LARIAC 5

Product Guide

For the
Los Angeles Region
Imagery Acquisition Consortium
(LARIAC) Program
2017-2018

LOS ANGELES ⊕ REGION
LAR|ac
imagery acquisition consortium

Product Guide Developed by:

Los Angeles County

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Orthophotography Data Acquisition & Data Production provided by:
   Prime: Pictometry International Corp.

Oblique Imagery Data and Viewer provided by:
   Pictometry International Corp.

Building Representation Data provided by:
   Pictometry International Corp.

Digital Terrain Data provided by:
   Pictometry International Corp.

Quality Assurance, Quality Control and Deliverables provided by:
   Dewberry Engineers Inc.

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LARIAC – BACKGROUND AND OVERVIEW

Please see the original **LARIAC Product Guide** for complete background and overview information on the LARIAC5 program. The original LARIAC Project Guide (2006 provides plenty of information on the first iteration of the project, orthophotography, digital terrain datasets and oblique aerial digital imagery.

This document, along with reports, documents, presentations, and other information, can be found online on the LARIAC Program Web Site:
http://egis3.lacounty.gov/dataportal/wp-content/uploads/2012/05/ProductGuideFinal.pdf

Overview of Data Acquisition Process – LARIAC5

Pictometry International Corp. (hereafter referred to as Pictometry) acquired ortho and oblique imagery for the LARIAC5 Project. Aerial photography data were collected and processed by Pictometry for all LARIAC5 project areas. The collected nadir image chips were post processed by Pictometry.

To provide the proper geodetic controls for the production of the digital ortho imagery, a combination of existing GPS ground control points and GPS/IMU were employed during the image capture. Existing digital terrain model (DTM) data from LARIAC5 was provided by Los Angeles County and used in the production of the digital ortho imagery. Pictometry accomplished aerial triangulation (AT solution) of the photo set using automatic analytical aerial triangulation (AAAT) procedures in a softcopy environment and the resulting external orientations.

Pictometry processed the imagery, completed the orthorectification and produced 4-band (RGBNIR), 32-bit (8-bit per channel) digital orthophotos at 4 inch and 1 foot pixel resolution for respective project areas with no overlap between areas. The 4 inch (0.32' final pixel size) and 1 foot (0.8' final pixel size) areas were color balanced independently. The ground resolution of the ortho photography will be approximately nominal 10 cm GSD (Ground Sample Distance) and nominal 28 cm GSD. All products from the LARIAC5 Project underwent rigorous quality assurance and quality control (QA/QC) procedures by Dewberry Engineers Inc. (hereafter referred to as Dewberry) as an independent QA/QC firm.

All project data were established and produced in the California State Plane Coordinate System (1983, Zone V). The 4-inch and 1-foot pixel resolution orthophotos were delivered by Pictometry to Dewberry for eventual distribution to the LARIAC5 participants. Oblique imagery was delivered by Pictometry to Dewberry for eventual distribution to the LARIAC5 participants.

PROJECT DELIVERABLES

The LARIAC5 Project consists of digital imagery and elevation products in various delivery formats. The LARIAC5 Technical Advisory Group (TAG) made every effort to consider and include as many products and delivery formats as possible. While not every format is included, the final products can be converted to other formats, if necessary. The following is a description of all LARIAC5 Project Deliverables:

Digital Orthophotography, LiDAR, and Oblique Imagery and Viewers

After the quality assurance team receives, reviews and accepts all of the ortho products delivered by Pictometry for each delivery area, the data is finalized and copied to hard drives for delivery to Los Angeles County and the LARIAC5 participants.

The full countywide delivery of oblique imagery, software and support data is also delivered to Dewberry by Pictometry for creation of the Spatially-Limited Dataset (SLDS) deliveries of all project data products to the various LARIAC5 participants. The final SLDS datasets will be delivered on external hard drives (provided through the LARIAC5 contract).

The delivery extents for each SLDS are defined by two shapefiles developed and provided by Los Angeles County in consultation with each SLDS participant. One shapefile defines the 4inch (urban) and 1-foot (forest) ortho imagery delivery boundaries, and the other defines the Pictometry (oblique product) delivery boundary.

LARIAC5 Project Deliverables (each described below):

There are three (3) main products (now called deliverables) for LARIAC5 and over twelve (12) data formats. The main products include:

> **Deliverable 1** - Color Orthogonal Imagery, 4" resolution (urban areas) and 1' resolution (national forests), 1' resolution for urban areas (for Web/public consumption).
> **Deliverable 2** - Color Oblique Aerial Digital Imagery (with web application and other integration software).
> **Deliverable 3** – Building Outlines – Esri File Geodatabase containing building footprints collected from the 4" and 1' imagery.

Data Formats
Pictometry translated or transferred the digital data from the original system specific format to the final and required output format.   Pictometry will provide their oblique imagery library, software, and supporting materials. Their oblique imagery format is a propriety JPEG format. The formats listed below for the listed deliverables are for graphic display only and do not contain any written reports.

Delivery Product	Format 1	Format 2	Format 3

Orthophoto – RGB (4" and 1' products)	GeoTIFF & JPG2000	ECW (20:1 mosaic)	File Geodatabase
Oblique images	Online Viewer	Proprietary JPG	Compressed JPG

Reports and support data:

Ground Control:	ESRI ArcGIS shapefile with attributes
	ASCII point file listing
	Report
Tile Grid	ESRI ArcGIS shapefile
Block Adjustment	ESRI ArcGIS shapefile
	Report

Each participant will receive all delivery formats for the area agreed upon prior to joining the LARIAC5 project (provided in their letter of support with the County). For most entities this is their jurisdiction or coverage area along with a buffer area. All products are delivered in the State Plane Coordinate System, NAD83, California, Zone V, U.S. Survey Feet (0405).

Deliverable 1 – 4 - Band Multispectral Imagery (RGBNIR)
1. Four-inch pixel resolution natural color ortho imagery coverage of the urban project area and Santa Catalina Island (Area 1 and Area 3) at a 1" = 100' map scale.
2. One-foot pixel resolution ortho imagery coverage of the national forest areas (Area 2) at a 1" = 200' map scale.
3. One-foot pixel resolution ortho imagery coverage of the urban project area and Santa Catalina Island (Area 1 and Area 3) at a 1"=200' map scale (reprocessed from 4" pixel resolution imagery).
4. Imagery to be delivered as GeoTIFF files (uncompressed) corresponding to each ortho tile in the supplied tile grid.
5. Other data formats to be provided include ECW, JPEG2000, and ESRI File Geodatabase.

Deliverable 2 - Color Oblique Aerial Digital Imagery
1. 4,276 Sectors of Community 2-Way Images covering 4,083 square miles of the County (all areas plus some buffer). This includes 963 Sectors of Community 2-Way Images covering Area 2 (national forests).
2. 3,309 Sectors of Neighborhood 4-Way Images covering Area 1.
3. 139 Sectors of Neighborhood 4-Way Images covering Area 3 (Santa Catalina Island).
4. 16 Sectors of Neighborhood 8-Way Images covering downtown areas.
5. Shapefiles representing the oblique footprint of each image trapezoid in California State Plane Coordinate System, Zone V, NAD 83, and U.S. Survey Feet.
6. Oblique imagery is a proprietary image trailer tacked onto industry standard image format. May be exported to a number of formats. County DTM with up to 2m spacing will be included in image trailer.

Deliverable 4 – Building Representations (Rooflines)

1. ArcGIS Shapefile and File geodatabase including building rooflines representing all buildings as of date of orthogonal imagery capture, including attributes identifying source of change (modification, new construction, replacement) and links to prior building IDs.
2. ArcGIS shapefile of all buildings that have been updated since 2014, to support change analysis and detection, including attributes identifying source of change (demolition, modification, new construction, replacement) and links to current building IDs.

Map of LARIAC5 Project Areas
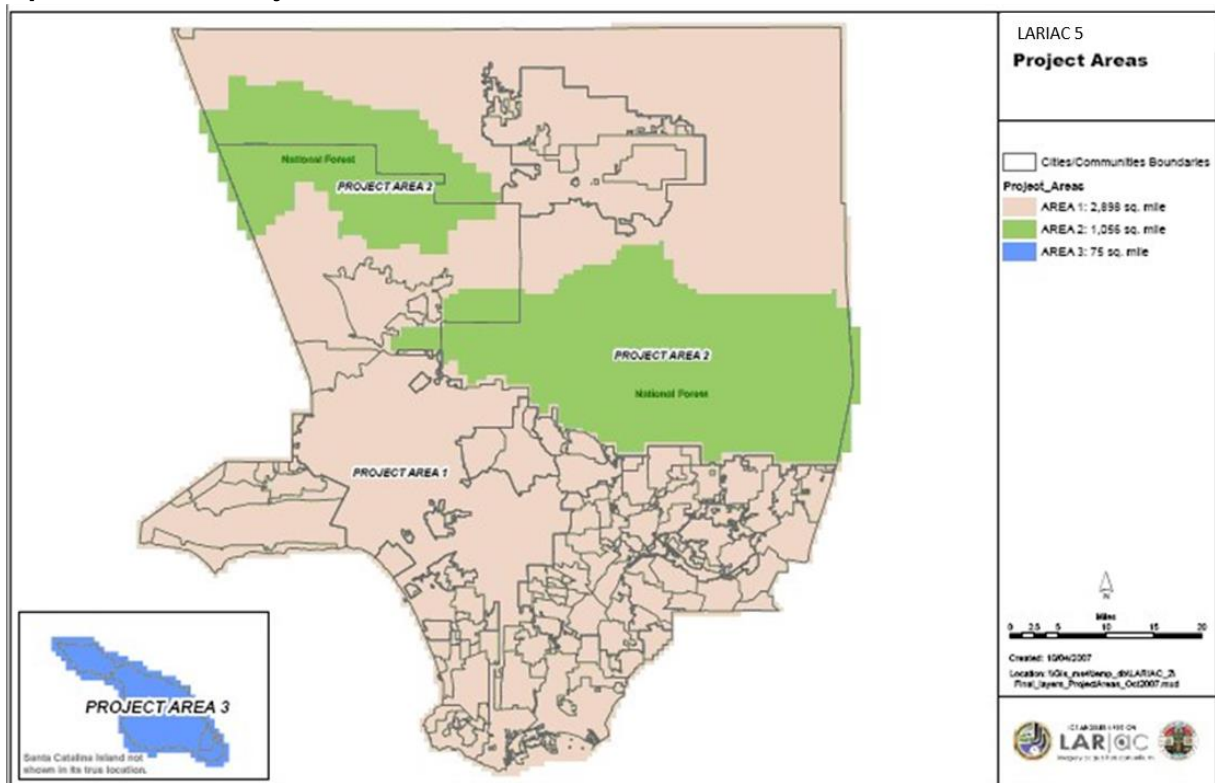
Area 1 – urban, Area 2 – national forests, Area 3 – Santa Catalina Island.

Other Deliverables

1. Federal Geographic Data Committee (FGDC) compliant metadata.
2. Geodetic control network for ground control points used for AT solution.
3. Oblique imagery software from Pictometry
   - Electronic Field Study (EFS) 2.7 R1.19
   - Configuration Editor 2.0 release 3
   - Change Analysis 2.7 R1.19
   - ArcGIS Extension
   - Network Image Warehouse (NIW)

See **Readme** delivered with oblique imagery data products for software information (included here as **Attachment 1**).

DELIVERABLE REVIEW & ACCEPTANCE CRITERIA

All products from the LARIAC5 Project underwent rigorous quality assurance and quality control (QA/QC) procedures. The same Acceptance Criteria was used for LARIAC5 as LARIAC. For detailed information regarding the acceptance criteria, please see the LARIAC Product Guide (pages 15 to 20).

Coordinate System and Datum for LARIAC5 Project Data

All LARIAC5 Project deliverables (except oblique aerial digital imagery) are projected in the State Plane Coordinate System, NAD 83, CA Zone V, US Survey Feet (0405) Epoch 2010.00.

Horizontal and Vertical Positional Accuracy

Horizontal Accuracy – For Orthophotos

LARIAC5's 4" digital orthophotos were tested in accordance with the 4 inch GSD Acceptance Criteria listed above. The "georeferenced ground positions of higher accuracy," referred to generically as "QA/QC checkpoints," were provided from the first LARIAC project and from other data points collected by the vendors. The National Standard for Spatial Data Accuracy (NSSDA) absolute accuracy statistic ($Accuracy_r$) is computed as $RMSE_r$ x 1.7308 in order to report the tested horizontal accuracy at the 95% confidence level as required by FGDC Geospatial Positioning Accuracy Standards, Part 3: NSSDA. The 4" digital orthophotos were tested with **1.35 feet horizontal accuracy at 95% confidence level.** Class 1 (1 foot accuracy) for Area 1 and 3 and class 2 (2 foot accuracy) are the same standards as LARIAC.

Horizontal and Vertical Positional Accuracy - For Oblique Imagery

The *georeferenced ground positions of higher accuracy*, referred to generically as *QA/QC checkpoints*, were provided by LARIAC5 from multiple sources. Most checkpoints were X's painted on asphalt, accurately surveyed as control points, and used as *target points* by photogrammetric firms for aerial triangulation. Because these checkpoints are accurate, well defined and photo-identifiable on the airborne oblique imagery, Dewberry measured the x-, y- and z-coordinates on these checkpoints on each of the 4-view Pictometry images, where visible, to compute errors in Eastings (Δx), errors in Northings (Δy), and errors in elevations (Δz). For each checkpoint, Dewberry also averaged the Eastings, Northings and elevations for all views that were visible; for many, the average resulted from four views, but some points were obscured by buildings, trees, cars, etc., so the average resulted from the mean of three, two, and (in a few cases) only one view.

When coordinates were averaged from north-view, south-view, east-view, and west-view images, the averaged coordinates were normally more accurate than coordinates from individual views, as summarized with the following accuracy statements:

Accuracy of clearly-defined surveyed targets on Pictometry 4-view images with coordinates averaged from all views in which targets were visible and could be measured: **All-view averaged coordinates tested 3.63 ft horizontal accuracy at 95% confidence level**
All-view averaged coordinates tested 1.20 ft vertical accuracy at 95% confidence level.

These results are well within contract specifications for oblique imagery for the LARIAC5 Project.

OPERATING OPTIONS

The LARIAC5 Project is mainly about data products but it is important to note how the data can be viewed and what special software is included or can be used. For detailed information regarding hardware and software requirement, please see the LARIAC Product Guide (pages 20 to 23).

LARIAC5 product deliverable Index Files (identifying the tile grid, etc.) are provided in ESRI shapefile format. ArcView, or the free ArcExplorer and AccuGlobe applications, and most other GIS software can read the index shapefiles included with the data.

Other LARIAC5 Project reports (Horizontal and Vertical Accuracy, Aerial Triangulation, Geodetic Control, etc.) are provided in Adobe Acrobat (.PDF) file format. Other miscellaneous data tables can be opened and used with a word processing and/or spreadsheet application like Microsoft Word or Microsoft Excel.

Pictometry deliverables may also be accessed through Pictometry Online and the Connect (ConnectExplorer) platform. This is the preferred way to view and use the oblique data collected by Pictometry.

ACCESSING OR LOADING DATA

The following section refers to accessing and/or loading the LARIAC5 data. Most agencies are receiving their data on an external hard drive (provided this time through the LARIAC5 Project). See the original LARIAC Product Guide regarding Data Loading (pages 24 and 25).

Orthophotography – Delivery Blocks, Tile Counts, Tile Grid and Tile Naming Convention

Tile Counts:
12,302 tiles for 4" orthos and digital terrain datasets (Area 1 – urban)
1,080 tiles for 1' orthos and digital terrain datasets (Area 2 – national forests)
428 tiles for 4" orthos and digital terrain datasets (Area 3 – Santa Catalina Island)

Tile Grid:

Tiles for Area 1 and Area 3 – 0.25 sq. mile area, 0.5 mile length and width
(2,640 ft. x 2,640 ft.)
Tiles for Area 2 – 1 sq. mile area, 1 mile length and width
(5,280 ft. x 5,280 ft.) – Some tiles (along the edge of Area 1) are 2,640 ft. x 2,640 ft.
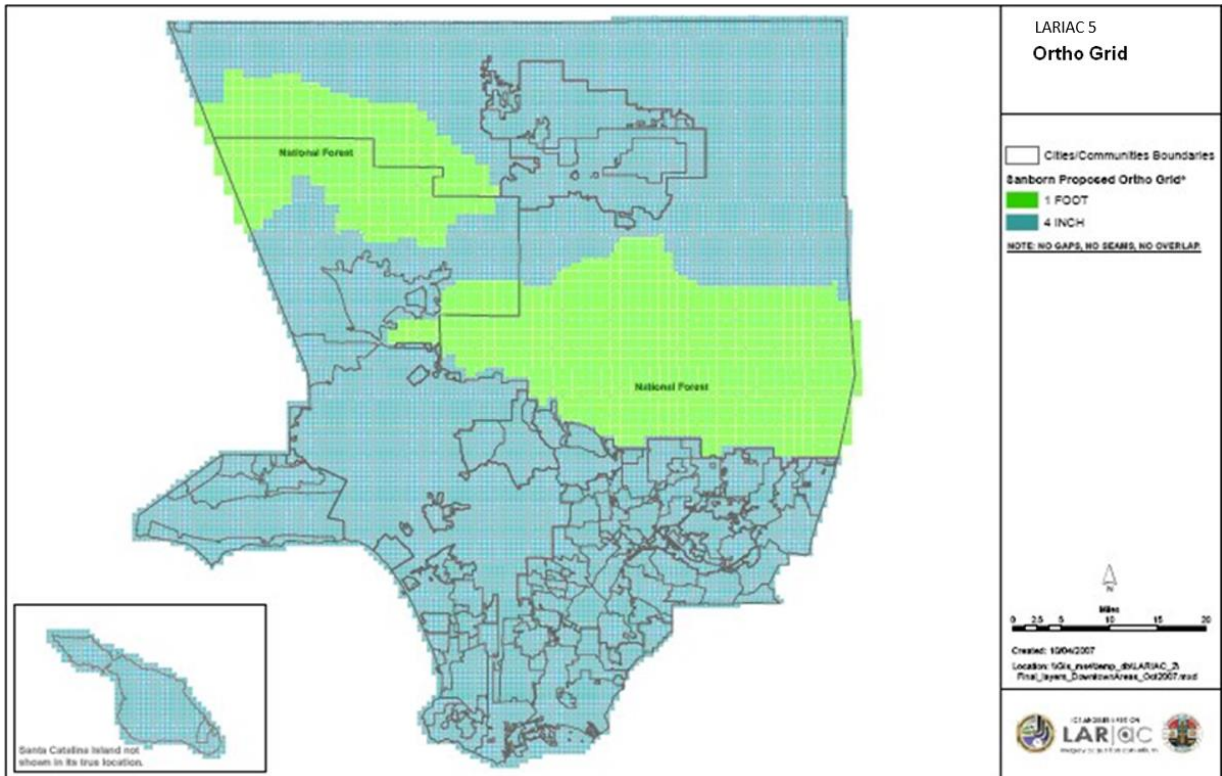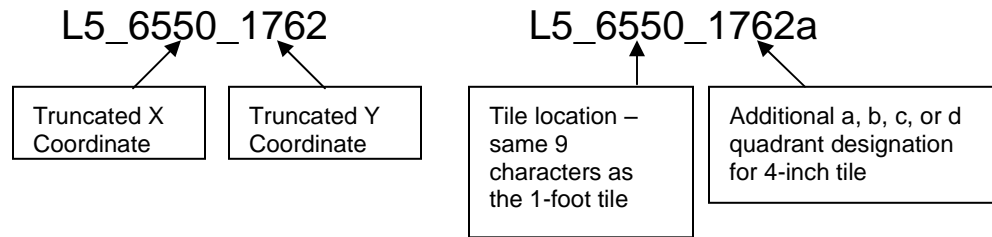

Map of tile grids (ortho delivery products).

Tile Naming Convention – Tile ID:

In order to be able to work with the tiles, it is necessary to have a unique naming convention that uses a deterministic process to identify both the geographic location, as well as the type of data product and format. Each 1-foot tile name is a 12-character ID. The first three characters, "L5_", distinguish between LARIAC and LARIAC5 data files. The latter part of the name consists of a truncated X coordinate (first 4 digits) in thousands of feet, separated with an underscore from a truncated Y coordinate in thousands (last 4 digits). Each 4-inch tile name has an additional a, b, c, or d quadrant designation.

Examples: **1-foot tile**   **4-inch tile**

L5_6550_1762   L5_6550_1762a

| Truncated X Coordinate | Truncated Y Coordinate | Tile location – same 9 characters as the 1-foot tile | Additional a, b, c, or d quadrant designation for 4-inch tile |

Sample 4-inch tiles with the LARIAC4 tile grid and naming convention.

All of the core orthophotography files are identified by this tile number and a file extension that designates the files data file format (e.g. .tif or .jp2). For all of the other LARIAC5 data products, the 12-character ID is followed by a product type identifier (suffix). The file type (product) suffix starts with an underscore and is followed by a 2- or 3-character product type designation, consisting of:

_1	1-foot resampled ortho tile
_dem	digital elevation model data
_dtm	digital terrain model data

NOTE:

Following each file name is the file extension. The extension begins with a period and then a 3 (or more) character string designation of the data format (e.g., .dwg, .dgn, .shp, .xyz, etc.).

CREDITS - HOW TO CITE THE LARIAC5 DATA

The mapping products provided under the LARIAC5 Project are an important operative component to all consortium participants and have significant value. This value must be protected by all consortium participants and parties affiliated with LARIAC5 and its contractors. When using the LARIAC5 datasets for public viewing, media or third party applications, Los Angeles County strongly encourages its LARIAC5 participants to properly cite the source of the data.

NOTE: Third party or "derived datasets" created from the LARIAC5 data are not subject to citation requirements.

Citing Pictometry Data (ortho products)
When citing the source of the Pictometry data please use one of the two following options:

Option 1 - Short Version:
> "This is a proprietary dataset provided courtesy of the Los Angeles Region Imagery Acquisition Consortium (LARIAC) and Pictometry International Corp."

Option 2 - Long Version:
> This is a proprietary dataset provided courtesy of the Los Angeles Region Imagery Acquisition Consortium (LARIAC) and Pictometry International Corp. Use other than what is allowable under license or by written permission from Pictometry International Corp. will be considered unauthorized and may be punishable by law.   Permission for external use may be given with written permission from Pictometry International Corp.

Citing Pictometry Imagery (oblique products)
When citing the Pictometry oblique imagery please use the following:
> "© Copyright 2014, Pictometry International"

Let Us Know How You Are Using the LARIAC5 Data
We want to know about your successes! The LARIAC5 Technical Advisory Group will be documenting how people are using the LARIAC5 products. This valuable information will help Los Angeles County present a strong business case to decision-makers for maintaining the County's geographic information systems (GIS) infrastructure. Please send a few sentences about how you are using the data to gis@planning.lacounty.gov.

LARIAC5 PROJECT HELP

For help using the LARIAC5 data products, users can contact:

> Los Angeles County Chief Information Office
> > Project Manager and Project Director – Steven J. Steinberg, County GIO
> > **SSteinberg@isd.lacounty.gov** (562) 392-7126

Los Angeles County Department of Regional Planning – GIS Section
  Outreach Manager – Nick Franchino, GIS Manager
  gis@planning.lacounty.gov (213) 893-0881

LARIAC5 Project information can be found at the project Web site:
  http://egis3.lacounty.gov/dataportal/lariac/

Data Quality Assurance and Distribution by:
  Dewberry Engineers Inc.
  8401 Arlington Boulevard
  Fairfax, VA 22031-4666
  Phone: (813) 421-8632
  jnovac@dewberry.com

Data Acquisition, Ortho Production, and Oblique Data Production by:
  Pictometry International Corp.
  100 Town Centre Drive, Suite A
  Rochester, NY 14623
  Phone:(888)771-9714
  carl.shoenthal@eagleview.com

CITATIONS

All citations should reference the original LARIAC Product Guide (pages 34 and 35).

Readme

This document is provided to you through the Los Angeles Region Imagery Acquisition Consortium 4 (LARIAC5) Project. It provides you with the list of Pictometry software you have received with the oblique imagery delivery, as well as the LARIAC5 Project contact information. For detailed instructions on how to get started with your oblique imagery, please refer to the Oblique Image Library Instructions included in this document.

Pictometry Software Deliverables
- Electronic Field Study (EFS) 2.7 R1.19
- Configuration Editor 2.0 release 3
- Change Analysis 2.7 R1.19
- ArcGIS Extension
- ArcMap Script

LARIAC5 Project Contact Information
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Los Angeles County Chief Information Office
    Project Manager and Project Director – Steven J. Steinberg, County GIO
    SSteinberg@isd.lacounty.gov (562) 392-7126

Los Angeles County, Department of Regional Planning – Outreach Manager
    Nick Franchino, GIS Manager
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Project information, can be found at the project Web site:
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Oblique Imagery Data Acquisition and Data Production by:
        Pictometry International Corp.
        100 Town Centre Drive, Suite A
        Rochester, NY 14623
        Phone:(888)771-9714
        carl.shoenthal@eagleview.com

Data Quality Assurance and Distribution by:
        Dewberry Engineers Inc.
        8401 Arlington Boulevard
        Fairfax, VA 22031-4666
        Phone: (703) 849-0396
        emacpherson@dewberry.com