

**USDA Service Center Agencies
Geospatial Data Management Team
Data Management Plan For**

Ortho Imagery-National Digital Ortho Photography Program

**January 2005
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I. Purpose and Scope (business case)

A. Purpose

These products are used for CLU digitizing and boundary maintenance, Farm Program administration, conservation planning and Soil Survey production.

Digital Ortho Photo Quarter Quads (DOQQs) are acquired by the National Digital Ortho Photography Program (NDOP), and administered by the U.S. Geological Survey (USGS). NDOP DOQQs are acquired in spring or fall, or “leaf off”. Full national coverage of DOQQs will be achieved in 2004.

B. Scope

The scope of the dataset is the continental United States.

For source year for available digital orthophotoquads see:

http://www.ndop.gov/status_doq_range2.html

For National Aerial Photography Program Cycle-4 Forecast of future photography see:

http://www.ndop.gov/status_napp4.html

II. Acquisition

A. Data Source

1. Producer Information

a. Name

US Geological Survey

b. Location of Headquarters

USGS National Center
12201 Sunrise Valley Drive
Reston, VA 20192, USA

c. Internet Address

<http://www.usgs.gov/>

2. Publisher Information

a. Name

DOQs are available through the USGS EROS Data Center.

- b. Location of Headquarters

US Geological Survey
EROS Data Center
Sioux Falls, South Dakota

- c. Internet Address

<http://edc.usgs.gov/>

3. Acquisition Information

- a. Delivery Media

NDOP DOQs are available on CDROM, DVD, and DLT tapes
- b. Download URL

www.nationalmap.usgs.gov
- c. Projected Data Availability Schedule

DOQs are available generally within 14 months of acquisition.

B. Standards Information

1. Geospatial Data Standard

- a. Standard Name and Steward Information

United States Department of Agriculture (USDA) Service Center Agencies (SCA)
Standard for Geospatial Data
- b. Standard Version

SCI Std 003-02
October 15, 2003
- c. Standard URL

<http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataStandard.pdf>

2. Metadata Standard

- a. Standard Name and Steward Information

Metadata are compliant with:
Federal Geographic Data Committee (FGDC)
Content Standard for Digital Geographic Metadata FGDC
STD-001-1998 Version 2 revised June 1998

And:
United States Department of Agriculture (USDA) Service Center Agencies (SCA)
Standard for Geospatial Dataset Metadata
SCI Std 003-02 October 15, 2003

<http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDatasetFileMetadata.pdf>
- 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

The format is Geotiff and DOQ format.

- c. Data Extent

Continental United States

- d. Horizontal and Vertical Resolution

Horizontal resolution is one meter.

- e. Absolute Horizontal and Vertical Accuracy

Accuracy of DOQs is based on National Map Accuracy Standards for 1:12,000 maps.

- f. Nominal Scale

1:12,000

- g. Horizontal and Vertical Datum

The datum is North American Datum 1983 for all appropriate areas (UTM zone 3 through 22) and World Geodetic System 1984 elsewhere. The vertical datum is mean sea level.

- h. Projection

Universal Transverse Mercator (UTM)

- i. Coordinate Units

Metes

- j. Average Data Set Size

The average single band DOQ is approximately 48 megabytes. The average three-band DOQ is 144 megabytes.

- k. Symbology

None

2. Attribute Data Format

- a. Format Name

Raster data sets with no attribute information.

- b. Database Size

Not Applicable to raster data sets.

3. Data Model

- a. Geospatial Data Structure

Single Band DOQs are available as a raw raster file. 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

Not Applicable to raster data sets.

- c. Database Table Definition

Not Applicable to raster data sets.

- d. Data Relationship Definition

Not Applicable to raster data sets.

- e. Data Dictionary

Not Applicable to raster data sets.

D. Policies

1. Restrictions

- a. Use Constraints

Ortho imagery used to develop critical USDA datasets shall meet USDA Geospatial data standards. Service Center Standards require register with SCA data sets, such as CLU.

- b. Access Constraints

None. Ortho imagery for the service center is in the public domain. FGDC guidelines for data acquisition and sharing apply. The maps must be made available to the public. Any NRI imagery is an exception.

- c. Certification Issues

Compressed county mosaics (CCMs), metadata text file, and projection file (.aux) and index shape and metadata files are delivered from vendor on CD to APFO. Two sets for each county deliverable are provided to APFO. After a cursory inspection that checks for proper projection, no missing data, etc, a CD is sent to cost share partners as well as FSA state offices

The CCM is delivered as soon as possible to Service Centers for use in aerial compliance. The full resolution tiles are delivered from contractors later in the acquisition process for a full inspection process, storage in GDW and as source material for any rework.

After a full inspection of quarter quads and any resulting rework, a new CMM is produced and distributed to the SC and all cost share partners. Rework can also result

from feedback and requests from Service Centers. Delivery options include CD/DVD, DLT7000, and Firewire/USB2 hard drives.

Ortho imagery stored on local servers should be synchronized with ortho imagery in the USDA Geospatial GDW for critical applications. Users accessing ortho imagery via GDW Internet Mapping Services (IMS) should have the same view as users accessing the imagery from local storage in a Field Service Center. Certified ortho imagery will be hosted in the GDW raster data mart to support IMS applications. Non-standard or un-certified imagery will not be hosted on the GDW IMS.

2. Maintenance

a. Temporal Information

For DOQs, image acquisition and production dates are contained in the embedded header.

b. Average Update Cycle

NDOP continues to acquire DOQs on a project basis, usually in partnership with state governments and other federal agencies.

E. Acquisition Cost

1. Cooperative Agreement

a. Description of Agreement

NDOP is managed by USGS and acquired through cooperative funding partnerships.

b. Status of Agreement

Partnerships for NDOP are ongoing.

2. Cost to Acquire Data

NDOP quarter quads are available from USGS at a nominal cost.

III. Integration

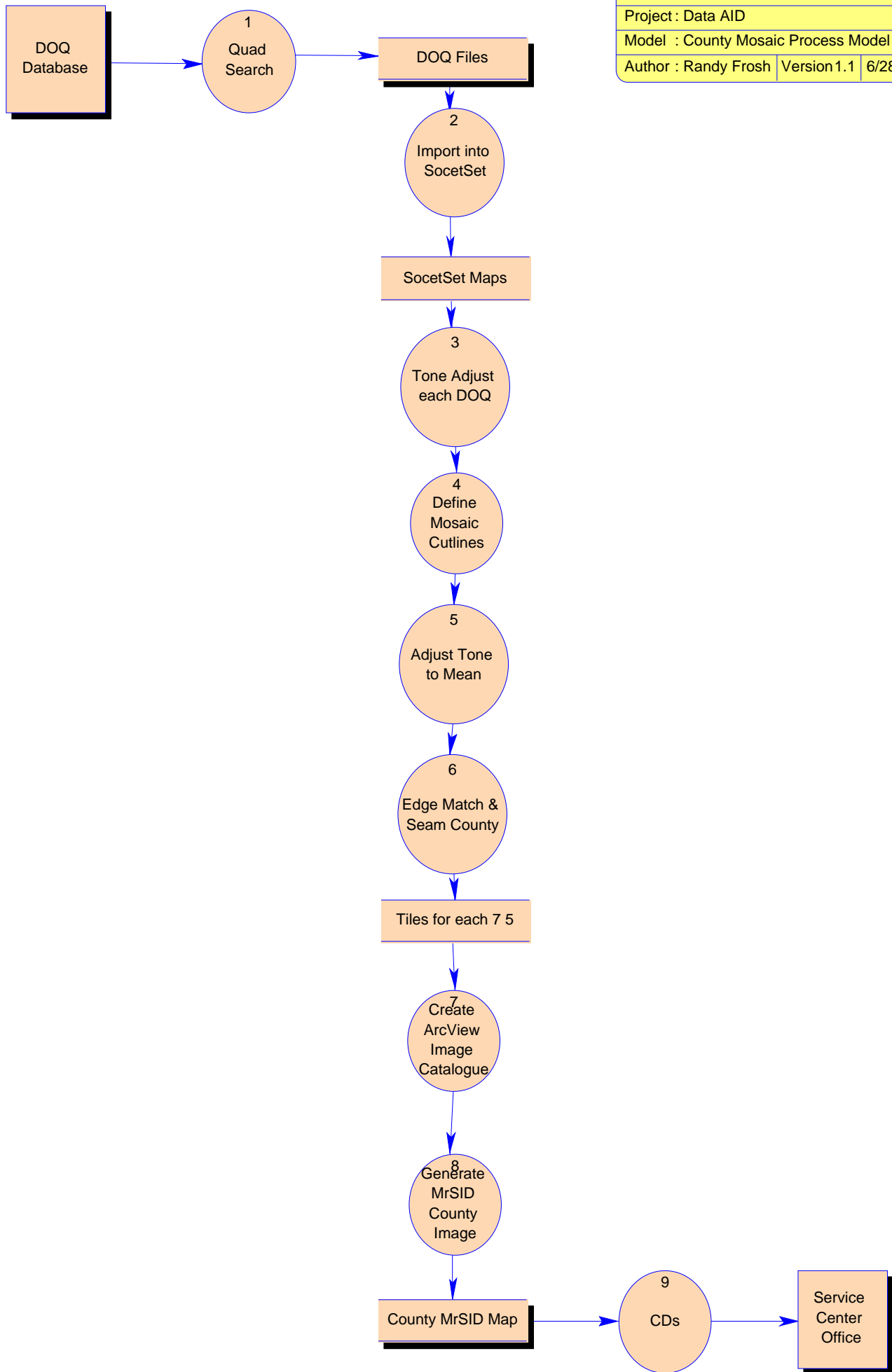
A. Value Added Process

1. Benefit to the Service Center

The integration process benefits the service center by providing and ensuring that digital ortho imagery made available to Service Centers meet SCA standards. Integration involves inspecting the imagery for content, performing rework and transforming the imagery to Service Center standard projection if necessary and producing a compressed county mosaic in a single UTM zone. Rework on MDOQ ortho imagery is supported. Custom requests are supported as resources permit.

2. Process Model

a. Flow Diagram



b. Process Description

The integration process for NDOP DOQs consists of tone or color balancing DOQs and mosaicking them into a compressed county mosaic in a single UTM zone. Both Lizardtech's MrSID and ERMapper ECW compression software can be used. DOQs mosaicked by APFO, known as mosaicked DOQs (MDOQs) are edged matched to within 3 meters and tone/color balanced both within and between counties. DOQs mosaicked by NCGC, enhanced DOQs (EDOQs), are tone/color balanced only.

Rework on MDOQ ortho imagery is supported. Problem reports and requests must be reported to the MDOQ Data steward. To ensure that most current version tiles are used, POC will send data center production staff a shape file and table containing the quarter quads tiles required for reworking the compressed county mosaic (CCM). NAIP imagery is warranted up to the end of the calendar year of acquisition. Data Center production staff will perform rework.

- DOQs are selected for county coverage
- DOQs are imported into digital photogram metric software.
- Tone adjusts each DOQ to produce a well contrasted image.
- Mosaic cut lines are defined within DOQ image over edge.
- 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 photogram metric software. Each input DOQ is tone adjusted to produce a well contrasted image. Mosaic cut lines are interactively defined within the DOQ image over edges by examining each DOQ pair wise 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

A 20:1 target compression ratio for panchromatic MDOQs and a 50:1 target compression ratio for CIR MDOQs are currently employed.

c. Scale

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

d. Tonal Matching

Color balancing standards for MDOQ mosaics is subjective. The region for collecting statistics for producing color or tone balancing is a county.

e. Edge-matching

Edge matching of input DOQs is performed on agricultural areas of the imagery.

4. Quality Control

a. Procedures

Since every input DOQ is examined pair wise with adjoining DOQs during interactive seaming, the mosaic process in effect, is quality assurance on 100% of the DOQs that comprise a county mosaic.

All input DOQs are inspected along the over edge areas. Output mosaic tiles are inspected along seam lines for areas of missing data and other mosaic anomalies.

b. Acceptance Criteria

See above.

5. Data Steward

a. Name and Organization

Kent Williams
USDA APFO
2222 west 2300 south
Salt Lake City, UT 84119

b. Responsibilities

The Data Steward for NAIP imagery will:

1. Act as the designated authority and point of contact for all business-area decisions concerning the database. Responsibilities include obtaining the needs/requirements from the users, and coordinating with the Data Team on metadata and other data management issues.

2. Establish and maintain business rules and consistent definitions for data elements, identify data domains and relationships, establish data quality and certification standards associated with the contents of the database, and recommend availability, security and access authority for the data

3. Ensure that metadata is collected, approved, and certified for release according to the adopted industry, Federal and USDA metadata and data management standards.

4. Ensure the validity, accuracy and completeness of the physical data and supporting metadata; certify that data meets quality standards; and certify that data is ready for release for internal and/or public use.

5. Provide training within the Data Steward's business area on data management roles and responsibilities.

B. Integrated Data Structure

1. Geospatial Data Format

a. Format (raster, vector, etc.)

Raster

b. Format Name

DOQ for quads and MrSID with world file for county mosaics.

c. Data Extent

7.5 minute for quads and individual county for mosaics.

d. Horizontal and Vertical Resolution

One meter.

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

Generally, not Applicable to raster data sets.

<http://www.itc.nrcs.usda.gov/scdm/docs/SPG-StandardforGeospatialSymbology.pdf>

2. Attribute Data Format

a. Format Name

Not Applicable to raster data sets.

b. Database Size

Not Applicable to raster data sets.

3. Data Model

a. Geospatial Data Structure

DOQ for quads and compressed county mosaic with world file.

b. Attribute Data Structure

Not Applicable to raster data sets.

- c. Database Table Definition
Not Applicable to raster data sets.
- d. Data Relationship Definition
Not Applicable to raster data sets.
- e. Data Dictionary
Not Applicable to raster data sets.

C. Resource Requirements

1. Hardware and Software

Quality Assurance of NDOP imagery is performed on ArcGIS running on Dell workstations.

2. Staffing

Unknown

D. Integration Cost

1. Hardware and Software

Unknown

2. Staffing

Unknown

IV. Delivery

A. Specifications

1. Directory Structure

The different versions of ortho imagery are all stored in the imagery/ortho_imagery subfolder.

- a. Folder Theme Data is Stored In

F:\geodata\ ortho_imagery

<http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataSetFileNamingStandard.pdf>

2. File Naming Convention

<http://www.itc.nrcs.usda.gov/scdm/docs/SPG-GeospatialDataSetFileNamingStandard.pdf>

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

Quads	<a><nnnnnnn>_<yyyymmdd>
Mosaics	ortho_e<x-x>_<f>_<stnnn>

B. User Information

1. Accuracy Assessment

- a. Alignment with Other Theme Geospatial Data

Meets National Map Accuracy Standards for 1:12,000. 90% of well defined points are within 10 meters of higher order accuracy, i.e., ground survey

b. Content

The data is ortho-rectified digital imagery.

2. Appropriate Uses of the Geospatial Data

a. Display Scale

The resolution of the NAIP and DOQ compressed county mosaics allow them to be displayed 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 line work 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 compressed county mosaics for map revision.

b. Plot Scale

Hardcopy plots of the compressed county ortho mosaics can be horizontally accurate to National Map Accuracy Scale (NMAS) 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 compressed county ortho mosaics and the full resolution images 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 surfaces must consider the effects of the vertical perspective.

d. Decision Making

The final NAIP one meter compressed county mosaic and the enhanced MDOQ mosaic from APFO, are the officially approved products for all service center applications. Other USDA versions of DOQ mosaics may also be used as needed.

C. Maintenance and Updating

1. Recommendations and Guidelines

a. Original data location and structure

The permanent database is at APFO. The most current version of ortho imagery for each year shall be kept on-line at the service center. Older versions shall not be maintained on the server at the service center.

Service Center servers should maintain the most current copy of all imagery in the proper f:\geodata folder for daily use. As new imagery becomes available Service Centers should replace the daily working copies in the f:\geodata folder with the newer imagery and move the older set to an archive folder (as yet unidentified). Any previous versions of the imagery should be moved off the server for a historical local archive and onto other media, such as CD, DVD, or tape.

b. Update Cycle

NDOP DOQs will be updated on a project by project basis.

c. Availability

Ortho imagery that meets Service Center standards will be loaded and managed in the Geospatial Data Warehouse (GDW). Ortho imagery is stored uncompressed at one-meter resolution.

d. Change Control

The most current version of standard ortho image data is managed in the GDW in SDE databases. The databases consist of full resolution quarter quads mosaicked into one degree x one degree raster catalog. There is a separate database for color and color infrared (CIR) NAIP, panchromatic (black and white) MDOQs, and CIR MDOQs.

The SDE image data base component of the GDW provides the authoritative source for populating data marts and internet mapping services. The on-line imagery is replicated between APFO and NCGC to provide a fail-over capability.

The original full resolution image tiles are stored on high speed tape under a Hierarchical Storage Management (HSM) system in a robotic tape silo. This means that all versions of the imagery will be maintained and can be accessed and retrieved from tape upon request for delivery.