FINAL REPORT

Agreement Number: Cooperative Agreement No. 08HQAG0061

Proposal Title: Building Stewardship of Integrated Statewide Structure and Transportation Geospatial Databases in West Virginia.

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Collaborating Organization(s): U.S. Forest Service, WV Division of Homeland Security and Emergency Management, WV Department of Transportation, WV GIS Coordinator, WV Statewide Addressing and Mapping Board (SAMB), WV Association of Geospatial Professionals

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Data Themes: Structures and transportation road network

Executive Summary: This project integrated locally produced, high resolution, spatially and temporally accurate structure and transportation data into the National Spatial Data Infrastructure. This locally produced 1:4800 scale data from the Statewide Addressing and Mapping Board now serves as the foundation for the structure and road centerline GIS layers in West Virginia. County-level maintenance of these locally produced layers is performed by the county E-911 offices, while state-level integration of county E-911 data is performed by the WV Division of Homeland Security and Emergency Management. The structure and road centerline data themes can be integrated into nationwide databases as was done with the newly re-aligned TIGER roads released by Census in December 2008. In addition, the project focused on the improved utilization of the structures data by creating a bulk geocoding service for site addresses. Although this project served as a catalyst for the integration of locally derived transportation and structure data into nationwide databases, challenges still exist regarding the long term maintenance of these framework base layers.   In the future, a funded project by the WV Department of Transportation will review the technical issues regarding the feasibility of a shared road network in West Virginia which incorporates linear referencing, addressing, and routing capabilities.

1) **Project Goals:** A primary goal of this project was to integrate locally produced structures and transportation data into nationwide databases. Another intended goal was the development of long-term partnerships with organizations to act as data stewards for structures and for transportation data within West Virginia. A third goal was to create a bulk geocoding service derived from the SAMB addressable structures and road centerline themes.

2) **Accomplishments:** Progress was made on data sharing and procedures for integrating state-produced road data into national databases.

   a) Data Integration: Statewide road centerlines at 1:4800-scale from the Statewide Addressing and Mapping project were integrated into Census MAF/TIGER Line database.

This statewide, unattributed structures data was made available to the U.S. Geological Survey and now resides in the public domain. See Appendix A.

b) Data Stewardship: The Statewide Addressing and Mapping Board transferred state-level stewardship of E-911 addressing and mapping (road centerlines/structures) data to the WV Division of Homeland Security. Another state agency, the WV Division of Highways, proposed funding to determine the feasibility of integrating the E-911 and Division of Highway road centerline databases. See Appendix B.

c) Bulk Geocoding Service: The WV GIS Technical Center worked with other cooperators to create a successful site geocoding service. This spatially accurate locator service geocodes to the centroids of building structures collected at 1:4800 scale. See Appendix C for more information.

3) **Challenges:** At the federal, state, and county levels, several challenges exits regarding the long term maintenance of the structure and road centerline databases.

a) National: No formal protocols exist for submitting addressable structures or attributed road centerlines for inclusion into nationwide databases.

b) National: In commercial applications like Google Maps, the spatial accuracy of road centerlines and addresses in rural areas of West Virginia needs to be improved.

c) National: Title 13 law restrictions make it difficult for the Census Bureau and the state to reconcile addressable databases.

d) State: The statewide geocoding service corresponds directly to the quality of the data submitted. It is hoped that in the near future all 55 counties will have submitted addressable structures and roads to the statewide repository.

e) State: Road centerlines are maintained by the E-911 and WV Division of Highways. It is hoped that a shared road network can be developed, although technical and organizational hurdles exist.

f) County: Not all 55 counties in West Virginia have completed their addressing. Another concern is whether counties will continually submit data updates to the state repository unless there are funding incentives.

4) **Future Directions:** Through applied research involving cooperative partners, this and other funded projects will result in the creative and improved utilization of the "statewide" structures and transportation data themes for the Nation. A future project funded by the WV Division of Highways will continue the work accomplished by this CAP grant. This planned study will evaluate the technical and organizational issues associated with integrating E-911 and Division of Highways transportation data into a shared state-level road network database that incorporate linear referencing, geocoding, and routing capabilities. Partners for this project include the Rahall Transportation Institute and the private sector. Lastly, the WV GIS Coordinator is spearheading an effort to modernize the State GIS Plan and business plans relevant to the long term stewardship of the transportation and structures framework layers.

APPENDIX A (DATA SHARING)

Meetings were held with the U.S. Forest Service, WV Department of Transportation, and Statewide Addressing and Mapping Board to facilitate the exchange of local resolution (1:4800 scale) structure and transportation datasets to the public domain. Data sharing activities are listed below:

(1) Transportation Road Network

CENSUS TIGER ROADS: In December 2008, Census TIGER roads re-aligned to 1:4800-scale SAMB geometry were released for the entire State. A number of the TIGER roads had incorrect road classifications. The WV GIS Technical Center (WVGISTC) corrected some of these errors and posted an enhanced TIGER road version on the WV GIS Data Clearinghouse. WVGISTC notified Census of the road classification issue. In the future, updated TIGER roads will be released every year. Link: http://www.wvgis.wvu.edu/data/dataset.php?ID=300

U.S. FOREST SERVICE ROADS: In July 2008 the USFS made available 1,500 miles of forest service roads (Monongahela National Forest) collected in 2007 at 1:24,000-scale. Link: http://www.wvgis.wvu.edu/data/dataset.php?ID=72

WV DOT MAJOR ROADS: 37,000 miles of major roads are maintained by WV DOT.   In 2008 major roads (Interstates, U.S. Highways, State Routes, & County Routes) of 1:4,800-scale or better were made available by WV DOT. Link: http://gis.wvdot.com/ or http://gis.wvdot.com/GTI/DataCatalog.aspx

E-911 ROADS: E-911 road geometry is available to authorized users; the validation of combined geometry and addressing attributes is in progress.   Link: http://www.addressingwv.org/

(2) Structures (geometry only): In the fall of 2008, the structures database collected from the Statewide Addressing and Mapping Project was provided to the Denver Mapping Center, U.S. Geological Survey. In addition, these spatial data sets have been made available to the public and are accessible via the WV GIS Data Clearinghouse.
(http://www.wvgis.wvu.edu/data/data.php).

E-911 STRUCTURES: Statewide building centroids and footprint (structures > 7500 square feet) geometry was made available to the public and provided to the U.S. Geological Survey. http://www.wvgis.wvu.edu/data/dataset.php?ID=288

OTHER STRUCTURES: Dams, locks, bridges, tunnels, and other structures from the statewide addressing and mapping project were made available to the public. http://www.wvgis.wvu.edu/data/dataset.php?ID=289

(3) Structures (point geometry/site addresses).   A bulk geocoding service was created and can be accessed online with the proper permission. The site geocoding service has been used recently to validate churches for the Geographic Names Information System, Red Cross shelters, and accuracy of fire stations created by the HSIP Freedom program. This address locator service will be incorporated into online mapping applications too.

See WV Framework Data Report to view data development efforts for all framework base layers.

APPENDIX B (MAINTENANCE)

State-Level Maintenance:

Structures: The primary state-level structures database is derived from the Statewide Addressing and Mapping System, which integrates addressable point structures from 55 counties. Structure data from the addressing system can be further processed for inclusion into standardized, national structure databases. Another source of statewide critical infrastructure data is from HSIP Freedom. Polygon footprints of large buildings for the entire state were compiled in 2003 by the Statewide Addressing and Mapping Board; however, these building footprints are not being updated statewide.

Road Centerlines: The E-911 structures and road centerline data are updated at the county level and submitted to a centralized repository maintained by the WV Division of Homeland Security and Emergency Management. Currently the attributed databases, specifically addressable structures and named road centerlines, are partially completed. The state of West Virginia is dependent on the counties to maintain and provide this data to the state repository. The attributed E-911 data are not currently available to the public, although in the future data sharing agreements could be made with national data stewards. The WV Division of Highways maintains major roads based upon a linear referencing system and is interested in a shared road network that incorporates the addressing capabilities of the E-911 database and routing of the commercial road navigational databases.

National-Level Maintenance:

Structures: The U.S Geological Survey should provide preferred specifications for receiving statewide structure data. In the past, the WV GIS Technical Center has provided named structure updates to USGS via the Geographic Names Information System.

Road Centerlines: West Virginia does not have the operational capacity to integrate state-produced road databases into a seamless, comprehensive, nationwide road database. Although data *sharing* of statewide road centerline with national stewards is feasible, the *integration* of multiple road databases into consistent, seamless, nationwide databases will have to occur at the national level by the federal government or private sector. For example, the Census Bureau updated the Census TIGER road network with 1:4800-scale roads provided by West Virginia. In the future, to continually *maintain* the TIGER database with new road information, the Census will have access to updated road databases maintained by the WV DOT or state E-911 office to update their national database. Likewise, private sector companies like TeleAtlas and NAVTEQ should have access to transportation databases that reside in the public domain to update their road networks.

APPENDIX C (GEOCODING SERVICE)

The WV GIS Technical Center (WVGISTC) utilized the street and structure datasets from the statewide addressing and mapping system to develop a bulk geocoding service for West Virginia. Two locator services, WV SITE Locator and WV Street Locator, were created for addressing matching to sites (building centroids) or street address ranges. The WV Site locator service allows a direct match of the physical address of the structure, while the WV Street locator service provides an estimated location based on street address ranges.

In order to develop the geocoding service, WVGISTC worked with Michael Baker Jr., Inc. to efficiently harvest the datasets from the state addressing and mapping servers. After the data was extracted from the servers, it was processed with customized programs to properly assemble and prepare the data for the locator services. The enterprise locator services were built using standard ESRI locator models and ArcGIS Server technology; the locator services are available to authenticated users via the Internet.

Both locator services offer a highly accurate geocoding service when compared to other commercial geocoding service available to West Virginia. Although the new locator services offer highly accurate returns, not all addresses in West Virginia are included in the locator services and results will vary between counties. Because the addressing project is ongoing and county data is constantly being updated, WVGISTC plans to update the locator services quarterly with new data.
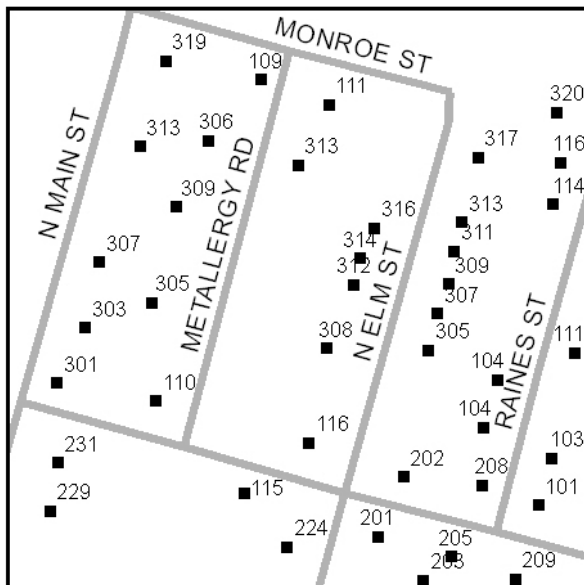

Figure C1: Sample Address Data
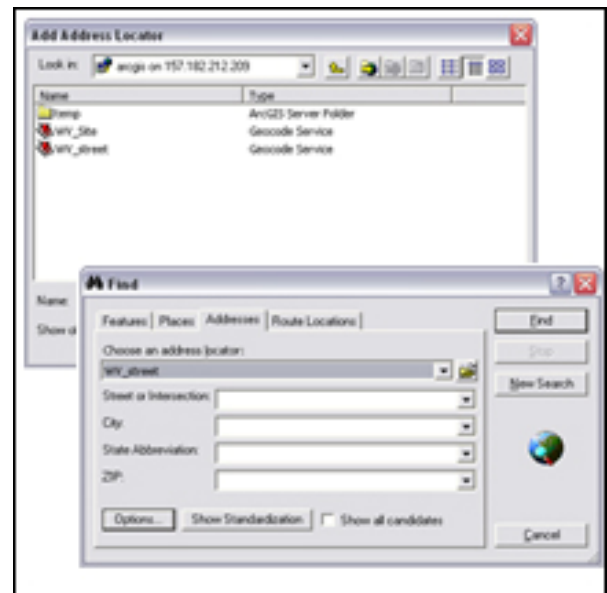
Figure C2: ESRI Address Locator Interface to WV Geocode Services

APPENDIX D (Feedback on Cooperative Agreements Program)

What are the program strengths and weaknesses?

Strengths: Seed funding from the FGDC CAP is effective in building partnerships and programs that improve the National Spatial Data Infrastructure (NSDI).

Weaknesses: Constantly shifting priorities and policies of The National Map may adversely affect the overall success of stewardship projects at the state and local levels.

Where does the program make a difference? The incentive grant funding provides a catalyst for data integration, stewardship, and associated applications at the state level. Certain data development and coordination programs would not materialize without this strategic funding.

Was the assistance you received sufficient or effective? Yes. Project funding was sufficient but should be no less for this category.

What would you recommend doing differently? Enhance the dialogue between state stewards and national data theme leaders for structures and transportation.

Are there factors that are missing or additional needs that should be considered? No.

Are there program management concerns that need to be addressed? The cost share component increases project administration and accounting costs. **Time frame?** The time frame was okay for this particular project.

If you were to do this again, what would you do differently? With the one-year time frame and financial constraints, nothing would be done differently.