2009 GNIS UPDATES FINAL REPORT

UPDATING CULTURAL FEATURES: CHURCHES AND CEMETERIES

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FINAL REPORT

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Proposal Title: GNIS Cultural Features Project for West Virginia

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Collaborating Organization: United States Geologic Survey

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Data Themes: structures and cultural features

Executive Summary: In collaboration with the U.S. Geologic Survey, the WV GIS Technical Center (WVGISTC) updated 72 church and 347 cemetery features in the national Geographic Names Information System (GNIS). Since current and comprehensive listings did not exist for church and cemetery features in West Virginia, various data sources from agencies, businesses, and publications were required to update these cultural features. For this project, WVGISTC had more success locating statewide cemetery databases with name and location information; publicly accessible, comprehensive church listings were more difficult to attain, however. Although larger churches and cemeteries could be validated in the office by remote methods, most cultural features required local knowledge resources and on-site field verification. It was also discovered that ultra high-resolution imagery and city-style addresses of features improved the spatial validation procedures of features. Where possible, city-style addresses of cultural features like churches should be incorporated into the description or other designated fields of the GNIS. Lastly, West Virginia's geospatial community should further coordinate and establish useful validation strategies with local and state resources to update GNIS cultural features in the State.

Project Highlights

1) **Goals**: The main goal of this project is to support an ongoing activity for the state of West Virginia by continuing updates to GNIS for cultural features complementary to the existing Homeland Security Infrastructure Program (HSIP) and USGS structures and transportation update process. The focus of this cultural features updates was on churches and cemeteries.

2) **Accomplishments**: Batch data was submitted to the USGS Denver National Geospatial Operations Center (NGTOC) in the form of ESRI shape files. Over 400 edits were made to the existing GNIS data for the state of WV (Cemeteries 347, Churches 72). More than 500 additional un-submitted cemetery features were collected but could not be visually verified.

    a) Churches: The update of churches for this project was limited to Monongalia County, where field work and local knowledge could be used to verify both names and spatial locations. Similarly, the process of identifying changes and additions to the GNIS database involved accessing a variety of sources and subjecting revisions to a detailed data reconciliation process. For a more detailed description of data verification and validation processes please see Appendix A. Site maps for the church edits were produced and are posted on the WV GIS Data Clearinghouse.

    72 Edits were made to the GNIS database for churches Monongalia County, WV.

    b) Cemeteries: Data for cemeteries was more robust than data for churches and was accessed through local and state level sources. Due to the considerable size of the source data, cemetery updates were collected for 52 of West Virginia's 55 counties. A total of 873 edits and additions were made to the cemetery layer of the GNIS. Many of the added cemeteries could not be spatially validated with aerial photography, and were, therefore, recorded in a separate "un-validated" database. Maps displaying cemeteries were generated for each county as well as for each cemetery site. These maps can be found on the WV GIS Data Clearinghouse. For more information on the process of cemetery validation, verification, and reconciliation please see Appendix B.

    c) Summary Data: For a summary table of edits made to the GNIS database please see Appendix C.

3) **Challenges**: Cultural data from a variety of sources with varying quality presents several challenges in terms of long term maintenance as well as source validation and access to specific structures.
    a) Updating information about features that need to be field verified l involve site-specific challenges based upon the practicality of field work and updates at the local level. The result is that not all areas statewide will receive the same attention or frequency of updates.

b) Comprehensive data listings are difficult to come by. While we were successful in obtaining statewide data for the cemeteries, similar spatial databases for churches do not yet exist in the public realm. Private companies collect business directory data, but these data are often expensive and may have licensing restrictions that prevent their inclusion in publications such as the GNIS.

c) Identifying structures only through aerial imagery depends on the accuracy of feature identification. Discrepancies between data sets complicate this process further.

d) Spatial validation for many cultural features requires a large amount of field work which tends to be time consuming and costly.

e) Church features were more difficult than cemeteries to update because the data sources were less comprehensive, their names change more frequently, and it is more difficult to identify churches than cemeteries in aerial imagery.

4) **Future Directions**: This project, and similar future federal-state-local collaborations, will help greatly in maintaining the GNIS so that it more accurately reflects the status and location of cultural features. Such activities may also stimulate more frequent and creative use of GNIS resources. Further work is needed to locate additional validated sources as well as improve the quality of other cultural features in the state.

5) **Recommendations**: Field work is an effective tool for spatial verification, and is often necessary, but it must be used judiciously to avoid exceeding time lines and project budgets. Similarly, a higher resolution for aerial imagery could help to remotely validate more cemetery features (Appendix D).
   - Cultural features, such as cemeteries and churches, are most accurately validated at local levels. Where possible, updates should incorporate knowledge of cemeteries and churches at the local and county levels.
   - Field work, though sometimes expensive in time and money, is a valuable tool for feature validation. Several churches and cemeteries which did not appear in written or digital sources were located en route to verify other sources. There were instances where a church could be geocoded and had an address but it was located in a building whose primary purpose was not as a church. Be sure to check the imagery for indications other than just an existing structure for church locations (such as architecture and parking areas).
   - When completing field work in rural areas a four wheel drive or all wheel drive vehicle is a requirement. Roads in some parts of WV counties can be dangerous to traverse without such a vehicle.
   - All cultural features which have a physical address should have the address information incorporated into the GNIS. The physical address should follow a city-style format. This makes it easier to validate geographic names. It also provides another method for geo-locating features.

- Increasing the accuracy of the state addressing and mapping database will be helpful when updating churches with addresses.
- Churches with websites were helpful as they often provided directions, addresses, and name information.
- Data providers should be encouraged to create organized datasets with unique feature identifiers and date information in order to expedite database updates and data reconciliation and validation.
- Statewide high resolution imagery (leaf off recommended for cemetery and church features) can improve the accuracy and precision of remote validation processes.
- Higher resolution orthoimagery may help in the identification of small cemeteries.

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APPENDIX A

CHURCH DATA RECONCILIATION AND VALDIATION

Updating the churches layer of the Geographic Names Information System was a complex and time consuming process. Sources for church data were internet and telephone book business listings, the West Virginia Development Office, the National Shelter System, and local field validation and resources. A detailed description (TABLE 1) of GNIS Source Codes used is included below, as well as the process used to update the GNIS churches layer.

Step 1: Data Collection. Information was collected through internet search and by accessing state government offices to obtain business or church listings. Data were compiled into a spreadsheet containing name and address information as well as cross references and spatial verification or validation.

A. Business Listings. Verizon's Yellow Pages (2008) and online yellow page resources were the main source of business listings. "Places of worship" were the key words used to search for and identify local churches, mosques, temples, etc. as well as their address or location.
B. West Virginia Development Office. This agency provided name and some address locations in the form of access databases. One database contained name and address information for churches or places of worship with five or more employees. Churches or places of worship with less than 5 employees only contained zip codes for their locations. While this dataset was valuable in verifying church names, it did not contain the quality of spatial reference needed to be a geographic source. Sources at the Development Office noted that data purchased from a private firm is expensive and time consuming to validate and therefore is not obtained for all places of worship or any other business with less than 5 employees.

C. Homeland Security Information Program (HSIP) Freedom. TechniGraphicS, Inc. (TGS) contracts with the NGA to obtain spatial data for large places of worship. This data contained spatial coordinates and was delivered in the form of an ESRI shapefile. This type of data can be purchased from many sources and therefore was not given its own source code within the GNIS database. The data only contained approximately 30 points for the entire state, and three for Monongalia County. In addition to the small size of the dataset, two of the three points delivered were already included in the GNIS database and were duplicates.
D. National Shelter Association. Data was collected using local resources to identify local Red Cross shelters. This was cross referenced with church names obtained from business listings and the WV Development Office for name validation.
E. Church Angel Website. While this website is very comprehensive, addresses and websites are out of date. Some churches listed no longer exist and the website is not maintained.

Step 2: Data Reconciliation. Data reconciliation consisted of comparing the church lists from each data source and combining them into one large spreadsheet, thereby eliminating duplicate sources and names and validating church names. Churches that could not be validated spatially or had questionable names were sorted for field verification. Also during this process, if an individual church had a website it was included in the information compiled in the comprehensive church list. Churches listed in the GNIS which are no longer associated with a structure were field checked and marked as historical.

Step 3: Data Validation. During the process of data reconciliation, churches were validated spatially using the 2003 SAMB orthophotography as well as the 2007 NAIP orthophotography. If a structure did not appear for each church in the GNIS, then it was marked to be field validated. This process was also combined with the State SAMB geocoding service in order to locate new churches by site address for inclusion into the updates to the GNIS. Similarly, name validation occurred when two or more sources used the same church name and address. Churches with multiple name sources and spatial validation were included in the updates to the GNIS. If a church was missing either name or spatial validation, then field validation and verification were completed to either add or leave out the church. In order for a church to be labeled a structure, the primary function of the structure needs to be as a church or place of worship. Churches or groups that meet in schools or other local community buildings were not added to the GNIS. Three days of field work were conducted totaling 24 hours to validate churches which could not be validated through remote means.

Step 4: Data Submission. Sample data were submitted in August 2009 to the USGS GNIS office in Denver, CO. Complete data for validated churches and cemeteries were submitted in December 2009 in the form of an ESRI shapefile, attributed according to GNIS standards, for batch mode loading by the USGS. Data were also published on the State GIS Data Clearinghouse in December 2009.

TABLE 1: CHURCH SOURCE CODES

Originator	Type	Code	Citation
US	Text	147	Data received from an Internet site or email other than USGenWeb. Website title or email originator follows.
US	Text	137	Telephone Directory. Verizon Yellow Pages/2008
WV	Dataset	2	West Virginia GIS Technical Center. Field validation and visitation of features visible in aerial imagery. Features were physically validated, documented, and photographed. Completed in August 2009.
WV	Text	118	West Virginia Development Office. West Virginia Businesses Directory 2008-2009, data retrieval from Dunn and Bradstreet.
WV	Dataset	3	National Shelter Association, listings of Red Cross Shelters, a combined effort of FEMA and the Red Cross Association. Data compiled by the West Virginia GIS Technical Center, December 2007.

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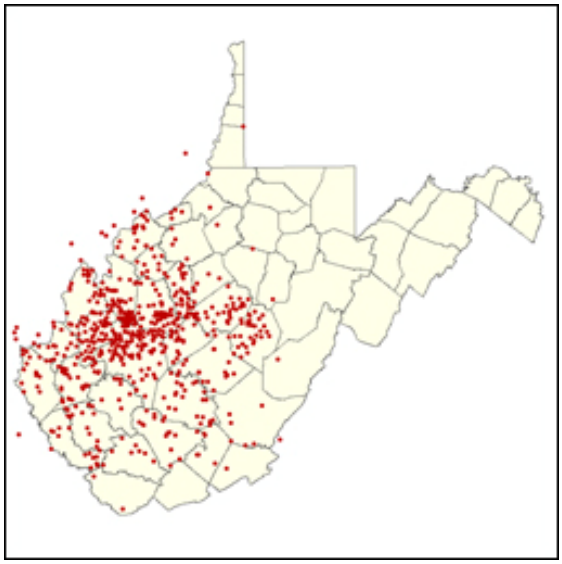
APPENDIX B

CEMETERY DATA RECONCILIATION AND VALDIATION

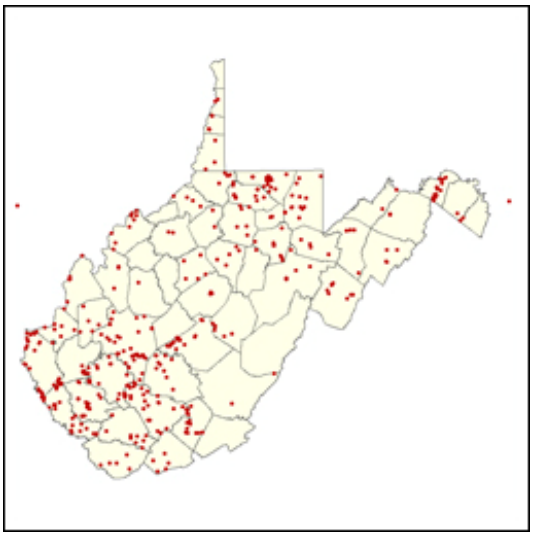
Updating the cemeteries layer of the Geographic Names Information System was more straightforward than the updates to the churches layer, due to the excellent sources obtained. Sources for cemetery data included cemetery descriptions from Sears Monument Company, a database maintained by the State Historic Preservation Office (SHPO), local cemetery readings available at the WV History Collection of WVU Libraries, and genealogical society websites. Some cemeteries were validated through field validation completed by the West Virginia GIS Technical Center and remote validation which included visual validation using aerial photography and digital raster graphics. A detailed description (TABLE 2) of GNIS Source Codes used is included below, as well as the process used to update the GNIS cemeteries layer.

Step 1: Data Collection. Data was collected by contacting Brent Sears at Sears Monument Company in Charleston, West Virginia. Also, the State Historic Preservation Office was contacted, to retrieve the database of cemeteries as archeological sites and their linkages to cemetery names and locations.

A. SEARS Data. Mr. Sears sent the WV GISTC a CD with word documents listing cemeteries in alphabetical order. Many cemeteries had geographic coordinates in the form of degrees minutes and decimal seconds. This data was then manually transferred from the Word documents into an Excel spreadsheet. Once the coordinates were in the spreadsheet, they were converted from degrees, minutes, and decimal seconds, to decimal degrees. The Excel file was then imported into Arc Map, based upon the coordinates given in the documents and into a geodatabase for editing.



B. SHPO Data. SHPO data was sent to the WV GISTC in the form of an Access database. The database was then imported into Arc Map and into a geodatabase for editing. This dataset required less pre-processing because it was already in database form, as opposed to the SEARS data which was in Word document form.



C. Grave Marker Readings. Local cemetery readings from the West Virginia History Collection were used to identify a few cemeteries in Monongalia County. They were also used to verify names. These cemeteries were mostly found by following the detailed directions to the cemetery within the cemetery readings. However, this process was lengthy and less productive than the other two datasets. A *strong* local knowledge of the area being researched is needed to employ this tactic of updating and locating cemeteries through cemetery readings. In addition, field research is necessary to validate many small cemeteries found using this method and field research over a broad geographic extent consumes a great volume of resources.

D. US GEN Web. Genealogical websites organized by counties to record the genealogical information about that county and its residents. Some websites have detailed cemetery records, directions, and occasionally coordinates. Not all counties have consistent data due to the large dependency on local volunteers to identify and record cemeteries and other genealogical information. Part of this dataset includes the Cemetery Preservation Association, which maintains a website with cemetery listings. Some of the cemeteries have spatial coordinates for location (http://www.wvcpaweb.org/index.html).

Step 2: Data Reconciliation. Data reconciliation consisted of loading the multiple source layers (SHPO, SEARS, GNIS) and searching by attribute for cemeteries within a quarter of a mile of cemeteries currently in the GNIS database. Through this process, duplicate cemeteries were eliminated, and a focus was placed on spatial validation of potential new cemeteries. Similarly, after data validation and reconciliation were completed, the cemeteries layers to be submitted for updates to the GNIS went through multiple quality check and assurance procedures.

Step 3: Data Validation. During data validation, cemeteries were selected individually and spatially validated using the highest quality aerial photography available for the area and local USGS topographic maps in the form of digital raster graphics (DRGs). The aerial imagery used to validate the sources was the 2003 State Address and Mapping Board (SAMB) orthorectified aerial photography, the 2007 National Agricultural Imaging Program (NAIP) orthorectified aerial imagery, the 2006 Charleston Urban aerial imagery, and the Berkeley County aerial imagery. Two databases were created for delivery to the GNIS, one for validated cemeteries and one for unvalidated cemeteries. Validated cemeteries are cemeteries which have been spatially validated. However, the GNIS is able to include features without coordinates if they have county and quad information. Therefore, the unvalidated cemetery database was created for submission to the GNIS, but these cemeteries could not be visually located in the aerial imagery or on the DRG. Excel database sheets, based upon source, were kept to record the spatial validation source, individual completing the validation, whether or not it named a previously un-named cemetery in the DRG, and the database it which it was included (if it was included).

Step 4: Submit Data. Data was submitted in early December 2009, in the form of an ESRI shapefile, attributed according to GNIS standards, to the USGS GNIS office in Denver, CO. Data was also published on the WV State GIS Data Clearinghouse in December 2009. The original data from Sears Monument Company and the State Historic Preservation Office were also included in this publication. The other independent sources are only located in the published *validated cemetery* updates.

TABLE 2. CEMETERY SOURCE CODES

Originator	Type	Code	Citation
WV	Text	114	Sears Monument Company Cemetery Directions and Coordinates. Compilation of word documents for cemeteries within an 80 mile radius of Kanawha County, WV. Most cemeteries are located within the southern region of the state of WV, and data spans 35 counties. Data was collected by company owner Brent Sears from March 2007 through May 2009.
WV	Dataset	1	State Historic Preservation Office of the West Virginia Division of Culture and History. Database was exported from State Historic Preservation Office archeological records and linked to cemetery database for place names. Dataset includes cemeteries with and without spatial references. Data on cemetery names and locations was collected between 1995 and May 2009, with most of the data collected within the past 10 years.
WV	Text	115	Monongalia County, West Virginia, Clinton District Cemetery Readings. Marion County Genealogical Club, Inc. Fairmont WV, 1987.
WV	Text	116	1938 Cemetery Readings of Monongalia County, Batelle District, Marion County Genealogical Society, 1980.
WV	Text	117	Clay District Cemetery Readings, Monongalia County. Marion County Genealogy Club, 1980.
WV	Dataset	2	West Virginia GIS Technical Center. Field validation and visitation of features visible in aerial imagery. Features were physically validated, documented, and photographed. Completed in August 2009.
US	Text	146	USGenWeb- data received from a state coordinator or from a state web

			page. Loosely organized volunteer group creating a genealogical research center for every county. Each page is the property and responsibility of an individual volunteer with consistent elements but varying in presentation. All information is freely available to the public.

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APPENDIX C

UPDATES SUMMARY

CHURCHES

Monongalia County, WV

Additions	Name changes	Location Changes	Historical	Total Edits
48	8	2	14	**72**

Remotely Validated (aerial imagery and geocoding)	Edits made to GNIS through field work	Field sites checked
30	42	80

CEMETERIES

Statewide Updates

Source	Validated	Unvalidated	Total
Sears	229	150	379
SHPO	93	375	468
Other	25	1	26
Totals	**347**	**526**	**873**

Newly Named Cemetery Updates on Topographic Maps

Source	
Sears	184
SHPO	80
Other	6
Total	**270**

Validation Source	Sears	SHPO	Total
Statewide 2003 SAMB	112	31	**143**
Statewide 2007 NAIP	36	46	**82**
Charleston 2006 Urban High Res.	8	0	**8**
USGS Topographic Map DRGs	65	38	**103**
Already in GNIS	30	109	**139**

This chart is meant to show the number of instances a cemetery was able to be spatially validated using the particular source listed at the left. The values presented are not unique, as one cemetery feature may appear in more than one type of imagery. In this case, it is listed as a value in all applicable types of imagery.

GNIS Specification and Qualifications (Fields and Definitions provided by USGS)

Data submitted to GNIS underwent a variety of procedures. GNIS was willing to accept batch data in either Excel database format or shape file format. The shapefile submitted had specific fields in a specific order as noted by GNIS. A brief description of the fields is included. Alternatively, data can also be submitted on an individual basis by accessing the GNIS interactive website. The USGS GNIS contact information as well as login info is located in a separate document. Please contact the WV GIS Technical Center for more information. Bibliographic codes for GNIS updates can be located by logging into the GNIS update system and clicking on new feature, and then the link to the codes. Most states have their own codes, as does West Virginia. The more specific code you can use the better; however, there are a few generic US based codes.

Column headings (these generally match the field entries in the web forms): [the size of the columns can be changed but they should not be re-arranged]

feature_id the current GNIS ID, if it exists

class feature class (lower case), a separate document listing the possible feature types is also available

name feature name (as shown, no abbreviations allowed) If you are making a name historical, append (historical) to the end of the name. For example, if Smith School is no longer a school, edit the name to now read, Smith School (historical) and add the *Historical* designation in the designation field. The name does not become a variant and we don't change the bibliographic citation. The next four fields (originator, ref_type, ref_code, and ref_detail) all relate to the **bibliographic citation** (or biblio code). For example, the biblio code US-text-147 2007/www.xyz.com breaks down like this: originator = US; ref_type = text; ref_code = 147; ref_detail =

	2007/www.xyz.com. The ref_detail won't necessarily be populated for every biblio code. You need biblio codes when you are entering a new name or changing an existing name. If you're changing coordinates, you won't need to populate the fields. Please don't use wiki-type sources as these are not reviewed.
originator	two-digit code, in caps (usually the state [WV] or [US] if it's national.
ref_type	type: map (M), text (T), dataset (D), web (W), interview (I). It is possible to add new codes if necessary.
ref_code	the number of the reference: if you're using a web citation, such as a listing from the Department of Education, use 147
ref_detail	might be the year of the map's publication or when you accessed a web site
county_sequence	sequence number of the county; primary counties are sequence 1
county_name	name of the county in which the primary point falls, other counties are listed in order of areal extent. If you have a feature that spans more than one county, or if you need to add an additional county, copy or change the set of fields and append the sequence number, i.e., county_sequence2, county_name2. Place them behind the county_name.
state_alpha	the postal abbreviation for the state
state_num	the FIPS code for the state, this will be calculated from the postal abbreviation, but you can enter it if you know it.
point_sequence	the sequence number of the feature; primary points are sequence 1. If you have more than one set of points you need to add, copy the sequence field name and append the sequence number, i.e., point_sequence3 and place it behind the point_sequence field. This field is theoretically tied to the latitude and longitude coordinates. The point sequence is used to denote which set of coordinates come first. In the event that you are adding only point features, this field will be largely irrelevant and you can simply put a 1 for all features. However, in the event that you are updating polygon or line features (such as lakes and streams), boundary lines can be crossed and multiple spatial coordinates will be necessary.
lat_dec	You can enter DMS values or decimal degree values. If you enter one type you don't need to enter the other.
lon_dec	
lat_dms	
lat_dms	
designation	There are many types of designations. You will probably use historical or the administering agency if you enter a park.
	history free text field to discuss the history of the feature. Personal information relating to individuals or families is omitted in accordance with GNIS policy.

description free text field to enter elevation or location information beyond just the coordinates, for example. If the feature has an address, it should be added here unless there are other designated GNIS fields for addresses.

The next five fields apply to variant names. The fields are similar to the official name fields. If you have more than one variant name, copy the five fields next to the block of the first set of variant_name fields and add a number to indicate that this is a second variant name, example: variant_name3, var_originator3, etc.

var_name1
var_originator1
var_ref_type1
var_ref_code1
var_ref_detail1
var_name2
var_originator2
var_ref_type2
var_ref_code2
var_ref_detail2

The feature_id will be assigned during the load process for new records and the cell_id (Cell Name) will be calculated from the coordinates as will the Elevation. If you enter coordinates as DMS, the lat/lon values need to be filled out completely. For example, write out 08 05 32 N for latitude rather than 8 5 32N and 098 52 09 W for longitude rather than 98 52 9 W. While you're working you can reduce the width of the columns as you wish, but please don't rearrange the columns.

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APPENDIX D

IMAGERY COMPARISONS

One of the many ways to improve remote validation accuracy would be to have higher resolution image data. While cemeteries are typically identifiable due to their texture and unique road pattern, higher resolution imagery reveals smaller cemeteries which would otherwise be lost in the lower resolution images. Following this page are several images that illustrate the importance and benefit of higher resolution imagery for projects needing visual remote validation. The following example compares the State Address and Mapping Board (SAMB) orthorectified aerial imagery from 2003 (2ft pixels), the National Agriculture Imaging Program (NAIP) orthorectified aerial imagery from 2007 (1m pixels), and imagery take of Berkley County, WV (3in pixels) of Cedar Grove Cemetery and Smoketown Cemetery. Similarly, using the Urban 1foot aerial imagery, which spans most of Kanawha County, increased the number of validated cemeteries in the county by 20% such as the Hunt-Donnally Cemetery as shown below.

Cedar Grove Cemetery

3″ Orthophoto 1:750

2′ SAMB Orthophoto 1:750

1m NAIP Orthophoto 1:750

Smoketown Cemetery

3" Orthophoto 1:750

2' SAMB Orthophoto 1:750

1m NAIP Orthophoto 1:750

Hunt-Donnally Cemetery

Charleston Region 1’ Imagery
1:1,000

2’ SAMB Orthophoto 1:1,000

1m NAIP Orthophoto 1:1,000