

**NORTH CAROLINA GEODETIC SURVEY**

Claude T Bowers Building  
4105 Reedy Creek Road  
Raleigh, North Carolina 27607  
(919)733-3836



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## Project Information

Prepared By: Steve Kaufman  
Project Name: 2014 LiDAR QC  
Sensor Info: na  
Required Nominal Pulse Spacing: 0.7  
Vendor Name: ESP  
Units: US Survey Feet  
Percent of Extent Tolerance: Extents Not Checked  
Date of Aquisition: Start: 3/26/2015 Finish: 3/26/2015

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## Metadata Information

Tile Index:

Path: C:\Users\skaufman\Documents\Drawing Files\Current\LiDAR QC\2014 LiDAR\2014 Contractor LiDAR

Number of Polys: 0

Intensity:

Tile Index Attribute: Not Specified

Path to Data: Not Specified

Number of Data Files Matching Attribute: Not Specified

DEM:

Tile Index Attribute: Not Specified

Path to Data: Not Specified

Number of Data Files Matching Attribute: Not Specified

LAS:

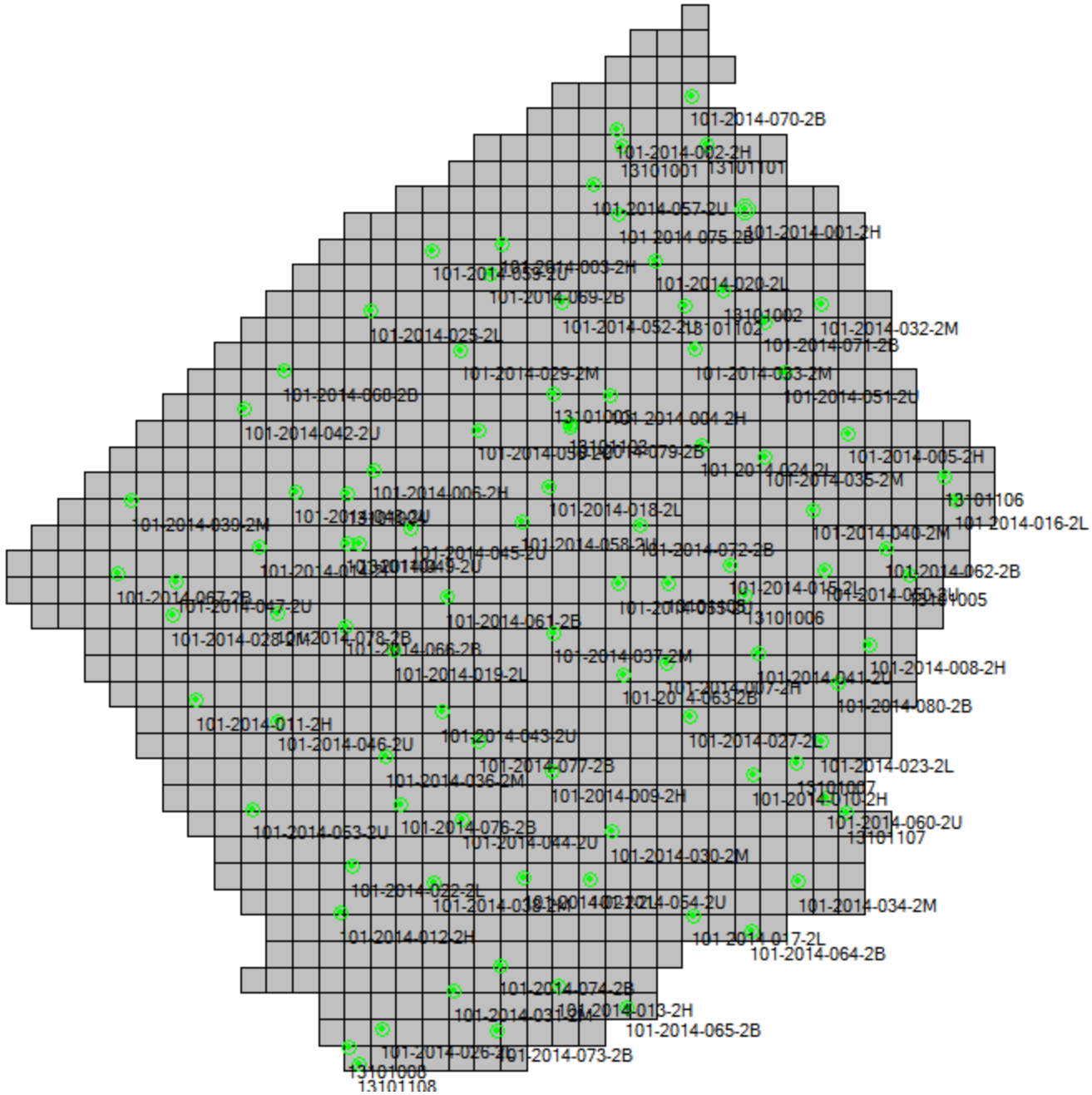
Tile Index Attribute: LiDARTiles

Path to Data: \\NCEMJFHQCLPSHP\FData\JohnstonCoNC\Masspoints

Number of Data Files Matching Attribute: 932 out of 932



## Tiled-Data Area





LiDAR Accuracy Assessment Summary

LC Type	# of Points	NVA	SVA	VVA
LAS				
ALL	96			
2H	13		0.412	0.412
2L	14		0.459	0.459
2M	13		0.747	0.747
2U	20	0.262	0.229	
2B	36	0.408	0.341	
Total	96			

Units: US Survey Feet



**Coordinates and Offsets of Analyzed Locations**

<b>ID</b>						
		<b>Survey X</b>	<b>Survey Y</b>	<b>Z1</b>	<b>Z DEM</b>	<b>Z LAS</b>
				<b>LC Type</b>	<b>ΔZ DEM</b>	<b>ΔZ LAS</b>
1)	<input checked="" type="checkbox"/> 101-2014-001-2H					
		2227128.862	715684.728	257.289	NaN	257.507
				2H	NaN	0.218
2)	<input checked="" type="checkbox"/> 101-2014-002-2H					
		2202258.114	730984.592	243.034	NaN	242.839
				2H	NaN	-0.195
3)	<input checked="" type="checkbox"/> 101-2014-003-2H					
		2180214.847	709009.908	278.648	NaN	278.579
				2H	NaN	-0.069
4)	<input checked="" type="checkbox"/> 101-2014-004-2H					
		2201119.749	679933.215	243.406	NaN	243.689
				2H	NaN	0.283
5)	<input checked="" type="checkbox"/> 101-2014-005-2H					
		2246929.599	672582.112	137.258	NaN	137.523
				2H	NaN	0.265
6)	<input checked="" type="checkbox"/> 101-2014-006-2H					
		2155648.064	665460.067	245.457	NaN	245.883
				2H	NaN	0.426
7)	<input checked="" type="checkbox"/> 101-2014-007-2H					
		2211898.243	628341.299	163.09	NaN	163.357
				2H	NaN	0.267



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
8)	101-2014-008-2H					
	2251108.755	631913.392	195.131	NaN	195.534	
			2H	NaN	0.403	
9)	101-2014-009-2H					
	2189835.652	607585.905	116.416	NaN	116.479	
			2H	NaN	0.063	
10)	101-2014-010-2H					
	2228571.117	606901.026	140.67	NaN	140.685	
			2H	NaN	0.015	
11)	101-2014-011-2H					
	2121642.829	621210.01	243.566	NaN	243.718	
			2H	NaN	0.152	
12)	101-2014-012-2H					
	2149223.459	580290.722	215.639	NaN	215.417	
			2H	NaN	-0.222	
13)	101-2014-013-2H					
	2191069.378	566240.815	113.15	NaN	113.226	
			2H	NaN	0.076	
14)	101-2014-014-2L					
	2133688.914	650688.767	256.468	NaN	256.927	
			2L	NaN	0.459	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
15)	101-2014-015-2L					
	2224083.469	647261.046	175.283	NaN	175.742	
			2L	NaN	0.459	
16)	101-2014-016-2L					
	2267441.322	659768.466	224.52	NaN	224.428	
			2L	NaN	-0.092	
17)	101-2014-017-2L					
	2217059.699	579924.529	179.619	NaN	179.714	
			2L	NaN	0.095	
18)	101-2014-018-2L					
	2189418.865	662354.972	208.532	NaN	208.555	
			2L	NaN	0.023	
19)	101-2014-019-2L					
	2159668.119	630777.095	207.781	NaN	207.836	
			2L	NaN	0.055	
20)	101-2014-020-2L					
	2209780.367	705770.537	247.237	NaN	247.056	
			2L	NaN	-0.181	
21)	101-2014-021-2L					
	2184623.723	587008.355	170.084	NaN	169.983	
			2L	NaN	-0.101	



**Coordinates and Offsets of Analyzed Locations (Continued)**

<b>ID</b>						
		<b>Survey X</b>	<b>Survey Y</b>	<b>Z1</b>	<b>Z DEM</b>	<b>Z LAS</b>
				<b>LC Type</b>	<b>ΔZ DEM</b>	<b>ΔZ LAS</b>
22)	<input checked="" type="checkbox"/> 101-2014-022-2L					
		2151478.735	589284.611	220.592	NaN	220.908
				2L	NaN	0.316
23)	<input checked="" type="checkbox"/> 101-2014-023-2L					
		2241547.892	613292.935	132.809	NaN	132.866
				2L	NaN	0.057
24)	<input checked="" type="checkbox"/> 101-2014-024-2L					
		2218653.896	670197.684	197.117	NaN	197.339
				2L	NaN	0.222
25)	<input checked="" type="checkbox"/> 101-2014-025-2L					
		2155009.206	696069.367	324.23	NaN	324.225
				2L	NaN	-0.005
26)	<input checked="" type="checkbox"/> 101-2014-026-2L					
		2157232.631	558061.252	183.105	NaN	183.133
				2L	NaN	0.028
27)	<input checked="" type="checkbox"/> 101-2014-027-2L					
		2216328.014	618018.323	164.295	NaN	164.543
				2L	NaN	0.248
28)	<input checked="" type="checkbox"/> 101-2014-028-2M					
		2116967.077	637599.7	229.81	NaN	229.97
				2M	NaN	0.16



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
29)	101-2014-029-2M					
	2172400.651	688599.526	263.641	NaN	263.429	
			2M	NaN	-0.212	
30)	101-2014-030-2M					
	2201371.712	596042.841	118.968	NaN	118.736	
			2M	NaN	-0.232	
31)	101-2014-031-2M					
	2171106.01	565331.606	183.824	NaN	184.213	
			2M	NaN	0.389	
32)	101-2014-032-2M					
	2241673.099	697382.636	197.947	NaN	198.631	
			2M	NaN	0.684	
33)	101-2014-033-2M					
	2217298.172	688681.089	207.713	NaN	208.159	
			2M	NaN	0.446	
34)	101-2014-034-2M					
	2237325.546	586363.525	83.351	NaN	83.545	
			2M	NaN	0.194	
35)	101-2014-035-2M					
	2230934.502	668109.99	187.735	NaN	188.201	
			2M	NaN	0.466	





Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
36)	101-2014-036-2M					
	2158063.442	610360.536	175.399	NaN	175.688	
			2M	NaN	0.289	
37)	101-2014-037-2M					
	2190306.486	634219.134	128.567	NaN	128.864	
			2M	NaN	0.297	
38)	101-2014-038-2M					
	2167195.076	586267.887	136.472	NaN	137.315	
			2M	NaN	0.843	
39)	101-2014-039-2M					
	2109128.286	659542.125	258.371	NaN	258.243	
			2M	NaN	-0.128	
40)	101-2014-040-2M					
	2240032.097	657912.439	188.375	NaN	188.965	
			2M	NaN	0.59	
41)	101-2014-041-2U					
	2229501.393	630283.929	164.546	NaN	164.739	
			2U	NaN	0.193	
42)	101-2014-042-2U					
	2130852.383	677151.887	290.317	NaN	290.265	
			2U	NaN	-0.052	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
43)	101-2014-043-2U					
	2168741.407	619004.029	209.051	NaN	208.965	
			2U	NaN	-0.086	
44)	101-2014-044-2U					
	2172667.938	598458.933	136.634	NaN	136.722	
			2U	NaN	0.088	
45)	101-2014-045-2U					
	2162888.798	654210.963	213.784	NaN	213.818	
			2U	NaN	0.034	
46)	101-2014-046-2U					
	2137317.856	617227.649	278.684	NaN	278.552	
			2U	NaN	-0.132	
47)	101-2014-047-2U					
	2117770.126	643942.501	290.622	NaN	290.558	
			2U	NaN	-0.064	
48)	101-2014-048-2U					
	2140589.103	661204.82	295.808	NaN	295.927	
			2U	NaN	0.119	
49)	101-2014-049-2U					
	2150490.409	651461.847	222.737	NaN	222.717	
			2U	NaN	-0.02	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
50)	101-2014-050-2U					
	2242245.321	646259.091	155.026	NaN	154.966	
			2U	NaN	-0.06	
51)	101-2014-051-2U					
	2234649.894	684190.448	180.445	NaN	180.301	
			2U	NaN	-0.144	
52)	101-2014-052-2U					
	2191936.164	697575.921	306.613	NaN	306.836	
			2U	NaN	0.223	
53)	101-2014-053-2U					
	2132379.661	600292.311	278.341	NaN	278.074	
			2U	NaN	-0.267	
54)	101-2014-054-2U					
	2197399.956	586842.775	164.54	NaN	164.56	
			2U	NaN	0.02	
55)	101-2014-055-2U					
	2202576.93	643659.941	148.579	NaN	148.44	
			2U	NaN	-0.139	
56)	101-2014-056-2U					
	2175751.208	673270.511	262.079	NaN	262.242	
			2U	NaN	0.163	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
57)	101-2014-057-2U					
	2197760.43	720412.617	324.75	NaN	324.832	
			2U	NaN	0.082	
58)	101-2014-058-2U					
	2184123.375	655665.184	168.641	NaN	168.868	
			2U	NaN	0.227	
59)	101-2014-059-2U					
	2167035.876	707749.006	162.393	NaN	162.263	
			2U	NaN	-0.13	
60)	101-2014-060-2U					
	2242763.065	602399.533	113.168	NaN	113.158	
			2U	NaN	-0.01	
61)	101-2014-061-2B					
	2169672.941	641104.46	234.671	NaN	234.494	
			2B	NaN	-0.177	
62)	101-2014-062-2B					
	2254013.382	650531.533	165.25	NaN	165.213	
			2B	NaN	-0.037	
63)	101-2014-063-2B					
	2203569.229	626133.698	141.528	NaN	141.686	
			2B	NaN	0.158	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
	Survey X	Survey Y	Z1	Z DEM	Z LAS	
			LC Type	ΔZ DEM	ΔZ LAS	
64)	<input checked="" type="checkbox"/> 101-2014-064-2B					
	2228160.765	576996.799	170.852	NaN	171.598	
			2B	NaN	0.746	
65)	<input checked="" type="checkbox"/> 101-2014-065-2B					
	2204210.258	562311.38	190.051	NaN	190.241	
			2B	NaN	0.19	
66)	<input checked="" type="checkbox"/> 101-2014-066-2B					
	2150282.313	635445.27	229.633	NaN	229.662	
			2B	NaN	0.029	
67)	<input checked="" type="checkbox"/> 101-2014-067-2B					
	2106328.249	645468.392	271.688	NaN	271.392	
			2B	NaN	-0.296	
68)	<input checked="" type="checkbox"/> 101-2014-068-2B					
	2138300.176	684498.035	255.306	NaN	255.327	
			2B	NaN	0.021	
69)	<input checked="" type="checkbox"/> 101-2014-069-2B					
	2177964.485	703321.22	301.99	NaN	301.847	
			2B	NaN	-0.143	
70)	<input checked="" type="checkbox"/> 101-2014-070-2B					
	2216742.164	737496.282	315.502	NaN	315.702	
			2B	NaN	0.2	



Coordinates and Offsets of Analyzed Locations (Continued)

ID						
		Survey X	Survey Y	Z1	Z DEM	Z LAS
				LC Type	ΔZ DEM	ΔZ LAS
71)	<input checked="" type="checkbox"/> 101-2014-071-2B					
		2230707.577	694008.49	211.524	NaN	211.804
				2B	NaN	0.28
72)	<input checked="" type="checkbox"/> 101-2014-072-2B					
		2206708.584	654762.199	156.956	NaN	157.324
				2B	NaN	0.368
73)	<input checked="" type="checkbox"/> 101-2014-073-2B					
		2179464.023	557613.716	197.643	NaN	197.673
				2B	NaN	0.03
74)	<input checked="" type="checkbox"/> 101-2014-074-2B					
		2179877.762	570297.65	193.277	NaN	193.425
				2B	NaN	0.148
75)	<input checked="" type="checkbox"/> 101-2014-075-2B					
		2202732.058	714671.117	271.162	NaN	271.049
				2B	NaN	-0.113
76)	<input checked="" type="checkbox"/> 101-2014-076-2B					
		2160901.74	601301.001	128.629	NaN	128.849
				2B	NaN	0.22
77)	<input checked="" type="checkbox"/> 101-2014-077-2B					
		2175982.424	613312.845	162.988	NaN	162.811
				2B	NaN	-0.177



Coordinates and Offsets of Analyzed Locations (Continued)

		<b>ID</b>				
		<b>Survey X</b>	<b>Survey Y</b>	<b>Z1</b>	<b>Z DEM</b>	<b>Z LAS</b>
				<b>LC Type</b>	<b>ΔZ DEM</b>	<b>ΔZ LAS</b>
78)	<input checked="" type="checkbox"/>	<b>101-2014-078-2B</b>				
		2137080.606	637877.91	244.228	NaN	244.059
				2B	NaN	-0.169
79)	<input checked="" type="checkbox"/>	<b>101-2014-079-2B</b>				
		2193314.54	673696.173	251.33	NaN	251.259
				2B	NaN	-0.071
80)	<input checked="" type="checkbox"/>	<b>101-2014-080-2B</b>				
		2244851.703	624540.989	146.808	NaN	146.71
				2B	NaN	-0.098
81)	<input checked="" type="checkbox"/>	<b>13101101</b>				
		2219752.673	728118.005	311.144	NaN	311.156
				2B	NaN	0.012
82)	<input checked="" type="checkbox"/>	<b>13101102</b>				
		2215377.573	697201.449	243.09	NaN	243.175
				2B	NaN	0.085
83)	<input checked="" type="checkbox"/>	<b>13101103</b>				
		2193319.488	674467.455	239.877	NaN	239.803
				2B	NaN	-0.074
84)	<input checked="" type="checkbox"/>	<b>13101104</b>				
		2152981.866	651449.198	208.651	NaN	208.68
				2B	NaN	0.029



Coordinates and Offsets of Analyzed Locations (Continued)

	ID					
		Survey X	Survey Y	Z1	Z DEM	Z LAS
				LC Type	ΔZ DEM	ΔZ LAS
85)	<input checked="" type="checkbox"/>	13101105				
		2212222.379	643830.428	173.221	NaN	173.539
				2B	NaN	0.318
86)	<input checked="" type="checkbox"/>	13101106				
		2265394.322	664219.005	212.286	NaN	212.473
				2B	NaN	0.187
87)	<input checked="" type="checkbox"/>	13101107				
		2246566.555	599455.119	91.82	NaN	91.74
				2B	NaN	-0.08
88)	<input checked="" type="checkbox"/>	13101108				
		2152762.367	551451.365	208.586	NaN	208.647
				2B	NaN	0.061
89)	<input checked="" type="checkbox"/>	13101001				
		2203253.65	727665.75	277.48	NaN	277.554
				2B	NaN	0.074
90)	<input checked="" type="checkbox"/>	13101002				
		2222905.44	699908.26	224.06	NaN	224.283
				2B	NaN	0.223
91)	<input checked="" type="checkbox"/>	13101003				
		2190325.67	680238.85	245.25	NaN	244.918
				2B	NaN	-0.332





Coordinates and Offsets of Analyzed Locations (Continued)

		<b>ID</b>				
		<b>Survey X</b>	<b>Survey Y</b>	<b>Z1</b>	<b>Z DEM</b>	<b>Z LAS</b>
				<b>LC Type</b>	<b>ΔZ DEM</b>	<b>ΔZ LAS</b>
92)	<input checked="" type="checkbox"/>	<b>13101004</b>				
		2150662.15	660858.49	240.35	NaN	240.159
				2B	NaN	-0.191
93)	<input checked="" type="checkbox"/>	<b>13101005</b>				
		2258590.78	645209.95	209.14	NaN	209.188
				2B	NaN	0.048
94)	<input checked="" type="checkbox"/>	<b>13101006</b>				
		2227050.62	641562.21	165.43	NaN	165.481
				2B	NaN	0.051
95)	<input checked="" type="checkbox"/>	<b>13101007</b>				
		2236929.88	609168.42	140.01	NaN	139.876
				2B	NaN	-0.134
96)	<input checked="" type="checkbox"/>	<b>13101008</b>				
		2150765	554527.36	206.06	NaN	206.101
				2B	NaN	0.041

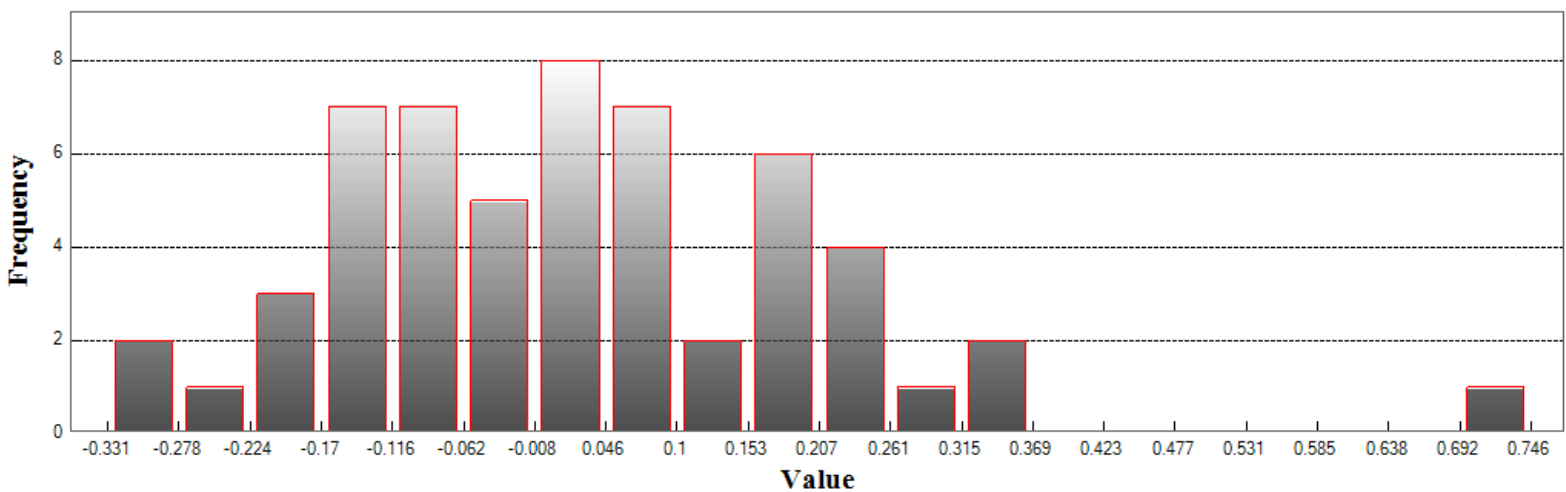


# LAS

## Non-vegetated Vertical Accuracy

LandCover Type: 2U, 2B  
Minimum DZ: -0.332  
Maximum DZ: 0.746  
Mean DZ: 0.026  
Mean Magnitude DZ: 0.375  
Number Observations: 56  
Standard Deviation DZ: 0.185  
RMSE Z: 0.185  
95% Confidence Level Z: 0.363  
Units: US Survey Feet

# Histogram



Min: -0.332  
Max: 0.746  
Number Of Bins: 20  
Bin Interval: 0.054

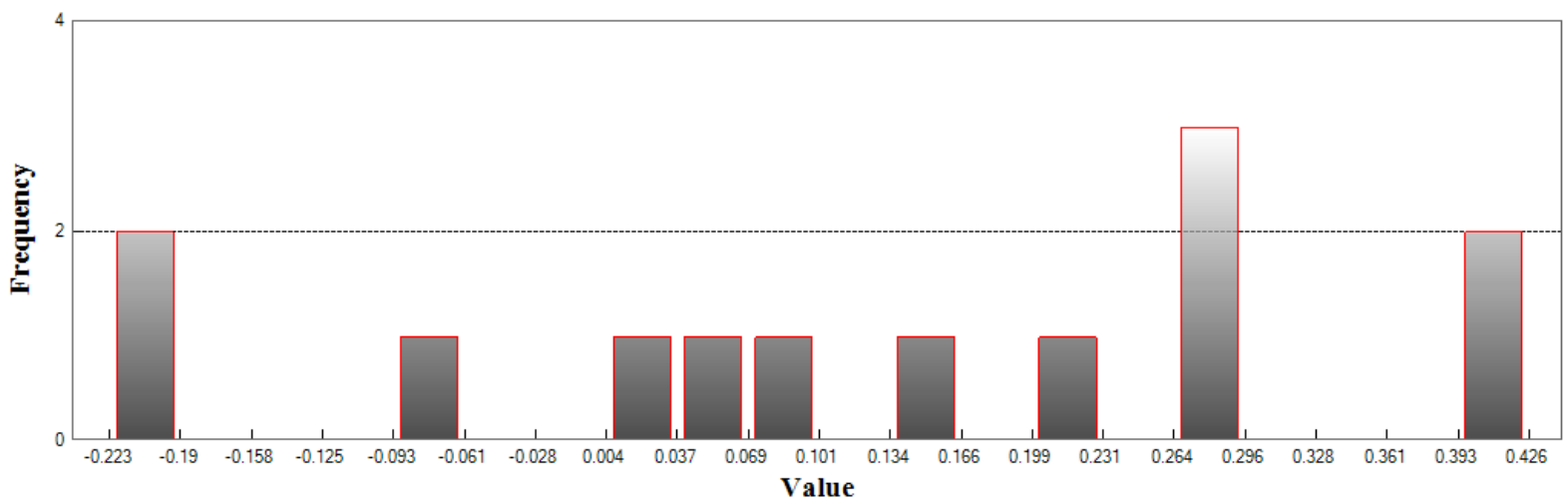


## LAS (Continued)

### Supplemental Vertical Accuracy

LandCover Type: 2H  
Minimum DZ: -0.222  
Maximum DZ: 0.426  
Mean DZ: 0.129  
Mean Magnitude DZ: 0.452  
Number Observations: 13  
Standard Deviation DZ: 0.208  
RMSE Z: 0.238  
95th Percentile: 0.412  
Units: US Survey Feet

## Histogram



Min: -0.222

Max: 0.426

Number Of Bins: 20

Bin Interval: 0.032

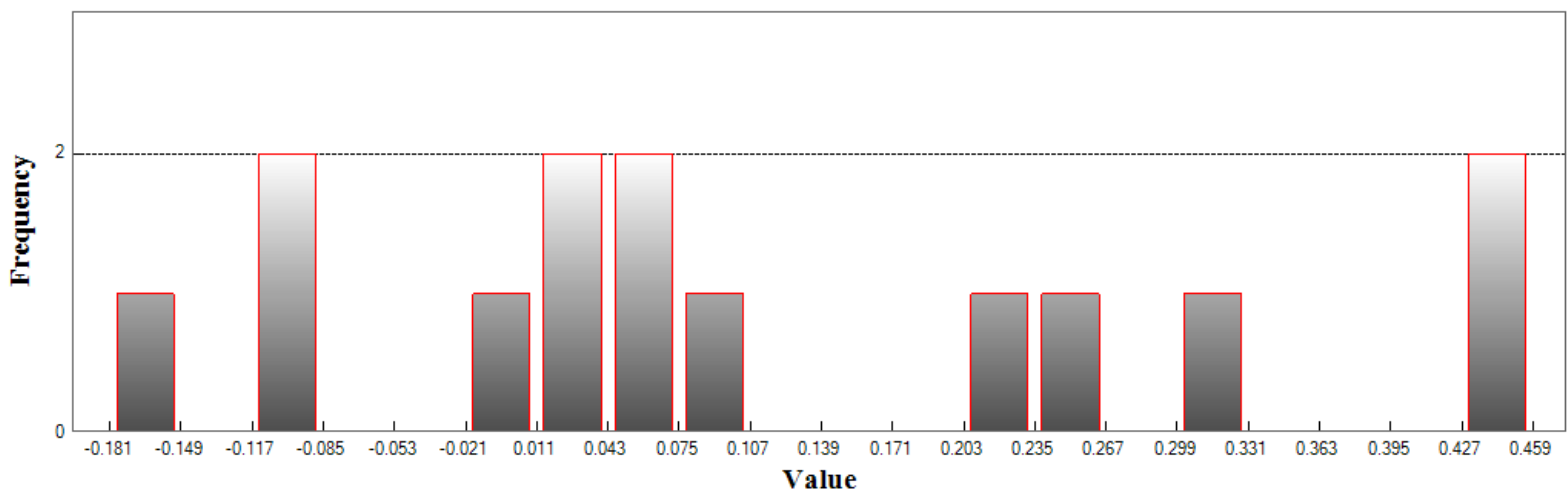


## LAS (Continued)

### Supplemental Vertical Accuracy

LandCover Type: 2L  
Minimum DZ: -0.181  
Maximum DZ: 0.459  
Mean DZ: 0.113  
Mean Magnitude DZ: 0.409  
Number Observations: 14  
Standard Deviation DZ: 0.2  
RMSE Z: 0.224  
95th Percentile: 0.459  
Units: US Survey Feet

## Histogram



Min: -0.181

Max: 0.459

Number Of Bins: 20

Bin Interval: 0.032

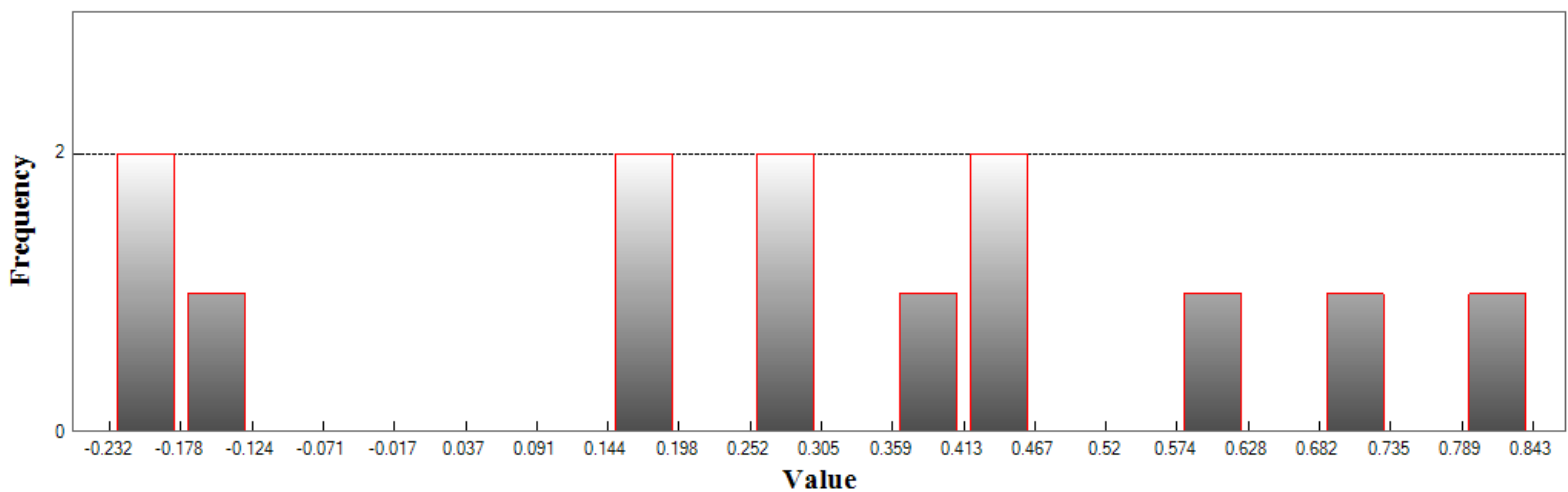


## LAS (Continued)

### Supplemental Vertical Accuracy

LandCover Type: 2M  
Minimum DZ: -0.232  
Maximum DZ: 0.843  
Mean DZ: 0.291  
Mean Magnitude DZ: 0.616  
Number Observations: 13  
Standard Deviation DZ: 0.334  
RMSE Z: 0.434  
95th Percentile: 0.747  
Units: US Survey Feet

## Histogram



Min: -0.232  
Max: 0.843  
Number Of Bins: 20  
Bin Interval: 0.054

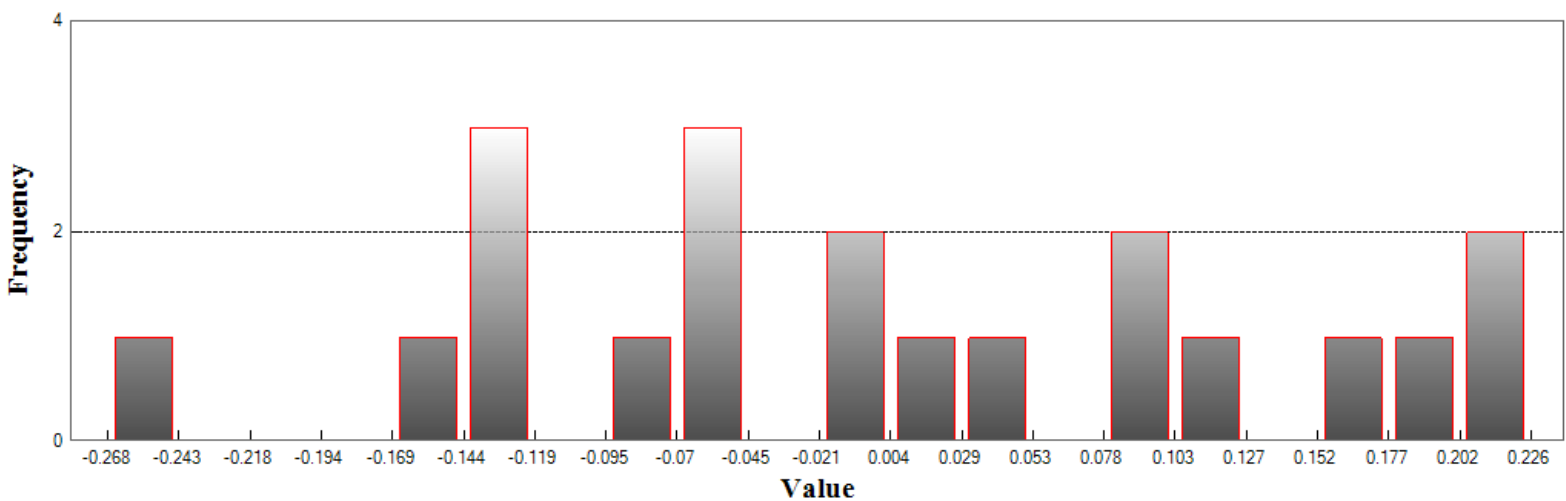


## LAS (Continued)

### Supplemental Vertical Accuracy

LandCover Type: 2U  
Minimum DZ: -0.267  
Maximum DZ: 0.227  
Mean DZ: 0.002  
Mean Magnitude DZ: 0.335  
Number Observations: 20  
Standard Deviation DZ: 0.137  
RMSE Z: 0.134  
95th Percentile: 0.229  
Units: US Survey Feet

## Histogram



Min: -0.267

Max: 0.227

Number Of Bins: 20

Bin Interval: 0.025

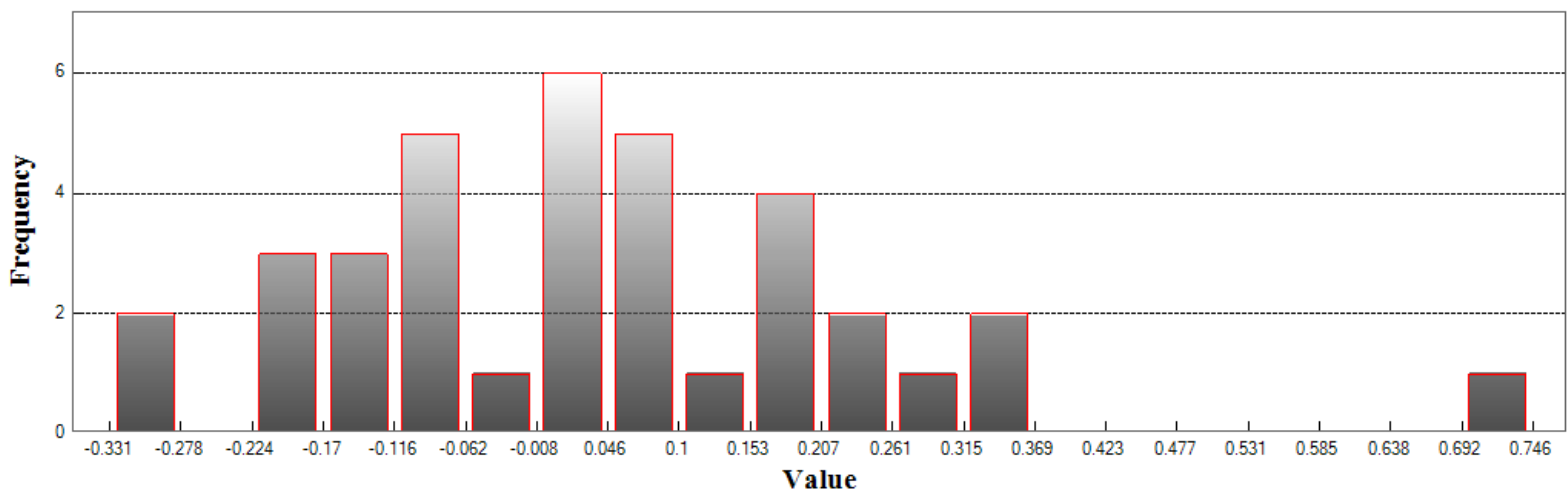


## LAS (Continued)

### Supplemental Vertical Accuracy

LandCover Type: 2B  
Minimum DZ: -0.332  
Maximum DZ: 0.746  
Mean DZ: 0.04  
Mean Magnitude DZ: 0.395  
Number Observations: 36  
Standard Deviation DZ: 0.207  
RMSE Z: 0.208  
95th Percentile: 0.341  
Units: US Survey Feet

## Histogram



Min: -0.332  
Max: 0.746  
Number Of Bins: 20  
Bin Interval: 0.054



## LAS (Continued)

### Vegetated Vertical Accuracy

LandCover Type: 2H, 2L, 2M

Minimum DZ: -0.232

Maximum DZ: 0.843

Mean DZ: 0.176

Mean Magnitude DZ: 0.498

Number Observations: 40

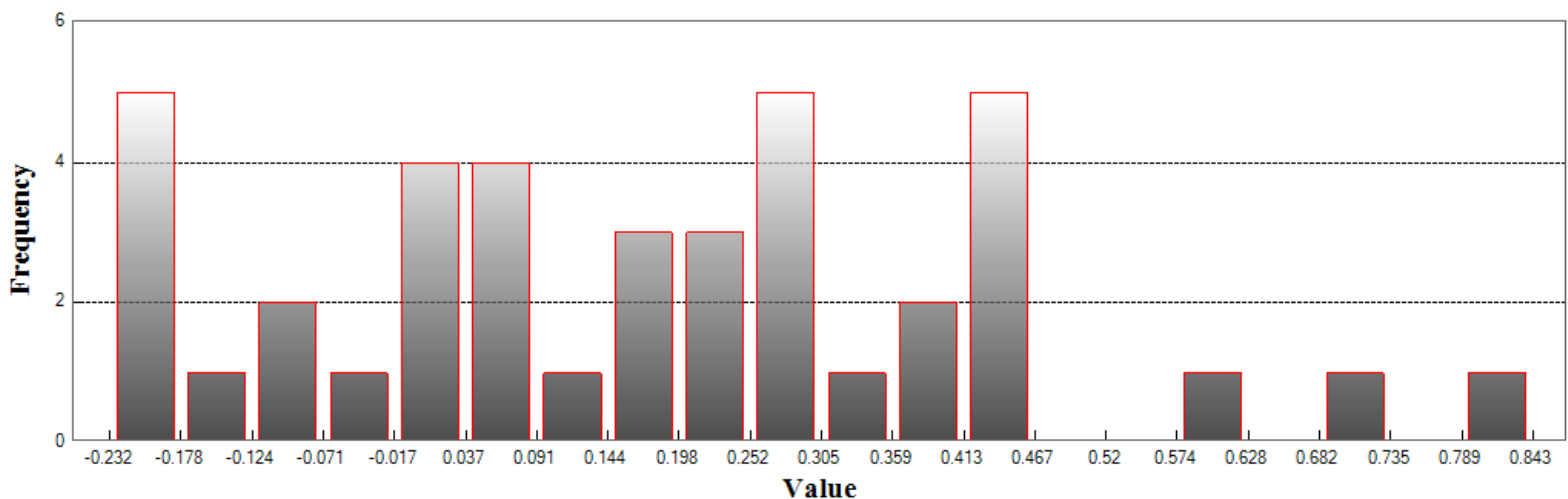
Standard Deviation DZ: 0.26

RMSE Z: 0.312

95th Percentile: 0.595

Units: US Survey Feet

## Histogram



Min: -0.232

Max: 0.843

Number Of Bins: 20

Bin Interval: 0.054