

LAR-IAC

Dewberry/Pinnacle Status for Independent QA/QC

Slides provided by
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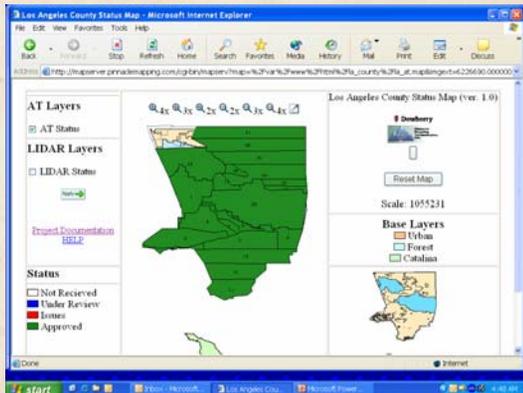
Pinnacle Project Status Web Application

- We started using a couple of weeks ago
- Will help us manage where we are as they finish up QA/QC efforts

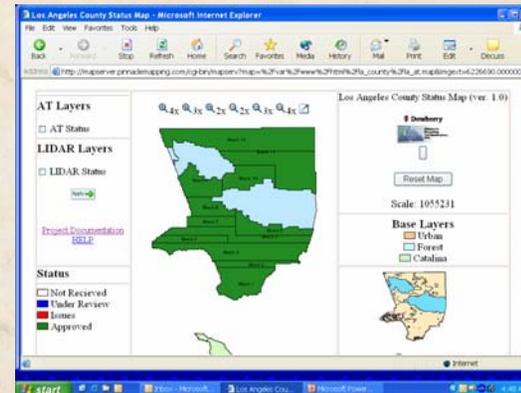
See MapServer site at
http://mapserver.pinnaclemapping.com/la_county/



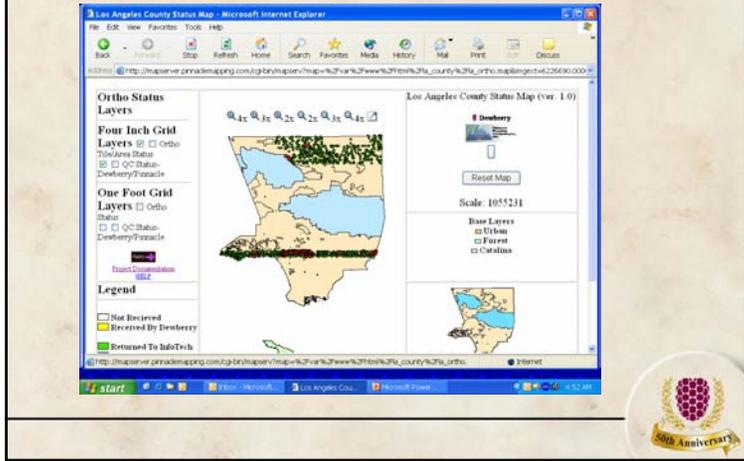
Aerotriangulation: 21 of 24 AT Blocks Complete – all 21 Passed QA/QC



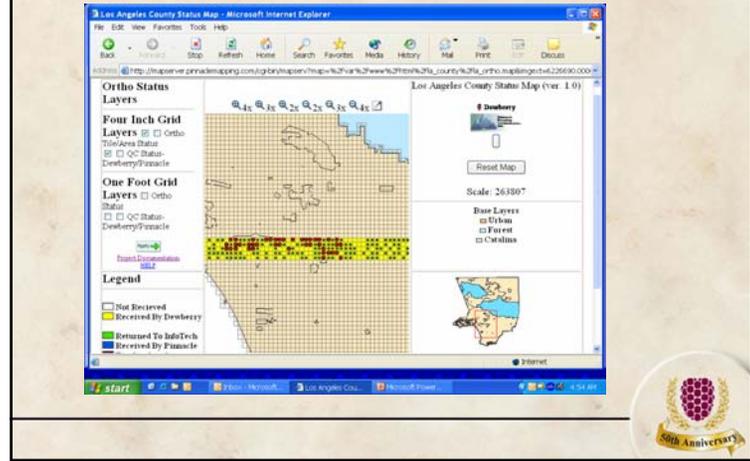
LIDAR: All blocks have completed QA/QC 316 of 12,412 tiles had issues



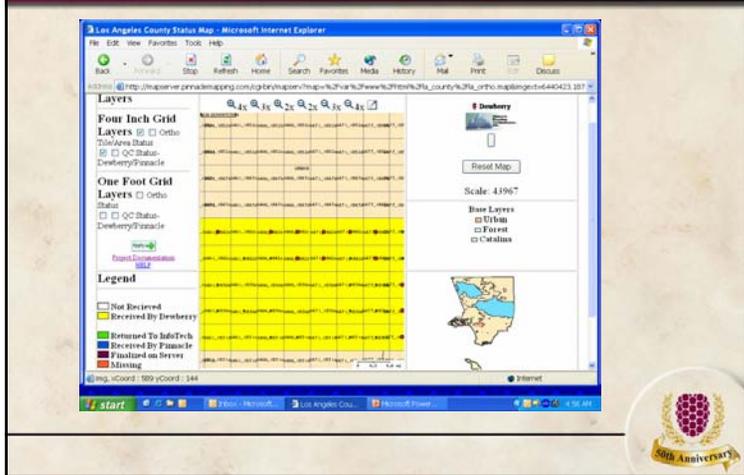
4" Orthophotos: 3,093 Tiles Received, 765 selected for QA/QC, 55 had issues (bldg.lean)



Zoomed-in to see individual tiles, relative to "downtown" polygons with building lean criteria



Zoomed-in further to see individual tile numbers



Awaiting for QA/QC

Dewberry Tasks:

- Remainder of 4" orthophotos
- Final DTMs with breaklines, contours
- Pictometry imagery draped on LiDAR
- All approved products for completeness reviews, generation of limited area datasets, and packaging

Problems/Issues We've Encountered

- LiDAR process had to be formalized better between Dewberry and Infotech
- Discrepancies with downtown areas polygon for "true orthos"
- LiDAR data for use with Pictometry (some delay here)



Recap....

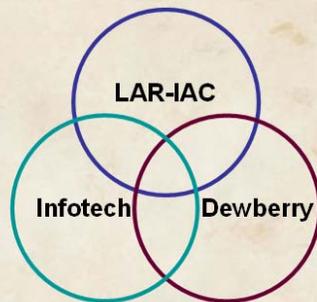
The following slides were in the last presentation highlighting Dewberry's QA/QC procedure.



Quality Assurance/Quality Control (QA/QC)

QA: Ensure the government gets what it paid for

QC: Validate production procedures used



Major Responsibilities of Dewberry Team

Dewberry Tasks:

- Project Management
- Quality Plan
- AT/control reports
- Horizontal & vertical accuracy assessments
- Orthophoto QA/QC
- LiDAR DTM QA/QC
- Review of contour QA/QC

Pinnacle Tasks:

- Map Server
- AT/control reports
- Contour QA/QC
- Completeness reviews
- Product generation
- Product delivery/training

Towill, Inc. Tasks:

- Survey QA/QC checkpoints

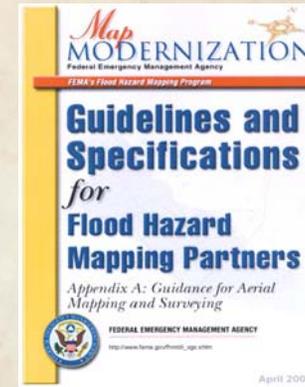
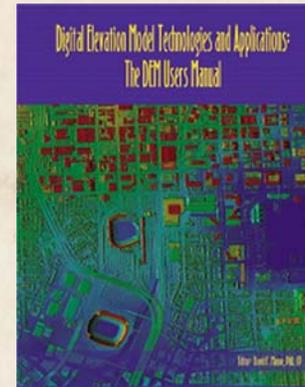


Why Dewberry

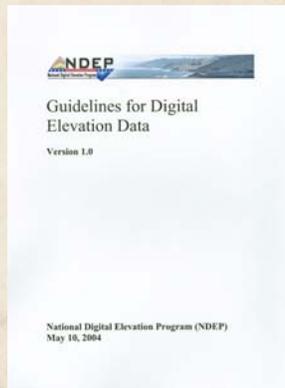
- Dewberry has written the major accuracy standards and guidelines
- We specialize in independent QA/QC of digital orthophotos and DTMs produced by others (NC, VA, MD, IN, VT, plus many individual counties)
- We have no inherent conflict of interest with producers; we don't compete for production
- All clients, as well as producers being evaluated, have thanked Dewberry for project success.



Dewberry specializes in “user requirements”



Dewberry drafted these accuracy guidelines



LAR-IAC Quality Plan based on Dewberry's lessons learned elsewhere



Dewberry/Pinnacle Synergy in Indiana



Dewberry performed QA/QC on up to 15,000 tiles/week, made edit calls

Pinnacle reviewed revised tiles for edit call corrections, performed reviews for completeness, generated value-added products, prepared all county and township deliverables, and provided training/data installation assistance →



Separate countywide deliverables in Indiana similar to spatially-limited datasets in L.A.



File naming convention (4" tile)

If tile index northwest corner is:

- Easting (x-coordinate): 6,565,280.000 ft
- Northing (y-coordinate): 1,822,640.000 ft

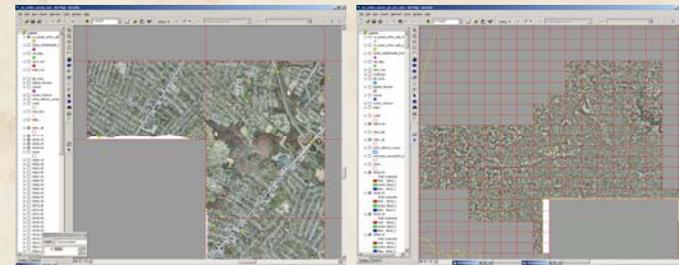
Then, file name will be

6565_1822a

(This example is in L.A. near 34° 118°)



Tiles may be incomplete >200' outside boundary



Major components of our QA/QC

1. Aesthetics
2. Accuracy
3. Completeness
4. Deliverables
5. Training



Acceptance Criteria (1-foot GSD, 1"=200')

Horizontal Accuracy Testing

Criteria	Characteristic	Measure of Acceptability
B.1	Ground Resolution	1.0 U.S. Survey Foot
B.2	Tile size	5280' x 5280' (5280 x 5280 pixels)
B.3	RMSE of QA/QC points measured on the image (ASPRS Class I)	RMSE _x = RMSE _y = 2 ft (2 pixels) Or RMSE _r = 1.4142 * RMSE _x = 2.83 ft
B.4	NSSDA radial accuracy	NSSDA accuracy (95% confidence level) such that 1.7308 * RMSE _r <= 5 ft
B.5	Mismatch of features along mosaic lines and production block boundaries of equal scale	Equal to or less than 3 pixels (3-ft) on well defined ground features (roads, sidewalks, curbs, etc.)



Acceptance Criteria (4-inch GSD, 1"=100')

Horizontal Accuracy Testing

Criteria	Characteristic	Measure of Acceptability
C.1	Ground Resolution	0.33 U.S. Survey Foot (2 decimals)
C.2	Tile size	2640' x 2640' (8000 x 8000 pixels)
C.3	RMSE of known ground points measured on the image	RMSE _x = RMSE _y = 1.00 ft (3 pixels) or RMSE _r = $\sqrt{RMSE_x^2 + RMSE_y^2}$ = 1.41 ft
C.4	NSSDA radial accuracy	NSSDA accuracy (20+ points) such that 1.7308 * RMSE _r <= 2.5 ft
C.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)
C.6	Mismatch of features between 1-foot and 4-inch images	Equal to or less than 3 pixels (1 ft) on well defined ground features (roads, sidewalks, curbs).



Horizontal comparison of National Map Accuracy Standard (NMAS and National Standard for Spatial Data Accuracy (NSSDA)

NMAS Map Scale	NMAS CMAS 90% confidence level (1/30 th inch)	NSSDA RMSE _r [function of RMSE _x & RMSE _y]	NSSDA Accuracy, 95% confidence level
1" = 50'	1.7 ft	1.1 ft	1.9 ft
1" = 66'	for LAR-IAC 4" pixel orthos		2.5 ft
1" = 100'	3.3 ft	2.2 ft	3.8 ft
1" = 132'	for LAR-IAC 1' pixel orthos		5.0 ft
1" = 200'	6.7 ft	4.4 ft	7.6 ft

NMAS relevant to hardcopy maps printed at these scales
NSSDA relevant to digital geospatial data compiled at these scales
Multiply RMSE_r x 1.7308 to get Accuracy,



Horizontal QA/QC Point Acceptance Criteria

Criteria	Characteristic	Measure of Acceptability
G.1	Visibility on digital imagery	QA/QC checkpoints must be clearly photo-identifiable on images at map scales evaluated (4-inch and 1-foot orthos)
G.2	Well defined	Points must be clearly visible and not elevated (no fence posts, fire hydrants, etc. that cast shadows)
G.3	Documentation	Each point is documented to describe the photo-identifiable feature surveyed
G.4	Terrestrial images	Each point is photographed from the ground to help in photo-identification
G.5	Survey accuracy and description of survey procedure used	Accuracy estimate, to include description of survey procedures used to achieve such accuracy.



NSSDA (3.2.2) Accuracy Test Guidelines

- “Horizontal accuracy shall be tested by comparing the planimetric coordinates of well-defined points³ in the dataset with coordinates of the same points from an independent source of higher accuracy. Vertical accuracy shall be tested by comparing the elevations in the dataset with elevations of the same points as determined from an independent source of higher accuracy.”
- “A minimum of 20 check points shall be tested, distributed to reflect the geographic area of interest and the distribution of error in the dataset. When 20 points are tested, the 95% confidence level allows one point to fail the threshold given in product specifications”
- NOTE: Dewberry normally tests AT blocks separately, but uses 6 points/block (min) and 20 points/block (max)

³ See Appendix 3-C, Section 1



NSSDA Appendix 3-C, section 1

Well-Defined Points

- “A well-defined point represents a feature for which the horizontal position is known to a high degree of accuracy and position with respect to the geodetic datum. For the purpose of accuracy testing, well-defined points must be easily visible or recoverable on the ground, and on the independent source of higher accuracy, and on the product itself. Graphic contour data and digital hypsographic data may not contain well-defined points.”
- “For orthoimagery, suitable well-defined points may represent features such as small isolated bushes, in addition to right-angle intersections of linear features.”



QA/QC checkpoints must be photo-identifiable We need to know what to look for on images



QA/QC checkpoint surveys preferably 3 times more accurate than the mapping product being tested for horiz./vert. accuracy, with same datum and epoch.



Dewberry qualitative reviews

- Dewberry does not perform such labor-intensive qualitative reviews on all DTM tiles because the costs would be prohibitive
- We QC approximately 20% of the tiles to identify systematic issues so that corrections, when applied, will correct all DTM tiles



Contour visual QA/QC

An estimated 80% of our QA/QC effort for contours is visual.

Acceptance criteria depends upon provisions of Infotech's contract with LAR-IAC and/or verbal agreements concerning the type and quality of the contours.



Questions?

