

**New Hampshire Broadband Mapping and Planning Program
University of New Hampshire
March 2011 Data Submission**

I. Data Description

In accordance with the effective NTIA guidance for Round 3 data submissions, the New Hampshire Broadband Mapping and Planning Program (NHBMPP) submitted the data set described below and associated documents to NTIA in March of 2011.

NH_SBDD_2011_0401.gdb – file geodatabase containing feature classes for:

Feature Class	Number of Records
BB_ConnectionPoint_LastMile	0
BB_ConnectionPoint_MiddleMile	57
BB_Service_Address	18
BB_Service_CAInstitutions	3,376
BB_Service_CensusBlock	62,432
BB_Service_Overview	0
BB_Service_RoadSegment	31,874
BB_Service_Wireless	18
State_Boundary	1

In total, almost 95,000 individual data records on broadband availability were submitted by New Hampshire. Collectively, these records describe availability as reported by 31 broadband providers in the state. In addition, the NHBMPP submitted data on 3,376 community anchor institutions.

II. Provider Participation

The NHBMPP has identified 49 broadband providers in the state. As noted above, 31 of these providers actively participated in the program for the Spring, 2011 cycle. The participating providers include:

Provider Name	Technology
1. Argent Communications	Cable, Fixed Wireless
2. AT&T Mobility LLC	Mobile Wireless
3. Freedom Ring Communications	Middle Mile
4. Charter Ring Communications	Cable
5. Comcast	Cable
6. Covad Communications Company	DSL, Middle Mile
7. Cyberpine Cooperative, Inc.*	Fixed Wireless
8. Dunbarton Telephone Company, Inc.	DSL
9. FairPoint Communications, Inc.	DSL
10. G4	Middle Mile
11. Granite State Telephone	DSL, Fiber

12. Level 3 Communications	Fiber, Middle Mile
13. Lighttower Fiber Networks	Middle Mile
14. MetroCast	Cable
15. Choice One of New Hampshire	DSL, Middle Mile
16. Oxford Networks*	Middle Mile
17. RadiusNorth	Middle Mile
18. Sidera Networks, LLC	Middle Mile
19. SkiSat*	Cable
20. Sovernet Communications*	DSL
21. Spectra Access*	Middle Mile
22. Sprint	Mobile Wireless
23. Tamworth Wireless Cooperative	Fixed Wireless
24. TDS Telecom	DSL, Fiber, Middle Mile
25. Time Warner Cable	Cable
26. T-Mobile	Mobile Wireless
27. Topsham Communications	Fiber
28. U.S. Cellular*	Mobile Wireless
29. Verizon Wireless	Mobile Wireless
30. Wireless LINC of NH and VT	Fixed Wireless
31. WiValley	Fixed Wireless

* Provider did not submit revised data for this round. Data collected for the September, 2010 submission was reported as still being effective.

The 5 providers listed below submitted data that could not be fully processed for this round or indicated they would participate in future rounds. Data that was not fully processed was either incomplete or was submitted to NHBMP after the final date publicized for inclusion in this collection cycle:

Provider Name
1. Bretton Woods Communications
2. Great Auk Wireless
3. IAMNOW.net
4. Qwest Communications
5. WaveComm

The remaining 13 providers, listed below, remained unresponsive to multiple requests to participate in the NHBMP:

Provider Name	
1. Akers Pond	8. NCIA
2. Boston Telephone	9. NHvt
3. Broadview Networks	10. Russet Communications
4. CityVoice	11. segTEL, inc.
5. Dixville Telephone Company	12. telJet

6. DSCI	13. Turnpike Technologies
7. The Granite Connection	

III. Data Collection and Integration

A. Primary Data Collection

Data Acquisition

Primary data was collected directly from the service providers. The NHBMP first developed a set of guidance documents based on NTIA specifications, and distributed those to the individual providers. Once the guidance was disseminated, NHBMP staff followed up with providers via phone/email to encourage participation and address questions, as required. Typically, multiple communications were required to ensure a complete data submission was received.

Data Pre-Processing

To support the data mapping and integration efforts, the following base data sets were acquired and/or retrieved from the NH GRANIT state GIS clearinghouse archives:

- State and town boundaries (based on 1:24,000 USGS DLG files);
- 2001 Land Cover data set (derived from Landsat TM imagery);
- 2000 TIGER Census Blocks;
- 2009 Census MAF/TIGER Road Segments; and
- 2009 USGS National Elevation Data set (NED).

All required NTIA fields were added to the census block and road segment data sets. In addition, the road segments were processed against the census blocks to populate two fields used internally – the left block ID and the right block ID associated with each road segment.

Data Processing and Integration

The broadband availability data was processed and integrated using a suite of GIS tools and procedures, depending upon the format and content of the data submitted by the individual providers. Generally, the processing involved executing one or more of the following steps:

- Scanning and georeferencing paper maps and using the digital products as a visual reference to select out corresponding features from the project base data sets;
- Geocoding addresses using both an internal locator based on the TIGER road segments, and where required, the ESRI TA_BatchAddress_US subscription service; where NDAs were in place, geocoded points were used to identify the host census block (if < 2 sq. mi.), or the TIGER road segment in closest proximity (if the host census block was > 2 sq. mi.). Related note(s):
 - In some cases, the selection of the TIGER road segment in closest proximity to the geocoded point yielded a pattern of disconnected road segments with broadband service.
- Using GIS buffering tools to generate service areas around central office locations

- Using ArcGIS Network Analyst to select road segments within a cumulative distance of 18,000 lineal feet from central office locations. The selected segments were subsequently used to identify adjacent census blocks ≤ 2 sq. mi. or used as features to quantify coverage along census blocks > 2 sq. mi.; and/or
- Using Cellular Expert ArcGIS extension to generate a signal prediction surface for wireless providers submitting antenna locations (and associated data). Related note(s):
 - A -85 DB threshold was used to define service areas of fixed-wireless providers.
 - In processing the fixed-wireless polygon data, the NHBMP eliminated exterior polygons, e.g. those outside of the main coverage footprint, that were $< .125$ sq. mi. Interior non-coverage polygons were not eliminated.

Data Processing Issues

The NHBMP encountered a number of issues in processing the broadband data for the state. These include:

- Most providers submitted data only on areas that are currently served, and not on areas that could be served following the NTIA guidance. This contributed to the pattern of occasional disconnected rural road segments with broadband service.
- Reliance on the TIGER road segments likely yielded overstated broadband coverage in rural areas. A single rural customer address, when geocoded, could result in a long street segment being selected as part of a provider's coverage area.
- Most providers did not submit typical speed data. As the volume of our speed test data set grows, we will explore using this information to estimate typical speeds.
- In our experience, smaller wireless providers were frequently unable to deliver the full set of antenna parameters required for the signal propagation software. Data was missing on exact antenna patterns (which in some instances was also unavailable from the antenna manufacturer), and/or on detailed power information specific to an antenna (e.g. power information provided on the host tower only). In these situations, default values were used to run the software. We believe this resulted in overstating coverage areas, and we will be working to refine our approach during the next submission period.
- Elevation data submitted by middle mile providers was typically reported relative to sea level, not relative to grade.
- Providers that are knowledgeable and experienced with the original 2009 NTIA NOFA and corresponding clarification documentation provided information appropriate to that data schema / model, and modifications to these in January 2011 resulted in additional follow-up required to achieve a complete data submission.

B. Community Anchor Institutions

Data was submitted for 3,376 Community Anchor Institutions (CAIs) in the state covering the full range of categories established by NTIA, as follows:

Category	Number of CAI's	Percent of Total
1. School – K through 12	654	19.4%
2. Library	602	17.8%
3. Medical/health care	743	22.0%
4. Public safety	544	16.1%
5. University, college, other post-secondary	55	1.6%
6. Other community support – government	728	21.6%
7. Other community support – non governmental	50	1.5%
TOTAL	3,376	100.0%

The data collection was largely accomplished by the nine regional planning commissions in New Hampshire, with the NHBMP staff at the University responsible for developing initial guidance and for compiling the resulting regional data sets into a standardized statewide layer. The primary steps in the data development process included:

- Develop a master list of CAIs by category, relying on statewide lists (schools, libraries, health care facilities), existing GIS data sets (largely from local hazard mitigation plans), and local knowledge;
- Map the location of each CAI, using existing GIS data sets, reference to aerial imagery, web research, and field data collection where necessary;
- Contact each CAI by phone to collect the required broadband information; and
- Verify data (see verification section below).

IV. Validation

A. Primary Data Collection

Feedback/verification was primarily implemented in cases where the provider delivered non-geographic data, e.g. address lists, named road segments/address ranges, lists of census blocks/tracts, or wireless tower locations. In these cases, the NHBMP returned maps (.pdf files) to the provider for their review and correction. Where providers delivered addresses or road segments, the product returned was a geographically referenced version of the data that was submitted. For wireless providers who delivered antenna locations and specifications, the program provided maps that displayed the modeled coverage area generated from the Cellular Expert signal propagation modeling software.

The Spring, 2011 feedback loop with providers was considerably more robust than prior efforts, largely due to increased effort on the part of program staff to solicit feedback. The process was successful in identifying several significant errors/omissions, e.g. in one instance, a provider omitted a large census tract from their original submission.

The NHBMP continued to develop a number of additional verification resources and procedures, as described below:

- Speed test – The NHBMP program has posted a customized speed test on the project web site (iwantbroadbandnh.org). To date, approximately 2,400 records have been submitted. We plan to explore ways to utilize this information to estimate typical speed.
- Broadband survey – The NHBMP website also hosts an online broadband survey, encouraging users to report their broadband access (or lack thereof) at the address level. The address submitted is then geocoded, which delivers a means of verifying provider coverage data at specific locations. (The survey is also linked to the speed test, so that users completing the form are asked to take the speed test as well.) To date, 243 surveys have been completed.
- Satellite dish survey – The NHBMP has completed a drive-by inventory of satellite dishes in selected rural areas of the state, under the premise that a cluster of buildings with satellite broadband dishes signifies an area with no other broadband options available. The data are now being processed, and will be utilized during the next submission.

B. Community Anchor Institutions

The CAI data has been subjected to three rounds of verification. An initial round of verification was completed in May, 2010 by re-interviewing a randomly selected subset of CAI contacts (20% of the entities within each of the 7 data categories). In August/September of 2010, a subsequent and comprehensive verification was accomplished by generating a broadband profile sheet for each participating CAI, emailing that to each CAI contact for review, and modifying the CAI record based on any updates returned. The latter process was repeated in December 2010/January 2011. Over 150 responses were received, and those updates were incorporated in the data set prior to the March submission.