

**USDA Service Center Initiative
Geospatial Data Acquisition, Integration and Delivery
Business Re-engineering Project**

Data Themes - Outline - Digital Ortho Quads

I. Acquisition

A. Data Source

1. Producer Information

a. Name

Digital ortho-photography quarter quadrangles (DOQs) are procured through the National Digital Ortho Photography (NDOP) program. NDOP is administered by the United States Geological Survey (USGS).

b. Location of Headquarters

US Geological Survey
523 National Center
Reston, VA 20192 USA

c. Internet Address

www.usgs.gov

2. Publisher Information

a. Name

DOQs are available through the USGS EROS Data Center.

b. Location of Headquarters

US Geological Center
EROS Data Center
Sioux Falls, South Dakota

c. Internet Address

The internet address of the USGS is www.usgs.gov

The internet address of the Eros Data Center is www.edc.usgs.gov

3. Acquisition Information

a. Delivery Media

DOQs are available on CDROM, 8mm tape cartridges, and via anonymous file transfer protocol (ftp) through the EROS Data Center. DOQ coverage and ordering information can be accessed through the Global Land Information System (GLIS) on the World Wide Web

b. Download URL

<http://mapping.usgs.gov/esic>

- c. Projected Data Availability Schedule

The NDOP program has produce DOQs covering approximately 60% of the continental U.S. as of 1/1/1999. Full coverage of the continental U.S. is expected by 1/1/2004.

B. Standards Information

1. Geospatial Data Standard

- a. Standard Name and Steward Information

USGS Standards for Digital Ortho-Photography

- b. Standard Version

12/96

- c. Standard URL

http://mapping.usgs.gov/www/ti/DOQ/standards_doq.html

2. Metadata Standard

- a. Standard Name and Steward Information

Standards for the Preparation of Digital Geospatial Metadata
Digital Ortho-photo Quadrangles

The metadata contact is:
US Geological Survey
508 National Center
Reston, VA 22092 USA

- b. Description of Metadata Captured

- c. Metadata Accuracy and Completeness Assessment

C. Acquired Data Structure

1. Geospatial Data Format

- a. Format (raster, vector, etc.)

Raster

- b. Format Name

DOQ format
Geotiff

- c. Data Extent

The continental United States

- d. Horizontal and Vertical Resolution

Horizontal resolution is 1 meter.

e. Absolute Horizontal and Vertical Accuracy

Accuracy of DOQS is based upon National Map Accuracy Standards for 1:12,000 maps.

f. Nominal Scale

g. Horizontal and Vertical Datum

The horizontal datum is the North American Datum of 1983 (NAD83).

h. Projection

Universal Transverse Mercator (UTM) coordinate system.

i. Coordinate Units

Meters.

j. Average Data Set Size

The average single band DOQ is approximately 48 Megabytes. The average multiband DOQ is 144 Megabytes.

k. Symbology

None

2. Attribute Data Format

a. Format Name

None

b. Database Size

None

3. Data Model

a. Geospatial Data Structure

Single band DOQs are available as a raw raster file. Multiple band DOQs are available in one of several formats: band sequential (BSQ), band interleaved by line (BIL), or band interleaved by pixel (BIP).

b. Attribute Data Structure

None

c. Database Table Definition

None

- d. Data Relationship Definition

None

- e. Data Dictionary

None

D. Policies

1. Restrictions

- a. Use Constraints

None

- b. Access Constraints

None

- c. Certification Issues

None

2. Maintenance

- a. Temporal Information

Photo acquisition and DOQ generation dates are contained in DOQ ASCII header.

- b. Average Update Cycle

Maintenance schedule is not established as of 1/1/99.

E. Acquisition Cost

1. Cooperative Agreement

- a. Description of Agreement

Federal, state and local government partnerships arranged for states and project blocks within states.

- b. Status of Agreement

Partnerships are on going.

2. Cost to Acquire Data

DOQs are available at a nominal cost.

II. Integration

A. Value Added Process

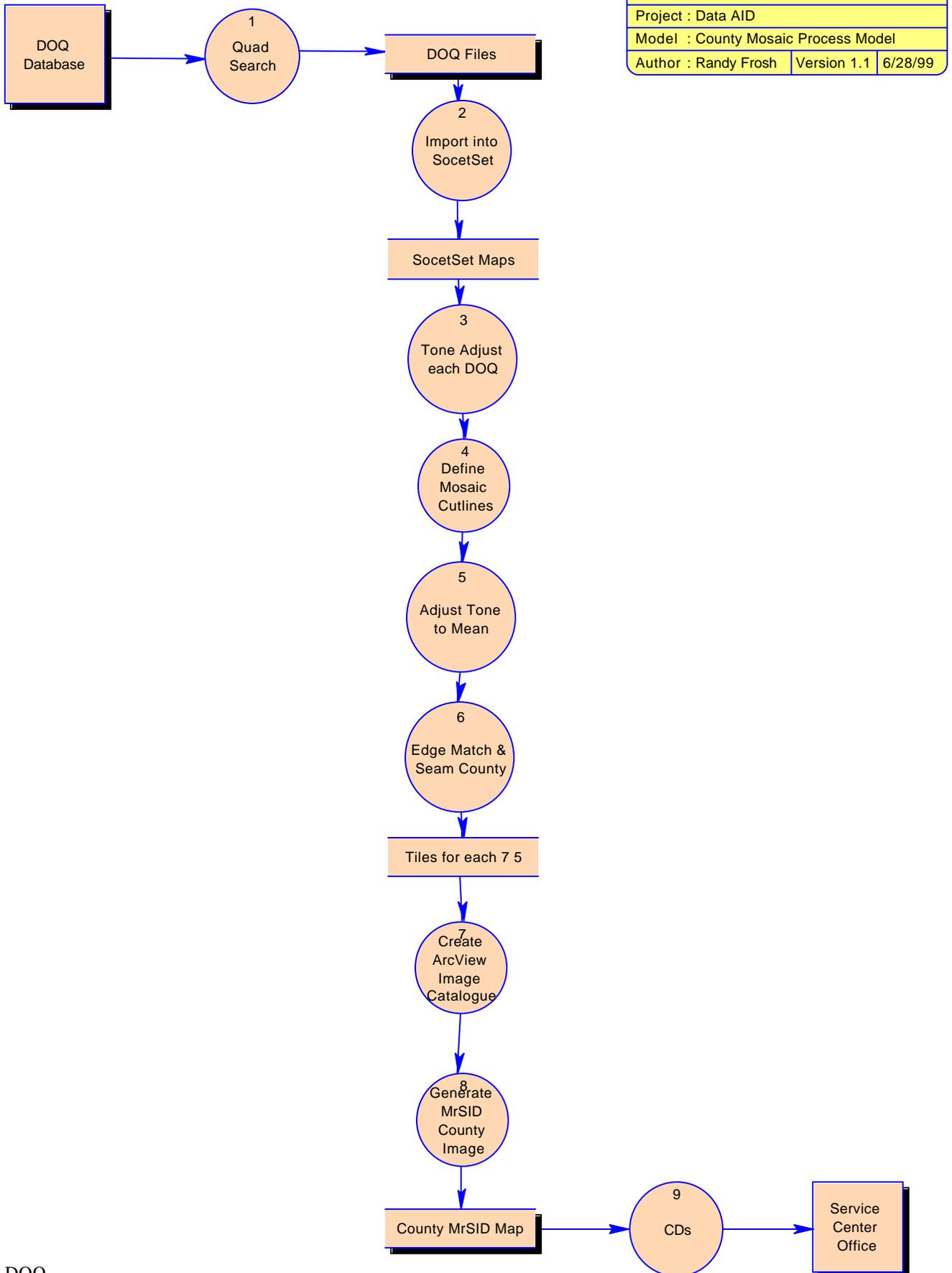
1. Benefit to the Service Center

DOQs are mosaiced to remove visible seam lines due to characteristics of the source aerial photography. This ensures that common land unit (CLU) boundaries, and other

vector datasets developed from the ortho-imagery, will be edge matched across ortho-image tiles. Data is provided in two formats, optimized for performance on the Field Service Center GIS platform: Full resolution tiles and a compressed county mosaic. The mosaic tiles supports display and work at large scales. The compressed county mosaic supports display at smaller scales as well as mobile applications that require full county, or full service center, datasets.

2. Process Model

a. Flow Diagram



Process Model		
Project : Data AID		
Model : County Mosaic Process Model		
Author : Randy Frosh	Version 1.1	6/28/99

DOQ

b. Process Description

- DOQs are selected for county coverage
- DOQs are imported into digital photogrammetric software.
- Tone adjust each DOQ to produce a well contrasted image.
- Mosaic cutlines are defined within DOQ image overedge.
- Image tone of input DOQs is adjusted to a mean value.
- Edge match and seam across county boundaries
- Image tiles are generated for each 7.5 quadrangle
- Image ArcView image catalogue created for the quadrangles
- Image tile is generated for county and compressed using MrSID.

DOQs are selected for county coverage and imported into digital photogrammetric software. Each input DOQ is tone adjusted to produce a well contrasted image. Mosaic cutlines are interactively defined within the DOQ image overedges by examining each DOQ pairwise with adjoining DOQs. The operator continually evaluates image tone differences and geometric misalignments between adjoining DOQs and interactively places the seam where both are minimized. DOQs are edge matched, or seamed across county boundaries. During the mosaicing process, the image tone of all input DOQs is adjusted towards a common value. Separate mosaic tiles, covering a 7.5' quadrangle, are generated. Tiles comprising a county are compressed into a single file using MrSID compression. A target compression ration of 20:1 is specified.

3. Technical Issues

a. Tiling

Image tiles from counties within two UTM zones will be converted into the zone covering the most area.

b. Compression

An appropriate compression ratio needs to be determined.

c. Scale

Map accuracy for the mosaic tiles and the compressed mosaic applies to a display scale of 1:12,000.

d. Tonal Matching

Tone adjustment is currently subjective. The region for collecting data for producing a common tone value for input DOQ images is a county.

e. Edge-matching

Edge matching of input DOQs is performed in agricultural areas.

4. Quality Control

a. Tiling

All input DOQs are inspected along the overedge areas. Overlaying a quarter quad vector file assesses the accuracy of quarter quad tic marks. Output mosaic tiles are

imported into ArcView and inspected along seam lines for areas of missing data and other mosaic anomalies. Imagery with defects is replaced.

- b. Acceptance Criteria .

See above.

5. Data Steward

- a. Name and Organization

Kent Williams
Aerial Photo Field Office
Farm Service Agency
US Department of Agriculture
2222 west 2300 south
Salt Lake City, Utah 84119 USA

- b. Responsibilities

The NDOP program is administered by USGS. FSA Aerial Photo Field Office is responsible for mosaicking DOQs, formatting the image tiles, and distributing the ortho-imagery to the field service center.

B. Integrated Data Structure

1. Geospatial Data Format

- a. Format (raster, vector, etc.)

Raster

- b. Format Name

TIFF with TIFF world, and ArcView image catalogue. SID with SID world.

- c. Data Extent

Individual county.

- d. Horizontal and Vertical Resolution

Same as source data.

- e. Absolute Horizontal and Vertical Accuracy

Same as source data.

- f. Nominal Scale

Same as source data.

- g. Horizontal and Vertical Datum

Same as source data.

- h. Projection

Same as source data. Image tiles in counties covering two UTM zones will be converted to the predominant zone.

- i. Coordinate Units

Same as source data.

- j. Symbology

None.

2. Attribute Data Format

- a. Format Name

None.

- b. Database Size

None

3. Data Model

- a. Geospatial Data Structure

County Ortho		Township Ortho	
sid.sdw	sdw file	tncmc.tfw	tfw file
sid.sid	sid.file	tncmc.tif	tif file

- b. Attribute Data Structure

None

- c. Database Table Definition

None

- d. Data Relationship Definition

None

- e. Data Dictionary

None

C. Resource Requirements

1. Hardware and Software

Integration of DOQs at FSA APFO is currently performed with SocetSet version 4.01 mosaicking software running on SUN Ultra workstations.

2. Staffing

D. Integration Cost

1. Hardware and Software
2. Staffing

III. Delivery

A. Specifications

1. Directory Structure
 - a. Folder Theme Data is Stored In

\Ortho Imagery

2. File Naming Convention

- a. List of Theme Files and The File Naming Convention

Version 5

nnnnn.sdw (nn=state FIPS code, nnn=county FIPS code)

nnnnn.sid (nn=state FIPS code, nnn=county FIPS code)

tncrnc.tfw (tnc=township, rnc=range)

tncrnc.tif (tnc=township, rnc=range)

(version 7)

\Service Center Themes

\<County Name>

\Cyyxxxnn.tif

Where:

C = Single character product code:

m = indicating a complete mosaic of 4 DOQs

x = indicating an incomplete mosaic (missing 1 or more DOQs)

z = indicating a mosaicked quad that has been reprojected into the predominant UTM zone of a county.

yy = Latitude of 1 degree block, with leading zeros

xxx = Longitude of 1 degree block

nn = 7.5 quad number within 1 degree block; 1 to 64 quads, running east to west, north to south.

\<County Name>.sid

MrSID compressed file of quads comprising a county.

B. User Information

1. Accuracy Assessment

- a. Alignment with Other Theme Geospatial Data

DOQs are produced to meet National Map Accuracy Standards at 1:12,000. The DOQ mosaics meet the same standards. Data captured from DOQs, or other data sets meeting NMAS at 1:12,000 should align with the DOQ mosaics.

- b. Content

The data is digital ortho-rectified imagery.

2. Appropriate Uses of the Geospatial Data

a. Display Scale

The resolution of the DOQs and the ortho quad mosaics allow them to be displayed and used at scales substantially larger than the accuracy specifications to which they were produced. It should be noted that while "heads up" digitizing at display scales larger than 1:12,000 may allow for more accuracy of the digitized data in a relative sense, i.e., digitized linework may more accurately follow features visible on the ortho-image, it will not necessarily lead to an improvement in absolute horizontal accuracy. Similar consideration should be given when using the ortho quad mosaics for map revision

b. Plot Scale

Hardcopy plots of the ortho quad mosaics can be horizontally accurate to NMAAS specifications for 1:12,000 maps. Consideration should be given to the dimensional stability of the plot media as well as the geometric accuracy of the plotting device.

c. Area Calculations

The ortho quad mosaics and the DOQs from which they were produced are an orthographic projection; i.e. they represent a vertical perspective of all ground features on the image. Relatively flat surfaces can be measured with accuracy that matches the source data. Area calculations of relatively steep surface must consider the effects of the vertical perspective.

d. Decision Making

The ortho mosaic quads are a composite of as many as 16 separate DOQs. Use of the ortho quad mosaics must consider the date of the source aerial photography used to produce the DOQs.

C. Maintenance and Updating

1. Recommendations and Guidelines

a. Frequency of Updates

A maintenance/update schedule for DOQs, and the ortho quad mosaics produced from DOQs, has not yet been determined.

b. Location for the Theme Data to be Maintained

The ortho quad mosaics will be warehoused at USDA Aerial Photo Field Office, Salt Lake City, Utah.

c. Maintenance and Updating Procedures Overview

Maintenance and update procedures have not yet been defined.