



## **New Mexico State Broadband Initiative**

### **Mapping Methodology: April 1, 2014**

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# New Mexico State Broadband Initiative

## Mapping Methodology: April 1, 2014

### Introduction

The State of New Mexico (hereafter, NM or State), through its agents Earth Data Analysis Center (EDAC [Mapping Team]) at The University of New Mexico and NM Department of Information Technology (DoIT), submitted the April 1, 2014 New Mexico Broadband (NMBB) Program data package, in compliance with the National Telecommunications and Information Administration (NTIA) State Broadband Initiative Program (SBI).

### Data Submittal Description

The NMBB April 1, 2014 data submission includes:

- NMBB\_DeliverableMemo\_2014\_04\_01.pdf: This document describes NMBB data submittal components, state-restricted data fields, and contact information.
- NM\_SBDD\_2014\_04\_01.gdb: The NMBB geodatabase was created to NTIA standards and includes FGDC-compliant metadata for the database layers.
- NM\_DataPackage\_2014\_04\_01.xlsx: The FCC-prepared data-package spreadsheet consists of three worksheets for overview and checklist, record count, and provider table.
- NM\_2014\_04\_01.txt: The data receipt file generated from running the Check Submission Tool, lists pass/fail for received data-submission layer and field entries.
- NM\_ReadMe\_2014\_04\_01.txt: This readme gives a brief description on the error or warning messages generated by the Check Submission Tool.
- NM\_Methodology\_2014\_04\_01.pdf: The Methodology document is included in the submitted package.
- NM\_Changes\_and\_Corrections\_2014\_04\_01.pdf: The document corresponds to a readme document, especially for Internet Service Provider (ISP) information.
- NMBB\_Provider\_Data\_Request\_Template.xls: The data-request spreadsheet contains an overview and upload instructions in addition to eight worksheets for different types of service, subscriber speed, and community anchor institutions.

All files were zipped together and submitted as NM\_SBDD\_20140401.zip.

SBDD Geodatabase Layer	Number of Records: April 1, 2014
BB_Service_Address	0*
BB_Service_Road_Segment	10,055
BB_Service_CensusBlock	150,059
BB_Service_CAIstitutions	3,571
BB_Service_Wireless	63
BB_Service_Overview	180
BB_ConnectionPoint_LastMile	0*
BB_ConnectionPoint_MiddleMile	405

\* Due to restrictions in the Non-disclosure Agreement (NDA) with New Mexico Internet Service Providers (ISPs), New Mexico cannot populate the Service Address and Last-Mile feature classes in the NMBB Geodatabase.

## Provider Participation

The NMBB Program, in January 2014, requested broadband data for the April 2014 (Round 9) submittal from seventy (70) NM Internet Service Providers (ISPs) out of an identified seventy-six (76) ISPs. The remaining six (6) ISPs were not contacted due to the lack of correct contact information.

A total of thirty-seven (37) different ISPs responded to this data request. Of those, thirty-three (33) ISPs provided data and the others indicated no changes to their previously-submitted data. And one ISP is still identified as not a broadband provider because the provided speeds did not meet broadband requirements.

The NMBB Program identified the additional ISP ValuTel Communications during Round 8, through broadband speed-data analysis. For the Round 9 data collection, the NMBB Program contacted ValuTel several times but received no response from them.

Internet Service Providers	Number: April 1, 2014
Identified	76
Contacted	70
Responded: Provided Data	33
Responded: No Changes to Data	4
Responded: Will not Participate	0
Responded: Not NM Broadband Provider	1
Did Not Respond: Previously Submitted Data	13
Did Not Respond: Never Submitted Data	19

See *Appendix A: Table of New Mexico Internet Service Providers* for those ISPs included in the data request and the participating ISPs.

## Data Verification Techniques

### Consistency Checks

- EDAC reviewed data provided by NM ISPs for completeness (and/or consistency), per NTIA Data Transfer Model requirements. The NMBB Program contacted ISPs by e-mail to request any missing information.  
This review included comparing newly provided data with the provider's previous data sets. Discrepancies or inconsistencies were noted and addressed through e-mail correspondence with the provider. *Appendix B: ISP-Data Verification and Validation* presents examples of these e-mails. See sections 1. *Data Collection*, 1.5 *Data Evaluation* and 2. *Data Validation*, 2.1 *Data Assessment*, 2.6 *Final Data Validation*.
- For those ISPs who provided block- or segment-level coverage, the Mapping Team checked for coverage containment within known service boundaries. See section 3. *Data Processing*, 3.3 *GIS Data Verification*.

- For ISPs providing wireless coverage, the Team checked for coverage containment to New Mexico. See section 3.3 *GIS Data Verification*.
- If an ISP provided Census Block shapefiles, the Team checked the area of the block to confirm that it fell into the categories for area less than 2 sq. mi. or greater than 2 sq. mi. See section 3.3 *GIS Data Verification*.
- The Mapping Team performed speed checks on data received from the ISPs to make sure they met broadband requirements. See section 3.3 *GIS Data Verification*.
- Topology is validated after loading the data into the geodatabase to identify any inconsistencies in data. See section 3. *Data Processing*, 3.6 *Validate Geodatabase*.
- Checked Speed values using the NTIA Readme.txt and Data\_Model\_Changenotes.txt files, provided with the data model in June 2013.

## Geocoding

- The Mapping Team geocoded address data using different reference street data sets to determine which road reference data set provided the best match. Sometimes a combination of reference data sets was used to obtain better address match rates. See section 3. *Data Processing*, 3.1, 3.2 *GIS Data*.
- Unmatched records were sent to the ISP as part of the validation process, with a request for better address information. See section 3. *Data Processing*, 3.3, 3.4 *GIS Data Verification, Updates, and Edits*.

## NM ISP Feedback Loop

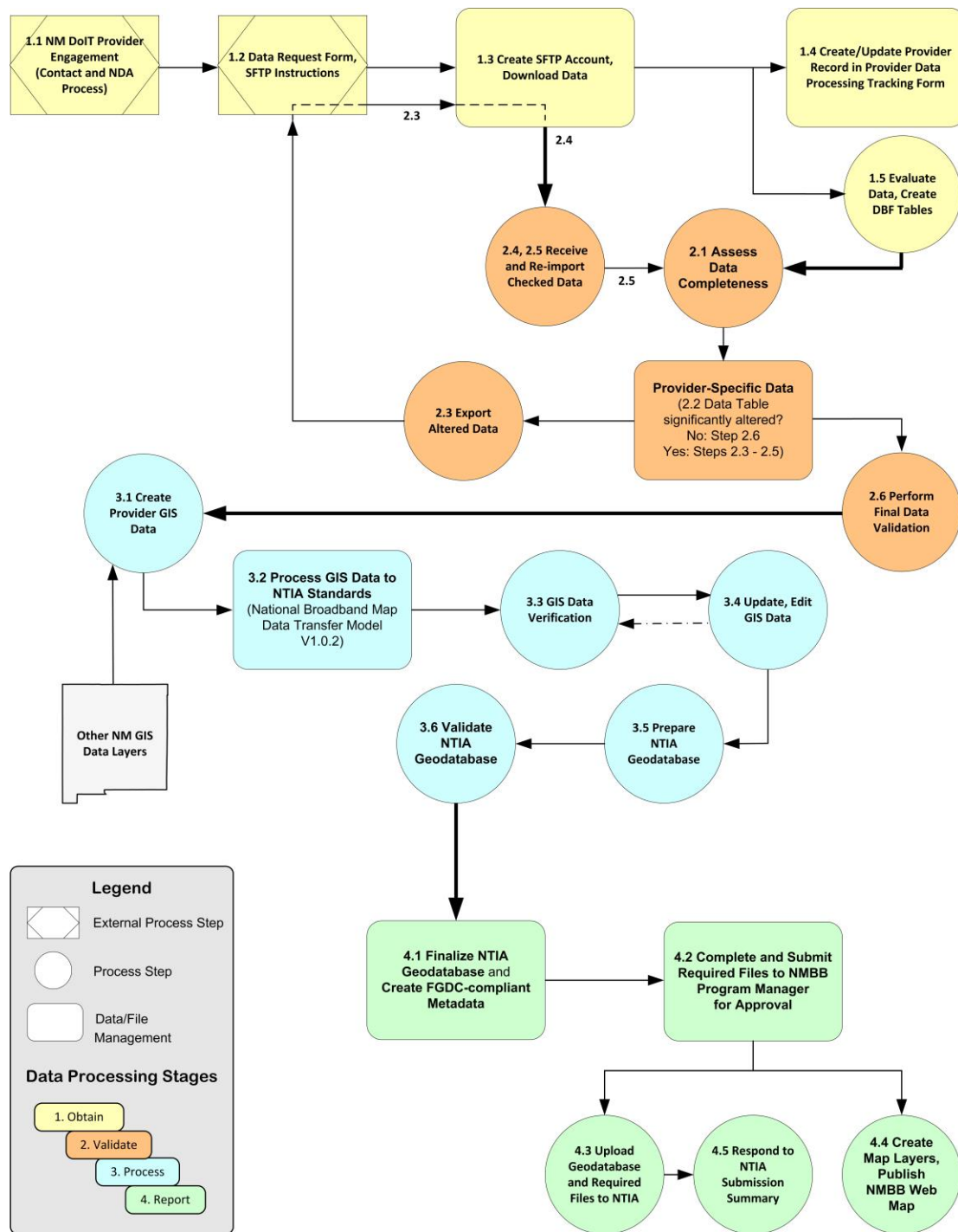
- After processing ISP data, the Mapping Team sent Feedback maps for approval. Any issues for how the service area was represented on the map, such as addition or removal of service, were addressed and corrected, as appropriate. Revised maps then were sent to the provider for review and approval. Feedback maps also included propagation-model results for Wireless broadband. See section 3. *Data Processing*, 3.3, 3.4 *GIS Data Verification, Updates, and Edits*. See Appendix C: *Feedback and Propagation Model Map*.

## Workflow Processing Scheme

New Mexico acknowledges the importance of understanding data reliability and integrity as the Provider data are processed for NTIA submittal. The NMBB Data Workflow and Processing Scheme includes four broad stages:

1. Obtain – Acquire raw Provider data.
2. Validate – Check for internal data consistency and for consistency with external data sources.
3. Process – Develop Geographic Information System (GIS) data and update NTIA Geodatabase.
4. Report – Submit the final Geodatabase to NTIA.

These stages and their relationships are depicted in the diagram below, and are discussed in the sections that follow. The April 1, 2014 Data Workflow and Processing Scheme did not change from the October 2012 scheme and so retained the V3.0 designation.



New Mexico Broadband Data Workflow and Processing Scheme V3.0 10.01.2012 EDAC

Figure 1 New Mexico Broadband Workflow and Processing Scheme

## 1. Data Collection

### 1.1 Provider Engagement

The NM Department of Information Technology established contact with each New Mexico Broadband Provider and negotiated a signed NDA with the State and with EDAC, as required.

### 1.2 Data Request

EDAC sent an e-mail requesting broadband data to sixty-nine NM ISPs in January 2014 and a reminder e-mail in February to those who had not responded. In addition to an NMBB Program overview and formal request for data, the message included a Web link for the NM Broadband Data Request Form (MS Excel Worksheet); this form included instructions for completing the eight data worksheets and for securely uploading Provider data to the EDAC Secure FTP site.

#### Data Request Schedule

NMBB Round 9 Data Collection Announcement	01/24/2014
NMBB ISP Data Collection Due	02/28/2014
NMBB Feedback Maps to ISPs for Approval	03/12/2014
NMBB ISP Feedback Due	03/21/2014
NTIA Round 9 Data Due	04/01/2014

### 1.3 Data Receipt

EDAC collects broadband data via a Secure File Transfer Protocol (SFTP) site. Each Provider is assigned a unique username and password to log in and upload the data; these data are downloaded from the SFTP site to the EDAC network. EDAC sends a receipt to each participating Provider, upon data download.

### 1.4 Provider and Data Tracking

EDAC creates or updates the specific Provider record in a Provider Data Processing Tracking Form. Throughout the data process, each Tracking Form step is recorded with analyst initials and date of task completion. Steps include:

- Record Provider name information and the assigned 2-digit Primary Key (PKey).
- Record the Holding Company Name, DBA Name, FRN (if available), and whether Community Anchor Institutions data are provided.
- Record type of files submitted; date of data submission and the initials of the receiving GIS analyst; and how data were submitted (e.g., FTP or physical medium).

### 1.5 Data Evaluation

EDAC evaluates the uploaded Provider data for consistency with the NTIA data model and previously submitted data and creates database-format tables.

## 2. Data Validation

### 2.1 Data Assessment

EDAC assesses the submitted data for completeness according to the National Broadband Map Data Transfer Model:

- Identify fields (names, types);
- Fill in missing data, if possible; and
- Check field codes, and standardize the values where appropriate.

## 2.3 Data Export

If the data are incomplete, based upon the above assessment steps, EDAC performs the *If required* steps, below; otherwise, EDAC proceeds with data validation. Changes and assumptions are documented.

If required:

- 2.2 Was the Data Table significantly altered? If yes, go to step 2.3. If no, go to step 2.6.
- 2.3 Return data in standardized format to the Provider for completion.
- 2.4 Receive modified data back from Provider.
- 2.5 Re-import data.

## 2.6 Data Validation

EDAC performs the final data validation for each Provider's data set: all missing data filled in; all field codes checked and standardized where appropriate. EDAC checks the ISP's provider name and FRN number using FCC's Commission Registration System (CORES) database.

<https://fjallfoss.fcc.gov/coresWeb/publicHome.do>

## 3. Data Processing

EDAC extracted download- and upload-speed data from the Speed Test database and included those data in the CAI (Community Anchor Institution) data processing. Speed-test data were collected from the publicly accessible NMBB Speed Test tool.

### 3.1, 3.2 GIS Data

EDAC creates and verifies Provider-specific GIS data, using ArcGIS 10.1 software and third-party data sets.

- New Mexico Road Centerline (NM RCL) data files [Geocoding; Primary Roads Data Set]
- NM Telephone Exchange Boundaries 911 [Census Blocks Processing]
- U.S. Census TIGER/Line shapefiles [Geocoding]
- NAVTEQ Road data files [Geocoding]
- ESRI Cable Boundaries data file [Census Blocks Processing]
- Ancillary consistency checks include comparison with other data sources that are available through the New Mexico geospatial clearinghouse – Resource Geographic Information System (RGIS; <http://rgis.unm.edu>)
- Propagation model results

EDAC processes the GIS data according to the National Broadband Map Data Transfer Model.



### Middle Mile Points

- ISPs provide the geographic coordinates for Middle Mile points. Those points are exported as shapefiles and a spatial join is performed against Census 2010 Blocks to obtain FULLFIPSID.
- Data sets are further processed by adding required fields based on the NTIA Data Model.

### Census Blocks

- ISP data were requested for the Census 2010 Blocks.
- If an ISP provides the Census Block IDs, then those tables are spatially joined with the Census 2010 Data and the blocks are extracted. Then, the Census Blocks (Area < 2 sq. mi.) are extracted.
- If the ISP provides address-specific data, those addresses are geocoded against the New Mexico Road Centerline (NM RCL) address locator. Unmatched addresses are processed against third-party data sets, such as the NAVTEQ Road data purchased by the State as a part of the NMBB project, and ESRI Road data. All of those matched records are appended together to obtain a single address data set. The address points are aggregated spatially to the Census Blocks, and the Census Blocks (Area < 2 sq. mi.) are extracted.
- If an ISP provides shapefiles of Census Blocks, EDAC verifies those to make sure they are less than 2 sq. mi. in area.
- If an ISP provides telephone exchange boundaries instead of addresses, then those boundaries are verified with the NM Telephone Exchange Boundaries 911 data set, and Census Blocks (Area < 2 sq. mi.) that lie within those boundaries are extracted. If an ISP provides the CO/RT locations, then a buffer of 1800 ft. is drawn, and the Census Blocks (Area < 2 sq. mi.) that intersect with the buffer area are extracted.
- If an ISP provides service areas instead of addresses for Cable, then the service areas are verified with the ESRI Cable Boundaries data file. Census Blocks (Area < 2 sq. mi.) that lie within the boundaries are extracted.
- Resulting Census blocks were checked for the attribute ALAND10 (2010 Census Land Area); blocks with Area = 0 were deleted from the data set.
- If an ISP does not provide data for this data-submittal round, data processed for the previous rounds are used for the current submittal.
- If an ISP provides the End User Category for Census Blocks, indicating residential and business/government subscribers, those values are used; otherwise, the default value of 5 is used for all the Census Blocks to reflect that the ISP does not distinguish the type of subscriber.
- Data sets are further processed by adding required fields based on the NTIA Data Model.

### Road Segments

- If an ISP provides address-specific data, EDAC geocodes those points (using a process similar to that explained above in *Census Blocks*). The address points are aggregated spatially to Census Blocks, and the blocks with area greater than 2 sq. mi. (Area > 2 sq. mi.) are extracted. NM RCL roads within those Census Blocks are exported, and the geocoded address points are spatially joined with adjacent road segments within a distance of 25 ft. (or 30 ft. for rural areas). The road segments with joined address points are selected and exported.

- If an ISP provides road segment data with address ranges, any one of the address range values (TO/FROM) for the road is taken and the data are geocoded. Or, if no address ranges are provided, the address file is joined with the NM RCL roads, based on Street Name, City, and Postal Code and the matched records are extracted. This involves manual data processing.
- If an ISP provides Tiger/Line roads data, those roads are extracted from the U.S. Census Tiger/Line shapefile by joining them based on the TLID (Tiger/Line ID). NM RCL road data that match the Tiger/Line roads are exported. If there are no matched roads in RCL data then Tiger/Line roads are submitted to NTIA.
- If an ISP provides Telephone Exchange Boundaries or CO/RT locations or Cable service area boundaries, road segments for these data sets are not processed due to uncertainty about the NMBB procedures for these cases. EDAC checks for ISP-provided address-specific data and, if those data are present, processes the data using the first-listed *Road Segments* step. Otherwise, those roads are not further processed.
- To improve upon the above-mentioned uncertainty, EDAC tested a different road-segments processing step by selecting two ISPs with coverage for Census blocks greater than 2 sq. mi. in area and adjoining smaller blocks. For those ISPs, EDAC processed road segments data by clipping the roads to the large blocks and manually choosing the road segments that were closer to the smaller blocks (less than 2 sq. mi. in area) with broadband coverage from the same ISP. EDAC has provided feedback maps to the ISPs and is currently assessing the processed results for improved accuracy.
- If an ISP provides the End User Category for Road Segments, indicating residential and business/government subscribers, those values are used; otherwise, the default value of 5 is used for all the Road Segments to reflect that the ISP does not distinguish the type of subscriber.
- Data sets are further processed by adding required fields based on the NTIA Data Model.

#### Community Anchor Institutions

- EDAC created an Anchor Geodatabase that has data for all the Community Anchor Institutions, such as Schools, Libraries, Health Care, Higher Education, Public Safety Facilities, Government Agencies, and Non-governmental Institutions throughout the State of New Mexico. These data were obtained from different sources, including the Public School Facilities Authority (PSFA), New Mexico State Library, Homeland Security Information Program (HSIP), NM Resource Geographic Information System Program (RGIS), National Center Education Statistics (NCES) Common Core of Data (CCD), Integrated Post-Secondary Education Data System (IPEDS), and Institute of Museum and Library Services (IMLS).
- EDAC developed a Community Anchor Site Assessment (CASA) crowd-sourcing application to collect information about Institutions and their Broadband Internet Access in the State of New Mexico. These results are added to the Anchor Database after locations are validated against satellite and aerial imagery.
- EDAC uses the NMBB Speed Test tool to collect broadband speed data for anchor institutions.
  - In Round 8, the NMBB Program requested that the State Library send out a mass email request to all the libraries across the state to take the Speed Test. The NMBB Program also

implemented a separate crowd-sourcing application to collect the location and broadband data from Navajo Nation Chapterhouses in New Mexico.

- EDAC also used New Mexico Public Education Department (NM PED) speed-test data, collected with the PARCC Readiness tool, to update broadband speeds for CAIs.
- It has been difficult to obtain subscription data (speeds and transmission technology) from the CAIs directly; hence NMBB used data from speed tests to update the NTIA database. Due to this, the speed for most of the institutions are lower than recommended for their technology of transmission. The NMBB Program is working with NM PED to determine the confidence levels of the speed-test and technology data; as of yet, PED has made no methods available.
- There are no changes to the UNM Bureau of Business and Economic Research (BBER) digital-literacy-survey data for non-governmental-organization (NGO) community support.
- Per the NTIA guidance email of March 17, 2014, if the technology type for a CAI is unknown, then NMBB uses '-9999' instead of 'Other.'
- Broadband data provided by the ISPs are also included in the geodatabase.
- Data sets are additionally processed by adding required fields based on the NTIA Data Model.

#### Wireless

- If an ISP has multiple spectra, the provided polygon is duplicated for each spectrum and then appended together to obtain a single shapefile with stacked geometry.
- If an ISP provides only tower locations (address or coordinates) instead of shapefiles showing their wireless coverage, EDAC generates wireless coverage using SiteSync propagation modeling software. For this, we request additional information from the ISP, such as: Location (address or coordinates), Antenna pattern (omni-directional, 180, 120, 90, etc.), Transmit frequency (MHz), Transmit Antenna Gain (dBi), and Antenna elevation.
- If an ISP provides tower location (address or coordinates) but no other above-mentioned variables, EDAC generates propagation models using default specifications (based on other ISP data) and sends the coverage maps to the ISP for verification.
- If an ISP provides KMZ (or KML) files, those files are converted to shapefiles.
- Wireless-coverage polygons with area less than 0.125 sq. mi., whether ISP-provided or modeled, are eliminated from the coverage, per NTIA specifications.
- If an ISP indicates providing Satellite services state-wide, a state boundary file is added to the database, processed per NTIA requirements.
- All of these wireless polygons were clipped to the New Mexico State Boundary to ensure that they fall within the state.
- The End User Category value used for all the wireless polygons is 5; subscriber type is difficult to determine due to the larger coverage area.
- Data sets are further processed by adding required fields based on the NTIA Data Model.

#### Overview

- This set of notes applies to wire-line data, only.

- If an ISP provides the Subscriber Weighted Nominal (SWNOM) Speed of respective technology types for the counties it serves, those values are joined with the County boundary file from the U.S. Census Tiger/Line shapefiles.
- If an ISP provides the technology of transmission, number of subscribers, and the maximum advertised speed for the Counties it serves, the SWNOM Speed is calculated and the values are joined with the County boundaries shapefile.
- These county files from each ISP are appended together to obtain a statewide stacked geometry. Data are further processed by adding required fields based on the NTIA Data Model.

### **3.3, 3.4 GIS Data Verification, Updates, and Edits**

Processed data are developed as Provider-specific spreadsheet and GeoPDF products. As the first step in New Mexico's Provider feedback loop, EDAC sends the feedback packages to the ISPs via email and requests that Providers verify accuracy and identify needed edits and corrections. Feedback packages also are placed on the SFTP site. Ten (10) ISPs responded to the verification request in the April 1, 2014 data submission cycle.

Data are updated and edited, based on Provider feedback, and then delivered to the Provider for final verification and to complete the feedback loop.

### **3.5 NTIA Geodatabase Preparation**

EDAC produces a final "clean" GIS data set from the processed and Provider-specific, versioned feature data sets, and then prepares the NTIA Geodatabase from these finalized GIS data.

### **3.6 NTIA Geodatabase Validation**

EDAC validates the geodatabase by performing the validation checks provided below and by running the geodatabase through the SBDD\_CheckSubmission tool. EDAC then assigns Quality Assurance/Quality Control (QA/QC) values.

- Repair Geometry
- Validate Topology
- Check Provider identification fields by Frequency tool and Summarize tool
- Check for Provider Name, Census Block, and Transmission Technology. Each ISP (Provider Name) should have only one Census Block per Transmission Technology
- Check for Null values in Transmission Technology codes, PROVIDER\_TYPE, FULLFIPSID, STATEFIPS, COUNTYFIPS, TRACT, BLOCKID, GEOUNITTYPE, STATECOUNTYFIPS fields
- Check for Null values in OWNERSHIP, BHCAPACITY, BHTYPE, TRANSTECH, ANCHORNAME, ADDRESS (BLDG NBR, STREETNAME), CITY, ZIP5, STATE, Latitude, Longitude fields
- Check Maximum advertised and typical down/upload speed fields for null values and for valid domain values: MAXADDOWN/TYPDOWN < MAXADUP/TYPUP; MAXADDOWN < '0' OR MAXADDOWN > '11'
- BHCAPACITY <0 and >9, BHTYPE <0 and >4, CAICAT <1 and >7
- Check for SPECTRUM values <1 and >10
- Speed Tiers:
  - DSL download speed tier: if 7 or higher, contact ISP to verify

- Cable Modem – DOCSIS 3.0 download speeds should not be 7 or lower
- Cable Modem – Other download speeds should not be 8 or higher
- Wireless download speed tier should not be 8 or higher
- End User Category <> 3, 4 instead use 5 as default

## **4. NMBB Report and Submittal**

### **4.1 Finalized NTIA Geodatabase and Metadata**

EDAC finalizes the Geodatabase per NTIA standards (National Broadband Map Data Transfer Model) and creates the associated metadata.

### **4.2 NMBB Program Manager**

The NMBB Program Manager receives the finalized Geodatabase through the SFTP site and approves the files for submittal to NTIA.

EDAC completes and delivers all files to the NMBB Program Manager, as required by the Program. Files include correspondence logs with NM Providers, documentation for Web mapping activities, and the Provider-specific Data Processing Tracking Form.

### **4.3 NTIA Submittal**

The Geodatabase and required files (data transmittal memorandum, Provider data request template [not a required file], data package spreadsheet, check-submission receipt, methodology, and changes and corrections) are uploaded, using the FCC/NTIA SFTP site.

### **4.4 NMBB Map Layers**

Following the NTIA submittal, EDAC creates GIS map layers from the Geodatabase and publishes them to the New Mexico Broadband Program Mapping site, [www.nmbbmapping.org/mapping/](http://www.nmbbmapping.org/mapping/).

### **4.5 Response: NTIA Submission Summary**

NM DoIT and EDAC developed a document template to respond to the NTIA Submission Summary, both to address NTIA-identified issues or gaps and to request clarification and additional information. New Mexico responds upon receiving NTIA's Submission Summary.

## **NMBB System Security**

The NM Broadband Program complies with standard system-security procedures and protocols required by the NM Department of Information Technology.

## **Lessons Learned**

EDAC continued the approach to further engage wireless-service ISPs that had submitted incomplete data, including feedback maps based on approximated propagation-model parameters. The approach was successful in prompting them to respond with accurate or additional values. EDAC then generated modified feedback maps. Beginning with an approximate coverage and refining that coverage based on the resulting ISP feedback has improved NMBB data collection and broadband-coverage displays.

The NM Broadband Program recognizes the need for and benefits from program visibility and promotion in New Mexico's communities and with ISPs. This exposure both informs broadband users and providers and motivates them to help build a robust database by participating in speed testing, using the NMBB Speed Test tool.

EDAC enhanced the CASA crowdsourcing application and interface for ease of use, including the addition of a link to a video tutorial. The tutorial is hosted at the NMBB Program's YouTube site and offers a user-friendly guide to adding and editing CAI information in the CASA Web application.

Another EDAC role in program and speed-test promotion included re-evaluating Speed Test fields, based on user/participant feedback. The Speed Test results-interface was enhanced with a glossary and download speeds required for certain activities.

EDAC also developed promotional materials for the NMBB Program, such as the NMBB trifold brochure. (Figs. 2 and 3)



Figure 2 NMBB Trifold Brochure: Outside



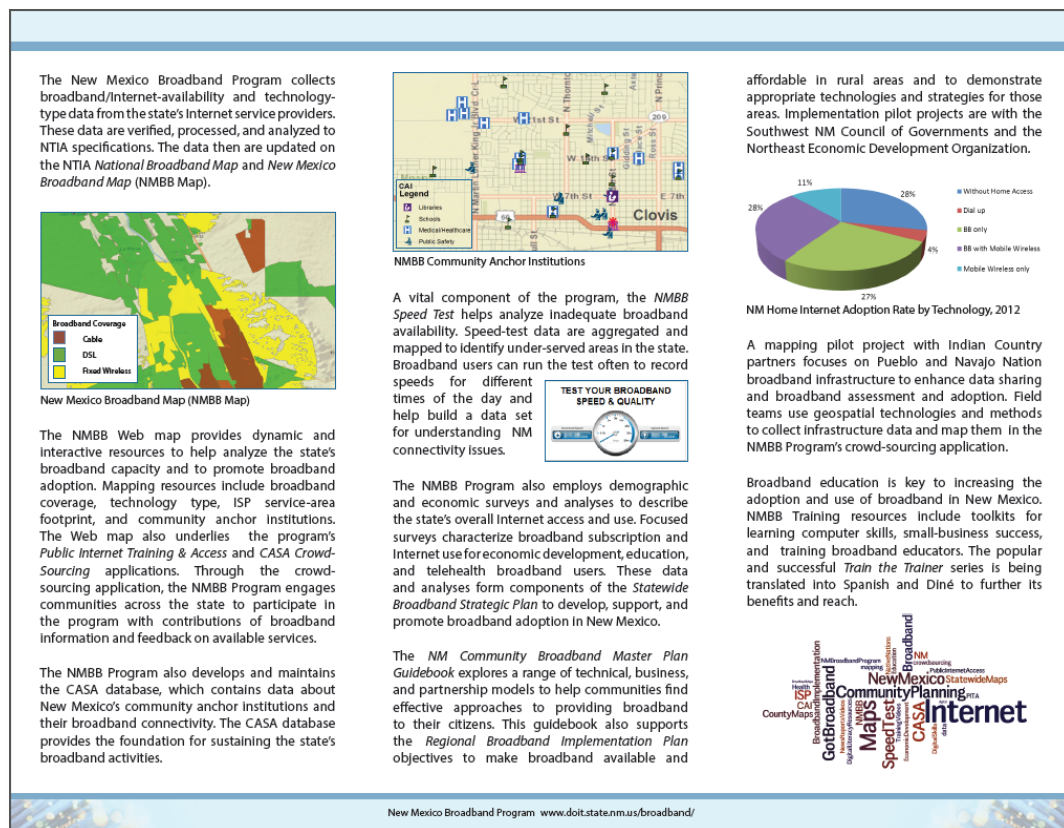


Figure 3 NMBB Trifold Brochure: Inside

## NMBB Web Map

The New Mexico Broadband Map ([www.nmbbmapping.org/mapping/](http://www.nmbbmapping.org/mapping/)) is developed as part of the NMBB Program for the State of New Mexico and displays processed broadband-service data. Data processing methods use Census Blocks for areas less than 2 sq. mi. and Public Land Survey System (PLSS) Section data for blocks with area greater than 2 sq. mi.; this approach minimizes over-estimation of ISP service coverage areas.

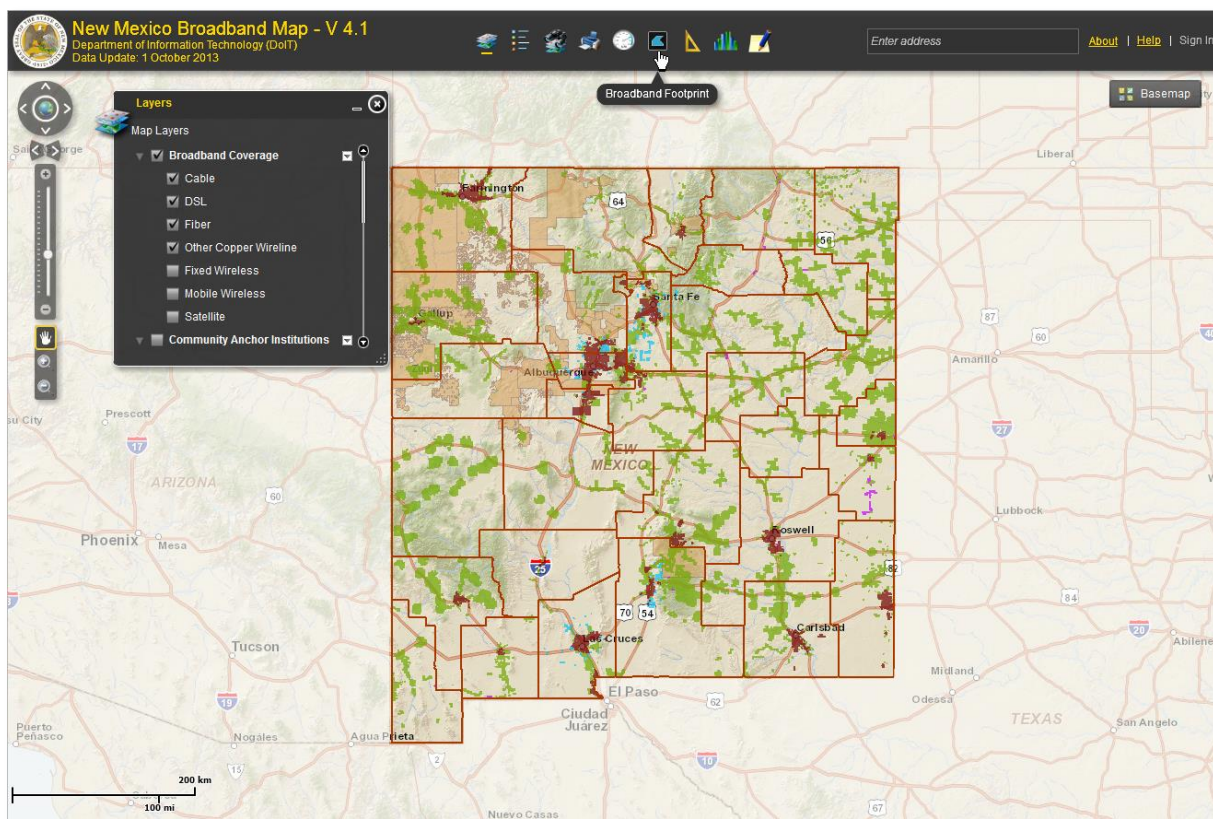
Figure 4 (below) is a screen-capture image of the New Mexico Broadband Map V 4.1 with Data Update: 1 October 2013 [map data are updated following each NTIA data submittal]. Map layers for DSL (green), Cable (dark red), Fiber (magenta), and Copper Wire (cyan) broadband coverage are displayed with Tribal Land Boundaries and the Streets base map. Fiber, Fixed Wireless, Mobile Wireless, and Satellite layers are not displayed.

Tools include options for standard Web mapping and custom broadband-mapping.

- Layer Selection
- Base Map Selection
- Dynamic Legend
- Slider-Bar and Custom Zoom
- Drag-and-Drop and Directional Pan

- Full, Previous, and Next Extent
- Scale Bar
- Identify
- Find Address
- Broadband Footprint
- Measure
- Census 2010 Estimates
- Broadband Speed Test
- Print Map

Additionally, the mapping site provides a user-feedback tool, help (online user guide), program information, and program disclaimer.



**Figure 4 New Mexico Broadband Map V 4.1, [www.nmbbmapping.org/mapping/](http://www.nmbbmapping.org/mapping/); accessed 24 March 2014**

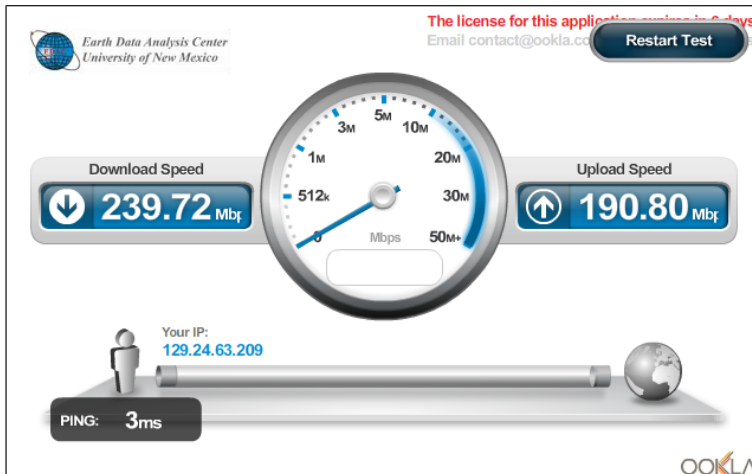
Figure 5 shows the enhanced interface for the Speed Test tool and results. Web users can open the Speed Test tool from several NMBB Program sites, including the NMBB site, mapping application, and CASA crowdsourcing application.



## New Mexico Broadband Program Speed Test

The **New Mexico Broadband (NMBB) Program** is soliciting your assistance in identifying those areas within New Mexico that have inadequate broadband service. A "Speed Test" is a simple way of doing this. The NMBB Program is suggesting that you conduct this Speed Test repeatedly during the week and at difference times in the day. That way we can analyze the differences between peak hour loads and low use periods.

The NMBB Program will gather these data, map the results, and aggregate them into categories to assess level of services within New Mexico. Please be assured your individual address will not be shared, the information will be aggregated into neighborhood blocks to provide a picture of broadband performance. These data will assist planning and funding requests for building more access to broadband.



### Last Result:

Download Speed: **239724** kbps (29965.5 KB/sec transfer rate)

Upload Speed: **190799** kbps (23849.9 KB/sec transfer rate)

Latency: **3** ms

Wednesday, September 25, 2013 1:20:58 PM

### Glossary of Terms

- **Bandwidth:** the rate at which data can be transmitted between your computer and the testing servers.
- **Kbps or KB/sec:** kilobits per second - a measure of Bandwidth. File sizes are normally indicated in terms of "bytes"; one byte is equal to 8 bits. In other words, 1000 kilobits per second is equal to 125 kilobytes per second.
- **Mbps or MB/sec:** Megabits per second - another measure of Bandwidth. One Megabit is equal to 1024 kilobits.
- **Packet:** a unit of data capable of being routed through a computer network.
- **Latency:** the time it takes for a single packet of data to be sent from your computer to the testing server and back (the "round trip" time). This is measured in milliseconds, or thousandths of a second.

### Broadband Speed Chart

Download Speed	Activity
768 Kbps - 1.5 Mbps	Basic Email, Voice over Internet (VoIP), Web Browsing, Streaming Music, Video Streaming
1.5 Mbps - 3 Mbps	Telecommuting, Video Conferencing, Standard Definition Video streaming
3 Mbps - 6 Mbps	Enhanced-definition and High-definition Video streaming, File Sharing (medium/large)
6 Mbps - 10 Mbps	Video On-Demand, Gaming
10 Mbps - 25 Mbps	Telemedicine, Remote Education
25 Mbps - 100 Mbps	Educational Services, HD Surveillance
Greater than 100 Mbps	Educational Services, Research Applications, Remote Supercomputing

Figure 5 NMBB Speed Test Results include explanations for terms and speed requirements for activity types

## Appendix A: Table of New Mexico Internet Service Providers

Internet Service Providers listed in black text were participating providers in NTIA Data Round 9.

Providers listed in blue text did not respond to NTIA Data Round 9 data requests.

Identified New Mexico Internet Service Providers: NTIA Data Submittal, April 1, 2014	
Agave Broadband LLC	T-Mobile
AT&T Corp, Inc.	Time Warner Cable
AT&T Mobility LLC	Transworld Network, Corp
Baca Valley Telephone Company, Inc.	Tularosa Communications, Inc.
Baja Broadband	TW Telecom of New Mexico, LLC
Cable One	Valley Telecom Group (Copper Valley Telephone, Inc.)
CenturyLink	Valley Telecom Group (Valley Telephone Cooperative, Inc.)
CityLink Fiber Holdings, Inc. & CityLink Wireless LLC	Verizon Wireless
CNSP Internet	ViaSat, Inc.
Comcast	VSAT Systems, LLC (Skycasters)
Cricket Communications, Inc.	Windstream Communications SouthWest
Cyber Mesa Telecom	WNM Communications
Dell Telephone Cooperative, Inc.	Yucca Telecom (Roosevelt County Rural Telephone Cooperative, Inc.)
ENMR Telephone Cooperative	Yucca Telecom (Yucca Telecommunication Systems, Inc.)
Frontier Navajo Communications (Navajo Communications Company, Inc.)	Zayo Group
Higher-Speed Internet, LLC	Action INTELEX
Hughes Network Systems	AmigoNet
Kit Carson Electric	Azulstar, Inc.
La Canada Wireless Association	BlackRock Networks, LLC
La Jicarita Rural Telephone Cooperative	Brainstorm Internet
Leaco Rural Telephone Cooperative	Cnet Internet
Level 3 Communications, LLC	Desertgate Internet
Lobo Internet Services, LTD.	Fast Track Communications
MATI Networks (Mescalero Apache Telecom, Inc.)	Huntleigh Telecommunications Group, Inc.
MegaPath Corporation	La Tierra Communications, Inc.
Penasco Valley Telecommunications	MetTel
Plateau Telecommunications, Inc.	RioLink, LTD
PTCI (Panhandle Telephone Cooperative, Inc.)	SCS Connect
PVT Networks	SentivaNet
Sacred Wind Communications, Inc.	Southwest Cyberport
Sierra Communications (a subsidiary of Baca Valley Telephone)	Spinn.Net
Southwestern Wireless	TaosNet, LLC
Sprint	Tewa Communications
Suddenlink Communications	Trilogy
StarBand Communications, Inc. (Spacenet, Inc.)	ValuTel Communications

## Appendix B: Table of Abbreviations and Acronyms

BB	broadband
BBER	[UNM] Bureau of Business and Economic Research
CAI	Community Anchor Institution
CAD	Computer-aided Design
CASA	Community Anchor Site Assessment
CORES	[FCC] Commission Registration System
CO/RT	Central Office/Rural Terminal
DBA	Doing Business As
dB <sub>i</sub>	decibel isotropic
DoIT	[NM] Department of Information Technology
DSL	Digital Subscriber Line
EDAC	[UNM] Earth Data Analysis Center
FCC	Federal Communications Commission
FGDC	Federal Geographic Data Committee
FRN	FCC Registration Number
ft.	foot
FTP	File Transfer Protocol
GDB, gdb	Geodatabase; Geodatabase file extension
GIS	Geographic Information Systems
HSIP	Homeland Security Information Program
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
ID	[unique] identifier
IMLS	Institute of Museum and Library Services
IPEDS	Integrated Postsecondary Education Data System
ISP	Internet Service Provider
MHz	megahertz
NCES	National Center for Education Statistics
NDA	Non-Disclosure Agreement
NGO	Non-governmental Organization
NM	New Mexico, State of New Mexico
NMBB	New Mexico Broadband [Program]
NM DoIT	New Mexico Department of Information Technology
NTIA	National Telecommunications and Information Administration
PARCC	Partnership for Assessment of Readiness for College and Careers
PDF, pdf	[Adobe] Portable Document Format and file extension
PED	Public Education Department
PLSS	Public Land Survey System
PSFA	[NM] Public School Facilities Authority

QA/QC	Quality Assurance/Quality Control
QR	Quick Response [Code]
RCL	[NM] Road Centerlines
RDP	Remote Desktop Protocol
RGIS	[NM] Resource Geographic Information System
SBI	State Broadband Initiative
SFTP	Secure File Transfer Protocol
SHA1, sha1	Secure Hash Algorithm 1
SMB	Server Message Block
sq. mi.	square mile(s)
SWNOM	Subscriber Weighted Nominal [Speed]
TIGER	[U.S. Census] Topologically Integrated Geographic Encoding and Referencing (system)
TXT, txt	Text file extension
UNM EDAC	The University of New Mexico Earth Data Analysis Center
UPS	uninterrupted power supply
USAC	Universal Service Administrative Company
VDR	VMware Data Recovery (application)
VM	Virtual Machine
Web	World Wide Web
XLS, xls	Microsoft Excel file extension
ZIP, zip	Zipped file extension