State Broadband Initiative Mapping Methodology

For the State of Idaho
Revised September 30, 2014

CostQuest Associates

LinkAMERICA Alliance

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Contents

Overview

This document provides an overview of how the tenth required data set was collected and processed for the State Broadband Initiative (SBI) in the state of Idaho.

This submission builds upon prior efforts to increase in-state broadband mapping and planning capacity. Although each state has taken a slightly different path to building in house capacity, this cross-state partnership helps the LinkAMERICA team focus on comparable outcomes across the four states, where appropriate and support each state based upon the State's elected transition path. Our intent is not to make the states look and be the same, rather it is to leverage economies of scope and scale among the business processes while at the same time pursuing the longer term goal of transitioning sustainable program leadership to the respective states.

Work has shifted to state partners. Much of this focuses upon the capacity building, planning and technical assistance components of the program. One immediate result of this is that in some of our states in-State partners have taken direct responsibility for the survey, validation and development of Community Anchor Institution information. The methods by which CAI data were developed are included as Appendix One. During this final program year we are working to transition the State broadband website and maps to the individual states for hosting and content. One of our states has completed this process and we expect one or two of the remaining three to transition their sites prior by October 31. LinkAMERICA provides support and guidance through the process but ultimately we leave it to the state to determine the final end product.

As expected, this document rests heavily on the prior drafts but has also been updated and expanded.

Significant changes include additions covering:

1. Trends in provider inputs
2. Modification to internal provider tracking
3. Requested changes based upon NTIA guidance
    a. Review of submitted speed with respect to NTIA supplied frequency table
    b. Review of NTIA speed guidelines, coverage processing and provider documentation
    c. Inclusion of Provider Universe Table (Appendix 4)
    d. Expansion of verification methods summary table
    e. Assignment of End User Category to Fixed Wireless Broadband Providers.
    f. Review of submitted Community Anchor Institution (CAI) data for appropriate Federal identifier codes.
    g. Attempts to harmonize CAI information with information supplied from NTIA on 9/17/14

In this final submission, we continued to focus resources on establishing stable business processes to track submissions, verify received and processed data, test for temporal stability and provide reporting deliverables consistent with NTIA expectations. We also worked with State partners to transition parts

of the process to them where there was interest. We assisted a number of providers with transitioning from SBI to FCC Form 477 submissions.

In our view, the final mapping deliverable reflects (1) a good faith effort, which results in a reasoned response to the NOFA, Technical Appendix A, as well as supplementary program office guidance and modifications offered in phone calls, emails, and webinars, (2) a stable foundation for improvement and prioritization of both NTIA and state needs and interests , (3) a valid data processing model to support online mapping, consumer feedback, provider verification and reporting, and finally, (4) a valid use of the evolving data transfer model and its intrinsic validation methods. More importantly, the resulting data and online coverage maps that follow from this work provide good input and context for the Broadband planning teams working across the states we have the pleasure to serve.

We also note that the mapping deliverable is increasingly important to state and federal policy makers as they analyze the policy ecosystem that supports the advancement of broadband access and adoption.

We close this methodology document with 4 appendices. Appendix 1 refers to efforts related to Community Anchor Institutions. Appendix 2 describes data collection challenges. This section describes some of the open issues, challenges and questions we have encountered. Appendix 3 describes the confidentiality framework explained by NTIA. Appendix 4 details the provider universe, those providers found to be non-NOFA compliant and those providing data.

Finally, we close this introduction thanking all of those people who helped conceive, develop and improve the broadband mapping enterprise. Without the assistance of broadband service providers, state officials, concerned citizens, outreach teams and program officials important work of this kind would have never happened.

Purpose of This Manual

This technical document was developed to provide transparency in our data production process.

Our goal is to illustrate a thoughtful process designed to meet the intent of the submission. Our hope is that we have developed a process that is reasonable, with respect to the data it deals with, as well as flexible enough to change with evolving NTIA requirements and lessons learned from the Broadband mapping community.

Data Sources

Developing the Provider List

Broadband provider lists for all states were developed from the following sources:

- Prior comparable mapping/research efforts
- State lists of regulated telecommunications, cable and wireless service providers
- State and national industry organizations (i.e. cable associations, wireless service provider organizations, telecommunications associations)
- FCC Form 477 respondents
- Third party data sources such as Warren Media, Media Prints, American Roamer Coverage Right, GeoResults Wirecenter Boundaries and TowerCoverage.com.
- Independent web research
- Interviews with key state staff members and important community influencers

As one would expect in a dynamic marketplace, provider identification is an ongoing and important component of our work. Mergers and acquisitions, the use of multiple regional DBAs, the lack of any universal identity management attribute, and the generally complex parent-subsidiary structure of many telecommunications companies, make provider identification and tracking very challenging. Because of this dynamic environment, the Provider list is reviewed on an on-going basis and changes are made as necessary to ensure that the list remains current. The intent of Appendix 4 is to demonstrate our view of the Broadband provider market in state.

At the start of each round, email or telephone contact is made to all known providers. This time consuming, but necessary, process ensures that the list of contact persons remains current, and that providers are aware of data request changes and deadlines associated with each round. This also provides an initial read out if corporate policy has changed impacting willingness to submit updated information. Where necessary, we execute new NDAs with providers. We maintain this communication with providers throughout the Data Collection period, providing multiple paths and opportunities for participation in the program.

As contact is made in each round, we qualify each provider by asking a series of questions regarding the type of service and speeds offered. If the provider does not meet the minimum specifications for a

Broadband provider (as defined in the NOFA) we make a note of the change in status.[1] Providers remain on our list and are included in program communications so that in the event that their service is upgraded or expanded their status can be updated accordingly.

Provider Outreach

To meet the program's deadlines and participation goals, LinkAMERICA believes it is critical to maintain rapport with providers. To do this we reach out to providers with project communication and work to include relevant news regarding broadband on our state mapping websites. In several states we have participated in trade association and policy summits.

As described above, individual e-mails or telephone calls are made to all providers explaining the status of the program and requesting their continued support. In some instances we've also had the opportunity to support providers in their BTOP / BIP applications. Through these collective outreach initiatives, and our engagement with various industry associations, we continue to enjoy a healthy and appropriate relationship with Broadband service providers.

Non-Disclosure Agreement (NDA)

To provide protection for all parties involved, LinkAMERICA continues to honor the terms of our NDA. If providers did not execute the NDA in previous rounds they can request a NDA be signed anytime in subsequent rounds. New providers were of course also supplied with a copy of the NDA.

To facilitate the execution of NDA's, LinkAMERICA continues to use the DocuSign online document management solution. This system allows providers to review and digitally sign the NDA in a legally binding manner, and has been instrumental in achieving rapid approval and execution of NDAs with the majority of providers. In some cases, NDA's were individually negotiated to address specific provider concerns. In all cases, minimum standards established by the NOFA are honored. In other cases, providers elect to submit data without executing an NDA.

Provider Survey

With many prior rounds of data collection completed, the LinkAMERICA team has a solid base of coverage and speed information with which to begin this current round. This allowed us to provide flexible response options to participating providers. One response option allowed them to review check maps of their coverage and speed data – submitting only corrections and additions to the existing dataset. (For provider convenience the check maps were created in both PDF and Google Earth (.KMZ) formats.) The second option was to allow submittal of completely new datasets, either in tabular form or in multiple other digital formats. For those without CAD or GIS systems, we continued to allow the submittal of printed/scanned maps and other written materials.

[1] As with other Grantees, we struggle with appropriate and consistent classification for service providers who opportunistically provision Broadband services. In this submission we continue to bring them into the analysis as a provider type "other". As the inclusion of this category isn't our primary goal, we are working to process data as we can. We are similarly categorizing and retaining reseller information. Appendix 4 illustrates the categorization of non-Broadband providers within our provider tracking and verification systems.

Survey Methods

Once again, we used a secure digital survey process (via our provider portal websites) to collect and display information for providers. The survey process was designed to accommodate both new and returning providers, and the different types of information they would be submitting. The following is a summary of the process encountered by each group:

New providers: New providers were routed directly to our standard survey where they were provided with templates for uploading data in tabular NTIA-compliant formats. As in previous rounds, if providers could not supply information in the requested format, alternatives were offered. These alternatives included uploading service-area boundary maps, exchange area maps, CAD drawings or customer address lists. From that information, the LinkAMERICA team developed a geographic representation of coverage and was able to build coverage features for each provider.

Returning providers: For Round 10 we continued to work with participating providers to improve their datasets. Check maps continue to be a useful tool to show providers how their area would be displayed on the resulting interactive state map and to get constructive feedback regarding corrections and changes that need to be made to their coverage and speed data. Data was also returned to providers in an additional text format. We supplied providers with a CSV file for each type of layer (Blocks, Roads, Addresses or Wireless Polygons) supplied to NTIA. Generating these customized documents in each round is an extremely time consuming verification process, but it allows us to close many of the gaps that might have otherwise persisted.

Follow Up

After the release of the Round 10 survey in early July 2014, LinkAMERICA launched an extensive effort to encourage responses. Every known provider was contacted at least twice during the months of July and August. A special email campaign was launched to reach out to those providers who have been 'non responsive' to date. The initial data submission deadline was set for mid-August, but we continued to accept "straggler" submissions into September.

No Response Policy

As mentioned above, every effort was made to contact each provider who appeared on our initial list. However, if no current information could be found on the company (i.e. no website, no valid phone number, or no contact person identified) they were removed from the list of "known providers". We believe the majority of those we were unable to reach were providers who have simply ceased to exist[2]. If we verify that a company is a broadband provider still doing business and are not able to get a response to our request for data, we make note of that in our datapackage.xls. If a provider has gone out of business due to an acquisition, we reflect that information in both the Changes and Corrections and README documents.

[2]The list of known providers and important submission statistics are contained in the datapackage.xls file.

Summary

In summary, an intensive 45-60 day provider outreach and data collection process is initiated at the beginning of each round. In Round 10, given the data vintage of June 30, 2014, we began this process in July. The last submissions were accepted in September 2014.

While we continue to successfully engage the majority of providers in each round, the amount of manpower required to solicit complete and timely responses should not be underestimated. This process is one of the most costly and complex within the entire SBI program.

Third Party Data Used

We have acquired the following commercial/restricted use data products:

- American Roamer, Coverage Right Advanced Services (tabular). This data served two purposes. The first was to verify the provider list and help find Broadband service providers not on other lists. The second was to verify the reasonableness of the Broadband service provider's submission.
- GeoResults Wirecenter Boundaries. This data was used in the verification of 'telephone' Broadband provider data. Where a public domain exchange boundary wasn't available, the boundary was used for coverage containment tests.
- Media Prints Cable boundaries. This tabular data was used in the verification of Cable/HFC Broadband provider data. It was used to research valid providers and discover if that provider was offering Internet service.
- FCC 477 restricted use data were analyzed to find valid providers within a given area. FCC 477 public data were also used.
- FCC FRN lookup tool was used to validate FRNs.
- Proprietary Provider Serving Areas. Since the first survey, a number of providers have supplied their engineering, serving area and/or franchise boundaries. We have maintained and enhanced these proprietary data sources.
- Towercoverage.com. This site offers a web mapping service to fixed wireless providers, many of which meet the criteria for our program. Providers can indicate through this site that they want to share their information for use on the National Broadband Map (NBM). In addition to using the site for provider validation purposes we pull mapping data for providers doing business in our state. In most instances we have found it necessary to contact the provider directly to get a complete and accurate submission of information for SBI.
- Community Anchor Institution Provider lists. A comparison against the list of providers for our Community Anchor Institutions was made against our current SBI provider list to ensure those providers were accounted for in our SBI system.

We have included third party data sources which touch on each of the three major technologies analyzed within the SBI program. Most of these data sources tie back to a public domain data source, which provides a cross-verification mechanism for the commercial data product.

Although there are a large number of third party licensed data sources available, we remain conservative in our acquisition plans. From our limited analysis we are concerned about the ability to cross-verify additional third party licensed sources against public domain data. Further, we are unsure of how we may be able to integrate another data provider's view of valid Broadband providers within the definitions used by the NOFA (e.g. Are they using an FRN/DBA identity view or a marketing view? Can the provider supply in a 7-10 day window? Are they a facilities based provider or not?). This leads us back to a statement we made in a 'lessons learned' Webinar (April 2010) about exploring a consortia to lower the cost of data acquisition and allow multiple entities to peer review the quality and methodologies behind licensed data products.[3]

Beyond these commercial data sources, we used a number of public domain sources. These included:

Geographic Data Files

- US Census TIGER data[4]

Sources that helped isolate providers, identity management or provider service areas

- NECA Tariff 4
- State produced exchange boundaries
- Carrier produced wirecenter boundaries (sometimes proprietary to provider)
- FCC Coals reports (321/325)
- FCC FRN API lookup tool
- FCC/FAA Antenna Registration System
- FCC FRN Lookup Tool (plain text search)
- USAC High Cost FCC Filing Appendices

Sources that helped isolate anchor institutions

- USAC Grant lookup tool
- USAC High-Cost FCC Filing Appendices
- BTOP Performance Reports
- HRSA data warehouse
- NCES data lookup
- State managed lists of schools (K-12), post-secondary institutions and libraries
- List of museums, conventions, and visitors bureaus from www.onlineatlas.us
- In state relationships to key stakeholders.
- Institute of Museum and Library Services (IMLS) data file.

Finally, challenges exist when dealing with the inevitable conflicts between provider-submitted data and third party sources (public or commercial). There is no guarantee third party sources are more accurate or timely than the providers' own reports. Indeed, some third party sources are based upon different standards than those specified in the NOFA, perhaps making them less reliable than information collected directly from providers. At the very minimum, provider data has a lineage and temporal status

[3] We also suggested forming a technical standards committee and a consistent system for confidence reporting.
[4] Census data were derived from < http://www.census.gov/cgi-bin/geo/shapefiles2010/main>, Census 2010 files. Roads were derived from the county faces and edges file downloaded at the same location and tiled for a full state.

that we can identify. A concern we have with increasing use of third party data is that we have no way to verify its quality or development methodology. Particularly in rural areas we are concerned about what third party data may reflect based upon what we assume to be a small sample of information.

In other words, we may hit a wall in which we can't determine how the commercial source derived its coverage conclusion. To us this means that third party data sources are beneficial, but represent a supplementary view, not an authoritative one, of the NOFA defined Broadband market.

In short, we have chosen to use provider data as the baseline. We will challenge provider reports when third party data shows major anomalies, when submitted data conflict with prior submissions or when a consistent volume of consumer feedback points to a potential error.

Confidentiality and the Use of Licensed Materials

As a mapping vendor, we are reliant upon the cooperation of Broadband service providers. In large part, what underlies this cooperation is trust that we will not violate the proprietary and confidential nature of the data provided to us.

We are thankful for the confidentiality clarification that NTIA shared with us (included as Appendix 3). We use this as a guiding document to help us communicate with providers about what information NTIA considers to be confidential. Our suggestion is that NTIA publish this, or something comparable, to ensure a consistent interpretation of the NOFA and how it guides NDAs.

As some providers are non-responsive to requests for information, or lack resources necessary to put data into NTIA compliant formats, we have fallen back to the use of commercial data sources in several limited places.

For some incumbent telephone providers we have used commercial wirecenter boundary products to filter Census Blocks and segments that are clearly out of their exchange areas. For cable providers we have used an estimate based upon Census Designated Places within MediaPrints named areas.

Public Engagement: Crowd Sourcing, Surveys and Social Media

Crowd sourcing (i.e., an intentional and carefully designed effort to tap into the collective intelligence of the public at large to expand our knowledge base) continues to be an important element of our data collection and validation process. An expanding use of social media is also an important strategy in our efforts to promote the program overall and engage more citizens in the work at hand. To that end we offer various opportunities for the public to provide input via the online service coverage maps and the related 'Broadband story' process. These opportunities along with assorted public surveys have provided important information for the broadband effort in our state. As previously stated we see worth in engaging the public in this program and have found value in using social media outlets such as Facebook and Twitter to advance our process.

Consumer Surveys

Consumer surveys funded by the SBI grant have been hosted in some states over the course of this program. The resulting data is helpful on a number of fronts in the SBI's mission to advance the access and adoption to Broadband. Survey data provides an important, albeit broad, gauge for assessing coverage information obtained by providers. For example, areas with widely available coverage (according to provider information), but lower consumer subscription levels (according to survey results), or perhaps where survey results suggest Broadband is not available, can be examined in more detail. Survey results are also very important to the broadband planning (and capacity building) components of the SBI program in that they help inform and formulate Broadband advancement priorities. Survey results also help inform Broadband policy discussions on both the local and state levels. Finally, survey results provide important information to the service provider community regarding market demand and Internet use in specific communities (i.e., regions).

Social Media

The phenomenon of social media is widely documented and is emerging as an effective access point for public engagement. We continue to explore appropriate ways to use a variety of social media venues in our SBI efforts. All of our efforts are informed by and consistent with relevant state statues and guidelines. Each state has a different perspectives on if and how the state will participate in the use of social media. Some state requirements are well defined and some are still being formed. Where appropriate, we have used LinkedIn, Facebook and Twitter to support our work. A central focus is on promoting awareness of the program and seeking to expand engagement. In some situations we find that sub-program initiatives (e.g., regional planning teams) are making very effective use of Facebook to help inform and engage citizens impacted by the SBI program. In addition, we continue to evaluate how Facebook and Twitter can be used to drive public input on two important crowd sourced issues: online speed tests and input on map accuracy. Based on data obtained through our web site traffic monitoring process and readily available social media tracking processes, results are promising.

Capacity Building and Transitioning to State Partners

A fundamental goal of LinkAMERICA has always been to transfer knowledge and capacity to our in-State partners.

Within each State, transition planning and responsibility for specific activities is on a slightly different timeline. Much of this is driven by resource availability, funding availability after the completion of the Federal program and partner identification within the State. For example we began transitioning the responsibility for Community Anchor Institution data to the State of Alabama in Round 3, starting with the use of interns to validate Community Anchor Institution data. In Round 4 the state's responsibility expanded to include collection of all CAI data, and in Round 5 the effort culminated with Alabama assuming responsibility for the CAI submission. LinkAMERICA supported this process with detailed transition documents and technical support. Alabama is continued the transition process assuming responsibility for the state website in the first Quarter of year 4 and assumed hosting responsibility of the state map in Quarter 2.

In Idaho the SBI Framework Coordinator took on the responsibility of reaching out to CAIs in round 5. Since that time he has been working on a new outreach tool to enhance the data collection effort. Wisconsin took on this responsibility in round 9. Idaho and Wisconsin, are working toward the goal of taking on responsibility for hosting a state broadband map and website by the end of the program. LinkAMERICA is providing support for this progression in each state with program leadership, technical assistance, tools, and project plans to ensure a smooth transition process.

Data Sharing With Other States

Where possible, LinkAMERICA works to share data with other state mapping entities. This data exchange tends to take two routes.

First for wireless providers if we find a fair amount of coverage that crosses into an adjacent state, we will ask the provider's permission to convey this information to the neighboring states. If the permission is received, we send the data to the mapping agency.

Second, in circumstances where we receive a speed that is outside of the technology speed 'norms' and this provider offers service in another state we try to check with other covered states to find out if the service is comparably marketed.

Third, in cases where we receive an unusual submission from a national provider, we check with neighboring states as we can to verify our understanding of the submission.

Trends in Submitted Data

Overall we note several important trends in this data submission. The list below represents general trends and not a scientific survey. It represents our experience over the last few submissions.

We note the following trends:

Within the allowable time resources, we have assisted providers with 477 questions. This has included providing Census block reports of their round 10 submissions. We have also discussed changes to technology of transmission under FCC form 477.

There has been some confusion over how or if SBI submissions remain necessary in round 10 given the FCC 477 collection.

We have noticed a distinct trend toward a decline in the number of submitted records for some national providers. Most providers explain this in terms of new and more accurate submission methodologies or attempting to harmonize with their 477 submission, but we are troubled by the record count reduction

in the final round of the SBI program. As we can, we are trying to ascertain how material the changes in submitted feature counts are relative to the impact on potential network demand.[5]

We also note several smaller providers who have modified their entire data development process or updated their submission which has been unchanged for several submission cycles. In a few of these cases we note a significant variation in the number of features submitted or housing units impacted over the prior submission.

In our final submission to NTIA we are including additional business oriented, typically fiber only providers. The motivating factor for inclusion to NTIA in this final round was to provide a comprehensive dataset and to be consistent with the NTIA submissions of other nearby states. We assign an End User Category code of 2 to differentiate these providers if desired

Activity from the FCC regarding the Connect America Fund has influenced the activity of providers and policy makers. We tried to assist users as best we could within the constraints of available time.

With respect to recent Study Area boundary collections, we supplied both providers and State entities with public domain Study Area boundaries we have used.

With respect to wireless coverage and its impact on potential Connect America Fund (CAF 2) support, we have received several questions on the nature of the supplied coverage.

xDSL speeds are increasing. More and more xDSL is likely ADSL 2+, VDSL, shortened loops, pair bonded or some combination of these. As we talk to providers who trigger speed/technology tripwires, we receive more and more feedback about the presence of these new technologies to enable speeds comparable with DOCSIS systems. We also see large ILECS transitioning in some areas from xDSL to fiber deployments.

DOCSIS 3 is becoming the norm. Most cable systems are becoming DOCSIS 3.0. Over time we are seeing the DOCSIS 2.0 areas diminish. In some DOCSIS 3 areas there tend to be pockets of non DOCSIS 3 in predominant DOCSIS 3.0 markets.

Fixed wireless providers are offering broadband services approaching 1 Gbps. This is occurring both in terms of licensed and unlicensed spectrum. Part of this is driven by where a provider has fiber or high capacity wireless backhaul but we are receiving more and more information from providers and radio manufacturers specific to very high speed wireless services. Although the service can be deployed within the 7-10 day NOFA window, these higher speed services tend to be purchased by high capacity customers. Some of these fixed wireless providers offer targeted point to point services making the use of a wireless coverage polygon potentially misleading. An address point or block/segment type

[5] We are including in changes and corrections estimated changes in the number of housing units for the providers with the most change (outside of acquisitions). . The housing unit estimate uses Census 2010 values and assumes complete block coverage with any evidence of address point or segment coverage in a census block.

coverage may be more representative of service offerings. Finally, it may be worth reconsidering the speed norms in this category.

There is less and less of a distinction between fixed wireless and mobile wireless. As firms market LTE or other 4G services as home broadband alternatives, we are a bit unsure how these two classes are to be established-what is the operating distinction between Transtech 80 (mobile licensed) and Transtech 71 (fixed licensed) when both are used as in-home Broadband service?

We note an increase in area covered for Wireless Broadband in the 700 MHz spectrum group. Presumably, this indicates an expansion in LTE type coverage.

Satellite providers are advertising broadband services comparable in speed to xDSL. Some satellite spectrum codes are not available for use in the data model. Some satellite providers are beginning to indicate a difference in speed within the states. We are working with providers to clarify this new type of submission.

We continue to see a number of national Broadband providers who do not show broadband coverage within pockets of otherwise covered areas. In the figure below, the orange represents Census blocks which are NOFA broadband covered. The transparent areas have no NOFA broadband coverage from the same provider.

Figure 1--Uncovered pockets within urban, covered areas

This coverage drop-out appears to be happening in urban census blocks typically with schools, shopping malls, universities and large businesses. We don't know why this is happening, but it could be an impact of the NOFA restriction on 7-10 provisioning. This is a noticeable artifact in the data and does challenge the notion of some who see NOFA compliant Broadband coverage as a uniform coverage surface across an area.

We tend to see a significant shift in broadband coverage when there is an acquisition or merger. It may be an overgeneralization, but it tends to take about 2 submissions before the format of submitted data stabilizes. Even with the stabilization, the coverage may not match that submitted prior to the merger or acquisition.

For Community Anchor Institutions we note two important trends. First, with respect to subscribed speeds we expend significant resources to find facility level connections. This becomes especially complex when dealing with cases of campus level connections whereby a central point may receive a certain broadband service and then allocate bandwidth to particular buildings. This challenge exists especially in school settings but also in settings where distinct types of CAIs share a common facility--such as a school within a hospital or a school within a jail. We also find within our survey, a small number of CAIs who report back unreliable information. This is typically not if the facility is served but what speed is subscribed to using a particular technology. An example of this would be a school receiving 1 Gbps xDSL coverage. Although not impossible, this is an unlikely state and we investigate this type of situation as we can.

Also we note from discussions with BTOP grantees that they provide lists of facilities which they have connected as a result of BTOP funding, but cannot disclose the levels of service taken to us. In other words, they show that the facility is 'hooked up' but they won't show if the facility takes service from that or any provider.

Data Production Process

We continue to model, refine and document our data production process. We find this to be a very beneficial step for several reasons.

First, it helps us understand why (and if) a task is being done, and if it is being done efficiently. Much of this program started so quickly that it was difficult to plan logical integration and hand off points among the various workgroups. We used this process model to efficiently plan cohesive information architecture.

Second, our process documentation and modeling helps explain why resources are being consumed in a particular way. This helps our State partners plan for in-sourcing specific tasks as their time and budgetary constraints allow. It also helps our LinkAMERICA team better plan and cross-train members to deal with the work surge that occurs 30-45 days prior to submission.

Finally, documenting and modeling our process helps us to take advantage of increasing specialization and proficiency with certain types of data and management responsibilities. In submission 3, we had

identified data “czars” responsible for check-in and check-out of data. That data czar helped to bridge the gap among receipt functions, provider feedback, production and DBA. In round 5 the data czar was also tasked with alerting on speed/technology tripwires. This individual was responsible for taking the initial review of each submission and determining if an NTIA speed/technology warning would be triggered.

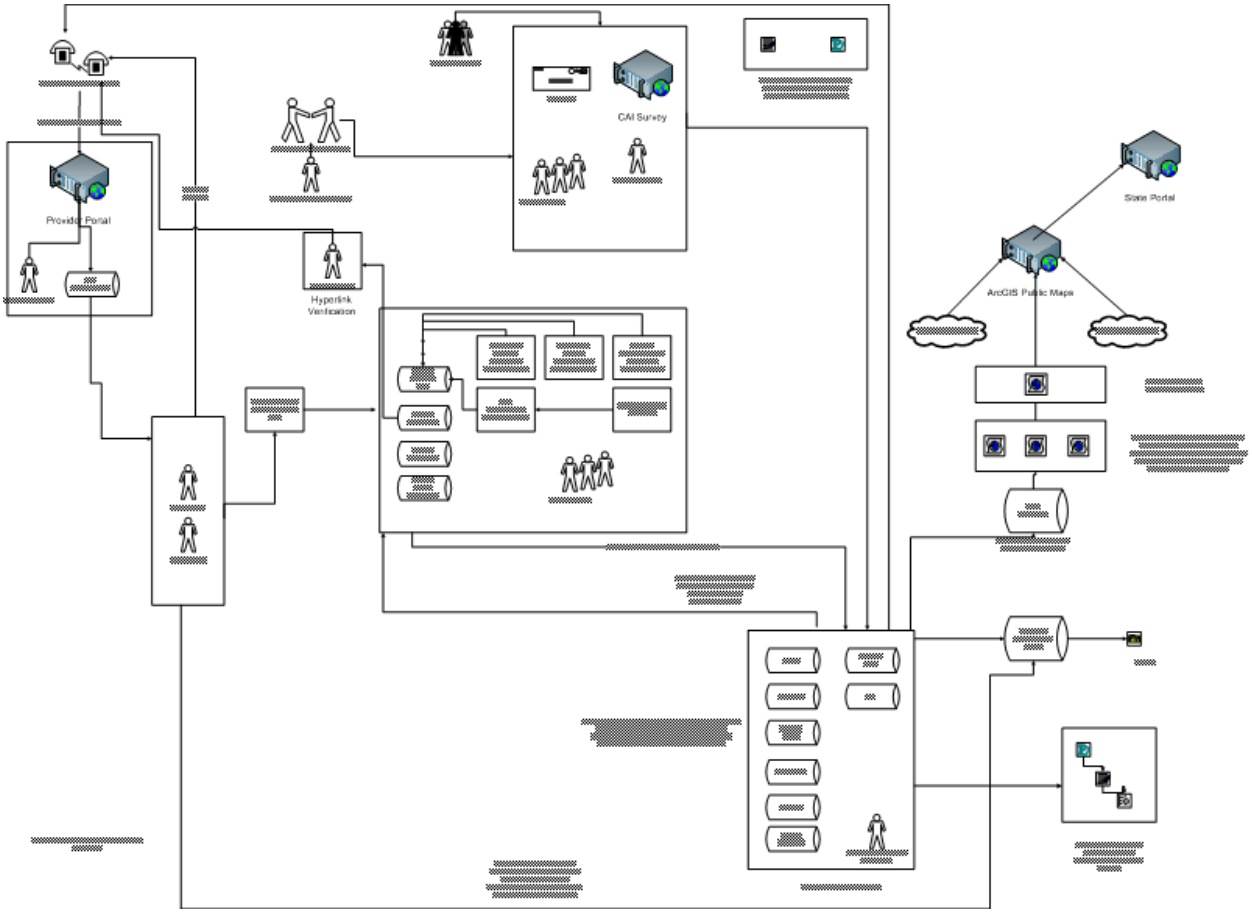


Figure 2—SBI Data Development Business Process Diagram

Provider Tracking In the Cloud

Prior to initiating the Round 5 survey, LinkAMERICA transitioned in house provider tracking systems to a Cloud based application, TrackVia. Prior to initiating the Round 8 survey, LinkAMERICA transitioned provider notes and data production into Evernote. Evernote provides a universally accessible repository of current and historical information on providers and is easily searchable across a variety of platforms.

The movement away from desktop solutions was based upon several factors. First, the architecture these systems were designed under no longer met the program realities. For example, deliverables like Datapackage.xls were not contemplated when the original provider tracking system was developed. Second, the ability to share data across multiple geographic areas and organizations was becoming increasingly important as the program evolves and responsibility moves to in-State partners. Third,

portions of this data need to securely transition back to State resources who may or may not be able to support a specific IT infrastructure. These factors combined to make the cloud applications a valuable alternative.

As with any IT transition, the process has not been without challenges. Nonetheless the investment in time and resources has proven to be effective and worthwhile.

Data Production Methods

As raw data were received from the provider community, attention turned to normalizing the disparate submission formats[6]. The team considered each submission with respect to the following criteria. These criteria are important because they perform the basis for our verification and quality assurance process. In other words, we have to appropriately scale our data verification efforts to match the scale or ambiguity of the following:

- Locational certainty
- Speed certainty
- Temporal certainty
- Provider and network ownership certainty

The team's goal was NOT to quantify a particular degree of precision with respect to any of these criteria. Rather, we are working to attribute the above "certainty attributes" to each submission, and will continue to implement quality assurance and verification mechanisms that are resource-appropriate for each.

Deriving Broadband Coverage Information

Broadband Coverage[7] was normalized into four formats:

1. Coverage in Census Blocks (2010) of 2.00 or less square miles
2. Covered Street Segments (2010) in Census Blocks greater than 2 square miles[8]
3. Address Level Coverage (point data)
4. Wireless Service Areas (SHP file format)

With each submission, the team went through a series of steps to normalize and categorize the data. Since data arrived in many different formats, and at many levels of granularity, the following normalization procedures were used:

[6] In line with NTIA Best Practices we continue to request and receive a large number of data input formats. This ranges from tabular block lists to hand drawn maps.

[7] Speed, Anchor institutions and Middle Mile facilities are discussed in later sections.

[7] To help clarify issues relating to Census block area and vintages in use, our team published a technical paper to the Grantee workspace. Because we were unsure if this standard should be implemented uniformly, this document was never distributed to the provider community.

- Determining the nature of service being provisioned (who is providing service and what technologies are in use)
- Planning an attack strategy for the submission –understanding the data and assigning team members to various tasks
- Alert provider relations staff if the received data trigger an NTIA speed/coverage tripwire.
- Georeferencing the data; QA the georeferenced data
- Geoprocessing the geo-referenced response
- Segregating the submission into the correct NOFA-compliant submission formats.
- Apply appropriate source metadata[9]

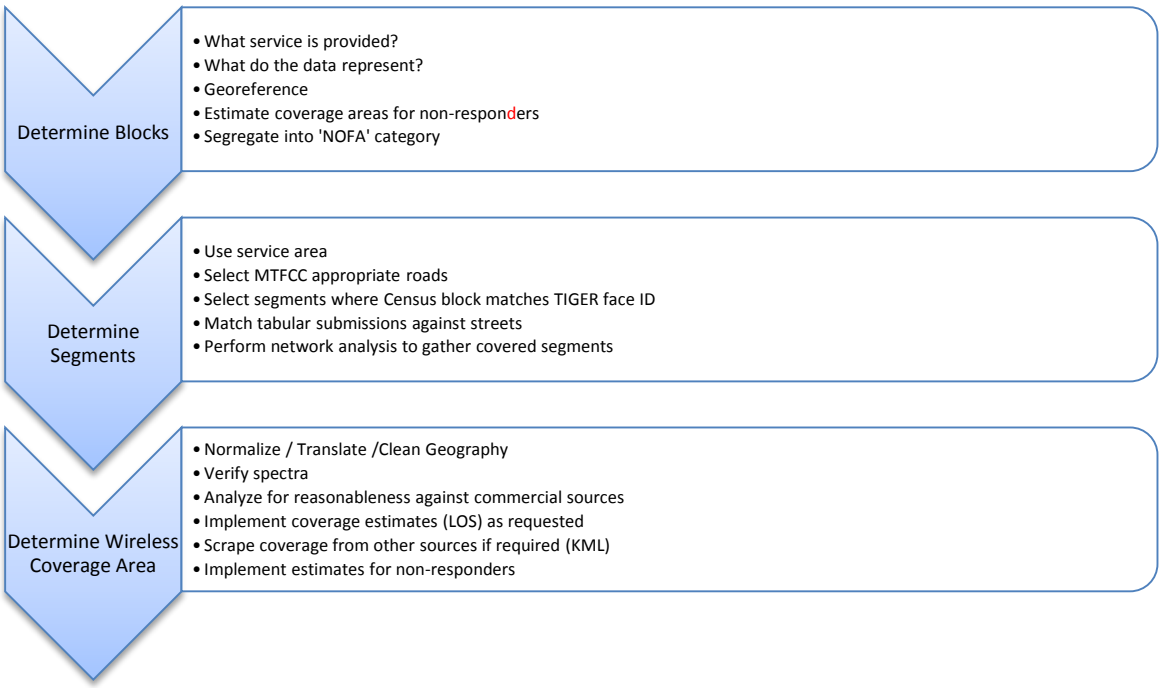


Figure 3-Components of Broadband Coverage Process

Impact of Program Change

There are several important program changes that have impacted how Broadband coverage is developed and submitted to NTIA.

Speed Examination

Given recent concerns about the depiction of speed and what that mapped speed represents, LinkAMERICA invests considerable time requesting detailed information on speed which appeared to be beyond normal speeds for a given Technology of Transmission given the NTIA supplied frequency tables.

[9] When our team logs a submission into the staging database we record at least two attributes. One records the method used to derive the coverage, the other records the method by which speed was attributed to that object. Other attributes carried to NTIA carry source metadata values as well.

Based upon these conversations we have learned

A) For incumbent telephone providers; the speeds beyond the normal xDSL range potentially represent shortened copper loops, bonded copper as well as upgrading DSLAMs and modems to support ADSL2+ or VDSL.

B) For cable providers the intermixing of DOCSIS levels (2 or 3) in a market area is typical and sometimes reflects a circumstance where segments of plant cannot be upgraded to DOCSIS 3.0. This variance can be at a level below the Census block. In these cases the maximum advertised speeds remain to represent the market area but the plant variance is typical. We also have one 'cable' provider who is delivering DOCSIS 2.0 over fiber plant (RF over Glass or RFog).

C)There exists a fundamental disconnect between some providers reporting a service qualified speed--the maximum speed available at a structure versus other providers submitting their maximum speed at the market (MSA/RSA level). Both submission paths are available to providers but the likelihood of providing a speed incompatible with a technology is much greater for providers submitting market level speed. For the most part, wireline providers are submitting block level speeds. This creates a fundamental disparity between the wireless speed reporting and wireline providers.

D) As we watch providers modify coverage, we sometimes see patterns in which technology and speed shift almost street by street. This is a difficult coverage pattern to apply into the NTIA data model as these shifts are sometimes below a Census block level.

E) Fixed wireless provides are using new radio technology to quickly deploy services which rival and sometimes exceed those of wireline service providers. These speeds are being advertised, sometimes on public facing websites as well as using direct field sales staff to target specific high demand customers. These services are actively marketed but they challenge the data model in that the speed is marketed and available within 7-10 days of request but the nature of the fixed wireless submission forces attribution of this speed within a potentially large geographic area.

E) There exists a minority of providers who submit a theoretical speed that is unmatched by their web advertising. In these cases we request clarification from the provider on the inconsistency. Our experience has been that providers will modify the speed to be consistent with their marketing and advertising.

F) The maximum advertised speed offered is not always clear. Sometimes the speed is described in advertisements in terms of a combination of video and data. Other times it is data not video. Some providers allow a customer to select how much bandwidth they want to allocate to their data stream versus video stream. In other words the bandwidth available to a household is constant but how it gets allocated among the data versus video becomes a customer or service directed choice. This makes getting Maximum Advertised Downstream speed very difficult because it is not just a product of the broadband network which we are mapping but also the customer's selected service package. Upstream is rarely advertised. Different marketing channels (Business to Consumer versus Business to Business) may yield different marketed speed combinations.

Provider Definitions

Within our provider verification process we work to derive a state level provider match against third party data sources. As discussed in the early pages of this manual, there is no guarantee that a third party data source is any more accurate than submitted data, nor does it necessarily reflect the provider ecosystem specified in the NOFA, Technical Appendix A. We devote significant resources to matching our submitted data against outside data sources. In many cases this becomes a manual judgment call trying to match provider names across systems. It is a difficult and somewhat arbitrary process. Nonetheless we do believe it has value because it forces a re-examination of who we believe is an appropriate provider within a non-NOFA context[10].

The use of a provider match system, as well as the webinar comments (3/17/11)[11] directing grantees to estimate, wherever possible, non-participating providers have made us back away from one of our fundamental assumptions in data collection. As discussed in prior versions of this manual, we had developed a certain "hold-out" class of data when a provider's data wasn't of sufficient quality to verify, or we were unable to put it into the data model (e.g. address points submitted for fixed wireless). In submission four, much of this hold-out data was included[12]. In some cases this involved using simple polygons to capture a wireless ISPs serving area. Other times, if we are confident in the coverage, but can get little clarification on the submitted speeds or frequencies, we release the coverage and note in our internal metadata the source issues with the other attributes.

In the weeks leading to submission 5 we received a request from NTIA to clarify the presence of unusual shaped wireless polygons. Our interpretation of this was a request for information relating to the source of these data which do not appear as propagated coverage. Although the 'unusual shapes request' represents a very small portion of the submitted data, it begs an important question about the expectations with respect to wireless coverage patterns. We look forward to working with NTIA to address these issues in a fair way across States and providers. We would not want to create a coverage dichotomy where advertised coverage was disallowed from the NTIA submission because of an expectation about how advertised coverage should appear. One concern we have when we develop a coverage estimate which differs from a providers advertised coverage pattern, which should we submit? As of this final round, this remains an open and important question.

Finally, we use the provider type classification of 'other' to bring specific aspects of certain provider's data into our submission. There still seems to be confusion on how to handle provider types where a provider offers multiple paths to provision Broadband for typically business customers. Rather than

[10] We have requested from NTIA information on how provider matching is done within their QA process; beyond the relatively short whitepaper posted with the national map <http://www.broadbandmap.gov/blog/wp-content/uploads/2011/02/DataComparison_Methodology2.pdf>, we have not received any more detailed information on how providers are cross verified between submitted and third party sources at the national level. Our understanding is licensing concerns are holding the release of this information.

[11] Clarifying comments from Akins Lawl indicate the Program Office does not want Satellite providers estimated if the provider is non-responsive to data requests (email 9/12/12).

[12] We continue to process older submission data looking for information and methods by which we can estimate coverage information. This will be an ongoing process.

waiting for certainty on the answer, we bring the provider in and list them as provider Type "other". Our sense is provider Type "other" will continue to expand in subsequent submissions.

Clearly one challenge is the data, but an equally significant challenge is appropriate messaging around this "other" provider type category. We do not want to leave consumers with the impression that they can get a high capacity fiber or microwave link despite the fact that the hospital next to them or in a nearby Census block can get this service.

After the April 2011 Grantee conference, LinkAMERICA submitted a paper describing our provider classification system[13]. It is our feeling that understanding the type of provider is essential to appropriate verification methods.

As part of the final survey process, we targeted specific providers to ascertain if they were predominantly focused on a non-residential market. As a result, several provider types have been updated. We are also including more coverage only on State maps versus submitting it to NTIA.

Coverage Geoprocessing Methods

The next section discusses how data were georeferenced and geoprocessed given a particular submission format. We have yet to find a particular method that works across all submissions. Rather we tend to tailor our geoprocessing to meet the specifics of the service provider and data submitted.

In many cases, in Round 10 we were not provided with street segment geographic objects for Blocks greater than two square miles (large Blocks). This necessitated subsidiary geoprocessing. As stated before, our first goal was to derive block level coverage. Then, for Blocks greater than 2.00 square miles, we moved to a segment gathering process. The segment process will be described in the last section.[14]

Block Level Coverage Derivation Using Service Point Data

A number of providers submitted point level customer data.

In some cases the submissions themselves were not internally consistent. For example, in the image below, unprojected points are shown, while the Census block polygon to which the points are supposed to "belong" is highlighted. In this case, one of the following scenarios has occurred: block attribution is wrong, the points are not in the location to which they are attributed, or different block shapes were used than what is assumed.

[13] https://sbdd-granteeworkspace.pbworks.com/w/file/42309493/provider%20ClassificationFINAL.docx

[14] As has been discussed previously, we note inconsistency in how providers are supplying information at the block and segment level. Beyond the temporal differences, we see that providers are computing area differently, as well as including or excluding water areas. This provides an inconsistent measure across providers for the 2.00 sq mile cut off. Our preference would be to provide guidance to service providers within our states, but our concern is that we will inconsistently message this with grantees in other states. We would appreciate consistent guidance from FCC/NTIA on this topic.

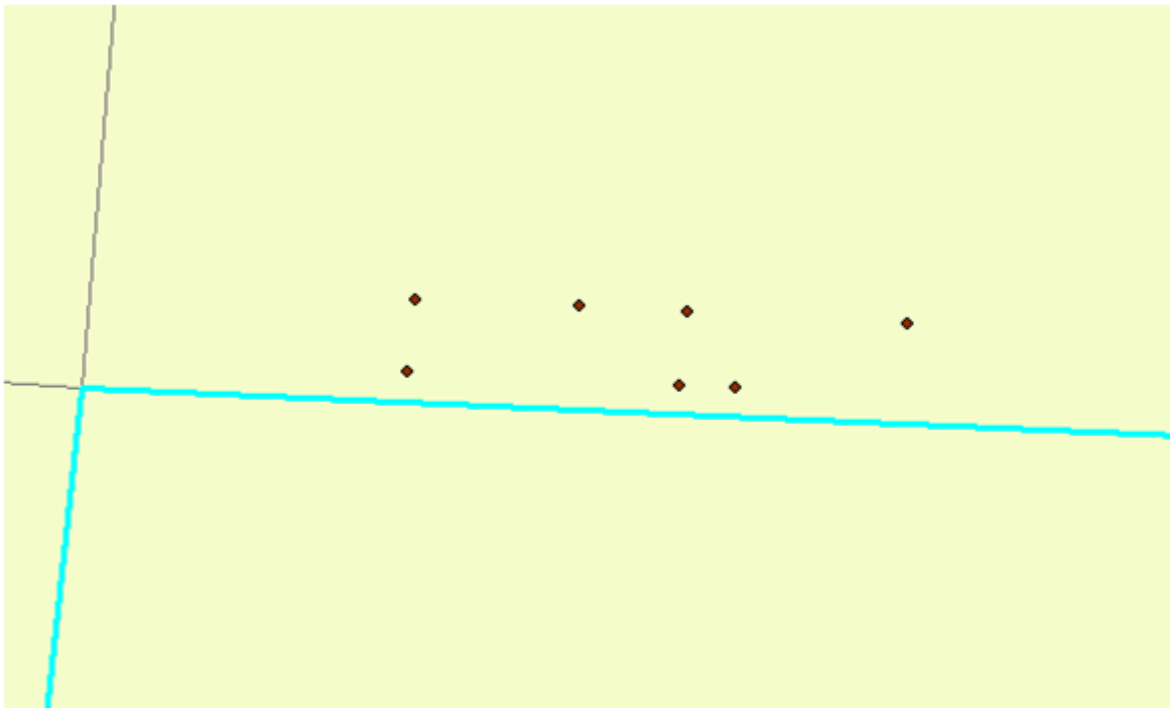


Figure 4-Internal inconsistency in submitted data

In other circumstances, we found that inconsistent geocoding standards may produce misleading results. The next image shows point level data, and the Blocks are colored based upon the counts of points intersecting Blocks. The challenge this presents is that if geocoding was performed on a different dataset than the block boundaries (the road traces are not coincident with block boundaries) and/or geocoding was done without an offset, it becomes problematic to assign coverage to a Census block based upon only the point locations.

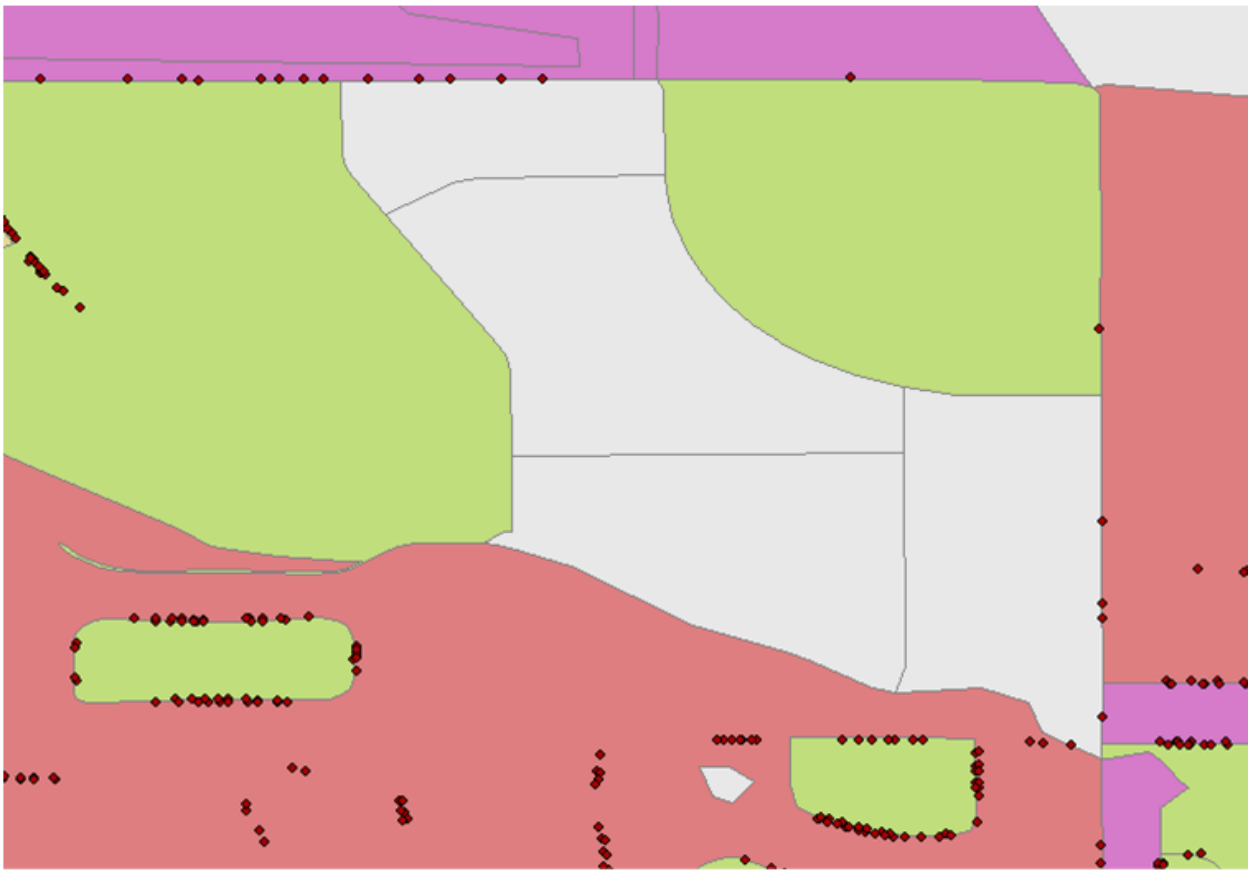


Figure 5-Block Coverage

For this reason, where we were provided address point data and asked to generate covered Census blocks, we elected to use a 150-200 foot buffer to select Census Blocks that intersect our points.

We also see a number of providers submit customer data and facility data. Their intent is to allow us to have two primary sources from which to derive the most accurate coverage. In these cases we tend to look for clusters of customers in areas where we see no facility based coverage.

With respect to deriving Block level speed from sub-Block data, we have instituted a business rule where the predominant speed in a Block is the speed we attribute to the Block.

Block Level Coverage Derivation Using Customer Facing Plant Level Point Data

In other circumstances, providers submitted point level plant data. From what we could gather, these points tended to be customer-dedicated terminals. Typically, these providers were high speed Broadband producers—which may somewhat strain the definition of Broadband as other providers supplying comparable services specifically disclaimed the ability to provide high-capacity Broadband services in the required 7-10 day interval. In these plant point data submissions, we had similar concerns to the point level customer data, but two factors tended to make us use a more conservative intersection buffer. First, we tended to have far fewer points to work from, so our concern was grabbing too many covered Blocks as the Blocks tended to be much smaller in these urban areas.

Second, these plant points tended to be dedicated to distinct customers, but it was difficult to know which element of the customer's campus to attach coverage to.

In the case of the image below, given a small shift to the left, it would be easily possible to gather 1 to 3 Census Blocks from this point. Although orthoimagery is helpful in a circumstance such as this, it is still indeterminate.

Thus, in the circumstance of plant level point data, we used a 100-foot intersection buffer.

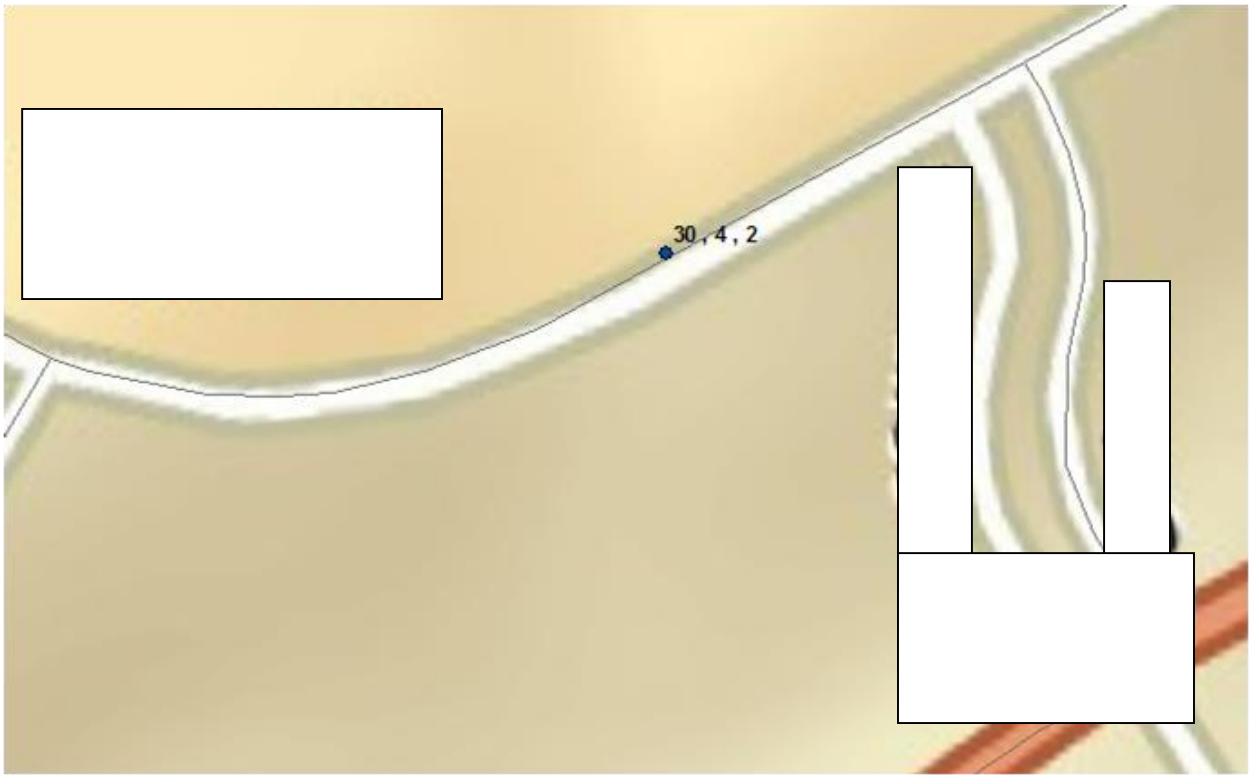


Figure 6-Plant Point level data

Coverage Derivation Using Linear Facilities Data

A number of providers submitted facilities data. We handled this data in different ways depending upon what we believed the facility data represented.

Most telecommunications networks are divided into two components. Feeder supplies higher capacity nodes (eg. DSLAMs, Fiber Nodes). Distribution usually supplies customer premises (NIDs, Pedestals, Taps, ONTs). Where we could discern what facilities we were provided, we used different methods.

The next image demonstrates a geo-referenced CAD image as given to us by a service provider. Note the light and dark green shading. We would infer that the lighter segments represent distribution and the dark green represents the feeder network.

In the case of a combined strand map, we used a relatively tight buffer of 200 feet to gather covered Census Blocks. Our intersection tolerance is based upon an assumption that our data likely represent a

situation comparable to customer point level submission in that we have most of the network footprint captured.

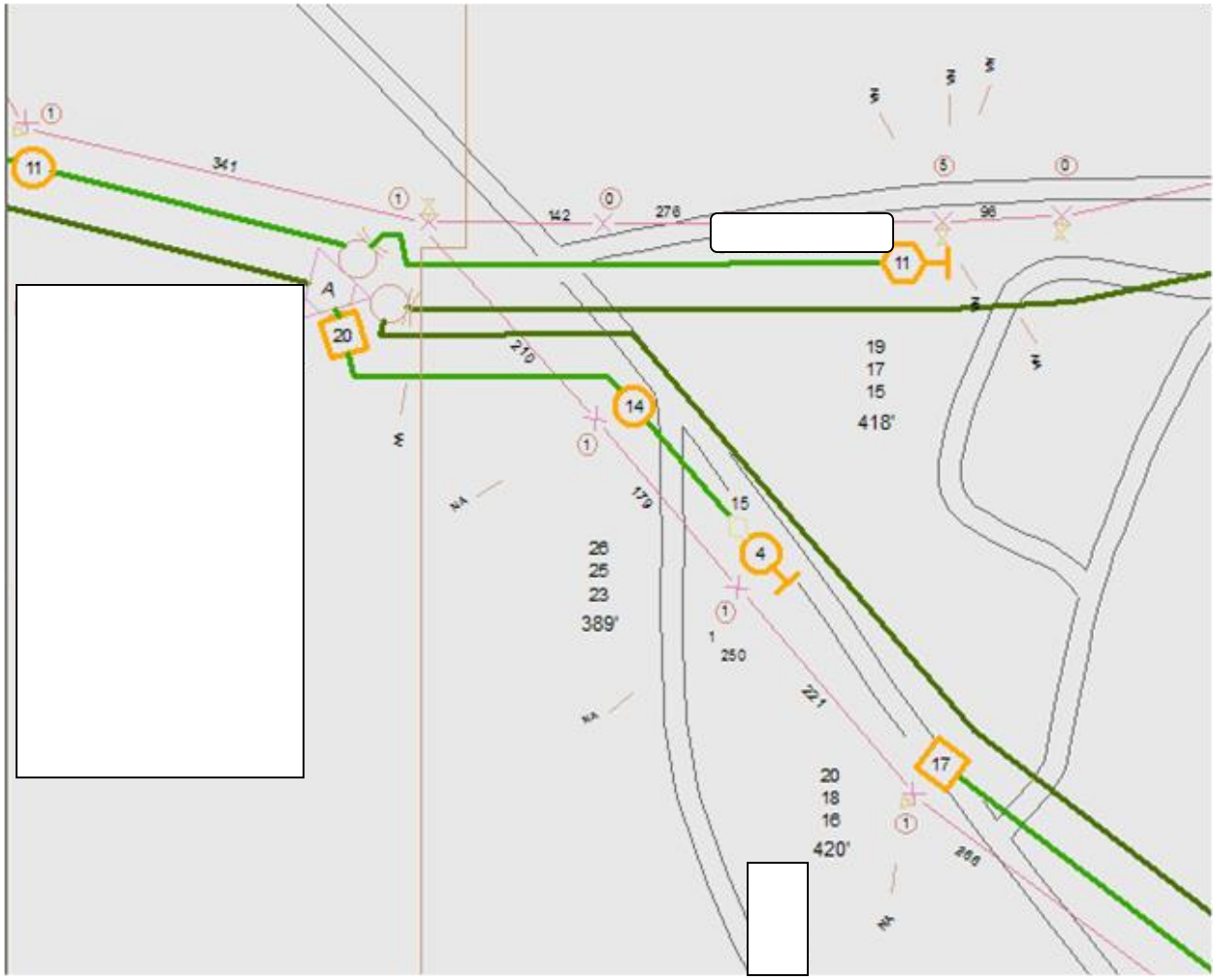


Figure 7-Georeferenced CAD information supplied by Broadband provider

In other circumstances, we were provided engineering information that we inferred to be feeder only. This inference was typically based upon the presence of fiber optic equipment only. In these cases, we used a more generous 2,000 meter Census block intersection. The 2,000 meter criteria was based upon an informal survey of population in proximity to the geo-referenced strand data, but it could be varied based upon a more complete survey. We tend to receive more information regarding distribution fiber than feeder fiber.

Coverage Derivation Using Covered Street Segment Data

In some cases we were provided with covered street segment data. Covered segments tended to come from two sources.

In some circumstances, providers gave us CAD data, which was not drawn in a projected manner. This is relatively common for older engineering data derived from hand drawn records. This meant that our team geo-registered the image into an approximate position. In this case, the boundary streets were selected, and an enclosing polygon was derived. The intersection of this polygon and the Blocks within became the geoprocessing method to derive Blocks.

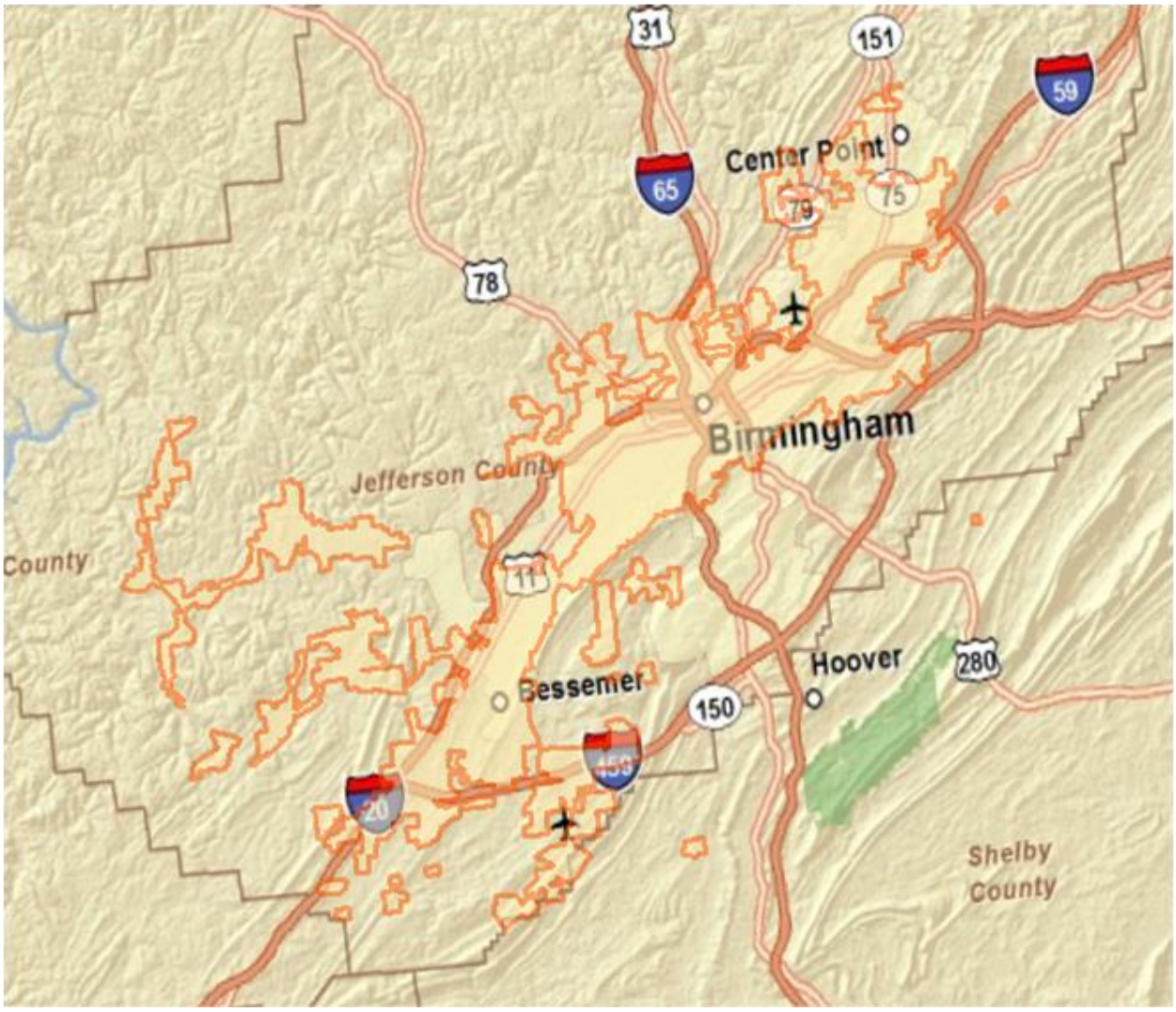


Figure 8-Coverage derived from street segments

In a second circumstance, street segment data was developed during coverage estimation. Handling the estimated data is discussed below.

Coverage Derivation Using Serving Area Point Submission Data

In other cases we worked with providers to derive service areas based upon point plant data. In these cases we were given a serving node and an appropriate road length service boundary. There is an important distinction from the plant data discussed above. In this specific case, the data submitted was

a node that served many locations--such as a Central Office or DSLAM. This is contrasted with the earlier example in which the point represents a node serving only a few customers.

When trying to derive coverage from Central Office or DSLAM nodes, the team used ESRI Network Analyst to derive covered road segments honoring these road engineering parameters.

The figure below shows street level coverage derived from Central Office and remote DSLAM point data.

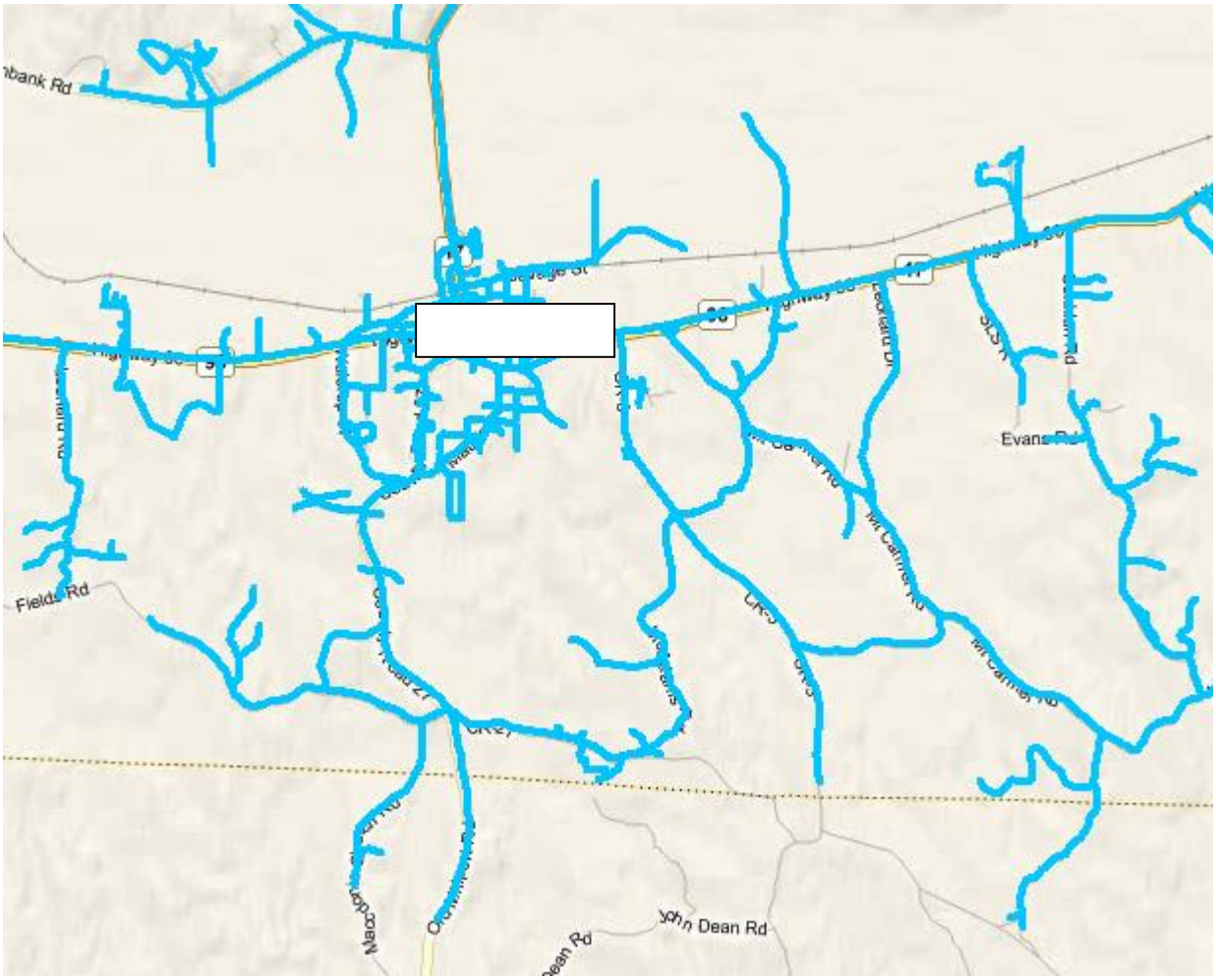


Figure 9-Coverage derived through road paths

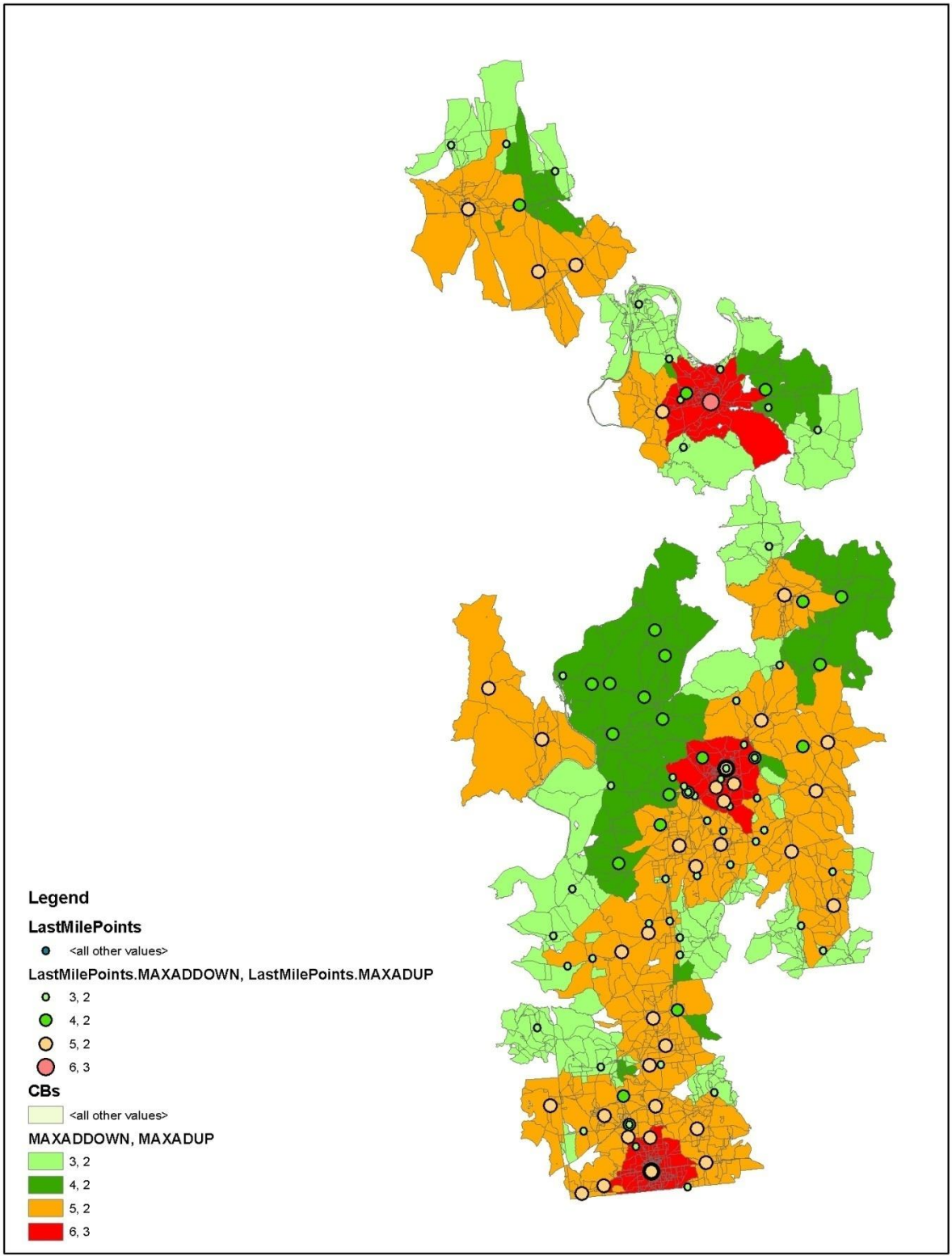
In response to Provider feedback we revised this process to include a larger variety of TIGER road types. In Round 1, unimproved roads were not used. In the current submission -- particularly to improve estimates in areas bordering parks and public lands -- a wider class of TIGER roads was used.[15] We still get concerns from service providers about missing road segments and incorrect centerline appearance.

[15]Only TIGER features of MTFCC type S1100 and S1200 were excluded from use.

The segment level coverage is easily extendable to derivations of Census block level speed. The figure below shows the attributions of block level speed based upon the Maximum Advertised Speed available from a DSLAM. Although the methodology isn't perfect, it does provide insight into the value of granular infrastructure data.[16]

Over time we have seen an increase in the number of providers submitting this type of data for our use. Our sense is some providers find plant level data easier to generate and are satisfied with the results of derived coverage.

[16] One of the concerns with this approach is that it assumes the routing and directionality used by ESRI Network Analyst is consistent with the actual network in place which it likely is not. We tend to see this manifest as an erroneous estimated speed, availability of service tends to be accurate.


Legend
LastMilePoints
<all other values>
LastMilePoints.MAXADDOWN, LastMilePoints.MAXADUP
3, 2
4, 2
5, 2
6, 3
CBs
<all other values>
MAXADDOWN, MAXADUP
3, 2
4, 2
5, 2
6, 3

Coverage Derivation Using Polygon/Polyline Serving Areas

Broadband service providers sometimes submitted coverage in terms of served areas. This was either in direct geospatial formats, CAD files, or paper maps. The image below reflects a carrier's service area. Within that service area, there are variations in technology of transmission and served speeds. When polygons with speed data and technology of transmission were available, we used a spatial intersection to gather covered Census Blocks. In many cases, using covered Census Blocks resulted in a loss of the speed variation (sometimes the speed variation was at a level smaller than a Block and did not get picked up within a spatial query).

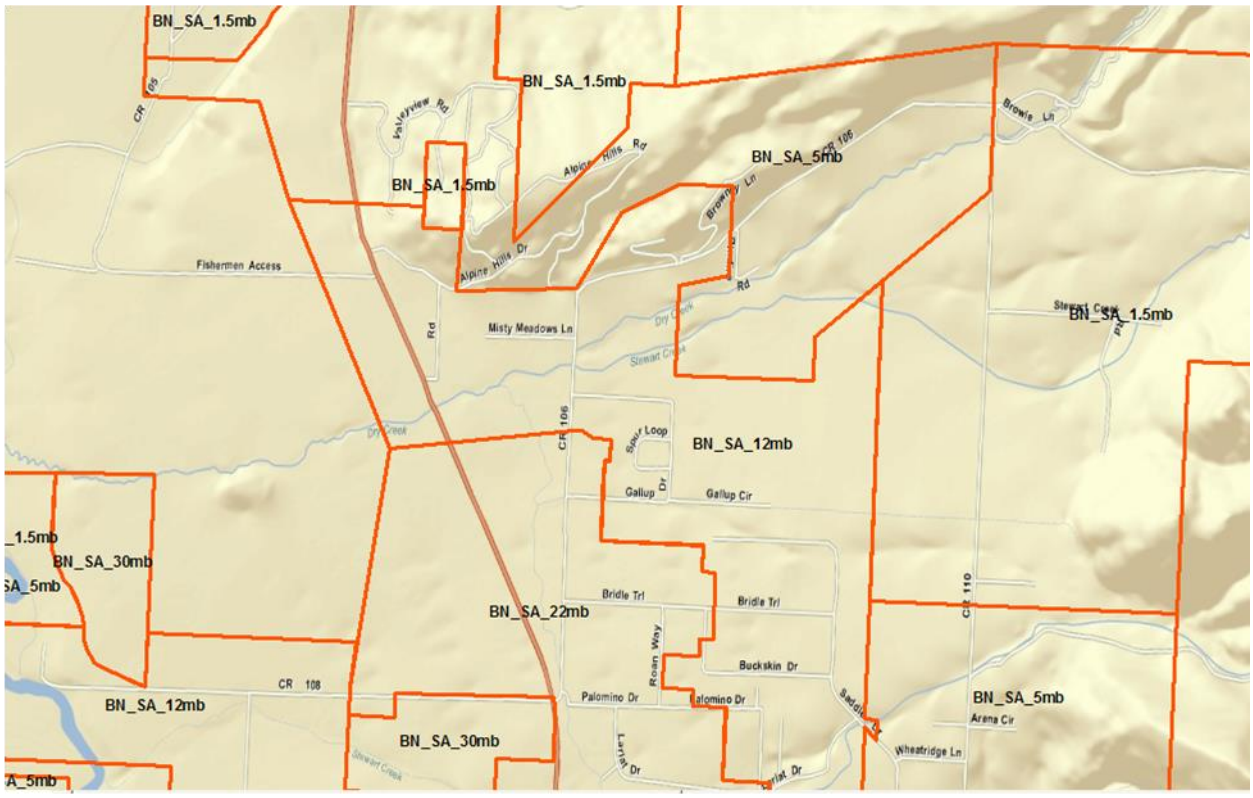


Figure 10-Coverage derived through serving area polygons

Although we cannot directly solve the loss of speed granularity due to Block shapes, we honor a business rule wherein we always select Blocks from the highest speed areas first, and then allow the lower speeds to select from the remaining Blocks. This is an arbitrary rule, but our feeling was that it should be a consistent selection, rather than an unordered selection.

Street Segment Derivation, Large Blocks

For those calculated Blocks greater than 2.00 square miles (large Blocks), we provided coverage to NTIA in terms of covered street segments and corresponding TIGER geography.

With respect to segments we had four sources of data:

1. Covered large Blocks
2. Tabular street segments and address ranges for large Blocks

3. Geographic segments either with street attributes or without
4. Service area boundaries

A few providers only submitted a list of covered large Blocks without corresponding segment information beneath the block. This yields the choice of either selecting all segments in the block, or none. In this case, we worked with the provider to identify an appropriate submission path. If they were unable to provide a direction, we discarded the large block information.

Some Broadband providers submitted covered street names and street ranges. In these cases we performed a manual analysis trying to link to specific segment names and address ranges within covered Blocks. Sometimes this was a simple process because a provider used a TIGER derived street database. In other cases we could not determine the source of the provider's street data. Street and Address matching tended to yield a relatively good result (typically between 30% and 100% of possible segments in the Block), but was very time consuming. Where yield rates were low, our result was a shredded

segment coverage pattern, like the image shown below.[17]

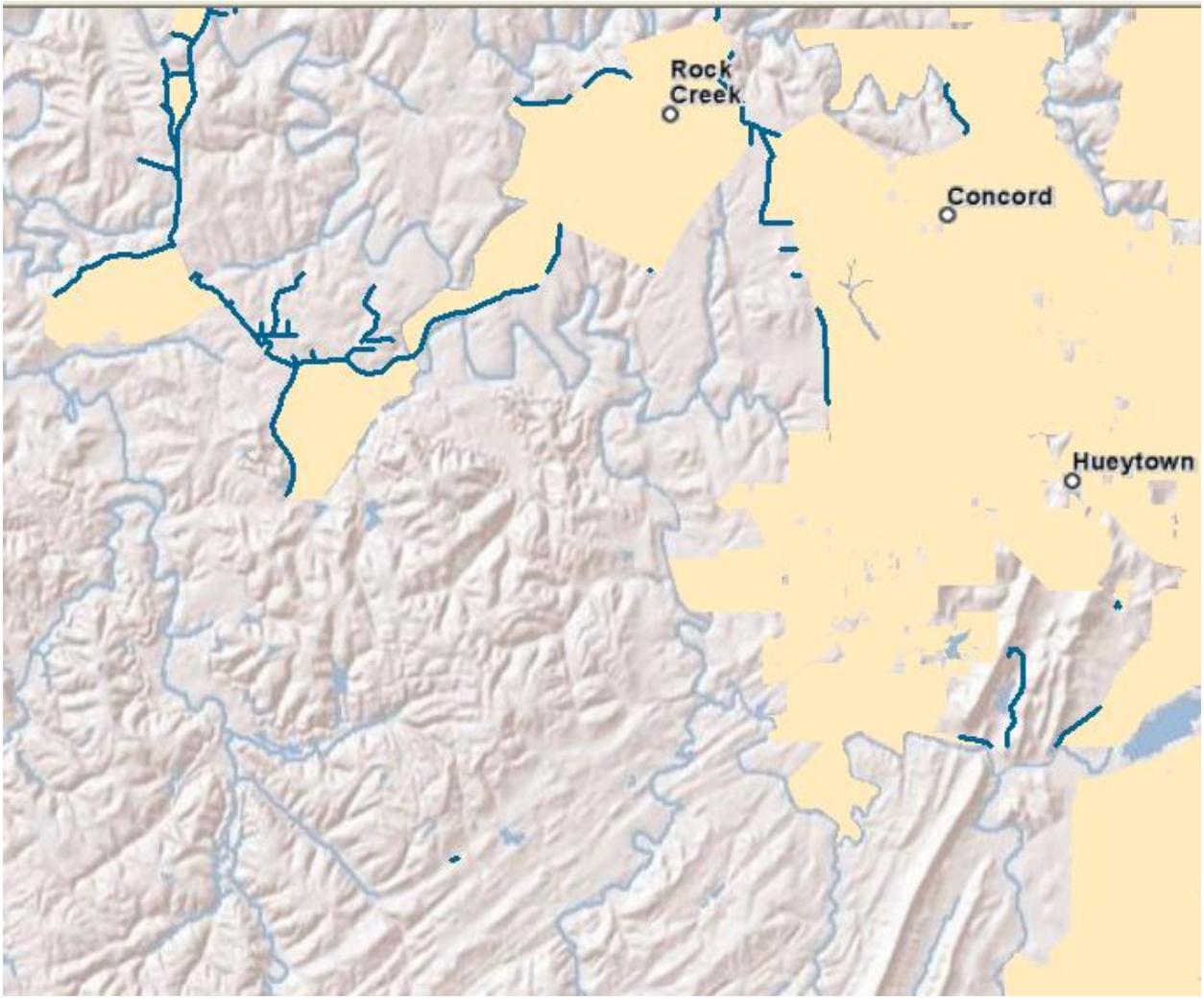


Figure 11-Blue road segments adjacent to peach covered small Blocks

A number of providers submitted geographic objects. In this case, our manual process was directed toward a conflation of data sources. The goal was to take provider submitted segments and put these segments in terms of our TIGER 2010 basemap. Although there is a trade-off in the accuracy using non-provider submitted segments, we felt it was more important to have a license-free road set that would edgematch our Block features, the TIGER state boundary and remain consistent with the block size standards we used for other providers. This is important for the appearance of the online maps, as well as potential verification work where we are attempting to judge a feature based upon its attachment to a covered small Census block. The figure below shows street segment input data.

[17] We continue to hear providers expressing concern that our request for either a geographic object or TIGER Line ID is beyond the scope of the NOFA clarification. Therefore, they cannot supply additional information to us.

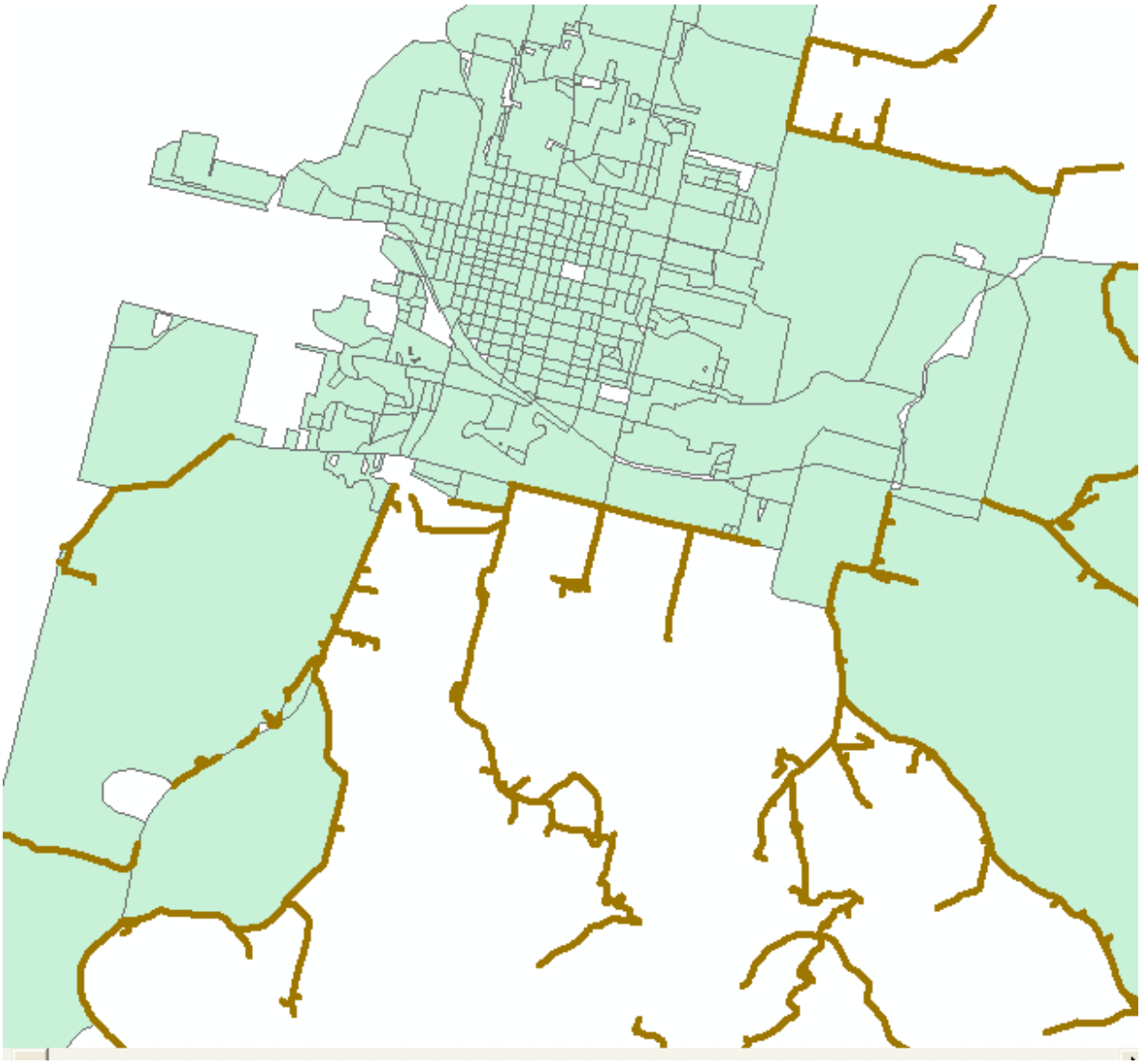


Figure 12-provider Submitted Street Segment Objects. The segments don't edge match the Blocks nor are they continuous.

The figure following demonstrates the same area after the conflation process. Blue segments are the conflated TIGER roads which will be passed to NTIA.

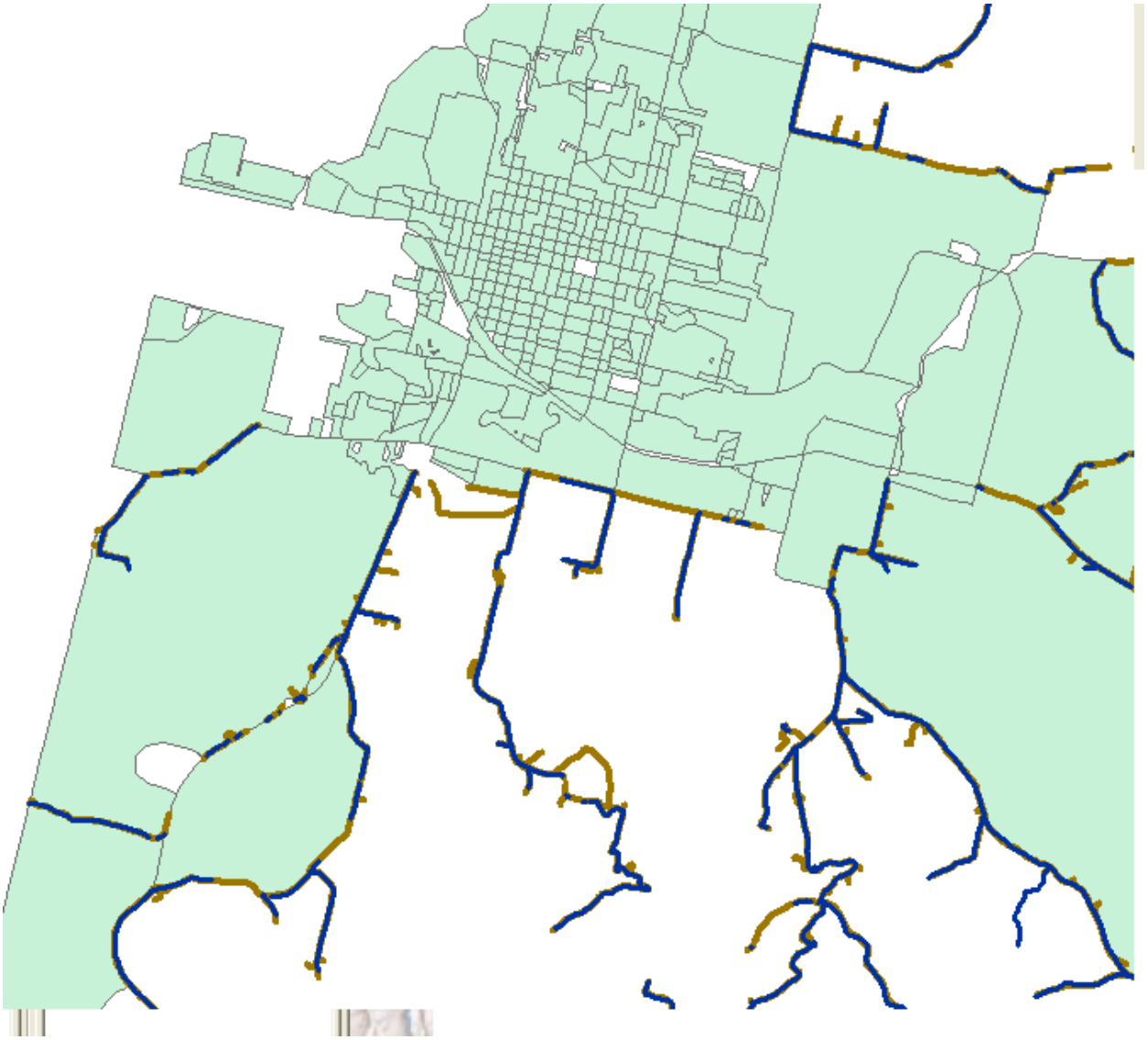


Figure 13-provider submitted segments in gold, selected TIGER in blue—Conflation result; in many cases what was a continuous segment is made discontinuous because even with a distance buffer the TIGER segment doesn't always intersect the provider segment

The final segment process was used when we were supplied with a Broadband covered area polygon. In this case, we found the segments within covered areas and eliminated those segments inside of Blocks less than or equal to 2.00 square miles.

Because there was more control over the format of the inputs (we knew we had a boundary and were working with TIGER segments), this was an automated process that followed this general format:

- Select large covered Blocks by provider ID (from updated Large Block table)
- Select TIGER 2010 road segments (MTFCC like 'S%') that face (CB = CBLeft2010 or CB = CBRight2010) covered large Blocks for provider

- Select segments as distinct records, max speed with corresponding technology, join in feature names, export selected records to temporary DBMS table
- Join TIGER roads feature class to temporary table on TLID
- Select covered segments (Python script)
- Select service area polygons for provider
- Clip selected facing segments with selected service area
- Export clipped segments to staging feature class, keyed by providerID

In this figure, orange represents covered small Blocks; black lines are covered segments in large Census Blocks (light blue). The service area boundary is shown in grey. Based upon feedback from providers, we have elected to clip segments at the end of a coverage boundary.[18]

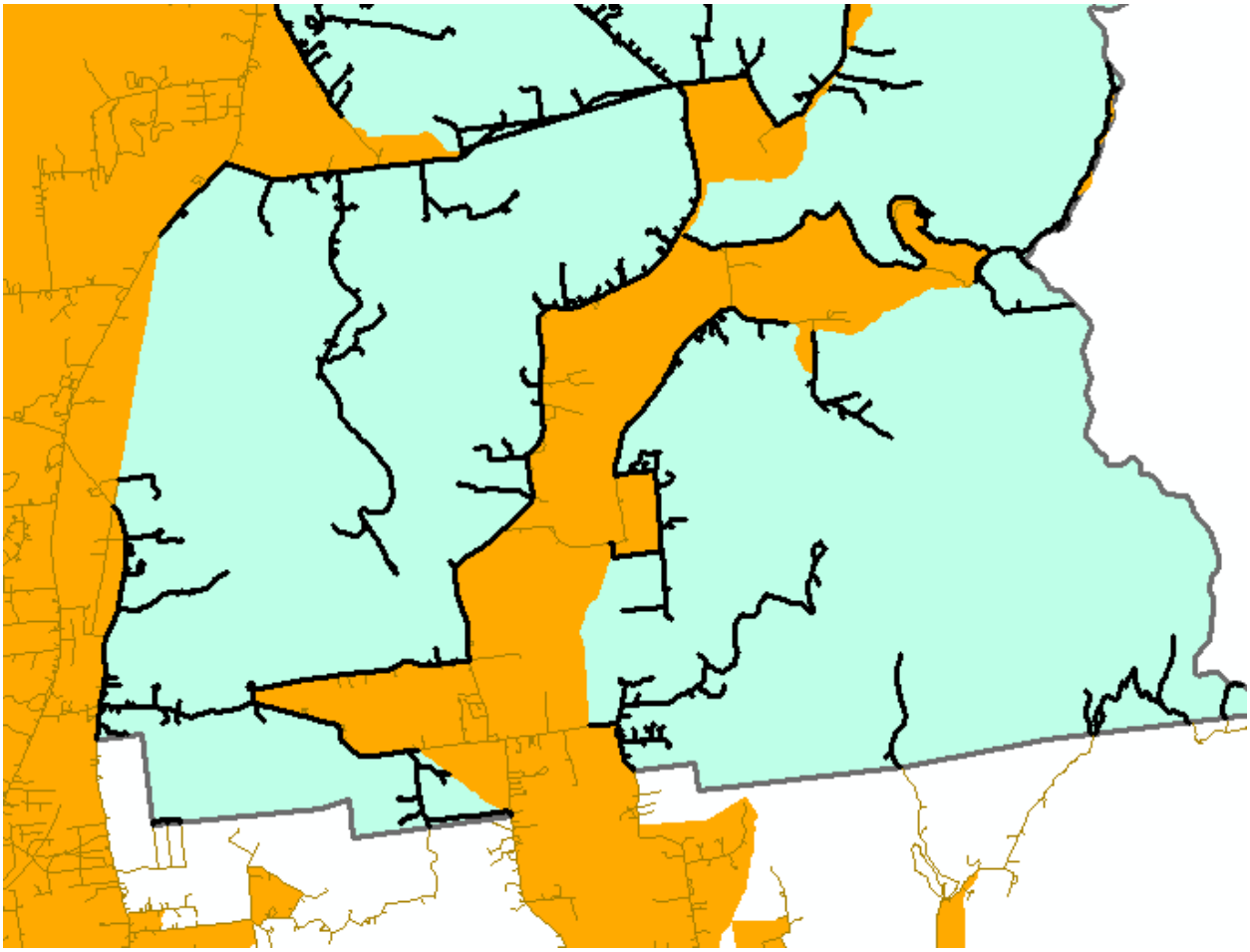


Figure 14-Output of the Segment Process

[18] An outcome not discussed here is how to handle address ranges on segments. As NTIA has asked for a Min and Max on the segment, deriving theses values for clipped segments is very problematic. Also the prevalence of alphabetic characters in addresses makes the min/max selections very arbitrary. We are grateful that addresses are nullable data elements.

Wireless Coverage Process

In general, most providers of mobile Broadband submitted coverage information in a NOFA-compliant format. Other than attributions for spectrum and speed, little was done to this coverage.[19]

Per Program Office direction, LinkAMERICA followed up with wireless providers where we determined that submitted data did not edgematch TIGER 2010 state boundaries. For the most part providers were unable to submit coverage data that edgedmatched as requested. In this case, we left the submitted data alone and did not perform any adjustments.

For providers who clip lower speeds out of higher speed coverage areas, we follow up and attempt to get revised coverage data.

LinkAMERICA continues to make aggressive efforts to bring additional WISP coverage into the NTIA dataset. For the most part, our outreach was with providers who were unable to supply sufficiently granular data in the past or those that could only submit wireless address points which is no longer a valid submission format. As stated earlier, we also work with third party service providers to getter coverage information.

Fixed wireless providers generally either supplied coverage information or infrastructure from which coverage estimates could be derived. Many allowed us to use their tower locations, antenna heights and direction/spread of coverage to derive a line of sight coverage estimate. In our experience, this is a conservative and reasonable derivation of coverage.

Some wireless providers submitted RF propagation studies. When this was done, there was a request that the signal strength be removed from coverage data. The request was honored. We note that some providers are very careful in that their coverage is an estimate of the probability of receiving an upstream link to their network. It is not intended as a depiction of any particular speed availability.

Other fixed wireless providers were able to supply us with hand drawn maps or polygons/polylines drawn in Google Earth format. In these cases we did our best to georeference and verify the coverage areas with the WISP.

When we received coverage information in KML format, like the image below, we accepted the data as it was presented to us as the submitted coverage patterns were used in the provider advertising.

[19] Some polygon data did exceed the node count threshold. In these cases, data was rasterized to 100m cells and then converted back to polygons. The polygons were dissolved to multi-part geometry. This addressed the node count concern.

As the image above shows, in some cases we were provided hand-drawn coverage, as well as infrastructure. Instead of estimating their coverage using a line of sight or RF study, we elected to stick with the provider's supplied information. Our decision was guided by two primary factors:

If the provider is advertising using this coverage they must have specific confidence in its accuracy. If the provider can supply coverage, as well as infrastructure that reasonably supports the coverage, there is a very high likelihood in the accuracy of the information. Second the use of this coverage pattern provides an objective standard to verify against.

The downside, of course, is the polygon shown on the map may not represent a predisposed notion of how wireless coverage should appear.

As shown in the image below, we continue to face complex decisions with respect to point to point fixed wireless providers. We may have provider supplied points which substantiate high bandwidth fixed wireless services to a business oriented market, but we work with the provider to impose a coverage boundary to represent a marketed area. In reality the pattern of customer location is more similar to a wireline provider due to the stationary location of the customer, but the SBI data model necessitates the development of a serving area polygon.

In general we note several interesting trends in the wireless data.

First, we can be successful in increasing the amount of WISP coverage when we aggressively pursue WISPs. This means we have to be willing to accept data on their terms and convey it into SBI formats. Some of our WISP submissions have taken over 12 hours to normalize into SBI formats. Second, we have to accept that some WISPs will not be able to supply FRNs. Third, there appears to be some variation on how the NOFA coverage definition is met. In other words, there seems to be a disparity on the necessary link budget necessary (e.g. -80 dB, -98 db, -120 dB, etc) to provide the appropriate quality of service for data services to be provided at a location/inside a location. Fourth it was very difficult

getting providers to identify spectra used for Broadband data services[20]. We are unsure if this is a competitive concern, or if the same coverage pattern is yielded for multiple frequencies. Typically, the spectra returned were those that a provider was licensed for. At this point, we have no reliable way to locally determine what set of frequencies are used to provide Broadband data services in a local area at a specific point in time.

Wireline Service Address Point Process

A handful of providers have requested that customer level, service address point data be submitted to NTIA. In these circumstances we have done minimal processing to preserve the provider's intent with this deliverable and not bias downstream NTIA use.

Our verification included checks against commercial or Public Utility/Public Service Commission exchange boundary maps. Points not contained within three miles of a boundary are not submitted to NTIA. The percentage of excluded data varies cross providers, but it tends to be under 1% of the total submission.

We retain from the provider the provided latitude and longitude, as well as Census block. For some coverage data, if a provider is unable to supply a longitude, latitude or Census block, we calculate these attributes. In those circumstances where we do not have a Census block, but we do have a longitude and latitude, we accept the given longitude and latitude and use that as the basis for our Census block assignment.

With point data we have tested for comparable geocoding success rates but do not overwrite provider information.[21] From this type of analysis we note the amount (usually little more than 10%) of addresses that seem to locate with less than street segment certainty. Deriving a thematic representation of the points on speed also illustrates some of the locational certainty issues in this point level data.

Coverage Estimation Process

Although the derivation of Broadband coverage into Census Blocks, street segments, or wireless coverage files is, in itself, a bit of an estimation process, there was an explicit estimation process required in cases where a Broadband provider either refused to participate in our survey, or provided such a threadbare submission that no carrier-based coverage information could be gleaned[22]. In our

[20] One provider responded by email, "This mapping program is to provide the coverage area for Broadband provided by a company. Not to keep a detailed account of every aspect of a companies (sic) network."

[21] We will make a second geocoding pass on locations with no longitude or latitude from provider. We typically pick up ~5% from our second geocoding pass. Typically the issue tends to be address quality but also difficulties in geocoding in very rural areas.

[22] We report estimated submissions to NTIA as a non-responsive provider but we have data in the submission for them. This is the reason for datapackage.xls entries which are non responsive but contain submitted data.

current submission, most of the submitted data which is entirely estimated from non-provider sources has been reviewed by the Broadband Provider in question.

We typically resorted to three possible estimation paths.

For Cable (HFC) providers who did not provide any coverage information, we fell back to Media Prints data. Rather than using the entire Census Block Group gathered by Media Prints, we used only those Census Designated Places carrying the same or similar names to the Media Prints p_com field. Our reasoning was that Cable systems tend to be franchised on a municipal or at least administrative basis so the coverage will likely follow a governmental boundary. As a general rule, cable infrastructure is not available in the public domain[23] and what could be found was poor in quality and difficult to ascertain for validity.

For DSL providers who did not provide any coverage information, we estimated road-based coverage from their Central Offices[24]. We only used Central Offices that showed evidence of DSL or fiber-based services in the NECA 4 tariff. Road-based engineering areas were derived via ESRI Network Analyst to 18kft. These segments/boundaries were clipped to commercial wirecenter boundary edges.

For fixed wireless providers who provided no coverage information, we relied on their public websites to derive coverage maps. When these maps were available, we georeferenced them and tried to use the outer polygon boundary to represent their serving area. In other cases, when only a tower could be provided, we used a viewshed analysis and estimated line of sight coverage at 10mi per tower[25]. Because much wireless propagation is driven far below the Census Block and much engineering information isn't known (frequency in use, polarization of the signal, coverage pattern of antenna(s), local terrain/land cover) this was the most complicated group to estimate.

For providers who refused to provide spectrum information, we defaulted to unlicensed for Fixed Wireless and NTIA category 1 for mobile wireless.

Speed

Speed attributes are reported both at the block (typical) and higher levels (maximum advertised and subscriber weighted). We note that in many cases, providers did not supply typical or subscriber-weighted speeds. In some cases, it appears--although we cannot verify--that their maximum advertised speeds were used to populate typical speed columns.

[23] The team tried to use data from the FCC Coals system and 321/325 fillings but this seemed to be a bit non-uniform in quality.

[24] Central Office location was derived from GeoResults. Wirecenter boundaries also came from this commercial product.

[25] In some cases we had an approximate radius of coverage but no height. In this case we used a 50' height estimate and then clipped the coverage to the provided coverage range. We also clipped wireless coverage to honor state boundaries but did not look for providers serving coverage with out of study state facilities.

We do have limited testing data on reported speeds, but we have been careful to not use our typical reported values with carrier-provided information. If we do not have a speed value from a provider, we report an empty value.

Several service providers claim they do not have data on typical speeds available, but estimate a 20% overhead factor between the advertised speed and what may be experienced by an end user.

As a general rule, in circumstances where a provider supplies a range of speed attributes, we assign NTIA categories based upon the midpoint of the range. We follow this rule unless we can determine other grantees are handling the same submitted information differently or are directed differently by NTIA as in the case of Verizon Wireless.

To support NTIA program office requests, we have also modified the structure of the Service Overview table. Even if Maximum Advertised Speed is supplied at the market or county level, we push that speed down to the contained Blocks. The only records that remain in this table, will be those wireline records with either a non-NULL nominal weighted speed or ARPU value.

Middle Mile

Middle Mile information was collected directly from providers via survey or interview. Middle Mile is a "chicken or egg" type of challenge in that it is possible to verify that the infrastructure exists, but extremely difficult to know what the site is doing without engineering level assistance. Although most providers submitted "something," there was a significant variance in what that "something" represented.

The purpose of this section is to record some of the comments and questions we have received about Middle Mile. We hope this provides better context for our data submission.

Within the NOFA, Middle Mile was defined as (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.")[26]

Given the existence of the "or" in this definition, providers submitted a variety of information. Based upon the NOFA example, several fixed wireless providers interpreted Middle Mile in terms of the connection points from their towers to their own serving backhaul location. The topology was commonly Microwave from their distribution towers to their NOC. The NOC and towers were listed as the Middle Mile points. This seems to be consistent with the first definition clause (a).

Telephone, Mobile Wireless, and Cable providers tended to remain either silent on the question, or would provide a single location in which Internet peering occurred (clause b). A number of participants explained that the NOFA was quite ambiguous with data traffic moving back and forth over both TDM

[26] From http://broadbandusa.gov/files/BroadbandMappingNOFA(FederalRegisterVersion).pdf at 54, visited March 28, 2010

and IP networks--it was unclear where the distinction should be drawn. As a general rule it seemed like many providers listed a single location where Internet Peering occurred.

A number of providers refused to answer the question on grounds of confidentiality[27]. Others would not disclose as their Middle Mile points are not owned--another company provides the physical and electronic connection to their network. In other words, the entity providing Broadband is not the entity providing Middle Mile.

Additionally, based upon the new Provider Type classification of "other," we have started to integrate points provided by Broadband service providers not meeting the NOFA definition. This includes POP locations and aggregation points for public / private networks.[28] Within a given submission there were two final attributes that tended to concern respondents. First, speed should be measured in terms of only data capacity and what exactly is "data" (e.g., can/should you segregate out voice or video), and is the relevant capacity of the physical connection, channelized to a specific virtual circuit on their network.

Finally, a number of other providers were unsure of the height above grade measure (is this their floor, the street outside, etc). We seem to have a combination of height above or below grade, as well as heights above mean sea level (AMSL).

To the extent possible in our timeframe, we verified the location of a sample of Middle Mile points. Where we could see infrastructure that appeared to be consistent in location with other provider infrastructure, we felt that the location was accurate. In some cases, the point provided seems sensible (is on a road, near other equipment), but using imagery, we couldn't find a place where this type of connection could occur. This wouldn't be unforeseen, in that Middle Mile connectivity likely takes place in a protected environment much smaller than a standard Central Office installation.

Mobile Wireless Coverage

We have received mobile wireless coverage from mobile Broadband providers in each state. At this point we have cleaned the geometry of the data and attributed it with spectra, NTIA speed categories and FRN as required.

Where possible, provider derived coverage has been reviewed for consistency against the commercial licensed product but this is difficult due to coverage definition and timing variations. To a limited extent we also use licensing locations and tower infrastructure to spot-check supplied coverage. This mode of verification remains complex, given the lack of facility-based information with mobile wireless.

[27] As received in email 9/30/10, "Due to security concerns and the risk of public disclosure of highly sensitive data, whether inadvertent or otherwise, ***REDACT***response to the Middle Mile and backbone interconnection request is limited to publicly available information available on {remainder not included}"

[28] As discussed in our readme.txt file, a number of middle mile points were lost in validation due to their location in adjacent state. This will cause a decrease in some providers relative to prior submissions.

Finally with respect to mobile Broadband services, we note several trends.

First LinkAMERICA used the NTIA supplied frequency tables to report speeds consistent with other grantees. In circumstances where a provider supplied a range of experienced speeds, we used the portion of the range consistent with the most frequently reported Grantee value or NTIA direction (eg. Verizon LTE speeds).

Second where a provider reports multiple frequency bands in use but doesn't distinguish these bands by submitted SHP file, we submit identical geometries but attribute one geometry to each submitted spectrum value.

Third we are seeing a trend toward increasing Broadband speed. As of this writing, there is not consistency across providers in how they attribute the advertised 4G speed values. In other words, for some providers 4G means advertised speed categories increase. For other providers the speed value did not change.

Fourth, we have requested providers submit SHP files that are consistent with the TIGER 2010 boundaries. For the most part, providers have not done this. We have not modified the submitted data to impose the TIGER 2010 state boundary.

Verification

Data verification is an ongoing and evolving process. Clearly, with each new data submission there will be a validation process at hand and at the same time, our team continues to expand and improve the efficiency and effectiveness of our data verification routines. Consistent with the movement toward an fGDB export database and use of a data receipt script, much of our validation effort is spent in supporting the ETL processes into the required formats. In future data submissions we will continue our work to stabilize and improve the business process that normalizes provider submissions into NTIA/FCC formats.

Verification Methods Summary

Our overall verification standard is focused on the level at which we supply processed data to NTIA. This means that the vast majority of our verification process and resources will be focused on verifying provider identity, coverage, advertised speed and appropriate metadata for Census block's less than or equal to 2 square miles.

We believe three broad verification themes are important to consider

a) The first step of broadband service verification is a consistently applied market definition—we call this provider identity verification.

b) There is probably not a single dispositive method of verification. Rather, a number of verification approaches are needed to appropriately classify confidence in data submitted to NTIA.

c) Verification approaches tend to meld together. As an example a web survey is complimented by a phone survey but expert review and external data may be necessary to reach a final informed judgment.

The table below demonstrates the various methods used across each feature class submitted to NTIA.

	Data Types			
Verification Method	**Census Block, Road segment or, address specific service availability**	**Mobile wireless service availability**	**Middle mile infrastructure locations**	**Community anchor institutions**
Provide/Subscriber Identity Verification	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Internal data consistency check	METHOD USED	METHOD USED	METHOD USED	METHOD USED
External data consistency checks	METHOD USED	METHOD USED		
Carrier confirmation	METHOD USED	METHOD USED	METHOD USED	
Public review	METHOD USED	METHOD USED		METHOD USED
Anchor institution review				METHOD USED
Expert review	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Telephone sampling				METHOD USED
Purchased Datasets	METHOD USED	METHOD USED	METHOD USED	METHOD USED
Developed Datasets	METHOD USED			
Web-based surveys	METHOD USED	METHOD USED		METHOD USED
Field Surveys	METHOD USED	METHOD USED		METHOD USED

The following table defines each of these methods and provides a summary of why this method is used, and the value we gain from it.

	Definition	Methodology	Purpose	Benefit
Provider Verification	Provider verification is the process of assembling a broadband provider database, determining which providers are properly classified into SBI eligible providers and developing contact information.	Provider verification involves combining multiple data sources, interviewing providers and classifying the broadband provider type.	Without a consistent understanding of the provider 'market' it is impossible to appropriately classify the coverage data. It is also impossible to explain to consumers of the data why a given provider is or isn't available in the submitted data.	The main benefit of this verification process is understanding who is providing broadband services, are the broadband services NTIA compliant and how do you 'contact' this provider (Name, DBA, FRN, Holding Company)
Internal data consistency check	An internal data consistency check is a validation measure across at least two dimensions. First is the provider data consistent with prior submissions. This would be an examination of this submission relative to a prior submission. Second is this submission	Most of this validation is performed using our spatial databases and running queries that compare submissions. We also use a similar set of queries to isolate transmission of technology outliers. These would be data sets which offer speed technology combinations	The purpose of this type of validation is to understand how things change over time and why. It also helps inform us for circumstances where we have data points which appear to be outside of the norm. If these outliers are	The main value is understanding why something changes and providing an opportunity to engage with the provider to understand why there has been a change.

	consistent with the technical specifications of the service offered.	which are unusual relative to other data received across all states.	detected, they can be pursued directly with the provider.	
External data consistency checks	An external data consistency check is a measure of the provider data against external sources (not from the Provider). The distinction between internal and external isn't pure, but our typical experience has been that External checks involve the acquisition of additional data sets and a comparison across multiple sets.	External validation can be performed by verifying supplied coverage against third party data sources. An example would be to test provider claimed DSL Census blocks against a commercial source of exchange boundaries. Wireless coverage is also compared to radio locations. Mobile drive test results can also be used.	We don't believe a single, exhaustive third party data set is available for validation. We do believe a combination of external datasets can be used to inform and help filter out the false positive cases from provider data. We also note that the external data appears to diminish in accuracy as the area of analysis becomes less urban.	External validation provides an external measure of data quality assessment not influenced by internal data sources. It can be one of the more effective means of isolating false positives in submitted data.
Carrier confirmation	Carrier confirmation is the process of sending processed data back to the service provider	We use two techniques to accomplish this. First a provider's data is summarized in a tabular format. This lets the	One of the more critical steps in broadband mapping is translating carrier	Carrier confirmation gives the provider information on how their data will look when submitted to NTIA. It also helps short circuit complex problems like

	to ensure that translation into NTIA formats is fair and appropriately accurate.	provider quickly verify firm information (FRNs, DBAs, counties served). We also develop two sets of check maps. One is a PDF version and the second is a Google Earth (KMZ) version. Both versions display the NTIA reported coverage and speed. A different map is developed for each technology of transmission	supplied data into NTIA formats. Providing verification deliverables to the service provider (carrier) is an important external feedback process. Several providers also ask us to repeat this process before data are submitted to NTIA so they can see what will be submitted to NTIA.	online map display problems—which tend to come from FRN issues or incorrect data entry. This process also helps to strengthen the sense of ownership and participation with providers.
Public review	Public review is the process of collecting structured feedback from the general public in a manner which can be analyzed and used to improve/validate the submitted data.	Currently we use an online map 'layer' which provides consumers the ability to feedback about the coverage and provide in depth information about their concerns. The maps are also discussed within the context of planning teams within each state. We receive	As with other crowd-source approaches the intent is to allow the general public to be participants in the process and provide feedback that can help improve the displayed and	The benefit is to engage the public in the broadband discourse and provide a tangible way for them to provide feedback. As a mechanism for validation the key is to develop feedback data which is structured in way that informs the mapping process.

		feedback from these meetings. In Q2 of year 4 we launched The *Mobile Broadband Test Project* which utilizes a free app for download to mobile devices that collect performance data, including speed and access, for mobile broadband networks. Data has been reported and in some states maps have been produced.	submitted data.	
Anchor institution review	Anchor institution review is targeted surveys intended to better understand the Anchor Institution broadband market.	We have used three methods to verify anchor institution data. The first is a targeted series of telephone calls. The second is specifically targeted mailers. The third is direct interviews with stakeholders. Schools for example, may have someone at the state or district level who maintains information about broadband connectivity.	As Anchor Institutions represent a different class of coverage information as well as a very different type of end user, a focused stakeholder management, data acquisition and data review process is advantageous.	Because CAIs represent a very distinct stakeholder community, building identifiable connections between the SBI program and the anchor institution community is important. Tailoring a specific data acquisition/ data review process helps Anchor Institutions establish a reliable set of infrastructure benchmarks which they can use to fulfill their mission.

Expert review	Expert review is the process of using subject matter experts to review submitted or processed provider data.	The method of subject matter review will be dependent upon the type of data in question. In the past this has taken the form of conversing with a wireless engineer to ensure that the coverage pattern appears plausible for a given technology. It may also involve a cross check on data from a second source—can this type of middle mile infrastructure support the maximum advertised speeds in this area? SME validation is also helpful trying to understand ambiguous information in submissions.	The purpose of expert review is to get a second opinion regarding some aspect of submitted or processed data. Given the large number of submission formats and innovative ways to supply broadband, it is always helpful to have multiple sets of eyes available to reduce errors from misunderstanding.	The most significant benefit is to have a secondary source for back checks and verification. For the most part expert review is from an engineering or deployment resource. Expert review also helps support process transparency so there isn't a closed GIS driven process making all the decisions.
Telephone sampling	Telephone sampling is the process of using targeted phone calls to verify aspects of submitted or processed data.	Telephone methodology tends to be consistent across the type of data being verified. A subject location or individual is identified. The phone number for that location is	The purpose of a telephone survey is to gather in depth information from a targeted respondent. We would	The primary benefits are to develop in depth information as well as surveying a large number of respondents regarding opinions or behavior. Phone surveys tend to be more helpful to survey attitudes or to find out location specific

		identified and a call is placed. The person performing the survey asks a scripted set of questions and records the responses in a database. For example, our team produces a survey to develop and monitor access and use trends at a regional level.	likely use telephone survey for targeted purposes--either clarifying anchor institution data or randomly polling consumers to better understand attitudes.	information. Telephone sampling is used in our CAI and consumer surveys.
Purchased Datasets	See external data consistency checks.			Also note that not all external data checks must be purchased. For example Census data could be used for an external consistency check but it is freely available for download.
Web-based surveys	Web based surveys can involve three dimensions. First a web survey (a form available to be filled out on the Internet) can be used to supplement and better understand consumers. A web survey could be a compliment or a substitute for a telephone	In the case where a web survey is a compliment to phone or in person, a survey instrument is developed and then respondents are invited to complete the form. In the case where a survey is a mechanism to gather additional information from provider web sites,	The purpose in all cases is to gather additional information via the Web.	The benefits of web survey are its relatively low cost as well as the ability to gather specific information into a form that can be easily used by downstream work processes.

	survey to target a specific demographic (a web survey can also be part of a social media campaign). Further web surveys can be used to verify provider information.	this could take the form of manual queries (looking for address listed in a Census block) or automated scraping where information is pulled from a website via a specific web application. We currently use both approaches depending on our goal.		
Field Surveys	A field survey is sending a team of skilled participants into the field to verify submitted data or sample some aspect of the environment in a given area.	Field survey methods involve assigning a field team, equipping them with data acquisition hardware, ensuring they have a consistent skill basis and recording observations. To date most of our field survey work has been in engaging CAIs into the process. As mentioned earlier, in Q2 of year 4 we launched the Mobile Broadband Test Project, which utilizes a free app for download to	Although expensive, field surveys are sometimes the best way to verify information such as provider equipment presence or the strength of a wireless broadband signal.	The benefits to field work are significant. They can help us better understand the exact phenomenon in a particular area.

	mobile devices that collect performance data, for mobile broadband networks. In addition to the crowd-source component, the project also provides the opportunity to conduct target tests using an advance licensed version of the app.

Verification Standard

Verification is a broad term, but in our definition it boils down to determining if broadband coverage is in the right place. For a given provider, the question is whether the coverage is assigned to appropriate Census Blocks, road segments or area features. Coverage verification can be further broken out into two distinct classes:

Technology verification is determining if the provider is listed with a technology consistent with their marketing information.

Speed verification is determining if the speed supplied for that block, road segment, point area file or market area is consistent with the technology and the marketing information received.

The final verification dimension is consumer feedback and crowd-source verification. This is a dynamic set of steps we are beginning to implement. One side of this is responding to consumer concerns. The second is using the crowd sourced data to validate provider claims and, if appropriate, update the map and the underlying data. A third is the implementation and use of mobile broadband testing tools.

At this stage, our working hypothesis (confirmed by our experience) is that there will not be a single measure to indicate broadband coverage availability. From prior work, and examining our current provider submissions, we believe that there is too much variation below the submitted record to make a single binary yes/no indication. Rather, there will be a series of measures that combine to provide qualitative confidence (a classification scheme) in our indication of Broadband availability at the block, segment, or wireless polygon level. We believe such a qualitative classification scheme is both relevant

to and supportive of NTIA interests, as well as the interests of our end-user community – that is, the states and citizens we serve through this program.

The intent of this section is to illustrate why our team is moving toward a particular verification methodology. Our team is learning as we go along, and will adjust and improve this thinking. But given our experience to date, this is our path. As stated above:

First, coverage verification is at the level of data submitted to NTIA.
Second, coverage verification is enhanced when there is a secondary measure of availability (such as infrastructure presence or serving area boundaries)

Third, given the limited resources of this effort, the most important coverage verification process to implement is the erroneous dispersion of coverage. These are the "islands" of coverage isolated by significant distance from other covered areas. In other words, Broadband Internet likely doesn't exist far away from other areas with Broadband Internet access supplied by the same provider.
Next we present several examples which illustrate the complexity of coverage verification.

The first example is taken from a gentleman who requested a map change in Alabama. His home is near the yellow dot. The darker grey Blocks are covered Census Blocks. The black lines are covered road segments. He cannot receive DSL from his incumbent provider, although his neighbors can. The incumbent carrier does have at least one structure in that block from which Broadband services can be provided; unfortunately his home is not served.

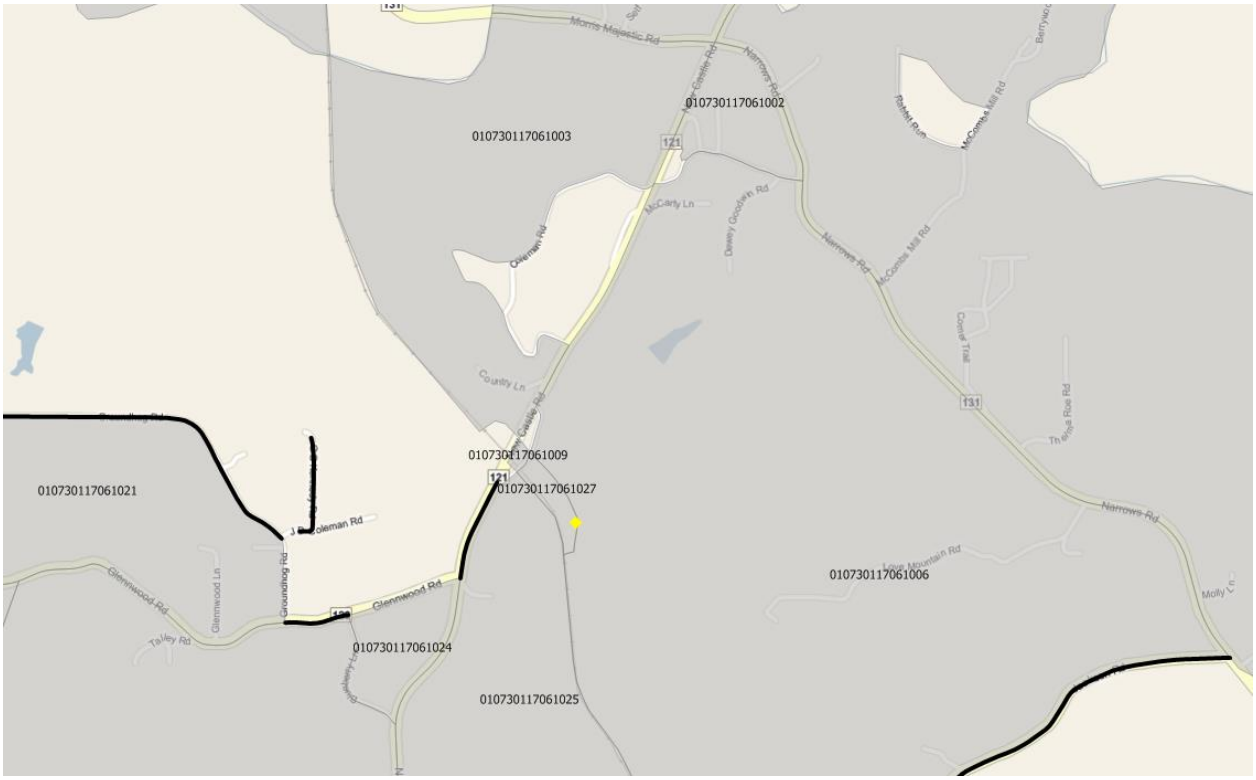


Figure 15--Sub block variation

Because the SBI program requires the depiction of coverage at the block level, the above map has been correctly generated. However, from the customer's point of view, the map is inaccurate. This requires us to explain that the maps are not intended to be a structure-level qualification, at which point some consumers question the value of the maps when seeking service information.

Beyond this type of one-off structure-level qualification, sometimes, as shown below, we have even larger gaps in provided coverage. The image here shows an "outlier" block that could be an error, or it could indicate missing Blocks along a major road that should have been filled in. In this figure, the outlier block is highlighted in turquoise.

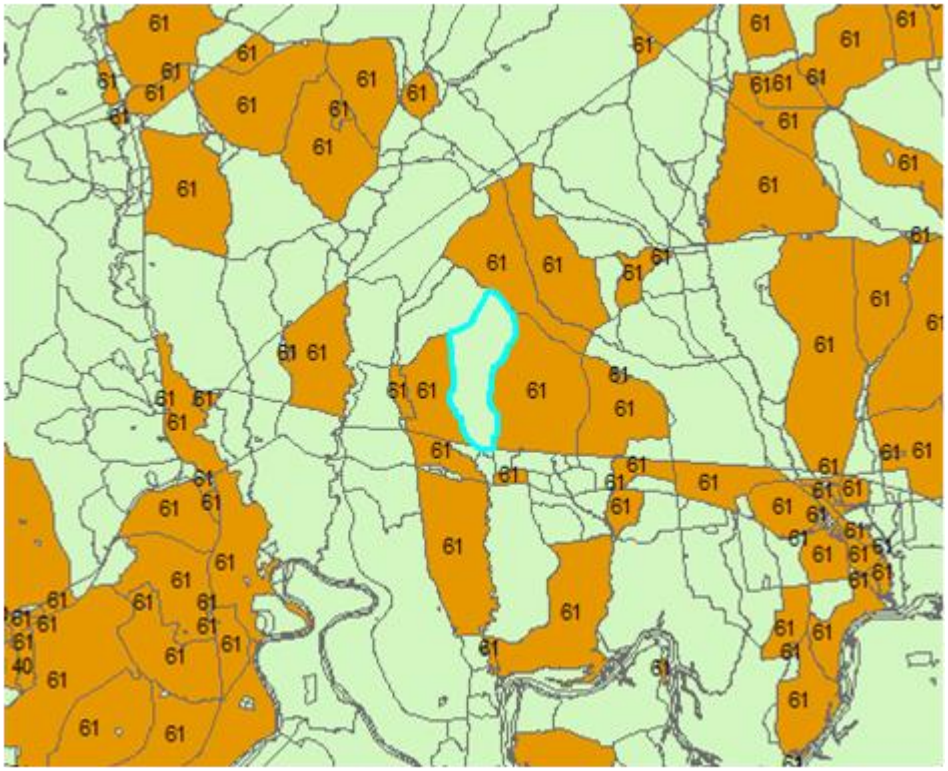


Figure 16--Dispersion in Submitted Data

In this particular case, we are faced with a different verification question. Based upon the properties of the neighbors, we believe this block should likely be covered (coverage interpolation,) but supplied data from the incumbent says otherwise. Although we don't have information to know how much of the data submitted to us is generated, our sense is that geocoded customers or plant are used. In this case the block dispersion could be the result of a side of the street assignment rather than an availability assignment. In other words the data may speak to where is working plant or working customers rather than where could service be provided in 7 to 10 days.

The next example shows where an interpolation process could require some adjustment. The figure below shows a town level view. There are some smaller Blocks that are likely covered by interpolation

logic, but we also do not want to extend coverage beyond a franchise boundary as in the areas shown in a box on the bottom of the map.

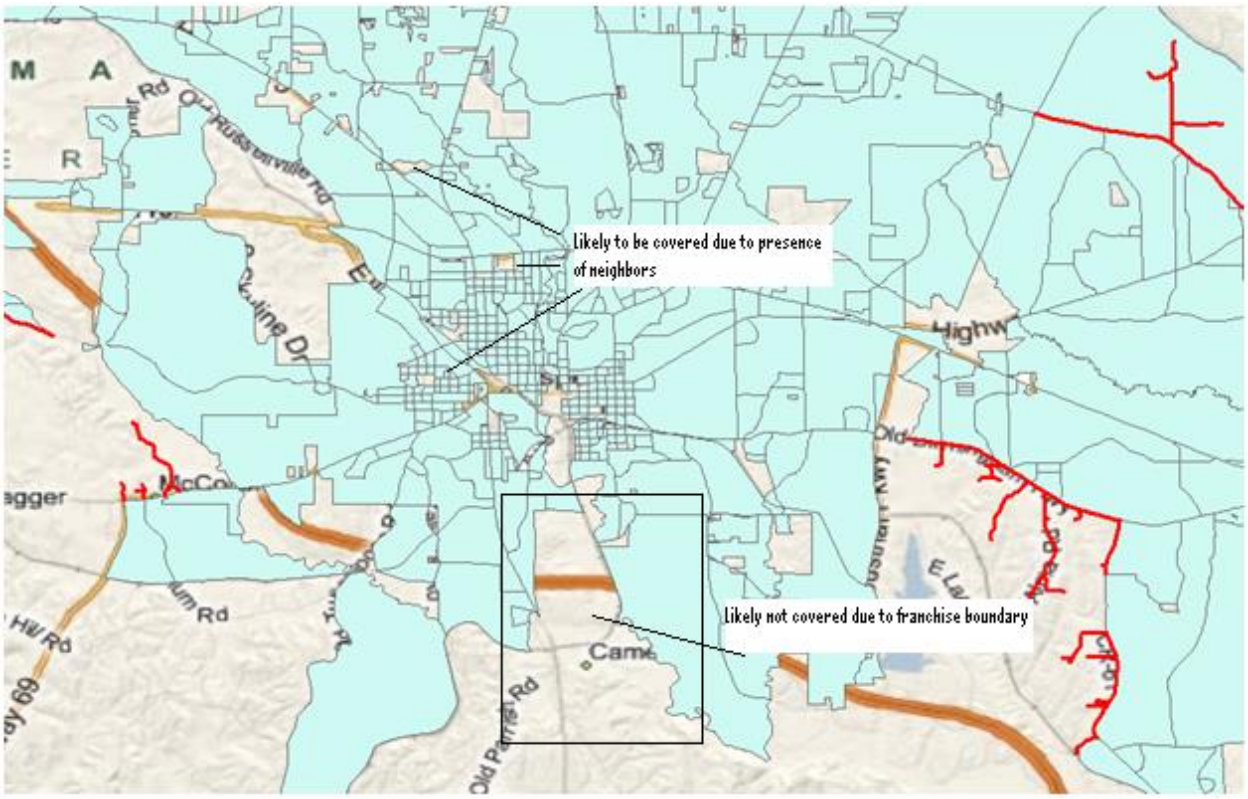


Figure 17-Where do you stop interpolating?

From what we can gather from some providers, the submitted data—data with consistently high degrees of dispersion or coverage holes—tends to come from geocoded billing records. In this paradigm, this means where there are no billing address points; service is not identified on a map. The interpolation verification question then takes on three dimensions.

First, if a provider has no customers in an area, how can we know if they would be able to provide service in a 7-10 day interval?

Second, if we use the properties of neighboring Blocks to interpolate coverage, when should we stop (e.g., at a franchise boundary, at a certain distance, etc.)?

Third, if we are comparing to a data source that examines coverage at a higher level (such as 477 Tract) do we use the Tract information to assign information block level coverage or do we use the tract coverage to filter out dispersions in coverage?

We continue to work with providers to get additional information to help us better understand and contend with this type of circumstance. However, we have not been entirely successful at getting franchise/service area boundaries that would address much of the issue. Also with some providers there is only a specific class (eg. Residential) of customer data supplied to the mapping program.

The final map shows this dispersion problem, but to an even larger degree. This solitary large block is likely the result of a bad geocode, but we don't know, given the data that has been submitted by the provider and the "single customer in a block standard" set by the NOFA clarification.

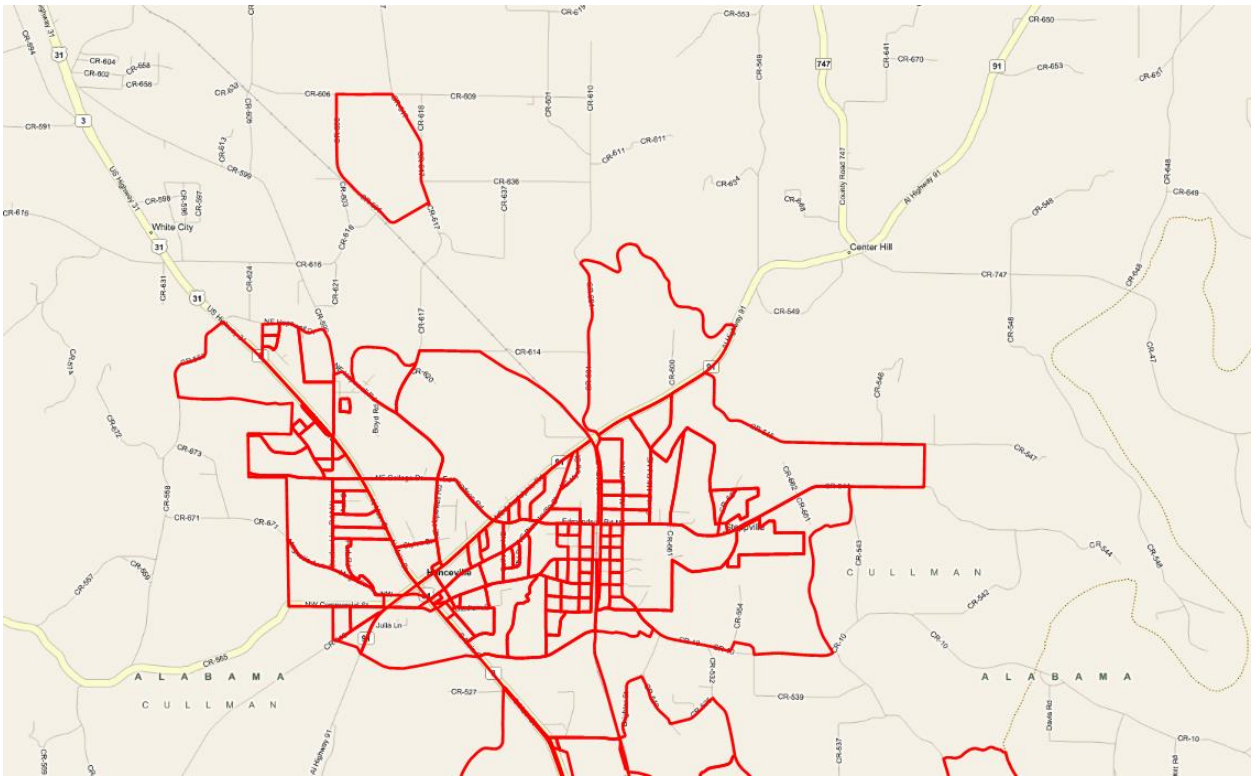


Figure 18-Dispersion in covered Blocks

Due to the fact that this situation is quite obvious in display, this type of problem is one that we are more aggressively trying to resolve. Where a single block has no neighbor offering comparable coverage and is a specified distance beyond an exchange boundary, our approach has been to filter these Blocks out. As of now, this filter is limited to incumbent xDSL providers because we have a good source of exchange boundaries.

The exchange boundary dispersion verification method breaks down when examining providers who are more likely to CLEC into neighboring territory. In the figure below, the black line represents the exchange boundary, while the continuity in the DSLAMs likely points to coverage extending along a road into another provider's territory.

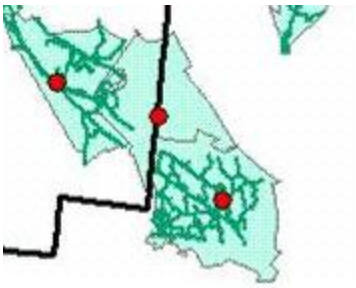


Figure 19--DSL Coverage outside of exchange boundary

In sum, the variability in our source data continues to suggest that our dynamic verification process is relevant, appropriate and evolving in a manner consistent with the overall program.

Verification Work Process

To support our dynamic multi-factor verification process, we have implemented the following steps.

Between submissions our provider relations team works to analyze our current broadband provider ecosystem and capture any changes such as acquisitions, mergers or cessation of operations. They also remain in touch with providers who have indicated when follow-up is necessary. The team confirms that the providers who submit data are NOFA compliant. Given these steps they begin a survey and awareness campaign to get data submitted for the program.

When data is received, an analyst reviews the submission and any immediate questions or concerns are sent back to the provider as quickly as possible. We have found this gatekeeping step very helpful in making sure we understand the intent of the submission.

For all providers who submitted data to us in the prior round, the provider received both a tabular data summary and mapped output[29]. Prior to releasing the "check maps" to providers, we inspected each provider's coverage area. After this in-house review, we solicited a second level of feedback from providers and received a number of requested changes and corrections used in the development of the current dataset.

For those providers who submit only block or segment level coverage (i.e., in those cases where we have no infrastructure to test with) we test for coverage containment within known service boundaries. The intent of this validation step is to remove Blocks that are obviously erroneous.

We have also begun to perform a mechanical test against some wireline providers. This is an examination to ensure that each feature submitted has some neighbor within 1 mile. We are testing

[29] Beginning in round 3 for the verification of data we submitted both PDF and KMZ (Google Earth) format check maps. Some providers prefer to work with the Google format as it supports easier modification. Others continue to submit marked up PDFs.

this process to try to understand what the neighbor distance should be. This has proven to be a difficult process and the results not conclusive enough to use in production.

We also verify the submitted speeds against the typical speed ranges in the NTIA frequency tables. If we note a value outside of typical range, we ask the provider for clarification. These responses are recorded.

As mentioned in the sections above, we have implemented a check on dispersed Blocks, but we have implemented less with respect to coverage interpolation (holes in coverage). We continue to work on a series of mechanical tools to assist with the inspection process but have run into challenges related to geographic basemap and timing.

As our submissions have moved online, we have also begun to benefit from crowd source feedback. In some cases this has helped us identify and fix errors in our underlying data. In other cases, as we have shared with NTIA, we have encountered some perceptual issues rooted in how the data are developed and modeled to comply with the NOFA. Depiction of uniform coverage in Census Blocks continues to be a challenge. Despite our best efforts to explain the full block coverage requirement, we continue to receive complaints that the coverage shown on the map is not accurate for a particular location within that block.

Cross Submission Validation

As part of our validation process, we compare submitted data from the current submission to the submission prior. This is an automated review in that all providers are examined in terms of submitted record counts and count/technology/speed combinations.

Sprint	1	2
80	1	2
3	1	1
6		1
StarBand Communications, Inc.	1	1
60	1	1
4	1	1
Starlite Computers	1	1
70	1	1
5	1	1
TDS	27884	27716
10	27878	27716
3	6219	4538
4	1761	2036
5	8778	8767
6	833	899
7	9023	10368
8	1264	1108
50	6	
8	6	
TEC - Cherokee Division	1828	2012
10	1239	1352
5	426	479
6	212	314

Figure 20--Cross Submission Review

Our team reviews the changes to make sure the scale of the change is consistent with our expectations given modified survey data.

We then take a second pass at the same submission summary data to review any providers who will be flagged by the NTIA submission script. Again this comparison is made between the current and prior submission.

A	B	C	D	E	F
DBAName	TRANSTEC	MAXADDC	Round	RcdCnt	Lyr
AT&T Mobility LLC	80	7	7	1	WR
AT&T Wisconsin	10	7	6	33911	CB
AT&T Wisconsin	10	7	6	45	SG
AT&T Wisconsin	10	7	7	38	SG
AT&T Wisconsin	10	7	7	34213	CB

This second pass helps us to prepare documentation for our readme.txt file. It also helps us monitor where there have been large speed changes by provider. Where we do see changes, we contact the

provider to understand how the networks in place support the speed reported. We also cross check advertising materials to make sure the reported speed is being actively marketed.

One of the largest challenges in the final submission has been the degree of change in some provider's submitted information. Given the receipt of new submissions within 60 days of submission to NTIA/FCC, detecting differences, understanding the nature of the change, speaking with the provider and attempting to verify the new information has been very challenging.

Consumer and Provider Responses to Deliverables

In this section we transition from internal verification to external verification. We view responses to our work product as a form of validation and verification. On the one hand, this gives us the opportunity to fix mistakes and then generate QA steps to make sure that the problem does not reoccur. We also learn how to improve what we are doing or better explain what we are doing to a community not always familiar with the NOFA and program office framework. On the other hand, listening and learning from this feedback helps us better target our mapping deliverable to meet the needs of our external customers. In this second case, external feedback not only provides feedback on perceived qualities (or lack of quality) in the data, it helps us to learn if we are developing data that is truly helpful to downstream users across a wide range of usage and intent.

At this point, our external deliverables take three forms: State Broadband Maps, data transfer to NTIA used for the National Broadband Map, and text format data requested by outside parties.

Online Map Experiences

With our State maps online, we continue to harvest viewer feedback and comments. Because an online map allows someone to zoom in far below the scale of the data, comments reflect sub-Census block concerns. While important to the citizens reporting these issues and to our Broadband planning teams, this level of data is outside the scope of our core validation process, which as noted above, is focused on the level of data submitted to NTIA.

There are several other themes that our team believes are important to share. These comments are actually quite helpful because they also improve our data processes to better meet the needs of map viewers. For example, we have invested significant time in harvesting more segments from provider data. Because the appearance of segments is so important, we are putting time into ensuring a visually appropriate edge match between the roads we harvest and the Blocks/roads we will show online. On a technical level, we also believe that a good segment process will help us understand more about dispersion in the data, and what is valid versus what is not valid.

Our team reviews the online comments on a periodic basis.

Online Display of Consumer Feedback

We have completed development of a consumer feedback layer for our online maps.

The intent of the new layer is to show viewers the feedback of other map viewers. This layer went live after the Round 4 data was posted.

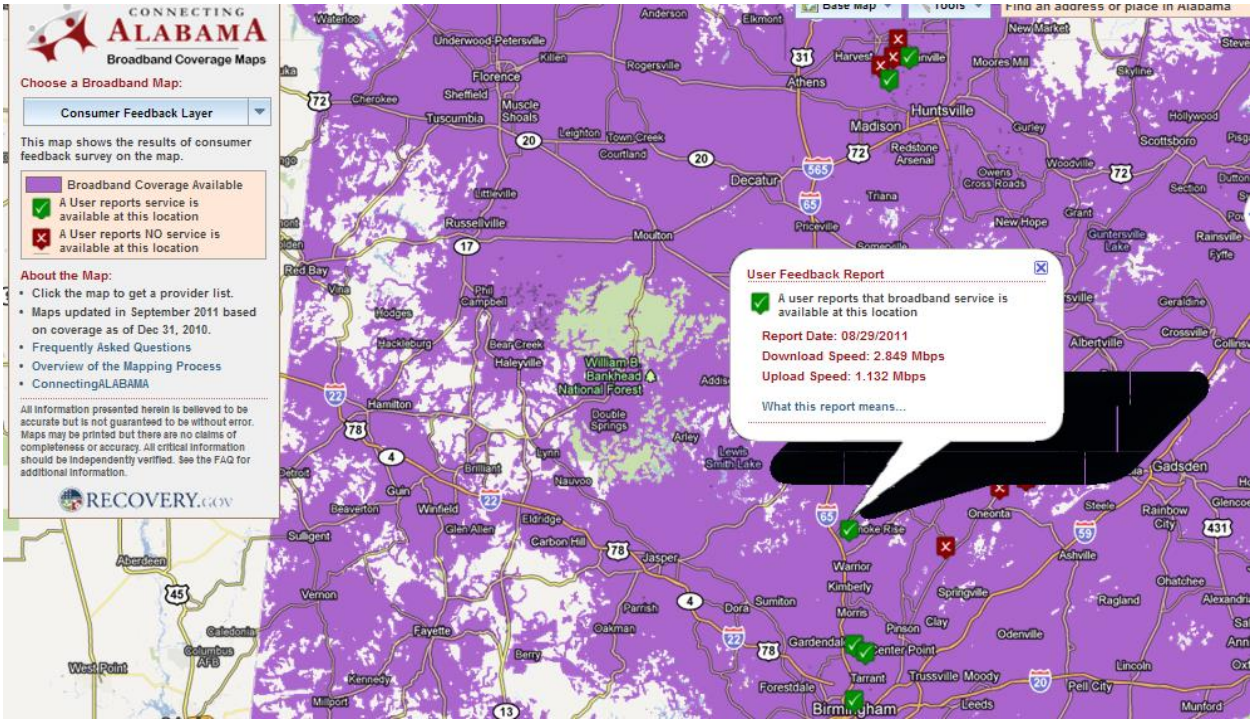
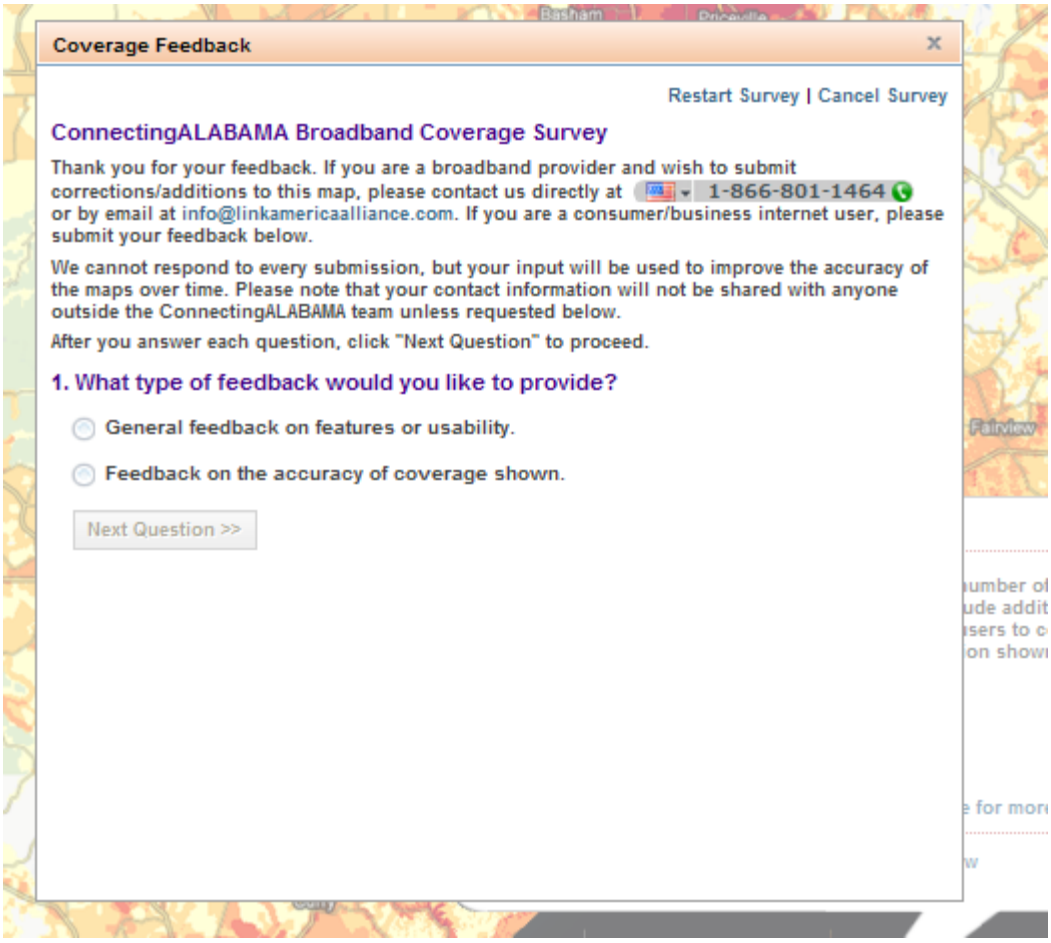


Figure 21--Consumer Feedback Layer

To gather feedback, we use a survey wizard which asks the end users to categorize their concerns. The survey went through several iterations of design and usability testing. Our experience has been unless we get a way to constrain the user feedback into manageable categories, it becomes very difficult to act upon.



As mentioned by other grantees we struggle with how to use all of the feedback we receive. The qualified data points seem to fall below a volume in which we can infer significant modifications to the map data. Nevertheless, we believe it is important to gather structure and display the feedback to support project transparency.

Perception of Unfair Treatment across Technologies

Several Broadband service providers have expressed strong concerns regarding how wireline services are displayed, as contrasted to how wireless coverage is displayed. This is an artifact of the SBI data model. As an example, consider the figure below.

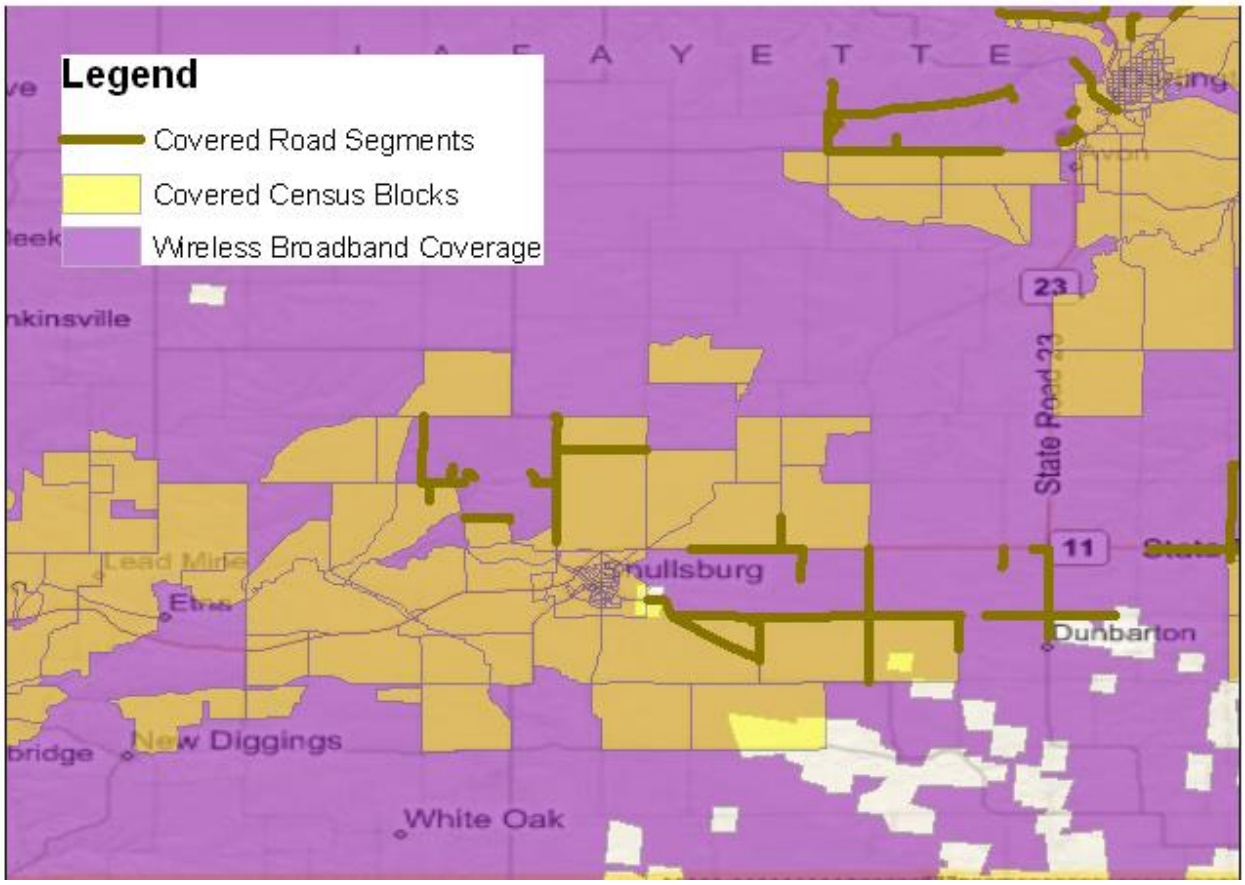


Figure 22--Multi Network Coverage portrayal

In this image, covered Census Blocks are light gold. Covered road segments are a darker gold and wireless coverage is purple. The concern seems to come down to how a wireline provider's coverage is shown in the large Census Blocks (greater than 2.0 sq mi). Some wireline providers have expressed dissatisfaction because their coverage is only tied to road geography, which leads to a visual "hole" in their coverage map. At the same time, they feel that it is unfair that the wireless provider's coverage is shown to be uniform in the same area. Put another way, if our maps show wireline in terms of Blocks and segments, why don't our maps show wireless the same way? This concern is getting amplified because wireless speed does not vary by Block whereas wireline does.

Loss of Geographic Granularity

Some providers particularly those who submitted facility level information are disappointed when we have to roll the derived data up to Census blocks or road segments as this changes the appearance of their service areas. This is especially important in rural areas where the larger blocks represent more of the service territory. Further, the FCC Order requesting service level boundaries has made some providers unhappy when submitted block level information does not line up with their service areas.

Perceptions of Carrier of Last Resort (COLR) Obligations

Some wireline providers have also expressed dissatisfaction because online maps limit the distance of coverage from a road segment. In our current State online maps we buffer a wireline carrier's service

from road centerline. A number of providers have expressed that they are mandated to provide voice coverage (which Broadband will accompany) anywhere in the exchange. There seems to be many dimensions to this argument, but the basic concern comes down to not being able to accurately reflect the scope of their COLR obligation within the mixed block/segment view. Their ability (or lack thereof) to actually provision such services for new users within a 7-10 day period adds yet another level of complexity when attempting to fairly portray their coverage capabilities.

Intentions of Coverage Mapping

When a viewer of an online map clicks on the map (or zooms to an address), they are provided with a pop-up of service provider coverage in the area. The critical question is this: what is the area to which that pop-up window responds to? In the past, we reported back to the specific Census block, or buffered road segment intersected by the user click. As far as the map was concerned, once we move off of that road, or out of that segment, we have a new area to examine.

Our sense, given feedback received, is that our provider view should be a bit more tilted toward finding providers in a general area, rather than finding providers at a single-click location. If the goal of the map is to get someone to call a provider for service, our bias should be to include all of the potential providers in the general area, rather than giving potential customers a method to self-disqualify. That is, we want to cast a wider coverage net, rather than one too narrow. The problem with this approach is that it will create a number of false positive Broadband reports. As of this date we cannot determine if the claims of inaccurate coverage in online maps are due to the looser provider view standard or not. We keep this relaxed standard in place to minimize the likelihood of self-disqualifications.

Appendix One-Idaho

Community Anchor Institutions

Collecting broadband subscription data at Community Anchor Institutions (CAIs) in Idaho was a complex process. In a state characterized by such a diverse geography and spread out rural communities it was necessary to design a variety of outreach strategies that would encourage CAIs to participate in the State Broadband Initiative (SBI). The main focus of the mapping team was to establish a productive dialog with CAIs, which included informing them about the goals of the SBI and the opportunities it offered for CAIs.

In the first submission, the team gathered information on what data was available and what resources will be required to engage these categories of important institutions. In subsequent submissions we have focused our efforts on obtaining connectivity information for CAIs through direct outreach to the specific institutions as well as through central sources within the state or institution associations. The work performed in the previous nine submissions has yielded a comprehensive dataset of CAIs in Idaho.

For the final submission our efforts focused on actively reaching out to K-12 public school districts to obtain and verify connectivity information. Our objectives were:

1) Collaborate with School Districts Technology Coordinators to verify or update broadband subscription information for their schools.
2) Follow up with Police Departments in rural communities to encourage them to provide broadband connectivity information they subscribe to.

CAI Philosophy

The work performed for this submission was guided by three principles:

First, CAIs are important stakeholders within the planning process and are traditionally active participants in their communities. The challenge is to encourage CAIs to include broadband accessibility in their discussions as a means to improve their services to the community. It also allows broadband planning to tie into existing organizational and planning networks.

Second, CAIs will likely be one of the primary beneficiaries of targeted broadband funding. Some CAI categories are especially positioned to avail on the extended applications offered by broadband to improve the efficiency of the services they provide to the community (e.g., improved emergency planning, management and response, better medical services, etc.)

Third, the CAI process prioritizes the discovery, inventory and integration of Broadband planning activities into those CAIs that stand to produce the greatest synergies with the SBI planning process rather than an exhaustive census of anything that could be a CAI.

Based on these principles, the team directs its efforts to integrate broadband mapping in the ongoing fabric of the communities. We want to support CAIs to be able to become active voices in their communities to encourage the inclusion of broadband in the community planning processes.

Anchor Institution Outreach

During the third submission period we designed and developed a simple on-line survey system called CAVS (Community Anchor Verification Survey). The intent of the survey was to both verify received connectivity information and garner additional connectivity information from CAIs. The link for the survey is housed on the Home Page of the State SBI website, thus providing the added opportunity for responding institutions to learn more about broadband activities in their state. The survey remains open between collection periods to allow responding institutions access to update their data as necessary. This system allows us to store and track the CAI data during and between collection cycles.

For this final submission we continued our approach of mapping broadband availability by means of direct communications with IT personnel at School District Offices and Police Departments. Our focus on these specific sectors was driven by a goal to provide the state with data that we felt could possibly be useful for future funding prospects. In Idaho the Idaho Education Network (IEN) provides broadband internet to the district offices as the main collection point. The districts then assign broadband to each of their schools based on their needs. During data collection for Round 6 we worked with IEN to obtain broadband connectivity data for the public schools. For the final collection cycle we focused our efforts on getting School Districts Technical Coordinators to verify the broadband connection for the schools in their care.

We developed an automated email system that was able to send customized emails to School District IT Coordinators. The emailing system retrieved broadband subscription information of all schools in a district from the information stored in the CAVS database. The fields retrieved included School name, Transmission Technology, Download and Upload Speed Tiers and Availability of Public Wi-Fi. This information was used to populate a table within an html message that requested School District Technical Coordinators to verify or update the subscription information.

The first email was sent to all 180 school districts. One week later a reminder email was sent to all School Districts that did not reply. Finally we followed-up with non-responders via phone calls. Responses were processed on a case by case basis. Some school districts simply verified that the information was correct or updated it to reflect their current architecture. Other districts provided information that did not match the parameters defined by NTIA. For example, some districts had aggregated more than one type of transmission technology to serve their schools. In these cases, we chose to report the main transmission technology and make a note of the aggregated configuration. Some school district coordinators required further explanations before they volunteered any data, which we usually did via phone calls. Some of the answers we received informed us of changes in personnel at the district so we started over with the outreach process to the newly provided contacts.

This method resulted in an approximately 60% response rate. Any changes or new information on broadband subscription was updated in CAVS. A side benefit of this process was to identify and purge from our database schools that are no longer operational or that have been merged.

We also reached out to Police Departments in rural Idaho that had not participated in the SBI during previous data collection rounds. We chose to call these CAIs directly to encourage them to participate. Unfortunately, the response rate was below 10%.

Anchor Institution Trends

To date we have focused our efforts on identifying Community Anchor Institutions, verifying physical address information for the institutions and seeking broadband subscription information from the institutions. Collecting connectivity data for public safety institutions continues to be one of our most significant challenges. Through our interaction with this sector we have learned that there are security concerns about sharing details of their network connections and the potential benefits of participating are not perceived as meaningful by these institutions.

Another important trend seen was that the broadband subscription information received does not necessarily fit within NTIA categorization. For example PRI or T1 were classified as "other copper." We also had difficulty obtaining both the subscribed upstream and downstream channel capacities. In most instances, when it was logical to do so, we made the speeds symmetrical, but this is an assumption on our part.

In the K-12 sector we have found that many schools, especially those found in rural communities, are using more than one type of transmission technology to meet the broadband needs of the institution. Another trend that we see in the K-12 sector is the emerging multiplex or co-located schools. These are "schools within a school" and on one site there might be a traditional school, a charter school, and a magnet school with a special theme, i.e. School for the arts. These multiplexes are different from typical school-within-a-school models, such as academies or learning communities because each school on the campus is led by a different principal and operates autonomously. This can often prove to be confusing when collecting information and verifying location and NCES codes.

Validation:

Prior to submission we run validation scripts against our CAI dataset to identify data anomalies such as higher reported upload speed than download, duplicate values etc. Because many CAI are closely clustered together and may even share the same building (physical address) we perform the de-duplication manually. It is during this step that we often determine that the name of a school or library has been changed. We have found that there is a fluidity in regards to name and location in the school and library sectors that presents a unique challenge for tracking.

In February 2014 we added a transtech/speed check to our process. In some reported instances we saw cases were the speed reported did not line up with our expectations based on the transtech reported. For example we see instances where the fixed wireless subscription speeds in our dataset exceed NTIA acceptable speeds for the fixed wireless transfer technology. This could be due to a point-to-point access that the institution has negotiated with the carrier, but we have also seen instances where fixed wireless providers in the state are advertising download speeds exceeding speed tier 7 (the acceptable MAD for the particular Transfer Technology). The majority of the time we find that these anomalies occurred in the data entry phase of the survey by either the Administrator in the survey worksheet or in

that data entry process. In instances where the discrepancy requires further examination we flag the institution for post-submission follow-up. Through this process we have also identified instances where it appeared that there may have been some confusion about the specific technology of transmission type, i.e. Cable Modem Other vs. Cable Modem DOCSIS 3. In these instances, when appropriate, we apply an experienced view of the data and make an educated assumption regarding the correct transtech assignment. Adding this additional validation step provided insight to our process and identified areas of focus for data collection.

For this final submission NTIA provided a comparison dataset that flagged technology transmission data that was different between the Dec 2013 SBI dataset and the FCC E-rate data which was developed based upon FCC requests for information to validate the FCC E-Rate maps. The request was for the Grantees to review any institutions for their states that appeared on the list with the intent of "harmonizing" the data to ensure that the final SBI submission reflects a consensus for the school and library broadband adoption data.

In ID 17 schools were flagged as not having the same delivery transmission as what was reported on the E-Rate map. The reported E-Rate data was compared to the dataset generated for the October 1, 2014 submission, (data current as of June 2014). We found that all of the listed institutions had submitted data for the June 2014 SBI dataset. As it has been our policy to report the subscription level data obtained from the institution when possible we did not make changes to the data submitted by those institutions. We found that 11 of the schools had reported the upgrade to fiber which was already included in the June 2014 SBI dataset, however the speed that they reported differed in some instances with what was reported for the E-Rate maps. In these instances we included the speed provided by the institution in the June 2014 SBI dataset. One of the institutions identified, Artic Charter School, is an umbrella organization with many campus locations. They were able to confirm that their campuses have access to Fiber but they could not confirm the speed. For this institution we did not report speed.

Appendix Two

Data Collection Challenges

This section summarizes some of the challenges we have experienced with data collection and processing. The team believes it is important to categorize these challenges as they help inform the geoprocessing and verification methods used. It is also our hope that some of the more global issues can be discussed and decided within the Grantee community.

We begin with several global issues and then continue toward more granular challenges.

Global Data Collection Issues

Maximum Advertised Speed is Not Reported Consistently

As has been discussed in webinars and also within the context of NTIA data assessments, some reported speed information continues to be reported at the market level (MSA/RSA) and then uniformly pushed down to the Census blocks. This has a tendency to create a problem with NTIA speed tripwires since the technology is reported by block but the maximum advertised speed is reported at a regional level.

This challenge gets further amplified at a block level when comparing to a third party data provider. It can create a mismatch between third party data generated at an area larger than block level versus block level generated speed and vice versa. To minimize the potential confusion, it might be helpful to be able to provide a flag at the submitted record level which indicates the geographic basis by which the Maximum Advertised Speed is reported.

Census Block and Road Standards are not clear

There seem to be several methods by which providers are calculating the Census block area. So the distinction at 2.00 square miles can be uniform, it would be ideal to articulate an operational area calculation definition.

Providers Not Wishing for Block Level Aggregation of Their Data

For providers who submit address point data, we do minimal additional processing. Our main test is to ensure that points are contained within 1 mile of exchange boundaries, census block IDs are appropriate and duplicate points are reasonable; the only other processing was normalization into NTIA formats.

Broadband providers not Meeting the NOFA "provider" Definition

Comments on the NTIA grantee collaborative site appear to reflect a concern among a number of grantees about what a Broadband provider is--and how that definition impacts mapping.

If the 7-10 day provisioning rule is to be strictly enforced, it could seem to eliminate a number of prominent Broadband providers[30]. Further, the need for clarification around a facilities-based provider, versus the reseller, has injected even more uncertainty. Right now we are unclear on how strictly to interpret either of these important distinctions, but we are concerned that we are beginning to create an NTIA exclusion criterion that is going to confuse downstream consumers of the data.

Given mergers and acquisitions in the CLEC space we are noticing a drop off in participation in this program by several national CLECs. We hope this is an artifact of the mergers and resource constraints rather than a long term trend.

Again, we do not want to exclude a service provider, but we believe there needs to be further clarification around the "7-10 day rule," the definition of a "reseller," and better interpretation of facility-based providers, versus equipping UNEs, SpA or leased lines.

We have used the provider Type of "Other" to classify a number of providers who offer Broadband services, but we do not offer them in a manner consistent with Technical Appendix A definitions.

To What Extent Should We Begin "Classifying" the Data and Maps?

The question immediately preceding gets to the intent of a Broadband provider. This question gets to the intent of the Data and Maps.

Earlier in this document we discussed the question of what type of bias we should introduce to our online map messaging. In an online environment, do we want to more likely create an overstatement of coverage for a provider than an understatement? In other words, is the larger problem allowing a consumer to self-disqualify, versus calling a number of neighboring providers? There is a related issue to this. Clearly in our maps there is a lot of scatter in data that we believe should be more continuous. These are the islands of coverage from an incumbent provider[31]. There are a number of processes that could be put in place to deal with this type of scatter, but without more information from the service provider-- essentially the last mile facilities-- it will be difficult to perform this clean up in an informed manner. On the one hand, we can aesthetically clean the maps up and reduce the scatter, but we have little sub-block engineering information upon which to make this decision. Right now our preference is to put out a somewhat aesthetically messier deliverable and work with providers to get better information to clarify their submission. If that isn't forthcoming, we are limited in what can be done given the lack of facility level information. In summary this yields two questions

In our online maps should we error on overstating coverage to prevent consumer self-disqualification?
In our online maps should we work to clean up a lot of the scatter that we see without having facility-based evidence from which to remove it?

As we examine results from third party data assessments, it appears that this scatter is something that is also problematic with the assessment results. It also appears to be evident that different third party data sources treat water areas differently. When we are developing data based upon Wireline facilities, we exclude water blocks. We do not filter out water blocks from provider submitted data. We are

[31] For a provider who sells opportunistically (not within a franchise area) it becomes even more problematic to classify their coverage because the points are more related to the type of consumer purchasing the service than a bounded offering. In a matter of speaking, the ProviderType is more determined by the technology and/or location than a type of business. The core intent of the NOFA and our grant application was centered around the 7-10 day providers but we believe maintaining information on provider Type "Other" and "Reseller" is important to assist in validation and market segment analysis as resources are available.

unsure if there is or should be a standard in how water covered blocks are treated for Wireline broadband providers.

Point to Point Fixed Wireless

We are finding a consistent class of fixed wireless providers who offer extremely high broadband speeds to specific locations such as multi-unit dwellings or commercial office parks. Their customers tend to be clustered. In these circumstances using address point or Census block data may be more reflective of the service offering than a large service area polygon. If this class of providers continues to increase it may be worthwhile to reconsider revising if wireless coverage can be submitted at the Census block level.

Community Anchor Institution Surveys

Over time the base of participation in CAI surveys has broadened. Our teams are interacting with more organizations interested in broadband planning. This is a benefit because it helps integrate the importance of broadband mapping, planning and capacity building within their organizational framework. But it also begins to create challenges in data collection. There are two noticeable trends in this area.

First, CAIs are organizationally diverse. For a school, you expect to have a centralized entity that can answer and support questions about Broadband services. For a rural, volunteer fire department answering questions about broadband may go to the Chief. The way that he/she answers about Broadband is probably specific to her experience and context. The implication is two-fold. First saying that some percentage of CAIs in a state have access to broadband can be misleading because the formality of a school or government building is much different than the formality of a volunteer fire department. Second, that volunteer fire department may get broadband via a 3G mobile hotpsot when they need it…but the presence of *this* type of broadband is a very different thing than the presence of a responder who has mobile LTE broadband.

Second, technical knowledge of the survey respondent differs within each organization. This complicates our data collection. It is not uncommon for someone to say yes we have Broadband, I just don't know how we get it or how fast this is. So in response we report they are broadband served but unknown speed or technology. This doesn't mean they haven't been surveyed, it just means the response was unknown. As there are now a large number of people collecting this data, it would be helpful to have some consistent national business rules from which we can answer questions about the meaning of any particular data element. As an example, when should "no" be used versus when should "unknown" be used. In other words, what is the standard for the difference between never made contact with the CAI versus a respondent didn't know/couldn't answer. We have guidelines internally but are unsure if this is consistent across states.

Granular Data Collection Issues

Non-Uniform Submission Standards

It is clear among providers that there isn't a consistent method used to derive Broadband coverage. Some providers appear to be use a geocoding approach and then point in polygon or point on segment

process. Others may be using GPS locations. In some cases, it is difficult to infer what reference data was used to georeference plant (is it the carrier's roadbase?). This leads to uncertainty regarding the input data scale or accuracy relative to other base layers. Although we may be trading off absolute accuracy, our standard has been to conflate submitted data to TIGER 2010 Blocks and TIGER 2010 roads. We perform our verification against this conflated data product.

Temporal

We are unsure of how well the data are temporally consistent. Some providers give us their best effort to control to the vintage date we request however, we note that some providers were clear that the submission was as of extract date without any way to move back in time. They have no means to control for time and cannot provide any audit support beyond when the data are released to us. Some data-especially loop qualification data-may change from day to day. It will be very difficult to clarify why something was changed from a given point in time.

Perceived Inaccuracy with Respect to Internal Standards

The NOFA is clear on submitting a list of Blocks in which a provider delivers Broadband service. This is a different objective than perfectly reflecting service territories. If a firm's accuracy standard is a reflection of their service area, then the data created under the NOFA will not meet their perception of accuracy. This leads to two other issues: First, using Census Blocks rather than serving area may overstate or understate a particular provider's Broadband serving area. This was a significant concern of ***REDACT*** who specifically (at that time) required us to submit only address-level qualification data. The second issue this brings up is how or if, there should be some standard on how much of a Census Block needs to be covered to call it covered.

Confidentiality

Several providers have noted concerns with CPNI-related issues and have stated this as a reason for non-participation. We have also heard expressions of comparable concern regarding identifiable responses to Anchor Institution information.

Unclear on Definitions

As discussed earlier, several providers claimed confusion on several key terms involved in Middle Mile. We note a consistent stream of questions around the interpretation of Maximum Advertised Speed. Some providers understand this to be the most common speed package bought within the mass market, while others view this as a speed that can be purchased for an additional cost above a mass market offering (e.g. a Turbo option for an additional fee per month). Others interpret this as the fastest speed that is available for that particular location--in terms of xDSL, a structure qualified speed, for example.

Perception of Data Use

There seems to be some hesitancy releasing speed information because no one is sure of how the information will be used, or what the speed is intended to reflect. A number of providers have verbally indicated that typical speed will be about (on average) 80% of purchased speed due to overhead. But there are many other factors (such as a user's home network) that influence speeds measures. Providers are concerned about introducing statistics without a clear understanding of how those statistics are derived and will then be used. Also, as advertised speed is pushed down to a block level,

we sense more trepidation to report speed values. This quickly begins to touch on parity across network types (why is wireline down at the block when wireless is half the state, etc.). Finally we note a significant increase in speed values reported to us. This may be due to network upgrades or competitive concerns to match the theoretical network speed.

Location Uncertainty In Source Data

Within this document we have noted concerns about the impact of source data accuracy. Our geoprocessing methodology provided what we believe is a relatively conservative tolerance to account for the scale issue in the source data, but we are unsure of how this may impact downstream users. Clearly, it also impacts the verification process because we can't attempt to verify received data beyond a scale at which it was developed.

Covered Segment Process

Deriving Broadband covered segments in Census Blocks greater than 2 square miles has proved to be a challenge. Moving from a NOFA specified tabular deliverable to a requested geographic deliverable also increases the complexity of the effort.

Miscellaneous Data Collection Notes

We note the following important observations regarding our data submission:

There are Middle Mile plant records for providers who are not present in the Census block, segment or wireless area feature classes. This is due to classification as non-NOFA Broadband providers.
In some cases, we have trimmed wireless coverage estimates to honor state boundaries.
We believe some providers are trimming their coverage to honor license area boundaries.
In tables with mandatory Street and Zip5 attributes (Service Address), if the value is unavailable we fill the default value.
We have a significant amount of VDSL, ADSL 2 and ADSL 2+ coverage categorized into the xADSL category. This introduces large variance in speed availability as some providers are using VDSL, shortened loops and/or pair bonding to increase speed to levels nearly 30 Mbps.
We note a few providers who have speeds seemingly inconsistent with their technology of transmission. This is either very low speeds with optical fiber, or very high speeds with non DOCSIS 3.0 systems. We have verified on provider websites that the reported speeds are available in the area but these speeds will fall out of the NTIA frequency table analysis.
We have a small number of providers who serve an area with both a residential and business speed tier. In cases where we cannot distinguish which speed tier offering to use, we use the higher of the speed tiers.
Per NTIA request we have modified the manner in which we handle Wireless coverage polygons. If a Provider submits a single geometry but specifies multiple spectrum codes in use in that polygon, we duplicate the polygon for each spectrum code. In other words the geographic object is identical but the attribute data for the object is unique.
In point level data submissions (Service Address and CAI) we note points that are spatially coincident. With respect to Service Address points our thought is these represent multi-unit dwellings or businesses but we don't have enough address detail to determine if these are multi-unit structures or duplicated

customers. Because we cannot determine the reason for the duplication we leave spatially coincident records in our submission. We also leave in our CAI submission points which may be the same physical structure but have slight variations in addressing.

In point level middle mile data, we are finding a variance in the quality of the geocoded longitude and latitude returned. Given the data received we are unsure if this is an issue where the plant address is difficult to geocode or if the longitude and latitude provided to us is different than what would be returned in geocoding.

For Block and Segment level data which we produce based upon provider facility or service area boundaries, we remove Census blocks which are entirely water covered. This results in a drop of Census block counts for a number of providers.

We note Community Anchor Institutions that have speed ranges inconsistent with their technology of transmission per NTIA standards. In some cases we have modified the received information so as to change the technology of transmission (e.g. xDSL was changed to Other Copper). In the case of cable and fixed wireless, the values were left as is. As most of these outliers represent survey information, we will go back to the source for additional review.

Appendix Three

This appendix contains the confidentiality clarification supplied in a series of emails between CostQuest and NTIA.

Feature Class	*Metadata*	*NOFA Confidential?*	*Online Map*	*Public Disclosure*	*Exemption*
Last Mile	Constraints on accessing and using the data	Yes	No	No	None
	Access constraints: None				
	Use constraints:				
	This data is confidential as defined in the NOFA.				
Middle Mile	Constraints on accessing and using the data	Yes	No	No	None
	Access constraints: None				
	Use constraints:				
	This data is confidential as defined in the NOFA.				
Service Address	Constraints on accessing and using the data	No	No	Yes	
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
CAI	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential

	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Census Block	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Service Overview	Constraints on accessing and using the data	No	Yes	Yes	The only provider who may not show up on this table is a provider who has provided only confidential data (last mile, Middle Mile,

					address point with provider name)
	Access constraints: None				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Road Segment	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None.				
	Use constraints:				
	There are no restrictions on distribution of the data by users.				
Wireless	Constraints on accessing and using the data	No	Yes	Yes	NO attributes on any record in this feature class are considered confidential
	Access constraints: None				
	Use constraints:				

	There are no restrictions on distribution of the data by users

Appendix Four-Idaho

This appendix details our analysis of the potential and actual broadband provider market. We include both our internal tracking description document and then our categorization for each provider. As this extract was made prior to final submission, there may be differences between provider categorization and the attributes on the day of submission to NTIA.

Provider Categorization

Provider Type and Status Definitions

The Provider Type is based upon categories provided by NTIA, while the Provider Status is based upon categories developed internally for tracking purposes. It should be noted that the Provider Status discussed here relates to the provider's overall status within the program.

Provider Type Codes and Definitions:

NTIA code	Code	Name	Definition
1	P	Provider	This code applies to all confirmed providers of broadband service per the SBI program NOFA. A provider is given a "P" designation if we have determined that the company does indeed exist and appears to be providing broadband services.
2	R	Reseller	This code applies to all broadband entities that have been confirmed as pure resellers – meaning they do not own their own facility/equipment and simply resell services under their own brand name or the brand name of an actual Provider.
3	O	Other	The code applies to entities who were originally placed on the SBI provider list, but whose status is still in question or has been determined to be non-NOFA compliant.
	N/A	Not applicable	This code applies to entities who appeared on the original state provider list or a third party list (such as the FCC 477, American

4			Roamer, or Warren Media lists) but who have been confirmed as NOT providing broadband services.
	X	Inactive	This code applies to entities that may have appeared on an early provider list but whose identity and existence we subsequently have been unable to verify. This code may also apply to providers who have since been acquired or simply gone out of business and for which no FRN appears on the FCC list – These no longer need to be reported to NTIA. This is an INTERNAL category used to remove entities completely from the list of entities submitted to NTIA.

Once the proper Provider Type has been assigned to an entity, an overall Provider Status must be established. The Provider Status codes are specific to the Provider Types, and are not interchangeable. The following table lists the status codes associated with each Provider Type.

Provider Status Definitions

Provider Type Code	Provider Status Code	Name	Definition
P	D	Declined	A provider is given a Status of "D" if they have officially stated verbally or in writing that they will not participate in the SBI program.
	P	Participating	A provider is considered to be "Participating" if they have submitted USABLE data in at least one data submission round. The data does not need to be 100% complete for a provider to be assigned a "P" code – they simply have to have provided a level of data that is sufficient to submit to NTIA.
	NR	Non Responsive	A provider is considered "Non Responsive" if they have either failed to respond to any of our correspondence, or they have submitted insufficient data that makes inclusion of their data in the NTIA submission impossible.
	V	Submitted under other ID	A provider whose data is submitted under another Provider ID, but is operating under their own FRN.
	E	Estimated	A provider is marked as "Estimated" if they have not submitted usable data, and would otherwise be considered non-responsive, BUT for whom we are able to submit data by using estimation techniques and/or third party sources. This designation applies only to providers whose data is 100% estimated.
R	R	Reseller	"R" is the only status code for Resellers and it simply reconfirms their status as a reseller –data may not be submitted but name of provider is included in NTIA data package.
O	U	Unknown	The status of Unknown is assigned to an entity whose name has appeared on a list (or been submitted as a new possible provider) and is currently under investigation. It has not been determined yet if this entity is indeed offering broadband services or not.
	NC	Non-Compliant	This status is assigned to entities who appear to be in the broadband industry, but who do not meet the formal definition of a BB provider under NOFA requirements. Examples may be entities who cannot provision service within 7-10 days.

	P	Participating	These are providers who do not meet the formal definition of a BB provider under NOFA requirements, but are participating in the program and submitting data.
	NP	Not a Provider	This status applies to entities who may appear on a third partly list of valid providers, but who have been proven to either no longer exist, or simply no longer provides broadband services.
N/A			No status codes associated with this Provider Type
X			

Provider Disposition

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
679	ID	360 Networks (USA) Inc.	360 Networks (USA) Inc.	Zayo Group, LLC	O	NC
148	ID	A & W Satellite	A & W Satellite		R	R
120068	ID	Access One, Inc.	Access One, Inc.	Access One, Inc.	N/A	NP
851	ID	Access Spectrum	Access Spectrum	Access Spectrum	N/A	NP
120027	ID	Advanced Cable Technology	Advanced Cable Technology		N/A	NP
153	ID	All Idaho Internet	All Idaho Internet		R	R
120072	ID	Aloha Partners II LP	Aloha Partners II LP	Aloha Partners II LP	N/A	NP
678	ID	American Fiber Systems, Inc.	American Fiber Systems	Zayo Group, LLC	O	NC
704	ID	Asotin Telephone Company	TDS		N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
120000	ID	AT&T Inc.	New Cingular Wireless Services, Inc.	AT&T Inc.	P	V
661	ID	AT&T Mobility LLC	AT&T Mobility LLC	AT&T Mobility	P	P
115	ID	ATC Communications	Albion Telephone Company	Albion Telephone Company, Inc.	P	P
802	ID	Atlantic Tele-Network	Allied Wireless Communications Corporation	Atlantic Tele-Network	P	NR
855	ID	Atlantic Wireless LP	Atlantic Wireless LP	Atlantic Wireless LP	N/A	NP
154	ID	Big Sky Telecom	Big Sky Telecom		R	R
155	ID	BitSmart	BitSmart	BitSmart Corporation	P	P
858	ID	Blackfoot Telephone Cooperative Inc	Blackfoot Telephone Cooperative Inc	Blackfoot Telephone Cooperative Inc	N/A	NP
135	ID	Bresnan Internet	Bresnan Internet		N/A	NP
136	ID	Cable ONE	Cable ONE	Cable One, Inc.	P	P
120029	ID	Cache Broadband	Cache Broadband		N/A	NP
859	ID	Cache Valley Wireless	Cache Valley Wireless	Cache Valley Wireless	N/A	NP
120002	ID	Cactus International, Inc.	Cactus Computer		P	D
638	ID	Cambridge Telephone Company, Inc.	Cambridge Telephone	Cambridge Telephone Company, Inc.	P	P

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
862	ID	Cavalier Wireless, LLC	Cavalier Wireless, LLC	Cavalier Wireless LLC	N/A	NP
131	ID	CenturyTel, Inc.	CenturyLink	CenturyLink, Inc.	P	P
120073	ID	Charles W. Ergen	Charles W. Ergen	Charles W. Ergen	N/A	NP
120065	ID	Charles W. Ergen; 0017096629	Charles W. Ergen; 0017096629	Charles W. Ergen; 0017096629	N/A	NP
829	ID	Chickadee Wireless	Chickadee Wireless	N/A	P	D
132	ID	Citizens Telecommunications Company of Idaho	Frontier Communications of Idaho	Frontier Communications Corporation	P	P
868	ID	Cleartalk	Cleartalk	Cleartalk	N/A	NP
189	ID	Clearwire	Clearwire	Clearwire Corporation	P	P
149	ID	Coeur d`Alene Tribe	Red Spectrum Communication	N/A	P	P
987	ID	Cogent Communications, Inc.	Cogent Communications	Cogent Communications Group	O	P
722	ID	Columbine Telephone Company, Inc.	Silver Star Communications	ATC Communications	P	P
527	ID	Comcast of California Idaho, Inc.	Comcast	Comcast Corporation	P	P
120003	ID	CommWorld	CommWorld		P	NR

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
830	ID	Concept Communication Corp.	Concept Communication Corp.	Concept Communication Corp	P	P
872	ID	Continuum 700 LLC	Continuum 700 LLC	Continuum 700 LLC	N/A	NP
156	ID	Convertec Internet Services	Convertec Internet Services		N/A	NP
754	ID	Country Cable LLC	Country Cable	Country Cable, LLC	P	NR
137	ID	CoxCom, Inc.	Cox Communications	Cox Communications, Inc.	P	P
803	ID	Craner Technology Services	Craner Technology Services	Craner Technology Services	P	P
981	ID	Cricket License Company, LLC	Cricket Wireless	Leap Wireless International, Inc.	P	P
116	ID	CTC Telecom	CTC Internet	CTC Telecom	P	P
671	ID	Custer Telephone Broadband Services LLC.	Custer Telephone Broadband Services	Custer Telephone	P	P
117	ID	Custer Telephone Cooperative, Inc.	Custer Telephone Cooperative, Inc.	Custer Telephone Cooperative Inc.	P	P
157	ID	Datawav-is	Datawav-is		X	
158	ID	Digi-Comm	Digi-Comm		X	
170	ID	DIGIS	Last Mile Wireless		N/A	NP
686	ID	DigitalBridge Communications	Bridgemaxx		N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
159	ID	Direct Communications - wireless	Direct Communications	Direct Communications Rockland, Inc.	N/A	NP
138	ID	Direct Communications Rockland, Inc.	Direct Communications	Direct Communications Rockland, Inc.	N/A	NP
118	ID	Direct Communications Rockland, Inc.	Direct Communications	Direct Communications Rockland, Inc.	P	P
139	ID	Dish Network	Dish Network	Dish Network	R	R
120071	ID	Eagle Telephone System, Inc.	Snake River PCS	Eagle Telephone	N/A	NP
120061	ID	EarthLink	EarthLink	EarthLink	O	NC
695	ID	Electric Lightwave, LLC	Integra Telecom	Integra Telecom Holdings, Inc.	P	P
716	ID	Elk River TV Cable Company	Elk River TV Cable Company	Elk River Cable TV Inc.	N/A	NP
119	ID	FairPoint Communications	FairPoint Communications		N/A	NP
120	ID	Farmers Mutual Telephone Company	Farmers Mutual Telephone Company	Farmers Mutual Telephone Company (ID)	P	P
120070	ID	Fatbeam	Fatbeam		O	NC
120063	ID	Fiberpipe	Fiberpipe		N/A	NP
121	ID	Filer Mutual Telephone Company	Filer Mutual Telephone Company	Filer Mutual Telephone Company	P	P

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
120005	ID	First Step Internet, LLC	GLOBAL CROSSING TELECOMMUNICATIONS, INC.	Global Crossing North America, Inc.	R	R
162	ID	First Step Internet, LLC	First Step Internet	First Step Internet, LLC	P	P
973	ID	Fremont Telcom Co	Fremont Communications	FairPoint Communications, Inc.	P	P
769	ID	Fretel	FairPoint Communications		N/A	NP
974	ID	Fretel Communications, LLC	Fremont Communications	FairPoint Communications, Inc.	P	P
130	ID	Frontier Communications	Frontier Communications of Northwest Inc.	Frontier Communications Corporation	P	P
164	ID	Gem State Communications	GSC Wireless	N/A	N/A	NP
723	ID	Gold Star Communications LLC	Silver Star Wireless	Silver Star Telephone	P	P
804	ID	GreenFly	Clearfly	Greenfly Networks, Inc.	R	R
120059	ID	H.J. L.L.C.	Host Idaho / Big Dog Internet	H.J.L.L.C.	N/A	NP
951	ID	HJ LLC	Big Dog High Speed Internet	Big Dog H.J.L.L.C.	N/A	NP
805	ID	HNS License Sub, LLC	Hughes Network Systems	Hughes Communications, Inc.	P	P
120062	ID	Hughes Computer Services, Inc.	Hughes Computer Services, Inc.	Hughes Computer Services, Inc.	N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
888	ID	Idaho City Cable TV	Idaho City Cable TV	Idaho City Cable TV	N/A	NP
740	ID	Idaho Regional Optical Network	IRON		O	P
166	ID	Imbris, INc.	Imbris, Inc.		N/A	NP
966	ID	Imperial Wireless	IdahoWiFi		P	P
972	ID	Inland Cellular, LLC	Inland Cellular		P	P
167	ID	Inland Internet	Inland Internet	Western Elite Incorporated Services	P	V
122	ID	Inland Telephone Company	Inland Telephone Company	Western Elite Incorporated Services	P	P
168	ID	Intermax Networks	Intermax Networks	Newmax, LLC	P	P
169	ID	Ispeed Wireless	Ispeed Wireless		P	NR
956	ID	J&L Electronics, Inc.	Palousetronics		P	P
120023	ID	JAB Broadband	Jab-Skybeam		N/A	NP
687	ID	JAB Broadband	DIGIS	JAB Wireless, Inc.	P	P
165	ID	JAB Broadband	Heritage WiFi		N/A	NP
120009	ID	KeyOn Communications Holdings, Inc.	KeyON Communications Holdings, Inc.		X	
120031	ID	Laser image, Inc.	Laser image, Inc.	laser image, Inc.	N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
151	ID	Leader Communications, LLC	Leader Communications, LCC		P	P
729	ID	Leap Wireless International, Inc.	Cricket Communications, Inc.	Leap Wireless International, Inc.	N/A	NP
120010	ID	Level 3 Communications, LLC	Broadwing Communications, LLC		N/A	NP
660	ID	Level 3 Communications, LLC	Level 3 Communications, LLC	Level 3 Communications, LLC	P	P
120060	ID	Liberty-Bell, LLC	Liberty-Bell, LLC	Liberty-Bell, LLC	R	R
171	ID	LTLink	Family Friendly Internet Service		P	NR
894	ID	Manti Telephone Company	Manti Telephone Company	Manti Telephone Company	N/A	NP
127	ID	Martell Enterprises, Inc.	Rural Telephone Company	Martell Enterprises, Inc.	P	P
172	ID	Meadow Creek Computer Works	Meadow Creek Computer Works		R	R
645	ID	Megapath, Inc.	Megapath		N/A	NP
896	ID	Metro PCS	Metro PCS	Metro PCS	N/A	NP
120011	ID	Metropolitan Telecommunications Holding Co	Metropolitan Telecommunications Holding Co		R	R
173	ID	Microserv	Microserv		N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
174	ID	MicroWave DSL (HIBEK.Net)	MicroWave DSL		P	D
123	ID	Midvale Telephone Exchange, Inc.	MTE Communications	Midvale Telephone Exchange	P	P
779	ID	Millennium Networks	Silver Star Broadband	Silver Star Telephone	P	P
899	ID	MTPCS License Co., LLC	Cellular One	MTPCS LLC	N/A	NP
124	ID	Mud Lake Telephone Cooperative Association, Inc.	Mud Lake Telephone Cooperative Association, Inc.	Mud Lake Telephone Cooperative Assn., Inc.	P	P
145	ID	Mullan Cable	Mullan Cable	Mullan Cable TV Inc.	P	P
120066	ID	Network Innovations, Inc.	Network Innovations, Inc.	Network Innovations, Inc.	N/A	NP
674	ID	New Edge Network, Inc.	New Edge Networks	New Edge Holding Company	O	NC
768	ID	Nez Perce Tribe	Nez Perce Tribe	N/A	P	P
175	ID	NIDAHO.NET	North Idaho Connection		P	NR
146	ID	Northland Cable Television	Northland Cable Television	Northland Communications Corp.	P	P
690	ID	OneEighty Networks	OrbitCom, Inc.	OrbitCom, Inc	P	NR
955	ID	OneWave Networks, LLC	OneWave Networks		P	P
125	ID	Oregon-Idaho Utilities, Inc.	Oregon-Idaho Utilities, Inc.	Robinson Communications Corporation	P	P

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
176	ID	Overarch Broadband	Overarch Broadband		N/A	NP
737	ID	PAETEC Holding Corp	McLeodUSA Telecommunications Services, Inc.	Windstream Corporation	N/A	NP
161	ID	Pass Word PKA -Fastlane-i.com	Pass Word, Inc.		N/A	NP
705	ID	Potlatch Telephone Company	TDS	Telephone and Data Systems, Inc.	P	P
126	ID	Project Mutual Telephone Cooperative Association, Inc.	Project Mutual Telephone Cooperative Association, Inc.	Project Mutual Telephone	P	P
178	ID	Ptera Wireless Inc.	Ptera	N/A	P	P
179	ID	QROIdaho	QRO High-Speed Internet of Idaho	Qrowireless of idaho	P	P
908	ID	Qualcomm	MediaFLO	Qualcomm	N/A	NP
129	ID	Qwest	CenturyLink	CenturyLink, Inc.	P	V
120057	ID	Reallinx, Inc.	Reallinx, Inc.	Reallinx, Inc.	R	R
120056	ID	RTI-Rural Telecom	RTI-Rural Telecom	RURAL TELEPHONE CO.	N/A	NP
806	ID	Rural Network Services	MTE Communications	Rural Network Services	P	P
120012	ID	Rural Network Services (Owned by Midvale Tel)	Rural Network Services		N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
180	ID	SafeLink Internet	SafeLink Internet	Safelink Internet	P	P
141	ID	Silver Star Broadband	Silver Star Broadband	Millennium Networks, LLC	P	P
128	ID	Silver Star Telephone Company, Inc.	Silver Star Communications	Silver Star Telephone	P	P
181	ID	SISNA (dialup)	SISNA		N/A	NP
188	ID	Sky Blue	Sky Blue		O	S
838	ID	Skycasters, LLC	Skycasters, LLC	VSAT Systems, LLC	P	P
120067	ID	Spacenet Inc.	Spacenet Inc.	Spacenet Inc.	P	V
916	ID	SpectrumCo	SpectrumCo	SpectrumCo	N/A	NP
836	ID	SpeedConnect LLC	Speed Connect		P	P
182	ID	SpeedyQuick Networks	SpeedyQuick Networks		P	NR
183	ID	Spokane Skynet	Spokane Skynet		O	S
651	ID	Sprint Corporation	Sprint	Sprint Corporation	P	P
191	ID	St. Maries Gazette Record	St. Maries Gazette Record	The Corporation	P	P
163	ID	St. Maries Gazette Wireless	St. Maries Gazette Record		P	V
807	ID	StarBand Communications, Inc.	StarBand Communications, Inc.	StarBand Communications Inc.	P	P
120014	ID	Stat Network Solutions	Stat Network Solutions		N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
120015	ID	Stratos Global Corporation	Stratos Offshore Services Company		O	S
142	ID	Suddenlink Communications	Suddenlink Communications	Cequel Communications, LLC	P	P
143	ID	Superior Satellite	Superior Satellite		R	R
184	ID	Surf1	Surf1		P	NR
696	ID	Syringa Networks, LLC	Syringa Networks, LLC	Syringa Networks, LLC	P	P
845	ID	Syringa Wireless, LLC	Syringa Wireless	Syringa Wireless	P	D
133	ID	Telephone and Data Systems, Inc.	TDS TELECOMMUNICATIONS CORPORATION		P	V
185	ID	Teton Wireless	Teton Wireless		N/A	NP
653	ID	Time Warner Cable Inc.	Time Warner Cable	Time Warner Cable Inc.	P	P
134	ID	T-Mobile USA, Inc.	T-Mobile	Deutsche Telekom AG	P	P
923	ID	Toba Inlet PCS, LLC	Toba Inlet PCS, LLC	Toba Inlet PCS, LLC	N/A	NP
144	ID	Troy TV Cable, Inc.	Troy TV Cable, Inc.		N/A	NP
759	ID	tw telecom of Idaho llc	tw telecom	tw telecom inc.	P	P
924	ID	U. S. Cellular	U. S. Cellular	United States Cellular	N/A	NP
925	ID	Union Telephone Company	Union Telephone Company	Union Telephone Company	N/A	NP

Provider ID	Provider State	Provider Name	DBA	NTIA Name	Provider Type	Provider Status
120017	ID	Verizon Business Global LLC	Verizon Business	Verizon Communications Inc.	O	NC
713	ID	Verizon Wireless	Verizon Wireless	Verizon Communications Inc./Cellco Partnership	P	P
666	ID	ViaSat	ViaSat Communications	WildBlue Communications, Inc.	P	P
766	ID	Westcom LLC	Westel Fiber	WestCom LLC	P	P
930	ID	Western Communications Inc.	Western Communications Inc.	Western Communications Inc.	N/A	NP
931	ID	Whidbey Telephone Company	Whidbey Telephone Company	Whidbey Telephone Company	N/A	NP
186	ID	Wilderness Wireless	Wilderness Wireless	N/A	P	P
147	ID	Windjammer Cable	Windjammer Cable	Windjammer Communications LLC	N/A	NP
152	ID	Wired Or Wireless, Inc.	AIR-PIPE	Wired or Wireless, Inc.	P	P
808	ID	XO Holdings, Inc.	XO Communications, LLC	XO Holdings, Inc.	R	R
120020	ID	Zayo Bandwidth Northwest, Inc.	Zayo Group, LLC (FiberNet)	Zayo Group, LLC	O	NC
938	ID	Zito Media	Zito Media	Windjammer Communications LLC	P	P