

# Vertical Accuracy Report

Wisconsin WROC - 3DEP 2019  
Monroe County Lidar

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# Vertical Accuracy Report

## Project Information

Prepared By: Ayres

Project Name: Wisconsin WROC – 3DEP Monroe County Lidar 2019

Sensor Info: Riegl VQ 1560i, serial number 061

USGS Quality Level: 2

Required Nominal Pulse Spacing: 0.7

Contractor Name: Ayres

Units: US Survey Feet

Date of Acquisition: Start: 4/9/2019 | Finish: 4/28/2019

## Report Information

This report documents the absolute vertical accuracy of the lidar data collected for the Monroe County, WI, QL2 lidar project. Independent ground control checkpoints were collected by land surveyors using Trimble GNSS equipment connected to WISCRS base stations. The checkpoints were collected from May 7, 2019, to May 20, 2019.

The checkpoints were collected under various land cover types that are predominant in the County. Each land cover type falls into either the Non-vegetated Vertical Accuracy (NVA) or the Vegetated Vertical Accuracy (VVA) group. For this project, 55 NVA points and 50 VVA points were collected throughout the County.

The following report shows the final statistics for the NVA checkpoints compared against the raw swath point cloud and the bare earth DEM, and the VVA statistics compared against the DEM. Statistics are reported for LAS and DEM by NVA and VVA categories and by land cover type.

Vertical Accuracy Specifications per USGS QL2 level:

### LAS:

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

### DEM:

NVA equates to 10 cm RMSEz, or 19.6 cm (0.64 ft) at the 95% confidence level.

VVA equates to 29.4 cm (0.96 ft) at the 95th percentile.

The NVA and VVA statistics for this project are within the above stated specifications.

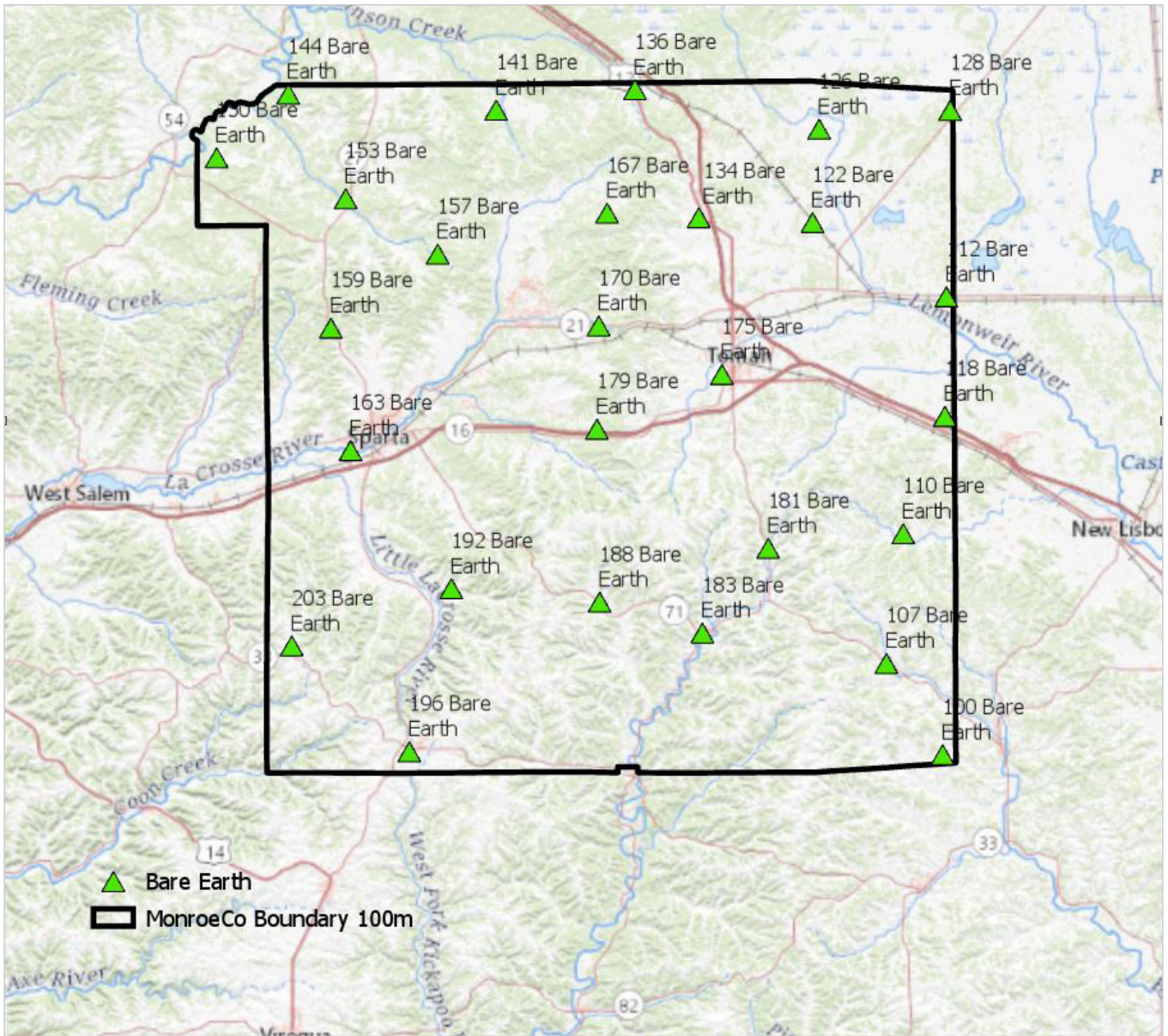


## Lidar Accuracy Assessment Summary

LAND COVER TYPE	# OF POINTS	NVA	VVA
<b>LAS</b>		95% confidence level	N/A
1. Bare Earth	27	0.368	N/A
2. Urban Areas	28	0.253	N/A
3. Tall Weeds	24	N/A	N/A
5. Forest	26	N/A	N/A
TOTAL	105	0.315	N/A
<b>DEM</b>		95% confidence level	95th percentile
1. Bare Earth	27	0.345	N/A
2. Urban Areas	28	0.236	N/A
3. Tall Weeds	24	N/A	0.413
5. Forest	26	N/A	0.586
TOTAL	105	0.295	0.586

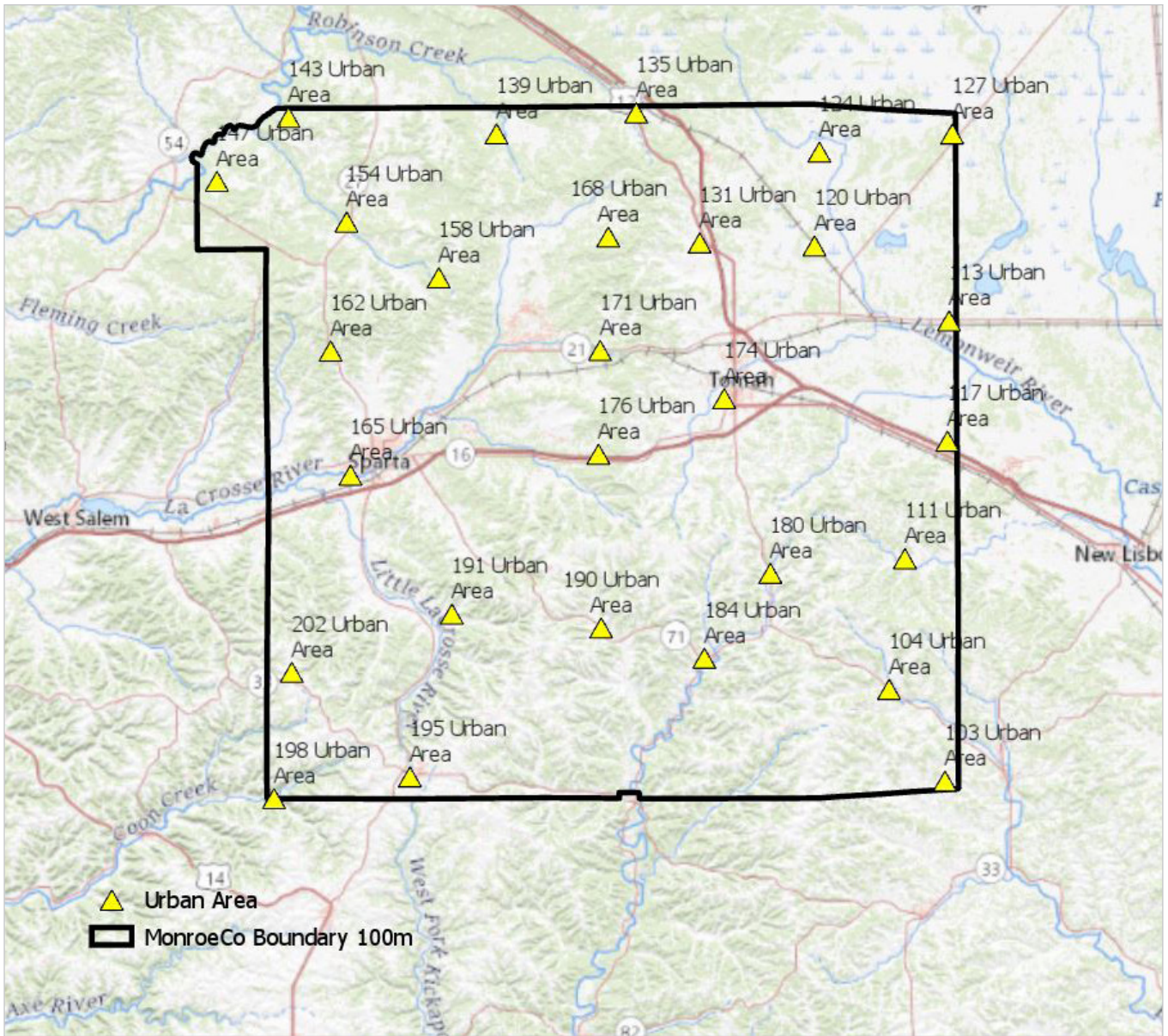
Units: US Survey Feet

## Map of NVA Checkpoint Locations - 1. Bare Earth



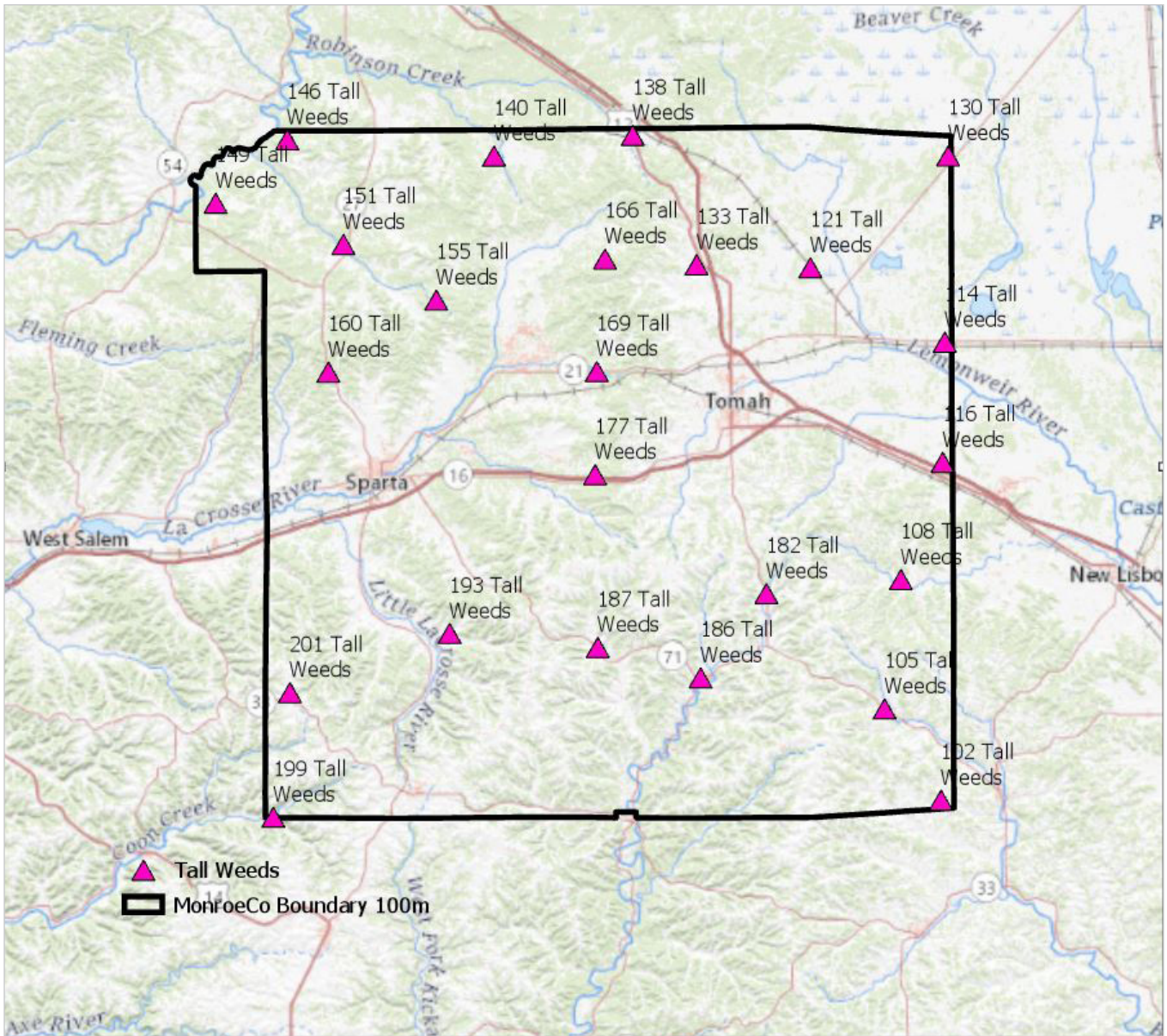


## Map of NVA Checkpoint Locations - 2. Urban Areas



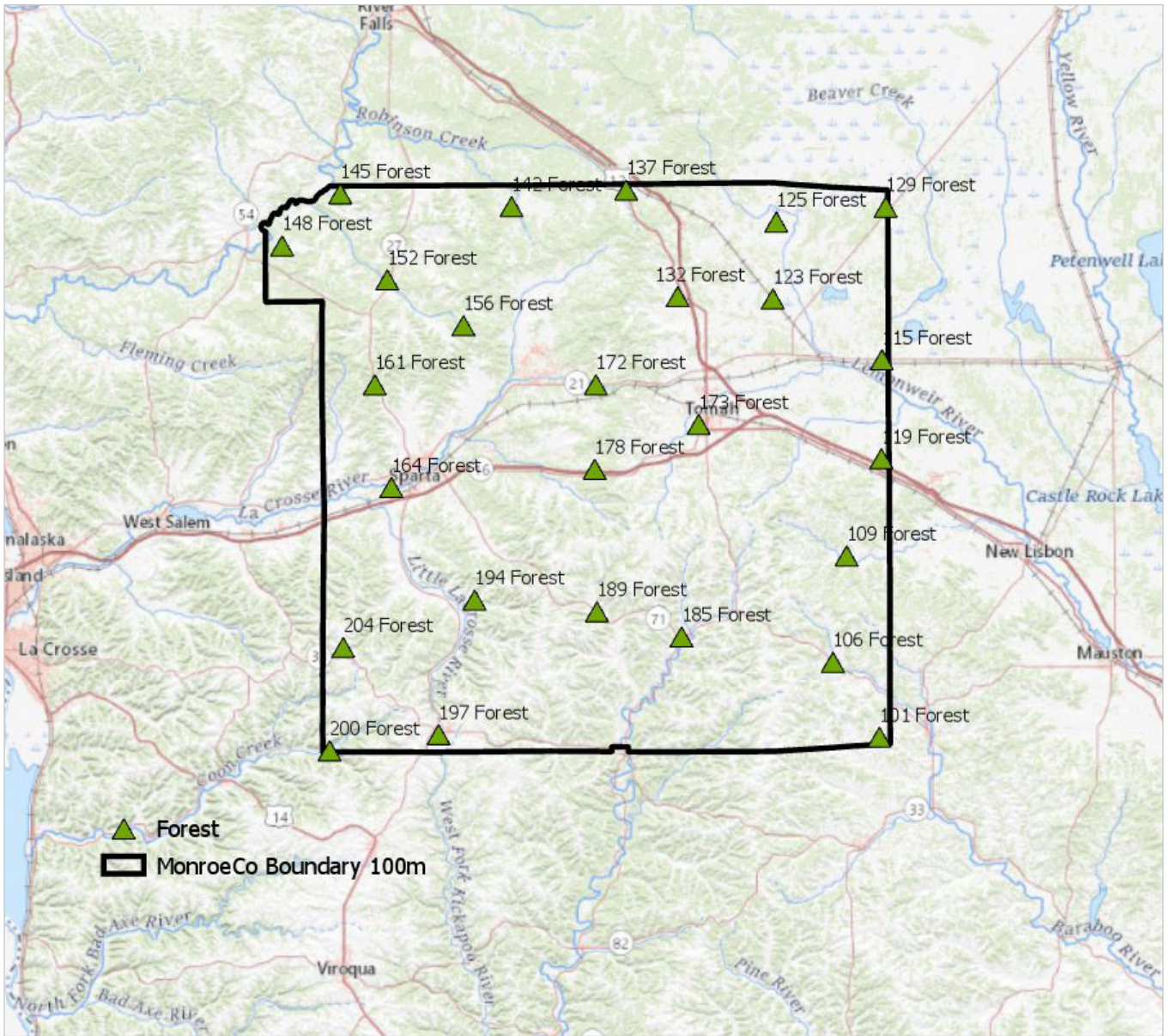


### Map of VVA Checkpoint Locations - 3. Tall Weeds





## Map of VVA Checkpoint Locations - 5. Forested Areas



## LAS

<b>NONVEGETATED VERTICAL ACCURACY – OVERALL</b>	
<b>Land Cover Type</b>	<b>1. Bare Earth, 2. Urban Areas</b>
Minimum DZ	-0.597
Maximum DZ	0.382
Mean DZ	0.011
Mean Magnitude DZ	0.349
Number Observations	55
Standard Deviation DZ	0.162
RMSE Z	0.161
95% Confidence Level Z	0.315
Units	US Survey Feet

## DEM

<b>NONVEGETATED VERTICAL ACCURACY – OVERALL</b>	
<b>Land Cover Type</b>	<b>1. Bare Earth, 2. Urban Areas</b>
Minimum DZ	-0.501
Maximum DZ	0.417
Mean DZ	0.034
Mean Magnitude DZ	0.335
Number Observations	55
Standard Deviation DZ	0.148
RMSE Z	0.15
95% Confidence Level Z	0.295
Units	US Survey Feet

## DEM (Continued)

VEGETATED VERTICAL ACCURACY	
Land Cover Type	3. Tall Weeds
Minimum DZ	-0.072
Maximum DZ	0.655
Mean DZ	0.194
Mean Magnitude DZ	0.447
Number Observations	24
Standard Deviation DZ	0.146
RMSE Z	0.241
95% Confidence Level Z	0.413
Units	US Survey Feet

## DEM (Continued)

VEGETATED VERTICAL ACCURACY	
Land Cover Type	5. Forest
Minimum DZ	0.06
Maximum DZ	0.813
Mean DZ	0.298
Mean Magnitude DZ	0.546
Number Observations	26
Standard Deviation DZ	0.172
RMSE Z	0.343
95% Confidence Level Z	0.586
Units	US Survey Feet



# Point: 100 Bare Earth

Survey X: 755372.02, Survey Y: 304189.59, Z1: 1082.92, Z DEM: 1083.21, Z LAS: 1083.2, ΔZ DEM: 0.29, ΔZ LAS: 0.28



North



South



East



West



## Point: 101 Forest

Survey X: 755361.08, Survey Y: 304217.85, Z1: 1086.37, Z DEM: 1086.94, Z LAS: 1086.99, ΔZ DEM: 0.56, ΔZ LAS: 0.62



North



South



East



West



# Point: 102 Tall Weeds

Survey X: 755407.92, Survey Y: 304114.84, Z1: 1073.58, Z DEM: 1074.23, Z LAS: 1074.24, ΔZ DEM: 0.65, ΔZ LAS: 0.66



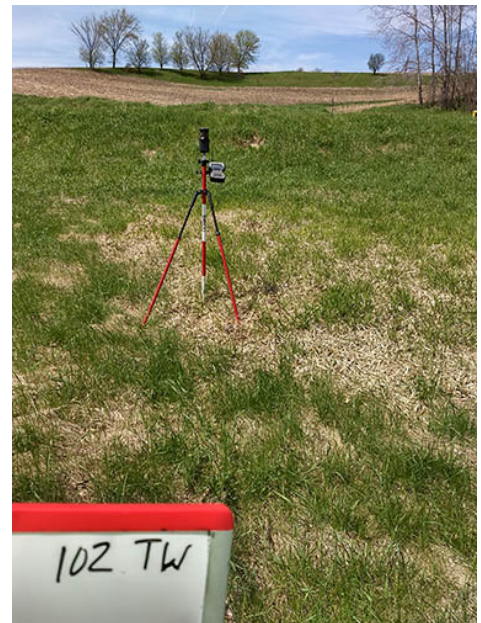
North



South



East



West

# Point: 103 Urban Area

Survey X: 755289.91, Survey Y: 304049.82, Z1: 1079.04, Z DEM: 1079.2, Z LAS: 1079.18,  $\Delta Z$  DEM: 0.16,  $\Delta Z$  LAS: 0.14



North



South



East



West



# Point: 104 Urban Area

Survey X: 742463.95, Survey Y: 325082.12, Z1: 1018.68, Z DEM: 1018.68, Z LAS: 1018.64, ΔZ DEM: 0, ΔZ LAS: -0.04



North



South



East



West



# Point: 105 Tall Weeds

Survey X: 742383.56, Survey Y: 325162.88, Z1: 1018.37, Z DEM: 1018.52, Z LAS: 1018.55, ΔZ DEM: 0.15, ΔZ LAS: 0.18



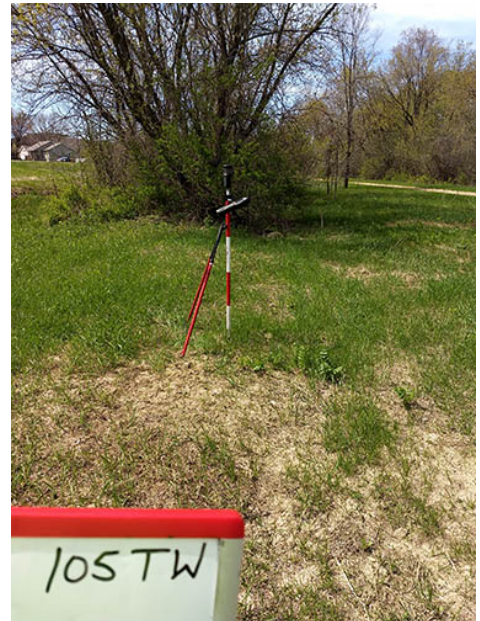
North



South



East



West



## Point: 106 Forest

Survey X: 742348.01, Survey Y: 325189.5, Z1: 1018.68, Z DEM: 1018.96, Z LAS: 1018.94,  $\Delta Z$  DEM: 0.28,  $\Delta Z$  LAS: 0.26



North



South



East



West



# Point: 107 Bare Earth

Survey X: 742386.49, Survey Y: 325218.83, Z1: 1018.6, Z DEM: 1018.52, Z LAS: 1018.55, ΔZ DEM: -0.08, ΔZ LAS: -0.04



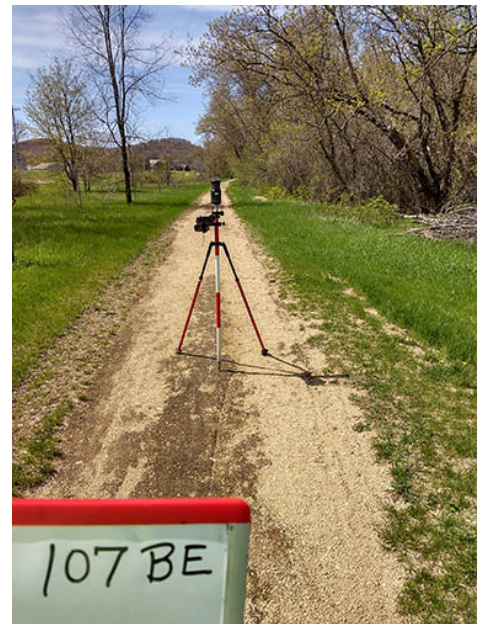
North



South



East



West



# Point: 108 Tall Weeds

Survey X: 746156.36, Survey Y: 354988.45, Z1: 961.96, Z DEM: 962.06, Z LAS: 962.15, ΔZ DEM: 0.1, ΔZ LAS: 0.19



North



South



East



West



# Point: 109 Forest

Survey X: 746183.52, Survey Y: 354963.22, Z1: 961.8, Z DEM: 962.05, Z LAS: 962.07, ΔZ DEM: 0.25, ΔZ LAS: 0.27



North



South



East



West



# Point: 110 Bare Earth

Survey X: 746266.49, Survey Y: 355119.3, Z1: 963.93, Z DEM: 963.99, Z LAS: 964.02, ΔZ DEM: 0.06, ΔZ LAS: 0.09



North



South



East



West

## Point: 111 Urban Area

Survey X: 746090.05, Survey Y: 355095.19, Z1: 953.46, Z DEM: 953.5, Z LAS: 953.55, ΔZ DEM: 0.05, ΔZ LAS: 0.09



North



South



East



West



# Point: 112 Bare Earth

Survey X: 756214.86, Survey Y: 409712.24, Z1: 908.56, Z DEM: 908.59, Z LAS: 908.67, ΔZ DEM: 0.03, ΔZ LAS: 0.11



North



South



East



West

# Point: 113 Urban Area

Survey X: 756233.13, Survey Y: 409685.59, Z1: 908.7, Z DEM: 908.85, Z LAS: 908.82, ΔZ DEM: 0.15, ΔZ LAS: 0.12



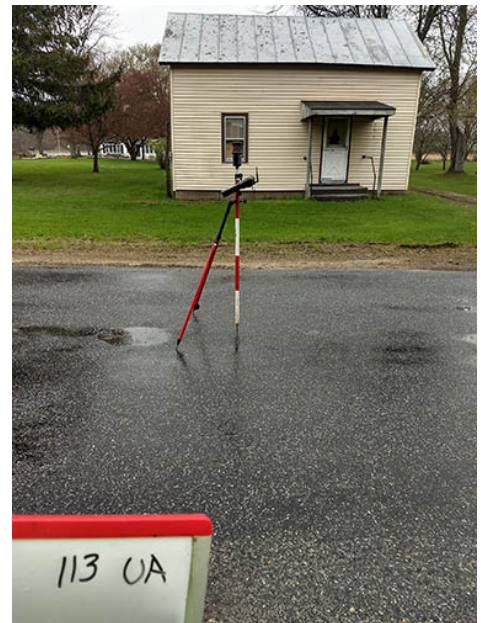
North



South



East



West



# Point: 114 Tall Weeds

Survey X: 756275.08, Survey Y: 409776.39, Z1: 908.09, Z DEM: 908.5, Z LAS: 908.48, ΔZ DEM: 0.41, ΔZ LAS: 0.4



North



South



East



West



# Point: 115 Forest

Survey X: 756082.11, Survey Y: 409889.96, Z1: 907.46, Z DEM: 907.95, Z LAS: 907.91, ΔZ DEM: 0.49, ΔZ LAS: 0.44



North



South



East



West



# Point: 116 Tall Weeds

Survey X: 755794.32, Survey Y: 382049.29, Z1: 949.38, Z DEM: 949.53, Z LAS: 949.6, ΔZ DEM: 0.16, ΔZ LAS: 0.23



North



South



East



West



## Point: 117 Urban Area

Survey X: 755858.36, Survey Y: 382074.01, Z1: 955.26, Z DEM: 955.25, Z LAS: 955.12, ΔZ DEM: -0.02, ΔZ LAS: -0.14



North



South



East



West

# Point: 118 Bare Earth

Survey X: 755881.09, Survey Y: 382154.14, Z1: 955.97, Z DEM: 956.05, Z LAS: 955.99, ΔZ DEM: 0.08, ΔZ LAS: 0.02



North



South



East



West



# Point: 119 Forest

Survey X: 755937.52, Survey Y: 382187.47, Z1: 957.94, Z DEM: 958.25, Z LAS: 958.4, ΔZ DEM: 0.31, ΔZ LAS: 0.46



North



South



East



West



# Point: 120 Urban Area

Survey X: 725325.31, Survey Y: 426891.53, Z1: 951.66, Z DEM: 951.6, Z LAS: 951.57, ΔZ DEM: -0.06, ΔZ LAS: -0.09



North



South



East



West

# Point: 121 Tall Weeds

Survey X: 725278.8, Survey Y: 426924.34, Z1: 950.39, Z DEM: 950.59, Z LAS: 950.51, ΔZ DEM: 0.2, ΔZ LAS: 0.13



North



South



East



West



# Point: 122 Bare Earth

Survey X: 725358.2, Survey Y: 426821.93, Z1: 951.52, Z DEM: 951.49, Z LAS: 951.48, ΔZ DEM: -0.03, ΔZ LAS: -0.04



North



South



East



West



# Point: 123 Forest

Survey X: 725516.62, Survey Y: 426948.14, Z1: 947.71, Z DEM: 947.94, Z LAS: 947.96, ΔZ DEM: 0.22, ΔZ LAS: 0.25



North



South



East



West

# Point: 124 Urban Area

Survey X: 726445.16, Survey Y: 448419.16, Z1: 957.03, Z DEM: 956.9, Z LAS: 956.9,  $\Delta Z$  DEM: -0.12,  $\Delta Z$  LAS: -0.13



North



South



East

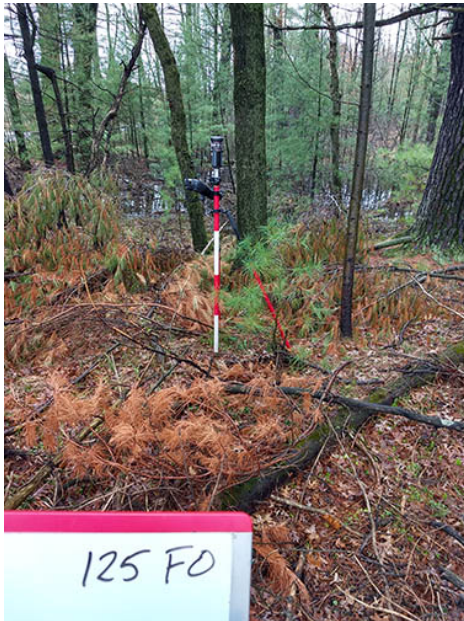


West



## Point: 125 Forest

Survey X: 726502.34, Survey Y: 448493.75, Z1: 952.78, Z DEM: 952.95, Z LAS: 953.04, ΔZ DEM: 0.17, ΔZ LAS: 0.26



North



South



East



West

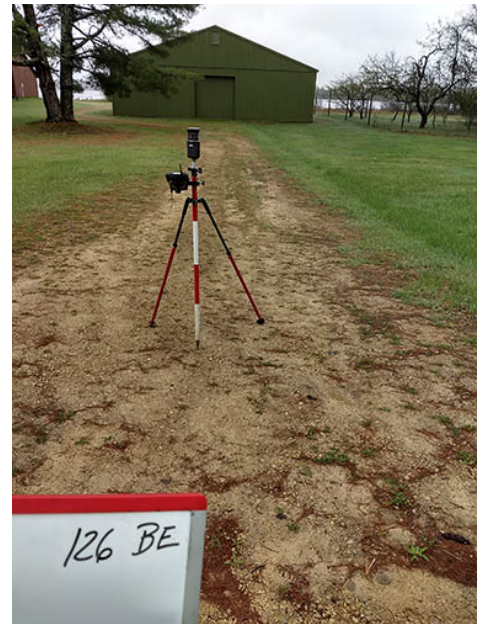


## Point: 126 Bare Earth

Survey X: 726883.72, Survey Y: 448353.6, Z1: 955.86, Z DEM: 955.81, Z LAS: 955.83, ΔZ DEM: -0.05, ΔZ LAS: -0.02



North



South



East



West



# Point: 127 Urban Area

Survey X: 756957.31, Survey Y: 452608.76, Z1: 970.13, Z DEM: 970.12, Z LAS: 970.06,  $\Delta Z$  DEM: -0.01,  $\Delta Z$  LAS: -0.06



North



South



East



West

# Point: 128 Bare Earth

Survey X: 757082.66, Survey Y: 452653.93, Z1: 964.02, Z DEM: 964.14, Z LAS: 964.09, ΔZ DEM: 0.13, ΔZ LAS: 0.07



North



South



East



West



# Point: 129 Forest

Survey X: 757130.37, Survey Y: 452629.25, Z1: 964.07, Z DEM: 964.13, Z LAS: 964.09, ΔZ DEM: 0.06, ΔZ LAS: 0.02



North



South



East



West



# Point: 130 Tall Weeds

Survey X: 757058.06, Survey Y: 452738.19, Z1: 963.81, Z DEM: 964.13, Z LAS: 964.17, ΔZ DEM: 0.32, ΔZ LAS: 0.36



North



South



East



West



# Point: 131 Urban Area

Survey X: 698954.01, Survey Y: 427584.61, Z1: 991.3, Z DEM: 991.13, Z LAS: 991.07, ΔZ DEM: -0.16, ΔZ LAS: -0.22



North



South



East



West



# Point: 132 Forest

Survey X: 698894.46, Survey Y: 427588.92, Z1: 987.9, Z DEM: 988.08, Z LAS: 988.24, ΔZ DEM: 0.18, ΔZ LAS: 0.34



North



South



East



West



# Point: 133 Tall Weeds

Survey X: 699015.07, Survey Y: 427626.43, Z1: 990.65, Z DEM: 990.77, Z LAS: 990.69, ΔZ DEM: 0.12, ΔZ LAS: 0.04



North



South



East



West



# Point: 134 Bare Earth

Survey X: 699123.79, Survey Y: 427921.41, Z1: 999.16, Z DEM: 999.05, Z LAS: 999.12, ΔZ DEM: -0.1, ΔZ LAS: -0.04



North



South



East



West



# Point: 135 Urban Area

Survey X: 684348.59, Survey Y: 457452.77, Z1: 971.86, Z DEM: 971.71, Z LAS: 971.73, ΔZ DEM: -0.15, ΔZ LAS: -0.13



North



South



East



West

# Point: 136 Bare Earth

Survey X: 684424.09, Survey Y: 457447.73, Z1: 969.66, Z DEM: 969.66, Z LAS: 969.58, ΔZ DEM: 0, ΔZ LAS: -0.08



North



South



East



West



# Point: 137 Forest

Survey X: 684450.54, Survey Y: 457393.02, Z1: 966.97, Z DEM: 967.15, Z LAS: 967.31, ΔZ DEM: 0.18, ΔZ LAS: 0.34



North



South



East



West



# Point: 138 Tall Weeds

Survey X: 684297.97, Survey Y: 457459.92, Z1: 967.67, Z DEM: 967.71, Z LAS: 967.76, ΔZ DEM: 0.03, ΔZ LAS: 0.09



North



South



East



West



# Point: 139 Urban Area

Survey X: 652268.49, Survey Y: 452629.84, Z1: 907.75, Z DEM: 907.7, Z LAS: 907.63, ΔZ DEM: -0.04, ΔZ LAS: -0.11



North



South



East



West



# Point: 140 Tall Weeds

Survey X: 652285.76, Survey Y: 452692.85, Z1: 905.84, Z DEM: 905.9, Z LAS: 905.89, ΔZ DEM: 0.06, ΔZ LAS: 0.06



North



South



East



West



# Point: 141 Bare Earth

Survey X: 652403.14, Survey Y: 452736.09, Z1: 907.17, Z DEM: 907.03, Z LAS: 907.02, ΔZ DEM: -0.14, ΔZ LAS: -0.15



North



South



East



West



# Point: 142 Forest

Survey X: 652387.05, Survey Y: 452763.92, Z1: 905.93, Z DEM: 906.1, Z LAS: 906.28, ΔZ DEM: 0.18, ΔZ LAS: 0.35



North



South



East



West



# Point: 143 Urban Area

Survey X: 604491.63, Survey Y: 456375.57, Z1: 855.69, Z DEM: 855.63, Z LAS: 855.54,  $\Delta Z$  DEM: -0.06,  $\Delta Z$  LAS: -0.15



North



South



East



West

# Point: 144 Bare Earth

Survey X: 604468.83, Survey Y: 456413.89, Z1: 854.45, Z DEM: 854.29, Z LAS: 854.3, ΔZ DEM: -0.16, ΔZ LAS: -0.15



North



South



East



West



## Point: 145 Forest

Survey X: 604428.57, Survey Y: 456359.77, Z1: 856.94, Z DEM: 857.01, Z LAS: 857.17, ΔZ DEM: 0.07, ΔZ LAS: 0.24



North



South



East



West



# Point: 146 Tall Weeds

Survey X: 604593.51, Survey Y: 456463.11, Z1: 848.35, Z DEM: 848.45, Z LAS: 848.43, ΔZ DEM: 0.09, ΔZ LAS: 0.07



North



South



East



West



# Point: 147 Urban Area

Survey X: 588039.83, Survey Y: 441707.05, Z1: 865.95, Z DEM: 865.81, Z LAS: 865.78, ΔZ DEM: -0.14, ΔZ LAS: -0.17



North



South



East



West

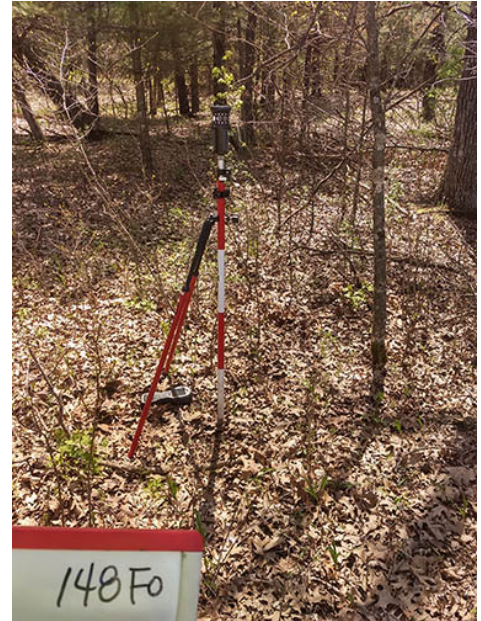


# Point: 148 Forest

Survey X: 588145.45, Survey Y: 441783.43, Z1: 859.96, Z DEM: 860.29, Z LAS: 860.33, ΔZ DEM: 0.33, ΔZ LAS: 0.37



North



South



East



West



# Point: 149 Tall Weeds

Survey X: 588077.75, Survey Y: 441835.82, Z1: 861.77, Z DEM: 861.77, Z LAS: 861.76, ΔZ DEM: 0.01, ΔZ LAS: -0.01



North



South



East



West



# Point: 150 Bare Earth

Survey X: 587959.84, Survey Y: 441738.83, Z1: 857, Z DEM: 856.98, Z LAS: 856.94, ΔZ DEM: -0.02, ΔZ LAS: -0.05



North



South



East



West



# Point: 151 Tall Weeds

Survey X: 617555.26, Survey Y: 432301.93, Z1: 838.21, Z DEM: 838.44, Z LAS: 838.4, ΔZ DEM: 0.23, ΔZ LAS: 0.19



North



South



East



West



# Point: 152 Forest

Survey X: 617583.44, Survey Y: 432280.84, Z1: 838.32, Z DEM: 838.65, Z LAS: 838.76, ΔZ DEM: 0.32, ΔZ LAS: 0.44



North



South



East



West



# Point: 153 Bare Earth

Survey X: 617721.72, Survey Y: 432318.65, Z1: 841.31, Z DEM: 841.3, Z LAS: 841.31, ΔZ DEM: -0.01, ΔZ LAS: 0



North



South



East



West



# Point: 154 Urban Area

Survey X: 617816.5, Survey Y: 432375.66, Z1: 845.7, Z DEM: 845.69, Z LAS: 845.73,  $\Delta Z$  DEM: -0.01,  $\Delta Z$  LAS: 0.03



North



South



East



West



# Point: 155 Tall Weeds

Survey X: 638968.93, Survey Y: 419469.75, Z1: 953.83, Z DEM: 954.02, Z LAS: 953.99, ΔZ DEM: 0.19, ΔZ LAS: 0.16



North



South



East



West



## Point: 156 Forest

Survey X: 638901.54, Survey Y: 419459.09, Z1: 951.44, Z DEM: 951.71, Z LAS: 951.74, ΔZ DEM: 0.27, ΔZ LAS: 0.31



North



South



East



West



# Point: 157 Bare Earth

Survey X: 638917.03, Survey Y: 419550.47, Z1: 954.43, Z DEM: 954.68, Z LAS: 954.81, ΔZ DEM: 0.26, ΔZ LAS: 0.38



North



South



East



West



# Point: 158 Urban Area

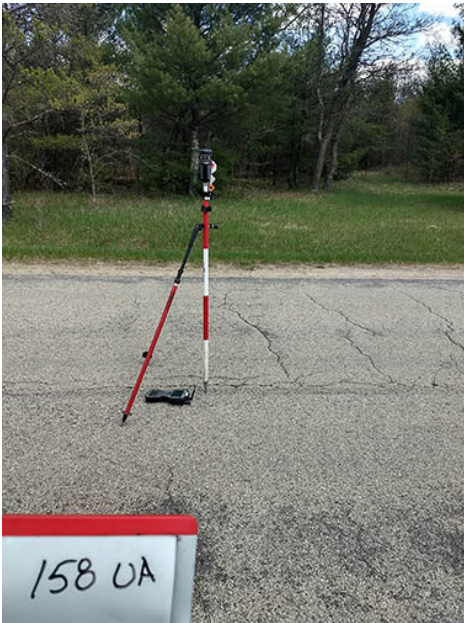
Survey X: 639000.58, Survey Y: 419581.34, Z1: 958.31, Z DEM: 958.35, Z LAS: 958.36, ΔZ DEM: 0.04, ΔZ LAS: 0.05



North



South



East



West



# Point: 159 Bare Earth

Survey X: 614294.96, Survey Y: 402487.46, Z1: 930.86, Z DEM: 930.89, Z LAS: 930.85, ΔZ DEM: 0.03, ΔZ LAS: -0.01



North



South



East



West



## Point: 160 Tall Weeds

Survey X: 614081.08, Survey Y: 402859.21, Z1: 928.73, Z DEM: 928.91, Z LAS: 929.04, ΔZ DEM: 0.17, ΔZ LAS: 0.31



North



South



East



West



# Point: 161 Forest

Survey X: 614105.56, Survey Y: 402881.53, Z1: 927.45, Z DEM: 927.67, Z LAS: 927.71, ΔZ DEM: 0.22, ΔZ LAS: 0.26



North



South



East



West



# Point: 162 Urban Area

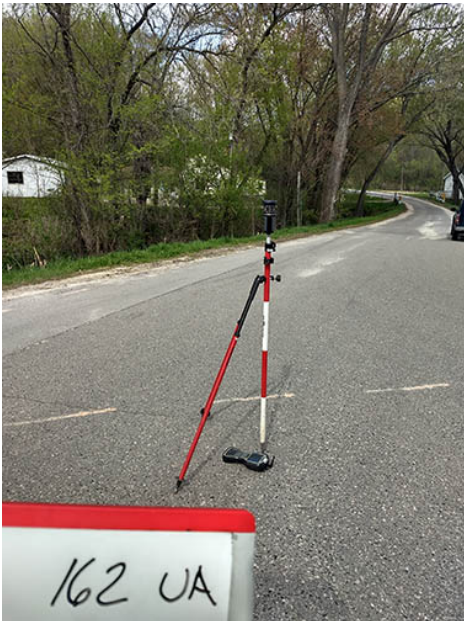
Survey X: 614164.87, Survey Y: 402763.85, Z1: 931.11, Z DEM: 931.16, Z LAS: 931.09, ΔZ DEM: 0.05, ΔZ LAS: -0.02



North



South



East



West



# Point: 163 Bare Earth

Survey X: 618839.59, Survey Y: 374266.49, Z1: 770.3, Z DEM: 770.45, Z LAS: 770.46, ΔZ DEM: 0.16, ΔZ LAS: 0.17



North



South



East



West



# Point: 164 Forest

Survey X: 618747.81, Survey Y: 374161.71, Z1: 765.79, Z DEM: 766.1, Z LAS: 766.08, ΔZ DEM: 0.31, ΔZ LAS: 0.29



North



South



East



West



# Point: 165 Urban Area

Survey X: 618728.98, Survey Y: 374260.3, Z1: 768.43, Z DEM: 768.54, Z LAS: 768.48, ΔZ DEM: 0.12, ΔZ LAS: 0.06



North



South



East



West



# Point: 166 Tall Weeds

Survey X: 677880.76, Survey Y: 428943.72, Z1: 1007.26, Z DEM: 1007.5, Z LAS: 1007.53, ΔZ DEM: 0.24, ΔZ LAS: 0.28



North



South



East



West



# Point: 167 Bare Earth

Survey X: 677987.51, Survey Y: 428983.92, Z1: 1010.33, Z DEM: 1010.45, Z LAS: 1010.39, ΔZ DEM: 0.12, ΔZ LAS: 0.06



North



South



East



West



# Point: 168 Urban Area

Survey X: 677951.85, Survey Y: 428939.48, Z1: 1010.35, Z DEM: 1010.47, Z LAS: 1010.42, ΔZ DEM: 0.12, ΔZ LAS: 0.07



North



South



East



West



# Point: 169 Tall Weeds

Survey X: 676011.14, Survey Y: 402978.79, Z1: 952.22, Z DEM: 952.15, Z LAS: 952.17, ΔZ DEM: -0.07, ΔZ LAS: -0.05



North



South



East



West



## Point: 170 Bare Earth

Survey X: 676055.62, Survey Y: 403001.66, Z1: 947.4, Z DEM: 946.9, Z LAS: 946.8, ΔZ DEM: -0.5, ΔZ LAS: -0.6



North



South



East



West



# Point: 171 Urban Area

Survey X: 676053.51, Survey Y: 402893.19, Z1: 945.5, Z DEM: 945.4, Z LAS: 945.3, ΔZ DEM: -0.1, ΔZ LAS: -0.2



North



South



East



West



## Point: 172 Forest

Survey X: 675989.46, Survey Y: 402880.17, Z1: 946.87, Z DEM: 946.97, Z LAS: 947.04, ΔZ DEM: 0.1, ΔZ LAS: 0.17



North



South



East



West



## Point: 173 Forest

Survey X: 704769.55, Survey Y: 391782.62, Z1: 968.04, Z DEM: 968.28, Z LAS: 968.32, ΔZ DEM: 0.24, ΔZ LAS: 0.28



North



South



East



West



## Point: 174 Urban Area

Survey X: 704578.61, Survey Y: 391835.39, Z1: 967.17, Z DEM: 967.36, Z LAS: 967.39, ΔZ DEM: 0.19, ΔZ LAS: 0.22



North



South



East



West



# Point: 175 Bare Earth

Survey X: 704465.67, Survey Y: 391801.95, Z1: 966.25, Z DEM: 966.67, Z LAS: 966.62, ΔZ DEM: 0.42, ΔZ LAS: 0.37



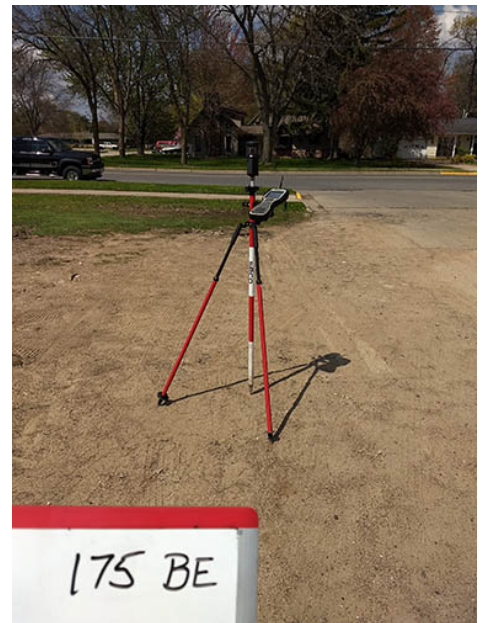
North



South



East



West



# Point: 176 Urban Area

Survey X: 675690.46, Survey Y: 379064.79, Z1: 1025.91, Z DEM: 1025.86, Z LAS: 1025.84,  $\Delta Z$  DEM: -0.04,  $\Delta Z$  LAS: -0.07



North



South



East



West



# Point: 177 Tall Weeds

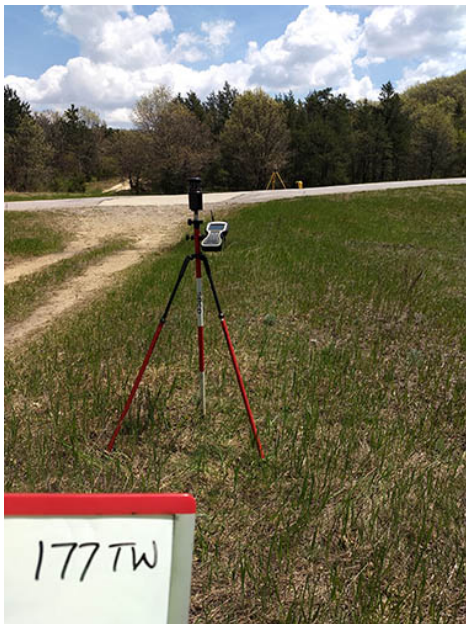
Survey X: 675607.83, Survey Y: 379195.54, Z1: 1019.54, Z DEM: 1019.73, Z LAS: 1019.63, ΔZ DEM: 0.19, ΔZ LAS: 0.1



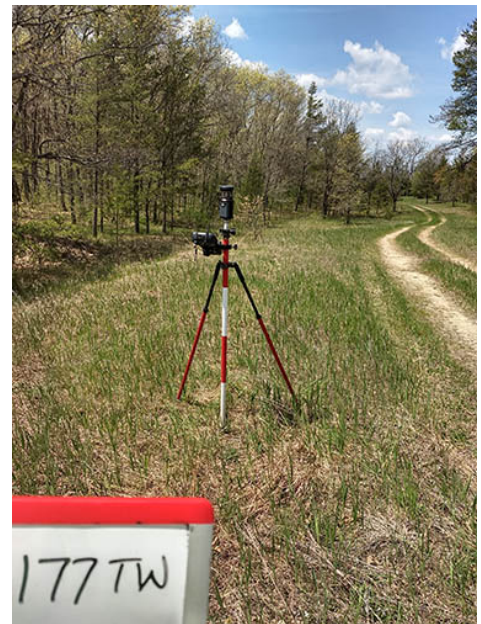
North



South



East



West



# Point: 178 Forest

Survey X: 675636.8, Survey Y: 379238.29, Z1: 1020.67, Z DEM: 1020.91, Z LAS: 1020.91,  $\Delta Z$  DEM: 0.24,  $\Delta Z$  LAS: 0.24



North



South



East



West



## Point: 179 Bare Earth

Survey X: 675645.98, Survey Y: 379195.9, Z1: 1019.31, Z DEM: 1019.38, Z LAS: 1019.43,  $\Delta Z$  DEM: 0.07,  $\Delta Z$  LAS: 0.13



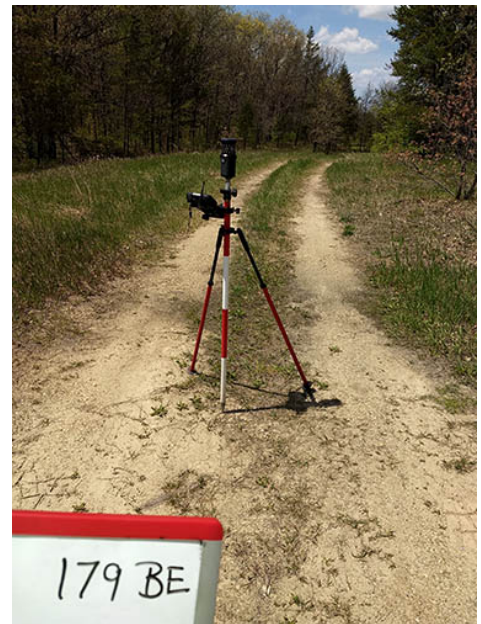
North



South



East



West



## Point: 180 Urban Area

Survey X: 715182.26, Survey Y: 351729, Z1: 1116.42, Z DEM: 1116.35, Z LAS: 1116.3,  $\Delta Z$  DEM: -0.08,  $\Delta Z$  LAS: -0.12



North



South



East



West

## Point: 181 Bare Earth

Survey X: 715131.87, Survey Y: 351715.87, Z1: 1114.05, Z DEM: 1113.99, Z LAS: 1113.96,  $\Delta Z$  DEM: -0.06,  $\Delta Z$  LAS: -0.09



North



South



East

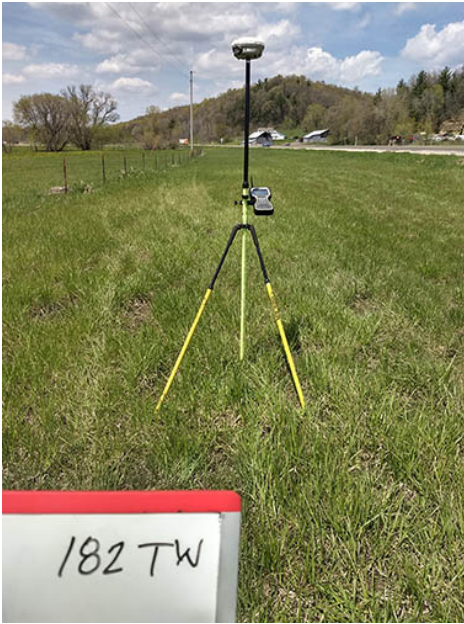


West



# Point: 182 Tall Weeds

Survey X: 715132.06, Survey Y: 351766.05, Z1: 1113.41, Z DEM: 1113.58, Z LAS: 1113.59, ΔZ DEM: 0.17, ΔZ LAS: 0.19



North



South



East



West



# Point: 183 Bare Earth

Survey X: 699971.26, Survey Y: 332220.38, Z1: 975.82, Z DEM: 975.93, Z LAS: 975.97, ΔZ DEM: 0.11, ΔZ LAS: 0.15



North



South



East



West



# Point: 184 Urban Area

Survey X: 700017.19, Survey Y: 332246.91, Z1: 979.33, Z DEM: 979.38, Z LAS: 979.4, ΔZ DEM: 0.05, ΔZ LAS: 0.07



North



South



East



West



# Point: 185 Forest

Survey X: 699977.99, Survey Y: 332298.49, Z1: 986.18, Z DEM: 986.53, Z LAS: 986.56, ΔZ DEM: 0.34, ΔZ LAS: 0.38



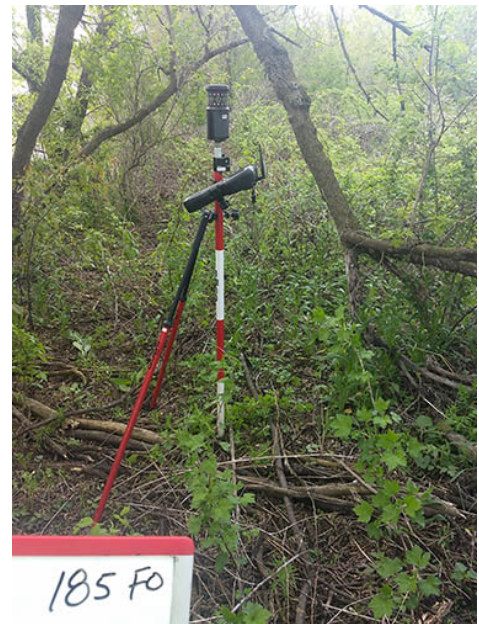
North



South



East



West

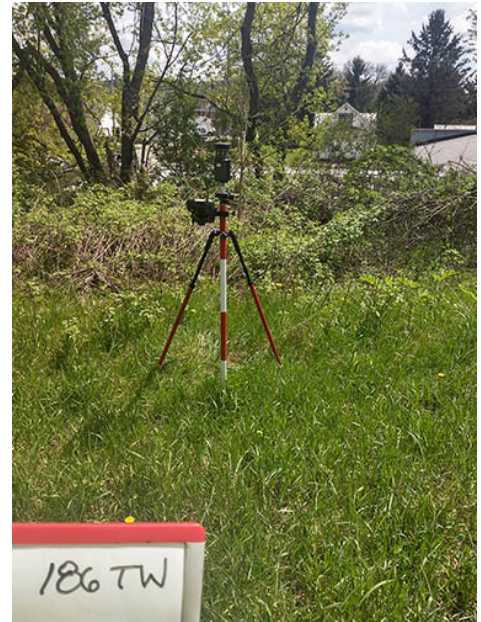


## Point: 186 Tall Weeds

Survey X: 699952.02, Survey Y: 332319.42, Z1: 987.38, Z DEM: 987.66, Z LAS: 987.7, ΔZ DEM: 0.28, ΔZ LAS: 0.32



North



South



East



West



# Point: 187 Tall Weeds

Survey X: 676215.09, Survey Y: 339340.21, Z1: 1022.03, Z DEM: 1022.36, Z LAS: 1022.42, ΔZ DEM: 0.33, ΔZ LAS: 0.39



North



South



East



West



# Point: 188 Bare Earth

Survey X: 676267.85, Survey Y: 339345.98, Z1: 1023.63, Z DEM: 1023.74, Z LAS: 1023.67, ΔZ DEM: 0.11, ΔZ LAS: 0.04



North



South



East



West



# Point: 189 Forest

Survey X: 676284.14, Survey Y: 339300.81, Z1: 1022.37, Z DEM: 1022.53, Z LAS: 1022.55, ΔZ DEM: 0.17, ΔZ LAS: 0.18



North



South



East



West



# Point: 190 Urban Area

Survey X: 676317.22, Survey Y: 339198.43, Z1: 1021.21, Z DEM: 1021.27, Z LAS: 1021.27, ΔZ DEM: 0.06, ΔZ LAS: 0.06



North



South



East



West



# Point: 191 Urban Area

Survey X: 642018.46, Survey Y: 342383.19, Z1: 882.93, Z DEM: 883.03, Z LAS: 882.93, ΔZ DEM: 0.1, ΔZ LAS: 0



North



South



East



West



# Point: 192 Bare Earth

Survey X: 642081.22, Survey Y: 342453.01, Z1: 883.8, Z DEM: 883.93, Z LAS: 883.95, ΔZ DEM: 0.13, ΔZ LAS: 0.15



North



South



East



West



# Point: 193 Tall Weeds

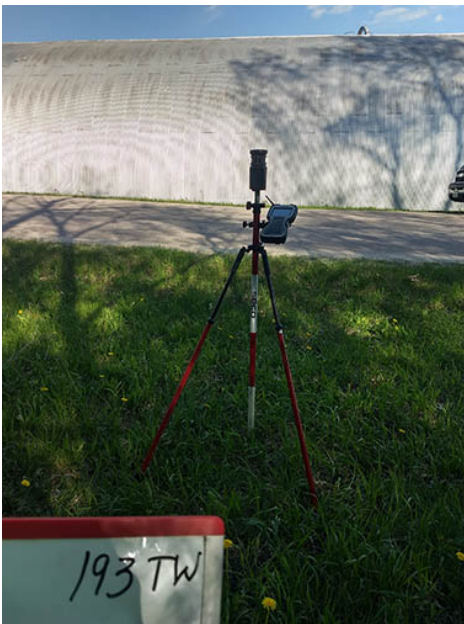
Survey X: 642058.6, Survey Y: 342567.91, Z1: 889.58, Z DEM: 889.78, Z LAS: 889.82, ΔZ DEM: 0.2, ΔZ LAS: 0.23



North



South



East



West



# Point: 194 Forest

Survey X: 642037.94, Survey Y: 342603.57, Z1: 892.91, Z DEM: 893.37, Z LAS: 893.38, ΔZ DEM: 0.45, ΔZ LAS: 0.47



North



South



East



West



# Point: 195 Urban Area

Survey X: 632376.18, Survey Y: 305006.12, Z1: 1367.52, Z DEM: 1367.71, Z LAS: 1367.68, ΔZ DEM: 0.2, ΔZ LAS: 0.16



North



South



East



West



# Point: 196 Bare Earth

Survey X: 632386.82, Survey Y: 304873.31, Z1: 1364.44, Z DEM: 1364.72, Z LAS: 1364.63, ΔZ DEM: 0.28, ΔZ LAS: 0.19



North



South



East



West



# Point: 197 Forest

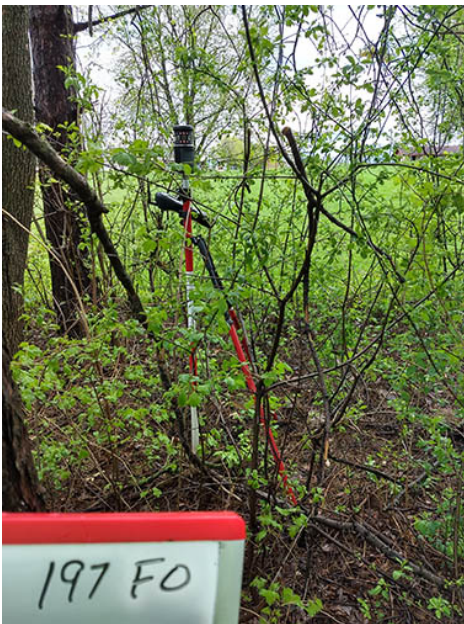
Survey X: 631942.91, Survey Y: 304910.58, Z1: 1357, Z DEM: 1357.41, Z LAS: 1357.34, ΔZ DEM: 0.41, ΔZ LAS: 0.35



North



South



East



West

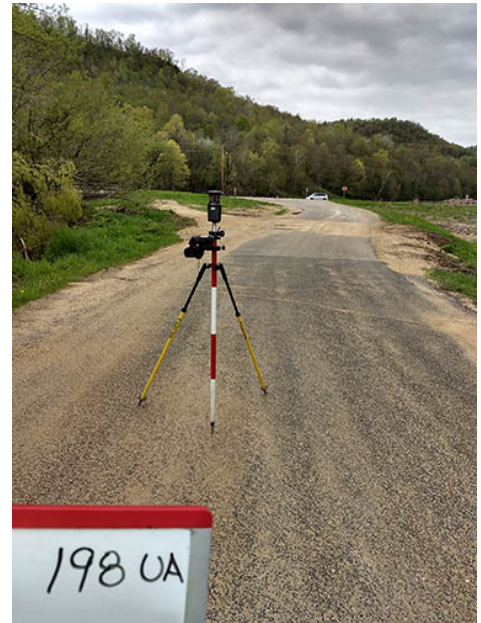


## Point: 198 Urban Area

Survey X: 601155.56, Survey Y: 300019.47, Z1: 844.92, Z DEM: 845.24, Z LAS: 845.19, ΔZ DEM: 0.33, ΔZ LAS: 0.28



North



South



East



West



## Point: 199 Tall Weeds

Survey X: 601374.59, Survey Y: 300174.11, Z1: 845.02, Z DEM: 845.2, Z LAS: 845.22, ΔZ DEM: 0.18, ΔZ LAS: 0.2



North



South



East



West



## Point: 200 Forest

Survey X: 601448.8, Survey Y: 300392.53, Z1: 847.18, Z DEM: 847.99, Z LAS: 847.42, ΔZ DEM: 0.81, ΔZ LAS: 0.24



North



South



East



West



# Point: 201 Tall Weeds

Survey X: 605220.74, Survey Y: 328933.92, Z1: 1355.1, Z DEM: 1355.33, Z LAS: 1355.21, ΔZ DEM: 0.23, ΔZ LAS: 0.11



North



South



East



West



# Point: 202 Urban Area

Survey X: 605234.36, Survey Y: 329005.75, Z1: 1356.11, Z DEM: 1356.23, Z LAS: 1356.21, ΔZ DEM: 0.12, ΔZ LAS: 0.1



North



South



East



West



# Point: 203 Bare Earth

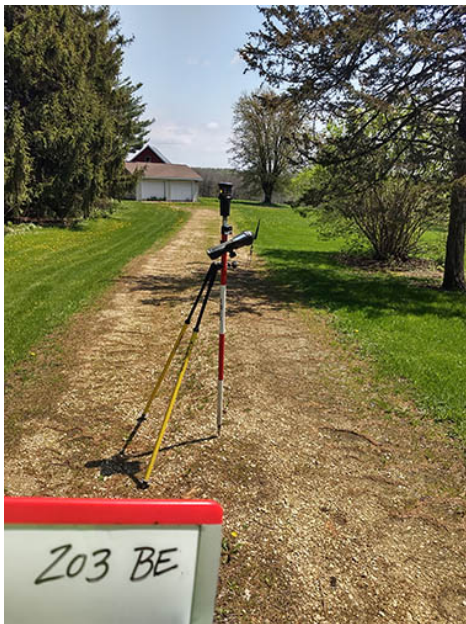
Survey X: 605283.3, Survey Y: 329250.3, Z1: 1354.91, Z DEM: 1354.92, Z LAS: 1354.81, ΔZ DEM: 0.01, ΔZ LAS: -0.1



North



South



East



West

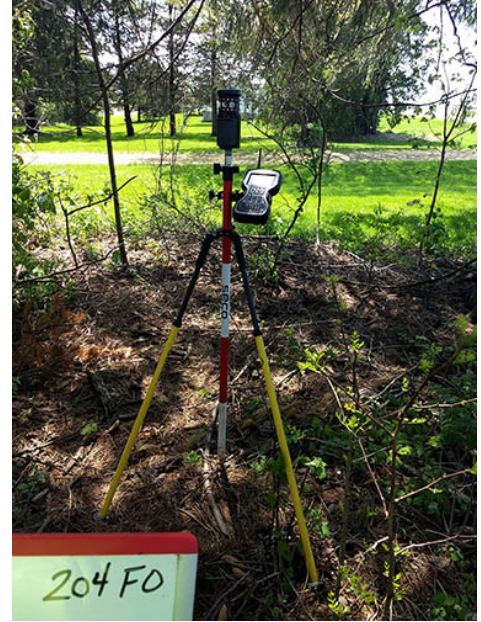


# Point: 204 Forest

Survey X: 605253.94, Survey Y: 329294.55, Z1: 1356.41, Z DEM: 1356.99, Z LAS: 1356.47, ΔZ DEM: 0.59, ΔZ LAS: 0.06



North



South



East



West