

# Illinois Department of Transportation District 5, Douglas County LiDAR Acquisition Preliminary

Metadata also available as

## Metadata:

- [Identification Information](#)
- [Data Quality Information](#)
- [Spatial Data Organization Information](#)
- [Spatial Reference Information](#)
- [Metadata Reference Information](#)

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### *Identification\_Information:*

*Citation:*

*Citation\_Information:*

*Originator:* AeroMetric, Inc.

*Publication\_Date:* 20131011

*Title:*

Illinois Department of Transportation  
District 5, Douglas County LiDAR Acquisition  
Preliminary

*Geospatial\_Data\_Presentation\_Form:* remote-sensing image

*Publication\_Information:*

*Publication\_Place:* Sheboygan, WI

*Publisher:* AeroMetric, Inc.

*Description:*

*Abstract:*

This task order is for planning, acquisition, processing, and derivative products of LiDAR data to be collected for areas of Illinois. LiDAR data and derivative products produced in compliance with this task order are part of the data to be obtained under Job Number P-95-052-11.

Specifications listed below are based on the U.S. Geological Survey National Geospatial Program Base LiDAR Specification, Version 13.

*Purpose:*

LiDAR data was collected for the Illinois Department of Transportation. The Illinois Department of Transportation LiDAR Acquisition project is to acquire high accuracy bare-earth processed LiDAR data; to produce vector collection of water and drainage features, DAT files and Triangulated Integrated Network (TIN) files.

The data referenced here is part of Illinois District 5, is preliminary, and refers to Douglas

County, Illinois.

The data was collected as one project including all counties of Illinois District 5. LiDAR data was placed into a tile layout and later divided by county boundaries. The data referenced is part of Illinois District 5 collection but refers only to Douglas County.

Douglas County is 1080 square kilometers (417 square miles).

The project consists of airborne acquisition, post-processing, classification of LiDAR data, collection of water and drainage and creation of final deliverable products. All areas are collected at a nominal pulse spacing (NPS) of 1.0 meters based on UTM16, related to the North American Datum of 1983 HARN. Vertical accuracy is to achieve a RMSE of 0.61 feet or better in the "Open Terrain" land cover category. At the time of delivery of the Douglas County LiDAR data the ground survey measurements necessary for vertical accuracy calculations are incomplete.

*Supplemental\_Information:* This metadata is preliminary.

*Time\_Period\_of\_Content:*

*Time\_Period\_Information:*

*Range\_of\_Dates/Times:*

*Beginning\_Date:* 20120217

*Ending\_Date:* 20121116

*Currentness\_Reference:* ground condition

*Status:*

*Progress:* Complete

*Maintenance\_and\_Update\_Frequency:* As needed

*Spatial\_Domain:*

*Bounding\_Coordinates:*

*West\_Bounding\_Coordinate:* -88.475

*East\_Bounding\_Coordinate:* -87.935

*North\_Bounding\_Coordinate:* 39.882

*South\_Bounding\_Coordinate:* 39.649

*Keywords:*

*Theme:*

*Theme\_Keyword\_Thesaurus:* None

*Theme\_Keyword:* Light Detection and Ranging

*Theme\_Keyword:* LiDAR

*Theme\_Keyword:* Elevation

*Theme\_Keyword:* Breaklines

*Theme\_Keyword:* Shapefiles

*Theme\_Keyword:* Survey Control

*Theme\_Keyword:* Lift

*Theme\_Keyword:* LAS

*Theme\_Keyword:* Swath

*Theme\_Keyword:* DAT

*Theme\_Keyword:* TIN

*Place:*

*Place\_Keyword\_Thesaurus:* None

*Place\_Keyword:* US

*Place\_Keyword:* State

*Place\_Keyword:* IL

*Place\_Keyword:* Illinois

*Place\_Keyword:* Tuscola

*Place\_Keyword:* Douglas County

*Access\_Constraints:* None.

*Use\_Constraints:*

None. However, users should be aware that temporal changes may have occurred since this data set was collected and that some parts of this data may no longer represent actual surface conditions. This report is released as a draft or preliminary version. Users should not use this data for critical applications without a full awareness of its limitations.

Acknowledgment of the Illinois Department of Transportation, Bureau of Design and Environment, would be appreciated for products derived from these data.

*Point\_of\_Contact:*

*Contact\_Information:*

*Contact\_Person\_Primary:*

*Contact\_Person:* Amy Eller

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*Hours\_of\_Service:* unknown

*Contact\_Instructions:* none

*Data\_Set\_Credit:* AeroMetric, Inc.

*Native\_Data\_Set\_Environment:*

1. Scanner - Optech Gemini and Leica ALS70
2. Processing Programs and versions - Applanix POSGPS and POSProc, versions 4.4, MMS version 5.2 and IPAS TC 3.2
3. Program and version - Optech ASDA and Alspp 2.75
4. Processing Programs and versions - TerraSolid TerraScan (version 013.012), TerraModeler (version 013.005) and TerraMatch (version 013.005), Geopak (version 08.01.00.07), Intergraph MicroStation (version 08.05.02.70), and GeoCue (version 2012.1.27.7)
5. Viewing Program - GlobalMapper V12.00

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*Data\_Quality\_Information:*

*Attribute\_Accuracy:*

*Attribute\_Accuracy\_Report:*

Project data was collected as one project including all counties of Illinois District 5. LiDAR data was placed into a tile layout and later divided by county boundaries.

*Logical\_Consistency\_Report:* None.

*Completeness\_Report:* Complete

*Positional\_Accuracy:*

*Horizontal\_Positional\_Accuracy:*

*Horizontal\_Positional\_Accuracy\_Report:*

All data were acquired at or below 1600 meters above mean terrain (AMT) and have a horizontal accuracy of 0.30 meters (per manufacturers system specifications), with a nominal point spacing of 1.0 meters.

*Vertical\_Positional\_Accuracy:*

*Vertical\_Positional\_Accuracy\_Report:*

The vertical accuracy of the data has a requirement to achieve a Fundamental Vertical Accuracy (FVA) of 1.19 ft at 95% confidence level based on an RSMEz x 1.960 in "open terrain" as defined by National Standards for Spatial Data Accuracy (NSSDA); assessed and reported using National Digital Elevation Program (NDEP)/ASPRS Guidelines. Further, the data requires a Consolidated Vertical Accuracy (CVA) of 1.19 ft at 95th Percentile and a target value for Supplemental Vertical Accuracy (SVA) of 1.19 ft at 95th Percentile.

The ground survey data for District 5 is not available. Vertical assessment of the LiDAR data will be evaluated at a later date and this metadata will be released in final form.

*Lineage:*

*Process\_Step:*

*Process\_Description:*

The LiDAR data was acquired using AeroMetric's or a vendor's twin engine fixed wing aircraft equipped with LiDAR systems. The LiDAR systems include a differential GPS unit and inertial measurement system to provide superior accuracy.

Acquisition parameters:

1. Flight Height - 1600 meters above mean terrain (AMT)
2. Swath Width - 40 degrees
3. Sidelap - 50%
4. Nominal Post Spacing - 1.0 meters

GPS and IMU processing parameters:

1. Maximum baseline length - Not greater than 100 kilometers.
2. Number of base stations during LiDAR collection - A minimum of 1.
3. Maximum positional RMS of trajectory during LiDAR collection - 0.10 meters
4. IMU processing monitored for consistency and smoothness - Yes.

Point Cloud Processing:

1. Horizontal Datum - North American\_1983/HARN
2. Horizontal Coordinates - NAD 1983 HARN StatePlane Illinois East FIPS 1201 in feet.
3. Vertical Datum - North American Vertical Datum of 1988
4. Geoid Model used to reduce satellite derived elevations to orthometric heights - NGS Geoid09.

### LiDAR Processing:

1. Point Cloud data is imported to TerraScan in a Microstation V8 (V) CAD environment on a specified 2000 feet by 2000 feet tiling scheme.
2. Analyze the data for overall completeness and consistency. This is to ensure that there are no voids in the data collection.
3. Inspect for calibration errors in the dataset using the TerraMatch software by sampling the data collected across all flight lines and classifying the individual lines to ground. The software will use the ground-classified lines to compute corrections (Heading, Pitch, Roll, and Scale).
4. Orientation corrections (i.e. Calibration corrections) are then applied (if needed) to the entire dataset.
5. Automatic ground classification is performed using algorithms with customized parameters to best fit the project area. Several areas of varying relief and planimetric features were inspected to verify the final ground surface.
6. AeroMetric, Inc. performed Quality Assurance and Quality Control (QA/QC) for this project by comparing field observed points in 'open terrain' land cover category to LiDAR data set points. TerraScan's Output Control Report (OCR) was used to compare the QA/QC data to the LiDAR data. This routine searches the LiDAR dataset by X and Y coordinates finding the closest LiDAR point and comparing the vertical (Z) values to the known data collected in the field. Based on the QA/QC data, a bias adjustment was determined, and the results were applied (if necessary) to the LiDAR data.
7. After the LiDAR data is finalized for vertical placement, a macro is run via TerraScan to output a dataset generated on a per swath basis as part of the final deliverables. All points of the swath are reclassified to class 0 during this step.
8. Each tile is reviewed for accuracy and consistency of the macro ground classification. During this phase, MicroStation is used to generate line work representing water bodies and rivers. Separate line work is also placed in instances where overpasses have blocked enough valid ground returns or water gave too few ground returns to reasonably portray the ground surface. A proprietary in-house software program is then run to drape the river line work in a flowing fashion. Contours are generated on the river breaklines to review monotonicity of the draped line work.
9. Once the automatic processing and the testing of LiDAR is complete, AeroMetric meticulously reviews the generated bare-earth surface data to ensure that proper classification was achieved as part of a Quality Control process. Point classification follows the standard established by The American Society for Photogrammetry and Remote Sensing (ASPRS) for LAS data:  
Code 1 Processed, but unclassified / non-ground  
Code 2 Ground  
Code 7 Noise / Low Points  
Code 9 Water  
Code 10 Ignored Ground (Breakline proximity)
10. Final deliverables are generated and output to a client specified 2000 feet by 2000 feet tiling scheme.
11. On a per tile basis, data files and Triangulated Integrated Network (TIN) files are

generated by processing the finalized line work along with bare earth LiDAR points through a Geopak macro. Subsequent files are reviewed for adherence and completeness to the data and tile layout used during the creation process.

*Process\_Date*: 201309

*Cloud\_Cover*: Unknown

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*Spatial\_Data\_Organization\_Information:*

*Direct\_Spatial\_Reference\_Method*: Point

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*Spatial\_Reference\_Information:*

*Horizontal\_Coordinate\_System\_Definition:*

*Planar:*

*Grid\_Coordinate\_System:*

*Grid\_Coordinate\_System\_Name*: State Plane Coordinate System 1983

*State\_Plane\_Coordinate\_System:*

*SPCS\_Zone\_Identifier*: 1201 Illinois State Plane East

*Transverse\_Mercator:*

*Scale\_Factor\_at\_Central\_Meridian*: 0.999975

*Longitude\_of\_Central\_Meridian*: 88.3333

*Latitude\_of\_Projection\_Origin*: 36.66666

*False\_Easting*: 984250.0

*False\_Northing*: 0

*Planar\_Coordinate\_Information:*

*Planar\_Coordinate\_Encoding\_Method*: coordinate pair

*Coordinate\_Representation:*

*Abscissa\_Resolution*: 0.01

*Ordinate\_Resolution*: 0.01

*Planar\_Distance\_Units*: survey feet

*Geodetic\_Model:*

*Horizontal\_Datum\_Name*: North American Datum of 1983/HARN

*Ellipsoid\_Name*: Geodetic Reference System 80

*Semi-major\_Axis*: 6378137

*Denominator\_of\_Flattening\_Ratio*: 298.257222101

*Vertical\_Coordinate\_System\_Definition:*

*Altitude\_System\_Definition:*

*Altitude\_Datum\_Name*: North American Vertical Datum of 1988

*Altitude\_Resolution*: 0.1

*Altitude\_Distance\_Units*: feet

*Altitude\_Encoding\_Method:*

Explicit elevation coordinate included with horizontal coordinates

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*Metadata\_Reference\_Information:*

*Metadata\_Date*: 20131011

*Metadata\_Contact:*

*Contact\_Information:*

*Contact\_Organization\_Primary:*

*Contact\_Organization:* AeroMetric, Inc.  
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*Metadata\_Standard\_Name:* FGDC Content Standard for Digital Geospatial Metadata  
*Metadata\_Standard\_Version:* FGDC-STD-001-1998