# LIDAR 2003 First and Last Returns

Metadata also available as - [[Parseable text](file:///D:\LiDAR\LIDAR2003FirstandLastReturns.txt)]

## Metadata:

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* [Distribution\_Information](#6)
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Identification\_Information:

Citation:

Citation\_Information:

Originator: Spatial Systems Associates, Inc.

Publication\_Date: 20031130

Title: LIDAR 2003 First and Last Returns

Geospatial\_Data\_Presentation\_Form: model

Series\_Information:

Series\_Name: Maryland LIDAR

Issue\_Identification: 2003

Publication\_Information:

Publication\_Place: Annapolis, Maryland

Publisher: Maryland Department of Natural Resources

Other\_Citation\_Details:

1. 3Di, Inc. (flight firm) 2. Airborne 1 (flight firm) 3. Computational Consulting Services, LLC (processing firm) 4. Spatial Systems Associates, Inc. (post-processing firm) 5. Dewberry & Davis (QA/QC firm)

Online\_Linkage: <<http://dnrweb.dnr.state.md.us/gis/data/lidar>>

Description:

Abstract:

Light Detection and Ranging (LIDAR) is a method of locating objects on the ground using aerial-borne equipment. It is similar to RADAR or SONAR in that the two-way travel time of an energy beam reflected off an object is precisely measured, but this technology uses laser light instead of radio or sound waves. This technology has proven very useful in remote sensing of the earth. It can be used for determining elevations of both the earth's surface and items (natural and man-made) on the surface. Analysis of LIDAR data is used in detailed modeling of the earth's surface for drainage and floodplain studies, determining how a new structure will affect views from various locations, shoreline erosion studies, and other reasons. "First returns" are the first elevation value that the LiDAR sensor recorded for a given x,y coordinate. Likewise, "last returns" are the last elevation value that the LiDAR sensor recorded for a given x,y coordinate.

Purpose:

The LIDAR-derived data were collected by the Maryland Department of Natural Resources in support of shore erosion studies along the shorelines of the Chesapeake Bay. It also supports the Federal Emergency Management Agency's specifications for mapping floodplains. These efforts required detailed elevation data and models, such as those available from LIDAR sensing. The data have also been made available to aid in other projects that require detailed surface, vegetation and/or structure elevations.

Supplemental\_Information:

These data are part of a suite of spatial data products generated using the LIDAR technology. First and Last returns are generated. From these data, Bare-Earth Mass Points that represent the earth's surface are produced. A gridded Digital Elevation Model (DEM) is produced from the Bare Earth Mass Points. Imagery is also created that represents the intensity of the LIDAR return; it is a 1-meter resolution product that resembles a panchromatic Digital Orthophoto Quad (DOQ).

Time\_Period\_of\_Content:

Time\_Period\_Information:

Range\_of\_Dates/Times:

Beginning\_Date: 20030301

Beginning\_Time: Unknown

Ending\_Date: 20030731

Ending\_Time: Unknown

Currentness\_Reference: ground condition

Status:

Progress: Complete

Maintenance\_and\_Update\_Frequency: None planned

Spatial\_Domain:

Bounding\_Coordinates:

West\_Bounding\_Coordinate: -76.472538

East\_Bounding\_Coordinate: -75.297853

North\_Bounding\_Coordinate: 39.124828

South\_Bounding\_Coordinate: 37.881527

Keywords:

Theme:

Theme\_Keyword\_Thesaurus: MMRG

Theme\_Keyword: elevation

Theme:

Theme\_Keyword\_Thesaurus: DNR General

Theme\_Keyword: bald earth

Theme\_Keyword: bare earth

Theme\_Keyword: DEM

Theme\_Keyword: Digital Elevation Model

Theme\_Keyword: first return

Theme\_Keyword: gridded DEM

Theme\_Keyword: last return

Theme\_Keyword: LIDAR

Theme\_Keyword: elevation and derived products

Theme\_Keyword: elevation model

Theme\_Keyword: surface model

Theme\_Keyword: terrain model

Theme\_Keyword: DNR

Place:

Place\_Keyword\_Thesaurus: Maryland

Place\_Keyword: Maryland

Place\_Keyword: USA

Access\_Constraints:

Unless accessed from the Internet, these data are distributed on DVD-ROM discs (specifically, DVD-R format for recorded DVD-ROMs). As such, access to a DVD-ROM drive capable of reading such discs is required.

Use\_Constraints:

The Department of Natural Resources makes no warranty, expressed or implied, as to the use or appropriateness of Spatial Data, and there are no warranties of merchantability or fitness for a particular purpose or use. The information contained in Spatial Data is from publicly available sources, but no representation is made as to the accuracy or completeness of Spatial Data. The Department of Natural Resources shall not be subject to liability for human error, error due to software conversion, defect, or failure of machines, or any material used in the connection with the machines, including tapes, disks, CD-ROMs, or DVD-ROMs and energy. The Department of Natural Resources shall not be liable for any lost profits, consequential damages, or claims against the Department of Natural Resources by third parties. The liability of the Department of Natural Resources for damage regardless of the form of the action shall not exceed any distribution fees that may have been paid in obtaining Spatial Data.

Point\_of\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

Address:

Tawes State Office Building 580 Taylor Avenue, E-2

City: Annapolis

State\_or\_Province: Maryland

Postal\_Code: 21401-2397

Country: United States

Contact\_Voice\_Telephone: 410-260-8753

Contact\_TDD/TTY\_Telephone: 410-260-8835

Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Data\_Set\_Credit:

Spatial Systems Associates, Inc. was the prime contractor for this project. It partnered with 3Di Corporation, Airborne 1 Corporation, Computational Consulting Services, Inc., NXL Construction Services, Inc and Dewberry LLC.

Native\_Data\_Set\_Environment:

A variety of specialized hardware and software platforms were used to collect, process and quality assess these data. Typically, Intel machines running Microsoft Windows 2000 Version 5.0 (Build 2195) Services Pack 4.

Cross\_Reference:

Citation\_Information:

Originator: Spatial Systems Associates, Inc.

Publication\_Date: 20031130

Title: LIDAR 2003 Bare Earth Mass Points

Geospatial\_Data\_Presentation\_Form: model

Series\_Information:

Series\_Name: Maryland LIDAR

Issue\_Identification: 2003

Publication\_Information:

Publication\_Place: Annapolis, Maryland

Publisher: Maryland Department of Natural Resources

Other\_Citation\_Details:

1. Airborne 1 (flight firm) 2. Computational Consulting Services, LLC (processing firm) 3. Spatial Systems Associates, Inc. (post-processing firm) 4. Dewberry & Davis (QA/QC firm)

Online\_Linkage: [<http://dnrweb.dnr.state.md.us/gis/data/lidar>](http://dnrweb.dnr.state.md.us/gis/data/lidar)

Cross\_Reference:

Citation\_Information:

Originator: Spatial Systems Associates, Inc.

Publication\_Date: 20031130

Title: LIDAR 2003 Intensity Imagery

Geospatial\_Data\_Presentation\_Form: remote-sensing image

Series\_Information:

Series\_Name: Maryland LIDAR

Issue\_Identification: 2003

Publication\_Information:

Publication\_Place: Annapolis, Maryland

Publisher: Maryland Department of Natural Resources

Other\_Citation\_Details:

1. Airborne 1 (flight firm) 2. Computational Consulting Services, LLC (processing firm) 3. Spatial Systems Associates, Inc. (post-processing firm) 4. Dewberry & Davis (QA/QC firm)

Online\_Linkage: [<http://dnrweb.dnr.state.md.us/gis/data/lidar>](http://dnrweb.dnr.state.md.us/gis/data/lidar)

Cross\_Reference:

Citation\_Information:

Originator: Spatial Systems Associates, Inc.

Publication\_Date: 20031130

Title: LIDAR 2002 First Last Returns

Geospatial\_Data\_Presentation\_Form: model

Series\_Information:

Series\_Name: Maryland LIDAR

Issue\_Identification: 2002

Publication\_Information:

Publication\_Place: Annapolis, Maryland

Publisher: Maryland Department of Natural Resources

Other\_Citation\_Details:

1. 3Di, Inc. (flight firm) 2. Airborne 1 (flight firm) 2. Computational Consulting Services, LLC (processing firm) 3. Spatial Systems Associates, Inc. (post-processing firm) 4. Dewberry & Davis (QA/QC firm)

Online\_Linkage: [<http://dnrweb.dnr.state.md.us/gis/data/lidar>](http://dnrweb.dnr.state.md.us/gis/data/lidar)

Cross\_Reference:

Citation\_Information:

Originator: Spatial Systems Associates, Inc.

Publication\_Date: 20031130

Title: LIDAR 2003 Gridded DEM

Geospatial\_Data\_Presentation\_Form: model

Series\_Information:

Series\_Name: Maryland LIDAR

Issue\_Identification: 2003

Publication\_Information:

Publication\_Place: Annapolis, Maryland

Publisher: Maryland Department of Natural Resources

Other\_Citation\_Details:

1. 3Di, Inc. (flight firm) 2. Airborne 1 (flight firm) 3. Computational Consulting Services, LLC (processing firm) 4. Spatial Systems Associates, Inc. (post-processing firm) 5. Dewberry & Davis (QA/QC firm)

Online\_Linkage: <<http://dnrweb.dnr.state.md.us/gis/data/lidar>>

Data\_Quality\_Information:

Attribute\_Accuracy:

Attribute\_Accuracy\_Report:

There are four (4) attributes in the First Returns and Last Returns files, representing the horizontal coordinates (easting & northing), vertical elevation observed and intensity. Random inspections were made to assure that each line in the files contained four values.

Logical\_Consistency\_Report:

Computational Consulting Services, the LIDAR processing vendor, used proprietary algorithms to remove features and artifacts in the First and Last Return data that did not reflect true ground elevation. Subsequent quality assurance testing by Dewberry determined that the data met FEMA and MD DNR specifications for both vertical accuracy and other consistencies (see QA report at <<http://dnrweb.dnr.state.md.us/gis/data/lidar>>).

Completeness\_Report:

Spatial Systems Associates performed various inspections of the data to ensure: that each file contained the points located within that tile; that tiles were completely filled; that the point density per tile was within expected ranges; and that the tiles were correctly named.

Positional\_Accuracy:

Horizontal\_Positional\_Accuracy:

Horizontal\_Positional\_Accuracy\_Report:

The horizontal coordinate values were designed to meet NSSDA accuracy for data at 1:2400 scale.

Vertical\_Positional\_Accuracy:

Vertical\_Positional\_Accuracy\_Report:

The RMSE value of 14.3 cm at the 95% confidence level was determined by an independent accuracy assessment conducted by Dewberry LLC according to the contract specifications. These specifications followed FEMA Appendix A guidelines regarding assessing vertical accuracy. For data accurate to within 18.5 cm RMSE, the guidelines recommended a minimum of 20 independent check points be located in each of 5 different land cover categories: Grass/Ground, High Grass/Crops, Brush/Low Trees, Forest, and Urban/Pavement. A total of 125 points were used for the assessments. These points were surveyed by a licensed land surveyor and provided a positional location and elevation with an accuracy that exceeded the predicted accuracy of the LIDAR data. The entire accuracy reports can be found at <<http://dnrweb.dnr.state.md.us/gis/data/lidar>>.

Quantitative\_Vertical\_Positional\_Accuracy\_Assessment:

Vertical\_Positional\_Accuracy\_Value: 14.3

Vertical\_Positional\_Accuracy\_Explanation:

The RMSE value is 14.3 cm. See the Vertical Positional Accuracy Report section for more information.

Lineage:

Process\_Step:

Process\_Description:

LIDAR Data Acquisition. Airborne 1 flew the project area with the LIDAR sensor. A portion of the 2003 project area included data acquisition of portions of the LIDAR 2002 project area that had incomplete coverage. Where overlaps between the two series of data occurred, the newer data was used. No attempt at blending the two datasets was made to maintain the highest data integrity. In an effort to permit correlation of the point values with tidal gauge stations, the Airborne 1 was required to fly tidal shoreline areas during the low tide cycle (slack water  low tide  slack water) as predicted by local tide stations. The LIDAR sensor collected raw data that was referenced in UTM. The specifications called for data collection during leaf-off conditions, which generally run through early to mid April. However, due to late winter snow cover, windy flight conditions and other technical obstacles, data acquisitions continued into early June 2003. In addition, a small area in the north end of the project area was acquired in July. Anticipating the trouble with leaf density, Airborne 1 modified the flight parameters to increase the laser light penetration to the ground. The flight plan on this project included the following specifications to meet the project requirements: \*Single pass density - 1.696 square meters per sample; \*Average area sampling density -1.272 square meters per sample; \*Swath width - 996.76 meters; \*Flight altitude -1371 meters (4500 ft); \*Flight line spacing - 498.38 meters w/50% overlap; \*Scan frequency - 21 Hz; \*Firing rate - 25 kHz; \*Scan angle - 20 degrees; \*Ground speed - 140 knots. When complete, the raw data was delivered to Spatial Systems.

Process\_Date: 20040120

Process\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

Address:

Tawes State Office Building 580 Taylor Avenue, E-2

City: Annapolis

State\_or\_Province: Maryland

Postal\_Code: 21401-2397

Country: United States

Contact\_Voice\_Telephone: 410-260-8753

Contact\_TDD/TTY\_Telephone: 410-260-8835

Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Process\_Step:

Process\_Description:

LIDAR Data Processing. Computational Consulting Systems. The First and Last Return data was delivered to CCS in large blocks of data. CCS processed the data using both the First and Last Returns, removed artifacts using automated and manual techniques, reprojected the data into the client-specified X,Y,Z text files using the 1200 meter x 1800 meter tiles, NAD 83 meters, NAVD 88 meters. CCS also generated the Intensity Imagery using the client-specified USGS 3.75' tiling scheme. The data products were delivered to SSA for quality assurance testing, formatting and final delivery.

Process\_Date: 20040120

Process\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

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Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Process\_Step:

Process\_Description:

LIDAR Data Post Processing. Spatial Systems Associates. SSA digitized the shoreline from the Intensity Imagery for the purposes of delineating a shoreline. Any LIDAR points that fell seaward of this shoreline were assigned the value of zero (0). In addition to the shoreline, SSA delineated upland ponds using the same technique and assigned all LIDAR points that fell within the water area the value of the lowest observed point close to the shore. The observed elevation values were not lost  a fourth field in the data file was added for the assigned value. SSA also performed a variety of QA procedures to determine if the point density was within expected ranges; that each tile was completely filled; that all tiles were accounted for, and that the tiles were named in accordance with client specifications.

Process\_Date: 20041020

Process\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

Address:

Tawes State Office Building 580 Taylor Avenue, E-2

City: Annapolis

State\_or\_Province: Maryland

Postal\_Code: 21401-2397

Country: United States

Contact\_Voice\_Telephone: 410-260-8753

Contact\_TDD/TTY\_Telephone: 410-260-8835

Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Process\_Step:

Process\_Description:

LIDAR Data Check Point Surveys. NXL Construction Services. NXL was contracted to acquire the check-points in the 5 different land cover classes. SSA provided NXL with maps of each area where a check-point was to be located. The points were scattered throughout the project area. NXL was permitted the latitude to select the exact location based on field conditions, provided the points were generally within a 1 mile radius of the chosen location and that the land cover class was the same as the one specified. The land cover classes were: Grass/Ground, High Grass/Crops, Brush/Low Trees, Forest, and Urban/Pavement.

Process\_Date: 20040120

Process\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

Address:

Tawes State Office Building 580 Taylor Avenue, E-2

City: Annapolis

State\_or\_Province: Maryland

Postal\_Code: 21401-2397

Country: United States

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Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Process\_Step:

Process\_Description:

LIDAR Data Quailty Assurance. Dewberry LLC was provided with the check-point and LIDAR Bare Earth Mass Points data to perform their independent quality assurance work. They performed detailed analyses to determine if the vertical accuracy with within specifications and examined the data for flight, data collection and processing inconsistencies. Neither the flight vendor (Airborne 1) nor the processing vendor (CCS) was given access to the check-point data. The entire accuracy report can be found at <<http://dnrweb.dnr.state.md.us/gis/data/lidar>>.

Process\_Date: 20040120

Process\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

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Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Cloud\_Cover: 0

Spatial\_Data\_Organization\_Information:

Direct\_Spatial\_Reference\_Method: Point

Point\_and\_Vector\_Object\_Information:

SDTS\_Terms\_Description:

SDTS\_Point\_and\_Vector\_Object\_Type: Point

Spatial\_Reference\_Information:

Horizontal\_Coordinate\_System\_Definition:

Planar:

Grid\_Coordinate\_System:

Grid\_Coordinate\_System\_Name: State Plane Coordinate System 1983

State\_Plane\_Coordinate\_System:

SPCS\_Zone\_Identifier: 1900

Lambert\_Conformal\_Conic:

Standard\_Parallel: 38.3

Longitude\_of\_Central\_Meridian: -77

Latitude\_of\_Projection\_Origin: 37.666667

False\_Easting: 400000

False\_Northing: 0

Planar\_Coordinate\_Information:

Planar\_Coordinate\_Encoding\_Method: Coordinate Pair

Coordinate\_Representation:

Abscissa\_Resolution: 0.000256

Ordinate\_Resolution: 0.000256

Planar\_Distance\_Units: meters

Geodetic\_Model:

Horizontal\_Datum\_Name: North American Datum of 1983

Ellipsoid\_Name: Geodetic Reference System 80

Semi-major\_Axis: 6378137

Denominator\_of\_Flattening\_Ratio: 298.257

Vertical\_Coordinate\_System\_Definition:

Altitude\_System\_Definition:

Altitude\_Datum\_Name: North American Vertical Datum of 1988

Altitude\_Resolution: 0.001

Altitude\_Distance\_Units: meters

Altitude\_Encoding\_Method:

Explicit elevation coordinate included with horizontal coordinates

Entity\_and\_Attribute\_Information:

Detailed\_Description:

Entity\_Type:

Entity\_Type\_Label: Point

Entity\_Type\_Definition: Point feature derived from LIDAR shot.

Entity\_Type\_Definition\_Source: Spatial Systems Associates, Inc.

Attribute:

Attribute\_Label: intensity

Attribute\_Definition: The measure of reflectance of the LIDAR shot.

Attribute\_Definition\_Source: Spatial Systems Associates, Inc.

Attribute\_Domain\_Values:

Unrepresentable\_Domain: Domain range values can not be established at this time.

Attribute:

Attribute\_Label: xcoord

Attribute\_Definition:

First field of a line of data. The point location at x (east) coordinate.

Attribute\_Definition\_Source: Spatial Systems Associates, Inc.

Attribute\_Domain\_Values:

Range\_Domain:

Range\_Domain\_Minimum: 0

Range\_Domain\_Maximum: 600000

Attribute\_Units\_of\_Measure: meters

Attribute\_Measurement\_Resolution: 0.01

Attribute:

Attribute\_Label: ycoord

Attribute\_Definition:

Second field of a line of data. The point location at y (north) coordinate.

Attribute\_Definition\_Source: Spatial Systems Associates, Inc.

Attribute\_Domain\_Values:

Range\_Domain:

Range\_Domain\_Minimum: 0

Range\_Domain\_Maximum: 250000

Attribute\_Units\_of\_Measure: meters

Attribute\_Measurement\_Resolution: 0.01

Attribute:

Attribute\_Label: zvalue

Attribute\_Definition: Third field of a line of data. The point elevation in meters.

Attribute\_Definition\_Source: Spatial Systems Associates, Inc.

Attribute\_Domain\_Values:

Range\_Domain:

Range\_Domain\_Minimum: -99

Range\_Domain\_Maximum: 999999

Attribute\_Units\_of\_Measure: meters

Attribute\_Measurement\_Resolution: 0.01

Overview\_Description:

Entity\_and\_Attribute\_Overview:

The following parameters apply only to these fields: (1) xcoord, (2) ycoord, (3) zvalue and (4) intensity. 1. Field Width = 8 characters, 2. F = Floating Point and 3. 3 = 3 decimal places.

Entity\_and\_Attribute\_Detail\_Citation: None

Distribution\_Information:

Distributor:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

Address:

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Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Resource\_Description: Offline Data

Distribution\_Liability: None

Standard\_Order\_Process:

Digital\_Form:

Digital\_Transfer\_Information:

Format\_Name: ASCII text files

Format\_Version\_Date: 20021031

Digital\_Transfer\_Option:

Offline\_Option:

Offline\_Media: DVD-ROM

Recording\_Capacity:

Recording\_Density: 4.7 Gigabytes

Recording\_Density\_Units: Gigabytes

Recording\_Format: DVD-R discs

Compatibility\_Information: DVD-ROM drives capable of reading DVD-R

Digital\_Form:

Digital\_Transfer\_Information:

Format\_Name: ASCII text files

Format\_Version\_Date: 20021031

Digital\_Transfer\_Option:

Offline\_Option:

Offline\_Media: external hard drive

Recording\_Capacity:

Recording\_Density: 250 Gigabytes

Recording\_Density\_Units: Gigabytes

Recording\_Format:

Hard disk that requires USB2.0 or FireWire (IEEE 1394) connections.

Compatibility\_Information:

A computer with FireWire or USB connections and compatible operating system is required.

Fees: Please refer to [<http://www.msgic.state.md.us/techtool>](http://www.msgic.state.md.us/techtool)

Ordering\_Instructions: Please refer to [<http://www.msgic.state.md.us/techtool>](http://www.msgic.state.md.us/techtool)

Turnaround: 1-3 business days after receiving payment.

Technical\_Prerequisites:

(1) Knowledge of Light Detection And Ranging (LIDAR) imagery is recommended. (2) Access to a DVD-ROM drive capable of reading DVD-R discs is required. (3) Access to a computer with FireWire or USB connections and compatible operating system is required for external hard drive.

Metadata\_Reference\_Information:

Metadata\_Date: 20060818

Metadata\_Review\_Date: 20060818

Metadata\_Future\_Review\_Date: 20070818

Metadata\_Contact:

Contact\_Information:

Contact\_Organization\_Primary:

Contact\_Organization: Maryland Department of Natural Resources

Contact\_Person: Kevin Boone

Contact\_Position: Chief, Geographic Information Services

Contact\_Address:

Address\_Type: mailing and physical address

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Contact\_Facsimile\_Telephone: 410-260-8759

Contact\_Electronic\_Mail\_Address: kboone@dnr.state.md.us

Hours\_of\_Service: 0800 - 1700 Eastern Time

Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata\_Standard\_Version: FGDC-STD-001-1998

Metadata\_Time\_Convention: local time

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