

LIDAR Digital Terrain Model

Identification Information:

Dataset Identifier:	LIDAR Survey of Barron County, WI
Citation:	
Originator:	Laser Mapping Specialists Inc.
Publication Date:	20060706
Title	LIDAR data of Barron County, Wisconsin
Geospatial Data	
Presentation Form:	ASCII point files, space-delimited, NEZ. Drawings in DXF format, Shape format.

Description:

Abstract: LIDAR data was collected in Barron County, WI. May of 2005, leaf off and no snow, using an Optech ALTM1225, a 25 kHz LIDAR system mounted on board a Cessna 337 twin engine aircraft. A total of 178 flight lines were flown in a north/south direction at approx. 2800' agl on 964' centers with a 50% sidelap, a 38° scan angle and an average air speed of 155 mph. This produced an average LIDAR raw point density of sub 0.8 meter throughout the approx 1033 sq mile survey area. The data was processed to create a digital terrain model of the bald earth ground surface and the first return feature surface. A 15 foot gridded bald earth ground surface was used to rectify digital pictures.

Purpose: Maps and analysis.

Time Period of Content:

Range of Date/Time	
Beginning Date:	20050525
Ending Date:	20050608

Currentness Reference: Ground condition

Status:

Progress:	Complete
Maintenance and Update Frequency:	Unknown

Spatial Domain:

Bounding Coordinates:	
West Bounding Coordinate:	-92.1816600240756
East Bounding Coordinate:	-91.5162651491292
North Bounding Coordinate:	45.6541784937125
South Bounding Coordinate:	45.1930737964231

1 Mile Offset Polygon to County Boundary Bounding Coordinates:

North	East
45.6568101743275	-92.1796526397418
45.6570418883195	-92.1343399118275
45.6571691693144	-92.1137739447565
45.6572953800903	-92.0930816108485
45.6573317584811	-92.0826204412766
45.6572022887849	-92.0517026473516
45.6572793154408	-92.0415293562968

45.6572013291951 -92.0309729452757
45.6570507774812 -92.0109719560678
45.656883379514 -92.0008322126843
45.6566546473777 -91.9702420832186
45.6565961110004 -91.9596742579294
45.6564678424132 -91.9496776462982
45.6563845210413 -91.9289252772103
45.6561970261072 -91.9185816776468
45.6560919947739 -91.9084584815942
45.6560606875423 -91.8884711911189
45.6560594864629 -91.8776148344786
45.6559588703815 -91.8678763122103
45.6559176070972 -91.8473972552599
45.6558724640429 -91.8268270686838
45.6558899512661 -91.8063070052599
45.6558530375347 -91.7645786595673
45.655867688768 -91.7441814236359
45.6558955782307 -91.7236267026439
45.6558942219074 -91.7032111556444
45.6559180832482 -91.682526728942
45.6557697401123 -91.6723857280884
45.6557176822539 -91.6622563491509
45.6556931648335 -91.6530603656841
45.6554711188584 -91.6426543143499
45.655346746287 -91.6329397680989
45.6554476260351 -91.6227773558458
45.6552222225826 -91.580889418749
45.6550737928906 -91.5605705020877
45.6545592322122 -91.5161053710717
45.6234910226575 -91.5155951758464
45.6091699551834 -91.5154661919493
45.5805182166792 -91.5152077159807
45.5661279877013 -91.5150772905736
45.5516053264744 -91.515270248321
45.5370944529922 -91.5153745883455
45.5082904842086 -91.5156906996303
45.5010508861793 -91.5156270223345
45.4793351450243 -91.5160492587976
45.465081458535 -91.5162875269551
45.4509996852474 -91.5163066258151
45.4364148904686 -91.5162864041216
45.4220018190078 -91.5167319885004
45.4077877220993 -91.5168042804083
45.3790337779829 -91.5167265213934
45.3644297393206 -91.5166657642599
45.3501463380634 -91.5166828990277
45.3356161160137 -91.5166141742876
45.321191225615 -91.5167473211172
45.3067072763094 -91.5166356816234
45.2920594934377 -91.5167468269715
45.2783770670146 -91.517009206451
45.2639411232378 -91.5170733306463
45.2495297264267 -91.5171615056215
45.2422755077916 -91.5172078029406
45.2349435773667 -91.5175510947769
45.2206674675062 -91.5177501229094

45.1890527414094 -91.5181902595018
45.1895250635947 -91.5530951463337
45.1897750634225 -91.5631973237374
45.1900464140999 -91.5936475690311
45.1902510091379 -91.6040107211248
45.1905747196472 -91.6245559462183
45.1905724183919 -91.6350065447374
45.1907276542871 -91.6453862606258
45.1907677657894 -91.6658287291664
45.1909376879663 -91.686384318405
45.1909632814291 -91.7069738319057
45.1910858563879 -91.7274364326616
45.1911437036143 -91.7479590030602
45.1911853483945 -91.7580558207135
45.1911508737792 -91.7681923758658
45.1910993998007 -91.7889951572371
45.1913753092536 -91.8092217215067
45.1910527427232 -91.8293689334733
45.1912653728118 -91.8607048642318
45.1912366932865 -91.8708816974365
45.1912969000774 -91.8911697110585
45.1912257244482 -91.9117966168811
45.1914017103626 -91.9322580248453
45.1914030093079 -91.9424024749721
45.1916531483667 -91.9932431165042
45.1917967374447 -92.0132415120737
45.1916371872899 -92.0231939865762
45.1916274398457 -92.0338190681216
45.191777086335 -92.0542995835031
45.1919576364719 -92.0745816935372
45.192087017168 -92.0948652379717
45.1924204396927 -92.1811870471481
45.2241013252364 -92.180503169286
45.2383572733482 -92.1804768838086
45.2527052714593 -92.180599954426
45.2671115697016 -92.1807731284984
45.2816079670998 -92.1809622412158
45.3092489844263 -92.181098029606
45.3236935422377 -92.1812154220819
45.3381202042423 -92.1811405149182
45.3526026390692 -92.1811899655069
45.3672704257972 -92.1808853833643
45.3742245501444 -92.1807214773017
45.3810852190079 -92.18077983497
45.3883466478025 -92.1805909330191
45.4094490925015 -92.1804767467552
45.423728760275 -92.1806429951119
45.4529579311509 -92.1805596455801
45.4674506610505 -92.1805406079383
45.4895631371787 -92.1803849840492
45.4967801427469 -92.180186821797
45.5110036453744 -92.1798482010738
45.5253299873775 -92.1797115342704
45.538948485351 -92.1794818336056
45.5461410016068 -92.1795828891861
45.5535657621932 -92.1795362792931

45.5679700108659 -92.179390415816
 45.6568101743275 -92.179652639741

Processing Level:

Processing Level Identifier: Level 4
 Processing Level Authority: ISPRS

Keywords:

Theme:

Theme Keyword Thesaurus: None
 Theme Keyword: LIDAR
 Theme Keyword: First return
 Theme Keyword: Last return
 Theme Keyword: digital terrain model
 Theme Keyword: Airborne laser mapping
 Theme Keyword: Remote sensing

Place:

Place Keyword Thesaurus: None
 Place Keyword: United States
 Place Keyword: Wisconsin
 Place Keyword: Barron
 Place Keyword: County

Stratum:

Stratum Keyword Thesaurus: Vertical land surface
 Stratum Keyword: Last Return Bare Earth
 Stratum Keyword: First Return Vegetation

Temporal:

Temporal Keyword Thesaurus: None
 Temporal Keyword: 21st Century
 Temporal Keyword: 2005

Platform and Instrument Identification:

Platform Full Name: Twin Engine Cessna 337
 Platform Serial Identifier: N111AT
 Instrument Full Name: Optech ALTM1225
 Instrument Short Name: 25kHz LIDAR Airborne Laser Mapping System

Band Identification:

Thematic Layer Identification:

Number of Thematic Layers: 5
 Layer Name: INDEX
 Layer Name Theme: INDEX CONTOURS
 Layer Name: INDEX_DEP
 Layer Name Theme: INDEX DEPRESSION CONTOURS
 Layer Name: INDEX_TEXT
 Layer Name Theme: INDEX CONTOURS TEXT
 Layer Name: INTERMEDIATE
 Layer Name Theme: INTERMEDIATE CONTOURS
 Layer Name: INTERMEDIATE_DEP
 Layer Name Theme: INTERMEDIATE DEPRESSION CONTOURS

Access Constraints:

All data rights belong to County of Barron, WI.

Use Constraints:

As determined by County of Barron, WI

Point of Contact:

Contact Person Primary:

Contact Person:

Mark Netterlund

Contact Organization:

County of Barron, WI

Contact Address:

Address Type:

Mailing Address

Address:

330 E. LaSalle Ave.

City:

Barron

State or Province:

Wisconsin

Postal Code:

54812

Country:

USA

Contact Voice Telephone:

(715) 537-6824

Contact Facsimile Telephone:

(715) 537-6820

Contact Email Address:

mark.netterlund@co.barron.wi.us

Hours of Service:

Browse Graphic:

Browse Graphic File Name:

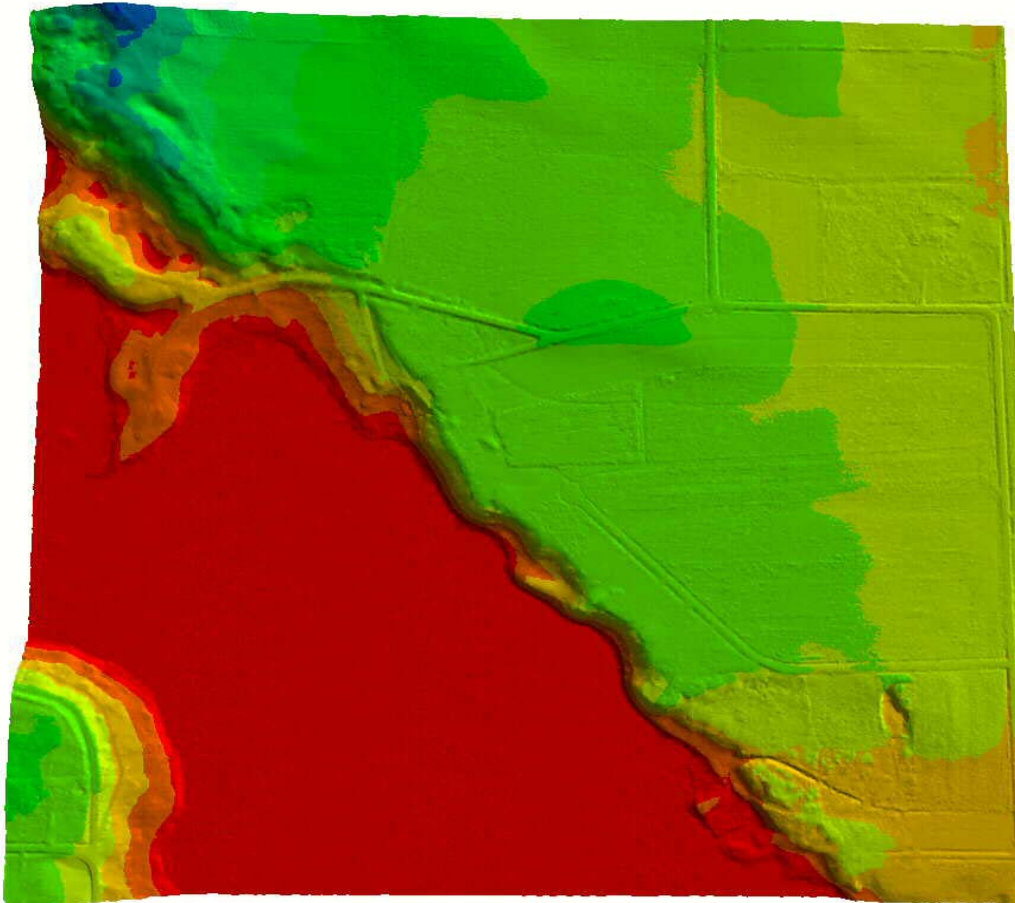
Barronwi.jpg

Browse Graphic File Desc:

Shaded relief map of LIDAR bald earth data around
County of Barron WI

Browse Graphic File Type:

jpg



Data Set Credit:

Native Data Set Environment:

Barron County, WI., Laser Mapping Specialists, Inc.

Point data in ASCII text file, space delimited, NEZ, breakline files in DXF format, contours in Shape format.

Data Quality Information:

Attribute Accuracy:

Attribute Accuracy Report:

A combination of GPS ground survey points, airborne GPS and inertial measurement unit technology were applied to position x y z i raw elevation measurements over the approx. 1033 sq mile project area using an Optech ALTM1225 LIDAR system. Raw elevation measurements have been determined to be vertically accurate to within 9 cm.

Logical Consistency Report:

The completed LIDAR x y z i points are imported into Terra Model cad software by flight line, and all lines that flew over a Ground Control Point are noted in a spreadsheet with the control point value and difference.

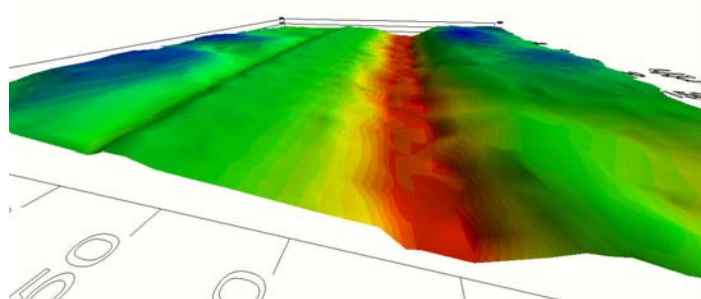
Completeness Report:

The ALTM1225 LIDAR system flew the project at 2800' agl using a 38° scan angle, with flight lines spaced on 964' centers using a 50% sidelap to create an average point spacing of 0.8 meter and had a vertical accuracy of sub 10cm. All LIDAR elevation measurements within the polygon coordinates of this shapefile were used to derive this dataset. They were then imported into the project area polygon and checked and verified to be free of data voids or gaps, except in the bald earth surface model where voids or gaps were created by vegetation, buildings, water or other removed features.

Positional Accuracy:

Horizontal Positional Accuracy:

Horizontal Positional Accuracy Report:



The LIDAR data was collected and processed by experienced LIDAR mapping specialists. The collection, processing and mapping was all performed under the direct supervision of professional land surveyors. Proprietary data analysis and adjustment methods were utilized to form a seamless edge matched LIDAR DTM model of both the first and last return surface models that was then tied into ground control points. The horizontal accuracy was analyzed by comparing data from opposing LIDAR flight lines having a 50% sidelap in flight coverage. This gave feature definition on each flight line from each direction. This produces millions of check points from each line as compared to the adjoining line. The overlapped data was compared for alignment of features and checked for the clarity and consistency of said features. The horizontal accuracy was determined to be less than 1 foot horizontal accuracy and can be clearly seen on the image to the left.

Vertical Positional Accuracy:
Vertical Positional Accuracy Report:

The LIDAR data was collected and processed by experienced LIDAR mapping specialists. The collection, processing and mapping was all performed under the direct supervision of professional land surveyors. Proprietary data analysis and adjustment methods were utilized to form a seamless edge matched LIDAR DTM model of both the first and last return surface models that was then tied into ground control points. Control sources: The LIDAR elevation data was tied into a geodetic network of (40) ground surveyed points distributed throughout the project area that were established to provide control for the LIDAR data. The vertical accuracy was determined by comparing the LIDAR bald earth DTM points to the established ground control points using an interpolation method between the LIDAR DTM points. This method established the RMS error between the LIDAR DTM and the ground control network to be 9cm. Additionally, to comply with FEMA specifications, ground truth cross sections were taken throughout the county through vegetation and canopy and compared to the LIDAR dtm that determined the data to be within 10cm RMSE as compared to 158 ground surveyed points.

Lineage:

Source Information:

Source Citation:

Citation Information:

Originator:

Publication Date:

Title:

Geospatial Data Presentation Form

Publication Information:

Publication Place:

Publisher:

Laser Mapping Specialists Inc.

20060706

LIDAR Survey of Barron County, WI.

Vector Digital Data

Raymond, MS

LMSI

Type of Source Media:

Point elevation measurements collected by the LIDAR system.

Source Time Period of Content:

Time Period Information:

Range Date:

Beginning Date

Ending Date

20050525

20050608

Source Currentness

Reference:

Ground condition

Source Citation Abbreviation:

LMSI

Source Contribution:

Data collection and processing of LIDAR data of Barron County, Wisconsin

Process Step:

Process Description:

Raw elevation measurements collected by Optech's ALTM1225 were processed to x y z i point files and converted to Barron County U.S. Survey Feet, x y z i coordinates. Files were saved as ASCII space delimited text files.

Source Used Citation Abbreviation:

Process Date:

Process Description:

20050525

Raw LIDAR range, GPS and IMU data was imported into Applanix Posproc software and Optech's REALM software and processed to final x y z i point files. First return points and last return points were output. Removal of vegetation and other above ground features was completed in Terra-scan software. The x y z i ASCII point files were converted to Barron County coordinates, then imported into Spectra's Terramodel software. The LIDAR x y z i data was compared to ground control points and adjustments were made to the LIDAR flight lines to match the ground control points. The flight lines were then tied to each other and seamlessly edge matched. Any remaining noise was removed from the LIDAR x y z i bald earth point files to create a final surface model of irregularly spaced points.

20050525

Process Time:

Process Contact:

Contact Information:

Contact Person Primary:

Contact Person:

Contact Organization:

Contact Position:

Contact Address:

Address Type:

Address:

City:

State or Province:

Postal Code:

Country:

Contact Voice Telephone:

Contact Facsimile Telephone:

Contact Electronic Mail Address:

Hours of Service:

Mary Robison, PLS
Laser Mapping Specialists, Inc
President

Mailing
P.O. Box 7
Raymond
MS
39154
USA
(601) 857-0796
(601) 857-4181
maryr@lasermaps.com
M-F, 8:00-5:00

Spatial Data Organization Information:

Indirect Spatial Reference:

Barron County

Direct Spatial Reference Method:

Vector

Point and Vector Object Information:

Point

Spatial Reference Information:

Horizontal Coordinate System Definition:

Planar:

Map Projection

Map Projection Name:	Transverse Mercator
Map Projection Parameters:	
Geoid Separation:	-29.83 meters
Longitude of Central Meridian:	-91 51 0.0000
Latitude of Projection Origin:	45 08 0.0000
False Easting:	93150.00000 meters
False Northing:	0.00000
Scale Factor at Central Meridian	0.9999960000
Grid Coordinate System:	
Grid Coordinate	

System Name:

Wisconsin CCS

State Plane Coordinate System:

SPCS Zone Identifier:

9503

Planar Coordinate Information:

Planar Coordinate Encoding

Method:

Coordinate pair

Planar Distance Units:

Feet

Geodetic Model:

Horizontal Datum Name:

NAD83 (97)

Ellipsoid Name:

GRS80

Geoid Model:

Geoid03

Semi-major Axis:

6378137

Denominator of Flattening Ratio:

298.257

Vertical Coordinate System Definition:

Altitude System Definition:

Altitude Datum Name:

NAVD88

Altitude Resolution:

Altitude Distance Units:

Feet

Altitude Encoding Method:

Orthometric

Geo-referencing Description:

Ground Control Point Information:

Ground Control Point Organization:

National Spatial reference System (NSRS)

Ground Control Point Description:

Points set in locations distributed across project to control and validate the LIDAR dtm.

Control Point Type:

Static GPS

Control Point Origin:

Laser Mapping Specialists, Inc

Control Point Use Flag:

Control Point Horizontal X Accuracy:

<sub 5cm RMS

Control Point Horizontal Y Accuracy:

<sub 5cm RMS

Control Point Vertical Accuracy:

<sub 5cm RMS

Ground Control Point Position:

Control Point Identification:

Control Point ID:

Control Point Earth Location:

Control Point x Value:

Control Point y Value:

Control Point z Value:

ID	X	Y	Z
7	243472.058	184890.173	1429.019
343	253786.456	166086.062	1312.504
351	295655.107	166118.207	1314.715

490	303627.298	158297.256	1373.742
497	321945.338	158197.86	1229.323
505	343108.447	158172.313	1201.027
899	274622.934	134718.076	1230.336
977	374593.985	131695.891	1491.501
1113	248261.077	121651.601	1248.069
1511	327142.832	100357.072	1098.453
1536	237577.86	98264.821	1204.578
2092	258412.806	66891.456	1237.935
2152	318925.859	63653.383	1192.028
2176	382486.026	63345.369	1070.124
2653	305689.637	35314.138	1103.272
A	282511.908	159469.514	1246.186
BB	379937.436	28274.442	1117.135
D	350965.258	184272.164	1216.442
DD	361313.218	63113.66	1057.719
E	364221.397	147559.357	1175.055
GG	286565.273	58688.003	1215.817
H	277852.994	100639.083	1168.069
HH	270079.809	27558.646	1019.721
I	312665.011	97625.225	1102.71
J	355929.854	100214.408	1083.073
K	384923.808	100229.2	1257.723
KK	269050.949	100769.836	1148.138
L	230474.198	38445.428	1160.541
LL	299494.237	105760.376	1130.583
M	246384.96	38345.532	1209.689
N	296217.278	35208.975	1067.212
NN	306341.013	126612.196	1236.042
OO	340310.207	118756.265	1155.09
P	338018.877	45507.298	1036.625
Q	371791.226	37539.124	1105.672
R	380861.518	188883.4	1273.533
S	262725.933	155065.975	1267.058
T	230322.76	171539.481	1334.34
Y	369567.238	166019.108	1199.958
Z	366475.881	100314.096	1252.943

FEMA Ground Truthing Cross Section Surveys:
Ground Truthing Point Organization:
FEMA Ground Truthing Cross Section Description:

Ground Truth Point Type:
Ground Truth Point Origin:
Ground Truth Point Use Flag:
Ground Truth Point Horizontal X Accuracy as
Compared to LIDAR DTM:
Ground Truth Point Horizontal Y Accuracy as
Compared to LIDAR DTM::
Ground Truth Point Vertical Accuracy as
Compared to LIDAR DTM:

National Spatial reference System (NSRS)
Survey cross sections were taken throughout the project area through the different vegetation classifications in the county. This included forested, fully covered canopy, high grass, short grass, crops and urban. The purpose of the cross sections were to validate the data accuracy through vegetation and canopy as described in the FEMA Appendix A specifications.
Fast static, RTK GPS and conventional survey
Barron County, WI

Sub 1 foot RMSE

Sub 1 foot RMSE

<10cm RMSE

Ground Truth Point Authority:

Contact Information:

Other Geo-referencing Description:

Mark Netterlund Barron County, Wisconsin

Barron County Coordinates US Survey Feet,
Orthometric Height, Geoid03

Entity and Attribute Information:

Detailed Description:

Entity Type:

Entity Type Label:

Entity Type Definition:

Entity Type Definition Source:

Tile Index

Tile layout for LIDAR DTM point data

None

Attribute:

Attribute Label:

Attribute Definition:

Attribute Domain Values:

Range Domain:

Range Domain Minimum:

Range Domain Maximum:

Citation Information:

Tile name

022_220

186_388

Each polygon is labeled consistent with the N,E
Wisconsin CCS position of the southwest corner of each
individual polygon.

Entity Type:

Entity Type Label:

Entity Type Definition:

Entity Type Definition Source:

Attribute:

Attribute Label:

Attribute Definition:

Attribute Domain Values:

Range Domain:

Range Domain Minimum:

Range Domain Maximum:

LIDAR bald earth dtm points and first return dtm points

ASCII text file in N E Z format (bald earth) and N E Z I
format (first return)

None

x y z

Citation Information:

985.57' bare earth

1658.74' bare earth

Each LIDAR point contains x y z values.

Distribution Information:

Distributor:

Contact Information:

Contact Person Primary:

Contact Person:

Contact Organization:

Contact Address:

Address Type:

Address:

City:

State or Province:

Postal Code:

Country:

Contact Voice Telephone:

Contact Facsimile Telephone:

Contact Email Address:

Hours of Service:

Mark Netterlund

Barron County, WI

Mailing Address

330 E. LaSalle Ave.

Barron

Wisconsin

54812

USA

(715) 537-6824

(715) 537-6820

mark.netterlund@co.barron.wi.us

Resource Description:

Distribution Liability:

Users must assume responsibility to determine the usability of this data.

Standard Order Process:

Digital Form:

Digital Transfer Information:

Format Name:

Format Version Number:

Format Version Date:

Format Specification:

Format Information Content:

Transfer Size:

Metadata Reference Information:

Metadata Date:

20060706

Metadata Review Date:

20060706

Metadata Contact:

Contact Information:

Contact Person Primary:

Contact Person:

Contact Organization:

Contact Position:

Contact Address:

Address Type:

Address:

City:

State or Province:

Postal Code:

Country:

Contact Voice Telephone:

Contact Facsimile Telephone:

Contact Electronic Mail Address:

Hours of Service:

Mary Robison, PLS
Laser Mapping Specialists, Inc
President

Mailing
P.O. Box 7
Raymond
MS
39154
USA
(601) 857-0796
(601) 857-4181
maryr@lasermaps.com
M-F, 8:00-5:00

Metadata Standard Name:

FGDC CSDGM

Metadata Standard Version:

FGDC-STD-001-1998

Metadata Time Convention:

Metadata Access Constraints:

Access to this Metadata File is limited to entities checking for compliance to specifications.

Metadata Use Constraints:

Metadata Extensions: