MAP ACCURACY REPORT
Countywide Imagery & DEM
Crow Wing County

Data Contact Person:	Don Sigety, LS	**Department:**	County Surveyor
Type of Mapping:	DEM (LiDAR) & Ortho	**Contractor:**	Merrick & Company
Independent Testing:	Mn/DOT Photo Unit	**Contract Delivery date:**	2 April 2008

The purpose of this report is to independently test orthophotos and LiDAR derived digital elevation model data that was contracted for by St. Cloud State University for horizontal and vertical accuracy. This project consisted of flights flown between the period of 9 May 2007 for both aerial imagery acquisition and Light Detection and Ranging (LiDAR) and GPS/IMU technologies. The photographic flights were controlled using ground targets and by the GPS/IMU equipment onboard the aircraft. The specific equipment used for the aerial imagery collection was a Cessna 402B twin engine plane, a DACS medium format digital camera. For the aerial-triangulation and image production, SOCET SET & ORIMA software was used. The specific equipment used for the DEM acquisition and processing was the same plane with an LH Systems ALS50 laser scanner system and proprietary software called MARS® software. The preflight mission was scheduled so that photography and LiDAR were collected simultaneously and flown at 6500 feet AGL. The flights were controlled using Trimble 5700 GPS receivers on the ground and by Applanix 510 POS/AV GPS/IMU equipment in the aircraft. Merrick & Company eliminated that portion of the data set that did not come in contact with the ground surface. There was no additional file manipulation or filtering done by St. Cloud State University, Crow Wing County or Mn/Dot.

The vertical Datum used was the North American Vertical Datum of 1988 (NAVD 88) and the Horizontal Datum used was the North American Datum of 1983 (NAD 83). The products were delivered in the Crow Wing County Coordinate System as well as UTM Zone 15, NAD 83 (1996 adj.) The Geoid model used was the GEOID 03. The Ortho and LiDAR portions of this project contain approximately 744,001 acres in area each.

ORTHOPHOTO & DEM

EAST BOUNDING COORDINATE: 93° 46' 30.69489" W. Long.
WEST BOUNDING COORDINATE: 94° 23' 47.78784" W. Long.
NORTH BOUNDING COORDINATE: 46° 53' 11.19639" N. Lat.
SOUTH BOUNDING COORDINATE: 46° 09' 19.62339" N. Lat.

Geodetic monumentation used to control this project was published by Mn/DOT and can be found in the geodetic database online at www.olmweb.dot.state.mn.us. Merrick & Company reported only post processing their data through the use of OPUS and did not use any published monumentation for this project. Mn/DOT's District 3 Surveys reported using the VRS system.

Merrick & Company delivered the LiDAR and ortho-photos on a portable hard drive in LAS format, version 1.1 and in TIF with world files with a transmittal. The tilling scheme maps for both products are included as part of electronic file package.

The overall project area encompasses the entire county with flight strips extended to include the entire Camp Ripley area and a portion of the Mille Lacs Kathio State Park in Mille Lacs County. The accuracy reporting for Camp Ripley was provided separately to Craig Erickson, GIS Specialist at Camp Ripley and can be reached at 320.616.2716 or through e-mail at craig.erickson@mn.ngb.army.mil

The vertical accuracy test done for the DEM portion of this project were a direct comparison of the field surveyed elevations and the elevations derived from Geopak TIN model created from the LiDAR data at the surveyed X,Y coordinates. The contract called for a 1m GSD as a deliverable product.

The horizontal accuracy test done on the orthophotos were a direct comparison of field surveyed features on the ground such as sidewalk intersections, to the closest pixel location that an experienced technician could find. There is a certain amount of personal bias involved in this type of testing, knowing this, when the operator selected a pixel that was outside of the norm, a second technician was asked to see if they could replicate the results. In review of

the horizontal data sheet the user will see that there are a number of test points there were not used. There are two reasons for this; one is the points selected on the ground were not as distinctive as they should have been and second, the quality of the imagery is some areas is poor. The contract called for a 1" = 200 feet, 6" pixel size orthophoto to National Map Accuracy Standard (NMAS). The NMAS was and often is still used as the standard for testing hard copy or paper maps, where as digital data is tested against the current National Standard for Spatial Data Accuracy (NSSDA). The NSSDA for the horizontal (R) component or the combined X and Y coordinate for this project are:

Photo Identifiable Points	**$RMSE_r$**	**NSSDA (Horizontal)**
Urban Areas Only	0.91'	1.57' with 31 points

The test data was obtained by District 3 Survey personnel throughout the project area encompassing different ground cover types per the American Society for Photogrammetry and Remote Sensing (ASPRS) Guidelines for Vertical Accuracy Reporting for LiDAR Data, May 2004. The test data itself was collected by VRS – RTK methods for each cover type except the forested area where a total station was used. Each test point was collected twice to ensure that the independent test source was at least 3 times as accurate. When applying the test data to the elevation model produced the accuracy test results indicated below. The contract called for 1.5' contour accuracy or 0.90' at the 95% confidence. District 3 Surveys selected test points that geographically represent the various cover types as well as the general layout of the county.

The National Standard for Spatial Data Accuracy (NSSDA) for the vertical (Z) component of the DEM by ground cover/type for this project is:

Ground Cover/Type	**$RMSE_z$**	**NSSDA (Vertical)**
Open Terrain – L1O	0.14'	0.28' with 25 points.
Tall Weeds & Crops – L2T	0.41'	0.81' with 20 points.
Brush Lands & Low Trees – L3B	0.59'	1.16' with 21 points. *
Forested Areas with Canopy – L4F	0.74'	1.44' with 20 points. *
Urban Areas with Structures – L5U	0.41'	0.80' with 32 points.
All Ground Cover	0.48'	0.95' with 118 points. *

* Certain test points in these categories fell outside of the norm and were reported to the contractor for further inspection and review of data and procedures. The contractor provided me a response and is included in this report.

The horizontal accuracy of the DEM was not tested as part of this project due to the fact that the model does not contain distinct or well-defined topographical features but the expected horizontal accuracy as stated by the laser manufacturer is 1/2000th of the flying height which calculates to 3.25 feet. The outcome of the vertical testing results suggests that the horizontal accuracy is of sufficient accuracy otherwise it could not support this type of vertical accuracies.

The tabulated test results, correspondence, related notes and hard copies are attached to this report.

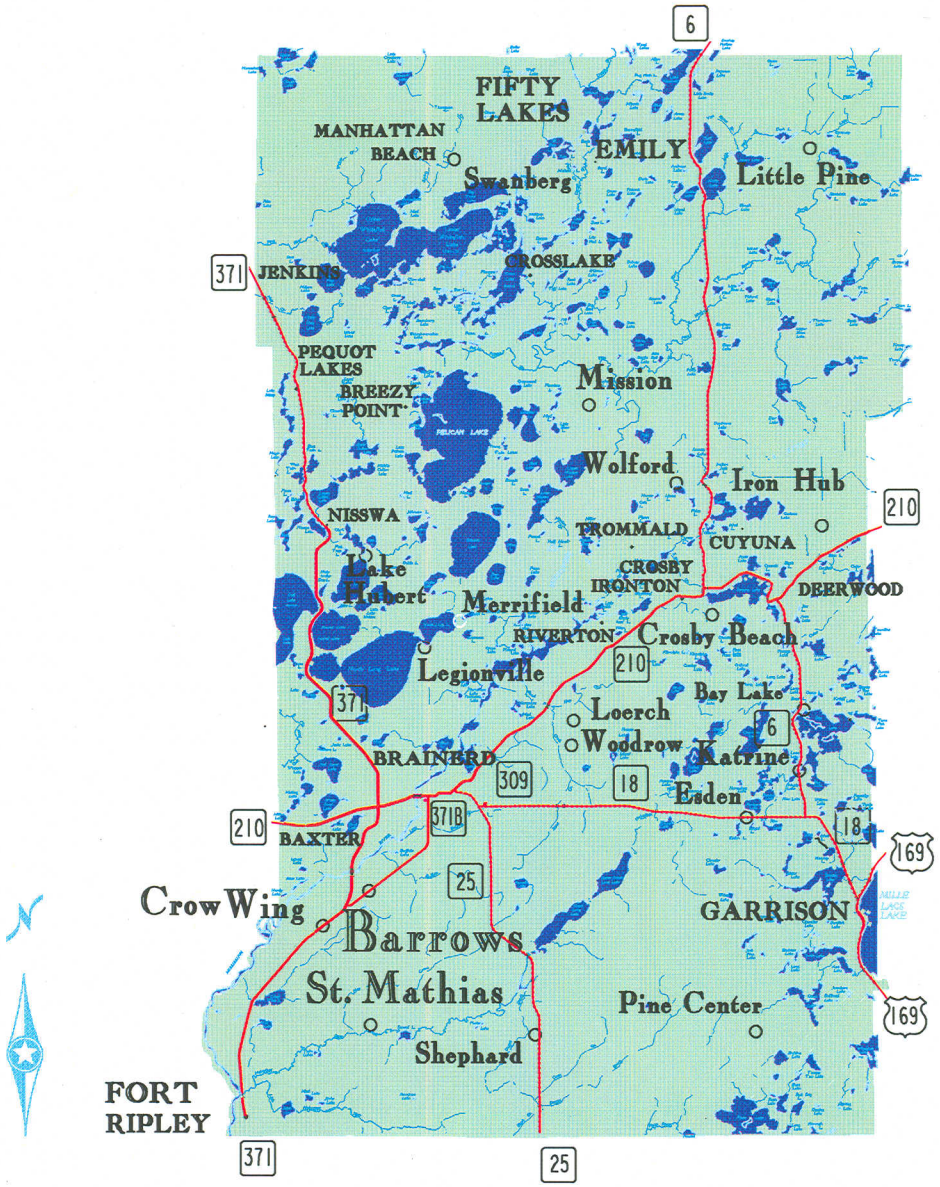
Peter Jenkins, LS
Minnesota Department of Transportation
395 John Ireland Boulevard, MS 640
St. Paul, MN 55155

Phone: (651) 366-3457
e-mail: peter.jenkins@dot.state.mn.us

I HEREBY CERTIFY THAT THIS SURVEY, PLAN OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF MINNESOTA.

PETER W. JENKINS

DATE 5 Sept 08 REG. NO. 22683



S. P. : CROW WING COUNTY LIDAR
T.H. :
COLLECTION DATE : 07
LOCATION : CROW WING COUNTY
MAPPING : LIDAR
CONSULTANT MAPPING : YES
MAPPING COMPLETED : 08-08-2008
ARCHIVE INFO : 651.366.3457
ARCHIVE TAPE : J:\ARC\LIDAR\ 2007-S\ CROW WING COUNTY

MAP DATUM

The vertical datum of the TIN file associated with this map is based on the North American Vertical Datum of 1988 (NAVD 88).

The horizontal datum of this map is based on Crow Wing county coordinate system which is related to the Minnesota state plane coordinate system NAD 1983 (HARN 1996) adjustment center zone.

MAP ACCURACY

The vertical accuracy of the TIN file associated with this map has been tested using NSSDA (June 1998) methods and computes to 0.95 FT. based on 118 test elevations.

The horizontal accuracy of the orthophoto has been tested using NSSDA (June 1998) methods and computes to 1.57 FT. based on 31 test points.

Mn/DOT Agreement No. 90461

CFMS Contract No. A96825

STATE OF MINNESOTA
INTERAGENCY AGREEMENT

Project Identification: Crow Wing County Digital Elevation Model and Orthophoto

This Agreement is between the Minnesota Department of Transportation ("Mn/DOT") and St. Cloud State University ("SCSU").

Agreement

1 Term of Agreement; Incorporation of Exhibits

1.1 **Effective Date:** This Agreement will be effective on the date signed by all necessary Mn/DOT officials, as required by Minnesota Statutes §16C.05, subdivision 2.

1.2 **Expiration Date:** This Agreement will expire on **January 31, 2008**, or when all obligations have been satisfactorily fulfilled, whichever occurs first.

1.3 **Exhibit:** Exhibit A is attached and incorporated into this Agreement.

2 Scope of Work

2.1 Crow Wing County, through a partnership with other agencies, has administered a Contract with SCSU for aerial LiDAR collection services and to create a Digital Elevation Model (DEM).

2.2 SCSU will provide the following services:

2.2.1 SCSU will create and publish a Request for Proposals (RFP);

2.2.2 SCSU will establish a vendor selection committee to select a vendor after receipt of proposals in response to the RFP. This committee must include a member from Mn/DOT's Photogramametric Unit;

2.2.3 SCSU will provide project management duties regarding the selected vendor, from acquisition through final delivery;

2.2.4 SCSU will provide invoice payment services to the selected vendor;

2.2.5 SCSU will complete all data storage and dissemination services.

2.3 Mn/DOT's cooperation in this partnership will assure Mn/DOT a copy of the complete data set that can be utilized by Mn/DOT's District 3. This data will be most valuable for design, pre-engineering, hydraulic studies and Geographic Information System (GIS) professionals. The total number of Control Sections covered partially or in whole is 15.

3 Consideration and Payment

3.1 SCSU will be paid on a Lump Sum basis. SCSU will submit an invoices, using the format set forth in Exhibit A, for work performed prior to June 30, 2007. Mn/DOT must receive this invoices prior to August 1, 2007.

3.2 The total obligation of Mn/DOT for all compensation and reimbursements to SCSU under this agreement will not exceed $25,000.00.

4 Conditions of Payment

4.1 All services provided by SCSU under this Agreement must be performed to Mn/DOT's satisfaction, as determined at the sole and reasonable discretion of Mn/DOT's Authorized Representative.

5 Agreement Personnel

5.1 Mn/DOT's Authorized Representative will be:

Name: Ashley Hartfiel, Contract Administrator (or his/her successor)
Address: Minnesota Department of Transportation
Consultant Services Section, Mail Stop 680
395 John Ireland Boulevard, St. Paul, Minnesota 55155-1899
Telephone: 651-296-3558
Fax: 651-282-5127
E-Mail: ashley.hartfiel@dot.state.mn.us

5.2 Mn/DOT's Project Manager will be:

Name: Peter Jenkins, Photogrammetric Engineer (or his/her successor)
Address: Minnesota Department of Transportation
Office of Land Management, Mail Stop 640
395 John Ireland Boulevard, St. Paul, Minnesota 55155-1899
Telephone: 651-296-1079
Fax: 651-297-1521
E-Mail: peter.jenkins@dot.state.mn.us

5.3 SCSU's Authorized Representative will be:

Name: Richard Rothaus
Address: St. Cloud State University
Sponsored Programs, Administrative Services 210
720 Fourth Avenue South, St. Cloud, Minnesota 56301-4498
Telephone: 320-308-4932
E-Mail: rrothaus@stcloudstate.edu

6 Amendments

6.1 Any Amendment to this Agreement must be in writing and will not be effective until it has been executed and approved by the same parties who executed and approved the Original Agreement, or their successors in office.

7 Liability

7.1 Each party will be responsible for its own acts and omissions and the results thereof, to the extent permitted by law.

8 Termination

8.1 Either party may terminate this Agreement at any time, with or without cause, upon 15 days' written notice to the other party.

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STATE ENCUMBRANCE VERIFICATION
Individual certifies that funds have been encumbered as required by Minnesota Statutes §16A.15 and §16C.05.

Signed: _____

Date: 1.23.2007

CFMS Contract No: A96825

DEPARTMENT OF TRANSPORTATION

By: _____
(with delegated authority)

Title: Asst. Director - OM

Date: 1/24/07

SCSU*

By: _____

Title: Provost

Date: 1/18/07

Mn/DOT CONTRACT MANAGEMENT

By: _____

Date: 1-29-07

***Note: If this Agreement is signed by a college official other than the President, please attach the applicable Delegation of Authority.**

FINAL INVOICE

To: Ashley Hartfiel, Authorized Representative
Minnesota Department of Transportation
Consultant Services, Mail Stop 680
395 John Ireland Boulevard, St. Paul, Minnesota 55155

Estimated Completion: _____%

Period Ending: _____
Invoice Date: _____

Copy: Peter Jenkins, Project Manager
Minnesota Department of Transportation
Office of Land Management, Mail Stop 640
395 John Ireland Boulevard, St. Paul, Minnesota 55155

Re: Mn/DOT Contract No. 90461
Contract Expiration Date: January 31, 2008
Project Description: Crow Wing County Digital Elevation Model and Orthophoto

	Total Contract Amount	Total Billing to Date	Amount Previously Billed	Billed This Invoice
1. Lump Sum Amount:	$25,000.00			
Net Earnings Totals:	**$25,000.00**			
			Total Amount Due This Invoice:	

Activity Code	Total Billing to Date	Amount Previously Billed	Billed This Invoice
1018			
Total*			

*Must Match Net Earnings Totals Above

For Consultant Services Use Only

I certify that the above statement is correct and payment has not been received.

Signature: _____

Print Name: _____

Title: _____

Billing Address: St. Cloud State University
Sponsored Programs
720 Fourth Avenue South
St. Cloud, Minnesota 56301-4498

Telephone: 320-308-4932

Approved for Payment: _____

Date: _____

Crow Wing County
Horizontal Accuracy Test

Point Number	Point Description	X From Survey	Y From Survey	X From Map	Difference in X	X-Difference Squared	Y From Map	Difference in Y	Y-Difference Squared	X-Diff. Sq. + Y-Diff. Sq.
1018	L5U	571092.38	176959.38	571093.33	-0.95	0.90	176960.17	-0.79	0.62	1.52
1026	L5U	572661.92	177024.70	572662.31	-0.40	0.16	177024.20	0.50	0.25	0.41
1027	L5U	573381.64	178250.27	573380.96	0.67	0.45	178251.29	-1.02	1.05	1.50
1028	L5U	573379.26	177133.30	573378.66	0.60	0.36	177133.57	-0.27	0.07	0.43
1029	L5U	570747.29	175835.00	570746.90	0.39	0.15	175834.78	0.22	0.05	0.20
1030	L5U	570714.98	174373.41							
1031	L5U	572012.69	174756.47	572012.48	0.21	0.04	174756.42	0.05	0.00	0.05
1032	L5U	575233.98	177014.12	575233.94	0.04	0.00	177014.27	-0.15	0.02	0.02
1033	L5U	576161.94	178026.06	576161.81	0.14	0.02	178026.73	-0.66	0.44	0.46
1034	L5U	577349.59	178635.77	577350.22	-0.63	0.39	178635.99	-0.22	0.05	0.44
1035	L5U	577495.59	179166.79							
1036	L5U	577755.69	175748.56							
1043	L5U	572469.79	178844.01	572470.12	-0.33	0.11	178844.08	-0.07	0.01	0.11
1044	L5U	571457.29	178807.83	571457.38	-0.08	0.01	178808.35	-0.52	0.27	0.27
1045	L5U	572823.58	181129.04							
2003	L5U	627539.26	310185.07	627540.79	-1.53	2.35	310185.33	-0.26	0.07	2.42
2004	L5U	627574.22	310185.02							
2052	L5U	532601.09	279758.65	532600.80	0.29	0.08	279757.55	1.10	1.21	1.29
2053	L5U	532615.90	279730.38	532616.00	-0.09	0.01	279729.77	0.60	0.37	0.37
2051	L5U	533086.92	278869.10	533086.14	0.78	0.61	278868.28	0.82	0.67	1.28
2005	L5U	625657.44	310022.64	625657.24	0.20	0.04	310022.45	0.19	0.04	0.07
2018	L5U	623767.70	217523.14	623768.08	-0.37	0.14	217523.24	-0.10	0.01	0.15
2019	L5U	623993.50	217516.30	623994.40	-0.90	0.80	217516.15	0.16	0.02	0.83
2020	L5U	623941.15	217440.02	623942.13	-0.98	0.96	217440.02	0.01	0.00	0.96
1045	L5U	572823.58	181129.04							
1044	L5U	571457.29	178807.83	571456.97	0.32	0.10	178808.19	-0.36	0.13	0.23
1043	L5U	572471.12	178844.01	572470.93	0.19	0.04	178843.76	0.25	0.06	0.10
1027	L5U	573381.64	178250.27	573382.03	-0.39	0.15	178249.33	0.94	0.88	1.03
1028	L5U	573379.26	177133.30							
1026	L5U	572661.92	177024.70	572662.96	-1.05	1.09	177024.27	0.42	0.18	1.27
1018	L5U	571092.38	176959.38							
1029	L5U	570747.29	175835.00	570748.46	-1.17	1.38	175835.43	-0.43	0.19	1.57
1030	L5U	570714.98	174373.41							
1031	L5U	572012.69	174756.47	572013.55	-0.86	0.74	174756.37	0.10	0.01	0.75
1032	L5U	575233.98	177014.12							

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Aerial Collection: Spring 2007
Delivery: February 2008

Crow Wing County
Horizontal Accuracy Test

Point Number	Point Description	X From Survey	Y From Survey	X From Map	Difference in X	X-Difference Squared	Y From Map	Difference in Y	Y-Difference Squared	X-Diff. Sq. + Y-Diff. Sq.
1033	L5U	576161.94	178026.06	576161.43	0.51	0.26	178026.25	-0.19	0.04	0.30
1034	L5U	577349.59	178635.77	577350.51	-0.92	0.84	178636.33	-0.56	0.31	1.15
1035	L5U	577495.59	179166.79							
1036	L5U	577755.69	175748.56							
2034	L5U	662204.29	151817.07	662204.24	0.05	0.00	151816.97	0.11	0.01	0.01
2035	L5U	661064.06	151594.65	661065.48	-1.42	2.02	151595.28	-0.63	0.40	2.43
2036	L5U	661200.06	150922.19	661201.96	-1.90	3.63	150922.78	-0.59	0.35	3.97
2073	L5U	526824.56	103383.71	526824.38	0.18	0.03	103383.80	-0.10	0.01	0.04
2074	L5U	526791.53	103375.39							
2075	L5U	526812.21	103430.54							

Sum	25.67
Average	0.83
RMSEr	0.91
NSSDA	1.57

Pilot Area 1 Area 2 Area 3

31 Total Number of Points

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Aerial Collection: Spring 2007
Delivery: February 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1006	L1O	1298.254	1297.948	0.31	0.09
1007	L1O	1298.614	1298.606	0.01	0.00
1008	L1O	1298.526	1298.341	0.19	0.03
1021	L1O	1256.250	1256.027	0.22	0.05
1022	L1O	1255.954	1255.870	0.08	0.01
1023	L1O	1255.964	1255.858	0.11	0.01
1037	L1O	1258.788	1259.091	-0.30	0.09
1038	L1O	1258.999	1258.936	0.06	0.00
1039	L1O	1258.941	1259.002	-0.06	0.00
1060	L1O	1267.027	1267.100	-0.07	0.01
1061	L1O	1267.099	1267.275	-0.18	0.03
1062	L1O	1266.925	1267.127	-0.20	0.04
1067	L1O	1164.662	1164.820	-0.16	0.02
1068	L1O	1164.985	1165.223	-0.24	0.06
1069	L1O	1164.474	1164.484	-0.01	0.00
1009	L2T	1269.464	1269.068	0.40	0.16
1010	L2T	1269.749	1269.787	-0.04	0.00
1011	L2T	1269.356	1269.132	0.22	0.05
1024	L2T	1229.051	1229.073	-0.02	0.00
1025	L2T	1227.608	1227.630	-0.02	0.00
1026	L2T	1232.356	1232.531	-0.17	0.03
1040	L2T	1309.733	1310.337	-0.60	0.36
1041	L2T	1309.136	1310.015	-0.88	0.77
1042	L2T	1307.498	1308.019	-0.52	0.27
1054	L2T	1269.695	1270.306	-0.61	0.37
1055	L2T	1270.233	1270.671	-0.44	0.19
1056	L2T	1270.147	1270.336	-0.19	0.04
1070	L2T	1166.821	1167.641	-0.82	0.67
1071	L2T	1165.870	1166.315	-0.44	0.20
1072	L2T	1164.696	1164.874	-0.18	0.03
1012	L3B	1274.962	1274.988	-0.03	0.00
1013	L3B	1272.162	1272.341	-0.18	0.03
1014	L3B	1273.959	1273.929	0.03	0.00
1027	L3B	1259.945	1260.367	-0.42	0.18
1028	L3B	1259.306	1259.677	-0.37	0.14
1029	L3B	1253.937	1254.401	-0.46	0.22
1043	L3B	1256.910	1257.741	-0.83	0.69
1044	L3B	1256.351	1257.873	-1.52	2.32
1045	L3B	1256.705	1258.042	-1.34	1.79
1057	L3B	1275.448	1275.995	-0.55	0.30
1058	L3B	1276.149	1276.392	-0.24	0.06
1059	L3B	1276.114	1276.557	-0.44	0.20
1076	L3B	1164.550	1165.224	-0.67	0.45
1077	L3B	1166.065	1166.702	-0.64	0.41
1078	L3B	1167.137	1167.660	-0.52	0.27
2000	L4F	1271.760	1271.421	0.34	0.12
2001	L4F	1270.183	1270.205	-0.02	0.00
2002	L4F	1270.030	1269.653	0.38	0.14
2003	L4F	1250.101	1249.325	0.78	0.60
2004	L4F	1249.156	1248.791	0.36	0.13

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

LiDAR Collection: Spring 2007
Delivery: January 2008

2005	L4F	1247.560	1247.469	0.09	0.01
2006	L4F	1266.938	1266.588	0.35	0.12
2007	L4F	1268.394	1266.847	1.55	2.39
2008	L4F	1268.461	1267.849	0.61	0.38
2009	L4F	1171.675	1170.569	1.11	1.22
2010	L4F	1174.071	1173.274	0.80	0.64
2011	L4F	1171.718	1170.452	1.27	1.60
2012	L4F	1257.932	1256.908	1.02	1.05
2013	L4F	1257.854	1257.285	0.57	0.32
2014	L4F	1258.564	1257.542	1.02	1.04
1003	L5U	1298.239	1297.421	0.82	0.67
1004	L5U	1297.683	1297.264	0.42	0.18
1005	L5U	1300.719	1300.262	0.46	0.21
1018	L5U	1253.985	1253.578	0.41	0.17
1019	L5U	1254.414	1253.767	0.65	0.42
1020	L5U	1254.325	1253.878	0.45	0.20
1034	L5U	1260.635	1260.410	0.22	0.05
1035	L5U	1260.071	1259.837	0.23	0.05
1036	L5U	1260.899	1260.281	0.62	0.38
1051	L5U	1267.943	1267.611	0.33	0.11
1052	L5U	1268.033	1267.672	0.36	0.13
1053	L5U	1267.650	1267.419	0.23	0.05
1073	L5U	1170.047	1169.463	0.58	0.34
1074	L5U	1170.138	1169.886	0.25	0.06
1075	L5U	1170.045	1169.901	0.14	0.02
N2000	L4F	1250.109	1249.791	0.32	0.10
N2001	L4F	1252.542	1251.697	0.85	0.71
N2002	L4F	1254.040	1254.334	-0.29	0.09
N2003	L4F	1254.503	1254.131	0.37	0.14
N2004	L4F	1253.078	1253.205	-0.13	0.02
N1000	L1O	1198.024	1197.951	0.07	0.01
N1001	L1O	1197.816	1197.749	0.07	0.00
N1002	L1O	1197.937	1197.871	0.07	0.00
N1003	L1O	1197.930	1197.931	0.00	0.00
N1004	L1O	1198.098	1197.938	0.16	0.03
N1005	L1O	1197.435	1197.541	-0.11	0.01
N1006	L1O	1197.276	1197.346	-0.07	0.00
N1007	L1O	1197.346	1197.345	0.00	0.00
N1008	L1O	1197.364	1197.356	0.01	0.00
N1009	L1O	1197.499	1197.462	0.04	0.00
N1045	L5U	1203.185	1203.006	0.18	0.03
N1010	L5U	1213.021	1212.719	0.30	0.09
N1011	L5U	1213.649	1213.480	0.17	0.03
N1012	L5U	1212.679	1211.947	0.73	0.54
N1013	L2T	1204.641	1204.833	-0.19	0.04
N1014	L2T	1204.401	1204.456	-0.06	0.00
N1015	L2T	1203.489	1203.808	-0.32	0.10
N1016	L2T	1203.550	1203.886	-0.34	0.11
N1017	L2T	1204.427	1204.248	0.18	0.03
P1018	L5U	1208.255	1208.137	0.12	0.01
N1019	L5U	1208.252	1208.139	0.11	0.01
N1020	L5U	1207.951	1207.754	0.20	0.04

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

LiDAR Collection: Spring 2007
Delivery: January 2008

N1021	L5U	1209.582	1209.327	0.26	0.07
N1022	L5U	1206.703	1206.456	0.25	0.06
N1023	L5U	1206.244	1205.882	0.36	0.13
N1024	L5U	1205.993	1205.535	0.46	0.21
N1025	L5U	1206.421	1205.878	0.54	0.30
P1032	L5U	1186.480	1185.774	0.71	0.50
N1033	L5U	1194.344	1194.211	0.13	0.02
N1034	L5U	1205.917	1205.520	0.40	0.16
N1035	L5U	1197.224	1197.026	0.20	0.04
N1036	L5U	1221.370	1221.128	0.24	0.06
N1037	L3B	1204.497	1204.593	-0.10	0.01
N1038	L3B	1205.282	1204.756	0.53	0.28
N1039	L3B	1204.693	1204.507	0.19	0.03
N1040	L3B	1205.167	1204.994	0.17	0.03
N1041	L3B	1205.592	1205.718	-0.13	0.02
N1042	L3B	1205.528	1205.465	0.06	0.00

Pilot Area

Total Number of Points =	118
User-Defined Tolerance =	0.90
Chi Square Test :	

Sum	27.52
Average	0.23
$RMSE_z$	0.48
NSSDA	0.95

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1006	L1O	1298.254	1297.948	0.31	0.09
1007	L1O	1298.614	1298.606	0.01	0.00
1008	L1O	1298.526	1298.341	0.19	0.03
1021	L1O	1256.250	1256.027	0.22	0.05
1022	L1O	1255.954	1255.870	0.08	0.01
1023	L1O	1255.964	1255.858	0.11	0.01
1037	L1O	1258.788	1259.091	-0.30	0.09
1038	L1O	1258.999	1258.936	0.06	0.00
1039	L1O	1258.941	1259.002	-0.06	0.00
1060	L1O	1267.027	1267.100	-0.07	0.01
1061	L1O	1267.099	1267.275	-0.18	0.03
1062	L1O	1266.925	1267.127	-0.20	0.04
1067	L1O	1164.662	1164.820	-0.16	0.02
1068	L1O	1164.985	1165.223	-0.24	0.06
1069	L1O	1164.474	1164.484	-0.01	0.00
N1000	L1O	1198.024	1197.951	0.07	0.01
N1001	L1O	1197.816	1197.749	0.07	0.00
N1002	L1O	1197.937	1197.871	0.07	0.00
N1003	L1O	1197.930	1197.931	0.00	0.00
N1004	L1O	1198.098	1197.938	0.16	0.03
N1005	L1O	1197.435	1197.541	-0.11	0.01
N1006	L1O	1197.276	1197.346	-0.07	0.00
N1007	L1O	1197.346	1197.345	0.00	0.00
N1008	L1O	1197.364	1197.356	0.01	0.00
N1009	L1O	1197.499	1197.462	0.04	0.00

Pilot Area		Sum	0.51
Total Number of Points =	25	Average	0.02
User-Defined Tolerance =	0.90	$RMSE_z$	0.14
Chi Square Test :		NSSDA	0.28

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1009	L2T	1269.464	1269.068	0.40	0.16
1010	L2T	1269.749	1269.787	-0.04	0.00
1011	L2T	1269.356	1269.132	0.22	0.05
1024	L2T	1229.051	1229.073	-0.02	0.00
1025	L2T	1227.608	1227.630	-0.02	0.00
1026	L2T	1232.356	1232.531	-0.17	0.03
1040	L2T	1309.733	1310.337	-0.60	0.36
1041	L2T	1309.136	1310.015	-0.88	0.77
1042	L2T	1307.498	1308.019	-0.52	0.27
1054	L2T	1269.695	1270.306	-0.61	0.37
1055	L2T	1270.233	1270.671	-0.44	0.19
1056	L2T	1270.147	1270.336	-0.19	0.04
1070	L2T	1166.821	1167.641	-0.82	0.67
1071	L2T	1165.870	1166.315	-0.44	0.20
1072	L2T	1164.696	1164.874	-0.18	0.03
N1013	L2T	1204.641	1204.833	-0.19	0.04
N1014	L2T	1204.401	1204.456	-0.06	0.00
N1015	L2T	1203.489	1203.808	-0.32	0.10
N1016	L2T	1203.550	1203.886	-0.34	0.11
N1017	L2T	1204.427	1204.248	0.18	0.03

Pilot Area	
Total Number of Point	20
User-Defined Tolerand	0.90
Chi Square Test :	

Sum	3.44
Average	0.17
$RMSE_z$	0.41
NSSDA	0.81

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1012	L3B	1274.962	1274.988	-0.03	0.00
1013	L3B	1272.162	1272.341	-0.18	0.03
1014	L3B	1273.959	1273.929	0.03	0.00
1027	L3B	1259.945	1260.367	-0.42	0.18
1028	L3B	1259.306	1259.677	-0.37	0.14
1029	L3B	1253.937	1254.401	-0.46	0.22
1043	L3B	1256.910	1257.741	-0.83	0.69
1044	L3B	1256.351	1257.873	-1.52	2.32
1045	L3B	1256.705	1258.042	-1.34	1.79
1057	L3B	1275.448	1275.995	-0.55	0.30
1058	L3B	1276.149	1276.392	-0.24	0.06
1059	L3B	1276.114	1276.557	-0.44	0.20
1076	L3B	1164.550	1165.224	-0.67	0.45
1077	L3B	1166.065	1166.702	-0.64	0.41
1078	L3B	1167.137	1167.660	-0.52	0.27
N1037	L3B	1204.497	1204.593	-0.10	0.01
N1038	L3B	1205.282	1204.756	0.53	0.28
N1039	L3B	1204.693	1204.507	0.19	0.03
N1040	L3B	1205.167	1204.994	0.17	0.03
N1041	L3B	1205.592	1205.718	-0.13	0.02
N1042	L3B	1205.528	1205.465	0.06	0.00

Pilot Area		Sum	7.42
Total Number of Point	21	Average	0.35
User-Defined Toleranc	0.90	$RMSE_z$	0.59
Chi Square Test :		NSSDA	1.16

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
2000	L4F	1271.760	1271.421	0.34	0.12
2001	L4F	1270.183	1270.205	-0.02	0.00
2002	L4F	1270.030	1269.653	0.38	0.14
2003	L4F	1250.101	1249.325	0.78	0.60
2004	L4F	1249.156	1248.791	0.36	0.13
2005	L4F	1247.560	1247.469	0.09	0.01
2006	L4F	1266.938	1266.588	0.35	0.12
2007	L4F	1268.394	1266.847	1.55	2.39
2008	L4F	1268.461	1267.849	0.61	0.38
2009	L4F	1171.675	1170.569	1.11	1.22
2010	L4F	1174.071	1173.274	0.80	0.64
2011	L4F	1171.718	1170.452	1.27	1.60
2012	L4F	1257.932	1256.908	1.02	1.05
2013	L4F	1257.854	1257.285	0.57	0.32
2014	L4F	1258.564	1257.542	1.02	1.04
N2000	L4F	1250.109	1249.791	0.32	0.10
N2001	L4F	1252.542	1251.697	0.85	0.71
N2002	L4F	1254.040	1254.334	-0.29	0.09
N2003	L4F	1254.503	1254.131	0.37	0.14
N2004	L4F	1253.078	1253.205	-0.13	0.02

Pilot Area			
Total Number of Point	20	Sum	10.83
User-Defined Toleranc	0.90	Average	0.54
Chi Square Test :		$RMSE_z$	0.74
		NSSDA	1.44

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1003	L5U	1298.239	1297.421	0.82	0.67
1004	L5U	1297.683	1297.264	0.42	0.18
1005	L5U	1300.719	1300.262	0.46	0.21
1018	L5U	1253.985	1253.578	0.41	0.17
1019	L5U	1254.414	1253.767	0.65	0.42
1020	L5U	1254.325	1253.878	0.45	0.20
1034	L5U	1260.635	1260.410	0.22	0.05
1035	L5U	1260.071	1259.837	0.23	0.05
1036	L5U	1260.899	1260.281	0.62	0.38
1051	L5U	1267.943	1267.611	0.33	0.11
1052	L5U	1268.033	1267.672	0.36	0.13
1053	L5U	1267.650	1267.419	0.23	0.05
1073	L5U	1170.047	1169.463	0.58	0.34
1074	L5U	1170.138	1169.886	0.25	0.06
1075	L5U	1170.045	1169.901	0.14	0.02
N1045	L5U	1203.185	1203.006	0.18	0.03
N1010	L5U	1213.021	1212.719	0.30	0.09
N1011	L5U	1213.649	1213.480	0.17	0.03
N1012	L5U	1212.679	1211.947	0.73	0.54
P1018	L5U	1208.255	1208.137	0.12	0.01
N1019	L5U	1208.252	1208.139	0.11	0.01
N1020	L5U	1207.951	1207.754	0.20	0.04
N1021	L5U	1209.582	1209.327	0.26	0.07
N1022	L5U	1206.703	1206.456	0.25	0.06
N1023	L5U	1206.244	1205.882	0.36	0.13
N1024	L5U	1205.993	1205.535	0.46	0.21
N1025	L5U	1206.421	1205.878	0.54	0.30
P1032	L5U	1186.480	1185.774	0.71	0.50
N1033	L5U	1194.344	1194.211	0.13	0.02
N1034	L5U	1205.917	1205.520	0.40	0.16
N1035	L5U	1197.224	1197.026	0.20	0.04
N1036	L5U	1221.370	1221.128	0.24	0.06

Pilot Area		Sum	5.33
Total Number of Point	32	Average	0.17
User-Defined Tolerand	0.90	$RMSE_z$	0.41
Chi Square Test :		NSSDA	0.80

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

CROW WING COUNTY
Vertical Accuracy Test

Point Number	Point Description	Z (Survey)	Z (Map)	Difference in Z	Z-Difference Squared
1003	L5U	1298.239	1297.421	0.82	0.67
1004	L5U	1297.683	1297.264	0.42	0.18
1005	L5U	1300.719	1300.262	0.46	0.21
1018	L5U	1253.985	1253.578	0.41	0.17
1019	L5U	1254.414	1253.767	0.65	0.42
1020	L5U	1254.325	1253.878	0.45	0.20
1034	L5U	1260.635	1260.410	0.22	0.05
1035	L5U	1260.071	1259.837	0.23	0.05
1036	L5U	1260.899	1260.281	0.62	0.38
1051	L5U	1267.943	1267.611	0.33	0.11
1052	L5U	1268.033	1267.672	0.36	0.13
1053	L5U	1267.650	1267.419	0.23	0.05
1073	L5U	1170.047	1169.463	0.58	0.34
1074	L5U	1170.138	1169.886	0.25	0.06
1075	L5U	1170.045	1169.901	0.14	0.02
N1045	L5U	1203.185	1203.006	0.18	0.03
N1010	L5U	1213.021	1212.719	0.30	0.09
N1011	L5U	1213.649	1213.480	0.17	0.03
N1012	L5U	1212.679	1211.947	0.73	0.54
P1018	L5U	1208.255	1208.137	0.12	0.01
N1019	L5U	1208.252	1208.139	0.11	0.01
N1020	L5U	1207.951	1207.754	0.20	0.04
N1021	L5U	1209.582	1209.327	0.26	0.07
N1022	L5U	1206.703	1206.456	0.25	0.06
N1023	L5U	1206.244	1205.882	0.36	0.13
N1024	L5U	1205.993	1205.535	0.46	0.21
N1025	L5U	1206.421	1205.878	0.54	0.30
P1032	L5U	1186.480	1185.774	0.71	0.50
N1033	L5U	1194.344	1194.211	0.13	0.02
N1034	L5U	1205.917	1205.520	0.40	0.16
N1035	L5U	1197.224	1197.026	0.20	0.04
N1036	L5U	1221.370	1221.128	0.24	0.06

Pilot Area		Sum	5.33
Total Number of Point	32	Average	0.17
User-Defined Toleranc	0.90	$RMSE_z$	0.41
Chi Square Test :		NSSDA	0.80

Contractor: Merrick Co.
Owner: Crow Wing County
Independent Tester: Mn/DOT

Collection Date: Spring 2007
Delivery Date: January 2008

From: Peter Jenkins
To: lidonnay@stcloudstate.edu
Date: 5/22/2008 8:42:42 AM
Subject: Crow Wing

Linda:
I have looked over Area's 2 & 3 and have discovered something interesting. I don't see this as an error but more as requiring an explanation. If you look at the attached document you will notice the first properties picture (ESRI) shows the proper coordinates and datum. I believe that this comes from the world file. The second picture (non-ESRI) shows the properties where the coordinates and datum are not specified. The interesting thing is that the coordinates and resolution are in meters. If you multiply the coordinates by (3937/1200) you do get the proper Crow Wing County Coordinates. Same is true with the resolution. This is also the same for Area 1.

However if you use the TIFF's in something like a MicroStation's Raster Manager you don't get the images to come into the correct place. MicroStation does not read the World file automatically, you have to let it know what to do. I don't know if this is true with AutoCAD because I don't have a copy of AutoCAD. Don Sigety might have to look at this. Anyway you look at this, it requires first hand knowledge of this situation in order to perform the switch correctly and maybe this is one of the things you give up when ordering two sets of coordinates systems for a final deliverable.

As for testing, I am getting some good results however the test point contrast as selected by the field surveyors has made it difficult for my folks to identify the intended object. Thirty-one of the forty-five points are good but fourteen are causing us issues. If we can not see the object clear enough they are usually dropped and for most other projects we usually drop five or less. I don't know what the exact issues is because it could be one of three or it could be a combination of any of the three. I don't want to place blame here and since we are running behind and since the guidelines suggest a minimum of twenty to thirty I could finish up and send it as final if you want to wrap things up.

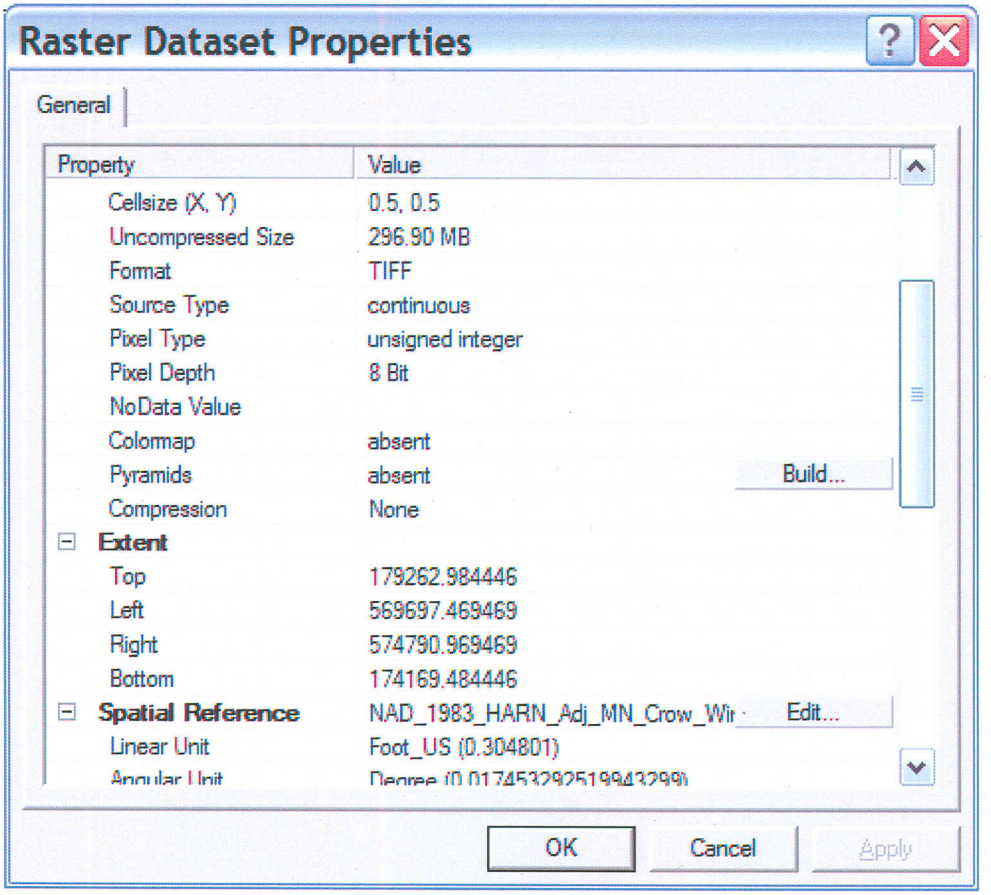
Anyway, run this by Don to get his opinion, this may be a non-issue to him and therefore no action would be required by you.
Pete

Peter W. Jenkins, LS
Photogrammetric Unit Supervisor
Minnesota Department of Transportation
395 John Ireland Boulevard, MS 640
St. Paul, MN 55155-1899

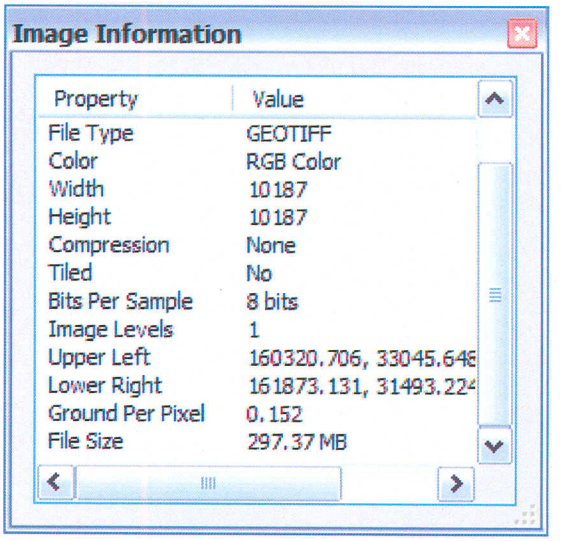
Phone: 651.366.3457
peter.jenkins@dot.state.mn.us

CC: don.sigety@co.crow-wing.mn.us

ESRI



Non-ESRI



From: "Donnay, Linda I." <LIDonnay@stcloudstate.edu>
To: Don Sigety <Don.Sigety@co.crow-wing.mn.us>
Date: 4/29/2008 8:37:51 AM
Subject: RE: 2ND PHASE OF ORTHOS AREA 2

Good morning Don,

Pete alerted me to the problem yesterday so I emailed Doug. Here's Doug's response received just moments ago:

"After review, it appears the GeoTIFF attributes somehow got corrupted when transformed from the UTM projection. These will be corrected and resubmitted with the Area 3 delivery."

We'll send the data to you as quickly as we can once we receive it from Merrick. Thanks and have a good week:-}

Linda Donnay
Director of Grants and Contracts
Office of Sponsored Programs

St. Cloud State University
720 4th Avenue South AS210
St. Cloud, MN 56301-4498
320-308-5148 phone
320-308-5292 fax

-----Original Message-----
From: Don Sigety [mailto:Don.Sigety@co.crow-wing.mn.us]
Sent: Tuesday, April 29, 2008 8:29 AM
To: Donnay, Linda I.
Cc: doug jacoby
Subject: 2ND PHASE OF ORTHOS AREA 2

Linda,

We have looked at the new ORTHOS and the quality is good but the projection for the ORTHOS in Crow Wing County coordinates is not defined. They all come in on top of each other. Please have Merrick fix this. We will send the hard drive back to you.

Thanks,

Don

CC: doug jacoby <Doug.Jacoby@Merrick.com>, Peter Jenkins <Peter.Jenkins@dot.state.mn.us>

From: Peter Jenkins
To: lidonnay@stcloudstate.edu
Date: 4/28/2008 3:23:41 PM
Subject: Fwd: Crow Wing Area 2

Linda:
Please forward this to Merrick. They have some problems with the coordinates as they appear in the properties section for the Crow Wing County Coordinates. We discovered this when they did not come in the correct place. Get back to me when you can.
Thanks
Pete

Peter W. Jenkins, LS
Photogrammetric Unit Supervisor
Minnesota Department of Transportation
395 John Ireland Boulevard, MS 640
St. Paul, MN 55155-1899

Phone: 651.366.3457
peter.jenkins@dot.state.mn.us

>>> Adam Smith 4/28/2008 3:04 PM >>>
Pete,

Here are some screen shots showing how the images are coming in. I didn't check all the images, but out of about 20, only one displayed correctly and had a spacial extent listed.

Thanks,

Adam

Adam E. Smith
Photogrammetric Unit
Minnesota Department of Transportation
395 John Ireland Boulevard, MS 640
St. Paul, MN 55155-1899

Phone: 651.366.3479
adam.smith@dot.state.mn.us

Zoom in to see details.

Image has extent listed and comes in correctly

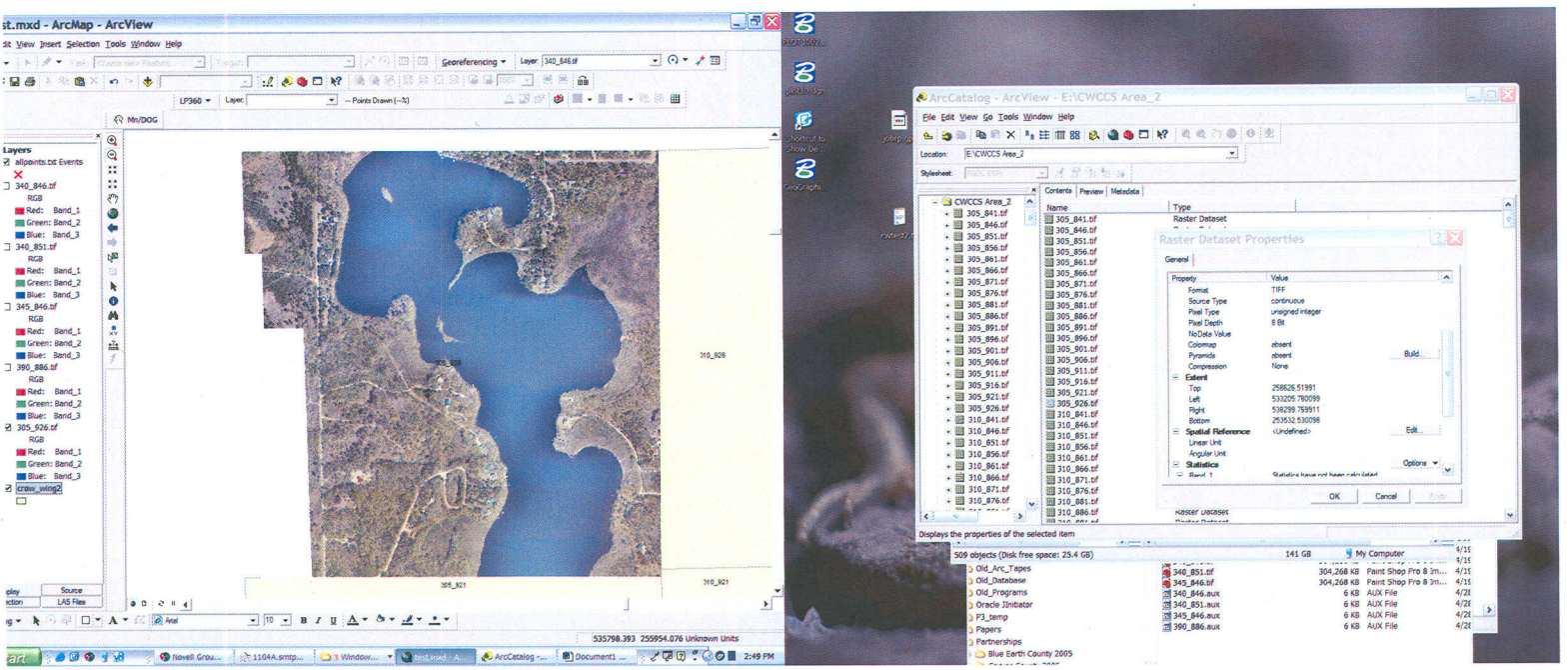
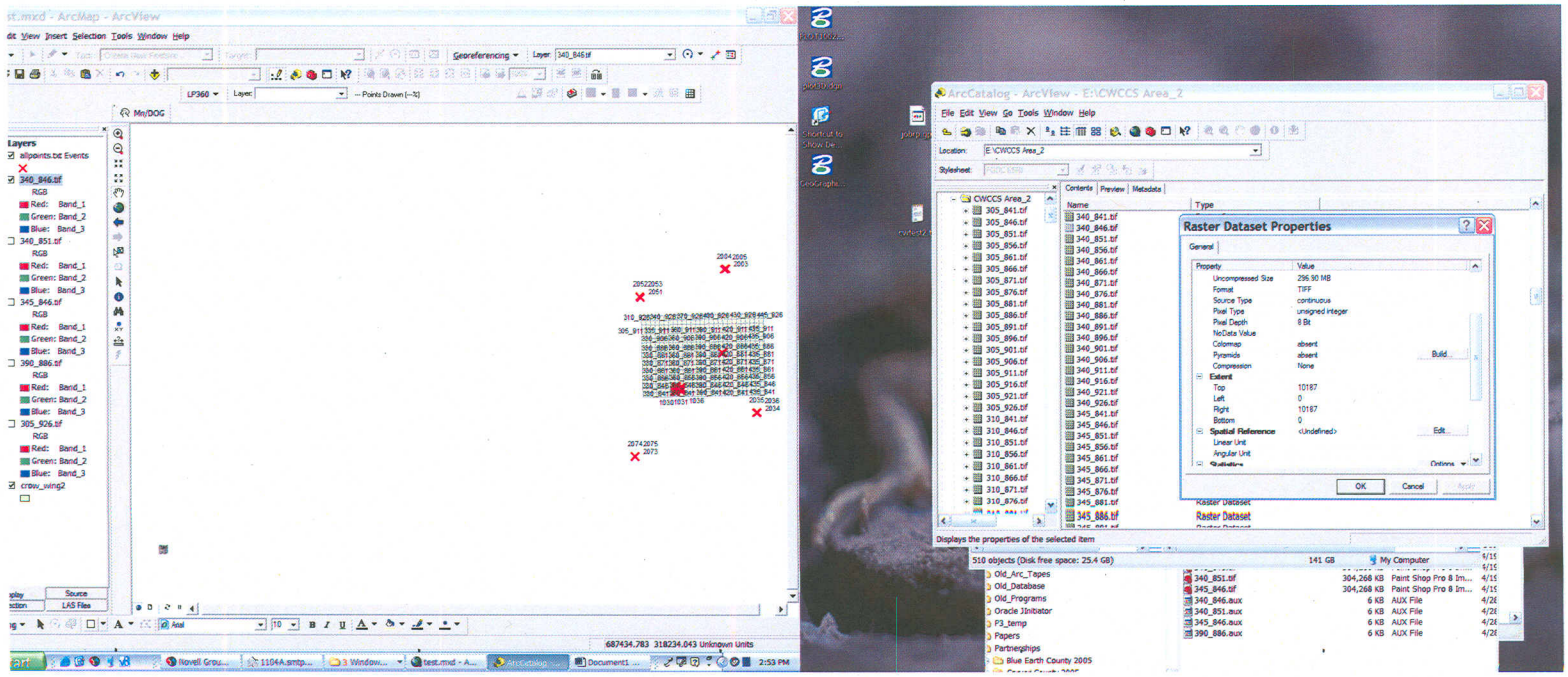


Image has no extent and comes in incorrectly.



From: "Donnay, Linda I." <LIDonnay@stcloudstate.edu>
To: Don Sigety <Don.Sigety@co.crow-wing.mn.us>, Peter Jenkins <Peter.Jenkins@dot.state.mn.us>
Date: 3/26/2008 3:28:11 PM
Subject: Crow Wing Digital Ortho Imagery

Good afternoon Don and Pete,

Today our office received Area 1 imagery from Merrick. Areas 2 and 3 are pending feedback from area 1. If the area 1 results are acceptable and Merrick is to reprocess all the remaining imagery using the new workflow; these areas would be shipped mid- and late-April. Merrick is basically redoing all the imagery from scratch using a new workflow and software. Therefore, please review and provide feedback ASAP on the Area 1 imagery so Merrick knows if they should continue reprocessing the remaining imagery.

Area 1 imagery (272 GB) is being sent to each of you on a 1TB hard drive. When you receive the information, would you please move it to another storage area and return the 1TB hard drive to us? We'll need these drives to copy Areas 2 and 3.

If you have any questions, just let me know. Thanks much:-}

Linda Donnay
Director of Grants and Contracts
Office of Sponsored Programs

St. Cloud State University
720 4th Avenue South AS210
St. Cloud, MN 56301-4498
320-308-5148 phone
320-308-5292 fax

From: "Doug Jacoby" <Doug.Jacoby@merrick.com>
To: "Erickson, Craig CIV NGMN" <Craig.Erickson@mn.ngb.army.mil>
Date: 2/26/2008 9:53:21 AM
Subject: RE: Camp Ripley resurvey of LIDAR test points (UNCLASSIFIED)

Craig,

I'm just looking for clarity... The phrase "okay to proceed" could be construed different ways such as: 1) yes, proceed with interpolating contours, or 2) we agree with your position - please disregard the contour request / compromise. Assuming the former, we've already begun to interpolate the contours.

Bottom line...the point we're trying to make is that in Addendum 1 to the RFP it was stated that above all the various accuracy standards referenced in the RFP, ASPRS would be used for the vertical accuracy reporting. That said, as derived from ASPRS Guidelines Vertical Accuracy Reporting for LIDAR Data: "For ASPRS purposes, the LIDAR dataset's required "fundamental" vertical accuracy, which is the vertical accuracy in open terrain tested to 95% confidence (normally distributed error), shall be specified, tested and reported." Note "open terrain". We met this.

Again you could argue this until the cows come home. Neither of us have the luxury of time (or in our case budget) to do this. We (Merrick) would simply like some acknowledgement indicating you received a darn good product.

Doug Jacoby, CMS, GISP
Director of Projects / Project Manager
Merrick & Company
GeoSpatial Solutions
303-353-3903
303-521-6522 Cell

-----Original Message-----
From: Erickson, Craig CIV NGMN [mailto:Craig.Erickson@mn.ngb.army.mil]
Sent: Tuesday, February 26, 2008 8:05 AM
To: Doug Jacoby
Cc: Donnay, Linda I.; Peter Jenkins
Subject: RE: Camp Ripley resurvey of LIDAR test points (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Doug,
In a previous message to Linda Donnay you stated "in a gesture of goodwill,
and for the sake of moving forward with the project, Merrick will agree to
produce the two-foot (2') contour geodatabase per Craig's suggestion". From
that I interpreted Merrick was willing to provide the contour layer. I don't
understand your reaction in the message below?

Here's my position on the accuracy issue, as stated at the kickoff meeting
and in the RFP we intended to test vertical accuracy across the 5 identified
land cover types. Based on that assessment the data in the prototype areas
did not meet the required accuracy. Therefore, in exchange for the limited
accuracy I requested the 2ft contour layer. I don't consider that a "freebie".

I'm not disputing the findings of your assessment. In fact, we had similar
results as you in the cover types you tested for. However, your assessment
did not include all the land cover types addressed in our test. That
difference ultimately explains the discrepancy between the two assessments.
Our process for evaluating vertical accuracy was made clear early in this
effort, I don't feel we are out of line by following through with it.

Regarding your comment "The criteria for vertical assessment calls for a minimum of twenty (20) checkpoints for each land cover class tested - this
was not done". Your point is taken, we have only assessed a subset of our
test points. We have additional test points to complete the assessment
however at this time we only have the prototype areas to test against.

I think we'd all agree we need to move forward on this. Here's a possible
solution, if you'd be willing to provide TINs for the additional tiles where
we have collected test points we could complete our vertical accuracy
assessment. If the assessment shows the overall accuracy meets the
requirement we can move forward as-is. However, if it turns out the
assessment shows the required accuracy is not met I'd like the two-foot (2')
contour layer in exchange. Is that acceptable to you?

Craig Erickson
GIS Manager
Minnesota Army National Guard
Camp Ripley
320.616.2716
DSN: 871.2716

CC: "Donnay, Linda I." <LIDonnay@stcloudstate.edu>, "Peter Jenkins" <Peter.Jenkins@dot.state.mn.us>, "Doug Jacoby" <Doug.Jacoby@merrick.com>, "Roger Hanson" <Roger.Hanson@merrick.com>

From: "Donnay, Linda I." <LIDonnay@stcloudstate.edu>
To: "Don Sigety" <Don.Sigety@co.crow-wing.mn.us>
Date: 2/21/2008 9:15:27 AM
Subject: LIDAR-ORTHO Status

Don,

I talked with Doug this morning. Can you please send me ASAP the eight sample areas referenced in your recent letter?

This same letter also stated an elevation issue was rectified and the LIDAR prototype in the Brainerd area is fine. Does "fine" mean acceptable?

Merrick is currently processing Area 1 imagery from scratch using an entirely new workflow. Once complete, Area 1 will be submitted for review.

Merrick is trying to address the issues and does need some feedback from you. Please respond to the questions above ASAP so we can move forward.

Craig: Merrick plans to have a response to your request on Friday.

Thanks much:-}

Linda Donnay
Director of Grants and Contracts
Office of Sponsored Programs

St. Cloud State University
720 4th Avenue South AS210
St. Cloud, MN 56301-4498
320-308-5148 phone
320-308-5292 fax

-----Original Message-----
From: Donnay, Linda I.
Sent: Wednesday, February 20, 2008 8:11 AM
To: 'Don Sigety'
Cc: Craig CIV NGMN Erickson
Subject: RE: LIDAR-ORTHO Status

Don,

I agree. Can you please resend the areas requested to me? I left a message for Doug yesterday so I'm anticipating a phone call shortly. On my list to discuss with him was a more diverse Crow Wing County wide sampling. If you can define that area for me, it would be most helpful.

Thanks much:-}

Linda Donnay
Director of Grants and Contracts
Office of Sponsored Programs

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-----Original Message-----
From: Don Sigety [mailto:Don.Sigety@co.crow-wing.mn.us]
Sent: Wednesday, February 20, 2008 7:49 AM
To: Donnay, Linda I.
Cc: Craig CIV NGMN Erickson
Subject: LIDAR-ORTHO Status

Linda,

Just wondering what is going on. I would like some more sample data from the areas that I requested. If Merrick has misplaced the info we sent them in July I will send it again. This is dragging on and I would like to get this resolved one way or another.

Thanks,

Don Sigety

CC: "Craig CIV NGMN Erickson" <Craig.Erickson@mn.ngb.army.mil>, "Peter Jenkins" <Peter.Jenkins@dot.state.mn.us>

From: "Donnay, Linda I." <LIDonnay@stcloudstate.edu>
To: "Doug Jacoby" <Doug.Jacoby@Merrick.com>
Date: 2/5/2008 10:36:58 AM
Subject: RE: Accuracy Assessment

Craig, Don, Pete and Wes:

Any response to Doug's email of February 1 regarding the ortho imagry and LIDAR data? I realize this project comes on top of everything else you have going on at work but if we want to keep the project on schedule, timely feedback is essential.

How does the data look on the 10 points resurveyed at Camp Ripley? When will Doug be sent the data?

Doug:

Let's hold on the delivery of any additional data until the existing issues are clarified and "cleaned up." SCSU needs the ability to bill the partners in this project before we can incur additional expenses.

Group:

Should we look at another phone conference or group meeting?

Any questions, just let me know. I'm here all week.

Linda Donnay

Director of Grants and Contracts

Office of Sponsored Programs

St. Cloud State University

720 4th Avenue South AS210

St. Cloud, MN 56301-4498

320-308-5148 phone

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Linda,

Thanks for the confirmation.

Your previous e-mail implied not to deliver any data until the existing prototype data was "cleaned up". Is this still the case, or do I submit what we intended to submit? Please advise.

Doug Jacoby, CMS, GISP
Director of Projects / Project Manager
Merrick & Company
GeoSpatial Solutions
303-353-3903
303-521-6522 Cell

From: Doug Jacoby [mailto:Doug.Jacoby@Merrick.com]
Sent: Friday, February 01, 2008 5:02 PM
To: Donnay, Linda I.
Cc: Don.Sigety@co.crow-wing.mn.us; Erickson, Craig CIV NGMN; peter.jenkins@dot.state.mn.us; Wesley E Newton; Restani, Marco; Doug Jacoby; rothaus@trefoilcultural.com
Subject: RE: Accuracy Assessment

Linda,

Thank you for the feedback.= General comments:

Ortho Imagery

· We will re-review our submittal in earnest, but after an initial review we believe the resubmittal is better than the original version.= We will begin by confirming we sent the correct version of the data, and continue from there.

· In the meantime, please confirm the following:

o What platform are you viewing the imagery?

o If using ArcGIS, be sure to not apply any histogram stretch as this will severely degrade the imagery.= Arc will sometimes apply this automatically.

o Are you reviewing the imagery at the intended scale (i.e., 1:1,200)?

o Is your issue possibly stemming from areas of trees and the mosaicking of such?= Ground features and infrastructure seem very clear in our brief review.

· Rather than issuing general "AWFUL" statement, please provide a shapefile and/or screenshots representing constructive feedback.= We can use these to pinpoint and get a better understanding of your concern(s).

LIDAR

Crow Wing County

· You may have to refresh my memory regarding the eight (8) sample areas. =My recollection was since you were provided the project-wide LIDAR data, sample areas could be chosen at your discretion. =If I misunderstood, I do apologize.= Let me know where you would like to see these 8 samples, and I can redeliver such post-haste.

· I interpret that the questionable survey results in the Brainerd area that I suggested in my report have been resolved, and that the area is considered, to use your term, fine.

Camp Ripley

· To reiterate, the ten (10) points were removed to emulate the MNDOT results - nothing more.= Each point was reviewed, and the findings were that the dense vegetation resulted in little to no penetration in those areas.= Additionally the possibility of / presence of thick undergrowth is a concern due to the conditions during the acquisition.

· The 10 new test points / coordinates will be evaluated upon receipt; however, there is no guarantee that the results will be any different than the first set based on the aforementioned explanation.

I'm disappointed that the accuracy results presented in the LIDAR report don't appear to carry any weight in the opinion of the LIDAR data itself.= Regardless I'm interested in any further comments Mr. Jenkins can add to prove / disprove the methodologies used to validate the data.

Should I proceed with the deliver of Areas 1 and 4, or shall I hold until I hear from you (or the team).= Please advise.

Happy Friday,

Doug Jacoby, CMS, GISP
Director of Projects / Project Manager
Merrick & Company
GeoSpatial Solutions
303-353-3903
303-521-6522 Cell

From: Donnay, Linda I. [mailto:LIDonnay@stcloudstate.edu]
Sent: Friday, February 01, 2008 2:18 PM
To: Doug Jacoby
Cc: Don.Sigety@co.crow-wing.mn.us; Erickson, Craig CIV NGMN; peter.jenkins@dot.state.mn.us; Wesley E Newton; Restani, Marco
Subject: Accuracy Assessment
Importance: High

Good afternoon Doug,

This email is in response to your letter dated January 22, 2008, related to the accuracy assessment of LIDAR data submitted to-date on the project for Crow Wing and Camp Ripley. At the December 18 meeting, it was very apparent that there was much work needed on the data to meet the criteria per our contract.

I asked the collaborators on this project to review the data submitted to us in January and formulate a response to your letter. Attached is the response received from Don at Crow Wing and below is the response received from Craig at Camp Ripley. They are resurveying the 10 test points eliminated from your assessment of the Camp Ripley data.

Our contract with you is for a specific set of deliverables. At this point in time, the data submitted to-date does not meet the criteria as listed in the RFP. Please let me know how you intend to proceed. We will get the results of the resurveyed 10 test points at Camp Ripley to you as soon as possible.

If you have any questions, feel free to contact me. Thank you.

Linda Donnay

Director of Grants and Contracts

Office of Sponsored Programs

St. Cloud State University

720 4th Avenue South AS210

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320-308-5148 phone

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Doug,

Regarding the Camp Ripley piece of the January 22, 2008 Accuracy Assessment the results of the Camp Ripley/MNDOT accuracy test are listed (RMSEZ = 0.86'

/ AccuracyZ = 1.69'). Then the ten test points with the highest error were removed from the sample, without explanation, to achieve improved results (RMSEZ = 0.33' / AccuracyZ = 0.65').

If in fact these points are unfit (e.g. steep slope, uneven terrain, downed trees, etc.) I agree they should be removed from the sample. However, arbitrary removal of these test points is misleading when determining the overall accuracy of the dataset. Especially since nine of these ten points are located in forested and brush land cover types which make up over 50% of the Camp Ripley project area.

In order to make the determination weather these points are fit or unfit each of the ten points will be revisited, photos will be taken, and Z values will be verified. Unfit test points will be removed from the sample. I'd ask that the remaining points then be addressed on your end, possibly through alteration of the classification algorithm to more accurately identify bare earth points within these cover types.

Our goal is to complete these site visits by the end of this week (February 1). The information will be passed on to you shortly after it is collected.

The accuracy assessment with the validated test points need to meet the required results (RMSEZ ? 0.3' / AccuracyZ ? 0.6' at 95% confidence).

Feel free to contact me if you have any questions. Thanks.

Craig Erickson

GIS Manager

Minnesota Army National Guard

Camp Ripley

320.616.2716

DSN: 871.2716

Classification: UNCLASSIFIED

Caveats: NONE

CC: <Don.Sigety@co.crow-wing.mn.us>, "Erickson, Craig CIV NGMN" <Craig.Erickson@mn.ngb.army.mil>, <peter.jenkins@dot.state.mn.us>, "Wesley E Newton" <wnewton@usgs.gov>, "Restani, Marco" <restani@stcloudstate.edu>

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January 22, 2008

Ms. Linda Donnay
Director of Grants and Contracts
St. Cloud State University
Office of Sponsored Programs
720 Fourth Avenue South
St. Cloud, MN 56301-4498

Subject: Accuracy Assessment

Dear Ms. Donnay:

On Tuesday, December 18, 2007, Merrick & Company (Merrick) met with St. Cloud State University and the agencies it represents to review and discuss the prototype deliverables Merrick developed for the Crow Wing County and Camp Ripley LIDAR Survey and Crow Wing County Digital Ortho Survey. In attendance of the meeting were representatives of the following agencies:

- St. Cloud State University (University)
- Crow Wing County
- Camp Ripley
- Minnesota Department of Transportation (MNDOT)
- United States Geological Survey (USGS)

During our meeting Merrick was provided with a series of independent surveyed checkpoint coordinates. These coordinates were used to calculate horizontal and vertical accuracy results of the prototype deliverables. It is my understanding that the independent survey was performed by Minnesota Department of Transportation (MNDOT), Camp Ripley and Crow Wing County. It appears that NMDOT and Camp Ripley implemented the following FEMA land class / ground cover classifications (or similar) during their field work:

L1 - Bare-earth and low grass (e.g., plowed fields, lawns, golf courses);
L2 - High grass, weeds, and crops (e.g., hay fields, corn fields, wheat fields);
L3 - Brush lands and low trees (e.g., chaparrals, mesquite);
L4 - Forested, fully covered by trees (e.g., hardwoods, evergreens, mixed forests);
L5 - Urban areas (e.g., high, dense manmade structures);

After review and discussion of the results, it was agreed that the University and/or the agencies it represents would provide Merrick with the coordinates so Merrick could replicate said results for confirmation. Coordinates were provided as promised; however, no action from Merrick was taken until after holidays (shortage of resources).

The following will include the independent results, Merrick's findings, and a brief narrative. Merrick's findings will be referenced within by filename, and these files will be placed on Merrick's ftp site (i.e., ftp://scsuftp:bS7qH8Av@ftp.merrick.com/SCSU) for retrieval (located in directory *Accuracy_Assessment*). Note that all values listed are based on the U.S. Survey Foot (units).

Camp Ripley

Vertical Accuracy Tests

Merrick performed an accuracy comparison using the University provided coordinates vs. the 2007 LIDAR bare-earth surface. The target accuracy used was the National Standard for Spatial Data Accuracy (NSSDA) for one-foot (1') contours (i.e., $RMSE_Z \leq 0.3$' / $Accuracy_Z \leq 0.6$' @ 95% confidence). Following are the results of our analysis:

Camp Ripley / MNDOT: 76 points total met $RMSE_Z = 0.86$' / $Accuracy_Z = 1.69$'.

Camp Ripley / MNDOT (points removed*): 66 points total met $RMSE_Z = 0.33$' / $Accuracy_Z = 0.65$'.

Merrick: 76 points total met $RMSE_Z = 0.87$' / $Accuracy_Z = 1.70$' at 78.95% confidence (60 of 76). See Comma Separated Value file (.csv) named *Camp_Vertical_Report.csv* for details (provided via ftp).

Merrick (points removed*): 65 points total met $RMSE_Z = 0.33$' / $Accuracy_Z = 0.65$' at 92.31% confidence (60 of 65). See Comma Separated Value file (.csv) named *Camp_Vertical_Points_Removed_Report.csv* for details (provided via ftp).

* Points removed were 30, 41, 45, 52, 54, 55, 56, 60, 64 and 73.

Many of the independent checkpoints fell in areas of dense vegetation. During the evaluation process, these dense vegetated areas were affected by lack of LIDAR penetration and suspected thick ground cover that made it difficult to validate an overall accuracy. These dense, obscured areas are defined two ways: 1) contours are attributed as obscured, and 2) polygons are provided as a feature class within the geodatabase. That said, Merrick deemed it necessary to review that accuracy results by the land cover classifications. These results were as follows:

L1: 13 points total met $RMSE_Z = 0.10$' / $Accuracy_Z = 0.20$' at 100.00% confidence (13 of 13). See Comma Separated Value file (.csv) named *Camp_Ripley_Feet_L1_Final.csv* for details (provided via ftp).

L2: 11 points total met $RMSE_Z = 0.18$' / $Accuracy_Z = 0.35$' at 100.00% confidence (11 of 11). See Comma Separated Value file (.csv) named *Camp_Ripley_Feet_L2_Final.csv* for details (provided via ftp).

L3: 19 points total met $RMSE_Z = 0.71$' / $Accuracy_Z = 1.39$' at 63.16% confidence (12 of 19). See Comma Separated Value file (.csv) named *Camp_Ripley_Feet_L3_Final.csv* for details (provided via ftp).

L4: 20 points total met $RMSE_Z = 1.52$' / $Accuracy_Z = 2.97$' at 55.00% confidence (11 of 20). See Comma Separated Value file (.csv) named *Camp_Ripley_Feet_L4_Final.csv* for details (provided via ftp.

L5: 13 points total met $RMSE_Z = 0.29$' / $Accuracy_Z = 0.57$' at 100.00% confidence (13 of 13). See Comma Separated Value file (.csv) named *Camp_Ripley_Feet_L5_Final.csv* for details (provided via ftp).

The results from classes L1, L2 and L5 are similar to Merrick's Camp Ripley accuracy assessment as illustrated in the detailed LIDAR Report submitted on September 13, 2007 (i.e., $RMSE_Z = 0.22'$ / $Accuracy_Z = 0.43'$), which were based on the paneled control checkpoints established in support of the LIDAR and digital imagery acquisition.

Crow Wing County

Vertical Accuracy Tests

Merrick performed an accuracy comparison using the University provided coordinates vs. the 2007 LIDAR bare-earth surface. The target accuracy used was the National Standard for Spatial Data Accuracy (NSSDA) for two-foot (2') contours (i.e., $RMSE_Z \leq 0.6'$ / $Accuracy_Z \leq 1.2'$ @ 95% confidence). Following are the results of our analysis:

MNDOT: 43 points total met $RMSE_Z = 0.30'$ / $Accuracy_Z = 0.59'$.

Merrick: 43 points total met $RMSE_Z = 0.30'$ / $Accuracy_Z = 0.58'$ at 100.00% confidence (43 of 43). See Comma Separated Value file (.csv) named *MnDOTtestPoints_Removed_Points.csv* for details (provided via ftp).

Merrick (all points*): 52 points total met $RMSE_Z = 0.29'$ / $Accuracy_Z = 0.58'$ at 100.00% confidence (52 of 52). See Comma Separated Value file (.csv) named *MnDOTtestPoints_All_Points.csv* for details (provided via ftp).

* The control coordinate file MNDOT provided included an additional nine (9) points that were not included in their assessment.

Similar to the exercise we performed for Camp Ripley, Merrick elected to review that accuracy results by the land cover classifications. These results were as follows:

L1: 10 points total met $RMSE_Z = 0.09'$ / $Accuracy_Z = 0.17'$ at 100.00% confidence (10 of 10). See Comma Separated Value file (.csv) named *MnDOTtestPoints_L1O_Report.csv* for details (provided via ftp).

L2: 5 points total met $RMSE_Z = 0.23'$ / $Accuracy_Z = 0.45'$ at 100.00% confidence (5 of 5). See Comma Separated Value file (.csv) named *MnDOTtestPoints_L2T_Report.csv* for details (provided via ftp).

L3: 6 points total met $RMSE_Z = 0.22'$ / $Accuracy_Z = 0.44'$ at 100.00% confidence (6 of 6). See Comma Separated Value file (.csv) named *MnDOTtestPoints_L3B_Report.csv* for details (provided via ftp).

L4: 6 points total met $RMSE_Z = 0.36'$ / $Accuracy_Z = 0.71'$ at 100.00% confidence (6 of 6). See Comma Separated Value file (.csv) named *MnDOTtestPoints_L4F_Report.csv* for details (provided via ftp.

L5: 25 points total met $RMSE_Z = 0.35'$ / $Accuracy_Z = 0.69'$ at 100.00% confidence (25 of 25). See Comma Separated Value file (.csv) named *MnDOTtestPoints_L5U_Report.csv* for details (provided via ftp).

The results from all classes are similar to Merrick's Crow Wing County accuracy assessment as illustrated in the detailed LIDAR Report submitted on September 13, 2007 (i.e., $RMSE_Z = 0.20'$ / $Accuracy_Z = 0.39'$) , which were based on the paneled control checkpoints established in support of the LIDAR and digital imagery acquisition.

Crow Wing County performed a secondary survey which resulted in the following:

Crow Wing County: 97 points total met $RMSE_Z = 1.15'$ / $Accuracy_Z = 2.25'$.

Merrick: 97 points total met $RMSE_Z = 1.16'$ / $Accuracy_Z = 2.28'$ at 62.89.00% confidence (61 of 97). See Comma Separated Value file (.csv) named *TOPO-TEST-PNTS_Report.csv* for details (provided via ftp).

While investigating these results, several items stood out:

1. There appears to be a negative bias for all the 500-series numbered points (i.e., all survey shots fall below the LIDAR surface).
2. TEST point #55 appears to be the same coordinate as paneled checkpoint #337; however, the elevation of such is 0.23' higher than the original checkpoint. This may explain why points numbered 1-101 are consistently higher than the LIDAR surface.
3. MNDOT checkpoints fall nearby the Crow Wing County and are well within specification.
4. MNDOT checkpoints fall within the same LIDAR flight line and meet specification, which theoretically should not happen with the LIDAR calibration and boresight procedures used during post-processing. See *Flight_Line_South.JPG* for crude example.
5. The vertical differences illustrated on the Crow Wing County provided check plots were not a result of contour smoothing as originally thought.

These findings, coupled with the favorable MNDOT (listed above) and the Merrick LIDAR Report results, lead us to believe the secondary survey should be considered suspect.

Horizontal Accuracy Tests

Merrick performed an accuracy comparison using the University provided coordinates vs. the 2007 Crow Wing County half-foot (0.5') pixel resolution color digital ortho imagery. The target accuracy used was the National Standard for Spatial Data Accuracy (NSSDA) for 1:1,200 scale (1"=100') mapping (i.e., Radial $RMSE_r \leq 2.2'$ / $Accuracy_r \leq 3.8'$). Following are the results of our analysis:

MNDOT: 11 points total met Radial $RMSE_r = 0.99'$ / $Accuracy_r = 1.71'$.

Merrick: 15 points total met Radial $RMSE_r = 0.70'$ / $Accuracy_r = 1.21'$. See Comma Separated Value file (.csv) named *Horizontal Accuracy Statistic Worksheet_merrick_calc.xls* for details (provided via ftp).

Note that Merrick discovered a minor shift in the original prototype ortho imagery, and made adjustments to such that included the entire project area (adjustments also included improved radiometric balancing). The Merrick results portrayed above are based on this updated imagery,

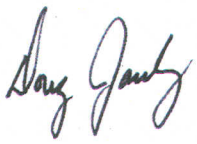
which was resubmitted on January 22, 2008. Regardless, the original submittal was well within specification.

Conclusion

The results depicted in this document and in the previously submitted LIDAR Report provide statistical validation that NSSDA specifications were met for the University's project. Should you have any questions or comments regarding the content of this report, please feel free to contact me at 303-353-3903 or doug.jacoby@merrick.com.

Very truly yours,

MERRICK & COMPANY



Doug Jacoby, CMS, GISP
Project Manager

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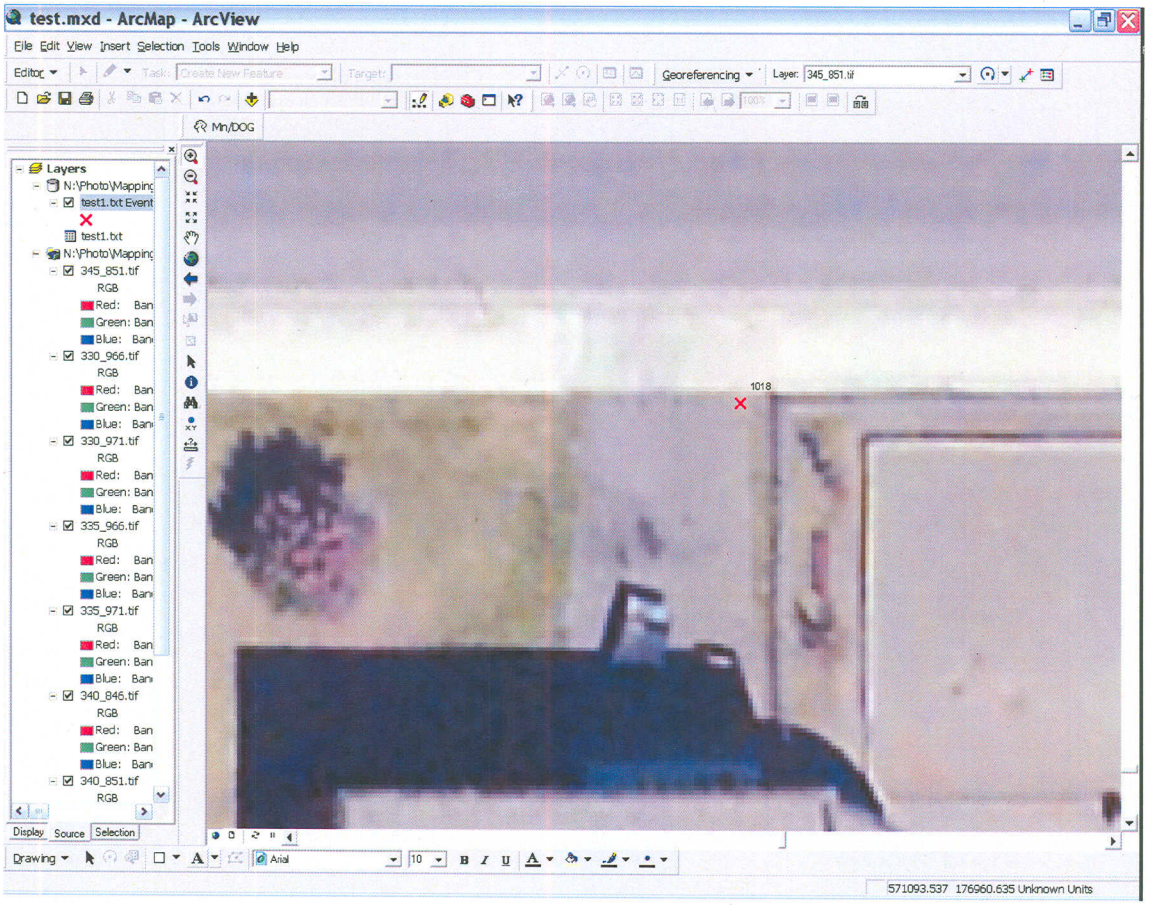
enc.

From: Adam Smith
To: Peter Jenkins
Date: 12/13/2007 7:44:46 AM
Subject: Crow Wing Horizontal Test

Pete,

After reviewing the test points and imagery, I have decided that we need to change the location of some of the test shots and some may need to be double stubbed. Attached is a Word document containing screen shots showing the areas where I came up with high residuals or could not make out the exact spot the survey crew shot. The first three images in the word document show points that may need double stubbing. The contrast is good on the image, but the points appear off. The next five images show points where I could not tell what the survey crew shot. The last five images are suggestions of what they could shoot, that show good distinct corners and have good contrast in the photography. I understand that it is near to impossible for the survey crew to know what the camera is going to capture from the sky and that what they see on the ground may look good from 6 ft above but not from 1500 ft. I have also attached the horizontal test sheet so you can compare the screen shots to the test. If you have any questions let me know.

Adam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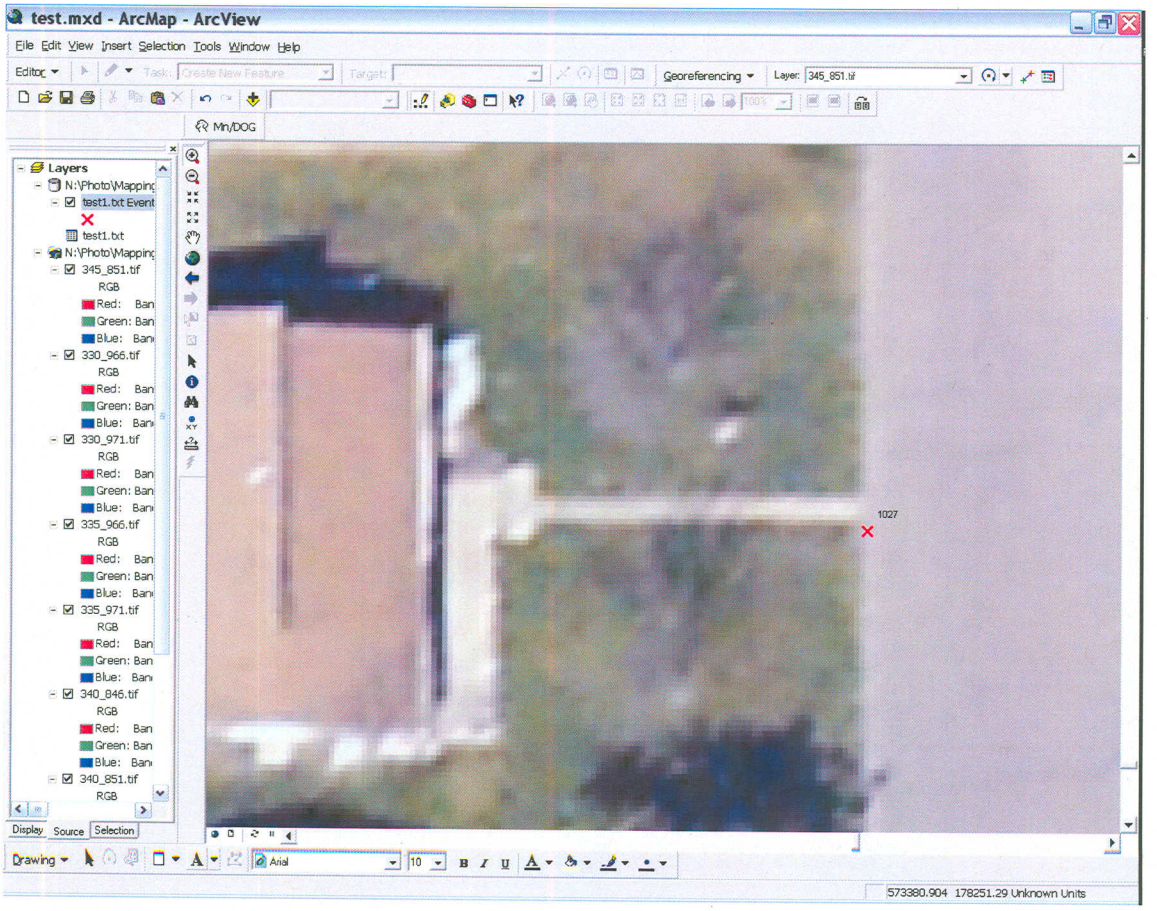
571093.537 176960.635 Unknown Units


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Task:
Create New Feature
Target:
Georeferencing
Layer:
345_851.tif
Mn/DOG
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
N:\Photo\Mapping
345_851.tif
RGB
Red: Ban
Green: Ban
Blue: Ban
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
Display
Source
Selection
Drawing
Arial
10
1027
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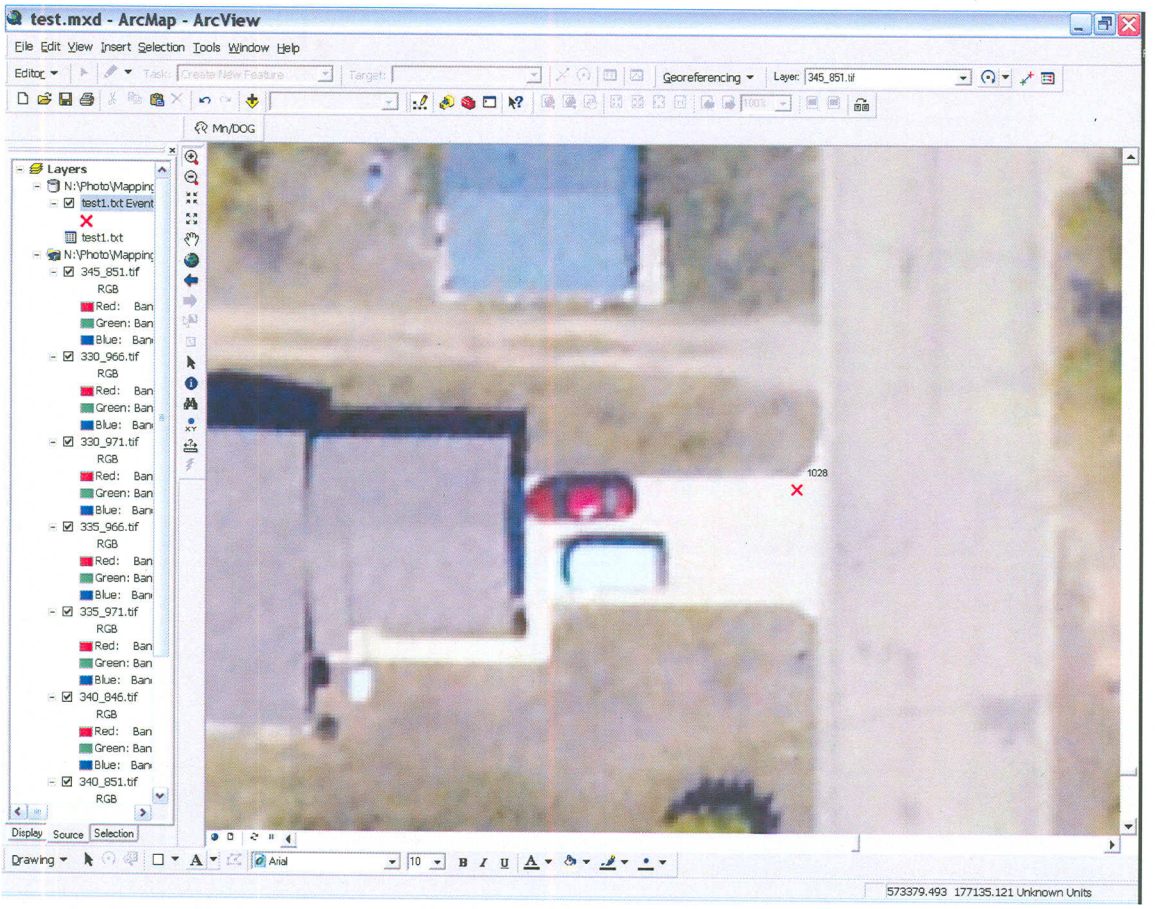
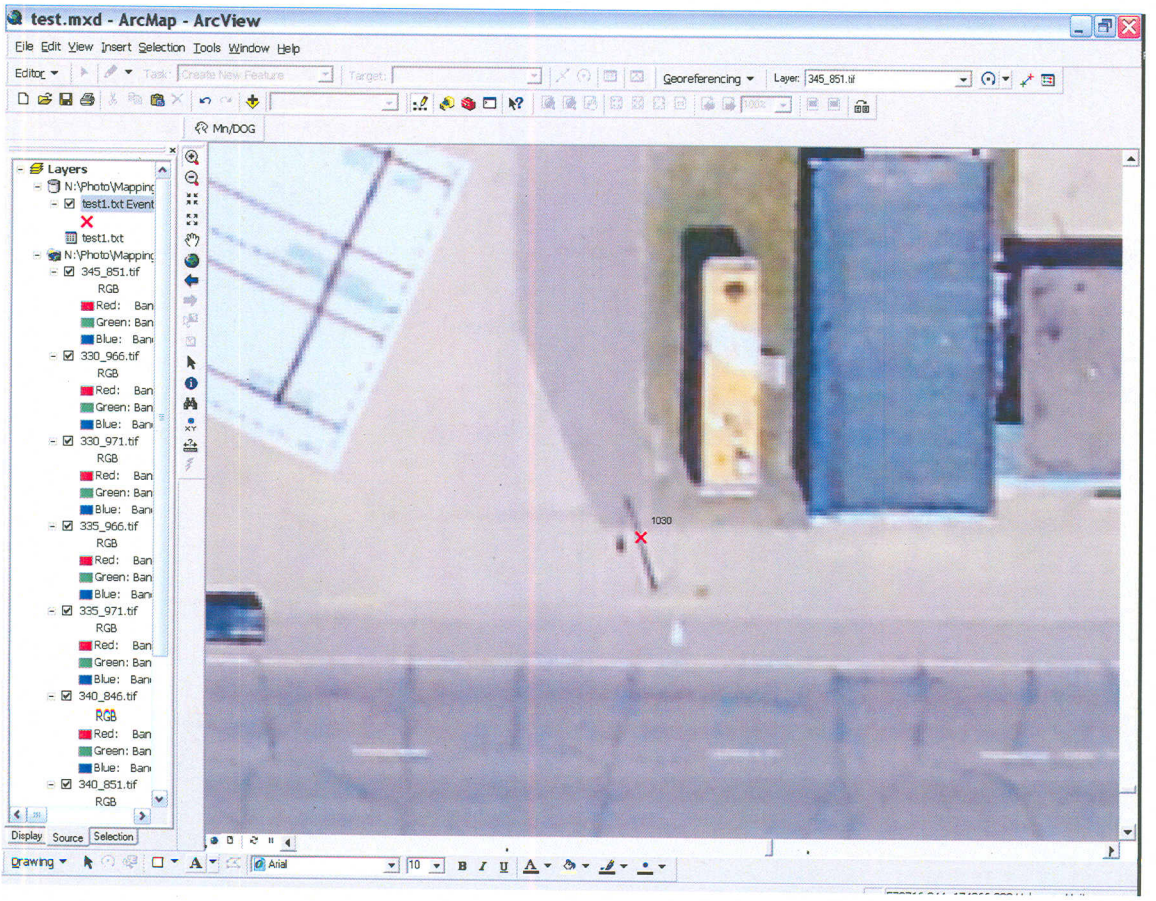
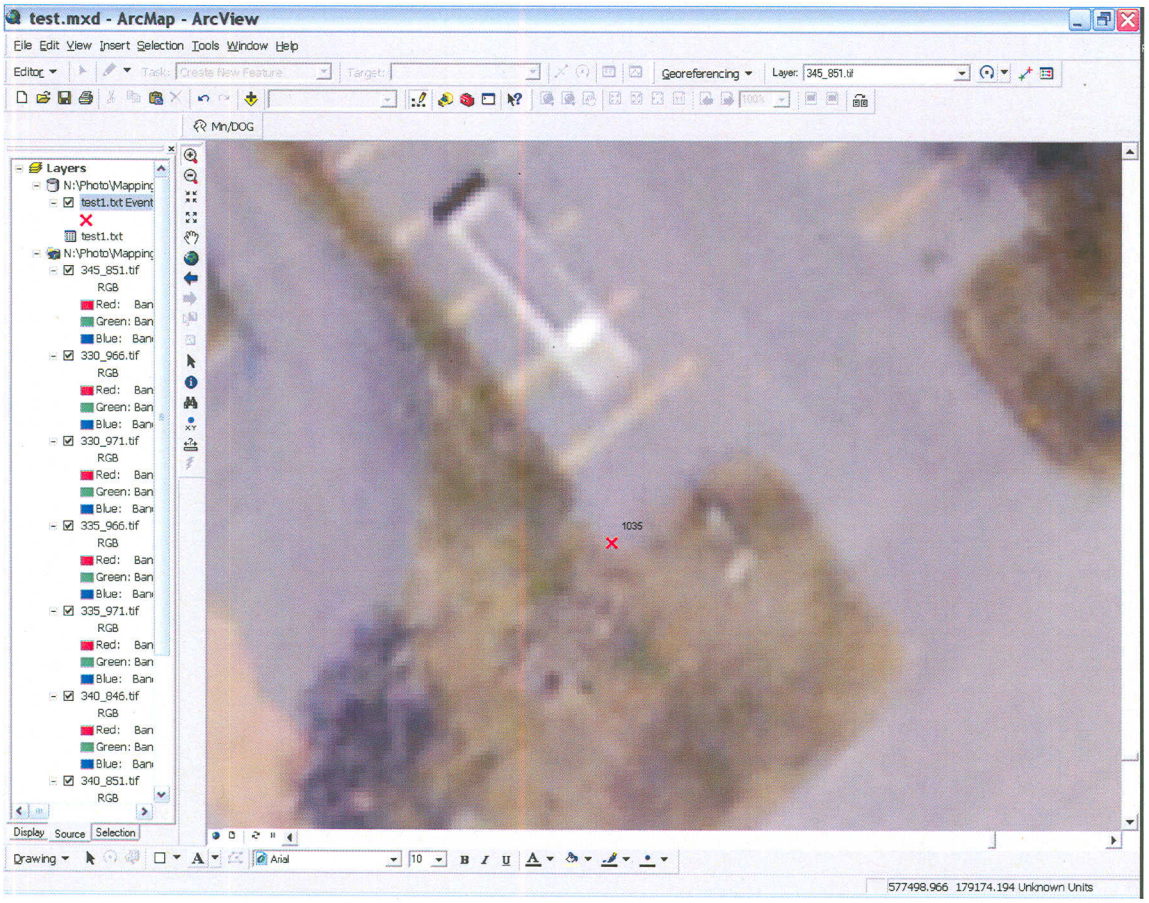
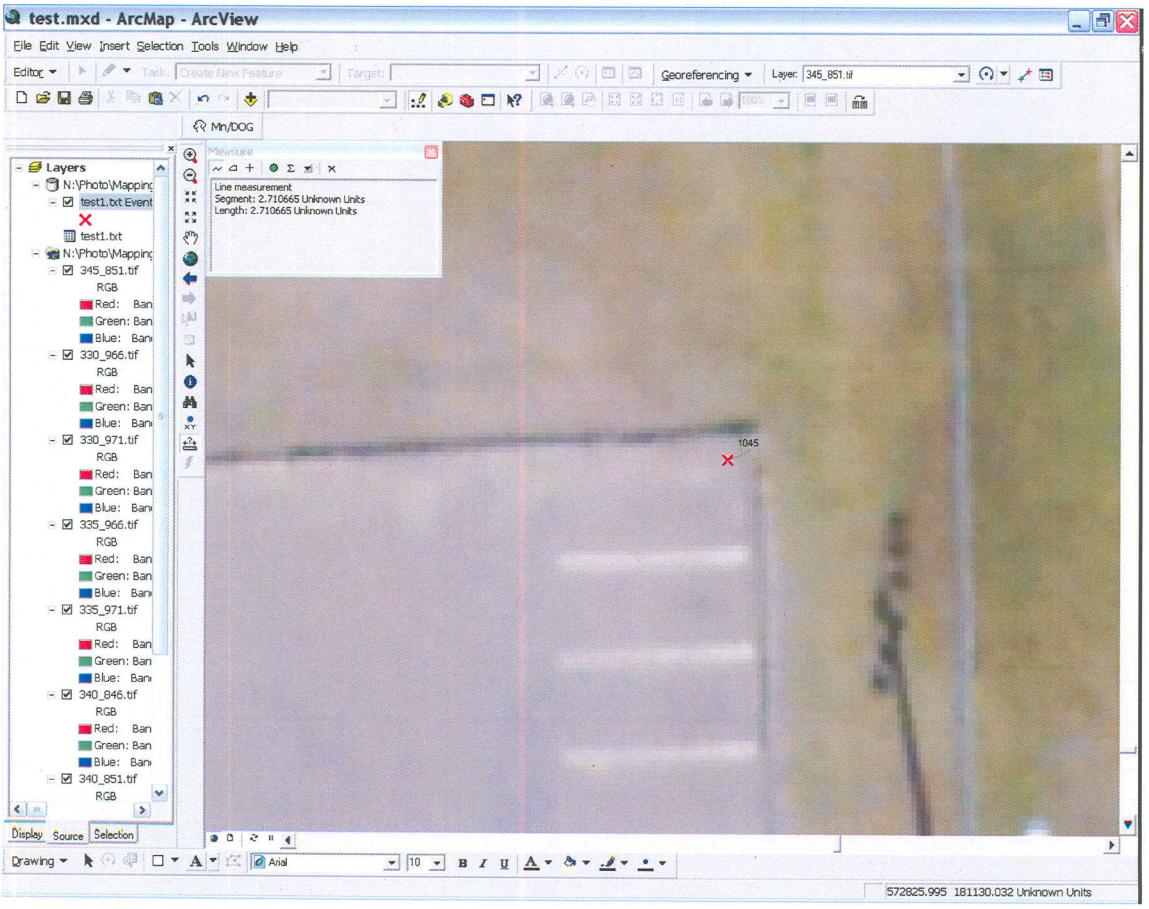

test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
test1.txt Event
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red: Ban
Green: Ban
Blue: Ban
1028
Display Source Selection
Drawing
Arial
573379.493 177135.121 Unknown Units


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
test1.txt Event
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red: Ban
Green: Ban
Blue: Ban
1030
Display Source Selection
Drawing
Arial


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Task: Create New Feature
Target:
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
N:\Photo\Mapping
345_851.tif
RGB
Red: Ban
Green: Ban
Blue: Ban
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
Display Source Selection
Drawing
Arial
10
1035
577498.966 179174.194 Unknown Units


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Task: Create New Feature
Target:
Georeferencing
Layer: 345_851.tif
Mn/DOG
Measure
Line measurement
Segment: 2.710665 Unknown Units
Length: 2.710665 Unknown Units
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
N:\Photo\Mapping
345_851.tif
RGB
330_966.tif
330_971.tif
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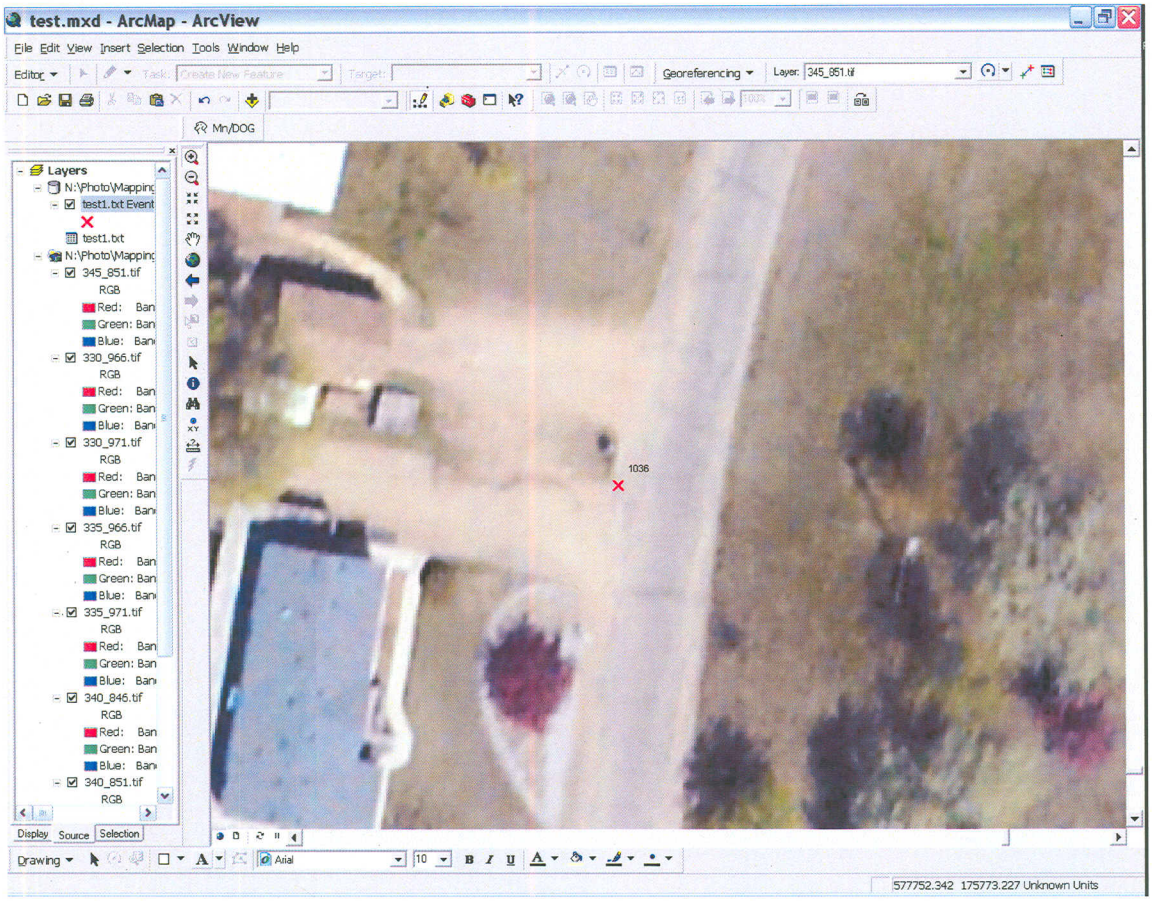
335_971.tif
340_846.tif
340_851.tif
Display Source Selection
Drawing
Arial
10
1045
572825.995 181130.032 Unknown Units


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
test1.txt
345_851.tif
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330_971.tif
335_966.tif
335_971.tif
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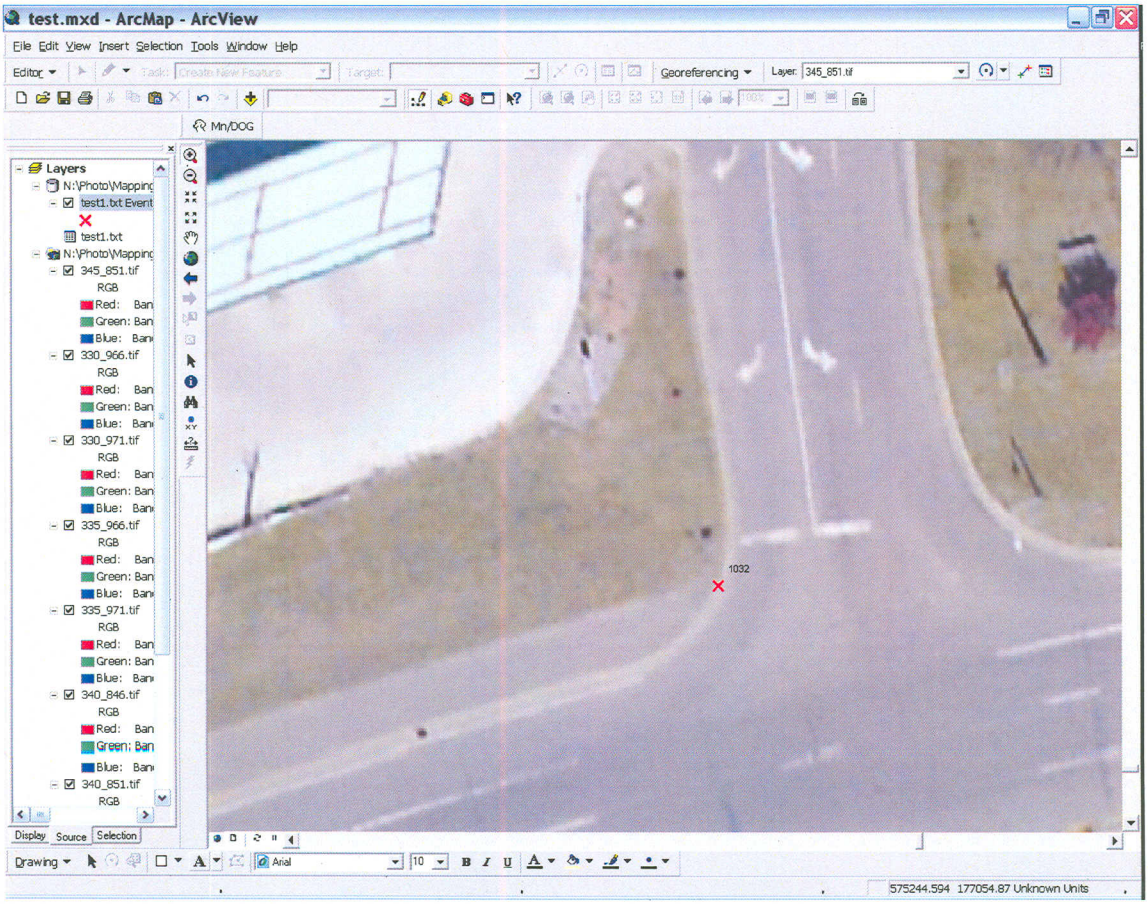
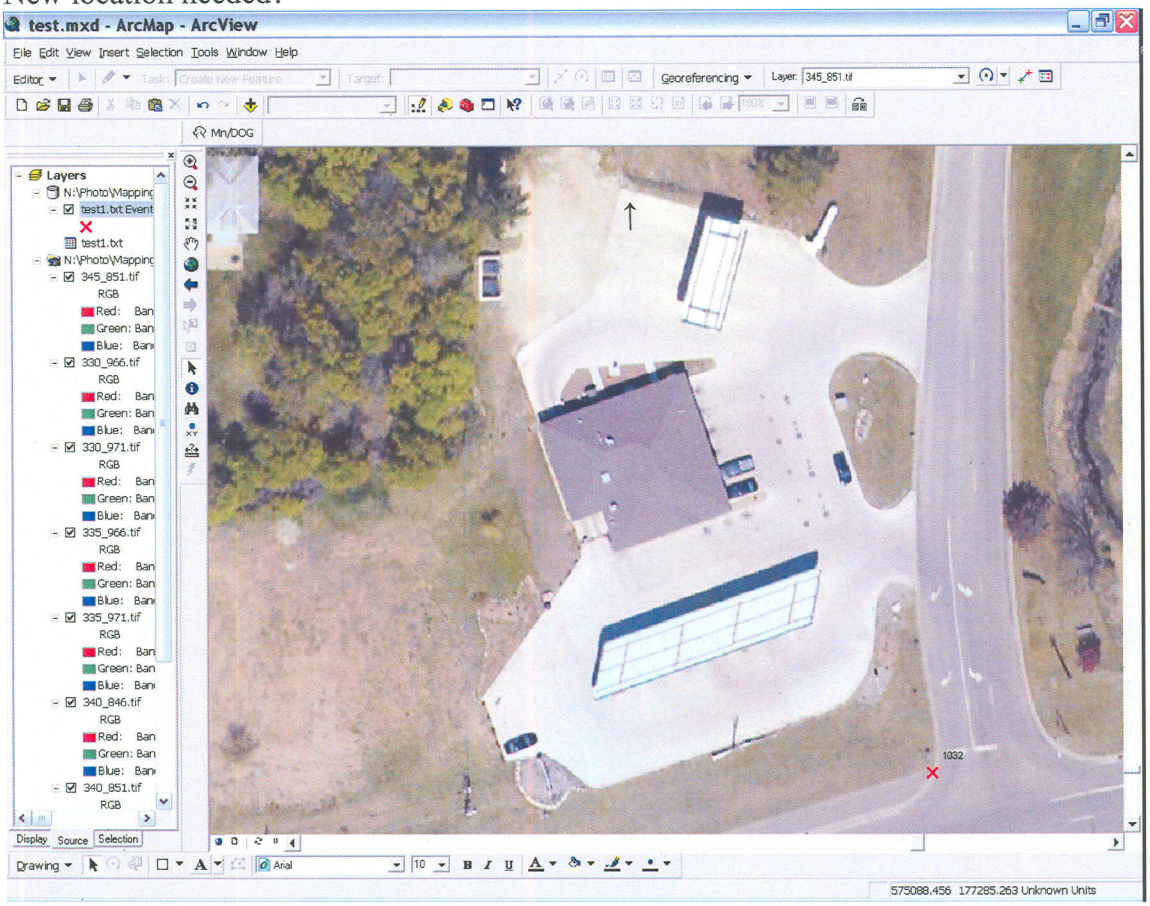
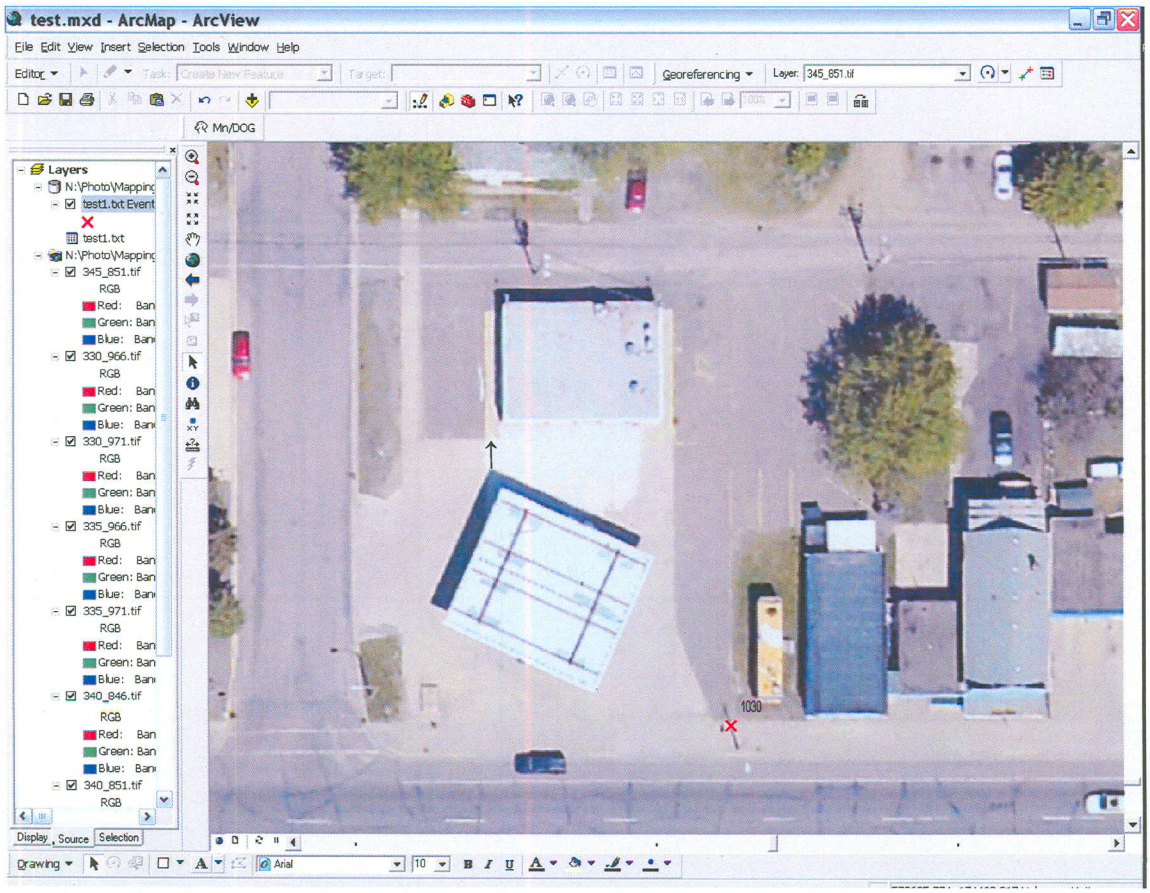
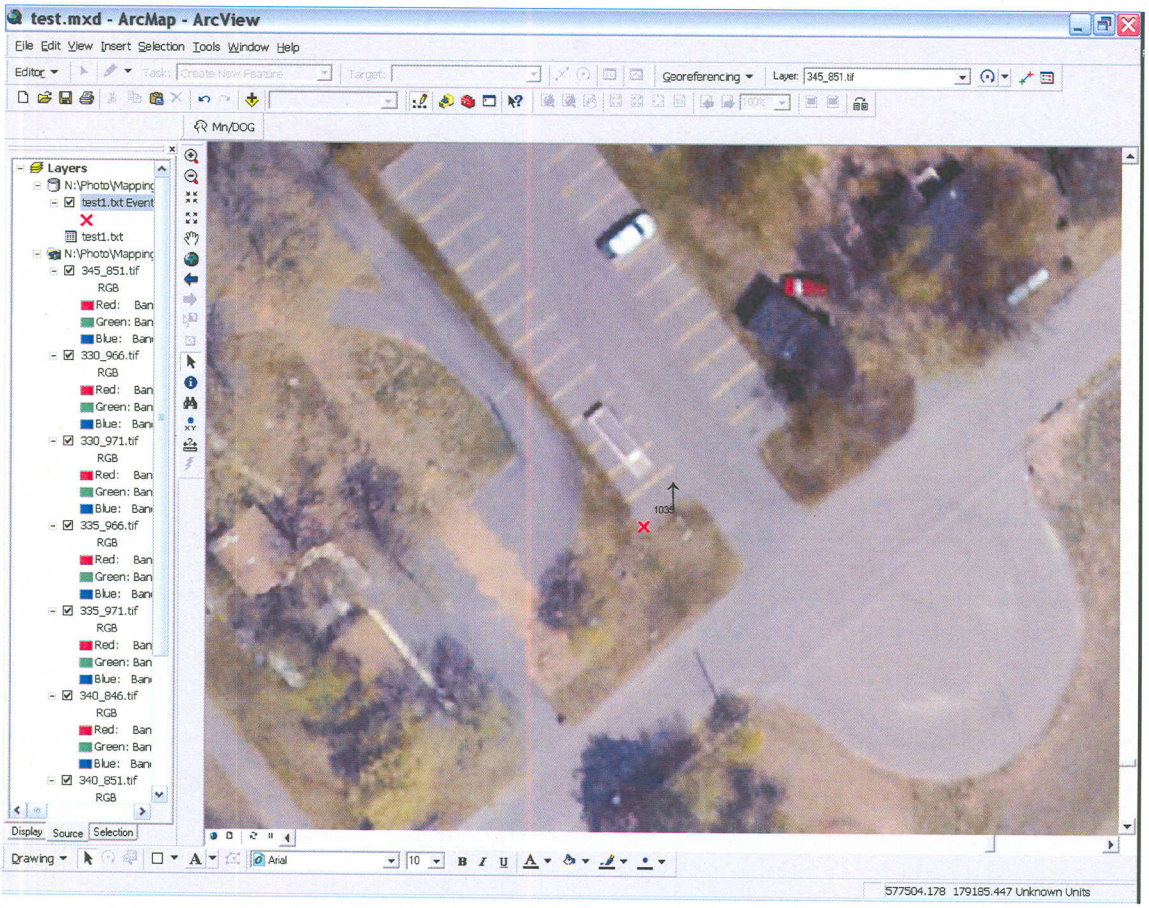
340_851.tif
RGB
Red:
Green:
Blue:
1036
Display
Source
Selection
Drawing
Arial
577752.342 175773.227 Unknown Units

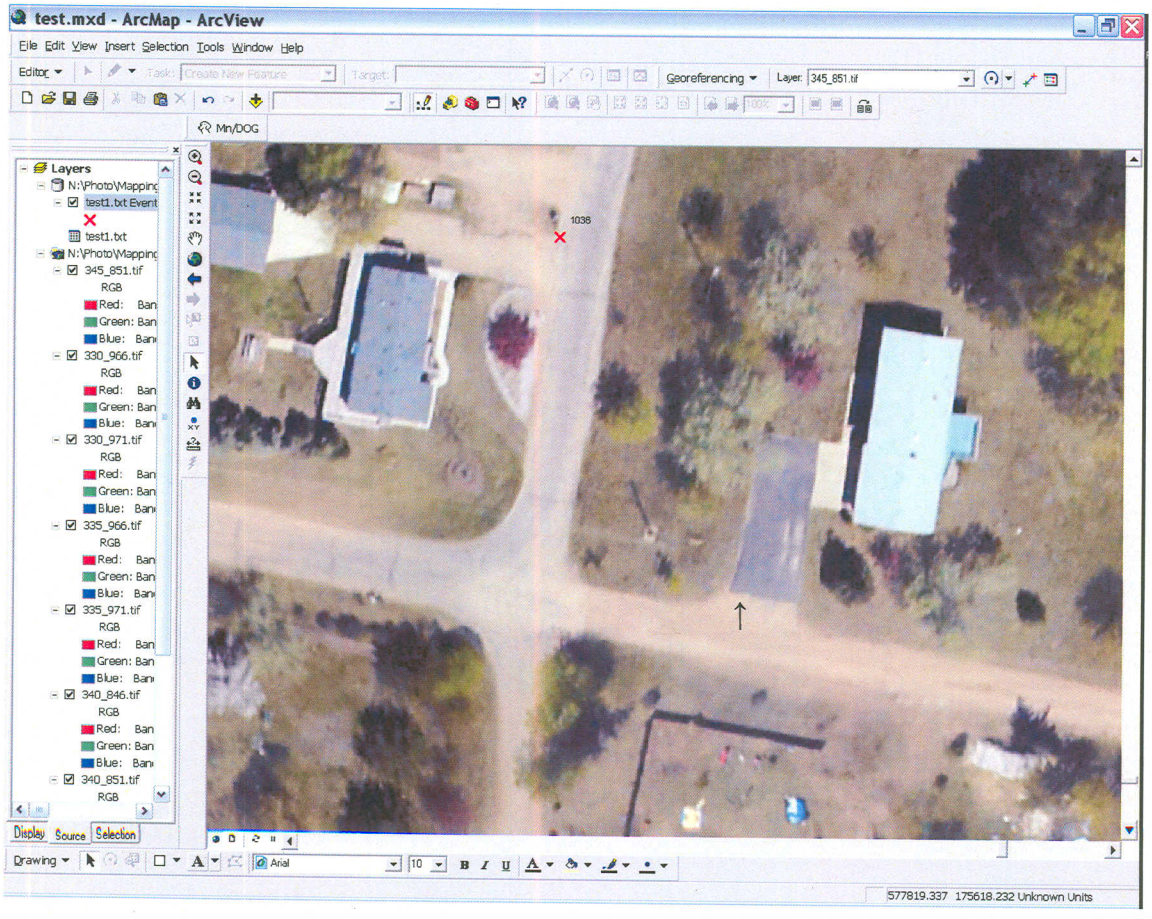

test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red:
Green:
Blue:
1032
Display
Source
Selection
Drawing
Arial
575244.594 177054.87 Unknown Units

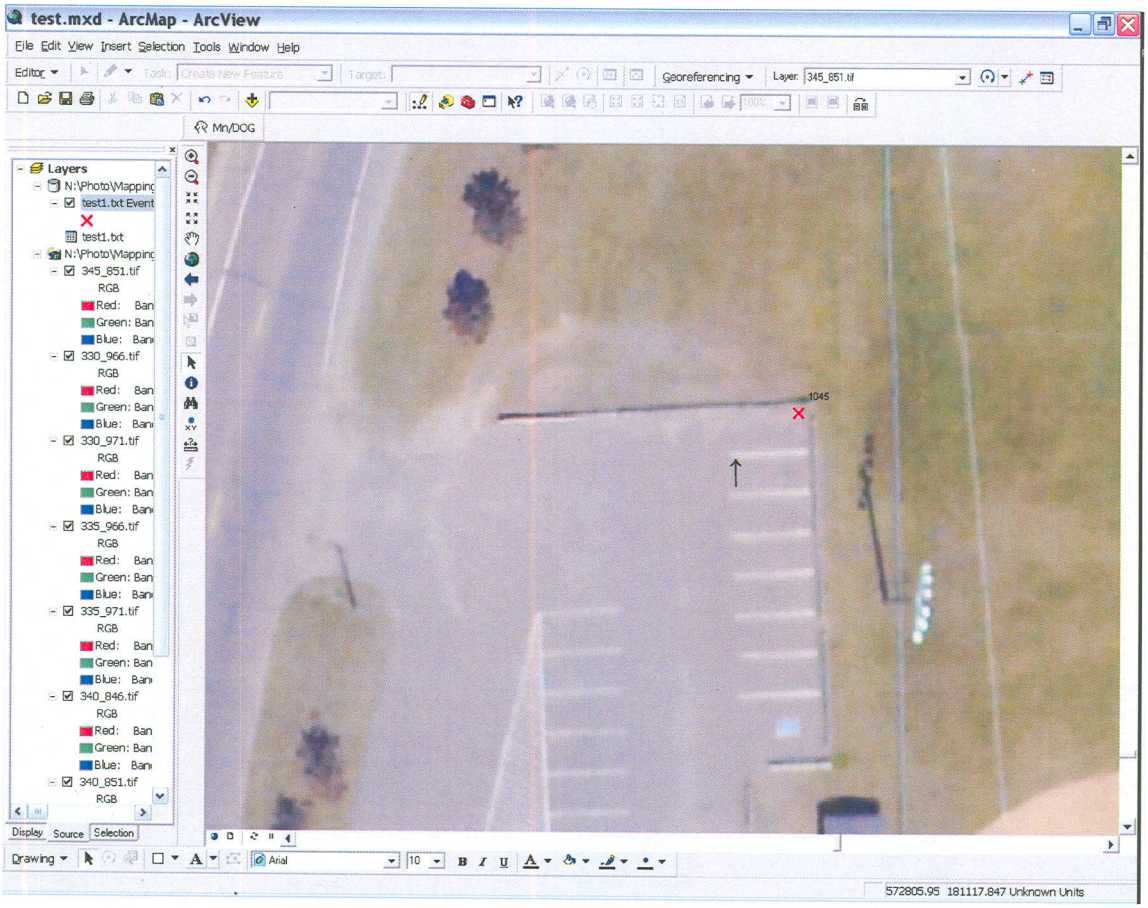
New location needed?






test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red:
Green:
Blue:
1035
Display
Source
Selection
Drawing
Arial
577504.178 179185.447 Unknown Units


test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red:
Green:
Blue:
1038
Display
Source
Selection
Drawing
Arial
577819.337 175618.232 Unknown Units

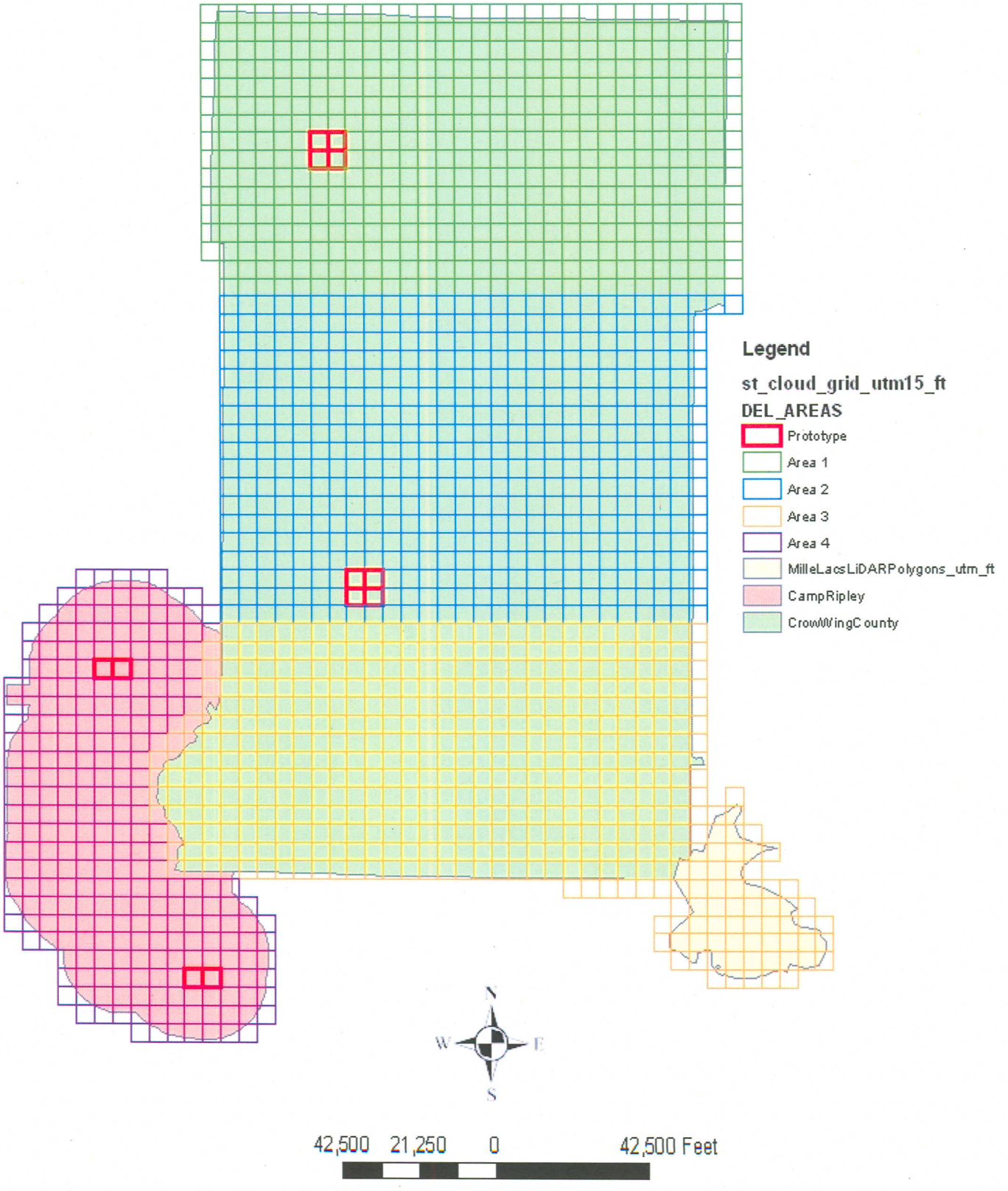

test.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Editor
Georeferencing
Layer: 345_851.tif
Mn/DOG
Layers
N:\Photo\Mapping
test1.txt Event
test1.txt
345_851.tif
330_966.tif
330_971.tif
335_966.tif
335_971.tif
340_846.tif
340_851.tif
RGB
Red:
Green:
Blue:
1045
Display
Source
Selection
Drawing
Arial
572805.95 181117.847 Unknown Units

From: Frank Kromar
To: Peter Jenkins
Date: 12/11/2007 11:20:19 PM
Subject: CAMP RIPLEY LIDAR

Pete,
I converted the arc\gis shape files I originally rec'd from the cd that I gave back to you and I converted the shapes with
the same titles from the camp Ripley cd that was left on my desk. They are the same files. There weren't ASCII
files that covered the area that the camp Ripley files cover on the large hard drive.
I rec'd 2 text files that contain test points for Ripley LIDAR test shots.CSV, points 1-78 and Ripley LIDAR test shots_
Oct07.csv points 79-129. An example of the coordinates x 395083.2 y 5103890 z 348.05. You sent me a converted Camp Ripley Feet.txt, that contained 1-78 points so I believe this is a conversion of file Ripley LIDAR test shots.CSV, an example of
these coordinates are x 527978.666, y 72408.414 z 1141.917 .
An example of the coordinates of the converted arc\gis files are x 1274997.8880 y 16830998.9910 z 1206.3920.
The e-mail I rec'd with the Camp Ripley test shots Ripley LIDAR test shots _Oct07.csv states that they are in UTM, ZONE
15 NORTH coordinates, when you converted the point file it was from UTM to Crow Wing Cty FT. I don't know what
coordinate system the ARC\GIS Camp Ripley files are in.

I need a text file with the coordinates for the test shots provided by Crow Wing county as in the Auto Cad file
LIDAR-TEST.DWG, I've had no luck trying to extract them from the graphics file. I could copy then out long
hand but it would be great if I could get a text file.
Frank

St. Cloud State University
Job No. 02015525



APPENDIX A

NMAS Equivalent Contour Interval	NSSDA RMSE(z)	NSSDA Accuracy (z)	Required Accuracy for Reference Data for "Tested to Meet"
0.5	0.15 ft or 4.60 cm	0.30 ft or 9.10 cm	0.10 ft
1	0.30 ft or 9.25 cm	0.60 ft or 18.2 cm	0.20 ft
2	0.61 ft or 18.5 cm	1.19 ft or 36.3 cm	0.40 ft
4	1.22 ft or 37.0 cm	2.38 ft or 72.6 cm	0.79 ft
5	1.52 ft or 46.3 cm	2.98 ft or 90.8 cm	0.99 ft
10	3.04 ft or 92.7 cm	5.96 ft or 181.6 cm	1.98 ft

Table 1 Comparison of NMAS/NSSDA Vertical Accuracy

NMAS Mp Scale	NMAS CMAS 90%	NSSDA RMSE(r)	NSSDA Accuracy (r) 95% confidence level
1" = 100' or 1:1, 200	3.33 ft	2.20 ft or 67.0 cm	3.80 ft or 1.159 m
1" = 200' or 1: 2, 400	6.67 ft	4.39 ft or 1.339 m	7.60 ft or 2.318m
1" = 400' or 1: 4, 800	13.33 ft	8.79 ft or 2.678 m	15.21 ft or 4.635 m
1" = 500' or 1: 6,000	16.67 ft	10.98 ft or 3.348 m	19.01 ft or 5.794 m
1: = 1000' or 1: 12, 000	33.33 ft	21.97 ft or 6.695 m	38.02 ft or 11.588 m
1" = 2000' or 1: 24, 000*	40.00 ft	26.36 ft or 8.035m	45.62 ft or 13.906 m

Table 2 Comparison of NMAS/NSSDA Horizontal Accuracy