

WISCONSIN WROC – 3DEP
PORTAGE COUNTY
LIDAR 2016-17

Vertical Accuracy Report

April 28, 2017

Project Information

Prepared By: Ayres Associates

Project Name: Wisconsin WROC - 3DEP | Portage County LiDAR 2016-17

Sensor Info: Optech Orion H300

Required Nominal Pulse Spacing: 0.7 meter

Contractor Name: Ayres Associates

Units: US Survey Feet

Date of Acquisition: Start: 4/5/2016 Finish: 4/14/2016

Report Information

This report documents the absolute vertical accuracy of the lidar data collected for the Portage County, WI, QL2 LiDAR project. Independent ground control checkpoints were collected by land surveyors using Trimble GNSS equipment connected to WISCORS base stations. The checkpoints were collected in March and April, 2016. 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, 92 NVA points and 52 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.

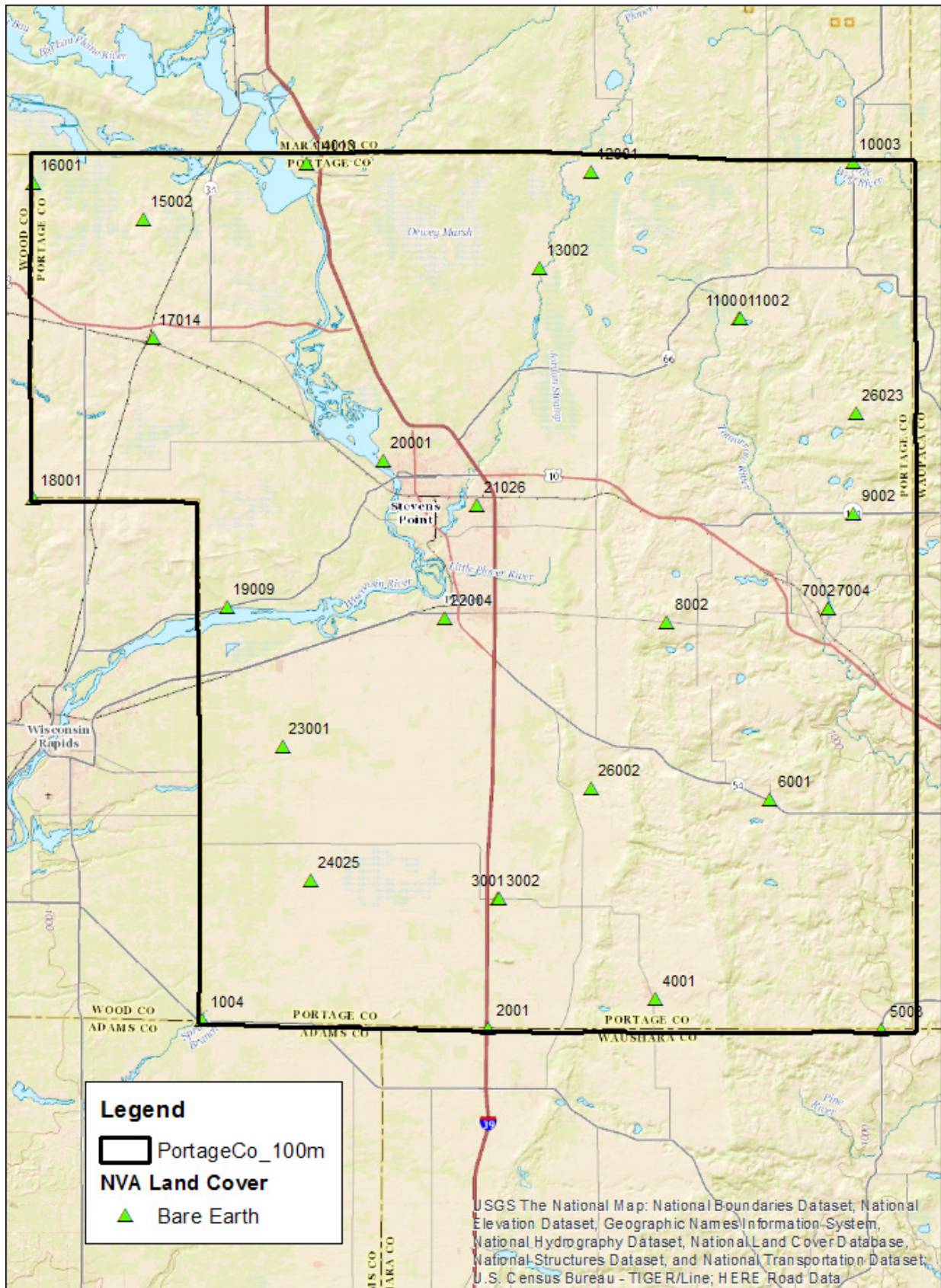
The NVA and VVA statistics for this project are within the above stated specifications.

LiDAR Accuracy Assessment Summary

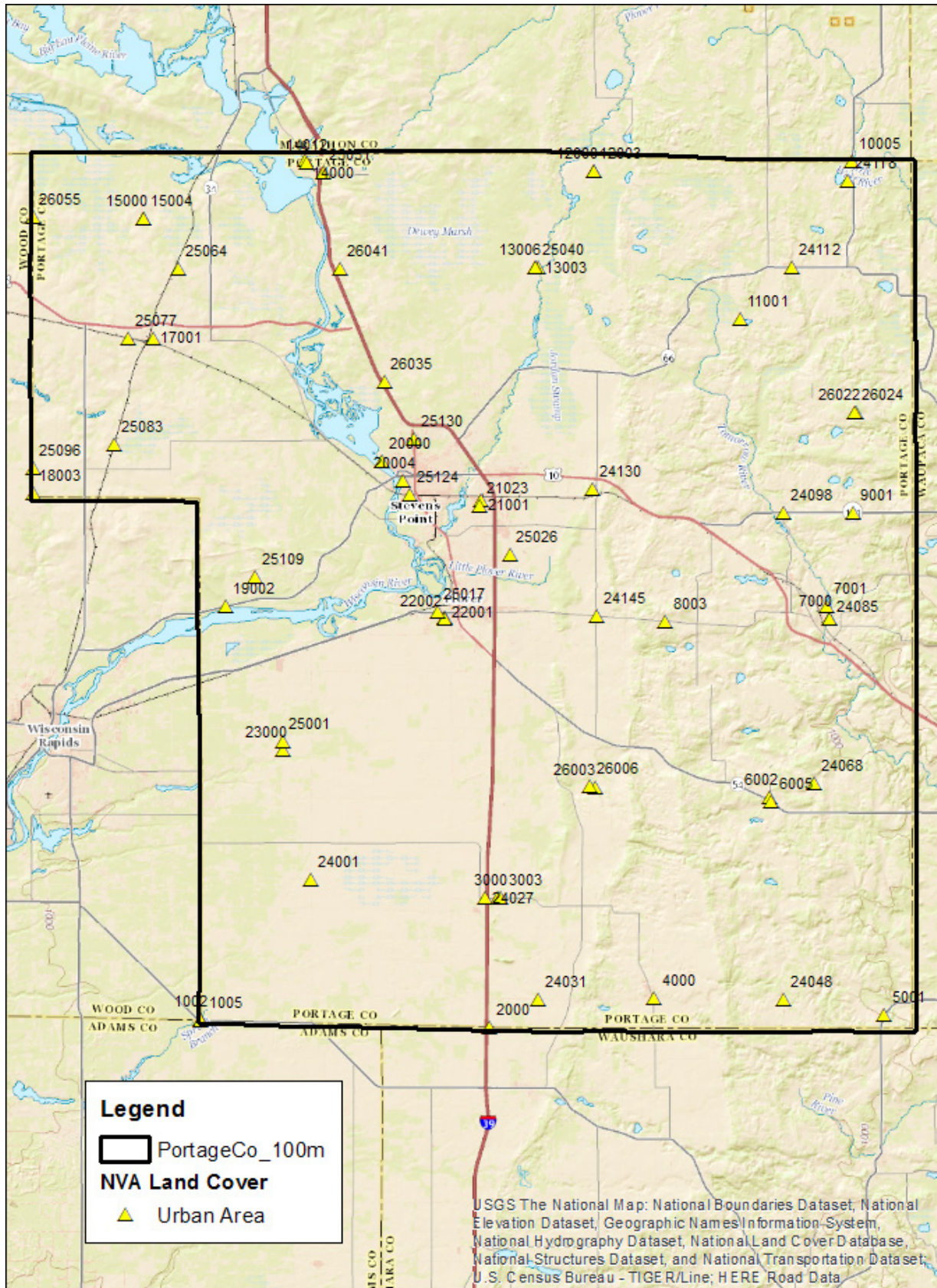
LAND COVER TYPE	# OF POINTS	NVA	VVA
LAS		95% confidence level	N/A
1. Bare Earth	29	0.261	N/A
2. Urban Areas	63	0.284	N/A
3. Tall Weeds	16	N/A	N/A
5. Forest	25	N/A	N/A
7. Swamp	11	N/A	N/A
TOTAL	144	0.277	N/A
DEM		95% confidence level	95th percentile
1. Bare Earth	29	0.251	N/A
2. Urban Areas	63	0.265	N/A
3. Tall Weeds	16	N/A	0.405
5. Forest	25	N/A	0.310
7. Swamp	11	N/A	0.537
TOTAL	144	0.261	0.405

Units: US Survey Feet

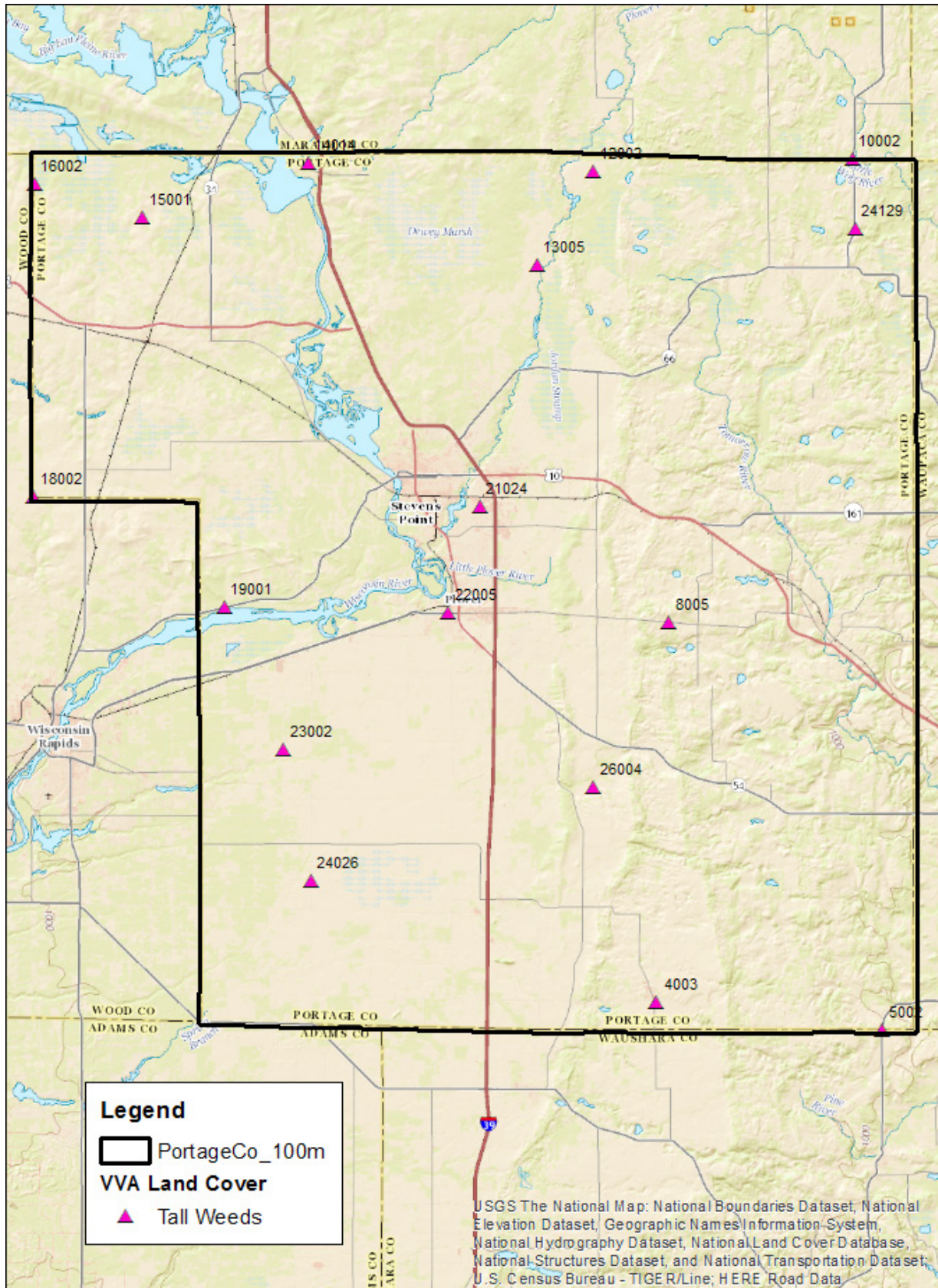
Map of NVA Checkpoint Locations - 1. Bare Earth



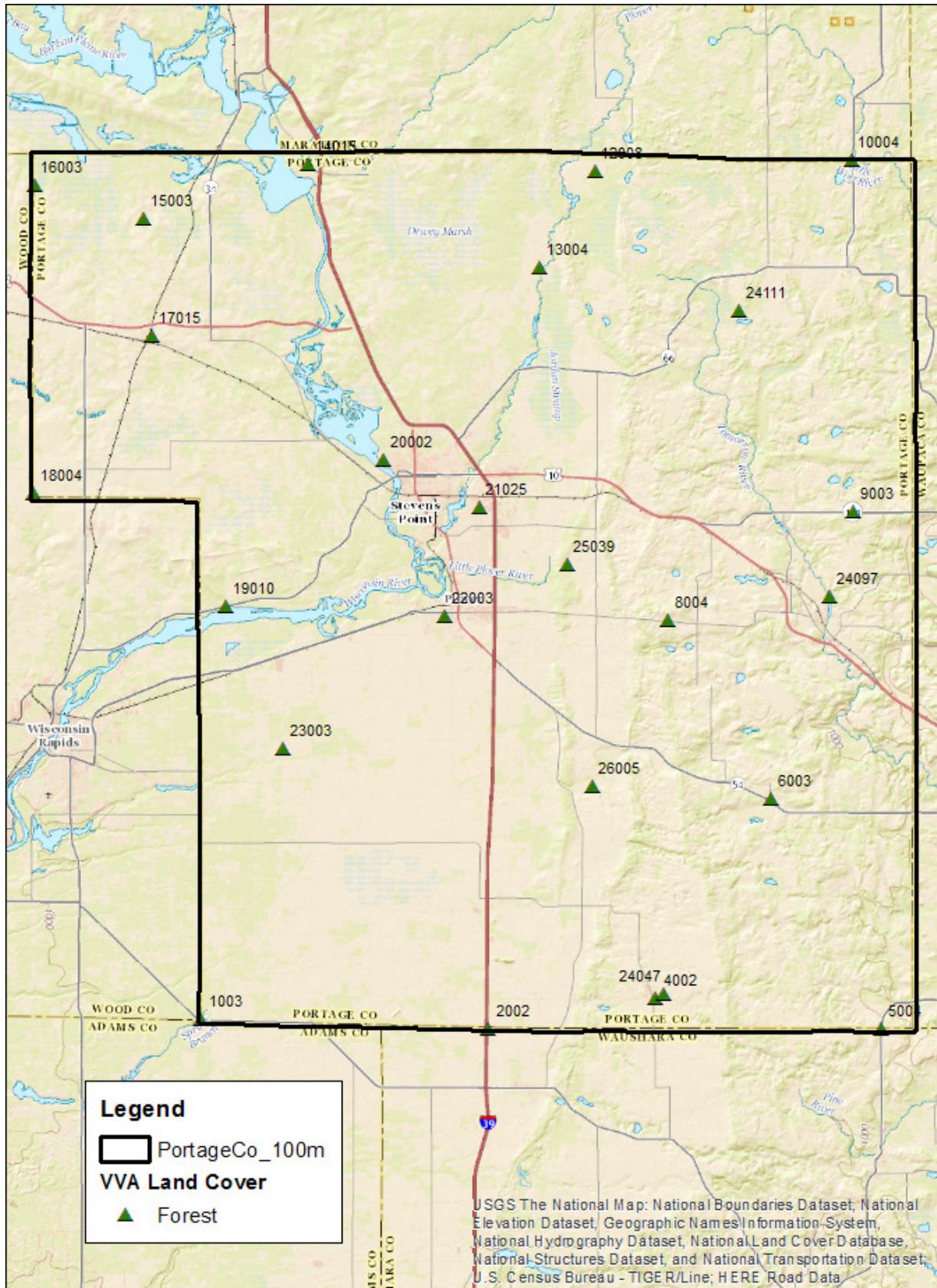
Map of NVA Checkpoint Locations - 2. Urban Area



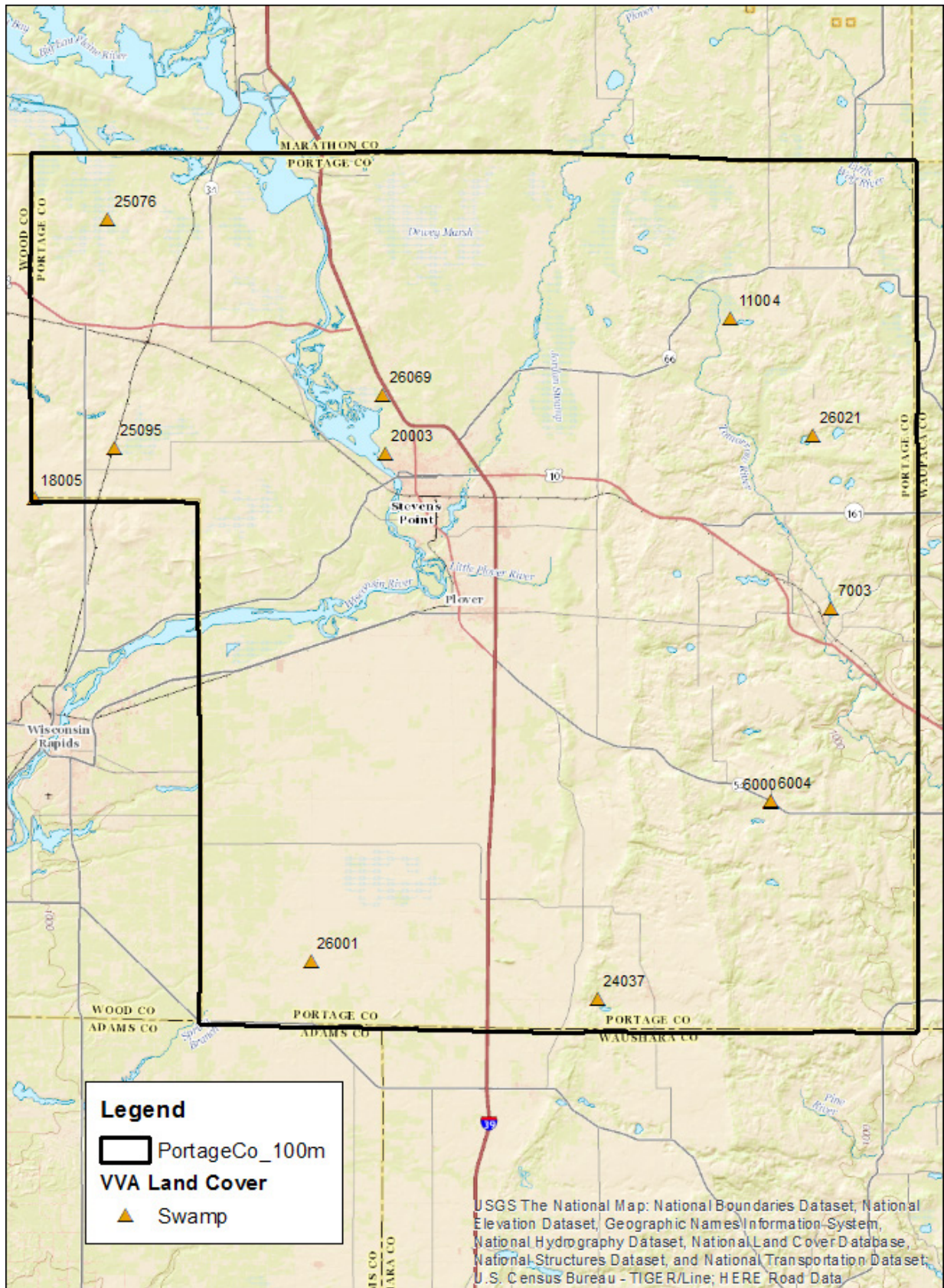
Map of NVA Checkpoint Locations - 3. Tall Weeds



Map of NVA Checkpoint Locations - 5. Forested Areas



Map of NVA Checkpoint Locations - 7. Swamp



LAS

NONVEGETATED VERTICAL ACCURACY – OVERALL	
Land Cover Type	1. Bare Earth, 2 Urban Areas
Minimum DZ	-0.25
Maximum DZ	0.399
Mean DZ	-0.002
Mean Magnitude DZ	0.338
Number Observations	92
Standard Deviation DZ	0.142
RMSE Z	0.141
95% Confidence Level Z	0.277
Units	US Survey Feet

DEM

NONVEGETATED VERTICAL ACCURACY	
Land Cover Type	1. Bare Earth, 2 Urban Areas
Minimum DZ	-0.236
Maximum DZ	0.403
Mean DZ	-0.001
Mean Magnitude DZ	0.328
Number Observations	92
Standard Deviation DZ	0.134
RMSE Z	0.133
95% Confidence Level Z	0.261
Units	US Survey Feet

DEM (Continued)

VEGETATED VERTICAL ACCURACY	
Land Cover Type	3. Tall Weeds
Minimum DZ	-0.122
Maximum DZ	0.604
Mean DZ	0.194
Mean Magnitude DZ	0.467
Number Observations	16
Standard Deviation DZ	0.181
RMSE Z	0.261
95% Percentile	0.405
Units	US Survey Feet

VEGETATED VERTICAL ACCURACY – OVERALL	
Land Cover Type	3. Tall Weeds, 7. Swamp, 5. Forest
Minimum DZ	-0.196
Maximum DZ	0.604
Mean DZ	0.152
Number Observations	52
RMSE Z	0.223
95% Percentile	0.405
Units	US Survey Feet

DEM (Continued)

VEGETATED VERTICAL ACCURACY	
Land Cover Type	5. Forest
Minimum DZ	-0.196
Maximum DZ	0.496
Mean DZ	0.101
Mean Magnitude DZ	0.378
Number Observations	25
Standard Deviation DZ	0.155
RMSE Z	0.182
95% Percentile	0.31
Units	US Survey Feet

DEM (Continued)

VEGETATED VERTICAL ACCURACY	
Land Cover Type	7. Swamp
Minimum DZ	0.002
Maximum DZ	0.537
Mean DZ	0.208
Mean Magnitude DZ	0.456
Number Observations	11
Standard Deviation DZ	0.137
RMSE Z	0.246
95% Percentile	0.537
Units	US Survey Feet

Point: 1002 Urban Area

Survey X: 126074.17, Survey Y: 102750.51, Z1: 1033.73, Z DEM: 1033.6, Z LAS: 1033.61, LC Type: 2, ΔZ DEM: -0.12, ΔZ LAS: -0.12



North



South



East



West



Point: 1003 Forest

Survey X: 126134.38, Survey Y: 102803.63, Z1: 1032.29, Z DEM: 1032.47, Z LAS: 1032.58, LC Type: 5, AZ DEM: 0.17, AZ LAS: 0.29



North



South



East



West



Point: 1004 Bare Earth

Survey X: 126302.78, Survey Y: 102695.31, Z1: 1034.07, Z DEM: 1033.95, Z LAS: 1033.93, LC Type: 1, ΔZ DEM: -0.12, ΔZ LAS: -0.14



North



South



East



West



Point: 1005 Urban Area

Survey X: 126141.7, Survey Y: 102517.61, Z1: 1033.23, Z DEM: 1033.13, Z LAS: 1033.09, LC Type: 2, ΔZ DEM: -0.1, ΔZ LAS: -0.14



North



South



East



West



Point: 2000 Urban Area

Survey X: 179109.8, Survey Y: 101251.36, Z1: 1100.46, Z DEM: 1100.33, Z LAS: 1100.31, LC Type: 2, ΔZ DEM: -0.12, ΔZ LAS: -0.15



North



South



East



West



Point: 2001 Bare Earth

Survey X: 178927.64, Survey Y: 101261.59, Z1: 1099.22, Z DEM: 1099.15, Z LAS: 1099.15, LC Type: 1, ΔZ DEM: -0.07, ΔZ LAS: -0.06



North



South



East



West



Point: 2002 Forest

Survey X: 179015.35, Survey Y: 101094.43, Z1: 1098.85, Z DEM: 1098.79, Z LAS: 1098.75, LC Type: 5, ΔZ DEM: -0.05, ΔZ LAS: -0.09



North



South



East



West



Point: 3000 Urban Area

Survey X: 180707.43, Survey Y: 125010.37, Z1: 1088.07, Z DEM: 1088.2, Z LAS: 1088.2, LC Type: 2, ΔZ DEM: 0.13, ΔZ LAS: 0.13



North



South



East



West



Point: 3001 Bare Earth

Survey X: 180817.94, Survey Y: 125106.18, Z1: 1089.95, Z DEM: 1090.13, Z LAS: 1090.13, LC Type: 1, ΔZ DEM: 0.18, ΔZ LAS: 0.18



North



South



East



West



Point: 3002 Bare Earth

Survey X: 180886.42, Survey Y: 125172.84, Z1: 1089.59, Z DEM: 1089.7, Z LAS: 1089.67, LC Type: 1, ΔZ DEM: 0.12, ΔZ LAS: 0.08



North



South



East



West



Point: 3003 Urban Area

Survey X: 181273.64, Survey Y: 125183.2, Z1: 1090.33, Z DEM: 1090.67, Z LAS: 1090.64, LC Type: 2, ΔZ DEM: 0.34, ΔZ LAS: 0.31



North



South



East



West



Point: 4000 Urban Area

Survey X: 209540.84, Survey Y: 106579.42, Z1: 1143.83, Z DEM: 1143.8, Z LAS: 1143.8, LC Type: 2, ΔZ DEM: -0.03, ΔZ LAS: -0.03



North



South



East



West



Point: 4001 Bare Earth

Survey X: 209683.42, Survey Y: 106595.5, Z1: 1143.57, Z DEM: 1143.58, Z LAS: 1143.57, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0



North



South



East



West



Point: 4002 Forest

Survey X: 209809.02, Survey Y: 106537.65, Z1: 1144.83, Z DEM: 1144.88, Z LAS: 1144.92, LC Type: 5, ΔZ DEM: 0.05, ΔZ LAS: 0.09



North



South



East



West



Point: 4003 Tall Weeds

Survey X: 209776.17, Survey Y: 106074.97, Z1: 1146.06, Z DEM: 1146.4, Z LAS: 1146.3, LC Type: 3, ΔZ DEM: 0.34, ΔZ LAS: 0.24



North



South



East



West



Point: 5001 Urban Area

Survey X: 251921.41, Survey Y: 103485.35, Z1: 989.21, Z DEM: 989.28, Z LAS: 989.27, LC Type: 2, ΔZ DEM: 0.07, ΔZ LAS: 0.07



North



South



East



West



Point: 5002 Tall Weeds

Survey X: 251176.05, Survey Y: 100945.02, Z1: 1018.41, Z DEM: 1018.82, Z LAS: 1018.83, LC Type: 3, ΔZ DEM: 0.4, ΔZ LAS: 0.42



North



South



East



West



Point: 5003 Bare Earth

Survey X: 251387.74, Survey Y: 101002.23, Z1: 1013.28, Z DEM: 1013.54, Z LAS: 1013.5, LC Type: 1, ΔZ DEM: 0.25, ΔZ LAS: 0.22



North



South



East



West



Point: 5004 Forest

Survey X: 251159.16, Survey Y: 101068.31, Z1: 1017.24, Z DEM: 1017.55, Z LAS: 1017.6, LC Type: 5, ΔZ DEM: 0.31, ΔZ LAS: 0.36



North



South



East



West



Point: 6000 Swamp

Survey X: 230680.3, Survey Y: 142919.02, Z1: 1083.34, Z DEM: 1083.6, Z LAS: 1083.69, LC Type: 7, ΔZ DEM: 0.26, ΔZ LAS: 0.36



North



South



East



West



Point: 6001 Bare Earth

Survey X: 230775.1, Survey Y: 143368.88, Z1: 1090.36, Z DEM: 1090.26, Z LAS: 1090.26, LC Type: 1, ΔZ DEM: -0.1, ΔZ LAS: -0.11



North



South



East



West



Point: 6002 Urban Area

Survey X: 230861.59, Survey Y: 143631.18, Z1: 1090.65, Z DEM: 1090.61, Z LAS: 1090.59, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: -0.06



North



South



East



West



Point: 6003 Forest

Survey X: 230936.57, Survey Y: 143295.31, Z1: 1090, Z DEM: 1090.05, Z LAS: 1089.94, LC Type: 5, ΔZ DEM: 0.05, ΔZ LAS: -0.06



North



South



East



West



Point: 6004 Swamp

Survey X: 230702.17, Survey Y: 143143.87, Z1: 1083.73, Z DEM: 1083.87, Z LAS: 1083.89, LC Type: 7, ΔZ DEM: 0.14, ΔZ LAS: 0.16



North



South



East



West



Point: 6005 Urban Area

Survey X: 231076.67, Survey Y: 142738.01, Z1: 1090.6, Z DEM: 1090.59, Z LAS: 1090.64, LC Type: 2, ΔZ DEM: 0, ΔZ LAS: 0.04



North



South



East



West



Point: 7000 Urban Area

Survey X: 241668.38, Survey Y: 176540.88, Z1: 1039.31, Z DEM: 1039.26, Z LAS: 1039.19, LC Type: 2, ΔZ DEM: -0.05, ΔZ LAS: -0.12



North



South



East



West



Point: 7001 Urban Area

Survey X: 241236.23, Survey Y: 178684.32, Z1: 1050.99, Z DEM: 1051.14, Z LAS: 1051.11, LC Type: 2, ΔZ DEM: 0.16, ΔZ LAS: 0.13



North



South



East



West



Point: 7002 Bare Earth

Survey X: 241613.18, Survey Y: 178582.91, Z1: 1045.15, Z DEM: 1045.17, Z LAS: 1045.16, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0.01



North



South



East



West



Point: 7003 Swamp

Survey X: 241664.63, Survey Y: 178387.9, Z1: 1040.13, Z DEM: 1040.24, Z LAS: 1040.1, LC Type: 7, ΔZ DEM: 0.12, ΔZ LAS: -0.03



North



South



East



West



Point: 7004 Bare Earth

Survey X: 241589.98, Survey Y: 178493.74, Z1: 1044.06, Z DEM: 1044.07, Z LAS: 1044.1, LC Type: 1, ΔZ DEM: 0.01, ΔZ LAS: 0.04



North



South



East



West



Point: 8002 Bare Earth

Survey X: 211867.25, Survey Y: 176014.77, Z1: 1213.82, Z DEM: 1213.97, Z LAS: 1213.92, LC Type: 1, ΔZ DEM: 0.15, ΔZ LAS: 0.1



North



South



East



West



Point: 8003 Urban Area

Survey X: 211605.91, Survey Y: 176005, Z1: 1218.21, Z DEM: 1218.41, Z LAS: 1218.36, LC Type: 2, ΔZ DEM: 0.2, ΔZ LAS: 0.15



North



South



East



West



Point: 8004 Forest

Survey X: 211949.45, Survey Y: 176106.9, Z1: 1217.31, Z DEM: 1217.55, Z LAS: 1217.58, LC Type: 5, ΔZ DEM: 0.24, ΔZ LAS: 0.27



North



South



East

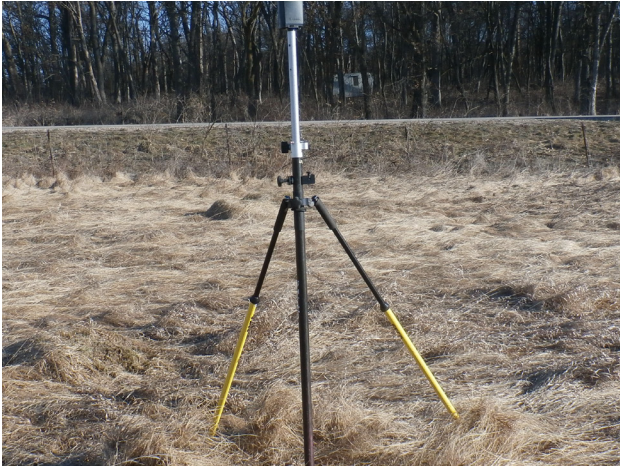


West



Point: 8005 Tall Weeds

Survey X: 211972.79, Survey Y: 175878.76, Z1: 1206.85, Z DEM: 1207.21, Z LAS: 1207.26, LC Type: 3, ΔZ DEM: 0.36, ΔZ LAS: 0.41



North



South



East



West



Point: 9001 Urban Area

Survey X: 246077.33, Survey Y: 195972.85, Z1: 1169.9, Z DEM: 1170, Z LAS: 1169.99, LC Type: 2, ΔZ DEM: 0.09, ΔZ LAS: 0.08



North



South



East



West



Point: 9002 Bare Earth

Survey X: 246166.17, Survey Y: 196051.75, Z1: 1164.96, Z DEM: 1165.04, Z LAS: 1165.04, LC Type: 1, ΔZ DEM: 0.08, ΔZ LAS: 0.09



North



South



East



West



Point: 9003 Forest

Survey X: 246050.44, Survey Y: 196107.64, Z1: 1163.43, Z DEM: 1163.71, Z LAS: 1163.71, LC Type: 5, ΔZ DEM: 0.29, ΔZ LAS: 0.29



North



South



East



West



Point: 10003 Bare Earth

Survey X: 246059.81, Survey Y: 260581.36, Z1: 1141.69, Z DEM: 1141.64, Z LAS: 1141.6, LC Type: 1, ΔZ DEM: -0.05, ΔZ LAS: -0.09



North



South



East



West



Point: 10004 Forest

Survey X: 245792.51, Survey Y: 260823.54, Z1: 1140.3, Z DEM: 1140.42, Z LAS: 1140.38, LC Type: 5, ΔZ DEM: 0.12, ΔZ LAS: 0.08



North



South



East



West



Point: 10005 Urban Area

Survey X: 245929.7, Survey Y: 260550.78, Z1: 1143.56, Z DEM: 1143.62, Z LAS: 1143.56, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: -0.01



North



South



East



West



Point: 11000 Bare Earth

Survey X: 225146.45, Survey Y: 231750.66, Z1: 1149.24, Z DEM: 1149.15, Z LAS: 1149.13, LC Type: 1, ΔZ DEM: -0.09, ΔZ LAS: -0.11



North



South



East



West



Point: 11001 Urban Area

Survey X: 225277.04, Survey Y: 231743.59, Z1: 1149.33, Z DEM: 1149.26, Z LAS: 1149.25, LC Type: 2, ΔZ DEM: -0.06, ΔZ LAS: -0.07



North



South



East



West



Point: 11002 Bare Earth

Survey X: 225365.89, Survey Y: 231899.2, Z1: 1148.59, Z DEM: 1148.6, Z LAS: 1148.63, LC Type: 1, ΔZ DEM: 0.02, ΔZ LAS: 0.05



North



South



East



West



Point: 11004 Swamp

Survey X: 223424.35, Survey Y: 231991.71, Z1: 1146.39, Z DEM: 1146.56, Z LAS: 1146.6, LC Type: 7, ΔZ DEM: 0.16, ΔZ LAS: 0.21



North



South



East



West



Point: 12000 Urban Area

Survey X: 198316.06, Survey Y: 258769.59, Z1: 1163.44, Z DEM: 1163.49, Z LAS: 1163.47, LC Type: 2, AZ DEM: 0.06, AZ LAS: 0.04



North



South



East



West



Point: 12001 Bare Earth

Survey X: 197833.55, Survey Y: 258824.62, Z1: 1162.39, Z DEM: 1162.46, Z LAS: 1162.41, LC Type: 1, ΔZ DEM: 0.07, ΔZ LAS: 0.02



North



South



East



West



Point: 12002 Tall Weeds

Survey X: 198172.88, Survey Y: 258730.72, Z1: 1160.69, Z DEM: 1160.89, Z LAS: 1160.9, LC Type: 3, ΔZ DEM: 0.2, ΔZ LAS: 0.21



North



South



East



West



Point: 12003 Urban Area

Survey X: 198372.67, Survey Y: 258793, Z1: 1163.8, Z DEM: 1163.85, Z LAS: 1163.82, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: 0.01



North



South



East



West



Point: 12008 Forest

Survey X: 198573.42, Survey Y: 258817.21, Z1: 1161.9, Z DEM: 1162.07, Z LAS: 1162.13, LC Type: 5, ΔZ DEM: 0.17, ΔZ LAS: 0.23



North



South



East



West



Point: 13002 Bare Earth

Survey X: 188462.12, Survey Y: 241061.82, Z1: 1136.48, Z DEM: 1136.4, Z LAS: 1136.37, LC Type: 1, ΔZ DEM: -0.08, ΔZ LAS: -0.11



North



South



East



West



Point: 13003 Urban Area

Survey X: 188145.01, Survey Y: 241042.75, Z1: 1138.62, Z DEM: 1138.5, Z LAS: 1138.46, LC Type: 2, ΔZ DEM: -0.12, ΔZ LAS: -0.15



North



South



East



West



Point: 13004 Forest

Survey X: 188391.13, Survey Y: 241132.28, Z1: 1135.63, Z DEM: 1135.61, Z LAS: 1135.63, LC Type: 5, ΔZ DEM: -0.02, ΔZ LAS: -0.01



North



South



East



West



Point: 13005 Tall Weeds

Survey X: 187800.58, Survey Y: 241554.67, Z1: 1136.41, Z DEM: 1136.29, Z LAS: 1136.32, LC Type: 3, ΔZ DEM: -0.12, ΔZ LAS: -0.09



North



South



East



West



Point: 13006 Urban Area

Survey X: 187734.09, Survey Y: 241006.86, Z1: 1139.81, Z DEM: 1139.64, Z LAS: 1139.67, LC Type: 2, ΔZ DEM: -0.16, ΔZ LAS: -0.13



North



South



East



West



Point: 14000 Urban Area

Survey X: 145258.41, Survey Y: 260806.13, Z1: 1128.87, Z DEM: 1128.94, Z LAS: 1128.94, LC Type: 2, ΔZ DEM: 0.07, ΔZ LAS: 0.08



North



South



East



West



Point: 14012 Urban Area

Survey X: 145490.44, Survey Y: 260483.36, Z1: 1131.91, Z DEM: 1131.97, Z LAS: 1131.97, LC Type: 2, ΔZ DEM: 0.06, ΔZ LAS: 0.06



North



South



East



West



Point: 14013 Bare Earth

Survey X: 145608.48, Survey Y: 260309.64, Z1: 1130.96, Z DEM: 1131.02, Z LAS: 1130.97, LC Type: 1, ΔZ DEM: 0.06, ΔZ LAS: 0.01



North



South



East



West



Point: 14014 Tall Weeds

Survey X: 145742.17, Survey Y: 260467.42, Z1: 1122.41, Z DEM: 1122.54, Z LAS: 1122.51, LC Type: 3, ΔZ DEM: 0.13, ΔZ LAS: 0.1



North



South



East



West



Point: 14015 Forest

Survey X: 145831.36, Survey Y: 260223.84, Z1: 1123.94, Z DEM: 1124.04, Z LAS: 1124.07, LC Type: 5, ΔZ DEM: 0.09, ΔZ LAS: 0.13



North



South



East



West



Point: 15000 Urban Area

Survey X: 115451.71, Survey Y: 250129.02, Z1: 1144.27, Z DEM: 1144.11, Z LAS: 1144.09, LC Type: 2, ΔZ DEM: -0.16, ΔZ LAS: -0.18



North



South



East



West



Point: 15001 Tall Weeds

Survey X: 115348.57, Survey Y: 250407.5, Z1: 1139.55, Z DEM: 1139.7, Z LAS: 1139.81, LC Type: 3, ΔZ DEM: 0.15, ΔZ LAS: 0.26



North



South



East



West



Point: 15002 Bare Earth

Survey X: 115495.2, Survey Y: 250132.73, Z1: 1143.66, Z DEM: 1143.5, Z LAS: 1143.47, LC Type: 1, ΔZ DEM: -0.17, ΔZ LAS: -0.19



North



South



East



West



Point: 15003 Forest

Survey X: 115594.15, Survey Y: 250196.02, Z1: 1138.3, Z DEM: 1138.36, Z LAS: 1138.3, LC Type: 5, ΔZ DEM: 0.06, ΔZ LAS: 0



North



South



East



West



Point: 15004 Urban Area

Survey X: 115483.29, Survey Y: 250124.07, Z1: 1143.99, Z DEM: 1143.8, Z LAS: 1143.81, LC Type: 2, ΔZ DEM: -0.2, ΔZ LAS: -0.18



North



South



East



West



Point: 16001 Bare Earth

Survey X: 95220.8, Survey Y: 256757.46, Z1: 1166.62, Z DEM: 1166.43, Z LAS: 1166.41, LC Type: 1, ΔZ DEM: -0.19, ΔZ LAS: -0.22



North



South



East



West



Point: 16002 Tall Weeds

Survey X: 95411.63, Survey Y: 256547.3, Z1: 1154.08, Z DEM: 1154.33, Z LAS: 1154.46, LC Type: 3, ΔZ DEM: 0.25, ΔZ LAS: 0.38



North



South



East



West



Point: 16003 Forest

Survey X: 95451.39, Survey Y: 256272.99, Z1: 1150.89, Z DEM: 1150.88, Z LAS: 1150.93, LC Type: 5, ΔZ DEM: -0.01, ΔZ LAS: 0.04



North



South



East



West



Point: 17001 Urban Area

Survey X: 117407.39, Survey Y: 228126.97, Z1: 1161.24, Z DEM: 1161, Z LAS: 1160.99, LC Type: 2, ΔZ DEM: -0.24, ΔZ LAS: -0.25



North



South



East



West



Point: 17014 Bare Earth

Survey X: 117232.3, Survey Y: 228343.95, Z1: 1161.32, Z DEM: 1161.16, Z LAS: 1161.17, LC Type: 1, ΔZ DEM: -0.17, ΔZ LAS: -0.15



North



South



East



West



Point: 17015 Forest

Survey X: 117117.56, Survey Y: 228445.6, Z1: 1162.26, Z DEM: 1162.21, Z LAS: 1162.24, LC Type: 5, ΔZ DEM: -0.05, ΔZ LAS: -0.02



North



South



East



West



Point: 18001 Bare Earth

Survey X: 95254.5, Survey Y: 198818.59, Z1: 1131.68, Z DEM: 1131.67, Z LAS: 1131.7, LC Type: 1, ΔZ DEM: -0.01, ΔZ LAS: 0.01



North



South



East



West



Point: 18002 Tall Weeds

Survey X: 95242.54, Survey Y: 198910.38, Z1: 1130.45, Z DEM: 1130.58, Z LAS: 1130.6, LC Type: 3, ΔZ DEM: 0.13, ΔZ LAS: 0.15



North



South



East



West



Point: 18003 Urban Area

Survey X: 95114.05, Survey Y: 199456.94, Z1: 1133.56, Z DEM: 1133.36, Z LAS: 1133.32, LC Type: 2, ΔZ DEM: -0.19, ΔZ LAS: -0.24



North



South



East



West



Point: 18004 Forest

Survey X: 95264.74, Survey Y: 199499.33, Z1: 1129.33, Z DEM: 1129.22, Z LAS: 1129.29, LC Type: 5, ΔZ DEM: -0.11, ΔZ LAS: -0.04



North



South



East



West



Point: 18005 Swamp

Survey X: 95375.15, Survey Y: 198756.66, Z1: 1127.81, Z DEM: 1127.81, Z LAS: 1127.99, LC Type: 7, ΔZ DEM: 0, ΔZ LAS: 0.18



North



South



East



West



Point: 19001 Tall Weeds

Survey X: 130320.61, Survey Y: 178645.31, Z1: 1054.83, Z DEM: 1054.87, Z LAS: 1054.86, LC Type: 3, ΔZ DEM: 0.04, ΔZ LAS: 0.03



North



South



East



West



Point: 19002 Urban Area

Survey X: 130755.78, Survey Y: 178697.14, Z1: 1053.35, Z DEM: 1053.27, Z LAS: 1053.26, LC Type: 2, ΔZ DEM: -0.07, ΔZ LAS: -0.08



North



South



East



West



Point: 19009 Bare Earth

Survey X: 130856.07, Survey Y: 178857.38, Z1: 1051.17, Z DEM: 1051.14, Z LAS: 1051.14, LC Type: 1, ΔZ DEM: -0.04, ΔZ LAS: -0.03



North



South



East



West



Point: 19010 Forest

Survey X: 130734.44, Survey Y: 178858.29, Z1: 1054.56, Z DEM: 1054.36, Z LAS: 1054.4, LC Type: 5, ΔZ DEM: -0.2, ΔZ LAS: -0.15



North



South



East



West



Point: 20000 Urban Area

Survey X: 159423.98, Survey Y: 205558.59, Z1: 1091.52, Z DEM: 1091.6, Z LAS: 1091.61, LC Type: 2, ΔZ DEM: 0.08, ΔZ LAS: 0.1



North



South



East



West



Point: 20001 Bare Earth

Survey X: 159655.64, Survey Y: 205635.34, Z1: 1093.71, Z DEM: 1093.77, Z LAS: 1093.85, LC Type: 1, ΔZ DEM: 0.05, ΔZ LAS: 0.14



North



South



East



West



Point: 20002 Forest

Survey X: 159753.82, Survey Y: 205708.76, Z1: 1093.59, Z DEM: 1093.75, Z LAS: 1093.74, LC Type: 5, ΔZ DEM: 0.15, ΔZ LAS: 0.14



North



South



East



West



Point: 20003 Swamp

Survey X: 159857.58, Survey Y: 207005.01, Z1: 1096.15, Z DEM: 1096.44, Z LAS: 1096.45, LC Type: 7, ΔZ DEM: 0.29, ΔZ LAS: 0.3



North



South



East



West



Point: 20004 Urban Area

Survey X: 163137.87, Survey Y: 201745.93, Z1: 1086.9, Z DEM: 1086.85, Z LAS: 1086.86, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: -0.04



North



South



East



West



Point: 21001 Urban Area

Survey X: 177594.66, Survey Y: 198372.71, Z1: 1095.24, Z DEM: 1095.2, Z LAS: 1095.19, LC Type: 2, ΔZ DEM: -0.03, ΔZ LAS: -0.05



North



South



East



West



Point: 21023 Urban Area

Survey X: 177453.5, Survey Y: 197283.73, Z1: 1095.15, Z DEM: 1094.93, Z LAS: 1094.93, LC Type: 2, ΔZ DEM: -0.22, ΔZ LAS: -0.22



North



South



East



West



Point: 21024 Tall Weeds

Survey X: 177250.11, Survey Y: 197128.92, Z1: 1091.82, Z DEM: 1091.75, Z LAS: 1091.77, LC Type: 3, ΔZ DEM: -0.07, ΔZ LAS: -0.05



North



South



East



West



Point: 21025 Forest

Survey X: 177261.38, Survey Y: 196967.95, Z1: 1092.46, Z DEM: 1092.43, Z LAS: 1092.47, LC Type: 5, ΔZ DEM: -0.03, ΔZ LAS: 0.01



North



South



East



West



Point: 21026 Bare Earth

Survey X: 176864.98, Survey Y: 197592.06, Z1: 1094.28, Z DEM: 1094.26, Z LAS: 1094.27, LC Type: 1, ΔZ DEM: -0.02, ΔZ LAS: -0.01



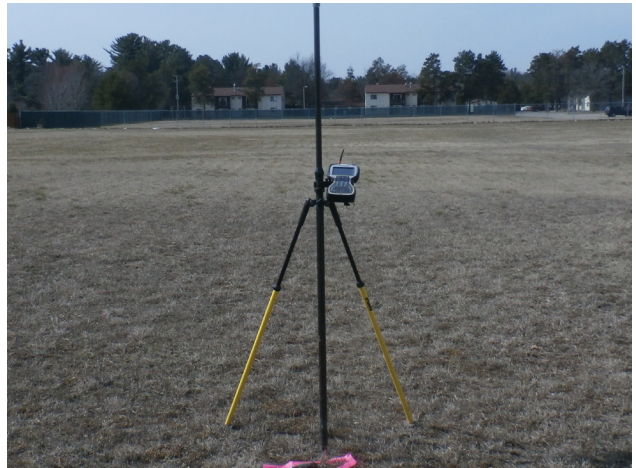
North



South



East



West



Point: 22001 Urban Area

Survey X: 171033.12, Survey Y: 176708.3, Z1: 1073.68, Z DEM: 1073.82, Z LAS: 1073.82, LC Type: 2, ΔZ DEM: 0.14, ΔZ LAS: 0.14



North



South



East



West



Point: 22002 Urban Area

Survey X: 171033.66, Survey Y: 176502.39, Z1: 1073.51, Z DEM: 1073.64, Z LAS: 1073.65, LC Type: 2, ΔZ DEM: 0.13, ΔZ LAS: 0.14



North



South



East



West



Point: 22003 Forest

Survey X: 171066.43, Survey Y: 176884.69, Z1: 1074.44, Z DEM: 1074.67, Z LAS: 1074.8, LC Type: 5, ΔZ DEM: 0.23, ΔZ LAS: 0.36



North



South



East



West



Point: 22004 Bare Earth

Survey X: 170878.31, Survey Y: 176716.73, Z1: 1074.78, Z DEM: 1074.95, Z LAS: 1074.92, LC Type: 1, ΔZ DEM: 0.16, ΔZ LAS: 0.14



North



South



East



West



Point: 22005 Tall Weeds

Survey X: 171507.3, Survey Y: 177640.23, Z1: 1076.4, Z DEM: 1076.62, Z LAS: 1076.64, LC Type: 3, ΔZ DEM: 0.22, ΔZ LAS: 0.24



North



South



East



West



Point: 23000 Urban Area

Survey X: 141102.38, Survey Y: 152415.46, Z1: 1053.07, Z DEM: 1052.96, Z LAS: 1052.98, LC Type: 2, ΔZ DEM: -0.11, ΔZ LAS: -0.09



North



South



East



West



Point: 23001 Bare Earth

Survey X: 141092.88, Survey Y: 152961.6, Z1: 1049.35, Z DEM: 1049.29, Z LAS: 1049.25, LC Type: 1, ΔZ DEM: -0.06, ΔZ LAS: -0.1



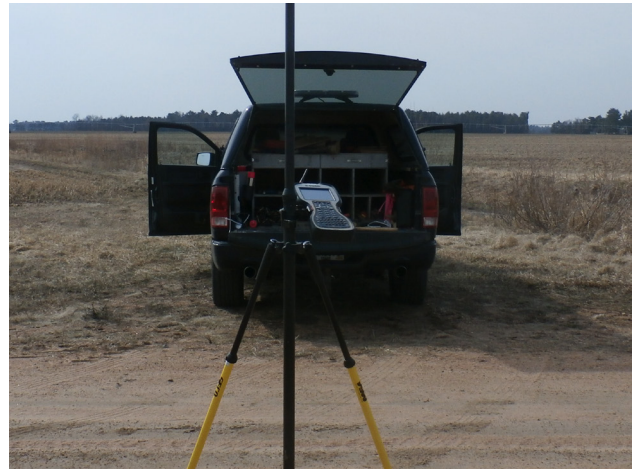
North



South



East



West



Point: 23002 Tall Weeds

Survey X: 141152.92, Survey Y: 152477.62, Z1: 1052.57, Z DEM: 1052.7, Z LAS: 1052.76, LC Type: 3, ΔZ DEM: 0.13, ΔZ LAS: 0.19



North



South



East



West



Point: 23003 Forest

Survey X: 141194.84, Survey Y: 152544.1, Z1: 1052.81, Z DEM: 1052.93, Z LAS: 1052.96, LC Type: 5, AZ DEM: 0.12, AZ LAS: 0.15



North



South



East



West



Point: 24001 Urban Area

Survey X: 146411.55, Survey Y: 128454.38, Z1: 1054.3, Z DEM: 1054.17, Z LAS: 1054.11, LC Type: 2, ΔZ DEM: -0.13, ΔZ LAS: -0.19



North



South



East



West



Point: 24025 Bare Earth

Survey X: 146282.38, Survey Y: 128457.7, Z1: 1051.52, Z DEM: 1051.37, Z LAS: 1051.34, LC Type: 1, ΔZ DEM: -0.15, ΔZ LAS: -0.18



North



South



East



West



Point: 24026 Tall Weeds

Survey X: 146230.38, Survey Y: 128384.47, Z1: 1051.87, Z DEM: 1051.96, Z LAS: 1052.01, LC Type: 3, ΔZ DEM: 0.09, ΔZ LAS: 0.13



North



South



East



West



Point: 24027 Urban Area

Survey X: 178447.5, Survey Y: 124987.74, Z1: 1105.68, Z DEM: 1105.84, Z LAS: 1105.97, LC Type: 2, ΔZ DEM: 0.16, ΔZ LAS: 0.28



North



South



East



West



Point: 24031 Urban Area

Survey X: 188184.55, Survey Y: 106435.08, Z1: 1111.03, Z DEM: 1110.88, Z LAS: 1110.88, LC Type: 2, ΔZ DEM: -0.16, ΔZ LAS: -0.15



North



South



East



West



Point: 24037 Swamp

Survey X: 198875.45, Survey Y: 106511.15, Z1: 1099.83, Z DEM: 1099.97, Z LAS: 1099.96, LC Type: 7, ΔZ DEM: 0.14, ΔZ LAS: 0.13



North



South



East



West



Point: 24047 Forest

Survey X: 211227.19, Survey Y: 107300.09, Z1: 1176.21, Z DEM: 1176.49, Z LAS: 1176.51, LC Type: 5, ΔZ DEM: 0.29, ΔZ LAS: 0.31



North



South



East



West



Point: 24048 Urban Area

Survey X: 233409.86, Survey Y: 106314.16, Z1: 1154.42, Z DEM: 1154.3, Z LAS: 1154.36, LC Type: 2, ΔZ DEM: -0.12, ΔZ LAS: -0.07



North



South



East



West



Point: 24068 Urban Area

Survey X: 239050.17, Survey Y: 146073.81, Z1: 1061.22, Z DEM: 1061.33, Z LAS: 1061.31, LC Type: 2, ΔZ DEM: 0.1, ΔZ LAS: 0.09



North



South



East



West



Point: 24085 Urban Area

Survey X: 241889.82, Survey Y: 176506.17, Z1: 1043.46, Z DEM: 1043.47, Z LAS: 1043.44, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: -0.02



North



South



East



West



Point: 24097 Forest

Survey X: 241820.26, Survey Y: 180572.63, Z1: 1056.56, Z DEM: 1056.67, Z LAS: 1056.66, LC Type: 5, ΔZ DEM: 0.11, ΔZ LAS: 0.1



North



South



East



West



Point: 24098 Urban Area

Survey X: 233376.73, Survey Y: 195887.35, Z1: 1100.54, Z DEM: 1100.58, Z LAS: 1100.56, LC Type: 2, ΔZ DEM: 0.04, ΔZ LAS: 0.02



North



South



East



West



Point: 24111 Forest

Survey X: 225174.72, Survey Y: 233056.78, Z1: 1149.88, Z DEM: 1149.98, Z LAS: 1150.08, LC Type: 5, ΔZ DEM: 0.1, ΔZ LAS: 0.2



North



South



East



West



Point: 24112 Urban Area

Survey X: 234800.82, Survey Y: 241141.71, Z1: 1139.34, Z DEM: 1139.59, Z LAS: 1139.54, LC Type: 2, ΔZ DEM: 0.25, ΔZ LAS: 0.2



North



South



East



West



Point: 24118 Urban Area

Survey X: 245142.34, Survey Y: 257104.74, Z1: 1155.42, Z DEM: 1155.43, Z LAS: 1155.4, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: -0.03



North



South



East



West



Point: 24129 Tall Weeds

Survey X: 246368.33, Survey Y: 248368.41, Z1: 1122.34, Z DEM: 1122.94, Z LAS: 1122.86, LC Type: 3, ΔZ DEM: 0.6, ΔZ LAS: 0.52



North



South



East



West



Point: 24130 Urban Area

Survey X: 198279.2, Survey Y: 200428.93, Z1: 1153.66, Z DEM: 1153.56, Z LAS: 1153.54, LC Type: 2, ΔZ DEM: -0.1, ΔZ LAS: -0.12



North



South



East



West



Point: 24145 Urban Area

Survey X: 198952.23, Survey Y: 176875.49, Z1: 1141.28, Z DEM: 1141.33, Z LAS: 1141.45, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: 0.17



North



South



East



West



Point: 25001 Urban Area

Survey X: 141097.23, Survey Y: 153737.97, Z1: 1053.47, Z DEM: 1053.38, Z LAS: 1053.36, LC Type: 2, ΔZ DEM: -0.09, ΔZ LAS: -0.1



North



South



East



West



Point: 25017 Urban Area

Survey X: 169587.64, Survey Y: 177603.46, Z1: 1073.3, Z DEM: 1073.45, Z LAS: 1073.55, LC Type: 2, ΔZ DEM: 0.15, ΔZ LAS: 0.25



North



South



East



West



Point: 25026 Urban Area

Survey X: 182946.47, Survey Y: 188220.87, Z1: 1097.79, Z DEM: 1097.75, Z LAS: 1097.78, LC Type: 2, ΔZ DEM: -0.03, ΔZ LAS: 0



North



South



East



West



Point: 25039 Forest

Survey X: 193498.06, Survey Y: 186465.96, Z1: 1133.7, Z DEM: 1133.64, Z LAS: 1133.6, LC Type: 5, ΔZ DEM: -0.06, ΔZ LAS: -0.11



North



South



East



West



Point: 25040 Urban Area

Survey X: 187738.03, Survey Y: 241065.27, Z1: 1139.8, Z DEM: 1139.66, Z LAS: 1139.68, LC Type: 2, ΔZ DEM: -0.14, ΔZ LAS: -0.12



North



South



East



West



Point: 25051 Urban Area

Survey X: 148497.07, Survey Y: 258454.02, Z1: 1162.81, Z DEM: 1162.91, Z LAS: 1162.95, LC Type: 2, ΔZ DEM: 0.09, ΔZ LAS: 0.13



North



South



East



West



Point: 25064 Urban Area

Survey X: 122008.83, Survey Y: 240944.5, Z1: 1164.88, Z DEM: 1164.84, Z LAS: 1164.83, LC Type: 2, ΔZ DEM: -0.04, ΔZ LAS: -0.05



North



South



East



West



Point: 25076 Swamp

Survey X: 108809.54, Survey Y: 250045.79, Z1: 1122.38, Z DEM: 1122.61, Z LAS: 1122.72, LC Type: 7, ΔZ DEM: 0.23, ΔZ LAS: 0.35



North



South



East



West



Point: 25077 Urban Area

Survey X: 112725.27, Survey Y: 228122.51, Z1: 1161.57, Z DEM: 1161.64, Z LAS: 1161.67, LC Type: 2, ΔZ DEM: 0.07, ΔZ LAS: 0.1



North



South



East



West



Point: 25083 Urban Area

Survey X: 110223.96, Survey Y: 208534.6, Z1: 1124.3, Z DEM: 1124.31, Z LAS: 1124.28, LC Type: 2, ΔZ DEM: 0.01, ΔZ LAS: -0.02



North



South



East



West



Point: 25095 Swamp

Survey X: 110070.63, Survey Y: 207890.31, Z1: 1118.43, Z DEM: 1118.57, Z LAS: 1118.65, LC Type: 7, ΔZ DEM: 0.14, ΔZ LAS: 0.22



North



South



East



West



Point: 25096 Urban Area

Survey X: 95112.96, Survey Y: 204099.12, Z1: 1143.33, Z DEM: 1143.24, Z LAS: 1143.23, LC Type: 2, ΔZ DEM: -0.09, ΔZ LAS: -0.1



North



South



East



West



Point: 25109 Urban Area

Survey X: 136090.16, Survey Y: 184058.07, Z1: 1082.89, Z DEM: 1082.81, Z LAS: 1082.79, LC Type: 2, ΔZ DEM: -0.08, ΔZ LAS: -0.1



North



South



East



West



Point: 25124 Urban Area

Survey X: 164606.09, Survey Y: 199291.26, Z1: 1087.44, Z DEM: 1087.49, Z LAS: 1087.46, LC Type: 2, ΔZ DEM: 0.05, ΔZ LAS: 0.02



North



South



East



West



Point: 25130 Urban Area

Survey X: 165283.41, Survey Y: 209485.31, Z1: 1124.3, Z DEM: 1124.7, Z LAS: 1124.7, LC Type: 2, ΔZ DEM: 0.4, ΔZ LAS: 0.4



North



South



East

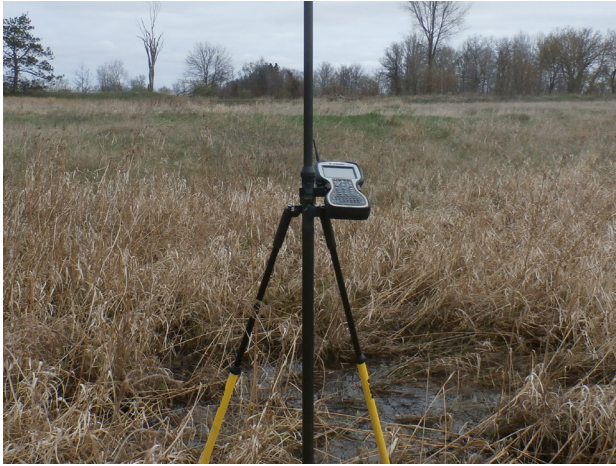


West



Point: 26001 Swamp

Survey X: 146235.78, Survey Y: 113534.1, Z1: 1048.4, Z DEM: 1048.67, Z LAS: 1048.72, LC Type: 7, ΔZ DEM: 0.27, ΔZ LAS: 0.31



North



South



East



West



Point: 26002 Bare Earth

Survey X: 197967.54, Survey Y: 145445.76, Z1: 1092.85, Z DEM: 1093.19, Z LAS: 1093.21, LC Type: 1, ΔZ DEM: 0.34, ΔZ LAS: 0.35



North



South



East



West



Point: 26003 Urban Area

Survey X: 198557.76, Survey Y: 145443.54, Z1: 1094.5, Z DEM: 1094.49, Z LAS: 1094.5, LC Type: 2, ΔZ DEM: -0.01, ΔZ LAS: 0



North



South



East



West



Point: 26004 Tall Weeds

Survey X: 198212.74, Survey Y: 145558.99, Z1: 1091.08, Z DEM: 1091.34, Z LAS: 1091.38, LC Type: 3, ΔZ DEM: 0.26, ΔZ LAS: 0.3



North



South



East



West



Point: 26005 Forest

Survey X: 198118.53, Survey Y: 145582.23, Z1: 1091.44, Z DEM: 1091.94, Z LAS: 1091.88, LC Type: 5, ΔZ DEM: 0.5, ΔZ LAS: 0.44



North



South



East



West



Point: 26006 Urban Area

Survey X: 197688.26, Survey Y: 145510.62, Z1: 1094.47, Z DEM: 1094.63, Z LAS: 1094.67, LC Type: 2, ΔZ DEM: 0.16, ΔZ LAS: 0.21



North



South



East



West



Point: 26022 Urban Area

Survey X: 246538.89, Survey Y: 214446.33, Z1: 1177.54, Z DEM: 1177.4, Z LAS: 1177.38, LC Type: 2, ΔZ DEM: -0.14, ΔZ LAS: -0.15



North



South



East



West



Point: 26023 Bare Earth

Survey X: 246607.38, Survey Y: 214407.1, Z1: 1174.26, Z DEM: 1174.15, Z LAS: 1174.1, LC Type: 1, ΔZ DEM: -0.12, ΔZ LAS: -0.16



North



South



East



West



Point: 26024 Urban Area

Survey X: 246522.71, Survey Y: 214435.82, Z1: 1177.09, Z DEM: 1176.94, Z LAS: 1177.01, LC Type: 2, ΔZ DEM: -0.16, ΔZ LAS: -0.08



North



South



East



West



Point: 26035 Urban Area

Survey X: 159862.63, Survey Y: 220018.42, Z1: 1124.82, Z DEM: 1125.1, Z LAS: 1125.14, LC Type: 2, ΔZ DEM: 0.28, ΔZ LAS: 0.32



North



South



East



West



Point: 26041 Urban Area

Survey X: 151681.39, Survey Y: 240986.74, Z1: 1110.35, Z DEM: 1110.29, Z LAS: 1110.27, LC Type: 2, ΔZ DEM: -0.07, ΔZ LAS: -0.08



North



South



East



West



Point: 26055 Urban Area

Survey X: 95158.82, Survey Y: 250300.06, Z1: 1178.39, Z DEM: 1178.32, Z LAS: 1178.39, LC Type: 2, ΔZ DEM: -0.06, ΔZ LAS: 0.01



North



South



East



West



Point: 26069 Swamp

Survey X: 159479.66, Survey Y: 217865.29, Z1: 1089.46, Z DEM: 1090, Z LAS: 1090.02, LC Type: 7, ΔZ DEM: 0.54, ΔZ LAS: 0.56



North



South



East



West

