

West Virginia Geological and Economic Survey

State Broadband Mapping Methodology

For the State of West Virginia, October 2014

Contents

Overview 1

Purpose..... 1

Data Sources 1

Provider List 1

Data Gathering 1

Provider Data Request..... 1

Coverage Information 2

Geocoding Issues..... 3

Other Issues..... 3

Additional Data Processing Techniques..... 3

Federal Communications Commission Registration Number Discrepancies 4

Community Anchor Institutions 4

Validation and Verification 5

Validation Processes 6

Outreach to Providers..... 7

Third Party Datasets 8

State Broadband Interactive Map..... 8

Additional Steps Performed for Validation..... 10

Verification Tasks Performed 11

Field Verification Pilot Test 12

Statewide Field Verification 12

Use of Broadband Mapping Datasets for State Broadband Grant Program..... 12

Providers..... 14

Non-Responsive Providers 14

Satellite Providers 15

Providers that Submitted Data 15

Broadband Planning and Other Broadband Activities 16

Appendix A West Virginia Geological and Economic Survey Provider Data Request Letter 18

Appendix B West Virginia Geological and Economic Survey Guide to Broadband Submission . 22

Overview

This document provides a summary of the data collection, normalization and verification processes used by the State of West Virginia (State) up to the tenth data submission, in October 2014, to the National Telecommunication and Information Agency (NTIA) in accordance with the State Broadband Data Development (SBDD) program. Most of the processes used in this data submission remained the same as ones for the previous submissions. The State of West Virginia interactive broadband map continues to provide the broadband coverage information to the public and is able to receive comments and feedback from consumers and citizens of the State. In January 2013, West Virginia expanded their verification effort to include wireless coverage and network facility field validation. This effort was completed in September 2013.

Purpose

This documentation was developed to illustrate the processes used during the data collection, normalization and verification processes. The information within this document will provide a background to the development of the provider list and data request, and specific issues encountered by West Virginia regarding data collection, normalization and validation.

Data Sources

Provider List

The provider list for this tenth round of data collection started during the first round of data collection. For this round, the list was regenerated to include any new providers within the State. The list was created by contacting the West Virginia Cable Telecommunications Association, the West Virginia Public Services Commission (PSC) and the West Virginia Broadband Deployment Council. The State receives an updated provider list from the PSC every six months. This information was compiled and compared against the list from the Federal Communications Commission (FCC). Providers were then contacted using information provided by the FCC's public information search Web tool. Providers who were contacted during the first round of data were contacted again through the same name and address. If a provider contacted during the first round had given more detailed contact information for a specific individual, those individuals were contacted instead of the contact provided by the FCC.

The provider list is updated every six months to reflect any mergers or acquisitions that have occurred. There are some legal issues when a merger occurs, but the data integration does not occur until up to a year later. In those circumstances, the data is kept separate until a full merger occurs.

Data Gathering

Provider Data Request

This component of the project was heavily reliant on working with service providers to obtain data. Each identified provider was mailed a standard data request outlining the elements identified in the Notice of Funds Availability (NOFA) Technical Appendix that were requested from providers. This request included information regarding the availability of broadband services, technology used to provide them, the location of certain broadband infrastructure and the speed of the service. Depending upon the technology each respective provider used to provide service, West Virginia requested that served areas be reported in one of the following manners: census blocks and street segments, service area boundaries or qualified address points (wireline providers); tower data that could be used to develop viewsheds (fixed wireless providers); or terrain-adjusted coverage shapefiles (fixed and mobile wireless providers). If a provider was unable to fulfill such requirements, the West Virginia Geological and Economic Survey (WVGES) worked with those providers to gather the necessary data in an alternative approach. An updated guide for broadband data submission, previously developed by the State, continued to be circulated to providers this round as a supplement to the data request. Along with this guide, a letter

outlining the continued overall goals of the broadband mapping program and the objectives of the new updated guide were sent to each provider. The guide was developed to continue to standardize the data received from providers, including modifications and updates that have been made to the requirements by the NTIA since the original Technical Appendix. Examples of the letter and guide are provided in Appendix A and Appendix B in this document. All of the providers that submitted census block information for this submission provided census 2010 geometry or census block numbers. However, once again, no providers submitted TIGER/Line Record Identification (TLIDs) for roads as described within the guide. Without TLIDs, roads need to be hand selected or geocoded, which can lead to some additional processes and inaccuracies because of the limitations described in the Geocoding Issues section.

After the initial data request was mailed, follow up phone calls and emails were made to remind providers of due dates and to collect any missing or unclear data. As of this submission, the response rate from providers continues to be greater than 90 percent. After data was received, the data was normalized per NTIA standards and placed into the provided geodatabase. The WVGES continued to operate under the same assumption as used in the first round of data gathering. The WVGES let the data "speak for itself" and did not make any grand assumptions or estimates in the interest of maintaining clean and accurate data.

Providers submitted only maximum advertised speed data. Providers have not been very willing to submit typical speed data as the typical speeds are generally lower than the advertised speeds. Advertised speed data was given by all providers and then pushed to typical speeds as per NTIA's advice in the Round 3 data review conference call.

In addition to the data request, each provider was required to sign a Nondisclosure Agreement (NDA) between themselves and WVGES. The NDA outlined how provider data would be handled and what portions of that data would be considered confidential, which would be shared with the NTIA and which were to be made publically available.

Coverage Information

Data was derived and normalized into four formats in accordance with the data model:

- Census blocks (2010) of two or less square miles
- Street segments (2010) of census blocks greater than two square miles
- Address level (geocoded point data)
- Wireless area (shapefile)

The normalization procedures were as follows:

- Determine service being provided – what technologies are being used to provide the service
- Understand data/determine how to process – determine which feature class in the geodatabase data belongs
- Georeference/geocode necessary data – georeference data for wireless area coverage and other service area maps, as well as geocode address level data
- Segregate data into NOFA compliant formats – completely filling in geodatabase fields, as well as making sure topology is correct
- Provide quality assurance/quality control (QA/QC) – verification and validation of data

Typically there were two main types of data supplied for normalization – service area maps and flat Excel tables.

Service areas were georeferenced, digitized and then intersected with the master blocks and roads files. These blocks and road segments were then loaded into the geodatabase and the additional company specific data was appended to those records.

Flat Excel tables were exported to a database and then joined with the Federal Information Processing Standard Identification (FIPS ID) for the block files and the TLID for the roads files. The joined fields were exported and then imported into the

database. The NTIA has not required this information and in cases where a TLID was not given by the provider there was much greater difficulty and inaccuracy as roads had to be geocoded and hand selected.

Geocoding Issues

The West Virginia Statewide Addressing and Mapping Board (SAMB) information is not yet completed across all of the counties in West Virginia, leaving areas within the State without complete or verified address information. This led to low geocoding match rates of provider supplied information, especially in rural areas, throughout the data normalization workflows. For some of these areas, additional broadband coverage processes were used to derive coverage estimates described in the next section.

Other Issues

Another issue of incomplete broadband coverage was due to the acquisition of Verizon by Frontier. When Frontier submitted digital subscriber line access multiplexer (DSLAM) locations for the April 1, 2011 deadline, it did not include the entire Verizon infrastructure. Frontier has since re-submitted its DSLAM locations for the October 1, 2011 deadline, which now should include those missing Verizon DSLAMs, and the coverage map has been extended into certain areas that were not previously included.

Additional Data Processing Techniques

Because of geocoding inconsistencies in certain areas of the State, some provider address information could not be mapped and other data processing techniques had to be implemented to create broadband coverage estimates. In cases where DSLAM points were able to be provided, broadband coverage was mapped by loading the DSLAM points into Environmental System Research Institute's (ESRI's) Network Analyst. For this processing, the West Virginia State SAMB street centerlines were used as the source roads. The DSLAM points were loaded into the facilities point feature class of the service area template using a 1000 foot snapping tolerance to help locate points to nearest roadway. Any points still not connecting to the road network were viewed and manually linked to the road network. Processing was run to create segment lines for each point and to create a detailed polygon area around each street segment area for each point. Distance parameters used and speeds applied varied per DSLAM, according to the facility information providers supplied. No impedances were placed on the streets.

Once the process was run, the created segment lines were linked to the original DSLAM point attribute table and exported from the analyst dataset into a line feature class. Segments derived from DSLAM points that plotted inside the wire center boundaries were clipped to the boundary features. Segments that derived from DSLAM points that plotted outside the wire center boundaries were not clipped out of concern that the wire center dataset may not accurately reflect updated boundaries. The segment feature class was used to select covered census blocks and street segments for the data submission.

Starting with the April 2013 submission, to increase the accuracy of coverage selected through DSLAM network development, roads attributed with the following Master Address File (MAF)/TIGER Feature Class Codes (MTFCCs) were excluded from network creation:

MTFCC Code	Description
S1500	Vehicular Trail
S1630	Ramp
S1710	Walkway/Pedestrian Trail
S1820	Bike path or trail
S1830	Bridle path
S1740	Private road for service vehicles

This resulted in a net feature (blocks/segments) decrease from the Round 6 submission, affecting both Frontier West Virginia, Inc. and Citizens Telecommunications Company of West Virginia.

One of the foremost issues of the fourth round of data collection, submitted in October 2011 was converting to 2010 Census Blocks. The NTIA's decision to switch to 2010 Census Blocks did not leave much time during that data collection window to notify providers of the change. Many providers submitted 2000 Census Blocks, not 2010 Census Blocks. The conversion led to multiple inaccuracies between Round 3 and Round 4 submissions because of the problems intersecting 2000 Census Blocks with 2010 Census Blocks and errors of commission. Many block boundaries had been redrawn and the crosswalk file provided by the Census was in a very unwieldy format and not much help. For this seventh round submission, most of the providers submitted 2010 Census Block information and with the previous submission base data having been already converted to 2010 Census Block information, the processing techniques for 2010 Census Blocks has become integrated into the long-term maintenance process.

Prior to the seventh submission, another unique processing issue occurred when providers submitted address-level fixed wireless data which would produce errors through the new data model. As per discussion with NTIA, the unlicensed fixed wireless points were plotted and then buffered out to 800 feet. A shapefile was created and moved to the wireless feature class within the geodatabase. For the April 2013 submission, computerized radio propagation studies were used to predict coverage for StratusWave service areas. Site location information, as well as equipment and antenna system data was provided by StratusWave engineers. This information was utilized in wireless network engineering software to create propagation prediction models using the Anderson 2D propagation model and 10 meter digital terrain elevation data. Median signal levels (50 percent time and 50 percent location variability) are predicted and then an additional margin (Prediction Confidence Margin) is incorporated to account for performance objectives and environmental losses. The propagation prediction models were then exported to map data which indicates StratusWave predicted coverage areas to include in the data submission.

Federal Communications Commission Registration Number Discrepancies

Discrepancies between Round 2 and Round 3 data submissions were noticed concerning FCC Registration Numbers (FRNs). Effected providers were contacted directly to clear up these issues. The FRNs that were loaded into the database come from direct contact with providers. The FRNs are verified as a continued validation process during each data collection period.

Community Anchor Institutions

The process used to identify the Community Anchor Institutions was based on the information provided by NTIA. This included the categories of K-12 schools, libraries, medical/healthcare, Public Safety, higher education and other community support consisting of either government or nongovernmental facilities.

All public schools in West Virginia were used for the K-12 category. Libraries consisted of all public libraries throughout West Virginia. Medical/healthcare included hospitals, nursing homes and primary care centers. The primary care centers are made up of main locations of the primary care centers along with satellite clinics. School-based health centers are now grouped with K-12 schools, as all school-based health centers are located inside the schools. Public Safety consisted of West Virginia police departments along with the correctional facilities and juvenile centers, fire departments and 9-1-1 centers. Higher education consisted of public and private universities located across West Virginia. The community support consisted of courthouses, regional development centers and workforce locations.

There was a cutoff created to focus on identifying main facilities as Community Anchor Institutions (CAIs). However, if there is a need to include more facilities, the State is open to adding those facilities for future updates.

The following agencies were contacted for information: West Virginia (WV) Department of Education, WV Library Commission, Hospitals located throughout the state, Nursing Homes located throughout the State, WV Division of Primary Care, WV Primary Care Association, WV 9-1-1 Center Directors, WV Emergency Management Directors, WV Regional Jail Authority, WV Higher Education Policy Commission, WV Courthouse Facility Improvement Authority, Workforce WV, WV Regional Development Centers and county addressing coordinators.

Data was collected and verified by the West Virginia Division of Homeland Security. Surveys were sent out to various facilities and included a section where their primary city-style address could be filled in. For those facilities that returned the survey, the statewide addressing and mapping data that the counties provided was used as a way to verify the address. Once the location was verified the latitude and longitude coordinates were added. In cases where surveys were not returned, the statewide addressing and mapping data was used to determine if the information could be matched. If this wasn't possible, then the Internet was used to find a Webpage with additional information. If this method was not successful, attempts were made to contact the facility directly. Currently, there is approximately a 90-95 percent match rate for the location of the CAIs.

Since the October 2011 data submission, additional surveys were sent by mail to healthcare facilities and fire, police and ambulance locations throughout the state. This amounted to approximately 1,500 surveys that were mailed out. Based on the information that was received back from the surveys, the primary city-style address, broadband technology, speeds and other attributes associated with the community anchor institution feature class were verified and updated where necessary. An on-line survey was released since the last data submission with the objective of receiving further updates and also getting the survey, and also emailing the survey to those locations where the survey sent by mail was returned by the United State Postal Service due to invalid address information or a facility having changed location. The survey was successful in collecting additional missing attribute information for some of those CAI locations but there are still locations where attributes are missing that did not respond to the survey. For the April 2012 submission, there were additional community anchor institution locations that are included in the map due to the NTIA allowing some 'unknown' classifications for attributes within the community anchor institution feature class. Since the April 2012 submission the data has been updated frequently by contacting the agencies mentioned previously and working with them to make sure all information for each facility is correct and up to date.

Validation and Verification

Throughout the data gathering and data preparation processes for each data submission, the data verification has been continuous and has evolved based on the evolution of the data model. The focus has been on getting complete data from all providers and assuring that all data can be processed into the required data model for submission. Where providers did not submit data in acceptable formats for data normalization into NOFA formats or where they did not submit complete data or any data, there has been continued focus by WVGES on working with the providers to continue to improve the source information being provided. Data verification and validation is an on-going, long term process that will continue to evolve throughout the broadband data development program.

The seventh submission incorporated further refinement to validate the provider supplied information against the Census 2010 geographies, submitted address points, and wireless coverage polygons. Limited research was performed for specific areas of the map where any user feedback points to a gap in coverage or an over-estimate in coverage. The research was limited due to a small sampling of user feedback at this time. Plans to advertise surveys and the interactive broadband map continue to be executed and are described further in other sections of this document.

A confidence scale metric, which scores submission data according to a series of accuracy and consistency checks, was developed in January 2013. Rankings were used to identify and prioritize areas where additional verification and validation techniques (e.g. consumer and business surveys) were needed. A pilot area was established to begin applying the confidence scale and test the results to determine that the criteria provides adequate results to highlight areas that might

require more follow-up with specific providers. The application of the confidence scale was reviewed following the eighth submission, and seven providers were selected to be part of the pilot study project. The initial confidence scale focused only on the location and attribution qualities of the submitted data, based on the format of the data submitted. It was determined that a third score was necessary to reflect the consistency of the data as compared to previous rounds as well as allow for general mapping issues. This score, called the "Committee Score" was then averaged with the scores obtained by the location and attribution checks to provide a better rating of the data. The evaluation of the pilot study showed acceptable results. The remaining 19 providers were then evaluated and a confidence rating established for each provider. This confidence rating will be revisited for each provider following the tenth submission.

West Virginia began a comprehensive pilot validation project in January 2013, focused on identifying gaps and over-representations in the wireless coverage data, and verifying the existence of provider-reported network facilities. The pilot testing project is described below, and took place in a three-county study area (Marion, Monongalia and Preston counties).

Mobile wireless coverage validation was conducted by drive-testing the study area, and collecting coverage and speed data using specific app-enabled smart phones provided by the State. QoS Solutions smart phone applications were used for the pilot test. The purpose of the testing was to assess the spatial and attribute accuracy of the service area polygons that two providers, AT&T and nTelos, submitted to West Virginia as part of the Round 6 data collection effort. Comparisons between the field data collected and the provider-supplied service area polygons facilitated the identification of possible coverage and speed inaccuracies reported to the State by the providers.

Central Office (CO) validation was conducted through a combination of field testing and comparisons against other data sources of known high spatial accuracy. Provider-submitted facilities were mapped according to latitude/longitude coordinates, and those that plotted within the study area were compared against both the WVSAMB 2011 structure layer and the WVSAMB imagery. Facilities that were confirmed during this initial verification phase were then field validated during drive testing. Because block and segment coverage for facility-supplying providers is derived from CO and Remote Terminal (RT) locations, CO spatial accuracy is a direct reflection of coverage accuracy for these providers.

West Virginia began its Statewide validation process in May 2013 to continue its initial efforts to identify gaps and over-representations in the wireless coverage data. These efforts were completed September 2013.

Mobile wireless coverage validation was conducted by drive-testing preselected roads within the Round 7 submitted coverage boundaries within the entire state. During drive-testing, coverage and speed data was collected using specific app-enabled smart phones provided by the State. QoS Solutions smart phone applications were used for the pilot test. The purpose of the testing was to assess the spatial and attribute accuracy of the service area polygons that four providers, AT&T, nTelos, US Cellular and Verizon submitted to West Virginia as part of the Round 7 data collection effort. Comparisons between the field data collected and the provider-supplied service area polygons facilitated the identification of possible coverage and speed inaccuracies reported to the State by the providers.

Validation Processes

Data validation begins within the data collection process to determine if the data submission by providers is formatted in a way that can be normalized into the required NOFA formats. Where data is deemed incomplete or in non-conforming standards, WVGES staff reached out to providers as necessary to improve the data submissions. After each round of data preparation the format for the updates being collected has improved.

Quality assurance and quality control has been a big focus of the data validation of the submittals assuring that the required data fields are populated properly and that data fields are populated with values that follow the data model rules. As the data model has evolved over each round of data submission these QA/QC checks have been modified to include the changes in fields, values, domains, etc. that are being required for submission.

Validation methods employed include the following:

- Assuring all applicable providers' datasets are propagated forward to each round of data collection
- Verifying that all required fields are populated with valid values and default values are used when appropriate. This includes:
 - Speeds valid for the technologies reported
 - Latitude/longitude coordinates fall within an acceptable range, given the state boundaries
 - The relationships between maximum and typical, and downstream and upstream speeds are valid
 - Service reported at the block level is done using blocks of the appropriate size (less than two square miles)
 - Speeds and technologies reported per provider are consistent between blocks and segments
 - Administrative information (provider name, doing business as [DBA] Name, FRN) is consistently reported per provider in each populated feature class.

Outreach to Providers

To further assure the providers' broadband footprints would be accurately represented in data submissions, "check maps" depicting each respective provider's served small census blocks and segments located in large blocks were distributed back to providers, along with the data request letters, in January of 2013. Providers were requested to either approve their check maps as-is, or submit additional changes if their coverage was not accurately represented. No coverage corrections were received as a result of this effort.

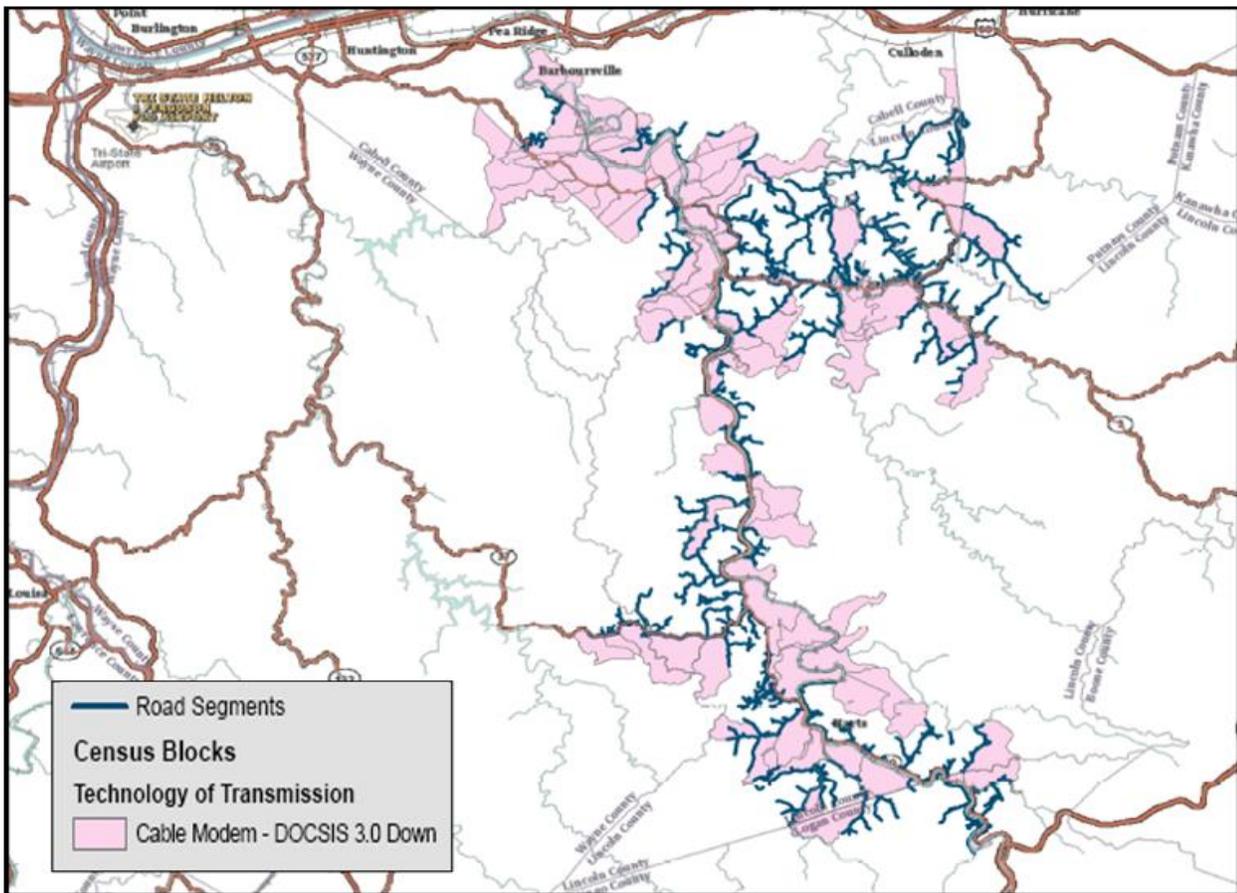


Figure 1—Example of a Portion of a Provider Check Map

The validation process for all submissions included the use of the Python scripts for validation provided by NTIA.

Third Party Datasets

As data collections and data normalization processes progressed, additional validation was conducted using commercially available datasets. The following commercially available datasets were used as a reference for the specific technologies that their data represented.

- American Roamer datasets
- TeleAtlas Exchange boundaries
- Media Prints Cable boundaries

These datasets were used primarily as a validation source for provider service coverage.

State Broadband Interactive Map

The State of West Virginia released its interactive broadband mapping Website to the public in May 2011. The Website address is www.wvbroadbandmap.org. The Website provides consumers the opportunity to review broadband availability across the State.

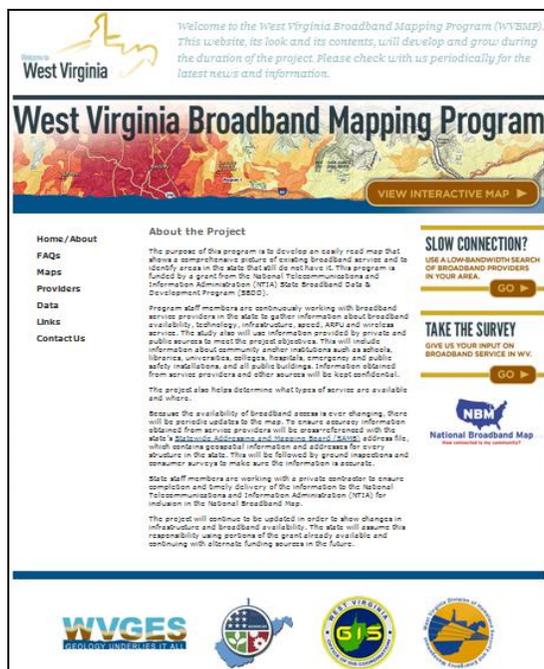


Figure 2—West Virginia Broadband Mapping Program Main Landing Page

The main landing page for the West Virginia Broadband Mapping Program (WVBMP) provides background information on the program, contact information and a frequently asked questions section. The landing page has the main link to the broadband coverage map and a link to an address lookup tool for users with slow Internet connections. This will allow the user to view what coverage is available around their address or zip code without needing to view the entire map, which may not be feasible for users that may still be on dial-up connection speeds. By having this slow Internet connection coverage tool, it allows feedback from those consumers even if they do not have the capabilities to bring up the interactive map application.

The Web application has the functionality for consumers and citizens using the State broadband map Web application to submit comments and feedback. The information gathered from that feedback is being reviewed as more potential source information for validating and determining confidence levels of the broadband coverage across the regions of the State. By comparing comments supplied by consumers about broadband availability to the broadband coverage, trends could be recognized where potential inconsistencies in the existing broadband map could exist. This could delineate the need for

further focused validation or verification in specific areas that could refine the broadband coverage information for future data submissions.

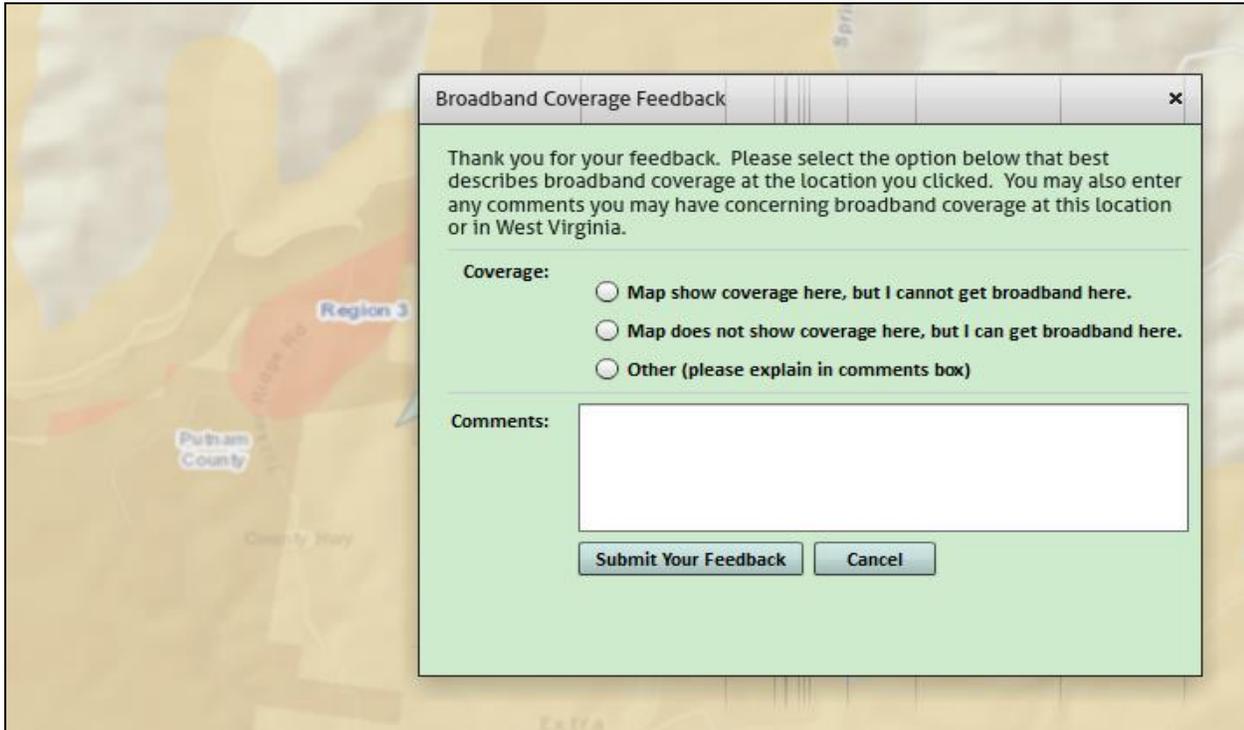


Figure 3—Example of Feedback Tool Interface

For users that can browse the interactive map, they can click on any location on the map and choose to provide specific feedback for that location. This will store the coordinate information of the location that they selected allowing them to choose from a couple of coverage categories for their comment or choose other. Within the feedback tool, they can enter more specific details about their broadband coverage.

After the initial release of the broadband map, there was some initial feedback and comments mainly pertaining to a few areas that were not showing coverage. The feedback indicated that there should be coverage or scenarios where we were showing coverage. One resident made a comment that there was no cable service on a particular road or area. Some of the missing coverage was due to the acquisition of Verizon by Frontier as discussed above.

The State continued to implement plans throughout the project to incorporate more advertising to the interactive broadband map and feedback tools, and continued to work closely with the regional planning councils to review coverage in their communities.

A speed test was developed within the WVBMP Interactive Website. The design of the Website includes links to the speed test developed using the Ookla broadband speed test tools. The speed test is embedded within a broadband survey wizard that allows consumers to provide specific information that will help the State analyze information about use and demand for broadband within the State. The State advertised the speed test through presentations and broadband meetings to get more users to take the speed test to obtain more results for analysis. Speed test results and statistics were leveraged to compare against the existing broadband coverage and help validate speed information. To date there is still a lack of substantial data collected via the speed-test or surveys to be able to detect patterns or trends and continued planning within the regional planning councils could provide more exposure to the Websites and speed test at the grass roots level. Links to the speed

test and the interactive map have also been added to additional Websites, including a new West Virginia Broadband Deployment Council Website (www.broadband.wv.gov) that was launched at the end of 2011.

Additional Steps Performed for Validation

As part of continued broadband planning activities and future validation of data, a third party dataset from Infogroup was purchased. For broadband map validation, the Infogroup datasets provided consumer broadband use information including coordinate based location information along with provider name and technology used by that particular consumer. The Infogroup data allowed the consumer information to be plotted on the map and compared against existing coverage maps. For example, there may be clusters of consumer points for a particular provider that exist in an area of the State where there is no coverage for that provider. The goal was to identify the major patterns or trends that might need to be re-visited with a provider, if data appears to be missing.

In addition, a dataset representing speed tests taken across the State was purchased from Ookla to complement speed tests being collected through the State’s speed test application. This data was used to assist in the verification tasks by comparing speeds across the State from the Ookla dataset against the data collected from the providers. The data was used for broadband planning purposes to determine what typical user broadband speeds are in particular areas. The data is currently in the early stages of analysis.

During the summer of 2012, as part of the data verification tasks, a comparison was performed between the State broadband coverage area from the State’s last data submission to the NTIA in April 2012 with the third party information from Infogroup purchased by the State. An Excel spreadsheet was provided by Infogroup and contains customer location information for cable, digital subscriber line (DSL), fiber optic (fiber), and wireless subscribers and can be converted into a spatial geographic information system (GIS) dataset. The findings were used to indicate whether or not there are any areas in the submitted broadband coverage data that may need to be updated or verified.

Also present in the spreadsheet table is customer location information for dialup subscribers. This dataset can be converted into a spatial GIS layer and used to identify areas that may not have broadband services, but can still access information through a dialup service.

When comparing the current broadband coverage area and the new XY point layer from the Infogroup records, only a small percentage of points fell outside of the coverage area. Table 1 highlights the key results that were found.

Type of Service	Total Number of Points	Number of Points Outside of Coverage Area	Number of points Within 50 ft of Coverage Area	Number of points Over 500 ft of Coverage Area
Cable	108,503	303	60	92
DSL	63,462	268	69	64
Fiber	428	4	1	1
Wireless	4,962	54	2	25
Total	177,355	629	132	182

Table 1—Points Outside of Coverage Area by Technology

In conclusion, the analysis of the dataset indicates that no immediate changes need to be made to the existing broadband coverage area because of the low percentage of points that fell outside of the current coverage areas.

Throughout the broadband data development program, as addressing information from the State Addressing and Mapping Board's addressing datasets are continually updated, address point information from providers will continually be re-verified prior to each submission to NTIA to improve geocoding results and refine the broadband coverage areas.

Verification Tasks Performed

The West Virginia Broadband Mapping Program had outlined specific objectives for data verification throughout 2012 and 2013. These objectives were focused on five main components:

1. Begin development of a plan for integration of Public Data Sources for verification activities
2. Begin development of a plan to compile free wireless broadband services offered and operated by a government, business, or community entity
3. Continue verification activities by revisiting contacts for each anchor institution and developing verification strategy for data with which we are less confident
4. Continue to refine a confidence scale that indicates the level of confidence for each record
5. Obtain speeds at the block/segment level

To achieve these objectives as outlined to NTIA in the West Virginia Broadband Mapping Program activities, the West Virginia Office of GIS Coordination (WVOGC) implemented the following tasks from 2012 through early 2014.

- Received the current FCC Form 477 data from the WVOGC and provided comparisons to the Round 6 submission data to determine if there are additional build out by providers that need to be requested for the Round 7 submission. This round marked the first time that U.S. Cellular participated in the data collection effort.
- Used service availability query tools published on providers' websites to compare to what has been submitted.
- Finished compilation of free wireless broadband services offered and operated by a government, business, or community entity. Researched information on websites and applications that list free Wi-Fi hotspots. Further field verification of these hotspots through a pilot test is described in a separate section of this document. This layer was compiled for the pilot area during the wireless coverage field verification project timeline. The Wi-Fi hotspots GIS layer was added to the interactive map to provide residents of the State and visitors information that will allow them to locate businesses or community centers that provide free access to Wi-Fi. The compilation of free wireless broadband services offered and operated by a government, business or community entity for the remainder of the State has been completed. The locations of these free Wi-Fi establishments were determined through Internet research and then mapped using SAMB data. The Wi-Fi hotspots GIS layer for use through a Web viewer is in development and is currently in the testing phase.
- Reviewed submitted wireline attributes (central offices, remote terminals, etc.) and compared locations as submitted by providers to any visible location information on orthophotos or against any facilities coded in the SAMB data. Additional field verification was completed in pilot area testing described in this document.

Additional objectives continued to be reviewed and considered in 2013-2014 such as the following:

- Work with WVOGC and the West Virginia Department of Homeland Security and Emergency Management (WVDHSEM) to launch an outreach campaign to have community anchor institutions take the speed test and take a specific survey developed for community anchors beyond what has already been surveyed and collected so far by WVDHSEM.
- Obtain speeds at the block/segment level. Research the currently available options for obtaining more detailed speed information, including third-party source data, and providing recommendations to WVOGC.
- Continue to mine information from the speed tests and develop new campaigns to encourage the use of the speed test.

Field Verification Pilot Test

To achieve the long-term success of specific verification tasks outlined above, a field verification pilot test of a three-county study area was conducted during the first quarter of 2013. This pilot test involved the following activities:

- Used mobile applications on smart phones or laptops to test wireless broadband availability and speeds, and verifying the locations of Central Offices. This field verification was then expanded statewide and was completed by the end of 2013.
- Collected and verified locations of Wi-Fi hotspots and free public broadband to help compile a map of these locations

After analyzing the results of the field verification pilot testing and determining that the project produced useful information, the State decided to expand these verification activities beyond these pilot areas.

Statewide Field Verification

In May 2013, the State implemented a Statewide field verification project. This project involved the following activities:

- Used mobile applications on smart phones or laptops to test wireless broadband availability and speeds.
- Met with representatives from each of the 11 regional planning and development councils to gain feedback regarding local broadband concerns.
- Provided a report of findings to each of the 11 regional planning and development councils, as well as the State.

To determine the centerlines traveled during the drive-testing, the WVSAMB 2011 centerline coverage was evaluated against the provider submitted Round 7 coverage areas for potential use. Removed from the dataset were named driveways and dead-end streets. These potential drive-testing centerlines were chosen based on several factors. They were a good representation of roads within the submitted coverage areas. Also, they had residents living on them and did not appear to be “fade-away” roads (dirt roads that ultimately lead to nothing). Random broadband speed test point locations were selected in populated areas within the provider submitted Round 7 coverage areas.

Testing results were analyzed and reports of findings were developed. In general, speed test results revealed that providers are not achieving the maximum advertised download and upload speeds in some areas of the State. Analysis of the data collected was reviewed against coverage areas submitted by the wireless carriers to determine where inconsistencies exist that could be prioritized for any required follow up with carriers.

Use of Broadband Mapping Datasets for State Broadband Grant Program

The West Virginia Broadband Deployment Council launched a State grant program in the summer of 2012 to help bring affordable broadband to unserved areas of West Virginia. One of the most important ways it does this is by providing grants to help fund broadband deployment projects. Broadband deployment projects can be one of two types – infrastructure and demand promotion. Infrastructure projects are those that bring affordable broadband service to people and businesses that do not currently have it and may never have it without some sort of public funding. Demand promotion projects are those that help people and businesses understand and value the benefits broadband service would bring to them, and cause them to want to use that service. To help delineate specific potential project areas, as described in the West Virginia Code 31-15C-1, the broadband mapping coverage that has been developed as part of the NTIA’s broadband mapping program was used to generate maps that depicted Type 1, 2 and 3 areas outlined in that statute.

A Type 1 unserved area is an area in which broadband may be deployed by service providers in an economically feasible manner. A Type 2 unserved area is an area in which broadband may be deployed by broadband service providers and other entities in an economically feasible manner, provided some form of public money is made available. A Type 3 unserved area is an area in which, at present, cable or wireline broadband cannot be deployed in an economically feasible manner and an

intermodal approach employing other technologies, such as satellite and wireless, is required to provide that area with high-speed Internet access.

Broadband service providers each have unique processes for determining when it is economically feasible to deploy broadband service to a given area. The process varies from provider to provider and depends greatly on the technology being deployed. Because no consistent formula exists and the definition of a Type 1, 2 or 3 unserved area is not strictly defined, an objective means to classify unserved areas is based upon known metrics for populations more likely to have broadband service today. Metrics regarding current broadband deployment were obtained from FCC reports. Factors including structure points, population density, median income, age, distance from existing networks and terrain were considered in classifying unserved areas as Type 1, 2 or 3.

The known areas currently served by broadband service providers were documented from the State Broadband Mapping Program through the GIS coordinator's office and WVGES. Areas currently served by broadband service were excluded from the determination. Unserved areas were then subdivided based on proximity to structure points and road segments. Each area was then correlated with 2000 and 2010 census data for population density, income and population age to determine likelihood for deploying broadband service.

Criteria used to determine the likelihood of a given area receiving broadband service was based on metrics provided by the Broadband Adoption and Use in America, Omnibus Broadband Initiative (OBI) Working Paper Series No. 1, by John B. Horrigan for areas where broadband is currently deployed. Specific categories considered in the determination included population density, population age, income and proximity to existing networks. Each category was weighted on a scale of one to five, with a score of five indicating a high likelihood to receive broadband service and a score of one indicating a low likelihood to receive broadband service. Based on the average of the four considered categories, each subdivided area was classified as Type 1, 2 or 3.

Based on the determination, a map was developed which depicts the Type 1, 2 and 3 classifications across the State. A 1,000 foot boundary was included within the documented area around each structure point to reflect the area that a wireline provider may be willing to lay cable from a roadway in order to provide broadband service. Served areas are reflected with a yellow color. Each unserved area is color classified according to the Type 1, 2 and 3 determinations.

A second round of the grant program was launched in the summer of 2013. The broadband mapping coverage data was used once again to delineate Type 1, 2 and 3 areas. House Bill 2979 of 2013 amended the definition of broadband in West Virginia to match the FCC definition of broadband and change with it. That definition is currently 4 Mbps download speed and 1 Mbps upload speed. Because of the speed tier breaks established by the NTIA in the broadband mapping submissions, the 3 Mbps download and 768 kbps upload as proxy were used for 4 Mbps download and 1 Mbps upload in accordance with the methodology described in FCC Report 12-90.

A third round of the grant program was launched in late 2013 and the latest GIS broadband mapping coverage was again utilized to depict the Type 1, 2, and 3 areas. GIS was also used to validate the location of the proposed projects against served and unserved areas according to the broadband mapping coverage collected to date.

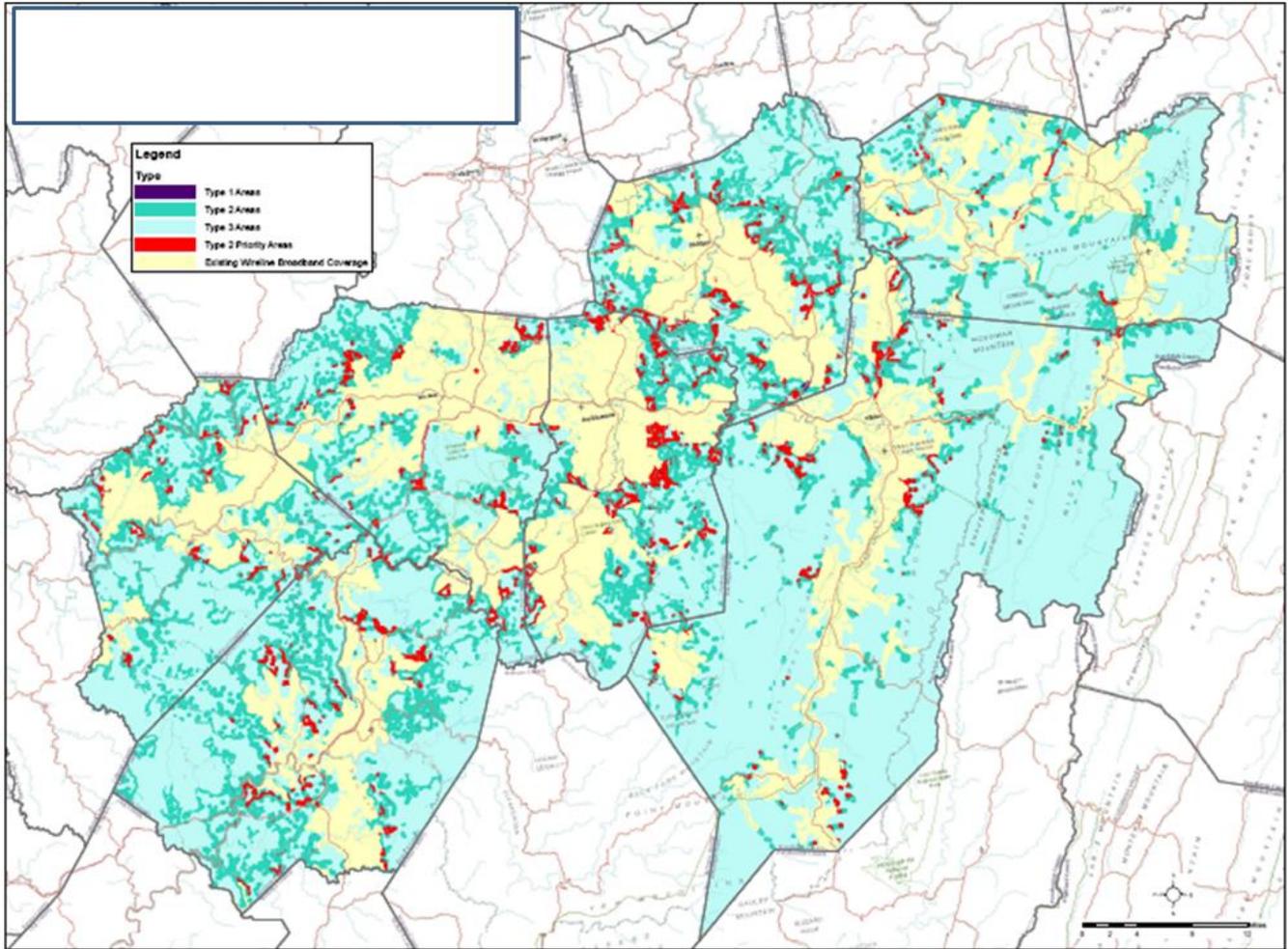


Figure 4—Sample of a Type 1, 2 and 3 Map

Providers

Non-Responsive Providers

Atlantic Broadband LLC

DBA: Atlantic Broadband, LLC

FRN: 0009596883

This provider was contacted eight times. Data was not provided by the submittal date.

**SkyWeb, Inc

DBA: SKYWEB Inc.

FRN: 0018516799

**Tower locations were provided along with additional information for each tower site. Two computerized propagation studies were performed to approximate coverage for a local provider supplying broadband data. The two studies were predicted in the 900 MHz and 2.4 GHz bands that are utilized at these locations. The data was received from the provider that defined the tower sites currently utilized to provide coverage. Parameters provided include site locations, ground elevation, transmit power, antenna height above ground and antenna gain. All of these components were compiled into the EDraw Max (EDX) Signal software program that calculates the associated link budget and in which the program takes into account terrain and

land use land clutter (LULC). Propagation studies show potential coverage throughout the area. Additional assumptions made include a predicted reliability of 90 percent for any signal received by a device and no additional signal loss was taken into account for signals received inside buildings which may further impact the coverage predictions. Coverage areas based on the propagation studies do not seem to represent realistic coverage.

Satellite Providers

Data requests sent to Satellite providers were met with the response of “We provide to the entire State.” Attempts made at gathering more detailed data sets were unsuccessful for this round of data collection.

Hughes Communications, Inc.

DBA: HNS License Sub, LLC

FRN: 0018483073

Detailed data was not provided by the submittal date.

StarBand Communications Inc.

DBA: StarBand Communications Inc.

FRN: 0005087457

Detailed data was not provided by the submittal date.

WildBlue Communications, Inc.

DBA: WildBlue Communications, Inc.

FRN: 0007843766

Detailed data was not provided by the submittal date.

Providers that Submitted Data

Provider Name	DBA Name	FRN
Armstrong Holdings, Inc.	Armstrong Telephone Company - Northern Division	0004311528
Armstrong Holdings, Inc.	Armstrong Telephone Company-WV	0004379731
Armstrong Holdings, Inc.	Armstrong Utilities, Inc.	0003765617
AT&T Inc	New Cingular Wireless Services, Inc.	0003766532
AT&T Mobility, LLC	AT&T Mobility, LLC	0004979233
Broadview Networks Holdings, Inc.	Broadview Networks Holdings, Inc.	0010296853
Blue Devil	Blue Devil	0003749116
Cequel Communications, LLC	Suddenlink Communications	0015784663
Citizens Communications Company	Frontier Communications Corporation	0003576352
City of Philippi	City of Philippi	0001984244
Comcast Corporation	Comcast Cable Communications Inc.	0003768165
Community Antenna Service, Inc.	Community Antenna Service Inc.	0004966131
Deutsche Telekom AG	T-Mobile USA, Inc.	0006945950
Gateway Telecom, LLC	Gateway Telecom LLC	0018536623
Hardy Telecommunications, Inc.	Hardy Telecommunications Inc	0002008043
Hardy Telecommunications, Inc.	Hardy Telecommunications, Inc CLEC	0013169313
Hickory Tech Corporation	Enventis Telecom Inc.	0008394322

Provider Name	DBA Name	FRN
Inter Mountain Cable, Inc.	Inter-Mountain Cable Inc	0001789080
Inter Mountain Cable, Inc.	Mikrotec CATV, LLC	0014471288
JB-Nets	JB-Nets	0016474868
Cricket License Company, LLC	Cricket Wireless	0018402123
Crystal Broadband Networks	Crystal Broadband Networks	0019674191
Level 3 Communications, LLC	Level 3 Communications, LLC	0003723822
Level 3 Communications, LLC	Broadwing Communications, LLC	0008599706
LightEdge Solutions, Inc	LightEdge Solutions, Inc.	0015546443
Lumos Networks	Lumos Networks, LLC	0003771011
Lumos Networks	Lumos Networks of West Virginia	0004342762
Metropolitan Telecommunications Holding Company	Metropolitan Telecommunications Holding Company	0009806019
Micrologic, Inc.	Micrologic, Inc.	0018675256
New Edge Holding Company	New Edge Network, Inc.	0003720471
NTELOS, Inc.	NTELOS Communications Inc.	0004342762
NTELOS, Inc.	West Virginia PCS Alliance, L.C.	0002049328
Otelco Inc.	War Acquisition Corp	0018657858
Qwest Communications International, Inc.	Qwest Communications Company, LLC	0003605953
Shenandoah Telecommunications Company	Shentel Cable Company	0018024075
Sprint Nextel Corporation	Sprint Nextel Corporation	0022117618
Spruce Knob Seneca Rocks Telephone, Inc.	Spruce Knob Seneca Rocks Telephone, Inc.	0004337002
TelAtlantic, Inc.	West Side Telecommunications	0002009405
TelAtlantic, Inc.	Communications Plus, Inc.	0009281262
Time Warner Cable, Inc.	Time Warner Cable, Inc.	0007556251
TW Telecom inc.	tw telecom holdings inc.	0014942668
United States Cellular Corporation	U.S. Cellular	0004372322
Verizon Communications Inc.	Cellco Partnership	0003290673
Verizon Communications Inc.	Verizon Business Global LLC	0010856284
Verizon Communications Inc.	Verizon West Virginia Inc.	0002011278
Visual Link Internet LLC	Visual Link Internet LLC	0017645813
WVVA.NET	WVVA.NET	0018473223

Table 2—Providers That Have Submitted Data for SBDD Program

Broadband Planning and Other Broadband Activities

The West Virginia Broadband Mapping Program received funding through the State Broadband Initiative (SBI) program for the development of regional broadband plans. WVBMP worked with the eleven Regional Planning and Development Councils across the state in the development of the regional plans. Each regional Council developed broadband planning teams to develop the strategic plans for their region. To maintain consistency in the overall strategic plans, the WVBMP developed broadband planning kits as guidelines for the efforts. The regional plans were completed near the end of 2013 and are being used as a basis for a statewide broadband plan that is awaiting approval by the West Virginia Broadband Deployment Council

in order to be finalized. The broadband mapping data collected through the SBI program has been used as a baseline for analytical purposes in both the regional plans and the statewide plan.

Through the SBI program, the WVBMP developed a Technical Assistance Grant Program to provide funding for projects that focus on the enhancement of broadband technologies within the State of West Virginia. The program provided funds for projects ranging in amounts from \$5,000 to \$30,000. The grants were open to state, local and county government agencies, as well as non-profit agencies, educational institutions, community organizations and planning and economic groups.

The first round of grant funding included 33 grants being awarded totaling approximately \$675,000. A second round of grant funding for 39 projects was awarded totaling approximately \$840,000.

Appendix A West Virginia Geological and Economic Survey Provider Data Request Letter

The WVGES Provider Data Request Letter can be found on the following page.

The balance of this page is intentionally left blank.

WEST VIRGINIA
GEOLOGICAL AND ECONOMIC SURVEY

1 Mont Chateau Road
Morgantown, WV 26508-8079

Earl Ray Tomblin, *Governor*
Keith Burdette, *Secretary, Department of Commerce*
Michael Ed. Hohn, *Director and State Geologist*



Phone: (304) 594-2331
Fax: (304) 594-2575
E-mail: info@geosrv.wvnet.edu
Web Site: <http://www.wvgs.wvnet.edu>

July 1, 2014

Re: Data Request in Compliance with the State Broadband Data and Development Grant Program and the Broadband Data Improvement Act

Response Requested by August 29, 2014

Dear :

The West Virginia Geological and Economic Survey (WVGES) must collect certain data regarding the availability of broadband services, technology used to provide them, and the location of certain broadband infrastructure. The WVGES is required to provide the collected data to the NTIA every six months beginning March 2010 until October 2014. Entities that provide broadband service, as defined below, on either a commercial or noncommercial basis within West Virginia are subject to this request.

WVGES was designated as the single West Virginia entity eligible to receive a grant under the Broadband Data Improvement Act of 2008 (BDIA), 47 U.S.C. §§ 1301-04. In 2009, the WVGES successfully applied to the National Telecommunications and Information Administration (NTIA) for such a grant, pursuant to the NTIA's Notice of Funds Availability (NOFA).

The NTIA's State Broadband Data and Development Grant Program Notice of Funds Availability, Docket No. 0660ZA (July 8, 2009) (NOFA), defines broadband as follows:

...two-way data transmission to and from the Internet with advertised speeds of at least 768 kilobits per second (kbps) downstream and at least 200 kbps upstream to end users, or providing sufficient capacity in a middle mile project to support the provision of broadband service to end users...

Please note that the broadband inventory maps derived from these data may result in

government-subsidized broadband deployment in unserved and underserved areas. Providers that do not respond may face subsidized competition in areas they already serve.

Attached to this request are the Technical Appendix to the NOFA and a technical appendix written by the WVGES to clarify the data that needs to be collected. **Please note this appendix is new as of January 1, 2012.** These documents outline the broadband availability information WVGES is required to collect. Every broadband service provider within the state of West Virginia is expected to provide the information specified in the attached documents to WVGES **no later than August 29, 2014**, in the format WVGES has specified.

Six Month Update:

Pursuant to the BDIA and the NOFA, WVGES must collect updates on broadband data on a six month rolling basis. **If you had submitted adequate information during the 1st collection period of 2014 and there are no changes to your infrastructure, the WVGES requests a letter stating such.** If infrastructures changes have been made in the interim period, submissions of the changes are required.

Contact Information:

Please submit the requested data **no later than August 29, 2014** by CD or DVD to Samantha McCreery, West Virginia Geological and Economic Survey, 1 Mont Chateau Rd. Morgantown WV 26508-8079.

If you have questions about this request, contact Samantha McCreery by email at smccreery@geosrv.wvnet.edu, or by phone at (304) 594-2331.

Nondisclosure Agreement:

Data submitted to WVGES in response to this request will be protected under the confidentiality requirements set forth in Section 106 (h)(2) of the BDIA. This section states that, “[n]otwithstanding any provision of Federal or State law to the contrary, an eligible entity shall treat any matter that is a trade secret, commercial or financial information, or privileged or confidential, as a record not subject to public disclosure except as otherwise mutually agreed to by the broadband service provider and the entity.” Further, the NOFA states that “[a]s a measure to protect the confidential or proprietary nature of the information received from broadband service providers and other organizations during the data collection phase, awardees may execute nondisclosure agreements (consistent with applicable law) that require awardees to treat any matter that is a trade secret, commercial or financial information, or privileged or confidential, as a record not subject to public disclosure except where mutually agreed upon by the information provider and the awardee, provided, however, that any such nondisclosure restriction a) will not restrict the providing of all data collected under this Program to NTIA, nor b) restrict NTIA’s use of such data as contemplated under this Notice (including sharing such data with the FCC or other federal agencies)”. NTIA expects awardees to enter into such agreements upon the request of the service provider. WVGES believes that these provisions will protect the confidentiality of information that

broadband providers submit pursuant to this request and intends to enter into a nondisclosure agreement with any provider that wishes to do so.

Michael Ed Hohn
Director and State Geologist
West Virginia Geological and Economic Survey

Additional information may be obtained from the NOFA, available at 74 Fed. Reg. 32,545 or online at <http://broadbandusa.sc.egov.usda.gov>.

Enclosures:

- Letter from Gov. Joe Manchin III to Mr. Larry Strickling, Administrator NTIA (August 12, 2009)
- State Broadband Data and Development Grant Program, Notice of Funds Availability; clarification (August 7, 2009). Available at http://broadbandusa.sc.egov.usda.gov/broadband_mapping.htm
- WVGES Guide to Broadband Submission January 1, 2012

Appendix B West Virginia Geological and Economic Survey Guide to Broadband Submission

The WVGES Guide to Broadband Submission can be found on the following page.

The balance of this page is intentionally left blank.



January 3, 2013

West Virginia Geological and Economic Survey Guide to Broadband Submission

Purpose:

Several changes in submission guidelines have been made by NTIA since the writing of the original Technical Appendix. This document clarifies what is preferred and required for submission and the original NTIA Technical Appendix no longer adequately describes what is required.

Broadband definition:

Broadband Service is the provision, on either a commercial or noncommercial basis, of data transmission technology that provides two-way data transmission to and from the Internet with advertised speeds of at least 768 kilobits per second (kbps) downstream **and greater than 200 kbps upstream** to end users, or providing sufficient capacity in a middle mile project to support the provision of broadband service to end-users within the project area.

2010 census requirements:

Beginning in June 2011, all census block and road information **must be derived from 2010 Census Data**. All block and road data submitted **must have a unique identifier present**, such as census block # or TLID.

The WVGES has created two shapefiles which contain all census blocks in West Virginia less than 2 square miles and all roads contained in census blocks greater than 2 square miles. All census and road data must correspond to these master files.

The shape files are located at:

<https://dssfm.kimballdata.com>

Username: censusdata
Password: censusdata#1

Data preferences:

The WVGES prefers data to be submitted in the following order of preference:

- ESRI shapefile format with all required fields submitted.
- Service area boundary with defined speeds and fields that can be converted to blocks and roads.
- Flat Excel or comma-delimited files that contain all data field and unique identifiers.

Data Types and required fields:

Wireless Services not Provided to a Specific Address – Shapefile

Facilities-based providers of wireless broadband service that is not address specific (e.g., nomadic, terrestrial mobile wireless, or satellite), may provide WVGES with GIS-compatible shapefiles depicting areas in which broadband service is available to end users.

For this purpose, an “end user” of broadband service is a residential or business party, institution, or state or local government entity that may use broadband service for its own purposes and that does not resell such service to other entities or incorporate such service into retail Internet-access service. Internet Service Providers (ISPs) are not “end users” for this purpose. An entity is a “facilities-based” provider of broadband service connections to end user locations if any of the following conditions are met: (1) it owns the portion of the physical facility that terminates at the end user location; (2) it obtains unbundled network elements (UNEs), special access lines, or other leased facilities that terminate at the end user location and provisions/equips them as broadband; or (3) it provisions/equips a broadband wireless channel to the end user location over licensed or unlicensed spectrum.

For this purpose, “broadband service” is “available” at a location if the provider does, or could, within a typical service interval (7 to 10 business days) without an extraordinary commitment of resources, provision two-way data transmission with advertised speeds of at least 768 kilobits per second (kbps) downstream and greater than 200 kbps upstream to end-users at that location. The data shall be submitted to WVGES as an ESRI Shapefile such that the associated data contains the following fields:

- Instructions for providers needing to obtain a FRN can be accessed at <https://fjallfoss.fcc.gov/coresWeb/publicHome.do>.
- All map areas must be closed, non-overlapping polygons with a single, unique identifier.
- Any variation in any of the required fields necessitates the creation of a separate closed, non-overlapping polygon.
- In the area covered by each polygon, subscribers must have broadband service with the speed characteristics shown in the data record 95% of the time to within 50 feet of the polygon’s boundary.
- The technology of transmission should be entered as an integer based on the coding scheme shown below.
- The speed tiers should be entered as integers according to the reference in below.
- The data must be expressed using the WGS 1984 geographic coordinate system.
- Maps must be accompanied by metadata or a plain text “readme” file that contains a comprehensive explanation of the methodology employed to generate the map layer including any necessary assumptions and an assessment of the accuracy of the finished product.
- Since ESRI Shapefiles typically consist of 5 to 7 individual files including the associated metadata and geodatabase, data for the entire state or territory should be submitted as a single, zipped file containing all the component files. The file should be named “area_availability_XX.zip” where XX is the two-letter postal abbreviation for the state or territory.

**Record Format for Availability Area Data for Each Provider – Use Only in Connection with
Wireless Services not Provided to a Specific Address**

Field	Description	Type	Example
Provider Name	Provider Name	Text	ABC Co.
DBA Name	“Doing-business-as” name	Text	Superfone, Inc.
FRN	Provider FCC Registration Number	Integer	8402202
Technology of Transmission	Category of technology for the provision of service (see details following Part 1(a) for codes)	Integer	41
Spectrum Used	If technology of transmission is wireless, is Cellular spectrum (824-849 MHz; 862-869) used to provide service (Y/N)?	Text	Y
Spectrum Used	If technology of transmission is wireless, is 700 MHz spectrum (698-758 MHz; 775-788 MHz; 805-806 MHz) used to provide service (Y/N)?	Text	Y
Spectrum Used	If technology of transmission is wireless, is Broadband Personal Communications Services spectrum (1850-1915 MHz; 1930-1995) used to provide service (Y/N)?	Text	Y
Spectrum Used	If technology of transmission is wireless, is Advanced Wireless Services spectrum (1710-1755 MHz; 2100-2155) used to provide service (Y/N)?	Text	N
Spectrum Used	If technology of transmission is wireless, is Broadband Radio Service/Educational Broadband Service spectrum (2496-2690 MHz) used to provide service (Y/N)?	Text	N
Spectrum Used	If technology of transmission is wireless, is Unlicensed (including broadcast television “white spaces”) spectrum used to provide service (Y/N)?	Text	N
Spectrum Used	If technology of transmission is wireless, but the spectrum used to provide service is not listed above, please identify as one of the following: Specialized Mobile Radio Service (SMR) (817-824 MHz; Spectrum Used 862-869 MHz; 896-901 MHz; 935-940 MHz), Wireless Text SMR Communications Service (WCS) spectrum (2305-2320 MHz; 2345-2360 MHz), 3650-3700 MHz, Satellite (L-band, Big LEO, Little LEO, 2 GHz).	Text	SMR
Maximum Advertised Downstream Speed	Speed tier code for the maximum advertised downstream speed available (see details following Part 1(a) for codes)	Integer	8

Maximum Advertised Upstream Speed	Speed tier code for the maximum advertised upstream speed that is offered with the above maximum advertised downstream speed available (see details following Part 1(a) for codes)	Integer	8
Typical Downstream Speed	Speed tier code for the downstream data transfer throughput rate that most subscribers to service at the maximum advertised downstream speed (above) can achieve consistently during expected periods of heavy network usage (see details following Part 1(a) for codes).	Integer	8
Typical Upstream Speed	Speed tier code for the upstream data transfer throughput rate that most subscribers to service at the maximum advertised upstream speed (above) can achieve consistently during expected periods of heavy network usage (see details following Part 1(a) for codes).	Integer	8

Middle Mile and Backbone Interconnection Points

In addition to the information shown in the tables below, awardees shall provide NTIA with a list of interconnection points of facilities in their state that provide connectivity between (a) a service provider’s network elements (or segments) or (b) between a service provider’s network and another provider’s network, including the Internet backbone. (Collectively, (a) and (b) are “middle-mile and backbone interconnection points”).

Middle-mile and backbone interconnection points typically enable relatively fast data rates, are built to handle substantial capacities, and may be service-quality assured.

Examples might include: points of interconnection enabling communications between an incumbent local exchange carrier central office and the Internet, between a cable aggregation point (headend) and the Internet, or between a wireless base station and the provider’s core network elements that connect to other networks including the internet.

These data shall be submitted to NTIA as a tab-delimited text file in which each record has the following format:

- Instructions for providers needing to obtain a FRN can be accessed at <https://fjallfoss.fcc.gov/coresWeb/publicHome.do>.
- The capacity of the serving facility should represent the capacity as currently configured and be expressed according to the following reference:
- Coordinates must be expressed using the WGS 1984 geographic coordinate system.
- Data for the entire state or territory should be submitted as a single, tab-delimited plain text file named “middlemile_XX.txt” where XX is the two-letter postal abbreviation for the state or territory.

Record Format for Middle-Mile and Internet Backhaul Connection Points Data for Each Provider

Field	Description	Type	Example
Provider Name	Provider Name	Text	ABC Co.
DBA Name	Doing-business-as name	Text	Superfone, Inc.
FRN	FCC Registration Number	Integer	8402202
Ownership	Is the facility owned (0) or leased (1)?	Integer	0
Serving Facility Capacity	Serving capacity of transport facility (see details below)	Integer	1
Serving Facility Type	Type of transport facility (1=Fiber; 2=Copper; 3=Hybrid Fiber Coax (HFC); 4=Wireless)	Integer	1
Latitude	Latitude in decimal degrees	Float	38.88456
Longitude	Longitude in decimal degrees	Float	-77.028123
Elevation	Elevation relative to grade to the nearest foot (positive integers indicate above grade, negative below grade)	Integer	-10

Serving Facility Codes

Data Rate Code	Interconnection Point Data Rate
1	Multiple T1s and less than 40 mbps
2	Greater than 40 mbps and less than 150 mbps
3	Greater than 150 mbps and less than 600 mbps
4	Greater than or equal to 600 mbps and less than 2.4 gbps
5	Greater than or equal to 2.4 gbps and less than 10 gbps
6	Greater than or equal to 10 gbps

Service Address Service Associated with Specific Address

For each facilities-based provider of broadband service to specified end-user locations in their state, awardees shall provide NTIA with a list of all addresses at which broadband service is available to end users in the provider’s service area, along with the associated service characteristics identified below.

For this purpose, “broadband service” is the provision, on either a commercial or noncommercial basis, of data transmission technology that provides two-way data transmission to and from the Internet with advertised speeds of at least 768 kilobits per second (kbps) downstream **and greater than 200 kbps upstream** to end users, or providing sufficient capacity in a middle mile project to support the provision of broadband service to end-users within the

project area.

For this purpose, an “end user” of broadband service is a residential or business party, institution or state or local government entity that may use broadband service for its own purposes and that does not resell such service to other entities or incorporate such service into retail Internet-access services. Internet Service Providers (ISPs) are not “end users” for this purpose. An entity is a “facilities-based” provider of broadband service connections to end user locations if any of the following conditions are met: (1) it owns the portion of the physical facility that terminates at the end user location; (2) it obtains unbundled network elements (UNEs), special access lines, or other leased facilities that terminate at the end user location and provisions/equips them as broadband; or (3) it provisions/equips a broadband wireless channel to the end user location over licensed or unlicensed spectrum.

For this purpose, “broadband service” is “available” at an address if the provider does, or could, within a typical service interval (7 to 10 business days) without an extraordinary commitment of resources, provision two-way data transmission to and from the Internet with advertised speeds of at least 768 kilobits per second (kbps) downstream and greater than 200 kbps upstream to endusers at that address. The list of addresses shall be submitted to WVGES as a tab-delimited text file in which each record has the following format:

- All fields are required.
- Instructions for providers needing to obtain a FRN can be accessed at <https://fjallfoss.fcc.gov/coresWeb/publicHome.do>.
- The ID field is a sequential integer ranging from 1 to the total number of addresses.
- Address data fields should be space-delimited in standardized Postal Service form. See <http://pe.usps.gov/cpim/ftp/pubs/Pub28/pub28.pdf>.
- Categories of end users should be entered as integers based on the following table.
- For reporting the technology of transmission, report the technology used by the portion of the connection that terminates at the end-user location. If different technologies are used in the two directions of information transfer (“downstream” and “upstream”), report the connection in the technology category for the downstream direction. The technology of transmission should be entered as an integer based on the following tables.
- Speed tiers should be entered as integers based on the following tables.
- Data for the entire state or territory should be submitted as a single, tab-delimited plain text file named “address_availability_XX.txt” where XX is the two-letter postal abbreviation for the state or territory.

Record Format for Address Data for Each Provider

Field	Description	Type	Example
Provider Name	Provider Name	Text	ABC Co.
DBA Name	“Doing-business-as” name	Text	Superfone, Inc.
FRN	Provider FCC Registration Number	Integer	8402202
ID	Sequential record number	Integer	1

End User location/Service Data End-User Address	Complete address	Text	1401 Constitution Ave NW Washington DC 20230
End-User Building Number End-User Prefix Direction	Building number Prefix direction	Text	1401
End-User Street	Street name	Text	Constitution
End-User Street Type End-User Suffix Direction	Street type Suffix direction	Text	Avenue NW
End-User City	City	Text	Washington
End-User State Abbreviation	Two-letter state postal abbreviation	Text	DC
End-User ZIP Code	5-digit ZIP code (with leading zeros)	Text	20230
End-User ZIP Plus 4	4-digit add-on code (with leading zeros)	Text	0005
Category of End User	Category of End User Served at Address (see details below for codes)	Integer	3
Technology of Transmission	Category of technology available for the provision of service at the address (see details below for codes)	Integer	50
Maximum Advertised Downstream Speed	Speed tier code for the maximum advertised downstream speed available at the address (see details below for codes)	Integer	8
Maximum Advertised Upstream Speed	Speed tier code for the maximum advertised upstream speed that is offered with the above maximum advertised downstream speed available at the address (see details below for codes)	Integer	8
Typical Downstream Data	Speed tier code for the downstream data transfer throughput rate that most subscribers to service at the maximum advertised downstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8

Typical Upstream Speed	Speed tier code for the upstream data transfer throughput rate that most subscribers to service at the maximum advertised upstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8
------------------------	--	---------	---

End User Codes

End User Category Code	End User Category	Description
1	Residential	Address denotes a residential living unit, individual living unit in institutional settings such as college dormitories and nursing homes and other locations designed primarily for residential use at which broadband service is available.
2	Governmental	Address denotes a state or local government location at which broadband service is available.
3	Small Business	Address denotes the location of a small business.
4	Medium or Large Enterprise	Address denotes the location of a medium or large enterprise.
5	Other	Address denotes a location not meeting any of the above descriptions.

Technology of Transmission Codes

Technology Code	Description	Details
10	Asymmetric xDSL	
20	Symmetric xDSL	
30	Other Copper Wireline	All copper-wire based technologies other than xDSL (Ethernet over copper and T-1 are examples)
40	Cable Modem - DOCSIS 3.0	
41	Cable Modem - Other	

50	Optical Carrier/Fiber to the End User	Fiber to the home or business end user (does not include "fiber to the curb")
60	Satellite	
70	Terrestrial Fixed Wireless - Unlicensed	
71	Terrestrial Fixed Wireless - Licensed	
80	Terrestrial Mobile Wireless	
90	Electric Power Line	
0	All Other	Any specific technology not listed above.

Speed Tier Codes

Upload Speed Tier	Download Speed Tier	Description
1	--	Less than or equal to 200 kbps
2	--	Greater than 200 kbps and less than 768 kbps
3	3	Greater than or equal to 768 kbps and less than 1.5 mbps
4	4	Greater than or equal to 1.5 mbps and less than 3 mbps
5	5	Greater than or equal to 3 mbps and less than 6 mbps
6	6	Greater than or equal to 6 mbps and less than 10 mbps
7	7	Greater than or equal to 10 mbps and less than 25 mbps
8	8	Greater than or equal to 25 mbps and less than 50 mbps
9	9	Greater than or equal to 50 mbps and less than 100 mbps
10	10	Greater than or equal to 100 mbps and less than 1 gbps
11	11	Greater than or equal to 1 gbps

Census Blocks Less than Two Square Miles

Record Format for Wireline Service by Census Block

(For Census Blocks no greater than two square miles in area in which broadband service is available to end users)

Field	Description	Type	Example
Provider Identification Data			
Provider Name	Provider Name	Text	ABC Co.
DBA Name	"Doing-business-as" name	Text	Superfone, Inc.
FRN	Provider FCC Registration Number	Integer	8402202
ID	Sequential record number	Integer	1

Census Block Identification Data			
Census Block FIPS Code	15-digit Federal Information Processing Standard (FIPS) Code identifying individual Census Block. Must include leading "0"	Integer	60750160001015
Census Block Square Mileage	Provide square mileage for specific census block number to the first decimal place	Number	1.8
Broadband Technology and Speed Data			
Technology of Transmission	Category of technology available for the provision of service at the address (see details below for codes)	Integer	50
Typical Downstream Speed	Speed tier code for the downstream data transfer throughput rate that most subscribers to service at the maximum advertised downstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8
Typical Upstream Speed	Speed tier code for the upstream data transfer throughput rate that most subscribers to service at the maximum advertised upstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8

Roads contained within Census Blocks greater than two square miles

Record Format for Wireline Service by Street Segment

(For Census Blocks larger than two square miles in area in which broadband service is available to end users)

Field	Description	Type	Example
Provider Identification Data			
Provider Name	Provider Name	Text	ABC Co.
DBA Name	"Doing-business-as" name	Text	Superfone, Inc.
FRN	Provider FCC Registration Number	Integer	8402202
ID	Sequential record number	Integer	1

End User location/ Service Data			
Census Block FIPS Code	15-digit Federal Information Processing Standard (FIPS) Code identifying individual Census Block	Integer	60750160001015
Census Block Square Mileage	Provide square mileage for specific census block number to the first decimal place	Number	5.8
Street Name	Provide street name to identify street segment	Text	Van Ness
Street Type	Street type to identify street segment	Text	Avenue
Street Direction Prefix	Street Prefix to identify street segment	Text	N
TLID	Unique identifier for each street segment	Text	0015874962
Broadband Technology and Speed Data			
Technology of Transmission	Category of technology available for the provision of service at the address (see details below for codes)	Integer	50
Typical Downstream Speed	Speed tier code for the downstream data transfer throughput rate that most subscribers to service at the maximum advertised downstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8
Typical Upstream Speed	Speed tier code for the upstream data transfer throughput rate that most subscribers to service at the maximum advertised upstream speed (above) can achieve consistently during expected periods of heavy network usage (see details below for codes)	Integer	8