with an RMSEz of 7.8 cm (0.256 feet overall RMSE).

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Franklin Co., IL derived bare-earth DEM tile data. All values are in US Feet.

Statistic	Overall	Hard Surface	Brush	Short Grass	Trees	Tall Grass
Count	116	26	20	27	20	23
RMSEz (FVA)	0.256	0.203	0.334	0.184	0.336	0.222