LiDAR ACCURACY REPORT

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Project:	2015 ILHMP LiDAR Project
Report Area:	Bond-Clinton-Washington Counties, IL
Project No.:	U15008
Retainer Contract:	E0016502-R2
Date:	8-September-2015
Submitted by:	Wade Williams, C.P. Project Manager
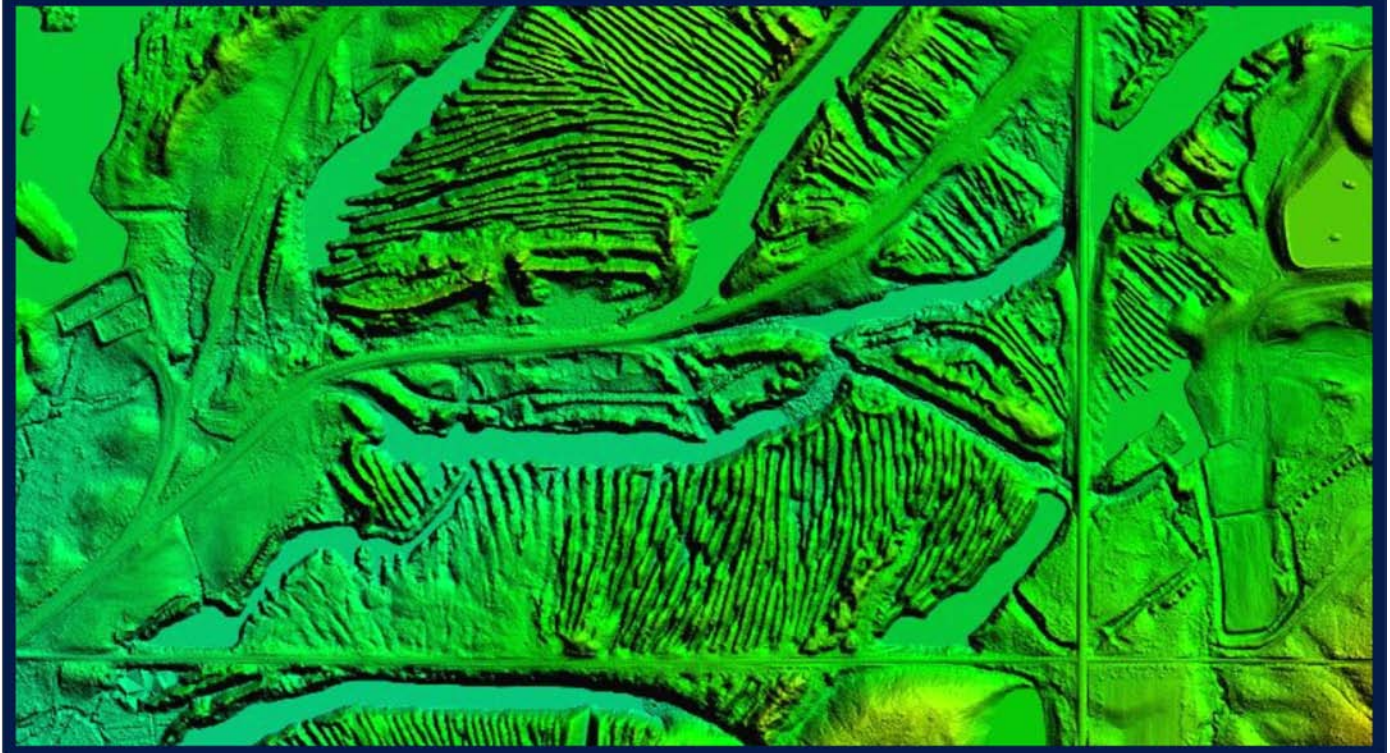
Project Overview

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 three IL county (Bond, Clinton & Washington) project area totaled over 1,617 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 Bond, Clinton & Washington Counties, IL. The project limits are presented in the graphics below. The project area consisted of 1,804 tiles sized 5,000' square, covering approximately 1,617 square miles of elevation data (county plus buffer for full tiles).
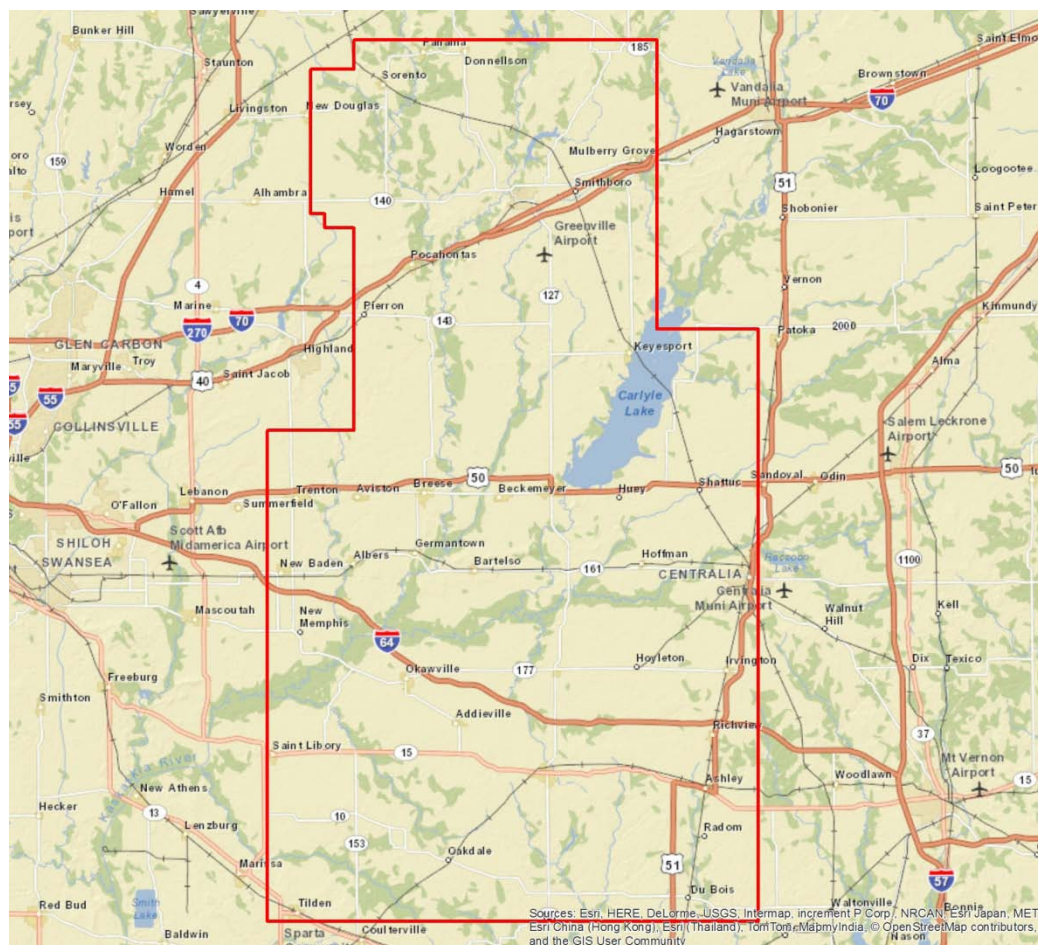
LiDAR Data Collection

The majority of the LiDAR elevation data for this project was collected from January 1 to January 20, 2015 with a Leica ALS70HP Aerial LiDAR sensor system mounted in a twin engine Cessna 335.   There were two reflight lines at the southern end of Washington County that were captured on March 15, 2015. For efficiency purposes, this project design called for one combined flight plan for all three counties, with acquisition of LiDAR data with lines flown approximately 9,200' 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.

Bond, Clinton & Washington Co. Swath LiDAR Control

The field survey control for this three county area consisted of 35 hard surface (bare-earth) control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points over the counties A complete copy of the results has been provided in the swath accuracy report table, this chart shows the results.
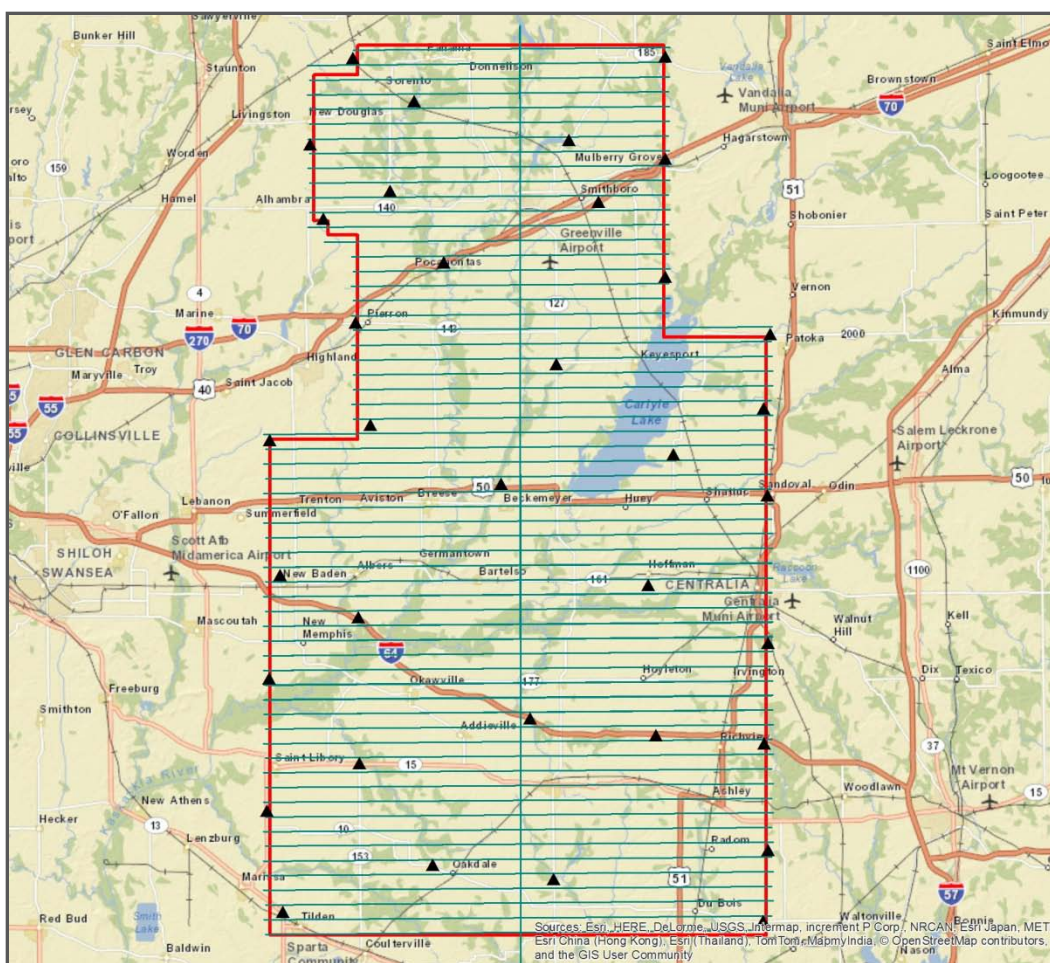

Stat	Hard Surface (HS)
Count	35
RMSEz (NVA) feet	0.249

95% Confidence Level (NVA) feet	0.488

Bond, Clinton & Washington Co. LiDAR QC Check

An additional set of survey check points were collected over the combined Bond, Clinton & Washington 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: 26 hard surface points, 24 short grass points, 26 tall grass points, 24 tree & 24 brush points for a total of 124 QC check points in the three counties. The graphic below presents the distribution of QC check points over the counties.
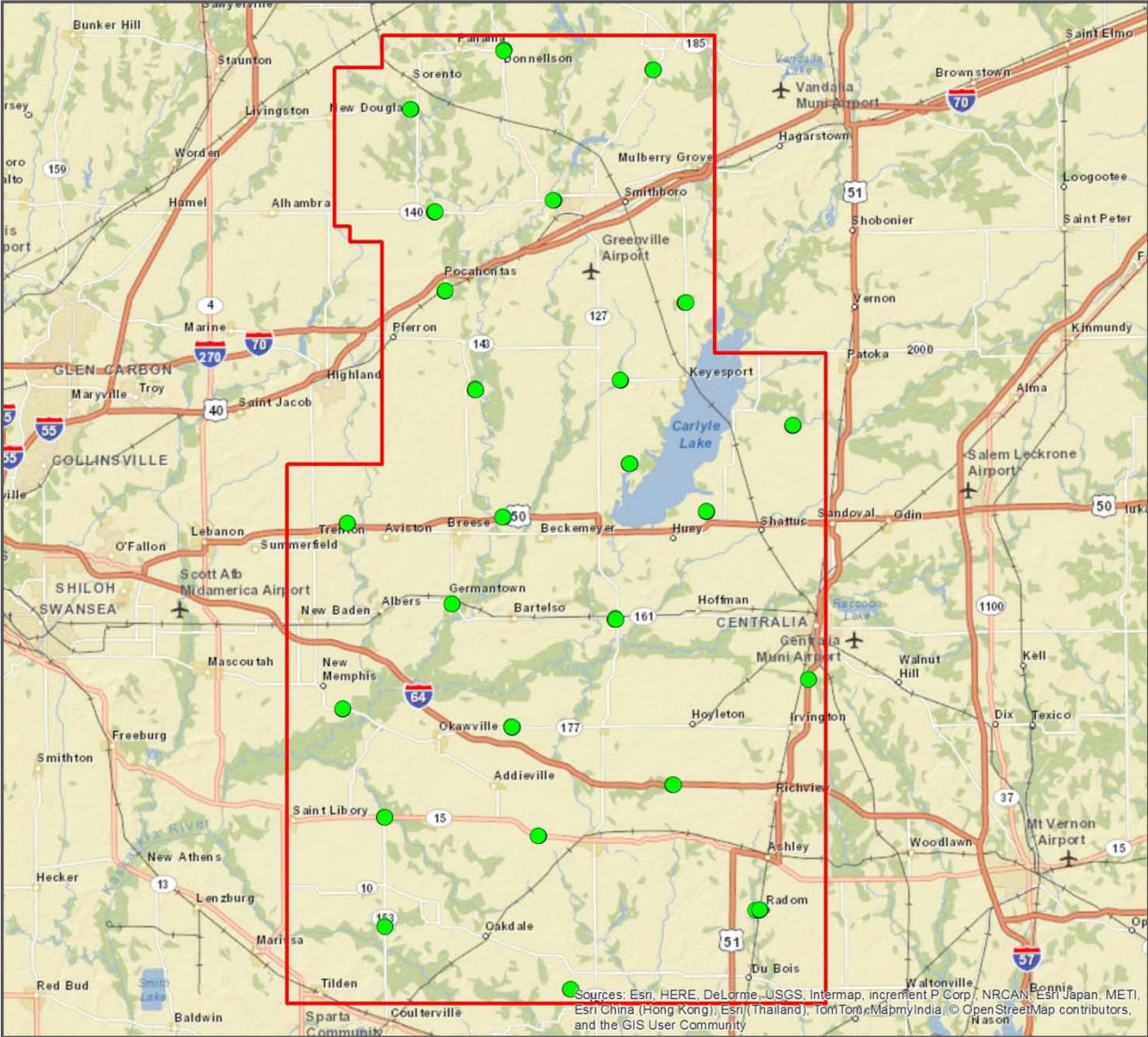
These points consisted of various types of ground cover including hard surface, brush, short grass, tall grass and trees. Examples of actual points surveyed in Bond, Clinton & Washington are included below.

Brush –Point 1009b

Trees –Point 1015t

Short Grass – Point 1006sg

Tall Grass – Point 1008tg

Hard Surface – Point 1007hs

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 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 6.24 cm (0.205 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 Bond, Clinton & Washington 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	124	26	24	26	24	24
RMSEz	0.374	0.205	0.263	0.243	0.501	0.540
95% CI	0.732	0.401	0.515	0.476	0.982	1.059
95th Percentile	0.788	0.388	0.555	0.419	0.821	0.955

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Bond, Clinton & Washington 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	124	26	24	26	24	24
RMSEz	0.364	0.204	0.247	0.236	0.476	0.539
95% CI	0.713	0.399	0.484	0.462	0.934	1.056
95th Percentile	0.776	0.397	0.525	0.412	0.790	0.952