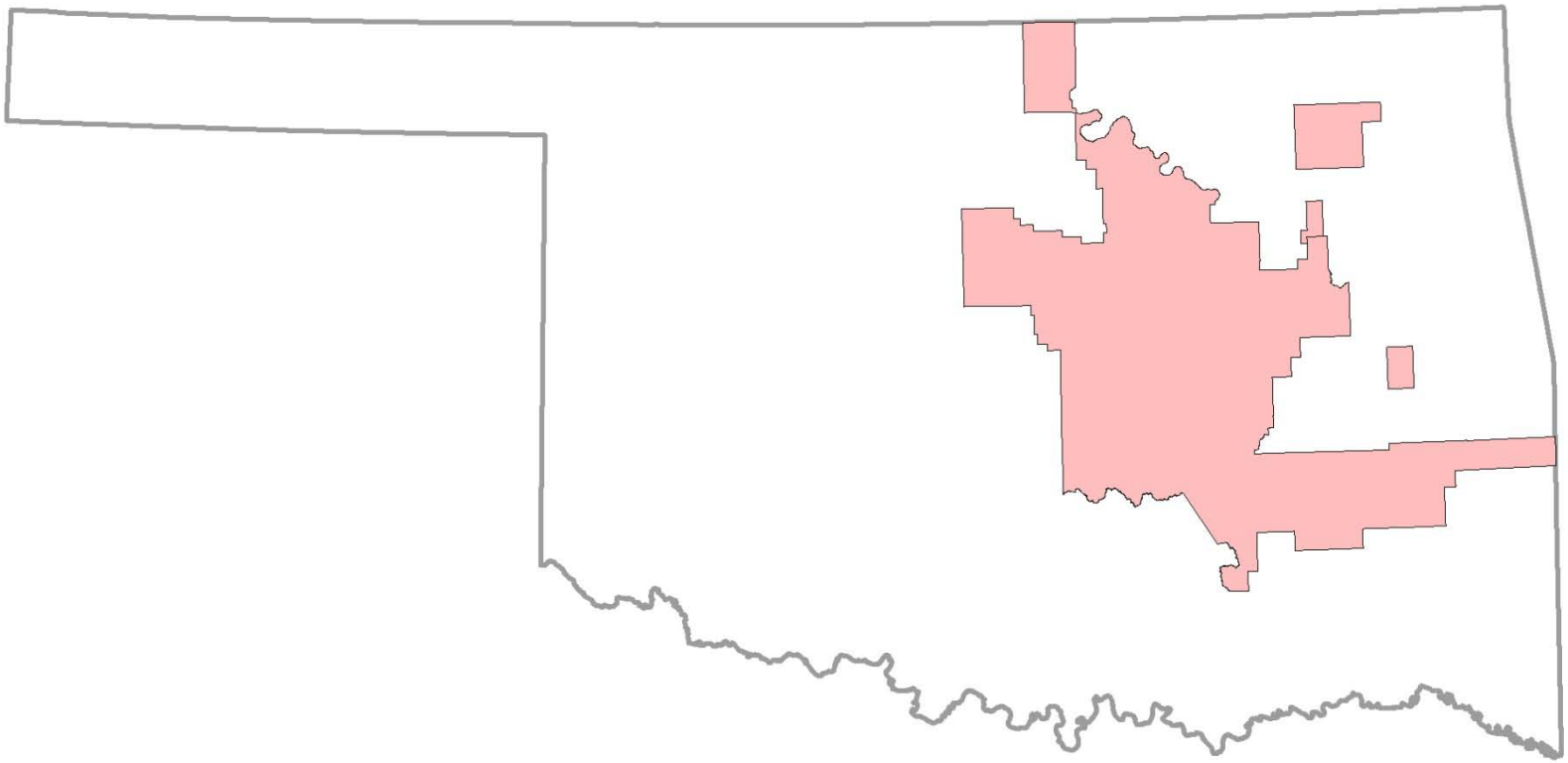
OKSCAUG Conference



2012 Oklahoma Area 1 LiDAR Project

September 25, 2012

2012 MO LiDAR Project

Presenter

- Brian Stinson, BrianS@surdex.com
  Business Development

2012 MO LiDAR Project

Presentation Topics

- Project Overview
- LiDAR Acquisition
- Survey Ground Control
- Accuracy Results
- LiDAR Data Post Processing
- Hydro Enforced Breaklines
- Project Deliverables
- Data Availability

2012 MO LiDAR Project

Project Client

Oklahoma USDA-NRCS

Chris Stoner, Chris.Stoner@ok.usda.gov

NRCS Natural Resources Conservation Service

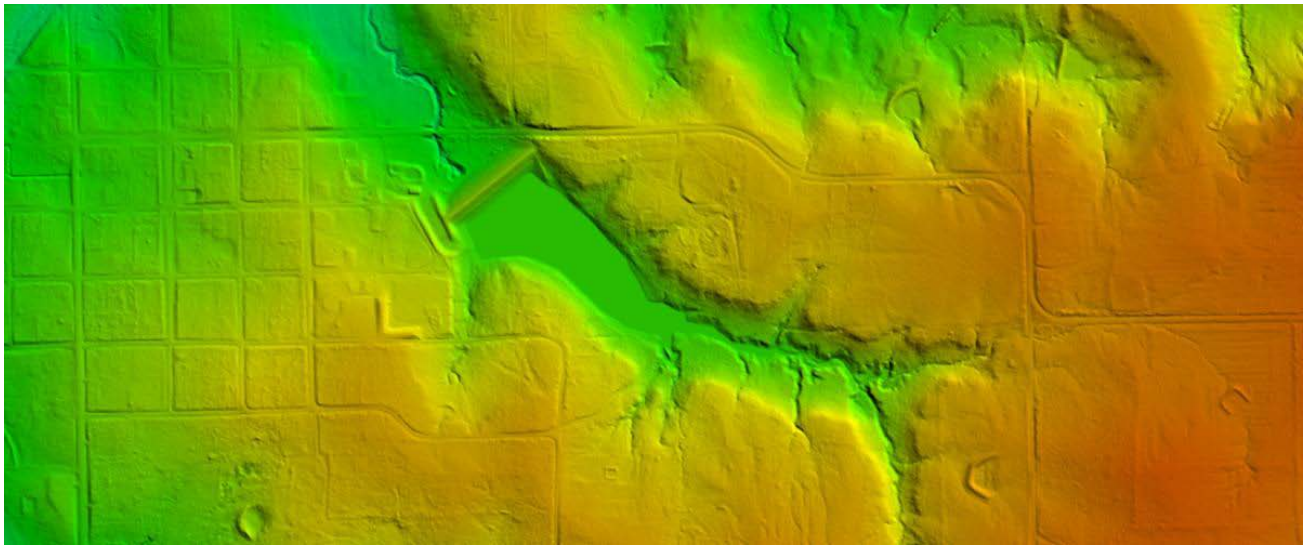
URS Corporation (*Contract Manager*)

Jennifer Williams, Jennifer.Williams@urs.com

2012 MO LiDAR Project

Project Overview

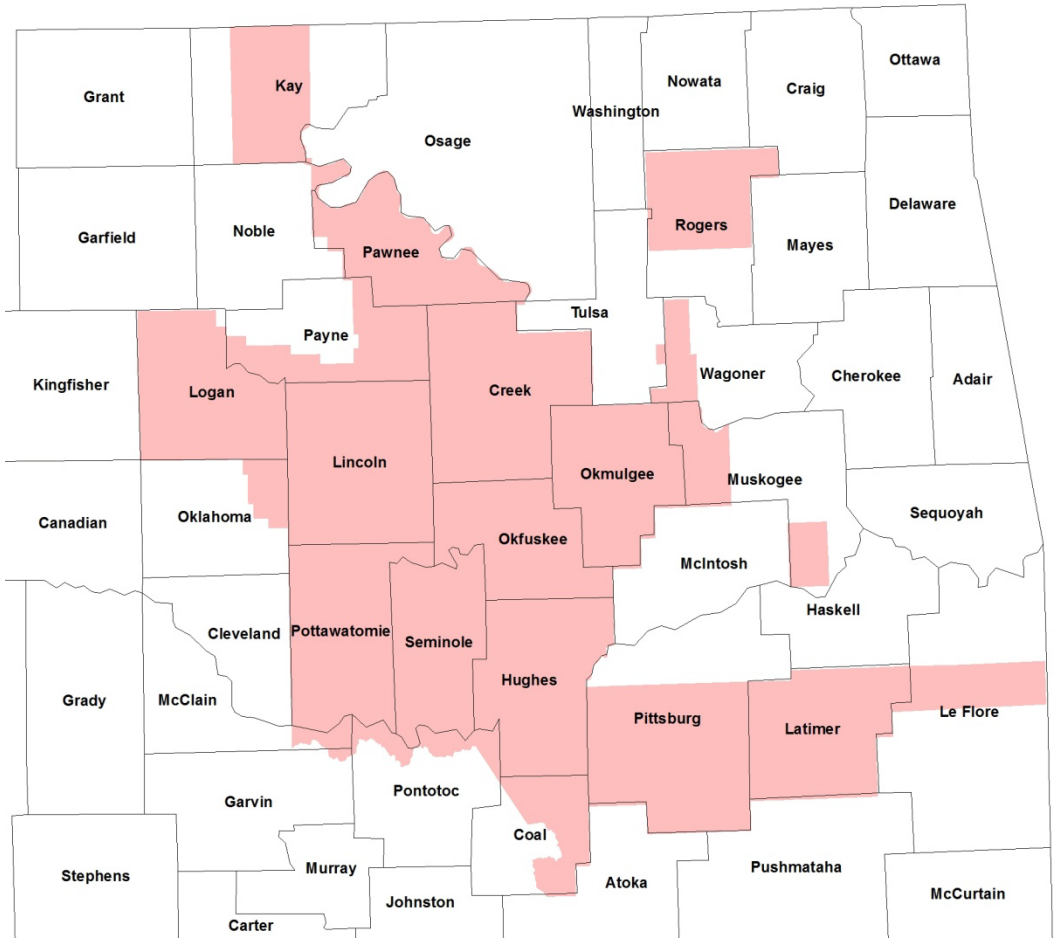
- Referred to as Area 1 & AML 1-3 LiDAR Project
- Project Area: portions of 21 Oklahoma Counties totaling 11,100 square miles
- Purpose: high resolution LiDAR data of various watersheds to generate digital elevation models for use in hydraulic/hydrologic modeling



2012 MO LiDAR Project

Project Coverage

- Portions of 21 Oklahoma Counties were covered



2012 MO LiDAR Project

Project Specifications

- 1.4 meter LiDAR nominal post spacing
- Collected leaf-off, snow-free, water at normal or below normal levels
- Data accuracies follow NDEP guidelines for NSSDA of 95% confidence level for 2’ contours and ASPRS Class 1 Standards (vertical accuracy of 18.5cm RMSEz)
- ASPRS LAS format V1.2

2012 MO LiDAR Project

LiDAR Acquisition

- Cessna 335 & 406
- Leica ALS50-II

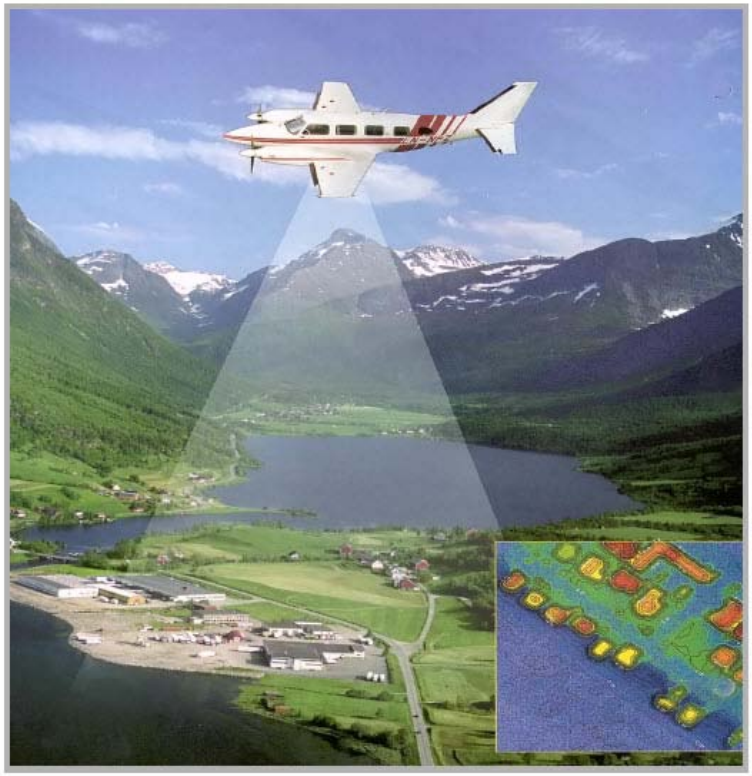
Performance Specifications

- **Operating Altitude** 200m – 6000m AGL
- **Accuracy** (see graph at right, example for 40-degree FOV, including 10cm GPS error)
- **Number of Returns** 4 (first, second, third, last)
- **Number of Intensities** 3 (first, second, third)
- **Intensity Digitization** 8 bit intensity + 8-bit AGC level + continuously variable laser output
- **Maximum FOV** 75 degrees full angle
- **Roll Stabilization** automatic adaptive, range = 75 minus current FOV
- **Laser Divergence** 0.22mr @ $1/e^2$ (~0.15mr @1/e)
- **Recording Media** 300GB HDD (~17 hours at maximum pulse rate)
- **Waveform Profiling** 8 bits @ 1nsec interval @ 50kHz (option)

2012 MO LiDAR Project

LiDAR Acquisition

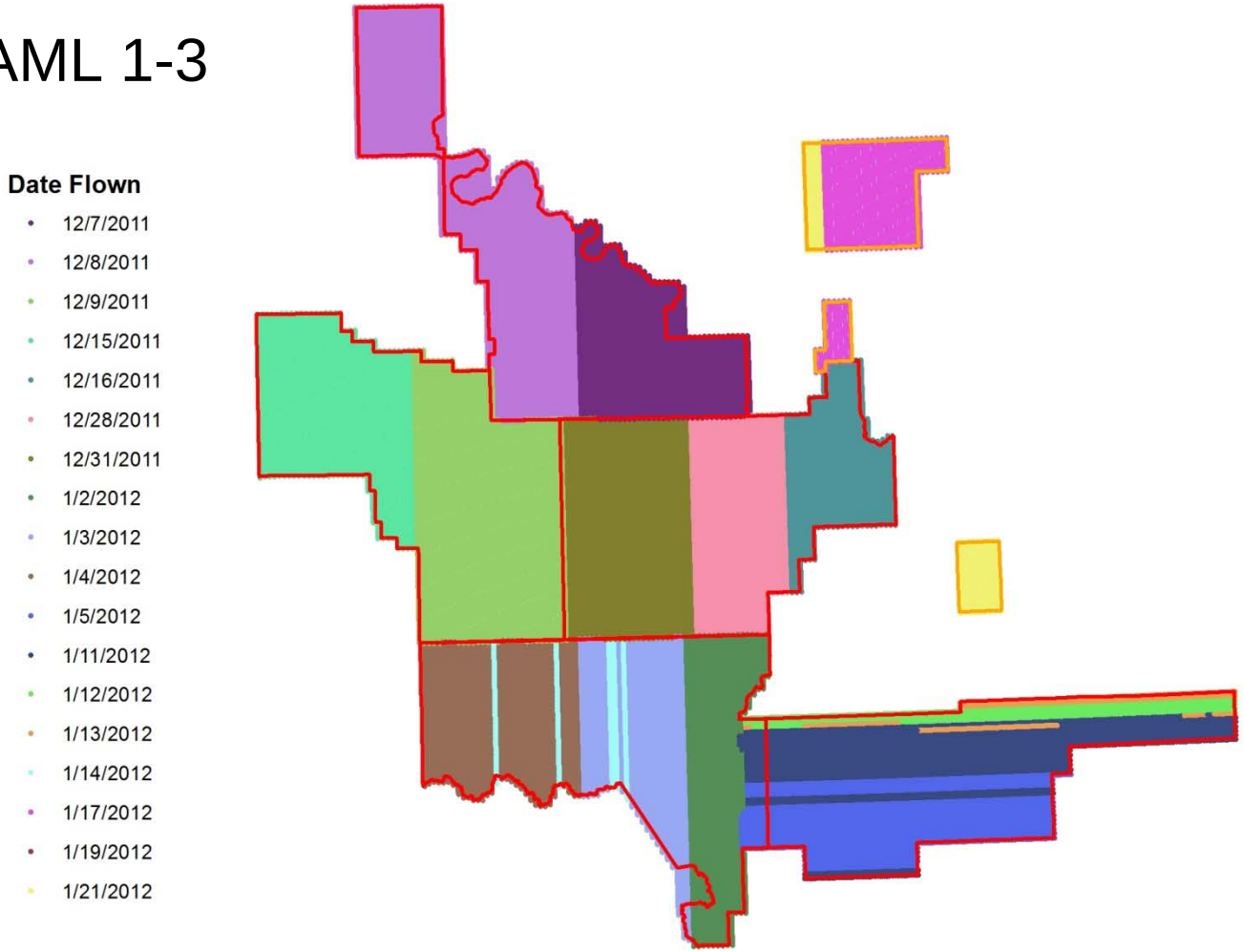
- Data Acquired from December 7, 2011 - January 21, 2012
- Flight Altitude ~8,500’ AGL
- Airspeed: ~170 knots
- Average Point Spacing: 1.4m
- Returns Per Pulse: 4+ Intensity
- Field of View: 40 degrees
- Minimum Line Overlap: 20%
- Scan Frequency: 36.1 Hertz
- Airborne GPS: 25 mile max.



2012 MO LiDAR Project

LiDAR Acquisition

- Area 1 & AML 1-3



2012 MO LiDAR Project

Survey Ground Control

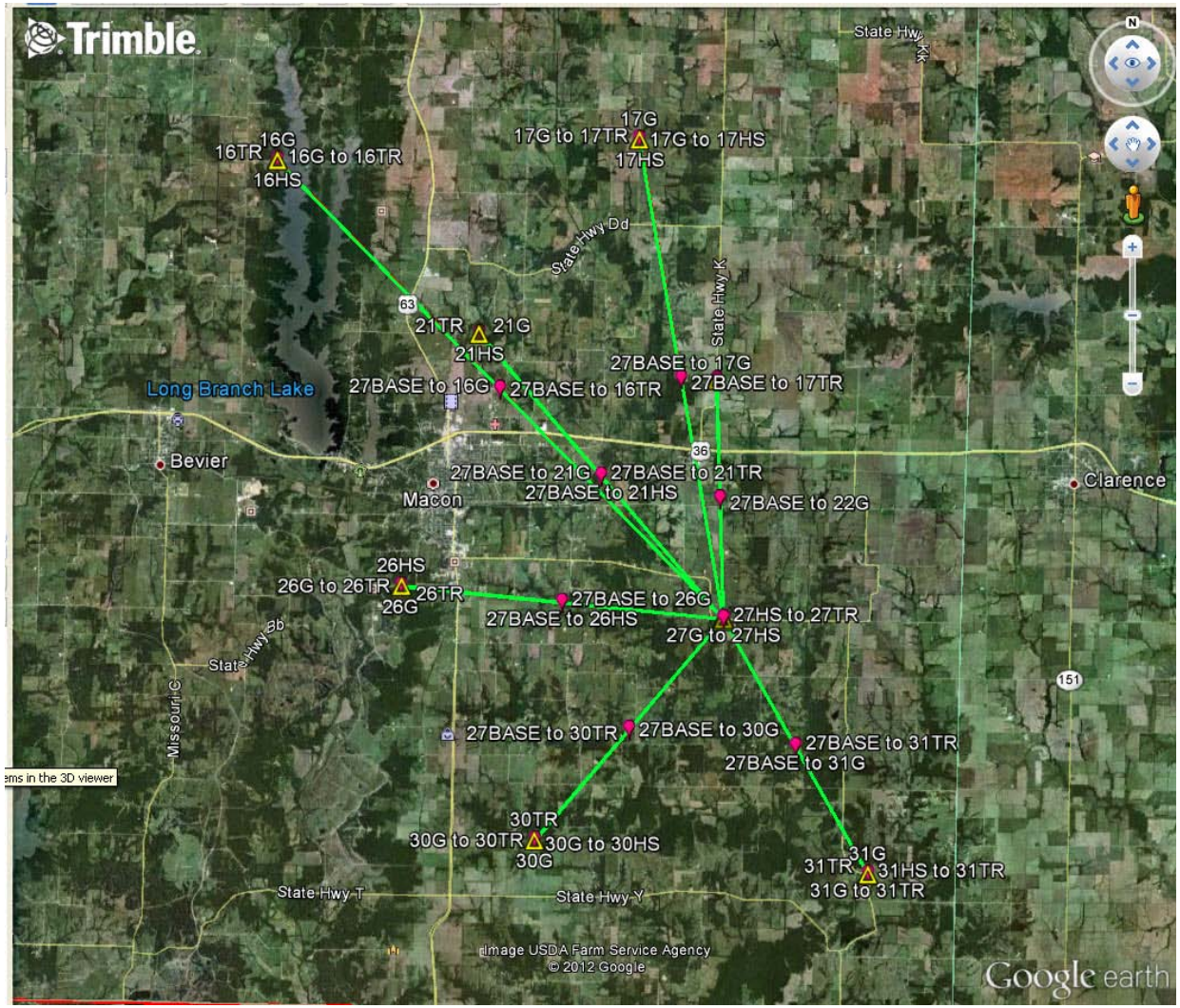
- 100+/- Survey points collected per ~2,000 sq. mile delivery area
- 580+ total survey points across the entire project
- All points were tied into National Geodetic Survey monuments
- 40% of the survey points were used for control & 60% were used as independent check points
- All survey provided in UTM NAD83 Zone 14 or 15, NAVD88 (Geoid 2009), meters

2012 MO LiDAR Project

Survey Ground Control

2012 MO LiDAR Project

Survey Ground Control



2012 MO LiDAR Project

Accuracy Results

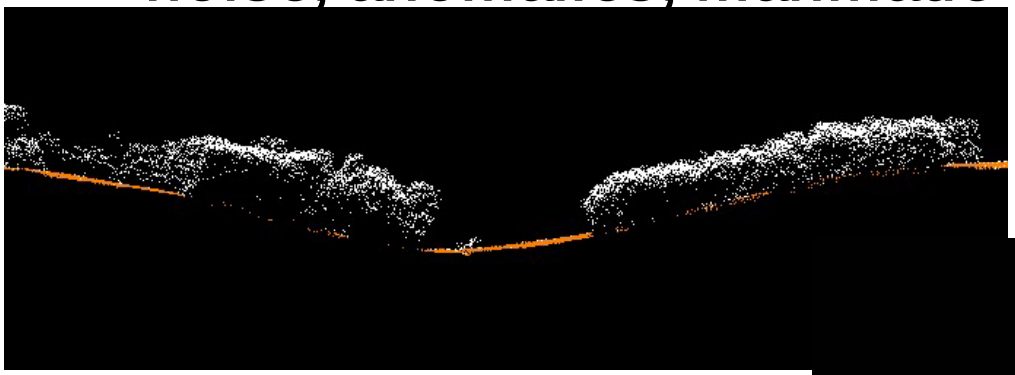
- Average RMSEz per delivery area = 10.7 cm (18.5 cm spec.)
- Average 95% CL per delivery area = 20.9 cm (36.3 cm spec.)

Stat	Control Points	Check Points	All Points
Count	245	337	582
Average	0.000	-0.010	-0.005
RMSEz	0.109	0.106	0.107
95% Confidence Level	0.213	0.207	0.209

2012 MO LiDAR Project

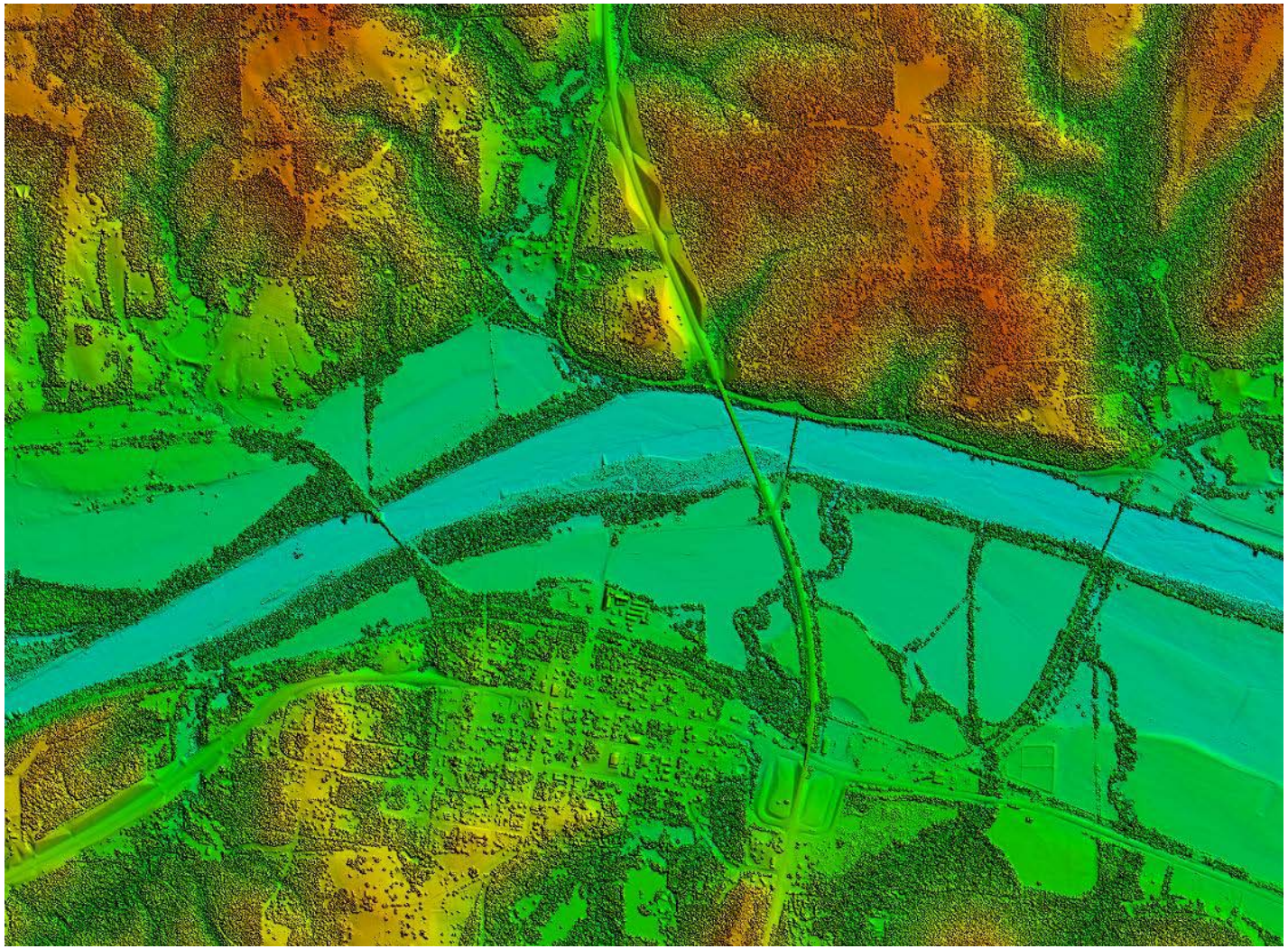
LiDAR Data Post Processing

- All 11,100 sq. miles were post processed at Surdex
- Automated and manual filtering techniques were used for creation of the bare-earth surface
- 95+% removal of artifacts, outliers, voids, errors, noise, anomalies, manmade features & vegetation



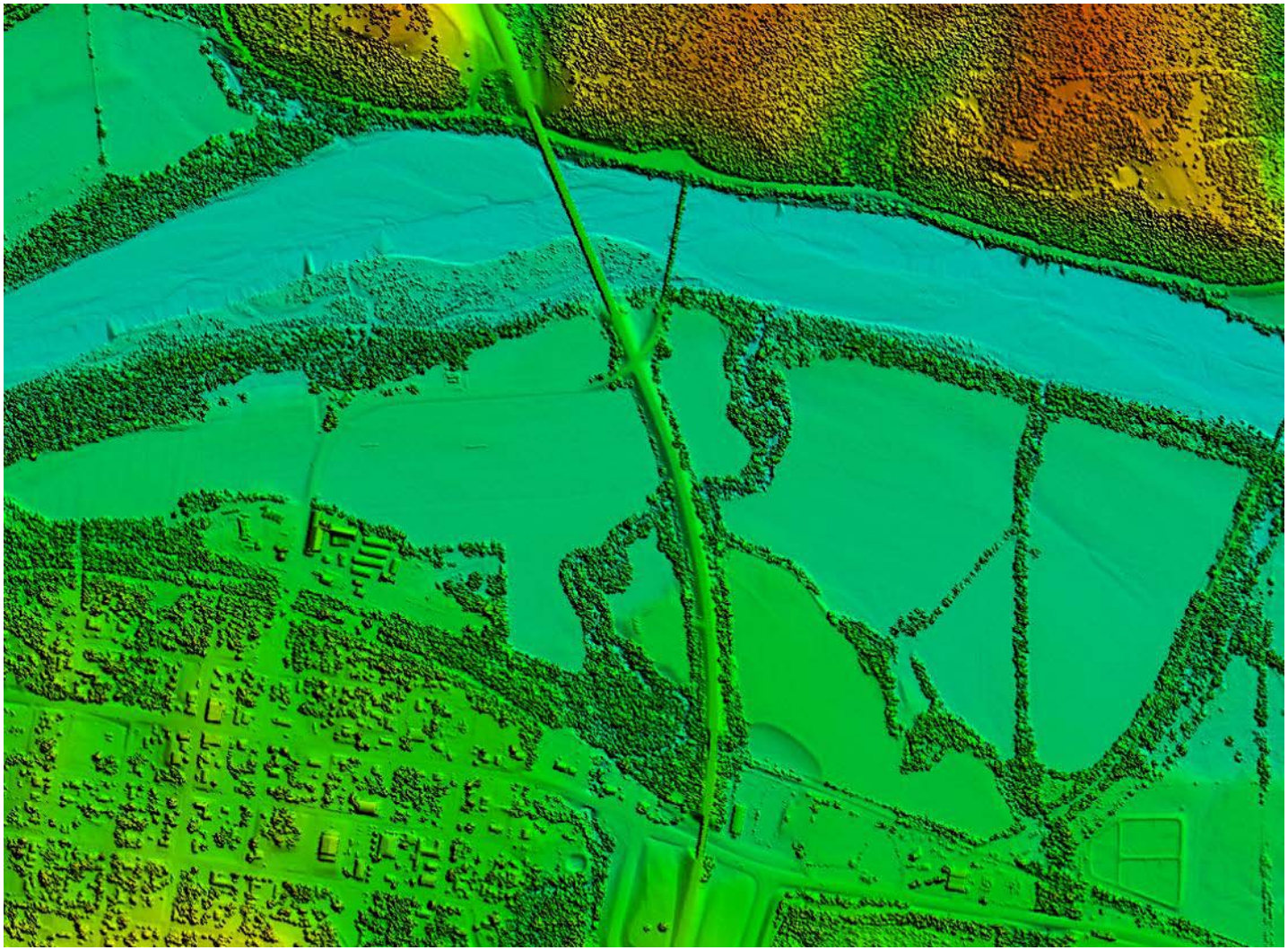
2012 MO LiDAR Project

LiDAR First Return Data



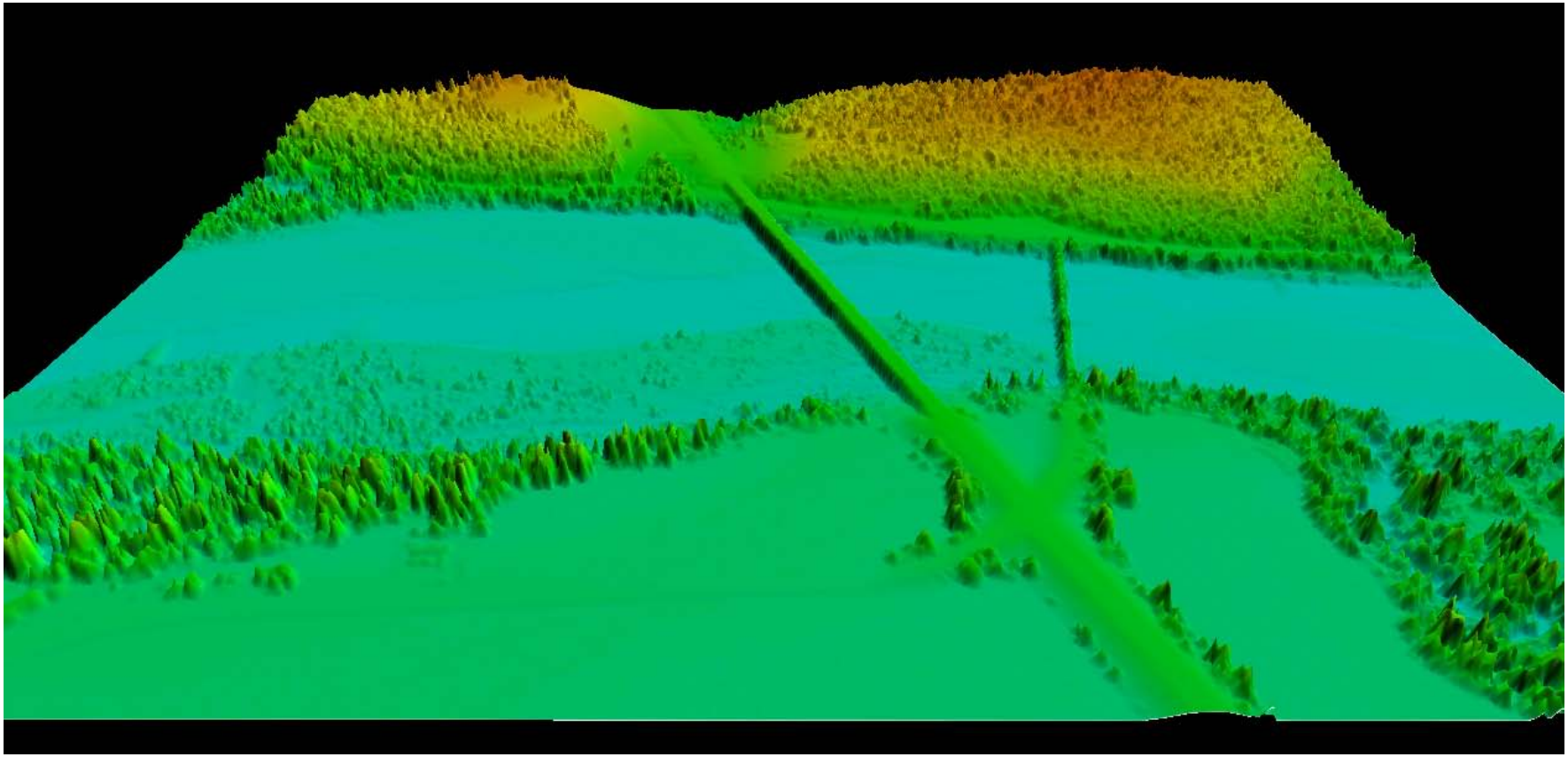
2012 MO LiDAR Project

LiDAR First Return Data



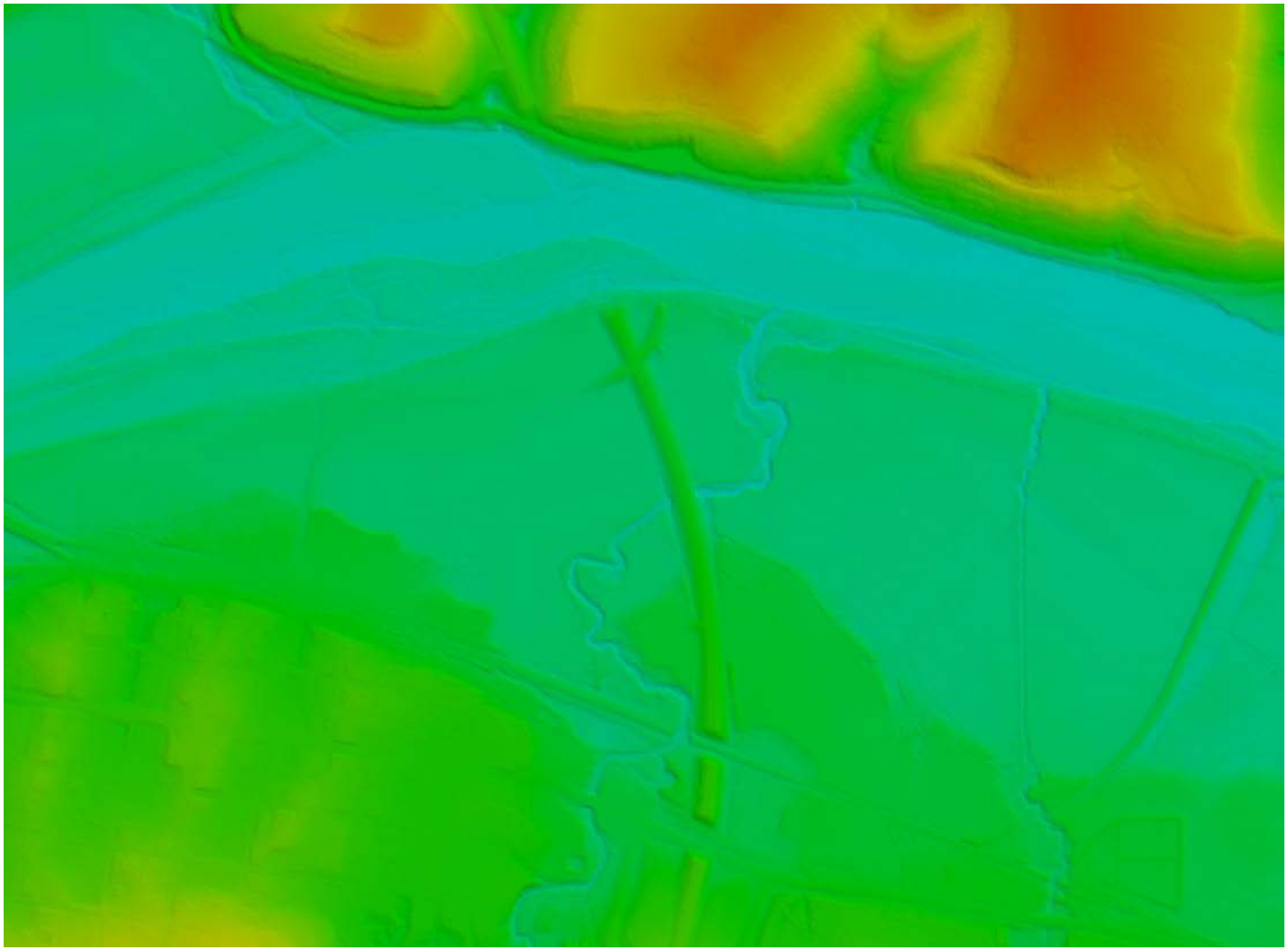
2012 MO LiDAR Project

LiDAR First Return Data 3D



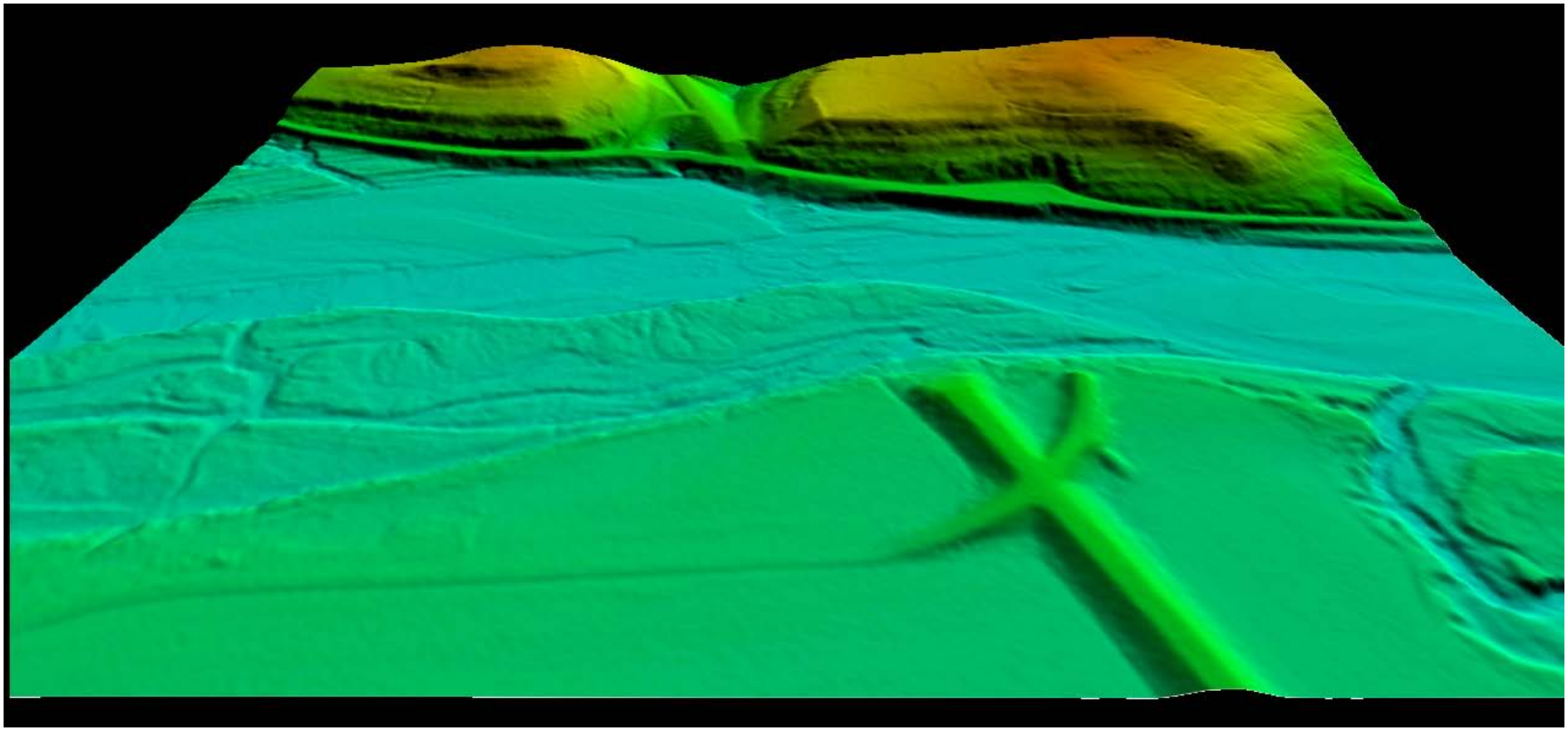
2012 MO LiDAR Project

LiDAR Bare Earth Data



2012 MO LiDAR Project

LiDAR Bare Earth Data 3D



2012 MO LiDAR Project

LiDAR Intensity Data

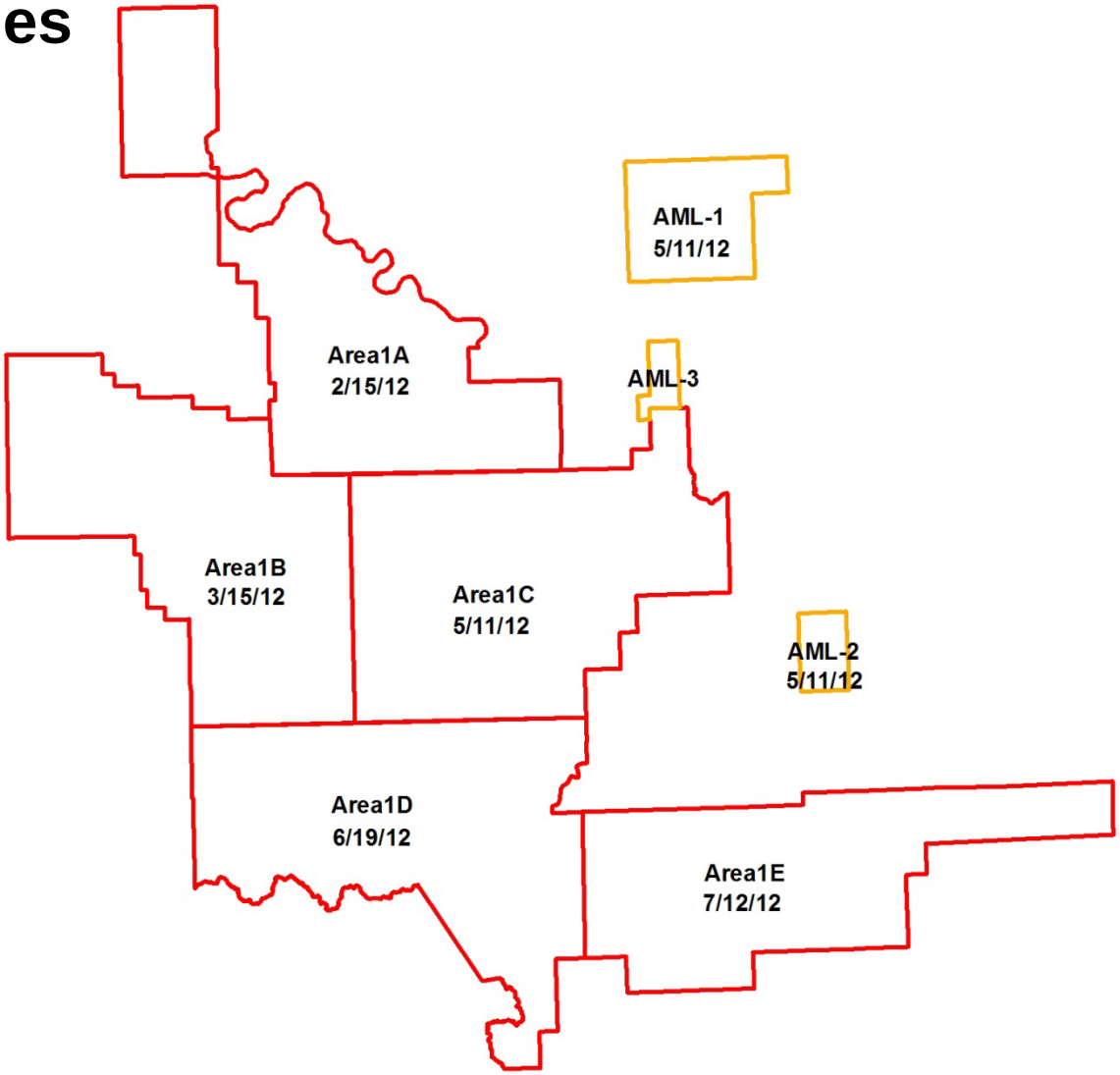
2012 MO LiDAR Project

Project Deliverables

- All data delivered in UTM NAD83 Zones 14 or 15 meters, NAVD88
- USGS DOQQQ tile index & naming scheme
- Classified LAS tiles (classes 1= default, 2= ground & 7= low points)
- 2-meter ESRI Grid Bare-Earth & First-Return tiles
- 2-meter ESRI Geodatabase Raster mosaics for each delivery area
- FGDC Metadata in XML format
- Flight, Processing & Accuracy Reports

2012 MO LiDAR Project

Project Deliveries



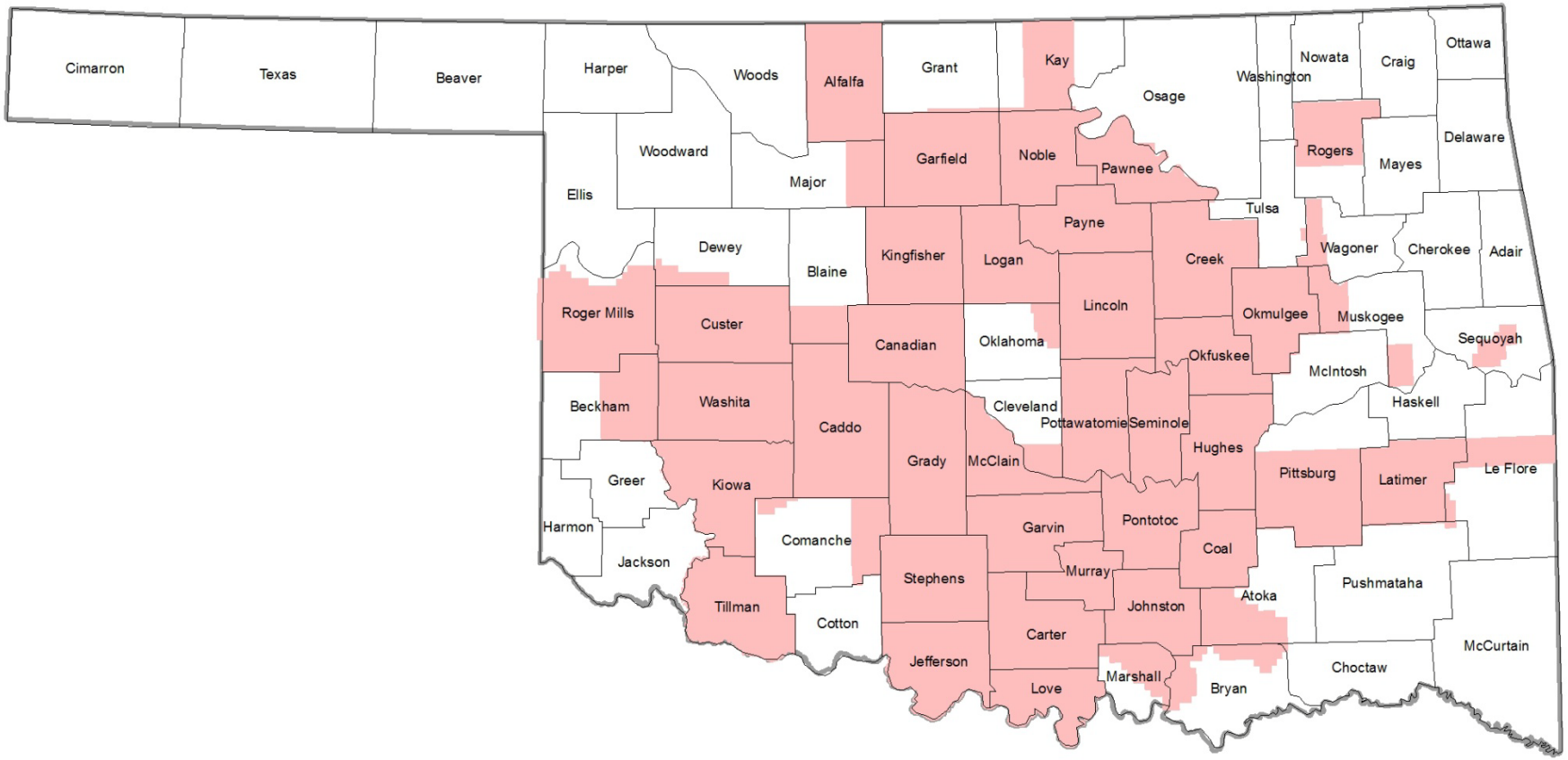
2012 MO LiDAR Project

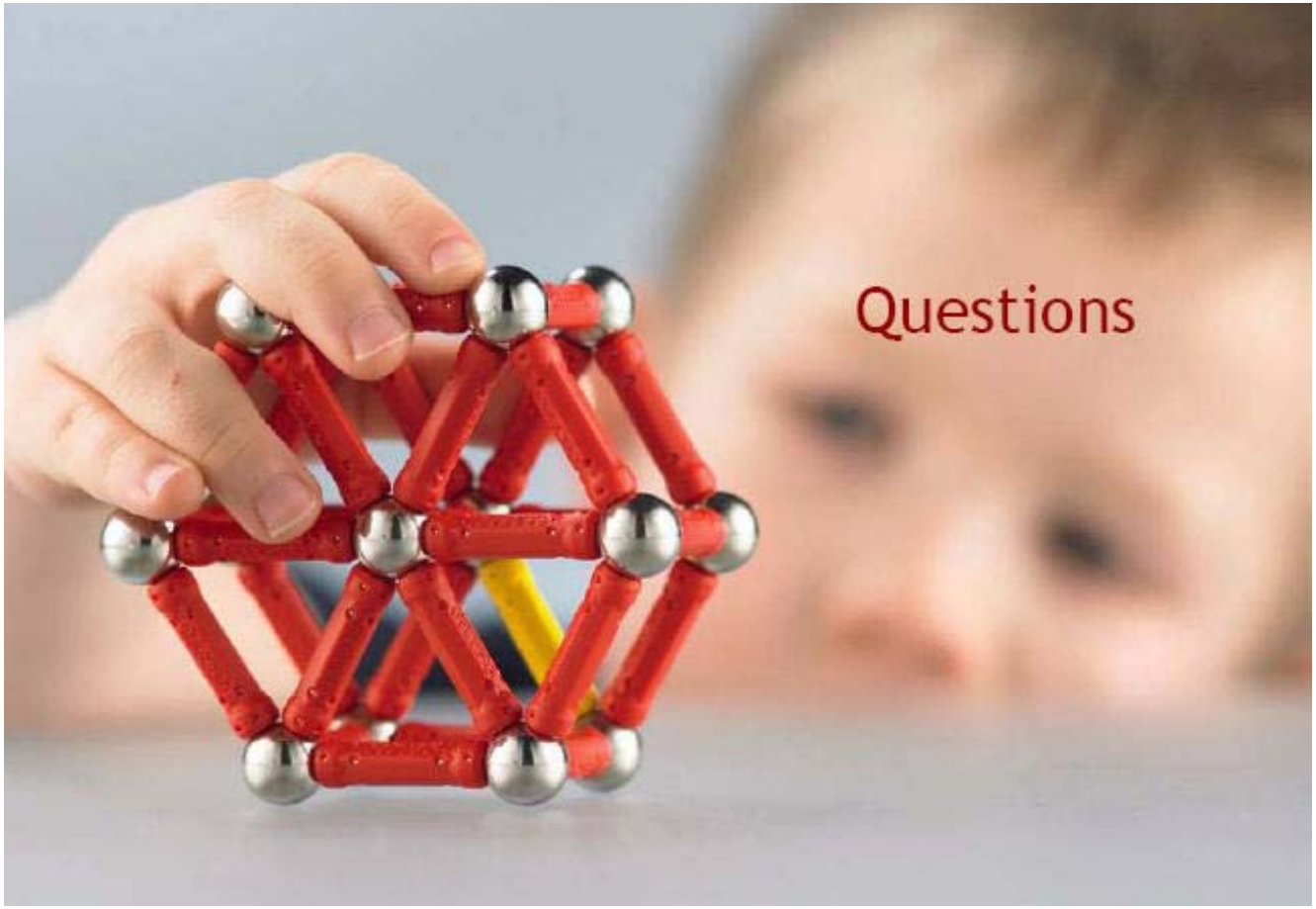
Data Availability

- Chris Stoner, Chris.Stoner@ok.usda.gov

2012 MO LiDAR Project

Statewide LiDAR Data Coverage




Questions