# South Dakota Broadband Mapping Project: Product Release White Paper


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|---|---|
| **Product Specification:** | Spring 2012 NTIA Data Model |
| **Product/Process:** | NTIA—April 1, 2012 Data Deliverable |
| **Dataset Submission QC:** | NTIA—SBDD_CheckSubmission.py |

# Table of Contents

# OVERVIEW

This white paper highlights the **Submission Summary** for this deliverable, as well as describes the **Data Gathering**, **Data Integration**, **Data Validation and Verification** and **Quality Control** processes used to create the Broadband Mapping Project's April 1, 2012 data submission. To support varying levels of technical and program knowledge, both a **high-level summary** and a **detailed process review** are supplied.

# SUBMISSION SUMMARY

## PROVIDER DETAILS

### PROVIDER PARTICIPATION

- Provider Participation Statistics Summary

| Summary | Count |
|---|---|
| Total Providers Researched/Contacted | 98 |
| Total Valid Broadband Providers | 48 |
| Non-Responsive Providers | 0 |
| Non-Cooperative Providers | 0 |
| Number of Providers - Supplied Updates for this Submission | 35 |
| Number of Providers - Confirmed No Updates | 12 |

- New Providers Since Last Data Submission
  - Cable One, Inc.
  - Data Truck
  - Fibercomm
  - Hughes Network Systems
  - Skycasters
  - WildBlue Communications Inc.
  - Zayo Group LLC

- Existing Providers – No Updates
  - Consolidated Telecom
  - DigitalBridge Communications (BridgeMaxx)
  - Faith
  - Frontier Communications
  - Interstate Telecommunications Cooperative
  - Midstate Communications
  - MNW Wireless
  - New Edge Network, Inc.
  - Santel Communications

- Sioux Valley Wireless
- StarBand Communications Inc.
- Valley Telephone

- Providers Included (listed by Provider and Holding Company name)

| | |
|---|---|
| Alliance Communications Cooperative | MNW Wireless |
| AT&T MOBILITY | New Edge Network, Inc. |
| Beresford Municipal Telephone | Northern Valley Communications |
| Cable One, Inc. | Northern Wireless |
| CenturyLink (SD) | RC Communications |
| Cheyenne River Sioux Tribe | RC Technologies, Inc. |
| Consolidated Telecom | Roberts County Telephone Cooperative |
| Data Truck | Santel Communications |
| DigitalBridge Communications (BridgeMaxx) | SDN Communications |
| Faith | Sioux Valley Wireless |
| Fibercomm | Skycasters |
| Fort Randall | Sprint |
| Frontier Communications | StarBand Communications Inc. |
| Golden West Communications | Swiftel Communications |
| Hughes Network Systems | Triotel / McCook Cooperative |
| Interstate Telecommunications Cooperative | Valley Telecommunications Cooperative |
| Kennebec Telephone Company | Valley Telephone |
| KeyOn Communications Inc. | Venture Communications |
| Knology, Inc. | Verizon Wireless |
| Long Lines | West River Cooperative |
| Mediacom Communications Corporation | West River Telecommunications Cooperative |
| Midcontinent Communications | Western Telephone Company |
| Midstate Communications | WildBlue Communications Inc. |
| Mitchell Telecom (Sancom, Inc. dba Mitchell Telecom) | Zayo Group LLC |

- Non-Responsive Providers/Non-Cooperative Providers
  - None

- Providers researched and identified as non-broadband providers can be viewed within the table at the end of this document.

## COVERAGE AREA CHANGES

- Coverage Footprint Reductions/Map Refinement –
  - Midcontinent Communications (TT-40)
  - South Dakota Network (TT-50)
  - Venture Communications (TT-10)
  - CenturyTel, Inc. (TT-10)
  - West River Cooperative Telephone Company (TT-10)
  - Golden West Telecommunications Cooperative Inc (TT-10)
  - Interstate Telecommunications Cooperative, Inc. (TT-10)
  - West River Cooperative Telephone Company (TT-50)

- Coverage Footprint Expansion –
  - Knology, Inc. (TT-40)
  - Sprint Nextel Corporation (TT-80)
  - Verizon Wireless (TT-80)
  - Mitchell Telecom (TT-50)
  - AT&T Mobility LLC (TT-80)
  - Interstate Telecommunications Cooperative, Inc. (TT-50)
  - Fort Randall Telephone Company (TT-10)
  - Midstate Communications (TT-10)
  - Golden West Telecommunications Cooperative Inc (TT-50)
  - Venture Communications Coop. (TT-50)

## DATA CORRECTIONS

- Beresford Municipal Telephone
  - We identified through our internal QC and verification efforts that Beresford was reporting different upload and download speeds, with a transmission technology assignment of TT-20 (Symmetric - xDSL). After reviewing the error with the provider, their coverage areas were updated to a TT-10 (Asymmetric - xDSL).

- Per NTIA's guidance on 02/21/12, we updated all Verizon speed data to support the business rules they laid out.

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  All grantees should then apply the following business rule, as some of the speed ranges fall into two tiers:

  3G Speeds:
  Maximum and Typical download speed: 600 kbps to 1.4 Mbps (Speed Tier 3: 768 kbps – 1.5 Mbps)
  Maximum and Typical upload speed: 500 kbps to 800 kbps (Speed Tier 2: 200 – 768 kbps)

  4G LTE Speeds:
  Max Adv Download Speed: 12 Mbps (Speed Tier 7: 10 Mbps – 25 Mbps)

Max Adv Upload Speed: 5 Mbps (Speed Tier 5: 3 Mbps – 6 Mbps)

Typical download speed: 8.5 Mbps (Speed Tier 6: 6 Mbps – 10 Mbps)
Typical upload speed: 2 Mbps to 5 Mbps (Speed Tier 5: 3 Mbps – 6 Mbps)

- The NTIA 3rd Party data review and summary were also compared to the product prior data submission and no changes were required. The Technology/Speed tier differences highlighted were reviewed with the providers and corrected, where needed.

# COMMUNITY ANCHOR INSTITUTION (CAI) DETIALS

## OVERALL STATISTICS

| Community Anchor Institution - Categories | Overall Count | Broadband Subscriber (Yes) | Trans Tech | Advertised Speed Down | Advertised Speed Up |
|---|---|---|---|---|---|
| Category 1 - School K through 12 | 701 | 336 | 320 | 316 | 316 |
| Category 2 - Library | 125 | 28 | 24 | 17 | 16 |
| Category 3 - Medical/Healthcare | 215 | 40 | 35 | 26 | 25 |
| Category 4 - Public Safety | 476 | 72 | 58 | 32 | 32 |
| Category 5 - Universities/Colleges | 49 | 30 | 31 | 35 | 35 |
| Category 6 - Other: Government | 626 | 424 | 404 | 363 | 361 |
| Category 7 - Other: Non-Government | 19 | 5 | 4 | 3 | 3 |
| **Total** | **2211** | **935** | **876** | **792** | **788** |

## CAI CHANGES

- The State Information Technology Bureau, the Bureau of Information and Telecommunications, extracted broadband service details from their circuit inventory system regarding the broadband capabilities of the k-12 schools, universities, and state/county/local government offices to which it provides services.

- The CAI inventory was review again against the database mentioned below for the following categories: Category 1: K-12 Schools, Category 2: Libraries and Category 5: Colleges
These databases are as follows:

  - For K-12 institutions (CAI type 1) please add the NCES ID CCD ID value found here: **http://nces.ed.gov/ccd/bat/**

  - For Higher Education (CAI type 5) please add the NCES IPEDS ID value found here: **http://nces.ed.gov/ipeds/datacenter/**

- For Libraries (CAI type 2) please. Combine (do not add) "FSCSKey" and "FSCs_SEQ" from the "puout08av2000" file and place them here: **http://harvester.census.gov/imls/data/pls/index.asp** (FYI the LIBID is your state's unique ID for libraries)

# SUBMISSION RECEIPT

## SUBMISSION RECEIPT RESULTS

- Attached are the results from the NTIA data submission receipt quality script.

SD_2012_04_01.txt

- Error Report
  - All items flagged within the submission receipt where confirmed with either the provider or with NTIA that the values are valid. One item that was identified, but not within any commentary from the PBWorks or the NTIA webinar is as follows:
    - Speed Tier: FAILED Go check data and keep only Maximum Advertised Speeds
      - This record is due to a provider coverage having two footprints that mostly overlap with each other, with different speeds and the same technology. The script is not taking the residential and business-only flags into consideration here.
  - The exceptions NTIA noted during the 03/27/12 webinar are as follows:
    - Middle Mile Elevation Fails
    - Middle Mile Latitude/Longitude Fails
    - Middle Mile Ownership Fails
    - Address SpeetTier Fails
    - CAI Transtech Fail

Hyperlinks to Grantee Workspace in which the same issues were identified by other Grantees:

**https://sbdd-granteeworkspace.pbworks.com/w/page/50162555/December%202011%20Data%20Package%20Issues**

**https://sbdd-granteeworkspace.pbworks.com/w/file/49939449/December%202011%20Submission.zip**

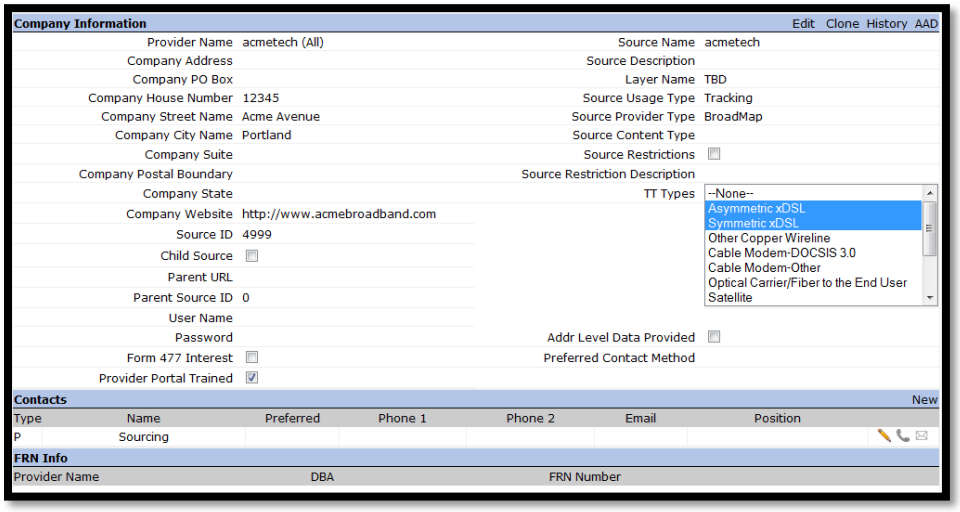
# HIGH-LEVEL SUMMARY

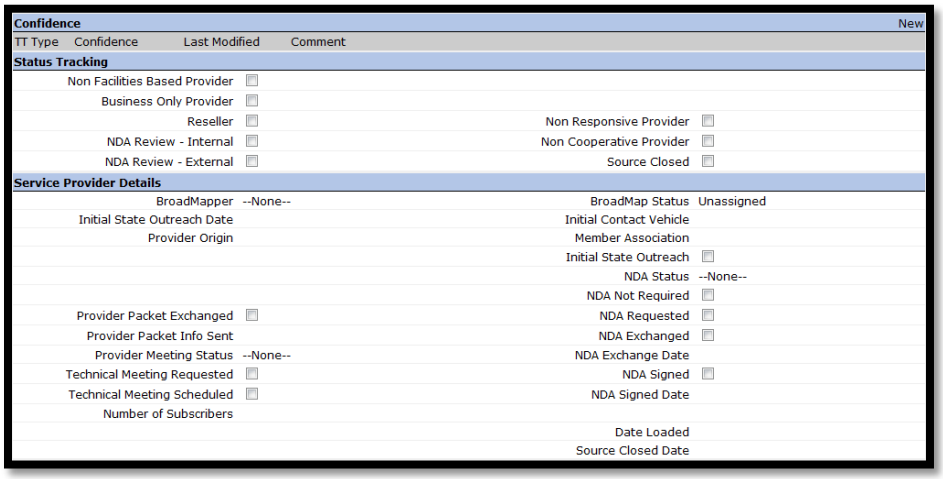
## DATA GATHERING

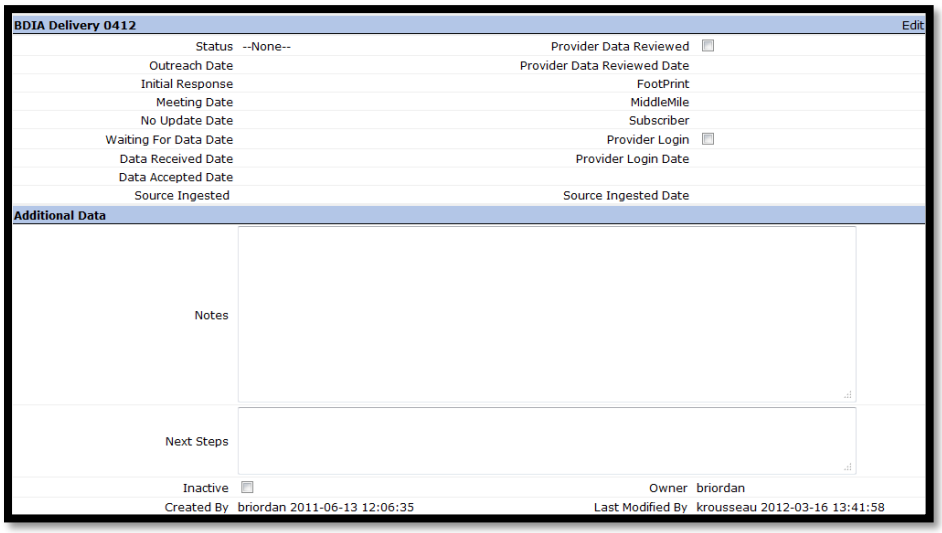
### BROADBAND SERVICE AREAS, MIDDLE MILE AGGREGATION POINTS AND BROADBAND SERVICE OVERVIEW

The collection of Broadband Service Areas, Middle Mile Aggregation Points and Broadband Service Overview information is handled through the following Provider Outreach Process:

- Build and maintain an inventory of Broadband providers through currently known providers and research.
- The inventory and everyday interaction with providers is tracked using the Provider Catalog (PCat). Below are some examples of the web application, which has a shared access between our team and mapping partner (BroadMap).





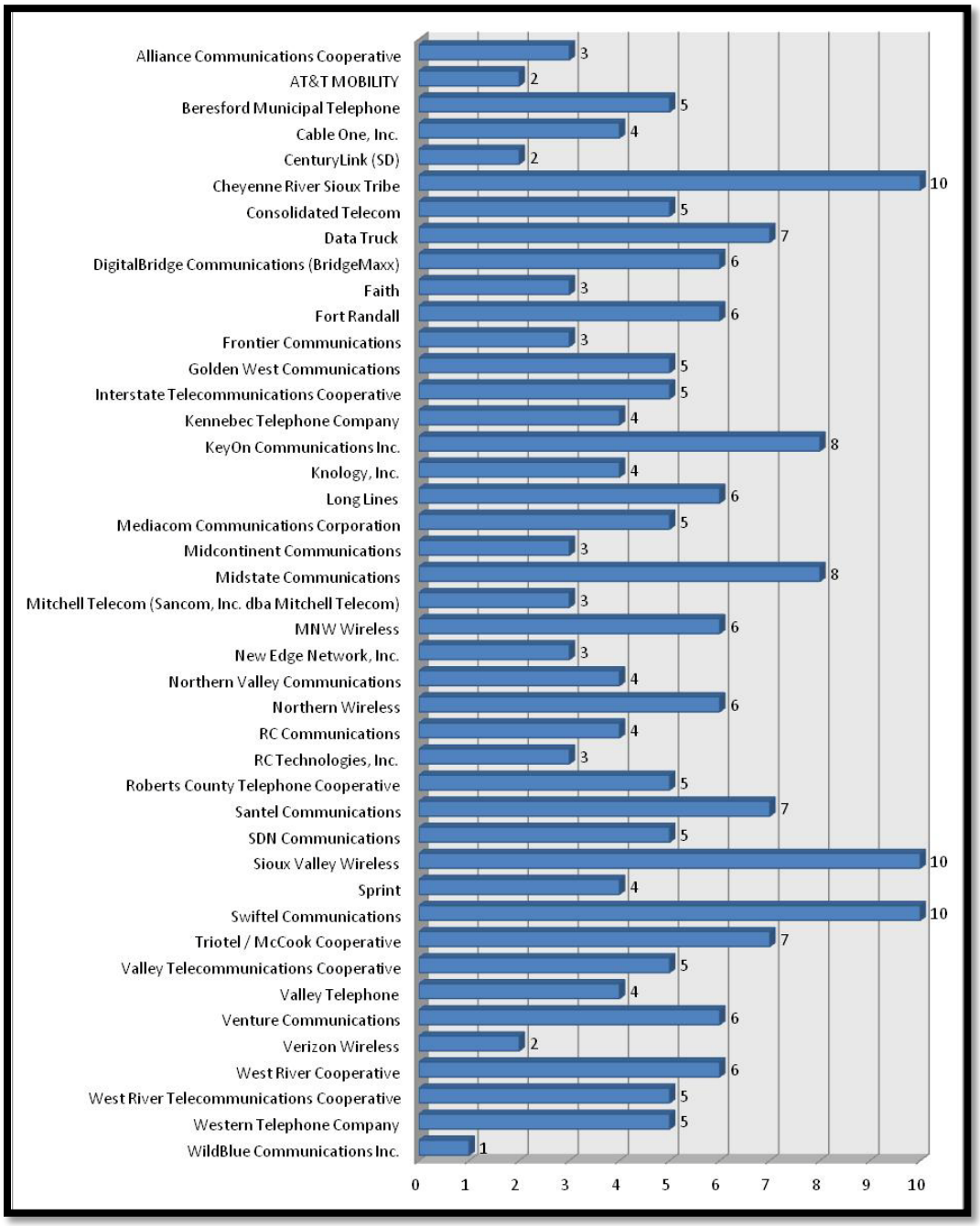
**BDIA Delivery 0412** Edit

| | | | |
|---|---|---|---|
| Status | --None-- | Provider Data Reviewed | ☐ |
| Outreach Date | | Provider Data Reviewed Date | |
| Initial Response | | FootPrint | |
| Meeting Date | | MiddleMile | |
| No Update Date | | Subscriber | |
| Waiting For Data Date | | Provider Login | ☐ |
| Data Received Date | | Provider Login Date | |
| Data Accepted Date | | | |
| Source Ingested | | Source Ingested Date | |

**Additional Data**

| | | | |
|---|---|---|---|
| Notes | | | |
| Next Steps | | | |
| Inactive | ☐ | Owner | briordan |
| Created By | briordan 2011-06-13 12:06:35 | Last Modified By | krousseau 2012-03-16 13:41:58 |

- In order to encourage participation throughout the life of the program, we feel it's important to foster relationships with the providers and encourage a collaborative team effort between all parties for each data submission. The chart below represents that interaction count with each provider.




- Update provider material that describes the data requirements and logistics for data transfer.
- Update Non-Disclosure Agreement (NDA) for use in the project, where applicable.

- Maintain multiple protocols for the provider to submit data, including Secure File Transfer Protocol (SFTP) technology when desired.
- Conduct one-on-one informational discussions with each provider to communicate the following:
    - Requirements of this project;
    - Broadband data required to support the product data model;
    - Submission protocols available;
    - Capability to validate how the supplied data is aggregated.
- Download/receive provider data.
- Establish a repeatable process with provider. Maintain provider communication, transaction and data handling records throughout the project (dates contacted, data received, etc.).

## *COMMUNITY ANCHOR INSTITUTION (CAI)*

The collection of CAI information is handled through the following CAI Collection Process:

- Collect and maintain inventory of CAIs through currently known CAIs, data mining, and research.
- Maintain web-based CAI portal for institutions to add or confirm attribution, location and enter broadband-specific information.
- Upload web-based data to Core Database for standardization.
- Perform internal cleansing, such as removing duplicate records, identifying gaps in broadband attribution and verifying category.
- Geocode CAI locations.
- Translate Core Database data to deliverable-ready format.
- Continue engagement with non-responsive institutions.

# DATA INTEGRATION PROCESS

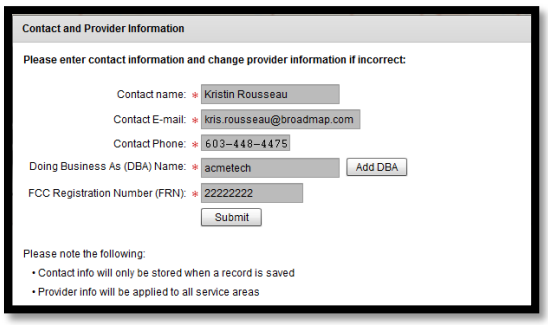
The data integration and processing mechanisms currently used allows for multiple types of inputs and result in a standardized output that meets the NTIA deliverable requirements. This flexible process supports data model changes and project-requested enhancements.

- Receive inputs from providers via submission protocols; upload into Sourcing Database and catalog with provider information.
- Review provider-supplied data for completeness and for potential discrepancies that require resolution prior to processing and flag as necessary.
- Categorize input into data-type category (addresses, block lists, paper maps, etc.).
- Standardize input based on data type within Staging Database.
- Create Compact Polygons (CP)—(internal methodology for generating area-based feature for coverage in Staging Database).
- Apply broadband attribution to CP; apply metadata to CP.
- Perform quality analysis of the CP against the source supplied to identify any completeness or accuracy issues.
- Request additional information from the provider if elements of coverage are missing or contain discrepancies. This is a second manual quality check to ensure data is complete.
    - Process coverage area to build the required NTIA data model layers.

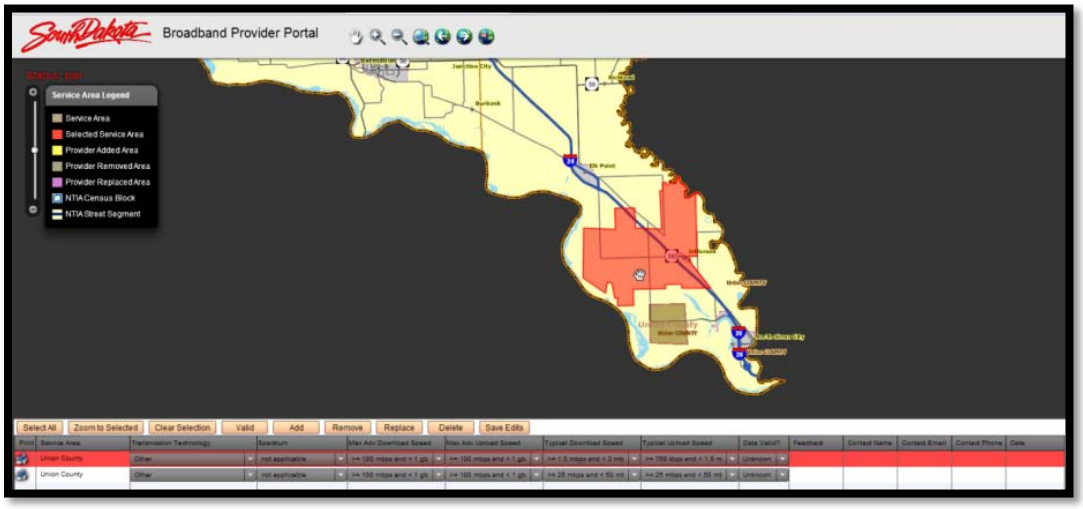
With the deployment of the Provider Portal this round, the data collection and later validation process was streamlined allowing both activities to occur within a secure web application. The majority of the providers used this methodology as it supplies them with more visibility into how their data is being represented and gives them knowledge and ownership of their coverage representation. Below are some bullet points and supporting screen shots on how the portal is used.

- Each provider is assigned credentials with a strong password to ensure security measures are taken into consideration


- Collection and confirmation our contact, as well as the company's DBA Name and FRN accuracy

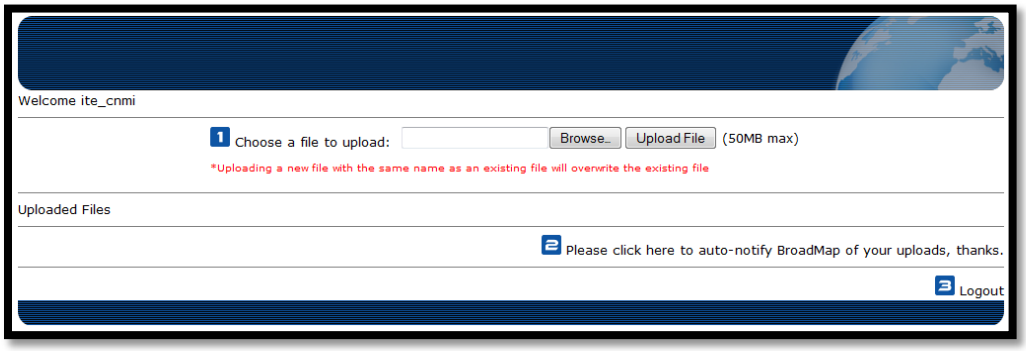


- Capability to review and request changes to the coverage footprint




- The provider can Add/Remove portions, or all, of the footprint requesting that their footprint be increased or refined.


- File upload functionality to support providers that would prefer a shapefile, spreadsheet, PDF, KMZ/KML file be used to reflect changes for the data round




- Once the provider has reviewed completed changes to their coverage, they can then validate them by signing off that everything is accurate.

# DATA VALIDATION AND VERIFICATION

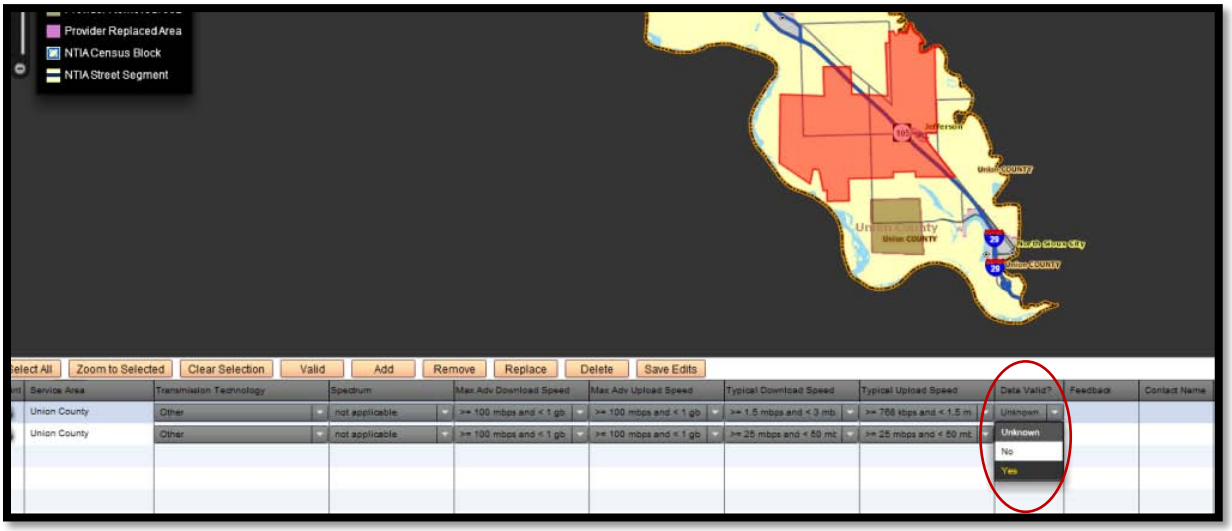
To ensure the data collected and processed is as accurate and as comprehensive as possible, South Dakota broadband verification encompasses many efforts. The methodologies employed are documented below:

## BROADBAND PROVIDER VALIDATION—PROVIDER PORTAL APPLICATION

First and foremost, all providers are given access to, and are trained in the use of, a web application we call the "provider portal". After each data collection and ingestion of provider data, representatives from the provider are able to review the polygons, segments, speeds, technologies, and other attribution that our GIS teams have developed based on the submitted data. Providers are given the opportunity to make changes to the data's attributes (speeds, technology, spectrum, etc…) as well as add/change/move/delete coverage areas. The requested changes are delivered to the GIS teams for full ingestion in our broadband database. This process is repeated until the provider representatives confirm that all aspects of the coverage areas are accurate and complete.

This portal is available 24/7/365 for providers to utilize, allowing those companies without GIS or mapping staff access to those technologies and benefits for review, presentations, and other business opportunities. This process has proven both successful and popular in the provider community.

- Coverage validation can be done on one record/footprint at a time or by selecting footprints and selecting the 'Valid' button. The provider could also print off or download their coverage for their own tracking purposes.


All validation results are tracked internally through our Validation Table, which also improves the overall **Confidence Value** as mentioned below.

## *INDUSTRY KNOWLEDGE – SUBJECT MATTER EXPERTS*

South Dakota's technology and telecommunications businesses are highly consolidated, with the State of South Dakota often being the largest consumer of services in the state. Given that, relationships and partnerships often already exist between the State of South Dakota and the broadband providers, giving a first-hand look at the services offered and where they are offered. In addition, the South Dakota broadband team has ready access to industry experts within the SD Public Utilities Commission, telecommunications association's boards, and technology industry experts in the fields of telecommunications and data networking.

Our office has met and consulted with these experts regarding provider data as issues were found. Examples of these consultations are the review of provider coverage areas against telecommunications exchange areas with the Public Utilities Commission and against known technological capabilities. Any anomalies or questioned material is relayed to the providers for review.

## FIELD VERIFICATION

A number of field verification efforts have taken place during the last six months.

- For newly discovered fixed wireless providers, we have sent remote office staff out to document and photograph the tower infrastructure reported by the provider.

- For mobile wireless providers, broadband staff and other team members have completed over 40,000 miles of drive testing utilizing mobile wireless phones collecting information on coverage and broadband performance. This drive testing has collected over 1.5 million data points across the state that confirm the availability of wireless broadband signal at a geographic location by coordinates, with the data collected every 10 seconds during the drive testing. Tower location information and wireless speed test results were also collected during this drive testing, with other 20,000 test results collected.

An important point to note is that with the development of an automated toolset that allows team members to start data collection upon entering the vehicle and not need any further intervention, a number of staff members have been volunteering time to drive untested roads and territories of the state during vacations, other state business, or leisure time at no cost to the program.

Due to the nature of our organization being a centralized IT group for government and education, we are uniquely positioned to request field verification by our remote office staff. As technicians travel the state, they have performed speed tests at businesses, homes, and government offices, as well as surveyed remote office staff on availability of coverage areas at their homes.

## THIRD-PARTY DATA VERIFICATION

The South Dakota broadband team has collected data from the FCC CBT and Mobile tests, the FCC dead zone reporting tool, FCC ASR datasets, our own hosted speed test application, provider speed test results, census data, provider exchange boundaries and commercially available datasets from Ookla to confirm the availability of broadband service. Of particular interest to our program were datasets that tied a specific address to the broadband data, as we have found other location-based services (IP geolocation) to be woefully inaccurate in our state.

Collected third-party data is overlaid against provider coverage areas for comparison. Most valuable has been our hosted speed test server (speedtest.sd.gov). This test collects specific address location information and provider details, while providing consumers the ability to directly provide more accurate location information via a clickable map in the event that their address is not geocoded correctly. This provides benefits to our verification effort as well as our Improved Address Files grant program.

Recently added to our verification efforts have been more accurate provider exchange boundaries and 2010 Census information on population density. Provider coverage areas are compared against known exchange boundaries, and census population density information is used to explain any possibly gaps in coverage.

## CROWD SOURCING

In addition to our Crowd sourced speed test system, our state broadband website broadband.sd.gov offers consumers the ability to report broadband dead zones, take surveys on available broadband and related topics, report inaccuracies in our online static/interactive maps, as well as any other relevant feedback about the broadband environment of South Dakota. This feedback is compared against provider coverage areas, with relevant information reported to the providers for comments and/or correction.

## CONFIDENCE VALUES

All verification, validation and manual quality review results are tracked by provider/technology type and stored and maintained within a **Validation table**. A confidence value is assigned, based on internal assessments of the collected information, to highlight the provider coverage areas and/or attributions that would benefit from further investigation and/or enhancements.

With the continued efforts on provider validation, 3rd party verification and the release of the public interactive map with feedback collection functionality, the confidence values will be utilized further to identify specific areas in need of attention. We're currently at the initial stages of this initiative, but will have a more complete picture in time for the next data submission.

# QUALITY CONTROL

Following collection, processing and analysis of the provider and CAI data, the product is checked manually and algorithmically against the NTIA data model. Some of the items included within these checks are:

- Format correctness;
- Table and field structure;
- Valid values, including default values, where applicable;
- Geographic extent and topology errors.

Prior to data submission, another quality control script supplied by NTIA is run. This script, SBDD_CheckSubmission.py, creates an output in text form that is required to be submitted along with the final deliverable. All errors must come up clean, unless otherwise specified by NTIA.

List of errors within the script, which will be listed as exceptions, can be found on PB Works – Grantee Workspace at the following link:

**https://sbdd-granteeworkspace.pbworks.com/w/page/50162555/December%202011%20Data%20Package%20Issues**

# DETAILED PROCESS REVIEW

To review the detailed process, please review the attached object:

BMap_ProcessDetails_2012_04_01.docx

# PROVIDERS RESEARCHED

Below is a list of providers that were researched and contacted, but identified as non-broadband providers and didn't require inclusion within the data submission. Some may be due to different naming conventions or inaccurate FRN/DBA names and were therefore considered a closed source.

| |
|---|
| 5LINX Enterprises, Inc. |
| Airespring, Inc. |
| Apptix, Inc. |
| Aptela, Inc. |
| Bandwidth.com, Inc. |
| Birch Communications Inc. |
| Broadvox Go!, LLC |
| BullsEye Telecom, Inc. |
| Cause Based Commerce Inc. |
| CommPartners Holding Corporation |
| CommPartners Holding Corporation |
| Consolidated Telcom |
| Dickey Rural Telephone Cooperative |
| DigitalBridge Communications Corp. |
| Evertek, Inc. |
| Farmers Mutual Telephone Company (MN & SD) |
| Fionda VoIP, LLC |
| Granite Telecommunications, LLC |
| Great Plains Communications, Inc. |
| GreatCall, Inc. |
| Hickory Tech Corporation |
| iCore Networks, Inc. |
| InPhonex.com, LLC |
| Kosmaz Technologies, LLC |
| Level 3 Communications, LLC |

| |
|---|
| LY Holdings, LLC |
| Matrix Telecom, inc. |
| Megapath, Inc. |
| Metropolitan Telecommunications Holding Company |
| Millicorp |
| Minnesota Valley Television Improvement Corporation |
| Mitel Netsolutions Inc. |
| MobilePro Corp. |
| New Edge Holding Company |
| NextWave Wireless Inc. |
| nexVortex, Inc. |
| Northeast Nebraska Telephone Company |
| NOS Communications, Inc. |
| OrbitCom, Inc |
| PaeTec Corporation |
| Phone.com, LLC |
| Proximiti Technologies, Inc. |
| Siouxland WISP |
| Trans National Communications International, Inc. |
| tw telecom inc. |
| VoIP360, Inc. |
| VoIPStreet, Inc. |
| Vonage Holdings Corp. |
| Wave2Wave Communications, Inc. |