

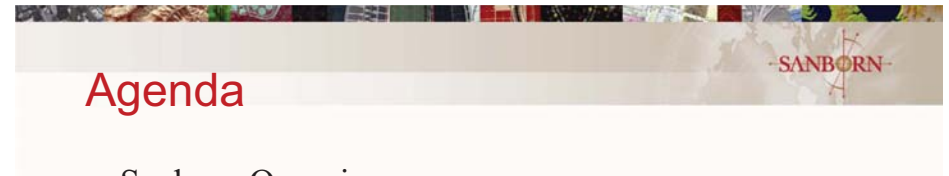


Presentation to LAR-IAC for Sanborn Certified Pictometry Ortho Imagery

Date: July 29th, 2010

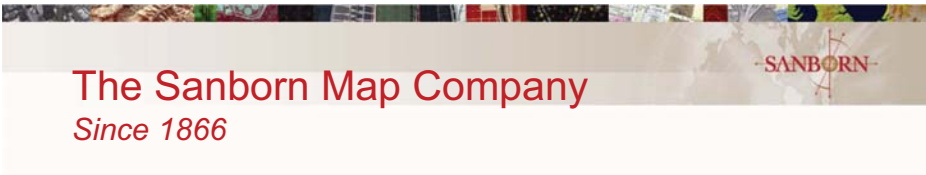
Location: Los Angeles County

Presented by: Jason Caldwell, Director of Strategic Accounts





Agenda

- Sanborn Overview
- Sanborn Certified Pictometry Products
- 2008 Product Review
- Sanborn Production Methodology
- Process Improvements
- Questions



The Sanborn Map Company Since 1866

Office Locations	Acquisition Resources	Services
Ann Arbor, Michigan Charlotte, North Carolina Colorado Springs, Colorado Fort Worth, Texas Pelham, New York Portland, Oregon St. Louis, Missouri Sacramento, California	Fixed wing aircraft (8) UltraCam Digital (2) Z/I DMC (4) Optech LiDAR-50 Hz (1) Leica LiDAR ALS 50 II (2)	Photogrammetric Mapping Remote sensing and analysis GIS software development Decision support tools Data analysis
	  	



- Sanborn uses Pictometry Nadir imagery acquisition to produce accurate and esthetically pleasing orthos for LAR-IAC
- 4-inch (1"=100' ASPRS Class I, NMAS, NSSDA)
- 1-foot (1"=200' ASPRS Class I, NMAS, NSSDA)
- DTM/DEM provided by customer
- Spatial accuracy dependent upon quality of DTM/DEM and Exterior Orientation provided by Pictometry
- Radiometric balance, auto seaming with manual review, bridge correction



Orthoimagery

Project Details			
Boundary	Area 1	Area 2	Area 3
Ground Sample Distance	10cm	30cm	10cm
Output Pixel Resolution	4"	1.0'	0.33'
Imagery Type	RGB	RGB	RGB
Accuracy Standard	1"=100' (ASPRS)	1"=200' (ASPRS)	1"=100' (ASPRS)
File Format	GEOTiff	GEOTiff	GEOTiff
Tile Format	1/4 sq. mile	1 sq. mile	1/4 sq. mile

Orthoimagery

- 3-band (RGB), 8-bits per band in GeoTIFF format
- High-quality
- Seamless coverage across areas
- Color balanced within each resolution area
- Surface: existing DEM with updates as necessary



Stereo Compilation for Updates and New Features

- AT Solution Allows for:
 - Updates to Elevation Modeling
 - Building outline development
 - All accuracies consistent with:
 - 1"=100' for 0.33-foot AOI
 - 1"=200' for 1.0-foot AOI



Accuracy Requirements for LAR-IAC

4 inch GSD, equivalent to 1"=100'-scale (1:1200)	
Ground Resolution	0.33 survey foot (2 decimals)
Tile size	2640' x 2640' (8000 pixels x 8000 pixels)
RMSE of known ground points measured on the image <i>See ASPRS Class 1 Standards Page 8, Table 16, and NSSDA Part 3, Appendices 3-A and 3-D for explanation of formulas.</i>	$RMSE_x = RMSE_y = 1.0\text{-ft}$ $RMSE_r = 1.4142 * RMSE_x = 1.4142 * RMSE_y = 1.41\text{-ft}$
NSSDA radial accuracy	NSSDA accuracy (20+ points) such that $1.73 * RMSE_r < 2.5'$
Mismatch of features along mosaic lines between pixel resolution blocks of equal scale	Equal to or less than 4 pixels on well defined ground features (roads, sidewalks, curbs).

Accuracy Requirements for LAR-IAC

1-foot GSD, equivalent to 1"=200'-scale (1:2400)	
Ground Resolution	1 foot
Tile size	5280' x 5280'
Mismatch of features along mosaic lines and production block boundaries of equal scale	Equal to or less than 3 pixels on well defined ground features (roads, sidewalks, curbs).

Accuracy assessment by Dewberry

Criteria for 4-inch GSD Imagery	Acceptance Criteria	Tested
RMSE, (acceptance criteria 30)	1.00 ft	0.722 ft
RMSE, (acceptance criteria 30)	1.00 ft	0.518 ft
RMSE, (acceptance criteria 30)	1.41 ft	0.888 ft
Accuracy, (acceptance criteria 31)	2.50 ft	1.537 ft
Aerial Triangulation Block(s) used	N/A	15
Number of QA/QC checkpoints used	N/A	203

Tested 1.537 feet horizontal accuracy at 95% confidence level.

David F. Maune

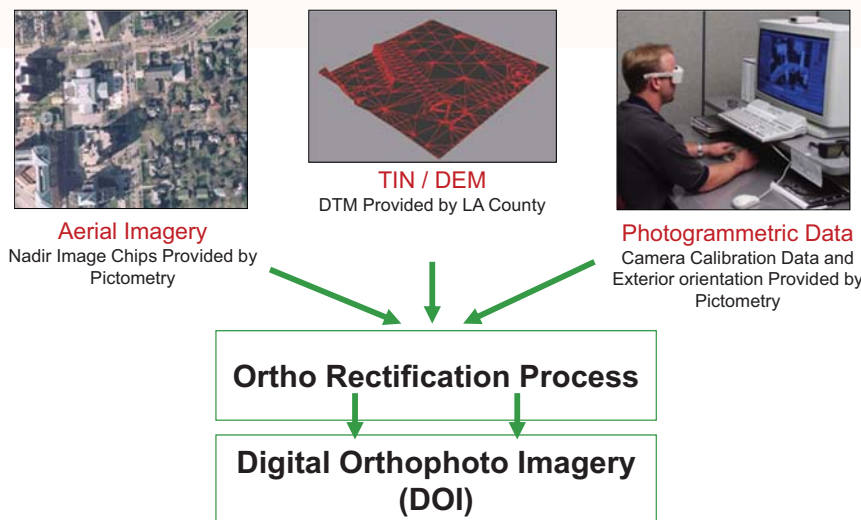
David F. Maune, Ph.D., PS, GS, CP
Project Manager



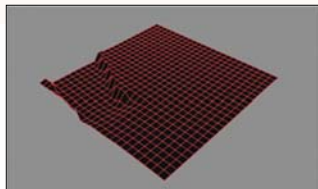
Sanborn Responsibilities

- Attend Project Meetings
 - Kickoff
 - Pilot Review
 - Status Calls/Meetings
- Confirm source data receipt
 - Boundaries, tile layouts
 - Control/AT
 - DEM
- Update of County DTM (due to new grading) from stereo pairs to preserve requested accuracy
- Rectify imagery sources to DEM and mosaic to provide final seamless product
- Quality Control
 - Products meet specifications
 - Products meet expectations

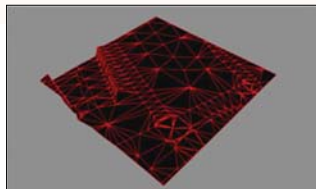
Orthophoto Imagery Production



Rectification



GRID



TIN



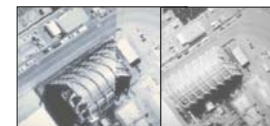
Sanborn uses terrain as a TIN, rather than a regular grid DEM/DTM when producing Orthophotos.



Digital Orthoimagery Esthetic Corrections

Sanborn Corrects Common Inherent Orthophoto Problems Including:

- Bridge Distortion
- Edge Displacement
- Building Ghosting
- Image Smearing
- Radiometric Correction



SPICE Color Balancing Sample

Target thumbnail zone selected "Local" thumbnail color-balance Global high-resolution color-balance Final balanced seamed ortho-image



1. Thumbnails are grouped into geographic/terrain-specific areas for local color-balancing. Target zone is selected.

2. Thumbnails are color-balanced against local target(s). Target parameters are then prepared for global color-balancing.

3. Local and global color-balancing weights are applied to high-resolution ortho-imagery.

4. Color-balanced and seamed final ortho-imagery is available for client.

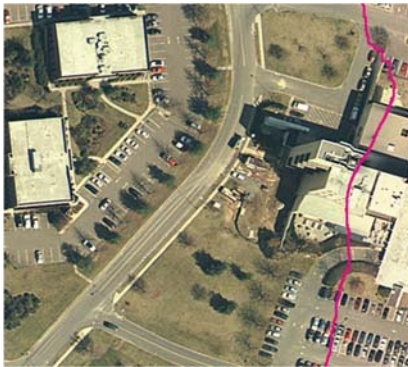


Bridge Correction

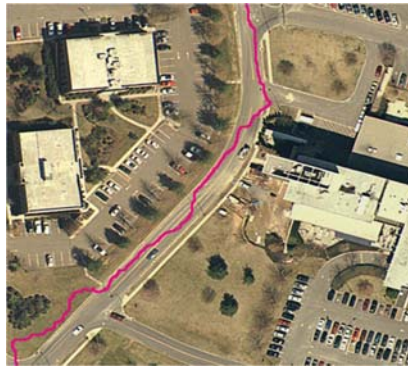


Smart Seaming

Typical Seaming Problem



Intelligent Seaming Process



Seamline Comparison

- Pictometry Medium vs. Large Format Digital (DMC or UltraCam)
- 4x amount of exposure
- 16x amount seamline



~70 Images



18 Images

Project Improvements

Building Lean:

Correction applied based upon revised flight plan and sensor lens configuration

Radiometry

More consistent across entire project area: Look at jurisdictional adjustments, histogram standardization in source imagery and flying adjacent flight lines within a few days of each other.

Color balancing of coastal water areas: cut and paste of preferred pixels to standardize color



LAR-IAC vs. Bing or Google

- LAR-IAC provides 1-foot imagery to the USGS for financial contribution (as public domain). This data is ingested by Google Earth and Bing Maps.
- However, LAR-IAC offers participants the following benefits over Bing Maps or Google Earth:
 - Higher resolution
 - Better accuracy
 - Better radiometry
 - Updated DTM
 - Use for custom map production
 - Possibility to integrate with agency layers
 - Create customized GIS websites for specific needs of agencies
 - Ability to extract additional planimetric features



Questions?

SANBORN