

## Identification\_Information:

## Citation:

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Originator: EarthData International of Maryland, LLC  
Publication\_Date: 20020900  
Publication\_Time: Unknown  
Title: Digital Land Base Mapping of the City of Sturgeon Bay, Door County, WI  
Edition: 1st Edition  
Geospatial\_Data\_Presentation\_Form: map  
Series\_Information:  
Publication\_Information:  
Larger\_Work\_Citation:  
Citation\_Information:  
Series\_Information:  
Publication\_Information:

## Description:

## Abstract:

This metadata document describes the collection and processing of Light Detection and Ranging (LIDAR) data of the City of Sturgeon Bay in Door County, Wisconsin. The resulting data are a bare ground elevation model generated from LIDAR data and topographic mapping with a 2' contour interval produced for the United States Army Corps of Engineers.

## Purpose:

This dataset is intended for use by the United States Army Corps of Engineers for base mapping.

## Time\_Period\_of\_Content:

## Time\_Period\_Information:

Single\_Date/Time:  
Calendar\_Date: 20020900  
Range\_of\_Dates/Times:  
Multiple\_Dates/Times:

Currentness\_Reference: Publication Date

## Status:

Progress: Complete  
Maintenance\_and\_Update\_Frequency: None planned

## Spatial\_Domain:

## Bounding\_Coordinates:

West\_Bounding\_Coordinate: -087.436039  
East\_Bounding\_Coordinate: -087.293591  
North\_Bounding\_Coordinate: 44.871042  
South\_Bounding\_Coordinate: 44.792001

## Keywords:

## Theme:

Theme\_Keyword\_Thesaurus: None  
Theme\_Keyword: Digital Land Base Mapping  
Theme\_Keyword: Light Detection and Ranging (LIDAR)  
Theme\_Keyword: Topographic Map

## Place:

Place\_Keyword\_Thesaurus: None  
Place\_Keyword: United States of America (USA)  
Place\_Keyword: Wisconsin (WI)  
Place\_Keyword: Door County (55029)  
Place\_Keyword: City of Sturgeon Bay

## Stratum:

## Temporal:

Access\_Constraints: None

Use\_Constraints: None

## Point\_of\_Contact:

## Contact\_Information:

Contact\_Person\_Primary:

Contact\_Organization\_Primary:

Contact\_Organization: EarthData International of Maryland

## Contact\_Address:

Address\_Type: mailing and physical address

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Hours\_of\_Service: 9:00-5:00 M-F

## Security\_Information:

## Cross\_Reference:

## Citation\_Information:

Series\_Information:

Publication\_Information:

## Data\_Quality\_Information:

## Attribute\_Accuracy:

## Logical\_Consistency\_Report:

Height values between individual LIDAR points within a 3.5 meter radius were differentiated against surveyed control points. A statistical result was determined and indicated that the vertical RMSE was +/- 0.15 meters (1 sigma) over the project area.

The resultant map products are fully compliant with National Map Accuracy Standards.

## Completeness\_Report:

Differences between individual LIDAR points within a 3.5 meter radius were calculated against surveyed control points. A statistical result was determined and indicated that the vertical RMSE was +/- 0.15 meters (1 sigma) for the entire project.

The following software was used for the validation.

1. Bentley - Microstation
2. Terrasolid - Terrscan
3. Trimble - Terramodel
4. Esri - ArcInfo
5. EarthData Proprietary software

## Positional\_Accuracy:

Horizontal\_Positional\_Accuracy:

Vertical\_Positional\_Accuracy:

## Lineage:

## Source\_Information:

## Source\_Citation:

## Citation\_Information:

Originator: Towill

Publication\_Date: 20020400

Publication\_Time: Unknown

Title: Ground Control Survey of Door County, WI

Geospatial\_Data\_Presentation\_Form: model

Series\_Information:

Publication\_Information:

Publication\_Place: Towill, Inc, San Francisco, CA

Publisher: Towill

Larger\_Work\_Citation:  
     Citation\_Information:  
         Series\_Information:  
         Publication\_Information:  
 Source\_Scale\_Denominator: 14,400  
 Type\_of\_Source\_Media: electronic mail system  
 Source\_Time\_Period\_of\_Content:  
     Time\_Period\_Information:  
         Single\_Date/Time:  
             Calendar\_Date: 20020400  
         Range\_of\_Dates/Times:  
         Multiple\_Dates/Times:  
     Source\_Currentness\_Reference: Publication Date  
 Source\_Citation\_Abbreviation: GPS Ground Control  
 Source\_Contribution:  
     Ground control was established prior to the acquisition of aerial data acquisition. The ground control points were established using GPS for vertical and horizontal coordinate values. Ground control references the Wisconsin Central State Plane NAD83, NAVD29, US Survey Feet.

Source\_Information:  
     Source\_Citation:  
         Citation\_Information:  
             Originator: EarthData Aviation  
             Publication\_Date: 20020417  
             Publication\_Time: Unknown  
             Title: LIDAR Coverage of Door County, WI  
             Geospatial\_Data\_Presentation\_Form: model  
             Series\_Information:  
                 Publication\_Information:  
                     Publication\_Place: Hagerstown, MD  
                     Publisher: EarthData Aviation  
             Larger\_Work\_Citation:  
                 Citation\_Information:  
                     Series\_Information:  
                     Publication\_Information:  
             Type\_of\_Source\_Media: CD-ROM  
             Source\_Time\_Period\_of\_Content:  
                 Time\_Period\_Information:  
                     Single\_Date/Time:  
                         Calendar\_Date: 20020300  
                         Time\_of\_Day: Unknown  
                     Range\_of\_Dates/Times:  
                     Multiple\_Dates/Times:  
                 Source\_Currentness\_Reference: Publication Date  
             Source\_Citation\_Abbreviation: Earthdata Aviation  
             Source\_Contribution:  
                 The project area was flown using EarthData Aviation's Navajo Chieftain aircraft equipped with an AeroScan LIDAR system, an Inertial Measurement Unit (IMU), and dual frequency GPS receiver and antennae. The position and orientation (omega, phi, and kappa) of the aircraft were determined using a GPS receiver located at an existing NGS control point.  
                 The LIDAR, IMU, and GPS data were correlated using GPS time and processed using LIDAR post-processing software to determine the coordinate of each point on the ground. A reflective surface DEM of the project area

was delivered with a relative accuracy of +/- 0.15 meters.

Process\_Step:

Process\_Description:

EarthData has developed a unique method for processing LIDAR data to identify and remove elevation points falling on vegetation, buildings, and other above-ground structures. The algorithms for filtering data were utilized within EarthData's proprietary software and commercial software written by TerraSolid. This software suite of tools provides efficient processing for small to large-scale projects and has been incorporated into ISO 9001 compliant production work flows. The following is a step-by-step breakdown of the process.

1. Using the LIDAR data set provided by EarthData Aviation, the technician performed a visual inspection of the data to verify that the flight lines overlap correctly. The technician also verified that there were no voids, and that the data covered the project limits. The technician then selected a series of areas from the dataset and inspected them where adjacent flight lines overlapped. These overlapping areas were merged and a process which utilizes 3-D Analyst and EarthData's proprietary software was run to detect and color code the differences in elevation values and profiles. The technician reviewed these plots and located the areas that contained systematic errors or distortions that were introduced by the LIDAR sensor.

2. Systematic distortions highlighted in step 1 were removed and the data were re-inspected. Corrections and adjustments can involve the application of angular deflection or compensation for curvature of the ground surface that can be introduced by crossing from one type of land cover to another.

3. The LIDAR data for each flight line were trimmed in batch for the removal of the overlap areas between flight lines. The data were checked against a control network to ensure that vertical requirements were maintained. Conversion to the client-specified datum and projections were then completed. The LIDAR flight line data sets were then segmented into adjoining tiles for batch processing and data management.

4. The initial batch-processing run removed 95% of points falling on vegetation. The algorithm also removed the points that fell on the edge of hard features such as structures, elevated roadways and bridges. In addition, points not classified as ground are coded as intermediate canopy, top of canopy, building, etc. Thus the LIDAR data was classified into thematic layers that can be analyzed separately or together.

5. The data were processed interactively by the operator using LIDAR editing tools. During this final phase the operator generated a TIN based on a desired thematic layers to evaluate the automated classification performed in step 4. This allowed the operator to quickly re-classify points from one layer to another and recreate the TIN surface to see the effects of edits. The use of geo-referenced images were toggled on or off to aid the operator in identifying problem areas. The data was also examined with an automated profiling tool to aid the

operator in the reclassification.

6.The data were separated into a bare-earth DEM. A grid fill program was used to fill data voids caused from reflective objects such as buildings and vegetation. The final DEM was written as an ASCII file (comma & space delimited), ESRI Shape file, and an ESRI TIN file to a CDROM.

Source\_Used\_Citation\_Abbreviation: EarthData International

Process\_Date: 20020900

Process\_Contact:

Contact\_Information:

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Hours\_of\_Service: 9 AM - 5 PM Mon. - Fri.

Cloud\_Cover: 0

Spatial\_Data\_Organization\_Information:

Spatial\_Reference\_Information:

Horizontal\_Coordinate\_System\_Definition:

Planar:

Grid\_Coordinate\_System:

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

Universal\_Transverse\_Mercator:

Transverse\_Mercator:

Universal\_Polar\_Stereographic:

Polar\_Stereographic:

State\_Plane\_Coordinate\_System:

SPCS\_Zone\_Identifier: Wisconsin Central (4802)

Lambert\_Conformal\_Conic:

Standard\_Parallel: 44 15 0.0

Standard\_Parallel: 45 30 0.0

Longitude\_of\_Central\_Meridian: -090.000000

Latitude\_of\_Projection\_Origin: +43.833333

False\_Easting: 600000.0

False\_Northing: 0.0

Transverse\_Mercator:

Oblique\_Mercator:

Oblique\_Line\_Point:

Polyconic:

ARC\_Coordinate\_System:

Equiarectangular:

Azimuthal\_Equidistant:

Planar\_Coordinate\_Information:

Planar\_Coordinate\_Encoding\_Method: coordinate pair

Coordinate\_Representation:

Abscissa\_Resolution: 2

Ordinate\_Resolution: 2

Distance\_and\_Bearing\_Representation:

Planar\_Distance\_Units: Survey Feet  
 Geodetic\_Model:  
 Vertical\_Coordinate\_System\_Definition:  
   Altitude\_System\_Definition:  
     Altitude\_Datum\_Name: National Geodetic Vertical Datum of 1929  
     Altitude\_Resolution: 0.15  
     Altitude\_Distance\_Units: Meters  
     Altitude\_Encoding\_Method: Explicit elevation coordinate included with horizontal coordinates  
   Depth\_System\_Definition:  
 Entity\_and\_Attribute\_Information:  
   Detailed\_Description:  
     Entity\_Type:  
     Attribute:  
       Attribute\_Domain\_Values:  
       Attribute\_Value\_Accuracy\_Information:  
   Overview\_Description:  
 Distribution\_Information:  
   Distributor:  
     Contact\_Information:  
       Contact\_Person\_Primary:  
       Contact\_Organization\_Primary:  
         Contact\_Organization: United States Army Corps of Engineers - Detroit District  
       Contact\_Address:  
         Address\_Type: mailing and physical address  
         Address: 477 Michigan Avenue  
         City: Detroit  
         State\_or\_Province: MI  
         Postal\_Code: 48226  
         Country: USA  
       Contact\_Voice\_Telephone: 313-226-6751  
   Distribution\_Liability: None.  
   Standard\_Order\_Process:  
     Digital\_Form:  
       Digital\_Transfer\_Information:  
       Digital\_Transfer\_Option:  
         Online\_Option:  
           Computer\_Contact\_Information:  
             Network\_Address:  
             Dialup\_Instructions:  
         OffLine\_Option:  
           Recording\_Capacity:  
   Available\_Time\_Period:  
     Time\_Period\_Information:  
       Single\_Date/Time:  
       Range\_of\_Dates/Times:  
       Multiple\_Dates/Times:  
 Metadata\_Reference\_Information:  
   Metadata\_Date: 20021000  
   Metadata\_Contact:  
     Contact\_Information:  
       Contact\_Person\_Primary:  
       Contact\_Organization\_Primary:  
         Contact\_Organization: EarthData International of Maryland, LLC  
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Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata

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

Metadata\_Security\_Information: