

**ORTHOPROCESSING REPORT
BLUESTONE LAKE AND DOWNSTREAM
DIGITAL ELEVATION MODEL AND
ORTHOPHOTOGRAPHY PROJECT**



**PREPARED FOR:
U.S. ARMY CORPS OF ENGINEERS
HUNTINGTON DISTRICT**



**PREPARED BY:
3001, INC.**

SURVEY ID: H1200903

PROJECT ID: BLN

CONTRACT# W91237-08-D-0002

DELIVERY ORDER NO.: 0006

DATE: 30 NOVEMBER 2009

**ORTHOPROCESSING REPORT
BLUESTONE LAKE AND DOWNSTREAM
DIGITAL ELEVATION MODEL AND ORTHOPHOTOGRAPHY PROJECT**

West Virginia

Prepared For:

USACE Huntington District
502 Eighth Street
Huntington, WV 25701

Prepared By:

3001, Inc.
401 Dividend Drive, Suite K
Peachtree City, GA 30269
Phone: 770.631.0903

Table of Contents

| | |
|------------------------------------|---|
| Introduction | 4 |
| Project Area | 4 |
| Data & Image Processing | 4 |
| Source Image Data | 4 |
| Ortho-Rectification | 4 |
| Mosaicing and Finishing | 4 |
| Orthophoto Accuracy Analysis | 4 |

ORTHOPROCESSING REPORT

BLUESTONE LAKE AND DOWNSTREAM

DIGITAL ELEVATION MODEL AND ORTHOPHOTOGRAPHY PROJECT

Introduction

This report describes the orthorectification process used to generate digital orthophoto images for the 2009 USACE Huntington District – Bluestone Lake and Downstream Digital Elevation Models and Orthophotography Project.

Project Area

The project area encompasses approximately 1,425 sq miles in West Virginia, including Bluestone Lake and its headwater tributaries, and the drainage corridor and its included tributaries along the New River downstream to approximately mile 0, and the Kanawha River and its tributaries.

Data & Image Processing

Source Image Data

The source image data used to produce the orthophoto images was collected from April 9 – April 27, 2009. The results of the collection effort and AT processing are described in the report “Aerial Triangulation Report, Bluestone Lake and Downstream Elevation Model and Orthophotography Project”, dated May 2009, by Woolpert under subcontract to 3001, Inc.

Ortho-Rectification

Each block was orthographically rectified using Leica GPRO software version 3.3.1 to correct imagery for relief displacement using Digital Elevation Models (DEM) of the acquisitioned areas. DEMs used in this process were created from bare earth surface filtered LiDAR collected between April 4 and April 17, 2009, and processed in support of this project.

Mosaicing and Finishing

The ortho-rectified images were mosaiced together using a combination of manual and automated seamline processes in the OrthoVista software version 4.4. Project specified digital orthophoto images were clipped from the mosaic. The images were reviewed for local rectification errors and edits made to correct if necessary. GeoTIFF headers were applied to the final digital orthophoto images to provide spatial reference for GIS software.

Orthophoto Accuracy Analysis

Control points collected and used in the AT processing were measured in the digital orthophoto images to determine overall positional accuracy as described in FGDC Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA). The control point collection and processing effort is described in the report “Photogrammetric Ground Control Survey Report, Bluestone Lake and Downstream Digital Elevation Model and Orthophotography Project”, dated May 2009, by Woolpert under subcontract to 3001, Inc. Orthophoto accuracy measurements were performed using ESRI ArcGIS software version 9.2.

ORTHOPHOTO ACCURACY REPORT FOR 1-FOOT ORTHO AREA

| POINT ID | CONTROL | | MEASURED | | DELTA (feet) | | |
|----------|-------------|------------|-------------|------------|--------------|----------|-------|
| | EASTING | NORTHING | EASTING | NORTHING | EASTING | NORTHING | HORIZ |
| 109 | 1914171.980 | 468026.600 | 1914169.547 | 468026.043 | 2.433 | 0.557 | 2.496 |
| 102 | 1669030.670 | 673322.930 | 1669032.444 | 673322.711 | -1.774 | 0.219 | 1.787 |
| 126 | 1692436.000 | 618071.420 | 1692436.250 | 618071.361 | -0.250 | 0.059 | 0.257 |
| 123 | 1725459.390 | 527900.000 | 1725459.660 | 527900.142 | -0.270 | -0.142 | 0.305 |
| 106 | 1833452.200 | 536945.590 | 1833453.718 | 536945.172 | -1.518 | 0.418 | 1.574 |
| 124 | 1800538.870 | 481819.980 | 1800539.484 | 481819.296 | -0.614 | 0.684 | 0.919 |
| 107 | 1865367.680 | 568264.410 | 1865369.012 | 568263.969 | -1.332 | 0.441 | 1.403 |
| 132 | 1881151.610 | 428491.870 | 1881150.058 | 428491.355 | 1.552 | 0.515 | 1.635 |
| 131 | 1885319.030 | 567558.990 | 1885317.822 | 567558.287 | 1.208 | 0.703 | 1.398 |

| | | |
|----------------------|--------------|-------------|
| RMSEasting | 1.394 | Feet |
| RMSEnorthing | 0.269 | Feet |
| RMSEr | 1.420 | Feet |
| RMSE accuracy | 2.457 | Feet |

FGDC-STD-007.3-1998

$$RMSEnorthing = \sqrt{[\sum (CONTROLnorthing - MEASUREDnorthing)^2/n]}$$

$$RMSEeastings = \sqrt{[\sum (CONTROLeastings - MEASUREDeastings)^2/n]}$$

$$RMSEr = \sqrt{[RMSEeastings^2 + RMSEnorthing^2]}$$

$$RMSE\ accuracy = 1.7308 * RMSEr$$

Coordinates in State Plane Zone West Virginia South , North American Datum 1983, Units U.S. Survey Feet.

ORTHOPHOTO ACCURACY REPORT FOR 2-FOOT ORTHO AREA

| POINT ID | CONTROL | | MEASURED | | DELTA (feet) | | |
|----------|-------------|------------|-------------|------------|--------------|----------|-------|
| | EASTING | NORTHING | EASTING | NORTHING | EASTING | NORTHING | HORIZ |
| 113 | 2011712.780 | 111208.130 | 2011714.021 | 111207.760 | -1.241 | 0.370 | 1.295 |
| 111 | 2075323.680 | 279070.610 | 2075325.426 | 279069.026 | -1.746 | 1.584 | 2.357 |
| 125 | 1999843.810 | 245655.290 | 1999848.490 | 245653.700 | -4.680 | 1.590 | 4.943 |
| 117RESET | 1921219.640 | 400709.390 | 1921219.785 | 400708.064 | -0.145 | 1.326 | 1.334 |

| | | |
|----------------------|--------------|-------------|
| RMSEeasting | 1.677 | Feet |
| RMSEnorthing | 0.501 | Feet |
| RMSEr | 1.751 | Feet |
| RMSE accuracy | 3.030 | Feet |

FGDC-STD-007.3-1998

$$RMSEnorthing = \sqrt{[\sum (\text{CONTROLnorthing} - \text{MEASUREDnorthing})^2/n]}$$

$$RMSEeasting = \sqrt{[\sum (\text{CONTROLEasting} - \text{MEASUREDeasting})^2/n]}$$

$$RMSEr = \sqrt{[RMSEeasting^2 + RMSEnorthing^2]}$$

$$RMSE\ accuracy = 1.7308 * RMSEr$$

Coordinates in State Plane Zone West Virginia South , North American Datum 1983, Units U.S. Survey Feet.