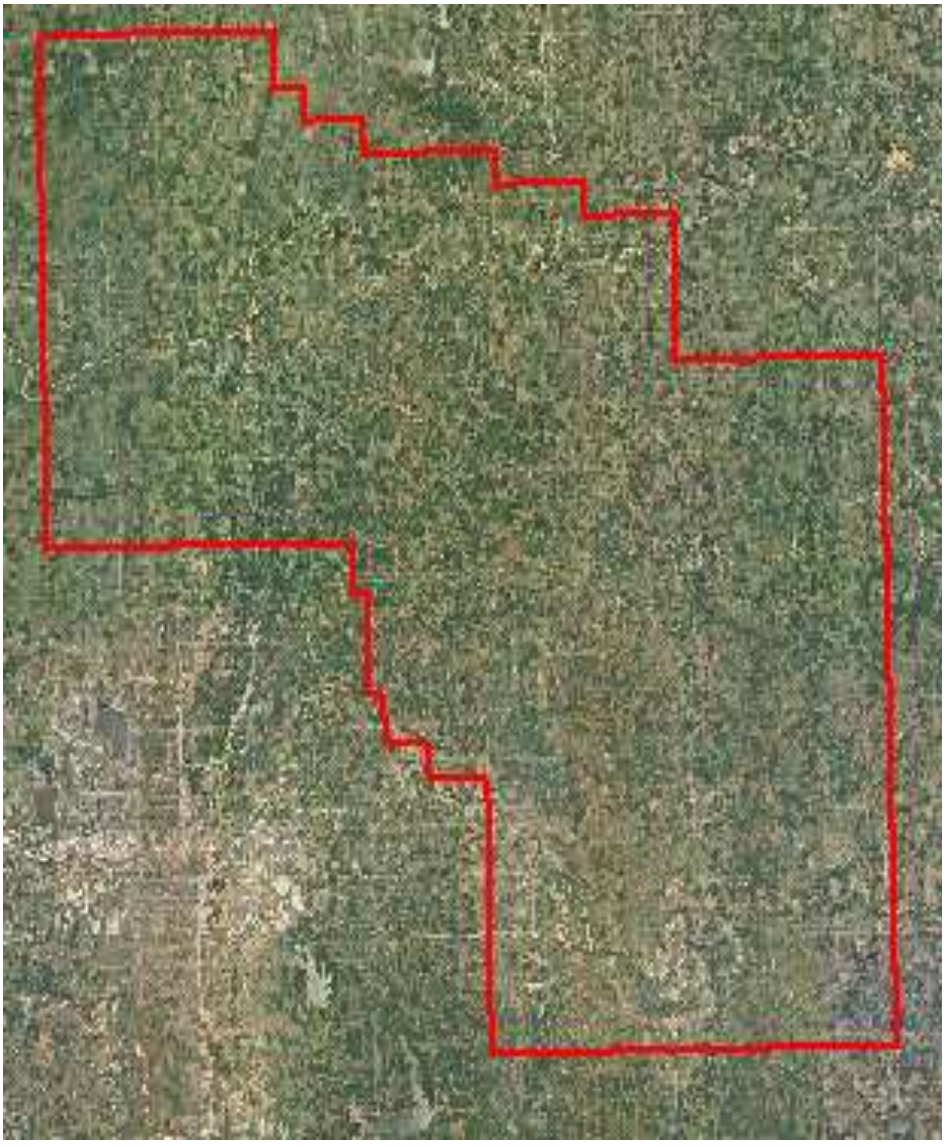
LiDAR Quality Assessment Report

The USGS National Geospatial Technical Operations Center, Data Operations Branch is responsible for conducting reviews of all Light Detection and Ranging (LiDAR) point-cloud data and derived products delivered by a data supplier before it is approved for inclusion in the National Elevation Dataset. The USGS recognizes the complexity of LiDAR collection and processing performed by the data suppliers and has developed this Quality Assessment (QA) procedure to accommodate USGS collection and processing specifications with flexibility. The goal of this process is to assure LiDAR data are of sufficient quality for database population and scientific analysis. Concerns regarding the assessment of these data should be directed to the Chief, Data Operations Branch, 1400 Independence Road, Rolla, Missouri 65401.

OK NCRS Area1B 2011

NGTOC

2014-05-01



Project Information

Project: OK NCRS Area1B 2011

Contractor: Surdex

Project Type:
Contributed

Applicable Specification:
NGP LiDAR Base Specification V 1.0

Project Points of Contact:

Name:	*Type:*	*Email:*
Collin McCormick	NCRS	collin.mccormick@ftw.usda.gov

REPORT QUALIFICATION SUMMARY:

Metadata:
0 of 1 Reviews Accepted
1 Reviews Not Accepted

Vertical Accuracy:
0 of 1 Reviews Accepted
0 Reviews Not Accepted

Tiled/Classified LAS:
0 of 1 Reviews Accepted
1 Reviews Not Accepted

DEM(s):
0 of 1 Reviews Accepted
1 Reviews Not Accepted

NED Review:
0 of 1 DEM tile reviews recommended for NED 1/3rd
0 of 1 DEM tile reviews recommended for NED 1/9th

Project Delivery Lots: Select...

Dates Collected Range:
Collection Start: 12/9/2011
Collection End: 12/15/2011

Project Aliases:

Licensing:
Public Domain

Project Description:
The Oklahoma USDA and the Oklahoma Natural Resource Conservation Service (NRCS) to collect detailed ground elevation data for approximately 10,500 Square Miles into a unified collection and processing project to benefit the US Government. These partners require high-resolution digital elevation data developed from Aerial LiDAR collection in east-central Oklahoma. These data will then be used to generate digital elevation models and contours for use in hydraulic/hydrologic models and other purposes to include conservation planning activities and environmental assessments. This project covers area 1B approximately 2183 square miles.

Review Information

3rd Party QA Performed: ☐ *Date Delivered:*

Action To Contractor Date:	*Issue Description:*	*Return Date:*
4/22/2014	**DEM tiles are not hydro flattened!!!** **DEM errors:** **4 spikes** **5 culverts** **60 bridges** **719 flatten hydro** **Classified LAS Global Encoder = 0** **Metadata and Reporting issues/errors:** Required vertical accuracy is not reported correctly. Required vertical accuracy is reported in metadata and reports as required to meet vertical accuracy of 18.5cm RMSEz. Required RMSEz should be reported as meeting or exceeding 12.5cm RMSEz. absres and ordres in xml metadata should be 2m not .001 Note: xml metadata for DEM and classified LAS are tiled. **Breaklines not delivered.** **Swath not delivered** **Project boundary not delivered** **Calibration and Check points combined into one file**	

Review Complete:
5/1/2014

Project Materials Received

All project deliverables must be supplied according to collection and processing specifications. The USGS will postpone the QA process when any of the required deliverables are missing. When deliverables are missing, the Contracting Officer Technical Representative (COTR) will be contacted by the Elevation Section supervisor and informed of the problem. Processing will resume after the COTR has coordinated the deposition of remaining deliverables.

METADATA

Deliverables	*Delivered*	*XML Metadata*	*Required*	*Format*	*Quantity*	*Additional Details*
Collection Report:	☑		☑	*PDF*	*1*	collection and processing

						combined
Survey Report:	☑		☑	*PDF*		
Processing Report:	☑		☑	*PDF*	1	(details)collection and processing combined
QA/QC Report:	☐		☐	*Select...*		
Project Level XML Metadata:	☑		☑	*XML*		DEM metadata substitued for project metadata. All metadata are tiled.
Project Extent:	☐	☐	☐	*.shp*		created at NGTOC
Tile Scheme:	☑	☐	☐	*.shp*	1	
Control (Calibration) Points:	☐	☐	☐	*Select...*		not delivered
Check (Validation) Points:	☐	☐	☐	*Select...*		not delivered
Additional Comments:						

LIDAR DATA

Deliverables	*Delivered*	*XML Metadata*	*Required*	*Format*	*Quantity*	*Additional Details*
Swath Data:	☐	☐	☐	Select...		not delivered
Classified/ Tiled Data:	☑	☑	☑	.las	608	
Additional Comments:						

DERIVED DELIVERABLES

Deliverables	*Delivered*	*XML Metadata*	*Required*	*Format*	*Quantity*	*Additional Details*
DEM Tiles:	☑	☑	☑	Select...	608	Arc Grid
Breaklines:	☐	☐	☐	Select...		not delivered

Additional Comments:	

Geographic Information

Area Extent: 2183.2 *Sq. Miles*

Tile Size: *Select...*

DEM/DTM Grid Spacing: 2 *Meters*

Coordinate Reference System:

NAD_1983_UTM_Zone_14N

Projection: Transverse_Mercator

Horizontal Datum: NAD83

- (•) Meters
- ( ) U.S. Feet
- ( ) Int'l Feet

Vertical Datum: NAVD88

- (•) Meters
- ( ) U.S. Feet
- ( ) Int'l Feet

THIS PROJECTION COORDINATE REFERENCE SYSTEM IS CONSISTENT ACROSS THE FOLLOWING DELIVERABLES

- [x] *Project Tile Scheme*
- [x] *Project Level XML Metadata*
- [x] *Tiled/Classified XML Metadata*
- [x] *Tiled/Classified LiDAR*
- [x] *DEM(s)*
- [x] *DEM XML Metadata*

Additional Comments:

Collection Information

Configured Project Nominal Pulse Spacing:

1.4 Meters

Additional Comments:

Metadata Review Not Accepted

Vendor provided metadata files have been parsed using 'mp' metadata parser. Any errors generated by the parser are documented below for reference and/or corrective action.

Parser can be located @ http://geo-nsdi.er.usgs.gov/validation/

The Project Level XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: ☐

The Classified XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: ☐

The DEM XML Metadata parsed without errors.

Check if 'Best Use' metadata for NED: ☐

Additional Comments:

absres and ordres in xml metadata should be 2m not .001
required vertical accuracy for LiDAR Specification 1.0 is reported incorrectly in all xml metadata

Based on this review, the USGS does not accept the xml metadata provided.

End of Metadata Review

Vertical Accuracy Review

ASPRS recommends that checkpoint surveys be used to verify the vertical accuracy of LiDAR data sets. Checkpoints are to be collected by an independent survey firm licensed in the particular state(s) where the project is located. While subjective, checkpoints should be well distributed throughout the dataset. National Standards for Spatial Data Accuracy (NSSDA) guidance states that checkpoints may be distributed more densely in the vicinity of important features and more sparsely in areas that are of little or no interest. Checkpoints should be distributed so that points are spaced at intervals of at least ten percent of the diagonal distance across the dataset and at least twenty percent of the points are located in each quadrant of the dataset.

NSSDA and ASPRS require that a minimum of twenty checkpoints (thirty is preferred) are collected for each major land cover category represented in the LiDAR data. Checkpoints should be selected on flat terrain, or on uniformly sloping terrain in all directions from each checkpoint. They should not be selected near severe breaks in slope, such as bridge abutments, edges of roads, or near river bluffs. Checkpoints are an important component of the USGS QA process. There is the presumption that the checkpoint surveys are error free and the discrepancies are attributable to the LiDAR dataset supplied.

For this dataset, USGS checked the spatial distribution of checkpoints with an emphasis on the bare-earth (open terrain) points; the number of points per class; the methodology used to collect these points; and the relationship between the data supplier and checkpoint collector. When independent control data are available, USGS has incorporated this into the analysis.

Required Vertical Accuracy

○ *Yes* ◉ *No*

There are no required vertical accuracy conditions for this project.

Reported Vertical Accuracy

◉ *Yes* ○ *No*

REPORTED FUNDAMENTAL VERTICAL ACCURACY FOR SWATH LIDAR FILES

Confidence Interval Reported: Select or type... th % CI

Reported Unit: Select or type...

Reported # of checkpoints:

Reported RMSEz:

*Reported Vertical Accuracy (RMSEz * .% CI)*

REPORTED FUNDAMENTAL VERTICAL ACCURACY FOR DEM FILES

Confidence Interval Reported: 95 th % CI

Reported Unit: Meters

Reported # of checkpoints: 51

Reported RMSEz: 0.095

*Reported Vertical Accuracy (RMSEz * .% CI)* 0.187

REPORTED SUPPLEMENTAL VERTICAL ACCURACY FOR DEM FILES

SVA Statistic Reported: Select...

SVA Confidence Level/Percentile Reported: Select or type...

Class	# of Checkpoints	SVA Reported th	
Select or type...			Select or type...

REPORTED CONSOLIDATED VERTICAL ACCURACY FOR DEM FILES

CVA Statistic Reported: Select...

CVA Confidence Level/Percentile Reported: Select or type...

Total number of checkpoints:

Reported CVA: Select or type... *at the th*

Additional Reported Vertical Accuracy Information: SVAs and CVA were not required per SOW

Reviewed Vertical Accuracy

○ *Yes* ◉ *No*

Vertical Accuracy information was not or could not be reviewed.

Based on this review, the USGS Select... the vertical accuracy.

End of Vertical Accuracy Review

Raw-Swath LiDAR Review

LAS swath files or raw unclassified LiDAR data are reviewed to assess the quality control used by the data supplier during collection. Furthermore, LAS swath data are checked for positional accuracy. The data supplier should have calculated the Fundamental Vertical Accuracy using ground control checkpoints measured in clear open terrain (*see Vertical Accuracy Review Section*).

Review Required: ○ *Yes* ◉ *No* *Not Delivered*

Tiled/Classified LiDAR Review Not Accepted

Classified LAS tile files are used to build digital terrain models using the points classified as ground. Therefore, it is important that the classified LAS are of sufficient quality to ensure that the derivative product accurately represents the landscape that was measured. Classified LAS Tiles are comprised as follows, "all project swaths, returns, and collected points, fully calibrated, adjusted to ground, and classified and cut, by tiles, excluding calibration swaths, cross-ties, and other swaths not used, or intended to be used, in product generation".

Review Required: (•) *Yes* ( ) *No*

CLASSIFIED LIDAR TILE CHARACTERISTICS

☑ *Separate folder for classified/tiled LiDAR files*

LAS Version: 1.2

Point Record Format: Unknown

☑ *Classified LAS tile files conform to project tiling scheme*

☑ *Quantity of classified LAS tile files conforms to project tiling scheme*

☐ *Classified LAS tile files do not overlap*

las tiles overlap

☑ *Classified LAS tile files are uniform in size*

☑ *Correct and properly formatted georeference information is included in all LAS file headers*

☐ *Adjusted GPS time used with the global encoder id set to 1*

global encoder id = 0

☑ *Classified LAS tile files have no points classified as '12' (Overlap)*

☑ *Point classifications are limited to the standard values listed below:*

Code	Description	Used
1	Processed, but unclassified	☐
2	Bare-earth/Ground	☐
7	Noise(low or high, manually identified, if needed)	☐
8	Model key points	☐
9	Water	☐
10	Ignored ground (breakline proximity)	☐
11	Withheld (if the "Withheld Bit" is not implemented in the processing software	☐

Additional comments:

global encoder = 0
las tiles overlap

Based on this review, the USGS does not accept classified/tiled LiDAR data.

End of Tiled/Classified LiDAR Review

Breakline Review

Breaklines are vector feature classes that are used to hydro-flatten the bare earth Digital Elevation Models.

Review Required: ( ) *Yes* (•) *No* *Not Delivered*

DEM Review Not Accepted

The derived bare-earth file(s) receive a review of the vertical accuracies provided by the data supplier, vertical

accuracies calculated by the USGS using supplied and independent checkpoints (*see the prior Vertical Accuracy Review Section*), and a thorough visual review for any anomalies or inconsistencies in assessing the quality of the DEM(s).

BARE-EARTH DEM TILE CHARACTERISTICS:

☑ Separate folder for bare-earth DEM files

Raster File Type: Select...

Raster Cell Size: 2 Meters

Tile bit depth/pixel Type: 32_BIT_FLOAT

Interpolation or Resampling Technique: Unknown

☐ DEM tiles do not overlap

☑ DEM tiles conform to Project Tiling Scheme

☑ Quantity of DEM files conforms to Project Tiling Scheme

☑ DEM tiles are uniform in size

☑ DEM tiles properly edge match and free of edge artifacts

☑ Tiles are free from Spikes and Pits

☑ Tiles are free from Data Holidays (*voids due to processing or collection errors*)

☑ Tiles do not exhibit systematic sensor error or cornrowing

DEM tiles are properly Hydro Flattened ○ Yes ◉ No

☐ Waterbodies 2 Acres or greater are flattened

☐ Streams 100 ft. or greater are flattened in a downstream manner

☐ Tidal Boundaries/Shorelines are flattened

☐ No missing islands 1 Acre or larger

☐ Bridges/Overpasses are properly removed

☑ Culverts are maintained (Not Hydro Enforced)

☑ Depressions, Sinks, are not filled in (Not Hydro Conditioned)

☑ Vegetation properly removed

☑ Manmade structures properly removed

ADDITIONAL COMMENTS, ERRORS, ANOMALIES, OR OTHER ISSUES:

DEM tiles are not hydro flattened!!!

DEM errors:

4 spikes
5 culverts
60 bridges
719 flatten hydro

All errors have been documented in an error shapefile.

Tiles recommended for NED 1/3rd: ○ Yes. ◉ No.
Tiles recommended for NED 1/9th: ○ Yes. ◉ No.

Based on this review, the USGS does not accept the DEM tiles.

End of DEM Review

END OF REPORT (v2.1.1)