

# Orthoimagery Standards

## Chatham County, Georgia

Jason Lee and Noel Perkins



# SAGIS

Savannah Area Geographic  
Information System

## Table of Contents

<b>Introduction</b> .....	<b>1</b>
Objective .....	1.1
<b>Data Description</b> .....	<b>2</b>
<b>Spatial and Temporal Environments</b> .....	<b>3</b>
Spatial Extent and Tiling .....	3.1
Seasonal acquisition times .....	3.2
Time of day acquisition and conditions .....	3.3
<b>Sensor Equipment</b> .....	<b>4</b>
<b>Image Parameters and Specifications</b> .....	<b>5</b>
Image Resolution .....	5.1
Orthorectification .....	5.2
Consistency .....	5.3
Accuracy .....	5.4
Image Quality .....	5.5
Radiometric Resolution .....	5.6
<b>Deliverables</b> .....	<b>6</b>
Image Deliverables .....	6.1
Metadata .....	6.2
Final Report .....	6.3
<b>Projections</b> .....	<b>7</b>
Primary Projection .....	7.1
Secondary Projection .....	7.2
<b>Miscellaneous</b> .....	

## 1 Introduction

### 1.1 Objective

This document presents the standards by which orthoimagery is collected, processed and delivered to Savannah Area GIS (SAGIS) and or partners of SAGIS. Specifications include all details SAGIS deems relevant to create a product of consistent appearance and accuracy for the multiple uses required by the citizens of Chatham County and Savannah. Metadata prerequisites are also discussed.

SAGIS has adopted the Federal Geographic Data Committee (FGDC) “Content Standards for Digital Orthoimagery”, (February 1999; [http://www.fgdc.gov/standards/projects/FGDC-standards-projects/orthoimagery/orth\\_299.pdf](http://www.fgdc.gov/standards/projects/FGDC-standards-projects/orthoimagery/orth_299.pdf)) as its baseline standards. The following specifications are addendums or improvements to that FGDC format.

These specifications are not written as a static document, but as needs and GIS continue to evolve so will this document. SAGIS has established an Imagery Committee in anticipation of this, and this Committee is charged with monitoring and improving on these specifications. The Imagery Committee is made up of both municipal and private stakeholders so that all needs will be considered.

## 2 Data Description

SAGIS accepts the following orthoimage definition:

“A digital orthoimage is a georeferenced image prepared from a perspective photograph or other remotely-sensed data in which displacement of objects due to sensor orientation and terrain relief have been removed. It has the geometric characteristics of a map and the image qualities of a photograph. Digital orthoimages are composed of an array of georeferenced pixels that encode ground reflectance as a discrete value. Digital orthoimagery comes from various sources and in a number of formats, spatial resolutions,

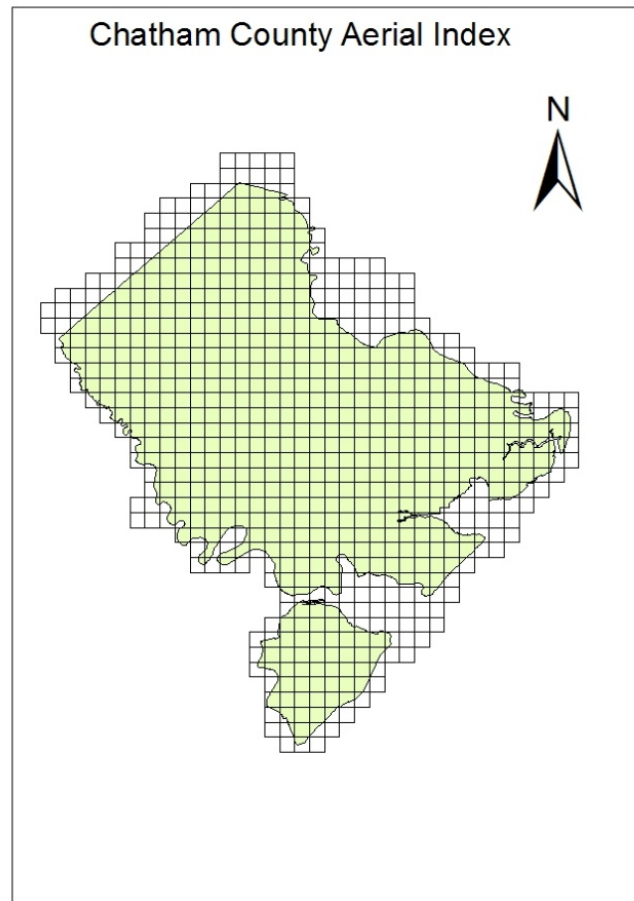


and areas of coverage. Many geographic features, including some in other framework data themes, can be interpreted and compiled from an orthoimage.” FGDC “Content Standards for Digital Orthoimagery”

### 3 Spatial and Temporal Environments

#### 3.1 Spatial Extent and Tiling

SAGIS requires that its orthoimagery be tiled according to the Chatham County Aerial Index, used on previous acquisitions for Chatham County. This Index will be provided to contractor by SAGIS. The Areal Extent of imagery shall also be based on this layer, unless otherwise specified. The Metadata should list all date(s) and time(s) of acquisition in conjunction with each tile identifier. The polygonal Index should also be amended to reflect any multiple images in individual tiles (footprints), and both a date field named DATE and a time field named TIME should be added.



### 3.2 Seasonal acquisition times

Although there may be special considerations concerning the season of the year in which the flight shall take place, unless otherwise stated in the producer's contract, images will be acquired in 'leaf off' conditions. 'Leaf off' will be defined as that seasonal time period when deciduous trees have lost their leaves, typically December, January and February for coastal Georgia. This acquisition time period is optimal for penetrating canopy and viewing ground objects. Seasonal acquisition times require approval by SAGIS, and will be rejected if optimal conditions are not met.

### 3.3 Time of day acquisition and conditions

As with season acquisition times, there may be special considerations to this specification, but unless otherwise stated the imagery should be acquired in a daylight condition (defined as a sun angle greater than 30°) in which shadow effects are minimal. Cloud-free conditions are required. Obscuring or any other atmospheric effects must be minimal. Imagery with excessive shadowing, clouds, haze or other visual obstructions may be refused by SAGIS. Ground conditions should be optimal; for instance recent flooding would be prohibitive. Also, acquisition during the lower half of the tide cycle is preferred for tidally influenced areas.

## 4 Sensor Equipment

All imagery must be collected with a SAGIS approved airborne digital imagery sensor (partly due to the superior radiometric image quality as compared to film). Sensors likely to be approved include the Leica ADS40-SH52, Vexcel UltraCAM, or Intergraph DMC airborne imaging sensor. All bands must be co-registered in the nadir position.

## 5 Image Parameters and Specifications

### 5.1 Image Resolution

Unless declared otherwise, all one foot raw imagery will have a nominal ground sampling resolution not to exceed .9 feet. One foot orthorectified images shall be delivered resampled to 1.0 foot pixels. All six inch imagery will have a nominal ground sampling resolution of not to exceed 5.5 inches. Six inch orthorectified images shall be delivered resampled to 6 inch pixels.

### 5.2 Orthorectification

The most accurate DEM available must be used for orthorectification. Currently that will be one based on the 1999 LiDAR for Chatham County.



### 5.3 Consistency

Spatial consistency with existing orthoimagery will be a primary goal of the contractor. Currently those are the 2004 True-Color Orthoimagery and the 2001 Black and White Orthoimagery.

### 5.4 Accuracy

These specifications include an absolute horizontal accuracy of  $\pm 5$  feet at the 95% confidence interval for one foot imagery, and  $\pm 2.5$  feet at the 95% confidence level for six inch imagery. Orthoimagery shall meet or exceed this as defined by the FGDC Geopositioning Accuracy Standards, part 3: National Standard for Spatial Data Accuracy

(<http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy/part3/chapter3>). A minimum of 50 independent checkpoints should be acquired for accuracy testing. At minimum checkpoints shall be spaced at intervals of at most 10% of the diagonal distance across the dataset and at least 20 percent of the points are located in each quadrant of the dataset. The check points will be part of the delivery package, and will contain a field that references the orthoindex.

### 5.5 Image Quality

Color consistency with existing orthoimagery will be a primary goal of the contractor. Currently that is the 2004 True-Color Orthoimagery. Color balancing should be performed on all tiles with as little loss of original data as possible. Any enhancements that may be deemed radical should be detailed in the Final Report. A full seamless mosaic of the tiles should then be produced and used for visual assessment of the radiometric processing. The mosaic will also be part of the delivery package.

### 5.6 Radiometric Resolution



Each band of imagery will be delivered as no less than 8-bit binary data. The True Color Imagery will consist of 24 bit red, green, blue (RGB) imagery. Infrared bands will be in the near infrared wavelengths of the spectrum, preferably 835–885 nm.

### Specification Table for Orthoimagery

Horizontal Accuracy	+/- 5 feet horizontal accuracy OR +/- 2.5 feet horizontal accuracy
Vertical Accuracy	DEM based
Pixel size	1 foot or .5 foot
Data Format uncompressed	GeoTIFF with world file
Data Format compressed	MrSID or JPEG2000 with world file
Primary Projection	State Plane GA East US Foot
Secondary Projection	UTM 17N NAD 83

## 6 Deliverables

### 6.1 Image Deliverables





Two formats will be required; uncompressed GeoTIFF with a projection file, and a compressed version (JPEG2000 or MrSID Gen3). The (lossy) compression rate will be determined by SAGIS, and will require the contractor providing samples of compressed imagery before final approval.

## 6.2 Metadata

Metadata must comply with FGDC Content Standard for Metadata, which will be drafted for the project as a whole. Processing methodology should be robust in description, but will also only be drafted for the entire project. Individual image differences that require detailing in metadata should be listed there. As stated before, a list of acquisition dates and times in conjunction with image identifiers should be included.

## 6.3 Final Report

The Final Report should contain, in document form, the information found in the Metadata, and also any other information deemed appropriate for use of the imagery. This should include at least an accuracy report and general notes concerning the both the flight and orthorectification process.

### Delivery Table for Orthoimagery

DATA	Format
Metadata	ArcGIS Xml
Edited Tile Index	Polygon feature class and DWG with labels
Checkpoints	Point feature class & ASCII
Final Report	Hardcopy and PDF

Individual Image Tiles, uncompressed	GeoTIFF
Mosaic of Image Tiles, uncompressed	GeoTIFF
Individual Image Tiles, compressed	MrSID or JPEG2000
Mosaic of Image Tiles, compressed	MrSID or JPEG2000

## 7 Projections

### 7.1 Primary Projection

The SAGIS projection is State Plane Georgia East NAD 1983 FIPS 1001. It is based on a Transverse Mercator projection with the following parameters:

- False Easting: 656166.666666666510000000
- False Northing: 0.000000000000000000
- Central Meridian: -82.166666666666671000
- Scale Factor: 0.999900000000000010
- Latitude of Origin: 30.000000000000000000
- Linear Units US Foot
- Prime Meridian: Greenwich
- Spheroid: GRS 1980



Semi-minor Axis: 6356752.3141403561

Angular Units: Degree

## 7.2 Secondary Projection

SAGIS may also request a secondary projection if the data may be included in statewide or regional datasets. The Secondary Projection will usually be UTM Zone 17 North, NAD 1983. It is based on a Transverse Mercator Projection with the following parameters.

False\_Easting: 500000.00000000

False\_Northing: 0.00000000

Central\_Meridian: -81.00000000

Scale\_Factor: 0.99960000

Latitude\_Of\_Origin: 0.00000000

Linear Unit: Meter

## 8 Miscellaneous

The contractor shall retain the original raw imagery and a copy of the processed imagery for at least 5 years, and must contact SAGIS before removing or deleting data.

All data should be delivered on USB/Firewire drives of 500 GB minimum.

Contact: Jason Lee ,[jlee@thempc.org](mailto:jlee@thempc.org), 912-651-1493 or Noel Perkins, [perkinsn@thempc.org](mailto:perkinsn@thempc.org), 912-651-1476

